HMC261LM1

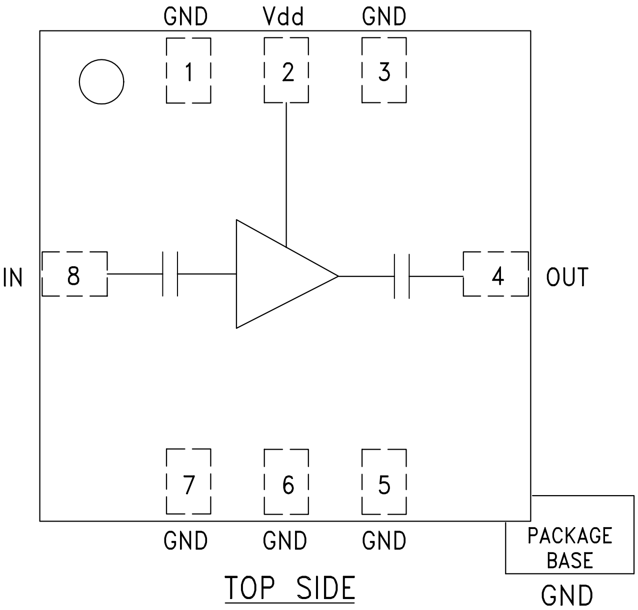
SMT DISTRIBUTED GaAs MMIC AMPLIFIER, 20 - 32 GHz

Typical Applications

The packaged HMC261LM1 amplifier enables economical PCB SMT assembly for:

- Millimeterwave Point-to-Point Radios
- LMDS
- SATCOM

Functional Diagram



Features

SMT mmWave Package

13 dB Gain

P1dB Output Power: +12 dBm

Single Positive Supply: +3V to +4V

No Gate Bias

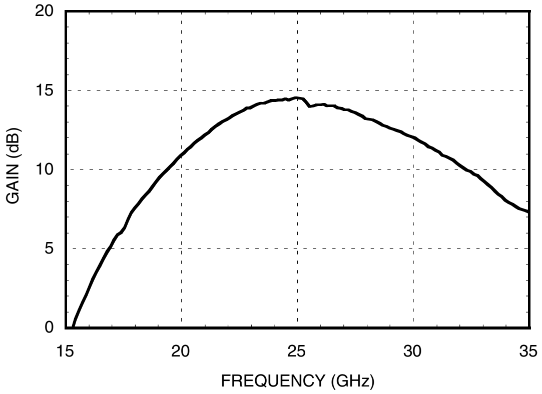
General Description

The HMC261LM1 is a GaAs MMIC distributed amplifier in a SMT leadless chip carrier package covering 20 to 32 GHz. The LM1 is a true surface mount broadband millimeterwave package offering low loss & excellent I/O match, preserving MMIC chip performance. Utilizing a GaAs PHEMT process the device offers 13 dB gain and +14 dBm saturated output power from a bias supply of +4V @ 75 mA. As an alternative to chip-and-wire hybrid assemblies the HMC261LM1 eliminates the need for wirebonding, thereby providing a consistent connection interface for the customer. All data is with the non-hermetic, epoxy sealed LM1 packaged amplifier device mounted in a 50 ohm test fixture. This part replaces the HMC261CB1 by offering more bandwidth and gain.

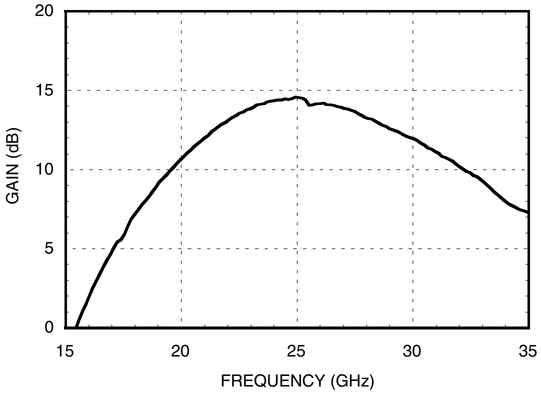
Electrical Specifications, T_A = +25° C, Vdd = +4V

