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

RECOM
DC/DC Converter

RPMA-4.5/OF

4.5 Amp 1/32 Brick Open Frame Single Output

3 Year Warranty

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 (1) [VDC]	Max. Output Current [A]	Efficiency typ. (2) [%]
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

RoHS 2+ compliant 10 from 10 — RECOM-CONVERTERS COMPLIANT PRODUCTS

REACH compliant — RECOM-CONVERTERS COMPLIANT PRODUCTS

c UL us
E224736

UL/CSA 62368-1 certified

Model Numbering

RPMA5.0-4.5/OF

- **O**pen **F**rame package
- Max. Output Current

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

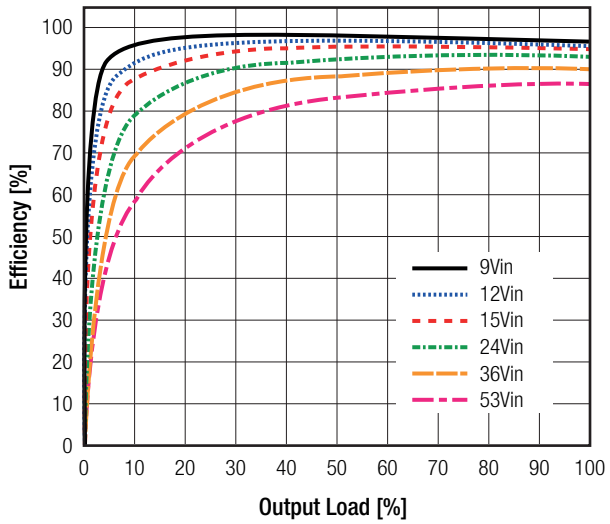
BASIC CHARACTERISTICS				
Parameter	**Condition**	**Min.**	**Typ.**	**Max.**
Absolute Maximum Input Voltage		-0.25VDC		55VDC
Input Voltage Range		9VDC	VDC	53VDC
Under Voltage Lockout (UVLO)	DC-DC ON DC-DC OFF hysteresis		8VDC 7VDC 1VDC	
Input Current	V_{IN}= 28VDC, V_{OUT}= 24VDC, full load			10A
Inrush Current				1A²s
Quiescent Current	V_{IN}= 48VDC, V_{OUT}= 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_{CTRL}<0.5VDC Open or 3.1VDC<V_{CTRL}<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			2.5mAp-p	
Remote Sense (3)	%V_{OUT} nom.	0%		5%
Maximum Capacitive Load				1200µF

Notes:

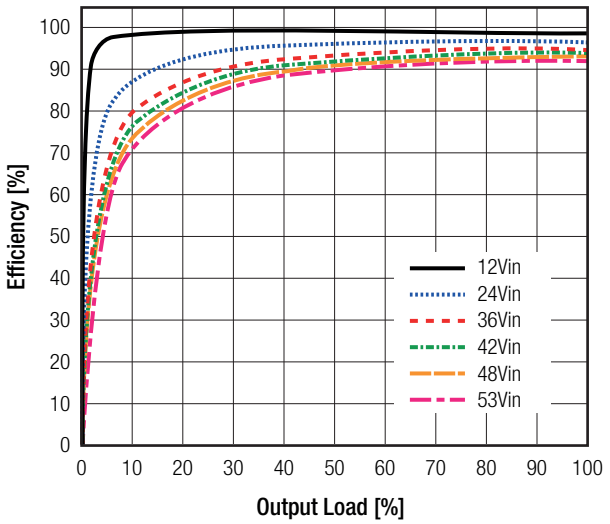
Note3: If sense function is not being used, connect Sense pin to +Vout pin

Efficiency vs. Output Current

V_{OUT}= 5VDC



V_{OUT}= 9VDC



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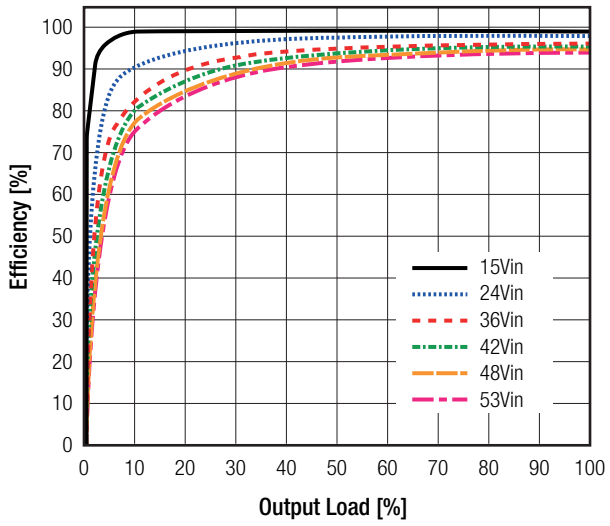
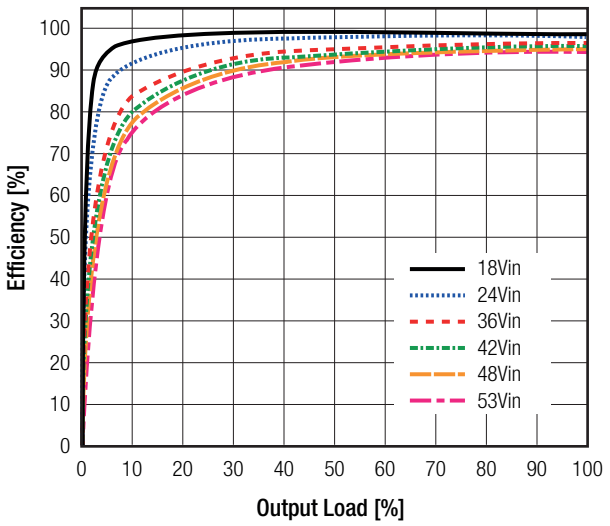
Specifications (measured @ Ta= 25°C, full load and after warm-up unless otherwise stated)

Efficiency vs. Output Current

V_{OUT}= 12VDC

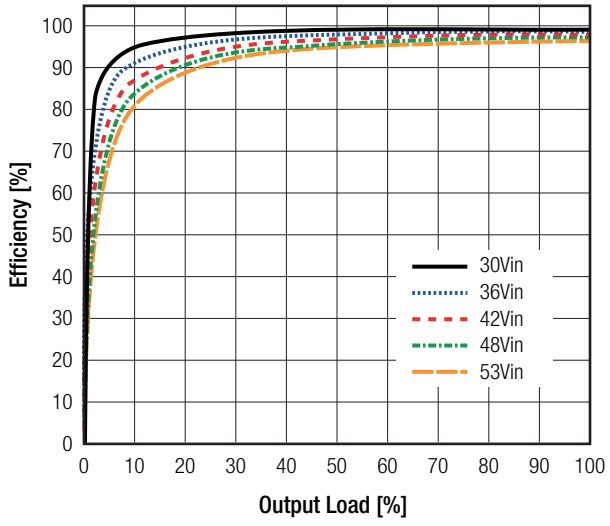


V_{OUT}= 15VDC

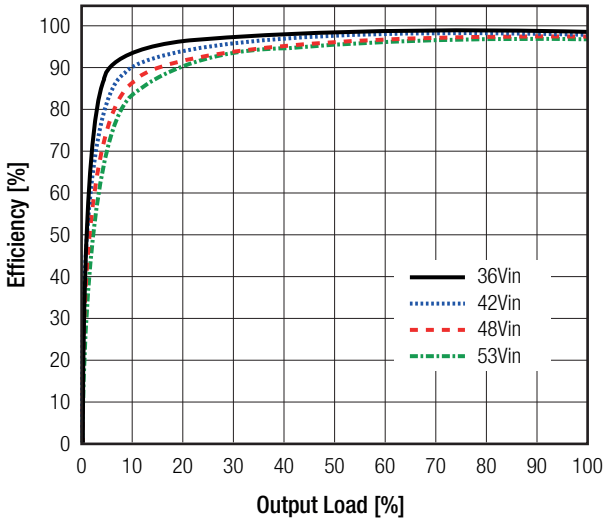


Efficiency vs. Output Current

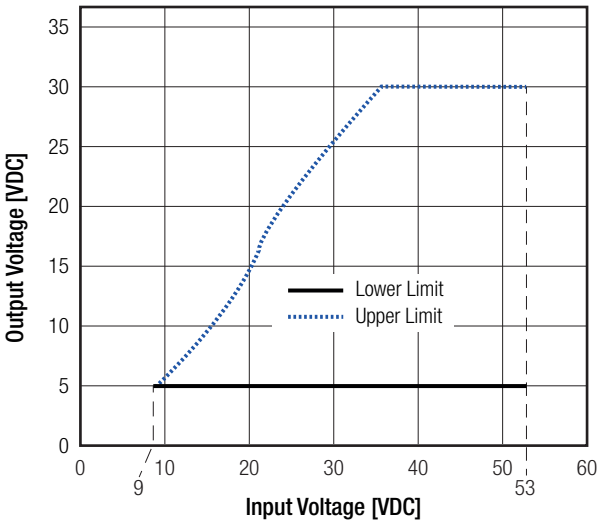
V_{OUT}= 24VDC



V_{OUT}= 30VDC

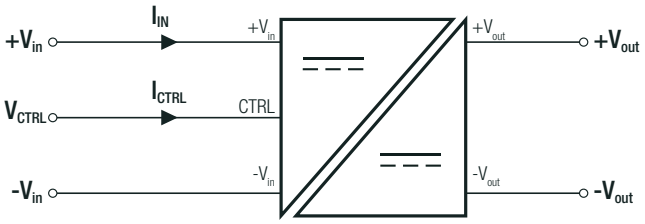


Output Voltage vs. Input Voltage



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

ON/OFF CTRL

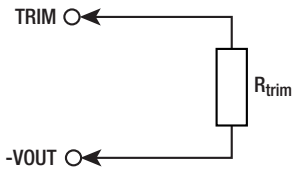


Negative Logic

DC-DC ON	Short or 0VDC < V_{CTRL} < 0.5VDC
DC-DC OFF	Open or 3.1VDC < V_{CTRL} < 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:

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

V_{OUTnom}	= nom. output voltage	[VDC]
V_{OUTset}	= trimmed output voltage	[VDC]
Vref	= reference voltage	[VDC]
R_{trim}	= external trim resistor	[kΩ]
k	= trim factor	[36.5]

Practical Example V_{OUTset}= 15VDC:

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

R_{trim} according to E96 ≈ **1k25Ω**

Practical Example V_{OUTset}= 24VDC:

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

R_{trim} according to E96 ≈ **511Ω**

V_{OUTset} =	15	18	24	28	30	[VDC]
R_{trim} 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.

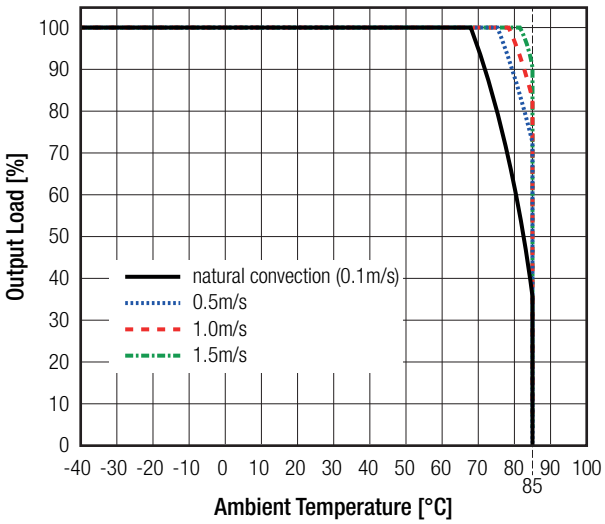
Specifications (measured @ Ta= 25°C, full load and after warm-up unless otherwise stated)

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

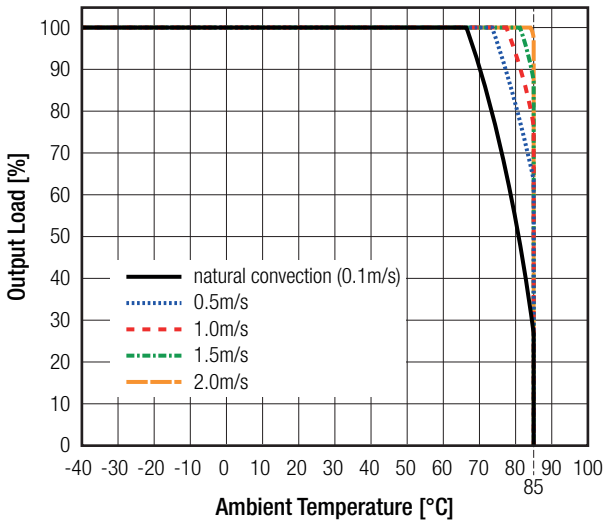
ENVIRONMENTAL			
Parameter	**Condition**		**Value**
Operating Temperature Range	refer to below graphs		-40°C to +85°C
Maximum Case Temperature			+120°C
Operating Altitude			5000m
Operating Humidity	non-condensing		95% RH max.
Pollution Degree			PD2
MTBF	according to Telcordia SR332 Issue 3	80% load,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

