Features

Power Module

- 2.5 - 6.0VDC input 3A buck regulator module
- Integrated inductor
- Low profile 1.3mm
- Small footprint 2x2.5mm
- Adjustable output 0.6 to 5.25VDC
- Up to 105°C ambient temperature with derating

RECOM
DC/DC Converter

RPZ-3.0

3.0 Amp 8-Pin QFN Package

3 YEAR warranty

Description

The RPZ-3.0 is a 3A buck converter with integrated power transistors and inductor in a tiny 2mm x 2.5mm x 1.3mm thermally-enhanced QFN package. The input range is from 2.5 to 6.0VDC for use in low power/low voltage systems. The tightly regulated output voltage can be set with two resistors in the range from 0.6V up to 5.25V. The output current is up to 3A and is fully protected against continuous short-circuits, output overcurrent or over-temperature faults. Its high current and small size make the RPZ-3.0 ideal for optical modules, industrial PCs, machine imaging systems, distributed power architectures, portable equipment in telecom as well as industrial applications.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage Range (1) [VDC]	Output Current max. [mA]	Efficiency (2) typ. [%]
RPZ-3.0	2.5 - 6.0	0.6 - 5.25	3000	93

Notes:

Note1: As input approaches output voltage set point, device enters 100% duty cycle mode. In 100% duty cycle mode, Vout equals Vin minus dropout voltage. (refer to ***"SAFE OPERATING AREA"***)

Note2: Efficiency tested at V_{IN}= 5VDC, full load, and V_{OUT}= 3.3VDC

Model Numbering

RPZ-3.0-__

Output Current — Packaging (3)

Notes:

Note3: add suffix "-R" for tape and reel packaging
add suffix "-CT" for cut tape packaging (refer to "***"PACKAGING INFORMATION"***)

Specifications

ABSOLUTE MAX RATINGS (exceeding these ratings may damage the device)

Parameter	Symbol	Min.	Typ.	Max.
Absolute Maximum Voltage	V_{IN}	0.3VDC		7VDC
	others (4)	-0.3VDC		7.3VDC
Maximum continuous power losses (5)	T_{AMB} = 25°C			3.7W
Junction Temperature	T_J	-40°C		+150°C
Lead Temperature	10 seconds max			+260°C

Notes:

Note4: For CTRL absolute max ratings, please refer to ***"CTRL Operating CONDITIONS"***

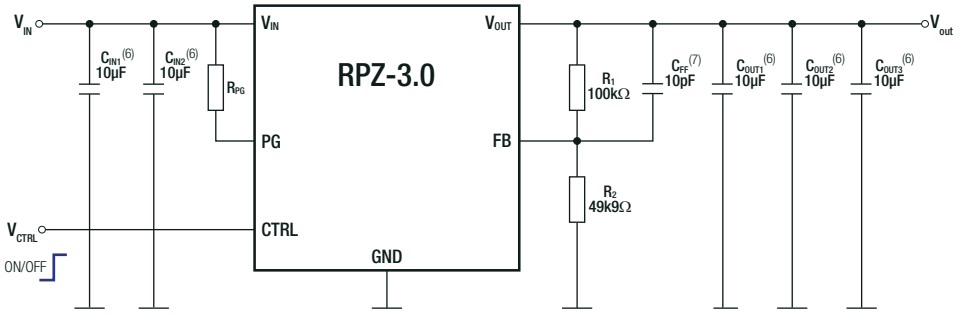
Note5: Exceeding maximum allowable power dissipation causes device to enter thermal shutdown which protects device from permanent damage. Refer to ***"CHARACTERISTIC CURVES"***

Specifications

OPERATING CONDITIONS (V_{IN}= 3.3VDC, V_{OUT}= 1.8VDC, I_{OUT}= 3A, unless otherwise noted, typical values are at T_{AMB}= +25°C)					
Parameter	**Symbol**	**Condition**	**Min.**	**Typ.**	**Max.**
Input Voltage Range	V_{IN}	refer to ***"SAFE OPERATING AREA"***	2.5VDC		6VDC
Under Voltage Lockout UVLO			2.1VDC	2.2VDC	2.3VDC
UVLO hysteresis				200mV	
Output Voltage Range	V_{OUT}	refer to ***"OUTPUT VOLTAGE SETTING"***	0.6VDC		5.25VDC
Output Current Range	I_{OUT}		0A		3A
Standby current	I_{IN}	V_{CTRL} = 0VDC		0.1µA	0.5µA
Quiescent current	I_Q	$V_{FB} = V_{REF}$ x 105%	10mA	16mA	30mA
Switching frequency	f_{SW}		1.92MHz	2.4MHz	2.88MHz
Feedback voltage	V_{FB}		594mV	600mV	606mV
Output load regulation			refer to ***"Characteristic Curves"***		
Maximum Duty Cycle			100%		
Minimum On Time				50ns	
Rise Time		CTRL high to 95% V_{OUTnom}		0.3ms	1ms

Typical Application

V_{IN}= 3.3VDC, V_{OUT}= 1.8VDC, I_{OUT}= 3.0A

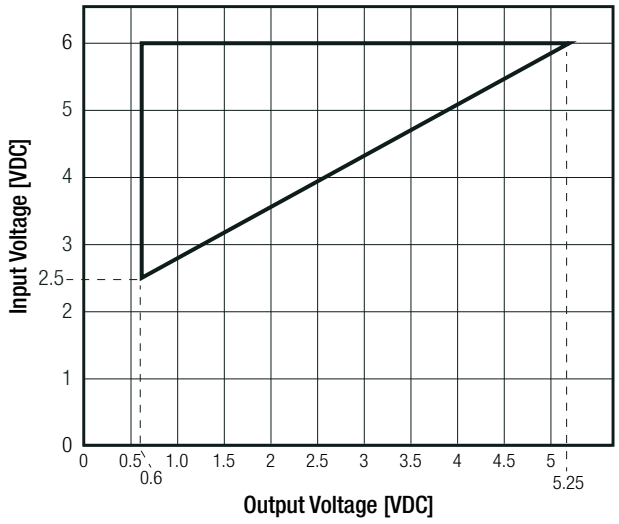


Notes:

Note6: The RPZ-3.0 requires 2x 10µF MLCC input capacitors as close as possible to V_{IN} and GND pin and 3x 10µF output capacitors to reduce noise.

Note7: Transient load reaction time can be improved by adding a feed-forward capacitor, C_{FF} across V_{OUT} and FB pin, but it is not required for normal operation.

SAFE OPERATING AREA

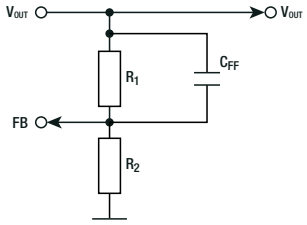


Specifications

OUTPUT VOLTAGE SETTING

A resistor divider connected to the FB pin (pin 8) sets the output voltage of the RPZ-3.0. The output voltage adjustment range is from 0.6VDC to 5.25VDC. The schematic below shows the feedback resistor connections for setting the output voltage. The recommended value of R1 is 100kΩ. Use the equation to calculate the value for R2. The table below lists the R2 resistor values according to standard E96 values; therefore, the specified voltage may slightly vary.

Feedback Network



Calculation:

$$R_2 = \frac{0.6V}{(V_{OUTset} - 0.6V)} \times R_1$$

Practical example with V_{OUTset}= 1.8VDC

$$R_2 = \frac{0.6V}{(1.8V - 0.6V)} \times 100k\Omega = \mathbf{50k}\Omega$$

Table below lists recommended resistor values for common V_{OUT}:

V_{OUTset} [VDC]	R1 [Ω]	R2 [Ω]	C_{FF} [pF] *	C_{OUT} [µF]
1.2	100k	100k	(optional *)	30
1.5		66k5		30
1.8		49k9		30
2.5		31k6		30
3.3		22k1		30

*to stabilize the system and optimize the load transient response, place a feed-forward capacitor (C_{FF}) in parallel with R1.

CTRL OPERATING CONDITIONS (V_{IN}= 3.3VDC, V_{OUT}= 1.8VDC, I_{OUT}= 3A, unless otherwise noted, typical values are at T_{AMB}= +25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.
CTRL rising threshold	V_{CTRL_RISING}		1VDC		
CTRL hysteresis				600mV	

POWER GOOD OPERATING CONDITIONS (V_{IN}= 3.3VDC, V_{OUT}= 1.8VDC, I_{OUT}= 3A, unless otherwise noted, typical values are at T_{AMB}= +25°C)

Parameter	Condition	Min.	Typ.	Max.
PG thresholds	V_{OUT} rising	93.5%	95%	97.5%
	V_{OUT} falling	86%	88%	91%

REGULATIONS

Parameter	Condition	Min.	Typ.	Max.
Load Regulation	0-100% load			±1%
Line Regulation	low line to high line, 100% load			0.5%
Temperature Regulation	T_{AMB}= -40°C to +105°C, 100% load			2%

PROTECTIONS

Parameter	Condition	Value
Short Circuit Protection SCP		hiccup mode
Over Current Protection		5A typ.
Thermal shutdown	junction temperature	150°C typ.
	hysteresis	20°C

THERMAL OPERATING CONDITIONS (V_{IN}= 3.3VDC, V_{OUT}= 1.8VDC, I_{OUT}= 3A, unless otherwise noted, typical values are at T_{AMB}= +25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.
Operating Ambient Temperature	T_{AMB}	junction to ambient	refer to ***"Thermal Derating"***		
Operating Junction Temperature	T_J		-40°C		+125°C
Thermal Resistance (8)	R_{th_JA}	junction to ambient		27K/W	

Notes:

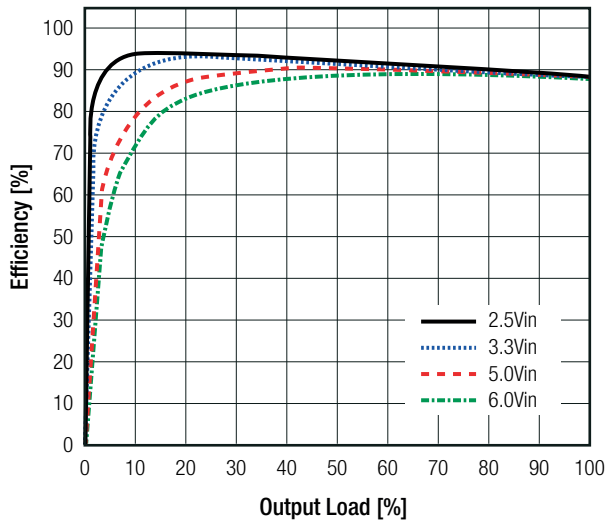
Note8: Tested with 80x80mm, double layer PCB (75µm copper) RECOM EVM board.

Specifications

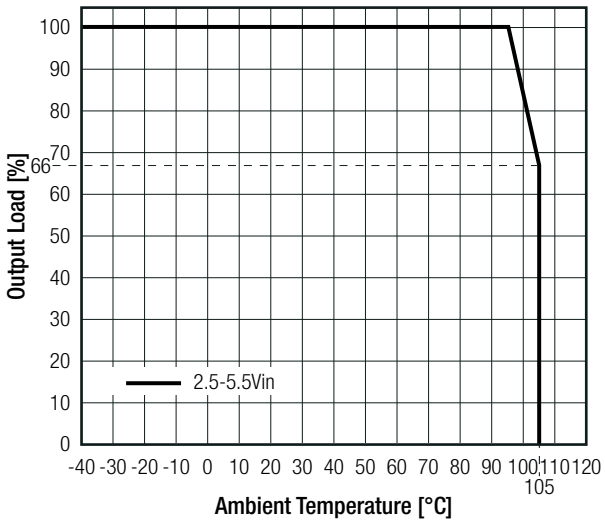
ENVIRONMENTAL		
Parameter	**Condition**	**Value**
ESD	human-body model (HBM), ANSI/ESDA/JEDEC JS-001	±2.5kV
	charged-device model (CDM), JEDEC JESD22-C101	±1kV
MTTF	T_J= 55°C; V_{IN}= 6VDC	19700 x 10^3 hours

