Features

Regulated Converters

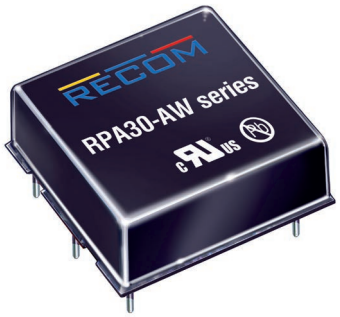
- 4:1 Wide Input Voltage Range
- 1.6kVDC Isolation
- UL, IEC/EN and EN50155 Certified
- Efficiency Up To 89%
- OVP, OCP & OTP
- +105°C max Case Temperature

RECOM
DC/DC Converter

RPA30-AW

30 Watt 1"x1" Single & Dual Output

3 YEAR Warranty



UL60950-1 Certified
IEC/EN60950 Certified
EN50155 Certified

Description

The RPA30-AW series are high power density, wide input voltage range 30W DC/DC converters in an industry standard 1"x1" case size. Despite their small size, the RPA30-AW converters are fully specified devices with output currents up to 7.5Amps, up to 89% efficiency, no minimum load, 1600VDC isolation, tight regulation and low ripple/noise figures. The outputs are also fully protected against over-temperature, short circuits, overcurrent and overvoltage and the single output version offers a ±10% trim range. A heatsink option is available to extend the operating temperature range. The converters are UL and EN50155 certified and will find many uses in railway and industrial applications where board space is at a premium.

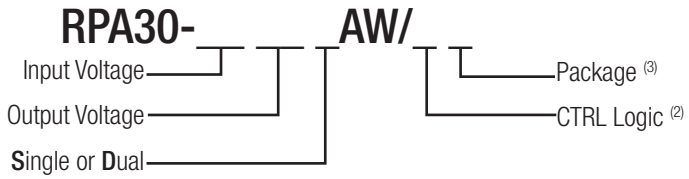
Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Input[1] Current [mA]	Efficiency[1] typ. [%]	Max. Capacitive Load [µF]
RPA30-243.3SAW[2,3]	9-36	3.3	7500	1172	88	10000
RPA30-2405SAW[2,3]	9-36	5	6000	1404	89	10000
RPA30-2412SAW[2,3]	9-36	12	2500	1420	88	1000
RPA30-2415SAW[2,3]	9-36	15	2000	1420	88	1000
RPA30-2412DAW[2,3]	9-36	±12	±1250	1420	88	±1000
RPA30-2415DAW[2,3]	9-36	±15	±1000	1420	88	±680

Notes:

Note1: Tested at nominal Vin, full load and at +25°C ambient

Model Numbering



Ordering Examples

RPA30-243.3SAW = 24V Input, 3.3V Output, Single, no CTRL pin
RPA30-2405SAW/P = 24V Input, 5V Output, Single, Pos. CTRL function
RPA30-2415SAW-HC = 24V Input, 15V Output, Single, no CTRL pin, glued Heat-sink
RPA30-2415DAW/N-HC = 24V Input, 15V Output, Dual, Neg. CTRL function, glued Heat-sink

Notes:

Note2: part without suffixes is without CTRL pin, trim pin fitted
add suffix "P" for positive CTRL function (1=ON, 0=OFF), trim pin fitted
add suffix "N" for negative CTRL function (0=ON, 1=OFF), trim pin fitted
trim pin is only available for single outputs

