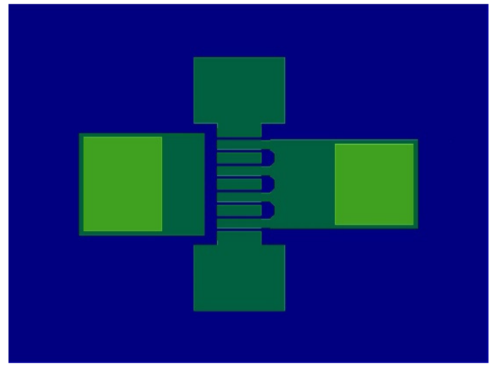
TGF2942

DC – 25 GHz, 28 V, 2 W GaN RF Transistor

Product Overview

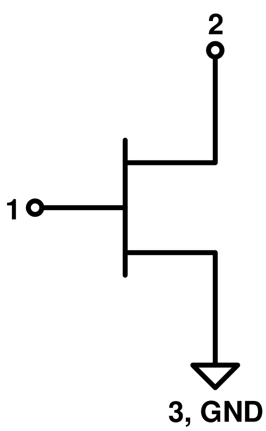
The Qorvo TGF2942 is a 2 W (P_{3dB}) discrete GaN on SiC HEMT which operates from DC to 25 GHz and 28 V supply. The device is constructed with Qorvo's proven QGaN15 process. The device can support pulsed, CW, and linear operations.

Lead-free and ROHS compliant



0.411 x 0.551 x 0.100 mm

Functional Block Diagram



Key Features

- Frequency: DC to 25 GHz
- Output Power (P_{3dB})[1]: 2.4 W
- Linear Gain[1]: 18 dB
- Typical PAE_{3dB}[1]: 59%
- Typical Noise Figure[1]: 1.2 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
TGF2942	EAR99	DC–25 GHz, 28 V, 2 W GaN RF Transistor

Absolute Maximum Ratings[1]

Parameter	Rating	Units
Breakdown Voltage, BV_{DG}	+60	V
Gate Voltage Range, V_G	-7 to +1.5	V
Drain Current, I_{DMAX}	500	mA
Gate Current Range, I_G	See page 20.	mA
Power Dissipation, CW, P_{DISS}	3.2	W
RF Input Power, CW, 10 GHz, T = 25 °C	+23	dBm
Channel Temperature, T_{CH}	275	°C
Mounting Temperature (30 Seconds)	320	°C
Storage Temperature	–65 to +150	°C

Notes:

1. Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions[1]

Parameter	Min	Typ	Max	Units
Operating Temp. Range	–40	+25	+85	°C
Drain Voltage Range, V_D	+12	+20	+29.5	V
Drain Bias Current, I_{DQ}	10	20	40	mA
Drain Current, I_D	–	170	–	mA
Gate Voltage, V_G[3]	–	–2.8	–	V
Channel Temperature (T_{CH})	–	–	250	°C
Power Dissipation, CW (P_D)[2]	–	–	2.9	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 °C
3. To be adjusted to desired I_{DQ}

Model Load Pull Performance – Power Tuned[1]

Parameter	Typical Values								Units
Frequency, F	3		6		10		18		GHz
Drain Voltage, V_D	20	28	20	28	20	28	20	28	V
Drain Bias Current, I_{DQ}	20	20	20	20	20	20	20	20	mA
Output Power at 3dB compression, P_{3dB}	32.5	33.8	32.5	33.7	32.6	33.8	32.8	33.8	dBm
Power Added Efficiency at 3dB compression, PAE_{3dB}	58.7	61.3	60.5	58.6	57.2	56.6	54.3	54.2	%
Gain at 3dB compression, G_{3dB}	20.5	22.5	17.3	19.5	12.8	13.6	8.9	9.8	dB
Load Reflection Coefficient (2), Γ_L	0.32∠18°	0.54∠22°	0.42∠45°	0.57∠45°	0.45∠63°	0.58∠59°	0.61∠99°	0.70∠90°	--

Notes:
1. CW, bondwires not included
2. Characteristic Impedance, Zo = 50 Ω.

