Hittite
MICROWAVE CORPORATION

HMC261

GaAs MMIC MEDIUM POWER DISTRIBUTED AMPLIFIER 20 - 40 GHz

FEBRUARY 2001

v01.05.00

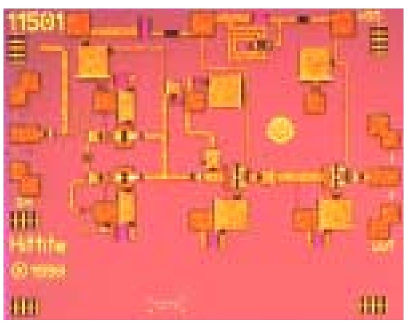
Features

STABLE GAIN vs. TEMPERATURE: 14dB ± 1.5 dB

HIGH REVERSE ISOLATION : 40 ~ 50 dB

P1dB OUTPUT POWER: +12 dBm

SMALL SIZE: 1.3mm x 1.7mm



General Description

The HMC261 chip is a GaAs MMIC distributed amplifier which covers the frequency range of 20 to 40 GHz. The chip can easily be integrated into Multi-Chip Modules (MCMs) due to its small (2.21 mm^2) size. The chip utilizes a GaAs PHEMT process, operating from a single bias supply of + 3 to +4V with a P1dB output power of +12 dBm. This amplifier can be used in microwave & millimeter wave point-to-point radios, Local Multi-Point Distribution Systems (LMDS), VSAT, and other SATCOM applications. All data is 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). The HMC261 may be used to drive the LOs of HMC mixers such as the HMC203 or HMC259.

Guaranteed Performance, Vdd = +4V, -55 to +85 deg C

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range		20 - 40			27 - 32		GHz
Gain	8	13	18	11	14	17	dB
Input Return Loss	3	9		6	8		dB
Output Return Loss	4	10		7	8		dB
Reverse Isolation	32	45		40	45		dB
Output Power for 1dB Compression (P1dB)	8	12		9	12		dBm
Saturated Output Power (Psat)	11	13		11	13		dBm
Output Third Order Intercept (IP3)	20	23		20	23		dBm
Noise Figure		7.5	13		7	10	dB
Supply Voltage (Vdd)	3.75	4.0	4.25	3.75	4.0	4.25	Vdc
Supply Current (Idd)		75	90		75	90	mA

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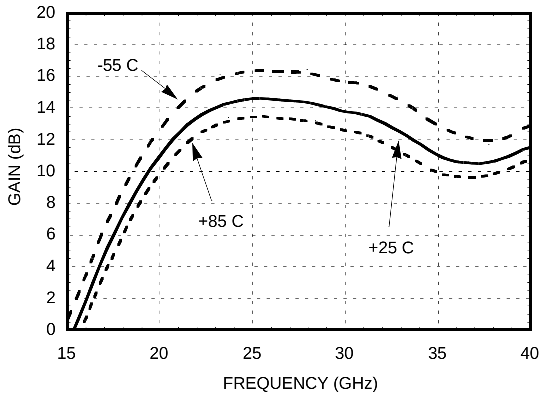
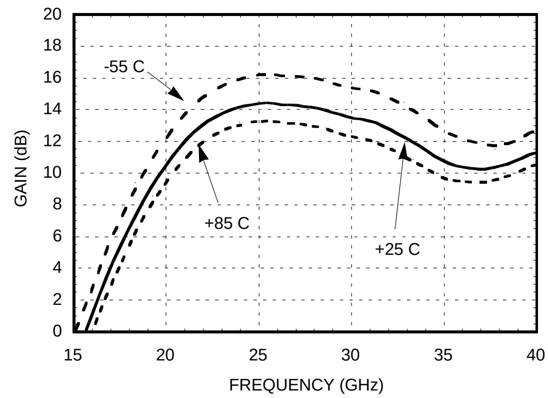
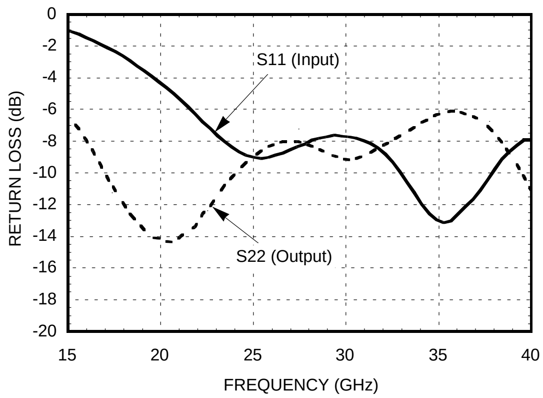
Gain vs. Temperature @ Vdd = +4V



