WÜRTH ELEKTRONIK

Electronic Components

2020/2021

Passive Components
Optoelectronics
Power Modules

REDEXPERT

WÜRTH ELEKTRONIK

REDEXPERT. The online platform of Würth Elektronik to select electronic and electromechanical components.

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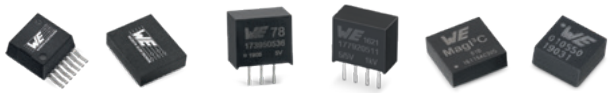

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Information in this publication is subject to change. The process of continually improving our product range leads to changes in content. For new designs please refer to the latest data sheets on www.we-online.com or contact our technical field staff.

The Würth Elektronik eiSos Group

The Würth Elektronik Group

Employees: 7,300
Sales: 822 Mil. Euro

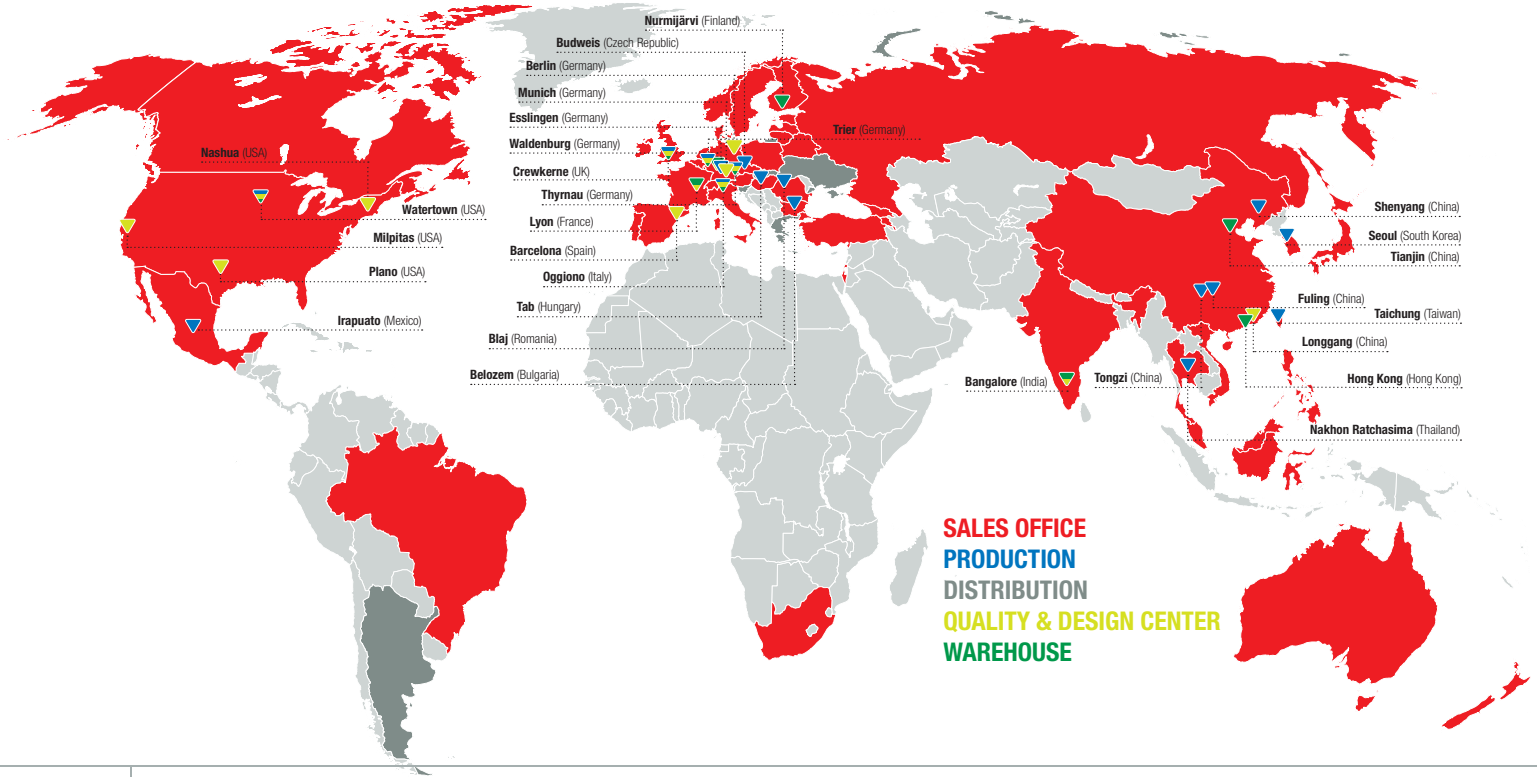
Würth Elektronik eiSos Group

Printed Circuit Boards

Intelligent Power and Control Systems

Passive Components	Power Modules & Optoelectronics	Electromechanical Components	Automotive & eMobility	Wireless Connectivity & Sensors
				
Würth Elektronik eiSos GmbH & Co. KG	Würth Elektronik eiSos GmbH & Co. KG	Würth Elektronik eiCan	Würth Elektronik eiSos GmbH & Co. KG	Würth Elektronik eiSos GmbH & Co. KG
Würth Electronics Midcom Inc.		Würth Elektronik Stelvio Kontek S.p.A.	Würth Elektronik iBE GmbH	(former AMBER wireless GmbH)
IQD Frequency Products Ltd.			Erwin Büchele GmbH & Co. KG	

Globally available. Locally present.



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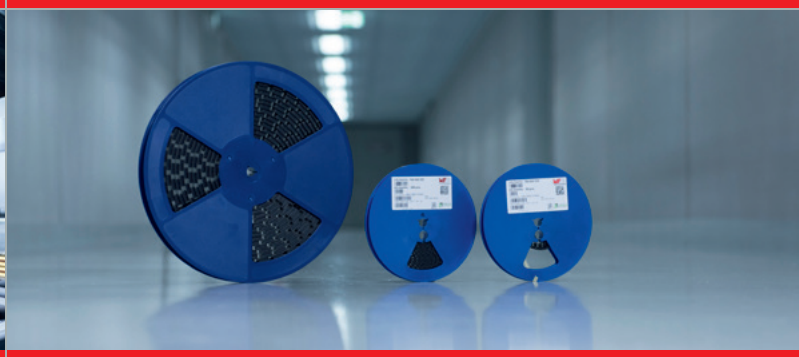

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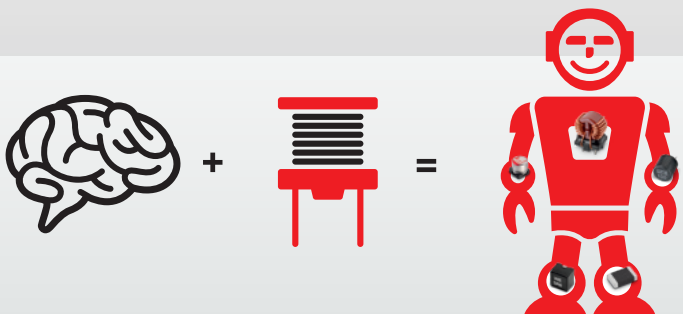

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αRack

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Global Technology Partnerships eMotorsports:
Formula E as a Driving Innovative Force

Wurth Elektronik eiSos is one of the leading manufacturers of electronic and electromechanical components for the electronics industry. We are convinced that eMobility is the engine of the future. Better than any alternative, it stands for conserving resources, green efficiency, sustainability and ecology. The Formula E Racing Team of Audi Sport ABT Schaeffler is our perfect technology partner.

Audi Sport
Official Partner

www.we-speed-up-the-future.com

Total Quality Management

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1 4 Quality Centers Worldwide

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Lyon, France

Shenzhen, China

Watertown, USA

2 Test Equipment

- Analysis Lab – Microscopic Analysis, Thermal Strength Wetting Balance, RoHS Reflow Parts, XRF X-Ray and many more
- Measurement Lab – Precision LCRs, ESD Testers, RF Impedance / Material Analyzer, Network / Spectrum / Impedance Analyzers and many more
- Environmetal Lab – Shock and Vibration, Temperature Cycling, Thermal Shock, Steam Aging and many more
- Process Lab – Reflow, Wave and Vapor phase soldering, Pick and Placing simulations, washing process, Tape- and Reeling and many more
- EMC Lab – Fully anechoic chamber and shielded rooms, Radiated emission measurements, Radiated immunity tests, Automotive monopole testing, electrical voltage tests, burst and surge test, ESD test

3 Process and Product Quality

We work with the common quality methods like:

- Quality system with PDCA-Cycle
- Risk prevention with FMEA-Process
- Quality planning with APQP & PPAP
- Complaint handling with 8D-method
- Change management with PCN / PTN
- FiFo with lot no & date code traceability
- Functional component and product qualifications

Environmental and Energy Management

4 Material Compliance

As one of the leading manufacturers of electronic components worldwide, we are fully conscious of our responsibility for the environment and its protection. That's why we comply with the following laws regarding material compliance:

- RoHS directive 2011/65EU and 2015/863/China RoHS
- REACh-regulation no 1907/2006
- Conflict Mineral Reporting [CMRT]
- End-of Life Vehicles directive 200/53EC and 2005/64/EC
- California Proposition 65
- Persistent Organic Pollutants (POPs)
- Ozone Depleting Substances (ODS)

We continuously work on the reduction of RoHS Exemptions and REACh SVHC.

We also test our products according the two common Halogen Free standards and it's our target to reduce halogens to a minimum. Halogen free products are labeled with one or both of the following standards:

- Halogen Free JEDEC JS 709B
- Halogen Free IEC 61249-2-21

RoHS COMPLIANT REACh COMPLIANT HALOGEN FREE

5 Our Ecology Projects

The WE eiSos contributes to the preservation of the environment for future generations and commits to the international climate protection goals. That's why we support several projects regarding sustainability and ecology.

- Monitoring of energy consumption
- Photovoltaics for renewable energy
- E-car & E-bike charging stations
- Reduction of plastic in our packaging
- WEBee – Bee colonies at our headquarter

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Certifications and more to download: www.we-online.com/certifications

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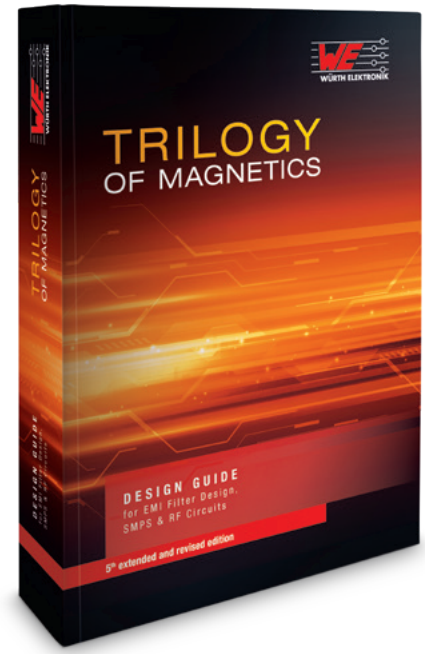
Trilogy of Magnetics
5th Edition

The Trilogy covers a multitude of new components and applications. Over 200 practical examples for audio, filter and video circuits, interfaces, motor control units, SMPS, line filter and power supply.

Order Code:
English version: **744 006**
German version: **744 019**

Further information and free extracts on
www.we-online.com/trilogy



Abc of Capacitors

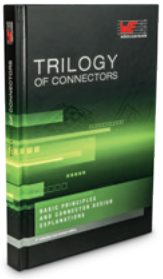
Basic Principles, Characteristics and Capacitor Types

Order Code:
English version: **744 013**
German version: **744 012**

Trilogy of Connectors

3rd Edition:
Basic Principles and Connector Design Explanations

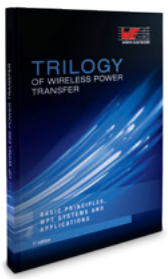
Order Code:
English version: **699 004**
German version: **699 005**



Trilogy of Wireless Power Transfer

1st Edition:
Basic Principles, WPT Systems and Applications

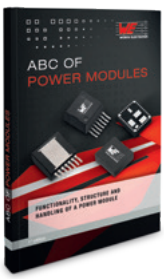
Order Code:
English version: **744 018**



Abc of Power Modules

1st Edition:
Functionality, Structure and Handling of a Power Module

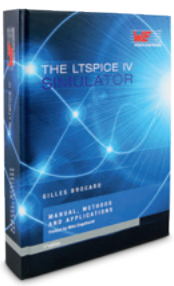
Order Code:
English version: **744 016**
German version: **744 014**



The LT Spice IV Simulator

1st Edition:
Manual, Methods and Applications

Order Code:
German version: **744 011**



Application Notes

Find helpful and comprehensive application notes about DC/DC converters, interfaces, filter design and on how to use inductors, ferrites, wireless power transfer coils, shielding material, power modules, electromechanical components, capacitors and LEDs on **www.we-online.com/appnotes**

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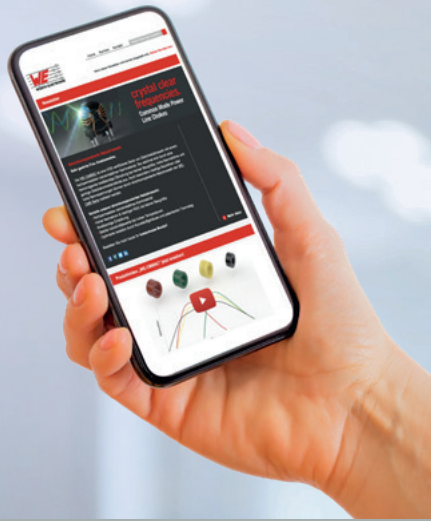

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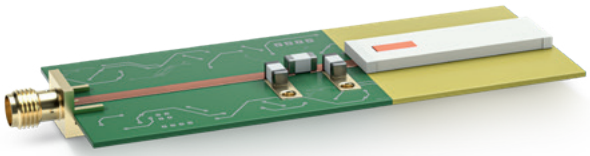

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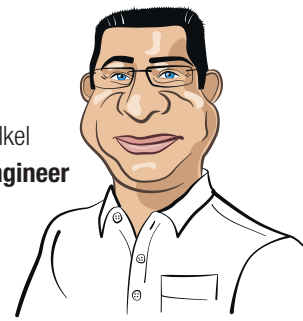

Lorandt Fölkel
Design Engineer at heart

or contact me directly:
askLorandt@we-online.com

1 PASSIVE COMPONENTS

EMC Components

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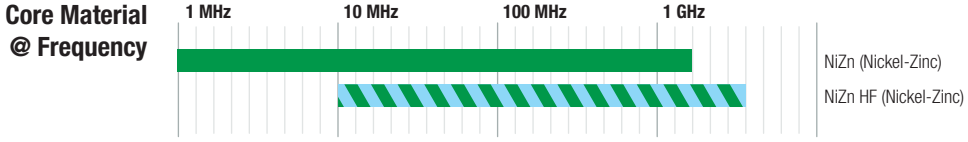
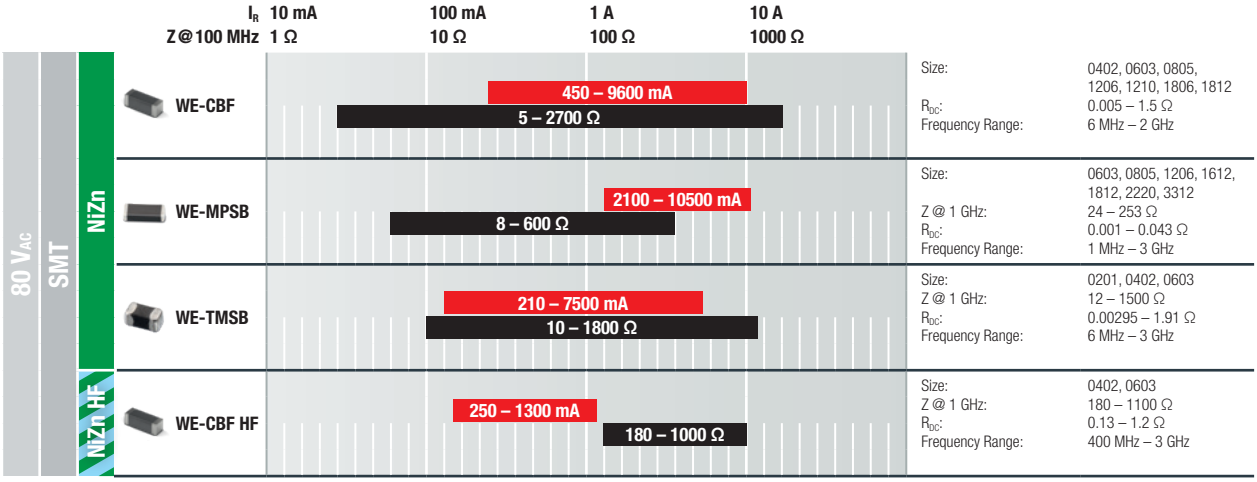
Filter Applications: EMI Suppression

Ferrites for PCB Assembly

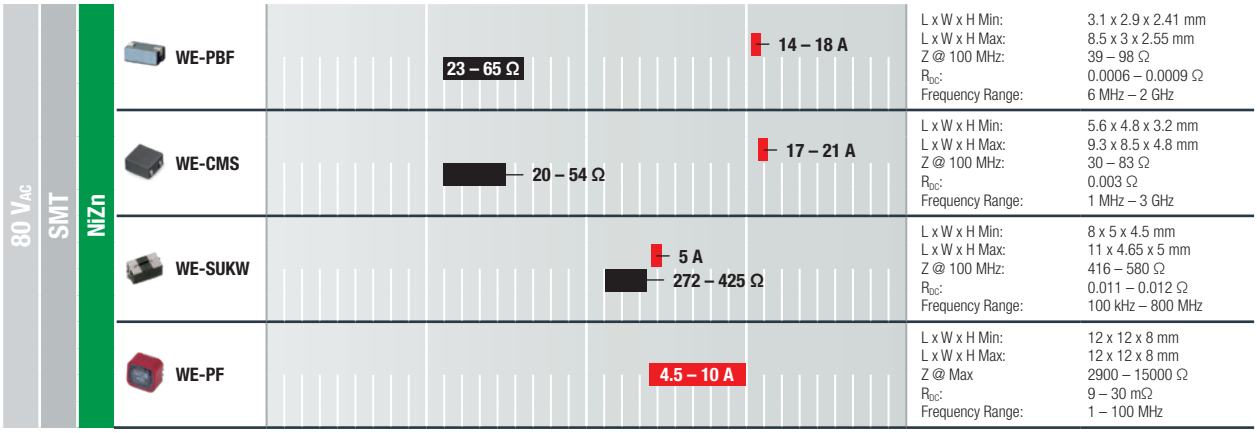


Multilayer SMT Ferrites



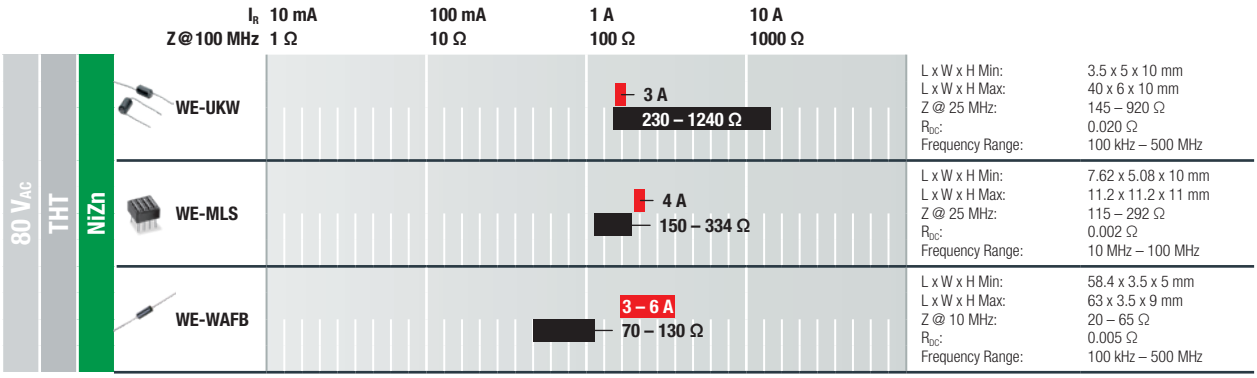
	WE-CBF	WE-MPSB	WE-TMSB	WE-CBF HF
Size:	0402, 0603, 0805, 1206, 1210, 1806, 1812	0603, 0805, 1206, 1612, 1812, 2220, 3312	0201, 0402, 0603	0402, 0603
Z @ 1 GHz:		24 – 253 Ω	12 – 1500 Ω	180 – 1100 Ω
R_{DC}:	0.005 – 1.5 Ω	0.001 – 0.043 Ω	0.00295 – 1.91 Ω	0.13 – 1.2 Ω
Frequency Range:	6 MHz – 2 GHz	1 MHz – 3 GHz	6 MHz – 3 GHz	400 MHz – 3 GHz

Wired SMT Ferrites



	WE-PBF	WE-CMS	WE-SUKW	WE-PF
L x W x H Min:	3.1 x 2.9 x 2.41 mm	5.6 x 4.8 x 3.2 mm	8 x 5 x 4.5 mm	12 x 12 x 8 mm
L x W x H Max:	8.5 x 3 x 2.55 mm	9.3 x 8.5 x 4.8 mm	11 x 4.65 x 5 mm	12 x 12 x 8 mm
Z @ 100 MHz:	39 – 98 Ω	30 – 83 Ω	416 – 580 Ω	
Z @ Max				2900 – 15000 Ω
R_{DC}:	0.0006 – 0.0009 Ω	0.003 Ω	0.011 – 0.012 Ω	9 – 30 mΩ
Frequency Range:	6 MHz – 2 GHz	1 MHz – 3 GHz	100 kHz – 800 MHz	1 – 100 MHz

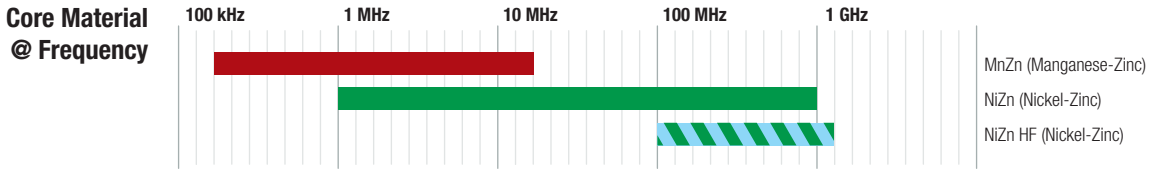
THT Ferrites



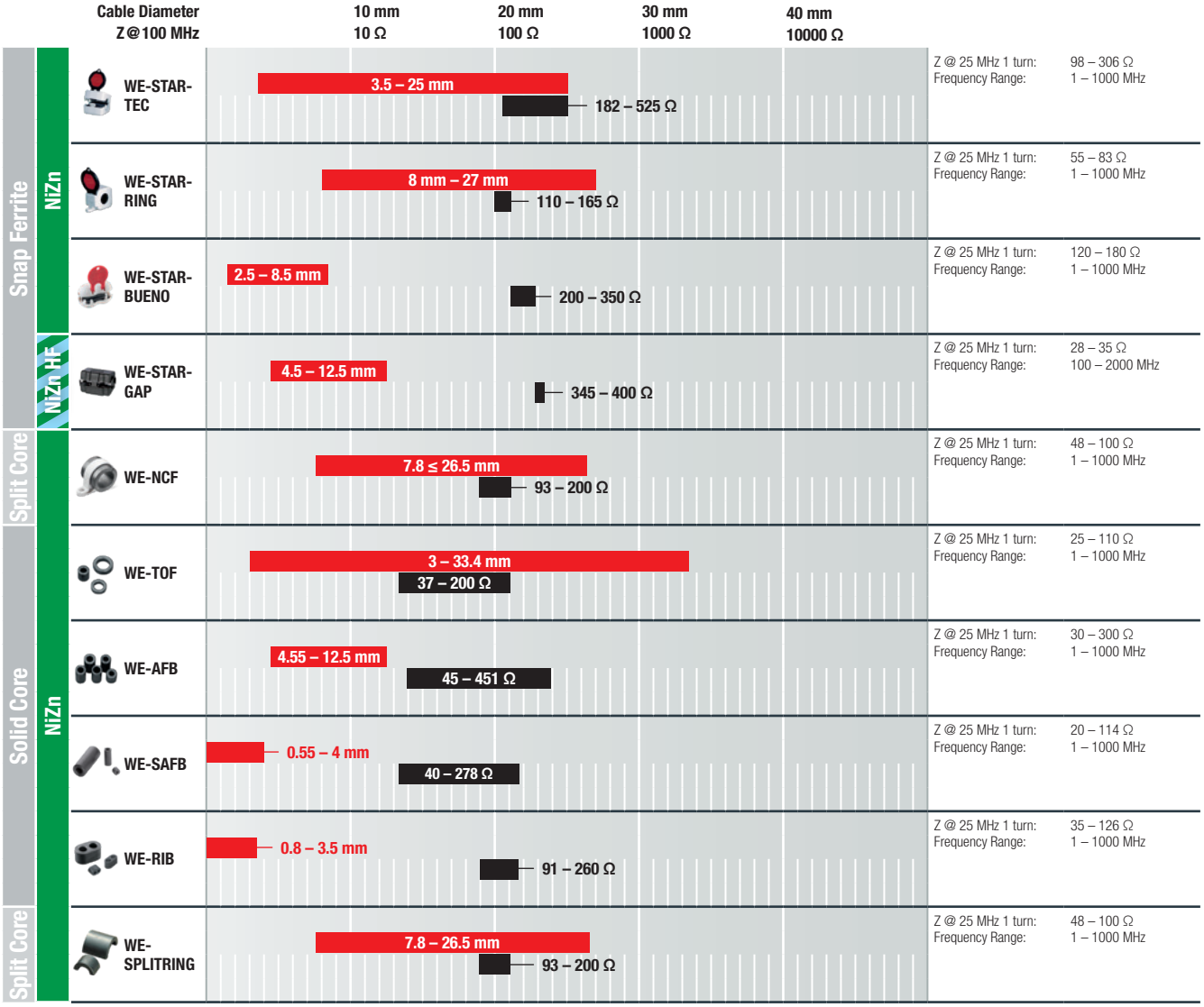
	WE-UKW	WE-MLS	WE-WAFB
L x W x H Min:	3.5 x 5 x 10 mm	7.62 x 5.08 x 10 mm	58.4 x 3.5 x 5 mm
L x W x H Max:	40 x 6 x 10 mm	11.2 x 11.2 x 11 mm	63 x 3.5 x 9 mm
Z @ 25 MHz:	145 – 920 Ω	115 – 292 Ω	
Z @ 10 MHz:			20 – 65 Ω
R_{DC}:	0.020 Ω	0.002 Ω	0.005 Ω
Frequency Range:	100 kHz – 500 MHz	10 MHz – 100 MHz	100 kHz – 500 MHz

Filter Applications: EMI Suppression

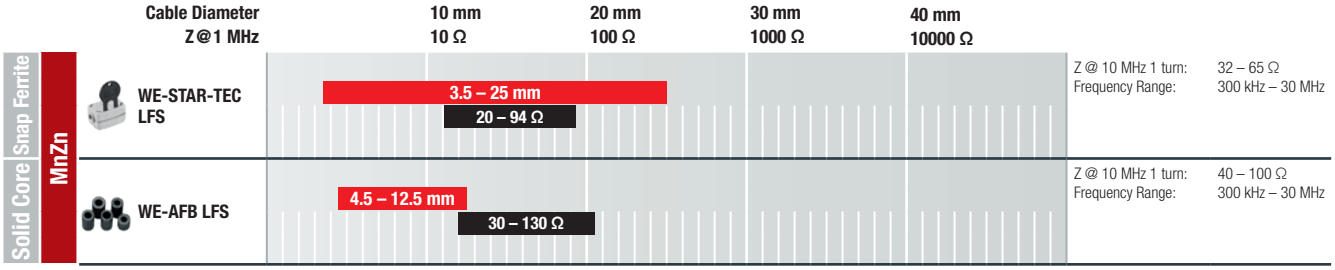
Ferrites for Cable Assembly



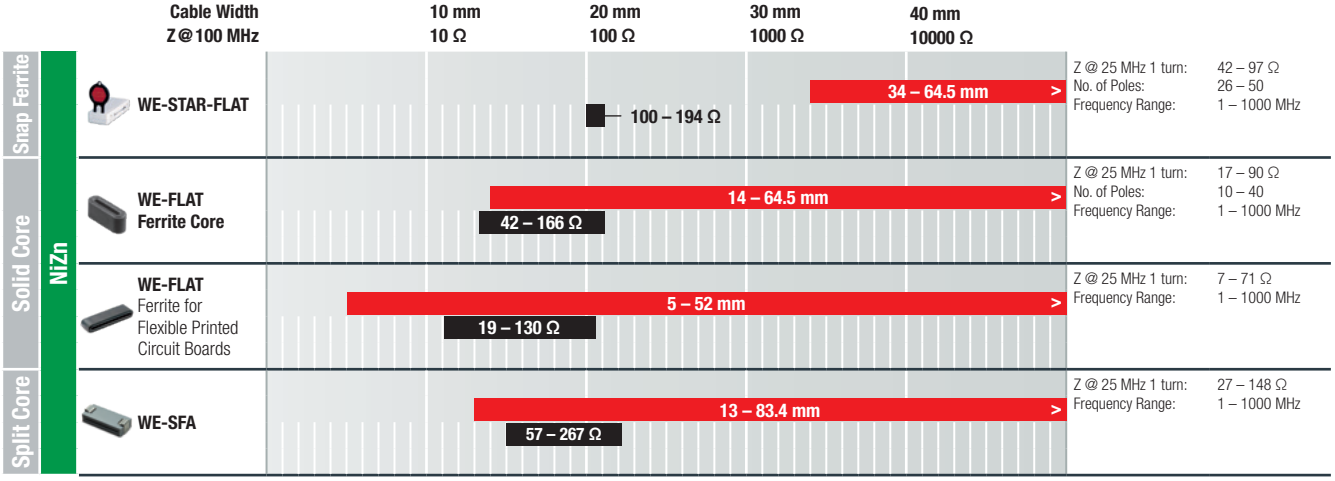
Round Cable – Medium and High Frequency



Round Cable – Low Frequency



Flat Cable



Accessories

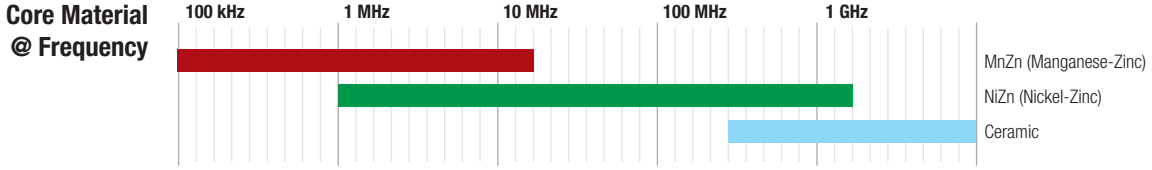
WE-STAR-CLIP
For the fixation of Snap Ferrite STAR-TEC (LFS), STARD-FIX (LFS) and STAR-GAP

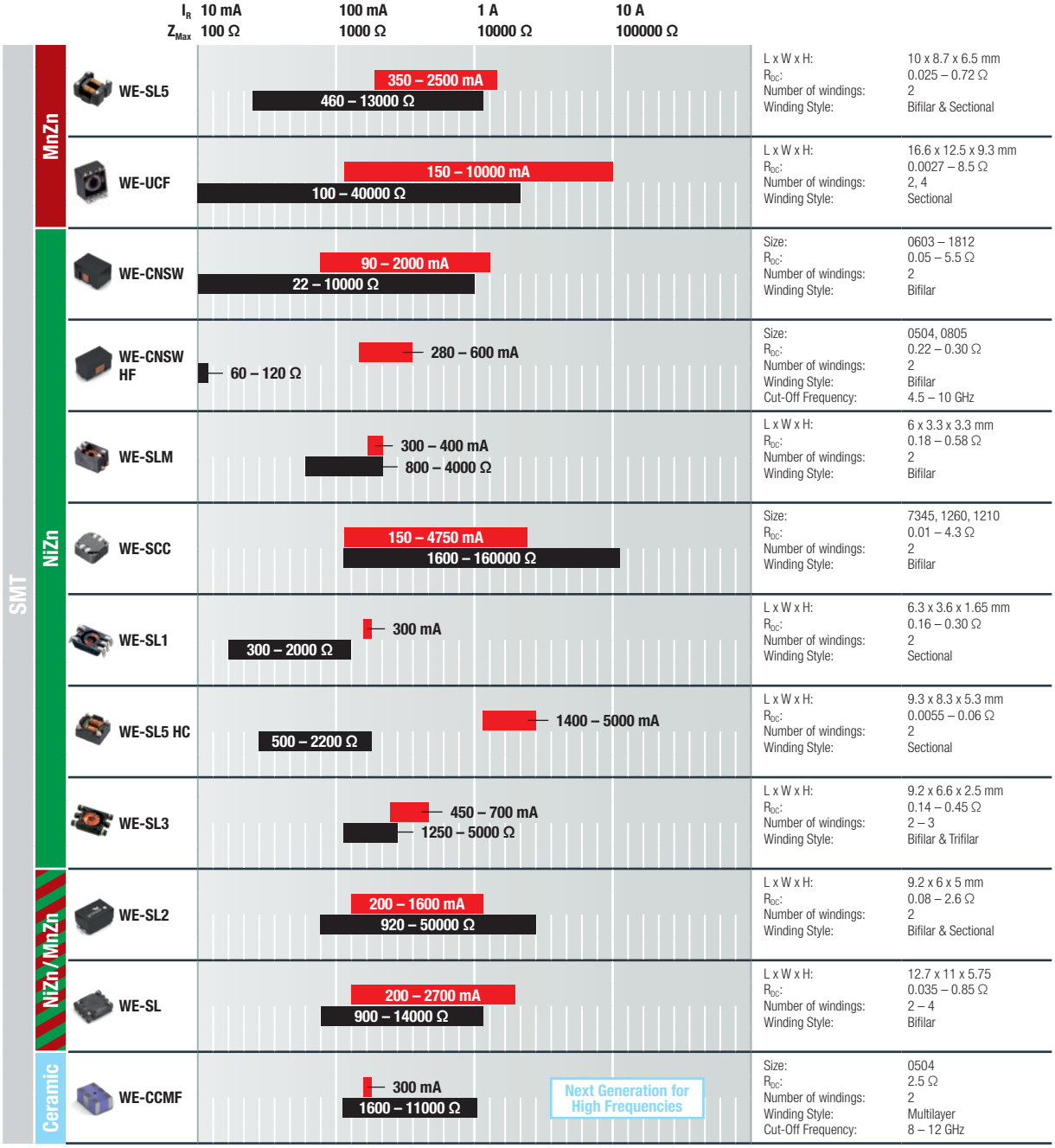
WE-STAR-KEY
Equipment to open Snap Ferrites of WE-STAR Series

WE-FCAC
Easy fixation for flat cores on ribbon cables

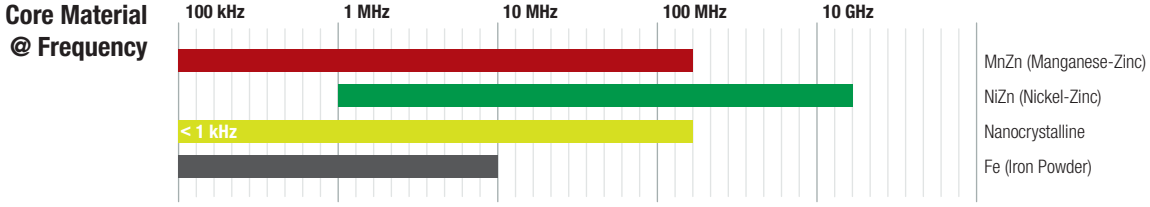
Filter Applications: EMI Suppression

Common Mode Chokes for Low Voltage and Data Lines

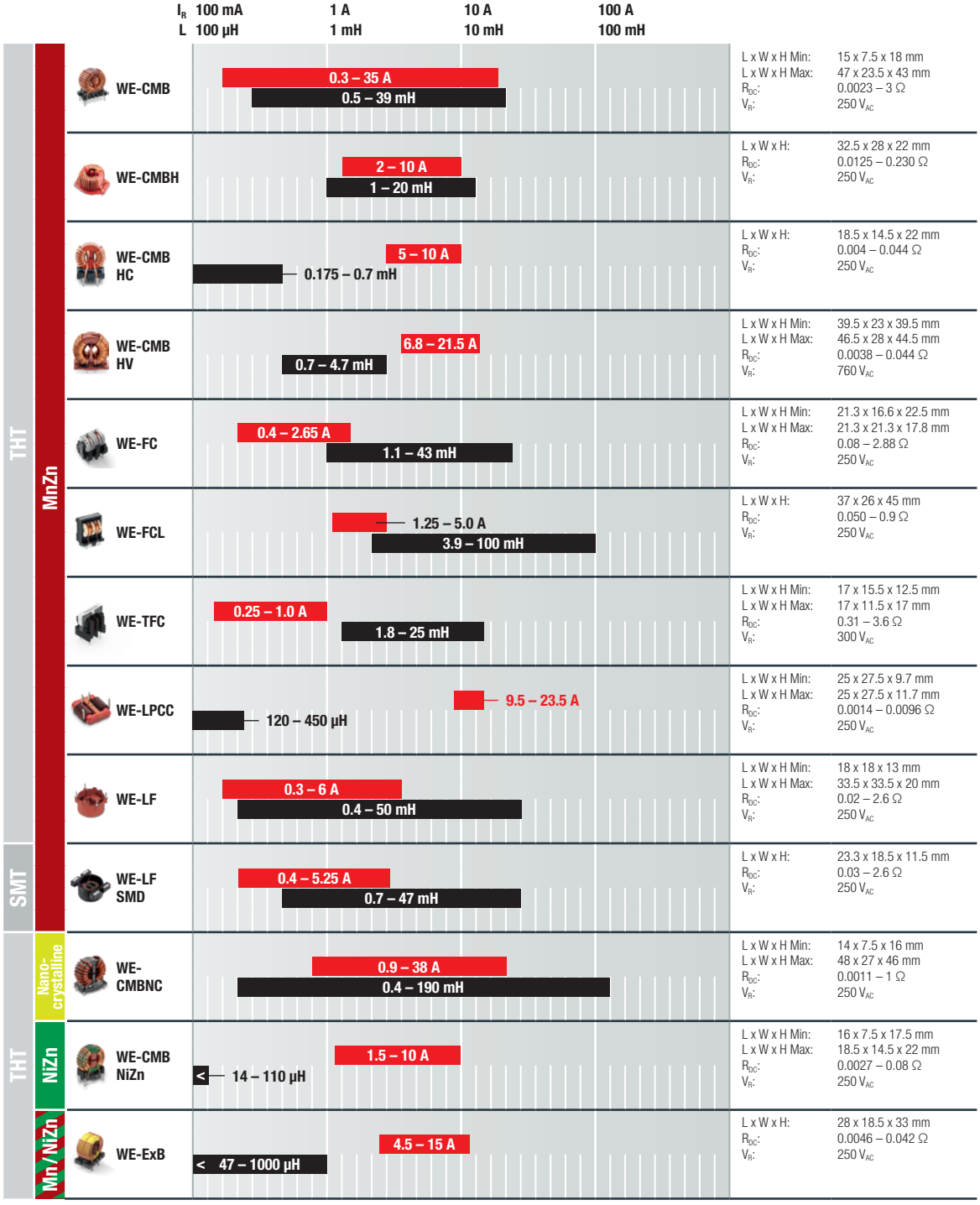




Common Mode Chokes for Mains Power Lines

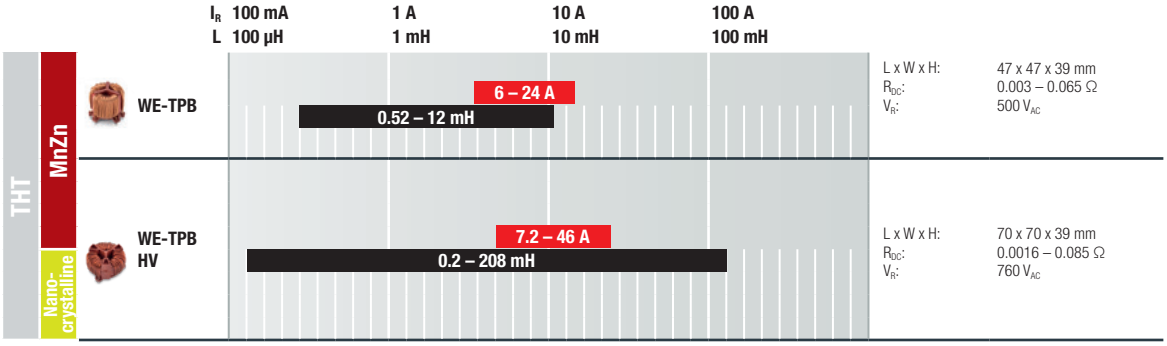


Single Phase Common Mode Chokes (2 Windings)

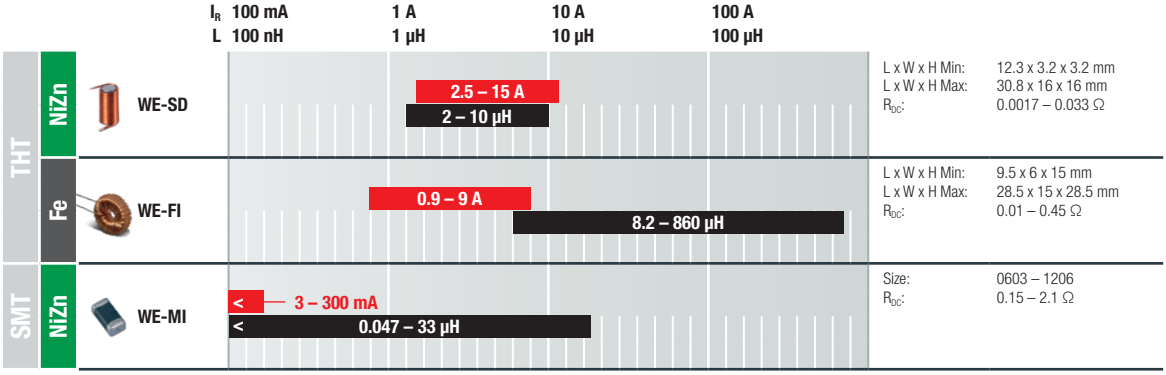


Filter Applications: EMI Suppression

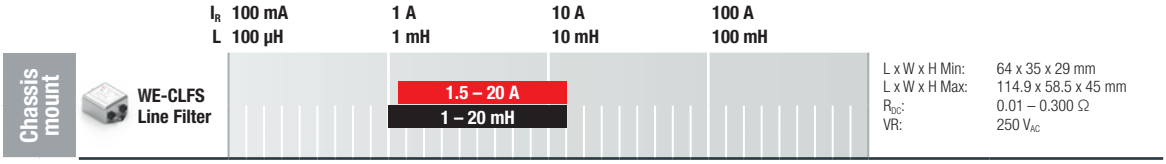
Three Phases Common Mode Chokes (3 Windings)



Differential Mode Chokes (1 Winding)



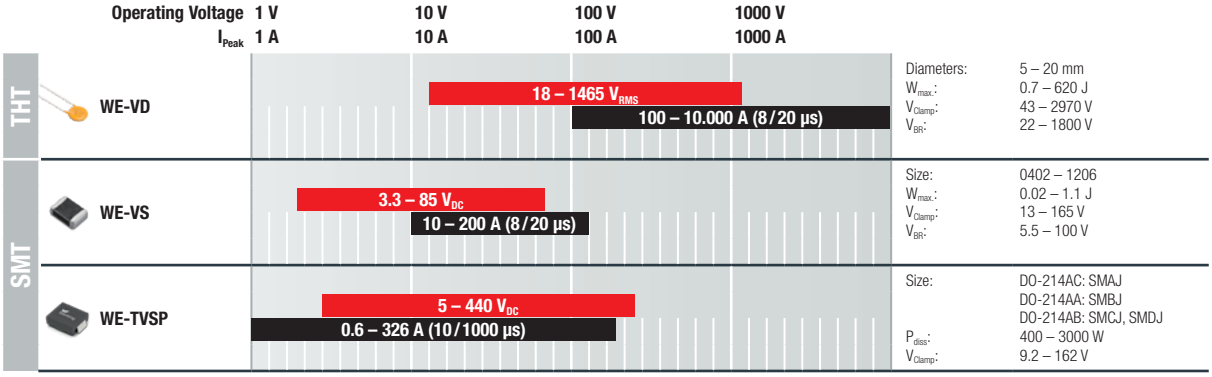
Line Filter



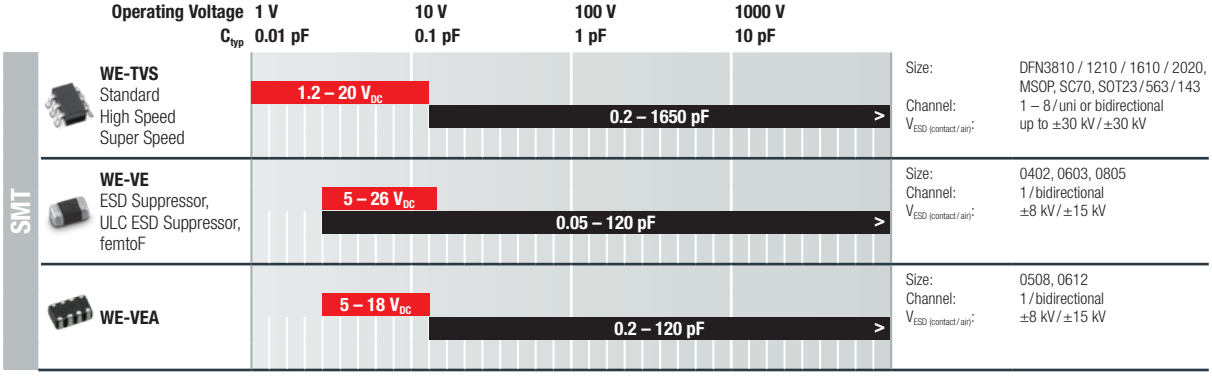
Size: L x W x H

ESD and Surge Protection

Surge Protection



ESD Protection



Product Overview

How to find detailed product information?

Visit www.we-online.com and search for product series information, e.g.:

WE-CBF

Ferrites for PCB Assembly

Extended

WE-TMSB
Z @ 100 MHz: 10 ~ 1800 Ω
I_R: 210 ~ 7500 mA
R_{DC}: 3 mΩ ~ 1.9 Ω
Frequency Range: 6 ~ 3000 MHz

WE-CBF
Z @ 100 MHz: 5 ~ 2700 Ω
I_R: 450 ~ 9600 mA
R_{DC}: 5 mΩ ~ 1.5 Ω
Frequency Range: 6 ~ 2000 MHz

WE-CBF HF
Z @ 1 GHz: 180 ~ 1100 Ω
I_R: 250 ~ 1300 mA
R_{DC}: 0.13 ~ 1.2 Ω
Frequency Range: 300 ~ 3000 MHz

WE-MPSB
Z @ 100 MHz: 8 ~ 600 Ω
I_R: 2100 ~ 10.500 mA
R_{DC}: 1.0 ~ 43 mΩ
Frequency Range: 1 ~ 3000 MHz

WE-PBF
Z @ 100 MHz: 39 ~ 98 Ω
Z @ 25 MHz: 23 ~ 65 Ω
I_R: 14 ~ 18 A
R_{DC}: 0.4 ~ 0.9 mΩ
Frequency Range: 6 ~ 2000 MHz

WE-PF
I_R: 4.5 ~ 10 A
R_{DC}: 9 ~ 30 mΩ
Frequency Range: 1 ~ 100 MHz

WE-CMS
Z @ 25 MHz: 20 ~ 54 Ω
Z @ 200 MHz: 30 ~ 83 Ω
I_R: 17 ~ 21 A
Frequency Range: 1 ~ 3000 MHz

WE-SUKW
Z @ 25 MHz: 272 ~ 425 Ω
Z @ 100 MHz: 416 ~ 580 Ω
I_R: 5 A
Frequency Range: 0.1 ~ 800 MHz

WE-UKW
Z @ 25 MHz: 145 ~ 920 Ω
Z @ 100 MHz: 230 ~ 1240 Ω
I_R: 3 A
Frequency Range: 0.1 ~ 500 MHz

WE-MLS
Z @ 25 MHz: 115 ~ 292 Ω
Z @ 100 MHz: 150 ~ 334 Ω
I_R: 4 A
Frequency Range: 10 ~ 800 MHz

WE-WAFB
Z @ 10 MHz: 28 ~ 65 Ω
Z @ 100 MHz: 70 ~ 130 Ω
I_R: 3 ~ 6 A
Frequency Range: 1 ~ 1000 MHz

Ferrites for Cable Assembly

WE-STAR-BUENO
Z @ 25 MHz 1 turn: 120 ~ 180 Ω
Z @ 100 MHz 1 turn: 250 ~ 350 Ω
Cable Diameter: 2.5 ~ 8.5 mm
Frequency Range: 1 ~ 1000 MHz

WE-STAR-TEC LFS
Z@ 1 MHz 1 turn: 20 ~ 94 Ω
Z@ 10 MHz 1 turn: 32 ~ 65 Ω
Cable Diameter: 3.5 ~ 25 mm
Frequency Range: 300kHz ~ 30 MHz

WE-STAR-TEC
Z @ 25 MHz 1 turn: 98 ~ 306 Ω
Z @ 100 MHz 1 turn: 182 ~ 525 Ω
Cable Diameter: 3.5 ~ 25 mm
Frequency Range: 1 ~ 1000 MHz

WE-STAR-GAP
Z @ 25 MHz 1 turn: 28 ~ 35 Ω
Z @ 500 MHz 1 turn: 345 ~ 400 Ω
Cable Diameter: 4.5 ~ 12.5 mm
Frequency Range: 100 ~ 2000 MHz

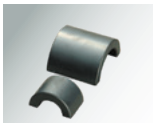
WE-STAR-RING
Z @ 25 MHz 1 turn: 55 ~ 83 Ω
Z @ 100 MHz 1 turn: 110 ~ 165 Ω
Cable Diameter: 8 ~ 27 mm
Frequency Range: 1 ~ 1000 MHz

WE-STAR-FLAT
Z @ 25 MHz 1 turn: 42 ~ 97 Ω
Z @ 100 MHz 1 turn: 101 ~ 194 Ω
No. of Poles: 26 ~ 50
Frequency Range: 1 ~ 1000 MHz

WE-STAR-CLIP
For the fixation of
Snap Ferrite STAR-TEC (LFS),
STAR-FIX (LFS) and STAR-GAP

WE-NCF
Z @ 25 MHz 1 turn: 48 ~ 100 Ω
Z @ 100 MHz 1 turn: 93 ~ 200 Ω
Cable Diameter: ≤ 7.8 ≤ 26.5 mm
Frequency Range: 1 ~ 1000 MHz

Ferrites for Cable Assembly



WE-SPLITRING
Z @ 25 MHz 1 turn: 48 ~ 100 Ω
Z @ 100 MHz 1 turn: 93 ~ 200 Ω
Cable Diameter: ≤ 7.8 ≤ 26.5 mm
Frequency Range: 1 ~ 1000 MHz

WE-SFA
Z @ 25 MHz 1 turn: 27 ~ 148 Ω
Z @ 100 MHz 1 turn: 57 ~ 267 Ω
No. of Poles: 10 ~ 64
Frequency Range: 1 ~ 1000 MHz

WE-FLAT
Z @ 25 MHz 1 turn: 17 ~ 90 Ω
Z @ 100 MHz 1 turn: 42 ~ 166 Ω
Types: round, square, edged
Frequency Range: 1 ~ 1000 MHz

WE-FLAT Ferrite for Flexible Printed Circuit Boards
Z @ 25 MHz 1 turn: 7 ~ 71 Ω
Z @ 100 MHz 1 turn: 19 ~ 130 Ω
Types: round, square
Frequency Range: 1 ~ 1000 MHz

WE-FCAC
Easy fixation for flat cores on ribbon cables
No. of Poles: 16 ~ 40

WE-TOF
Z @ 25 MHz 1 turn: 25 ~ 110 Ω
Z @ 100 MHz 1 turn: 37 ~ 200 Ω
Cable diameter: 3.0 ~ 33.4 mm
Frequency Range: 1 ~ 1000 MHz

WE-AFB LFS
Z @ 1 MHz 1 turn: 30 ~ 130 Ω
Z @ 10 MHz 1 turn: 40 ~ 100 Ω
Cable diameter: 4.5 ~ 12.5 mm
Frequency Range: 300 kHz ~ 30 MHz

WE-AFB
Z@ 25 MHz 1 turn: 30 ~ 300 Ω
Z@ 100 MHz 1 turn: 45 ~ 451 Ω
Cable diameter: 4.55 ~ 12.5 mm
Frequency Range: 1 ~ 1000 MHz

WE-SAFB
Z @ 25 MHz 1 turn: 20 ~ 144 Ω
Z @ 100 MHz 1 turn: 40 ~ 278 Ω
Cable diameter: 3.3 ~ 17.5 mm
Frequency Range: 1 ~ 1000 MHz

WE-RIB
Z @ 25 MHz 1 turn: 35 ~ 126 Ω
Z @ 100 MHz 1 turn: 91 ~ 260 Ω
Cable diameter: 0.8 ~ 3.5 mm
Frequency Range: 1 ~ 1000 MHz

Filter Chokes

WE-MI
L: 0.047 ~ 10 µH
I_R: 3 ~ 300 mA
R_{DC}: 0.15 ~ 2.1 Ω
Frequency Range: 1 ~ 100 MHz

WE-SD
L: 2 ~ 10 µH
I_R: 2.5 ~ 15 A
R_{DC}: 1.7 ~ 33 mΩ
Frequency Range: 0.01 ~ 90 MHz

WE-FI
L: 8.2 ~ 860 µH
I_R: 0.4 ~ 5 A
R_{DC}: 0.01 ~ 0.45 Ω
Frequency Range: 0.01 ~ 0.3 MHz

Common Mode Chokes Power Lines

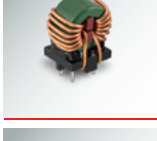
WE-CMB
L: 0.5 ~ 39 mH
I_R: 0.3 ~ 35 A
R_{DC}: 1.7 ~ 3000 mΩ
Frequency Range: 0.1 ~ 100 MHz
Number of Windings: 2

WE-CMBNC
L: 0.4 ~ 190 mH
I_R: 0.9 ~ 32 A
R_{DC}: 1.1 ~ 430 mΩ
Frequency Range: 0.001 ~ 300 MHz
Number of Windings: 2

WE-CMB HC
L: 0.175 ~ 0.7 mH
I_R: 5 ~ 10 mA
R_{DC}: 2.7 ~ 13 Ω
Frequency Range: 0.1 ~ 100 MHz
Number of Windings: 2

WE-CMB HV
L: 0.7 ~ 4.7 mH
I_R: 6.8 ~ 21.5 A
R_{DC}: 3.5 ~ 44 mΩ
Frequency Range: 0.005 ~ 5 MHz
Number of Windings: 2

WE-CMB NiZn
L: 14 ~ 110 µH
I_R: 1.5 ~ 10 A
R_{DC}: 2.7 ~ 80 mΩ
Frequency Range: 0.1 ~ 100 MHz
Number of Windings: 2



WE-ExB
L: 47 ~ 1000 µH
I_R: 4.5 ~ 15 A
R_{DC}: 4.6 ~ 42 mΩ
Frequency Range: 0.1 ~ 200 MHz
Number of Windings: 2

Product Overview

Common Mode Chokes Power Lines

WE-CMBH

L:	1 ~ 7 mH
I_R:	3.5 ~ 10 A
R_{DC}:	12.5 ~ 80 mΩ
Frequency Range:	0.1 ~ 100 MHz
Number of Windings:	2

WE-LF

L:	0.4 ~ 50 mH
I_R:	0.3 ~ 6 A
R_{DC}:	0.02 ~ 2.6 Ω
Frequency Range:	0.1 ~ 100 MHz
Number of Windings:	2

WE-LF SMD

L:	0.7 ~ 47 mH
I_R:	0.3 ~ 5.25 A
R_{DC}:	0.03 ~ 2.6 Ω
Frequency Range:	0.1 ~ 100 MHz
Number of Windings:	2

WE-TFC

L:	1.8 ~ 25 mH
I_R:	0.25 ~ 1.0 A
R_{DC}:	0.31 ~ 3.60 Ω
Frequency Range:	0.001 ~ 100 MHz
Number of Windings:	2

WE-FC

L:	1.1 ~ 43 mH
I_R:	0.4 ~ 2.65 A
R_{DC}:	0.07 ~ 2.5 mΩ
Frequency Range:	0.001 ~ 100 MHz
Number of Windings:	2

WE-FCL

L:	3.9 ~ 100 mH
I_R:	1.25 ~ 5 A
R_{DC}:	50 ~ 900 Ω
Frequency Range:	0.001 ~ 100 MHz
Number of Windings:	2

WE-LPCC

L:	120 - 450 µH
I_R:	9.5 ~ 23.5 A
R_{DC}:	1.4 ~ 9.6 mΩ
Frequency Range:	0.1 ~ 500 MHz
Number of Windings:	2

WE-TPB

L:	0.52 ~ 12 mH
I_R:	6 ~ 24 A
R_{DC}:	3 ~ 65 mΩ
Frequency Range:	0.01 ~ 30 MHz
Number of Windings:	3

WE-TPB HV

L:	0.2 ~ 208 mH
I_R:	7.2 ~ 46 A
R_{DC}:	1.6 ~ 85 mΩ
Frequency Range:	0.005 ~ 5 MHz
Number of Windings:	3

Common Mode Chokes Signal Lines

WE-CNSW

Z @ 100 MHz:	45 ~ 10000 Ω
I_R:	90 ~ 2000 mA
R_{DC}:	0.05 ~ 5.5 Ω
Frequency Range:	1 ~ 3000 MHz
Number of Windings:	2

WE-CNSW HF

Z @ 100 MHz:	60 ~ 120 Ω
I_R:	280 ~ 600 mA
R_{DC}:	0.22 ~ 0.30 Ω
Frequency Range:	10 ~ 10000 MHz
Number of Windings:	2

Extended

WE-CCMF

Z @ 100 MHz:	1.6 ~ 2 Ω
f_c:	8 ~ 12 GHz
I_R:	300 mA
Common mode Attenuation @ 2450 MHz:	20 ~ 30 dB

WE-SLM

L:	11 ~ 470 µH
I_R:	300 ~ 400 mA
R_{DC}:	0.18 ~ 0.58 Ω
Frequency Range:	0.01 ~ 600 MHz
Number of Windings:	2

WE-SL1

L:	10 ~ 330 µH
I_R:	300 mA
R_{DC}:	0.16 ~ 0.3 Ω
Frequency Range:	0.01 ~ 600 MHz
Number of Windings:	2

WE-SL2

L:	10 ~ 20000 µH
I_R:	0.2 ~ 1.6 A
R_{DC}:	0.08 ~ 2.6 Ω
Frequency Range:	0.01 ~ 600 MHz
Number of Windings:	2

WE-SL3

L:	20 ~ 100 µH
I_R:	450 ~ 700 mA
R_{DC}:	0.14 ~ 0.45 Ω
Frequency Range:	9 ~ 600 MHz
Number of Windings:	2 – 3

WE-SL5

L:	120 ~ 4700 µH
I_R:	350 ~ 2500 mA
R_{DC}:	0.025 ~ 0.72 Ω
Frequency Range:	9 ~ 600 MHz
Number of Windings:	2

WE-SL5 HC

L:	5 ~ 30 µH
I_R:	1.2 ~ 5 A
R_{DC}:	0.0055 ~ 0.06 Ω
Frequency Range:	1.4 ~ 300 MHz
Number of Windings:	2

WE-SL

L:	35 ~ 4700 µH
I_R:	0.2 ~ 2.7 A
R_{DC}:	0.035 ~ 0.85 Ω
Frequency Range:	0.01 ~ 600 MHz
Number of Windings:	2 ~ 4

WE-SCC

L:	1 ~ 1000 µH
I_R:	150 ~ 4750 mA
R_{DC}:	0.01~ 4.30 Ω
Frequency Range:	0.1 ~ 300 MHz
Number of Windings:	2

WE-UCF

L:	0.013 ~ 100 mH
I_R:	0.15 ~ 10 A
R_{DC}:	0.0027 ~ 8.5 Ω
Frequency Range:	0.01 ~ 400 MHz
Number of Windings:	2 ~ 4

ESD and Surge Protection

WE-TVS
Operating Voltage: 1.2 ~ 24 V_{DC}
C_{typ}: 0.18 ~ 1650 pF
Channels: 1 ~ 8 (+VDD)
Uni / Bidirectional, Rail-to-Rail

WE-VE / WE-VEA
Operating Voltage: 5 ~ 26 V_{DC}
C_{typ}: 0.05 ~ 120 pF
Size: 0402 ~ 0805 / 0508 ~ 0612

Extended

WE-TVSP
Operating Voltage: 5 ~ 440 V_{DC}
I_{Peak} (10 / 100 µs): 2.5 ~ 326.1 A
V_{Clamp}: 9.2 ~ 713 V
Size: SMAJ, SMBJ, SMCJ, SMDJ

WE-VS
Operating Voltage: 3.3 ~ 85 V_{DC}
I_{Peak} (8 / 20 µs): 10 ~ 200 A
W_{max}: 0.02 ~ 1.1 J
Size: 0402 ~ 1206

WE-VD
Operating Voltage: 14 ~ 1000 V_{RMS}
I_{Peak} (8 / 20 µs): 0.1 ~ 10 kA
W_{max}: 0.7 ~ 620 J
Diameters: 5 ~ 20 mm
Reference for cURus / CQC / VDE

EMC Shielding Solutions

EMC Tapes
EMC tapes with copper tape, aluminum tape, conductive foam, conductive fabric

Extended

Board Level Shielding WE-SHC & WE-SHC Seamless
Metal cabinets for board level shielding, ShielDIY for prototyping, SMD & THT, frame & cover, one piece solution

Extended

EMI Gaskets & Grounding WE-SECF, WE-SMGS, WE-EEL, WE-ST
SMD grounding contacts, grounding cables for earthing belts, cable shielding and metal clips

Magnetic Shielding WE-FAS, WE-FSFS, WE-CPU
Absorber Sheets, Thermal Conductive & EMI Absorber Sheets, Flexible Ferrite Sheets, Ferrite Plates

Thermal Management

Thermal Gap Filler Pad WE-TGF

Line Filters

WE-CLFS Line Filter
I_R: 1.5 ~ 20 A
I_{Leak}: 0.173 ~ 0.785 mA
R_{DC}: 15 ~ 300 mΩ
Frequency Range: 0.01 ~ 100 MHz

D-SUB Filter Connectors

D-SUB Filter Connectors
Bent 90°, solder cup, solder pin straight, filter adapter

All EMC Components at a glance:
www.we-online.com/emc-components

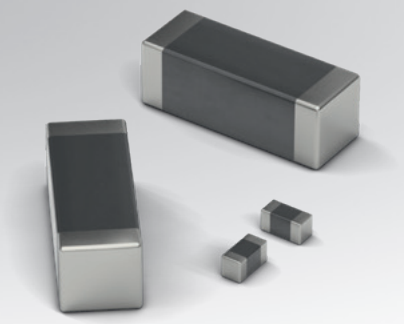
Explore our application notes for EMC Components:
www.we-online.com/appnotes

Component libraries available for:
- **PCB library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star**
- **S-Parameter & SPICE model: S-Parameter, LTspice, PSpice, Spectre**
- **RF & microwave simulation models: Modelithics**

www.we-online.com/library

WE-CBF HF

SMT EMI Suppression Ferrite Bead



Additional rated current definition!

