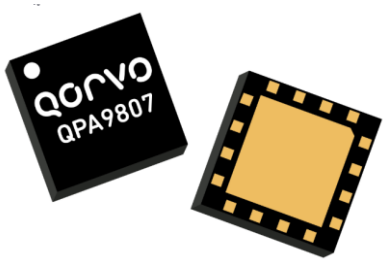
QPA9807

2300 – 2700 MHz 1/4W Balanced Amplifier

General Description

The QPA9807 is a balanced amplifier module with embedded hybrid couplers to convert to single ended input and output ports. The module has an enable pin to allow for shutting down of the amplifier. The module requires minimal external components which are VCC choke inductors, decoupling caps and resistors for bias control.

The QPA9807 provides 24.7 dBm P1dB with 19 dB gain and +40.3 dBm OIP3 across a wide frequency range of 2300-2700 MHz to cover the 3GPP Bands 7, 30, 38, 40, and 41. The linear driver amplifier is targeted for use in wireless infrastructure where high linearity, medium power and high integration is required. The balanced amplifier configuration provides very good input and output VSWR and is especially ideal as the output stage in a macrocell transceiver board that connects to the high power amplifier (HPA) board through a long cable or microstrip trace. The QPA9807 is packaged in a small 5 x 5 mm leadless package that is internally matched to 50 Ω on all RF ports.

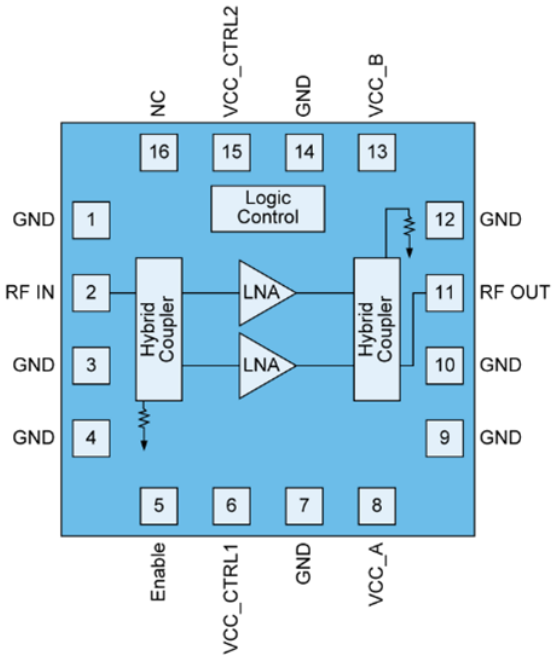


16 Pad 5 x 5 mm leadless SMT Package

Product Features

- 2300 – 2700 MHz
- Balanced Amplifier with integrated 3 dB hybrids
- Internally Matched 50 Ω Input / Output
- Shutdown Mode with 1.8V logic control
- 19 dB Gain
- +40.3 dBm OIP3
- +24.7 dBm P1dB
- Good gain flatness across Bands 7, 30, 38, 40, 41

Functional Block Diagram



Top View

Applications

- Wireless Infrastructure
- Macro BTS Transceivers
- Booster Amps, Repeaters

Ordering Information

Part No.	Description
QPA9807TR13	2,500 pieces on a 13” reel (standard)
QPA9807SR	100 pieces on a 7” reel
QPA9807PCB4B01	2300 – 2700 MHz Evaluation Board

Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	−40 to +150 °C
RF Input Power, CW, 50 Ω, T=25 °C	+TBD dBm
Supply Voltage (V_{CC})	+6 V
Enable Voltage (Enable)	+5.5 V

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
Device Voltage (V_{CC})	+3.30	+5	+5.25	V
Enable (High)	+1.17	+1.8	+3.6	V
Enable (Low)	0		+0.63	V
T_{CASE}	−40		+105	°C
Tj for >10^6 hours MTTF			+190	°C

