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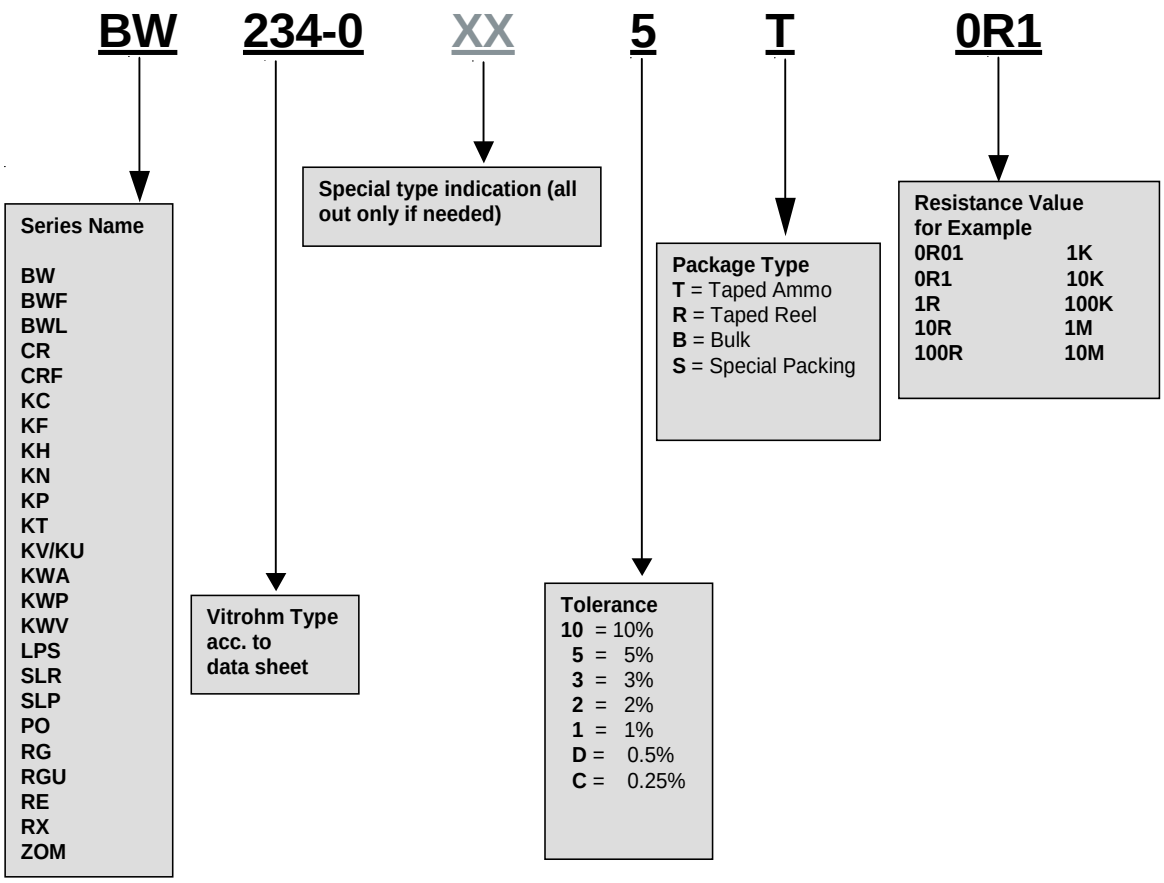
Contents by Series

