

# Millimeter Wave Reflective SP4T with TTL Driver

## 0.5 - 30 GHz



MASW-011137

Rev. V1

### Features

- Hermetic SP4T Reflective Switch
- 2.4 mm Field Replaceable RF Connectors
- Unique All RF Ports Isolation State
- +5 V, -20 V, TTL Driver
- 3.8 dB Insertion Loss @ 30 GHz
- 30 dB Isolation @ 30 GHz
- 2:1 VSWR @ 30 GHz
- 70 ns  $T_{ON}$  Switching Speed
- Non-RoHS\* Part

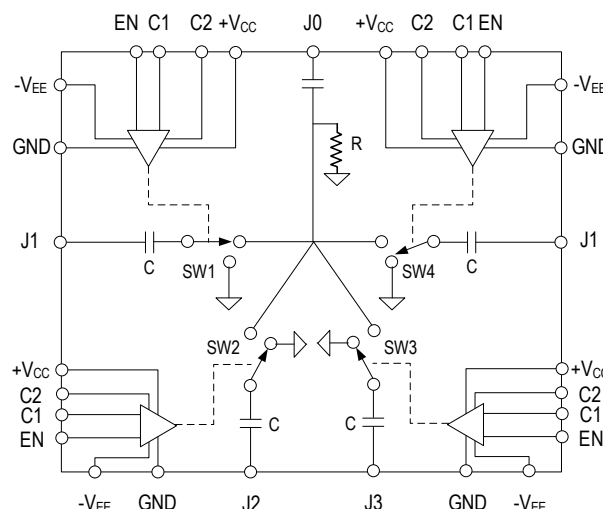
### Applications

- Aerospace and Defense
- Space

### Description

The MASW-011137 is a 0.5 – 30 GHz hermetic reflective SP4T that uses 2.4 mm RF replaceable connectors with an integrated TTL driver operating with +5 VDC and -20 VDC. The additional enable logic control provides for a unique state where all RF ports can be placed into simultaneous isolation. This product provides an exceptional isolation to insertion loss ratio, with 70 ns switching speed in a compact, 1.3" x 1.3" x 0.7" metal housing. It is ideally suited for applications requiring hermetic hardware enclosures.

### Functional Schematic



### Port Configuration<sup>1</sup>

Port Description	Function
J0	RF Input
J1	RF Output 1
J2	RF Output 2
J3	RF Output 3
J4	RF Output 4
C1	TTL Logic Control 1
C2	TTL Logic Control 2
EN	TTL Enable Logic Control
V <sub>CC</sub>	Positive Bias
V <sub>EE</sub>	Negative Bias
GND	RF & DC Voltage Ground Return

1. The RF ground is provided through the RF connectors and the metal housing. The driver ground is provided through the DC feedthrus and the metal housing.

### Ordering Information

Part Number	Package
MASW-011137-CS0240	Bulk

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**Electrical Specifications:**  $T_A = 25\text{ }^{\circ}\text{C}$ ,  $P_{IN} = 0\text{ dBm}$  (unless otherwise defined),  
 $Z_0 = 50\text{ }\Omega$ , DC Power = +5 V @ +90 mA, -20 V @ -30 mA

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	0.5 - 30 GHz 2GHz 18GHz 30GHz	dB	—	3.0 0.9 2.1 4.0	5.4 1.0 2.6 5.4
Return Loss	0.5 - 30 GHz	dB	—	14	—
Input to Output Isolation	One Port in Insertion Loss 0.5 - 30 GHz 2GHz 18GHz 30GHz	dB	26 61 39 26	40 65 40 30	—
Input to Output Isolation	All Ports in Isolation 0.5 - 30 GHz	dB	—	35	—
Switching Speed $T_{ON}$ $T_{OFF}$	F=10 GHz, 100 kHz TTL repetition rate ( 50% Control Voltage - 90% RF Voltage ) ( 50% Control Voltage - 10% RF Voltage )	ns	—	70 40	—
CW Incident Power <sup>2</sup>	10 GHz	dBm	—	30	—
Input IP2	2 Tone, 5 dBm/Tone 10 MHz spacing at 10 GHz	dBm	—	74	—
Input IP3	2 Tone, 5 dBm/Tone 10 MHz spacing at 10 GHz	dbm	—	45	—

2. Maximum source and load VSWR = 1.2:1

## Recommended Operating Conditions

Parameter	Test Conditions	Units	Min	Typ.	Max
CW Input Power	10 GHz, +25 °C	dBm	—	—	30
$V_{CC}$	—	V	—	+5.0	—
$V_{EE}$	—	V	—	-20.0	—
$I_{CC}$	One Port in Insertion Loss All Ports in Isolation	mA	+79 +105	+82 +108	+85 +111
$I_{EE}$	One Port in Insertion Loss All Ports in Isolation	mA	-29 -3	-26 0	-23 0
C1, C2, EN	Logic "0" Logic "1"	V	0.0 2.0	0.0 +5.0	+0.8 +5.0
Operating Temperature	—	°C	-40	+25	+85
Storage Temperature	—	°C	-65	+25	+150

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### Maximum Survivability Ratings<sup>3,4,5,6</sup>

Parameter	Absolute Maximum
CW Input Power	31 dBm @ +25 °C
V <sub>CC</sub> <sup>6</sup>	+4.5 V ≤ V <sub>CC</sub> ≤ +5.5 V
V <sub>EE</sub> <sup>6</sup>	-22 V ≤ V <sub>EE</sub> ≤ to -10 V
C1, C2, EN	-0.5 V ≤ V <sub>CC</sub> ≤ +7.0 V
Junction Temperature	+175 °C
Operating Temperature	-55 °C to +95 °C
Storage Temperature	-65 °C to +150 °C

- Operating at recommended conditions with T<sub>J</sub> ≤ +175°C will ensure MTTF > 1 x 10<sup>6</sup> hours.
- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near ANY of these maximum survivability limits.
- Important: The TTL driver in the MASW-011137 SP4T does NOT use reverse polarity protection for the V<sub>CC</sub> and V<sub>EE</sub> voltage inputs. The MASW-011137 can be damaged if V<sub>CC</sub> and V<sub>EE</sub> voltage inputs are reversed.

### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices. This device is ESD defined as HBM Class 1A.

### Truth Table

Inputs			Outputs			
C1	C2	EN	J0-J1	J0-J2	J0-J3	J0-J4
1	1	0	Insertion Loss	Isolation	Isolation	Isolation
0	1	0	Isolation	Insertion Loss	Isolation	Isolation
1	0	0	Isolation	Isolation	Insertion Loss	Isolation
0	0	0	Isolation	Isolation	Isolation	Insertion Loss
X	X	1	Isolation	Isolation	Isolation	Isolation

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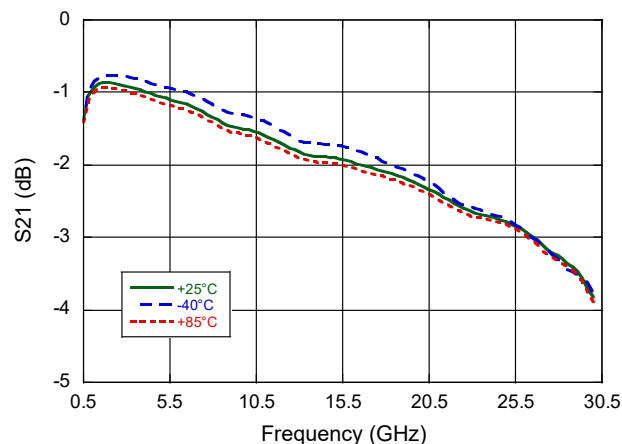


