HMC1099LP5DE

10 WATT GaN POWER AMPLIFIER 0.01 - 1.1 GHz

Typical Applications

The HMC1099LP5DE is ideal for:

- Extended Battery Operation for Public Mobile Radio
- Power Amplifier Stage for Wireless Infrastructure
- Test & Meassurement Equipment
- Commercial & Military Radar
- General Purpose Transmitter Amplification

Features

High Psat: +40.5 dBm

High Small Signal Gain: 18.5 dB

Instantaneous Bandwidth: 10 MHz to 1.1 GHz

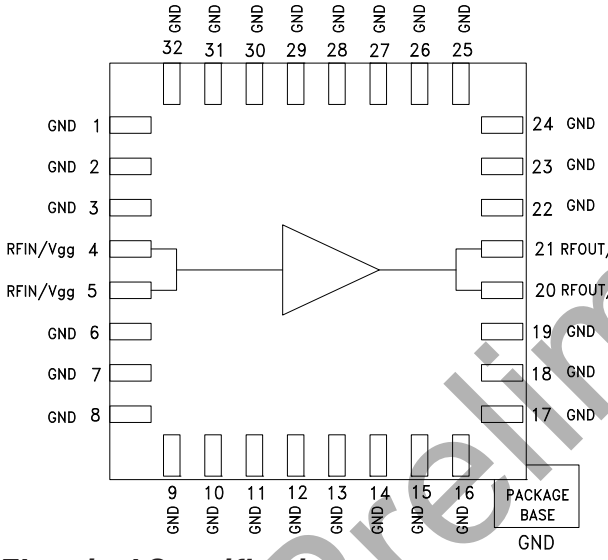
High PAE: 69%

Supply Voltage: Vdd = +28V @ 100 mA

Internal Prematching: Simple & compact external tuning for optimum performance.

32 Lead 5x5 SMT Package: 25 mm²

Functional Diagram



General Description

The HMC1099LP5DE is a GaN broadband power amplifier delivering 10W with up to 70% PAE across an instantaneous bandwidth of 10 MHz to 1.1 GHz, with ±0.5 dB gain flatness. The HMC1099LP5DE is ideal for pulsed or CW applications such as wireless infrastructure, radar, public mobile radio and general purpose amplification. The HMC1099LP5DE amplifier is externally tuned using low cost surface mount components and is available in a compact QFN package.

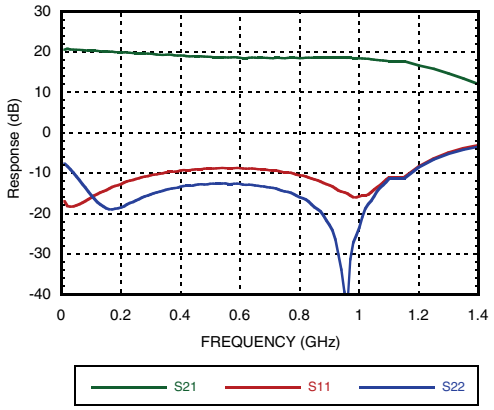
Electrical Specifications, T_A = +25° C, Vdd =+28V, Idd = 100 mA [1]

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max	Units
Frequency Range		0.01 - 0.4			0.4 - 0.7			0.7 - 1.1		GHz
Small Signal Gain	18	20		16.5	18.5		16.5	18.5		dB
Gain Flatness		±1			±0.25			±0.5		dB
Input Return Loss		12			9.5			12		dB
Output Return Loss		15			14			17		dB
Output Power for 4dB Compression (P4dB)		40			40.5			41.5		dBm
Power Gain for 4dB Compression (P4dB)		15			14			14		dB
Output Power for 27 dBm Input		40.5			40.5			41.5		dBm
Saturated Output Power (Psat)		40.5			40.5			41.5		dBm
Power Gain for Saturated Output Power (Psat)		13			13			13.5		dB
Output Third Order Intercept (IP3) [2]		49			48			47		dBm
Power Added Efficiency (PAE)		73			69			69		%
Noise Figure		8			5.5			5		dB
Total Supply Current		100			100			100		mA

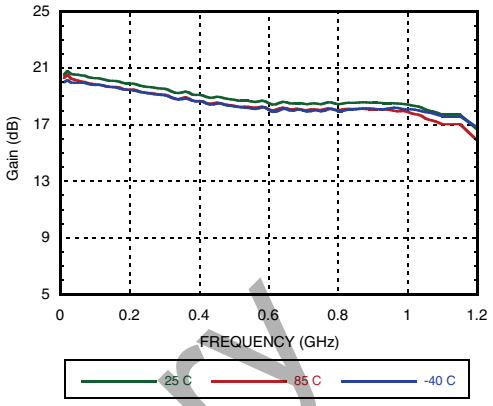
[1] Adjust Vgg between -8 to 0V to achieve Idd = 100 mA typical.

[2] Measurement taken at Pout / tone = +30 dBm.

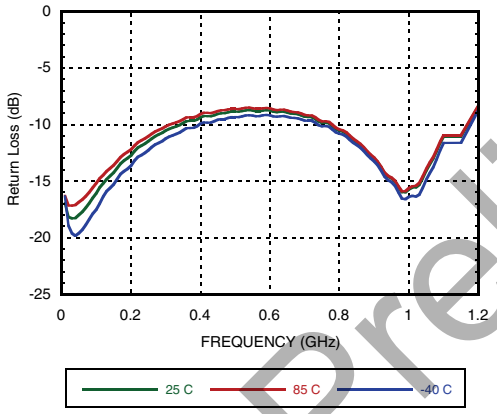
Gain & Return Loss



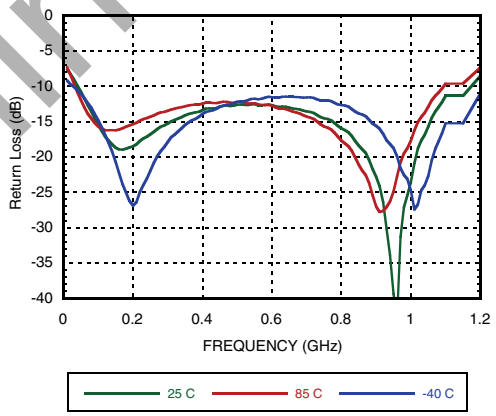
Gain vs. Temperature



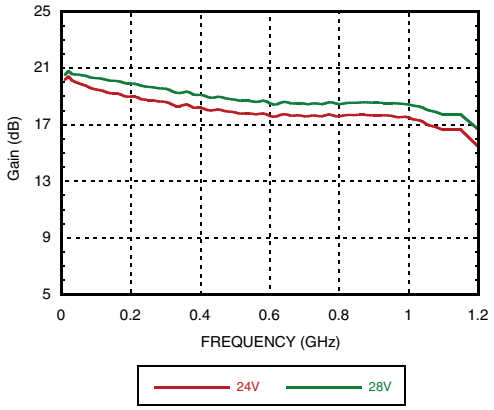
Input Return Loss vs. Temperature



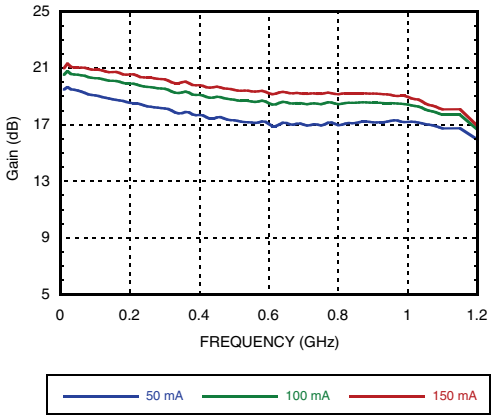
Output Return Loss vs. Temperature



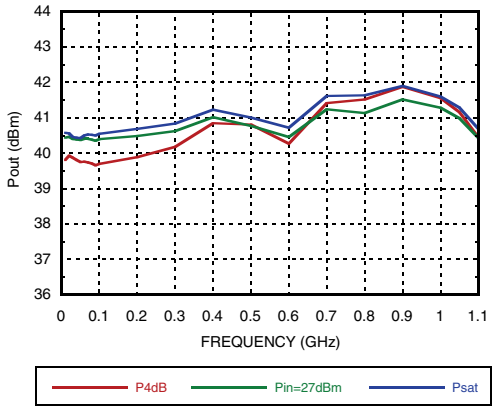
Gain vs. Supply Voltage



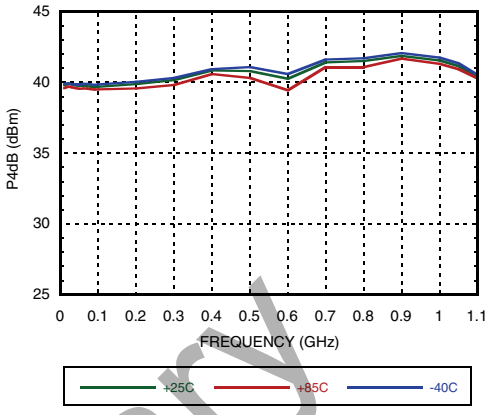
Gain vs. Supply Current



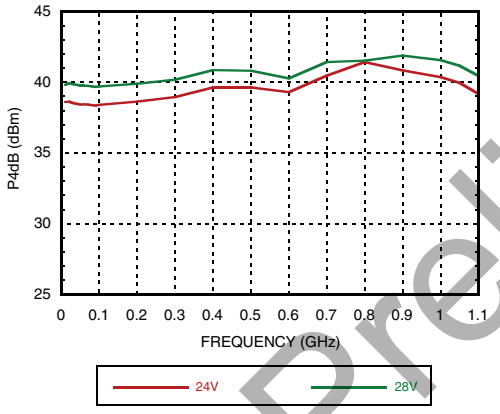
