Technical Data Sheet

RPZ-2.0 Series ◊ Power Module

2.0 Amp ◊ 2.75-6.0VDC ◊ 18 Pad QFN Package

RECOM DC/DC Converter

FEATURES

- 2.75-6VDC input range
- Low profile 1.6mm
- Ultra-compact footprint 2.5x3.5mm
- Adjustable output 0.6 to 5.74V
- 2A output current
- Up to 90°C ambient temperature at full load
- Integrated solution
- 3 year warranty

Dimensions (LxWxH): 2.5 x 3.5 x 1.6mm (0.098 x 0.137 x 0.063inch)
0.1g (0.0002lbs)

APPLICATIONS

SAFETY & EMC

RoHS² compliant 10 from 10

Reach compliant

DESCRIPTION

The RPZ-2.0 is a synchronous buck converter with integrated inductor in a tiny 2.5mm x 3.5mm x 1.6mm thermally-enhanced QFN package. The input range is from 2.75 to 6VDC. The output voltage can be set with two resistors in the range from 0.6V up to 5.74V. The output current is up to 2A and is fully protected against continuous short-circuits, output overcurrent, or over-temperature faults. Its high current and small size make the RPZ-2.0 ideal for imaging systems, distributed power architectures, optical modules, FPGA, ASIC, DSP power, and portable battery-powered equipment in telecom as well as industrial applications.

SELECTION GUIDE

Part Number	Input Voltage Range [VDC]	Output Voltage Range [VDC]	Output Current max. [mA]	Efficiency (1) typ. [%]
RPZ-2.0	2.75 - 6.0	0.6 - 5.74	2000	82

Note1: Efficiency is tested at V_{IN}= 3.6VDC, V_{OUT}= 1.2VDC full load at +25°C ambient

MODEL NUMBERING

RPZ-2.0-

Output Current — Packaging (2)

Note2: Add suffix "-R" for tape and reel packaging
Add suffix "-CT" for bag packaging (refer to **„Packaging information“**)

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ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Min.	Typ.	Max.
Absolute maximum voltage	V_{IN}		-0.3VDC		6.5VDC
		others	-0.3VDC		6.5VDC
Maximum continuous power losses (3)		T_{AMB} = +25°C			3W
Junction Temperature	T_J				+150°C
Lead Temperature					+260°C

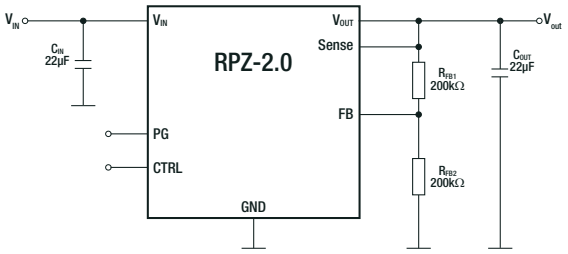
Note3: Exceeding maximum allowable power dissipation causes device to enter thermal shutdown which protects device from permanent damage.

BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

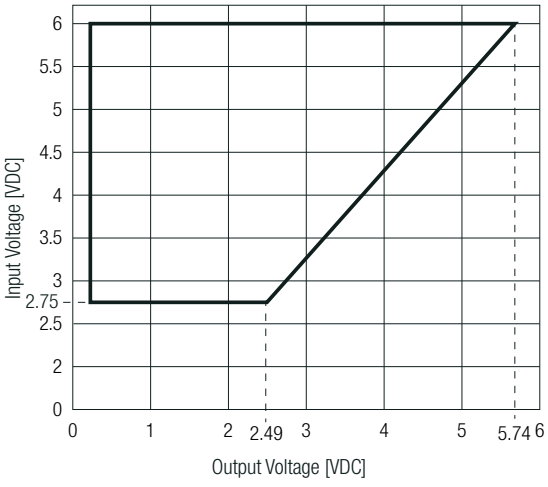
Parameter	Symbol	Condition	Min.	Typ.	Max.
Input Voltage Range	V_{IN}	refer to **„Safe Operating Area“**	2.75VDC		6VDC
Under Voltage Lockout UVLO			2.3VDC	2.5VDC	2.75VDC
Under Voltage Lockout Hysteresis				400mV	
Quiescent current	I_Q	V_{IN}= 3.6VDC, V_{CTRL}= 2VDC, V_{FB}= 0.63VDC		500µA	
Recommended Input Capacitance		V_{IN}= 3.6VDC, V_{OUT}= 1.2VDC, I_{OUT}= 2A	4.7µF	22µF	
Output Capacitance		V_{IN}= 3.6VDC, V_{OUT}= 1.2VDC, I_{OUT}= 2A	10µF	22µF	100µF
Output Voltage Range	V_{OUT}	refer to **„Safe Operating Area“**	0.6VDC		5.74VDC
Standby current	I_{IN}	V_{CTRL}= 0VDC, T_J= 25°C		0µA	1µA
Feedback voltage	V_{FB}	2.75VDC ≤ V_{IN} ≤ 6VDC	591mV	600mV	609mV
Feedback current	I_{FB}	V_{FB}= 0.6VDC		10nA	
High Side MosFet Peak Current Limit			2.8A	5.6A	
Low Side Valley Current Limit				1.5A	
Internal Inductor L Value	L	Inductance value at 1MHz		1µH	
Dropout resistance	R_{DR}	100% on duty		130mΩ	
Output Ripple		V_{OUT}= 1.2VDC, I_{OUT}= 2000mA, C_{OUT}= 22µF		5mV	
Load transient peak-to-peak voltage		C_{OUT}= 22µF, I_{OUT}= 0 to 2000mA @1A/µs			100mV
Minimum On Time				80ns	
Minimum Off Time				230ns	
On time	T_{ON}	V_{IN}= 5VDC, V_{OUT}= 1.2VDC		185ns	
		V_{IN}= 3.6VDC, V_{OUT}= 1.2VDC		250ns	

