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GaAs SPDT Switch DC - 20 GHz

Rev. V3

Features

- Very Broadband Performance
- Low Insertion Loss: 1.9 dB Typical @ 20 GHz
- High Isolation: 40 dB Typical @ 20 GHz
- Fast Switching Speed
- Reflective Configuration
- Ultra Low DC Power Consumption
- Lead-Free 4 mm 24-Lead PQFN Package
- Halogen-Free “Green” Mold Compound
- RoHS Compliant* and 260°C Reflow Compatible

Description

The MASW-008322 is a versatile, broadband, high isolation SPDT switch offered in a lead-free 4 mm 24-lead PQFN surface mount plastic package. The design incorporates both series and shunt circuit elements with the locations optimized to achieve outstanding broadband performance to 20 GHz. The combination of broadband performance along with very fast switching and excellent settling time make this device ideal for many applications, including Test & Measurement, EW and broadband communication systems.

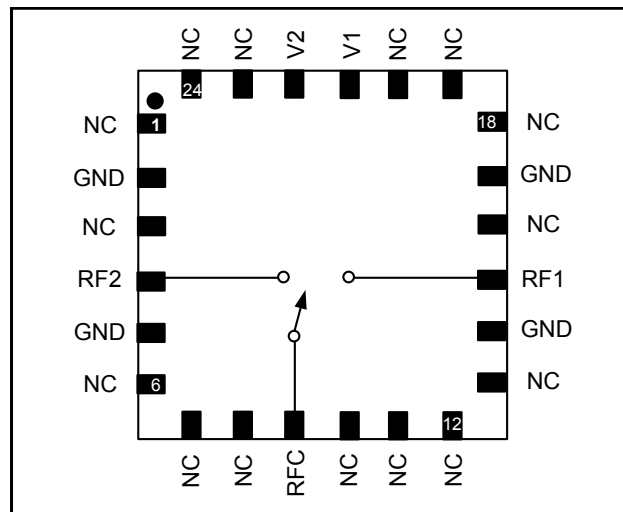
The MASW-008322 is fabricated using M/A-COM Technology’s mature 0.5um Low Gate-Lag pHEMT process. This robust process features full surface passivation for a high performance and high reliability.

Ordering Information^{1,2}

| Part Number | Package |
|--------------------|-----------------|
| MASW-008322-TR0500 | 500 piece reel |
| MASW-008322-TR1000 | 1000 piece reel |
| MASW-008322-001SMB | Sample Board |

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

Functional Schematic



Pin Configuration³

| Pin No. | Function | Pin No. | Function |
|---------|----------|---------|---------------------|
| 1 | NC | 14 | GND |
| 2 | GND | 15 | RF1 |
| 3 | NC | 16 | NC |
| 4 | RF2 | 17 | GND |
| 5 | GND | 18 | NC |
| 6 | NC | 19 | NC |
| 7 | NC | 20 | NC |
| 8 | NC | 21 | V1 |
| 9 | RFC | 22 | V2 |
| 10 | NC | 23 | NC |
| 11 | NC | 24 | NC |
| 12 | NC | 25 | Paddle ⁴ |
| 13 | NC | | |

3. M/A-COM Technology recommends that all unused (N/C) pins be connected to ground. All data on this datasheet was taken with N/C pins connected to ground.
4. The exposed pad centered on the package bottom must be connected to RF and DC ground.

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

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Electrical Specifications⁵: $T_A = +25^\circ\text{C}$, $Z_0 = 50\Omega$, $V_{1,2} = -5/0\text{V}$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|--|---|---------------|------|-------|-----------------|
| Insertion Loss | 1 GHz | dB | — | 0.4 | 0.55 |
| | 10 GHz | | — | 1.0 | — |
| | 18 GHz | | — | 1.5 | — |
| | 20 GHz | | — | 1.9 | 2.5 |
| Isolation | 1 GHz | dB | 50 | 52 | — |
| | 10 GHz | | — | 48 | — |
| | 18 GHz | | — | 43 | — |
| | 20 GHz | | 39 | 40 | — |
| VSWR | 1 - 20 GHz | Ratio | — | 2.0:1 | — |
| Trise, Tfall | 10% to 90% RF and 90% to 10% RF | ns | — | 9 | — |
| Ton, Toff | 50% control to 90% RF, and 50% control to 10% RF | ns | — | 12 | 25 ⁷ |
| Input P1dB | 0.5 - 20 GHz, 0 to -5 V | dBm | — | 30 | — |
| IIP3 | Two Tone, +5 dBm/Tone, 5 MHz Spacing, >50 MHz 0.5 - 20 GHz | dBm | — | 48 | — |
| Settling Time | 50% Vctl to 0.1 dB of final value | μs | — | 1 | — |
| Control Current (Complementary Logic) | V_{IN} Low, -5 V | μA | — | 3 | 50 |
| | V_{IN} High, 0 V | | — | — | 20 |

5. All specifications apply with 50 Ω impedance connected to all RF ports, 0 and -5 VDC control voltages.

6. Loss changes 0.0025 dB/ $^\circ\text{C}$ (from -55 $^\circ\text{C}$ to +85 $^\circ\text{C}$).

7. Max switching speed guaranteed by design.

Absolute Maximum Ratings⁸

| Parameter | Absolute Maximum |
|-----------------------|---|
| Control Voltage | -8.5 VDC |
| Input RF Power | +33 dBm |
| Operating Temperature | -40 to +85 $^\circ\text{C}$ |
| Storage Temperature | -65 $^\circ\text{C}$ to +150 $^\circ\text{C}$ |

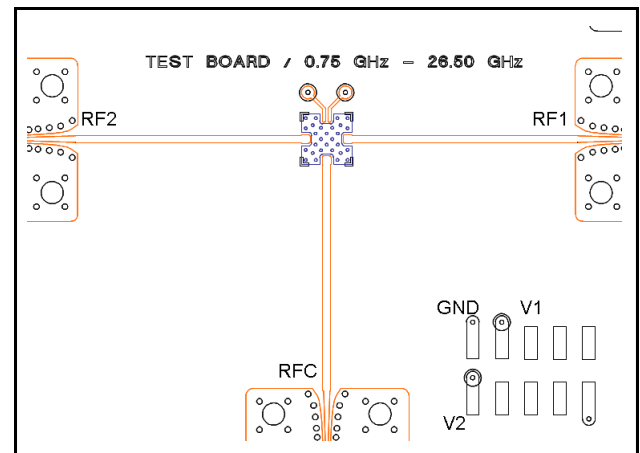
8. Exceeding any one or combination of these limits may cause permanent damage to this device.

Truth Table⁹

| Control Inputs | | Condition of Switch | |
|----------------|------|---------------------|-----|
| V1 | V2 | RF1 | RF2 |
| High | Low | Off | On |
| Low | High | On | Off |

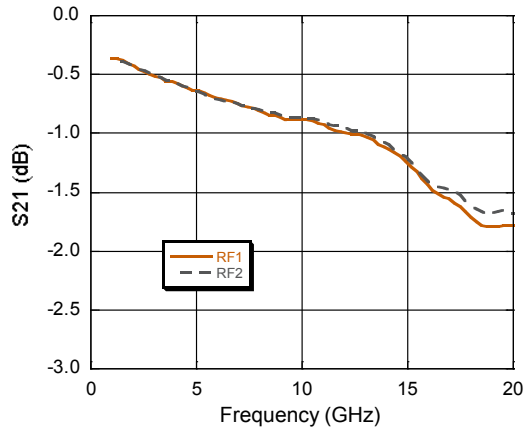
9. $V_{low} = -5\text{ V}$, $V_{high} = 0\text{ V}$

Sample Board

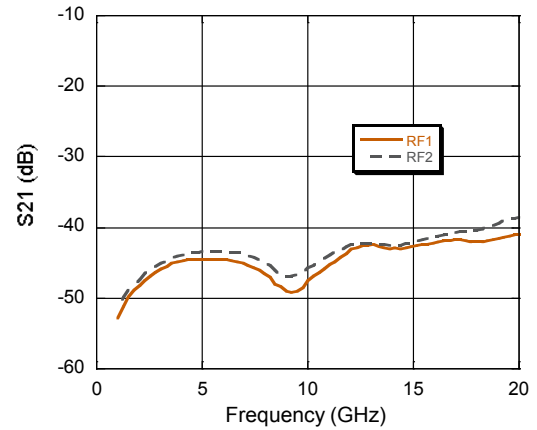


Typical Performance Curves

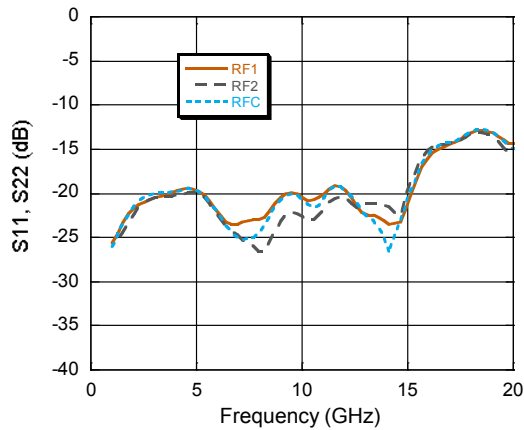
Insertion Loss



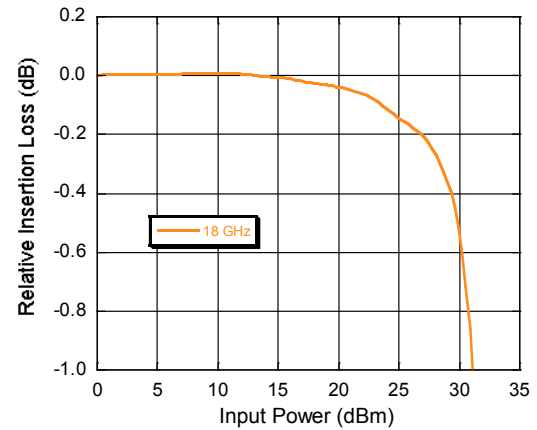
Isolation



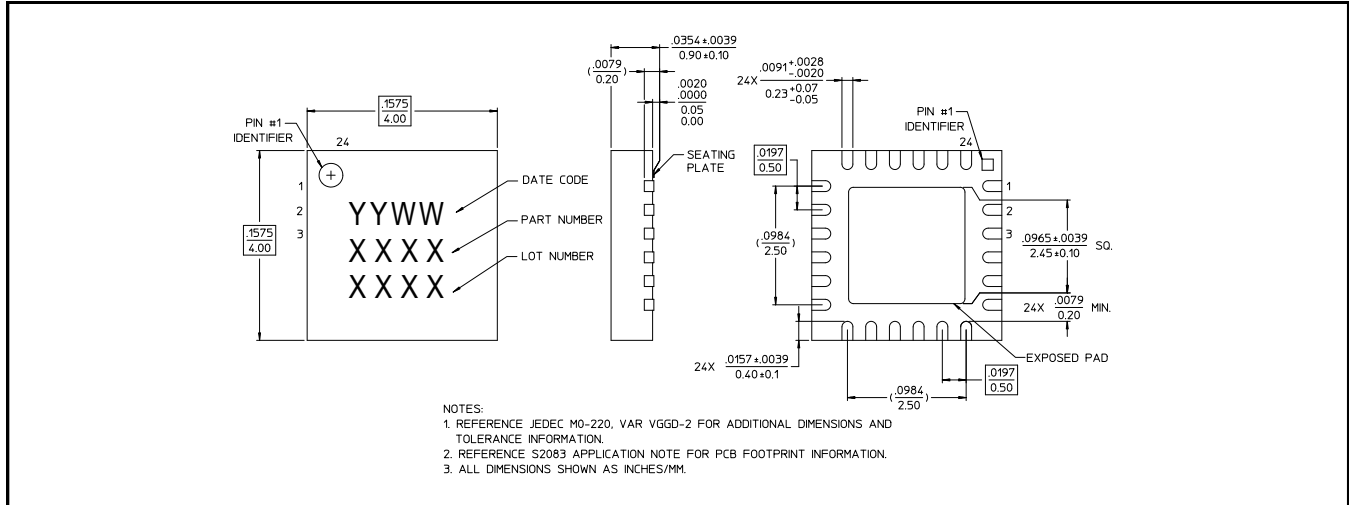
Return Loss



P1dB



Lead Free 4 mm 24-Lead PQFN †



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

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.

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