Features

Regulated Converters

- 4:1 Wide Input Voltage Range
- 3kVDC Isolation and Reinforced Insulation
- UL60950-1 & IEC/EN60950-1 Certified
- EN50155 Pending
- Efficiency up to 88.5%
- OCP, OVP, OTP
- +100°C max. Case Temperature

RECOM

DC/DC Converter

RPA120H-RW

120 Watt Half Brick Single Output

3 YEAR warranty

Description

The RPA120H series are high power, 110VDC wide input range 120W DC/DC converters in an industry standard half brick format. Despite their low cost, the RPA120H converters are fully specified devices with output currents up to 8.3Amps, up to 88.5% efficiency, no minimum load, 3kVDC isolation, tight regulation and low ripple/noise figures. The trimmable outputs are also fully protected against over-temperature, short circuits, overcurrent and overvoltage. The converters are UL60950-1 and IEC/EN60950-1 certified and EN50155 pending and will find many uses in cost sensitive railway and industrial applications.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Output Power [W]	Efficiency(1) typ. [%]	Max. Capacitive Load [µF]
RPA120H-11012SRW(2)	53-154	12	8300	100	86	680
RPA120H-11015SRW(2)	53-154	15	6700	100	88.5	680
RPA120H-11024SRW(2)	53-154	24	5000	120	88.5	300

Notes:

Note1: Efficiency is tested by nominal Vin, full load and at 25°C.

E224736

UL60950-1 Certified
IEC/EN60950-1 Certified
EN50155 Pending

Model Numbering

RPA120H-___ ___ SRW/___

- Input Voltage
- Output Voltage
- Single
- CTRL Logic(2)
- Gate Out Pin(2)

Ordering Examples

RPA120H-11012SRW/P = 110V Input, 12V Output, Single, Pos. CTRL function, without Gate Out pin
RPA120H-11015SRW/GP = 110V Input, 15V Output, Single, Pos. CTRL function, with Gate Out pin
RPA120H-11024SRW/N = 110V Input, 24V Output, Single, Neg. CTRL function, without Gate Out pin
RPA120H-11015SRW/GN = 110V Input, 15V Output, Single, Neg. CTRL function, with Gate Out pin

Notes:

Note2: standard part is with suffix "P" for positive logic (1=ON, 0=OFF) omitted Gate Out pin
or add suffix "N" instead for negative logic (0=ON, 1=OFF) omitted Gate Out pin
add suffix "G" for Gate Out pin

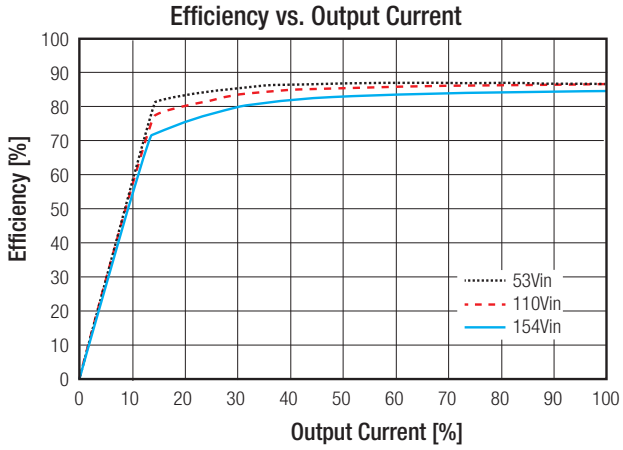
RPA120H-RW Series

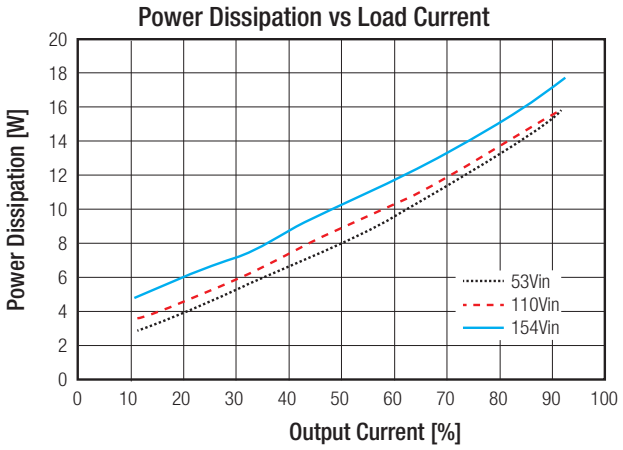
Specifications measured @ta = 25°C, full load, nominal Vin unless otherwise noted