Derating Graph
(@ Chamber)

V_{IN}= 48VDC, V_{OUT}= 18VDC



V_{IN}= 48VDC, V_{OUT}= 24VDC



SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	**Report / File Number**	**Standard**
Audio/Video, information and communication technology equipment - Part1: Safety requirements		UL62368-1:2014 CAN/CSA-C22.2 No. 62368-1:2014
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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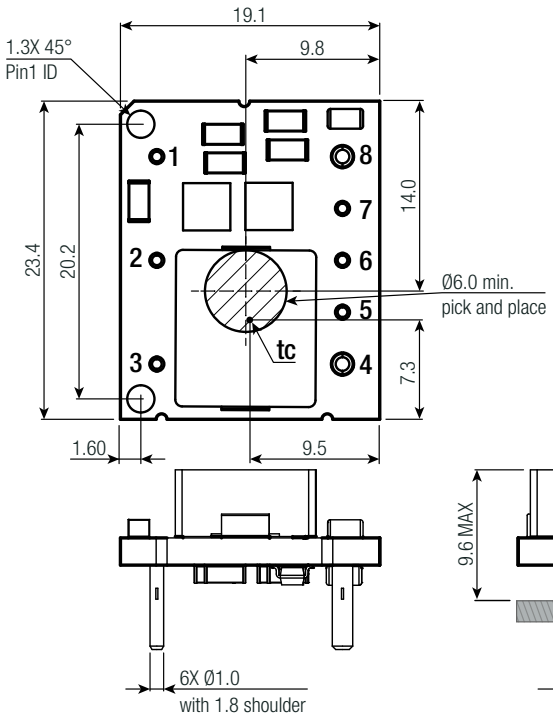
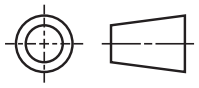
Specifications (measured @ Ta= 25°C, full load and after warm-up unless otherwise stated)

Dimension Drawing (mm)



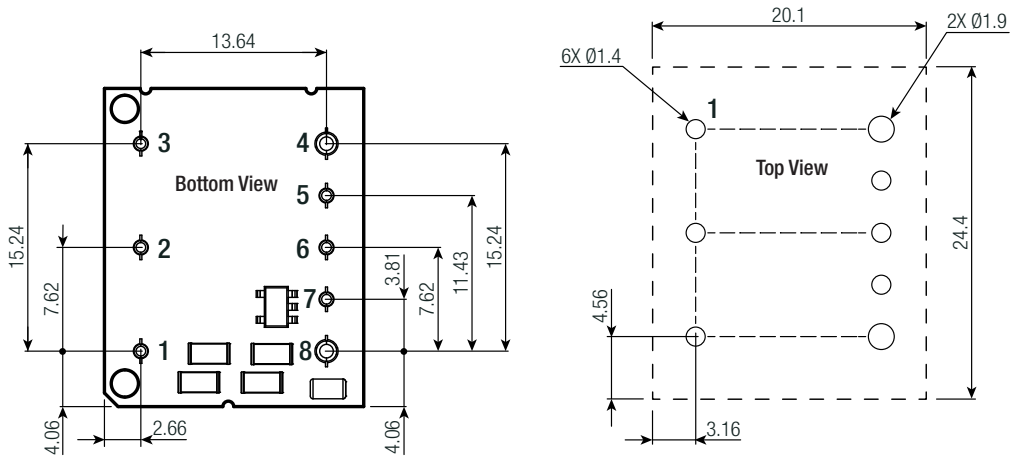


Pinning Information

Pin #	Function
1	+Vin
2	CTRL
3	-Vin
4	-Vout
5	NC
6	Trim
7	+Sense (3)
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.