Technical Data Sheet

R-78K-1.0 series ◊ Switching Regulator

1.0Amp ◊ Single Output ◊ SIP3

RECOM DC/DC Converter

FEATURES

- Efficiency up to 96%, no need for heat-sinks
- 4.5-36VDC wide input voltage
- -40°C to +90°C ambient operation without derating
- Pin compatible with 78 series regulators
- Non isolated DC/DC converter
- Undervoltage and short circuit protection
- 3 year warranty



Dimensions (LxWxH): 11.5 x 7.55 x 10.2mm (0.45 x 0.30 x 0.40 inch)
1.7g (0.038 lbs)

APPLICATIONS



SAFETY & EMC

RoHS² compliant 10 from 10 | Reach compliant | IECEE CB SCHEME

DESCRIPTION

The R-78K-1.0 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-78K-1.0's high efficiency of up to 95% no heat-sink is required, and operation from -40 to 90°C is possible with slight derating. The compact TO-220 compatible SIP3 package measures only 11.5 x 7.55 x 10.2mm, so it saves precious board space.

SELECTION GUIDE

Part Number	Input Voltage Range [VDC]	Output Voltage nom. [VDC]	Output Current max. [mA]	Efficiency @ min. Vin [%]	Efficiency @ max. Vin [%]
R-78K1.8-1.0	4.5-36	1.8	1000	83	71
R-78K2.5-1.0	4.5-36	2.5	1000	85	75
R-78K3.3-1.0	4.5-36	3.3	1000	88	79
R-78K5.0-1.0	6.5-36	5	1000	92	85
R-78K9.0-1.0	12-36	9	1000	93	89
R-78K12-1.0	15-36	12	1000	95	91
R-78K15-1.0	18-36	15	1000	94	91

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MODEL NUMBERING

R-78K__-1.0

Output Voltage — Output Current

ABSOLUTE MAX. RATINGS (exceeding these ratings may damage the device)

Parameters	Condition	Min.	Typ.	Max.
Maximum Input Voltage Slew Rate (1)	$+V_{IN}$ to GND			10VDC/µs
Case Temperature		-40°C		110°C
Storage Temperature		-50°C		125°C

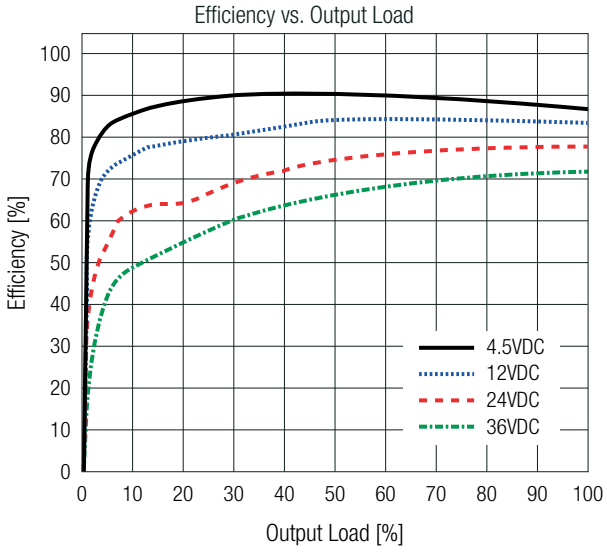
Note1: At higher slew rates or hard plugging, add 27µF E-Cap between +Vin and GND, especially when Vin is >18VDC

