Features

Regulated Converter

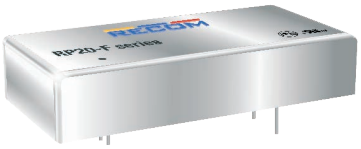
- 2:1 input voltage range
- 1.6kVDC isolation
- UL certified
- Efficiency up to 89%
- Six-sided continuous shield
- No minimum load required

RECOM
DC/DC Converter

RP20-F

20 Watt 2“ x 1“ Single and Dual Output

3 YEAR warranty



UL60950-1 certified

Description

The RP20-F series DC/DC converters are certified to UL 60950-1 and to cUL 60950-1. This makes them ideal for all telecom and industrial applications where approved safety standards are required. The industry standard 2” x 1” package meets military standards for thermal shock and vibration tolerance.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Input (1) Current [mA]	Efficiency (1) typ. [%]	Max. Capacitive Load (2) [µF]
RP20-123.3SF (3,4)	9-18	3.3	5000	1618	85	13000
RP20-1205SF (3,4)	9-18	5	4000	1916	87	6800
RP20-1212SF (3,4)	9-18	12	1670	1942	86	2200
RP20-1215SF (3,4)	9-18	15	1330	1933	86	755
RP20-243.3SF (3,4)	18-36	3.3	5000	799	86	13000
RP20-2405SF (3,4)	18-36	5	4000	936	89	6800
RP20-2412SF (3,4)	18-36	12	1670	960	87	2200
RP20-2415SF (3,4)	18-36	15	1330	955	87	755
RP20-483.3SF (3,4)	36-75	3.3	5000	395	87	13000
RP20-4805SF (3,4)	36-75	5	4000	468	89	6800
RP20-4812SF (3,4)	36-75	12	1670	474	88	2200
RP20-4815SF (3,4)	36-75	15	1330	477	87	755
RP20-1212DF (3,4)	9-18	±12	±833	1937	86	±680
RP20-1215DF (3,4)	9-18	±15	±667	1938	86	±450
RP20-2412DF (3,4)	18-36	±12	±833	957	87	±680
RP20-2415DF (3,4)	18-36	±15	±667	947	88	±450
RP20-4812DF (3,4)	36-75	±12	±833	473	88	±680
RP20-4815DF (3,4)	36-75	±15	±667	473	88	±450

Notes:

Note1: Maximum values at nominal input voltage and full load
Note2: Max. Cap load is tested at minimum input and constant resistive load

Model Numbering

RP20-__ __ __F/ __-__

- nom. Input Voltage
- Output Voltage
- Single or Dual
- “Package (4)”
- “CTRL Logic (3)”

Notes:

Note3: no suffix for CTRL function with positive logic (1=ON, 0=OFF)
add suffix “N” for CTRL function with negative logic (0=ON, 1=OFF)
Note4: add suffix “-HC” for premounted Heat-sink with clips

Ordering Examples

RP20-2405SF = 24V input, 5V output, single, positive Logic CTRL pin
RP20-4812DF/N-HC = 48V input, ±12V output, dual, negative Logic CTRL pin, Heat-sink premounted

Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

BASIC CHARACTERISTICS

Parameter	Condition		Min.	Typ.	Max.
Input Filter [5]					LC-Type
Input Voltage Range	nom. Vin = 12VDC nom. Vin = 24VDC nom. Vin = 48VDC		9VDC 18VDC 36VDC	12VDC 24VDC 48VDC	18VDC 36VDC 75VDC
Input Surge Voltage	100ms max.	nom. Vin = 12VDC nom. Vin = 24VDC nom. Vin = 48VDC			36VDC 50VDC 100VDC
Output Voltage Trimming	refer to ***„OUTPUT VOLTAGE TRIMMING“***		-10%		+10%
Input Reflected Ripple Current [6]				20mAp-p	
Minimum Load [7]	Single Dual		0% 10%		
Start-up Time	Power up ON/OFF CTRL			10ms 10ms	
ON/OFF CTRL [8]	Positive Logic	DC-DC ON DC-DC OFF			Open or 3.0VDC < V_{CTRL}< 12VDC Short or 0VDC < V_{CTRL}< 1.2VDC
	Negative Logic	DC-DC ON DC-DC OFF			Short or 0VDC < V_{CTRL}< 1.2VDC Open or 3.0VDC < V_{CTRL}< 12VDC
Input Current of CTRL pin	DC-DC ON		-0.5mA		+0.5mA
Standby Current	DC-DC OFF			2.5mA	
Internal Operating Frequency			450kHz	500kHz	550kHz
Ripple and Noise	measured at 20MHz BW with a 0.1µF/50V MLCC	3.3Vout 5Vout, 12Vout, 15Vout		60mVp-p 75mVp-p	
		±12Vout, ±15Vout		100mVp-p	

