

GaAS MMIC BI-PHASE MODULATOR 4 - 8 GHz

FEBRUARY 2001

v01.0300

Features

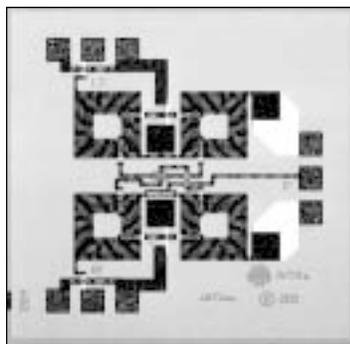
- CHIP INTEGRATES DIRECTLY INTO MIC DESIGNS
- 30 dB OF CARRIER SUPPRESSION
- DIRECT MODULATION IN THE 4 - 8 GHz BAND
- FUNCTIONS ALSO AS A PHASE DETECTOR

General Description

The HMC136 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.



5

MODULATORS

DIE



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

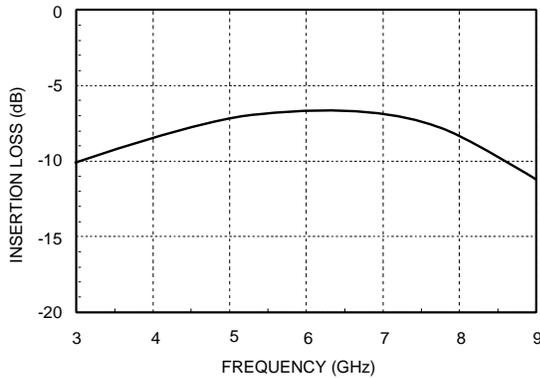
Parameter	Min.	Typ.	Max.	Units
Frequency Band		4-8		GHz
Insertion Loss		8	10	dB
Return Loss, RF and LO Ports	2.5	3.0		dB
Amplitude Balance		0.1	0.5	dB
Phase Balance		4.0	6.0	deg
Carrier Suppression (When driven with a 1 MHz square wave, 1.4 Vp-p)	25	30		dBc
Input Power for 1 dB Compression	4	8		dBm
Third Order Intercept, Input	10	15		dBm
Second Order Intercept, Input	25	35		dBm
Bias Current (Bias current forward biases internal Schottky diodes providing approximately 0.6 V at the control port).	2	5	10	mA

