RoHS✓ EARTH FRIENDLY

HMC618LP3 / 618LP3E

GaAs SMT pHEMT LOW NOISE AMPLIFIER, 1.2 - 2.2 GHz

Electrical Specifications

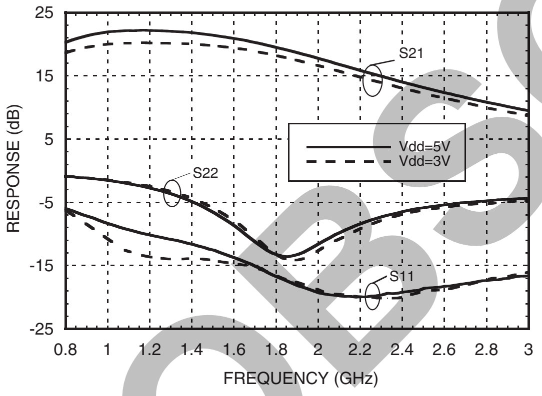
T_A = +25° C, Rbias = 10K Ohm for Vdd1 = Vdd2 = 3V

Parameter	Vdd = 3 Vdc									Units
	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Frequency Range	1200 - 1700			1700 - 2000			2000 - 2200			MHz
Gain	18	22		15	18		12.5	15.8		dB
Gain Variation Over Temperature		0.009			0.009			0.009		dB/°C
Noise Figure		0.8	1.1		0.9	1.2		0.9	1.2	dB
Input Return Loss		26			17			19		dB
Output Return Loss		14			13			11		dB
Output Power for 1 dB Compression (P1dB)	10	15		12	15		13	15		dBm
Saturated Output Power (Psat)		16			16			16		dBm
Output Third Order Intercept (IP3)		28			28			28		dBm
Supply Current (Idd)		47	65		47	65		47	65	mA

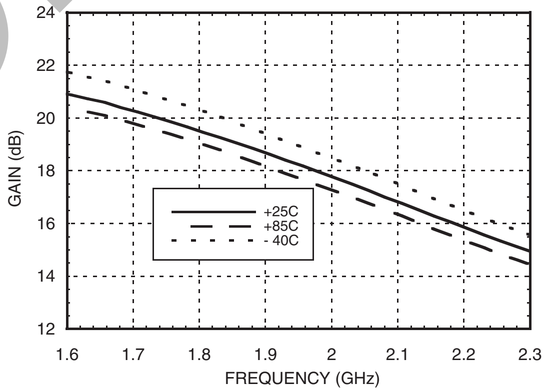
* Rbias resistor sets current, see application circuit herein

1700 to 2200 MHz Tune

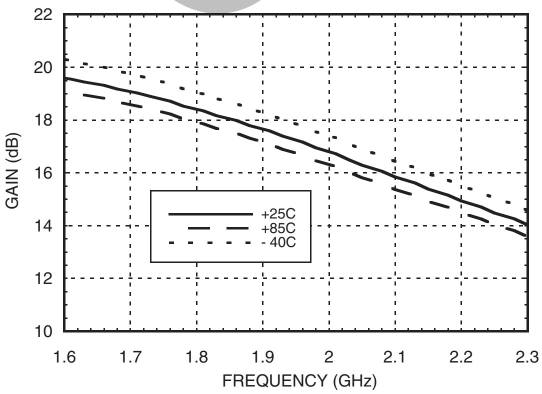
Broadband Gain & Return Loss [1] [2]



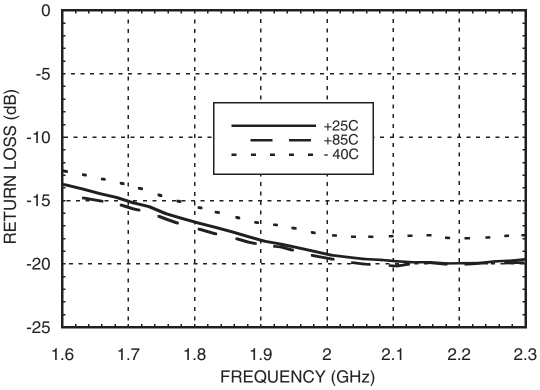
Gain vs. Temperature [1]



Gain vs. Temperature [2]



Input Return Loss vs. Temperature [1]



[1] Vdd = 5V, Rbias = 470 Ohm [2] Vdd = 3V, Rbias = 10K Ohm

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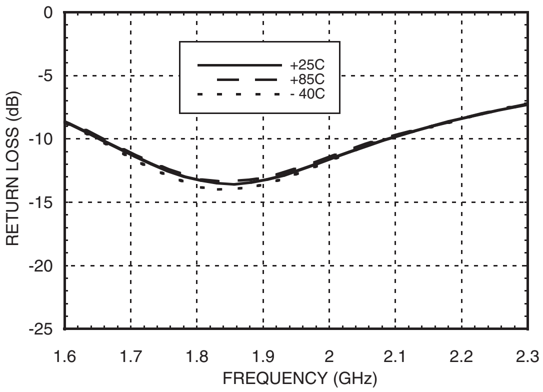
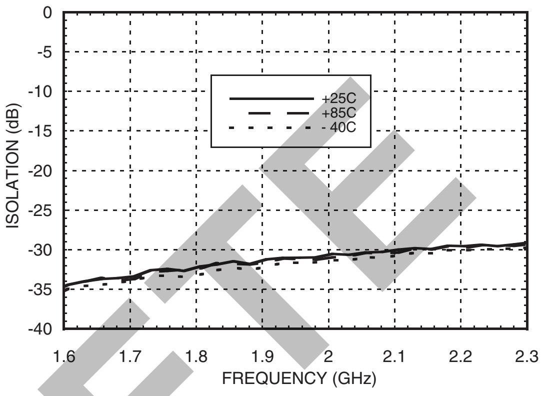
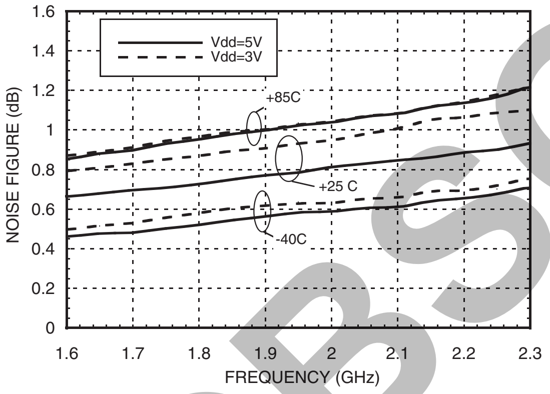
Output Return Loss vs. Temperature [1]



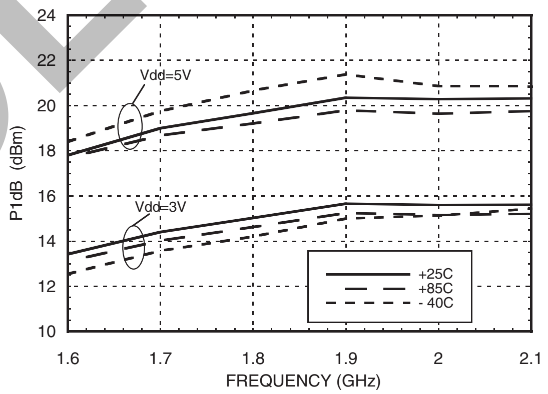
Reverse Isolation vs. Temperature [1]



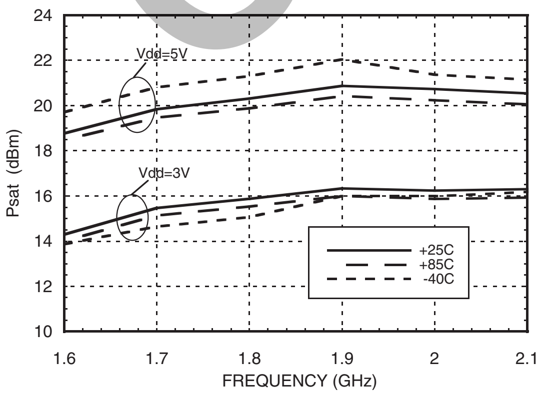
Noise Figure vs Temperature [1] [2] [3]



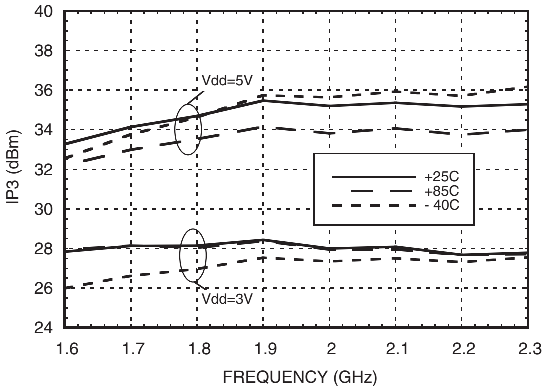
Output P1dB vs. Temperature [1] [2]



Psat vs. Temperature [1] [2]



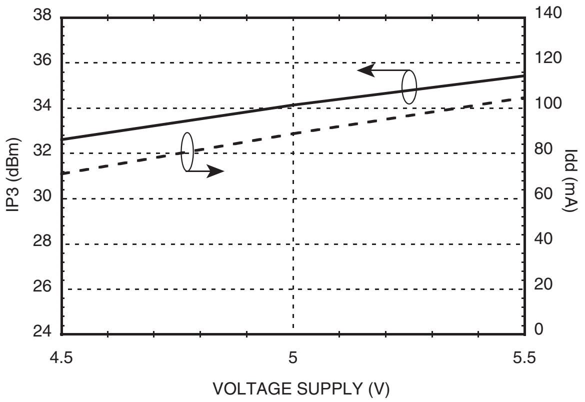
Output IP3 vs. Temperature [1] [2]



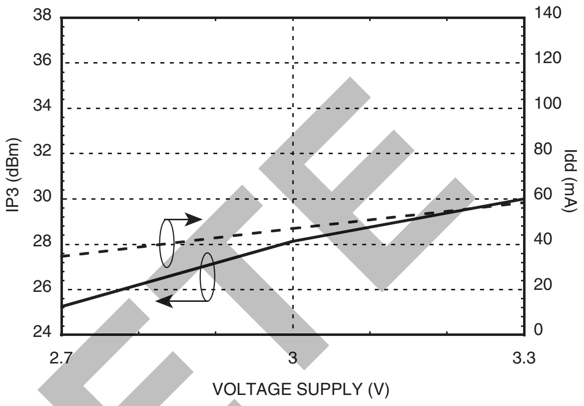
[1] Vdd = 5V, Rbias = 470 Ohm [2] Vdd = 3V, Rbias = 10K Ohm
[3] Measurement reference plane shown on evaluation PCB drawing.

1700 to 2200 MHz Tune

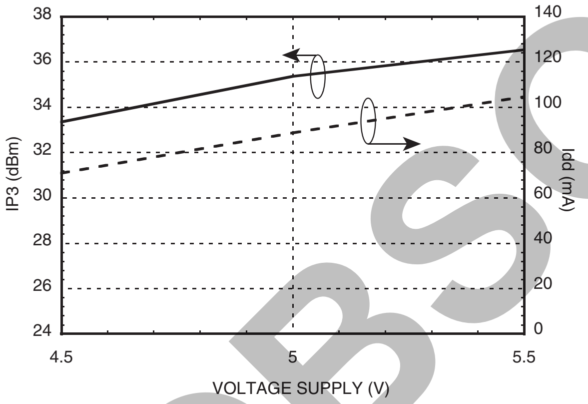
Output IP3 and Idd vs. Supply Voltage @ 1750 MHz [1]



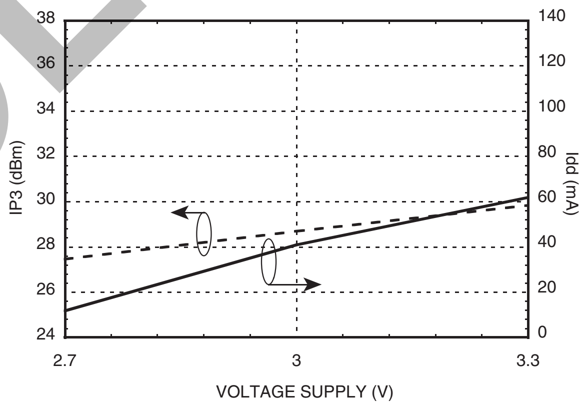
Output IP3 and Idd vs. Supply Voltage @ 1750 MHz [2]



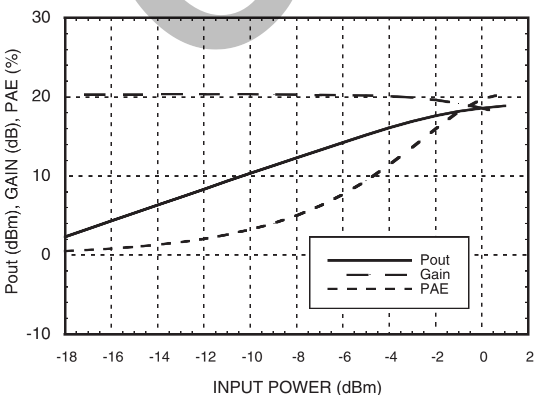
Output IP3 and Idd vs. Supply Voltage @ 2100 MHz [1]



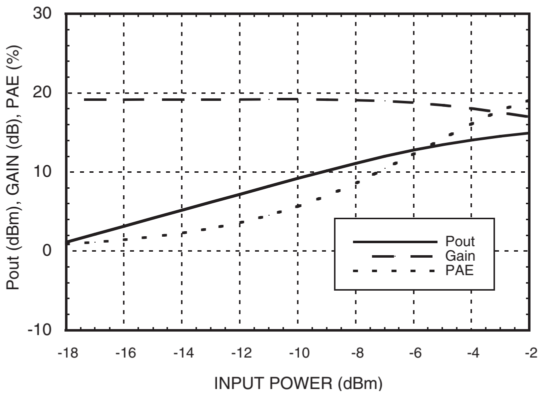
Output IP3 and Idd vs. Supply Voltage @ 2100 MHz [2]



Power Compression @ 1750 MHz [1]



Power Compression @ 1750 MHz [2]



[1] Vdd = 5V, Rbias = 470 Ohm [2] Vdd = 3V, Rbias = 10K Ohm

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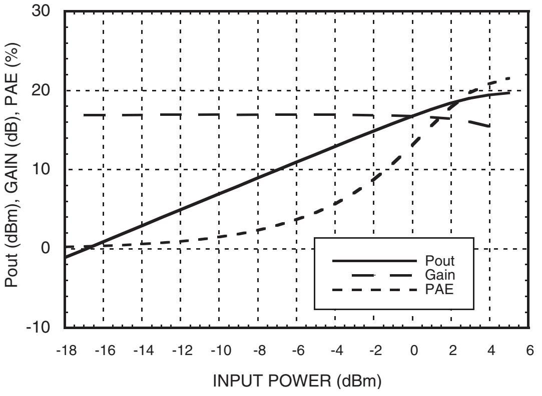
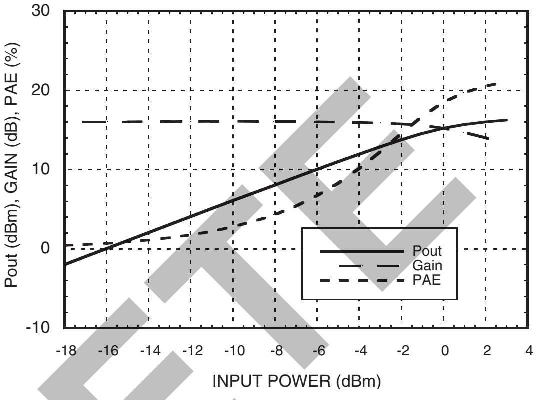
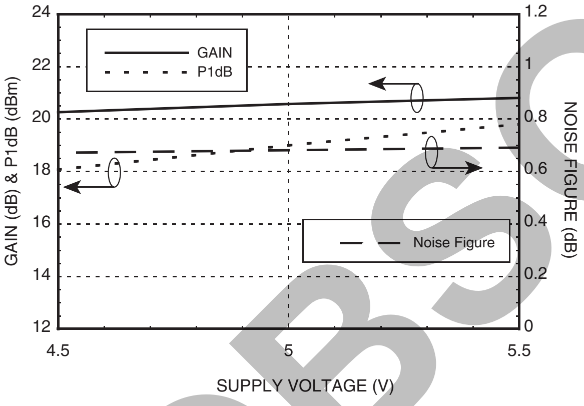
Power Compression @ 2100 MHz [1]



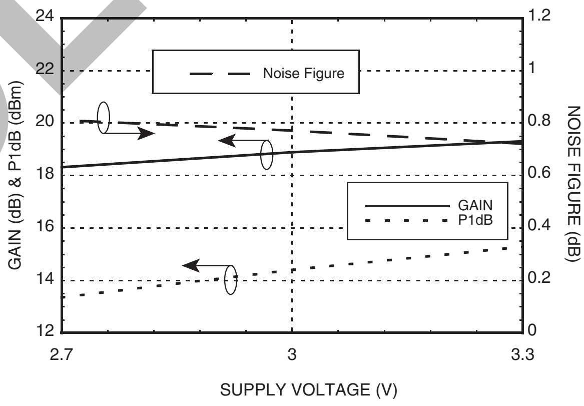
Power Compression @ 2100 MHz [2]



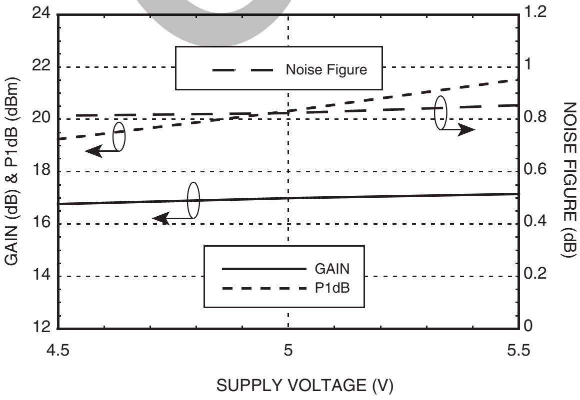
Gain, Power & Noise Figure vs. Supply Voltage @ 1750 MHz [1]



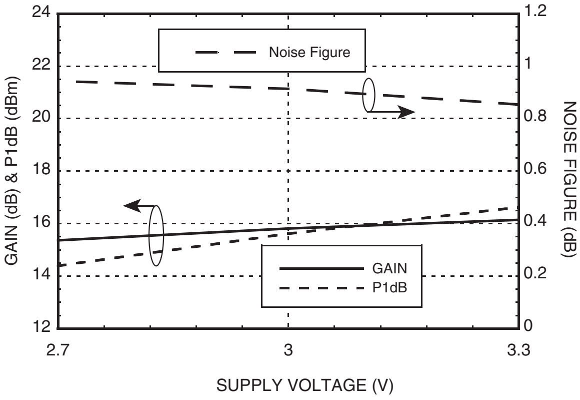
Gain, Power & Noise Figure vs. Supply Voltage @ 1750 MHz [2]



Gain, Power & Noise Figure vs. Supply Voltage @ 2100 MHz [1]



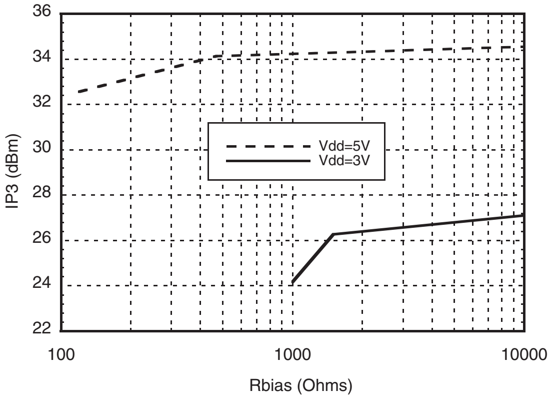
Gain, Power & Noise Figure vs. Supply Voltage @ 2100 MHz [2]



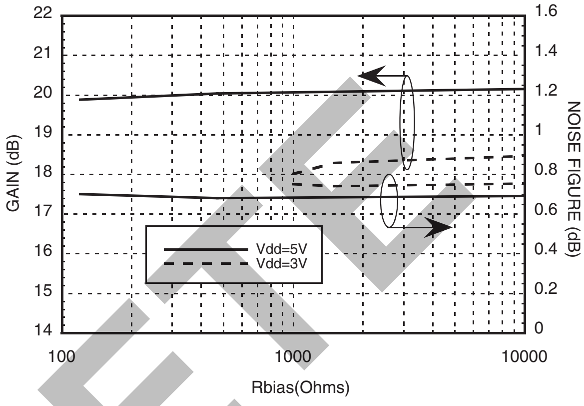
[1] Vdd = 5V, Rbias = 470 Ohm   [2] Vdd = 3V, Rbias = 10K Ohm

1700 to 2200 MHz Tune

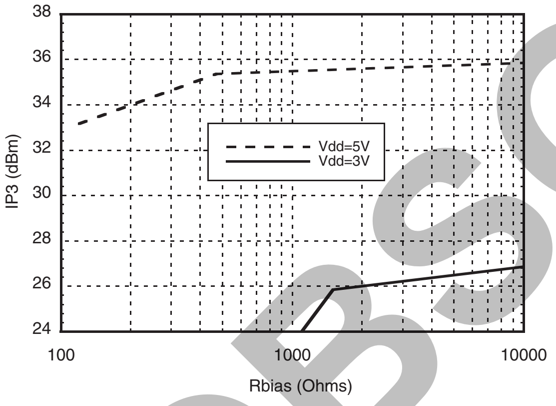
Output IP3 vs. Rbias @ 1750 MHz



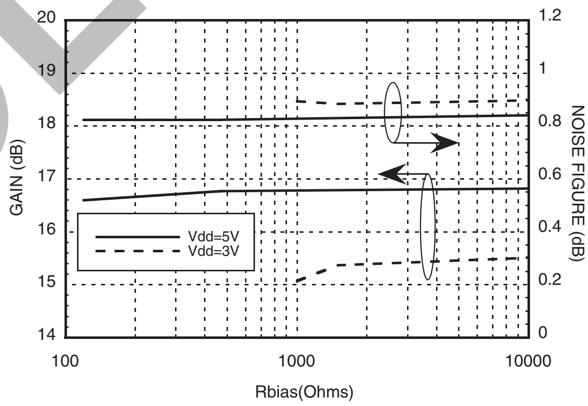
Gain, Noise Figure vs. Rbias @ 1750 MHz



Output IP3 vs. Rbias @ 2100 MHz



Gain, Noise Figure vs. Rbias @ 2100 MHz



[1] Vdd = 5V, Rbias = 470 Ohm [2] Vdd = 3V, Rbias = 10K Ohm

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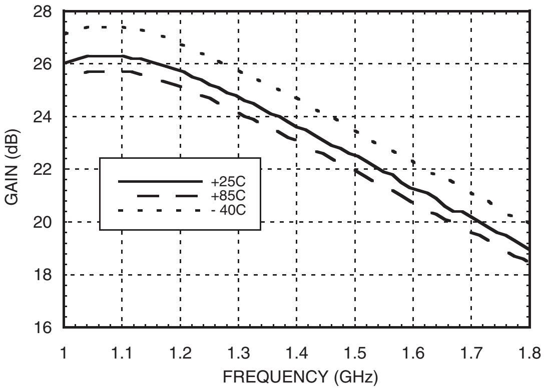
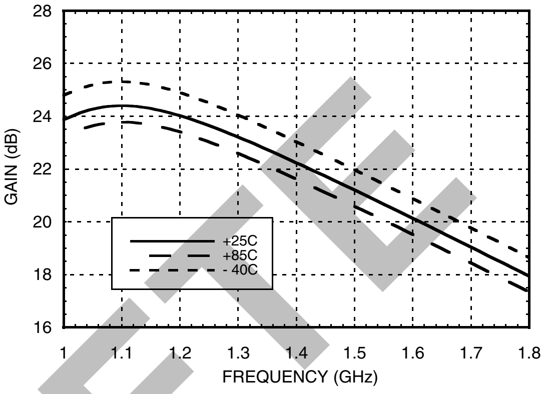
1200 to 1700 MHz Tune

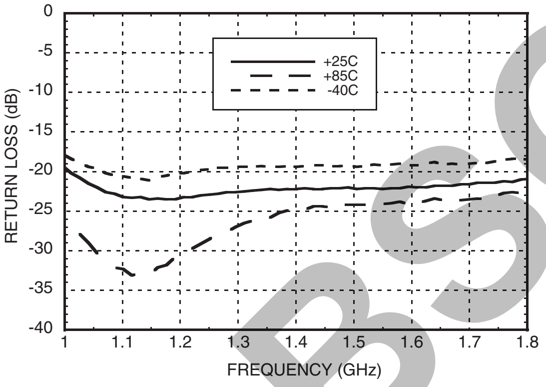
Gain vs. Temperature [1]



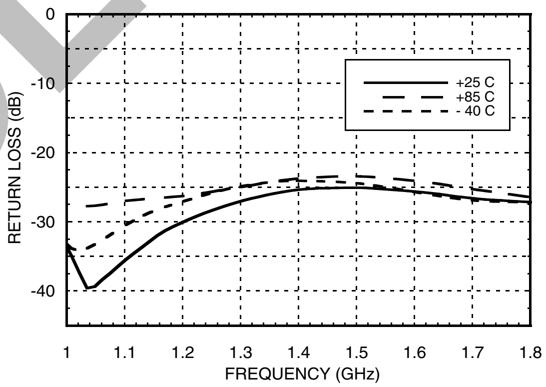
Gain vs. Temperature [2]



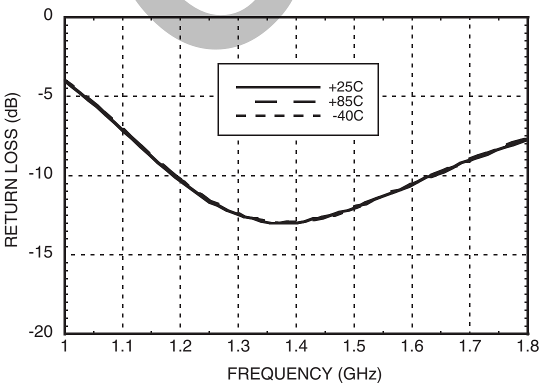
Input Return Loss vs. Temperature [1]



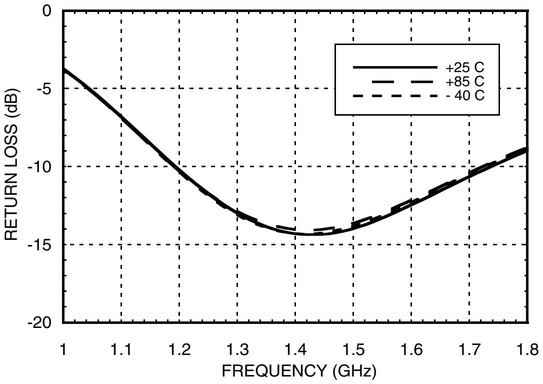
Input Return Loss vs. Temperature [2]



Output Return Loss vs. Temperature [1]



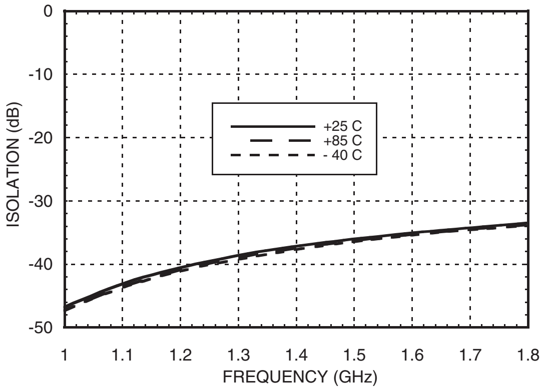
Output Return Loss vs. Temperature [2]



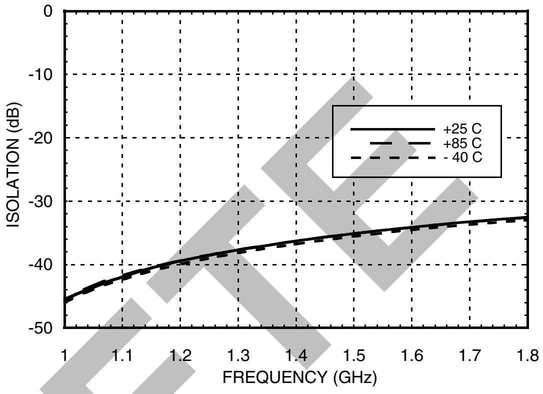
[1] Vdd = 5V, Rbias = 470 Ohm [2] Vdd = 3V, Rbias = 10K Ohm

1200 to 1700 MHz Tune

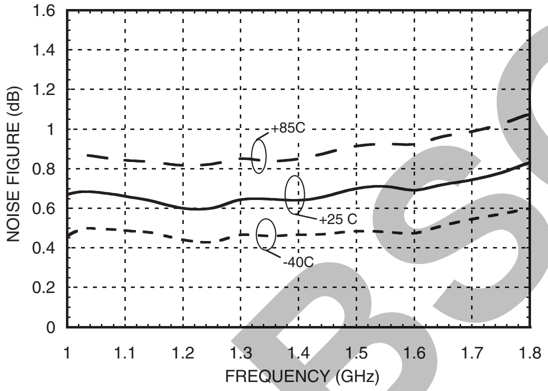
Reverse Isolation vs. Temperature [1]



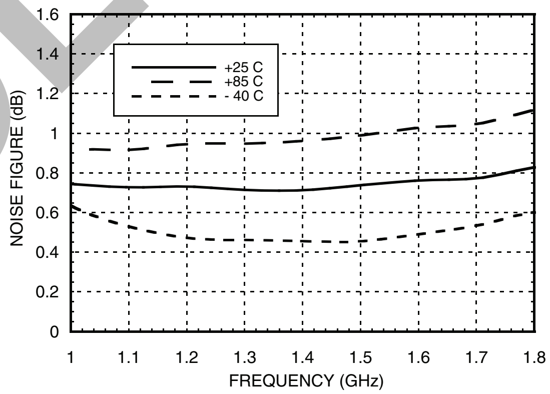
Reverse Isolation vs. Temperature [2]



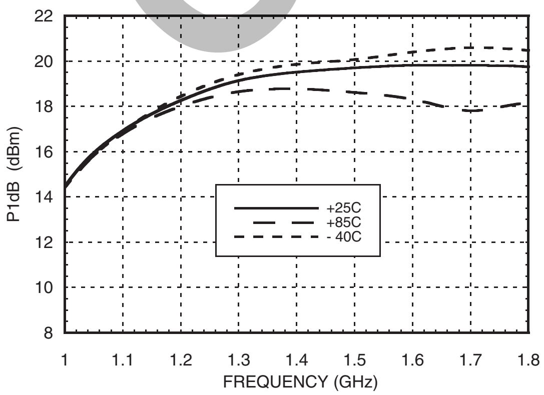
Noise Figure vs. Temperature [1]



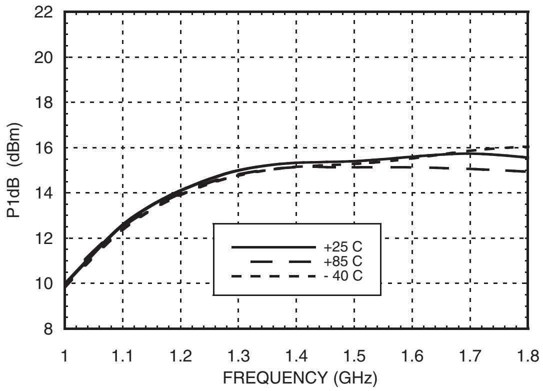
Noise Figure vs. Temperature [2]



Output P1dB vs. Temperature [1]



Output P1dB vs. Temperature [2]



[1] Vdd = 5V, Rbias = 470 Ohm [2] Vdd = 3V, Rbias = 10K Ohm

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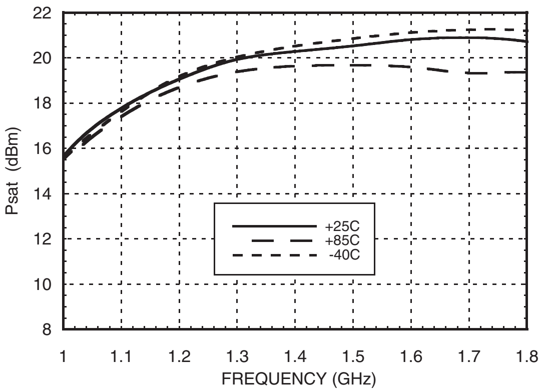
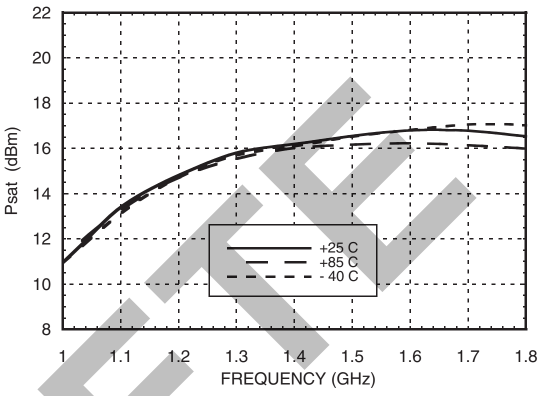
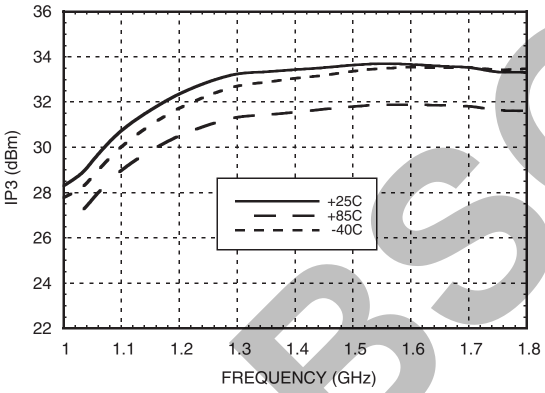
Psat vs. Temperature [1]



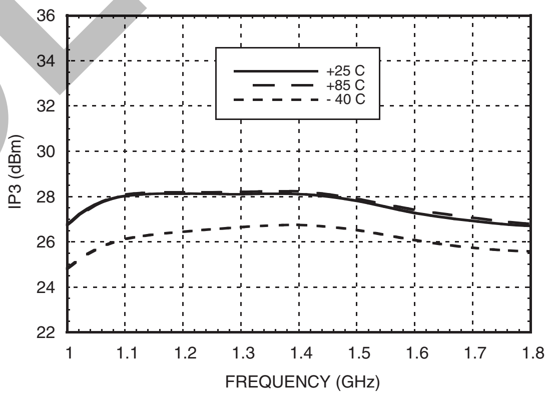
Psat vs. Temperature [2]



Output IP3 vs. Temperature [1]



Output IP3 vs. Temperature [2]



Absolute Bias Resistor Range & Recommended Bias Resistor Values for Idd

Vdd1 = Vdd2 (V)	Rbias			Idd1 + Idd2 (mA)
	Min (Ohms)	Max (Ohms)	R1 (Ohms)	
3V	1K [3]	Open Circuit	1k	28
			1.5k	34
			10k	47
5V	0	Open Circuit	120	71
			270	84
			470	89

[1] Vdd = 5V, Rbias = 470 Ohm [2] Vdd = 3V, Rbias = 10K Ohm

[3] With Vdd= 3V and Rbias < 1K Ohm may result in the part becoming conditionally stable which is not recommended.

GaAs SMT pHEMT LOW NOISE AMPLIFIER, 1.2 - 2.2 GHz

Absolute Maximum Ratings

Drain Bias Voltage (Vdd1, Vdd2)	+6V
RF Input Power (RFIN) (Vdd = +5 Vdc)	+10 dBm
Channel Temperature	150 °C
Continuous Pdiss (T= 85 °C) (derate 9.68 mW/°C above 85 °C)	0.63 W
Thermal Resistance (channel to ground paddle)	103.4 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

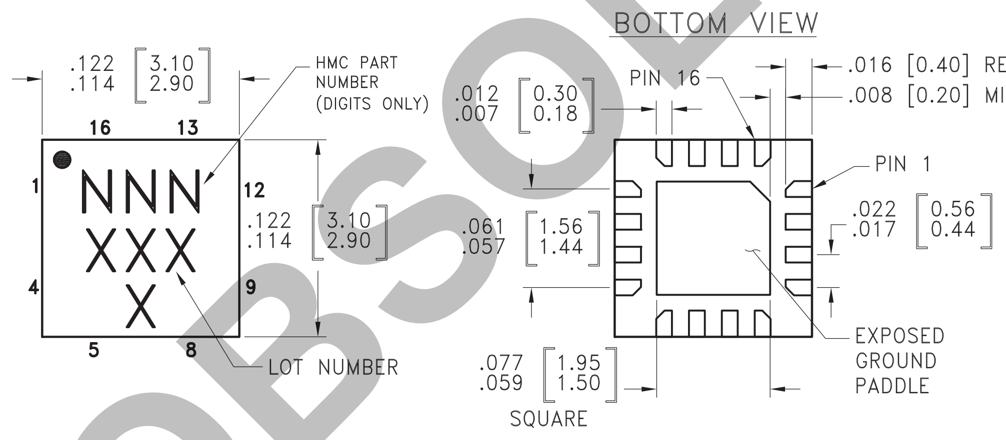
ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

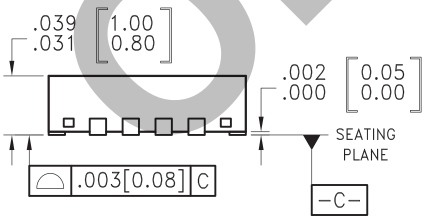
Typical Supply Current vs. Vdd
Rbias = 10 KOhm for 3V
Rbias = 470 Ohm for 5V

Vdd (Vdc)	Idd (mA)
2.7	35
3.0	47
3.3	58
4.5	72
5.0	89
5.5	106

Note: Amplifier will operate over full voltage ranges shown above.

Outline Drawing



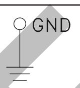
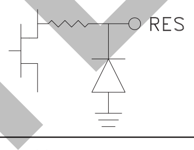
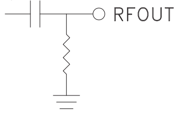
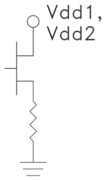


NOTES:
1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
4. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM.
   PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
7. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED LAND PATTERN.

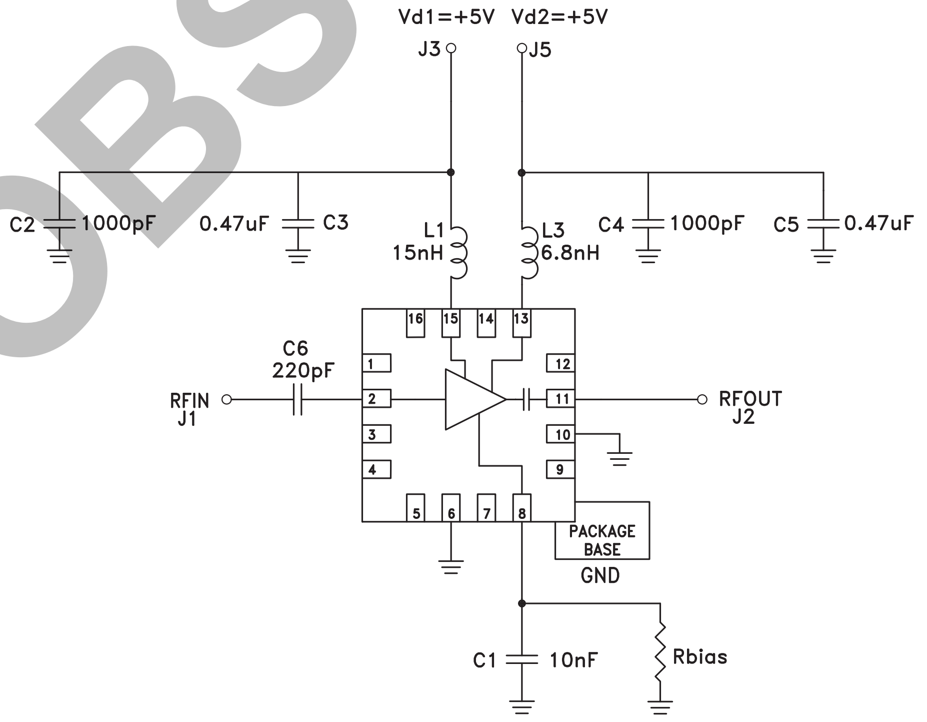
Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [3]
HMC618LP3	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 [1]	618 XXXX
HMC618LP3E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	618 XXXX