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range		20 - 32			27 - 30		GHz
Gain	8	13	17	10	13	16	dB
Input Return Loss	5	8		6	8		dB
Output Return Loss	10	12		10	12		dB
Reverse Isolation		35			40		dB
Output Power for 1 dB Compression (P1dB)	8	12		8	12		dBm
Saturated Output Power (Psat)	10	14		11	14		dBm
Output Third Order Intercept (IP3)	16	21		17	21		dBm
Noise Figure		8.5	12.5		7	8.5	dB
Supply Current (Idd)		75	90		75	90	mA

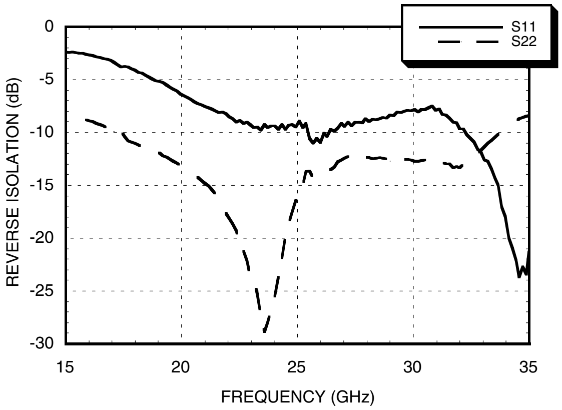
Gain @ Vdd = +4V



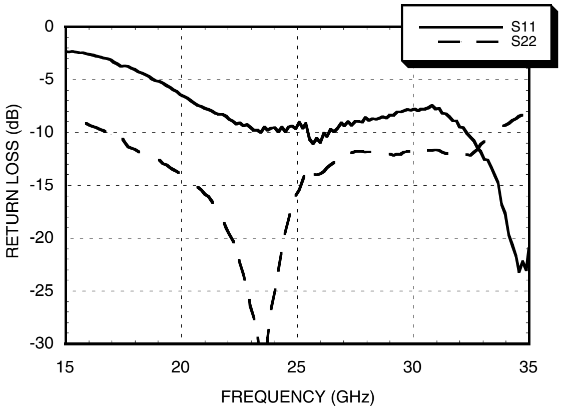
Gain @ Vdd = +3V



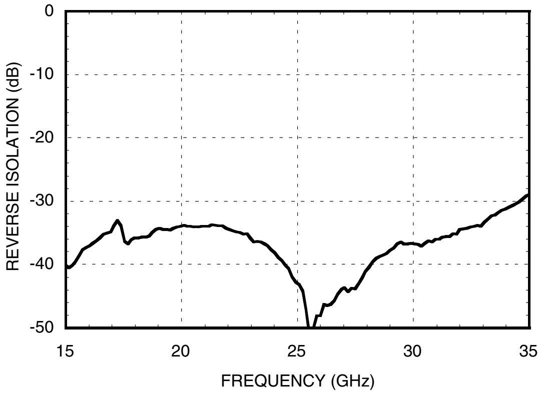
Return Loss @ Vdd = +4V



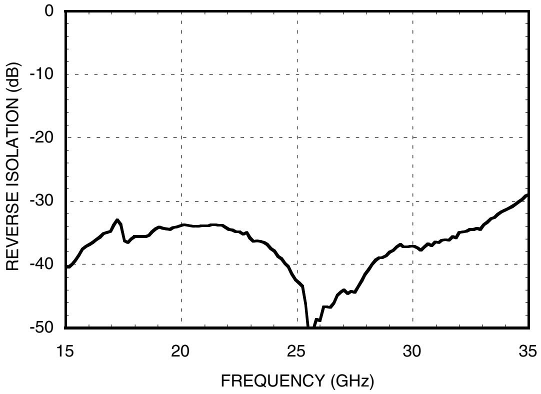
Return Loss @ Vdd = +3V



Reverse Isolation @ Vdd = +4V



Reverse Isolation @ Vdd = +3V



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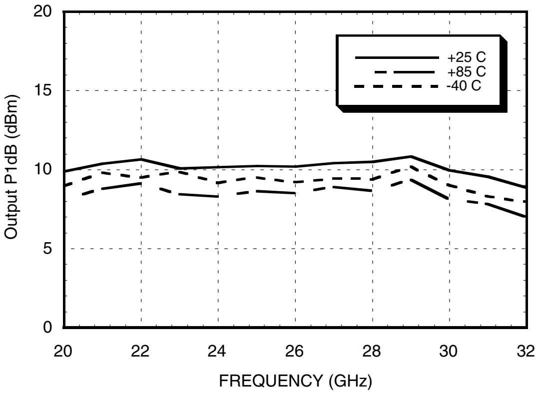
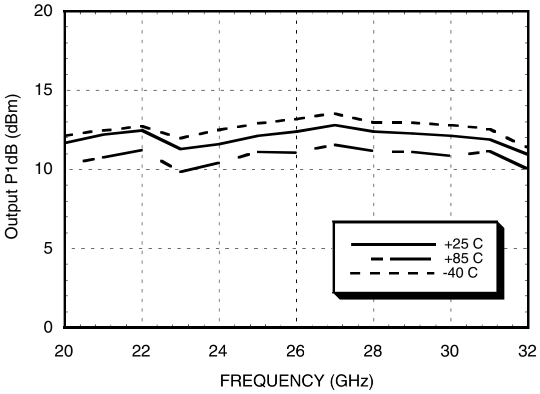
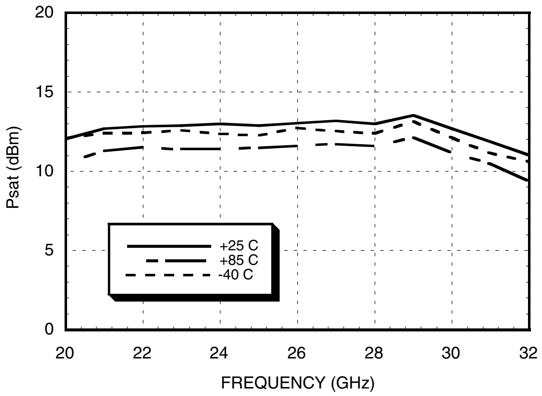
P1dB Output Power vs. Temperature @ Vdd = +3V



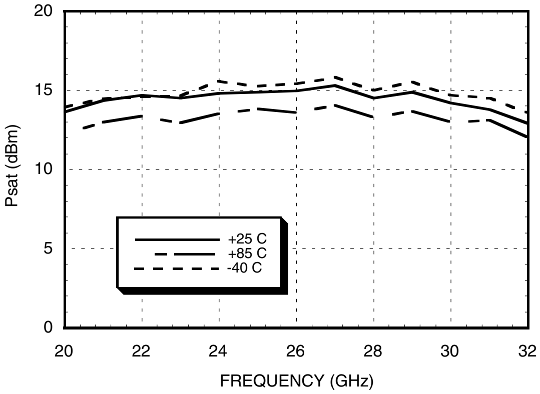
P1dB Output Power vs. Temperature @ Vdd = +4V



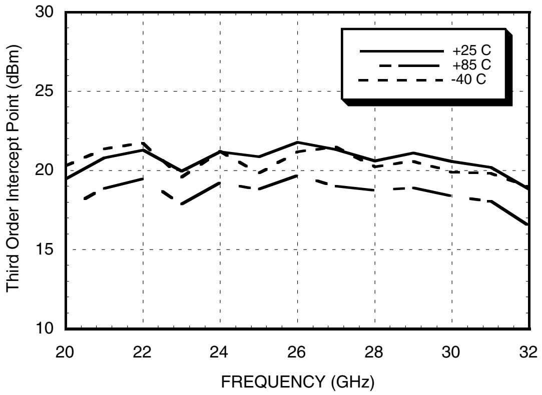
Psat vs. Temperature @ Vdd = +3V



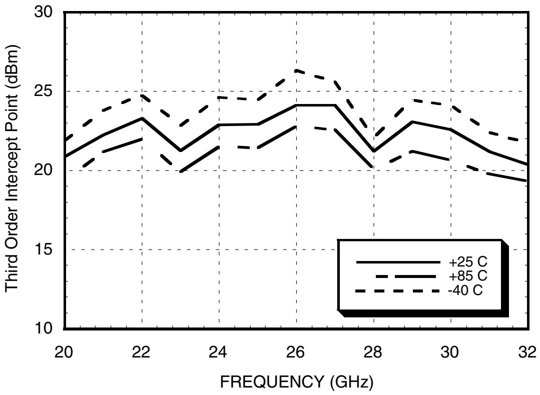
Psat vs. Temperature @ Vdd = +4V



IP3 vs. Temperature @ Vdd = +3V



IP3 vs. Temperature @ Vdd = +4V



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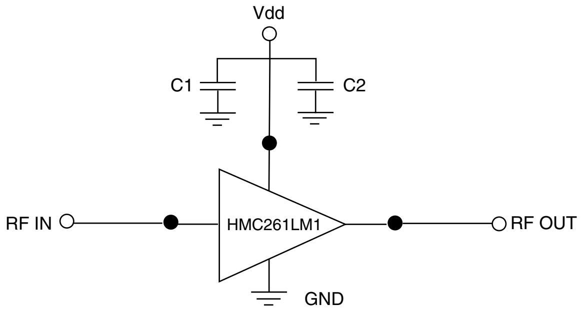
Absolute Maximum Ratings

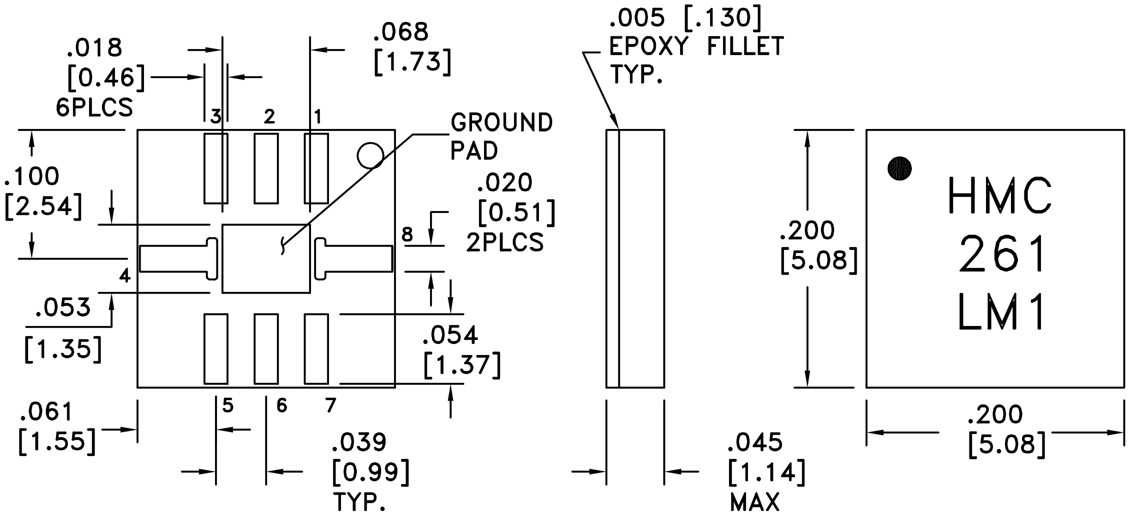
Supply Voltage (Vdd)	+5.5 Vdc
Input Power (RFin) (Vdd= +3V)	+16 dBm
Channel Temperature (Tc)	175 °C
Thermal Resistance (Θjc) (Channel Backside)	90 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-55 to +85 °C

Application Circuit



Recommended Component Values	
C1	100 pF
C2	10,000 pF

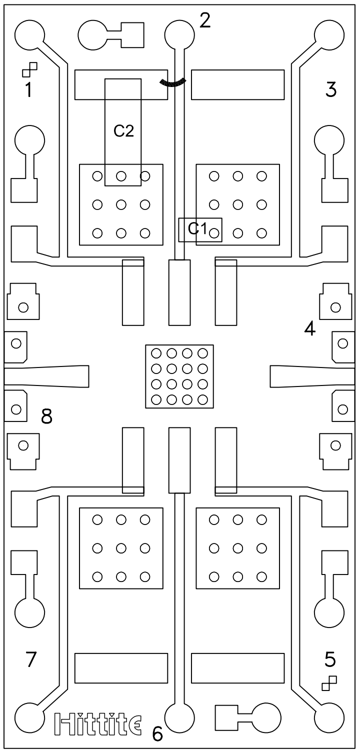
Outline Drawing



Pin	Function
1	GND
2	Vdd
3	GND
4	RF OUT
5	GND
6	GND
7	GND
8	RF IN

1. MATERIAL: PLASTIC
2. PLATING: GOLD OVER NICKEL
3. DIMENSIONS ARE IN INCHES (MILLIMETERS).
4. ALL TOLERANCES ARE ±0.005 (±0.13).
5. ALL GROUNDS MUST BE SOLDERED TO THE PCB RF GROUND.
6. • INDICATES PIN 1.

HMC261LM1 Evaluation PCB

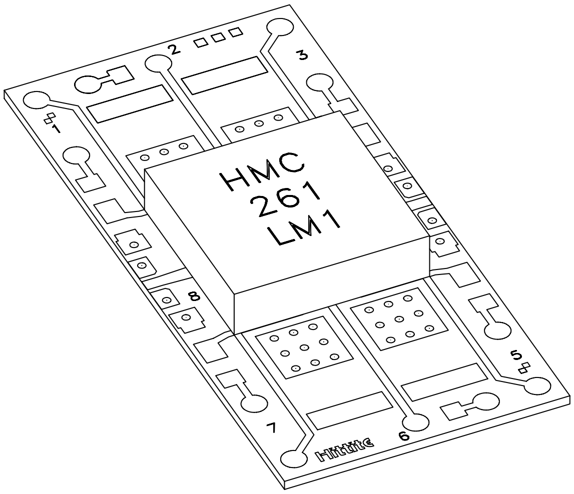


LM1 Evaluation PCB

The grounded Co-Planar Wave Guide (CPWG) PCB input/output transitions allow use of Ground-Signal-Ground (GSG) probes for testing. Suggested probe pitch is 400um (16 mils). Alternatively, the board can be mounted in a metal housing with 2.4 mm coaxial connectors.

Evaluation Circuit Board Layout Design Details

Layout Technique	Micro Strip to CPWG
Material	Rogers 4003 with 1/2 oz, Cu
Dielectric Thickness	0.008" (0.20 mm)
Microstrip Line Width	0.018" (0.46 mm)
CPWG Line Width	0.016" (0.41 mm)
CPWG Line to GND Gap	0.005" (0.13 mm)
Ground Via Hole Diameter	0.008" (0.13 mm)
C1	100 pF Capacitor, 0402 Pkg.
C2	10,000 pF Capacitor, 1206 Pkg.



LM1 Package Mounted to Evaluation PCB

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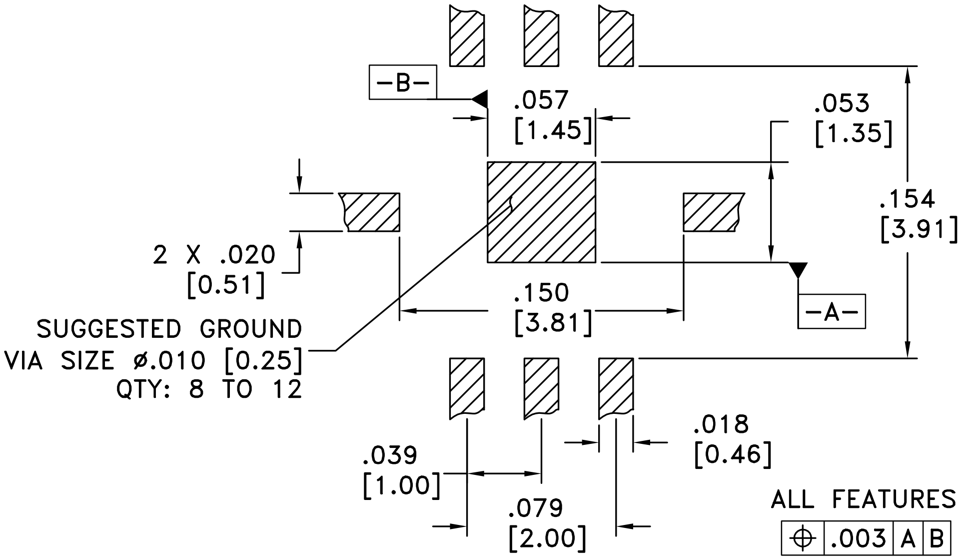
Suggested LM1 PCB Land Pattern *Tolerance: ± 0.003” (± 0.08 mm)*

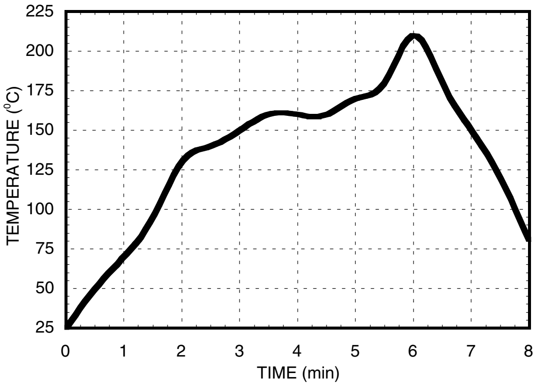
UPDATED 12-5-01



HMC261LM1 Recommended SMT Attachment Technique

Preparation & Handling of the LM1 Millimeterwave Package for Surface Mounting

The HMC LM1 package was designed to be compatible with high volume surface mount PCB assembly processes. The LM1 package requires a specific mounting pattern to allow proper mechanical attachment and to optimize electrical performance at millimeterwave frequencies. The PCB layout pattern can be found on each LM1 product data sheet. It can also be provided as an electronic drawing upon request from Hittite Sales & Application Engineering.



Recommended solder reflow profile
for HMC LM1 SMT package

Follow these precautions to avoid permanent damage: *Cleanliness:* Observe proper handling procedures to ensure clean devices and PCBs. LM1 devices should remain in their original packaging until component placement to ensure no contamination or damage to RF, DC & ground contact areas.

Static Sensitivity: Follow ESD precautions to protect against ESD strikes.
General Handling: Handle the LM1 package on the top with a vacuum collet or along the edges with a sharp pair of bent tweezers. Avoid damaging the RF, DC, & ground contacts on the package bottom. Do not apply excess pressure to the top of the lid.
Solder Materials & Temperature Profile: Follow the information contained in the application note. Hand soldering is not recommended. Conductive epoxy attachment is not recommended.

Solder Paste

Solder paste should be selected based on the user's experience and should be compatible with the metallization systems used. See the LM1 data sheet Outline drawing for pin & ground contact metallization schemes.

Solder Paste Application
Solder paste is generally applied to the PCB using either a stencil printer or dot placement. The volume of solder paste will be dependent on PCB and component layout and should be controlled to ensure consistent mechanical & electrical performance. Excess solder may create unwanted electrical parasitics at high frequencies.

Solder Reflow

The soldering process is usually accomplished in a reflow oven but may also use a vapor phase process. A solder reflow profile is suggested above.

Prior to reflowing product, temperature profiles should be measured using the same mass as the actual assemblies. The thermocouple should be moved to various positions on the board to account for edge and corner effects and varying component masses. The final profile should be determined by mounting the thermocouple to the PCB at the location of the device.

Follow solder paste and oven vendor's recommendations when developing a solder reflow profile. A standard profile will have a steady ramp up from room temperature to the pre-heat temperature to avoid damage due to thermal shock. Allow enough time between reaching pre-heat temperature and reflow for the solvent in the paste to evaporate and the flux to completely activate. Reflow must then occur prior to the flux being completely driven off. The duration of peak reflow temperature should not exceed 15 seconds. Packages have been qualified to withstand a peak temperature of 235°C for 15 seconds. Verify that the profile will not expose the device to temperatures in excess of 235°C.

Cleaning

A water-based flux wash may be used.

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Notes: