

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)



RP40-GW

40 Watt
2" x 2"
Single, Dual
Output



UL60950-1 Certified

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.

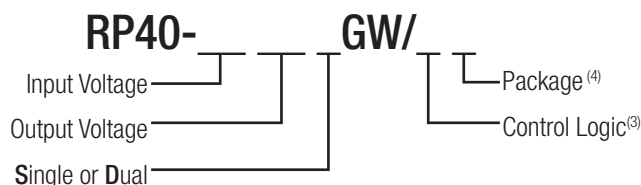
Selection Guide

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.

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

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

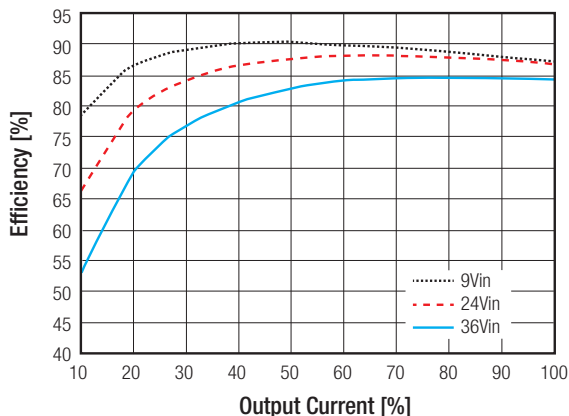
BASIC CHARACTERISTICS					
Parameter	Condition		Min.	Typ.	Max.
Input Voltage Range	nom. Vin= 24V nom. Vin= 48V		9VDC 18VDC	24VDC 48VDC	36VDC 75VDC
Under Voltage Lockout (UVLO)	Vin = 24V	DC-DC ON DC-DC OFF		8VDC	9VDC
	Vin = 48V	DC-DC ON DC-DC OFF		16VDC	18VDC
Input Filter ⁽⁵⁾					Pi-Type
Input Reflected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

Notes:

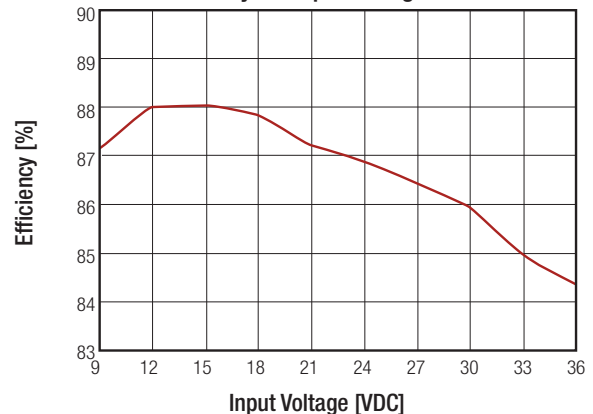
- Note5: An external filter capacitor is required for normal operation. The capacitor should be capable of handling 1A ripple current for 48V/24V models. RECOM suggest: Nippon chemi-con KY series, 220µF/100V, ESR 90m Ω.
- Note6: Simulated source impedance of 12µH. 12µH inductor in series with +Vin.
- Note7: Operating frequency for dual output: master (5V_{out}) 300kHz slave (3.3V_{out}) 500kHz.
- Note8: The ON/OFF control pin voltage is referenced to -Vin pin.

RP40-2405SGW

Efficiency vs. Output Current



Efficiency vs. Input Voltage

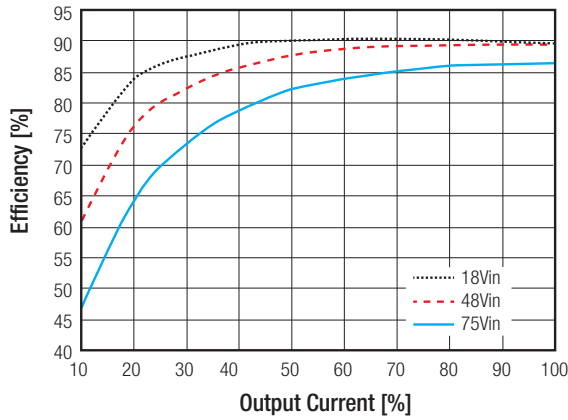


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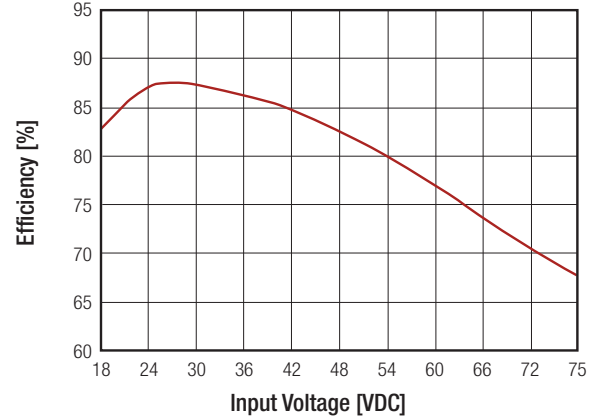
Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

RP40-4805SGW

Efficiency vs. Output Current



Efficiency vs. Input Voltage



REGULATIONS

Parameter	Condition	Value	
Output Voltage Accuracy		±1.0% max.	
Voltage Adjustability ⁽⁹⁾		±10.0% max.	
Line Voltage Regulation	low line to high line	±0.2% max.	
Load Voltage Regulation ^(10,11)	min. load to full load	Single	±0.5% max.
		Dual	±1.0% max.
Cross Regulation	asymmetrical 25%/100% FL	±5.0% max.	
Transient Response recovery time	25% load step change	250µs 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.

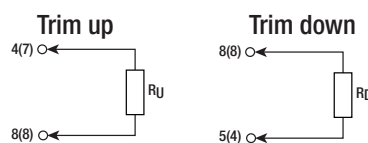
Note10: The dual output required a minimum loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification

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 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 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 _γ =	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 _δ =	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 _γ =	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 _δ =	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 _γ =	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 _δ =	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 _γ =	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 _δ =	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 _γ =	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 _δ =	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

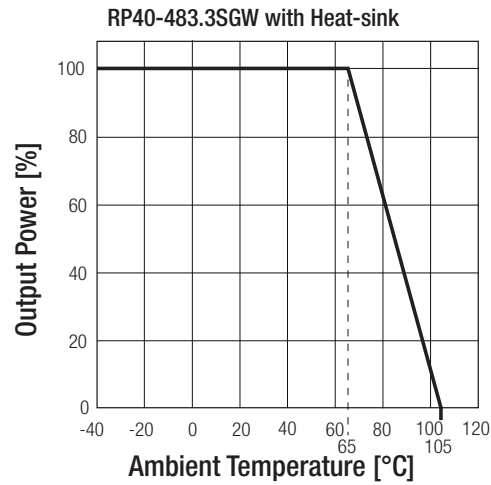
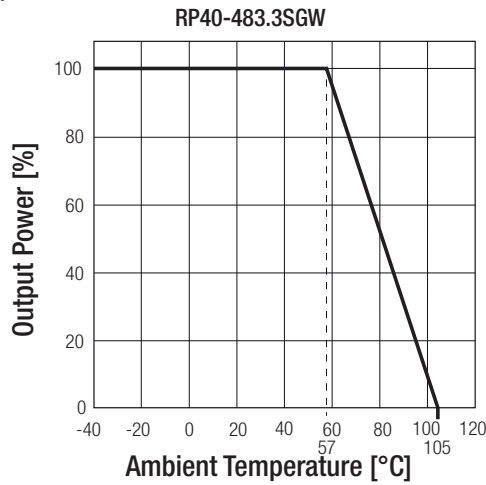
RP40-xx15DGW											
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	30.30	30.60	30.90	31.20	31.50	31.80	32.10	32.40	32.70	33.00	Volts
R _v =	268.29	120.64	71.43	46.82	32.06	22.21	15.10	9.91	5.81	2.53	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	29.70	29.40	29.10	28.80	28.50	28.20	27.90	27.60	27.30	27.00	Volts
R _b =	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	3.9VDC
		5Vout	6.2VDC
		12Vout	15VDC
		15Vout	18VDC
Over Temperature Protection (OTP)		110°C typ.	
Over Load Protection (OLP)	% of lout rated	150% max.	
Isolation Voltage	I/O to O/P	1.6kVDC/ 1 minute	
	I/O (O/P) to Case	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	-40°C to +57°C
	with derating	-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	9.2°C/Watt
	natural convection (20LFM) with Heat-sink	7.6°C/Watt
Operating Humidity		5% - 95% RH
Thermal Shock		MIL-STD-810F
Vibration		MIL-STD-810F
MTBF	MIL-HDBK-217F	6617 x 10 ² hours
	Bellcore TR-NWT-000332 ⁽¹³⁾	1105 x 10 ³ hours
continued on next page		

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 Vr.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 $\mu\text{F}/100\text{V}$

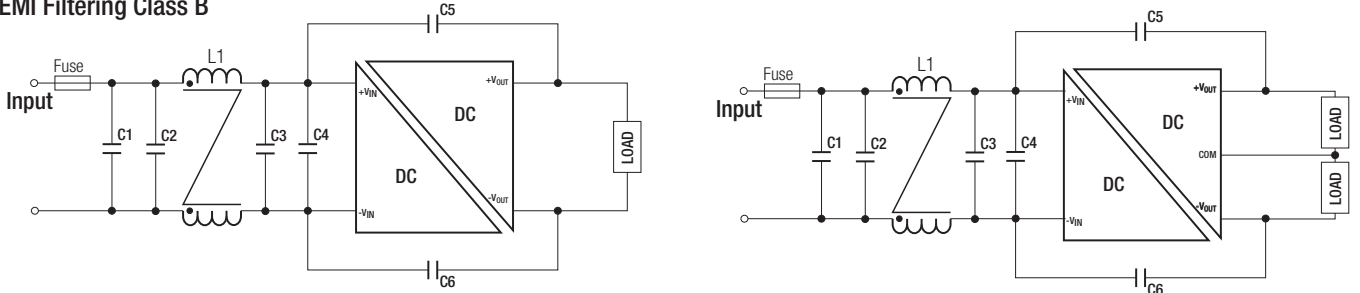
EMI Filtering Class A

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Specifications measured at Ta = 25°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	2.2µF/100V 1812 MLCC	2.2µF/100V 1812 MLCC	1000pF/2kV 1206 MLCC

EMI Filtering Class B

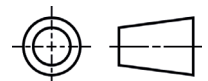
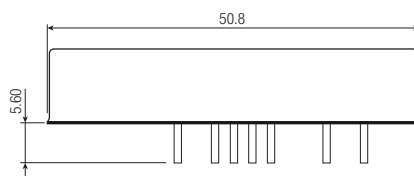
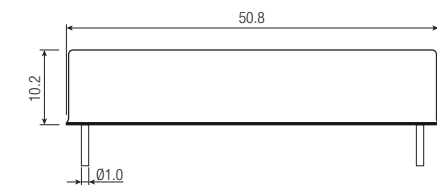


MODEL	C1	C2	C3	C4	C5/C6	L1
RP40-24xxSGW RP40-24xxDGW	4.7µF/50V 1812 MLCC	N/A	4.7µF/50V 1812 MLCC	N/A	1000pF/2kV 1206 MLCC	CMC: 450µH ref.: WE 7448227005 ref.: CMC-05
RP40-24xxSGW RP40-24xxDGW	2.2µF/100V 1812 MLCC	2.2µF/100V 1812 MLCC	2.2µF/100V 1812 MLCC	2.2µF/100V 1812 MLCC	1000pF/2kV 1206 MLCC	CMC: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

DIMENSIONS and PHYSICAL CHARACTERISTICS

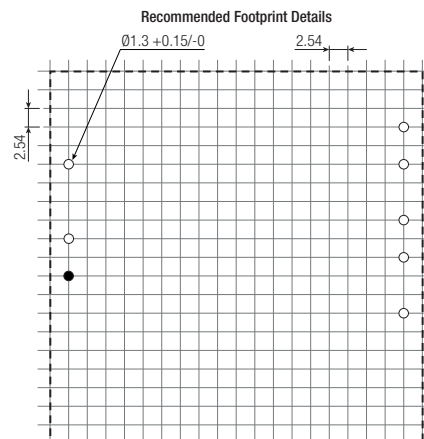
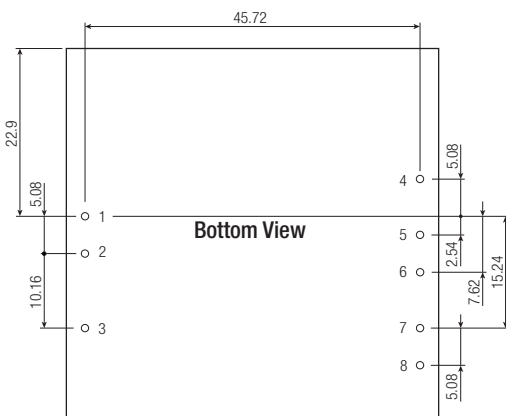
Parameter	Type	Value
Material	Case	Nickel coated copper
	Base	FR4 PCB
	Potting	Epoxy (UL94-V0)
Package Dimensions (LxWxH)	without Heat-sink	50.8 x 50.8 x 10.2mm
	with Heat-sink	56.8 x 50.8 x 17.0mm
Package Weight	without Heat-sink	60g
	with Heat-sink	81.06g

Dimension Drawing (mm)



Pin Connections

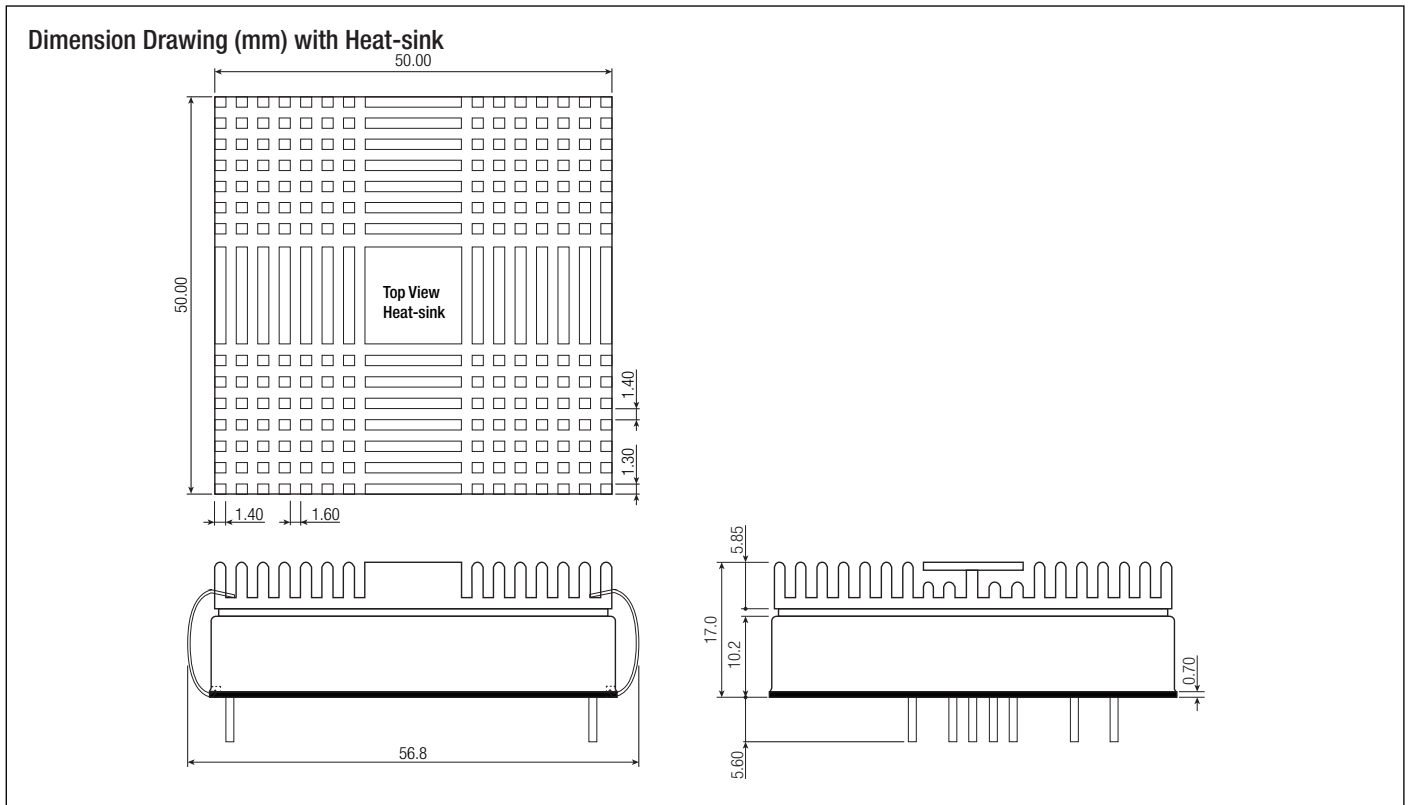
Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	CTRL	CTRL
4	-Sense ⁽⁹⁾	+Vout
5	+Sense ⁽⁹⁾	Com
6	+Vout	Com
7	-Vout	-Vout
8	Trim	Trim



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

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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

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