BASIC CHARACTERISTICS

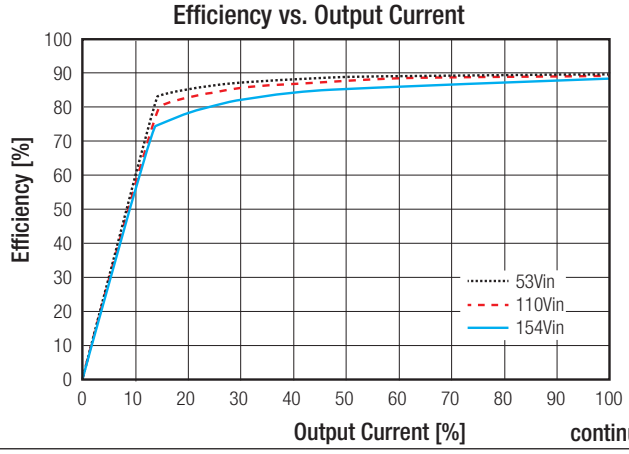
Parameter	Condition		Min.	Typ.	Max.
Internal Input Filter					Pi-Type
Input Voltage Range	nom. Vin = 110V		53VDC	110VDC	154VDC
Input Surge Voltage	<100ms				250VDC
Quiescent Current	12Vout 15Vout 24Vout			18.3mA 21.5mA 25mA	30mA 30mA 35mA
Start-up time	Power up CTRL ON/OFF			50ms 55ms	80ms 100ms
Rise Time	Vout from 10% to 90%			25ms	50ms
Internal Operating Frequency				550kHz	
Minimum Load			0%		
Ripple and Noise	5Hz to 20MHz BW			50mVp-p	100mVp-p
Under Voltage Lockout (UVLO)	DC-DC ON DC-DC OFF		49VDC 46VDC	51VDC 48VDC	53VDC 50VDC
Over Voltage Lockout (OVLO)	DC-DC ON DC-DC OFF		154VDC 158VDC	158VDC 162VDC	162VDC 166VDC
ON/OFF Control	Positive Logic	DC-DC ON DC-DC OFF	3VDC 0VDC		5VDC 1VDC
	Negative Logic	DC-DC ON DC-DC OFF	0VDC 3VDC		1VDC 5VDC
Input current of CTRL pin				17.1mA	30mA
Output Voltage Trimming	Single Outputs		-10%		+10%

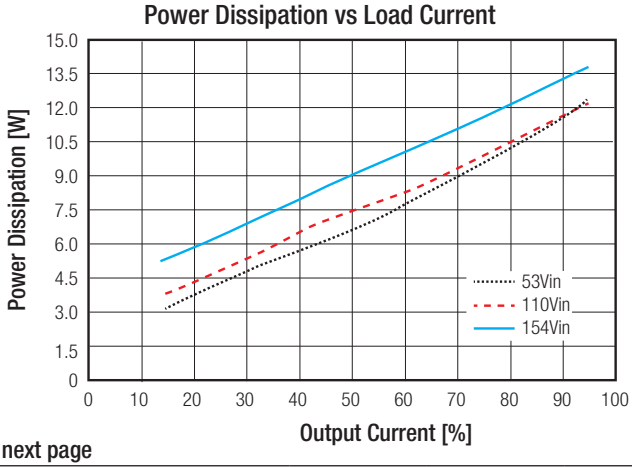
RPA120H-11012SRW





RPA120H-11015SRW





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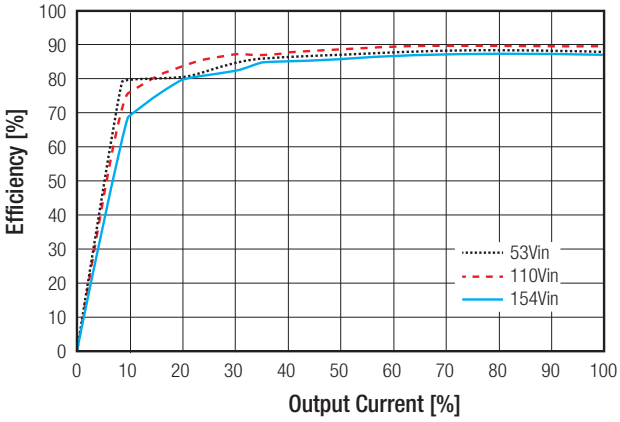
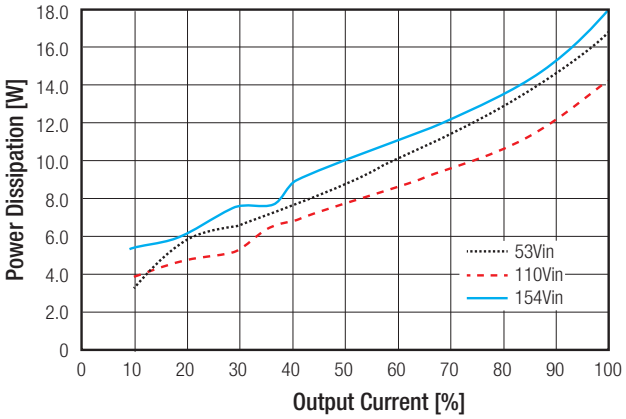
Specifications measured @ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted

RPA120H-11024SRW

Efficiency vs. Output Current



Power Dissipation vs Output Current

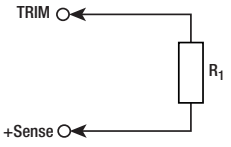


OUTPUT TRIM

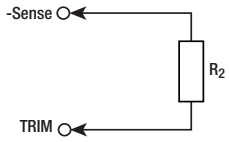
Output Voltage Trimming

RPA120H-RW converters offer the feature of trimming the output voltage over a certain range around the nominal value by using external trim resistors. The values for trim resistors shown in trim tables below are according to standard E96 values; therefore, the specified voltage may slightly vary; they also can be calculated with below shown equation.

TRIM UP



TRIM DOWN



Trim Calculation

$$R_1 = \frac{\left[Vout * \frac{(100+\Delta Vout)}{100} - 2.5 \right] * 120}{Vout * \frac{\Delta Vout}{100} * 2.5} - 10$$

$$R_2 = \frac{10 * Vout * \frac{(100+\Delta Vout)}{100}}{Vout - Vout * \frac{(100-\Delta Vout)}{100}}$$

Vout = Output Voltage
ΔVout = Output Voltage Change in %
R1 = trim up resistor
R2 = trim down resistor

Practical Example:

Trim Up:

Vout = 12V, ΔVout = +10% (13.2V)

$$R_1 = \frac{\left[12 * \frac{(100+10)}{100} - 2.5 \right] * 120}{12 * \frac{10}{100} * 2.5} \quad -10 = \frac{1284}{3} - 10 = 418k\Omega$$

Trim down:

Vout = 12V, ΔVout = -10% (10.8V)

$$R_2 = \frac{10 * 12 * \frac{(100-10)}{100}}{12 - 12 * \frac{(100-10)}{100}} = \frac{10*12*0.9}{12-12*0.9} = \frac{108}{1.2} = 90k\Omega$$

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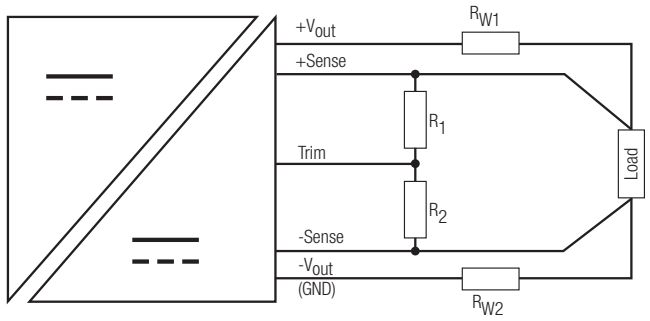
Specifications measured @ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted

RPA120H-11012SRW											
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	Volts
R_U =	3830	1960	1300	976	787	665	576	511	464	422	KOhms
RPA120H-11015SRW											
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	15.15	15.30	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50	Volts
R_U =	5490	2550	1740	1300	1050	887	768	681	604	549	KOhms
RPA120H-11024SRW											
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	Volts
R_U =	8660	4420	2940	2210	1820	1540	1300	1150	1050	953	KOhms
Trim down RPA120H series											
Trim down	1	2	3	4	5	6	7	8	9	10	%
R_D =	976	487	324	243	191	154	133	115	100	90.9	KOhms

Remote Sense



The output voltage can be adjusted by both trim and remote sense. The maximum combined adjustment range ±10%. Derate the maximum output power if using the trim or sense function.

