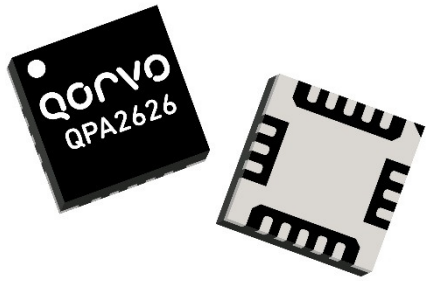
# QPA2626

## 17-22 GHz GaAs Low Noise Amplifier

## Applications

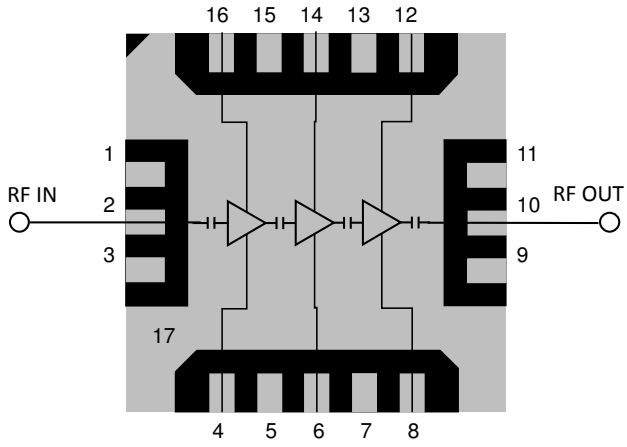
- Satellite Communications
- Point-to-Point Communications




## Product Features

- Frequency Range: 17 – 22 GHz
- Noise Figure: 1.3 dB (typical)
- Small Signal Gain: 25 dB (typical)
- P1dB: 20 dBm (typical)
- IM3: –55 dBc (typical) (Pout=0 dBm/tone)
- Bias: $V_D$ = 3.5 V, $I_{DQ}$ = 90 mA, $V_G$ = –0.46 V (typical)
- Plastic Overmolded Package
- Package Dimensions: 4.0 x 4.0 x 0.85 mm

## Functional Block Diagram




## General Description

Qorvo's QPA2626 is a packaged, high-performance, low noise amplifier fabricated on Qorvo's production 90nm pHEMT (QPHT09) process. Covering 17 – 22 GHz, the QPA2626 provides 25 dB small signal gain and P1dB of 20 dBm, while supporting a noise figure of 1.3 dB and IM3 levels of –55 dBc (at Pout=0 dBm/tone).

Packaged in a small 4 mm x 4 mm plastic overmold QFN, the QPA2626 is matched to 50 ohms with integrated DC blocking caps on both I/O ports for easy handling and simple system integration.

The QPA2626 high performance and ease of handling makes it ideal for satellite and point to point communication systems.

Lead-free and RoHS compliant.

Evaluation boards are available upon request.

## Pad Configuration

| Pad No. | Label |
|---|---|
| 1, 3, 9, 11, 17 (slug) | GND |
| 2 | RF Input |
| 4 | VG1 |
| 6 | VG2 |
| 8 | VG3 |
| 10 | RF Output |
| 12 | VD3 |
| 14 | VD2 |
| 16 | VD1 |
| 5, 7, 13, 15 | N/C |

## Ordering Information

| Part | ECCN | Description |
|---|---|---|
| QPA2626 | EAR99 | 17 – 22 GHz Low Noise Amplifier |


Disclaimer: Subject to change without notice
© 2016 TriQuint

## Absolute Maximum Ratings

| Parameter | Value |
|---|---|
| Drain Voltage ($V_D$) | 5.0 V |
| Drain Current ($I_{D1}/I_{D2}/I_{D3}$) | 45/45/160 mA |
| Gate Voltage Range | 0 to –1.5 V |
| Gate Current ($I_{G1}/I_{G2}/I_{G3}$ at 125 °C) | 5.0/5.0/6.6 mA |
| RF Input Power (50 Ω, 85 °C) | 20 dBm |
| Channel Temperature, $T_{CH}$ | 175 °C |
| Mounting Temperature (30 seconds) | 260 °C |
| Storage Temperature | –55 to 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.

## Recommended Operating Conditions

| Parameter | Value |
|---|---|
| Drain Voltage | 3.5 V |
| Drain Current (quiescent, $I_{DQ}$) | 90 mA |
| Drain Current ($I_D$, Low noise / $P_{SAT}$) | 90 / 175 mA |
| Gate Voltage (typical) | –0.46 V |
| Operating Temperature Range | –40 to 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: 25 °C, $V_D$ = 3.5 V, $I_{DQ}$ = 90 mA. Data de-embedded to device reference plane.

| Parameter | Min | Typical | Max | Units |
|---|---|---|---|---|
| Frequency | 17 | | 22 | GHz |
| Small Signal Gain | | 25 | | dB |
| Noise Figure | | 1.3 | | dB |
| 1-dB Compression Point | | 20 | | dBm |
| Input Return Loss | | 12 | | dB |
| Output Return Loss | | 17 | | dB |
| 3RD Order Intermodulation level (Pout=0 dBm/tone) | | –55 | | dBc |
| Output TOI (Pout=0 dBm/tone) | | 28 | | dBm |
| Gain Temperature Coefficient | | –0.013 | | dBm/°C |


© 2016 TriQuint

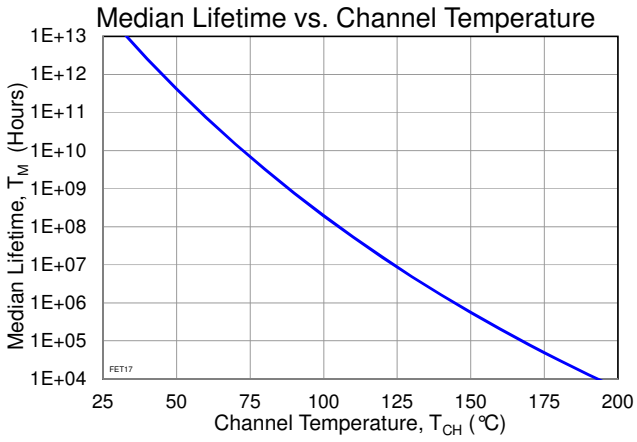
## Thermal and Reliability Information

| Parameter | Test Conditions | Value | Units |
|---|---|---|---|
| Thermal Resistance ($\theta_{JC}$) (1) | $T_{base}$ = 85°C, $V_D$ = 3.5 V, $I_{DQ}$ = 90 mA<br>Quiescent/Small Signal operation<br>$P_{DISS}$ = 0.315 W | 65.1 | °C/W |
| Channel Temperature ($T_{CH}$) | | 105.5 | °C |
| Median Lifetime ($T_M$) | | 1.236E08 | Hrs |

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

## Median Lifetime

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



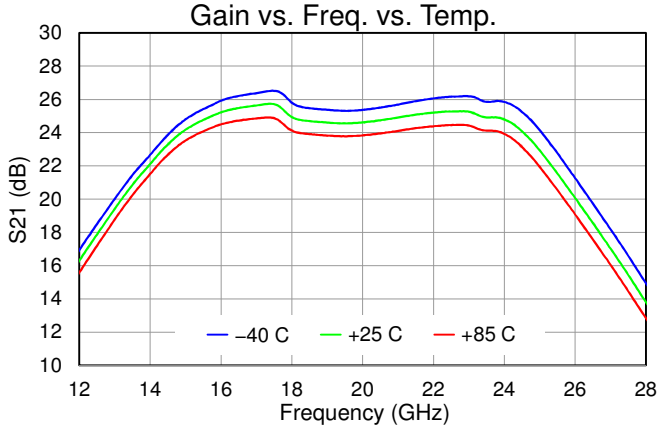


© 2016 TriQuint
Disclaimer: Subject to change without notice
www.triquint.com, www.qorvo.com

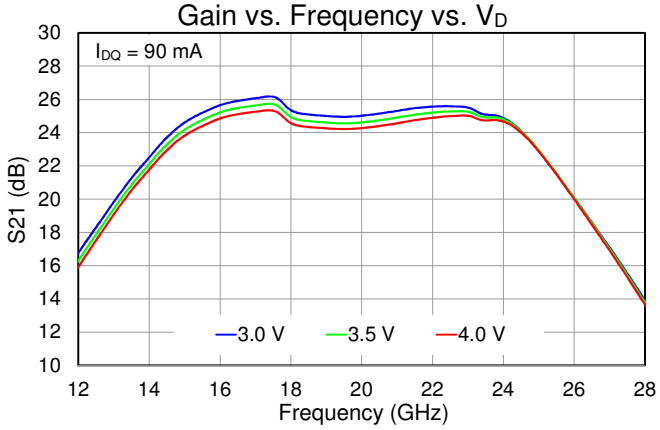
## Typical Performance: Small Signal

Test conditions unless otherwise noted: Temp. = 25 °C, $V_D$ = 3.5 V, $I_{DQ}$ = 90 mA. Data de-embedded to device reference plane.

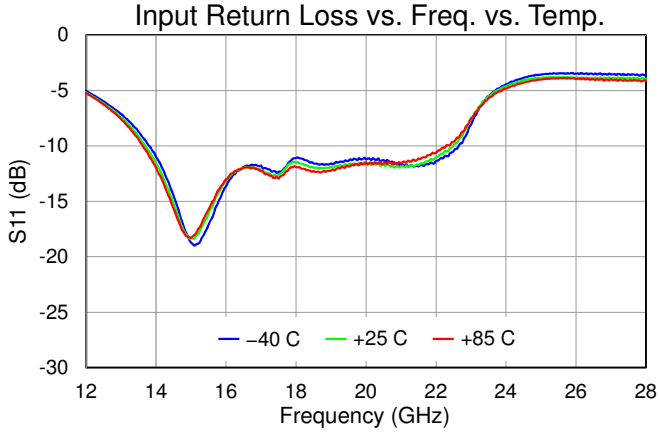
Gain vs. Freq. vs. Temp.



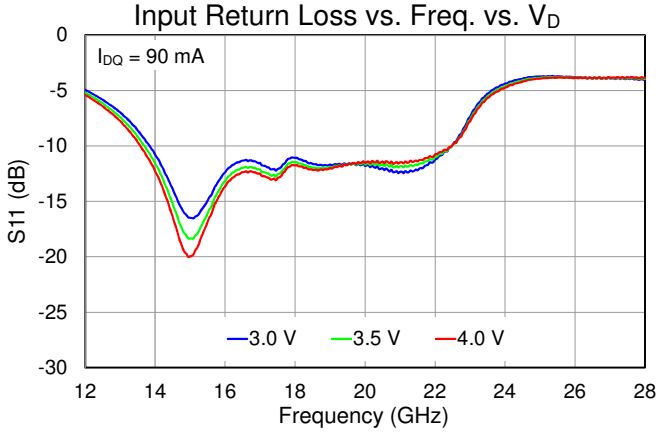

Gain vs. Frequency vs. $V_D$



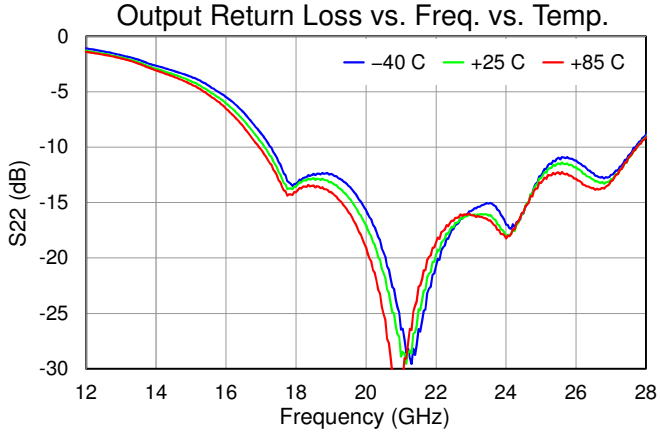

Input Return Loss vs. Freq. vs. Temp.



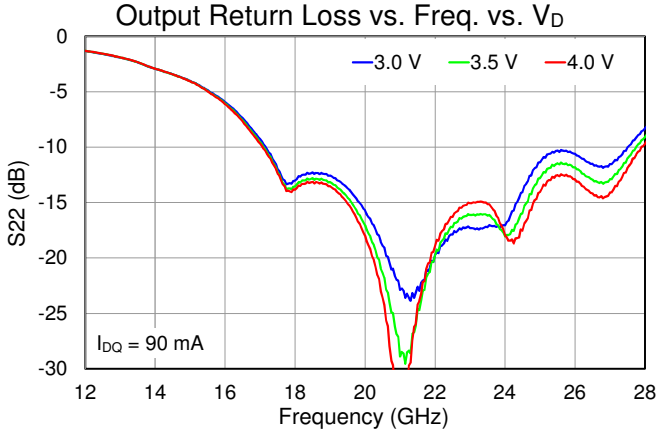

Input Return Loss vs. Freq. vs. $V_D$




Output Return Loss vs. Freq. vs. Temp.




Output Return Loss vs. Freq. vs. $V_D$



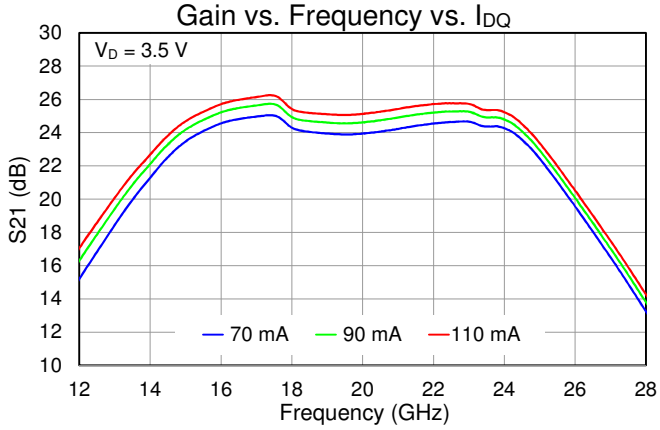


© 2016 TriQuint
Disclaimer: Subject to change without notice
www.triquint.com, www.qorvo.com

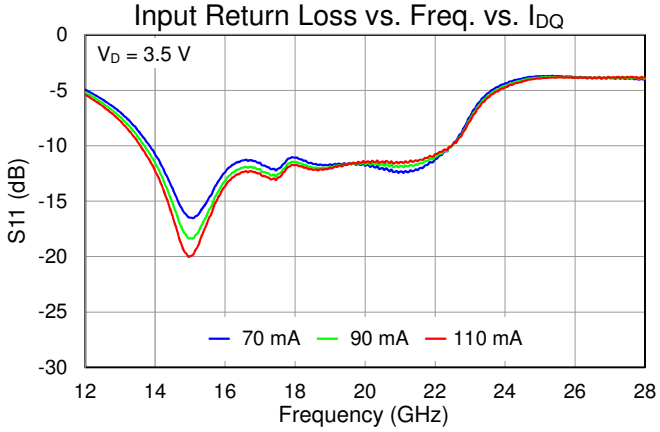
## Typical Performance: Small Signal

Test conditions unless otherwise noted: Temp. = 25 °C, $V_D$ = 3.5 V, $I_{DQ}$ = 90 mA. Data de-embedded to device reference plane.

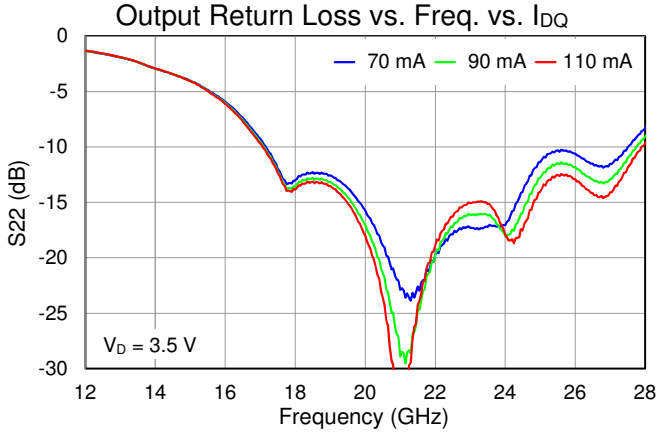
Gain vs. Frequency vs. $I_{DQ}$




Input Return Loss vs. Freq. vs. $I_{DQ}$




Output Return Loss vs. Freq. vs. $I_{DQ}$

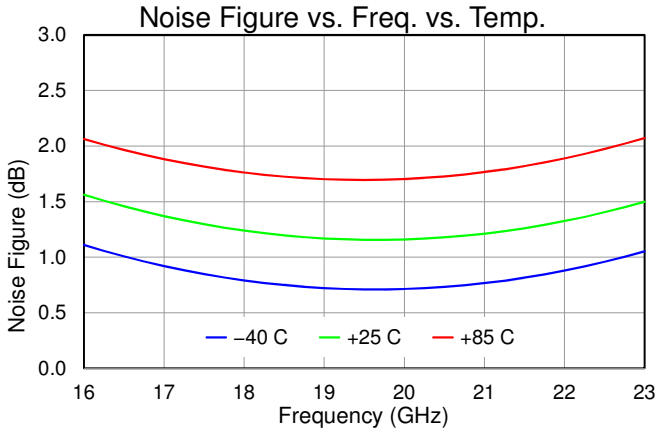


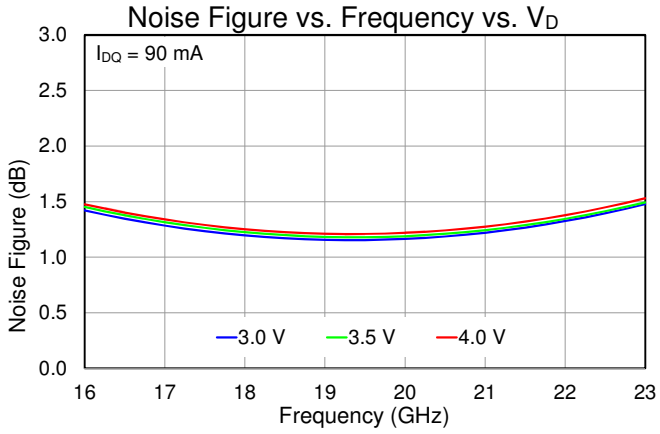


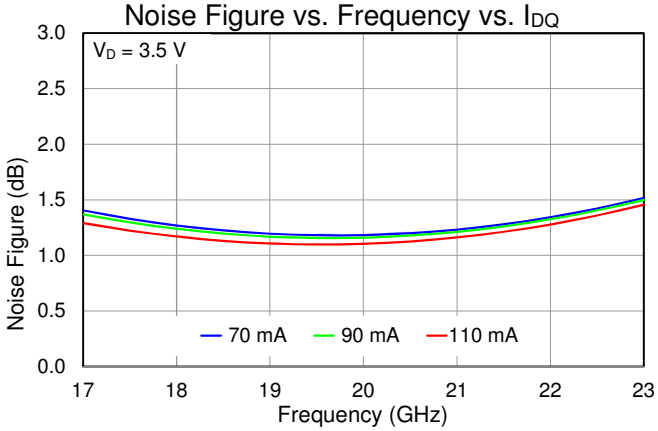
*© 2016 TriQuint*

## Typical Performance: Noise Figure

Test conditions unless otherwise noted: Temp. = 25 °C, $V_D$ = 3.5 V, $I_{DQ}$ = 90 mA. Data de-embedded to device reference plane.






Disclaimer: Subject to change without notice

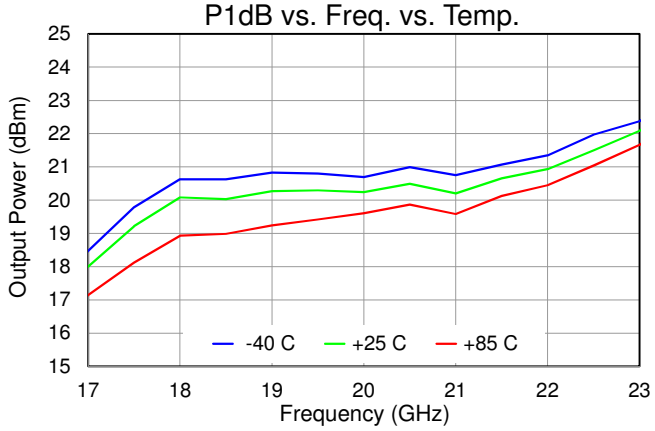
*© 2016 TriQuint*

www.triquint.com, www.qorvo.com

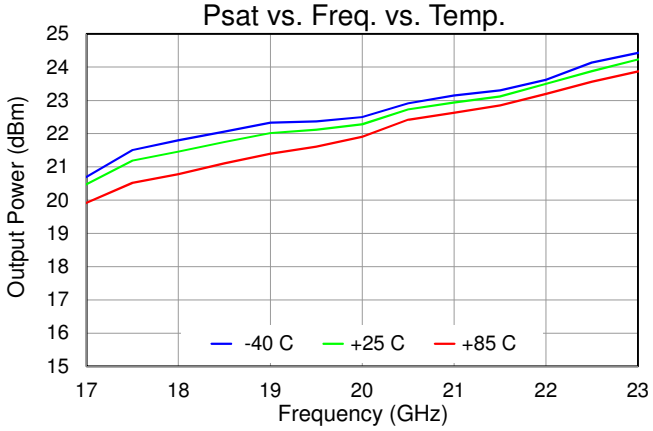
## Typical Performance: Large Signal

Test conditions unless otherwise noted: Temp. = 25 °C, $V_D$ = 3.5 V, $I_{DQ}$ = 90 mA. Data de-embedded to device reference plane.

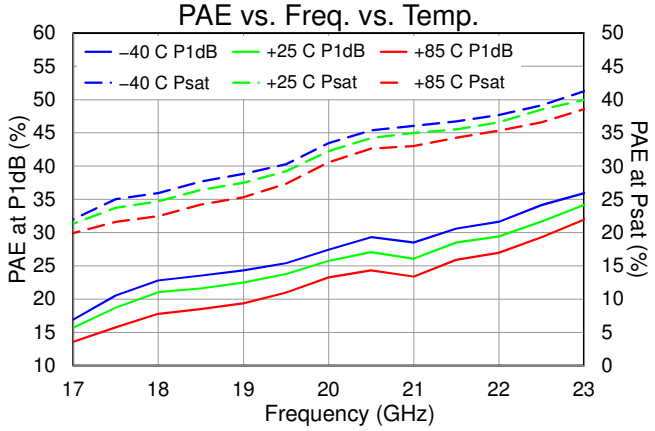
P1dB vs. Freq. vs. Temp.



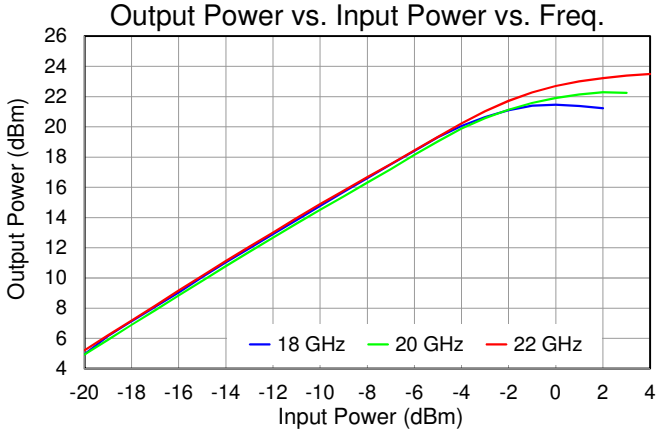

Psat vs. Freq. vs. Temp.



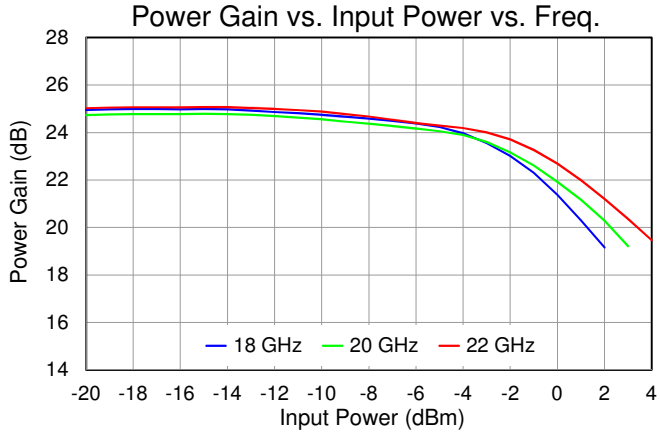

PAE vs. Freq. vs. Temp.



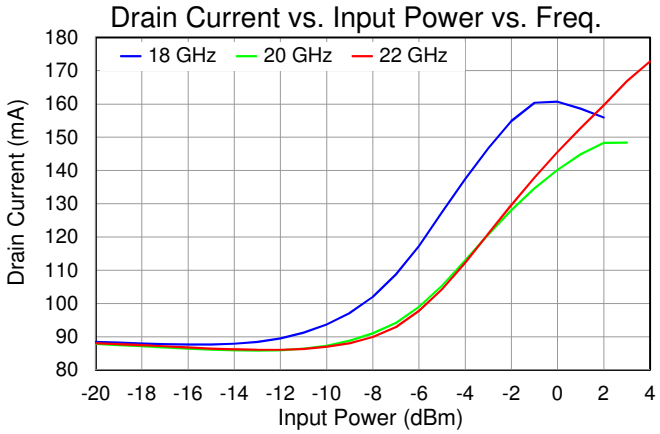

Output Power vs. Input Power vs. Freq.




Power Gain vs. Input Power vs. Freq.




Drain Current vs. Input Power vs. Freq.



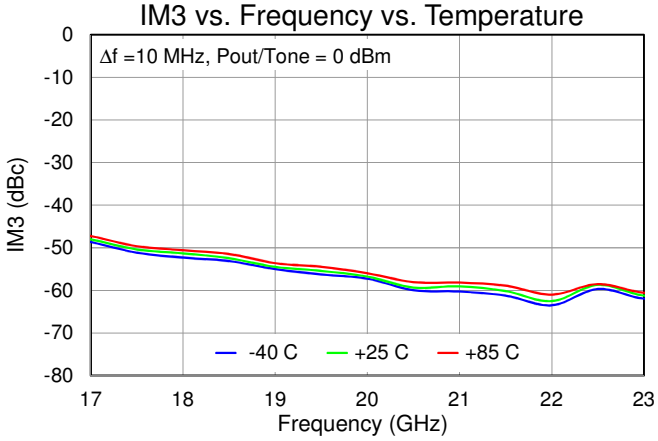


Disclaimer: Subject to change without notice
© 2016 TriQuint
www.triquint.com, www.qorvo.com

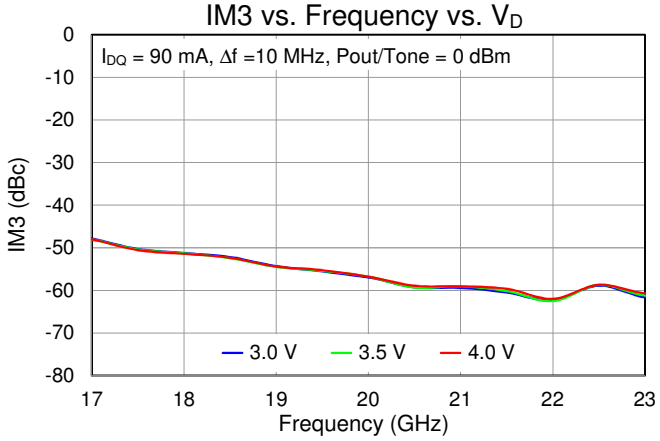
## Typical Performance: Linearity

Test conditions unless otherwise noted: Temp. = 25 °C, $V_D$ = 3.5 V, $I_{DQ}$ = 90 mA. Data de-embedded to device reference plane.

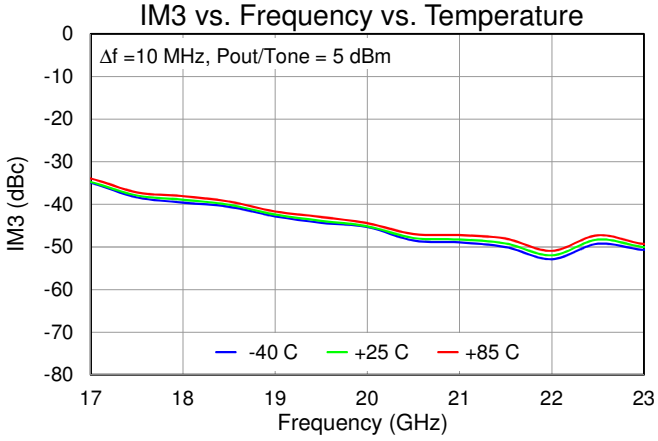
IM3 vs. Frequency vs. Temperature



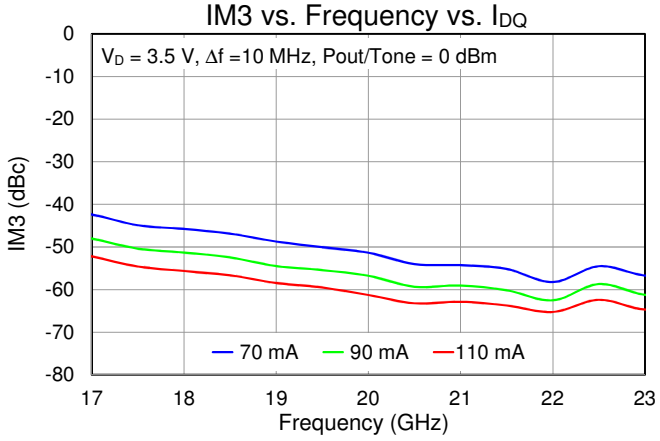

IM3 vs. Frequency vs. $V_D$



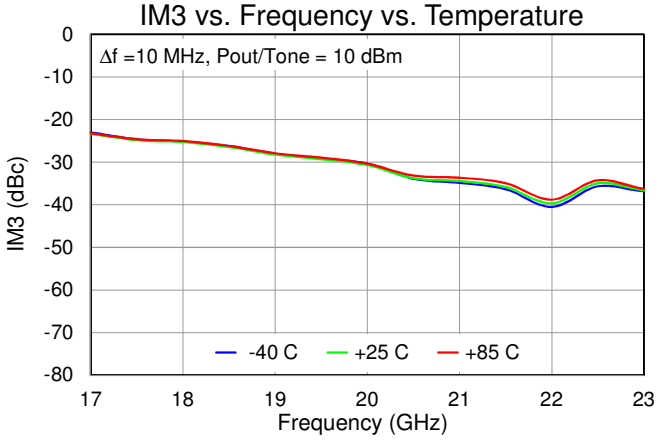

IM3 vs. Frequency vs. Temperature



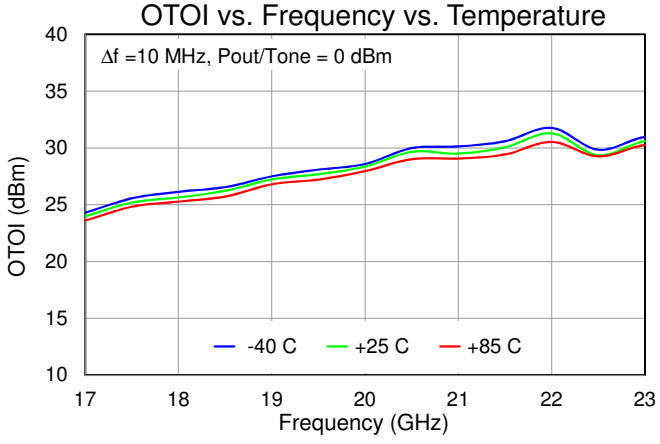

IM3 vs. Frequency vs. $I_{DQ}$




IM3 vs. Frequency vs. Temperature




OTOI vs. Frequency vs. Temperature



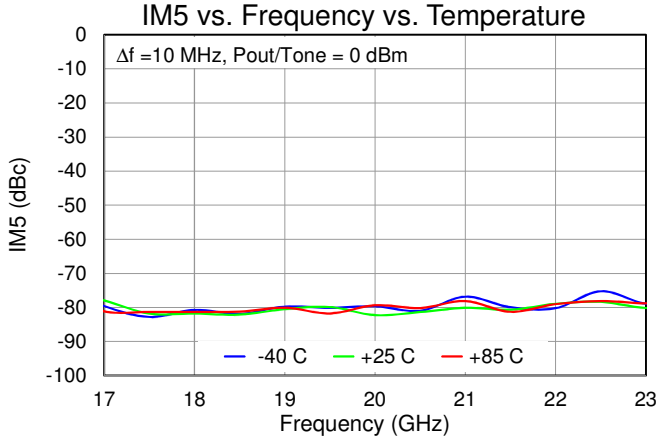


© 2016 TriQuint

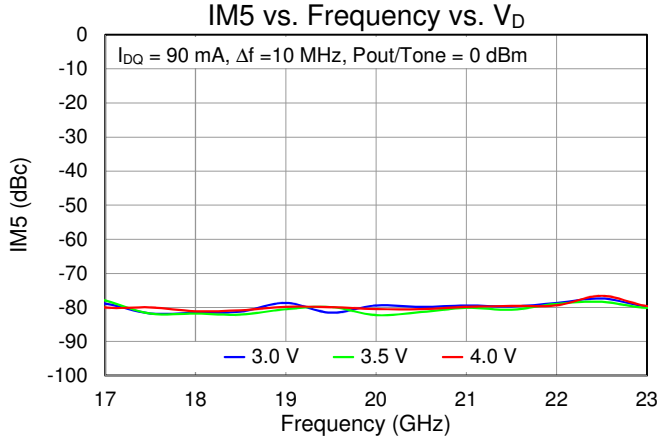
## Typical Performance: Linearity

Test conditions unless otherwise noted: Temp. = 25 °C, $V_D$ = 3.5 V, $I_{DQ}$ = 90 mA. Data de-embedded to device reference plane.

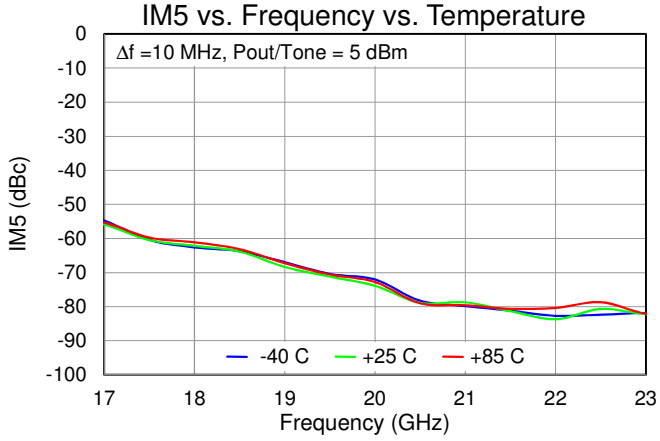
IM5 vs. Frequency vs. Temperature



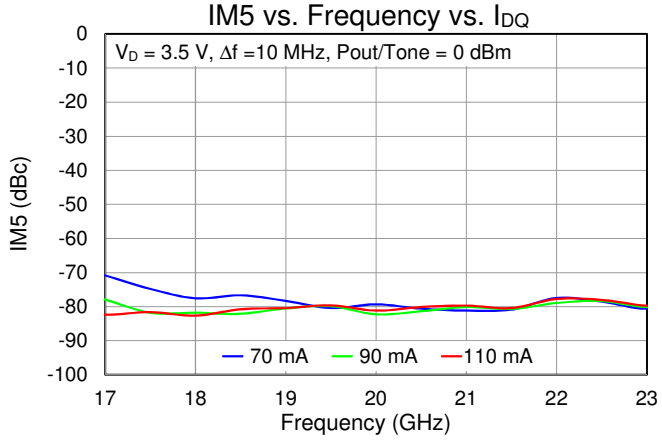

IM5 vs. Frequency vs. $V_D$



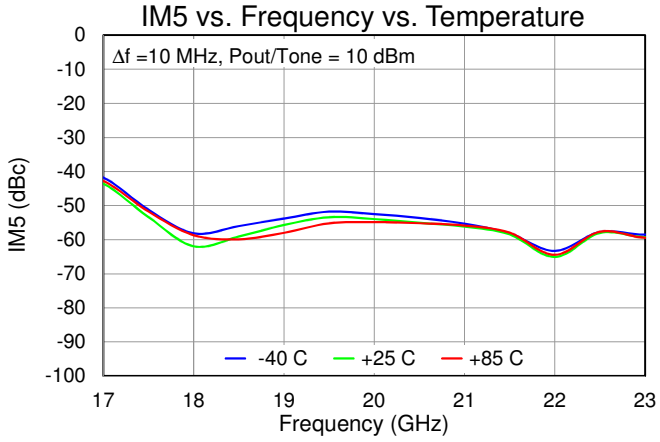

IM5 vs. Frequency vs. Temperature




IM5 vs. Frequency vs. $I_{DQ}$



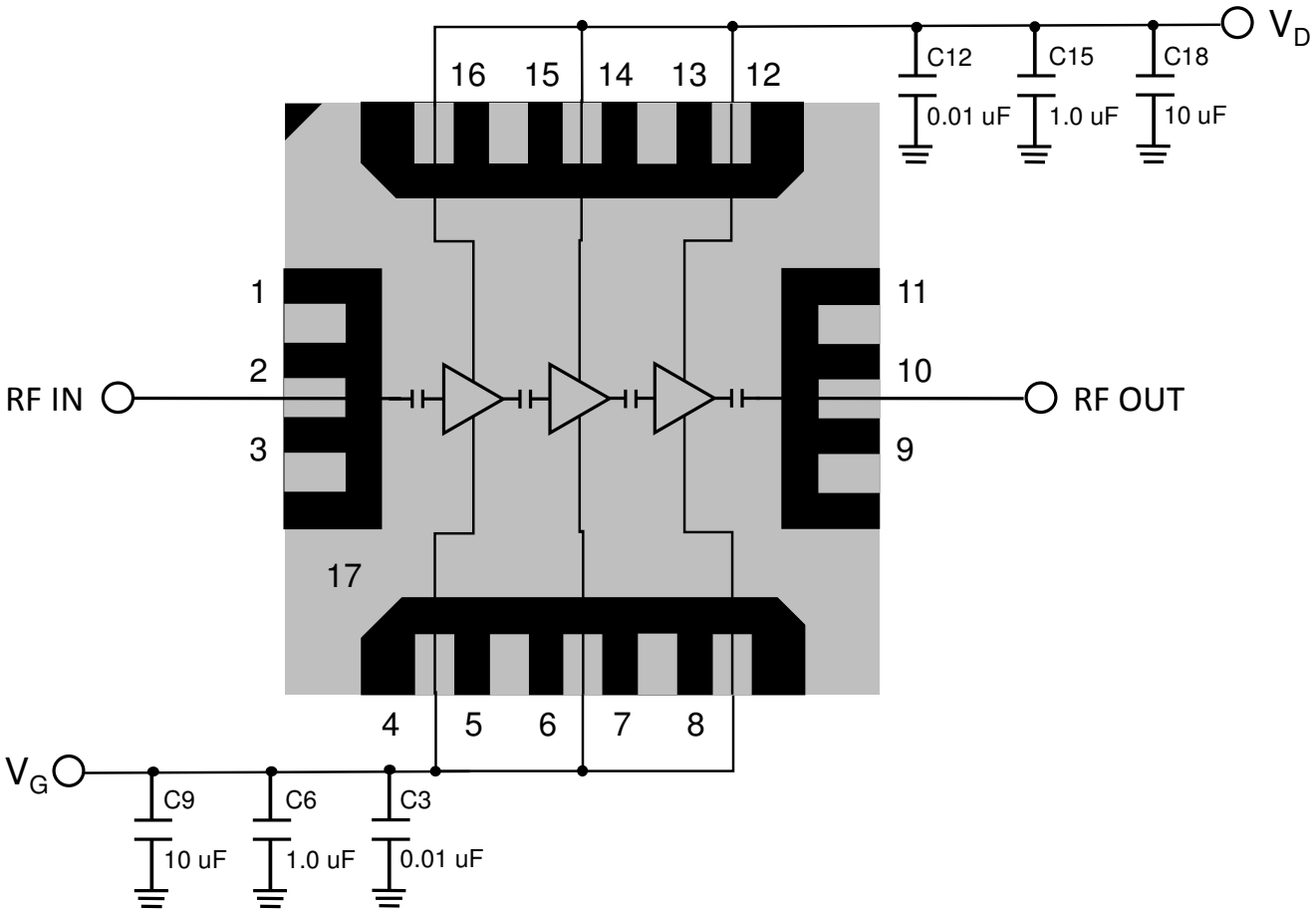

IM5 vs. Frequency vs. Temperature





Disclaimer: Subject to change without notice
*© 2016 TriQuint*
www.triquint.com, www.qorvo.com

