Features

Regulated Converter

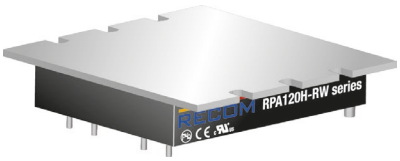
- 4:1 wide input voltage range
- 3kVDC isolation and reinforced insulation
- UL60950-1 & IEC/EN60950-1 certified
- EN50155 pending
- Efficiency up to 88.5%
- OCP, OVP, OTP
- +100°C max. case temperature

RECOM
DC/DC Converter

RPA120H-RW

120 Watt Half Brick Single Output

3 YEAR warranty



UL60950-1 certified
IEC/EN60950-1 certified
EN50155 certified

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

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

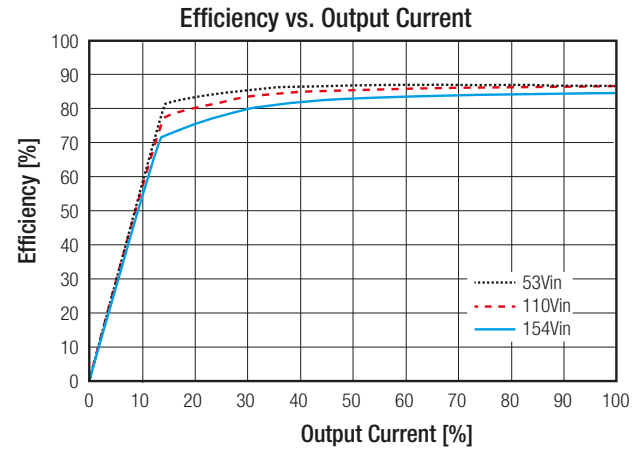
Notes:

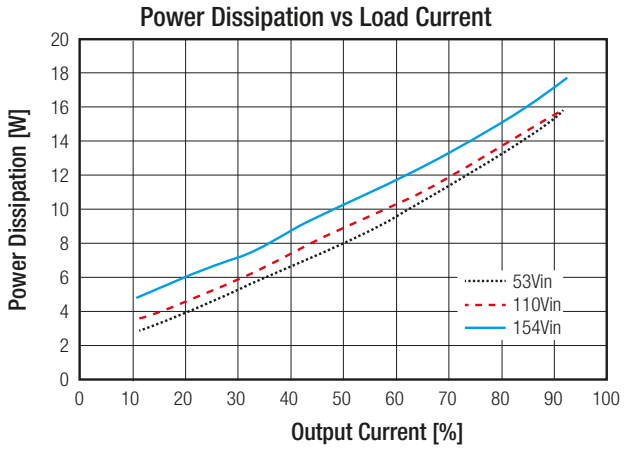
Note2: standard part is with suffix "P" for positive logic (1=ON, 0=OFF) omitted Gate Out pin
or add suffix "N" instead for negative logic (0=ON, 1=OFF) omitted Gate Out pin
add suffix "G" for Gate Out pin

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

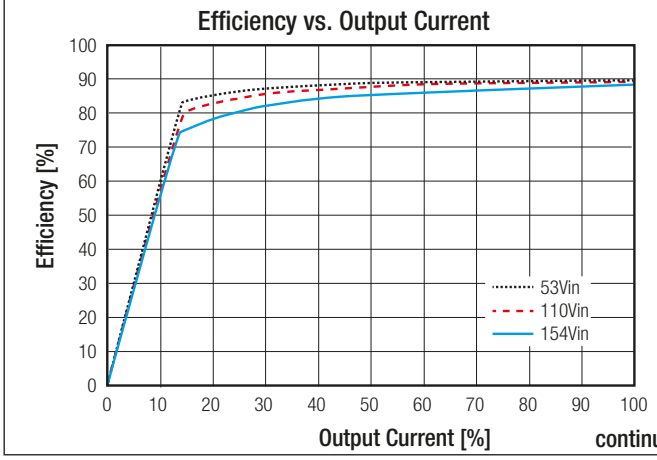
BASIC CHARACTERISTICS					
Parameter	**Condition**		**Min.**	**Typ.**	**Max.**
Internal Input Filter					Pi-Type
Input Voltage Range	nom. Vin = 110V		53VDC	110VDC	154VDC
Input Surge Voltage	<100ms				250VDC
Quiescent Current	12Vout 15Vout 24Vout			18.3mA 21.5mA 25mA	30mA 30mA 35mA
Start-up time	Power 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%

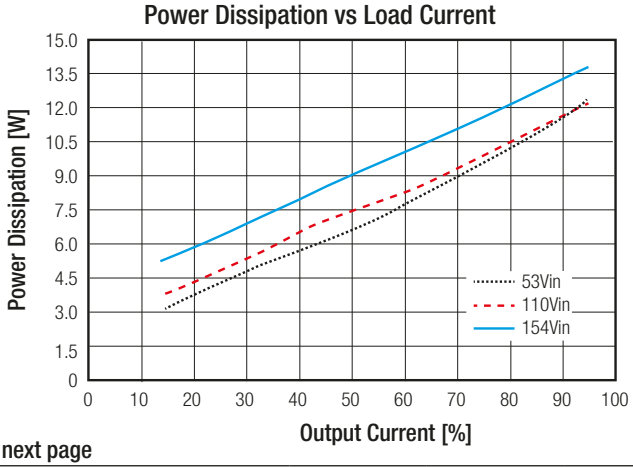
RPA120H-11012SRW





RPA120H-11015SRW





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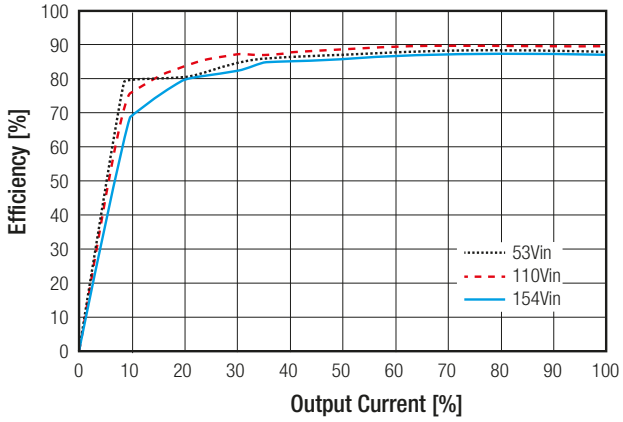
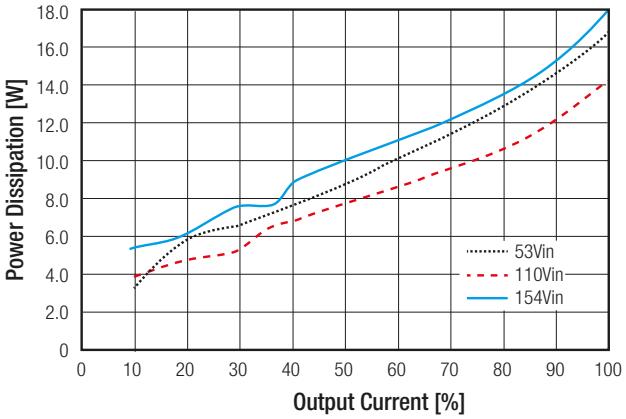
Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

RPA120H-11024SRW

Efficiency vs. Output Current



Power Dissipation vs Output Current

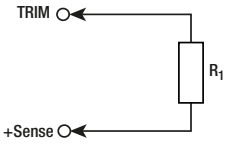


OUTPUT TRIM

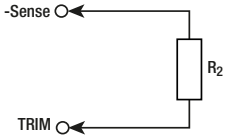
Output Voltage Trimming

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)

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

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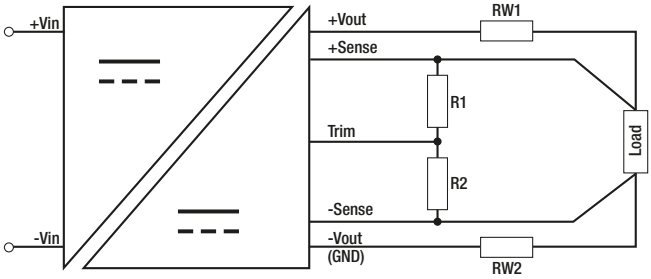
Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

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	rated for 1 minute	3kVDC 1.5kVDC 0.5kVDC 3kVDC
Isolation Resistance			10MΩ min.

