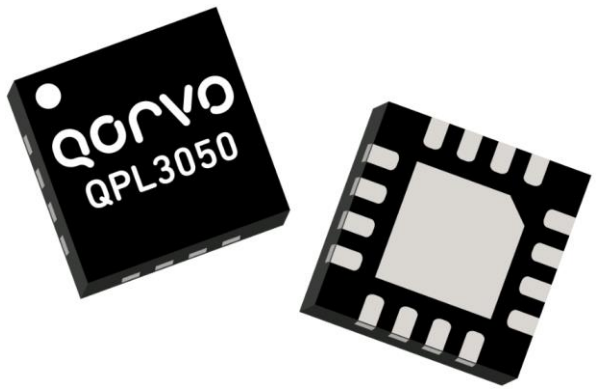
QPL3050

6 – 14 GHz Driver Amplifier

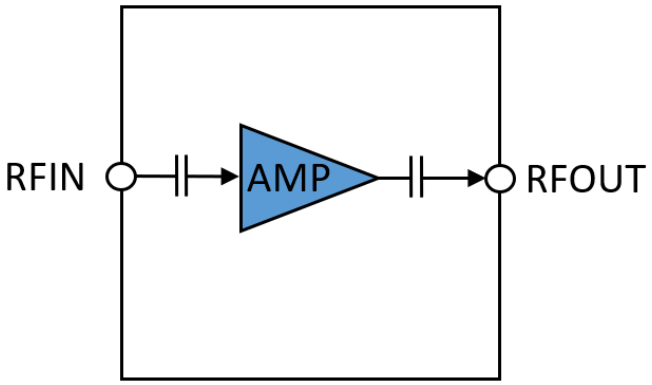
General Description

The QPL3050 is a broadband MMIC driver amplifier housed in a leadless 3x3 mm plastic surface mount package. The QPL3050 is ideally suited for EW and communications systems where small size and low power consumption are needed. The broadband device delivers 18 dB of gain and 20 dBm saturated output power from a single 5 V supply.

The QPL3050 is a 50 ohm matched design eliminating the need for external DC blocks and RF port matching.



Functional Block Diagram



Product Features

- Frequency Range: 6 – 14 GHz
- Small Signal Gain: 19 dB
- P1dB: 20 dBm
- Saturated Power: 22 dBm
- OIP3: 43 dBc @ Pout = 5 dBm / tone
- Noise Figure: 4.0 dB
- Bias: V_{DD} = 5 V, I_{DQ} = 74 mA
- Plastic Overmold Package
- Package Dimensions: 3.0 x 3.0 x 0.85 mm

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

Applications

- Satellite Communications
- Point to Point Communications
- Military and Commercial Radar Applications

Ordering Information

Part No.	Description
QPL3050SR	Tape and Reel, 7", Qty 100
QPL3050TR7	Tape and Reel, 7", Qty 750
QPL3050EVB	QPL3050 Evaluation Board, Qty 1

Absolute Maximum Ratings

Parameter	Min Value	Max Value	Units
Drain Voltage (V_{DD})	-	6.0	V
Drain Current	-	100	mA
RF Input Power (50 Ω, 85 °C)	-	15	dBm
Channel Temperature, T_{CH}	-	175	°C
Mounting Temperature (30 seconds)	-	260	°C
Storage Temperature	−55	150	°C

Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied. Extended application of Absolute Maximum Rating conditions may reduce device reliability.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Drain Voltage (V_{DD})	3	5	5.5	V
Quiescent Drain Current (I_{DQ}, typical, self-biased)		74		mA
Operating Temperature Range	−40		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 stated: V_{DD} = 5 V, I_{DQ} = 74 mA, 25 °C. Data de-embedded of fixture losses

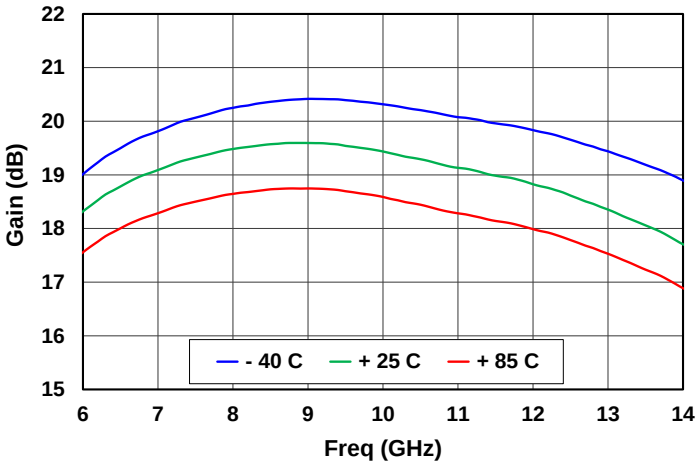
Parameter	Min	Typical	Max	Units
Frequency	6		14	GHz
Small Signal Gain		19		dB
Noise Figure		4		dB
Saturated Power		22		dB
1-dB Compression Point		20		dBm
Input Return Loss		12		dB
Output Return Loss		13		dB
3RD Order Intermodulation level (Pout=5 dBm/tone)		-40		dBc
Output TOI (Pout=0 dBm/tone)		27		dBm
Gain Temperature Coefficient		-0.014		dB/°C

Note: The measured data is for preliminary tests on die.

