

TGA2704-SM

8W 9-11 GHz Power Amplifier



Applications

- Marine and Air Radar, Traffic Control
- Weather Monitoring
- Port Security
- Point-to-Point Radio
- Communications

Product Features

- Frequency Range: 9 - 11 GHz
- Saturated Output Power: 39 dBm
- Small Signal Gain: 21 dB
- Bias: $V_d = 9\text{ V}$, $I_{dq} = 1.05\text{ A}$, $V_g = -0.74\text{ V}$ typical

General Description

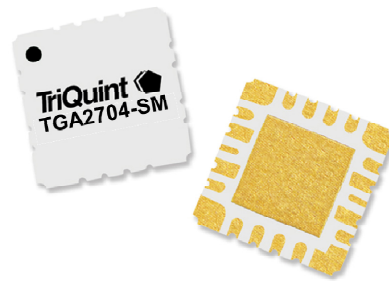
The TriQuint TGA2704-SM provides 21 dB of small signal gain and 8W of output power across 9-11 GHz. TGA2704-SM is designed using TriQuint's proven standard 0.25 μm gate pHEMT 3MI production process.

The TGA2704-SM features a ceramic QFN designed for surface mount to a printed circuit board.

Fully matched to 50 ohms and with integrated DC blocking capacitors on both I/O ports, the TGA2704-SM is ideally suited to support both commercial and defense related applications

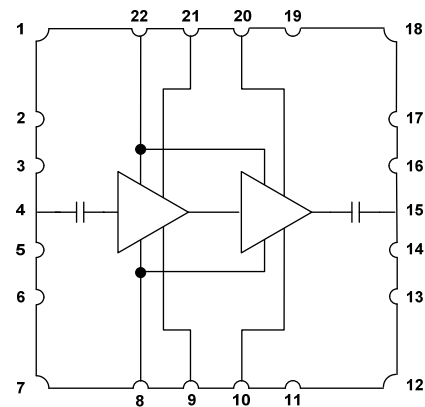
Lead-free and RoHS compliant.

Evaluation Boards are available upon request.



QFN 7x7mm 22L

Functional Block Diagram



Pin Configuration

| Pin # | Symbol |
|-------------------------------------|--------|
| 1,2,3,5,6,7,11,12,13,14,16,17,18,19 | Gnd |
| 4 | RF In |
| 8 | Vg |
| 9 | Vd1 |
| 10 | Vd2 |
| 15 | RF Out |
| 20 | Vd2 |
| 21 | Vd1 |
| 22 | Vg |

Ordering Information

| Part No. | ECCN | Description |
|------------|-------------|------------------------|
| TGA2704-SM | 3A001.b.2.b | X-band Power Amplifier |

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Specifications

Absolute Maximum Ratings

| Parameter | Rating |
|-----------------------------------|---------------|
| Drain Voltage, Vd | 10 V |
| Gate Voltage, Vg | -1.2 to 0.5 V |
| Drain Current, Id | 3.85 A |
| Gate Current range, Ig | -14 to 126 mA |
| RF Input Power, CW, 50Ω, T = 25°C | 23 dBm |
| Channel Temperature, Tch | 200 °C |
| Mounting Temperature (30 Seconds) | 260 °C |
| Storage Temperature | -40 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 | Min | Typ | Max | Units |
|---------------------------|-----|-------|-----|-------|
| Vd | | 9 | | V |
| Idq (no RF drive) | | 1.05 | | A |
| Id_drive (under RF drive) | | 2.06 | | A |
| Vg | | -0.74 | | V |

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, Vd = 9 V, Idq = 1.05 A, Vg = -0.74 V typical, CW

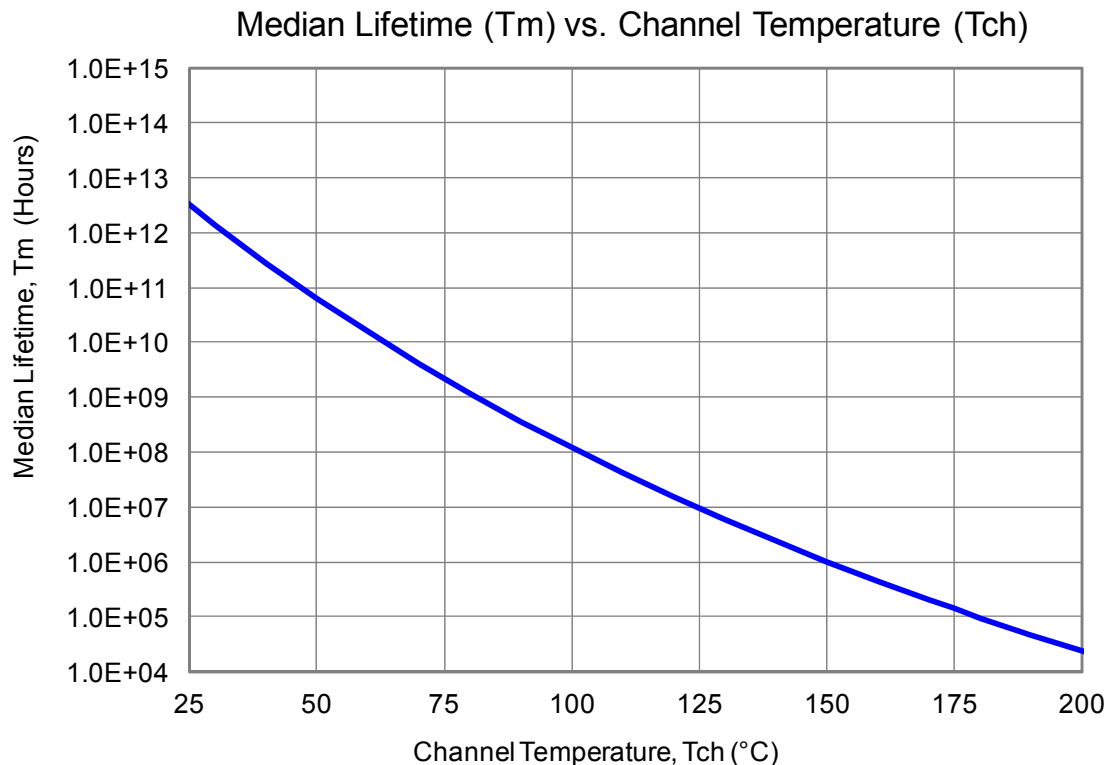
| Parameter | Min | Typ | Max | Units |
|-------------------------------------------|-----|--------|-----|-------|
| Operational Frequency Range | 9 | | 11 | GHz |
| Small Signal Gain | | 21 | | dB |
| Small Signal Gain Temperature Coefficient | | -0.046 | | dB/°C |
| Output Power @ Saturation | | 39 | | dBm |
| Power-Added Efficiency @ Saturation | | 42 | | % |
| Output Power @ 1 dB compression | | 38.5 | | dBm |
| Output Power Temperature Coefficient | | -0.011 | | dB/°C |

