QPA4586A

DC – 4000 MHz Cascadable SiGe HBT Amplifier

General Description

The QPA4586A 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

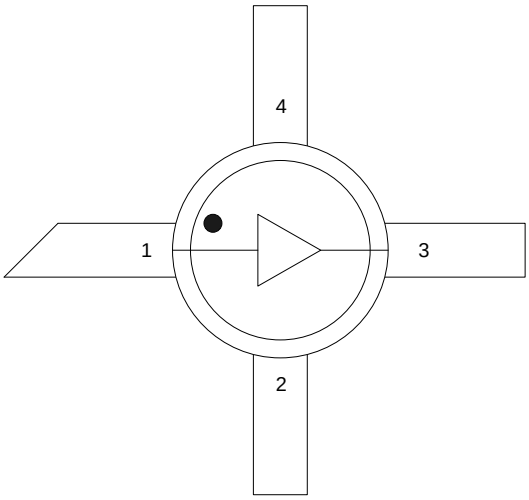
Product Features

- High Gain: 19.9 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

Functional Block Diagram



Top View

Ordering Information

Part No.	Description
QPA4586ATR13	3000 pieces on a 13” reel (standard)
QPA4586ASQ	25 Piece Sample Bag
QPA4586ASR	100 Pieces on 7” Reel
QPA4586APCK401	850 MHz, +5 V 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	+3.2	+3.5	+3.8	V

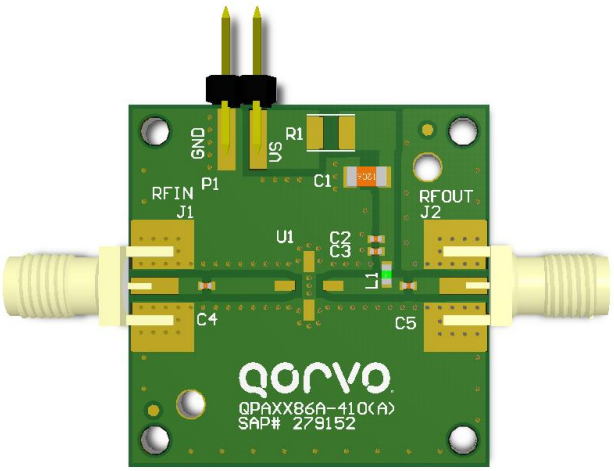
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

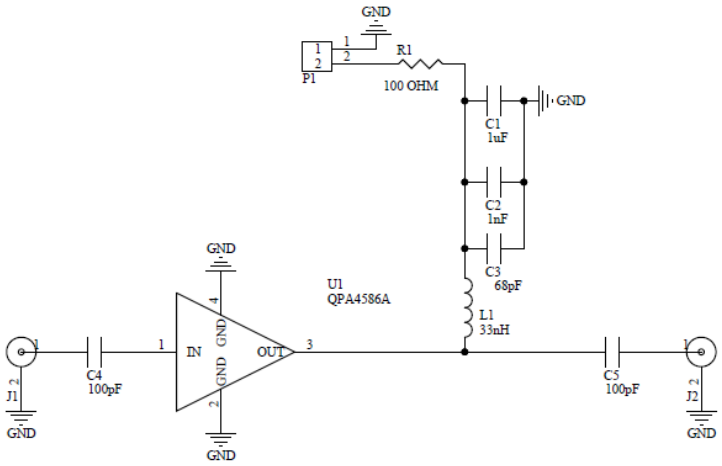
Electrical Specifications

Parameter	Conditions	Min	Typ	Max	Units
Small Signal Gain	850 MHz		23.3		dB
	1950 MHz		19.9		dB
	2400 MHz		18.6		dB
Output Power at 1dB Compression	850 MHz		+15.7		dBm
	1950 MHz		+16.3		dBm
Output Third Intercept Point	850 MHz		+29.7		dBm
	1950 MHz		+30.1		dBm
Input Return Loss	1950 MHz		16.3		dB
Output Return Loss	1950 MHz		24.2		dB
Noise Figure	1950 MHz		2.7		dB
Device Operating Current			45		mA
Thermal Resistance, θjc			86		°C/W

Notes:
1. Test conditions unless otherwise noted: V_S = +8 V, I_D = 45 mA Typ., OIP3 Tone Spacing=1 MHz, P_{OUT} per tone = 0 dBm, R1 = 100 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, QPA4586A	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	100 Ω	RES, 5%, 1/2W, 1210	Panasonic Industrial Co	ERJ-14NF1400U
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	QPA4586A
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	51 Ω	100 Ω	150 Ω	180 Ω

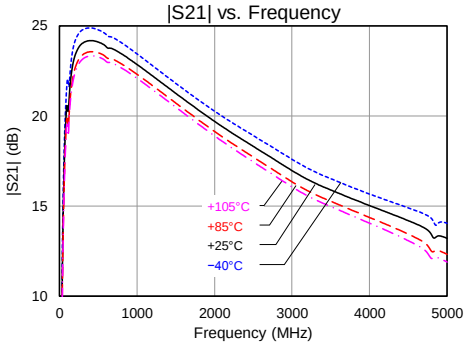
Typical Performance – 850 MHz Application Circuit

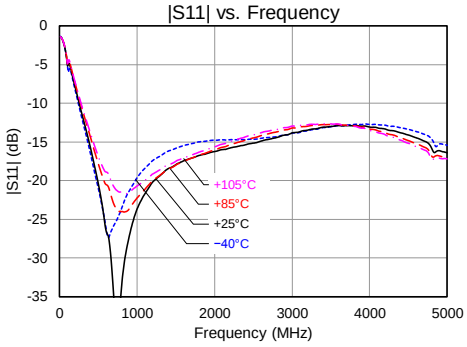
Parameter	Typical Value					Units
Frequency	500	850	1950	2400	3500	MHz
Small Signal Gain	24.1	23.3	19.9	18.6	15.9	dB
Output Third Intercept Point	+28.6	+29.9	+30.1	+29.6	+26.4	dBm
Output Power at 1dB Compression	+15.2	+15.7	+16.3	+16.0	+14.4	dBm
Input Return Loss	20.5	30.0	16.3	15.4	13.0	dB
Output Return Loss	13.4	20.4	24.2	20.2	17.9	dB
Reverse Isolation	26.5	25.8	23.7	23.0	21.9	dB
Noise Figure	2.6	2.4	2.7	2.9	3.2	dB

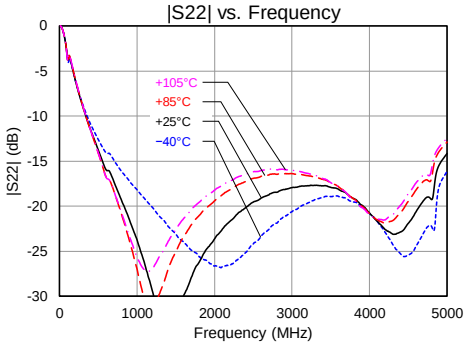
Notes:
1. Test conditions: V_S = +8 V, I_D = 45 mA Typ., OIP3 Tone Spacing=1 MHz, P_{OUT} per tone = 0 dBm, R1 = 100 Ω, 50 Ω system, Temp = +25 °C

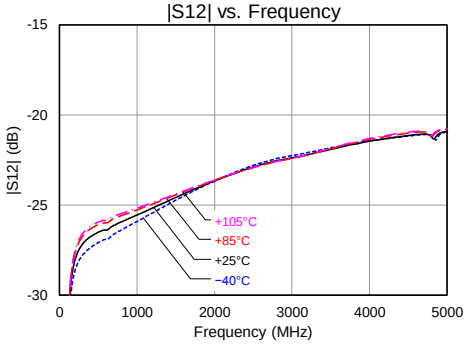
Performance Plots – 850 MHz Application Circuit

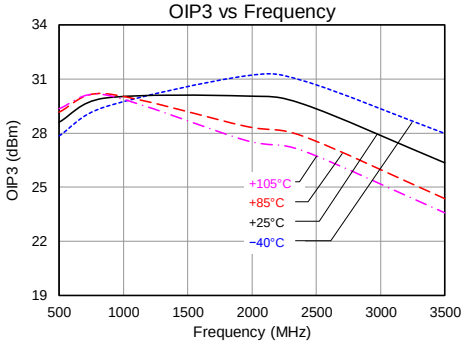
Test conditions unless otherwise noted: V_S = +8.0 V, I_D = 45 mA, Temp.= +25 °C

