GaAS MMIC BI-PHASE MODULATOR 1.8 - 5.2 GHz

FEBRUARY 2001 v01.0300

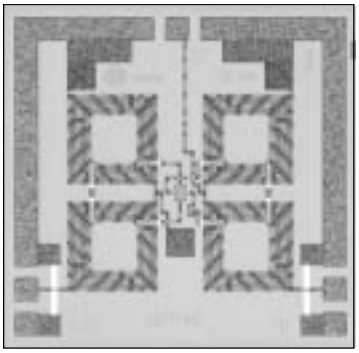
Features

CHIP INTEGRATES DIRECTLY INTO MIC DESIGNS

30 dB OF CARRIER SUPPRESSION

DIRECT MODULATION IN THE 1.8-5.2 GHz BAND

FUNCTIONS ALSO AS A PHASE DETECTOR



General Description

The HMC135 Bi-Phase Modulator is designed to phase-modulate an RF signal into reference and 180 degree states. Device input is at the RF port and output is at the LO port. The polarity of the bias current at the control port (IF port) defines the phase states. Excellent amplitude and phase balance provided by closely matched monolithic balun and diode circuits delivers 30 dB of carrier suppression in a tiny monolithic chip.

The device also functions as a demodulator or phase comparator. As a demodulator, data emerges at the control port when a modulated signal at the RF port is compared to a reference signal at the LO port. As a phase comparator, the phase angle between two signals applied to the RF and LO ports is represented by an analog voltage at the control port.

Except for carrier suppression, the data presented here was measured under static conditions in which a DC bias current (nominally 5 mA) is applied to the control port.

Guaranteed Performance, *For 5 mA Bias Current, -55 to +85 deg C*

Parameter	Min.	Typ.	Max.	Units
Frequency Band		1.8-5.2		GHz
Insertion Loss		9	11	dB
Return Loss, RF and LO Ports	2.5	3.0		dB
Amplitude Balance		0.2	0.5	dB
Phase Balance		2.5	5.0	deg
Carrier Suppression (When driven with a 1 MHz square wave, 1.4 Vp-p)	25	30		dBc
Input Power for 1 dB Compression	0	8		dBm
Third Order Intercept, Input	5	10		dBm
Second Order Intercept, Input	15	30		dBm
Bias Current (Bias current forward biases internal Schottky diodes providing approximately 0.6 V at the control port).	2	5	10	mA

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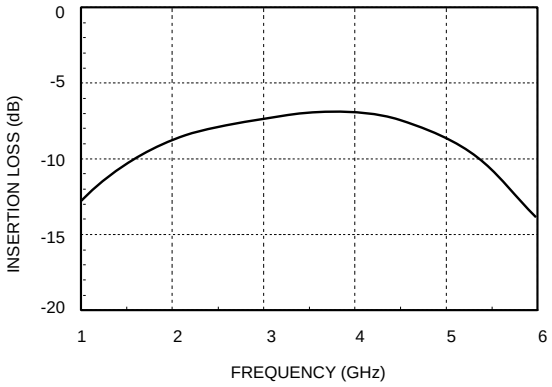
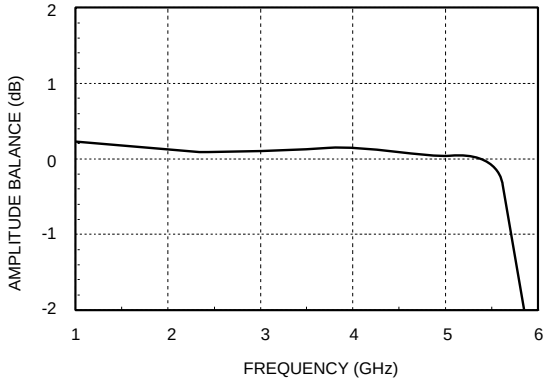
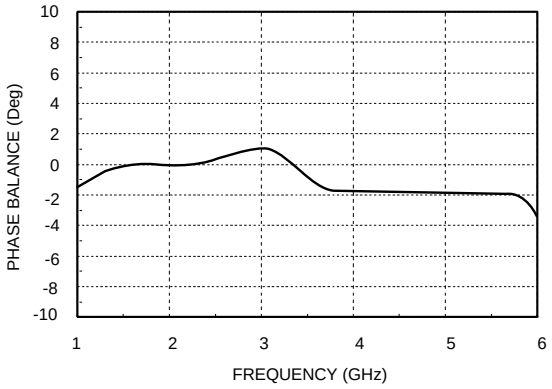
Insertion Loss



