HMC754S8GE

v00.0409

GaAs HBT HIGH LINEARITY PUSH-PULL AMPLIFIER, 75 Ohm, DC - 1 GHz

Typical Applications

The HMC754S8GE is ideal for:

- CATV / Broadband Infrastructure
- Test & Measurement Equipment
- Line Amps and Fiber Nodes
- Customer Premise Equipment

Features

Output IP2: +78 dBm

High Gain: 14.5 dB

High Output IP3: +38 dBm

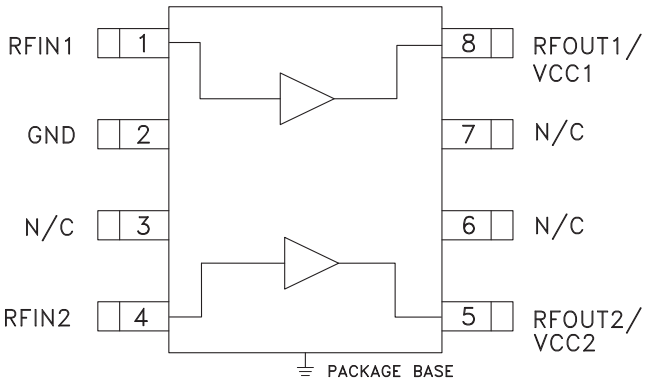
75 Ohm Impedance

Single Positive Supply: +5V

Robust 1000V ESD, Class 1C

SOIC-8 SMT Package

Functional Diagram



General Description

The HMC754S8GE is a GaAs/InGaP HBT Dual Channel Gain Block MMIC SMT amplifier covering DC to 1 GHz. This versatile product contains two gain blocks, packaged in a single 8 lead plastic SOIC-8, for use with both amplifiers combined in push-pull configuration using external baluns to cancel out second order non-linearities and improve IP2 performance. In this configuration, the HMC754S8GE offers high gain, very low distortion & simple external matching. This high linearity amplifier consumes only 160mA from a single positive supply.

Electrical Specifications, T_A = +25° C, Vcc1 = Vcc2 = 5V, Zo = 75 Ohm [1]

Parameter		Min.	Typ.	Max.	Units
Gain	0.05 - 0.5 GHz 0.5 - 0.87 GHz 0.87 - 1.0 GHz	13.5 12.7 12.1	14.7 14.2 13.4		dB dB dB
Gain Variation Over Temperature	0.05 - 0.87 GHz		0.008		dB/ °C
Input Return Loss	0.05 - 0.5 GHz 0.5 - 0.87 GHz		17 10		dB dB
Output Return Loss	0.05 - 0.5 GHz 0.5 - 0.87 GHz		10 20		dB dB
Reverse Isolation	0.05 - 0.87 GHz		23		dB
Output Power for 1 dB Compression (P1dB)	0.05 - 0.87 GHz	19.5	21		dBm
Output Third Order Intercept Point (IP3) (Pout= 0 dBm per tone, 1 MHz spacing)	0.05 - 0.87 GHz		38		dBm
Output Second Order Intercept Point (IP2)	0.05 - 0.5 GHz		78		dBm
Composite Second Order (CSO) [2]	0.05 - 0.87 GHz		-81		dBc
Composite Triple Beat (CTB) [2]	0.05 - 0.87 GHz		-75		dBc
Cross Modulation (XMOD) [2]	0.05 - 0.87 GHz		-67		dBc
Noise Figure	0.05 - 0.5 GHz 0.05 - 0.87 GHz		5.5 6.5		dB dB
Supply Current (Icc1 + Icc2)		145	160	175	mA

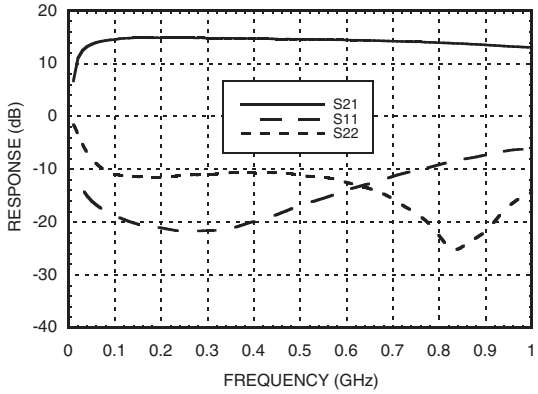
[1] Data taken with dual amplifiers combined in push-pull (default) configuration
[2] Input level +15 dBmV, 133 channels - with analog modulation

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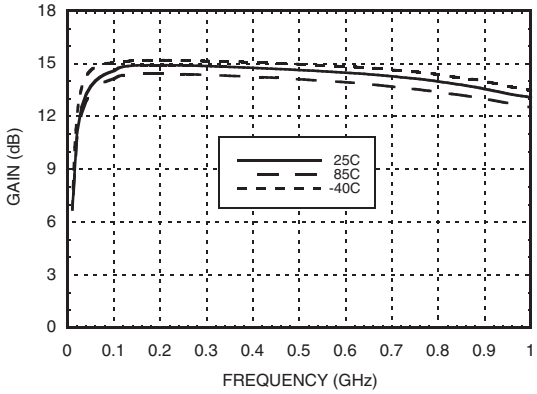
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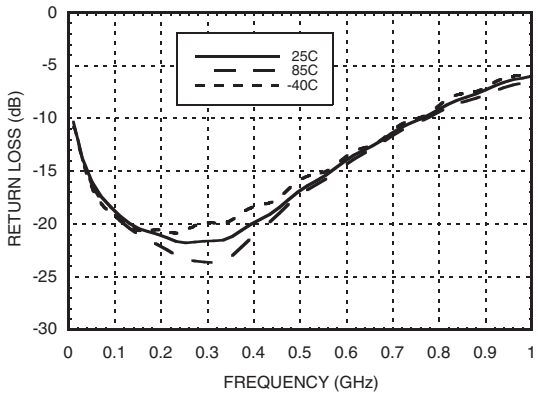
Gain & Return Loss



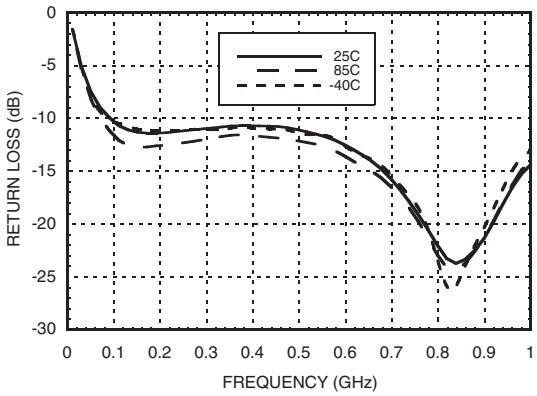
Gain vs. Temperature



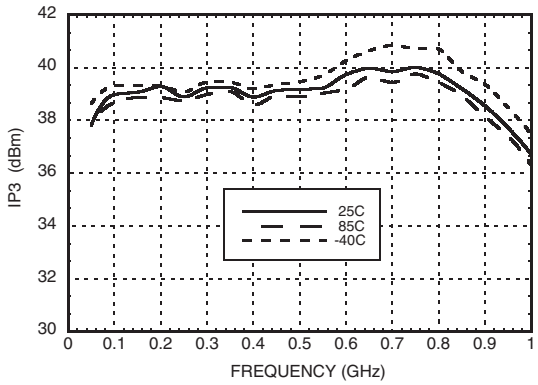
Input Return Loss vs. Temperature



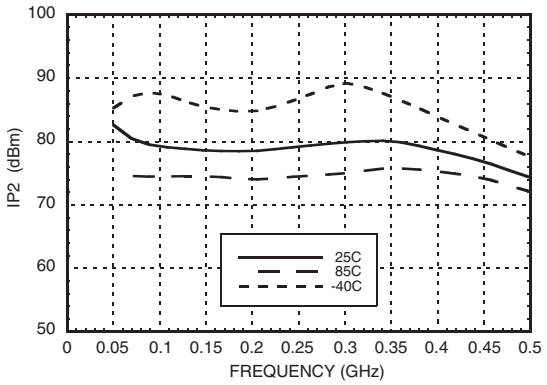
Output Return Loss vs. Temperature



Output IP3 vs. Temperature



Output IP2 vs. Temperature

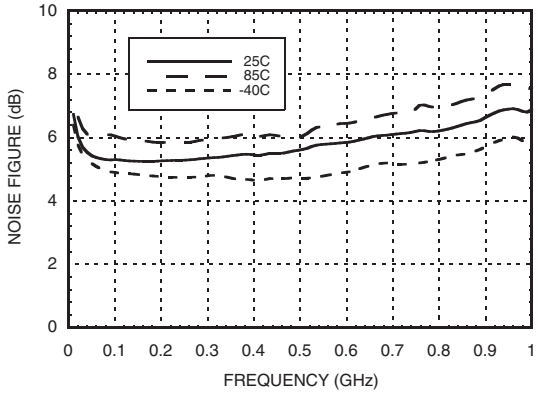


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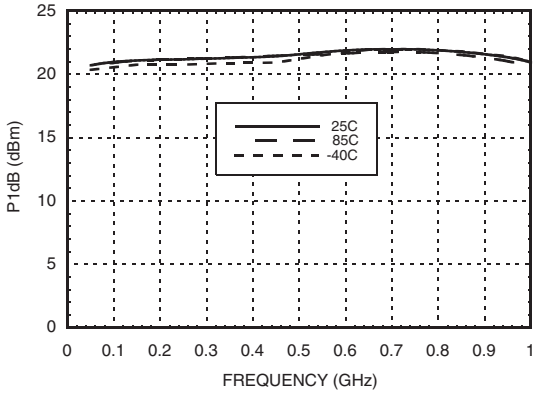
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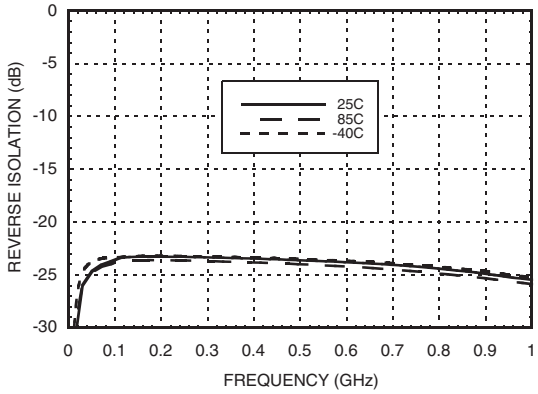
Noise Figure vs. Temperature



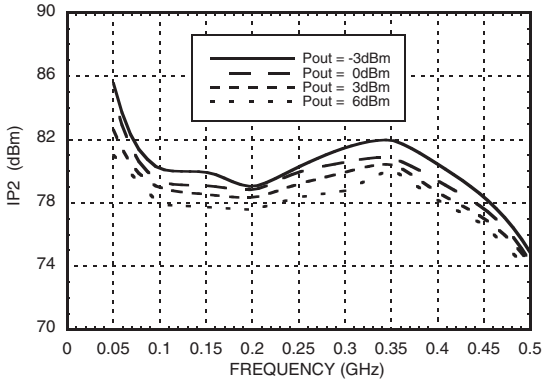
P1dB vs. Temperature



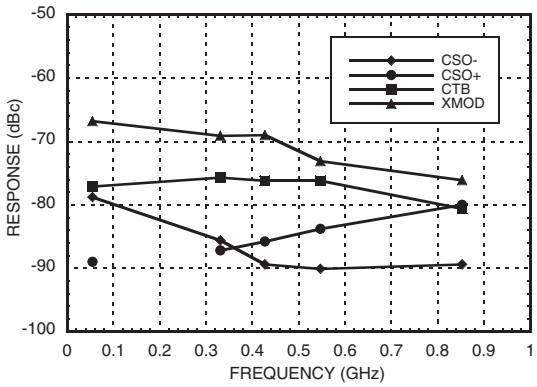
Reverse Isolation vs. Temperature



Output IP2 vs. Output Power



CSO / CTB / XMOD @ +15 dBmV input, 133 channels (Analog)



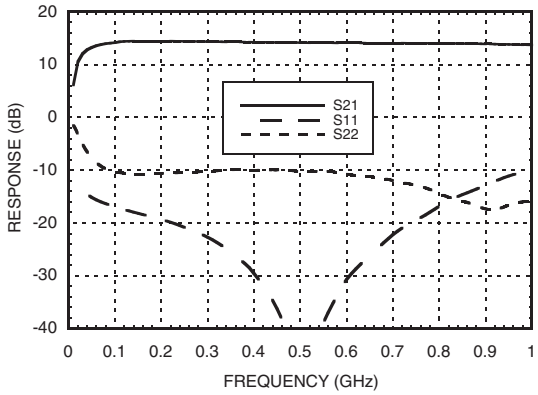
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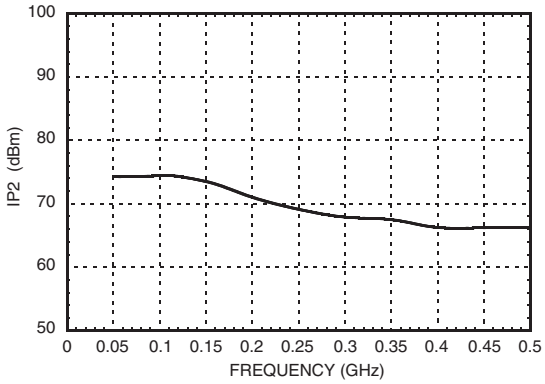
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Option 1 - Improved Input Return Loss & Gain Flatness (with Lower IP2) Application

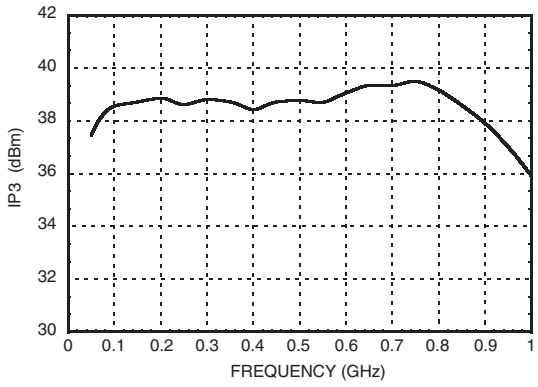
Gain & Return Loss



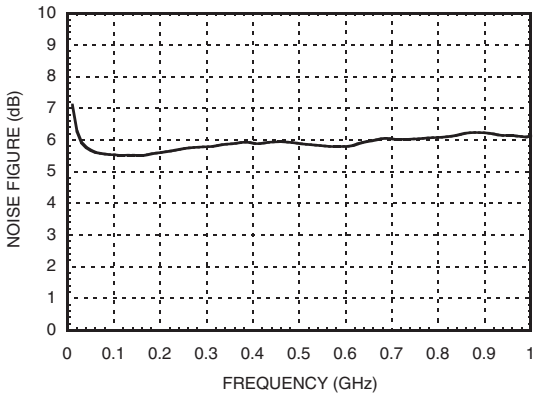
Output IP2 vs. Frequency



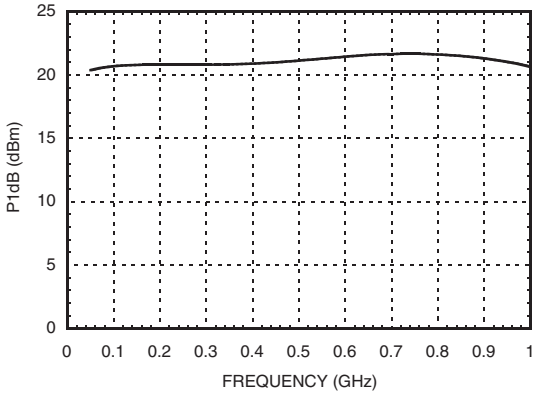
Output IP3 vs. Frequency



Noise Figure vs. Frequency



P1dB vs. Frequency



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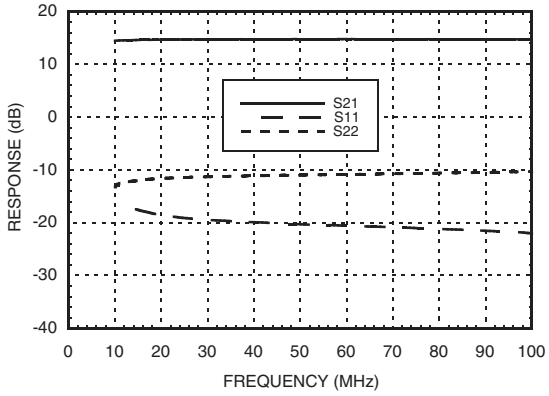
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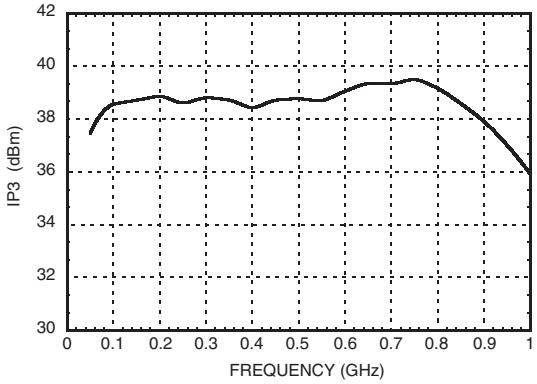
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Option 2 - 10 to 100 MHz Application

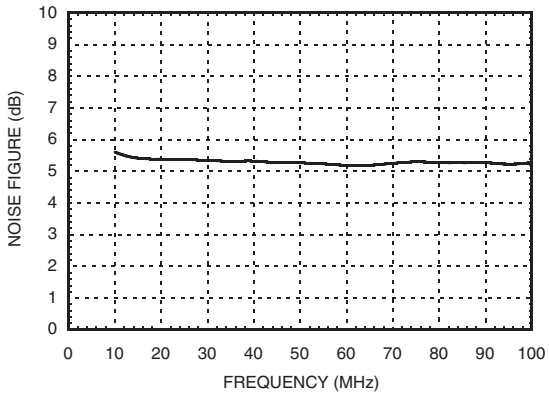
Gain & Return Loss



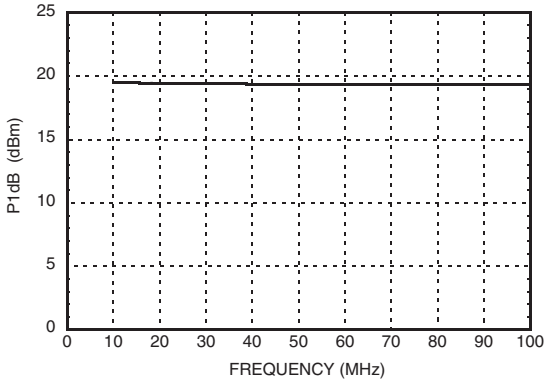
Output IP3 vs. Frequency



Noise Figure vs. Frequency



P1dB vs. Frequency



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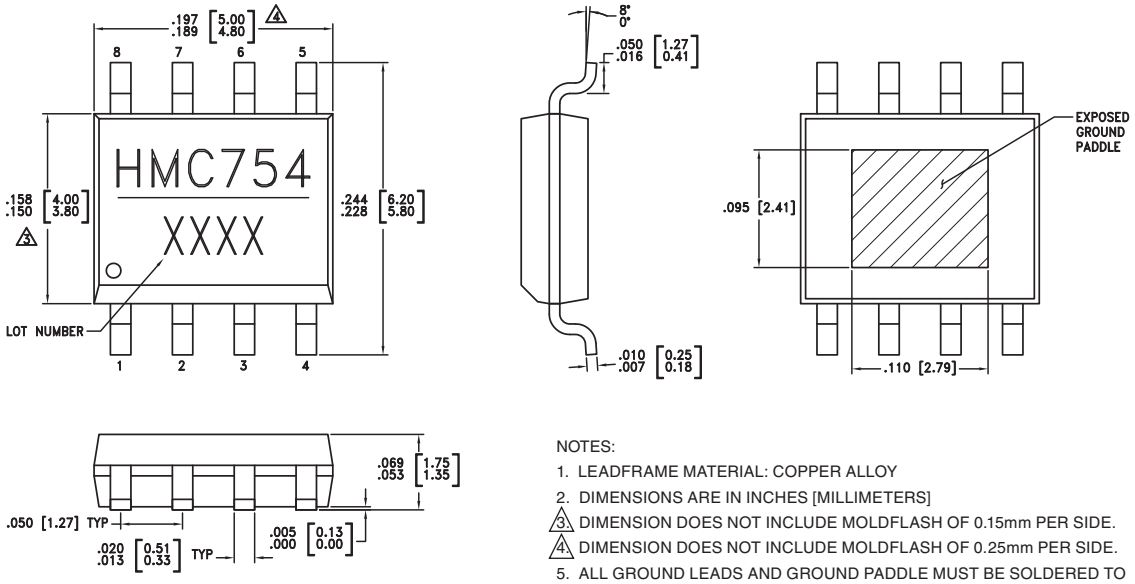
GaAs HBT HIGH LINEARITY PUSH-PULL AMPLIFIER, 75 Ohm, DC - 1 GHz

Absolute Maximum Ratings

Collector Bias Voltage (Vcc)	+5.5 Vdc
RF Input Power (RFIN)	+10 dBm
Junction Temperature	150 °C
Continuous Pdiss (T = 85 °C) (derate 18.69 mW/°C above 85 °C)	1.21 W
Thermal Resistance (junction to ground paddle)	53.5 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class 1C

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



NOTES:

1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
4. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
5. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

Package Information

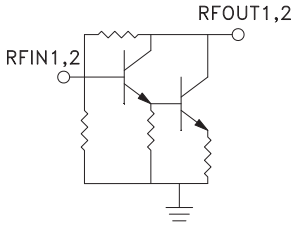
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [3]
HMC754S8GE	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	HMC754 XXXX

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

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Pin Descriptions

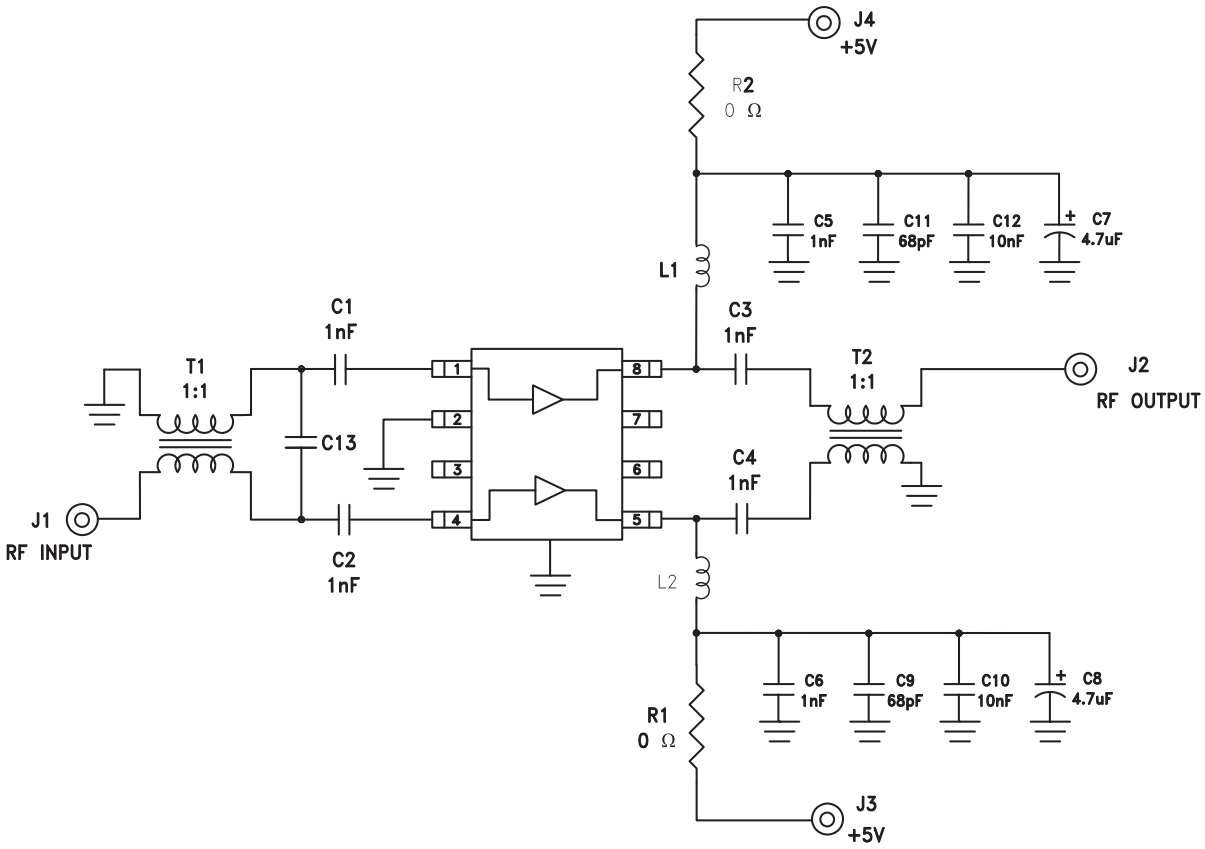
Pin Number	Function	Description	Interface Schematic
1, 4	RFIN1, RFIN2	These pins are DC coupled. An off chip DC block capacitor is required.	
5, 8	RFOUT1/VCC1, RFOUT2/VCC2	RF Output and DC bias for the output stage.	
2	GND	These pins and package bottom must be connected to RF/ DC ground.	
3, 6, 7	N/C	No connection. These pins may be connected to RF ground. Performance will not be affected.	

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Application Circuit for Push-Pull Operation



Components for Selected Options

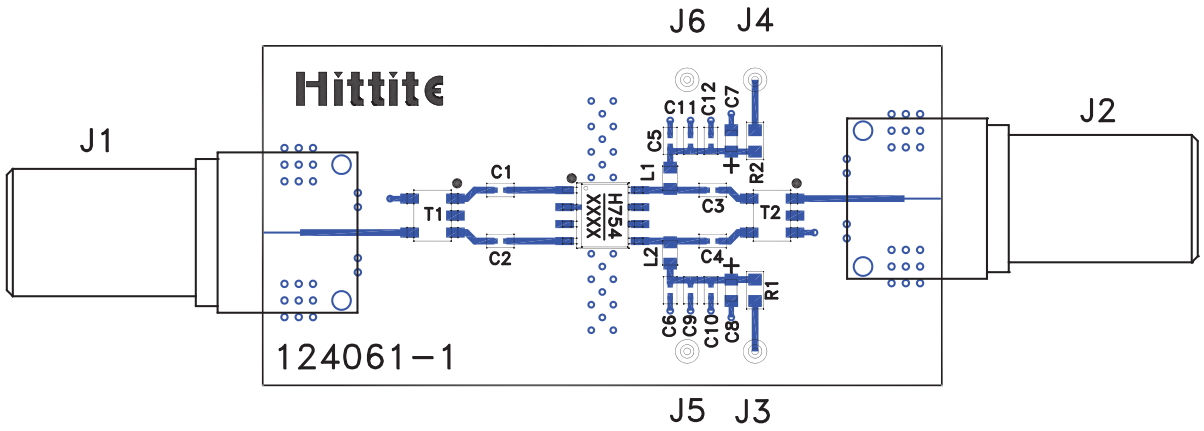
Tune Options	Standard	Option 1	Option 2
Evaluation PCB Number	124063	126311	124825
T1 [1]	ETC 1-1-13	MABACT0039	ETC1-1T-5TR
T2 [1]	ETC 1-1-13	ETC 1-1-13	ETC1-1T-5TR
L1, L2	180 nH	180 nH	10 uH
C13	Open	1.1 pF	Open

[1] 1:1 Transformer

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Evaluation PCB - Standard and Option 2 Application



List of Materials for Evaluation PCB [1]

Item	Description
J1, J2	F-Connector
J3 - J6	DC PIN
C1 - C6	1 nF Capacitor, 0402 Pkg.
C7, C8	4.7 µF Capacitor, Tantalum, 0603 Pkg.
C9, C11	68 pF Capacitor, 0402 Pkg.
C10, C12	10 nF Capacitor, 0402 Pkg.
L1, L2 [2]	Inductor, 0603 Pkg.
R1, R2	0 Ohm Resistor, 0603 Pkg.
T1, T2 [2]	1:1 Transformer
U1	HMC754S8GE Amplifier
PCB [3]	124061 Evaluation PCB

[1] When requesting an evaluation board, please reference the appropriate evaluation PCB number listed in the table "Components for Selected Options."
[2] Please refer to "Components for Selected Options" table for values
[3] Circuit Board Material: Rogers 4350 or Arlon 25FR

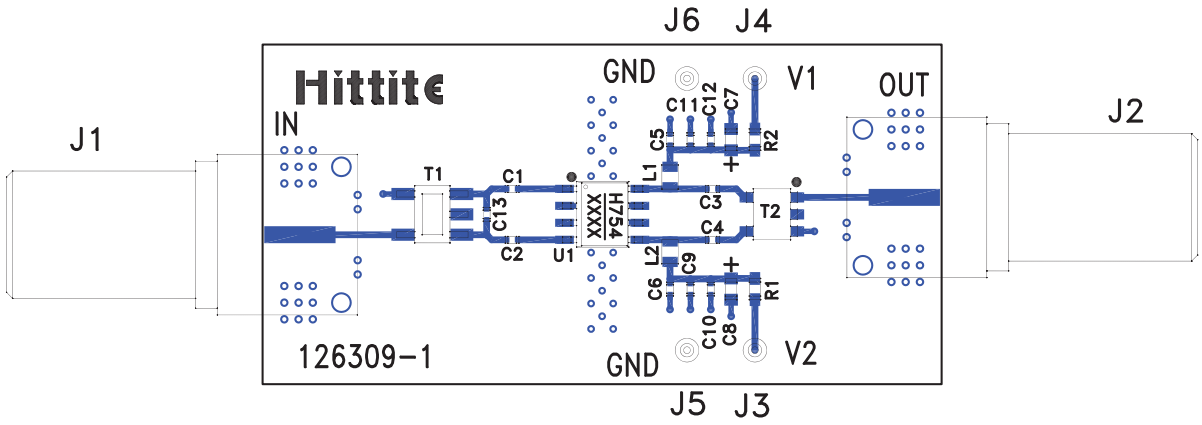
The circuit board used in the final application should use RF circuit design techniques. Signal lines should have 75 ohm impedance while the package ground leads and package bottom should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used 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.

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Evaluation PCB - Option 1 Application



List of Materials for Evaluation PCB [1]

Item	Description
J1, J2	F-Connector
J3 - J6	DC PIN
C1 - C6	1 nF Capacitor, 0402 Pkg.
C7, C8	4.7 µF Capacitor, Tantalum, 0603 Pkg.
C9, C11	68 pF Capacitor, 0402 Pkg.
C10, C12	10 nF Capacitor, 0402 Pkg.
C13	1.1 pF Capacitor, 0402 Pkg.
L1, L2	180 nH Inductor, 0603 Pkg.
R1, R2	0 Ohm Resistor, 0603 Pkg.
T1, T2 [2]	1:1 Transformer
U1	HMC754S8GE Amplifier
PCB [3]	126309 Evaluation PCB

[1] When requesting an evaluation board, please reference the appropriate evaluation PCB number listed in the table "Components for Selected Options."
[2] Please refer to "Components for Selected Options" table for values
[3] Circuit Board Material: Rogers 4350 or Arlon 25FR

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