



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



**DATA SHEET**

# SKY13296-340LF: GaAs SP4T Absorptive Switch

## 20 MHz–2.5 GHz


**Features**

- Positive voltage control (0/3 V to 0/5 V)
- High isolation 35 dB at 1 GHz
- Integrated silicon CMOS driver
- Isolated ports are absorptive
- Use of external DC blocks to allow good return loss to low frequency
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020

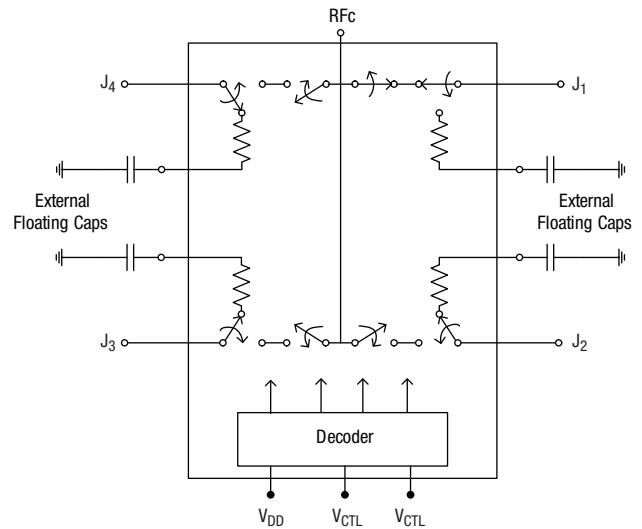
**Description**

The SKY13296-340LF is a pHEMT GaAs FET IC high isolation, absorptive single-pole four-throw switch packaged in a lead (Pb)-free, 4 x 4 mm, 20-lead exposed-pad plastic package for low-cost commercial applications. The use of external DC blocking capacitors on the RF ports and in series with the internal RF terminations enables the user to extend the range of good return loss to arbitrarily low frequency. This switch is an ideal building block for filter bank switching.

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



**Functional Diagram**



**Electrical Specifications**

**V<sub>CTL</sub> = 0 V/3V, T = 25 °C, P<sub>INPUT</sub> = 0 dBm, Z<sub>0</sub> = 50 Ω, C<sub>BLOCK</sub> = 1000 pF, C<sub>BYPASS</sub> = 1000 pF, unless otherwise noted**

Parameter	Frequency	Min.	Typ.	Max.	Unit
Insertion loss	0.02–1.00 GHz		0.4	0.6	dB
	1.00–2.00 GHz		0.6	0.8	dB
	2.00–2.50 GHz		0.7	1.1	dB
Isolation	0.02–1.00 GHz	35	40		dB
	1.00–2.00 GHz	25	30		dB
	2.00–2.50 GHz	21	26		dB
Return loss (Insertion loss state) Lower freq. return loss is dependent on DC blocks	0.02–1.00 GHz	12	18		dB
	1.00–2.00 GHz	9	13		dB
	2.00–2.50 GHz	7	13		dB
Return loss (Isolation state) Lower freq. return loss is dependent on DC blocks and floating caps	0.02–1.00 GHz	9.5	14		dB
	1.00–2.00 GHz	8.0	11		dB
	2.00–2.50 GHz	7.0	9		dB

## Operating Characteristics

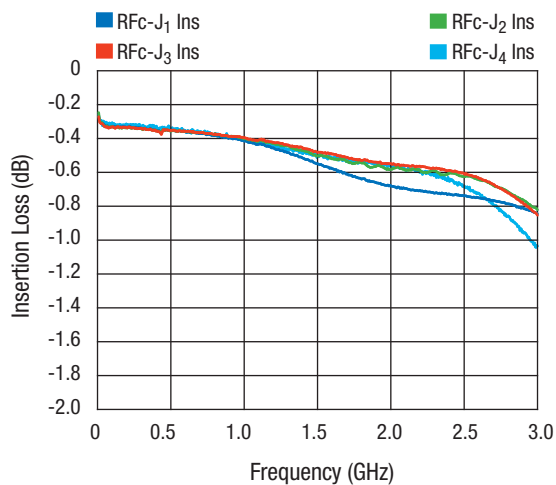
$V_{CTL} = 0\text{ V}/3\text{V}$ ,  $T = 25\text{ }^\circ\text{C}$ ,  $P_{INPUT} = 0\text{ dBm}$ ,  $Z_0 = 50\text{ }\Omega$ ,  $C_{BLOCK} = 1000\text{ pF}$ ,  $C_{BYPASS} = 1000\text{ pF}$ , unless otherwise noted

Parameter	Condition	Frequency	Min.	Typ.	Max.	Unit
Switching characteristics						
Rise/fall time	10/90% or 90/10% RF			25		ns
On/Off time	50% $V_{CTL}$ to 90/10% RF			50		ns
Input power for 0.1 dB compression	$V_{DD} = 3\text{ V}$	870 MHz	13	16		dBm
Intermodulation intercept point (IP3)	For two tone input power 8 dbm/tone 1 MHz spacing, $V_{DD} = 3\text{ V}$	900 MHz		40		dBm
Control voltages <sup>(1)</sup>	$V_{CTL\text{ LOW}}$ $V_{CTL\text{ HIGH}}$		0 2.75		0.2 $V_{DD}$	V V
Supply voltage ( $V_{DD}$ )			3		5.5	V
Supply currents	$V_{DD} = 3\text{ V}$ $V_{CTL\text{ LOW}}, V_{CTL\text{ HIGH}}$			5 5		$\mu\text{A}$ $\mu\text{A}$

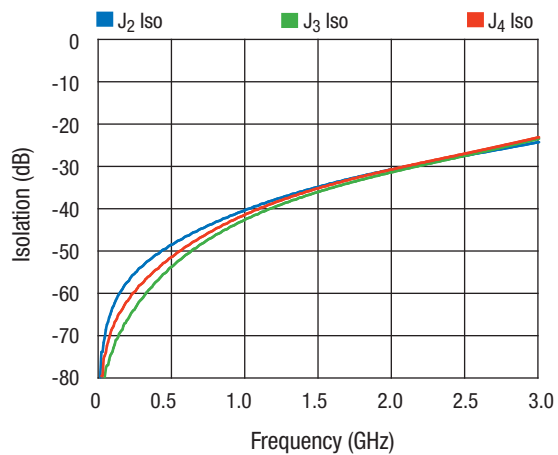
1. Control voltages switch the  $V_{DD}$  voltage to the GaAs switch.  
 $V_{DD}$  must be powered on prior to a  $V_{CTL}$  high signal. A latch up condition may occur if a logic high signal is applied prior to the  $V_{DD}$  voltage.

## Typical Performance Data

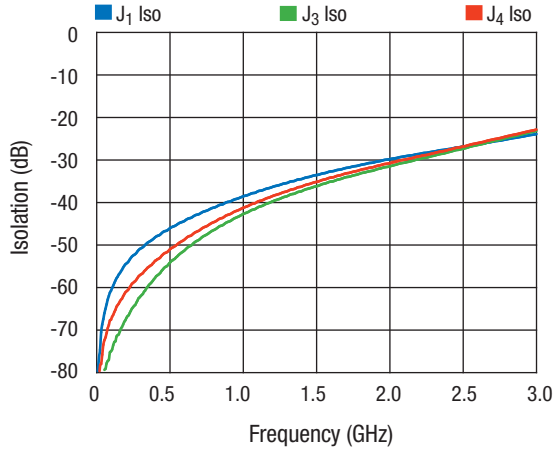
$V_{CTL} = 0\text{ V}/3\text{V}$ ,  $T = 25\text{ }^\circ\text{C}$ ,  $P_{INPUT} = 0\text{ dBm}$ ,  $Z_0 = 50\text{ }\Omega$ ,  $C_{BLOCK} = 1000\text{ pF}$ ,  $C_{BYPASS} = 1000\text{ pF}$ , unless otherwise noted



