

- SIL8 / DIL16 Package
- Wide Input Range 2:1
- Regulated Output
- Efficiency up to 81 %
- Low Ripple and Noise
- Continuous Short Circuit Protection
- Isolation 1000 VDC, up to 3000 VDC
- Remote ON OFF Control (Optional)
- Operation Temperature Range -40 ~ 99 °C max.
- Non Conductive Black Plastic Case

RoHS



Picture similar

Number Structure

RS5	-	05	05	RS	20	A	1	(C)
Series / Package		Input Voltage	Output Voltage	Output Type	Power	Int. Code	Isolation Voltage	Pinning
RS5 = SIL8		05 = 5.0 Vdc	03 = 3.3 Vdc	RS = Regulated	20 = 2 W	Logistics	1 = 1000 Vdc	C = Optional
RD5 = DIL16		12 = 12 Vdc	05 = 5.0 Vdc	- Single Out.		Code	3 = 3000 Vdc	Control Pin
		24 = 24 Vdc	09 = 9.0 Vdc	RD = Regulated				P = Optional
		48 = 48 Vdc	12 = 12 Vdc	- Dual Out.				Special Pinning
			15 = 15 Vdc					
			24 = 24 Vdc					

* Control Pin (Optional) only for SIL Models

Model Selection Guide								
Model Number	Input Voltage Range (VDC)	Input Current		Output Voltage (VDC)	Output Current		Efficiency @ FL (% , typ.)	Capacitive Load @ FL (μF, max.)
		No-Load (mA, max.)	Full Load (mA, typ.)		Min. Load (mA)	Full Load (mA)		
RS5-0503RS20AX	4.5 ~ 9	20	508	3.3	125	500	65	3300
RS5-0505RS20AX	4.5 ~ 9	25	588	5	100	400	68	3300
RS5-0509RS20AX	4.5 ~ 9	50	555	9	56	222	72	470
RS5-0512RS20AX	4.5 ~ 9	85	563	12	42	167	71	470
RS5-0515RS20AX	4.5 ~ 9	30	555	15	33	133	72	470
RS5-0524RS20AX	4.5 ~ 9	70	555	24	21	83	72	220
RS5-1203RS20AX	9 ~ 18	15	196	3.3	125	500	70	3300
RS5-1205RS20AX	9 ~ 18	10	216	5	100	400	77	3300
RS5-1209RS20AX	9 ~ 18	15	214	9	56	222	78	470
RS5-1212RS20AX	9 ~ 18	15	216	12	42	167	77	470
RS5-1215RS20AX	9 ~ 18	15	210	15	33	133	79	470
RS5-1224RS20AX	9 ~ 18	25	214	24	21	83	78	220
RS5-2403RS20AX	18 ~ 36	8	94	3.3	125	500	73	3300
RS5-2405RS20AX	18 ~ 36	8	108	5	100	400	77	3300
RS5-2409RS20AX	18 ~ 36	10	107	9	56	222	78	470
RS5-2412RS20AX	18 ~ 36	12	105	12	42	167	79	470
RS5-2415RS20AX	18 ~ 36	12	104	15	33	133	80	470
RS5-2424RS20AX	18 ~ 36	15	105	24	21	83	79	220
RS5-4803RS20AX	36 ~ 72	6	50	3.3	125	500	69	3300
RS5-4805RS20AX	36 ~ 72	6	55	5	100	400	76	3300
RS5-4809RS20AX	36 ~ 72	6	55	9	56	222	76	470
RS5-4812RS20AX	36 ~ 72	6	53	12	42	167	78	470
RS5-4815RS20AX	36 ~ 72	6	53	15	33	133	78	470
RS5-4824RS20AX	36 ~ 72	8	54	24	21	83	77	220
RD5-0503RS20AX	4.5 ~ 9	20	508	3.3	125	500	65	3300
RD5-0505RS20AX	4.5 ~ 9	20	588	5	100	400	68	3300
RD5-0509RS20AX	4.5 ~ 9	50	580	9	56	222	69	470
RD5-0512RS20AX	4.5 ~ 9	30	563	12	42	167	71	470
RD5-0515RS20AX	4.5 ~ 9	70	563	15	33	133	71	470
RD5-0524RS20AX	4.5 ~ 9	70	556	24	21	83	72	220
RD5-1203RS20AX	9 ~ 18	15	196	3.3	125	500	70	3300
RD5-1205RS20AX	9 ~ 18	10	222	5	100	400	75	3300
RD5-1209RS20AX	9 ~ 18	15	219	9	56	222	76	470
RD5-1212RS20AX	9 ~ 18	15	214	12	42	167	78	470
RD5-1215RS20AX	9 ~ 18	15	214	15	33	133	78	470
RD5-1224RS20AX	9 ~ 18	35	216	24	21	83	77	220
RD5-2403RS20AX	18 ~ 36	8	97	3.3	125	500	71	3300
RD5-2405RS20AX	18 ~ 36	8	111	5	100	400	75	3300
RD5-2409RS20AX	18 ~ 36	10	105	9	56	222	79	470
RD5-2412RS20AX	18 ~ 36	15	104	12	42	167	80	470
RD5-2415RS20AX	18 ~ 36	15	105	15	33	133	79	470
RD5-2424RS20AX	18 ~ 36	15	108	24	21	83	77	220
RD5-4803RS20AX	36 ~ 72	6	51	3.3	125	500	67	3300
RD5-4805RS20AX	36 ~ 72	6	56	5	100	400	75	3300
RD5-4809RS20AX	36 ~ 72	10	57	9	56	222	73	470
RD5-4812RS20AX	36 ~ 72	10	54	12	42	167	77	470
RD5-4815RS20AX	36 ~ 72	6	54	15	33	133	77	470
RD5-4824RS20AX	36 ~ 72	8	54	24	21	83	77	220

Model Selection Guide

Model Number	Input Voltage Range (VDC)	Input Current		Output Voltage (VDC)	Output Current		Efficiency @ FL (% , typ.)	Capacitive Load @ FL (μF, max.)
		No-Load (mA, max.)	Full Load (mA, typ.)		Min. Load (mA)	Full Load (mA)		
RS5-0503RD20AX	4.5 ~ 9	25	493	±3.3	±63	±250	67	±1000
RS5-0505RD20AX	4.5 ~ 9	35	493	±5	±50	±200	67	±1000
RS5-0509RD20AX	4.5 ~ 9	30	548	±9	±28	±111	73	±220
RS5-0512RD20AX	4.5 ~ 9	35	548	±12	±21	±83	73	±220
RS5-0515RD20AX	4.5 ~ 9	40	556	±15	±17	±67	72	±220
RS5-0524RD20AX	4.5 ~ 9	120	580	±24	±10	±42	69	±100
RS5-1203RD20AX	9 ~ 18	15	196	±3.3	±63	±250	70	±1000
RS5-1205RD20AX	9 ~ 18	20	228	±5	±50	±200	73	±1000
RS5-1209RD20AX	9 ~ 18	20	210	±9	±28	±111	79	±220
RS5-1212RD20AX	9 ~ 18	15	210	±12	±21	±83	79	±220
RS5-1215RD20AX	9 ~ 18	20	210	±15	±17	±67	79	±220
RS5-1224RD20AX	9 ~ 18	35	219	±24	±10	±42	76	±100
RS5-2403RD20AX	18 ~ 36	8	97	±3.3	±63	±250	71	±1000
RS5-2405RD20AX	18 ~ 36	8	108	±5	±50	±200	77	±1000
RS5-2409RD20AX	18 ~ 36	8	108	±9	±28	±111	77	±220
RS5-2412RD20AX	18 ~ 36	8	102	±12	±21	±83	81	±220
RS5-2415RD20AX	18 ~ 36	12	105	±15	±17	±67	80	±220
RS5-2424RD20AX	18 ~ 36	25	107	±24	±10	±42	78	±100
RS5-4803RD20AX	36 ~ 72	6	48	±3.3	±63	±250	71	±1000
RS5-4805RD20AX	36 ~ 72	6	57	±5	±50	±200	73	±1000
RS5-4809RD20AX	36 ~ 72	6	55	±9	±28	±111	76	±220
RS5-4812RD20AX	36 ~ 72	6	53	±12	±21	±83	78	±220
RS5-4815RD20AX	36 ~ 72	8	52	±15	±17	±67	80	±220
RS5-4824RD20AX	36 ~ 72	12	56	±24	±10	±42	74	±100
RD5-0503RD20AX	4.5 ~ 9	25	485	±3.3	±63	±250	68	±1000
RD5-0505RD20AX	4.5 ~ 9	35	597	±5	±50	±200	67	±1000
RD5-0509RD20AX	4.5 ~ 9	30	547	±9	±28	±111	73	±220
RD5-0512RD20AX	4.5 ~ 9	60	555	±12	±21	±83	72	±220
RD5-0515RD20AX	4.5 ~ 9	60	555	±15	±17	±67	72	±220
RD5-0524RD20AX	4.5 ~ 9	110	563	±24	±10	±42	71	±100
RD5-1203RD20AX	9 ~ 18	15	194	±3.3	±63	±250	71	±1000
RD5-1205RD20AX	9 ~ 18	20	231	±5	±50	±200	72	±1000
RD5-1209RD20AX	9 ~ 18	20	211	±9	±28	±111	79	±220
RD5-1212RD20AX	9 ~ 18	15	214	±12	±21	±83	78	±220
RD5-1215RD20AX	9 ~ 18	30	214	±15	±17	±67	78	±220
RD5-1224RD20AX	9 ~ 18	45	222	±24	±10	±42	75	±100
RD5-2403RD20AX	18 ~ 36	8	95	±3.3	±63	±250	72	±1000
