

# QPA0163L

## 100MHz to 1300MHz, CASCADABLE SiGe HBT MMIC AMPLIFIER

The QPA0163L is a high performance SiGe HBT MMIC low noise amplifier. This device has an internal temperature compensation circuit allowing operation from a supply voltage as low as +2.5V. The QPA0163L has been characterized at  $V_D = +3V$  for low power and +4V for medium power applications. Only two DC-blocking capacitors, a bias resistor, and an optional RF choke are required for operation from 800MHz to 1300MHz.

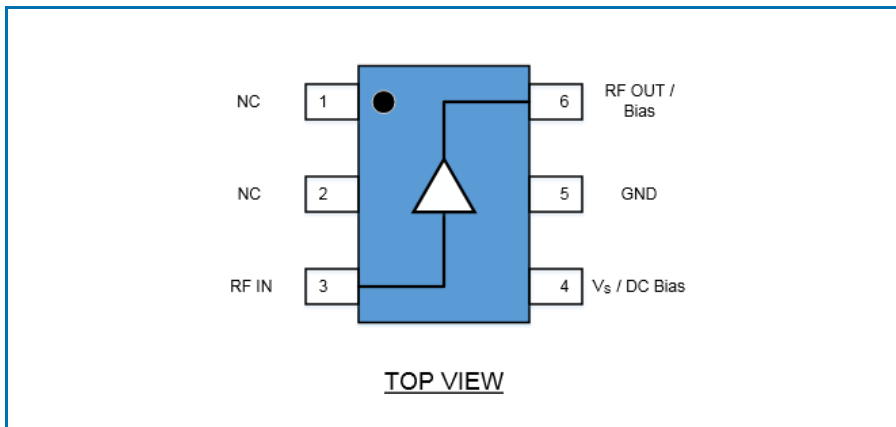


SOT-363 Package

### Features

- 100MHz to 1300MHz Operation
- Internally Matched To  $50\Omega$  800MHz to 1300MHz
- High Input/Output Intercept
- Low Noise Figure: 1.5 dB Typical at 900 MHz at +3V
- Low Power Consumption
- Single Voltage Supply
- Internal Temperature Compensation

### Functional Block Diagram



### Applications

- Receivers, GPS, RFID
- Cellular, Fixed Wireless, Land Mobile

### Ordering Information

QPA0163LSQ	Sample Bag with 25 pieces
QPA0163LSR	7" Reel with 100 pieces
QPA0163LTR7	7" Reel with 3000 pieces
QPA0163LPCK401	800MHz to 1300MHz PCBA with 5-piece Sample Bag

# QPA0163L

## Absolute Maximum Ratings

Parameter	Rating	Units
Device Voltage(V <sub>D</sub> )	+5.0	V
Device Current (I <sub>D</sub> )	45	mA
RF Input Power <sup>Note 1</sup>	+10	dBm
Storage Temperature	-55 to +150	°C
ESD Rating (HBM)	TBD	-
Moisture Sensitivity Level	MSL1	-

Notes:

1. Load Condition 1: Z<sub>L</sub> = 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<sub>D</sub>V<sub>D</sub> < (T<sub>J</sub> - T<sub>L</sub>) / R<sub>TH</sub>, and T<sub>L</sub> = T<sub>LEAD</sub>.



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		+105	°C
Junction Temperature (T <sub>J</sub> )			+125	°C
Operating Voltage	+2.5		+4.5	V

## Electrical Specifications – General

Parameter	Specification (V <sub>S</sub> = + 3V)		Specification (V <sub>S</sub> = + 4V)		Units	Conditions
	Min	Max	Min	Max		
Small Signal Gain, S21		16.5		17.7	dB	800MHz
		15.7		16.8	dB	900MHz
		14.9		16.0	dB	1000MHz
Output Power at 1 dB Compression		+6.0		+13.2	dBm	800MHz
		+6.4		+13.7	dBm	900MHz
		+6.8		+14.0	dBm	1000MHz
Output Third Order Intercept Point		+26.1		+30.4	dBm	800MHz
		+26.8		+31.0	dBm	900MHz
		+27.0		+31.3	dBm	1000MHz
Input Return Loss, S11		15.4		12.8	dB	900MHz
Output Return Loss, S22		9.0		9.4	dB	900MHz
Reverse Isolation, S12		25.0		24.6	dB	900MHz
Noise Figure		1.45		2.7	dB	800MHz
		1.48		2.6	dB	900MHz
		1.58		2.5	dB	1000MHz
Device Operating Current		13.8		30.7	mA	
Thermal Resistance		TBD		TBD	°C/W	

