DATA SHEET

SKY13270-92LF: 20 MHz-2.7 GHz GaAs SPDT Switch

Applications

- Transmit/receive and diversity switching over 3 W
- Analog and digital wireless communication systems including cellular, GSM, and UMTS

Features

- Broadband frequency range: 20 MHz to 2.7 GHz
- Very low insertion loss, 0.4 dB typical @ 1.0 GHz
- High isolation: 24 dB typical @ 1.0 GHz
- IP0.1dB = +37 dBm typical @ 3 V
- Low current consumption: <100 µA @ 3 V
- Ultra-miniature, SC-70 (6-pin, 2.00 x 1.25 mm) package (MSL1, 260 °C per JEDEC J-STD-020)

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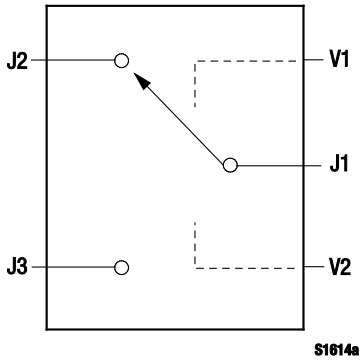


Figure 1. SKY13270-92LF Block Diagram

Description

The SKY13270-92LF is a pHEMT GaAs FET Single Pole Double Throw (SPDT) high linearity switch. This wideband switch is designed for use in systems operating from 20 MHz to 2.7 GHz for which extremely high linearity, low control voltage, high isolation, low insertion loss, and ultra-miniature package size are required.

The device is controlled with positive, negative, or a combination of both voltages. The RF signal paths within the device are fully bilateral.

The SKY13270-92LF is manufactured in a compact, low-cost 2.00 x 1.25 mm, 6-pin SC-70 package. A functional block diagram is shown in Figure 1. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.

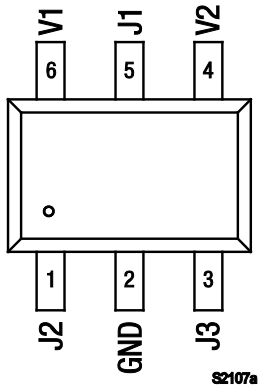


Figure 2. SKY13270-92LF Pinout –6-Pin SC-70 (Top View)

Table 1. SKY13270-92LF Signal Descriptions

Pin #	Name	Description	Pin #	Name	Description
1	J2	RF input/output. According to the logic voltage levels applied to the V1 and V2 pins, this port is either connected to J1 using a low insertion loss path or isolated from J1 (Note 1).	4	V2	DC control voltage input #2. The logic voltage applied to this pin, along with the voltage level applied to the V1 pin, determines the states of the RF paths between J1/J2 and J1/J3.
2	GND	Ground. Equipotential port, internal circuit common, which must connected to the PCB ground or common using the lowest possible impedance.	5	J1	RF input/output. According to the logic voltage levels applied to the V1 and V2 pins, this port is either connected to J2 or to J3 using a low insertion loss path and isolated from the other RF port (Note 1).
3	J3	RF input/output. According to the logic voltage levels applied to the V1 and V2 pins, this port is either connected to J1 using a low insertion loss path or isolated from J1 (Note 1).	6	V1	DC control voltage input #1. The logic voltage applied to this pin, along with the voltage level applied to the V2 pin, determines the states of the RF paths between J1/J2 and J1/J3.

Note 1: A 100 pF blocking capacitor is required for >500 MHz operation. Use larger value capacitors for lower frequency operation.

Table 2. SKY13270-92LF Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Control voltage	V_{CTL}	–0.2	+8.0	V
RF input power (V_{CTL} = 0-5 V @ 0.9 GHz)	P_{IN}		+37.8	dBm
Operating temperature	T_{OP}	–40	+85	°C
Storage temperature	T_{STG}	–65	+150	°C

Note: 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.

