Features

Switching Regulator

- Efficiency up to 96%, no need for heatsinks
- 2A continuous output current
- Vin up to 32V
- Vout: 1.2V - 15V
- Wide operating temperature -40°C to +70°C at full load
- Continuous short circuit protection
- Pin compatible with TO220 linear regulators
- Positive to negative converter

RECOM

DC/DC Converter

R-78B-2.0

2.0 Amp SIP3 Single Output

3 YEAR warranty

Description

The R-78Bxx-2.0 series high efficiency switching regulators are ideally suited to replace 78xx linear regulators and are pin compatible. The efficiency of up to 96% means that very little energy is wasted as heat. Full power is available over a temperature range of -40°C up to 70°C without the need for heat sinks with their additional space and mounting costs. A high input voltage of up to 32VDC and output voltages from 1.2V up to 15V, low ripple and noise figures and a short circuit input current of typically only 50mA round off the specifications of this versatile converter series.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Efficiency @ full load @ min Vin [%]	@ max. Vin [%]	Max. Capacitive Load [1] [µF]
R-78B1.2-2.0	4.75 - 32	1.2	2000	87	72	3300
R-78B1.5-2.0	4.75 - 32	1.5	2000	90	79	3300
R-78B1.8-2.0	4.75 - 32	1.8	2000	91	80	3300
R-78B2.5-2.0	4.75 - 32	2.5	2000	92	84	2300
R-78B3.3-2.0	4.75 - 32	3.3	2000	92	86	1800
R-78B5.0-2.0	6.5 - 32	5	2000	94	90	820
R-78B9.0-2.0	11 - 32	9	2000	95	93	620
R-78B12-2.0	15 - 32	12	2000	96	94	470
R-78B15-2.0	18 - 32	15	2000	96	95	470

Notes:

Note1: Max. cap load is tested by nominal input and full resistive load

IEC62368-1 certified
EN62368-1 certified
EN55032 compliant
CB report

Model Numbering

R-78B__-2.0

Output Voltage — Output Current

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm up unless otherwise specified)

BASIC CHARACTERISTICS

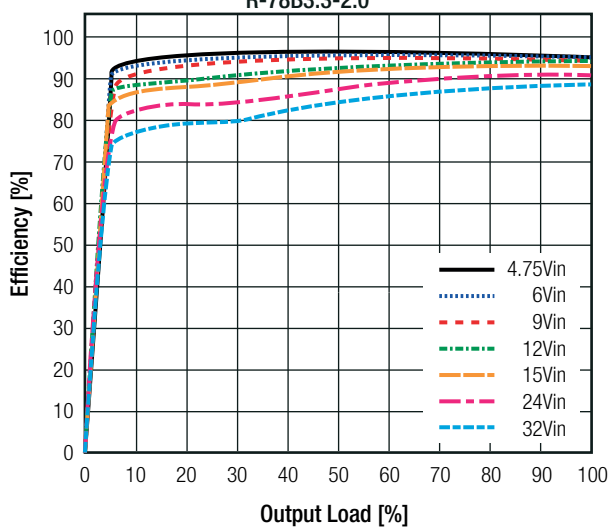
Parameter	Condition		Min.	Typ.	Max.
Input Voltage Range	nom. Vin= 24VDC	1.2Vout - 3.3Vout 5Vout 9Vout 12Vout 15Vout	4.75VDC 6.5VDC 11VDC 15VDC 18VDC	24VDC	32VDC
Maximum Reverse Voltage					0V
Inrush Current				2A	
Quiescent Current	nom. Vin= 24VDC			2mA	
Internal Power Dissipation	Vout= 1.5VDC			0.35W	0.8W
Start-up time				10ms	
Rise Time				50µs	
Internal Operating Frequency	nom. Vin= 24VDC			460kHz	
Minimum Load			0%		
Output Ripple and Noise (2)	20MHz BW	Vout ≤3.3VDC Vout ≥5VDC		50mVp-p 75mVp-p	

Notes:

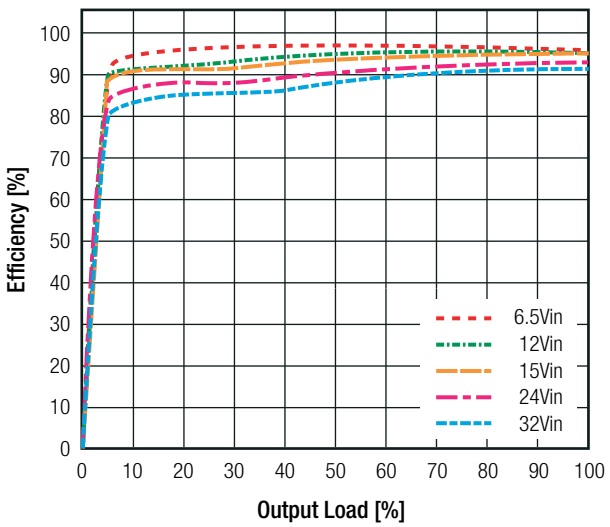
Note2: Measurements are made with a 100nF MLCC across output (low ESR)

Efficiency vs. Load

R-78B3.3-2.0

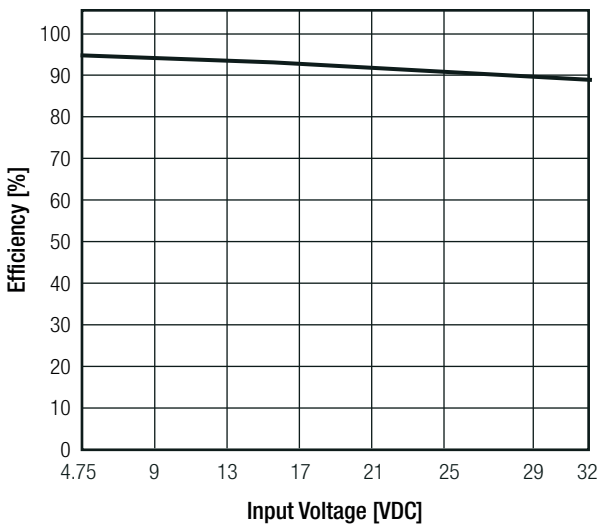


R-78B5.0-2.0

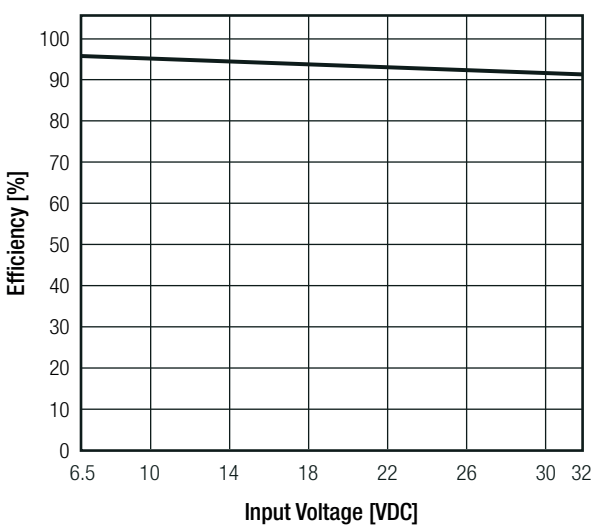


Efficiency vs. Input Voltage

R-78B3.3-2.0



R-78B5.0-2.0



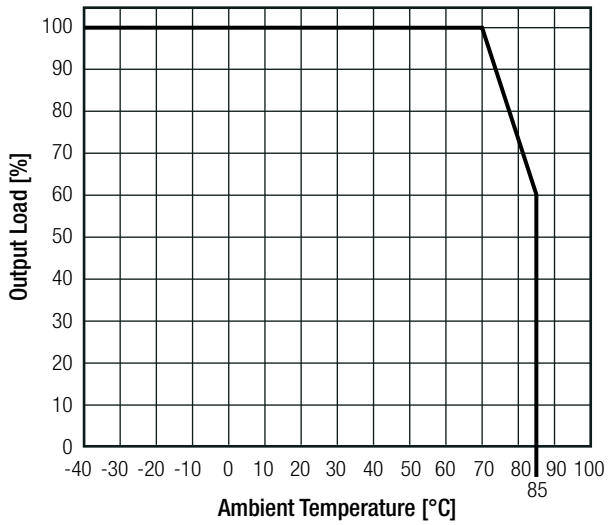
Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm up unless otherwise specified)

REGULATIONS		
Parameter	**Condition**	**Value**
Output Accuracy	100% load	±2.0% typ.
Line Regulation	low line to high line, full load	±0.5% typ.
Load Regulation	0% to 100% load	±1.0% typ.

PROTECTIONS			
Parameter	**Condition**		**Value**
Short Circuit Protection (SCP)	below 100mΩ		continuous, automatic recovery
Short Circuit Input Current	nom. Vin= 24VDC	<5Vout ≥5Vout	50mA typ. 75mA typ.

ENVIRONMENTAL			
Parameter	**Condition**		**Value**
Operating Temperature Range	without derating (see graph)		-40°C to +70°C
Maximum Case Temperature			+105°C
Temperature Coefficient			0.02%/°C typ.
Operating Altitude			5000m
Operating Humidity	non-condensing		95% RH max.
Pollution Degree			PD2
Vibration			10-55Hz, 2G, 30min along X, Y and Z axis
MTBF	according to MIL-HDBK-217F, G.B.	+25°C	6349 x 10^3 hours

Derating Graph
(@ Chamber and natural convection 0.1m/s)

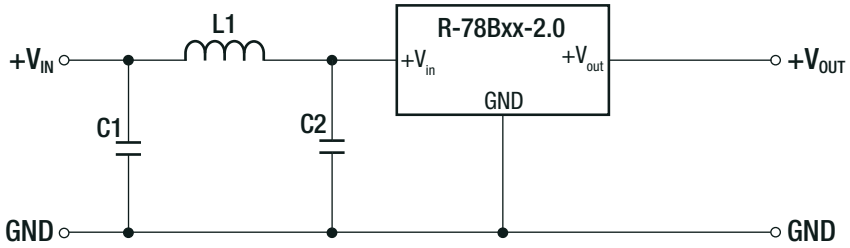


Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm up unless otherwise specified)

SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	**Report / File Number**	**Standard**
Audio/video, information and communication technology equipment Safety requirements (CB Scheme)	L0339m38-B1-L	IEC62368-1: 2014, 2nd Edition EN62368-1: 2014
EAC	RU-AT.49.09571	TP TC 004/2011
RoHS2+		RoHS 2011/65/EU + AM2015/863

EMC Compliance	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment - Emission requirements	with external components (see filter suggestion below)	EN55032, Class A EN55032, Class B
Information technology equipment - Immunity characteristics - Limits and methods of measurement		EN55024:2010
Electromagnetic compatibility of multimedia equipment - Emission requirements		EN55032: 2013, Class B
ESD Electrostatic discharge immunity test	Air ±8kV; Contact ± 4kV	IEC61000-4-2, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3 V/m	IEC61000-4-3, Criteria A
Fast Transient and Burst Immunity	±0.5kV	IEC61000-4-4, Criteria A
Surge Immunity	±0.5kV	IEC61000-4-5, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	3V	IEC61000-4-6, Criteria A
Power Magnetic Field Immunity	50Hz/ 1A/m	IEC61000-4-8, Criteria A

EMC Filtering Suggestion according to EN55032



EN55022	C1	C2	L1
Class A	4.7µF 50V MLCC 1206	N/A	3.3µH Choke
Class B	10µF 50V MLCC 1210	4.7µF 50V MLCC 1206	10µH Choke

DIMENSION and PHYSICAL CHARACTERISTICS		
Parameter	**Type**	**Value**
Material	case potting PCB	plastic, (UL94 V-0) silicone, (UL94 V-0) FR4, (UL94 V-0)
Dimension (LxWxH)		11.5 x 8.5 x 17.5mm
Weight		4.0g typ.

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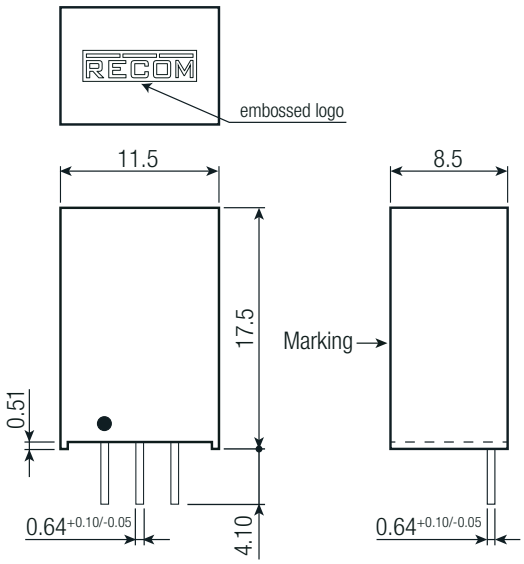
Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm up unless otherwise specified)

Dimension Drawing (mm)

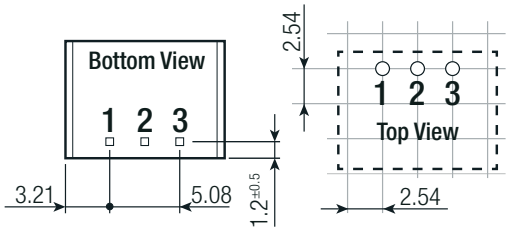


Pin Connections

Pin #	Single
1	+Vin
2	GND
3	+Vout

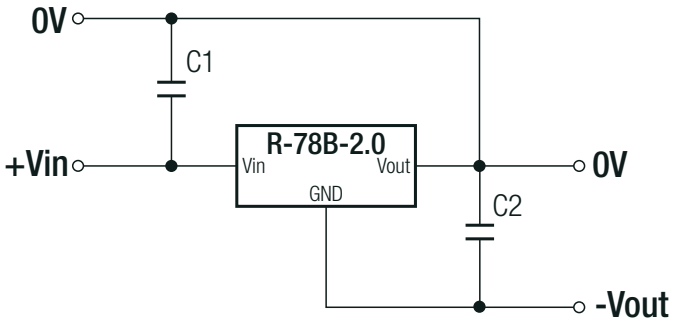
Tolerance: xx.x= ±0.5mm
xx.xx= ±0.25mm

Recommended Footprint Details



INSTALLATION and APPLICATION

Positive to Negative



Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Efficiency @ full load @ min Vin [%]	@ max. Vin [%]	External Capacitor [C1 / C2]
R-78B1.2-2.0	4.75 - 32	-1.2	-1000	86	86	10µF / 10µF
R-78B1.5-2.0	4.75 - 32	-1.5	-1000	74	87	10µF / 10µF
R-78B1.8-2.0	4.75 - 32	-1.8	-1000	76	88	10µF / 10µF
R-78B2.5-2.0	4.75 - 32	-2.5	-1000	79	89	10µF / 10µF
R-78B3.3-2.0	4.75 - 32	-3.3	-1000	83	89	10µF / 10µF
R-78B5.0-2.0	6.5 - 32	-5	-1000	86	90	10µF / 10µF
R-78B9.0-2.0	11 - 32	-9	-1000	90	91	10µF / 10µF
R-78B12-2.0	15 - 32	-12	-1000	91	92	10µF / 10µF
R-78B15-2.0	18 - 32	-15	-1000	92	93	10µF / 10µF

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm up unless otherwise specified)

PACKAGING INFORMATION		
Parameter	**Type**	**Value**
Packaging Dimension (LxWxH)	tube	520.0 x 25.1 x 10.6mm
Packaging Quantity		42pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidity	non-condensing	95% RH max.