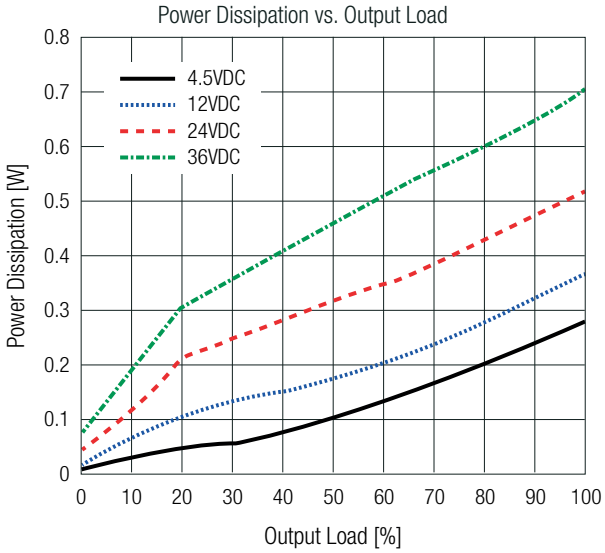
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition		Min.	Typ.	Max.
Input Under Voltage Lockout (UVLO)	R-78K1.8-1.0, R-78K2.5-1.0, R-78K3.3-1.0	DC-DC ON	3.75VDC		4.05VDC
		DC-DC OFF	3.6VDC		3.8VDC
	R-78K5.0-1.0	DC-DC ON	5VDC		5.25VDC
		DC-DC OFF	4.6VDC		4.9VDC
	R-78K9.0-1.0	DC-DC ON	9.5VDC		10.5VDC
		DC-DC OFF	9.1VDC		9.7VDC
	R-78K12-1.0	DC-DC ON	13.0VDC		13.5VDC
		DC-DC OFF	12.5VDC		13.1VDC
	R-78K15-1.0	DC-DC ON	16.9VDC		17.5VDC
		DC-DC OFF	15.6VDC		16.6VDC
Quiescent Current					1mA
Internal Operating Frequency				400kHz	
Minimum Load			0%		
Output Ripple and Noise (2)	20MHz BW	R-78K1.8-1.0 - R-78K5.0-1.0		50mVp-p	
		R-78K9.0-1.0		60mVp-p	
		R-78K12-1.0		75mVp-p	
		R-78K15-1.0		100mVp-p	

Note2: The test setup can have an impact on ripple noise values (placement of scope probe, capacitors, it's specifications, wires, PCB tracks, distances, etc.)

