QPA6489A

DC to 3500 MHz, CASCADABLE SiGe HBT MMIC AMPLIFIER

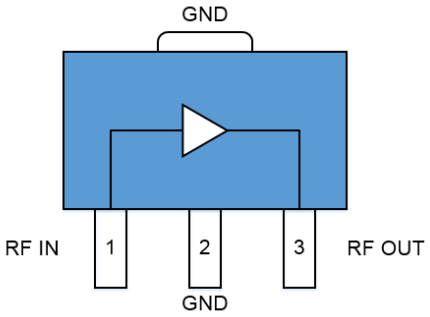
The QPA6489A is a high performance SiGe HBT MMIC amplifier. A Darlington configuration provides high F_T and excellent thermal performance. The heterojunction increases breakdown voltage and minimizes leakage current between junctions. Cancellation of emitter junction non-linearities results in higher suppression of intermodulation products. Only two DC-blocking capacitors, a bias resistor, and an optional RF choke are required for operation.

SOT-89 Package

Features

- DC to 3500MHz Operation
- High Gain: 19.2 dB at 1950MHz
- Cascadable 50Ω
- Operates from Single Supply
- Low Thermal Resistance Package

Functional Block Diagram



TOP VIEW

Applications

- Power Amplifier Driver
- Cellular, PCS, GSM, UMTS
- IF Amplifier
- Wireless Data, Satellite

Ordering Information

QPA6489ASQ	Sample Bag with 25 pieces
QPA6489ASR	7" Reel with 100 pieces
QPA6489ATR13	13" Reel with 3500 pieces
QPA6489APCK401	850MHz, 8V Operation PCBA with 5-piece Sample Bag

Absolute Maximum Ratings

Parameter	Rating	Units
Device Voltage(V_D)	+7.0	V
Device Current (I_D)	150	mA
RF Input Power Note 1	+18	dBm
Storage Temperature	-55 to +150	°C
ESD Rating (HBM)	TBD	V
Moisture Sensitivity Level	MSL2	-

Notes:

1. Load Condition 1: Z_L = 50 Ω
2. Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation, the device voltage and current must not exceed the maximum operating values specified in this table.
3. Bias Conditions should also satisfy the following expression: $I_D V_D < (T_J - T_L)/R_{TH}$, and $T_L = T_{LEAD}$.

Caution! ESD sensitive device.

RFMD Green: RoHS status based on EU Directive 2011/65/EU (at time of this document revision), halogen free per IEC 61249-2-21, < 1000 ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

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. Specified typical performance or functional - operation of the device under Absolute Maximum Rating conditions is not implied.

Recommended Operating Conditions

Parameter	Rating			Units
	Min	Typ	Max	
Operating Temperature Range	-40		+85	°C
Junction Temperature (T_J)			+125	°C
Device Operating Voltage	+4.7	+5.1	+5.5	V

Electrical Specifications – General

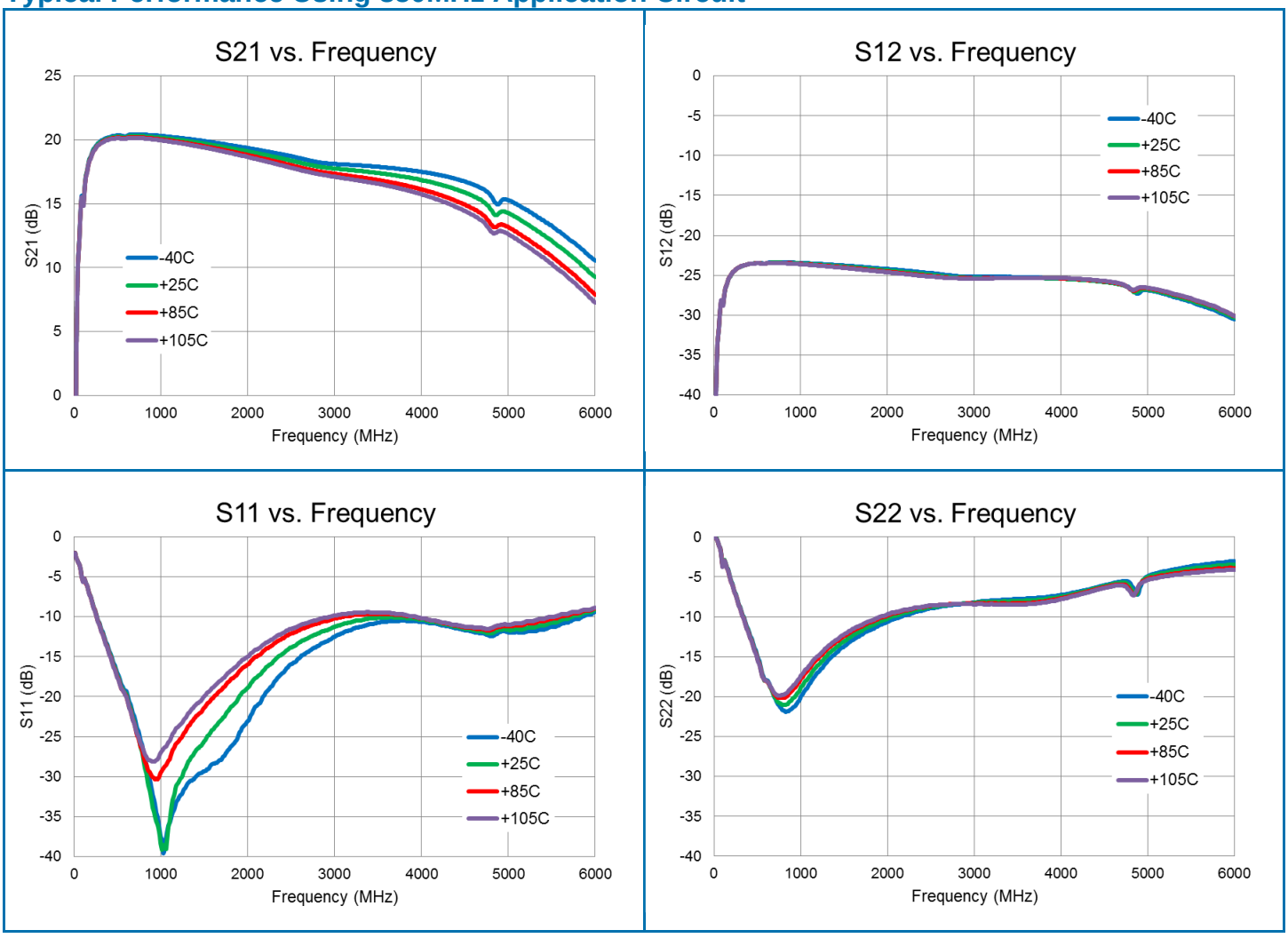
Parameter	Specification			Units	Conditions
	Min	Typ	Max		
Small Signal Gain, S21		20.3		dB	850MHz
		19.2		dB	1950MHz
		18.5		dB	2400MHz
Output Power at 1 dB Compression		+20.1		dBm	850MHz
		+19.4		dBm	1950MHz
		+18.4		dBm	2400MHz
Output Third Order Intercept Point		+36.0		dBm	500MHz
		+36.0		dBm	850MHz
		+31.9		dBm	1950MHz
		+30.4		dBm	2400MHz
Input Return Loss, S11		30.7		dB	850MHz
		19.4		dB	1950MHz
		14.7		dB	2400MHz
Output Return Loss, S22		20.9		dB	850MHz
		10.4		dB	1950MHz
		9.0		dB	2400MHz
Test Conditions unless otherwise specified: $+V_D$ = +5.1 V, V_S = 8 V, I_D = 75 mA Typ., OIP3 Tone Spacing=1 MHz, P_{OUT} per tone = 0 dBm, R_{BIAS} = 39Ω, T_L = 25°C, Z_S = Z_L =50 Ω					

Electrical Specifications – General (Continued)

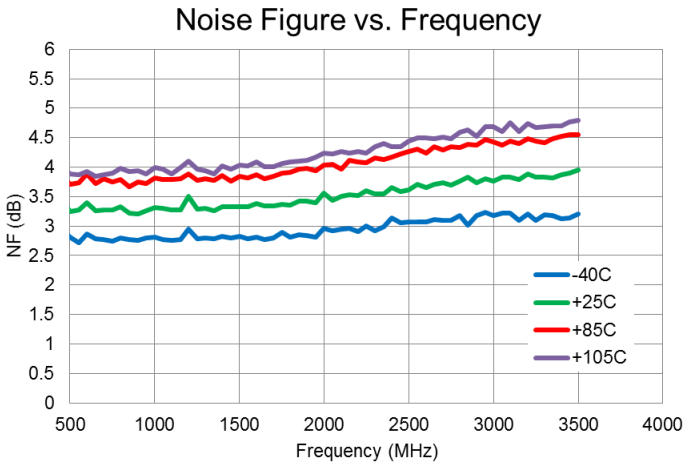
Parameter	Specification			Units	Conditions
	Min	Typ	Max		
Reverse Isolation, S12		23.5		dB	850MHz
		24.3		dB	1950MHz
		24.8		dB	2400MHz
Noise Figure		3.2		dB	850MHz
		3.4		dB	1950MHz
		3.7		dB	2400MHz
Thermal Resistance		97		°C/W	
Device Operating Current		75		mA	

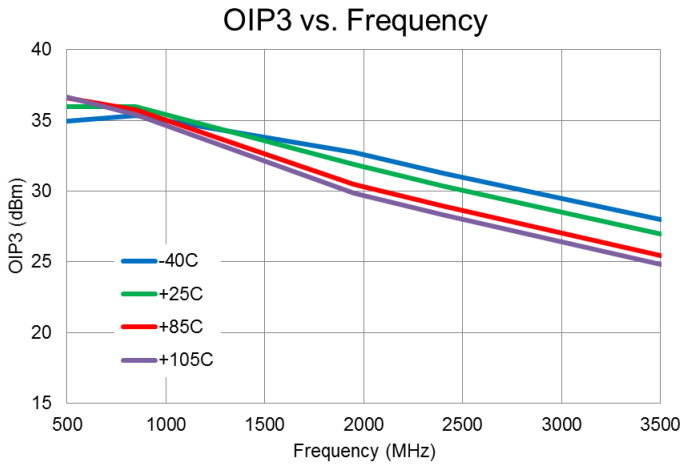
Test Conditions unless otherwise specified: $+V_D$ = +5.1 V, V_S = 8 V, I_D = 75 mA Typ., OIP3 Tone Spacing=1 MHz, P_{OUT} per tone = 0 dBm, R_{BIAS} = 39Ω, T_L = 25°C, Z_S = Z_L =50 Ω

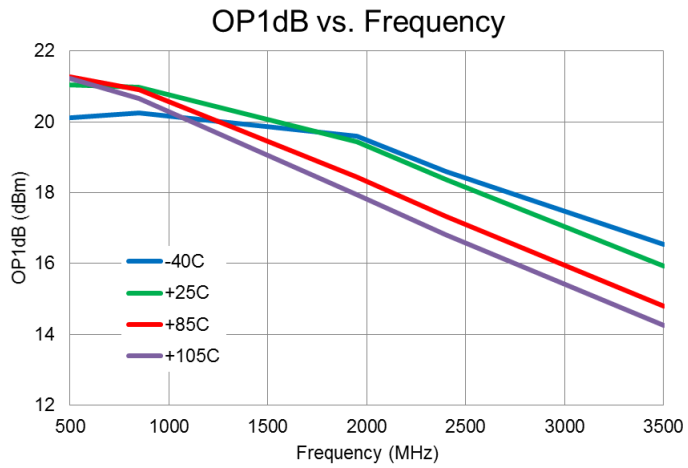
Typical Performance Using 850MHz Application Circuit

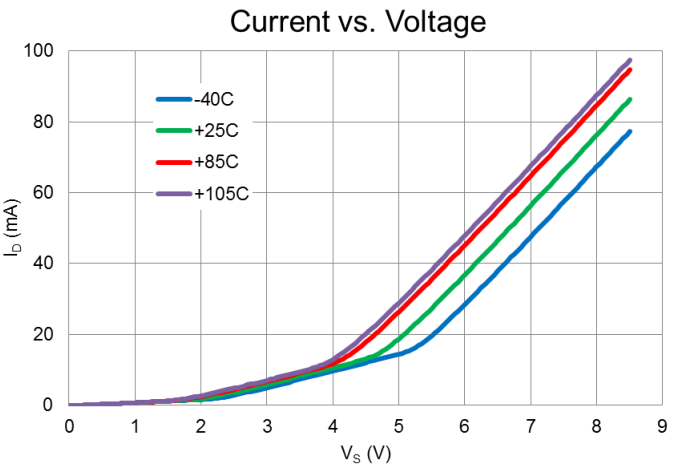


Typical Performance Using 850MHz Application Circuit

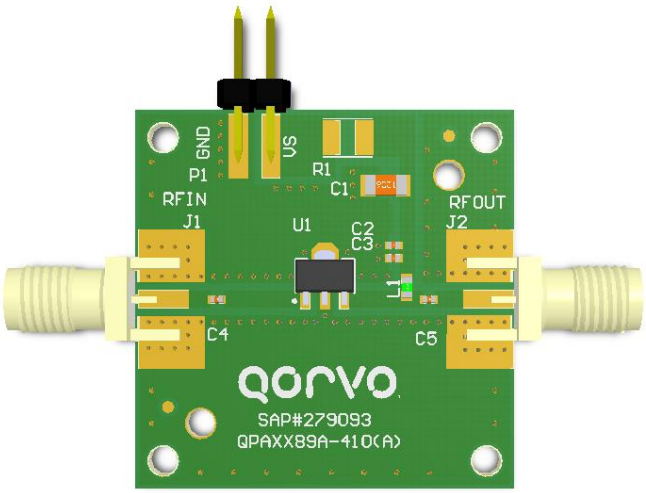


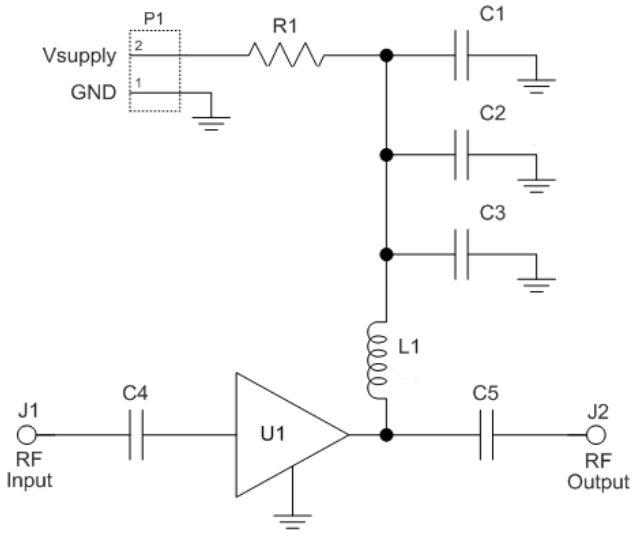






Evaluation Board and Schematic





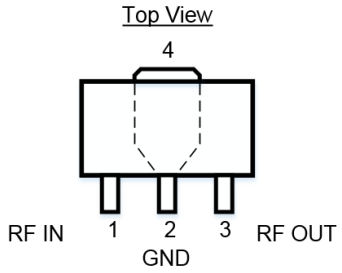
Evaluation Board Bill of Materials For 850MHz Application Circuit

Description	Reference Designator	Manufacturer	Manufacturer's P/N
Gain Block	U1	QORVO	QPA6489A
PCB	NA	Viasystems	QPAXX89A
CAP, 1uF, 10%, 25V, X7R, 1206	C1	Murata Electronics	GRM31MR71E105KA01L
CAP, 1000pF, 10%, 50V, X7R, 0402	C2	Murata Electronics	GRM155R71H102KA01D
CAP, 68pF, 5%, 50V, C0G, 0402	C3	Murata Electronics	GRM1555C1H680JA01D
CAP, 100pF, 5%, 50V, C0G, 0402	C4, C5	Murata Electronics	GRM1555C1H101JA01D
RES, 39 OHM, 1%, 1/2W, 1210	R1	Panasonic Industrial Devices	ERJ-P14F39R0U
IND, 33nH, 5%, M/L, 0603	L1	Murata Electronics	LL1608-FSL33NJ
CONN, SMA, EL, FLT, 0.068" SPE-000318	J1. J2	Amphenol RF Asia Corp	901-10426
CONN, HDR, ST, 1x2, 0.100", HI-TEMP, T/H	P1	Samtec Inc.	HTSW-102-07-G-S

