QPB3311

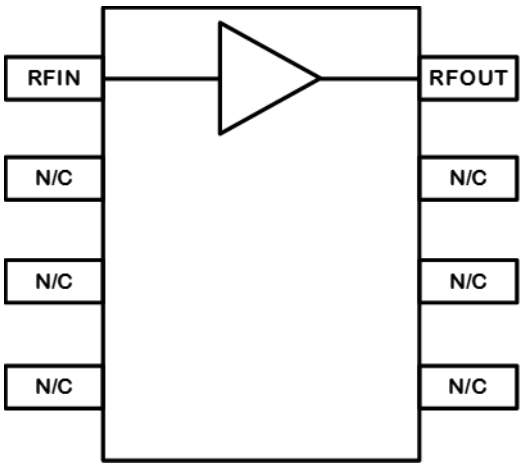
15 dB Return Path Amplifier 5 – 210 MHz

Product Overview

The QPB3311 is an HBT single ended RF amplifier IC operating as return path amplifier capable of supporting DOCSIS 3.1 applications. This IC is designed to provide a low noise, high gain option for 5-210MHz interface using an 8V power supply to provide lower overall power dissipation. 5V operation is possible in applications with reduced linearity and gain requirements. The QPB3311 is packaged in a convenient SOIC8 package and features an externally adjustable bias control.

Package: SOIC-8 with Exposed Pad

Functional Block Diagram



Top View

Key Features

- 5MHz to 210MHz Operation
- 8V and 5V Operation
- Gain; 15.3dB Typical
- Noise Figure 3.8dB Typical
- Adjustable Bias Using External Resistors
- SOIC-8 Exposed Pad

Applications

- Head End CMTS Equipment
- Post Amp for Return Path Optical Receivers
- DOCSIS 3.1 Optical Nodes
- Residential Amplifiers and Splitters

Ordering Information

Part No.	Description
QPB3311SQ	Sample bag with 25 pieces
QPB3311SR	7" Reel with 100 pieces
QPB3311TR13	13" Reel with 2500 pieces
QPB3311PCK	5 – 210 MHz PCBA with 5 pc sample bag

Absolute Maximum Ratings

Parameter	Rating
Supply Voltage (V_{DD})	+10V
Supply Current (I_{DD})	275mA
Maximum CW Input Power for VDD=8V	+16dBm
Operating Temperature Range	-40 to +85 °C
Storage Temperature Range	−65 to +150 °C
Maximum Junction Temperature	+150 °C

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.

Electrical Specifications – 8V

Parameter	Condition (1)	Min	Typ	Max	Unit
Supply Voltage (V_{DD})			8		V
Supply Current (I_{DD})			172		mA
Frequency Range		5		210	MHz
Gain	50MHz		15.3		dB
Gain Flatness			±0.2		dB
Gain Tilt	Gain(210MHz) - Gain(5MHz)		-0.10		dB
Input Return Loss	Full Band		15		dB
Output Return Loss	Full Band		20		dB
Reverse Isolation	Full Band		19		dB
Noise Figure	Includes balun loss		3.8		dB
DTO	f1=13MHz, f2=19MHz 58dBmV per tone		80		-dBc
DSO	f1=13MHz, f2=19MHz 58dBmV per tone		60		-dBc
ACLR	Pout = 61dBmV, 5-195MHz OFDM w/ 9.6MHz exclusion band.		63		dB
OIP2	9dBm/tone, F1 = 113MHz, F2 = 119MHz		69		dBm
OIP3	9dBm/tone, F1 = 113MHz, F2 = 119MHz		48		dBm
Output P1dB	Full Band		23.5		dBm
Thermal Resistance	Θ_{JC}		28		˚C/W

Notes:

