HMC450QS16G / 450QS16GE

v02.0406

GaAs InGaP HBT MMIC POWER AMPLIFIER, 0.8 - 1.0 GHz

RoHS✓ EARTH FRIENDLY

Designer's Kit Available

Typical Applications

The HMC450QS16G / HMC450QS16GE is ideal for power and driver amplifier applications:

- GSM, GPRS, & Edge
- CDMA & WCDMA
- Base Stations & Repeaters

Features

Gain: 26 dB

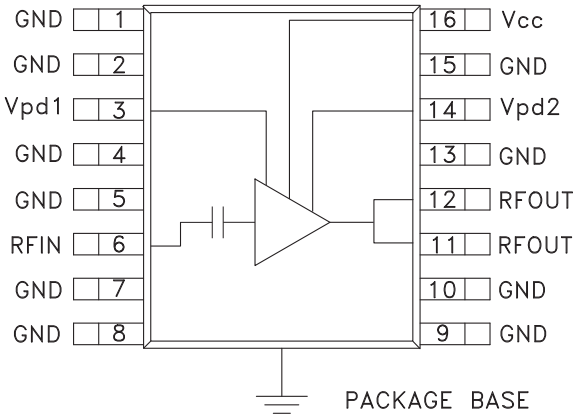
32% PAE @ 28.5 dBm Output Power

+40 dBm Output IP3

Integrated Power Control (Vpd)

Included in the HMC-DK002 Designer's Kit

Functional Diagram



General Description

The HMC450QS16G & HMC450QS16GE are high efficiency GaAs InGaP HBT Medium Power MMIC amplifiers operating between 800 and 1000 MHz. The amplifier is packaged in a low cost, surface mount 16 lead package and offers the same pinout and functionality as the higher band HMC413QS16G 1.6-2.3 GHz PA. With a minimum of external components, the amplifier provides 26 dB of gain, +40 dBm OIP3 and +28.5 dBm of saturated power from a +5V supply voltage. The integrated power control (Vpd) can be used for full power down or RF output power/current control. The combination of high gain and high output IP3 make the HMC450QS16G & HMC450QS16GE ideal linear drivers for Cellular, PCS & 3G applications.

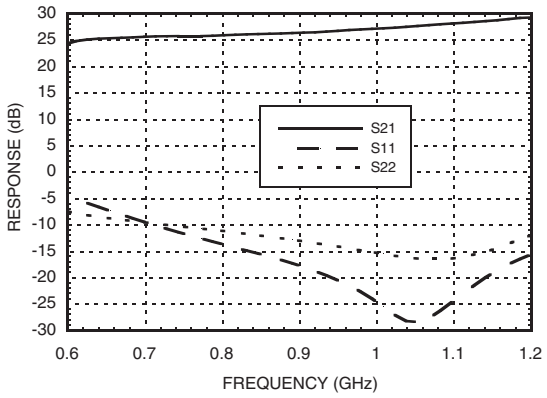
Electrical Specifications, T_A = +25° C, Vs = +5V, Vpd = +4V [1]

Parameter	Min.	Typ.	Max.	Units
Frequency Range		0.8 - 1.0		GHz
Gain	23	26		dB
Gain Variation Over Temperature		0.015	0.025	dB/°C
Input Return Loss		17		dB
Output Return Loss		13		dB
Output Power for 1 dB Compression (P1dB)	23	26		dBm
Saturated Output Power (Psat)		28.5		dBm
Output Third Order Intercept (IP3) [2]	37	40		dBm
Noise Figure		8		dB
Supply Current (Icq)		310		mA
Control Current (Ipd)		12		mA
Switching Speed tON, tOFF		10		ns

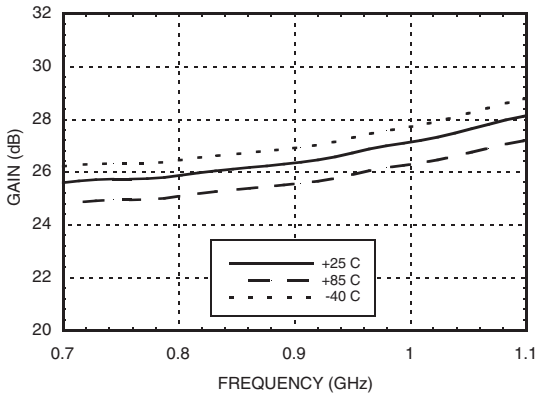
[1] Specifications and data reflect HMC450QS16G measured using the application circuit found herein. Contact the HMC Applications Group for assistance in optimizing performance for your application.
[2] Two-tone output power of +15 dBm per tone, 1 MHz spacing.

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

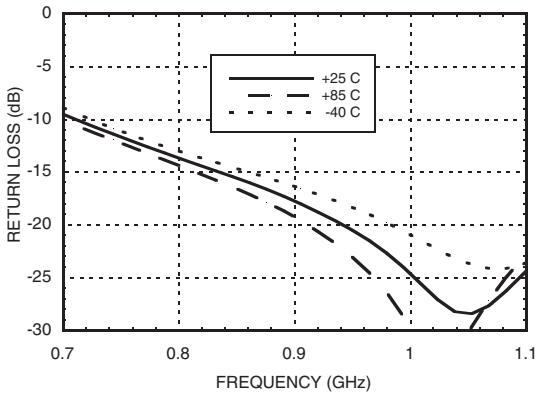
Broadband Gain & Return Loss



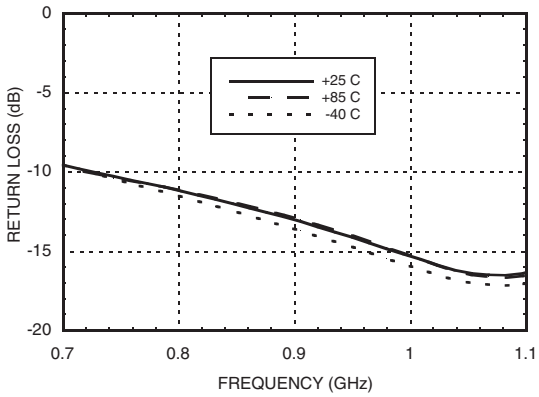
Gain vs. Temperature



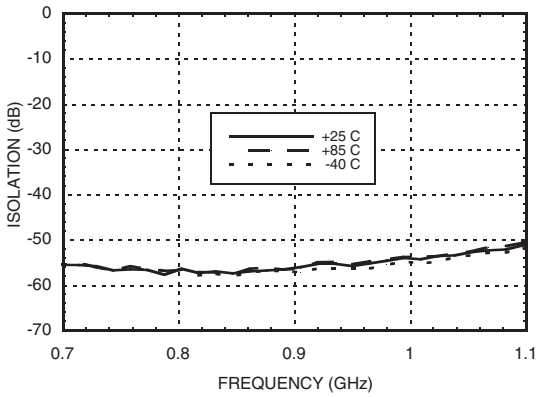
Input Return Loss vs. Temperature



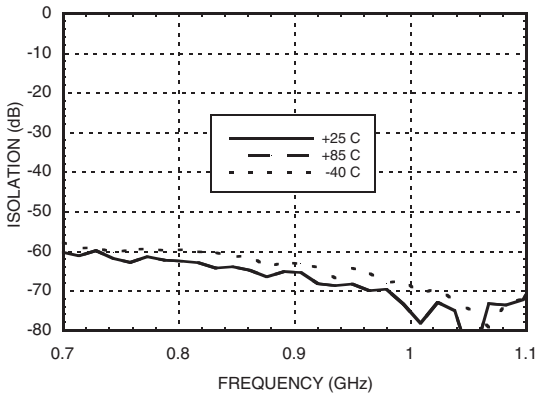
Output Return Loss vs. Temperature



Reverse Isolation vs. Temperature