Specifications (cont'd)

Thermal and Reliability Information

| Parameter | Condition | Rating |
|----------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------|
| Channel Temperature (Tch), Median Lifetime (Tm), Thermal Resistance* | Tbase = 85 °C, Vd = 7V, Idq = 1.40 A, Pdiss 9.8 W, no RF input power, CW | Tch 161°C Tm = 4.1E+5 Hours θJC = 7.8 °C/W |
| Channel Temperature (Tch), Median Lifetime (Tm), Thermal Resistance* | Tbase = 85 °C, Vd = 7V, Id = 1.93 A, Pdiss = 8.1 W, Pout = 37.3 dBm, CW | Tch = 137°C Tm = 3.1E+6 Hours θJC = 6.4°C/W |
| Channel Temperature (Tch), Median Lifetime (Tm), Thermal Resistance* | Tbase = 85 °C, Vd = 9V, Idq = 1.05 A, Pdiss = 9.5 W, no RF input power, CW | Tch = 156 °C Tm = 6.1E+5 Hours θJC = 7.5°C/W |
| Channel Temperature (Tch), Median Lifetime (Tm), Thermal Resistance* | Tbase = 85 °C, Vd = 9V, Id = 2.11 A, Pdiss = 11.2 W, Pout = 38.9 dBm, CW | Tch = 156°C Tm = 6.1E+5 Hours θJC = 6.3°C/W |

* Thermal Resistance, θJC, measured to center bottom of package

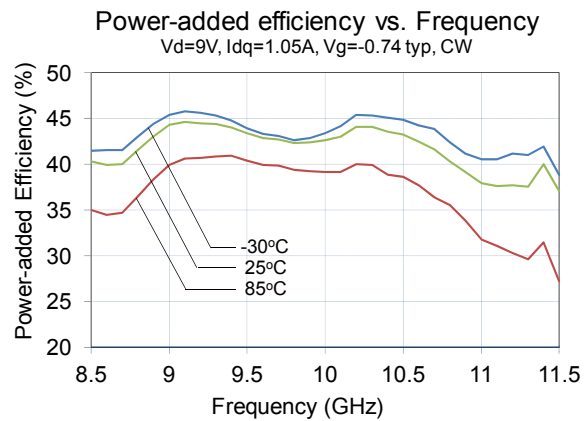
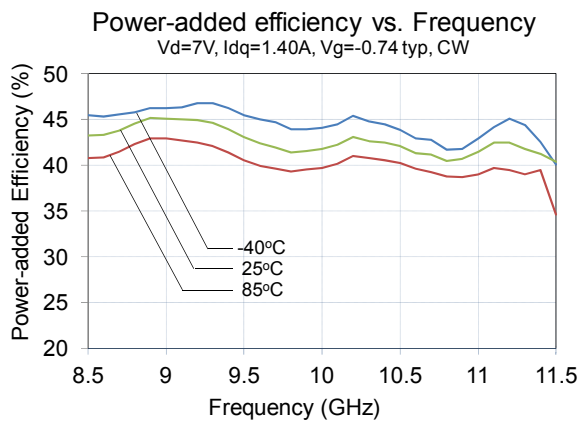
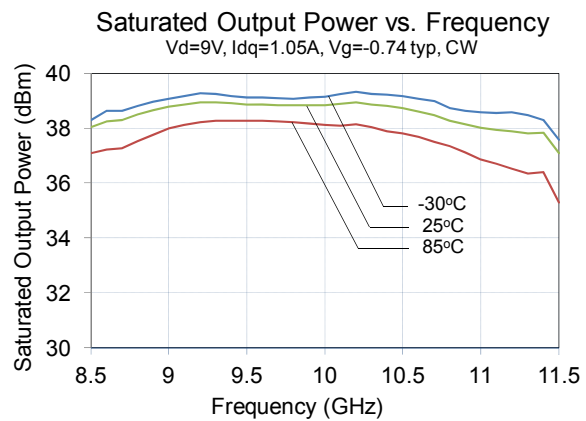
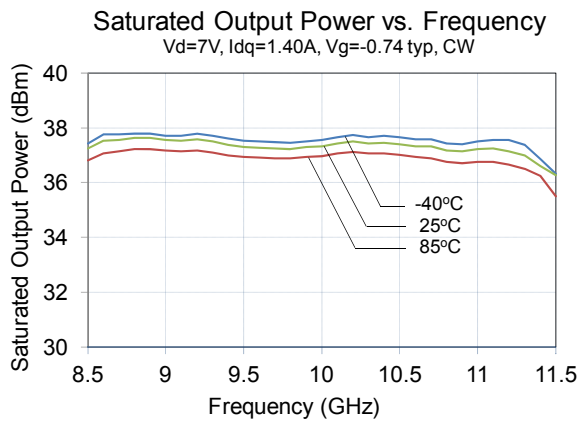
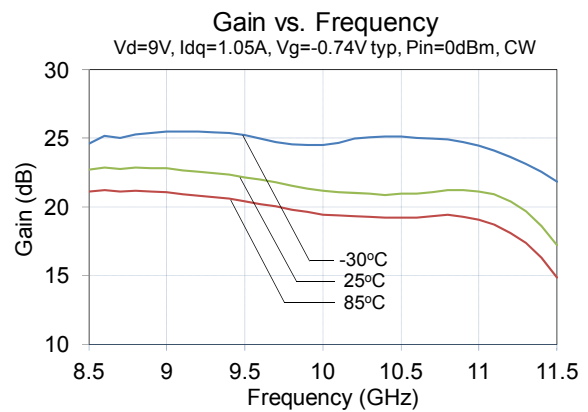
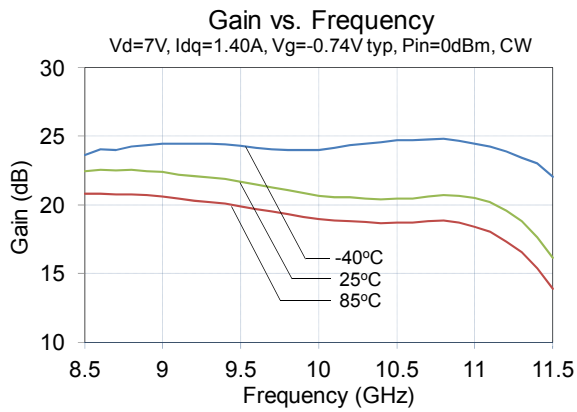


