

- SIL4 / DIL8 Package
- Input Range $\pm 10\%$
- Efficiency up to 83 %
- Low Ripple and Noise
- Isolation 1000 VDC, up to 3000 VDC
- EMI Complies with EN55032 Class B
- Operation Temperature Range -40 ~ 90 °C max.
- Non Conductive Black Plastic Case

RoHS



Picture similar

Number Structure

RS1	-	05	05	S	10	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	10 = 1 W	Logistics Code	1 = 1000 Vdc 3 = 3000 Vdc
RD1 = DIL8		05 = 5.0 Vdc	05 = 5.0 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.)				
RS1-0303S10AX	2.97-3.63	25	421	3.3	303	72	220
RS1-0305S10AX	2.97-3.63	25	394	5	200	77	220
RS1-0307S10AX	2.97-3.63	40	375	7.2	138.9	81	220
RS1-0309S10AX	2.97-3.63	30	399	9	111.1	76	220
RS1-0312S10AX	2.97-3.63	45	485	12	100	75	220
RS1-0315S10AX	2.97-3.63	35	389	15	66.6	78	220
RS1-0318S10AX	2.97-3.63	40	375	18	55.5	81	220
RS1-0324S10AX	2.97-3.63	53	461	24	50	79	220
RS1-0503S10AX	4.5-5.5	20	254	3.3	303	79	220
RS1-0505S10AX	4.5-5.5	25	250	5	200	80	220
RS1-0507S10AX	4.5-5.5	16	239	7.2	138.9	84	220
RS1-0509S10AX	4.5-5.5	25	250	9	111.1	80	220
RS1-0512S10AX	4.5-5.5	25	300	12	100	80	220
RS1-0515S10AX	4.5-5.5	25	244	15	66.6	82	220
RS1-0518S10AX	4.5-5.5	25	244	18	55.5	82	220
RS1-0524S10AX	4.5-5.5	35	290	24	50	83	220
RS1-1203S10AX	10.8-13.2	15	109	3.3	303	77	220
RS1-1205S10AX	10.8-13.2	18	106	5	200	79	220
RS1-1207S10AX	10.8-13.2	16	103	7.2	138.9	81	220
RS1-1209S10AX	10.8-13.2	15	106	9	111.1	79	220
RS1-1212S10AX	10.8-13.2	20	125	12	100	80	220
RS1-1215S10AX	10.8-13.2	16	106	15	66.6	79	220
RS1-1218S10AX	10.8-13.2	20	103	18	55.5	81	220
RS1-1224S10AX	10.8-13.2	25	125	24	50	80	220
RS1-1503S10AX	13.5-16.5	12	86	3.3	303	78	220
RS1-1505S10AX	13.5-16.5	9	83	5	200	81	220
RS1-1507S10AX	13.5-16.5	12	88	7.2	138.9	76	220
RS1-1509S10AX	13.5-16.5	10	87	9	111.1	77	220
RS1-1512S10AX	13.5-16.5	15	100	12	100	80	220
RS1-1515S10AX	13.5-16.5	15	88	15	66.6	76	220
RS1-1518S10AX	13.5-16.5	15	85	18	55.5	79	220
RS1-1524S10AX	13.5-16.5	15	99	24	50	81	220
RS1-2403S10AX	21.6-26.4	8	55	3.3	303	76	220
RS1-2405S10AX	21.6-26.4	8	53	5	200	80	220
RS1-2407S10AX	21.6-26.4	10	57	7.2	138.9	74	220
RS1-2409S10AX	21.6-26.4	10	55	9	111.1	76	220
RS1-2412S10AX	21.6-26.4	8	63	12	100	80	220
RS1-2415S10AX	21.6-26.4	8	52	15	66.6	81	220
RS1-2418S10AX	21.6-26.4	8	52	18	55.5	81	220
RS1-2424S10AX	21.6-26.4	9	62	24	50	81	220

