

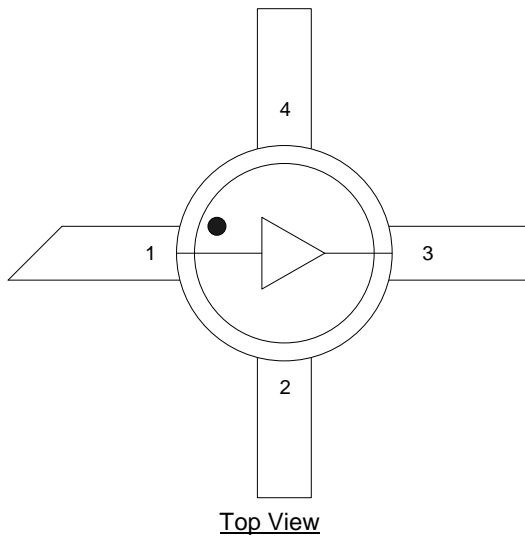
General Description

The QPA4486A is a high performance SiGe HBT MMIC Amplifier. A Darlington configuration provides high F_T and excellent thermal performance. The heterojunction increases breakdown voltage and minimizes leakage current between junctions. Cancellation of emitter junction non-linearities results in higher suppression of intermodulation products. Only two DC-blocking capacitors, a bias resistor, and an optional RF choke are required for operation.



4 Lead SOT-86 Package

Functional Block Diagram



Product Features

- DC to 4500 MHz Operation
- High Gain: 16.5 dB at 1950 MHz
- Cascadable 50 Ω
- Operates from Single Supply
- Low Thermal Resistance Package

Applications

- Instrumentation
- Repeaters
- Boosters
- PA Driver Amplifier
- Cellular, PCS, GSM, UMTS
- IF Amplifier
- Wireless Data, Satellite

Ordering Information

| Part No. | Description |
|----------------|--|
| QPA4486ATR13 | 3000 pieces on a 13" reel (standard) |
| QPA4486ASQ | 25 Piece Sample Bag |
| QPA4486ASR | 100 Pieces on 7" Reel |
| QPA4486APCK401 | 850 MHz, +8V EVB with 5 Piece Sample Bag |

Absolute Maximum Ratings

| Parameter | Rating |
|----------------------------------|----------------|
| Storage Temp | -55 to +150 °C |
| Device Voltage (V _D) | +5 V |
| Device Current (I _D) | 90 mA |
| RF Input Power | +18 dBm |

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Recommended Operating Conditions

| Parameter | Min | Typ | Max | Units |
|--|------|------|------|-------|
| Operating Temperature | -55 | | +105 | °C |
| Junction Temperature (T _J) | | | +125 | °C |
| Device Operating Voltage | +2.9 | +3.2 | +3.5 | V |

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

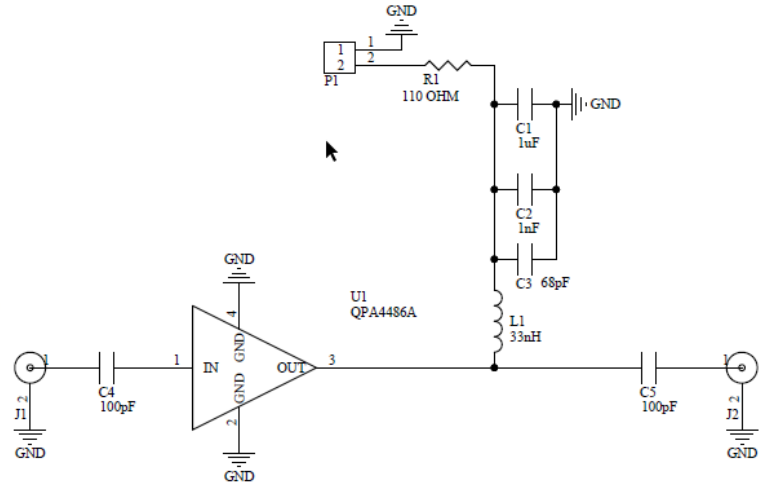
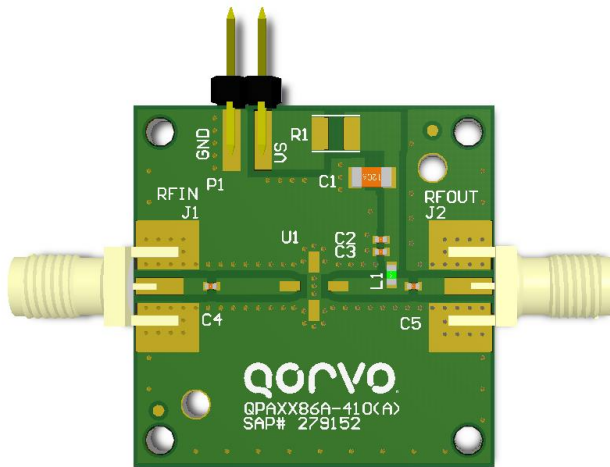
Electrical Specifications

| Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------------|------------|-----|-------|-----|-------|
| Small Signal Gain | 850 MHz | | 19.0 | | dB |
| | 1950 MHz | | 16.5 | | dB |
| | 2400 MHz | | 15.7 | | dB |
| Output Power at 1dB Compression | 850 MHz | | +15.8 | | dBm |
| | 1950 MHz | | +15.5 | | dBm |
| | 2400 MHz | | +15.3 | | dBm |
| Output Third Intercept Point | 500 MHz | | +31.4 | | dBm |
| | 850 MHz | | +31.8 | | dBm |
| | 1950 MHz | | +29.8 | | dBm |
| Input Return Loss | 2400 MHz | | +29.3 | | dBm |
| | 850 MHz | | 19.2 | | dB |
| | 1950 MHz | | 14.6 | | dB |
| Output Return Loss | 2400 MHz | | 15.1 | | dB |
| | 850 MHz | | 19.5 | | dB |
| | 1950 MHz | | 15.6 | | dB |
| Reverse Isolation | 2400 MHz | | 17.4 | | dB |
| | 850 MHz | | 21.8 | | dB |
| | 1950 MHz | | 20.4 | | dB |
| Noise Figure | 2400 MHz | | 19.9 | | dB |
| | 850 MHz | | 2.8 | | dB |
| | 1950 MHz | | 3.1 | | dB |
| Device Operating Current | | | 45 | | mA |
| Thermal Resistance, θ_{jc} | | | 85 | | °C/W |

Notes:

1. Test conditions unless otherwise noted: V_D = +3.2 V, V_S = +8 V, I_D = 45 mA Typ., OIP3 Tone Spacing=1 MHz, P_{OUT} per tone = -5 dBm, R1 = 110 Ω, 50 Ω system, Temp = +25 °C

Evaluation Board and Schematic – 850 MHz Application Circuit



Bill of Material – 850 MHz Application Circuit

| Reference | Value | Description | Manufacturer | Part Number |
|-----------|---------|--|-------------------------|--------------------|
| n/a | n/a | PCB, QPA4486A | Qorvo | QPAXX86A-410(A) |
| C1 | 1 uF | CAP, 10%, 25V, X7R, 1206 | Murata Electronics | GRM31MR71E105KA01L |
| C2 | 1000 pF | CAP, 10%, 50V, X7R, 0402 | Murata Electronics | GRM155R71H102KA01D |
| C3 | 68 pF | CAP, 5%, 50V, C0G, 0402 | Murata Electronics | GRM1555C1H680JA01D |
| C4, C5 | 100 pF | CAP, 5%, 50V, C0G, 0402 | Murata Electronics | GRM1555C1H101JA01D |
| R1 | 110 Ω | RES, 5%, 1/2W, 1210 | Panasonic Industrial Co | ERJ-14YJ111U |
| L1 | 33 nH | IND, 5%, M/L, 0603 | Murata Electronics | LL1608-FSL33NJ |
| J1, J2 | n/a | CONN, SMA, EL, FLT, 0.068" SPE-000318 | Amphenol RF Asia Corp | 901-10426 |
| U1 | n/a | HBT MMIC Amplifier | Qorvo | QPA4486A |
| J3, J4 | n/a | CONN, HDR, ST, 1x2, 0.100", Hi-temp, T/H | Samtec Inc | HTSW-102-07-G-S |

Component Values for Specific Frequencies

| Frequency | 500 MHz | 850 MHz | 1950 MHz | 2400 MHz | 3500 MHz |
|-----------|---------|---------|----------|----------|----------|
| C4, C5 | 220 pF | 100 pF | 68 pF | 56 pF | 39 pF |
| C3 | 100 pF | 68 pF | 22 pF | 22 pF | 15 pF |
| L1 | 68 nH | 33 nH | 22 nH | 18 nH | 15 nH |

Recommended Bias Resistor Values for Various Supply Voltages

| Vsupply | +6 V | +8 V | +10 V | +12 V |
|---------|------|-------|-------|-------|
| R1 | 62 Ω | 110 Ω | 150 Ω | 200 Ω |

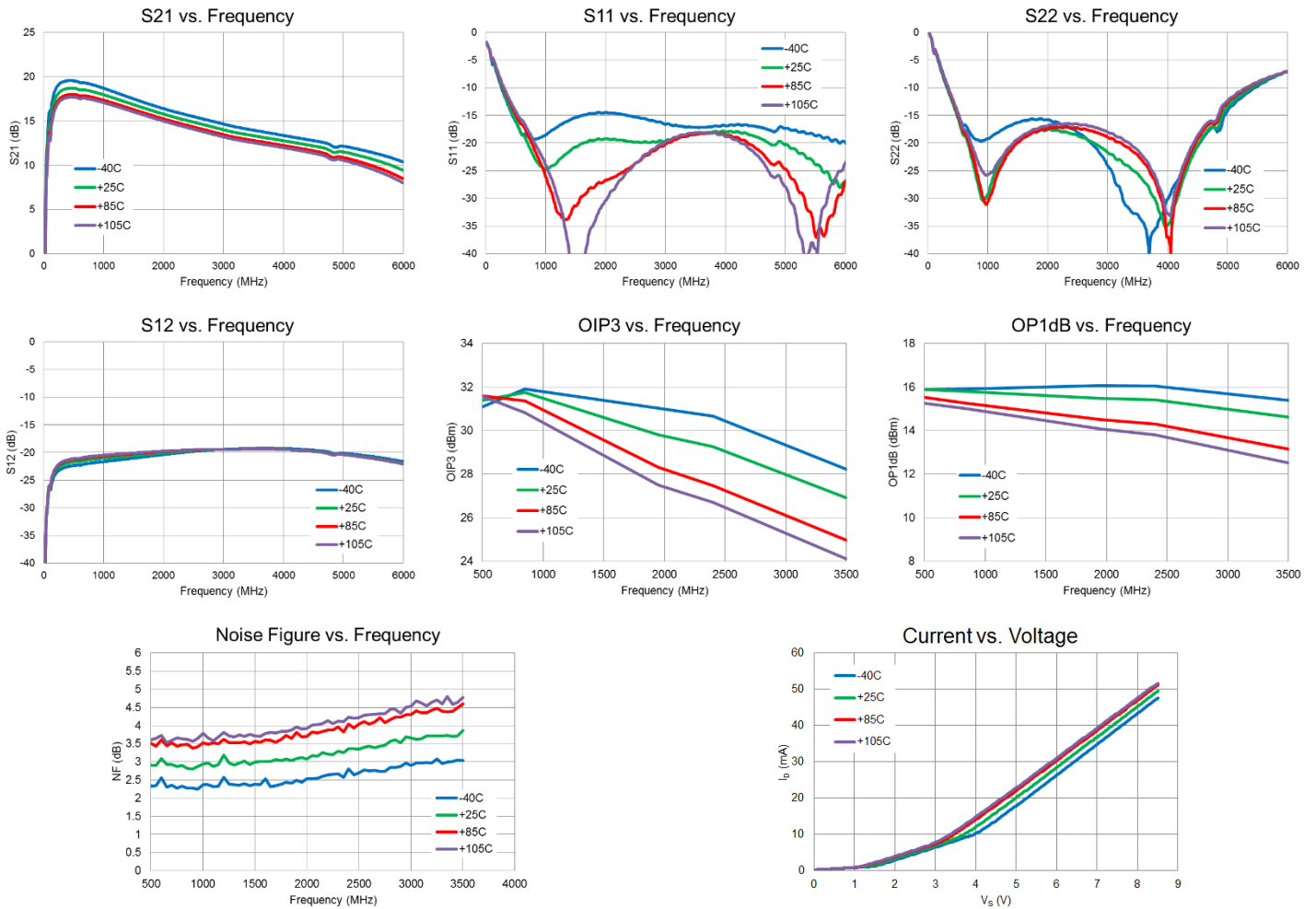
Typical Performance – 850 MHz Application Circuit