***CAUTION**: 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. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.*

Technical Description

The SKY13270-92LF is controlled using two voltage inputs, V1 and V2 (pins 6 and 4, respectively). Depending on the voltage level applied to these pins, the common RF port (J1) is connected to one of two RF ports (J2 or J3) using a low insertion loss path, while the path between J1 and the other RF port is in its isolation state.

When the control voltages are toggled, the states between J1 and J2, as well as J1 and J3, are also toggled.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY13270-92LF are provided in Table 2. Electrical specifications are provided in Table 3 and the operating characteristics are specified in Table 4.

Typical performance characteristics of the SKYA13270-92LF are illustrated in Figures 3 through 6.

The state of the SKY13270-92LF is determined by the logic provided in Table 5.

Table 3. SKY13270-92LF Electrical Specifications (Note 1)
(V_{CTL} = 0-3 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Insertion loss	IL	0.02 to 0.5 GHz 0.5 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz		0.40 0.45 0.50 0.60	0.50 0.50 0.60 0.70	dB dB dB dB
Isolation	Iso	0.02 to 0.5 GHz 0.5 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz	28 22 17 15	30 24 22 19		dB dB dB dB
Return loss (insertion loss state)	|S11|	0.02 to 2.7 GHz		18		dB
Switching characteristics: Rise/fall On/off Video feedthrough		 0/90% or 90/10% RF 50% control to 90/10% RF T_{RISE} = 1 ns, bandwidth = 500 MHz		 60 100 50		 ns ns mV
0.1 dB Input Compression Point	IP0.1dB	@ 48 MHz @ 900 MHz		+33.9 +37.0		dBm dBm
2nd and 3rd harmonics	2fo, 3fo	P_{IN} = +34.5 dBm @ 900 MHz		–65		dBc
Thermal resistance				25		°C/W
Control voltage: Low (@ 20 µA max) High (@100 µA max) High (@ 200 µA max)	 V_{CTL_L} V_{CTL_H} V_{CTL_H}		 0		 2.5 5.0	 V V V

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Typical Performance Characteristics

(V_{CTL} = 0-3 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_0] = 50 Ω, C_{BL} = 100 pF, Unless Otherwise Noted)

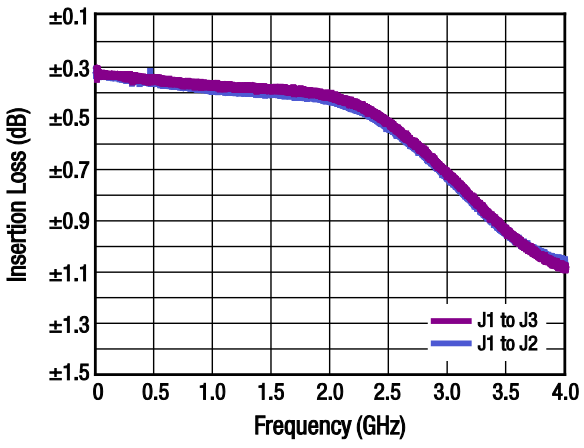


Figure 3. Insertion Loss vs Frequency

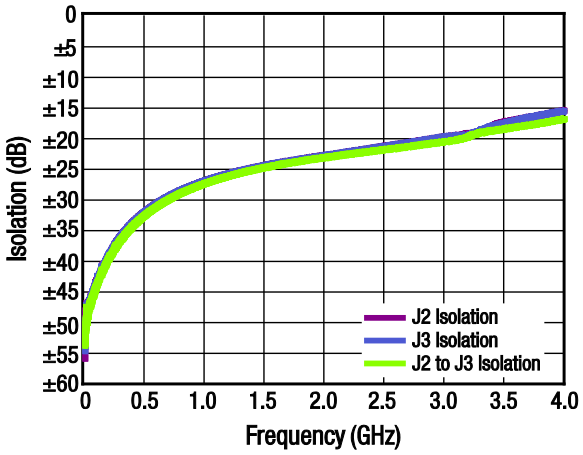


Figure 4. Isolation vs Frequency

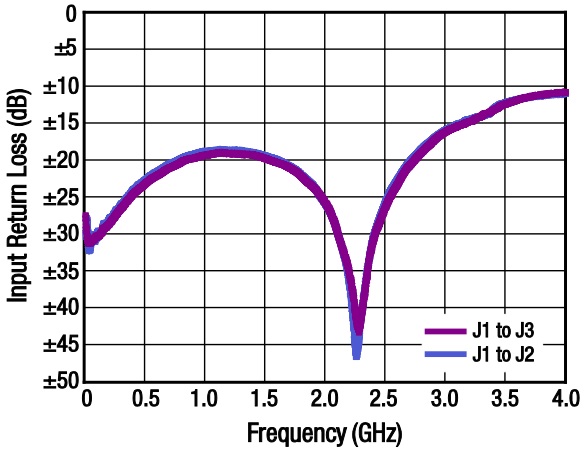


Figure 5. Input Return Loss (Insertion Loss State) vs Frequency

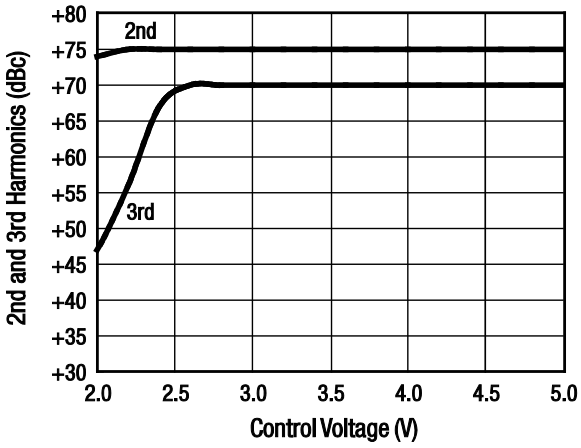


Figure 6. Second and Third Harmonics vs Control Voltage (Pin = +34.5 @ 900 MHz, GSM Signal)

Table 4. Truth Table (V_{HIGH} = 2 to 5 V)

V1	V2	J1-J2	J1-J3
V_{LOW}	V_{HIGH}	Isolation	Insertion loss
V_{HIGH}	V_{LOW}	Insertion loss	Isolation

Note: V_{LOW} = 0 to 0.2 V, V_{HIGH} = 2.5 to 5.0 V. Any state other than described in this Table places the device in an undefined state. An undefined state does not damage the device.

Evaluation Board Description

The SKY13270-92LF Evaluation Board is used to test the performance of the SKY13270-92LF SPDT switch. An Evaluation Board schematic diagram is provided in Figure 7. An assembly drawing for the Evaluation Board is shown in Figure 8.

Package Dimensions

Typical case markings are shown in Figure 9. Package dimensions for the 6-pin SC-70 are shown in Figure 10, and tape and reel dimensions are provided in Figure 11.

Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SKY13270-92LF is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