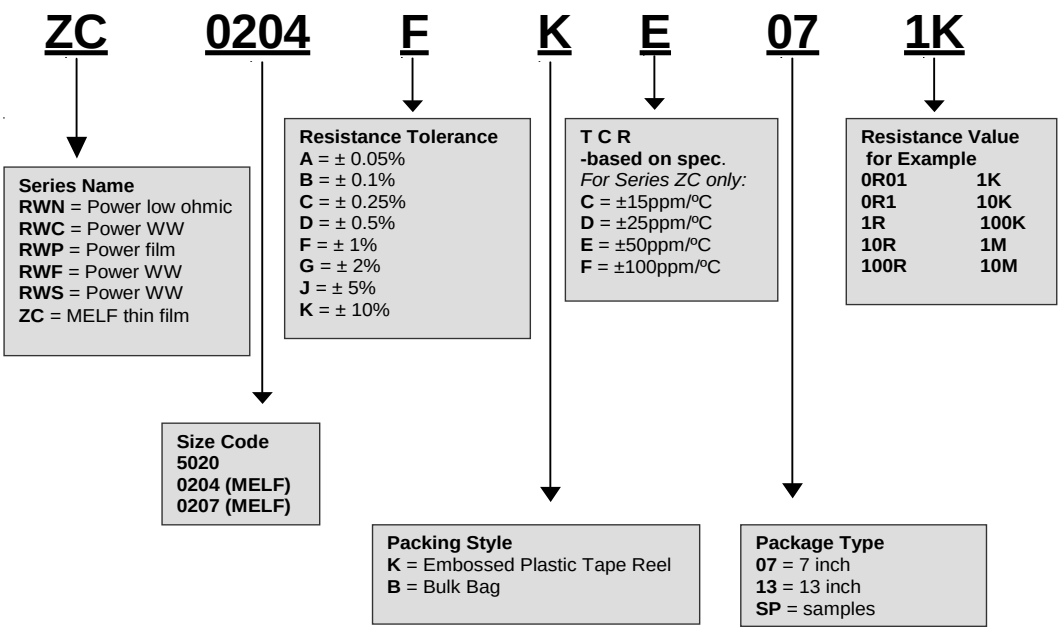
VITROHM

Explanation :

Wirewound & Film Resistor



SMD Resistors



Type

Internal Vitrohm-reference for a certain component, normally identical with the ordering-number.
IEC 115-1 clause 2.2.2

Series

Collection of types with similar constructional features and comparable technical data.

Style

Industrialized, often internationally standardized, designation with respect to the dimensions of a component, e.g. length/width, diameter/length.
IEC 115-1 clause 2.2.3

Dimensions

The accurate mechanical size of a certain type or tabular for a series. If without tolerances, refer to DIN 7168 (coarse).

Rated Power P_{70}

Electrical power defined by current and voltage a resistor can bear continuously. Commonly the value is given for 70°C ambient temperatur.
IEC 115-1 clause 2.2.13

Resistance range

Data, showing the minimum and maximum resistance value possible for a given type or series.

Series E of preferred values

Internationally standardized staggeration for resistance values within one decade, different E-series vary on the total number of values per decade. The preferred values result (approximated) from

$$\sqrt[E]{10^{n}} \qquad (n = 1, 2, 3 \ldots E)$$

IEC 115-1 clause 2.3.2 and IEC 63

Tolerances

Here admissible deviation from nominal resistance value at the moment of receiving. Possible resistance changes due to electrical, climatic or mechanical stress are not included in the nominal tolerance.

Temperature coefficient

A value, determined by materials and styles, indicating the dependency of a resistance value from temperature. Resistance changes caused by temperature coefficient are reversible.
IEC 115-1 clauser 2.2.20.2 and 4.8.4.2

Voltage coefficient

A value mainly determined by materials, indicating the dependency between resistance value and applied voltage. The voltage coefficients is negative, resulting resistance changes are reversible.
IEC 115-1 clauses 2.2.25 and 4.11

Maximum continuous working voltage

Limit for the voltage applied to a resistor. May not be exceeded, even if other limitations, e.g. rated power, are not reached. If instead of a voltage value the general equation is given, the limiting voltage is only determined by the rated power.
IEC 115-1 clause 2.2.16

Thermal resistance

A value influenced by materials and dimensions indicating the selfheating of a resistor by electrical power.

Insulation voltage

Test voltage applied for one minute between components terminals and sheathing (e.g. surface). The given value does not define continuous isolation.
IEC 115-1 clause 2.2.17

Insulation resistance

Electrical resistance between components terminals and sheathing. Given for a certain measuring voltage, e.g. 100 V or 500 V.
IEC 115-1 clauses 2.2.19 and 4.6

Climatic category
Defined in IEC 68-1, this statement establishes the lowest and highest test temperature (category temperature) as well as the duration of humidity-testing. Consequently climatic category substitutes according to the CECC- and IEC-approval-systems the former applicability classes of DIN 40040, which were almost impossible to verify by testing.