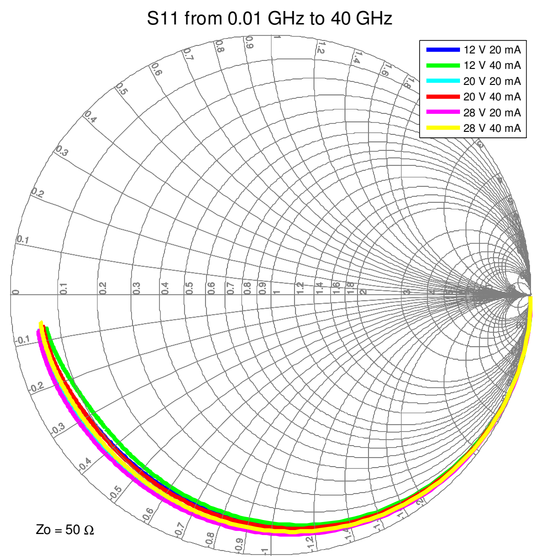
Model Load Pull Performance – Efficiency Tuned[1]

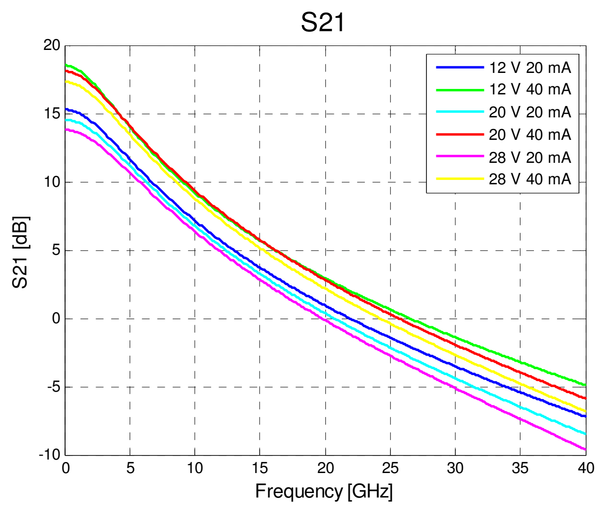
Parameter	Typical Values								Units
Frequency, F	3		6		10		18		GHz
Drain Voltage, V_D	20	28	20	28	20	28	20	28	V
Drain Bias Current, I_{DQ}	20	20	20	20	20	20	20	20	mA
Output Power at 3dB compression, P_{3dB}	32.1	33.8	31.5	33.7	31.7	33.4	32.1	33.8	dBm
Power Added Efficiency at 3dB compression, PAE_{3dB}	62.8	61.3	61.5	58.6	60.3	59.2	56.3	54.2	%
Gain at 3dB compression, G_{3dB}	22.6	22.5	17.9	19.5	14.9	15.3	9.4	9.8	dB
Load Reflection Coefficient (2), Γ_L	0.45∠27°	0.54∠22°	0.57∠45°	0.57∠45°	0.63∠72°	0.67∠63°	0.71∠98°	0.70∠90°	--

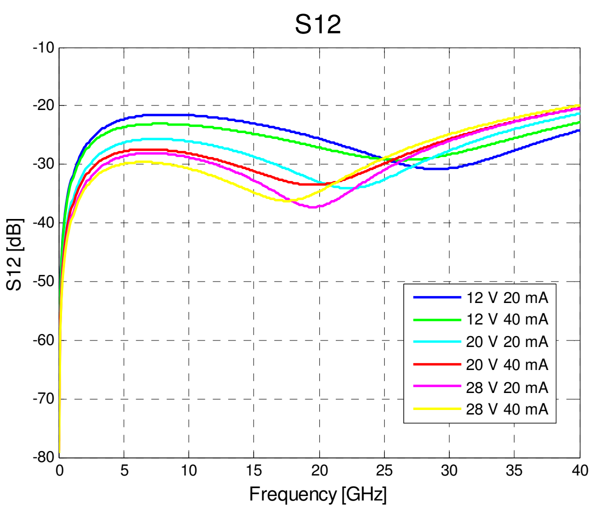
Notes:
1. CW, bondwires not included
2. Characteristic Impedance, Zo = 50 Ω.