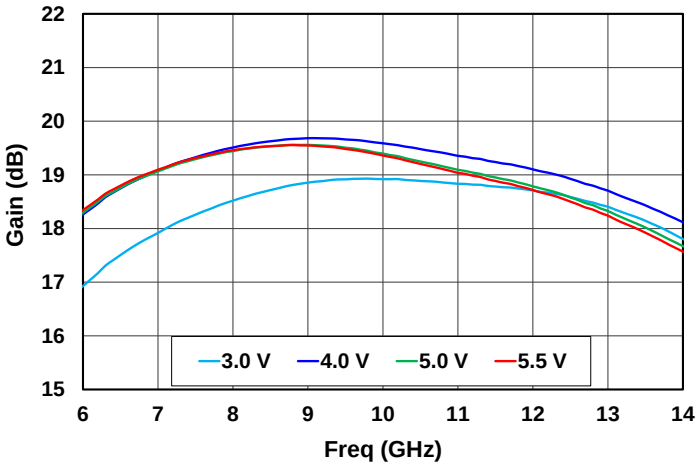
Performance Plots – Small Signal

Test Conditions unless otherwise stated: V_{DD} = 5 V, I_{DQ} = 74 mA, 25 °C

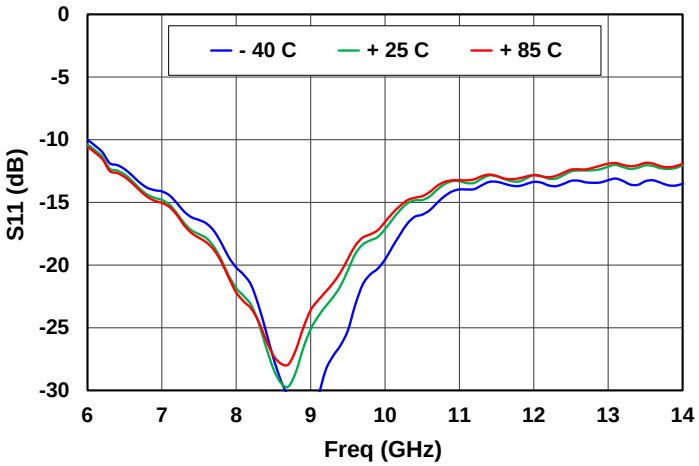
Gain vs Temperature



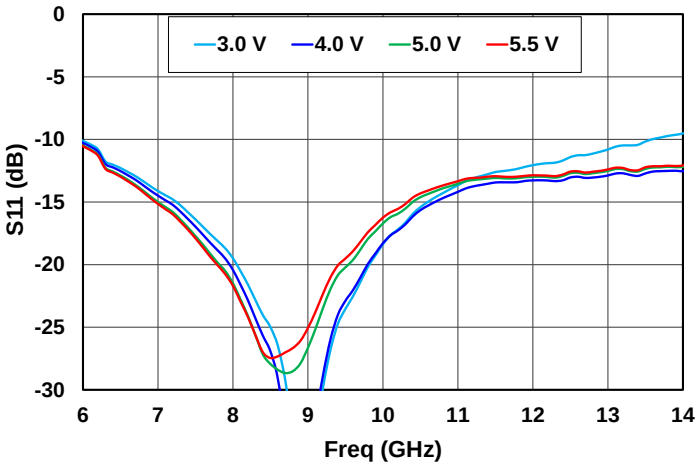
Gain vs Voltage



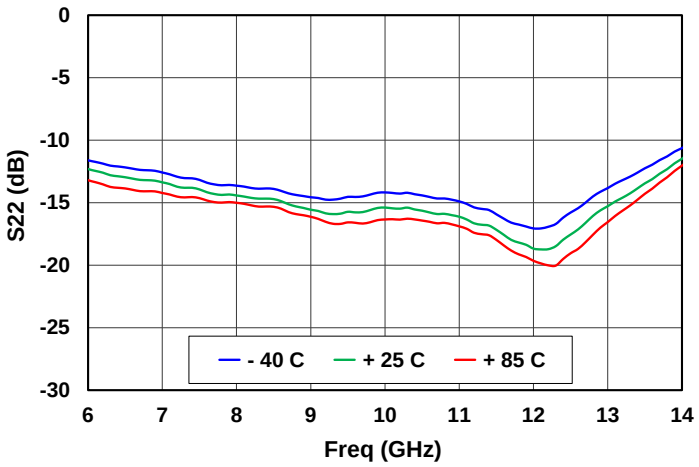
Input Return Loss vs Temperature



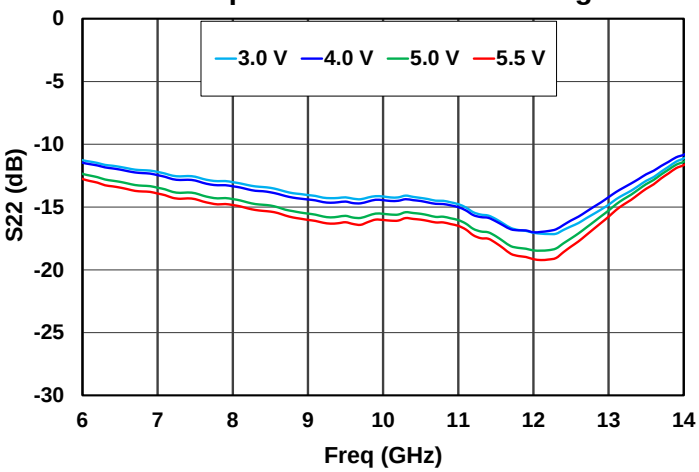
Input Return Loss vs Voltage



Output Return Loss vs Temperature

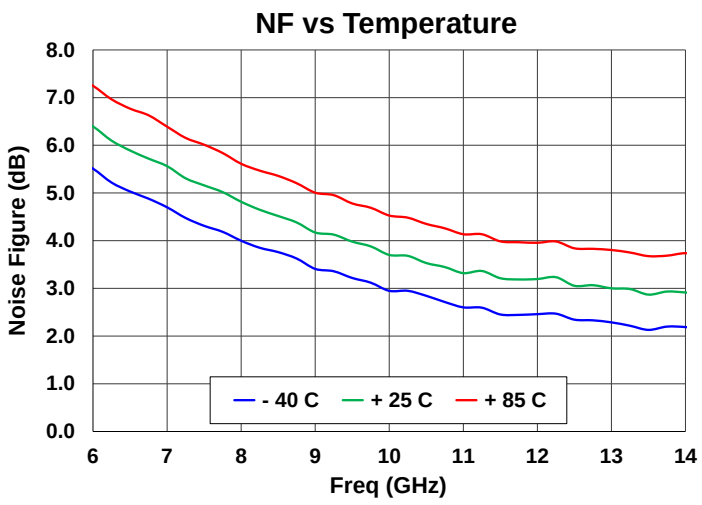


