



查询HMC230MS8\_06供应商

捷多邦，专业PCB打样工厂，24小时加急出货

# HMC230MS8 / 230MS8E

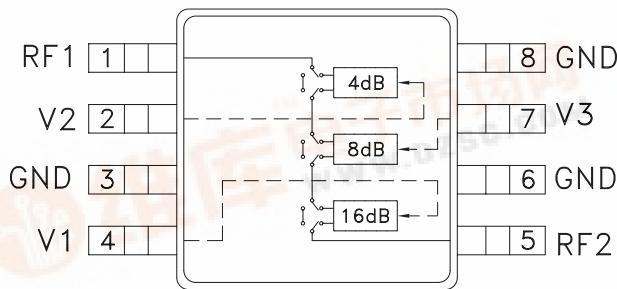
**4 dB LSB GaAs MMIC 3-BIT DIGITAL ATTENUATOR, 0.75 - 2.0 GHz**

## Typical Applications

The HMC230MS8 / HMC230MS8E is ideal for:

- Cellular
- PCS, ISM, MMDS
- WLL Handset
- Base Station Infrastructure

## Functional Diagram



## Electrical Specifications,

$T_A = +25^\circ C$ ,  $Vdd = +3V$  to  $+5V$  &  $Vctl = 0/Vdd$  (Unless Otherwise Stated)

Parameter	Frequency	Min.	Typical	Max.	Units
Insertion Loss	0.75 - 1.7 GHz 1.7 - 2.0 GHz		1.6 1.8	1.8 2.1	dB dB
Attenuation Range	0.75 - 2.0 GHz		28		dB
Return Loss (RF1 & RF2, All Atten. States)	0.75 - 1.7 GHz 1.7 - 2.0 GHz	10 13	13 16		dB dB
Attenuation Accuracy: (Reference to Insertion Loss)					
4, 8, 12, 16, 20 dB States 24, 28 dB States All Attenuation States	0.75 - 1.4 GHz 0.75 - 1.4 GHz 1.40 - 2.0 GHz		$\pm 0.3 + 3\%$ of Atten. Setting Max $\pm 0.4 + 6\%$ of Atten. Setting Max $\pm 0.3 + 3\%$ of Atten. Setting Max		dB dB dB
Input Power for 0.1 dB Compression	5V 3V	0.75 - 2.0 GHz	20 19		dBm dBm
Input Third Order Intercept (Two-Tone Input Power = 0 dBm Each)	5V 3V	0.75 - 2.0 GHz	46 45		dBm dBm
Switching Characteristics					
RISE/FALL (10/90% RF) TON, TOFF (50% CTL to 10/90% RF)	0.75 - 2.0 GHz		560 600		ns ns

## Features

- 4 dB LSB Steps to 28 dB
- Single Positive Control Per Bit
- $\pm 0.5$  dB Typical Bit Error
- Pin - For - Pin Replacement to AA100-59 Digital Attenuator

## General Description

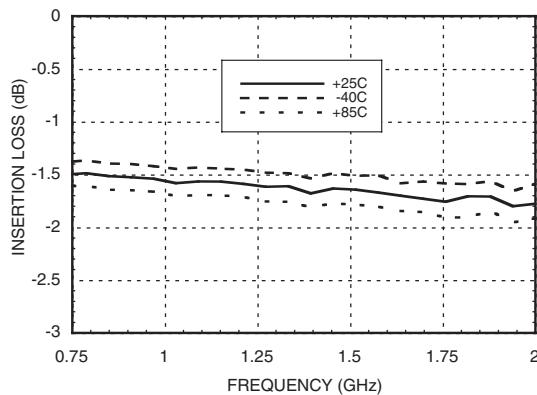
The HMC230MS8 & HMC230MS8E are broadband 3-bit positive control GaAs IC digital attenuators in 8 lead MSOP surface mount plastic packages. Covering 0.75 to 2 GHz, the insertion loss is typically less than 2 dB. The attenuator bit values are 4 (LSB), 8, and 16 dB for a total attenuation of 28 dB. Accuracy is excellent at  $\pm 0.5$  dB typical with an IIP3 of up to +48 dBm. Three bit control voltage inputs, toggled between 0 and +3 to +5 volts, are used to select each attenuation state at less than 50  $\mu$ A each. A single Vdd bias of +3 to +5 volts applied through an external 5K Ohm resistor is required.



