Electronics

## Features

- 1 dB Compression Point: +39 dBm @ -8 V
- 3rd Order Intercept: +65 dBm @ -8 V
- Insertion Loss: 0.4 dB
- Low Power Consumption
- Fast Switching Speed
- Lead-Free High Performance Ceramic Package
- RoHS* Compliant and $260^{\circ} \mathrm{C}$ Reflow Compatible


## Description

M/A-COM's SW-276 is a broadband GaAs SPDT switch available in a lead-free, 7-lead ceramic package. The package is hermetically sealed, making this switch ideal for space, military radios and other environmentally harsh applications.

Typical applications include synthesizer switching, transmit / receive switching, switch matrices and filter banks in systems such as radio and cellular equipment, PCM, GPS and fiber optic modules.

M/A-COM fabricates the SW-276 using a 1.0-micron gate length MESFET process. The process features full chip passivation for performance and reliability.

## Ordering Information

| Part Number | Package |
| :---: | :---: |
| SW-276 | Bulk Packaging (CR-2) |
| SW-276G | Gull Wing (CR-2 w/gull wing) |
| SW-276B ${ }^{1}$ | Bulk Packaging (CR-2) |
| SW-276T1 ${ }^{2}$ | Bulk Packaging (CR-2) |

[^0]Functional Schematic/Pin Configuration


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

| Parameter | Absolute Maximum |
| :---: | :---: |
| Input Power |  |
| 0.05 GHz | +35 dBm |
| $0.5-2.0 \mathrm{GHz},-5 \mathrm{~V}$ Control | +36 dBm |
| $0.5-2.0 \mathrm{GHz},-8 \mathrm{~V}$ Control |  |
| $0.5-2.0 \mathrm{GHz},-10 \mathrm{~V}$ Control | +40 dBm |
| Power Dissipation ${ }^{5,6}$ | 2.0 W |
| Control Voltage | $-12 \mathrm{~V},+1 \mathrm{~V}$ |
| Operating Temperature | $-55^{\circ} \mathrm{C}$ to $+125^{\circ} \mathrm{C}$ |
| Storage Temperature | $-65^{\circ} \mathrm{C}$ to $+150^{\circ} \mathrm{C}$ |
| Maximum Junction Temperature | $+175^{\circ} \mathrm{C}$ |
| Thermal Resistance ${ }^{5}: ~ \theta \mathrm{jc}$ | $+50^{\circ} \mathrm{C} / \mathrm{W}$ |

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.
5. $\mathrm{T}_{\text {CASE }}=+25^{\circ} \mathrm{C}$, where $\mathrm{T}_{\text {CASE }}$ is the temperature at the bottom of the case.
6. Special consideration must be given to the mounting of the switch to minimize the thermal resistance. The bottom of the case should be thermally attached to the mounting surface to maintain the junction temperature under the absolute maximum rating.

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- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300
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Electrical Specifications: $\mathrm{T}_{\mathrm{A}}=-55$ to $+85^{\circ} \mathrm{C}, \mathrm{Z}_{0}=50 \Omega^{7,8}$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Insertion Loss | DC - 0.5 GHz | dB | - | 0.4 | 0.5 |
|  | DC - 1.0 GHz | dB | - | 0.5 | 0.65 |
|  | DC - 2.0 GHz | dB | - | 0.7 | 0.8 |
|  | DC - 3.0 GHz | dB | - | 0.9 | 1.0 |
| Isolation | DC - 0.5 GHz | dB | 37 | - | - |
|  | DC - 1.0 GHz | dB | 31 | - | - |
|  | DC - 2.0 GHz | dB | 24 | - | - |
|  | DC - 3.0 GHz | dB | 19 | - | - |
| VSWR | DC - 0.5 GHz | Ratio | - | - | 1.3:1 |
|  | DC - 1.0 GHz | Ratio | - | - | 1.5:1 |
|  | DC - 2.0 GHz | Ratio | - | - | 1.5:1 |
|  | DC - 3.0 GHz | Ratio | - | - | 1.6:1 |
| Trise, Tfall | 10\% to 90\% RF, $90 \%$ to $10 \%$ RF | nS | - | 30 | - |
| Ton, Toff | 50\% control to $90 \% \mathrm{RF}$, and $50 \%$ control to $10 \% \mathrm{RF}$ | nS | - | 35 | - |
| Transients | In Band | mV | - | 12 | - |
| Input Power for P0.1dB | 0.9 GHz (-5 V Control) | $\mathrm{dBm}$ | - | 32 | - |
| Input Power for P1dB | 0.9 GHz (-5 V Control) | dBm | - | 35 | - |
|  | 0.9 GHz (-8 V Control) | dBm | - | 39 | - |
| Third Order Intercept Point | Two +10 dBm Input tones |  |  |  |  |
|  | $0.9 \mathrm{GHz}(-5 \mathrm{~V}$ Control) | dBm | - | 61 | - |
|  | 0.9 GHz (-8 V Control) | dBm | - | 65 | - |

7. All specifications apply when operated with bias voltages of 0 V for $\mathrm{V}_{\mathbb{I N}}$ Low and -5 to -10 V for $\mathrm{V}_{\mathbb{I N}}$ High, and 50 ohm impedance at all RF ports, unless otherwise specified.
8. High power (greater than 1 W ) handling specifications apply to cold switching only. For input powers under 1W hot switching can be used.