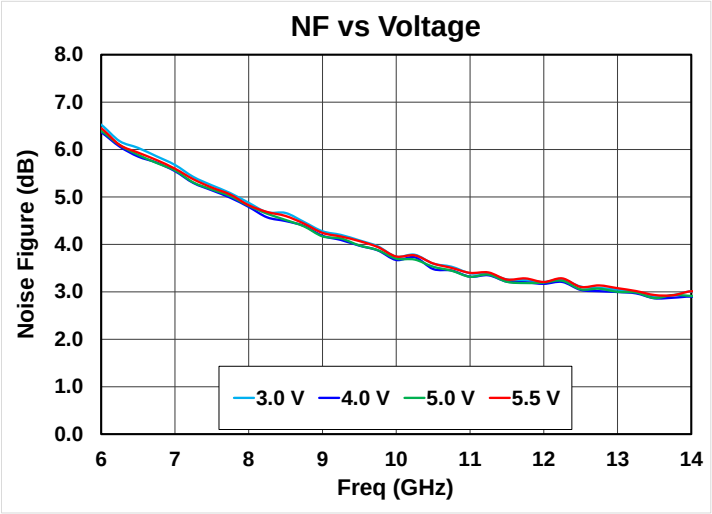
Output Return Loss vs Voltage



Performance Plots – Noise Figure

Test Conditions unless otherwise stated: V_{DD} = 5V, I_{DQ} = 74 mA, 25 °C

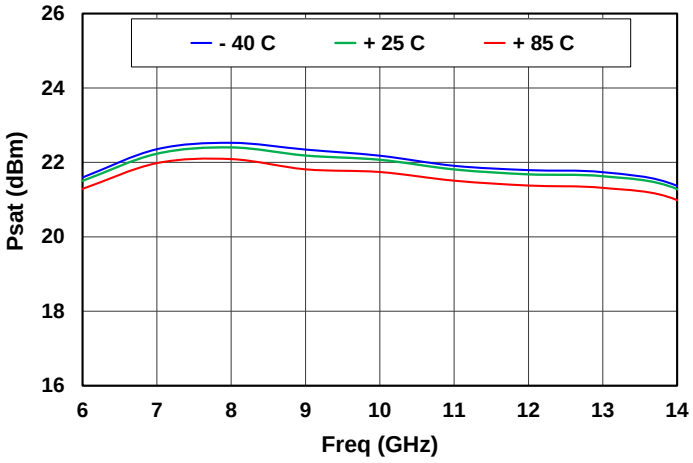




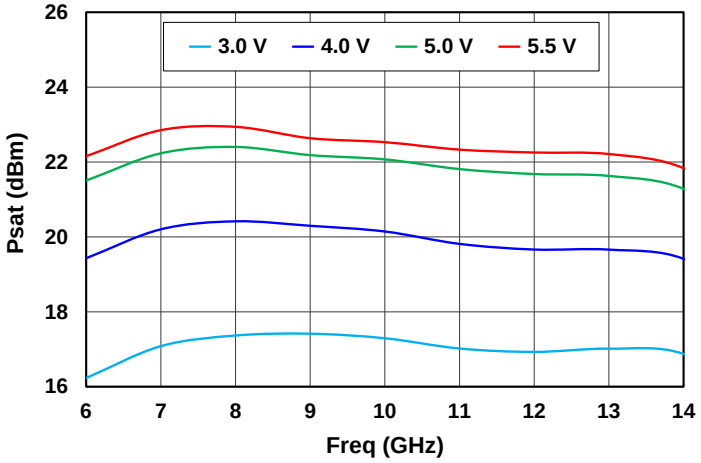
Performance Plots – Power

Test Conditions unless otherwise stated: V_{DD} = 5V, I_{DQ} = 74 mA, 25 °C

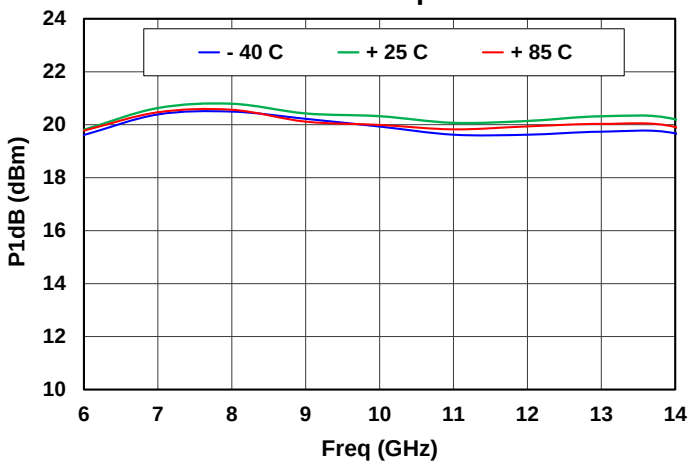
Psat vs Temperature



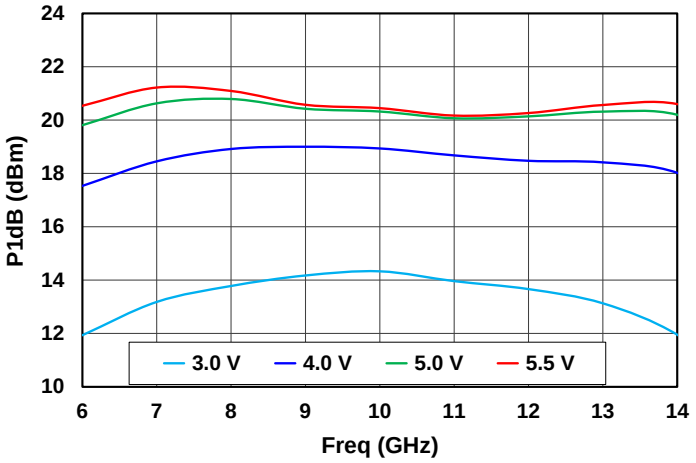
