HMC694

v03.1108

GaAs MMIC ANALOG VARIABLE GAIN AMPLIFIER, 6 - 17 GHz

Typical Applications

The HMC694 is ideal for:

- Point-to-Point Radio
- Point-to-Multi-Point Radio
- EW & ECM
- X-Band Radar
- Test Equipment

Features

Wide Gain Control Range: 23 dB

Single Control Voltage

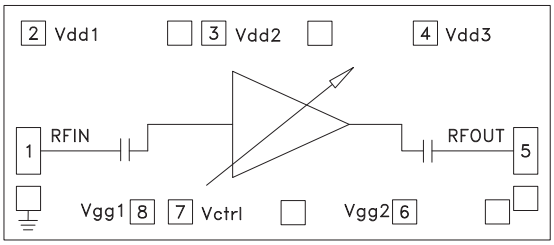
Output IP3 @ Max Gain: +30 dBm

Output P1dB: +22 dBm

No External Matching

Die Size: 2.26 x 0.97 x 0.1 mm

Functional Diagram



General Description

The HMC694 is a GaAs MMIC PHEMT analog variable gain amplifier die which operates between 6 and 17 GHz. Ideal for microwave radio applications, the amplifier provides up to 24 dB of gain, output P1dB of up to 22 dBm, and up to 30 dBm of Output IP3 at maximum gain, while requiring only 170 mA from a +5V supply. A gate bias (Vctrl) is provided to allow variable gain control up to 23 dB. Gain flatness is excellent from 6 to 17 GHz, making the HMC694 ideal for EW, ECM and radar applications. The HMC694 can easily be integrated into Multi-Chip-Modules (MCMs) due to its small size and no