HMC-AUH232

GaAs HEMT MMIC MODULATOR DRIVER AMPLIFIER, DC - 43 GHz

Typical Applications

This HMC-ALH232 is ideal for:

- 40 Gb/s Lithium Niobate/ Mach Zender Fiber Optic Modulators
- Broadband Gain Block for Test & Measurement Equipment
- Broadband Gain Block for RF Applications
- Military & Space

Features

Small Signal Gain: 12 dB

Output Voltage: up to 8V pk-pk

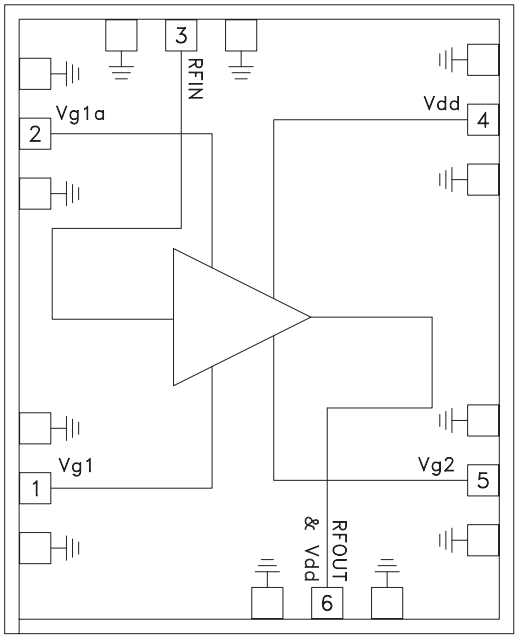
Single-Ended I/Os

High Speed Performance: 46 GHz 3 dB Bandwidth

Low Power Dissipation: 0.9 W

Small Die Size: 2.1 x 1.70 x 0.1 mm

Functional Diagram



General Description

The HMC-AUH232 is a GaAs MMIC HEMT Distributed Driver Amplifier die which operates between DC and 43 GHz and provides a typical 3 dB bandwidth of 46 GHz. The amplifier provides 12 dB of small signal gain while requiring only 180 mA from a +5V supply voltage. The HMC-AUH232 exhibits very good gain and phase ripple to 40 GHz, and can output up to 8V peak-to-peak with low jitter, making it ideal for for use in broadband wireless, fiber optic communication and test equipment applications. The amplifier die occupies less than 3.6 mm² which facilitates easy integration into Multi-Chip-Modules (MCMs). The HMC-AUH232 requires external bias-tee as well as off-chip blocking components and bypass capacitors for the DC supply lines. A gate voltage adjust, Vg2 is provided for limited gain adjustment, while Vg1a adjusts the bias current for the device.

Electrical Specifications*, T_A = +25 °C

Parameter		Min.	Typ.	Max.	Units
Frequency Range			DC - 43		GHz
Small Signal Gain	0.5 - 5.0 GHz	12	14		dB
	35 - 45 GHz	10	12.5		dB
Input Return Loss			10		dB
Output Return Loss			8.5		dB
Supply Current			180	225	mA
3 dB Bandwidth		43	46		GHz
Gain Ripple (5 to 35 GHz)			±0.6	±1	dB
Group Delay Variation[1]	0.5 - 5.0 GHz		±14	±20	pS
	5 - 30 GHz		±10	±11	pS
	30 - 45 GHz		±22	±25	pS

Electrical Specifications (Continued)*

Parameter		Min.	Typ.	Max.	Units
10% to 90% Rise / Fall Time[2]			6 - 12		pS
Output Voltage Level[3]			8		V_{p-p}
Additive jitter (RMS)			0.4		pS
1 dB Output Gain Compression Point at 20 GHz			16.5		dBm
Output Power	20 GHz @ Pin= 15 dBm[4]	22	22		dBm
	40 GHz @ Pin= 15 dBm[4]	17	19.5		dBm
Power Dissipation			0.9	1.25	W
Noise Figure	5 GHz		5.4		dB
	10 & 15 GHz		4.2		dB
	20 GHz		4.6		dB
	25 GHz		5.4		dB
	30 GHz		8.3		dB
	35 GHz		7.4		dB
	40 GHz		9.1		dB

[1] Measured with a 1 GHz aperture

[2] Measurement limited by rise/fall time of input reference signal

[3] With a 2.7 V_{P-P} input signal

*Unless otherwise indicated, all measurements are from probed die

[4] Verified at RF on-wafer probe. VG1 is adjusted until the drain current is 200 mA and VG2=1.5 V.The drain voltage is applied through the RF output port using a bias tee with 5 volts on the bias Tee.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units
Positive Supply Voltage	V_D		5	6	V
Positive Supply Current	I_D	150	180	225	mA
RF Input Power			12	16	dBm
Bias Current Adjust	V_{G1A}	-1.5	-0.2		V
Output Voltage Adjust	V_{G2}	0	1.5	2	V
Operating Temperature	T_{OP}	0	25	85	°C
Power Dissipation	P_D		0.9	1.25	W

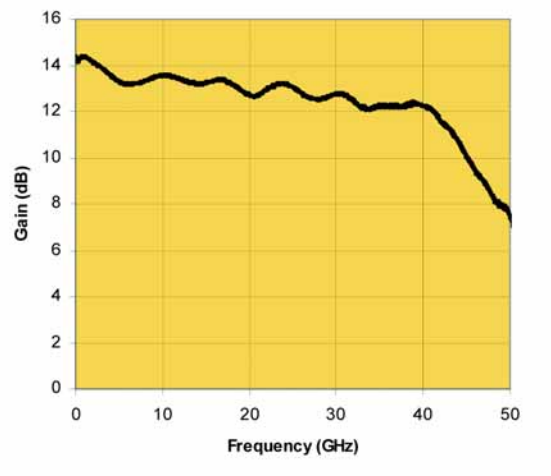
Reliability Characteristics

Parameter	Symbol	Typ.	Units
Activation Energy	E_A	1.7	eV
Median time to Failure (MTF) @125 °C Channel Temperature	MTF	6×10^9	Hours

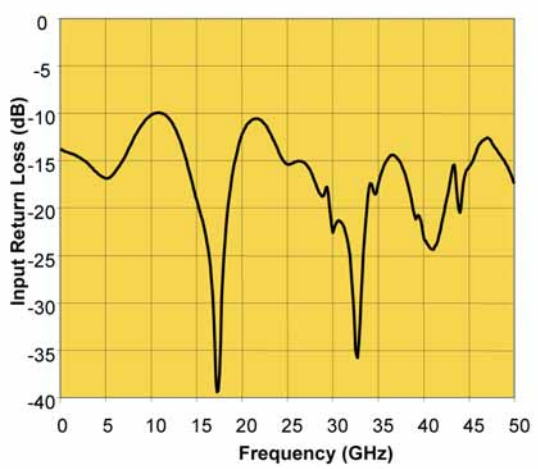
Thermal Characteristics

Parameter	P_{DISS} (W)	T_{BASE} (°C)	T_{CH} (°C)	R (°C/W)	MTF (Hrs)
Thermal Resistance to back side of chip	1.25	85	145	48	5.8×10^8
Thermal resistance to backside of carrier using 25.4 um of 84-1LMIT epoxy	1.25	85	155	56	1.8×10^8
Thermal Resistance to back side of chip	1.25	110	170	48	3.9×10^7
Thermal resistance to backside of carrier using 25.4 um of 84-1LMIT epoxy	1.25	110	180	56	1.4×10^7