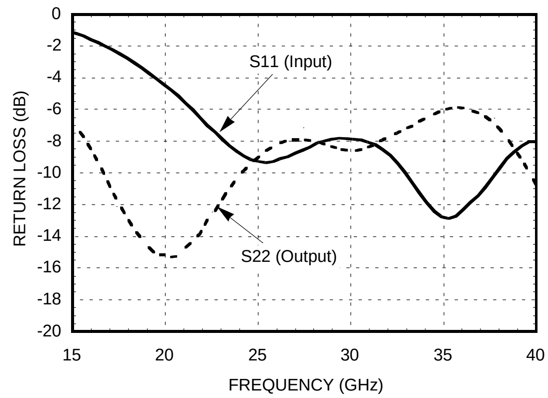
Gain vs. Temperature @ Vdd = +3V



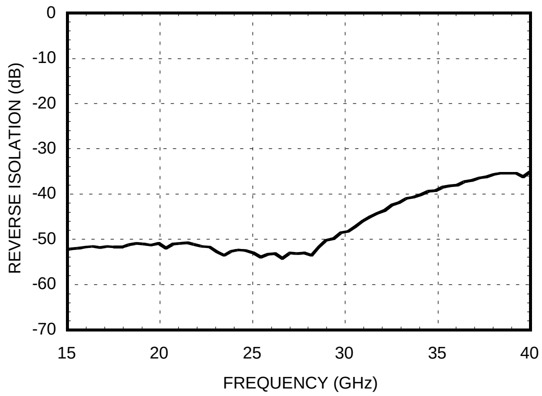
Return Loss @ Vdd = +4V



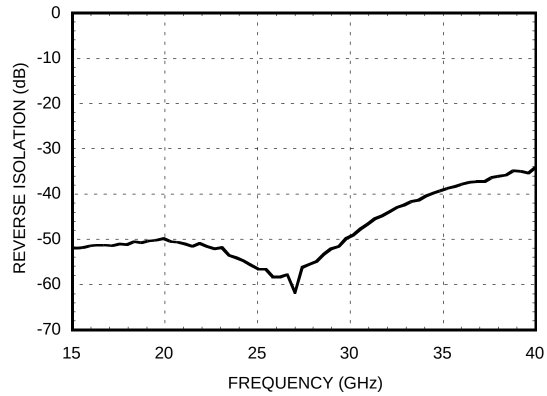
Return Loss @ Vdd = +3V



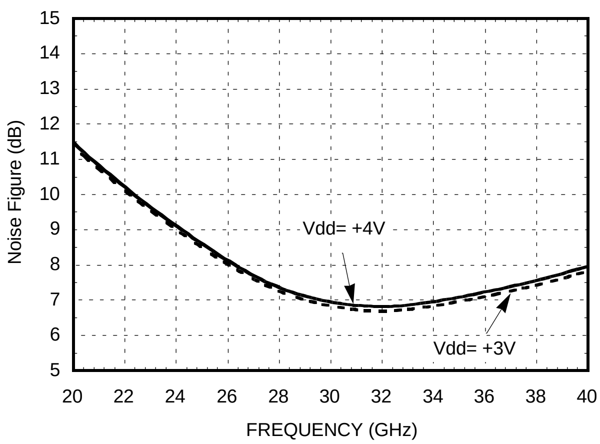
Reverse Isolation @Vdd = +4V



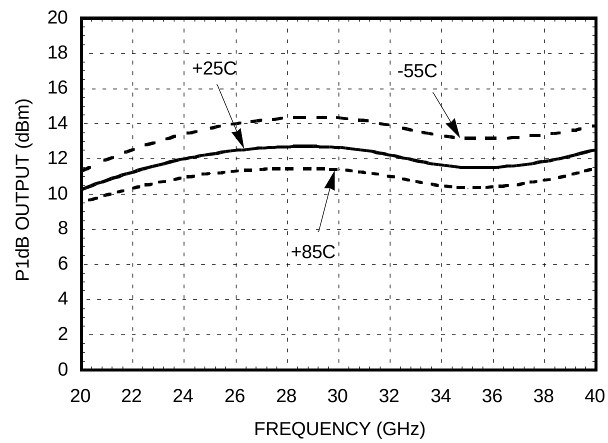
Reverse Isolation @Vdd = +3V



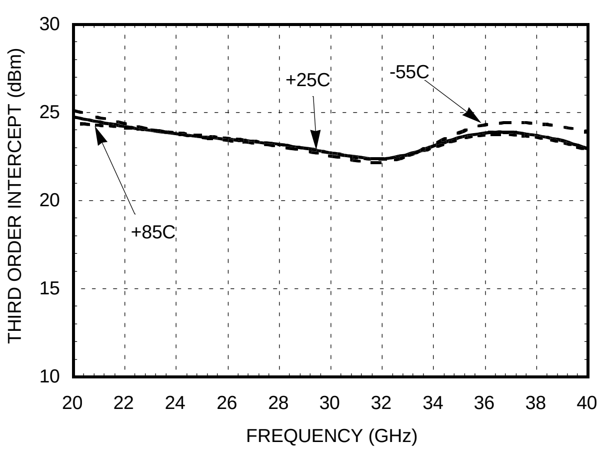
Noise Figure vs. Vdd



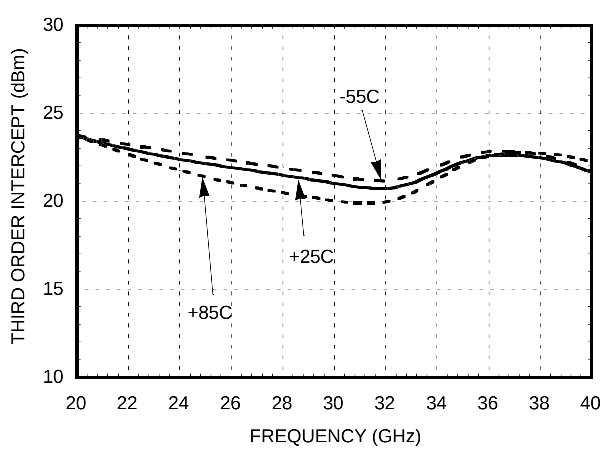
P1dB Output Power vs. Temperature @ Vdd = +4V



Output IP3 vs. Temperature @ Vdd = +4V