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

Electrical Specifications

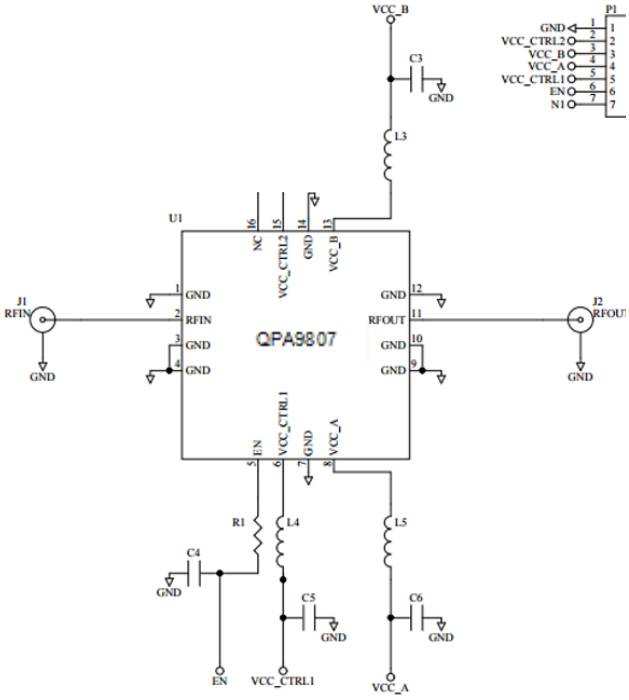
Parameter	Conditions(1)	Min	Typ	Max	Units
Operational Frequency Range		2300		2700	MHz
Test Frequency			2500		MHz
Gain			20		dB
Gain Slope (peak to peak)	Fc ± 100 MHz		0.1		dB
	Fc ± 250 MHz		0.3		dB
	Fc ± 350 MHz		0.4		dB
	Fc ± 500 MHz		0.5		dB
Output IP3	Pin = −13 dBm/tone, Δf = 1 MHz		+40.3		dBm
Output P1dB			+24.7		dBm
Noise Figure			1.4		dB
Input Return Loss			26		dB
Output Return Loss			31		dB
Control Current	V_{CC_CTRL1} (Pin 6)		3		mA
Total Current			267		mA
Rise time	From Enable to 90% RF		<1		uS
Fall time	From Disable to 10% RF		<1		uS
Thermal Resistance, θjc	Module (channel to case)			TBD	°C/W

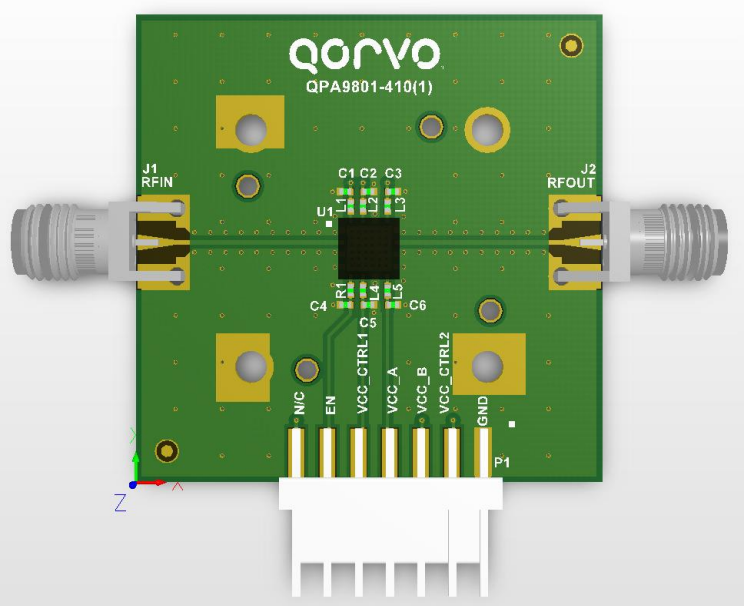
Notes:
1. Test conditions unless otherwise noted: V_{CC} = V_{CC_CTRL1} = +5.0 V, Enable = +1.8V, Temp = +25 °C, 50 Ω system.

