

PRELIMINARY DATA SHEET

SKY12325-350LF: 3-Bit Digital Attenuator

500 MHz–6 GHz, 1 dB LSB

Features

- Broadband: 500 MHz–6 GHz
- Attenuation range: 7 dB
- Positive control voltage
- Resolution: 1 dB
- Miniature QFN-16 3 x 3 mm package
- Available lead (Pb)-free and RoHS-compliant

Applications

- Cellular BTS
- General-purpose level control

Description

The SKY12325-350 is a 3-bit digital attenuator in a low cost QFN-16, 3 x 3 mm package. The attenuation bits are binary weighted, with the least significant bit (LSB) 1 dB. States are selected by 3 positive-voltage control inputs. DC blocking capacitors are required at each RF port. Both RF ports are absorptive.

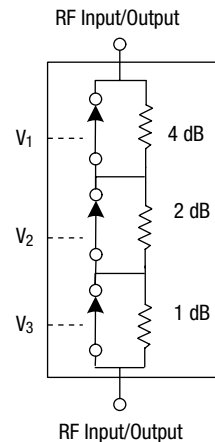
The QFN-16 package is lead (Pb)-free and complies with current RoHS requirements.

The attenuator can operate over the temperature range of -40 °C to +85 °C.

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



Functional Block Diagram



Electrical Specifications at 25°C

$V_{CTL} = 0\text{ V}/5\text{ V}$, $T = 25\text{ °C}$, $P_{INPUT} = 0\text{ dBm}$, $Z_0 = 50\ \Omega$, unless otherwise noted

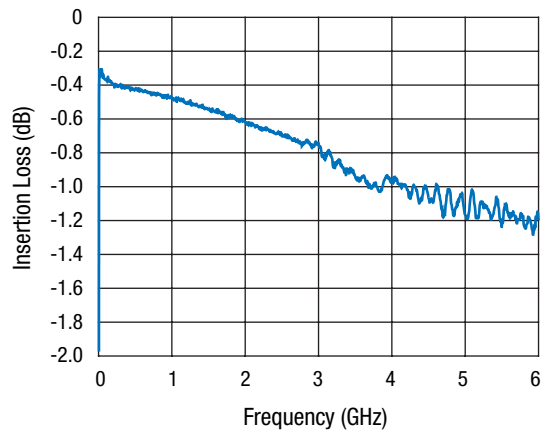
Parameter	Frequency	Min.	Typ.	Max.	Unit
Insertion loss	0.5–3.0 GHz		0.7	0.9	dB
	3.0–4.5 GHz		0.9	1.1	dB
	4.5–6.0 GHz		1.3	1.5	dB
Attenuation range			7		dB
Attenuation accuracy	0.5–4.0 GHz	± (0.2 + 3% of attenuation setting in dB)			dB
	4.0–6.0 GHz	± (0.3 + 3% of attenuation setting in dB)			dB
Return loss	0.5–3.5 GHz		15		dB
	3.5–6.0 GHz		15		dB

Operating Characteristics at 25°C

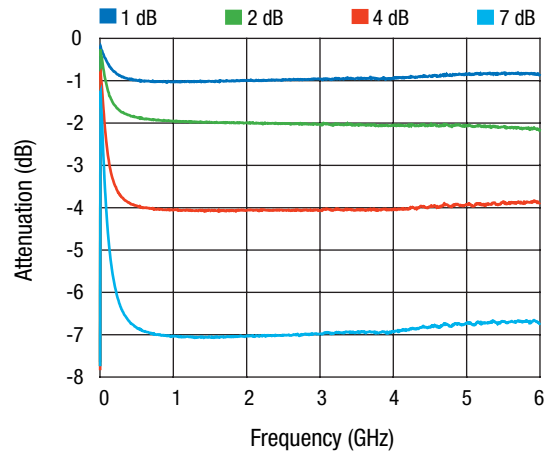
T = 25 °C, Z₀ = 50 Ω, unless otherwise noted

Parameter	Condition	Frequency	Min.	Typ.	Max.	Unit
Input power for 1 dB compression	V _{DD} = 3 V	0.5–6.0 GHz		24		dBm
	V _{DD} = 5 V			27		
Input third order intermodulation intercept	For two-tone input power 5 dBm, Δf = 1 MHz	0.5–6.0 GHz		44		dBm
	V _{LOW} = 0 V, V _{HIGH} = 3 V V _{LOW} = 0 V, V _{HIGH} = 5 V			47		
Control voltages	V _{LOW} = 0 V to 0.8 V @ 50 μA max. V _{HIGH} = 3 V to V _{DD} @ 50 μA max.					

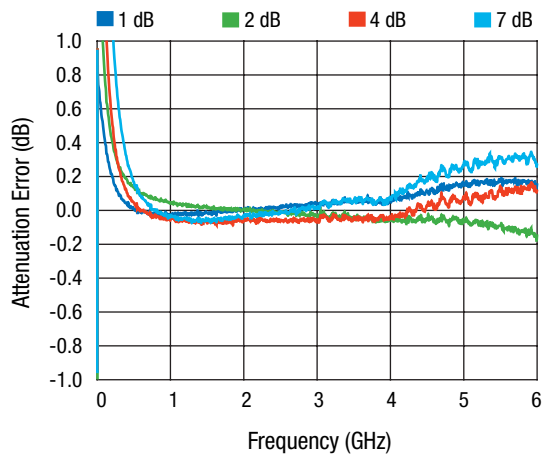
Typical Performance Data



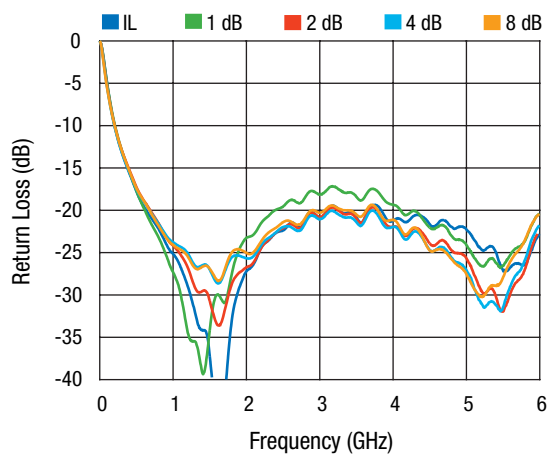
Insertion Loss vs. Frequency



Attenuation vs. Frequency, Normalized to Insertion Loss



Attenuation Error vs. Frequency



Return Loss vs. Frequency

Absolute Maximum Ratings

Characteristic	Value
RF input power	30 dBm
Supply voltage	6 V
Control voltage	$0 V \leq V_C \leq 6 V$
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.

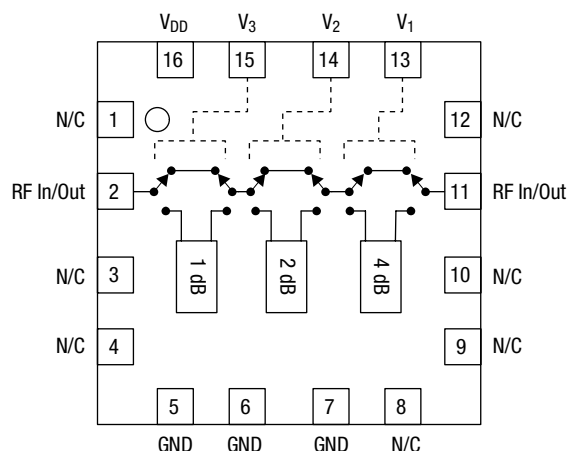
CAUTION: Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without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

Truth Table

Control Voltage ¹			Attenuation (dB) ²
V ₁	V ₂	V ₃	
V _{LOW}	V _{LOW}	V _{LOW}	7
V _{LOW}	V _{LOW}	V _{HIGH}	6
V _{LOW}	V _{HIGH}	V _{LOW}	5
V _{LOW}	V _{HIGH}	V _{HIGH}	4
V _{HIGH}	V _{LOW}	V _{LOW}	3
V _{HIGH}	V _{LOW}	V _{HIGH}	2
V _{HIGH}	V _{HIGH}	V _{LOW}	1
V _{HIGH}	V _{HIGH}	V _{HIGH}	0

1. $+2.7 V \leq V_{HIGH} \leq +5.5 V, -0.2 \leq V_{LOW} \leq +0.2 V$.
 2. Attenuation normalized to insertion loss

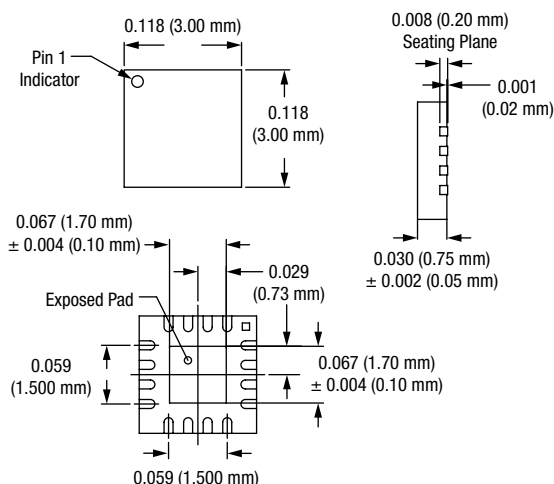
Pin Out



Pin Descriptions

Pin Number	Pin Name	Description
1, 3, 4, 8, 9, 10, 12	N/C	Not connected
2, 11	J ₂	RF Input/Output - RF input or output port, supply voltage input. External DC block required
5, 6, 7	GND	Equipotential Point - Equipotential points for control voltages and RF circuits. Must be connected to pcb ground via lowest possible impedance
13	V ₁	Control Voltage - High Impedance control voltage input for 4 dB weighted bit (MSB)
14	V ₂	Control Voltage - High Impedance control voltage input for 2 dB weighted bit
15	V ₃	Control Voltage - High Impedance control voltage input for 1 dB weighted bit (LSB)
16	V _{DD}	Supply Voltage - Supply voltage, $2.7 V \leq V_{DD} \leq 5.5 V$

-350 (QFN 3 x 3)



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.

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, are incorporated by reference.