HMC136 BI-PHASE MODULATOR 4 - 8 GHz

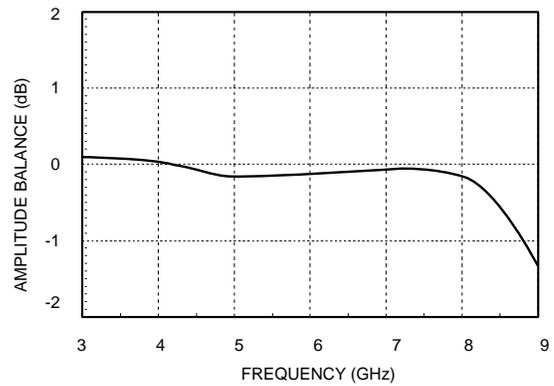
v01.0300

FEBRUARY 2001

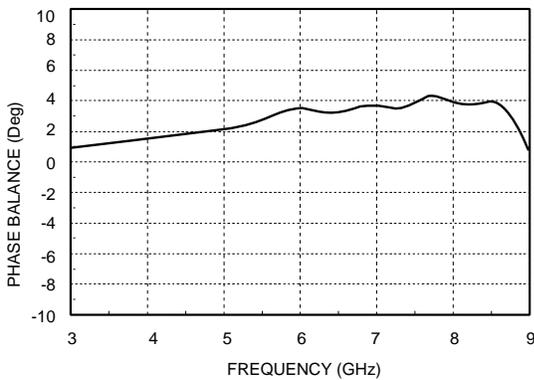
Insertion Loss



Amplitude Balance

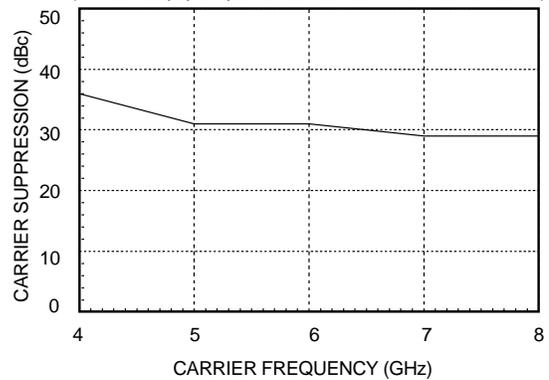


Phase Balance

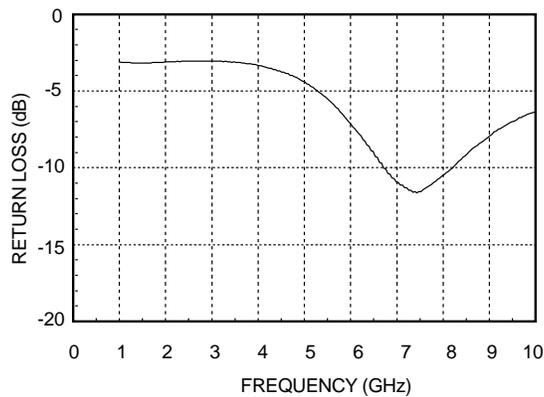


Carrier Suppression

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



Return Loss



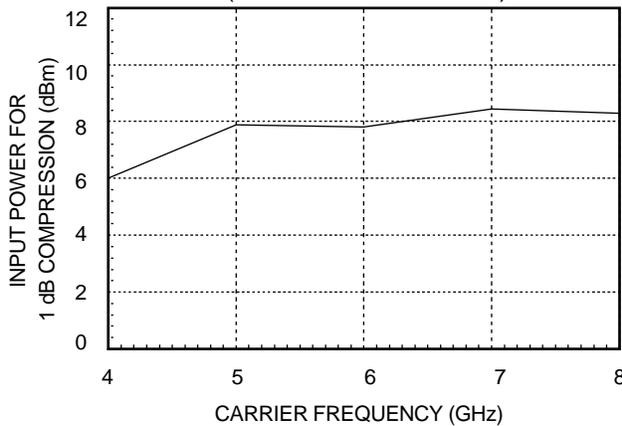
HMC136 BI-PHASE MODULATOR 4 - 8 GHz

FEBRUARY 2001

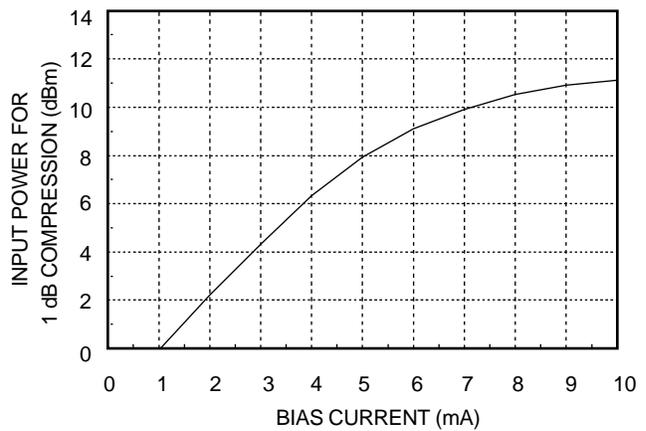
v01.0300

Compression vs Frequency

(For 5 mA Bias Current)

