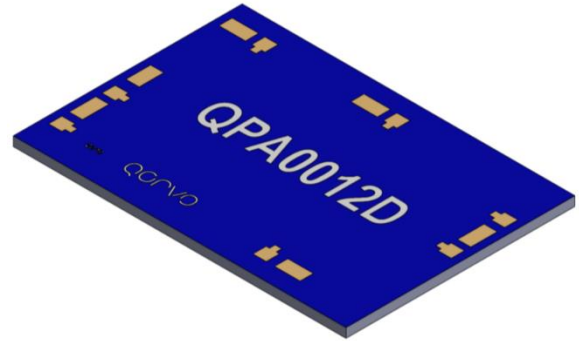
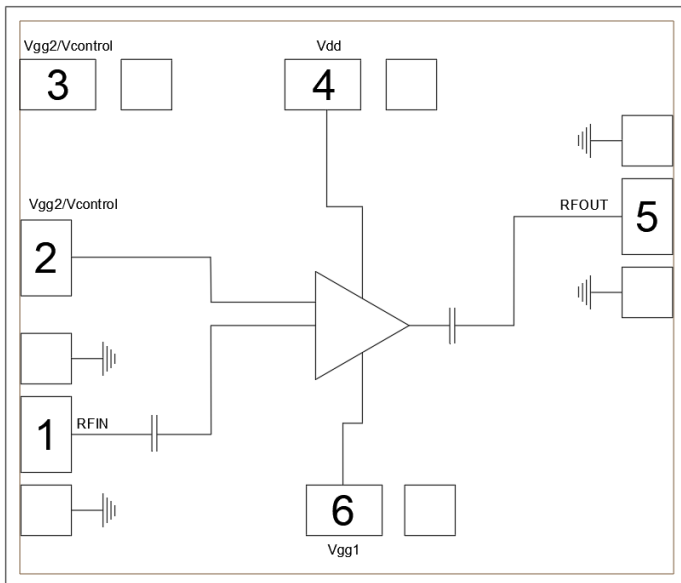


Product Overview

Qorvo's QPA0012D is a broadband MMIC low noise distributed amplifier with AGC via the control gate. The LNA in die form operates over the 2 to 22 GHz bandwidth. The QPA0012D is ideally suited for EW and communications systems where small size and low power consumption are needed. The broadband device delivers 11 dB of flat gain with a corresponding output 1 dB compression point of +18 dBm and a noise figure of 3 dB. The QPA0012D is a 50 Ohm matched design incorporating on chip dc bias choke and blocking capacitors. The QPA0012D amplifier is the perfect alternative to costly hybrid amplifiers.



Functional Block Diagram



Key Features

- Wide bandwidth
- Low noise
- High gain
- High linearity
- Adjustable gain control (AGC)
- TGA1342-SCC replacement
- On chip bias choke and blocking capacitors
- Small die size

Performance is typical across frequency. Please reference electrical specification table and data plots for more details.

Applications

- EW systems
- Communications systems
- Low noise receiver systems

Ordering Information

Part No.	Description
QPA0012D	50 pcs gel pack

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	10 V
Gate Voltage, Vgg1	-2.5 V to 0 V
Gate Voltage/Vcontrol, Vgg2	5 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	1480 mW
Operating Temperature	-55 to 85 °C
Storage Temperature	-55 to 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.

Recommended Operating Conditions

Parameter	Min	Typ.	Max	Units
Vdd	3	6	9	V
Idd		60		mA
Vgg1		-0.5		V
Temperature Range	-55	+25	+85	°C

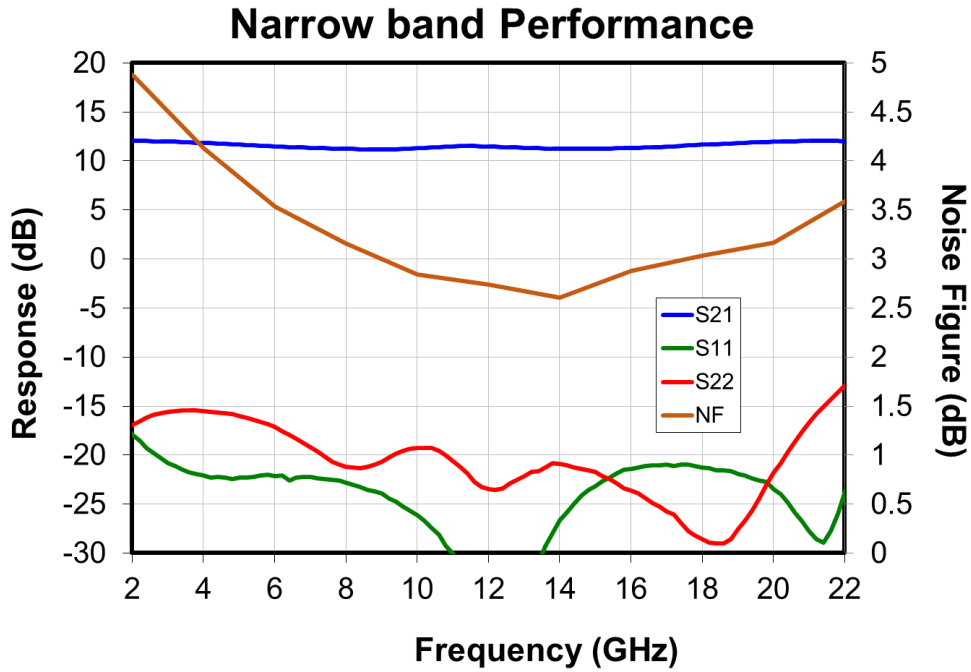
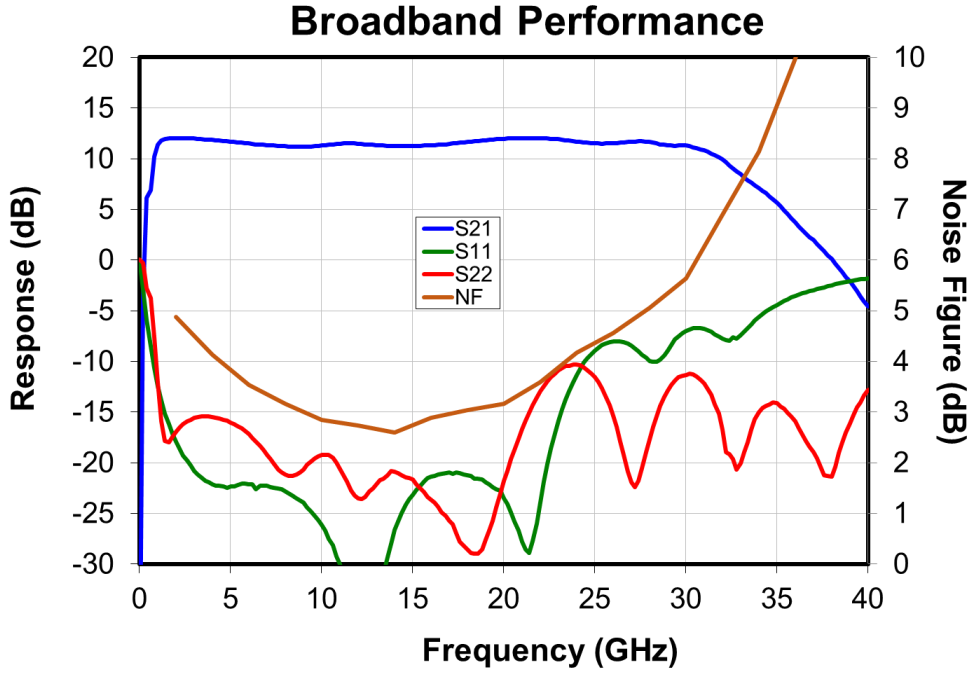
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

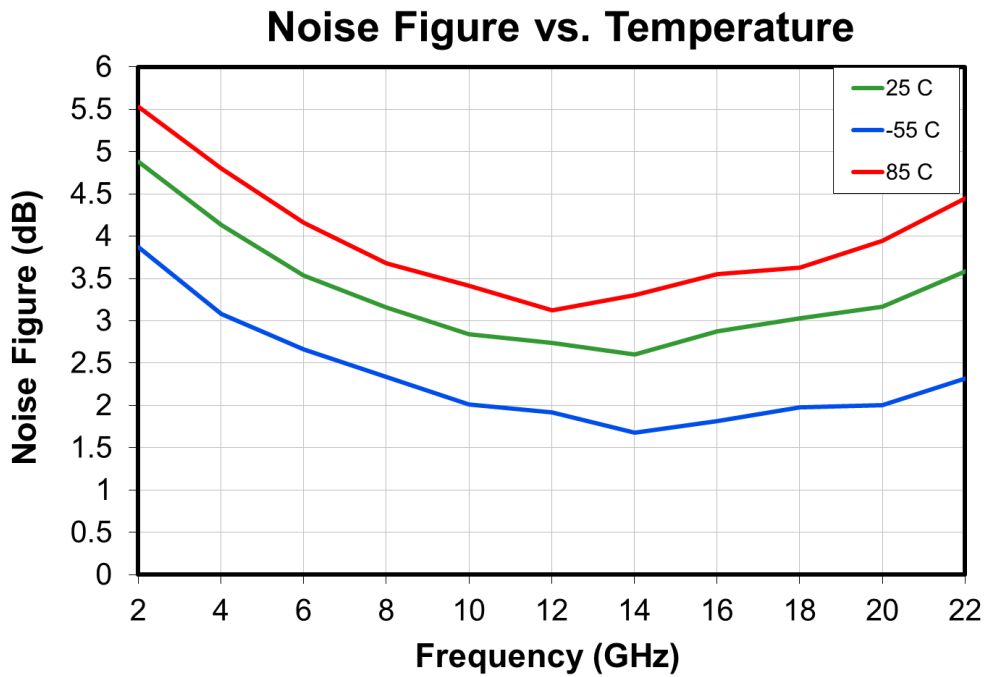
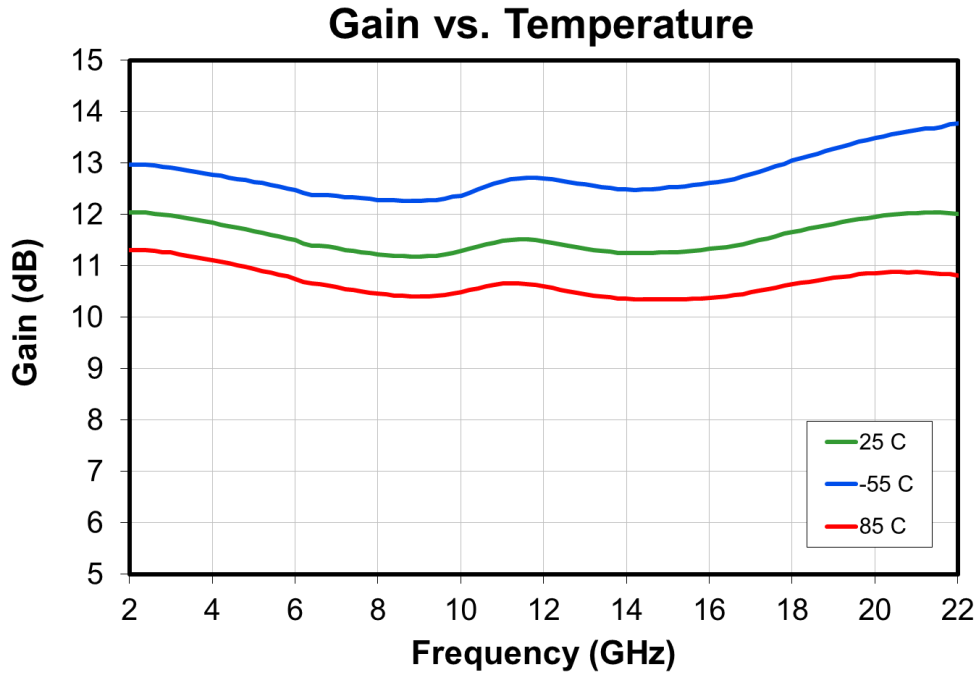
Test conditions unless otherwise noted: $V_{dd} = 6\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$,

Parameter	Min	Typ.	Max	Units
RF Operational Frequency Range	2	–	22	GHz
Gain		11		dB
Noise Figure		3		dB
Input Return Loss		20		dB
Output Return Loss		18		dB
Output Power (P_{1dB})		18		dBm
Output Power (P_{sat})		21		dBm
Output IP3		26		dBm
Supply Current		60		mA
Gain Temperature Coefficient		0.012		dB/ $^\circ\text{C}$
Noise Figure Temperature Coefficient		0.011		dB/ $^\circ\text{C}$

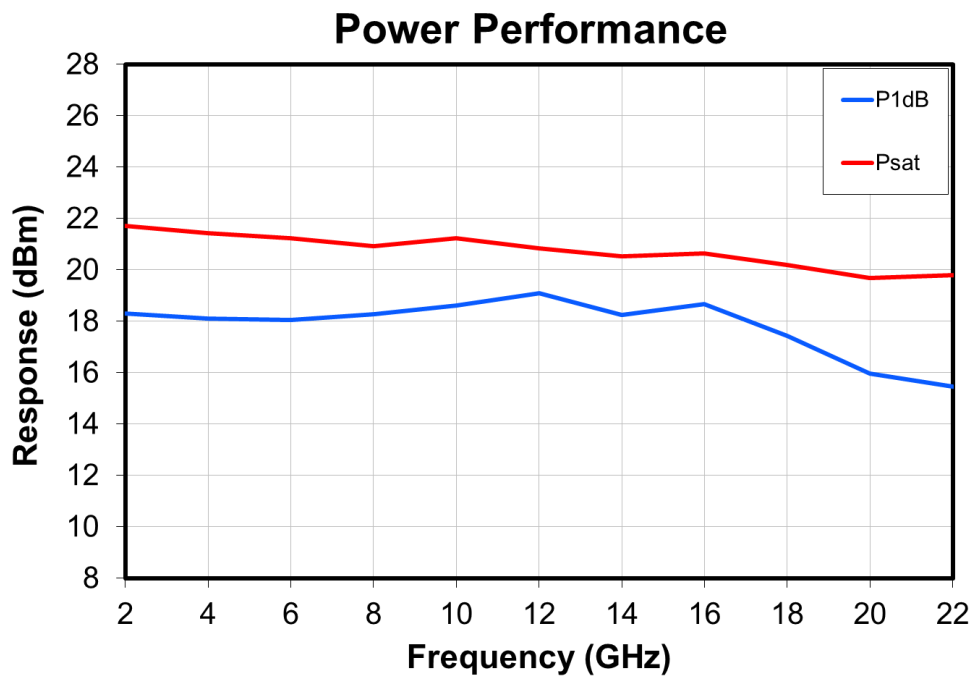
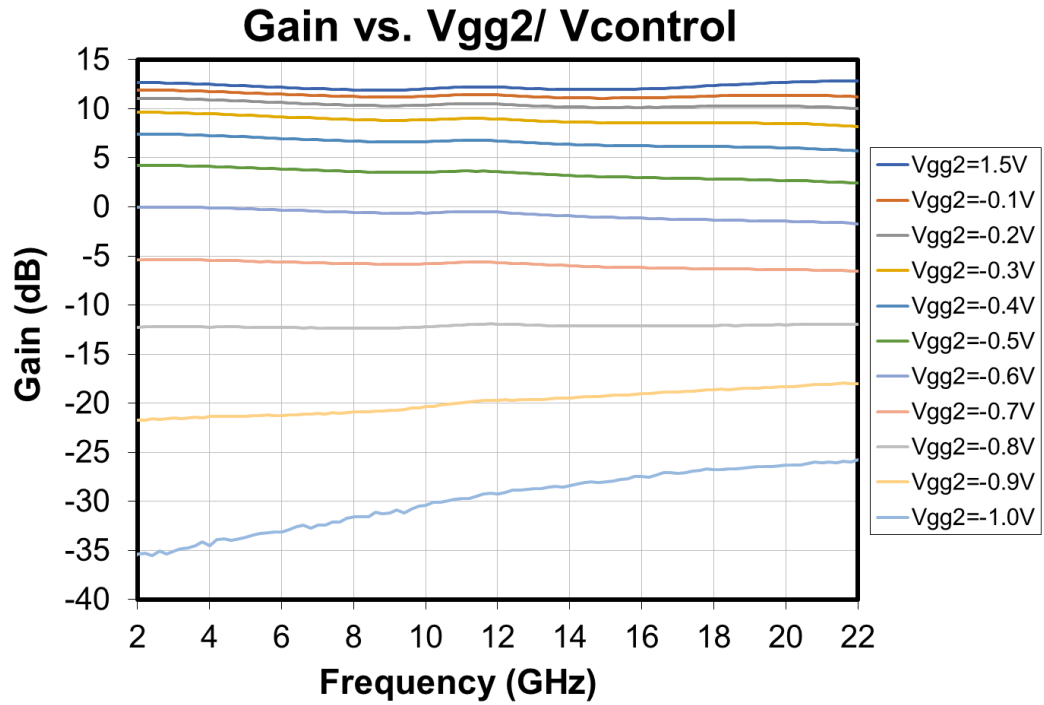
Typical Performance – V_{dd}=6 V, I_{dd}=60 mA, T_A = 25 °C



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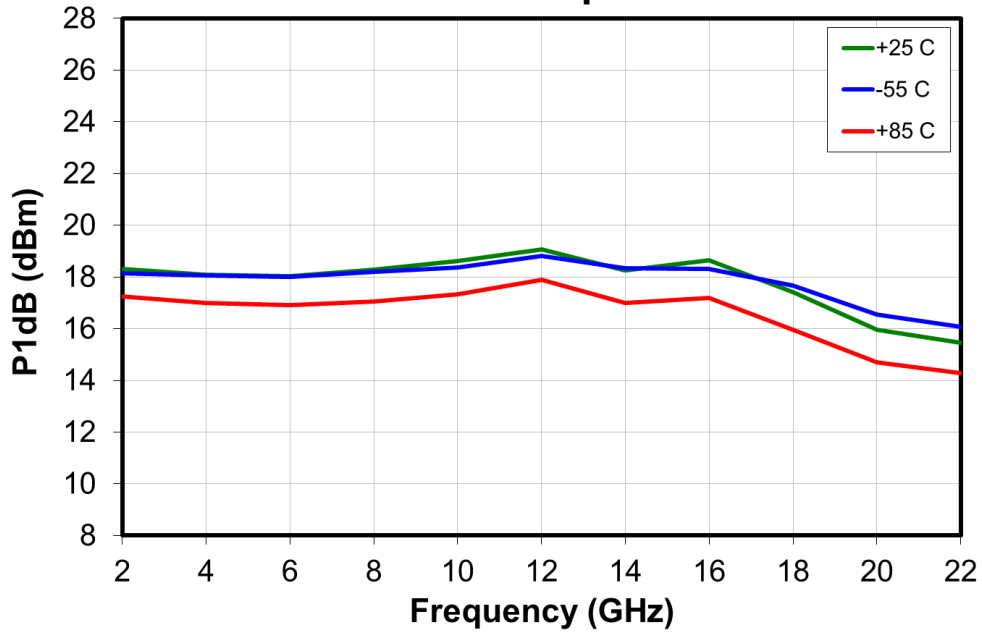


Typical Performance – Vdd=6 V, Idd=60 mA, TA = 25 °C

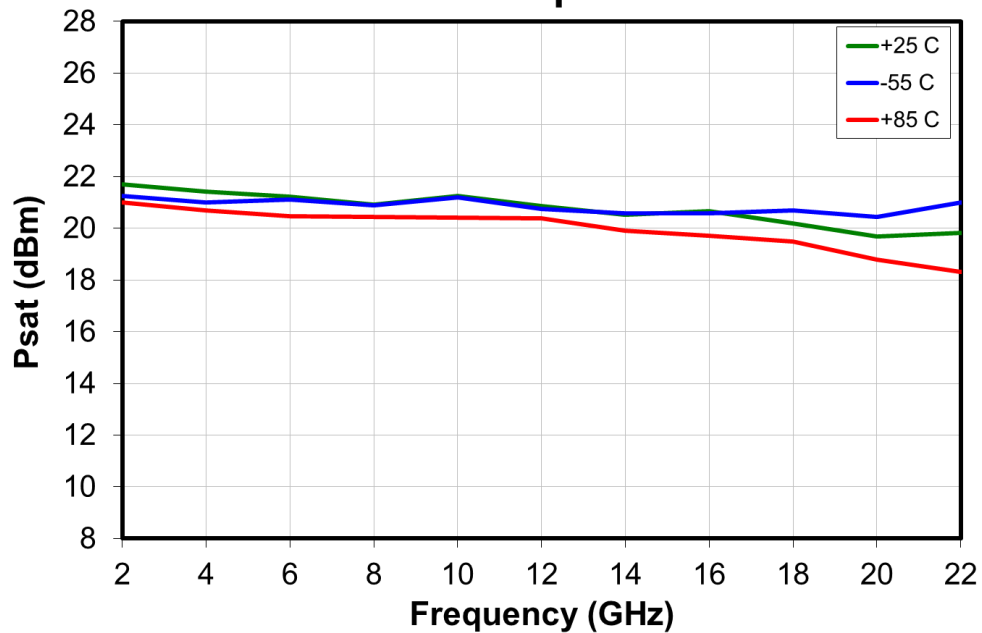


Typical Performance – V_{dd}=6 V, I_{dd}=60 mA, T_A=25 °C

P1dB vs. Temperature

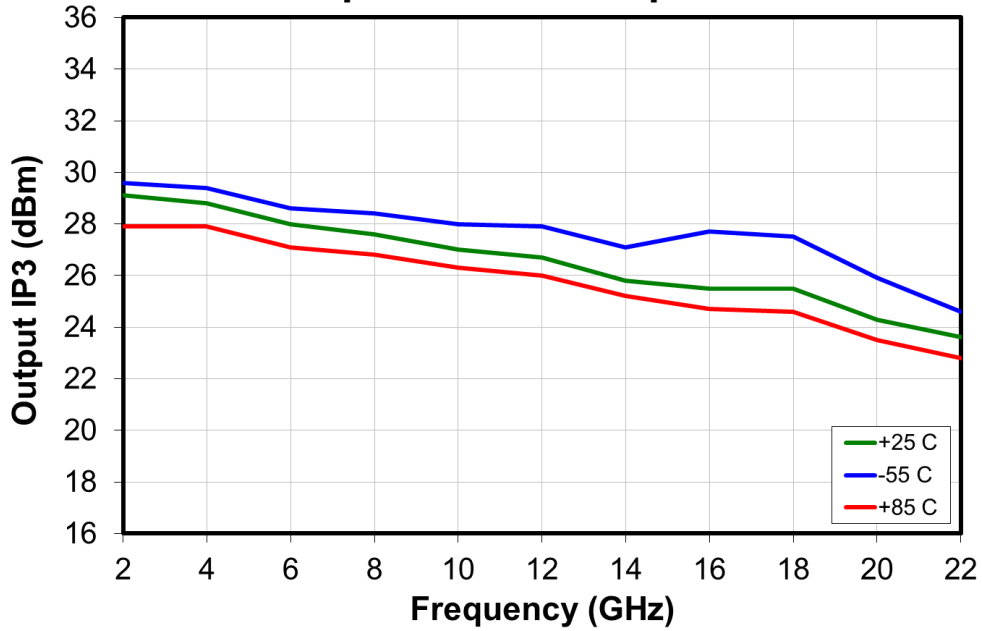


Psat vs. Temperature

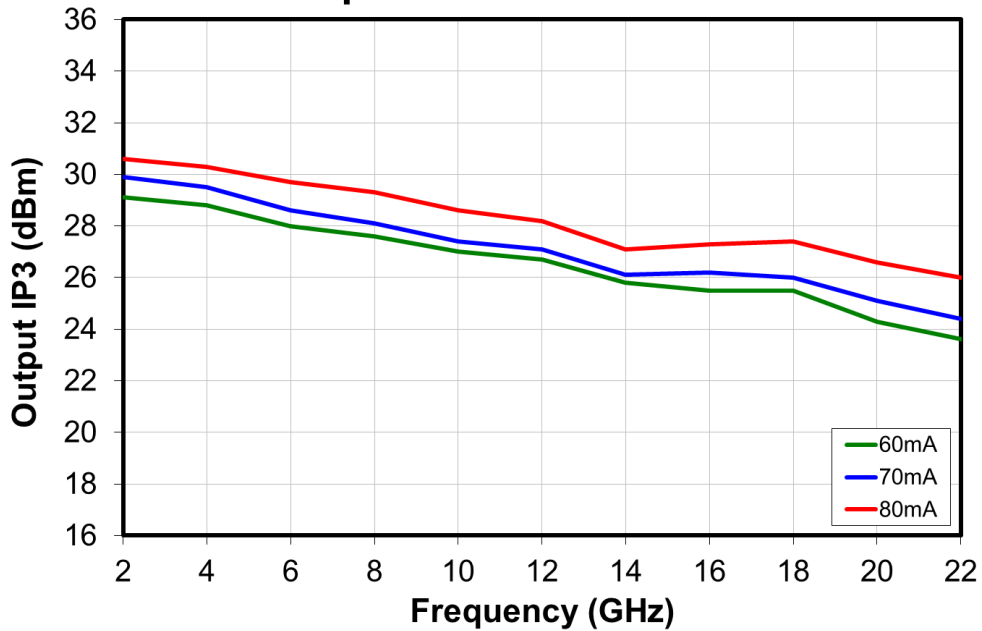


Typical Performance – V_{dd}=6 V, I_{dd}=60 mA, T_A=25 °C

Output IP3 vs. Temperature



Output IP3 vs. Drain Current



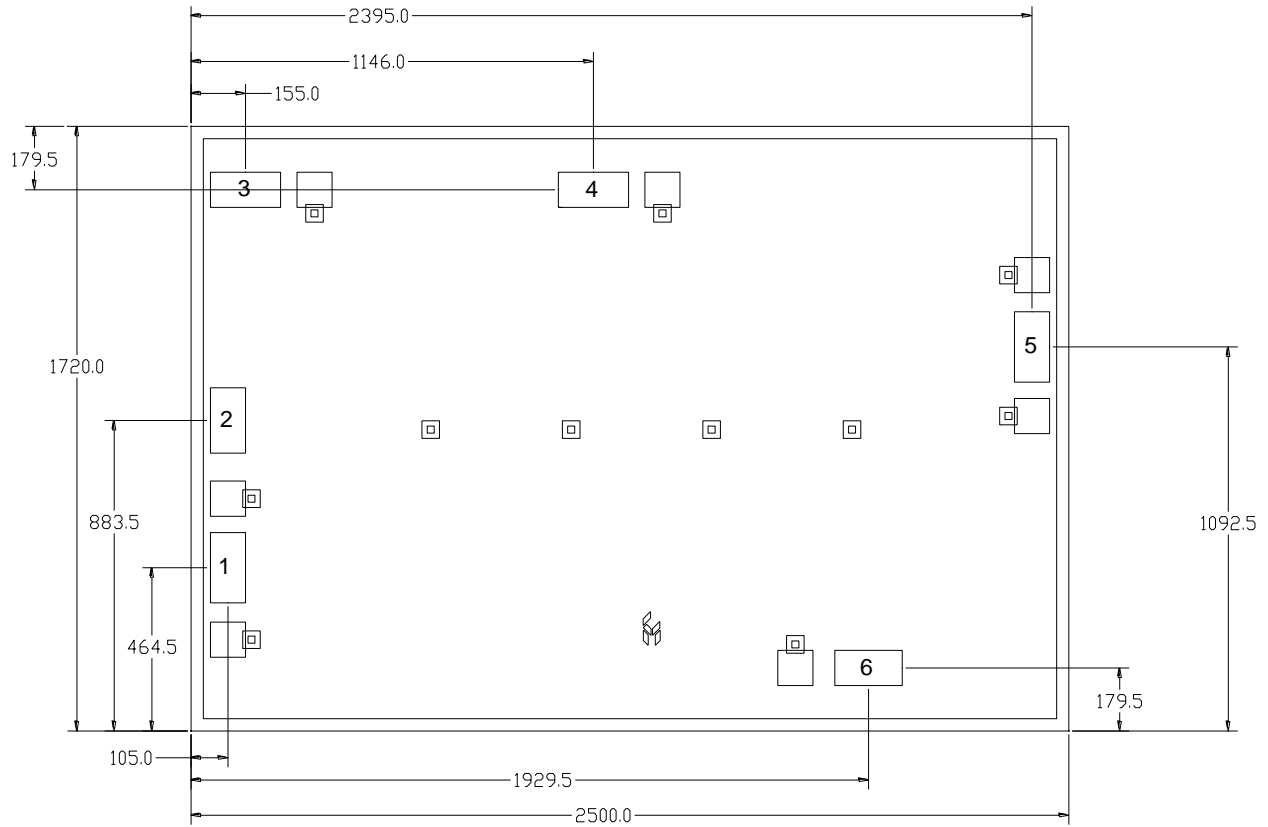
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85\text{ }^{\circ}\text{C}$, CW $P_{DISS} = 0.33\text{ W}$	43.9	$^{\circ}\text{C/W}$
Channel Temperature (T_{CH}) ⁽¹⁾		99.5	$^{\circ}\text{C}$
Median Lifetime (T_M)		3.78E7	Hrs

Notes:

1. Measured to the back of the die.

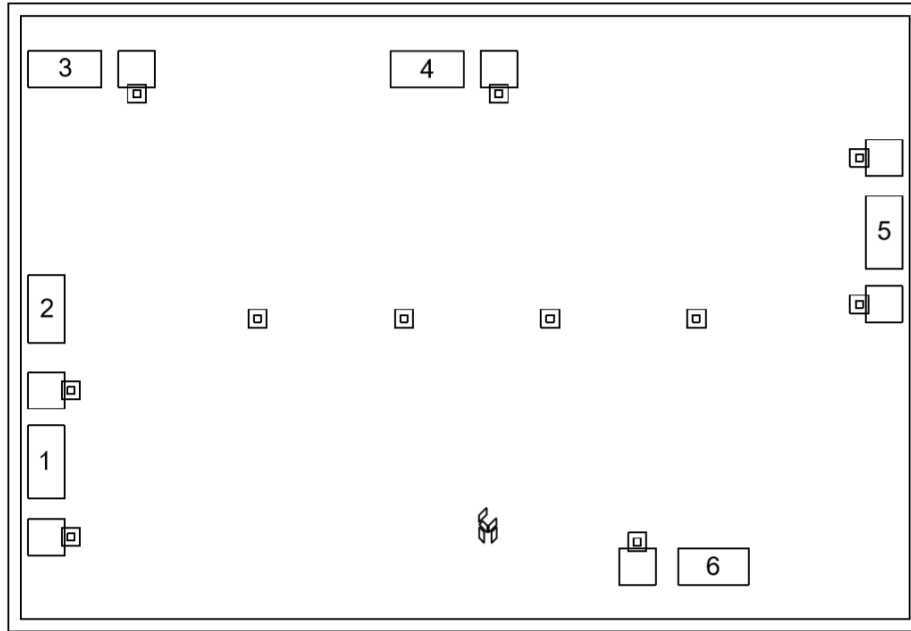
Mechanical Information



Notes:

1. All dimensions in microns.
2. No connection required for unlabeled grounds
3. Backside is RF and DC ground.
4. Backside and bond pad metal: Gold.
5. Die is 70 um thick.
6. Bond pads (1), (2), (3), (4), (5) and (6) are 150 x 100 um,.

Pin Diagram



Bond Pad Description

Pad No.	Symbol	Pad Size (um)	Description
1	RF in	100 x 150	This pin is AC coupled and matched to 50 Ohms.
2	Vgg2/Vcontrol	100 x 150	Vgate 2 and gain control pin. Leave open for no gain control.
3	Vgg2/Vcontrol	100 x 150	As pin 2 but access from top side of chip.
4	Vdd	100 x 100	Power supply voltage. Decoupling and bypass capacitors required.
5	RF out	100 x 150	This pin is AC coupled and matched to 50 Ohms.
6	Vgg1	100 x 150	Vgg1 set the bias current of amplifier.
Backside	Ground		Connect to RF / DC ground.

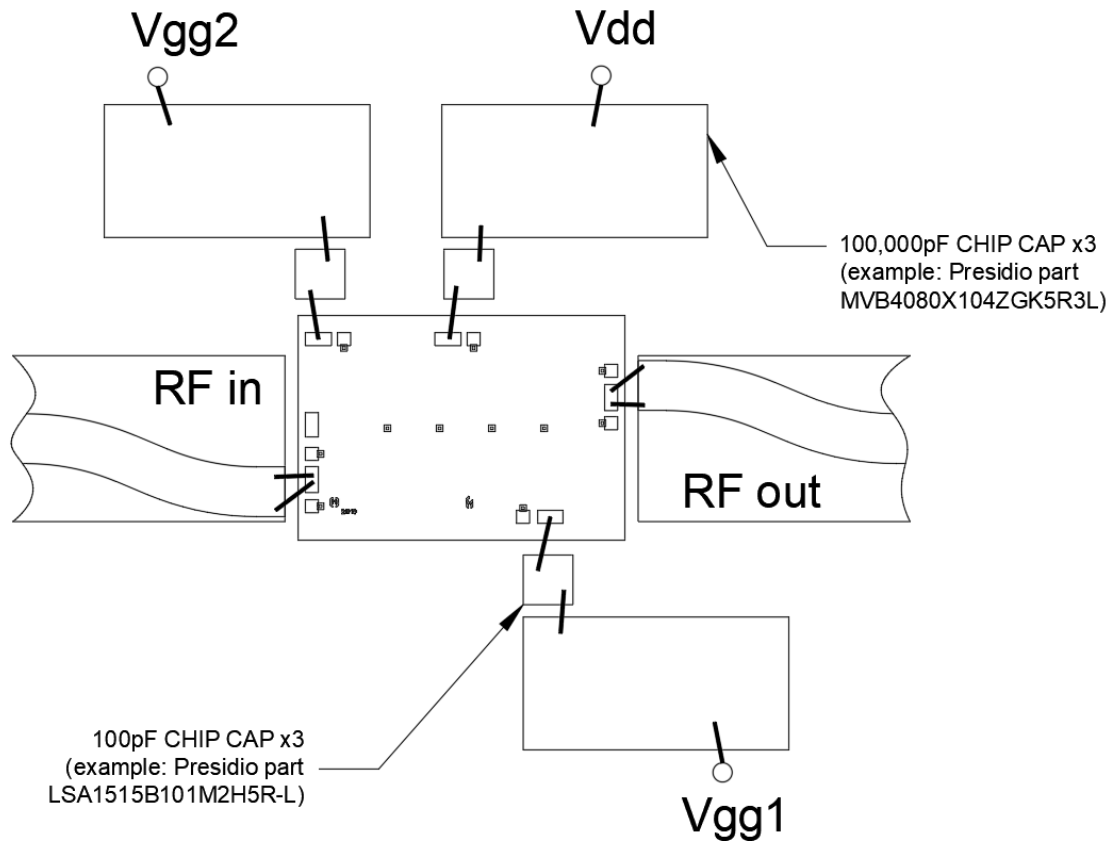
Assembly Guidelines

The backside of the QPA0012D is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy only. Eutectic attach is not recommended. Standard assembly procedures should be followed for high frequency devices. The top surface of the semiconductor should be made planar to the adjacent RF transmission lines.

RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 0.8 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized.

The semiconductor is 70 μm thick and should be handled by the sides of the die or with a custom collet. Do not make contact directly with the die surface as this will damage the monolithic circuitry. Handle with care.

Assembly Diagram



Bias and Operation

The QPA0012D is biased with a positive drain supply and a negative gate supply. Performance is optimized when the drain voltage (Vdd) is set to +6 V. The nominal gate voltage (Vgg) is -0.5 V.

Turn ON procedure:

1. Apply gate voltage Vgg1 and set to -2 V
2. Apply drain voltage Vdd and set to +6 V
3. Increase Vgg1 (less negative) to achieve a drain current of 60 mA

Turn OFF procedure:

1. Turn off drain voltage Vdd
2. Turn off gate voltage Vgg1

RF power can be applied at any time.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1A	ESDA / JEDEC JS-001-2012
MSL – Convection Reflow 235 °C	N/A	JEDEC standard IPC/JEDEC J-STD-020



Caution!
ESD-Sensitive Device

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 (C₁₅H₁₂Br₄O₂) 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

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