Features

Unregulated Converters

- Fully RoHS 6/6 Conform
- Full Power at 100°C Ambient Temperature
- 1kVDC or 3kVDC Isolation Options
- UL /CSA Certified, CB Report
- Suitable for Fully Automated Assembly (including Vapour Phase Soldering)
- Optional Continuous Short Circuit Protection
- Efficiency to 84%

Selection Guide

Part Number SMD	(3kV)	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (mA)	Efficiency (%)	Max Capacitive Load[1]
R1S**-xx3.3	(H)	3.3, 5, 12, 15, 24	3.3	303	75	2200µF
R1S**-xx05	(H)	3.3, 5, 12, 15, 24	5	200	72-78	1000µF
R1S**-xx09	(H)	3.3, 5, 12, 15, 24	9	111	74-78	1000µF
R1S**-xx12	(H)	3.3, 5, 12, 15, 24	12	84	75-80	470µF
R1S**-xx15	(H)	3.3, 5, 12, 15, 24	15	66	75-82	470µF
R1S**-xx24	(H)	3.3, 5, 12, 15, 24	24	42	74-84	220µF
R1D**-xx3.3	(H)	3.3, 5, 12, 15, 24	±3.3	±152	75	±1000µF
R1D**-xx05	(H)	3.3, 5, 12, 15, 24	±5	±100	72-78	±470µF
R1D**-xx09	(H)	3.3, 5, 12, 15, 24	±9	±56	74-78	±470µF
R1D**-xx12	(H)	3.3, 5, 12, 15, 24	±12	±42	75-80	±220µF
R1D**-xx15	(H)	3.3, 5, 12, 15, 24	±15	±33	75-82	±220µF
R1D**-xx24	(H)	3.3, 5, 12, 15, 24	±24	±21	74-84	±100µF

xx = Input Voltage (other input and output voltage combinations available on request)

* add Suffix "H" for 3kV Isolation, e.g. R1S-0505/H, R1D-0505/H, R1S12-0505/H, R1D12-0505/H

* add Suffix "P" for Continuous Short Circuit Protection, e.g. R1S8-0505/P, R1S-0505/HP, R1D12-0505/HP

* add suffix -R for tape & reel packing e.g. R1S-0505-R. For more details see Application Notes.

R1S-R1D

Case and Pinning Options (note restrictions on /H option)

R1S** : ** without marking denotes 5 pins out of 8 fitted (includes /H option)
** with marking **8** denotes 8 pins out of 8 fitted (/H option not available)
** with marking **12** denotes 10 pins out of 12 fitted (includes /H option)
R1D** : ** without marking denotes 6 pins out of 10 fitted (includes /H option)
** with marking **10** denotes with 10 pins out of 10 fitted (/H option not available)
** with marking **12** denotes 10 pins out of 12 fitted (includes /H option)
R1DA : ** without marking denotes 10 pins out of 10 fitted (/H option not available)

Specifications (measured at T_A = 25°C, nominal input voltage, full load and after warm-up)

Input Voltage Range		±10%
Output Voltage Accuracy		±2% typ., ±5% max.
Line Voltage Regulation	All Variants	1.2%/1% of Vin typ.
Load Voltage Regulation (10% to 100% full load)	3.3V output types	15% typ., 20% max.
	5V output type	12% typ., 15% max.
	9V output type	7% typ., 10% max.
	12V, 15V, 24V output types	6% typ., 10% max.
Output Ripple and Noise (20MHz BW limited)		50mVp-p typ., 100mVp-p max.
Operating Frequency		20kHz min. / 60kHz typ. / 100kHz max.
Efficiency at Full Load		See Selection Guide
Minimum Load = 0%		Specifications valid for 10% minimum load only.

cont.

ECONOLINE
DC/DC-Converter
with 3 year Warranty

RECOM

1 Watt SMD Single & Dual Output

RoHS 2002/95/EC 6/6

E-224736

UL-60950-1 Certified
EN-60601-1 Certified
(/H suffix)

R1S_R1D

Description

The R1S and R1D converters are of the enclosed open frame type, i.e. they are not potted.
The converters are typically used in general purpose and industrial low power isolation and voltage matching applications where an SMD converter is required.
The converter series feature an extended ambient temperature operating range of -40°C ~ +100°C without derating and optional continuous short circuit protection.
In addition to two isolation options and three different case formats, the converters are also available prepacked as tape and reel for use with automatic insertion machines.