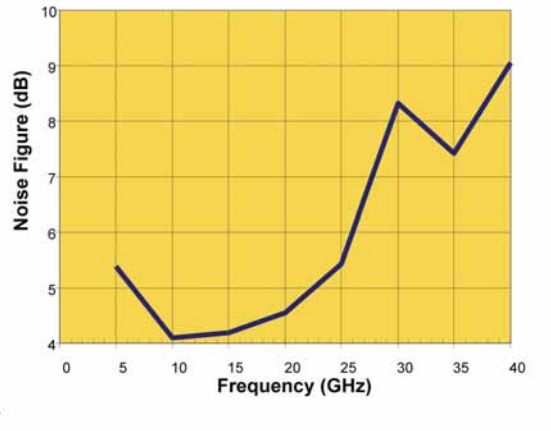
Gain vs. Frequency



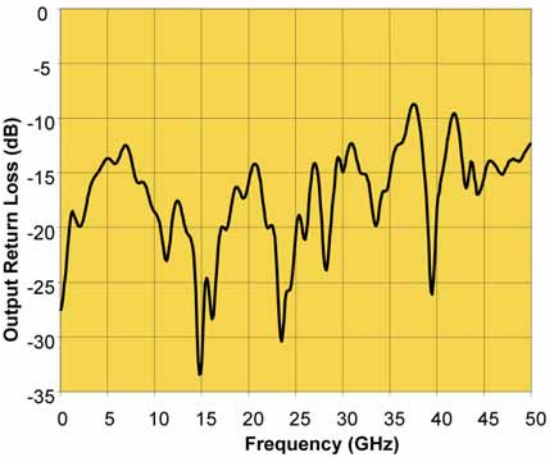
Input Return Loss vs. Frequency



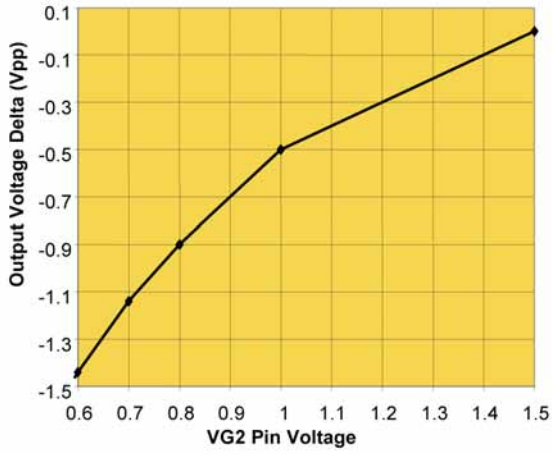
Noise Figure vs. Frequency



Output Return Loss vs. Frequency



Output Voltage Delta vs. Control Voltage



Note: Measured Performance Characteristics (Typical Performance at 25°C) Vg2 = 1.5V, Vdd= 5V, Idd = 200 mA (Measured data obtained from die in a test fixture unless otherwise stated)

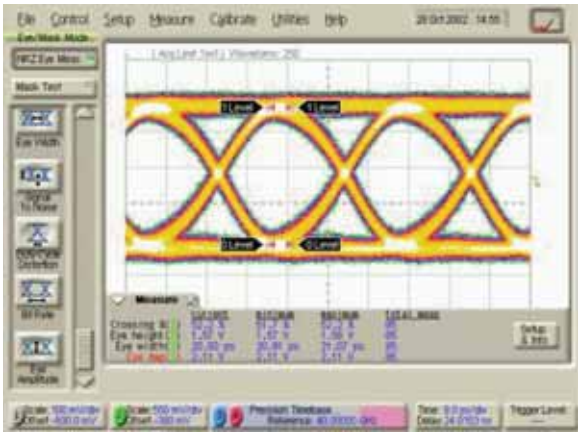
Absolute Maximum Ratings

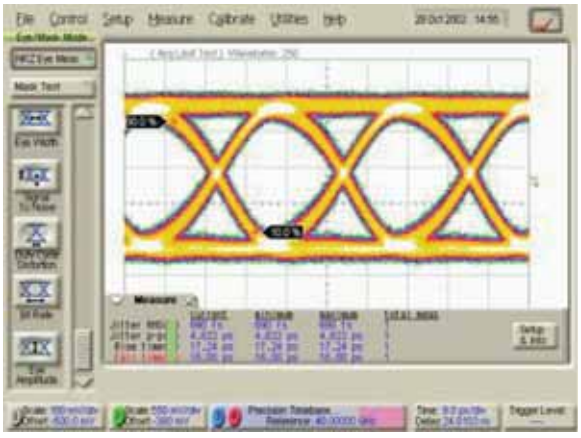
Drain Bias Voltage (Vdd)	+6 Vdc
Gain Bias Voltage (Vg1a)	-1.5 to 0 Vdc
Output Voltage Adjust (Vg2)	0 to +2 Vdc
RF Input Power	+18.5 dBm
40 Gb/s Input Voltage Pk-Pk (Vpp)	3V
Thermal Resistance (channel to die bottom)	48 °C/W
Channel Temperature	180 °C
Storage Temperature	-65 to +150 °C
Operating Temperature	-55 to +110 °C

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Input Reference Signal

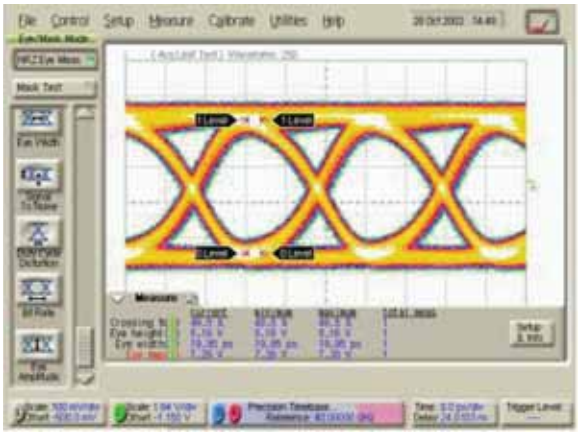
PRBS=2^{31}-1, 2.1V Input, Data rate of 40 Gb/s

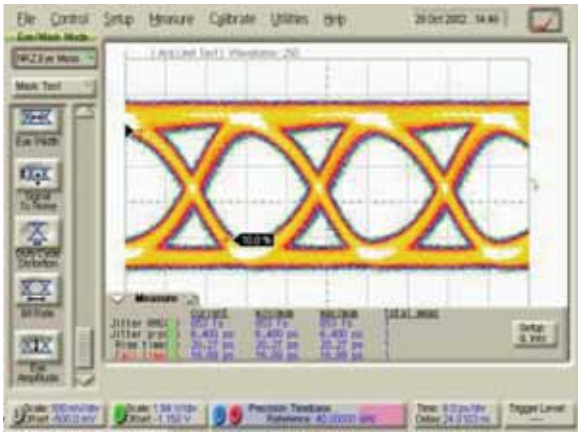




Output Reference Signal

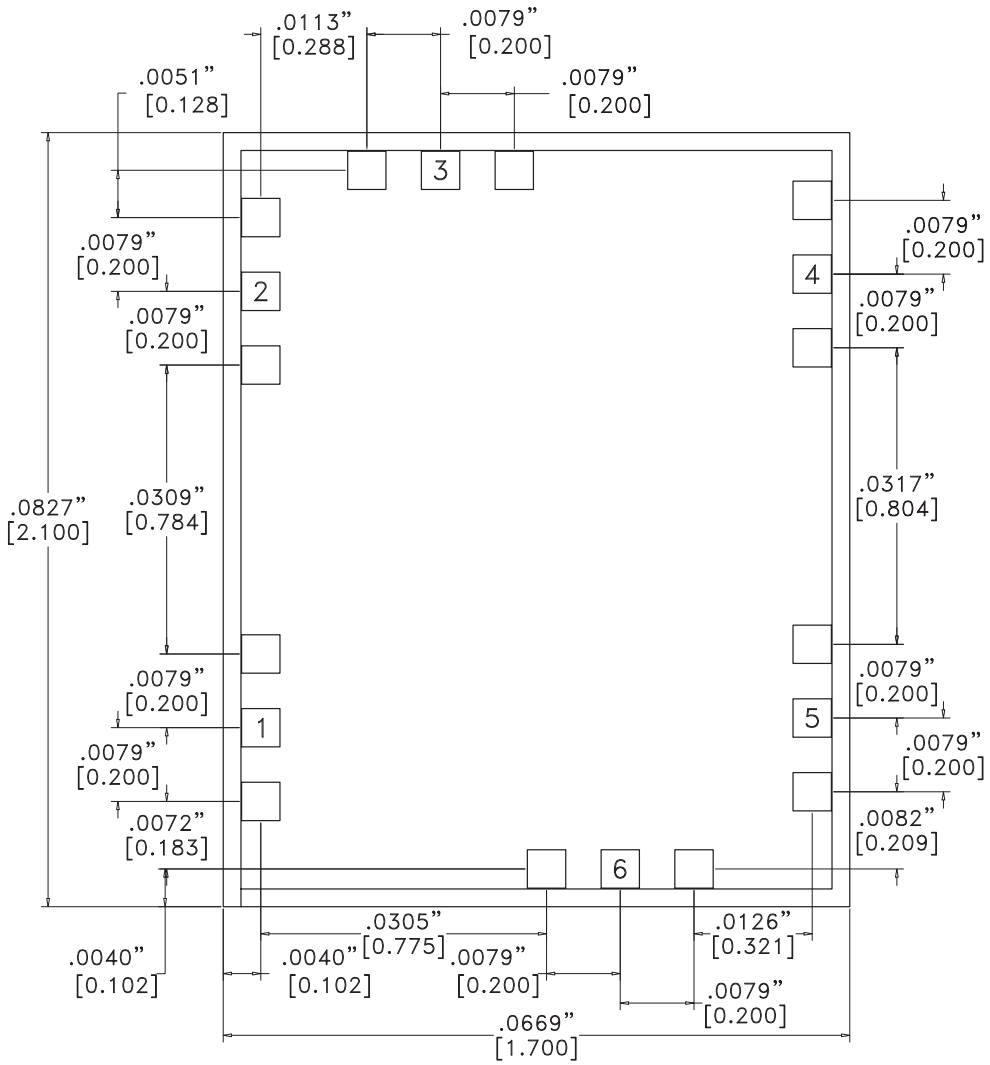
PRBS=2^{31}-1, 7.3V Input, Data rate of 40 Gb/s





Note: Measured Performance Characteristics (Typical Performance at 25°C) (Measured data obtained from die in a test fixture unless otherwise stated)

Outline Drawing



NOTES:

1. ALL DIMENSIONS ARE IN INCHES [MM].
2. TYPICAL BOND PAD IS .004" SQUARE.
3. BACKSIDE METALLIZATION: GOLD.
4. BACKSIDE METAL IS GROUND.
5. BOND PAD METALLIZATION: GOLD.
6. CONNECTION NOT REQUIRED FOR UNLABELED BOND PADS.
7. OVERALL DIE SIZE ±.002"