R-78K1.8-1.0

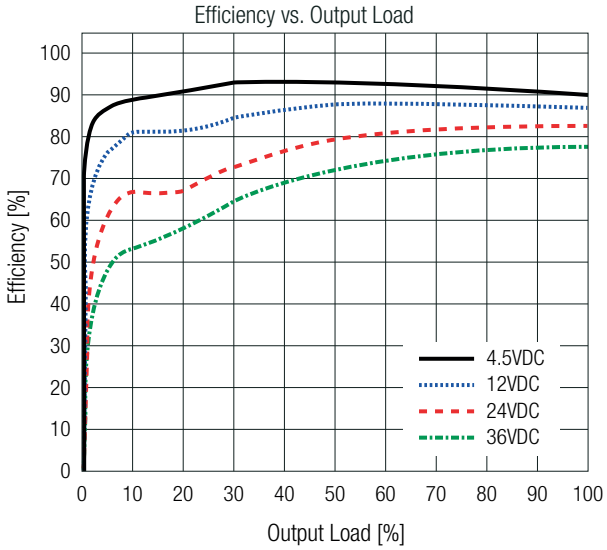


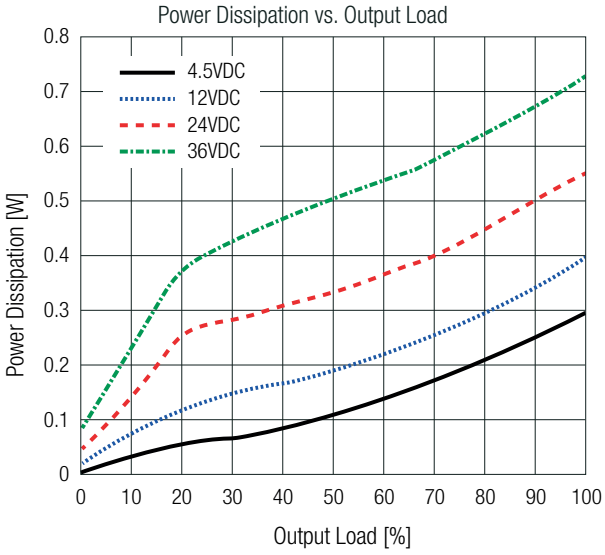


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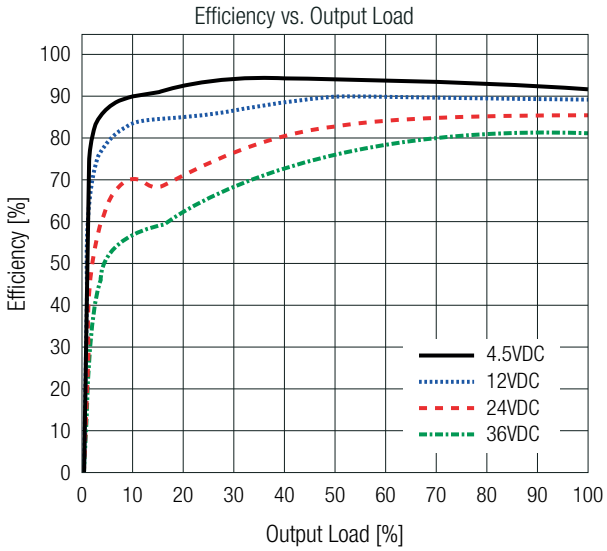
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

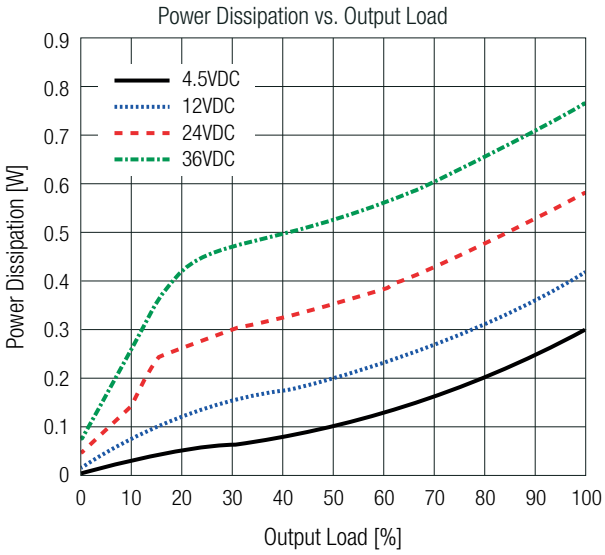
R-78K2.5-1.0



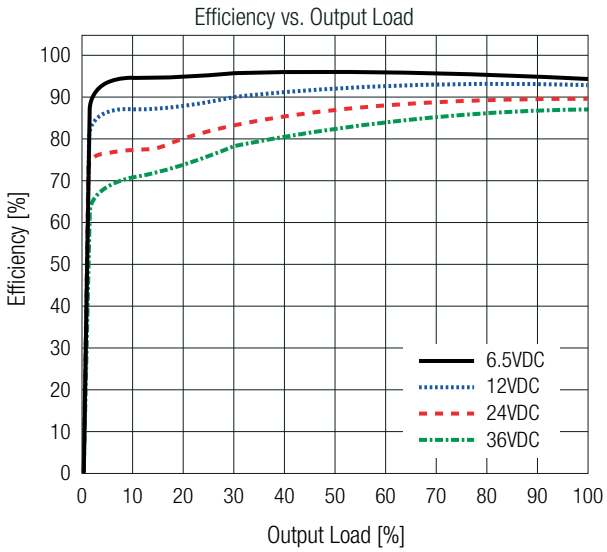


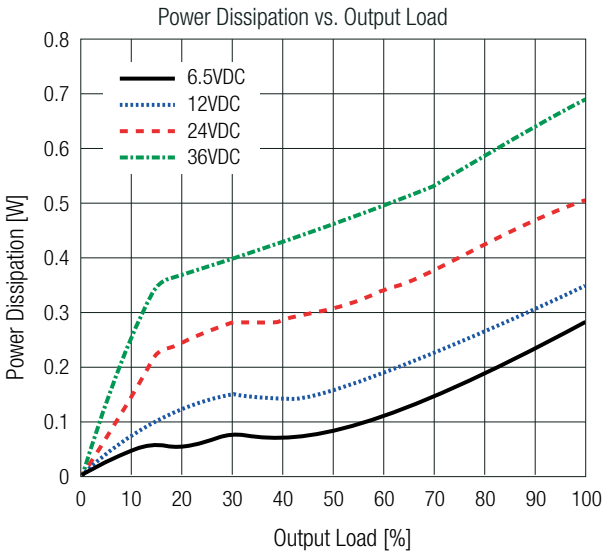
R-78K3.3-1.0





R-78K5.0-1.0

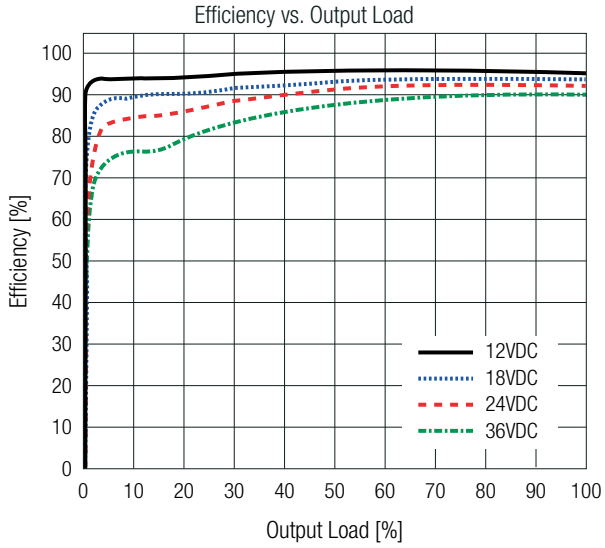


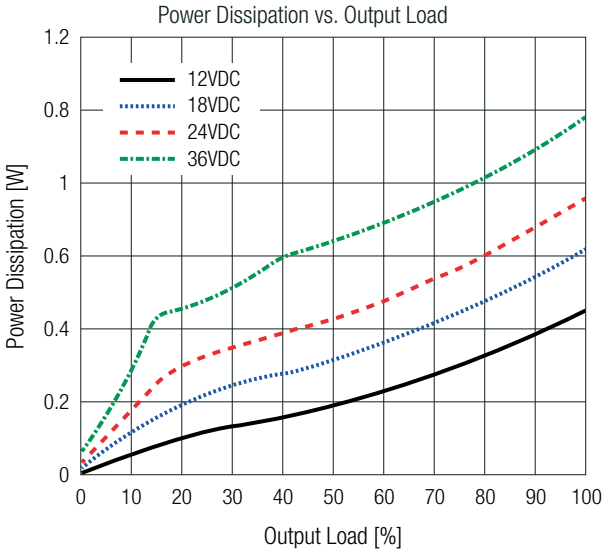


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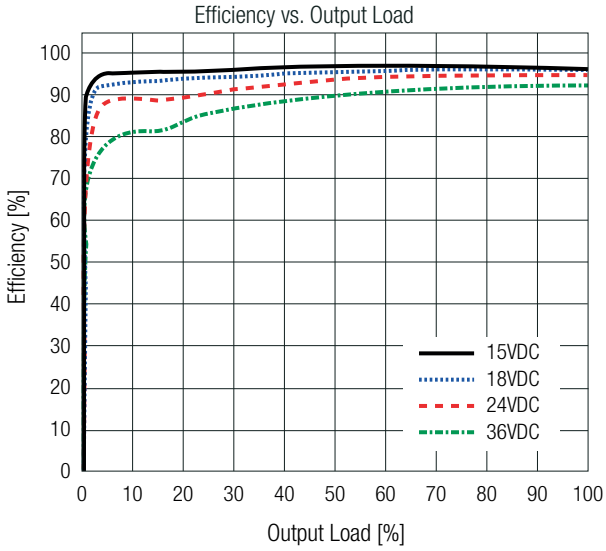
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