Output IP3 vs. Temperature @ Vdd = +3V



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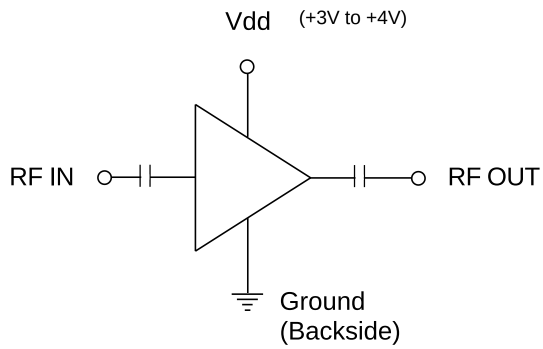
Schematic

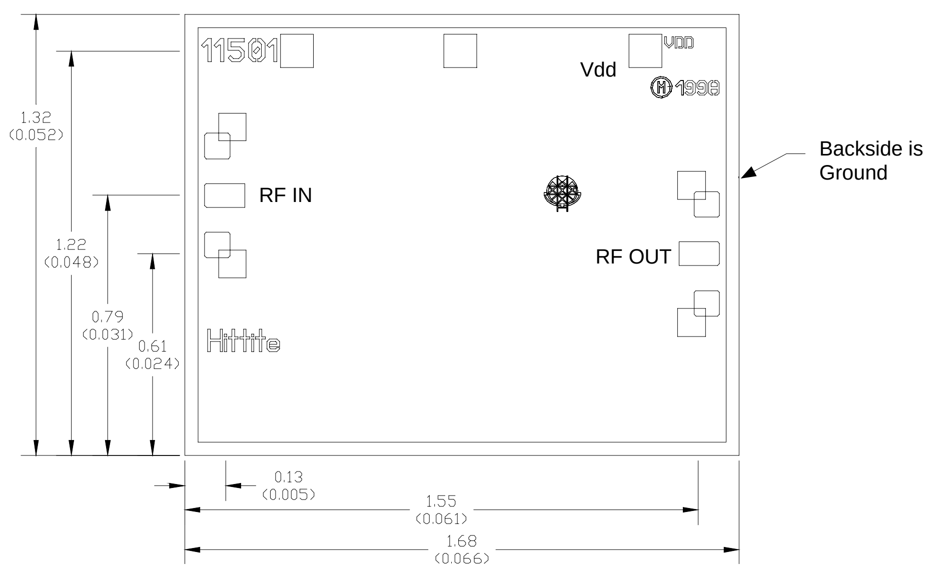


NOTE: A 100pF single layer chip bypass capacitor is recommended on the Vdd port no further than 0.762 mm (30mils) from the HMC261

Absolute Maximum Ratings

Supply Voltage (Vdd)	+5.5 Vdc
Input Power (RFin) (Vdd = +3V)	+16 dBm
Channel Temperture (Tc)	175 °C
Thermal Resistance (⊖jc) (Channel Backside)	90 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-55 to +85 °C

Outline *(See Die Handling, Mounting, Bonding Note Page 1 - 7)*



ALL DIMENSION IN MILLIMETERS (INCHES)
ALL TOLERANCES ARE ±0.025 (0.001)
DIE THICKNESS IS 0.100 (0.004) BACKSIDE IS GROUND
BOND PADS ARE 0.100 (0.004) SQUARE
BOND PAD SPACING, CTR-CTR: 0.150 (0.006)
BACKSIDE METALLIZATION : GOLD
BOND PAD METALLIZATION : GOLD

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MIC Assembly Techniques for HMC261

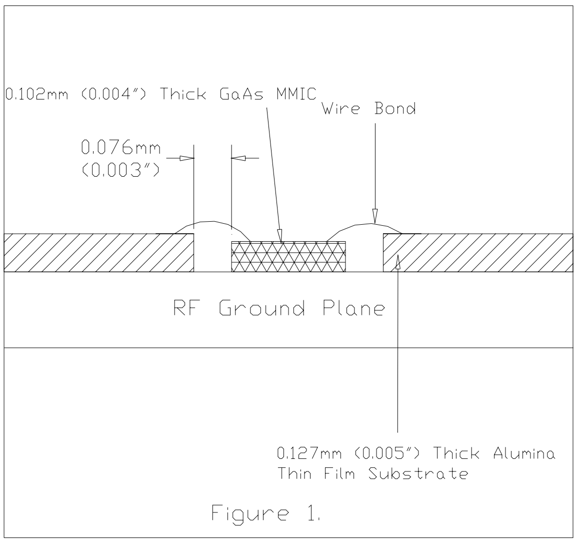

Figure 1.

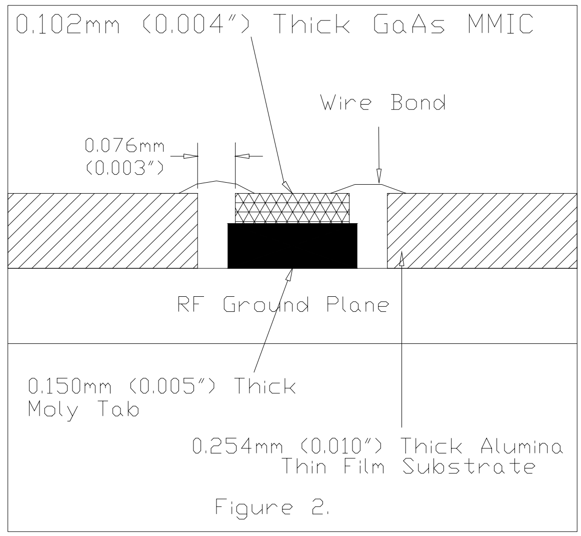

Figure 2.

Mounting & Bonding Techniques for Millimeterwave GaAs MMICs

The die should be attached directly to the ground plane eutectically or with conductive epoxy (see HMC general Handling, Mounting, Bonding Note).

50 Ohm Microstrip transmission lines on 0.127mm (5 mil) thick alumina thin film substrates are recommended for bringing RF to and from the chip (Figure 1). If 0.254mm (10 mil) thick alumina thin film substrates must be used, the die should be raised 0.150mm (6 mils) so that the surface of the die is coplanar with the surface of the substrate. One way to accomplish this is to attach the 0.102mm (4 mil) thick die to a 0.150mm (6 mil) thick molybdenum heat spreader (moly-tab) which is then attached to the ground plane (Figure 2).

Microstrip substrates should brought as close to the die as possible in order to minimize bond wire length. Typical die-to-substrate spacing is 0.076mm (3 mils).

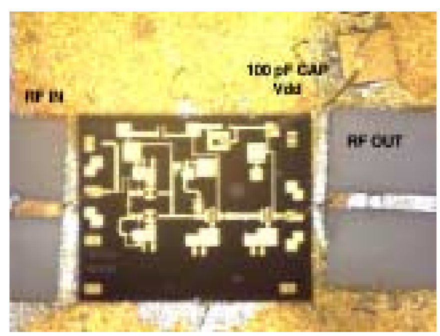

***Figure 3**: Typical HMC261 Assembly*

An RF bypass capacitor should be used on the Vdd input. A 100 pF single layer capacitor (mounted eutectically or by conductive epoxy) placed no further than 0.762mm (30 Mils) from the chip is recommended. The photo in figure 3 shows a typical assembly for the HMC261 MMIC chip.

12 Elizabeth Drive, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373 Web Site: www.hittite.com

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

The chip is back-metallized and can be die mounted with AuSn eutectic preforms or 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 0.025 mm (1 mil) 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 or substrate. All bonds should be as short as possible <0.31 mm (12 mils).