Refer to Application Notes

Specifications - continued

Isolation Voltage		(tested for 1 second)	1000VDC
		(rated for 1 minute)	500VAC / 60Hz
Isolation Voltage	H-Suffix	(tested for 1 second)	3000VDC
	H-Suffix	(rated for 1 minute)	1500VAC / 60Hz
Isolation Capacitance		R1S, R1S8, R1D, R1D10	15pF min. / 70pF max.
		R1S12, R1D12	10pF min. / 75pF max.
Isolation Resistance			10 GΩ min.
Short Circuit Protection			1 Second
P-Suffix			Continuous
Operating Temperature Range (free air convection)			-40°C to +100°C (see Graph)
Storage Temperature Range			-55°C to +125°C
Reflow Temperature	ROHS compliant		245°C (30 sec), Peak 255°C (5 sec) max.
Vapour Phase Process	(for more details see Application Notes)		230°C (90 sec) max.
Relative Humidity			95% RH
Humidity Susceptibility Test			1000 hrs / 90% humidity / +85°C ambient
Package weight		R1S	1.0g
		R1S8	1.1g
		R1S12, R1D, R1D10, R1D12	1.2g
Packing Quantity		R1S, R1S8	40 pcs per Tube
		R1S12, R1D, R1D10, R1D12	33 pcs per tube
		All Types	500 pcs per Reel
MTBF (+25°C) *Detailed Information see*		using MIL-HDBK 217F	4275 x 10^3 hours
(+85°C) *Application Notes chapter "MTBF"*		using MIL-HDBK 217F	1365 x 10^3 hours

CERTIFICATIONS

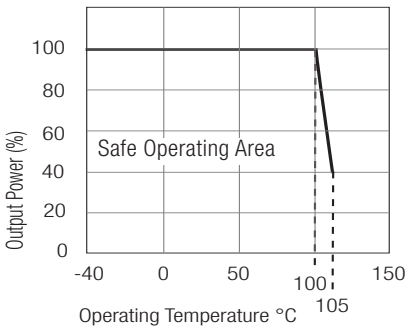
CB Test Report	Report: US/14402A/UL	IEC 60950-1:2001 1st Ed.
UL General Safety	Report: E322406	UL 60950-1 1st Ed.
CUL General Safety		C22.2 No. 60950-1-03
EN Medical Safety	Report: MDD 1005061	EN60601-1: 1990 + A13:1996
EN General Safety	Report: LVD 1005061	EN60950-1: 2006 2nd Ed. +A11:2009

Notes

Note 1: Maximum capacitive load is defined as the capacitive load that will allow start up in under 1 second without damage to the converter.

Derating-Graphs
(Ambient Temperature)

R1S-0505, R1D-0505

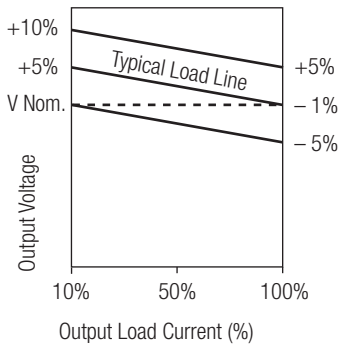


The derating graphs are valid only for the part numbers shown.

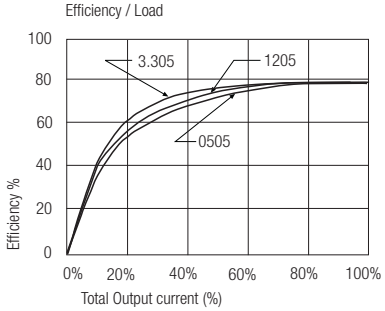
R1S-R1D

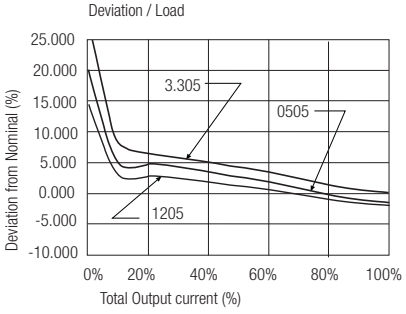
Typical Characteristics

Tolerance Envelope

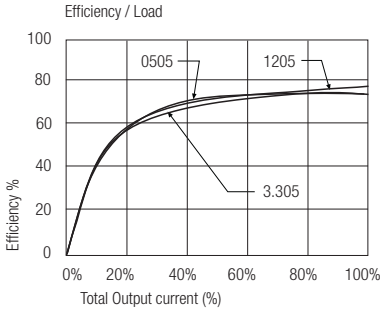


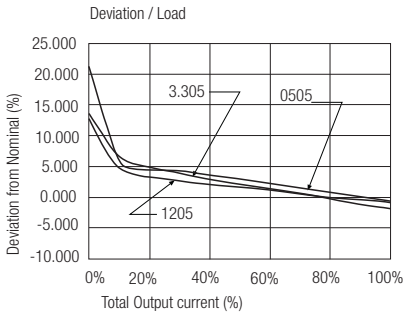
R1S**-xx05





R1D**-xx05





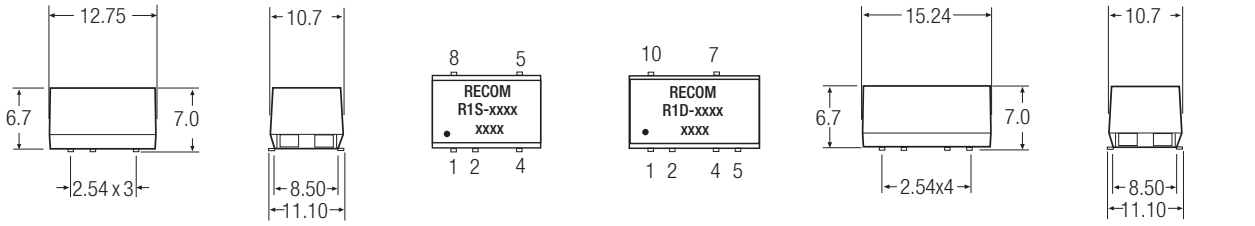
Package Style and Pinning (mm)

5 PIN Single SMD Package

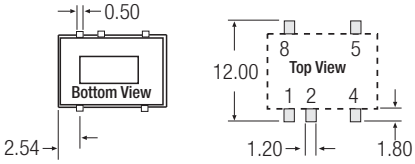
Note: /H option is available in these pin packages

6 PIN Dual SMD Package

3rd angle projection



Recommended Footprint Details



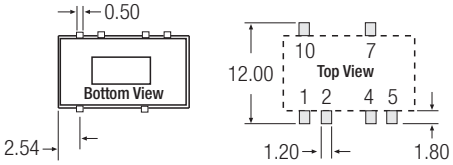
Pin Connections

Pin #	Single	Dual
1	–Vin	–Vin
2	+Vin	+Vin
4	–Vout	Com
5	+Vout	–Vout
7	No Pin	+Vout
8	NC	No Pin
10	No Pin	NC

NC = No Connection

XX.X ± 0.5 mm
XX.XX ± 0.25 mm

Recommended Footprint Details

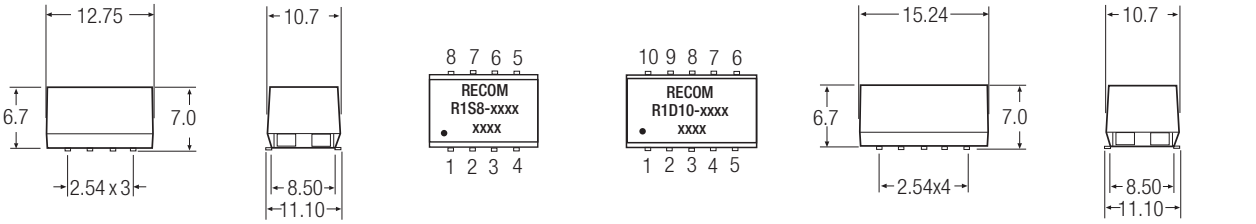


8 PIN Single SMD Package

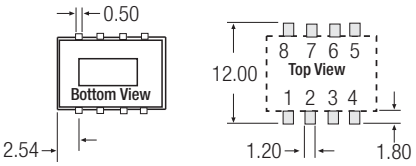
Note: /H option is not available in these pin packages

10 PIN Dual SMD Package

3rd angle projection



Recommended Footprint Details



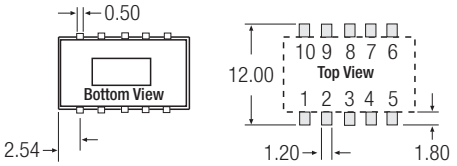
Pin Connections

Pin #	Single	Dual	D(isol)
1	–Vin	–Vin	–Vin
2	+Vin	+Vin	+Vin
3	NC	NC	-
4	–Vout	Com	–Vout1
5	+Vout	–Vout	+Vout1
6	NC	NC	–Vout2
7	NC	+Vout	+Vout2
8	NC	NC	-
9	-	NC	-
10	-	NC	NC

NC = No Connection

XX.X ± 0.5 mm
XX.XX ± 0.25 mm

Recommended Footprint Details



R1S** : ** without marking denotes 5 pins out of 8 fitted (includes /H option) — e.g. R1S-0505, R1S-0505/H, R1S-0505/HP
** with marking **8** denotes 8 pins out of 8 fitted (/H option not available) — e.g. R1S8-0505, R1S8-0505/P

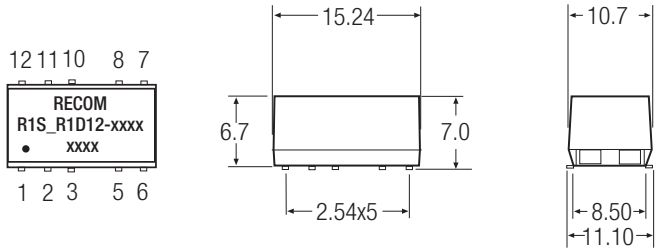
R1D** : ** without marking denotes 6 pins out of 10 fitted (includes /H option) — e.g. R1D-0505, R1D-0505/H, R1D-0505/HP
** with marking **10** denotes with 10 pins out of 10 fitted (/H option not available) — e.g. R1D10-0505, R1D10-0505/P

Package Style and Pinning (mm)

12 PIN Single and Dual SMD Package

Note: /H option is available in this pin package

3rd angle projection



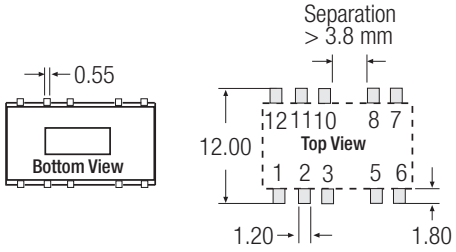
Pin Connections

Pin #	Single	Dual
1	–Vin	–Vin
2	+Vin	+Vin
3	NC	NC
5	–Vout	Com
6	NC	–Vout
7	NC	NC
8	+Vout	+Vout
10	NC	NC
11	NC	NC
12	NC	NC

NC = No Connection

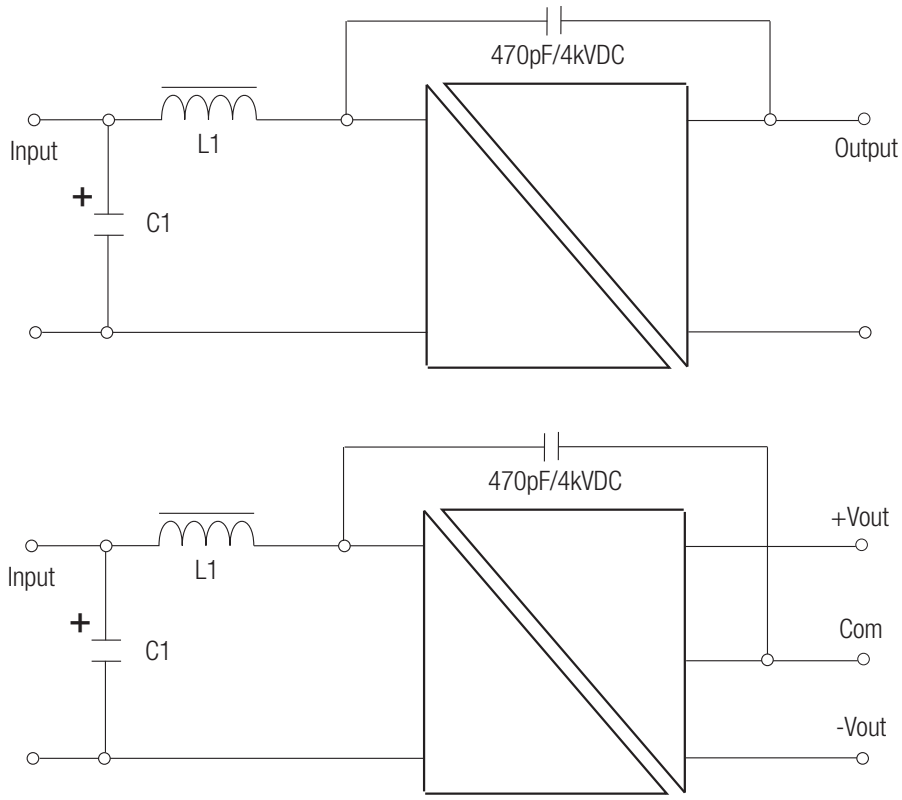
XX.X ± 0.5 mm
XX.XX ± 0.25 mm

Recommended Footprint Details



R1S** : ** with marking **12** denotes 10 pins out of 12 fitted (includes /H option) e.g. R1S12-0505, R1S12-0505/H, R1S12-0505/HP
R1D** : ** with marking **12** denotes 10 pins out of 12 fitted (includes /H option) e.g. R1D12-0505, R1D12-0505/H, R1D12-0505/HP

EMC Filtering - Suggestion for EN55022 Class B (Conducted and Emitted)



Standard and /H versions

C1	L1	Vin
4.7µF	3.3µH	3.3V
2.2µF	4.7µH	5V
2.2µF	10µH	9V
2.2µF	10µH	12V
2.2µF	22µH	15V
4.7µF	22µH	24V

/P and /HP versions

C1	L1	Vin
4.7µF	10µH	3.3V
10µF	10µH	5V
4.7µF	22µH	9V
4.7µF	22µH	12V
4.7µF	22µH	15V
10µF	47µH	24V

C1 = MLCC
L1 = SMD Inductor