# HMC863LP4E

v02.0111

## GaAs pHEMT MMIC ½ WATT POWER AMPLIFIER, 22 - 26.5 GHz

### Typical Applications

The HMC863LP4E is ideal for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios
- VSAT
- Military & Space

### Features

Saturated Output Power:
up to +27.5 dBm @ 15% PAE

High Output IP3: +33 dBm

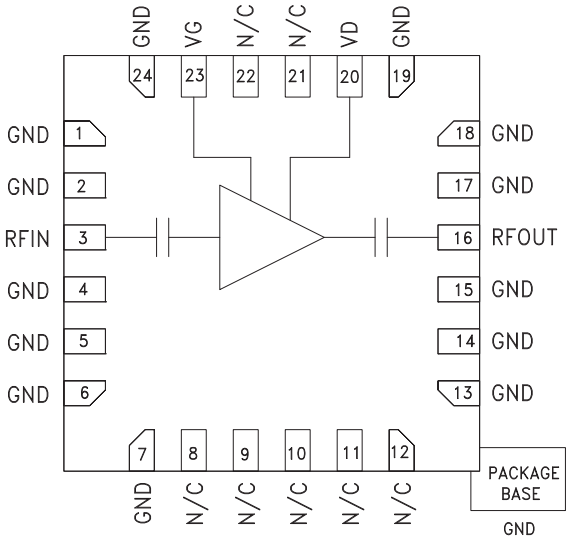
High Gain: 21.5 dB

DC Supply: +6V @ 350mA

No External Matching Required

24 Lead 4x4 mm SMT Package: 16 mm²

### Functional Diagram




### General Description

The HMC863LP4E is a three stage GaAs pHEMT MMIC ½ Watt Power Amplifier which operates between 22 and 26.5 GHz. The HMC863LP4E provides 21.5 dB of gain, +27.5 dBm of saturated output power and 15% PAE from a +6V supply. High output IP3 makes the HMC863LP4E ideal for point-to-point and point-to-multi-point radio systems as well as VSAT applications. The RF I/Os are DC blocked and matched to 50 Ohms for ease of integration into higher level assemblies. The HMC863LP4E can also be operated from a 5V supply with only a slight decrease in output power & IP3.

### Electrical Specifications, $T_A$ = +25° C, Vdd = Vdd1 = Vdd2 = +6V, Idd = 350mA [1]

| Parameter | Min. | Typ. | Max. | Units |
|---|---|---|---|---|
| Frequency Range | | 22 - 26.5 | | GHz |
| Gain | 19 | 21.5 | | dB |
| Gain Variation Over Temperature | | 0.032 | | dB/ °C |
| Input Return Loss | | 11 | | dB |
| Output Return Loss | | 15 | | dB |
| Output Power for 1 dB Compression (P1dB) | 22 | 24.5 | | dBm |
| Saturated Output Power (Psat) | | 27 | | dBm |
| Output Third Order Intercept (IP3)[2] | | 33 | | dBm |
| Total Supply Current (Idd) | | 350 | 380 | mA |

[1] Adjust Vgg between -2 to 0V to achieve Idd = 350mA typical.