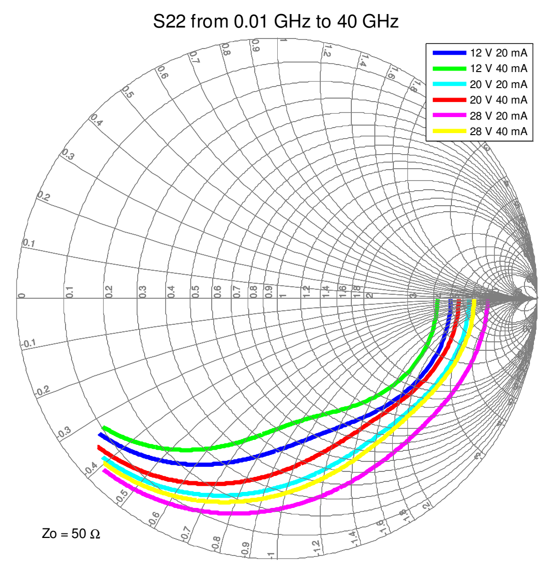
Model S-parameters[1]

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



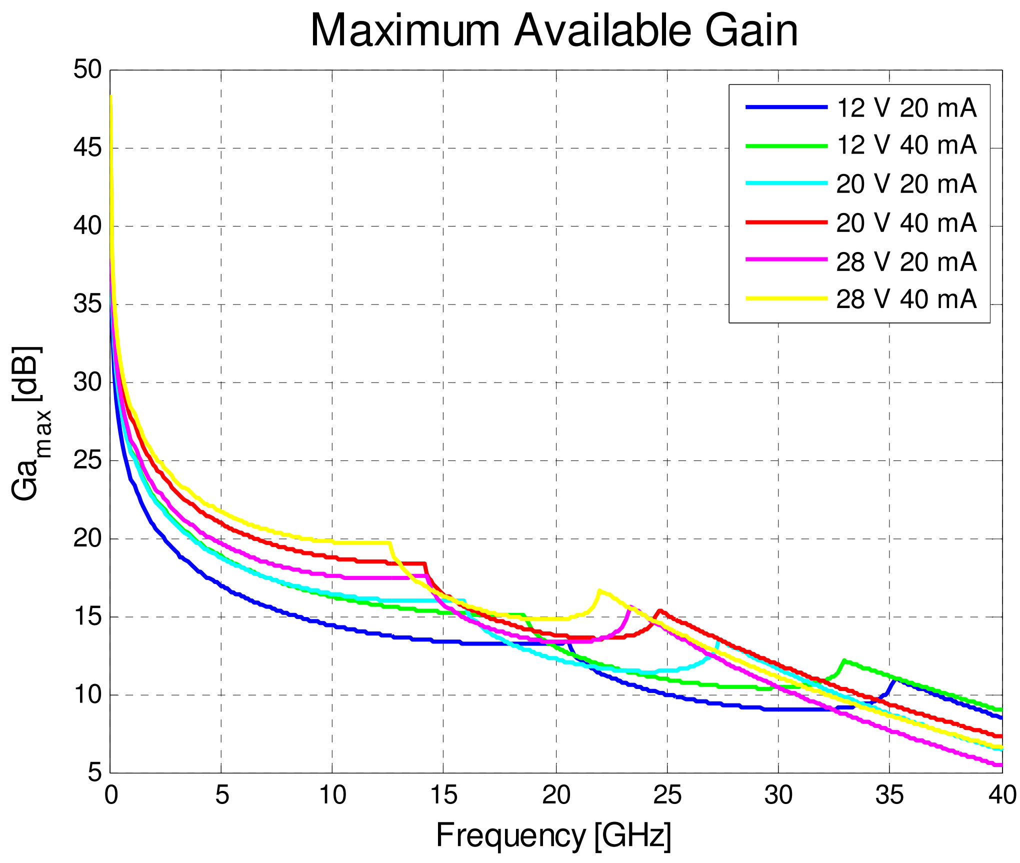






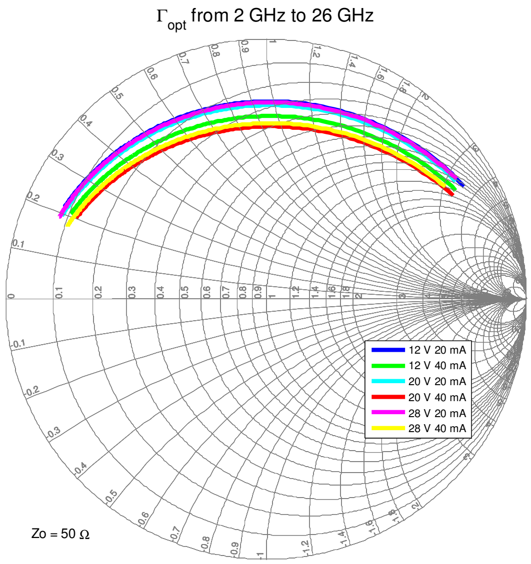