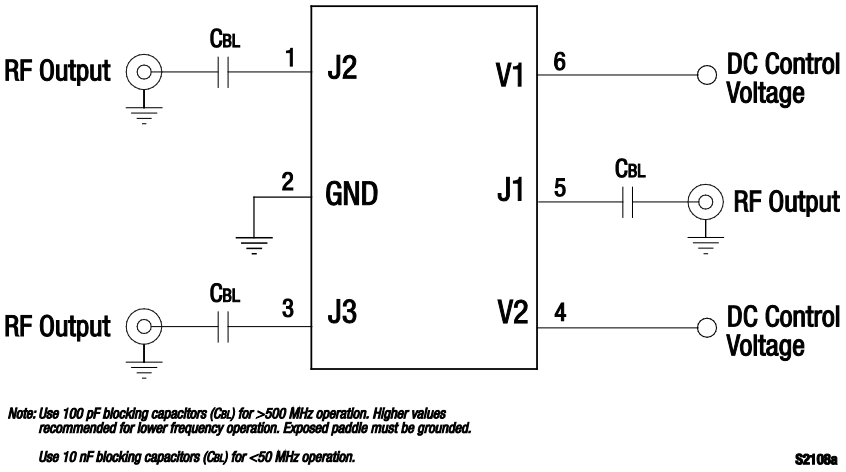


Figure 7. SKY13270-92LF Evaluation Board Schematic

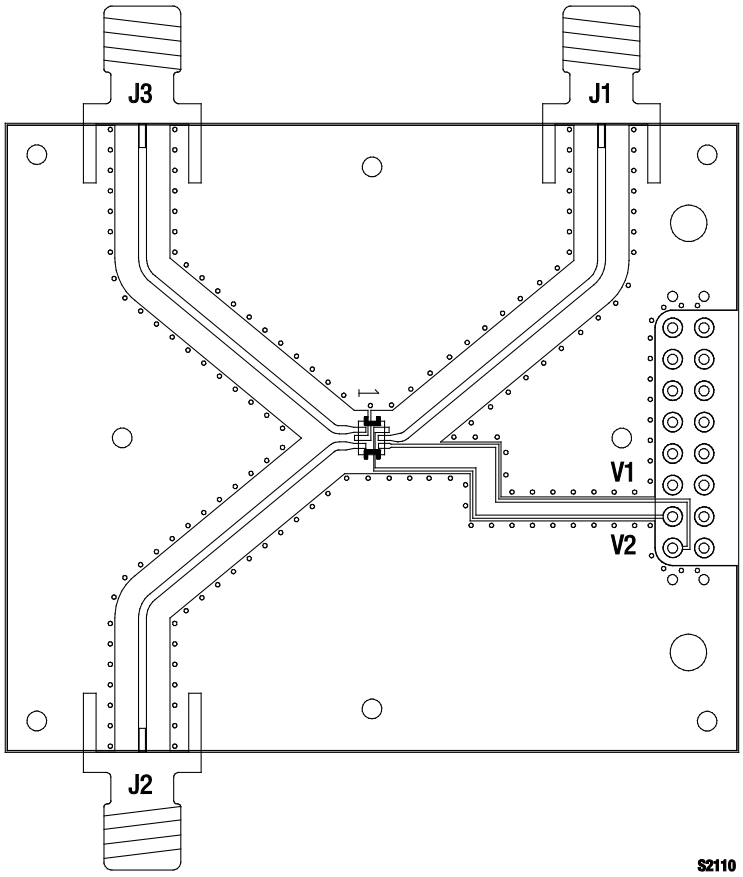


Figure 8. SKY13270-92LF Evaluation Board Assembly Diagram

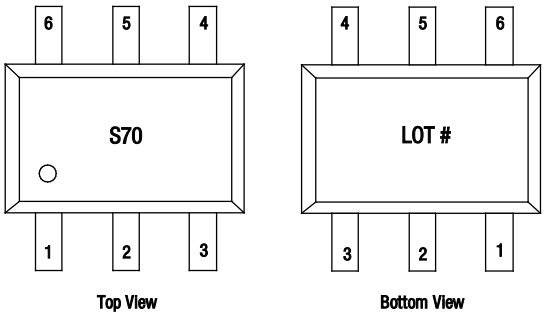
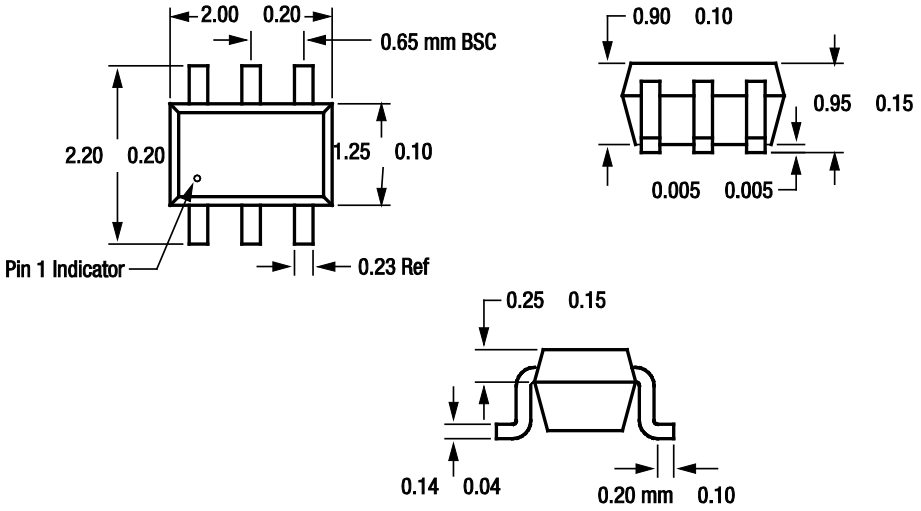


