HMC210MS8

GaAs MMIC VOLTAGE-VARIABLE ATTENUATOR, 1.5 - 2.3 GHz

Typical Applications

The HMC210MS8 is ideal for:

- Base Station Infrastructure
- Portable Wireless
- MMDS

Features

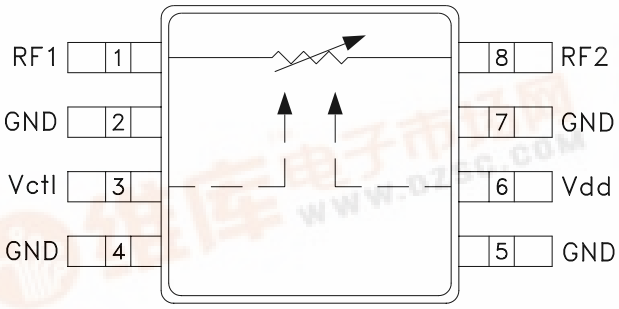
Single Positive Voltage Control: 0 to +2.5V

High Attenuation Range: >50 dB @ 1.9 GHz

High Input IP3: +15 dBm Typical
(All Attenuation States)

Ultra Small Package: MSOP

Functional Diagram



General Description

The HMC210MS8 is a miniature absorptive voltage variable attenuator in an 8-lead MSOP package. The device operates with a positive supply voltage (+2.5V), and a positive control voltage. A unique feature is the high third order intercept point for all attenuation states. Operation up to 2.3 GHz is possible with a reduced attenuation range of 31 dB.

Electrical Specifications, T_A = +25° C, Vdd = +2.5 Vdc, 50 Ohm System

Parameter	Condition	Min.	Typical	Max.	Units
Insertion Loss (VCTL = 0 V Min. Atten.)	1.8 - 2.0 GHz 1.7 - 2.1 GHz 1.5 - 2.3 GHz		3.3 3.4 5.0	4.9 5.5 7.5	dB dB dB
Attenuation Range (VCTL = 0 to +2.5 V)	1.8 - 2.0 GHz 1.7 - 2.1 GHz 1.5 - 2.3 GHz	44 39 31	55 43 40		dB dB dB
Return Loss (VCTL = 0 to +2.5 V)	1.5 - 2.0 GHz 2.0 - 2.3 GHz		9 6		dB dB
Input Power for 0.1 dB Compression (f = 1.9 GHz)	Min Atten. Atten. >2.0		15 -5		dBm dBm
Input Power for 1.0 dB Compression (f = 1.9 GHz)	Min Atten. Atten. >2.0	17 0	20 3		dBm dBm
Input Third Order Intercept (f = 1.9 GHz, Two-tone Input Power = +5 dBm Each Tone)	Min Atten. Atten. >2.0	30 10	35 15		dBm dBm
Switching Characteristics tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF)	1.5 - 2.3 GHz		0.9 2.6		µS µS

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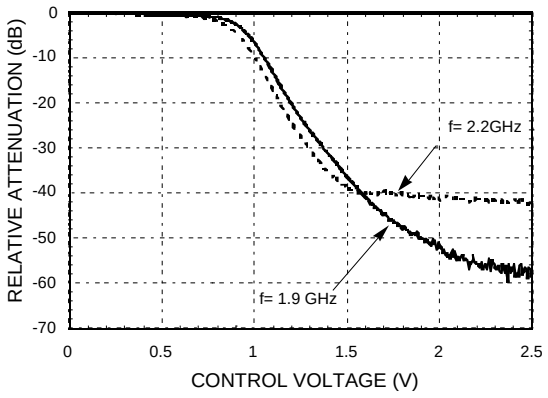
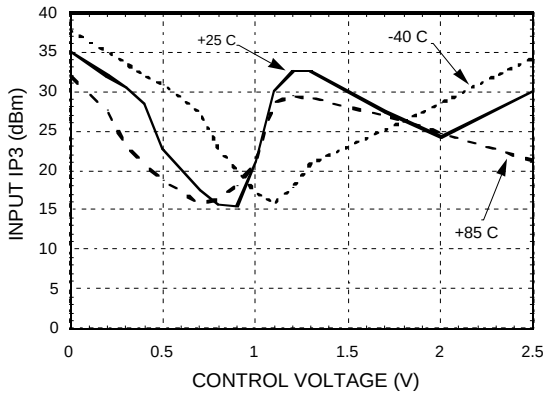
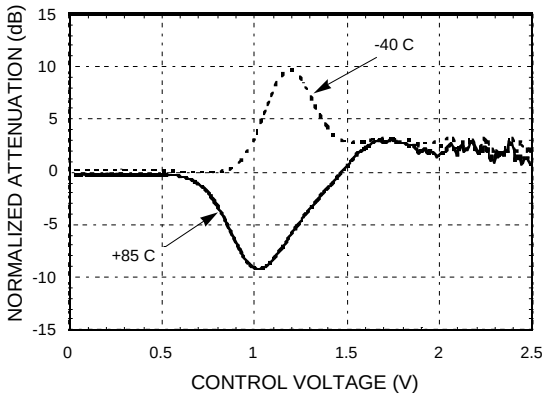
Relative Attenuation vs. Control Voltage @ 1.9 and 2.2 GHz



