

Regulated Converters

- 2:1 Wide Input Voltage Range
- 1.6kVDC Isolation
- UL Certified
- Efficiency up to 90%
- Six-Sided Continuous Shield
- Available as Power Module (RPM30-E)



RP30-E

30 Watt Single & Dual Output



Description

The RP30-E series DC/DC converters are certified to UL 60950-1 and cUL 60950-1. This makes them ideal for all telecom and industrial applications where approved safety standards are required. The industry standard 2" x 1.6" 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]
RP30-123.3SE ^(3,4)	9-18	3.3	6000	1941	85	19500
RP30-1205SE ^(3,4)	9-18	5	6000	2874	87	10200
RP30-1212SE ^(3,4)	9-18	12	2500	2841	88	3240
RP30-1215SE ^(3,4)	9-18	15	2000	2841	88	1100
RP30-243.3SE ^(3,4)	18-36	3.3	6000	959	86	19500
RP30-2405SE ^(3,4)	18-36	5	6000	1420	88	10200
RP30-2412SE ^(3,4)	18-36	12	2500	1404	89	3240
RP30-2415SE ^(3,4)	18-36	15	2000	1404	89	1100
RP30-483.3SE ^(3,4)	36-75	3.3	6000	474	87	19500
RP30-4805SE ^(3,4)	36-75	5	6000	702	89	10200
RP30-4812SE ^(3,4)	36-75	12	2500	694	90	3240
RP30-4815SE ^(3,4)	36-75	15	2000	694	90	1100
RP30-1212DE ^(3,4)	9-18	±12	±1250	2874	87	±1020
RP30-1215DE ^(3,4)	9-18	±15	±1000	2874	87	±675
RP30-2412DE ^(3,4)	18-36	±12	±1250	1420	88	±1020
RP30-2415DE ^(3,4)	18-36	±15	±1000	1420	88	±675
RP30-4812DE ^(3,4)	36-75	±12	±1250	710	88	±1020
RP30-4815DE ^(3,4)	36-75	±15	±1000	710	88	±675

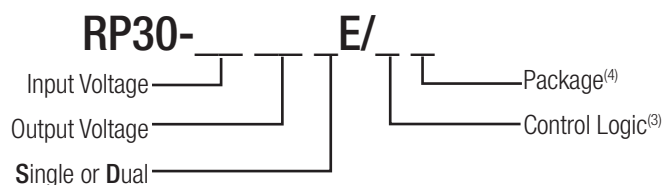
Notes:

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

RP30-2405SE = 24V Input, 5V Output, Positive Logic CTRL pin.

RP30-4812DE-HC = 48V Input, $\pm 12V$ Output, Positive Logic CTRL pin, Heat-sink fitted

Notes:

Note3: no suffix for CTRL function with Positive Logic (1=ON, 0=OFF)

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. Vin= 12V nom. Vin= 24V nom. Vin= 48V	9VDC 18VDC 36VDC	12VDC 24VDC 48VDC	18VDC 36VDC 75VDC
Under Voltage Lockout (UVLO)	Vin = 12V DC-DC ON DC-DC OFF		8VDC	9VDC
	Vin = 24V DC-DC ON DC-DC OFF		16VDC	17.8VDC
	Vin = 48V DC-DC ON DC-DC OFF		33VDC	36VDC
Input Filter ⁽⁵⁾	L-C Type			
Input Reflected Ripple Current ⁽⁶⁾	nominal Vin and full load		30mA _{p-p}	
Input Surge Voltage	Vin= 12V, 100ms max. Vin= 24V, 100ms max. Vin= 48V, 100ms max.			36VDC 50VDC 100VDC
Start-up time	Power up Remote ON/OFF		25ms 25ms	
Operating Frequency Range		270kHz	300kHz	330kHz
Minimum Load		0%		
Ripple and Noise	measured by 20MHz bandwidth with a 0.1μF/50V MLCC	3.3V _{out} , 5V _{out} 12V _{out} , 15V _{out} Dual all	50mV _{p-p} 75mV _{p-p} 100mV _{p-p}	
Remote ON/OFF ⁽⁷⁾	Positive Logic	DC-DC ON DC-DC OFF	Open or $3.0\text{V} < V_r < 12\text{V}$ Short or $0\text{V} < V_r < 1.2\text{V}$	
Input current of Remote pin (CTRL)		DC-DC OFF		2.5mA
		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.

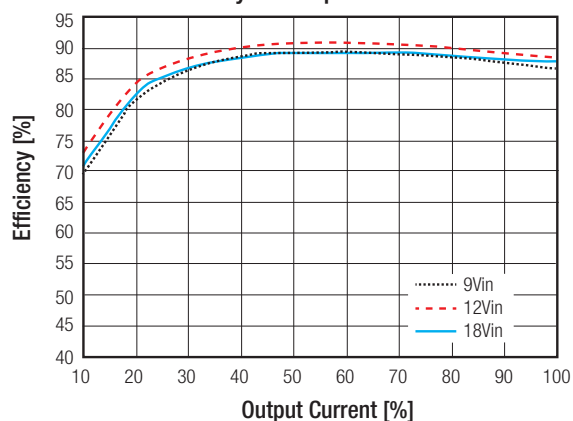
RECOM suggest: Nippon chemi-con KY series, 220μF/100V, ESR 90m Ω.

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

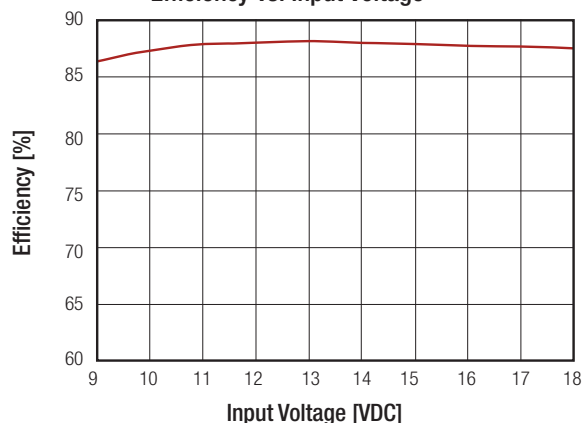
Note7: The ON/OFF control pin voltage is referenced to -Vin pin

RP30-1205SE

Efficiency vs. Output Current



Efficiency vs. Input Voltage

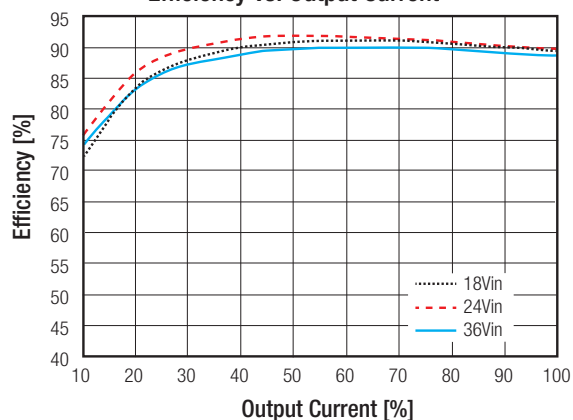


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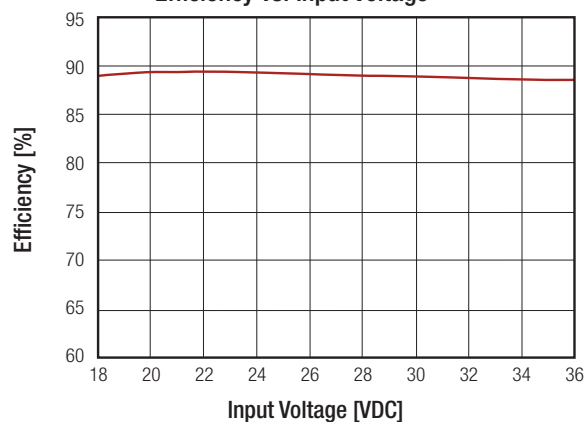
Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

RP30-2405SE

Efficiency vs. Output Current

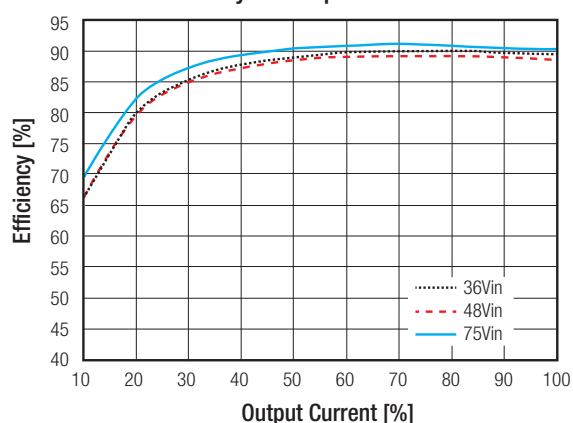


Efficiency vs. Input Voltage

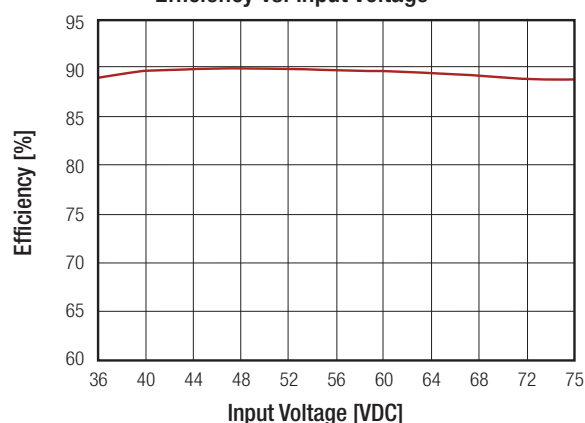


RP30-4805SE

Efficiency vs. Output Current



Efficiency vs. Input Voltage



REGULATIONS

Parameter	Condition		Value
Output Voltage Accuracy			$\pm 1\%$
Voltage Adjustability			$\pm 10\%$
Line Voltage Regulation	low line to high line at full load	Single	$\pm 0.2\%$
		Dual	$\pm 0.5\%$
Load Voltage Regulation	no load to full load	Single	$\pm 0.5\%$
		Dual	$\pm 1.0\%$
Cross Regulation	asymmetrical 25% <> 100% load		$\pm 5\%$
Transient Response recovery time	25% load step change		300 μs typ.

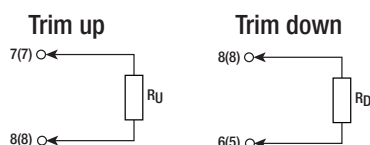
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Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

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.



RP30-xx3.3SE

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

RP30-xx05SE

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	5.05	5.10	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

RP30-xx12SE

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

RP30-xx15SE

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

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

Dual Output Voltage Trim Tables RP30-xx12DE

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

RP30-xx15DE

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	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	%
V _{out} =	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	3.3V _{out} 5V _{out} 12V _{out} 15V _{out}	3.9VDC 6.2VDC 15VDC 18VDC
Over Load Protection (OLP)	% of I _{out} rated		150% typ.
Over Temperature Protection (OTP)			115°C typ.
Isolation Voltage	I/P to O/P I/P to O/P to case		1.6kVDC/ 1 minute 1.6kVDC/ 1 minute
Isolation Resistance	500VDC		1GΩ min.
Isolation Capacitance			1000pF max.

Notes:

Note8: This power module is not internally fused. An input line fuse must always be used.

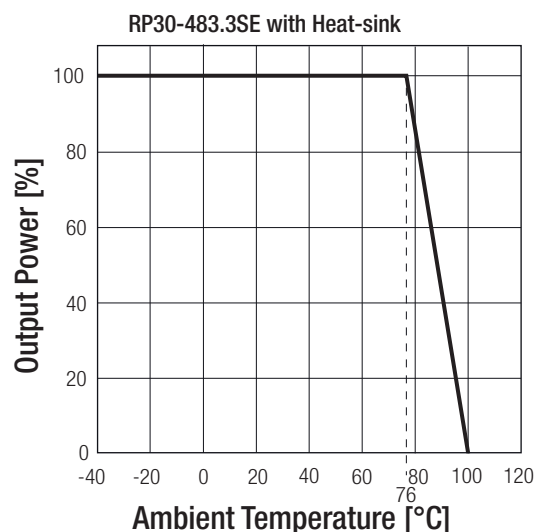
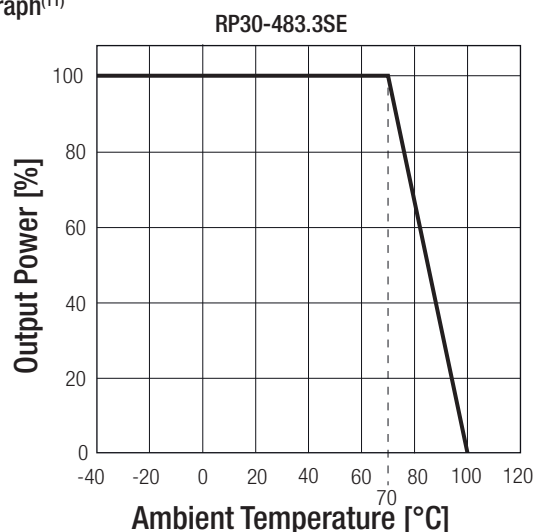
ENVIRONMENTAL

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%/°C max.
Thermal Impedance	Natural convection (20LFM) Natural convection (20LFM) with Heat Sink	10°C/Watt 8.24°C/Watt
Operating Humidity		5% - 95% RH
Thermal Shock		MIL-STD-810F
Vibration		MIL-STD-810F
MTBF	MIL-HDBK-217F Bellcore TR-NWT-000332 ⁽¹⁰⁾	1283 x 10 ³ hours 1535 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⁽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 our technical support service at techsupportAT@recom-power.com

SAFETY AND CERTIFICATIONS

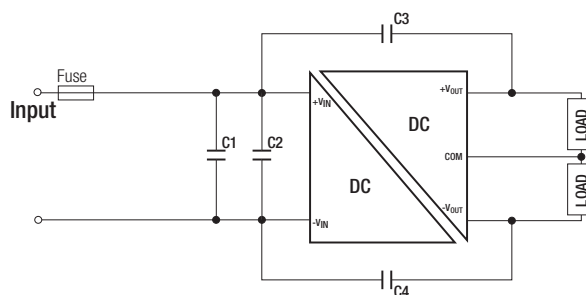
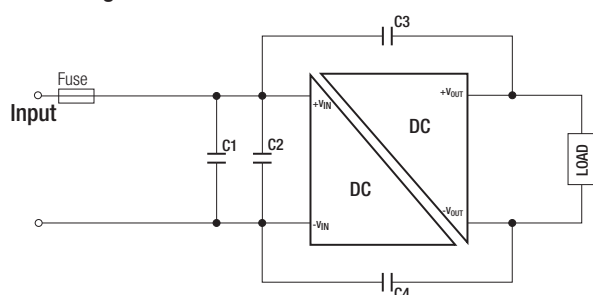
Certificate Type (Safety)	Report / File Number	Standard
UL General Safety	E196683	UL60950-1 1st. Ed.: 2003 C22.2 No. 60950 1st. Ed.: 2003
EMC Compliance	Condition	Standard / Criterion
EMI Standard ⁽¹²⁾	with external filter	EN55022, Class A, Class B
ESD	Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$	EN61000-4-2, Criteria B
Radiated Immunity	10 V/m	EN61000-4-3, Criteria A
Fast Transient ⁽¹³⁾	$\pm 2\text{kV}$	EN61000-4-4, Criteria B
Surge ⁽¹³⁾	$\pm 1\text{kV}$	EN61000-4-5, Criteria B
Conducted Immunity	10 Vr.m.s	EN61000-4-6, Criteria A

Notes:

Note10: The standard modules meet EMI Class A or Class B with external components, see filter suggestions below.

Note11: 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, $220\mu\text{F}/100\text{V}$

EMI Filtering Class A

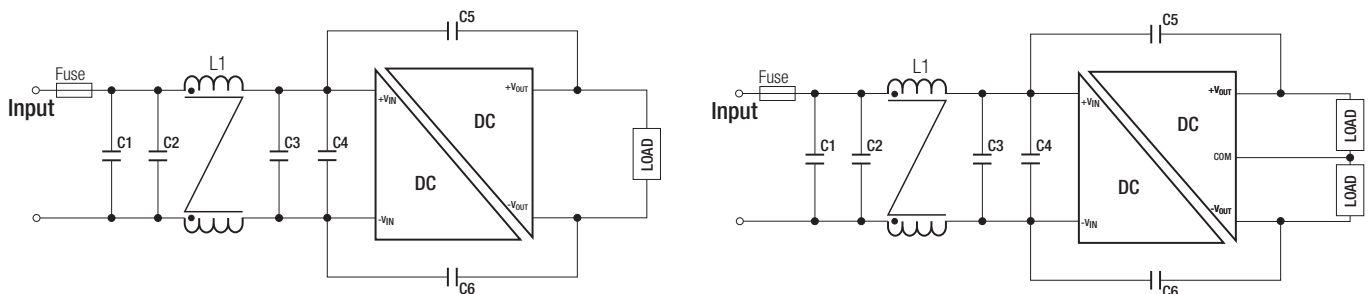


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Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

MODEL	C1	C2	C3/C4
RP30-12xxSE RP30-12xxDE	6.8 μF /50V 1812 MLCC	N/A	1000pF/2kV 1808 MLCC
RP30-24xxSE RP30-24xxDE	6.8 μF /50V 1812 MLCC	N/A	1000pF/2kV 1808 MLCC
RP30-48xxSE RP30-48xxDE	2.2 μF /100V 1812 MLCC	N/A	1000pF/2kV 1808 MLCC

EMI Filtering Class B



MODEL	C1	C2	C3	C4	C5/C6	L1
RP30-12xxSE	4.7 μF /50V 1812 MLCC	N/A	4.7 μF /50V 1812 MLCC	N/A	1000pF/2kV 1808 MLCC	CMC: 450 μH ref.: WE 7448227005 ref.: CMC-05
RP30-24xxSE	6.8 μF /50V 1812 MLCC	N/A	6.8 μF /50V 1812 MLCC	N/A	1000pF/2kV 1808 MLCC	CMC: 450 μH ref.: WE 7448227005 ref.: CMC-05
RP30-48xxSE	2.2 μF /100V 1812 MLCC	2.2 μF /100V 1812 MLCC	2.2 μF /100V 1812 MLCC	2.2 μF /100V 1812 MLCC	1000pF/2kV 1808 MLCC	CMC: 450 μH ref.: WE 7448227005 ref.: CMC-05

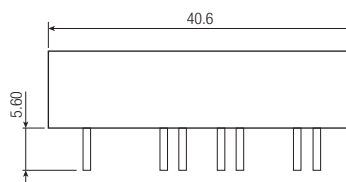
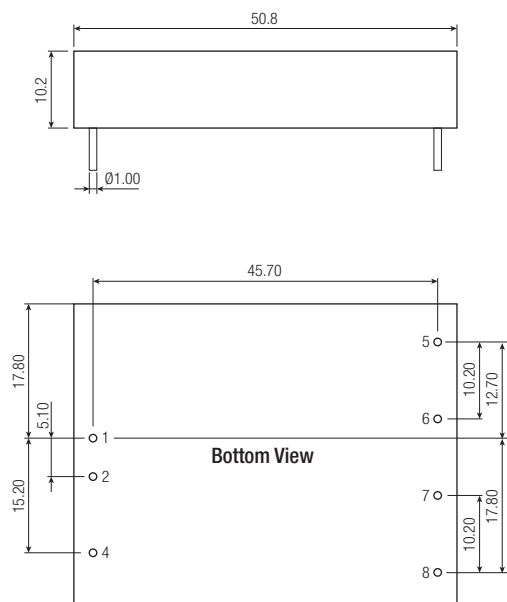
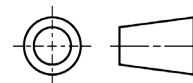
DIMENSIONS and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	Case	Nickel coated copper
	Base	FR4 PCB
	Potting	Epoxy (UL94-V0)
Package Dimensions (LxWxH)	without Heat-sink	50.8 x 40.6 x 10.2mm
	with Heat-sink	56.8 x 40.6 x 17.0mm
Package Weight	without Heat-sink	48g
	with Heat-sink	65.78

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

Dimension Drawing (mm)

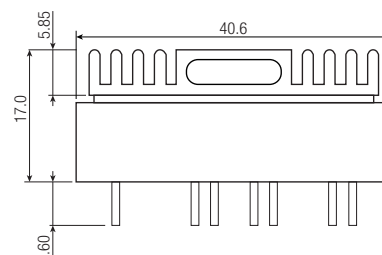
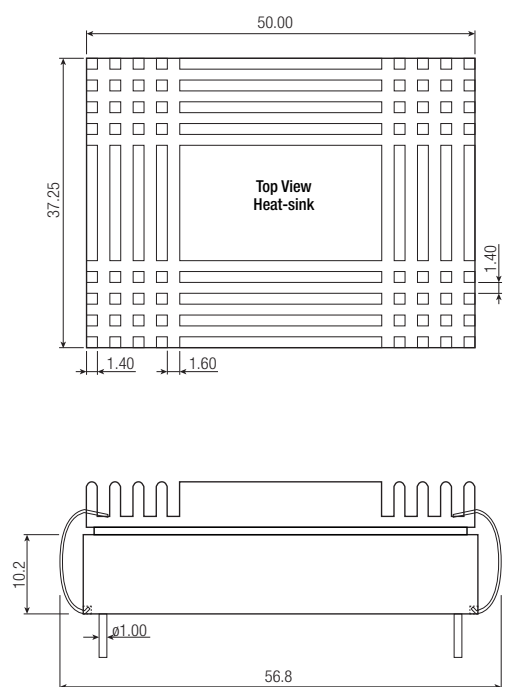


Pin Connections

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
4	CTRL	CTRL
5	No Pin	+Vout
6	+Vout	Com
7	-Vout	-Vout
8	Trim	Trim

Pin Pitch Tolerance $\pm 0.25\text{mm}$
Pin Dimension Tolerance $\pm 0.1\text{mm}$
Tolerance: X.X $\pm 0.5\text{mm}$
X.XX $\pm 0.25\text{mm}$

Dimension Drawing (mm) with Heat-sink



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

PACKAGING INFORMATION		
Parameter	Type	Value
Packaging Quantity	without Heat-sink	5pcs.
	with Heat-sink	15pcs.
Storage Temperature Range		-55°C to +125°C
Storage Humidity		5% - 95% RH