

## GaAs SP3T Switch DC - 3.5 GHz

Rev. V2

### Features

- Low Insertion Loss: 0.55 dB @ 2.45 GHz
- High P1dB: 35 dBm @ 2.6 V
- 0.5 micron GaAs pHEMT Process
- Lead-Free 2 mm 8-Lead PDFN Package
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- Low gate lag for timing sensitive applications
- 1.8 V Operation with 1.8 V on Voltage Pull Up

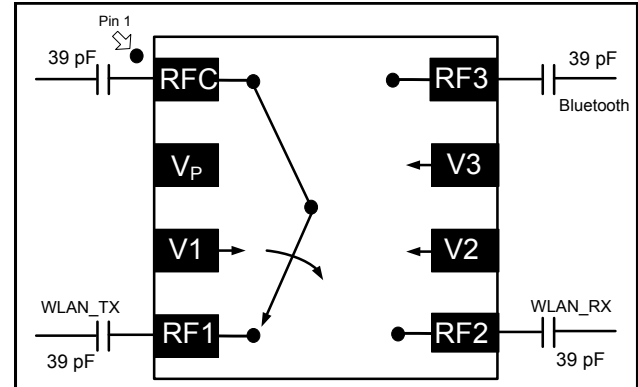
### Description

M/A-COM’s MASW-008955 is a GaAs pHEMT MMIC single pole three throw (SP3T) switch in a lead-free 2 mm 8-lead PDFN package. The MASW-008955 is ideally suited for applications where low control voltage, low insertion loss, high isolation, small size, and low cost are required.

Typical applications are for filter and antenna switching in WLAN or Bluetooth systems that connect separate receive functions to a common antenna. This part can be used in all systems operating up to 3.5 GHz requiring low control voltage.

The MASW-008955 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

### Application Schematic



### Pin Configuration

| Pin No. | Function                      | Description              |
|---------|-------------------------------|--------------------------|
| 1       | RFC                           | RF In/Out                |
| 2       | V <sub>P</sub> <sup>3,4</sup> | Optional Voltage Pull Up |
| 3       | V1 <sup>3</sup>               | Control 1                |
| 4       | RF1                           | RF In/Out                |
| 5       | RF2                           | RF In/Out                |
| 6       | V2 <sup>3</sup>               | Control 2                |
| 7       | V3 <sup>3</sup>               | Control 3                |
| 8       | RF3                           | RF In/Out                |

3. Depending on system sensitivity optional DC line bypass capacitors (22 pF) may be used.
4. Improved linearity at low control voltage can be obtained by tying pin 2 to the most positive control voltage. Otherwise, leave pin 2 unconnected.

### Ordering Information<sup>1,2</sup>

| Part Number        | Package           |
|--------------------|-------------------|
| MASW-008955-TR1000 | 1000 piece reel   |
| MASW-008955-TR3000 | 3000 piece reel   |
| MASW-008955-001SMB | Sample Test Board |

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

### Absolute Maximum Ratings<sup>5,6</sup>

| Parameter                                       | Absolute Maximum |
|---|------------------|
| Max Input Power<br>(0.5-3.5 GHz, 2.6 V Control) |                  |
| RFC – RF1                                       | 35 dBm           |
| RFC – RF2                                       | 31 dBm           |
| RFC – RF3                                       | 31 dBm           |
| V <sub>HI</sub> -V <sub>LO</sub>                | 8.5 volts        |
| Operating Temperature                           | -40°C to +85°C   |
| Storage Temperature                             | -65°C to +150°C  |

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. M/A-COM does not recommend sustained operation near these survivability limits.

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

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Electrical Specifications:  $T_A = 25^\circ\text{C}$ ,  $V_C = 0\text{ V} / 2.6\text{ V}$ ,  $Z_0 = 50\ \Omega$  <sup>7,9</sup>

