

# Features

- 1W power in SMD package
- 4:1 Input voltage range
- Efficiency up to 81%
- 1.6kVDC/1min isolation
- Regulated output
- -40°C to +90°C at full load
- Continuous short circuit protected

# Regulated Converters

## R1M

**1 Watt  
SMD  
Single & Dual  
Output**



### Description

The R1M is an isolated 1W DC/DC converter in a compact SMD package available with 4:1 inputs covering 5, 12, 24, and 48V rails providing single or dual regulated, short-circuit protected outputs. There is no minimum load requirement. Isolation is 1.6kVDC/1min, and the operating temperature is from -40°C up to +90°C without derating. Class A and Class B EMC conformity requires only a few external components. Standard packaging is tube.

### Selection Guide

Part Number	Input Voltage Range <sup>(1)</sup> [VDC]	nom. Output Voltage [VDC]	Output Current [mA]	Efficiency typ. <sup>(2)</sup> [%]	max. Capacitive Load <sup>(3)</sup> [µF]
R1M-xx3.3S/SMD	4.5-18, 9-36, 18-75	3.3	300	75-77	1680
R1M-xx05S/SMD	4.5-18, 9-36, 18-75	5	200	78-79	820
R1M-xx09S/SMD	4.5-18, 9-36, 18-75	9	112	79	630
R1M-xx12S/SMD	4.5-18, 9-36, 18-75	12	90	81	470
R1M-xx15S/SMD	4.5-18, 9-36, 18-75	15	70	81	330
R1M-xx24S/SMD	4.5-18, 9-36, 18-75	24	45	80	160
R1M-xx05D/SMD	4.5-18, 9-36, 18-75	±5	±100	77	±470
R1M-xx12D/SMD	4.5-18, 9-36, 18-75	±12	±45	80	±330
R1M-xx15D/SMD	4.5-18, 9-36, 18-75	±15	±35	81	±220

#### Notes:

- Note1: Refer to **“Input Voltage Range”**  
 Note2: Efficiency is tested at nominal input and full load at +25°C ambient  
 Note3: Max Cap Load is tested at nominal input and full resistive load

### Model Numbering



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

BASIC CHARACTERISTICS				
Parameter	Condition	Min.	Typ.	Max.
Input Voltage Range	nom. V <sub>IN</sub> = 12VDC	4.5VDC	12VDC	18VDC
	nom. V <sub>IN</sub> = 24VDC	9VDC	24VDC	36VDC
	nom. V <sub>IN</sub> = 48VDC	18VDC	48VDC	75VDC
Input Surge Voltage	1 second max.	nom. V <sub>IN</sub> = 12VDC		25VDC
		nom. V <sub>IN</sub> = 24VDC		50VDC
		nom. V <sub>IN</sub> = 48VDC		100VDC

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**Specifications** (measured @  $T_a = 25^\circ\text{C}$ , nom.  $V_{in}$ , full load and after warm-up unless otherwise stated)