[2] Measurement taken at +6V @ 350mA, Pout / Tone = +14 dBm



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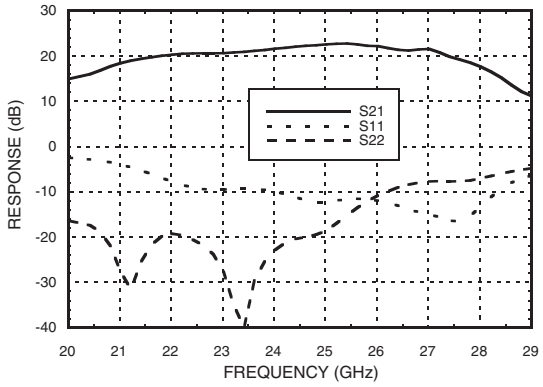
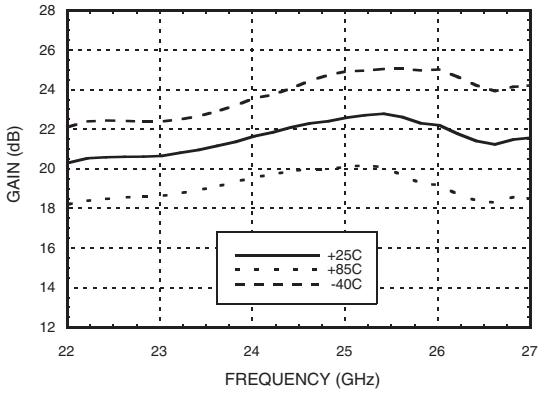
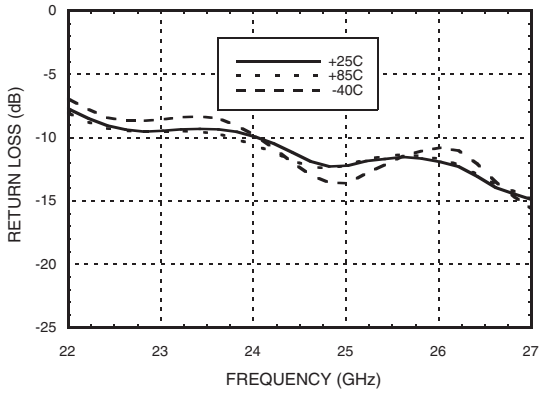
## Broadband Gain & Return Loss vs. Frequency



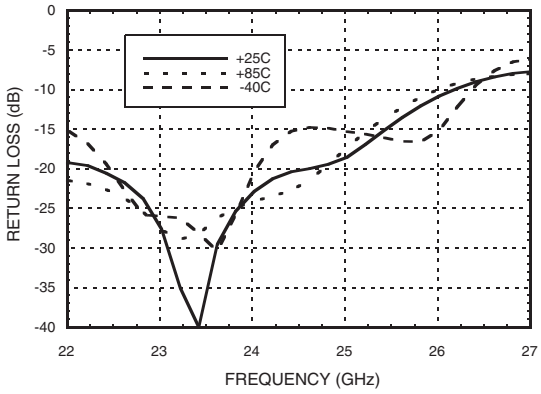

## Gain vs. Temperature



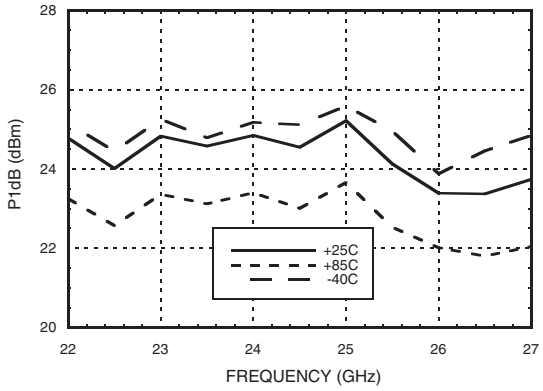

## Input Return Loss vs. Temperature



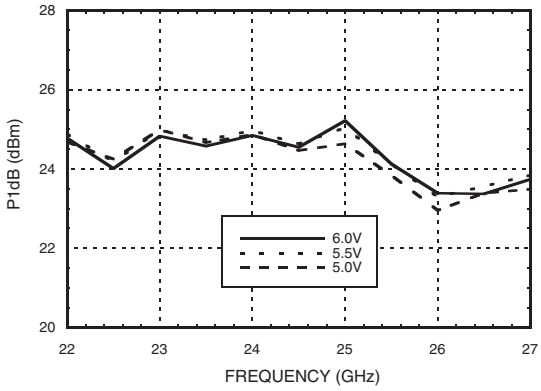

## Output Return Loss vs. Temperature




## P1dB vs. Temperature




## P1dB vs. Supply Voltage



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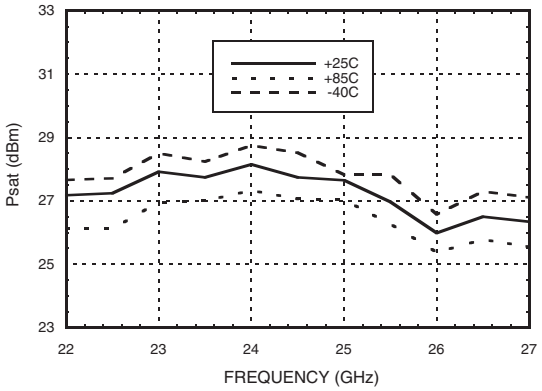
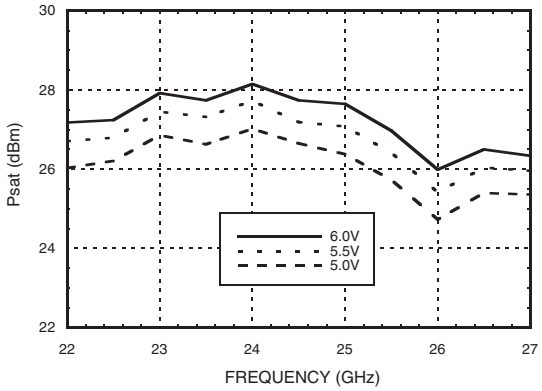
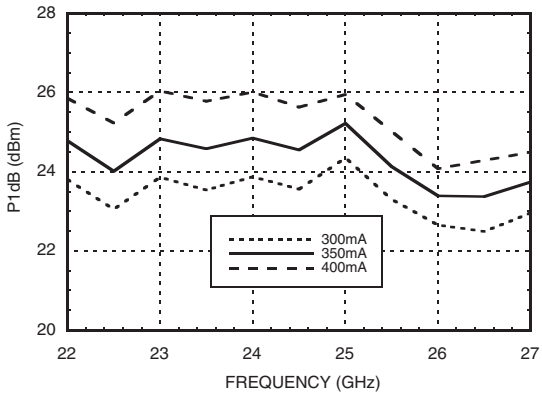
### Psat vs. Temperature



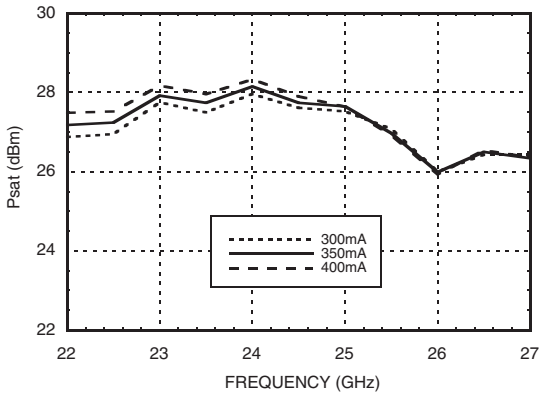

### Psat vs. Supply Voltage



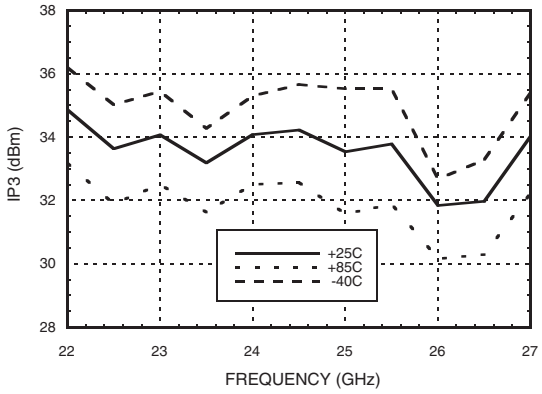

### P1dB vs. Supply Current (Idd)




### Psat vs. Supply Current (Idd)




### Output IP3 vs. Temperature, Pout/Tone = +14 dBm

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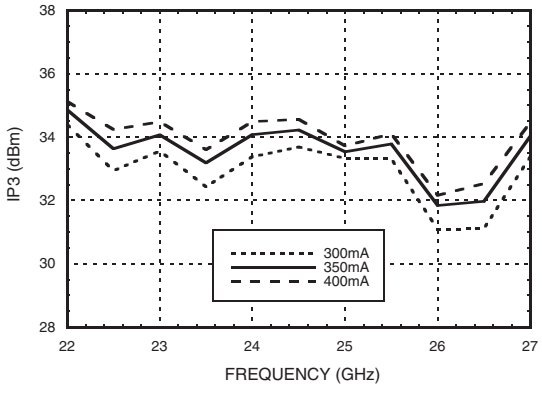




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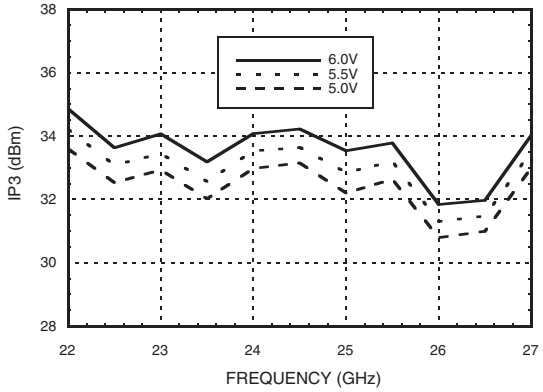
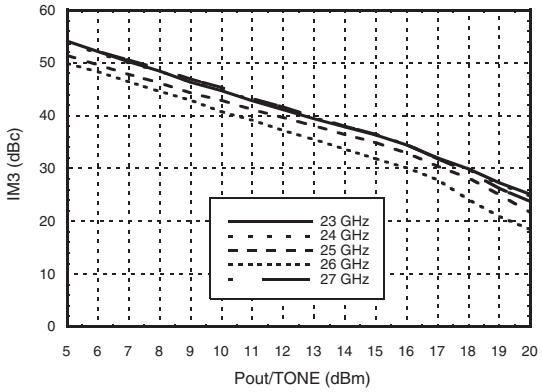
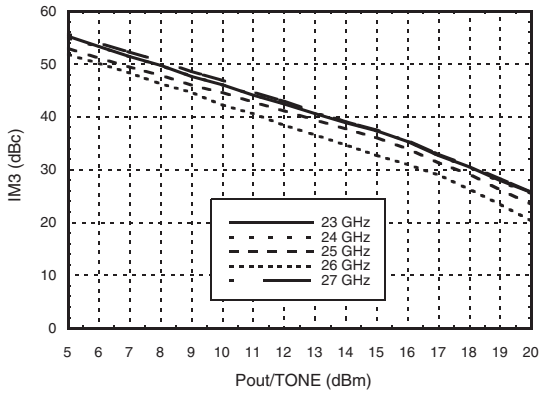
### Output IP3 vs. Supply Voltage, Pout/Tone = +14 dBm



