

# Features

# Switching Regulator

- 4.5A industrial grade non-isolated DC/DC
- Compact, industry standard 1/32nd brick format
- Efficiency up to 98%
- 9-53V input voltage
- 5-30V adjustable output voltage



## RPMA-4.5/OF

**4.5 Amp**  
**1/32 Brick**  
**Open Frame**  
**Single Output**



### Description

The RPMA5.0-4.5/OF is a high efficiency non-isolated buck converter with up to 4.5A output current in a 1/32nd brick footprint. The input voltage range is from 9-53VDC, and the output voltage is trimmable from 5-30VDC via a fixed trim resistor. Typical applications for these highly compact, reliable converters include distributed power architecture voltage conversion from 12, 24, 28, 36, and 48V bus systems for industrial, medical, test and measurement, and telecom equipment. With an efficiency up to 98%, the converter operates at temperatures from -40°C to +85°C and comes with RECOM's standard 3 year warranty.

### Selection Guide

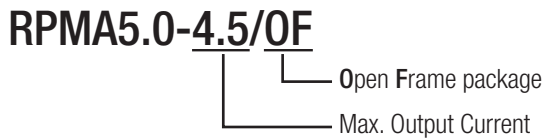
Part Number	Input Voltage Range [VDC]	Output Voltage Adjustment Range <sup>(1)</sup> [VDC]	Max. Output Current [A]	Efficiency typ. <sup>(2)</sup> [%]
RPMA5.0-4.5/OF	9-53	5-30	4.5	96.5

#### Notes:

Note1: External trim resistor is mandatory, do not leave floating

Note2: Efficiency tested at  $V_{IN}= 36VDC$ , full load and  $V_{OUT}= 24VDC$

### Model Numbering



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

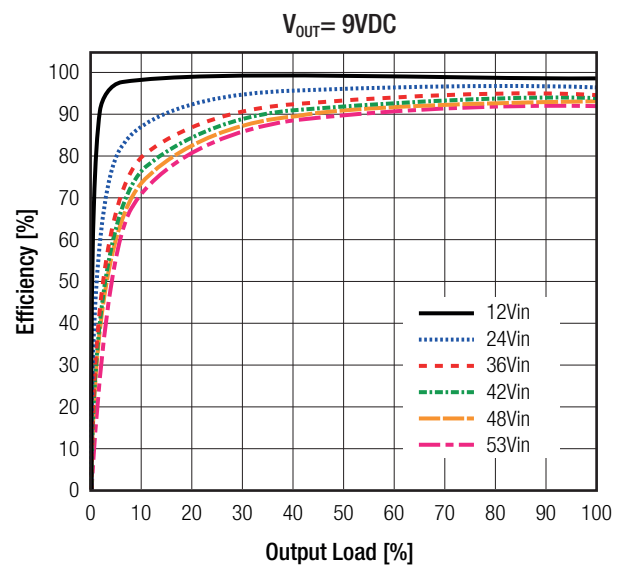
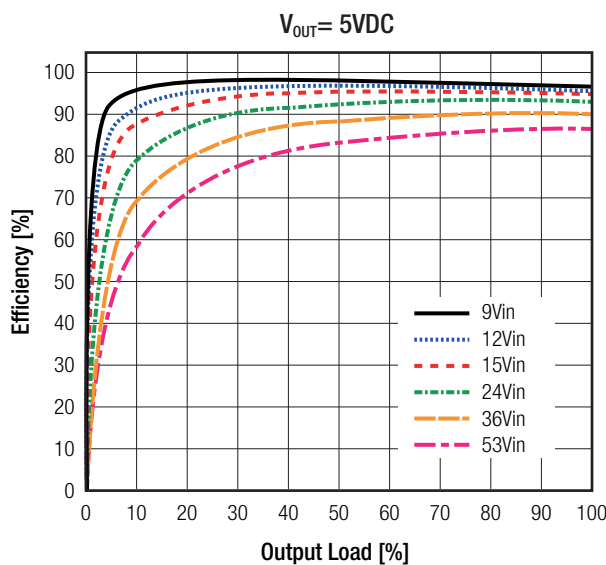
**BASIC CHARACTERISTICS**