Model Maximum Available Gain[1]

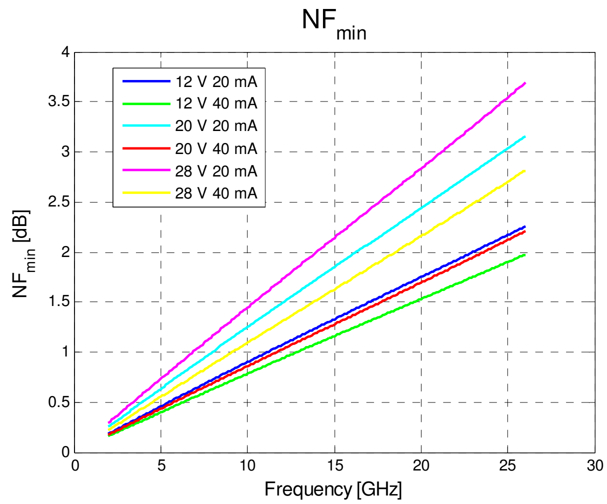
Notes:
1. Bondwires are not included. T = 25 °C.

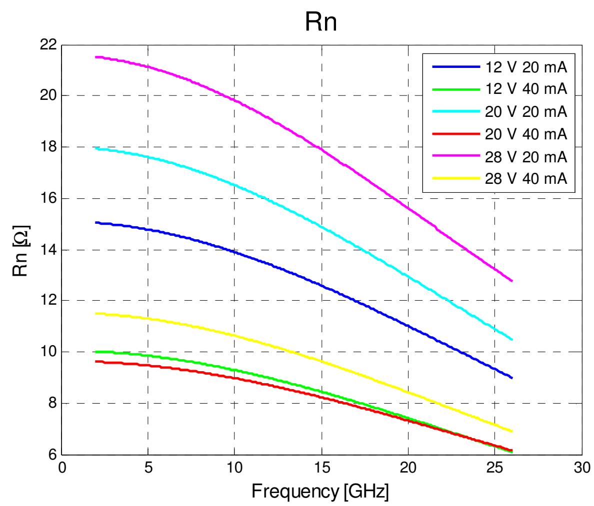


Model Noise[1]

