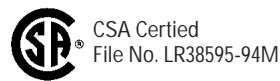


RSS Series — Panel Mount Solid State Relays

Key features of the RSS series include:

- Photo isolation
- 1,200 volt blocking voltage
- 4,000 volt optical isolation
- Zero voltage turn-on
- 100% tested at rated current
- High surge capability
- Optional finger-safe terminal cover (RSS-CVR)
- Dual SCR output
- Built-in snubber



Specifications	Input	Series	RSSDN			RSSAN	
		Voltage Range	4 – 32V DC			90 – 280V AC	
		Impedance	1,000Ω			40K ±10%	
		Pick-up Voltage	4V DC			90V AC	
		Drop Out Voltage	1V DC			10V AC	
		Dielectric Strength (input-output-base)	4,000 RMS (minute)			4,000 RMS (minute)	
		Capacitance (input to output)	8pF			8pF	
		Reverse Voltage Protection	Yes (-32VDC)			N/A	
	Output	Current (continuous)	10A	25A	50A	75A	90A
		1-Cycle Surge Current	100A	250A	750A	750A	1,000A
		1-Second Surge Current	30A	75A	145A	200A	280A
		Voltage Drop at Rated Current	1.6V (maximum)				
		Voltage Range	48 – 660V AC				
		Contact	1 Form A (SPST-NO)				
Over Voltage Rating		1200 PIV					
Frequency Range		47 – 80Hz					
Off-State Leakage at Rated Voltage		20mA (maximum)					
Turn-on Time		1/2 cycle at 60Hz					
Turn-off Time	1/2 cycle at 60Hz						
Minimum Holding Current	50mA						
Zero Voltage Switching	Yes						
Static DV/DT	200V/μsec						
Commutating DV/T	Snubbed for 0.5 power factor at rated load						

Part Numbers

Part Numbers: RSS Series

Continuous Output Current	Part No.	
	DC	AC
10A	RSSDN-10A	RSSAN-10A
25A	RSSDN-25A	RSSAN-25A
50A	RSSDN-50A	RSSAN-50A
75A	RSSDN-75A	RSSAN-75A
90A	RSSDN-90A	RSSAN-90A



2. The Fingersafe cover is part no. RSS-CVR.

Recommended Loads

Transformer Loads

Transformer loads sometimes result in severe inrush current when the transformer saturates during the first cycle. Use a relay rated for this surge, which has a 1/2 cycle surge current greater than the maximum applied line voltage ÷ the transformer's primary resistance (approximately 10x rated current).

Recommended Loads

SSR Rating	at 120V AC	at 240V AC
2A	150VA	300VA
4A	200VA	400VA
10A	500VA	1KVA
25A	1KVA	2KVA
50A	2KVA	4KVA

Heater Loads

When using solid state relays for driving heaters where the load is switched on and off rapidly and continuously, severe thermal stress will result. In such cases, use an SSR relay at no more than 75% of the rating.

Recommended Loads

SSR Rating	at 120V AC	at 240V AC
2A	250W	500W
4A	400W	800W
10A	1KW	2KW
25A	2KW	4KW
50A	3KW	6KW

Solenoid Valves and Contactors

RSS relays use high-noise immunity circuitry with a snubber to handle the electrical noise generated by inductive loads.

Recommended Loads

SSR Rating	at 120V AC	at 240V AC
2A	250W	500W
4A	400W	800W
10A	900W	1,800W
25A	2,100W	4,200W
50A	3,800W	7,500W

RSS series relays provide a highly reliable means of switching AC loads when applied properly. Read the following technical notes prior to installing then quality solid state relays.

Lamp Loads

Zero voltage switching is ideal for driving incandescent lamps, since the cold filament will not be subjected to a large inrush current. Using a zero-switched SSR will reduce inrush current and prolong lamp life.

Recommended Loads

SSR Rating	at 120V AC	at 240V AC
2A	2A	2A
4A	3A	3A
10A	1KW	2KW
25A	2KW	4KW
50A	3KW	6KW

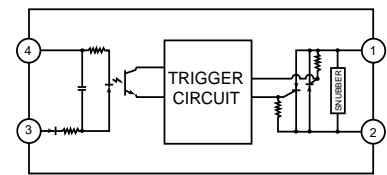
Calculating Input Current

RSS relays (DC in/AC out) have a circuit with 1,000Ω in series with opto-couplers LEDs. At 4V input, the relay will turn on with 3mA: $[4V - (1V \text{ drop across LED}) = 3V]$; $[3V \div 1,000\Omega = 3mA]$.

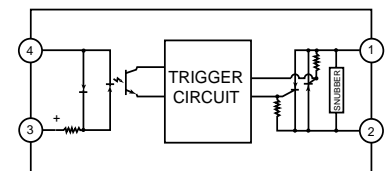
$$[(\text{Input Voltage} - 1) \div \text{Impedance}] = \text{Input Current (A)}$$



At higher voltages, the current will be correspondingly higher.



**RSSAN AC INPUT
EQUIVALENT CIRCUIT**



**RSSDN DC INPUT
EQUIVALENT CIRCUIT**

Technical Notes

Environment

Do not install SSRs near sources of excessive heat. Make sure applications are dry and well ventilated.

If SSRs must be installed in an environment subject to high temperatures or poor ventilation, or if SSRs are mounted collectively, reduce the load current so that it does **not** approach the ambient temperature-load current recommendation. (See the Temperature Derating Curves on the following page.)

When SSRs are used with inductive loads, suppress the inrush current to half of the peak surge current.

Heat Sinks

Heat sinks are recommended for 10, 25, 50, 75, and 90 amp rated solid state relays depending on ambient temperature and mounting position. The recommended heat sink dimensions and material are shown in the table:

Output Rating	Dimensions	Material
10A	12" x 12" x 1/8"	Aluminum (black anodized)
25A	12" x 12" x 1/8" (DC/AC)	Aluminum (black anodized)
25A	15" x 15" x 1/8" (AC/AC)	Aluminum (black anodized)
50A	15" x 15" x 1/8"	Aluminum (black anodized)
75A	17" x 17" x 1/8"	Aluminum (black anodized)
90A	17" x 17" x 1/8"	Aluminum (black anodized)

Using a thermal compound between the base of the SSR and the heat sink for heat dissipation is recommended.

Wiring

Locate SSRs as far from motor leads as possible to prevent malfunction from induced current.

Use shielded wires for input leads when they are exposed to a source of induced current.

Mounting

Provide sufficient ventilation.

Use #6 – 32 screws, at washers, and lock washers to secure mounting on heat sinks.

Vertical mounting is recommended to allow air to flow unimpeded. Horizontal or inverted mounting is possible, but the SSR must be derated according to the derating curves on the following page.

Additional Information

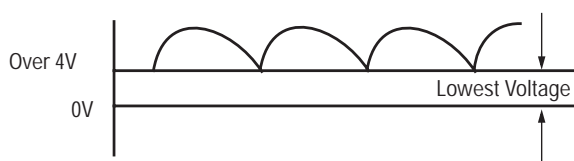
Do not exceed the load voltage and current specifications.

A small-capacity load may not turn off due to the leakage current present after the SSR has turned off. If this is the case, use a resistor in parallel with the load to shunt the leakage current.

Observe the polarity of input terminals. Failure to do so may cause damage to the SSR.

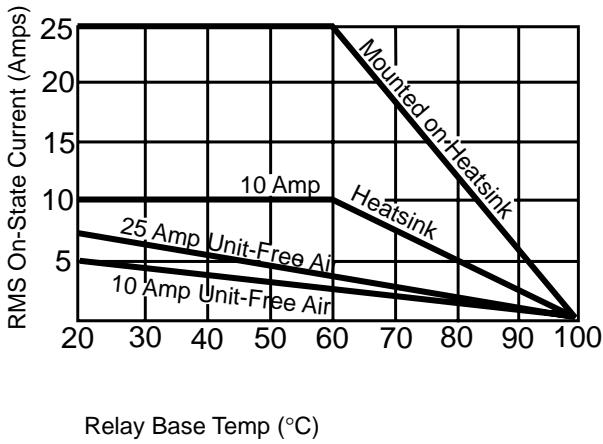
When the SSR output is subjected to a higher than rated voltage, a varistor or other element should be connected to the output terminals to absorb the over-voltage.

When the input signal contains a ripple voltage, the lowest ripple amplitude should exceed the minimum pick-up voltage of 4V.

