

GaAs SP3T Switch DC - 3.5 GHz

Rev. V1

Features

- Low Insertion Loss: 0.6 dB
- High P1dB: 36 dBm
- 0.5 micron GaAs pHEMT Process
- Fast Settling Speed for timing-sensitive applications
- 1.8 V Operation with 1.8 V on Voltage Pull Up
- Lead-Free 1.5 mm 8-Lead PDFN Package
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

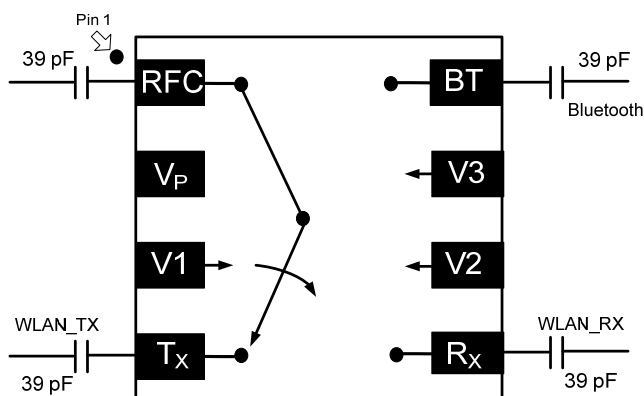
Description

The MASW-010612 is a GaAs pHEMT MMIC SP3T switch in a lead-free 1.5 mm 8-lead PDFN package. This device is ideal for low control voltage, low insertion loss, high isolation and small size applications.

A typical application is antenna, WLAN and Bluetooth systems that connect separate receive functions to a common antenna. This part is optimized at 2.4 GHz for switching between WLAN and Bluetooth to a single antenna.

The MASW-010612 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

Functional Schematic



Pin Configuration

Pin No.	Function	Description
1	RFC	RF In/Out
2	V _P ^{3,4}	Optional Voltage Pull Up
3	V1 ³	Control 1
4	T _x	RF In/Out
5	R _x	RF In/Out
6	V2 ³	Control 2
7	V3 ³	Control 3
8	BT	RF In/Out
Paddle ⁵	RF, DC and Thermal Ground	

3. Depending on system sensitivity optional DC line bypass capacitors (22 pF) may be used.
4. Improved linearity at low control voltage can be obtained by tying pin 2 to the most positive control voltage. Otherwise, leave pin 2 unconnected.
5. The exposed pad centered on the package bottom must be connected to RF, DC, and thermal ground.

Ordering Information^{1,2}

Part Number	Package
MASW-010612-TR1000	1000 piece reel
MASW-010612-TR3000	3000 piece reel
MASW-010612-001SMB	Sample Test Board

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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Electrical Specifications: Freq: 2.45 GHz, $T_A = 25^\circ\text{C}$, $V_C = 0\text{ V} / 3\text{ V}$, $Z_0 = 50\ \Omega$ ^{6,7}

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss ⁸	—	dB	—	0.6	0.85
Isolation	RFC - T_X , R_X , BT	dB	19	21	—
Return Loss	—	dB	—	20	—
IP3	Two Tone, +10 dBm/tone, 10 MHz Spacing	dBm	—	54	—
P1dB	T_X R_X BT	dBm	—	36 34 34	—
3rd Harmonic	+20 dBm	dBc	—	-78	—
Trise, Tfall	10% to 90% RF, 90% to 10% RF	ns	—	16 20	—
Ton, Toff	50% control to 90% RF, 50% control to 10% RF	ns	—	26 30	—
Control Current	$ V_C = 3\text{ V}$	μA	—	4	10

6. For positive control voltage, external DC blocking capacitors are required on all RF ports.

7. Specifications apply with no connection to pin 2 (V_P).

8. Insertion loss can be optimized by varying the DC blocking capacitor value, e.g. 100 pF for 100 - 500 MHz, 39 pF for 2.45 GHz.

Absolute Maximum Ratings ^{9,10}

Parameter	Absolute Maximum
Max Input Power (0.5-3.5 GHz, 3 V Control)	
RFC - T_X	35 dBm
RFC - R_X	31 dBm
RFC - BT	31 dBm
$ V_{HI}-V_{LO} $	8.5 volts
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

9. Exceeding any one or combination of these limits may cause permanent damage to this device.

10. M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.

Truth Table ^{11,12,13}

V1	V2	V3	RFC - T_X	RFC - R_X	RFC - BT
1	0	0	On	Off	Off
0	1	0	Off	On	Off
0	0	1	Off	Off	On

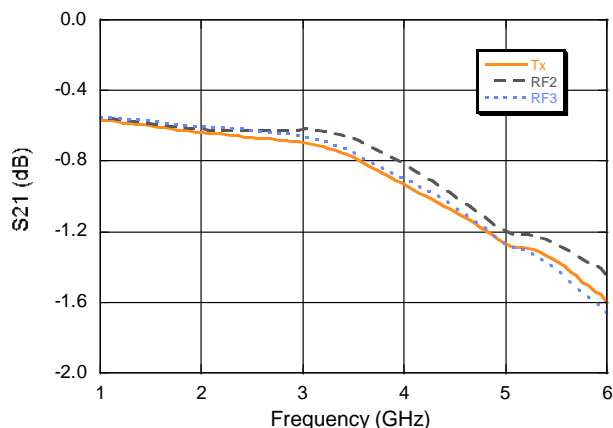
11. 0 = 0 V \pm 0.2 V, 1 = 1.8 V to +5 V, minimum $V_{HI}-V_{LO} = 1.8\text{ V}$, maximum $V_{HI}-V_{LO} = 8.5\text{ V}$.

12. For use at low voltage, M/A-COM recommends connecting pin 2 to a voltage equal to the most positive control voltage.

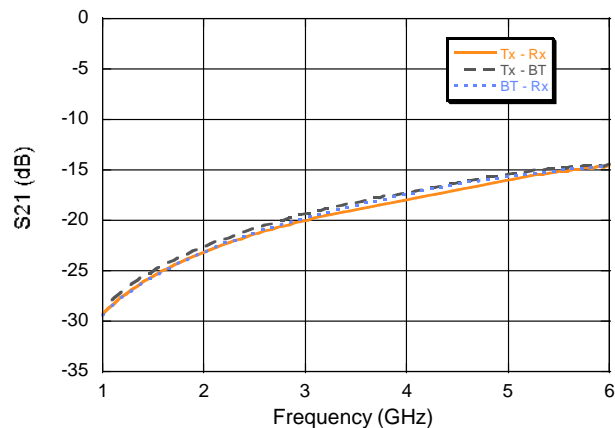
13. Negative control voltage may be used. The '1' in the table would be the most positive (0 V) and the '0' would be the most negative (-3 V for example).

Typical Performance Curves:

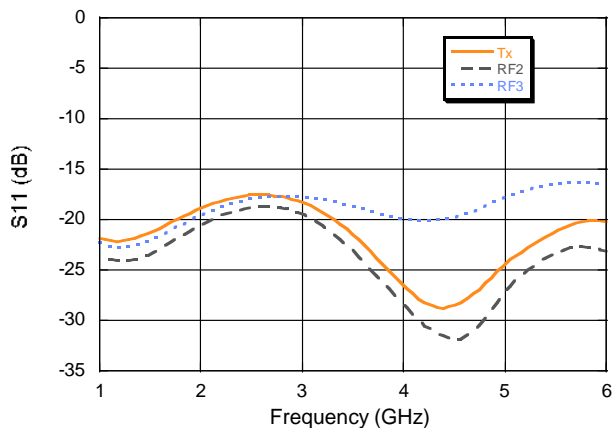
Insertion Loss



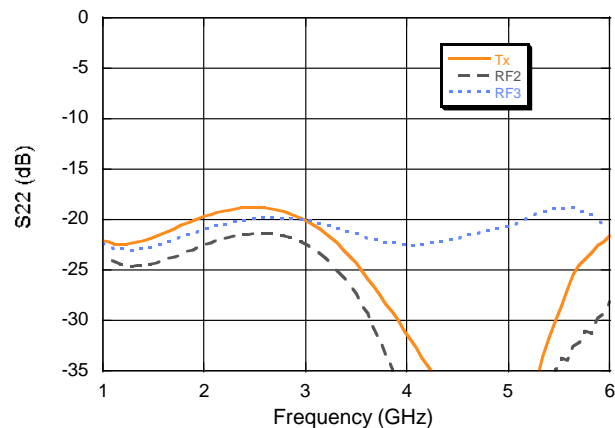
T_x Isolation



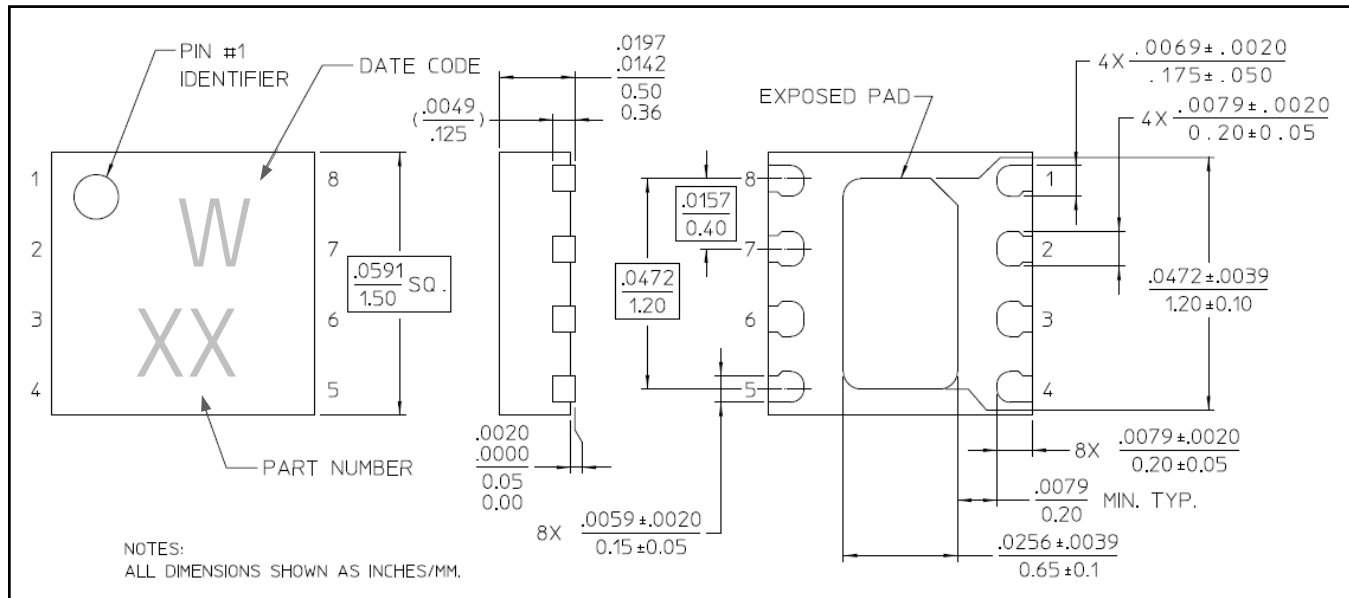
Input Return Loss



Output Return Loss



Lead Free 1.5 mm 8-Lead PDFN[†]



[†] Reference Application Note S2083 for lead-free solder reflow recommendations and PCB footprint information.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is NiPdAu over copper.

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.