

- SIL4 / DIL8 Package
- Input Range $\pm 10\%$
- Efficiency up to 74 %
- Low Ripple and Noise
- Isolation 1000 VDC, up to 3000 VDC
- EMI Complies with EN55032 Class B
- Operation Temperature Range -40 ~ 91 °C max.
- Non Conductive Black Plastic Case

RoHS



Picture similar

Number Structure

RS1	-	05	05	S	02	A	1
Series / Package		Input Voltage	Output Voltage	Output Type	Power	Int. Code	Isolation Voltage
RS1 = SIL4		03 = 3.3 Vdc	03 = 3.3 Vdc	S = Single Output	02 = 0.25 W	Logistics Code	1 = 1000 Vdc
RD1 = DIL8		05 = 5.0 Vdc	05 = 5.0 Vdc				3 = 3000 Vdc
		12 = 12 Vdc	07 = 7.2 Vdc				
		15 = 15 Vdc	09 = 9.0 Vdc				
		24 = 24 Vdc	12 = 12 Vdc				
			15 = 15 Vdc				
			18 = 18 Vdc				
			24 = 24 Vdc				

Model Selection Guide							
Model Number	Input Voltage Range (VDC)	Input Current		Output Voltage (VDC)	Output Current Full Load (mA)	Efficiency @ FL (%, typ.)	Capacitive Load @ FL (µF, max.)
		No-Load (mA, max.)	Full Load (mA, typ.)				
RS1-0303S02AX	2.97-3.63	25	119	3.3	75.7	64	100
RS1-0305S02AX	2.97-3.63	25	114	5	50	67	100
RS1-0307S02AX	2.97-3.63	25	119	7.2	34.7	64	100
RS1-0309S02AX	2.97-3.63	32	110	9	27.7	69	100
RS1-0312S02AX	2.97-3.63	40	119	12	20.8	64	100
RS1-0315S02AX	2.97-3.63	25	119	15	16.6	64	100
RS1-0318S02AX	2.97-3.63	25	115	18	13.8	66	100
RS1-0324S02AX	2.97-3.63	20	115	24	10.4	66	100
RS1-0503S02AX	4.5-5.5	20	79	3.3	75.7	64	100
RS1-0505S02AX	4.5-5.5	15	71	5	50	71	100
RS1-0507S02AX	4.5-5.5	18	71	7.2	34.7	71	100
RS1-0509S02AX	4.5-5.5	15	68	9	27.7	74	100
RS1-0512S02AX	4.5-5.5	14	69	12	20.8	73	100
RS1-0515S02AX	4.5-5.5	20	68	15	16.6	74	100
RS1-0518S02AX	4.5-5.5	17	70	18	13.8	72	100
RS1-0524S02AX	4.5-5.5	18	69	24	10.4	73	100
RS1-1203S02AX	10.8-13.2	15	33	3.3	75.7	64	100
RS1-1205S02AX	10.8-13.2	12	34	5	50	62	100
RS1-1207S02AX	10.8-13.2	10	31	7.2	34.7	69	100
RS1-1209S02AX	10.8-13.2	12	34	9	27.7	63	100
RS1-1212S02AX	10.8-13.2	15	33	12	20.8	65	100
RS1-1215S02AX	10.8-13.2	13	33	15	16.6	65	100
RS1-1218S02AX	10.8-13.2	13	32	18	13.8	66	100
RS1-1224S02AX	10.8-13.2	18	38	24	10.4	55	100
RS1-1503S02AX	13.5-16.5	10	26	3.3	75.7	65	100
RS1-1505S02AX	13.5-16.5	8	27	5	50	63	100
RS1-1507S02AX	13.5-16.5	12	28	7.2	34.7	60	100
RS1-1509S02AX	13.5-16.5	12	27	9	27.7	63	100
RS1-1512S02AX	13.5-16.5	12	27	12	20.8	62	100
RS1-1515S02AX	13.5-16.5	13	29	15	16.6	58	100
RS1-1518S02AX	13.5-16.5	12	30	18	13.8	57	100
RS1-1524S02AX	13.5-16.5	15	28	24	10.4	60	100
RS1-2403S02AX	21.6-26.4	8	18	3.3	75.7	61	100
RS1-2405S02AX	21.6-26.4	7	18	5	50	59	100
RS1-2407S02AX	21.6-26.4	8	19	7.2	34.7	57	100
RS1-2409S02AX	21.6-26.4	8	18	9	27.7	61	100
RS1-2412S02AX	21.6-26.4	10	19	12	20.8	57	100
RS1-2415S02AX	21.6-26.4	10	18	15	16.6	58	100
RS1-2418S02AX	21.6-26.4	10	19	18	13.8	56	100
RS1-2424S02AX	21.6-26.4	10	18	24	10.4	61	100

Model Selection Guide							
Model Number	Input Voltage Range (VDC)	Input Current		Output Voltage (VDC)	Output Current Full Load (mA)	Efficiency @ FL (%, typ.)	Capacitive Load @ FL (µF, max.)
		No-Load (mA, max.)	Full Load (mA, typ.)				
RD1-0303S02AX	2.97-3.63	25	119	3.3	75.7	64	100
RD1-0305S02AX	2.97-3.63	25	114	5	50	67	100
RD1-0307S02AX	2.97-3.63	25	119	7.2	34.7	64	100
RD1-0309S02AX	2.97-3.63	32	110	9	27.7	69	100
RD1-0312S02AX	2.97-3.63	40	119	12	20.8	64	100
RD1-0315S02AX	2.97-3.63	25	119	15	16.6	64	100
RD1-0318S02AX	2.97-3.63	25	115	18	13.8	66	100
RD1-0324S02AX	2.97-3.63	20	115	24	10.4	66	100
RD1-0503S02AX	4.5-5.5	20	79	3.3	75.7	64	100
RD1-0505S02AX	4.5-5.5	15	71	5	50	71	100
RD1-0507S02AX	4.5-5.5	18	71	7.2	34.7	71	100
RD1-0509S02AX	4.5-5.5	15	68	9	27.7	74	100
RD1-0512S02AX	4.5-5.5	14	69	12	20.8	73	100
RD1-0515S02AX	4.5-5.5	20	68	15	16.6	74	100
RD1-0518S02AX	4.5-5.5	17	70	18	13.8	72	100
RD1-0524S02AX	4.5-5.5	18	69	24	10.4	73	100
RD1-1203S02AX	10.8-13.2	15	33	3.3	75.7	64	100
RD1-1205S02AX	10.8-13.2	12	34	5	50	62	100
RD1-1207S02AX	10.8-13.2	10	31	7.2	34.7	69	100
RD1-1209S02AX	10.8-13.2	12	34	9	27.7	63	100
RD1-1212S02AX	10.8-13.2	15	33	12	20.8	65	100
RD1-1215S02AX	10.8-13.2	13	33	15	16.6	65	100
RD1-1218S02AX	10.8-13.2	13	32	18	13.8	66	100
RD1-1224S02AX	10.8-13.2	18	38	24	10.4	55	100
RD1-1503S02AX	13.5-16.5	10	26	3.3	75.7	65	100
RD1-1505S02AX	13.5-16.5	8	27	5	50	63	100
RD1-1507S02AX	13.5-16.5	12	28	7.2	34.7	60	100
RD1-1509S02AX	13.5-16.5	12	27	9	27.7	63	100
RD1-1512S02AX	13.5-16.5	12	27	12	20.8	62	100
RD1-1515S02AX	13.5-16.5	13	29	15	16.6	58	100
RD1-1518S02AX	13.5-16.5	12	30	18	13.8	57	100
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RD1-2403S02AX	21.6-26.4	8	18	3.3	75.7	61	100
RD1-2405S02AX	21.6-26.4	7	18	5	50	59	100
RD1-2407S02AX	21.6-26.4	8	19	7.2	34.7	57	100
RD1-2409S02AX	21.6-26.4	8	18	9	27.7	61	100
RD1-2412S02AX	21.6-26.4	10	19	12	20.8	57	100
RD1-2415S02AX	21.6-26.4	10	18	15	16.6	58	100
RD1-2418S02AX	21.6-26.4	10	19	18	13.8	56	100
RD1-2424S02AX	21.6-26.4	10	18	24	10.4	61	100

ALL SPECIFICATIONS ARE TYPICAL AT 25 °C, NOMINAL INPUT AND FULL LOAD UNLESS OTHERWISE NOTED.

Input Specifications					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	3.3 Vdc Input	2.97	3.3	3.63	VDC
	5.0 Vdc Input	4.5	5.0	5.5	
	12 Vdc Input	10.8	12	13.2	
	15 Vdc Input	13.5	15	16.5	
	24 Vdc Input	21.6	24	26.4	
Input Current (No Load)		See Table			mA
Input Current (Full Load)		See Table			mA
Input Filter		Capacitor			-
Input Reflected Ripple Current ⁽¹⁾			20		mApk-pk
Start up Time	Nominal Vin and constant resistive load		20		ms
Recommended input fuse (slow blow)	3.3 Vdc Input		0.16		A
	5.0 Vdc Input		0.16		
	12 Vdc Input		0.1		
	15 Vdc Input		0.1		
	24 Vdc Input		0.1		
Note : 1. Measured with a simulated source inductance of 12 μH and a source capacitor Cin (47 μF, ESR < 1 Ω at 100 kHz).					

Output Specifications					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		-3		+3	%
Line Regulation	For 1 % Vin Change	RS1-0303S02AX	-1.3	+1.3	%
		RS1-0503S02AX			
		All Other Output			
Load Regulation	From 20 % to 100 % Load			8	%
Ripple & Noise	20 MHz Bandwidth			100	mVpk-pk
Short Circuit Protection		Short Term (1 sec.)			
Temperature Coefficient		-0.02		+0.02	%/°C
Maximum Capacitive Load	Minimum Vin and constant resistive load	See Table			

Absolute Maximum Ratings					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (100 ms)	3.3 Vdc Input			6	VDC
	5.0 Vdc Input			7	
	12 Vdc Input			15	
	15 Vdc Input			18	
	24 Vdc Input			28	
Soldering Temperature	1.5 mm from case 10 sec. max.			260	°C
Note : These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.					

General Specifications						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Efficiency			See Table			%
Isolation Voltage	Input-output, and rated for 60 sec.	Suffix “1”	1000			VDC
		Suffix “3”	3000			
Isolation Resistance	Input-output		1000			MΩ
Isolation Capacitance	Input-output			60		pF
Switching Frequency				80		kHz
Reliability Calculated MTBF	MIL-HDBK-217 F @ 25 °C		1121			k hours
Safety Standard	IEC / EN / UL 62368-1		Designed to meet			
Environmental compliance	RoHS		Designed to meet			

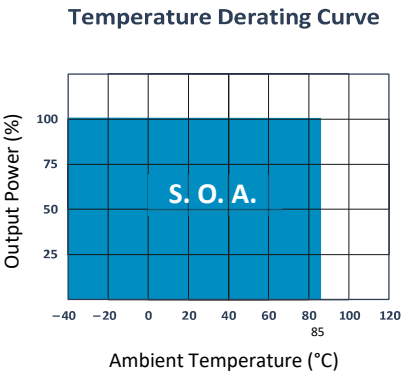
Environmental Specifications					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating Ambient Temperature	See the Derating Curve	-40		91	°C
Maximum Case Temperature				100	°C
Thermal Impedance		70			°C/W
Storage Humidity				95	% rel. H
Storage Temperature		-55		125	°C
Cooling	Natural Convection	30 - 65 LFM			

EMC Specifications			
Parameter	Standard	Condition	Criterion
Conducted Emissions	EN55032	with external components	B
Radiated Emissions	EN55032		B
ESD	IEC 61000-4-2	Air: ±8 kV / Indirect: ±6 kV	A
RS	IEC 61000-4-3	10 V/m	A
EFT	IEC 61000-4-4	±2 kV with external components	A
Surge	IEC 61000-4-5	±0.5 kV with external components	A
CS	IEC 61000-4-6	10 Vrms	A
PFMF	IEC 61000-4-8	1 A/m	A

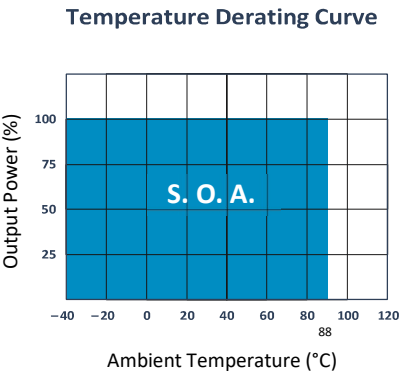
Physical Specifications		
Parameter	Value	
Case Material	Nonconductive Black Plastic (UL94V-0 rated)	
Pin Material	SIL	Alloy 42
	DIL	Ø0.5mm Brass Solder-coated
Potting Material	Epoxy (UL94V-0 rated)	
Weight	SIL	1.5 g, typ.
	DIL	1.8 g, typ.
Dimensions	SIL	0.46" x 0.24" x 0.40"
	DIL	0.50" x 0.40" x 0.27"

Thermal Derating

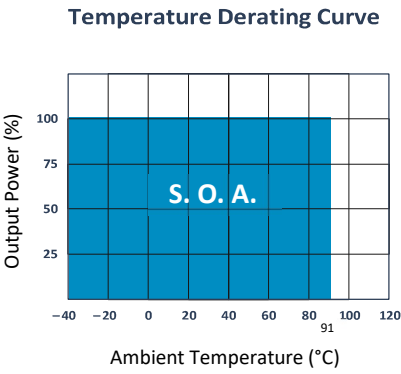
To enhance the system reliability, the power module should always be operated below the maximum operating temperature. If the temperature exceeds the maximum operating temperature, reliability of the unit may be affected.



Efficiency 55 ~ 61 % Models



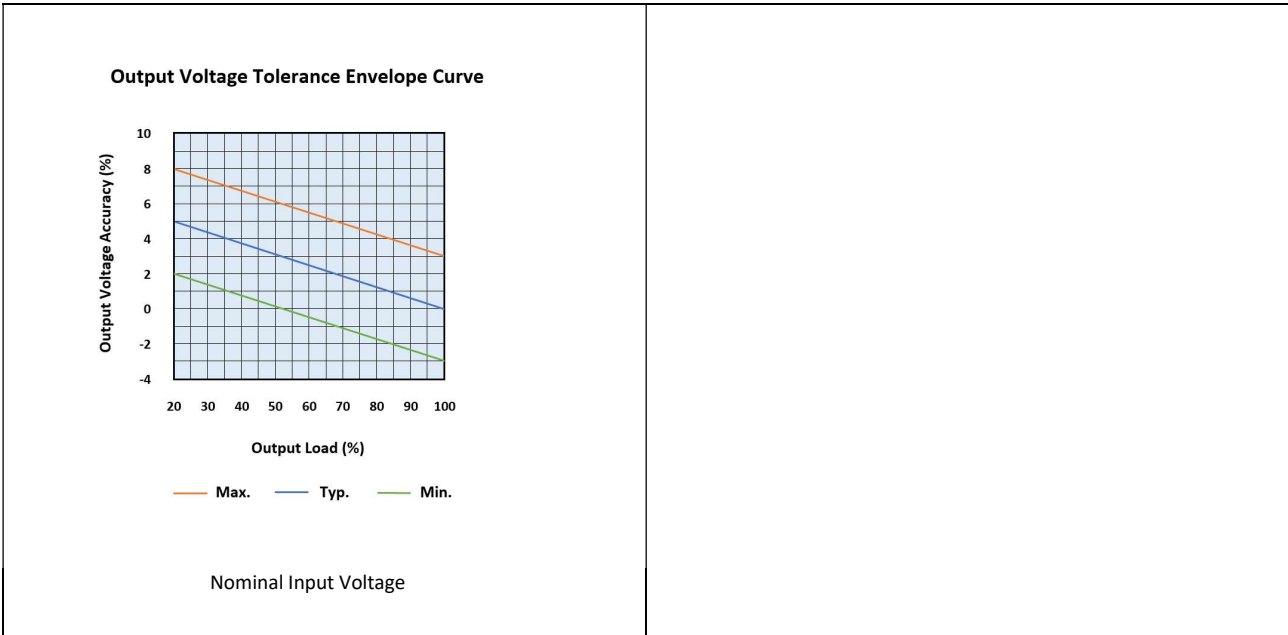
Efficiency 62 ~ 67 % Models



Efficiency 68 ~ 74 % Models

Output Voltage Tolerance Envelope Curve

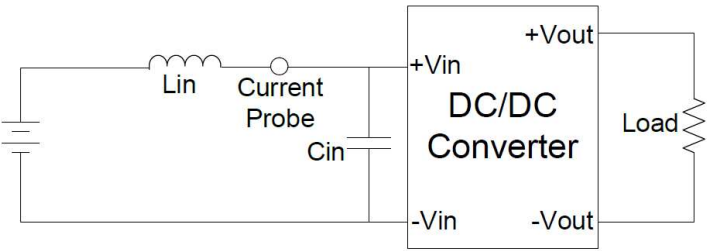
Output Voltage Tolerance Envelope Curve



Test Configurations

Input Reflected Ripple Current Test Step

Input reflected ripple current is measured with a source inductor L_{in} (12 μ H) and a source capacitor C_{in} (47 μ F, ESR < 1.0 Ω at 100 kHz) at nominal input and full load.



Isolation Voltage

This series is designed to meet the functional insulation of UL, both input and output should be maintained within SELV limits (less than 42.4 V peak, or 60 Vdc).

The isolation test voltage represents a measure of immunity to transient voltages and the part should never be used as an element of a safety isolation system. The part could be expected to function correctly with hundreds of volts offset applied continuously across the isolation barrier; but then the circuitry on both sides of the barrier must be regarded as operating at an unsafe voltage and further isolation/insulation systems must form a barrier between these circuits and any user-accessible circuitry according to safety standard requirements.

Repeated High-Voltage Isolation Testing

Repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment. This series has isolation transformers without additional insulation between primary and secondary windings of enameled wire.

While parts can be expected to withstand several times the stated test voltage, the isolation capability does depend on the wire insulation.

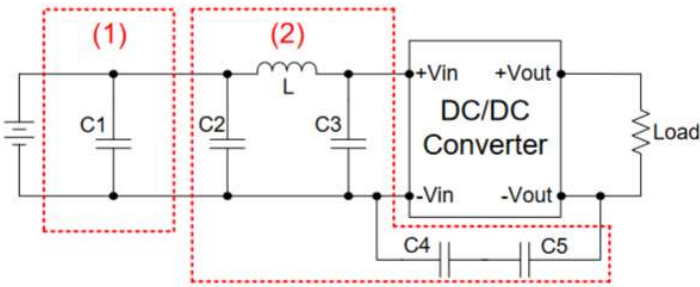
Any material including the enamel (typically polyurethane) is susceptible to eventual chemical degradation when subject to very high applied voltage, thus implying that the number of tests should be strictly limited.

We strongly advise against repeated high voltage isolation testing, but if it is absolutely required, the isolation test voltage should be reduced by 20 % from specified test voltage.

EMC Filter Details

EMC Filter

The part (1) Circuit is used to meet Surge & EFT test, and the part (2) Circuit is used to meet EMI test.



V in	C1	C2	L1	C3	C4	C5
3.3 V	Nippon Chemi-con KY-Series 470μF / 100V	MLCC 2.2μF / 100V	18μH	/	/	/
5.0 V						
12 V						
15 V				MLCC 2.2μF / 100V	MLCC 470pF, 2kV	/
24 V					MLCC 820pF, 2kV	MLCC 820pF, 2kV
24 V (3kV)						

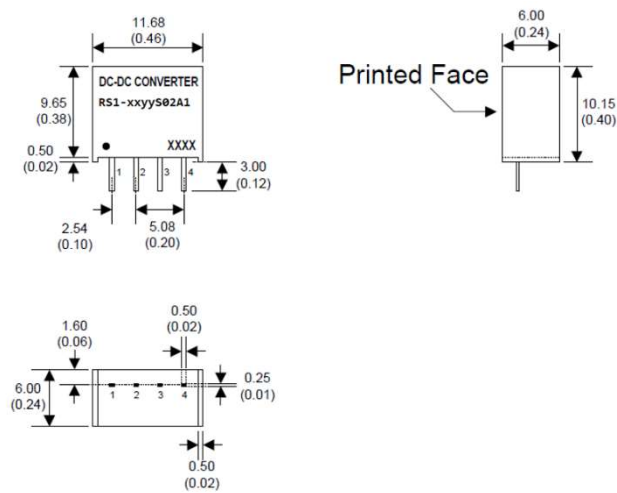
Pin Connections

SIL4 Package	
PIN NUMBER	DUAL
1	-Vin
2	+Vin
3	-Vout
4	+Vout

DIL8 Package	
PIN NUMBER	DUAL
1	-Vin
4	+Vin
5	+Vout
7	-Vout

Mechanical Specifications

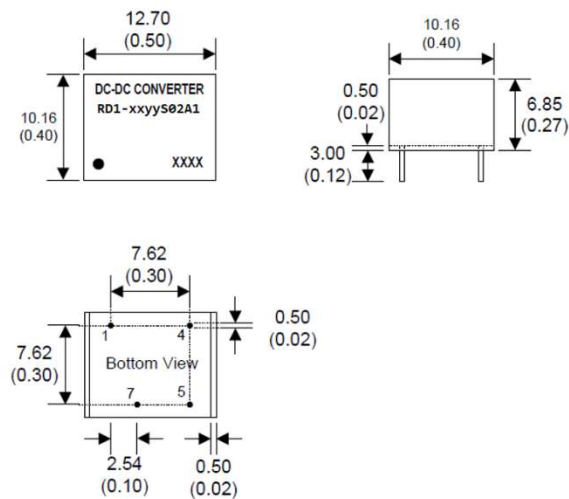
SIL 4 Package



- Notes : All dimensions are typical in millimeters (inches).
- 1. Pin dimension tolerance: ± 0.05 (± 0.002)
 - 2. Pin pitch and length tolerance: ± 0.35 (± 0.014)
 - 3. Pin to case tolerance: ± 0.5 (± 0.02)
 - 4. Case Tolerance: ± 0.5 (± 0.02)

Mechanical Specifications

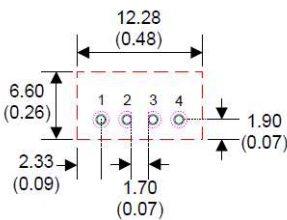
DIL 8 Package



- Notes : All dimensions are typical in millimeters (inches).
- 1. Pin dimension tolerance: ± 0.05 (± 0.002)
 - 2. Pin pitch and length tolerance: ± 0.35 (± 0.014)
 - 3. Pin to case tolerance: ± 0.5 (± 0.02)
 - 4. Case Tolerance: ± 0.5 (± 0.02)

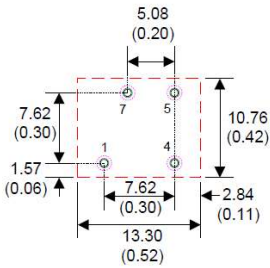
Recommended Footprint Details

SIL 4 Package



Notes : All dimensions are typical in millimeters (inches).
1. Through hole (black): $\varnothing$ 0.80 (0.031)
2. Top view pad (green) $\varnothing$ 1.00 (0.039)
3. Bottom view pad (pink): $\varnothing$ 1.60 (0.063)

DIL 8 Package



Notes : All dimensions are typical in millimeters (inches).
1. Through hole (black): $\varnothing$ 0.80 (0.031)
2. Top view pad (green): $\varnothing$ 1.00 (0.039)
3. Bottom view pad (pink): $\varnothing$ 1.60 (0.063)

Notes

The information and specification contained in this data sheet are believed to be correct at time of publication. However, Acal BFi accepts no responsibility for consequences arising from printing errors or inaccuracies. Specifications are subject to change without notice.