Amplitude Balance

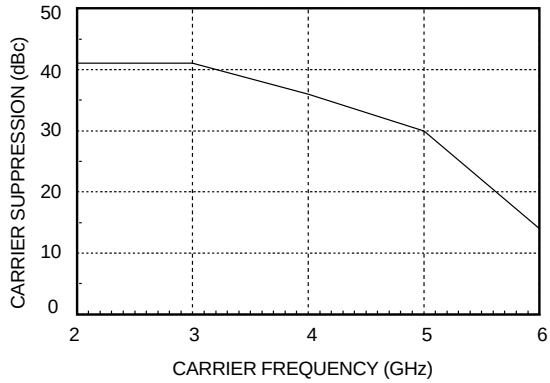


Phase Balance

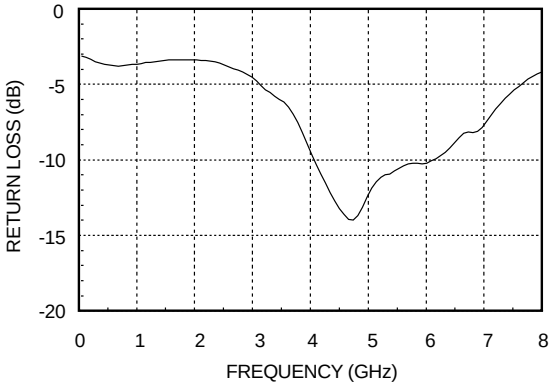


Carrier Suppression

(For 1.4 Vp-p Square Wave Modulation at 1 MHz)



Return Loss



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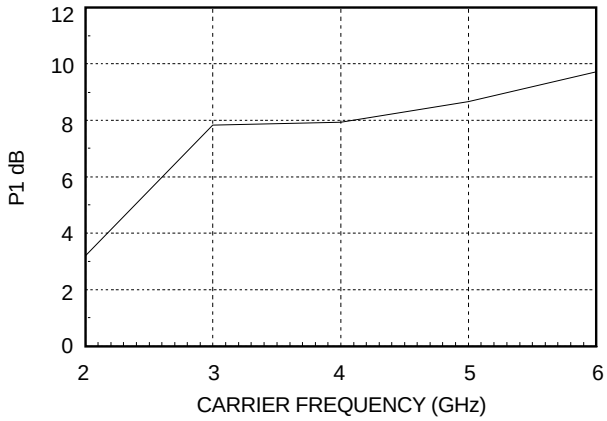
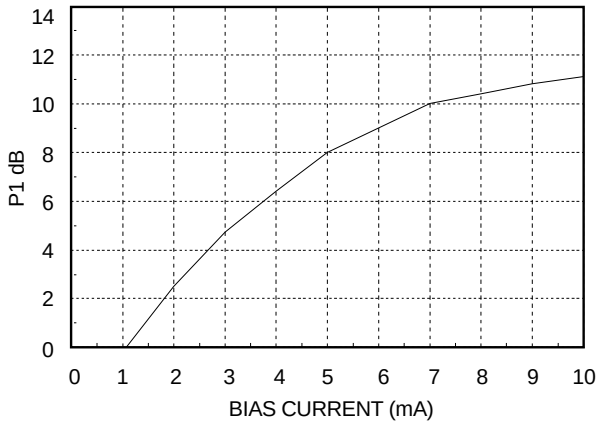
Compression vs Frequency

(For 5 mA Bias Current)