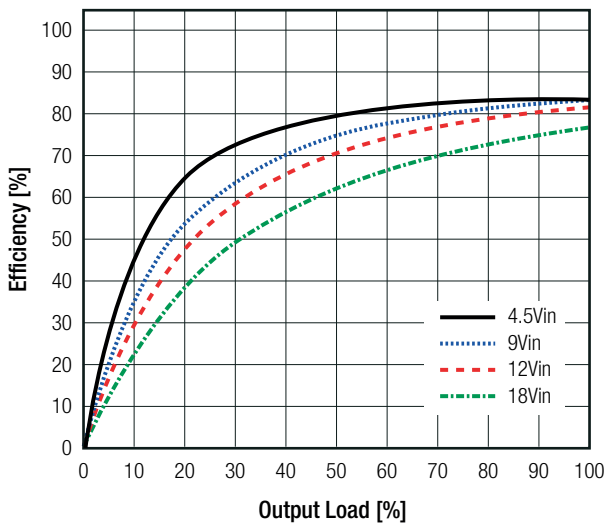
**BASIC CHARACTERISTICS**

Parameter	Condition	Min.	Typ.	Max.
Quiescent Current	nom. $V_{in} = 12\text{VDC}$		20mA	
	nom. $V_{in} = 24\text{VDC}$		10mA	
	nom. $V_{in} = 48\text{VDC}$		5mA	
Start-up time	power up, CTRL ON/OFF		10ms	20ms
ON/OFF CTRL <sup>(4)</sup>	DC-DC ON	open or high impedance		
	DC-DC OFF	2mA	3mA	4mA
Standby Current	DC-DC OFF		2.5mA	
Internal Operating Frequency		100kHz		
Output Ripple and Noise	20MHz BW		30mVp-p	
Reflected Back Ripple Current	with external components	nom. $V_{in} = 12\text{VDC}$	15mA <sub>p-p</sub>	
		nom. $V_{in} = 24\text{VDC}$	10mA <sub>p-p</sub>	
		nom. $V_{in} = 48\text{VDC}$	5mA <sub>p-p</sub>	

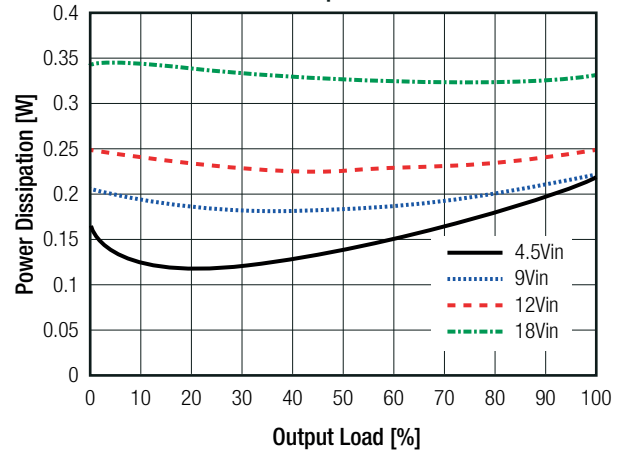
**Notes:**

Note4: Refer to "ON/OFF CTRL"