Pout vs. Frequency



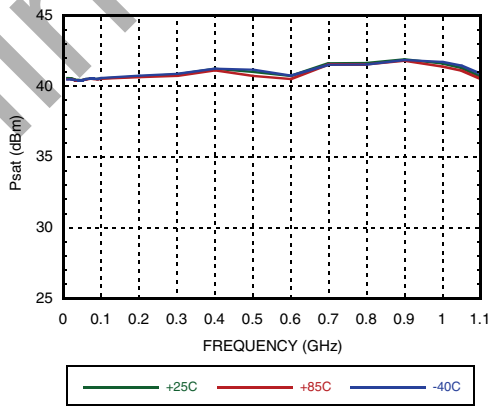
P4dB vs. Temperature



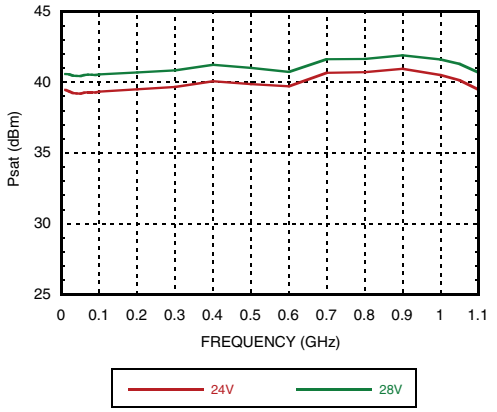
P4dB vs. Supply Voltage



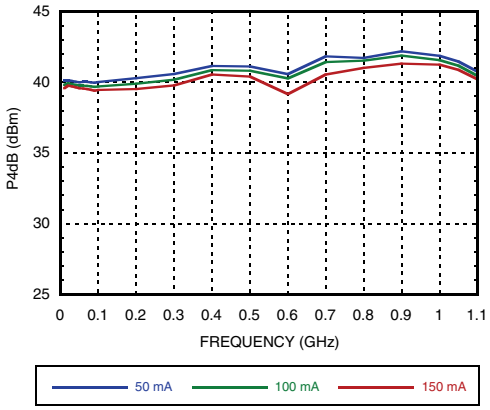
Psat vs. Temperature



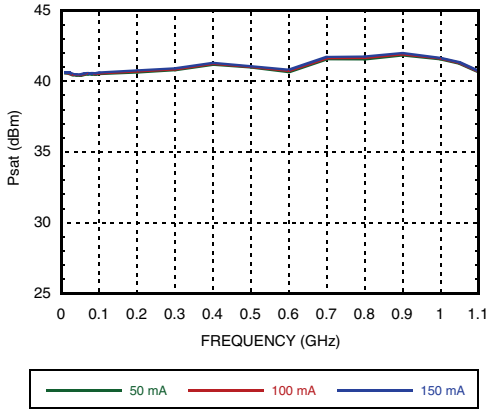
Psat vs. Supply Voltage



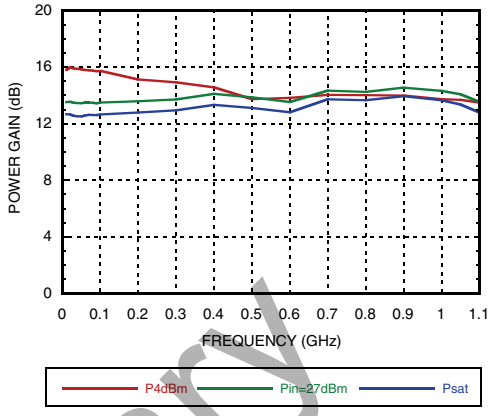
P4dB vs. Supply Current



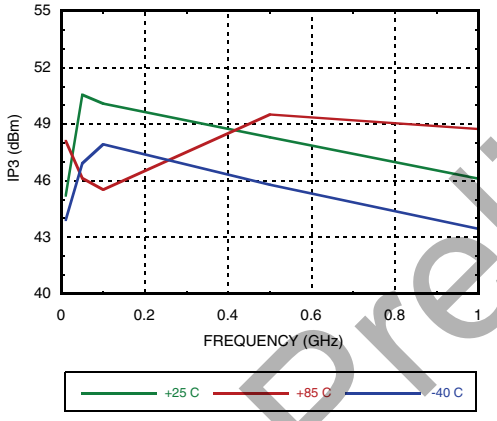
Psat vs. Supply Current



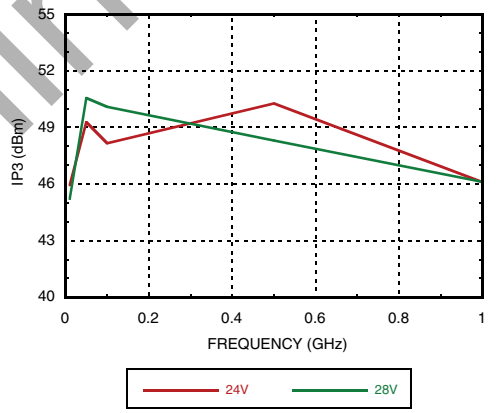
