

## High Power GaAs SPDT Switch DC - 7.0 GHz

#### 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<sub>X</sub> 0.70 dB @ 3.5 GHz, RCF to R<sub>X</sub>
- High P0.1dB Compression: 40 dBm @ 3V, 3.5 GHz, RFC to T<sub>x</sub>
  - 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
- Halogen-Free Green Mold Compound
  Del Ot Composition and 200% Deflaw Comp
- 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 <sup>1,2</sup>

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		

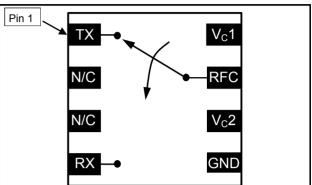
1. Reference Application Note M513 for reel size information.

2. All sample boards include 5 loose parts.

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

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#### Functional Schematic



### Pin Configuration<sup>3</sup>

Pin No.	Pin Name	Description		
1	T <sub>x</sub>	RF Output 1		
2	N/C	No Connection		
3	N/C	No Connection		
4	R <sub>x</sub>	RF Output 2		
5	GND	RF and DC Ground		
6	V <sub>C</sub> 2	Voltage Control 2		
7	RFC	RF Common		
8	V <sub>C</sub> 1	Voltage Control 1		
9	Paddle <sup>4</sup>	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

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Parameter	Absolute Maximum		
Input Power @ 5 V Control (RFC to R <sub>X</sub> Path)	+38 dBm		
Input Power @ 5 V Control (RFC to T <sub>X</sub> Path)	+40 dBm		
Voltage	≤ 8.5 volts		
Operating Temperature	-40°C to +85 <sup>°</sup> C		
Storage Temperature	-65 °C to +150 °C		

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

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.

Rev. V1



### High Power GaAs SPDT Switch DC - 7.0 GHz

Rev. V1

## Electrical Specifications: $T_A = 25^{\circ}C$ , $Z_0 = 50 \Omega$ , $V_C = 0 V / 3 V$ , 4.7 pF Capacitor <sup>8,9</sup>

Parameter	Test Conditions	Units	Min.	Тур.	Max.
Insertion Loss RFC to R <sub>x</sub>	0.05 - 2 GHz <sup>10</sup> 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 <sub>x</sub>	0.05 - 2 GHz <sup>10</sup> 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 <sup>10</sup> 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 <sub>X</sub>	10 MHz Spacing, +20 dBm 2.4 GHz 3.5 GHz 5.8 GHz	dBm dBm dBm		102 99 84	
Input IP2 T <sub>x</sub>	10 MHz Spacing, +20 dBm 2.4 GHz 3.5 GHz 5.8 GHz	dBm dBm dBm		104 101 88	
Input IP3 R <sub>x</sub>	10 MHz Spacing, +20 dBm 2.4 GHz 3.5 GHz 5.8 GHz	dBm dBm dBm		59 57 51	
Input IP3 T <sub>x</sub>	10 MHz Spacing, +20 dBm 2.4 GHz 3.5 GHz 5.8 GHz	dBm dBm dBm		62 58 52	
Input P0.1dB R <sub>x</sub>	2.4 GHz 3.5 GHz 5.8 GHz	dBm dBm dBm		38 37 39	
Input P0.1dB T <sub>x</sub>	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.

<sup>2</sup> 

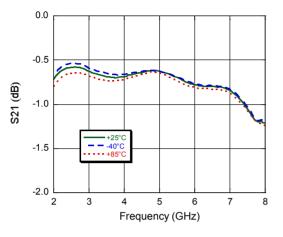


Rev. V1

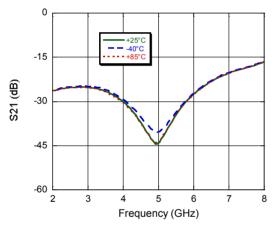
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## Typical Performance Curves Over Temp.: $Z_0 = 50 \Omega$ , 4.7 pF Blocking Caps on all RF Ports