## Application Circuit




## Bias-up Procedure

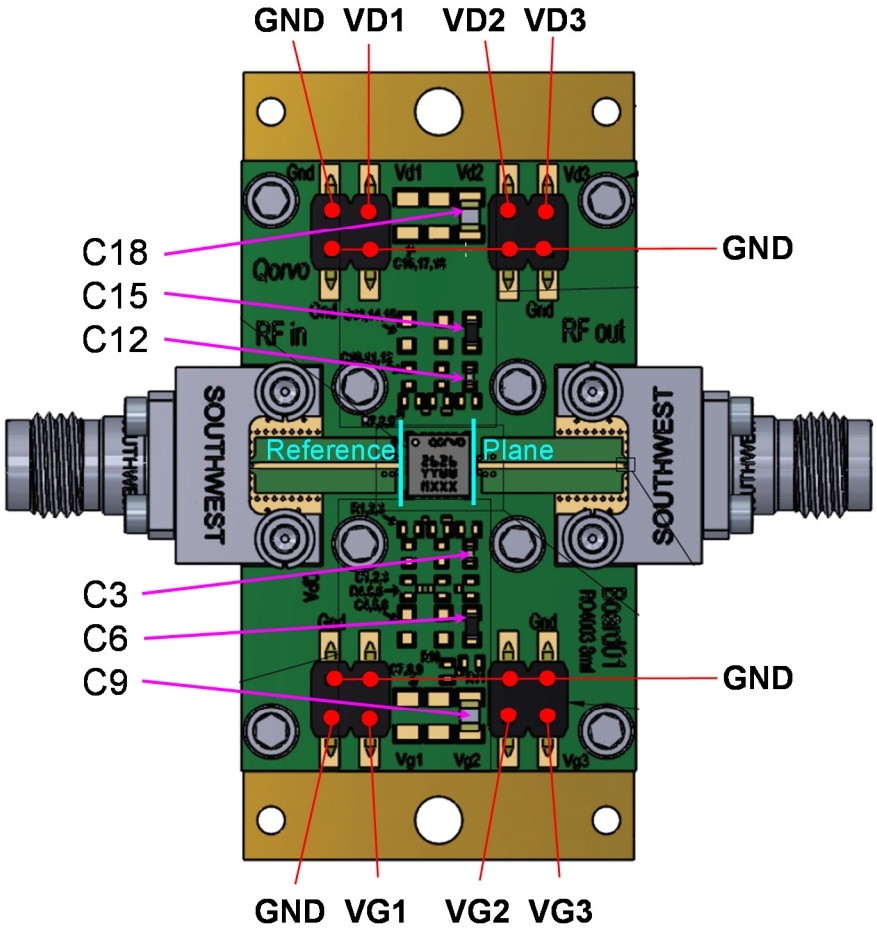
| |
|---|
| 1. Set $I_D$ limit to 200 mA, $I_G$ limit to 10 mA |
| 2. Set $V_G$ to –1.5 V |
| 3. Set $V_D$ +3.5 V |
| 4. Adjust $V_G$ more positive until $I_{DQ}$ = 90mA ($V_G$ ~ –0.46 V Typical) |
| 5. Apply RF signal |

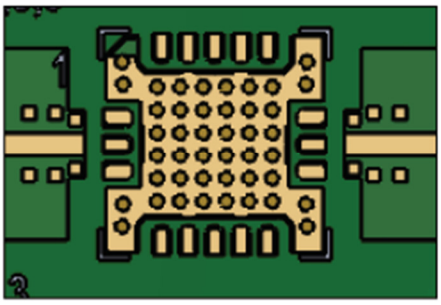
## Bias-down Procedure

| |
|---|
| 1. Turn off RF signal |
| 2. Reduce $V_G$ to –1.5 V. Ensure $I_{DQ}$ ~ 0mA |
| 3. Set $V_D$ to 0V |
| 4. Turn off $V_D$ supply |
| 5. Turn off $V_G$ supply |


© 2016 TriQuint

## Evaluation Board and Mounting Detail



**Mounting pad detail**

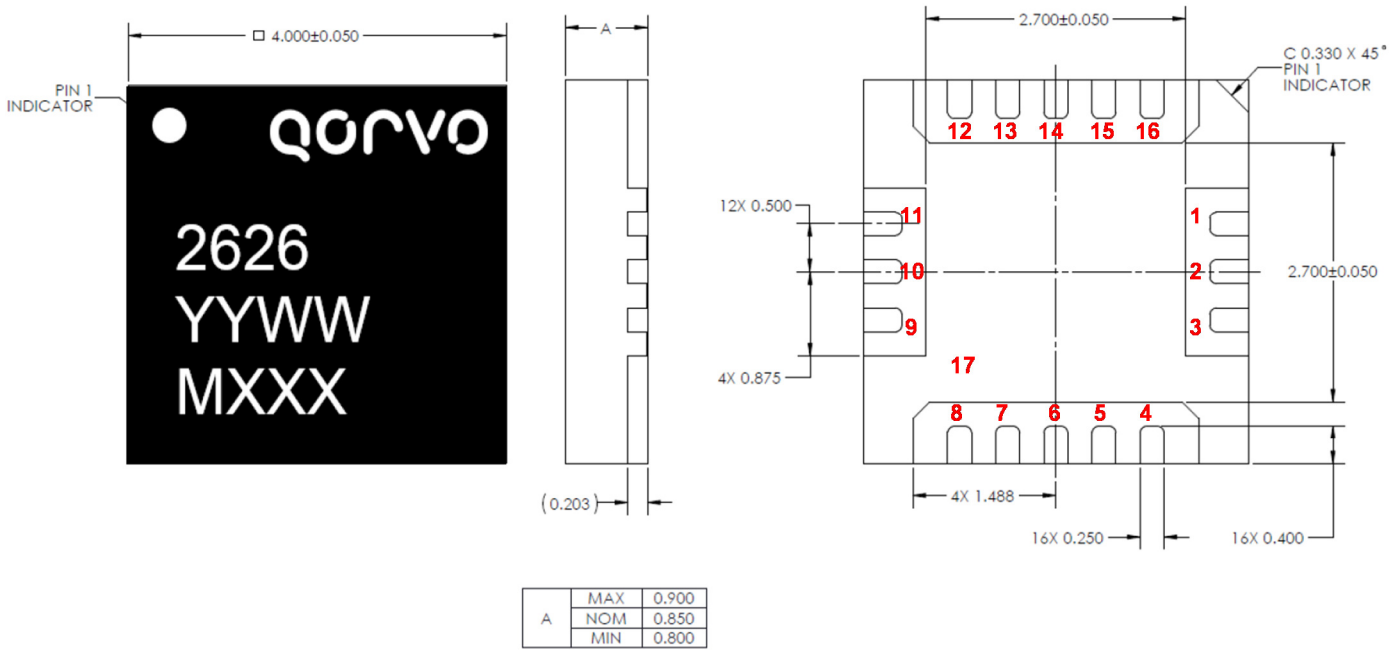
RF Layer is 0.008" thick Rogers Corp. RO4003C ($\varepsilon_r$ = 3.35). Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1492-04A-5.