Parameter	Condition	Min.	Typ.	Max.
Absolute Maximum Input Voltage		-0.25VDC		55VDC
Input Voltage Range		9VDC	VDC	53VDC
Under Voltage Lockout (UVLO)	DC-DC ON DC-DC OFF hysteresis		8VDC 7VDC 1VDC	
Input Current	V <sub>IN</sub> = 28VDC, V <sub>OUT</sub> = 24VDC, full load			10A
Inrush Current				1A <sup>2</sup> s
Quiescent Current	V <sub>IN</sub> = 48VDC, V <sub>OUT</sub> = 24VDC, no load		50mA	
Output Voltage Trimming	refer to "OUTPUT VOLTAGE TRIMMING"	5VDC		30VDC
Output Current				4.5A
Minimum Load		0%		
Start-up Time	power up / CTRL ON/OFF		11ms	
Rise Time			7ms	
ON/OFF CTRL	DC-DC ON DC-DC OFF		Short or 0VDC < V <sub>CTRL</sub> < 0.5VDC Open or 3.1VDC < V <sub>CTRL</sub> < 13.2VDC	
Input Current of CTRL Pin	DC-DC OFF		2mA	
Internal Operating Frequency			300kHz	
Output Ripple and Noise	20MHz BW, 1µF ceramic capacitor and 22µF ceramic capacitor		150mVp-p	
Reflected Back Ripple Current			2.5mA <sub>p-p</sub>	
Remote Sense <sup>(3)</sup>	%V <sub>OUT</sub> nom.	0%		5%
Maximum Capacitive Load				1200µF

**Notes:**

Note3: If sense function is not being used, connect Sense pin to +Vout pin

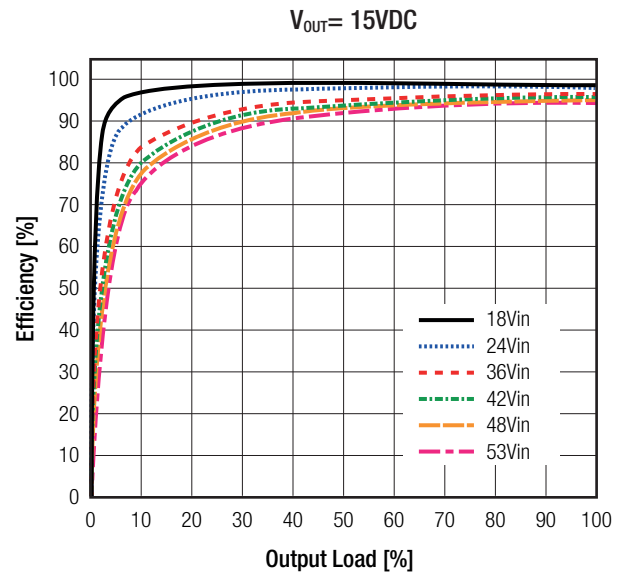
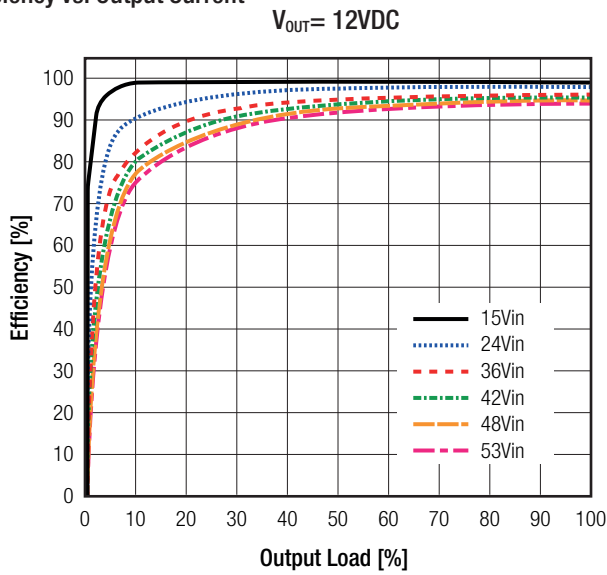
**Efficiency vs. Output Current**



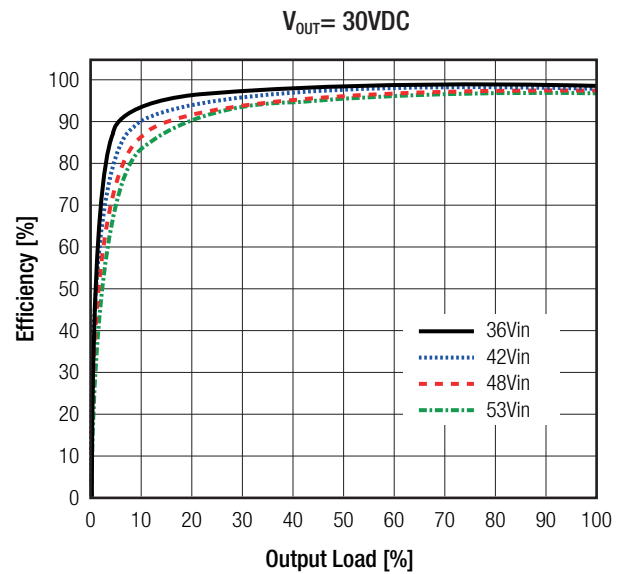
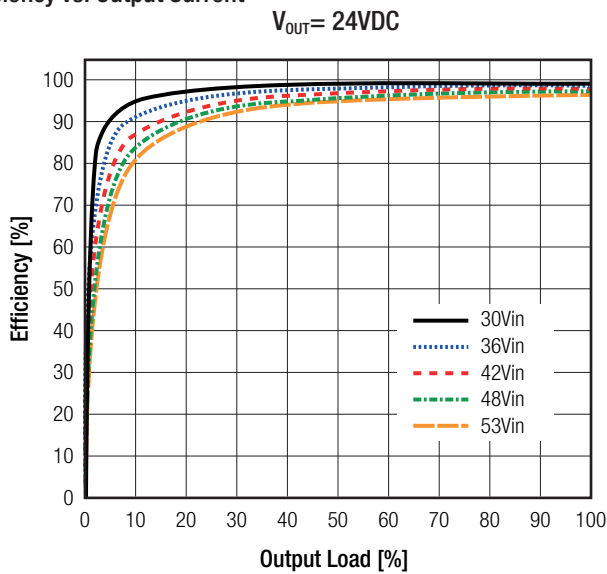
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Specifications (measured @  $T_a = 25^\circ\text{C}$ , full load and after warm-up unless otherwise stated)

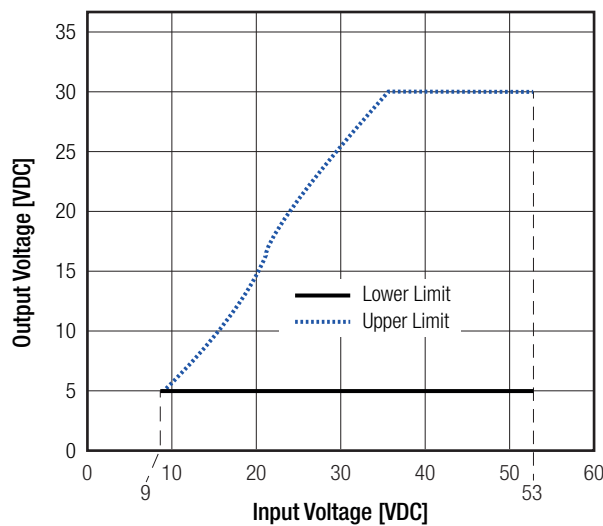
Efficiency vs. Output Current



Efficiency vs. Output Current

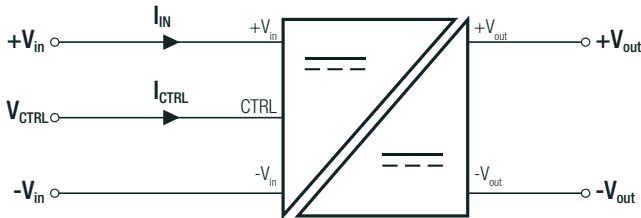


Output Voltage vs. Input Voltage



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

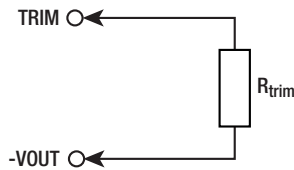
**ON/OFF CTRL**



Negative Logic      DC-DC ON      Short or 0VDC < V<sub>CTRL</sub> < 0.5VDC  
 DC-DC OFF      Open or 3.1VDC < V<sub>CTRL</sub> < 13.2VDC

**OUTPUT VOLTAGE TRIMMING**

The output voltage of the RPMA5.0-4.5/OF can be trimmed between 5VDC and 30VDC by using an external trim resistor. The values for the trim resistor are according to standard E96 values; therefore, the specified voltage may slightly vary. Resistor values may be calculated with the following equation:



Calculation:

$$R_{trim} = \frac{V_{ref} \times k}{V_{OUTset} - 2.59} - 0.511 = k\Omega$$

V<sub>OUTnom</sub> = nom. output voltage [VDC]  
 V<sub>OUTset</sub> = trimmed output voltage [VDC]  
 V<sub>ref</sub> = reference voltage [VDC]  
 R<sub>trim</sub> = external trim resistor [kΩ]  
 k = trim factor [36.5]

**Practical Example V<sub>OUTset</sub> = 15VDC:**

$$R_{trim} = \left[ \frac{0.6VDC \times 36.5}{15 - 2.59} \right] - 0.511 = 1.254k\Omega$$

R<sub>trim</sub> according to E96 ≈ **1k25Ω**

**Practical Example V<sub>OUTset</sub> = 24VDC:**

$$R_{trim} = \left[ \frac{0.6VDC \times 36.5}{24 - 2.59} \right] - 0.511 = 512\Omega$$

R<sub>trim</sub> according to E96 ≈ **511Ω**

V <sub>OUTset</sub> =	15	18	24	28	30	[VDC]
R <sub>trim</sub> E96 ≈	1k25	909	511	348	287	[Ω]

**REGULATIONS**

Parameter	Condition	Value
Output Accuracy	excluding trimming tolerances	±2.0% typ.
Line Regulation	low line to high line, full load	±0.2% typ.
Load Regulation	0% to 100% load	1.0% typ.
Transient Response	50% load step recovery time	350mV typ. 30μs typ.

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

**PROTECTIONS**

Parameter	Condition	Value
Over Current Protection (OCP)		9A, hiccup mode
Over Temperature Protection (OTP)	on TC point	135°C, automatic restart

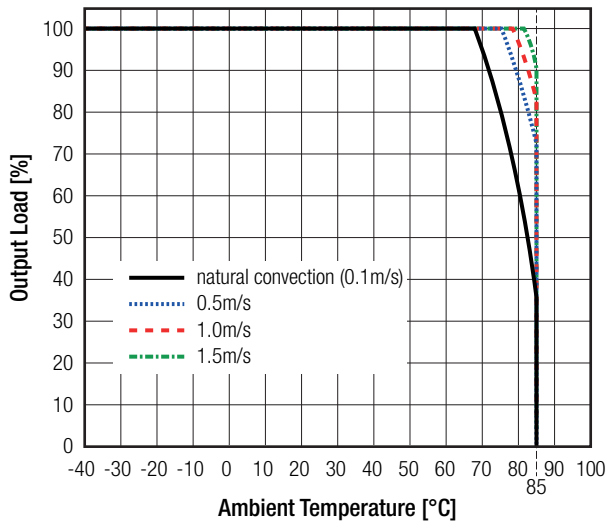
**ENVIRONMENTAL**

Parameter	Condition		Value
Operating Temperature Range	refer to below graphs		-40°C to +85°C
Maximum Case Temperature			+120°C
Operating Altitude			5000m
Operating Humidity	non-condensing		95% RH max.
Pollution Degree			PD2
MTBF	according to Telcordia SR332 Issue 3	80% load, $T_{\text{AMB}} = 40^\circ\text{C}$ , airflow = 1.5m/s	82797 x 10 <sup>3</sup> hours

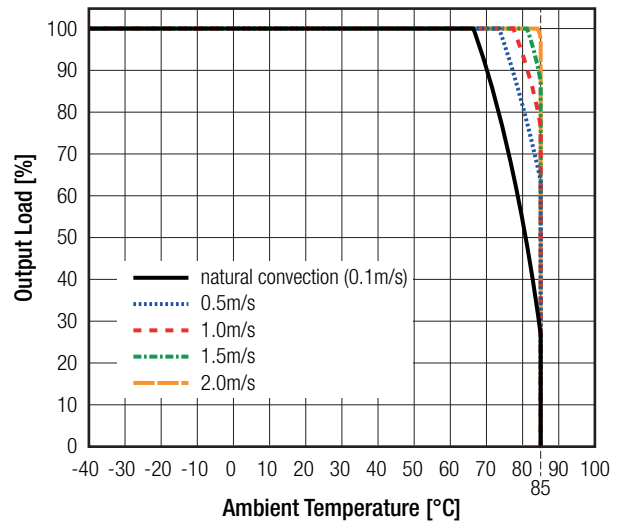
**Derating Graph**

(@ Chamber)

$V_{\text{IN}} = 48\text{VDC}$ ,  $V_{\text{OUT}} = 18\text{VDC}$



$V_{\text{IN}} = 48\text{VDC}$ ,  $V_{\text{OUT}} = 24\text{VDC}$



**SAFETY AND CERTIFICATIONS**

Certificate Type (Safety)	Report / File Number	Standard
RoHS2		RoHS 2011/65/EU + AM2015/863

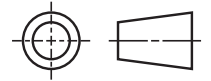
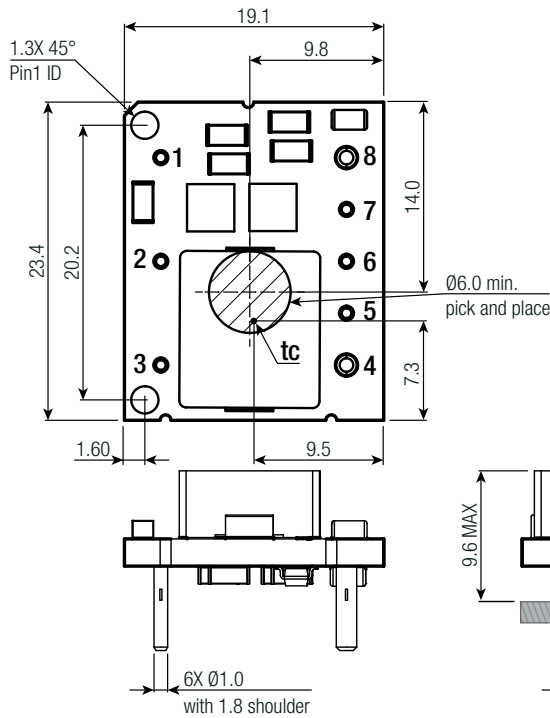
**DIMENSION AND PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	PCB	FR4, (UL94V-0)
Dimension (LxWxH)		19.1 x 23.4 x 9.6mm
Weight		8g typ.

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

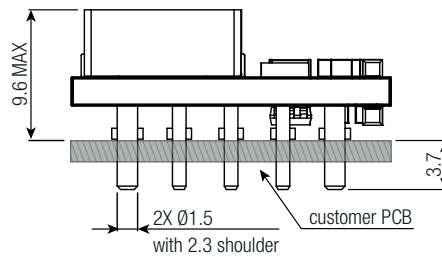
**Dimension Drawing (mm)**



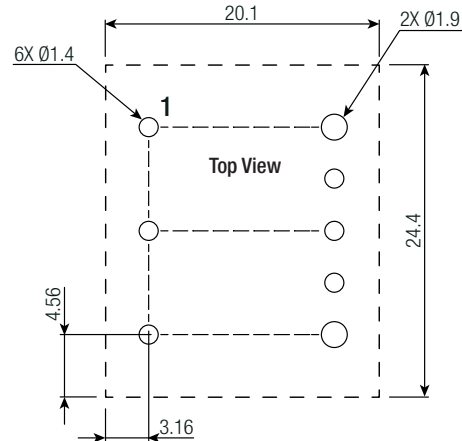
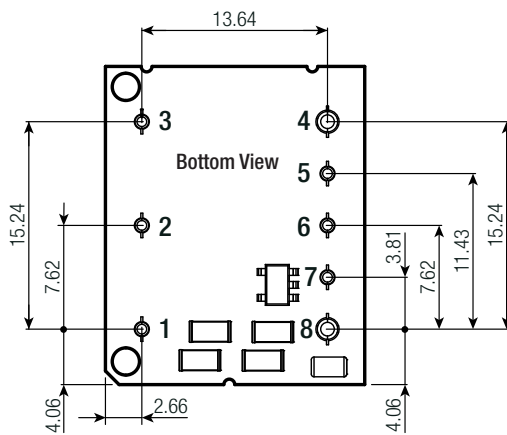
**Pinning Information**

Pin #	Function
1	+Vin
2	CTRL
3	-Vin
4	-Vout
5	NC
6	Trim
7	+Sense <sup>(3)</sup>
8	+Vout

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



**Recommended Footprint Details**



**PACKAGING INFORMATION**

Parameter	Type	Value
Packaging Dimension (LxWxH)	cardboard box	221.0 x 128.0 x 33.0mm
Packaging Quantity		20pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidity	non-condensing	95% RH max.

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