[1] Max peak reflow temperature of 235 °C
[2] Max peak reflow temperature of 260 °C
[3] 4-Digit lot number XXXX

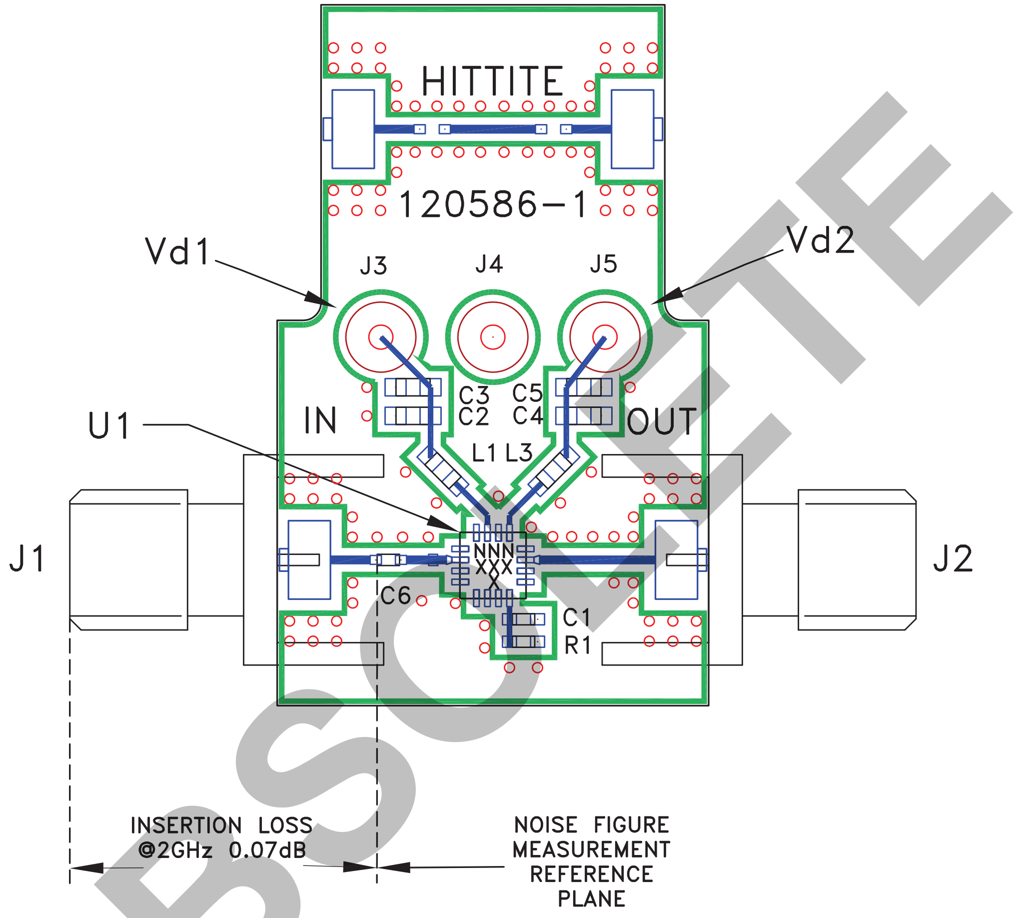
Pin Number	Function	Description	Interface Schematic
1, 3 - 5, 7, 9, 12, 14, 16	N/C	No connection required. These pins may be connected to RF/DC ground without affecting performance.	
2	RFIN	This pin is DC coupled and matched to 50 Ohms.	
6, 10	GND	This pin and ground paddle must be connected to RC/DC ground.	
8	RES	This pin is used to set the DC current of the amplifier by selection of the external bias resistor. See application circuit.	
11	RFOUT	This pin is matched to 50 Ohms.	
13, 15	Vdd2, Vdd1	Power Supply Voltage for the amplifier. External bypass capacitors of 1000 pF, and 0.47 µF are required.	

Application Circuit, 1700 to 2200 MHz Tune



[1] Vdd = 5V, Rbias = 470 Ohm [2] Vdd = 3V, Rbias = 10K

Evaluation PCB, 1700 to 2200 MHz Tune



Evaluation PCB Ordering Information

Item	Content	Part Number
Evaluation PCB	HMC618LP3E Evaluation PCB	117905-HMC618LP3E

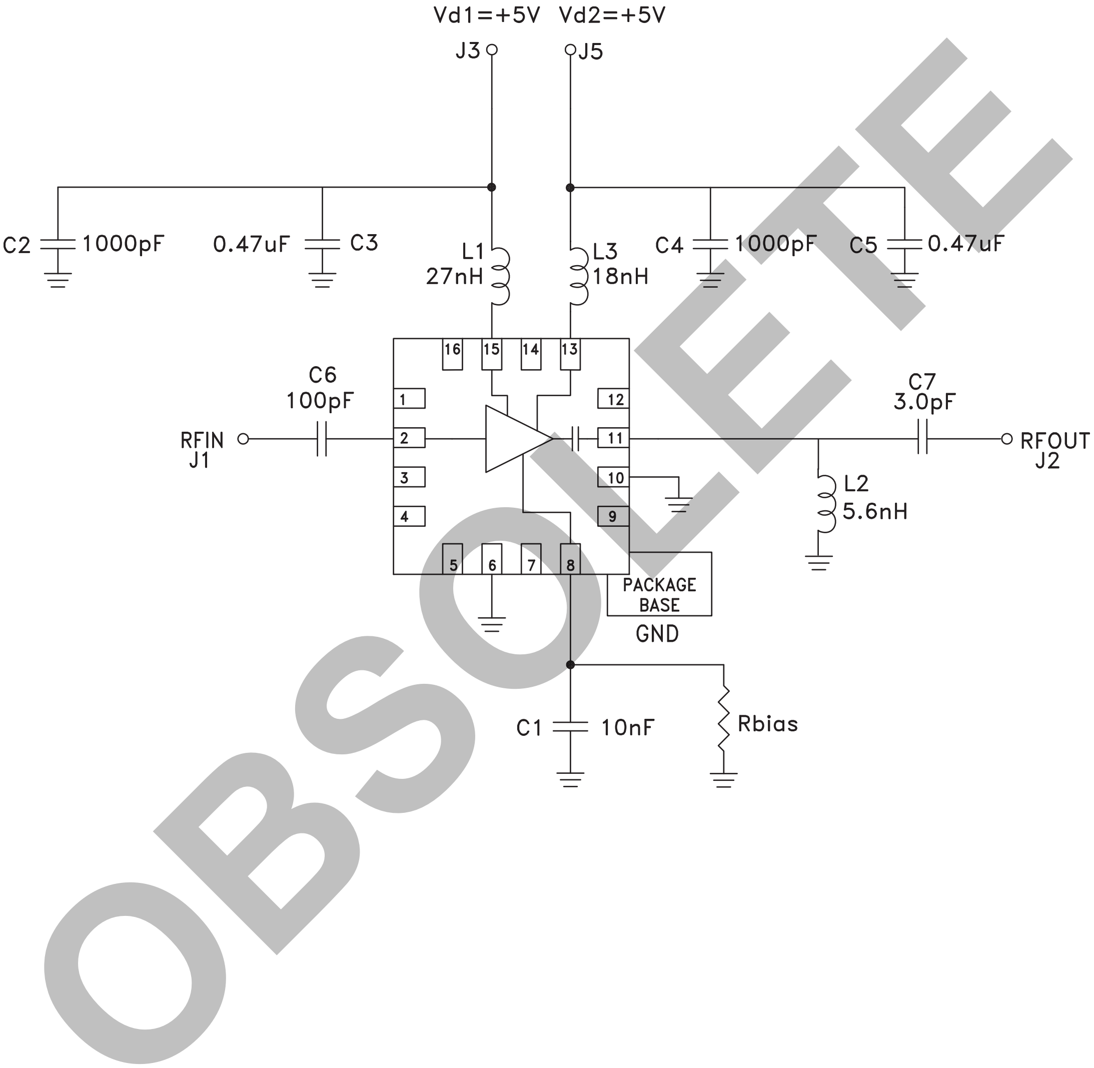
The circuit board used in this application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect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

List of Materials for Evaluation PCB

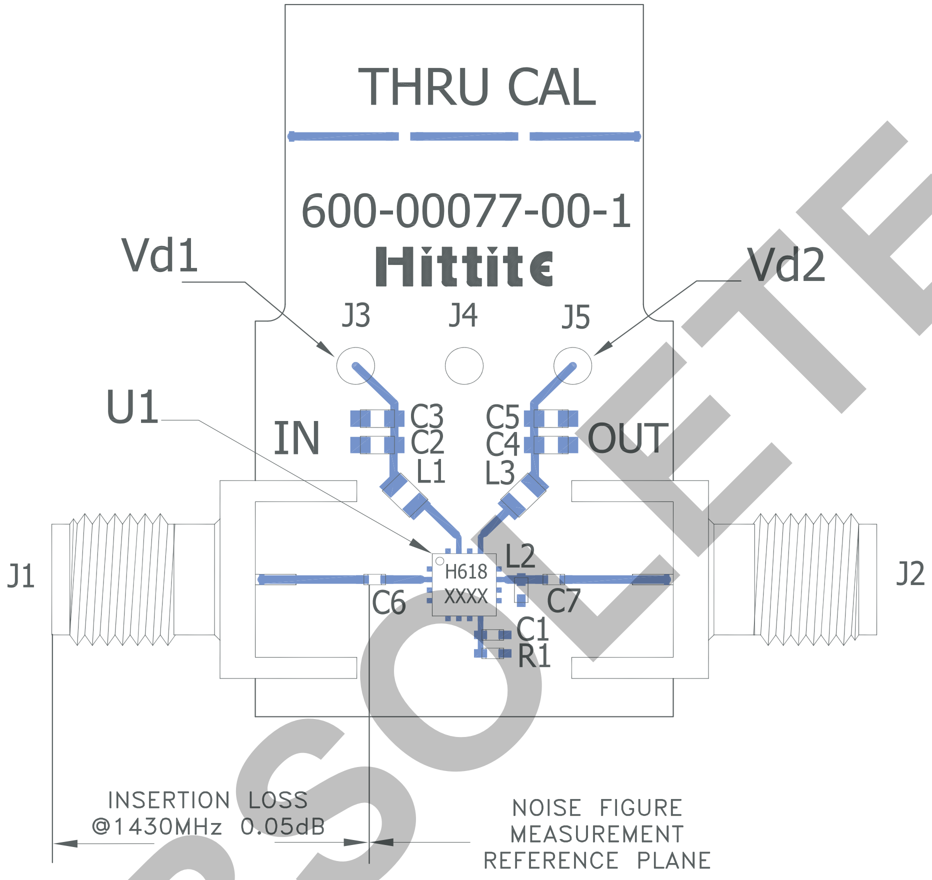
Item	Description
J1, J2	PCB Mount SMA RF Connector
J3 - J5	DC Pin
C2, C4	1000 pF Capacitor, 0603 Pkg..
C3, C5	0.47 µF Capacitor, Tantalum
L1	15 nH, Inductor, 0603 Pkg.
L3	6.8 nH, Inductor, 0603 Pkg.
C6	220 pF Capacitor, 0402 Pkg.
C1	10 nF Capacitor, 0402 Pkg.
R1	470 Ohm resistor, 0402 Pkg.
U1	HMC618LP3(E) Amplifier
PCB [2]	120586 Evaluation PCB

[1] Reference this number when ordering complete evaluation PCB

Application Circuit, 1200 to 1700 MHz Tune



Evaluation PCB, 1200 to 1700 MHz Tune



Evaluation PCB Ordering Information

Item	Content	Part Number
Evaluation PCB	HMC618LP3E Evaluation PCB	EVAL01-HMC618LP3E

The circuit board used in this 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 board should be mounted to an appropriate heat sink. The evaluation circuit board shown is available from Hittite upon request.

List of Materials for Evaluation PCB

Item	Description
J1, J2	PCB Mount SMA RF Connector
J3 - J5	DC Pin
C1	10 nF Capacitor, 0402 Pkg.
C2, C4	1000 pF Capacitor, 0603 Pkg..
C3, C5	0.47 µF Capacitor, 0603 Pkg.
C6	100 pF Capacitor, 0402 Pkg.
C7	3 pF Capacitor, 0402 Pkg.
L1	27 nH, Inductor, 0603 Pkg.
L2	5.6 nH, Inductor, 0603 Pkg.
L3	18 nH, Inductor, 0603 Pkg.
R1	470 Ohm resistor, 0402 Pkg.
U1	HMC618LP3(E) Amplifier
PCB [1]	120586 Evaluation PCB

[1] Circuit Board Material: Rogers 4350.