Notes:

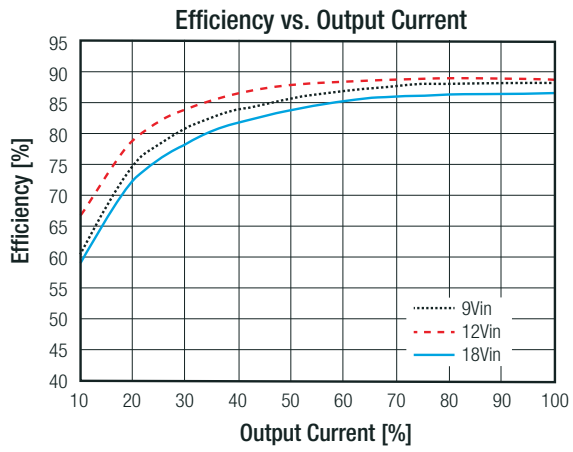
Note5: An external filter capacitor is required for normal operation. The capacitor should be capable of handling 1A ripple current for 48V/24V models. RECOM suggest: Nippon chemi-con KY series, 220µF/100V, ESR 90m Ω

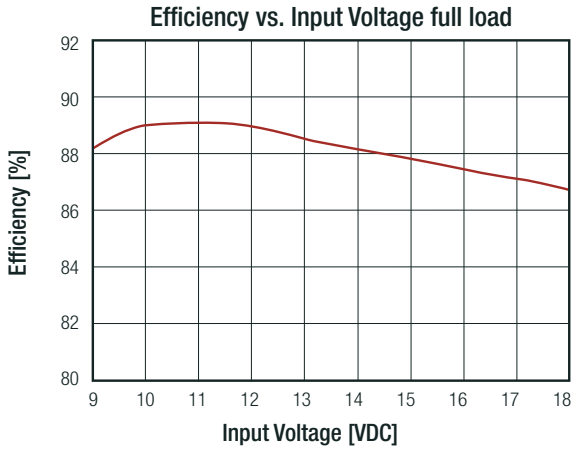
Note6: Simulated source impedance of 12µH. 12µH inductor in series with +Vin

Note7: The RP15-F series requires a minimum of 10% loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification

Note8: The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to -Vin pin

RP20-1205SF





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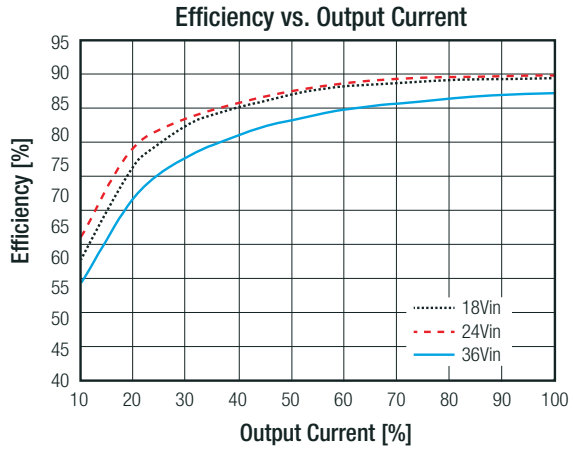
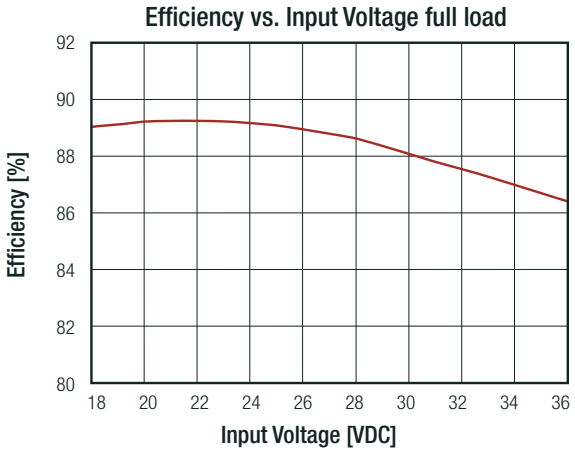
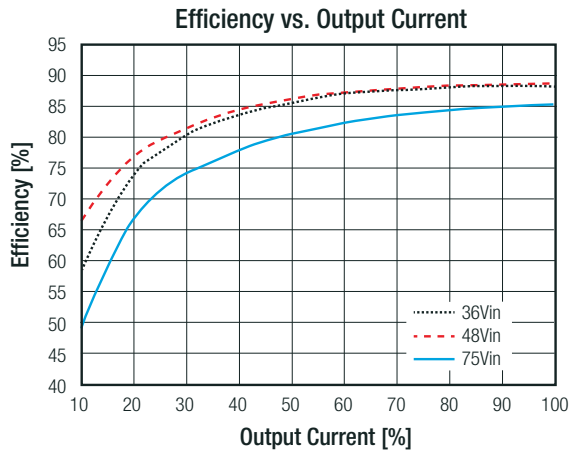
Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

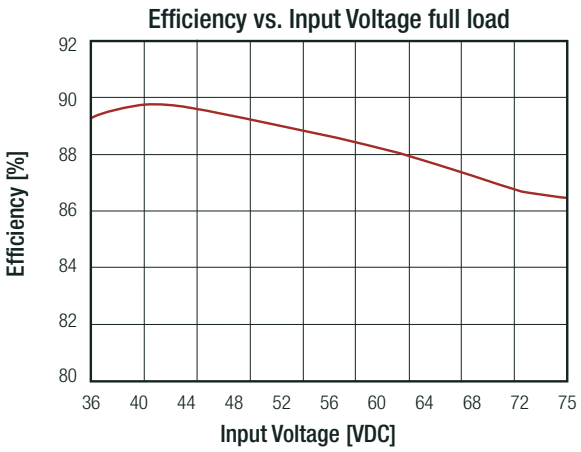
RP20-2405SF





RP20-4805SF

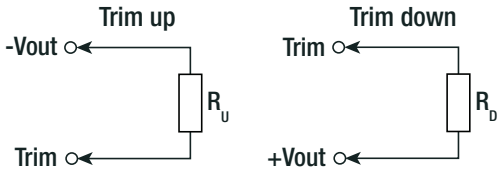




OUTPUT VOLTAGE TRIMMING

Output Voltage Trimming

Single output Powerline converters offer the feature of trimming the output voltage over a certain range around the nominal value by using external trim resistors. No general equation can be given for calculating the trim resistors, but the following trimtables give typical values for choosing these trimming resistors. If voltages between the given trim points are required, extrapolate between the two nearest given values to work out the resistor required or use a variable resistor to set the output voltage. Output can be externally trimmed by using the method shown below.



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Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

RP20-xx3.3SF

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.63	[VDC]
R_U =	57.93	26.16	15.58	10.28	7.11	4.99	3.48	2.34	1.46	0.75	[kΩ]
Trim down	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.97	[VDC]
R_D =	69.47	31.23	18.49	12.12	8.29	5.74	3.92	2.56	1.50	0.65	[kΩ]

RP20-xx05SF

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	5.05	5.01	5.15	5.20	5.25	5.30	5.35	5.4	5.45	5.50	[VDC]
R_U =	36.57	16.58	9.92	6.58	4.59	3.25	2.30	1.59	1.03	0.59	[kΩ]
Trim down	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	4.95	4.90	4.85	4.80	4.75	4.70	4.65	4.60	4.55	4.50	[VDC]
R_D =	45.53	20.61	12.31	8.15	5.66	4.00	2.81	1.92	1.23	0.68	[kΩ]

RP20-xx12SF

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20	[VDC]
R_U =	367.91	165.95	98.64	64.98	44.78	31.32	21.70	14.49	8.88	4.39	[kΩ]
Trim down	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	10.92	10.8	[VDC]
R_D =	460.99	207.95	123.60	81.42	56.12	39.25	27.20	18.16	11.13	5.51	[kΩ]

RP20-xx15SF

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	15.15	15.3	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50	[VDC]
R_U =	404.18	180.59	106.06	68.80	46.44	31.53	20.88	12.90	6.69	1.72	[kΩ]
Trim down	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	14.85	14.70	14.55	14.40	14.25	14.10	13.95	13.80	13.65	13.50	[VDC]
R_D =	499.82	223.41	131.27	85.20	57.56	39.14	25.97	16.10	8.42	2.282	[kΩ]

REGULATIONS

Parameter	Condition	Value
Output Accuracy		±1.0%
Line Regulation	low line to high line, full load	±0.2%
Load Regulation	0% to 100% load	±0.5%
Cross Regulation	asymmetrical 25%<>100% load	±5.0%
Transient Response Recovery Time	25% load step change	250µs typ.

Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

PROTECTIONS

Parameter	Condition		Value
Short Circuit Protection (SCP)			continuous, automatic recovery
Over Voltage Protection (OVP)	zener diode clamp	3.3Vout 5Vout 12Vout 15Vout	3.9VDC 6.2VDC 15VDC 18VDC
Over Load Protection (OLP)	% of Iout rated		150% typ.
Isolation Voltage [9]	I/P to O/P I/P to O/P to case		1.6kVDC/ 1 minute 1.6kVDC/ 1 minute
Isolation Resistance	Viso= 500VDC		1GΩ min.
Isolation Capacitance			1000pF max.

Notes:

Note9: For repeat Hi-Pot testing, reduce the time and/or the test voltage

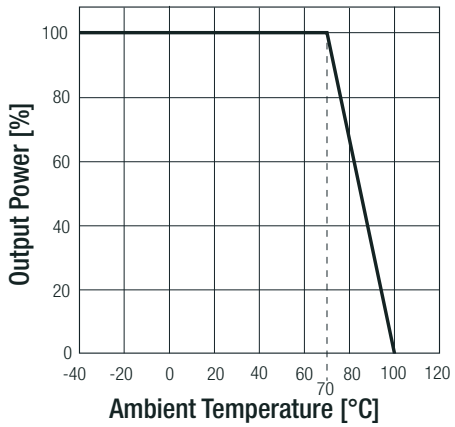
Note10: This power module is not internally fused. An input line fuse must always be used

ENVIRONMENTAL

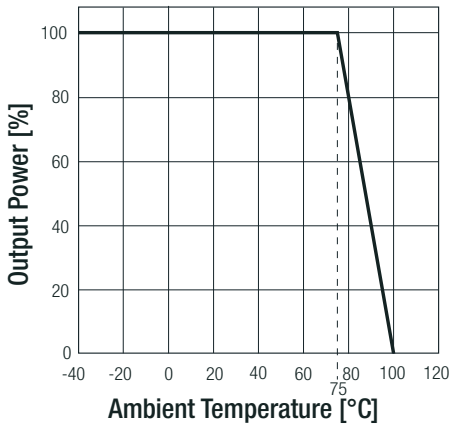
Parameter	Condition		Value
Operating Temperature Range	without derating with derating		-40°C to +70°C -40°C to +100°C
Maximum Case Temperature			+100°C
Temperature Coefficient			±0.02%/K max.
Thermal Impedance	@ natural convection 0.1m/s	without heat-sink with heat-sink	12K/W 10K/W
Operating Altitude			2000m
Operating Humidity	non-condensing		5% - 95% RH
Pollution Degree			PD2
Thermal Shock			according to MIL-STD-810F
Vibration			according to MIL-STD-810F
MTBF	MIL-HDBK-217F, G.B. Bellcore TR-NWT-000332 [11]		1583 x 10^3 hours 1791 x 10^3 hours

Derating Graph [12]

RP20-4805SF



RP20-4805SF-HC



Notes:

Note11: BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C (Ground fixed and controlled environment)

Note12: Derating graphs are valid only for the shown part numbers. If you need detailed derating-information about a part-number not shown here please contact RECOM Techsupport for detailed information

Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	**Condition**	**Standard**
Information Technology Equipment, General Requirements for Safety	E196683	UL60950-1, 2nd Edition, 2011 CAN/CSA-C22.2 No. 60950-1-03, 2nd Edition, 2011
RoHS 2		RoHS-2011/65/EU + AM-2015/863

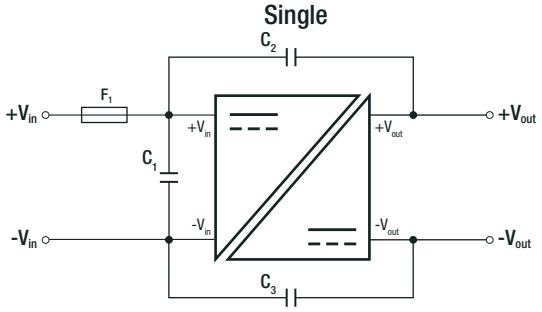
EMC Compliance	**Condition**	**Standard / Criterion**
Electromagnetic compatibility of multimedia equipment - Emission requirements	with external filter (see filter suggestion below)	EN55032, Class A and B
ESD Electrostatic discharge immunity test	Air ±8kV and Contact ±6kV	EN61000-4-2, Criteria B
Radiated, radio-frequency, electromagnetic field immunity test	10 V/m	EN61000-4-3, Criteria A
Fast Transient and Burst Immunity (13)	±2kV	EN61000-4-4, Criteria B
Surge Immunity (13)	±1kV	EN61000-4-5, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	10 Vr.m.s	EN61000-4-6, Criteria A
Power Magnetic Field Immunity	100A/m continuous; 1000A/m 1s	EN61000-4-8, Criteria A

Notes:

Note13: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5
Recom suggests Nippon chemi-con KY series 220µF/100V

EMC Filtering Suggestions according to EN55032

Single



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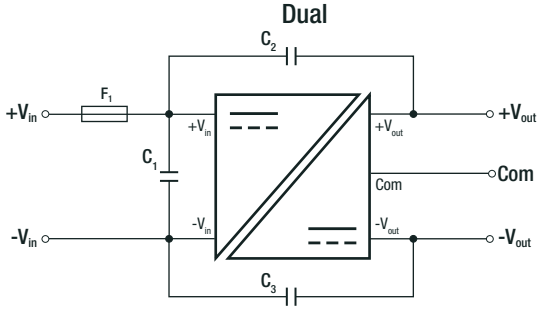
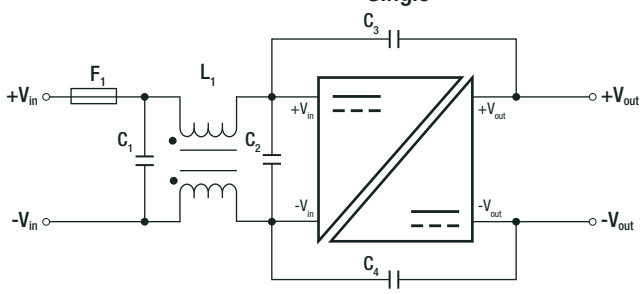


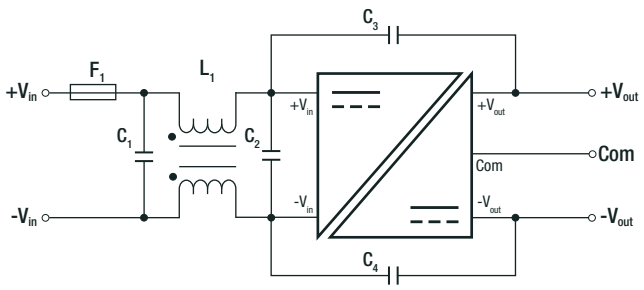
Component List Class A

MODEL	C1	C2	C3
RP20-12xxSF, RP20-12xxDF	4.7µF/50V, 1812 MLCC	1000pF/2kV, 1808 MLCC	1000pF/2kV, 1808 MLCC
RP20-24xxSF, RP20-24xxDF	2.2µF/50V, 1812 MLCC	1000pF/2kV, 1808 MLCC	1000pF/2kV, 1808 MLCC
RP20-48xxSF, RP20-48xxDF	2.2µF/100V, 1812 MLCC	1000pF/2kV, 1808 MLCC	1000pF/2kV, 1808 MLCC