| Parameter | Typical Value | | | | | Units |
|---------------------------------|---------------|-------|-------|-------|-------|-------|
| Frequency | 500 | 850 | 1950 | 2400 | 3500 | MHz |
| Small Signal Gain | 18.7 | 18.3 | 15.9 | 15.0 | 13.3 | dB |
| Output Third Intercept Point | +31.4 | +31.8 | +29.8 | +29.3 | +26.9 | dBm |
| Output Power at 1dB Compression | +15.9 | +15.8 | +15.5 | +15.4 | +14.6 | dBm |
| Input Return Loss | 15.9 | 23.3 | 19.4 | 19.7 | 18.5 | dB |
| Output Return Loss | 15.3 | 27.9 | 17.6 | 18.4 | 25.5 | dB |
| Reverse Isolation | 21.7 | 21.2 | 20.1 | 19.8 | 19.4 | dB |
| Noise Figure | 2.9 | 2.8 | 3.1 | 3.4 | 3.9 | dB |

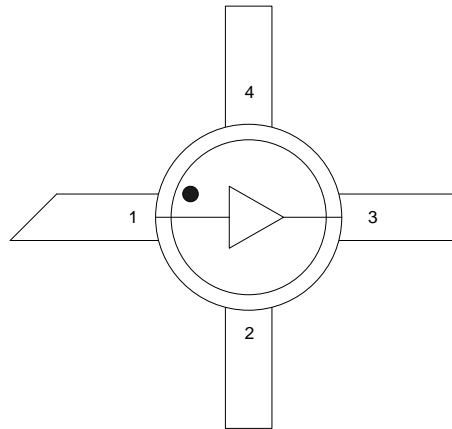
Notes:
 1. Test conditions unless otherwise noted: $V_D = +3.2\text{ V}$, $V_S = +8\text{ V}$, $I_D = 45\text{ mA Typ.}$, OIP3 Tone Spacing=1 MHz, P_{OUT} per tone = -5 dBm, $R_1 = 110\ \Omega$, 50 Ω system, Temp = +25 °C

Performance Plots – 850 MHz Application Circuit

Test conditions unless otherwise noted: $V_S = +8.0\text{ V}$, $I_D = 45\text{ mA}$, Temp. = +25 °C



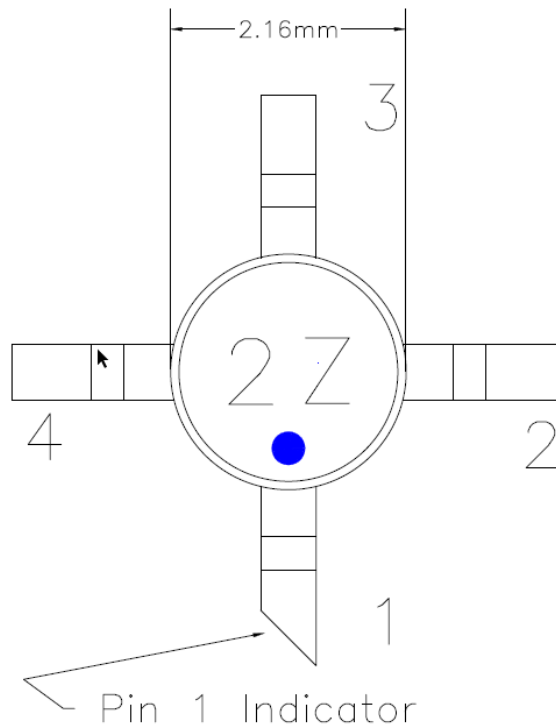
Pin Configuration and Description



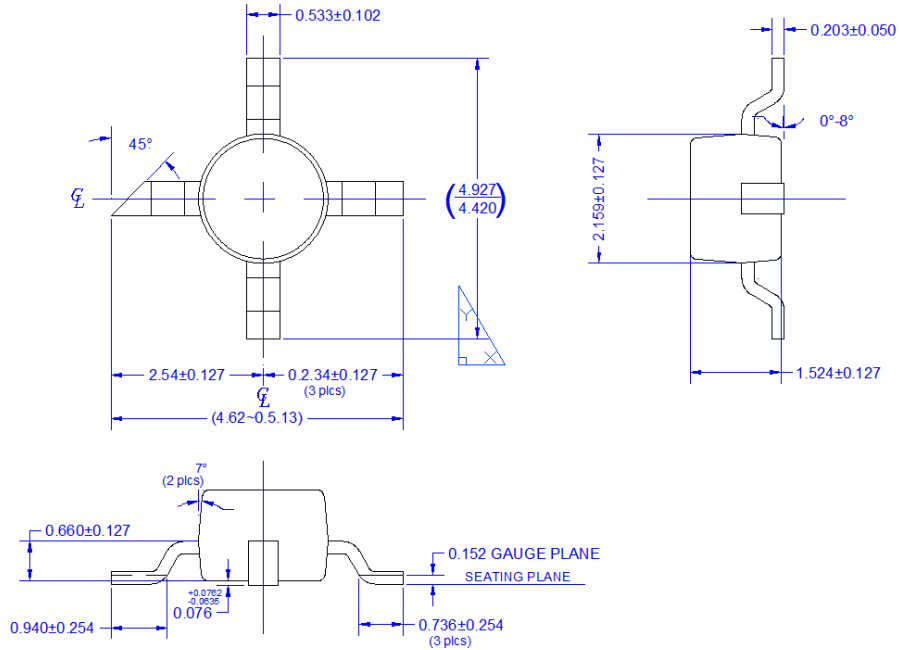
Top View

| Pad No. | Label | Description |
|---------|-------------------|---|
| 1 | RF _{IN} | RF Input Pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. |
| 2, 4 | GND | Connection to ground. Use via holes in PCB for best performance to reduce lead inductance as close to ground leads as possible |
| 3 | RF _{OUT} | RF Output and Bias Pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper operation. |

Package Marking

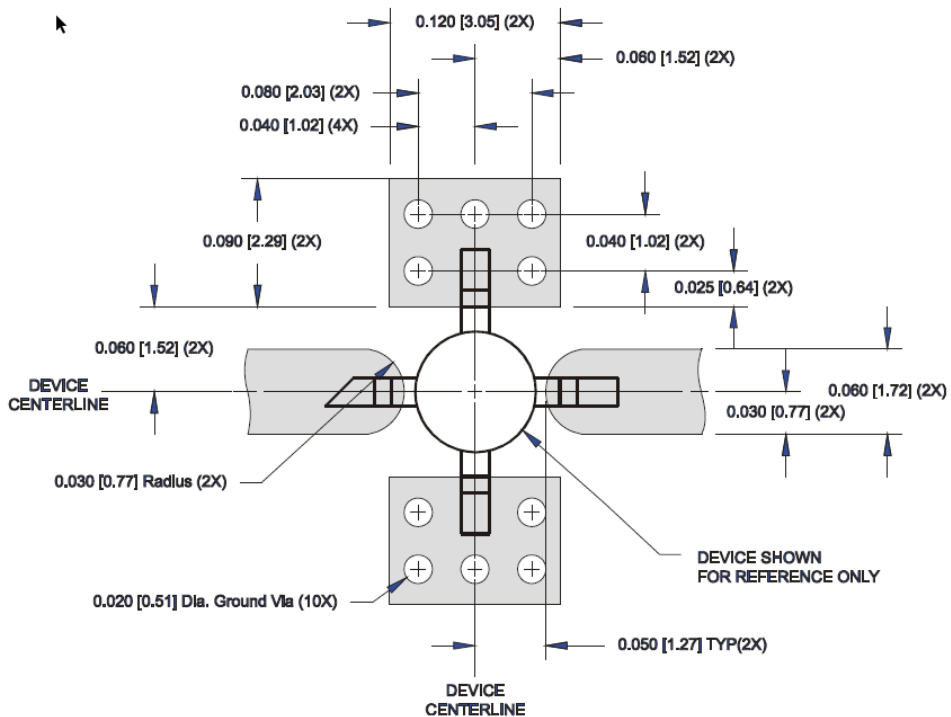


Package Dimensions



- Notes:
1. All dimensions are in millimeters. Angles are in degrees.
 2. Dimension and tolerance formats conform to ASME Y15.5-2009.

PCB Mounting Pattern



- Notes:
1. All dimensions are in inches (millimeters). Angles are in degrees.