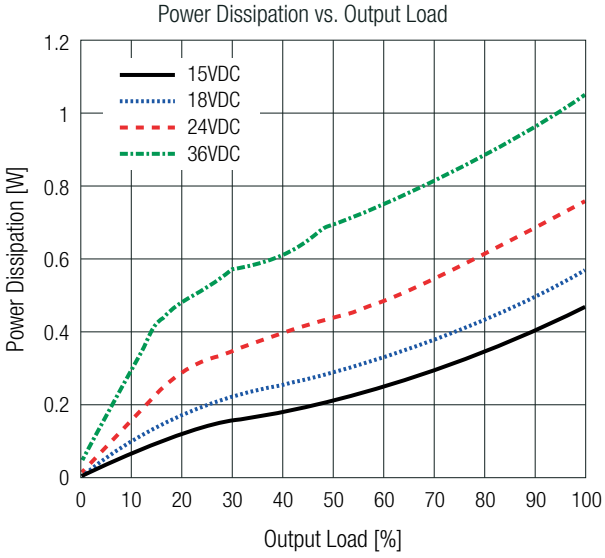
R-78K9.0-1.0



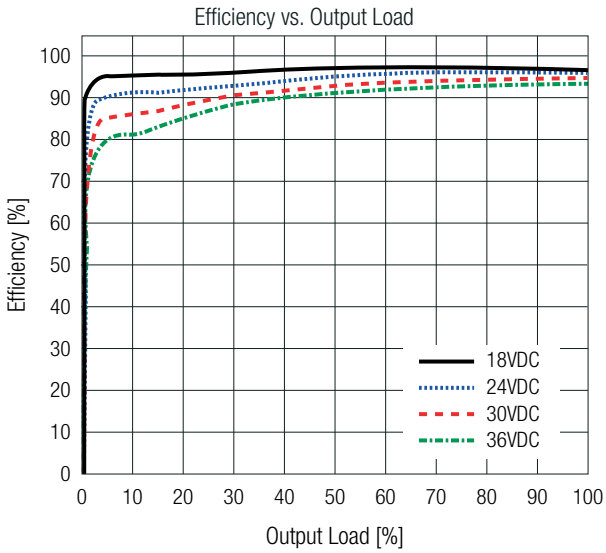


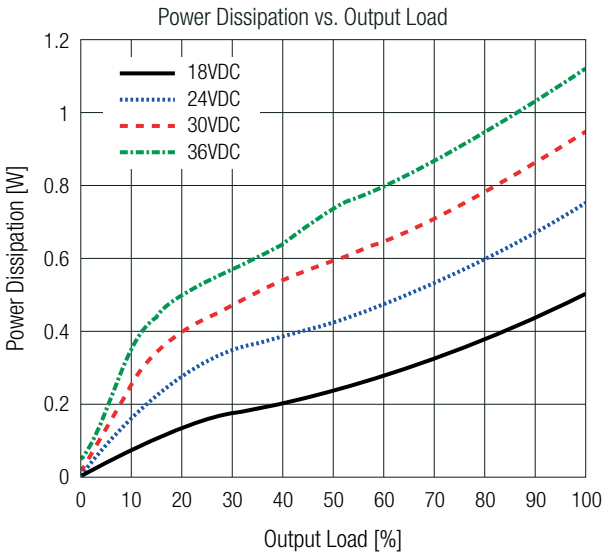
R-78K12-1.0





R-78K15-1.0





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RECOM DC/DC Converter

REGULATIONS

Parameter	Condition	Value
Output Accuracy		±2.0% typ. / ±3.5% max.
Line Regulation	low line to high line, full load	±0.5% max.
Load Regulation	0% to 100%	2.0% typ. / 3.5% max.

PROTECTIONS

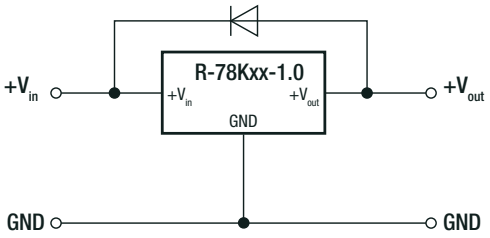
Parameter	Condition	Value
Short Circuit Protection (SCP)		continuous, automatic recovery
Short Circuit Input Current		50mA max.

Optional Diode Protection Circuit

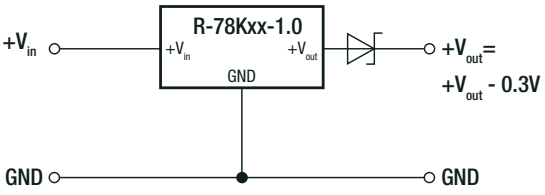
Add a blocking diode to Vout if current can flow backwards into the output, as this can damage the converter when it is powered down.

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:

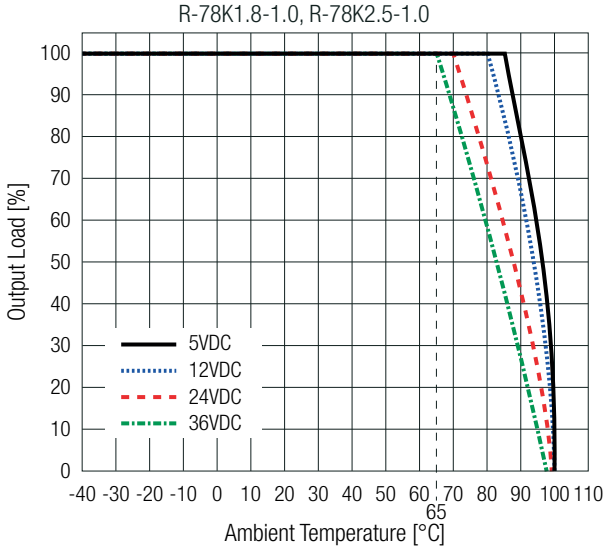


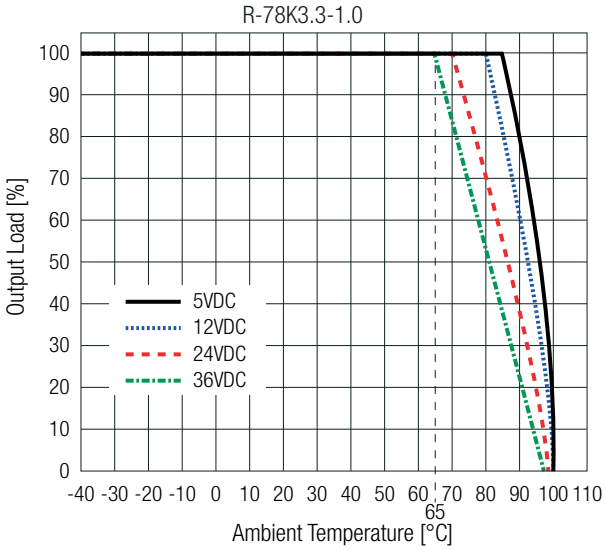
ENVIRONMENTAL

Parameter	Condition		Value
Operating Temperature Range	refer to **"Derating Graph"**		-40°C to +90°C
Maximum Case Temperature			+110°C
Operating Altitude			0.01%/K
Operating Humidity	non-condensing		95% RH max.
Vibration			10-55Hz, 2G, 30min along X,Y and Z axis
MTBF	according to MIL-HDBK-217F, G.B., +25°C	R-78K1.8-1.0	5139 x 10^3 hours
		R-78K2.5-1.0	4990 x 10^3 hours
		R-78K3.3-1.0	4878 x 10^3 hours
		R-78K5.0-1.0	5031 x 10^3 hours
		R-78K9.0-1.0	4546 x 10^3 hours
		R-78K12-1.0	4340 x 10^3 hours
		R-78K15-1.0	4546 x 10^3 hours

Derating Graph

(@ Chamber and natural convection 0.1m/s)



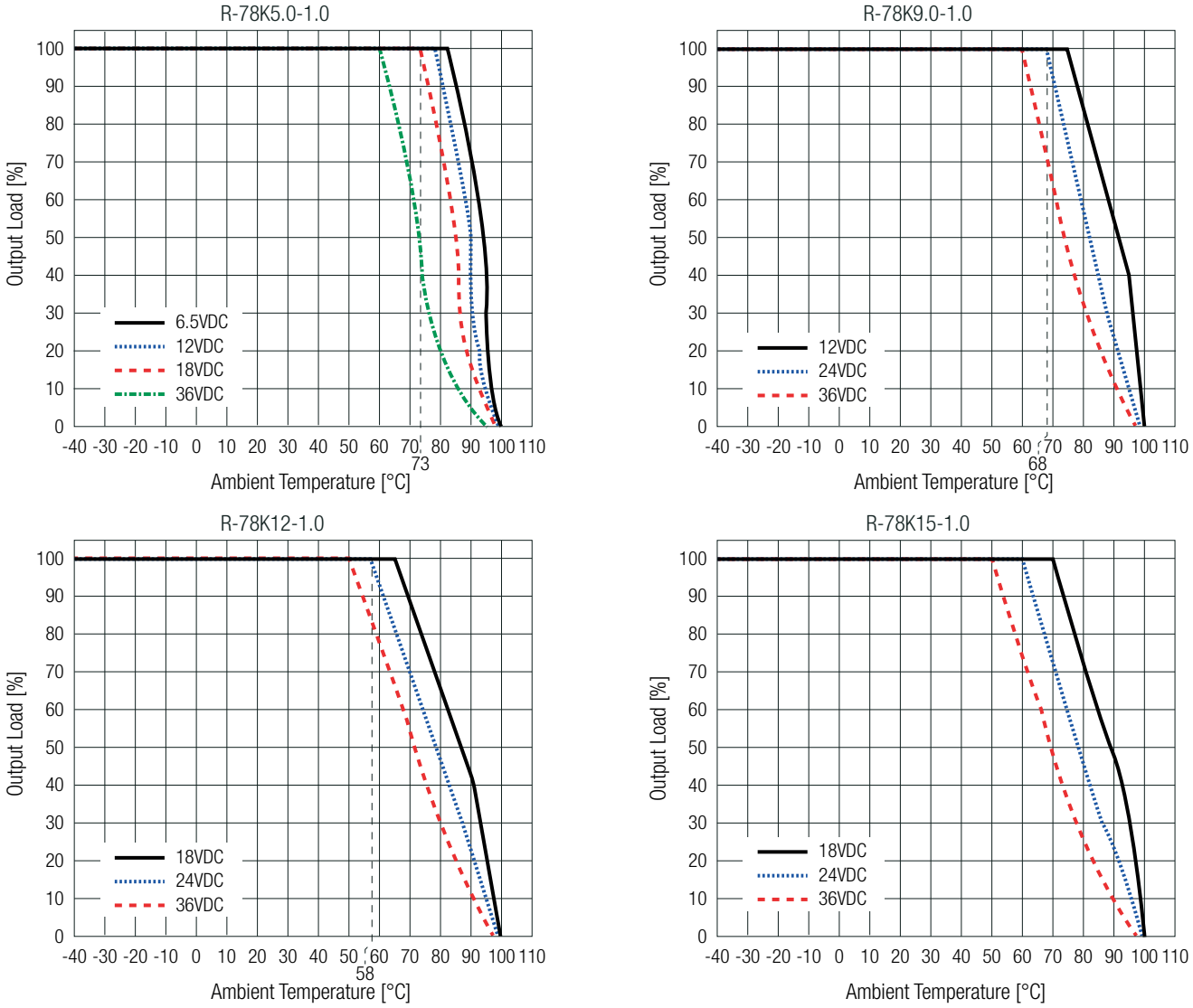


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ENVIRONMENTAL

Derating Graph

(@ Chamber and natural convection 0.1m/s)

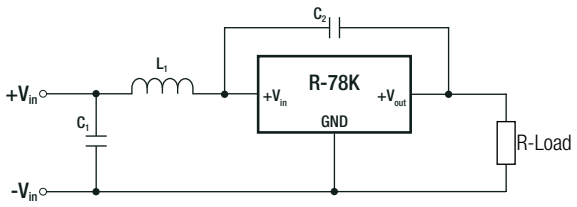


SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Part 1: Safety requirements (CB Scheme)	085-210593601-100	IEC62368-1:2018 3rd Edition
Audio/Video, information and communication technology equipment - Part 1: Safety requirements		EN IEC 62368-1:2020+A11:2020
RoHS2		RoHS 2011/65/EU + AM2015/863

EMC Compliance	Condition	Standard /Criterion
Electromagnetic compatibility of multimedia equipment - Emission requirements	with external filter	EN55032, Class B

EMC Filtering Suggestions according to EN55032



Component List Class B for 1.8V, 2.5V, 3.3V version

C1	L1	C2
10µF	RLS-186	1nF

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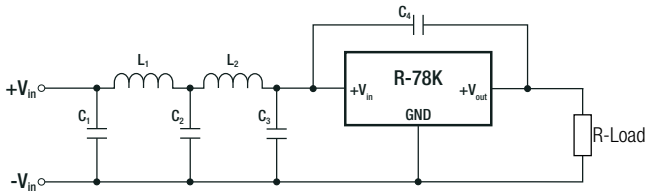
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1.0Amp ◊ Single Output ◊ SIP3

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SAFETY AND CERTIFICATIONS

EMC Filtering Suggestions according to EN55032



Component List Class B for 5V, 12V & 15V version

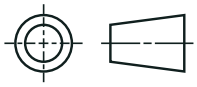
C1/C2	L1	C3	C4	L2
10µF	RLS-397	22µF	1nF	RLS-186

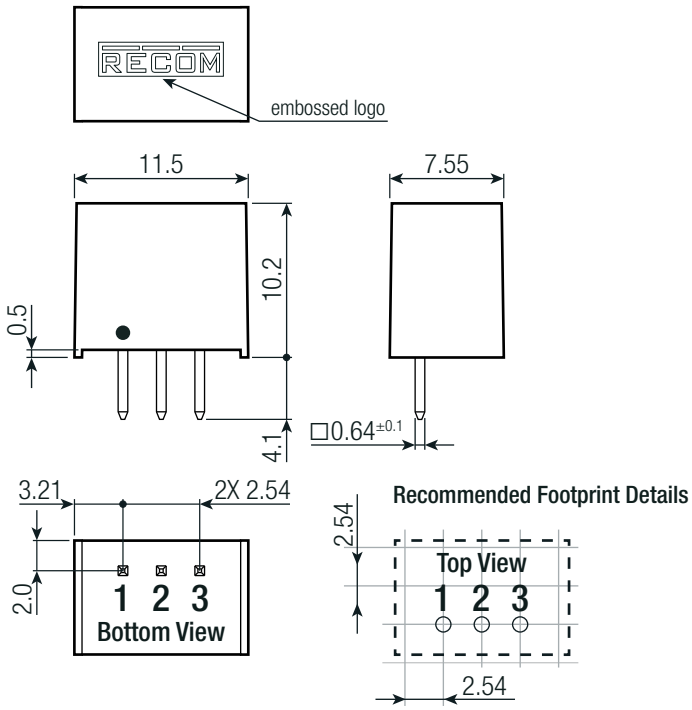
DIMENSION & PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Materials	case	black plastic, (UL94 V-0)
	potting	PU, (UL94 V-0)
	PCB	FR4, (UL94 V-0)
Dimension (LxWxH)		11.5 x 7.55 x 10.2mm 0.45 x 0.30 x 0.40 inch
Weight		1.7g typ. 0.038 lbs

DIMENSION & PHYSICAL CHARACTERISTICS

Dimension Drawing





Pinning information

Pin #	Single
1	$+V_{IN}$
2	GND
3	$+V_{OUT}$

Tolerances:
x.x= ±0.5mm
x.xx= ±0.25mm

PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	520.0 x 9.2 x 19.0mm
Packaging Quantity		43pcs
Storage Temperature Range		-50°C to +125°C
Storage Humidity	non-condensing	95% RH max.

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