QPD2060D

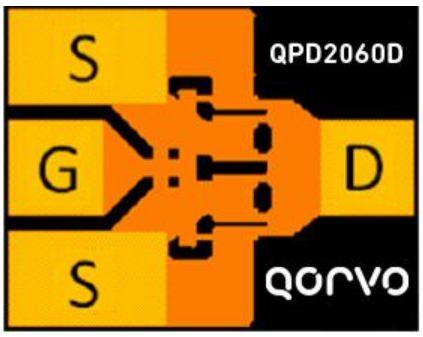
600 um Discrete GaAs pHEMT

Product Overview

The Qorvo QPD2060D is a discrete 600 micron pHEMT which operates from DC to 20 GHz. The QPD2060D is fabricated using Qorvo's proven standard 0.25 um power pHEMT production process. This process features advanced techniques to optimize microwave power and efficiency at high drain bias operating conditions.

The QPD2060D typically provides 28 dBm of output power at P1dB with gain of 12 dB and 55% power-added efficiency at 1 dB compression. This performance makes the QPD2060D appropriate for high efficiency applications. The protective overcoat layer with silicon nitride provides a level of environmental robustness and scratch protection.

The QPD2060D is lead-free and RoHS compliant.



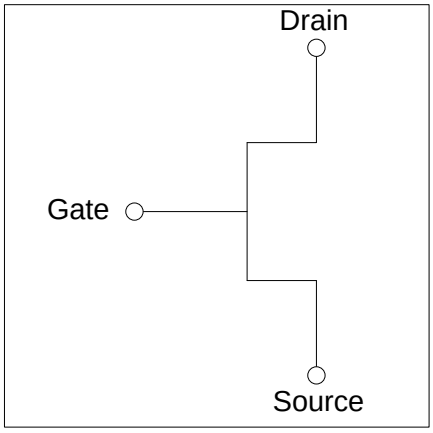
Key Features

- Frequency: DC – 20 GHz
- Output Power (P_{1dB})[1]: 28 dBm
- Typical Gain[1]: 12 dB
- Typical PAE_{1dB}[1]: 55%
- Noise Figure[1]: 1.4 dB
- No Vias
- Technology: 0.25 um GaAs pHEMT
- Chip Dimensions: 0.41 x 0.34 x 0.10 mm

Notes:

1. @ 12 GHz

Functional Block Diagram



Pad Dimensions	Terminal
71 um x 71 um	Gate
71 um x 71 um	Drain
113.8 um x 71 um	Source

Applications

- Defense and Aerospace
- High-Reliability
- Test and Measurement
- Commercial
- Broadband Wireless

Ordering Information

Part Number	Description
QPD2060D	600 um GaAs pHEMT

Absolute Maximum Ratings[1]

Parameter	Absolute	Continuous	Units
Drain-Source Voltage (V_{DS})[2]	12	8	V
Gate-Source Voltage (V_{GS})	-7	-3	V
Drain Current (I_{DS})[2]	I_{DSS}	I_{DSS}	mA
Forward Gate Current ($I_{G,F}$)	30	5	W
Channel Temperature (T_{CH})[3]	175[4]	150[5]	°C
Storage Temperature (T_{STG})	-65 to 150	-65 to 150	°C
RF Input Power (P_{IN})[2]	24	At 3dB Compression	dBm
Power Dissipation (P_{TOT})	3.2	2.1	W

Notes:

1. These ratings represent the maximum operable values for this device. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device and/or affect device lifetime. These are stress ratings only, and functional operation of the device at these conditions is not implied.
2. Combinations of supply voltage, supply current, input power, and output power shall not exceed the maximum total power dissipation listed in the table.
3. Junction operating temperature will directly affect the device median time to failure. For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.
4. When operated at this channel temperature, the median life is 1.0E+5 hours.
5. When operated at this channel temperature, the median life is 1.0E+6 hours.

Electrical Characteristics[1]

Parameters	Conditions	Typical Values	Units
Output Power at 1dB Compression (P_{1dB})	Freq = 12 GHz V_{DS} = 8 V I_{DS} = 50% I_{DSS}	28	dBm
Gain at P1dB (G_{1dB})		12	dB
PAE at P1dB (PAE)		55	%
50Ω Noise Figure (NF)	Freq =12 GHz, V_{DS} = 3V, I_{DS} = 25 mA	1.4	dB
Saturated Drain Current (I_{DSS})	V_{DS} = 2 V, V_{GS} = 0 V	194[2]	mA
Transconductance (Gm)	V_{DS} = 2 V, I_{DS} = 50% I_{DSS}	232	mS
Pinch-Off Voltage (V_P)	V_{DS} = 2 V, I_{DS} = 0.30 mA	-1.0	V
Gate-Drain Breakdown Voltage (BV_{GD})	I_G = 0.60 mA, source open	-15	V
Gate-Source Breakdown Voltage (BV_{GS})	I_G = 0.60 mA, drain open	-15	V
Thermal Resistance (R_{TH})[3]	AuSn eutectic attach	54	°C/W

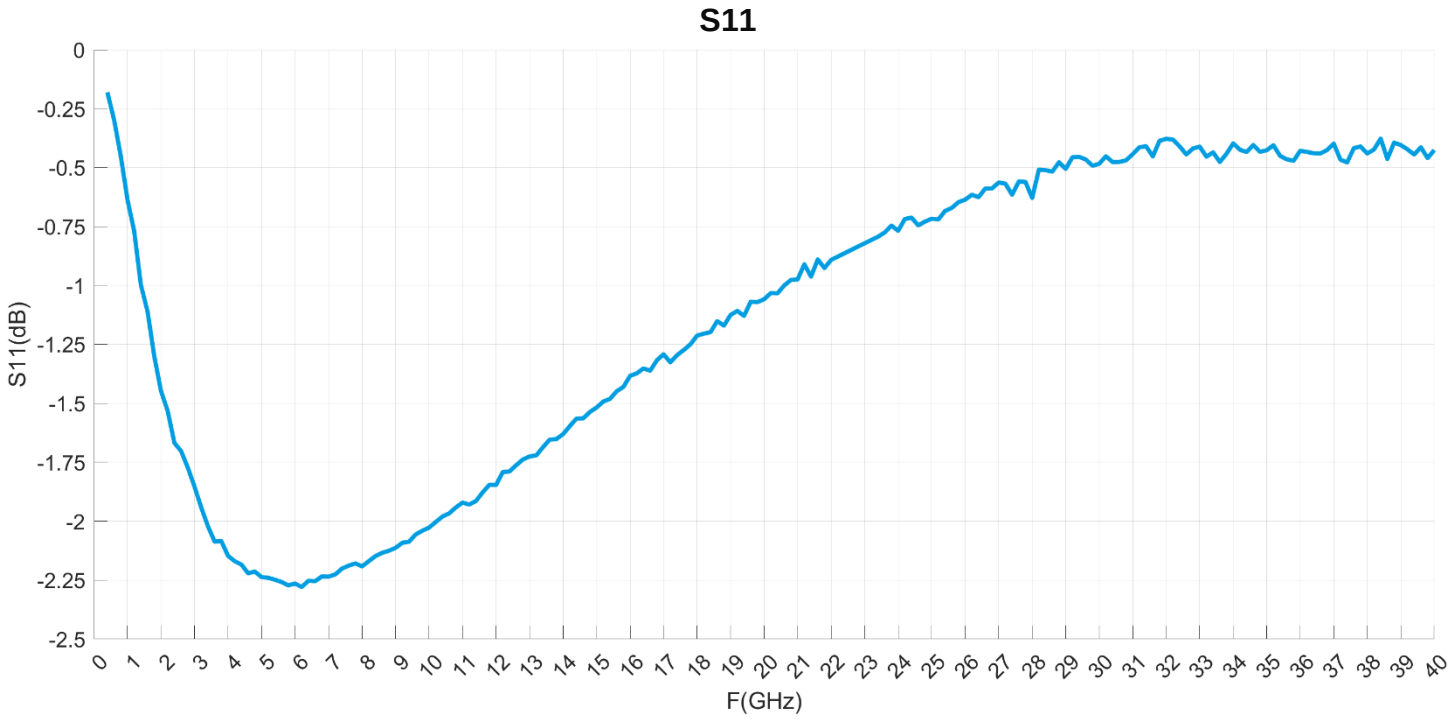
Notes:

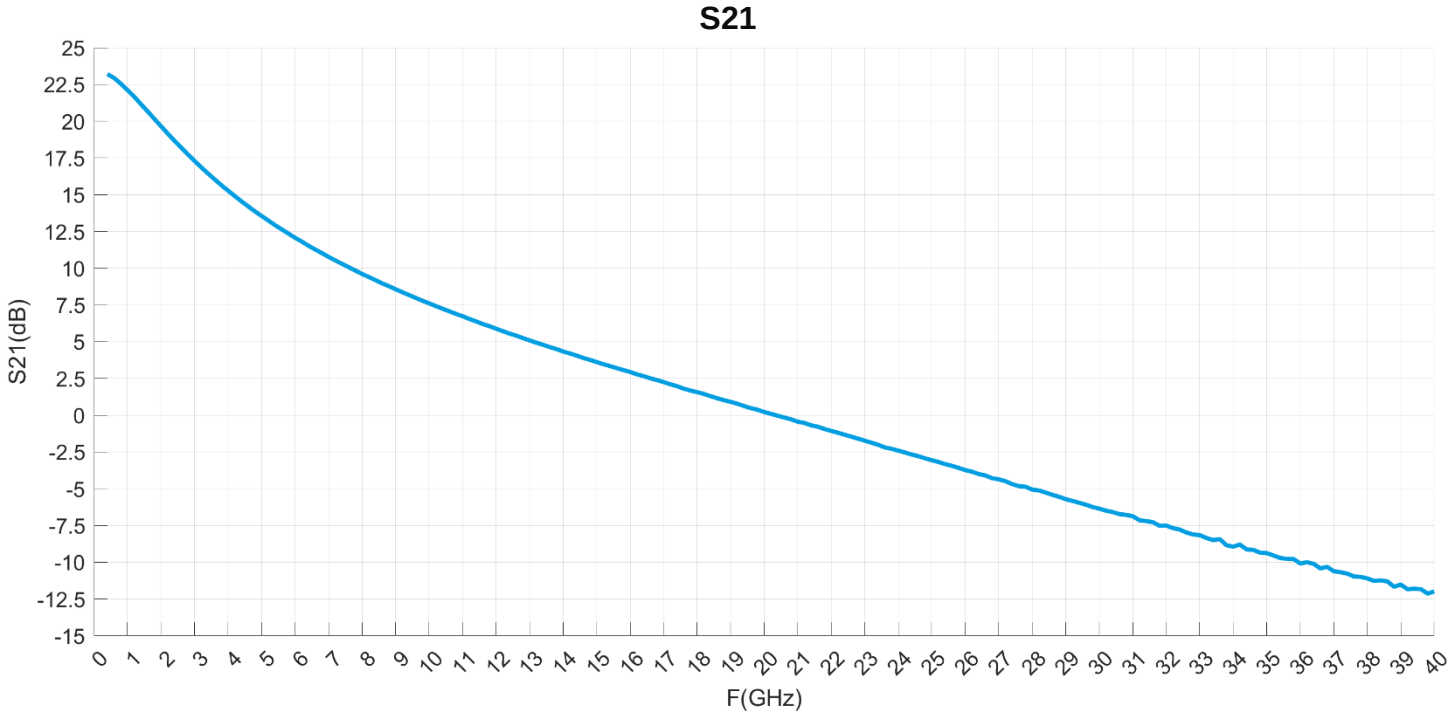
1. Test conditions unless otherwise noted: T_A = +25 °C
2. Typical Standard Deviation of 2 mA (1 σ).
3. Based on IR Scan.

S-Parameters[1]

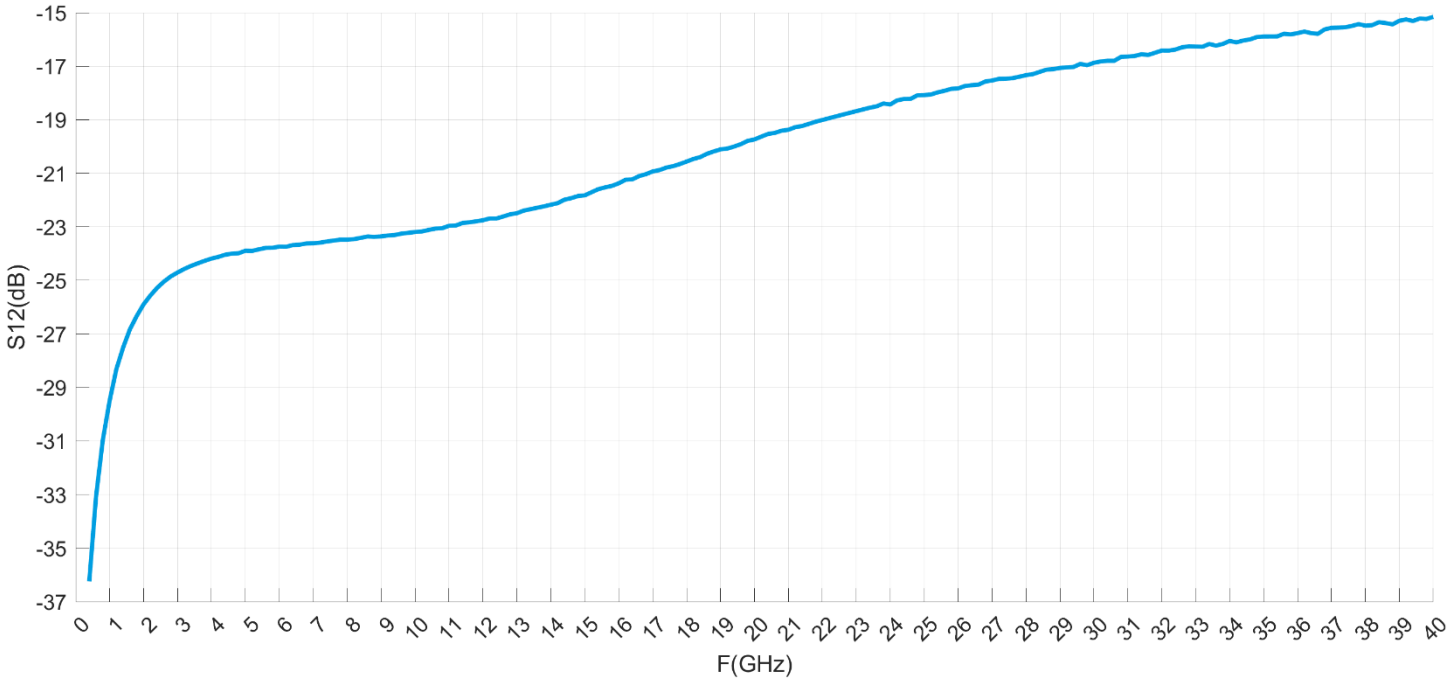
Notes:

1. S-Parameter data was measured by Modelithics with bonding wires at V_D = 8 V, I_{DQ} = 48 mA, and T_A = 25 °C. Please review Modelithics's QPD2060D model datasheet for more information on configurations of bonding wires.

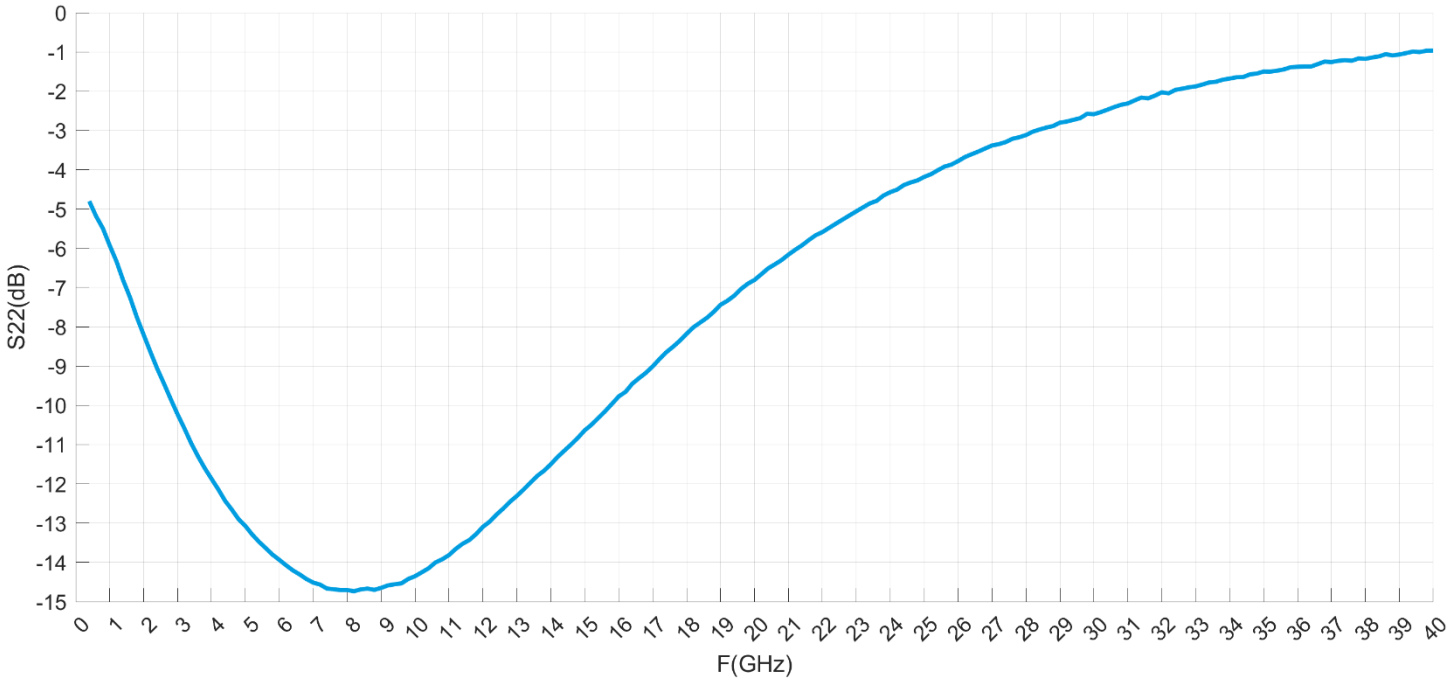




S12



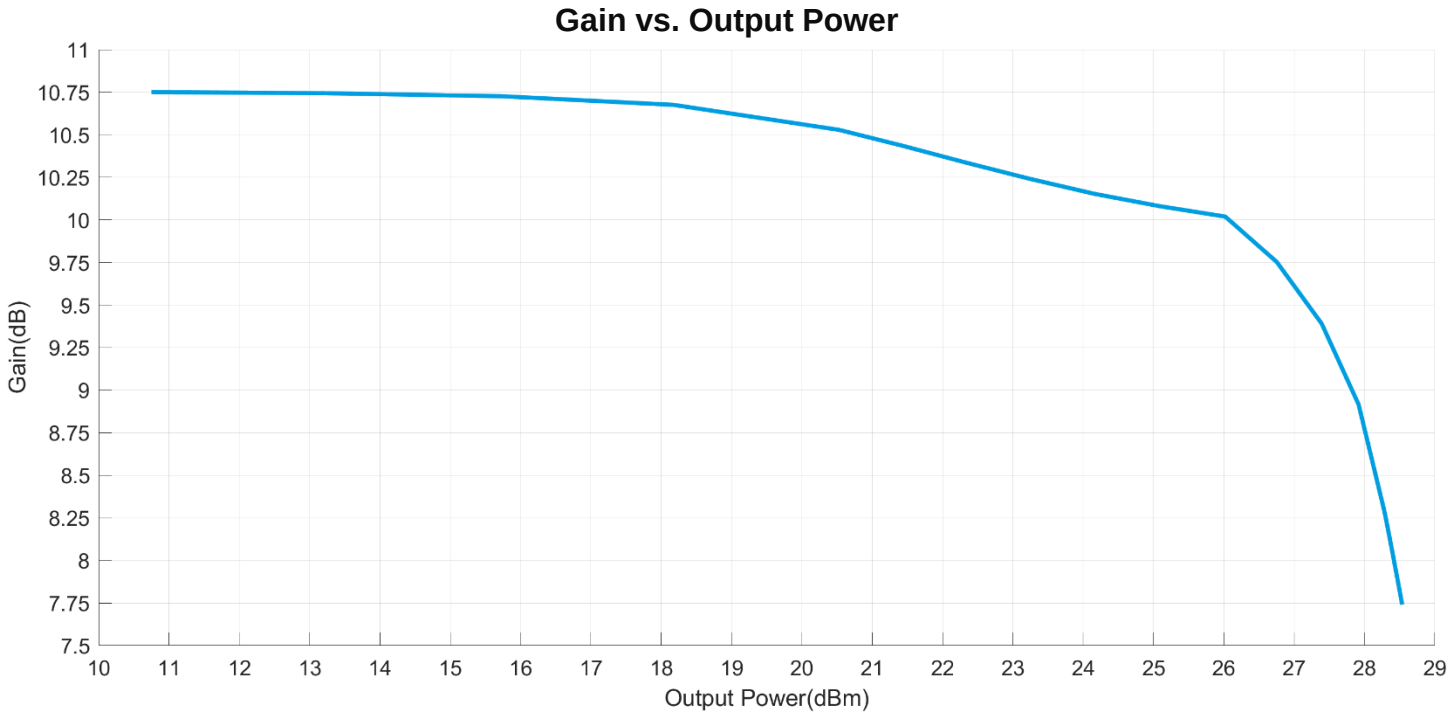
S22

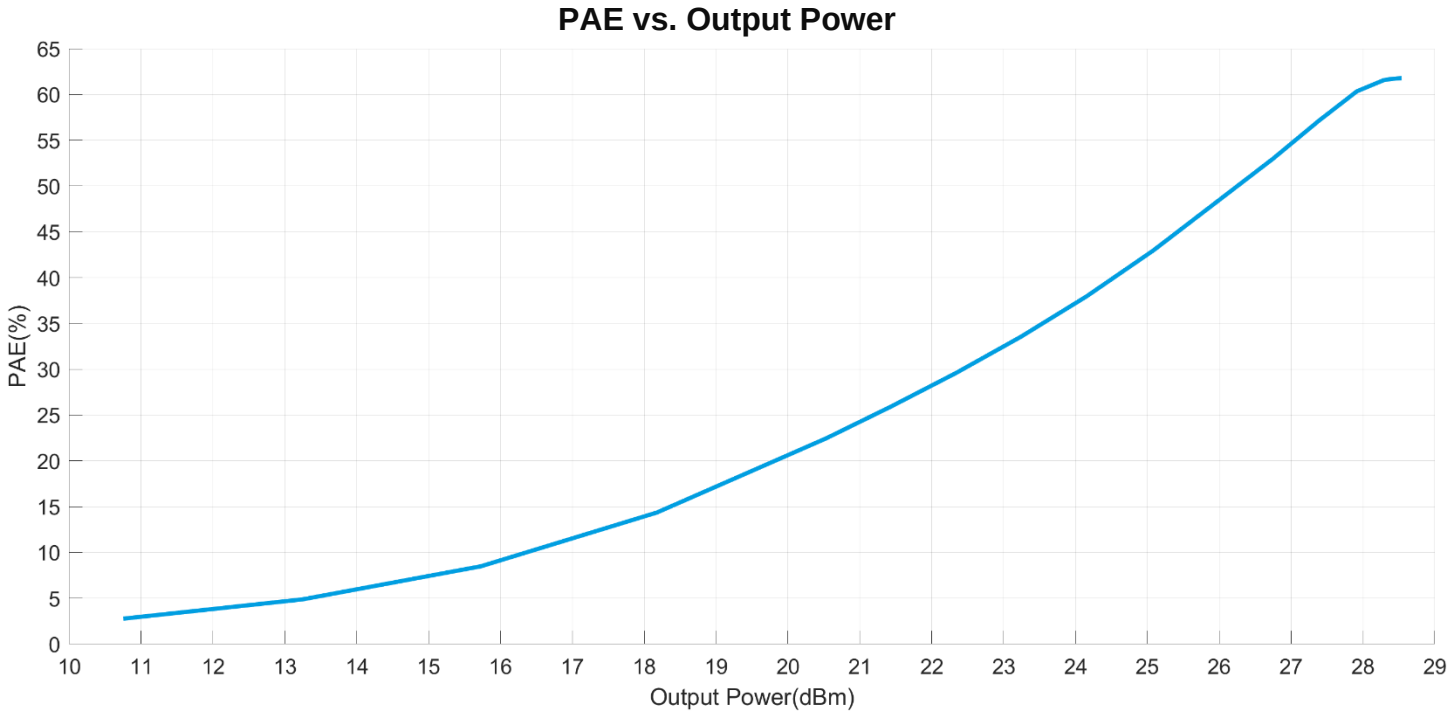


Performance Plots – Power Tuned @ 12 GHz[1]

Notes:

1. Performance Plots are simulated result using Modelithics's QPD2060D model with V_D = 8 V, I_{DQ} = 48 mA, BWremoval = 0. Please visit Modelithics for Measurement vs. Model Data and more information.

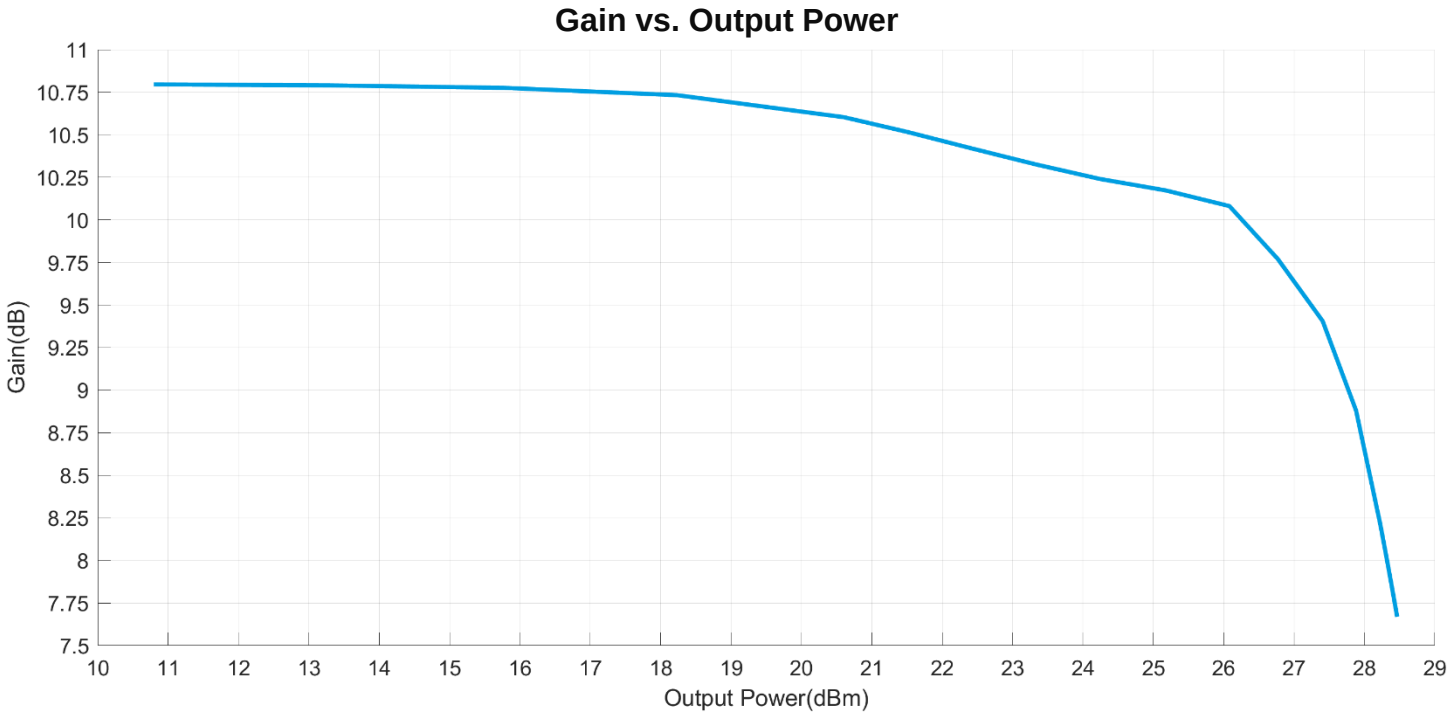


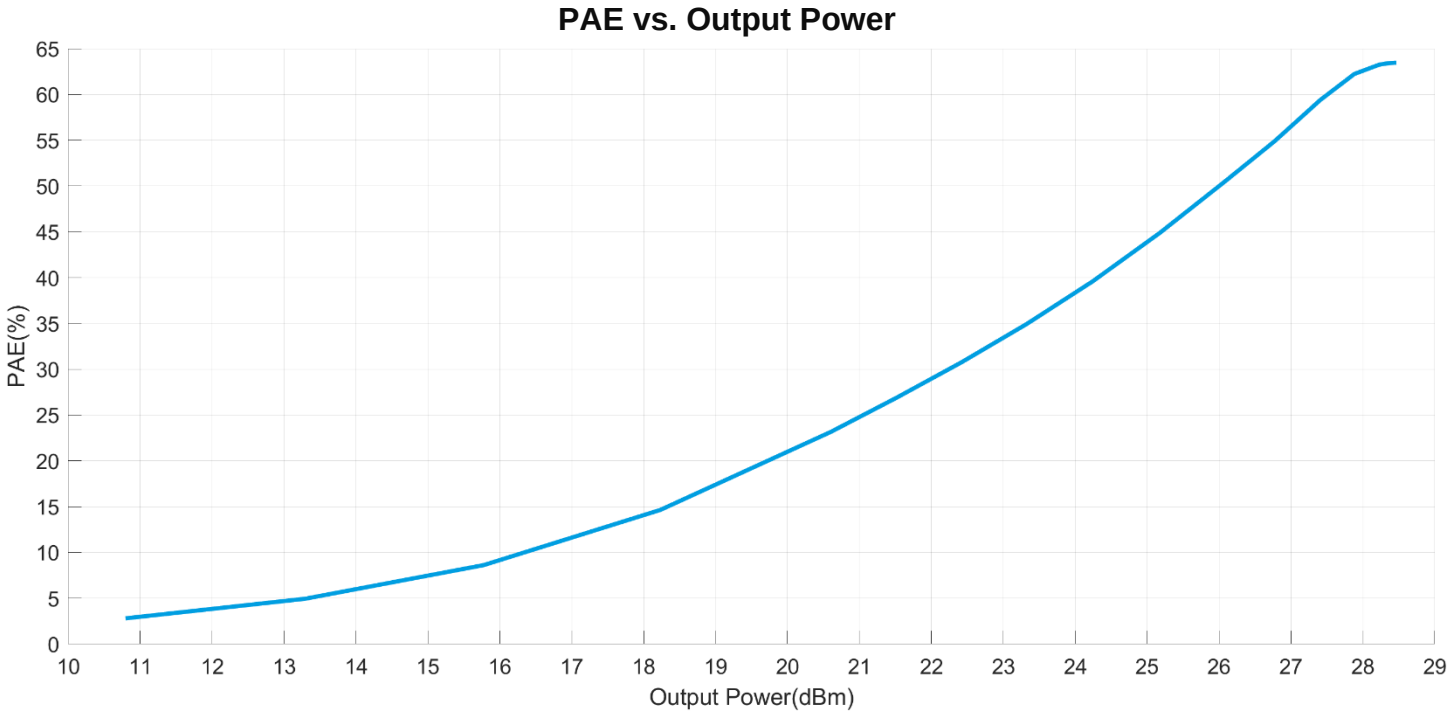


Performance Plots – Efficiency Tuned @ 12 GHz[1]

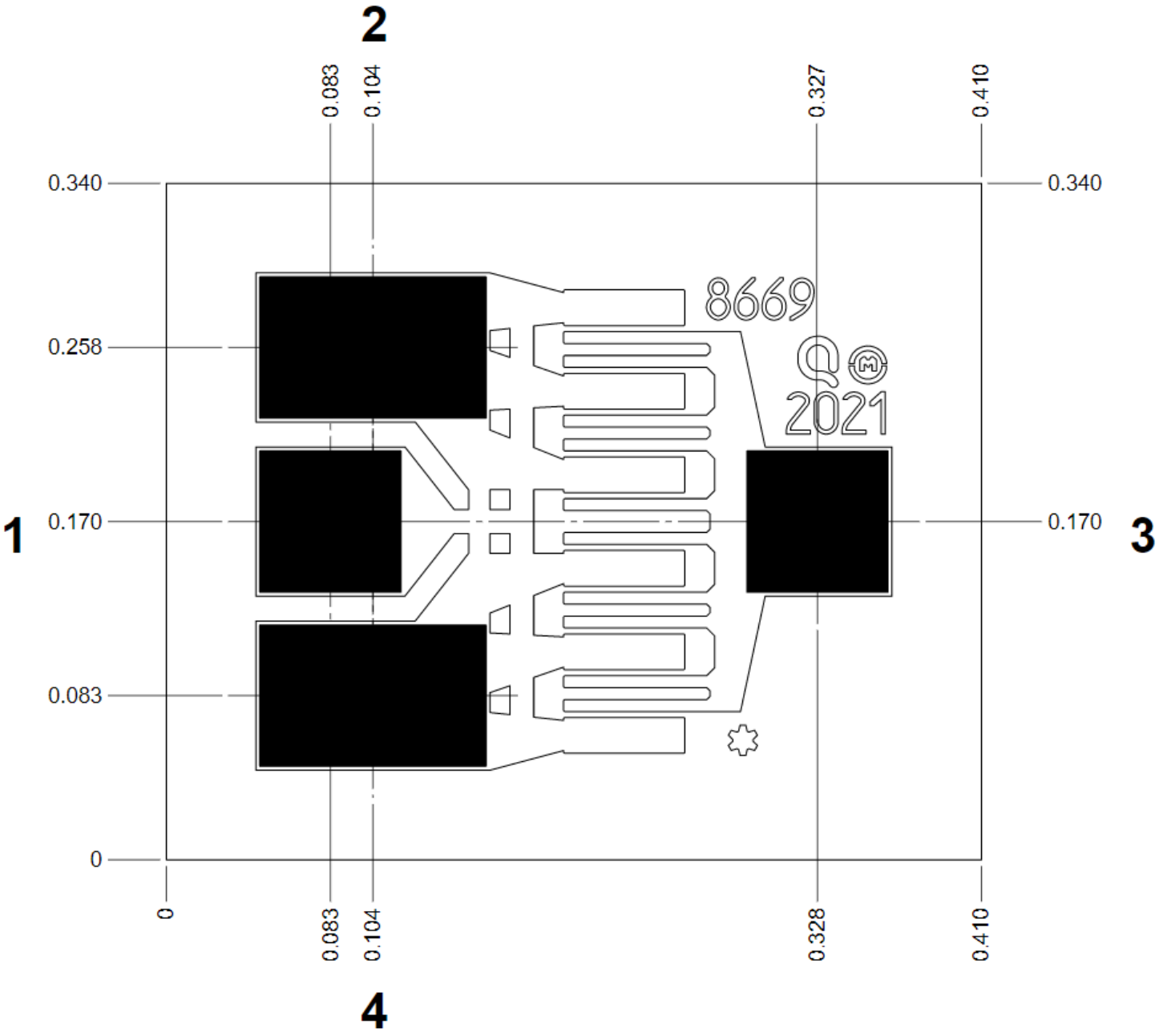
Notes:

1. Performance Plots are simulated result using Modelithics's QPD2060D model with V_D = 8 V, I_{DQ} = 48 mA, BWremoval = 0. Please visit Modelithics for Measurement vs. Model Data and more information.





Die Dimensions[1]

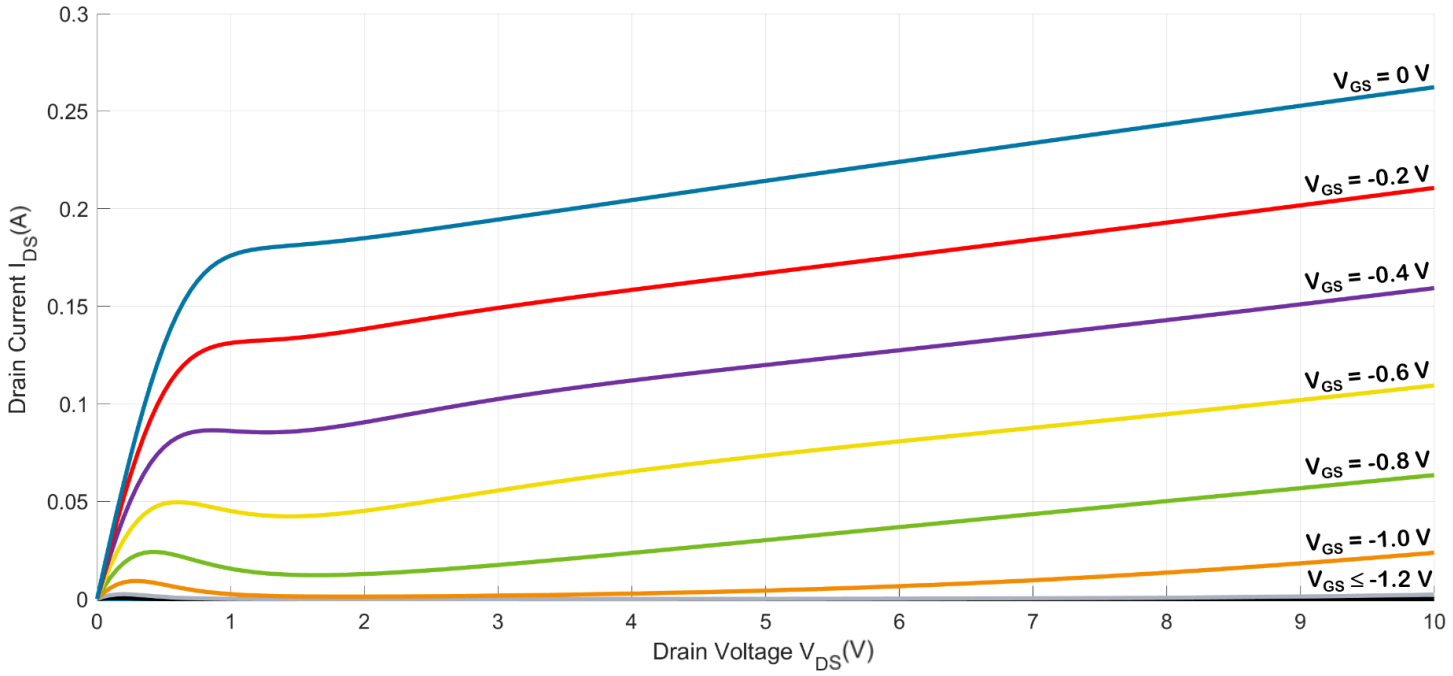


PIN	X	Y
1	0.071	0.071
2	0.1138	0.071
3	0.071	0.071
4	0.1138	0.071

Notes:

1. All units are in mm.

DC Characteristics[1]



Notes:

1. The I-V plot shown above was simulated data using Modelithics's model with Model self_heat = 0. Please visit Modelithics for Measurement vs. Model Data and more information.

Assembly Notes

Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment (i.e. epoxy) can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.

Reflow process assembly notes:

- Recommend Eutectic die attach with AuSn (80/20) solder and limit exposure to temperatures above 300°C to 30 seconds, maximum.
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- Do not use any kind of flux.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

Interconnect process assembly notes:

- Either Thermo-compression Wedge Bonding or Thermosonic Ball Bonding can be used to bond onto the die.
- Force, time, and ultrasonics are critical bonding parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0008-inch wire.

Handling Precautions

GaAs devices are susceptible to damage for electrostatic discharge. Proper precautions should be observed during handling, assembly, and test.

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 ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Not HAST compliant.

Contact Information

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

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Email: customer.support@qorvo.com

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