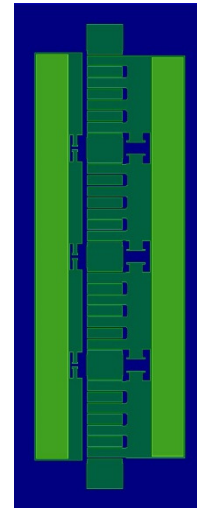


Product Overview

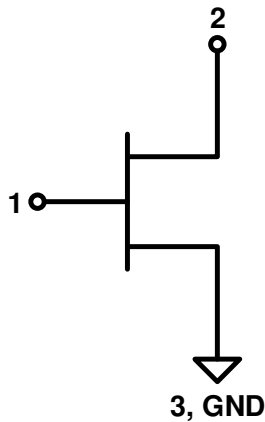
The Qorvo TGF2934 is a 14 W (P_{3dB}) discrete GaN on SiC HEMT which operates from DC to 25 GHz and 28 V supply. The device is constructed with Qorvo's proven QGaN15 process. The device can support pulsed, CW, and linear operations.

Lead-free and ROHS compliant



1.457 x 0.551 x 0.100 mm

Functional Block Diagram



Key Features

- Frequency: DC to 25 GHz
 - Output Power (P_{3dB})¹: 14 W
 - Linear Gain¹: 14 dB
 - Typical PAE_{3dB}¹: 49%
 - Typical Noise Figure¹: 1.5 dB
 - Operating Voltage: 28 V
 - CW and Pulse capable
 - Non-linear & Noise Models available
- Note 1: @ 10 GHz

Applications

- Defense and Aerospace
- Broadband wireless
- Low noise amplifier

Ordering info

| Part No. | ECCN | Description |
|----------|------------|--|
| TGF2934 | 3A001b.3.b | DC–25 GHz, 28 V, 3.5 W GaN RF Transistor |

Absolute Maximum Ratings¹

| Parameter | Rating | Units |
|---|--------------|------------------|
| Breakdown Voltage, BV_{DG} | +60 | V |
| Gate Voltage Range, V_G | -7 to +1.5 | V |
| Drain Current, $I_{D_{MAX}}$ | 4 | A |
| Gate Current Range, I_G | See page 20. | mA |
| Power Dissipation, CW, P_{DISS}^2 | 17.4 | W |
| RF Input Power, CW, 10 GHz, $T = 25\text{ }^\circ\text{C}$ | +33 | dBm |
| Channel Temperature, T_{CH} | 275 | $^\circ\text{C}$ |
| Mounting Temperature (30 Seconds) | 320 | $^\circ\text{C}$ |
| Storage Temperature | -65 to +150 | $^\circ\text{C}$ |

Notes:

1. Operation of this device outside the parameter ranges given above may cause permanent damage.
2. Base temperature at 85 $^\circ\text{C}$

Recommended Operating Conditions¹

| Parameter | Min | Typ | Max | Units |
|--|-----|------|-------|------------------|
| Operating Temp. Range | -40 | +25 | +85 | $^\circ\text{C}$ |
| Drain Voltage Range, V_D | +12 | +20 | +29.5 | V |
| Drain Bias Current, I_{DQ} | 80 | 160 | 320 | mA |
| Drain Current, I_D | - | 1000 | - | mA |
| Gate Voltage, V_G^3 | - | -2.8 | - | V |
| Channel Temperature (T_{CH}) | - | - | 250 | $^\circ\text{C}$ |
| Power Dissipation, CW (P_D) ² | - | - | 15.8 | W |

Notes:

1. Electrical performance is measured under conditions noted in the electrical specifications table. Specifications are not guaranteed over all recommended operating conditions.
2. Package base at 85 $^\circ\text{C}$
3. To be adjusted to desired I_{DQ}

Model Load Pull Performance – Power Tuned¹

| Parameter | Typical Values | | | | | | | | Units |
|---|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------|
| | 3 | | 6 | | 10 | | 18 | | |
| Frequency, F | | | | | | | | | GHz |
| Drain Voltage, V_D | 20 | 28 | 20 | 28 | 20 | 28 | 20 | 28 | V |
| Drain Bias Current, I_{DQ} | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | mA |
| Output Power at 3dB compression, P_{3dB} | 40.7 | 41.6 | 40.8 | 41.7 | 40.8 | 41.5 | 39.5 | 41.8 | dBm |
| Power Added Efficiency at 3dB compression, PAE_{3dB} | 56.9 | 51.7 | 55.0 | 51.3 | 51.4 | 49.3 | 43.7 | 44.9 | % |
| Gain at 3dB compression, G_{3dB} | 18.7 | 21.5 | 13.3 | 15.4 | 8.9 | 11.2 | 5.9 | 6.9 | dB |
| Load Reflection Coefficient ⁽²⁾ , Γ_L | $0.63 \angle 162^\circ$ | $0.45 \angle 153^\circ$ | $0.73 \angle 164^\circ$ | $0.67 \angle 153^\circ$ | $0.82 \angle 166^\circ$ | $0.85 \angle 159^\circ$ | $0.92 \angle 167^\circ$ | $0.92 \angle 167^\circ$ | -- |

Notes:

1. CW, bondwires not included
2. Characteristic Impedance, $Z_0 = 50 \Omega$.

Model Load Pull Performance – Efficiency Tuned¹

| Parameter | Typical Values | | | | | | | | Units |
|---|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------|
| | 3 | | 6 | | 10 | | 18 | | |
| Frequency, F | | | | | | | | | GHz |
| Drain Voltage, V_D | 20 | 28 | 20 | 28 | 20 | 28 | 20 | 28 | V |
| Drain Bias Current, I_{DQ} | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | mA |
| Output Power at 3dB compression, P_{3dB} | 40.2 | 41.3 | 40.1 | 41.7 | 40.8 | 41.5 | 39.5 | 41.8 | dBm |
| Power Added Efficiency at 3dB compression, PAE_{3dB} | 58 | 53.1 | 57.5 | 51.3 | 51.4 | 49.3 | 43.7 | 44.9 | % |
| Gain at 3dB compression, G_{3dB} | 18.4 | 23.0 | 13.6 | 15.4 | 8.9 | 11.2 | 5.9 | 6.9 | dB |
| Load Reflection Coefficient ⁽²⁾ , Γ_L | $0.67 \angle 153^\circ$ | $0.50 \angle 143^\circ$ | $0.76 \angle 157^\circ$ | $0.67 \angle 153^\circ$ | $0.82 \angle 166^\circ$ | $0.85 \angle 159^\circ$ | $0.92 \angle 167^\circ$ | $0.92 \angle 167^\circ$ | -- |

Notes:

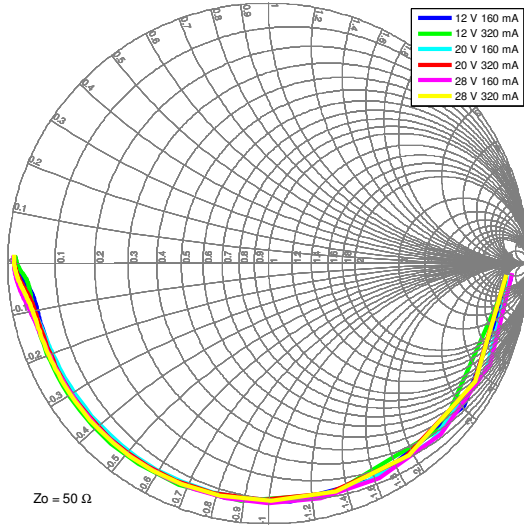
1. CW, bondwires not included
2. Characteristic Impedance, $Z_0 = 50 \Omega$.

Model S-parameters¹

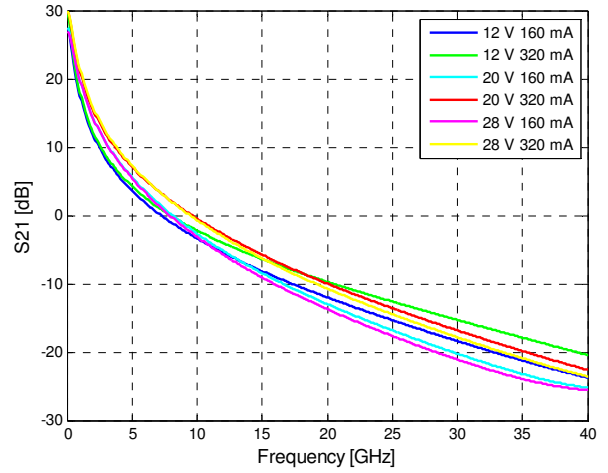
Notes:

- Bondwires are not included. T = 25 °C.

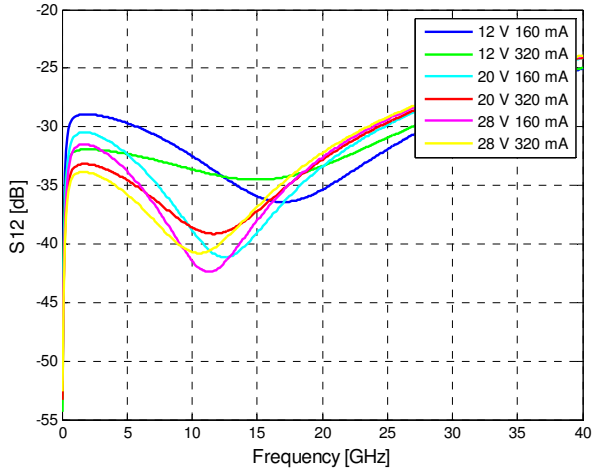
S11 from 0.01 GHz to 40 GHz



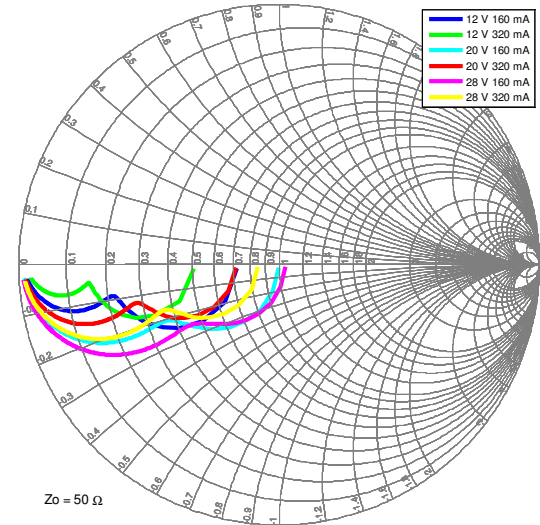
S21



S12



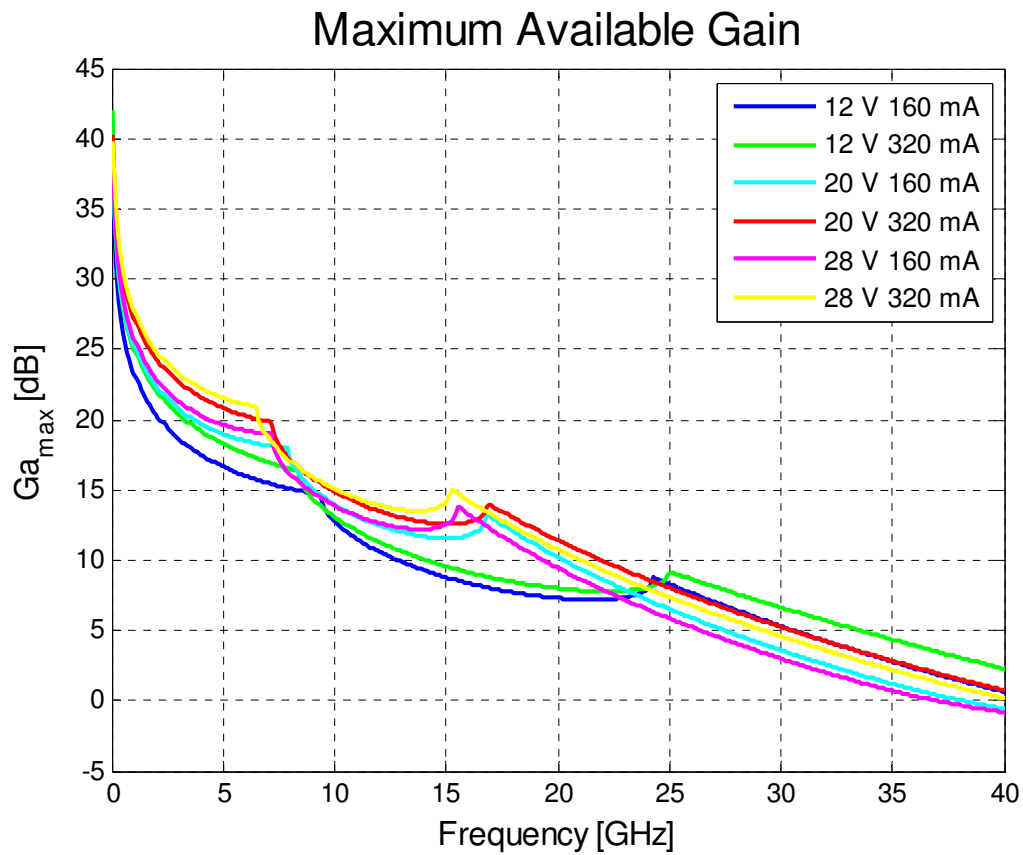
S22 from 0.01 GHz to 40 GHz



Model Maximum Available Gain¹

Notes:

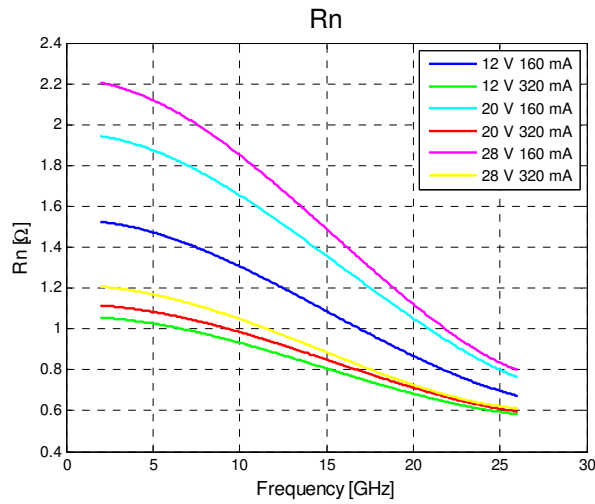
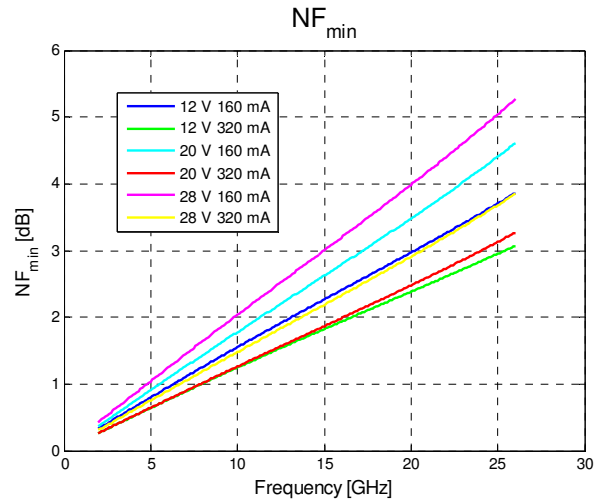
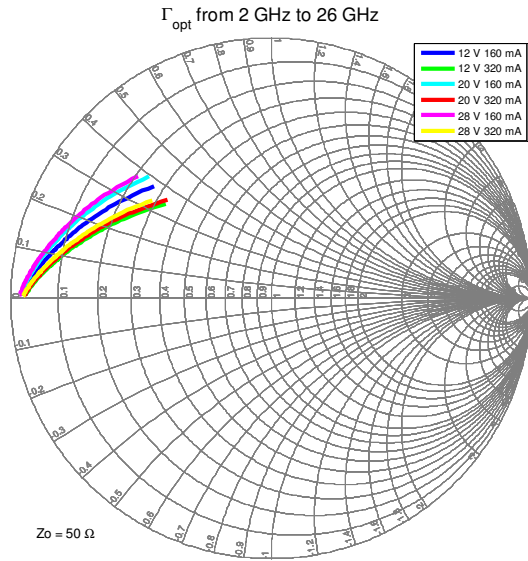
1. Bondwires are not included. T = 25 °C.



Model Noise¹

Notes:

- 1. Bondwires are not included. T = 25 °C.

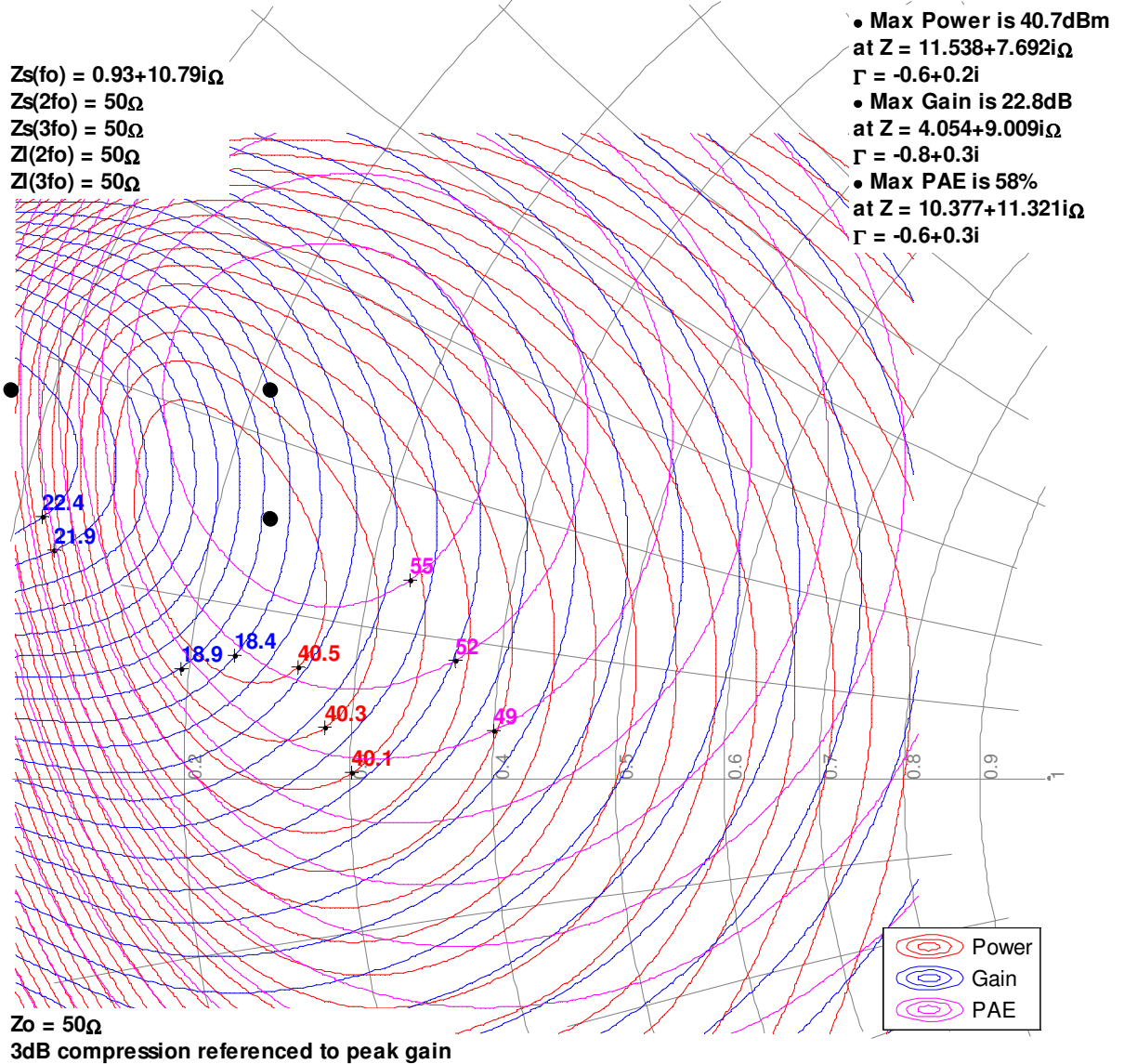


Model Load-Pull Smith Charts^{1, 2, 3}

Notes:

1. Test Conditions: $V_D = 20\text{ V}$, $I_{DQ} = 160\text{ mA}$, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.

3GHz, Load-pull



Model Load-Pull Smith Charts^{1, 2}

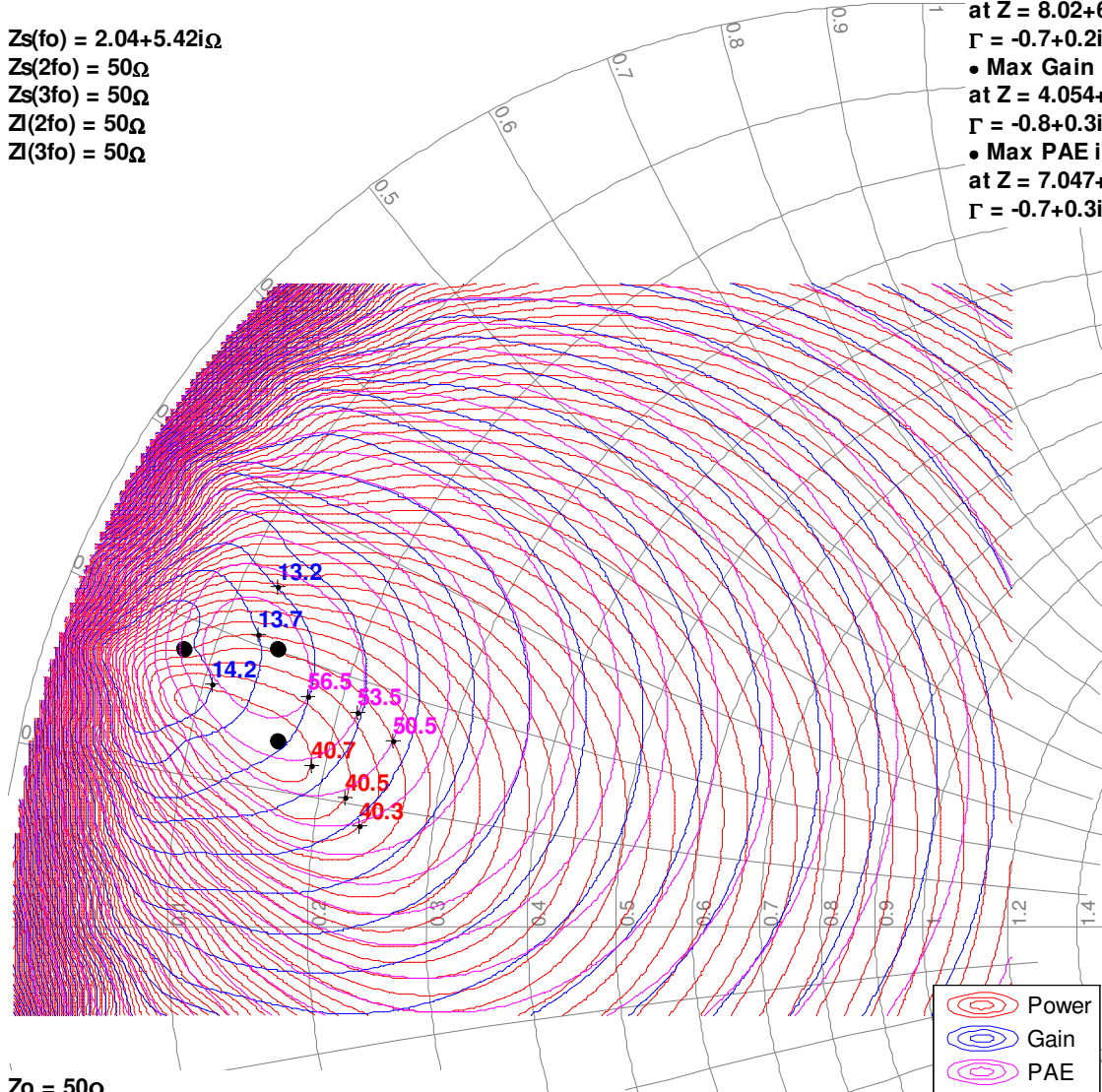
Notes:

1. Test Conditions: $V_D = 20\text{ V}$, $I_{DQ} = 160\text{ mA}$, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.

6GHz, Load-pull

$Z_s(f_0) = 2.04 + 5.42i\Omega$
 $Z_s(2f_0) = 50\Omega$
 $Z_s(3f_0) = 50\Omega$
 $Z_l(2f_0) = 50\Omega$
 $Z_l(3f_0) = 50\Omega$

- Max Power is 40.8dBm at $Z = 8.02 + 6.826i\Omega$
 $\Gamma = -0.7 + 0.2i$
- Max Gain is 14.3dB at $Z = 4.054 + 9.009i\Omega$
 $\Gamma = -0.8 + 0.3i$
- Max PAE is 57.5% at $Z = 7.047 + 10.067i\Omega$
 $\Gamma = -0.7 + 0.3i$



$Z_0 = 50\Omega$
 3dB compression referenced to peak gain

Model Load-Pull Smith Charts^{1, 2}

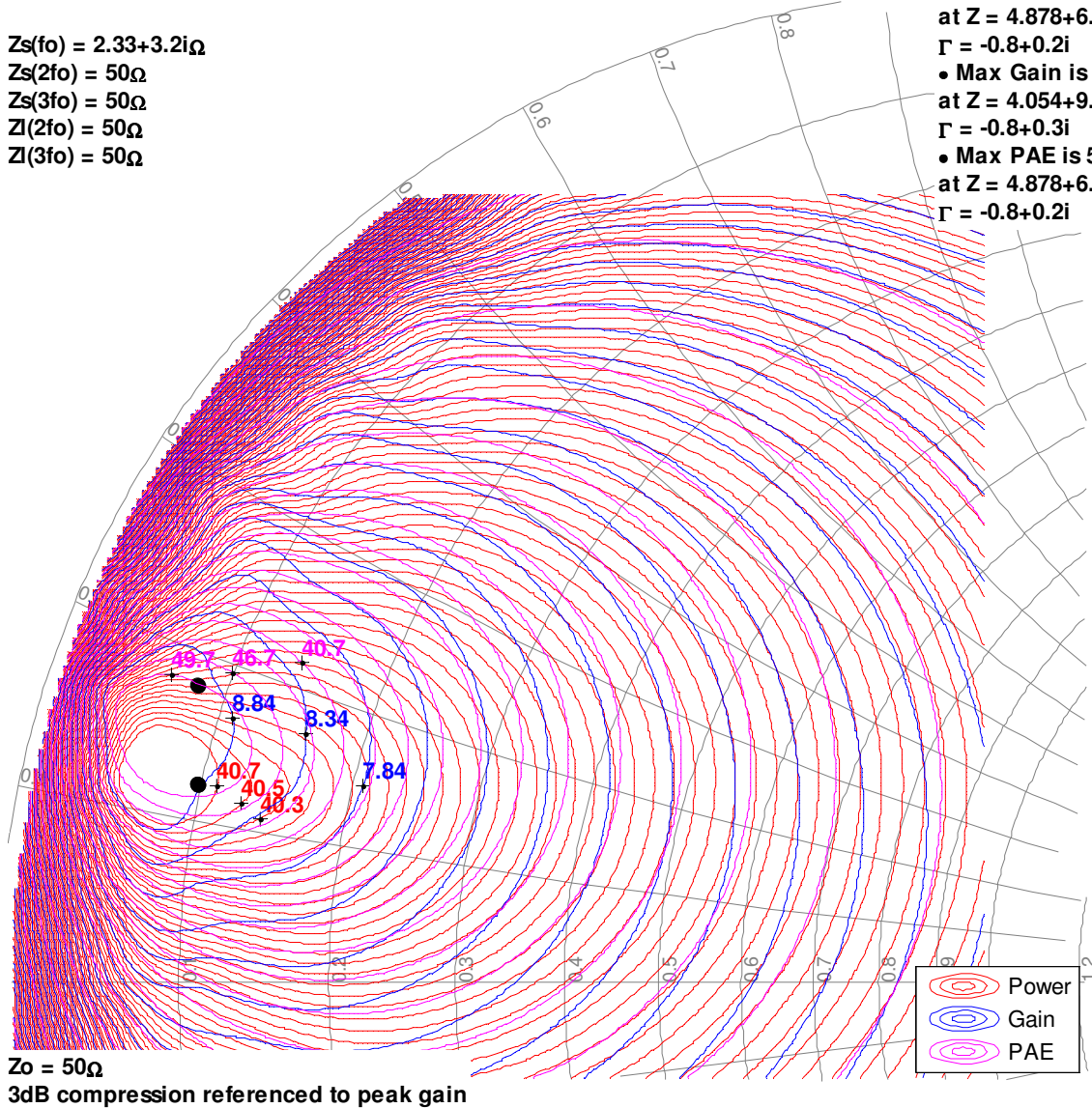
Notes:

1. Test Conditions: $V_D = 20\text{ V}$, $I_{DQ} = 160\text{ mA}$, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.

10GHz, Load-pull

$Z_s(f_0) = 2.33 + 3.2i\Omega$
 $Z_s(2f_0) = 50\Omega$
 $Z_s(3f_0) = 50\Omega$
 $Z_l(2f_0) = 50\Omega$
 $Z_l(3f_0) = 50\Omega$

- Max Power is 40.8dBm at $Z = 4.878 + 6.097i\Omega$
 $\Gamma = -0.8 + 0.2i$
- Max Gain is 9dB at $Z = 4.054 + 9.009i\Omega$
 $\Gamma = -0.8 + 0.3i$
- Max PAE is 51.4% at $Z = 4.878 + 6.097i\Omega$
 $\Gamma = -0.8 + 0.2i$

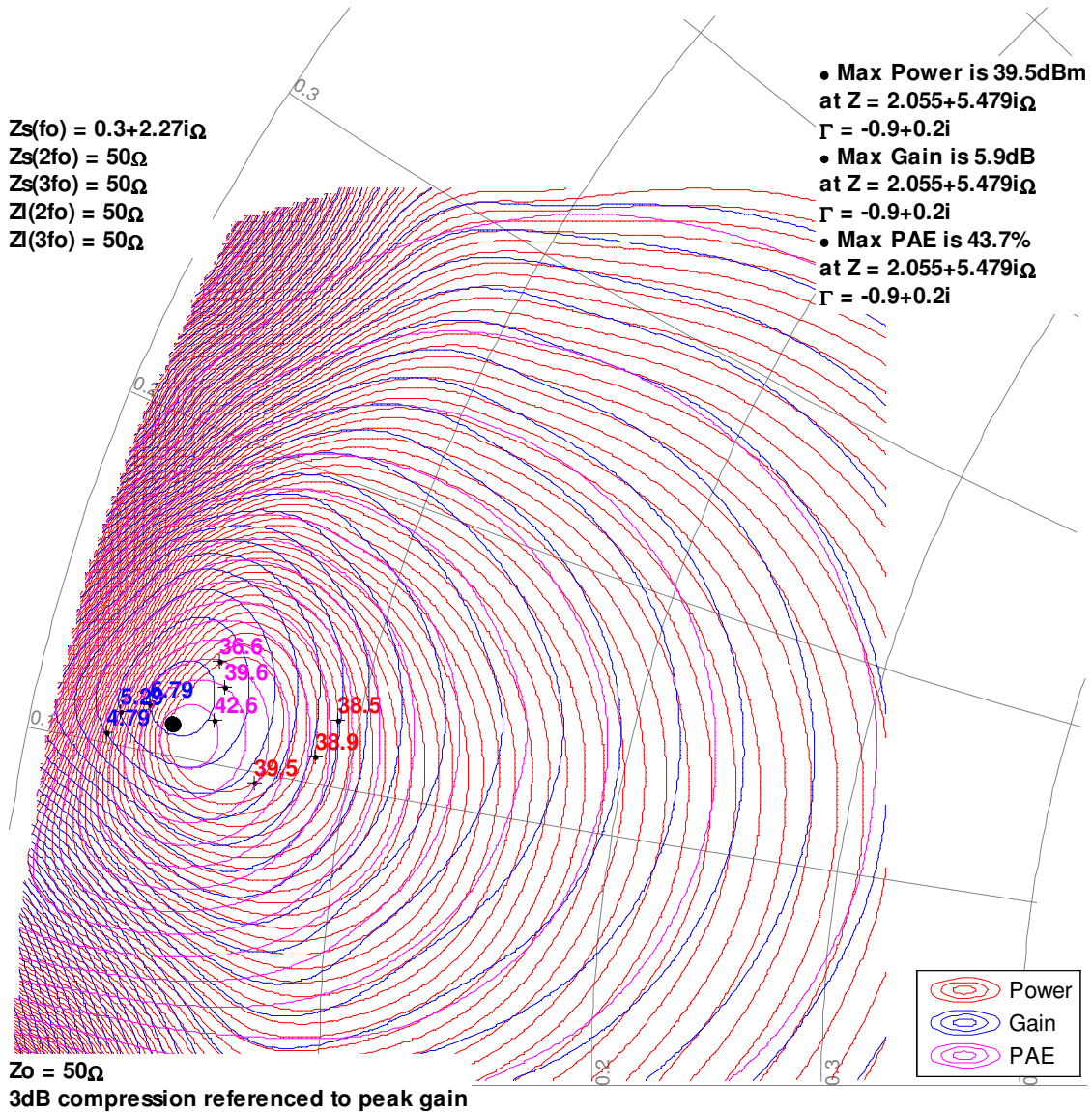


Model Load-Pull Smith Charts^{1, 2}

Notes:

1. Test Conditions: $V_D = 20\text{ V}$, $I_{DQ} = 160\text{ mA}$, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.

18GHz, Load-pull

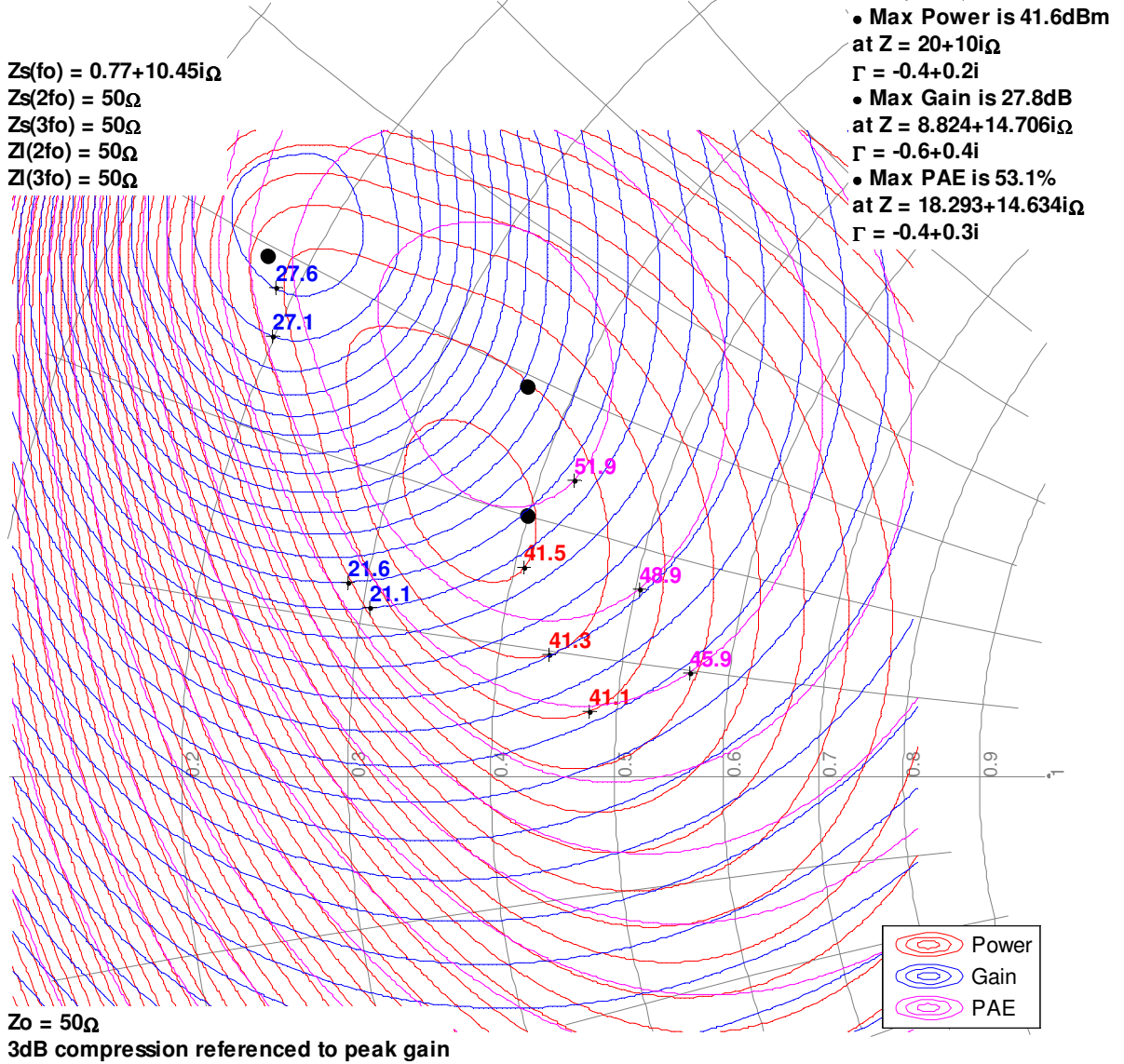


Model Load-Pull Smith Charts^{1,2}

Notes:

1. Test Conditions: $V_D = 28\text{ V}$, $I_{DQ} = 160\text{ mA}$, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.

3GHz, Load-pull



Model Load-Pull Smith Charts^{1,2}

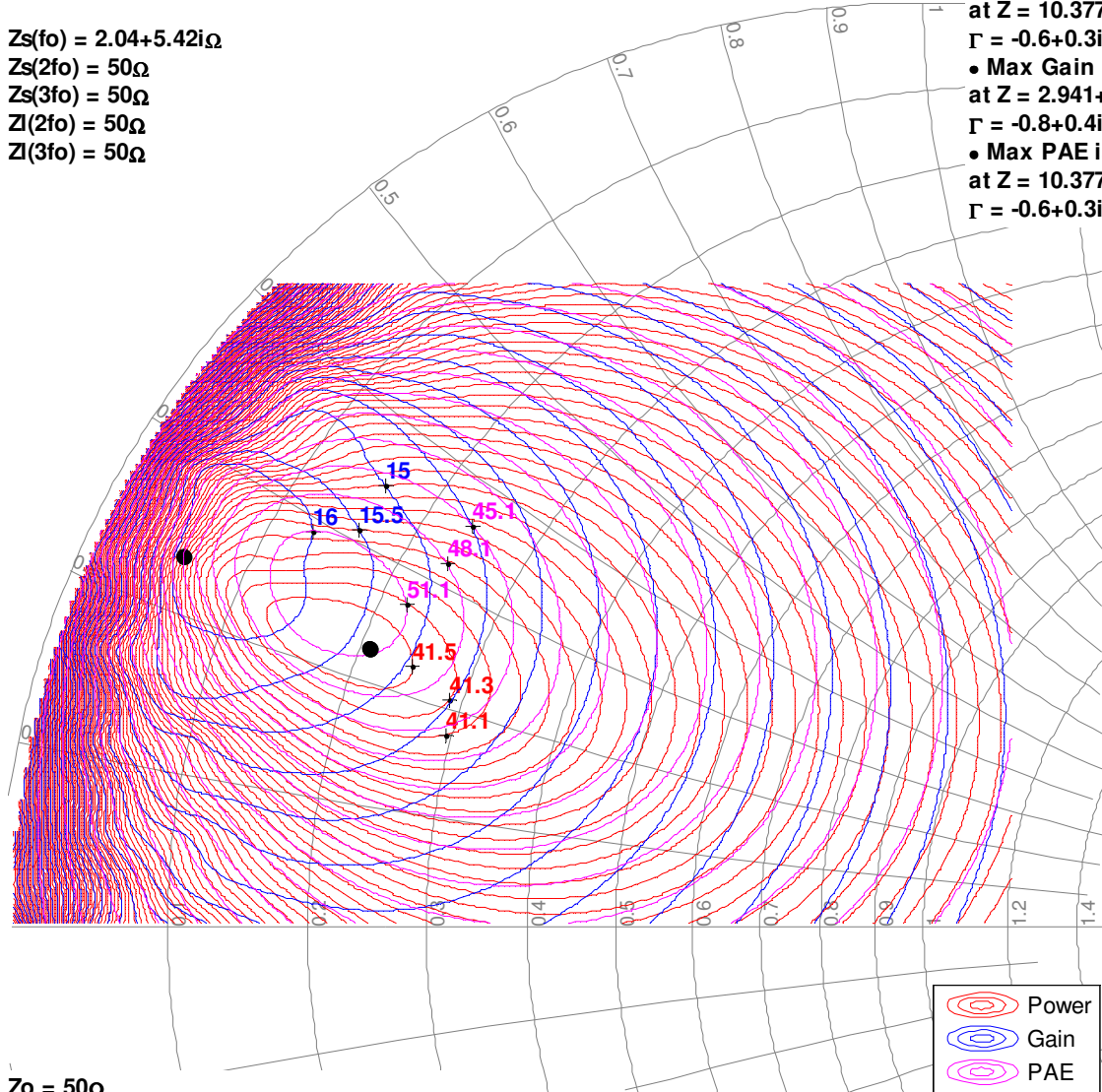
Notes:

1. Test Conditions: $V_D = 28\text{ V}$, $I_{DQ} = 160\text{ mA}$, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.

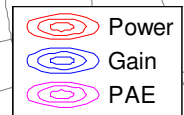
6GHz, Load-pull

$Z_s(f_0) = 2.04 + 5.42i\Omega$
 $Z_s(2f_0) = 50\Omega$
 $Z_s(3f_0) = 50\Omega$
 $Z_l(2f_0) = 50\Omega$
 $Z_l(3f_0) = 50\Omega$

- Max Power is 41.7dBm at $Z = 10.377 + 11.321i\Omega$
 $\Gamma = -0.6 + 0.3i$
- Max Gain is 16.4dB at $Z = 2.941 + 11.765i\Omega$
 $\Gamma = -0.8 + 0.4i$
- Max PAE is 51.4% at $Z = 10.377 + 11.321i\Omega$
 $\Gamma = -0.6 + 0.3i$