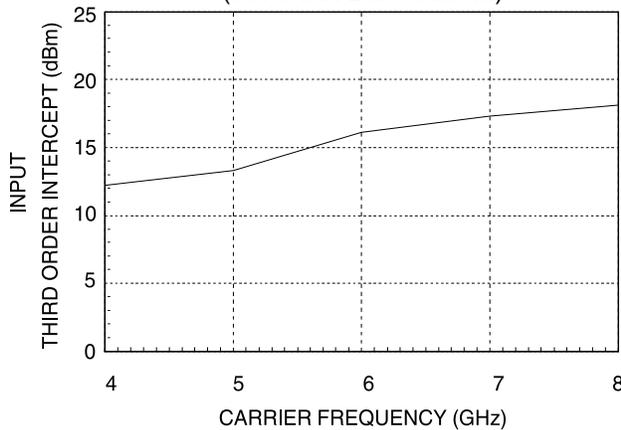


Compression vs Bias at 6GHz

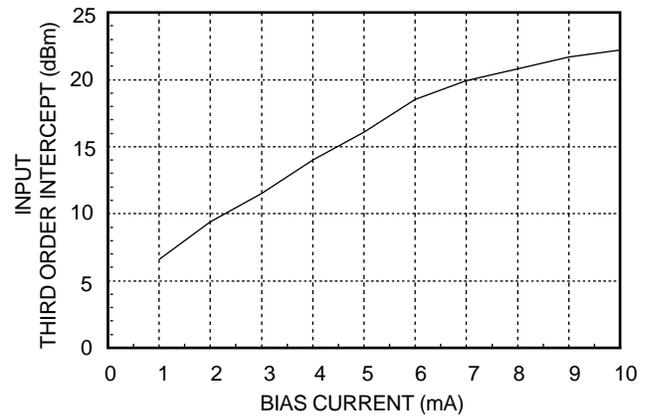


Third Order Intercept vs Frequency

(For 5 mA Bias Current)



Third Order Intercept vs Bias at 6 GHz

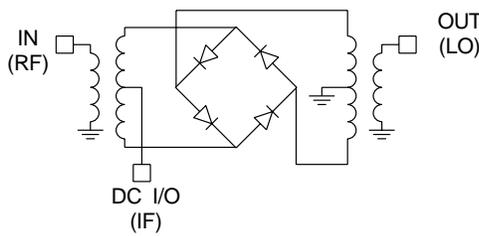


HMC136 BI-PHASE MODULATOR 4 - 8 GHz

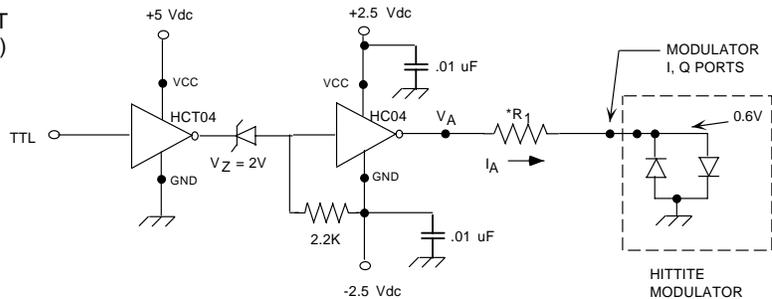
v01.0300

FEBRUARY 2001

Schematic



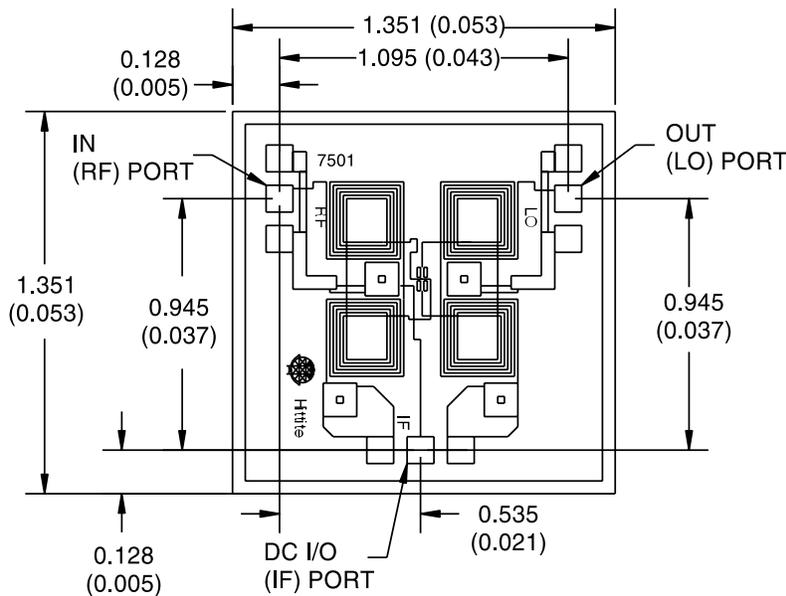
Suggested TTL Driver for a Bi-Phase Modulator



NOTES

- 1) V_A ALTERNATES BETWEEN $\pm 2.4 V_{dc}$
 $\pm I_A = \frac{2.4 - 0.6}{360 \Omega} = \pm 5 \text{ mA}$
 - 2) HCT04 and HC04 are QMOS HEX INVERTERS.
- * $R_1 = 300$ TO $620 \pm 2\%$ SELECT R_1 TO SUPPLY ± 3 TO $\pm 6 \text{ mA}$ 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)