v00.0504

HMC453QS16G

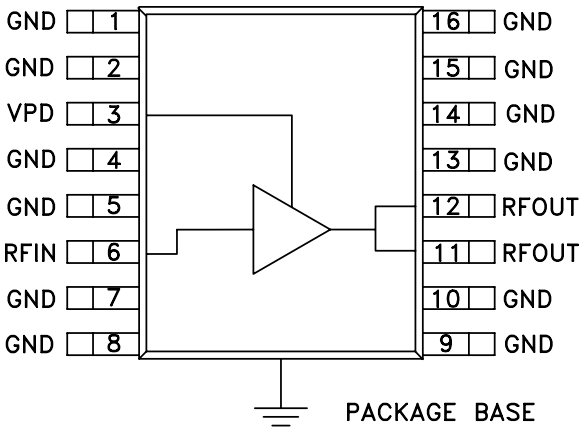
InGaP HBT 1.6 WATT POWER AMPLIFIER, 0.45 - 2.2 GHz

Typical Applications

The HMC453QS16G is ideal for applications requiring a high dynamic range amplifier:

- GSM, GPRS & EDGE
- CDMA & W-CDMA
- CATV/Cable Modem
- Fixed Wireless & WLL

Functional Diagram



Features

Output IP3: +50 dBm

Gain: 15 dB @ 900 MHz

42% PAE @ +32 dBm Pout

+25 dBm CDMA2000 Channel Power@ -45 dBc ACP

Single +5V Supply

Integrated Power Control (VPD)

QSOP16G SMT Package: 29.4 mm^2

General Description

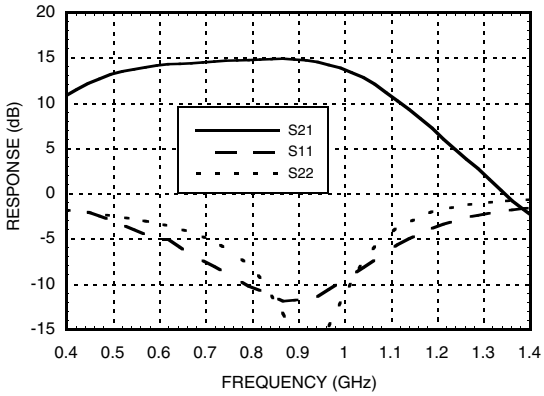
The HMC453QS16G is a high dynamic range GaAs InGaP Heterojunction Bipolar Transistor (HBT) 1.6 watt MMIC power amplifier operating between 0.45 and 2.2 GHz. Packaged in a miniature 16 lead QSOP plastic package, the amplifier gain is typically 15 dB from 0.8 to 1.0 GHz and 9 dB from 1.8 to 2.0 GHz. Utilizing a minimum number of external components and a single +5V supply, the amplifier output IP3 can be optimized to +49 dBm at 0.9 GHz or +50 dBm at 1.9 GHz. The power control (VPD) can be used for full power down or RF output power/current control. The high output IP3 and PAE makes the HMC453QS16G an ideal power amplifier for Cellular/PCS/3G, WLL, ISM and Fixed Wireless applications.

Electrical Specifications, T_A = +25°C, Vs= +5V, VPD = +5V (note 1)

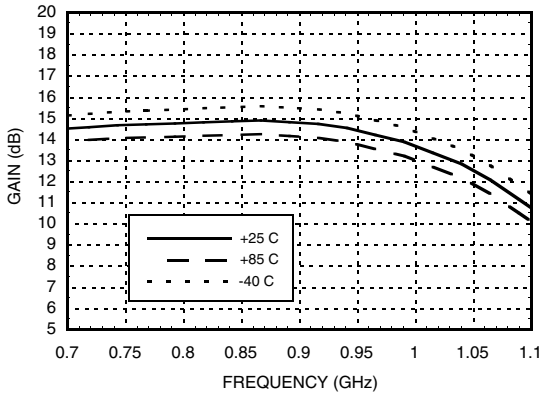
Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range		810 - 960			1710 - 1990		MHz
Gain	12	15		6	9		dB
Gain Variation Over Temperature		0.012	0.02		0.012	0.02	dB / °C
Input Return Loss		12			10		dB
Output Return Loss		15			13		dB
Output Power for 1dB Compression (P1dB)	29	32		28.5	31.5		dBm
Saturated Output Power (Psat)		32.5			32		dBm
Output Third Order Intercept (IP3) (note 2)	46	49		44	50		dBm
Noise Figure		7			7.5		dB
Supply Current (Icq)		725			725		mA
Control Current (IPD)		12			12		mA

Note 1: Specifications and data reflect HMC453QS16G measured using the respective application circuits for each designated frequency band found herein. Contact the HMC Applications Group for assistance in optimizing performance for your application.
Note 2: Two-tone input power of -10 dBm per tone, 1 MHz spacing.