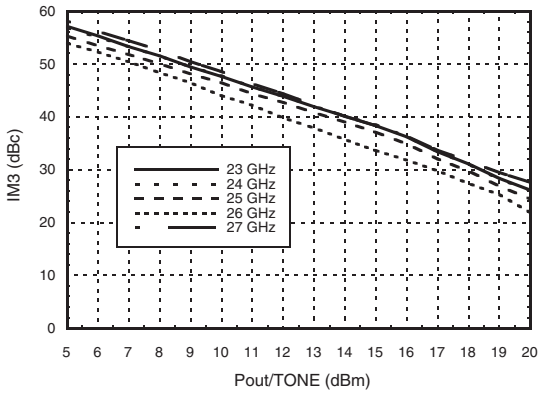

### Output IM3 @ Vdd = +5V



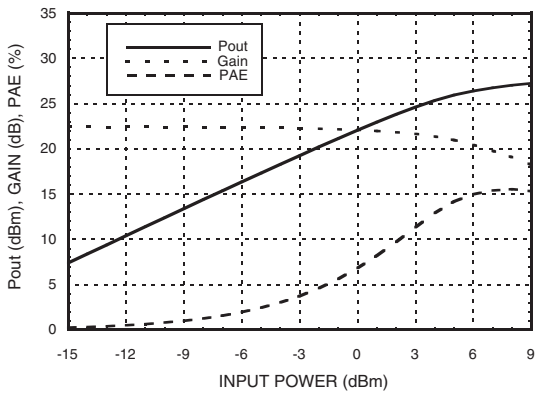

### Output IM3 @ Vdd = +5.5V



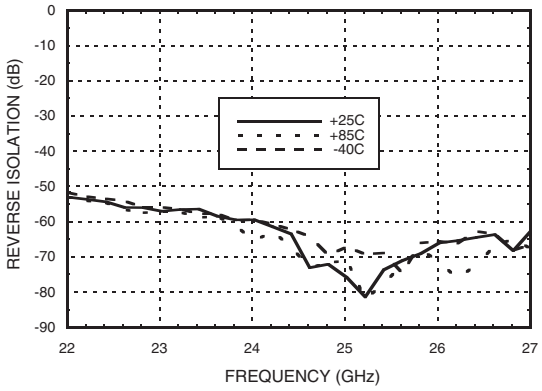

### Output IM3 @ Vdd = +6V




### Power Compression @ 25 GHz




### Reverse Isolation vs. Temperature



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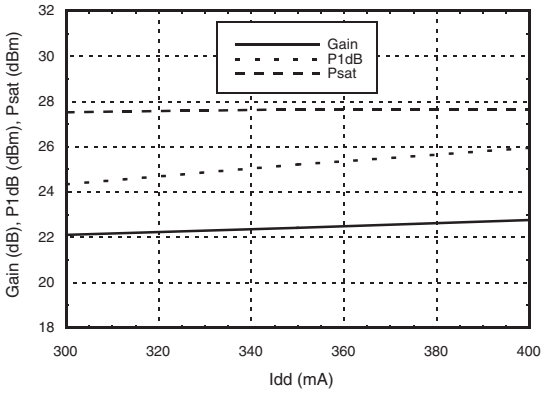
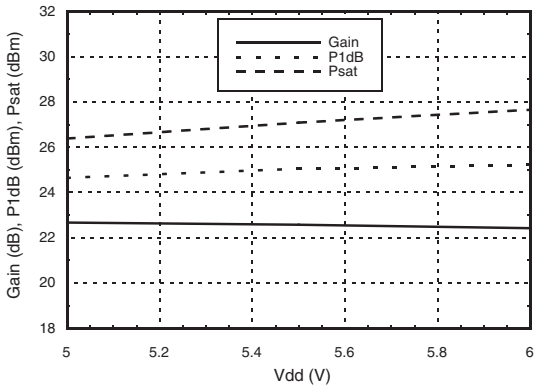
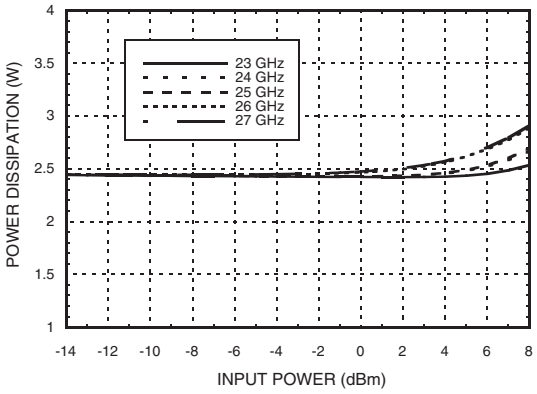
### Gain & Power vs. Supply Current @ 25 GHz




### Gain & Power vs. Supply Voltage @ 25 GHz




### Power Dissipation




### Absolute Maximum Ratings

| | |
|---|---|
| Drain Bias Voltage (Vd) | 6.3V |
| RF Input Power (RFIN) | +26 dBm |
| Channel Temperature | 150 °C |
| Continuous Pdiss (T= 85 °C) (derate 37 mW/°C above 85 °C) | 2.52 W |
| Thermal Resistance (channel to ground paddle) | 26.9 C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -55 to +85 °C |
| ESD Sensitivity (HBM) | Class 0, 150V |

### Typical Supply Current vs. Vdd

| Vdd (V) | Idd (mA) |
|---|---|
| +5.0 | 350 |
| +5.5 | 350 |
| +6.0 | 350 |

*Note: Amplifier will operate over full voltage ranges shown above Vgg adjusted to achieve Idd = 350mA at +5.5V*

