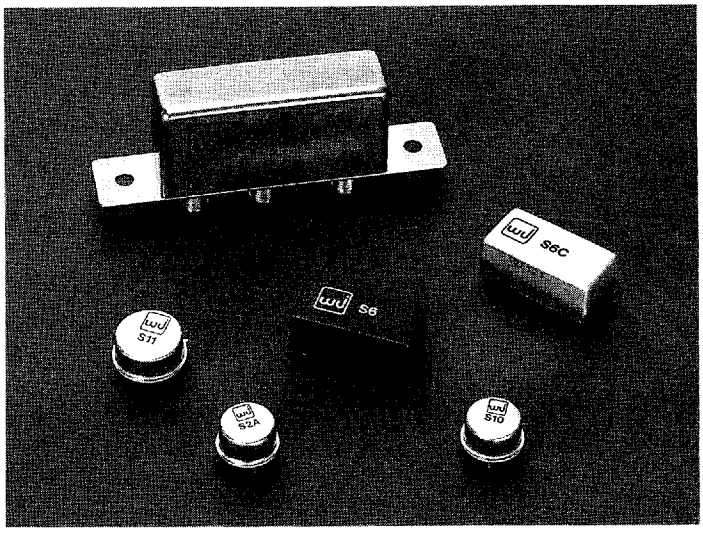
RF SPST Switches

- ◆ HIGH ON-OFF RATIO
- ◆ EXCELLENT ISOLATION OF THE SWITCHING SIGNAL
- ◆ FAST SWITCHING SPEED



Description: The Watkins-Johnson line of solid-state switches is designed for transient-free operation over a wide frequency range. Utilizing a balanced construction, high frequency components of switching signal are typically suppressed 30 dB or greater. Schottky barrier diodes in the Models S1 and S6 permit switching speeds less than 2 nanoseconds with "on-off" ratios greater than 90 dB.

Specifications at +25°C

Model	Description	Frequency Range MHZ	On-Off Ratio,[2] Min. dB	MHz	Insertion Loss Max dB	MHz	Switching Signal Rejection[3] Min. dB	MHz	Switching Speed (nsec) Max.	Switching Condition On	Off	Weight (gms)	Package Type	Hermetic Seal	Outline Drawing
S1	SPST	0.5-500	90	0.5-50	5.0	2-100	30	0.5-500	1.0	+20 mA	-20 mA	45.6	SMA	No	I
			80	50-100	6.0	1-200				≈+1.5V	≈-1.0V				
			70	100-200	7.0	0.5-500									
			60	200-500											
S2A (CS2A)	SPST	10-1000	60	10-100	5.0	10-200	30	10-200	2.0	+20 mA	-20 mA	2.3	PC Mounted (SMA)	Yes (Yes)	J (K)
			50	100-200	5.5	200-500	20	200-400							
			37	200-500	7.0	500-1000	12	400-1000							
			27	500-1000											
S6 (S6C)	SPST	0.5-200	70	0.5-20	3.5	1-50	30	0.5-200	2.0	+20 mA	-20 mA	3.6 (6.8)	PC (PC)	No (Yes)	M (N)
			65	20-50	4.0	0.5-200				≈+1.0V	≈ -1.0V				
			50	50-100											
			45	100-200											
S10 (S11[4])	SPST	10-500	65	10-100	1.7	10-100	45	10-100	5.0 S10	+20 mA	-20 mA	2	TO-8	Yes	J
										=+1.0V	≈-1.0V				
			60	100-300	2.0	100-300	30	100-300	(20.0)						
			45	300-500	2.5	300-500	45	300-500	(S11)	(TTL)	(TTL)	(2.7)	(TO-8B)	(Yes)	(P)

NOTES:
1. Measured in a 50-ohm system with an input signal level of +4 dBm or less and with specified switching currents applied.
2. On-Off ratio is specified between ports A and B. Insertion loss is specified between port A and port B.
3. Sinusoidal switching signal of +17 dBm is applied to switching port and fundamental component of that signal is measured at output port.
4. S11 has an internal TTL driver circuit.

Absolute Maximum Ratings

Operating Temperature.....-54 to +100°C
Storage Temperature....-65°C to + 100°C
Peak Input Current
Model S1.....70 mA
Models S6, S6C, S10 and S11
.....200 mA
Peak Power
Modes SI, S6, S6C, S10 and S11
.....+30 dBm

Environmental

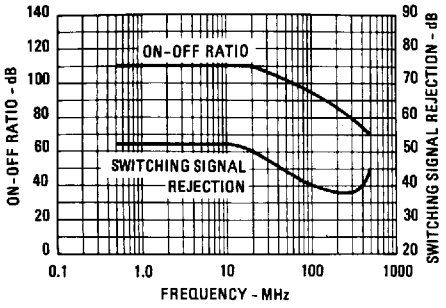
All units* are guaranteed to meet their specifications after exposure to any or all of the following tests per MIL-STD-202E:

EXPOSURE	METHOD	TEST CONDITION
Temperature Cycle	102A	C
Thermal Shock	107D	B
Altitude	105C	G
H.F. Vibration	204C	D
Mechanical Shock	213B	C
Random Vibration (15 minutes per axis)	214	IIF
Solderability	208B	
Terminal Strength	211A	C
Resistance to Soldering Heat	210A	B

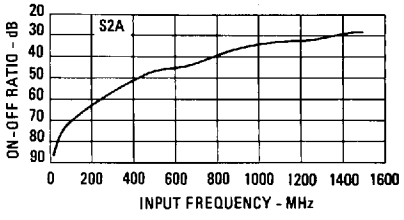
Hermetically sealed units meet the requirements of method 106D of MIL-STD-202E when exposed tp humidity.
*The temperature range for Model S1 is -20°C to +100°C for input frequencies below 1 MHz.

Typical Performance at 25°C

On-Off Ratio vs. Frequency: The "on-off" ratio is defined as the ratio of the output voltage when the switch is turned "on" to the output voltage when the switch is turned "off." At lower frequencies, the "on-off" ratio is higher than it is at higher frequencies. The S1 has the best "on-off" ratio.

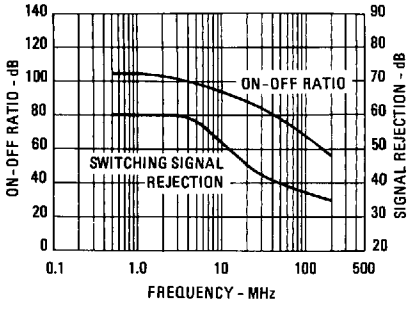


MODEL S1

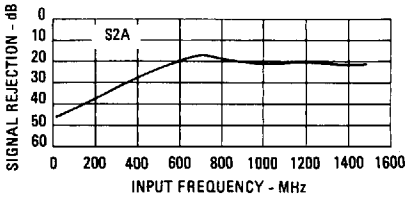


MODEL S2A

Switching Signal Rejection vs. Frequency: The switching signal rejection is defined as the amount of isolation between the switching input port and the output port. It is measured by applying a sinusoidal signal of +17 dBm to the SW port (pins 3 and 4, for pc switches) and measuring the fundamental component of the signal at the output. For transient-free switching, this rejection should be as high as possible.

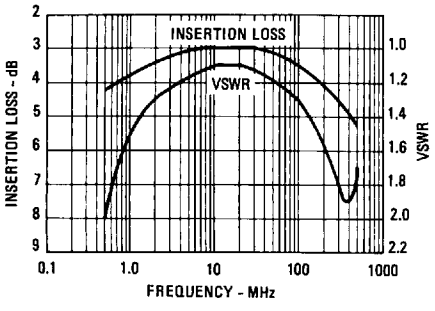


MODEL S6/S6C

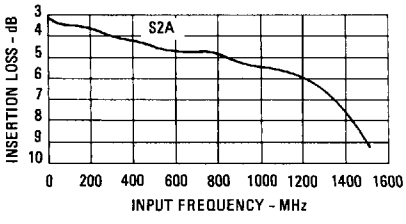


MODEL S2A

Insertion Loss vs. Frequency: The insertion loss is defined as the power loss from the input to the output with the switch turned on by the recommended minimum switching current. With a higher switching current some improvement in performance can be obtained as shown in the insertion loss vs. signal level curves.



MODEL S1



MODEL S2A

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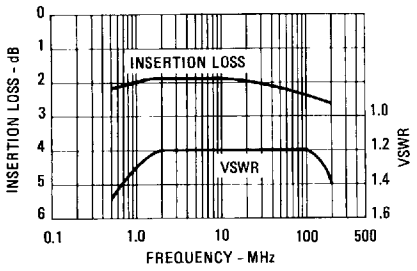
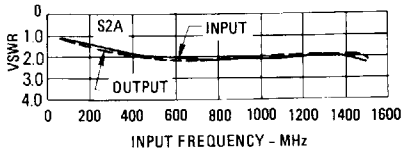
Typical Performance at 25°C

VSWR vs. Frequency: The VSWR is defined as the VSWR of either the input or output port when the switch is turned "on" and the other port is terminated in 50 ohms. When the switch is in the "off" mode, the VSWR of the SPST switches is essentially that of an open circuit.

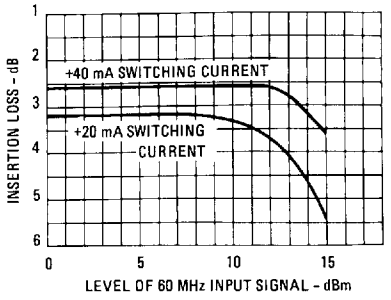


MODEL S6/S6C

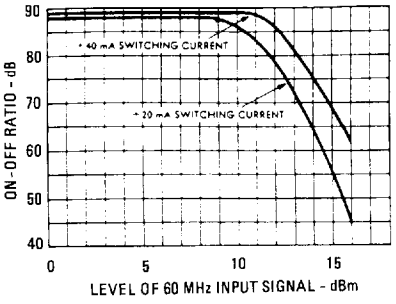


MODEL S2A

Insertion Loss vs. Signal Level: As the input signal level is increased above the maximum specified level of +4 dBm, the input signal starts to control the switch rather than the switching signal. The insertion loss of the switch for various input levels of a 60 MHz signal and switching currents is plotted for each switch.

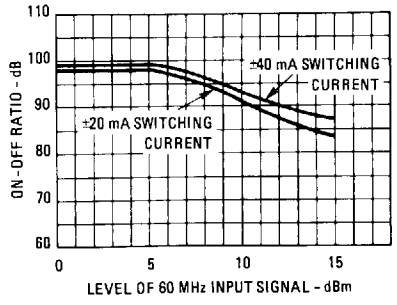


MODEL S1

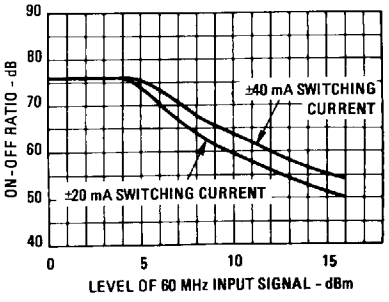


MODEL S6/S6C

On-Off Ratio vs. Signal Level: The loss of "on-off" ratio as a function of input level is plotted for a 60 MHz signal. An increase in the switching current improves the "on-off" ratio.



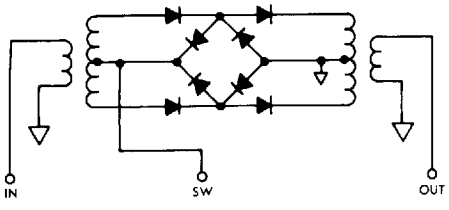
MODEL S1



MODEL S6/S6C

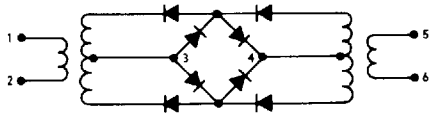
Schematic Diagrams

S1



A biasing current of +20 mA into the SW port gives the on-condition, and -20 mA into the SW port gives the off condition. The corresponding voltages are approximately +1.5V for the switch "on" and -1.0V for the switch "off."

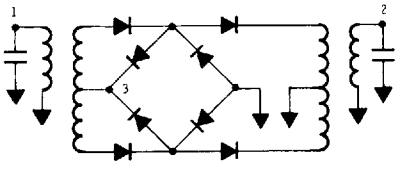
S6/S6C



The input signal is applied at Pins 5 and 6 and the output signal appears at Pins 1 and 2.

Bias is applied to Pins 3 and 4 with Pin 3 at signal ground, if there is a signal ground reference. A bias current of +20 mA into Pin 4 turns the switch "on," and a bias current of -20 mA out of Pin 4 turns the switch "off." For the S6/S6C, the corresponding voltages (Pin 4 to Pin 3) are approximately +1.0V for the switch "on" and -1.0V for the switch "off." Pin 3 is internally grounded to case on Model S6C.

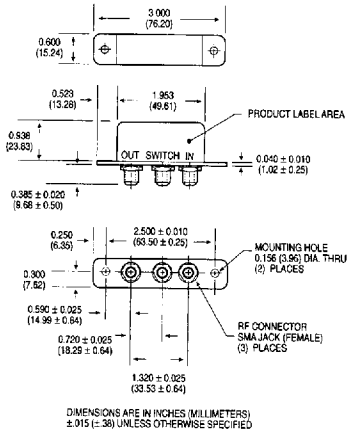
S2A



The input signal is applied at Pin 1 and the output signal is taken from Pin 2. The switching bias is applied to Pin 3. A bias current of +20 mA into Pin 3 turns the switch on, and a bias current of -20 mA out of Pin 3 turns the switch off. The corresponding voltages (Pin 3) are approximately +1.0V for the on condition and -1.0V for the off condition.

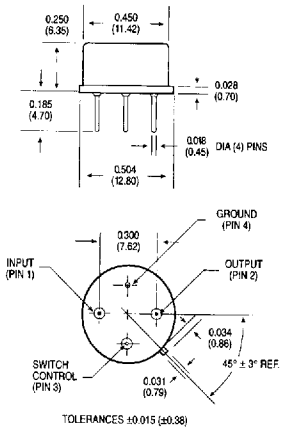
Outline Drawings

Package 1
S1



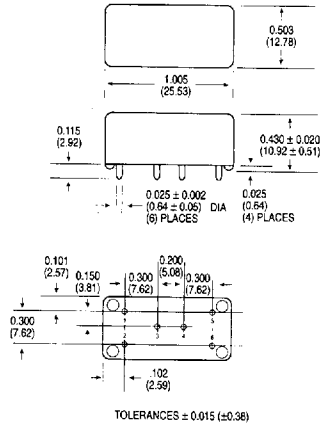
DIMENSIONS ARE IN INCHES (MILLIMETERS)
±.015 (±.38) UNLESS OTHERWISE SPECIFIED

Package J
S2A/S10



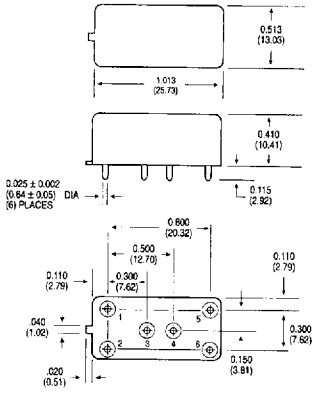
TOLERANCES ±0.015 (±0.38)

Package M
S6



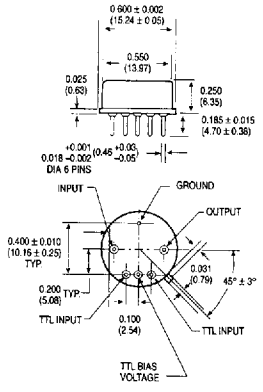
TOLERANCES ± 0.015 (±0.38)

Package N
S6C



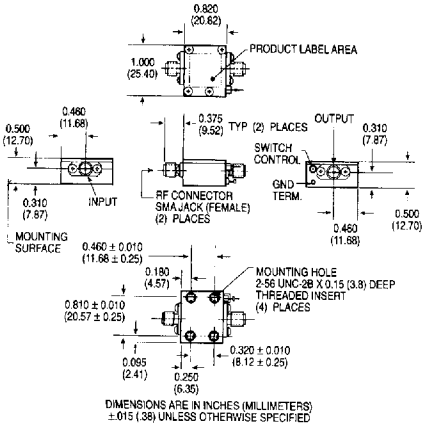
DIMENSIONS ARE IN INCHES (MILLIMETERS)
±.015 (±.38) UNLESS OTHERWISE SPECIFIED

Package P
S11



TOLERANCES ±0.015 (±0.38)

Package K
CS2A



DIMENSIONS ARE IN INCHES (MILLIMETERS)
±.015 (.38) UNLESS OTHERWISE SPECIFIED

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