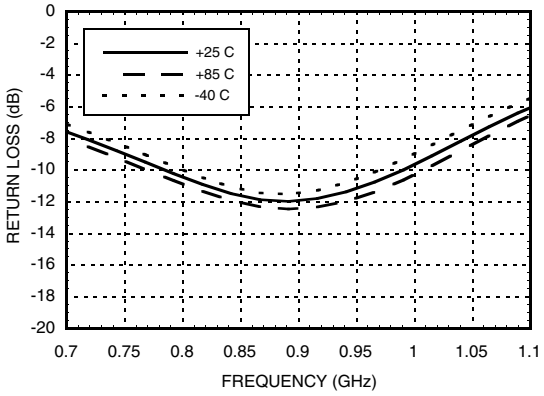
Broadband Gain & Return Loss @ 900 MHz



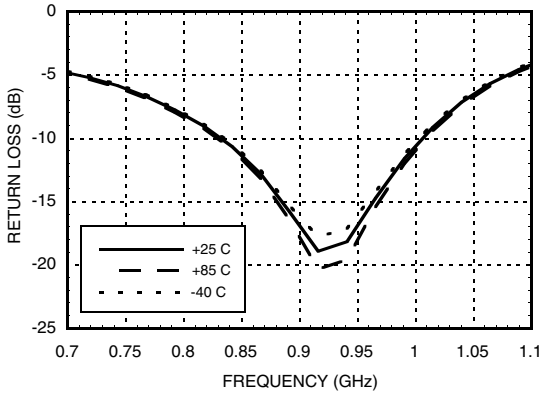
Gain vs. Temperature @ 900 MHz



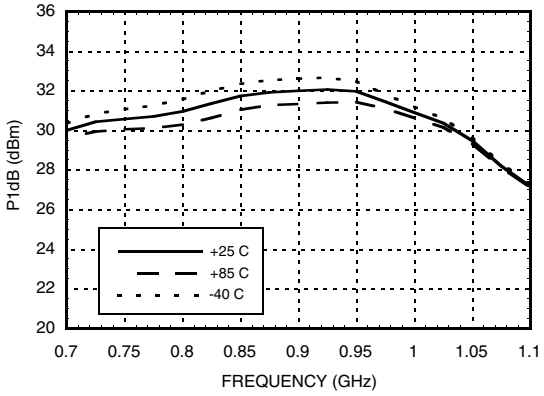
Input Return Loss vs. Temperature @ 900 MHz



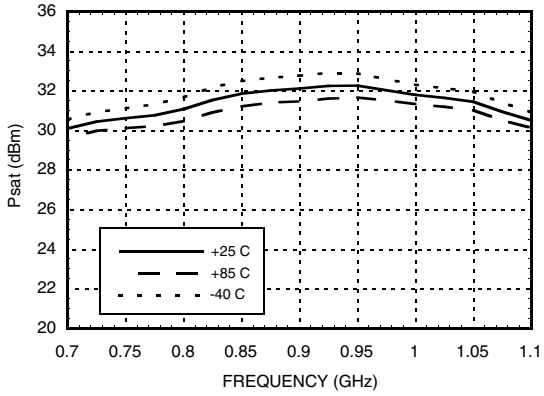
Output Return Loss vs. Temperature @ 900 MHz