$Z_0 = 50\Omega$
 3dB compression referenced to peak gain



Model Load-Pull Smith Charts^{1, 2}

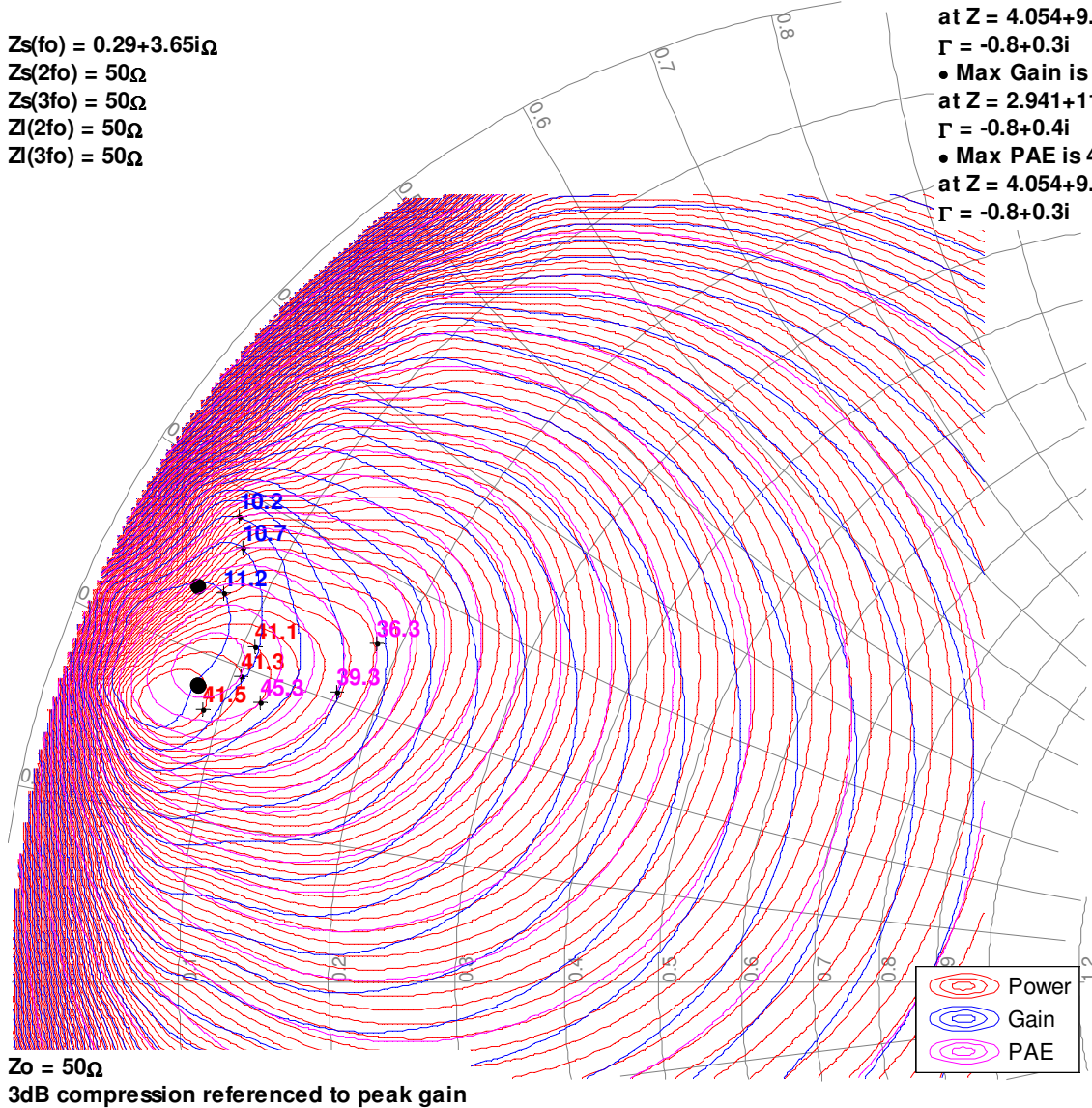
Notes:

1. Test Conditions: $V_D = 28\text{ V}$, $I_{DQ} = 160\text{ mA}$, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.

10GHz, Load-pull

$Z_s(f_0) = 0.29 + 3.65i\Omega$
 $Z_s(2f_0) = 50\Omega$
 $Z_s(3f_0) = 50\Omega$
 $Z_l(2f_0) = 50\Omega$
 $Z_l(3f_0) = 50\Omega$

- Max Power is 41.5dBm at $Z = 4.054 + 9.009i\Omega$
 $\Gamma = -0.8 + 0.3i$
- Max Gain is 11.3dB at $Z = 2.941 + 11.765i\Omega$
 $\Gamma = -0.8 + 0.4i$
- Max PAE is 49.1% at $Z = 4.054 + 9.009i\Omega$
 $\Gamma = -0.8 + 0.3i$

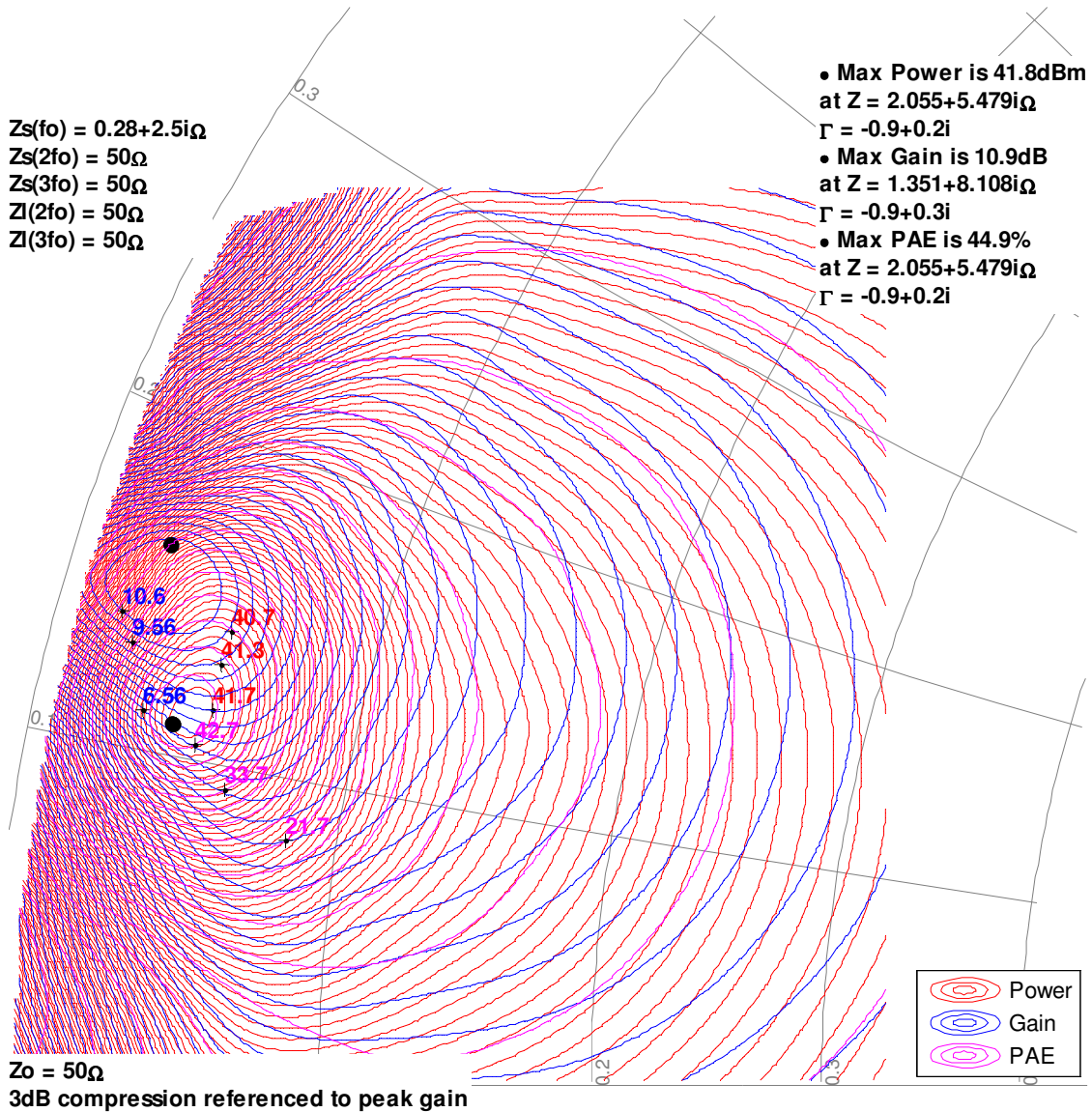


Model Load-Pull Smith Charts^{1, 2}

Notes:

1. Test Conditions: $V_D = 28\text{ V}$, $I_{DQ} = 160\text{ mA}$, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.

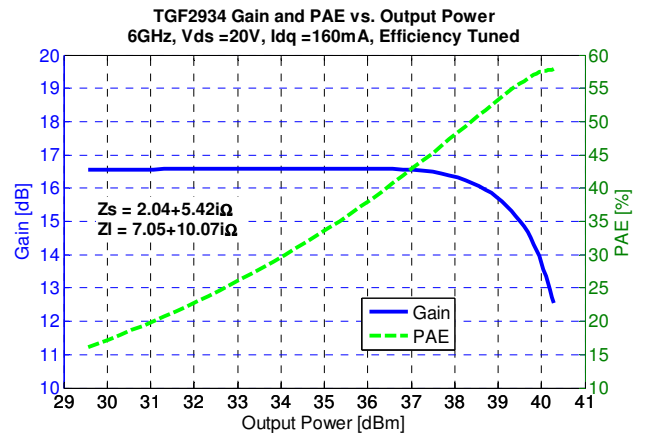
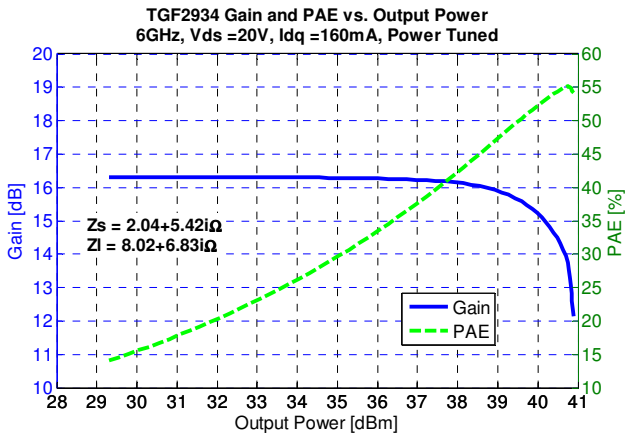
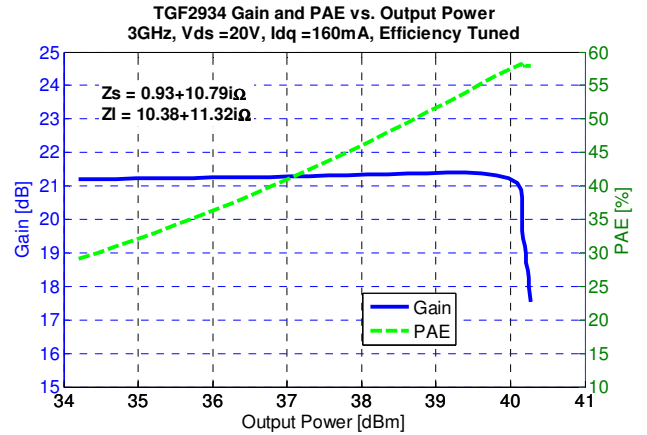
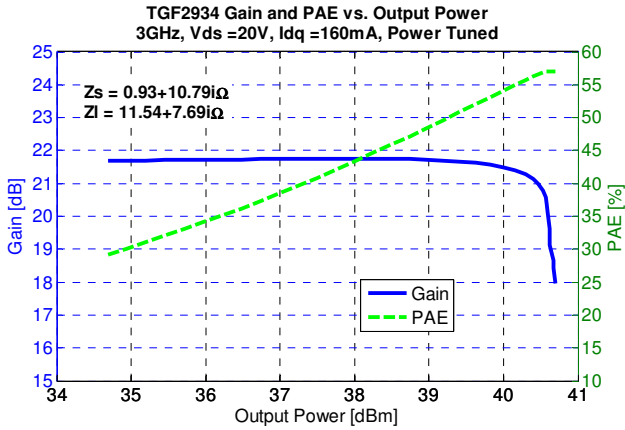
18GHz, Load-pull



Typical Model Performance – Load-Pull Drive-up^{1, 2}

Notes:

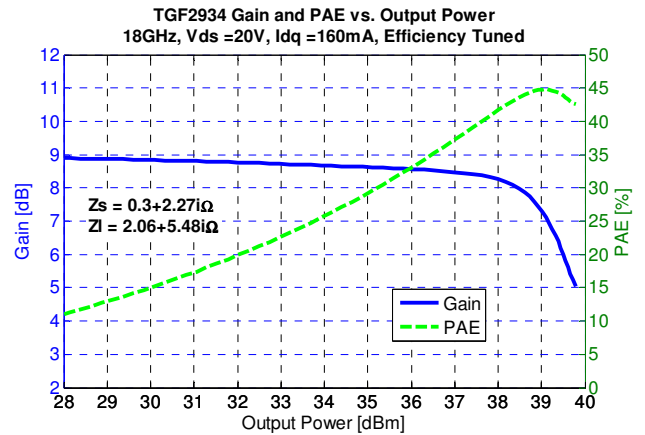
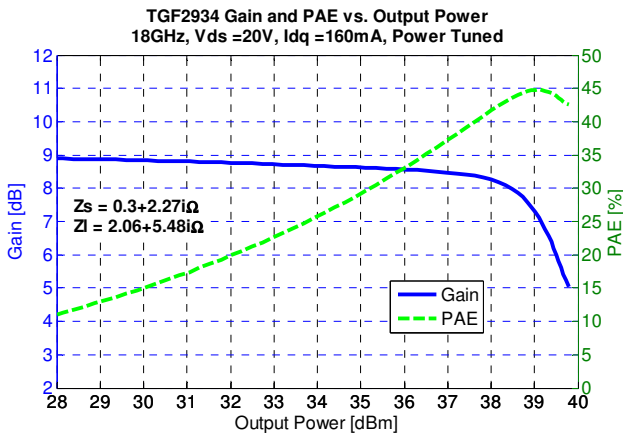
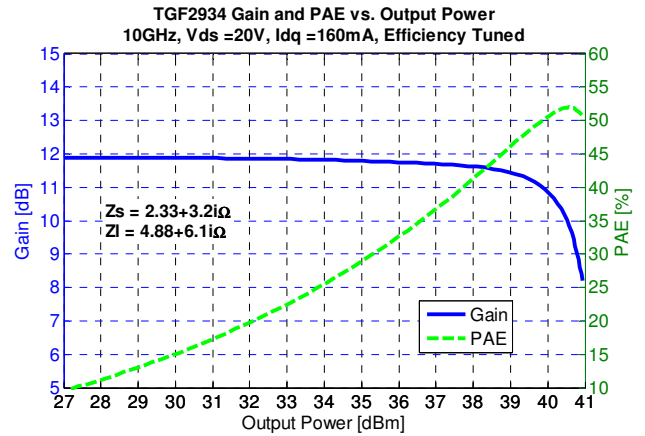
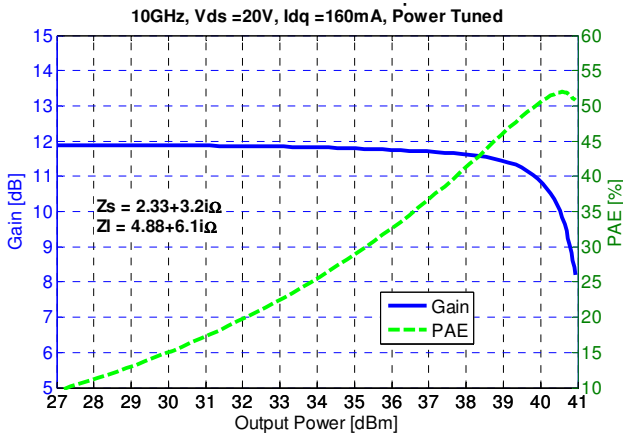
1. CW, Bondwires not included
2. See page 22 for load-pull and source-pull reference planes where the performance was measured.



Typical Model Performance – Load-Pull Drive-up^{1,2}

Notes:

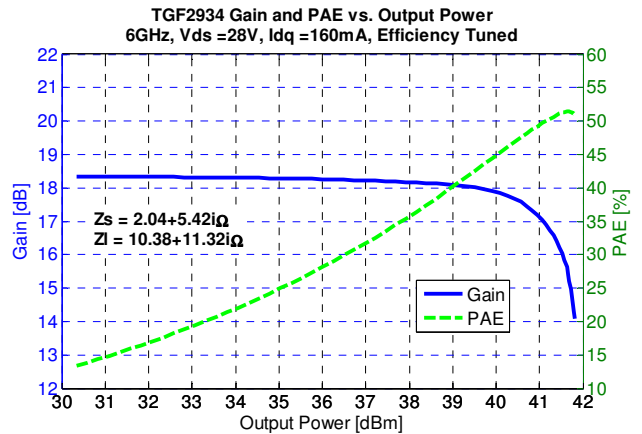
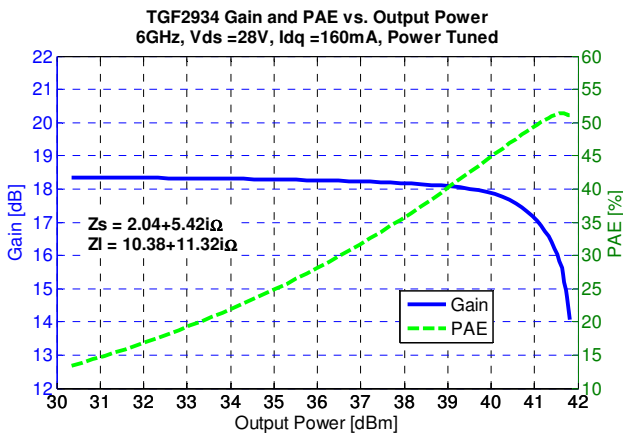
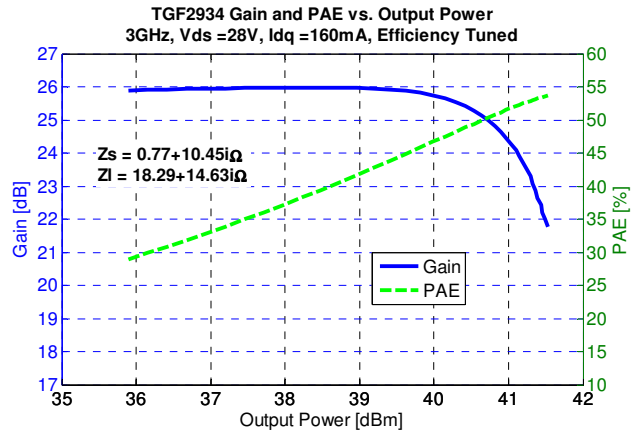
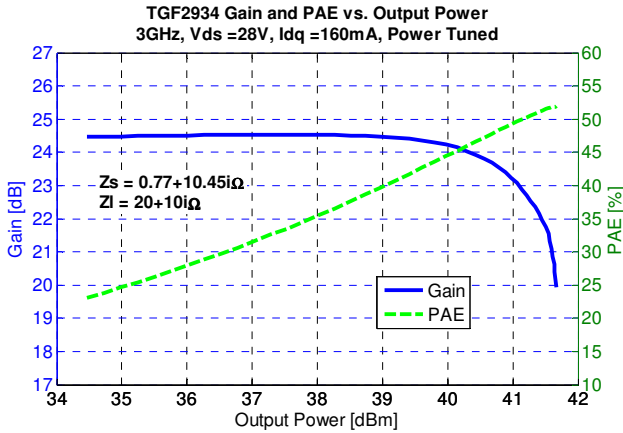
1. CW, Bondwires not included
2. See page 22 for load-pull and source-pull reference planes where the performance was measured.



Typical Model Performance – Load-Pull Drive-up^{1,2}

Notes:

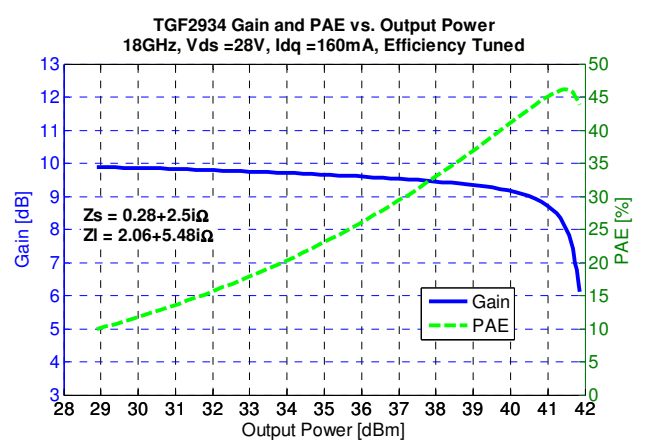
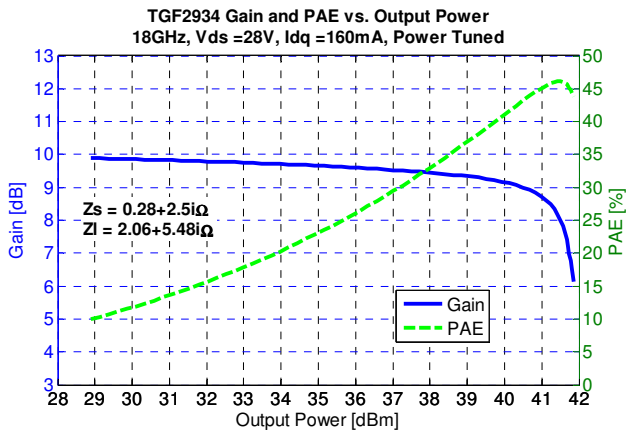
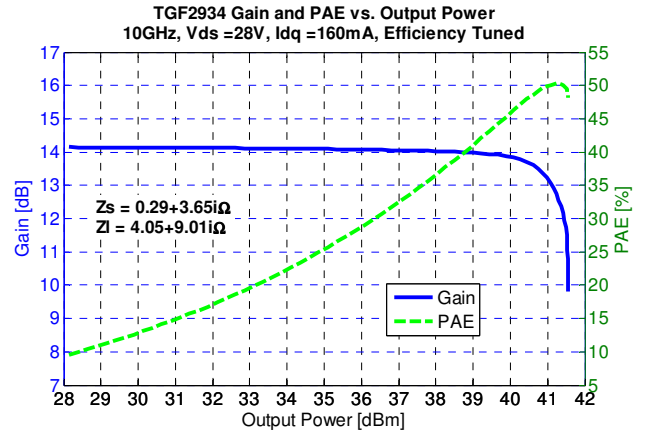
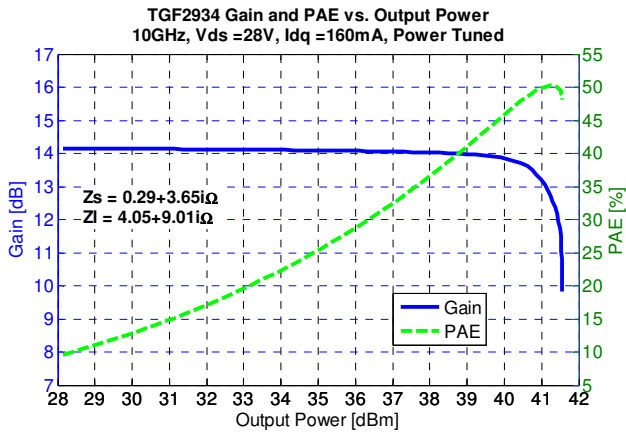
1. CW, Bondwires not included
2. See page 22 for load-pull and source-pull reference planes where the performance was measured.



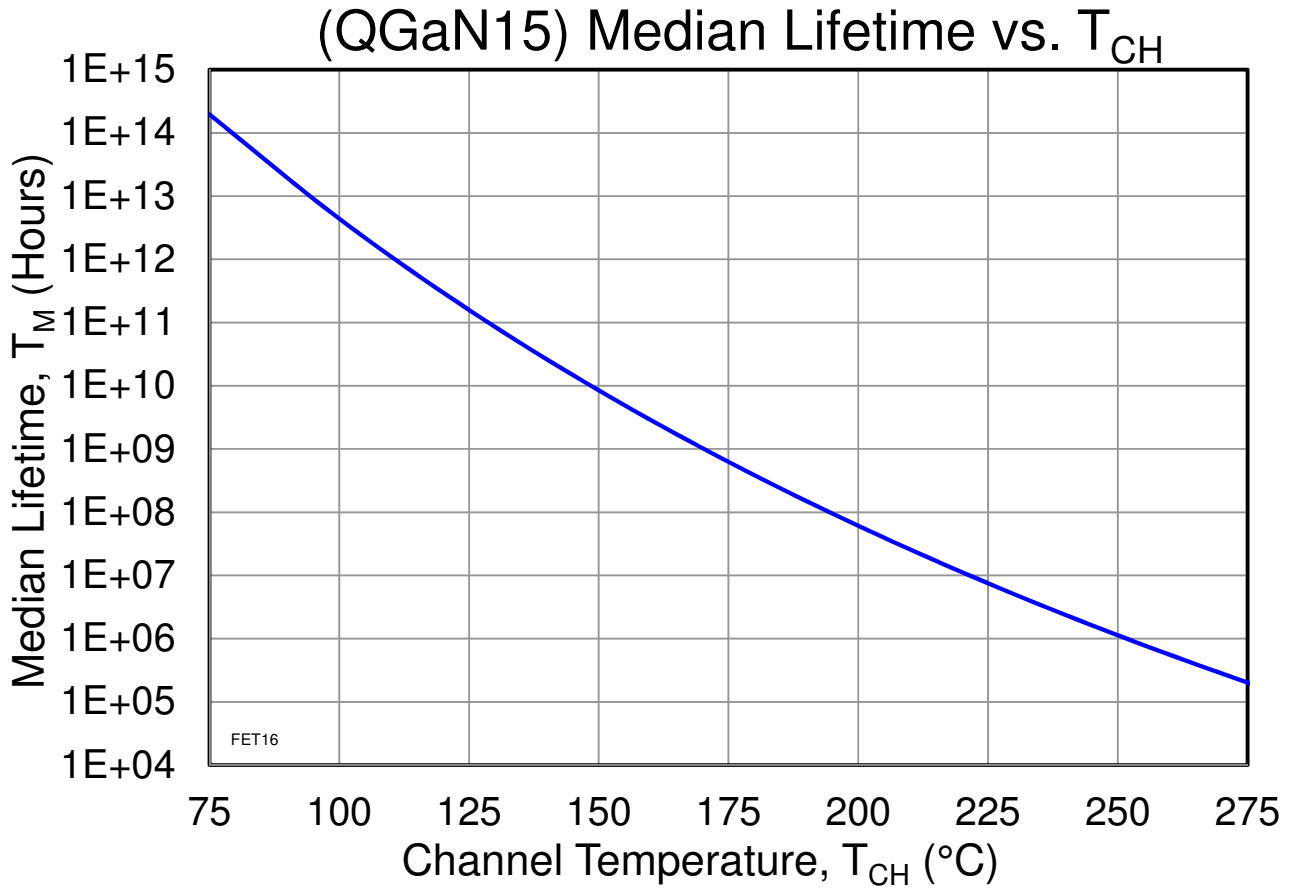
Typical Model Performance – Load-Pull Drive-up^{1,2}

Notes:

1. CW, Bondwires not included
2. See page 22 for load-pull and source-pull reference planes where the performance was measured.



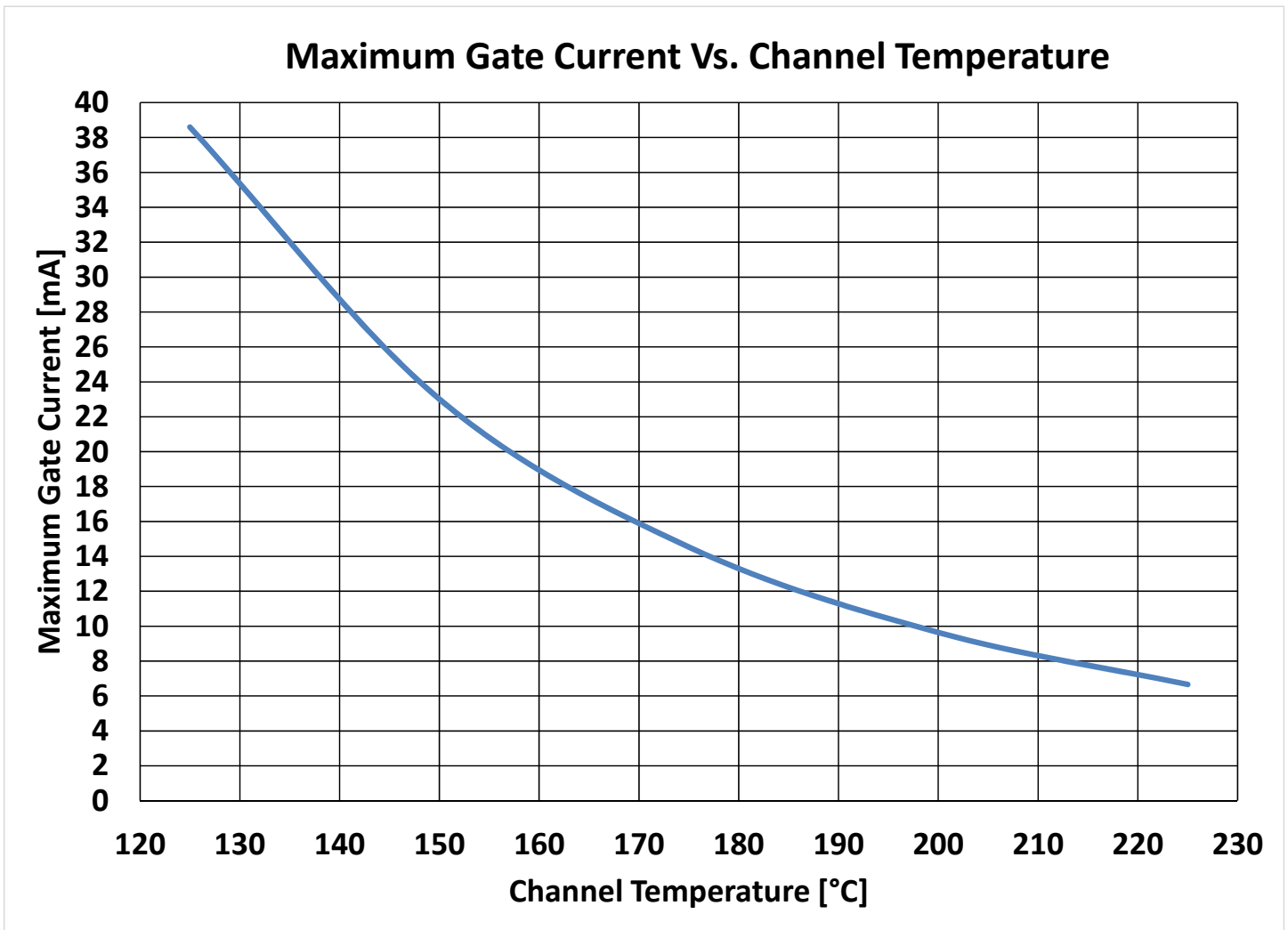
Median Lifetime¹



Notes:

1. Test Conditions: $V_D = +28\text{ V}$; Failure Criteria = 10% reduction in I_{D_MAX} during DC Life Testing

Maximum Gate Current

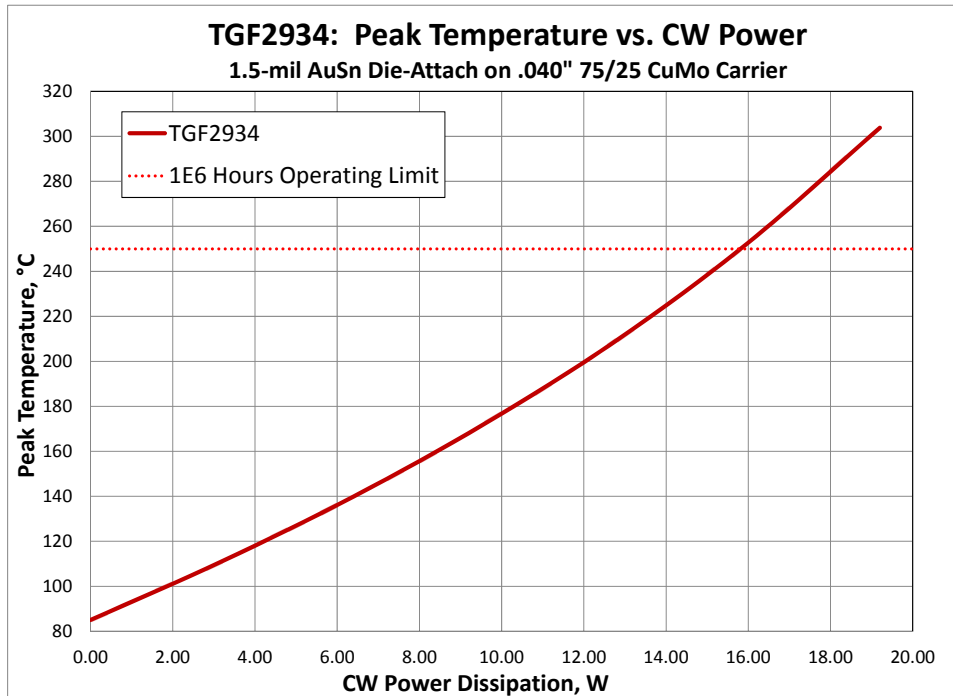


Thermal and Reliability Information

| Parameter | Test Conditions | Value | Units |
|--|---------------------------------|--------|-------|
| Thermal Resistance, θ_{JC} ⁽¹⁾ | CW | 8.1 | °C/W |
| Channel Temperature, T_{CH} | $T_{baseplate} = +85\text{ °C}$ | 111 | °C |
| Median Lifetime, T_M | $P_{DISS} = 3.2\text{ W}$ | 9.7E11 | Hrs |
| Thermal Resistance, θ_{JC} ⁽¹⁾ | CW | 8.6 | °C/W |
| Channel Temperature, T_{CH} | $T_{baseplate} = +85\text{ °C}$ | 140 | °C |
| Median Lifetime, T_M | $P_{DISS} = 6.4\text{ W}$ | 2.6E10 | Hrs |
| Thermal Resistance, θ_{JC} ⁽¹⁾ | CW | 9.1 | °C/W |
| Channel Temperature, T_{CH} | $T_{baseplate} = +85\text{ °C}$ | 172 | °C |
| Median Lifetime, T_M | $P_{DISS} = 9.6\text{ W}$ | 8.4E8 | Hrs |
| Thermal Resistance, θ_{JC} ⁽¹⁾ | CW | 9.7 | °C/W |
| Channel Temperature, T_{CH} | $T_{baseplate} = +85\text{ °C}$ | 209 | °C |
| Median Lifetime, T_M | $P_{DISS} = 12.8\text{ W}$ | 2.8E7 | Hrs |
| Thermal Resistance, θ_{JC} ⁽¹⁾ | CW | 10.5 | °C/W |
| Channel Temperature, T_{CH} | $T_{baseplate} = +85\text{ °C}$ | 253 | °C |
| Median Lifetime, T_M | $P_{DISS} = 16\text{ W}$ | 9.1E5 | Hrs |
| Thermal Resistance, θ_{JC} ⁽¹⁾ | CW | 11.4 | °C/W |
| Channel Temperature, T_{CH} | $T_{baseplate} = +85\text{ °C}$ | 304 | °C |
| Median Lifetime, T_M | $P_{DISS} = 19.2\text{ W}$ | 3.3E4 | Hrs |

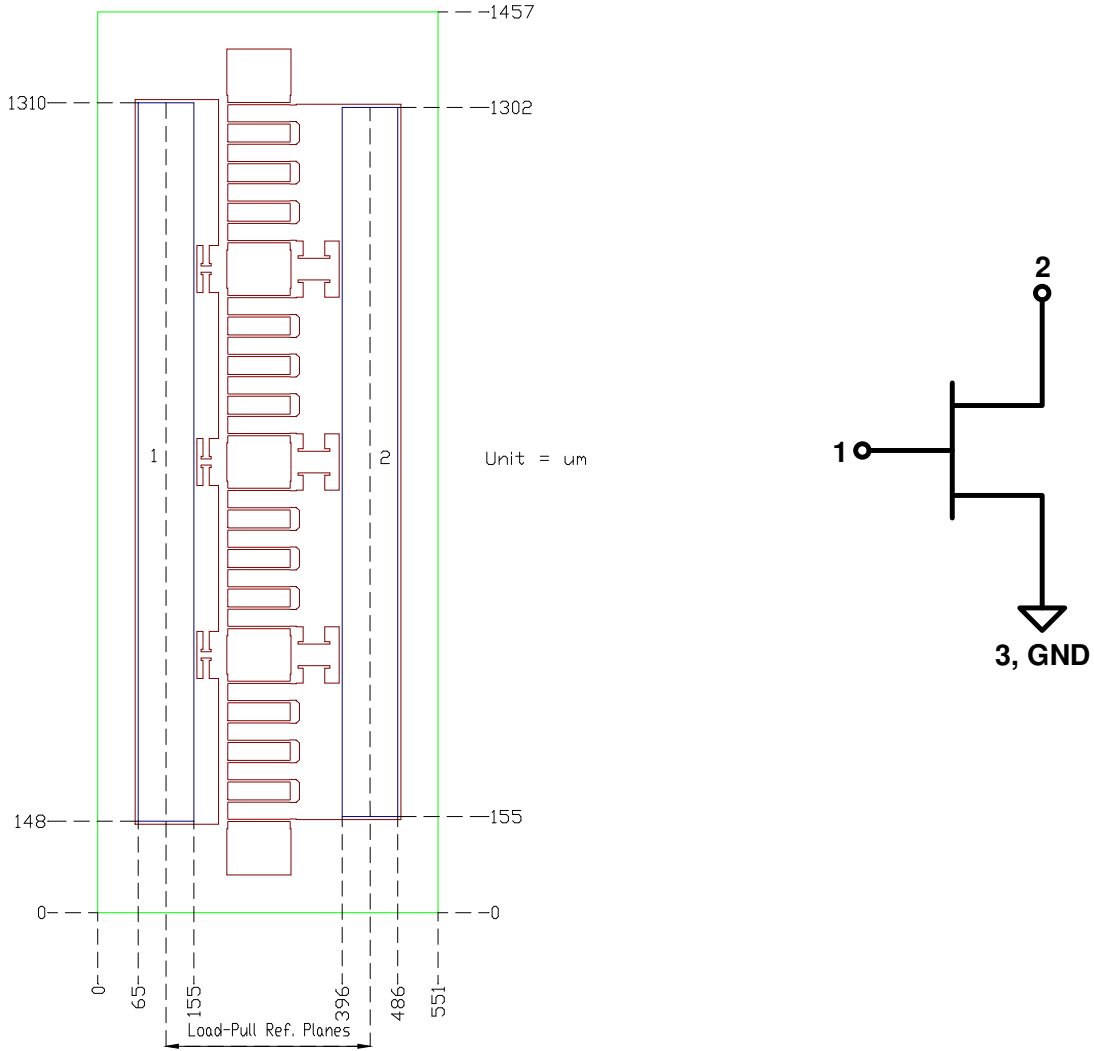
Notes:

1. Thermal resistance measured at back of package.



Pin Configuration and Description¹

Notes: 1. Die size tolerance is ± 0.015 mm.



Pin Description

| Pin | Symbol | Description | Dimension |
|-----|----------------|-----------------------------------|------------------|
| 1 | RF IN / V_G | Gate | 1.162 x 0.090 mm |
| 2 | RF OUT / V_D | Drain | 1.147 x 0.090 mm |
| 3 | Source | Source / Ground / Backside of die | 1.457 x 0.551 mm |

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) not recommended.

Reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300°C to 3-4 minutes, 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:

- Ball bonding is the preferred interconnect technique, except where noted on the assembly diagram.
- Force, time, and ultrasonics are critical bonding parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.

Disclaimer

GaN/SiC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

| Bias-up Procedure | Bias-down Procedure |
|--|--|
| <ol style="list-style-type: none"> 1. Set V_G to -4 V. 2. Set I_D limit to 200 mA. 3. Slowly adjust V_G until I_D reaches 160 mA. 4. Set I_D limit to 1200 mA. 5. Apply RF signal. | <ol style="list-style-type: none"> 1. Turn off RF signal. 2. Turn off V_D and wait 1 second to allow drain capacitor discharge. 3. Turn of V_G. |

Handling Precautions

| Parameter | Rating | Standard |
|----------------------------------|--------|--------------------------|
| ESD – Human Body Model (HBM) | N/A | ESDA / JEDEC JS-001-2012 |
| ESD – Charged Device Model (CDM) | N/A | JEDEC JESD22-C101F |
| MSL – Moisture Sensitivity Level | N/A | IPC/JEDEC J-STD-020 |



Caution!
ESD-Sensitive Device

Solderability

Compatible with both lead-free (260°C max. reflow temp.) and tin/lead (245°C max. reflow temp.) soldering processes.

Solder profiles available upon request.

Contact plating: NiPdAu

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, and information about Qorvo:

Web: www.Qorvo.com
Email: info-sales@qorvo.com

Tel: +1.972.994.8465
Fax: +1.972.994.8504

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

Important Notice

The information contained herein is believed to be reliable; however, Qorvo makes no warranties regarding the information contained herein and assumes no responsibility or liability whatsoever for the use of the information contained herein. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Qorvo 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. **THIS INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

Without limiting the generality of the foregoing, Qorvo 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.

Copyright 2016 © Qorvo, Inc. | Qorvo is a registered trademark of Qorvo, Inc.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.