1. Typical performance at these conditions: Temp = +25°C, V_{DD} = +8V, 75Ω system

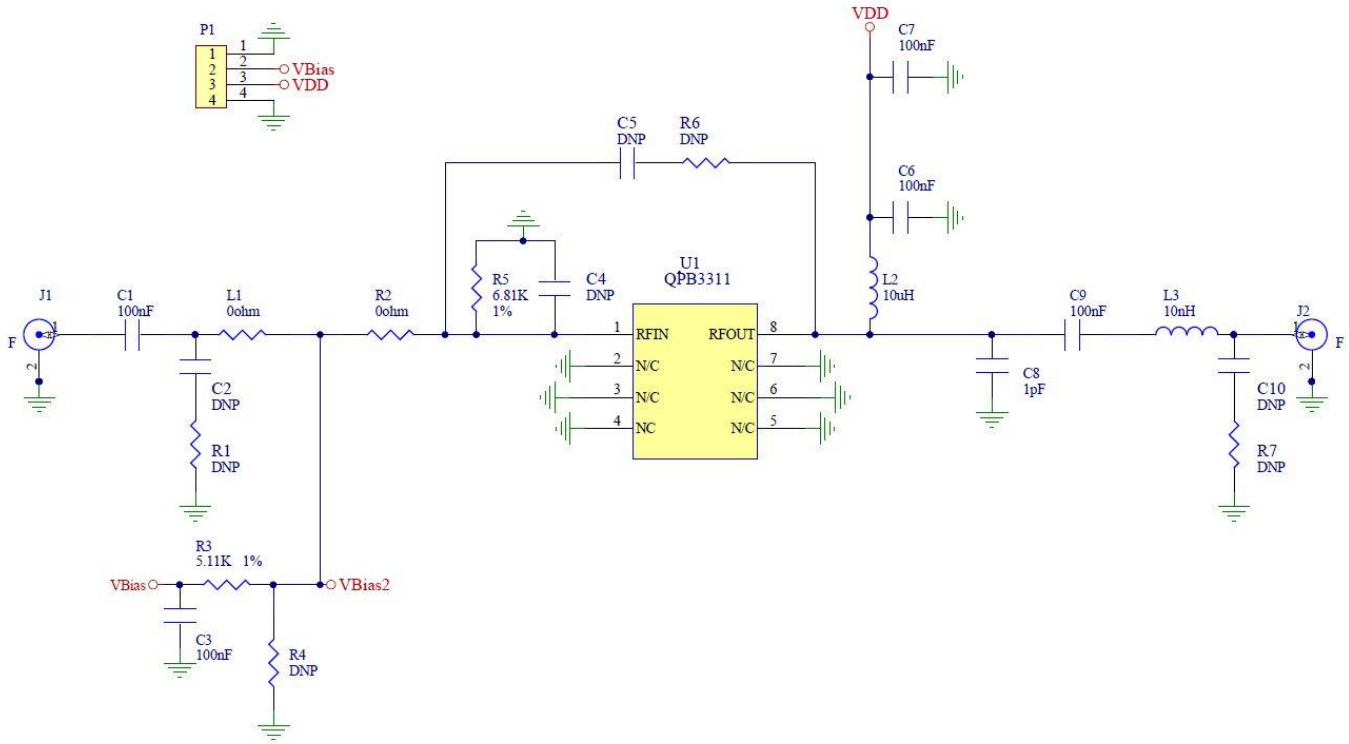
Electrical Specifications – 5V

Parameter	Condition [1]	Min	Typ	Max	Unit
Supply Voltage (V_{DD})			5		V
Supply Current (I_{DD})					mA
Frequency Range		5		210	MHz
Gain	Full Band		13.5		dB
Gain Flatness			±0.2		dB
Gain Tilt	Gain(210MHz) - Gain(5MHz)		-0.1		dB
Input Return Loss	Full Band		22		dB
Output Return Loss	Full Band		21		dB
Reverse Isolation	Full Band		20		dB
Noise Figure	Full Band		5.0		dB
DTO	f1=13MHz, f2=19MHz 55dBmV per tone		76		-dBc
DSO	f1=13MHz, f2=19MHz 55dBmV per tone		55		-dBc
ACLR	Pout = 53dBmV, 5-195MHz OFDM w/ 9.6MHz exclusion band.		62		dB
OIP2	6dBm/tone, F1 = 113MHz, F2 = 119MHz		54		dBm
OIP3	6dBm/tone, F1 = 113MHz, F2 = 119MHz		39		dBm
Output P1dB	Full Band		18.6		dBm

Notes:

1. Typical performance at these conditions: Temp = +25°C, V_{DD} = +5V, 75Ω system

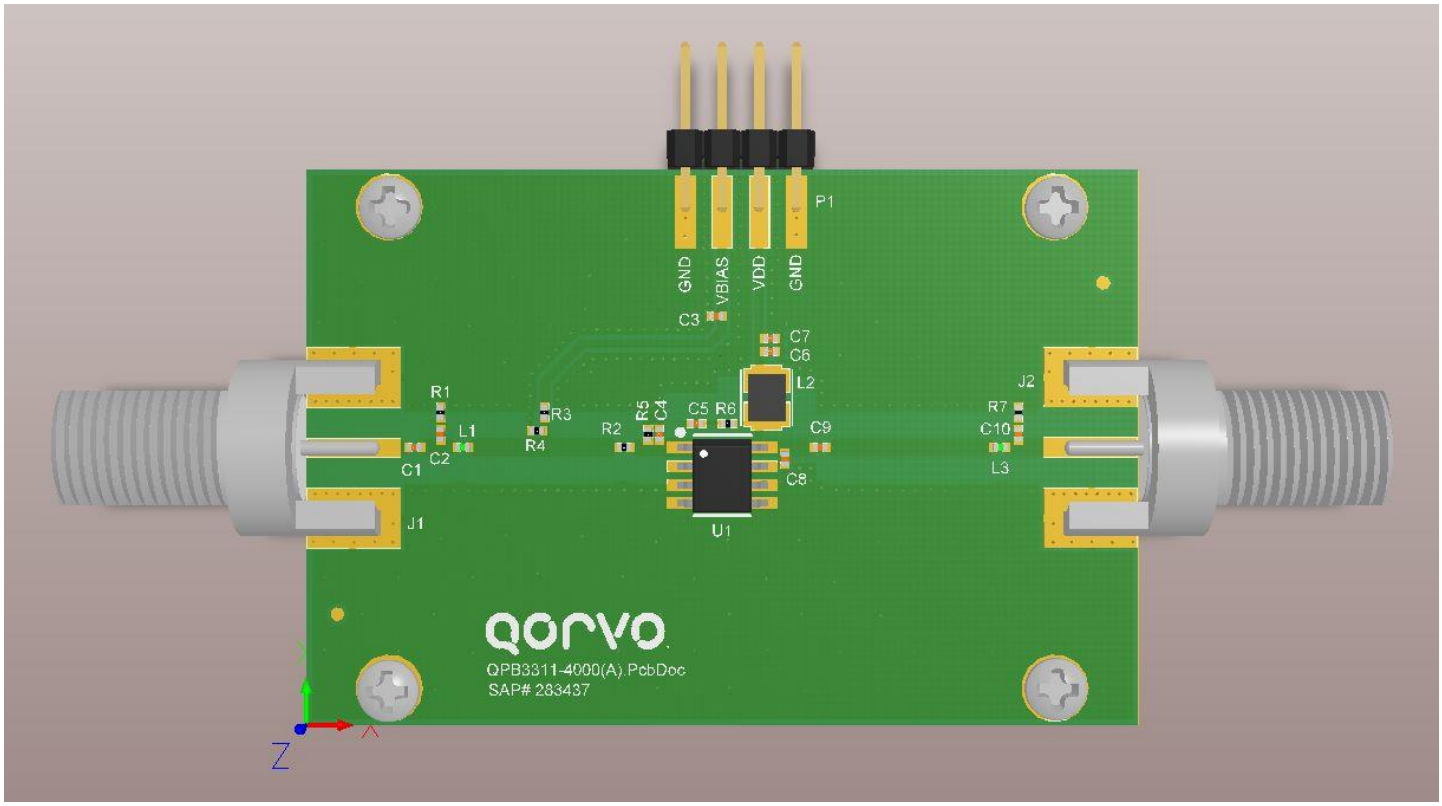
Evaluation Board Schematic 5-210MHz



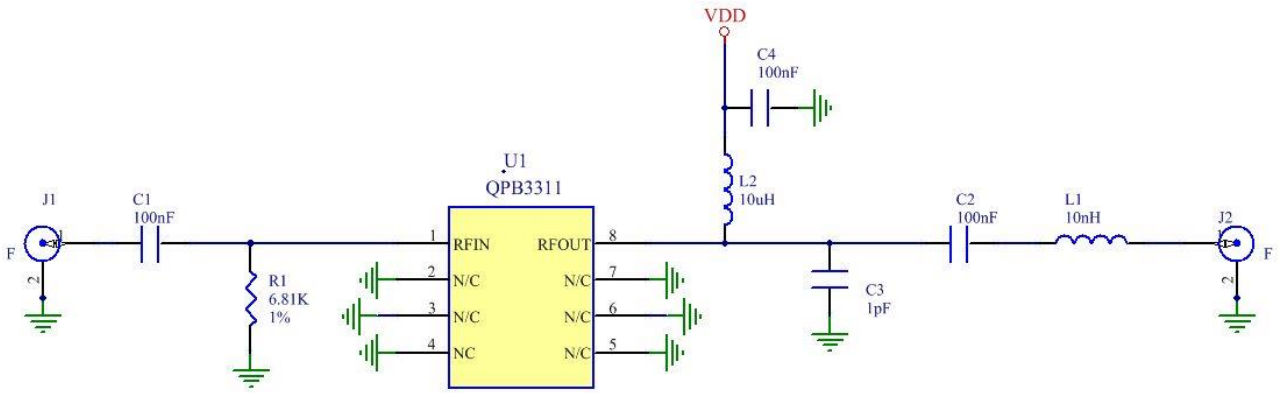
Evaluation Board Bill of Materials

Designator	Description	Manufacturer	Part Number
PCB	QPB3311-4000	DDI	QPB3311-4000(A)
C1, C3, C6, C7, C9	CAP, 0.1uF, 10%, 16V, X7R, 0402	Murata Electronics	GRM155R71C104KA88D
C8	CAP, 1.0pF, ±0.1pF, 50V, NPO, 0402	Murata Electronics	GRM1555C1H1R0BZ01D
J1, J2	CONN, F FEM EDGE MOUNT, 75 OHMS	Millimeter Wave Technologies, LLC	MW-846-C-DD-75
L1, R2	JMPR, 0 OHM, 0402	Panasonic	ERJ-2GE0R00
L2	IND, 10uH, 10%, 500mA, W/W, 1210	Murata	82103C
L3	IND, 10nH, 5%, M/L, 0402	Murata Electronics	LQG15HN10NJ02D
P1	CONN, HDR, ST, FRCTN LOCK, 4-PIN	Molex	22-23-2041
R3	RES, 5.11K, 1%, 1/16W , 0402	Cal-Chip Electronics	RM04F5111CT
R5	RES, 6.81K, 1%, 1/16W, 0402	Panasonic	ERJ-2RKF6811X
U1	15dB High-Linearity MMIC	Qorvo	QPB3311
C2, C4, C5, C10, R1, R4, R6, R7	DNP	N/A	N/A
HS1	Heat Sink 1.5 x 2	Shenzhen Minxingda Automation Equip	211086
S1, S2, S3, S4	Screw, 2-56x3/16:, Socket Head	McMaster-Carr Supply Co.	92196A076

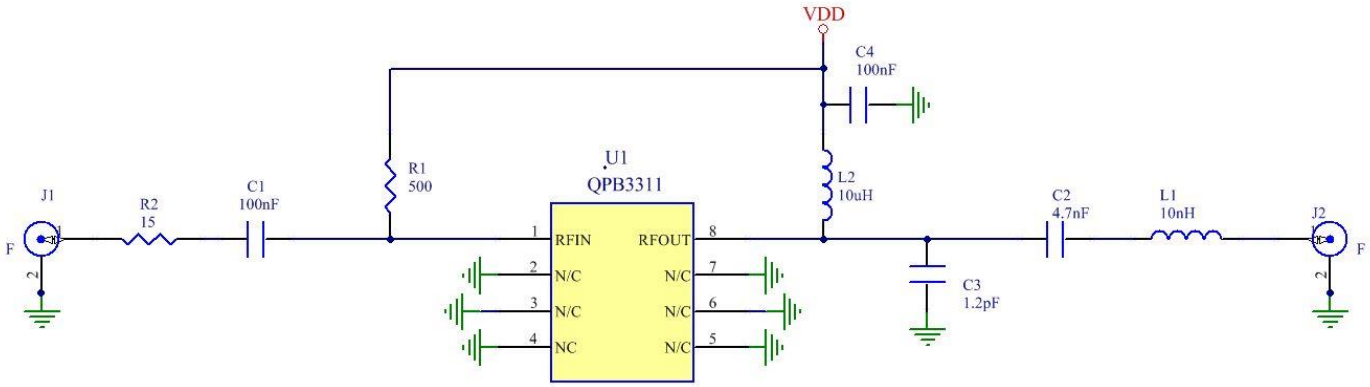
Evaluation Board Assembly Drawing



Typical Application Schematic, 8V



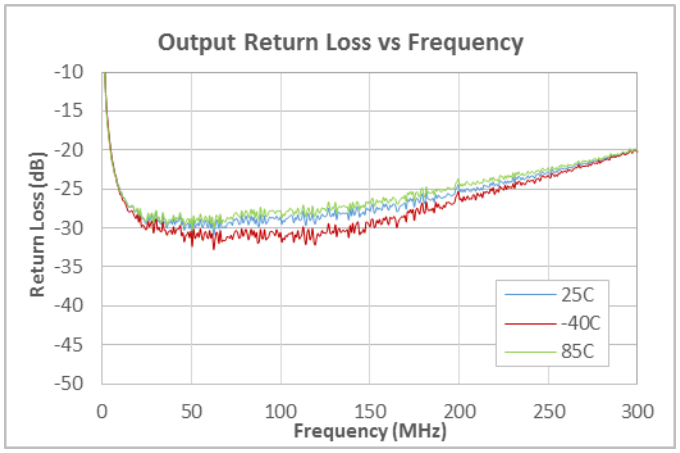
Typical Application Schematic, 5V

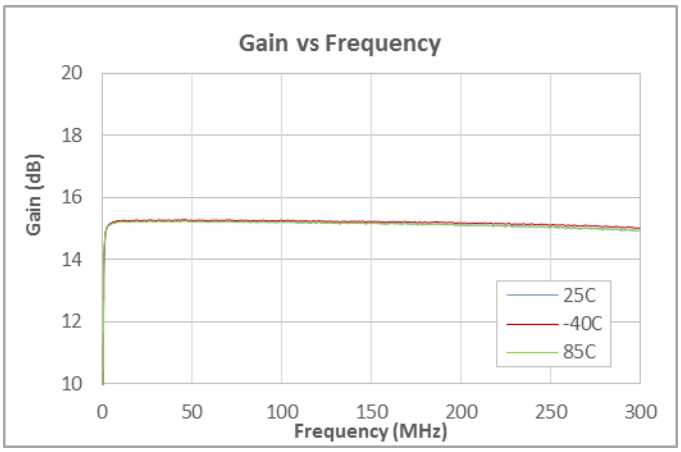


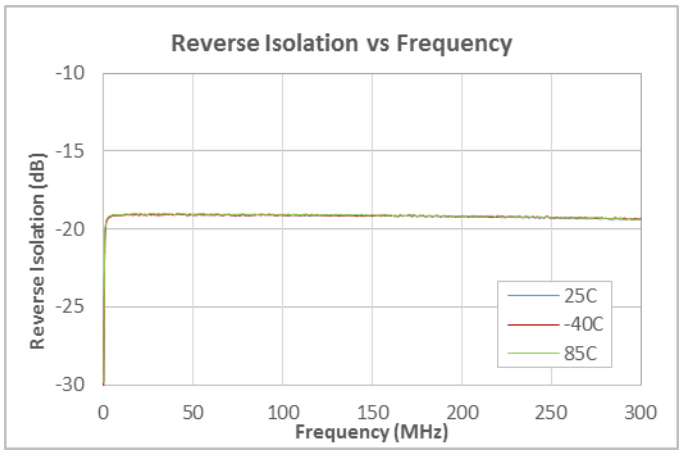
Notes:

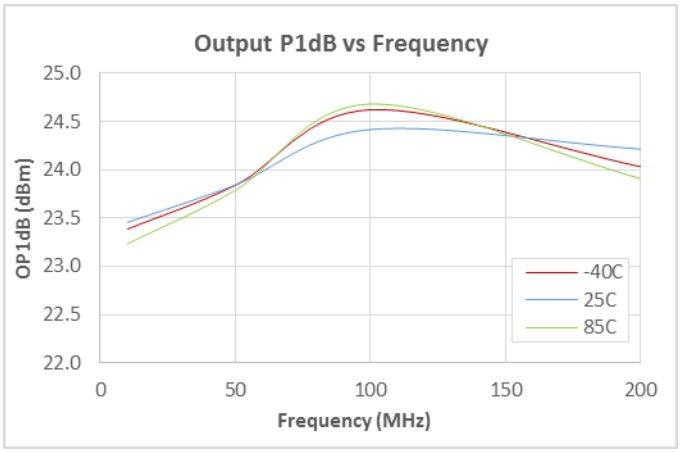
1. R2 can be reduced for improved noise figure (will degrade input return loss).
2. R1 increases bias current to recommended 100mA operating point for improved bias stability versus temperature.

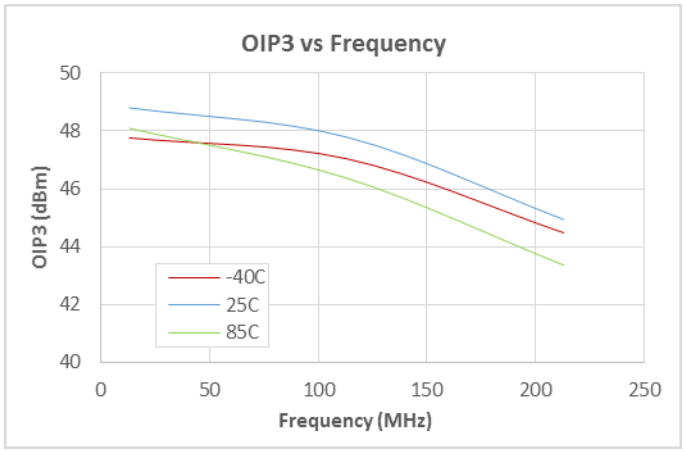
Performance Data – 8V







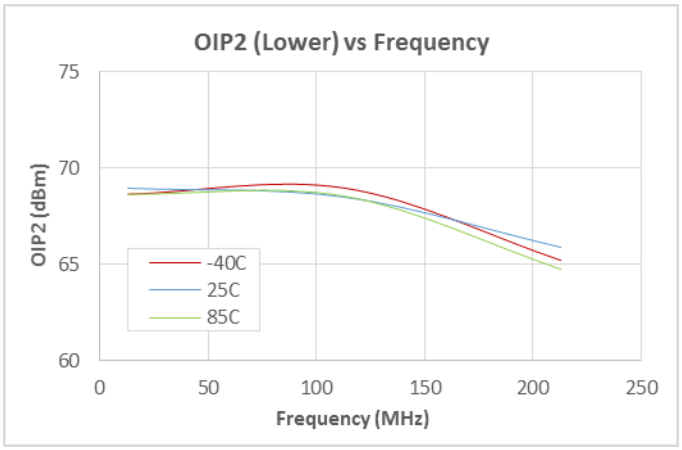


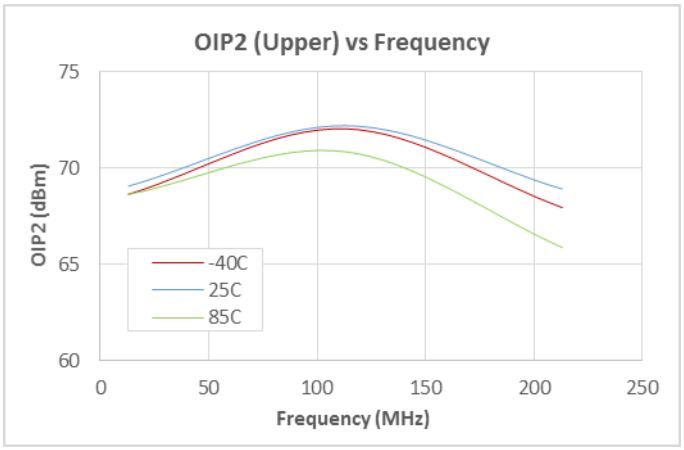


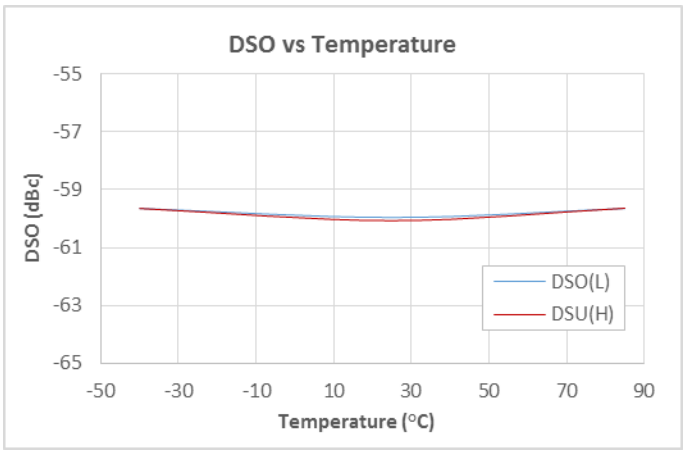
Notes:

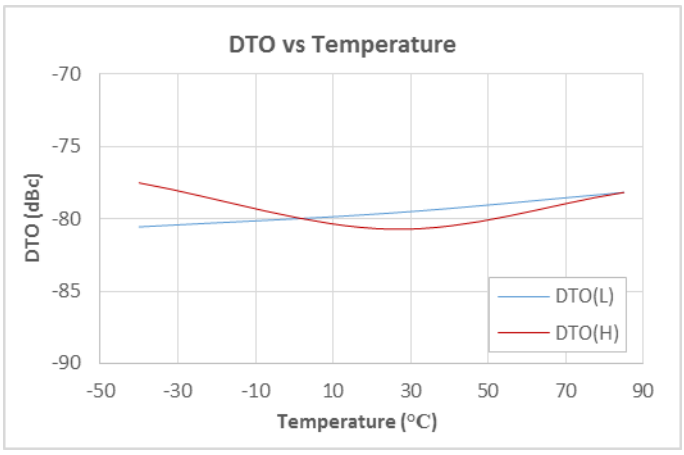
(1) OIP3: 9dBm/tone, F1 = 113MHz, F2 = 119MHz

