## GaAs DPDT Diversity Switch

## Features

- Low Insertion Loss: 0.8 dB at 5.2 GHz
- Ideal for WLAN IEEE 802.11a
- 0.5 micron GaAs PHEMT Process
- Integrated DC Blocking Capacitors
- Lead-Free 3 mm 12-Lead PQFN Package
- 100\% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- $260^{\circ} \mathrm{C}$ Reflow Compatible
- RoHS* Compliant Version of MASWSS0039


## Description

M/A-COM's MASWSS0175 is a GaAs PHEMT MMIC DPDT diversity switch in a lead-free 3 mm 12 lead PQFN package. It is designed for low insertion loss and allows for independent control and selection of each switch path. It integrates blocking capacitors on all RF ports and thus eliminates the need for additional off-chip DC blocking capacitors.

The MASWSS0175 is ideally suited for applications where very small size and low cost are required. Typical applications are for WLAN IEEE 802.11a systems that employ two antennas for transmit and receive diversity. This part can be used in all systems operating between 4.5 GHz and 6.0 GHz requiring moderate power and diversity switching.

The MASWSSO175 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

## Ordering Information

| Part Number | Package |
| :---: | :---: |
| MASWSS0175 | Bulk Packaging |
| MASWSS0175TR-3000 | 3000 Piece Reel |
| MASWSS0175SMB | Sample Test Board |

[^0]
## Functional Schematic



## Pin Configuration ${ }^{1}$

| Pin No. | Pin Name | Description |
| :---: | :---: | :---: |
| 1 | Ctrl 1 | Control 1 |
| 2 | Port 3 | RF Port 3 |
| 3 | Ctrl 4 | Control 4 |
| 4 | N/C | No Connection |
| 5 | Port 2 | RF Port 2 |
| 6 | N/C | No Connection |
| 7 | Ctrl 3 | Control 3 |
| 8 | Port 4 | RF Port 4 |
| 9 | Ctrl 2 | Control 2 |
| 10 | N/C | No Connection |
| 11 | N/C | RF Port 1 |
| 12 | Paddle ${ }^{1}$ | No Connection |
| 13 |  | RF and DC Ground |

1. The exposed pad centered on the package bottom must be connected to RF and DC ground.
[^1]Electrical Specifications: $\mathrm{T}_{\mathrm{A}}=\mathbf{2 5}{ }^{\circ} \mathrm{C}, \mathrm{Z}_{0}=\mathbf{5 0} \Omega, \mathrm{V}_{\mathrm{C}}=0 \mathrm{~V} / 3 \mathrm{~V}$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Insertion Loss | $\begin{aligned} & \text { 4.9 GHz } \\ & \text { 5.2 GHz } \\ & \text { 5.8 GHz } \end{aligned}$ | dB <br> dB <br> dB | — | $\begin{aligned} & 0.9 \\ & 0.8 \\ & 0.8 \end{aligned}$ | $\begin{aligned} & 1.3 \\ & 1.2 \\ & 1.2 \end{aligned}$ |
| Isolation | $\begin{aligned} & \text { 4.9 GHz } \\ & \text { 5.2 GHz } \\ & \text { 5.8 GHz } \end{aligned}$ | dB <br> dB <br> dB | $\begin{aligned} & 15 \\ & 20 \\ & 20 \end{aligned}$ | $\begin{aligned} & 20 \\ & 25 \\ & 29 \end{aligned}$ | - |
| Return Loss | $4.5-6.0 \mathrm{GHz}$ | dB | 15 | 25 | - |
| P1dB | $\begin{aligned} & 5.2 \mathrm{GHz}, \mathrm{~V}_{\mathrm{C}}=2.7 \mathrm{~V} \\ & 5.2 \mathrm{GHz}, \mathrm{~V}_{\mathrm{C}}=3.0 \mathrm{~V} \\ & 5.2 \mathrm{GHz}, \mathrm{~V}_{\mathrm{C}}=5.0 \mathrm{~V} \end{aligned}$ | dBm dBm dBm | - | $\begin{aligned} & 31 \\ & 33 \\ & 39 \end{aligned}$ | - |
| IP2 | $\begin{gathered} \text { Two Tone, }+15 \mathrm{dBm} / \text { tone, } 5 \mathrm{MHz} \text { Spacing } \\ 5.2 \mathrm{GHz} \end{gathered}$ | dBm | - | 98 | - |
| IP3 | $\begin{gathered} \text { Two Tone, }+15 \mathrm{dBm} / \text { tone, } 5 \mathrm{MHz} \text { Spacing } \\ 5.2 \mathrm{GHz}, \mathrm{~V}_{\mathrm{C}}=3 \mathrm{~V} \\ 5.2 \mathrm{GHz}, \mathrm{~V}_{\mathrm{C}}=5 \mathrm{~V} \end{gathered}$ | dBm dBm | - | $\begin{aligned} & 52 \\ & 55 \end{aligned}$ | - |
| $2^{\text {nd }}$ Harmonic | $5.2 \mathrm{GHz}, \mathrm{P}_{\mathrm{IN}}=20 \mathrm{dBm}$ | dBc | - | -85 | - |
| $3{ }^{\text {rd }}$ Harmonic | $5.2 \mathrm{GHz}, \mathrm{P}_{\mathrm{IN}}=20 \mathrm{dBm}$ | dBc | - | -83 | - |
| Trise, Tfall | 10\% to $90 \%$ RF and $90 \%$ to 10\% RF | nS | - | 20 | - |
| Ton, Toff | 50\% Control to 90\% RF 50\% Control to $10 \%$ RF | $\begin{aligned} & \mathrm{nS} \\ & \mathrm{nS} \end{aligned}$ | - | $\begin{aligned} & 35 \\ & 40 \end{aligned}$ | - |
| Control Current | $\left\|\mathrm{V}_{\mathrm{C}}\right\|=3 \mathrm{~V}$ | $\mu \mathrm{A}$ | - | 5 | 25 |