Psat vs Bias



P1dB vs Temperature



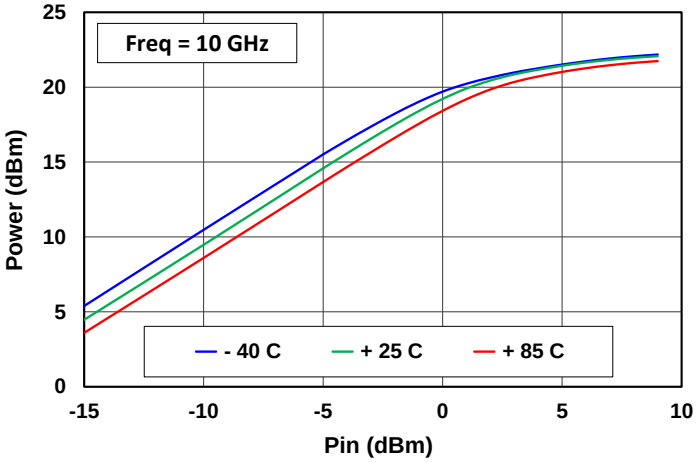
P1dB vs Bias



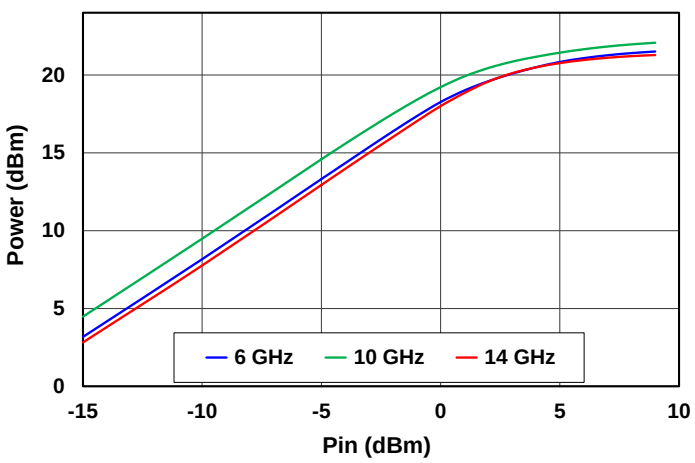
Performance Plots – Power

Test Conditions unless otherwise stated: V_{DD} = 5V, I_{DQ} = 74 mA, 25 °C

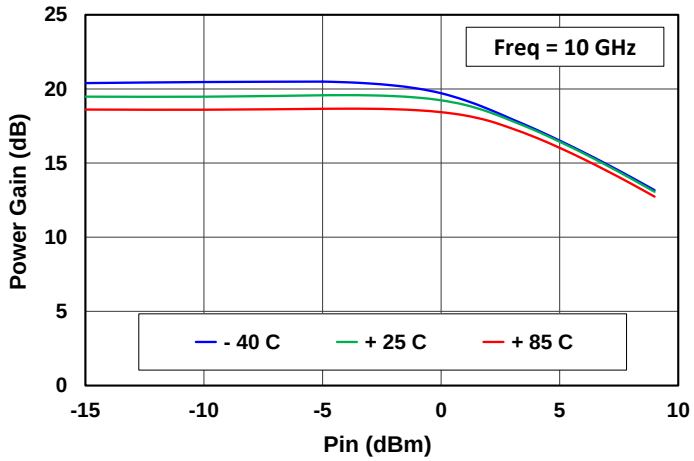
Power vs Pin vs Temp



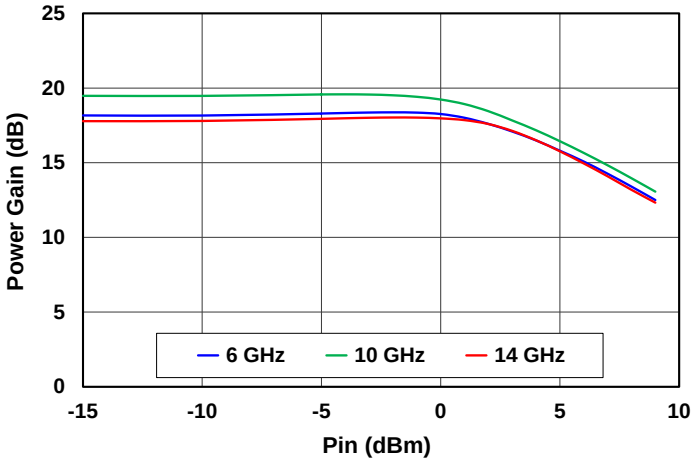
Power vs Pin



Power Gain vs Pin vs Temp

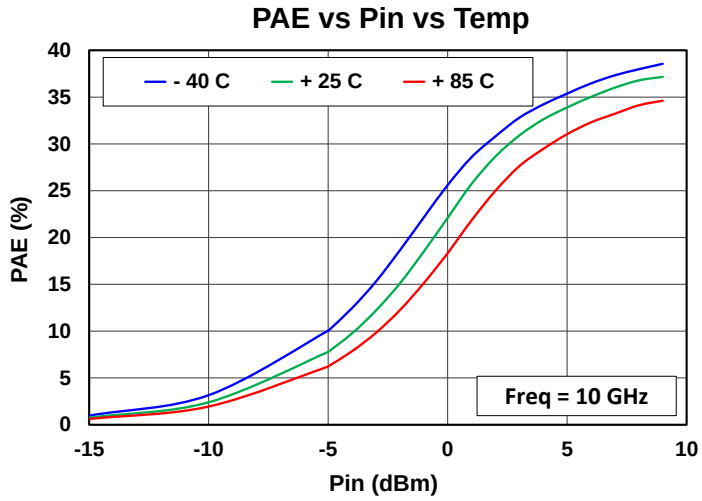


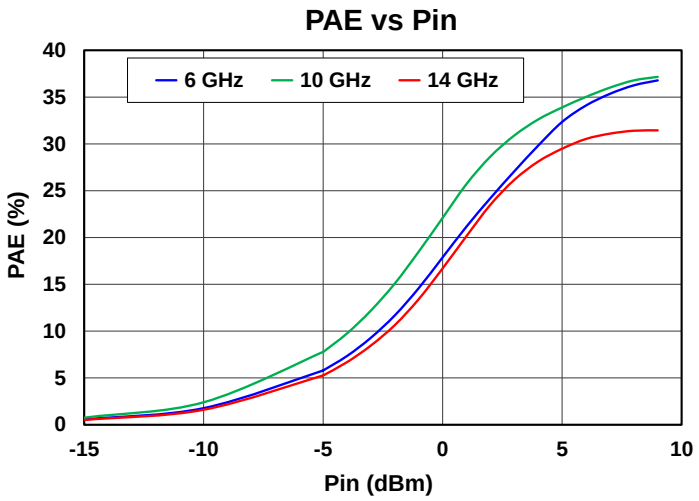
Power Gain vs Pin

