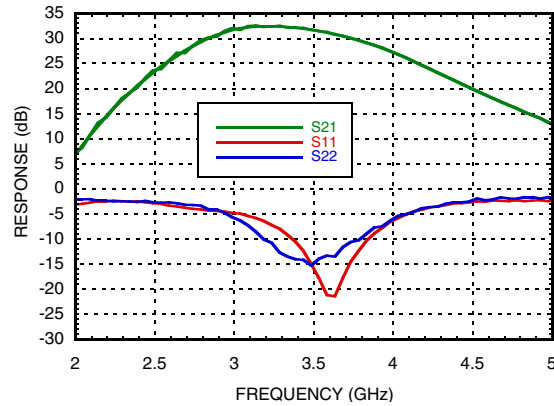
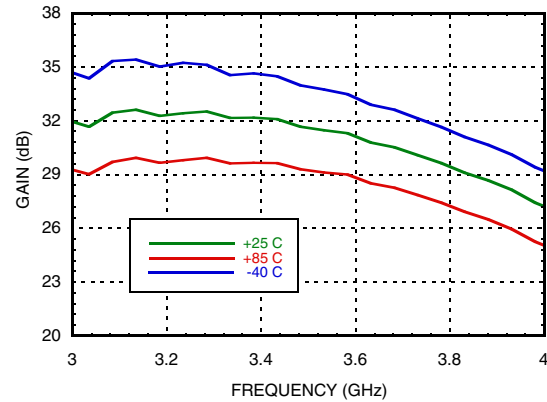
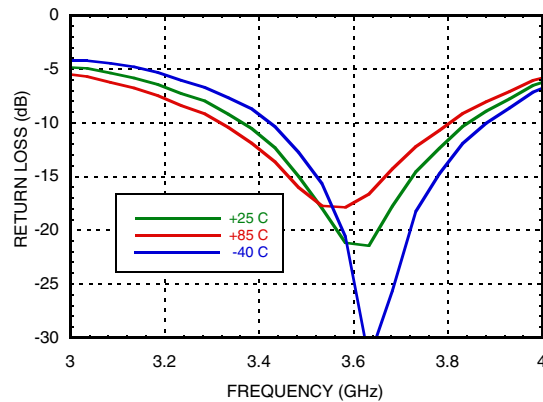
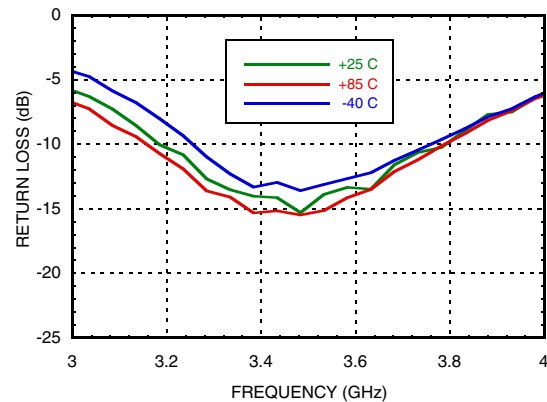
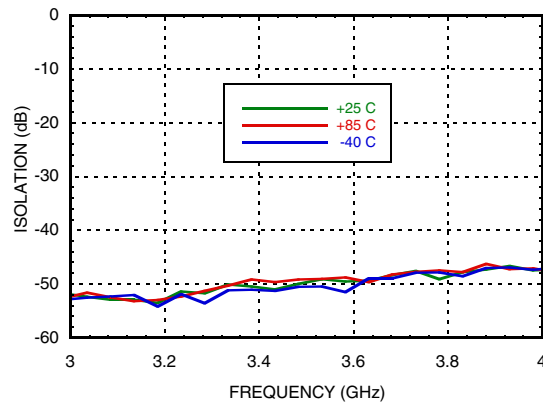
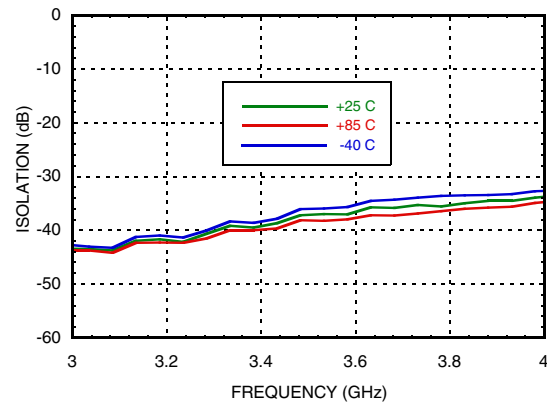
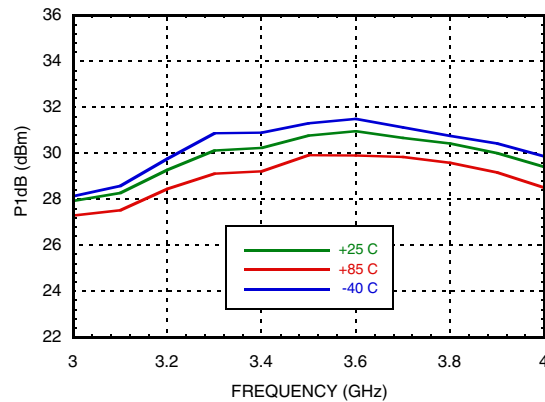
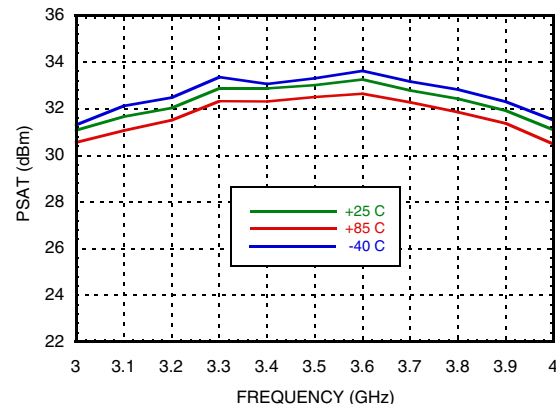
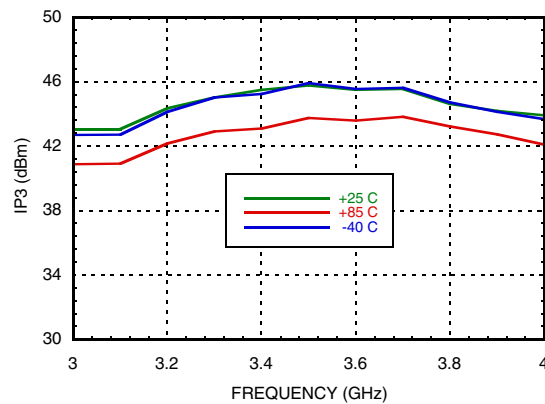
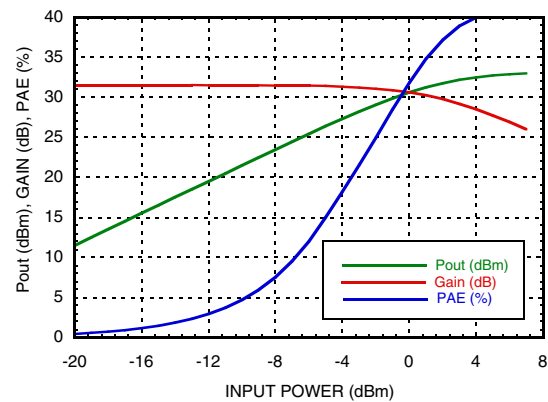
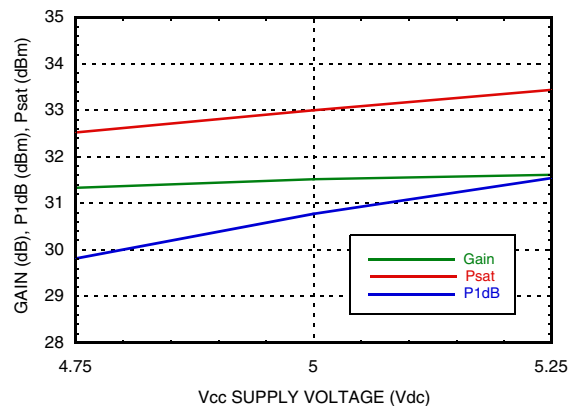
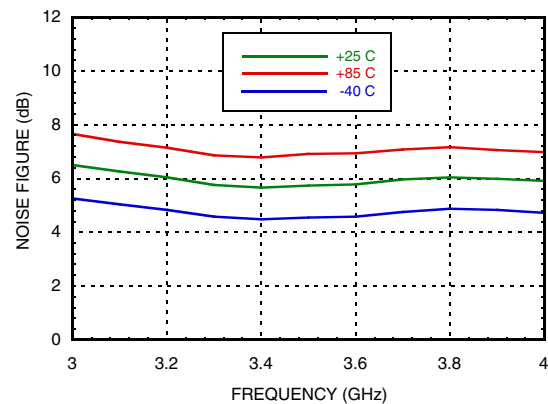


GaAs InGaP HBT 1 WATT POWER AMPLIFIER, 3.3 - 3.8 GHz

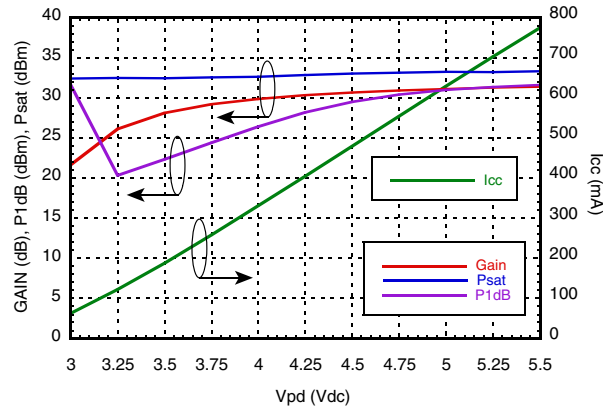
Broadband Gain & Return Loss

Gain vs. Temperature

Input Return Loss vs. Temperature

Output Return Loss vs. Temperature

Reverse Isolation vs. Temperature

Power Down Isolation vs. Temperature


GaAs InGaP HBT 1 WATT POWER AMPLIFIER, 3.3 - 3.8 GHz

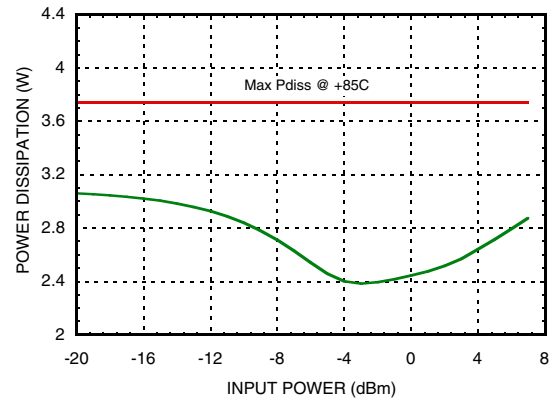
P1dB vs. Temperature

Psat vs. Temperature

Output IP3 vs. Temperature

Power Compression @ 3.5 GHz

Gain & Power vs. Supply Voltage

Noise Figure vs. Temperature


**GaAs InGaP HBT 1 WATT
POWER AMPLIFIER, 3.3 - 3.8 GHz**

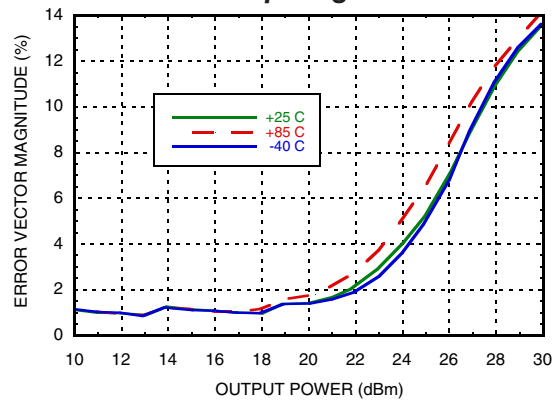
**Gain, Power & Quiescent
Supply Current vs. V_{pd} @ 3.5 GHz**



Power Dissipation



**EVM vs. Temperature @ 3.5 GHz OFDM
54 Mbps Signal**



GaAs InGaP HBT 1 WATT POWER AMPLIFIER, 3.3 - 3.8 GHz

Absolute Maximum Ratings

Collector Bias Voltage (Vcc1, Vcc2)	+5.5 Vdc
Control Voltage (Vpd)	+5.5 Vdc
RF Input Power (RFIN)(Vs = Vpd = +5Vdc)	+10 dBm
Junction Temperature	150 °C
Continuous P _{diss} (T = 85 °C) (derate 57.5 mW/°C above 85 °C)	3.74 W
Thermal Resistance (junction to ground paddle)	17.4 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class 1A, Passed 250V

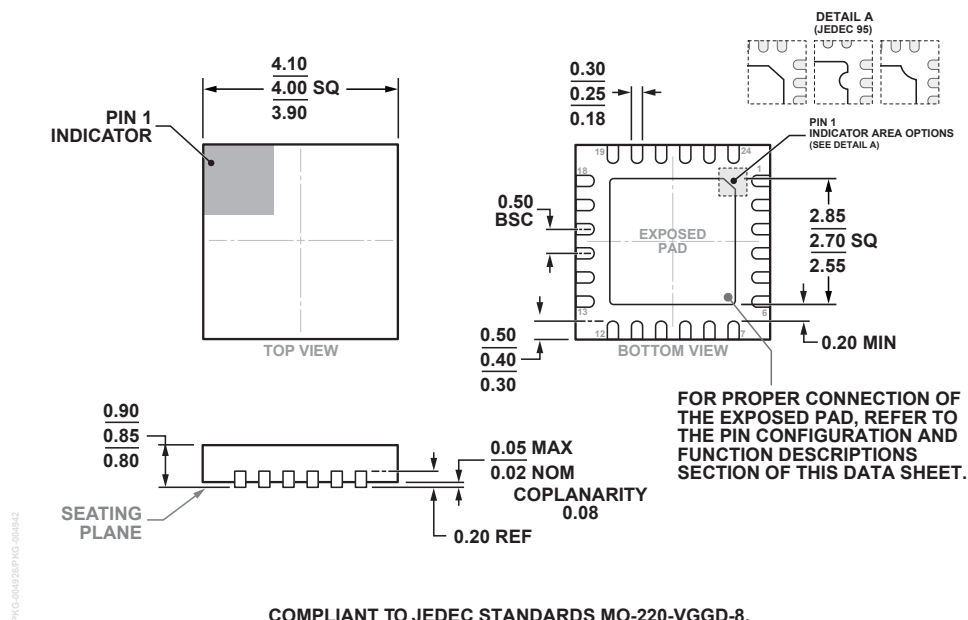
Typical Supply, Current vs. Supply Voltage, Vcc1 = Vcc2 = Vpd

Vs (Vdc)	Icq (mA)
4.75	516
5.0	615
5.25	721



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



Package Information

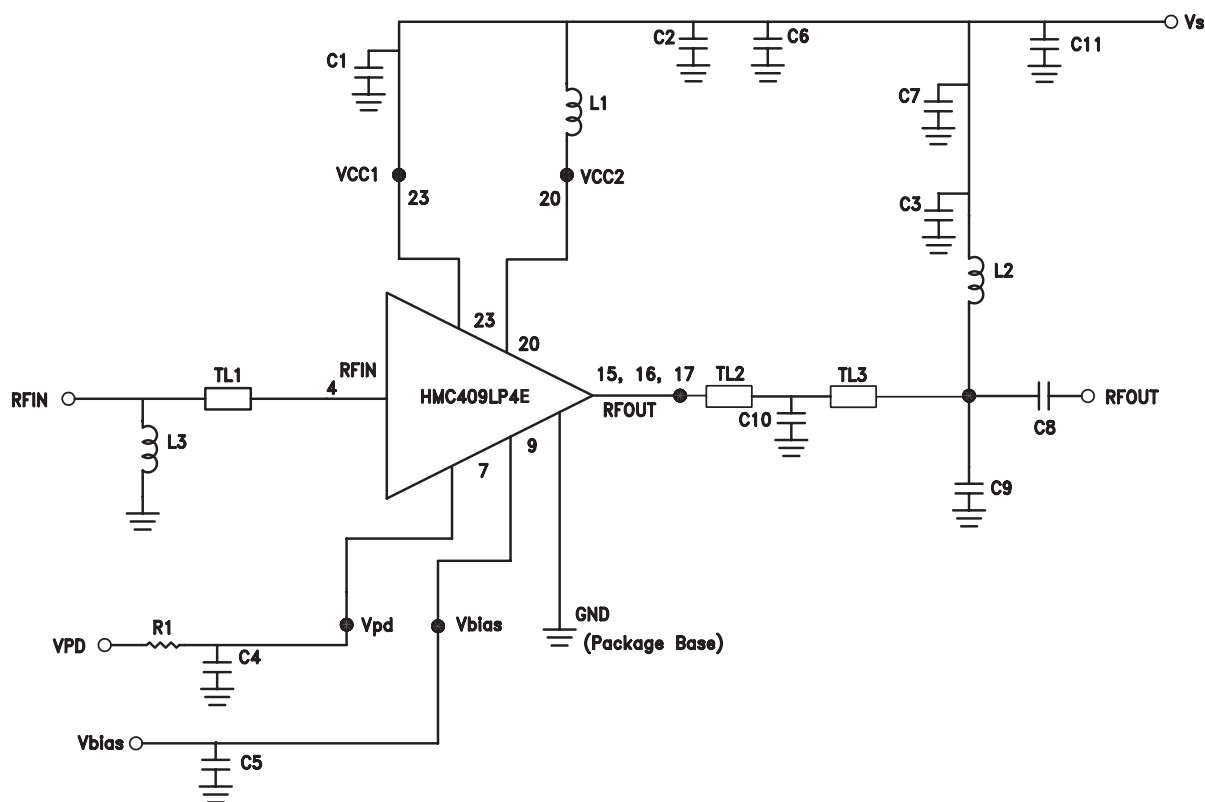
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking ^[2]
HMC409LP4E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL3 ^[1]	H409 XXXX

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX

**GaAs InGaP HBT 1 WATT
POWER AMPLIFIER, 3.3 - 3.8 GHz**

Application Circuit

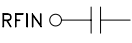
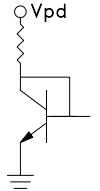
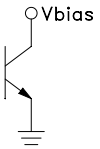
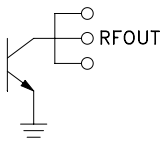
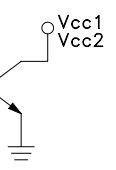


Recommended Component Values	
C1 - C5	100 pF
C6 - C7	1000 pF
C8	10 pF
C9	0.5 pF
C10	1.6 pF
C11	4.7μF
L1, L2	3.9 nH
L3	2.2 nH
R1	56 Ohm

	TL1	TL2	TL3
Impedance	50 Ohm	27 Ohm	50 Ohm
Physical Length	0.068"	0.062"	0.164"
Electrical Length	12°	11°	29°
PCB Material: 10 mil Rogers 4350, Er = 3.48			

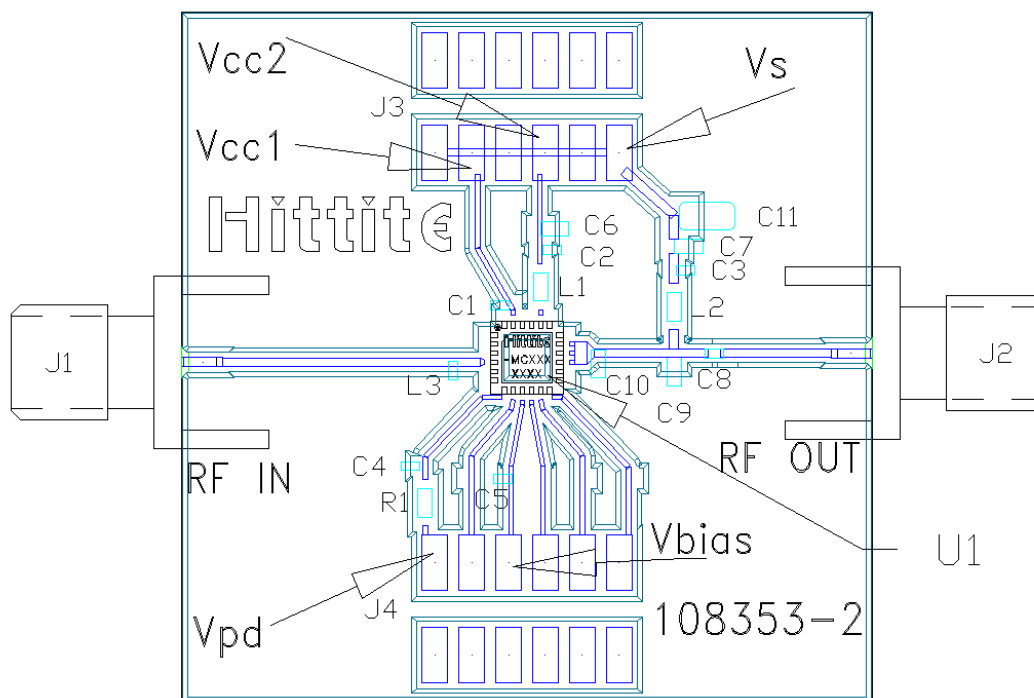
**GaAs InGaP HBT 1 WATT
POWER AMPLIFIER, 3.3 - 3.8 GHz**

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1-3, 5, 6, 8, 10 -14, 18, 19, 21, 22, 24	N/C	No connection required. These pins may be connected to RF/DC ground without affecting performance.	
4	RFIN	This pin is AC coupled and matched to 50 Ohms.	
7	Vpd	Power control pin. For maximum power, this pin should be connected to 5V thru a 56 Ω resistor. A high-voltage or small resistor is not recommended for lower idle current. This voltage can be reduced or the resistor increased.	
9	Vbias	DC power supply pin for bias circuitry	
15, 16, 17	RFOUT	RF output and DC bias for the output stage.	
20	Vcc2	Power supply voltage for the second amplifier stage. External bypass capacitors and pull up choke are required as shown in the application schematic.	
23	Vcc1	Power supply voltage for the first amplifier stage. External bypass capacitors are required as shown in the application schematic.	
	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.	

**GaAs InGaP HBT 1 WATT
POWER AMPLIFIER, 3.3 - 3.8 GHz**

Evaluation PCB



List of Materials for Evaluation PCB 108355 ^[1]

Item	Description
J1 - J2	PCB Mount SMA RF Connector
J3, J4	2 mm DC Header
C1 - C5	100 pF Capacitor, 0402 Pkg.
C6 - C7	1000 pF Capacitor, 0603 Pkg.
C8	10 pF Capacitor, 0402 Pkg.
C9	0.5 pF Capacitor, 0603 Pkg.
C10	1.6 pF Capacitor, 0603 Pkg.
C11	4.7 μ F, Tantalum
L1, L2	3.9 nH Inductor, 0603 Pkg.
L3	2.2 nH Inductor, 0402 Pkg. Toko
R1	56 Ohm Resistor, 0603 Pkg.
U1	HMC409LP4E Amplifier
PCB ^[2]	108353 Eval Board

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350, Er = 3.48

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 board should be mounted to an appropriate heat sink. The evaluation circuit board shown is available from Analog Devices, upon request.