R_{W1} ... wire losses +
R_{W2} ... wire losses -
R_1 ... trim up resistor
R_2 ... trim down resistor

REGULATION

Parameter	Condition		Value
Output Accuracy			±0.5% max.
Line Regulation	Vin = 53 to 154V, Io = full load		±0.01% typ. to ±0.2% max.
Load Regulation	Vin = 110V, Io = Io min to Io max.		±0.05% typ. to ±0.2% max.
Transient Response	110V, 0.1A/µs	50% Iout max to 75% 75% Iout max to 50%	300mV typ., 600mV max. 300mV typ., 600mV max.

PROTECTION

Parameter	Condition	Value
Over Voltage Protection (OVP)	Over full temp. range; % of nom. Vout	110-130%, Hiccup Mode, auto restart after fault condition is removed
Over Current Protection (OCP)		Hiccup Mode
Over Temperature Protection (OTP)		115°C, automatic recovery after cooling down
Isolation Voltage	I/P to O/P I/P to Base O/P to Base Reinforced I/P to O/P	3kVDC/1minute 1.5kVDC/1minute 0.5kVDC/1minute 3kVDC/1minute
Isolation Resistance		10MΩ min.

Notes:

Note3: An input fuse is required if the mains supply isn't over-current protected. Recommended fuse: 7.5A slow blow.

Specifications measured @ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted

ENVIRONMENTAL

Parameter	Condition		Value
Operating Temperature Range			refer to derating graph
Maximum Case Temperature			100°C
Temperature Coefficient			0.007%/°C
Thermal Impedance[4]	vertical direction by natural convection (0.1m/s) without Heat-sink		8.37°C/W
	vertical direction by forced air without Heat-sink	0.2m/s	5.8°C/W
		0.5m/s	5.3°C/W
		1.0m/s	4.9°C/W
		1.5m/s	3.8°C/W
		2.0m/s	3.2°C/W
	vertical direction by natural convection (0.1m/s) with Heat-sink		6.8°C/W
	vertical direction by forced air with Heat-sink	0.2m/s	4.5°C/W
		0.5m/s	4.2°C/W
		1.0m/s	3.2°C/W
		1.5m/s	2.5°C/W
		2.0m/s	2.1°C/W
Operating Altitude			2000m
Operating Humidity			95% RH
Pollution Degree (PD)			PD2
MTBF	according to MIL-HDBK-217F standard, 25°C		1302 x 10^3h

Thermal Calculation

$R_{thcase\text{-}ambient}$ = 3.8°C/W (vertical)
$R_{thcase\text{-}ambientHC}$ = 2.5°C/W (vertical)

$$R_{thcase\text{-}ambient} = \frac{T_{case} - T_{ambient}}{P_{dissipation}}$$

$$P_{dissipation} = P_{IN} - P_{OUT} = \frac{P_{OUTapp}}{\eta} - P_{OUTapp}$$

T_{case} = Case Temperature
$T_{ambient}$ = Environment Temperature
$P_{dissipation}$ = Internal losses
P_{IN} = Input Power
P_{OUT} = Output Power
η = Efficiency under given Operating Conditions
$R_{thcase\text{-}ambient}$ = Thermal Impedance

Practical Example:
Take the RPA120H-11015SRW with 53V input Voltage and 50% load. What is the maximum ambient operating temperature? Use converter vertical in application with 1.5m/s airflow.

Eff_{min} = 88.5% @ V_{nom}
P_{OUT} = 100W
P_{OUTapp} = 100.5 x 0.5 = 50.25W
η = 88% (Efficiency vs. Load Graph)

$$P_{dissipation} = \frac{50.25}{0.88} - 50.25 = 6.9W$$

without Heat-sink

$$R_{th} = \frac{T_{casemax} - T_{amb}}{P_{dissipation}} \text{ --> } 3.8°C/W = \frac{100\text{-}T_{amb}}{6.9W}$$

T_{amb} = 73°C

with Heat-sink

$$R_{thHC} = \frac{T_{casemax} - T_{amb}}{P_{dissipation}} \text{ --> } 2.5°C/W = \frac{100\text{-}T_{amb}}{6.9}$$

T_{ambHC} = 82°C

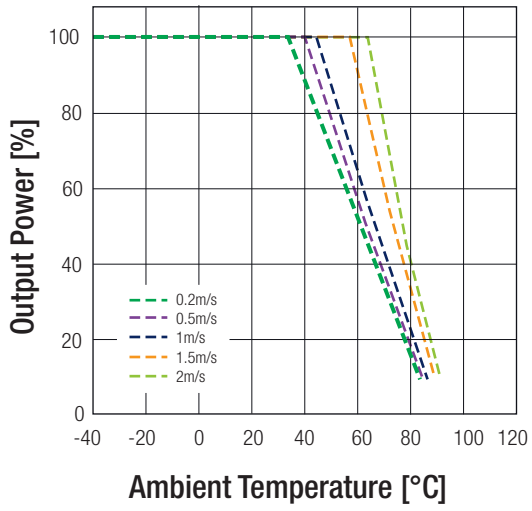
Notes:

Note4: Recommended Heat-sink BK-05-0543 (http://www.broadlake.com).

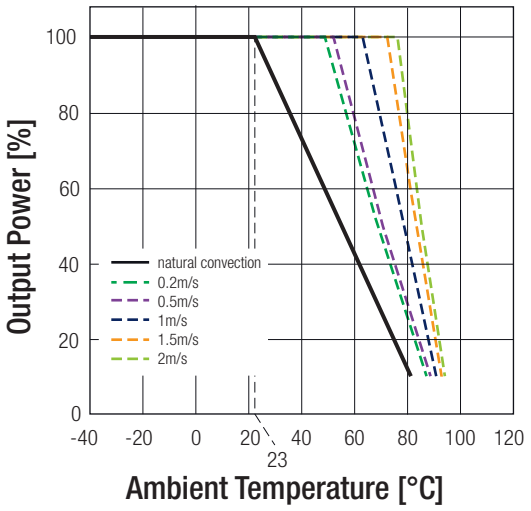
Specifications measured @ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted

Derating Graph[5]
(@ Chamber and natural convection 0.1m/s)

RPA120H-11012SRW



RPA120H-11012SRW-HC



Notes:

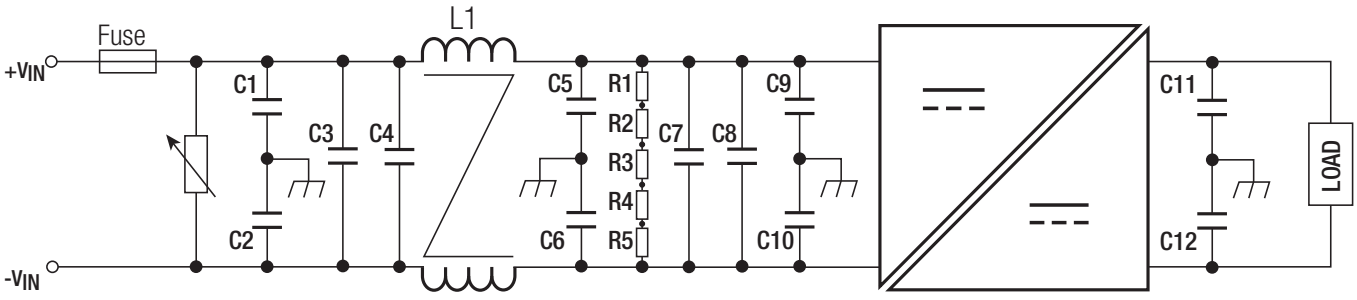
Note5: Derating graphs are valid only for the shown part numbers. If you need detailed derating-information about a part-number not shown here please contact our technical support service team at techsupportAT@recom-power.com

SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety	E224736	UL60950-1, 2nd Edition, 2014 CSA C22.2 No. 60950, 2nd Edition, 2014
IEC/EN Information Technology Equipment - General Requirments for Safety (CB Scheme)	E224736	IEC60950-1, 2nd Edition, 2005 EN60950-1, 1st Edition, 2005
EN Information Technology Equipment - General Requirments for Safety (LVD Directive)		EN60950-1, 1st Edition, 2006
Railway Applications - Electrical Equipment used on rolling stock	pending	EN50155, 2007

EMC Compliance (designed to meet)	Condition	Standard / Criterion
Information technology equipment - Radio disturbance characteristics Limits and methods of measurement	with external filter	EN55022, Class A, 2010

EMI Filtering EN50155



C1, C2, C5, C6	C9, C10, C11, C12	C3, C4, C8	C7	L1	R1, R2, R3,R4, R5
220pF/275VAC	2200pF/300VAC	0.47µF/250V	120µF/400V	CMC: 3.4mH	300kΩ/1206

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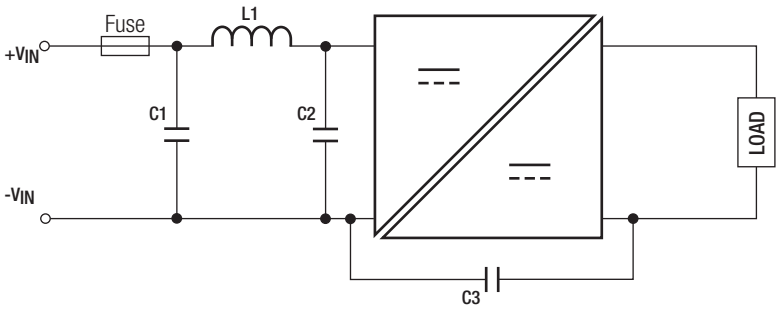
RPA120H-RW Series

Specifications measured @ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted

EMI Filtering EN55022 Class A

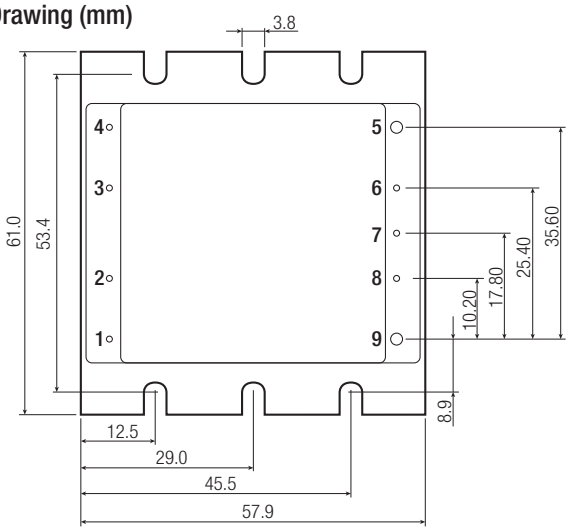


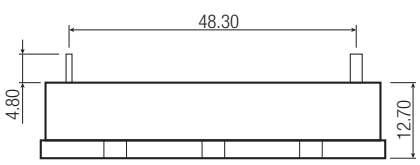
C1	C2	L1	C3
100µF/50V	6.8µF/50V	4.7µH	6.8nF/2kV

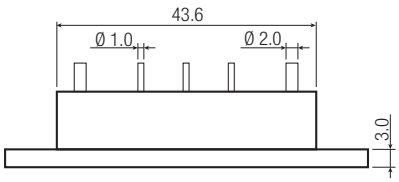
DIMENSIONS and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	Baseplate Case Potting	Aluminium Plastic Silicone UL94-0
Package Dimensions (LxWxH)		57.9 x 61.0 x 12.7mm
Package Weight		82.0g

Dimension Drawing (mm)



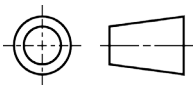




Pin Connections

Pin #	Single
1	+Vin
2	Gate In
3	Gate Out
4	-Vin
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+vVout

Pin Pitch Tolerance ±0.25mm
Pin dimension tolerance ±0.1mm
XX.X ± 0.5mm
XX.XX ± 0.25mm



PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimensions (LxWxH)	Tray	380.0 x 230.0 x25.0mm
Packaging Quantity		15pcs.
Storage Temperature Range		-55°C to +125°C
Storage Humidity		95% RH