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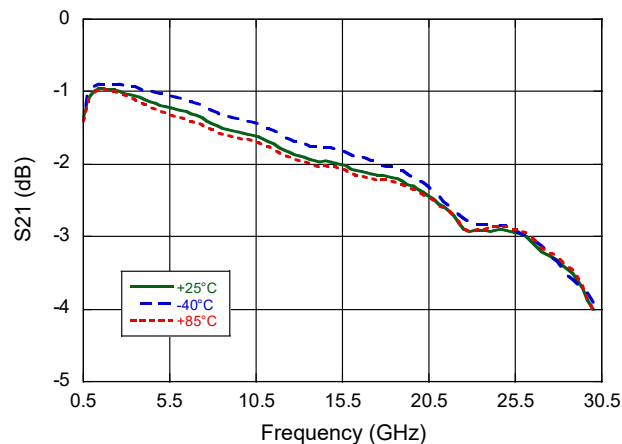
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### Typical Performance Curves

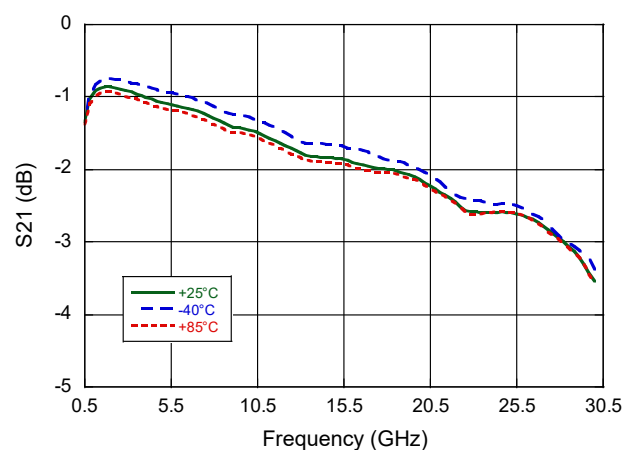
**J0 -J1 Insertion Loss**



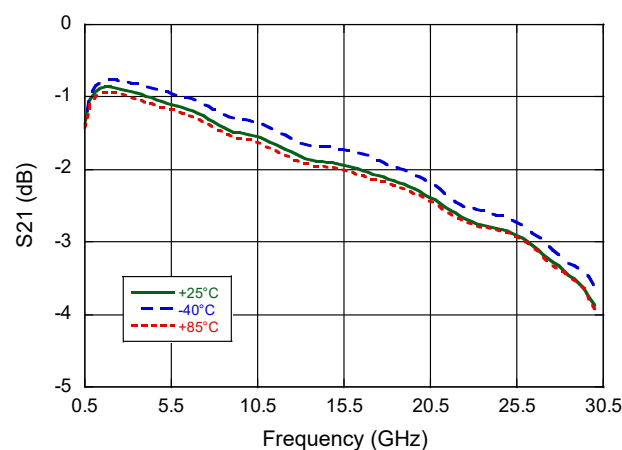
**J0 -J2 Insertion Loss**



**J0 -J3 Insertion Loss**



**J0 -J4 Insertion Loss**



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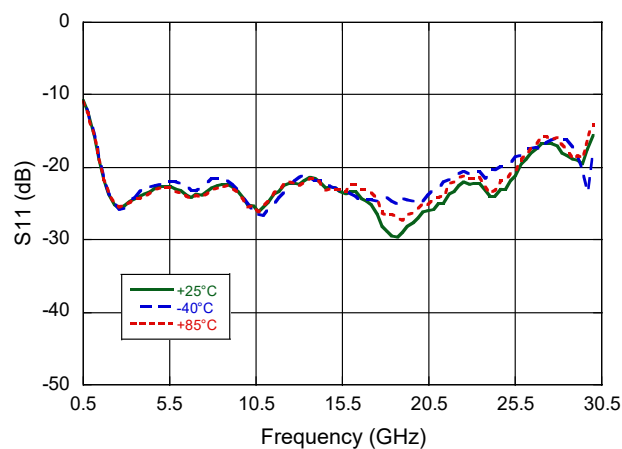


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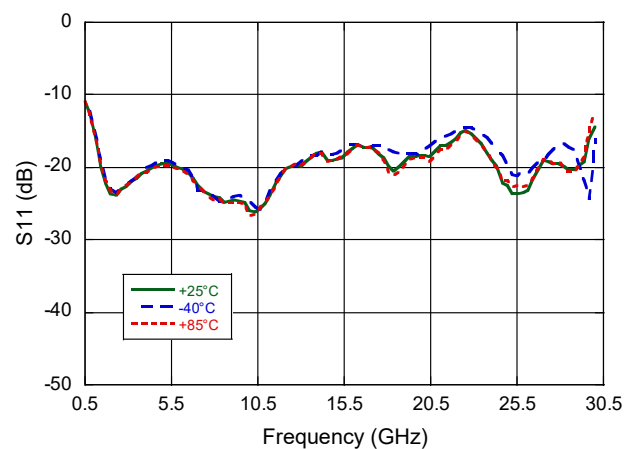
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### Typical Performance Curves

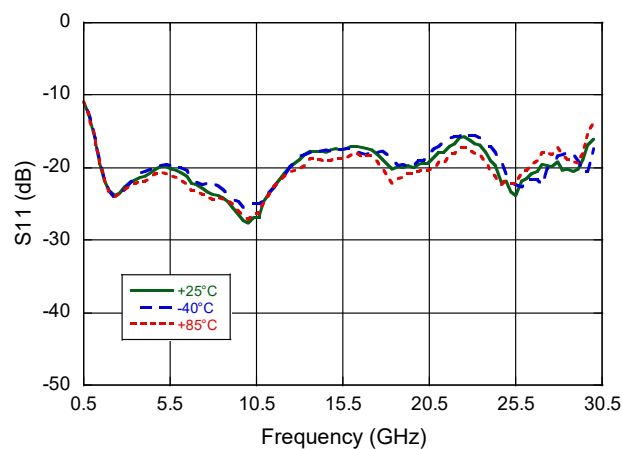
**J0 -J1 Return Loss**



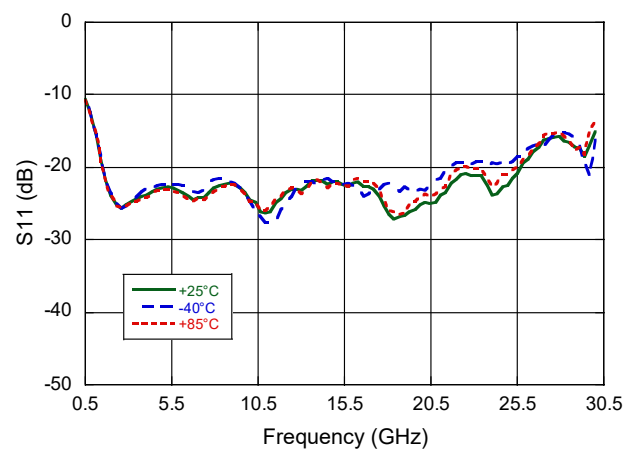
**J0 -J2 Return Loss**



**J0 -J3 Return Loss**



**J0 -J4 Return Loss**



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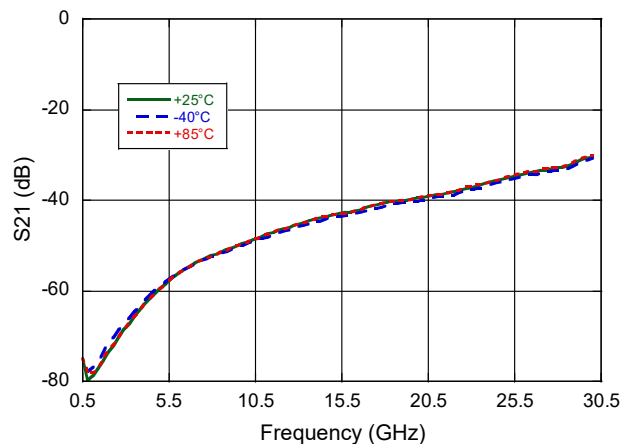


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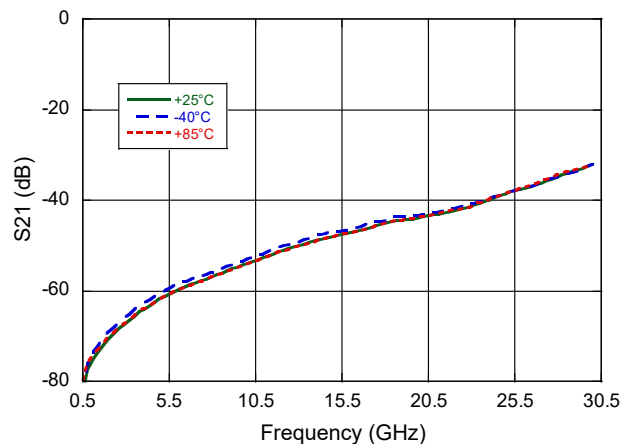
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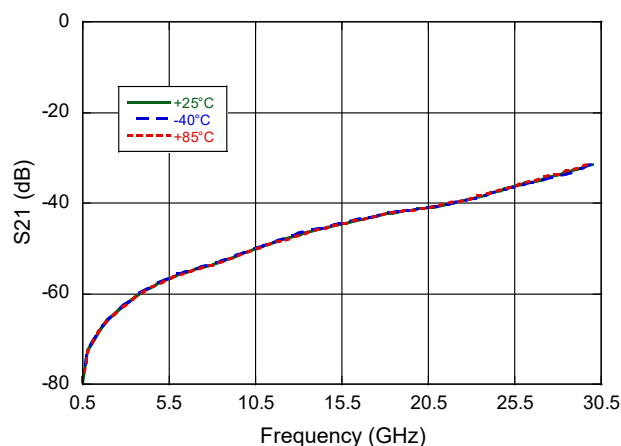
**J0 -J1 Isolation ( J0 -J2 in Insertion Loss )**



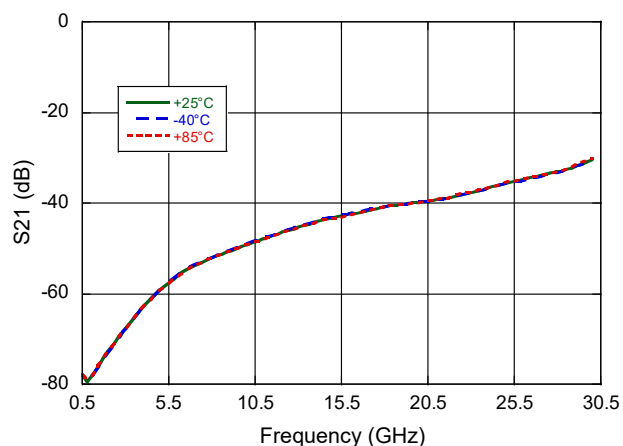
**J0 -J2 Isolation ( J0 -J3 in Insertion Loss )**



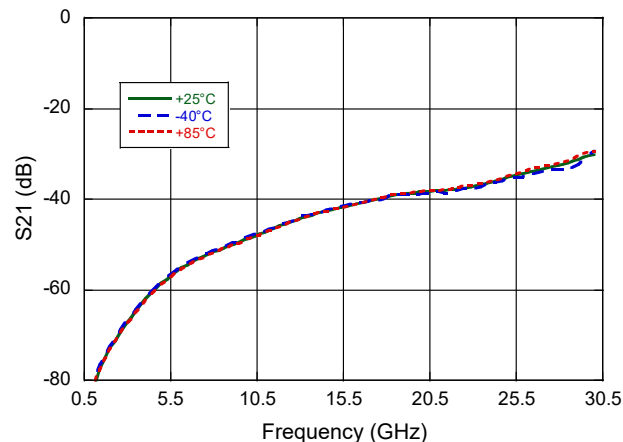
**J0 -J3 Isolation ( J0 -J4 in Insertion Loss )**



**J0 -J4 Isolation ( J0 -J3 in Insertion Loss )**



**J0 -J1 Isolation ( All Ports in Isolation )**



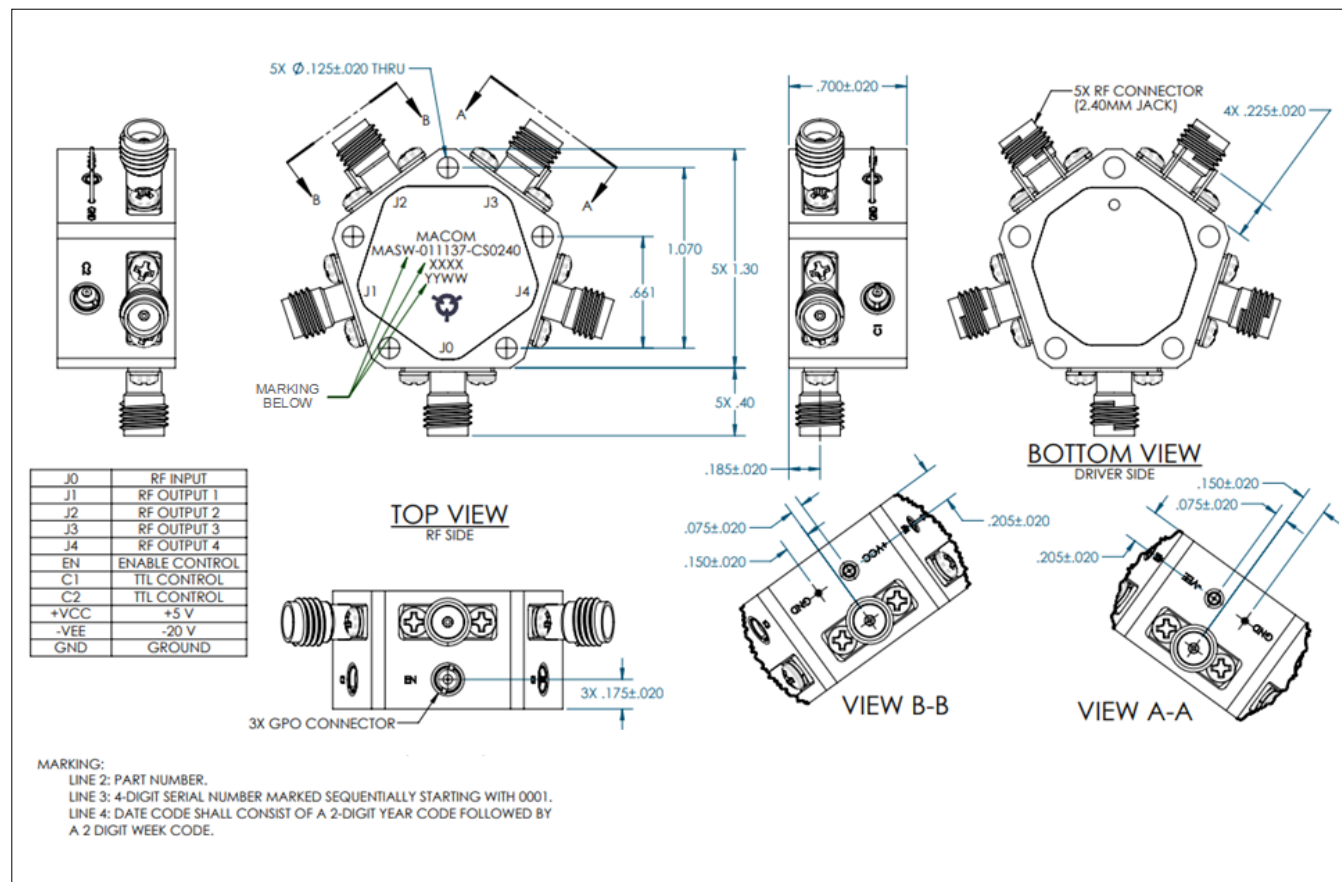
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## Outline Drawing (dimensions shown are in inches)



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