Temperature range
Limits for ambient temperature. Components may be used within the stated limits.
IEC 115-1 clause 2.2.9

Derating
Reduction of electrical power at increased ambient temperature, to avoid excess of maximum surface temperature by selfheating.
IEC 115-1 clause 2.2.24

Failure rate
Number of statistically possible defects, depending on time and quantity of components. If not stated differently, the given value refers to total-failure under nominal conditions.

Load life
Relative irreversible resistance change after a certain testing time. Normally related to rated power 70°C ambient temperature and 1000 hours testing.
IEC 115-1 clause 4.25

Damp heat, steady state
Relative irreversible resistance change after a defined climatic stress.
IEC 115-1 clause 4.24

Climatic sequence
Relative irreversible resistance change after a defined sequence of climatic stresses.
IEC 115-1 clause 4.23

Terminal strength
Relative irreversible resistance change after a defined sequence of mechanical stresses to the terminals. Test procedures according to CECC or IEC are standardized in the applicable detailed specification.

Terminal tensile strength
Limit for the tensile force applied to the terminals.

Resistance to soldering heat
Relative irreversible resistance change due to soldering. Test procedures according to CECC or IEC are standardized in the applicable detailed specification.
IEC 115-1 clause 4.18

Current noise
A voltage, having a statistical distribution of frequencies, depending on the DC-current through the resistor. Current-noise-voltage is additional to thermal noise, which depends on materials and styles.
IEC 115-1 clause 4.12

Non-linearity
A value for possible non-linearity between current through and voltage applied to an ohmic resistor.

Standards
Here enumeration of norms and standard specifications, nationally or internationally known for a given series of components. If applicable also the CECC-detailed-specification to which the given series has been approved to.

Packaging units
Quantity packed in a standard packaging unit, method of packing, in cases possibilities of selection.

Ordering-example
Necessary order processing-details for required components.

Preferred values acc. to DIN/IEC

VITROHM

E 6	E 12	E 24
1.0	1.0	1.0
		1.1
	1.2	1.2
		1.3
1.5	1.5	1.5
		1.6
	1.8	1.8
		2.0
2.2	2.2	2.2
		2.4
	2.7	2.7
		3.0
3.3	3.3	3.3
		3.6
	3.9	3.9
		4.3
4.7	4.7	4.7
		5.1
	5.6	5.6
		6.2
6.8	6.8	6.8
		7.5
	8.2	8.2
		9.1

E 48	E 96	E 192	E 48	E 96	E 192	E 48	E 96	E 192	E 48	E 96	E 192	E 48	E 96	E 192
100	100	100	162	162	162	261	261	261	422	422	422	681	681	681
		101			164			264			427			690
	102	102		165	165		267	267		432	432		698	698
		104			167			271			437			706
105	105	105	169	169	169	274	274	274	442	442	442	715	715	715
		106			172			277			448			723
	107	107		174	174		280	280		453	452		732	732
		109			176			284			459			741
110	110	110	178	178	178	287	287	287	464	464	464	750	750	750
		111			180			291			470			759
	113	113		182	182		294	294		475	475		768	768
		114			184			298			481			777
115	115	115	187	187	187	301	301	301	487	487	487	787	787	787
		117			189			305			493			796
	118	118		191	191		309	309		499	499		806	806
		120			193			312			505			816
121	121	121	196	196	196	316	316	316	511	511	511	825	825	825
		123			198			320			517			835
	124	124		200	200		324	324		523	523		845	845
		126			203			328			530			856
127	127	127	205	205	205	332	332	332	536	536	536	866	866	866
		129			208			336			542			876
	130	130		210	210		340	340		549	549		887	887
		132			213			344			556			898
133	133	133	215	215	215	348	348	348	562	562	562	909	909	909
		135			218			352			569			920
	137	137		221	221		357	357		576	576		931	931
		138			223			361			583			942
140	140	140	226	226	226	365	365	365	590	590	590	953	953	953
		142			229			370			597			965
	143	143		232	232		374	374		604	604		976	976
		145			234			379			612			988
147	147	147	237	237	237	383	383	383	619	619	619			
		149			240			388			626			
	150	150		243	243		392	392		634	634			
		152			246			397			642			
154	154	154	249	249	249	402	402	402	649	649	649			
		156			252			407			657			
	158	158		255	255		412	412		665	665			
		160			258			417			673			