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Typical Performance

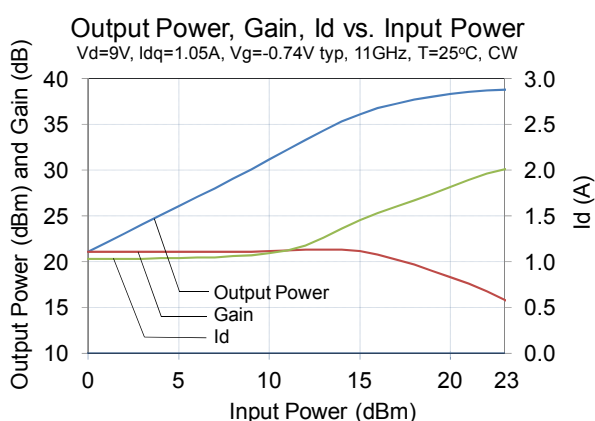
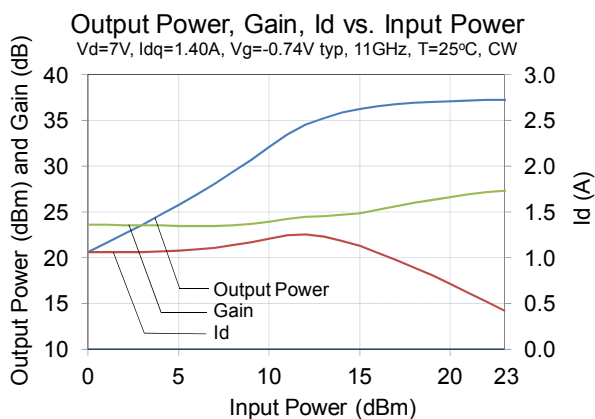
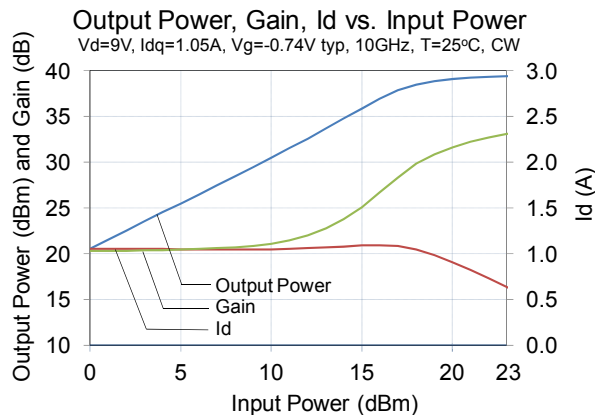
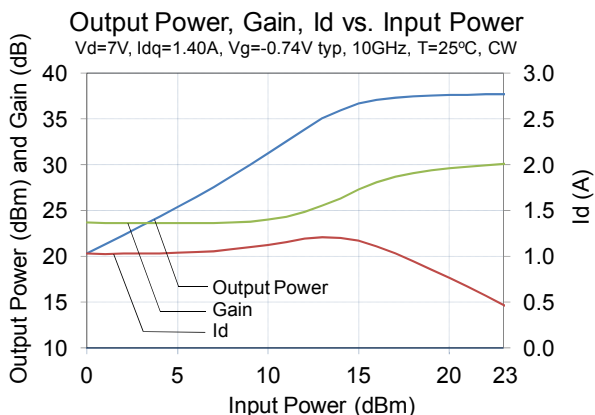
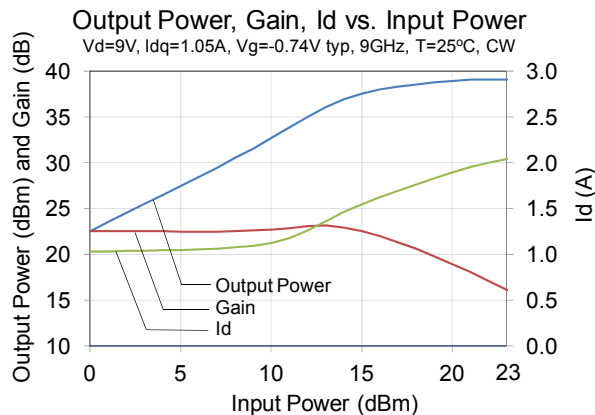
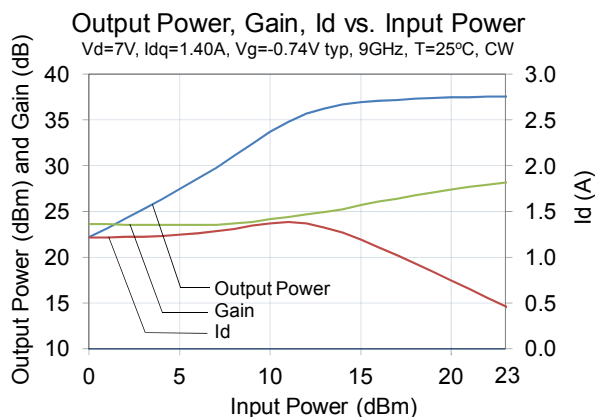


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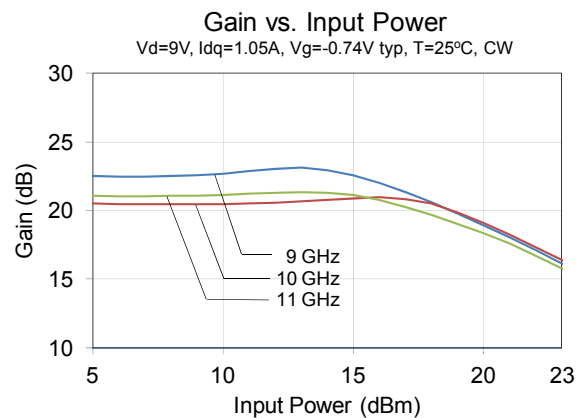
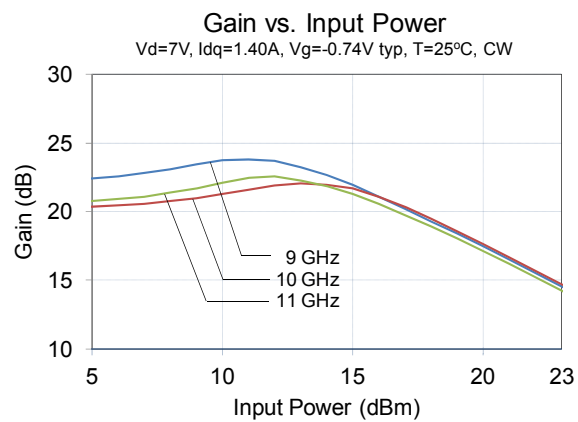
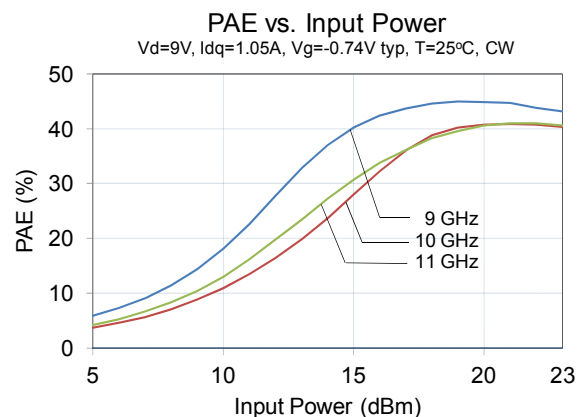
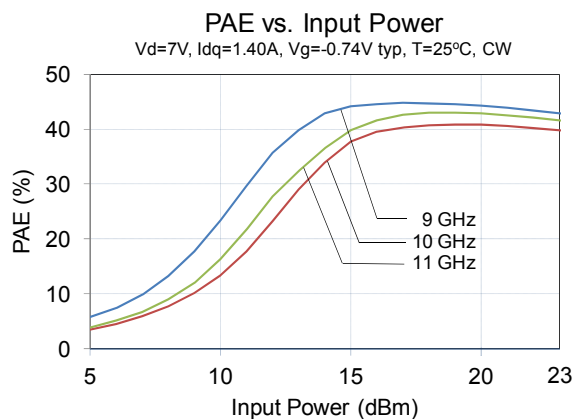
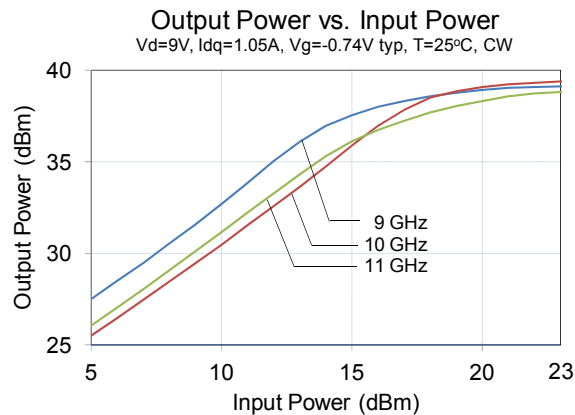
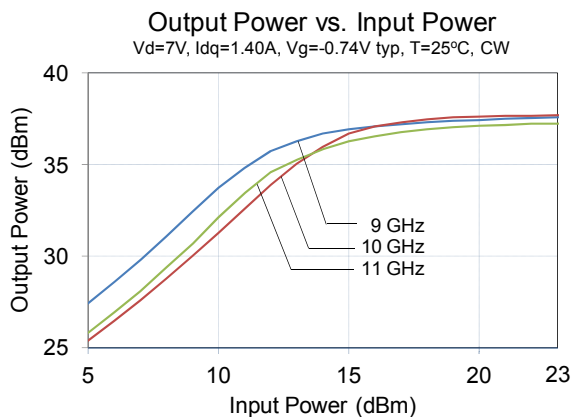


Typical Performance



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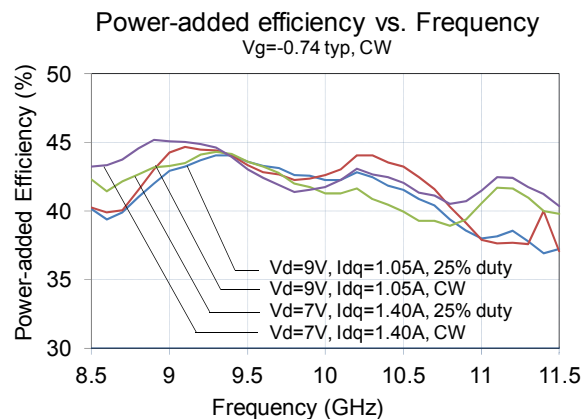
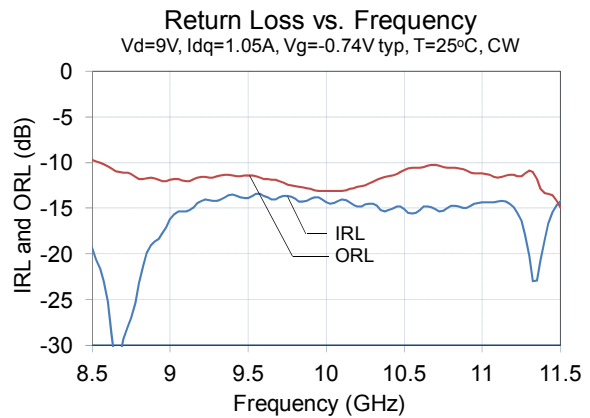
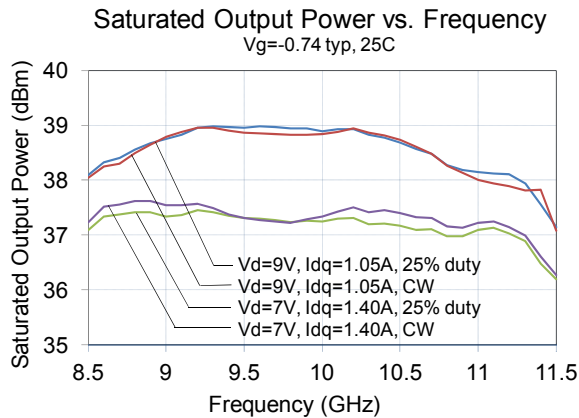
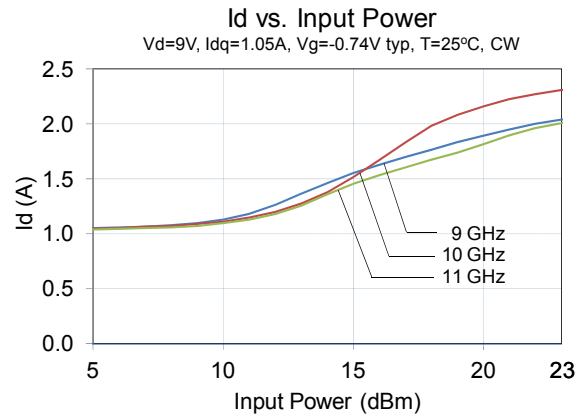
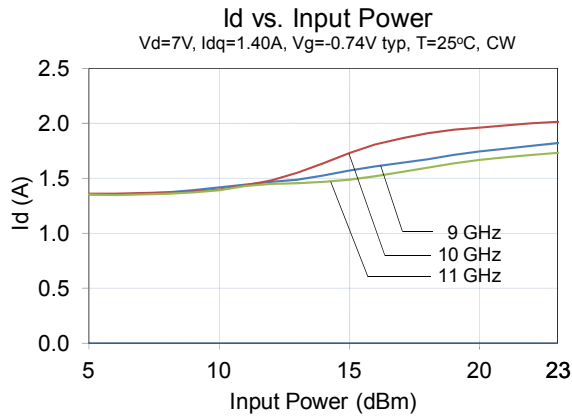


