HMC152

PHASE COMPENSATED VARIABLE GAIN AMPLIFIER 2.5 - 5.0 GHz

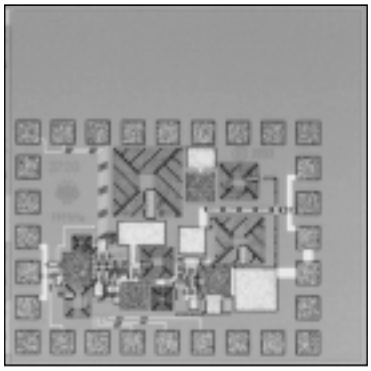
SEPTEMBER 1999

Features

GAIN: **15 dB typ.**

GAIN ADJUSTMENT RANGE: **> 20 dB**

RELATIVE PHASE SHIFT: **10 DEGREES**



General Description

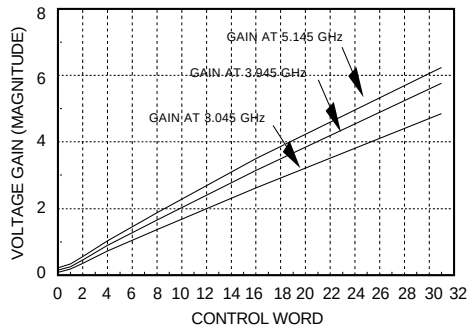
The HMC152 is an amplifier with gain controlled with a 5 bit binary word. The magnitude of the voltage gain varies linearly with the value of the control word. This transfer function is used to perform weighted loading of antenna arrays, alignment of monopulse receivers, antenna nulling and digital modulation for communications. The amplifier provides low phase shift vs gain state. Intermodulation performance improves as gain decreases, which is opposite to what occurs in most voltage variable attenuators in which Intermodulation distortion degrades as attenuation is increased.

Guaranteed Performance, *-55 to +85 deg C*

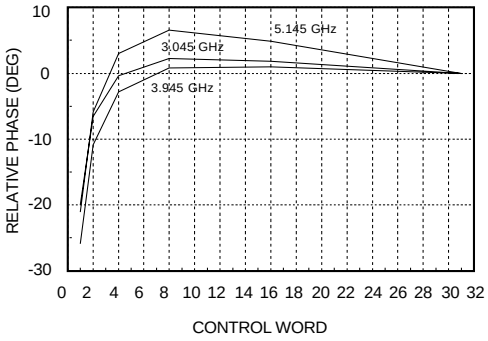
Parameter	Frequency	Min.	Typ.	Max.	Units
Gain	1 - 4 GHz	9	12	15	dB
Gain Adjustment Range	1 - 4 GHz	20	22		dB
Return Loss	1 - 4 GHz	5	10		dB
Relative Phase Shift (Control Word 2 thru 31)	1 - 4 GHz		10	12	Deg.
Input Power for 1dB Compression	1 - 4 GHz		-9		dBm
Input Third Order Intercept	1 - 4 GHz		+5		dBm
Noise Figure Control Word 31 (Max. Gain): Control Word 2 (Min. Gain):	1 - 4 GHz		7 20		dB dB
DC Current at Vdd=+5V			60	75	mA

SEPTEMBER 1999

Gain vs Control Word

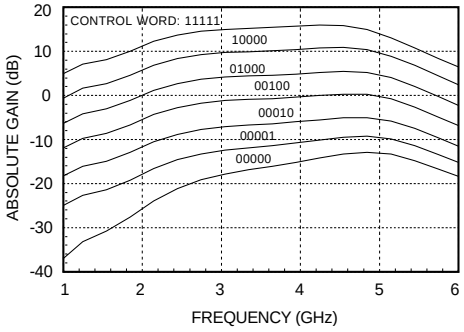


Phase vs Control Word

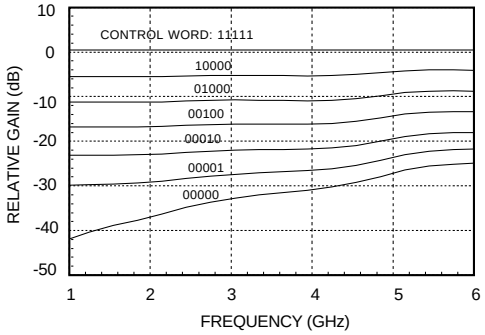


Voltage Gain (magnitude, not dB) is linearly related to the digital control word. Maximum gain is provided for control word 11111 (Decimal 31). Minimum gain is provided for control word 00000 (Decimal 0). Intermediate gain levels are provided for the intervening control words (Decimal 1 through 30)

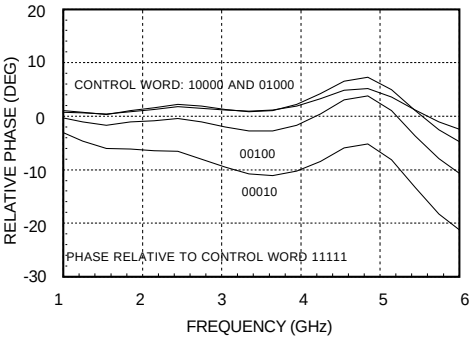
Gain vs Control Word



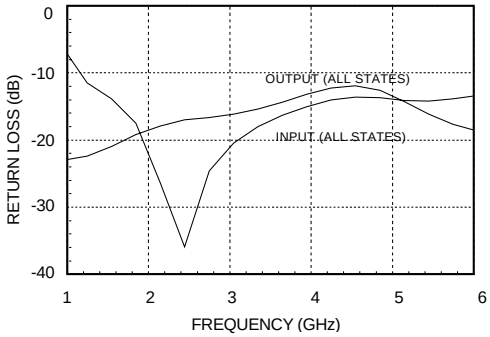
Relative Gain vs Control Word



Relative Phase vs Control Word



Return Loss

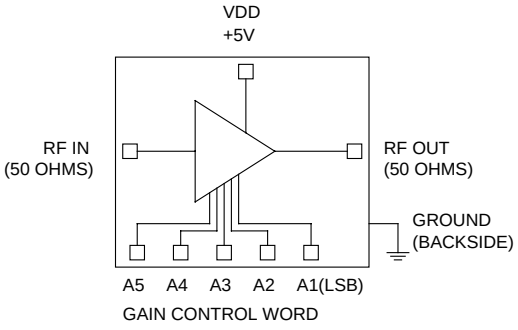


MICROWAVE CORPORATION

HMC152 VARIABLE GAIN AMPLIFIER 2.5 - 5.0 GHz

SEPTEMBER 1999

Schematic



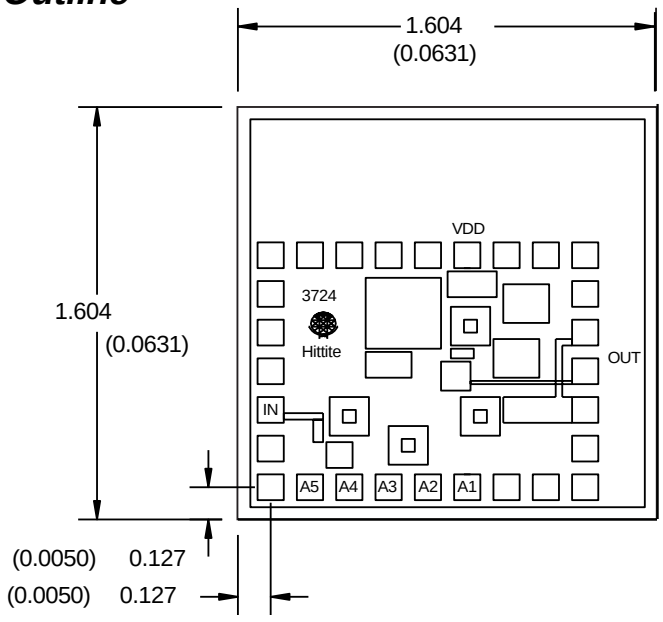
Control Voltages

State	Function	Bias Condition
1	Gain Enable	+2.5V +/- 0.1V @ 1mA Max.
0	Gain Disable	-1V to -5V @ 1mA Max.

Absolute Maximum Ratings

Supply Voltage	+7.0 Vdc Max.
Control Voltage	+2.5 to -5.0 Vdc
Storage Temperature	-65 to +150 deg C
Operating Temperature	-55 to +125 deg C

Outline



ALL DIMENSIONS IN MILLIMETERS (INCHES)
ALL TOLERANCES ARE ± 0.025 (0.001)
DIE THICKNESS IS 0.100 (0.004), BACKSIDE IS GROUND
BONDPADS ARE 0.100 (0.004) SQUARE,
EQUALLY SPACED AT 0.150 (0.006) CENTERS
BONDPAD METALLIZATION: GOLD
BACKSIDE METALLIZATION: GOLD

SEPTEMBER 1999

Handling Precautions

Follow these precautions to avoid permanent damage:
Cleanliness: Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems.
Static Sensitivity: Follow ESD precautions to protect against ≥±250V ESD strikes (*see page 8 - 2*).
Transients: Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pick-up.
General Handling: Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers. The surface of the chip has fragile air bridges and should not be touched with vacuum collet, tweezers, or fingers.

Mounting

As indicated on each data sheet some chips are back-metallized and can be die mounted with AuSn eutectic preforms. All chips can be mounted with electrically conductive epoxy. The mounting surface should be clean and flat.

Eutectic Die Attach:
A 80/20 gold tin preform is recommended with a work surface temperature of 255 deg. C and a tool temperature of 265 deg. C. When hot 90/10 nitrogen/hydrogen gas is applied, tool tip temperature should be 290 deg. C.
DO NOT expose the chip to a temperature greater than 320 deg. C for more than 20 seconds. No more than 3 seconds of scrubbing should be required for attachment.

Epoxy Die Attach:
Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip once it is placed into position.
Cure epoxy per the manufacturer's schedule.

Wire Bonding

Ball or wedge bond with 1.0 diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 deg. C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package. RF bonds should be as short as possible.