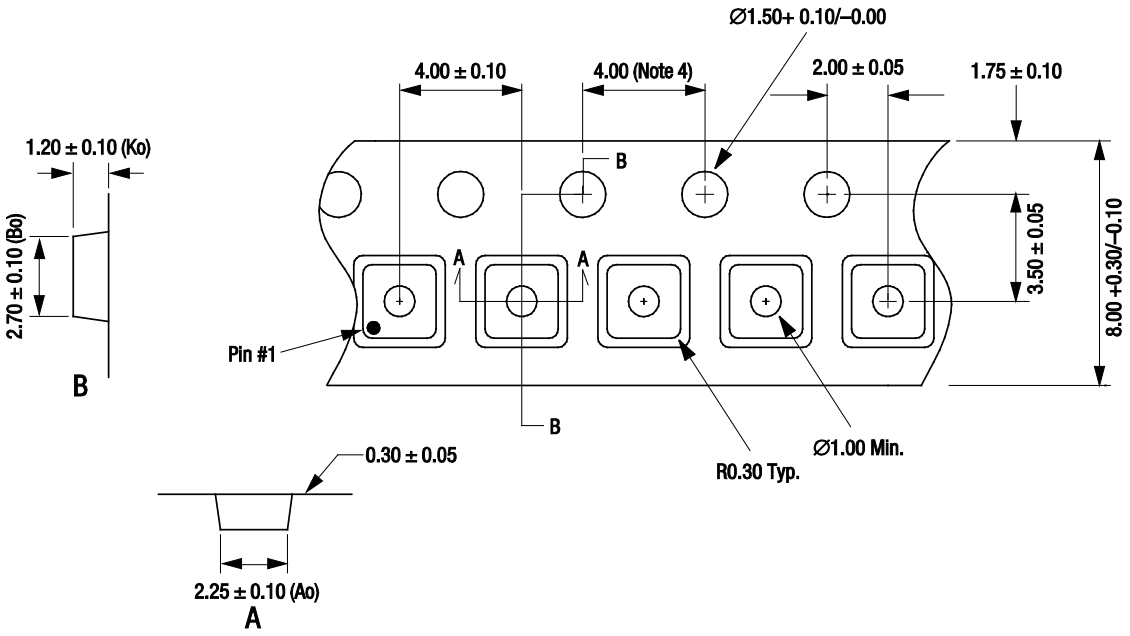
Figure 9. Typical Case Markings



All measurements are in millimeters

Dimensioning and tolerancing according to ASME Y14.5M-1994 **S1479**

Figure 10. SKY13270-92LF 6-Pin SC-70 Package Dimensions



Notes:
1. *Carrier tape: black conductive polystyrene.*
2. *Cover tape material: transparent conductive HSA.*
3. *Cover tape size: 5.40 mm width.*
4. *Ten sprocket hole pitch cumulative tolerance ±0.20 mm.*
5. *All measurements are in millimeters.*

S1581

Figure 11. SKY13270-92LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKY13270-92LF SPDT Switch	SKY13270-92LF	SKY13270-92LF-EVB

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