Technical Data Sheet

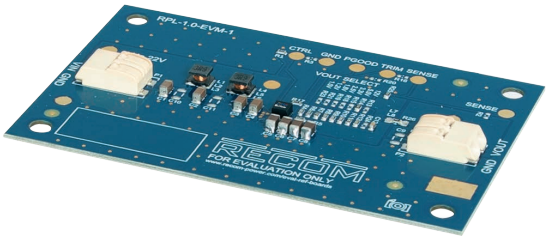
RPL-1.0-EVM-1 ◊ Evaluation Module

1Amp ◊ Input: 3-22VDC

RECOM DC/DC Converter

FEATURES

- Evaluation platform for RPL-1.0 Buck Regulator Module
- Thermal design considerations included
- EMI Class B filter
- Easy evaluation of control, power good, soft-start, and sensing functions



DESCRIPTION

The RPL-1.0-EVM-1 generates a constant output voltage with an output current up to 1A from an external DC source. All the functions of the RPL-1.0-EVM-1 like trimming, control, and sensing can be evaluated. Also the behavior in overload or over temperature can be evaluated easily before it is designed in.

SELECTION GUIDE

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current max. [mA]	Switching Frequency [kHz]
RPL-1.0-EVM-1	3-22	1.0, 1.2, 1.8, 2.5, 3.3, 5.0, 12	1000	1125-1325

Quick Start Guide:

1 Connect P1 to power supply (observe correct polarity!)

2. Connect P2 to a Load

3. The evaluation module is preset to VOUT= 5.0VDC.
The output voltage can be selected with values of 1.0V, 1.2V, 1.8V, 2.5V, 3.3V, 5.0V, and 12V by shorting a 0Ω resistor to the respective places as seen in the board silkscreen.
The deault sense preset via R25 is directly at the power module, so the preset voltage is very accurate at the output of the RPL-1.0. To equalize ohmic losses of the filter, remove the resistor at R25, and solder a 0Ω resistor at R2.

4. Disable the device via R3
The device is preset as normally on. It can be disabled by pulling the CTRL pad to GND.
Short R3 to disable the device.

Caution:
ESD sensitive. Always follow ESD preventative procedures when handling the product!

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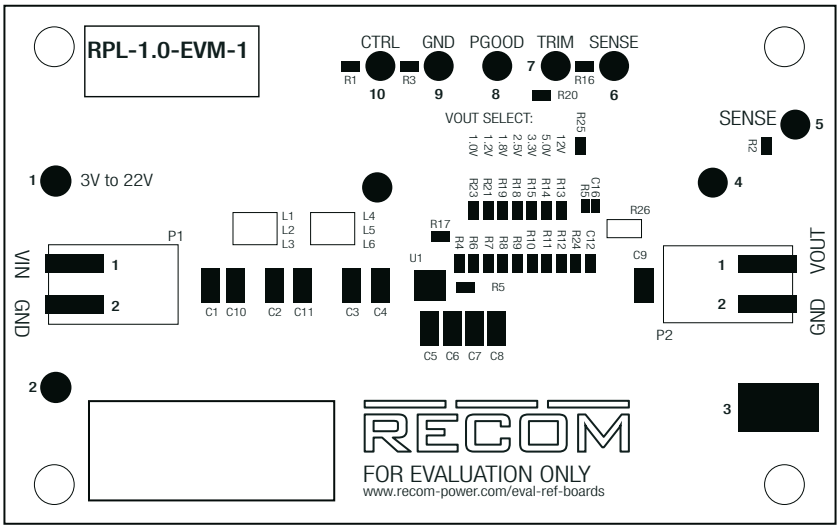
COMPONENT PLACEMENT



Connector Description

Pads direct connection

Pin	Name	Description
1	VIN	Positive Input Voltage
2	GND	Common GND
3	GND	Common GND
4	VOUT	Positive Output Voltage
5	SENSE	Output Voltage Sense Pin (leave open if not used)
6	SENSE	Output Voltage Sense Pin (leave open if not used)
7	TRIM	Trim Pin (leave open if not used)
8	PGOOD	Power Good Signal
9	GND	Common GND (can connect oscilloscope GND for measurement)
10	CTRL	CTRL Pin (leave open if not used)