external matching. All data is taken with the chip in a 50 Ohm test fixture connected via 0.025 mm (1 mil) diameter wire bonds of minimal length 0.31 mm (12 mils).

Electrical Specifications, T_A = +25° C, Vdd1, 2, 3= 5V, Vctrl= -2V, Idd= 170 mA*

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range		6 - 10			10 - 17		GHz
Gain	19	24		17	21		dB
Gain Flatness		±1			±1.5		dB
Gain Variation Over Temperature		0.03			0.03		dB/ °C
Gain Control Range		23			20		dB
Noise Figure		5.5	7.5		5	6.5	dB
Input Return Loss		15			12		dB
Output Return Loss		10			8		dB
Output Power for 1 dB Compression (P1dB)	19	21		21	22		dBm
Saturated Output Power (Psat)		22			23		dBm
Output Third Order Intercept (IP3)		30			30		dBm
Total Supply Current (Idd)		170			170		mA

*Set Vctrl = -2V and then adjust Vgg1, 2 between -2V to 0V (typ. -0.8V) to achieve Idd = 170mA typical.

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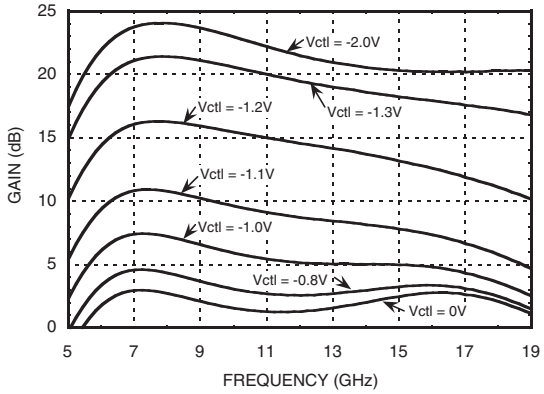
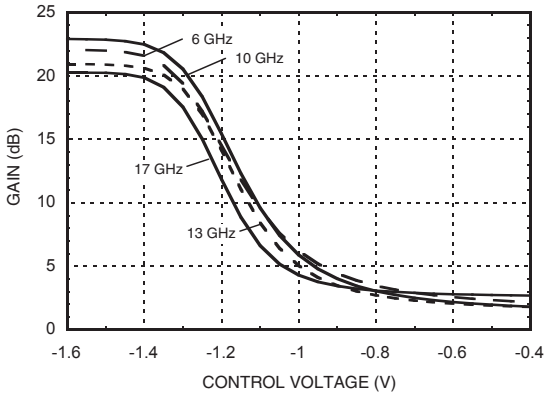
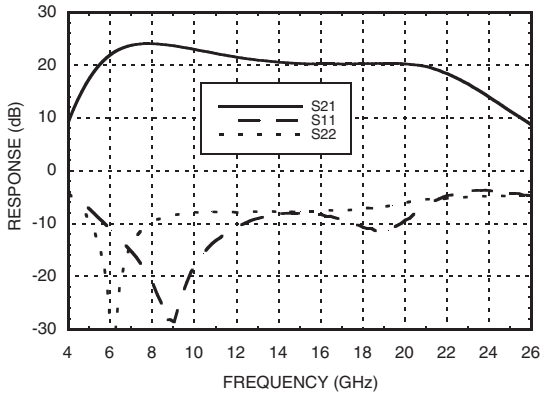
Control Voltage Range vs. Gain