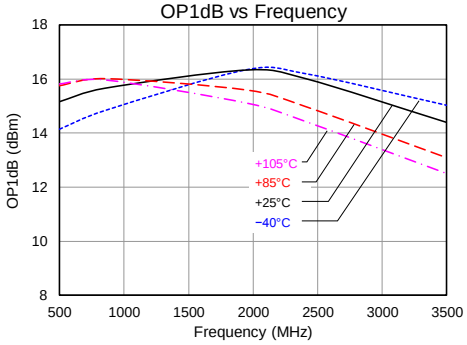


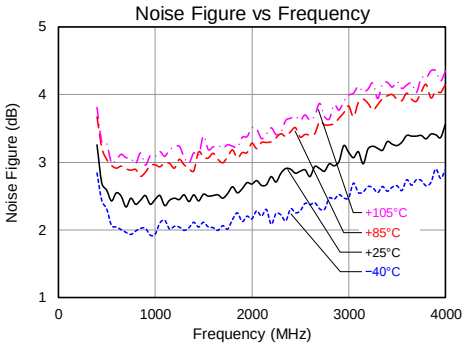


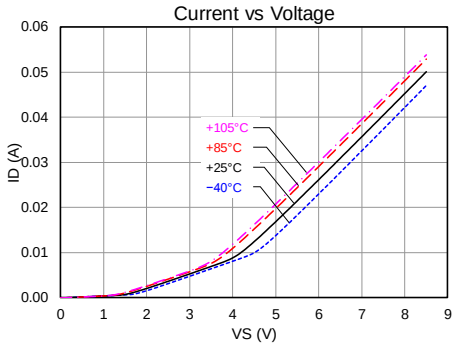




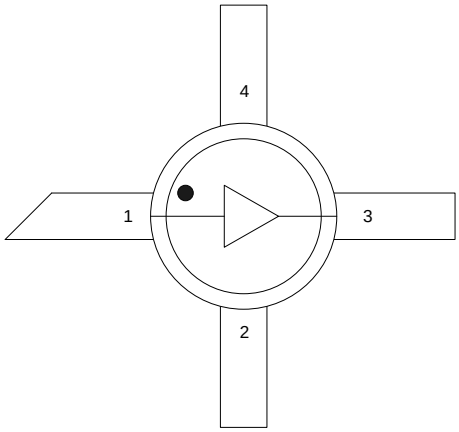








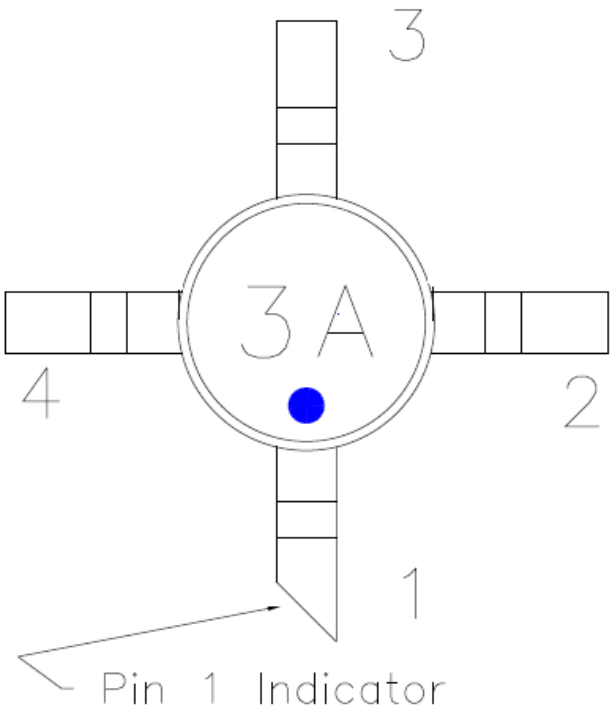
Pin Configuration and Description



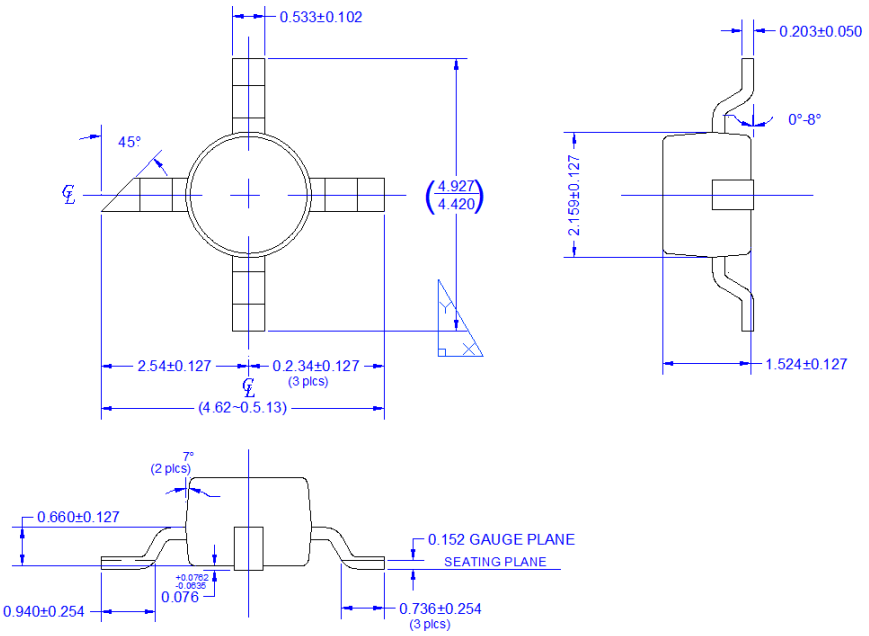
Top View

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

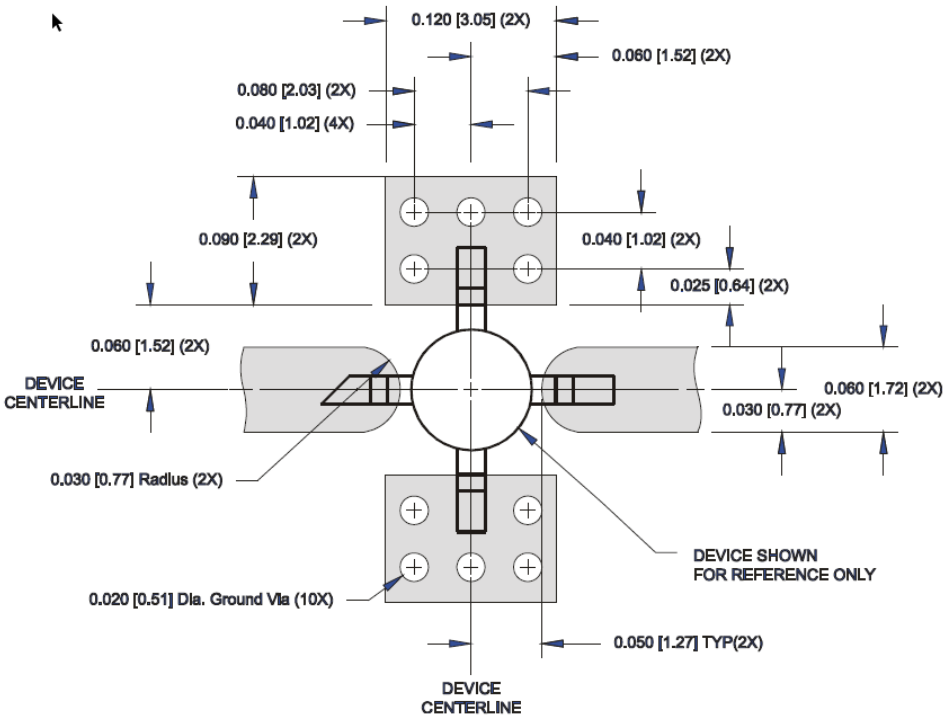


Package Dimensions



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.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 2	ESDA / JEDEC JS-001-2014
ESD – Charged Device Model (CDM)	Class C3	ESDA / JEDEC JS-002-2014
MSL – Moisture Sensitivity Level	Level 1	IPC/JEDEC J-STD-020

Caution!
ESD-Sensitive Device

Solderability

Compatible with lead-free (260°C max. reflow temp.) soldering process.
Solder profiles available upon request.

Contact plating: Matte Sn

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

For technical questions and application information: **Email:** sjcapplications.engineering@qorvo.com

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