MASW-007921

High Power GaAs SPDT Switch
DC - 7.0 GHz

Rev. V1

Features

- Ideal for high power SPDT switch applications including WiMAX, WLAN, Mesh Networks, and Fixed Wireless Access
- Broadband Performance: DC - 7.0 GHz
- Low Insertion Loss:
  0.65 dB @ 3.5 GHz, RFC to T_X
  0.70 dB @ 3.5 GHz, RCF to R_X
- High P0.1dB Compression:
  40 dBm @ 3V, 3.5 GHz, RFC to T_X
- Fast Settling for Low Gate Lag requirements
- Lead-Free 2 mm 8-Lead PDFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible
- Asymmetrical Design for optimized performance

Description

M/A-COM's MASW-007921 is a broadband GaAs pHEMT MMIC SPDT switch available in a lead-free 2 mm 8-lead PDFN package. The MASW-007921 is ideally suited for applications where very small size and high linearity are required.

Typical applications include WiMAX, WLAN, Mesh networks, fixed wireless access, and other higher power systems. This switch has a very high initial compression point, ideal for complex modulations such as OFDM, with large peak average power levels.

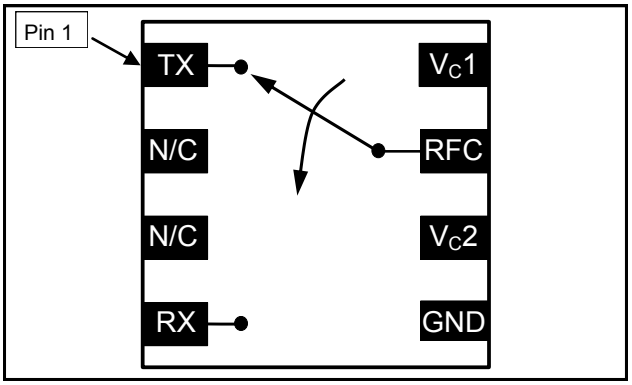
The MASW-007921 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

Ordering Information [1,2]

Part Number	Package
MASW-007921-TR3000	3000 piece reel
MASW-007921-001SMB	Sample Board 2.0 - 6.0 GHz Tuning
MASW-007921-002SMB	Sample Board 0.05 - 2.0 GHz Tuning

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

Functional Schematic



Pin Configuration [3]

Pin No.	Pin Name	Description
1	T_X	RF Output 1
2	N/C	No Connection
3	N/C	No Connection
4	R_X	RF Output 2
5	GND	RF and DC Ground
6	V_C2	Voltage Control 2
7	RFC	RF Common
8	V_C1	Voltage Control 1
9	Paddle[4]	RF and DC Ground

3. M/A-COM recommends connecting unused pins to ground.
4. The exposed pad centered on the package bottom must be connected to RF and DC ground.

Absolute Maximum Ratings [5,6,7]

Parameter	Absolute Maximum
Input Power @ 5 V Control (RFC to R_X Path)	+38 dBm
Input Power @ 5 V Control (RFC to T_X Path)	+40 dBm
Voltage	≤ 8.5 volts
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. M/A-COM does not recommend sustained operation near these survivability limits.
7. Maximum Input Power applies for 0.5 to 7.0 GHz range.

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

High Power GaAs SPDT Switch
DC - 7.0 GHz

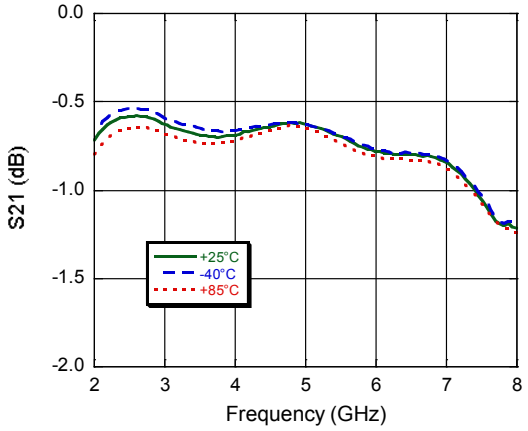
Electrical Specifications: T_A = 25°C, Z_0 = 50 Ω, V_C = 0 V / 3 V, 4.7 pF Capacitor [8,9]