Single



Dual



Component List Class B

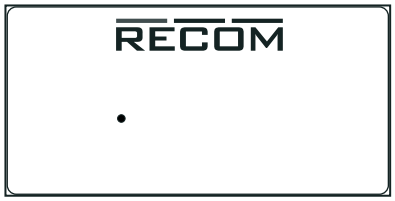
MODEL	C1	C2	C3/C4	L1
RP20-12xxSF RP20-12xxDF	3.3µF/50V 1812 MLCC	3.3µF/50V 1812 MLCC	1000pF/2kV 1808 MLCC	CMC: 450µH ref.: WE 74482270005 ref.: CMC-05
RP20-24xxSF RP20-24xxDF	4.7µF/50V 1812 MLCC	N/A	1000pF/2kV 1808 MLCC	CMC: 450µH ref.: WE 74482270005 ref.: CMC-05
RP20-48xxSF RP20-48xxDF	2.2µF/100V 1812 MLCC	2.2µF/100V 1812 MLCC	1000pF/2kV 1808 MLCC	CMC: 450µH ref.: WE 74482270005 ref.: CMC-05

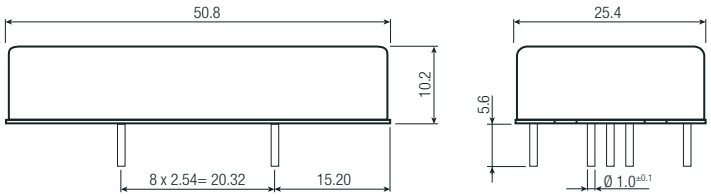
Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

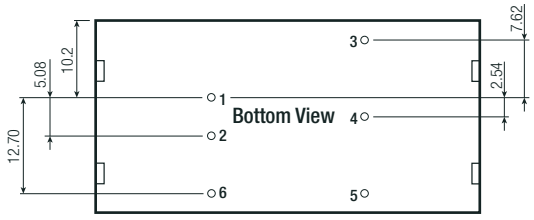
DIMENSIONS and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	case base potting	nickel coated copper non-conductive black plastic epoxy (UL94V-0)
Dimensions (LxWxH)	without Heat-sink with Heat-sink	50.8 x 25.4 x 10.2mm 56.8 x 25.4 x 16.8mm
Weight	without Heat-sink with Heat-sink	27g 37.89g

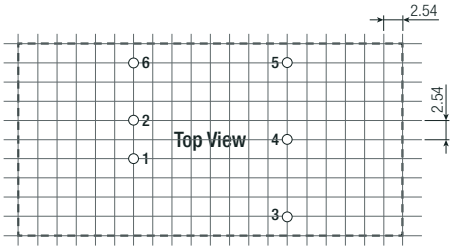
Dimension Drawing (mm)

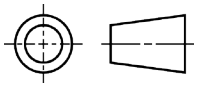






Recommended Footprint Details



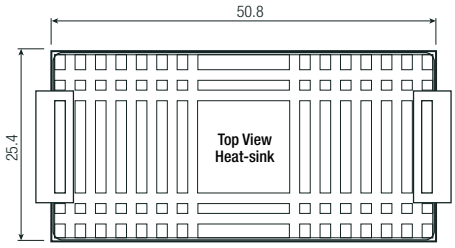


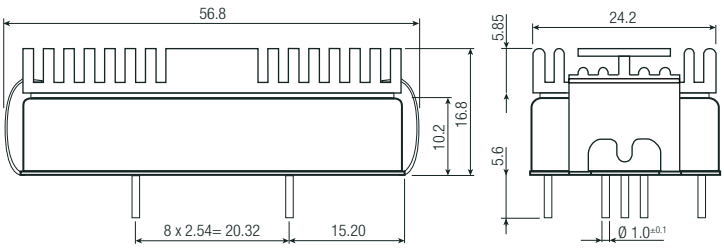
Pinning Information

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	Com
5	-Vout	-Vout
6	CTRL (3)	CTRL (3)

Tolerance: xx.x= ±0.5mm
xx.xx= ±0.25mm

Dimension Drawing with Heat-sink (mm)





Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

PACKAGING INFORMATION			
Parameter	**Type**		**Value**
Packaging Dimension (LxWxH)	tube tray	without heat-sink with heat-sink	255.0 x 54.0 x 22.0mm 302.5 x 222.0 x 20.0mm
Packaging Quantity	tube tray	without heat-sink with heat-sink	9pcs 20pcs
Storage Temperature Range			-55°C to +125°C
Storage Humidity	non-condensing		5% - 95% RH

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