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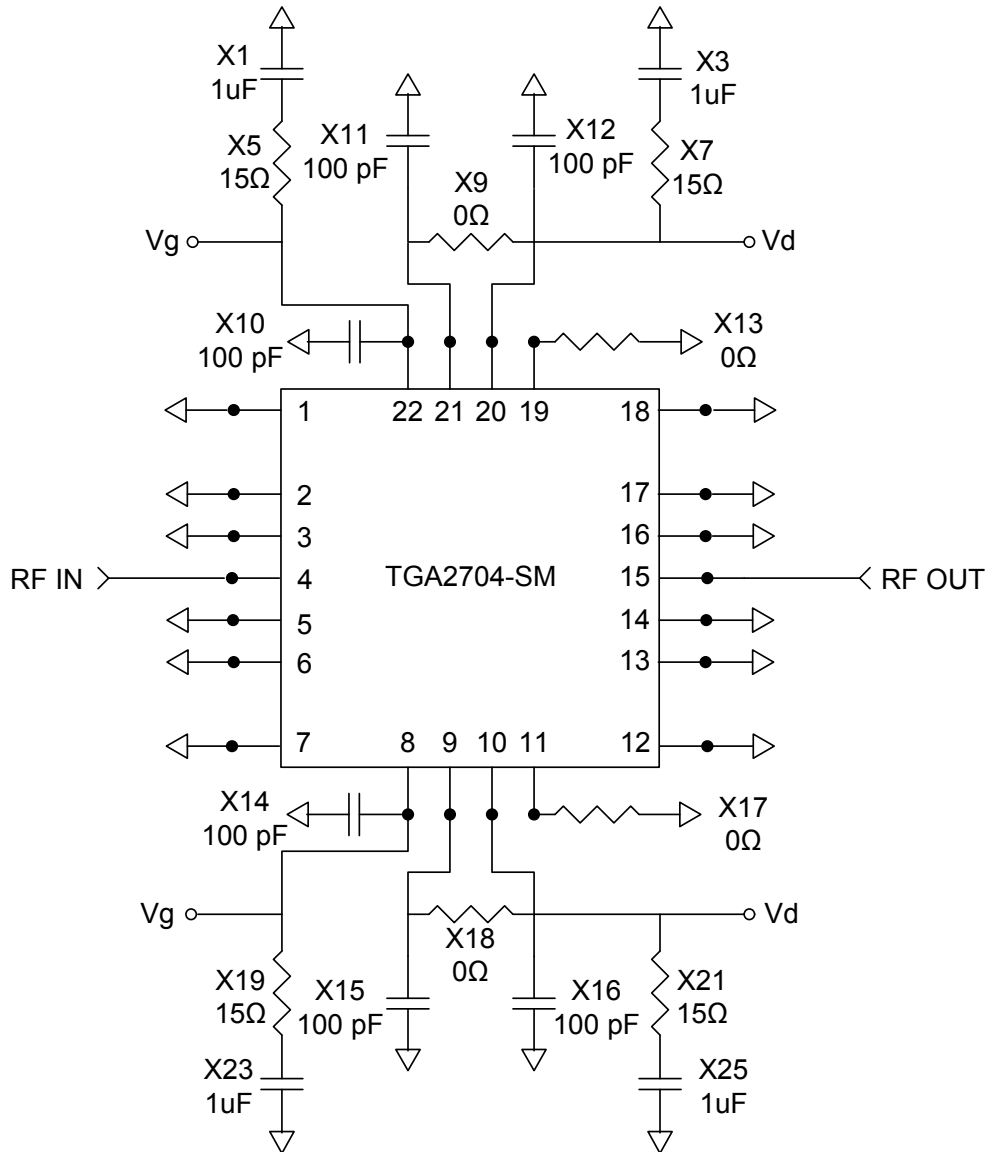
Typical Performance



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Application Circuit



Bias-up Procedure

- Turn V_g to -1.2 V
- Turn V_d to 9 V
- Adjust V_g more positive until I_{dq} is 1.05 A. This will be $V_g \sim -0.74$ V typical
- Apply RF signal

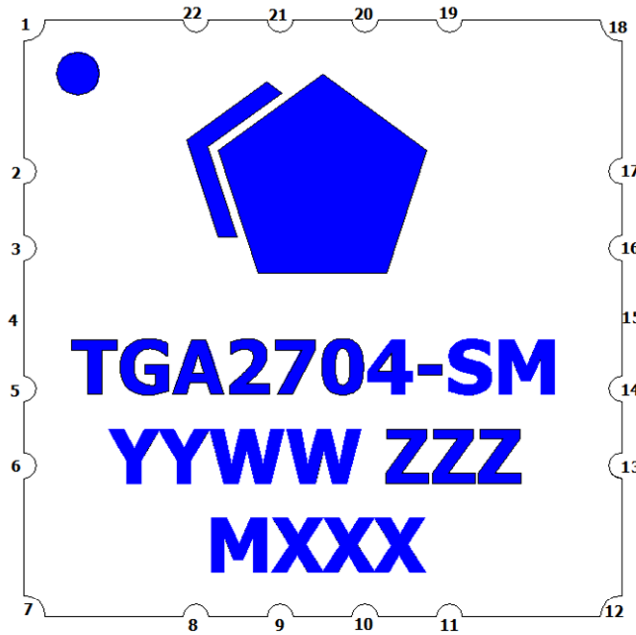
Bias-down Procedure

- Turn off RF signal
- Reduce V_g to -1.2 V. Ensure $I_d \sim 0$ mA
- Turn V_d to 0 V
- Turn V_g to 0 V

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Pin Description



| Pin # | Symbol | Description |
|-------------------------------------|--------|-------------------------------------------|
| 1,2,3,5,6,7,11,12,13,14,16,17,18,19 | Gnd | Connect to Ground |
| 4 | RF In | Input, matched to 50Ω |
| 8 | Vg | Gate voltage. Bias network is required |
| 9 | Vd1 | Drain 1 voltage. Bias network is required |
| 10 | Vd2 | Drain 2 voltage. Bias network is required |
| 15 | RF Out | Output, matched to 50Ω |
| 20 | Vd2 | Drain 2 voltage. Bias network is required |
| 21 | Vd1 | Drain 1 voltage. Bias network is required |
| 22 | Vg | Gate voltage. Bias network is required |

