

DATA SHEET

SKY12324-73, SKY12324-73LF: GaAs IC 2-Bit Digital Attenuator 4 dB LSB 0.5–4 GHz

Features

- 4 dB LSB steps to 12 dB
- Single positive control voltage per bit
- Low insertion loss
- Low-cost SOT-6 plastic package
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020

Description

The SKY12324-73 is a 2-bit digital attenuator fabricated with Skyworks GaAs PHEMT technology. The two attenuation bits, 4 and 8 dB, can be independently switched into or out of the signal path according to the magnitudes of the control voltages applied to the two high-impedance control voltage inputs. The RF ports are internally matched to 50 Ω and are fully bilateral. The SKY12324-73 is packaged in the SOT-6 package.

The SKY12324-73 is ideally suited for use in applications where low insertion loss, excellent attenuation accuracy and excellent intermodulation distortion performance are required. These applications include cellular telephone base stations, test instruments and wireless data level control circuits.

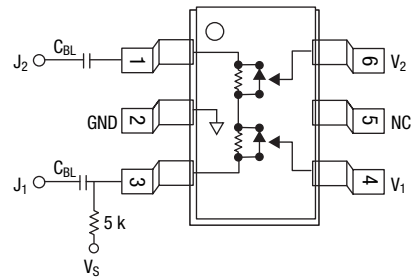
A populated evaluation board is available.

NEW

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



Pin Out (Top View)



DC blocking capacitors (C_{BL}) must be supplied externally for positive voltage operation. $C_{BL} = 47$ pF for operation > 500 MHz.



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Electrical Specifications at 25 °C

$Z_0 = 50 \Omega$, $V_{CTL} = 0/3 V$, $V_S = 3 V$, unless otherwise noted

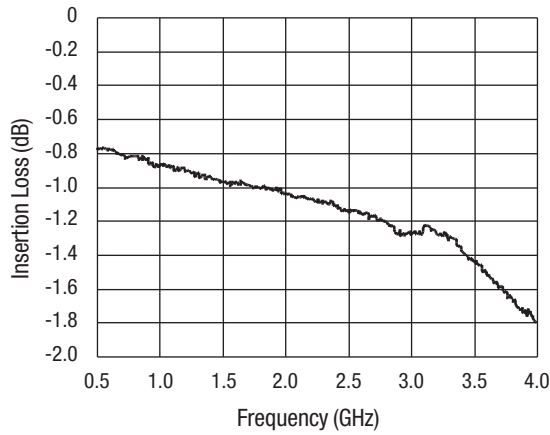
Parameter	Frequency	Min.	Typ.	Max.	Unit
Insertion loss	0.5–1.0 GHz		0.9	1.0	dB
	1.0–2.0 GHz		1.0	1.2	dB
	2.0–2.5 GHz		1.2	1.3	dB
	2.5–3.0 GHz		1.3	1.4	dB
	3.0–4.0 GHz		2.0	2.1	dB
Attenuation range		12			dB
Attenuation accuracy	0.5–1.0 GHz	± (0.2 + 3% of attenuation setting in dB)			dB
	1.0–3.0 GHz	± (0.3 + 5% of attenuation setting in dB)			dB
	3.0–4.0 GHz	± (0.4 + 5% of attenuation setting in dB)			dB
Return loss (insertion loss state)	0.5–3.0 GHz	15	20		dB
	3.0–4.0 GHz	12	15		dB
Return loss (attenuation state)	0.5–3.0 GHz	12	18		dB
	3.0–4.0 GHz	12	15		dB

Operating Characteristics at 25 °C

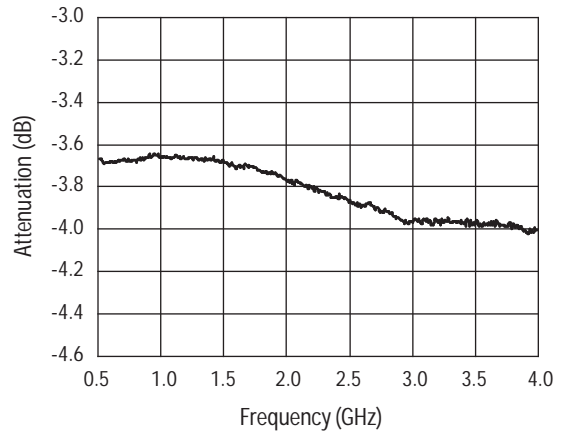
Parameter	Condition	Frequency	Min.	Typ.	Max.	Unit
Switching characteristics						
Rise, fall	10/90% or 90/10% RF			40		ns
On, Off	50% CTL to 90/10% RF			100		ns
Video feedthru	$T_{RISE} = 1 \text{ ns}$, $BW = 500 \text{ MHz}$			50		mV
Input power for 1dB compression	$V_S = 3 V$	900 MHz		30		dBm
Intermodulation intercept point (IIP3)	Two-tone 15 dBm each	1.0 GHz		46		dBm
		3.0 GHz		44		dBm
V_S voltage	V_S		3		5	V
Control voltage	V_{LOW}		0		0.2	V
Control voltage	V_{HIGH}		$V_S - 0.2$		$V_S + 0.2$	V
Control current	V_{LOW}			10	20	uA
Control current	$V_{HIGH} = 3 V$			50	100	uA
Control current	$V_{HIGH} = 5 V$			100	200	uA