Characteristics:

- Modified internal layout increases the effective suppression range
- The impedance at 1 GHz are at least 3 times higher compared to the WE-CBF product family
- Operating temperature: -55 °C up to +125 °C

Applications:

- Especially for the suppression of signal lines in the high frequency range
- For fast data lines: CPU, highspeed bus systems, HDD

www.we-online.com/we-cbfhf

Size 0402

Technical Data:

Order Code	Z @ 100 MHz (Ω)	$I_{R\,2}$ (mA)	Test Condition $I_{R\,2}$	Z_{max} (Ω)	Test Condition Z_{max}	$R_{DC\,typ.}$ (Ω)	Z @ 1 GHz (Ω)	Type
742843122	220	800	ΔT = 40 K	400	750 MHz	0.25	300	High Current
742841160	600	250		1800	650 MHz	0.82	1100	Wide Band
742841210	1000	250		1750	500 MHz	0.9	900	Wide Band

Z @ 100 MHz: Impedance @ 100 MHz; $I_{R\,2}$: Rated Current 2; Test Condition $I_{R\,2}$: Rated Current 2 (Test cond.); Z_{max}: Maximum Impedance; Test Condition Z_{max}: Maximum Impedance (Test cond.); $R_{DC\,typ.}$: DC Resistance; Z @ 1 GHz: Impedance @ 1 GHz

Size 0603

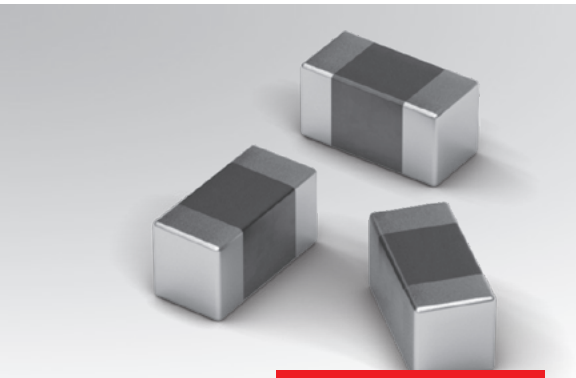
Technical Data:

Order Code	Z @ 100 MHz (Ω)	$I_{R\,2}$ (mA)	Test Condition $I_{R\,2}$	Z_{max} (Ω)	Test Condition Z_{max}	$R_{DC\,typ.}$ (Ω)	Z @ 1 GHz (Ω)	Type
742862160	600	350	ΔT = 40 K	1500	700 MHz	0.8	850	High Speed
742863160	600	500		950	600 MHz	0.22	800	High Current
742861210	1000	300		2200	450 MHz	1.2	1100	Wide Band

Z @ 100 MHz: Impedance @ 100 MHz; $I_{R\,2}$: Rated Current 2; Test Condition $I_{R\,2}$: Rated Current 2 (Test cond.); Z_{max}: Maximum Impedance; Test Condition Z_{max}: Maximum Impedance (Test cond.); $R_{DC\,typ.}$: DC Resistance; Z @ 1 GHz: Impedance @ 1 GHz

WE-TMSB

Tiny Multilayer Suppression Bead



Perfect for downsizing

Characteristics:

- Perfect for miniaturization of EMI solutions
- Wide impedance range from 10 Ω up to 1500 Ω
- Operating temperature: -55 °C up to +125 °C

Applications:

- General signal & low power lines
- Audio / video / clock lines
- Small handhelds
- IoT, 5G

www.we-online.com/we-tmsb

Size 0201

Technical Data:

Order Code	Z @ 100 MHz (Ω)	I_{R2} (mA)	Test Condition I_{R2}	Z_{max} (Ω)	Test Condition Z_{max}	$R_{DC\ typ.}$ (Ω)	Z @ 1 GHz (Ω)	Type
742692003	120	250	ΔT = 40 K	259	770 MHz	0.29	250	Wide Band
742692004	240	300		460	536 MHz	0.57	342	
74269221561	560	250		750	225 MHz	0.75	250	

Z @ 100 MHz: Impedance @ 100 MHz; I_{R2}: Rated Current 2; Test Condition I_{R2}: Rated Current 2 (Test cond.); Z_{max}: Maximum Impedance; Test Condition Z_{max}: Maximum Impedance (Test cond.); $R_{DC\ typ.}$: DC Resistance; Z @ 1 GHz: Impedance @ 1 GHz

Size 0402

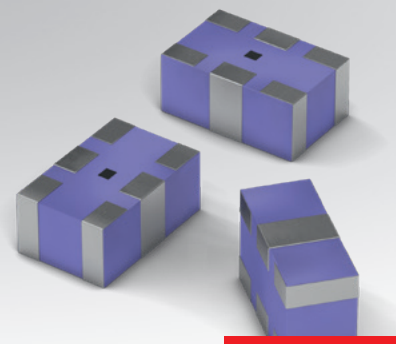
Technical Data:

Order Code	Z @ 100 MHz (Ω)	I_{R2} (mA)	Test Condition I_{R2}	Z_{max} (Ω)	Test Condition Z_{max}	$R_{DC\ typ.}$ (Ω)	Z @ 1 GHz (Ω)	Type
74269242111	110	1200	ΔT = 40 K	195	745 MHz	0.07	188	Wide Band
74269242161	160	1000		280	550 MHz	0.12	250	High Current
74269242261	260	1000		375	300 MHz	0.12	220	High Current
74269243461	460	500		1250	230 MHz	0.35	300	High Speed
74269241601	600	850		720	211 MHz	0.22	218	Wide Band
74269244182	1800	210		2700	450 MHz	1.91	1500	High Frequency

Z @ 100 MHz: Impedance @ 100 MHz; I_{R2}: Rated Current 2; Test Condition I_{R2}: Rated Current 2 (Test cond.); Z_{max}: Maximum Impedance; Test Condition Z_{max}: Maximum Impedance (Test cond.); $R_{DC\ typ.}$: DC Resistance; Z @ 1 GHz: Impedance @ 1 GHz

WE-CCMF

Ceramic Common Mode Filter



For extremely high speed datalines like USB 3 / 4

Characteristics:

- Compact multilayer common mode choke / filter
- High common mode attenuation on WiFi frequencies (> 30 dB @ bandwidth)
- Ultra-high-speed differential signal transmission
- > 12 GHz differential mode cutoff frequency
- LTCC based low-loss and highly reliable structure
- High thermal stability
- Recommended soldering: Reflow
- Operating temperature: -40 °C up to +85 °C

Applications:

- High speed differential datalines
- USB 3 / 4
- Thunderbolt 2 / 3
- HDMI 2.0 & 2.1
- Sata 3.X
- Display Port
- PCIe 3.0
- eDP

www.we-online.com/we-ccmf

Size 0504

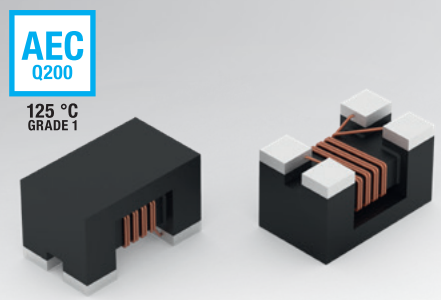
Technical Data:

Order Code	$IL_{(SCC\ 2,1)}$ (dB)	Test Condition $IL_{(SCC\ 2,1)}$	f_c (GHz)	V_R (V_{DC})	$R_{DC\ max.}$ (Ω)	I_R (mA)	Z @ 100 MHz (Ω)	R_{ISO} (MΩ)
748020024	30	2450 MHz	8	5	2.5	300	2	100
748030024	30	2450 MHz	12				2	
748032455	20	2450 & 5500 MHz	12				1.6	

$IL_{(SCC\ 2,1)}$: Common Mode Attenuation; Test Condition $IL_{(SCC\ 2,1)}$: Common Mode Attenuation (Test cond.); f_c: Cut-Off Frequency; V_R: Rated Voltage; $R_{DC\ max.}$: DC Resistance max.; I_R: Rated Current; Z @ 100 MHz: Impedance @ 100 MHz; R_{ISO}: Insulation Resistance

WE-CNSW HF

SMT Common Mode Line Filter



Characteristics:

- Current compensated data line filter
- High common mode noise suppression at high frequencies
- Small influence on high speed signals through winding symmetry
- Climatic category 40/105/21 (Size 0504 / 0603)
- Climatic category 40/125/21 (Size 0805 / 1206 / 1812)
- Flammability corresponding to UL 94 V-0

Applications:

- USB 2.0
- IEEE 1394 (Firewire)
- LVDS
- High Speed Data Lines
- LAN

New AEC-Q 200 qualification

www.we-online.com/we-cnswhf

Size 0504

Technical Data:

Order Code	Z @ 100 MHz (Ω)	I_R (mA)	$R_{DC\ max.}$ (mΩ)	V_R (V)	V_T (V_{AC})	Application	Winding Style
7442335600	60	600	220	20	125	USB 3.X, HDMI 1.4	bifiliar
7442335900	90	500	270				

Z @ 100 MHz: Impedance @ 100 MHz; I_R: Rated Current; $R_{DC\ max.}$: DC Resistance max.; V_R: Rated Voltage; V_T: Insulation Test Voltage

Size 0805

Technical Data:

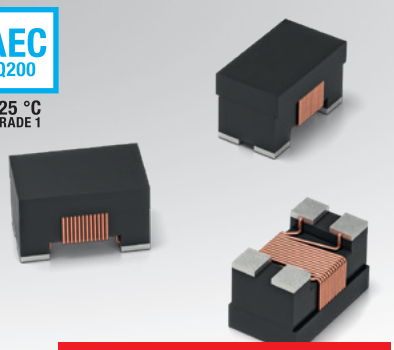
Order Code	Z @ 100 MHz (Ω)	I_R (mA)	$R_{DC\ max.}$ (mΩ)	V_R (V)	V_T (V_{AC})	Application	Winding Style
744233670	67	320	240	50	125	USB 3.0	bifiliar
744233900	90	280	300			HDMI	
744233121	120	280	300			LVDS/USB2.0	

Z @ 100 MHz: Impedance @ 100 MHz; I_R: Rated Current; $R_{DC\ max.}$: DC Resistance max.; V_R: Rated Voltage; V_T: Insulation Test Voltage

WE-CNSW

SMT Common Mode Line Filter

AEC Q200
125 °C GRADE 1



New AEC-Q 200 qualification

Characteristics:

- Current compensated data line filter
- High common mode noise suppression at high frequencies
- Small influence on high speed signals through winding symmetry
- Climatic category 40/105/21 (Size 0603)
- Climatic category 40/125/21 (Size 0805 / 1206 / 1812)
- Flammability corresponding to UL 94 V-0

Applications:

- USB 2.0
- IEEE 1394 (Firewire)
- LVDS
- High Speed Data Lines
- LAN

www.we-online.com/we-cnsw

Size 0603

Technical Data:

Order Code	Z @ 100 MHz (Ω)	I_R (mA)	$R_{DC\ max.}$ (Ω)	V_R (V)	V_T (V_{AC})	Application	Winding Style
744230220	22	800	0.08	50	125	High Speed Data Lines	bifiliar
744230450	45	650	0.11			High Speed Data Lines	
744230900	90	550	0.145			USB 2.0	
744230121	120	450	0.175			IEEE 1394/ Firewire 400 Mbps	
744230181	180	400	0.21			IEEE 1394/ Firewire 400 Mbps	
744230251	250	350	0.28			High Speed Data Lines	

Z @ 100 MHz: Impedance @ 100 MHz; I_R: Rated Current; $R_{DC\ max.}$: DC Resistance max.; V_R: Rated Voltage; V_T: Insulation Test Voltage

Size 0805

Technical Data:

Order Code	Z @ 100 MHz (Ω)	I_R (mA)	$R_{DC\ max.}$ (Ω)	V_R (V)	V_T (V_{AC})	Application	Winding Style
744231061	67	400	0.25	50	125	High Speed Data Lines	bifiliar
744231091	90	370	0.3			USB 2.0	
744231121	120	370	0.3			IEEE1394/Firewire 400 Mbps	
744231181	180	330	0.35			IEEE1394/Firewire 400 Mbps	
744231261	260	300	0.4			High Speed Data Lines	
744231371	370	280	0.45			IEEE1394/Firewire 400 Mbps	

Z @ 100 MHz: Impedance @ 100 MHz; I_R: Rated Current; $R_{DC\ max.}$: DC Resistance max.; V_R: Rated Voltage; V_T: Insulation Test Voltage

Size 1206

Technical Data:								
Order Code	**Z @ 10 MHz (Ω)**	**Z @ 100 MHz (Ω)**	**I_R (mA)**	**$R_{DC\ max.}$ (Ω)**	**V_R (V)**	**V_T (V_{DC})**	**Application**	**Winding Style**
744232090	–	90	370	0.3	50	125	USB 2.0	bifiliar
744232161	–	160	340	0.4			IEEE1394 / Firewire 400 Mbps	
744232261	–	260	310	0.5			–	
744232601	–	600	260	0.8			–	
744232102	–	1000	230	1			–	
744232222	–	2200	200	1.2			–	
744232101	6000	–	90	5.5			–	

Z @ 10 MHz: Impedance @ 10 MHz; Z @ 100 MHz: Impedance @ 100 MHz; I_R: Rated Current; $R_{DC\ max.}$: DC Resistance max.; V_R: Rated Voltage; V_T: Insulation Test Voltage

Size 1812

Technical Data:							
Order Code	**Z @ 10 MHz (Ω)**	**Z @ 100 MHz (Ω)**	**I_R (mA)**	**$R_{DC\ max.}$ (Ω)**	**V_R (V)**	**V_T**	**Winding Style**
744235900	–	90	2000	0.05	60	125 V_{AC}	bifiliar
744235601	–	600	1200	0.1			
744235801	–	800	1000	0.12			
744235110	–	5000	450	0.8			
744235220	–	8000	250	2.65			
744235510	3000	–	200	1			
744235101	5000	–	150	2			
744235251	10000	–	200	1.6			

Z @ 10 MHz: Impedance @ 10 MHz; Z @ 100 MHz: Impedance @ 100 MHz; I_R: Rated Current; $R_{DC\ max.}$: DC Resistance max.; V_R: Rated Voltage; V_T: Insulation Test Voltage

WE-SL2

SMD Common Mode Line Filter

AEC Q200
125 °C GRADE 1

New AEC-Q200 qualification

Characteristics:

- A huge variety of inductance values, bifilar and sectional winding style and two different core materials MnZn and NiZn ensure the right parameters for many applications
- Rated voltage: 80 V_{DC} (42 V_{AC})
- Flammability corresponding to UL 94 V-0
- Climatic category 40/125/21
- Size (LWH): 9.2 mm x 6 mm x 5 mm

Applications:

- Current compensated choke for low voltage lines
- DC input and output filter
- Filter for measurement signals
- CAN
- Suppression of common mode noise with a highly flexible component

www.we-online.com/we-sl2

Size 9260

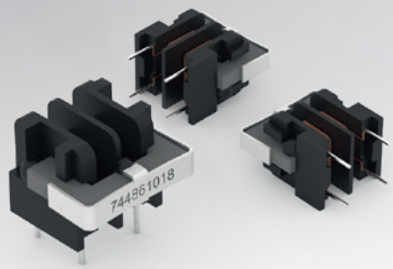
Technical Data:

Order Code	L (µH)	Tol. L	Z_{max} (Ω)	I_R (mA)	$R_{DC\ max.}$ (Ω)	Winding Style
744226	10	±30%	920	1600	0.08	bifilar
744226S	10	±30%	920	1600	0.08	sectional
744228	25	±30%	2800	1000	0.12	bifilar
744228S	25	±30%	2800	1000	0.12	sectional
744225	40	±30%	3100	900	0.25	bifilar
744225S	40	±30%	3100	900	0.25	sectional
744227	51	±30%	5500	1000	0.16	bifilar
744227S	51	±30%	5500	1000	0.16	sectional
744224	250	±50%	1800	1200	0.13	bifilar
744223	500	±50%	3300	1000	0.15	bifilar
744222	1000	±50%	6000	800	0.207	bifilar
744221	2000	±50%	9200	600	0.42	bifilar
744220	4700	±50%	20000	500	0.75	bifilar
744229	6500	±50%	18400	400	0.95	bifilar
744220103	10000	±50%	25000	350	1.2	bifilar
744220203	20000	±50%	50000	200	2.6	bifilar

L: Inductance; Tol. L: Inductance (Tol.); Z_{max}: Maximum Impedance; I_R: Rated Current; $R_{DC\ max.}$: DC Resistance max.

WE-TFC

Common Mode Power Line Choke



Characteristics:

- Suppression of common mode noise up to 70 dB
- Approximate 1% stray inductance for symmetrical interference suppression
- Flammability corresponding to UL 94 V-0
- Climate category 40/125/21

Applications:

- Mains filter
- Compact switched-mode power supplies
- Electronic ballast applications (LED bulb)
- Lighting
- White goods

Excellent price performance ratio

www.we-online.com/we-tfc

Size UU9.8V

Technical Data:

Order Code	I_R (A)	L (mH)	$R_{DC\ max.}$ (Ω)	V_R (V_{AC})	V_T (V_{AC})	L (mm)	W (mm)	H (mm)	Mount
744862250	0.25	25	3.6	300	2500	17	11.5	17	THT
744862180	0.3	18	3.1						
744862120	0.4	12	2						
744862100	0.45	10	1.65						
744862082	0.5	8.2	1.3						
744862056	0.6	5.6	0.83						
744862033	0.8	3.3	0.51						
744862018	1	1.8	0.31						

I_R: Rated Current; L: Inductance; $R_{DC\ max.}$: DC Resistance max.; V_R: Rated Voltage; V_T: Insulation Test Voltage; L: Length; W: Width; H: Height

Size UU9.8H

Technical Data:

Order Code	I_R (A)	L (mH)	$R_{DC\ max.}$ (Ω)	V_R (V_{AC})	V_T (V_{AC})	L (mm)	W (mm)	H (mm)	Mount
744861250	0.25	25	3.6	300	2500	17	15.5	12.5	THT
744861180	0.3	18	3.1						
744861120	0.4	12	2						
744861100	0.45	10	1.65						
744861082	0.5	8.2	1.3						
744861056	0.6	5.6	0.83						
744861033	0.8	3.3	0.51						
744861018	1	1.8	0.31						

I_R: Rated Current; L: Inductance; $R_{DC\ max.}$: DC Resistance max.; V_R: Rated Voltage; V_T: Insulation Test Voltage; L: Length; W: Width; H: Height

WE-TVSP

Power TVS Diode

More voltage options available on request

Characteristics:

- Low profile package
- Glass passivated junction
- Excellent clamping capability
- MSL Level 1 per J-STD-020
- Classification of the plastic case: UL 94 V-0
- Safety certification:
  – UL 497B: E478010
  – UL 1449: E332875
- Fast response time
- Identical design:
  – DO-214AC = SMAJ
  – DO-214AA = SMBJ
  – DO-214AB = SMCJ/SMDJ

Applications:

- Ideal to protect the I/O interfaces, bus voltage and other circuits of sensitive electronic equipment against voltage transients

www.we-online.com/we-tvsp

DO-214AC (400 W) / SMAJ

Technical Data:

Order Code	Bidirectional	Marking UNI	Marking BI	V_{DC} (V)	V_{BR} (V)	Test Condition V_{BR}	Tol. V_{BR}	$V_{Clamp\ max.}$ (V)	Test Condition V_{Clamp}	I_{Peak} (A)	I_{Leak} (µA)
824500162	824501162	SP	VP	160	187.5	1 mA	±5 %	259	I_{PEAK}	1.5	1
824500202	824501202	SV	VV	200	235.5			324		1.2	
824500222	824501222	GE	VX	220	259			356		1.1	
824500252	824501252	SZ	VZ	250	294			405		1	
824500302	824501302	TE	UE	300	353			486		0.8	
824500352	824501352	TG	UG	350	411.5			567		0.7	
824500402	824501402	TK	UK	400	470.5			648		0.6	
824500442	824501442	TM	UM	440	517.5			713		0.6	

V_{DC}: DC Operating Voltage; V_{BR}: (Reverse) Breakdown Voltage [min.]; Test Condition V_{BR}: (Reverse) Breakdown Voltage (Test cond.); Tol. V_{BR}: (Reverse) Breakdown Voltage (Tol.); $V_{Clamp\ max.}$: Clamping Voltage [max.]; Test Condition V_{Clamp}: Clamping Voltage (Test cond.); I_{Peak}: (Reverse) Peak Pulse Current; I_{Leak}: Leakage Current

DO-214AA (600 W) / SMBJ

Technical Data:

Order Code	Bidirectional	Marking UNI	Marking BI	V_{DC} (V)	V_{BR} (V)	Test Condition V_{BR}	Tol. V_{BR}	$V_{Clamp\ max.}$ (V)	Test Condition V_{Clamp}	I_{Peak} (A)	I_{Leak} (µA)
824520162	824521162	PP	EP	160	187.5	1 mA	±5 %	259	I_{PEAK}	2.3	1
824520202	824521202	PV	EV	200	235.5			324		1.9	
824520222	824521222	PX	EX	220	259			356		1.7	
824520252	824521252	PZ	EZ	250	294			405		1.5	
824520302	824521302	QE	FE	300	353			486		1.3	
824520352	824521352	QG	FG	350	411.5			567		1.1	
824520402	824521402	QK	FK	400	470.5			648		0.9	
824520442	824521442	QM	FM	440	517.5			713		0.9	

V_{DC}: DC Operating Voltage; V_{BR}: (Reverse) Breakdown Voltage [min.]; Test Condition V_{BR}: (Reverse) Breakdown Voltage (Test cond.); Tol. V_{BR}: (Reverse) Breakdown Voltage (Tol.); $V_{Clamp\ max.}$: Clamping Voltage [max.]; Test Condition V_{Clamp}: Clamping Voltage (Test cond.); I_{Peak}: (Reverse) Peak Pulse Current; I_{Leak}: Leakage Current

DO-214AB (1500 W) / SMCJ

Technical Data:											
Order Code	**Bidirec-tional**	**Marking UNI**	**Marking BI**	**V_{DC} (V)**	**V_{BR} (V)**	**Test Condition V_{BR}**	**Tol. V_{BR}**	**$V_{Clamp\ max.}$ (V)**	**Test Condition V_{Clamp}**	**I_{Peak} (A)**	**I_{Leak} (µA)**
824540162	824541162	GHP	PHP	160	187.5	1 mA	±5 %	259	I_{PEAK}	5.8	1
824540202	824541202	GHV	BHV	200	235.5			324		4.6	
824540302	824541302	CJE	BJE	300	353			486		3.1	
824540352	824541352	GJG	BJG	350	411.5			567		2.6	
824540222	824541222	CHX	BHX	220	259			356		4.2	
824540252	824541252	CHZ	BHZ	250	294			405		3.7	
824540402	824541402	GJK	BJK	400	470.5			648		2.3	
824540442	824541442	GJM	BJM	440	517.5			713		2.1	

V_{DC}: DC Operating Voltage; V_{BR}: (Reverse) Breakdown Voltage [min.]; Test Condition V_{BR}: (Reverse) Breakdown Voltage (Test cond.); Tol. V_{BR}: (Reverse) Breakdown Voltage (Tol.); $V_{Clamp\ max.}$: Clamping Voltage [max.]; Test Condition V_{Clamp}: Clamping Voltage (Test cond.); I_{Peak}: (Reverse) Peak Pulse Current; I_{Leak}: Leakage Current

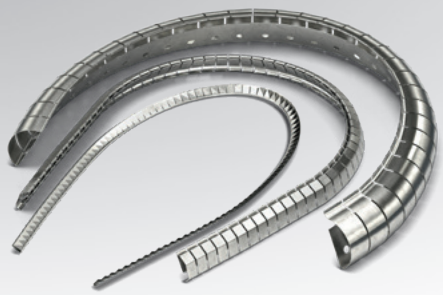
DO-214AB (3000 W) / SMDJ

Technical Data:											
Order Code	**Bidirec-tional**	**Marking UNI**	**Marking BI**	**V_{DC} (V)**	**V_{BR} (V)**	**Test Condition V_{BR}**	**Tol. V_{BR}**	**$V_{Clamp\ max.}$ (V)**	**Test Condition V_{Clamp}**	**I_{Peak} (A)**	**I_{Leak} (µA)**
824550162	824551162	PHP	DHP	160	187.5	1 mA	±5 %	259	I_{PEAK}	11.6	2
824550202	824551202	HHX	IHX	200	235.5			324		9.3	
824550222	824551222	HIE	IIE	220	259			356		8.4	

V_{DC}: DC Operating Voltage; V_{BR}: (Reverse) Breakdown Voltage [min.]; Test Condition V_{BR}: (Reverse) Breakdown Voltage (Test cond.); Tol. V_{BR}: (Reverse) Breakdown Voltage (Tol.); $V_{Clamp\ max.}$: Clamping Voltage [max.]; Test Condition V_{Clamp}: Clamping Voltage (Test cond.); I_{Peak}: (Reverse) Peak Pulse Current; I_{Leak}: Leakage Current

WE-CSGS

Contact Spring Gasket



More sizes available

Characteristics:

- Customizable product series (dimension; profile; plating; raw material)
- Low compression force needed
- High conductivity
- Beryllium copper with nickel plating as standard
- Operating temperature: -40 °C up to +110 °C

Applications:

- Displays
- Metal housing
- Switching cabinets
- EMC chambers

More sizes available:
www.we-online.com/we-csgs

Technical Data:

Order Code	W (mm)	H (mm)	Recommended Compression min. (mm)	Recommended Compression max. (mm)	R_S (Ω)
3851020	27.18	5.97	4.776	4.4775	0.05
3851120	27.18	5.97	4.776	4.4775	
3851200	15.24	5.59	4.472	4.1925	
3851150	15.2	3.1	2.48	2.325	
3851140	11.4	3	2.4	2.25	
3851230	11.4	2.2	1.76	1.65	
3851010	11	3.88	3.104	2.91	
3851260	9.4	3.3	2.64	2.475	
3851220	8.9	2.8	2.24	2.1	
3851190	8.13	2.8	2.24	2.1	
3851250	8.13	2.79	2.232	2.0925	
3851180	8.13	2.79	2.232	2.0925	
3851240	4.19	1.5	1.2	1.125	
3851270	4.13	1.2	0.96	0.9	

W: Width; H: Height; R_S: Surface Resistance

WE-EGS

EMI Elastomer Gasket

Characteristics:

- Customizable product series (dimension; profile; conductive filler; rubber material)
- Conductive filler cickel carbon mixed with silicone as standard
- Depending on the application an IP68 protection class could be reached, that means by the use of the shielding gasket a total protection against dust (index 6) and protection against full inmersions under high pressure (index 8)
- Operating temperature: -50 °C up to +150 °C

Applications:

- Displays
- Metal housings
- Switching cabinets
- Applications in wet enviroments

More sizes & profiles available

Check all sizes:
www.we-online.com/we-egs

Hollow D Profile

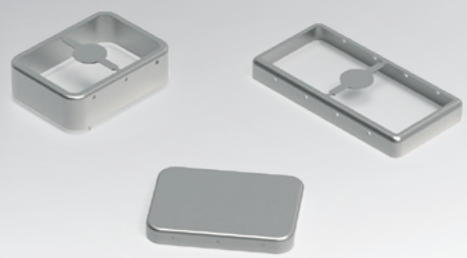
Technical Data:

Order Code	H (mm)	W (mm)	Recommended Compression min. (mm)	Recommended Compression max. (mm)	R_S (Ω)
38401309	–	–	7.2	6.3	
38401210	1.57	19.05	1.256	1.099	
38401211	1.57	22.35	1.256	1.099	
38401207	1.91	12.7	1.528	1.337	
38401208	3.18	12.7	2.544	2.226	
38401209	4.78	12.7	3.824	3.346	0.05
38401503	5.72	3.2	4.576	4.004	
38401506	5.94	8.31	4.752	4.158	
38401005	7.92	7.92	6.336	5.544	
38401004	7.92	7.92	6.336	5.544	
38401006	8.23	12.37	6.584	5.761	

H: Height; W: Width; R_S: Surface Resistance

WE-SHC

Shielding Cabinet



Characteristics:

- Customizable product series (dimension; profile; plating; raw material)
- Low compression force needed
- High conductivity
- Beryllium copper with nickel plating as standard
- Operating temperature: -40 °C up to +110 °C

Applications:

- Displays
- Metal housings
- Switching cabinets
- EMC chambers

Fully enclosed shield for high frequency applications

www.we-online.com/we-shc

Technical Data:

Order Code	W (mm)	H (mm)
3670087	6.3	3
3671087	6.9	2.7
3670128	12.3	7.5
3671128	12.7	3.5
3670168	13.5	5
3671168	13.9	3
3670453	16.2	6
3671453	16.8	2.9
3670415	16.8	6.8
3670223	17.3	5
3671415	17.4	4
3671223	17.7	4
3670206	17.8	3
3670308	17.8	4.4
3671206	18.4	2.7
3671308	18.4	4.4
3670213	19.9	2.9
3672213	20.3	2.5
3671213	20.3	2.5
3670260	23	7.8
3670345	23.3	3.5
3670473	23.3	5.3
3672260	23.6	4
3671260	23.6	4
3670323	23.8	3.7
3672345	23.9	3.3
3671345	23.9	3.3
3671473	23.9	3.5
3672473	23.9	3.5
3670544	23.9	7.5
3671323	24.4	4
3672323	24.4	4
3671544	24.5	5

Technical Data:		
Order Code	**W (mm)**	**H (mm)**
3670290	26	3
3671290	26.6	2.9
3670737	28.1	2.9
3671737	28.7	3
3670382	33.3	5
3671382	33.9	3
3670366	34.1	3.3
3671366	34.5	2.8
3670585	49.7	4.7
3671585	50.3	3
W: Width; H: Height		

Design Kits

Product Category	Design Kit	Order Code	Lifelong Refill
Ferrites for PCB Assembly			
	WE-CBF 0402, 0603, 0805; SMT Ferrites	742790	✓
	WE-CBF 1206, 1210, 1806, 1812; SMT Ferrites	742791	✓
	WE-CBF HF 0402, 0603; SMT Ferrites for High Frequency Applications	742841	✓
	WE-MPSB, WE-PBF, WE-SUKW & WE-CMS; PCB Ferrites for Inrush Peak Currents	742793	✓
Ferrites for Cable Assembly			
	Snap Ferrites	742711	✓
	WE-AFB; Axial Ferrite Beads	742700	✓
	WE-FLAT; Flat Ferrite Cores	742722	✓
	WE-TOF; EMI Suppression Toroidal Ferrites	742701	✓
Filter Chokes			
	WE-FI; Toroidal Line Chokes	744705	✓
	WE-MI; SMT Multilayer Inductors	744790	✓
	WE-SD; Rod Core Chokes	744713	✓
Common Mode Chokes			
	SMT Common Mode Line Filters	744725	✓
	WE-CMB & WE-CMBH; Common Mode Power Line Chokes	744825	✓
	WE-CMB, WE-CMB HC, WE-CMB NiZn, Common Mode Power Line Chokes	744821	✓
	WE-CMBNC; Common Mode Power Line Chokes	744800	✓
	WE-CNSW & WE-CNSW HF; SMT Common Mode Line Filters	744230	✓
	WE-ExB, WE-CMB & WE-CMBNC	744824	✓
	WE-LF; Common Mode Power Line Chokes	744630	✓
	WE-TFC, WE-TFCH, WE-FC; Power Line Common Mode Filters	744864	✓

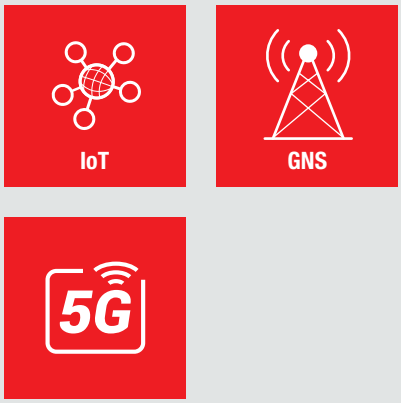
Product Category	Design Kit	Order Code	Lifelong Refill
ESD Protection			
	ESD Protection	823999	✓
Surge Protection			
	WE-TVSP, TVS Power Diodes Low Power	824599	✓
	WE-TVSP; TVS Power Diodes High Power	824598	✓
	WE-VD; Disk Varistors	820999	✓
	WE-VS; SMT Varistors	825998	✓
EMC Shielding Solutions			
	Shielding Cabinets	361999	✓
	ShielDIY Do It Yourself Custom Shielding Cabinets	360002	
	WE-FAS / WE-FSFS	304999	✓
	WE-SECF; SMT EMI Contact Fingers	331001	✓
EMC Filter			
	Design Your EMC-Filter	744998	
EMC General			
	Interfaces; USB 2.0/3.0/3.1, Ethernet 100/1000 Base-T, CAN, VGA, HDMI, RS232, RS485	744999	✓

Focus Product

Innovative Design:
WE-SHC Seamless

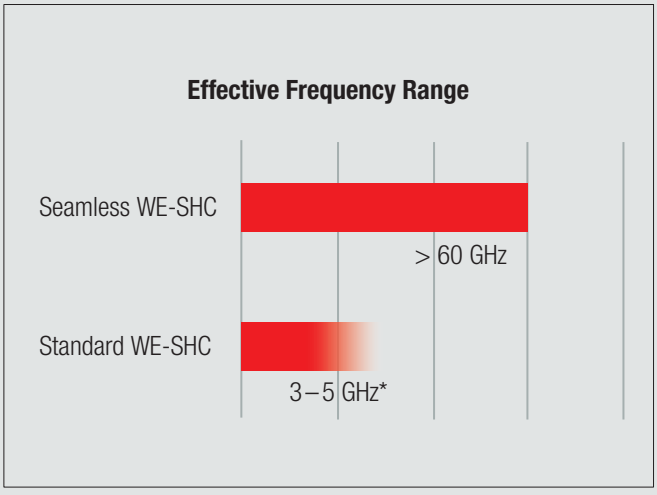
Seamless Shielding Cabinets Ready for New Technologies!

The new WE-SHC Seamless are especially designed for 5G, IoT, GNSS and microwave electronics applications. This product is produced through a deep drawing method in order to achieve a fully enclosed shield, in this way the faraday cage effect provided by these cabinets is increased, in particular in higher frequencies on which new technologies are working in.

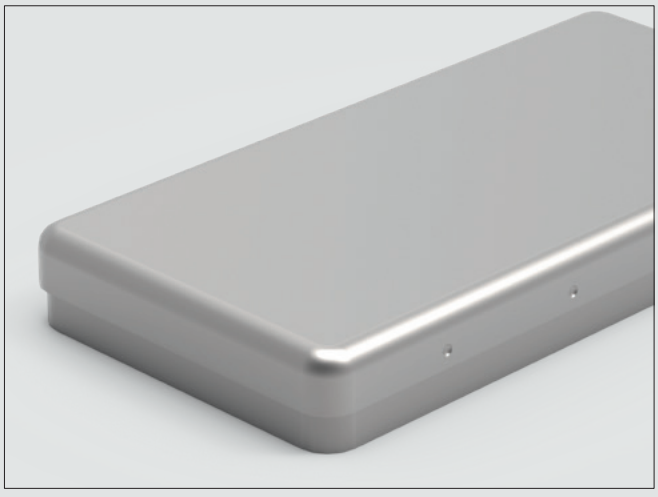


- Especially well suited for 5G, IoT, IO-Link Wireless and GNSS applications
- Fully sealed, seamless corners and no open slots to provide an exceptional faraday cage effect
- Customizable product series (dimension; profile; plating; raw material)
- To save costs and speed up your project, we offer you a wide range of sizes available ex stock

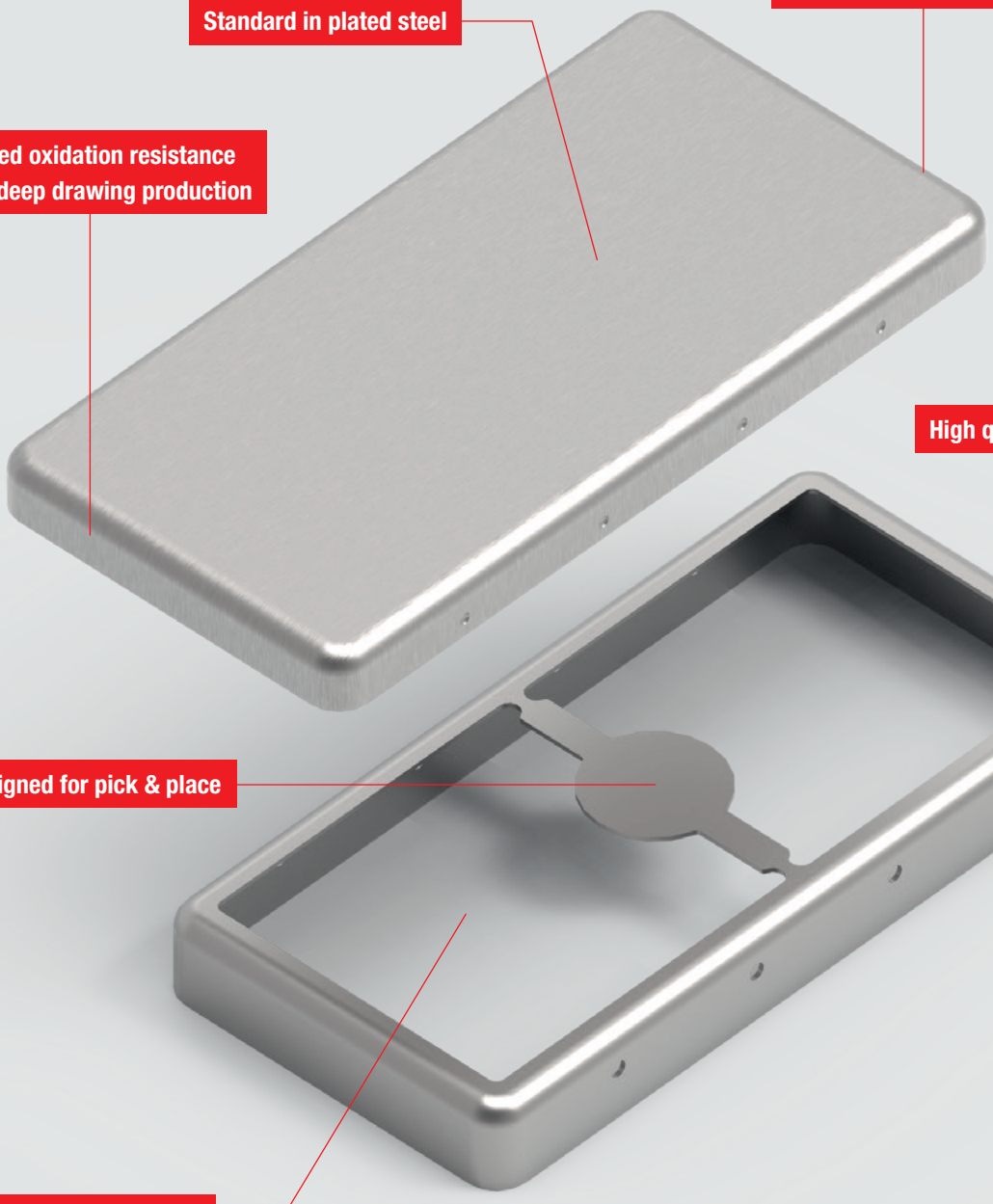
WE-SHC Seamless: Effective until more than 60 GHz



Over 100 sizes available ex stock to find exactly the right cabinet for your application



* Shielding effectiveness lower at 5 GHz

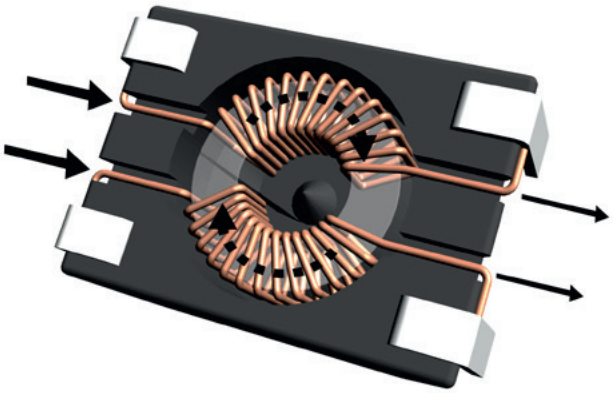


WE FIT YOUR SHIELD
Customize your shielding cabinets and many other shielding products to achieve the optimal result for your application:
www.we-online.com/customized-we-shc

Learn more about WE-SHC Seamless:
www.we-online.com/we-shc-seamless

Common Mode Chokes

Common Mode Behaviour

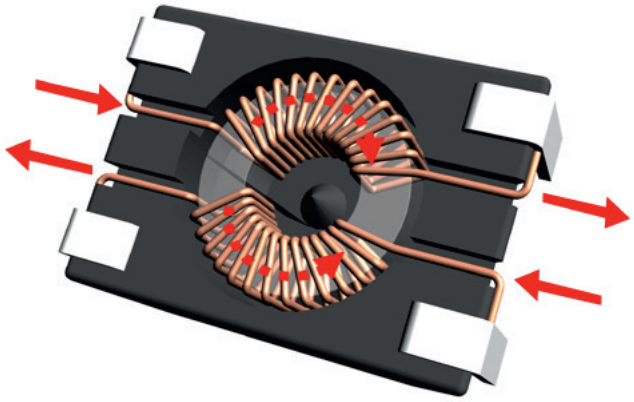


Huge Common Mode Attenuation!

Current Magnetic field

When the common mode component of a signal tries to go through the choke, it will meet a high impedance, due to the inductance created by the magnetization of the core and the coils.

Differential Mode Behaviour



Current Magnetic field

In opposition to the common mode behaviour, the differential mode component of the signal will see almost no impedance in the choke, this phenomenon could be explained with the magnetic field compensation inside the core. If the core is not magnetized, then no inductance will appear in the line.

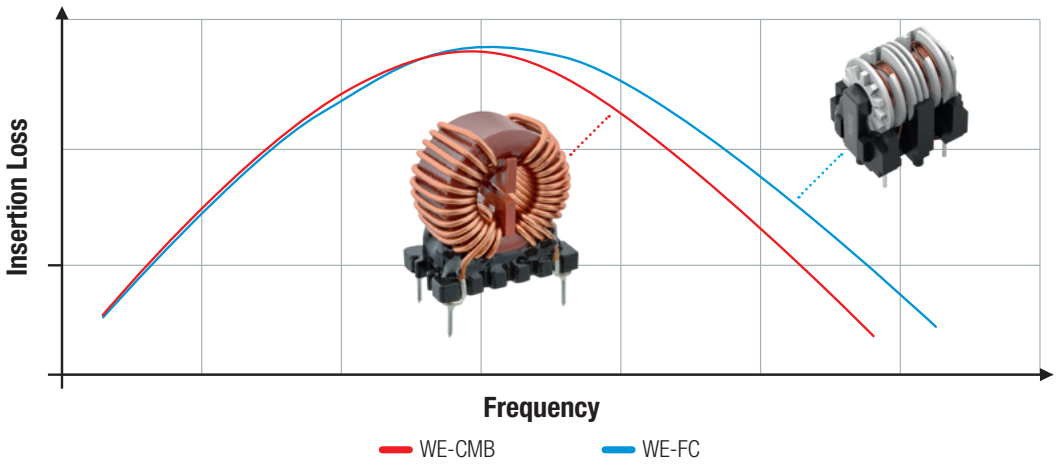
Winding Styles for Different Applications

Bifilar winding: Shows the lowest attenuation in differential mode. These chokes are recommended for data lines, where a high isolation is not needed and some high speed signals are involved.

Sectional winding: Shows the highest attenuation in differential mode. This chokes are recommended for power lines, where a high isolation is mandatory and the power delivery is happening at low frequency.

Compare the two techonologies in REDEXPERT:
www.we-online.com/redexpert-winding-styles

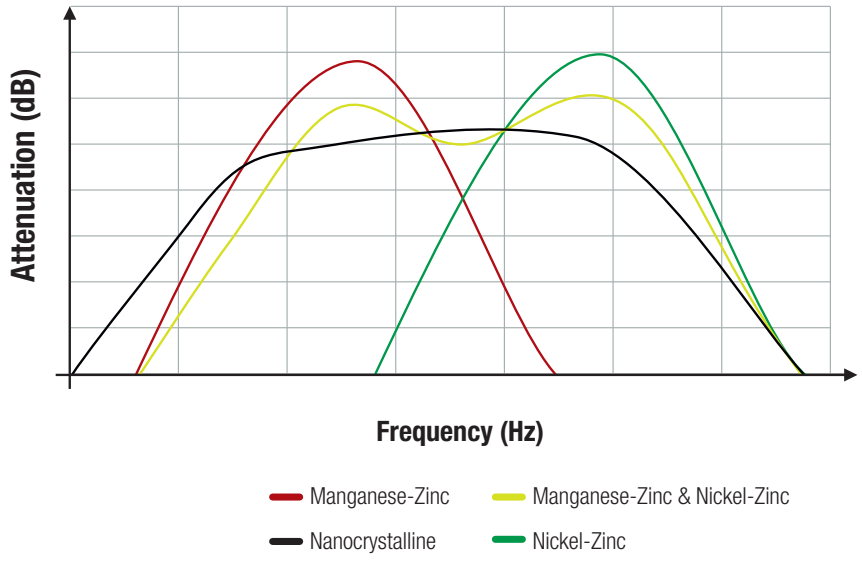
Comparison Winding Style



A division of the winding space in separate chambers (see WE-FC, 2 chambers on each winding) reduces the intrawinding capacitance increasing the bandwith of the choke. The current capabilities will be reduced due to the smaller winding space.

Compare the two series in REDEXPERT:
www.we-online.com/redexpert-compare-cmb-fc

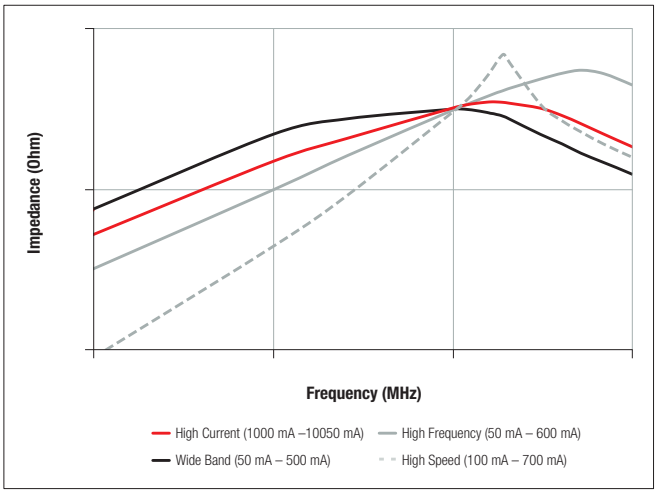
Comparison Core Material



Compare the different materials for our chokes in REDEXPERT:
www.we-online.com/redexpert-compare-core-material

SMD EMI Suppression Ferrite Beads

Characterisation



High Speed SMD Ferrites
Have lower impedance in the lower frequency ranges. Therefore they have only a low attenuation on fast signals. Application e.g. USB, IEEE 1394, LVDS

High Current SMD Ferrites
Are designed for high current (over 1 A). The rated current refers to 40 K self-heating. Application e.g. power supply, DC/DC converter.

Wide Band SMD Ferrites
Show already high impedance in low frequency range. Therefore they are wide band through the whole spectrum. Application e.g. control signals, RS232, RS422, DC/DC converter.

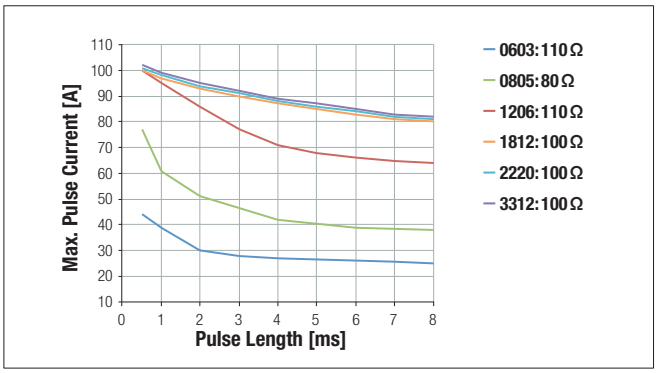
High Frequency SMD Ferrites
Have, due to a modified internal layout, an increased effective suppression frequency range. Consequently the impedance at 1 GHz is up to 3 times higher. Application e.g. HDD, fast bus signals and clock signals.

WE-MPSB

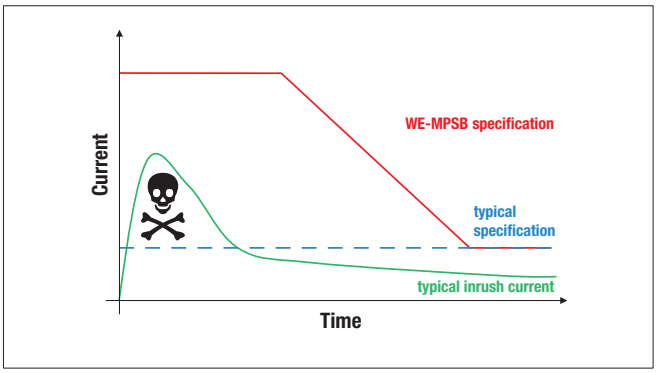
Multilayer Power Suppression

- Peak current is up to 20-times higher than rated current
- Up to 40 % higher rated current compared with similar products

The Maximum Allowed Current Varies with Pulse Length



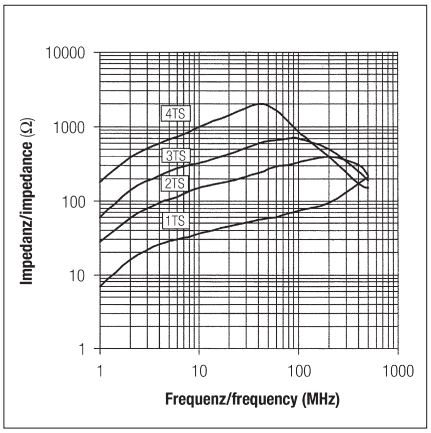
Specified Inrush Peak Current Rating Protects and Extends the Life of Your Application

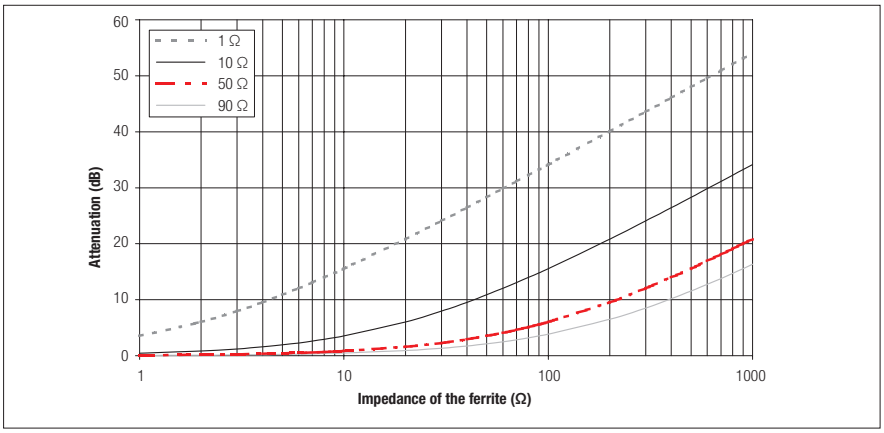


Wired SMT Ferrite generally resistant to peak current up to a pulse length of 100 ms with 100 A. Check WE-PBF, WE-CMS and WE-SUKW.

More information:
www.we-online.com/mpsb

Impedance vs. Frequency Cable Ferrites

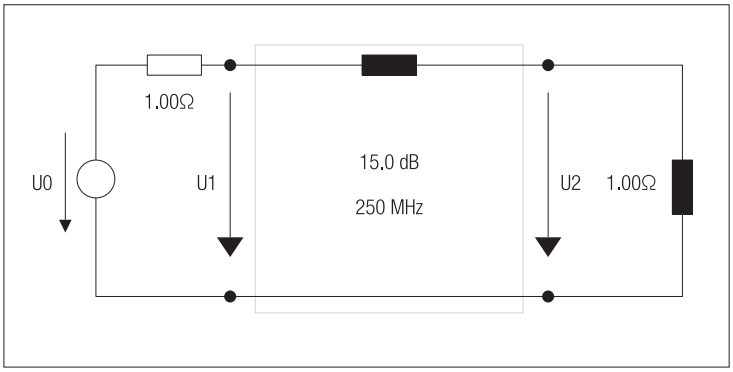




Relationship between the number of winding turns and the impedance across the frequency spectrum

See all ferrites with different turns
Go to REDEXPERT:
www.we-online.com/redexpert-different-turns

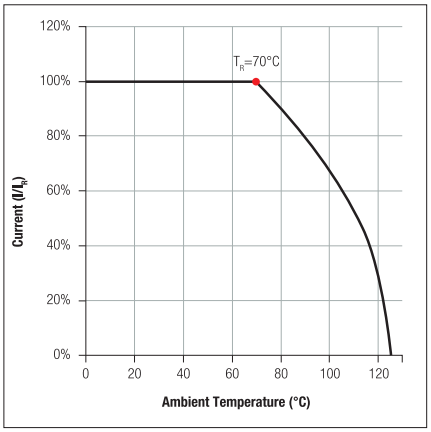
Impedance Determination in REDEXPERT

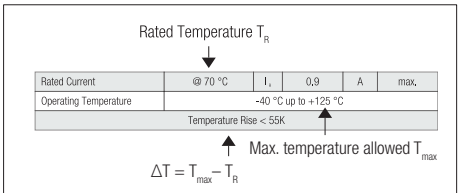


$$A\,(dB) = 20\log_{10}\frac{Z_A + Z_F + Z_B}{Z_A + Z_B}$$

Determine the needed impedance in REDEXPERT:
www.we-online.com/re-impedance

Derating Curve – Interpretation



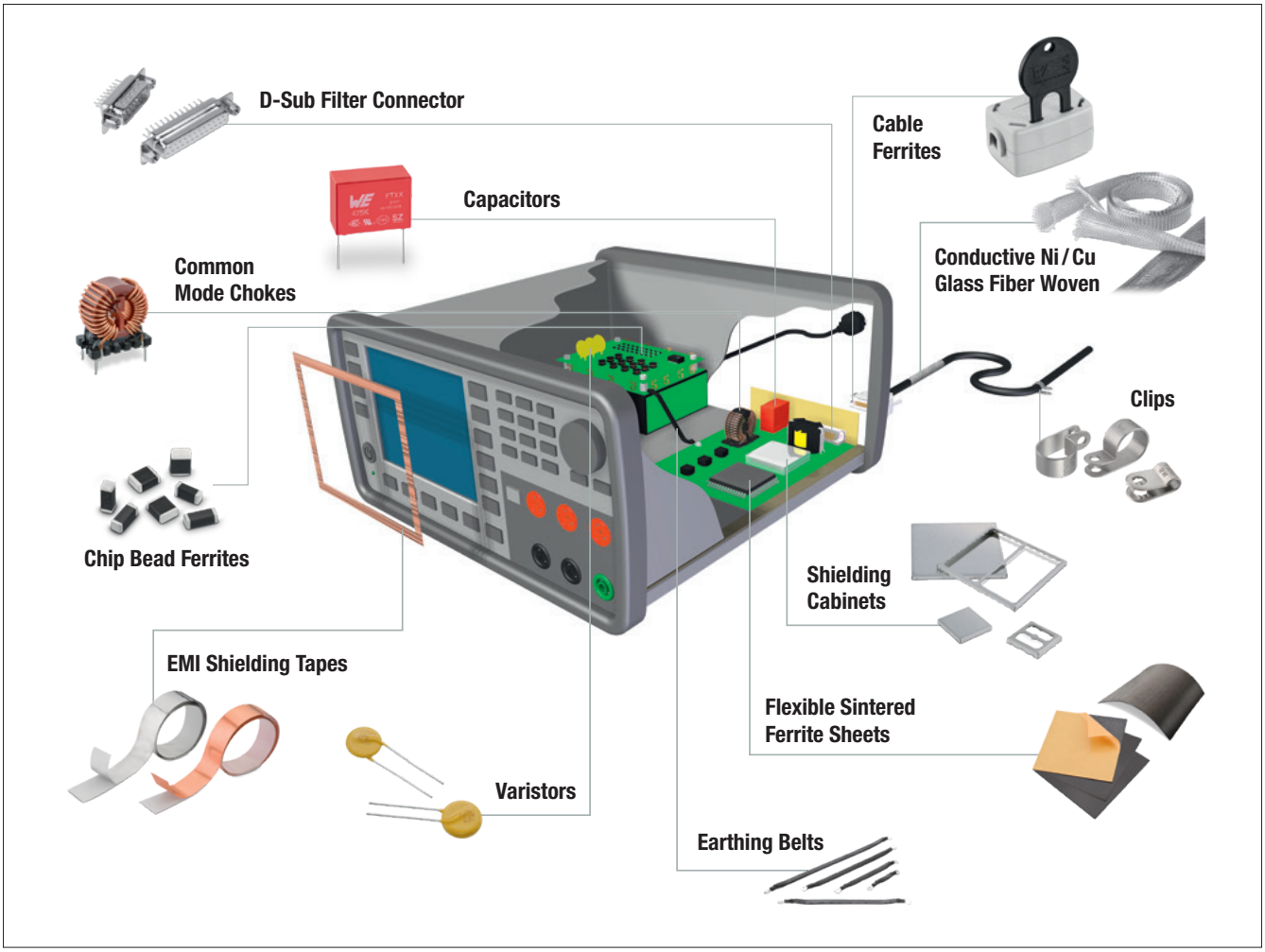


Example of use: The maximum ambient temperature at maximum current is 70 °C . At a higher ambient temperature the current capabilities sink. For an ambient temperature of 90 °C the current should not be over 80 % of IR (0.9 Amps).

Derating curves for CMC in REDEXPERT:
www.we-online.com/redexpert-derating-curves-cmc

WE are your EMC Component Specialist

Würth Elektronik offers personal advice and support for your design-in and EMC questions, EMC products of all kinds as well as helpful tools to speed up your design-in.



More than Products – Our Services

PERSONAL SUPPORT

For all EMC questions and issues we have the right personal contact for you.

WEBINARS & SEMINARS

Technology and product specialists offer interesting webinars and seminars on all aspects of EMC.

REDEXPERT

Perfect to select the right EMC component to solve your EMI issue.

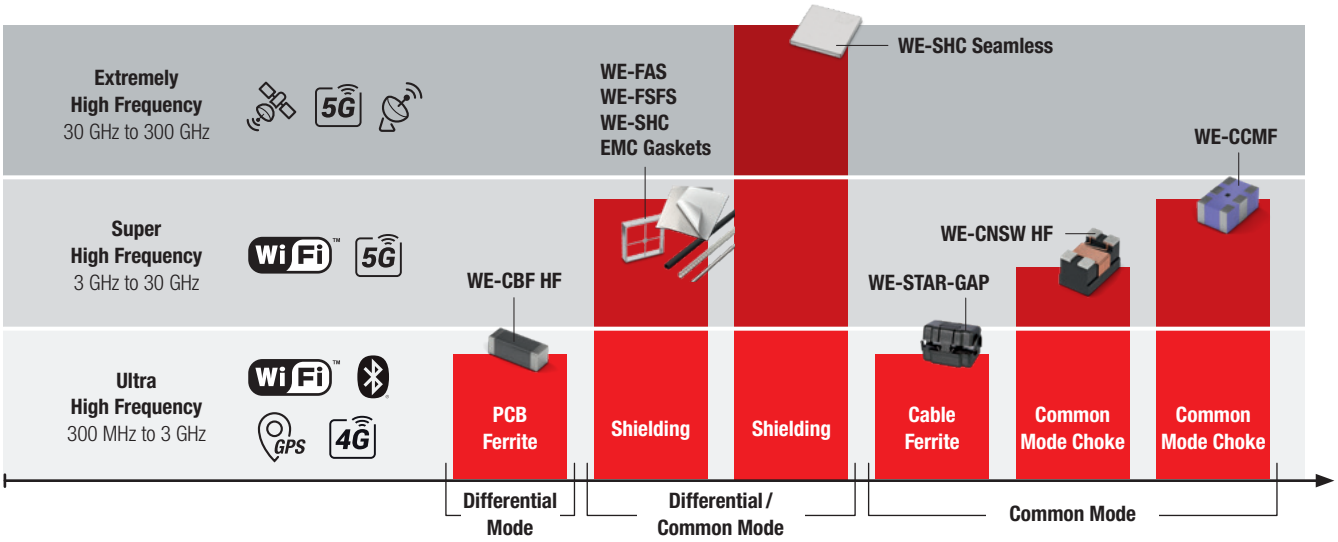
APPLICATION NOTES

Find additional product and application information in our App Notes.

Explore our EMC portfolio:
www.we-online.com/emc-components

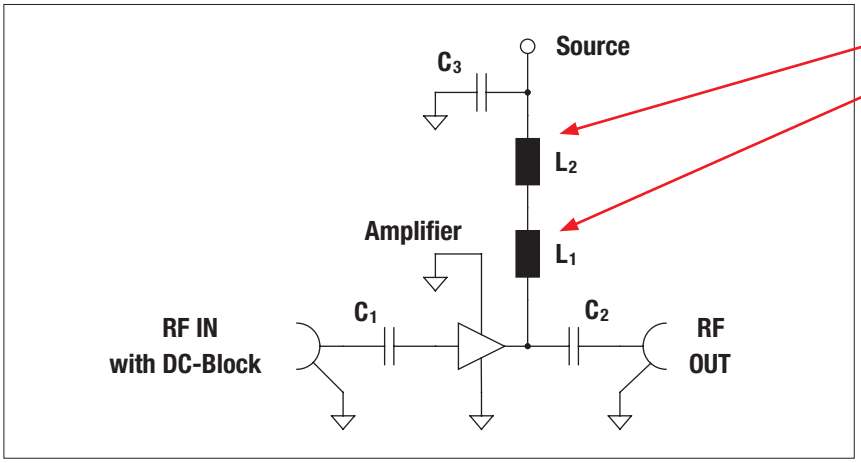
Technology is advancing at a tremendous rate and the next generation of devices are also shifting towards wireless applications. The movement towards higher frequency, into the gigahertz range has begun. We support you to find the right components for your HF application.

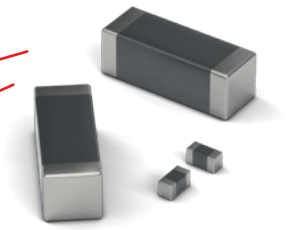
Our High Frequency Components for your Application



The Magic of High Frequency SMT Chip Bead Ferrites

Broadband amplifier 5 MHz – 5 GHz





Use our WE-CBF HF to reproduce a wide range of signals with low noise.

Your advantages:

- Wide frequency range
- Stable input and output impedances
- Effective decoupling of the supply voltage

Check out the App Note for more details
www.we-online.com/anp045

Signal Integrity and EMI

Signal Integrity and Increase in Data Speed

Signal integrity defines the quality of an electrical signal and refers to the challenges that arise due to high frequency data transmission. With the high switching speeds of the modern digital I/O interfaces, we are now able to achieve high data rates and bandwidth. At the same time, noise is a big concern for the integrity of these high frequency digital signals.

USB 3.1 Gen1 5 Gbps	HDMI 2.0 / Sata 3.0 6 Gbps	PCIe 3.0 8 Gbps	USB 3.1 Gen2 10 Gbps	PCIe 4.0 16 Gbps	Thunderbolt 4 / USB 4 20 Gbps

Design and Layout Challenges with Fast Data Lines

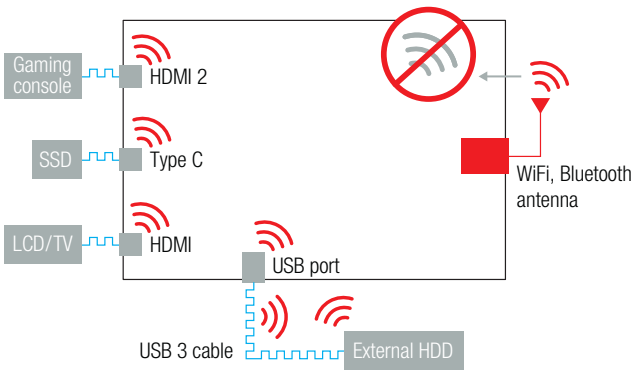
Faster Data Rates
The switching speeds of the modern digital interfaces are getting increasingly fast which translates to high data rates and bandwidth.

Higher noise frequency
With the increase in the switching speeds of digital circuits like USB 3.2 or HDMI 2.1, more and more noise is being generated at higher frequencies.

Noise at 2.4 / 5.0 GHz
Noise can interfere with the extremely sensitive wireless channels operating at 2.4 / 5.0 GHz bands.

Affected applications
- Wi-Fi 2.4 / 5 GHz
- Bluetooth
- GPS / GNSS
- 3G, 4G & 5G communications

Communication Interfaces – source of noise



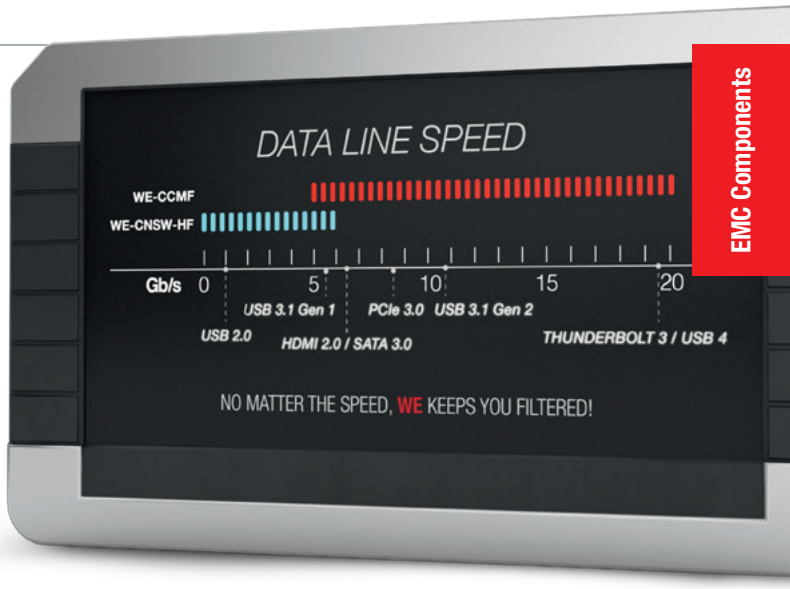
Noise can interfere with the extremely sensitive wireless channels operating at 2.4 / 5.0 GHz bands.

- Communication interfaces radiate noise on a very broad spectrum which can interfere with the wifi signal
- This can lead to loss of the Wi-Fi signal

Webinar Extremely High Data Line Chokes:
www.we-online.com/datalinewebinar

Signal Integrity – Don't lose your useful signal

- Common mode Filters / Chokes are a very effective way of protecting the data lines against noise interference, while reducing emissions at the same time.
- Choosing the appropriate common mode choke for a high-speed differential interface requires knowledge about both the application and the filter itself.
- Differential mode cut-off frequency (also known as 3dB frequency) is one of the most important criteria for the choke selection and can be evaluated with the help of s-parameters

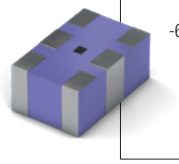


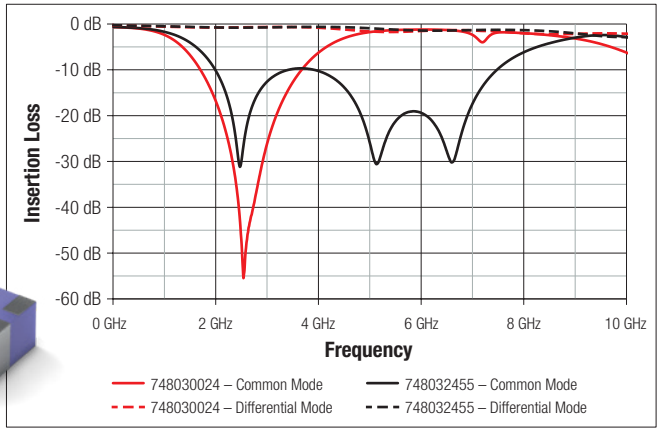
Next Generation Common Mode Chokes for High Speed Data Lines

WE-CCMF

Ceramic Common Mode Filter

- Ceramic based choke that works on the principle of the transmission line theory
- Complex inner resonant structure ensures high common mode suppression at wireless frequencies (2.4 & 5.0 GHz)
- Keeps the differential signal intact

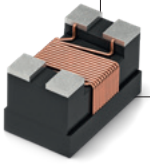


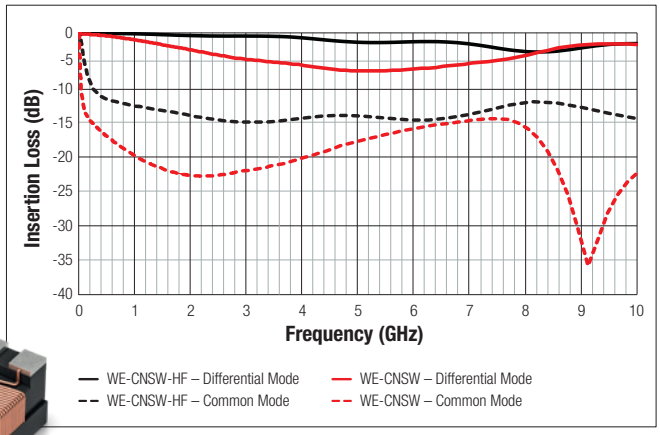


WE-CNSW HF

SMT Common Mode Line Filter

- Ferrite-based core and winding symmetry chokes.
- While the **WE-CNSW** can work up to USB 2.0 interfaces, the **WE-CNSW HF** version was designed to have wider band to be able to work with the newest high speed interfaces such as USB 3 1 Gen 1 and Gen 2. Wider common mode attenuation band before the cut-off-frequency (-3 dB).
- Wide variety of applications include USB 2.0, USB 3.1, HDMI and other.