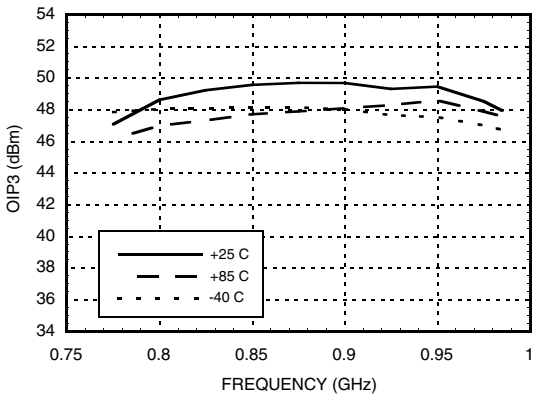
P1dB vs. Temperature @ 900 MHz



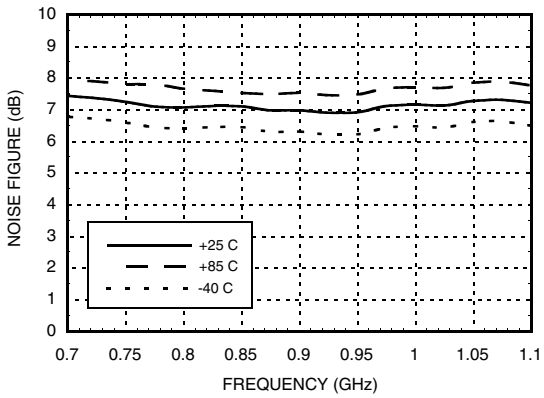
Psat vs. Temperature @ 900 MHz



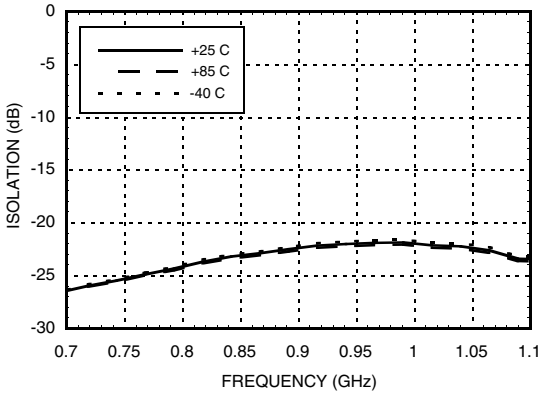
Output IP3 vs. Temperature @ 900 MHz



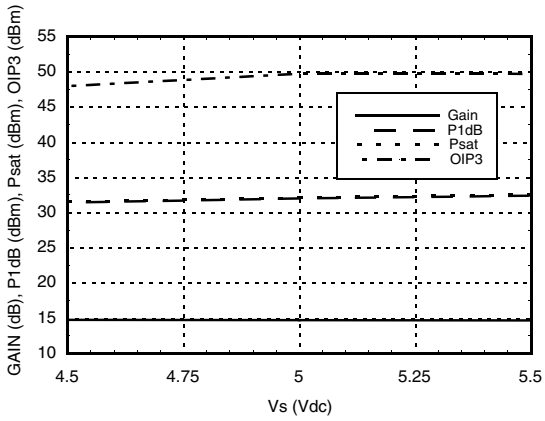
Noise Figure vs. Temperature @ 900 MHz



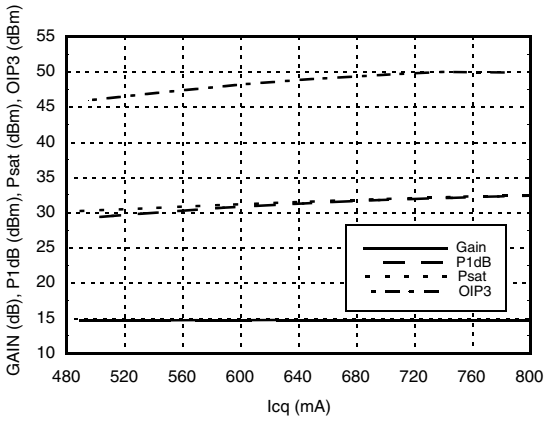
Reverse Isolation vs. Temperature @ 900 MHz



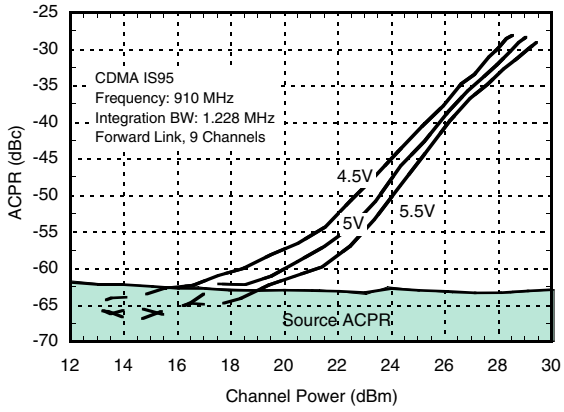
Gain, Power & IP3 vs. Supply Voltage @ 900 MHz



Gain, Power & IP3 vs. Supply Current @ 900 MHz*

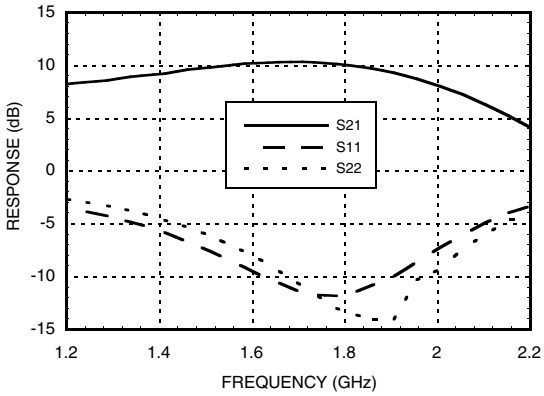


ACPR vs. Supply Voltage @ 910 MHz CDMA IS95, 9 Channels Forward

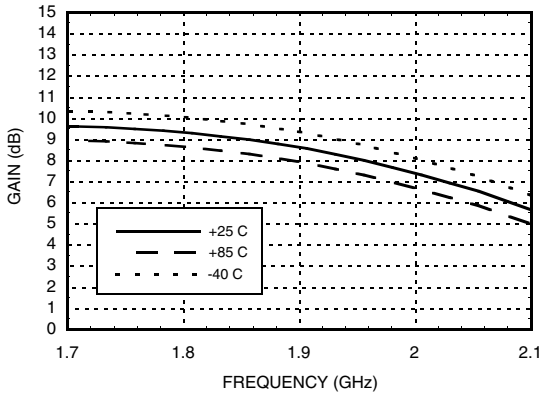


* Icq is controlled by varying VPD.