Typical Performance Data

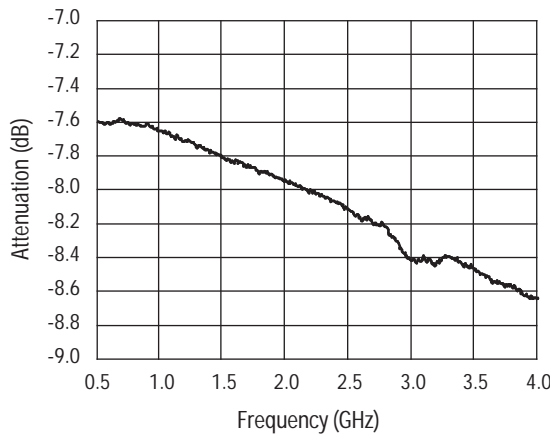
T = 25°C, Z₀ = 50 Ω, V_{CTL} = 0/3 V, V_S = 3 V, unless otherwise noted



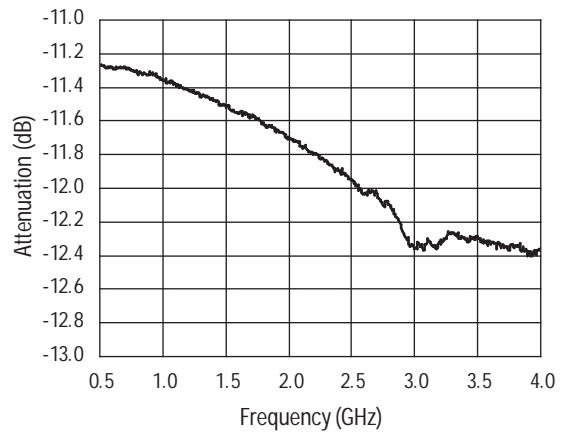
Insertion Loss vs. Frequency



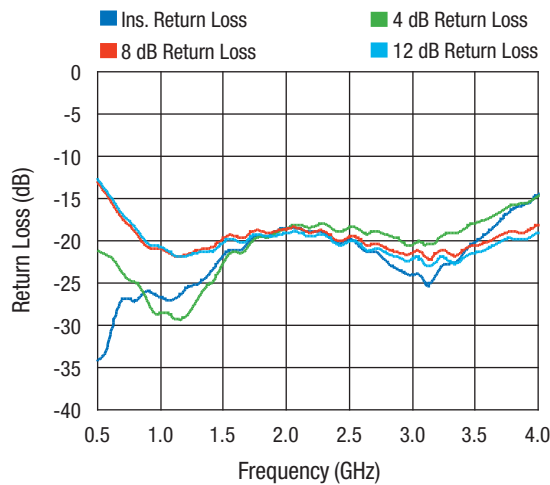
4 dB Bit Attenuation vs. Frequency



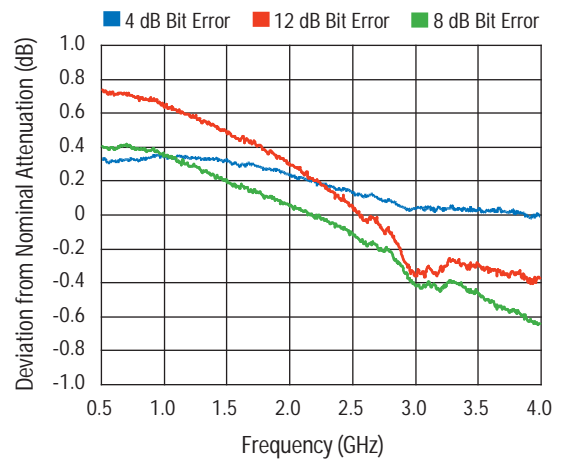
8 dB Bit Attenuation vs. Frequency



12 dB Bit Attenuation vs. Frequency



Return Loss vs. Frequency



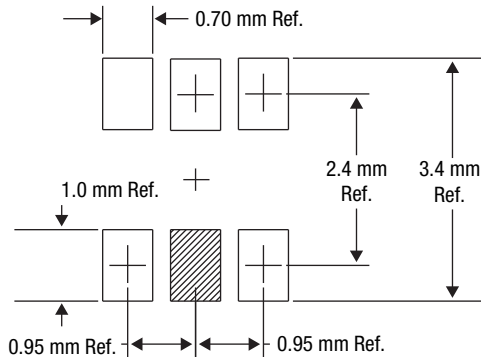
Attenuation Accuracy vs. Frequency

Truth Table

V ₁ (8 dB)	V ₂ (4 dB)	J ₁ -J ₂
High	High	Reference I.L.
High	Low	4 dB
Low	High	8 dB
Low	Low	12 dB

V_{HIGH} = 3 to 5 V (V_S = V_{HIGH} ± 0.2 V).

Suggested Land Pattern



Pin Descriptions

Pin Number	Pin Name	Description
1	J ₂	RF Input/Output – RF input/output with 50 Ω nominal impedance. An internally generated DC voltage is present at this pin, so an external DC block must be used to connect this pin to the external circuit.
2	Ground	Equipotential Point – Internal circuit common, which must be connected to the pcb ground or common via the lowest possible impedance.
3	J ₁	RF Output/Input – DC supply voltage input and RF output/input with 50 Ω nominal impedance. The nominal voltage required at this pin is listed in the Specifications table. Supply current must be limited by an external resistor connected between the DC power supply and this pin.