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss RFC to R_X	0.05 - 2 GHz[10] 2.4 GHz 3.5 GHz 5.8 GHz	dB dB dB dB	— — — —	0.5 0.6 0.70 0.8	— 0.85 — —
Insertion Loss RFC to T_X	0.05 - 2 GHz[10] 2.4 GHz 3.5 GHz 5.8 GHz	dB dB dB dB	— — — —	0.5 0.65 0.65 1.2	— 0.85 — —
Isolation	0.05 - 2 GHz[10] 2.4 GHz 3.5 GHz 5.8 GHz	dB dB dB dB	— 21 — —	27 25 26 30	— — — —
Return Loss	DC - 6.0 GHz	dB	—	15	—
Input IP2 R_X	10 MHz Spacing, +20 dBm 2.4 GHz 3.5 GHz 5.8 GHz	 dBm dBm dBm	 — — —	 102 99 84	 — — —
Input IP2 T_X	10 MHz Spacing, +20 dBm 2.4 GHz 3.5 GHz 5.8 GHz	 dBm dBm dBm	 — — —	 104 101 88	 — — —
Input IP3 R_X	10 MHz Spacing, +20 dBm 2.4 GHz 3.5 GHz 5.8 GHz	 dBm dBm dBm	 — — —	 59 57 51	 — — —
Input IP3 T_X	10 MHz Spacing, +20 dBm 2.4 GHz 3.5 GHz 5.8 GHz	 dBm dBm dBm	 — — —	 62 58 52	 — — —
Input P0.1dB R_X	2.4 GHz 3.5 GHz 5.8 GHz	dBm dBm dBm	— — —	38 37 39	— — —
Input P0.1dB T_X	2.4 GHz 3.5 GHz 5.8 GHz	dBm dBm dBm	— — —	38 40 39	— — —
Trise, Tfall	10% to 90% RF 90% to10% RF	nS nS	— —	21 18	— —
Ton, Toff	50% control to 90% and 50% control to 10% RF	nS	—	40	—
Transients		mV	—	100	—
Control Current		µA	—	2.0	10.0

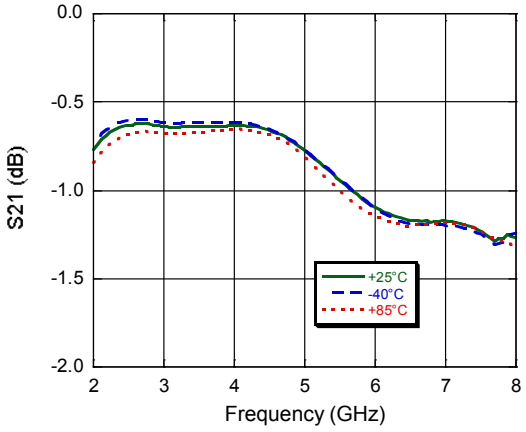
8. For positive voltage control, external DC blocking capacitors are required on all RF ports.
9. Performance can be optimized by varying the DC blocking capacitor value. See application schematic for details.
10. 0.05 - 2.0 GHz specifications apply with 1000 pF blocking capacitors. See applications section for typical data.

Typical Performance Curves Over Temp.: Z_0 = 50 Ω, 4.7 pF Blocking Caps on all RF Ports

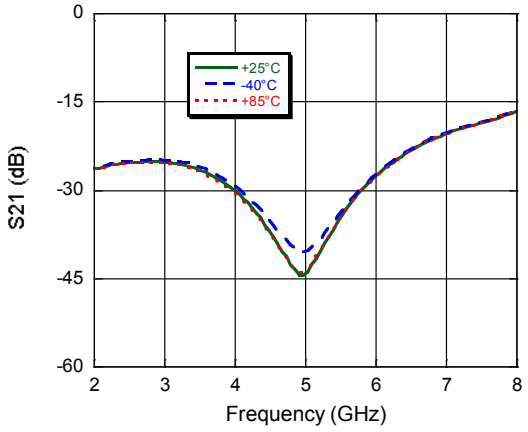
RFC to Rx Insertion Loss



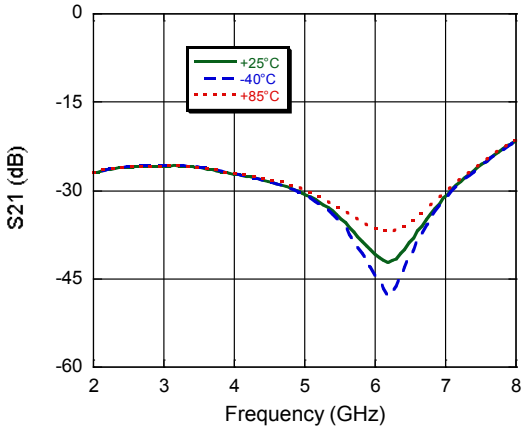
RFC to Tx Insertion Loss



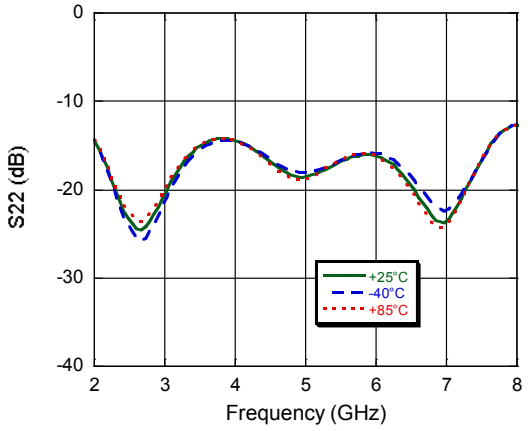
RFC to Rx Isolation



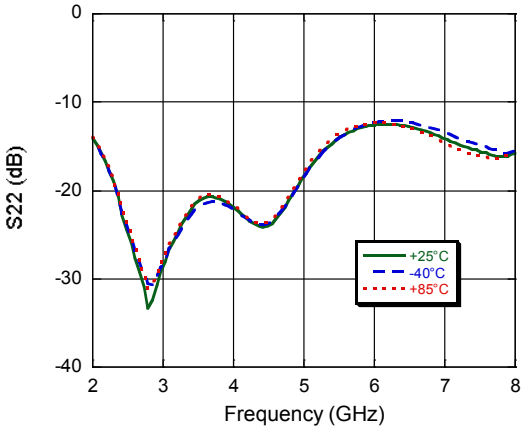
RFC to Tx Isolation



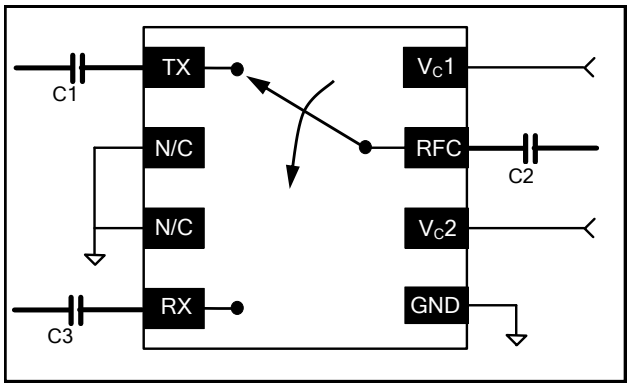
Rx Return Loss



Tx Return Loss



Application Schematic [11]



Frequency	Recommended Value C1 - C3
0.05 - 2.0 GHz	1000 pF
2.4 - 2.5 GHz	8 pF
2.0 - 6.0 GHz	4.7 pF
4.9 - 7.0 GHz	1.5 pF

11. M/A-COM recommends connecting unused package pins (N/C) to ground as shown.

Truth Table [12,13]

Control V_C1	Control V_C2	RFC - TX	RFC - RX
1	0	On	Off
0	1	Off	On

12. Differential voltage, V (state 1) - V (state 0), must be +2.7 V minimum and must not exceed 8.0 V.
13. Positive Control: 1 = +2.9 V to +8 V, 0 = 0 V ± 0.2 V. Negative Control: 1 = 0 V ± 0.2 V, 0 = -2.9V to –8.0 V.

Qualification

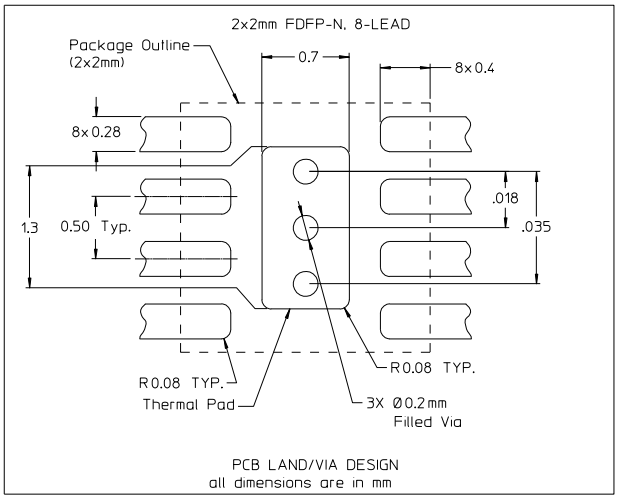
Qualified to M/A-COM specification REL-201, Process Flow –1.

