

Features

- 2:1 input voltage range
- 1.6kVDC isolation
- UL certified

Regulated Converter

- Efficiency up to 89%
- Six-sided continuous shield
- No minimum load required

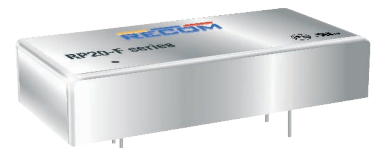
RECOM DC/DC Converter

RP20-F

20 Watt

2" x 1"

Single and Dual Output



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.

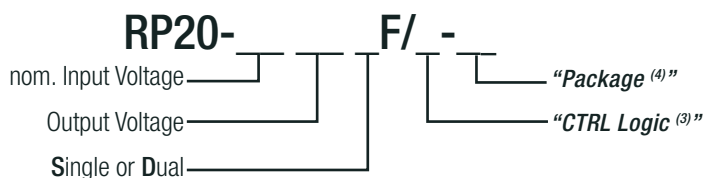
Selection Guide

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



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)

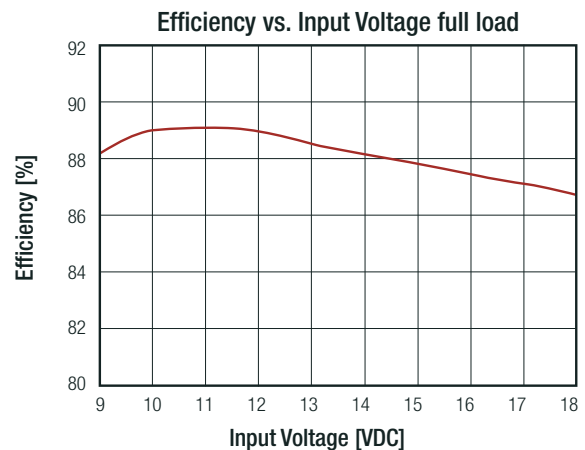
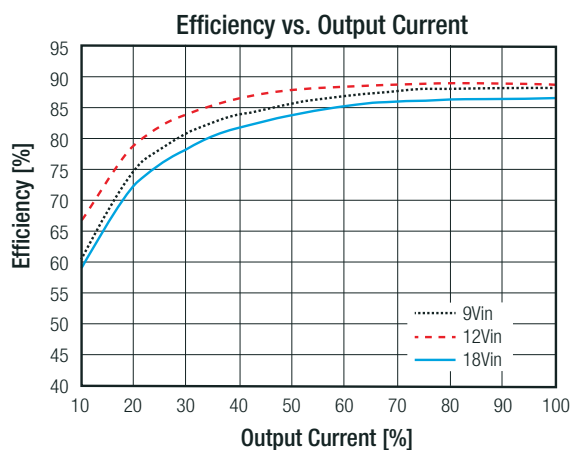
BASIC CHARACTERISTICS

Parameter	Condition		Min.	Typ.	Max.
Input Filter ⁽⁶⁾			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⁾				20mA _{p-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	3.3V _{out} 5V _{out} , 12V _{out} , 15V _{out}		60mV _{p-p} 75mV _{p-p}	
		±12V _{out} , ±15V _{out}		100mV _{p-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

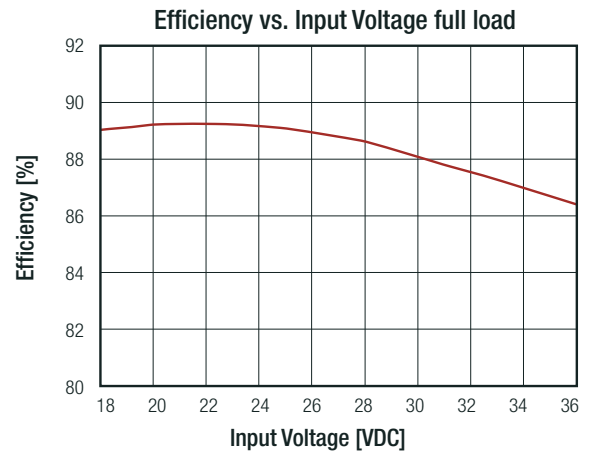
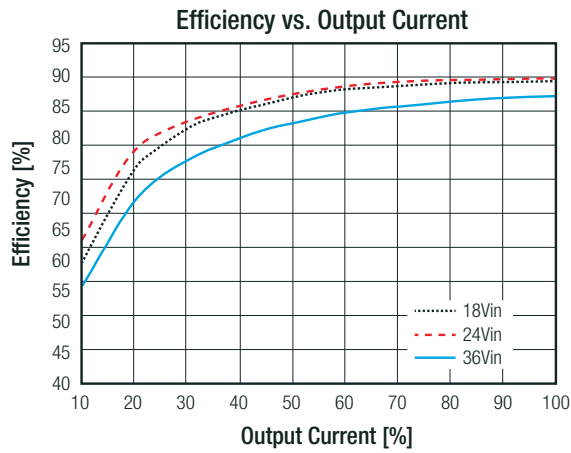
RP20-1205SF