Notes:

Note3: Refer to local wiring regulations if input over-current protection is also required. 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:

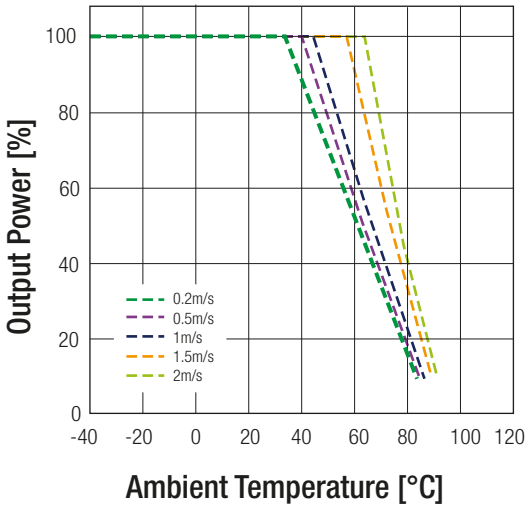
Note4: Recommended Heat-sink BK-05-0543 (http://www.broadlake.com)

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

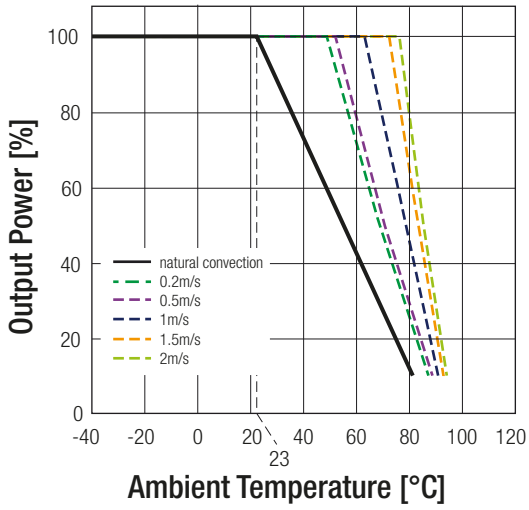
Derating Graph[5]

(@ 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
EAC	RU-AT.49.09571	TP TC 004/2011
RoHS 2+		RoHS 2011/65/EU
Railway Applications - Electrical Equipment used on Rolling Stock	15100174-001	EN50155, 2007

EMC Compliance	**Condition**	**Standard / Criterion**
Information Technology Equipment - Radio Disturbance Characteristics Limits and Methods of Measurement	with external filter	EN55022:2010, Class A
Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurement		EN55024:2010
ESD Electrostatic Discharge Immunity Test	Air +/-8kV Contact +/-4kV	EN61000-4-2, Criteria B
Radiated, Radio-Frequency, Electromagnetic Field Immunity Test	3V/m	EN61000-4-3, Criteria A
Fast Transient and Burst Immunity	DC Power Port: +/-1kV	EN61000-4-4, Criteria A
Surge Immunity	DC Power Port: +/-2kV	EN61000-4-5, Criteria B
Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields	DC Power Port 3V	EN61000-4-6, Criteria A
Power Magnetic Field Immunity	50Hz, 1A/m	EN61000-4-8, Criteria A
Voltage Dips and Interruptions	Voltage Dips >95% Voltage Dips 30% Voltage Interruptions >95%	EN61000-4-11, Criteria C EN61000-4-11, Criteria C EN61000-4-11, Criteria B

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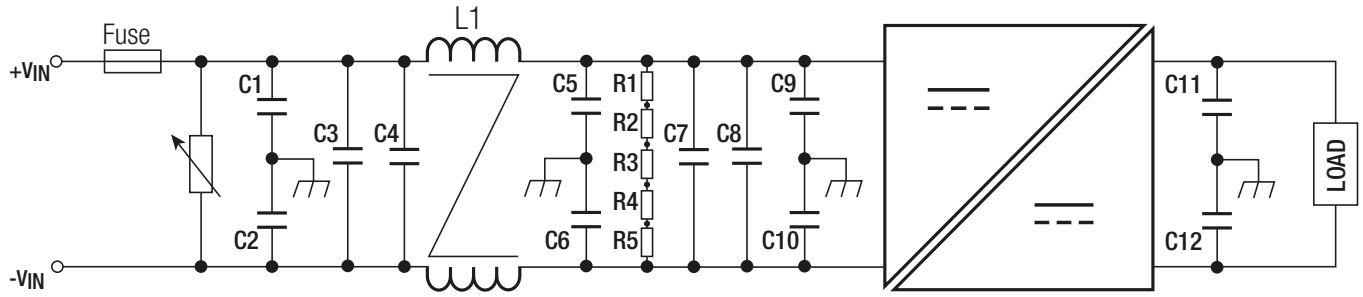
Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

EMC Compliance Railway	Condition	Standard / Criterion
Railway Applications - Electrical Equipment used on Rolling Stock		EN50155:2007, Clause 5.4 and 5.5
Railway Applications - Electromagnetic Compatibility - Part 3-2: Rolling Stock - Apparatus		EN50121-3-2:2015
ESD Electrostatic Discharge Immunity Test	Air +/-8kV, Contact +/-6kV	EN61000-4-2, Criteria A
Radiated, Radio-Frequency, Electromagnetic Field Immunity Test	20V/m (80-1000MHz) 10V/m (1.4-2.0GHz) 5V/m (2.0-2.7GHz) 3V/m (5.1-6.0GHz)	EN61000-4-3, Criteria A
Fast Transient and Burst Immunity	DC Power Port: +/-2kV	IEC61000-4-4, Criteria A
Surge Immunity	DC Power Port: +/-1kV	EN61000-4-5, Criteria A
Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields	DC Power Port 10V	EN61000-4-6, Criteria A

EMI Filtering according to EN50121-3-2 and EN55022 Class A



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

DIMENSIONS and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	baseplate case potting	aluminium plastic silicone, (UL94-V0)
Package Dimensions (LxWxH)		57.9 x 61.0 x 12.7mm
Package Weight		82.0g

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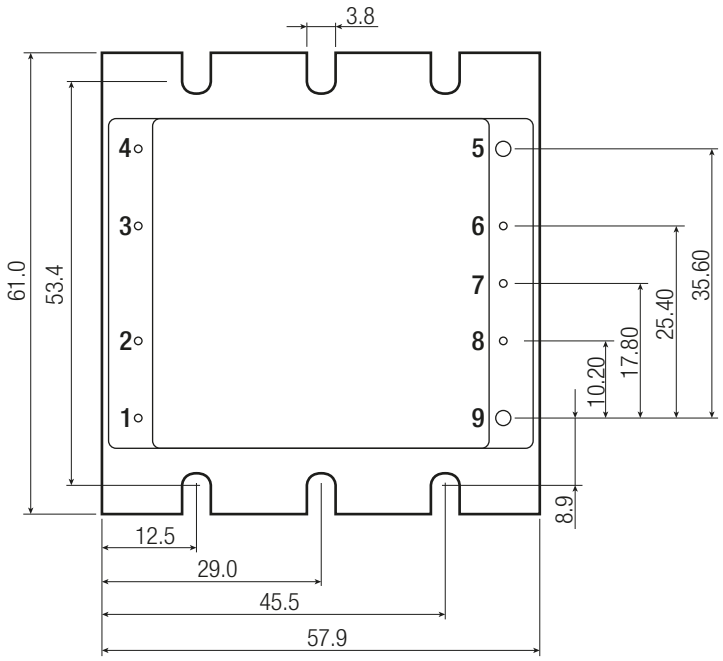
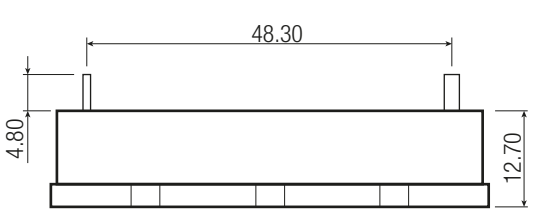
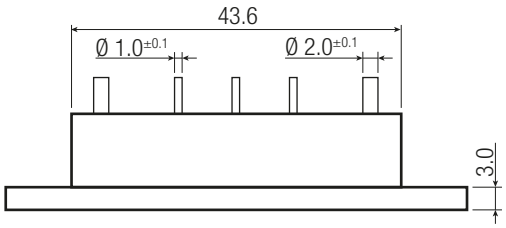
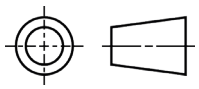
Specifications (measured @Ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted)

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