Power Gain vs. Frequency



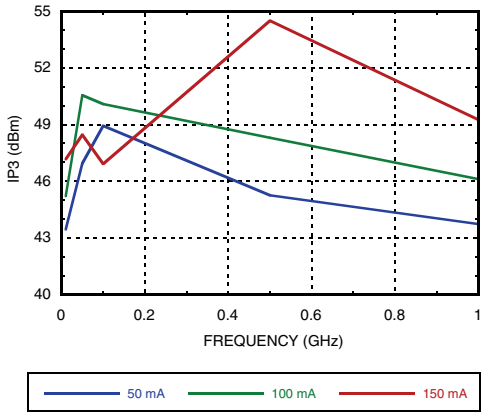
Output IP3 vs. Temperature, Pout/tone = +30 dBm



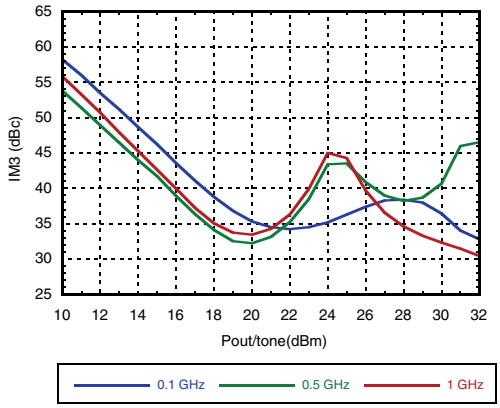
Output IP3 vs. Supply Voltage, Pout/tone = +30 dBm



Output IP3 vs. Supply Current, Pout/tone = +30 dBm



Output IM3 @ Vdd= +24V



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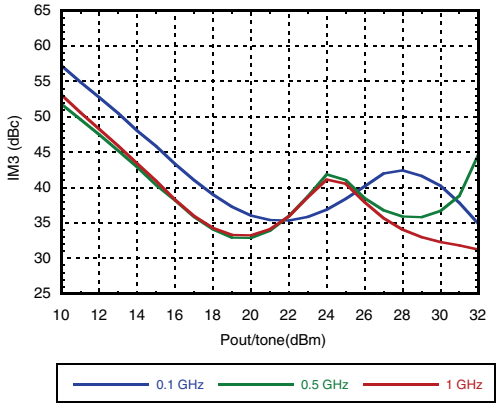
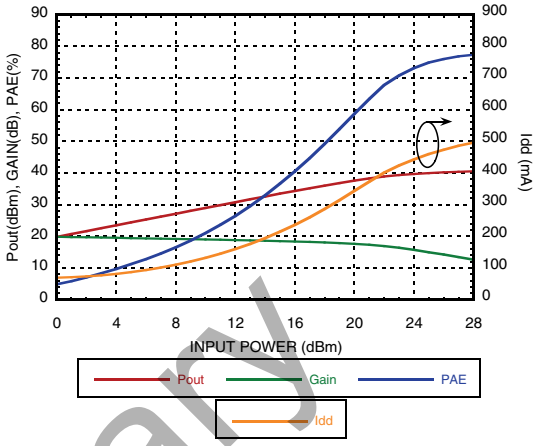
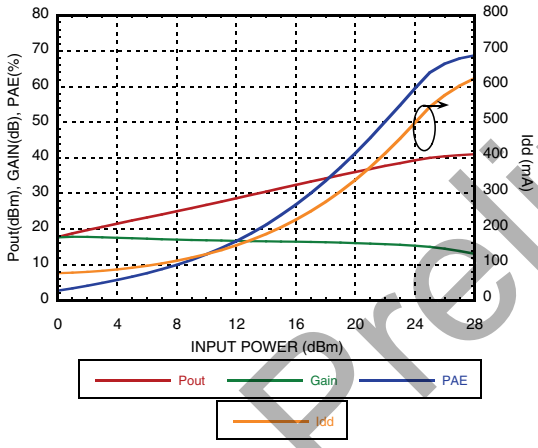
Output IM3 @ Vdd= +28V



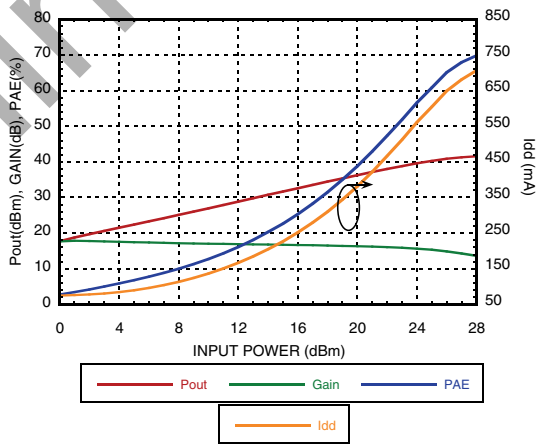
Power Compression @ 0.1 GHz



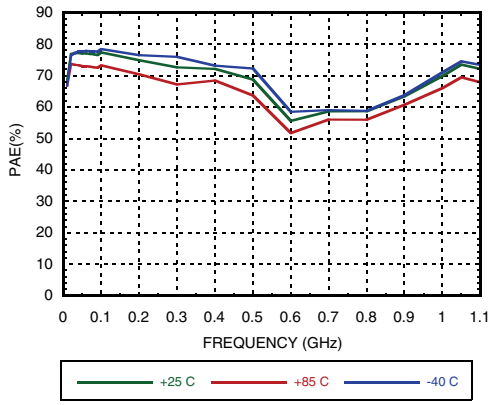
Power Compression @ 0.5 GHz



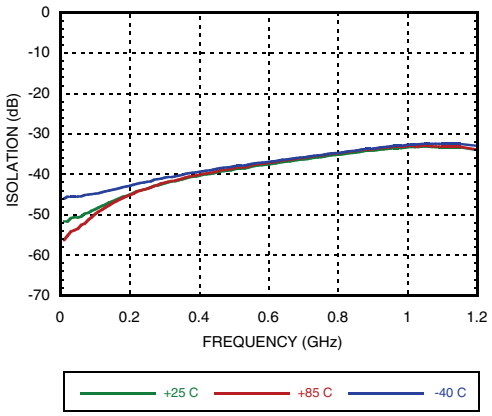
Power Compression @ 1 GHz



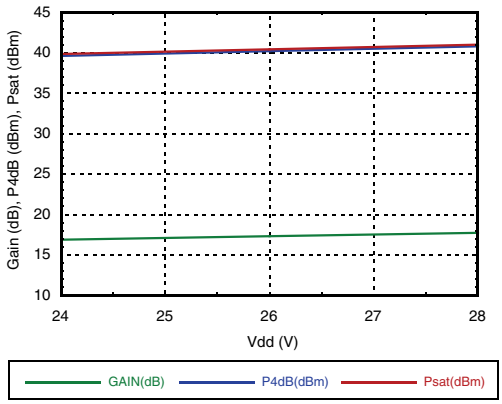
PAE vs. Temperature



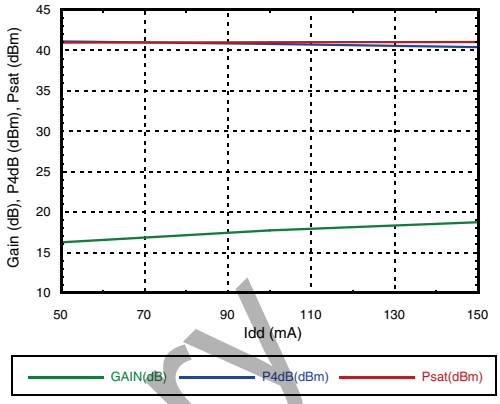
Reverse Isolation vs. Temperature



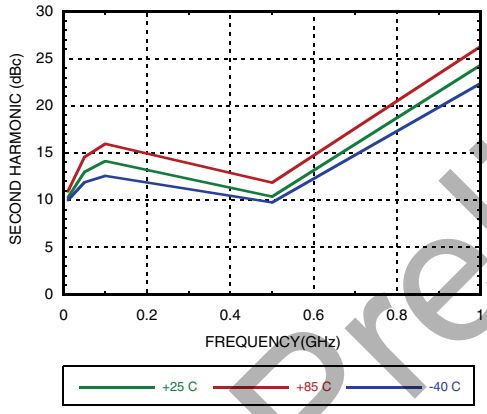
Gain & Power vs. Supply Voltage @ 0.5 GHz



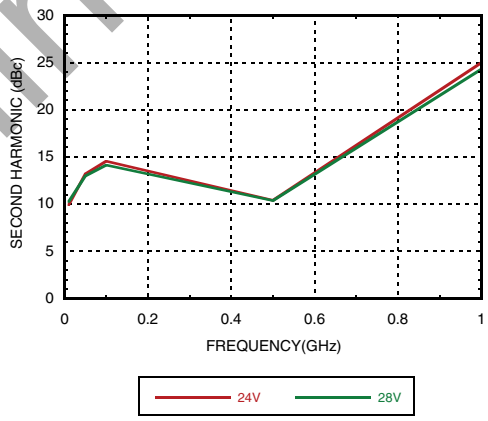
Gain & Power vs. Supply Current @ 0.5 GHz



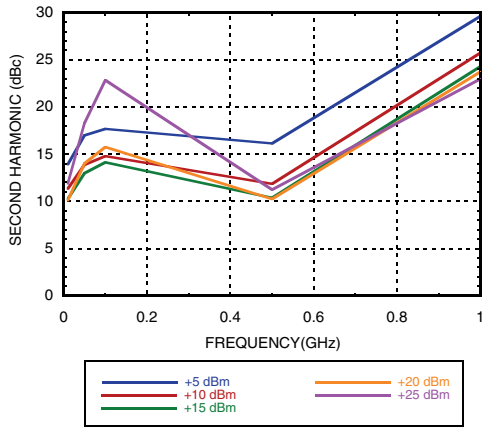
Second Harmonics vs. Temperature



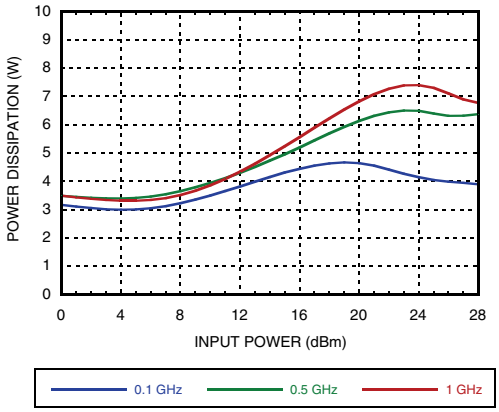
Second Harmonics vs. Supply Voltage



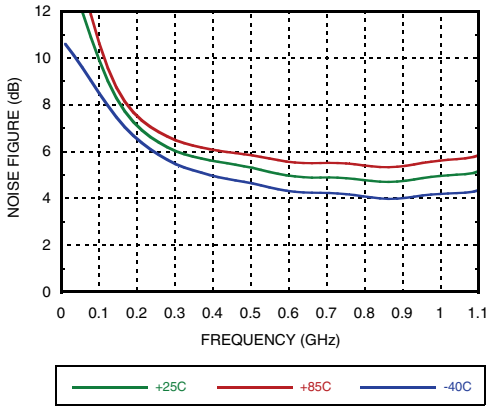
Second Harmonics vs. Input Power



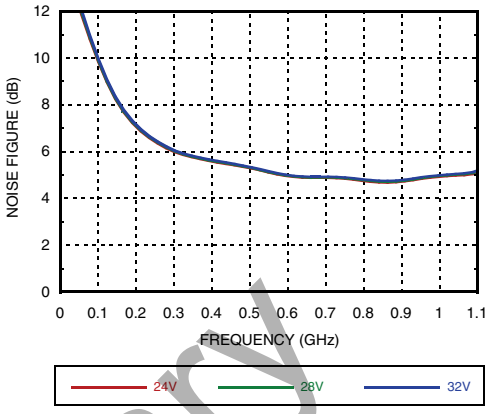
Power Dissipation



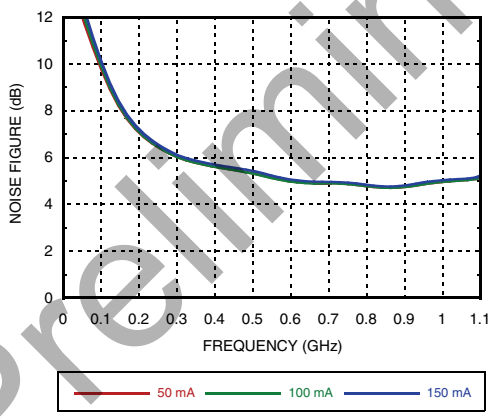
Noise Figure vs. Temperature



Noise figure vs. Supply Voltage



Noise Figure vs. Supply Current



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Absolute Maximum Ratings

Drain Bias Voltage (Vdd)	+32 Vdc
Gate Bias Voltage (Vgg)	-8 to 0 Vdc
RF Input Power (RFIN)	+33 dBm
Channel Temperature	225°C
Continuous Pdiss (T= 85 °C) (derate 89 mW/°C above 85 °C)	12.5 W
Thermal Resistance (Junction to back of paddle)	11.2 °C/W
Maximum Forward Gate Current (mA)	4 mA
Maximum VSWR [1]	6:1
Storage Temperature	-55 to 150°C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class 1A, Passed 250V

[1] Restricted by maximum power dissipation.

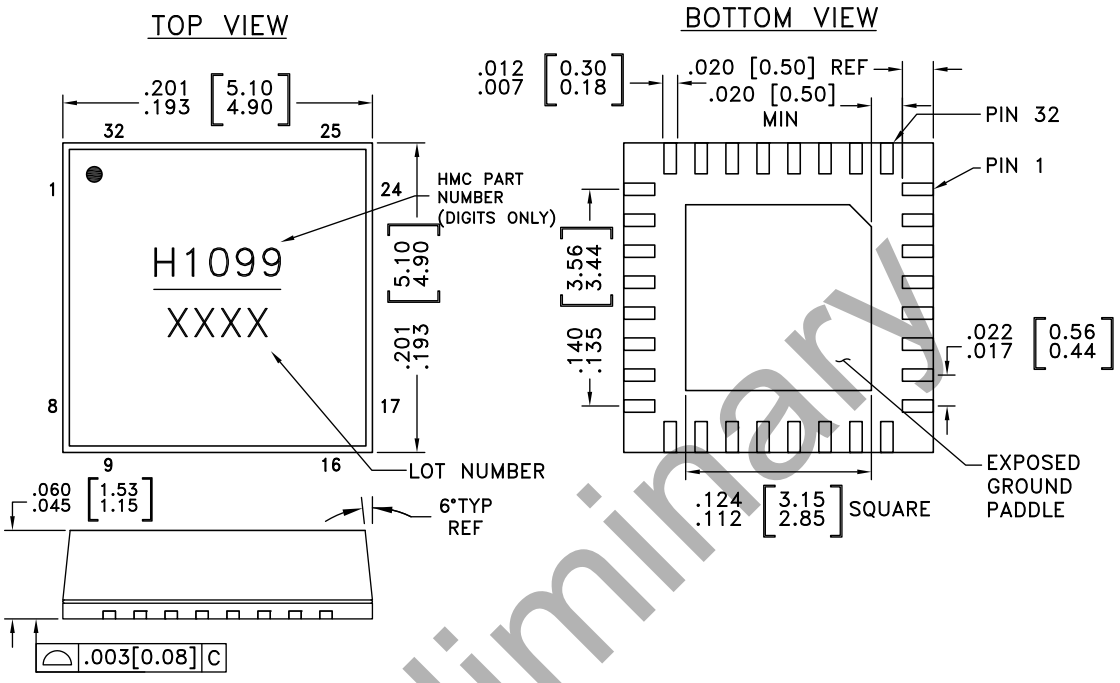
Typical Supply Current vs. Vdd

Vdd (V)	Idd (mA)
+24	100
+28	100

Adjust Vgg to achieve Idd = 100 mA

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



NOTES:

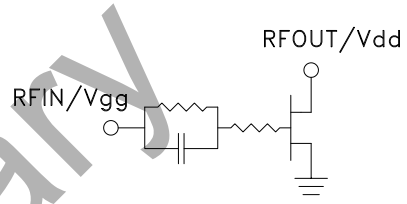
1. PACKAGE BODY MATERIAL: MOLDED LCP POLYMER.
2. LEAD AND GROUND PADDLE MATERIAL: CDA 194 F/H COPPER ALLOY.
3. LEAD AND GROUND PADDLE PLATING: Au FLASH OVER 2u" PALLADIUM 100 u" NICKEL.
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
6. CHARACTERS TO BE HELVETICA MEDIUM, .025 HIGH, WHITE INK, OR LASER MARK LOCATED APPROX. AS SHOWN.
7. BOTTOM CONTACT PADS ARE TO PROTRUDE OUTWARD FROM THE BODY BY 0.00 mm MIN TO 0.05 mm MAX.
8. MAX ALLOWABLE BURR HEIGHT TO BE 0.0254 mm (.001").
9. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
10. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED PCB LAND PATTERN.

Package Information

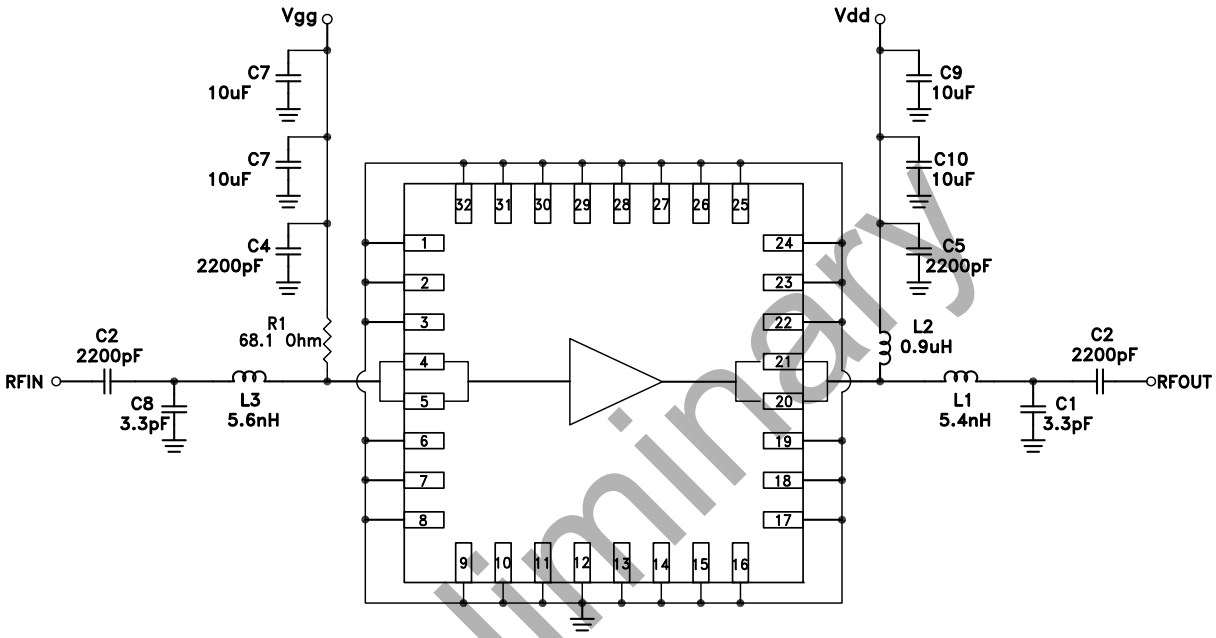
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [1]
HMC1099LP5DE	LCP PREMOLDED COPPER ALLOY LEADFRAME	NiPdAu	MSL3 [2]	H1099 XXXX

[1] 4-Digit lot number XXXX
[2] Max peak reflow temperature of 260 °C

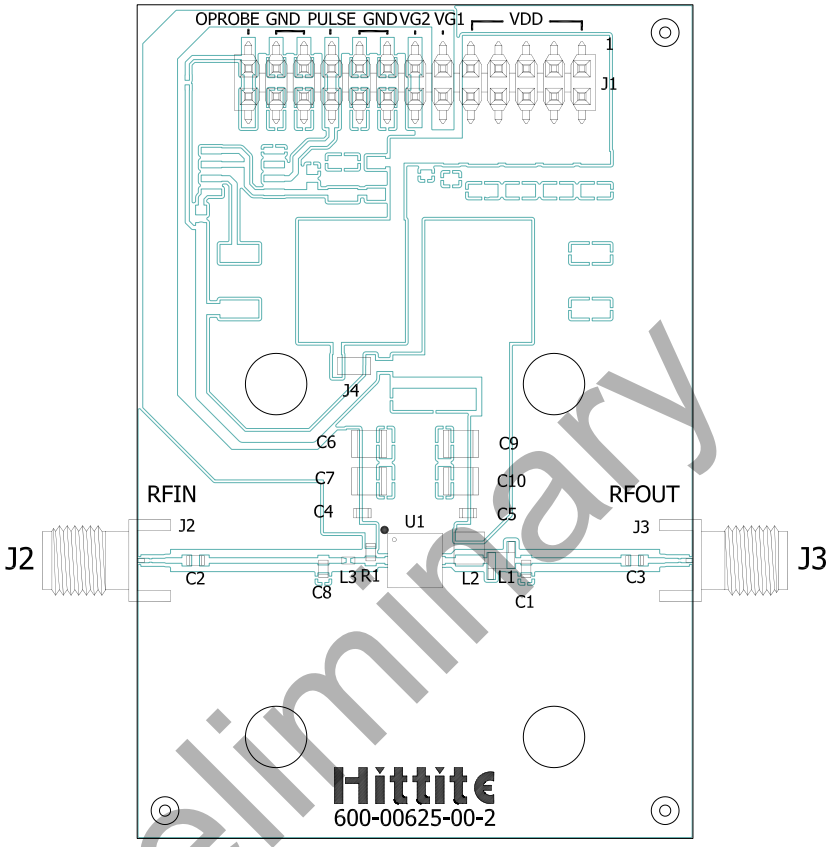
Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32	GND	These pins and package bottom must be connected to RF/DC ground.	
4, 5	RFIN/ Vgg	This pin is DC coupled with internal prematching, and requires external matching to 50 Ohms as shown in the application schematic.	
20, 21	RFOUT/Vdd	This pin is DC coupled, and requires exteral matching to 50 Ohms as shown in the application schematic.	

Application Circuit



Evaluation PCB



Evaluation Order Information

Item	Contents	Part Number
Evaluation PCB Only	HMC1099LP5DE Evaluation PCB	EVL1-HMC1099LP5D [1]

[1] Reference this number when ordering Evaluation PCB Only

List of Materials for Evaluation PCB EVL1-HMC1099LP5D

Item	Description
J2, J3	SMA Connectors.
J1	DC Pins.
J4	Preform jumper.
C1, C8	3.3 pF Capacitor, 0603 Pkg.
C2 - C5	2200 pF Capacitor, 0603 Pkg.
C6, C7, C9, C10	10 uF Capacitor, 1210 Pkg.
L1	5.4 nH Inductor, 0906 Pkg.
L2	0.9 uH Inductor, 1008 Pkg.
L3	5.6 nH Inductor, 0402 Pkg.
R1	68.1 Ohm Resistor, 0603 Pkg.
U1`	HMC1099LP5DE.
PCB [1]	600-00625-00 Evaluation PCB.

[1] Circuit Board Material: Rogers 4350 or Arlon 25FR

The circuit board used in the application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation circuit board shown is available from Hittite upon request.