## 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 ${ }^{9}$

| Control |  | Condition of Switch, <br> RF Common to each <br> RF Port |  |
| :---: | :---: | :---: | :---: |
| A | B | RF1 | RF2 |
| 1 | 0 | On | Off |
| 0 | 1 | Off | On |

9. $0=$ Low $=0$ to $-0.2 \mathrm{~V} @ 20 \mu \mathrm{~A}$ max.,

1 = High $=-5 \mathrm{~V} @ 50 \mu \mathrm{~A}$ typ. to $-10 \mathrm{~V} @ 800 \mu \mathrm{~A}$ max.

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High Power GaAs SPDT Switch

## Two Tone IP3 Measurements

$\left.\begin{array}{|c|c|c|c|c|}\hline \text { Bias Voltage } & \begin{array}{c}\text { Input Power } \\ \text { for each tone } \\ \text { (dBm) }\end{array} & \begin{array}{c}\text { 3rd Order } \\ \text { Intermodulation } \\ \text { Products (dBc) }\end{array} & \begin{array}{c}\text { IP3 (dBm) }\end{array} & \\ \hline 0,-5 \mathrm{~V} & +27 & -34 & +44 \\ \text { (dBc) }\end{array}\right]$

## Lead-Free CR-2 Package ${ }^{\dagger}$


$\dagger$ Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.

Lead-Free CR-2 wl Gull Wing Package ${ }^{\dagger}$


## Typical Performance Curves

Compression vs. Control Voltage at 900 MHz


Isolation vs. Frequency


Insertion Loss vs. Frequency


VSWR vs. Frequency


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Table 1 - Screening ${ }^{10}$ (Reference Document MIL-STD-883D)

| Test | Sample Size | Method/Condition |
| :---: | :---: | :---: |
| Internal Visual ${ }^{11}$ | 1\% | M/A-COM Workmanship Standard |
| Stabilization Bake | 100\% | $1008 / \mathrm{C}, 150^{\circ} \mathrm{C}$ for 24 hours |
| Temperature Cycling | 100\% | 1010/C, $-65^{\circ} \mathrm{C}, 150^{\circ} \mathrm{C}$ |
| Constant Acceleration | 100\% | 2001/A, 5000G, Y1 Plane only |
| Burn-In ${ }^{12}$ | 100\% | 1015, $125^{\circ} \mathrm{C}$ for 160 hours |
| Final Electrical | 100\% | Product Data Sheet Guaranteed Parameters |
| Seal Test - Fine Leak | 100\% | 1014/A |
| Seal Test - Gross Leak | 100\% | 1014/C |
| External Visual ${ }^{13}$ | 100\% | M/A-COM Workmanship Standard |

10. This test does not apply to connectorized units. Connectorized units using hermetically sealed hybrid microcircuits will be screened to Table 1 at the hybrid level.
11. Sample size for internal visual will be per MIL-STD-105, AQL $1 \%$.
12. Burn-in temperature will be reduced as necessary to keep the internal junction temperatures from exceeding their absolute maximum ratings.
13. Parts will be marked with their standard marking, plus a screening date and "T1" to signify that they were screened.

Table B - Screening (Reference Document MIL-STD-883D), Includes 100\% Internal Visual

| Test | Sample Size | Method/Condition |
| :---: | :---: | :---: |
| Internal Visual | 100\% | 2017 |
| Stabilization Bake | 100\% | 1008/C, $150^{\circ} \mathrm{C}$ for 24 hours |
| Temperature Cycling | 100\% | 1010/C, $-65^{\circ} \mathrm{C}, 150^{\circ} \mathrm{C}$ |
| Constant Acceleration | 100\% | 2001/A, 5000G, Y1 Plane only |
| Burn-In ${ }^{14}$ | 100\% | $1015,125^{\circ} \mathrm{C}$ for 160 hours |
| Final Electrical | 100\% | Product Data Sheet Guaranteed Parameters |
| Seal Test - Fine Leak | 100\% | 1014/A |
| Seal Test - Gross Leak | 100\% | 1014/C |
| External Visual ${ }^{15}$ | 100\% | 2009 |

14. Burn-In temperature will be reduced as necessary to keep the internal junction temperatures from exceeding their absolute maximum ratings.
15. Parts will be marked with their standard marking, plus a " $B$ " suffix.

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[^0]:    1. Table B Screening
    2. Table 1 Screening