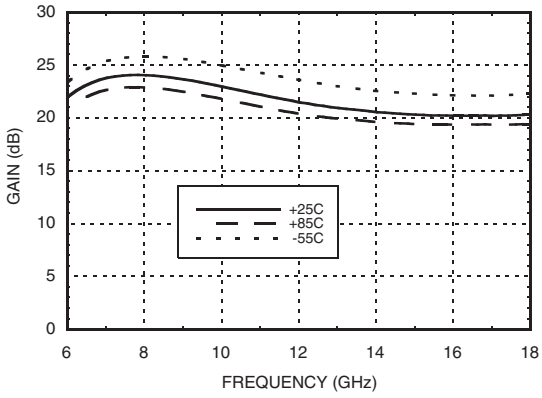
Gain vs. Control Voltage



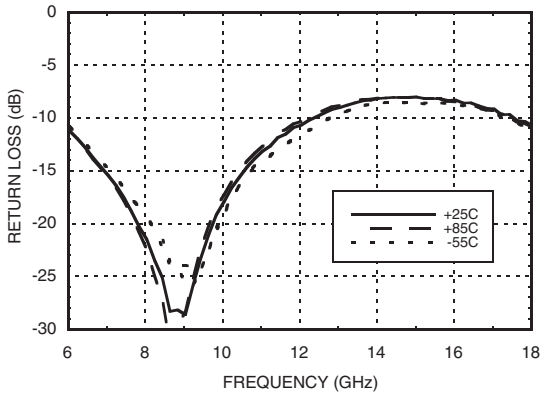
Broadband Gain & Return Loss



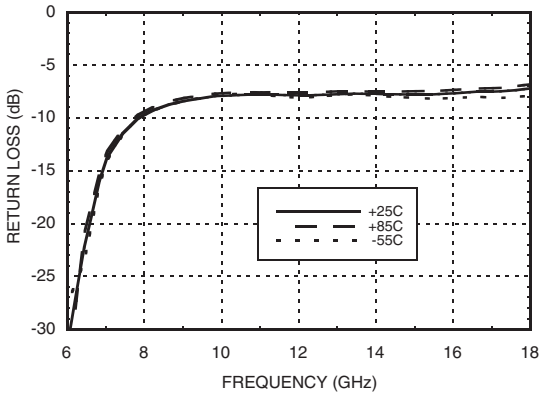
Gain vs. Temperature



Input Return Loss vs. Temperature



Output Return Loss vs. Temperature



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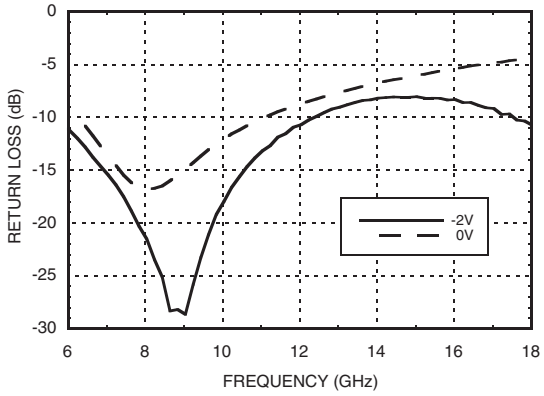
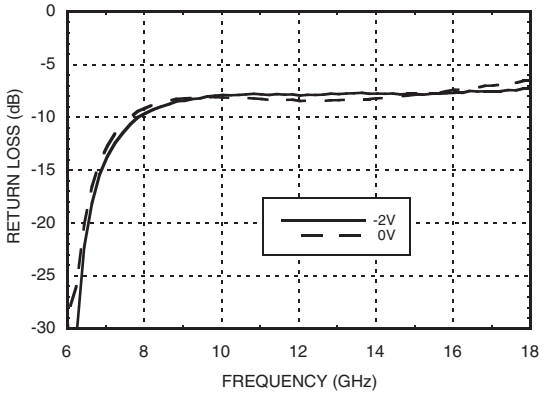
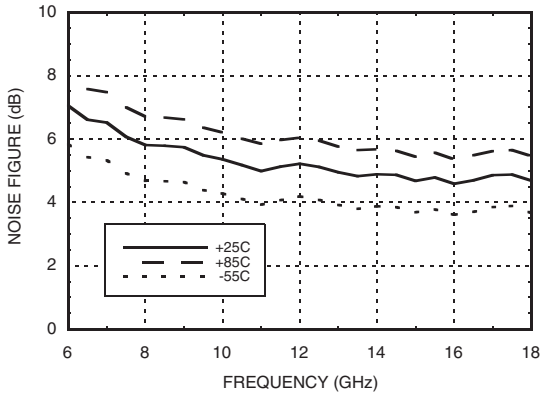
Return Loss @ Voltage Extreme



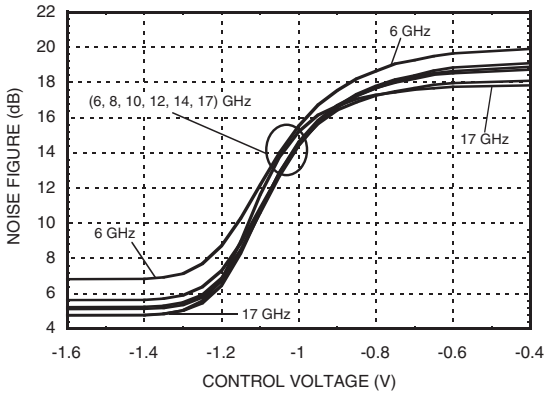
Output Return Loss @ Voltage Extreme



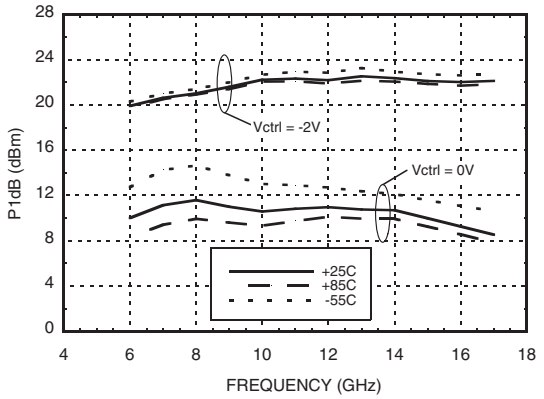
Noise Figure vs. Temperature



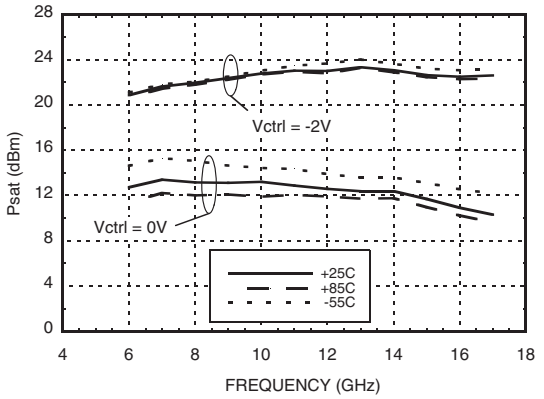
Noise Figure vs. CTRL



P1dB vs. Temperature



Psat vs. Temperature



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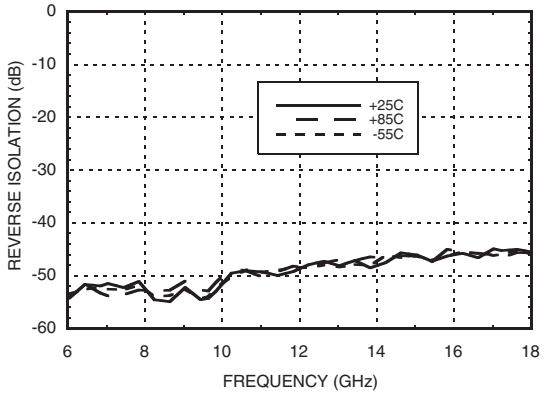
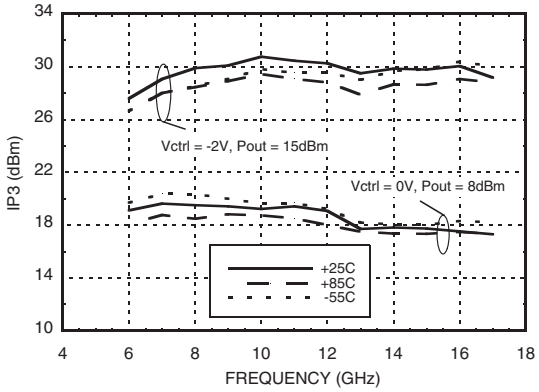
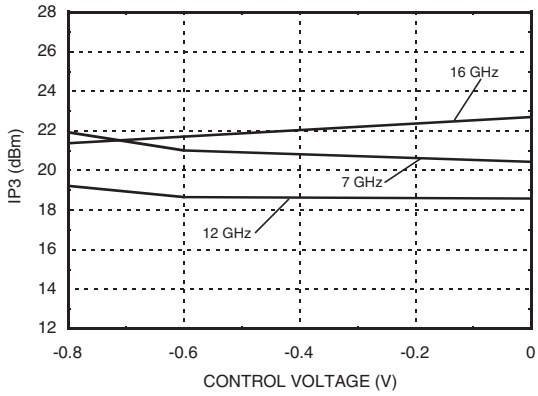
Reverse Isolation vs. Temperature



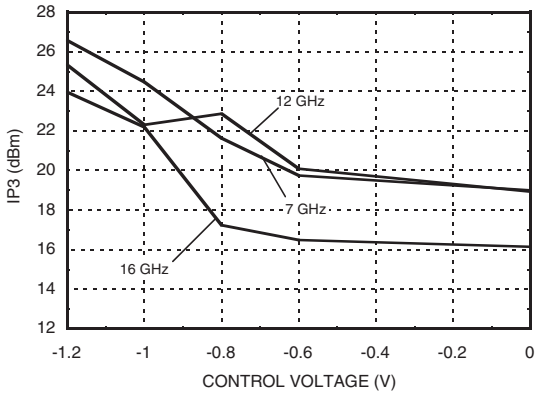
Output IP3 vs. Temperature



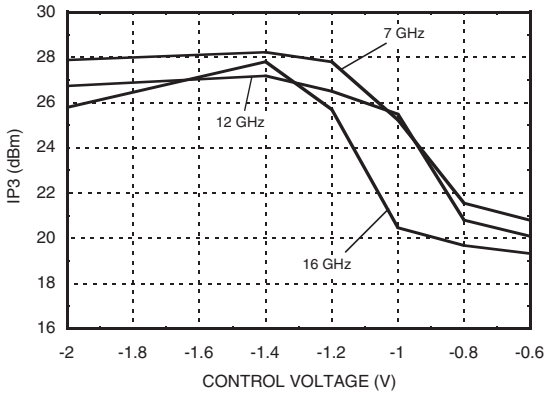
Output IP3 @ 0 dBm



Output IP3 @ 5 dBm



Output IP3 @ 10 dBm



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Absolute Maximum Ratings

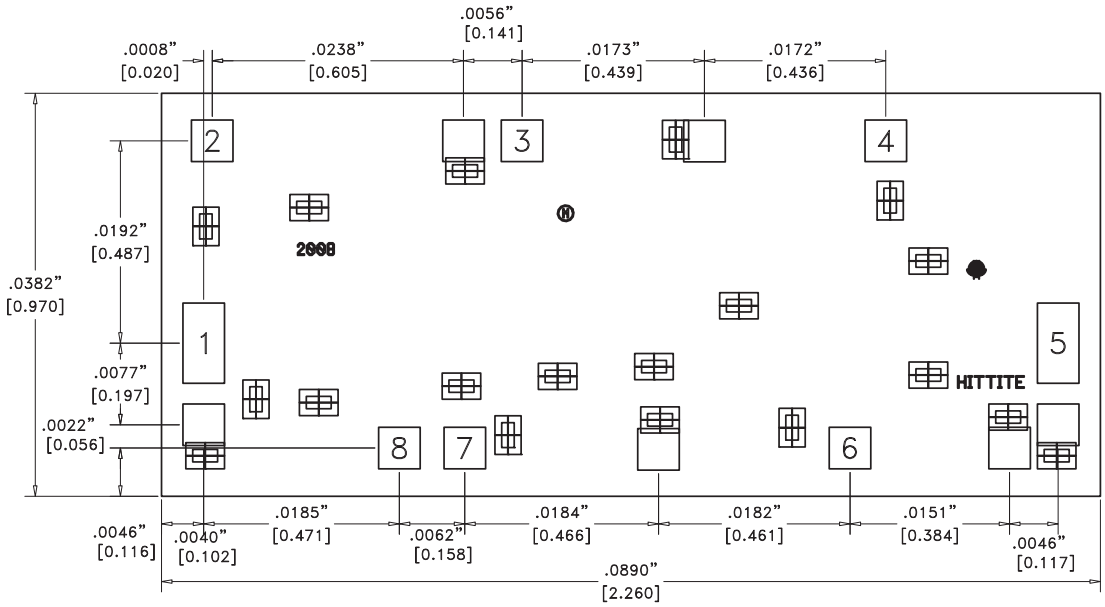
Drain Bias Voltage (Vdd1, 2, 3)	+5.5V
Gate Bias Voltage (Vgg1, 2)	-3 to 0V
Gain Control Voltage (Vctrl)	-3 to 0V
RF Input Power	+5 dBm
Channel Temperature	175 °C
Continuous Pdiss (T= 85 °C) (derate 10.2 mW/°C above 85 °C)	0.92 W
Thermal Resistance (channel to die bottom)	97.6 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-55 to +85 °C

Typical Supply Current vs. Vdd

Vdd1,2,3 (V)	Idd Total (mA)
+5	170
Vgg1,2 (V)	Igg Total (mA)
0V to -2V	<3 µA

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



Die Packaging Information [1]

Standard	Alternate
GP-2 (Gel Pack)	[2]

[1] Refer to the "Packaging Information" section for die packaging dimensions.
[2] For alternate packaging information contact Hittite Microwave Corporation.