Learn more:
www.we-online.com/cmc

EMC Shielding Solutions

Low impedance connections

EMC housing sealing

EMI source / victim shielding

Magnetic absorption / decoupling

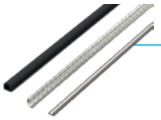
Product portfolio and more information:
www.we-online.com/shielding

EMC Accesories

- EMC Tapes
- Grounding Connections

Board Level Shielding

- One piece solution
- Two pieces solution (frame + cover)
- DIY shielding cabinet (ShielDIY)
- **Fit your shield:** custom dimensions, material, SMT / THT



EMC Gaskets

- Fabric over foam (WE-LT)
- Conductive elastomer (WE-EGS)
- Metal contact spring (WE-CSGS)
- Wire mesh over foam (WE-GS)
- **Fit your shield:** custom length, adhesive

EMI Patch

- Magnetic absorber (WE-FAS)
- Ferrite sheet (WE-FSFS)
- Thermally conductive absorber (WE-FAS TC)
- **Fit your shield:** custom size, shape

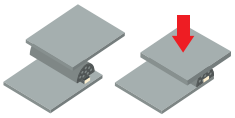
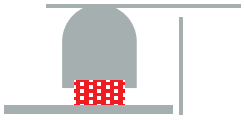
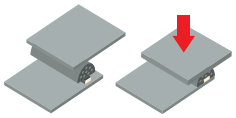
WE Fit your Shield

PROTOTYPING SERVICE | CUSTOMIZATION | APPLICATION ADVISING | FAST SAMPLING

Find Your EMC Gasket

Selection Steps to the Right EMC Gasket

Finding the right EMC gasket can be a long and tedious process – with these major points, we make it easy to choose the most suitable EMC gasket.

	WE-EGS	WE-LT	WE-CSGS	WE-GS
Ingress Protection	 **IP68** High protection for normal applications	 **IP54** Low protection for normal applications	 **IP20** Nearly no protection for normal applications	 **IP40** Protected against particles of more than 1 mm diameter
Compression Force Needed	+ + + **High Compression Force** Fixed applications, high sealing effect needed	+ + **Medium Compression Force** General applications	+ **Low Compression Force** Applications which require open & close function	+ + + **High Compression Force** Fixed applications, high sealing effect needed
Attachment Method	 **Mechanical Force** Compressible Conductive Elastomer Material Application examples: O-Rings for I/O entries, highly sealed housings, etc.	 **Adhesive Tape** Conductive / Non-Conductive PSA Application examples: not environmental exposed housing, medium sealed housing, etc.	 **Clip On & Screw Hole** Elastic Beryllium Copper Alloy with Nickel plating Application examples: EMC chambers, industrial ovens, etc.	 **Mechanical Force** Knitted Monel Wire Over Elastomer Material Application examples: Industrial ovens, rough environments
Operating Temperature Range	**-50 °C to +150 °C** Highest temperature range for extreme temperatures	**-40 °C to +85 °C** Low temperature range for general applications	**-40 °C to +120 °C** Medium temperature temperature range for extended needs	**-30 °C to +80 °C** Low temperature range for general applications

You have special requirements?

Check our complete portfolio online and customize your shielding to achieve the most optimal solution for your application.

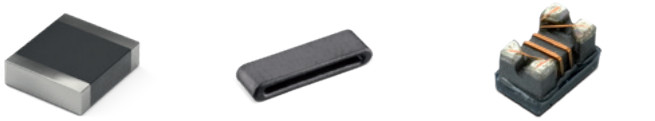
Not found the right product? Customize your shielding now!

Our portfolio::
www.we-online.com/shielding

Select EMC Components in REDEXPERT

Find the Perfect Match Between Common and Differential Mode Impedance to Ensure Signal Integrity of the Application.

- Filter for electrical and mechanical parameters
- Get chart data out of the lab
- Direct access to certificates and datasheets
- Read out chart values in the product table
- Calculate attenuation by entering system parameters
- Check temperature derating to make sure the current can be handled
- Enter your desired attenuation and frequency and **REDEXPERT** will propose suitable ferrites and common mode chokes based on system model calculations.



Try it out:
www.we-online.com/redexpert-emc-components

1 PASSIVE COMPONENTS

Power Magnetics

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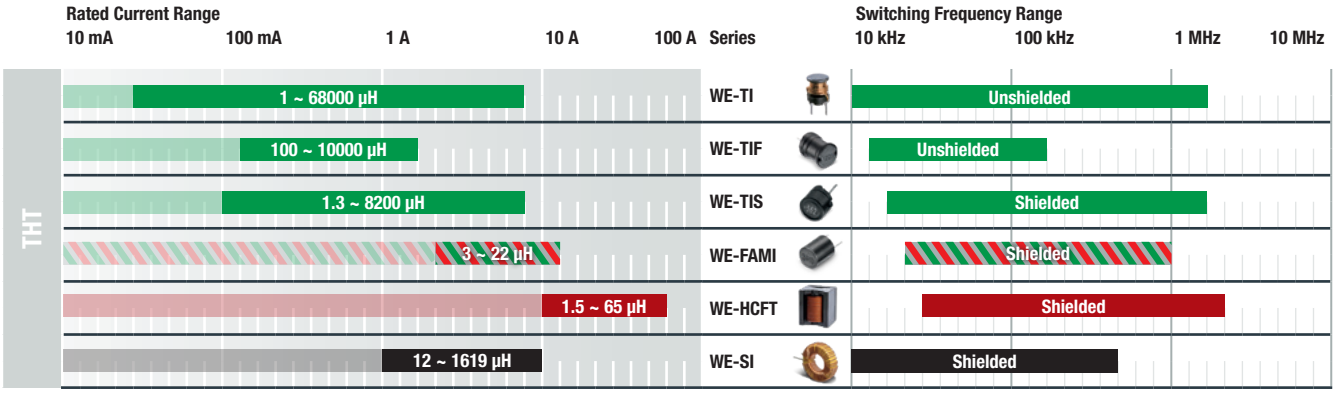
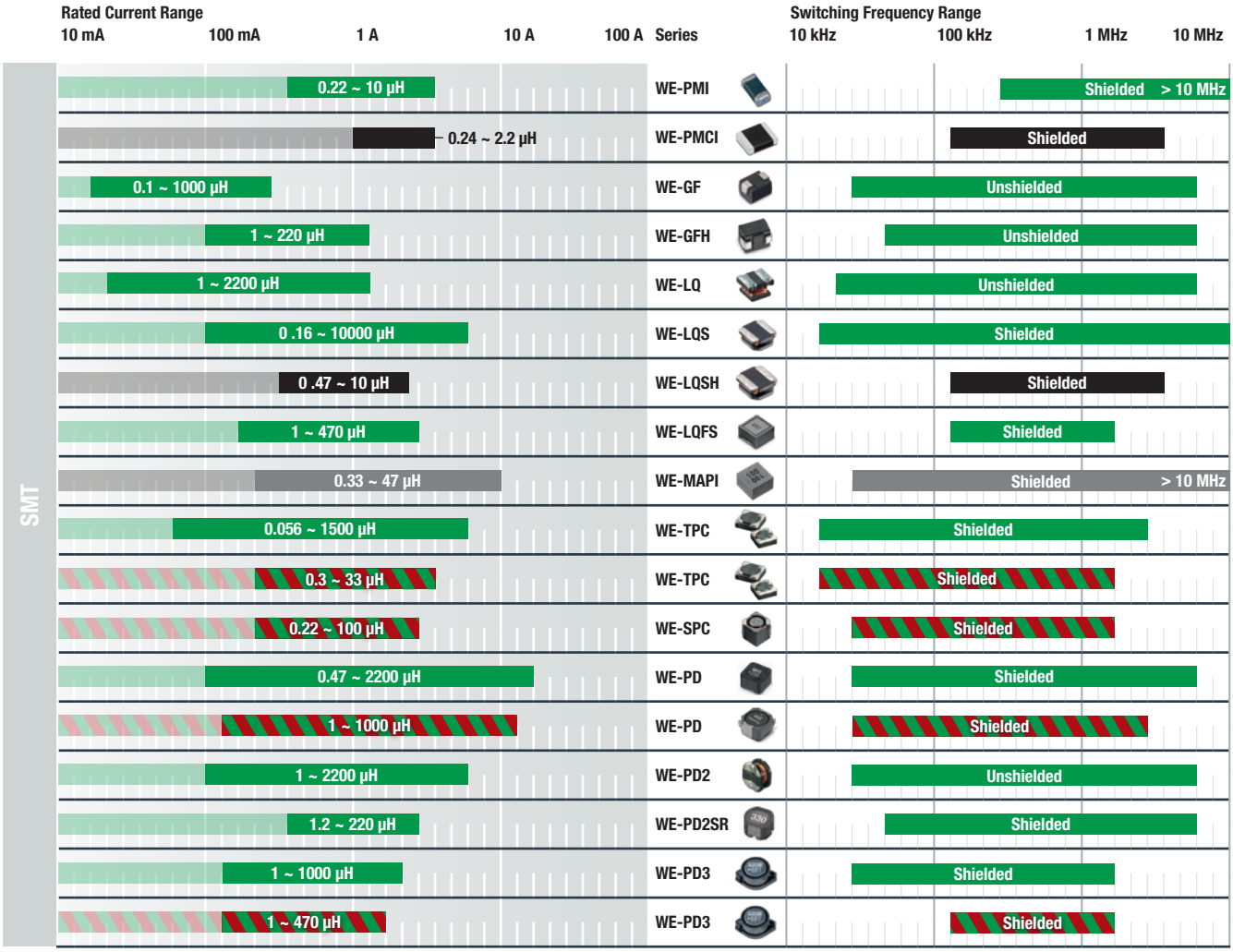
Design Kits	68
Additional Information	73

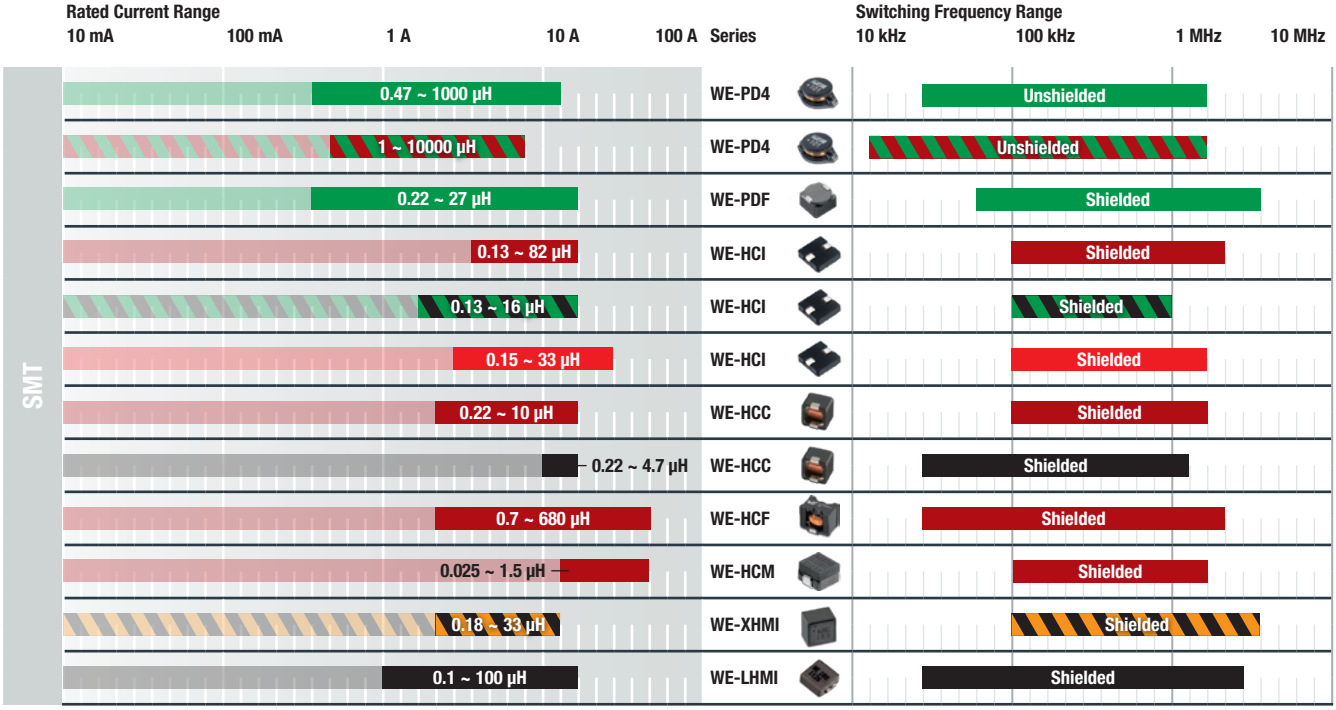
Storage Applications: Power Inductors for SMPS

Single Coil Power Inductors THT

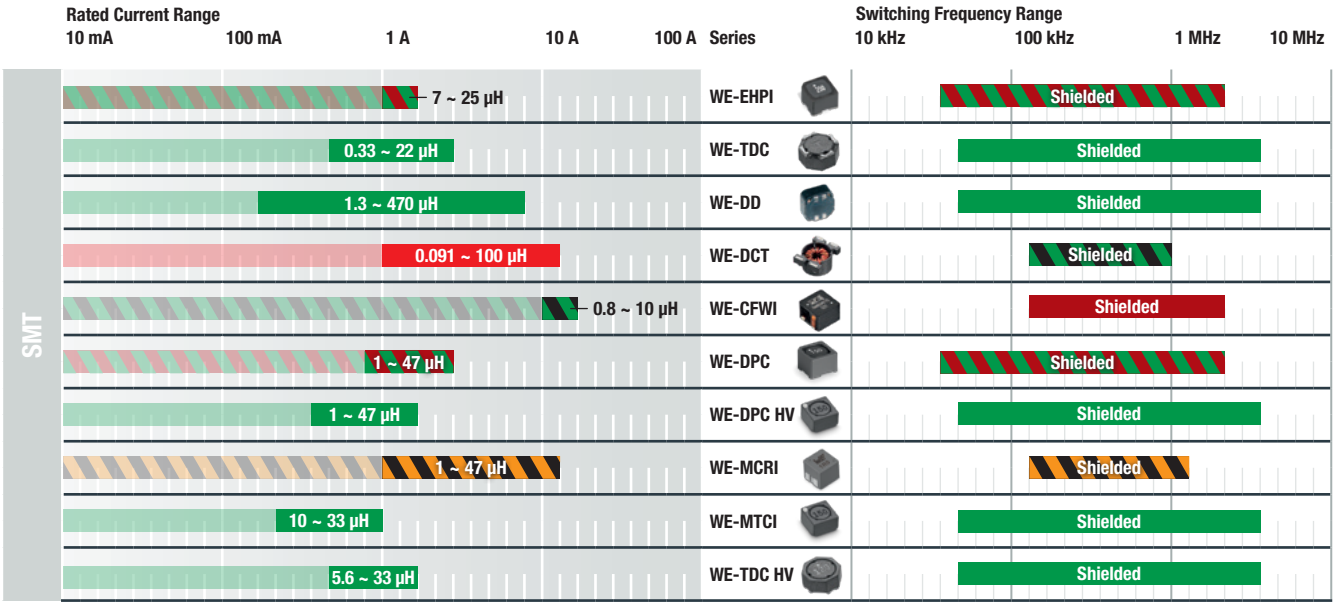


Single Coil Power Inductors SMT



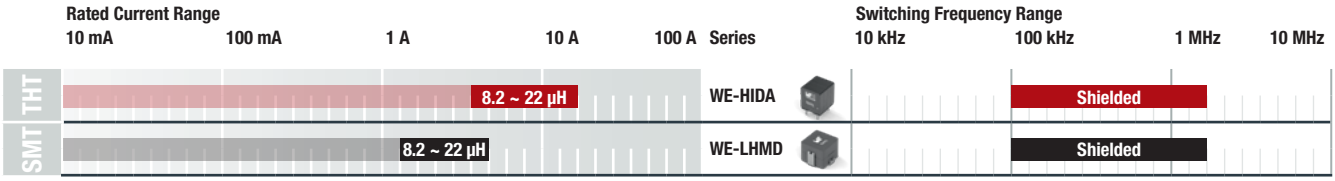


Coupled Inductors

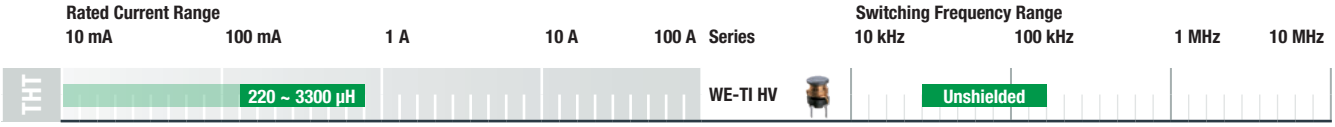


Storage Applications: Power Inductors for SMPS

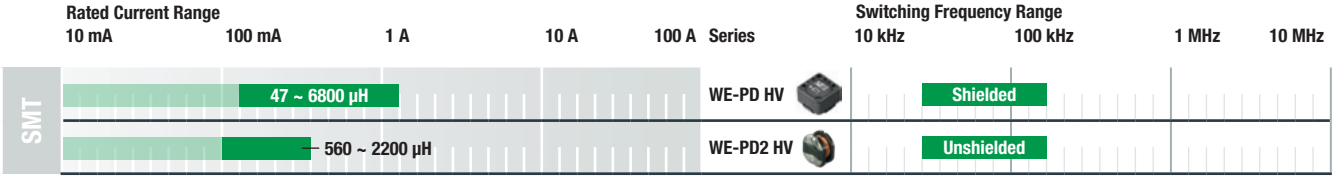
Inductors for Audio Amplifiers



High Voltage Inductors THT



High Voltage Inductors SMT



Iron Powder (Fe)
Nickel-Zinc (NiZn)
Superflux
Metal Alloy
WE-PERM®
Manganese-Zinc (MnZn)
Nickel-Zinc / Manganese-Zinc (NiZn / MnZn)
Hyperflux®
Nickel-Zinc / Manganese-Zinc / Metal Alloy (NiZn / MnZn / Metal Alloy)

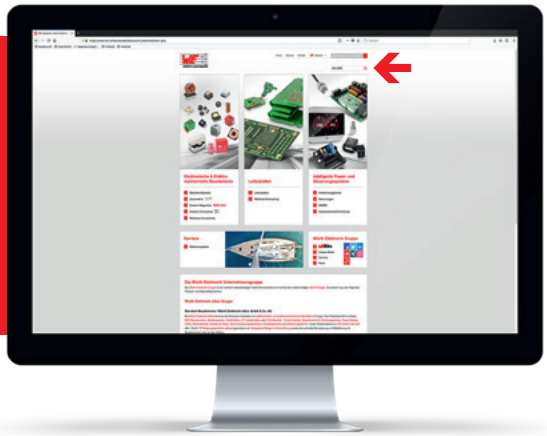
® Registered European Trademark

Product Overview

How to find detailed product information?

Visit www.we-online.com and search for product series information, e.g.:

WE-PD



Single Coil Power Inductors

WE-PMI
L: 0.11 ~ 10 µH
I_R: 650 ~ 4000 mA
R_{DC}: 7 ~ 500 mΩ
Frequency Range: 0.1 ~ 100 MHz

WE-PMCI
L: 0.24 ~ 2.2 µH
I_R: 1200 ~ 3600 mA
R_{DC}: 19 ~ 170 mΩ
Frequency Range: 0.05 ~ 6 MHz

WE-GF
L: 0.1 ~ 1000 µH
I_R: 30 ~ 450 mA
R_{DC}: 0.32 ~ 50 Ω
Frequency Range: 0.1 ~ 1000 MHz

WE-GFH
L: 1.0 ~ 220 µH
I_R: 160 ~ 1600 mA
R_{DC}: 81 ~ 9126 mΩ
Frequency Range: 0.1 ~ 100 MHz

WE-LQ
L: 1 ~ 2200 µH
I_R: 0.04 ~ 1.8 A
R_{DC}: 0.08 ~ 63 Ω
Frequency Range: 0.1 ~ 250 MHz

WE-LQS
L: 0.16 ~ 10000 µH
I_R: 0.13 ~ 8 A
R_{DC}: 6 ~ 22800 mΩ
Frequency Range: 0.01 ~ 10 MHz

WE-LQSH
L: 0.47 ~ 10 µH
I_R: 0.58 ~ 4.5 A
R_{DC}: 18 ~ 816 mΩ
Frequency Range: 0.06 ~ 6 MHz

WE-LQFS
L: 1.0 ~ 470 µH
I_R: 0.26 ~ 4.47 A
R_{DC}: 21 ~ 2803 mΩ
Frequency Range: 0.05 ~ 10 MHz

WE-MAPI
L: 0.33 ~ 47 µH
I_R: 0.39 ~ 9.6 A
$R_{DC\ typ.}$: 6 ~ 2090 mΩ
Frequency Range: 0.05 ~ 6 MHz

WE-TPC
L: 0.056 ~ 1500 µH
I_R: 0.08 ~ 8.5 A
R_{DC}: 0.0035 ~ 9 Ω
Frequency Range: 0.05 ~ 10 MHz

WE-SPC
L: 0.22 ~ 100 µH
I_R: 0.40 ~ 5.30 A
R_{DC}: 0.014 ~ 1.133 Ω
Frequency Range: 0.01 ~ 10 MHz

WE-PD
L: 0.47 ~ 1500 µH
I_R: 0.2 ~ 23.5 A
R_{DC}: 0.003 ~ 9.44 Ω
Frequency Range: 0.05 ~ 10 MHz

WE-PDF
L: 0.22 ~ 27 µH
I_R: 4.3 ~ 19 A
R_{DC}: 1.95 ~ 42.5 mΩ
Frequency Range: 0.1 ~ 10 MHz

WE-PD2SR
L: 1.2 ~ 220 µH
I_R: 0.67 ~ 4.85 A
$R_{DC\ typ.}$: 8.5 ~ 743 mΩ
Frequency Range: 0.1 ~ 10 MHz

WE-PD2
L: 1 ~ 2200 µH
I_R: 0.18 ~ 7.4 A
R_{DC}: 0.004 ~ 12.5 Ω
Frequency Range: 0.1 ~ 10 MHz

WE-PD3
L: 1 ~ 1000 µH
I_R: 0.19 ~ 3.9 A
R_{DC}: 0.027 ~ 3.2 Ω
Frequency Range: 0.1 ~ 10 MHz

WE-PD4
L: 0.47 ~ 10000 µH
I_R: 0.07 ~ 18 A
R_{DC}: 0.002 ~ 39 Ω
Frequency Range: 0.1 ~ 10 MHz

WE-HCI
L: 0.13 ~ 82 µH
I_R: 3.5 ~ 41.5 A
R_{DC}: 0.35 ~ 34.5 mΩ
Frequency Range: 0.1 ~ 3 MHz

WE-HCC
L: 0.22 ~ 10 µH
I_R: 4.4 ~ 27 A
R_{DC}: 1.1 ~ 38.5 mΩ
Frequency Range: 0.1 ~ 3 MHz

Extended

WE-HCF
L: 0.7 ~ 680 µH
I_R: 4.8 ~ 56 A
R_{DC}: 0.44 ~118.3 mΩ
Frequency Range: 0.05 ~ 3 MHz

Extended

WE-HCFT
L: 1.5 ~ 65 µH
I_R: 17.2 ~ 75 A
R_{DC}: 0.34 ~ 13.13 mΩ
Frequency Range: 0.05 ~ 3 MHz

WE-HIDA
L: 8.2 ~ 22 µH
I_R: 5.7 ~ 19 A
R_{DC}: 2.5 ~ 14.8 mΩ
Frequency Range: 0.05 ~ 2 MHz

WE-LHMD
L: 8.2 ~ 22 µH
I_R: 2 ~ 7 A
R_{DC}: 16 ~ 104 mΩ
Frequency Range: 0.05 ~ 2 MHz

Extended

WE-HCM
L: 0.025 ~ 1.5 µH
I_R: 23 ~ 70 A
R_{DC}: 0.114 ~ 0.7 mΩ
Frequency Range: 0.1 ~ 3 MHz

Product Overview

Single Coil Power Inductors

WE-XHMI

L:	0.18 ~ 33 µH
I_R:	4.7 ~ 20.0 A
R_{DC}:	1.32 ~ 31.0 mΩ
Frequency Range:	0.05 ~ 5 MHz

WE-LHMI

L:	0.1 ~ 100 µH
I_R:	1 ~ 32.5 A
R_{DC}:	0.60 ~ 500 mΩ
Frequency Range:	0.05 ~ 5 MHz

WE-FAMI

L:	3.0 ~ 22.0 µH
I_R:	3.7 ~ 14.5 A
R_{DC}:	3.1 ~ 30.9 mΩ
Frequency Range:	0.01 ~ 10 MHz

WE-TI

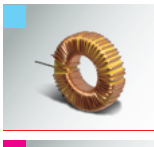
L:	1 ~ 68000 µH
I_R:	0.05 ~ 8.5 A
R_{DC}:	0.006 ~ 90.8 Ω
Frequency Range:	0.1 ~ 10 MHz

WE-TIF

L:	100 ~ 10000 µH
I_R:	0.21 ~ 2.6 A
R_{DC}:	0.075 ~ 9.3 Ω
Frequency Range:	0.1 ~ 10 MHz

WE-TIS

L:	1.3 ~ 6800 µH
I_R:	0.05 ~ 8.5 A
R_{DC}:	0.007 ~ 40 Ω
Frequency Range:	0.1 ~ 10 MHz



WE-SI

L:	12 ~ 1619 µH
I_R:	0.5 ~ 5 A
R_{DC}:	0.008 ~ 0.7 Ω
Frequency Range:	0.01 ~ 0.1 MHz

WE-PD HV

L:	220 ~ 3300 µH
I_R:	0.24 ~ 1.30 A
R_{DC}:	0.30 ~ 6.5 Ω
Frequency Range:	0.1 ~ 10 MHz

WE-PD2 HV

L:	560 ~ 2200 µH
I_R:	0.15 ~ 0.41 A
R_{DC}:	1.77 ~ 6 Ω
Frequency Range:	0.1 ~ 10 MHz

WE-TI HV

L:	220 ~ 3300 µH
I_R:	0.25 ~ 0,9 A
R_{DC}:	0.5 ~ 5.9 Ω
Frequency Range:	0.05 ~ 1 MHz

Dual Coil Power Inductors

WE-EHPI

L:	7.5 ~ 75000 µH
I_R:	0.0035 ~ 2.29 A
R_{DC}:	1.5 ~ 1.9 mΩ
Frequency Range:	0.001 ~ 0.3 MHz

WE-TDC

L:	0.33 ~ 22 µH
I_R:	0.7 ~ 4.5 A
R_{DC}:	0.0145 ~ 0.48 Ω
Frequency Range:	0.01 ~ 10 MHz

WE-DD

L:	1.3 ~ 470 µH
I_R:	0.3 ~ 8.6 A
R_{DC}:	0.011 ~ 1.73 Ω
Frequency Range:	0.1 ~ 10 MHz

WE-DCT

L:	0.091 ~ 100 µH
I_R:	1.1 ~ 14.5 A
R_{DC}:	3.5 ~ 290 mΩ
Frequency Range:	0.05 ~ 3 MHz

WE-CFWI

L:	0.8 ~ 4.4 µH
I_R:	12.0 ~ 28 A
R_{DC}:	1.6 ~ 9.6 mΩ
Frequency Range:	0.1 ~ 3 MHz

WE-DPC

L:	1 ~ 47 µH
I_R:	0.9 ~ 4.5 A
R_{DC}:	25 ~ 350 mΩ
Frequency Range:	0.1 ~ 10 MHz

WE-MTCI

L:	10 ~ 297 µH
I_R:	0.45 ~ 0.95 A
R_{DC}:	349 ~ 5200 mΩ
Frequency Range:	0.1 ~ 3 MHz

WE-DPC HV

L:	1 ~ 47 µH
I_R:	0.6 ~ 2.9 A
R_{DC}:	32 ~ 1.200 mΩ
Frequency Range:	0.1 ~ 10 MHz

WE-CPIB HV

L:	4.7 ~ 47 µH
I_R:	0.55 ~ 1.45 A
R_{DC}:	105 ~ 1.000 mΩ
Frequency Range:	0.1 ~ 10 MHz

WE-TDC HV

L:	5.6 ~ 33 µH
I_R:	0.75 ~ 1.4 A
R_{DC}:	190 ~ 700 mΩ
Frequency Range:	0.1 ~ 10 MHz

WE-MCRI

L:	1 ~ 47 µH
I_R:	1.5 ~ 17 A
R_{DC}:	4.5 ~ 240 mΩ
Frequency Range:	0.1 ~ 3 MHz

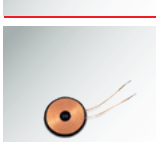
Wireless Power Transmission

WE-WPCC Wireless Power Transmitter Coil

L:	2.8 ~ 24 µH
Q:	30 ~ 220
I_R:	2.0 ~ 18 A
R_{DC}:	10 ~ 255 mΩ

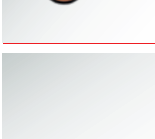
WE-WPCC Wireless Power Array

L:	6.4 ~ 12.5 µH
µHQ:	100 ~ 145
I_R:	8.0 ~ 10.0 A
R_{DC}:	38 ~ 56 mΩ



WE-WPCC Wireless Power Receiver Coil

L:	1.4 ~ 47.0 µH
Q:	10 ~ 50
I_R:	0.40 ~ 5.0 A
R_{DC}:	0.08 ~ 1200 Ω



WE-WPCC WPT / NFC Combination Coil

L:	L_1 = 6.3 ~ 24 µH L_2 = 0.7 ~ 1.6 µH
Q:	Q_1 = 19 ~ 125 Q_2 = 47 ~ 82
I_R:	I_{R1} = 6 ~ 7.5 A I_{R2} = 2.6 ~ 50 A
R_{DC}:	R_{DC1} = 0.048 ~ 0.4 Ω R_{DC2} = 0.03 ~ 0.1 Ω

PFC Chokes

WE-PFC

L:	150 ~ 1800 µH
I_R:	0.3 ~ 3.0 A
R_{DC1}:	78 ~ 1550 mΩ
R_{DC2}:	140 ~ 1200 mΩ

High Performance	1:1 High Voltage
Consumer	1:1 High Current
Low Profile	High Voltage
High Current	1:N Multi Turns Ratio
SEPIC	THT Inductors
Class D	All Purpose

Power Transformers

WE-FLEX
suitable for all switch mode power supply topologies like: Buck-Converter, Boost-Converter, SEPIC-Converter, Flyback-Converter, Forward-Converter and Push-Pull-Converter

WE-FLEX+
suitable for all switch mode power supply topologies like: Buck-Converter, Boost-Converter, SEPIC-Converter, Flyback-Converter, Forward-Converter and Push-Pull-Converter

WE-FLEX HV
suitable for all switch mode power supply topologies like: Buck-Converter, Boost-Converter, SEPIC-Converter, Flyback-Converter, Forward-Converter and Push-Pull-Converter

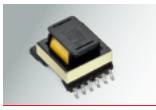
WE-PoE
suitable for Power over Ethernet ICs

WE-PoE+
Compliant with the 30W PoE+ objectives of IEEE802.3at

Suitable for PoE+ powered devices

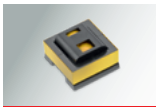
WE-PoEH
- PoE and PoE+ powered devices
- Flyback or Forward Transformer
- designed for 12 V, 24 V or 48 V input of Switching Mode Power Supply

WE-FB
for LT3573, LT3751, LT3574, LT3575, LT3748



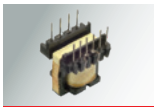
WE-UOST

U_i:	85 ~ 265 V_{ac}
U_{o1}:	5 ~ 24 V
I_{o1}:	0.56 ~ 3.0 A



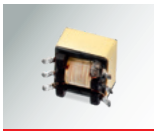
WE-LLCR

U_i:	360 ~ 400 Vdc
U_o:	12, 24 or 48 Vdc
P:	150, 200 or 250 W



WE-UNIT

U_i:	85 ~ 265 V_{ac}
U_{o1}:	5 ~ 24 V
I_{o1}:	0.13 ~ 2.0 A



WE-GDT

L:	260 ~ 650 µH
R_{DC1}:	520 ~ 1200 mΩ
R_{DC2}:	150 ~ 600 mΩ
R_{DC3}:	170 ~ 600 mΩ

WE-GDTI

L:	735 ~ 1800 µH
R_{DC1}:	1000 ~ 1600 mΩ
R_{DC2}:	600 ~ 1300 mΩ
R_{DC3}:	650 ~ 1300 mΩ

Extended

WE-CST
for Switch Mode Power Supply and AC current detection

NEW

WE-AGDT

Input Voltage:	9 – 18 V ~ 18 – 36 V
Output Unipolar:	15 V ~ 20 V
Output Bipolar:	+15 V / -4 V
Interwinding Capacitance:	6.8 pF
Total Output Power:	Up to 6 W

All Power Magnetic Components at a glance:
www.we-online.com/power-magnetics

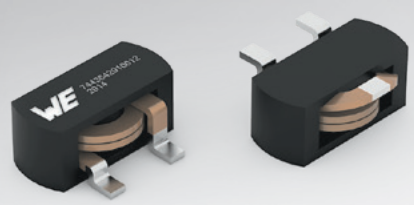
Explore our application notes for Power Magnetics:
www.we-online.com/appnotes

Component libraries available for:
- **PCB library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star**
- **S-Parameter & SPICE model: S-Parameter, LTspice, PSpice, Spectre**
- **RF & microwave simulation models: Modelithics**

www.we-online.com/library

WE-HCF

SMT High Current Inductor



Characteristics:

- Inductance values up to 2 µH
- Saturation current up to 56 A
- Low core losses (MnZn)
- 3-pin SMT to ensure mechanical stability
- Magnetically shielded
- Operating temperature: -40 °C up to +125 °C

Applications:

- POL regulator for FPGA / ASIC / GPU
- High current DC/DC converter
- Forward converter (output inductor)
- Half-bridge and full-bridge converters (e.g. current doubler)
- Battery chargers and inverters

www.we-online.com/we-hcf

Size 2010

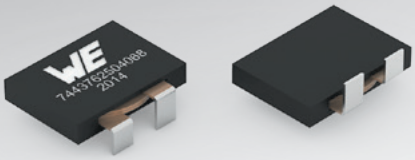
Technical Data:

Order Code	L (µH)	Tol. L	I_R (A)	I_{SAT} (A)	$R_{DC\ typ.}$ (mΩ)	$R_{DC\ max.}$ (mΩ)	f_{res} (MHz)
7443642010100	1	±20 %	45	56	0.84	0.92	44
7443642010120	1.2			47			42
7443642010200	2			30			30

L: Inductance; Tol. L: Inductance (Tol.); I_R: Rated Current; I_{SAT}: Saturation Current; $R_{DC\ typ.}$: DC Resistance; $R_{DC\ max.}$: DC Resistance max; f_{res}: Self Resonant Frequency

WE-HCFT

THT High Current Inductor



Characteristics:

- Inductance values ranging from 1 µH to 10 µH
- Saturation current up to 33 A
- Very low profile (height < 4mm)
- Low core losses (MnZn)
- Magnetically shielded
- THT version

Applications:

- POL regulators for FPGA / ASIC / GPU
- High current DC/DC Converters
- Forward converter (output inductor)
- Half-bridge and full-bridge converters (e.g. current-doubler)
- Battery chargers and inverters

www.we-online.com/we-hcft

Power Magnetics

Size 2504

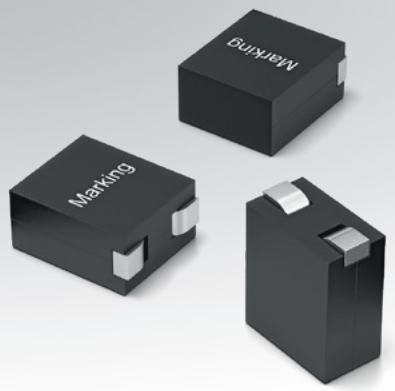
Technical Data:

Order Code	L (µH)	Tol. L	I_R (A)	I_{SAT} (A)	$R_{DC\ typ.}$ (mΩ)	$R_{DC\ max.}$ (mΩ)	f_{res} (MHz)
7443762504010	1	±20 %	39	33	0.86	0.95	38
7443762504022	2.2		30	23.8	1.78	1.96	23
7443762504047	4.7		24	14	2.77	3.05	14.5
7443762504068	6.8		20	12.6	4.21	4.63	11
7443762504100	10		20	8.8	4.21	4.63	8.4

L: Inductance; Tol. L: Inductance (Tol.); I_R: Rated Current; I_{SAT}: Saturation Current; $R_{DC\ typ.}$: DC Resistance; $R_{DC\ max.}$: DC Resistance max.; f_{res}: Self Resonant Frequency

WE-HCM

SMT High Current Flat Wire Inductor



Characteristics:

- Low core losses (MnZn)
- Extremely low R_{DC}
- R_{DC} Tol.: ±10 %
- Operating temperature: -40 °C up to +125 °C

Applications:

- Multiphase switching regulators
- CPU/RAM/FPGA power supply
- Power PC
- Graphic cards
- Convertible notebooks

www.we-online.com/we-hcm

Size 4030

Technical Data:

Order Code	L (µH)	Tol. L	I_R (A)	I_{SAT} (A)	R_{DC} (mΩ)	Tol. R_{DC}	f_{res} (MHz)
744340300025	0.025	±15 %	27	45	0.27	±15 %	180
744340300030	0.03			44			170
744340300055	0.055			24			123
744340300075	0.075			20			106

L: Inductance; Tol. L: Inductance (Tol.); I_R: Rated Current; I_{SAT}: Saturation Current; R_{DC}: DC Resistance; Tol. R_{DC}: DC Resistance (Tol.); f_{res}: Self Resonant Frequency

Size 4035

Technical Data:

Order Code	L (µH)	Tol. L	I_R (A)	I_{SAT} (A)	R_{DC} (mΩ)	Tol. R_{DC}	f_{res} (MHz)
74434035007	0.07	±20 %	29	17	0.38	±10 %	85
74434035010	0.1			16			69

L: Inductance; Tol. L: Inductance (Tol.); I_R: Rated Current; I_{SAT}: Saturation Current; R_{DC}: DC Resistance; Tol. R_{DC}: DC Resistance (Tol.); f_{res}: Self Resonant Frequency

Size 5030

Technical Data:

Order Code	L (µH)	Tol. L	I_R (A)	I_{SAT} (A)	R_{DC} (mΩ)	Tol. R_{DC}	f_{res} (MHz)
74435030010	0.1	±15 %	27	17	0.31	±15 %	83

L: Inductance; Tol. L: Inductance (Tol.); I_R: Rated Current; I_{SAT}: Saturation Current; R_{DC}: DC Resistance; Tol. R_{DC}: DC Resistance (Tol.); f_{res}: Self Resonant Frequency

Size 9065

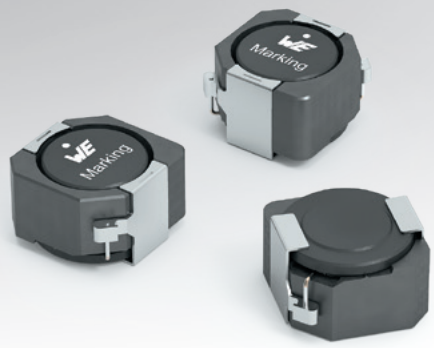
Technical Data:

Order Code	L (µH)	Tol. L	I_R (A)	I_{SAT} (A)	R_{DC} (mΩ)	Tol. R_{DC}	f_{res} (MHz)
744300006	0.06	±20 %	37	63	0.22	±10 %	124
744300008	0.08			51			94
744300010	0.1			42			74
744300015	0.15			29			51
744300022	0.22			19			38

L: Inductance; Tol. L: Inductance (Tol.); I_R: Rated Current; I_{SAT}: Saturation Current; R_{DC}: DC Resistance; Tol. R_{DC}: DC Resistance (Tol.); f_{res}: Self Resonant Frequency

WE-PD

SMT Power Inductor



Characteristics:

- AEC-Q 200 qualified
- Ultra low R_{DC} and R_{AC}
- Highest possible saturation current based on ferrite
- Suitable for switching frequencies up to 5 MHz
- Temperature dependent parameter available on **REDEXPERT**
- Operating temperature: -40 °C up to +150 °C

Applications:

- Switched-mode power supplies from 0.01 W up to 300 W
- Integrated DC/DC converter
- Ideal for switch mode power supplies with extremely high efficiency (> 95 %)

www.we-online.com/we-pd

Power Magnetics

Size 1280

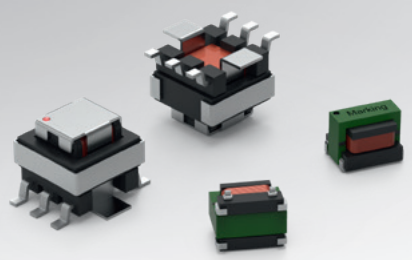
Technical Data:

Order Code	L (µH)	Tol. L	I_R (A)	I_{SAT} (A)	$R_{DC\ typ.}$ (mΩ)	$R_{DC\ max.}$ (mΩ)	f_{res} (MHz)
7447707015	1.5	±30 %	12	24	4.6	5.5	49.2
7447707022	2.2	±30 %	11	20.5	5.7	6.8	41.7
7447707033	3.3	±30 %	9.4	17.5	7.5	9	32.3
7447707047	4.7	±30 %	8.5	15.5	8.5	10	28.8
7447707068	6.8	±20 %	6.8	13	11.8	14	19.1
7447707100	10	±20 %	5.6	11	18	21	15.1
7447707150	15	±20 %	4.7	9	23	26.5	13.2
7447707220	22	±20 %	4	7.4	31.5	36	10.2
7447707330	33	±20 %	3.15	6.1	46.5	53	8.3
7447707470	47	±20 %	2.9	5.1	55	63	7.2
7447707680	68	±20 %	2.45	4.2	78	90	5.5
7447707101	100	±20 %	2.1	3.5	105	120	4.3
7447707151	150	±20 %	1.65	2.8	165	190	3.5
7447707221	220	±20 %	1.35	2.35	240	265	2.9
7447707331	330	±20 %	1.08	1.9	370	410	2.1
7447707471	470	±20 %	0.93	1.6	490	540	1.9
7447707681	680	±20 %	0.78	1.3	700	770	1.5
7447707102	1000	±20 %	0.66	1.1	985	1090	1.2

L: Inductance; Tol. L: Inductance (Tol.); I_R: Rated Current; I_{SAT}: Saturation Current; $R_{DC\ typ.}$: DC Resistance; $R_{DC\ max.}$: DC Resistance max.; f_{res}: Self Resonant Frequency

WE-CST

Current Sense Transformer



High rated current with tiny size

Characteristics:

- Tiny size and low profile
- Surface mount
- Frequency up to 1 MHz
- Primary current rating up to 20 A
- Up to 750 V_{AC} isolation
- Operating temperature: -40 °C up to +125 °C

Applications:

- AC current detection
- Switched-mode power supplies
- Overload sensing
- Load drop / shutdown detection
- Metering
- Load measurements
- High frequency current sensing

www.we-online.com/we-cst

Size EE4.4

Technical Data:

Order Code	L (µH)	n	I_R (A)	$R_{DC1\ max}$ (mΩ)	$R_{DC2\ max}$ (Ω)	∫Udt (µVs)	V_T (V_{AC})
749252020	33	1:20	7	3	0.35	9	750
749252030	74	1:30			0.8	13.5	
749252040	132	1:40			1.6	18	
749252060	295	1:60			3.6	27	
749252070	400	1:70			4.6	31.5	
749252125	1280	1:125			13	56.2	
749252150	1800	1:150			21	67.5	

L: Inductance; n: Turns Ratio; I_R: Rated Current; $R_{DC1\ max}$: DC Resistance 1; $R_{DC2\ max}$: DC Resistance 2; ∫Udt: Voltage-µSecond; V_T: Insulation Test Voltage

Size EE5 SMT

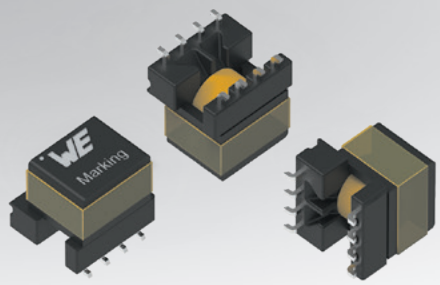
Technical Data:

Order Code	L (µH)	n	I_R (A)	$R_{DC1\ max}$ (mΩ)	$R_{DC2\ max}$ (Ω)	∫Udt (µVs)	V_T (V_{AC})
749251020	80	1:20	20	0.75	0.2	10	500
749251030	180	1:30			0.48	15	
749251040	320	1:40			0.9	20	
749251050	500	1:50			1.4	25	
749251060	720	1:60			1.75	30	
749251070	980	1:70			2.2	35	
749251100	2000	1:100			5.5	50	
749251125	3000	1:125			6.5	68	

L: Inductance; n: Turns Ratio; I_R: Rated Current; $R_{DC1\ max}$: DC Resistance 1; $R_{DC2\ max}$: DC Resistance 2; ∫Udt: Voltage-µSecond; V_T: Insulation Test Voltage

WE-AGDT

Auxiliary Gate Drive Transformer



Ultra low interwinding capacitance for SiC MOSFETs and IGBTs

Characteristics:

- Interwinding capacitance down to 6.8 pF
- Tiny surface mount EP7 package
- Dielectric insulation up to 4 kV AC
- Basic insulation
- Safety: IEC62368-1 / IEC61558-2-16
- Common control voltages for SiC MOSFET's
- Flyback with primary side regulation
- Wide range input voltages 9 V to 36 V
- High efficiency and very compact solution
- Reference designs with Analog Devices and Texas Instruments
- Operating temperature: -40 °C up to +130 °C

Applications:

- Industrial drives
- AC motor inverters
- Electric vehicles / e-mobility
- Powertrain
- Battery chargers
- Solar inverters
- Data centers
- Uninterruptible power supplies
- Active power factor correction
- Switching power supplies

www.we-online.com/we-agdt

Size EP7

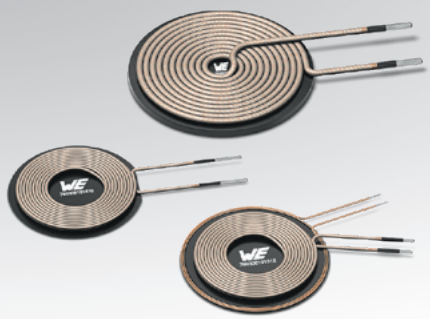
Technical Data:

Order Code	V_{in} (V)	V_{Out1} (V)	V_{Out2} (V)	C_{WW} (pF)	f_{switch} (kHz)	IC Reference	P_O (W)
750317894	9 – 18	+15	-4	7	350	LM5180	3
750317893	9 – 18	+19	–	6.8		LM5180	3
750318208	18 – 36	+15	-4	7		LM5180	5
750318207	18 – 36	+19	–	8.2		LM5180	5
750318131	9 – 18	+15	-4	7.5		LT8302	6
750318114	9 – 18	+19	–	6.8		LT8302	6

V_{in}: Input Voltage; V_{Out1}: Output Voltage 1; V_{Out2}: Output Voltage 2; C_{WW}: Interwinding Capacitance; f_{switch}: Switching Frequency; P_O: Total Output Power

WE-WPCC

Wireless Power Transfer Coil



Characteristics:

- Litz wire and high quality ferrite for highest Q and maximum power transfer efficiency
- Based on Qi standard
- Applicable for Qi (5 & 15 W) and higher in proprietary solutions
- High permeability ferrite shielding focuses magnetic flux and protects sensitive electronics
- High reliability construction

Applications:

- Portable devices used in a clean area, where connectors pose a risk of polluting, e.g. medical facilities, (industrial) clean rooms, mining industry
- Devices with a large number of mating cycles to avoid connector damage, e.g. smart watches, fitness tracker
- Consumer products, e.g. digital cameras, baby phones, remote control, smartphone sleeves, watertight products
- Explosion sensitive area where the use of a physical connection is hazardous
- Smart sensors

www.we-online.com/we-wpcc

Transmitter – Low Profile

Technical Data:

Order Code	L (µH)	$R_{DC\ max.}$ (mΩ)	$I_{R\ DC}$ (A)	Q	f_{res} (MHz)	P (W)	Size	Compliance
760308101411	6.3	48	7.5	110	20	150	Ø 50 x 2.8 mm	works with Qi Tx IC's
760308101410	24	100	5.5	170	6	100	Ø 50 x 3.1 mm	
760308101310	24	110	7.5	155	7.7	100	Ø 75 x 3.3 mm	

L: Inductance; $R_{DC\ max.}$: DC Resistance max.; $I_{R\ DC}$: Rated Current DC; Q: Q-Factor; f_{res}: Self Resonant Frequency; P: Power Capability

Transmitter – Combination WPT and NFC coils

Technical Data:

Order Code	L_1 (µH)	L_2 (µH)	$R_{DC1\ max.}$ (mΩ)	$R_{DC2\ max.}$ (mΩ)	$I_{R\ DC1}$ (A)	$I_{R\ DC2}$ (A)	$Q_{min.}$	$Q_{typ.}$	$f_{res\ 1}$ (MHz)	$f_{res\ 2}$ (MHz)	P (W)	Size	Compliance
760308101150	6.3	1.2	48	55	7.5	7	100	80	27	48	100	Ø 65 x 3.5 mm	Qi – Airfuel Alliance – NFC
760308101312	24	0.7	90	30	6	13	125	30	7	63		Ø 54 x 4 mm	Qi – Airfuel Alliance – NFC

L_1: Inductance; L_2: Inductance [2]; $R_{DC1\ max.}$: DC Resistance; $R_{DC2\ max.}$: DC Resistance [2]; $I_{R\ DC1}$: Rated Current DC [1]; $I_{R\ DC2}$: Rated Current DC [2]; $Q_{min.}$: Q-Factor [1]; $Q_{typ.}$: Q-Factor [2]; $f_{res\ 1}$: Self Resonant Frequency [1]; $f_{res\ 2}$: Self Resonant Frequency [2]; P: Power Capability

Transmitter – High Power

Technical Data:

Order Code	L (µH)	$R_{DC\ max.}$ (mΩ)	Q	f_{res} (MHz)	P (W)	Size	Compliance
760308101311	5.8	14	220	13	400	Ø 70 x 8.5 mm	works with Qi Tx IC's

L: Inductance; $R_{DC\ max.}$: DC Resistance max.; Q: Q-Factor; f_{res}: Self Resonant Frequency; P: Power Capability

WE-ACHC

SMT High Current Air Coil

No core losses and no saturation

Characteristics:

- No saturation
- No core losses
- Extremly high Q factor
- Ultra low R_{DC}
- High current capability
- Inductances from 22 nH up to 146 nH
- Operating temperature: -40 °C up to +125 °C

Applications:

- High current DC/DC converters with frequencies > 4 MHz
- RF power amplifiers
- RF voltage regulators
- High current RF filters / chokes
- Power supplies
- Magnetically sensitive applications

www.we-online.com/we-achc

Power Magnetics

Size 1010

Technical Data:

Order Code	L (nH)	Tol. L	Test Condition L	$Q_{min.}$	Test Condition Q	$R_{DC\ max.}$ (mΩ)	I_R (A)	f_{res} (MHz)
7449150023	23	±20 %	1 MHz	191	100 MHz	1.2	30	867
7449150046	46.5			223		1.62	28	581
7449150079	79			184		2.11	23	422
7449150111	111			186		2.11	22	374
7449150146	146			163		3.33	19	332

L: Inductance; Tol. L: Inductance (Tol.); Test Condition L: Inductance (Test cond.); $Q_{min.}$: Q-Factor; Test Condition Q: Q-Factor (Test cond.); $R_{DC\ max.}$: DC Resistance max.; I_R: Rated Current; f_{res}: Self Resonant Frequency

Size 1212

Technical Data:

Order Code	L (nH)	Tol. L	Test Condition L	$Q_{min.}$	Test Condition Q	$R_{DC\ max.}$ (mΩ)	I_R (A)	f_{res} (MHz)
7449152022	22	±20 %	1 MHz	280	100 MHz	0.55	40	867
7449152042	42			240		0.77	34	605
7449152066	66			245		0.99	32	457
7449152090	90			226		1.21	30	359
7449152111	117			211		1.43	32	345

L: Inductance; Tol. L: Inductance (Tol.); Test Condition L: Inductance (Test cond.); $Q_{min.}$: Q-Factor; Test Condition Q: Q-Factor (Test cond.); $R_{DC\ max.}$: DC Resistance max.; I_R: Rated Current; f_{res}: Self Resonant Frequency

Design Kits

Product Category	Design Kit	Order Code	Lifelong Refill
Single Coil Power Inductor			
	WE-GF; SMT Wire Wound Inductors	744766	✓
	WE-HCC; SMT High Current Cube Inductors	744332	✓
	WE-HCI 1030, 1040, 1050; SMT Flat Wire High Current Inductors	744355	✓
	WE-HCI 1335, 1350, 1365; SMT Flat Wire High Current Inductors	744356	✓
	WE-HCI 1890; SMT Flat Wire High Current Inductors	744357	✓
	WE-HCI 5040, 7030, 7040, 7050; SMT Flat Wire High Current Inductors	744354	✓
	WE-PMCI 0603, 0805, 0806,1008; Power Molded Chip Inductor	742792	✓
	WE-HCM; SMT High Current Flat Wire Inductors	744300	✓
	WE-LHMI 1040, 1335, 1365; SMT Low Profile High Current Molded Inductors	7443736	✓
	WE-LHMI 4012, 4020; SMT Low Profile High Current Molded Inductors	7443732	✓
	WE-LHMI 8030, 8040; SMT Low Profile High Current Molded Inductors	7443735	✓
	WE-LHMI 7030, 7050; SMT Low Profile High Current Molded Inductors	7443734	✓
	WE-LQ 1210, 1812; SMT Inductors	744032	✓
	WE-LQFS 3818, 4818, 4828; SMT Shielded Power Inductors	7440601	✓
	WE-LQS 2010, 2512, 3015; SMT Semi-Shielded Power Inductors	7440402	✓
	WE-LQS 3012, 4025; SMT Semi-Shielded Power Inductors – Low Loss	7440403A	✓
	WE-LQS 4012, 4018, 5020, 5040; SMT Semi-Shielded Power Inductors	7440405	✓
	WE-LQS 6028, 6045, 8040; SMT Semi-Shielded Power Inductors	7440408	✓
	WE-LQSH 2010, 2512, 3012, 4020; SMT Semi-Shielded High Saturation Power Inductors	7440502	✓
	WE-MAPI 1610, 2010; Metal Alloy Power Inductors	7443831	✓
	WE-MAPI 2506, 2508, 2510, 2512; Metal Alloy Power Inducturs	7443832	✓
	WE-MAPI 3010, 3012, 3015, 3020; Metal Alloy Power Inductors	7443833	✓
	WE-MAPI 4020, 4030; Metal Alloy Power Inductors	7443834	✓
	WE-PD 1030, 1050; SMT Shielded Power Inductors	7447713	✓
	WE-PD 1210, 1280; SMT Shielded Power Inductors	744770	✓
	WE-PD 6033, 7332; SMT Shielded Power Inductors	744778	✓
	WE-PD 7345, 1260; SMT Shielded Power Inductors	744777	✓
	WE-PD2 4532, 5820, 5848; SMT Power Inductors	744773	✓

Product Category	Design Kit	Order Code	Lifelong Refill
	WE-PD2 7850, 1054; SMT Power Inductors	744775	✓
	WE-PMI; Power Multilayer Inductors	744797	✓
	WE-PD HV; SMT Power Inductors	768771	✓
	WE-SPC; SMT Shielded Power Inductors	7440894	✓
	WE-TI 5075, 6065, 8055, 8075, 8095; Radial Leaded Wire Wound Inductors	744741	✓
	WE-TI 8012, 1014; Radial Leaded Wire Wound Inductors	744743	✓
	WE-TIS; Shielded Radial Leaded Wire Wound Inductors	744731	✓
	WE-TPC 2811, 2813, 2828, 3816, 4818; SMT Shielded Tiny Power Inductors	744028	✓
	WE-TPC 4828, 5818, 5828; SMT Shielded Tiny Power Inductors	744043	✓
	WE-TPC 6823, 1028, 1038; SMT Shielded Tiny Power Inductors	744062	✓
	WE-TPC 8012, 8015, 8020; SMT Shielded Tiny Power Inductors	744070	✓
	WE-XHMI 1090, 1510; SMT Xtreme High Current	7443936	✓
	WE-XHMI 6030, 6060, 8080; SMT Xtreme High Current	7443934	✓
PFC Chokes			
	WE-PFC; Power Factor Correction Chokes	760801	✓
Dual Coil Power Inductors			
	Energy Harvesting Design Kit	IC-744885	
	Energy Harvestin Demo Kit Gleanergy	IC-744888	
	WE-DD; SMT Shielded Coupled Inductors	744870	✓
	WE-TDC; SMT Coupled Inductors	744894	✓
Wireless Power Transmission			
	200 W Development Kit Wireless Power Transfer Extend Medium Power Solution	760308EMP	
	15 W Design Kit Wireless Power Medium Solution including data transfer	760308MP2	
	LCD Board for the 200W Development Kit	760308EMP LCD	
Flexible Transformers for SMPS			
	WE-FLEX; Flexible Transformers	749196	✓
Transfomers for DC/DC-Converters			
	WE-PoE; Transformer for Power-over-Ethernet	749119	✓

Focus Product

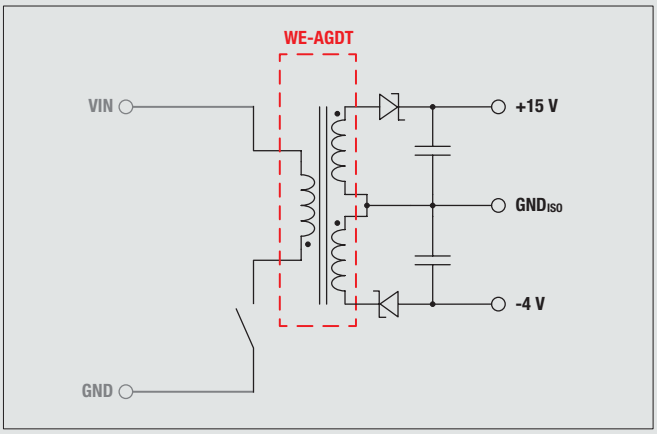
High Power in Small Size: WE-AGDT

Compact Transformers for Gate Driver Auxiliary Power Supply up to 6 W

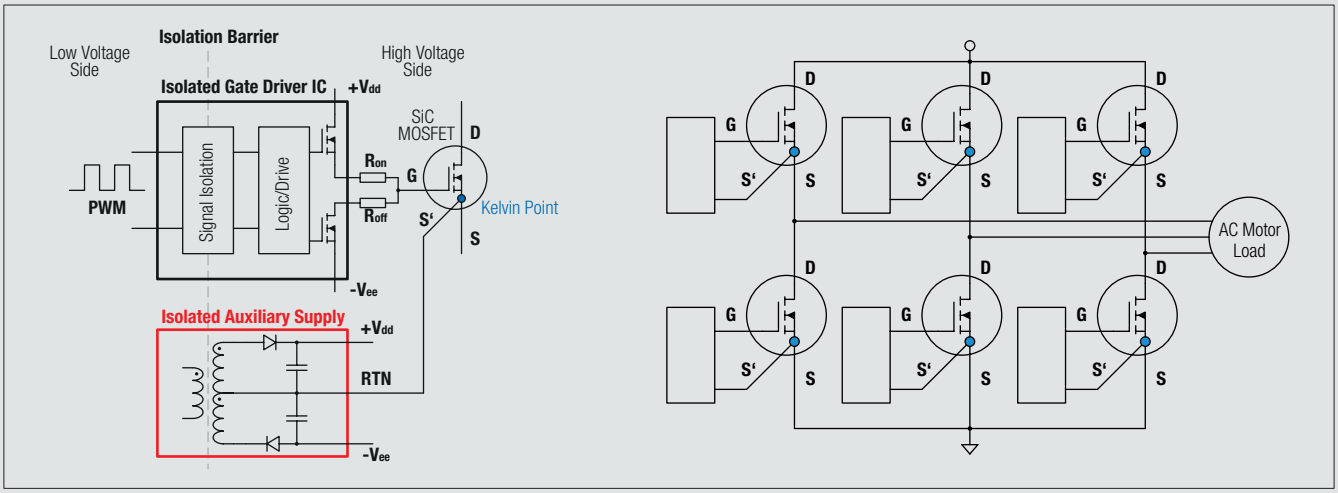
WE-AGDT is a small sized power transformer with very low inter-winding capacitance and high isolation, optimized for high speed SiC MOSFET and IGBT applications.

- Interwinding capacitance down to 6.8 pF
- High efficiency and very compact
- Common control voltages for SiC MOSFETs
- Wide range input voltages from 9 V to 36 V
- Dielectric insulation up to 4 kV
- Reference designs with Analog Devices and Texas Instruments

Simplified Flyback Application with Bipolar Output

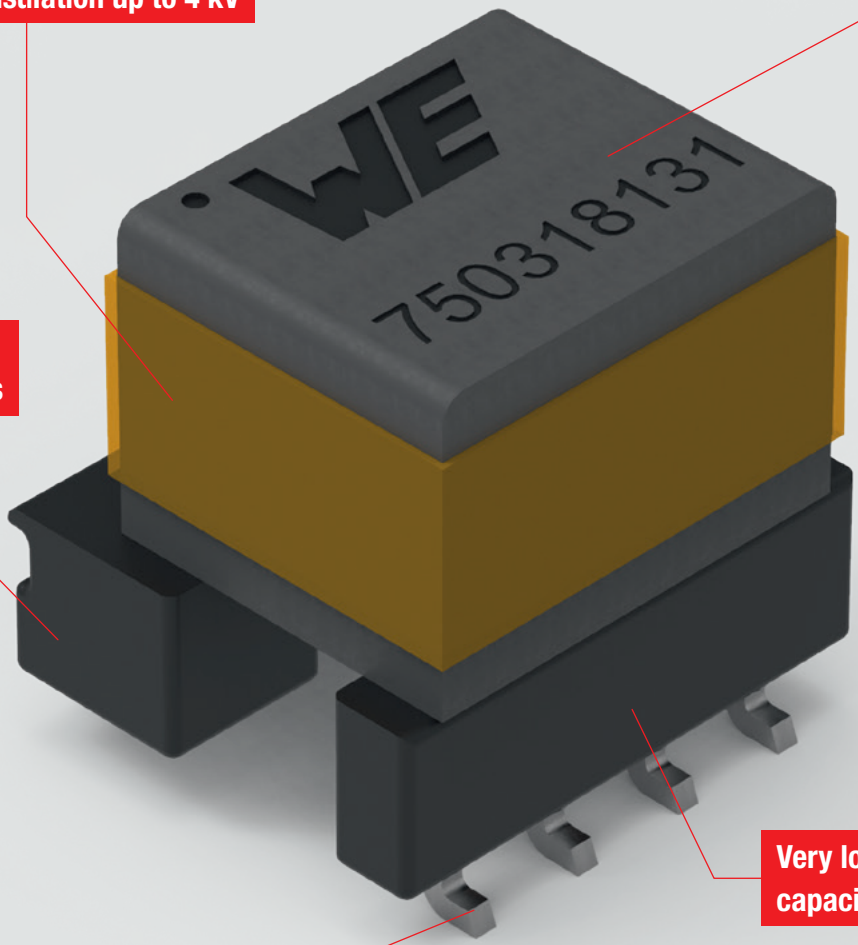


Application Example: Three Phase SiC Motor Inverter



Wide range input voltages from 9 V to 36 V

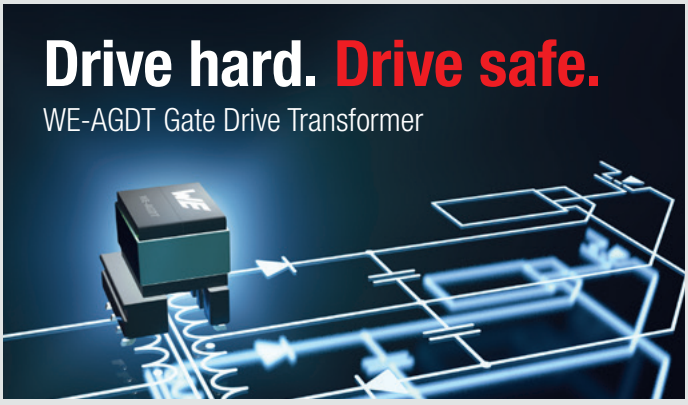
Dielectric insulation up to 4 kV



Optimized for high speed SiC MOSFETs

Very low interwinding capacitance

Surface mount EP7



Drive hard. Drive safe.
Product video and more:
www.we-online.com/agdt

Learn more about WE-AGDT:
www.we-online.com/we-agdt

Single Coil Inductors

Ferrite
NiZn: Robust WE-PD, WE-PD2, WE-LQS, WE-TI
MnZn: Performance WE-PD, WE-HCF, WE-TPC

Iron
Powder: Power density WE-LHMI
Alloy: Efficient WE-MAPI, WE-XHMI, WE-HCI and WE-PMCI

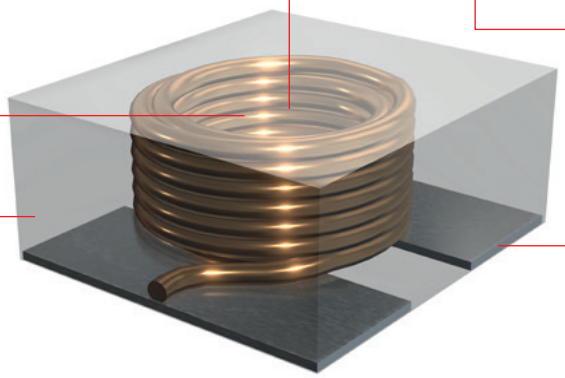
Core material

Round Wire:
Up to 4 wires in parallel for ultra low losses, e.g. WE-PD, WE-TPC, WE-MAPI, WE-LHMI

Flat Wire:
Best filling grade for highest power density possible, e.g. WE-HCI, WE-XHMI and extremly low R_{DC} e.g. WE-HCM

Litz Wire:
Up to 115 wires twisted for highest ripple current application, e.g. WE-HCF

Wire types



Shielding types

Unshielded (cost efficient)

Semi shielded (allrounder)

Shielded (best performance)

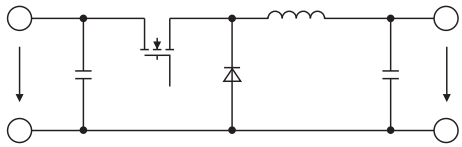
Molded (highest power)

Suitable for all kind of applications

SMT Surface Mount

THT Through Hole

- AEC-Q200 qualified (certain series)
- Temperature range: -40 °C up to +125 °C / +150 °C / +155 °C
- Outstanding saturation behavior
- Extreme low R_{DC}
- Highest power density based in package volume
- Robust design for advanced applications
- Best filter characteristics
- Operating voltage rating up to 400 V
- Size from 1.6 mm up to 41 mm
- Current rating up to > 125 A
- Inductance value from 25 nH up to 22 mH
- Switching frequency from 10 kHz up to 10 MHz



Usage of Single Coil Inductors:

- Often used in DC/DC converter, e.g. buck converter
- One of the most important factors of an inductor is its current capability

Compare in REDEXPERT:
www.we-online.com/re-ferrite-iron

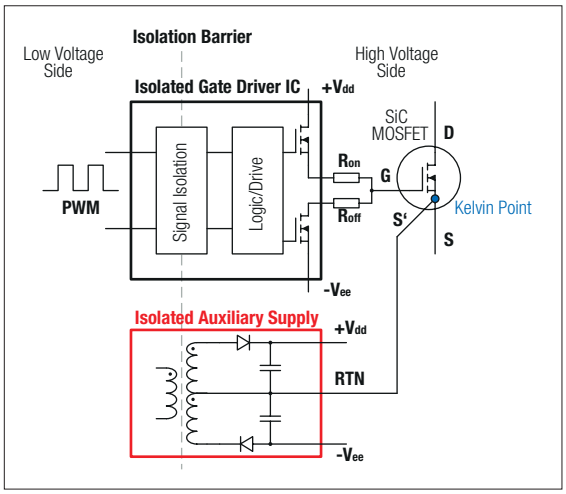
Power Magnetics for SiC-MOSFET Gate Drivers

Gate Driver System for SiC-MOSFET

Isolated Gate Driver systems control the turn-on and turn-off of power semiconductor devices (like SiC-MOSFET) in switching applications.

They provide:

- Safety and operating galvanic isolation
- Optimal gate-source drive voltage levels
- Fast drive current
- Power required for the switching events



The gate drive IC controller and the auxiliary power supply with bipolar output are configured and connected to the SiC-MOSFET as shown in the image

Fast switching times

High efficiency

Smaller solution and lower system costs

The new WE-AGDT auxiliary gate drive transformer for SiC-MOSFET: www.we-online.com/we-agdt

SiC-MOSFETs for State-of-the-art, Present and Future Power Electronics Applications

Principal Characteristics of SiC-MOSFETs

- Extremely high switching speed
- Very high breakdown voltage
- Very low conduction resistance
- High temperature rating
- Robust and reliable operation

Advantages of SiC-MOSFETs in Power Converters

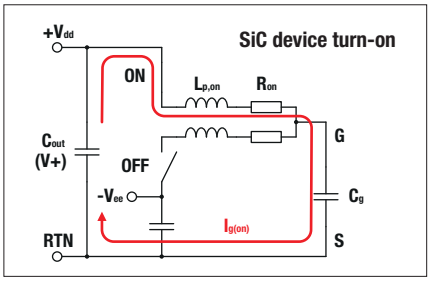
- Higher efficiency
- Higher output power
- Higher operating voltage
- Smaller solution size
- Lower system cost

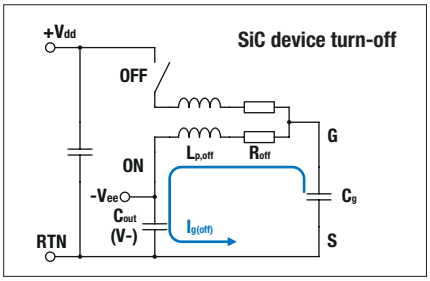
Challenges for driving SiC-MOSFETs

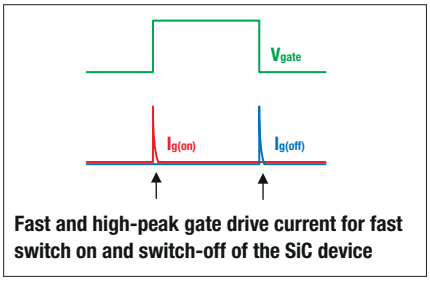
- Very fast current sourcing
- Rugged galvanic isolation
- Spurious turn-on (e.g. Miller effect)
- Gate voltage ringing and EMI
- Control signal distortion and CMTI

SiC-MOSFETs are Made to Switch Fast !

In order to turn on and off a SiC-MOSFET, it is required to charge and discharge its parasitic gate capacitance.
A very low parasitic inductance of the gate current loop, especially at the source terminal of the device, helps to achieve a very fast and well-controlled switching transition with low EMI ringing. Below the equivalent gate current loops during the switching transitions.







Fast and high-peak gate drive current for fast switch on and switch-off of the SiC device

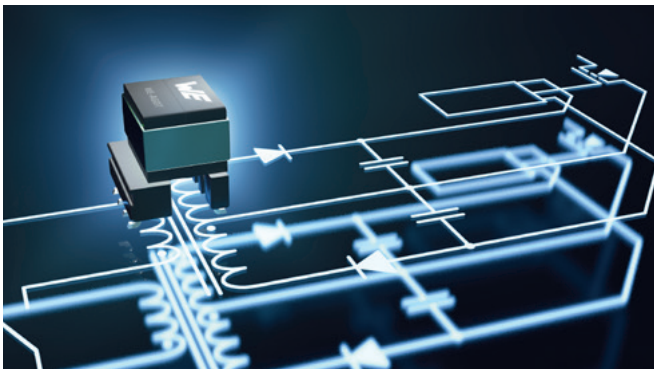
(*) see Reference Design Document RD001 for more information

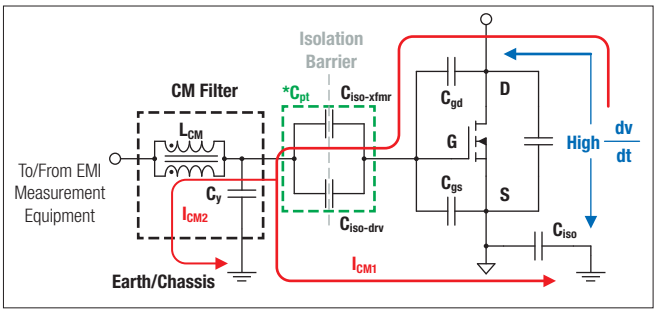
Power Magnetics for SiC-MOSFET Gate Drivers

Isolation Barrier Parasitic Capacitance: Common-mode Transient Immunity (CMTI) and EMI Performance

Common-mode Transient Immunity (CMTI) (measured in kV/us or V/ns), is an indication of the maximum dV/dt which can be tolerated across the isolation barrier before malfunction of the gate driver system occurs, due to excessive distortion of the gate drive control signals.

- SiC-MOSFETs switch extremely fast, helping to increase efficiency and reduce system size and cost.
- Fast switching speed causes high dV/dt to appear across the isolation barrier parasitic capacitance (Gate driver IC and auxiliary supply transformer).
- Common-mode displacement currents are generated.
- A lower parasitic capacitance reduces these displacement currents, helping to achieve a higher CMTI rating and better EMI performance.
- **It is critical to minimize the transformer interwinding capacitance in fast-switching SiC-MOSFET gate drive applications.**



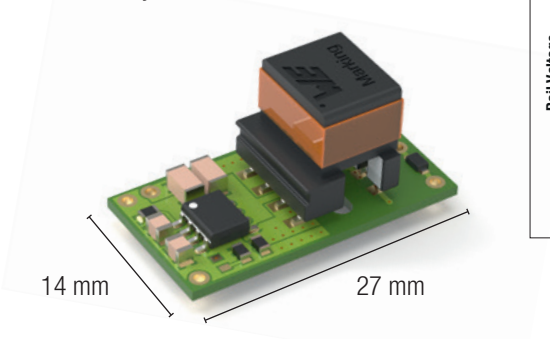


Example EMI common-mode current concept schematic

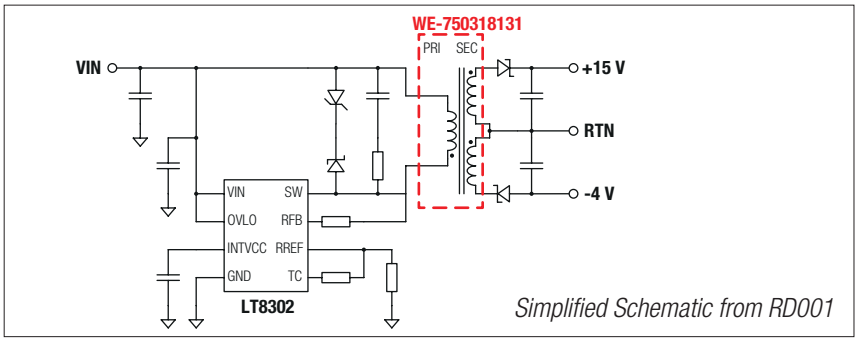
Würth Elektronik Reference Design RD001

6W Isolated auxiliary supply for SiC-MOSFET and IGBT Gate Driver systems.

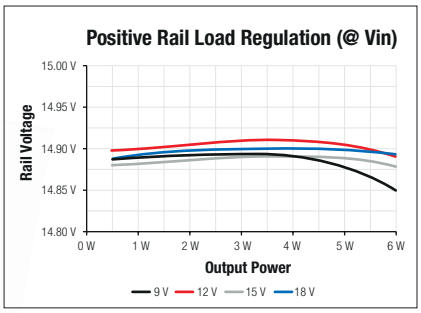
- Extremely compact solution
- Wide input voltage PSR flyback converter
- Bipolar output voltage: +15 V / -4 V
- Output power up to 6 W
- Efficiency over 86 %
- Easy to integrate into the Gate Driver system
- PCB layout and fabrication files available

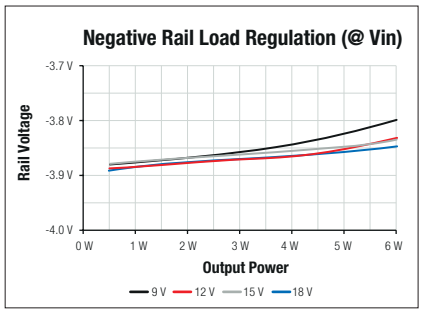


Two compact board design variants are provided: One single-sided and one double-sided.



Simplified Schematic from RD001





Our reference design 6W Isolated auxiliary power supply for SiC-MOSFET gate driver: www.we-online.com/RD001

Class-D Digital Audio Inductors

What are Class-D Digital Audio Inductors?

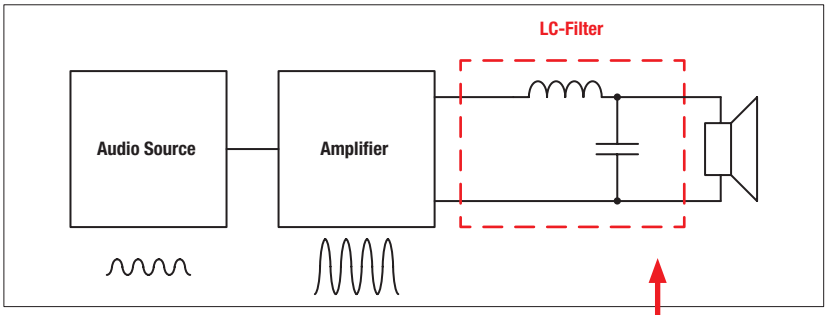
The WE-HIDA and WE-LHMD are designed to be used in high quality Class-D audio applications. The parts have been tested and optimized in real applications to reduce total harmonic distortion and noise (THD+N) and idle mode losses significantly.

- Special selected core materials for best THD+N performance
- Low R_{DC} for decreased idle mode losses
- 2-in-1 designs for low profile in full bridge circuitries

Our webinar on Class-D inductors:
www.we-online.com/class-d

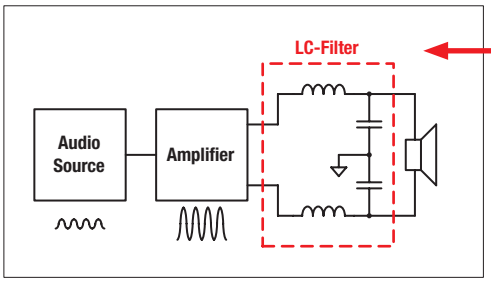
Full bridge circuit

- Less components needed
- Bus-pumping issue



Half bridge circuit

- Double voltage swing
- Lower gain increase before cut-off frequency



Low pass filter

- Cut-off frequency between 20 – 60 kHz
- Mostly second order filters
- Optimizes EMI behavior of higher order harmonics

Design-In Steps

1st Step

Define LC-Filter requirements:
Cut-off frequency, inductance value, switching frequency, speaker impedance.

2nd Step

Check current capability:
RMS and peak currents.

3rd Step

Select single or dual inductor type with correct current capability.

4th Step

Optimize PCB layout for EMI reduction with filter components.

Our audio inductors are available in THT (WE-HIDA) and SMT (WE-LHMD) to provide the right mounting style for your application.

Sizes SMT (WE-LHMD): 1008, 1213
Sizes THT (WE-HIDA): 1415, 1480, 1521, 1715, 3119

Learn more about audio inductors:
www.we-online.com/digital-audio

Select Power Magnetics in REDEXPERT

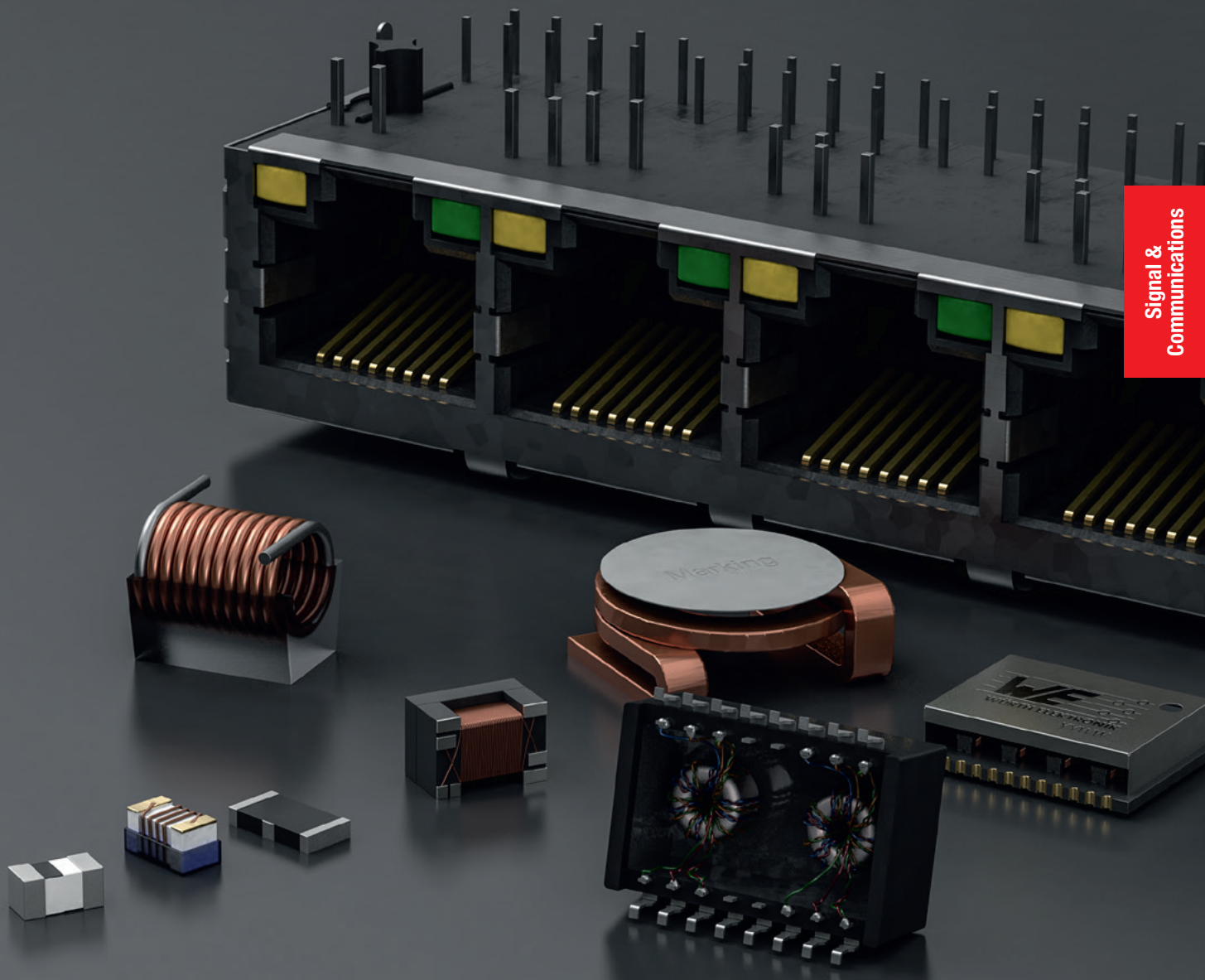
Get Suggestions for Optimal L Value L_{opt}, I_{rms} and I_{max} for the Needed Inductor!

- Select by electrical and mechanical parameters
- Compare products easily
- Find detailed inductance values at DC bias
- Simulate losses in the application for any DC/DC converter
- Sort losses in the product table to find the “coolest” parts

Try it out:
www.we-online.com/redexpert-power-inductors

1 PASSIVE COMPONENTS

Signal & Communications



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Additional Information	94

Product Overview

How to find detailed product information?

Visit www.we-online.com and search for product series information, e.g.:

WE-ASI

AS-Interface Inductor

WE-ASI

L:	3.0 ~ 18.0 mH
I_R:	0.08 ~ 0.24 A
R_{DC}:	10.0 ~ 72.0 Ω

LAN Transformers

WE-LAN

Speed:	10/100/1000 Mbit/s
Ports:	1~4
Temp. Range:	-40 to +125 °C
PoE:	350 ~2000 mA

WE-LAN 10G

Speed:	10 Gbit/s
Ports:	1
Temp. Range:	-40 to +105 °C
PoE:	350 ~ 1500 mA

Extended

WE-LAN AQ

Speed:	10/100/1000 Mbit/s
Ports:	1
Temp. Range:	-40 to +85 °C

Extended

WE-RJ45 LAN

Speed:	10/100/1000 Mbit/s
Ports:	1~4
Temp. Range:	-40 to +85 °C
PoE:	350 mA ~ 720 mA

Extended

WE-RJ45 LAN 10G

Speed:	10 Gbit/s
Ports:	1
Temp. Range:	-40 to +85 °C
PoE:	350 mA ~ 1000 mA

Extended

WE-STST

Speed:	10/100/1000 Mbit/s
Temp. Range:	-40 to +105 °C
PoE:	350 ~ 600 mA

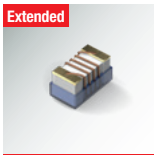
Filter Solutions

WE-EPLE

USB-A connector with integrated circuit protection device and EMI noise reduction

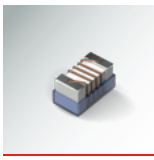
RF Inductors

Extended



WE-KI

L (±2 % or ±5 %):	1 ~ 1800 nH
Q:	15 ~ 60
SRF:	188 ~ 12500 MHz
I_R:	100 ~ 1360 mA
Sizes:	0402, 0603, 0805, 1008



WE-KI HC

L (±2 %):	1 ~ 390 nH
Q:	18 ~ 46
SRF:	880 ~ 16000 MHz
I_R:	170 ~ 2300 mA
Sizes:	0402, 0603

WE-RFI

L (±5 %):	0.47 ~ 47 µH
Q:	15 ~ 45
SRF:	17 ~ 375 MHz
I_R:	45 ~ 500 mA
Sizes:	0805, 1008

WE-RFH

L (±5 %):	0.56 ~ 10 µH
Q:	15 ~ 45
SRF:	40 ~ 415 MHz
I_R:	300 ~ 760 mA
Sizes:	1008

WE-TCI

L (±0.1 nH or 2 %):	1 ~ 22 nH
Q:	8 ~ 13
SRF:	2800 ~ 9000 MHz
I_R:	90 ~ 700 mA
Sizes:	0201, 0402

Extended

WE-MK

L (±5 %):	1 ~ 470 nH
Q:	8 ~ 20
SRF:	250 ~ 17000 MHz
I_R:	100 ~ 600 mA
Sizes:	0201, 0402, 0603

WE-CAIR

L (±5 %):	1.65 ~ 548 nH
Q:	100 ~ 140
SRF:	1.1 ~ 12.5 GHz
I_R:	1.5 ~ 4 A
Sizes:	1322, 1340, 3136, 3168, 4248, 5910

WE-AC HC

L (±20 %):	22 ~ 146 nH
Q_{typ}:	163 ~ 280
SRF_{typ}:	332 ~ 867 MHz
I_R:	19 ~ 40 A
Sizes:	1010, 1212

Signal Filters

WE-LPF

Low-Pass Filter

Frequency Range:	902 ~ 5875 MHz
Sizes:	0603, 0805

WE-BPF

Band-Pass Filter

Frequency Range:	2400 ~ 5920 MHz
Sizes:	0805, 1008

Balun

WE-BAL

Balun

Frequency Range:	2400 ~ 5875 MHz
Sizes:	0603, 0805

Antennas

Extended

WE-MCA

Multilayer Chip Antenna

Frequency Range:	423 ~ 5875 MHz

Signal & Communications

All Signal & Communications Components at a glance:
www.we-online.com/signal-com

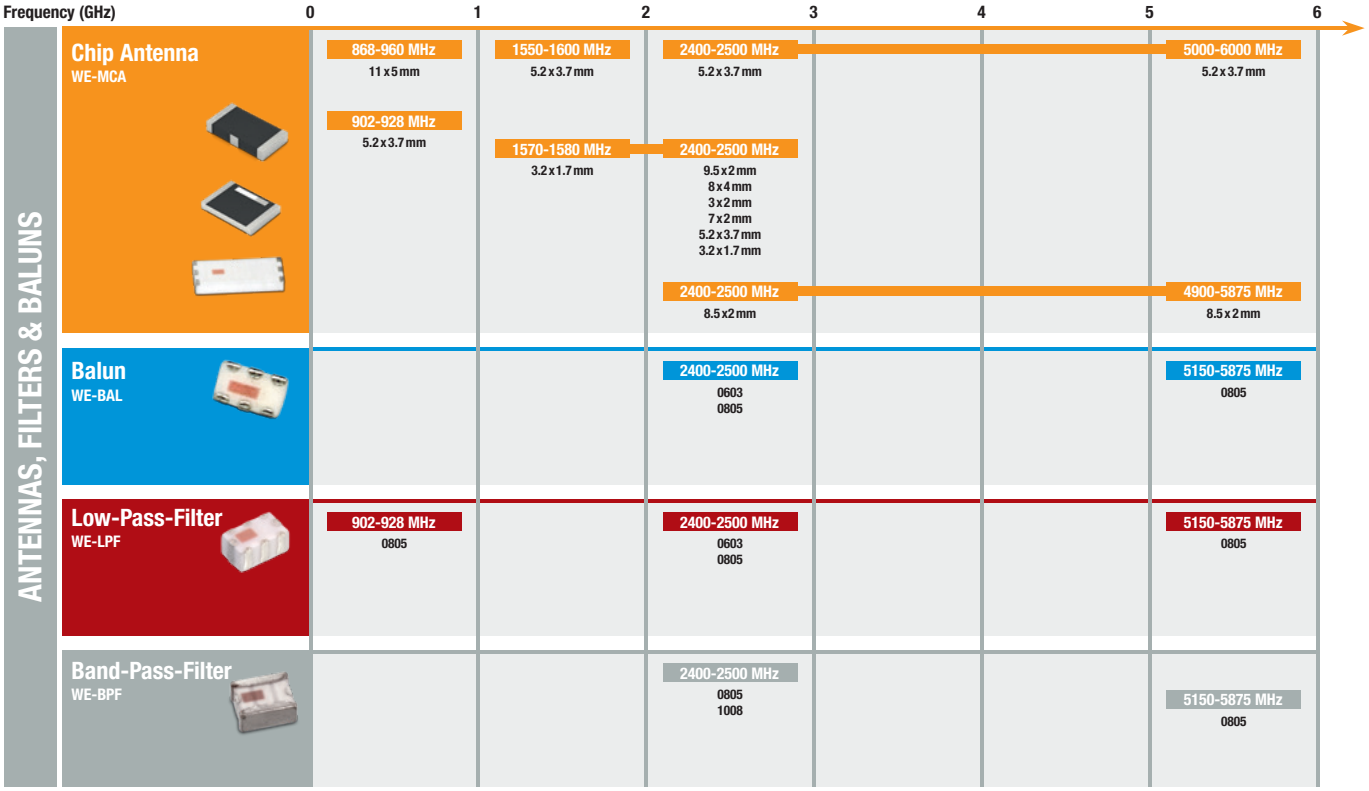
Explore our application notes for Signal & Communications:
www.we-online.com/appnotes

Component libraries available for:

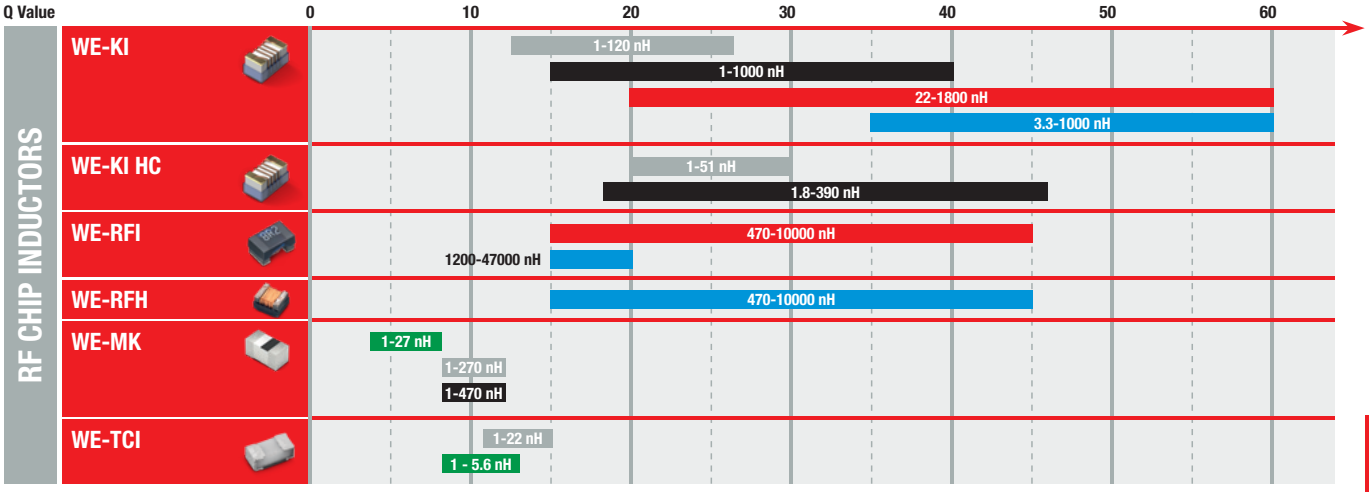
- **PCB library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star**
- **S-Parameter & SPICE model: S-Parameter, LTspice, PSpice, Spectre**
- **RF & microwave simulation models: Modelithics**

www.we-online.com/library

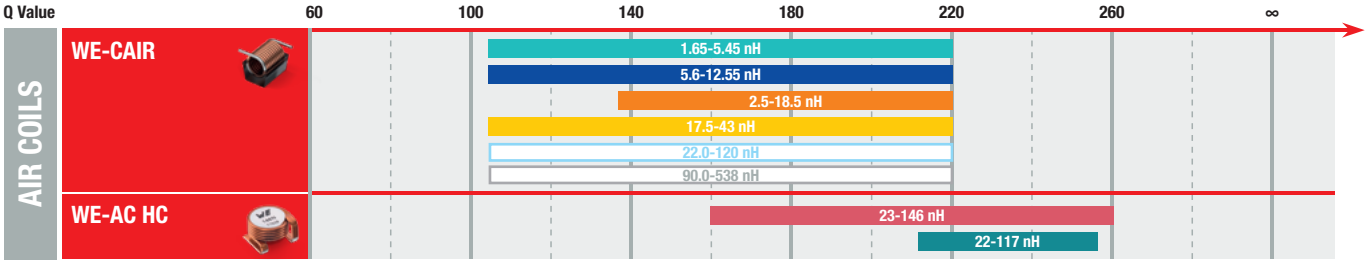
RF Product Finder

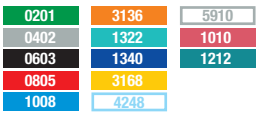


Frequency ranges:										
	ISM	433/868 MHz	GPS	1559/1610 MHz	WLAN	2400/2483 MHz	WiMAX	3410/3594 MHz	WLAN	5150/5250 MHz
	ZigBEE EU	868 MHz	4G	1710/2690 MHz	ZigBee	2402/2480 MHz				5250/5350 MHz
	ZigBEE USA	915 MHz			Bluetooth	2402/2480 MHz				5470/5725 MHz
	Mobil-DB	878/880 MHz			HomeRF	2402/2480 MHz				5725/5825 MHz
	GSM	890/914 MHz			4G	1710/2690 MHz			DECT2	5725/5825 MHz
		935/959 MHz								
	4G	700/960 MHz								



Need a higher Q factor?

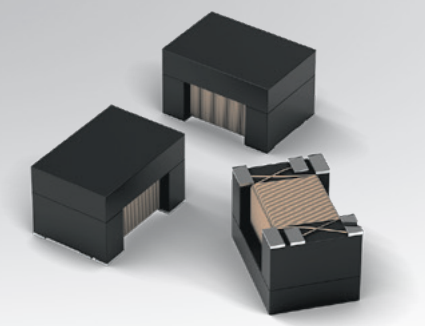




RF Product Portfolio:
www.we-online.com/signal-and-communications

WE-STST

Super Tiny Signal Transformer



Now for PoE and PoE+ applications

Characteristics:

- Super small size
- 1.5 kV isolation voltage
- 350 µH OCL as per IEEE 802.3
- Power over Ethernet up to 30 W
- Operating temperature: -40 °C up to +105 °C

Applications:

- Ethernet 10/100/1000 Base-T
- Ethernet 2.5/5G and 10G Base-T
- Single Pair Ethernet (SPE)
- Industrial sensors
- g.fast

www.we-online.com/we-stst

Size 4532

Technical Data:

Order Code	Data rate	Application	PoE	L (µH)	V_T	L (mm)	W (mm)	H (mm)
74930000	10/100/1000 Base-T, 10/100 Base-T1	Ethernet, Single Pair Ethernet	–	350	1500 V_{RMS}	4.7	3.22	2.9
74930100	10G Base-T, 1000 Base-T1	Ethernet, Single Pair Ethernet	–	120	1500 V_{RMS}			
74930030	10/100/1GBase-T	Ethernet, PoE	PoE (up to 350 mA)	350	1500 V_{RMS}			
74930130	10/100/1G/10GBase-T	Ethernet, PoE	PoE (up to 350 mA)	110	1500 V_{RMS}			
74930120	10/100/1G/10GBase-T	Ethernet, PoE+	PoE+ (up to 600 mA)	110	1500 V_{RMS}			
749302010	–	Short distance sensing at high frequency	–	300	400 V_{AC}			
749302011	–	Long distance sensing at low frequency	–	2000	400 V_{AC}			

L: Inductance; V_T: Insulation Test Voltage; L: Length; W: Width; H: Height

WE-LAN AQ

LAN Transformer Automated Quality

Now for PoE and PoE+ applications

Characteristics:

- Extremely consistent electrical values with highest signal integrity
- 100 % automatic production
- Ethernet with speeds up to 1 Gbit/s
- Improved solderability and AOI inspection due to half-vias with gold plating
- Improved return loss and crosstalk properties
- Compatible with existing LAN products
- Operating temperature: -40 °C up to +105 °C

Applications:

- Suitable for PoE and PoE+ applications
- Compatible to industrial Ethernet systems like EtherCAT or Profinet
- Compliant with most IC's for Ethernet applications such as Analog Devices, Texas Instruments, Broadcom
- Hubs, routers, switches, IP cameras, IoT applications

www.we-online.com/we-lan-aq

10/100 Base-T SMT Transformer

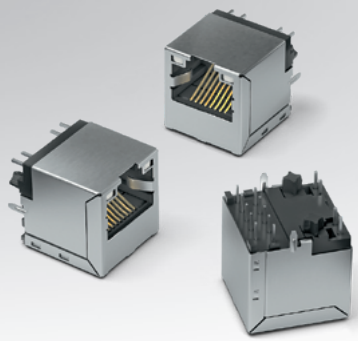
Technical Data:

Order Code	Data rate	PoE	L (µH)	V_T (V (RMS))	L (mm)	W (mm)	H (mm)
749013310	10/100 Base-T	PoE (up to 350 mA)	180	1500	12.7	8.67	4.25
749012310	10/100 Base-T	PoE+ (up to 720 mA)	150		12.7	8.67	4.25
749023310	1000 Base-T	PoE (up to 350 mA)	180		16.5	10.3	4.35
749022310	1000 Base-T	PoE+ (up to 720 mA)	150		16.5	10.3	4.35

L: Inductance; V_T: Insulation Test Voltage; L: Length; W: Width; H: Height

WE-LAN RJ45

LAN Transformer



Characteristics:

- RJ45 connector with integrated transformer / common mode choke
- Power over Ethernet up to 50 Watt and speeds up to 1 Gbit
- Compliant with standards: IEEE 802.3u, IEEE 802.3ab, IEEE 802.3af and IEEE 802.3at
- Operating temperature: -40 °C up to +85 °C

Applications:

- Compatible to industrial Ethernet systems like EtherCat or Profinet
- Compliant with most IC's for Ethernet applications such as Analog Devices, Texas Instruments, Broadcom
- Hubs, routers, switches, IP cameras, IoT applications

www.we-online.com/we-lan-rj45

LAN RJ45

Technical Data:

Order Code	Number of Ports	Data rate	PoE	Tab	Shield Tabs	LED	L (mm)	W (mm)	H (mm)
7499410440	1	10/100 Base-T	PoE+ (up to 720 mA)	Down	No	yellow/green-yellow/green	21.35	15.9	13.65
7499411440	1	10/100 Base-T	PoE+ (up to 720 mA)	Down	Yes	yellow/green-yellow/green	21.35	15.9	13.65
7499011448	1	10/100 Base-T	non-PoE	Vertical	Yes	yellow/green-yellow/green	16.8	16	16.9
7499311614	1	1000 Base-T	PoE (up to 350 mA each center Tap)	Up	Yes	green/orange-green	33.02	17	13.87
7499511420	1	1000 Base-T	PoE+ (up to 1000 mA per center Tap)	Up	Yes	green/yellow-green	33.02	17	13.87
7499111615	1	1000 Base-T	non-PoE	Up	Yes	green/orange-yellow	24.6	17.78	11.3
7499510440	1	1000 Base-T	PoE (up to 600 mA)	Down	No	yellow/green-yellow/green	21.35	15.9	13.65
7499511441	1	1000 Base-T	PoE (up to 600 mA)	Down	Yes	yellow/green-yellow/green	21.35	15.9	13.65
74991104402	1	1000 Base-T	non-PoE	Vertical	No	yellow/green-yellow/green	16.9	16	16.9
74991114410	1	1000 Base-T	non-PoE	Vertical	Yes	yellow/green-yellow/green	16.9	16	16.8
74990214400	1 x 2	10/100 Base-T	non-PoE	Up	Yes	yellow/green-yellow/green	21.5	31	13.4

Tab: Tab Position; LED: LED (Left-Right); L: Length; W: Width; H: Height

WE-LAN RJ45 10G

10 Gbit LAN Transformer

Characteristics:

- Highspeed data transfer with 10 Gbit/s
- Compliant with standards: IEEE 802.3af, IEEE.3at, IEEE 802.3bt
- Power over Ethernet up to 100 Watts
- Operating temperature: -40 °C up to +85 °C

Applications:

- Compliant with Valens Ethernet ICs
- Highspeed communications and servers
- Suitable for HDBaseT applications

www.we-online.com/we-lan-rj45-10g

RJ45 LAN 10G

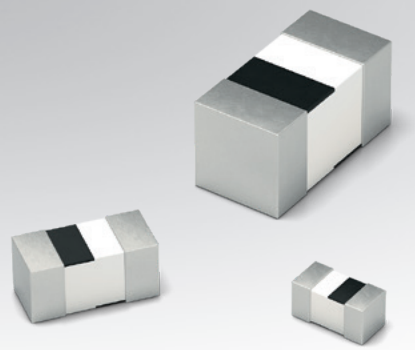
Technical Data:

Order Code	Data rate	PoE	Tab	Shield Tabs	L (mm)	W (mm)	H (mm)
7499811120	10G Base-T	PoE+ (up to 1000 mA)	Down	Yes	28.57	17.53	11.92
7499611422		non-PoE			23.88	17.53	11.3
7499611424		non-PoE			26.06	17.58	11.3
7499611423		non-PoE			28.57	17.53	11.92

Tab: Tab Position; L: Length; W: Width; H: Height

WE-MK

SMT Multilayer Ceramic Inductor



Characteristics:

- Coil integrated in a multilayer ceramic structure
- All inductors with polarity marking
- Extremely high self resonant frequency
- Inductance tolerances of ±2 % (or ±0.1 nH) and ±5 % (or ±0.3 nH)
- Inductance very stable over the temperature range
- Recommended soldering: Reflow
- Operating temperature: -55 °C up to +125 °C

Applications:

- High frequency circuits
- Bluetooth
- Wireless LAN
- Filter circuits
- Oscillators
- Pagers
- Laptops
- PCMCIA-cards

New! All articles also with ±2 % (or ±0.1 nH) of inductance tolerance

www.we-online.com/we-mk

Size 0201

Technical Data:

Order Code	L (nH)	Tol. L	Test Condition L	$Q_{min.}$	Test Condition Q	$R_{DC\ max.}$ (Ω)	I_R (mA)	f_{res} (MHz)
7447820010G	1	±0.1 nH	100 MHz	4	100 MHz	0.11	470	10000
7447820012G	1.2	±0.1 nH				0.12	450	10000
7447820015G	1.5	±0.1 nH				0.13	430	10000
7447820018G	1.8	±0.1 nH				0.16	390	10000
7447820020G	2	±0. 1nH				0.17	380	8800
7447820022G	2.2	±0.1 nH				0.19	360	8800
7447820024G	2.4	±0. 1nH				0.2	350	8300
7447820027G	2.7	±0.1 nH				0.21	340	7700
7447820030G	3	±0.1 nH				0.22	330	7200
7447820033G	3.3	±0.1 nH				0.23	320	6700
7447820036G	3.6	±0.1 nH				0.25	310	6400
7447820039G	3.9	±0.1 nH				0.27	300	6000
7447820043G	4.3	±0.1 nH				0.3	280	5700
7447820047G	4.7	±0.1 nH				0.3	280	5300
7447820051G	5.1	±0.1 nH				0.33	270	5000
7447820056G	5.6	±0.1 nH				0.36	260	4600
7447820062G	6.2	±2 %				0.38	250	4200
7447820068G	6.8	±2 %				0.39	250	3900
7447820075G	7.5	±2 %				0.41	240	3600
7447820082G	8.2	±2 %				0.45	230	3400
7447820091G	9.1	±2 %				0.48	220	3200
7447820110G	10	±2 %				0.51	220	2900
7447820112G	12	±2 %				0.68	190	2700
7447820115G	15	±2 %				0.71	180	2300
7447820118G	18	±2 %				0.81	170	2100
7447820122G	22	±2 %				1	150	1800
7447820127G	27	±2 %				1.35	120	1800
7447820133G	33	±2 %				1.5	110	1700

L: Inductance; Tol. L: Inductance Tolerance; $Q_{min.}$: Q-Factor; $R_{DC\ max.}$: DC Resistance max.; I_R: Rated Current; f_{res}: Self Resonant Frequency

Size 0402

Technical Data:								
Order Code	**L (nH)**	**Tol. L**	**Test Condition L**	**$Q_{min.}$**	**Test Condition Q**	**$R_{DC\ max.}$ (Ω)**	**I_R (mA)**	**f_{res} (MHz)**
7447840010G	1	±0.1 nH				0.1	300	8000
7447840012G	1.2	±0.1 nH				0.1	300	8000
7447840015G	1.5	±0.1 nH				0.1	300	8000
7447840018G	1.8	±0.1 nH				0.1	300	6000
7447840020G	2	±0.1 nH				0.12	300	6000
7447840022G	2.2	±0.1 nH				0.15	300	6000
7447840027G	2.7	±0.1 nH				0.17	300	6000
7447840030G	3	±0.1 nH				0.18	300	6000
7447840033G	3.3	±0.1 nH				0.19	300	6000
7447840039G	3.9	±0.1 nH				0.19	300	6000
7447840047G	4.7	±0.1 nH				0.23	300	6000
7447840056G	5.6	±0.1 nH				0.26	300	5300
7447840068G	6.8	±2 %				0.29	300	4200
7447840075G	7.5	±2 %				0.31	300	4200
7447840082G	8.2	±2 %				0.33	300	3600
7447840110G	10	±2 %				0.35	300	3200
7447840112G	12	±2 %	100 MHz	8	100 MHz	0.41	300	2800
7447840115G	15	±2 %				0.46	300	2300
7447840118G	18	±2 %				0.51	300	2100
7447840122G	22	±2 %				0.58	300	1800
7447840127G	27	±2 %				0.67	300	1600
7447840133G	33	±2 %				0.67	200	1500
7447840139G	39	±2 %				1.06	200	1200
7447840147G	47	±2 %				1.15	200	1000
7447840156G	56	±2 %				1.2	200	800
7447840168G	68	±2 %				1.25	180	800
7447840182G	82	±2 %				1.6	150	600
7447840210G	100	±2 %				1.6	150	600
7447840212G	120	±2 %				1.6	150	600
7447840215G	150	±2 %				2.99	140	500
7447840218G	180	±2 %				3.38	150	500
7447840222G	220	±2 %				3.77	120	500
7447840227G	270	±2 %				4.9	110	500

L: Inductance; Tol. L: Inductance Tolerance; $Q_{min.}$: Q-Factor; $R_{DC\ max.}$: DC Resistance max.; I_R: Rated Current; f_{res}: Self Resonant Frequency

WE-MK

SMT Multilayer Ceramic Inductor

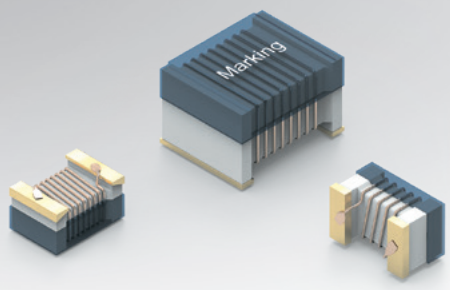
Size 0603

Technical Data:								
Order Code	**L (nH)**	**Tol. L**	**Test Condition L**	**$Q_{min.}$**	**Test Condition Q**	**$R_{DC\ max.}$ (Ω)**	**I_R (mA)**	**f_{res} (MHz)**
7447860010G	1	±0.1 nH	100 MHz	8	100 MHz	0.05	300	10000
7447860012G	1.2	±0.1 nH	100 MHz	8	100 MHz	0.05	300	10000
7447860015G	1.5	±0.1 nH	100 MHz	8	100 MHz	0.1	300	6000
7447860018G	1.8	±0.1 nH	100 MHz	8	100 MHz	0.1	300	6000
7447860022G	2.2	±0.1 nH	100 MHz	8	100 MHz	0.1	300	6000
7447860027G	2.7	±0.1 nH	100 MHz	10	100 MHz	0.1	300	6000
7447860033G	3.3	±0.1 nH	100 MHz	10	100 MHz	0.12	300	6000
7447860039G	3.9	±0.1 nH	100 MHz	10	100 MHz	0.14	300	6000
7447860047G	4.7	±0.1 nH	100 MHz	10	100 MHz	0.16	300	4000
7447860056G	5.6	±0.1 nH	100 MHz	10	100 MHz	0.18	300	4000
7447860068G	6.8	±2 %	100 MHz	10	100 MHz	0.22	300	4000
7447860082G	8.2	±2 %	100 MHz	10	100 MHz	0.24	300	3500
7447860110G	10	±2 %	100 MHz	12	100 MHz	0.26	300	3400
7447860112G	12	±2 %	100 MHz	12	100 MHz	0.28	300	2600
7447860115G	15	±2 %	100 MHz	12	100 MHz	0.32	300	2300
7447860118G	18	±2 %	100 MHz	12	100 MHz	0.35	300	2000
7447860122G	22	±2 %	100 MHz	12	100 MHz	0.4	300	1600
7447860127G	27	±2 %	100 MHz	12	100 MHz	0.45	300	1400
7447860133G	33	±2 %	100 MHz	12	100 MHz	0.55	300	1200
7447860139G	39	±2 %	100 MHz	12	100 MHz	0.6	300	1100
7447860147G	47	±2 %	100 MHz	12	100 MHz	0.7	300	900
7447860156G	56	±2 %	100 MHz	12	100 MHz	0.75	300	900
7447860168G	68	±2 %	100 MHz	12	100 MHz	0.85	300	700
7447860182G	82	±2 %	100 MHz	12	100 MHz	0.95	300	600
7447860210G	100	±2 %	100 MHz	12	100 MHz	1	300	600
7447860212G	120	±2 %	50 MHz	8	50 MHz	1.2	300	500
7447860215G	150	±2 %	50 MHz	8	50 MHz	1.2	300	500
7447860218G	180	±2 %	50 MHz	8	50 MHz	1.3	300	400
7447860222G	220	±2 %	50 MHz	8	50 MHz	1.5	300	400
7447860227G	270	±2 %	50 MHz	8	50 MHz	1.9	300	400
7447860233G	330	±2 %	50 MHz	8	50 MHz	2.1	300	350
7447860239G	390	±2 %	50 MHz	8	50 MHz	2.3	150	350
7447860243G	430	±2 %	50 MHz	8	50 MHz	2.4	150	300
7447860247G	470	±2 %	50 MHz	8	50 MHz	2.6	150	300

L: Inductance; Tol. L: Inductance Tolerance; $Q_{min.}$: Q-Factor; $R_{DC\ max.}$: DC Resistance max.; I_R: Rated Current; f_{res}: Self Resonant Frequency

WE-KI

SMT Wire Wound Ceramic Inductor



New! Higher inductance values up to 1800 nH

Characteristics:

- Inductance tolerances: ±0.2 nH, ±2 % and ±5 %
- High Q and small R_{DC}
- Self resonant frequency up to 12.5 GHz
- Best price performance ratio
- High thermal stability
- Recommended solder profile: Reflow
- Operating temperature: -40 °C up to +125 °C
- Custom designs on request

Applications:

- VCO, RF module & other wireless products
- Wireless LAN
- Bluetooth
- Computer peripherals e.g. mouse, keyboard, earphone
- Cellular phone (CDMA/GSM/PHS)
- Cordless phone (DECT/CT1/CT2)
- Remote control
- Set Top Box & CATV
- Cable modem
- RF transceivers
- SAT & GPS receiver

Size 0603

Technical Data:

Order Code	L (nH)	Tol. L	Test Condition L	$Q_{min.}$	Test Condition Q	$R_{DC\ max.}$ (Ω)	I_R (mA)	f_{res} (MHz)
744761247A	470	±5 %	25 MHz	15	25 MHz	2.1	170	250
744761256A	560					2.5	120	220
744761268A	680					2.9	120	200
744761282A	820					3.2	120	200
744761310A	1000					3.5	120	200

L: Inductance; Tol. L: Inductance (Tol.); Test Condition L: Inductance (Test cond.); $Q_{min.}$: Q-Factor; Test Condition Q: Q-Factor (Test cond.); $R_{DC\ max.}$: DC Resistance max.; I_R: Rated Current; f_{res}: Self Resonant Frequency

Size 0805

Technical Data:

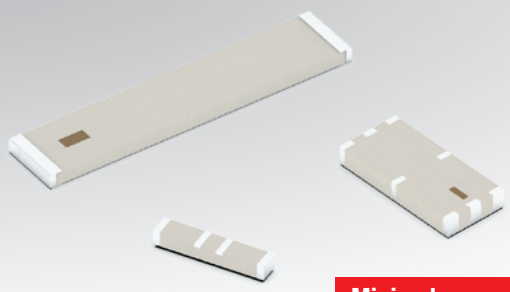
Order Code	L (nH)	Tol. L	Test Condition L	$Q_{min.}$	Test Condition Q	$R_{DC\ max.}$ (Ω)	I_R (mA)	f_{res} (MHz)
7447602470A	470	±5 %	25 MHz	25	100 MHz	1.05	210	350
7447602560A	560			18	100 MHz	1.1	230	250
7447602620A	620			18	100 MHz	1.2	230	250
7447602680A	680			15	100 MHz	1.2	400	188
7447602820A	820			15	100 MHz	1.5	300	215
7447603100A	1000			20	50 MHz	2.8	180	250
7447603120A	1200			18	50 MHz	3.2	200	190
7447603150A	1500			18	50 MHz	5.88	160	210
7447603180A	1800			18	50 MHz	6.26	140	210

L: Inductance; Tol. L: Inductance (Tol.); Test Condition L: Inductance (Test cond.); $Q_{min.}$: Q-Factor; Test Condition Q: Q-Factor (Test cond.); $R_{DC\ max.}$: DC Resistance max.; I_R: Rated Current; f_{res}: Self Resonant Frequency

www.we-online.com/we-ki

WE-MCA

Multilayer Chip Antenna



Characteristics:

- SMD multilayer chip antenna
- Extremely low profile
- Omni-directional radiation pattern
- Excellent size to performance ratio
- Smallest form factor in the industry
- Operating temperature: -40 °C up to +85 °C

Applications:

- IoT devices
- GSM 900
- WLAN/WiFi 2.4 & 5.5
- Bluetooth
- GPS/GNSS
- Zigbee
- LoRa 868 & 915
- LPD433

Minimal ground clearance for small devices

www.we-online.com/we-mca

Single Band

Technical Data:

Order Code	Frequency Range (MHz)	G_{peak} (dBi)	VSWR	Z (Ω)
7488910043	423 – 443	-4	2	50
7488910092	868 – 960	-0.7	2.5	
7488910915	902 – 928	0.5	3	
7488920157	1550 – 1600	3.4	2	
7488930245	2400 – 2500	0.5	2	
7488920245	2400 – 2500	1.3	2	
7488940245	2400 – 2500	2	2	
7488910245	2400 – 2500	3	2	
7488960245	2400 – 2500	3	2.5	

Frequency Range: Frequency Range Min & Max; G_{peak}: Peak Gain; Z: Impedance

Dual Band

Technical Data:

Order Code	Frequency Range (MHz)	Frequency Range 2 (MHz)	G_{peak} (dBi)	$G_{peak,2}$ (dBi)	VSWR	$VSWR_2$	Z (Ω)
7488915724	1570 – 1580	2400 – 2500	0.69	0.97	2.5	2.5	50
7488912455	2400 – 2500	4900 – 5875	1	-1.5	2.2	2.2	
7488922455	2400 – 2500	5000 – 6000	3	3.3	2	2	

Frequency Range: Frequency Range Min & Max; Frequency Range 2: Frequency Range Min & Max 2; G_{peak}: Peak Gain; $G_{peak,2}$: Peak Gain 2; $VSWR_2$: VSWR 2; Z: Impedance

Design Kits

Product Category	Design Kit	Order Code	Lifelong Refill
LAN Transformers			
	WE-LAN; LAN Transformers	749010	✓
	LAN Transformers & RJ45 Connectors without Magnetics	749615	✓
RF Inductors			
	WE-KI HC 0402/0603; SMT High Current Ceramic Inductor	74476	✓
	WE-KI 0402; SMT Wire Wound Ceramic Inductor	744765A	✓
	WE-KI 0402; SMT Wire Wound Ceramic Inductor	744765G	✓
	WE-KI 0603; SMT Wire Wound Ceramic Inductor	744761	✓
	WE-KI 0603; SMT Wire Wound Ceramic Inductor	744761G	✓
	WE-KI 0805/1008; SMT Wire Wound Ceramic Inductor	744762G	✓
	WE-KI 0805/1008; SMT Wire Wound Ceramic Inductor	744762	✓
	WE-RFI; Ferrite SMT Inductor	744762A/RFI	✓
	WE-MK 0201; Multilayer Ceramic SMT Inductor	744785	✓
	WE-MK 0402A; Multilayer Ceramic SMT Inductor	744784A	✓
	WE-MK 0603A; Multilayer Ceramic SMT Inductor	744786A	✓
	WE-CAIR; Air Coil Inductor	74491	✓

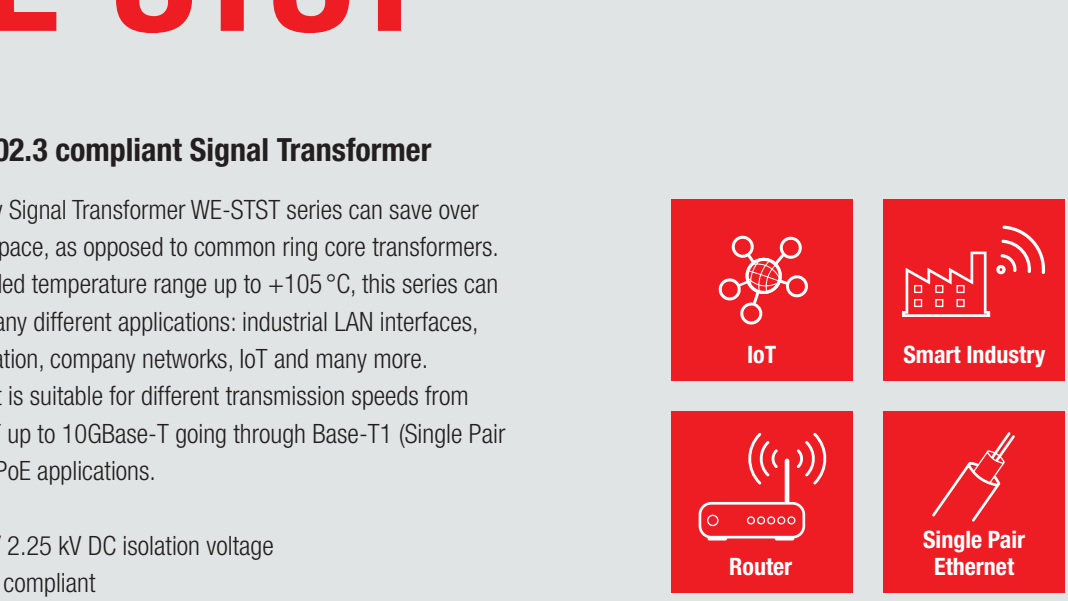
Focus Product

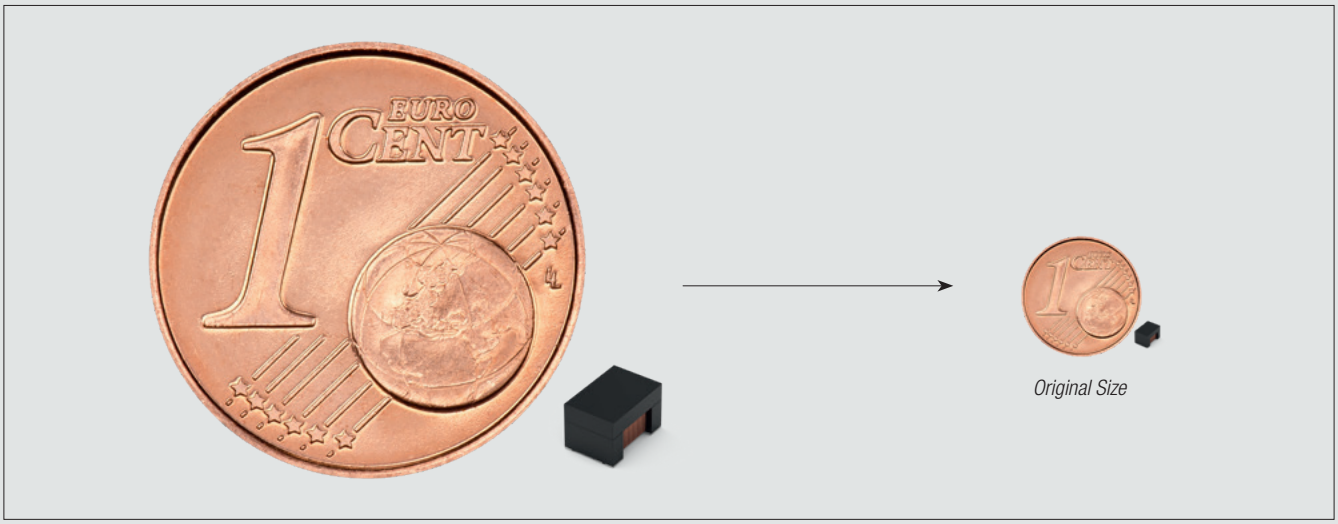
Super Tiny Signal Transformer WE-STST

The IEEE 802.3 compliant Signal Transformer

The Super Tiny Signal Transformer WE-STST series can save over 50 % of PCB space, as opposed to common ring core transformers. With its extended temperature range up to +105 °C, this series can be used for many different applications: industrial LAN interfaces, factory automation, company networks, IoT and many more. Furthermore, it is suitable for different transmission speeds from 10/100Base-T up to 10GBase-T going through Base-T1 (Single Pair Ethernet) and PoE applications.

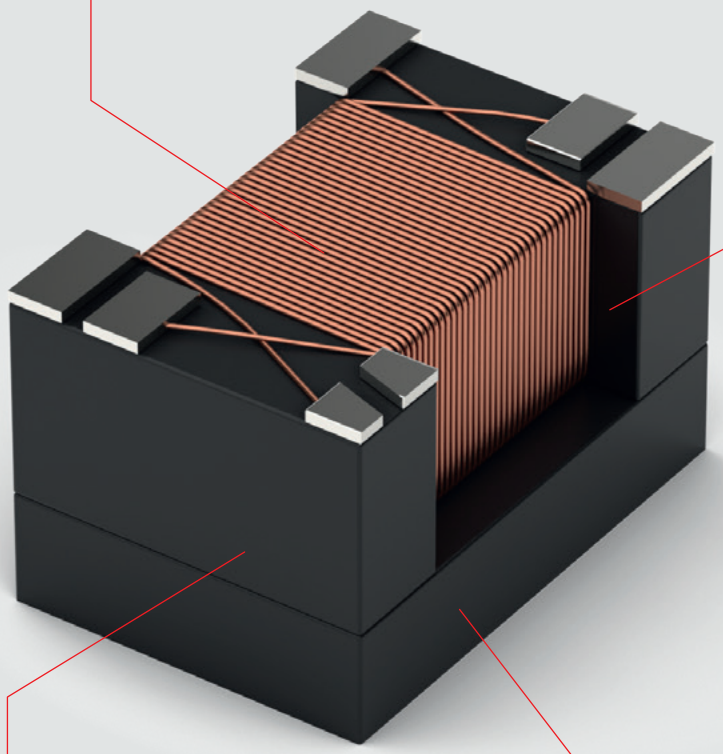
- 1.5 kV AC / 2.25 kV DC isolation voltage
- IEEE 802.3 compliant
- Over 50 % PCB space savings
- Ethernet up to 10GBase-T
- Single Pair Ethernet





1.5 kV isolation voltage

350 µH OCL as per IEEE 802.3



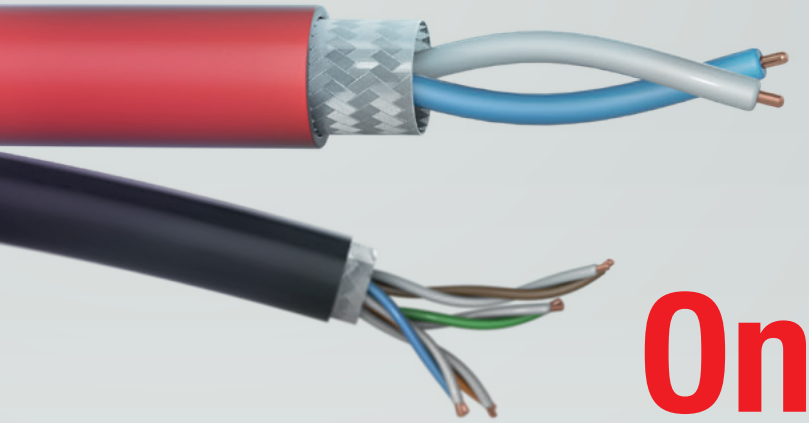
Over 90 % smaller than a 0.01 € coin

For Single Pair Ethernet & Ethernet 10/100/1000 Base-T & Ethernet 2.5 G, 5 G and 10 G Base-T

More information about WE-STST:
www.we-online.com/we-stst

Learn more about Single Pair Ethernet:
www.we-online.com/spe

Single Pair Ethernet



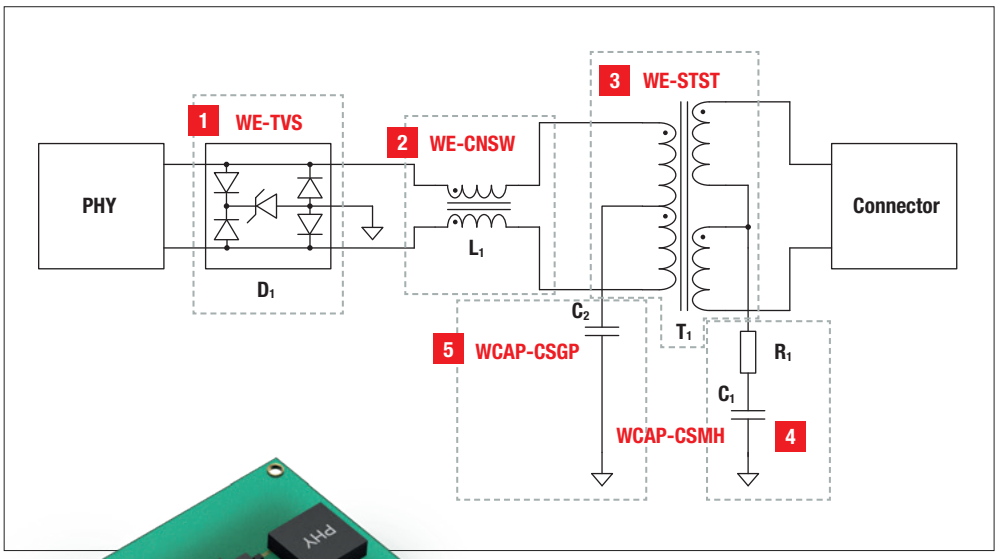
One Pair is all you need.

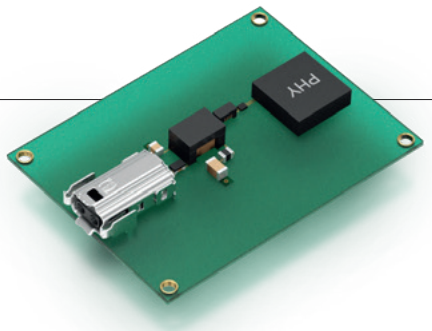
Würth Elektronik is the first manufacturer offering a fully industrial compliant Single Pair Ethernet solution on the PCB.

Industrial Design Recommendation

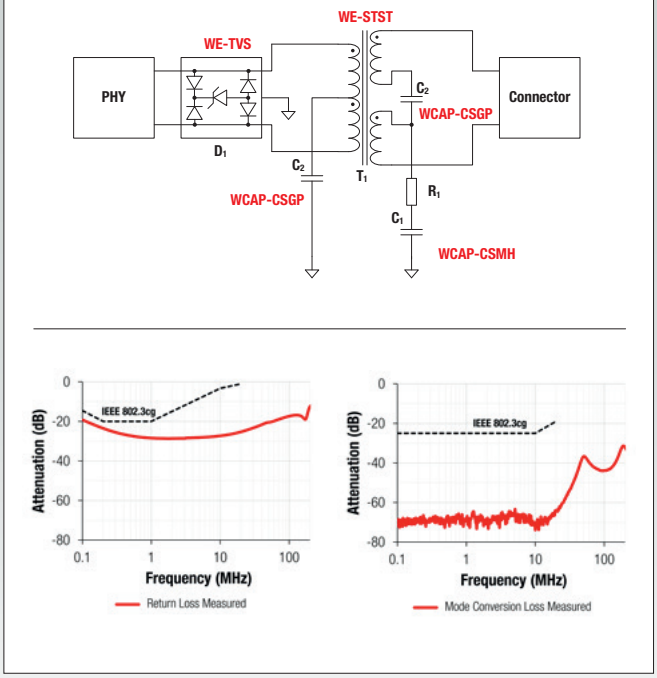
1. ESD protection up to 15 kV (IEC 61000-4-2)
2. Noise attenuation
3. Isolation 1.5 kV (IEC 62368-1)
   – Noise attenuation
4. EMC isolation
5. EMC isolation

The whole interface solution is compliant with IEEE 802.3cg/bw

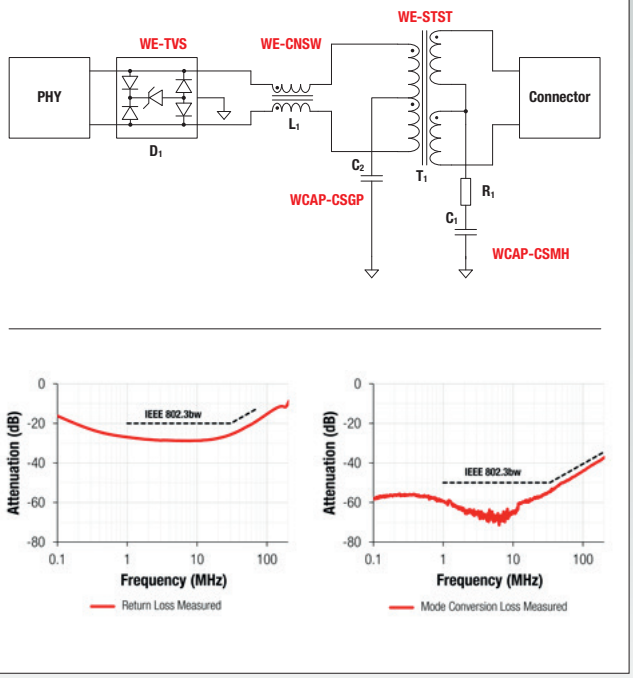




10BASE-T1



100BASE-T1



Signal Transformer

T1 WE-STST
L x W x H: 4.7 x 3.22 x 2.9 mm
Order Code: 74930000
Data Rate: 10/100 BASE-T1
L: 350 µH
V_T: 1500 V_{RMS}

Ceramic Capacitor

C1 WCAP-CSMH
Size: 1206
Order Code: 885342208024
V_{DC}: 2000 V
C: 1 nF

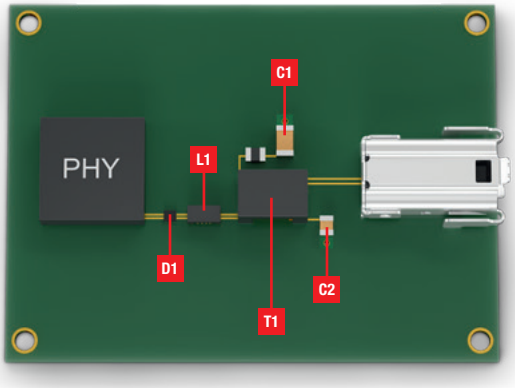
C2 WCAP-CSGP
Size: 0402
Order Code: 885012205086
V_{DC}: 50 V
C: 100 nF

TVS Diode

D1 WE-TVS
Size: DFN 1210-6L
Order Code: 824012823
ESD Protection up to 8/15 kV (contact/air)
V_{DC}: 3.3 V
C_{Ch}: 0.18 pF

Common Mode Line Filter

L1 WE-CNSW
Size: 1206
Order Code: 744232222
Z @ 100 MHz: 2200 Ω
I_R: 200 mA



More information:
www.we-online.com/spe

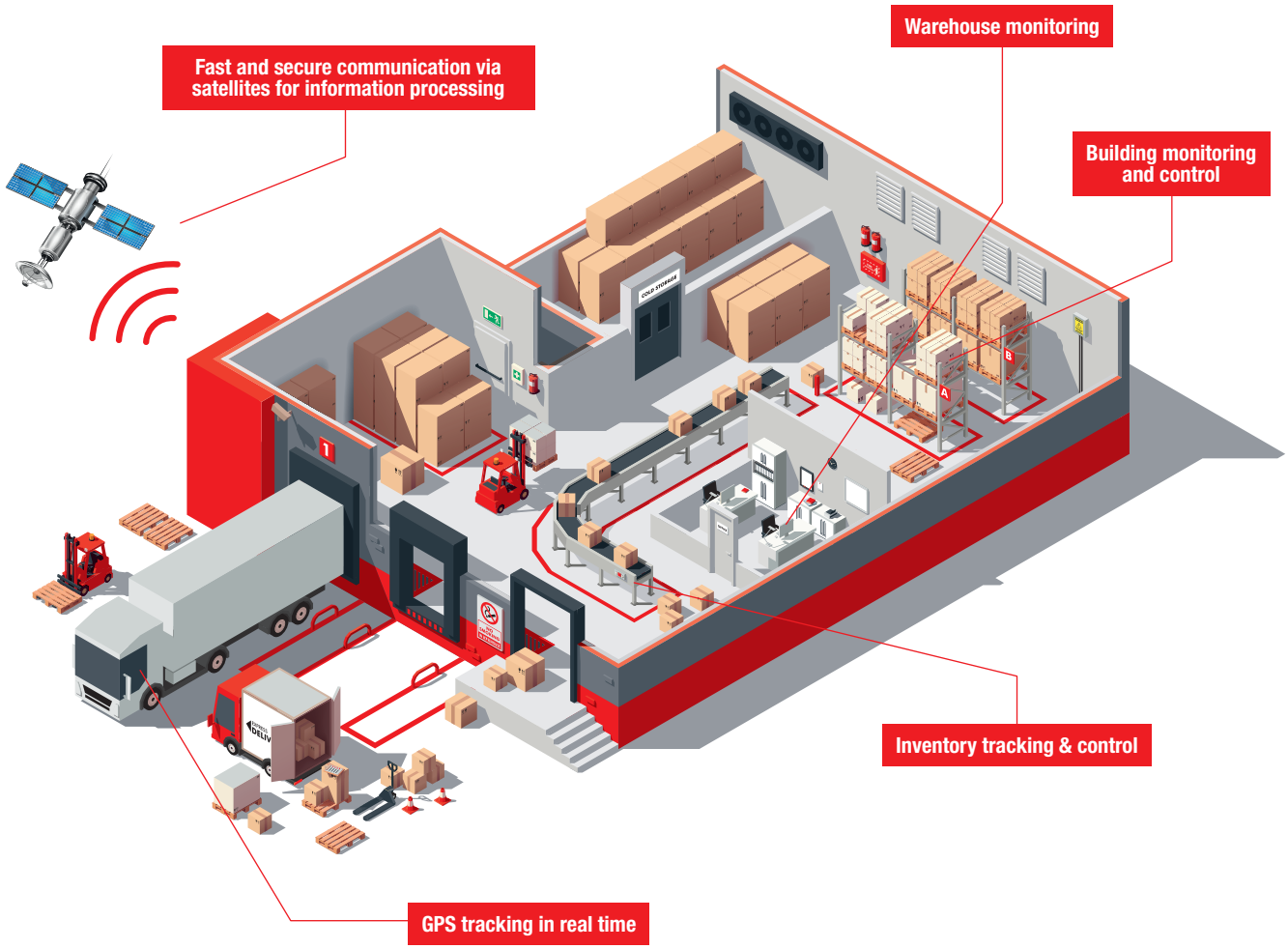
Internet of Things (IoT)

What is IoT?

Internet of things is a summarizing term for the next generation of smart devices that can transmit/receive data over a network autonomously. IoT devices and the data they generate, provide much needed connectivity for a range of new applications and have profound effects on our private and social life. Some of these applications include:

- Industrial automation
- Healthcare & fitness
- Home automation
- Smart cities & smart energy
- Smart farming / agriculture

Industry 4.0 or the Industrial IoT (IIoT) is the digitization of industrial assets and processes that connects products, machines, services, locations / sites to workers, managers, suppliers, and partners.



One of the applications of IoT is the tracking of goods and shipments in a warehouse. Having full knowledge of where everything is located at any moment, makes the warehouse much more efficient resulting in saving time and money.

Component Overview

The Würth Elektronik RF portfolio covers a wide variety of frequency ranges starting from KHz all the way up to several GHz bands. Here are some of the product series that can be easily integrated into your IoT device.

Antenna

WE-MCA
SMD multilayer chip antenna

Wire Wound Ceramic Inductor

WE-KI
SMD RF wire wound ceramic Inductors

Ceramic Multilayer Inductor

WE-MK
Multilayer Ceramic SMT Inductor

Quartz Oscillator

WE-SPXO
Simple Packaged Quartz Oscillator

Capacitor

WCAP-CSRF
SMD RF multi-layer ceramic capacitors

Balun

WE-BAL
Multilayer Chip Balun

Shielding Cabinets

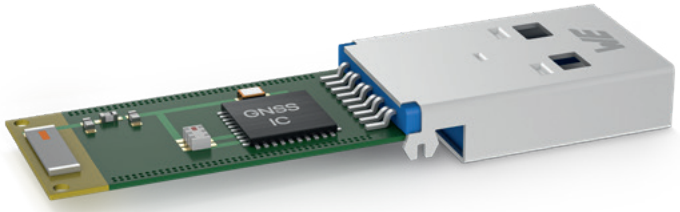
WE-SHC Seamless
High Frequency Shielding Cabinet

Complete Solutions

Wireless Connectivity & Sensors
Radio modules, GNSS modules & sensors

See our complete portfolio:
www.we-online.com/rfcomponents

Application Example: Plug-and-Track GPS Device Based on the Latest GPS Technology

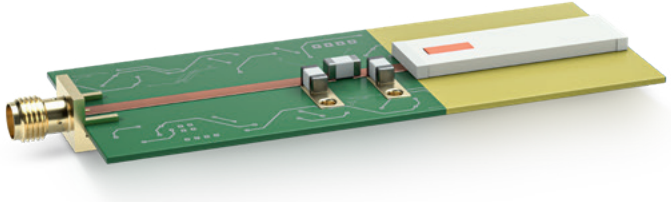


- Providing ultra-fast acquisition / reacquisition thanks to the exceptional efficiency of our antennas and the perfect matching circuit.
- Exceptional tracking sensitivity for tracking and navigation in difficult signal environments while using our filters and customized shielding solutions.

Get Your IoT Device Matched!

Antenna Matching Service

- Optimized antenna performance
- Customer support for antenna placement in design phase
- Smallest antennas with less ground clearance requirements



More information about Antenna Matching:
www.we-online.com/antennamatching

Application Note WE-MCA Multilayer Chip Antenna Placement & Matching:
www.we-online.com/ANP057

Simulate and Select Components in REDEXPERT

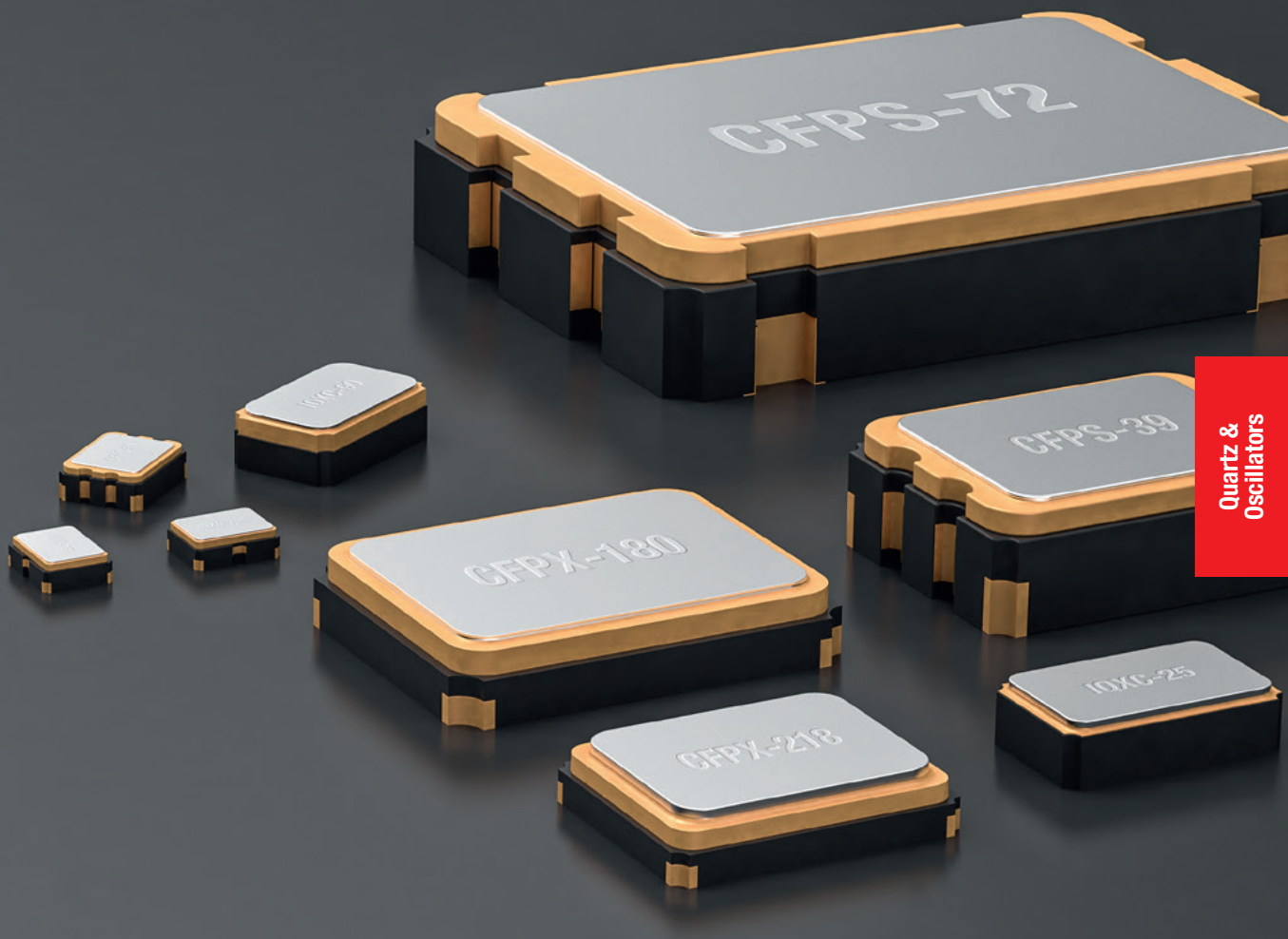
Try it out:
www.we-online.com/redexpert-signal-communications

Select by electrical and mechanical parameters

- Compare schematics fast and easily
- Filter for features such as “USB ports or tab-up or tab-down”
- Direct access to data sheets

1 PASSIVE COMPONENTS

Quartz & Oscillators



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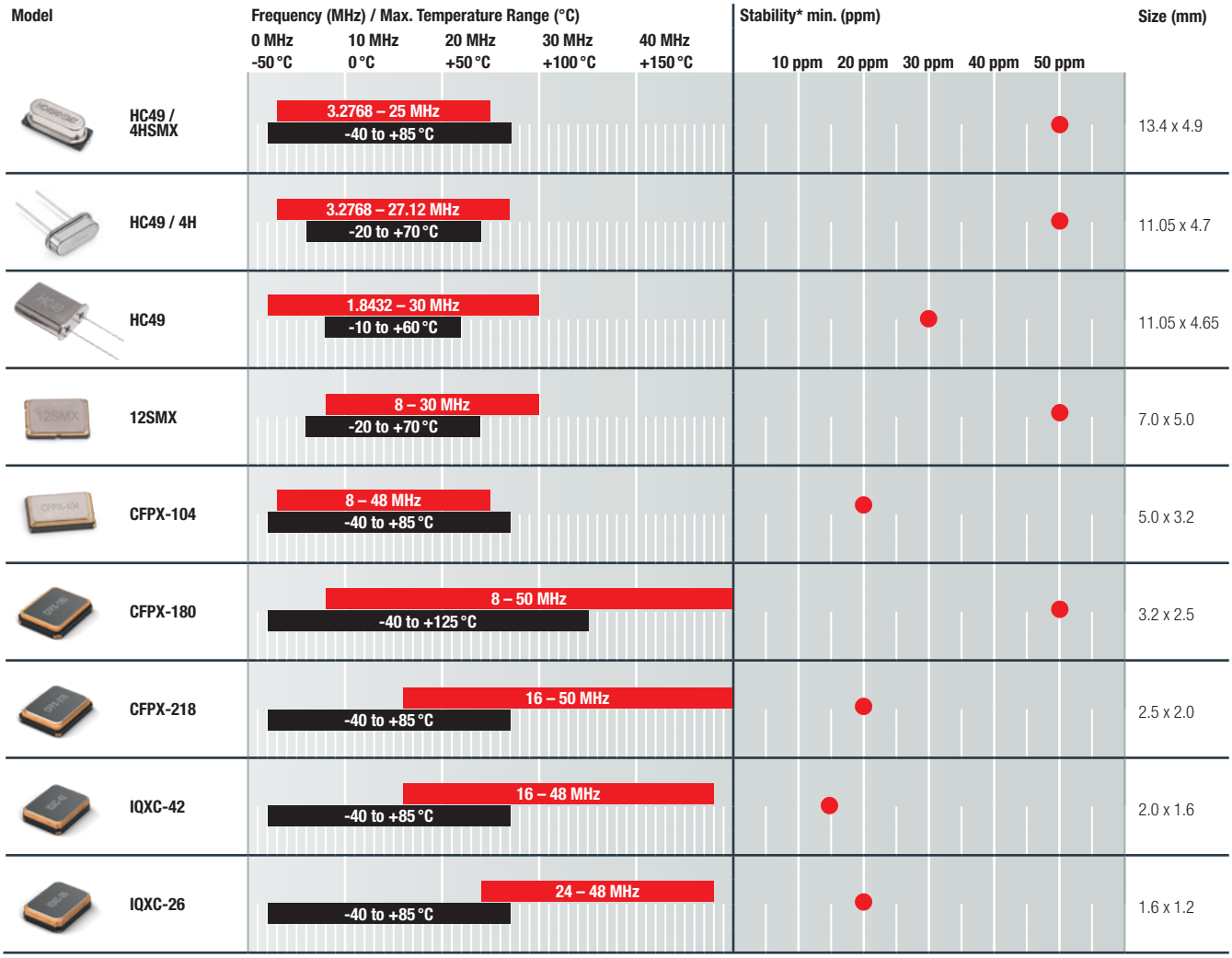
Quartz & Oscillators

WE-XTAL (Quartz Crystal)



*Stability min. for the widest operating temperature range

WE-XTAL (Watch Crystal)

Model	Frequency (MHz)	ESR (kΩ)	Size (mm)
	0 MHz · 0.01 MHz · 0.02 MHz · 0.03 MHz · 0.04 MHz	20 kΩ · 40 kΩ · 60 kΩ · 80 kΩ · 100 kΩ	
 85SMX	0.032768 MHz	60 kΩ	8.7 x 3.8
 CFPX-217	0.032768 MHz	60 kΩ	3.2 x 1.5
 CFPX-56	0.032768 MHz	60 kΩ	2.0 x 6.0
 Watch	0.032768 MHz	60 kΩ	2.0 x 6.0 or 3.0 x 8.0
 IQXC-25	0.032768 MHz	80 kΩ	2.0 x 1.2
 IQXC-90	0.032768 MHz	80 kΩ	1.6 x 1.0

Quartz & Oscillators

WE-SPXO (Simple Packaged Quartz Oscillator)

Model / Signal Type	Frequency (MHz) / Max. Temperature Range (°C) 0 MHz -50 °C · 50 MHz 0 °C · 100 MHz +50 °C · 150 MHz +100 °C · 200 MHz +150 °C	Stability* min. (ppm) / Voltage (V) 25 ppm 2 V · 50 ppm 3 V · 75 ppm 4 V · 100 ppm 5 V · 125 ppm 6 V	Size (mm)
 CFPS-72 HCMOS / TTL	4 – 80 MHz -40 to 85 °C		7.0 x 5.0
 CFPS-73 HCMOS	3.6864 – 125 MHz -40 to 85 °C		7.0 x 5.0
 CFPS-9 CMOS	4 – 50 MHz -40 to 85 °C		5.0 x 3.2
 CFPS-39 CMOS	8 – 125 MHz -40 to 85 °C		3.2 x 2.5
 IQXO-618-33 LVDS	100 – 156.25 MHz -40 to 55 °C		3.2 x 2.5
 IQXO-624 LVPECL	100 – 156.25 MHz -40 to 55 °C		3.2 x 2.5
 IQXO-618-25 LVDS	100 – 156.25 MHz -40 to 55 °C		3.2 x 2.5
 IQXO-623 LVPECL	100 – 156.25 MHz -40 to 55 °C		3.2 x 2.5
 IQXO-791 HCMOS	4 – 50 MHz -40 to 85 °C		2.5 x 2.0
 IQXO-794 HCMOS	4 – 50 MHz -40 to 85 °C		2.5 x 2.0
 IQXO-540 CMOS	4 – 50 MHz -40 to 85 °C		2.0 x 1.6
 IQXO-542 CMOS	4 – 50 MHz -40 to 85 °C		2.0 x 1.6
 CFPS-104 CMOS	0.032768 MHz -40 to 125 °C		3.2 x 2.5
 CFPS-102 CMOS	0.032768 MHz -40 to 125 °C		3.2 x 2.5

*Stability min. for the widest operating temperature range

Model / Signal Type	Frequency (MHz) / Max. Temperature Range (°C) 0 MHz -50 °C · 50 MHz 0 °C · 100 MHz +50 °C · 150 MHz +100 °C · 200 MHz +150 °C	Stability* min. (ppm) / Voltage (V) 25 ppm 2 V · 50 ppm 3 V · 75 ppm 4 V · 100 ppm 5 V · 125 ppm 6 V	Size (mm)
 **CFPS-109** CMOS	0.032768 MHz; -40 to 125 °C	50 ppm 3 V; 100 ppm 5 V	2.5 x 2.0
 **CFPS-107** CMOS	0.032768 MHz; -40 to 125 °C	25 ppm 2 V; 100 ppm 5 V	2.5 x 2.0
 **IQXO-402** CMOS	0.032768 MHz; -40 to 125 °C	50 ppm 3 V; 100 ppm 5 V	2.0 x 1.6
 **IQXO-404** CMOS	0.032768 MHz; -40 to 125 °C	25 ppm 2 V; 100 ppm 5 V	2.0 x 1.6

*Stability min. for the widest operating temperature range

Product Overview

How to find detailed product information?

Visit www.we-online.com and search for product series information, e.g.:

WE-XTAL

Quartz Crystals

Extended

WE-XTAL
Frequency: 1.84320 – 50 MHz
Model: HC49, HC49/4H, 12SMX, CFPX-104, CFPX-180, CFPX-218, HC49/4HSMX, IQXC-26, IQXC-42

WE-XTAL (Watch)
Frequency: 32.7680 kHz
Model: Watch, 85SMX, CFPX-217, CFPX-56, IQXC-25, IQXC-90

Crystal Oscillators

Extended

WE-SPXO
Frequency: 32.768 kHz, 3.6864 – 156.25 MHz
Model: CFPS-39, CFPS-72, CFPS-73, CFPS-9, IQXO-540, IQXO-542, IQXO-791, IQXO-794, IQXO-618-25, IQXO-618-33, IQXO-623, IQXO-624, CFPS-102, CFPS-104, CFPS-107, CFPS-109, IQXO-402, IQXO-404

All Frequency Products at a glance:
www.we-online.com/frequency-products

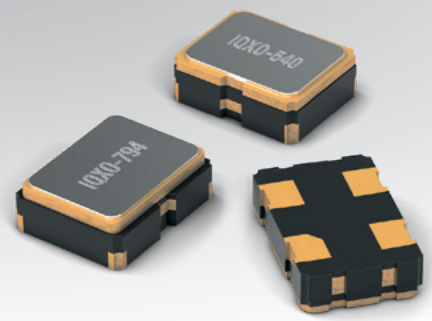
Component libraries available for:

- **PCB library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star**
- **S-Parameter & SPICE model: S-Parameter, LTspice, PSpice, Spectre**
- **RF & microwave simulation models: Modelithics**

www.we-online.com/library

WE-SPXO

Crystal Oscillator



Characteristics:

- SMT models
- Hermetically sealed
- Frequencies between 3.6864 MHz and 156.25 MHz plus 32.768 kHz
- Stabilities down to ±25 ppm
- Available supply voltages: 1.8 V, 2.5 V, 3.3 V and 5 V
- Available output signal types: CMOS; HCMOS/TTL; LVDS; LVPECL
- Max. operating temperature: -40 °C up to +125 °C

Applications:

- Microprocessor
- Wireless communication devices
- Industrial devices
- Real time clocks
- Wired communication (e.g. Ethernet and USB)
- IoT
- Optical network
- Audio and multimedia devices
- Test and measurement equipment
- Navigation and locators

www.we-online.com/we-spxo

IQXO-618-25

Technical Data:

Order Code	f (MHz)	Stability (ppm)	V_{Supply} (V)	Operating Temperature (°C)	Output Logic	L (mm)	W (mm)	H (mm)
830208332209	100	50	2.5	-40 up to +105	LVDS	3.2	2.5	1
830207511509	125							
830208332309	156.25							

f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height

IQXO-618-33

Technical Data:

Order Code	f (MHz)	Stability (ppm)	V_{Supply} (V)	Operating Temperature (°C)	Output Logic	L (mm)	W (mm)	H (mm)
830208331709	100	50	3.3	-40 up to +105	LVDS	3.2	2.5	1
830208331909	125							
830208332009	156.25							

f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height

IQXO-623

Technical Data:

Order Code	f (MHz)	Stability (ppm)	V_{Supply} (V)	Operating Temperature (°C)	Output Logic	L (mm)	W (mm)	H (mm)
830208332501	100	50	2.5	-40 up to +105	LVDS	3.2	2.5	1.1
830208332601	125							
830208332701	156.25							

f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height

WE-SPXO

Crystal Oscillator

IQXO-624

Technical Data:								
Order Code	**f (MHz)**	**Stability (ppm)**	**V_{Supply} (V)**	**Operating Temperature (°C)**	**Output Logic**	**L (mm)**	**W (mm)**	**H (mm)**
830208334301	100	50	3.3	-40 up to +105	LVPECL	3.2	2.5	1.1
830208334501	125							
830208334601	156.25							
f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height								

CFPS-72

Technical Data:								
Order Code	**f (MHz)**	**Stability (ppm)**	**V_{Supply} (V)**	**Operating Temperature (°C)**	**Output Logic**	**L (mm)**	**W (mm)**	**H (mm)**
830202536501	10	25	5	-40 up to +85	HCMOS/TTL	7	5	1.4
f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height								

IQXO-404

Technical Data:								
Order Code	**f (kHz)**	**Stability (ppm)**	**V_{Supply} (V)**	**Operating Temperature (°C)**	**Output Logic**	**L (mm)**	**W (mm)**	**H (mm)**
830207370601	32.768	30	1.8	-40 up to +85	CMOS	2	1.6	0.8
830207370701		100		-40 up to +125				
f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height								

IQXO-402

Technical Data:								
Order Code	**f (kHz)**	**Stability (ppm)**	**V_{Supply} (V)**	**Operating Temperature (°C)**	**Output Logic**	**L (mm)**	**W (mm)**	**H (mm)**
830207370001	32.768	30	3.3	-40 up to +85	CMOS	2	1.6	0.8
830207370101		100		-40 up to +125				
f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height								

CFPS-107

Technical Data:								
Order Code	**f (kHz)**	**Stability (ppm)**	**V_{Supply} (V)**	**Operating Temperature (°C)**	**Output Logic**	**L (mm)**	**W (mm)**	**H (mm)**
830206385009	32.768	30	1.8	-40 up to +85	CMOS	2.5	2	0.95
830208229109		100		-40 up to +125				
f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height								

CFPS-109

Technical Data:								
Order Code	**f (kHz)**	**Stability (ppm)**	**V_{Supply} (V)**	**Operating Temperature (°C)**	**Output Logic**	**L (mm)**	**W (mm)**	**H (mm)**
830207390509	32.768	30	3.3	-40 up to +85	CMOS	2.5	2	0.95
830208229409		100		-40 up to +125				
f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height								

CFPS-102

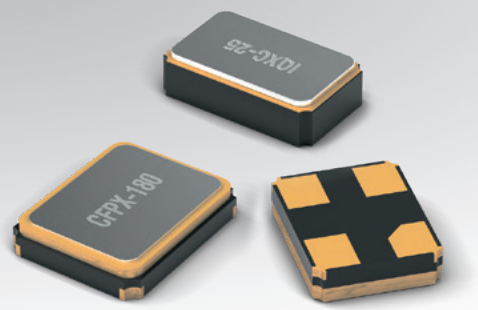
Technical Data:								
Order Code	**f (kHz)**	**Stability (ppm)**	**V_{Supply} (V)**	**Operating Temperature (°C)**	**Output Logic**	**L (mm)**	**W (mm)**	**H (mm)**
830205297709	32.768	25	1.8	-40 up to +85	CMOS	3.2	2.5	1.2
830208228309		100		-40 up to +125				
f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height								

CFPS-104

Technical Data:								
Order Code	**f (kHz)**	**Stability (ppm)**	**V_{Supply} (V)**	**Operating Temperature (°C)**	**Output Logic**	**L (mm)**	**W (mm)**	**H (mm)**
830205028309	32.768	25	1.8	-40 up to +85	CMOS	3.2	2.5	1.2
830208228609		100		-40 up to +125				
f: Frequency; V_{Supply}: Supply Voltage; L: Length; W: Width; H: Height								

WE-XTAL

Quartz Crystals



Characteristics:

- SMT models
- Hermetically sealed
- Frequencies between 1.8432 MHz and 50 MHz plus 32.768 kHz
- Tolerances down to ±10 ppm
- Stabilities down to ±10 ppm
- Max. operating temperature: -40 °C up to +125 °C

Applications:

- Microprocessor
- Wireless communication devices
- Industrial devices
- Real time clocks
- Wired communication (e.g. Ethernet and USB)
- IoT
- Optical network
- Audio and multimedia devices
- Test and measurement equipment
- Navigation and locators
- Wearables

www.we-online.com/we-xtal

IQXC-42

Technical Data:

Order Code	f (MHz)	Tol. f	Stability (ppm)	C_{load} (pF)	Operating Temperature (°C)	L (mm)	W (mm)	H (mm)
830108288709	16	±10 ppm	30	10	-40 up to +105	2	1.6	0.5

f: Frequency; Tol. f: Frequency Tolerance; C_{load}: Load Capacitance; L: Length; W: Width; H: Height

CFPX-180

Technical Data:

Order Code	f (MHz)	Tol. f	Stability (ppm)	C_{load} (pF)	Operating Temperature (°C)	L (mm)	W (mm)	H (mm)
830108313809	8	±30 ppm	50	12	-40 up to +85	3.2	2.5	0.8
830108338709	10	±20 ppm	50	12	-40 up to +105			
830105420809	12	±10 ppm	10	10	-20 up to +70			
830108338809	12	±20 ppm	30	12	-40 up to +105			
830105961109	13.56	±20 ppm	30	18	-40 up to +85			
830107878109	16	±30 ppm	50	12	-40 up to +125			
830108340709	24	±20 ppm	50	12	-40 up to +105			
830108340809	25	±20 ppm	30	12	-40 up to +105			
830105863709	25	±30 ppm	30	12	-40 up to +85			
830108340909	26	±10 ppm	20	12	-40 up to +105			

f: Frequency; Tol. f: Frequency Tolerance; C_{load}: Load Capacitance; L: Length; W: Width; H: Height

CFPX-104

Technical Data:

Order Code	f (MHz)	Tol. f	Stability (ppm)	C_{load} (pF)	Operating Temperature (°C)	L (mm)	W (mm)	H (mm)
830106162701	8	±20 ppm	30	16	-40 up to +85	5	3.2	1
830106163301	13.56							

f: Frequency; Tol. f: Frequency Tolerance; C_{load}: Load Capacitance; L: Length; W: Width; H: Height

Design Kits

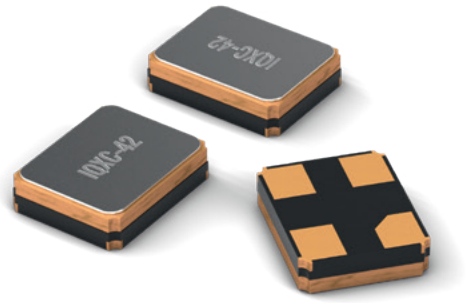
Product Category	Design Kit	Order Code	Lifelong Refill
Quartz & Oscillators			
	WE-XTAL; 32.768 kHz Watch Crystals	830001	✓
	WE-XTAL; Surface Mount Ceramic Package Quartz Crystals	830002	✓
	WE-XTAL; Through Hole and Surface Mount Metal Can Quartz Crystals	830003	✓

Quartz Crystals

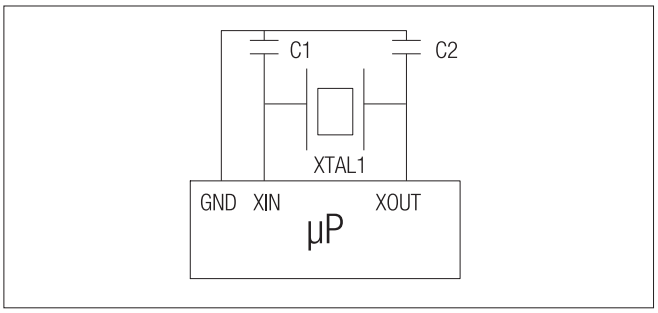
Crystal Specification

- Frequency [kHz or MHz]
- Package size (model and dimensions)
- Tolerance [ppm] – The frequency accuracy at 25 °C
- Stability [ppm]* – The frequency change over operating temperature range
- Operating temperature range [°C]*
- Circuit load condition C_{Load} [pF]
  - – For capacitive load (C_{Load}) value the stray PCB capacitance and the IC pin capacitance should be considered.
  - – Full CL value must match that of the crystal specification
  - – CL = (C1*C2) / (C1+C2) + C_{stray}
  - – C_{stray} = µP pin stray + PCB Stray ≈ 3 pF to 6 pF

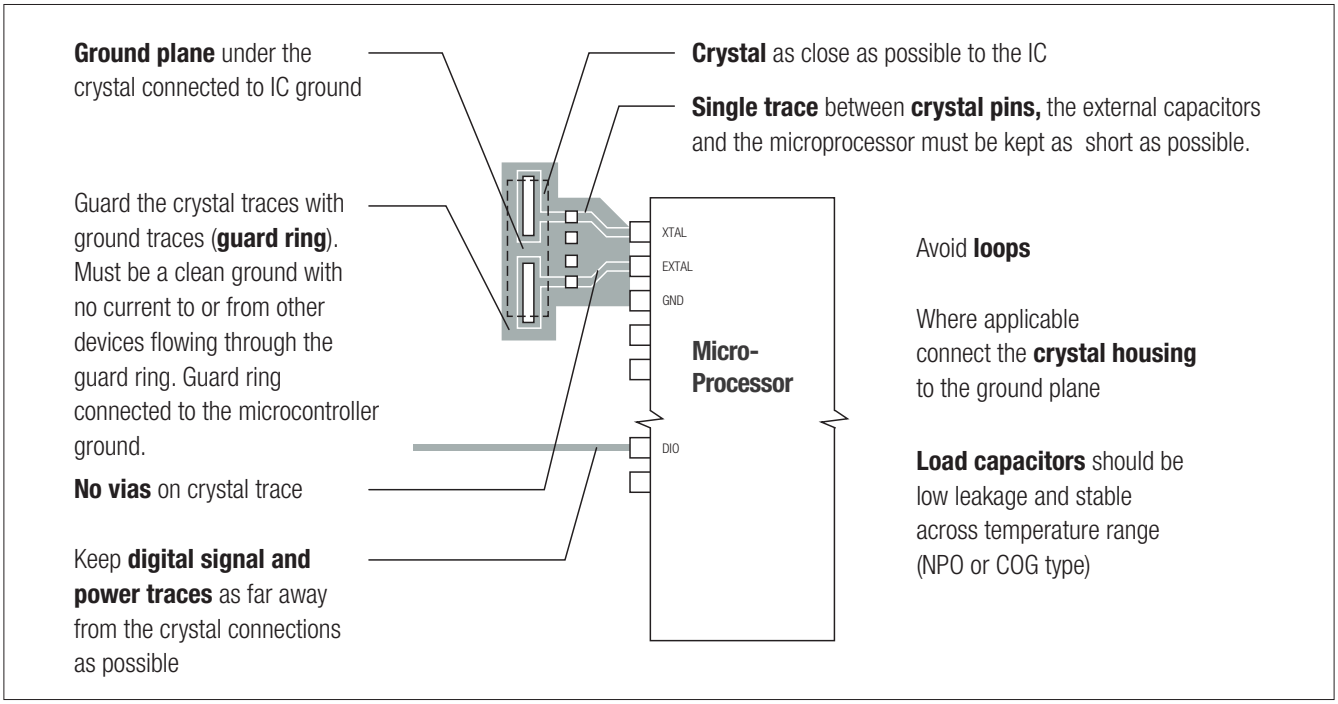
* Not relevant for watch crystal.



Capacitive Load

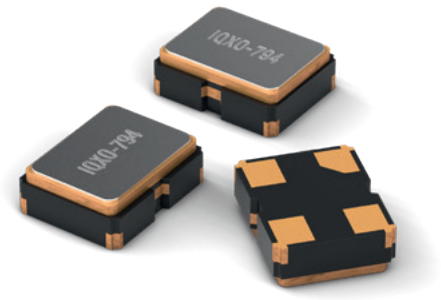


PCB Layout Design Considerations

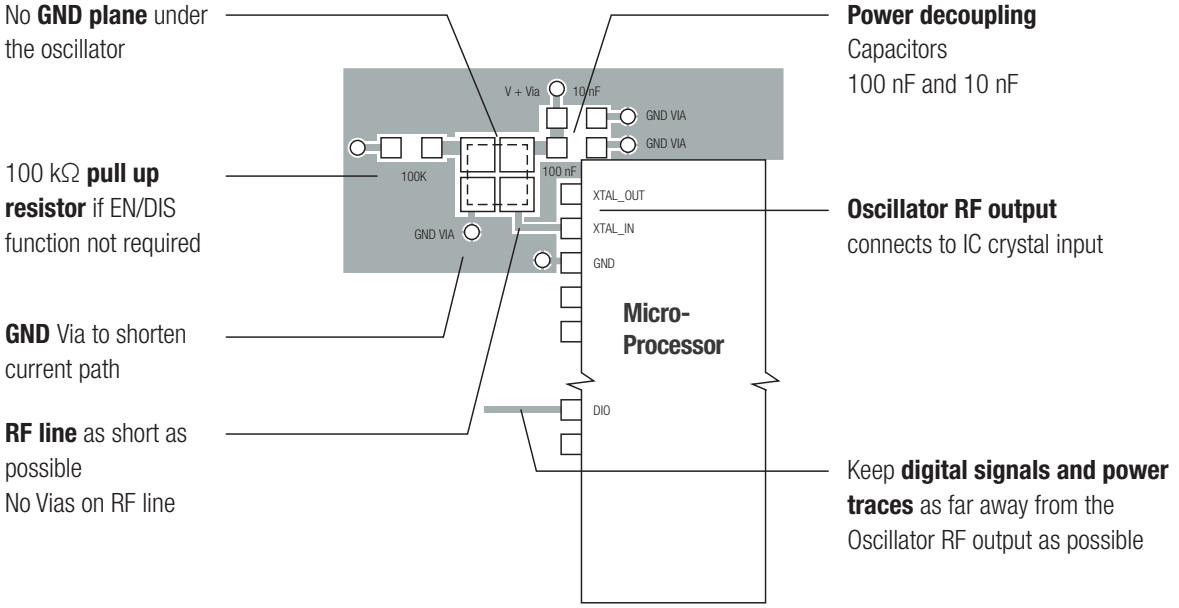


Oscillator Specification

- Frequency [MHz or kHz]
- Package size (model and dimensions)
- Stability [ppm] – The frequency change over operating temperature range
- Supply voltage [V]
- Output level (CMOS, HCMOS, HCMOS/TTL)
- Operating temperature range [°C]



PCB Layout Design Considerations



1 PASSIVE COMPONENTS

Capacitors

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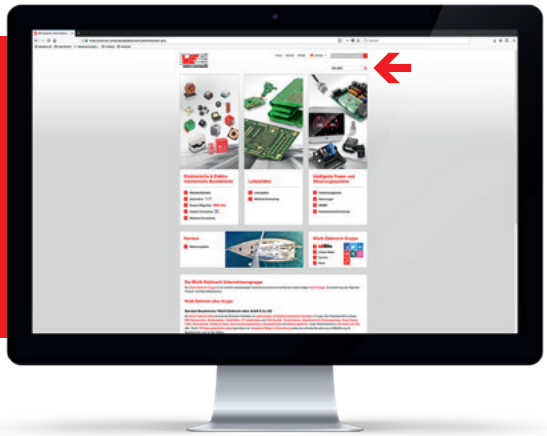
Product Overview

How to find detailed product information?

Visit www.we-online.com and search for product series information, e.g.:

WCAP-ATG8



Electrolytic Capacitors

Aluminum Electrolytic Capacitors

Radial THT

WCAP-ATG8
General Purpose +85 °C
C: 0.1 – 33000 µF
U_R: 10 – 400 V_{DC}
Temp.: -40 °C or -25 °C up to +85 °C
Endurance: 2000 h

WCAP-ATG5
General Purpose +105 °C
C: 0.1 – 18000 µF
U_R: 10 – 400 V_{DC}
Temp.: -40 °C or -25 °C to +105 °C
Endurance: 2000 h

WCAP-AT1H
Long Life
C: 6.8 – 3300 µF
U_R: 10 – 450 V_{DC}
Temp.: -40 °C or -25 °C up to +105 °C
Endurance: 5000 – 10000 h

WCAP-ATET
High Temperature +125 °C
C: 0.47 – 1000 µF
U_R: 10 – 350 V_{DC}
Temp.: -40 °C or -25 °C up to +125 °C
Endurance: 1000 – 2000 h

WCAP-ATLI
Low Impedance
C: 4.7 – 6800 µF
U_R: 10 – 100 V_{DC}
Temp.: -55 °C up to +105 °C
Endurance: 2000 – 5000 h

WCAP-ATUL
Low Leakage & Long Life
C: 22 – 4700 µF
U_R: 10 – 100 V_{DC}
Temp.: -40 °C up to +105 °C
Endurance: 4000 – 10000 h

WCAP-ATLL
Long Life
C: 0.47 – 6800 µF
U_R: 10 – 50 V_{DC}
Temp.: -55 °C up to +105 °C
Endurance: 3000 – 10000 h

V-Chip SMT

WCAP-ASLI
Low Impedance
C: 0.1 – 6800 uF
U_R: 6.3 – 100 V_{DC}
Temp.: -55 °C up to +105 °C
Endurance: 2000 h

WCAP-ASLL
Low Impedance & Long Life
C: 1.0 – 6800 µF
U_R: 6.3 – 450 V $_{DC}$
Temp.: -55 °C or -40 °C up to +105 °C
Endurance: 2000 – 5000 h

WCAP-ASLU
Low Leakage Current
C: 0.1 – 330 µF
U_R: 6.3 – 63 V_{DC}
Temp.: -40 °C up to +85 °C
Endurance: 1000 – 2000 h

WCAP-ASNP
Non-Polar
C: 0.1 – 560 µF
U_R: 6.3 – 50 V_{DC}
Temp.: -40 °C up to +85 °C
Endurance: 2000 h

WCAP-AS5H
Long Life
C: 0.1 – 1000 µF
U_R: 6.3 – 50 V_{DC}
Temp.: -40 °C up to +105 °C
Endurance: 5000 h

Snap-In

WCAP-AIG8
General Purpose +85 °C
C: 47 – 6800 µF
U_R: 63 – 450 V_{DC}
Temp.: -40 °C or -25 °C up to +85 °C
Endurance: 2000 h

WCAP-AIE8
Long Life
C: 68 – 6800 µF
U_R: 63 – 450 V_{DC}
Temp.: -40 °C or -25 °C up to +85 °C
Endurance: 3000 h

WCAP-AIG5
General Purpose +105 °C
C: 33 – 10000 µF
U_R: 63 – 450 V_{DC}
Temp.: -40 °C or -25 °C up to +105 °C
Endurance: 2000 h

WCAP-AI3H
Long Life
C: 68 – 10000 µF
U_R: 63 – 450 V_{DC}
Temp.: -40 °C or -25 °C up to +105 °C
Endurance: 3000 h

Product Overview

Electrolytic Capacitors

Aluminum Polymer Capacitors

Radial THT

WCAP-PTG5
General Purpose +105 °C

C:	39 – 2000 µF
U_R:	6.3 – 25 V_{DC}
Temp.:	-55 °C up to +105 °C
Endurance:	2000 h

WCAP-PTHR
Low ESR & High Voltage

C:	10 – 150 µF
U_R:	35 – 100 V_{DC}
Temp.:	-55 °C up to +105 °C
Endurance:	2000 h

WCAP-PTHT
High Temperature +125 °C

C:	22 – 2000 µF
U_R:	6.3 – 50 V_{DC}
Temp.:	-55 °C up to +125 °C
Endurance:	2000 h

WCAP-PT5H
Long Life

C:	22 – 2000 µF
U_R:	6.3 – 35 V_{DC}
Temp.:	-55 °C up to +105 °C
Endurance:	5000 h

V-Chip SMT

WCAP-PSLC
Large Capacitance

C:	10 – 2000 µF
U_R:	6.3 – 100 V_{DC}
Temp.:	-55 °C up to +105 °C
Endurance:	2000 h

WCAP-PSLP
Low Profile

C:	4.7 – 390 µF
U_R:	6.3 – 100 V_{DC}
Temp.:	-55 °C up to +105 °C
Endurance:	2000 h

WCAP-PSHP
High Ripple Current

C:	6.8 – 1200 µF
U_R:	6.3 – 100 V_{DC}
Temp.:	-55 °C up to +105 °C
Endurance:	2000 – 5000 h

H-Chip SMT

WCAP-PHGP
General Purpose

C:	100 – 560 µF
U_R:	2 – 6.3 V_{DC}
Temp.:	-55 °C up to +105 °C
Endurance:	2000 h

WCAP-PHLE
Low ESR

C:	100 – 560 µF
U_R:	2 – 6.3 V_{DC}
Temp.:	-55 °C up to +105 °C
Endurance:	2000 h

WCAP-PHSE
Super Low ESR

C:	330 – 560 µF
U_R:	2 – 2.5 V_{DC}
Temp.:	-55 °C up to +105 °C
Endurance:	2000 h

MLCCs – Multilayer Ceramic Chip Capacitors

SMT-Chip

WCAP-CSGP
General Purpose

C:	0.5 pF – 100 µF
U_R:	6.3 – 100 V_{DC}
Ceramic:	NP0, X7R, X5R

WCAP-CSMH
Mid and High Voltage

C:	10 pF – 470 nF
U_R:	200 – 3.000 V_{DC}
Ceramic:	NP0, X7R

WCAP-CSRF
High Frequency

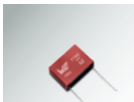
C:	0.2 pF – 33 pF
U_R:	25 – 50 V_{DC}
Ceramic:	NP0

WCAP-CSST
Soft Termination

C:	220 pF – 2.2 µF
U_R:	16 – 2.000 V_{DC}
Ceramic:	X7R

DC Film Capacitors

Boxed THT



WCAP-FTBP Boxed Type
Metallized Polypropylene

C:	33 nF – 6.8 µF
U_R:	160 – 630 V_{DC}
Pitch:	7.5 / 10.0 / 15.0 / 22.5 / 27.5 mm
Dielectric:	Polypropylene

WCAP-FTBE Boxed Type
Metallized Polyester

C:	10 nF – 6.8 µF
U_R:	100 – 1.000 V_{DC}
Pitch:	7.5 / 10.0 / 15.0 / 22.5 / 27.5 / 37.5 mm
Dielectric:	Polyester

Supercapacitors (EDLCs)

Radial THT

WCAP-STSC
Standard Cylindrical

C:	3 – 50 F
U_R:	2.7 V_{DC}
Temp:	-40 °C up to +65 °C

Safety Capacitors (X/Y)

Film Capacitors

Boxed THT

WCAP-FTXX
X2-Capacitors

C:	5.6 nF – 6.8 µF
U_R:	310 V_{AC}
Pitch:	7.5 / 10.0 / 12.5 / 15.0 / 22.5 / 27.5 / 37.5 mm
Safety class:	X2

WCAP-FTX2
X2-Capacitors

C:	5.6 nF – 6.8 µF
U_R:	275 V_{AC}
Pitch:	7.5 / 10.0 / 12.5 / 15.0 / 22.5 / 27.5 / 37.5 mm
Safety class:	X2

SMT-Chip

WCAP-CSSA
Safety Capacitors

C:	33 pF – 4.7 nF
U_R:	250 V_{AC}
Ceramic:	NP0, X7R
Safety class:	X1 / Y2, X2

All Capacitors at a glance
www.we-online.com/capacitors

Explore our application notes for Capacitors:
www.we-online.com/appnotes

Component libraries available for:

- **PCB library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star**
- **S-Parameter & SPICE model: S-Parameter, LTspice, PSpice, Spectre**
- **RF & microwave simulation models: Modelithics**

www.we-online.com/library

WCAP-PHGP

Aluminum Polymer Capacitors

General Purpose +105 °C

Characteristics:

- General purpose product series with max. operating temperature of +105 °C
- High ripple current capability
- Low profile
- Mounting style: H-Chip SMT
- Capacitance range: 100 µF – 560 µF
- Capacitance tolerance: ±20 %
- Voltage range (U_R): 2 – 6.3 V_{DC}
- Operating temperature: -55 °C up to +105 °C
- Endurance: 2000 h @ +105 °C
- Recommended soldering: Reflow

Applications:

- Noise suppression
- Input and output capacitor for DC/DC converter
- e.g. USB charger, smart meter, power bank

www.we-online.com/wcap-phgp

H-Chip SMT

Technical Data:

Order Code	C (µF)	V_R (V_{DC})	I_{RIPPLE} (mA)	DF (%)	$R_{ESR\ max.}$* (mΩ)	$I_{Leak\ max.}$** (µA)	Endurance (h)	L (mm)	W (mm)	H (mm)
875016219004	330	2	5600	6	12	66	2000	7.3	4.3	1.9
875016219005	390	2	5100		15	78				
875016219006	470	2	5100		15	94				
875016219007	560	2	5100		15	112				
875016319002	330	2.5	5100		15	82.5				
875016319003	390	2.5	5100		15	97.5				
875016319004	470	2.5	5100		15	117.5				
875015019003	180	4	5600		12	72				
875015019004	220	4	5600		12	88				
875015019005	330	4	5100		15	132				
875015119003	100	6.3	5100		15	63				
875015119004	150	6.3	5600		12	94.5				
875015119005	180	6.3	5100		15	113.4				
875015119006	220	6.3	5100		15	138.6				

C: Capacitance; V_R: Rated Voltage; I_{RIPPLE}: Ripple Current; DF: Dissipation Factor; $R_{ESR\ max.}$: ESR; I_{Leak}: Leakage Current; L: Length; W: Width; H: Height

* 100 kHz / +20 °C

** 2 minutes / +20 °C

WCAP-PHLE

Aluminum Polymer Capacitors

Low ESR +105 °C

Characteristics:

- Low ESR product series
- High ripple current capability
- Low profile
- Mounting style: H-Chip SMT
- Capacitance range: 100 µF – 560 µF
- Capacitance tolerance: ±20 %
- Voltage range (U_R): 2 – 6.3 V_{DC}
- Operating temperature: -55 °C up to +105 °C
- Endurance: 2000 h @ +105 °C
- Recommended soldering: Reflow

Applications:

- Noise suppression
- Input and output capacitor for DC/DC converter
- e.g. USB charger, smart meter, power bank, server, SSD

www.we-online.com/wcap-phle

H-Chip SMT

Technical Data:

Order Code	C (µF)	V_R (V_{DC})	I_{RIPPLE} (mA)	DF (%)	$R_{ESR\ max.}$* (mΩ)	$I_{Leak\ max.}$** (µA)	Endurance (h)	L (mm)	W (mm)	H (mm)
875036219012	330	2	8500	6	4.5	66	2000	7.3	4.3	1.9
875036219015	390	2	8500		4.5	78				
875036219018	470	2	8500		4.5	94				
875036219019	560	2	8500		4.5	112				
875036319012	330	2.5	8500		4.5	82.5				
875036319015	390	2.5	8500		4.5	97.5				
875036319018	470	2.5	8500		4.5	117.5				
875035019001	100	4	6300		9	40				
875035019002	180	4	6300		9	72				
875035019003	220	4	6300		9	88				
875035119002	180	6.3	6300		9	113.4				

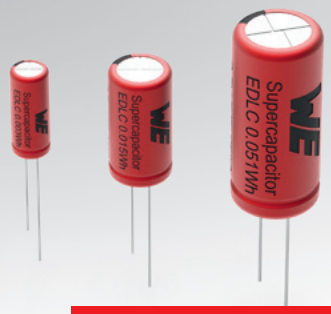
C: Capacitance; V_R: Rated Voltage; I_{RIPPLE}: Ripple Current; DF: Dissipation Factor; $R_{ESR\ max.}$: ESR; I_{Leak}: Leakage Current; L: Length; W: Width; H: Height

* 100 kHz / +20 °C

** 2 minutes / +20 °C

WCAP-STSC

Supercapacitors (EDLCs)



Standard Cylindrical +65 °C

Characteristics:

- Electric Double Layer Capacitors
- Mounting style: Radial THT
- Capacitance range: 3 F – 50 F
- Rated voltage: 2.7 V_{DC}
- Operating temperature: -40 °C up to +65 °C

Applications:

- Memory backup
- Smart meter
- Network equipment
- UPS systems
- Power assist
- Energy harvesting

www.we-online.com/wcap-stsc

Radial THT

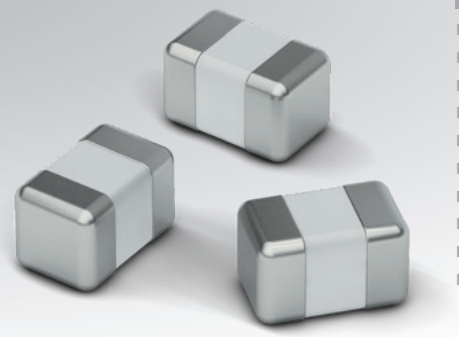
Technical Data:

Order Code	C (F)	V_R (V_{DC})	$R_{ESR\ DC}$ (mΩ)	$R_{ESR\ AC}$ (mΩ)	I_{Leak} (mA)	I_{Max} (A)	I_{Rated} (A)	P (kW/kg)	E (Wh/kg)	Endurance (Cycles)	Ø D (mm)	L (mm)	Pitch (mm)
850617030001	3	2.7	70	60	0.008	3.3	0.7	18.08	2.1	500000	8	20	3.5
850617021001	5		50	40	0.012	5.4	1.29	17.35	2.41		10	20	5
850617021002	7		45	35	0.02	7.1	1.7	18.92	3.3		10	20	5
850617021004	10		35	30	0.03	10	2.5	19.1	3.7		10	25	5
850617021005	15		33	30	0.06	13.5	3.6	12.27	3.3		13	25	5
850617022001	25		25	20	0.068	20.7	6	10.72	3.7		16	25	7.5
850617022002	50		20	15	0.105	33.7	11.2	8.13	4.5		18	40	7.5

C: Capacitance; V_R: Rated Voltage; $R_{ESR\ DC}$: ESR; $R_{ESR\ AC}$: ESR; I_{Leak}: Leakage Current; I_{Max}: Max. Discharge Current; I_{Rated}: Rated Discharge Current; P: Power Density; E: Energy Density; Ø D: Diameter; L: Length

WCAP-CSRF

MLCCs – High Frequency



Characteristics:

- High frequency product series
- Mounting style: SMT-Chip
- Ceramic: NP0 (Class I)
- Capacitance range: 0.2 pF – 33 pF
- Temperature coefficient: ±30 ppm/°C
- Voltage range (U_R): 25 – 50 V_{DC}
- Operating temperature: -55 °C up to + 125 °C
- Sizes: 0201 / 0402
- Termination: Cu/Ni/Sn
- Recommended soldering: Reflow

Applications:

- High frequency applications
- Antenna matching

www.we-online.com/wcap-csrf

Size 0201

Technical Data:

Order Code	C (pF)	Tol. C	V_R (V_{DC})	$Q_{min.}$	R_{ISO} (GΩ)	L (mm)	W (mm)	H (mm)
885392004001	0.2	±0.05 pF	25	404	10	0.6	0.3	0.3
885392004002	1	±0.1 pF		420				
885392004003	1.2	±0.1 pF		424				
885392004004	1.5	±0.1 pF		430				
885392004005	2.2	±0.1 pF		444				
885392004006	2.7	±0.1 pF		454				
885392004007	3.3	±0.1 pF		466				
885392004008	4.7	±0.25 pF		494				
885392004009	5.6	±0.25 pF		512				
885392004010	9	±0.5 pF		580				
885392004011	33	±5 %		1000				

C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; $Q_{min.}$: Q-Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

Size 0402

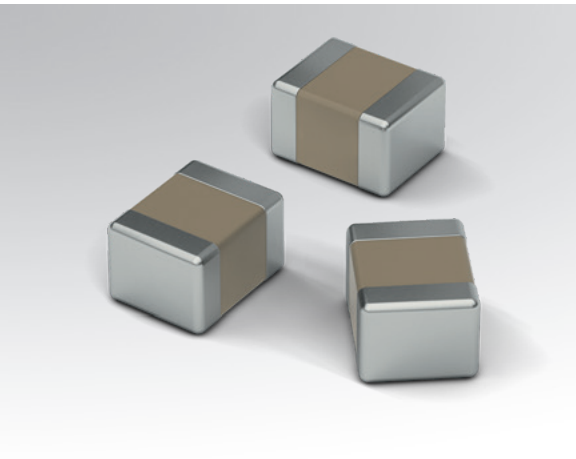
Technical Data:

Order Code	C (pF)	Tol. C	V_R (V_{DC})	$Q_{min.}$	R_{ISO} (GΩ)	L (mm)	W (mm)	H (mm)
885392005001	0.3	±0.1 pF	50	406	10	1	0.5	0.5
885392005002	0.4	±0.05 pF		408				
885392005003	0.4	±0.1 pF		408				
885392005004	0.5	±0.05 pF		410				
885392005005	1	±0.05 pF		420				
885392005006	1	±0.1 pF		420				
885392005007	1.5	±0.1 pF		430				
885392005008	1.8	±0.1 pF		436				
885392005009	2.3	±0.05 pF		446				
885392005010	3	±0.1 pF		460				
885392005011	3.3	±0.1 pF		466				
885392005012	4.7	±0.1 pF		494				
885392005013	5.6	±0.1 pF		512				
885392005014	9	±0.25 pF		580				

C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; $Q_{min.}$: Q-Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

WCAP-CSST

MLCCs – Soft Termination



Characteristics:

- Product series with high absorption of mechanical stress
- Mounting style: SMT chip
- Ceramic: X7R (Class II)
- Capacitance range: 220 pF – 2.2 µF
- Temperature coefficient: ±15 %
- Voltage range (U_R): 16 V_{DC} – 2 kV_{DC}
- Operating temperature: -55 °C up to +125 °C
- Sizes: 0603 / 0805 / 1206 / 1210
- Termination: Ag-Polymer/Ni/Sn
- Recommended soldering: Reflow
- Wave soldering only valid for 0603, 0805 with thickness ≤ 0.85 mm

Applications:

- Application with high mechanical stress
- Power supply
- e.g. Lighting

www.we-online.com/wcap-csst

Size 0603

Technical Data:

Order Code	C	Tol. C	V_R (V_{DC})	DF (%)	R_{ISO} (GΩ)	L (mm)	W (mm)	H (mm)
885382206001	220 pF	±10 %	50	2.5	10	1.6	0.8	0.8
885382206005	1 nF		200	2.5	10			
885382206002	10 nF		50	2.5	10			
885382206003	22 nF		50	2.5	10			
885382206004	100 nF		50	3	5			

C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; DF: Dissipation Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

Size 0805

Technical Data:

Order Code	C	Tol. C	V_R (V_{DC})	DF (%)	R_{ISO} (GΩ)	L (mm)	W (mm)	H (mm)
885382207010	270 pF	±10 %	500	2.5	10	2	1.25	1.25
885382207004	1 nF		50	2.5	10			
885382207005	2.2 nF		50	2.5	10			
885382207006	10 nF		50	2.5	10			
885382207009	10 nF		100	2.5	10			
885382207007	100 nF		50	2.5	5			
885382207008	220 nF		50	3	2.3			
885382207002	330 nF		25	3.5	1.5			
885382207001	1 µF		16	5	0.5			
885382207003	1 µF		25	5	0.5			

C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; DF: Dissipation Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

Size 1206

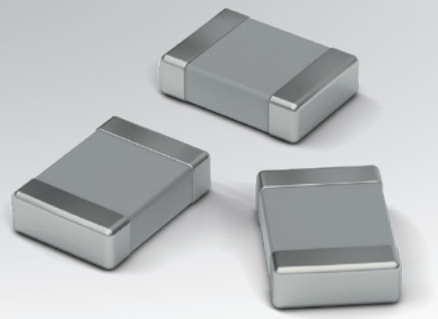
Technical Data:								
Order Code	**C**	**Tol. C**	**V_R (V_{DC})**	**DF (%)**	**R_{ISO} (GΩ)**	**L (mm)**	**W (mm)**	**H (mm)**
885382208008	270 pF	±10 %	500	2.5	10	3.2	1.6	1.25
885382208013	470 pF		2000	2.5	10			1.25
885382208014	680 pF		2000	2.5	10			1.25
885382208012	4.7 nF		1000	2.5	10			1.25
885382208002	10 nF		50	2.5	10			1.25
885382208009	10 nF		500	2.5	10			1.25
885382208010	22 nF		500	2.5	4.5			1.6
885382208011	33 nF		500	2.5	3			1.6
885382208003	100 nF		50	2.5	5			1.25
885382208006	100 nF		100	2.5	1			1.25
885382208007	100 nF		250	2.5	1			1.6
885382208004	470 nF		50	3	1			1.6
885382208005	1 µF		50	3	0.5			1.6
885382208001	2.2 µF		25	3.5	0.2			1.6
C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; DF: Dissipation Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height								

Size 1210

Technical Data:								
Order Code	**C**	**Tol. C**	**V_R (V_{DC})**	**DF (%)**	**R_{ISO} (GΩ)**	**L (mm)**	**W (mm)**	**H (mm)**
885382209001	33 nF	±10 %	500	2.5	3	3.2	2.5	1.6
885382209002	2.2 µF		100	5	0.05			2.5
C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; DF: Dissipation Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height								

WCAP-CSSA

MLCCs – Safety Capacitors



Product series for interference suppression

Characteristics:

- High capacitance stability
- Certificates: TÜV, cULus
- Safety class: X1/Y2, X2
- Mounting style: SMT chip
- Ceramic: NP0 (Class I), X7R (Class II)
- Capacitance range: 33 pF – 4.7 nF
- Rated Voltage (U_R): 250 V_{AC}
- Operating temperature: -55 °C up to + 125 °C
- Sizes: 1808 / 1812 / 2211 / 2220
- Termination: Cu/Ni/Sn
- Recommended soldering: Reflow

Applications:

- Interference suppression
- Filter in power supplies

www.we-online.com/wcap-cssa

Size 1808

Technical Data:

Order Code	C	Tol. C	V_{IMP} (V_{DC})	Safety Class	Ceramic	DF (%)	R_{ISO} (GΩ)	L (mm)	W (mm)	H (mm)
8853620100091	33 pF	±5 %	2500	X2	NP0 Class I	0.1	100	4.5	2	1.4
8853520100071	33 pF	±5 %	5000	X1 / Y2	NP0 Class I	0.1	100			1.4
8853620100111	47 pF	±5 %	2500	X2	NP0 Class I	0.1	100			1.6
8853620100171	100 pF	±5 %	2500	X2	NP0 Class I	0.1	100			2
8853622100181	150 pF	±10 %	2500	X2	X7R Class II	2.5	10			1.6
8853620100181	220 pF	±5 %	2500	X2	NP0 Class I	0.1	100			2
8853622100091	470 pF	±10 %	2500	X2	X7R Class II	2.5	10			1.6
8853622100131	680 pF	±10 %	2500	X2	X7R Class II	2.5	10			1.6
8853622100171	1 nF	±10 %	2500	X2	X7R Class II	2.5	10			2
8853522100131	1 nF	±10 %	5000	X1 / Y2	X7R Class II	2.5	10			2

C: Capacitance; Tol. C: Capacitance (Tolerance); V_{IMP}: Impulse Voltage; DF: Dissipation Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

Size 1812

Technical Data:

Order Code	C	Tol. C	V_{IMP} (V_{DC})	Safety Class	Ceramic	DF (%)	R_{ISO} (GΩ)	L (mm)	W (mm)	H (mm)
8853522110011	470 pF	±10 %	5000	X1 / Y2	X7R Class II	2.5	10	4.5	3.2	1.6
8853522110021	680 pF		5000	X1 / Y2						2
8853622110111	1 nF		2500	X2						1.6
8853522110031	1 nF		5000	X1 / Y2						2.5
8853622110151	2.2 nF		2500	X2						2.5

C: Capacitance; Tol. C: Capacitance (Tolerance); V_{IMP}: Impulse Voltage; DF: Dissipation Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

Size 2211

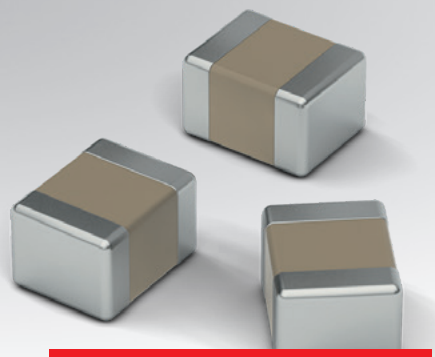
Technical Data:										
Order Code	**C (nF)**	**Tol. C**	**V_{IMP} (V_{DC})**	**Safety Class**	**Ceramic**	**DF (%)**	**R_{ISO} (GΩ)**	**L (mm)**	**W (mm)**	**H (mm)**
8853522130111	1	±10 %	5000	X1 / Y2	X7R Class II	2.5	10	5.7	2.8	2.5
8853522130151	2.2									
C: Capacitance; Tol. C: Capacitance (Tolerance); V_{IMP}: Impulse Voltage; DF: Dissipation Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height										

Size 2220

Technical Data:										
Order Code	**C (nF)**	**Tol. C**	**V_{IMP} (V_{DC})**	**Safety Class**	**Ceramic**	**DF (%)**	**R_{ISO} (GΩ)**	**L (mm)**	**W (mm)**	**H (mm)**
8853522140011	4.7	±10 %	5000	X1 / Y2	X7R Class II	2.5	10	5.7	5	2.5
C: Capacitance; Tol. C: Capacitance (Tolerance); V_{IMP}: Impulse Voltage; DF: Dissipation Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height										

WCAP-CSMH

MLCCs – Mid and High Voltage



Mid and high voltage up to 3 kV_{DC}

Characteristics:

- Product series for mid and high voltage up to 3 kV_{DC}
- Mounting style: SMT chip
- Ceramic: NP0 (Class I), X7R (Class II)
- Capacitance range: 10 pF – 470 nF
- Operating temperature: -55 °C up to +125 °C
- Voltage range (U_R): 200 V_{DC} – 3 kV_{DC}
- Sizes: 0603 / 0805 / 1206 / 1210 / 1808 / 1812
- Termination: Cu/Ni/Sn
- Recommended soldering: Reflow
- Wave soldering only valid for 0603, 0805 with thickness ≤ 0.85 mm

Applications:

- Ports protection against EFT and surge
- Blocking
- High voltage coupling
- Snubber

www.we-online.com/wcap-csmh

Size 0603

Technical Data:

Order Code	C	Tol. C	V_R (V_{DC})	Ceramic	DF (%)	$Q_{min.}$	R_{ISO} (GΩ)	L (mm)	W (mm)	H (mm)
885342006001	10 pF	±5 %	250	NP0 Class I	–	600	10	1.6	0.8	0.8
885342206006	10 nF	±10 %		X7R Class II	2.5	–				
885342006002	33 pF	±5 %		NP0 Class I	–	1000				
885342006003	100 pF	±5 %		NP0 Class I	–	1000				
885342206001	100 pF	±10 %		X7R Class II	2.5	–				
885342006004	220 pF	±5 %		NP0 Class I	–	1000				
885342206002	330 pF	±10 %		X7R Class II	2.5	–				
885342006005	470 pF	±5 %		NP0 Class I	–	1000				
885342206003	1 nF	±10 %		X7R Class II	2.5	–				
885342206004	1.5 nF	±10 %		X7R Class II	2.5	–				
885342206005	3.3 nF	±10 %		X7R Class II	2.5	–				

C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; DF: Dissipation Factor; $Q_{min.}$: Q-Factor [1]; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

Size 0805

Technical Data:

Order Code	C	Tol. C	V_R (V_{DC})	Ceramic	DF (%)	$Q_{min.}$	R_{ISO} (GΩ)	L (mm)	W (mm)	H (mm)
885342007004	15 pF	±5%	250	NP0 Class I	–	700	10	2	1.25	0.6
885342007006	47 pF	±5%	500	NP0 Class I	–	1000	10			0.6
885342207001	100 pF	±10%	200	X7R Class II	2.5	–	10			0.8
885342207015	100 pF	±10%	1000	X7R Class II	2.5	–	10			1.25
885342007001	220 pF	±5%	200	NP0 Class I	–	1000	10			1.25
885342007002	330 pF	±5%	200	NP0 Class I	–	1000	10			1.25
885342207002	470 pF	±10%	200	X7R Class II	2.5	–	10			0.8
885342207012	470 pF	±10%	500	X7R Class II	2.5	–	10			0.8
885342007003	1 nF	±5%	200	NP0 Class I	–	1000	10			1.25
885342207008	1 nF	±10%	250	X7R Class II	2.5	–	10			0.8
885342207013	1 nF	±10%	500	X7R Class II	2.5	–	10			0.8
885342007005	2.2 nF	±5%	250	NP0 Class I	–	1000	10			1.25
885342207016	2.2 nF	±10%	1000	X7R Class II	2.5	–	10			1.25
885342207009	4.7 nF	±10%	250	X7R Class II	2.5	–	10			0.8
885342207005	10 nF	±10%	200	X7R Class II	2.5	–	10			1.25
885342207014	10 nF	±10%	500	X7R Class II	2.5	–	10			1.25
885342207011	22 nF	±10%	250	X7R Class II	2.5	–	4.545			1.25

C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; DF: Dissipation Factor; $Q_{min.}$: Q-Factor [1]; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

Size 1206

Technical Data:										
Order Code	**C**	**Tol. C**	**V_R (V_{DC})**	**Ceramic**	**DF (%)**	**$Q_{min.}$**	**R_{ISO} (GΩ)**	**L (mm)**	**W (mm)**	**H (mm)**
885342008001	47 pF	±5 %	500	NP0 Class I	–	1000	10	3.2	1.6	0.8
885342008004	100 pF	±5 %	630	NP0 Class I	–	1000	10			0.8
885342008009	100 pF	±5 %	1000	NP0 Class I	–	1000	10			1.25
885342008011	100 pF	±5 %	2000	NP0 Class I	–	1000	10			1.25
885342208022	100 pF	±10 %	2000	X7R Class II	2.5	–	10			1.25
885342008002	220 pF	±5 %	500	NP0 Class I	–	1000	10			0.8
885342208005	470 pF	±10 %	500	X7R Class II	2.5	–	10			1.25
885342208023	470 pF	±10 %	2000	X7R Class II	2.5	–	10			1.25
885342008005	1 nF	±5 %	630	NP0 Class I	–	1000	10			1.6
885342208024	1 nF	±10 %	2000	X7R Class II	2.5	–	10			1.6
885342008007	2.2 nF	±5 %	630	NP0 Class I	–	1000	10			1.6
885342208019	2.2 nF	±10 %	1000	X7R Class II	2.5	–	10			1.25
885342208008	4.7 nF	±10 %	500	X7R Class II	2.5	–	10			1.25
885342208020	4.7 nF	±10 %	1000	X7R Class II	2.5	–	10			1.25
885342208012	10 nF	±10 %	630	X7R Class II	2.5	–	10			1.25
885342208021	10 nF	±10 %	1000	X7R Class II	2.5	–	10			1.25
885342208014	22 nF	±10 %	630	X7R Class II	2.5	–	4.545			1.6
885342208002	100 nF	±10 %	200	X7R Class II	2.5	–	1			1.6
885342208004	100 nF	±10 %	250	X7R Class II	2.5	–	1			1.6

C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; DF: Dissipation Factor; $Q_{min.}$: Q-Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

Size 1210

Technical Data:										
Order Code	**C**	**Tol. C**	**V_R (V_{DC})**	**Ceramic**	**DF (%)**	**$Q_{min.}$**	**R_{ISO} (GΩ)**	**L (mm)**	**W (mm)**	**H (mm)**
885342009004	10 pF	±5 %	2000	NP0 Class I	–	600	10	3.2	2.5	0.95
885342009002	22 pF	±5 %	1000	NP0 Class I	–	840	10			0.95
885342209008	220 pF	±10 %	2000	X7R Class II	2.5	–	10			1.25
885342009003	1 nF	±5 %	1000	NP0 Class I	–	1000	10			1.6
885342209009	1 nF	±10 %	2000	X7R Class II	2.5	–	10			1.25
885342009001	4.7 nF	±5 %	200	NP0 Class I	–	1000	10			1.6
885342209007	22 nF	±10 %	1000	X7R Class II	2.5	–	4.55			1.6
885342209004	33 nF	±10 %	630	X7R Class II	2.5	–	3.03			1.6
885342209002	100 nF	±10 %	200	X7R Class II	2.5	–	1			1.6
885342209003	220 nF	±10 %	250	X7R Class II	2.5	–	0.455			2.5

C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; DF: Dissipation Factor; $Q_{min.}$: Q-Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

WCAP-CSMH

MLCCs – Mid and High Voltage

Size 1808

Technical Data:										
Order Code	**C**	**Tol. C**	**V_R (V_{DC})**	**Ceramic**	**DF (%)**	**$Q_{min.}$**	**R_{ISO} (GΩ)**	**L (mm)**	**W (mm)**	**H (mm)**
885342010001	10 pF	±5 %	3000	NP0 Class I	–	600	10	4.5	2.03	1.25
885342010003	100 pF	±5 %	3000	NP0 Class I	–	1000				2
885342210003	470 pF	±10 %	3000	X7R Class II	2.5	–				2
885342210004	1 nF	±10 %	3000	X7R Class II	2.5	–				2
885342210002	2.2 nF	±10 %	2000	X7R Class II	2.5	–				2

C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; DF: Dissipation Factor; $Q_{min.}$: Q-Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

Size 1812

Technical Data:										
Order Code	**C**	**Tol. C**	**V_R (V_{DC})**	**Ceramic**	**DF (%)**	**$Q_{min.}$**	**R_{ISO} (GΩ)**	**L (mm)**	**W (mm)**	**H (mm)**
885342011002	100 pF	±5%	1000	NP0 Class I	–	1000	10	4.5	3.2	1.25
885342211009	1 nF	±10%	3000	X7R Class II	2.5	–	10			2
885342011003	1.5 nF	±5%	1000	NP0 Class I	–	1000	10			2
885342211010	2.2 nF	±10%	3000	X7R Class II	2.5	–	10			2.5
885342211008	4.7 nF	±10%	2000	X7R Class II	2.5	–	10			2
885342211004	10 nF	±10%	500	X7R Class II	2.5	–	10			1.25
885342211002	100 nF	±10%	200	X7R Class II	2.5	–	1			1.25
885342211005	100 nF	±10%	500	X7R Class II	2.5	–	1			2
885342211006	100 nF	±10%	630	X7R Class II	2.5	–	1			2
885342211003	470 nF	±10%	250	X7R Class II	2.5	–	0.213			2

C: Capacitance; Tol. C: Capacitance (Tolerance); V_R: Rated Voltage; DF: Dissipation Factor; $Q_{min.}$: Q-Factor; R_{ISO}: Insulation Resistance; L: Length; W: Width; H: Height

Design Kits

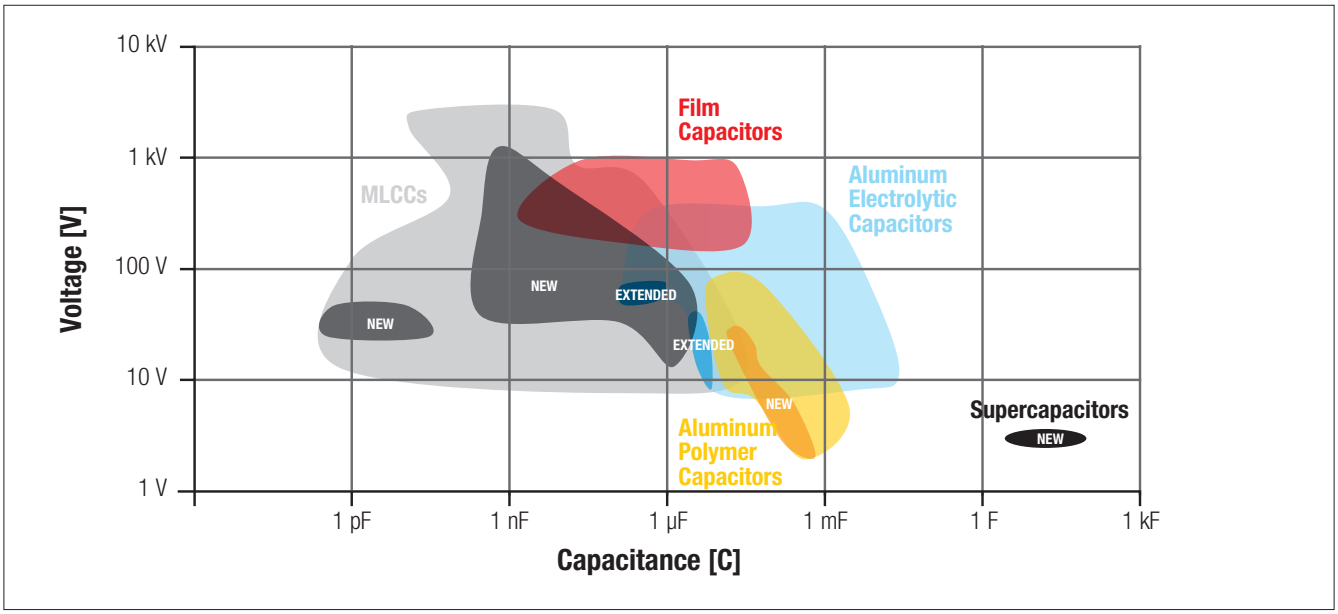
Product Category	Design Kit	Order Code	Lifelong Refill
Aluminum Electrolytic Capacitors			
	WCAP-AI3H; Aluminum Electrolytic Capacitors; Snap-In – Low Profile – 3000 h @ 105 °C	861142	✓
	WCAP-AI3H; Aluminum Electrolytic Capacitors; Snap-In – Slim Line – 3000 h @ 105 °C	861141	✓
	WCAP-AIE8; Aluminum Electrolytic Capacitors; Snap-In – Slim Line – 3000 h @85 °C	861221	✓
	WCAP-AIG5; Aluminum Electrolytic Capacitors; Snap-In – Slim Line – 2000 h @105 °C	861021	✓
	WCAP-AIG8; Aluminum Electrolytic Capacitors; Snap-In – Low Profile – 2000 h @ 85 °C	861012	✓
	WCAP-AIG8; Aluminum Electrolytic Capacitors; Snap-In – Slim Line – 2000 h @ 85 °C	861011	✓
	WCAP-AS5H; Aluminum Electrolytic Capacitors; SMT V-Chip – 5000 h @ 105 °C	865230	✓
	WCAP-ASLI; Aluminum Electrolytic Capacitors; SMT V-Chip – 2000 h @ 105 °C	865080	✓
	WCAP-ASLI; Aluminum Electrolytic Capacitors; SMT V-Chip – 2000 h @ 105 °C	865081	✓
	WCAP-ASLL; Aluminum Electrolytic Capacitors; SMT V-Chip – 2000 h to 5000 h @ 105 °C	865060	✓
	WCAP-ASLL; Aluminum Electrolytic Capacitors; SMT V-Chip – 2000 h to 5000 h @ 105 °C	865061	✓
	WCAP-ASLU; Aluminum Electrolytic Capacitors; SMT V-Chip – 1000 h @ 85 °C	865090	✓
	WCAP-ASNP; Aluminum Electrolytic Capacitors; SMT V-Chip – 2000 h @ 85 °C	865250	✓
	WCAP-AT1H; Aluminum Electrolytic Capacitors; Radial THT – 5000 h up to 10000 h @ 105 °C	860240	✓
	WCAP-AT1H; Aluminum Electrolytic Capacitors; Radial THT – 5000 h up to 10000 h @ 105 °C	860241	✓
	WCAP-ATET; Aluminum Electrolytic Capacitors; Radial THT – 1000 h up to 2000 h @ 125 °C	860130	✓
	WCAP-ATG5; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 105 °C	860020	✓
	WCAP-ATG5; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 105 °C	860021	✓
	WCAP-ATG5; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 105 °C	860022	✓
	WCAP-ATG5; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 105 °C	860023	✓
	WCAP-ATG8; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 85 °C	860012	✓
	WCAP-ATG8; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 85 °C	860011	✓
	WCAP-ATG8; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 85 °C	860013	✓
	WCAP-ATG8; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 85 °C	860010	✓
	WCAP-ATLI; Aluminum Electrolytic Capacitors; Radial THT – 2000 h up to 5000 h @ 105 °C	860082	✓
	WCAP-ATLI; Aluminum Electrolytic Capacitors; Radial THT – 2000 h up to 5000 h @ 105 °C	860080	✓
	WCAP-ATLI; Aluminum Electrolytic Capacitors; Radial THT – 2000 h up to 5000 h @ 105 °C	860081	✓
	WCAP-ATLL; Aluminum Electrolytic Capacitors; Radial THT – 3000 h up to 7000 h @ 105 °C	860160	✓
	WCAP-ATLL; Aluminum Electrolytic Capacitors; Radial THT – 4000 h up to 7000 h @ 105 °C	860161	✓
	WCAP-ATUL; Aluminum Electrolytic Capacitors; Radial THT – 5000 h up to 10000 h @ 105 °C	860040	✓

Design Kits

Product Category	Design Kit	Order Code	Lifelong Refill
Aluminum Electrolytic Capacitors			
	WCAP-ATUL; Aluminum Electrolytic Capacitors; Radial THT – 5000 h up to 10000 h @ 105 °C	860041	✓
	WCAP-ATUL; Aluminum Electrolytic Capacitors; Radial THT – 5000 h up to 10000 h @ 105 °C	860042	✓
Aluminum Polymer Capacitors			
	WCAP-PSHP; Aluminum Polymer Capacitors; SMT V-Chip – 2000 h @ 105 °C	875115	✓
	WCAP-PSLC; Aluminum Polymer Capacitors; SMT V-Chip – 2000 h @ 105 °C	875075	✓
	WCAP-PSLP; Aluminum Polymer Capacitors; SMT V-Chip – 2000 h @ 105 °C	875105	✓
	WCAP-PT5H; Aluminum Polymer Capacitors; Radial THT – 5000 h @ 105 °C	870235	✓
	WCAP-PTG5; Aluminum Polymer Capacitors; Radial THT – 2000 h @ 105 °C	870025	✓
	WCAP-PTHR; Aluminum Polymer Capacitors; Radial THT – 2000 h @ 105 °C	870055	✓
	WCAP-PTHT; Aluminum Polymer Capacitors; Radial THT – 2000 h @ 125 °C	870135	✓
MLCC			
	WCAP-CSGP; MLCC 0402, General Purpose	885050	✓
	WCAP-CSGP; MLCC 0603, General Purpose	885060	✓
	WCAP-CSGP; MLCC 0805, General Purpose	885070	✓
	WCAP-CSGP; MLCC 1206, 1210, 1812, General Purpose	885080	✓
	WCAP-CSGP; MLCC 100 V, General Purpose	885090	✓
	WCAP-CSMH; MLCC 200 V / 250 V / 500 V / 630 V, Mid and High Voltage	885341	✓
	WCAP-CSMH; MLCC 1 kV / 2 kV / 3 kV, Mid and High Voltage	885342	✓
	WCAP-CSRF; MLCC High Frequency	885390	✓
	WCAP-CSST; MLCC Soft Termination	885380	✓
DC Film Capacitors			
	WCAP-FTBE; General Purpose, MKT DC Film, 10 %	890020	✓
	WCAP-FTBP; General Purpose, MKP DC Film, 5 %	890010	✓
Safety Capacitors			
	WCAP-FTX2; MKP Film Capacitors X2 275 V_{AC}	890324	✓
	WCAP-FTXX; MKP Film Capacitors X2 310 V_{AC}	890334	✓

Product Portfolio

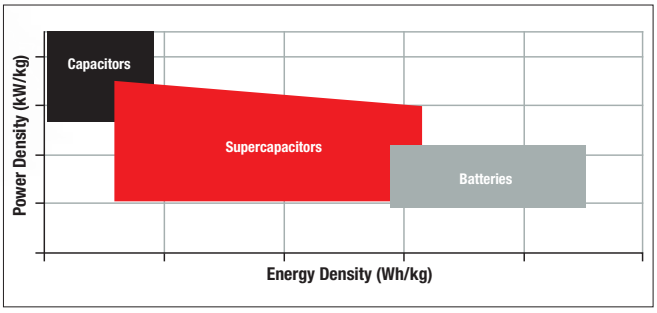
Portfolio Overview Capacitors



Supercapacitors (Electric Double Layer Capacitors – EDLCs)

Product series: WCAP-STSC

Supercapacitors close the gap between capacitors and batteries



Supercapacitors have:

- Higher power density than batteries
- Higher energy density than conventional capacitors

Features

- Large charge storing capacitance
- Ultra low equivalent series resistance (ESR)
- Provide a fast charging and discharging within seconds or minutes
- Cycle life is about 500 times and power output about 10 times higher compared to usual batteries
- Depending on the field of applications – possible replacement for batteries
- Easy to use: No battery charging circuit is required to prevent overcharging

Applications

Storage devices for power-offline periods

Hybrid application with battery

Product Portfolio

MLCCs – High Frequency

Product series: WCAP-CSRF

Designed for high frequency applications

- NP0 ceramic for high temperature stability, low equivalent series resistance and high Q characteristics
- Inner electrode consists of an exceeding conductive material

Applications

Power amplifier

Telecommunication

MLCCs – Soft Termination

Product series: WCAP-CSST

Better absorption of mechanical stress

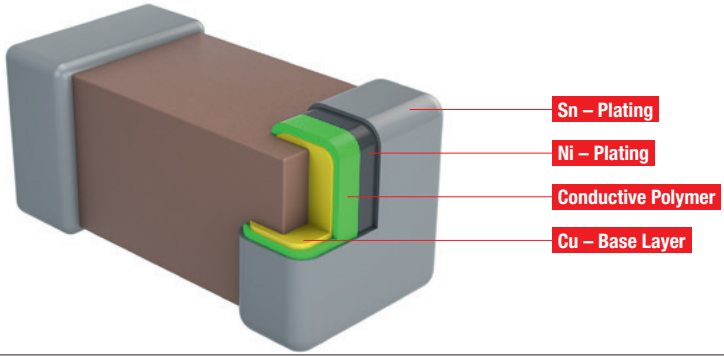
- Terminations with an additional conductive polymer layer
- Minimizes the risk of internal cracks
- More stable and robust performance during PCB handling as well as in the final application

Applications

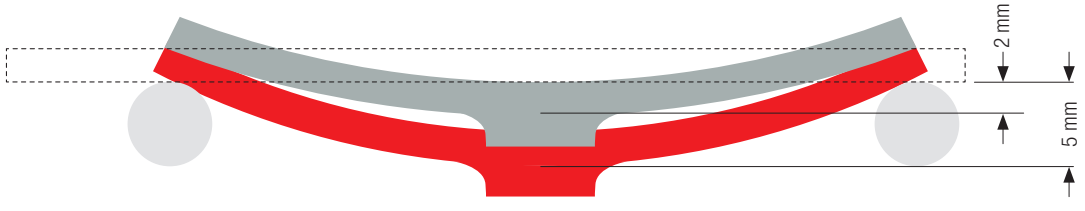
Power supply

Lighting applications

Inner structure



Board Flex up to 5 mm



WCAP-ASLU with slim diameter of 3 mm

- Low leakage current series of V-Chip SMT Aluminum Electrolytic Capacitors
- Products with a diameter of 3 mm are now available

Applications

DC/DC converter

H-Chip Aluminum Polymer Capacitors

Product series: WCAP-PHGP, WCAP-PHSE, WCAP-PHLE

Suitable alternative for tantalum capacitors & MLCCs

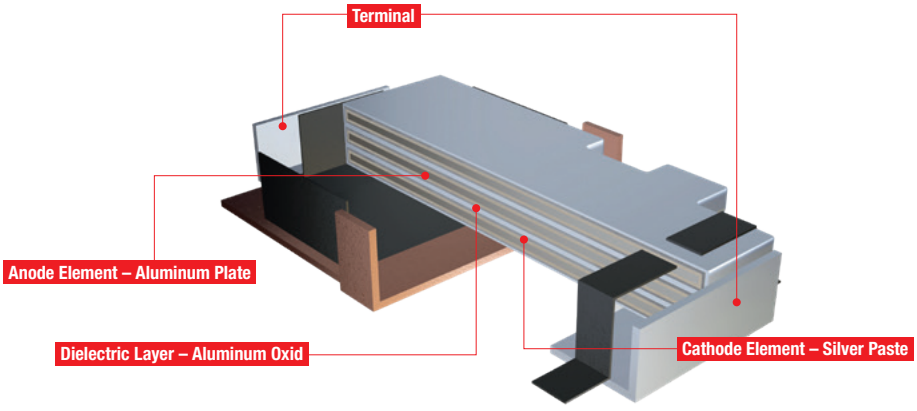
- Aluminum Polymer technology
- Low profile surface mount (SMT) package
- Extremely low ESR and ESL
- Suitable for high ripple currents

Applications

- Input and output capacitors for SMPS
- Noise suppression
- Communication infrastructures
- Servers
- Mainboards

Servers

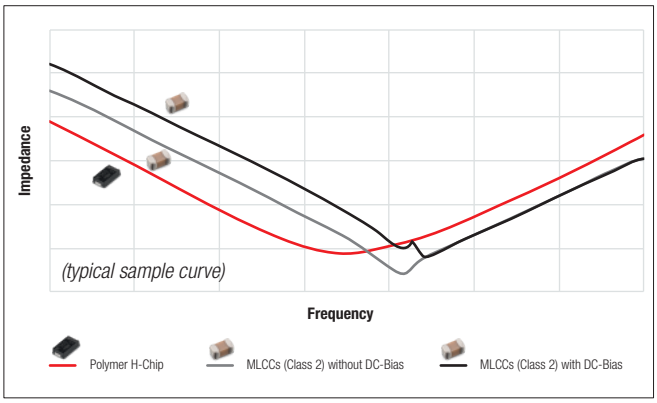
Inner Structure



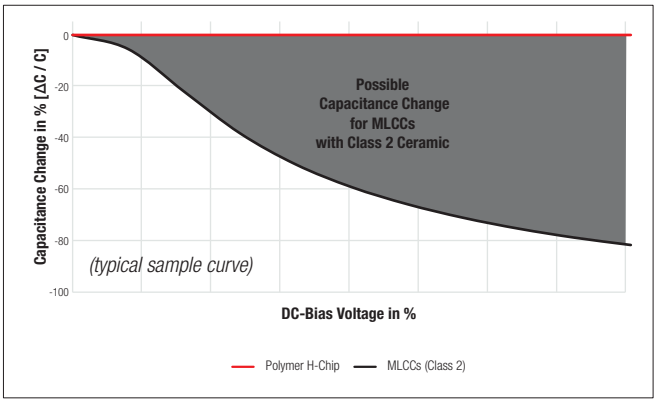
Learn more about our H-Chip Aluminum Polymer Capacitor: www.we-online.com/h-chip

Product Portfolio

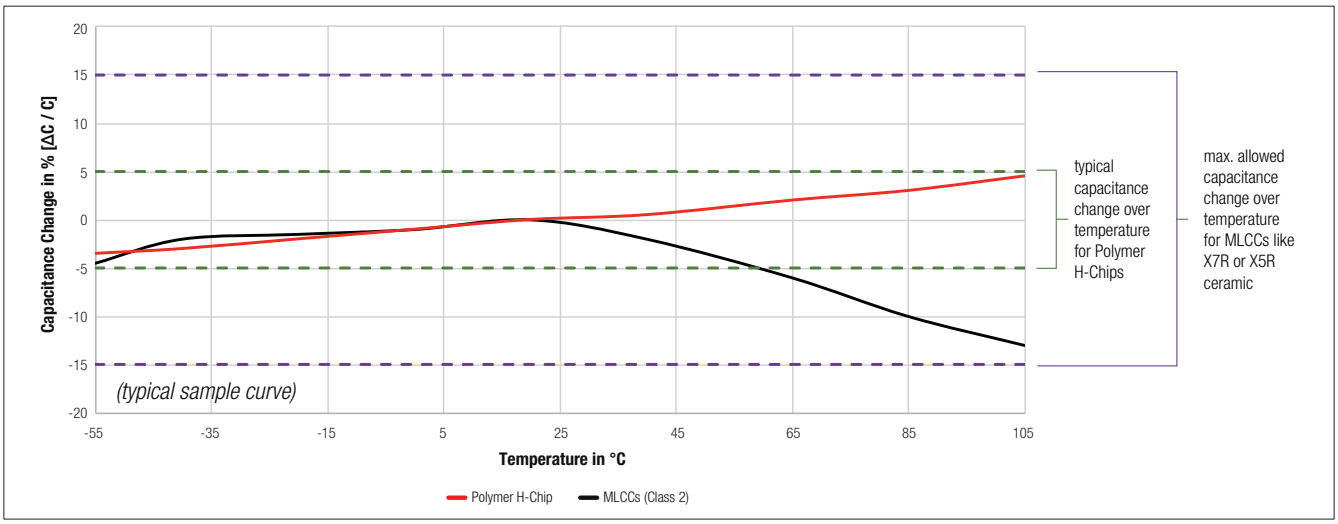
Impedance vs. Frequency



Capacitance Change vs. DC-Bias Voltage



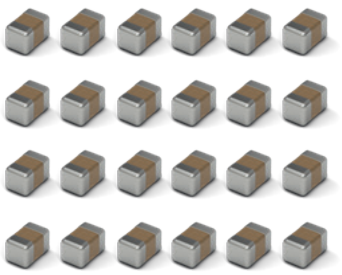
Capacitance Change vs. Temperature



Save Space on your PCB

24 x MLCCs

- P/N: 885012107006 with 47 µF
- 24 x 47 µF = 1128 µF
- V_R = 6.3 V_{DC}
- Size 0805 ➔ 2 x 1.25 mm
- **C @ 6 V_{DC} = 216 µF due to DC-Bias**
- **A = 255 mm²**



1 x H-Chip Aluminum Polymer Capacitor

- P/N: 875015119006 with 220 µF
- 1 x 220 µF = 220 µF
- V_R = 6.3 V_{DC}
- Size 2917 ➔ 7.3 x 4.3 mm
- **C @ 6 V_{DC} = 220 µF**
- **A = 44 mm²**

Expected Lifetime Calculation of Electrolytic Capacitors

The expected lifetime of a specific capacitor can be calculated based on the given endurance, maximum temperature and temperature of the application:

Aluminum Polymer Capacitors Radial THT & V-Chip SMT:

$$L_x = L_{Nom} \cdot 10^{\frac{T_{max} - T_A}{20}}$$

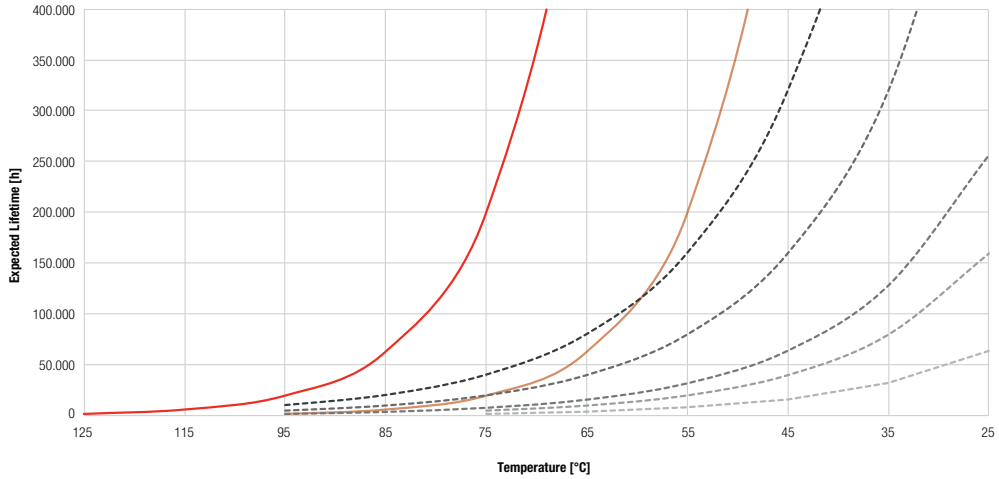
Aluminum Electrolytic Capacitors & Aluminum Polymer Capacitors H-Chip SMT:

$$L_x = L_{Nom} \cdot 2^{\frac{T_{max} - T_A}{10}}$$

L_x	= Expected lifetime of component
L_{Nom}	= Endurance of component (see datasheet)
T_{max}	= Maximum allowed temperature of component
T_A	= Component ambient temperature within application

	Aluminum Polymer Capacitors Radial THT & V-Chip SMT		Aluminum Electrolytic Capacitors & Aluminum Polymer Capacitors H-Chip SMT				
Temperature (°C)	Expected Lifetime (h)		Expected Lifetime (h)				
125	2.000	–	–	–	–	–	–
115	6.325	–	–	–	–	–	–
105	20.000	2.000	10.000	5.000	2.000	–	–
95	63.246	6.325	20.000	10.000	4.000	–	–
85	200.000	20.000	40.000	20.000	8.000	5.000	2.000
75	632.455	63.246	80.000	40.000	16.000	10.000	4.000
65	2.000.000	200.000	160.000	80.000	32.000	20.000	8.000
55	6.324.555	632.455	320.000	160.000	64.000	40.000	16.000
45	20.000.000	2.000.000	640.000	320.000	128.000	80.000	32.000
35	63.245.553	6.324.555	1.280.000	640.000	256.000	1.600.00	64.000

Expected Lifetime vs. Temperature



Aluminum Polymer Capacitors Radial THT & V-Chip SMT
— 125 °C / 2000 h
— 105 °C / 2000 h

Aluminum Electrolytic Capacitors & Aluminum Polymer Capacitors – H-Chip SMT
--- 105 °C / 10000 h
--- 105 °C / 5000 h
--- 105 °C / 2000 h
--- 85 °C / 5000 h
--- 85 °C / 2000 h

MLCCs – Multilayer Ceramic Chip Capacitors

Characteristics of Class 1 and Class 2 Ceramic Capacitors

Class 1 Ceramic Capacitors (i.e. NP0 = C0G) are characterized by a small permittivity ε_r, thus they have smaller capacitances. Their dependencies of temperature and voltage are linear and their aging is minimal.

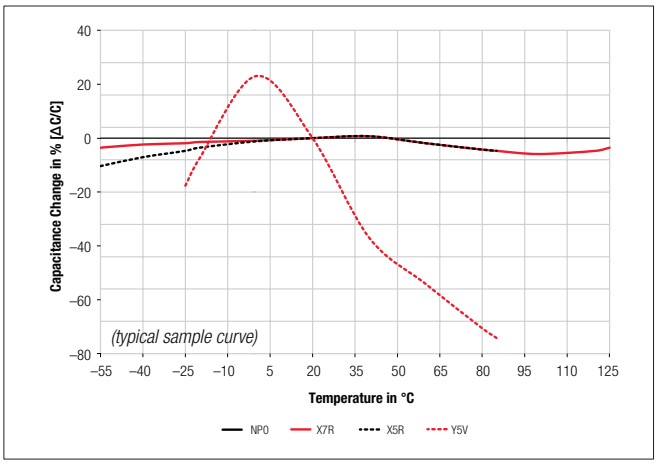
Class 2 Ceramic Capacitors (i.e. X7R, X5R, Y5V) own a higher permittivity ε_r. That is why they provide higher capacitances. Their dependencies of temperature and voltage are non-linear and they show aging behavior.

Functions and Applications Class 1 and Class 2 Ceramic Capacitors

Class 1 Ceramic Capacitors provide **high stability and low losses** for example in a resonant circuit, filter, temperature compensation and coupling applications.

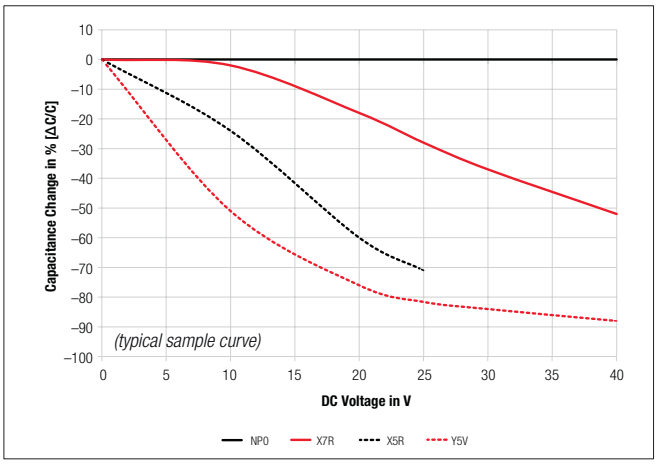
Class 2 Ceramic Capacitors provide **high volumetric capacitance** for example in smoothing, coupling, decoupling and by-pass applications.

Typical Capacitance Change vs. Temperature



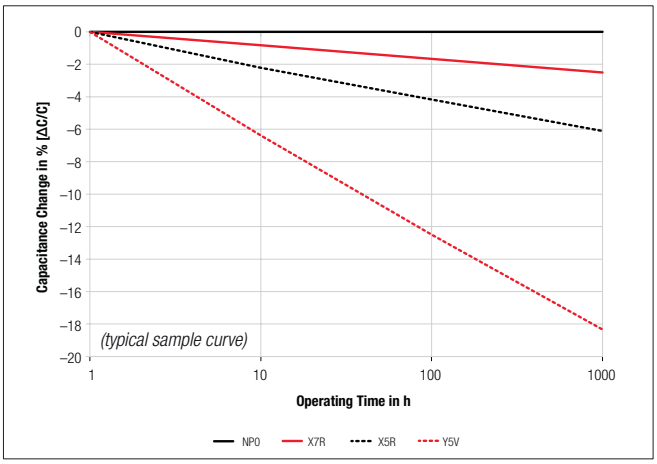
Temperature Characteristics	
Ceramic	**Operating Temperature**
NP0	-55 °C to + 125 °C
X7R	-55 °C to + 125 °C
X5R	-55 °C to + 85 °C
Y5V	-30 °C to + 85 °C

Typical Capacitance Change vs. DC Voltage*



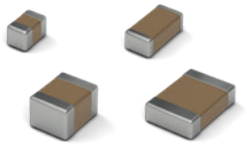
*Typical characteristics for ceramic capacitors with a rated DC voltage of 25 V (X5R) and 50 V (NP0, X7R, Y5V)

Typical Capacitance Change vs. Time



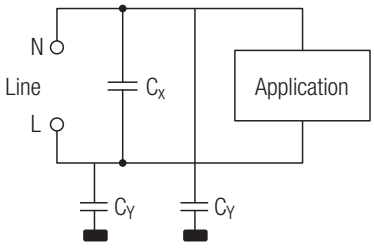
Capacitors for Interference Suppression X1/Y2, X2 MLCCs and X2 Film Capacitors

WCAP-FTX2 and WCAP-FTXX are X2 Film capacitors manufactured as metallized polypropylene (MKP) capacitors. WCAP-CSSA consists of X1/Y2 and X2 chip monolithic ceramic capacitors created with multilayer technology. All three series are used as filters in power supplies to suppress interferences.

	MLCCs – Ceramic Capacitors	Film Capacitors
		
Available series:	WCAP-CSSA	WCAP-FTX2 WCAP-FTXX
Safety class:	X1/Y2, X2	X2
Type:	SMT 1808, 1812, 2211, 2220	THT boxed
Rated Voltage:	250 V_{AC}	275 V_{AC}, 310 V_{AC}
Dielectric:	NP0, X7R	Polypropylene (PP)
Capacitance Range:	33 pF – 4.7 nF	5.6 nF – 6.8 µF
Approvals:	TUV (EN 60384-14), file numbers: R 50268363 & R 50376984 cULus, file numbers: E331896 & E345659	ENEC 10 by VDE, file number: 40038405 cULus, file number: E345659 CQC, file number: 13001104051

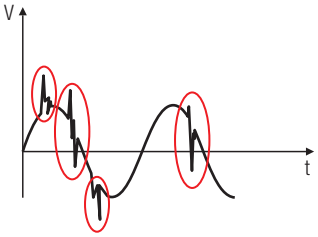
Application of X and Y Capacitors:

To filter possible spikes X capacitors (Cx) are used in parallel to the voltage source between the power lines whereas Y capacitors (Cy) are set between power line and ground.

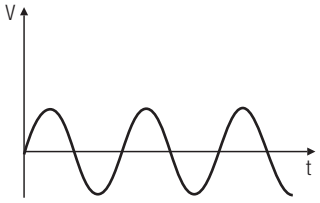


Function of X and Y Capacitors:

Voltage curve before filtering:
→ ripple on AC signal



Voltage curve after filtering:
→ grading of ripple on AC signal



Classification according to IEC 60384-14: 2013

Safety Class	Peak impulse voltage in use	Application	Peak impulse voltage applied before endurance test
X1	> 2.5 kV ≤ 4 kV	High pulse application	4 kV (C≤1 µF), $U_P = \frac{4\text{ kV}}{\sqrt{\frac{C_N (C>1\ \mu F)}{10^{-6}\ F}}}$
X2	≤ 2.5 kV	General Purpose	2.5 kV (C≤1 µF), $U_P = \frac{2.5\text{ kV}}{\sqrt{\frac{C_N (C>1\ \mu F)}{10^{-6}\ F}}}$

Safety Class	Type of bridged insulation	Range of rated voltages	Peak impulse voltage applied before endurance test
Y1	Double or reinforced	≤ 500 V	8 kV
Y2	Basic or supplemental	≥ 150 V ≤ 500 V	5 kV (C≤1 µF), $U_P = \frac{5\text{ kV}}{\sqrt{\frac{C_N (C>1\ \mu F)}{10^{-6}\ F}}}$

Supercapacitors (Electric Double Layer Capacitors – EDLCs)

How Supercapacitors can help you with Energy Storage

Design-In Steps

1st Step

Identify the mode of operation for the discharge process.

2nd Step

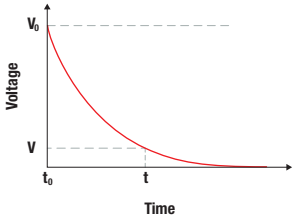
Calculate the necessary capacitance depending on the desired operation parameters such as operation time, output power and output current.

3rd Step

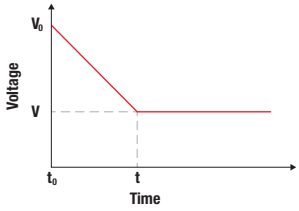
Identify the suitable charging process and calculate the charging time depending on the charging current.

Discharging Mode

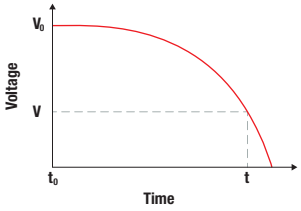
Constant Resistance



Constant Current



Constant Power

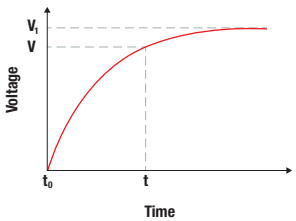


Supercapacitor (EDLC)

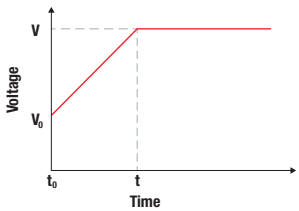
- Main device parameters are rated voltage and capacitance
- EDLCs are low voltage devices
- No constant voltage source

Charging Mode

Constant Voltage

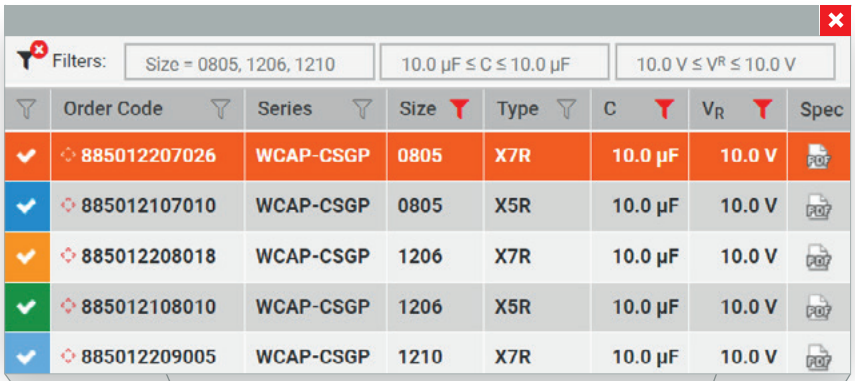


Constant Current



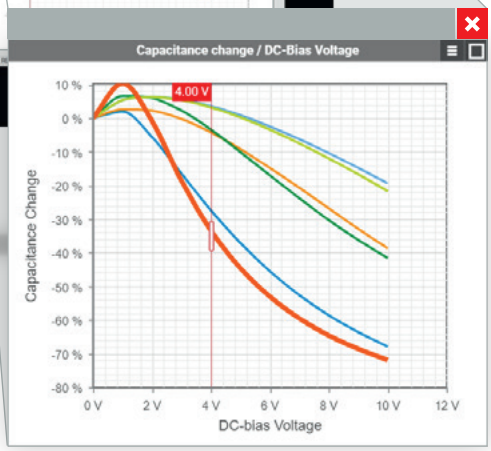
This page is only a visualization of the Design-In steps. Please use our Support Note for a more detailed Design In process: www.we-online.com/sn009

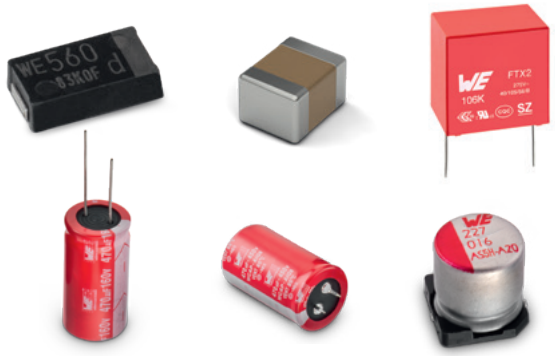
Compare and Select Capacitors in REDEXPERT



Get access to charts like ripple current vs temperature, which are only available in REDEXPERT!

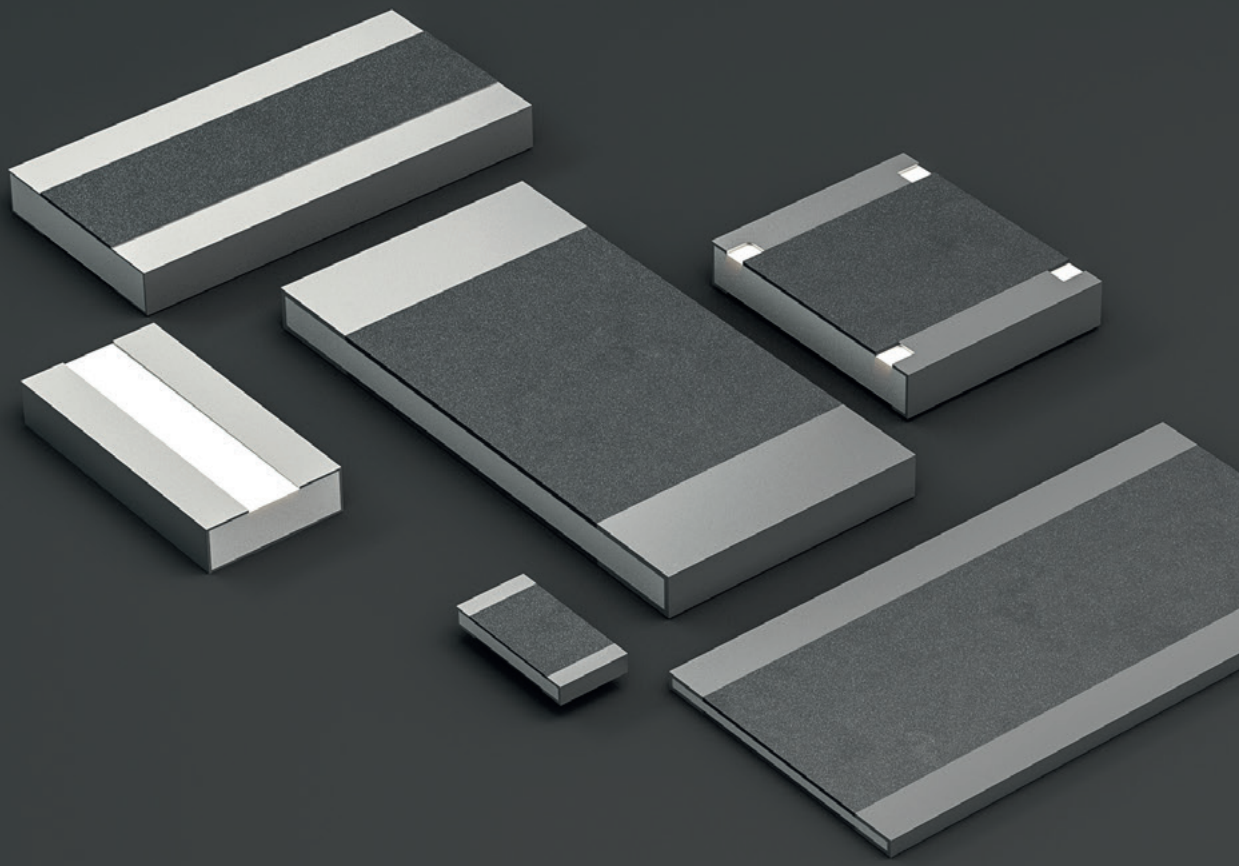
- Filter for electrical and mechanical parameters
- Download certificates (safety caps)
- Get chart data out of the lab
- More data available than in any data sheet
- Read out chart values in the product table
- Move chart marker to any x-axis value and read out the values in the product table (ripple current @ 50 °C in the shown chart)





Try it out:
www.we-online.com/redexpert-capacitors

Capacitors



1 PASSIVE COMPONENTS

Resistors

Product Overview	139
Products	140
Design Kit	147
Additional Information	148

Product Overview

How to find detailed product information?

Visit www.we-online.com and search for product series information, e.g.:

WRIS-PSMB

Metal Plate Resistors

WRIS-PSMB
Enhanced Current Sensing

R:	5 mΩ – 10 mΩ
R_{Tol}:	±1 %
P:	0.33 W up to 1 W
TCR:	±100 ppm/°C
Temp.:	-55 °C up to +155 °C

WRIS-PSMC
High Power Current Sensing

R:	2 mΩ – 10 mΩ
R_{Tol}:	±1 % / ±5 %
P:	2 W
TCR:	±100 ppm/°C
Temp.:	-55 °C up to +155 °C

WRIS-PWMC
High Power Current Sensing

R:	1 mΩ – 5 mΩ
R_{Tol}:	±1%
P:	3 W up to 6 W
TCR:	±100 ppm/°C
Temp.:	-55 °C up to +170 °C

Thick Film Resistors

WRIS-KSKE
General Purpose Current Sensing

R:	50 mΩ – 10 Ω
R_{Tol}:	±1 %
P:	0.125 W up to 1 W
TCR:	±100 / +200 / +250 / +300 ppm/°C
Temp.:	-55 °C up to +155 °C

WRIS-KWKB
High Power

R:	2.2 Ω – 18 kΩ
R_{Tol}:	±1 % / ±5 %
P:	0.75 W up to 2 W
TCR:	±200 ppm/°C
Temp.:	-55 °C up to +155 °C

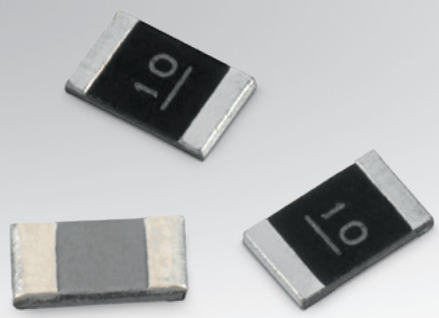
WRIS-KWKH
High Power Current Sensing

R:	100 mΩ – 620 mΩ
R_{Tol}:	±1 % / ±5 %
P:	1 W
TCR:	+200 / +250 / +350 ppm/°C
Temp.:	-55 °C up to +155 °C

All resistors at a glance:
www.we-online.com/resistors

WRIS-PSMB

Metal Plate Resistors



Extended current sensing

Characteristics:

- Product series for enhanced current sensing up to 1 W
- Mounting style: SMT-Chip (standard terminal)
- Resistance range: 5 mΩ – 10 mΩ
- Resistance tolerance: ±1 %
- Rated Power: 0.33 W – 1 W
- TCR: ±100 ppm/°C
- Operating temperature: -55 °C up to +155 °C
- Sizes: 0603 / 0805 / 2512
- Recommended soldering: Reflow

Applications:

- Motor control
- Battery pack
- DC/DC converter
- AC adapter

www.we-online.com/wris-psmb

Size 0603

Technical Data:

Order Code	R (mΩ)	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	I_R (A)	L (mm)	W (mm)	H (mm)
580060716001	5	±1 %	0.33	100	8.12	1.6	0.8	0.35
580060716002	10				5.74			0.3

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

Size 0805

Technical Data:

Order Code	R (mΩ)	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	I_R (A)	L (mm)	W (mm)	H (mm)
580060720003	5	±1 %	0.5	100	10	2	1.25	0.35
580060720008	10				7.07			0.22

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

Size 2512

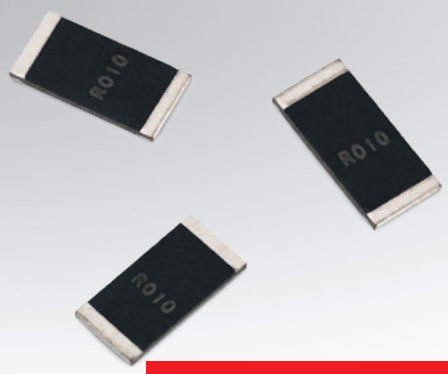
Technical Data:

Order Code	R (mΩ)	Tol. R	P_{Rated} (W)	TCR (ppm/ °C)	I_R (A)	L (mm)	W (mm)	H (mm)
580060763005	7	±1%	1	100	12	6.3	3.1	0.35

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

WRIS-PSMC

Metal Plate Resistors



High power current sensing

Characteristics:

- Product series for high power current sensing up to 2 W
- Mounting style: SMT chip (standard terminal)
- Resistance range: 2 mΩ – 10 mΩ
- Resistance tolerance: ±1 %; ±5 %
- Rated power: 2 W
- TCR: ±100 ppm/°C
- Operating temperature: -55°C up to +155°C
- Size: 2512
- Recommended soldering: Reflow

Applications:

- Ignition coil & ingiter
- Motor control
- Inverter
- Battery pack

www.we-online.com/wris-psmc

Size 2512

Technical Data:

Order Code	R (mΩ)	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	I_R (A)	L (mm)	W (mm)	H (mm)
580070763001	2	±1 %	2	100	31.62	6.3	3.1	0.58
580070763021	2	±5 %			31.62			0.58
580070763005	5	±1 %			20			0.51
580070763010	10	±1 %			14.14			0.35

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

WRIS-PWMC

Metal Plate Resistors

High power current sensing

Characteristics:

- Product series for high power current sensing up to 6 W
- High operating temperature
- Mounting style: SMT chip (wide terminal)
- Resistance range: 1 mΩ – 5 mΩ
- Resistance tolerance: ± 1 %
- Rated power: 3 W – 6 W
- TCR: ±100 ppm/°C
- Operating temperature: -55 °C up to +170 °C
- Sizes: 1225 / 2043
- Recommended soldering: Reflow

Applications:

- Ignition coil & igniter
- Inverter

www.we-online.com/wris-pwmc

Size 1225

Technical Data:

Order Code	R (mΩ)	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	I_R (A)	L (mm)	W (mm)	H (mm)
581070763001	1	±1 %	3	100	54.77	3.2	6.3	0.2
581070763005	5				24.49			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

Size 2043

Technical Data:

Order Code	R (mΩ)	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	I_R (A)	L (mm)	W (mm)	H (mm)
581070768001	1	±1 %	6	100	77.46	5	11	0.2
581070768005	5				34.6			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

WRIS-KSKE

Thick Film Resistors

General purpose current sensing

Characteristics:

- General purpose current sensing product series
- Mounting style: SMT chip (standard terminal)
- Resistance range: 50 mΩ – 10 Ω
- Resistance tolerance: ±1 %
- Rated power: 0.125 W – 1 W
- TCR: ±100; +200; +250; +300 ppm/°C
- Operating temperature: -55 °C up to +155 °C
- Sizes: 0402 / 0603 / 0805 / 1206 / 2010 / 2512
- Recommended soldering: Reflow

Applications:

- DC/DC converter
- Camera; night vision device
- Battery management for mobile phones
- Electric motor control

www.we-online.com/wris-kske

Size 0402

Technical Data:

Order Code	R	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	I_R (A)	L (mm)	W (mm)	H (mm)
560050310002	150 mΩ	±1 %	0.125	300	0.91	1	0.5	0.35
560050310010	500 mΩ			200	0.5			
560050310009	10 Ω			100	0.11			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

Size 0603

Technical Data:

Order Code	R	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	I_R (A)	L (mm)	W (mm)	H (mm)
560050316001	100 mΩ	±1 %	0.25	250	1.58	1.6	0.8	0.45
560050316011	500 mΩ			100	0.7			
560050316012	10 Ω			100	0.15			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

Size 0805

Technical Data:

Order Code	R	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	I_R (A)	L (mm)	W (mm)	H (mm)
560050320001	100 mΩ	±1 %	0.33	250	1.81	2	1.25	0.6
560050320003	270 mΩ			200	1.1			
560050320011	1 Ω			100	0.57			
560050320007	2.2 Ω			100	0.38			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

WRIS-KSKE

Thick Film Resistors

Size 1206

Technical Data:								
Order Code	**R**	**Tol. R**	**P_{Rated} (W)**	**TCR (ppm/°C)**	**I_R (A)**	**L (mm)**	**W (mm)**	**H (mm)**
560050332001	50 mΩ	±1 %	0.5	250	3.16	3.1	1.6	0.6
560050332013	500 mΩ			100	1			
560050332011	3.3 Ω			100	0.38			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

Size 2010

Technical Data:								
Order Code	**R (mΩ)**	**Tol. R**	**P_{Rated} (W)**	**TCR (ppm/°C)**	**I_R (A)**	**L (mm)**	**W (mm)**	**H (mm)**
560050350011	200	±1 %	0.75	200	1.93	5	2.5	0.6
560050350012	390				1.38			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

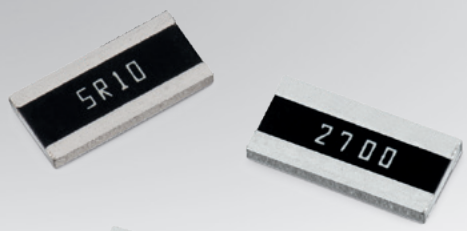
Size 2512

Technical Data:								
Order Code	**R**	**Tol. R**	**P_{Rated} (W)**	**TCR (ppm/°C)**	**I_R (A)**	**L (mm)**	**W (mm)**	**H (mm)**
560050363011	500 mΩ	±1 %	1	100	1.41	6.3	3.2	0.6
560050363012	3.3 Ω				0.55			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

WRIS-KWKB

Thick Film Resistors



High power

Characteristics:

- Product series for high power up to 2 W
- Mounting style: SMT chip (wide terminal)
- Resistance range: 2.2 Ω – 18 kΩ
- Resistance tolerance: ±1 %; ±5 %
- Rated power: 0.75 W – 2 W
- TCR: ±200 ppm/°C
- Operating temperature: -55 °C up to +155 °C
- Sizes: 0612 / 1020 / 1225
- Recommended soldering: Reflow

Applications:

- Electric motor
- Camera
- Lighting control
- TV

www.we-online.com/wris-kwkb

Size 0612

Technical Data:

Order Code	R	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	V_R (V)	L (mm)	W (mm)	H (mm)
561020132004	47 Ω	±5 %	0.75	200	5.9	1.6	3.2	0.55
561020132008	100 Ω	±1 %			8.7			
561020132009	100 Ω	±5 %			8.7			
561020132010	110 Ω	±5 %			9.1			
561020132011	120 Ω	±1 %			9.5			
561020132014	240 Ω	±1 %			13.4			
561020132023	470 Ω	±5 %			18.8			
561020132030	1.2 kΩ	±1 %			30			
561020132031	1.5 kΩ	±1 %			33.5			
561020132032	1.8 kΩ	±1 %			36.7			
561020132034	2.2 kΩ	±1 %			40.6			
561020132037	2.7 kΩ	±1 %			45			
561020132059	18 kΩ	±1 %			116.2			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); V_R: Rated Voltage; L: Length; W: Width; H: Height

Size 1020

Technical Data:

Order Code	R (Ω)	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	V_R (V)	L (mm)	W (mm)	H (mm)
561020150010	270	±1 %	1	200	16.4	2.5	5	0.55

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); V_R: Rated Voltage; L: Length; W: Width; H: Height

Size 1225

Technical Data:

Order Code	R (Ω)	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	V_R (V)	L (mm)	W (mm)	H (mm)
561020163016	2.2	±1 %	2	200	2.1	3.2	6.3	0.55
561020163017	5.1	±1 %			3.2			
561020163018	10	±1 %			4.5			
561020163011	270	±1 %			23.2			
561020163012	430	±5 %			29.3			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); V_R: Rated Voltage; L: Length; W: Width; H: Height

WRIS-KWKH

Thick Film Resistors

High power current sensing

Characteristics:

- Product series for high power current sensing up to 1 W
- Mounting style: SMT chip (wide terminal)
- Resistance range: 100 mΩ – 620 mΩ
- Resistance tolerance: ±1 % / ±5 %
- Rated power: 1 W
- TCR: +200; +250; +350 ppm/°C
- Operating temperature: -55 °C up to +155 °C
- Sizes: 0612 / 1020
- Recommended soldering: Reflow

Applications:

- DC/DC converter
- Camera
- Night vision device
- TV
- Lighting

www.we-online.com/wris-kwkh

Size 0612

Technical Data:

Order Code	R (mΩ)	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	I_R (A)	L (mm)	W (mm)	H (mm)
561070332051	100	±1 %	1	350	3.2	1.6	3.2	0.55
561070332055	150	±1 %		350	2.6			
561070332057	180	±1 %		350	2.4			
561070332092	240	±5 %		250	2			
561070332071	330	±1 %		250	1.7			
561070332096	330	±5 %		250	1.7			
561070332076	470	±1 %		250	1.5			
561070332078	510	±1 %		200	1.4			
561070332079	560	±1 %		200	1.3			
561070332080	600	±1 %		200	1.3			
561070332081	620	±1 %		200	1.3			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

Size 1020

Technical Data:

Order Code	R (mΩ)	Tol. R	P_{Rated} (W)	TCR (ppm/°C)	I_R (A)	L (mm)	W (mm)	H (mm)
561070350055	150	±1 %	1	350	2.58	2.5	5	0.55
561070350077	500			200	1.41			
561070350078	510			200	1.4			

R: Resistance; Tol. R: Resistance Tolerance; P_{Rated}: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I_R: Rated Current; L: Length; W: Width; H: Height

Design Kits

Product Category	Design Kit	Order Code	Lifelong Refill
Resistors			
	WRIS-KWKB / WRIS-KSKE / WRIS-KWKH / WRIS-PSMB / WRIS-PSMC; Current Sensing Resisitors; SMT	560000	✓

Current Sense Resistors

Product Portfolio

How does Current Sensing work?

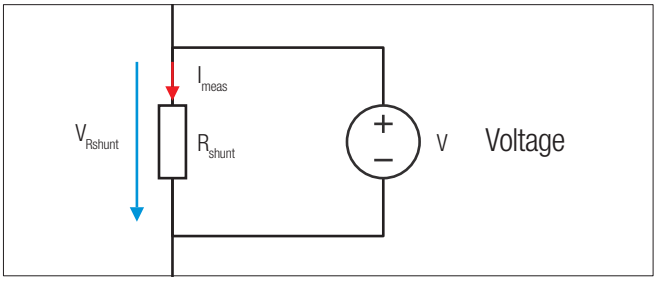
- Using a resistor within the circuit of the application to make the current measurable (called: shunt)
- The current through such a resistor generates a proportional voltage drop according to **Ohm's Law**:

$$I_{meas} = \frac{V_{Rshunt}}{R_{shunt}}$$

- Very low resistance values are used to generate a low voltage drop up to a few hundred mV
- In case of low currents, very precise resistance values and an amplifying circuit have to be used to get stable measurements, because of the very small voltage drop

Metal Plate Resistors

Thick Film Resistors



Example Calculation for a shunt*

Given:

- $I_0 = 10$ A
- We want to measure a voltage drop of 50 mV

Searched:

- Shunt, which is required to measure 50 mV
- Power loss, which will be caused by the shunt

Formulas:

$$\text{Shunt } R = \frac{U}{I} \qquad \text{Power Loss } P = U \cdot I = I^2 \cdot R$$

Calculation:

Shunt, which is required:

$$R_{Shunt} = \frac{U}{I} = \frac{50\text{ mV}}{10\text{ A}} = 0.005\ \Omega = \mathbf{5\ m\Omega}$$

Power loss of the shunt:

$$P_{Loss} = I^2 \cdot R = 10^2\text{ A} \cdot 5\ m\Omega = \mathbf{0.5\ W}$$

*Calculation is only an example, for application specific calculation or detailed support, please contact our technical support.

Where do I use Current Sense Resistors?

Current Control

- Used to detect and control the current on each phase and time and at any time
- To arrange a feedback for the control circuit

Applications

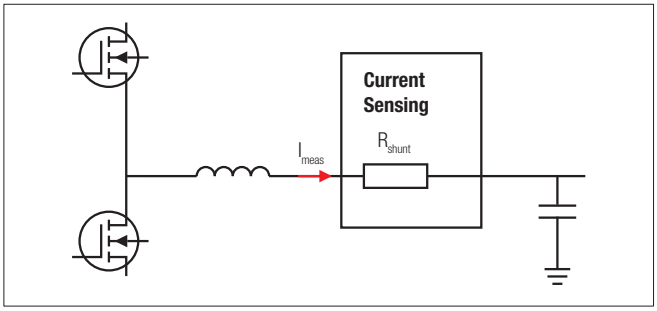
- Motor control
- DC/DC converter
- Power supply inverter

DC/DC converter

Power supply

Overcurrent Sensing & Detection

- Overcurrent within the circuit can cause malfunctions and failures
- Measured current is higher than the max. defined current
  ➔ the system will detect a failure state



Applications

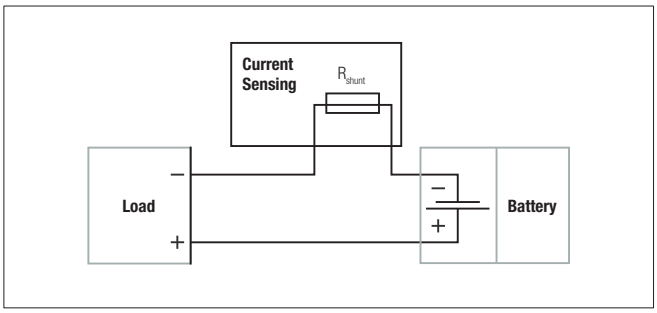
- Motor control
- Battery control
- Power supply protection

Battery control

Power supply protection

Current Management

- Especially for systems using secondary batteries
- Monitoring current or voltage level of a battery, to know the remaining power level and to keep the system properly operating
- Real-time measurement to monitor the power level and charging status



Applications

- Electric vehicles
- Mobile devices
- Computer devices

Electric vehicles

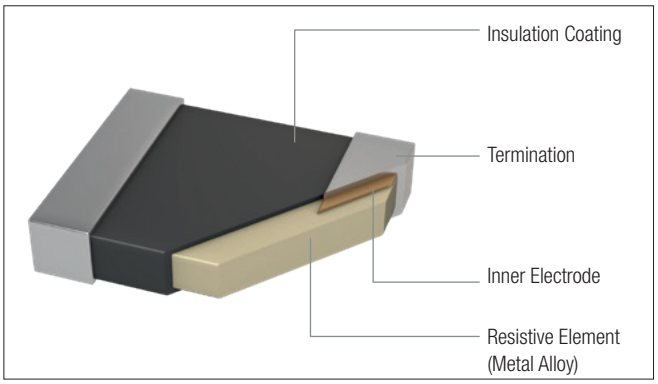
Mobile devices

Resistors

Types of Resistors and Selection

Which Type of Resistors do I need?

Metal Plate Resistors



- Current detection of a few tens of amperes
- Ultra low resistance values (up to 10 mΩ)

Features

- Superior abilities in case of power, temperature characteristics, linearity, accuracy and current-noise suppression level
- Stability and robustness make them suitable for current sensing applications

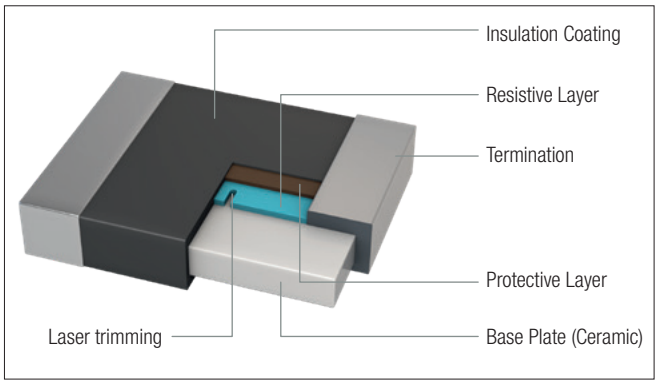
Construction

- Consists of a metal plate as core material
- Metal plate is covered with an isolated layer
- Termination consists from the inside out of a copper, nickel and tin layer

Available Product Series

- Standard Terminal:
  – WRIS-PSMB – Enhanced Current Sensing (max. 0.5 W
  – WRIS-PSMC – High Power Current Sensing (max. 2 W)
- Wide Terminal:
  – WRIS-PWMC – High Power Current Sensing (max. 6 W)

Thick Film Resistors



- Current detection of small current levels
- Low to mid level resistance values (a few hundred mΩ up to a few Ω)

Features

- For applications with general purpose and less precise low current measurements
- High cost efficiency, but less accurate as Metal Plate Resistors

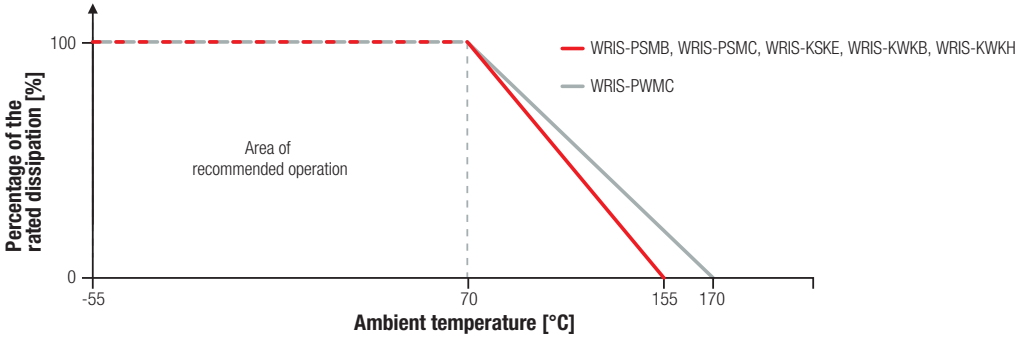
Construction

- Consists of a ceramic body as basis
- On one site of the ceramic body is a printed metal layer
- Metal layer is trimmed down by laser to the desired resistance value
- Part is coated with an isolated layer

Available Product Series

- Standard Terminal:
  – WRIS-KSKE – General Purpose Current Sensing (max. 1 W)
- Wide Terminal:
  – WRIS-KWKH – High Power Current Sensing (max. 1 W)
  – WRIS-KWKB – High Power (max. 2 W)

Derating curves



2 OPTOELECTRONICS

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Product Overview

How to find detailed product information?

Visit www.we-online.com and search for product series information, e.g.:

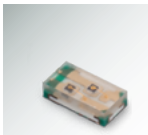
WL-SMCC

Visible LEDs

Chip LEDs

WL-SMCC SMD Mono-color Chip LED Compact

Size:	0402, 0603
$\lambda_{DOM\ typ}$:	470 – 630 nm
$I_{V\ typ}$:	50-800 mcd
$V_{F\ typ}$:	2.0 – 3.2 V
Emitting color:	Super Red, Red, Amber, Yellow, Bright Green, Green, Blue



WL-SBCC SMD Bi-Color Chip LED Compact

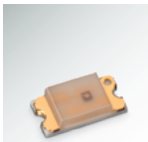
Size:	0603
$\lambda_{DOM\ typ}$:	570 – 625 nm
$I_{V\ typ}$:	30 – 60 mcd
$V_{F\ typ}$:	2 V
Emitting color:	Red/Bright Green

WL-SFCC SMD Full-color Chip LED Compact

Size:	0404
$\lambda_{DOM\ typ}$:	470 – 621 nm
$I_{V\ typ}$:	50 – 180 mcd
$V_{F\ typ}$:	2 – 2.8 V
Emitting color:	Red, Green, Blue

WL-SMCW SMD Mono-color Chip LED Waterclear

Size:	0603, 0805, 1206
$\lambda_{DOM\ typ}$:	470-630 nm
$I_{V\ typ}$:	40 – 450 mcd
$V_{F\ typ}$:	1.9 – 3.2 V
Emitting color:	Super Red, Red, Amber, Yellow, Bright Green, Green, Blue



WL-SMCD SMD Mono-color Chip LED Diffused

Size:	0603
$\lambda_{DOM\ typ}$:	470 – 630 nm
$I_{V\ typ}$:	60 – 430 mcd
$V_{F\ typ}$:	2.0 – 3.2 V
Emitting color:	Super Red, Red, Yellow, Bright Green, Green, Blue

Chip LEDs

Extended

WL-SBCW SMD Bi-color Chip LED Waterclear

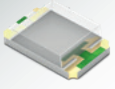
Size:	0606, 1210
$\lambda_{DOM\ typ}$:	520 – 630 nm
$I_{V\ typ}$:	30 – 560 mcd
$V_{F\ typ}$:	2 – 3.2 V
Emitting color:	Super Red/Bright Green, Yellow/Bright Green, Red, Green

WL-SFCW SMD Full-color Chip LED Waterclear

Size:	0606, 0805, 1206, 1210
$\lambda_{DOM\ typ}$:	470 – 624 nm
$I_{V\ typ}$:	70 – 360 mcd
$V_{F\ typ}$:	1.9 – 3.3 V
Emitting color:	Red, Green, Blue

WL-SFCD SMD Full-color Chip LED Diffused

Size:	0606, 0805, 1210
$\lambda_{DOM\ typ}$:	470 – 624 nm
$I_{V\ typ}$:	70 – 900 mcd
$V_{F\ typ}$:	2 – 3.3 V
Emitting color:	Red, Green, Blue



WL-SBCD SMD Bi-color Chip LED Diffused

Size:	0606, 0805
$\lambda_{DOM\ typ}$:	573 – 624 nm
$I_{V\ typ}$:	60 – 18 mcd
$V_{F\ typ}$:	2 – 3.3 V
Emitting color:	Red, Super Red, Green, Bright Green, Yellow

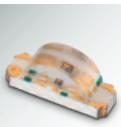
Chip LED Side View

WL-SMSW SMD Mono-color Side view Waterclear

Size:	0603, 3014, 1204
$\lambda_{DOM\ typ}$:	470 – 624 nm
$I_{V\ typ}$:	50 – 600 mcd
$V_{F\ typ}$:	2 – 3.4 V
Emitting color:	Red, Yellow, Bright Green, Green, Blue

WL-SBSW SMD Bi-color Side view Waterclear

Size:	1204
$\lambda_{DOM\ typ}$:	525 – 624 nm
$I_{V\ typ}$:	30 – 160 mcd
$V_{F\ typ}$:	2 – 3.3 V
Emitting color:	Red/Bright Green, Red/Green

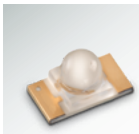


WL-SFSW SMD Full-color Side view Waterclear

Size:	1204
$\lambda_{DOM\ typ}$:	465 – 622 nm
$I_{V\ typ}$:	140 – 850 mcd
$V_{F\ typ}$:	2 – 3 V
Emitting color:	Red, Green, Blue

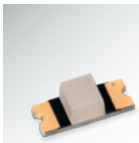
Visible LEDs

Chip LED Reverse Mount



WL-SMRW SMD Mono-color Reverse mount Waterclear

Size:	1205 (rectangular), 1206 (rectangular, cylindrical, dome)
$\lambda_{DOM\ typ}$:	470 – 630 nm
$I_{V\ typ}$:	30 – 2200 mcd
$V_{F\ typ}$:	2 – 3.3 V
Emitting color:	Super Red, Red, Amber, Yellow, Bright Green, Green, Blue



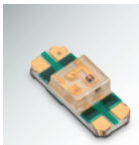
WL-SMRD SMD Mono-color Reverse mount Diffused

Size:	1205
$\lambda_{DOM\ typ}$:	470 – 624 nm
$I_{V\ typ}$:	40 – 200 mcd
$V_{F\ typ}$:	2 – 3.3 V
Emitting color:	Red, Yellow, Bright Green, Green, Blue

Extended

WL-SBRW SMD Bi-color Reverse mount Waterclear

Size:	1205
$\lambda_{DOM\ typ}$:	470 – 624 nm
$I_{V\ typ}$:	45 – 285 mcd
$V_{F\ typ}$:	2 – 3.3 V
Emitting color:	Red/Green, Red/Bright Green, Red/Blue, Yellow/Bright Green



WL-SFRW SMD Full-color Reverse mount Waterclear

Size:	1205, 1206
$\lambda_{DOM\ typ}$:	470 – 624 nm
$I_{V\ typ}$:	70 – 280 mcd
$V_{F\ typ}$:	2 – 3.3 V
Emitting color:	Red, Green, Blue

THT Round

WL-TMRW THT Mono-color Round Waterclear

Size:	3 mm (with/without stopper) 5 mm (with/without stopper)
$\lambda_{DOM\ typ}$:	470 – 623 nm
$I_{V\ typ}$:	1500 – 15000 mcd
$V_{F\ typ}$:	1.9 – 3.4 V
Emitting color:	Red, Yellow, Green, Blue

WL-TMRC THT Mono-color Round Color

Size:	3 mm (without stopper) 5 mm (without stopper)
$\lambda_{DOM\ typ}$:	470 – 645 nm
$I_{V\ typ}$:	30 –500 mcd
$V_{F\ typ}$:	2 – 3.2 V
Emitting color:	Red, Super Red, Yellow, Bright Green, Blue

TOP LED

Extended

WL-SMTW SMD Mono-color TOP LED Waterclear

Size:	2214, 3020, 2835, 3528, 5050
$\lambda_{DOM\ typ}$:	465 – 636 nm
$I_{V\ typ}$:	70 – 3500 mcd
$V_{F\ typ}$:	2 – 3.2 V
Emitting color:	Super Red, Red, Amber, Yellow, Bright Green, Green, Blue

Extended

WL-SMTD Mono-color TOP LED Diffused

Size:	3528
$\lambda_{DOM\ typ}$:	470 – 630 nm
$I_{V\ typ}$:	4200 – 30000 mcd
$V_{F\ typ}$:	2.4 – 3.2 V
Emitting color:	Super Red, Red, Yellow,Green, Blue

WL-SBTW SMD- Bi-color TOP LED Waterclear

Size:	3528
$\lambda_{DOM\ typ}$:	470 – 625 nm
$I_{V\ typ}$:	60 – 260 mcd
$V_{F\ typ}$:	2 – 3.2 V
Emitting color:	Red/Blue, Red/Bright Green, Yellow/Blue, Yellow/Bright Green

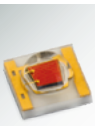
WL-SFTW SMD Full-color TOP LED Waterclear

Size:	3528 , 5050
$\lambda_{DOM\ typ}$:	470 – 625 nm
$I_{V\ typ}$:	230 – 1.700 mcd
$V_{F\ typ}$:	2 – 3.2 V
Emitting color:	Red, Green, Blue

WL-STFD SMD Full-color TOP LED Diffused

Size:	1616, 2022, 2828, 3535
$\lambda_{DOM\ typ}$:	470 – 625 nm
$I_{V\ typ}$:	400 – 1900 mcd
$V_{F\ typ}$:	2 – 3.2 V
Emitting color:	Red, Green, Blue

High Power Ceramic



WL-SMDC SMD Mono-color Ceramic LED Waterclear

Size:	3535
$\lambda_{DOM\ typ}$:	460 – 625 nm
$\Phi_{V\ typ}$:	25 – 85 lm
$V_{F\ typ}$:	2 – 3.4 V
Emitting color:	Red, Yellow, Green, Blue

WL-SMDC Mono-color Ceramic LED Waterclear Horticulture

Size:	3535
$\lambda_{DOM\ typ}$:	450 – 730 nm
$\Phi_{V\ typ}$:	Radiant 240 – 600 mW
$V_{F\ typ}$:	1.8 – 3.2 V
Emitting color:	Far Red, Hyper Red, Deep Blue

White LEDs

TOP LED

Extended

WL-SWTP SMD White Top view PLCC

Size:	3014, 3022, 3030, 5630
CCT:	2700 – 6000 K
$\Phi_{V\ typ}$:	7 – 39 lm
$V_{F\ typ}$:	2.8 – 3.2 V
Emitting color:	Sunrise, Warm White, Moonlight, Daylight, Cool White

High Power Ceramic

WL-SWTC SMD White Top view Ceramic LED

Size:	3535
CCT:	4000 – 6000 K
$\Phi_{V\ typ}$:	121 – 135 lm
$V_{F\ typ}$:	3.2 V
Emitting color:	Moonlight, Daylight, Cool White

Ultraviolet LEDs

High Power Ceramic

WL-SUMW SMD Ultraviolet Ceramic Waterclear

Size:	3535
λ_{Peak}:	365 – 405 nm
I_e:	650 – 1100 mW
$V_{F\ typ}$:	3.5 V

Product Overview

Infrared

Infrared Emitter

Chip LED

WL-SICW SMD Infrared Chip LED Waterclear

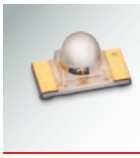
Size:	0402, 0603, 0805, 1206
$\lambda_{Centroid}$:	850, 940 nm
$I_{e\,typ}$:	0.8 – 2 mW/sr
$V_{F\,typ}$:	1.2 – 1.4 V

Chip LED Side View

WL-SISW SMD Infrared Sideview LED Waterclear

Size:	0402, 1002, 1104, 1106, 1206
$\lambda_{Centroid}$:	850, 940 nm
$I_{e\,typ}$:	1 – 11 mW/sr
$V_{F\,typ}$:	1.2 – 1.6 V

Chip LED Reverse Mount



WL-SIRW SMD Infrared Reverse mount Waterclear

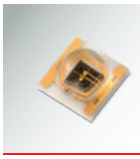
Size:	1206 (dome)
$\lambda_{Centroid}$:	850, 940 nm
$I_{e\,typ}$:	5 – 20 mW/sr
$V_{F\,typ}$:	1.2 – 1.4 V

TOP LED

WL-SITW SMD Infrared TOP LED Waterclear

Size:	3528
$\lambda_{Centroid}$:	845, 940 nm
$I_{e\,typ}$:	8 – 9 mW/sr
$V_{F\,typ}$:	1.4 – 1.5 V

High Power Ceramic



WL-SIMW SMD Infrared Ceramic Waterclear

Size:	3535
$\lambda_{Centroid}$:	850, 940 nm
$I_{e\,typ}$:	220 – 350 mW/sr
$V_{F\,typ}$:	1.9 – 2.2 V

High Power QFN

NEW

WL-SIWQ

Size:	2720, 3535, 3737
$\lambda_{Centroid}$:	845 – 935 nm
$I_{e\,typ}$:	125 – 800 mW/sr
$V_{F\,typ}$:	1.8 – 3.2 V

THT Infrared Round

WL-TIRW THT Infrared Round Waterclear

Size:	3 mm (without stopper) 5 mm (without stopper)
$\lambda_{Centroid}$:	845, 940 nm
$I_{e\,typ}$:	30 – 85 mW/sr
$V_{F\,typ}$:	1.3 – 1.5 V

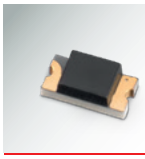
THT Infrared Round Color

WL-TIRC

Size:	3 mm (without stopper) 5 mm (without stopper)
$\lambda_{Centroid}$:	845, 940 nm
$I_{e\,typ}$:	30 – 85 mW/sr
$V_{F\,typ}$:	1.2 – 1.4 V

Photodiodes

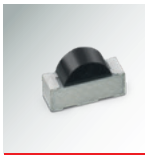
Chip Top View



WL-SDCB SMT Photodiode Chip Black

Size:	0805, 1206
λ_{Peak}:	940 nm
$I_{P\,typ}$:	1.8 µA
$I_{D\,max.}$:	10 nA

Chip Side View



WL-SDSB SMT Photodiode Sideview Black

Size:	1002, 1104
λ_{Peak}:	940 nm
$I_{P\,typ}$:	2.5 µA
$I_{D\,max.}$:	10 nA

THT Round

WL-TDRW THT Photodiode Round Waterclear

Size:	3 mm (without stopper) 5 mm (without stopper)
λ_{Peak}:	940 nm
$I_{P\,typ}$:	28 µA
$I_{D\,max.}$:	30 nA

WL-TDRB THT Photodiode Round Black

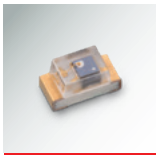
Size:	3 mm (without stopper) 5 mm (without stopper)
λ_{Peak}:	940 nm
$I_{P\,typ}$:	31 µA
$I_{D\,max.}$:	30 nA

All Optoelectronic Components at a glance:
www.we-online.com/optoelectronic

Explore our application notes for Optoelectronics:
www.we-online.com/appnotes

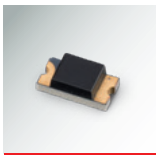
Phototransistors

Chip Top View



WL-STCW SMT Phototransistor Chip Waterclear

Size:	0603, 0805, 1206
λ_{Peak}:	940 nm
$I_{CE,\ p.\ typ.}$:	1.6 mA
$I_{CEO,\ Dark\ max.}$:	100 nA



WL-STCB SMT Phototransistor Chip Black

Size:	0603, 1206
λ_{Peak}:	940 nm
$I_{CE,\ p.\ typ.}$:	1.2 mA
$I_{CEO,\ Dark\ max.}$:	100 nA

Chip Side View

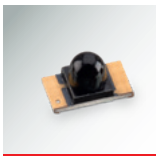
WL-STSW SMT Phototransistor Sideview Waterclear

Size:	1104
λ_{Peak}:	940 nm
$I_{CE,\ p.\ typ.}$:	2.5 mA
$I_{CEO,\ Dark\ max.}$:	100 nA

WL-STSB SMT Phototransistor Chip Black

Size:	1002
λ_{Peak}:	940 nm
$I_{CE,\ p.\ typ.}$:	1 mA
$I_{CEO,\ Dark\ max.}$:	100 nA

Chip Reverse Mount



WL-STRB SMT Phototransistor Reverse mount Black

Size:	1206 (dome)
λ_{Peak}:	940 nm
$I_{CE,\ p.\ typ.}$:	4.4 mA
$I_{CEO,\ Dark\ max.}$:	100 nA

PLCC Type

WL-STTW SMT Phototransistor Top Waterclear

Size:	3528
λ_{Peak}:	940 nm
$I_{CE,\ p.\ typ.}$:	3.1 mA
$I_{CEO,\ Dark\ max.}$:	100 nA

WL-STTB SMT Phototransistor Top Black

Size:	3528
λ_{Peak}:	940 nm
$I_{CE,\ p.\ typ.}$:	2.8 mA
$I_{CEO,\ Dark\ max.}$:	100 nA

THT Round

WL-TTRB THT Phototransistor Round

Size:	3 mm, 5 mm
λ_{Peak}:	940 nm
$I_{CE,\ p.\ typ.}$:	10 mA
$I_{CEO,\ Dark\ max.}$:	100 nA

WL-TTRW THT Phototransistor Round Waterclear

Size:	3 mm, 5 mm
λ_{Peak}:	850 nm
$I_{CE,\ p.\ typ.}$:	15 mA
$I_{CEO,\ Dark\ max.}$:	300 nA

Optocoupler

Series 816

Extended

WL-OCPT Optocoupler Phototransistor

Package:	Series 814/817 DIP 4 Series 354/356/357 SOP4 Series 101x LSOP4
CTR:	50 – 600 %
Viso:	3750 – 5000 V

Laser

NEW

WL-VCSL Vertical Cavity Surface Emitting Laser

Size:	3535
λ_{Peak}:	940 nm
$\Phi_{V\ typ.}$:	1900 mW
$V_{F\ typ.}$:	2 V

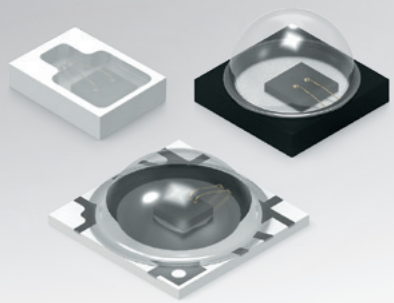
Component libraries available for:

- **PCB library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star**
- **S-Parameter & SPICE model: S-Parameter, LTspice, PSpice, Spectre**
- **RF & microwave simulation models: Modelithics**

www.we-online.com/library

WL-SIQW

SMT Infrared QFN LED Waterclear



Characteristics:

- High power output IR LED
- Compact size
- QuadFrame NoLead package
- Peak wavelengths: 850 nm & 940 nm
- Low thermal resistance
- Standard soldering pad

Applications:

- IR cameras
- Security cameras
- Face recognition
- Night vision
- Gaming and movement recognition

New QFN Package

www.we-online.com/wl-siqw

Size 2720

Electrical and Optical Characteristics @ 1 A					
Order Code	**$\lambda_{Peak\ typ.}$ (nm)**	**$I_{e\ typ.}$ (mW/sr)**	**$\Phi_{e\ typ.}$ (mW)**	**$V_{F\ typ.}$ (V)**	**$2\theta_{50\%\ typ.}$ (°)**
15427285BA240	850	160	450	1.8	120
15427285BA242	850	350	900	3.2	
15427294BA240	940	125	450	1.8	
15427294BA242	940	360	1000	3	

$\lambda_{Peak\ typ.}$: Peak Wavelength [typ.]; $I_{e\ typ.}$: Radiant Intensity [typ.]; $\Phi_{e\ typ.}$: Radiant Flux [typ.]; $V_{F\ typ.}$: Forward Voltage [typ.]; $2\theta_{50\%\ typ.}$: Viewing Angle Phi 0° [typ.]

Size 3535

Electrical and Optical Characteristics @ 1 A					
Order Code	**$\lambda_{Peak\ typ.}$ (nm)**	**$I_{e\ typ.}$ (mW/sr)**	**$\Phi_{e\ typ.}$ (mW)**	**$V_{F\ typ.}$ (V)**	**$2\theta_{50\%\ typ.}$ (°)**
15435385A9040	850	400	800	1.8	90
15435385A9042		800	1400	3.2	

$\lambda_{Peak\ typ.}$: Peak Wavelength [typ.]; $I_{e\ typ.}$: Radiant Intensity [typ.]; $\Phi_{e\ typ.}$: Radiant Flux [typ.]; $V_{F\ typ.}$: Forward Voltage [typ.]; $2\theta_{50\%\ typ.}$: Viewing Angle Phi 0° [typ.]

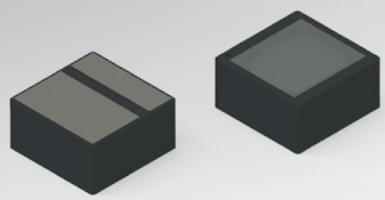
Size 3737

Electrical and Optical Characteristics @ 1 A					
Order Code	**$\lambda_{Peak\ typ.}$ (nm)**	**$I_{e\ typ.}$ (mW/sr)**	**$\Phi_{e\ typ.}$ (mW)**	**$V_{F\ typ.}$ (V)**	**$2\theta_{50\%\ typ.}$ (°)**
15437385AA540	850	180	700	1.8	150
15437385AA542		260	1100	3.2	

$\lambda_{Peak\ typ.}$: Peak Wavelength [typ.]; $I_{e\ typ.}$: Radiant Intensity [typ.]; $\Phi_{e\ typ.}$: Radiant Flux [typ.]; $V_{F\ typ.}$: Forward Voltage [typ.]; $2\theta_{50\%\ typ.}$: Viewing Angle Phi 0° [typ.]

WL-VCSL

VCSEL Laser



Characteristics:

- VCSEL laser
- Peak wavelength: 940 nm
- High optical power
- Homogeneous radiation patterns: 60° x 45° & 110° x 85°

Applications:

- Biometrical recognition
- LiDAR
- 3D recognition
- Time of flight
- Autonomous robotics
- Autonomous industry

Vertical cavity surface emitting laser

www.we-online.com/wl-vcsl

Size 3535

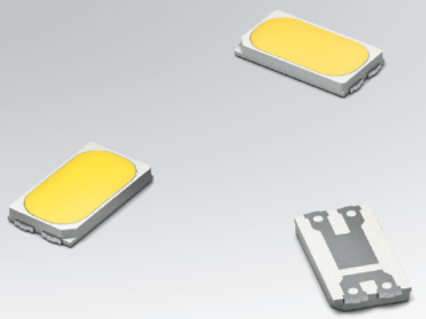
Electrical and Optical Characteristics @ 3 A

Order Code	$\Phi_{e\ typ.}$ (mW)	$\lambda_{Peak\ typ.}$ (nm)	$V_{F\ typ.}$ (V)	$2\theta_{50\%,\ X\ typ.}$ (°)	$2\theta_{50\%,\ Y\ typ.}$ (°)
159353940B1300	1800	940	2	110	85
159353940A6300	1900			60	45

$\Phi_{e\ typ.}$: Radiant Flux [typ.]; $\lambda_{Peak\ typ.}$: Peak Wavelength [typ.], $V_{F\ typ.}$: Forward Voltage [typ.]; $2\theta_{50\%,\ X\ typ.}$: Viewing Angle (X-Axis) [typ.]; $2\theta_{50\%,\ Y\ typ.}$: Viewing Angle (Y-Axis) [typ.]

WL-SWTP

SMT White Top View PLCC LED



Increased efficiency

Characteristics:

- Fast switching
- No IR radiation
- High CRI
- Excellent performance and visibility
- Suitable for all SMT assembly methods
- Top view
- Wide viewing angle
- Various of color temperature

Applications:

- Light pipe application
- Indicator lights and backlighting for consumer and industrial applications
- Indoor area lighting
- Downlight
- Outdoor and architectural lighting systems
- High bay and low bay
- Display and TV backlight

www.we-online.com/wl-swtp

Size 5630

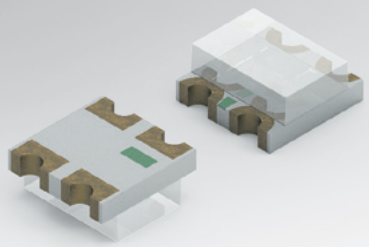
Electrical & Optical Characteristics @ 100 mA (typ.)

Order Code	Emitting Color	CCT typ. (K)	CRI typ.	$\Phi_{V\,typ.}$ (lm)	$V_{F\,typ.}$ (V)	Chip Technology	$2\theta_{50\%\,typ.}$ (°)
158563227A	Sunrise	2700	85	32	2.8	InGaN	120
158563230A	Warm White	3000		32			
158563240A	Moonlight	4000		32			
158563250A	Daylight	5000		35			
158563260A	Cool White	6000		35			

CCT typ.: Correlated Color Temperature [typ.]; CRI typ.: Color Rendering Index [typ.]; $\Phi_{V\,typ.}$: Luminous Flux [typ.]; $V_{F\,typ.}$: Forward Voltage [typ.]; $2\theta_{50\%\,typ.}$: Viewing Angle Phi 0° [typ.]

WL-SBCW

SMT Bi-color Chip LED Waterclear



Characteristics:

- Two chips in one package
- Small size
- Industry standard footprint
- High efficiency
- Low power consumption
- Wide viewing angle
- Small package for exceptional brightness
- Packaged in standard tape and 7" reel
- Compatible with automatic placement machine

Applications:

- Backlighting applications
- Status indicator
- Front panel indicators
- Push button backlighting
- Symbol and switch backlighting

www.we-online.com/wl-sbcw

Size 0606

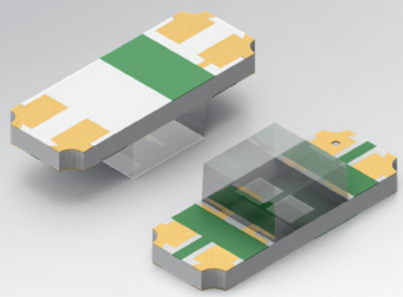
Technical Data:

Order Code	Emitting Color	$\lambda_{Dom\ typ.}$ (nm)	$\lambda_{Peak\ typ.}$ (nm)	$I_{V\ typ.}$ (mcd)	$V_{F\ typ.}$ (V)	$2\theta_{50\%\ typ.}$ (°)	Chip Technology
150066RG74000	Red ■	625	630	300	2	130	AlInGaP + InGaN
	Green ■	520	515	560	3.2		

$\lambda_{Dom\ typ.}$: Dominant Wavelength [typ.]; $\lambda_{Peak\ typ.}$: Peak Wavelength; $I_{V\ typ.}$: Luminous Intensity; $V_{F\ typ.}$: Forward Voltage; $2\theta_{50\%\ typ.}$: Viewing Angle Phi 0° [typ.]

WL-SBRW

SMT Bi-color Reverse Mount Waterclear



Top mount version

Characteristics:

- Bi-color LED
- Ideal for narrow space applications
- Wide viewing angle
- Low power consumption
- Industry standard footprint
- Small package for exceptional brightness
- Compatible with automatic placement machine

Applications:

- LED front panel indicators
- LCD backlighting
- Backlighting for keypads, symbols and switch buttons
- Messenger board
- Networking and telecommunications

www.we-online.com/wl-sbrw

Size 1205, Top Mount Packaging

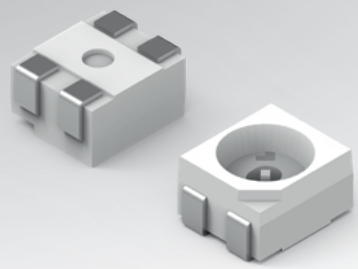
Technical Data:

Order Code	Emitting Color	$\lambda_{Dom\ typ.}$ (nm)	$\lambda_{Peak\ typ.}$ (nm)	$I_{V\ typ.}$ (mcd)	$V_{F\ typ.}$ (V)	$2\theta_{50\%\ typ.}$ (°)	Chip Technology
156125YV73000P	Yellow	592	592	70	2	120°	AlInGaP
	Bright Green	571	573	50	2.1		AlInGaP
156125RV73000P	Red	624	632	110	2		AlInGaP
	Bright Green	571	573	170	2.1		AlInGaP
156125RG73000P	Red	624	632	180	2		AlInGaP + InGaN
	Green	525	520	285	3.3		AlInGaP + InGaN

$\lambda_{Dom\ typ.}$: Dominant Wavelength [typ.]; $\lambda_{Peak\ typ.}$: Peak Wavelength; $I_{V\ typ.}$: Luminous Intensity; $V_{F\ typ.}$: Forward Voltage; $2\theta_{50\%\ typ.}$: Viewing Angle Phi 0° [typ.]

WL-SMTW

SMT Mono-color TOP LED Waterclear



Characteristics:

- Low energy consumption
- High reliability
- Low current requirement
- Fast switching
- Flexibility in design
- Top view
- Compact package outline, ideal for miniature applications
- Variety of colors

Applications:

- Backlight in LCD, cellular phones, switches, keys, displays
- Illuminated advertising, panels
- Lighting devices: indicators, general lighting
- Camera flash, hand carrier flash
- Coupling into light guides

Common anode / common cathode available

www.we-online.com/wl-smtw

Size 3528 PLCC 4

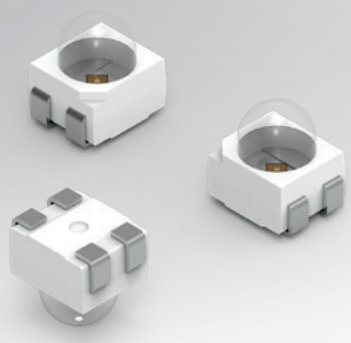
Technical Data:

Order Code	Emitting Color	$\lambda_{Peak\ typ.}$ (nm)	$\lambda_{Dom\ typ.}$ (nm)	$I_{V\ typ.}$ (mcd)	$V_{F\ typ.}$ (V)	Chip Technology	$2\theta_{50\%\ typ.}$ (°)
150141RS73130	Red	630	620	3000	2.4	AlInGaP	120
150141YS73130	Yellow	592	590	3000	2.4	AlInGaP	
150141GS73130	Green	515	520	3500	3.2	InGaN	
150141BS73130	Blue	465	470	2200	3.2	InGaN	
150141RS73140	Red	630	620	3000	2.4	AlInGaP	
150141YS73140	Yellow	592	590	3000	2.4	AlInGaP	
150141GS73140	Green	515	520	3500	3.2	InGaN	
150141BS73140	Blue	465	470	2200	3.2	InGaN	

$\lambda_{Peak\ typ.}$: Peak Wavelength [typ.]; $\lambda_{Dom\ typ.}$: Dominant Wavelength [typ.]; $I_{V\ typ.}$: Luminous Intensity [typ.]; $V_{F\ typ.}$: Forward Voltage [typ.]; $2\theta_{50\%\ typ.}$: Viewing Angle Phi 0° [typ.]

WL-SMTD

SMT Mono-color TOP LED Diffused Dome



Characteristics:

- Industry Standard PLCC-4
- High reliability LED package
- High optical efficiency
- Narrow viewing angle: 30° & 60°
- Compatible with both IR soldering process
- Common anode and common cathode

Applications:

- Traffic lights
- Backlighting for central consoles, cabins or push buttons
- Signal and symbol luminary
- Instrument panel backlighting
- Navigation and audio system

Common anode & common cathode available

www.we-online.com/wl-smtd

Size 3528

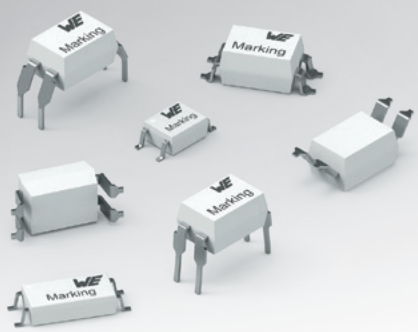
Technical Data:

Order Code	Emitting Color	$\lambda_{Dom\ typ.}$ (nm)	$\lambda_{Peak\ typ.}$ (nm)	$I_{V\ typ.}$ (mcd)	$V_{F\ typ.}$ (V)	Chip Technology	$2\theta_{50\%\ typ.}$ (°)
150141SS63130	Super Red	630	640	13000	2.4	AlInGaP	30
150141RS63130	Red	620	630	16000	2.4	AlInGaP	30
150141YS63130	Yellow	590	592	15000	2.4	AlInGaP	30
150141GS63130	Green	520	515	30000	3.2	InGaN	30
150141BS63130	Blue	470	465	6000	3.2	InGaN	30

$\lambda_{Dom\ typ.}$: Dominant Wavelength [typ.]; $\lambda_{Peak\ typ.}$: Peak Wavelength [typ.]; $I_{V\ typ.}$: Luminous Intensity [typ.]; $V_{F\ typ.}$: Forward Voltage [typ.]; $2\theta_{50\%\ typ.}$: Viewing Angle Phi 0° [typ.]

WL-OCPT

Optocoupler Phototransistor



Characteristics:

- High isolation voltage
- Good stability of inner isolation
- Stable CTR in full operation temperature range
- Different CTR binnings available
- High collector-emitter voltage
- Fast switching times

Applications:

- Measurement equipment
- Programmable controller

All binnings and packages available ex stock

www.we-online.com/wl-ocpt

Series 817, DIP4

Electrical & Optical Characteristics

Order Code	Package	Input	$V_{CE\ max.}$ (V)	$I_{F\ max.}$ (mA)	Test Condition CTR	$CTR_{min.}$ (%)	$CTR_{max.}$ (%)	V_{ISO} (V (RMS))	Operating Temperature (°C)
140817140010	DIP 4, Standard	DC	35	60	I_F = 5 mA V_{CE} = 5 V	50	600	5000	-55 up to +110
140817140110	DIP 4, Standard					80	160		
140817140210	DIP 4, Standard					130	260		
140817140310	DIP 4, Standard					200	400		
140817140410	DIP 4, Standard					300	600		
140817141010	DIP 4, M-Type					50	600		
140817141110	DIP 4, M-Type					80	160		
140817141210	DIP 4, M-Type					130	260		
140817141310	DIP 4, M-Type					200	400		
140817141410	DIP 4, M-Type					300	600		
140817142000	DIP 4, S-Type					50	600		
140817142100	DIP 4, S-Type					80	160		
140817142200	DIP 4, S-Type					130	260		
140817142300	DIP 4, S-Type					200	400		
140817142400	DIP 4, S-Type					300	600		
140817143000	DIP 4, SL-Type					50	600		
140817143100	DIP 4, SL-Type					80	160		
140817143200	DIP 4, SL-Type					130	260		
140817143300	DIP 4, SL-Type					200	400		
140817143400	DIP 4, SL-Type					300	600		
140817144000	DIP 4, SLM-Type					50	600		
140817144100	DIP 4, SLM-Type					80	160		
140817144200	DIP 4, SLM-Type					130	260		
140817144300	DIP 4, SLM-Type					200	400		
140817144400	DIP 4, SLM-Type					300	600		

$V_{CE\ max.}$: Collector Emitter Voltage; $I_{F\ max.}$: Forward Current; Test Condition CTR: Current Transfer Ratio (Test cond.); $CTR_{min.}$: Current Transfer Ratio [min.]; $CTR_{max.}$: Current Transfer Ratio [max.]; V_{ISO}: Isolation Voltage

WL-OCPT

Optocoupler Phototransistor

Series 814, DIP4

Electrical & Optical Characteristics									
Order Code	**Package**	**Input**	**$V_{CE\ max.}$ (V)**	**$I_{F\ max.}$ (mA)**	**Test Condition CTR**	**$CTR_{min.}$ (%)**	**$CTR_{max.}$ (%)**	**V_{ISO} (V (RMS))**	**Operating Temperature (°C)**
140814240010	DIP 4, Standard	AC	80	60	I_F = +/- 1 mA V_{CE} = 5 V	20	300	5000	-55 up to +110
140814240110	DIP 4, Standard					50	150		
140814241010	DIP 4, M-Type					20	300		
140814241110	DIP 4, M-Type					50	150		
140814242000	DIP 4, S-Type					20	300		
140814242100	DIP 4, S-Type					50	150		
140814243000	DIP 4, SL-Type					20	300		
140814243100	DIP 4, SL-Type					50	150		

$V_{CE\ max.}$: Collector Emitter Voltage; $I_{F\ max.}$: Forward Current; Test Condition CTR: Current Transfer Ratio (Test cond.); $CTR_{min.}$: Current Transfer Ratio [min.]; $CTR_{max.}$: Current Transfer Ratio [max.]; V_{ISO}: Isolation Voltage

Series 356, SOP4

Electrical & Optical Characteristics									
Order Code	**Package**	**Input**	**$V_{CE\ max.}$ (V)**	**$I_{F\ max.}$ (mA)**	**Test Condition CTR**	**$CTR_{min.}$ (%)**	**$CTR_{max.}$ (%)**	**V_{ISO} (V (RMS))**	**Operating Temperature (°C)**
140356145000	SOP 4	DC	80	60	I_F = 5 mA V_{CE} = 5 V	50	600	3750	-55 up to +110
140356145100						80	160		
140356145200						130	260		
140356145300						200	400		
140356145400						300	600		

$V_{CE\ max.}$: Collector Emitter Voltage; $I_{F\ max.}$: Forward Current; Test Condition CTR: Current Transfer Ratio (Test cond.); $CTR_{min.}$: Current Transfer Ratio [min.]; $CTR_{max.}$: Current Transfer Ratio [max.]; V_{ISO}: Isolation Voltage

Series 357, SOP4

Electrical & Optical Characteristics									
Order Code	**Package**	**Input**	**$V_{CE\ max.}$ (V)**	**$I_{F\ max.}$ (mA)**	**Test Condition CTR**	**$CTR_{min.}$ (%)**	**$CTR_{max.}$ (%)**	**V_{ISO} (V (RMS))**	**Operating Temperature (°C)**
140357145000	SOP 4	DC	35	60	I_F = 5 mA V_{CE} = 5 V	50	600	3750	-55 up to +110
140357145100						80	160		
140357145200						130	260		
140357145300						200	400		
140357145400						300	600		

$V_{CE\ max.}$: Collector Emitter Voltage; $I_{F\ max.}$: Forward Current; Test Condition CTR: Current Transfer Ratio (Test cond.); $CTR_{min.}$: Current Transfer Ratio [min.]; $CTR_{max.}$: Current Transfer Ratio [max.]; V_{ISO}: Isolation Voltage

Series 354, SOP4

Electrical & Optical Characteristics								
Order Code	**Package**	**Input**	**$V_{CE\ max.}$ (V)**	**Test Condition CTR**	**$CTR_{min.}$ (%)**	**$CTR_{max.}$ (%)**	**V_{ISO} (V (RMS))**	**Operating Temperature (°C)**
140354245000	SOP 4	AC	80	I_F = +/- 1 mA V_{CE} = 5 V	20	300	3750	-55 up to +110
140354245100					50	150		
$V_{CE\ max.}$: Collector Emitter Voltage; Test Condition CTR: Current Transfer Ratio (Test cond.); $CTR_{min.}$: Current Transfer Ratio [min.]; $CTR_{max.}$: Current Transfer Ratio [max.]; V_{ISO}: Isolation Voltage								

Series 101x, LSOP4

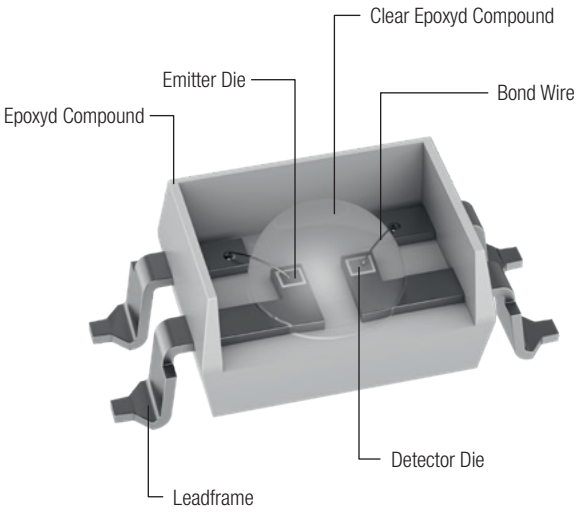
Electrical & Optical Characteristics									
Order Code	**Package**	**Input**	**$V_{CE\ max.}$ (V)**	**$I_{F\ max.}$ (mA)**	**Test Condition CTR**	**$CTR_{min.}$ (%)**	**$CTR_{max.}$ (%)**	**V_{ISO} (V (RMS))**	**Operating Temperature (°C)**
140105146000	LSOP4	DC	80	60	I_F = 5 mA V_{CE} = 5 V	50	150	5000	-55 up to +110
140107146000						80	160		
140106146000						100	300		
140108146000						130	260		
140109146000						200	400		
140100146000						300	600		
$V_{CE\ max.}$: Collector Emitter Voltage; $I_{F\ max.}$: Forward Current; Test Condition CTR: Current Transfer Ratio (Test cond.); $CTR_{min.}$: Current Transfer Ratio [min.]; $CTR_{max.}$: Current Transfer Ratio [max.]; V_{ISO}: Isolation Voltage									

Design Kits

Product Category	Design Kit	Order Code	Lifelong Refill
White LEDs			
	White LEDs	158300	✓
	Demo Board White LEDs – PLCC	158999	
Visible LEDs			
	Chip LED – Top View	150155	✓
	Chip LED – Reverse Mount & Side View	150156	✓
	PLCC, THT and Ceramic LED	150151	✓
	Demo Board Visible LEDs	9999003	
Infrared LEDs			
	Infrared LEDs	154150	✓

Order your Design Kit today!
www.we-online.com/designkit-154150

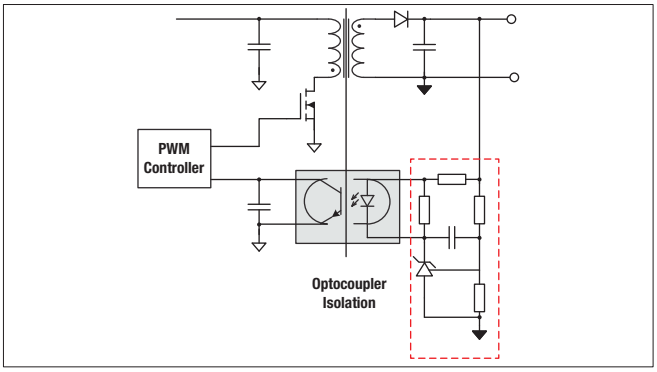
Optocoupler

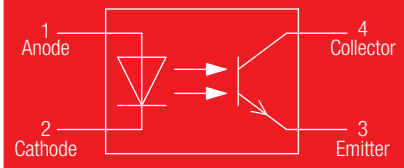
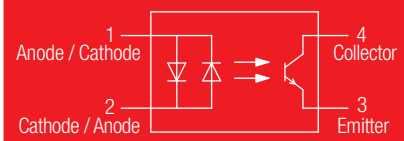


Benefits of Optocoupler

- Protect your application against overvoltage
- Isolation of persons from dangerous electrical installations
- Isolation of electrical systems
- Separation of low-voltage from high-voltage circuits

Application Example



Package	DIP-4 Leadframe Options (M, S, SL, SLM)	SOP-4	LSOP-4
Dimensions [mm] (L x W x H)	10.16 x 4.58 x 3.9	7.0 x 3.6 x 2.0	10.20 x 3.60 x 2.00
Series DC Series  AC Series 	Series 816/817  Series 814 	Series 356/357  Series 354 	Series 10xx 

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See all articles:
www.we-online.com/wl-ocpt

Optocoupler

Isolation Types

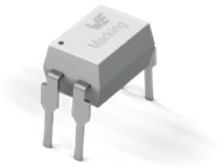
Magnetic Isolation with Transformers

- For high frequency AC signal transmission with high isolation voltage
- Robust solution and very long lifetime

Electrical Capacitive Coupling

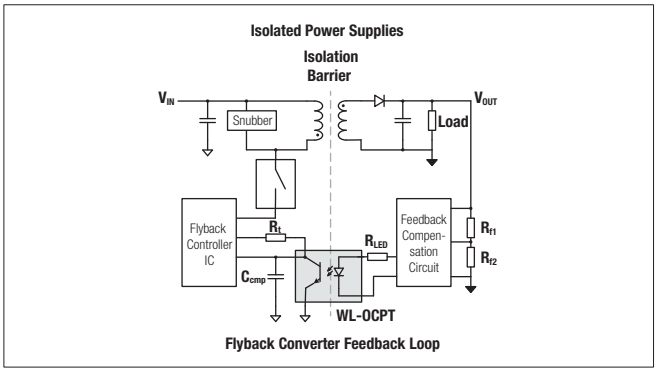
- Excellent for very high frequency AC signal transmission

Optical Coupling with Optocoupler

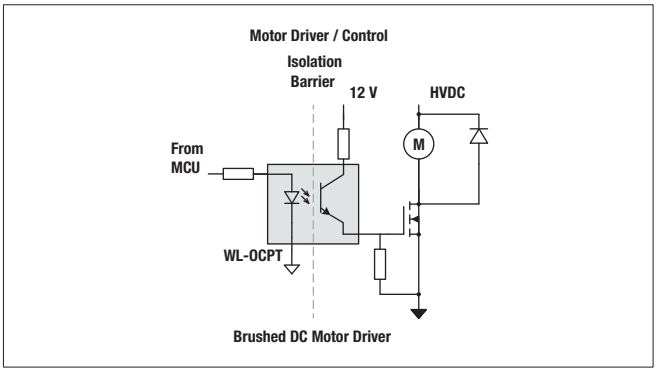


- Excellent electrical noise immunity with high isolation voltage in small package
- DC and AC, analog and digital, low and medium-frequency signal transmission

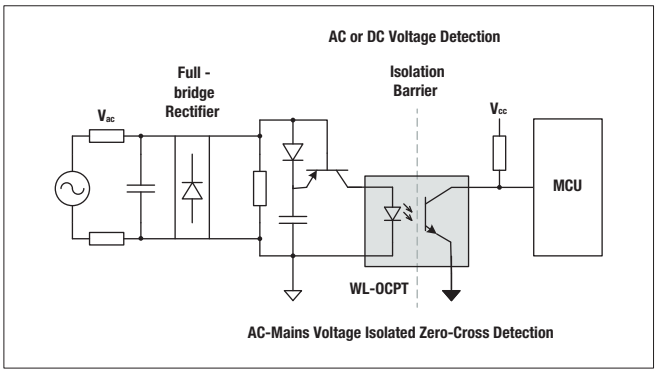
Application Examples of Optocouplers



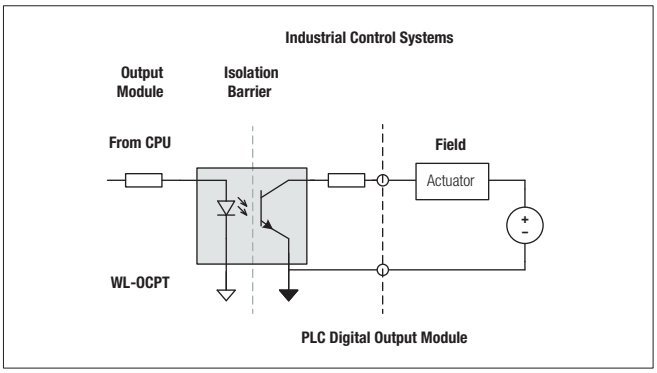
Providing robust galvanic isolation of feedback control loop in SMPS



Breaking ground loops and providing safety isolation in high-voltage motor drivers



Safety isolation in phase-controlled AC motor, safety relays/ switches, etc.



Ensuring noise immunity and safety in industrial environments

All technical details:
www.we-online.com/redexpert-wl-ocpt

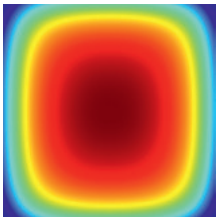
VCSEL Laser

Vertical Cavity Surface Emitting Lasers

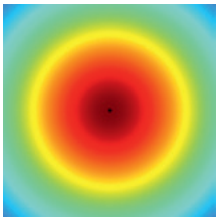
Vertical cavity surface emitting lasers are emitter for homogeneous light and high optical power output. With the different Field of View, offered from the special diffused silica glass, they can be put in multiple application – 3D sensing, LiDAR, Biomteric identification just to name a few. The robust package with low thermal resistance makes them suitable not only for commercial, but also industry applications.

- VCSEL arrays
- Homogeneous illumination
- High optical output – up to 2 W CW
- Various viewing angle possible
- Low thermal resistance package

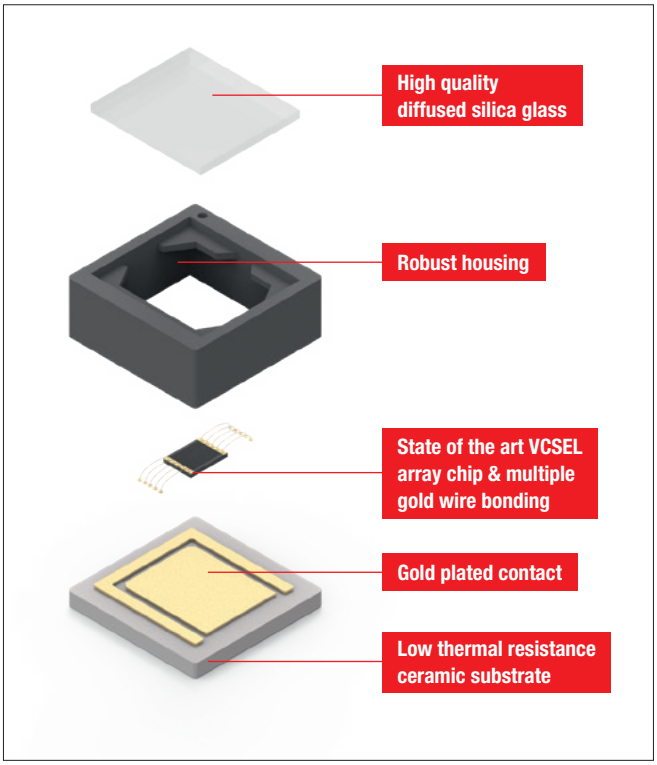
Compared to standard LED emitter, VCSEL provide coherent light, which can be used, not only for illumination, also as structured light for 3D and depth sensing. In addition, the homogeneous illumination pattern is more suitable for better picture resolution and detection.



Illumination distribution of VCSEL

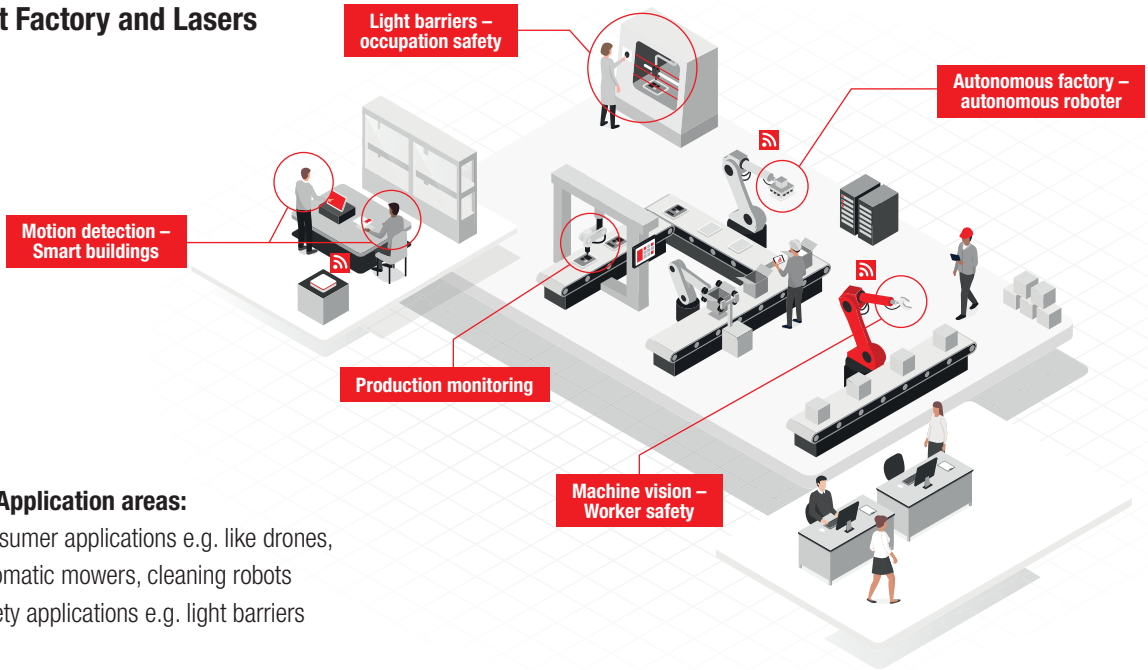


Illumination distribution of normal LEDs



More informations and details:
www.we-online.com/wl-vcsel

Smart Factory and Lasers



Other Application areas:

- Consumer applications e.g. like drones, automatic mowers, cleaning robots
- Safety applications e.g. light barriers

Infrared Application Portfolio

Industrial Applications

AUTOMATED INDUSTRY
- Security area
- Counter and encoder
- Data transmission


WL-TIRW


WL-SIQW


WL-SITW


WL-TDRW
WL-TDRB


WL-TTRW
WL-TTRB

SURVEILLANCE
- Night vision
- Security cameras


WL-TIRW


WL-SIMW


WL-SIQW

TOUCHLESS DEVICES
- Desinfection
- Watersyphons
- Hand dryer


WL-SISW


WL-SICW


WL-SIRW


WL-STSW


WL-STCW
WL-STCB


WL-STRB

Consumer Applications

HOME APPLIANCES
- Smoke detector
- Remote control
- Cleaning robots


WL-SITW


WL-SIRW


WL-TIRW


WL-STTB


WL-STRB


WL-TTRB

GAMING
- Keyboard / Mouse
- Gestrue recognition
- VR device


WL-SIQW


WL-SIMW


WL-SICW


WL-SDCB


WL-SDSB

Public Applications

LIGHT BARRIERS
- Automatic doors
- Parking houses


WL-SITW


WL-SIRW


WL-SIQW


WL-STTB


WL-STRB

Metering and Detection

HEALTH MONITOR
- Pulse oximetry
- Heart rate monitoring
- Blood pressure


WL-SIRW


WL-TIRW


WL-SITW


WL-STCW


WL-TTRW


WL-STTW

BIOMETRIC IDENTIFICATION
- Iris & Vein scan
- Face recognition


WL-SIQW


WL-SIMW

With **22 infrared LED product series** we always offers the right solution for your application.

We offer from the compact package on the market (0402), to the highest power output (>1 W). And all this coupled with the corresponding IR detector – Photodiode or Phototransistor.

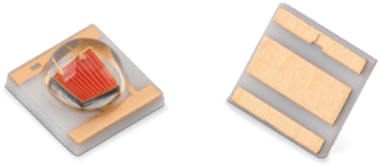
Technical details on REDEXPERT:
www.we-online.com/redexpert-ir-leds

Check out all matchcodes online:
www.we-online.com/ir-leds

Compare and Select Horticulture LEDs in REDEXPERT

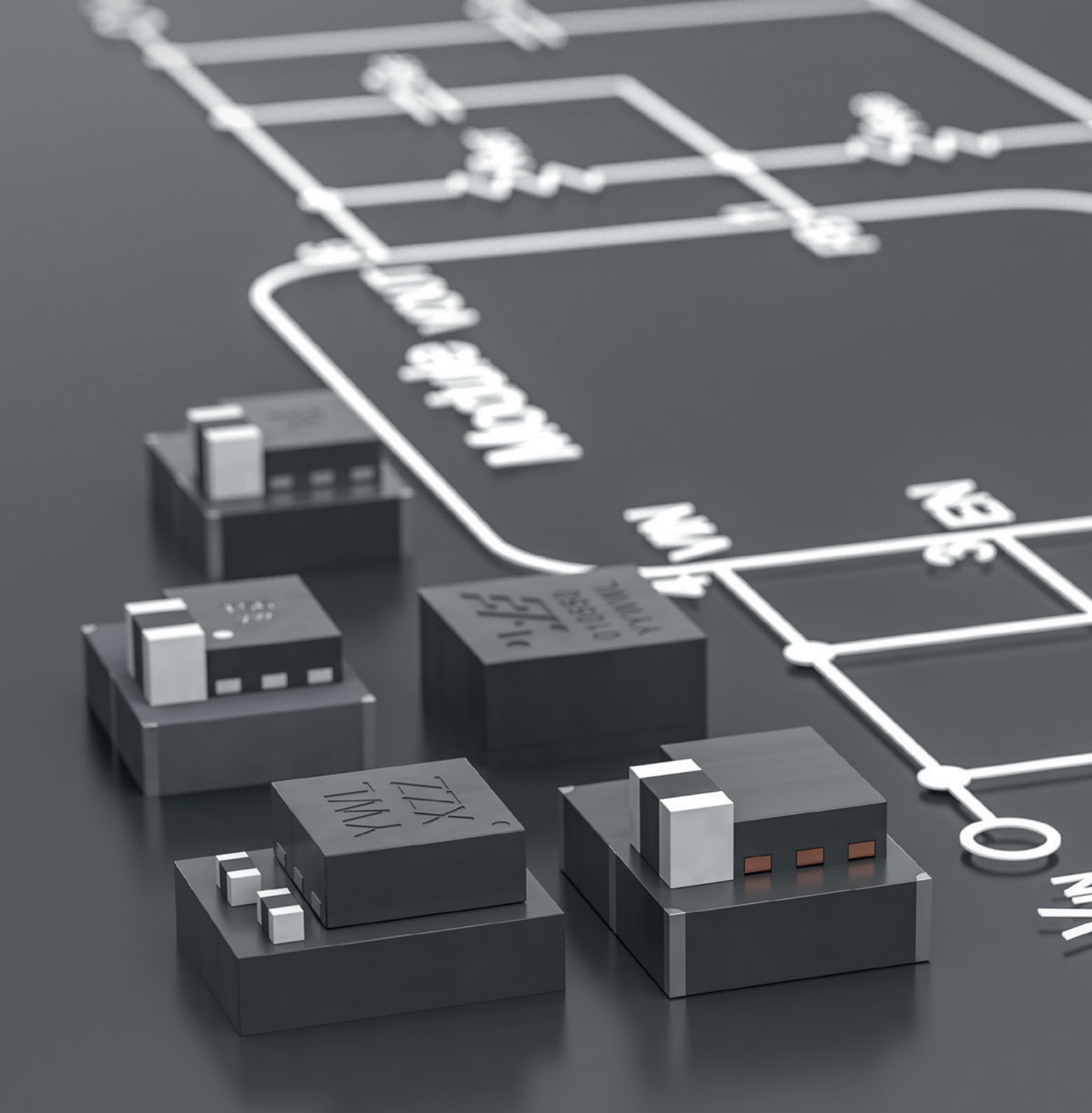
Check Horticulture LEDs Suitable to Your Application!

- Test your recipes – see how they look
- Compute your opto/electrical parameters
- Test your ideas and estimate the output of your lamp
- PPF values, power usage, R/B ratio and much more directly computed



Optoelectronics

Try it out:
www.we-online.com/redexpert-horticulture



3 POWER MODULES

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Product Overview

How to find detailed product information?

Visit www.we-online.com and search for product series information, e.g.:

MagI³C-LDHM

Variable Step Down Regulator Modules

MagI³C-VDRM
Variable Step Down Regulator Module

V_{IN}:	2.95 – 50 V
V_{OUT}:	0.8 – 24 V
I_{OUT}:	1 – 6 A
Switching Frequency:	0.2 – 2 MHz

LED Driver Modules

MagI³C-LDHM
LED Step Down High Current Module

V_{IN}:	4.5 – 60 V
V_{OUT}:	4.5 – 60 V
I_{OUT}:	0.45 A
Switching Frequency:	0.8 MHz

Variable Isolated SIP Modules

MagI³C-VISM
Variable Isolated SIP Module

V_{IN}:	8 – 42 V
V_{OUT}:	3.3 – 6 V
P_O:	1 W
$V_{isolation}$:	2000 V

Variable Step Down MicroModules

Extended

MagI³C-VDMM
Variable Step Down MicroModule

V_{IN}:	2.5 – 5.5 V
V_{OUT}:	0.6 – 5.5 V
I_{OUT}:	0.6 – 1.2 A
Switching Frequency:	2.25 – 4 MHz

Fixed Isolated Modules

MagI³C-FISM
Fixed Isolated SIP Module

V_{IN}:	3.3 – 24 V
V_{OUT}:	5 V / 12 V / 15 V
P_O:	1 W
$V_{isolation}$:	1000 – 4000 V

Fixed Step Down Regulator Modules

Extended

MagI³C-FDSM
Fixed Step Down Regulator Module

V_{IN}:	4.75 – 42 V
V_{OUT}:	3.3 V / 5 V
I_{OUT}:	0.5 – 1 A
Switching Frequency:	0.3 – 0.7 MHz

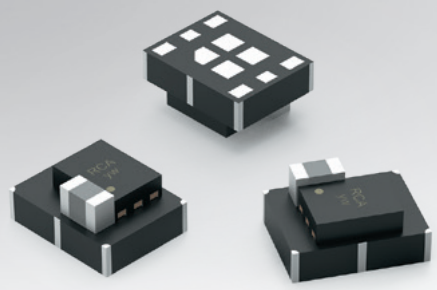
All Power Modules at a glance:
www.we-online.com/power-mod

Explore our application notes for Power Modules:
www.we-online.com/appnotes

Component libraries available for:
Altium Designer, EAGLE
www.we-online.com/library

MagI³C-VDMM

Variable Step Down MicroModule



Characteristics:

- Low conducted and radiated EMI (compliant to EN55032 class B / CISPR-32)
- Very low profile LGA-6EP micropackage
- Ideal for space constrained applications
- Power Good indicator to show V_{OUT} status
- 3 solder cycles supported

Applications:

- Point-of-Load DC/DC applications from 5 V or 3.3 V rail
- Replacement for linear regulators
- Interface and microcontroller supply
- DSP and FPGA power supply auxiliary voltages
- Portable instruments
- Battery powered equipment

www.we-online.com/magic-vdmm

Size LGA-6EP

Technical Data:

Order Code	V_{IN} (V)	V_{OUT} (V)	I_{OUT} (A)	Version	L (mm)	W (mm)	H (mm)
171010501	2.5 – 5.5	0.8 – 5.5	1	Power Good	3.2	2.5	1.6

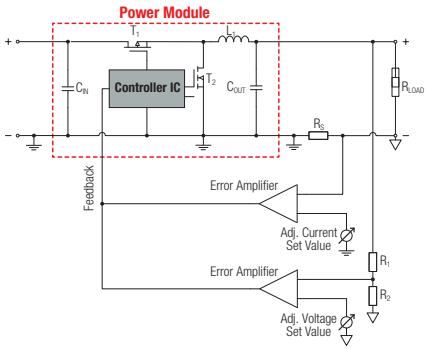
V_{IN}: Input Voltage; V_{OUT}: Output Voltage; I_{OUT}: Output Current; L: Length; W: Width; H: Height

All you Need in One Package – MagI³C Power Modules

MagI³C Power Modules are easy to use DC/DC converters with integrated regulator IC, power inductor and capacitors. Design and layout reviews as well as support with EMC filter design are offered as a service for all customers. Datasheets contain detailed specifications and application information.

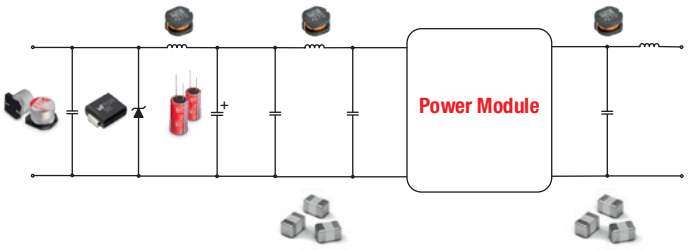
Design-In Support

- Product related & application specific support by hotline
- Troubleshooting and individual design solutions



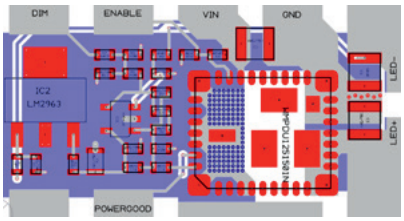
EMC Filter Design Support

- Solution for conducted & radiated emissions
- Tested filter configurations for EN55032 / CISPR-32 class compliance with inductor & capacitor order codes
- EMI filter EN55032 / CISPR-32 class B compliance
- Real EMI behavior shown on **REDEXPERT**
- Gain and phase response of EMI filter shown on **REDEXPERT**



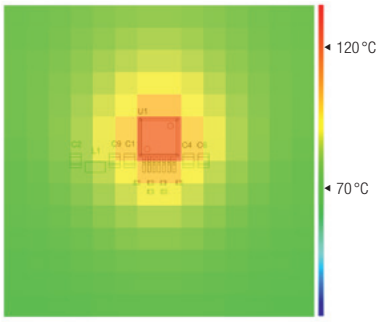
Layout Review Support

- Individual review of customer layouts
- Reference layout included in every datasheet



Thermal Design Support

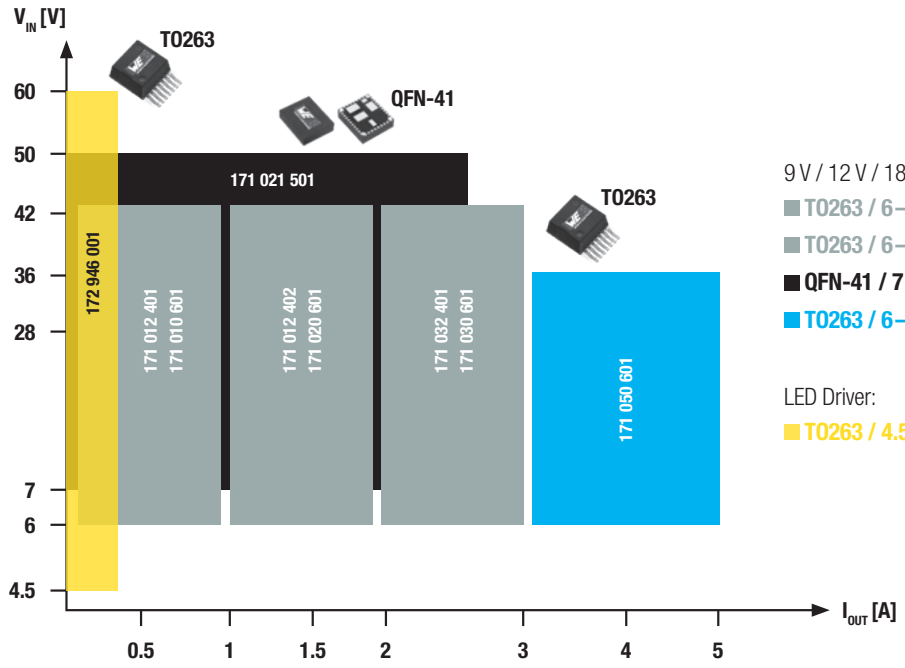
- Thermal behavior of power modules shown on **REDEXPERT**
- Simulation of temperature distribution on PCB
- Module temperature versus PCB area
- Interactive power loss chart on **REDEXPERT**



Get in contact with our Service Hotline:
powermodules@we-online.com

LDHM / VDRM / VDMM Portfolio

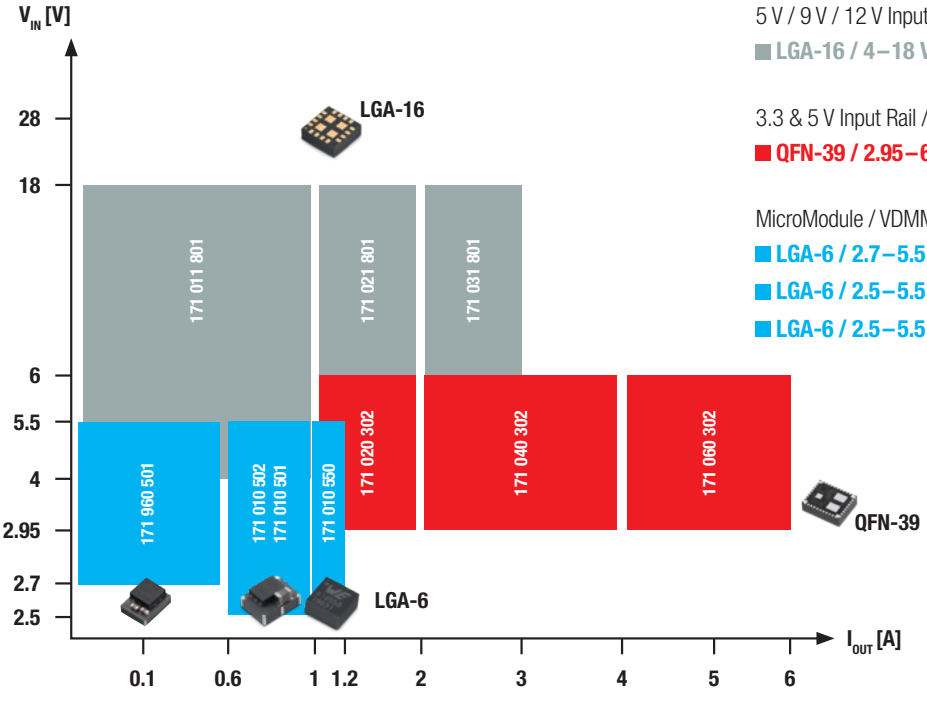
Variable Step Down Regulator Modules (VDRM) / LED Step Down High Current Module (LDHM) – High V_{IN}



9 V / 12 V / 18 V / 24 V Input Rail / Variable Output:
- TO263 / 6–42 V / 1 A, 2 A, 3 A / 5–24 V Output
- TO263 / 6–42 V / 1 A, 2 A, 3 A / 0.8–6 V Output
- QFN-41 / 7–50 V / 2.5 A / 2.5–15 V Output
- TO263 / 6–36 V / 5 A / 0.8–6 V Output

LED Driver:
- TO263 / 4.5–60 V / 450 mA / 1–16 LEDs

Variable Step Down Regulator Modules (VDRM) / MicroModule (VDMM) – Low V_{IN}



5 V / 9 V / 12 V Input Rail / VDRM:
- LGA-16 / 4–18 V / 1 A, 2 A, 3 A / 0.8–17 V Output

3.3 & 5 V Input Rail / VDRM:
- QFN-39 / 2.95–6 V / 2 A, 4 A, 6 A / 0.8–3.6 V Output

MicroModule / VDMM:
- LGA-6 / 2.7–5.5 V / 0.6 A / 0.6–5.5 V Output
- LGA-6 / 2.5–5.5 V / 1.0 A / 0.8–5.5 V Output*
- LGA-6 / 2.5–5.5 V / 1.2 A / 0.8–5.5 V Output

*Option Mode or PowerGood

LDHM / VDRM Portfolio

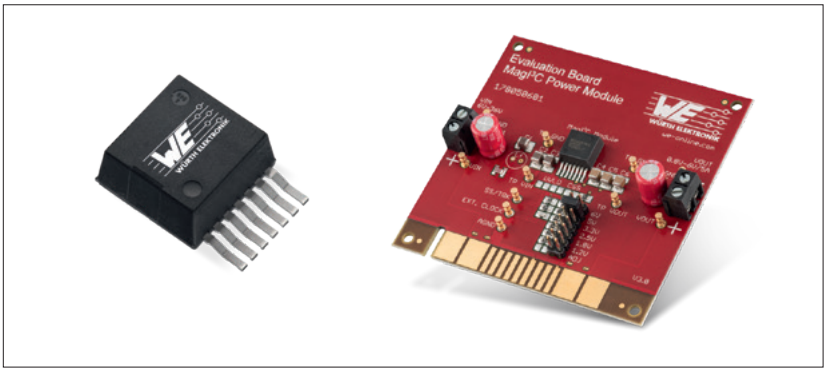
LDHM / VDRM MagI³C Power Modules

Type	Input Rail (V)	V_{IN} (V)	V_{OUT} (V)	I_{OUT} max (A)	Package	Order Code Module	Order Code EVAL Board
LED Step Down High Current Module (LDHM)							
	5, 9, 12, 18, 24, 36, 48	4.5 – 60	16 LEDs**	0.45	TO263-7EP	172 946 001	178 946 001
Variable Step Down Regulator Module (VDRM)							
	9, 12, 18, 24, 36*	6 – 42	0.8 – 6	1	TO263-7EP	171 010 601	178 010 601
				2		171 020 601	178 020 601
				3		171 030 601	178 030 601
		6 – 36		5		171 050 601	178 050 601
		6 – 42	5 – 24	1		171 012 401	178 012 401
				2		171 012 402	178 012 402
				3		171 032 401	178 032 401
		7 – 50*	2.5 – 15	2.5	BQFN-41	171 021 501	178 021 501
	3.3, 5	2.95 – 6	0.8 – 3.6	2	BQFN-39	171 020 302	178 020 302
				4		171 040 302	178 040 302
				6		171 060 302	178 060 302

* 36 V rail only supported by 50 V_{IN} module
** with forward voltage of 3.2 V each

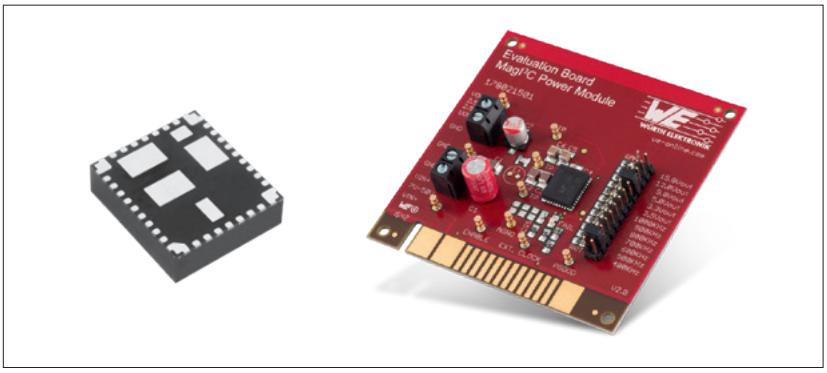
TO263 MagI³C Power Modules

- Leaded package for easy manufacturing and prototyping
- Simple layout
- Wide input voltage range for input transient capability
- Support ambient temperatures up to 105 °C
- 2 solder cycles supported



BQFN MagI³C Power Modules

- Low profile package
- Simple application circuit (only 4 external components required)
- Optional multiple features (adjustable frequency, adjustable soft-start, power-good, sequencing, tracking, synchronization to external clock, adjustable under-voltage lockout)
- Wide input voltage range (only for BQFN41)
- 3 solder cycles supported



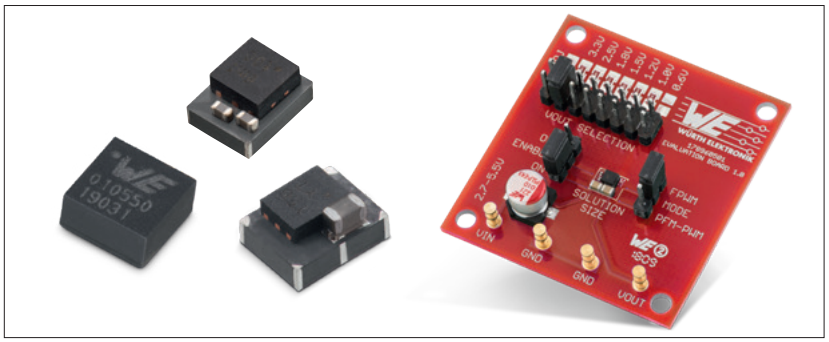
VDMM / VDRM Portfolio

VDMM / VDRM MagI³C Power Modules

Type	Input Rail (V)	V_{IN} (V)	V_{OUT} (V)	I_{OUT} max (A)	Package	Order Code Module	Order Code EVAL Board
Variable Step Down MicroModule (VDMM)							
	3.3, 5	2.7–5.5	0.6–5.5	0.6	LGA-6EP	171 960 501	178 960 501
		2.5–5.5	0.8–5.5	1		171 010 502	178 010 502
				1.2		171 010 550	178 010 550
Variable Step Down Regulator Module (VDRM)							
	5, 9, 12	4–18	0.8–17	1	LGA-16EP	171 011 801	178 011 801
				2		171 021 801	178 021 801
				3		171 031 801	178 031 801

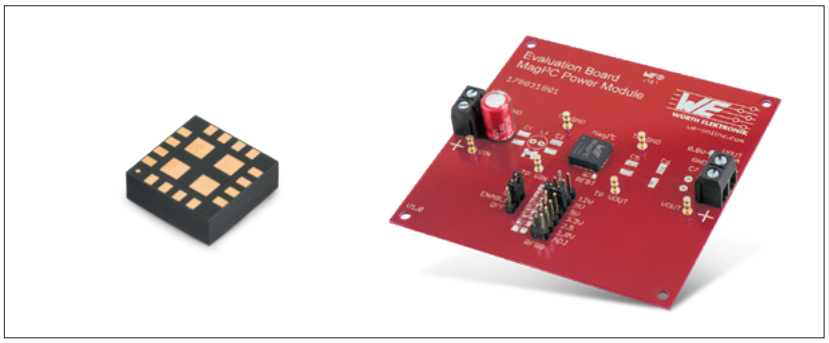
LGA-6 MagI³C Power Modules

- Very low profile micro package
- Ideal for space constrained applications
- Selectable forced PWM or auto PFM/PWM mode
- 3 solder cycles supported



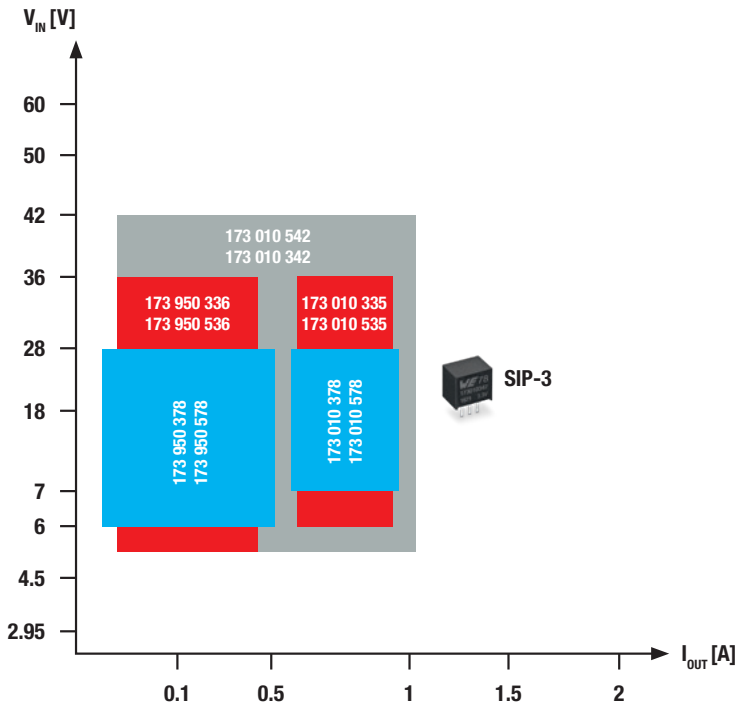
LGA-16 MagI³C Power Modules

- Low profile LGA package
- Stand alone solution (C_{IN} and C_{OUT} integrated, only 2 external components needed to set V_{OUT})
- Ideal for space constrained applications
- Auto PFM/PWM mode
- 2 solder cycles supported



FDSM / FISM / VISM Portfolio

Fixed Step Down Regulator Module (FDSM)



9 V / 12 V / 18 V Input Rail / Fixed Output:

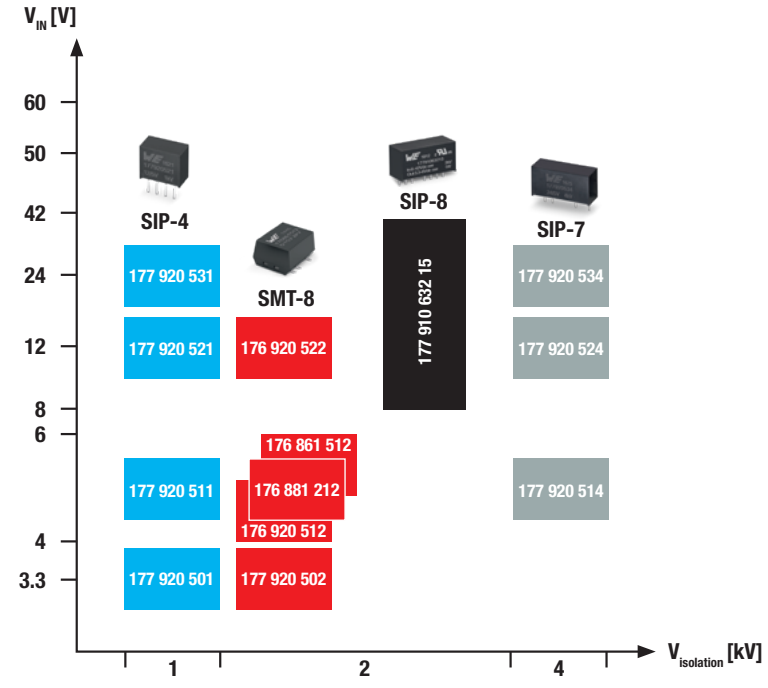
- SIP-3 / 6–28 V / 0.5 A / 3.3 V or 5 V Output
- SIP-3 / 7–28 V / 1 A / 3.3 V or 5 V Output

9 V / 12 V / 18 V / 24 V Input Rail / Fixed Output:

- SIP-3 / 4.75–36 V / 0.5 A / 3.3 V or 5 V Output

NEW
- SIP-3 / 6–36 V / 1 A / 3.3 V or 5 V Output
- SIP-3 / 7–42 V / 1 A / 3.3 V or 5 V Output

Fixed Isolated SIP Module (FISM) / Variable Isolated SIP Module (VISM)



3.3 V / 5 V / 12 V / 24 V Input Rail / Fixed Output:

- SIP-4 / 1 W / 3.3 V_{IN} / 5 V_{OUT} / 1 kV
- SIP-4 / 1 W / 5 V_{IN} / 5 V_{OUT} / 1 kV
- SIP-4 / 1 W / 12 V_{IN} / 5 V_{OUT} / 1 kV
- SIP-4 / 1 W / 24 V_{IN} / 5 V_{OUT} / 1 kV

3.3 V / 5 V / 12 V Input Rail / Fixed Output:

- SMT-8 / 1 W / 3.3 V_{IN} / 5 V_{OUT} / 2 kV
- SMT-8 / 1 W / 5 V_{IN} / 5 V_{OUT} / 2 kV
- SMT-8 / 1 W / 5 V_{IN} / 12 V_{OUT} / 2 kV
- SMT-8 / 1 W / 5 V_{IN} / 15 V_{OUT} / 2 kV
- SMT-8 / 1 W / 12 V_{IN} / 5 V_{OUT} / 2 kV

5 V / 12 V / 24 V Input Rail / Fixed Output:

- SIP-7 / 1 W / 3.3 V_{IN} / 5 V_{OUT} / 4 kV
- SIP-7 / 1 W / 12 V_{IN} / 5 V_{OUT} / 4 kV
- SIP-7 / 1 W / 24 V_{IN} / 5 V_{OUT} / 4 kV

9 V / 12 V / 18 V / 24 V Input Rail / Adjustable Output:

- SIP-8 / 1 W / 8–42 V_{IN} / 3.3–6 V_{OUT} / 2 kV

FDSM Portfolio (Through-Hole Package)

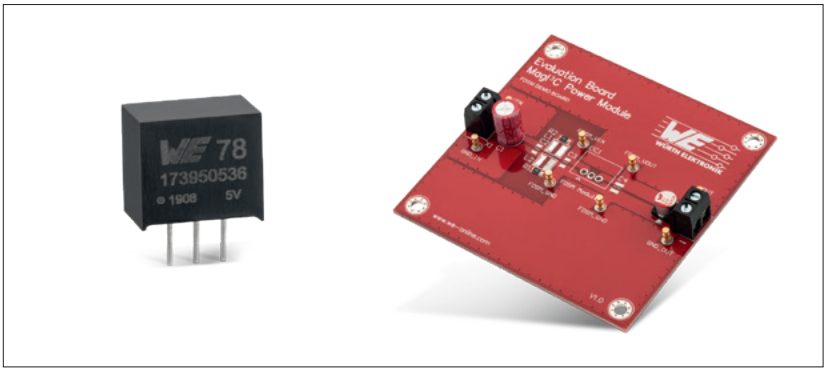
FDSM MagI³C Power Modules

Type	Input Rail (V)	V_{IN} (V)	V_{OUT} (V)	I_{OUT} max (A)	Package	Order Code Module	Order Code EVAL Board
Fixed Step Down Regulator Module (FDSM)							
	9, 12, 18	6–28	3.3	0.5	SIP-3	173 950 378	17800FDSM*
		6–36	3.3	1		173 010 335	
		7–28	5.0	0.5		173 950 578	
		7–28	3.3	1		173 010 378	
		8–28	5.0			173 010 578	
	9, 12, 18, 24	4.75–36	3.3	0.5		173 950 336	
		6.5–36	5.0			173 950 536	
		6.36	5.0	1		173 010 535	
		7–42	3.3			173 010 342	
		8–42	5.0			173 010 542	

*module is not included

SIP-3 MagI³C Power Modules

- Easy design-in (no power supply knowledge required)
- Leaded through-hole package for easy manufacturing and prototyping
- Stand alone solution (C_{IN} and C_{OUT} integrated, no external components)
- L78x series linear regulator replacement (no heatsink required)



Fixed Isolated SIP / SMT Module Portfolio

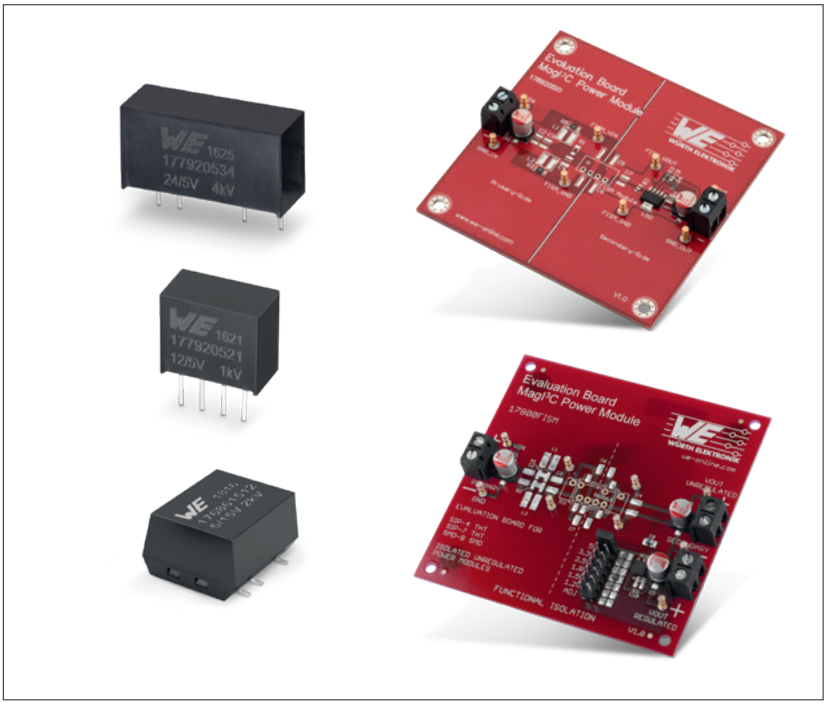
FISM MagI³C Power Modules

Type	Input Rail (V)	V_{IN} (V)	V_{OUT} (V)	P_{OUT} max (W)	$V_{isolation}$ (V) functional	Package	Order Code Module	Order Code EVAL Board
Fixed Isolated SIP Module (FISM)								
	±10 % from nominal V_{IN}	3.3	5.0	1	1000	SIP-4	177 920 501	178 920 5X1*
		5.0					177 920 511	
		12					177 920 521	
		24					177 920 531	
		3.3	5.0	1	2000	SMT-8	176 920 502	17800 FISM*
		5.0					176 920 512	
		12					176 920 522	
		5.0	12				176 881 212	
			15				176 861 512	
		5.0	5.0	1	4000	SIP-7	177 920 514	178 920 5X4*
		12					177 920 524	
		24					177 920 534	

*module is not included

SIP-4 / SIP-7 / SMT-8 isolated MagI³C Power Modules

- Easy isolated design-in (no transformer design know-how required)
- SIP: Leaded through-hole package for easy manufacturing and prototyping
- SMT: Industrial standard surface mount package
- Stand alone solution (C_{IN} and C_{OUT} integrated, no external components)
- Simple functional isolation for overvoltage protection, avoiding ground loops, ground shift and noise in signal path or sensor systems
- Industrial standard package and pin configuration
- IEC/EN/UL60950 approved



Variable Isolated SIP Module Portfolio

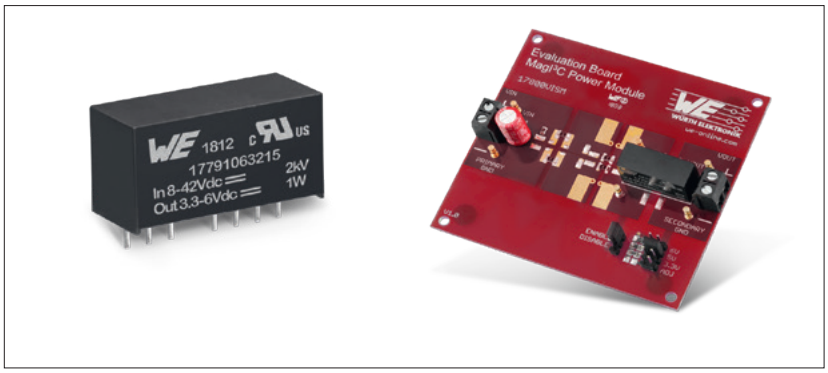
VISM MagI³C Power Modules

Type	Input Rail (V)	V_{IN} (V)	V_{OUT} (V)	P_{OUT} max (W)	V_{ISO} (V) functional	Package	Order Code Module	Order Code EVAL Board
Variable Isolated SIP Module (VISM)								
	9, 12, 18, 24	8 – 42	3.3 – 6	1 – 3*	2000	SIP-8	177 910 632 15	17800 VISM

* 3 W dynamic power boost for 0.5 s

SIP-8 adjustable isolated MagI³C Power Modules

- Easy isolated design-in (no transformer design know-how required)
- Flexible: Wide V_{IN} and adjustable regulated, short circuit protected V_{OUT}
- Power Boost: Tripple output power for short term load demands
- SIP: Leaded through-hole package for easy manufacturing and prototyping
- Stand alone solution (C_{IN} and C_{OUT} integrated, no external components)
- Simple functional isolation for overvoltage protection, avoiding ground loops, ground shift and noise in signal path or sensor systems
- Industrial standard package and pin configuration
- UL62368 approval



View details of emissions and temperature behavior in REDEXPERT: www.we-online.com/re-behavior

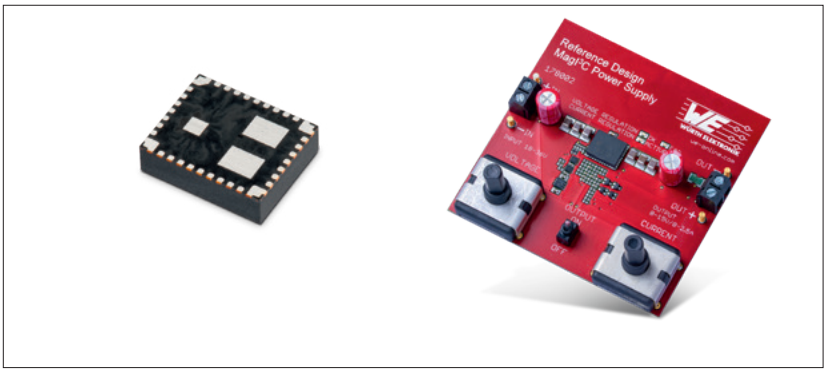
Reference Designs

Product Category	Product	Name	Description	Order Code
Reference Design				
	VDRM (171021501)	MagI³C LED Driver	V_{IN}: 7–24 V; V_{OUT}: up to 15 V; I_{OUT}: 1.5 A	178 001
		MagI³C Power Supply	V_{IN}: 7–36 V; V_{OUT}: 0–15 V; I_{OUT}: 0–2.5 A	178 002
		MagI³C Current Sharing	V_{IN}: 7–50 V; V_{OUT}: 2.5–15 V; I_{OUT}: 0–5 A	178 003
	VDRM (171031801)	MagI³C Current Source	V_{IN}: 4–18 V; V_{OUT}: 1.45–14.4 V; I_{OUT}: 0–3 A	178 004
	LDHM (172946001)	MagI³C Multi Color LED Driver	V_{IN}: 18–48 V; V_{OUT}: 1.8–V_{IN}; I_{OUT}: up to 450 mA	178 005 0

MagI³C Power Supply – 178002

7–36 V_{IN} / 0–2.5 A / 0–15 V_{OUT}

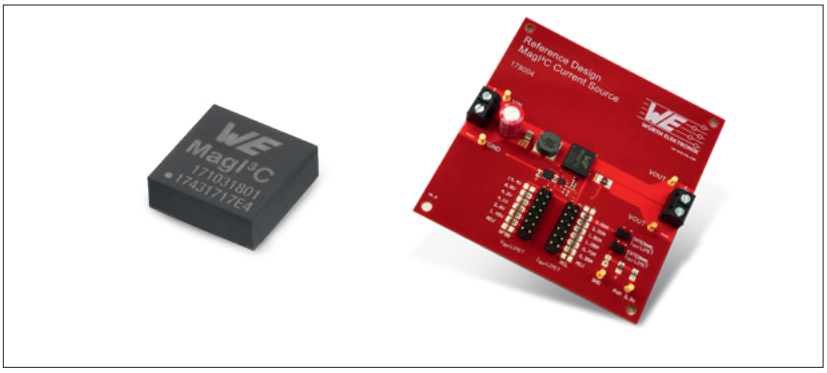
- Can be used as a constant current source
- Current and voltage dynamically adjustable by external microcontroller (using PWM)
- Designed for battery charger, super cap charger and high power LED driver applications



Current Source – 178004

4–18 V_{IN} / 0–3 A / 0–17 V_{OUT}

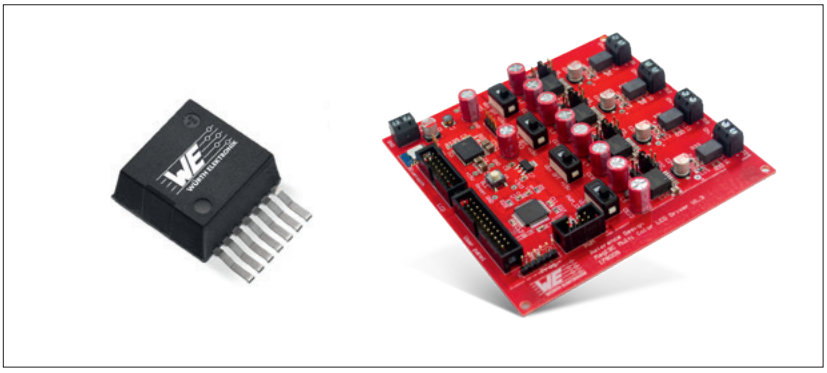
- Current dynamically adjustable by external microcontroller (using PWM)
- Voltage limit (end of charge voltage) can be individually selected by jumper
- Designed for battery charger, super cap charger and high power LED driver applications



Multi Color LED Driver – 1780050

18–48 V_{IN} / 0–0.45 A / 0–48 V_{OUT}

- 4 channel LED driver
- Dimming can be set by Bluetooth® with IOS app “WEilluminate”
- Intensity of each channel can be adjusted individually (dimming 0–100 %)
- Designed for horticulture lighting, mixing of white color temperatures, mixing of RGBW (red, green, blue, white) applications



Reference Filter Bags

Characteristics

- Discrete filter parts for conducted filtering
- Differential and common mode filter
- Tested according to EN55032 class B
- Application specific for short wire length

Applications

- Data acquisition
- Test and measurement systems
- Interface and microcontroller supply
- Industrial control

SIP-8 177001BAG

Isolated

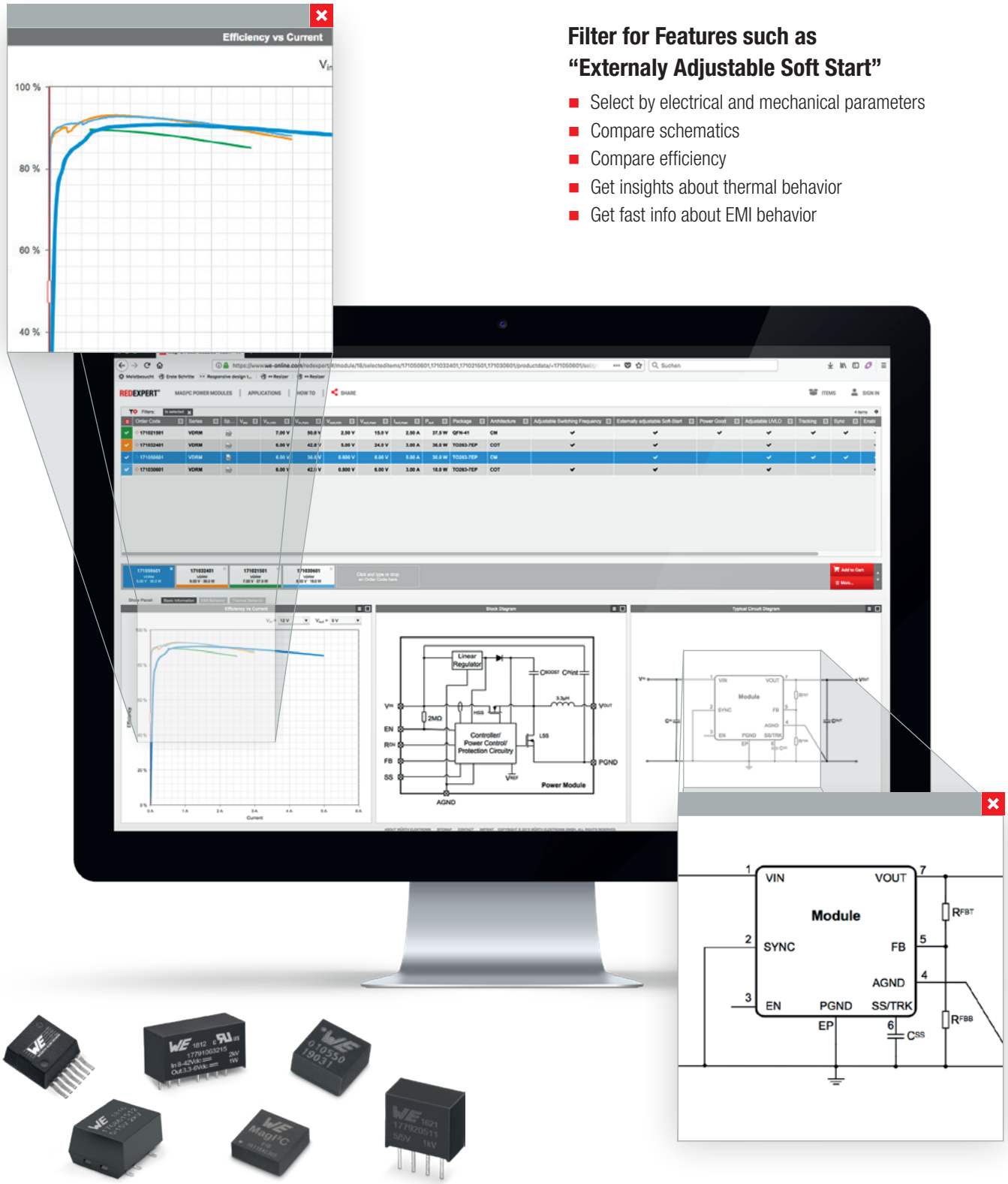
Order Code	C (V_R)	L (I_R)	f_{cutoff}*	Y-Cap (V_{ISO})	Power Module
177 001 BAG	10 µF (50 V)	22 µH (1 A)	11 kHz	470 pF (5 kV)	177 910 632 15
177 002	22 µF (10 V)	3.3 µH (2 A)	19 kHz	470 pF (2.5 kV)	177 920 501
177 003	10 µF (25 V)	4.7 µH (1.8 A)	23 kHz	470 pF (2.5 kV)	177 920 511
177 004	4.7 µF (50 V)	22 µH (1 A)	16 kHz	470 pF (2.5 kV)	177 920 521
177 005	2 x 4.7 µF (50 V)	68 µH (0.56 A)	6 kHz	1000 pF (5 kV)	177 920 531
177 006	10 µF (25 V)	4.7 µH (1.8 A)	23 kHz	470 pF (5 kV)	177 920 514
177 007	4.7 µF (50 V)	22 µH (1 A)	16 kHz	470 pF (5 kV)	177 920 524
177 008	2.2 µF (50 V)	47 µH (0.68 A)	16 kHz	470 pF (5 kV)	177 920 534
176 001	22 µF (10 V)	2.2 µH (2.5 A)	23 kHz	470 pF (2.5 kV)	176 920 502
					176 920 512
					176 881 212
					176 861 512
176 002	10 µF (25 V)	10 µH (1.45 A)	16 kHz	470 pF (2.5 kV)	176 920 522

Non-Isolated

Order Code	C (V_R)	L (I_R)	f_{cutoff}*	Power Module
171 001	10 µF (63 V)	2.2 µH (2.5 A)	34 kHz	171 050 601
171 002	1 µF (50 V)	10 µH (2.2 A)	50 kHz	171 010 601
				171 020 601
				171 030 601
171 003	10 µF (25 V)	10 µH (2.3 A)	16 kHz	171 011 801
				171 021 801
				171 031 801
173 001	10 µF (63 V)	1 µH (4 A)	50 kHz	173 950 336
				173 950 536

*Typically calculated values without DC bias effect

REDEXPERT Overview Power Modules



Filter for Features such as "Externaly Adjustable Soft Start"

- Select by electrical and mechanical parameters
- Compare schematics
- Compare efficiency
- Get insights about thermal behavior
- Get fast info about EMI behavior

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www.we-online.com/redexpert-power-modules

Power Modules

General Terms and Conditions of the Würth Elektronik eiSos Group

As of: May 2018

1. Application

1.1 These General Terms and Conditions (hereinafter "**Conditions**") shall apply to all deliveries and services of Würth Elektronik eiSos GmbH & Co. KG, Würth Elektronik iBE GmbH and Erwin Büchele GmbH & Co. KG (hereinafter "**Würth Elektronik**") even if they are not referred to in subsequent contracts. Any terms and conditions of the customer that conflict with, supplement, or deviate from these Conditions shall not become part of the contract unless their application is expressly approved by Würth Elektronik in writing. These Conditions shall apply even if Würth Elektronik accepts a delivery or service from the customer without reservations whilst being aware of the customer's conflicting or deviating terms and conditions.

1.2 Agreements which supplement or deviate from these Conditions and which are made between the customer and Würth Elektronik for the performance of a contract must be set out in writing in the contract. This also applies to the cancellation of this requirement of the written form.

1.3 Any rights beyond these Conditions to which Würth Elektronik is entitled by law shall remain unaffected.

2. Offer and formation of contract

2.1 Offers from Würth Elektronik shall be subject to change and non-binding, unless they are expressly stated to be binding.

2.2 Pictures, drawings, information as to weight, measurement, performance and consumption as well as other descriptions of the goods in the documentation pertaining to the offer shall be approximations only, unless they are expressly stated to be binding. They do not constitute an agreement on, or guarantee of, the corresponding quality of the goods.

2.3 Würth Elektronik reserves all proprietary rights and copyrights in any offer documents. Such documents may not be made available to any third party.

2.4 Orders from the customer shall be binding. Würth Elektronik may accept orders by sending a written order confirmation, by making delivery or providing the services.

2.5 Executing orders according to the documents to be provided by the customer shall require written approval by Würth Elektronik.

2.6 Contracts that are concluded shall oblige the customer to accept and pay for the goods or services ordered.

3. Prices, payment, set-off

3.1 The agreed price shall always be decisive. Not included in the price shall, in particular, be the costs for packaging, freight, insurance, customs, public levies and VAT. Statutory VAT shall be stated separately in the invoice, at the statutory rate applicable on the day the invoice is issued.

3.2 For services that shall not be performed within a period of four month after the contract has been concluded Würth Elektronik shall be entitled to adjust the price in line with any increases in wages and in the cost of materials that may have occurred in the meantime. The same shall apply for services that are to be provided as part of continuous obligations. If Würth Elektronik has agreed with the customer that the prices shall depend on specific price factors, for example, raw material prices, changes in the price factors can lead to price adjustments, irrespective of the performance period.

3.3. Unless otherwise agreed, payment shall be made net within 30 days after the date of the invoice. Würth Elektronik shall, however, be entitled to make the execution of outstanding deliveries or the provision of services contingent upon pre-payment or the provision of security if no previous business relationship exists with the customer, deliveries are to be made abroad, the customer's registered office is abroad or if there are any other reasons that give Würth Elektronik reason to doubt that payment will be made promptly after delivery or provision of the services.

3.4 If after the contract has been entered into Würth Elektronik becomes aware of circumstances that could considerably reduce the customer's creditworthiness and which could endanger the payment of outstanding receivables of Würth Elektronik by the customer under the individual contract, Würth Elektronik shall be entitled to refuse to continue to execute the contract until the customer makes payment or provides security for such. If the customer is in default of payment, all the receivables of Würth Elektronik that are outstanding with the customer shall become due immediately.

3.5 Payment shall be deemed made on the date on which Würth Elektronik can dispose of the amount owed. When paying by cheque, payment shall only be deemed made after the cheque has been cashed and Würth Elektronik can dispose of the amount. Discount charges and other cheque costs shall be borne by the customer. In the event of default of payment, the customer shall pay default interest at the rate of 9 percentage points above the base rate. The right to assert a further claim for damages is not excluded.

3.6 Würth Elektronik shall be entitled to credit payments made by the customer towards the customer's oldest debt first. If costs and interest have already accrued, Würth Elektronik shall be entitled to credit the payment towards the costs first, then towards interest, and finally towards the principal claim.

3.7 Counterclaims of the customer may only be set off or used to assert a right of retention by the customer if they have become final by virtue of a judgment or if they are undisputed. A right to retain may be asserted by the customer only if the customer’s counterclaim is based on the same contractual relationship.

4. Deliveries

4.1 Delivery periods and dates shall only be binding for Würth Elektronik if Würth Elektronik explicitly states or confirms that they are binding. Agreed delivery periods shall be deemed met if the goods have been handed over to the person in charge of the transport at Würth Elektronik's registered office or at one of Würth Elektronik's warehouses before this period has expired or if Würth Elektronik has provided notification that they are ready for dispatch but have not left the registered office or warehouse because the customer has declared that it will not accept the goods.

4.2 If making the agreed deliveries or providing the services of Würth Elektronik requires the cooperation of the customer, the customer shall ensure that Würth Elektronik is provided with all the necessary and appropriate information and data within good time and that such is of the required quality. If programming is required, the customer shall provide Würth Elektronik with the necessary computer processing power, test data and data inputting capacities within good time and to a sufficient extent.

4.3 The delivery period shall not start before all the documents, information, approvals and permits that are to be provided by the customer have been provided in full and any technical issues have been clarified and any agreed down-payment has been received. As a prerequisite for compliance with the delivery period or the delivery date, the customer must perform its other obligations properly and in due time. Compliance with the agreed delivery deadlines and delivery dates is subject to the condition that Würth Elektronik is supplied by its own suppliers in due time and properly. Any changes or amendments that are subsequently agreed with Würth Elektronik may result in a reasonable extension of the agreed delivery dates.

4.4 Würth Elektronik shall be entitled to make reasonable part deliveries and provide partial services. Unless otherwise expressly agreed, deliveries and services ahead of schedule shall be allowed.

4.5 If the customer is in default of acceptance or violates other duties to cooperate, Würth Elektronik can claim compensation for the damage caused including any additional expenditure and storage costs. Any other claims remain unaffected. Würth Elektronik shall be entitled, after setting a reasonable subsequent deadline, to otherwise dispose of the goods and to supply the customer with new goods within a reasonable extended deadline.

5. Passing of risk/dispatch

5.1 The risk of accidental loss or accidental deterioration of the goods shall pass to the customer at the latest when the goods are handed over to the customer or, if it is agreed that the goods will be shipped, already with the handing over of the goods to the shipping company, freight carrier or to any other person instructed to carry out the dispatch. This

shall also apply to part deliveries or if it has been agreed that the dispatch is “freight paid” or free of charge. In the absence of written instructions from the customer, Würth Elektronik shall be entitled to choose the carrier and the itinerary at its own discretion and after a due assessment of the circumstances. At the request and expense of the customer, Würth Elektronik shall take out transport insurance to insure the goods against the risks specified by the customer.

5.2 If there is a delay in handing over or dispatch for reasons for which the customer is responsible, the risk shall pass to the customer on the day the goods are ready to be dispatched and Würth Elektronik informs the customer of such.

5.3 If Würth Elektronik chooses the type of dispatch, the dispatch route and/or the person to carry out the dispatch, Würth Elektronik shall only be liable for wilful misconduct or gross negligence resulting from this choice.

6. Retention of title

6.1 The goods supplied remain the property of Würth Elektronik until all receivables owed to Würth Elektronik by the customer as a result of the business relationship have been fully paid. If Würth Elektronik's obligations to be performed include delivering software, up until payment in full has been made of any receivables, the customer shall in any case only be granted a revocable usage right. These receivables also include claims under cheques and bills of exchange, as well as current-account claims. The customer shall be obliged to handle all goods to which title is retained, and as long as title is retained, with due care. In particular, the customer is obliged to sufficiently insure the goods at the customer’s own expense against damage by fire, water, and theft at their replacement value. The customer hereby assigns to Würth Elektronik all claims for compensation arising from such insurance. Würth Elektronik hereby accepts the assignment. If an assignment is not allowed, the customer hereby irrevocably instructs its insurer to make payments, if any, only to Würth Elektronik. This does not affect any further claims of Würth Elektronik. Upon request, the customer must provide Würth Elektronik with evidence of the conclusion of the insurance policy.

6.2 The customer shall only be allowed to sell the goods which are subject to retention of title in the ordinary course of business. The customer shall not be entitled to pledge the goods which are subject to retention of title, to transfer them by way of security or to make any other dispositions which may jeopardize Würth Elektronik's ownership. In the event of attachments or other encroachments by third parties, the customer must notify Würth Elektronik without undue delay in textual form and provide all the information required, advise the third party of Würth Elektronik’s property rights and assist with the measures taken by Würth Elektronik to protect the goods which are subject to retention of title. The customer shall bear any costs for which it is responsible and which are necessary for the removal of the encroachment and the recovery of the goods, if and to the extent that these costs cannot be obtained from the third party.

6.3 The customer hereby assigns to Würth Elektronik all receivables arising from the resale of the goods, including all ancillary rights, irrespective of whether the goods which are subject to retention of title are resold without or after further processing. Würth Elektronik hereby accepts this assignment. In the event that such assignment is not allowed, the customer hereby irrevocably instructs the third-party debtor to make payments, if any, only to Würth Elektronik. The customer has the authority, which may be revoked at any time, to collect the receivables assigned to Würth Elektronik as a trustee on behalf of Würth Elektronik. All amounts collected must be remitted to Würth Elektronik immediately. Würth Elektronik may revoke the customer’s authority to collect receivables and its right to resell the goods if the customer fails to properly perform its payment obligations to Würth Elektronik, if the customer is in default of payment or stops payment, or if the creditworthiness or financial position of the customer deteriorates, he cease any other business activity essential for the contractual performance or if he becomes incapable for other reasons to fulfil the contractual duties. Any resale of these receivables is subject to prior approval by Würth Elektronik. The customer’s authority to collect shall expire with the notification of the assignment to the third-party debtor. In the event of a revocation of the authority to collect, Würth Elektronik may request that the customer disclose all receivables assigned, as well as the respective debtors' names, provide all information necessary for collection, provide the related documents and inform the debtors of the assignment.

6.4 In the event of default of payment on the part of the customer, Würth Elektronik shall be entitled to rescind the contract without prejudice to its other rights. The customer must immediately grant Würth Elektronik, or any third party commissioned by Würth Elektronik, access to the goods that are subject to retention of title, surrender such goods and inform Würth Elektronik where these goods are located. After a timely warning to such effect, Würth Elektronik may otherwise dispose of the goods that are subject to retention of title for the purpose of satisfying its due claims against the customer.

6.5 Any processing or alterations made by the customer to the goods which are subject to retention of title shall always be deemed made on behalf of Würth Elektronik. The customer’s right to acquire ownership of the goods which are subject to retention of title continues to exist as a right to acquire ownership of the processed or altered item. If the goods are processed, combined or mixed with other goods that are not owned by Würth Elektronik, Würth Elektronik shall acquire a co-ownership interest in the new item that is equal to the ratio of the value of the goods supplied to the value of the other items processed at the time of processing. The customer shall store the new items on behalf of Würth Elektronik. In all other respects, the item created through processing or alteration shall be governed by the same provisions as the goods that are subject to retention of title.

6.6 If requested by the customer, Würth Elektronik shall be obliged to surrender the security interests to which Würth Elektronik is entitled to the extent that the realizable value of these security interests exceeds Würth Elektronik’s receivables arising from the business relationship with the customer by more than 20% upon deduction of the mark-downs customary in the banking business. For valuation purposes, goods that are subject to retention of title shall be assessed on the basis of their invoice value and receivables shall be assessed on the basis of their nominal value.

6.7 In the event that goods are delivered to destinations with other legal systems in which the retention of title pursuant to clauses 6.1 to 6.6 above does not offer the same degree of protection as in the Federal Republic of Germany, the customer hereby grants Würth Elektronik the equivalent security interest. If the creation of this security interest requires further declarations or actions, the customer shall make these declarations and perform these actions. The customer shall assist with all measures required for, and conducive to, the validity and enforceability of such security interests.

7. Claims for quality defects and liability

7.1 Würth Elektronik shall manufacture its products according to the state of the art in technology applicable at time of entering into the contract. Any intended usage that goes beyond the customary usage of the products or that requires a quality that deviates from the norm, in particular, any usage that is relevant for safety purposes, for example, aerospace or automobile usage, must be agreed in advance in writing.

7.2 The customer's defect rights shall require that the customer has fulfilled its statutory obligations to inspect and give notice of defects (Sec. 377, 381 German Commercial Code (*HGB*)), in particular that the customer has checked the delivered goods upon receipt and notified Würth Elektronik without undue delay and in textual form upon receipt of the goods of any obvious defects and defects that could be identified during such inspection. The customer shall inform Würth Elektronik in writing of any hidden defects without undue delay after they have been discovered. The notification shall be deemed without undue delay if made within two weeks after delivery for obvious defects and defects that could be identified during a proper inspection or after discovery in the event of hidden defects; to meet the deadline, the dispatch of the notification or complaint shall suffice. If the customer fails to carry out a proper inspection and/or notification of the defects, Würth Elektronik shall not be liable for the defect. When reporting defects to Würth Elektronik, the customer must supply a detailed description of the defects in textual form.

7.3 Unless otherwise agreed, the customer shall initially deliver the goods at its own expense to Würth Elektronik so that the defects can be examined. The expenses that are required for the inspection and subsequent performance, in particular transportation, travel, labour and

material costs within the meaning of Sec. 439 (2 and 3) German Civil Code (*BGB*) shall only be borne by Würth Elektronik if it is determined during the inspection that a defect actually exists and provided these expenses are not increased due to the fact that the customer took the goods to a different location than the original delivery address. Personnel and material costs claimed by the customer in this connection shall be charged on the basis of net costs. The reimbursement of the costs for removal and installation in the context of supplementary performance regardless of fault is excluded. Equally excluded is the applicability of Sec. 445 a and 445 b German Civil Code (*BGB*).

7.4 If the goods are defective, Würth Elektronik shall be entitled - for the purposes of subsequent performance - to choose between remedying the defect or delivering goods that are free from defects.

7.5 If Würth Elektronik is not prepared or is not in a position to carry out subsequent performance after a reasonable deadline has expired, the customer can choose to rescind the agreement or reduce the purchase price. The same shall apply if the subsequent performance fails, if it is unacceptable to the customer or if a reasonable deadline is exceeded due to reasons for which Würth Elektronik is responsible.

7.6 The customer shall have no right to rescind the contract if the customer is unable to return the goods received and this is not due to the fact that it is impossible to return such due to their nature, if Würth Elektronik is responsible for such or if the defect did not become apparent until after the goods were processed or altered. The right to rescind the contract shall furthermore not exist if Würth Elektronik is not responsible for the defect and if instead of the received goods or services being returned by the customer, Würth Elektronik has to pay compensation for lost value.

7.7 Claims for defects shall not exist with respect to defects that are due to natural wear and tear, to improper handling by the customer or a third party, or to changes or repairs to the goods that have been carried out by the customer or a third party in an improper manner. The same shall apply to defects which can be attributed to the customer or which arise as a result of technical reasons other than the original defect. The customer shall, in particular, comply with the operational, storage and/or maintenance recommendations provided by Würth Elektronik or the manufacturer.

7.8 The customer's claim for reimbursement of expenses in place of damages in lieu of performance shall be excluded if and to the extent that such expenses would not have been made by a reasonable third party.

7.9 Würth Elektronik shall not be liable for damage for which it is not responsible, in particular, it shall not be liable for damage that is caused by improper usage or handling of the products. The customer is obliged to comply with the operational, storage and/or maintenance recommendations provided by Würth Elektronik or the manufacturer, to only make authorised changes, replace spare parts professionally and use the consumables that have the necessary specifications. Where applicable the customer shall, both before and also regularly after the deliveries have been made or the services have been provided by Würth Elektronik, perform backups to its computer systems at sufficiently regular intervals. Würth Elektronik shall assume no liability for damage which is caused by or can be attributed to a breach of the aforesaid obligations of the customer.

7.10 Würth Elektronik shall be liable without limitation for any damage resulting from breach of guarantee or from death, bodily injury, or damage to health. The same shall apply to wilful misconduct and gross negligence, to mandatory statutory liability for product defects (in particular under the German Product Liability Act *(ProdHaftG)* and to liability if defects were concealed with fraudulent intent. In cases of slight negligence, Würth Elektronik shall only be liable if material obligations are breached that result from the nature of the contract and the performance of which is of particular importance in order for the purpose of the contract to be achieved. If such obligations are breached, as well as in the event of default or if performance is impossible, Würth Elektronik's liability shall be limited to the damage which can typically be expected with such contract.

7.11 The limitation period for claims for defects of the customer shall be one year, unless the defective good has been used in its customary manner for a building and this has caused a defect to the building. The limitation period shall also apply to claims resulting from a tortious act that are based on a defect of the goods. The limitation period shall start with the delivery of the goods. This shall not affect the unlimited liability of Würth Elektronik for damage resulting from a breach of guarantee or from death, bodily injury or damage to health, for wilful misconduct and gross negligence, and product defects. If Würth Elektronik makes a statement with regard to a claim for defects asserted by the customer, this shall not be deemed as the start of negotiations with regard to the claim or the circumstances on which the claim is based, provided the claim for defects is fully rejected by Würth Elektronik.

8. Intellectual property and usage rights relating to software and other protected products, information and co-operation duties

8.1 Unless otherwise provided in the contract or by law, any rights relating to software or other protected products which are delivered to the customer or which are produced for the customer, in particular, copyrights, industrial property rights such as, patents, trademarks and registered designs, shall remain the property of Würth Elektronik or the individual proprietor of the rights. This shall also apply if the software or any other protected products are produced according to the specifications of or in co-operation with the customer.

8.2 If Würth Elektronik uses the customer's software, Würth Elektronik shall only use such software for the contractually agreed purpose. If Würth Elektronik requires the source codes for the software to make contractually agreed changes or remedy defects, the customer shall provide Würth Elektronik with such free of charge for use.

8.3 The customer shall only receive a simple right of use to the software and other protected products to such extent as is required for the purpose of the contract, unless otherwise provided in the contract, in particular, the applicable licencing terms of the software or an individual licence agreement, or by mandatory statutory law. With regard to software provided by Würth Elektronik, unless expressly permitted under the contract or by law, the customer shall in particular be forbidden from reproducing, distributing, disclosing, changing, translating, extending, making other modifications to and/or decompiling such.

8.4 For backup purposes, the customer may create the necessary backup copies of the software, provided the individual licence agreement does not contain provisions to the contrary. Sec. 69d (2) Germany Act on Copyright and Related Rights (*UrhG*) remains unaffected. Backup copies on moveable data carriers shall be marked as such and shall be endorsed with the copyright notice of the original data carrier.

8.5 In the event of unlawful use Würth Elektronik and/or third parties, in particular, the manufacturer of the software or other protected products, reserve the right to assert claims for compensation.

8.6 In the event that a third party alleges it has a claim which conflicts with the right of use granted to the customer, the customer shall inform Würth Elektronik without undue delay in text form. The notification shall also include information as to whether the customer has changed the software or the product or combined such with other software and whether this, from the customer's perspective, could justify the third party's claim. If so requested by Würth Elektronik, the customer shall allow Würth Elektronik to handle the defence against these claims and, to the extent permissible and possible, shall allow Würth Elektronik to represent the customer or shall conduct the defence itself as instructed by Würth Elektronik. Up until receiving notification as to whether Würth Elektronik will deal with the defence, the customer shall not acknowledge or enter into a settlement agreement regarding the alleged claims of the third party without the express approval of Würth Elektronik. If Würth Elektronik deals with the defence, this obligation shall continue to apply. In addition, the customer shall support Würth Elektronik in its defence, if this is required for an appropriate defence. In return, Würth Elektronik shall indemnify and hold the customer harmless against any necessary external costs and any third party compensation claims and claims for reimbursement of expenses resulting from the defence, provided these can be attributed to the fault of Würth Elektronik. In the event that Würth Elektronik does not deal with the defence, the customer shall be entitled to defend itself at its

own discretion. If existing third party claims cannot be attributed to the fault of Würth Elektronik, the customer shall not be entitled to assert claims against Würth Elektronik.

8.7 Notwithstanding Sec. 439 (1) German Civil Code (*BGB*), Würth Elektronik shall also be entitled with regard to title defects relating to software to attempt subsequent performance, if Würth Elektronik so chooses (cf. 7.4). In all other respects, the statutory provisions for warranty obligations for title defects with regard to software shall apply irrespective of whether Würth Elektronik is dealing with the defence against third party claims under clause 8.6 of these Conditions, however, with the following exceptions: (i) for the recovery of data, Würth Elektronik shall only be liable insofar as the loss of data would also have occurred if the customer had carried out the usual backups; (ii) clause 7.3 of these Conditions applies accordingly.

9. Product liability

9.1 The customer shall not modify the goods; in particular, the customer shall not modify or remove existing warnings relating to risks by improperly using the goods. If this duty is violated, the customer must inter partes indemnify and hold Würth Elektronik harmless from and against any product liability claims of third parties to the extent that the customer is responsible for the defect giving rise to liability.

9.2 If Würth Elektronik has to carry out a product recall or issue a product warning because of a product defect to the goods, the customer shall assist Würth Elektronik and take all measures ordered by Würth Elektronik, provided that these do not pose an unreasonable burden to the customer. The customer shall be obliged to bear the costs of the product recall or product warning, provided the customer is responsible for the product defect and the damage sustained. This does not affect any further claims of Würth Elektronik.

9.3 The customer shall inform Würth Elektronik without undue delay in textual form of any risks in the use of the goods and any possible product defects of which the customer becomes aware.

10. Force majeure

10.1 If Würth Elektronik is prevented by force majeure from performing its contractual obligations, in particular from delivering the goods, Würth Elektronik shall be released from its obligation to perform for the duration of the impediment and for a reasonable start-up period without being liable to the customer for damages. The same shall apply if the performance of its obligations by Würth Elektronik becomes unreasonably complicated or temporarily impossible because of unforeseeable circumstances for which Würth Elektronik is not responsible, in particular, because of industrial action, official acts, energy shortages, delivery problems on the part of suppliers, or major disruptions of operations.

10.2 Würth Elektronik shall have the right to rescind the contract if such an impediment continues for more than three months and if, as a result of such impediment, the performance of the contract is no longer of interest to Würth Elektronik. At the request of the customer, Würth Elektronik shall declare after the expiry of the aforesaid three-month period whether it intends to make use of its right to rescind the contract or whether it intends to deliver the goods within a reasonable period of time.

11. Confidentiality

The customer shall be obliged for an unlimited period of time to maintain the confidentiality of any and all information received through Würth Elektronik which is stated to be confidential or which due to other circumstances can be identified as a trade or business secret; the customer may neither record nor disclose or use any such information. The customer must ensure by means of suitable contractual agreements with its employees and those agents working on its behalf that such persons also refrain for an unlimited period of time from any use, disclosure and unauthorised recording of such trade and business secrets for their own purposes.

12. Final provisions

12.1 Any rights and obligations of the customer may only be assigned or transferred to a third party with the written consent of Würth Elektronik.

12.1 The legal relations between the customer and Würth Elektronik shall be governed by the laws of the Federal Republic of Germany, without regard to the United Nations Convention on Contracts for the International Sale of Goods (CISG).

12.3 Exclusive place of jurisdiction for all disputes arising from the business relationship between Würth Elektronik and the customer shall be the registered office of Würth Elektronik. Würth Elektronik may in addition sue the customer at the latter's registered office, as well as at any other permissible place of jurisdiction.

12.4 The place of performance for any and all obligations to be performed by the customer and by Würth Elektronik shall be the registered office of Würth Elektronik.

12.5 If a provision of this agreement is or becomes invalid or impracticable in whole or in part, or if this agreement is incomplete, this shall not affect the validity of the remaining provisions hereof. In lieu of the invalid or impracticable provision, such valid and impracticable provision shall be deemed agreed as comes closest to the purpose of the invalid or impracticable provision. In the event that this agreement is incomplete, such provision shall be deemed agreed as corresponds to what would have been agreed according to the purpose of this agreement if the contracting parties had considered the matter from the outset.

13. Environmental declaration

Würth Elektronik is committed to people and the environment. Therefore, we undertake to manufacture our products in a manner that conserves resources and to systematically realise any potential for saving energy in manufacturing processes and in transportation. We pay close attention to ecological alternatives as concerns the selection of sources of energy and raw materials and pursue a consistent policy of waste reduction and product recycling.

Notes

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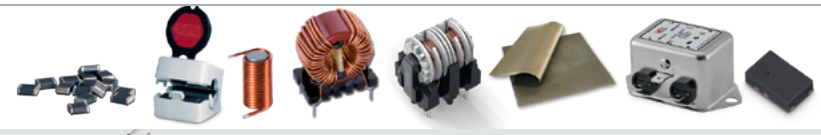
Electronic & Electromechanical Components

WÜRTH ELEKTRONIK



EMC Components

Power Magnetics

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Quartz & Oscillators

Capacitors

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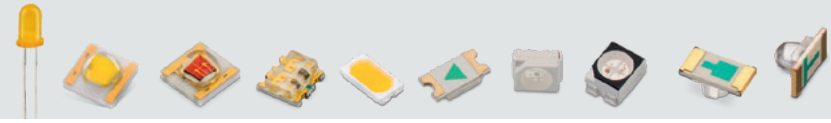
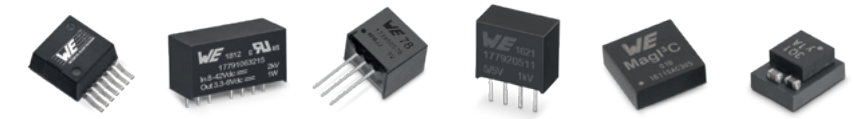
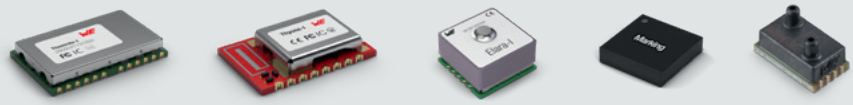
Automotive Standard Products



Optoelectronics



Power Modules



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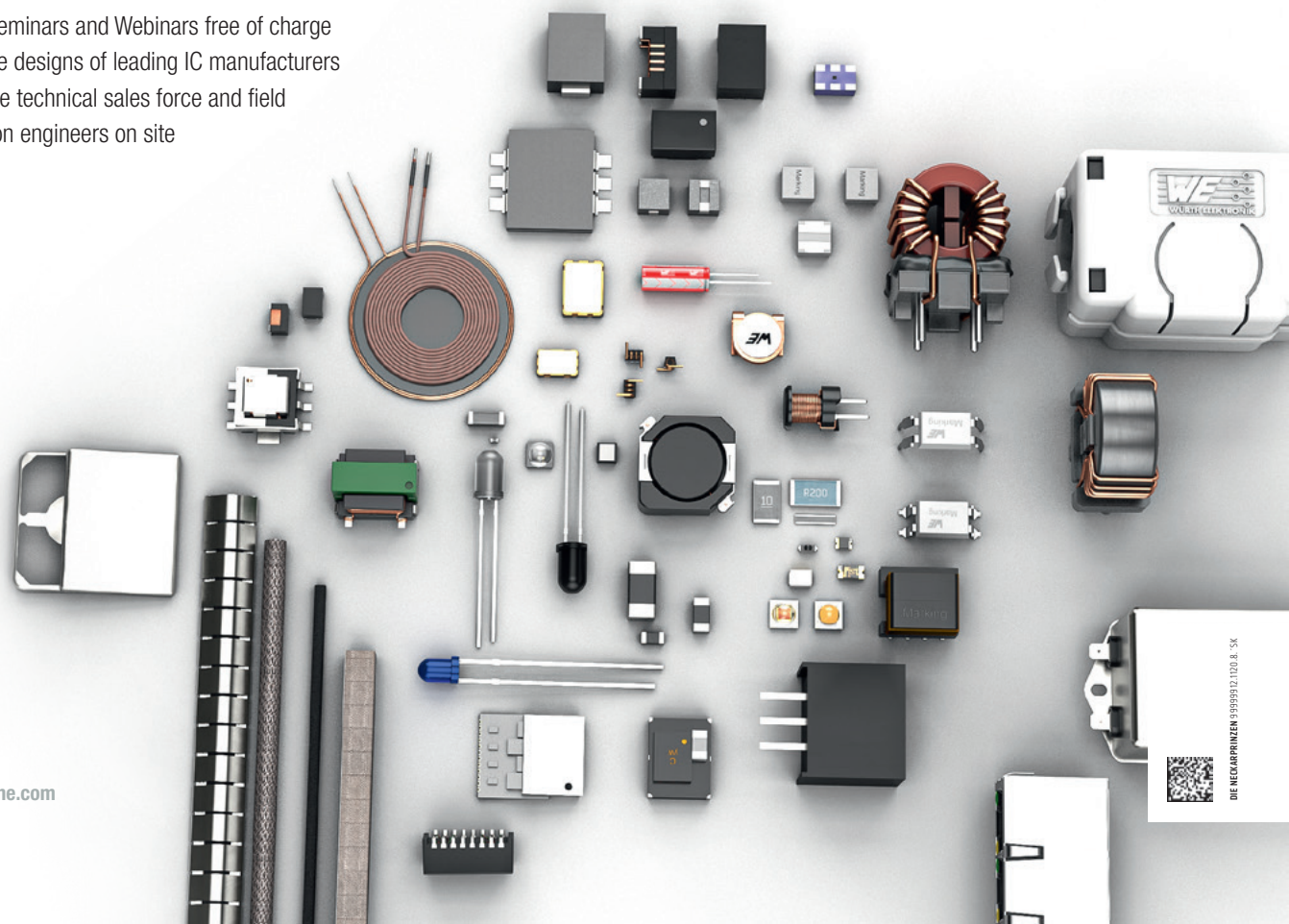
- Design Seminars and Webinars free of charge
- Reference designs of leading IC manufacturers
- Worldwide technical sales force and field application engineers on site



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