Test Conditions unless otherwise specified: V<sub>S</sub> = +3V, I<sub>D</sub> = 13.8mA or V<sub>S</sub> = +4V, I<sub>D</sub> = 30.7 mA, OIP3 Tone Spacing=1 MHz, P<sub>OUT</sub> per tone = -13 dBm, T<sub>L</sub> = +25°C, Z<sub>S</sub> = Z<sub>L</sub> =50 Ω

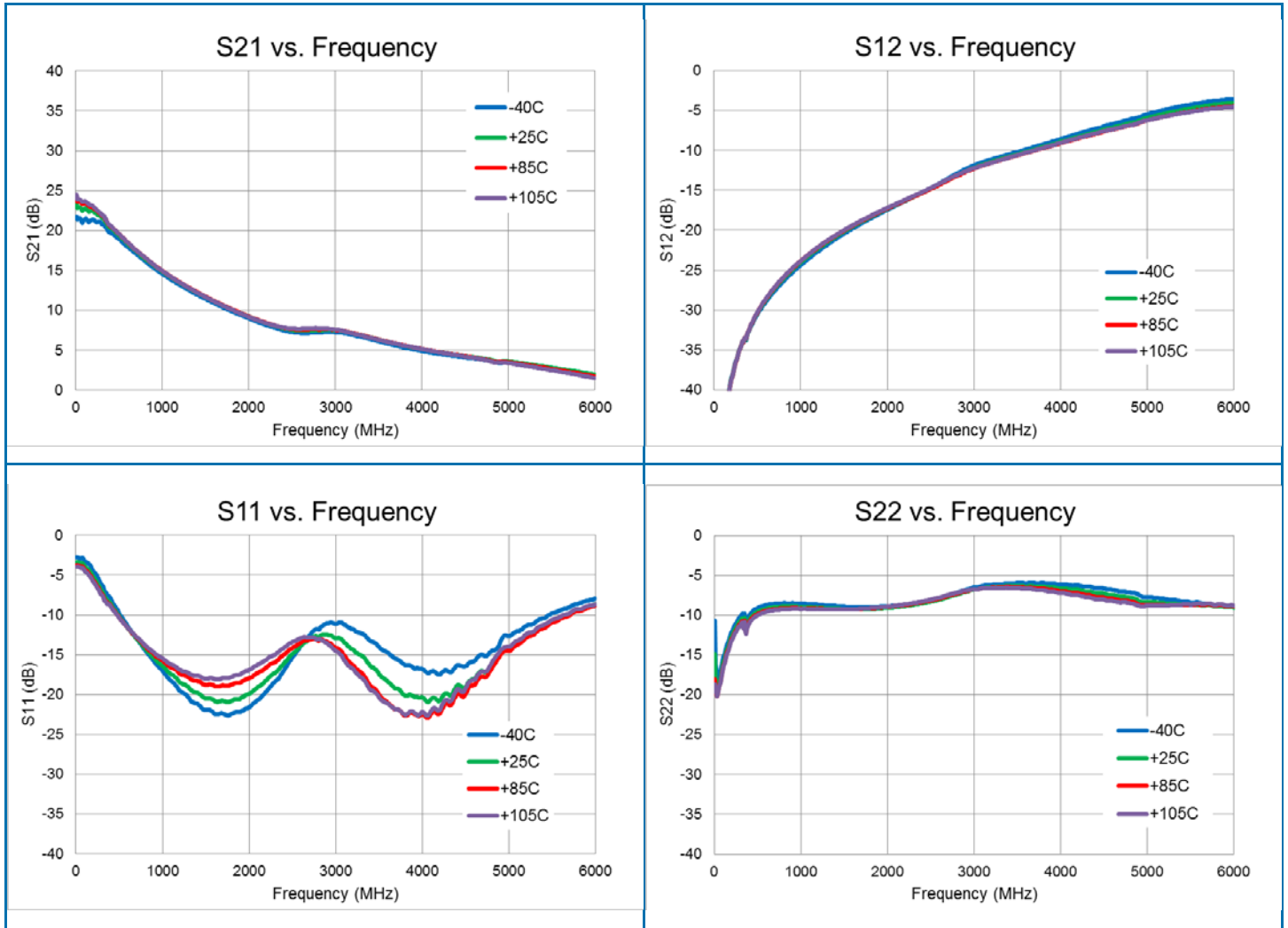
Preliminary



RFMD + TriQuint = Qorvo

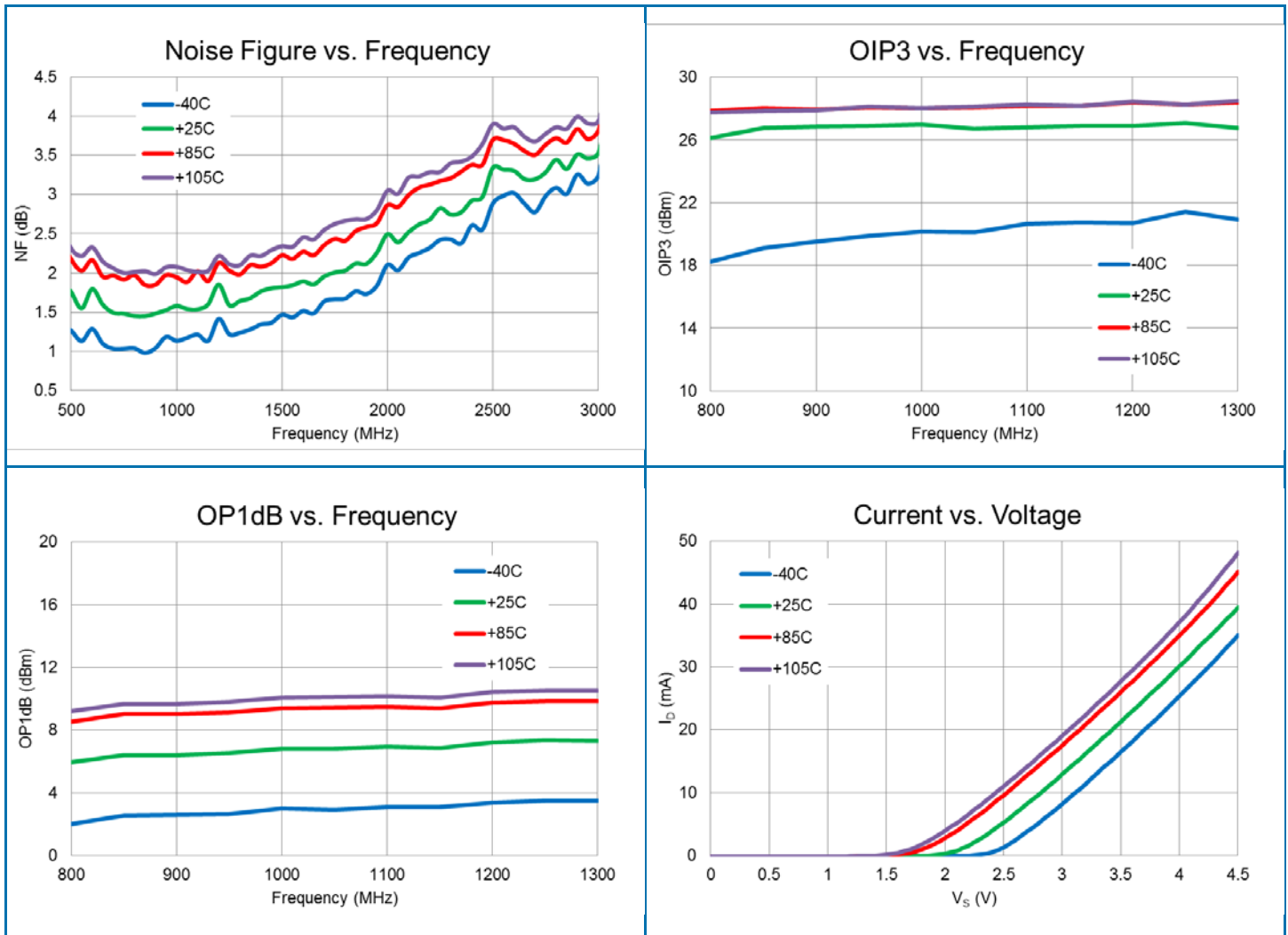
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Typical Performance Using 800MHz–1300MHz Application Circuit At +3V



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Typical Performance Using 800MHz–1300MHz Application Circuit At +3V



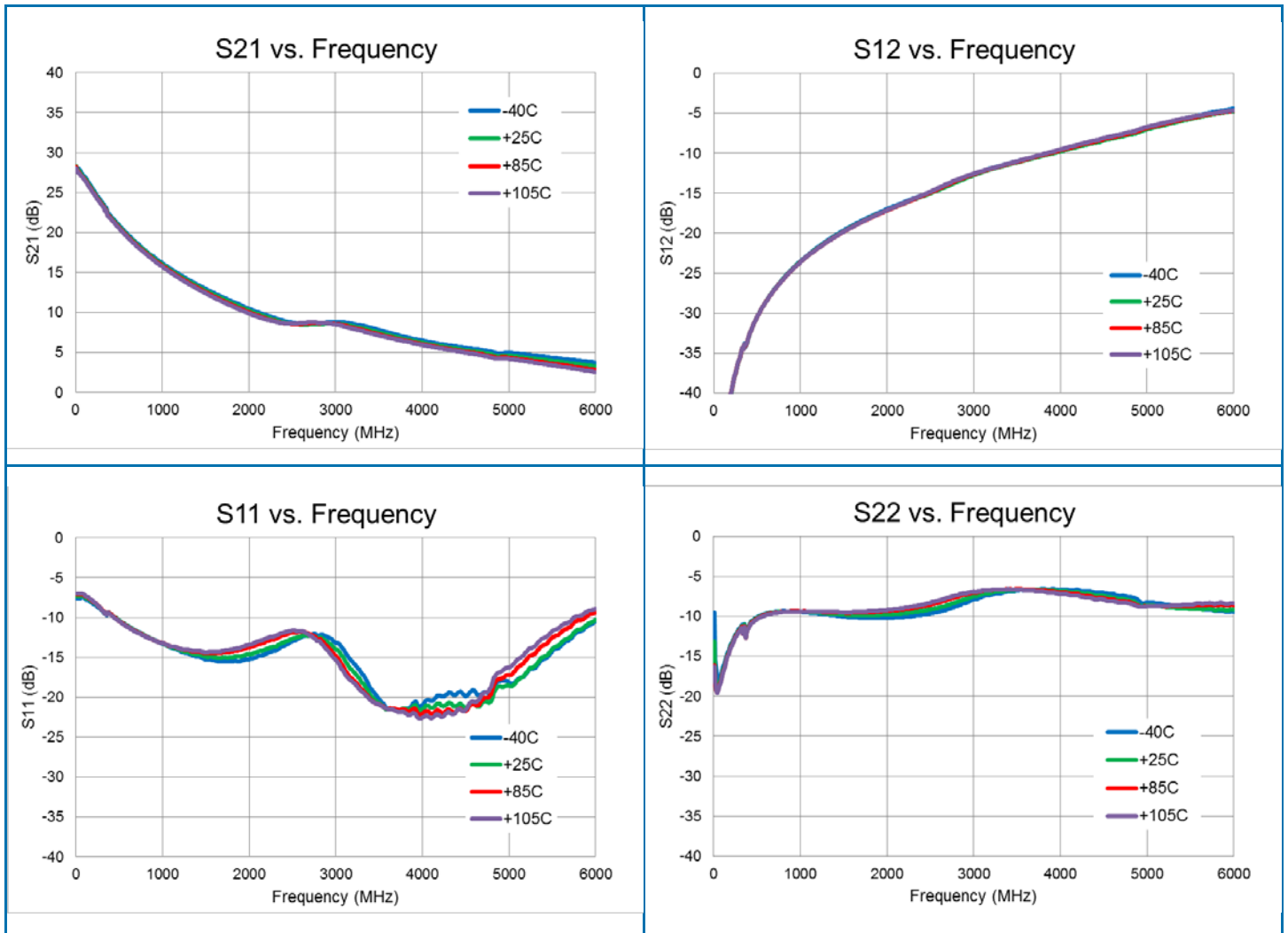
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RFMD + TriQuint = Qorvo

