Features

Regulated Converter

- 2:1 input voltage range
- 1.6kVDC isolation
- UL certified
- Efficiency up to 90%
- Six-sided continuous shield
- Available as power module (RPM40-G)

RECOM
DC/DC Converter

RP40-G

40 Watt 2" x 2" Single, Dual and Triple Output



UL60950-1 certified

Description

The RP40-G 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 2" 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]
RP40-123.3SG (3)	9-18	3.3	8000	2558	86	21000
RP40-1205SG (3)	9-18	5	8000	3876	86	13600
RP40-1212SG (3)	9-18	12	3333	3876	86	2360
RP40-1215SG (3)	9-18	15	2666	3830	87	1510
RP40-243.3SG (3)	18-36	3.3	8000	1264	87	21000
RP40-2405SG (3)	18-36	5	8000	1873	89	13600
RP40-2412SG (3)	18-36	12	3333	1894	88	2360
RP40-2415SG (3)	18-36	15	2666	1872	89	1510
RP40-483.3SG (3)	36-75	3.3	8000	625	88	21000
RP40-4805SG (3)	36-75	5	8000	926	90	13600
RP40-4812SG (3)	36-75	12	3333	936	89	2360
RP40-4815SG (3)	36-75	15	2666	936	89	1510
RP40-1212DG (3)	9-18	±12	±1800	4235	85	±1200
RP40-1215DG (3)	9-18	±15	±1400	4118	85	±750
RP40-2412DG (3)	18-36	±12	±1800	2069	87	±1200
RP40-2415DG (3)	18-36	±15	±1400	2011	87	±750
RP40-4812DG (3)	36-75	±12	±1800	1034	87	±1200
RP40-4815DG (3)	36-75	±15	±1400	1006	87	±750
RP40-120512TG (3)	9-18	5/±12	6000/±400	3837	86	6800/±330
RP40-120515TG (3)	9-18	5/±15	6000/±300	3779	86	6800/±110
RP40-240512TG (3)	18-36	5/±12	6000/±400	1897	87	6800/±330
RP40-240515TG (3)	18-36	5/±15	6000/±300	1868	87	6800/±110
RP40-480512TG (3)	36-75	5/±12	6000/±400	938	88	6800/±330
RP40-480515TG (3)	36-75	5/±15	6000/±300	923	88	6800/±110

Notes:

Note1: Maximum values at nominal input voltage and full load of standard type

Note2: Max. Cap load is tested at minimum Input and constant resistive load

Model Numbering

RP40-___ ___ G-___

- nom. Input Voltage
- Output Voltage
- Single, Dual or Triple
- *"Package (3)"*

Notes:

Note3: add suffix "-HC" for premounted Heat-sink with clips

Ordering Examples

RP40-2405SG = 24V Input, 5V Output, Single

RP40-4812DG-HC = 48V Input, ±12V Output, Dual, Heat-sink premounted

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

BASIC CHARACTERISTICS

Parameter	Condition			Min.	Typ.	Max.
Input Filter						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
Under Voltage Lockout (UVLO)	nom. Vin = 12VDC	DC-DC ON DC-DC OFF			8VDC	9VDC
	nom. Vin = 24VDC	DC-DC ON DC-DC OFF			16VDC	17.8VDC
	nom. Vin = 48VDC	DC-DC ON DC-DC OFF			34VDC	36VDC
Output Voltage Trimming (4)	refer to ***"OUTPUT VOLTAGE TRIMMING"***			-10%		+10%
Input Reflected Ripple Current (5)					40mAp-p	
Minimum Load (6)	Single Dual and Triple			0% 10%		
Start-up Time	Power up ON/OFF CTRL				25ms 25ms	
ON/OFF CTRL (7)	Positive Logic	DC-DC ON DC-DC OFF		Open or 3.0VDC < V_{CTRL}< 12VDC Short or 0VDC < V_{CTRL}< 1.2VDC		
Input Current of CTRL pin	DC-DC ON			-0.5mA		+0.5mA
Standby Current	DC-DC OFF				2.5mA	
Internal Operating Frequency				270kHz	300kHz	330kHz
Ripple and Noise	measured at 20MHz BW with a 0.1µF/50V MLCC	Single	3.3Vout, 5Vout 12Vout, 15Vout		50mVp-p 75mVp-p	
		Dual	±12Vout ±15Vout		120mVp-p 150mVp-p	
		Triple	5Vout ±12Vout, ±15Vout		50mVp-p 75mVp-p	

