

Features

Regulated Converters

- 4:1 Wide Input Voltage Range
- 1.6kVDC Isolation
- UL Certified
- Efficiency up to 89%
- Six-Sided Continuous Shield
- Available as Power Module (RPM40-GW)

RECOM
DC/DC Converter

RP40-GW

40 Watt
2" x 2"
Single, Dual
Output



Description

The RP40-GW series wide input range 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]
RP40-243.3SGW ^(3,4)	9-36	3.3	10000	1580	87	25750
RP40-2405SGW ^(3,4)	9-36	5	8000	1894	88	13600
RP40-2412SGW ^(3,4)	9-36	12	3333	1916	87	2360
RP40-2415SGW ^(3,4)	9-36	15	2666	1915	87	1510
RP40-483.3SGW ^(3,4)	18-75	3.3	10000	790	87	25750
RP40-4805SGW ^(3,4)	18-75	5	8000	936	89	13600
RP40-4812SGW ^(3,4)	18-75	12	3333	958	87	2360
RP40-4815SGW ^(3,4)	18-75	15	2666	947	88	1510
RP40-2412DGW ^(3,4)	9-36	±12	±1667	1938	86	±1200
RP40-2415DGW ^(3,4)	9-36	±15	±1333	1938	86	±750
RP40-4812DGW ^(3,4)	18-75	±12	±1667	958	87	±1200
RP40-4815DGW ^(3,4)	18-75	±15	±1333	969	86	±750

Notes:

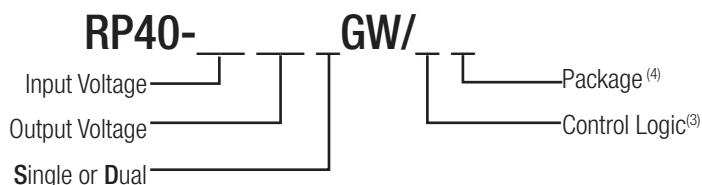
Note1: Maximum value at nominal input voltage and full load of standard type.

Note2: Test by minimum Vin and constant resistor load.



UL
E196683

Model Numbering



Ordering Examples

RP40-2405SGW = 24V 4:1 Input, 5V Output, Positive Logic CTRL pin.

RP40-4812DGW/N-HC = 48V 4:1 Input, ±12V Output, Negative Logic CTRL pin, Heat-sink fitted

Notes:

Note3: no suffix for CTRL function with Positive Logic (1=ON, 0=OFF) and trim pin
add suffix "N" for CTRL function with Negative Logic (0=ON, 1=OFF) and trim pin

Note4: add suffix -HC for premounted Heat-sink and clips

UL60950-1 Certified

Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

BASIC CHARACTERISTICS

Parameter	Condition	Min.	Typ.	Max.
Input Voltage Range	nom. $V_{in} = 24\text{V}$ nom. $V_{in} = 48\text{V}$	9VDC 18VDC	24VDC 48VDC	36VDC 75VDC
Under Voltage Lockout (UVLO)	$V_{in} = 24\text{V}$ DC-DC ON DC-DC OFF		8VDC	9VDC
	$V_{in} = 48\text{V}$ DC-DC ON DC-DC OFF		16VDC	18VDC
Input Filter ⁽⁵⁾	Pi-Type			
Input Reflected Ripple Current ⁽⁶⁾	nominal V_{in} and full load		20mA _{p-p}	
Input Surge Voltage	$V_{in} = 24\text{V}$, 100ms max. $V_{in} = 48\text{V}$, 100ms max.			50VDC 100VDC
Start-up time	Power up Remote ON/OFF		20ms 20ms	
Operating Frequency Range ⁽⁷⁾		270kHz	300kHz	330kHz
Minimum Load	of full load	0% 10%		
Ripple and Noise	measured by 20MHz bandwidth	Single 3.3V, 5V Single 12V, 15V	50mV _{p-p} 75mV _{p-p}	
		Dual 12Vout Dual 15Vout	120mV _{p-p} 150mV _{p-p}	
Remote ON/OFF ⁽⁸⁾	Positive Logic	DC-DC ON DC-DC OFF	Open or $3.0\text{V} < V_r < 12\text{V}$ Short or $0\text{V} < V_r < 1.2\text{V}$	
	Negative Logic	DC-DC ON DC-DC OFF	Short or $0\text{V} < V_r < 1.2\text{V}$ Open or $3.0\text{V} < V_r < 12\text{V}$	
Input current of Remote pin (CTRL)	24V _{in}	DC-DC OFF	10mA	
	48V _{in}	DC-DC OFF	5mA	
	DC-DC ON	-0.5mA		0.5mA

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, 220 μF /100V, ESR 90m Ω .

