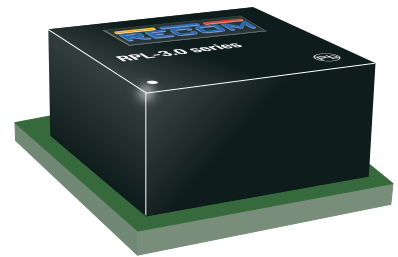# Features

Power Module

- Wide input range (3 - 18V)
- Low profile 1.45mm
- Small footprint 3x3mm
- Adjustable output 0.8 to 5.2V
- Up to 120°C ambient temperature with derating
- Integrated solution

RECOM
DC/DC Converter

RPL-3.0

3.0 Amp 10 Pad LGA Package

3 YEAR Warranty

Description

The RPL-3.0 is a buck converter with integrated inductor in a tiny 3mm x 3mm x 1.45mm thermally-enhanced LGA package. The input range is from 3.0 to 18VDC, allowing 5V and 12V supply rails to be used. The output voltage can be set with two resistors in the range from 0.8V up to 5.2V. 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 RPL-3.0 ideal for imaging systems, distributed power architectures, portable equipment in telecom as well as industrial applications.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current max. [mA]	Efficiency [1] typ. [%]
RPL-3.0	3.0-18.0	0.8-5.2	3000	89

Notes:

Note1: Efficiency tested at V_{IN}= 12VDC, full load and V_{OUT}= 3.3VDC

RoHS compliant 10 from 10

REACH compliant

EN55032 compliant

Model Numbering

RPL-3.0-___

Output Current —————— ——— Packaging [2]

Notes:

Note2: 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		20VDC
	V_{OUT}	0VDC		6.5VDC
	V_{CTRL}	0VDC		18VDC
	V_{PG}	0VDC		5.5VDC
	others [3]	-0.3VDC		4VDC
Maximum continuous power losses [4]	@ T_{AMB} = 25°C			2.08W
Junction Temperature	T_J			150°C
Lead Temperature				260°C

Notes:

Note3: For CTRL absolute max ratings, please refer to "**CTRL and SYNC Operating CONDITIONS**"

Note4: Exceeding maximum allowable power dissipation causes device to enter thermal shutdown which protects device from permanent damage. Refer to "**CHARACTERISTIC CURVES**"

EVAL BOARD available

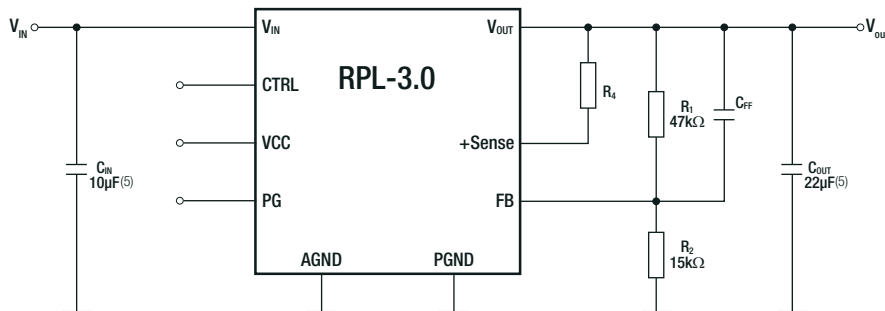www.recom-power.com/eval-ref-boards

Specifications

OPERATING CONDITIONS (V$_{IN}$= 12VDC, T$_J$= -40°C to +125°C, unless otherwise noted, typical values are at T$_J$= +25°C)