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS



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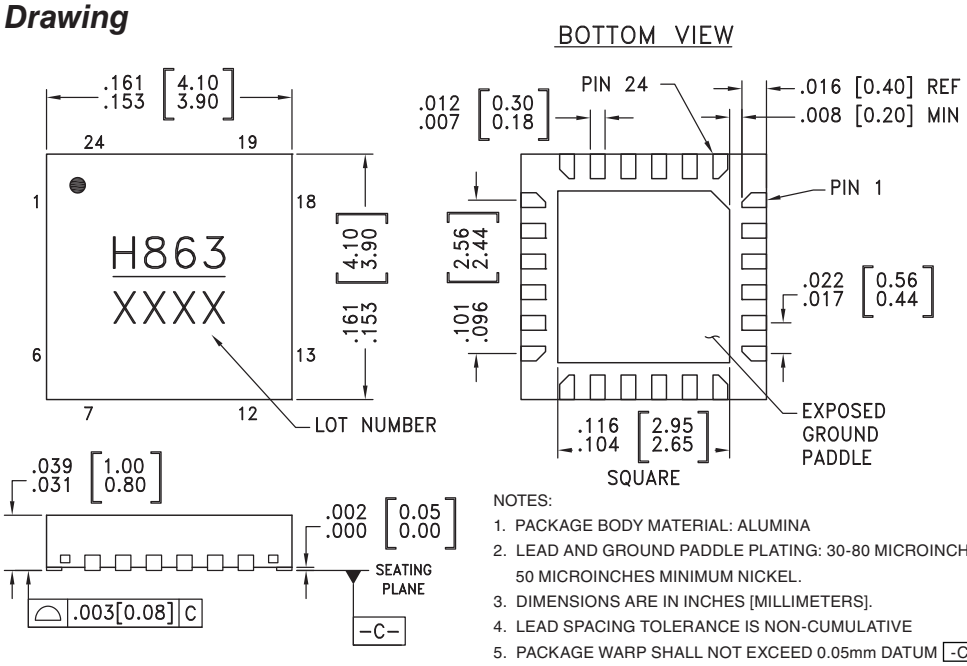
## Outline Drawing




NOTES:

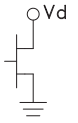
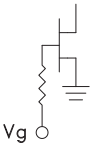
1. PACKAGE BODY MATERIAL: ALUMINA
2. LEAD AND GROUND PADDLE PLATING: 30-80 MICROINCHES GOLD OVER 50 MICROINCHES MINIMUM NICKEL.
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm DATUM -C-
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
7. CLASSIFIED AS MOISTURE SENSITIVITY LEVEL (MSL) 1.

## Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [1] |
|---|---|---|---|---|
| HMC863LP4E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [2] | H863<br>XXXX |

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

## Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 2, 4 - 7, 12 - 15, 17 - 19, 24 Package Bottom | GND | Ground pins and package bottom must be connected to RF/DC ground. |   |
| 3 | RFIN | This pin is AC coupled and matched to 50 Ohms. |   |
| 8 - 11 | N/C | The pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally. | |
| 16 | RFOUT | This pin is AC coupled and matched to 50 Ohms. |   |
| 20 | Vd | Drain bias for amplifier. External 100 pF, 0.1 µF and 4.7 µF bypass capacitors are required. |   |
| 23 | Vg | Gate control for PA. Adjust Vg to achieve recommended bias current. External 100 pF, 0.1 µF and 4.7 µF bypass capacitors are required. |   |



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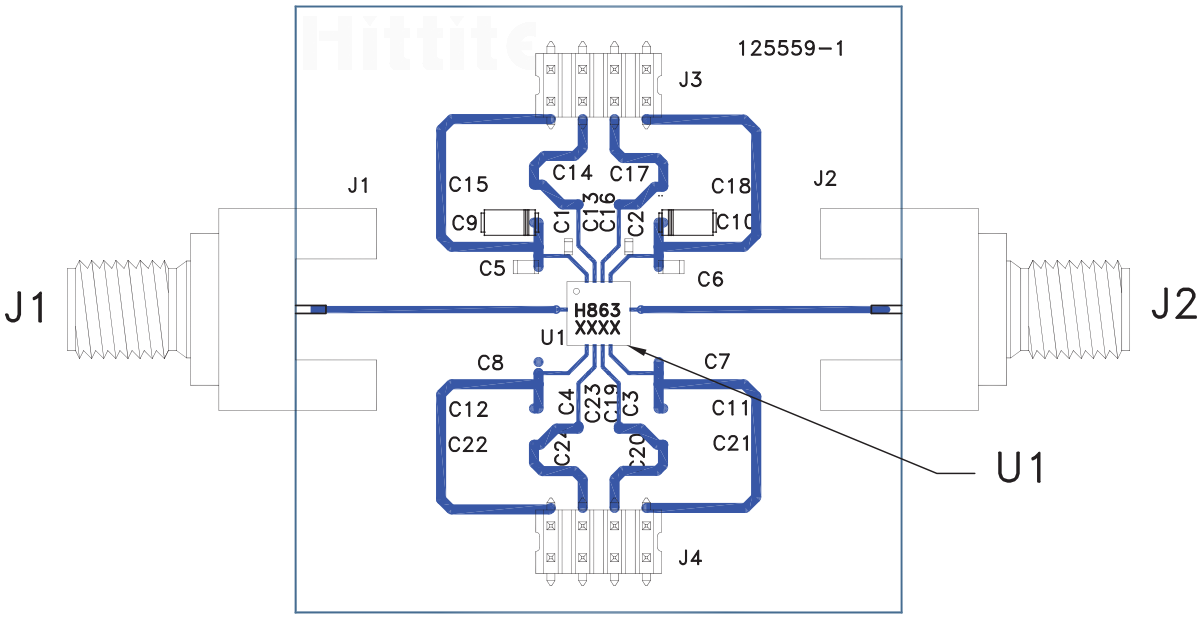
## Evaluation PCB




## List of Materials for Evaluation PCB 130560 [1]

| Item | Description |
|---|---|
| J1 - J2 | 2.9 mm Connectors |
| J3 - J4 | DC Pins |
| C1, C2 | 100 pF Capacitors, 0402 Pkg. |
| C6 | 10 kpF Capacitor, 0402 Pkg |
| C10 | 4.7 µF Capacitor, 0402 Pkg. |
| U1 | HMC863LP4E Power Amplifier |
| PCB [2] | 125559 Evaluation PCB |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350 or Arlon FR4

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 Hittite upon request.



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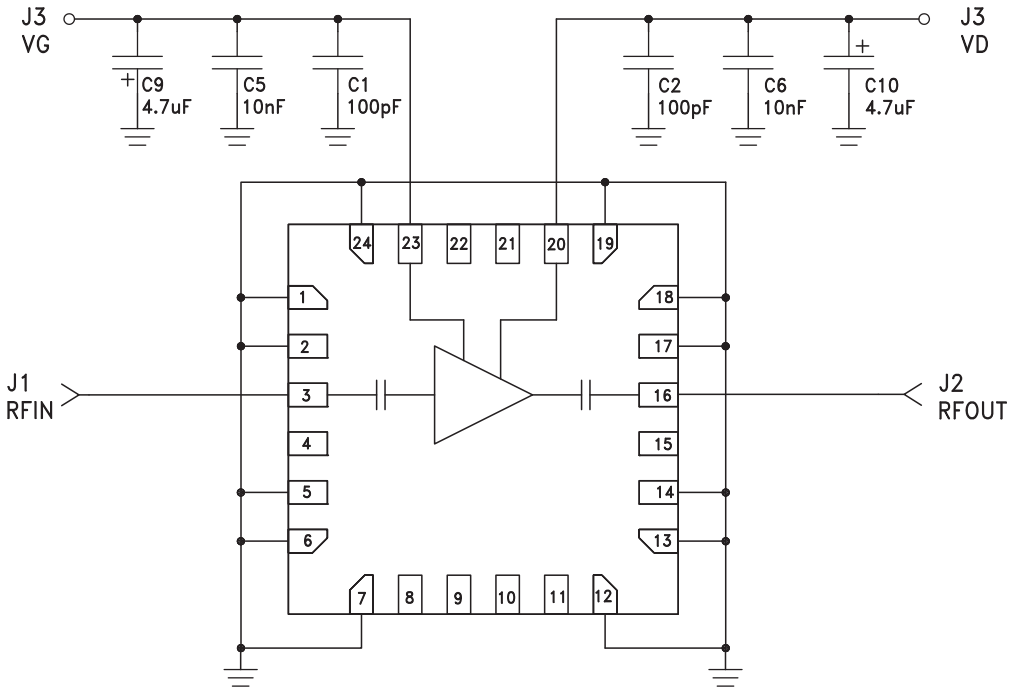
## Application Circuit





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