GaAs SP4T 2.5V High Power Switch DC - 3 GHz

Jan 16 2002

Preliminary

MASWSS0020

Features

- Low Voltage Operation 2.5V
- Low Harmonics > 65 dBc at +34 dBm & 1 GHz
- Low Insertion Loss 0.6 dB at 1 GHz
- High Isolation 23 dB at 2 GHz
- Miniature FQFP 16-lead 4x4mm Package
- 0.5 micron GaAs pHEMT Process

Description

M/A-COM's MASWSS0020 is a GaAs PHEMT MMIC single pole four throw (SP4T) high power switch in a low cost miniature FQFP 16-lead 4x4mm package. The MASWSS0020 is ideally suited for applications where high power, low control voltage, low insertion loss, high isolation, small size and low cost are required. Typical applications are for GSM and DCS handset systems that connect separate transmit and receive functions to a common antenna, as well as other handset and related applications. This part can be used in all systems operating up to 3 GHz requiring high power at low control voltage.

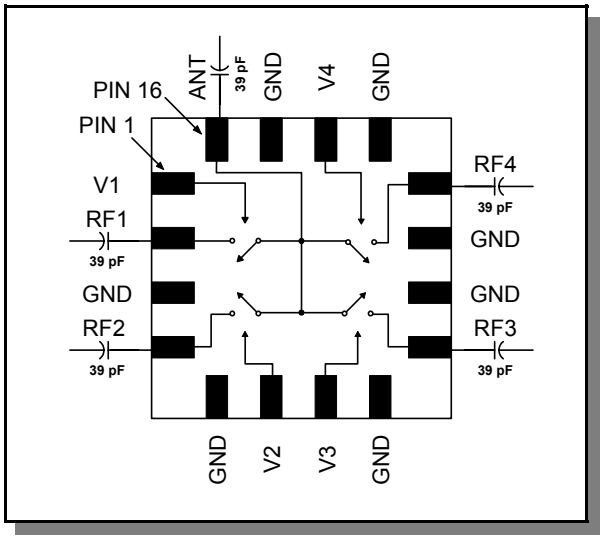
The MASWSS0020 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

Absolute Maximum Ratings [1]

Parameter	Absolute Maximum
Max Input Power (0.5 - 3 GHz, 2.5V Control)	+38 dBm
Operating Voltage	+8.5 volts
Operating Temperature	-40 °C to +85 °C
Storage Temperature	-65 °C to +150 °C

1. Exceeding any one or combination of these limits may cause permanent damage.

Functional Schematic



Pin Configuration

PIN No.	PIN Name	Description
1	V1	Control 1
2	RF1	RF Port 1
3	GND	RF Ground
4	RF2	RF Port 2
5	GND	RF Ground
6	V2	Control 2
7	V3	Control 3
8	GND	RF Ground
9	RF3	RF Port 3
10	GND	RF Ground
11	GND	RF Ground
12	RF4	RF Port 4
13	GND	RF Ground
14	V4	Control 4
15	GND	RF Ground
16	ANT	Antenna Port
17	GND (paddle)	RF Ground

Electrical Specifications: T_A = 25°C, Z_0 = 50Ω [2]

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	DC – 1 GHz 1 – 2 GHz 2 - 3 GHz	dB dB dB		0.6 0.8 1.0	0.8 1.0
Isolation	DC – 1 GHz 1 – 2 GHz 2 - 3 GHz	dB dB dB	25 21	29 23 18.5	
Return Loss	DC – 3 GHz	dB		20	
IP3	Two Tone +10dBm, 5 MHz Spacing, > 50 MHz Vc = 0V/2.5V	dBm		57	
P1dB	Vc = 0V/2.5V	dBm		38	
2nd Harmonic	1 GHz, P_{IN} = +34 dBm, Vc = 0V/2.5V	dBc	65		
3rd Harmonic	1 GHz, P_{IN} = +34 dBm, Vc = 0V/2.5V	dBc	65		
Trise, Tfall	50% control to 90% RF, and 50% control to 10% RF	uS			1
Ton, Toff	50 - 350 MHz	uS			1
Transients		mV		10	
Gate Leakage	|Vc| = 2.5V	uA			100

2. Insertion Loss can be optimized by varying the DC Blocking Capacitor value, ie. 1000 pF for 100 MHz - 500 MHz, 39 pF for 0.5 GHz - 3 GHz.