Notes:

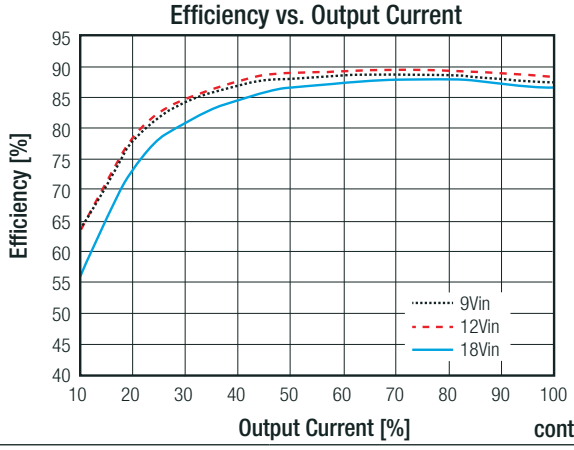
Note4: For the single output: Maximum output deviation is 10% inclusive of remote sense and trim. If remote sense is not being used, the +Sense should be connected to its corresponding +Vout and likewise the -Sense should be connected to its corresponding -Vout

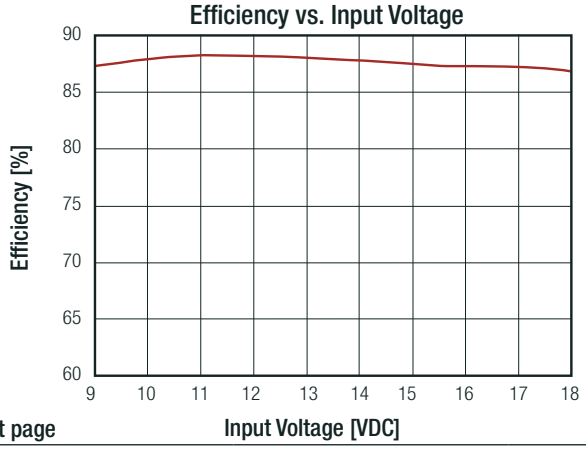
Note5: Simulated source impedance of 12µH. 12µH inductor in series with +Vin

Note6: The dual and triple output required a minimum 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

Note7: The pin voltage is referenced to -Vin pin

RP40-1205SG

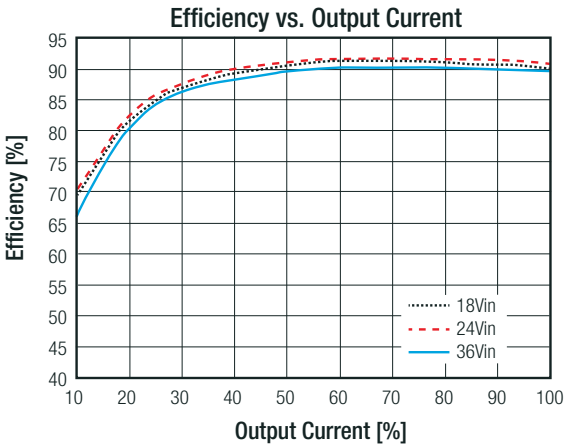


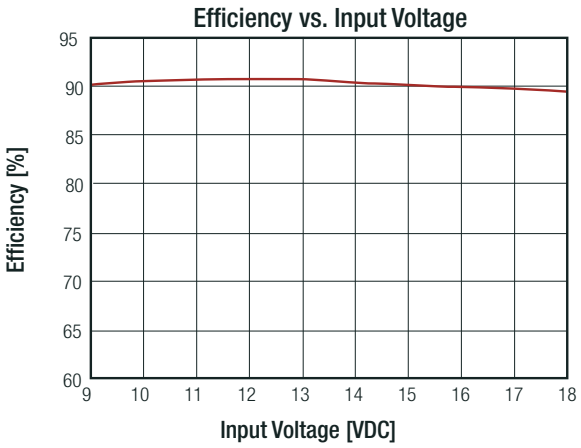


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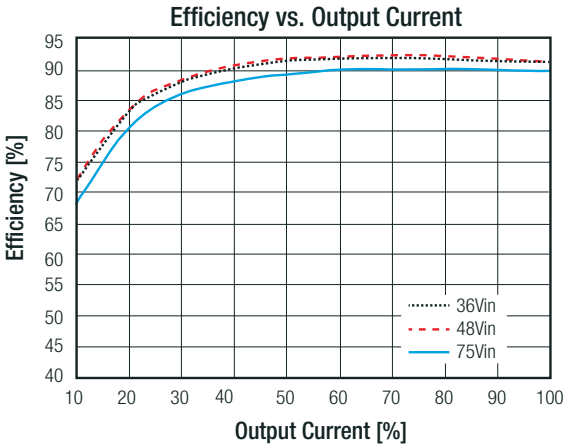
Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

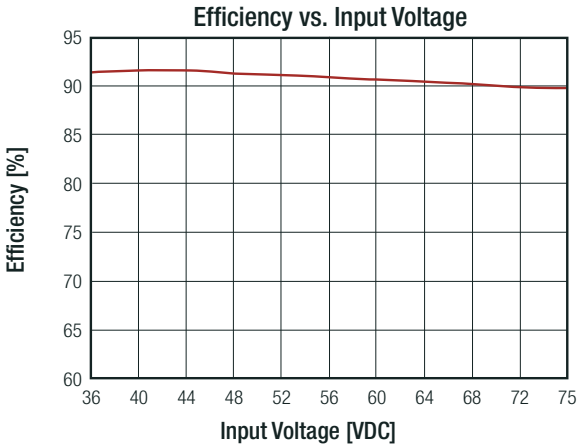
RP40-2405SG





RP40-4805SG

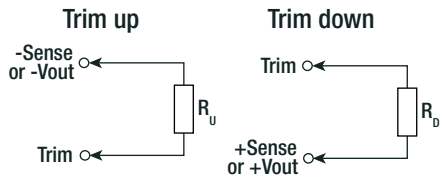




OUTPUT VOLTAGE TRIMMING

Output Voltage Trimming

Some single/dual 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.



RP40-xx3.3SG

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]

continued on next page

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

RP40-xx05SG

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	5.05	5.10	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]

RP40-xx12SG

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]

RP40-xx15SG

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]

RP40-xx12DG

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	24.24	24.48	24.72	24.96	25.20	25.44	25.68	25.92	26.16	26.40	[VDC]
R_U =	218.21	98.10	58.07	38.05	26.04	18.03	12.32	8.03	4.69	2.02	[kΩ]

Trim down	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	23.76	23.52	23.28	23.04	22.80	22.56	22.32	22.08	21.84	21.6	[VDC]
R_D =	273.44	123.02	72.87	47.80	32.76	22.73	15.57	10.20	6.02	2.67	[kΩ]

RP40-xx15DG

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	30.30	30.60	30.90	31.20	31.50	31.80	32.10	32.40	32.70	33.00	[VDC]
R_U =	268.29	120.64	71.43	46.82	32.06	22.21	15.10	9.91	5.81	2.53	[kΩ]

Trim down	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	29.70	29.40	29.10	28.80	28.50	28.20	27.90	27.60	27.30	27.00	[VDC]
R_D =	337.71	152.02	90.13	59.18	40.61	28.23	19.39	12.76	7.60	3.47	[kΩ]

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

REGULATIONS

Parameter	Condition		Value
Output Accuracy	Single, Dual Triple Main Triple Auxiliary		±1.0% max. ±1.0% max. ±5.0% max.
Line Regulation	low line to high line, full load	Single, Dual Triple Main Triple Auxiliary	±0.5% max. ±1.0% max. ±5.0% max.
Load Regulation	min. load to full load	Single Dual	±0.5% max. ±1.0% max.
	10% to 100% balanced on auxiliaries	Triple Main	±2.0% max.
	10% to 100% balanced on all outputs	Triple Auxiliary	±5.0% max.
Cross Regulation	asymmetrical 25%/100% FL	Dual	±5.0% max.
	Triple: main output (5Vout) 100%load, auxiliary 100%, other auxiliary 25% to 100% load or main output (5Vout) 25%, auxiliary 25%, other auxiliary 25% to 100%	Triple Main	±1.0% max.
		Triple Auxiliary	±5.0% max.
Transient Response Recovery Time	25% load step change		250µs typ.

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.
Over Temperature Protection (OTP)			115°C typ.
Isolation Voltage [8]	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:

Note8: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Note9: This power module is not internally fused. An input line fuse must always be used

ENVIRONMENTAL

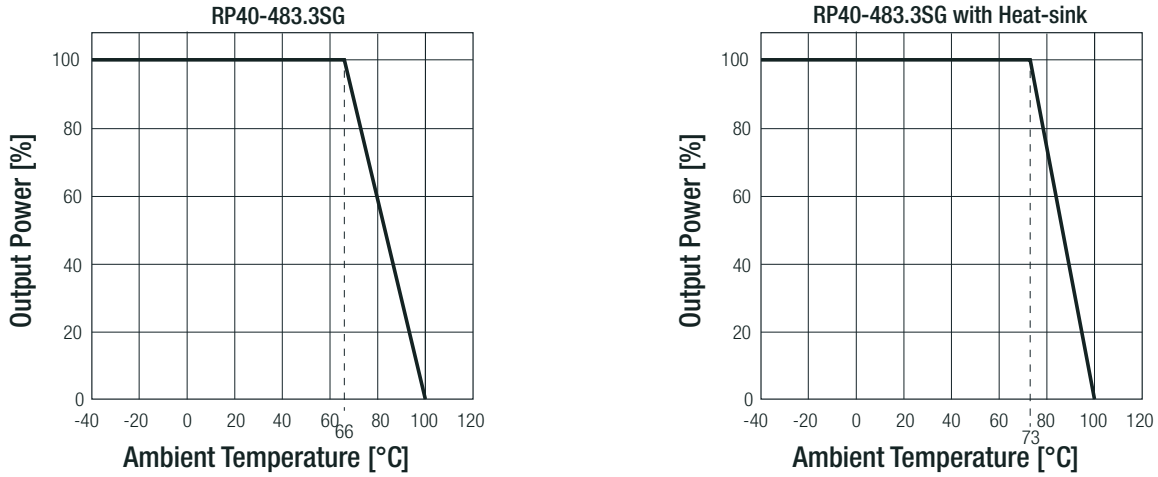
Parameter	Condition		Value
Operating Temperature Range	without derating with derating		-40°C to +66°C -40°C o +100°C
Maximum Case Temperature			+100°C max.
Temperature Coefficient			±0.02%/K max.
Thermal Impedance	@ natural convection 0.1m/s	without heat-sink with heat-sink	9.2K/W 7.6K/W
Operating Humidity	non-condensing		5% - 95% RH

continued on next page

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

Parameter	Condition	Value
Thermal Shock		according to MIL-STD-810F
Vibration		according to MIL-STD-810F
MTBF	MIL-HDBK-217F, G.B. Bellcore TR-NWT-000332 (10)	9224 x 10^2 hours 1398 x 10^3 hours

Derating Graph (11)



Notes:

Note10: BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C (Ground fixed and controlled environment)

Note11: 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

SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Condition	Standard
Information Technology Equipment, General Requirements for Safety	E196683	UL60950-1, 1st Edition CAN/CSA-C22.2 No. 60950-1, 1st Edition
EAC	RU-AT.49.09571	TP TC 004/2011
RoHS2		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 (12)	±2kV	EN61000-4-4, Criteria B
Surge Immunity (12)	±1kV	EN61000-4-5, Criteria B
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

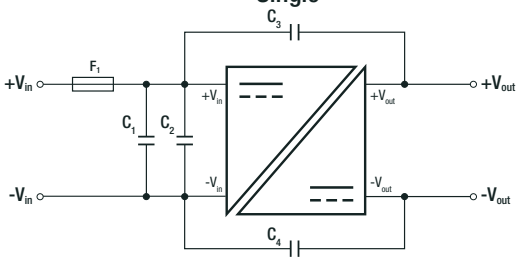
Notes:

Note12: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5
The filter capacitor Recom suggests: Nippon chemi-con KY series 220µF/100V

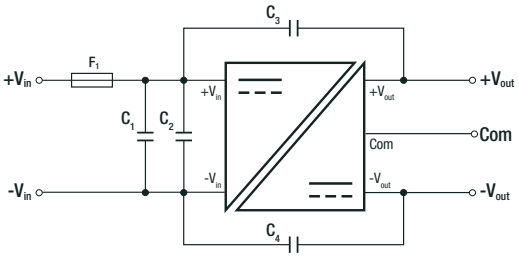
Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

EMC Filtering Suggestions according to EN55032

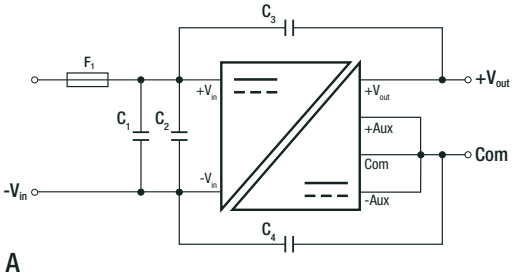
Single



Dual



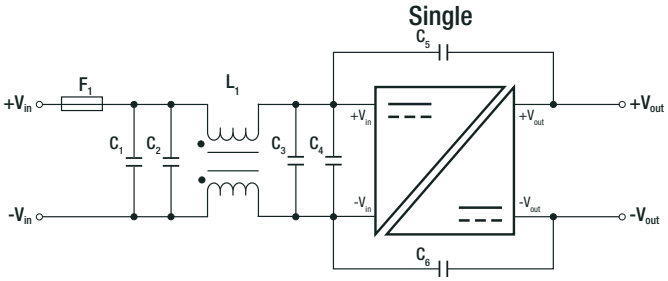
Triple



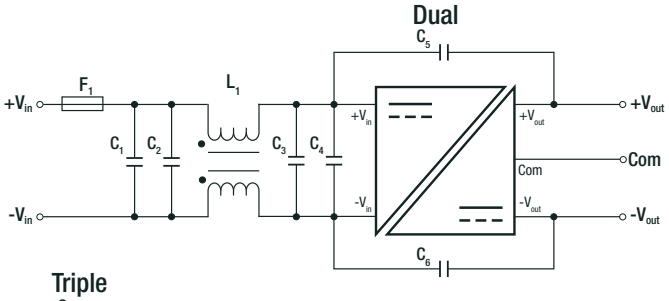
Component List Class A

MODEL	C1	C2	C3/C4
RP40-12xxSG, RP40-12xxDG RP40-12xxTG	6.8µF/50V, 1812 MLCC	N/A	1000pF/2kV, 1808 MLCC
RP40-24xxSG, RP40-24xxDG RP40-24xxTG	6.8µF/50V, 1812 MLCC	N/A	1000pF/2kV, 1808 MLCC
RP40-48xxSG, RP40-48xxDG RP40-48xxTG	2.2µF/100V, 1812 MLCC	N/A	1000pF/2kV, 1808 MLCC

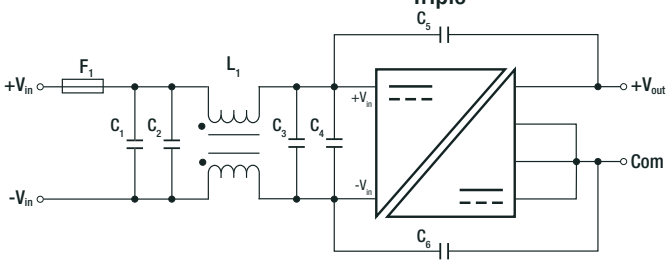
Single



Dual



Triple



Component List Class B

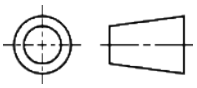
MODEL	C1	C2	C3	C4	C5/C6	L1
RP40-12xxSG RP40-12xxDG RP40-12xxTG	4.7µF/50V 1812 MLCC	N/A	4.7µF/50V 1812 MLCC	N/A	1000pF/2kV 1808 MLCC	CMC: 450µH ref.: WE 7448227005 or ref.: CMC-05
RP40-24xxSG RP40-24xxDG RP40-24xxTG	6.8µF/50V 1812 MLCC	N/A	6.8µF/50V 1812 MLCC	N/A	1000pF/2kV 1808 MLCC	CMC: 450µH ref.: WE 7448227005 or ref.: CMC-05
RP40-48xxSG RP40-48xxDG RP40-48xxTG	2.2µF/100V 1812 MLCC	2.2µF/100V 1812 MLCC	6.8µF/50V 1812 MLCC	2.2µF/100V 1812 MLCC	1000pF/2kV 1808 MLCC	CMC: 830µH ref.: WE 744822301 or ref.: CMC-08

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 FR4 PCB epoxy (UL94-V0)
Dimensions (LxWxH)	without Heat-sink with Heat-sink	50.8 x 50.8 x 10.2mm 56.8 x 50.8 x 17.0mm
Weight	without Heat-sink with Heat-sink	60.0g 81.06g

Dimension Drawing (mm)

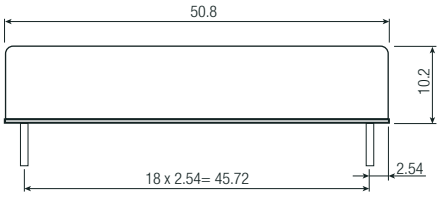


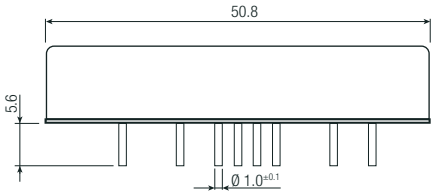


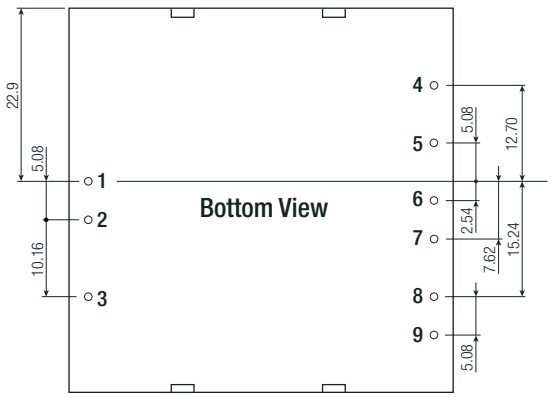
Pin Connections

Pin #	Single	Dual	Triple
1	+Vin	+Vin	+Vin
2	-Vin	-Vin	-Vin
3	CTRL	CTRL	CTRL
4	NC	No Pin	+AUX
5	-Sense (5)	+Vout	Com
6	+Sense (5)	Com	-AUX
7	+Vout	Com	+Vout
8	-Vout	-Vout	Com
9	Trim	Trim	NC

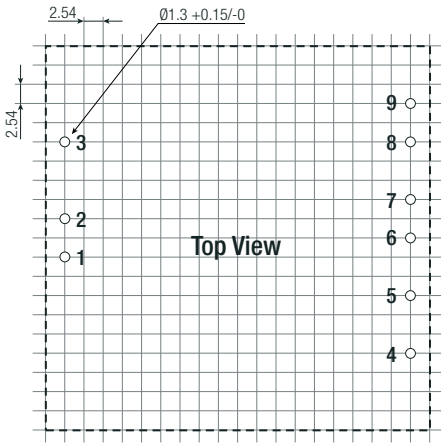
NC= No Connection
Pin Pitch Tolerance ±0.25mm
xx.x = ±0.5mm
xx.xx = ±0.25mm







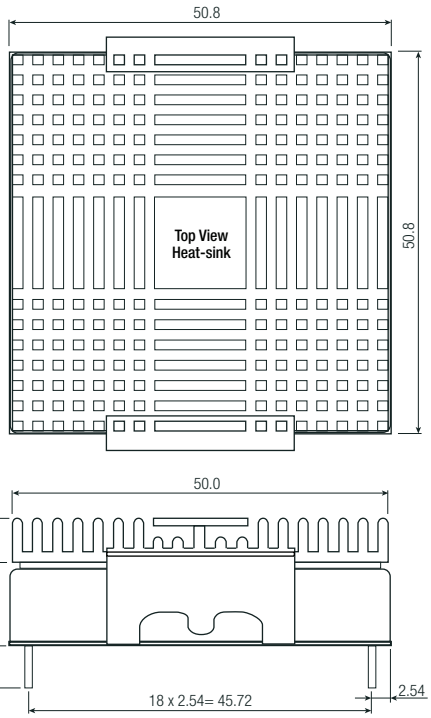
Recommended Footprint Details

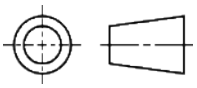


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Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

Dimension Drawing (mm) with Heat-sink





Pin Connections

Pin #	Single	Dual	Triple
1	+Vin	+Vin	+Vin
2	-Vin	-Vin	-Vin
3	CTRL	CTRL	CTRL
4	NC	No Pin	+AUX
5	-Sense [5]	+Vout	Com
6	+Sense [5]	Com	-AUX
7	+Vout	Com	+Vout
8	-Vout	-Vout	Com
9	Trim	Trim	NC

NC= No Connection
Pin Pitch Tolerance ±0.25mm
xx.x = ±0.5mm
xx.xx = ±0.25mm

PACKAGING INFORMATION

Parameter	Type		Value
Packaging Dimension (LxWxH)	tube	without heat-sink	255.0 x 54.0 x 22.0mm
	tray	with heat-sink	306.0 x 226.0 x 30.0mm
Packaging Quantity	tube	without heat-sink	4pcs
	tray	with heat-sink	12pcs
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.