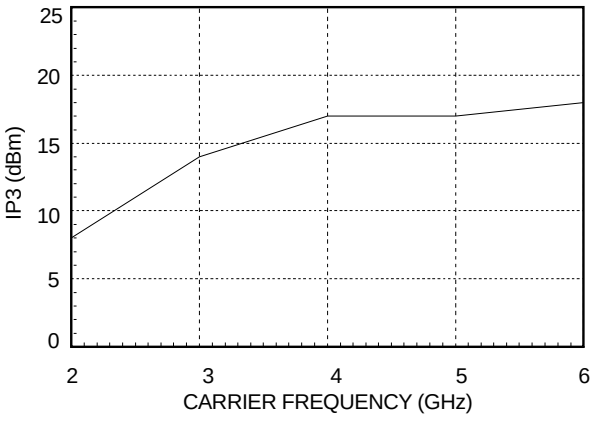


Compression vs Bias at 4 GHz

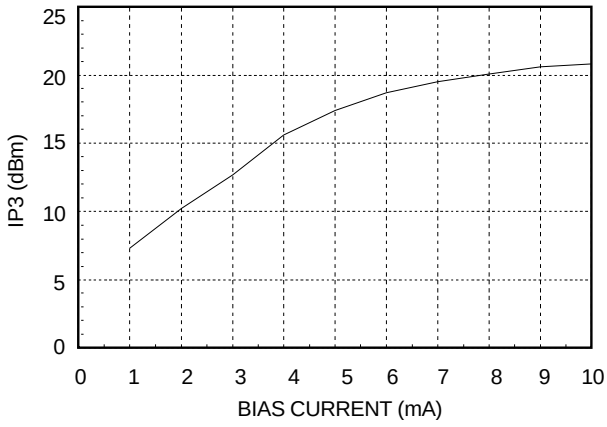


Third Order Intercept vs Frequency

(For 5 mA Bias Current)



Third Order Intercept vs Bias at 4 GHz



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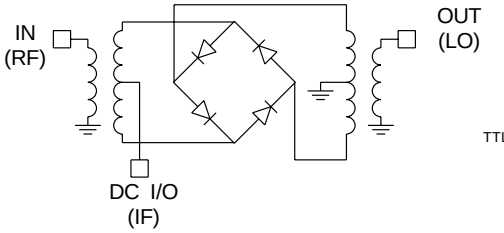
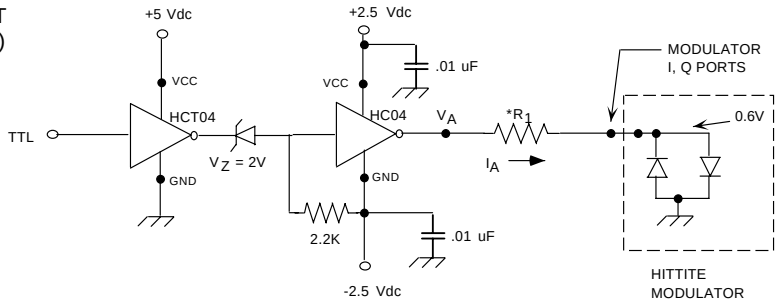
Schematic



Suggested TTL Driver for a Bi-Phase Modulator



NOTES

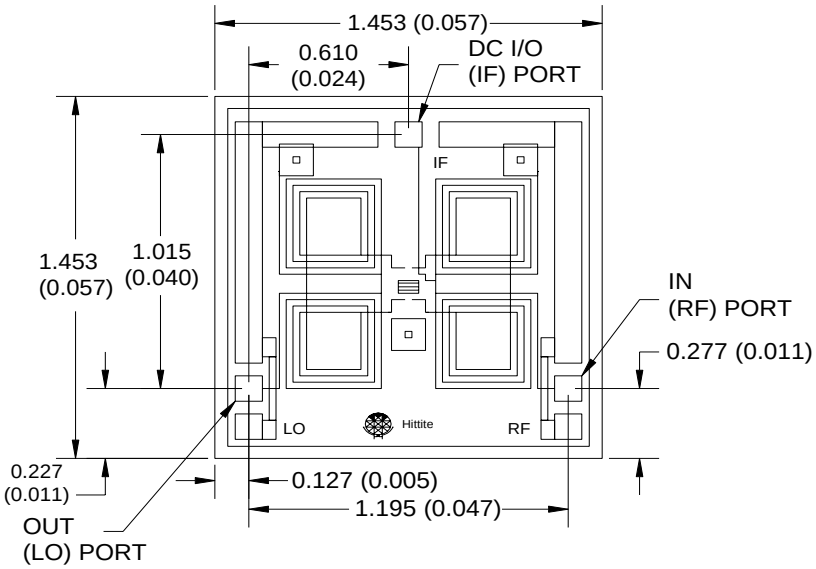
1) V_A ALTERNATES BETWEEN ± 2.4 V_{dc}

$$\pm I_A = \frac{2.4 - 0.6}{360\ \Omega} = \pm 5\ \text{mA}$$

2) HCT04 and HC04 are QMOS HEX INVERTERS.

*R_1 = 300 TO 620 ± 2% SELECT R_1 TO SUPPLY ± 3 TO ±6 mA TO THE IF PORT

Outline *(See DIE Handling, Mounting, Bonding Note Page 8 - 3)*



DIE THICKNESS IS 0.100 (0.004), BACKSIDE IS GROUND
BOND PADS ARE 0.100 (0.004), SQUARE
ALL DIMENSION ARE IN MILLIMETERS (INCHES)
BOND PAD METALLIZATION : GOLD
BACKSIDE METALLIZATION : GOLD
ALL TOLERANCES ARE ±0.025 (0.001)