## Absolute Maximum Ratings ${ }^{2,3}$

| Parameter | Absolute <br> Maximum |
| :---: | :---: |
| Input Power @ 3 V Control | +32 dBm |
| Input Power @ 5 V Control | +36 dBm |
| Operating Voltage | +8.5 volts |
| Operating Temperature | $-40^{\circ} \mathrm{C}$ to $+85^{\circ} \mathrm{C}$ |
| Storage Temperature | $-65^{\circ} \mathrm{C}$ to $+150^{\circ} \mathrm{C}$ |

2. Exceeding any one or combination of these limits may cause permanent damage to this device.
3. $M / A-C O M$ does not recommend sustained operation near these survivability limits.

## 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.

- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macom.com for additional data sheets and product information.

## Typical Performance Curves



Return Loss


Isolation


## Circuit Block Diagram*



C1 - C4 $=47 \mathrm{pF}$, Logic Control Decoupling Capacitors.
** Internal blocking capacitors are located on Port 1-Port 4.

## Truth Table ${ }^{4,5}$

| Control <br> V1 | Control <br> V2 | Control <br> V3 | Control <br> V4 | Port 1 - <br> Port 3 | Port 1 - <br> Port 4 | Port 2 - <br> Port 4 | Port 2 - <br> Port 3 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 0 | 0 | 0 | On | Off | Off | Off |
| 0 | 1 | 0 | 0 | Off | On | Off | Off |
| 0 | 0 | 1 | 0 | Off | Off | On | Off |
| 0 | 0 | 0 | 1 | Off | Off | Off | On |
| 1 | 0 | 1 | 0 | On | Off | On | Off |
| 0 | 1 | 0 | 1 | Off | On | Off | On |

4. $1=+2.5 \mathrm{~V}$ to $+5 \mathrm{~V}, 0=0 \mathrm{~V} \pm 0.2 \mathrm{~V}$.
5. Differential voltage, V (state 1 ) -V (state 0 ), must be 2.5 V minimum and must not exceed 8 V .

Mricon
GaAs DPDT Diversity Switch
4.5-6.0 GHz

## Lead-Free 3 mm 12-Lead PQFN ${ }^{\dagger}$



NOTES: 1. REFERENCE JEDEC MO-220, VAR. VEED-1 FOR ADDITIONAL DIMENSIONAL
AND TOLERANCE INFORMATION.
2. REFERENCE S2083 APPLICATION NOTE FOR PCB FOOTPRINT INFORMATION
3. ALL DIMENSIONS SHOWN AS INCHES/MM.

[^2]
[^0]:    Note: Reference Application Note M513 for reel size information.

[^1]:    * Restrictions on Hazardous Substances, European Directive 2002/95/EC.

[^2]:    ${ }^{\dagger}$ Reference Application Note M538 for lead-free solder reflow recommendations.

