

RPA300E

**300 Watt
Eighth Brick
Single Output**



UL62368-1 - certified
CAN/CSA-C22.2 No. 62368-1 - certified
CISPR22 compliant

Features

**Regulated
Converter**

- Eighth brick format
- 36-72VDC input voltage range
- 2.25kV basic isolation
- Remote ON/OFF, sense, and trim pins
- UVLO, OTP, OVP, OCP and SCP
- 94.8% efficiency (typical)
- Integrated heat spreader

Description

The RPA300E is a low cost 300W DC/DC converter in industry standard 1/8th brick low profile format (58.4mm x 23mm x 12.7mm) and pinning. The input range is 36 to 72VDC, and the output voltage is trimmable from 16 to 35VDC. The efficiency is exceptionally high (typically 94.8%) to permit full load operation from -40°C up to + 85°C with forced air cooling. The isolation voltage is 2.25kVDC/1 minute (basic insulation grade). Applications include demanding industrial power supplies, telecom, and PoE circuits.

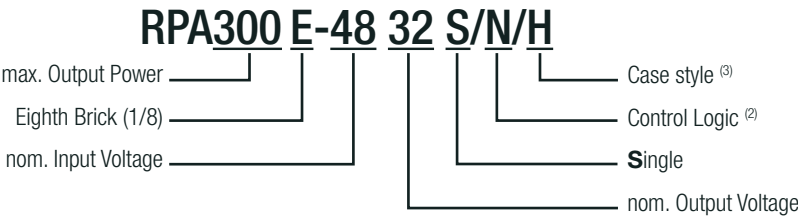
Selection Guide

Part Number	Input Voltage Range [VDC]	Nom. Output Voltage [VDC]	Output Current [A]	Efficiency typ. ⁽¹⁾ [%]
RPA300E-4832S/N/H	36-72	32	9.4	94.8

Notes:

Note1: Efficiency is tested at nominal input and full load at +25°C ambient

Model Numbering



Notes:

- Note2: suffix "N" for negative CTRL function (1=OFF, 0=ON)
Note3: suffix "/H" means pre-mounted heat-spreader.
refer to

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

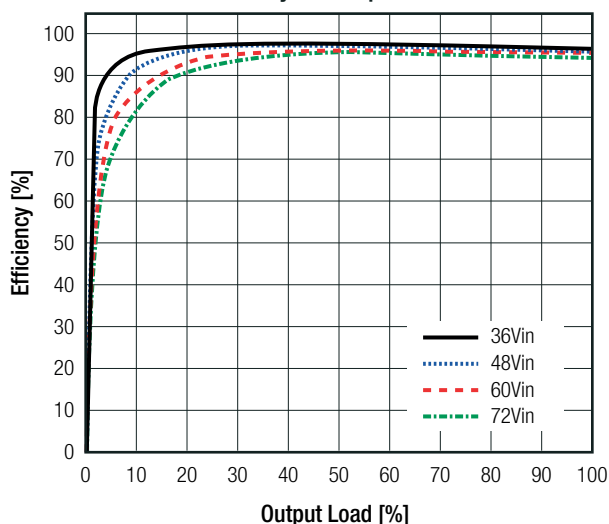
BASIC CHARACTERISTICS

Parameter	Condition	Min.	Typ.	Max.
Input Voltage Range	nom V_{IN} = 48VDC	36VDC	48VDC	72VDC
Absolute Maximum Input Voltage	continuous			72VDC
Input Surge Voltage	100ms max.			80VDC
Under Voltage Lockout (UVLO)	DC-DC ON DC-DC OFF hysteresis	33VDC 31VDC	2VDC	36VDC 34VDC
Input Current	V_{IN} = 36VDC, full load			9.4A
Inrush Current	with 100μF Al cap			1A ² s
Quiescent Current	V_{IN} = 48VDC, no load		100mA	
Standby Current	DC-DC OFF		30mA	
Output Voltage Trimming ⁽⁴⁾	refer to "OUTPUT VOLTAGE TRIMMING"	16VDC		35VDC
Minimum Load		0%		
Start-up Time	Power up ON/OFF CTRL		90ms 65ms	
Rise Time			60ms	
ON/OFF CTRL ⁽⁵⁾	Negative Logic	DC-DC ON DC-DC OFF	0VDC < V_{CTRL} < 0.8VDC Open or 3.5VDC < V_{CTRL} < 10VDC	
Input Current of CTRL pin				1.5mA
Leakage Current of CTRL pin	logic high, V_{CTRL} = 5VDC			1mA
Internal Operating Frequency			170kHz	
Output Ripple & Noise ⁽⁶⁾	5-20MHz BW, 48Vin, full load		150mVp-p	
Remote Sense	+Sense to +Vout -Sense to -Vout			3.5VDC 0.2VDC

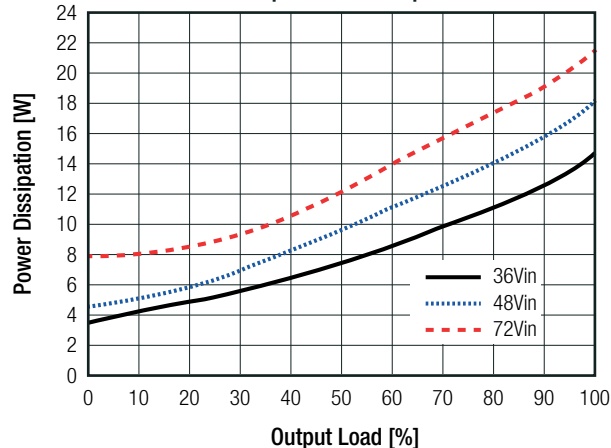
Notes:

- Note4: Trim up when input voltage is greater than 40VDC only
 Note5: If CTRL function is not used, please short the CTRL pin to -Vin
 Note6: Measurements are made with 470μF and a 1μF ceramic, 10μF tantalum across output

Efficiency vs. Output Current



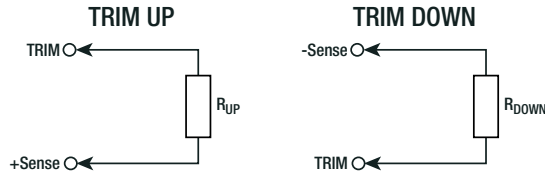
Power Dissipation vs. Output Current



Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

OUTPUT VOLTAGE TRIMMING

RPA300E 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 can also be calculated with below shown equation.



V_{OUTnom} = nom. output voltage [VDC]
 V_{OUTset} = trimmed output voltage [VDC]
 ΔV_{OUT} = output voltage change [%]
 R_{up} = trim up resistor [Ω]
 R_{down} = trim down resistor [Ω]

Calculation:

$$R_{UP} = \frac{5.11 \times V_{OUTnom} \times (100 + \Delta V_{OUT})}{1.225 \times \Delta V_{OUT}} - \frac{511}{\Delta V_{OUT}} - 10.22$$

$$R_{DOWN} = \frac{511}{\Delta V_{OUT}} - 10.2$$

Practical Example RPA300E-4832S/N trim up +5%

$V_{OUTnom} = 32VDC$, $\Delta V_{OUT} = +5\%$ (33.6VDC)

$$R_{UP} = \left[\frac{5.11 \times 32 \times (100 + 5)}{1.225 \times 5} \right] - \frac{511}{5} - 10.22 = 2690.78k\Omega$$

R_{UP} according to E96 $\approx$ **2M67 Ω**

Practical Example RPA300E-4832S/N trim down -20%

$V_{OUTnom} = 32VDC$, $\Delta V_{OUT} = -20\%$ (25.6VDC)

$$R_{DOWN} = \left[\frac{511}{20} \right] - 10.22 = 15.33k\Omega$$

R_{DOWN} according to E96 $\approx$ **15k4 Ω**

$\Delta V_{OUT} =$	1	2	3	4	5	6	7	8	9	10	[%]
$V_{OUTset} =$	32.32	32.64	32.96	33.28	33.60	33.92	34.24	34.56	34.88	35.00	[VDC]
$R_{UP} =$	13M0	6M49	4M42	3M32	2M67	2M26	1M96	1M74	1M54	1M50	[Ω]

$\Delta V_{OUT} =$	-1	-2	-3	-4	-5	-6	-7	-8	9	10	[%]
$V_{OUTset} =$	31.68	31.36	31.04	30.40	30.08	29.76	29.44	29.12	28.80	28.48	[VDC]
$R_{DOWN} =$	499k	243k	162k	118k	90k9	75k	63k4	53k6	46k4	41k2	[Ω]

$\Delta V_{OUT} =$	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	[%]
$V_{OUTset} =$	28.48	28.16	27.84	27.52	27.20	26.88	26.56	26.24	25.92	25.60	[VDC]
$R_{DOWN} =$	36k5	32k4	29k4	26k1	23k7	21k5	20k	18k2	16k5	15k4	[Ω]

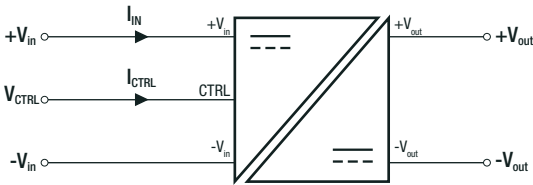
$\Delta V_{OUT} =$	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30	[%]
$V_{OUTset} =$	25.28	24.96	24.64	24.32	24.00	23.68	23.36	23.04	22.72	22.40	[VDC]
$R_{DOWN} =$	14k3	13k	12k1	11k	10k2	9k53	8k66	8k06	7k32	6k81	[Ω]

$\Delta V_{OUT} =$	-31	-32	-33	-34	-35	-36	-37	-38	-39	-40	[%]
$V_{OUTset} =$	22.08	21.76	21.44	21.12	20.80	20.48	20.16	19.84	19.52	19.20	[VDC]
$R_{DOWN} =$	6k19	5k76	5k23	4k81	4k42	4k02	3k57	3k24	2k87	2k55	[Ω]

$\Delta V_{OUT} =$	-41	-42	-43	-44	-45	-46	-47	-48	-49	-50	[%]
$V_{OUTset} =$	18.88	18.56	18.24	17.92	17.60	17.28	16.96	16.64	16.32	16.00	[VDC]
$R_{DOWN} =$	2k26	1k96	1k66	1k4	1k13	887	649	432	210	0	[Ω]

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

ON/OFF CTRL

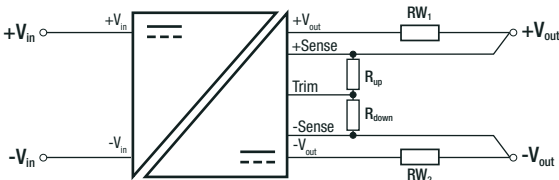


Negative Logic

DC-DC ON
DC-DC OFF

$0VDC < V_{CTRL} 0.8VDC$
Open or $3.5VDC < V_{CTRL} < 10VDC$

REMOTE SENSE



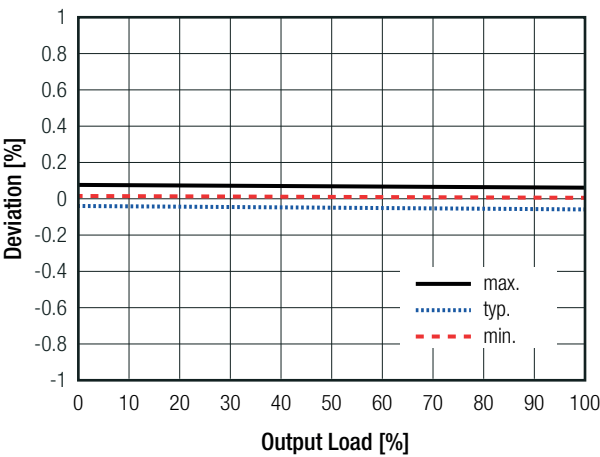
RW_1 ... wire losses +
 RW_2 ... wire losses -
 R_{up} ... trim up resistor
 R_{down} ... trim down resistor

The output voltage can be adjusted by both trim and remote sense. De-rate the maximum output power if using the trim or sense function to increase the output voltage.

REGULATIONS

Parameter	Condition	Value
Output Accuracy		±1.5% max.
Line Regulation	low line to high line	±0.3% max.
Load Regulation	0% to 100% load	0.5% max.
Transient Response	25% load change	600mV
	recovery time	500µS

Deviation vs. Load



Specifications (measured @ $T_a = 25^\circ\text{C}$, nom. V_{in} , full load and after warm-up unless otherwise stated)

PROTECTIONS

Parameter	Type		Value
Short Circuit Protection (SCP)			hiccup mode
Over Voltage Protection (OVP)	over full temp range; % of V_{OUTnom}		39VDC, hiccup mode
Over Current Protection (OCP)			10.4A - 13.5A, hiccup mode
Over Temperature Protection (OTP) ⁽⁷⁾	48Vin, 80% I_{OUT} , 1m/s (refer to "Airflow direction")	with heat-spreader ("H"), measured on "HOTSPOT"	+125°C typ.
Isolation Voltage ⁽⁸⁾			2.25kVDC
Isolation Capacitance			4.7nF typ.
Insulation Grade			basic

Notes:

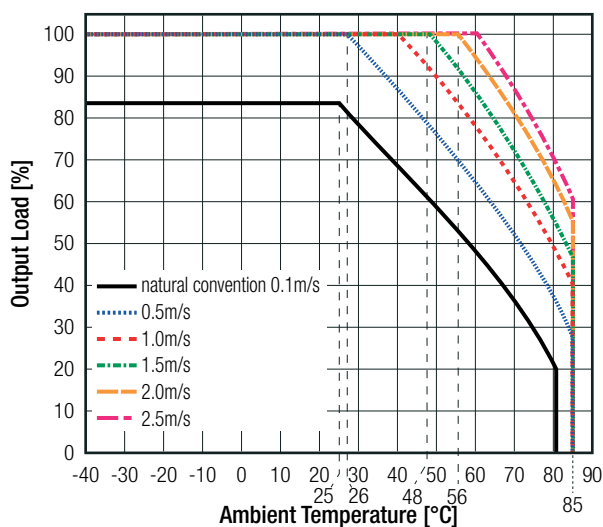
- Note7: Automatic restart after temperature is within specification. Hotspot temperature is just for references only.
 Note8: For repeat Hi-Pot testing, reduce the time and/or the test voltage
 Note9: Refer to local safety regulations if input over-current protection is also required. Recommended fuse: 20A normal blow type

ENVIRONMENTAL

Parameter	Condition		Value
Operating Temperature Range			-40°C to +85°C
Maximum Hotspot Temperatures	with heat-spreader ("H")		+110°C
Temperature Coefficient			$\pm 0.01\%/K$
Operating Altitude			4000m
Operating Humidity	non-condensing		95% RH max.
Pollution Degree			PD2
Mechanical Shock			30G, 11ms, 3 times, half sine
Vibration			2.4Grms, 10-500Hz, 30min along x, y and z axis
MTBF	$I_{OUT}=80\%$ of $I_{OUT\ max}$; $T_{AMB}=+25^\circ\text{C}$		5900×10^3 hours

Derating Graph

(Module vertical mounted and at $V_{IN}=48\text{VDC}$, refer to "APPLICATION and INSTALLATION")



Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

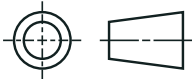
SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report / File Number	Standard
Audio/Video, information and communication technology equipment - Safety requirements	E224736	UL62368-1:2014 2nd Edition CSA C22.2 No. 62368-1-14, 2nd Edition
RoHS2		RoHS 2011/65/EU + AM2015/863
EMC Compliance	Condition	Standard / Criterion
Electromagnetic Compatibility of Multimedia Equipment - Emission Requirements	with external filter	CISPR22, Class B

DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	PCB	FR4, UL94 V-0
Dimension (LxWxH)		58.8 x 22.8 x 11.0mm
Weight	with heat-spreader ("H")	40g typ.

Dimension Drawing (mm)

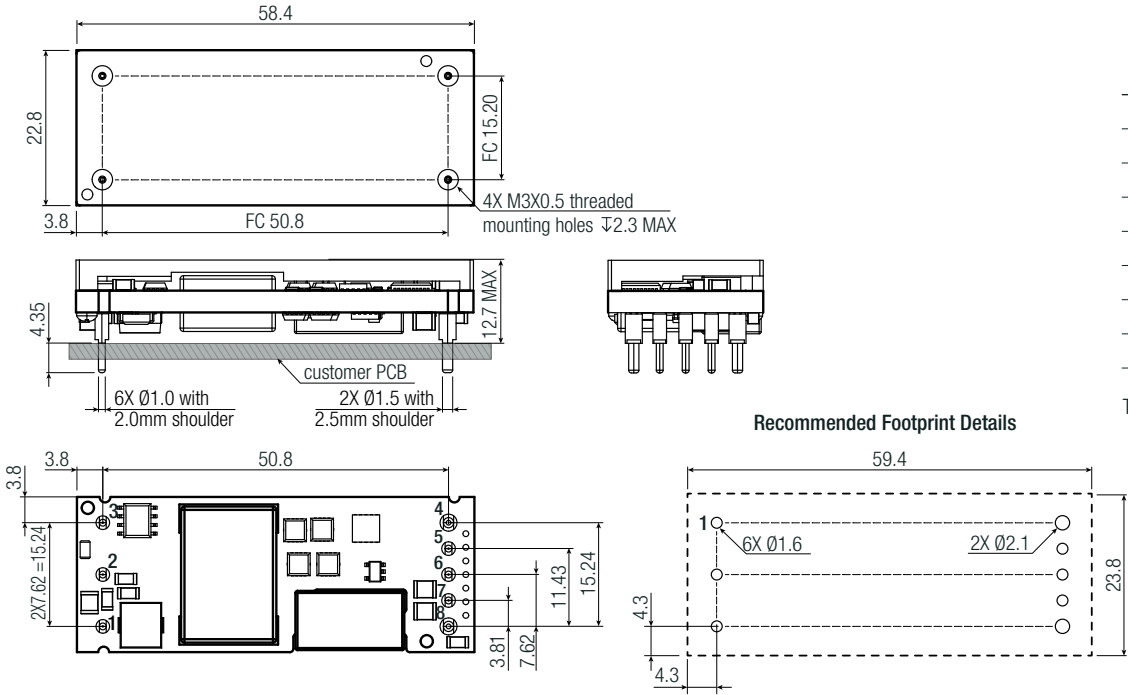


Pinning Information

Pin #	Single
1	+Vin
2	CTRL ON/OFF
3	-Vin
4	-Vout
5	-Sense
6	Trim
7	+Sense
8	+Vout

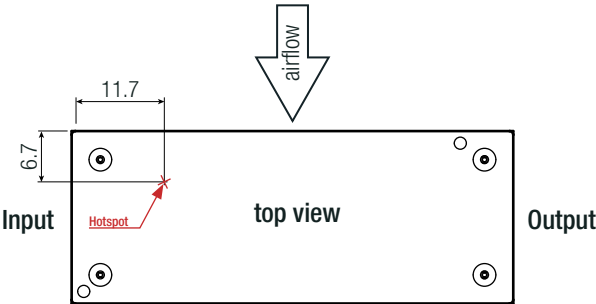
Tolerance:
xx.x = ±0.5mm
xx.xx = ±0.25mm

Recommended Footprint Details



APPLICATION AND INSTALLATION

Airflow direction
(vertically mounted)



Specifications

(measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

PACKAGING INFORMATION		
Parameter	Type	Value
Packaging Dimension (LxWxH)		221.0 x 128.0 x 33.0mm
Packaging Quantity		6pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidity	non-condensing	95% RH max.

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