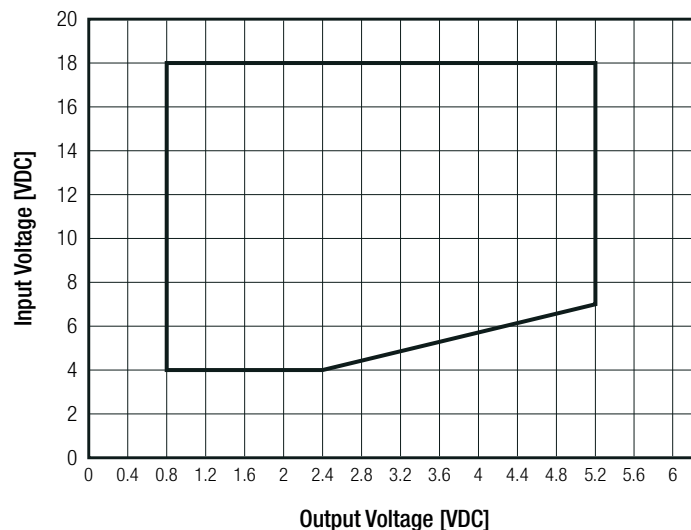| Parameter	Symbol	Condition	Min.	Typ.	Max.
Input Voltage Range	V$_{IN}$		4VDC		18VDC
UVLO threshold rising			3.2VDC	3.6VDC	3.9VDC
UVLO threshold falling				3.1VDC	
UVLO threshold hysteresis				500mV	
Output Voltage Range	V$_{OUT}$		0.8VDC		5.2VDC
Output Current Range	I$_{OUT}$		0A		3A
Standby current	I$_{IN}$	V$_{CTRL}$ = 0VDC			15µA
Quiescent current	I$_Q$	V$_{FB}$ = 0.85VDC, no switching		1.2mA	
Switching frequency	f$_{SW}$		1870kHz	2200kHz	2530kHz
Feedback voltage	V$_{FB}$		788mV	800mV	812mV
Output load regulation		0-100% load @ 3.3V$_{OUT}$	-0.5%		+0.5%
V$_{CC}$ regulator	V$_{CC}$			3.3VDC	
V$_{CC}$ load regulation		I$_{CC}$ = 20mA		3%	
Rise time		V$_{OUT}$ from 10% to 90%		1.65ms	

Typical Application

V$_{IN}$= 4-18VDC; V$_{OUT}$= 3.3VDC, I$_{OUT}$= 3A

Notes:

Note5: A 10µF input capacitor (C$_{IN}$) is required to absorb the input switching current. A 22µF output capacitor (C$_{OUT}$) is mandatory.
To get stable regulation use for R$_1$ and R$_2$ 1% or 0.1% resistors, R$_4$ should be 1kOhm.
RECOM recommends low ESR X5R or X7R ceramic caps.

Safe Operating Area

Specifications

CTRL OPERATING CONDITIONS (V_{IN}= 12VDC, T_J= -40°C to +125°C, unless otherwise noted, typical values are at T_J= +25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.
CTRL rising threshold	V_{CTRL_RISING}		1.1VDC	1.2VDC	1.3VDC
CTRL falling threshold	$V_{CTRL\_FALLING}$		0.96VDC	1VDC	1.04VDC

POWER GOOD OPERATING CONDITIONS (V_{IN}= 12VDC, T_J= -40°C to +125°C, unless otherwise noted, typical values are at T_J= +25°C)

Parameter	Symbol	Condition		Min.	Typ.	Max.
OV rising threshold	V_{FB}	PG_{OVHI}	fault	110%	115%	120%
OV falling threshold	V_{FB}	PG_{OVLO}	good		110%	
UV rising threshold	V_{FB}	PG_{UVHI}	good	85%	90%	95%
UV falling threshold	V_{FB}	PG_{UVLO}	fault		80%	
Sink current capability	V_{PG}	$sink_{current}$ = 4mA			0.4VDC	0.6VDC

PROTECTIONS

Parameter	Symbol	Condition	Min.	Typ.	Max.
Over current Limitation	L_{Limit1}	current monitor via internal MOSFET $R_{DS(on)}$	3A	3.3A	3.9A
OVP threshold	V_{OVP}	if V_{FB} is greater than V_{OVP}, for t_{OVP}, device will enter hiccup mode	110%	115%	120%
OVP hysteresis		disabled during soft start		5%	
Over voltage delay	t_{OVP}	if V_{FB} is greater than V_{OVP}, for t_{OVP}, device will enter hiccup mode		2µs	
Output pin OVP	$V_{OVP\ FB\ >\ 115\%}$		5.7VDC	6VDC	6.3VDC
Absolute OVP hysteresis				50mV	

THERMAL OPERATING CONDITIONS (V_{IN}= 12VDC, T_J= -40°C to +125°C, unless otherwise noted, typical values are at T_J= +25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.
Operating Junction Temperature	T_J		-40°C		+125°C
Thermal Resistance [6]	R_{thJA} R_{thJC}	junction to ambient junction to case		65K/W 30K/W	
Thermal shutdown		hysteresis		150°C 20°C	

Notes:

Note6: Tested with RECOM evaluation module: RPL-3.0-EVM-1

OUTPUT VOLTAGE SETTING

The external resistor divider sets the output voltage. Choose the R1 resistance. R2 can be estimated with Equation:
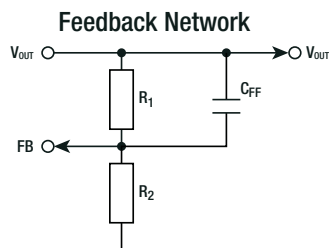
Feedback Network

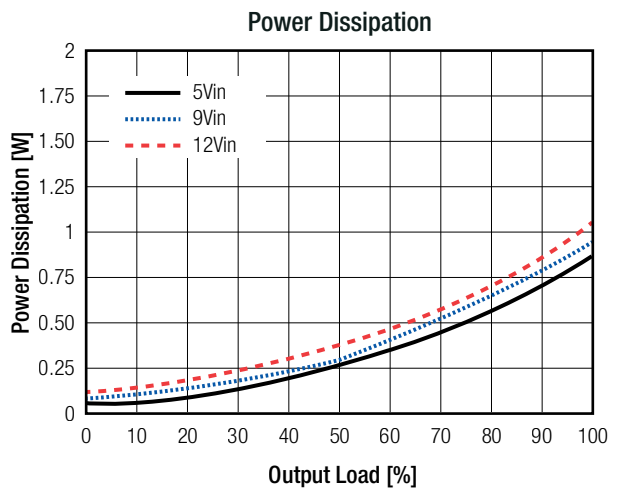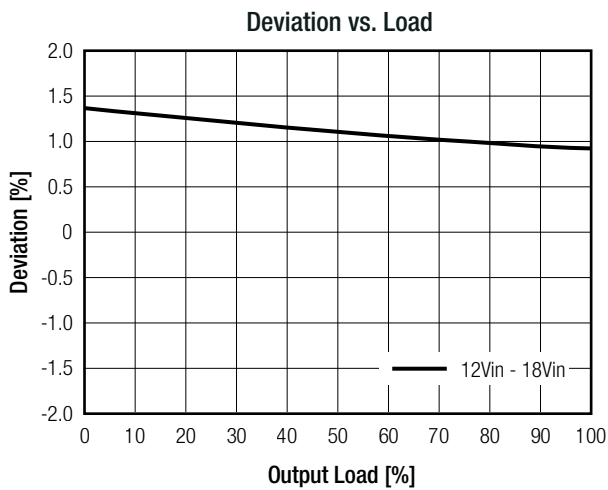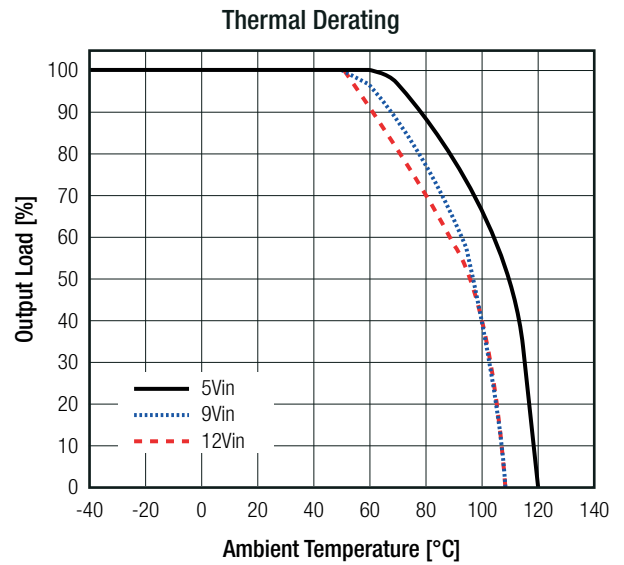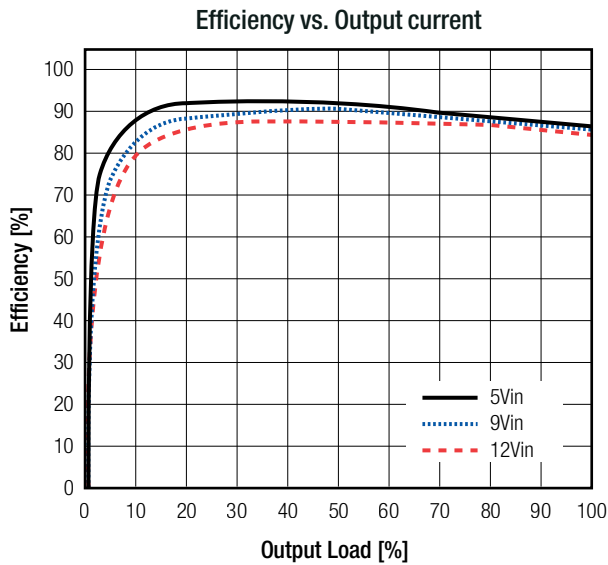$$R2 = \frac{R1}{\dfrac{V_{OUT}}{0.8VDC} - 1}$$

Where V_{OUT} is the output voltage. The output voltage feedback gain is determined by:

$$G_{FB} = \frac{R2}{R1 + R2}$$

Table below lists recommended resistor values for common Vout:

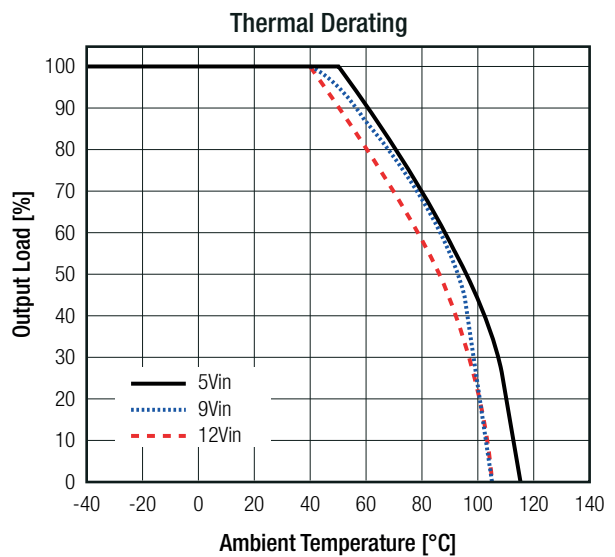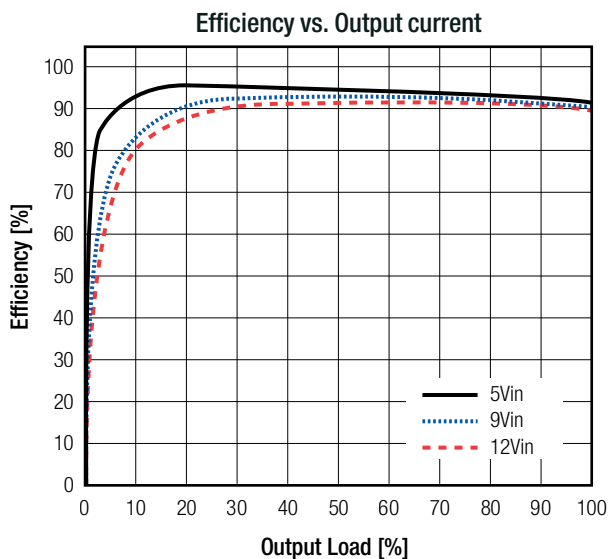| V_{OUT} [V]	R1 [kΩ]	R2 [kΩ]	C_{FF} [pF]	C_{OUT} [pF]
1	47	187	22	22
1.2	47	93.1	22	22
1.5	47	53.6	22	22
1.8	47	37.4	22	22
2.5	47	22	39	22
3.3	47	15	39	22
5	47	8.87	39	22

To stabilize the system and optimize the load transient response, place a feed-forward capacitor (C_{FF}) in parallel with R1. Upper table shows the values of feedback resistors and feed-forward capacitors for common output voltages.

Specifications

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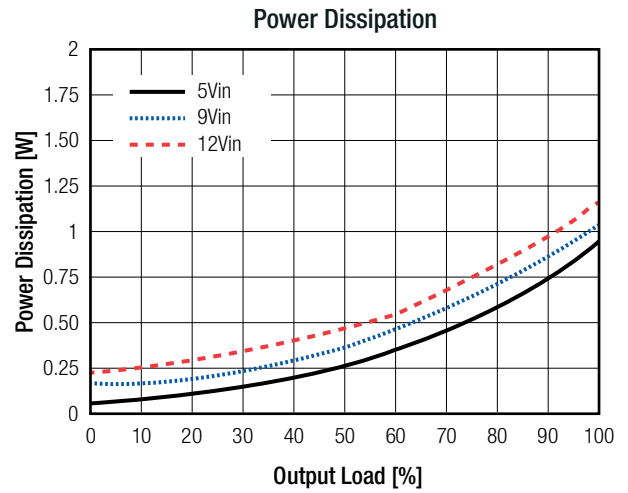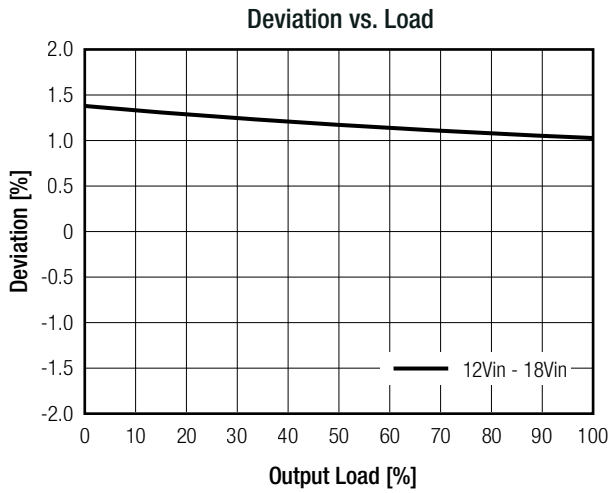

Efficiency vs. Output current

Thermal Derating

Deviation vs. Load

Power Dissipation

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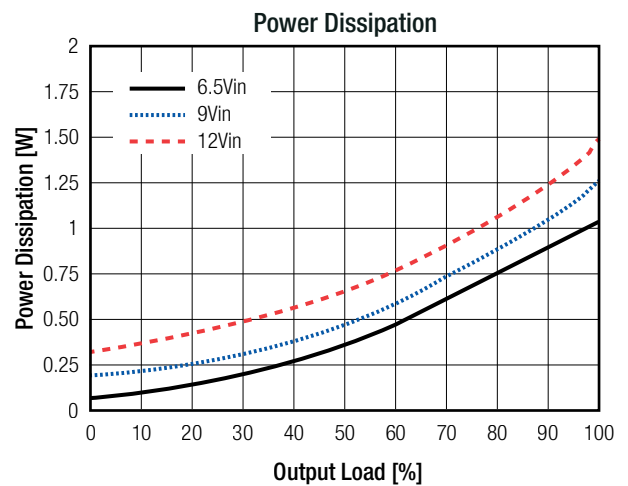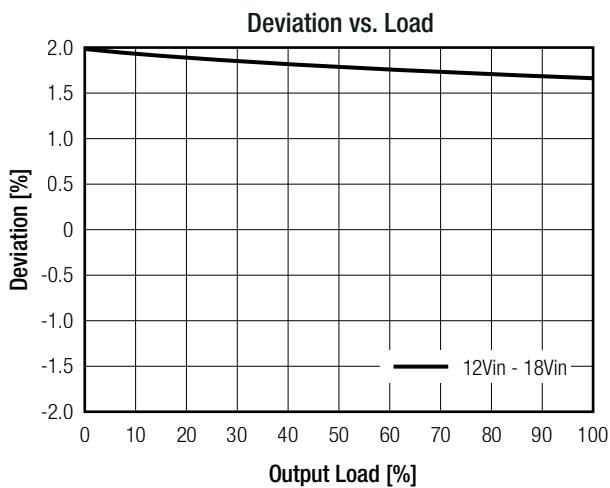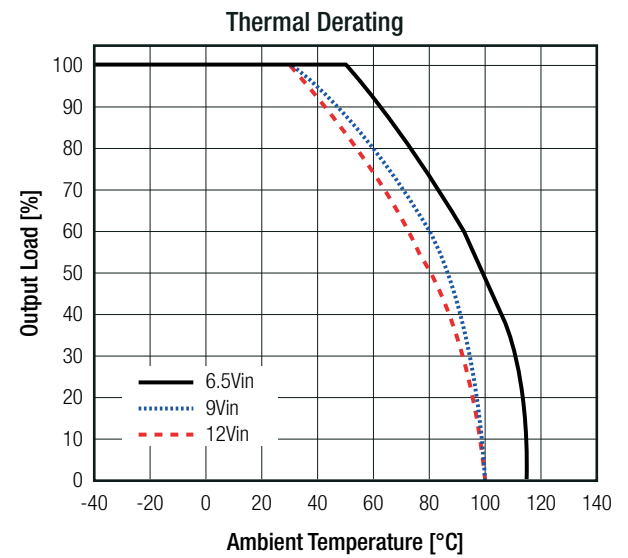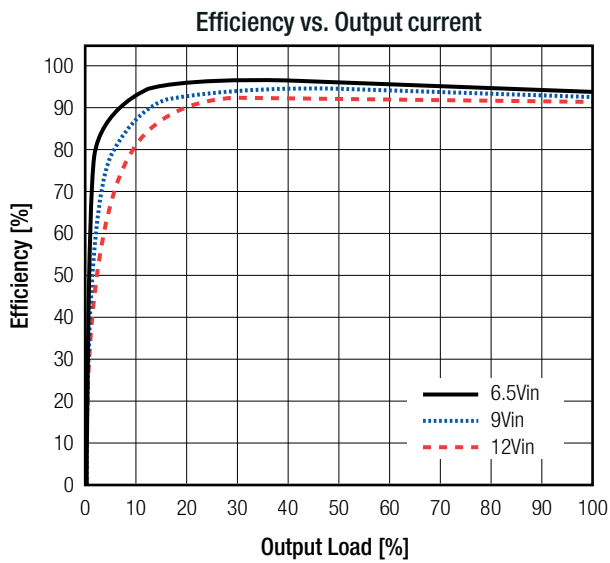