Logic Table

Parameter	High	Low
Enable	Active	Shutdown

Application Circuit Schematic and Layout





Bill of Material – QPA9807PCB4B01

Reference Des.	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board		
U1	n/a	¼ Watt Balanced Amplfier	Qorvo	QPA9807
L3, L5	18 nH	Inductor, wire wound	Coilcraft	0402CS-18NXGRW
R1, L4	0 Ω	Resistor, Chip, Jumper	Various	
C3, C6	1 uF	Capacitor, Chip, 10%, 10V, X5R	Various	
C5	100 pF	Capacitor, Chip, NPO, 5%, 50V, NPO/COG	Various	
C4		DNI		

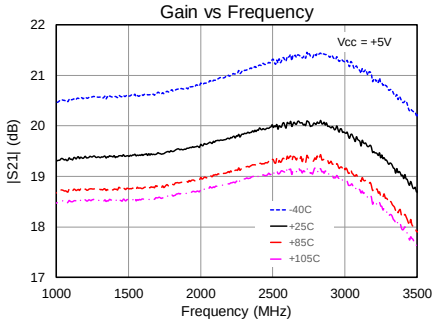
Typical Performance

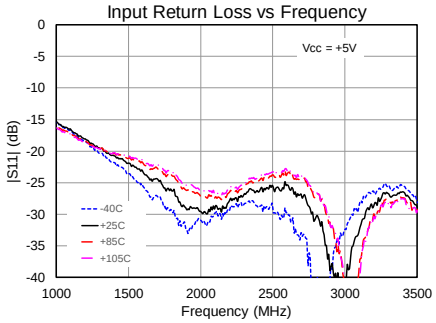
Parameter	Conditions[1]	Typical Value			Units
Frequency		2300	2500	2700	MHz
Gain		19.9	20.0	20.1	dB
Gain Slope (peak to peak)	Fc ± 100 MHz	0.1	0.1	0.1	dB
	Fc ± 250 MHz	0.3	0.3	0.2	dB
	Fc ± 350 MHz	0.5	0.4	0.3	dB
	Fc ± 500 MHz	0.6	0.5	0.6	dB
Input Return Loss		27	26	27	dB
Output Return Loss		32	31	28	dB
Output IP3	Pin = -13 dBm/tone, Δf = 1 MHz	+40.2	+40.3	+40.6	dBm
Output P1dB		+25.1	+24.7	+24.8	dBm
Noise Figure		1.2	1.4	1.4	dB

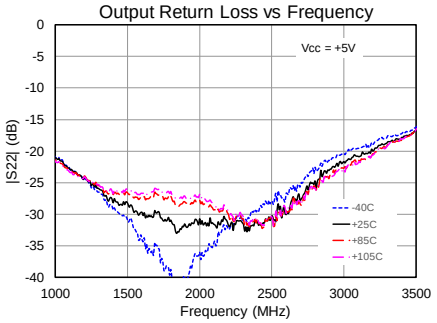
Notes:
1. Test conditions unless otherwise noted: $V_{CC} = V_{CC_CTRL1}$ = +5.0 V, Enable = +1.8V, Temp.=+25 °C

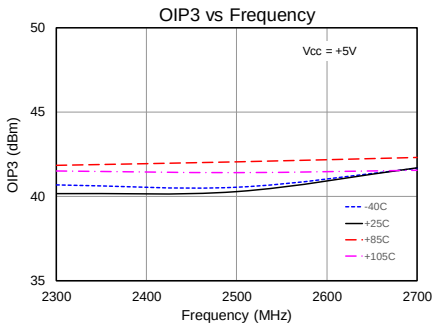
Performance Plots

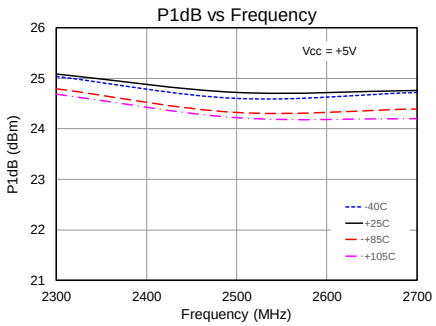
Test conditions unless otherwise noted: $V_{CC} = V_{CC_CTRL1}$ = +5V, Enable = +1.8 V, Temp.=+25 °C