Typical Application

V_{IN}= 2.75-6VDC, V_{OUT}= 1.2VDC, I_{OUT}= 2A



Safe Operating Area



CTRL OPERATING CONDITIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition	Min.	Typ.	Max.
CTRL input logic low voltage				0.3VDC
CTRL input logic high voltage		1.2VDC		
CTRL input current	V_{CTRL}= 2VDC		2µA	
	V_{CTRL}= 0VDC		0µA	

POWER GOOD OPERATING CONDITIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition	Min.	Typ.	Max.
UV threshold			-10%	
OV threshold			10%	
Delay			100µs	
Sink current capability	sink current 1mA			0.4VDC
Logic high voltage	V_{IN}= 5VDC, V_{FB}= 0.6VDC	4VDC		
Internal pull-up resistor			440kΩ	

SWITCHING CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Symbol	Condition	Min.	Typ.	Max.
Switching Frequency	f_{SW}	V_{OUT}= 1.2VDC, I_{OUT}= 1000mA		1150kHz	
Switch leakage	V_{SW}	V_{CTRL}= 0VDC, V_{IN}= 6VDC, V_{SW}= 0VDC and 6VDC		0µA	2µA

PROTECTIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition		Value
Short Circuit Protection SCP			hiccup, auto recovery
Over Current Protection OCP			hiccup, auto recovery
Thermal shutdown	restart after cooldown	junction temperature	160°C typ.
		hysteresis	30°C typ.

THERMAL OPERATING CONDITIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Symbol	Condition	Min.	Typ.	Max.
Operating Junction Temperature	T_J	refer to **„Thermal Derating“**	-40°C		+125°C
Thermal Resistance (4)	$R_{th_{JA}}$	junction to ambient			42K/W
	$R_{th_{JC}}$	junction to case			13K/W

Note4: Test PCB= 6.4 x 6.4cm double sided PCB with 20oz copper, natural convection

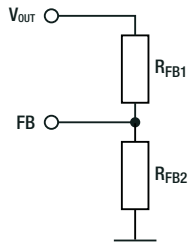
ENVIRONMENTAL

Parameter	Condition	Value
Moisture Sensitive Level		Level 3, 245°C, 168hrs

OUTPUT VOLTAGE SETTING

The RPZ-2.0 series offers the feature of trimming the output voltage by using external trim resistors (see **„Typical Application“**). The external resistor divider is used to set the output voltage. The feedback resistor (R_{FB1}) cannot be too large or too small considering the trade-off for stability and dynamics. There is no strict requirement for the feedback resistor. R_{FB2} can be calculated with Equation. The values for trim resistors shown in trim tables below are according to standard E96 values; therefore, the specified voltage may slightly vary.

Feedback Network



Calculation:

$$R_{FB2} = \frac{R_{FB1}}{\frac{V_{OUT}}{0.6} - 1}$$

Practical example with V_{OUT}= 1.8VDC

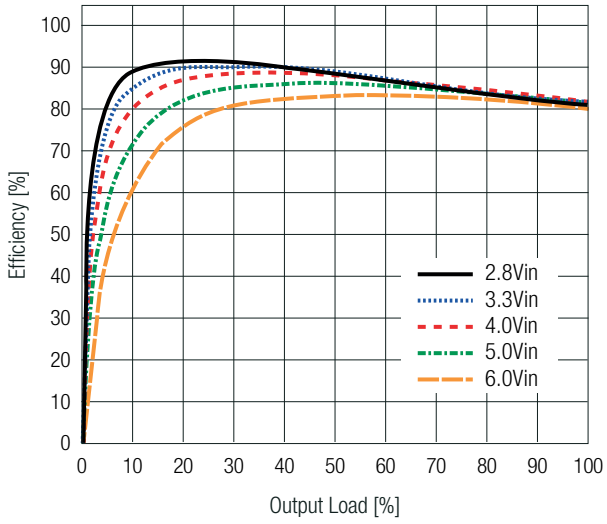
$$R_{FB2} = \frac{200k\Omega}{\frac{1.8}{0.6} - 1} = \mathbf{100}k\Omega$$

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

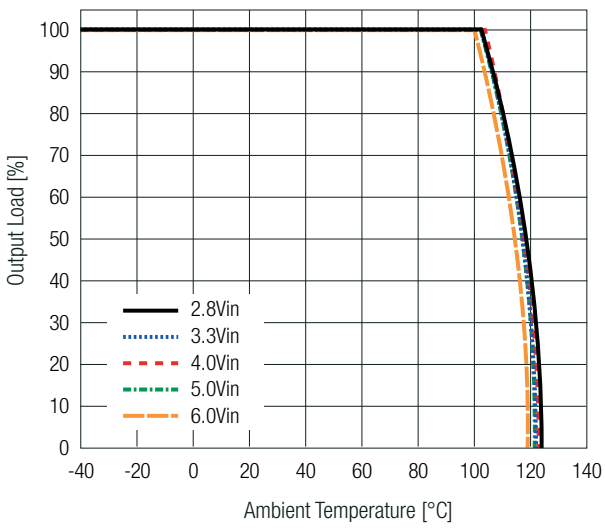
V_{OUT} [VDC]	R_{FB1} [Ω]	R_{FB2} [Ω]
1.0	200k	300k
1.2		200k
1.8		100k
2.5		63k2
3.3		44k2

TYPICAL PERFORMANCE CHARACTERISTICS (measured @ T_{AMB}= 25°C, V_{OUT}= 1.2VDC)

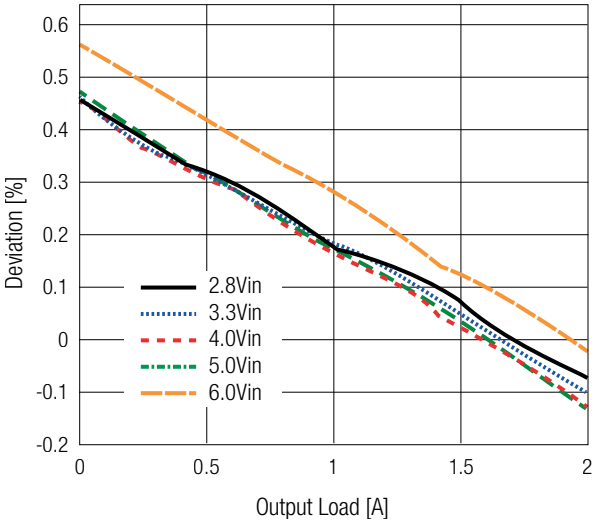
Efficiency vs. Output current



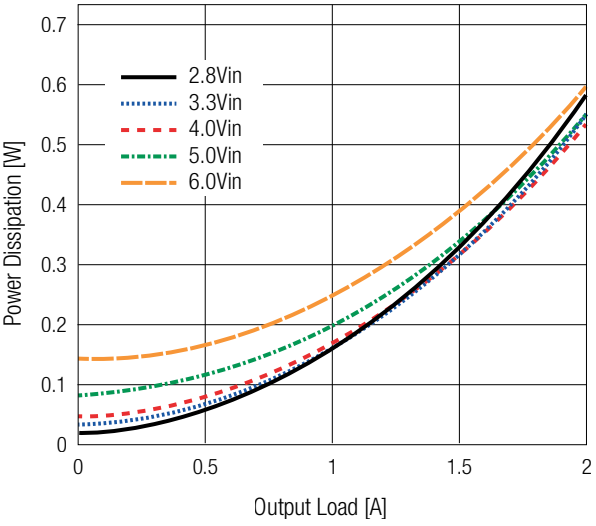
Thermal Derating



Deviation vs. Load

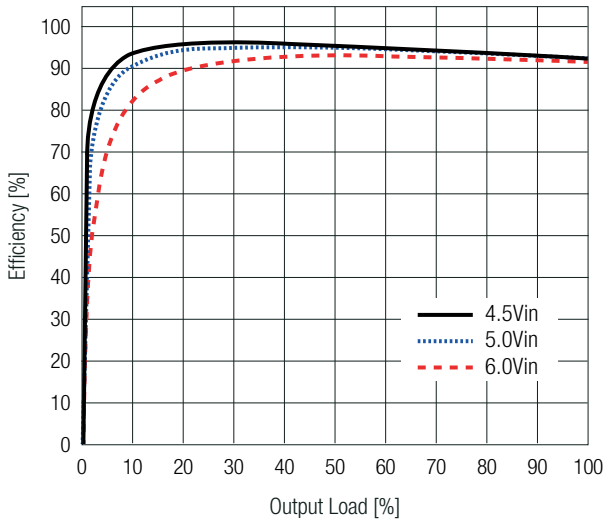


Power Dissipation

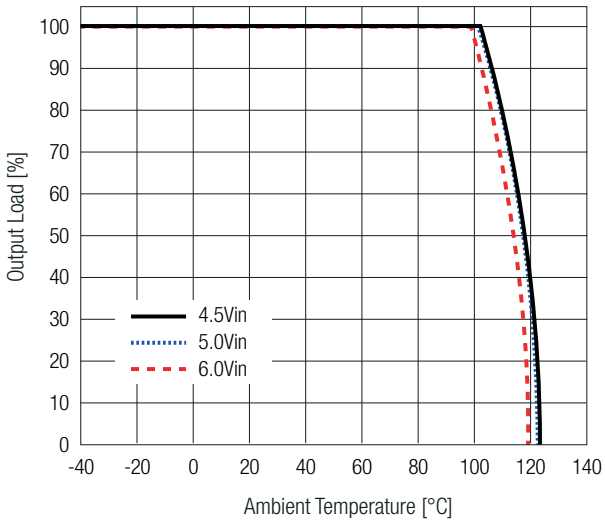


TYPICAL PERFORMANCE CHARACTERISTICS (measured @ T_{AMB}= 25°C, V_{OUT}= 3.3VDC)

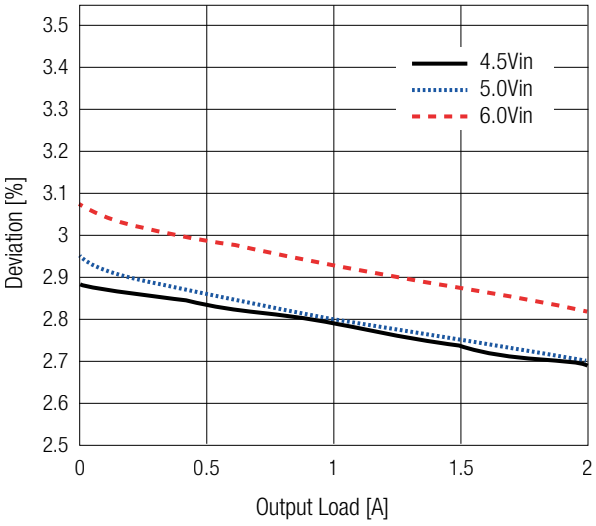
Efficiency vs. Output current



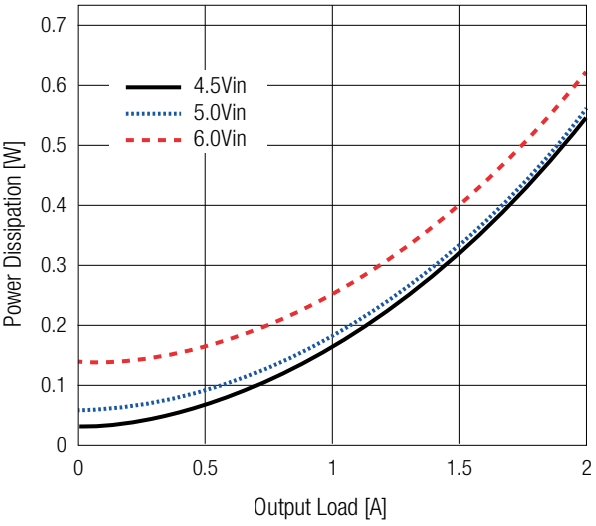
Thermal Derating



Deviation vs. Load



Power Dissipation



SAFETY & CERTIFICATIONS

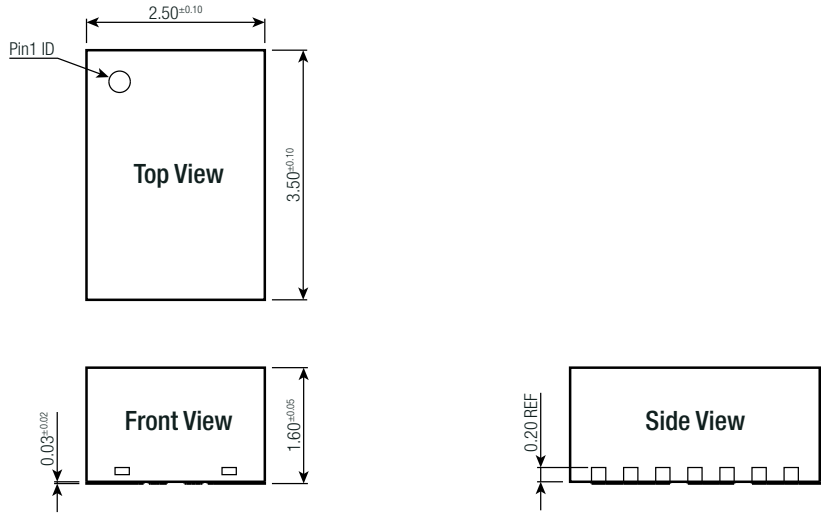
Certificate Type (Safety)	Report Number	Standard
RoHS2		RoHS 2011/65EU + AM2015/863

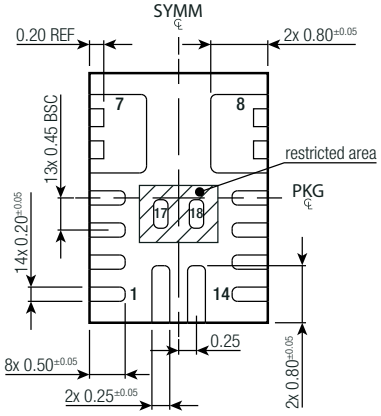
DIMENSION & PHYSICAL CHARACTERISTICS

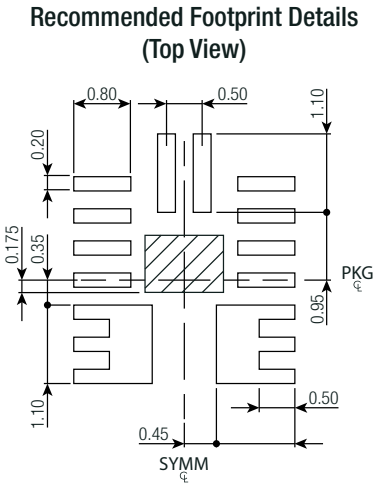
Parameter	Type	Value
Material	case	plastic
Dimension (LxWxH)		2.5 x 3.5 x 1.6mm 0.098 x 0.137 x 0.063inch
Weight		0.1g typ. 0.0002lbs

DIMENSION & PHYSICAL CHARACTERISTICS

Dimension Drawing (mm)







Pad Information

Pad #	Function	Description
1	AGND	Analog ground for the internal control circuit
2	FB	Feedback. Use an external resistor divider from the output to GND tapped to FB to set the output voltage
3	SENSE	Output voltage sense
4	CTRL	On/off control
5-7, 15	SW	Switch output
8-10	V_{OUT}	Power Output
11	NC	Do not connect this pin. Leave floating.
12	PG	Power good indicator. The output of PG is an open drain with an internal pull-up resistor to IN. PG is pulled up to IN when the FB voltage is within 10% of the regulation level; otherwise, PG is low.
13, 14	V_{IN}	Supply Voltage. The RPZ-2.0 operates from a +2.75V to +6V unregulated input range. A decoupling capacitor is needed to prevent large voltage spikes from appearing at the input.
16	PGND	Power Ground
17, 18	DNC	No connection. Leave DNC floating

Tolerances:
x.x= ±0.1mm
x.xx= ±0.05mm

PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	Suffix -R: tape & reel (diameter)	Ø330.2
	tape and reel (carton)	355.6 x 355.6 x 50.8mm
	Suffix -CT: moisture barrier bag	100 x 100 x 30mm
Packaging Quantity	Suffix -R: tape & reel	500pcs
	Suffix -CT: moisture barrier bag	10pcs
Tape Width		12mm
Storage Temperature Range		-65°C to +150°C
Storage Humidity	non-condensing	60% RH max.