Features

Switching Regulator

- Efficiency up to 94%, no need for heatsinks
- High reflow temperature SMD package
- Adjustable output voltage buck converter
- Short circuit protection, thermal shutdown
- Remote on/off control
- Very low shutdown current

RECOM
DC/DC Converter

R-78AA-1.0

1.0 Amp SMD Single Output

3 YEAR Warranty

Description

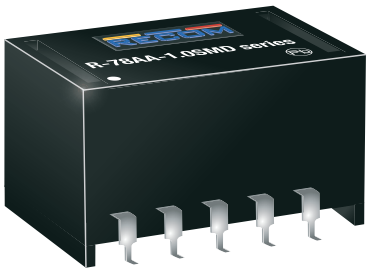
The R-78AAxx-1.0SMD series are adjustable output non-isolated buck converters that meet the requirements for RoHS 10/10 as well as the reflow soldering temperatures associated with vapor phase soldering, making these high efficiency switching regulators ideally suited to modern pick-and-place mass production. The efficiency of up to 97% means that very little energy is wasted as heat. The additional features of remote on/off control, continuous short circuit protection and adjustable output voltages will find many uses in the battery-powered, industrial, medical and automotive markets.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Vout Adjust Range [VDC]	Output Current [mA]	Efficiency @ min Vin [%]	Efficiency @ max. Vin [%]
R-78AA1.5-1.0SMD	4.75 - 18	1.5	fixed	1.0	77	73
R-78AA1.8-1.0SMD	4.75 - 18	1.8	1.5 - 3.0	1.0	82	76
R-78AA2.5-1.0SMD	4.75 - 18	2.5	1.5 - 3.0	1.0	87	81
R-78AA3.3-1.0SMD	4.75 - 18	3.3	3.0 - 5.5	1.0	90	84
R-78AA5.0-1.0SMD	6.5 - 18	5.0	3.0 - 5.5	1.0	94	89

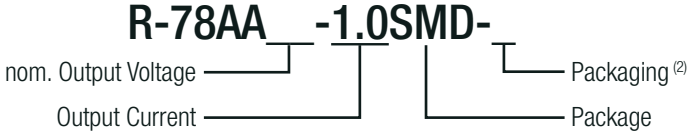
Notes:

Note1: Input voltage ranges valid for nominal output voltages
Vin must be higher than Vout including adjust range and dropout voltage



EN60950-1 certified
IEC60950-1 certified

Model Numbering



Notes:

Note2: add suffix -R for tape & reel packaging

Ordering Examples:

R-78AA5.0-1.0SMD-R = 5.0VDC Output Volage, 1.0A, SMD, tape and reel packaging
R-78AA2.5-1.0SMD = 2.5VDC Output Volage, 1.0A, SMD, tube

Specifications (measured @ Ta= 25°C, 10% minimum load, unless otherwise stated)

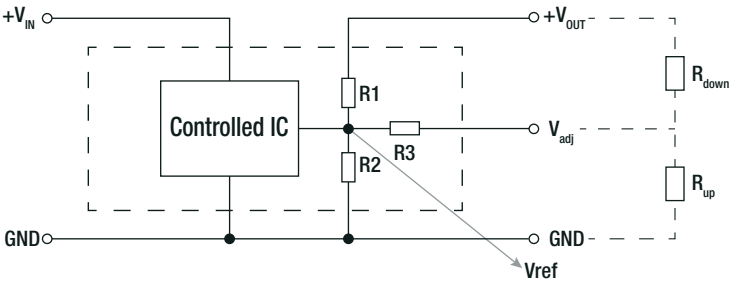
BASIC CHARACTERISTICS				
Parameter	**Condition**	**Min.**	**Typ.**	**Max.**
Quiescent Current	Vin= min. to max.		5mA	7mA
Internal Power Dissipation				0.4W
Output Voltage Adjustability				see calculation
Minimum Load (2)		0%		
Start-up time	ON/OFF CTRL		50ms	
ON/OFF CTRL	DC-DC ON DC-DC OFF			Open or 2.8VDC<Vr<5VDC GND or 0VDC<Vr<0.8VDC
Input Current of CTRL Pin	DC-DC OFF		1.8µA	
Standby Current			20µA	35µA
CTRL Thereshold Voltage		2.4VDC	2.6VDC	2.8VDC
CTRL Voltage Hysterese			250mV	
Internal Operating Frequency		335kHz	385kHz	435kHz
Output Ripple and Noise	20MHz BW		20mVp-p	30mVp-p
Maximum Capacitive Load	with normal start-up time, no external components			470µF
	with <1 second start-up time + diode protection circuit			6800µF

Notes:

Note3: Operation under no load will not harm the converter, but specifications may not be met. A minimum load of 10mA is recommended

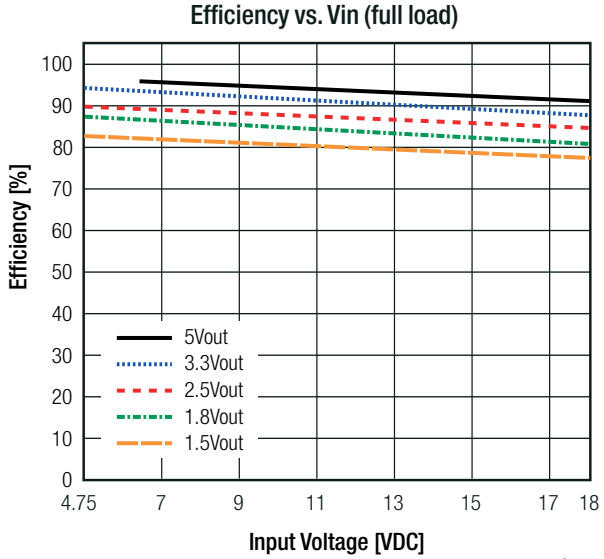
Output Voltage Adjustability Adjustment Resistor Values

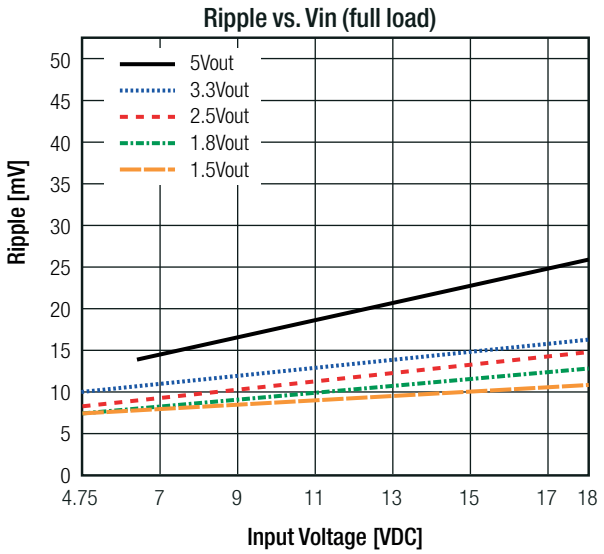
	R1	R2	R3	Vref(V)
1.8V	10KΩ	21KΩ	5.6KΩ	1.23
2.5V	22KΩ	21KΩ	5.6KΩ	1.23
3.3V	16.9KΩ	10KΩ	5.6KΩ	1.23
5.0V	30.9KΩ	10KΩ	10KΩ	1.23



Trim down $R_{down} = \dfrac{R2(R1 + R3) \times (Vref - Vo) + Vref \times R1R3}{R2Vo - Vref\,(R1 + R2)}$

Trim up $R_{up} = \dfrac{R2R3\,(Vref - Vo) + Vref\,R1\,(R2 + R3)}{R2\,(Vo - Vref) - Vref\,R1}$





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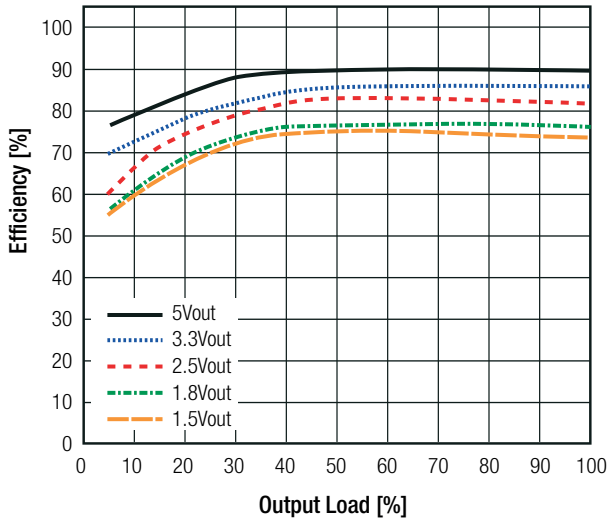
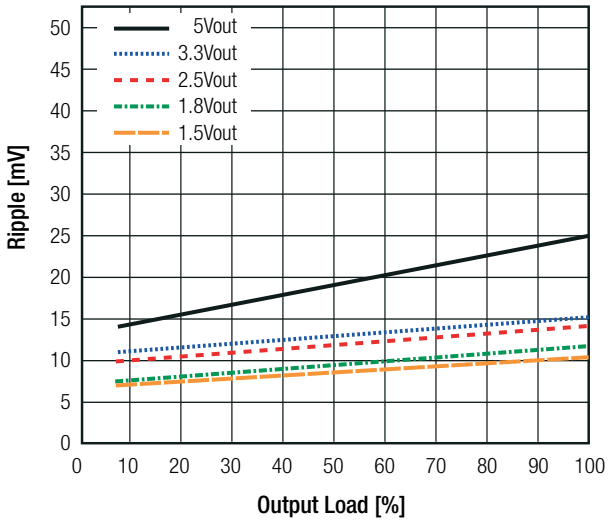
Specifications (measured @ Ta= 25°C, 10% minimum load, unless otherwise stated)

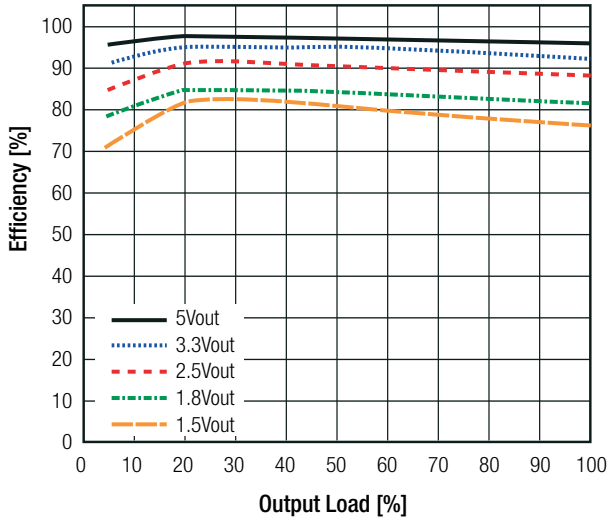
Efficiency vs. Load (max. Vin)



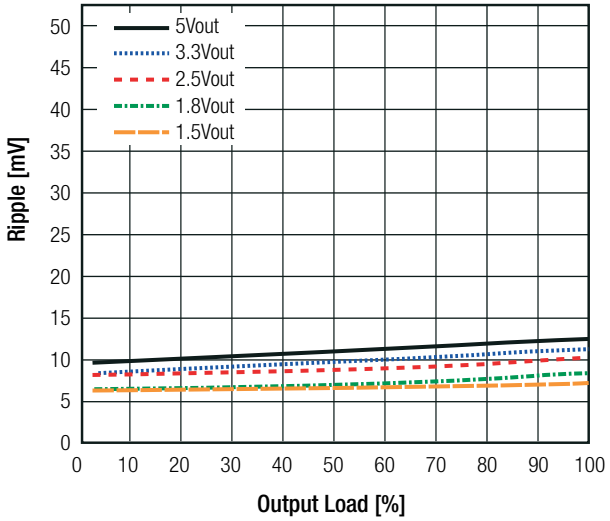
Ripple vs. Load (max. Vin)



Efficiency vs. Load (min. Vin)



Ripple vs. Load (min. Vin)



REGULATIONS			
Parameter	**Condition**		**Value**
Output Accuracy	full load		±2.0% typ. / ±3.0% max.
Line Regulation	low line to high line, full load		±0.2% typ. / ±0.4% max.
Load Regulation	10% to 100% load		±0.7% typ. / ±1.0% max.
Transient Response	25mA/µs	100% <-> 50% load	±85mV typ. / ±100mV max.

Specifications (measured @ Ta= 25°C, 10% minimum load, unless otherwise stated)

PROTECTIONS

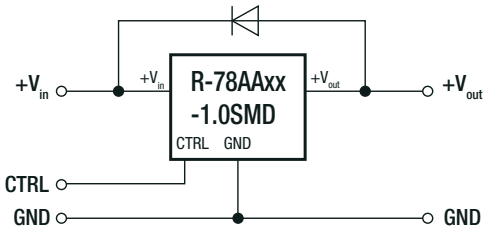
Parameter	Condition	Value
Short Circuit Protection (SCP)		continuous, automatic recovery
Short Circuit Input Current	nom. Vin= 12VDC	120mA max.

Optional Diode Protection Circuit

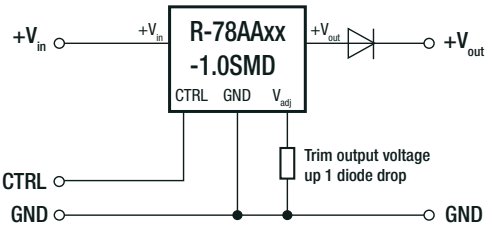
Add a blocking diode to Vout if current can flow backwards into the output, as this can damage the converter when it is powered down.

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:



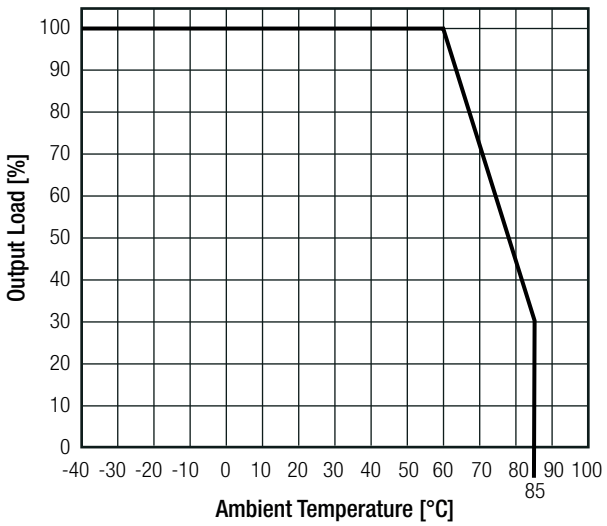
Optional Protection 2:



ENVIRONMENTAL

Parameter	Condition		Value
Operating Temperature Range	with derating (see graph)		-40°C to +85°C
Maximum Case Temperature			+100°C
Temperature Coefficient			±0.015%/°C
Thermal Impedance	0.1m/s, horizontal		70°C/W
Operating Altitude			2000m
Operating Humidity	non-condensing		5% - 95% RH max.
Pollution Degree			PD2
MTBF	according to MIL-HDBK-217F, G.B.	+25°C + 71°C	13338 - 21070 x 10^3 hours 3880 - 6769 x 10^3 hours

Derating Graph

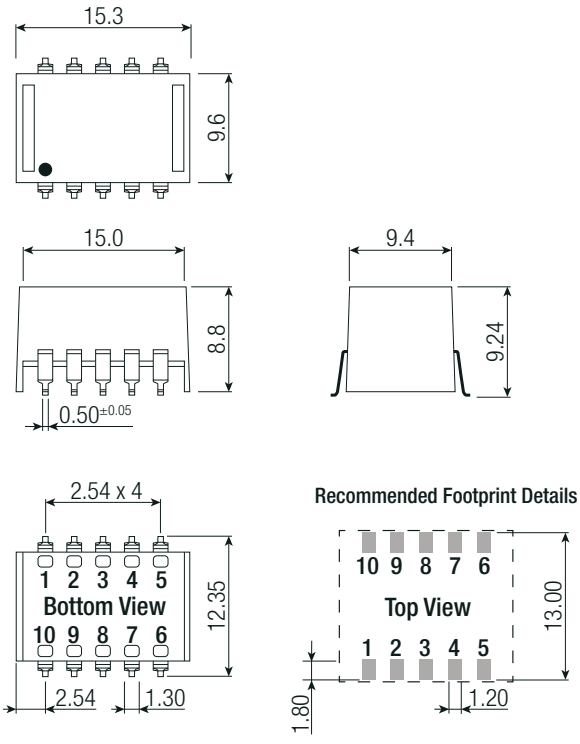


Specifications (measured @ Ta= 25°C, 10% minimum load, unless otherwise stated)

SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	**Report / File Number**	**Standard**
Information Technology Equipment, General Requirements for Safety	1603123	IEC60950-1:2005, 2nd Edition + AM 2:2013 EN60950-1:2006 + AM 2:2013
EAC	RU-AT.49.09571	TP TC 004/2011 TP TC 004/2011
RoHS 2+		RoHS 2011/65/EU + AM2015/863
EMC Compliance	**Condition**	**Standard / Criterion**
Electromagnetic compatibility of multimedia equipment - Emission requirements	with external filter	EN55032, Class B
ESD Electrostatic discharge immunity test	Air ±8kV; Contact ±4kV	EN61000-4-2
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	EN61000-4-3

DIMENSION AND PHYSICAL CHARACTERISTICS		
Parameter	**Type**	**Value**
Material	case PCB	non-conductive black plastic, (UL94 V-2) FR4, (UL94 V-1)
Dimension (LxWxH)		15.3 x 9.6 x 8.8mm
Weight		1.7g typ.

Dimension Drawing (mm)



Pinning information

Pin #	Single
1,2	+Vin
3,7,8,9	GND
4,5	+Vout
6	Vadj
10	CTRL

Tolerance:
xx.x= 0.5mm
xx.xx= ±0.25mm

Specifications (measured @ Ta= 25°C, 10% minimum load, unless otherwise stated)

PACKAGING INFORMATION		
Parameter	**Type**	**Value**
Packaging Dimension (LxWxH)	tube tape and reel (carton)	530.0 x 17.0 x 13.0mm 355.0 x 342.0 x 36.0mm
Packaging Quantity	tube tape and reel	33pcs 250pcs
Tape Width		24mm
Storage Temperature Range		-55°C to +125°C
Storage Humidity		95% RH max.