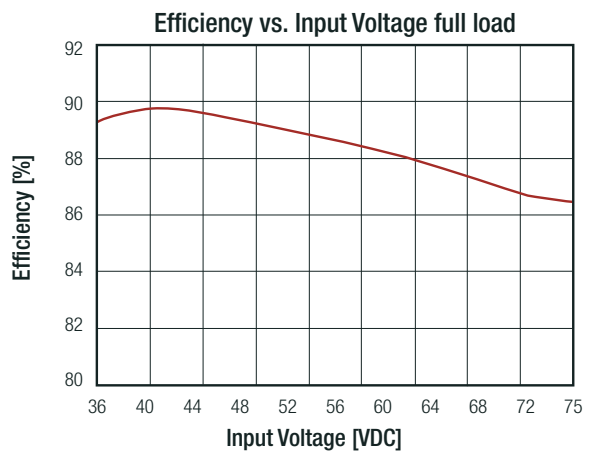
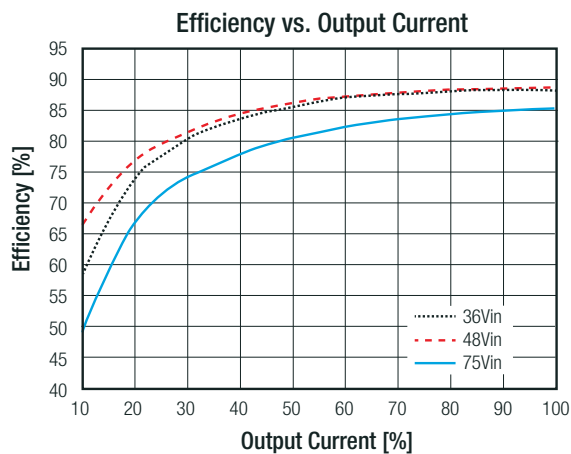
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Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

RP20-2405SF



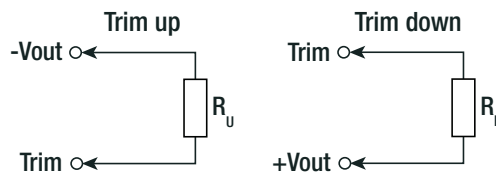
RP20-4805SF



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)

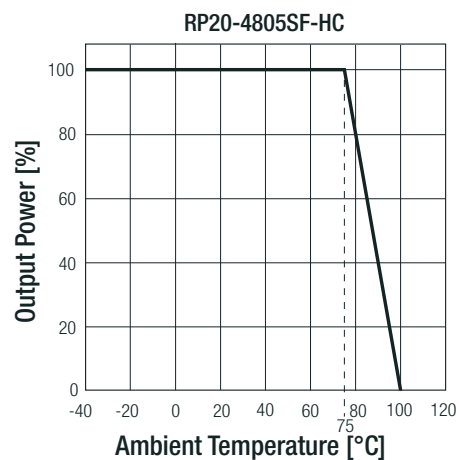
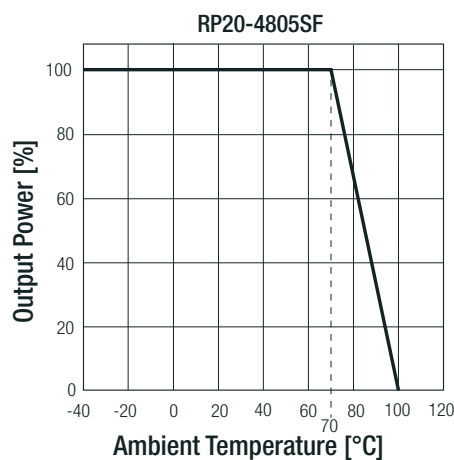
PROTECTIONS

Parameter	Condition		Value
Short Circuit Protection (SCP)			continuous, automatic recovery
Over Voltage Protection (OVP)	zener diode clamp	3.3Vout	3.9VDC
		5Vout	6.2VDC
		12Vout	15VDC
		15Vout	18VDC
Over Load Protection (OLP)	% of Iout rated		150% typ.
Isolation Voltage ⁽⁹⁾	I/P to O/P		1.6kVDC/ 1 minute
	I/P to O/P to case		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		-40°C to +70°C
	with derating		-40°C to +100°C
Maximum Case Temperature			+100°C
Temperature Coefficient			±0.02%/K max.
Thermal Impedance	@ natural convection	without heat-sink	12K/W
	0.1 m/s	with heat-sink	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.		1583 x 10 ³ hours
	Bellcore TR-NWT-000332 ⁽¹¹⁾		1791 x 10 ³ hours

Derating Graph⁽¹²⁾



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

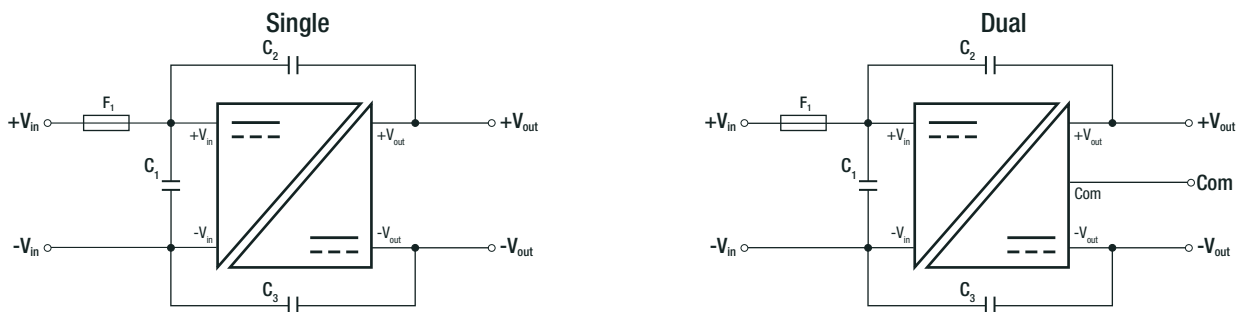
Certificate Type (Safety)	Condition	Standard
Information Technology Equipment, General Requirements for Safety	E196683	UL60950-1, 2nd Edition, 2011 CAN/CSA-C22.2 No. 60950-1-03, 2nd Edition, 2011
RoHS 2		RoHS-2011/65/EU + AM-2015/863

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:

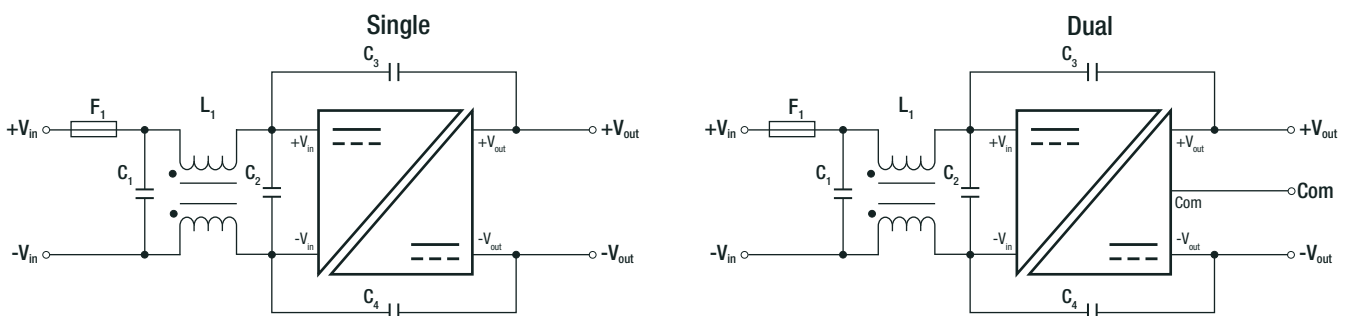
Note13: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5
Recom suggests Nippon chemi-con KY series 220µF/100V