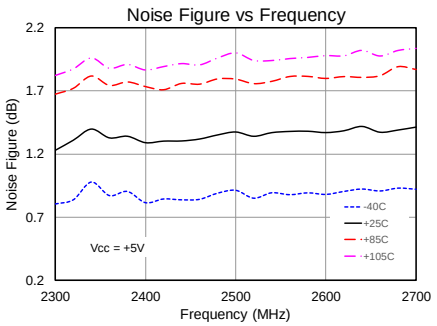












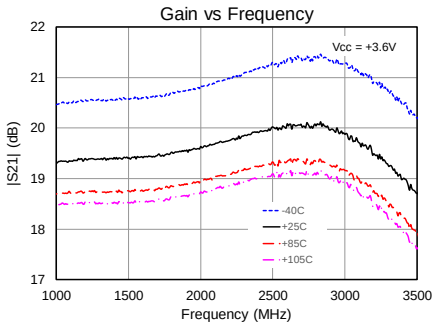
Typical Performance – V_{CC} = +3.6 V

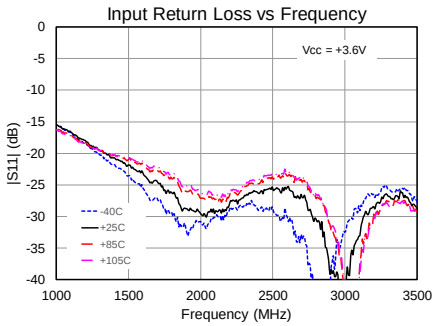
Parameter	Conditions(1)	Typical Value			Units
Frequency		2300	2500	2700	MHz
Gain		19.9	20.0	20.0	dB
Gain Slope (peak to peak)	Fc ± 100 MHz	0.1	0.1	0.1	dB
	Fc ± 250 MHz	0.3	0.3	0.1	dB
	Fc ± 350 MHz	0.5	0.4	0.3	dB
	Fc ± 500 MHz	0.6	0.5	0.6	dB
Input Return Loss		26	25	26	dB
Output Return Loss		28	27	26	dB
Output IP3	Pin = -13 dBm/tone, Δf = 1 MHz	+36.1	+35.9	+35.9	dBm
Output P1dB		+21.8	+21.3	+21.4	dBm
Noise Figure		1.2	1.2	1.3	dB

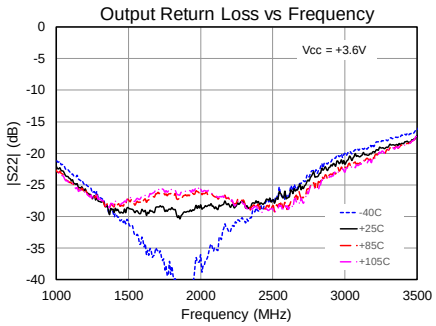
Notes:
2. Test conditions unless otherwise noted: V_{CC} = V_{CC_CTRL1} = +3.6 V, Enable = +1.8V, Temp.=+25 °C

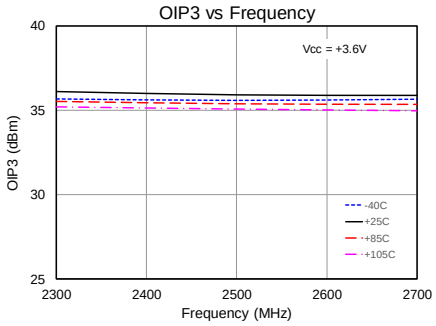
Performance Plots – V_{CC} = +3.6 V

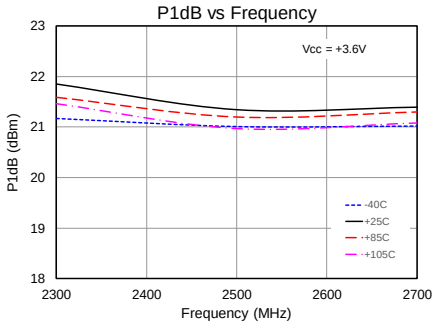
Test conditions unless otherwise noted: V_{CC} = V_{CC_CTRL1} = +3.6V, Enable = +1.8 V, Temp.=+25 °C