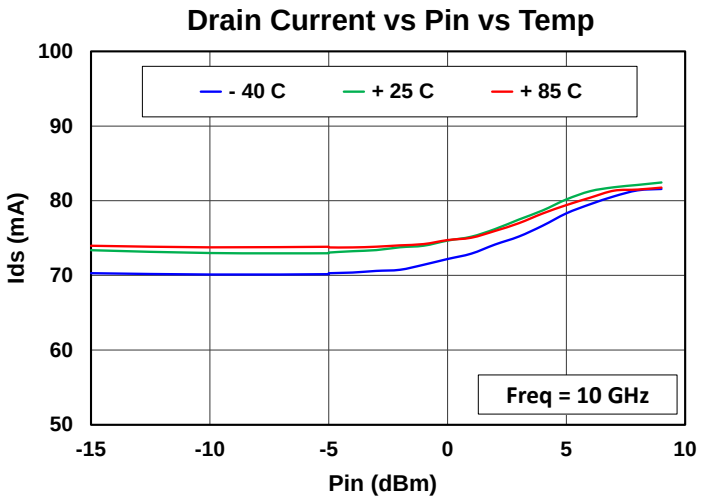


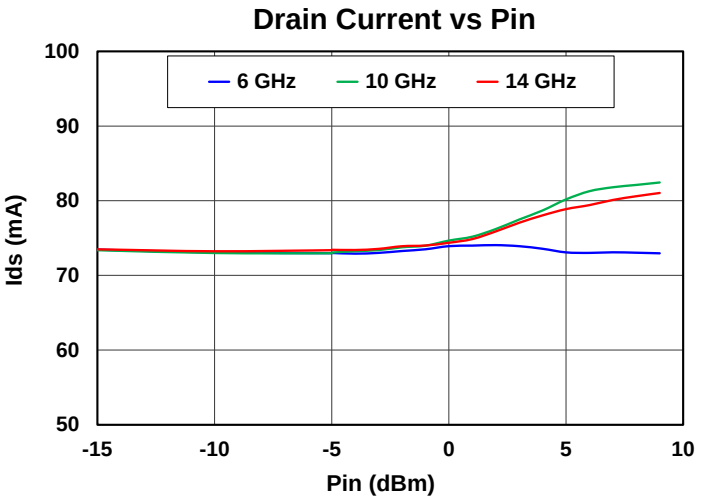
Performance Plots – Power

Test Conditions unless otherwise stated: V_{DD} = 5V, I_{DQ} = 74 mA, 25 °C



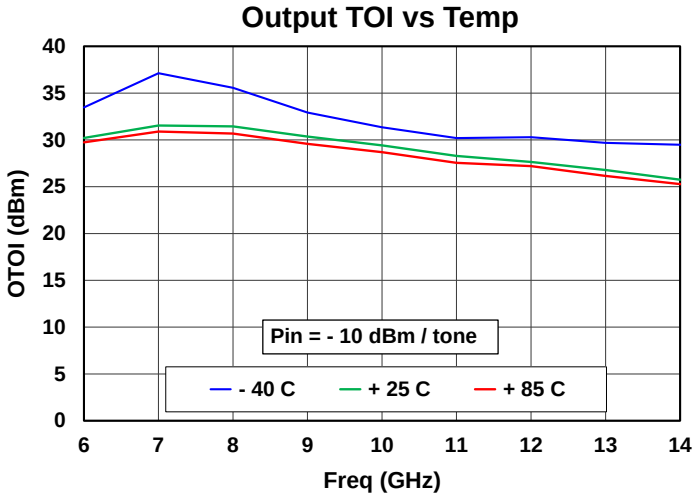


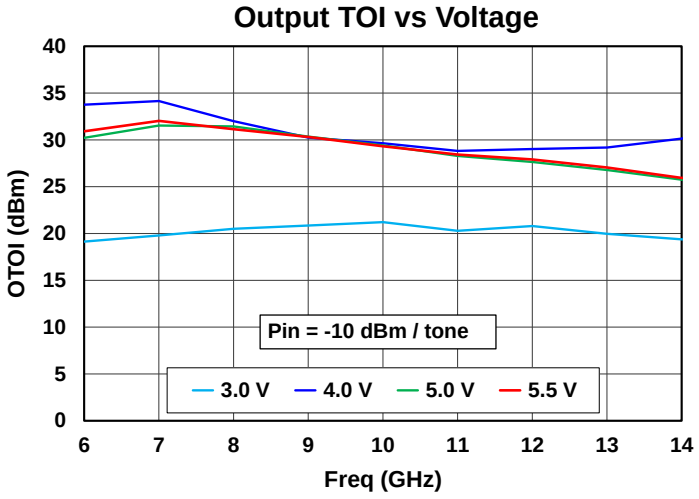


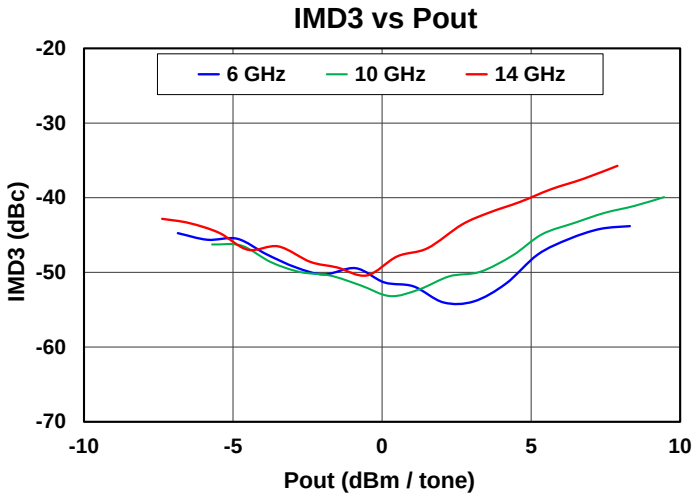


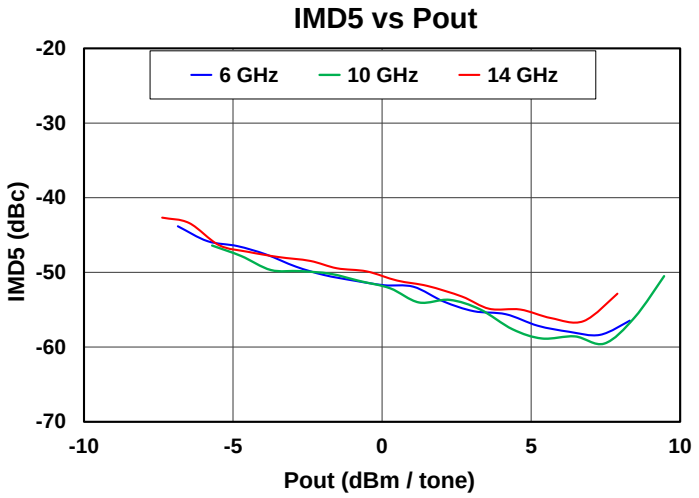
Performance Plots – Linearity

Test Conditions unless otherwise stated: V_{DD} = 5V, I_{DQ} = 74 mA, Tone spacing = 10 MHz, 25 °C

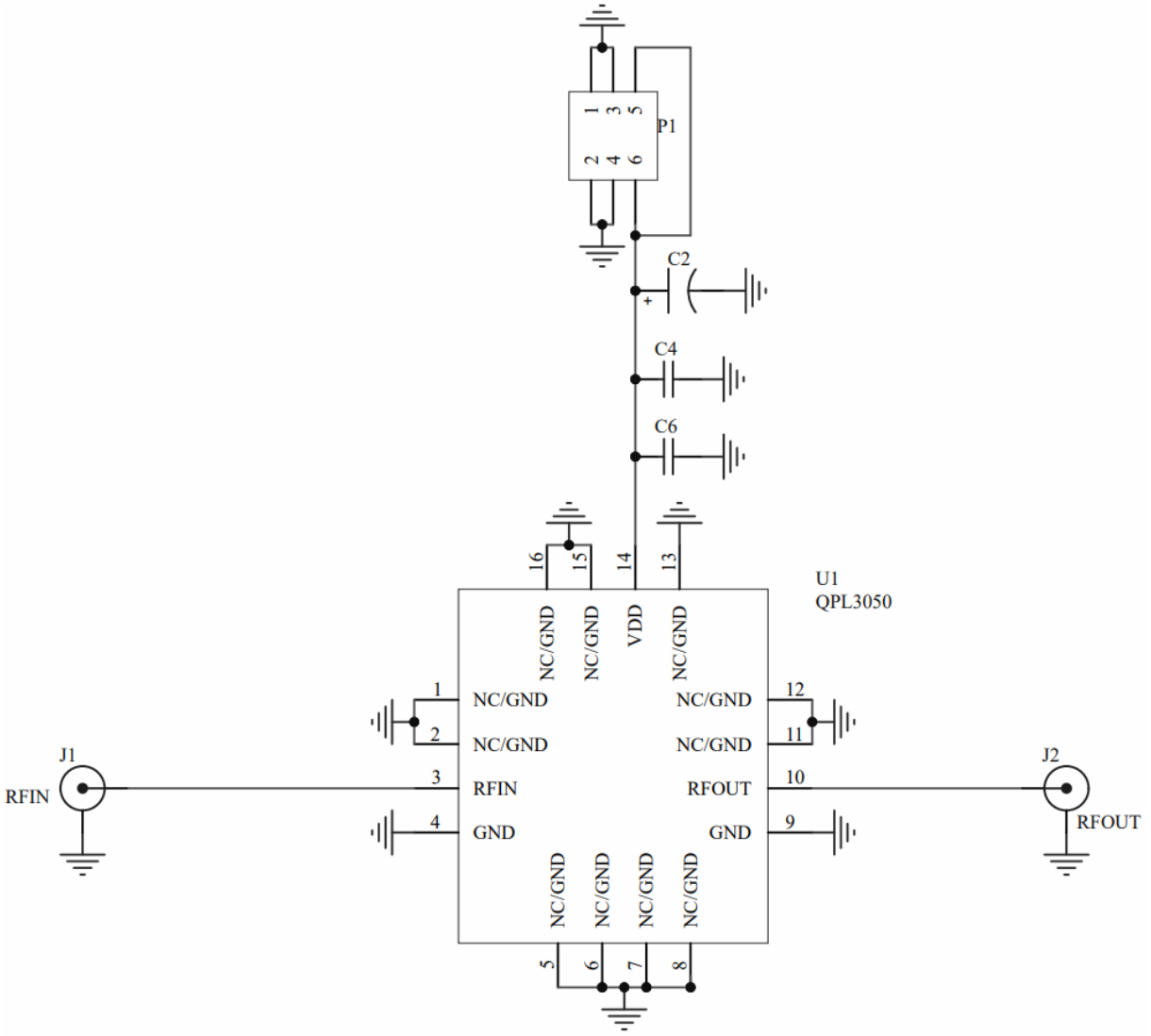






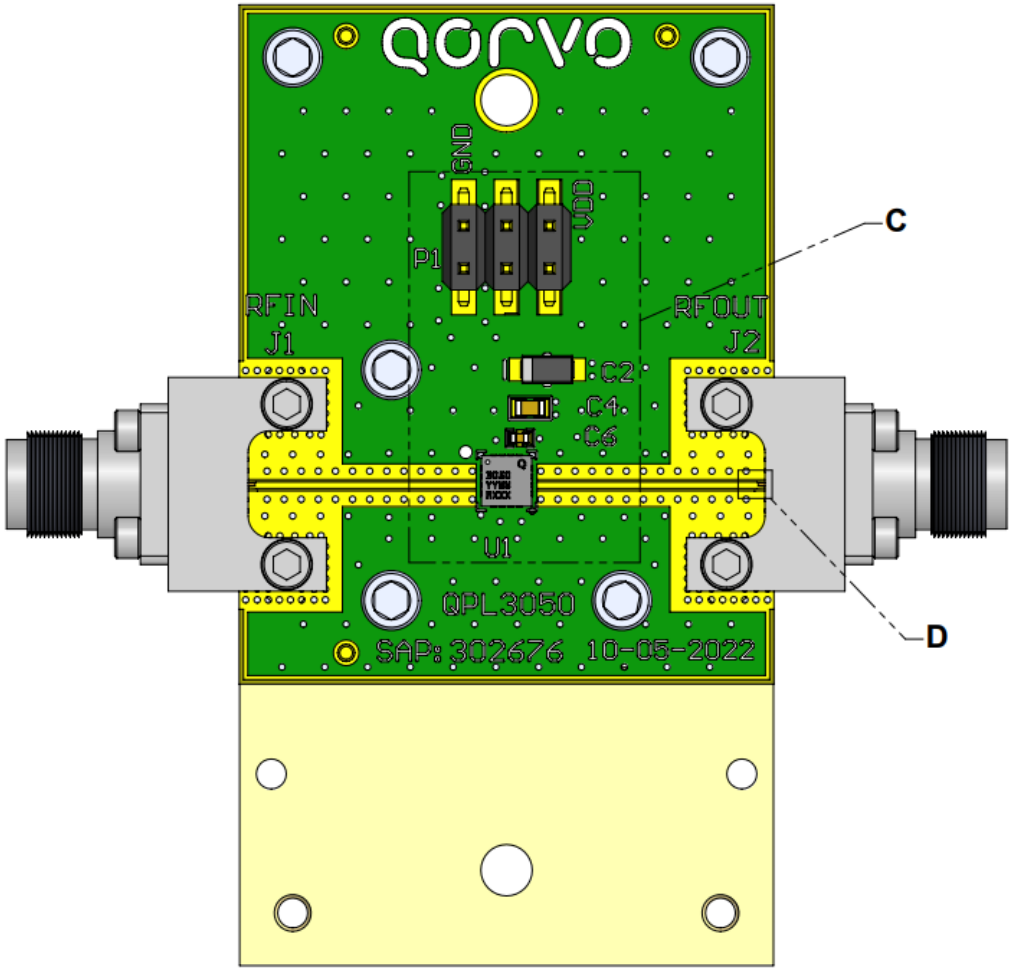


Application Circuit



Bias-up Procedure	Bias-down Procedure
1. Not required	1. Not required

Evaluation Board and Assembly

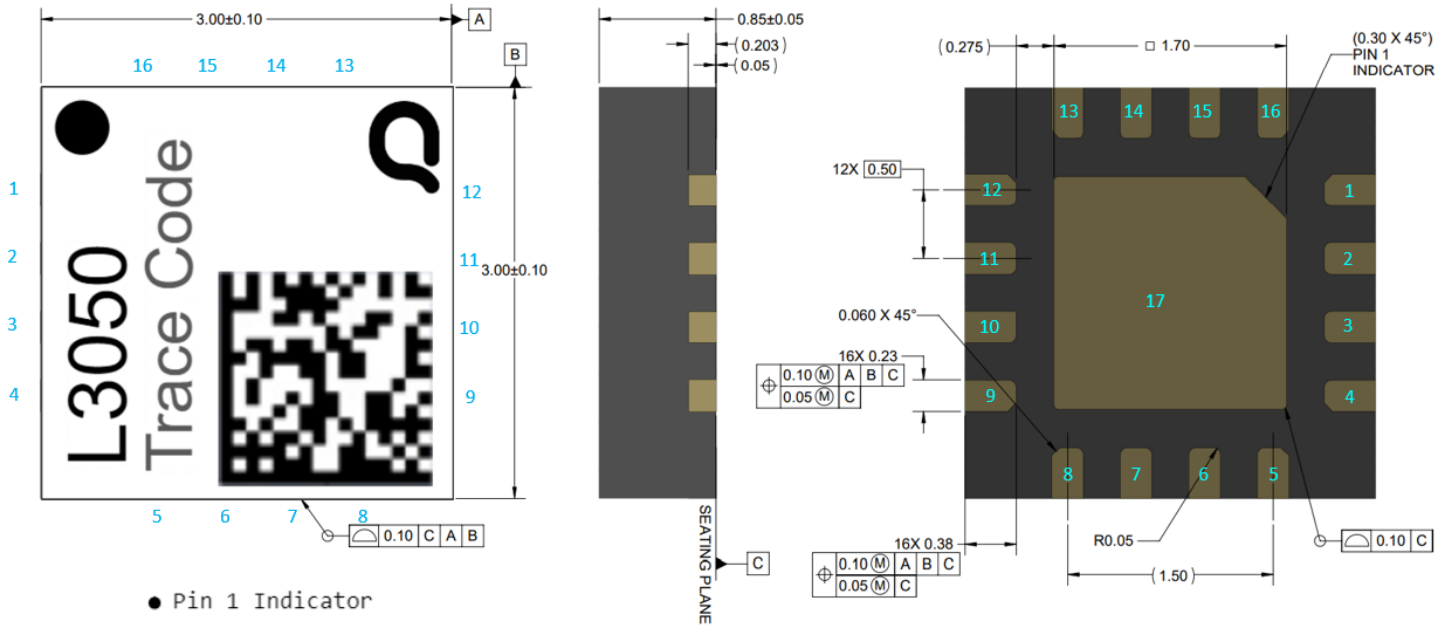


RF Layer is 0.010” thick Rogers Corp. RO4350. Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-01A-5.

Bill of Materials

Ref. Des.	Component	Value	Manuf.	Part Number
C2	Surface Mount Cap.	CAP 0.33 uF, +/-20%, 25V, 1206 Tant, ROHS	Various	
C4	Surface Mount Cap.	CAP 1000 pF +/-10%, 25V, 0603, X7R, ROHS	Various	
C6	Surface Mount Cap.	CAP 100 pF, +/-5%, 25V, 0402, C0G, ROHS	Various	
J1, J2	RF Connector	2.92 mm RF CONNECTOR	Southwest Microwave	1092-01A-5

Mechanical Drawing & Pad Description



Dimensions in mm,
Package is mold encapsulated with NiPdAu plated leads, typical gold plating thickness is 0.1 um
Part Marking: Trace Code and 2DID can be used to trace part manufacturing information

Pin Number	Label	Description
4, 9, 17 (slug)	GND	GROUND
3	RFIN	Matched to 50 ohms, DC blocked
10	RFOUT	Matched to 50 ohms, DC blocked
14	VDD	Drain power supply
1, 2, 5 - 8, 11 – 13, 15, 16	N/C	No internal connections, can be grounded