TYPICAL PERFORMANCE CHARACTERISTICS (V_{OUT}= 1.8VDC, T_J= +25°C; tested with RECOM evaluation module: RPZ-3.0-EVM-1)

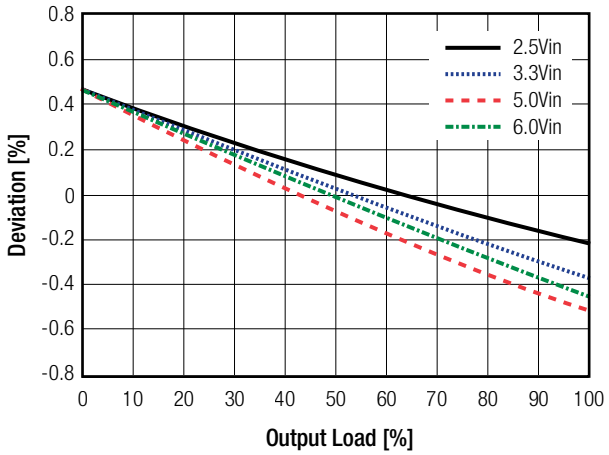
Efficiency vs. Output current



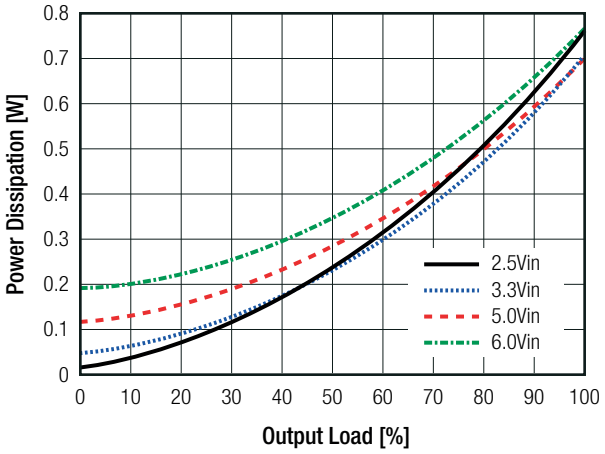
Thermal Derating



Deviation vs. Load



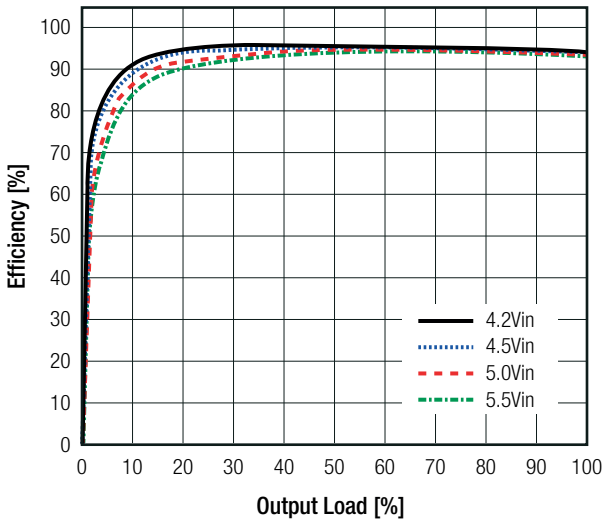
Power Dissipation



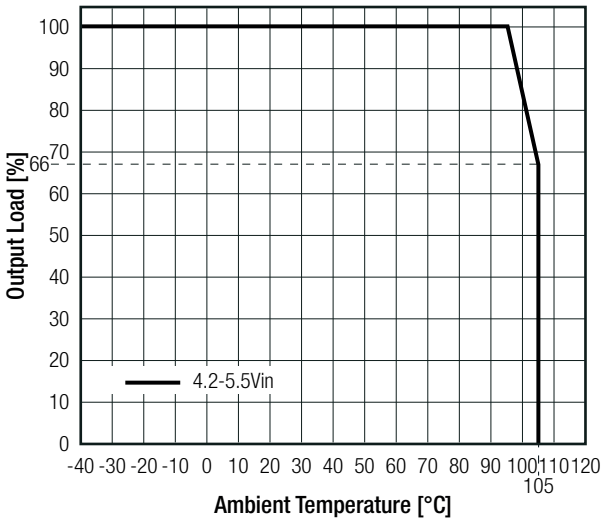
Specifications

TYPICAL PERFORMANCE CHARACTERISTICS (V_{OUT}= 3.3VDC, T_J= +25°C; tested with RECOM evaluation module: RPZ-3.0-EVM-1)