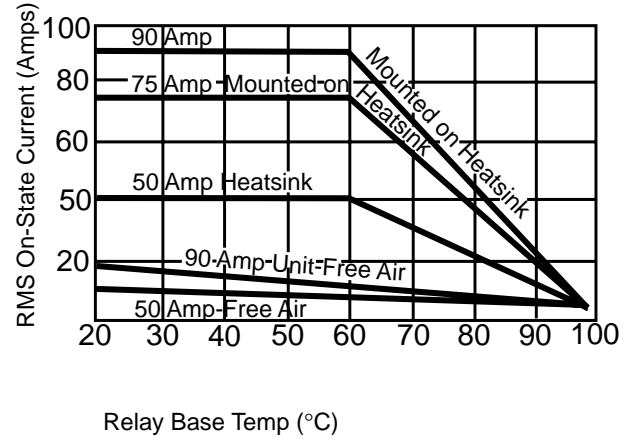


Temperature Derating Curves: RSS Series

Derating Curve
10-Amp and 25-Amp



Derating Curve
50-Amp, 75-Amp, and 90-Amp



For information on heat sink size, refer to the Technical Notes on the previous page.

RA Series — DC-AC Solid State Relays

Photo-Coupled, Zero Voltage Switching

Key features of the RA series include:

- 1A, 2A, 10A, and 20A current ratings, 30V AC to 264V AC output ratings
- Zero-voltage switching reduces inrush current
- Solid-state design: no arc, no chatter, no bounce
- High-speed, high-frequency switching, long life
- Photo-coupler completely isolates the input and output
- Wide input signal voltage range and small signal requirements enable direct drive from IC level signals
- Diode protection against reverse polarity
- Output circuit contains an RC snubber circuit (except RAHB)
- Sealed with epoxy resin for high resistance to moisture and vibration
- Panel mount, plug-in, and PCB mount models



		Series	RAFL, RAPP	RAHB	RALB	
Specifications	Input	Voltage Range	3 – 28V DC		4 – 30V DC	
		Impedance	Approximately 1.2K Ω		Approximately 1.5K Ω	
		Pick-up Voltage	3V DC maximum		4V DC maximum	
		Drop-out Voltage	0.8V DC minimum		1V DC minimum	
Output	Load Voltage Range	70 – 250V AC		30 – 264V AC		
	Maximum Load Current	2A	1A		2A	
	Off-State Leakage Current (maximum)	5mA (at 120V AC) 9mA (at 240V AC)	3mA (at 120V AC) 6mA (at 240V AC)		4mA (at 100V AC) 8mA (at 200V AC)	
	Voltage Drop with Output On (maximum)	1.7V rms	3V rms		1.6V rms	
	1-Cycle Surge Current	60A peak (non-repetitive)	16A peak (non-repetitive)		60A peak (non-repetitive)	
	Minimum Operating Current	50mA				
	Operating Time	1/2 cycle of line voltage maximum +1ms or less				
Reset Time						
Characteristics	Insulation Resistance	100M Ω or more (500V DC megger)				
	Dielectric Strength	Between live parts: 1,500V AC, 1 minute Between live and dead metal parts: 2,000V AC, 1 minute			Between input and output: 2,500V AC, 1 minute Between I/O and housing: 2,500V AC, 1 minute	
	Operating Temperature	–20 to +80C			–30 to +80C	
	Storage Temperature	–25 to +100C			–30 to +100C	
	Contact Configuration	SPNO (Form A) RAPP: 1 SPNO and 2 SPNO				

Part Numbers

Part Numbers: RA Series

Type	Plug-in			PCB Mount
	RAPP	RAHB	RALB	RAFL
Termination	Pin	Blade	Blade	PCB
Output Current/Voltage Range	2A (70 – 250V AC)	1A (70 – 250V AC)	2A (30 – 264V AC)	2A (70 – 250V AC)
Zero-Voltage Switching	Yes	Yes	Yes	Yes
Output: RC Absorbing	Yes	No	No	Yes
Complete Part No.	RAPP-202Z (1 SPNO) RAPP-202Z2 (2 SPNO)	RAHB-201Z	RALB-202ZL	RAFL-202Z



1. UL recognized and CSA certified models are available. RALB series includes an operation indicator standard.

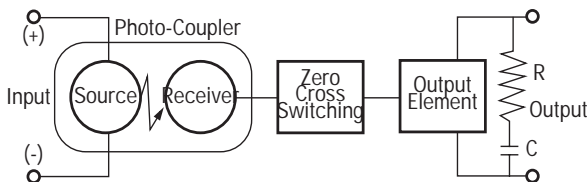
Part Numbers: Sockets

Relays	Standard DIN Rail Mount	Finger-Safe DIN Rail Mount	Panel Mount	PC Mount	Spring (optional)
RAPP	SR2P-05 SR2P-06	SR2P-05C	SR2P-51	—	SR2B-02F1 SR3P-01F1
RAHB	SH1B-05	SH1B-05C	SH1B-51	SH1B-62	SY2S-02F1 SY4S-51F1
RALB	SH2B-05	SH2B-05C	SH2B-51	SH2B-62	SY4S-51F1 SY4S-02F1