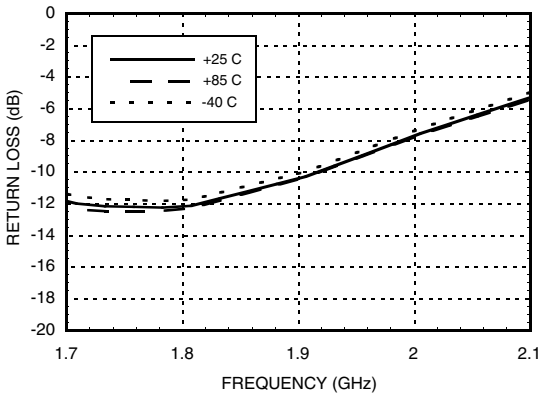
Broadband Gain & Return Loss @ 1900 MHz



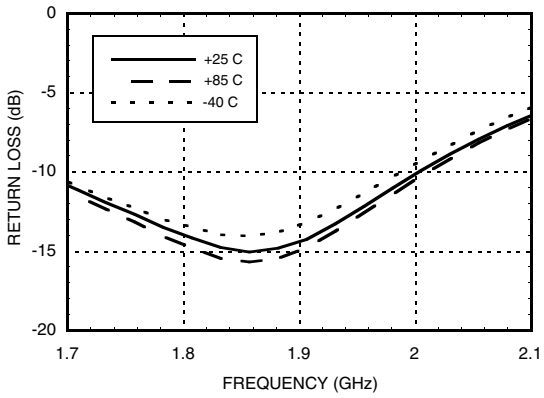
Gain vs. Temperature @ 1900 MHz



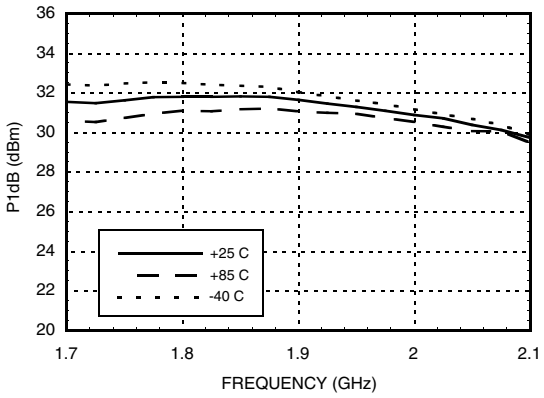
Input Return Loss vs. Temperature @ 1900 MHz



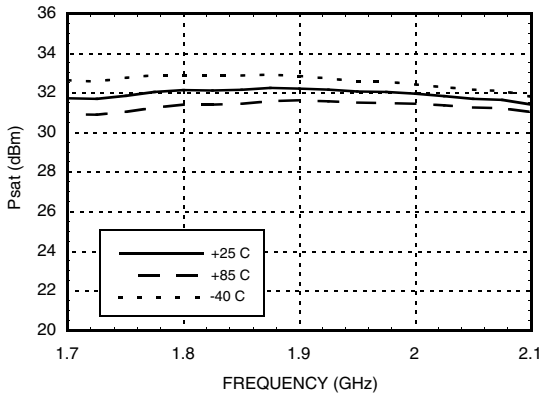
Output Return Loss vs. Temperature @ 1900 MHz



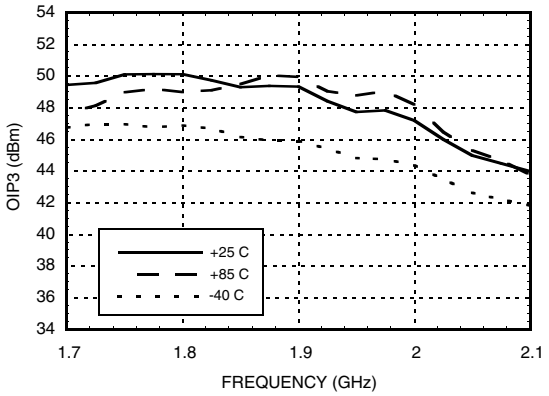
P1dB vs. Temperature @ 1900 MHz



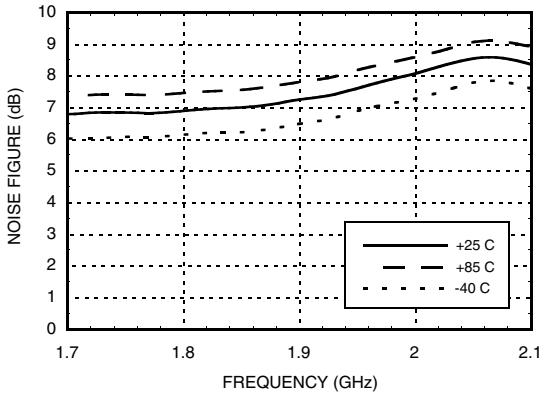
Psat vs. Temperature @ 1900 MHz



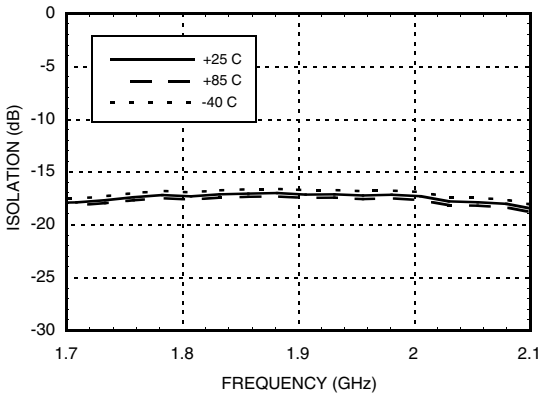
Output IP3 vs. Temperature @ 1900 MHz



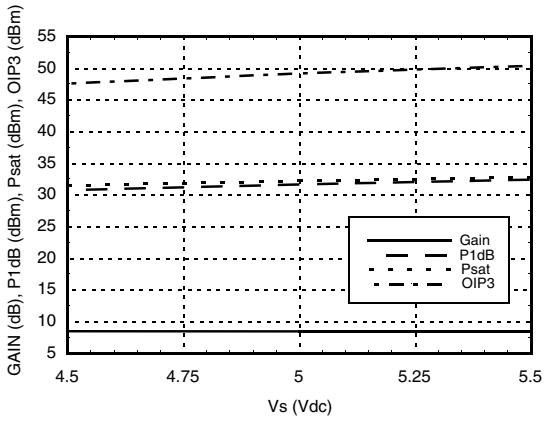
Noise Figure vs. Temperature @ 1900 MHz



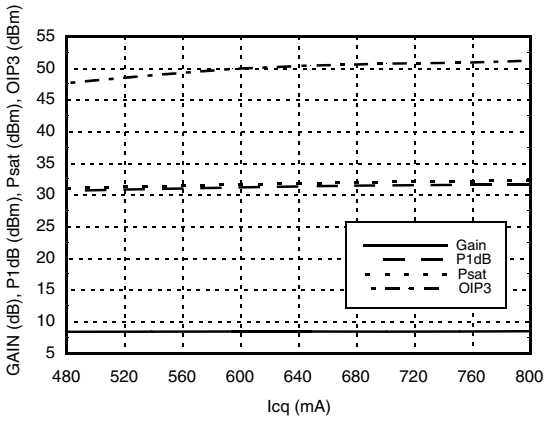
Reverse Isolation vs. Temperature @ 1900 MHz



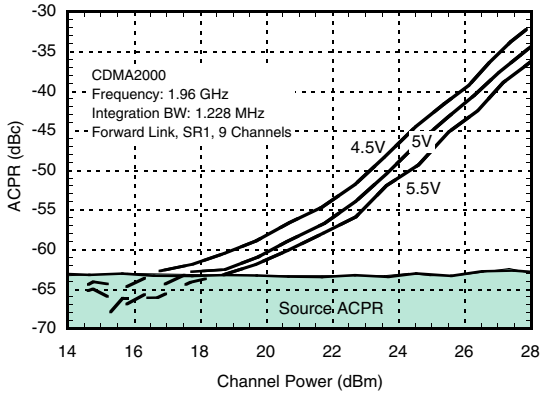
Gain, Power & IP3 vs. Supply Voltage @ 1900 MHz



Gain, Power & IP3 vs. Supply Current @ 1900 MHz

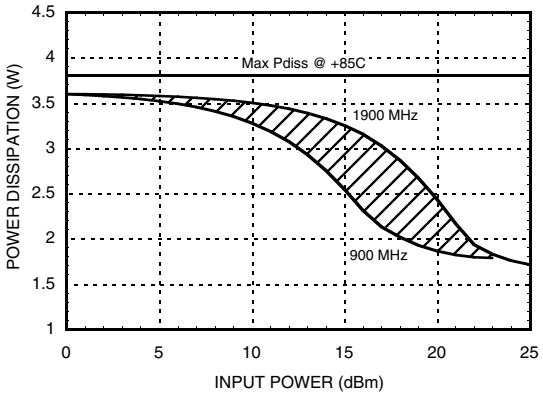


ACPR vs. Supply Voltage @ 1960 MHz CDMA 2000, 9 Channels Forward



InGaP HBT 1.6 WATT POWER AMPLIFIER, 0.45 - 2.2 GHz

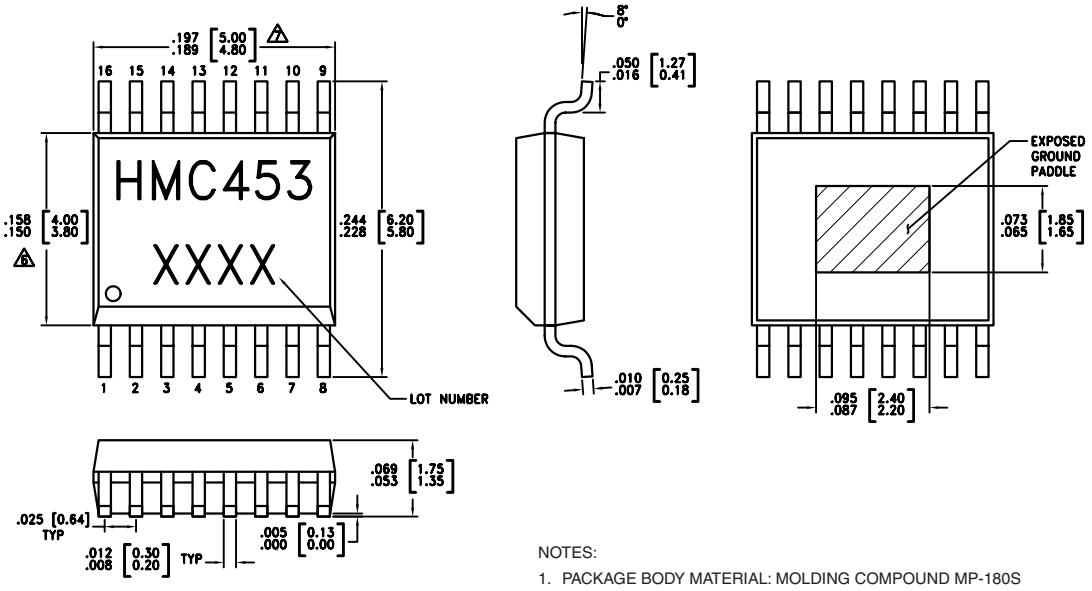
Power Dissipation



Absolute Maximum Ratings

Collector Bias Voltage (Vcc)	+6.0 Vdc
Control Voltage (Vpd)	+5.4 Vdc
RF Input Power (RFin)(Vs = Vpd = +5.0 Vdc)	+35 dBm
Junction Temperature	150 °C
Continuous Pdiss (T = 85 °C) (derate 58.5 mW/°C above 85 °C)	3.8 W
Thermal Resistance (junction to ground paddle)	17.1 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

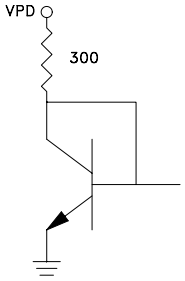
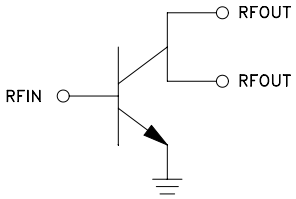
Outline Drawing



NOTES:

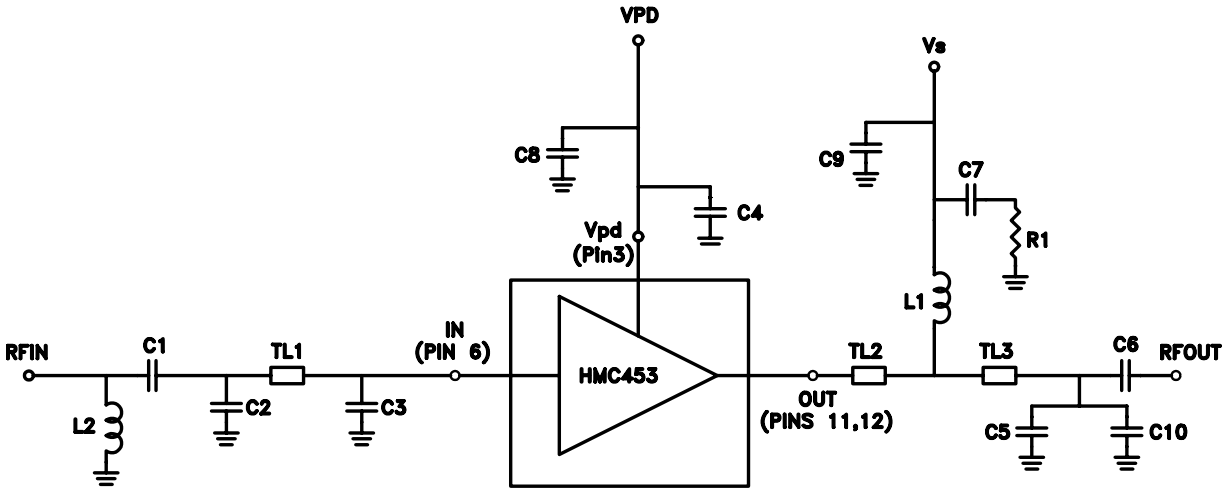
1. PACKAGE BODY MATERIAL: MOLDING COMPOUND MP-180S OR EQUIVALENT.
2. LEAD MATERIAL: Cu w/Ag SPOT PLATING.
3. LEAD PLATING: 80Sn/20Pb
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 2, 4, 5, 7-10, 13-16	GND	These pins & package bottom must be connected to RF/DC ground.	
3	VPD	Power control pin. For maximum power, this pin should be connected to 5.0V. A higher voltage is not recommended. For lower idle current, this voltage can be reduced.	
6	RFIN	This pin is DC coupled. Off chip matching components are required. See Application Circuit herein.	
11, 12	RFOUT	RF output and DC Bias input for the output amplifier stage. Off chip matching components are required. See Application Circuit herein.	

900 MHz Application Circuit

This circuit was used to specify the performance for 810-960 MHz operation. Contact the HMC Applications Group for assistance in optimizing performance for your application.

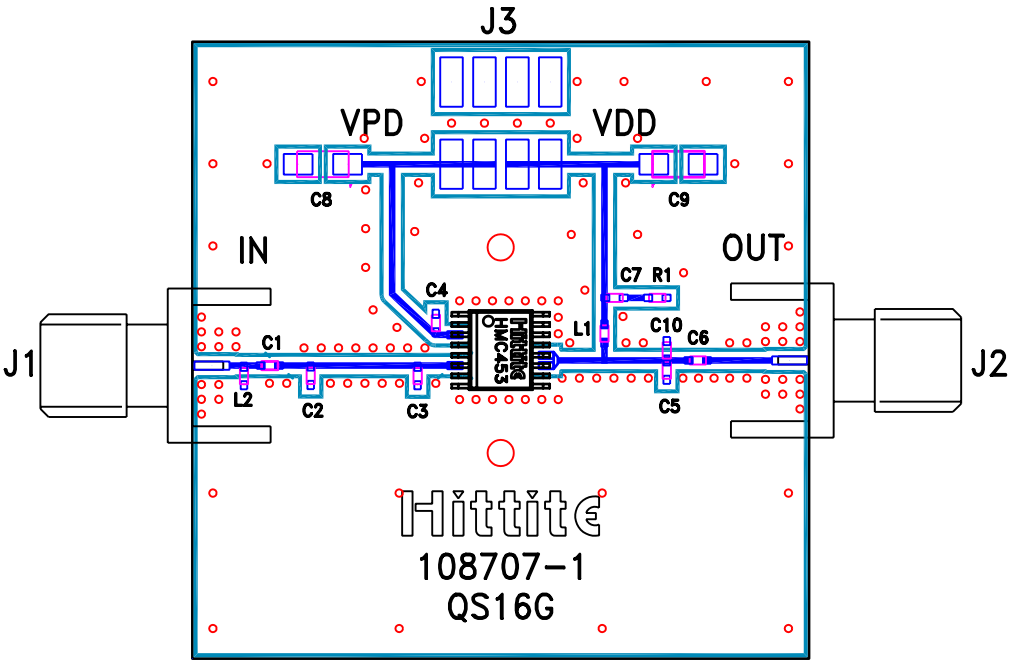


Note: C3 and C4 should be placed as close to pins as possible.

	TL1	TL2	TL3
Impedance	50 Ohm	50 Ohm	50 Ohm
Physical Length	0.26"	0.12"	0.15"
Electrical Length	28°	13°	16°
PCB Material: 10 mil Rogers 4350, Er = 3.48			

Recommended Component Values	
C1	5.0 pF
C2, C3	3.3 pF
C4, C7	100 pF
C5	8.2 pF
C6	56 pF
C8, C9	2.2 µF
C10	1.0 pF
L1	30 nH
L2	20 nH
R1	5.6 Ohm

900 MHz Evaluation PCB



List of Materials for Evaluation PCB 108709-900*

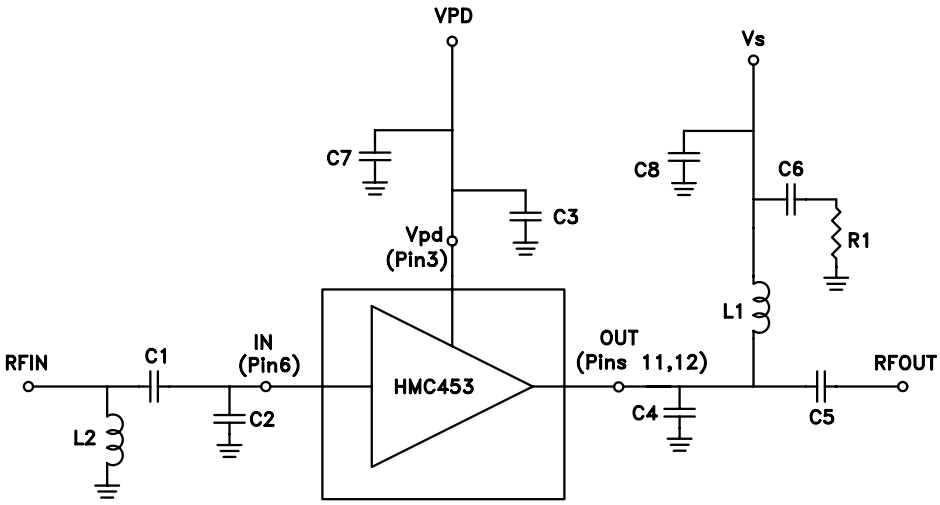
Item	Description
J1 - J2	PC Mount SMA Connector
J3	2 mm DC Header
C1	5.0 pF Capacitor, 0402 Pkg.
C2, C3	3.3 pF Capacitor, 0402 Pkg.
C4, C7	100 pF Capacitor, 0402 Pkg.
C5	8.2 pF Capacitor, 0402 Pkg.
C6	56 pF Capacitor, 0402 Pkg.
C8, C9	2.2 µF Capacitor, Tantalum
C10	1.0 pF Capacitor, 0402 Pkg.
L1	30 nH Inductor, 0402 Pkg.
L2	20 nH Inductor, 0402 Pkg.
R1	5.6 Ohm Resistor, 0402 Pkg.
U1	HMC453QS16G
PCB**	108707 Evaluation PCB, 10 mils
** Circuit Board Material: Rogers 4350, Er = 3.48	

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.

* Reference this number when ordering complete evaluation PCB.

1900 MHz Application Circuit

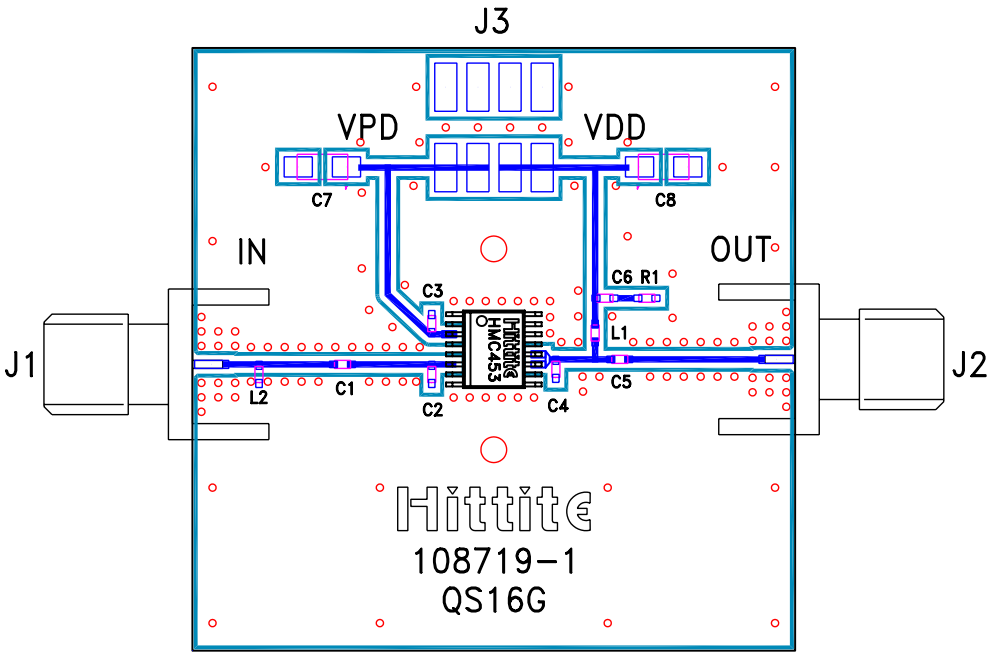
This circuit was used to specify the performance for 1710-1990 MHz operation. Contact the HMC Applications Group for assistance in optimizing performance for your application.



Note: C2, C3 and C4 should be placed as close to pins as possible.

Recommended Component Values	
L1	18 nH
L2	20 nH
R1	5.6 Ohms
C1	5.0 pF
C2	2.7 pF
C3, C6	100 pF
C4	3.9 pF
C5	15 pF
C7, C8	2.2 µF

1900 MHz Evaluation PCB



List of Materials for Evaluation PCB 108721-1900*

Item	Description
J1 - J2	PC Mount SMA Connector
J3	2 mm DC Header
C1	5.0 pF Capacitor, 0402 Pkg.
C2	2.7 pF Capacitor, 0402 Pkg.
C3, C6	100 pF Capacitor, 0402 Pkg.
C4	3.9 pF Capacitor, 0402 Pkg.
C5	15 pF Capacitor, 0402 Pkg.
C7, C8	2.2 µF Capacitor, Tantalum
L1	18 nH Inductor, 0402 Pkg.
L2	20 nH Inductor, 0402 Pkg.
R1	5.6 Ohms
U1	HMC453QS16G Linear Amp
PCB**	108719 Evaluation PCB, 10 mils
** Circuit Board Material: Rogers 4350, Er = 3.48	

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.

* Reference this number when ordering complete evaluation PCB.

Notes: