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DATA SHEET

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

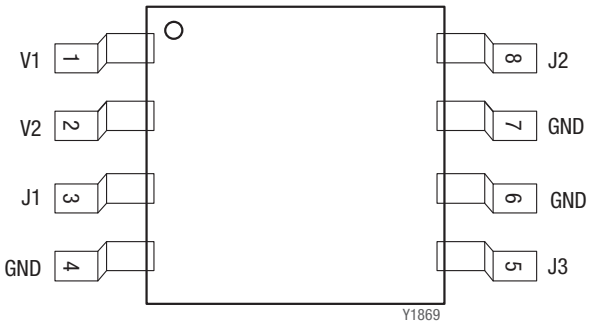
Applications

- 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)
- Three-switch solution for base station synthesizer switch
- Nonreflective
- Operation to 6 GHz
- Miniature lead (Pb)-free and RoHS-compliant MSOP-8 exposed pad package (MSL-1 @ 260 °C per JEDEC J-STD-020)

Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04–0074.



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

Figure 1. AS186-302LF Pinout Diagram

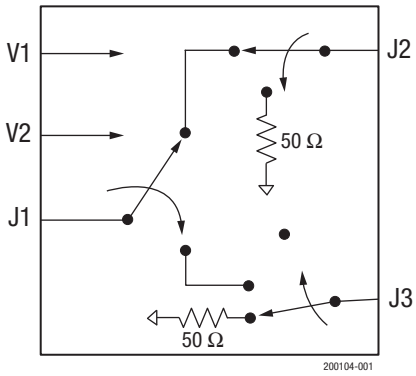


Figure 1. AS186-302LF Functional Block Diagram

Description

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

A functional block diagram for the AS186-302LF is shown in Figure 1. This device is available in an ultra-miniature SOT-6 package. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.

Table 1. AS186-302LF Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	V1	DC control voltage	5	J3	RF output
2	V2	DC control voltage	6	GND	Ground
3	J1	RF output	7	GND	Ground
4	GND	Ground	8	J2	RF output

Electrical and Mechanical Specifications

The absolute maximum ratings of the AS186-302LF are provided in Table 2. Electrical specifications are provided in Tables 3 through 6. The truth table is shown in Table 7.

Typical performance characteristics of the AS186-302LF are shown in Figures 2 through 8.

Table 2. Absolute Maximum Ratings[1]

Parameter	Symbol	Minimum	Typical	Maximum	Units
RF input power (V_{CTL} = 0/8 V) f > 500 MHz f < 500 MHz	P_{IN}		 100	 1	 W mW
Control voltage	V_{CTL}	–0.2		8	V
Operating temperature	T_{OP}	–40		+85	°C
Storage temperature	T_{STG}	–65		+150	°C
Electrostatic discharge: Human Body Model (HBM), Class 1A	ESD			 500	 V

[1] Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

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

Table 3. Electrical Specifications[1]
(–40 °C ≤ TOP ≤ +85 °C, VCTL = 0/5 V, Z0 = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Insertion loss	IL	LF to 2 GHz LF to 3 GHz LF to 4 GHz		0.8 0.9 1.0	1.05 1.15 1.25	dB dB dB
Isolation (Note 2)	ISO	LF to 2 GHz LF to 3 GHz LF to 4 GHz	50 45 35	55 50 40		dB dB dB
VSWR (On state)	VSWR	LF to 2 GHz LF to 4 GHz		1.3:1 1.3:1	1.5:1 1.6:1	
VSWR (Off state)	VSWR	0.5 to 4 GHz		1.35:1	1.7:1	

1 Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

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

Table 4. Electrical Specifications: Operating Characteristics
(–40 °C < TOP < +85 °C, VCTL = 0/5 V, Z0 = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Control voltages Low @ 20 μA max High	 VCTL_L VCTL_H		 0 3 (@ 100 μA)		 0.2 5 (@ 200 μA)	 V V
Input power for 1 dB compression	IP1dB	0.9 to 4 GHz: VCTL = 0/3 V VCTL = 0/5 V	 23 27	 25 30		 dBm dBm
Input third order intermodulation intercept point	IIP3	0.9 to 4 GHz, for two-tone input power 8 dBm: VCTL = 0/3 V VCTL = 0/5 V	 27 42	 38 46		 dBm dBm
Switching characteristics: Rise, fall time On, off time Video feedthru	 tR, tF tON, tOFF VFT	 10/90% or 90/10% RF 50% CTL to 90/10% RF tR = 3 ns, BW = 500 MHz		 30 50 25		 ns ns mV
Thermal resistance	θJA			25		°C/W

Table 5. 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

Table 6. IP3 vs Voltage and Temperature @ Tone Frequency: 900 and 901 MHz

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

Table 7. Truth Table

V1	V2	J1 to J2	J1 to J3
0	V_{HIGH}	Isolation	Insertion loss
V_{HIGH}	0	Insertion loss	Isolation

Typical Performance Characteristics

(–40 °C ≤ TOP ≤ +85 °C, VCTL = 0/5 V, Zo = 50 Ω, Unless Otherwise Noted)

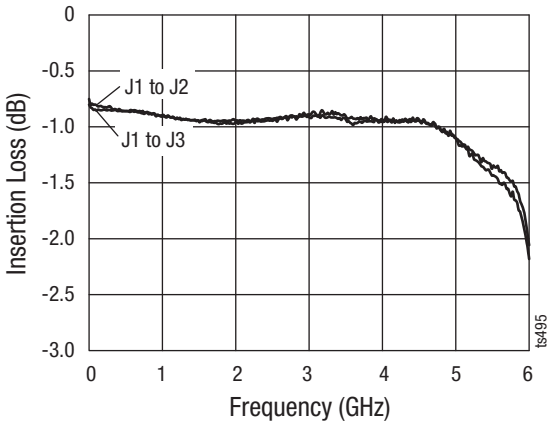


Figure 2. Insertion Loss vs Frequency

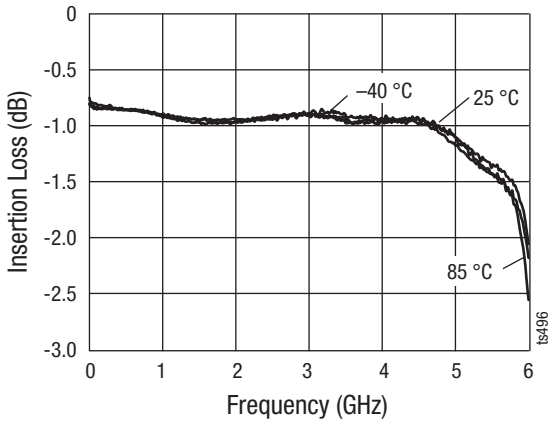


Figure 3. Insertion Loss vs Frequency at –40, 25, 85 °C

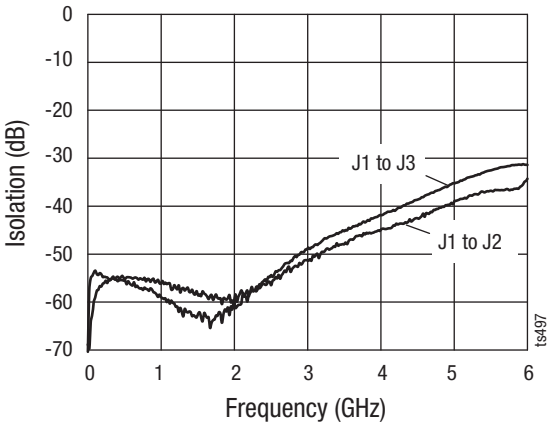


Figure 4. Isolation vs Frequency

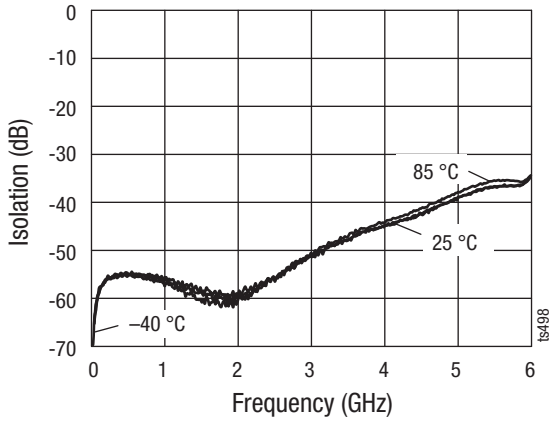


Figure 5. Isolation vs Frequency at –40, 25, 85 °C

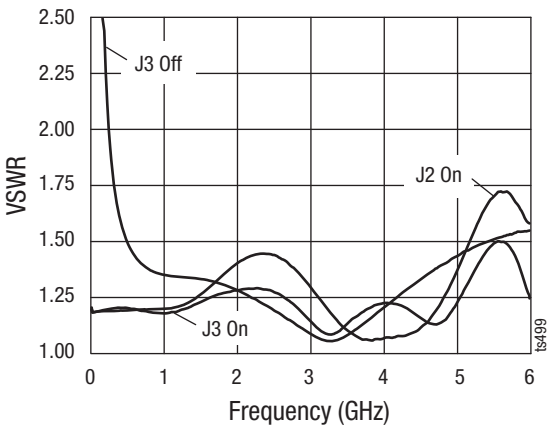


Figure 6. VSWR vs Frequency

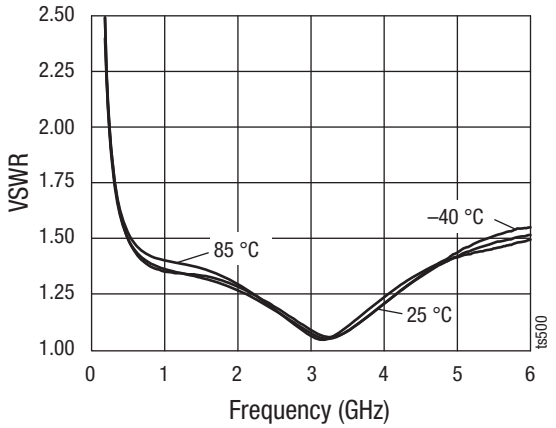


Figure 7. VSWR vs Frequency at –40, 25, 85 °C (J3 Off)

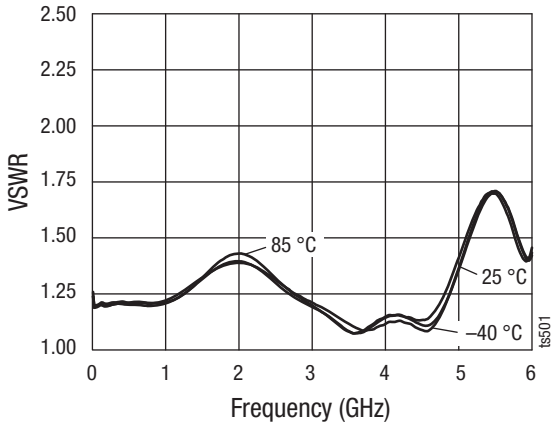


Figure 8. Input VSWR vs Frequency at –40, 25, 85 °C

Package Information

The MSOP-8 exposed pad plastic package is shown in Figure 9.

For the recommended solder reflow profiles, refer to the *"Recommended Solder Reflow Profile"* Application Note.

For tape and reel information, refer to the *"Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation"* Application Note.

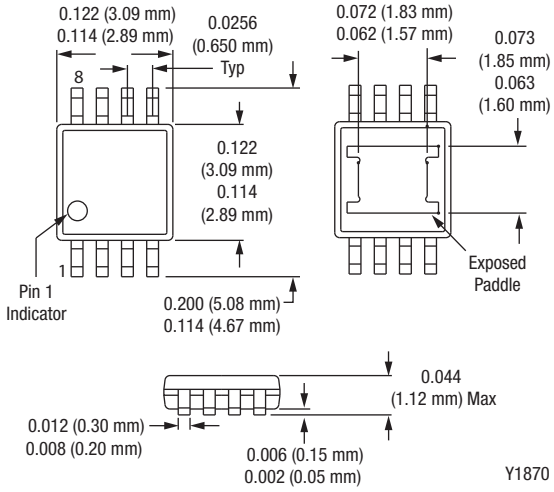


Figure 9. MSOP-8 Exposed Pad Package Dimension Drawing