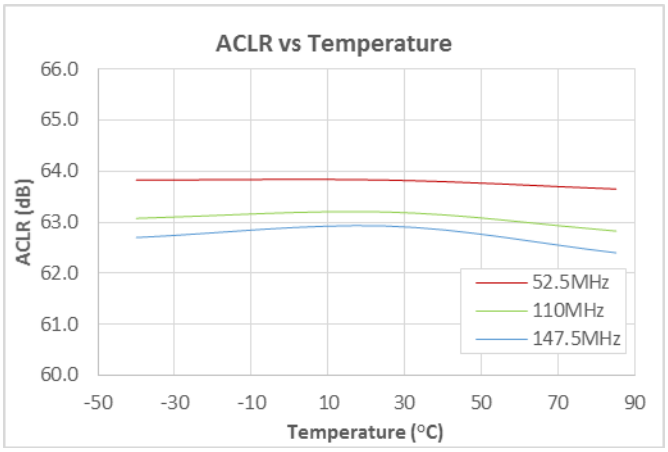
Performance Data – 8V

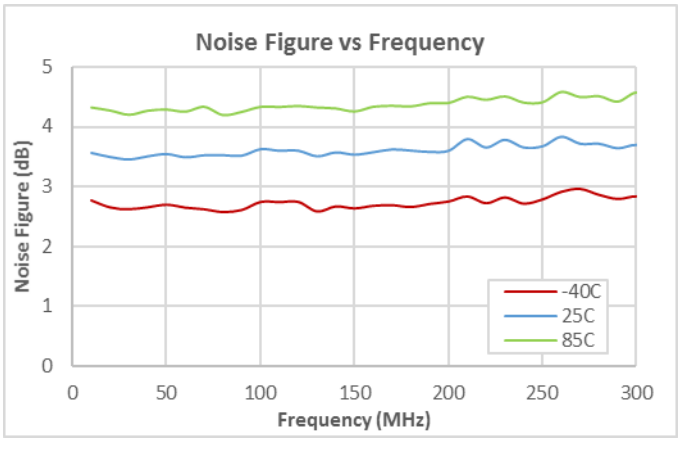












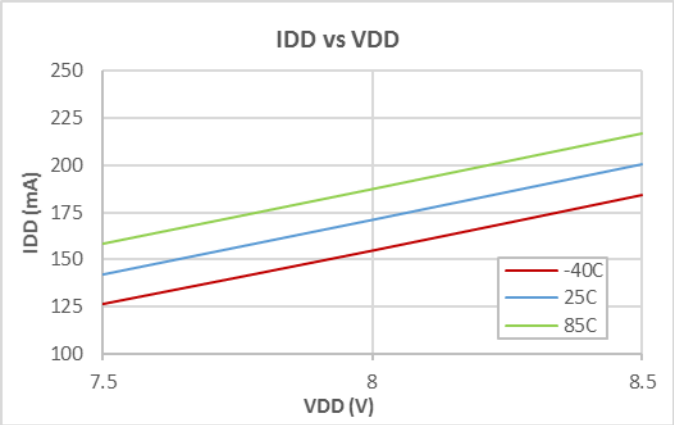
Notes:

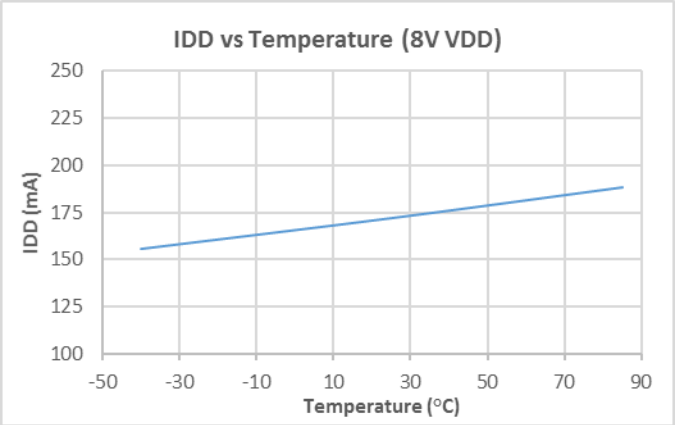
(2) OIP2: 9dBm/tone, F1 = 113MHz, F2 = 119MHz

(3) DSO/DTO: f1=13MHz, f2=19MHz 58dBmV per tone

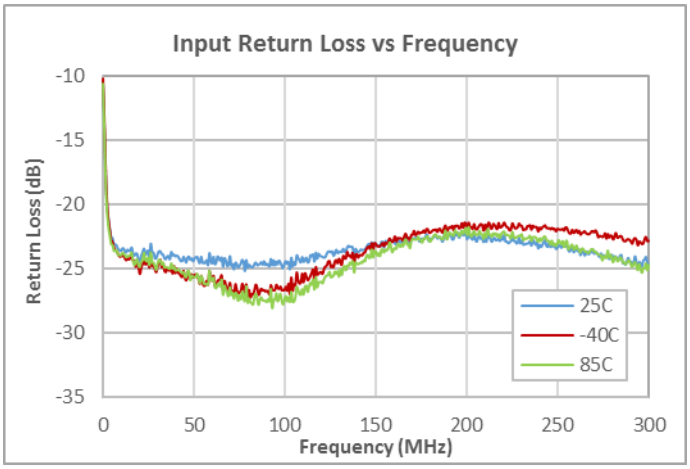
(4) ACLR: Pout = 61dBmV, 5-195MHz OFDM w/ 9.6MHz exclusion band.

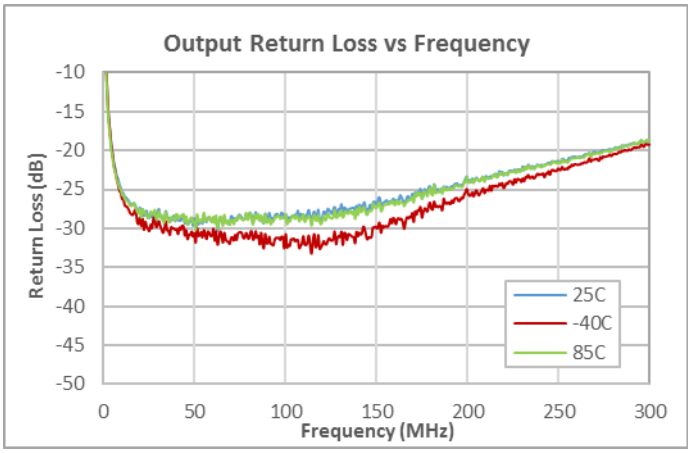
Performance Data – 8V

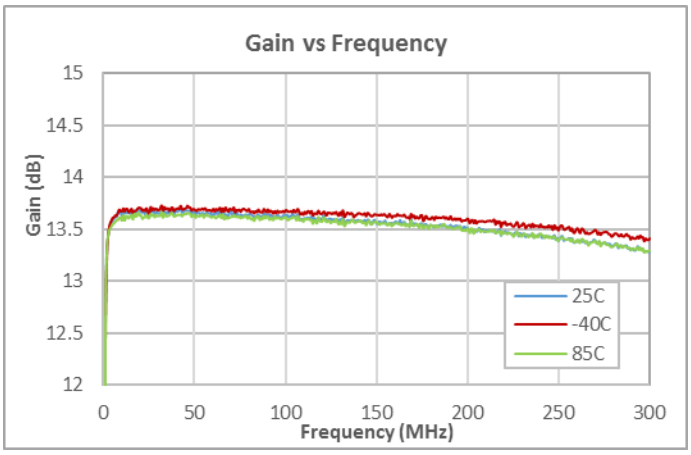


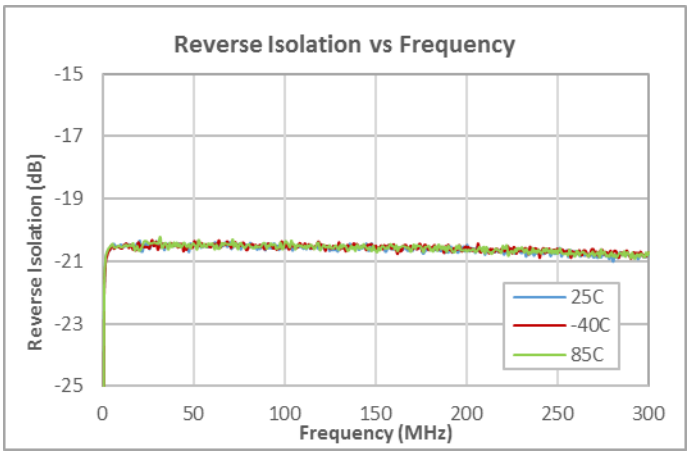


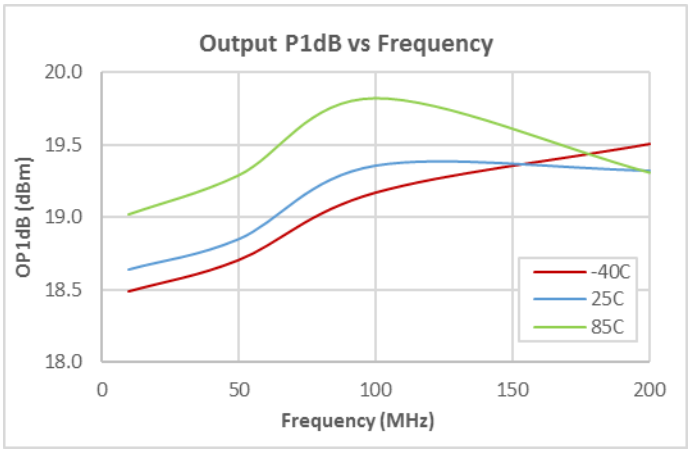
Performance Data – 5V

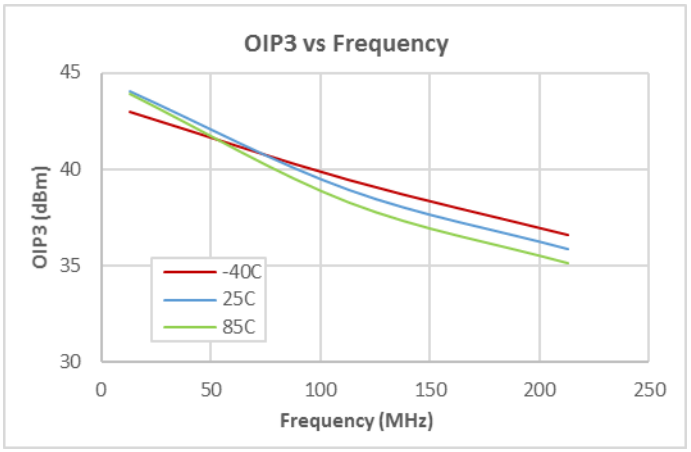








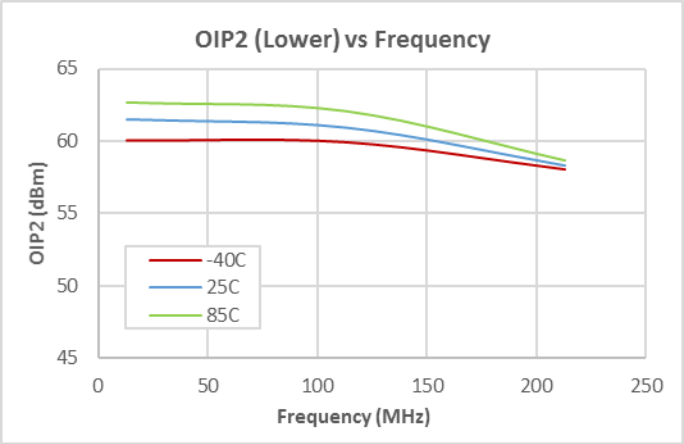


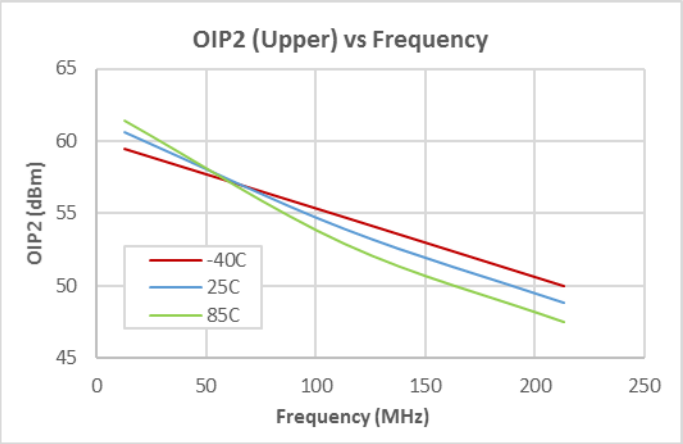


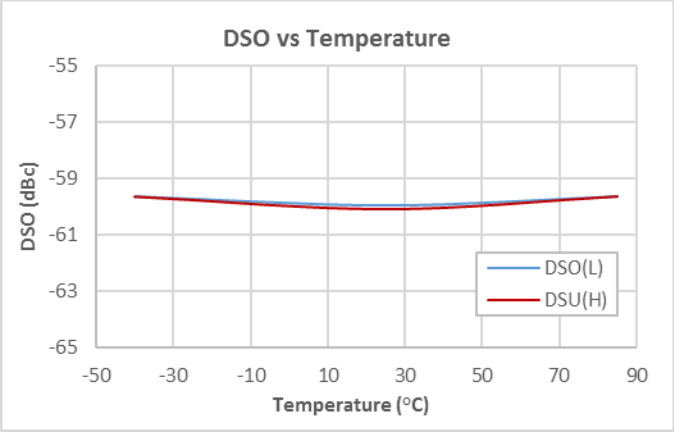
Notes:

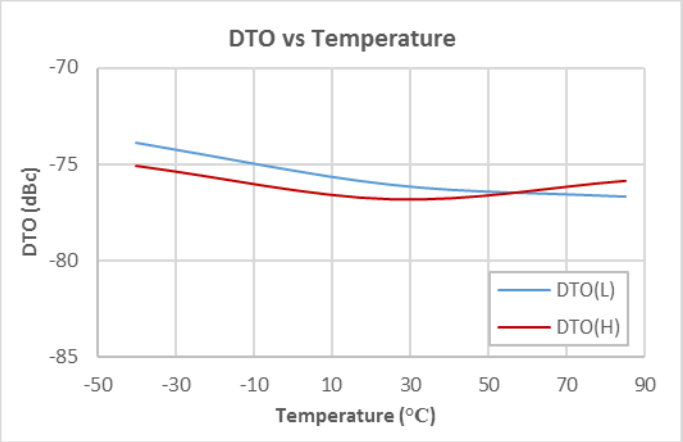
(1) OIP3: 6dBm/tone, F1 = 113MHz, F2 = 119MHz

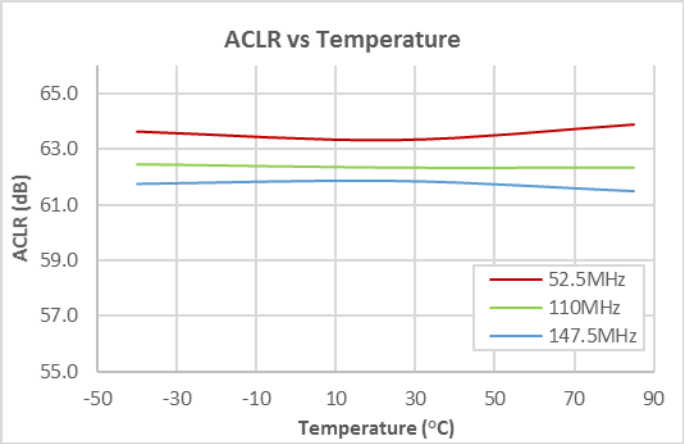
Performance Data – 5V

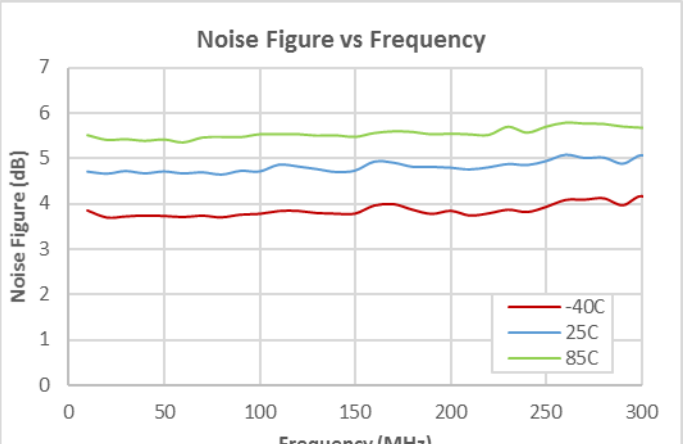












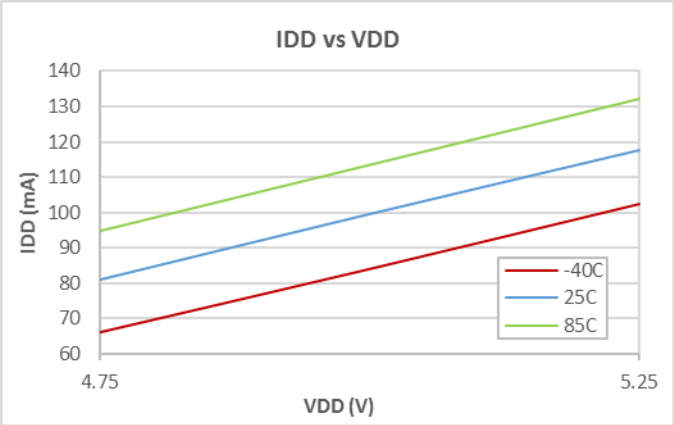
Notes:

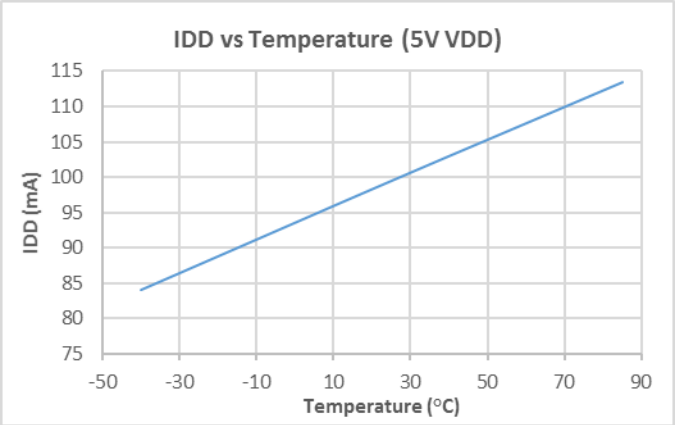
(1) OIP2: 6dBm/tone, F1 = 113MHz, F2 = 119MHz

(2) DSO/DTO: f1=13MHz, f2=19MHz 55dBmV per tone

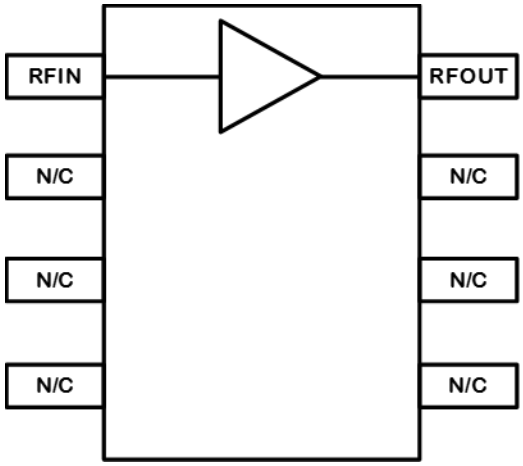
(3) ACLR: Pout = 53dBmV, 5-195MHz OFDM w/ 9.6MHz exclusion band.

Performance Data – 5V





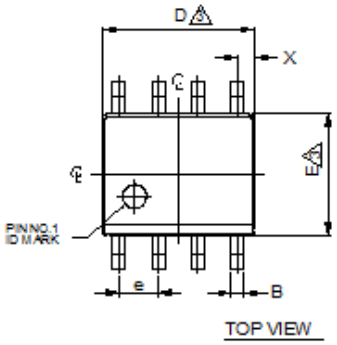
Pad Configuration and Description



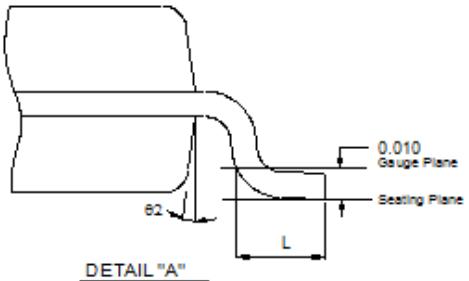
Top View

Pad No.	Label	Description
1	RFIN	RF Input, 75Ω
2	N/C	Internally Not Connected
3	N/C	Internally Not Connected
4	N/C	Internally Not Connected
5	N/C	Internally Not Connected
6	N/C	Internally Not Connected
7	N/C	Internally Not Connected
8	RFOUT	RF Output, 75Ω
Backside Paddle	GND	Ground. Use recommended via pattern to minimize inductance and thermal resistance. See PCB Mounting Pattern for suggested footprint.

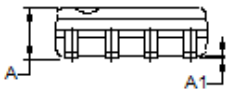
Package Outline

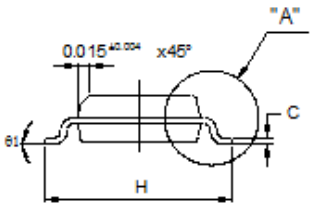


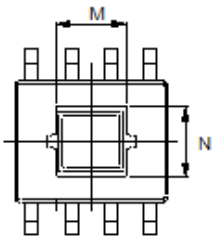
TOP VIEW



DETAIL "A"







BOTTOM VIEW

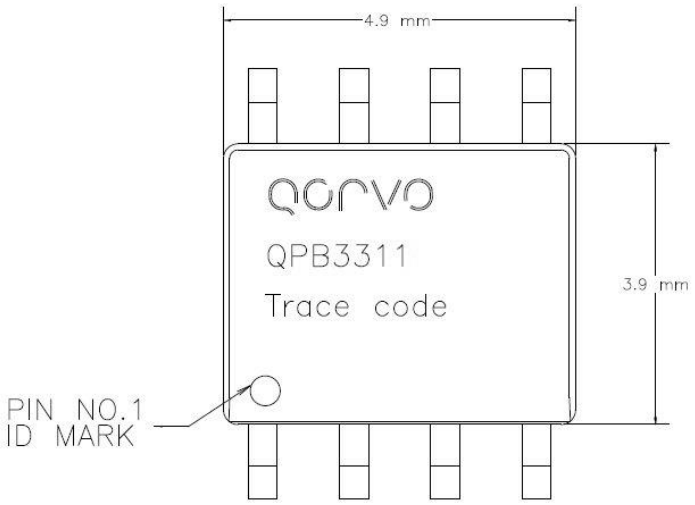
EXPOSED PADDLE

SYMBOL	8 SOIC	
	MIN	MAX
A	0.054	0.068
A1	0.001	0.004
B	0.014	0.019
D	0.189	0.196
E	0.150	0.157
H	0.229	0.244
M	0.087	0.097
N	0.082	0.092
e	0.050 BSC	
C	0.0075	0.0098
L	0.020	0.040
X	0.0215 REF	
θ1	0°	8°
θ2	7° BSC	

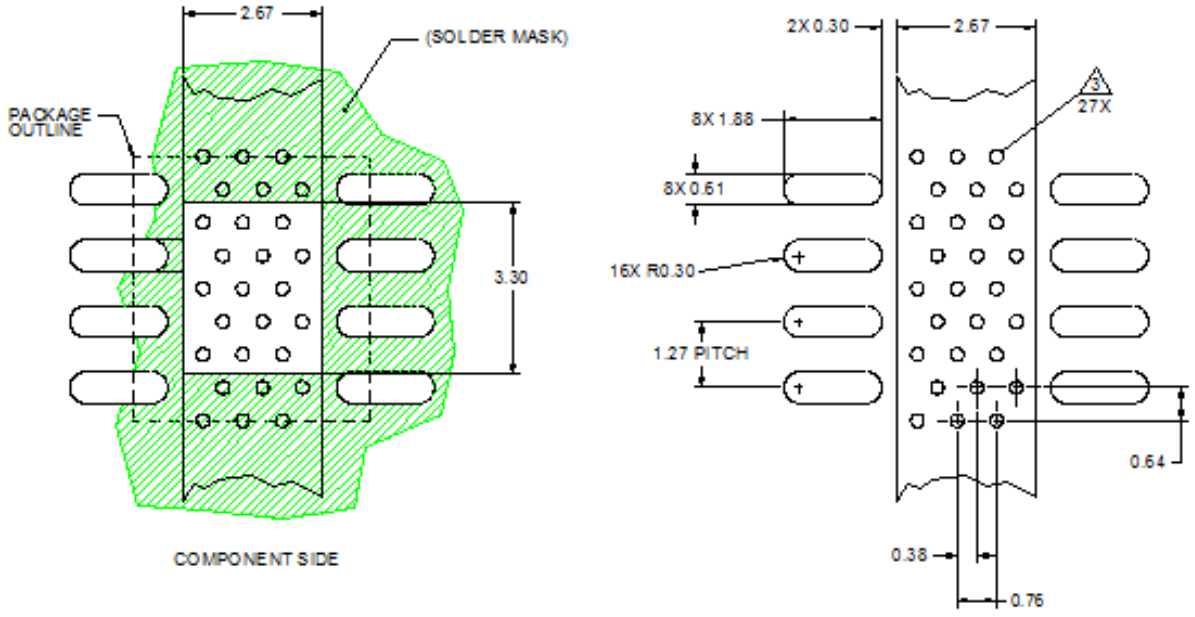
NOTE:
1. TOP PACKAGE SURFACE TO BE Ni, Pd, Au PLATING
2. BOTTOM PACKAGE SURFACE TO BE Ni. Pd. Au PLATING
3. DIMENSION ARE EXCLUSIVE MOLD FLASH AND GATE BURR.
4. FOOT LENGTH MEASURING IS BASED ON THE GAUGE PLANE METHOD.

Notes:
1. Dimensions in millimeters

Package Marking



Recommended Mounting Pattern



Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1oz. copper minimum for top and bottom layers
3. Vias are required under the backside paddle for proper RF/DC grounding and thermal dissipation. We recommend a 0.35mm (#80/0.135”) diameter bit for drilling via holes and a final plated through diameter of 0.25mm (0.010”).
4. Ensure good backside paddle solder attach for reliable operation and best electrical performance.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	1B	ESDA / JEDEC JS-001-2012
ESD – Charged Device Model (CDM)	C3	JEDEC JESD22-C101F
MSL – Moisture Sensitivity Level	MSL3	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: NiPdAu

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.

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:

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

Web: www.qorvo.com

Email: customer.support@qorvo.com

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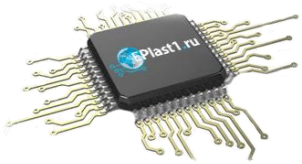
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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