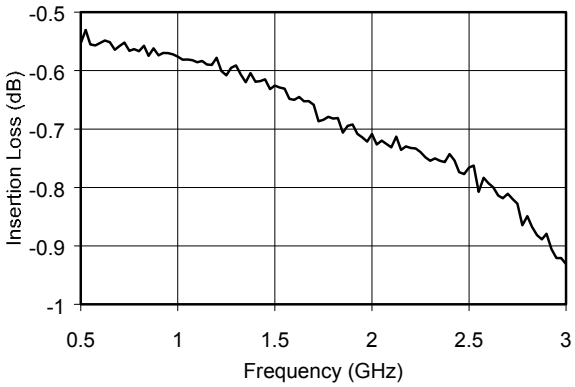
Truth Table [3]

V1	V2	V3	V4	ANT– RF1	ANT - RF2	ANT - RF3	ANT - RF4
+2.5 to +5V	0 ± 0.2V	0 ± 0.2V	0 ± 0.2V	On	Off	Off	Off
0 ± 0.2V	+2.5 to +5V	0 ± 0.2V	0 ± 0.2V	Off	On	Off	Off
0 ± 0.2V	0 ± 0.2V	+2.5 to +5V	0 ± 0.2V	Off	Off	On	Off
0 ± 0.2V	0 ± 0.2V	0 ± 0.2V	+2.5 to +5V	Off	Off	Off	On

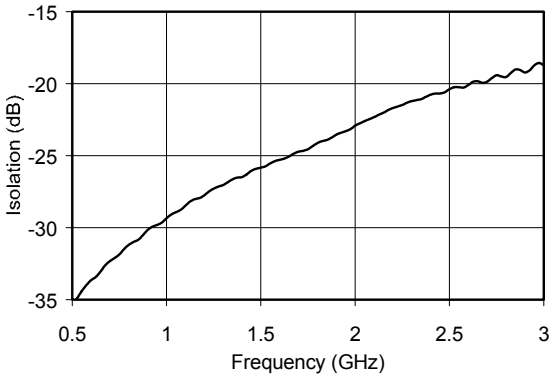
3. External DC blocking capacitors are required on all RF ports

Typical Performance Curves

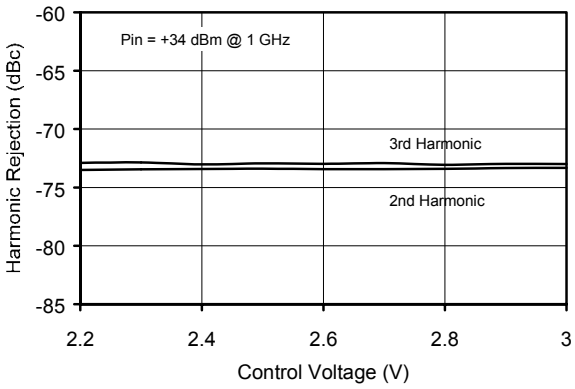
Insertion Loss vs. Frequency, 25 °C, 39 pF



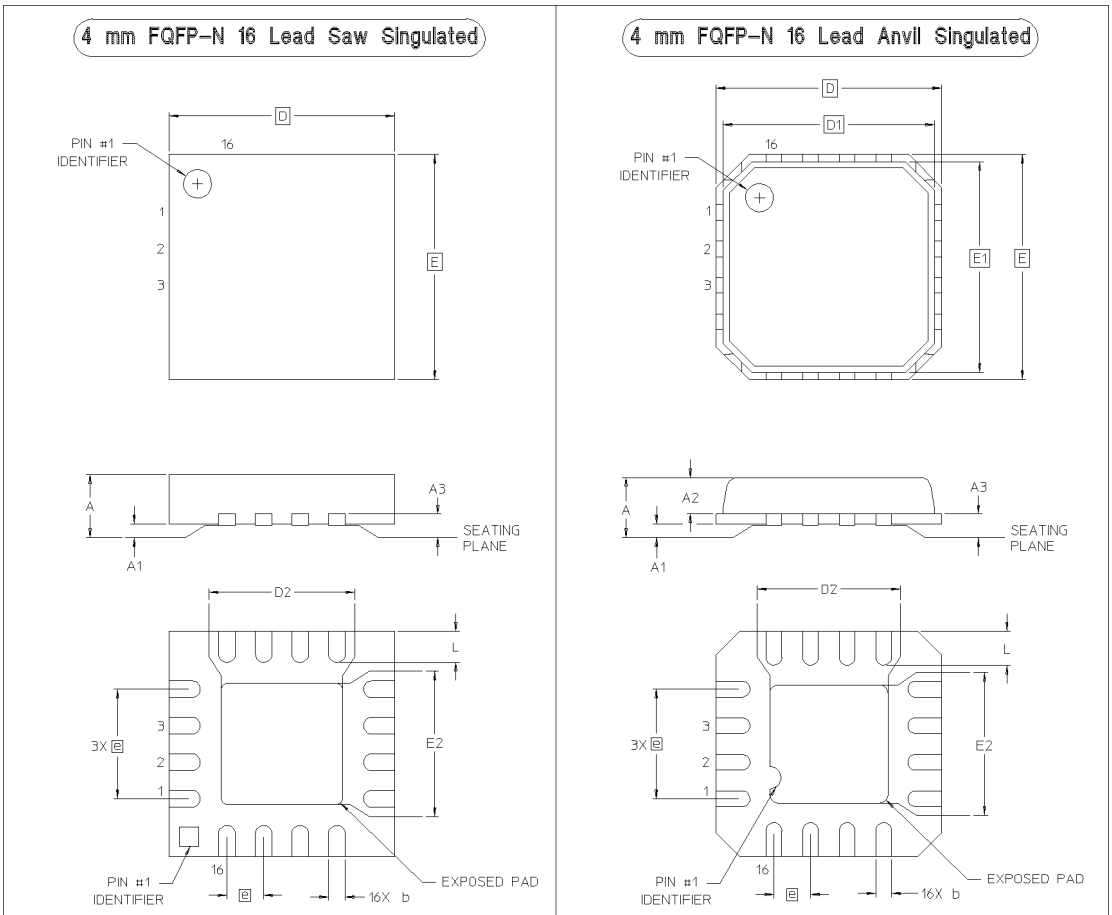
Isolation vs. Frequency, 25 °C, 39 pF



Harmonic Rejection vs. Control Voltage, 25 °C, 39 pF



FQFP 16-lead 4x4 mm



DIMENSION SYMBOL	MEASUREMENT (mm)		
	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0	0.02	0.05
A3		0.25 REF	
b	0.23	0.30	0.38
D		4.00 BSC	
D2	0.75	1.70	2.25
e		0.65 BSC	
E		4.00 BSC	
E2	0.75	1.70	2.25
L	0.35	0.55	0.75

DIMENSION SYMBOL	MEASUREMENT (mm)		
	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0	0.02	0.05
A2	0	0.65	1.00
A3		0.25 REF	
b	0.23	0.30	0.38
D		4.00 BSC	
D1		3.75 BSC	
D2	0.75	1.70	2.25
e		0.65 BSC	
E		4.00 BSC	
E1		3.75 BSC	
E2	0.75	1.70	2.25
L	0.35	0.55	0.75

NOTES: 1. REFERENCE JEDEC MO-220, VAR. VGGC (ISSUE C) FOR ADDITIONAL DIMENSIONAL AND TOLERANCE INFORMATION.
2. REFERENCE S2083 APPLICATION NOTE FOR PCB FOOTPRINT INFORMATION.

Handling Procedures

The following precautions should be observed to avoid damage:

Static Sensitivity

Gallium Arsenide Integrated Circuits are ESD sensitive and can be damaged by static electricity. Proper ESD techniques should be used when handling these devices.

Ordering Information

Part Number	Package
MASWSS0020	FQFP-N 16-lead Plastic Package
MASWSS0020TR	1000 piece reel
MASWSS0020SMB	Sample Test Board