Component Values For Specific Frequency and Voltage in Application Circuit

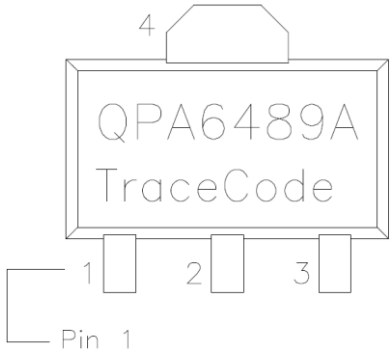
Reference Designator	Frequency (MHz)				
	500	850	1950	2400	3500
C_4, C_5	220pF	100pF	68pF	56pF	39pF
C_3	100pF	68pF	22pF	22pF	15pF
L_1	68nH	33nH	22nH	18nH	15nH
Required Bias Resistance for I_D =75mA Bias Resistance = R_{BIAS} + R_{LDC} = (V_S -V_D) / I_D					
Supply Voltage (V_S)		6 V	8 V	10 V	12 V
Bias Resistance (R_1 = R_{Bias})		12 Ω	39 Ω	62 Ω	91 Ω
*Note: Bias resistor improves current stability over temperature					

Pin Configuration and Description

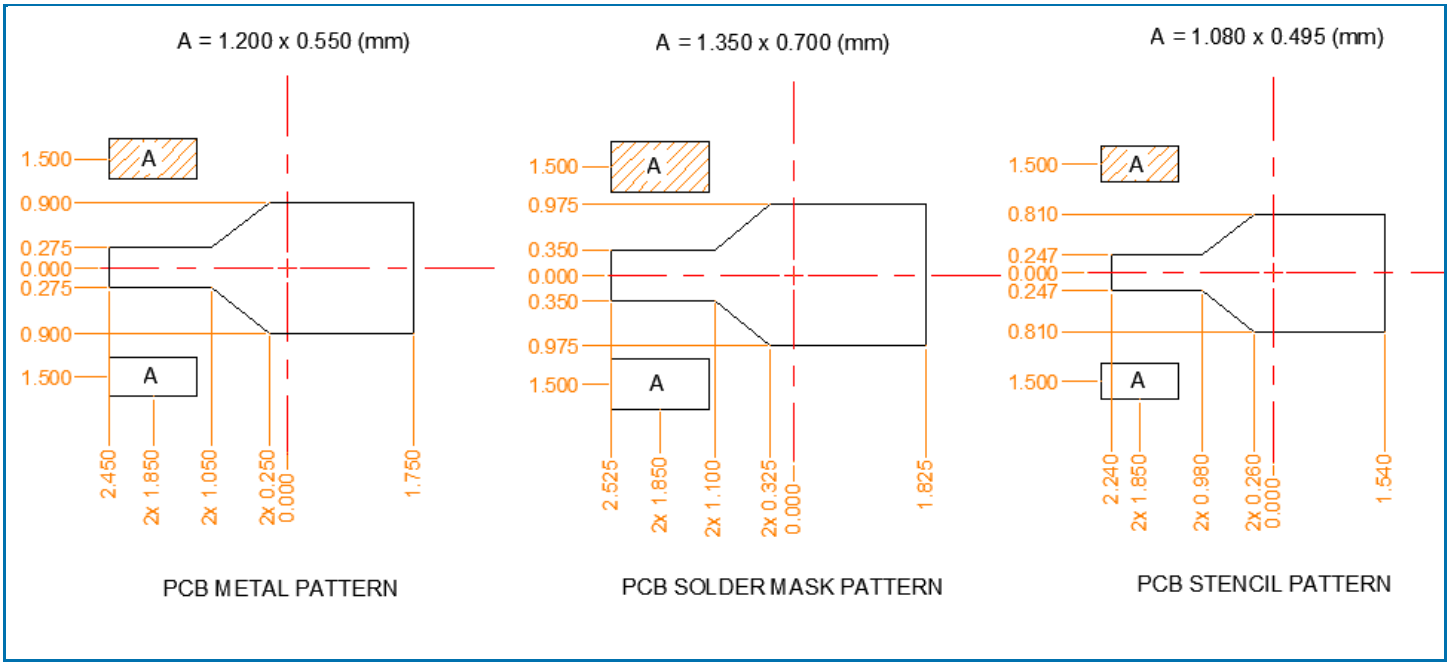


Pin	Label	Description
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor as shown in the application schematics
2	GND	Connect to ground per application circuit drawing.
3	RF OUT	RF output and bias pin. Bias will be supplied to this pin through an external RF choke. A DC blocking capacitor is necessary on the RF output as shown in the application circuit
4	GND	Exposed area on the bottom side of the package needs to be soldered to the ground plane of the board for thermal and RF performance. Vias should be located under the EPAD as shown in the recommended land pattern.

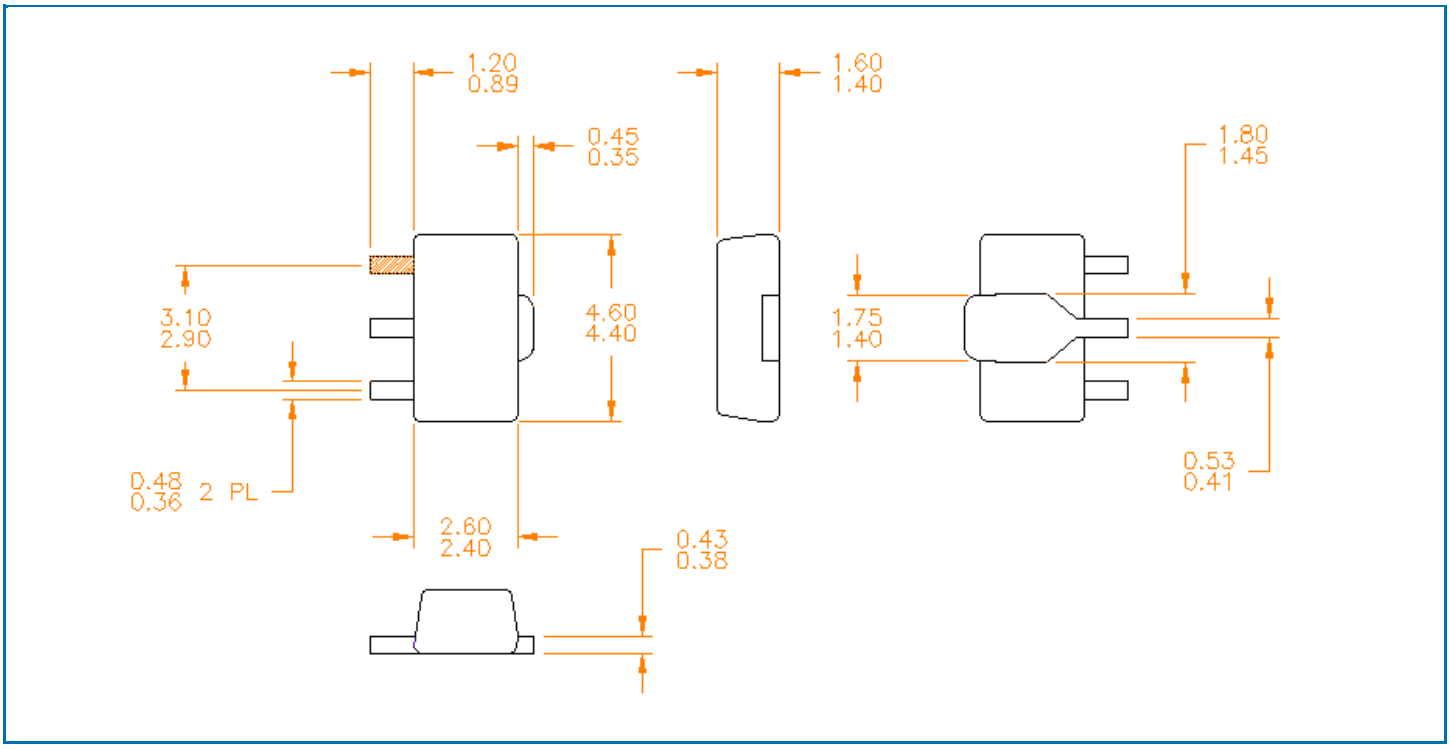
Package Marking



Suggested Pad Layout (Dimensions in millimeters)



Package Outline (Dimensions in millimeters)



Contact Information

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For information about the merger of RFMD and TriQuint as Qorvo:

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