P1

Pin	Name	Description
1	VIN	Positive Input Voltage (observe correct polarity!)
2	GND	Common GND

P2

Pin	Name	Description
1	VOUT	Positive Output Voltage
2	GND	Common GND

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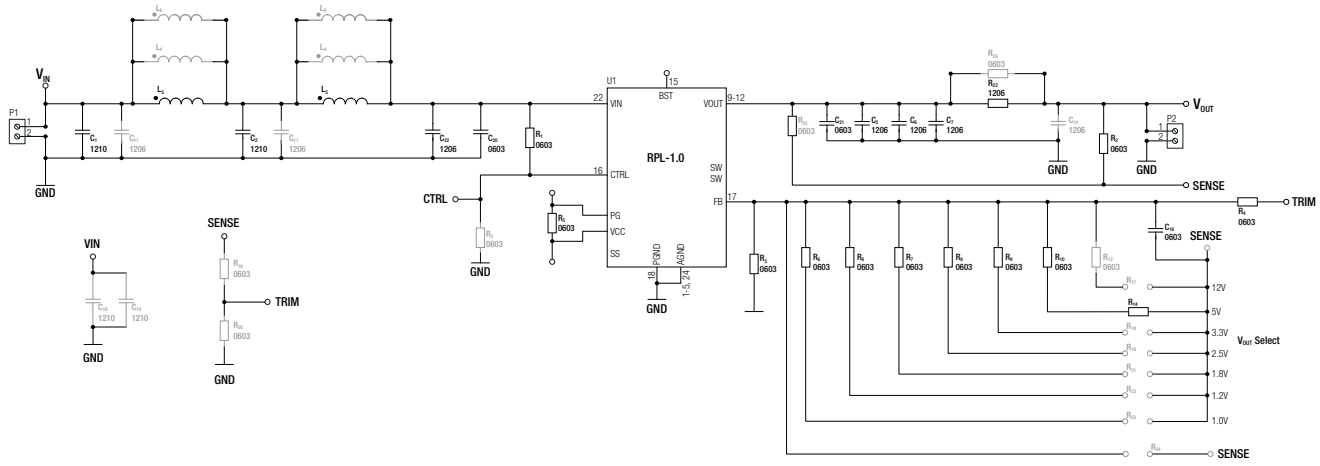
SCHEMATIC



Note1: Gray colored components are not mounted.

DESCRIPTION

U1: RPL-1.0 power module.

C1,C10,L1,L2,L3,C2,C11,L4,L5,L6,C3,C4: allow placement of various sized components to test input filter design. The populated filter is designed to meet EN55032 class B

C5,C6,C7,C8,L7,L8,R26,C9: allow placement of various sized components to test output filter design. The populated filter is designed to meet EN55032 class B

R3: connect 0Ω resistor to disable the module. This resistor is not populated.

R17: populated 100kΩ resistor which is pulled up to VCC. This is for output power good signal.

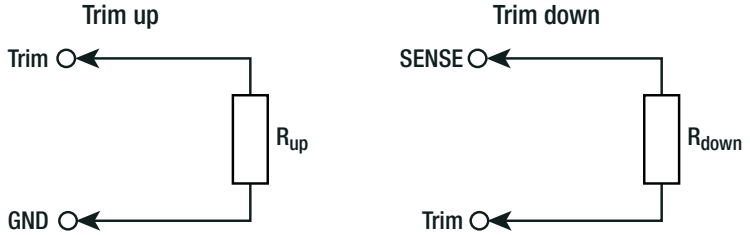
R2: populated 0Ω resistor sense point for output voltage after the filter.

R25: 0Ω resistor for direct output voltage measurement. If sense is desired at a different location, for example after the filter or directly at the load), desolder R25, and connect sense to the new measurement point.

R16 and R20: trim the output voltage. See **„Output Voltage Trimming“**

OUTPUT VOLTAGE TRIMMING

The RPL-1.0-EVM-1 offers the feature of trimming the output voltage by using external trim resistors. The values for the trim resistors in trim tables are according to standard E96 values; therefore, the specified voltage may slightly vary.



OUTPUT VOLTAGE TRIMMING

Calculation:

V_{OUT}	= nom. output voltage	[VDC]
$Vout_{set}$	= trimmed output voltage	[VDC]
V_{ref}	= reference voltage	[VDC]
R_{up}	= trim up resistor	[Ω]
R_{down}	= trim down resistor	[Ω]
R_1, R_2, R_3	= feedback resistors	[Ω]

V_{OUT} [VDC]	R_1 [Ω]	R_2 [Ω]	R_3 [Ω]	V_{ref}
1.0	147k	220k	1k	0.6VDC
1.2	220k			
1.8	442k			
2.5	698k			
3.3	976k			
5.0	2M62			
12	4M22			

$$R_{up} = \frac{[(V_{set} - V_{ref})(R_2R_3)] - [(R_1 \times V_{ref})(R_2 + R_3)]}{V_{ref}(R_1 + R_2) - R_2 \times V_{set}} = [k\Omega]$$

$$R_{down} = \frac{(V_{set} - V_{ref})(R_1R_2 + R_2R_3) - V_{ref}(R_1R_3)}{V_{ref}(R_1 + R_2) - V_{set}(R_2)} = [k\Omega]$$

Practical Example RPL-1.0, trim up:

$$R_{up} = \frac{[(6 - 0.6)(220k \times 1k)] - [(1.62M \times 0.6)(220k + 1k)]}{[0.6 \times (1.62M + 220k)] - (220k \times 6)}$$

$$R_{up} = 1M\Omega \ (according\ to\ E96\ 1\%)$$

Practical Example RPL-1.0, trim down:

$$R_{down} = \frac{(4 - 0.6)[(1.62M \times 220k) + (220k \times 1k)] - (0.6 \times 1.62M \times 1k)}{[0.6 \times (1.62M + 220k)] - (4 \times 220k)}$$

$$R_{down} = 5M36\Omega \ (according\ to\ E96\ 1\%)$$

$Vout_{set}$= 1.0VDC

Trim up

$Vout_{set}$ =	1.1	[VDC]
R_{up} (E96) ≈	887k	[Ω]

Trim down

$Vout_{set}$ =	0.9	0.8	[VDC]
R_{down} (E96) ≈	432k	147k	[Ω]

$Vout_{set}$= 1.2VDC

Trim up

$Vout_{set}$ =	1.3	1.4	[VDC]
R_{up} (E96) ≈	1M33	665k	[Ω]

Trim down

$Vout_{set}$ =	1.08	[VDC]
R_{down} (E96) ≈	887k	[Ω]

$Vout_{set}$= 1.8VDC

Trim up

$Vout_{set}$ =	1.9	2	[VDC]
R_{up} (E96) ≈	2M8	1M37	[Ω]

Trim down

$Vout_{set}$ =	1.7	1.6	1.5	[VDC]
R_{down} (E96) ≈	4M53	2M15	1M3	[Ω]

$Vout_{set}$= 2.5VDC

Trim up

$Vout_{set}$ =	2.6	2.8	3	[VDC]
R_{up} (E96) ≈	4M32	1M4	845k	[Ω]

Trim down

$Vout_{set}$ =	2.2	2.1	2	[VDC]
R_{down} (E96) ≈	3M65	2M61	2M	[Ω]

$Vout_{set}$= 3.3VDC

Trim up

$Vout_{set}$ =	3.4	3.5	3.6	3.63	[VDC]
R_{up} (E96) ≈	4M22	2M43	1M74	1M6	[Ω]

Trim down

$Vout_{set}$ =	2.9	[VDC]
R_{down} (E96) ≈	6M19	[Ω]

$Vout_{set}$= 5.0VDC

Trim up

$Vout_{set}$ =	5.5	6	[VDC]
R_{up} (E96) ≈	2M	1M	[Ω]

Trim down

$Vout_{set}$ =	4	[VDC]
R_{down} (E96) ≈	5M36	[Ω]

$Vout_{set}$= 12VDC

Trim down

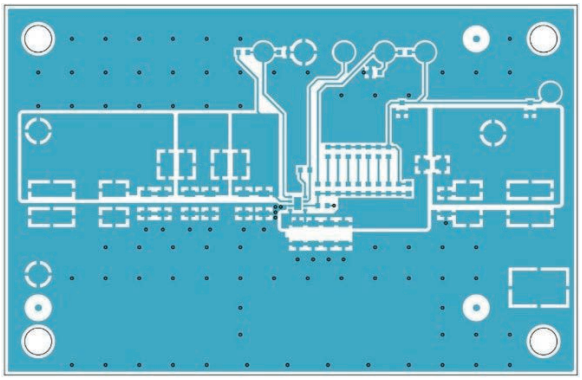
$Vout_{set}$ =	9.6	[VDC]
R_{down} (E96) ≈	15M	[Ω]

DIMENSION & PHYSICAL CHARACTERISTICS

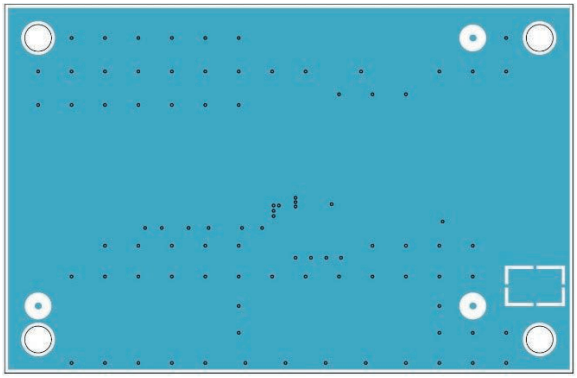
Parameter	Type	Value
Dimension (LxWxH)		85.0 x 55.0 x 5.9mm 0.86 x 0.36 x 0.44inch
Weight		15g typ. 0.03 lbs

Layout

Top Layer



Bottom Layer



Note2: Visit www.recom-power.com/eval-ref-boards to download Gerber files

BOM

Component	Description	Manufacturer Part Number	Manufacturer	Remarks
C1-C4	10µF X7R 50VDC 1206	C3216X7R1H106K160AC	TDK	
C5-C8	22µF X7S 25V 1206	GRM31CC71E226ME15L	MURATA	
C9-C11, L1, L8	1206			not mounted
C12	100pF X7R 25V 0603	VJ0603Y101KXXCW1BC	VISHAY	
L2, L5, L7	0805			not mounted
L3, L6	3.9µH 1.32A 140MOHM SMT	RLS-397	RECOM	
P1, P2	CONNECTOR	695402400222	WURTH	
R1, R17	100K 0.1W 1% 0603	RC0603FR-071KL	YAGEO	
R2, R3, R13, R15-R16, R18-R24	0603			not mounted
R4	1K 0.1W 1% 0603	RC0603FR-071KL	YAGEO	
R5	220K 0.1W 1% 0603	RC0603FR-07220KL	YAGEO	
R6	147K 0.1W 1% 0603	CRCW0603147KFKEA	VISHAY	
R7	220K 0.1W 1% 0603	RC0603FR-07220KL	YAGEO	
R8	442K 0.1W 1% 0603	CRCW0603442KFKEA	VISHAY	
R9	698K 0.1W 1% 0603	CRCW0603698KFKEA	VISHAY	
R10	976K 0.1W 1% 0603	CRCW0603976KFKEA	VISHAY	
R11	1M62 0.1W 1% 0603	CRCW06034M22FKEA	VISHAY	
R12	4M22 0.1W 1% 0603	CRCW06034M22FKEA	VISHAY	
R14	0R 0.1W 0603	RC0603JR-070RL	YAGEO	
R25-R26	0R 0.1W 0603	RC0603JR-070RL	YAGEO	
U1	RPL-1.0 MODULE	RPL-1.0	RECOM	

PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	single box	114.0 x 60.0 x 28.0mm
Packaging Quantity		1pc

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- RPL-1.0-EVM-1 Evaluation Module
- Terms and conditions

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