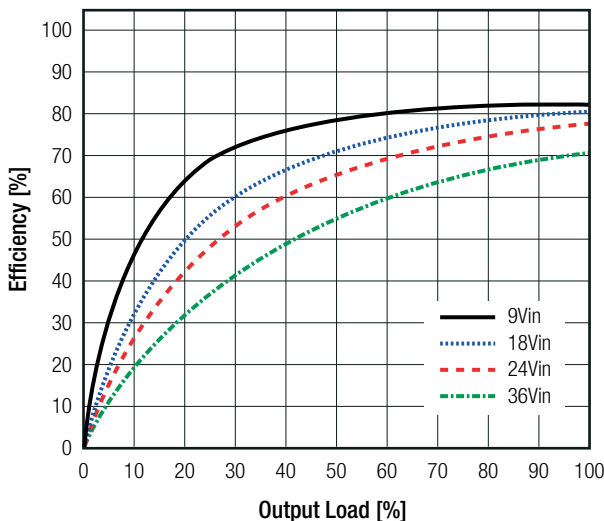
**R1M-1212S/SMD Efficiency vs. Load**



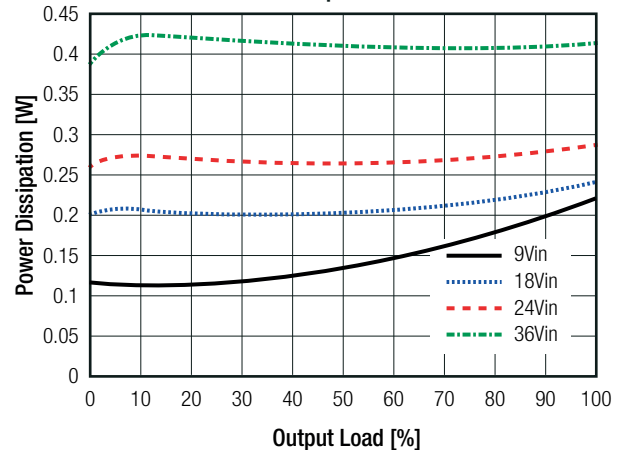
**Power Dissipation vs. Load**



**R1M-2405S/SMD Efficiency vs. Load**



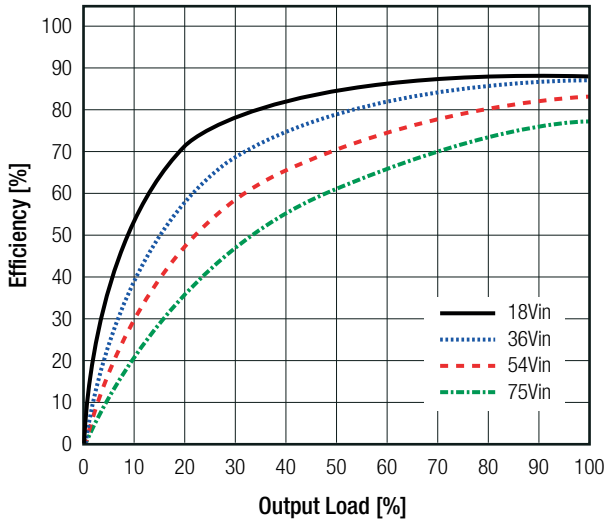
**Power Dissipation vs. Load**



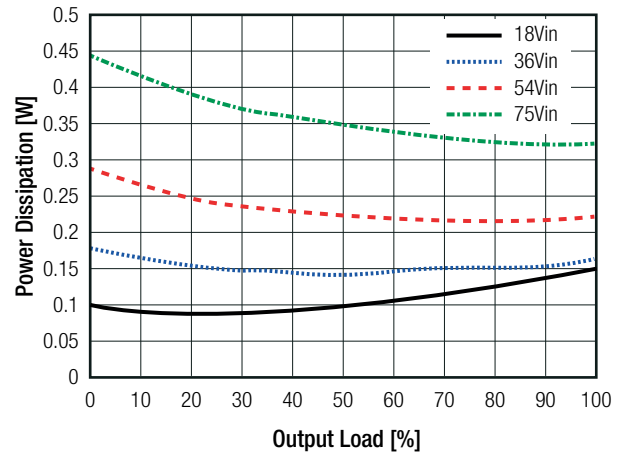
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Specifications (measured @  $T_a = 25^\circ\text{C}$ , nom.  $V_{in}$ , full load and after warm-up unless otherwise stated)