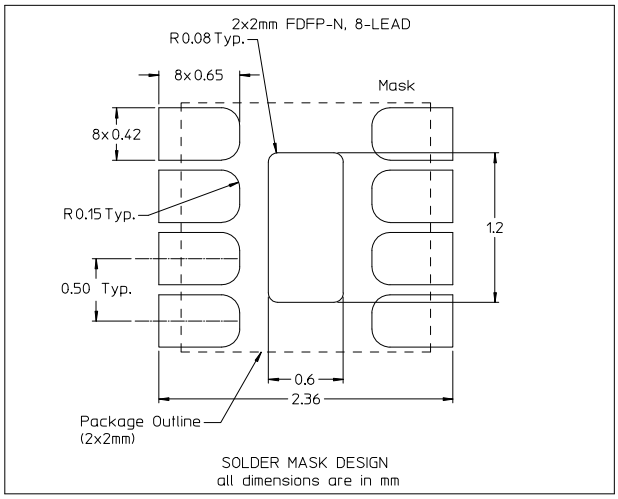
Handling Procedures

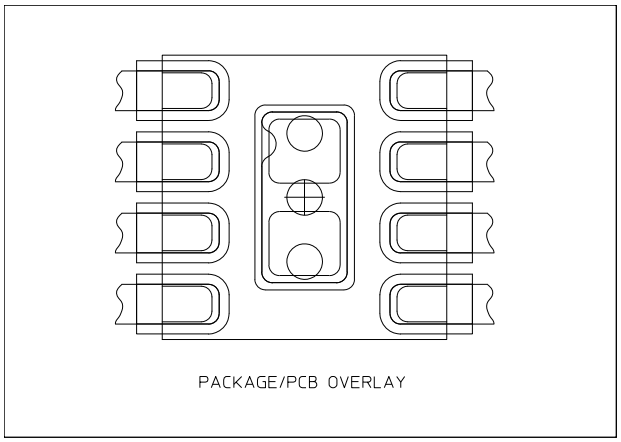
Please observe the following precautions to avoid damage:

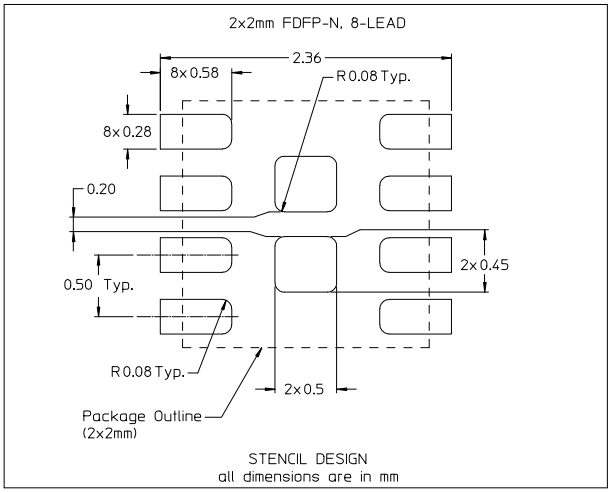
Static Sensitivity

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.

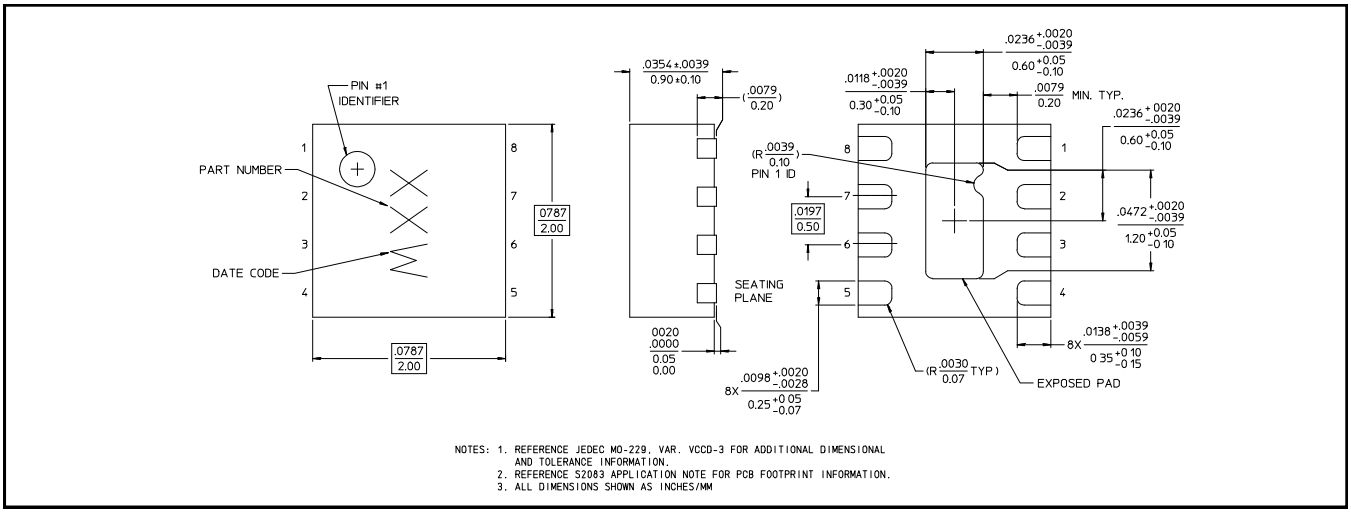








Lead Free 2 mm 8-lead PDFN †

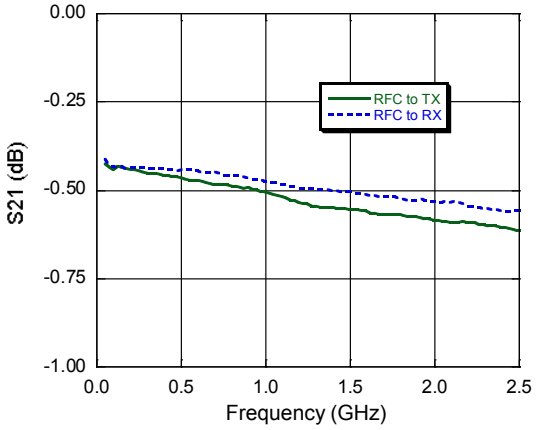


† Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.

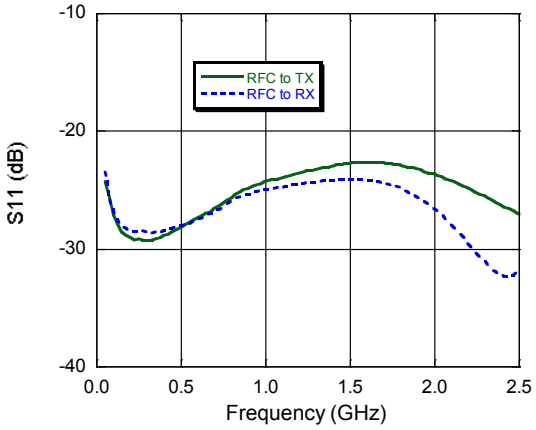
Applications Section

Typical Low Frequency Performance Curves: T_A = 25°C, Z_0 = 50 Ω, 1000 pF Blocking Caps on all RF Ports

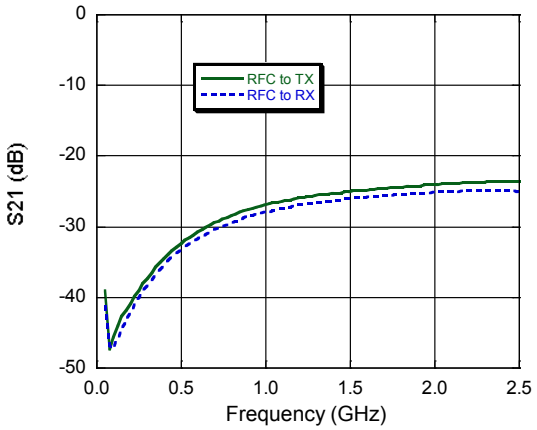
Insertion Loss



RFC Return Loss



Isolation



Tx and Rx Return Loss