

**DATA SHEET**

# AS186-302, AS186-302LF: GaAs IC High-Isolation Positive Control SPDT Nonreflective Switch LF-4 GHz

## Applications

- Typical applications include GSM, PCS, WCDMA, 2.4 GHz ISM and 3.5 GHz wireless local loop


## Features

- Positive voltage control (0/3 to 0/5 V)
- High isolation (55 dB @ 0.9 GHz and 1.9 GHz)
- Miniature MSOP-8 exposed pad package
- Three-switch solution for base station synthesizer switch
- Nonreflective
- Operation to 6 GHz
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020

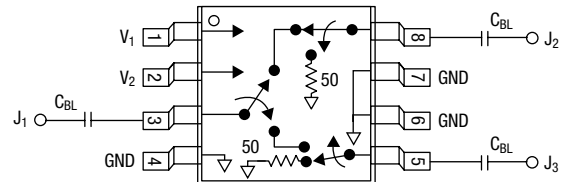
## Description

The AS186-302 is a GaAs FET IC SPDT nonreflective switch, packaged in an MSOP-8 exposed pad plastic package for low-cost, high-isolation commercial applications.

**NEW** Skyworks offers lead (Pb)-free, RoHS (Restriction of Hazardous Substances)-compliant packaging.



## Pin Out



$C_{BL} = 47$  pF for operation > 500 MHz.

## Electrical Specifications

**-40 °C ≤ T ≤ +85 °C,  $V_{CTL} = 0/5$  V,  $Z_0 = 50 \Omega$  unless otherwise noted**

| Parameter                | Condition | Frequency | Min. | Typ.   | Max.  | Unit |
|--------------------------|-----------|-----------|------|--------|-------|------|
| Insertion loss           |           | LF-2 GHz  |      | 0.8    | 1.05  | dB   |
|                          |           | LF-3 GHz  |      | 0.9    | 1.15  | dB   |
|                          |           | LF-4 GHz  |      | 1.0    | 1.25  | dB   |
| Isolation <sup>(1)</sup> |           | LF-2 GHz  | 50   | 55     |       | dB   |
|                          |           | LF-3 GHz  | 45   | 50     |       | dB   |
|                          |           | LF-4 GHz  | 35   | 40     |       | dB   |
| VSWR (on state)          |           | LF-2 GHz  |      | 1.3:1  | 1.5:1 |      |
|                          |           | LF-4 GHz  |      | 1.3:1  | 1.6:1 |      |
| VSWR (off state)         |           | 0.5-4 GHz |      | 1.35:1 | 1.7:1 |      |

1. Backside of exposed pad must be connected to RF ground to obtain specified isolation.

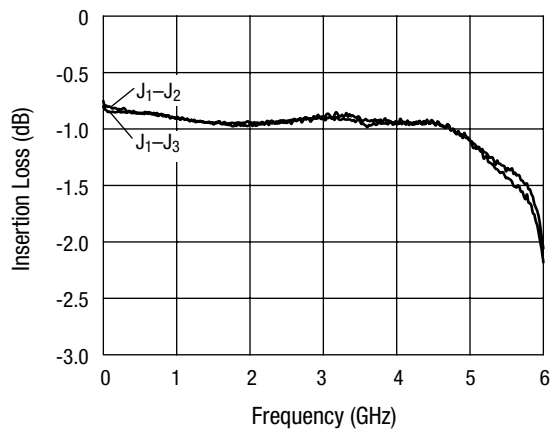
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### Operating Characteristics

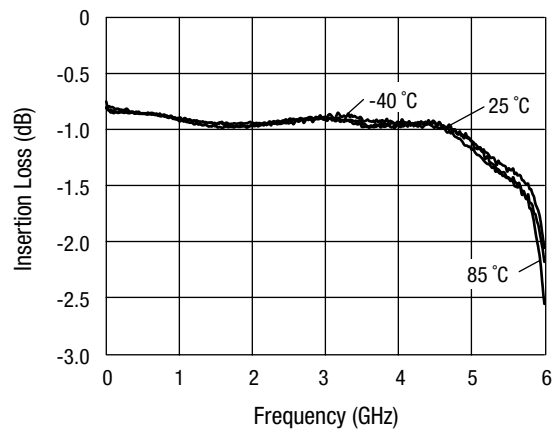
**-40 °C ≤ T ≤ +85 C, V<sub>CTL</sub> = 0/5 V, Z<sub>0</sub> = 50 Ω unless otherwise noted**

| Parameter  | Condition  | Frequency              | Min.     | Typ.     | Max. | Unit       |
|--|--|------------------------|----------|----------|------|------------|
| Switching characteristics                              |  |                        |          |          |      |            |
| Rise, fall   | 10/90% or 90/10% RF  |                        |          | 30       |      | ns         |
| On, off  | 50% CTL to 90/10% RF   |                        |          | 50       |      | ns         |
| Video feedthru   | T <sub>RISE</sub> = 3 ns, BW = 500 MHz   |                        |          | 25       |      | mV         |
| Input power for 1 dB compression                       | V <sub>CTL</sub> = 0/3 V<br>V <sub>CTL</sub> = 0/5 V   | 0.9–4 GHz<br>0.9–4 GHz | 23<br>27 | 25<br>30 |      | dBm<br>dBm |
| Input 3rd order intermodulation intercept point (IIP3) | For two-tone input power 8 dBm<br>V <sub>CTL</sub> = 0/3 V<br>V <sub>CTL</sub> = 0/5 V                   | 0.9–4 GHz<br>0.9–4 GHz | 27<br>42 | 38<br>46 |      | dBm<br>dBm |
| Thermal resistance                                     |  |                        |          | 25       |      | °C/W       |
| ESD rating   | Human body model   |                        | Class 1A |          |      |            |
| Control voltages                                       | V <sub>LOW</sub> = 0 to 0.2 V @ 20 μA max.<br>V <sub>HIGH</sub> = 3 V @ 100 μA max. to 5 V @ 200 μA max. |                        |          |          |      |            |

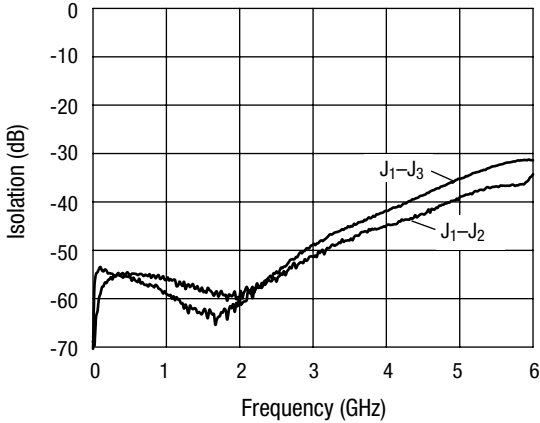
### Typical Performance Data (0, 5 V)



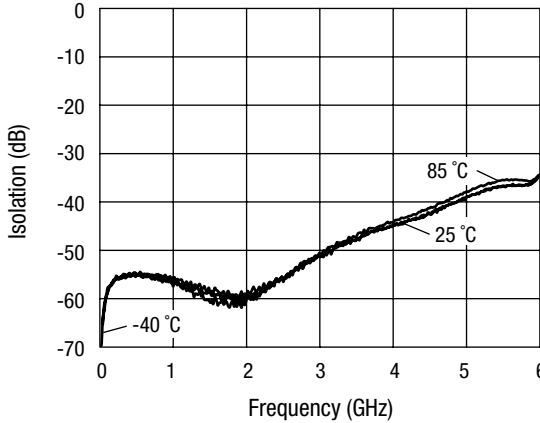
**Insertion Loss vs. Frequency**



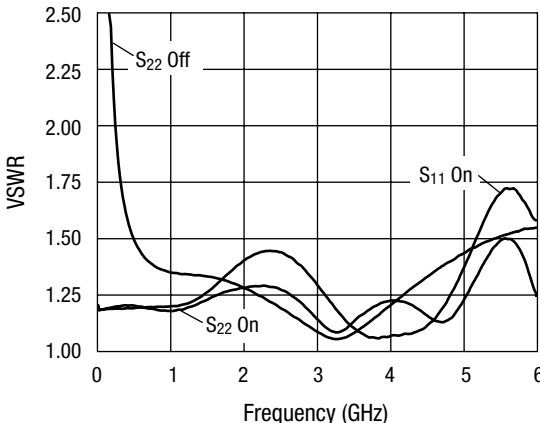
**Insertion Loss vs. Frequency  
-40, 25, 85 °C**



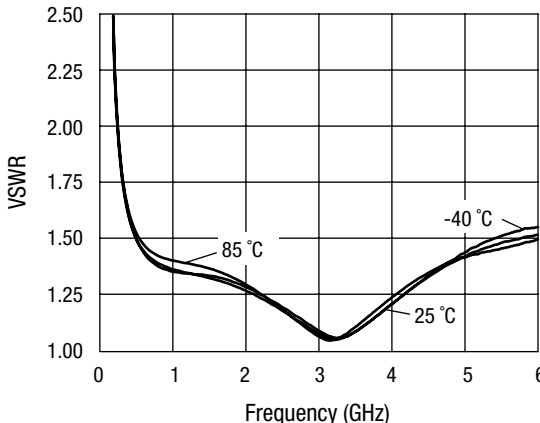
**Isolation vs. Frequency**



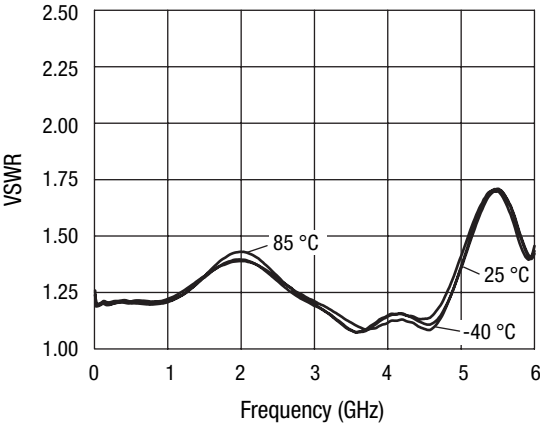
**Isolation vs. Frequency  
-40, 25, 85 °C**



**VSWR vs. Frequency**



**VSWR vs Frequency  
-40, 25, 85 °C (S<sub>22</sub> Off)**



**Input VSWR vs Frequency  
-40, 25, 85 °C**

### IP3 vs. Voltage and Temperature

| Control Voltage (V) | Temperature (°C) | IP3 @ 8 dBm Each Tone (dBm) |
|---------------------|------------------|-----------------------------|
| 3                   | -40              | 44                          |
| 3                   | 25               | 38                          |
| 3                   | 85               | 29.5                        |
| 5                   | -40              | 47.5                        |
| 5                   | 25               | 46.5                        |
| 5                   | 85               | 45.5                        |

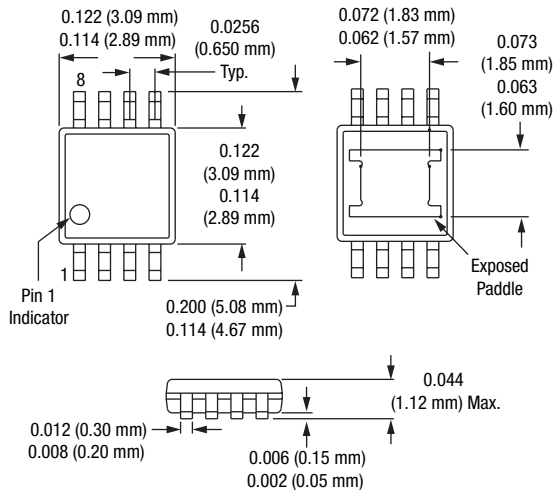
Tone frequencies: 900 and 901 MHz.

### Truth Table

| V <sub>1</sub>    | V <sub>2</sub>    | J <sub>1</sub> -J <sub>2</sub> | J <sub>1</sub> -J <sub>3</sub> |
|-------------------|-------------------|--------------------------------|--------------------------------|
| 0                 | V <sub>HIGH</sub> | Isolation                      | Insertion loss                 |
| V <sub>HIGH</sub> | 0                 | Insertion loss                 | Isolation                      |

All other conditions not recommended.  
V<sub>HIGH</sub> = 3 V to 5 V.

### MSOP-8 Exposed Pad



### Compression Point vs. Voltage and Temperature @ 900 MHz

| Control Voltage (V) | Temperature (°C) | Input Power @ 1 dB Compression (dBm) | Input power @ 0.1 dB Compression (dBm) |
|---------------------|------------------|--------------------------------------|--|
| 3                   | -40              | 20.5                                 | 16.5                                   |
| 3                   | 25               | 20                                   | 15.3                                   |
| 3                   | 85               | 19                                   | 14                                     |
| 5                   | -40              | 28.5                                 | 23                                     |
| 5                   | 25               | 28                                   | 23                                     |
| 5                   | 85               | 27.5                                 | 23                                     |

Frequency: 900 MHz.

### Absolute Maximum Ratings

| Characteristic        | Value  |
|-----------------------|--|
| RF input power        | 1 W max. for f > 500 MHz<br>100 mW for f < 500 MHz<br>V <sub>CTL</sub> = 0/8 V |
| Control voltage       | -0.2 V, +8 V   |
| Operating temperature | -40 °C to +85 °C   |
| Storage temperature   | -65 °C to +150 °C  |

Performance is guaranteed only under the conditions listed in the specifications table and is not guaranteed under the full range(s) described by the Absolute Maximum specifications. Exceeding any of the absolute maximum/minimum specifications may result in permanent damage to the device and will void the warranty.

**CAUTION:** Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions must be employed at all times.

### Recommended Solder Reflow Profiles

Refer to the [“Recommended Solder Reflow Profile”](#) Application Note.

### Tape and Reel Information

Refer to the [“Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation”](#) Application Note.

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