

# Features

## Evaluation Module

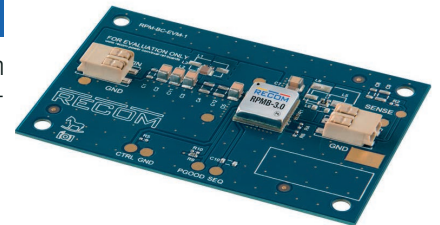
- Evaluation platform for RPMB-3.0 Power Modules
- Thermal design considerations included
- EMI Class B filter
- Easy evaluation of control, power good and sensing functions

**RECOM**  
Evaluation Module

## RPMB-3.0-EVM-1

### Description

The RPMB-3.0-EVM-1 generates a constant output voltage with an output current up to 3.0A from an external DC source. Functions of the RPMB-3.0 such as trimming, control, and sensing can be evaluated. Also the behavior in overload or over temperature can be evaluated easily before design-in.



### Selection Guide

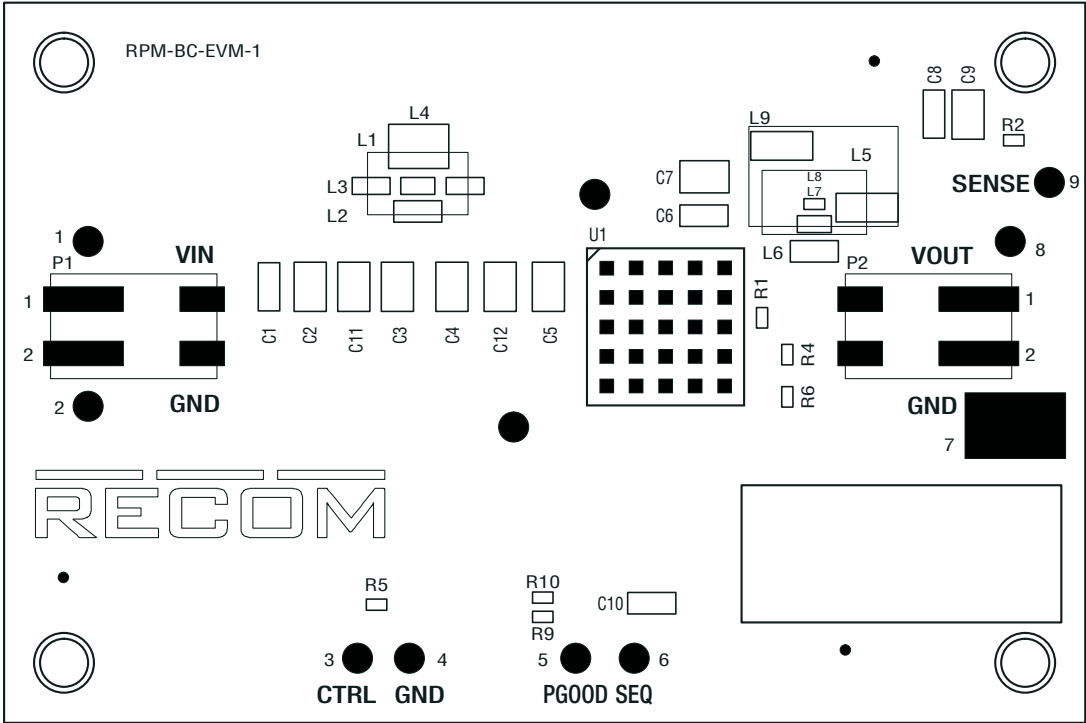
| Part Number       | Input Voltage Range [VDC] | nom. Output Voltage [VDC] | Vout Adjust Range [VDC] | Output Current max. [A] |
|-------------------|---------------------------|---------------------------|-------------------------|-------------------------|
| RPMB3.3-3.0-EVM-1 | 4-36                      | 3.3                       | 1-9                     | 3.0                     |
| RPMB5.0-3.0-EVM-1 | 5.5-36                    | 5                         | 1-9                     | 3.0                     |
| RPMB12-3.0-EVM-1  | 12.8-36                   | 12                        | 9-24                    | 3.0                     |
| RPMB15-3.0-EVM-1  | 16-36                     | 15                        | 9-24                    | 3.0                     |

### Quick Start Guide

- 1) Connect P1 to power supply (observe correct polarity!)
- 2) Connect P2 to a Load
- 3) Connect sense to the required potential  
The sense preset is via R1 directly at the power module, so the preset voltage is very accurate at the output of the RPMB-3.0. To equalize ohmic losses of the output filter, remove the resistor at R1, and solder a 0Ω resistor at R2.
- 4) Disable the device via R5  
The device is preset as normally on. It can be disabled by pulling the CTRL pad to GND. Short R5 to disable the device.

Specifications (measured @ Ta= 25°C, full load after warm up unless otherwise stated)

Component Placement



Connector Description

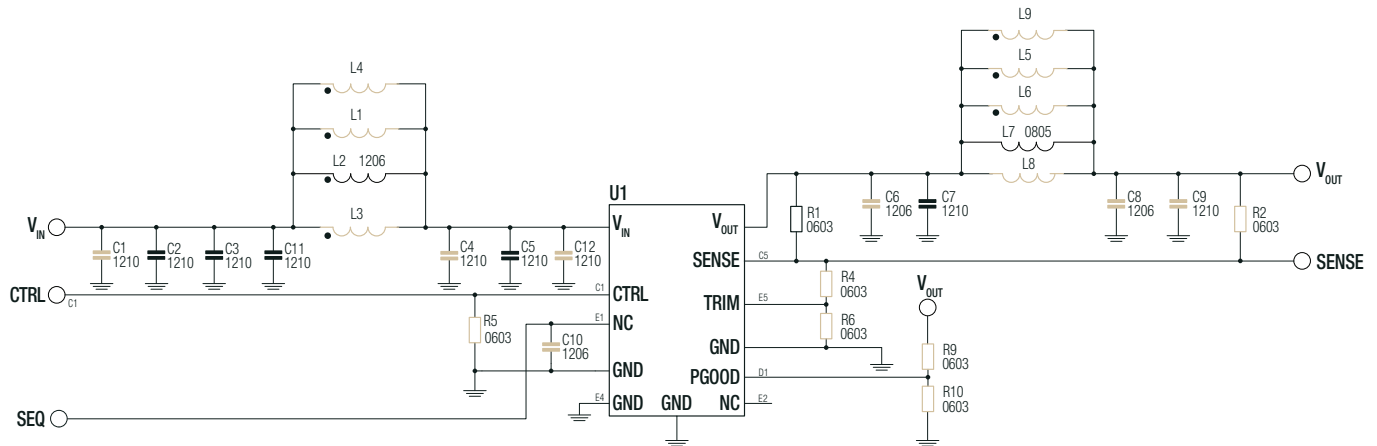
| P1  |                 |                                                    |
|-----|-----------------|----------------------------------------------------|
| Pin | Name            | Description                                        |
| 1   | V <sub>in</sub> | Positive Input Voltage (observe correct polarity!) |
| 2   | GND             | Common GND                                         |

| P2  |                  |                         |
|-----|------------------|-------------------------|
| Pin | Name             | Description             |
| 1   | V <sub>out</sub> | Positive Output Voltage |
| 2   | GND              | Common GND              |

PADS direct connection

| Pin | Name             | Description                                                   |
|-----|------------------|---------------------------------------------------------------|
| 1   | V <sub>in</sub>  | Connect to Vin                                                |
| 2   | GND              | Common GND                                                    |
| 3   | CTRL             | CTRL Pin (leave open if not used)                             |
| 4   | GND              | Common GND                                                    |
| 5   | PGOOD            | Power good signal                                             |
| 6   | SEQ              | Sequencing and soft start (not applicable for RPMB-3.0-EVM-1) |
| 7   | GND              | Common GND, can connect oscilloscope GND for measurement      |
| 8   | V <sub>out</sub> | Positive Output Voltage                                       |
| 9   | SENSE            | Output Voltage Sense Pin (leave open if not used)             |

## Schematic



## Notes:

Note1: Grey colored components are not mounted

## Description

U1: RPMB-3.0 power module.

C1, C2, C3, C11, L1, L2, L3, L4, C4, C5, C12: allow placement of various sized components to test input filter design. The populated filter is designed to meet EN55032 class B

C6, C7, L5, L6, L7, L8, L9, C8, C9: allow placement of various sized components to test output filter design. The populated filter is designed to meet EN55032 class B

R5: connect 0Ω resistor to disable the module. This resistor is not populated.

C10: not applicable for RPMB-3.0-EVM-1

R9 and R10: leave open (RPMB-3.0 has PGGOOD internally pulled up to 5V)

R1: populated 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, remove R1, and connect sense to the new measurement point.

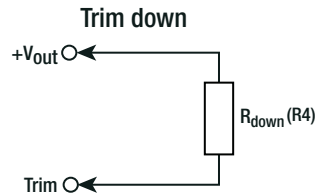
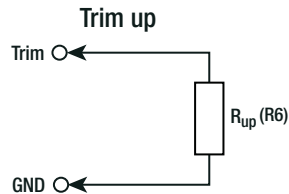
R2: sense point for output voltage after the filter. To set sense point here, remove R1 and solder a 0Ω resistor at R2.

R4 and R6: trim the output voltage. Refer to **"OUTPUT VOLTAGE TRIMMING"**

### Specifications (measured @ Ta= 25°C, full load after warm up unless otherwise stated)

#### OUTPUT VOLTAGE TRIMMING

The RPMB-series offers the feature of trimming the output voltage by using external trim resistors. The values for trim resistors shown in trim tables below are according to standard E96 values; therefore, the specified voltage may slightly vary. Refer to **"Selection Guide"** for applicable Vout Range.



#### Calculation:

$V_{out\_nom}$  = nominal output voltage [VDC]  
 $V_{out\_set}$  = trimmed output voltage [VDC]  
 $R_{up}$  (R6) = trim up resistor [kΩ]  
 $R_{down}$  (R4) = trim down resistor [kΩ]  
 $R_{Hi}, R_{Lo}$  = internal resistors [kΩ]

| $V_{out\_nom}$ | $R_{Hi}$ | $R_{Lo}$ |
|----------------|----------|----------|
| 3.3VDC         | 100kΩ    | 43.2kΩ   |
| 5VDC           | 100kΩ    | 24.9kΩ   |
| 12VDC          | 100kΩ    | 9.09kΩ   |
| 15VDC          | 90.9kΩ   | 6.49kΩ   |

$$R_{up} = \frac{R_{Lo} \times (V_{out\_set} - 1) - R_{Hi} \times (R_{Lo} + 1)}{R_{Hi} - R_{Lo} \times (V_{out\_set} - 1)}$$

$$R_{down} = \frac{R_{Lo} \times (V_{out\_set} - 1) \times (R_{Hi} + 1) - R_{Hi}}{R_{Hi} - R_{Lo} \times (V_{out\_set} - 1)}$$

#### Practical Example RPMB12-3.0, trim up

$V_{out\_set} = 15VDC$

$$R_{up} = \frac{9.09 \times (15 - 1) - 100 \times (9.09 + 1)}{100 - 9.09 \times (15 - 1)}$$

$R_{up}$  according to E96 ≈ **32.4kΩ**

#### Practical Example RPMB12-3.0, trim down

$V_{out\_set} = 9VDC$

$$R_{down} = \frac{9.09 \times (9 - 1) \times (100 + 1) - 100}{100 - 9.09 \times (9 - 1)}$$

$R_{down}$  according to E96 ≈ **267kΩ**

#### RPMB3.3-3.0

##### Trim up

|                  |      |       |
|------------------|------|-------|
| $V_{out\_set} =$ | 5    | [VDC] |
| $R_{up}$ (E96) ≈ | 57k6 | [Ω]   |

##### Trim down

|                    |      |      |      |      |       |
|--------------------|------|------|------|------|-------|
| $V_{out\_set} =$   | 2.5  | 1.8  | 1.5  | 1.1  | [VDC] |
| $R_{down}$ (E96) ≈ | 182k | 52k3 | 26k7 | 3k48 | [Ω]   |

#### RPMB5.0-3.0

##### Trim up

|                  |      |      |       |
|------------------|------|------|-------|
| $V_{out\_set} =$ | 5.5  | 9    | [VDC] |
| $R_{up}$ (E96) ≈ | 205k | 23k7 | [Ω]   |

##### Trim down

|                    |      |     |       |
|--------------------|------|-----|-------|
| $V_{out\_set} =$   | 3.3  | 2.5 | [VDC] |
| $R_{down}$ (E96) ≈ | 133k | 59k | [Ω]   |

#### RPMB12-3.0

##### Trim up

|                  |      |      |       |
|------------------|------|------|-------|
| $V_{out\_set} =$ | 15   | 24   | [VDC] |
| $R_{up}$ (E96) ≈ | 32k4 | 7k32 | [Ω]   |

##### Trim down

|                    |      |      |       |
|--------------------|------|------|-------|
| $V_{out\_set} =$   | 10   | 9    | [VDC] |
| $R_{down}$ (E96) ≈ | 453k | 267k | [Ω]   |

#### RPMB15-3.0

##### Trim up

|                  |      |       |       |
|------------------|------|-------|-------|
| $V_{out\_set} =$ | 20   | 24    | [VDC] |
| $R_{up}$ (E96) ≈ | 16k9 | 9k 09 | [Ω]   |

##### Trim down

|                    |      |      |       |
|--------------------|------|------|-------|
| $V_{out\_set} =$   | 12   | 9.99 | [VDC] |
| $R_{down}$ (E96) ≈ | 332k | 162k | [Ω]   |

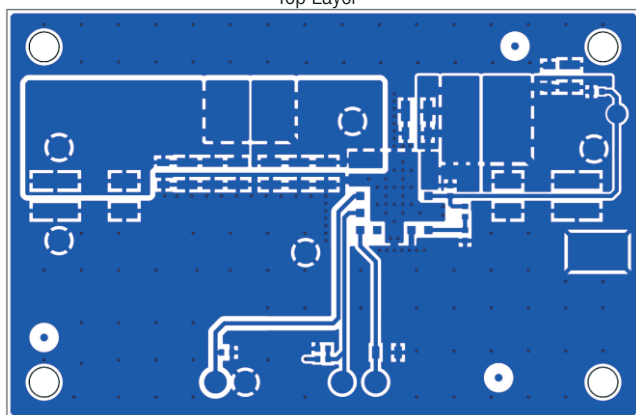
**Specifications** (measured @ Ta= 25°C, full load after warm up unless otherwise stated)

## DIMENSION AND PHYSICAL CHARACTERISTICS

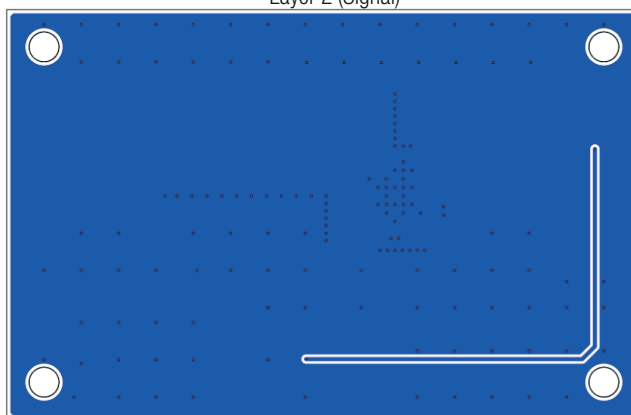
| Parameter         | Type | Value               |
|-------------------|------|---------------------|
| Dimension (LxWxH) |      | 85.0 x 55.0 x 5.9mm |
| Weight            |      | 20g                 |

### Layout

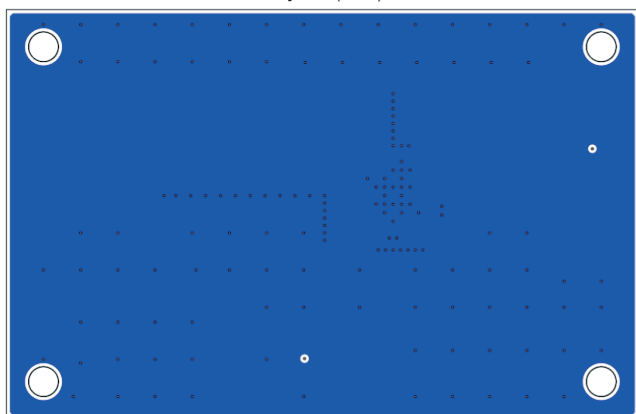
Top Layer



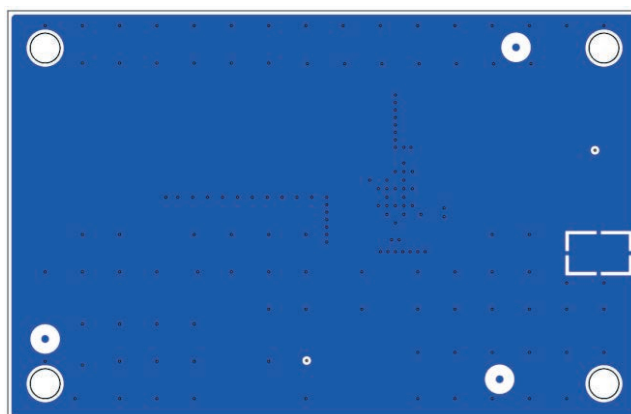
Layer 2 (Signal)



Layer 3 (GND)



Bottom (GND)



### Notes:

Note2: Visit [www.recom-power.com/eval-ref-boards](http://www.recom-power.com/eval-ref-boards) to download the Gerber files

Specifications (measured @ Ta= 25°C, full load after warm up unless otherwise stated)

## BOM

### RPMB-3.0-EVM-1 (all versions)

| Component | Description                                                                            | Manufacturer Part Number                               | Manufacturer | Remarks                                                                |
|-----------|----------------------------------------------------------------------------------------|--------------------------------------------------------|--------------|------------------------------------------------------------------------|
| C1        | 1206                                                                                   |                                                        |              | Not Mounted                                                            |
| C2        | 10µF 50V X7R 1210                                                                      | 12105C106KAT2A                                         | AVX          |                                                                        |
| C3        | 10µF 50V X7R 1210                                                                      | 12105C106KAT2A                                         | AVX          |                                                                        |
| C4        | 1210                                                                                   |                                                        |              | Not Mounted                                                            |
| C5        | 10µF 50V X7R 1210                                                                      | 12105C106KAT2A                                         | AVX          |                                                                        |
| C6        | 1206                                                                                   |                                                        |              | Not Mounted                                                            |
| C7        | 10µF 50V X7R 1210                                                                      | 12105C106KAT2A                                         | AVX          |                                                                        |
| C8        | 1206                                                                                   |                                                        |              | Not Mounted                                                            |
| C9        | 1210                                                                                   |                                                        |              | Not Mounted                                                            |
| C10       | 1206                                                                                   |                                                        |              | Not Mounted                                                            |
| C11       | 10µF 50V X7R 1210                                                                      | 12105C106KAT2A                                         | AVX          |                                                                        |
| C12       | 1210                                                                                   |                                                        |              | Not Mounted                                                            |
| L1        | 8.8mm x 4.75mm                                                                         |                                                        |              | Not Mounted                                                            |
| L2        | 2.2uH 1206                                                                             | DFE252012F-2R2M=P2                                     | Murata       |                                                                        |
| L3        | 0805                                                                                   |                                                        |              | Not Mounted                                                            |
| L4        | 4.5mm x 3.2mm                                                                          |                                                        |              | Not Mounted                                                            |
| L5        | 8.8mm x 4.75mm                                                                         |                                                        |              | Not Mounted                                                            |
| L6        | 1206                                                                                   |                                                        |              | Not Mounted                                                            |
| L7        | 0 OHM JUMPER 0805 0W125                                                                | CRCW08050000Z0ECC                                      | VISHAY       | Use 0R 0805                                                            |
| L8        | 0603                                                                                   |                                                        |              | Not Mounted                                                            |
| L9        | 11.68mm x 7.2mm                                                                        |                                                        |              | Not Mounted                                                            |
| P1        | CONNECTOR                                                                              | 695402400222                                           | WURTH        |                                                                        |
| P2        | CONNECTOR                                                                              | 695402400222                                           | WURTH        |                                                                        |
| R1        | 0 OHM JUMPER 0603 0W1                                                                  | CRCW06030000Z0EAC                                      | VISHAY       |                                                                        |
| R2        | 0 OHM JUMPER 0603 0W1                                                                  | CRCW06030000Z0EAC                                      | VISHAY       | Not Mounted                                                            |
| R4        | 0603                                                                                   |                                                        |              | Not Mounted                                                            |
| R5        | 0603                                                                                   |                                                        |              | Not Mounted                                                            |
| R6        | 0603                                                                                   |                                                        |              | Not Mounted                                                            |
| R9        | 0603                                                                                   |                                                        |              | Not Mounted                                                            |
| R10       | 0603                                                                                   |                                                        |              | Not Mounted                                                            |
| U1        | RPMB3.3-3.0 MODULES<br>RPMB5.0-3.0 MODULES<br>RPMB12-3.0 MODULES<br>RPMB15-3.0 MODULES | RPMB3.3-3.0<br>RPMB5.0-3.0<br>RPMB12-3.0<br>RPMB15-3.0 | RECOM        | 3.3Vout version<br>5.0Vout version<br>12Vout version<br>15Vout version |

**Specifications** (measured @ Ta= 25°C, full load after warm up unless otherwise stated)

**PACKAGING INFORMATION**

| Parameter                   | Type   | Value                 |
|-----------------------------|--------|-----------------------|
| Packaging Dimension (LxWxH) | carton | 114.0 x 60.0 x 28.0mm |
| Packaging Quantity          |        | 1pcs                  |

**Contents**

- RPMB-3.0-EVM-1 evaluation module
- Terms and conditions

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.