

# Features

# Switching Regulator

- Efficiency up to 91%, no need for heatsinks
- Pin-out compatible with LM78XX linears
- Low profile (LxWxH=11.6 x 8.5 x 10.4mm)
- Wide input range (7V - 28V)
- Short circuit protection
- IEC/EN60950-1 + AM2 certified



## R-78E-1.0

1.0 Amp  
SIP3  
Single Output



### Description

The R-78E series is a switching regulator module that has been designed to offer all the advantages of a switching regulator (high efficiency, wide input range, accurate output voltage regulation) but with a low cost for production quantities. Due to the R-78E's high efficiency of up to 91% at an output voltage of 5V/1A at the output, no heat sink is required. The compact TO-220 compatible SIP3 package measures only 11.6 x 8.5 x 10.4 mm, so it saves precious board space. The warranty is 3 years.

### Selection Guide

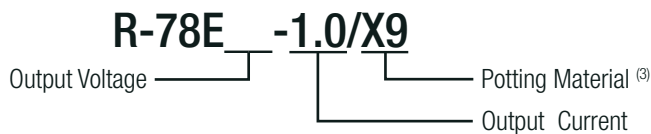
Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [A]	Efficiency <sup>(1)</sup>		max. Capacitive Load <sup>(2)</sup> [μF]
				@ min. Vin [%]	@ max. Vin [%]	
R-78E3.3-1.0	7-28	3.3	1.0	91	84	220
R-78E5.0-1.0	8-28	5.0	1.0	93	85	220
R-78E12-1.0/X9	15-27	12	1.0	97	93	100

#### Notes:

- Note1: Efficiency is tested at full load at +25°C ambient  
 Note2: Max. Cap Load is tested by nominal input and full resistive load



### Model Numbering



#### Notes:

- Note3: R-78E12-1.0/X9 is available with epoxy potting only.  
 For more information refer to "**Material**"

IEC60950-1 certified  
 EN60950-1 certified

### Specifications (measured at Ta= 25°C, full load, Vin= 24VDC and after warm-up)

BASIC CHARACTERISTICS				
Parameter	Condition	Min.	Typ.	Max.
Input Current	min. Vin			1000mA
Quiescent Current			1.5mA	
Internal Operating Frequency	3.3 & 5Vout		330kHz	
	12Vout		570kHz	
Minimum Load	only R-78E12-1.0/X9		2%	
Output Ripple and Noise <sup>(4)</sup>	20MHz BW			120mVp-p

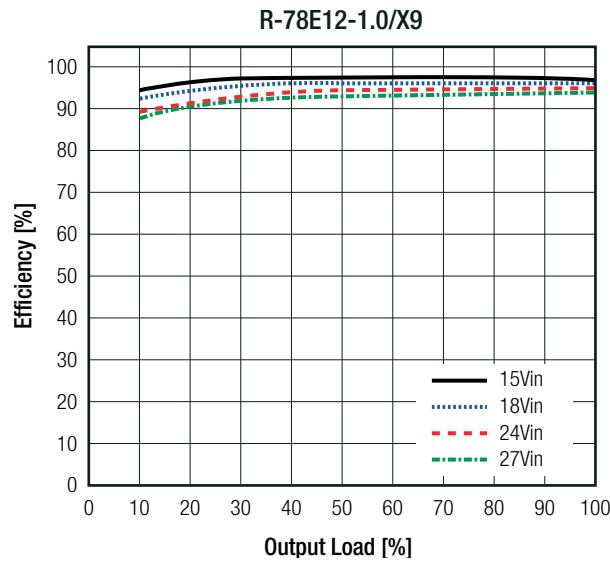
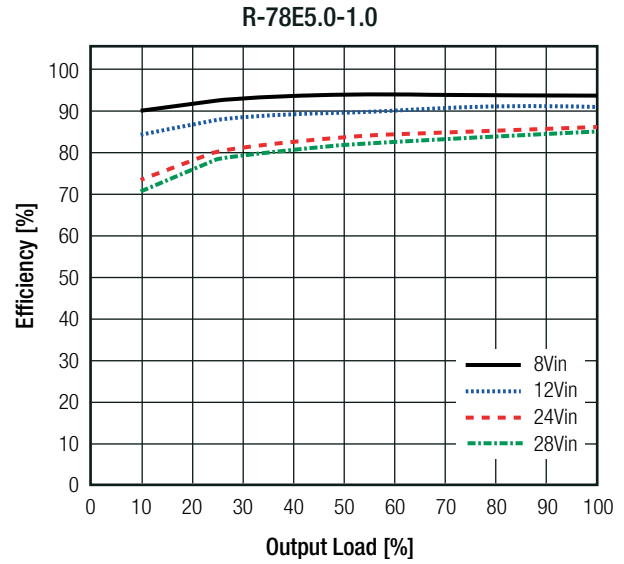
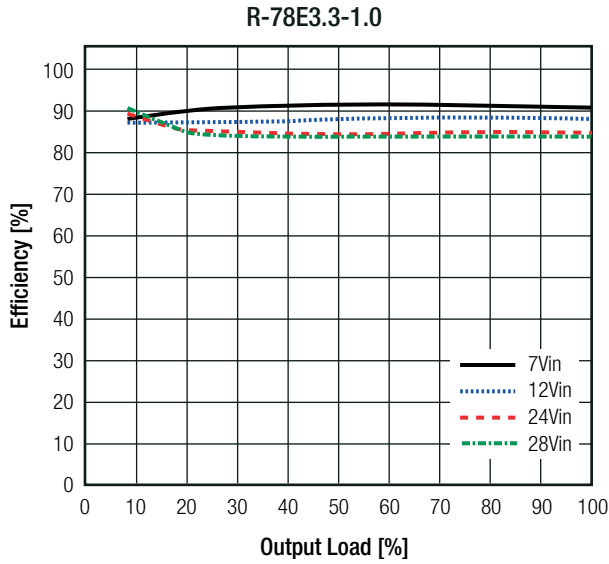
#### Notes:

- Note4: Measurements are made with a 100nF MLCC across output (low ESR)

continued on next page

Specifications (measured at Ta= 25°C, full load, Vin= 24VDC and after warm-up)

Efficiency vs. Load



**REGULATIONS**

Parameter	Condition	Value
Output Accuracy		±3.0% typ. / ±5.0% max.
Line Regulation	low line to high line, full load	±1.0% max.
Load Regulation	typ Vin. and 10% to 100% load	±1.5% max.

**PROTECTIONS**

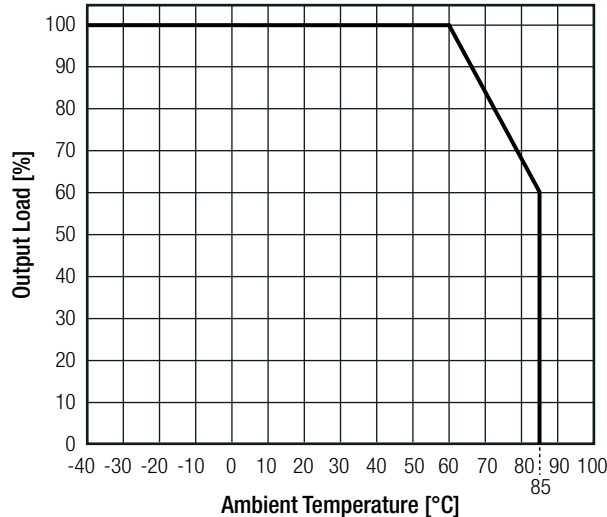
Parameter	Condition	Value
Short Circuit Protection (SCP)		Continuous, automatic recovery

Specifications (measured at Ta= 25°C, full load, Vin= 24VDC and after warm-up)

**ENVIRONMENTAL**

Parameter	Condition	Value	
Operating Temperature Range	natural convection and with derating (see graph)	-40°C to +85°C	
Humidity	non-condensing	95%, RH max.	
MTBF	according to MIL-HDBK-217F, G.B.	+25°C	3875 x 10 <sup>3</sup> hours
		+60°C	2088 x 10 <sup>3</sup> hours

**Derating Graph**



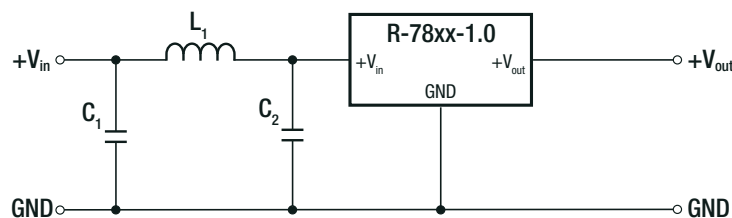
**SAFETY AND CERTIFICATIONS**

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 + AM2:2013
EAC	RU-AT.49.09571	TP TC 004/2011
RoHS2		RoHS 2011/65/EU + AM2015/863

**EMC Compliance**

EMC Compliance	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment - Emission requirements	with external filter (see filter suggestion below)	EN55032, Class A and B

**EMC Filter Suggestion according to EN55032**



**Component List Class A**

MODEL	C1	C2	L1
R-78E3.3-1.0	10µF	10µF	<a href="#">12µH choke</a>
R-78E5.0-1.0	100V MLCC	100V MLCC	<a href="#">RLS-126</a>
R-78E12-1.0/X9	10µF	10µF	5.6µH choke <a href="#">RLS-567</a>

**Component List Class B**

MODEL	C1	C2	L1
R-78E3.3-1.0	10µF	2.2µF	68µH choke
R-78E5.0-1.0	100V MLCC	100V MLCC	<a href="#">RLS-686</a>
R-78E12-1.0	10µF	10µF	100µH choke <a href="#">RLS-105</a>

**Notes:**

Note5: Filter suggestions are valid for indicated part numbers only. For other part numbers, please contact RECOM tech support for advice

Specifications (measured at Ta= 25°C, full load, Vin= 24VDC and after warm-up)

DIMENSION and PHYSICAL CHARACTERISTICS			
Parameter	Condition		Value
Material	case		non-conductive black plastic, (UL94 V-0)
	potting	3.3, 5Vout 12Vout	silicone, (UL94 V-0) epoxy, (UL94 V-0)
Package Dimension (LxWxH)			11.6 x 8.5 x 10.4mm
Package Weight			2g typ.

**Dimension Drawing (mm)**

**Pin Connections**

Pin #	Function
1	+Vin
2	GND
3	+Vout

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

**Recommended Footprint Details**

INSTALLATION AND APPLICATION	
<b>Standard Application</b>	
<p><b>Notes:</b></p> <p>Note6: The R-78Exx-1.0 can not be used as positive to negative converter</p>	
<p>To protect the converter during power-up, use soft start power supply.</p>	

PACKAGING INFORMATION		
Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	520.0 x 11.2 x 18.2mm
Packaging Quantity		42pcs
Storage Temperature Range		-55°C to +125°C

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