

Features

- Efficiency up to 97%, Non isolated, no need for heatsinks
- SMD Package
- Adjustable Output Voltage
- Wide input range.(4.75V ~ 34V)
- Short circuit protection, Thermal shutdown
- Remote On/Off Control
- UL94V-0 Package Material
- Very Low Shutdown Current
- See Positive-to Negative Converter Application Note for use as a voltage inverter (alternative to LM79xx Linear)

INNOLINE
DC/DC-Converter

R-78Axx-0.5SMD Series

**0.5 AMP
SMD
Single Output**

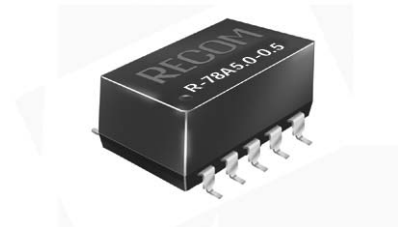
Selection Guide

| Part Number | Input Range (1) (V) | Output Voltage (V) | Adjust Range (V) | Output Current (A) | Efficiency (%) | |
|-----------------|---------------------|--------------------|------------------|--------------------|----------------|----------|
| | | | | | Min. Vin | Max. Vin |
| R-78A1.5-0.5SMD | 4.75 – 30 | 1.5 | fixed | 0.5 | 73 | 63 |
| R-78A1.8-0.5SMD | 4.75 – 34 | 1.8 | 1.5~3.3 | 0.5 | 82 | 71 |
| R-78A2.5-0.5SMD | 4.75 – 34 | 2.5 | 1.5~4.5 | 0.5 | 87 | 77 |
| R-78A3.3-0.5SMD | 4.75 – 34 | 3.3 | 1.8~5.5 | 0.5 | 91 | 81 |
| R-78A5.0-0.5SMD | 6.5 – 34 | 5.0 | 2.5~8.0 | 0.5 | 94 | 86 |
| R-78A6.5-0.5SMD | 8.0 – 34 | 6.5 | 3.3~11.0 | 0.5 | 95 | 88 |
| R-78A9.0-0.5SMD | 11 – 34 | 9.0 | 4.5~12.6 | 0.5 | 96 | 92 |
| R-78A12-0.5SMD | 15 – 34 | 12 | 4.5~12.6 | 0.5 | 97 | 94 |
| R-78A15-0.5SMD | 18 – 34 | 15 | fixed | 0.5 | 97 | 95 |

Note 1:1.5V Output can be unstable with $V_{in} > 30VDC$

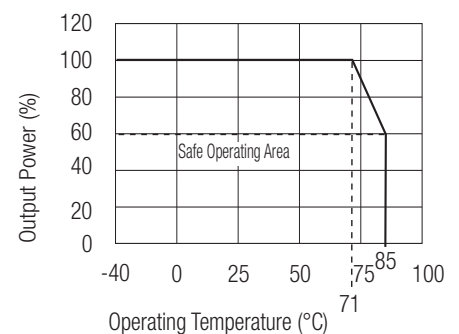
Description

The R-78Axx-0.5SMD series high efficiency switching regulators are ideally suited to pick-and-place mass production. The efficiency of up to 97% means that very little energy is wasted as heat. The additional features of remote on/off control and adjustable output voltages will find many uses in the Battery-powered, Industrial, Medical and Automotive markets. Low ripple and noise figures and a shutdown input current of typically only 20uA round off the specifications of this versatile SMD converter series.



RECOM

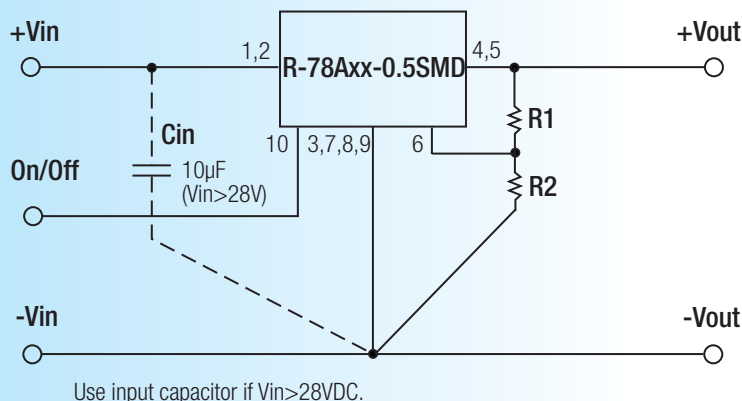
Derating-Graph (Ambient Temperature)



