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# HMC455LP3 / 455LP3E

v02.0605

## InGaP HBT ½ Watt High IP3 AMPLIFIER, 1.7 - 2.5 GHz

### Typical Applications

This amplifier is ideal for high linearity applications:

- Multi-Carrier Systems
- GSM, GPRS & EDGE
- CDMA & WCDMA
- PHS

### Features

Output IP3: +42 dBm

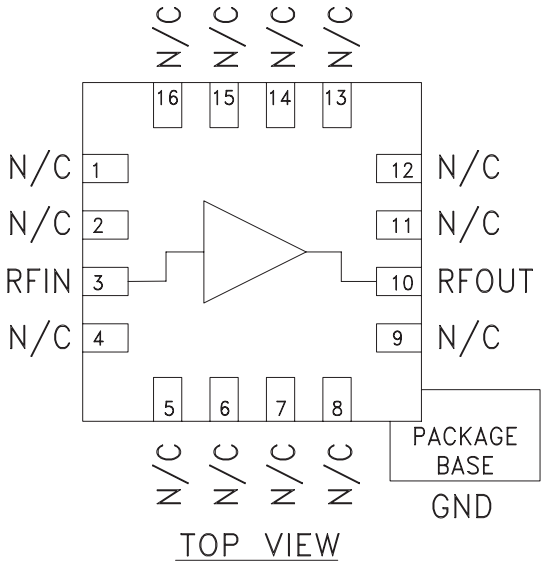
Gain: 13 dB

56% PAE @ +28 dBm Pout

+19 dBm W-CDMA Channel Power @ -45 dBc ACP

3x3 mm QFN SMT Package

### Functional Diagram




### General Description

The HMC455LP3 & HMC455LP3E are high output IP3 GaAs InGaP Heterojunction Bipolar Transistor (HBT) ½ watt MMIC amplifiers operating between 1.7 and 2.5 GHz. Utilizing a minimum number of external components the amplifier provides 13 dB of gain and +28 dBm of saturated power at 56% PAE from a single +5 Vdc supply voltage. The high output IP3 of +42 dBm coupled with the low VSWR of 1.4:1 make the HMC455LP3 & HMC455LP3E ideal driver amplifiers for PCS/3G wireless infrastructures. A low cost, leadless 3x3 mm QFN surface mount package (LP3) houses the linear amplifier. The LP3 provides an exposed base for excellent RF and thermal performance.

### Electrical Specifications, $T_A$ = +25° C, Vs= +5V

| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency Range | | 1.7 - 1.9 | | | 1.9 - 2.2 | | | 2.2 - 2.5 | | GHz |
| Gain | 11.5 | 13.5 | | 10.5 | 13 | | 9 | 11.5 | | dB |
| Gain Variation Over Temperature | | 0.012 | 0.02 | | 0.012 | 0.02 | | 0.012 | 0.02 | dB / °C |
| Input Return Loss | | 13 | | | 15 | | | 10 | | dB |
| Output Return Loss | | 10 | | | 18 | | | 15 | | dB |
| Output Power for 1dB Compression (P1dB) | 24 | 27 | | 24.5 | 27.5 | | 23 | 26 | | dBm |
| Saturated Output Power (Psat) | | 28.5 | | | 28 | | | 27 | | dBm |
| Output Third Order Intercept (IP3) | 37 | 40 | | 39 | 42 | | 37 | 40 | | dBm |
| Noise Figure | | 7 | | | 6 | | | 6 | | dB |
| Supply Current (Icq) | | 150 | | | 150 | | | 150 | | mA |

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# HMC455* PRODUCT PAGE QUICK LINKS

**Last Content Update: 02/23/2017**

## COMPARABLE PARTS

View a parametric search of comparable parts.

## EVALUATION KITS

- HMC455LP3 Evaluation Board

## DOCUMENTATION

**Application Notes**

- AN-1363: Meeting Biasing Requirements of Externally Biased RF/Microwave Amplifiers with Active Bias Controllers
- Broadband Biasing of Amplifiers General Application Note
- MMIC Amplifier Biasing Procedure Application Note
- Thermal Management for Surface Mount Components General Application Note

**Data Sheet**

- HMC455 Data Sheet

## TOOLS AND SIMULATIONS

- HMC455 S-Parameter

## REFERENCE MATERIALS

**Quality Documentation**

- Package/Assembly Qualification Test Report: LP2, LP2C, LP3, LP3B, LP3C, LP3D, LP3F, LP3G (QTR: 2014-0364)
- Package/Assembly Qualification Test Report: Plastic Encapsulated QFN (QTR: 05006 REV: 02)
- Semiconductor Qualification Test Report: GaAs HBT-B (QTR: 2013-00229)

## DESIGN RESOURCES

- HMC455 Material Declaration
- PCN-PDN Information
- Quality And Reliability
- Symbols and Footprints

## DISCUSSIONS

View all HMC455 EngineerZone Discussions.

## SAMPLE AND BUY

Visit the product page to see pricing options.

## TECHNICAL SUPPORT

Submit a technical question or find your regional support number.

## DOCUMENT FEEDBACK

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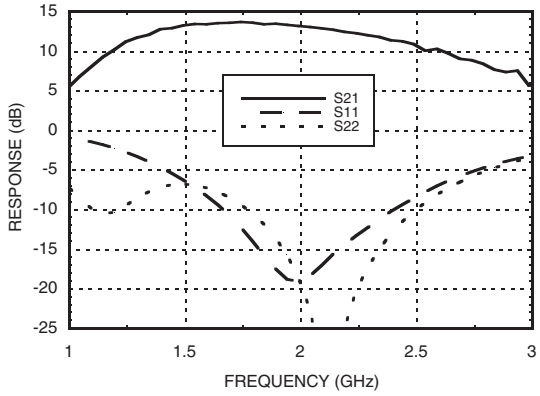
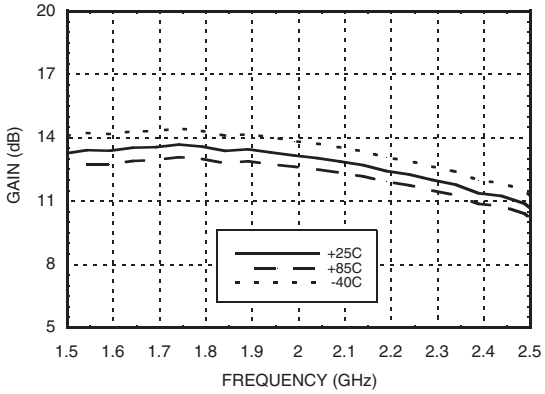
## InGaP HBT ½ Watt High IP3 AMPLIFIER, 1.7 - 2.5 GHz

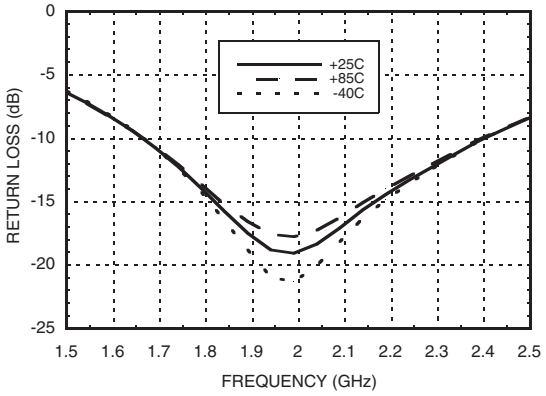
### Broadband Gain & Return Loss



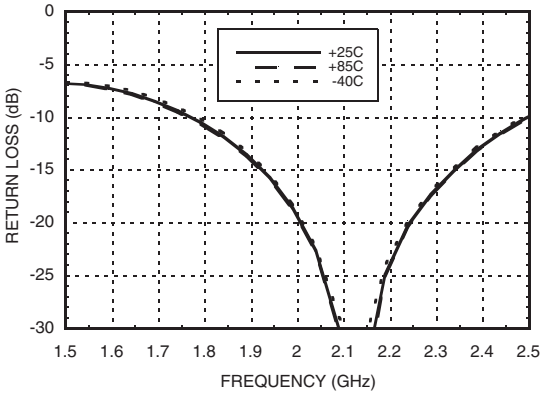

### Gain vs. Temperature



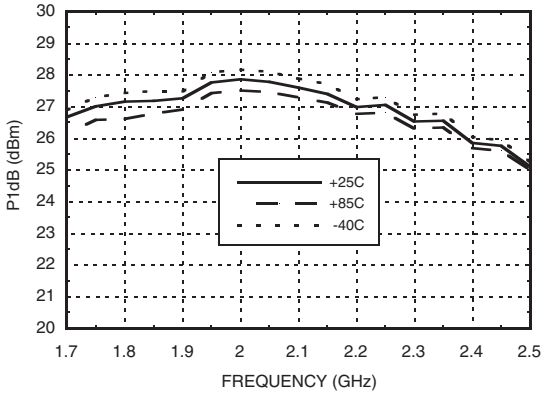

### Input Return Loss vs. Temperature



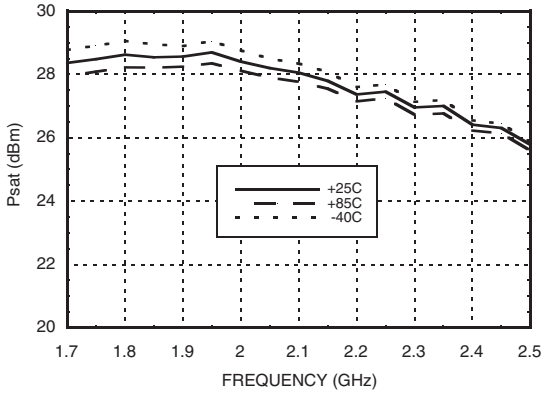

### Output Return Loss vs. Temperature




### P1dB vs. Temperature




### Psat vs. Temperature




Data shown is tuned for 1.85 - 2.2 GHz, contact HMC
Applications for recommended 1.7 - 1.85 GHz & 2.2 - 2.5 GHz tuning circuits.

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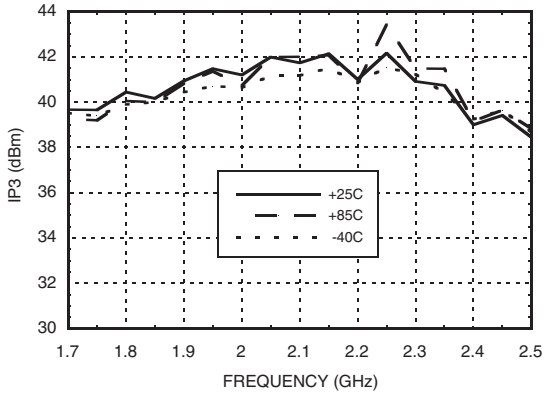
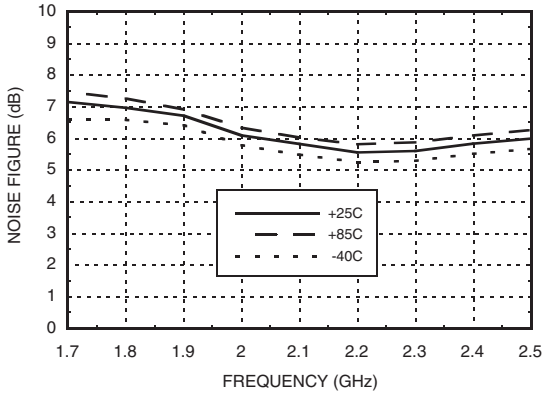
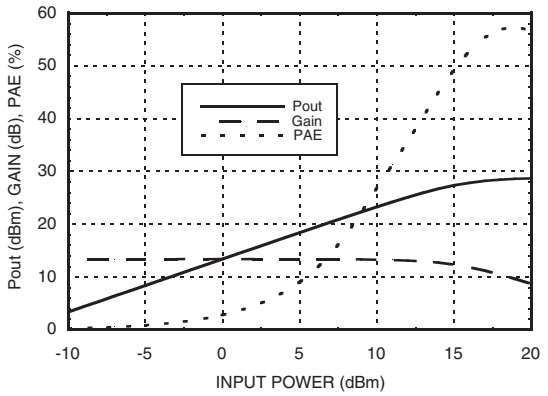
### Output IP3 vs. Temperature



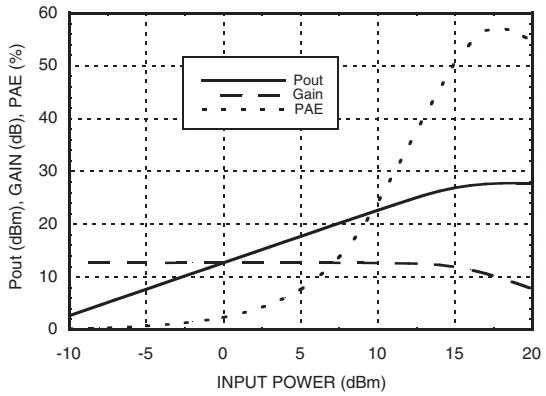

### Noise Figure vs. Temperature



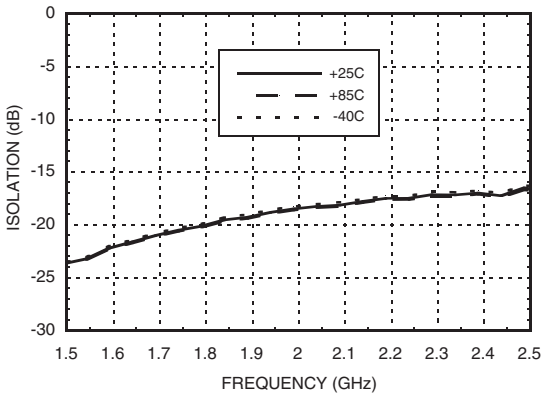

### Power Compression @ 1.95 GHz



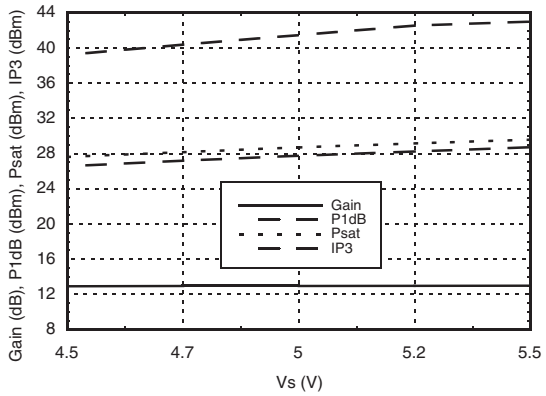

### Power Compression @ 2.15 GHz




### Reverse Isolation vs. Temperature




### Gain, Power & IP3 vs. Supply Voltage @ 1.95 GHz




Data shown is tuned for 1.85 - 2.2 GHz, contact HMC
Applications for recommended 1.7 - 1.85 GHz & 2.2 - 2.5 GHz tuning circuits.

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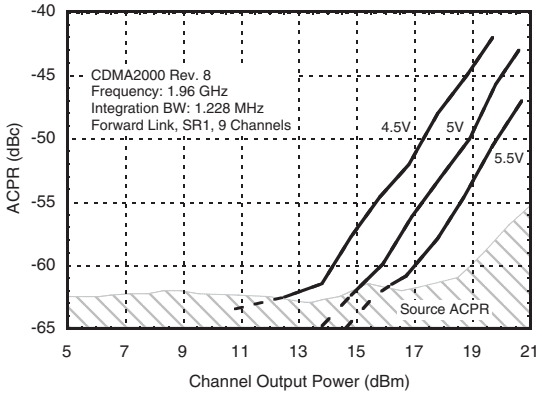
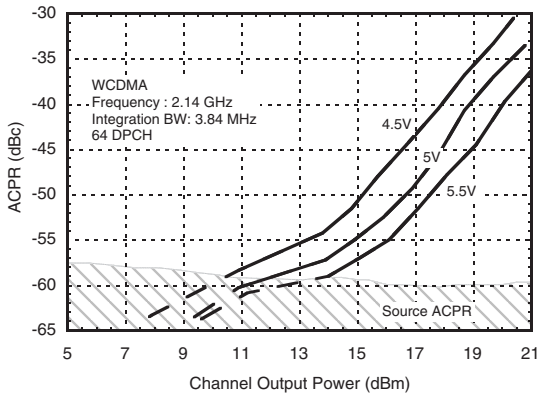
## InGaP HBT ½ Watt High IP3 AMPLIFIER, 1.7 - 2.5 GHz

### ACPR vs. Supply Voltage @ 1.96 GHz CDMA 2000, 9 Channels Forward




### ACPR vs. Supply Voltage @ 2.14 GHz W-CDMA, 64 DPCH

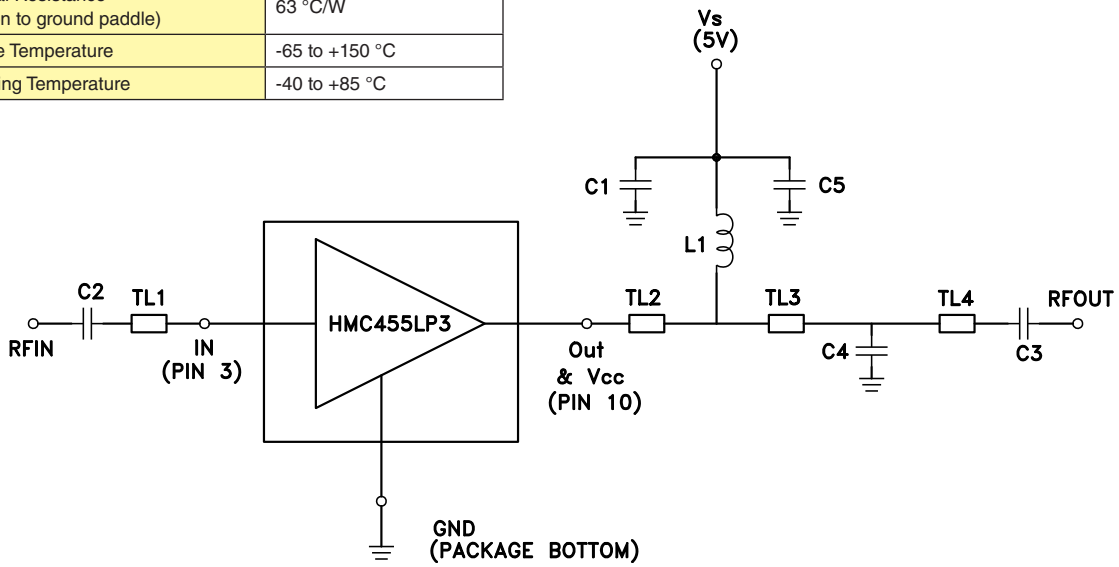



### Absolute Maximum Ratings

| | |
|---|---|
| Collector Bias Voltage (Vcc) | +6.0 Vdc |
| RF Input Power (RFIN)(Vs = +5Vdc) | +25 dBm |
| Junction Temperature | 150 °C |
| Continuous Pdiss (T = 85 °C) (derate 16 mW/°C above 85 °C) | 1.04 W |
| Thermal Resistance (junction to ground paddle) | 63 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

### Application Circuit




| | TL1 | TL2 | TL3 | TL4 |
|---|---|---|---|---|
| Impedance | 50 Ohm | 50 Ohm | 50 Ohm | 50 Ohm |
| Physical Length | 0.33" | 0.18" | 0.13" | 0.04" |
| Electrical Length | 34° | 19° | 13.5° | 4° |
| PCB Material: 10 mil Rogers 4350, Er = 3.48 | | | | |

| Recommended Component Values | |
|---|---|
| L1 | 8.2 nH |
| C1 | 2.2 µF |
| C2, C3 | 3.0 pF |
| C4 | 0.9 pF |
| C5 | 100 pF |

Data shown is tuned for 1.85 - 2.2 GHz, contact HMC

Applications for recommended 1.7 - 1.85 GHz & 2.2 - 2.5 GHz tuning circuits.

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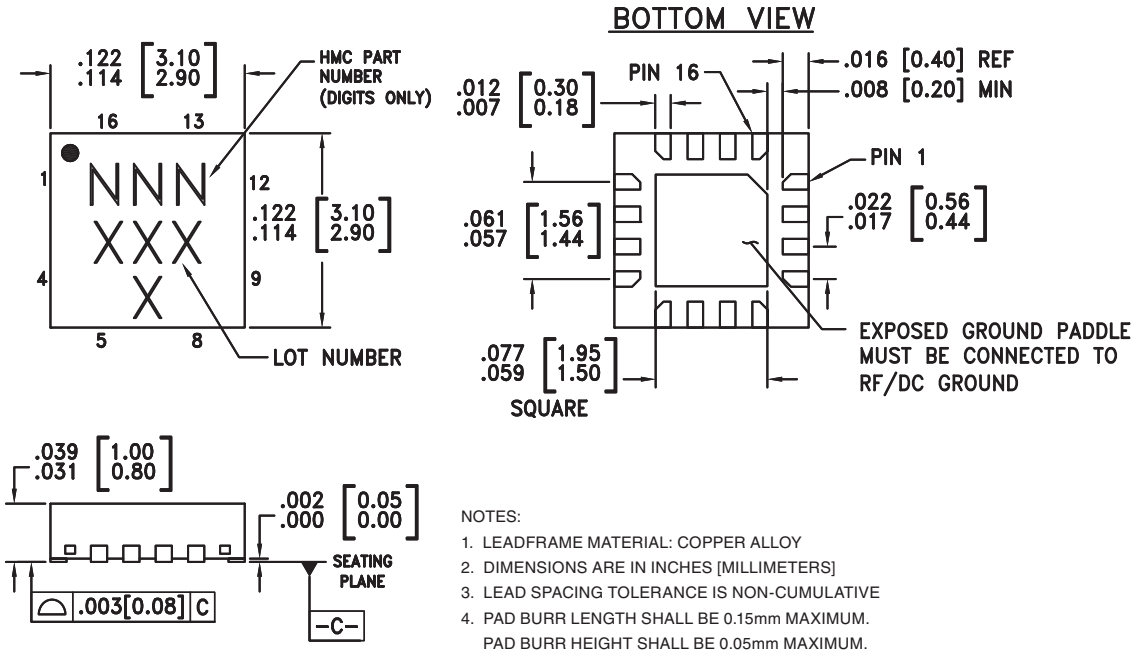
# HMC455LP3 / 455LP3E

v02.0605

## InGaP HBT ½ Watt High IP3 AMPLIFIER, 1.7 - 2.5 GHz

### Outline Drawing




NOTES:

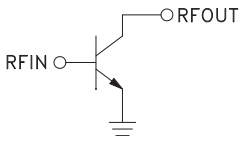
1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
4. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM. PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED 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] |
|---|---|---|---|---|
| HMC455LP3 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 [1] | 455<br>XXXX |
| HMC455LP3E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [2] | 455<br>XXXX |

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

### Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 2, 4 - 9, 11 - 16 | N/C | This pin may be connected to RF ground. | |
| 3 | RFIN | This pin is AC coupled. An off chip series matching capacitor is required. |  |
| 10 | RFOUT | RF output and DC Bias for the output stage. | |
| | GND | Package bottom must be connected to RF/DC ground. |  |





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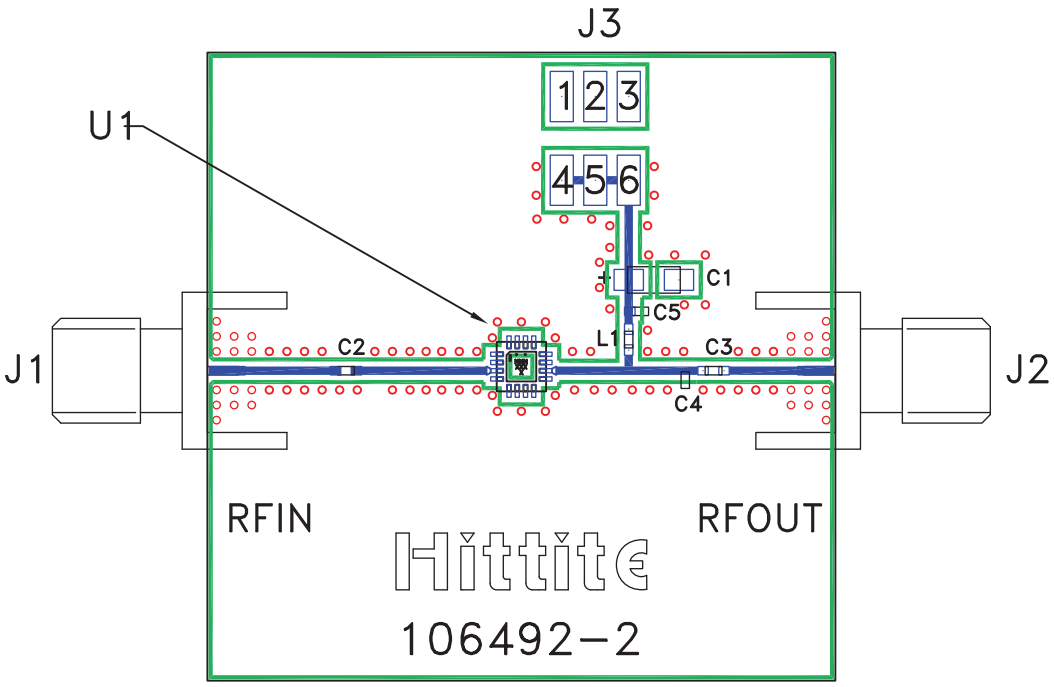
## Evaluation PCB




### J3

| Pin Number | Description |
|---|---|
| 1, 2, 3 | GND |
| 4, 5, 6 | Vs |

## List of Materials for Evaluation PCB 106058 [1]

| Item | Description |
|---|---|
| J1 - J2 | PCB Mount SMA Connector |
| J3 | 2 mm DC Header |
| C1 | 2.2 µF Capacitor, Tantalum |
| C2, C3 | 3.0 pF Capacitor, 0402 Pkg. |
| C4 | 0.9 pF Capacitor, 0402 Pkg. |
| C5 | 100 pF Capacitor, 0402 Pkg. |
| L1 | 8.2 nH Inductor, 0402 Pkg. |
| U1 | HMC455LP3 / HMC455LP3E Power Amplifier |
| PCB [2] | 106492 Evaluation PCB, 10 mils |

[1] Reference this number when ordering complete evalution PCB

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

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.

Data shown is tuned for 1.85 - 2.2 GHz, contact HMC
Applications for recommended 1.7 - 1.85 GHz & 2.2 - 2.5 GHz tuning circuits.

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