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Designation of resistance values according to IEC 62 and MIL:

resist. value	IEC 62	MIL 39008
0,1 Ohm	0R1 (R10)	-
1,0 Ohm	1R (1R0)	1R0
10 Ohm	10R	100
100 Ohm	100R (K10)	101
1000 Ohm	1 K (1K0)	102
10 KOhm	10K	103
0,1 MOhm	100K (M10)	104
1,0 MOhm	1M (1M0)	105
10,0 MOhm	10M	106

4-band colour code
colour coding of resistance values and tolerances

colour	1st band= 1st digit	2nd band= 2nd digit	3rd band= multi-plier	4th band= tole-rance
without	-	-	-	±20%
silver	-	-	x 0,01 Ω	±10%
gold	-	-	x 0,1 Ω	± 5%
black	-	0	x 1,0 Ω	-
brown	1	1	x 10 Ω	± 1%
red	2	2	x 100 Ω	± 2%
orange	3	3	x 1 kΩ	-
yellow	4	4	x 10 kΩ	-
green	5	5	x 100 kΩ	-
blue	6	6	x 1 MΩ	-
violet	7	7	x 1 MΩ	-
grey	8	8		-
white	9	9		-

5-band colour code
colour coding of resistance values and tolerances

*1*st band= 1st digit	2nd band= 2nd digit	3rd band= 3rd digit	4th band= multi-plier	5th band tole-rance
-	-	-	-	
-	-	-	x 0,01 Ω	
-	-	-	x 0,1 Ω	± 5%
-	0	0	x 1,0 Ω	-
1	1	1	x 10 Ω	± 1%
2	2	2	x 100 Ω	± 2%
3	3	3	x 1 kΩ	-
4	4	4	x 10 kΩ	-
5	5	5	x 100 kΩ	±0,5%
6	6	6	x 1 MΩ	-
7	7	7	x 1 MΩ	-
8	8	8		-
9	9	9		-

:

Tolerances according to MIL:

Tolerance	MIL
10 %	K
5 %	J
2 %	G
1 %	F
0,5 %	D
0,25 %	C
0,1 %	B

Designation and coding of temperature coeff.:

100	$\frac{10^{-6}}{K}$	T0	brown
50	"	T2	red
25	"	T9	yellow
15	"	T10	orange
10	"	T13	blue
5	"	T16	violet
2	"	T18	-

Resistors in the DC-circuit:

R = resistance value [Ω] I = current [A]
U = voltage [V] P = power [W]

$$R = \frac{U}{I} \qquad I = \frac{U}{R} \qquad U = I \bullet R$$

$$P = I^2 \bullet R \qquad P = \frac{U^2}{R} \qquad P = U \bullet I$$

Resistors in series

$$R_{ges.} = R_1 + R_2 + \ldots Rn$$

Resistors in parallel

$$\frac{1}{R_{ges.}} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots \frac{1}{Rn}$$

2 resistors in parallel

$$R_{ges.} = \frac{R_1 \bullet R_2}{R_1 + R_2}$$

Voltage divider R_1 in series with R_2

$$U_{ges.} = U_1 + U_2$$

$$\frac{U_1}{U_2} = \frac{R_1}{R_2}$$

Current splitting R_1 in parallel with R_2

$$I_{ges.} = I_1 + I_2$$

$$\frac{I_1}{I_2} = \frac{R_2}{R_1}$$

Temperature coefficient for wirewound resistors:

Series K

Table 1: Temperature coefficient of resistive wires used for series KC, KH, KV, KT, KF (Power wirewound resistors of Vitrohm with high pressure crimped contact)

P_{70}	Typ/*Type*	TK/*TC* $400^{\pm 50}$	TK/*TC* 0^{+40}_{-80}	TK/*TC* $0^{\pm 10}$
1W	200	0R056 - 0R2	0R22 - 300R	330R - 9K1
2W	202	0R075 - 0R43	0R47 - 620R	680R - 20K
3W	204	0R33 - 0R68	0R75 - 1K	1K1 - 30K
4W	206	0R056 - 0R2	0R22 - 300R	330R - 9K1
5W	208	0R075 - 0R3	0R33 - 470R	510R - 15K
7W	210	0R11 - 0R68	0R75 - 1K	1K1 - 30K
	212	0R075 - 0R3	0R33 - 470R	510R - 15K
9W	214	0R11 - 0R68	0R75 - 1K	1K1 - 30K
11W	216	0R15 - 1R	1R1 - 1K3	1K5 - 47K
17W	218	0R27 - 1R6	1R8 - 2K4	2K7 - 82K

TC in ppm = 10^{-6} K^{-1}

Series KP

Table 2: Temperature coefficient of resistive wires used for series KP

P_{70}	Type	TC $400^{\pm 50}$	TC 0^{+40}_{-80}	TC $0^{\pm 20}$
2 W	290	0R2 - 0R24	0R27 - 560R	620R - 7K5
4 W	292	0R3 - 0R39	0R32 - 820R	910R - 11K
5 W	294	0R47 - 0R62	0R68 - 1K3	1K5 - 20K
6,5W	296	0R68 - 0R91	1R - 1K8	2K - 27K
8 W	298	0R91 - 1R2	1R3 - 2K4	2K7 - 36K

Series BW / BWF

Table 3: Temperature coefficient of resistive wires used for series BW/BWF

234-0	0R1 . . . 0R15	TK ± 600	237-0	0R1	TK ± 1000
	0R16 . . . 0R62	TK ± 300		0R11 . . . 0R18	TK ± 600
	0R68 . . . 1K2	TK ± 150		0R2 . . . 0R68	TK ± 300
				0R75 . . . 1K	TK ± 150
235-0	0R1 . . . 0R16	TK ± 1000			
	0R18 . . . 0R68	TK ± 800	236-0	0R1	TK ± 1800
	0R75 . . . 2K4	TK ± 400		0R11 . . . 0R16	TK ± 1000
				0R18 . . . 0R68	TK ± 800
				0R75 . . . 1K	TK ± 400

Due to mechanical contacts resistive changes of ± 1,5 % are possible. This may influence results of TC-measurments.

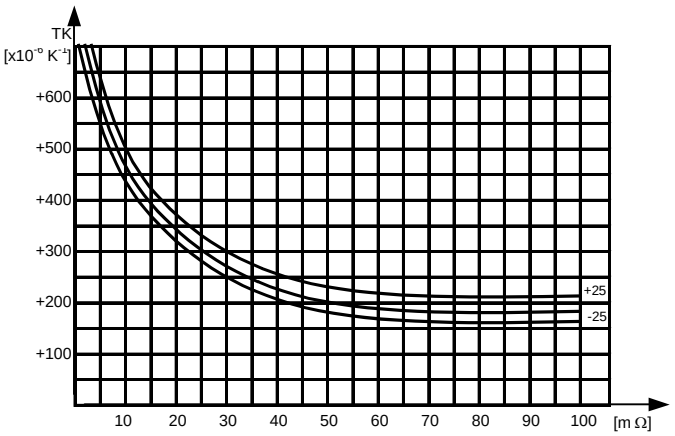


Diagram: Temperature coefficient of metal-band resistors series KN (350-354)

Pulse capability of resistors:

General information on pulse capability very often need additional explanations and do not always comply with a given application.
Please contact factory or sales office for your special requirements. For dealing with your application we need the following information:

- Pulse shape and repetition rate
- max. peak power
- Pulseduration or time constant
- max. peak voltage
- Resistance value

If already selected:

- Type or series or technology
- or preferred style

The Quality Assurance System of Vitrohm Group meets all requirements of CECC 00114 part 1, Harmonized System of Quality Assessment for Electronic Components (System of Quality Assessment for General Requirements) and meets also the requirements of DIN-ISO 9001:2000.

By this statement the General Management obliges all employees to fulfil their duties in accordance with the Quality Handbook, to assure the quality of all Vitrohm Products to meet the requirements of CECC and other standards.

All technical data given in this catalogue are based on statistical methods using equipments of modern techniques. The data are based on mass production. Therefore, testresults of singular specimens might differ from the average range of series.

All details in printed form are legally binding only after written confirmation conforming to §§ 463 and 480 II BGB.

We reserve the right to change products and specifications due to technical development.

TÜV

TÜV Rheinland Portugal, Lda.

Grupo TÜV Rheinland Berlin-Brandenburg

CERTIFICATE

The Certification Body TÜV Rheinland Portugal, Lda.

Certifies that the company

Vitrohm Portuguesa – Resistências Eléctricas, Lda
Estrada Nacional 249 – 4
Trajouce
2785-653 São Domingos de Rana
Portugal

has established and applies a Quality Management System for

Manufacturing of fixed wirewound resistors and fixed metal glaze resistors

An audit was performed, report n° 0 01 03065

Proof has been furnished that the requirements are fulfilled according to

NP EN ISO 9001:2000

This certificate is valid until 28 January 2007

Certificate Registration n° 0 01 03065

ACREDITAÇÃO IPQ

Certificação Gestão da Qualidade

ACREDITAÇÃO IPQ

Lisboa, 2004-01-29

Place, Date of emission

Responsible for the Certification Body

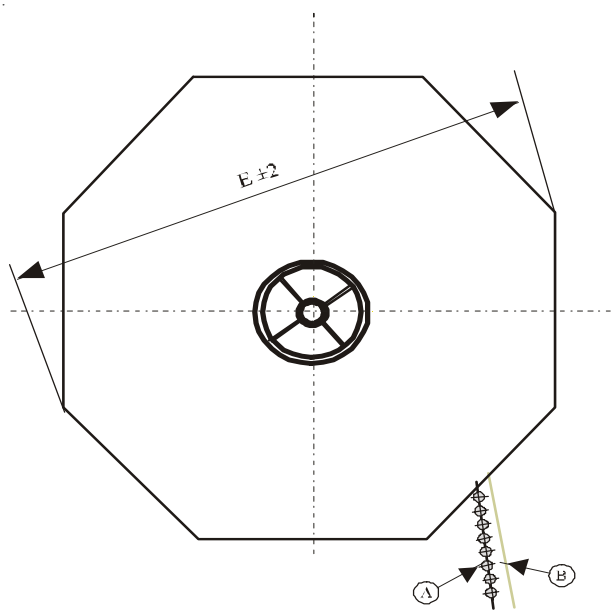
TÜV Rheinland Portugal, Lda.

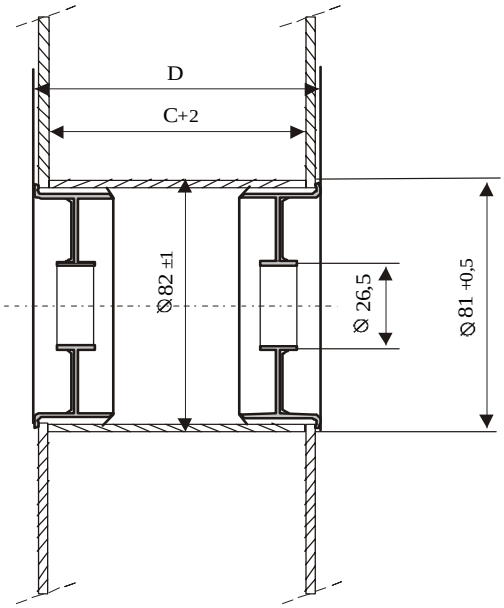
Rua Camilo Castelo Branco, 34-3° - 1050-045 Lisboa

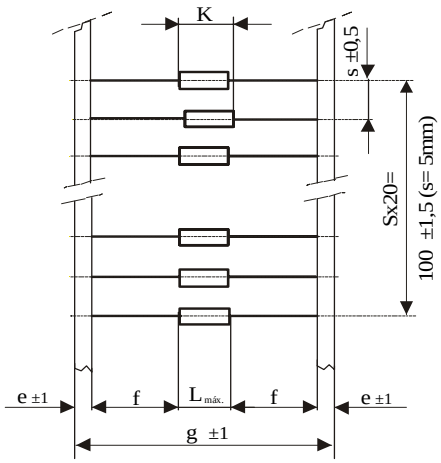
Taping Specification for axial components

Series	Type	Style	L_{max}	Taping e	Taping s	Taping g	Pieces Reel	Pieces E	Pieces Ammo
KC	200-0	0416	18,0	6	5	95	2000	356	1000*
	202-0	0424	26,0	6	5	95	2000	356	1000*
	204-0	0432	33,0	6	5	95	2000	356	1000*
KH	206-8	7x7x20	21,0	6	10	95	1000	356	-----
	208-8	7x7x25	26,0	6	10	95	1000	356	-----
	210-8	7x7x38	39,0	6	10	95	1000	356	-----
	212-8	10x10x26	26,0	6	10	95	500	356	-----
	214-8	10x10x38	39,0	6	10	95	500	356	-----
BW / F	234-0	0411	10,1	6	5	85	4000	356	1000*
	235-0	0614	14,5	6	10	85	1000	356	1000*
	236-0	0614	14,5	6	10	85	1000	356	1000*
	237-0	0411	10,1	6	5	85	4000	356	1000*
BWL	BWL 0614	0614	14,5	6	10	85	1000	356	1000*
CR / F	251-0/4	0309	9,5	6	5	65	5000	356	1000*
	253-0/4	0414	14,5	6	10	85	2000	356	1000*
	254-0/4	0612	13,5	6	10	85	1000	356	1000*
	255-0	0915	15,0	6	10	85	1000	356	500*
	256-0/4	0617	18,0	6	10	85	1000	356	1000*
	257-0/4	0918	19,0	6	10	85	1000	356	500*
	258-0	0922	23,0	6	10	85	1000	356	500*
	259-0	0927	27,0	6	10	85	1000	356	500*
KN	350-8	7x7x18	19,0	6	10	85	1000	356	-----
RG	515-0	0207	6,6	6	5	65	5000	356	1000*
	520-0	0309	8,2	6	5	65	5000	356	1000*
PO	590-0	0617	16,5	9	10	95	1000	270	1000*
	591-0	0922	20,0	9	10	95	500	270	500*
	593-0	0414	12,0	6	5	85	2500	270	1000*
	595-0	0207	6,3	6	5	65	5000	315	2000*
RX	0207 W5	0207	6,2	6	5	65	-----	-----	5000*
	0410 1W	0410	10,0	6	5	65	-----	-----	2000*
	0515 1W	0515	15,0	6	5	65	-----	-----	1000*
	0512 3W	0512	12,0	6	5	65	-----	-----	1000*
	0613 3W	0613	13,0	6	10	65	-----	-----	1000*
	0516 3W	0516	15,5	6	10	65	-----	-----	1000*
	0616 3W5	0616	16,0	6	10	65	-----	-----	1000*
	0716 3W	0716	16,0	6	10	65	-----	-----	500*
	0716 4W	0716	16,0	6	10	65	-----	-----	500*
ZOM	ZOM0207	0207	6,6	6	5	65	5000	356	2000*

*Standard







A	taped resistors
B	intermediate paper
C	inner reel width g+5
D	outer reel width g+10
E	maximum reel diametre

$L_{máx.}$ Body length

k $L_{máx.}$ +1,4 (k concentric betrween the tapes)

f	≥ 20 mm
g	taped width
s	step size
e	taped width

standard taping acc. to IEC 60286-1

SMD Power Resistors

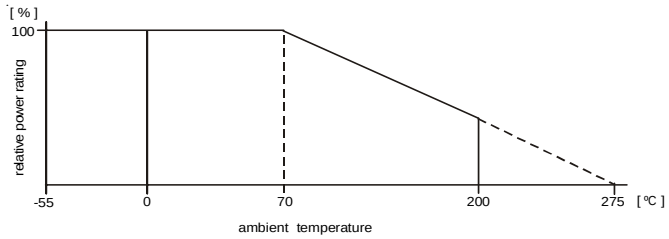
RoHS compliant

Specifications

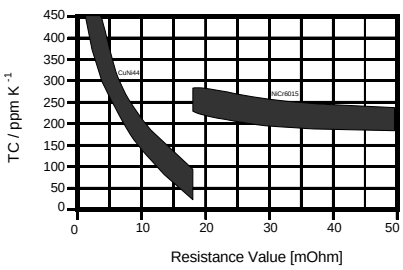
Type			RWN 5020	RWC 5020
Styles			5020	
Dimensions		mm	non inductive, no winding	wirewound on ceramic
Power rating ϑ_o = 200°C		W	P_{25} 2,2 P_{40} 2,0 P_{70} 1,6	
Single pulse	$I_{max.}$	A	50	
	$E_{i, max}$	mWs	625	
	$T_{imp, max}$	ms	5	
periodic pulse load	i_{max}	A	30 (R003 .. .R018) 40 (R022 ... R050)	
	$E_{i,per, max}$	mWs	225	
	$t_{imp, max}$	ms	5	
	t_{pause}	ms	100	
Tolerance		%	1, 2, 5 (F, G, J)	1, 2, 5 (F, G, J)
Resistance range		Ω	0R003 ... 0R050	0R051 ... 100R
Temperature coefficient		ppm K^{-1}	see diagram	± 80
E-Series			0R003, 0R005, ≥ 0R01 : E 12	E 12
			diverging values on request	
max. cont. work. voltage		V_{RMS}	$\sqrt{P \cdot R}$	
Thermal resistance		K/W	100 [1)]	
Insulation voltage (1 min.)		V_{RMS}	1000	
Insulation resistance			> 1000MΩ	
Climatic category			55/175/56	
Temperature range		°C	–55 . . . 200	
Endurance (P_{70}, 70°C, 1000h)		$[\frac{\Delta R}{R}]$ %	≤ 1,0	
Damp heat, steady state		$[\frac{\Delta R}{R}]$ %	≤ 0,25	
Resistance to soldering heat		$[\frac{\Delta R}{R}]$ %	≤ 0,25	
Short time overload (5 * P_{70}/5sec)		$[\frac{\Delta R}{R}]$ %	≤ 1%	
Temperature shock			≤ 0,25	
Board-bending-test			no interruption	
Solderability			suitble for wave and reflow soldering in acc. with CECC 0082	

[1)] Thermal data according to DIN 44050 with solder pads as on next page.

Derating:

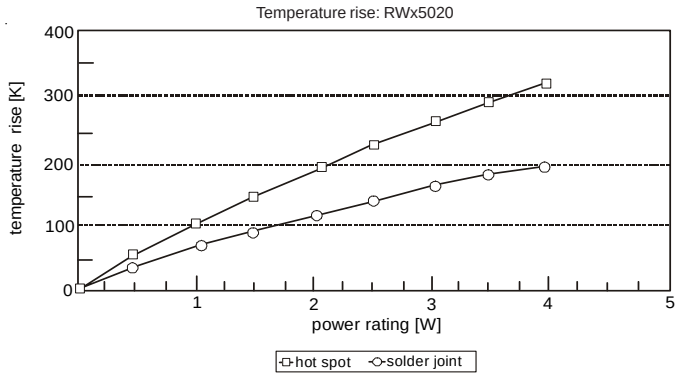


TC-Diagram (RWN 5020):

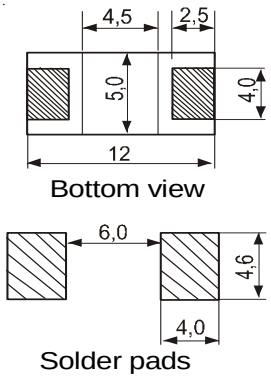


Temperature range -55 +165ºC

Temperature rise:

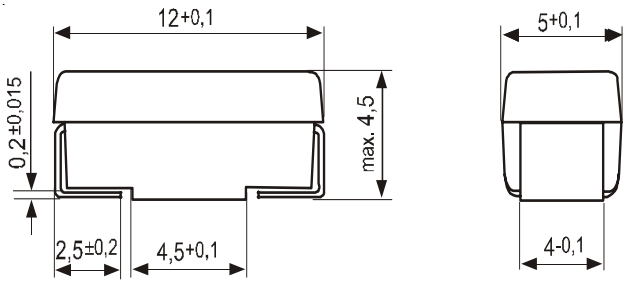


recommended solder pads:



Part mounted on FR 4, pads as recommended, copper layer 35 µm

Dimensions:



Marking:	Resistor: printed in clear: Type - Value - Tolerance					
Packaging	additional Batch-No. - Production date					
Packaging:	blistertape 24 mm antistatic / 1500 pcs. on reel 330 mm Ø					
Ordering example:	RWC 5020 Type	F tolerance	K blister tape reel	- TC	13 reel diameter	1R R-value

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