Specifications (typical at 25°C, 10% minimum load, unless otherwise specified)

| Characteristics | Conditions | Min. | Typ. | Max. |
|---|--|---------------------|--------------------------------|-------------------------------|
| Input Voltage Range (Note 1) | See Table | 4.75 | | 34.0V |
| Output Voltage Range | See Table | 1.5 | | 15V |
| Output Current | All Series | 0 | | 500mA |
| Output Current Limit | All Series | | | 2000mA |
| Short Circuit Input Current | All Series | | | 25mA |
| Internal Power Dissipation | | | | 0.4W |
| Short Circuit Protection | | | Continuous, automatic recovery | |
| Output Voltage Accuracy (At 100% Load) | All Series | | ±2 | ±3% |
| Adjustable Voltage Range | See Table 1 | | | ±50% |
| Line Voltage Regulation (Vin = min. to max. at full load) | 1.5V to 6.5V | | 0.2 | 0.4% |
| | 9V to 15V | | 0.1 | 0.2% |
| Load Regulation (10 to 100% full load) | 1.5V to 6.5V | | 0.7 | 1.0% |
| | 9V to 15V | | 0.25 | 0.4% |
| Dynamic Load Stability | 100% <-> 50% load | | ±75V | |
| | 100% <-> 10% load | | | ±100mV |
| Ripple & Noise (without Output Capacitor) | 1.5V to 6.5V | | 20mVp-p | 30mVp-p |
| | 9V to 15.5V | | 30mVp-p | 40mVp-p |
| Temperature Coefficient | -40°C ~ +85°C ambient | | | 0.015%/°C |
| Max capacitance Load | | | | 220µF |
| Switching Frequency | | 280 | 330 | 380kHz |
| Quiescent Current | Vin = min. to max. at 0% load | | 5 | 7mA |
| Shutdown Input Current | | | 20 | 35µA |
| Remote On/Off Threshold Voltage | | 0.8 | 1.2 | 1.6V |
| ON/OFF Remote Control | ON: Open or 1.6<Vr<5V, OFF: GND or 0<Vr<1.6V | | | Ir=1.8µA typ. |
| Operating Temperature Range (with derating) | | -40°C | | +85°C |
| Switch On/Off Time | (using Remote On/Off Control) | | | 50ms |
| Operating Case Temperature | | | | +100°C |
| Storage Temperature Range | | -55°C | | +125°C |
| Case Thermal Impedance | | | | 70°C / W |
| Thermal Shutdown | Internal IC junction | | +160°C | |
| Package Weight | | | | 2.7g |
| MTBF (+25°C) | } Detailed Information see Application Notes chapter "MTBF" | using MIL-HDBK 217F | | 21098 x 10 ³ hours |
| (+71°C) | | | | 4214 x 10 ³ hours |

Standard Application Circuit

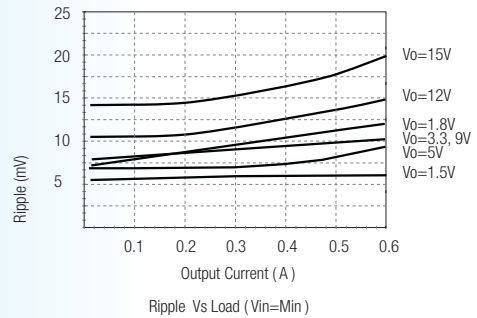
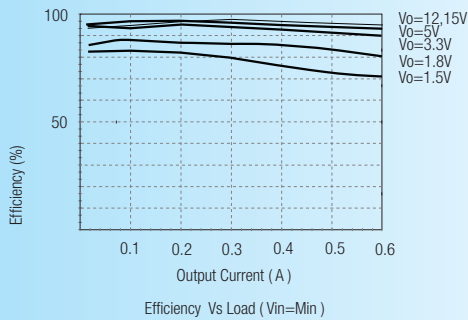
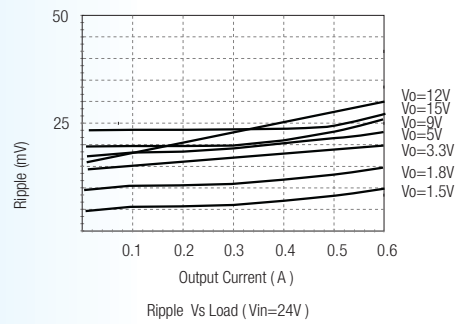
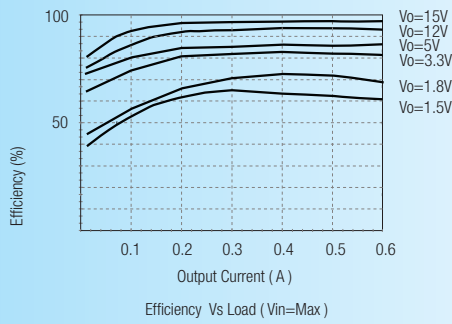
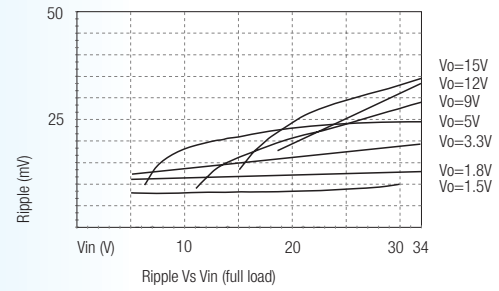
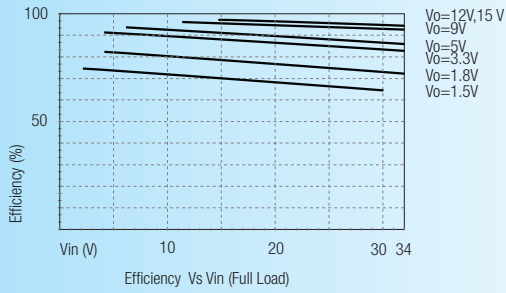


Add a blocking diode to Vout if current can flow backwards into the output, as this can damage the converter.. See Application Examples for details.

Characteristics

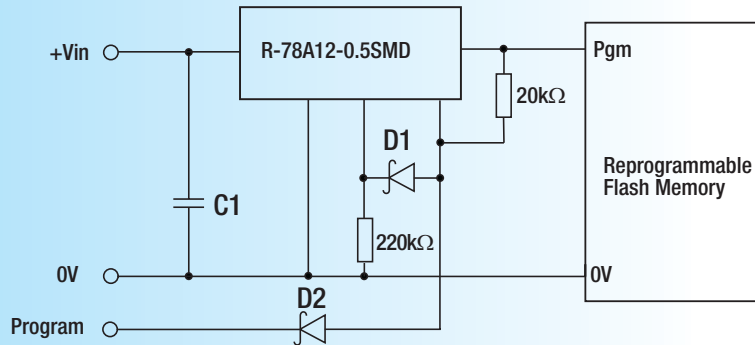
Efficiency

Ripple



Application Examples

Flash Memory Program Voltage Switcher

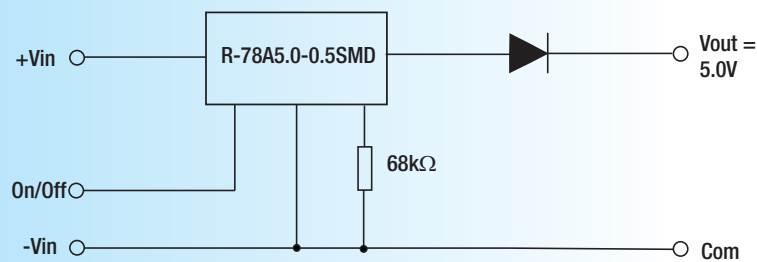


D1, D2: schottky Diode

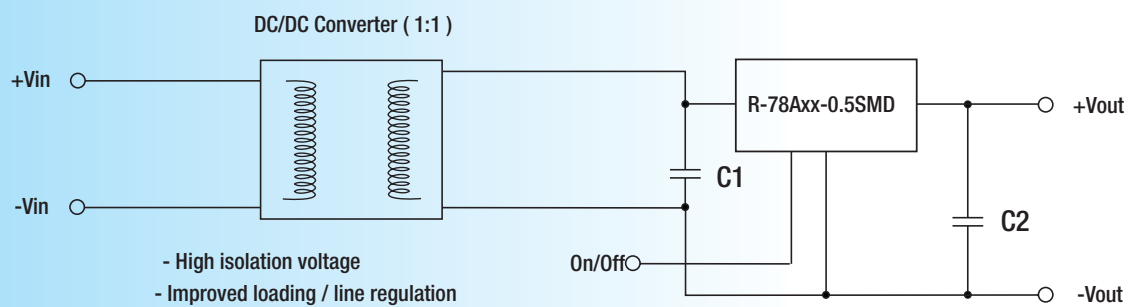
"Program" = 0V, Pgm Pin = +5V

"Program" = high, Pgm Pin = +12,6V

Output protection from external voltage



Converter Output set to 5.7V to compensate for diode drop



- High isolation voltage
- Improved loading / line regulation
- Wide Input Voltage Range
- Point-of-Load Architecture
- Remote On/Off Control

C1: Required (further decoupling filtering may be necessary between the two converters), C2: Optional

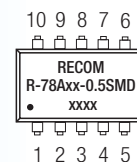
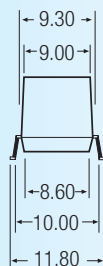
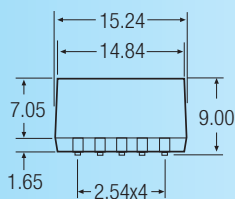
Table 1: Adjustment Resistor Values

| 0.5Adc | R-78A1.8 | | R-78A2.5 | | R-78A3.3 | | R-78A5.0 | | R-78A6.5 | | R-78A9.0 | | R-78A12.6 | |
|-------------|-------------|---------------|--------------|----------------|----------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|---------------|---------------|
| | -0.5SMD | | -0.5SMD | | -0.5SMD | | -0.5SMD | | -0.5SMD | | -0.5SMD | | -0.5SMD | |
| Vout (nom.) | 1.8Vdc | | 2.5Vdc | | 3.3Vdc | | 5.0Vdc | | 6.5Vdc | | 9.0Vdc | | 12.0Vdc | |
| Vout (adj) | R1 | R2 | R1 | R2 | R1 | R2 | R1 | R2 | R1 | R2 | R1 | R2 | R1 | R2 |
| 1.5 (V) | 3K Ω | | 200 Ω | | | | | | | | | | | |
| 1.8 (V) | | | 12K Ω | | | | | | | | | | | |
| 2.5 (V) | | 12K Ω | | | 21K Ω | | 5.6K Ω | | | | | | | |
| 3.0 (V) | | 4.7K Ω | | 50K Ω | 88.4K Ω | | 17K Ω | | | | | | | |
| 3.3 (V) | | 2.7K Ω | | 29K Ω | | | 27K Ω | | 6.7K Ω | | | | | |
| 3.6 (V) | | | | 19.4K Ω | | 69K Ω | 42K Ω | | 14K Ω | | | | | |
| 3.9 (V) | | | | 14k Ω | | 30.5K Ω | 58K Ω | | 23K Ω | | | | | |
| 4.5 (V) | | | | 8k Ω | | 12.1k Ω | 180K Ω | | 49K Ω | | 26K Ω | | 17K Ω | |
| 4.9 (V) | | | | | | 7.6k Ω | 850K Ω | | 77k Ω | | 36K Ω | | 24K Ω | |
| 5.0 (V) | | | | | | 6.8k Ω | | | 86k Ω | | 39K Ω | | 26K Ω | |
| 5.1 (V) | | | | | | 6.2k Ω | | 540k Ω | 97K Ω | | 42K Ω | | 28K Ω | |
| 5.5 (V) | | | | | | 4k Ω | | 71k Ω | 160K Ω | | 56K Ω | | 36K Ω | |
| 6.5 (V) | | | | | | | | 20.2k Ω | | | 112K Ω | | 63K Ω | |
| 8.0 (V) | | | | | | | | 7.2k Ω | | 26K Ω | 400K Ω | | 125K Ω | |
| 9.0 (V) | | | | | | | | | | 11.3K Ω | | | 200K Ω | |
| 10 (V) | | | | | | | | | | 5.2K Ω | | 59K Ω | 345K Ω | |
| 11 (V) | | | | | | | | | | 1.8K Ω | | 18.5K Ω | 740K Ω | |
| 12 (V) | | | | | | | | | | | | 5.2K Ω | | |
| 12.6 (V) | | | | | | | | | | | | 830K Ω | | 216K Ω |

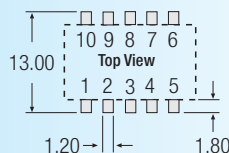
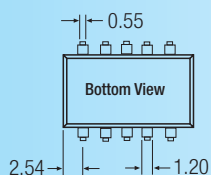
Package Style and Pinning (mm)

SMD 10Pin Package

3rd angle projection 



Recommended Footprint Details



Pin Connections

| Pin # | Connection |
|---------|---------------------|
| 1,2 | +Vin |
| 3,7,8,9 | GND |
| 4,5 | +Vout |
| 6 | V adj |
| 10 | Remote On/Off |
| xx.x | $\pm 0.5\text{mm}$ |
| xx.xx | $\pm 0.25\text{mm}$ |