EMC Filtering Suggestions according to EN55032



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



Component List Class B

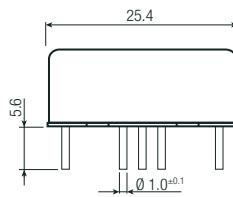
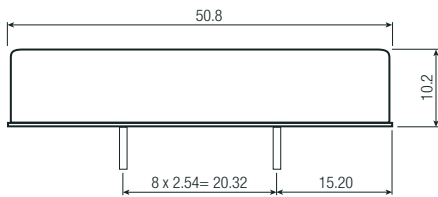
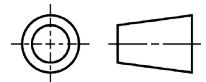
MODEL	C1	C2	C3/C4	L1
RP20-12xxSF	3.3µF/50V	3.3µF/50V	1000pF/2kV	CMC: 450µH
RP20-12xxDF	1812 MLCC	1812 MLCC	1808 MLCC	ref.: WE 74482270005 ref.: CMC-05
RP20-24xxSF	4.7µF/50V	N/A	1000pF/2kV	CMC: 450µH
RP20-24xxDF	1812 MLCC		1808 MLCC	ref.: WE 74482270005 ref.: CMC-05
RP20-48xxSF	2.2µF/100V	2.2µF/100V	1000pF/2kV	CMC: 450µH
RP20-48xxDF	1812 MLCC	1812 MLCC	1808 MLCC	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	nickel coated copper
	base	non-conductive black plastic
	potting	epoxy (UL94V-0)
Dimensions (LxWxH)	without Heat-sink	50.8 x 25.4 x 10.2mm
	with Heat-sink	56.8 x 25.4 x 16.8mm
Weight	without Heat-sink	27g
	with Heat-sink	37.89g

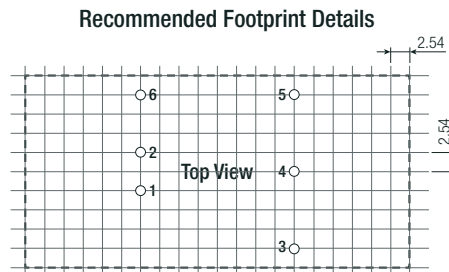
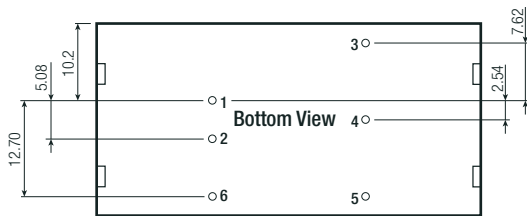
Dimension Drawing (mm)



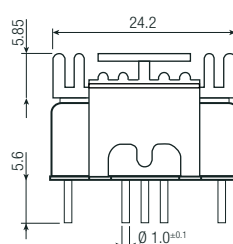
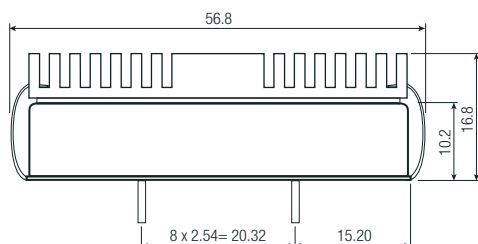
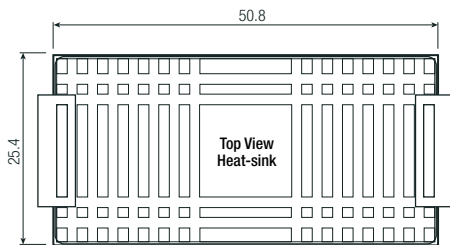
Pinning Information

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	without heat-sink	255.0 x 54.0 x 22.0mm
	tray	with heat-sink	302.5 x 222.0 x 20.0mm
Packaging Quantity	tube	without heat-sink	9pcs
	tray	with heat-sink	20pcs
Storage Temperature Range			-55°C to +125°C
Storage Humidity	non-condensing		5% - 95% RH

The product information and specifications may be subject to changes even without prior written notice. The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.

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