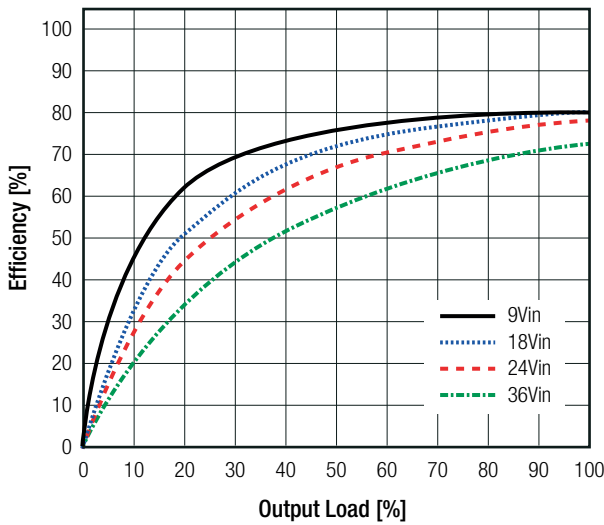
**R1M-4812S/SMD** Efficiency vs. Load



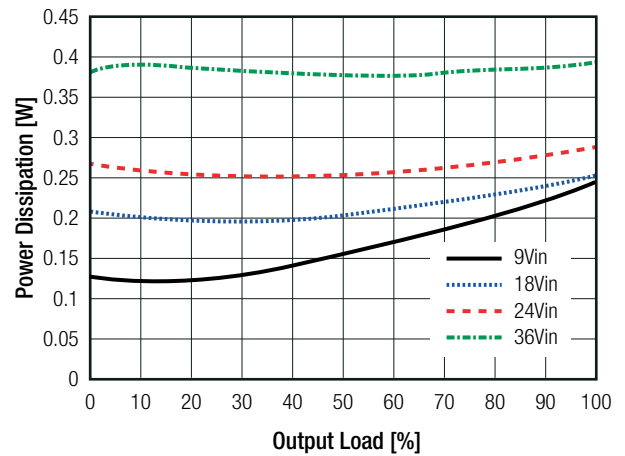
Power Dissipation vs. Load



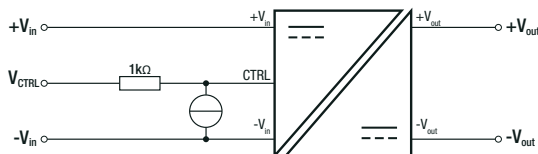
**R1M-2405D/SMD** Efficiency vs. Load



Power Dissipation vs. Load



### ON/OFF CTRL



DC-DC ON	Open or high impedance
DC-DC OFF	2.0mA to 4.0mA max.

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

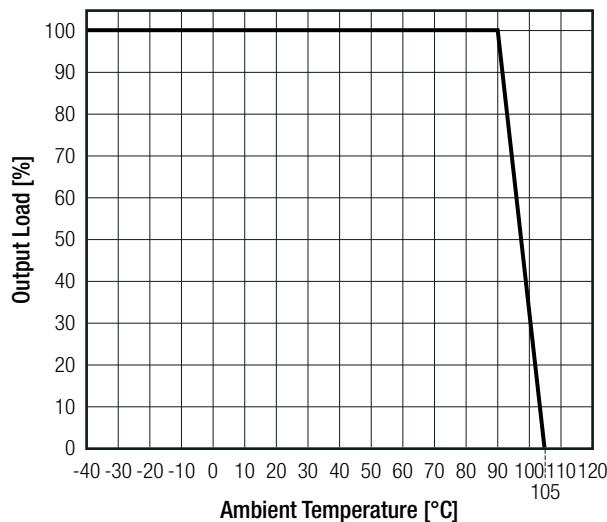
REGULATIONS			
Parameter	Condition	Value	
Output Accuracy		±1.0% max.	
Line Regulation	low line to high line, full load	±0.2% max.	
Load Regulation	0% to 100% load	single	1% max.
		dual	1% max.
	10% to 100% load	single	0.5% max.
		dual	0.8% max.
Cross Regulation	asymmetrical 25% / 100% load	±5% max.	
Transient Response Recovery Time	25% load step change	±500µs typ.	

PROTECTIONS		
Parameter	Type	Value
Short Circuit Protection (SCP)		continuous, auto recovery
Isolation Voltage <sup>(5)</sup>	I/P to O/P, 1 minute	1.6kVDC
Isolation Resistance	I/P to O/P, V <sub>ISO</sub> = 500VDC	1GΩ min.
Isolation Capacitance	I/P to O/P, 100kHz/0.1V	50pF typ.
<p><b>Notes:</b></p> <p>Note5: This power module is not internally fused. An input line fuse must always be used  Recom suggests: 12Vin=T0.5A; 24Vin=T0.315A; 48Vin=T0.16A slow blow</p>		

ENVIRONMENTAL		
Parameter	Condition	Value
Operating Temperature Range	with derating	-40°C to +105°C
	without derating	-40°C to +90°C
Maximum Case Temperature	measured at "tc point"	+105°C
Operating Humidity	non-condensing	5% - 95% RH max.
Thermal Shock		according to MIL-STD-810F
Vibration		according to MIL-STD-810F
MTBF	according to MIL-HDBK-217F, G.B. +25°C	8534 x 10 <sup>3</sup> hours

**Derating Graph**

(@ Chamber and natural convection 0.1m/s)