NOTES:
1. ALL DIMENSIONS IN INCHES [MILLIMETERS]
2. NO CONNECTION REQUIRED FOR UNLABELED BOND PADS
3. DIE THICKNESS IS 0.004 (0.100)
4. TYPICAL BOND PAD IS 0.004 (0.100) SQUARE
5. BACKSIDE METALLIZATION: GOLD
6. BACKSIDE METAL IS GROUND
7. BOND PAD METALIZATION: GOLD

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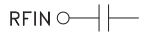
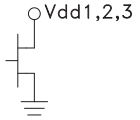
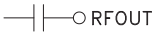
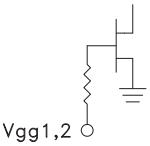
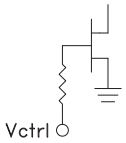
Pad Descriptions

Pad Number	Function	Description	Interface Schematic
1	RFIN	This pad is AC coupled and matched to 50 ohm.	
2 - 4	Vdd1, 2, 3	Drain Bias Voltage for the amplifier. See assembly diagram for required external components	
5	RFOUT	This pad is AC coupled and matched to 50 ohm.	
6, 8	Vgg1, 2	Gate control for amplifier. Adjust voltage to achieve typical Idd. Please follow “MMIC Amplifier Biasing Procedure” application note.	
7	Vctrl	Gain control Voltage for the amplifier. See assembly diagram for required external components.	
Die Bottom	GND	Die bottom must be connected to RF/DC ground.	

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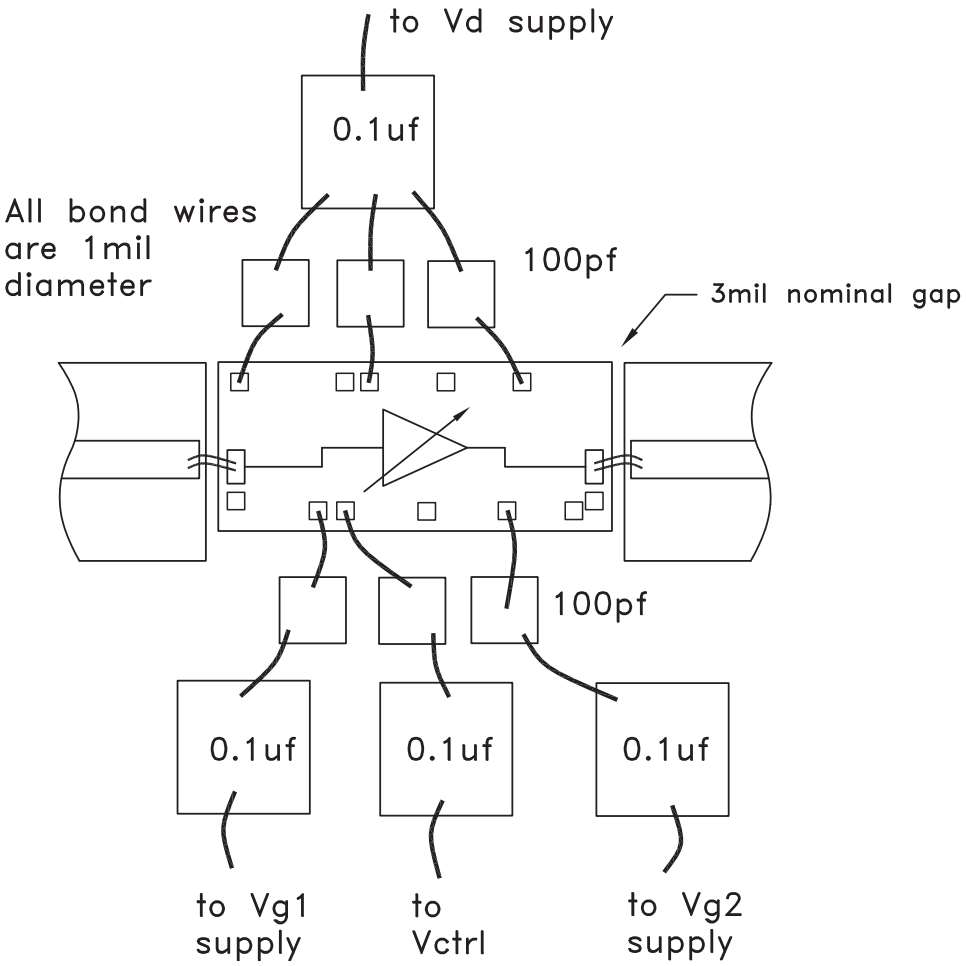
Assembly Diagram



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