

## 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)

Rev.3

## 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.

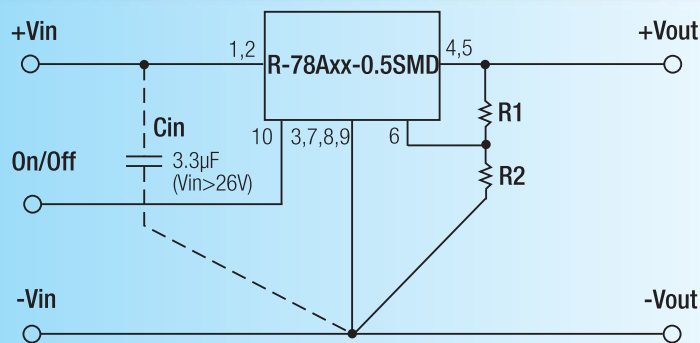
## Selection Guide

Part Number SMD	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  $V_{in} > 30VDC$

\* add suffix -R for tape&reel packing e.g. R-78A5.0-0.5-R. For more details see Application Notes.

## Standard Application Circuit



Use input capacitor if  $V_{in} > 26VDC$ .

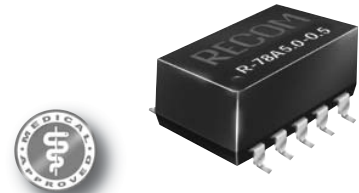
# INNOLINE

DC/DC-Converter

## R-78Axx-0.5SMD Series

### 0.5 AMP SMD

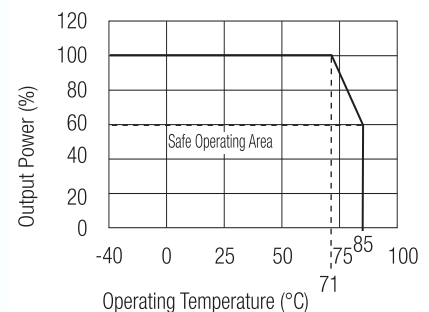
### Single Output



EN-55022 Certified  
EN-55024 Certified  
EN-60601-1-2 Certified  
EN-60950-1 Certified

# RECOM

## Derating-Graph (Ambient Temperature)



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

Characteristics	Conditions	Min.	Typ.	Max.
Input Voltage Range	See Table	4.75		34.0V
Output Voltage Range	See Table	1.5		15V
Output Current (see Note)	All Series	0*		500mA
Output Current Limit	All Series			2000mA
Short Circuit Input Current (Vin = 24V)	All Series			60mA
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
ON/OFF Remote Control Pin Drive Current			Ir=1.8µA typ	
Converter Input Current (valid for Vr < 1.6V)			20	30µA
Remote On/Off Threshold Voltage (Vr rising)		2.4	2.6	2.8V
Remote On/Off Voltage Hysteresis			250mV	
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
Conducted Emissions	EN55022			Class B
Radiated Emissions	EN55022			Class B
ESD	EN61000-4-2			Class A
Radiated Immunity	EN61000-4-3			Class A
Fast Transient	EN61000-4-4			Class A
Conducted Immunity	EN61000-4-6			Class A
Magnetic Field Immunity	EN61000-4-8			Class A
CE Certification				EN 60950-1
Package Weight				2.7g
MTBF (+25°C)	} Detailed Information see Application Notes chapter "MTBF"	using MIL-HDBK 217F		21098 x 10 <sup>3</sup> hours
(+71°C)				4214 x 10 <sup>3</sup> hours

\*Note: Operation under no load will not damage these devices, however they may not meet all specifications. A minimum load of 6mA is recommended

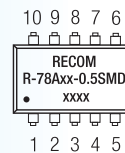
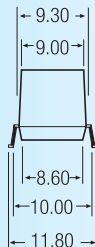
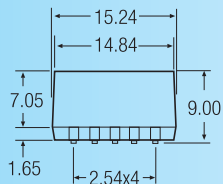
**IMPORTANT INFORMATION:** The R-78Ax.x-x.SMD series are not suitable to be soldered using vapour phase soldering, they are only guaranteed to be safe in IR or convection reflow ovens and by hand soldering. Reflow conditions should not exceed the limits of the Jedec STD-020C profile. This restriction applies to the product series R-78Ax.x-0.5SMD, R-78Ax.x-1.0SMD and RCD-24B-0.70/SMD only and does not affect any other RECOM products. For more details regarding this matter please contact [info@recom-development.at](mailto:info@recom-development.at)

**Table 1: Adjustment Resistor Values**

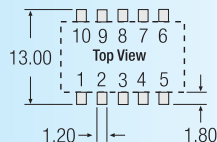
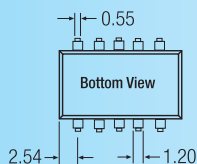
0.5A <sub>dc</sub>	R-78A1.8 -0.5SMD		R-78A2.5 -0.5SMD		R-78A3.3 -0.5SMD		R-78A5.0 -0.5SMD		R-78A6.5 -0.5SMD		R-78A9.0 -0.5SMD		R-78A12 -0.5SMD	
V <sub>out</sub> (nom.)	1.8V <sub>dc</sub>		2.5V <sub>dc</sub>		3.3V <sub>dc</sub>		5.0V <sub>dc</sub>		6.5V <sub>dc</sub>		9.0V <sub>dc</sub>		12.0V <sub>dc</sub>	
V <sub>out</sub> (adj)	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
1.5 (V)	3K $\Omega$		200 $\Omega$											
1.8 (V)			12K $\Omega$											
2.5 (V)		11.8K $\Omega$												
3.0 (V)		4.64K $\Omega$		44.2K $\Omega$	88.4K $\Omega$		17K $\Omega$							
3.3 (V)							27K $\Omega$		6.7K $\Omega$					
3.6 (V)						60.4K $\Omega$	42K $\Omega$		14K $\Omega$					
3.9 (V)						28K $\Omega$	58K $\Omega$		23K $\Omega$					
4.5 (V)						11.3k $\Omega$	180K $\Omega$		49K $\Omega$		26K $\Omega$		17K $\Omega$	
4.9 (V)						7.15k $\Omega$	850K $\Omega$		77k $\Omega$		36K $\Omega$		24K $\Omega$	
5.0 (V)						6.34k $\Omega$			86k $\Omega$		39K $\Omega$		26K $\Omega$	
5.1 (V)						5.9k $\Omega$		231k $\Omega$	97K $\Omega$		42K $\Omega$		28K $\Omega$	
5.5 (V)						3.9k $\Omega$		56.2k $\Omega$	160K $\Omega$		56K $\Omega$		36K $\Omega$	
6.5 (V)								14k $\Omega$			112K $\Omega$		63K $\Omega$	
8.0 (V)								2.32k $\Omega$		24.6K $\Omega$	400K $\Omega$		125K $\Omega$	
9.0 (V)										10.7K $\Omega$			200K $\Omega$	
10 (V)										4.75K $\Omega$		54.9K $\Omega$	345K $\Omega$	
11 (V)										1.65K $\Omega$		16.5K $\Omega$	740K $\Omega$	
12 (V)												3.6K $\Omega$		
12.6 (V)												0 $\Omega$		180K $\Omega$

## Package Style and Pinning (mm)

### SMD 10Pin Package



### Recommended Footprint Details



### Pin Connections

Pin #	Connection
1,2	+V <sub>in</sub>
3,7,8,9	GND
4,5	+V <sub>out</sub>
6	V <sub>adj</sub>
10	Remote On/Off
xx.x	±0.5mm
xx.xx	±0.25mm