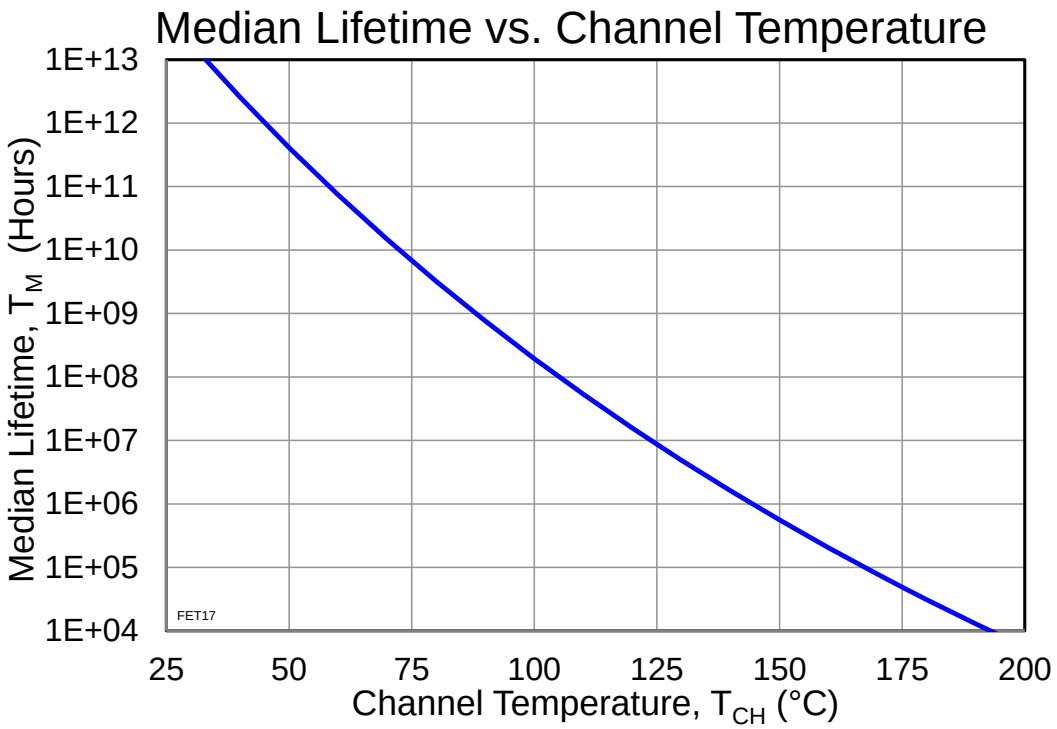
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	T_{base} = 85°C, V_D = 5 V, I_{DQ} = 74 mA Quiescent / Small Signal operation P_{DISS} = 0.37 W	131.0	°C/W
Channel Temperature (T_{CH})		133.5	°C
Median Lifetime (T_M)		9.7E06	Hrs

Notes:
1. Thermal resistance is referenced to back of the package.

Median Lifetime

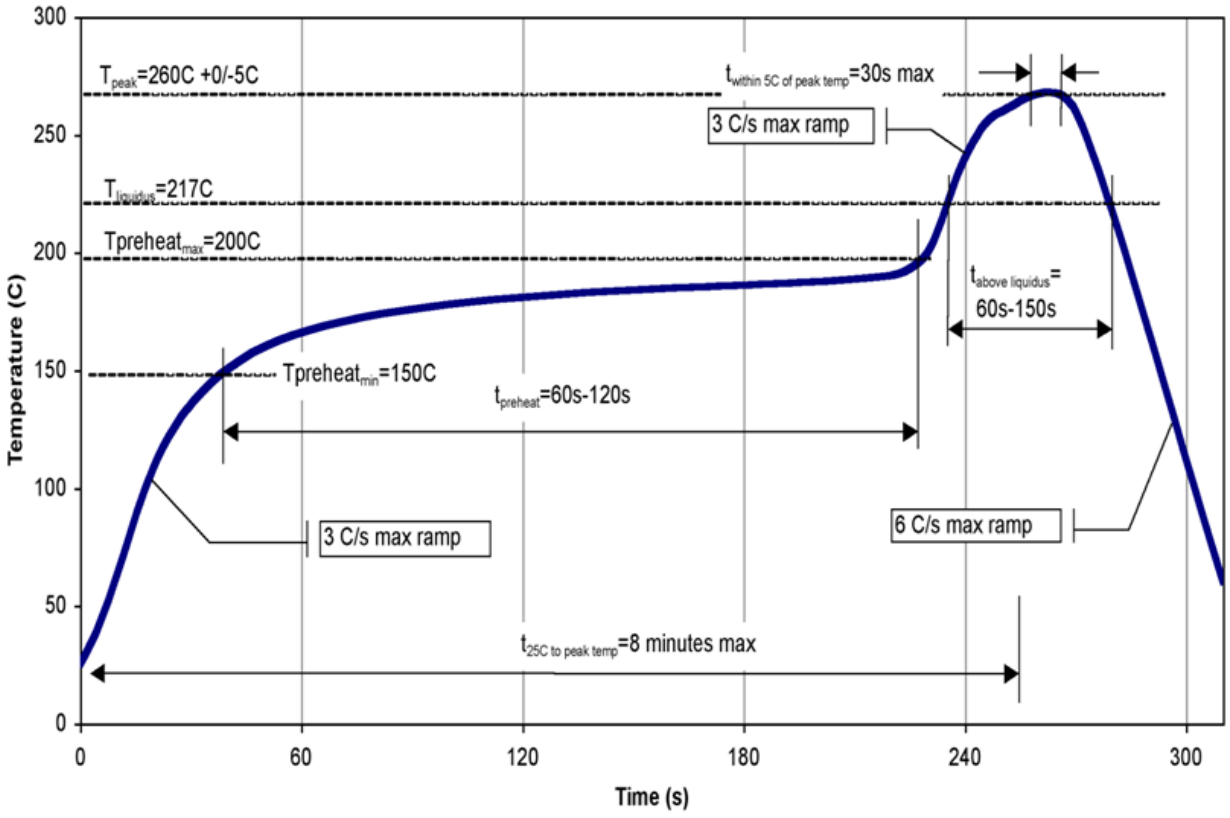
Test Conditions: V_D = 4 V
Failure Criteria = 10% reduction in I_{D_MAX}



Solderability

1. Compatible with the latest version of J-STD-020, lead-free solder, 260 °C peak reflow temperature.

Recommended Soldering Temperature Profile



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	1B	ESDA / JEDEC JS-001-2012
ESD – Charged Device Model (CDM)	C2b	ESDA / JEDEC JS-002-2014
MSL – Convection Reflow 260 °C	3	JEDEC standard IPC/JEDEC J-STD-020

Caution!
ESD-Sensitive Device

RoHS Compliance

This product is compliant with the 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
- SVHC Free
- PFOS 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**

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

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