

GaAs SPDT 2.7 V High Power Switch DC - 5.0 GHz

Rev. V2

Features

- Low Voltage Operation: 2.7 V
- High Power: +38dBm (typ) P0.1dB
- High IP3: +56 dBm
- Low Insertion Loss: 0.25 dB @ 1 GHz
- High Isolation: 25 dB @ 1 GHz
- Lead-Free SC70 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

M/A-COM's MASW-008853 is a GaAs PHEMT MMIC single pole double throw (SPDT) high power switch in a low cost SC70 six lead package. The MASW-008853 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 CDMA handset systems that connect separate transceiver and/or GPS functions to a common antenna, as well as other related handset and general purpose applications. The MASW-008853 can be used in all systems operating up to 5.0 GHz requiring high power at low control voltage.

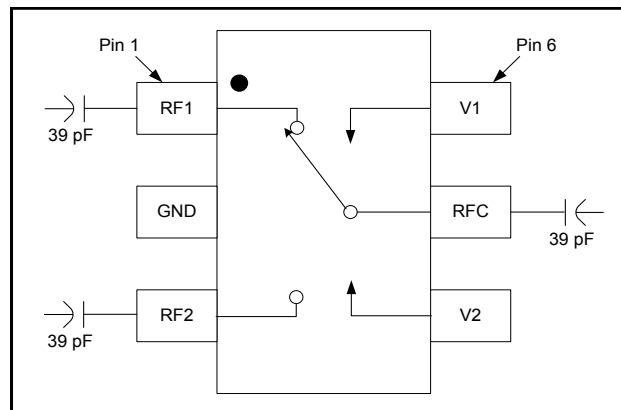
The MASW-008853 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

Ordering Information ^{1,2}

| Part Number | Package |
|--------------------|-------------------|
| MASW-008853-000000 | Bulk Packaging |
| MASW-008853-TR3000 | 3000 piece reel |
| MASW-008853-001SMB | Sample Test Board |

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

Functional Block Diagram



Pin Configuration

| Pin No. | Pin Name | Description |
|---------|----------|-------------|
| 1 | RF1 | RF Port 1 |
| 2 | GND | RF Ground |
| 3 | RF2 | RF Port 2 |
| 4 | V2 | Vcontrol 2 |
| 5 | RFC | RF Common |
| 6 | V1 | Vcontrol 1 |

Absolute Maximum Ratings ^{3,4}

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

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

GaAs SPDT 2.7 V High Power Switch DC - 5.0 GHz

Rev. V2

Electrical Specifications: $T_A = 25^\circ\text{C}$, $V_C = 0\text{ V}/2.7\text{ V}$, $Z_0 = 50\ \Omega$ ⁵

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|-----------------------------|--|---------------|------|------|------|
| Insertion Loss ⁶ | 1 GHz | dB | — | 0.30 | 0.65 |
| | 2 GHz | dB | — | 0.36 | — |
| | 3 GHz | dB | — | 0.45 | — |
| | 4 GHz | dB | — | 0.70 | — |
| | 5 GHz | dB | — | 1.10 | — |
| Isolation | 1 GHz | dB | 23 | 25 | — |
| | 2 GHz | dB | — | 19 | — |
| | 3 GHz | dB | — | 15 | — |
| | 4 GHz | dB | — | 13 | — |
| | 5 GHz | dB | — | 11 | — |
| Return Loss | DC – 3 GHz | dB | — | 20 | — |
| IP3 | 825 MHz Two Tone, +24 dBm Total Pin, 5 MHz Spacing | dBm | — | 56 | — |
| Cross Modulation | Two-tone signal input: Tx1 = +22 dBm @ 820 MHz, Tx2 = +22 dBm @ 821 MHz, R _x interfere = -23 dBm @ 869 MHz | dBm | — | -99 | — |
| | Two-tone signal input: Tx1 = +18 dBm @ 1880 MHz, Tx2 = +18 dBm @ 1881 MHz, R _x interfere = -23 dBm @ 1960 MHz | dBm | — | -94 | — |
| P0.1dB | 1 GHz | dBm | — | 38 | — |
| Trise, Tfall | 10% to 90% RF, 90% to 10% RF | nS | — | 70 | — |
| Ton, Toff | 50% control to 90% RF, 50% control to 10% RF | nS | — | 100 | — |
| Transients | In Band | mV | — | 25 | — |
| Control Current | $V_C = 2.7\text{ V}$ | μA | — | 5 | 20 |

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

6. Insertion loss can be optimized by varying the DC blocking capacitor value, e.g. 1000 pF for 100 MHz - 1 GHz, 39 pF for 0.5 GHz - 3 GHz.

Truth Table ^{7,8,9}

| V1 | V2 | ANT– RF1 | ANT - RF2 |
|----|----|----------|-----------|
| 1 | 0 | On | Off |
| 0 | 1 | Off | On |

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

8. Differential voltage, $V(\text{state } 1) - V(\text{state } 0)$, must be +2.7 V minimum, but must not exceed 8.5 V.

9. 0 = -5 V to +2.3 V, 1 = -2.3 V to +5 V.

Qualification

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

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

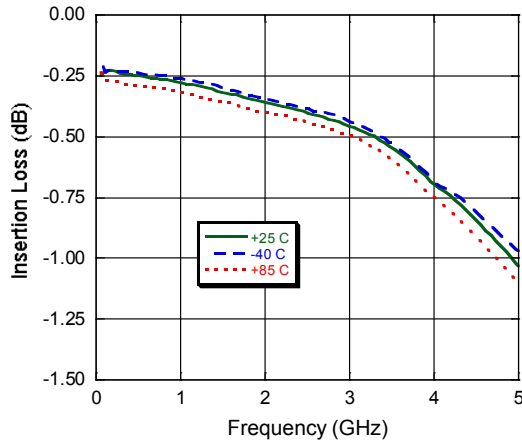
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

GaAs SPDT 2.7 V High Power Switch DC - 5.0 GHz

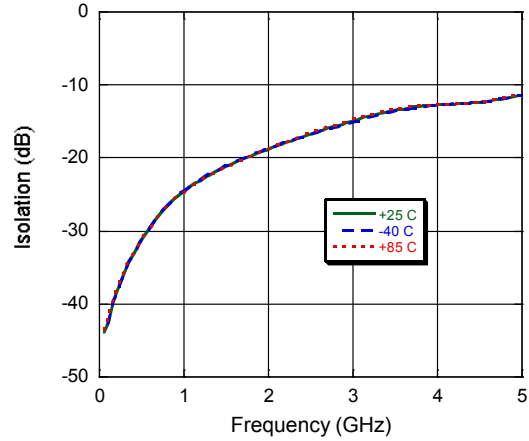
Rev. V2

Typical Performance Curves, 1000 pF

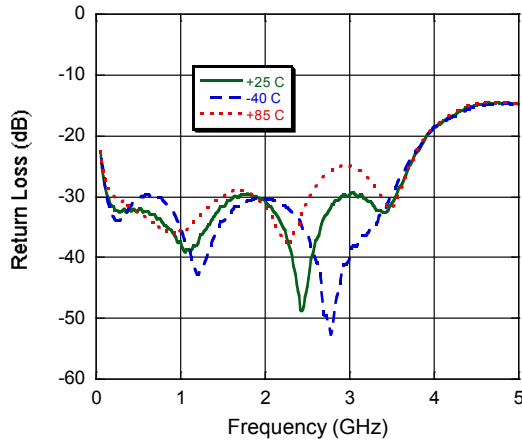
Insertion Loss



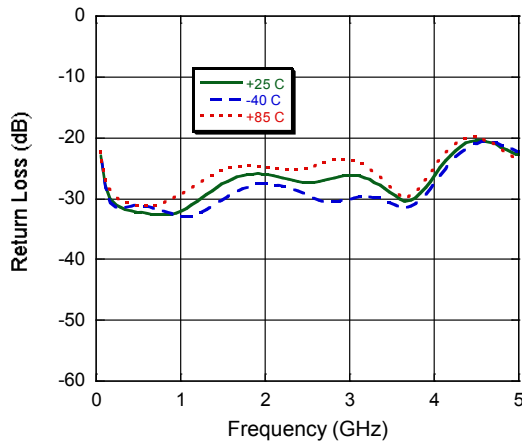
Isolation



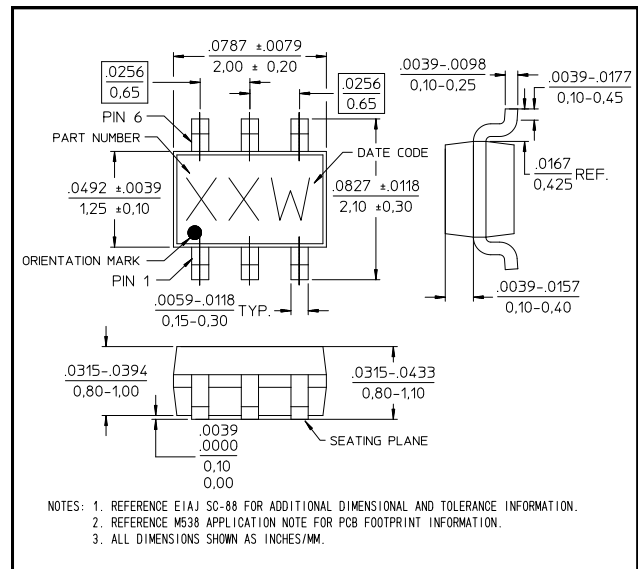
RF Return Loss



RF1/RF2 Return Loss



Lead-Free SC70 Plastic Package[†]



[†] Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.