Internal Circuit

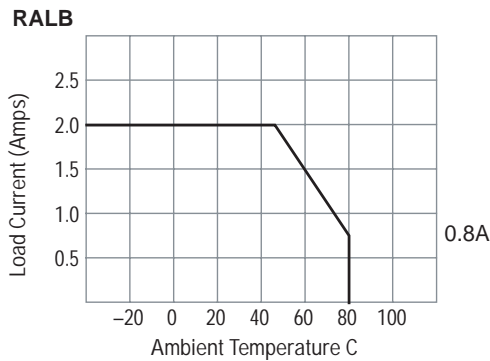
Zero-Voltage Switching

The zero-voltage circuit initiates switching near zero volts AC and is reset when the load current crosses zero. Switching is delayed until the next zero-crossing, even if an input signal enters during the AC cycle. Inrush current is reduced to a minimum.



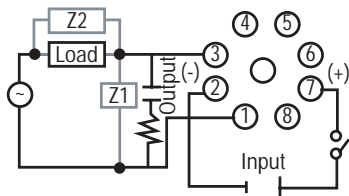
3. The surge absorber circuit is not contained in RAHB types.

Temperature Derating Curves



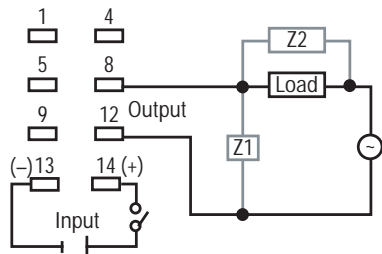
Connection Diagram

RAPP-202Z (2 SPNO)

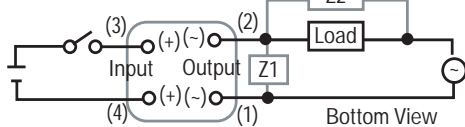


Connect overvoltage absorbing elements in place of Z1 and Z2 when switching inductive loads.

RALB

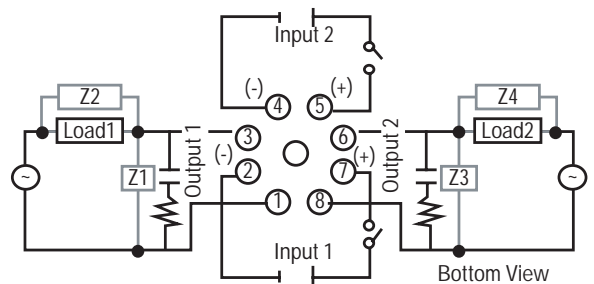


RAFL



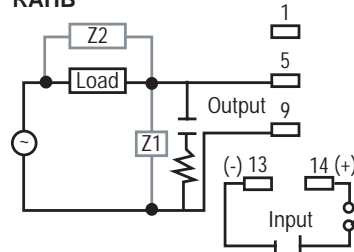
Connect overvoltage absorbing elements in place of Z1 and Z2 when switching inductive loads.

RAPP-202Z (1 SPNO)



Connect overvoltage absorbing elements in place of Z1, Z2, Z3, and Z4 when switching inductive loads.

RAHB

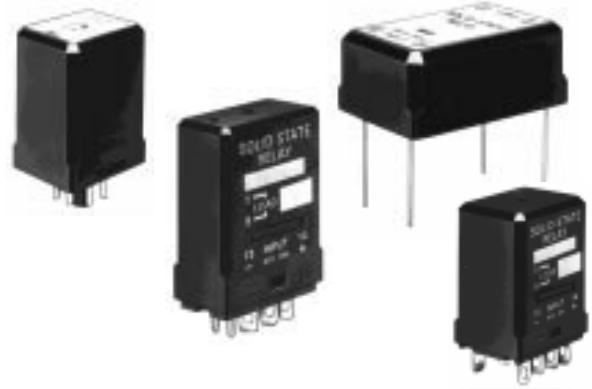


Connect an external RC absorber to the output terminals and overvoltage absorbing elements in place of Z1 and Z2 when switching inductive loads.

RB Series — DC-DC Type Solid State Relays

Key features of the RB series include:

- 3V to 8V DC input signal voltage, 5V to 60V DC output load range
- A photo-coupler ensures complete isolation between input and output terminals, resulting in high dielectric strength
- An all solid-state design generates no arc, no chatter, no bounce, and no mechanical noise
- Capable of high-speed and high-frequency switching with long life and excellent reliability
- Input diode protection against reverse polarity
- Sealed with epoxy resin for high resistance to moisture, shock, and vibration
- Available in PC mount or plug-in models



		Series	RBPP, RBHB, RBMB, RBFL	RBLB
Input	Voltage Range		3 to 28V DC	4 to 30V DC
	Impedance		Approximately 1.5kΩ	
	Pick-up Voltage		3V DC maximum	4V DC maximum
	Drop-out Voltage		0.8V DC minimum	1V DC minimum
Output	Load Voltage Range		5 to 60V DC	
	Maximum Load Current		2A	
	Off-State Leak Current		2mA maximum	
	Voltage Drop Output On		1.5V rms	
	Surge Current, 1 Cycle		5A (1 second maximum)	
	Minimum Operational Current		50mA	
Characteristics	Operating Time		0.5ms maximum	
	Reset Time		2ms maximum	
	Insulation Resistance		100MΩ minimum (measured with 500V DC megger)	
	Dielectric Strength		Between live parts: 2,000V AC, 1 minute Between live and dead metal parts: 2,000V AC, 1 minute	
	Operating Temperature		-25 to +80C	-30 to +80C
	Storage Temperature		-30 to 100C	
Contact Configuration		SPNO (Form A) RBPP: 1 SPNO or 2 SPNO		

Part Numbers

Part Numbers: RB Series

Type	Plug-in				PCB Mount
	RBPP	RBHB	RBMB	RBLB	RBFL
Termination	Pin	Blade	Blade	Blade	PC board
Applicable Load	2A (5 – 60V DC)	2A (5 – 60V DC)	2A (5 – 60V DC)	2A (5 – 60V DC)	2A (5 – 60V DC)
Complete Part No.	RBPP-0502 (1 SPNO) RBPP-0502-2 (2 SPNO)	RBHB-0502	RBMB-0502	RBLB-0502L	RBFL-0502

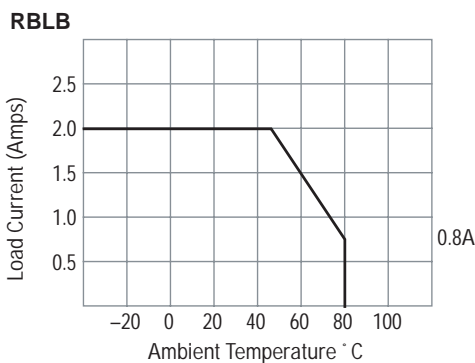


1. RBLB series includes an operation indicator standard.

Part Numbers: Sockets

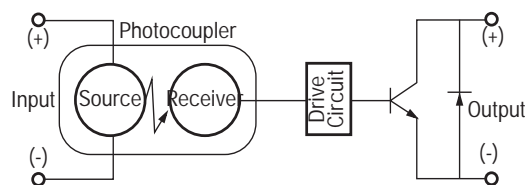
Relays	Standard DIN Rail Mount	Finger-Safe DIN Rail Mount	Panel Mount	PC Mount	Spring (optional)
RBPP	SR2P-05 SR2P-06	SR2P-05C	SR2P-51	—	SR2B-02F1 SR3P-01F1
RBHB	SH1B-05	SH1B-05C	SH1B-51	SH1B-62	SY2S-02F1 SY4S-51F1
RBMB	SH2B-05	SH2B-05C	SH2B-51	SH2B-62	SY4S-02F1 SY4S-51F1
RBLB	SH2B-05	SH2B-05C	SH2B-51	SH2B-62	SY4S-02F1 SY4S-51F1

Temperature Derating Curves



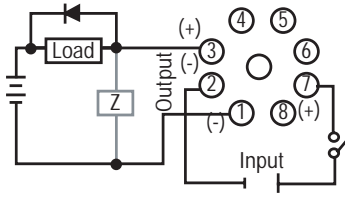
Internal Circuit

An input signal actuates the drive circuit through the photo-coupler, causing the output transistor to turn on the output. Turning off the input returns the output to the off state. Unlike AC solid-state relays, DC-DC solid-state relays do not require zero-voltage switching.

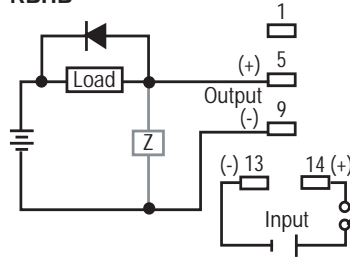


Connection Diagrams

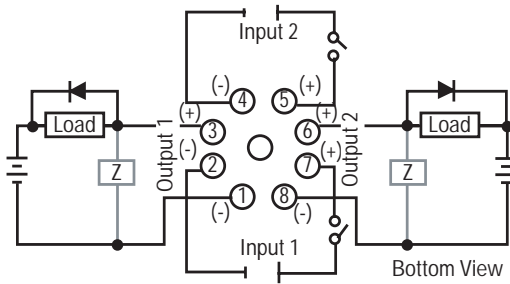
RBPP-0502 (one switching circuit)



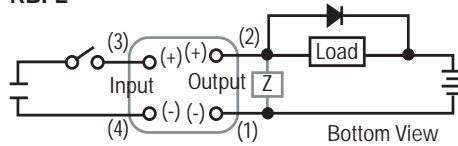
RBHB



RBPP-0502-2 (two switching circuit)

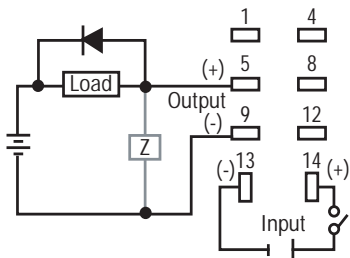


RBFL

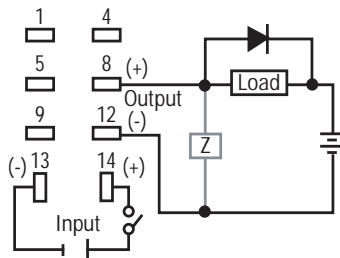


Connect an overvoltage absorbing element in place of Z.
Be sure to connect a diode in parallel with the inductive load.

RBMB

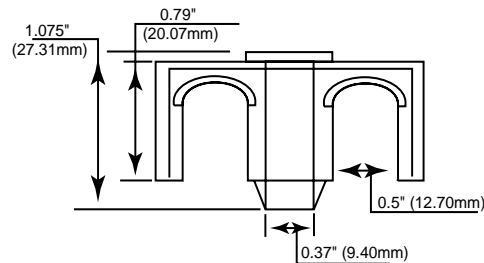
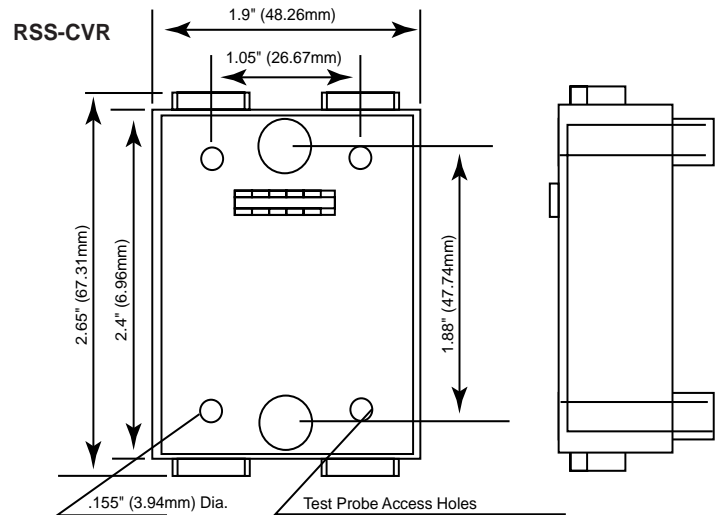
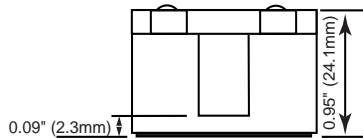
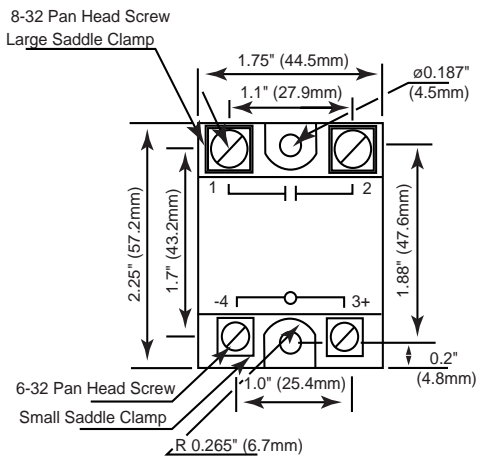


RBLB



RSS, RA, and RB Dimensions

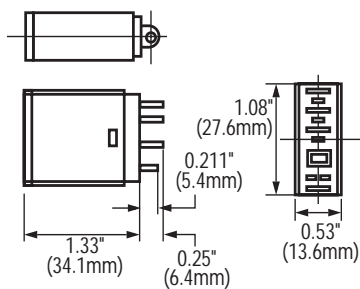
RSS Series



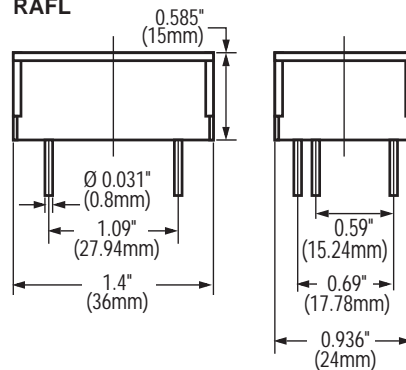
Material: Polycarbonate-Clear

RA Series

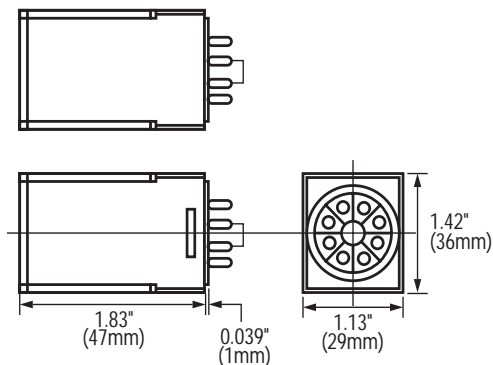
RAHB



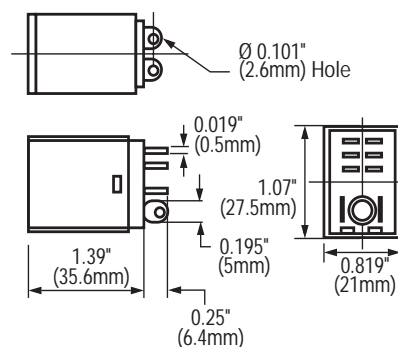
RAFL



RAPP and RBPP



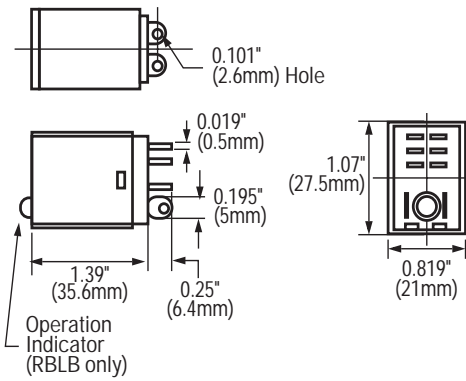
RALB



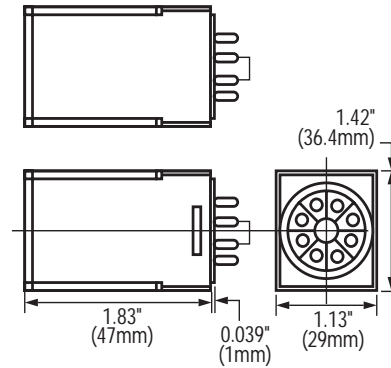
Dimensions, continued

RB Series

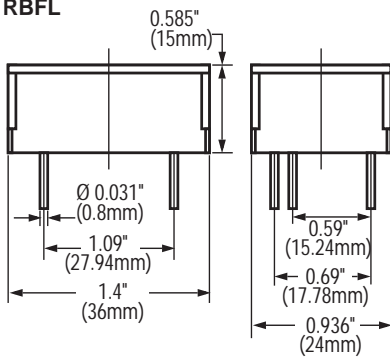
RBMB, RBLB



RBPP



RBFL



RBHB

