Features

Switching Regulator

- Efficiency up to 96%, no need for heatsinks
- Pin-out compatible with LM78XX linears
- Low profile (L*W*H=11.6*8.5*10.4mm)
- Wide input range (5V - 42V)
- Short circuit protection, thermal shutdown
- Low ripple and noise
- IEC/EN60950 certified
- Positive to negative converter

RECOM
DC/DC Converter

R-78C-1.0

1.0 Amp SIP3 Single Output

3 YEAR Warranty

IEC60950-1 certified
EN60950-1 certified
EN55032 compliant

Description

The R-78Cxx-1.0 series switching regulators are ideally suited to replace 1 Amp 78xx linear regulators and are pin compatible. Efficiencies of up to 96% means that very little energy is wasted as heat and the high input voltage is a useful feature.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [A]	Efficiency @ min Vin [%]	Efficiency @ max. Vin [%]
R-78C1.8-1.0	5 - 42	1.8	1.0	80	71
R-78C3.3-1.0	7 - 42	3.3	1.0	89	79
R-78C5.0-1.0	8 - 42	5	1.0	93	85
R-78C9.0-1.0	12 - 42	9	1.0	95	90
R-78C12-1.0	15 - 42	12	1.0	96	92
R-78C15-1.0	18 - 42	15	1.0	96	94

Model Numbering

R-78C__ -1.0

Output Voltage — Output Current

Specifications (measured at Ta= 25°C, minimum load, otherwise specified)

BASIC CHARACTERISTICS					
Parameter	**Condition**		**Min.**	**Typ.**	**Max.**
Input Voltage Range			Vout +3V		42VDC
Output Voltage Range			1.8VDC		15VDC
Minimum Load (1)			0%		
Quiescent Current				1mA	
Internal Operating Frequency			280kHz	350kHz	420kHz
Output Ripple and Noise (2)	20MHz BW	Vin= 24VDC Vout=1.8-15 full load		75mVp-p 30mVp-p	120mVp-p
Max. Capacitive Load	with normal start-up time, no external components	with <1 second start-up time + diode protection circuit			470µF 6800µF

Notes:

Note1: No load operation will not damage these devices, however they may not meet all specifications
A minimum load of 10mA is required

Note2: Measurements are made with a 10µF MLCC across output. (low ESR)

REGULATIONS		
Parameter	**Condition**	**Value**
Output Voltage Accuracy	full load	±2% typ. / ±3% max.
Line Voltage Regulation	max. Vin, full load	±0.2% typ.
Load Voltage Regulation	max. Vin. and 10% to 100% load	±0.4% typ.
Transient Response	100% <-> 50% load 100% <-> 10% load	±75mV max. ±200mV max.

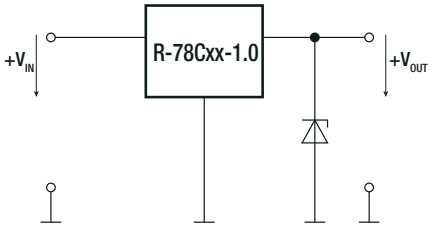
Specifications (measured at Ta= 25°C, minimum load, otherwise specified)

PROTECTIONS

Parameter	Condition	Value
Short Circuit Protection (SCP)		continuous, automatic recovery
Short Circuit Input Current	nom. Vin = 24VDC	65mA typ.

External Zener Diode Calculation for Output Over Voltage Protection

Minimum Zener Breakdown Voltage (VZmin) ≥ VOUTnom + 3% Accuracy

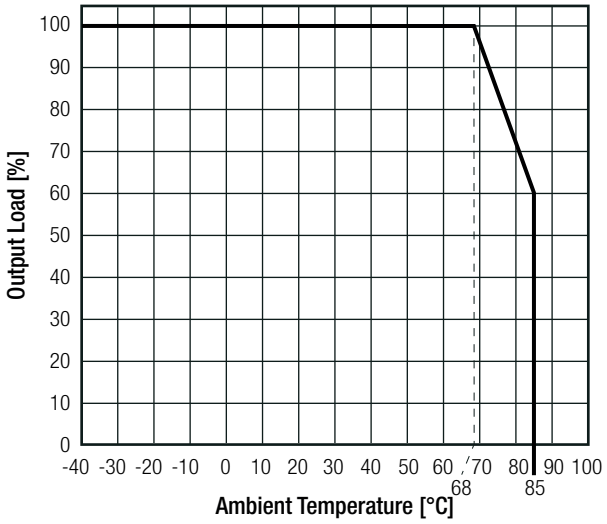


R-78C Vout	Zener Voltage, Vz (VZmin)	Recommended Zener Diode
1.8V (1.85V max.)	**2.0V** (1.90V)	MMSZ679T1G
3.3V (3.4V max.)	**3.6V** (3.42V)	MMSZ4685T1G
5V (5.15V max.)	**5.6V** (5.32V)	MMSZ4690T1G
9V (9.27V max.)	**10V** (9.50V)	MMSZ4697T1G
12V (12.36V max.)	**13V** (12.35V) **14V** (13.30V)	MMSZ4700T1G / MMSZ4701T1G
15V (15.45V max.)	**17V** (16.15V)	MMSZ4704T1G

ENVIRONMENTAL

Parameter	Condition		Value
Operating Temperature Range	with derating (see graph)		-40°C to +85°C
Max. Case Temperature			+100°C
Temperature Coefficient			0.015%/°C
Case Thermal Impedance			70°C/W max.
Operating Altitude			2000m
Operating Humidity	non condensing		5% - 95% max., RH
Pollution Degree			PD2
MTBF	MIL-HDBK 217F	+25°C +68°C	8600 x 10^3 hours 3880 x 10^3 hours

Derating Graph



SAFETY AND CERTIFICATIONS

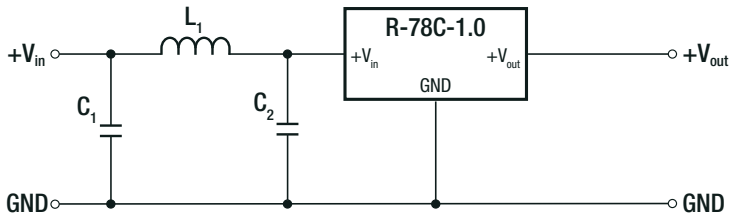
Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety	1603123	IEC60950-1:2005, 2nd Edition + AM 2:2013 EN60950-1:2006 + AM2:2013
RoHS 2+		RoHS 2011/65/EU + AM2015/863
EAC	RU-AT.49.09571	TP TC 004/2011

continued on next page

Specifications (measured at Ta= 25°C, minimum load, otherwise specified)

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	L1
R-78C3.3-1.0	10µF 100V MLCC	5.6µH choke RLS-567
R-78C5.0-1.0		

Component List Class B

MODEL	C1	C2	L1
R-78C3.3-1.0	10µF 100V MLCC	10µF 100V MLCC	12µH choke RLS-126
R-78C5.0-1.0			

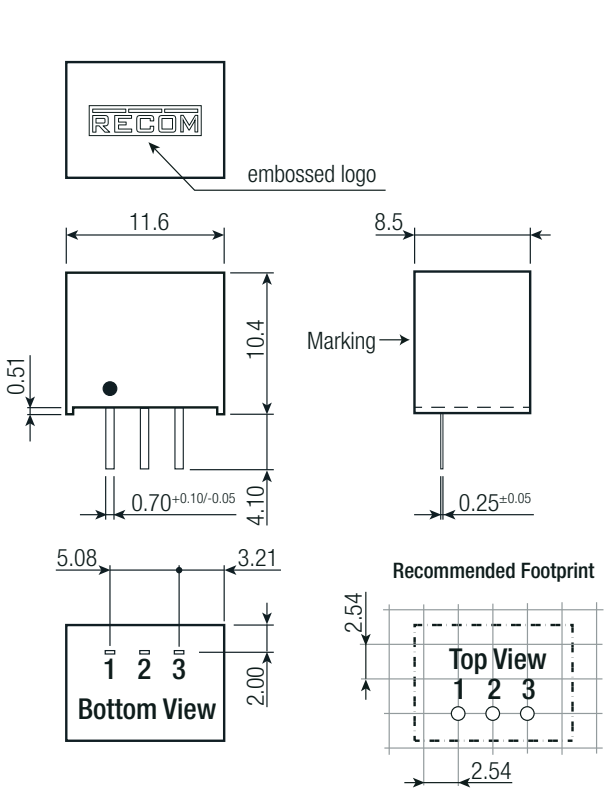
Notes:

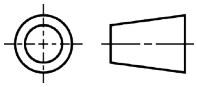
Note3: Filter suggestions are valid for indicated part numbers only. For other part numbers, please contact RECOM tech support for advice

DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter		Value
Material	case potting	non-conductive black plastic, (UL94 V-0) silicone, (UL94 V-0)
Package Dimension (LxWxH)		11.6 x 8.5 x 10.4mm
Package Weight		2g typ.

Dimension Drawing (mm)





Pin Connections

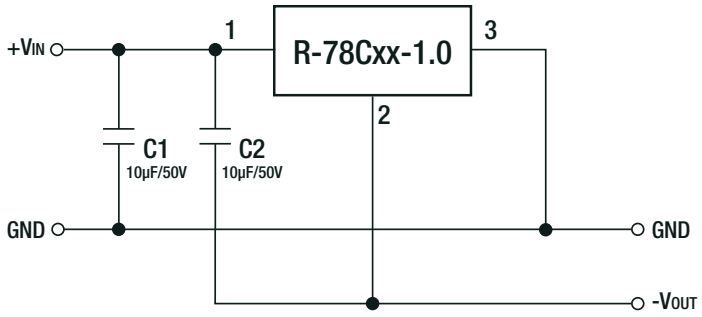
Pin #	Function
1	+Vin
2	GND
3	+Vout

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

Specifications (measured at Ta= 25°C, minimum load, otherwise specified)

INSTALLATION AND APPLICATION

Positive to Negative Converter



Pin Connections

Pin #	Negative	Positive
1	+Vin	+Vin
2	-Vout	GND
3	GND	+Vout

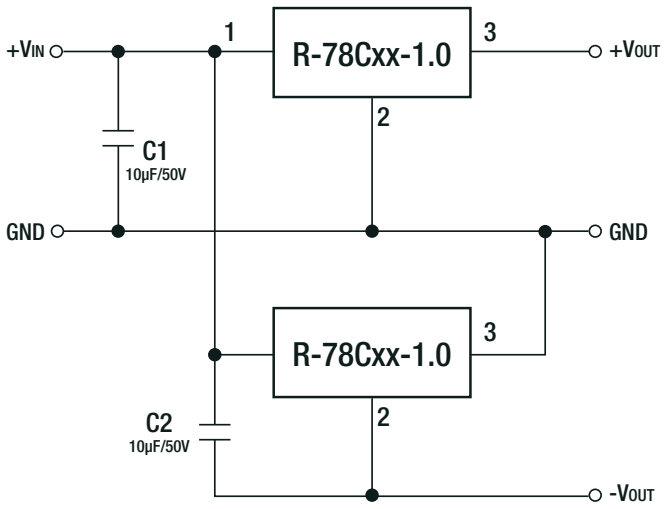
Selection Guide - Negative Output

Part Number	Input Voltage Range (3) [VDC]	Output Voltage [VDC]	Output Current [A]	Efficiency @ min Vin [%]	Efficiency @ max. Vin [%]
R-78C1.8-1.0	5 - 38	-1.8	-0.8	69	70
R-78C3.3-1.0	7 - 37	-3.3	-0.8	77	80
R-78C5.0-1.0	8 - 35	-5	-0.7	79	83
R-78C9.0-1.0	12 - 31	-9	-0.6	85	87
R-78C12-1.0	15 - 28	-12	-0.5	87	89
R-78C15-1.0	18 - 25	-15	-0.5	89	90

Notes:

Note4: When using the R-78C as positive-to-negative converter, the input voltage range is limited

Dual Output (two Converters) with Negative Output

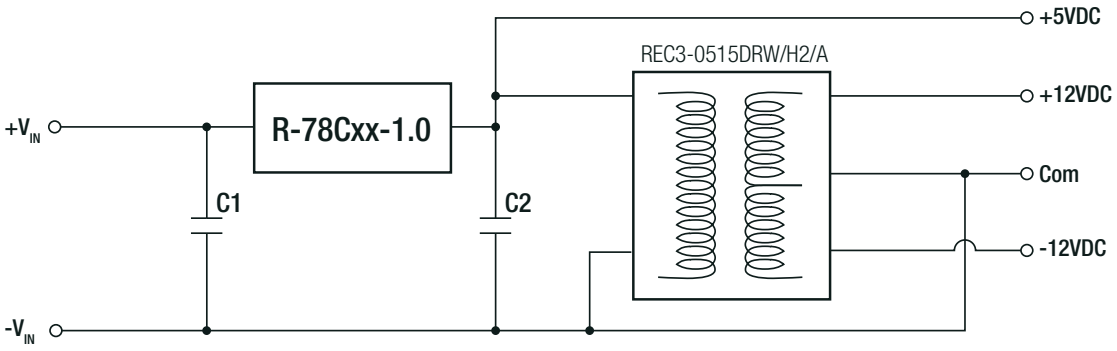


Notes:

Note5: When connecting two R-78C together to create a dual output, both connectors must be connected in parallel
Connecting them in series might cause start-up problems of the second R-78C

Specifications (measured at Ta= 25°C, minimum load, otherwise specified)

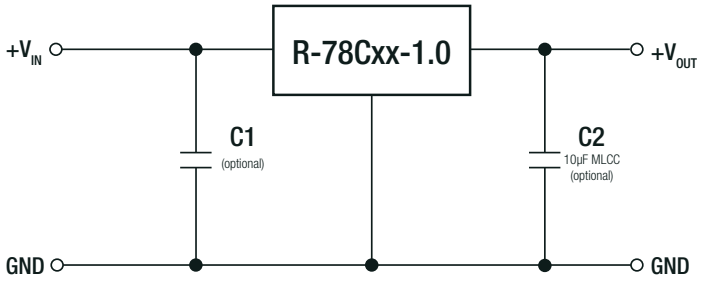
High Efficiency Regulated Outputs



C1: optional; C2: Required (further decoupling filtering may be neccesary between the two conversters)

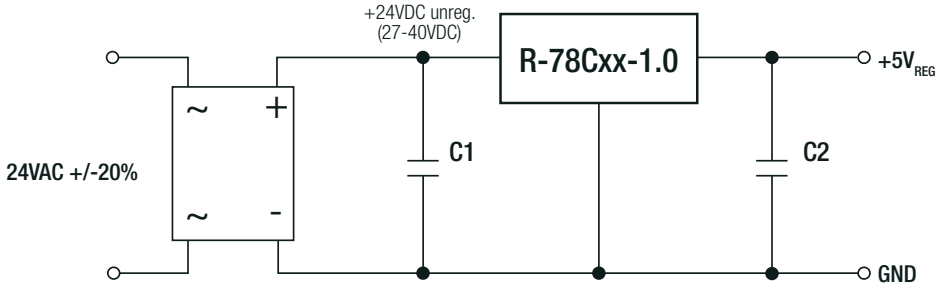
-Triple Outputs
- Wide Input Range 8V to 42V
- High System Efficiency, Suitable for 12V, 24V, 36V Battery Powered Devices

Standard Application Circuit



To protect the converter during power-up, use soft start power supply.

Low Voltage AC Input, Regulated DC Output



-Low Voltage AC Input
-Regulated and protected DC Output

PACKAGING INFORMATION		
Parameter	**Type**	**Value**
Packaging Dimension (LxWxH)	tube	520 x 18.2 x 11.2mm
Packaging Quantity		42pcs
Storage Temperature Range		-55°C to +125°C