| Parameter                   | Test Conditions                                  | Units | Min. | Typ. | Max. |
|-----------------------------|--|-------|------|------|------|
| Insertion Loss <sup>8</sup> | 2.45 GHz, RFC - RF1                              | dB    | —    | 0.55 | 0.85 |
|                             | 2.45 GHz, RFC - RF2                              |       | —    | 0.6  | 0.85 |
|                             | 2.45 GHz, RFC - RF3                              |       | —    | 0.6  | 0.85 |
| Isolation                   | 2.45 GHz, RFC - RF1                              | dB    | 20   | 22   | —    |
|                             | 2.45 GHz, RFC - RF2                              |       | 20   | 22   | —    |
|                             | 2.45 GHz, RFC - RF3                              |       | 19   | 20   | —    |
| Return Loss                 | 2.45 GHz   | dB    | —    | 20   | —    |
| IP3                         | Two Tone, +10 dBm/tone, 10 MHz Spacing, 2.45 GHz | dBm   | —    | 54   | —    |
| IP2                         | Two Tone, +10 dBm/tone, 10 MHz Spacing, 2.45 GHz | dBm   | —    | 98   | —    |
| P0.1dB                      | 2.45 GHz (RF1), 2.6 V                            | dBm   | —    | 29   | —    |
|                             | 2.45 GHz (RF2), 2.6 V                            |       |      | 25   |      |
|                             | 2.45 GHz (RF3), 2.6 V                            |       |      | 25   |      |
|                             | 2.45 GHz (RF1), 3 V                              |       |      | 32   |      |
|                             | 2.45 GHz (RF2), 3 V                              |       |      | 28   |      |
|                             | 2.45 GHz (RF3), 3 V                              |       |      | 28   |      |
| P1dB                        | 2.45 GHz (RF1), 2.6 V                            | dBm   | —    | 35   | —    |
|                             | 2.45 GHz (RF2), 2.6 V                            |       |      | 31   |      |
|                             | 2.45 GHz (RF3), 2.6 V                            |       |      | 31   |      |
|                             | 2.45 GHz (RF1), 3 V                              |       |      | 36   |      |
|                             | 2.45 GHz (RF2), 3 V                              |       |      | 34   |      |
|                             | 2.45 GHz (RF3), 3 V                              |       |      | 34   |      |
| 2nd Harmonic                | 900 MHz, 2.6 V, +10 dBm                          | dBc   | —    | -94  | —    |
|                             | 900 MHz, 2.6 V, +20 dBm                          |       |      | -75  |      |
|                             | 900 MHz, 3 V, +20 dBm                            |       |      | -80  |      |
|                             | 2.45 GHz, 2.6 V, +10 dBm                         |       |      | -86  |      |
|                             | 2.45 GHz, 2.6 V, +20 dBm                         |       |      | -70  |      |
|                             | 2.45 GHz, 3 V, +20 dBm                           |       |      | -99  |      |
| 3rd Harmonic                | 900 MHz, 2.6 V, +10 dBm                          | dBc   | —    | -102 | —    |
|                             | 900 MHz, 2.6 V, +20 dBm                          |       |      | -80  |      |
|                             | 900 MHz, 3 V, +20 dBm                            |       |      | -100 |      |
|                             | 2.45 GHz, 2.6 V, +10 dBm                         |       |      | -94  |      |
|                             | 2.45 GHz, 2.6 V, +20 dBm                         |       |      | -70  |      |
|                             | 2.45 GHz, 3 V, +20 dBm                           |       |      | -78  |      |
| Trise, Tfall                | 10% to 90% RF                                    | ns    | —    | 25   | —    |
|                             | 90% to 10% RF                                    |       |      | 14   |      |
| Ton, Toff                   | 50% control to 90% RF                            | ns    | —    | 30   | —    |
|                             | 50% control to 10% RF                            |       |      | 26   |      |
| Gate Lag                    | 50% control to 100% RF                           | μs    | —    | 4    | —    |
| Control Current             | $ V_C  = 2.6\text{V}$                            | μA    | —    | 4    | 20   |
| Thermal Resistance          | Junction to case                                 | °C/W  | —    | 96   | —    |

7. For positive control voltage, external DC blocking capacitors are required on all RF ports.

8. Insertion loss can be optimized by varying the DC blocking capacitor value, e.g. 100 pF for 100 - 500 MHz, 39 pF for 2.45 GHz.

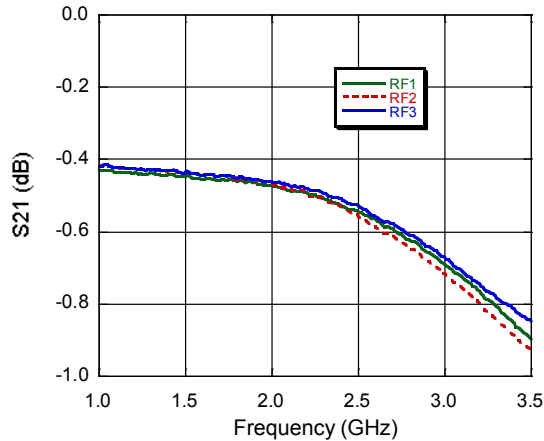
9. Specifications apply with no connection to pin 2 ( $V_P$ ).

2

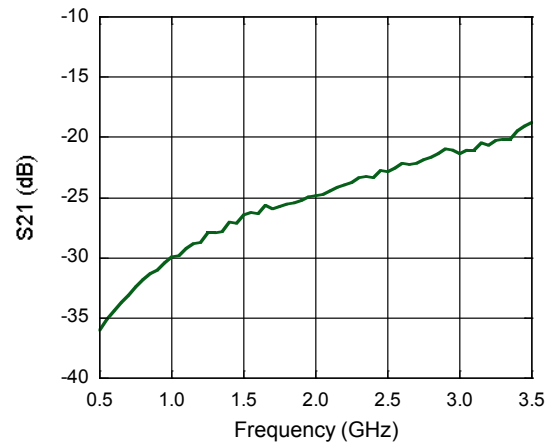
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## Typical Performance Curves

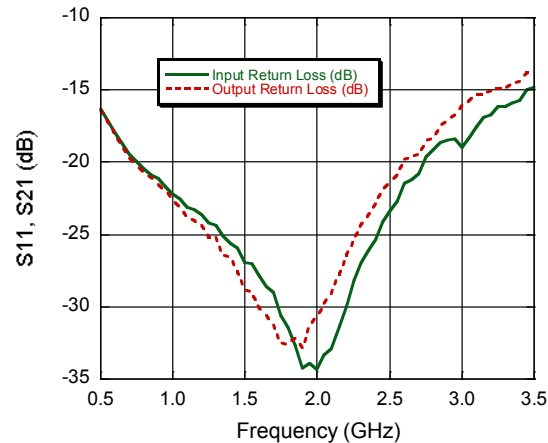
**Insertion Loss**



**Isolation**



**Return Loss**



## 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.

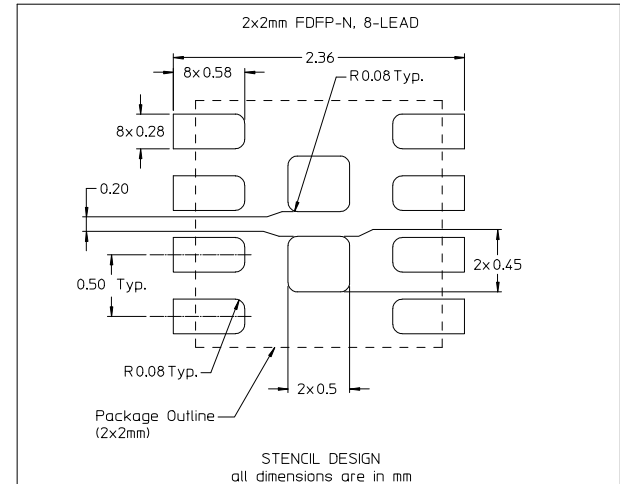
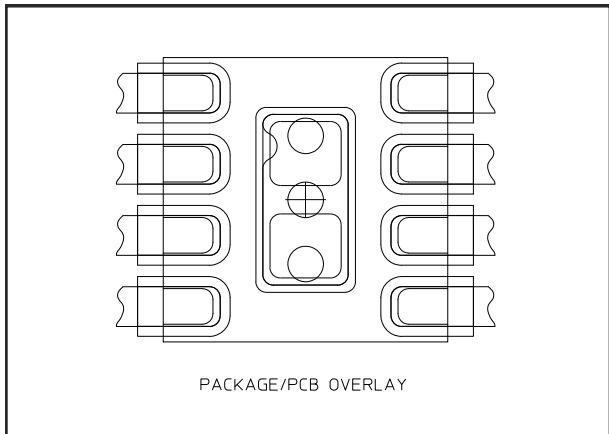
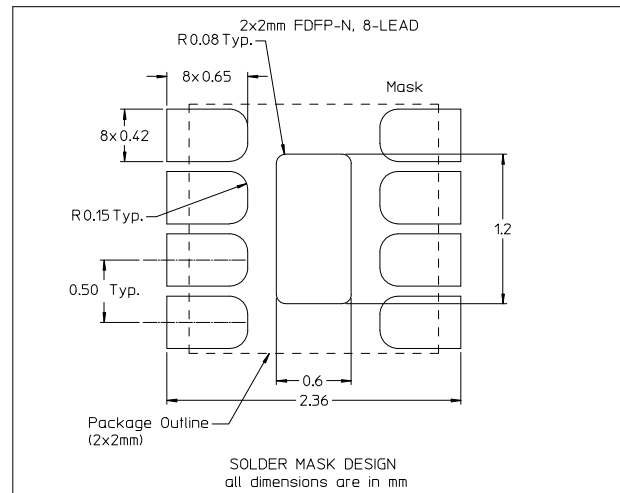
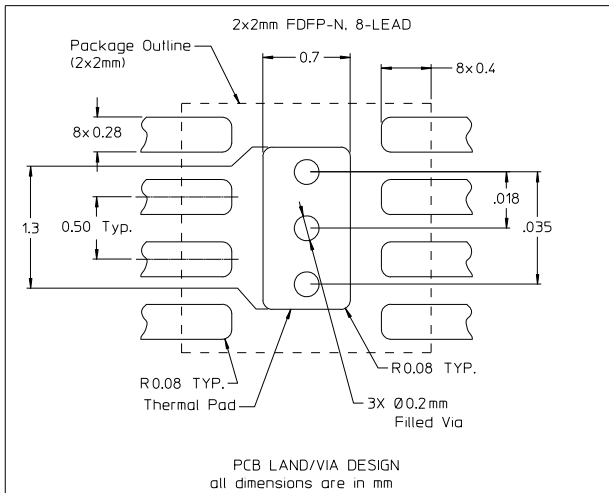
## Truth Table <sup>10,11,12</sup>

| V1 | V2 | V3 | RFC - RF1 | RFC - RF2 | RFC - RF3 |
|----|----|----|-----------|-----------|-----------|
| 1  | 0  | 0  | On        | Off       | Off       |
| 0  | 1  | 0  | Off       | On        | Off       |
| 0  | 0  | 1  | Off       | Off       | On        |

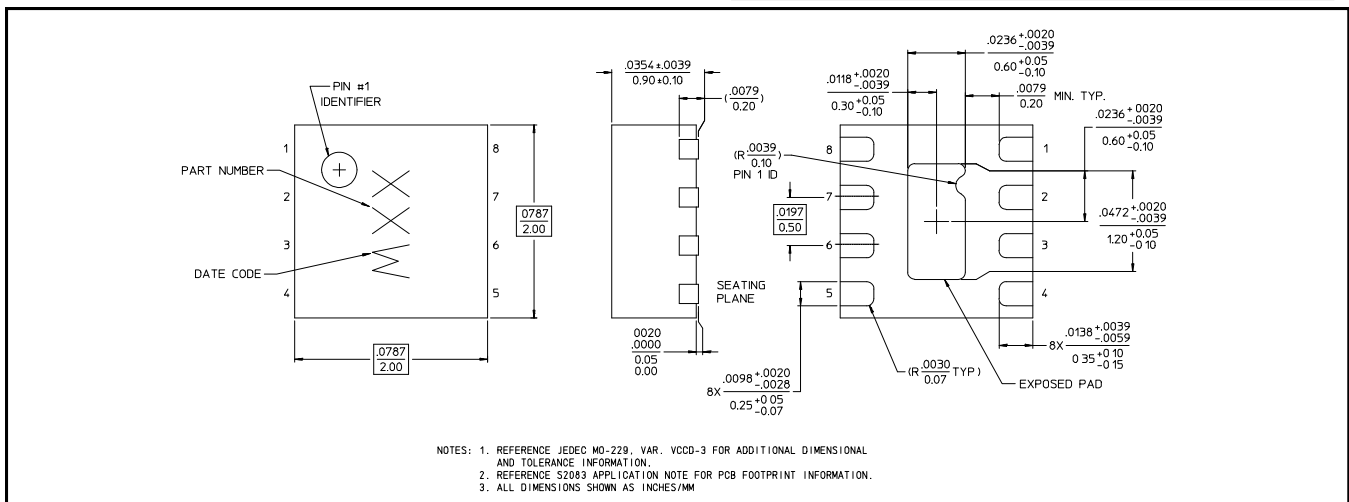
10. 0 = 0 V ± 0.2 V, 1 = 1.8 V to +5 V, minimum  $V_{HI}-V_{LO} = 1.8$  V, maximum  $V_{HI}-V_{LO} = 8.5$  V.
11. For use at low voltage, M/A-COM recommends connecting pin 2 to a voltage equal to the most positive control voltage.
12. Negative control voltage may be used. The '1' in the table would be the most positive (0 V) and the '0' would be the most negative (-3 V for example).

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### Lead Free 2 mm 8-lead PDFN<sup>†</sup>



<sup>†</sup> Reference Application Note S2083 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.  
Plating is 100% matte tin over copper.

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