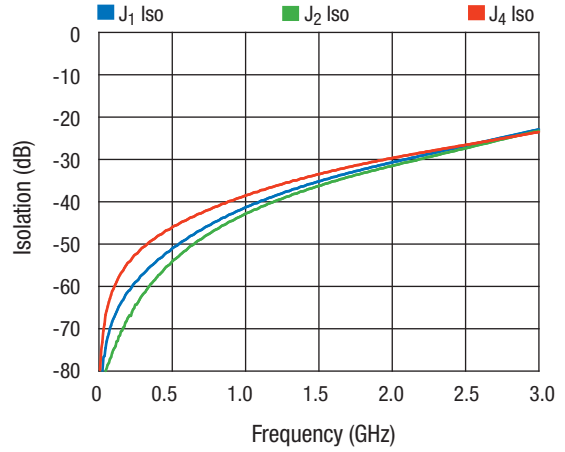
Typical Insertion Loss



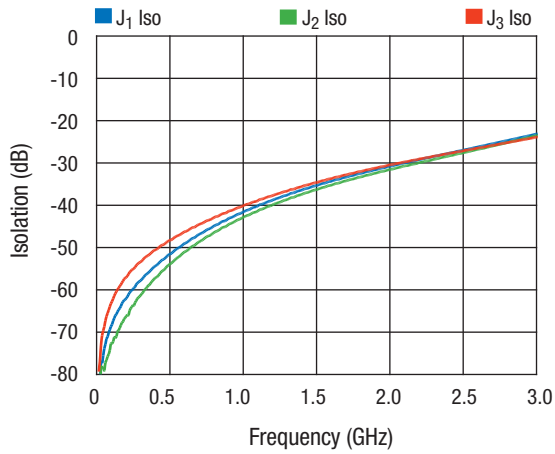
Typical Isolation RFC-J1 Path On



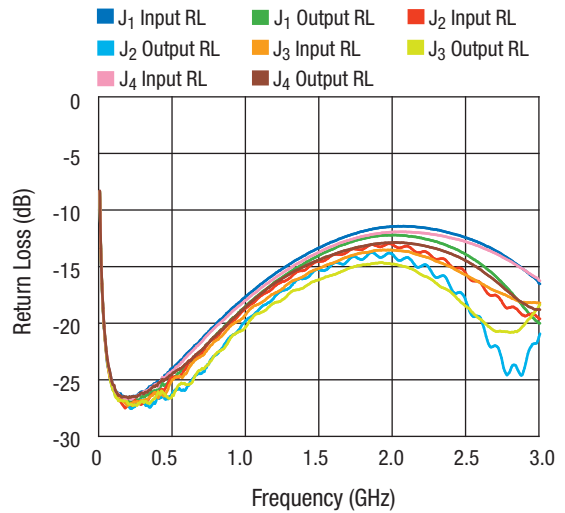
**Typical Isolation RFC-J<sub>2</sub> Path On**



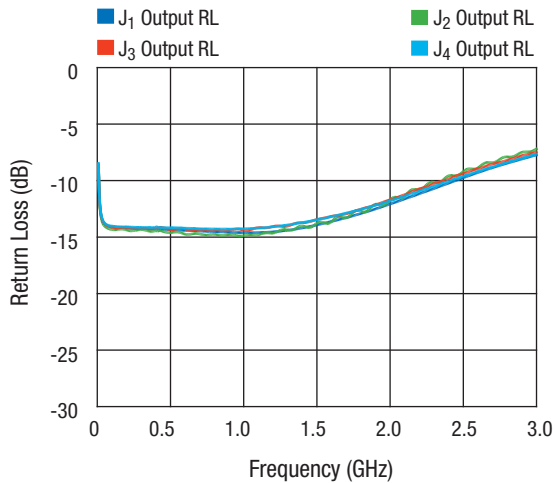
**Typical Isolation RFC-J<sub>3</sub> Path On**



**Typical Isolation RFC-J<sub>4</sub> Path On**

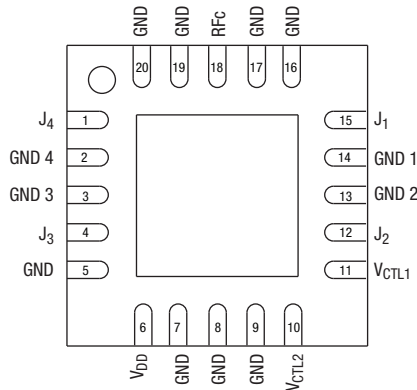


**Typical Return Loss  
Insertion Loss States**



**Typical Return Loss  
Isolation States**

### Pin Out (Top View X-ray of Pads on Bottom of Package)



DC blocks are required on RfC, J<sub>1</sub>, J<sub>2</sub>, J<sub>3</sub>, J<sub>4</sub>.  
Floating caps are required on Gnd 1, Gnd 2, Gnd 3, Gnd 4.

### Truth Table

V <sub>DD</sub>	V <sub>CTL 1</sub>	V <sub>CTL 2</sub>	RfC-J <sub>1</sub>	RfC-J <sub>2</sub>	RfC-J <sub>3</sub>	RfC-J <sub>4</sub>
1	0	0	Ins. Loss	Isolation	Isolation	Isolation
1	1	0	Isolation	Ins. Loss	Isolation	Isolation
1	0	1	Isolation	Isolation	Ins. Loss	Isolation
1	1	1	Isolation	Isolation	Isolation	Ins. Loss

V<sub>DD</sub> must be powered on prior to a VCTL high signal.  
"0" = 0 to 0.2 V.  
"1" = 2.75 to V<sub>DD</sub> V.  
V<sub>DD</sub> = 3 V to 5 V.

### Absolute Maximum Ratings

Characteristic	Value
V <sub>DD</sub> voltage range	2.75 ≤ V <sub>DD</sub> ≤ 5.5 V
RF input power @ 5.5 V	1 W, f > 500 MHz
Operating temperature	-40 °C to +85 °C
Storage temperature	-65 °C to +150 °C

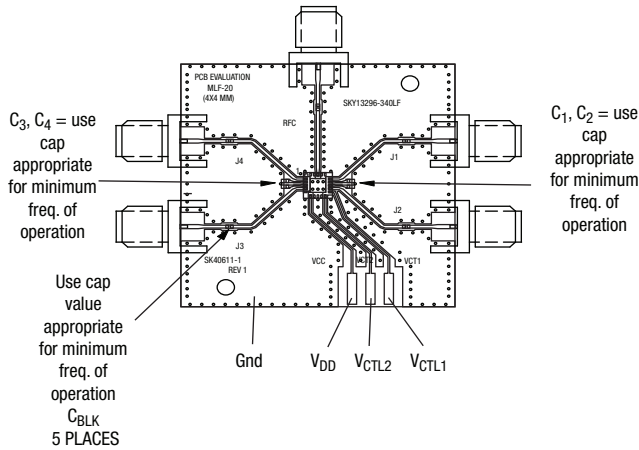
Performance is guaranteed only under the conditions listed in the specifications table and is not guaranteed under the full range(s) described by the Absolute Maximum specifications. Exceeding any of the absolute maximum/minimum specifications may result in permanent damage to the device and will void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

### Pin Assignments

Pin	Symbol	Description
1	J <sub>4</sub>	RF port. Must be DC blocked with a capacitor appropriate for lowest frequency of operation
2	GND 4	AC Ground for J <sub>4</sub> RF port. Must be DC blocked using a capacitor appropriate for lowest frequency of desired input return loss on J <sub>4</sub> port
3	GND 3	AC Ground for J <sub>3</sub> RF port. Must be DC blocked using a capacitor appropriate for lowest frequency of desired input return loss on J <sub>3</sub> port
4	J <sub>3</sub>	RF port. Must be DC blocked with a capacitor appropriate for lowest frequency of operation
5	GND	DC Ground
6	V <sub>DD</sub>	Supply voltage for decoder
7	GND	DC Ground
8	GND	DC Ground
9	GND	DC Ground
11	V <sub>CTL 1</sub>	DC control voltage applied to decoder
10	V <sub>CTL 2</sub>	DC control voltage applied to decoder
12	J <sub>2</sub>	RF port. Must be DC blocked with a capacitor appropriate for lowest frequency of operation
13	GND 2	AC Ground for J <sub>2</sub> RF port. Must be DC blocked using a capacitor appropriate for lowest frequency of desired input return loss on J <sub>2</sub> port
14	GND 1	AC Ground for J <sub>1</sub> RF port. Must be DC blocked using a capacitor appropriate for lowest frequency of desired input return loss on J <sub>1</sub> port
15	J <sub>1</sub>	RF port. Must be DC blocked with a capacitor appropriate for lowest frequency of operation
16	GND	DC Ground
17	GND	DC Ground
18	RfC	RF common port. Must be DC blocked with a capacitor appropriate for lowest frequency of operation
19	GND	DC Ground
20	GND	DC Ground
Exposed Paddle		DC Ground

### Evaluation Board



$C_{BLOCK} = 1000 \text{ pF}$  for operating frequency > 20 MHz.  
 $C_{BYPASS} C_1-C_4 = 1000 \text{ pF}$  for operating frequency > 20 MHz.

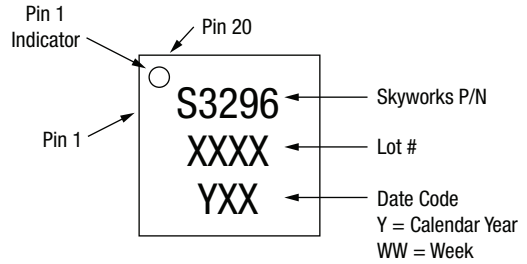
### Recommended Solder Reflow Profiles

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

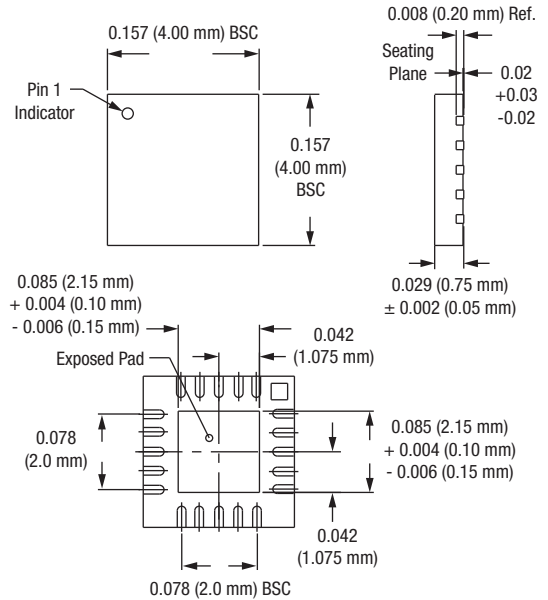
### Tape and Reel Information

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

### Part Marking



### QFN-20 (4 x 4)



Copyright © 2002, 2003, 2004, 2005, 2006, Skyworks Solutions, Inc. All Rights Reserved.

Information in this document is provided in connection with Skyworks Solutions, Inc. ("Skyworks") products or services. These materials, including the information contained herein, are provided by Skyworks as a service to its customers and may be used for informational purposes only by the customer. Skyworks assumes no responsibility for errors or omissions in these materials or the information contained herein. Skyworks may change its documentation, products, services, specifications or product descriptions at any time, without notice. Skyworks makes no commitment to update the materials or information and shall have no responsibility whatsoever for conflicts, incompatibilities, or other difficulties arising from any future changes.

No license, whether express, implied, by estoppel or otherwise, is granted to any intellectual property rights by this document. Skyworks assumes no liability for any materials, products or information provided hereunder, including the sale, distribution, reproduction or use of Skyworks products, information or materials, except as may be provided in Skyworks Terms and Conditions of Sale.

THE MATERIALS, PRODUCTS AND INFORMATION ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, INCLUDING FITNESS FOR A PARTICULAR PURPOSE OR USE, MERCHANTABILITY, PERFORMANCE, QUALITY OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT; ALL SUCH WARRANTIES ARE HEREBY EXPRESSLY DISCLAIMED. SKYWORKS DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. SKYWORKS SHALL NOT BE LIABLE FOR ANY DAMAGES, INCLUDING BUT NOT LIMITED TO ANY SPECIAL, INDIRECT, INCIDENTAL, STATUTORY, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS THAT MAY RESULT FROM THE USE OF THE MATERIALS OR INFORMATION, WHETHER OR NOT THE RECIPIENT OF MATERIALS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Skyworks products are not intended for use in medical, lifesaving or life-sustaining applications, or other equipment in which the failure of the Skyworks products could lead to personal injury, death, physical or environmental damage. Skyworks customers using or selling Skyworks products for use in such applications do so at their own risk and agree to fully indemnify Skyworks for any damages resulting from such improper use or sale.

Customers are responsible for their products and applications using Skyworks products, which may deviate from published specifications as a result of design defects, errors, or operation of products outside of published parameters or design specifications. Customers should include design and operating safeguards to minimize these and other risks. Skyworks assumes no liability for applications assistance, customer product design, or damage to any equipment resulting from the use of Skyworks products outside of stated published specifications or parameters.

Skyworks, the Skyworks symbol, and "Breakthrough Simplicity" are trademarks or registered trademarks of Skyworks Solutions, Inc., in the United States and other countries. Third-party brands and names are for identification purposes only, and are the property of their respective owners. Additional information, including relevant terms and conditions, posted at [www.skyworksinc.com](http://www.skyworksinc.com), are incorporated by reference.