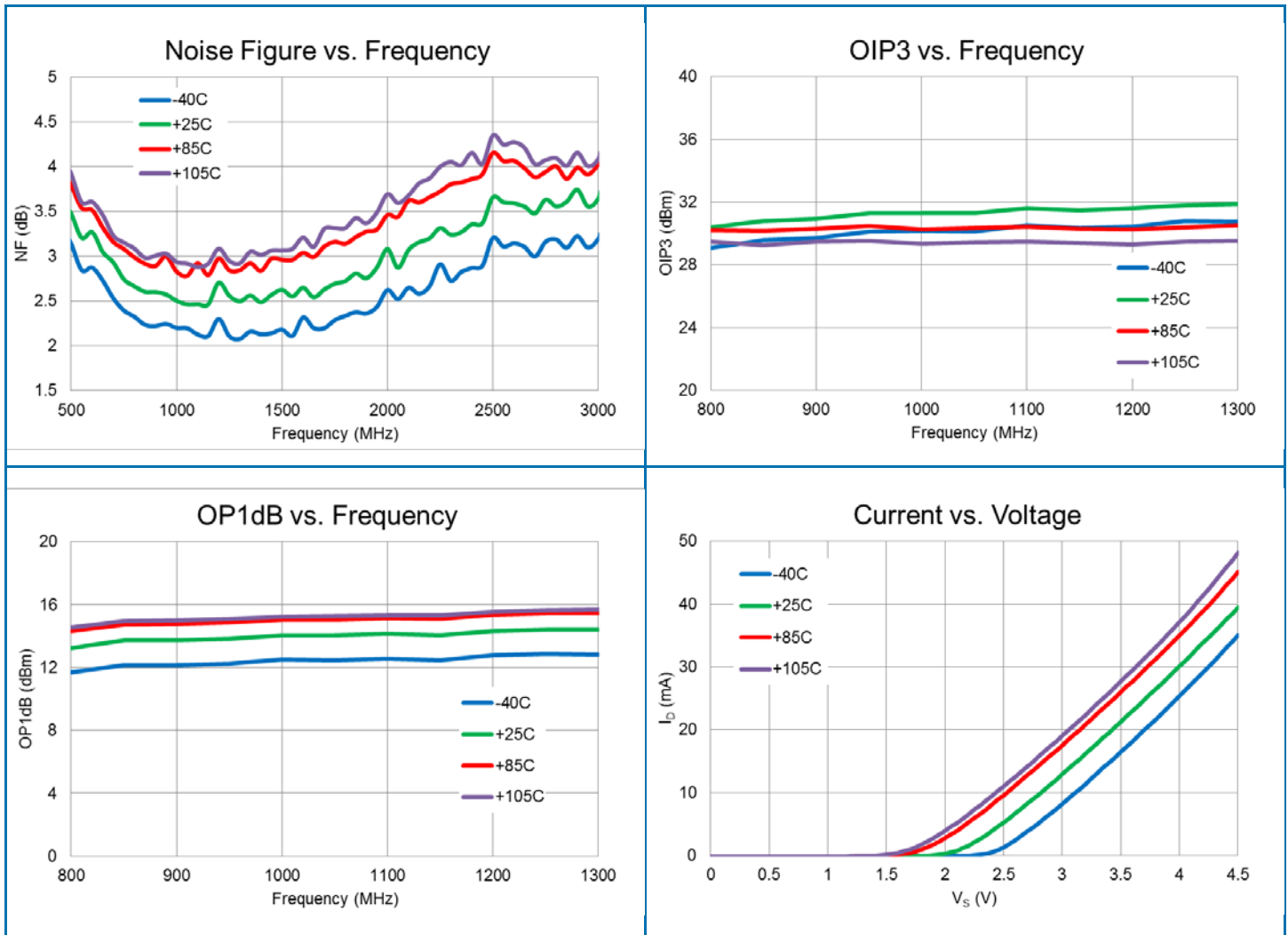
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Typical Performance Using 800MHz–1300MHz Application Circuit At +4V



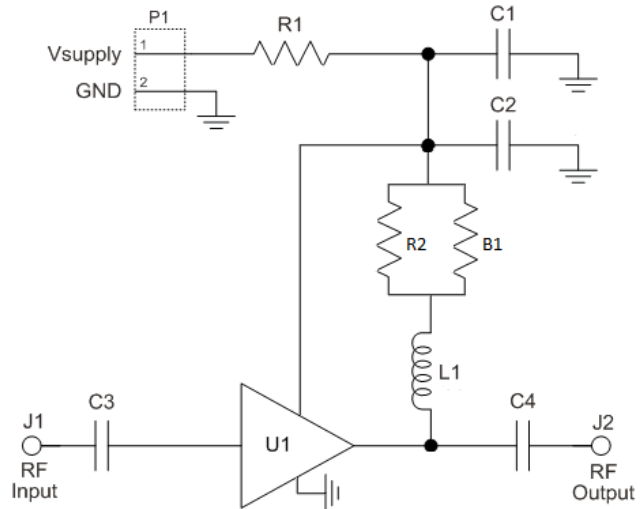
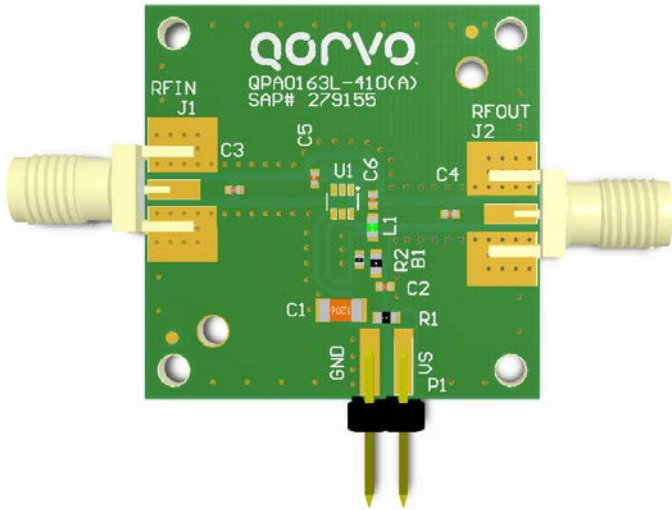
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Typical Performance Using 800MHz–1300MHz Application Circuit At +4V



# QPA0163L

## Evaluation Board and Schematic



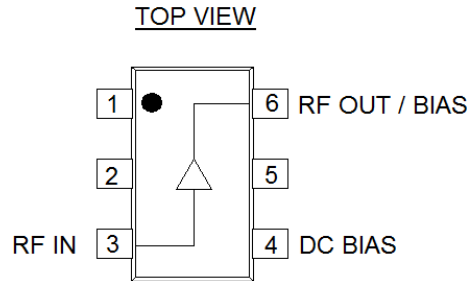
### Evaluation Board Bill of Materials For 800MHz-1300MHz Application Circuit

Description	Reference Designator	Manufacturer	Manufacturer's P/N
Gain Block	U1	Qorvo	QPA0163L
PCB, QPA0163L		Viasystems Technologies	QPA0163L-410(A)
CAP, 0.1uF, 5%, 25V, C0G, 1206	C1	Murata Electronics	GRM31C5C1E104JA01L
CAP, 100pF, 5%, 50V, C0G, 0402	C2	Murata Electronics	GRM1555C1H101JA01D
CAP, 0.1uF, 10%, 16V, X7R, 0402	C3, C4	Murata Electronics	GRM155R71C104KA88D
FER, BEAD, 1500 Ohm, 500mA, 0603	B1*	Murata Electronics	BLM18HE152SN1D
JMPR, 0 Ohm, 0603	R1	Panasonic Industrial Devices	ERJ-3GEY0R00
RES, 47 Ohm, 5%, 1/16W, 0402	R2*	Panasonic Industrial Devices	ERJ-2GEJ470
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

\* NOTE: B1 and R2 provide improved K-factor and are optional. R1 may be used as a dropping resistor for use with supply voltages greater than the desired bias voltage. C5 and C6 are shown on PCB as options for the feedback loop in 100MHz to 800MHz applications

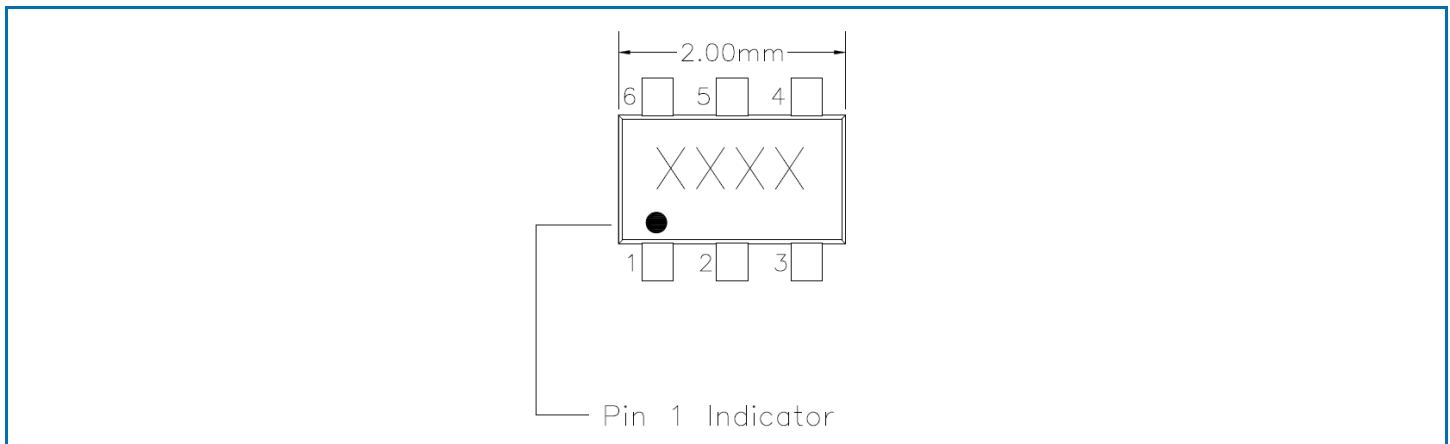
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Pin Configuration and Description



Pin	Label	Description
1, 2	NC	No Connection. Must be left floating and not connected to ground. This pin should be provided with an isolated ungrounded solder pad for mounting and integrity of the circuit.
3	RF IN	RF Input pin. This pin requires the use of an external DC blocking capacitor as shown in the application schematic.
4	DC BIAS	Direct Current Bias and Voltage Supply pin. Bypass with suitable capacitors.
5	GND	Ground. Connect to ground per application circuit drawing. For best performance, vias should be used as shown in the recommended pad layout.
6	RF OUT/BIAS	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.

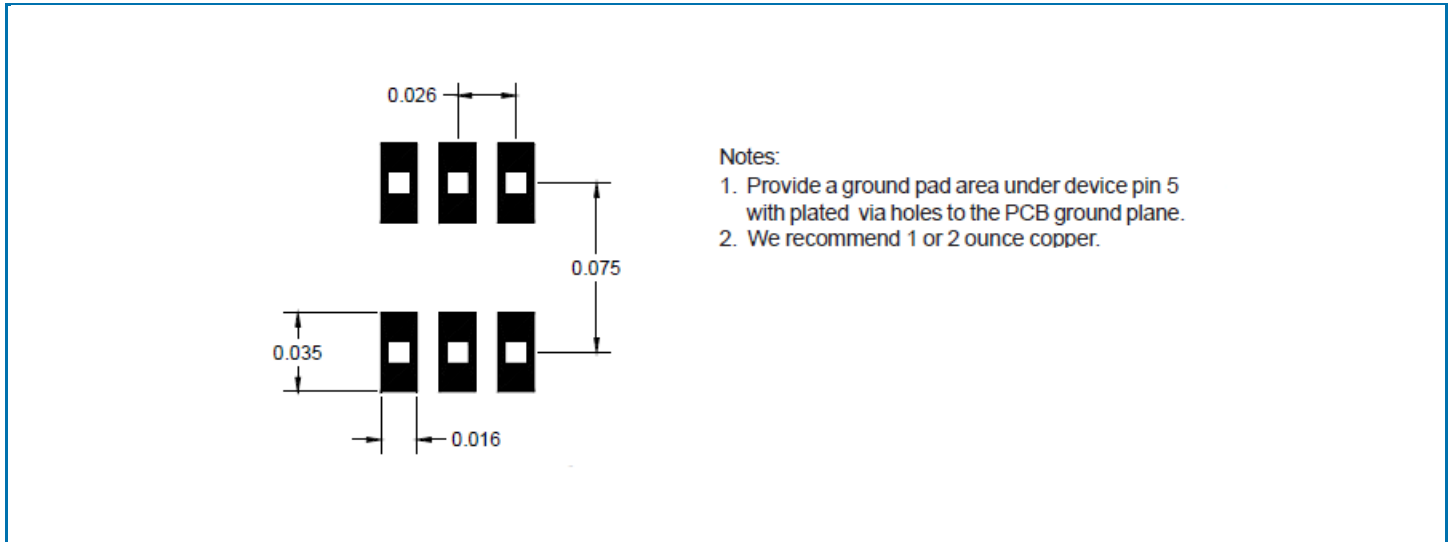
Package Marking



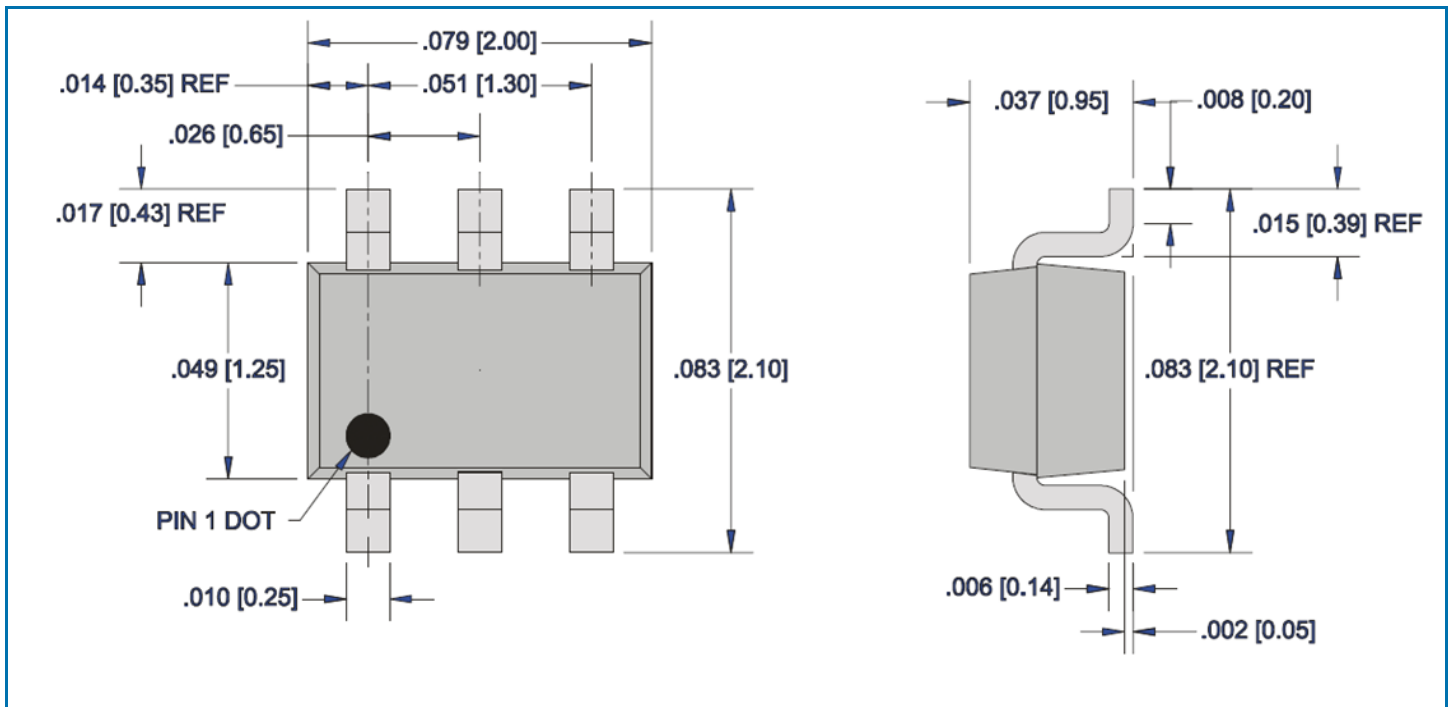


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Suggested Pad Layout (Dimensions in inches)



Package Outline (Dimensions in inches [millimeters])



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*Preliminary*



## Contact Information

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

**Web:** [www.rfmd.com](http://www.rfmd.com) **Tel:** 1-844-890-8163  
**Email:** [customer.support@qorvo.com](mailto:customer.support@qorvo.com)

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

**Web:** [www.qorvo.com](http://www.qorvo.com)

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