Input IP3 vs. Control Voltage @ 1.9 GHz



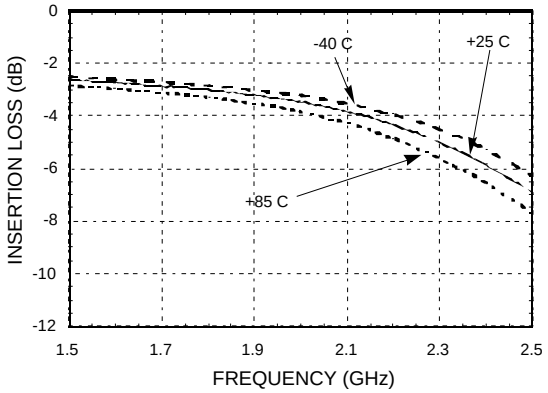
Attenuation vs. Temperature Normalized to +25° C @ 1.9 GHz



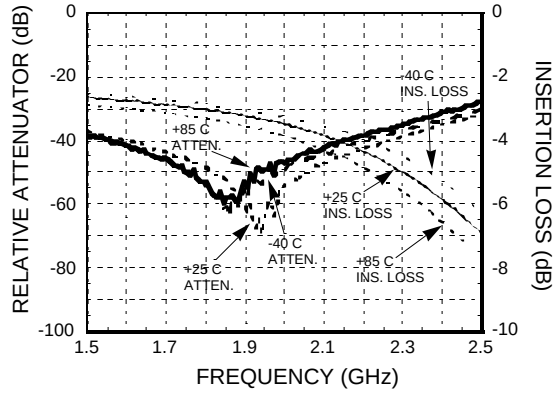
Typical Input P1dB Compression @ 1.9 GHz vs. Temperature

Input Power for 1 dB Compression Point						
Test Condition (1.9 GHz)	VCTL (Vdc)	Vdd (Vdc)	+25C	+85C	-40C	Units
Min. Attenuation	0.0	+2.5	20	20	21	dBm
Max. Attenuation	+2.5	+2.5	19	16	25	dBm
Worst Case P1dB	+1.0	+2.5	3	4	3	dBm

Broadband Insertion Loss

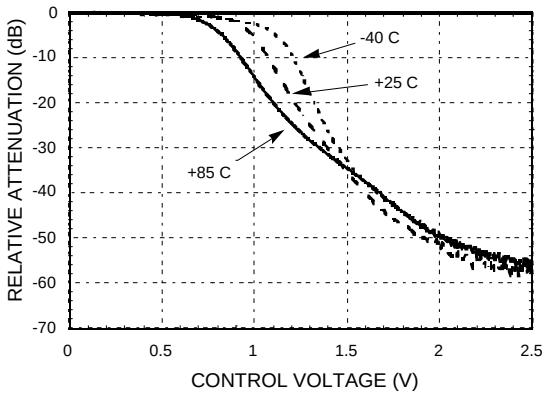


Broadband Maximum Relative Attenuation and Return Loss

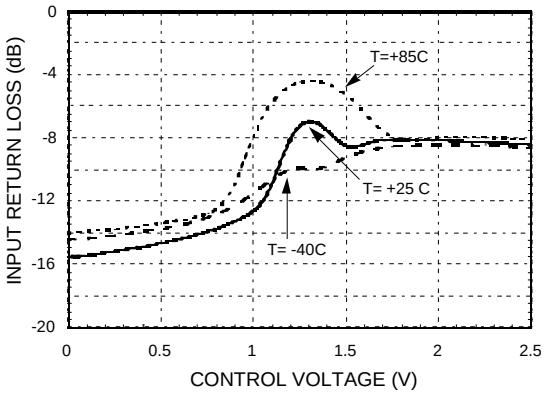


Typical Performance for 1.9 GHz Applications

Attenuation vs. Control Voltage @ 1.9 GHz

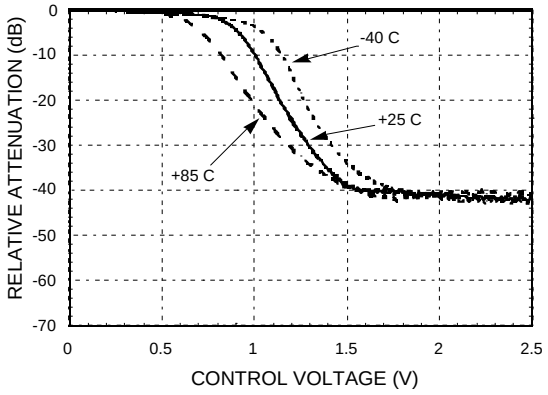


Return Loss vs. Control Voltage @ 1.9 GHz

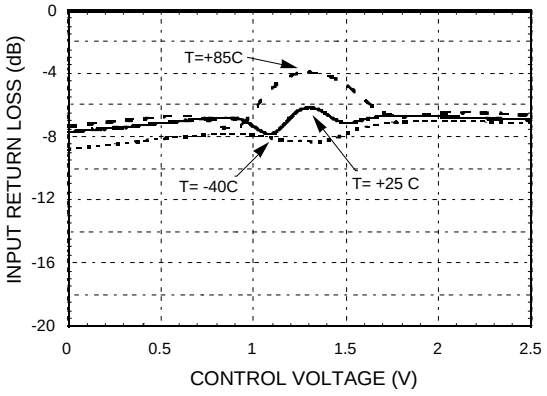


Typical Performance for 2.2 GHz Applications

Attenuation vs. Control Voltage @ 2.2 GHz



Return Loss vs. Control Voltage @ 2.2 GHz



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Absolute Maximum Ratings

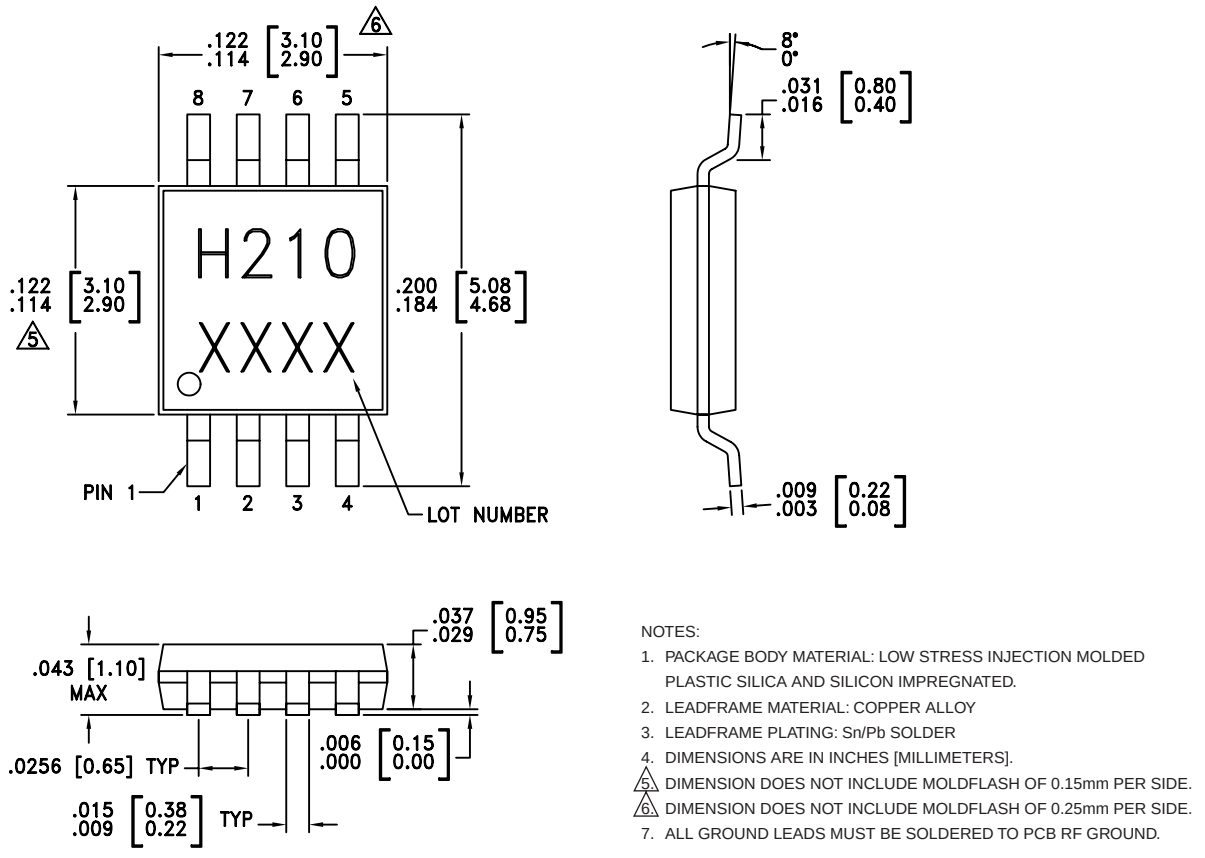
VCTL	-0.2 Vdc to Vdd
Vdd	+8 Vdc
Maximum Input Power (Vdd = +2.5 Vdc)	+26 dBm @ Min. Attenuation, VCTL = +0.0V +20 dBm @ Atten. >2 dB
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

Control and Bias Voltage

VCTL	0 to +2.5 Vdc @ -100 µA to +100 µA
Vdd	+2.5 Vdc +/- 0.1 Vdc @ +100 µA

*Note: DC blocking capacitors are required for RF ports. 100 pF RF chip capacitors (0603 size) are recommended on RF1 & RF2 ports..

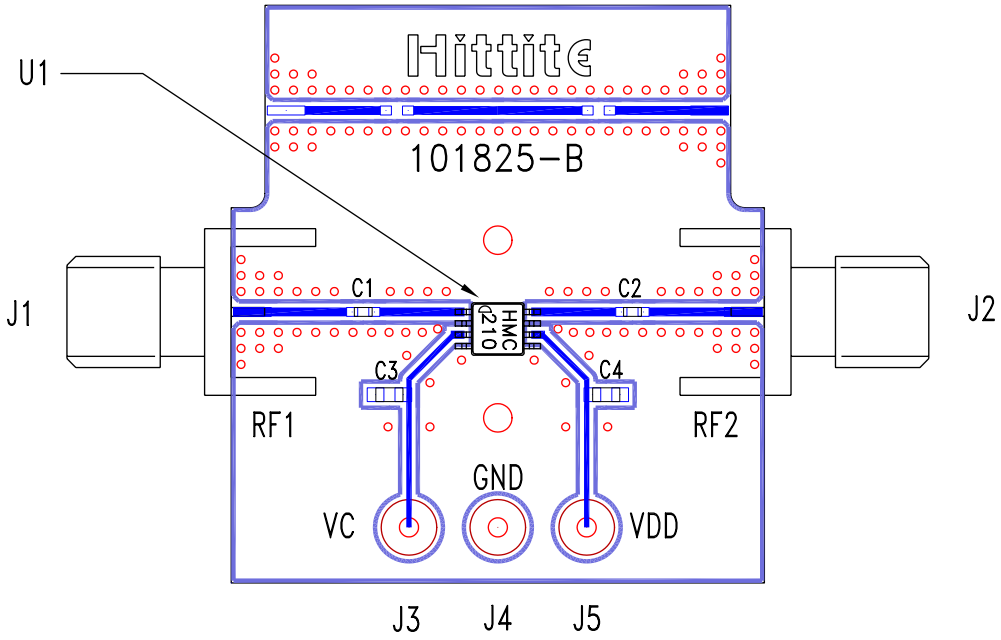
Outline Drawing



NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEADFRAME MATERIAL: COPPER ALLOY
3. LEADFRAME PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

Evaluation Circuit Board



List of Material

Item	Description
J1, J2	PC Mount SMA RF Connector
J3 - J5	DC PIN
C1, C2	330 pF capacitor, 0402 package
C3, C4	10,000 pF capacitor, 0603 package
U1	HMC210MS8 VVA
PCB*	101825 Eval Board
*Circuit Board Material: Rogers 4350	

The circuit board used in the final application should be generated with proper RF circuit design techniques. Signal lines at the RF ports should be 50 ohm impedance and the package ground leads and package bottom should be connected directly to the PCB RF ground plane, similar to that shown above. The evaluation circuit board shown above is available from Hittite Microwave Corporation upon request.

Notes: