

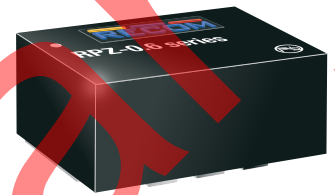
Features

- 1.8 - 5.5VDC input 0.6A buck regulator module
- Integrated inductor
- Low profile 1mm
- Small footprint 2x1.5mm
- Adjustable output 0.6 to 4.1VDC
- Up to 125°C ambient temperature with derating

Power Module

RPZ-0.6

0.6 Amp 8-Pin QFN Package



Description

The RPZ-0.6 is a 0.6A buck converter with integrated power transistors and inductor in a tiny 2mm x 1.5mm x 1mm thermally-enhanced QFN package. The input range is from 1.8 to 5.5VDC 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 4.1V. The output current is up to 0.6A and is fully protected against continuous short-circuits, output overcurrent or over-temperature faults. Its high current and small size make the RPZ-0.6 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-0.6	1.8 - 5.5	0.6 - 4.1	600	90

Notes:

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

Note2: Efficiency tested at V_{IN}= 4.5VDC, full load, and V_{OUT}= 3.3VDC

Model Numbering

RPZ-0.6-

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} , V _{OUT} , SW			6VDC
	others ⁽⁴⁾			6.6VDC
Maximum continuous power losses ⁽⁵⁾	T _{AMB} = 25°C			0.4W
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"**

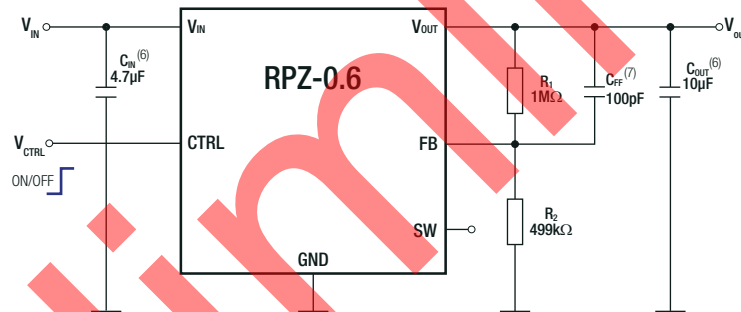
Specifications

OPERATING CONDITIONS ($V_{IN}= 4.2VDC$, $V_{OUT}= 1.8VDC$, $I_{OUT}= 0.6A$, unless otherwise noted, typical values are at $T_{AMB}= +25^{\circ}C$)

Parameter	Symbol	Condition	Min.	Typ.	Max.
Input Voltage Range	V_{IN}	refer to "SAFE OPERATING AREA"	1.8VDC		5.5VDC
Under Voltage Lockout UVLO					1.8VDC
UVLO hysteresis				100mV	
Output Voltage Range	V_{OUT}	refer to "OUTPUT VOLTAGE SETTING"	0.6VDC		5.5VDC
Output Current Range	I_{OUT}		0A		0.6A
Standby current	I_{IN}	$V_{CTRL} = 0VDC$		0.1 μ A	1 μ A
Quiescent current	I_Q	$V_{FB} = V_{REF} \times 105\%$		4 μ A	
Switching frequency	f_{SW}			3MHz	
Feedback voltage	V_{FB}		588mV	600mV	612mV
Output load regulation			refer to "Characteristic Curves"		
Maximum Duty Cycle			100%		
Minimum On Time				80ns	
Soft Start				1ms	

Typical Application

$V_{IN}= 1.8-5.5VDC$, $V_{OUT}= 1.8VDC$, $I_{OUT}= 0.6A$



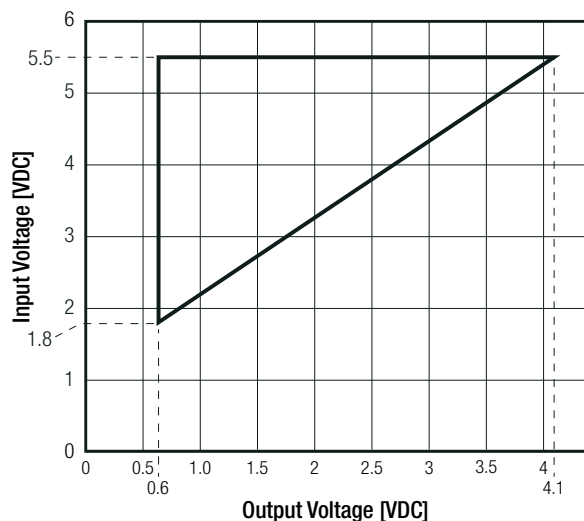
Notes:

Note6: The RPZ-0.6 require a 4.7 μ F MLCC input capacitor as close as possible to V_{IN} and GND pin and a 10 μ F output capacitor to reduce noise.

When $V_{OUT} < 1.2VDC$ a minimum 20 μ F output capacitor is recommended.

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

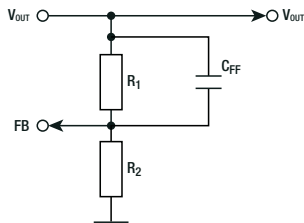


Specifications

OUTPUT VOLTAGE SETTING

A resistor divider connected to the FB pin (pin 4) sets the output voltage of the RPZ-0.6. The output voltage adjustment range is from 0.6VDC to 5.5VDC. The schematic below shows the feedback resistor connections for setting the output voltage. The recommended value of R1 is 1MΩ. 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 $V_{OUTset} = 1.8VDC$

$$R_2 = \frac{0.6V}{(1.8V - 0.6V)} \times 1M\Omega = 500k\Omega$$

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	1M	1M	22-100 (optional *)	20
1.5		665k		10
1.8		499k		10
2.5		316k		10
3.3		221k		10

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

CTRL OPERATING CONDITIONS ($V_{IN} = 4.2VDC$, $V_{OUT} = 1.8VDC$, $I_{OUT} = 0.6A$, unless otherwise noted, typical values are at $T_{AMB} = +25^\circ C$)

Parameter	Symbol	Condition	Min.	Typ.	Max.
CTRL rising threshold	V_{CTRL_RISING}		1.2VDC		
CTRL falling threshold	$V_{CTRL_FALLING}$				0.4VDC
CTRL hysteresis				100mV	

PROTECTIONS

Parameter	Condition	Value
Short Circuit Protection SCP		hiccup mode
Over Current Protection OCP		1.3A typ.
Thermal shutdown	junction temperature	150°C typ.
	hysteresis	15°C

THERMAL OPERATING CONDITIONS ($V_{IN} = 4.2VDC$, $V_{OUT} = 1.8VDC$, $I_{OUT} = 0.6A$, unless otherwise noted, typical values are at $T_{AMB} = +25^\circ C$)

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_{thJA}	junction to ambient		60.3K/W	
	R_{thJC}	junction to case		10K/W	

Notes:

Note8: Tested with 60x60mm, double layer PCB (75μm copper) RECOM EVM board.

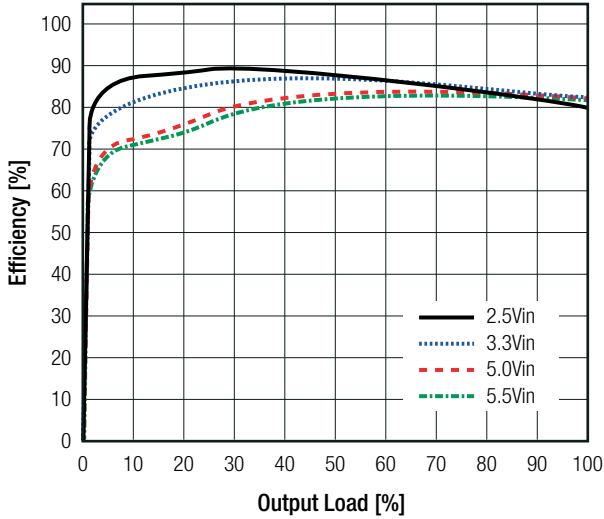
ENVIRONMENTAL

Parameter	Condition	Value
ESD	human-body model (HBM), ANSI/ESDA/JEDEC JS-001	±2.5kV
	charged-device model (CDM), JEDEC JESD22-C101	±600V
MTTF	$T_J = 55^\circ C$; $V_{IN} = 5.5VDC$	13100 x 10 ³ hours

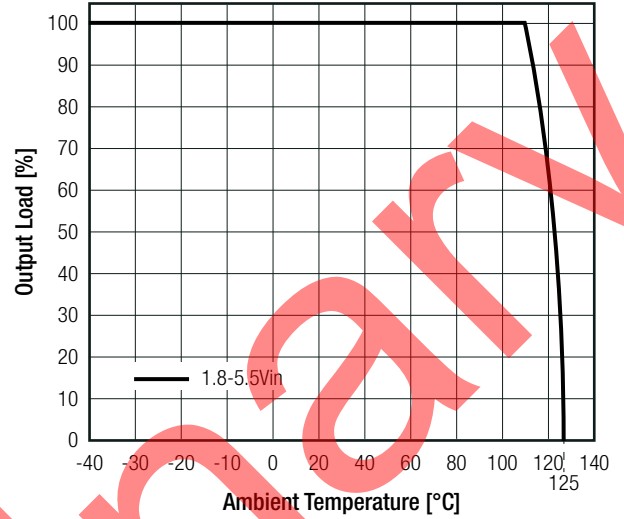
Specifications

TYPICAL PERFORMANCE CHARACTERISTICS ($V_{OUT}= 1.8VDC, T_J= +25^{\circ}C$; tested with RECOM evaluation module: RPZ-0.6-EVM-1)

