## Features

- 802.11a + b/g Dual Band Applications
- Broadband Performance: 2.0-6.0 GHz
- Low Insertion Loss: $0.75 \mathrm{~dB} @ 2.4 \mathrm{GHz}$

$$
0.9 \mathrm{~dB} @ 4.9 \text { to } 6.0 \mathrm{GHz}
$$

- High Isolation: $43 \mathrm{~dB} @ 2.4 \mathrm{GHz}$ 31 dB @ 4.9 to 6.0 GHz
- Fast Switching Speed: $0.5 \mu \mathrm{~m}$ GaAs PHEMT
- Lead-Free 2 mm 8-Lead UTDFN Package
- Electrolytic Gold Plate over Nickel Plate
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and $260^{\circ} \mathrm{C}$ Reflow Compatible


## Description

M/A-COM's MASWSSO190 is a broadband GaAs PHEMT MMIC diversity switch available in a low cost, lead-free, ultra thin 2 mm 8-lead UTDFN package. The MASWSSO190 is ideally suited for applications where very small size and low cost are required.

Typical applications are for WLAN IEEE 802.11a and $802.11 \mathrm{~b} / \mathrm{g}$ systems that employ two antennas for transmit and receive diversity. Other applications include cordless phones and base stations. Designed for high power, this DPDT switch maintains high linearity up to 6.0 GHz .

The MASWSS0190 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 |
| :---: | :---: |
| MASWSS0190TR-3000 | 7 inch, 3000 piece reel |
| MASWSS0190SMB | Sample Test Board |

## Functional Schematic



## Pin Configuration

| Pin No. | Pin Name | Description |
| :---: | :---: | :---: |
| 1 | Rx | Receive Port |
| 2 | GND | Ground |
| 3 | GND | Ground |
| 4 | Tx | Transmit Port |
| 5 | V $_{\mathrm{C}} 1$ | Control 1 |
| 6 | ANT1 | Antenna Port 1 |
| 7 | ANT2 | Antenna Port 2 |
| 8 | V $_{\mathrm{C}} 2$ | Control 2 |
| 9 | Paddle $^{1}$ | RF and DC Ground |

1. The exposed pad centered on the package bottom must be connected to RF and DC ground.
[^0]Electronics
RoHS
Compliant
GaAs Broadband DPDT Diversity Switch
2.0-6.0 GHz

Electrical Specifications: $\mathrm{T}_{\mathrm{A}}=\mathbf{2 5}^{\circ} \mathrm{C}, \mathrm{V}_{\mathrm{C}}=0 \mathrm{~V} / 3 \mathrm{~V}, 8 \mathrm{pF}$ Capacitor ${ }^{2}, \mathrm{Z}_{0}=50 \Omega$

| Parameter | Test Conditions | Units | Min. | Тур. | Max. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Insertion Loss | $2.4 \mathrm{GHz}$ <br> 4.9-6 GHz, with 3 pF DC blocking capacitors | $\mathrm{dB}$ $\mathrm{dB}$ | - | $\begin{gathered} 0.75 \\ .9 \end{gathered}$ | $\begin{gathered} 1.25 \\ 1.4 \end{gathered}$ |
| Isolation (on/off or off/on) | 2.4 GHz <br> 4.9-6 GHz, with 3 pF DC blocking capacitors | $\begin{aligned} & \mathrm{dB} \\ & \mathrm{~dB} \end{aligned}$ | $\begin{aligned} & 39 \\ & 27 \end{aligned}$ | $\begin{aligned} & 43 \\ & 31 \end{aligned}$ | - |
| Isolation (on/on or off/off) | 2.4 GHz <br> 4.9-6 GHz, with 3 pF DC blocking capacitors | $\mathrm{dB}$ $\mathrm{dB}$ | $\begin{aligned} & 5 \\ & 9 \end{aligned}$ | $\begin{gathered} 7 \\ 11 \end{gathered}$ | - |
| Return Loss (on/off or off/on) | $2.4 \mathrm{GHz}$ <br> 4.9-6 GHz, with 3 pF DC blocking capacitors | $\mathrm{dB}$ $\mathrm{dB}$ | $\begin{aligned} & 19 \\ & 17 \end{aligned}$ | $\begin{aligned} & 22 \\ & 20 \end{aligned}$ | - |
| IP2 | Two Tone, $15 \mathrm{dBm} /$ Tone, 5 MHz Spacing 2.4 GHz 5.3 GHz 5.8 GHz | dBm dBm dBm | - | $\begin{aligned} & 93 \\ & 86 \\ & 84 \end{aligned}$ | — |
| IP3 | Two Tone, $15 \mathrm{dBm} /$ Tone, 5 MHz Spacing $\begin{aligned} & \text { 2.4 GHz } \\ & \text { 5.3 GHz } \\ & 5.8 \mathrm{GHz} \end{aligned}$ | dBm dBm dBm | — | $\begin{aligned} & 52 \\ & 50 \\ & 50 \end{aligned}$ | - |
| Input P-1dB | $\begin{aligned} & \text { 2.4 GHz } \\ & \text { 5.3 GHz } \\ & \text { 5.8 GHz } \end{aligned}$ | dBm dBm dBm | — | $\begin{aligned} & 33 \\ & 31 \\ & 31 \end{aligned}$ | - |
| $2^{\text {nd }}$ Harmonic | $\begin{gathered} \mathrm{P}_{\mathrm{IN}}=20 \mathrm{dBm} \\ 2.4 \mathrm{GHz} \\ 5.8 \mathrm{GHz} \end{gathered}$ | dBm dBm | - | $\begin{aligned} & -75 \\ & -77 \end{aligned}$ | - |
| $3^{\text {rd }}$ Harmonic | $\begin{gathered} \mathrm{P}_{\mathrm{IN}}=20 \mathrm{dBm} \\ 2.4 \mathrm{GHz} \\ 5.8 \mathrm{GHz} \end{gathered}$ | dBm dBm | - | $\begin{aligned} & -69 \\ & -86 \end{aligned}$ | - |
| Trise, Tfall | 10\% to 90\% RF 90\% to 10\% RF | $\begin{aligned} & \mathrm{nS} \\ & \mathrm{nS} \end{aligned}$ | - | $\begin{aligned} & 35 \\ & 60 \end{aligned}$ | - |
| Ton, Toff | 50\% control to 90\% RF, and 50\% control to 10\% RF | nS | - | 90 | - |
| Transients | - | mV | - | 6 | - |
| Control Current | $\left\|\mathrm{V}_{\mathrm{c}}\right\|=3 \mathrm{~V}$ | $\mu \mathrm{A}$ | - | 3 | 10 |

2. For positive voltage control, external DC blocking capacitors are required on all RF ports. Performance values are valid using 8 pF DC blocking capacitors, except where noted. All scattering parameters can be optimized by varying the DC blocking capacitor value, e.g. 8 pF for $2.4 \mathrm{GHz}, 3 \mathrm{pF}$ for $4.9 \mathrm{GHz}-6 \mathrm{GHz}$.

RoHS
Compliant
M/LCOM
GaAs Broadband DPDT Diversity Switch

Evaluation Board for
Lead-Free 2 mm 8-lead UTDFN Package


Absolute Maximum Ratings ${ }^{3,4}$

| Parameter | Absolute Maximum |
| :---: | :---: |
| Input Power @ 3 V Control | +31 dBm |
| Input Power @ 5 V Control | +34 dBm |
| Voltage | $\pm 8.5$ volts |
| Operating Temperature | $-40^{\circ} \mathrm{C}$ to $+85^{\circ} \mathrm{C}$ |
| Storage Temperature | $-65^{\circ} \mathrm{C}$ to $+150^{\circ} \mathrm{C}$ |

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. M/A-COM 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.

## Application Schematic



Truth Table ${ }^{5,6}$

| Control <br> $\mathbf{V}_{\mathbf{c}} \mathbf{1}$ | Control <br> $\mathbf{V}_{\mathbf{c}} \mathbf{2}$ | ANT 1 <br> $\mathbf{- R x}$ | ANT 1 <br> $\mathbf{- T x}^{\mathbf{T}}$ | ANT 2 <br> $\mathbf{- ~ T x ~}$ | ANT 2 <br> $\mathbf{- ~ R x}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 0 | On | Off | On | Off |
| 0 | 1 | Off | On | Off | On |
| 1 | 1 | Off | Off | Off | Off |
| 0 | 0 | Off | Off | Off | Off |

5. $1=+2.9 \mathrm{~V}$ to $+5 \mathrm{~V}, 0=0 \mathrm{~V} \pm 0.2 \mathrm{~V}$.
6. Differential voltage, V (state 1 ) -V (state 0 ), must be 2.7 V minimum and must not exceed 8.5 V .

## Qualification

Qualified to M/A-COM specification REL-201, Process Flow -2.

GaAs Broadband DPDT Diversity Switch

## Typical Performance Curves (on/off or off/on states)

## Insertion Loss



Return Loss

Isolation


## Lead-Free 2 mm 8-Lead UTDFN ${ }^{\dagger}$



[^1]- North America Tel: 800.366.2266 / Fax: 978.366.2266
- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298

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


[^0]:    * Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

[^1]:    ${ }^{\dagger}$ Reference Application Note M538 for lead-free solder reflow recommendations.