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.)				
RD1-0303S10AX	2.97-3.63	25	421	3.3	303	72	220
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RD1-0315S10AX	2.97-3.63	35	389	15	66.6	78	220
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RD1-1203S10AX	10.8-13.2	15	109	3.3	303	77	220
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RD1-1218S10AX	10.8-13.2	20	103	18	55.5	81	220
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RD1-1505S10AX	13.5-16.5	10	84	5	200	80	220
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RD1-2424S10AX	21.6-26.4	9	62	24	50	81	220

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		0.63		A
	5.0 Vdc Input		0.4		
	12 Vdc Input		0.16		
	15 Vdc Input		0.16		
	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	-1.2		+1.2	%
Load Regulation	From 20 % to 100 % Load	RS1-0303S10AX RD1-0303S10AX		22	%
		3.3 V Input		15	
		RS1-0503S10AX RD1-0503S10AX		13	
		All Other Output		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			

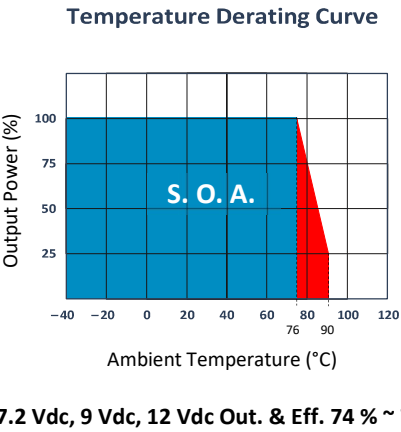
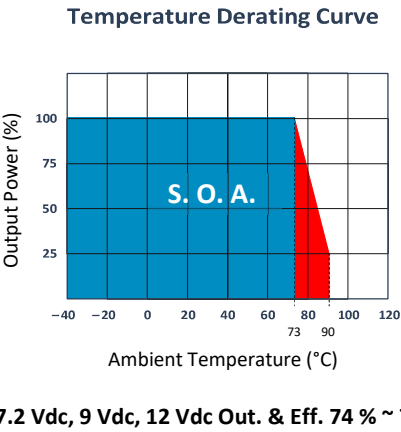
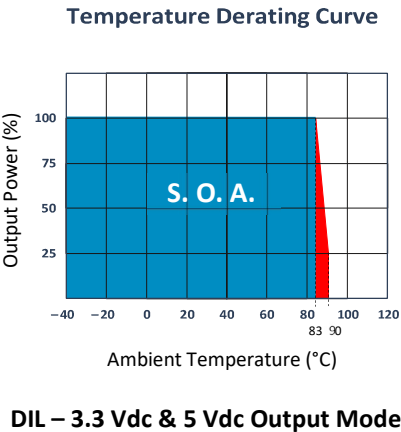
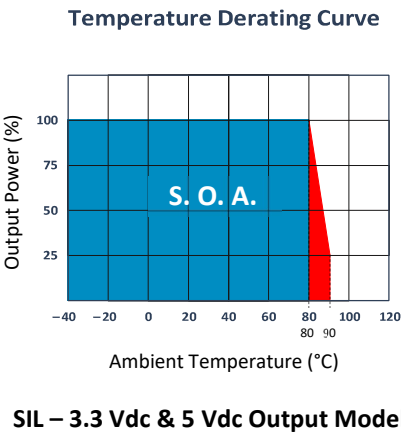
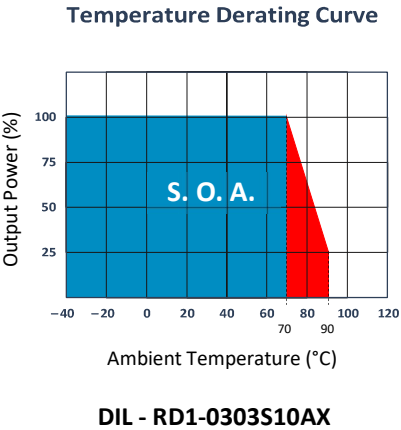
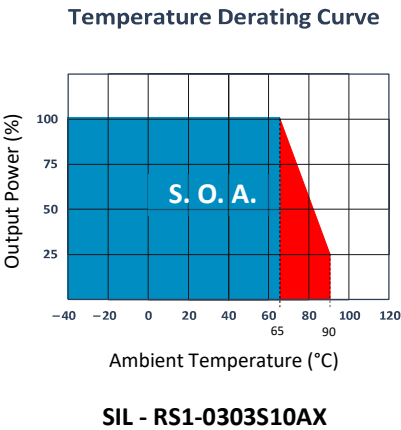
Environmental Specifications						
Parameter		Conditions	Min.	Typ.	Max.	Unit
Operating Ambient Temperature		See the Derating Curve	-40		90	°C
Maximum Case Temperature					100	°C
Thermal Impedance	SIL		65			°C/W
	DIL		55			
Storage Humidity					95	% rel. H
Storage Temperature			-55		125	°C
Cooling		Natural 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: ± 8kV / 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

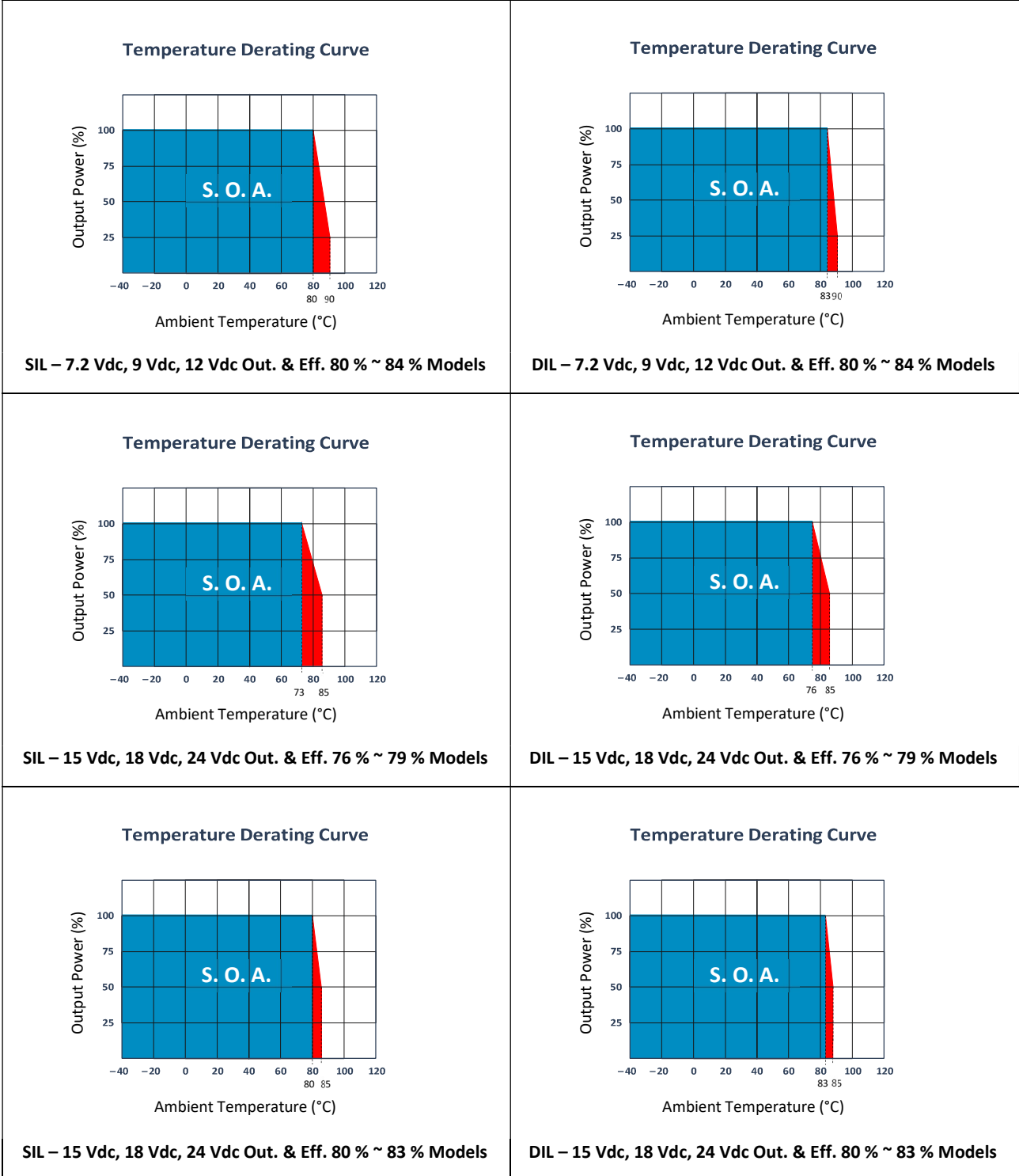
Physical Specifications		
Parameter	Value	
Case Material	Nonconductive Black Plastic (UL94V-0 rated)	
Pin Material	SIL	Alloy 42
	DIL	Ø0.5mm Brass Solder-coated
Potting Material	Epoxy (UL94V-0 rated)	
Weight ⁽¹⁾	SIL	1.5 g, typ.
	DIL	1.8 g, typ.
Dimensions ⁽¹⁾	SIL	0.46" x 0.24" x 0.40"
	DIL	0.50" x 0.40" 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.

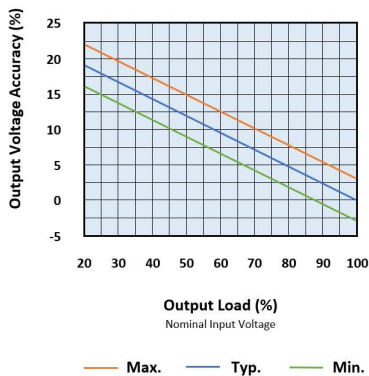


Thermal Derating



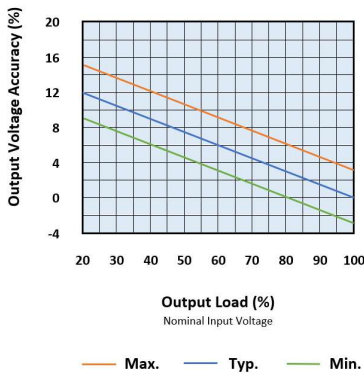
Output Voltage Tolerance Envelope Curve

Output Voltage Tolerance Envelope Curve



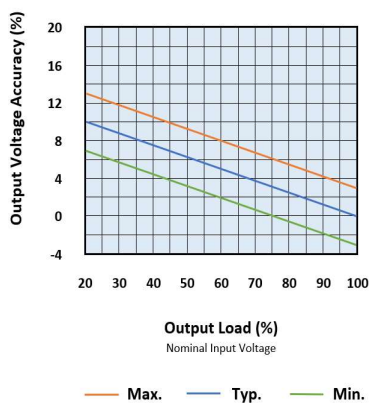
Load Regulation 22% Models

Output Voltage Tolerance Envelope Curve



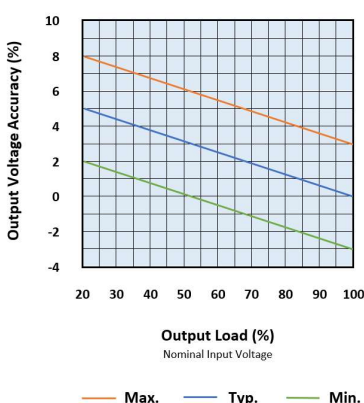
Load Regulation 15% Models

Output Voltage Tolerance Envelope Curve



Load Regulation 13% Models

Output Voltage Tolerance Envelope Curve

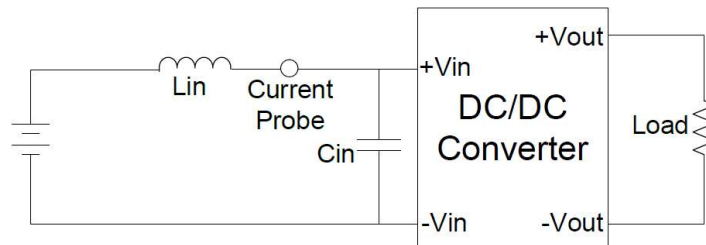


Load Regulation 8% Models

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.



Design & Feature Configurations

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.

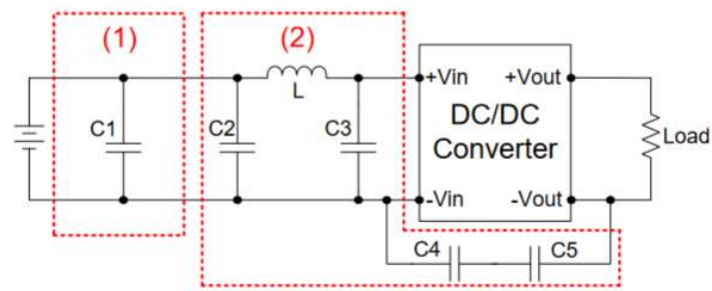
Any material including the enamel (typically polyurethane) is susceptible to eventual chemical degradation when subject to very high applied voltage, thus implying that the number of tests should be strictly limited.

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 V						
12 V						
15 V				MLCC 2.2μF / 100V	MLCC 470pF, 2kV	/
24 V						
24 V (3kV)					MLCC 820pF, 2kV	MLCC 820pF, 2kV

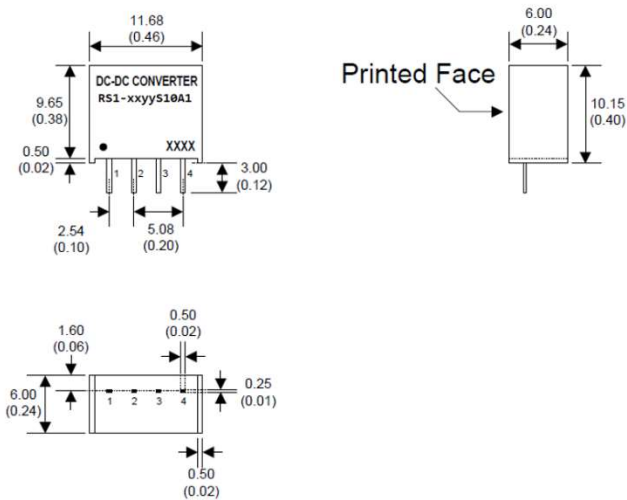
Pin Connections

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

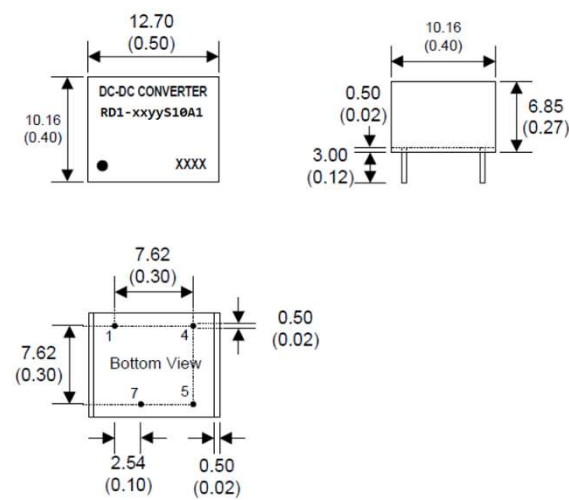
SIL 4 Package



- 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

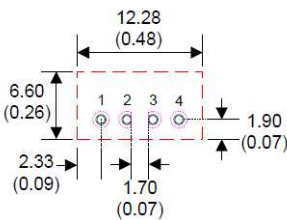
DIL 8 Package



- Notes : All dimensions are typical in millimeters (inches).
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 - 2. Pin pitch and length tolerance: ± 0.35 (± 0.014)
 - 3. Pin to case tolerance: ± 0.5 (± 0.02)
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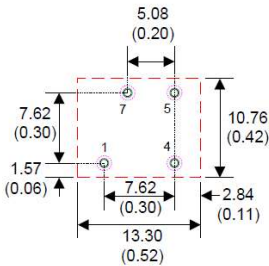
Recommended Footprint Details

SIL 4 Package



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

DIL 8 Package



Notes : All dimensions are typical in millimeters (inches).
1. Through hole (black): Ø 0.80 (0.031)
2. Top view pad (green): Ø 1.00 (0.039)
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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.