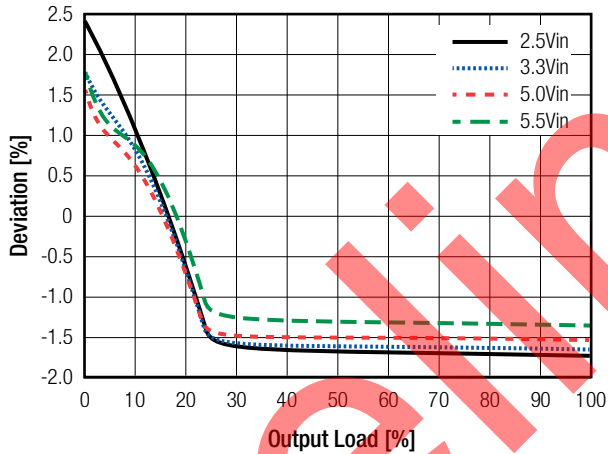
Efficiency vs. Output current



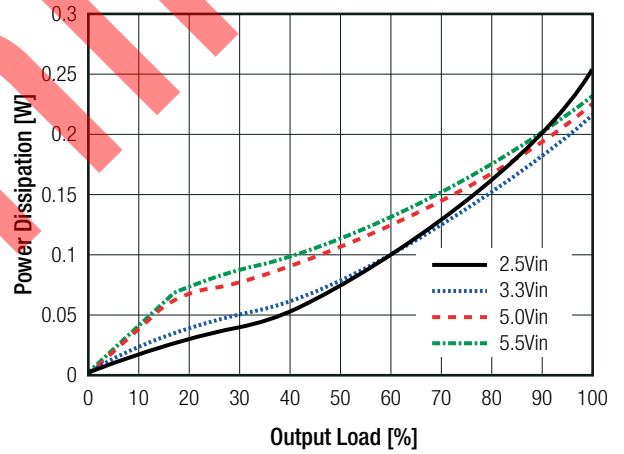
Thermal Derating



Deviation vs. Load

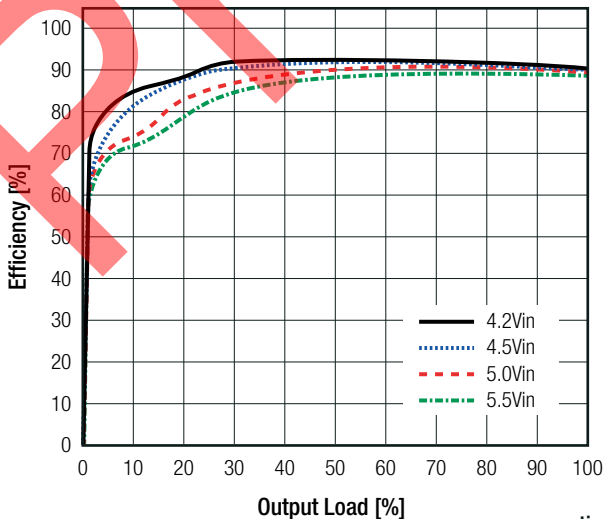


Power Dissipation

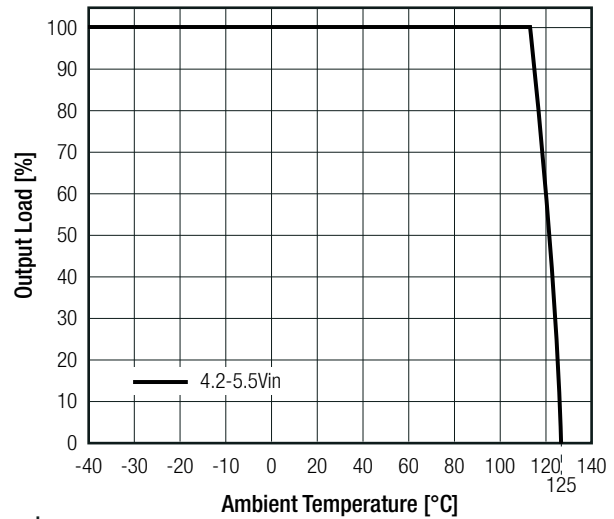


TYPICAL PERFORMANCE CHARACTERISTICS ($V_{OUT}= 3.3VDC, T_J= +25^{\circ}C$; tested with RECOM evaluation module: RPZ-0.6-EVM-1)

Efficiency vs. Output current



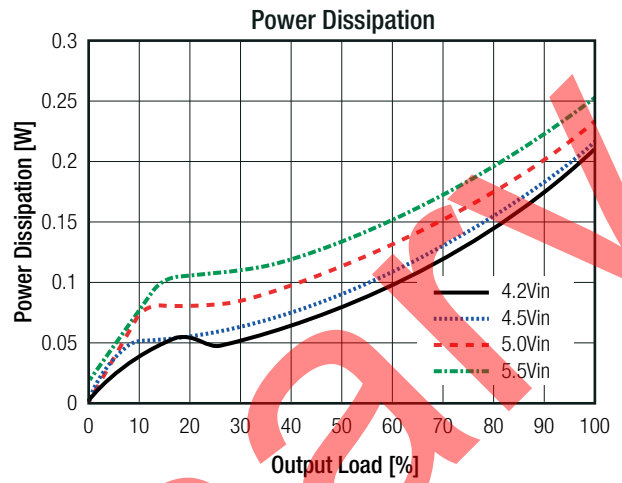
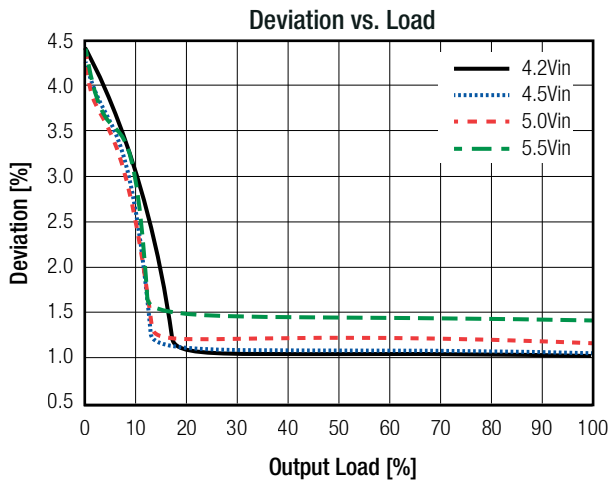
Thermal Derating



continued on next page

Specifications

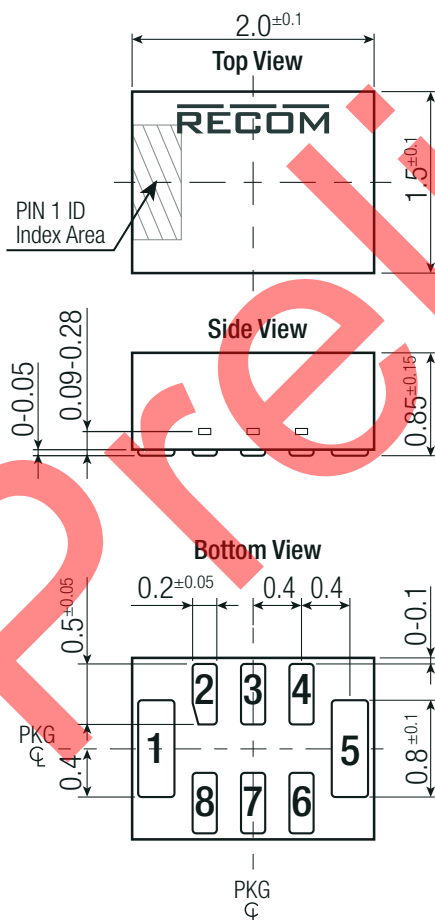
TYPICAL PERFORMANCE CHARACTERISTICS ($V_{OUT}= 3.3VDC$, $T_J= +25^{\circ}C$; tested with RECOM evaluation module: RPZ-0.6-EVM-1)



DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Dimension (LxWxH)		2.0 x 1.5 x 1.0mm
Weight		0.1g typ.

Dimension Drawing (mm)



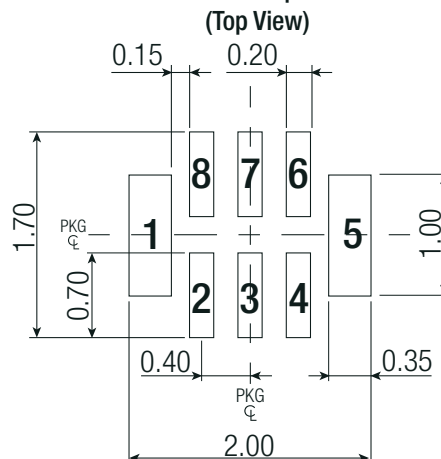
Pad Information

Pad #	Function	Description
1	V_{OUT}	Output voltage pin. Decouple this pin to GND with at least a 10 μ F MLCC (refer to "Typical Application")
2	CTRL	Pull high to turn on. Don not leave floating.
3, 7	GND	Ground pin
4	FB	Feedback voltage pin. Connect to the center point of output resistor divider to set the output voltage. (refer to "OUTPUT VOLTAGE SETTING")
5, 6	SW	Switch node pin. Leave it floating
8	V_{IN}	Input voltage pin. Decouple to GND with at least a 4.7 μ F ceramic capacitor (refer to "Typical Application")

All dimensions exclude mold flash and metal burr.

Tolerances:
 x.x= ±0.1mm
 x.xx= ±0.05mm

Recommended Footprint Details (*)



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

Specifications

SAFETY AND CERTIFICATIONS

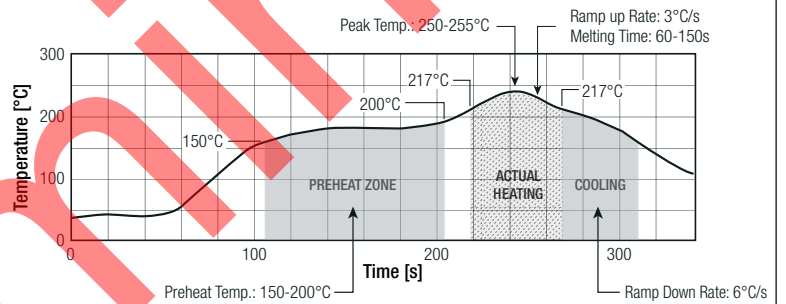
Certificate Type (Safety)	Standard
RoHS2	RoHS 2011/65/EU + AM2015/863

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

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

Solder Profil



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	3000pcs
	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

The product information and specifications may be subject to changes even without prior written notice. The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.