# HMC230MS8 / 230MS8E

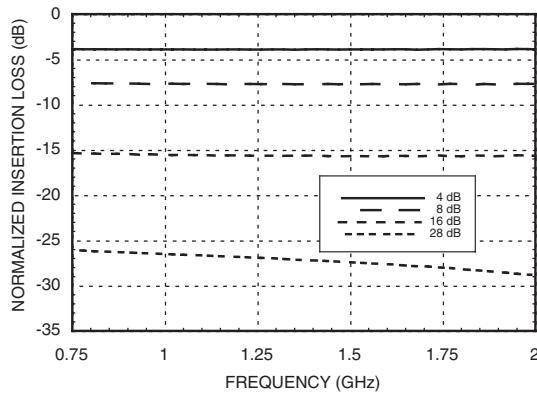
**4 dB LSB GaAs IC 3-BIT DIGITAL ATTENUATOR, 0.75 - 2.0 GHz**

## Insertion Loss



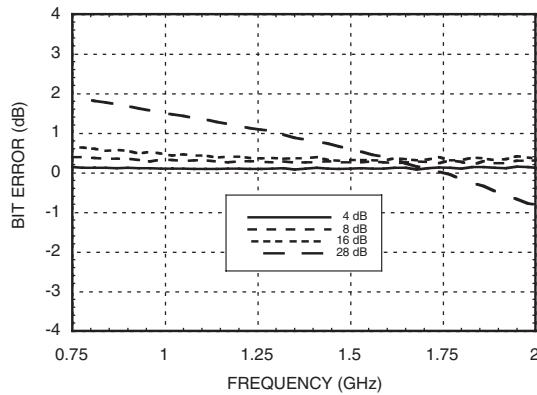
## Normalized Attenuation

(Only Major States are Shown)



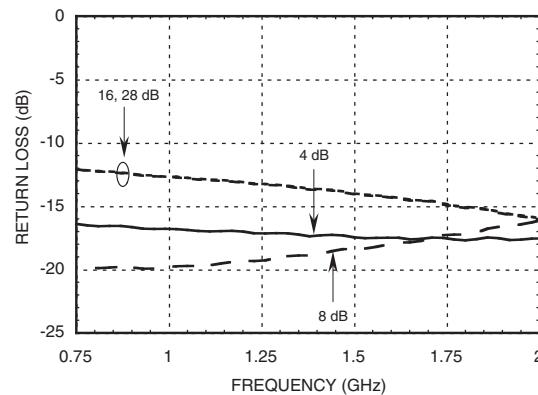
## Bit Error vs. Frequency

(Only Major States are Shown)

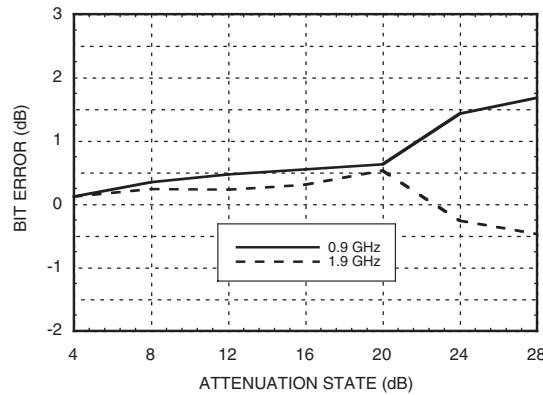


## Return Loss RF1, RF2

(Only Major States are Shown)

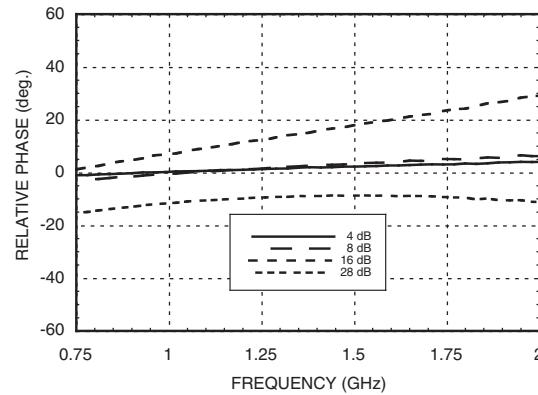


## Bit Error vs. Attenuation State



## Relative Phase vs. Frequency

(Only Major States are Shown)



*Note: All Data Typical Over Voltage (+3V to +5V) & Temperature (-40 to +85 deg C).*

*For price, delivery, and to place orders, please contact Hittite Microwave Corporation.*



# HMC230MS8 / 230MS8E

## 4 dB LSB GaAs IC 3-BIT DIGITAL ATTENUATOR, 0.75 - 2.0 GHz

### Control & Bias Voltages

State	Bias Condition
Low	0 to +0.2Vdc @ 20 uA Max
High	Vdd ±0.2V @ 50 uA Typ

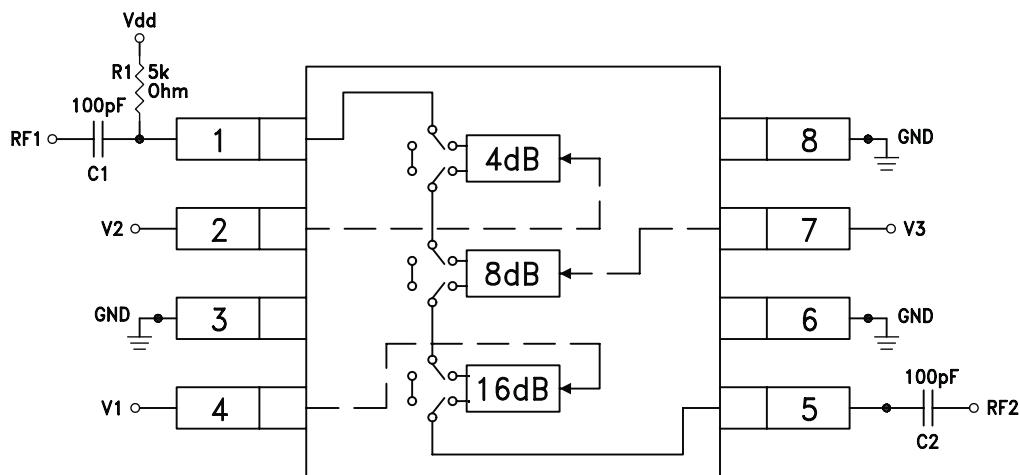
Note: Vdd = +3V to +5V ± 0.2V

### Truth Table

Control Voltage Input			Attenuation Setting RF1 - RF2
V1 16 dB	V2 4 dB	V3 8 dB	
High	High	High	Reference I.L.
High	Low	High	4 dB
High	High	Low	8 dB
Low	High	High	16 dB
Low	Low	Low	28 dB Max. Atten.

Any combination of the above states will provide an attenuation approximately equal to the sum of the bits selected.

### Application Circuit



DC blocking capacitors C1 & C2 are required on RF1 & RF2. Choose C1 = C2 = 100 ~ 300 pF to allow lowest customer specific frequency to pass with minimal loss. R1 = 5K Ohm is required to supply voltage to the circuit through either PIN 1 or PIN 5.



# 4 dB LSB GaAs IC 3-BIT DIGITAL ATTENUATOR, 0.75 - 2.0 GHz

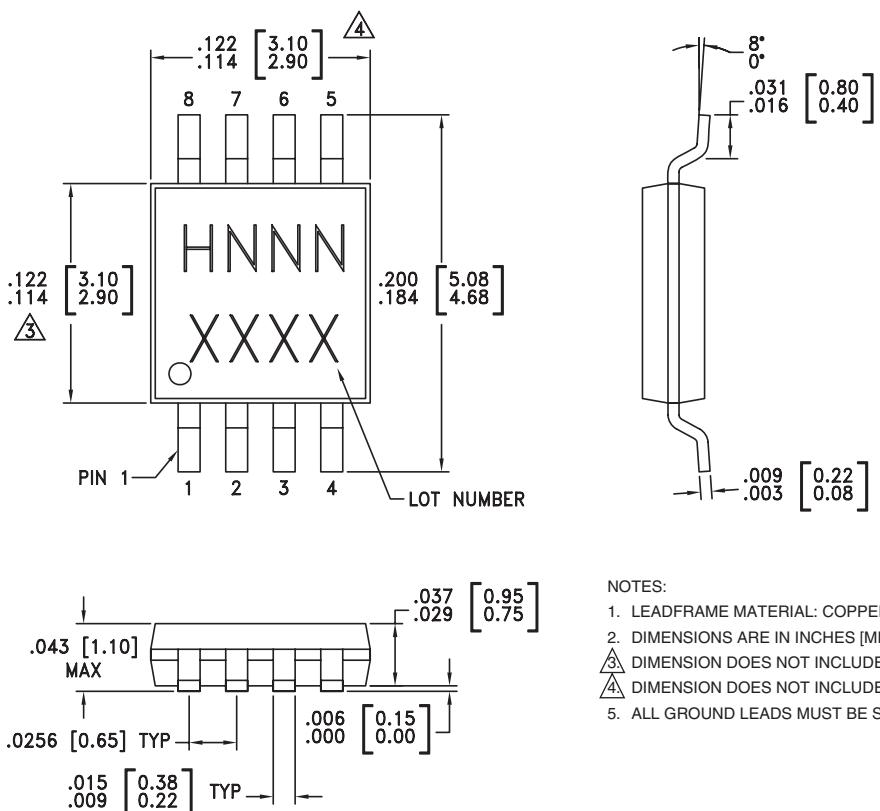
### ***Absolute Maximum Ratings***

Control Voltage (V1, V2, V3)	Vdd to +0.5 Vdc
Bias Voltage (Vdd)	+8.0 Vdc
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
RF Input Power (0.75 - 2 GHz)	+26 dBm



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

## **Outline Drawing**



## Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking <sup>[3]</sup>
HMC230MS8	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 <sup>[1]</sup>	H230 XXXX
HMC230MS8E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 <sup>[2]</sup>	H230 XXXX

[1] Max peak reflow temperature of 235 °C

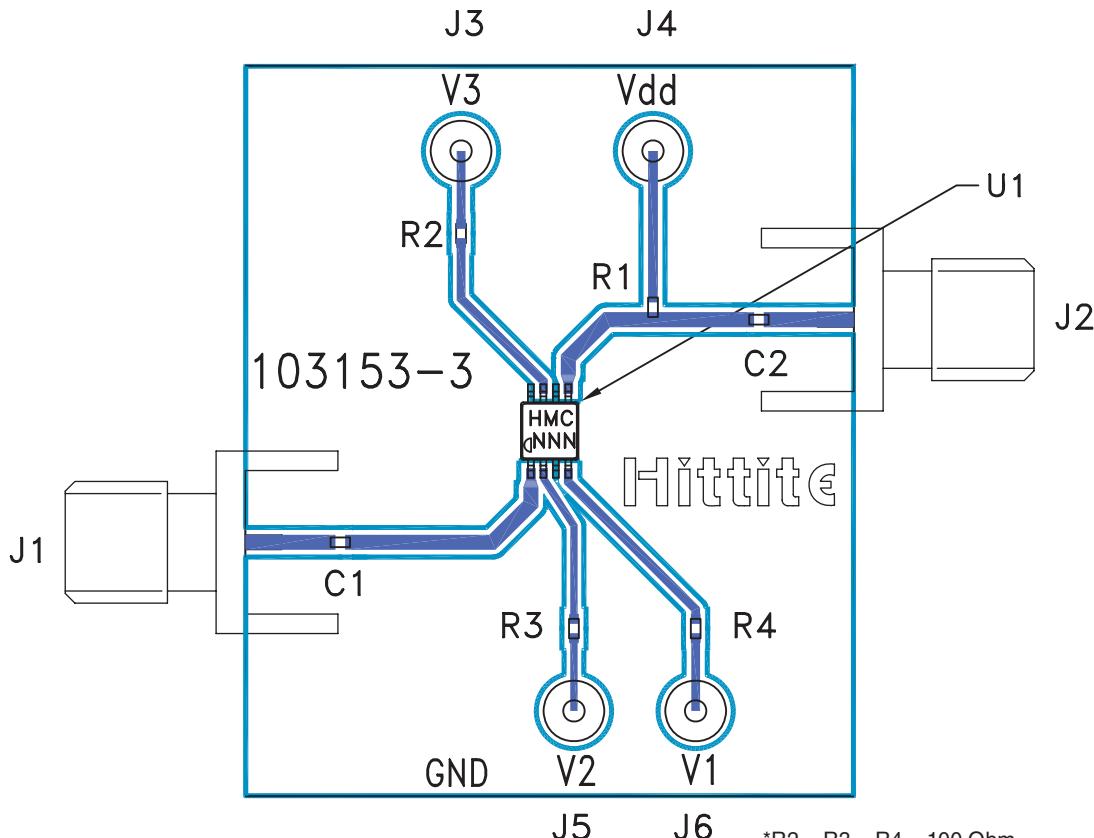
[1] Max peak reflow temperature of 255 °C  
[2] Max peak reflow temperature of 260 °C

[2] Max peak below temperature  
[3] 4-Digit lot number XXXX

**Evaluation Circuit Board**

6

ATTENUATORS - SMT



\*R2 = R3 = R4 = 100 Ohm.  
 These Resistors are optional and may be used to enhance decoupling of the RF path from the control inputs.

**List of Materials for Evaluation PCB 103153<sup>[1]</sup>**

Item	Description
J1 - J2	PCB Mount SMA Connector
J3 - J6	DC Pin
R1	5k Ohm Resistor, 0402 Chip
R2, R3, R4	100 Ohm Resistor, 0402 Chip
C1, C2	0402 Chip Capacitor, Select for Lowest Frequency of Operation
U1	HMC230MS8 / HMC230MS8E Digital Attenuator
PCB <sup>[2]</sup>	103153 Evaluation PCB 1.25" x 1.5"

The circuit board used in the final application should use RF circuit design techniques. Signal lines should have 50 ohm impedance while the package ground leads should be connected directly to the ground plane similar to that shown. A sufficient number of VIA holes should be used to connect the top and bottom ground planes. The evaluation circuit board as shown is available from Hittite Microwave Corporation upon request.

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350



v02.0505



## HMC230MS8 / 230MS8E

**4 dB LSB GaAs IC 3-BIT DIGITAL  
ATTENUATOR, 0.75 - 2.0 GHz**

**Notes:**

6

ATTENUATORS - SMT