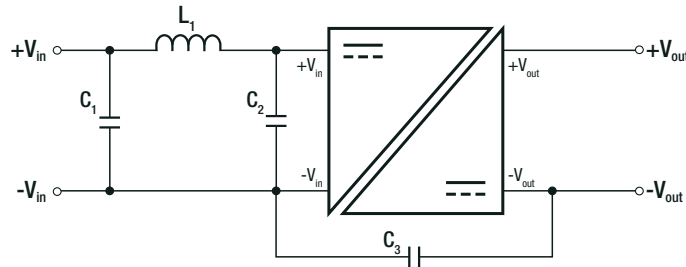


**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

**SAFETY AND CERTIFICATIONS**

<b>Certificate Type (Safety)</b>	<b>File Number</b>	<b>Standard</b>
RoHS2		RoHS-2011/65/EU + AM-2015/863
<b>EMC Compliance</b>	<b>Condition</b>	<b>Standard / Criterion</b>
Electromagnetic compatibility of multimedia equipment – Emission Requirements	with external filter refer to <b>“EMC Filtering”</b>	EN55032, Class A and B

**EMC Filtering Suggestions according to EN55032**



**Class A Component List**

Model	C1	C2	C3	L1
R1M-12xxS	10µF	N/A	N/A	4.7µH
R1M-24xxS	4.7µF	N/A	N/A	22µH
R1M-48xxS	2.2µF	N/A	150pF	39µH

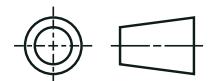
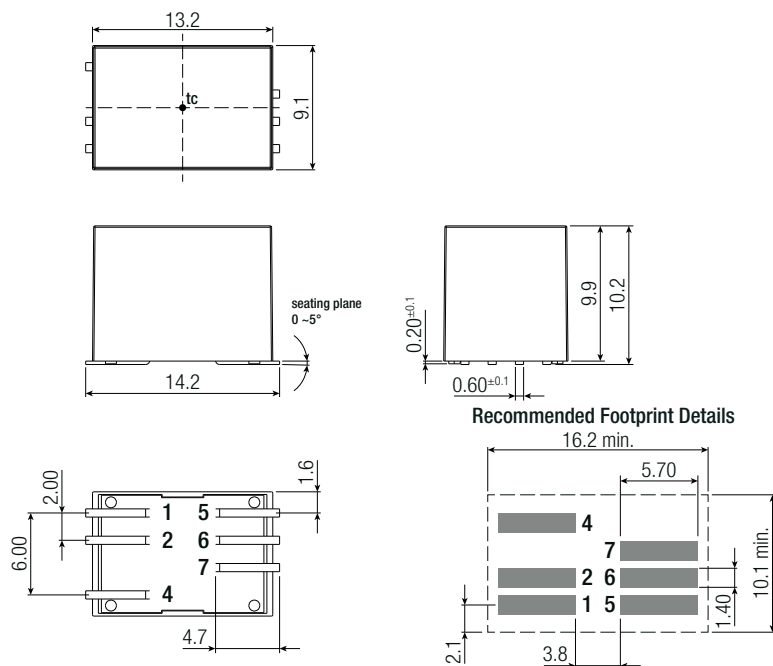
**Class B Component List**

Model	C1, C2	C3	L1
R1M-12xxS	10µF	100pF	4.7µH
R1M-24xxS	4.7µF	150pF	22µH
R1M-48xxS	2.2µF	150pF	39µH

**DIMENSION AND PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	baseplate/case	black plastic, (UL94 V-0)
	potting	silicone (UL94 V-0)
Dimension (LxWxH)		14.2 x 9.1 x 10.2mm
Weight		2.7g typ.

**Dimension Drawing (mm)**



**Pinning Information**

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
4	CTRL	CTRL
5	NC	-Vout
6	-Vout	COM
7	+Vout	+Vout

NC= no connection

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

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

PACKAGING INFORMATION		
Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	218.0 x 17.2 x 19.9mm
Packaging Quantity		20pcs
Storage Temperature Range	non-condensing	-55°C to +125°C
Storage Humidity		5% to 95% RH max.
Moisture Sensitive Level	MSL peak temp. <sup>(6)</sup>	Level 2
<b>Notes:</b> Note6: The Moisture Sensitivity Level rating is according to the JEDEC industry standard classifications and peak solder temperature		

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