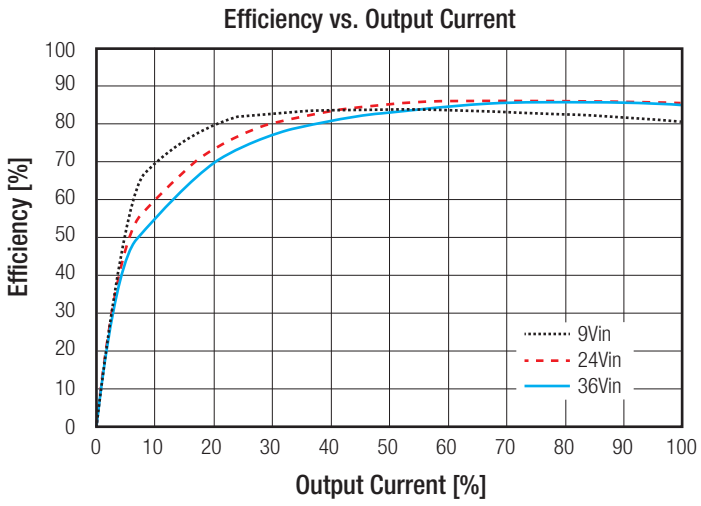
Note3: add suffix "-HC" for glued Heat-sink (compatible with all other suffixes)

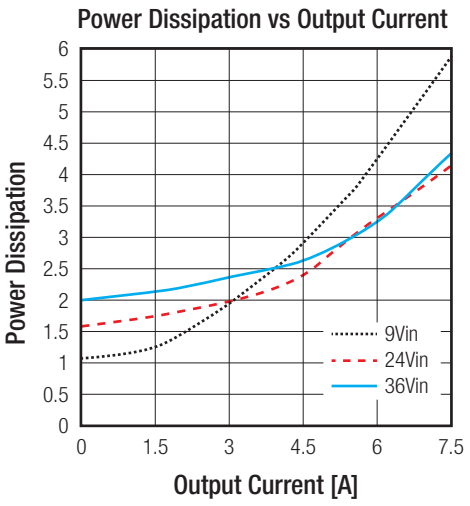
Specifications measured @ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted

BASIC CHARACTERISTICS

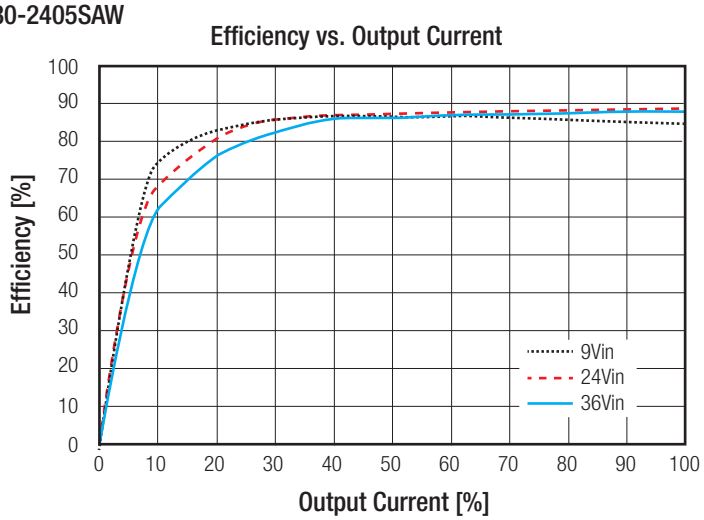
Parameter	Condition		Min.	Typ.	Max.
Internal Input Filter					Pi-Type
Input Voltage Range			9VDC	24VDC	36VDC
Input Surge Voltage	100ms max.				50VDC
Quiescent Current					
Start-up time	Power up CTRL ON/OFF			8ms	16ms
Internal Operating Frequency				550kHz	
Minimum Load			0%		
Ripple and Noise	20MHz BW, 10µF tantalum capacitor and 1µF ceramic capacitor			50mVp-p	
Under Voltage Lockout (UVLO)	DC-DC ON DC-DC OFF		8VDC 7VDC	8.5VDC 7.5VDC	9VDC 8VDC
ON/OFF Control	Positive Logic	DC-DC ON DC-DC OFF			Open or 2.4 < Vr < 10VDC Short or 0 < Vr < 0.8VDC
	Negative Logic	DC-DC ON DC-DC OFF			Short or 0 < Vr < 0.8VDC Open or 2.4 < Vr < 10VDC
Input current of CTRL pin				6mA	
Output Voltage Trimming	Single Outputs		-10%		+10%

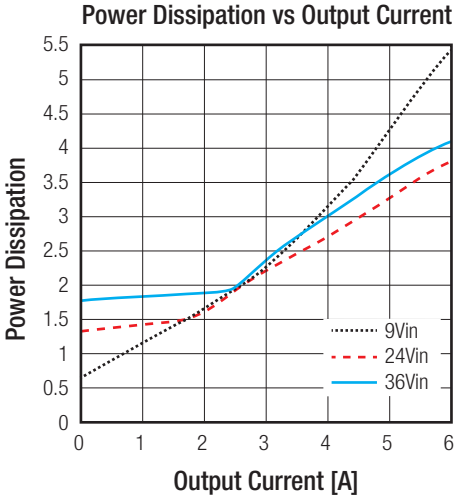
RPA30-243.3SAW





RPA30-2405SAW





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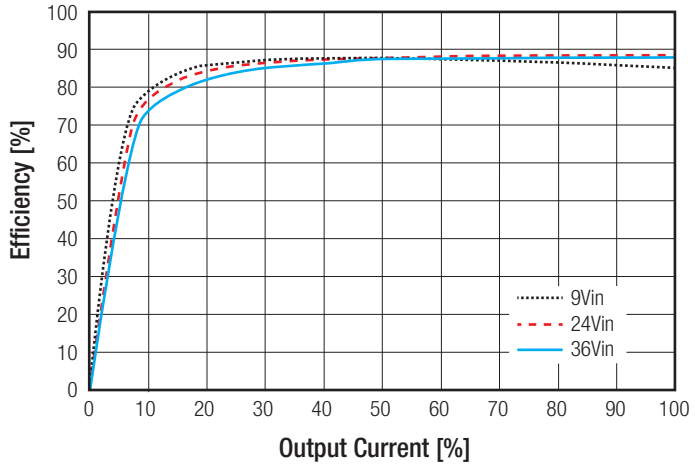
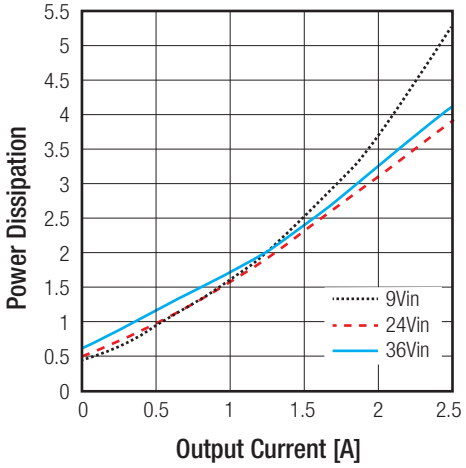
Specifications measured @ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted

RPA30-2412SAW

Efficiency vs. Output Current

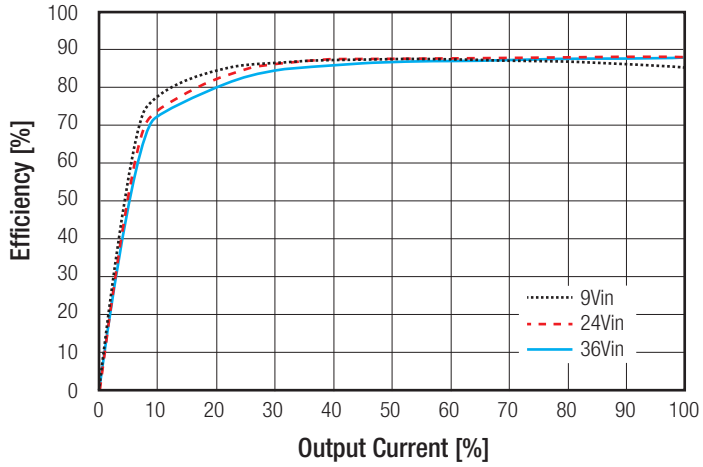


Power Dissipation vs Output Current

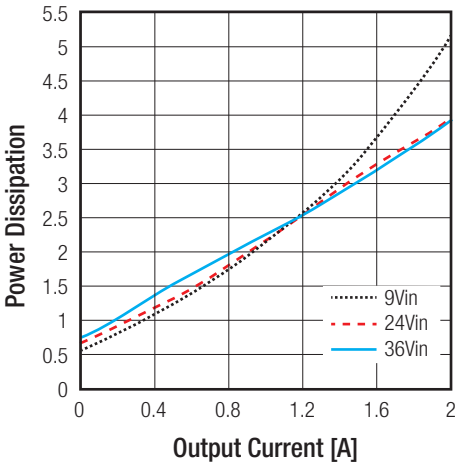


RPA30-2415SAW

Efficiency vs. Output Current

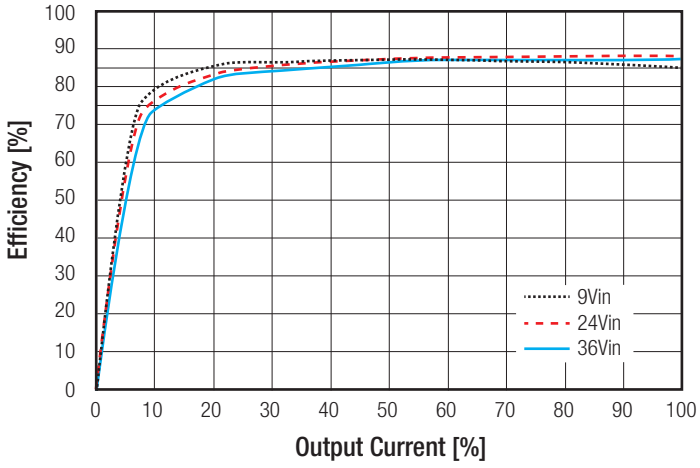


Power Dissipation vs Output Current

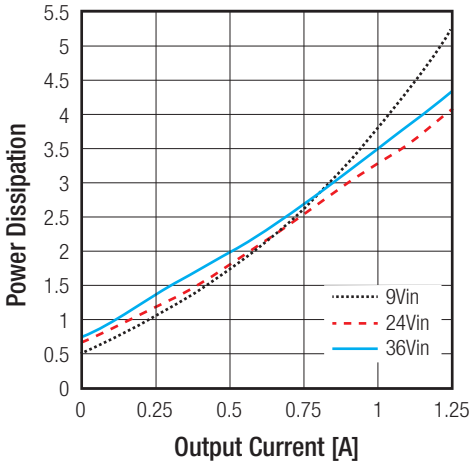


RPA30-2412DAW

Efficiency vs. Output Current



Power Dissipation vs Output Current



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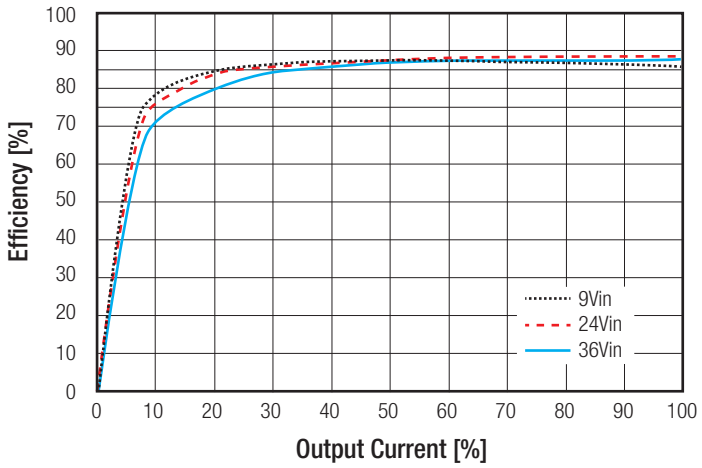
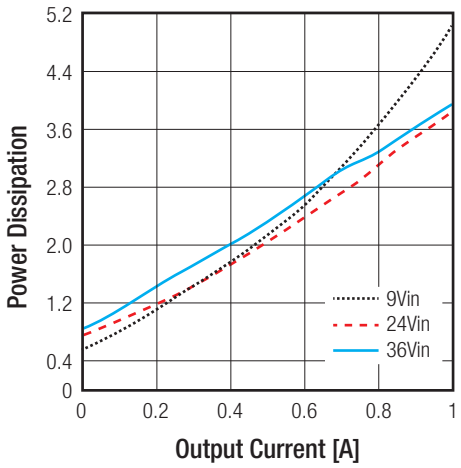
Specifications measured @ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted

RPA30-2415DAW

Efficiency vs. Output Current



Power Dissipation vs Output Current

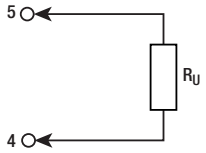


OUTPUT TRIM

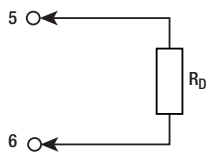
Output Voltage Trimming

RPA30-AW 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.

TRIM UP



TRIM DOWN



RPA30-243.3SAW

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	3.33	3.36	3.39	3.43	3.46	3.49	3.53	3.56	3.59	3.63	Volts
R_U =	402	169	100	75	47.5	34.8	26.1	17.8	12.1	8.06	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	3.27	3.23	3.20	3.17	3.14	3.10	3.07	3.04	3.0	2.97	Volts
R_D =	402	191	113	75	52.3	39.2	26.7	20	12.1	8.06	kOhms

RPA30-2405SAW

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	5.05	5.10	5.15	5.20	5.25	5.30	5.35	5.40	5.45	5.50	Volts
R_U =	604	243	147	95.3	68.1	39.2	34.8	22.1	15	8.06	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	4.95	4.90	4.85	4.80	4.75	4.70	4.65	4.60	4.55	4.50	Volts
R_D =	604	287	169	124	105	78.7	54.9	39.2	15	0.5	kOhms

RPA30-2412SAW

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	12.12	12.24	12.36	12.48	12.6	12.72	12.84	12.96	13.08	13.20	Volts
R_U =	604	267	162	105	75	499	40.2	24.9	18.2	10	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	10.92	10.80	Volts
R_D =	750	309	200	124	90.9	64.9	45.3	32.4	20	12.1	kOhms

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

RPA30-2415SAW											
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 =	1000	243	200	130	90.9	61.9	40.2	30.1	24.9	10	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	14.85	14.70	14.55	14.40	14.25	14.10	13.95	13.80	13.65	13.50	Volts
R_D =	1000	348	210	140	95.3	68.1	45.3	30.1	18.2	8.06	kOhms

REGULATION

Parameter	Condition		Value
Output Accuracy	Single & Dual		±2.0% max.
Line Regulation	low line to high line	Single	±0.2% max.
		Dual	±0.5% max.
Load Regulation	3.3Vout		±0.3%
	5Vout		±0.2%
	12Vout, 15Vout		±0.1%
	±12Vout, ±15Vout		±1.0%
Cross Regulation	asymmetrical 25%<>100% load		±3.0% max.
Transient Response	50-75%, full load, 0.1A/µs		±3.0% Vout typ.
	25% load step change		250µs typ.

PROTECTION

Parameter	Condition		Value
Short Circuit Protection (SCP)	below 100mΩ		continuous, auto recovery
Over Voltage Protection (OVP)			115%-150% Output Voltage, Hiccup, auto recovery
Over Current Protection (OCP)			110%-160% Output Current, Hiccup
Over Temperature Protection (OTP)			+115°C ±5°C
Isolation Voltage (5)	I/P to O/P	tested for 1 minute	1.6kVDC
Isolation Resistance			10MΩ min.
Isolation Capacitance			1100pF typ.
Insulation Grade			basic

Notes:

Note4: An input fuse is required if the mains supply is not over-current protected. Recommended fuse: 4A slow blow type.

Note5: For repeat Hi-Pot testing, reduce the time and/or the test voltage.

ENVIRONMENTAL

Parameter	Condition	Value
Operating Temperature Range (6)		-40°C to [refer to thermal calculation]
Maximum Case Temperature		+105°C
Temperature Coefficient		0.02%/°C
Thermal Impedance		please refer to table 1
Operating Altitude		2000m
Operating Humidity		95% RH
Shock		5G, 30ms, 6 times along X,Y and Z axis
Vibration		10-500Hz, 2.4G, 30mins along X,Y and Z axis
MTBF	according to Telcordia SR332 3, +25°C	5888 x 10^3 hours

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

Table 1: Thermal Impedance

	without Heatsink		with Heatsink	
airflow [m/s]	Rth without PCB [°C/W]	Rth with PCB (6) [°C/W]	Rth without PCB [°C/W]	Rth with PCB (6) [°C/W]
0.1	17.8	12.5	16.0	11.3
0.2	16.0	11.2	14.4	10.1
0.5	14.0	9.7	12.6	8.7
1.0	10.0	7.1	9.0	6.4
1.5	8.3	5.8	7.5	5.2
2.0	6.3	4.4	5.7	4.0

Notes:

Note6: Test PCB:160x100mm105µm (Eurocard), double layer

Thermal Calculation

choose your model:

RPA30-2405SAW (with PCB (6))

- Load conditions in application (e.g. 50%)
- Airflow conditions in application (e.g. 0.5m/s)
- use Rth from Table1 (9.7°C/W)

Calculation:

Iout = 50%
R_{th} = 9.7°C/W
P_{DISS} = 2.2W
$T_{CASEmax}$ = 105°C

$T_{OVER} = R_{th} \times P_{Dis} = 9.7°C/W \times 2.2W = \mathbf{21.3°C}$

$T_{AMBmax} = T_{CASEmax} - T_{OVER} = 105°C - 21.3°C = \underline{\mathbf{83.7°C}}$

choose your model:

RPA30-2405SAW-HC (with PCB (6))

- Load conditions in application (e.g. 50%)
- Airflow conditions in application (e.g. 0.5m/s)
- use Rth from Table1 (8.7°C/W)

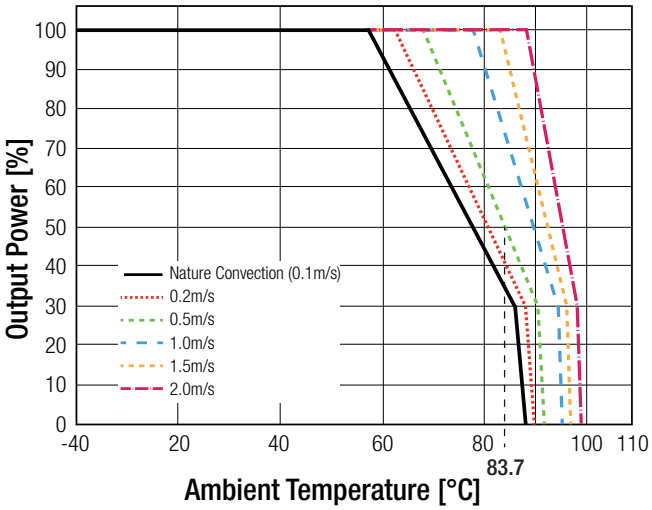
Calculation:

Iout = 50%
R_{th} = 8.7°C/W
P_{DISS} = 2.2W
$T_{CASEmax}$ = 105°C

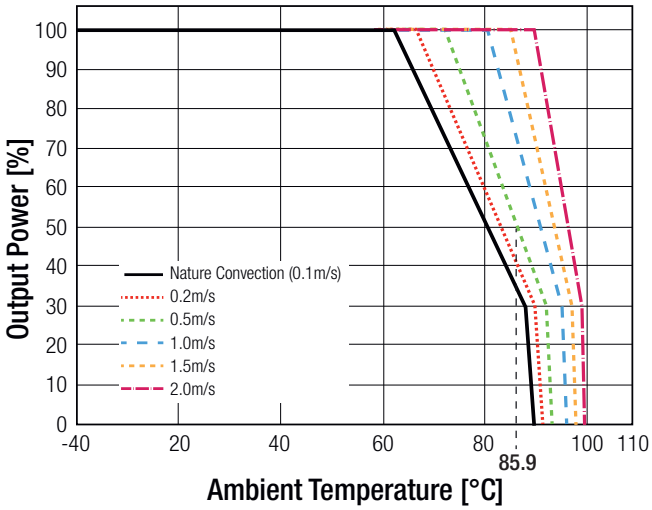
$T_{OVER} = R_{th} \times P_{Dis} = 8.7°C/W \times 2.2W = \mathbf{19.1°C}$

$T_{AMBmax} = T_{CASEmax} - T_{OVER} = 105°C - 19.1°C = \underline{\mathbf{85.9°C}}$

RPA30-2405SAW



RPA30-2405SAW-HC



SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	**Report / File Number**	**Standard**
Information Technology Equipment, General Requirements for Safety	E224736-A39 + A40	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-A39-CB + A40-CB	IEC60950-1, 2nd Edition, 2005 + AM2, 2013 EN60950-1, 1st Edition, 2006 + AM2, 2013
Railway Applications - Electrical Equipment used on rolling stock	15100175 001, 15100176 001	EN50155, 1st Edition, 2007, Clause 5.4 and 5.5
RoHs 2+		RoHS 10/10, 2011/65/EU + AM-2015/863

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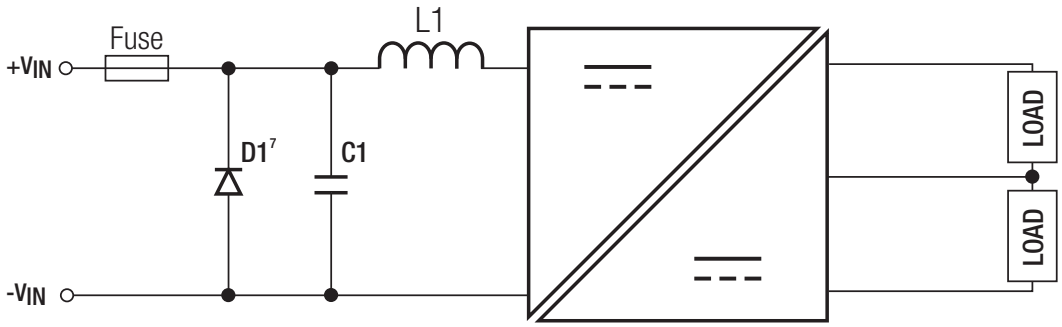
Specifications measured @ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted

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
Railway applications - Electromagnetic compatibility Part 3-2: Rolling stock - Apparatus		EN50121-3-2, 2015
Specification for radio disturbance and immunity measuring apparatus and methods Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements		EN55016-2-1, 2009
Specification for radio disturbance and immunity measuring apparatus and methods Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements		EN55016-2-3, 2010
ESD Electrostatic discharge immunity test	Air ±8kV, Contact ±6kV	EN61000-4-2, 2009; 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, 2006; Criteria A
Fast Transient and Burst Immunity	±2kV	IEC61000-4-4, 2004; Criteria A
Surge Immunity	±1kV	EN61000-4-5, 2006; Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	10V	EN61000-4-6, 2009; Criteria A

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



Notes:

Note7: Diode is only needed for EN50155.

C1	L1
47µF/50V electrolytic capacitor	1µH Choke

DIMENSIONS and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	Case Baseplate Potting	Al Alloy, anodize black non-conductive FR4 Silicone
Package Dimensions (LxWxH)	without Heat-sink with Heat-sink	25.4 x 25.4 x 10.2mm 25.4 x 25.4 x 16.8mm
Package Weight	without Heat-sink with Heat-sink	17g typ. 21g typ.

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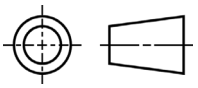
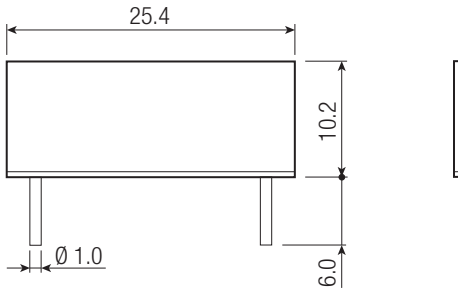
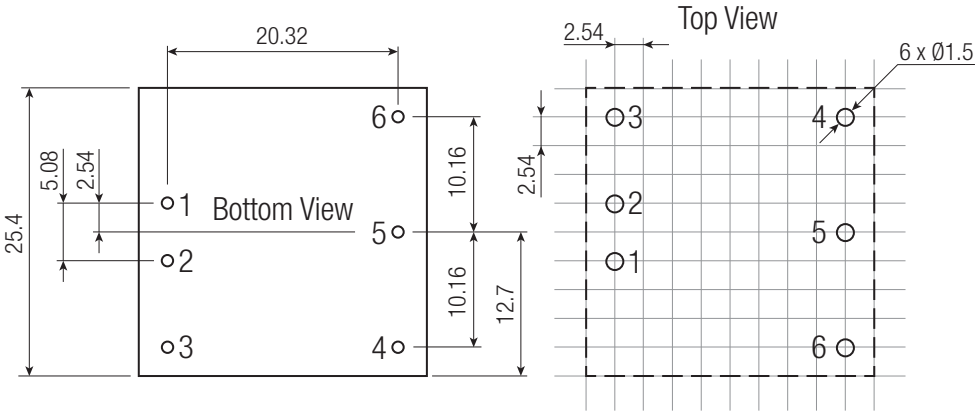
Specifications measured @ta = 25°C, resistive load, nominal Vin and rated Iout unless otherwise noted

Dimension Drawing (mm)

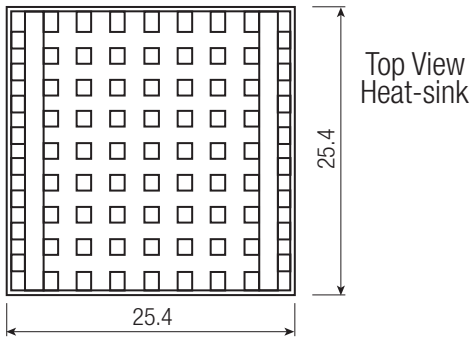


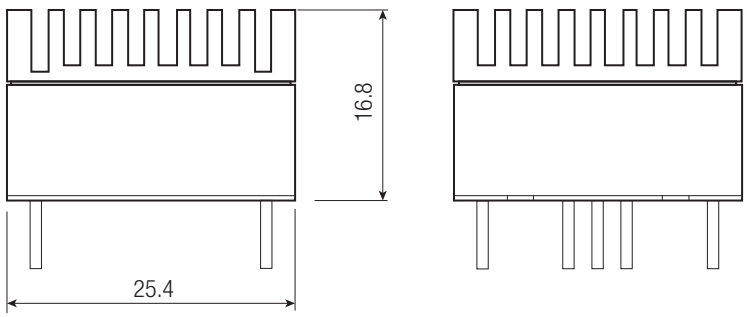


recommended Layout:



Heat-sink Dimension Drawing (mm)





Pin Connections

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	CTRL[2]	CTRL[2]
4	-Vout	-Vout
5	Trim	Com
6	+Vout	+Vout

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

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

PACKAGING INFORMATION			
Parameter	**Type**		**Value**
Packaging Dimensions (LxWxH)	without Heat-sink	tube	285.0 x 27.6 x 19.0mm
	with Heat-sink		285.0 x 27.6 x 25.8mm
Packaging Quantity			10pcs
Storage Temperature Range			-55°C to +125°C
Storage Humidity			5% - 95% RH