

# Features

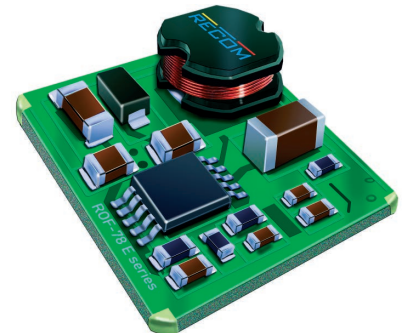
## Switching Regulator

- Low profile 4.5mm
- Low cost
- Wide input range (5V - 36V)
- Short circuit protection
- Castellated connections

**RECOM**  
DC/DC Converter

**ROF-78E-0.5SMD**

**0.5 Amp**  
**Non Isolated**  
**Power Module**



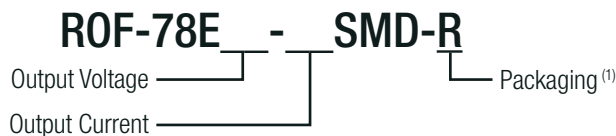
### Description

The ROF-78E is a switching regulator with a wide input voltage range, high efficiency and a low profile, pin-less SMD package. Three low-ripple output voltages are available as standard: 3.3V, 5V or 12V with 500mA continuous output current rating over the full operating temperature range of -40°C to +75°C without derating. An enable connection allows power sequencing or very low standby consumption (3.5µA) for battery powered applications. These modules can be SMD reflow soldered. The connection pads have corner half-vias to enable optical inspection of the joints after soldering.

### Selection Guide

| Part Number         | Input Voltage Range [VDC] | Output Voltage [VDC] | Output Current [mA] | Efficiency typ. [%] |
|---------------------|---------------------------|----------------------|---------------------|---------------------|
| ROF-78E3.3-0.5SMD-R | 5 - 36                    | 3.3                  | 500                 | 73 - 84             |
| ROF-78E5.0-0.5SMD-R | 9 - 36                    | 5.0                  | 500                 | 79 - 87             |
| ROF-78E12-0.5SMD-R  | 15 - 36                   | 12                   | 500                 | 87 - 92             |

### Model Numbering



#### Notes:

Note1: suffix -R for tape&reel packaging (refer to **"PACKAGING INFORMATION"**)

#### Ordering Examples:

ROF-78E3.3-0.5SMD-R = 3.3Vout, 0.5A Output Current, SMD, tape and reel packaging

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

#### BASIC CHARACTERISTICS

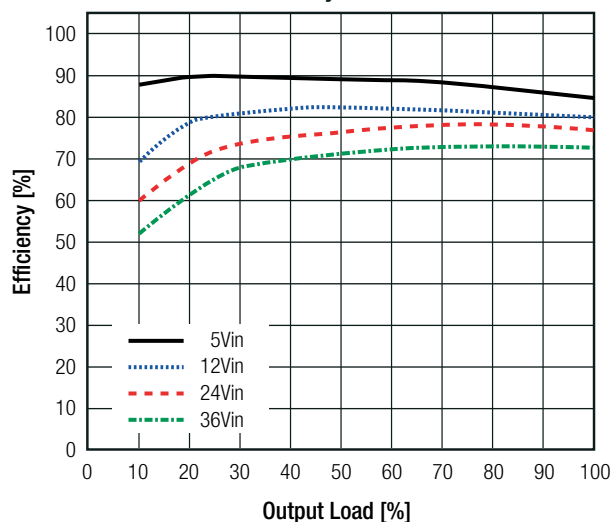
| Parameter                    | Condition                               | Min. | Typ.   | Max.                               |
|------------------------------|-----------------------------------------|------|--------|------------------------------------|
| Input Voltage Range          | nom. Vin= 12VDC and 24VDC               | 5VDC |        | 36VDC                              |
| Input Current                |                                         |      |        | 500mA                              |
| Quiescent Current            |                                         |      |        | 5mA                                |
| Minimum Load <sup>(2)</sup>  |                                         | 10%  |        |                                    |
| ON/OFF CTRL                  | max. Vin= 5VDC<br>DC-DC ON<br>DC-DC OFF |      |        | Open or >1.75VDC<br>GND or <0.7VDC |
| Standby Current              | DC-DC OFF                               |      | 3.5µA  | 6.5µA                              |
| Internal Operating Frequency |                                         |      | 650kHz |                                    |
| Output Ripple and Noise      | 20MHz BW                                |      |        | 100mVp-p                           |

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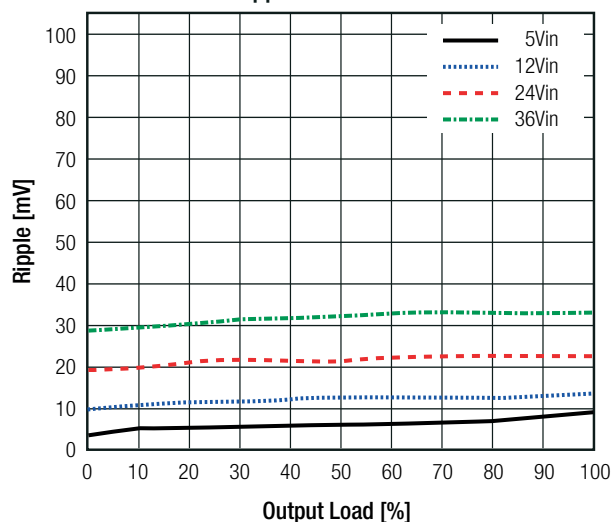
Specifications (measured @  $T_a = 25^\circ\text{C}$ , nom.  $V_{in}$ , full load and after warm-up unless otherwise stated)

ROF-78E3.3-0.5SMD

Efficiency vs. Load

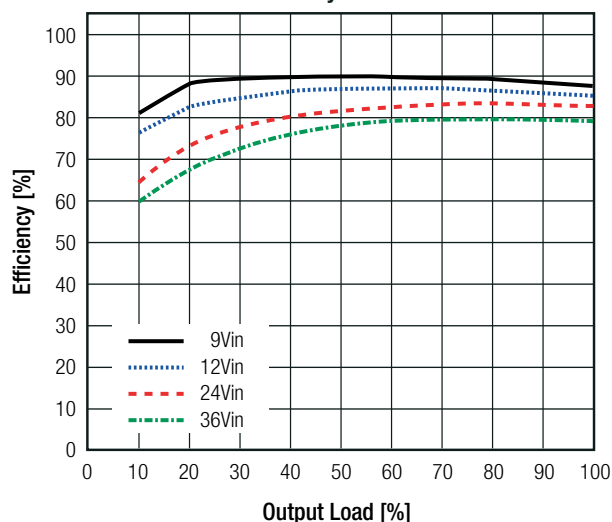


Ripple vs. Load

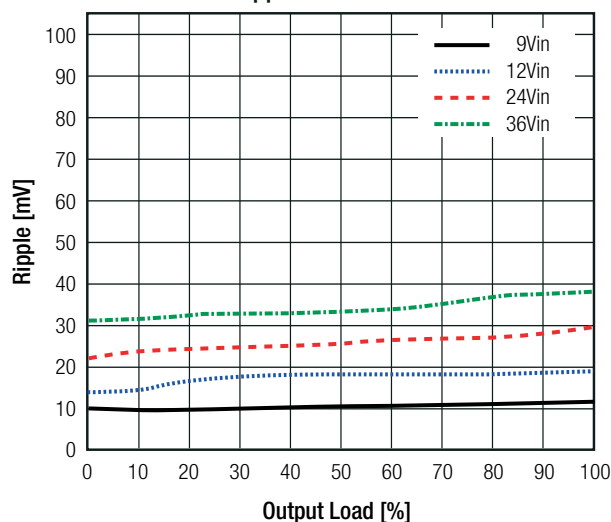


ROF-78E5.0-0.5SMD

Efficiency vs. Load

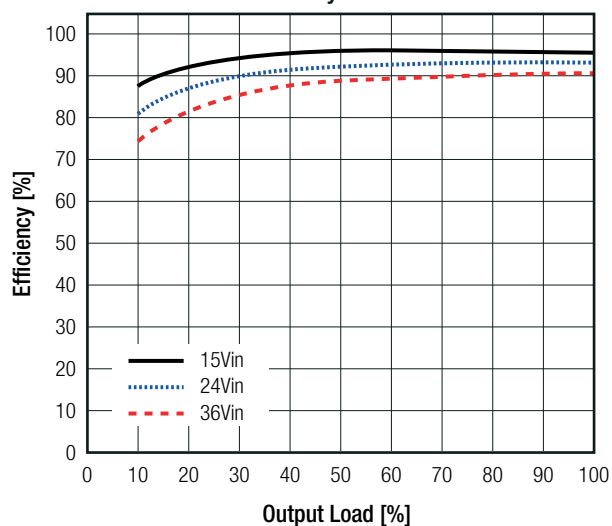


Ripple vs. Load

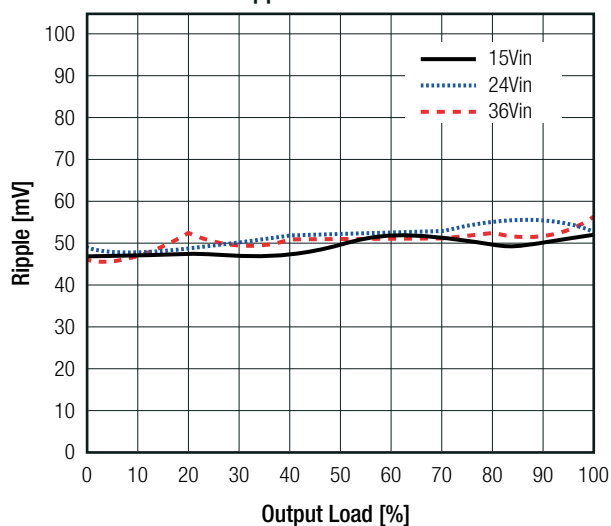


ROF-78E12-0.5SMD

Efficiency vs. Load



Ripple vs. Load



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

### REGULATIONS

| Parameter                      | Condition             | Value       |
|--------------------------------|-----------------------|-------------|
| Output Accuracy                |                       | ±5.0% max.  |
| Line Regulation                | low line to high line | ±1.0% max.  |
| Load Regulation <sup>(2)</sup> | 10% to 100% load      | ± 3.0% typ. |
| Transient Response             | 100% to 50% load      | ±100mV      |
|                                | 100% to 10% load      | ±200mV      |

**Notes:**

Note2: Operation below 10% load will not harm the converter, but specifications may not be met

### PROTECTIONS

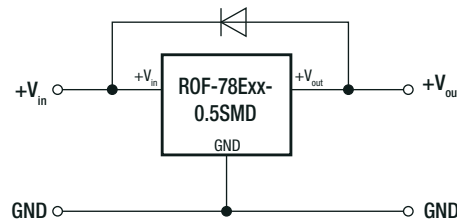
| Parameter                      | Condition | Value                   |
|--------------------------------|-----------|-------------------------|
| Short Circuit Protection (SCP) |           | automatic recovery      |
| Short Circuit Input Current    |           | 200mA max.              |
| Over Current Protection (OCP)  |           | >950mA typ. Hiccup mode |

#### Optional Diode Protection Circuit

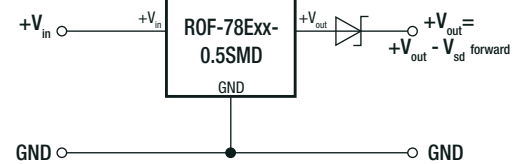
Add a blocking diode to Vout if current can flow backwards into the output, as this can damage the converter when it is powered down.

The diode can either be fitted across the device if the source is low impedance or fitted in series with the output (recommended).

#### Optional Protection 1:



#### Optional Protection 2:

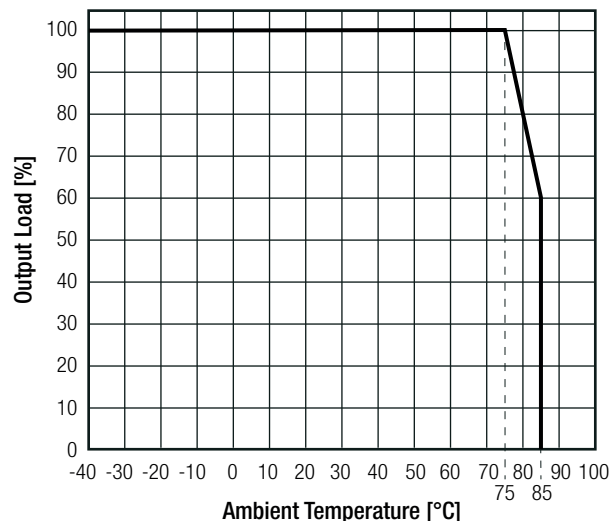


### ENVIRONMENTAL

| Parameter                   | Condition                                       | Value                        |
|-----------------------------|-------------------------------------------------|------------------------------|
| Operating Temperature Range | with derating @ free air convection (see graph) | -40°C to +85°C               |
| Operating Humidity          | non-condensing                                  | 5% - 95% RH max.             |
| MTBF                        | according to MIL-HDBK-217F, G.B. +25°C          | 3500 x 10 <sup>3</sup> hours |

#### Derating Graph

(@ free air convection)



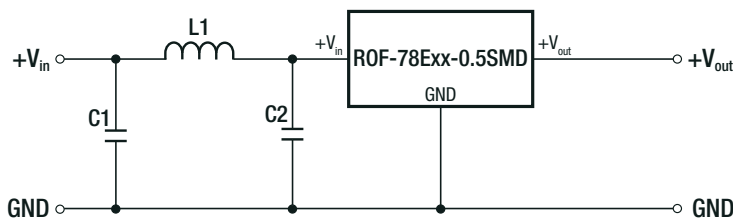
**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

### SAFETY AND CERTIFICATIONS

| Certificate Type (Safety) | Report / File Number | Standard                      |
|---------------------------|----------------------|-------------------------------|
| RoHS 2+                   |                      | RoHS-2011/65/EU + AM-2015/863 |
| EAC                       | RU-AT.49.09571       | TP TC 004/2011                |

| EMC Compliance                                                                                           | Condition            | Standard / Criterion |
|----------------------------------------------------------------------------------------------------------|----------------------|----------------------|
| Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement | with external filter | EN55032, Class B     |

### EMC Filtering Suggestion according to EN55032 Class A and Class B



### Component List Class A and B

| C1  | C2  | L1   |
|-----|-----|------|
| 1μF | 1μF | 33μH |

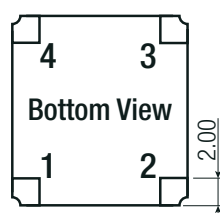
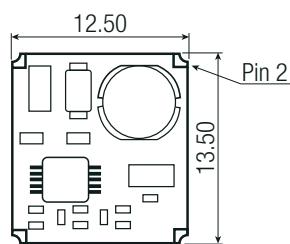
The capacitors used are ceramic capacitors, rated voltage 50V

### DIMENSION AND PHYSICAL CHARACTERISTICS

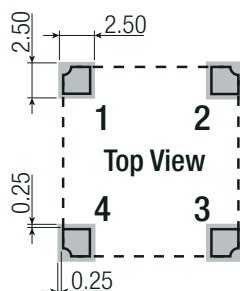
| Parameter                 | Type                 | Value                                      |
|---------------------------|----------------------|--------------------------------------------|
| Material                  | PCB                  | FR4, (UL94 V-0)                            |
| Package Dimension (LxWxH) | 3.3, 5Vout<br>12Vout | 12.5 x 13.5 x 4.0mm<br>12.5 x 13.5 x 4.5mm |
| Package Weight            |                      | 1g typ.                                    |

### Dimension Drawing (mm)

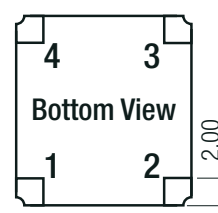
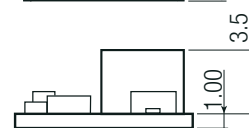
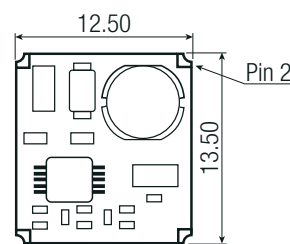
#### 3.3Vout & 5Vout



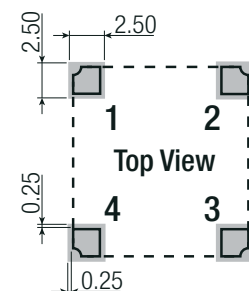
#### Recommended Footprint Details



#### 12Vout



#### Recommended Footprint Details



### Pin Connections

| Pin # | Single |
|-------|--------|
| 1     | +Vin   |
| 2     | GND    |
| 3     | +Vout  |
| 4     | CTRL   |

Tolerance: x.x= ±0.50mm  
x.xx= ±0.25mm

**Specifications** (measured @  $T_a = 25^\circ\text{C}$ , nom.  $V_{in}$ , full load and after warm-up unless otherwise stated)

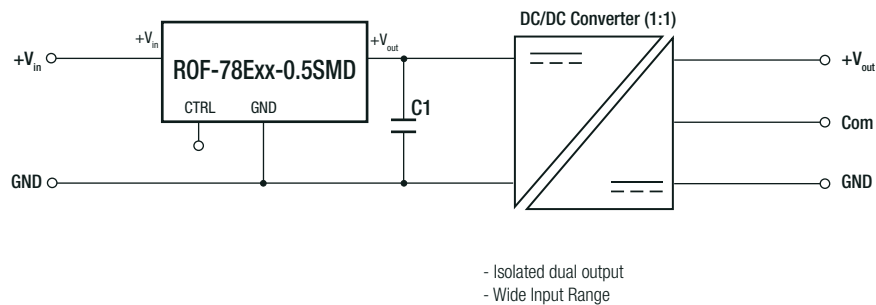
### INSTALLATION AND APPLICATION

#### Standard Application Circuit

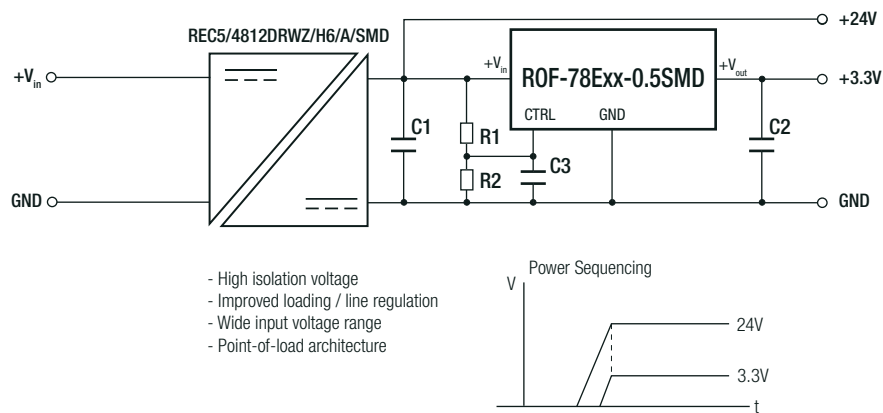


#### Application Examples

##### High Efficiency, Isolated, Dual Unregulated Output



##### Isolated (up to 6kVDC), Wide Input Range Regulated Output



### PACKAGING INFORMATION

| Parameter                   | Type                   | Value                  |
|-----------------------------|------------------------|------------------------|
| Packaging Dimension (LxWxH) | tape and reel (carton) | 355.0 x 342.0 x 36.0mm |
| Packaging Quantity          | tape and reel          | 500pcs                 |
| Tape Width                  |                        | 24mm                   |
| Storage Temperature Range   |                        | -55°C to +125°C        |
| Storage Humidity            |                        | 95% RH max.            |

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