# GaAs SPDT Switch, Absorptive, Single Supply, DC-4.0 GHz



Rev. V4

## Features

- Operates DC 4 GHz on Single Supply
- ASIC TTL / CMOS Driver
- Low DC Power Consumption
- 50 Ohm Nominal Impedance
- Test Boards are Available
- Tape and Reel are Available
- Lead-Free 4 x 6 mm PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of SW90-0002

## Description

M/A-COM's MASW-007071-000100 is a SPDT absorptive pHEMT switch with integral TTL driver. This device is in an PQFN plastic surface mount package. This switch offers excellent broadband performance and repeatability from DC to 4 GHz, while maintaining low DC power dissipation. The MASW-007071-000100 is ideally suited for wireless infrastructure applications.

# **Ordering Information**

Part Number	Package
MASW-007071-000100	Bulk Packaging
MASW-007071-0001TR	1000 piece reel
MASW-007071-0001TB	Sample Test Board

Note: Reference Application Note M513 for reel size information.

# Pin Configuration<sup>1,2,3,4</sup>

Pin No.	Function	Pin No.	Function
1	NC	17	NC
2	GND	18 C1	
3	RFC	19 NC	
4	GND	20	V <sub>CC</sub>
5	NC	21 NC	
6	NC	22	NC
7	GND	23 CP1	
8	RF1	24 CP2	
9	GND	25	NC
10	NC	26	V <sub>EE</sub>
11	NC	27	NC
12	V <sub>EE</sub>	28	NC
13	NC	29	NC
14	V <sub>cc</sub>	30	GND
15	NC	31	RF2
16	NC	32	GND

1. NC = No Connection

 VEE is internally generated and must remain isolated from external power supplies. Generated noise is typical of switching DC-DC Converters.

- Connections and external components shown in functional schematic are required. 0.1 μF Capacitors need to be located near pins 20 & 26.
- 4. The exposed pad centered on the package bottom must be connected to RF and DC ground. (For PQFN Packages)

## Truth Table (Switch)

Control Input	Condition of the Switch		
	RF Common to each RF Port		
C1	RF1	RF2	
0	Off	On	
1	On	Off	

"0" = TTL Low "1" = TTL High

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

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# Electrical Specifications: $T_A = 25^{\circ}C$ , $Z_0 = 50\Omega$

Parameter	Test Conditions	Frequency	Units	Min	Тур	Max
Insertion Loss	RFC—RF1,RF2 (Logic per truth table)	DC - 4.0 GHz	dB	_	-	1.8
Isolation	RF1—RF2 (All Logic "0")	DC - 4.0 GHz	dB	30	_	_
VSWR	On (RFC,RF1, RF2) (Logic per truth table)	DC - 4.0 GHz	Ratio	_	—	2.0:1
VSWR	Off (RF1, RF2) (Logic per truth table)	DC - 4.0 GHz	Ratio	_	_	1.8:1
1 dB Compression		50 MHz 0.5 - 4.0 GHz	dBm dBm	_	18 29	_
Input IP <sub>3</sub>	Two-tone inputs up to +5 dBm	50 MHz 0.5 - 4.0 GHz	dBm dBm	_	36 46	_
Switching Speed	Ton (50% Control to 10% RF)	—	ns	_	31	_
-	Toff (50% Control to 90% RF)	_	ns	—	19	_
	Trise (10% to 90% RF)	_	ns	—	6	_
	Tfall (90% to 10% RF)	—	ns	—	2	_
Vcc	—	—	V	4.5	5.0	5.5
V <sub>IL</sub> V <sub>IH</sub>	LOW-level input voltage HIGH-level input voltage		V V	0.0 2.0		0.8 5.0
lin (Input Leakage Current)	Vin = $V_{CC}$ or GND		uA	-1.0	_	1.0
	Vcc min to max, Logic "0" or "1"		mA	_	5	8
Turn-on Current <sup>6</sup>	For guaranteed start-up		mA	_	_	125
∆lcc (Additional Supply Current Per TTL Input Pin)	$V_{CC}$ = Max, Vcntrl = $V_{CC}$ - 2.1 V	_	mA	_	_	1.0
Switching Noise	Generated from DC-DC Converter with recommended capacitors	3.5 MHz	dBm	_	-93	_
Thermal Resistance θjc	_	—	°C/W	—	15	—

5. During turn-on, the device requires an initial start up current (Icc) specified as "Turn-on Current". Once operational, Icc will drop to the specified levels.

6. The DC-DC converter is guaranteed to start in 100 μs as long as the power supplies have the maximum turn-on current available for start-up.

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## Absolute Maximum Ratings<sup>7,8</sup>

Parameter	Absolute Maximum
Max. Input Power 0.05 GHz 0.5 - 4.0 GHz <sup>9</sup>	+27 dBm +34 dBm
V <sub>CC</sub>	$-0.5 V \le V_{CC} \le +6.0 V$
Vin <sup>10</sup>	$-0.5 \text{V} \leq \text{Vin} \leq \text{V}_{\text{CC}} + 0.5 \text{V}$
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +125°C

7. 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.
- 9. When the RF input is applied to the terminated port, the absolute maximum power is +30 dBm.
- 10.Standard CMOS TTL interface, latch-up will occur if logic signal is applied prior to power supply.

#### RF2 0.46 0.398 018 .016 0.711 30X Ø 0.343 PIN 1 $\overline{}$ PIN 1 MARKER 2.819 RFC ///\_\_\_\_ 2.779 .111 []]] []]? 109 111 man 77 0.279 30X 6X 45° CHAMFER RF1 ON PAD 4.763 188 6 604 .260 RECOMMENDED PC BOARD LAYOUT CIRCUIT MATERIAL: TETRA II .010 INCH THICK RELIEVEN AND A CONTAINT 44 RELINES ARE COPLANER- USE GND SPACING OF 016 GROUND VIAS 014 RE PORTS ARE 50 OHMS 01 µF ±10% CAPACITOR REQUIRED BETWEEN PINS 23 AND 24 0.1 $\mu F$ ±10% BYPASS CAPACITOR REQUIRED ON Vcc TRACE NEAR PIN 20 0.1 $\mu F$ ±10% BYPASS CAPACITOR REQUIRED ON Vee TRACE NEAR PIN 26

# **Recommended PCB Configuration**<sup>11</sup>

# 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.

## **Moisture Sensitivity**

The MSL rating for this part is defined as Level 2 per IPC/JEDEC J-STD-020. Parts shall be stored and/or baked as required for MSL Level 2 parts.

#### 11. Application Note S2083 is available on line at www.macom.com

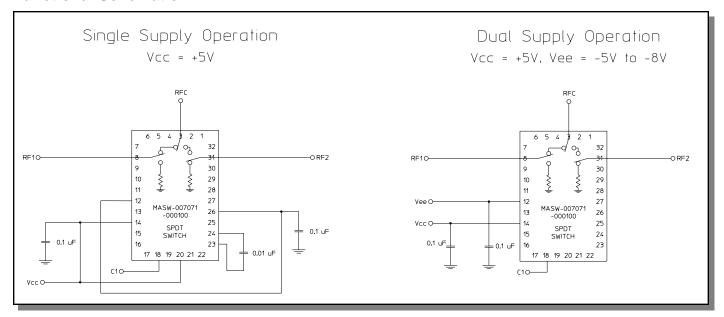
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# MASW-007071-000100

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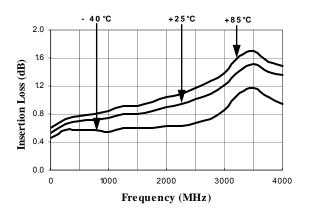
# Functional Schematic<sup>12</sup>



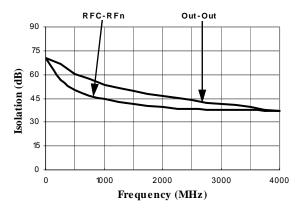
12. Dual Supply Operation will eliminate the start-up current mentioned in Note 5. It will also eliminate spurious signals caused by the DC-DC converter that are present in single supply operation.

# **Typical Performance Curves**

### Insertion Loss vs. Frequency



#### Isolation (dB) vs. Frequency



4





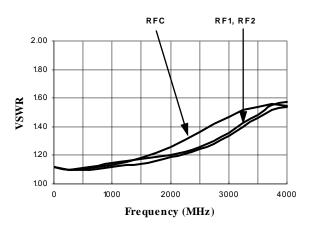
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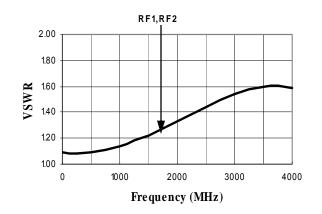
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# **Typical Performance Curves**

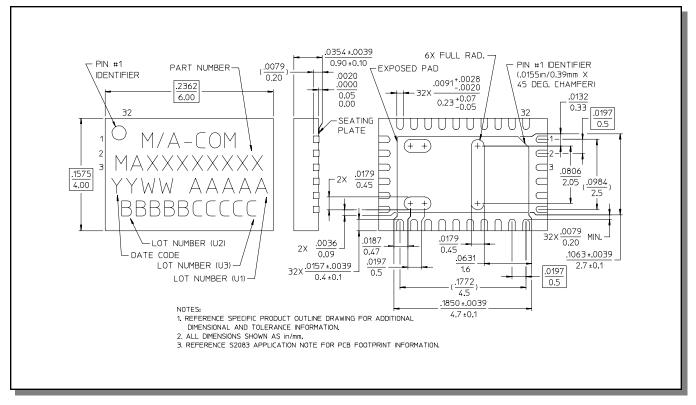
#### On VSWR vs. Frequency



## VSWR (Terminations) vs. Frequency



## CSP-1, Lead-Free 4 x 6 mm, 32-lead PQFN<sup>†</sup>



#### Reference Application Note M538 for lead-free solder reflow recommendations.

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