Efficiency vs. Output current

Thermal Derating

Specifications

TYPICAL PERFORMANCE CHARACTERISTICS (V$_{OUT}$= 3.3VDC, T$_J$= +25°C; tested with RECOM evaluation module: RPL-3.0-EVM-1)

Deviation vs. Load

Power Dissipation

TYPICAL PERFORMANCE CHARACTERISTICS (V$_{OUT}$= 5VDC, T$_J$= +25°C; tested with RECOM evaluation module: RPL-3.0-EVM-1)
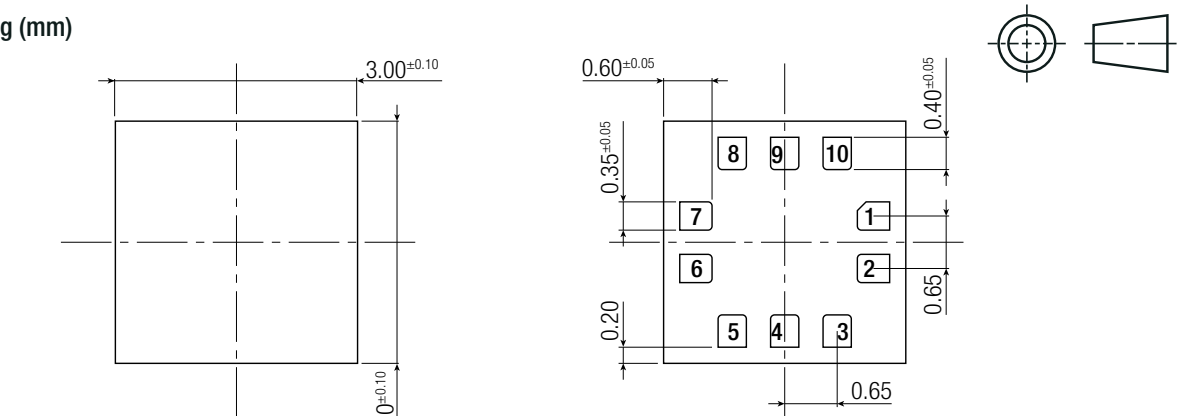

Efficiency vs. Output current

Thermal Derating

Deviation vs. Load

Power Dissipation

Specifications

SAFETY AND CERTIFICATIONS

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

DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material		plastic
Dimension (LxWxH)		3.00 x 3.00 x 1.45mm
Weight		0.1g typ.

Dimension Drawing (mm)

Recommended Footprint Details (Top View)

Pad Information

Pad #	Function	Description
1	CTRL	CTRL pin. Connect to +Vin when not used.
2	$+V_{IN}$	Input voltage. Connect using wide PCB traces. Requires Cin to decouple input rail.
3, 4	$-V_{IN}$	System ground. Reference ground of the regulated output voltage. Requires special consideration during PCB layout. Connect to $-V_{IN}$ with copper traces and vias.
5	V_{OUT}	Output voltage. Connect external bypass capacitors between this pin and GND close to the pins.
6	+Sense	Output voltage sense pin
7	FB	Feedback input. Used to set the output voltage between 0.8V and 5.2V
8	GND	Analog ground
9	VCC	Internal 3.3VDC LDO regulator output.
10	PG	Power good output.

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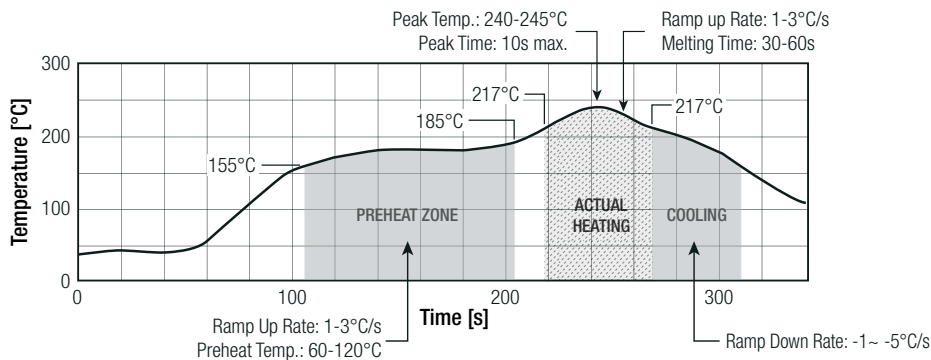   x.xx= ±0.05mm

Specifications

SOLDERING

Wave or Reflow etc.

Profile Feature	PB-Free Assembly
Preheat	
minimum Temperature (TS_min)	155°C
maximum Temperature (TS_max)	245°C
Time (tS)	100s-300s
Liquidus	
Temperature (TL)	217°C
Time (tL)	30-60s
Peak Temperature (TP)	245°C
Time remaining around Peak Temperature	10s
max Ramp Down Rate (from Ts_max to TP)	5°C/s
max Ramp Up Rate	3°C/s
max time from 25°C to Peak Temperature (TP)	8min

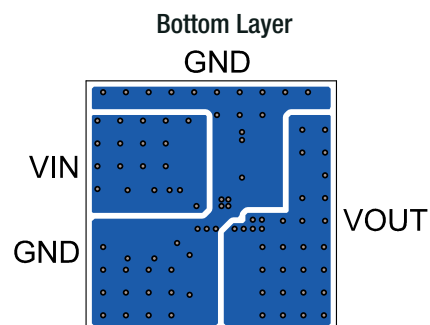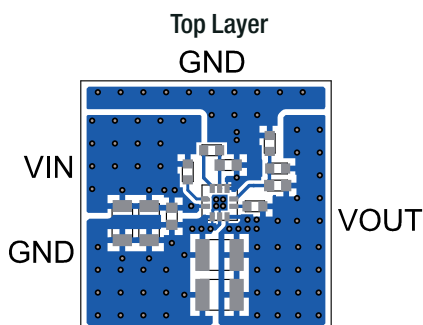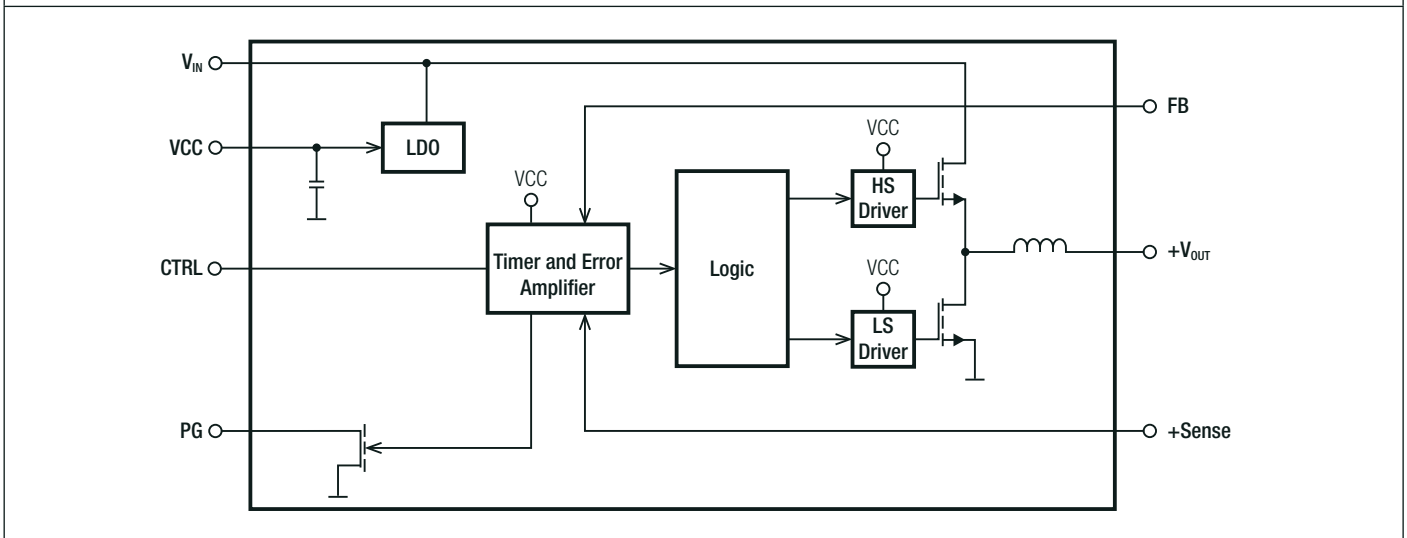|	
1	Pb-Free assembly is recommended according ro JEDEC J-STD020.
2	Ensure that the peak reflow temperature does not exceed 240°C ±5°C as per JEDEC J-STD020
3	The reflow time period during peak temperature of 240°C ±5°C should not exceed 30 seconds.
4	Reflow time above liquidus (217°C) should not exceed 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. vaporphase) are not verified and have to be validated at his own risk.

Solder Pofil

PCB LAYOUT SUGGESTION

Efficient PCB layout is critical for stable operation. For the best results, see Figure below and follow the guidelines below:

1. Keep the connection of the input ground and -V_{IN} as short and wide as possible.
2. Ensure that all feedback connections are short and direct.
3. Place the feedback resistors as close to the chip as possible.
4. Route sensitive analog areas such as FB away from SW.
5. Place enough vias around the chip to improve thermal performance.

Top Layer

Bottom Layer

Specifications

BLOCKDIAGRAMM

PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	reel (diameter + width)	Ø330.0 + 12.0mm height
	tape and reel (carton)	370.0 x 350.0 x 53.0mm
	moisture barrier bag ("-CT")	100.0 x 100.0 x 30.0mm
Packaging Quantity	tape and reel	500pcs
	tube ("-CT")	10pcs
Tape Width		12mm
Storage Temperature Range		-65°C to +150°C
Storage Humidity	non-condensing	95% RH max.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Switching Voltage Regulators *category:*

Click to view products by Recom Power *manufacturer:*

Other Similar products are found below :

FAN53610AUC33X FAN53611AUC123X MP2374DS-LF-Z EN6310QA NCP81108MNTXG NCP81109BMNTXG R3 LV5710GP-TE-L-H KE177614 MPQ4423GQ-AEC1-Z FAN53611AUC12X MAX809TTR NCV891234MW50R2G NCP6332CMTAATBG AST1S31PUR NCP81103MNTXG NCP81203PMNTXG NCP81208MNTXG NCP81109GMNTXG SCY1751FCCT1G NCP81109JMNTXG MP2161AGJ-Z NCP81241MNTXG MP2388GQEU-Z MPQ4481GU-AEC1-P MP8756GD-P MPQ2171GJ-P MPQ2171GJ-AEC1-P MP2171GJ-P NCV1077CSTBT3G MP28160GC-Z MPM3509GQVE-AEC1-P XDPE132G5CG000XUMA1 MP5461GC-P ISL95338IRTZ MP3416GJ-P BD9S201NUX-CE2 ISL9113AIRAZ-T MP5461GC-Z MPQ2172GJ-AEC1-Z MPQ4590GS-Z IR3888AMTRPBFAUMA1 MPQ4409GQBE-AEC1-P S-19903DA-A8T1U7 S-19903CA-A6T8U7 S-19903CA-S8T1U7 S-19902BA-A6T8U7 S-19902CA-A6T8U7 AP7361EA-SPR-13 AP7361EA-33DR-13