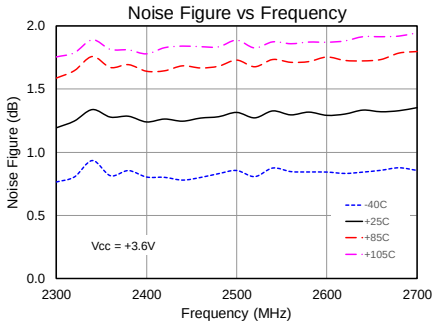




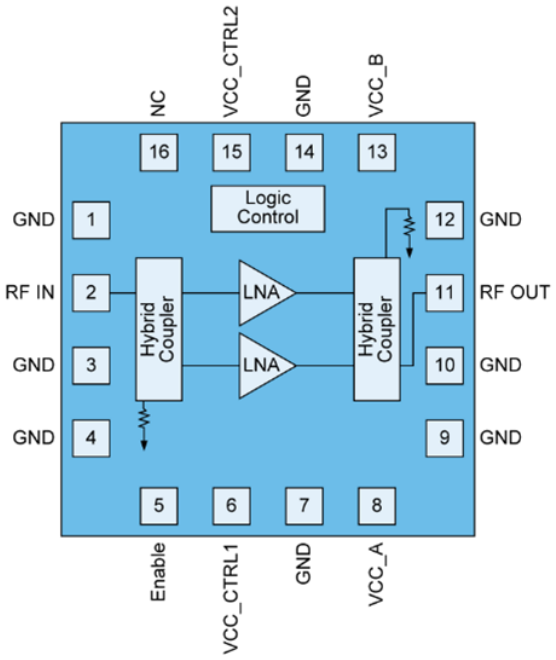








Pin Configuration and Description



Top View

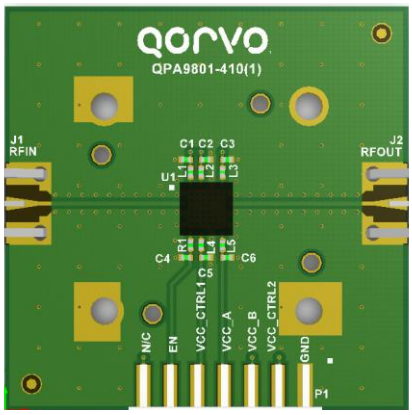
Pad No.	Label	Description
1, 3, 4, 7, 9, 10, 12, 14	GND	RF and DC Ground
2	RFin	RF Input; Internally 50 Ω matched
5	Enable	Enable pin to turn off amplifiers, 1- ON, 0 – OFF
6	VCC_CTRL1	Supply Voltage for control circuitry
8	VCC_A	Supply Voltage to Amplifier A
11	RFout	RF Output; Internally 50 Ω matched
13	VCC_B	Supply Voltage to Amplifier B
15	NC	Not connected
16	VCC_CTRL2	Not connected
Backside Paddle		RF/DC ground. See PCB Mounting Pattern for suggested footprint.

Evaluation Board PCB Information

PC Board Layout

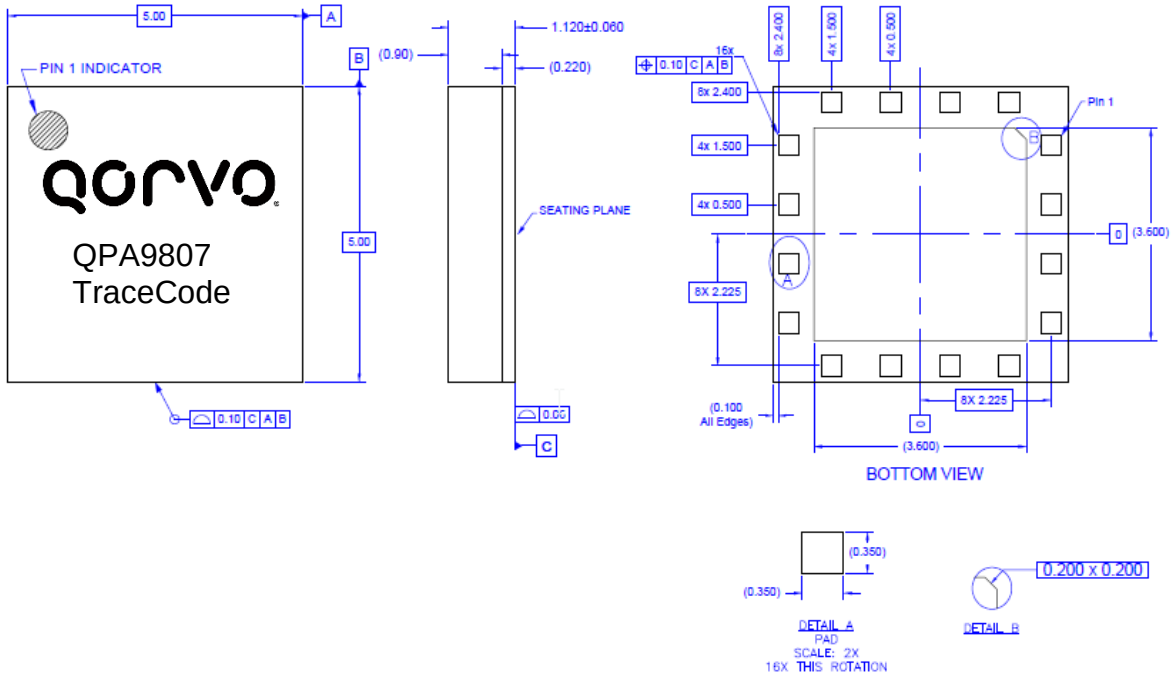
PCB Material (stackup):

1/2 oz. Cu top layer
0.008 inch FR-4
1 oz. Cu middle layer 1
.012 inch FR-4
1 oz. Cu middle layer 2
0.008 inch FR-4
1/2 oz. Cu bottom layer
Finished board thickness is 0.034±.003



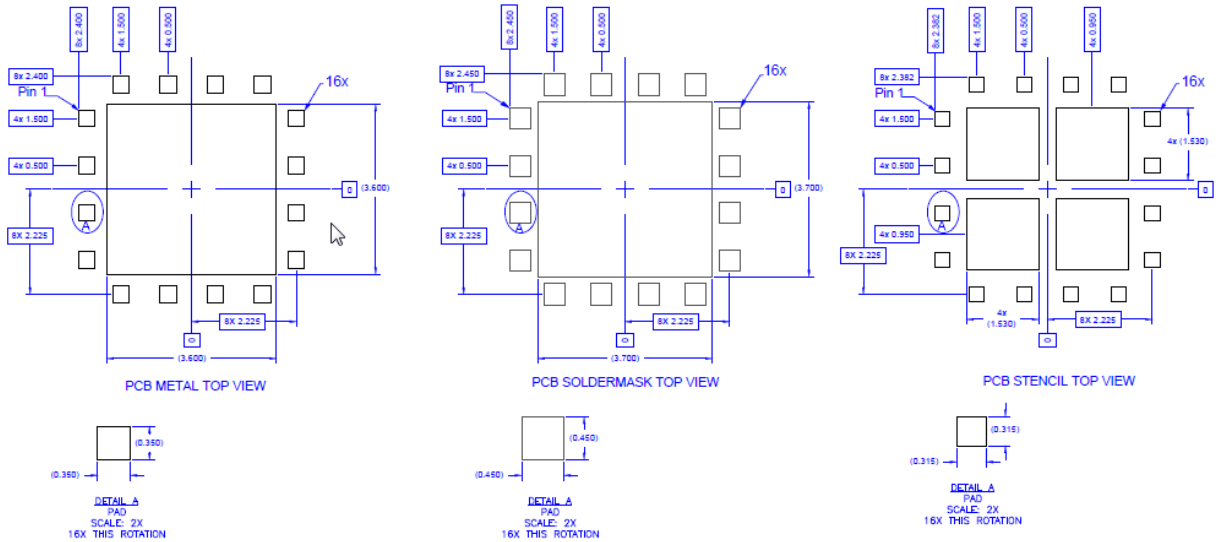
Package Marking and Dimensions

Marking: Part Number – QPA9807



Notes:
1. All dimensions are in millimeters. Angles are in degrees.
2. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.
3. Contact plating: Au over Ni

PCB Mounting Pattern



Notes:
1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25 mm (0.10").
4. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class TBD	ESDA / JEDEC JS-001-2012
ESD – Charged Device Model (CDM)	Class TBD	JEDEC JESD22-C101F
MSL – Moisture Sensitivity Level	Level 3	IPC/JEDEC J-STD-020



Caution!
ESD-Sensitive Device

Solderability

Compatible with both lead-free (260°C max. reflow temp.) and tin/lead (245°C max. reflow temp.) soldering processes.
Solder profiles available upon request.
Contact plating: Electrolytic plated Au over Ni

RoHS Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment). This product also has the following attributes:

- Product uses RoHS Exemption 7c-I to meet RoHS Compliance requirements
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free
- Qorvo Green

Contact Information

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

Tel: **1-844-890-8163**

Web: www.qorvo.com

Email: customer.support@qorvo.com

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

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