4	V ₁	Control Voltage 1 – High input-impedance control port for the 8 dB bit. The high control voltage applied to this pin must be within 0.2 V of the supply voltage applied to pin 3, or the part may be permanently damaged. The low control voltage is 0 V nominal.
5	NC	No internal connection
6	V ₂	Control Voltage 2 – High input-impedance control port for the 4 dB bit. The high control voltage applied to this pin must be within 0.2 V of the supply voltage applied to pin 3, or the part may be permanently damaged. The low control voltage is 0 V nominal.

Absolute Maximum Ratings

Characteristic	Value
RF input power, V _{CTL} = 0/8 V	31 dBm
Supply voltages	8 V
Control voltages	-0.2 V, +8 V
V _{HIGH}	V _S ± 0.2 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.

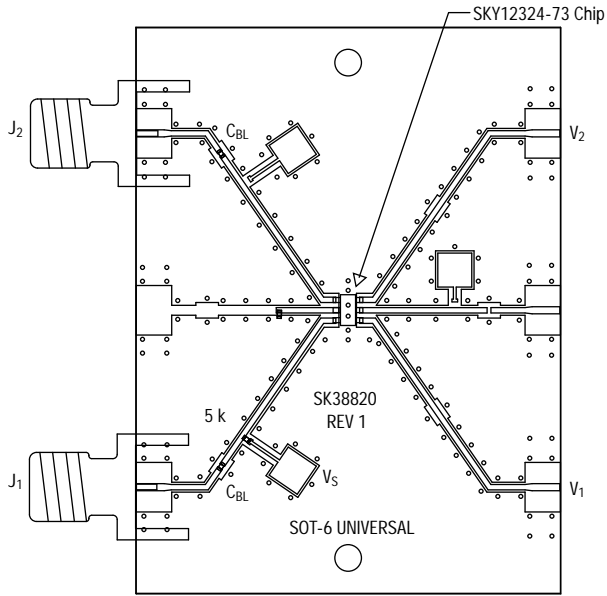
Recommended Solder Reflow Profiles

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

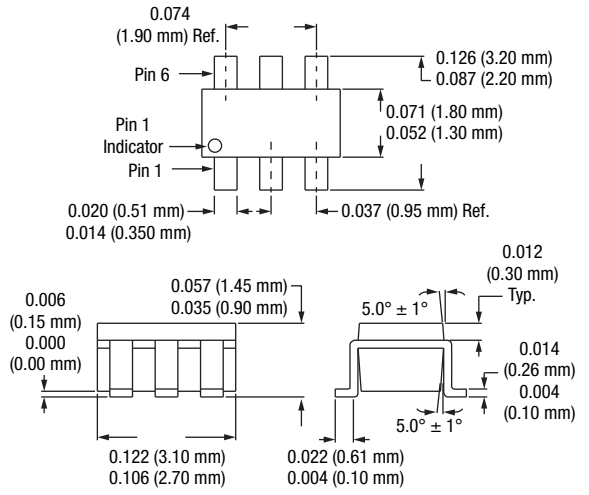
Tape and Reel Information

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

Evaluation Board



SOT-6



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