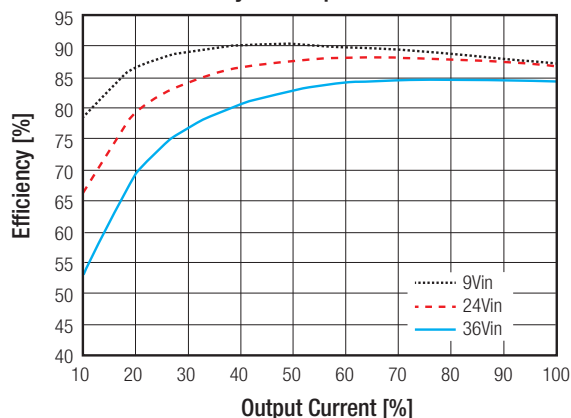
Note6: Simulated source impedance of 12 μH . 12 μH inductor in series with +V_{in}.

Note7: Operating frequency for dual output: master (5Vout) 300kHz slave (3.3Vout) 500kHz.

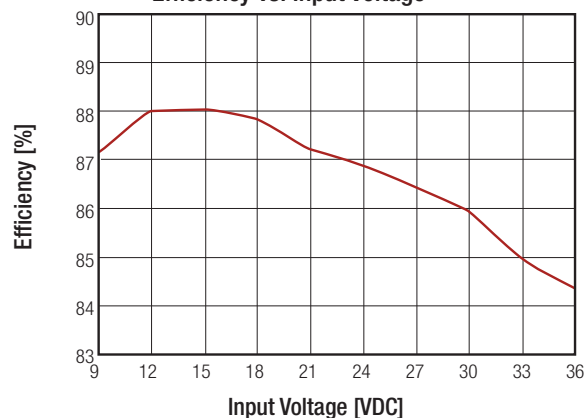
Note8: The ON/OFF control pin voltage is referenced to -V_{in} pin.

RP40-2405SGW

Efficiency vs. Output Current



Efficiency vs. Input Voltage

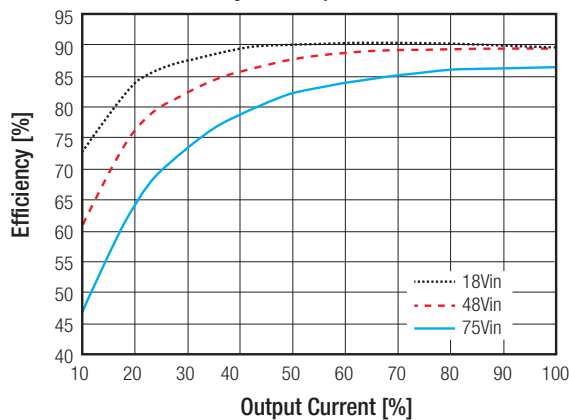


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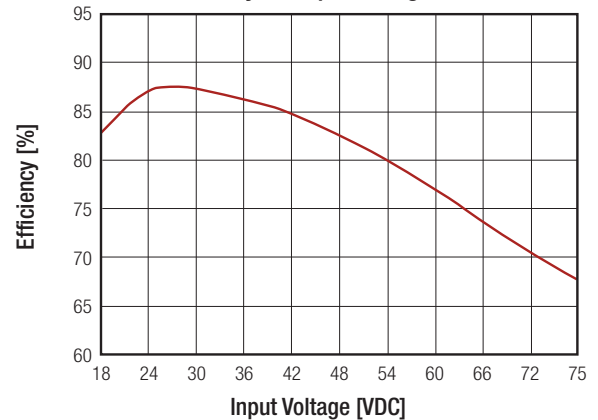
Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

RP40-4805SGW

Efficiency vs. Output Current



Efficiency vs. Input Voltage



REGULATIONS

Parameter	Condition	Value
Output Voltage Accuracy	full load and nominal input	$\pm 1.0\%$ max.
Voltage Adjustability ⁽⁹⁾		$\pm 10\%$ max.
Line Voltage Regulation	low line to high line at full load	$\pm 0.2\%$ max.
Load Voltage Regulation ^(10,11)	min. load to full load	Single Dual
		$\pm 0.5\%$ max. $\pm 1.0\%$ max.
Cross Regulation	asymmetrical 25%/100% FL	$\pm 5.0\%$ max.
Transient Response recovery time	25% load step change	250 μs typ.

Notes:

Note9: For the single output: Maximum output deviation is 10% inclusive of remote sense and trim. If remote sense is not being use, the +Sense should be connected to its corresponding +Vout and likewise the -Sense should be conneted to its corresponding -Vout.

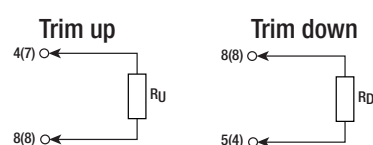
Note10: The dual output required a minimum loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification

Note11: Load regulation for dual output: Min load to 100% load balanced on all outputs.

External Output 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 resis tor 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 at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

RP40-xx3.3SGW

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.63	Volts
R _u =	57.93	26.16	15.58	10.28	7.11	4.99	3.48	2.34	1.46	0.75	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.97	Volts
R _d =	69.47	31.23	18.49	12.12	8.29	5.74	3.92	2.56	1.50	0.65	KOhms

RP40-xx05SGW

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	5.05	5.01	5.15	5.20	5.25	5.30	5.35	5.4	5.45	5.50	Volts
R _u =	36.57	16.58	9.92	6.58	4.59	3.25	2.30	1.59	1.03	0.59	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	4.95	4.90	4.85	4.80	4.75	4.70	4.65	4.60	4.55	4.50	Volts
R _d =	45.53	20.61	12.31	8.15	5.66	4.00	2.81	1.92	1.23	0.68	KOhms

RP40-xx12SGW

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20	Volts
R _u =	367.91	165.95	98.64	64.98	44.78	31.32	21.70	14.49	8.88	4.39	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	10.92	10.8	Volts
R _d =	460.99	207.95	123.60	81.42	56.12	39.25	27.20	18.16	11.13	5.51	KOhms

RP40-xx15SGW

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	15.15	15.3	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50	Volts
R _u =	404.18	180.59	106.06	68.80	46.44	31.53	20.88	12.90	6.69	1.72	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	14.85	14.70	14.55	14.40	14.25	14.10	13.95	13.80	13.65	13.50	Volts
R _d =	499.82	223.41	131.27	85.20	57.56	39.14	25.97	16.10	8.42	2.282	KOhms

Dual Output Voltage Trim Tables

RP40-xx12DGW

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	24.24	24.48	24.72	24.96	25.20	25.44	25.68	25.92	26.16	26.40	Volts
R _u =	218.21	98.10	58.07	38.05	26.04	18.03	12.32	8.03	4.69	2.02	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	23.76	23.52	23.28	23.04	22.80	22.56	22.32	22.08	21.84	21.6	Volts
R _d =	273.44	123.02	72.87	47.80	32.76	22.73	15.57	10.20	6.02	2.67	KOhms

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Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

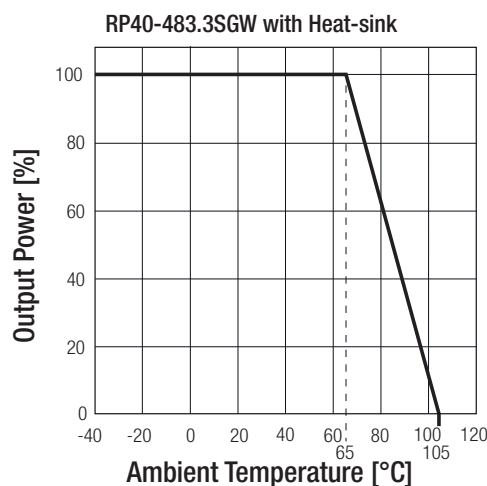
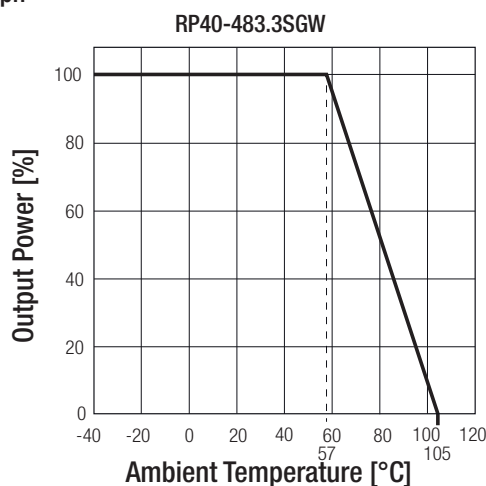
RP40-xx15DGW											
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	30.30	30.60	30.90	31.20	31.50	31.80	32.10	32.40	32.70	33.00	Volts
R _U =	268.29	120.64	71.43	46.82	32.06	22.21	15.10	9.91	5.81	2.53	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	29.70	29.40	29.10	28.80	28.50	28.20	27.90	27.60	27.30	27.00	Volts
R _D =	337.71	152.02	90.13	59.18	40.61	28.23	19.39	12.76	7.60	3.47	KOhms

PROTECTIONS		
Parameter	Condition	Value
Short Circuit Protection (SCP)		continuous, automatic recovery
Over Voltage Protection (OVP)	Zener Diode Clamp	3.3Vout 5Vout 12Vout 15Vout
Over Temperature Protection (OTP)		110°C typ.
Over Load Protection (OLP)	% of Iout rated	150% max.
Isolation Voltage	I/O to O/P I/O (O/P) to Case	1.6kVDC/ 1 minute 1.6kVDC/ 1 minute
Isolation Resistance	500VDC	1GΩ min.
Isolation Capacitance		2500pF max.
Notes: Note12: 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 +57°C -40°C to +105°C
Maximum Case Temperature		+105°C max.
Temperature Coefficient		±0.02%/°C max.
Thermal Impedance	natural convection (20LFM) without Heat-sink natural convection (20LFM) with Heat-sink	9.2°C/Watt 7.6°C/Watt
Operating Humidity		5% - 95% RH
Thermal Shock		MIL-STD-810F
Vibration		MIL-STD-810F
MTBF	MIL-HDBK-217F Bellcore TR-NWT-000332 ⁽¹³⁾	6617 x 10 ² hours 1105 x 10 ³ hours
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Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

Derating Graph⁽¹⁴⁾



Notes:

Note13: BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C (Ground fixed and controlled environment).

Note14: 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 our technical support service at techsupportAT@recom-power.com

SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report / File Number	Standard
UL General Safety	E196683	UL60950-1 1st. Ed.: 2003 C22.2 No. 60950 1st. Ed.: 2003
EMC Compliance	Condition	Standard / Criterion
EMI Standard ⁽¹⁵⁾	with external filter	EN55022, Class A or B
ESD	Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$	EN61000-4-2, Criteria A
Radiated Immunity	10 V/m	EN61000-4-3, Criteria A
Fast Transient ⁽¹⁶⁾	$\pm 2\text{kV}$	EN61000-4-4, Criteria B
Surge ⁽¹⁶⁾	$\pm 1\text{kV}$	EN61000-4-5, Criteria A
Conducted Immunity	10 V _{r.m.s}	EN61000-4-6, Criteria A

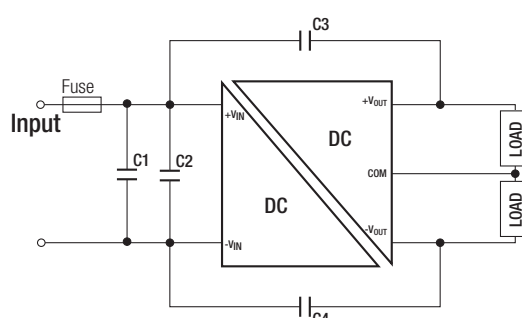
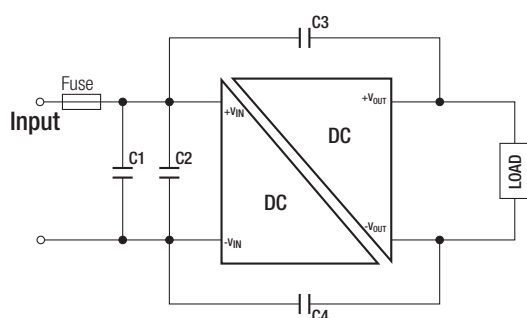
Notes:

Note15: The standard modules meet EMI Class A or Class B with external components, see filter suggestions below.

Note16: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.

The filter capacitor Recom suggest: Nippon chemi-con KY series, 220 μF /100V

EMI Filtering Class A

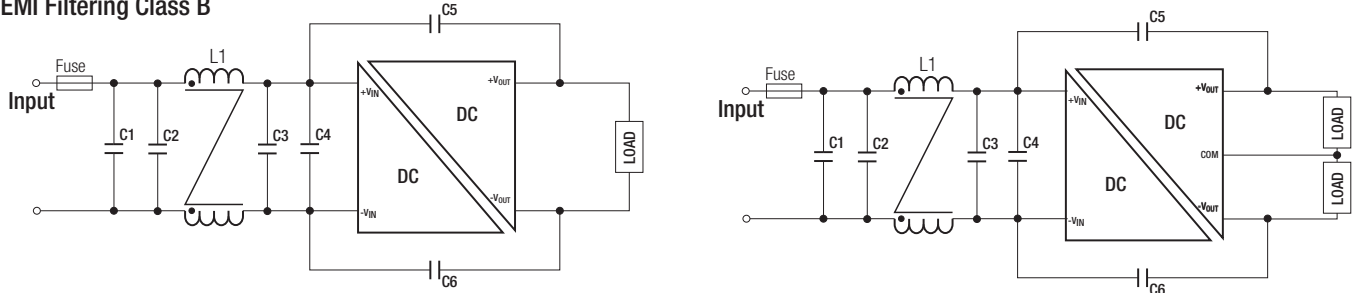


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Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

MODEL	C1	C2	C3/C4
RP40-24xxSGW RP40-24xxDGW	N/A	N/A	1000pF/2kV 1206 MLCC
RP40-48xxSGW RP40-48xxDGW	2.2 μ F/100V 1812 MLCC	2.2 μ F/100V 1812 MLCC	1000pF/2kV 1206 MLCC

EMI Filtering Class B

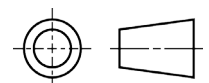
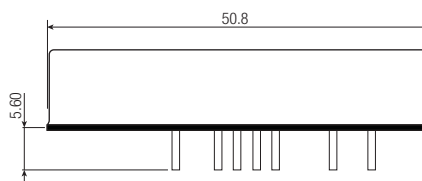
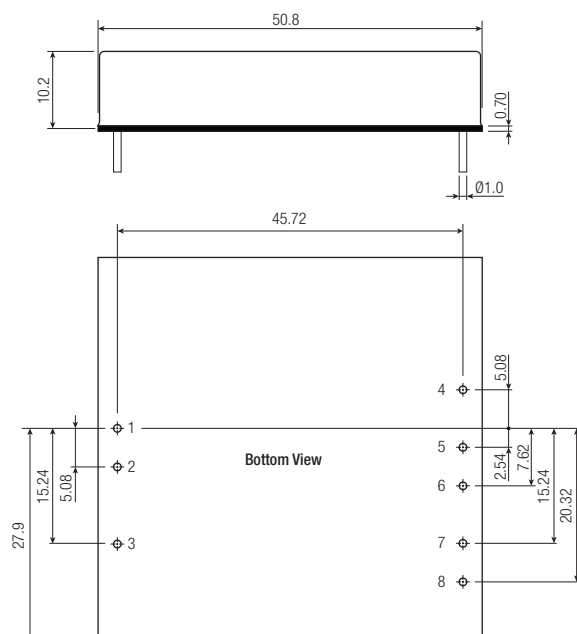


MODEL	C1	C2	C3	C4	C5/C6	L1
RP40-24xxSGW RP40-24xxDGW	4.7 μ F/50V 1812 MLCC	N/A	4.7 μ F/50V 1812 MLCC	N/A	1000pF/2kV 1206 MLCC	CMC: 450 μ H ref.: WE 7448227005 ref.: CMC-05
RP40-24xxSGW RP40-24xxDGW	2.2 μ F/100V 1812 MLCC	2.2 μ F/100V 1812 MLCC	2.2 μ F/100V 1812 MLCC	2.2 μ F/100V 1812 MLCC	1000pF/2kV 1206 MLCC	CMC: 830 μ H ref.: WE 744822301 ref.: CMC-08

DIMENSIONS and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	Case Base Potting	Nickel coated copper FR4 PCB Epoxy (UL94-V0)
Package Dimensions (LxWxH)	without Heat-sink with Heat-sink	50.8 x 50.8 x 10.2mm 56.8 x 50.8 x 17.0mm
Package Weight	without Heat-sink with Heat-sink	60g 81.06g

Dimension Drawing (mm)



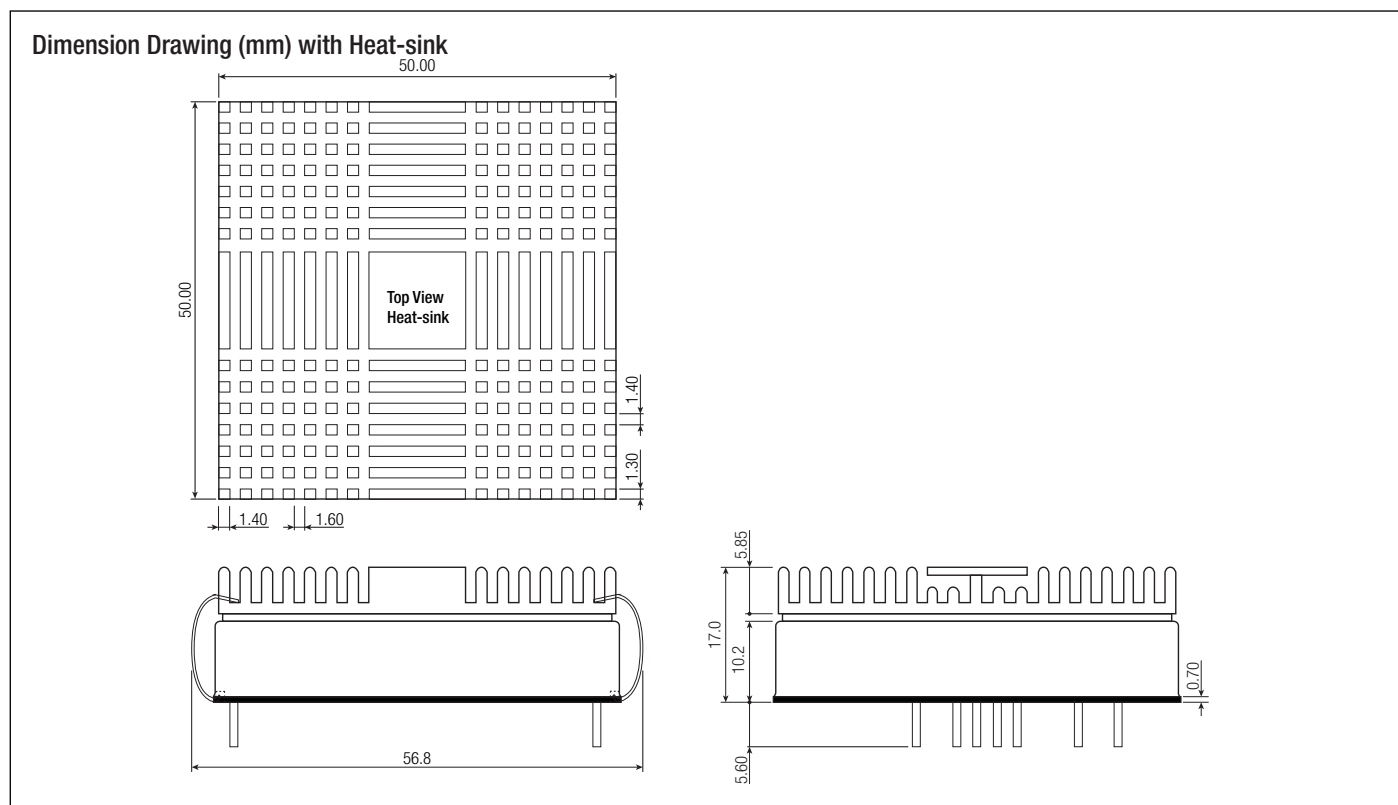
Pin Connections

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	CTRL	CTRL
4	-Sense ⁽⁹⁾	+Vout
5	+Sense ⁽⁹⁾	Com
6	+Vout	Com
7	-Vout	-Vout
8	Trim	Trim

Pin Pitch Tolerance ± 0.25 mm
Pin Dimension Tolerance ± 0.1 mm
Tolerance: X.X ± 0.5 mm
X.XX ± 0.25 mm

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Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted



PACKAGING INFORMATION

Parameter	Type		Value
Packaging Quantity	without Heat-sink	Tube	4pcs.
	with Heat-sink	Tray	12pcs.
Storage Temperature Range			-55°C to +125°C
Storage Humidity			5% - 95% RH