Note: See Application Circuit on page 8 as an example

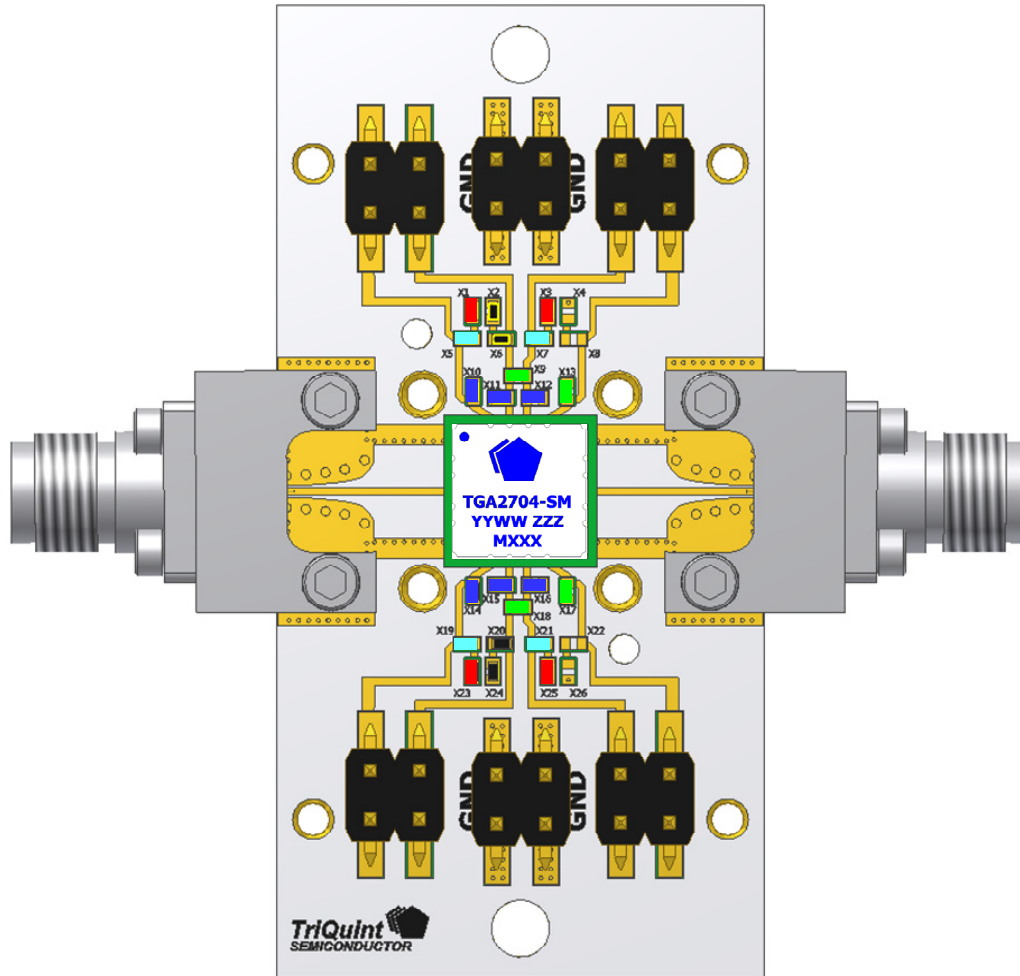
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Evaluation Board Layout

PC Board Layout

Board material is RO4003 0.008" thickness with ½ oz copper cladding.



Bill of Material

| Ref Des | Value | Description | Manufacturer | Part Number |
|---------------------------------|--------|----------------|--------------|----------------|
| X1,X3,X23, X25 | 1 uF | Cap, 0402 | TDK | C1005XR1C105M |
| X10,X11, X12,X14, X15,X16 | 100 pF | Cap, 0402 | AVX | 04025C101KAT2A |
| X5,X7,X19, X21 | 15Ω | Resistor, 0402 | Panasonic | ERJ-2GEJ150X |
| X9,X13,X17, X18 | 0Ω | Resistor, 0402 | Panasonic | ERJ-2GE0R00X |

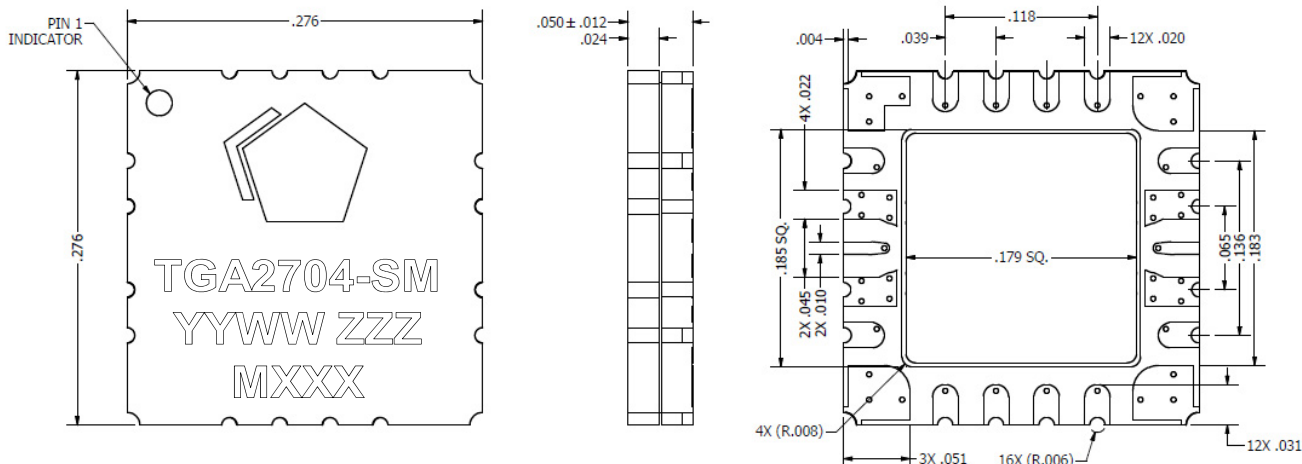
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Mechanical Information

Package Information and Dimensions

All dimensions in inches and are +/- 0.006in unless otherwise noted.



Part marking:

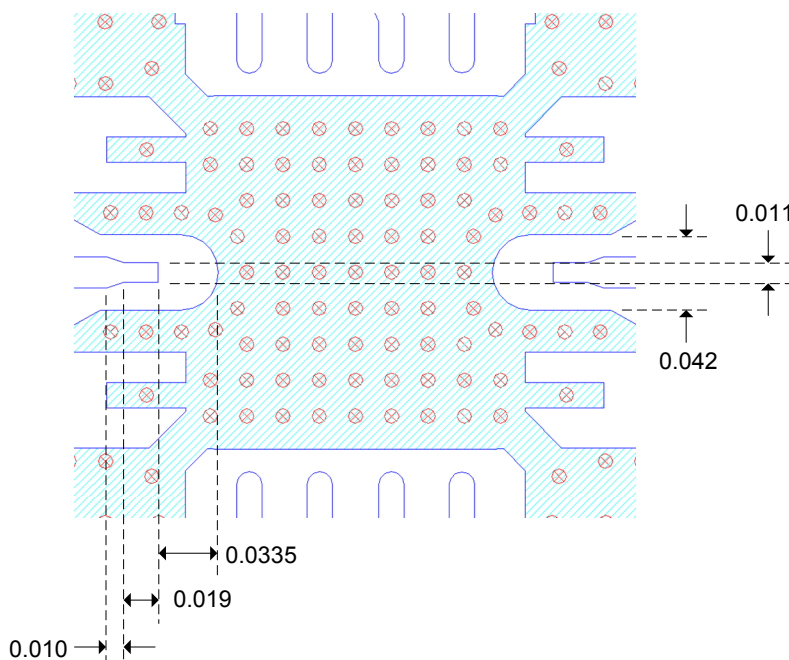
| | |
|-------------|-------------------------|
| YY | assembly lot start year |
| WW | assembly lot start week |
| ZZZ | part serial number |
| MXXX | batch ID |

PCB Mounting Pattern

All dimensions in inches

Notes:

- The pad pattern shown has been developed and tested for optimized assembly at TriQuint Semiconductor. The PCB land pattern has been developed to accommodate lead and package tolerances. Since surface mount processes vary from company to company, careful process development is recommended.
- Ground / thermal vias are critical for the proper performance of this device. Vias should use a 0.008in diameter drill, and they are solid filled, copper plated shut or silver filled paste with over plating.



Product Compliance Information

ESD Information



Caution! ESD-Sensitive Device

ESD rating: TBD
 Value: Passes < TBD V min.
 Test: Human Body Model (HBM)
 Standard: JEDEC Standard JESD22-A114

Solderability

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

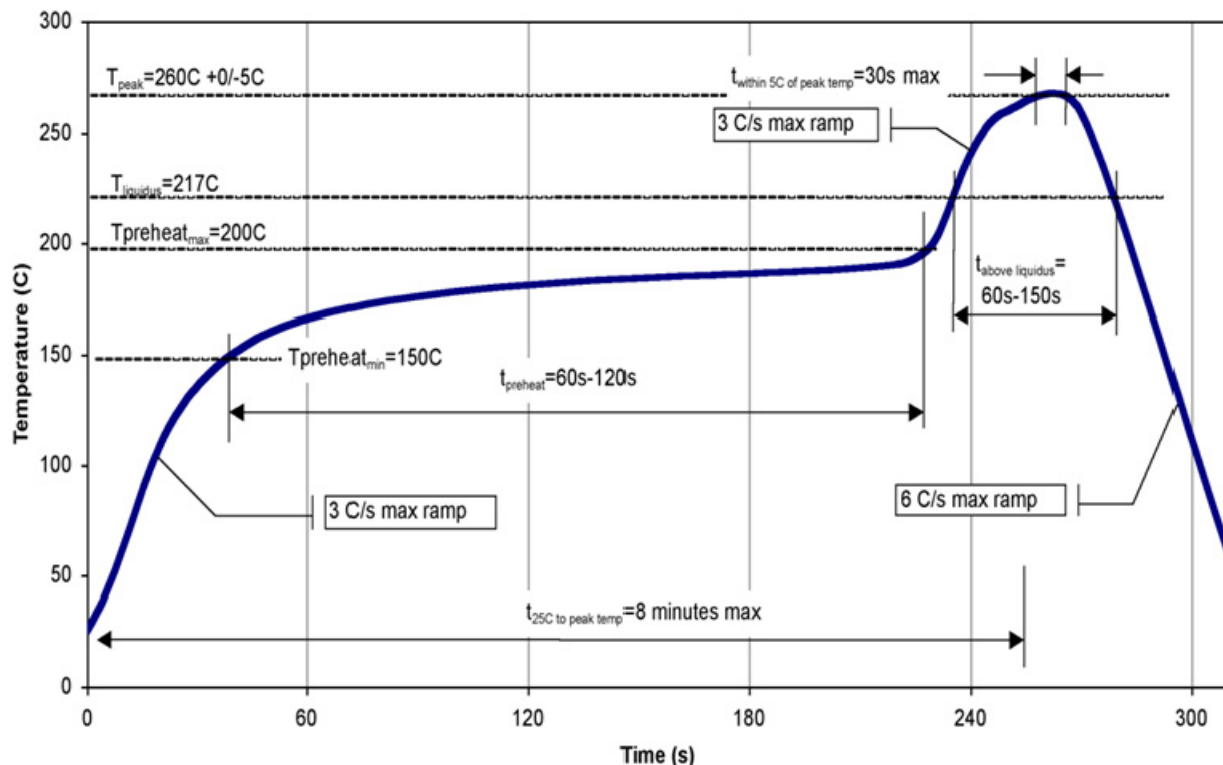
This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free

ECCN

US Department of Commerce: 3A001.b.2.b

Recommended Soldering Temperature Profile



TGA2704-SM

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Contact Information

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

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