RD5-2405RD20AX	18 ~ 36	10	113	±5	±50	±200	74	±1000
RD5-2409RD20AX	18 ~ 36	8	105	±9	±28	±111	79	±220
RD5-2412RD20AX	18 ~ 36	10	105	±12	±21	±83	79	±220
RD5-2415RD20AX	18 ~ 36	12	105	±15	±17	±67	79	±220
RD5-2424RD20AX	18 ~ 36	25	108	±24	±10	±42	77	±100
RD5-4803RD20AX	36 ~ 72	6	49	±3.3	±63	±250	70	±1000
RD5-4805RD20AX	36 ~ 72	6	57	±5	±50	±200	73	±1000
RD5-4809RD20AX	36 ~ 72	6	54	±9	±28	±111	77	±220
RD5-4812RD20AX	36 ~ 72	10	53	±12	±21	±83	79	±220
RD5-4815RD20AX	36 ~ 72	8	53	±15	±17	±67	78	±220
RD5-4824RD20AX	36 ~ 72	12	56	±24	±10	±42	74	±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	5.0 Vdc Input	4.5	5.0	9	VDC
	12 Vdc Input	9	12	18	
	24 Vdc Input	18	24	36	
	48 Vdc Input	36	48	72	
Input Current (No Load)		See Table			mA
Input Current (Full Load)		See Table			mA
Input Filter		Capacitor			-
Input Reflected Ripple Current ⁽¹⁾			35		mApk-pk
Start up Time	Nominal Vin and constant resistive load		20		ms
Remote ON OFF Control	Module ON	open or high impedance 0 VDC ~ 0.8 VDC Max. (Short circuit Pin 1 and Pin 3) or open circuit			
	Module OFF	4.5 VDC to 15 VDC max. (or 3.5 mA to 15 mA max.) (via R1, D1)			
	OFF idle current		5		mA
Recommended input fuse (slow blow)	5.0 Vdc Input		0.75		A
	12 Vdc Input		0.3		
	24 Vdc Input		0.2		
	48 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		-2.0		+2.0	%
Line Regulation		-0.5		+0.5	%
Load Regulation	From 25 % to 100 % Load	-1.0		+1.0	%
Cross Regulation	Asymmetrical Load 25 % / 100 % for Dual	-5		+5	%
Ripple & Noise ⁽¹⁾	20 MHz Bandwidth			80	mVpk-pk
Short Circuit Protection		Indefinite (Automatic Recovery)			-
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)	5.0 Vdc Input			12	VDC
	12 Vdc Input			24	
	24 Vdc Input			40	
	48 Vdc Input			80	
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			100		650	kHz
Reliability Calculated MTBF	MIL-HDBK-217 F @ 25 °C		1610			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		99	°C
Maximum Case Temperature				100	°C
Thermal Impedance		27.18			°C/W
Storage Humidity				95	% rel. H
Storage Temperature		-55		125	°C
Cooling	Natural Convection	30 - 65 LFM			

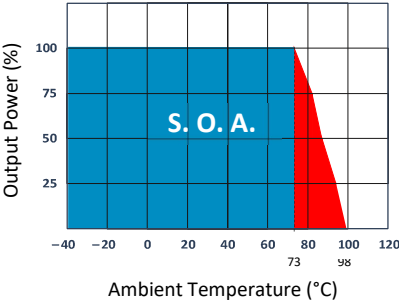
EMC Specifications			
Parameter	Standard	Condition	Criterion
Conducted Emissions	EN55032	with external components	A
Radiated Emissions	EN55032		A
ESD	IEC 61000-4-2	Air: ±8 kV / Indirect: ±6 kV	A
RS	IEC 61000-4-3	10 V/m	A
EFT	IEC 61000-4-4	±2 kV with external components	A
Surge	IEC 61000-4-5	±1 kV with 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	Alloy42 Solder-coated
	DIL	Ø0.5mm Brass Solder-coated
Potting Material	Epoxy (UL94V-0 rated)	
Weight	SIL	4.5 g , typ.
	DIL	6.0 g , typ.
Dimensions	SIL	0.86" x 0.36" x 0.44"
	DIL	0.92" x 0.55" x 0.40"

Thermal Derating

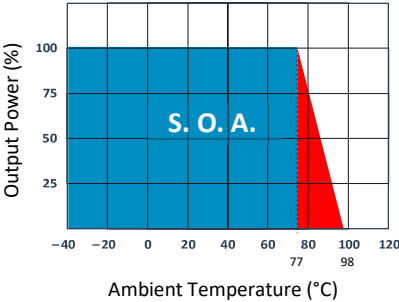
To enhance the system reliability, the power module should always be operated below the maximum operating temperature. If the temperature exceeds the maximum operating temperature, reliability of the unit may be affected.

Temperature Derating Curve



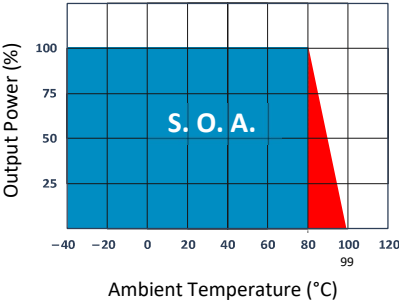
Efficiency 65 % ~ 69 % Models

Temperature Derating Curve



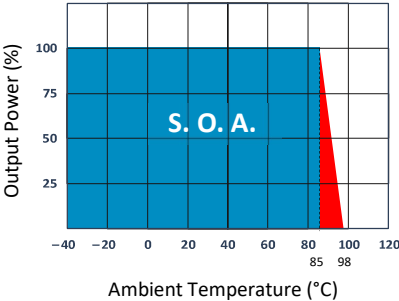
Efficiency 71 % ~ 73 % Models

Temperature Derating Curve



Efficiency 74 % ~ 77 % Models

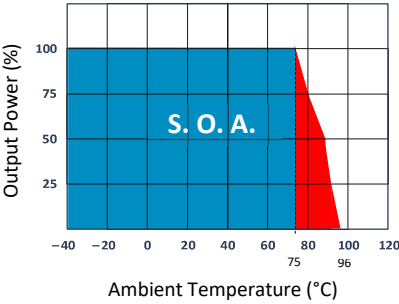
Temperature Derating Curve



Efficiency 78 % ~ 81 % Models

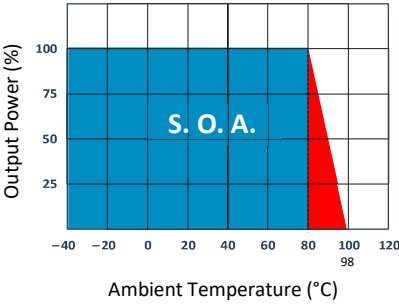
Thermal Derating

Temperature Derating Curve



Models:
RS5-0503RS20AX,
RD5-0503RS20AX,
RS5-0503RD20AX,
RD5-0503RD20AX,
RD5-4803RS20AX

Temperature Derating Curve

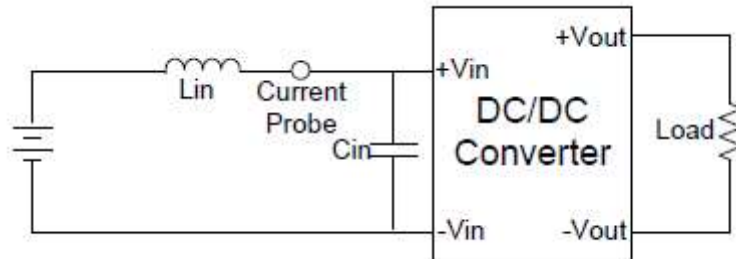


Models:
RS5-1203RS20AX, RS5-2403RS20AX,
RS5-4803RS20AX,
RD5-1203RS20AX, RD5-2403RS20AX,
RS5-1203RD20AX, RS5-2403RD20AX,
RS5-4803RD20AX,
RD5-1203RD20AX, RD5-2403RD20AX,
RD5-4803RD20AX

Test Configurations

Input Reflected Ripple Current Test Step

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



Remote Module ON / OFF

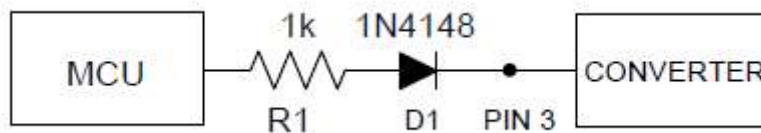
Remote Module ON / OFF

The MCU (Master Control Unit) Pin Voltage is referenced to $-V_{in}$ (Pin 1)

ON: 0 VDC ~ 0.8 VDC max. (Short circuit Pin 1 and Pin 3) or open circuit

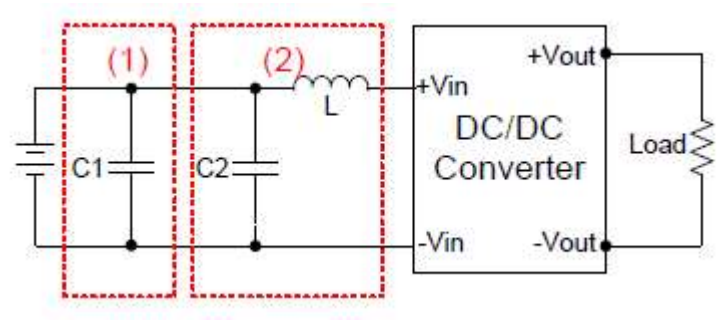
OFF: 4.5 VDC to 15 VDC max. (or 3.5 mA to 15 mA max.) (via R1, D1)

OFF idle current: 5 mA typ.



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	L
05 V	Nippon Chemi-con KY-Series 220μF / 100V	Nippon Chemi-con KY-Series 100μF / 100V	12μH
12 V			
24 V			
48 V			

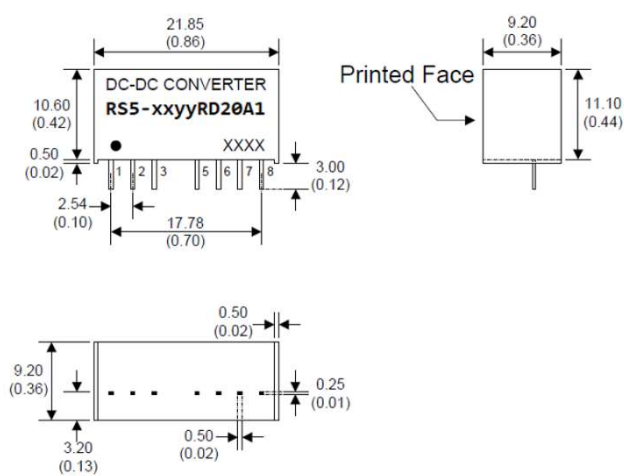
Pin Connections

SIL Package						
PIN NUMBER	SINGLE	SINGLE + Control Pin	DUAL	DUAL + Control Pin	DUAL / Special Pinning	DUAL / Special Pinning + Control Pin
1	-Vin	-Vin	-Vin	-Vin	-Vin	-Vin
2	+Vin	+Vin	+Vin	+Vin	+Vin	+Vin
3	N.P.	CTRL	N.C.	CTRL	N.C.	CTRL
5	N.P.	N.C.	N.C.	N.C.	N.C.	N.C.
6	+Vout	+Vout	+Vout	+Vout	+Vout	+Vout
7	-Vout	-Vout	-Vout	-Vout	COM	COM
8	N.C.	N.C.	COM	COM	-Vout	-Vout
	*N.P. : No PIN					
	*N.C. : No Connection					
	*CTRL : Control Remote ON/OFF					

DIL Package		
PIN NUMBER	SINGLE	DUAL
1	-Vin	-Vin
2	-Vin	-Vin
6	N.C.	COM
8	N.C.	-Vout
9	+Vout	+Vout
11	-Vout	COM
15	+Vin	+Vin
16	+Vin	+Vin
	*N.P. : No PIN	
	*N.C. : No Connection	

Mechanical Specifications

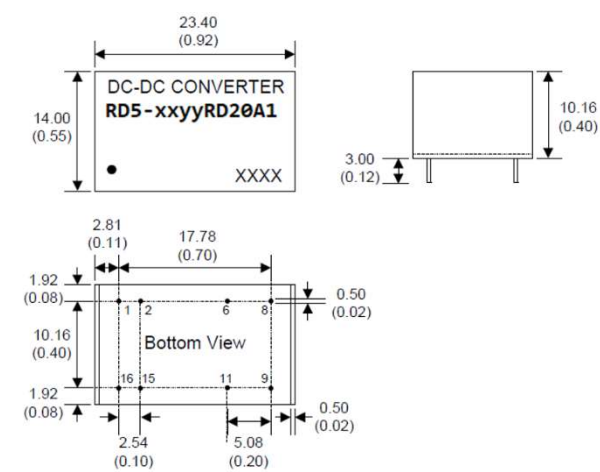
SIL Package



- 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)
 - 5. Stand-off tolerance: ± 0.1 (± 0.004)

Mechanical Specifications

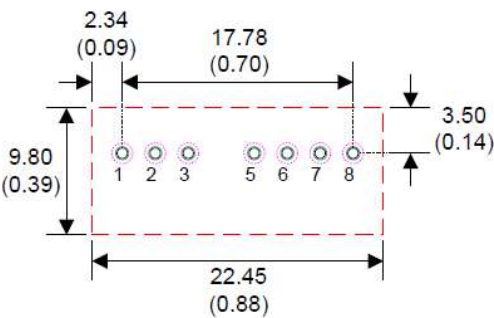
DIL Package



- 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)
 - 5. Stand-off tolerance: ± 0.1 (± 0.004)

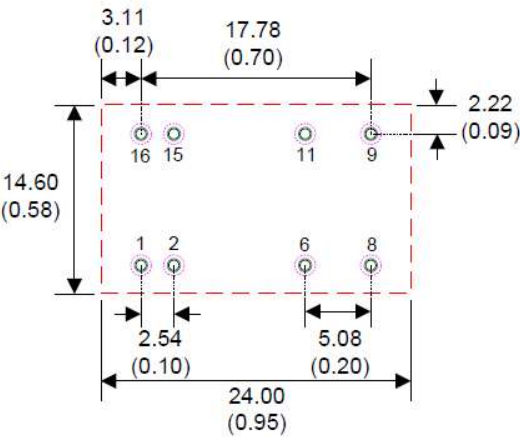
Recommended Footprint Details

SIL 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 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.