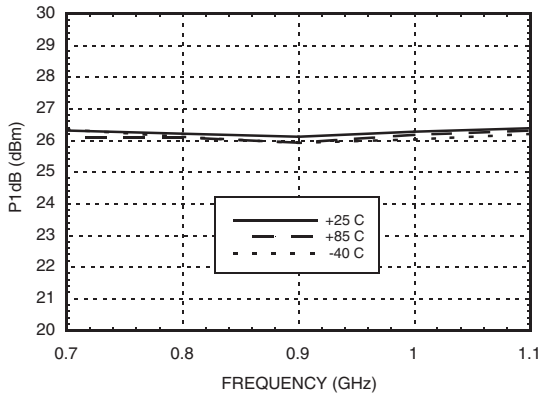


Power Down Isolation vs. Temperature

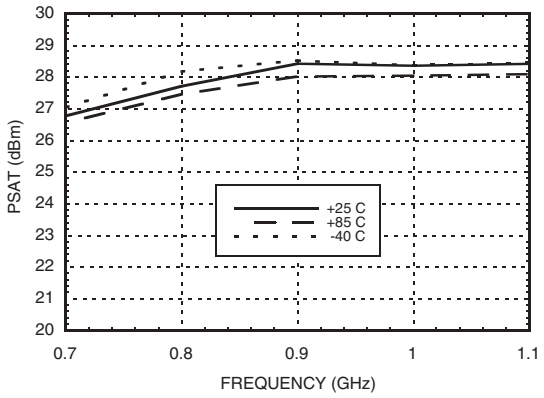


For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

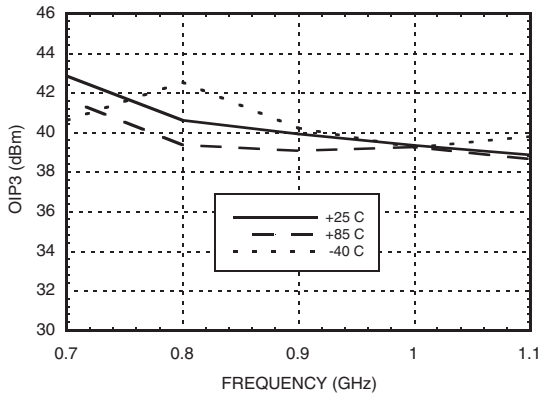
P1dB vs. Temperature



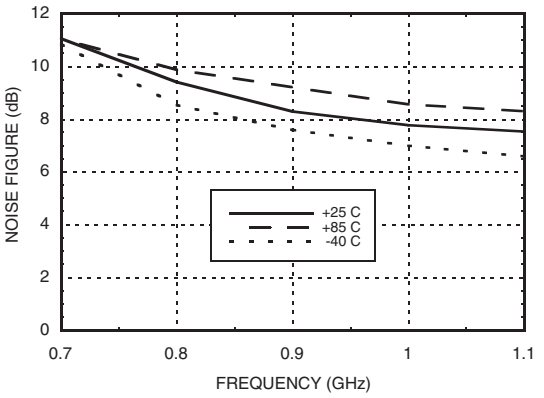
Psat vs. Temperature



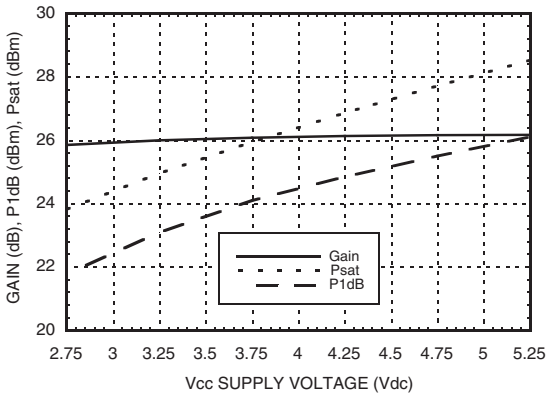
Output IP3 vs. Temperature



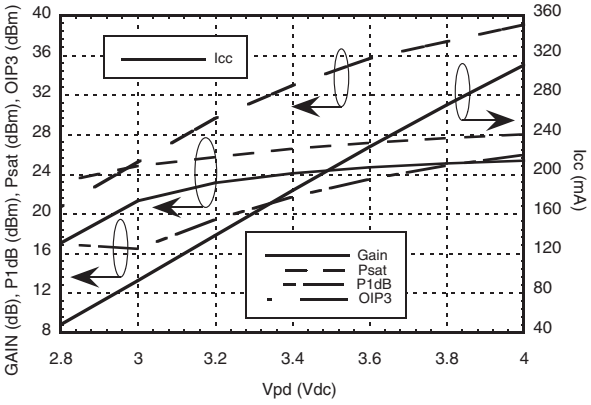
Noise Figure vs. Temperature



Gain and Power vs. Supply Voltage @ 900 MHz, Vpd= 4V



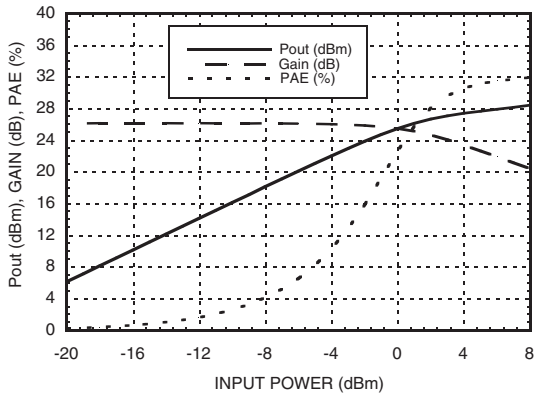
Gain, Power, OIP3 and Supply Current vs. Power Down Voltage @ 900 MHz



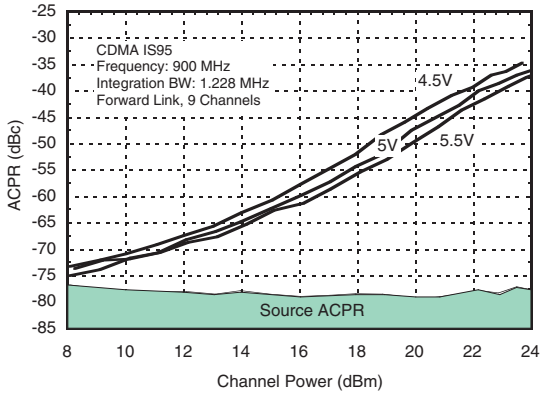
For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

GaAs InGaP HBT MMIC POWER AMPLIFIER, 0.8 - 1.0 GHz

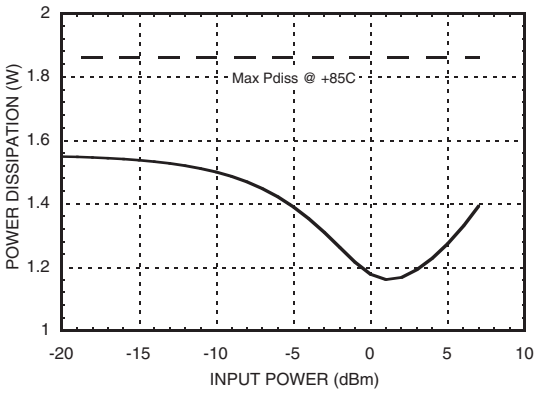
Power Compression @ 900 MHz



ACPR vs. Supply Voltage @ 900 MHz CDMA IS95, 9 Channels Forward



Power Dissipation@ 900 MHz



For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

RoHS✓ EARTH FRIENDLY

GaAs InGaP HBT MMIC POWER AMPLIFIER, 0.8 - 1.0 GHz

Absolute Maximum Ratings

Collector Bias Voltage (Vcc)	+5.5 Vdc
Control Voltage (Vpd1, Vpd2)	+5Vdc
RF Input Power (RFIN)(Vs = +5Vdc, VPD = +4.0 Vdc)	+10 dBm
Junction Temperature	150 °C
Continuous Pdiss (T = 85 °C) (derate 28 mW/°C above 85 °C)	1.86 W
Thermal Resistance (junction to ground paddle)	35 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

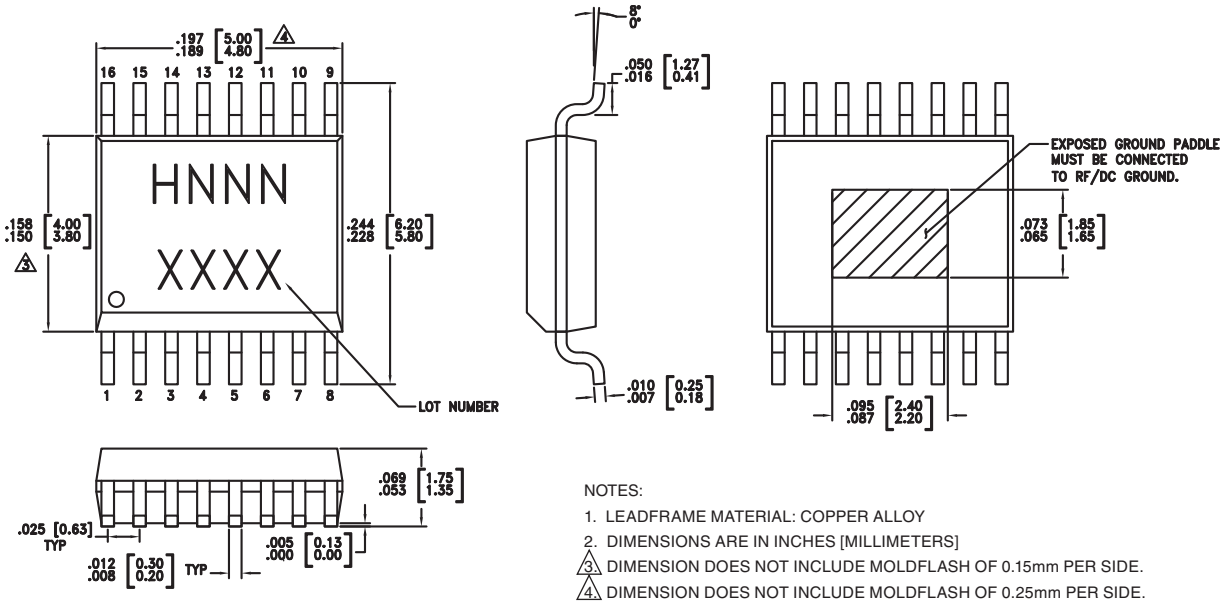
Typical Supply Current vs. Supply Voltage

Vs (V)	Icq (mA)
4.75	300
5.0	310
5.25	325

Note: Amplifier will operate over full voltage range shown above

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.

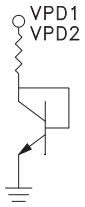
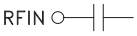
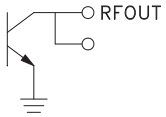
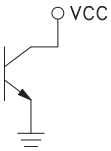
Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [3]
HMC450QS16G	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 [1]	H450 XXXX
HMC450QS16GE	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	H450 XXXX

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

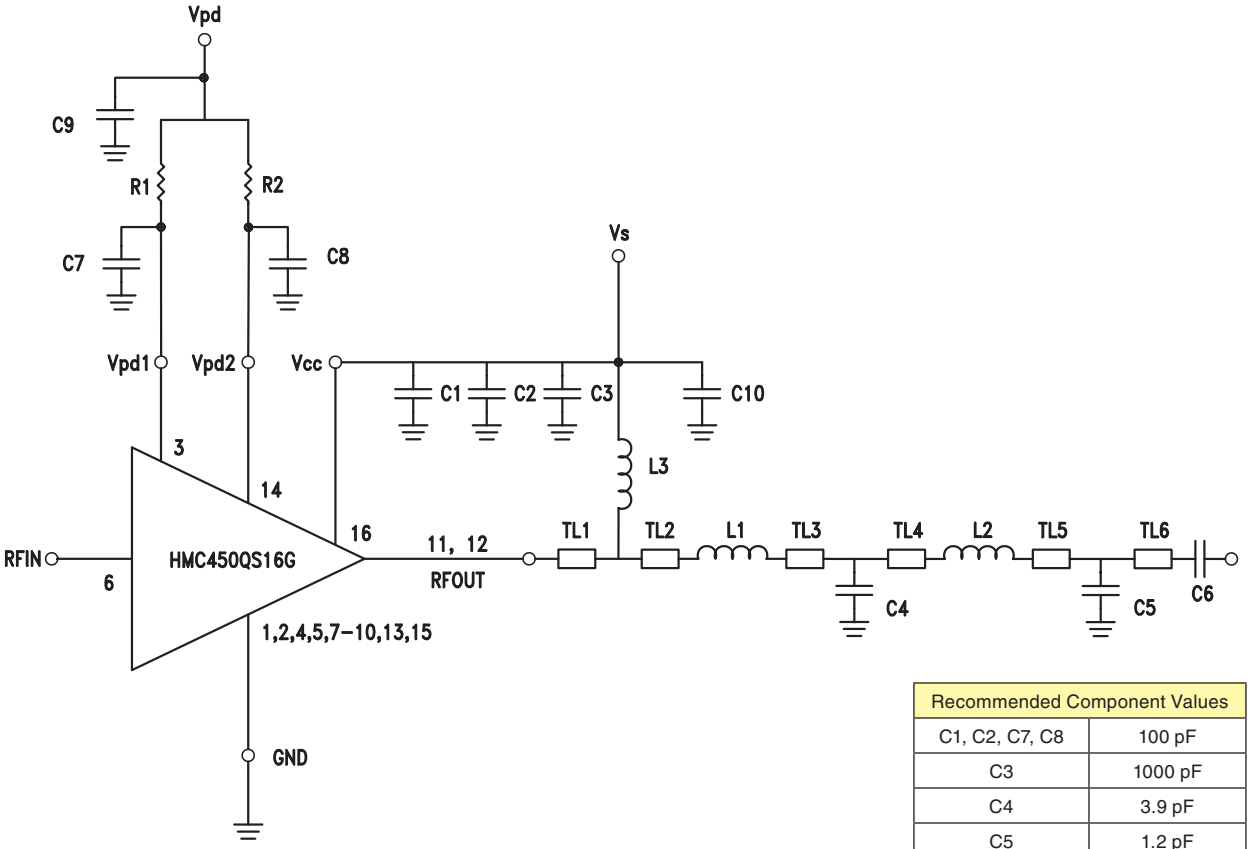
For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 2, 4, 5, 7, 8, 9, 10, 13, 15	GND	Ground: Backside of package has exposed metal ground slug that must be connected to ground thru a short path. Vias under the device are required.	
3, 14	Vpd1, Vpd2	Power Control Pin. For maximum power, this pin should be connected to 4.0V. For 5V operation, a dropping resistor is required. A higher voltage is not recommended. For lower idle current, this voltage can be reduced.	
6	RFIN	This pin is AC coupled and matched to 50 Ohms from 0.8 to 1.0 GHz.	
11, 12	RFOUT	RF output and bias for the output stage.	
16	Vcc	Power supply voltage for the first amplifier stage. An external bypass capacitor of 330 pF is required as shown in the application schematic.	

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

Application Circuit

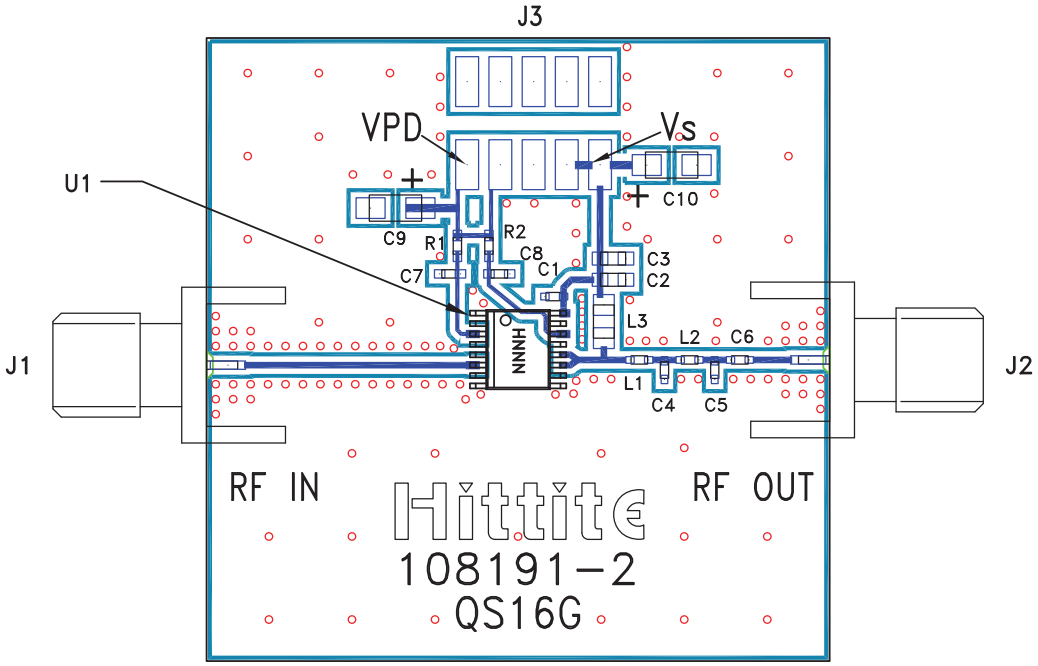


Recommended Component Values	
C1, C2, C7, C8	100 pF
C3	1000 pF
C4	3.9 pF
C5	1.2 pF
C6	27 pF
C9, C10	2.2 µF
L1	1.9 nH
L2	1.0 nH
L3	56 nH
R1, R2	50 Ohms

		TL1	TL2	TL3	TL4	TL5	TL6
	Impedance	50 Ohm	50 Ohm	50 Ohm	50 Ohm	50 Ohm	50 Ohm
Physical	Length	0.08”	0.05”	0.02”	0.02”	0.02”	0.02”
Electrical	Length	4˚	2.5˚	1.02˚	1.02˚	1.02˚	1.02˚
PCB Material: 10 mil Rogers 4350 Er = 3.48							

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

Evaluation PCB



List of Materials for Evaluation PCB 108349 [1]

Item	Description
J1 - J2	PCB Mount SMA Connector
J3	2 mm DC Header
C1, C7, C8	100 pF Capacitor, 0402 Pkg.
C2	100 pF Capacitor, 0603 Pkg.
C3	1000 pF Capacitor, 0603 Pkg.
C4	3.9 pF Capacitor, 0402 Pkg.
C5	1.2 pF Capacitor, 0402 Pkg.
C6	27 pF Capacitor, 0402 Pkg.
C9, C10	2.2 uF Capacitor, Tantalum
L1	1.9 nH Inductor 0402 Pkg.
L2	1.0 nH Inductor, 0402 Pkg.
L3	56nH Inductor, 0805 Pkg.
R1, R2	50 Ohms Resistor, 0402 Pkg.
U1	HMC450QS16G / HMC450QS16GE Power Amp.
PCB [2]	108191 Evaluation PCB, 10 mils

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the final 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.

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D