All data de-embedded to the device reference plane (shown).

| Ref. Des. | Component | Value | Manuf. | Part Number |
|---|---|---|---|---|
| C3, C12 | Surface Mount Cap. | CAP 0.01UF +/-10% 50V 0402 X7R ROHS | Various | |
| C6, C15 | Surface Mount Cap. | CAP 1.0UF +/-10% 16V 0603 X7R ROHS | Various | |
| C9, C18 | Surface Mount Cap. | CAP CER 10UF 10V X7R 10% 0805 TDK ROHS | Various | |


*© 2016 TriQuint*

## Mechanical Drawing & Pad Description



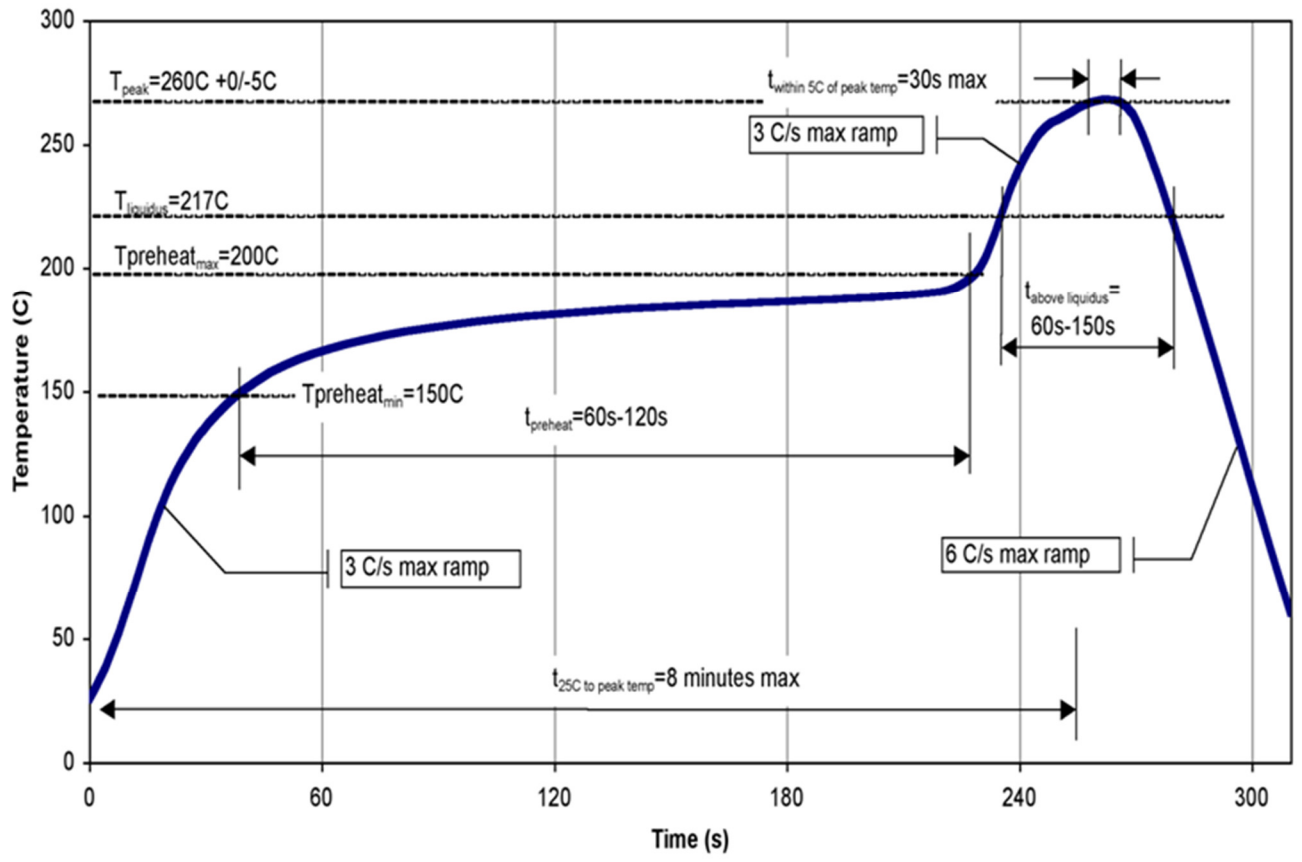

| A | | |
|---|---|---|
| | MAX | 0.900 |
| | NOM | 0.850 |
| | MIN | 0.800 |

Dimensions in mm
Part Marking:
2626: Part Number
YY = Part Assembly Year
MM = Part Assembly Month
MXXX = Batch ID

| Pin Number | Label | Description |
|---|---|---|
| 1, 3, 9, 11, 17 (slug) | GND | GROUND |
| 2 | RF Input | Matched to 50 ohms, DC blocked |
| 4 | VG1 | Gate Voltage; bias network is required ($V_G$ can be tied together at PCB) |
| 6 | VG2 | Gate Voltage; bias network is required ($V_G$ can be tied together at PCB) |
| 8 | VG3 | Gate Voltage; bias network is required ($V_G$ can be tied together at PCB) |
| 10 | RF Output | Matched to 50 ohms, DC blocked |
| 12 | VD3 | Drain Voltage; bias network is required ($V_D$ can be tied together at PCB) |
| 14 | VD2 | Drain Voltage; bias network is required ($V_D$ can be tied together at PCB) |
| 16 | VD1 | Drain Voltage; bias network is required ($V_D$ can be tied together at PCB) |
| 5, 7, 13, 15 | N/C | No internal connection. Recommend to GND at the PCB level |


© 2016 TriQuint

## Recommended Soldering Temperature Profile





© 2016 TriQuint

# Product Compliance Information

## ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: Class 1A
Value: ≥ 250 V and < 500 V
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

## MSL Rating

Level 3 at 260 °C convection reflow
The part is rated Moisture Sensitivity Level 3
JEDEC standard IPC/JEDEC J-STD-020.

## ECCN

US Department of Commerce: EAR99

## Solderability

Compatible with the latest version of J-STD-020 Lead free solder, 260 °C.

## 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:

- 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, and information about TriQuint:

**Web:** www.triquint.com **Tel:** +1.972.994.8465
**Email:** info-sales@triquint.com **Fax:** +1.972.994.8504

For technical questions and application information: **Email:** info-products@triquint.com

# Important Notice

The information contained herein is believed to be reliable. TriQuint makes no warranties regarding the information contained herein. TriQuint assumes no responsibility or liability whatsoever for any of the information contained herein. TriQuint assumes no responsibility or liability whatsoever for the use of the information contained herein. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the user. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for TriQuint products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information.

TriQuint products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.


© 2016 TriQuint