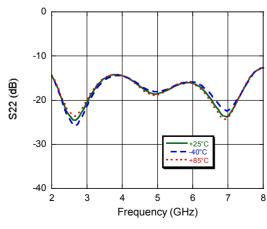
#### RFC to Rx Insertion Loss



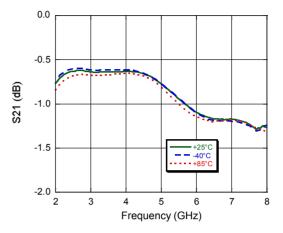
RFC to Rx Isolation



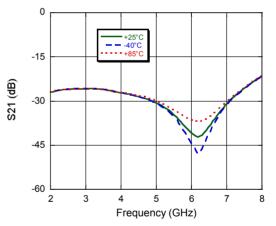


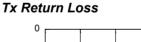


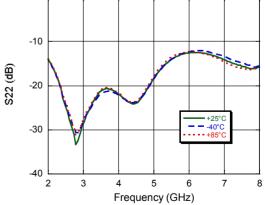
### RFC to Tx Insertion Loss



RFC to Tx Isolation





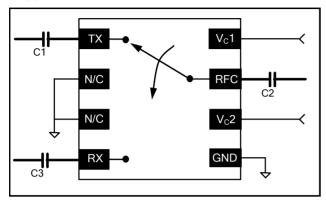


3



High Power GaAs SPDT Switch DC - 7.0 GHz

### Application Schematic <sup>11</sup>



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		

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

## Truth Table <sup>12,13</sup>

Control V <sub>c</sub> 1	Control V <sub>c</sub> 2	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:  $1 = +2.9 \vee \text{to} +8 \vee, 0 = 0 \vee \pm 0.2 \vee.$ Negative Control:  $1 = 0 \vee \pm 0.2 \vee, 0 = -2.9 \vee \text{to} -8.0 \vee.$ 

#### 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.

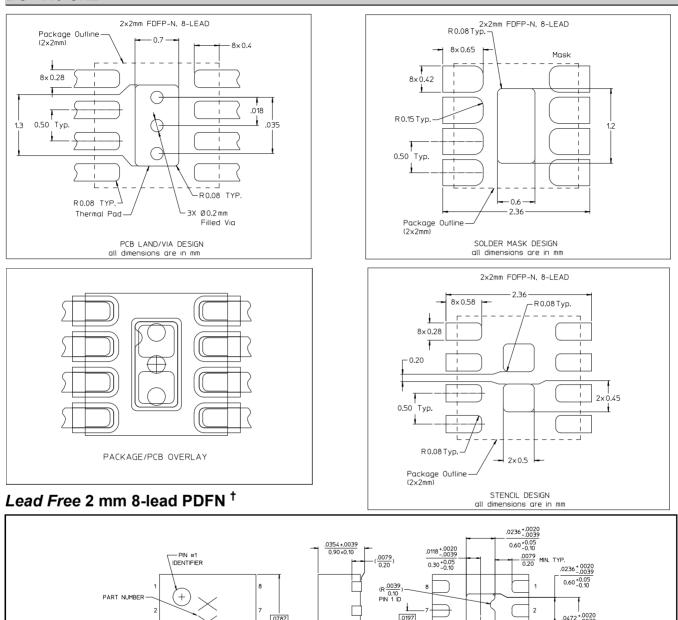
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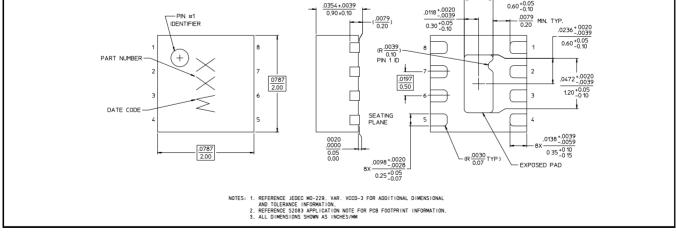
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## High Power GaAs SPDT Switch DC - 7.0 GHz

Rev. V1





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

5

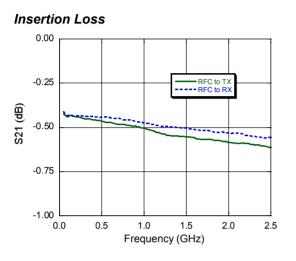


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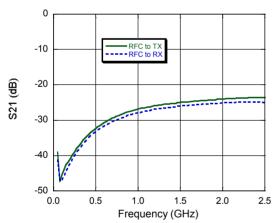
Rev. V1

### **Applications Section**

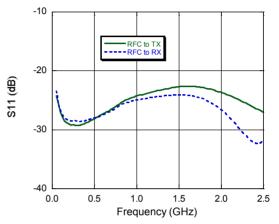
## Typical Low Frequency Performance Curves: $T_A = 25^{\circ}C$ , $Z_0 = 50 \Omega$ , 1000 pF Blocking Caps on all RF Ports



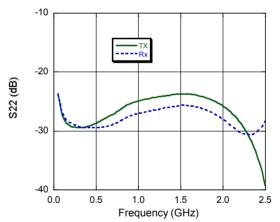
#### Isolation



#### **RFC Return Loss**



#### Tx and Rx Return Loss



6

High Power GaAs SPDT Switch DC - 7.0 GHz



Rev. V1

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<sup>7</sup> 

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