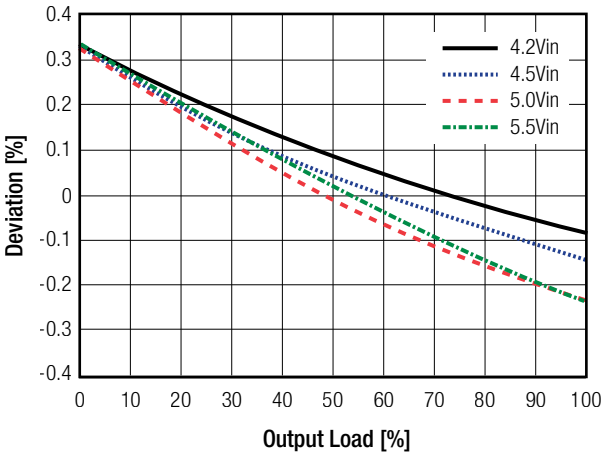
Efficiency vs. Output current



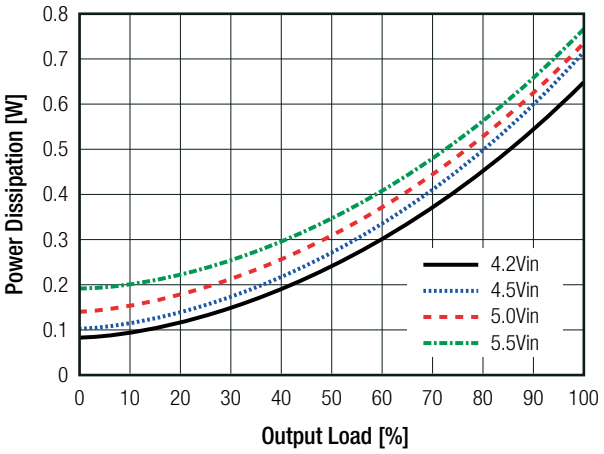
Thermal Derating



Deviation vs. Load



Power Dissipation



SAFETY AND CERTIFICATIONS

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

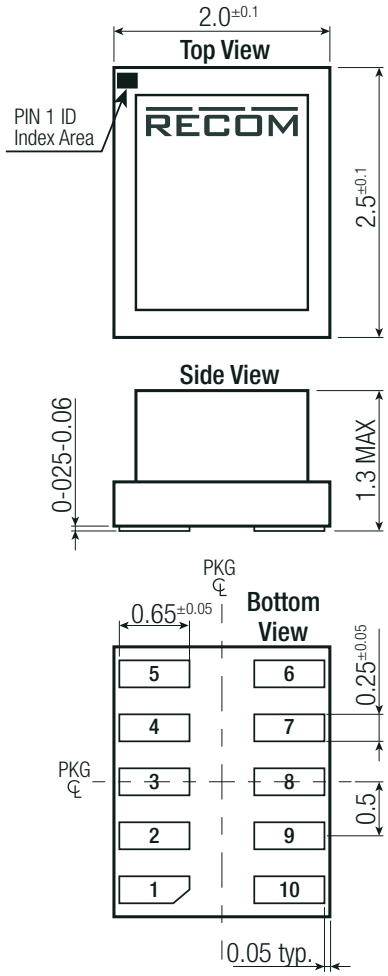
DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Dimension (LxWxH)		2.0 x 2.5 x 1.3mm
Weight		0.1g typ.

continued on next page

Specifications

Dimension Drawing (mm)



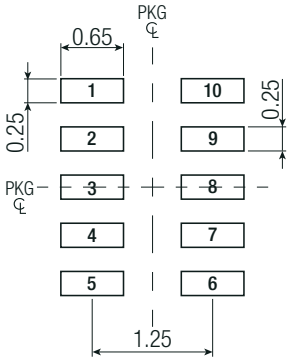
Pad Information

Pad #	Function	Description
3	CTRL	Pull high to turn on. Pull low to turn off.
9, 10	GND	Ground pin
8	FB	Feedback voltage pin. Connect to the center point of output resistor divider to set the output voltage. (refer to ***"OUTPUT VOLTAGE SETTING"***
4	PG	Power good drain output pin
1, 2	V_{IN}	Input voltage pin. Decouple to GND with at least a 20µF ceramic capacitor (refer to ***"Typical Application"***)
5, 6, 7	V_{OUT}	Output voltage pin. Decouple this pin to GND with at least a 30µF MLCC (refer to ***"Typical Application"***)

All dimensions exclude mold flash and metal burr.

Tolerances:
x.x= ±0.1mm
x.xx= ±0.05mm

Recommended Footprint Details (*)
(Top View)



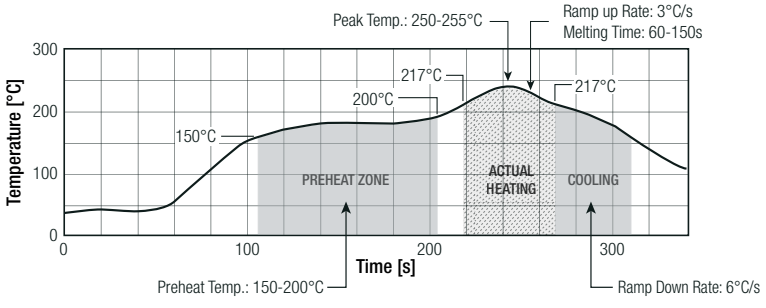
* A large ground plane greatly reduces noise and increases thermal performance.

SOLDERING

Profile Feature	PB-Free Assembly
Preheat	
minimum Temperature (TS_min)	150°C
maximum Temperature (TS_max)	200°C
Time (tS)	60s-120s
Liquids	
Temperature (TL)	217°C
Time (tL)	60-150s
Peak Temperature (TP)	255°C
max Ramp Down Rate (from Ts_max to TP)	6°C/s
max Ramp Up Rate	3°C/s
max time from 25°C to Peak Temperature (TP)	8min

1	Pb-Free assembly is recommended according ro JEDEC J-STD020.
2	Ensure that the peak re-flow temperature does not exceed 240°C ±5°C as per JEDEC J-STD020
3	The re-flow time period during peak temperature of 240°C ±5°C should not exceed 30 seconds.
4	Re-flow time above liquids (217°C) should not exceed 150 seconds.
5	For solder paste use a standard SAC Alloy such as SAC 305, type 3 or higher.
6	Other soldering methods (e.g. vapor-phase) are not verified and have to be validated at his own risk.

Solder Pofil



Specifications

PACKAGING INFORMATION		
Parameter	**Type**	**Value**
Packaging Dimension (LxWxH)	reel 7" (diameter + width)	Ø177.8 + 8.4mm
	tape and reel (carton)	215.0 x 215.0 x 215.0mm
	moisture barrier bag ("-CT")	100.0 x 100.0 x 30.0mm
Packaging Quantity	tape and reel	2500pcs
	moisture barrier bag ("-CT")	50pcs
Tape Width		8mm
Storage Temperature Range		-55°C to +150°C
Moisture Sensitive Level	MSL peak temp. (9)	Level 3, 260°C, 168hrs

Notes:

Note9: The Moisture Sensitivity Level rating is according to the JEDEC industry standard classifications and peak solder temperature