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

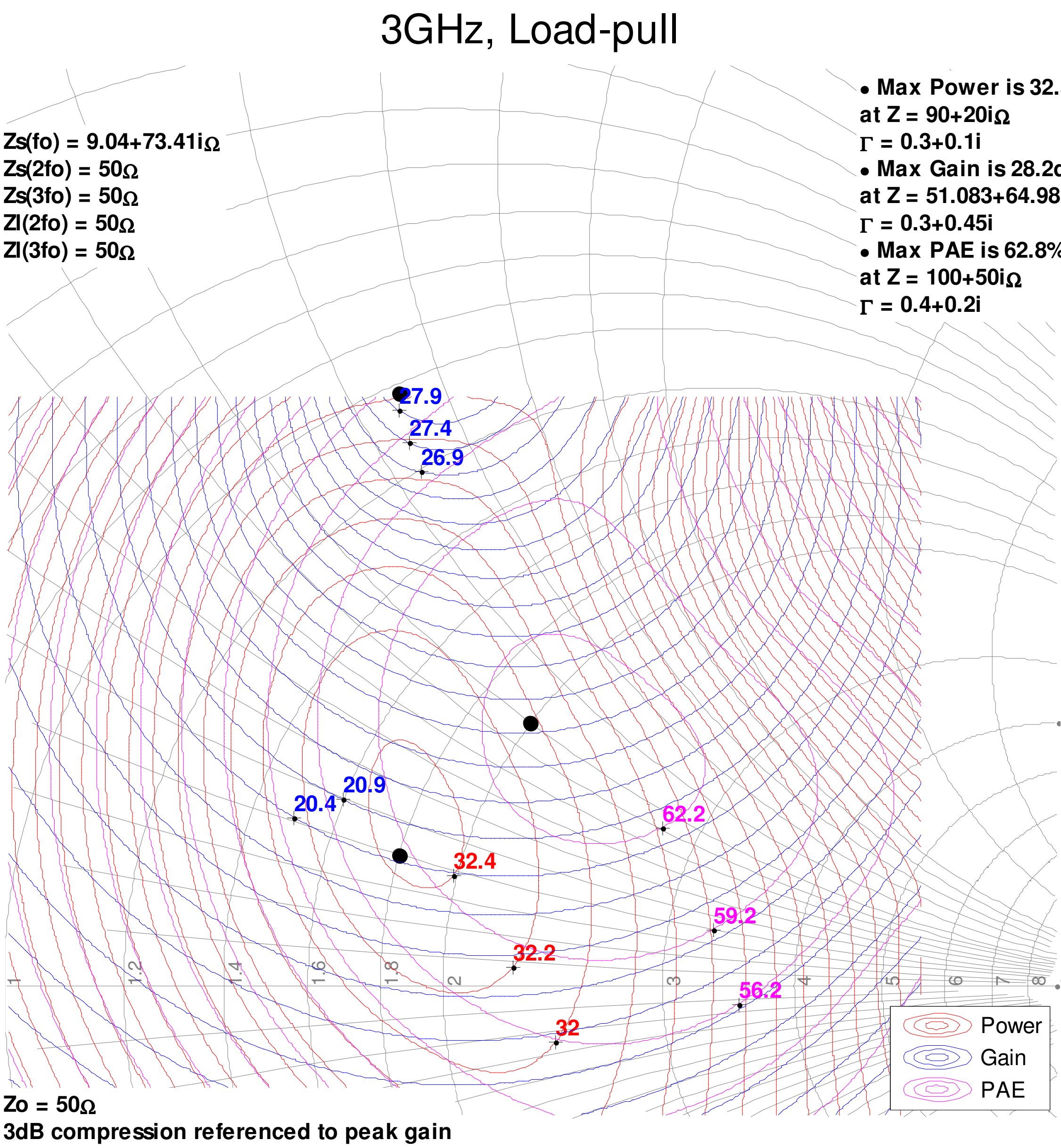






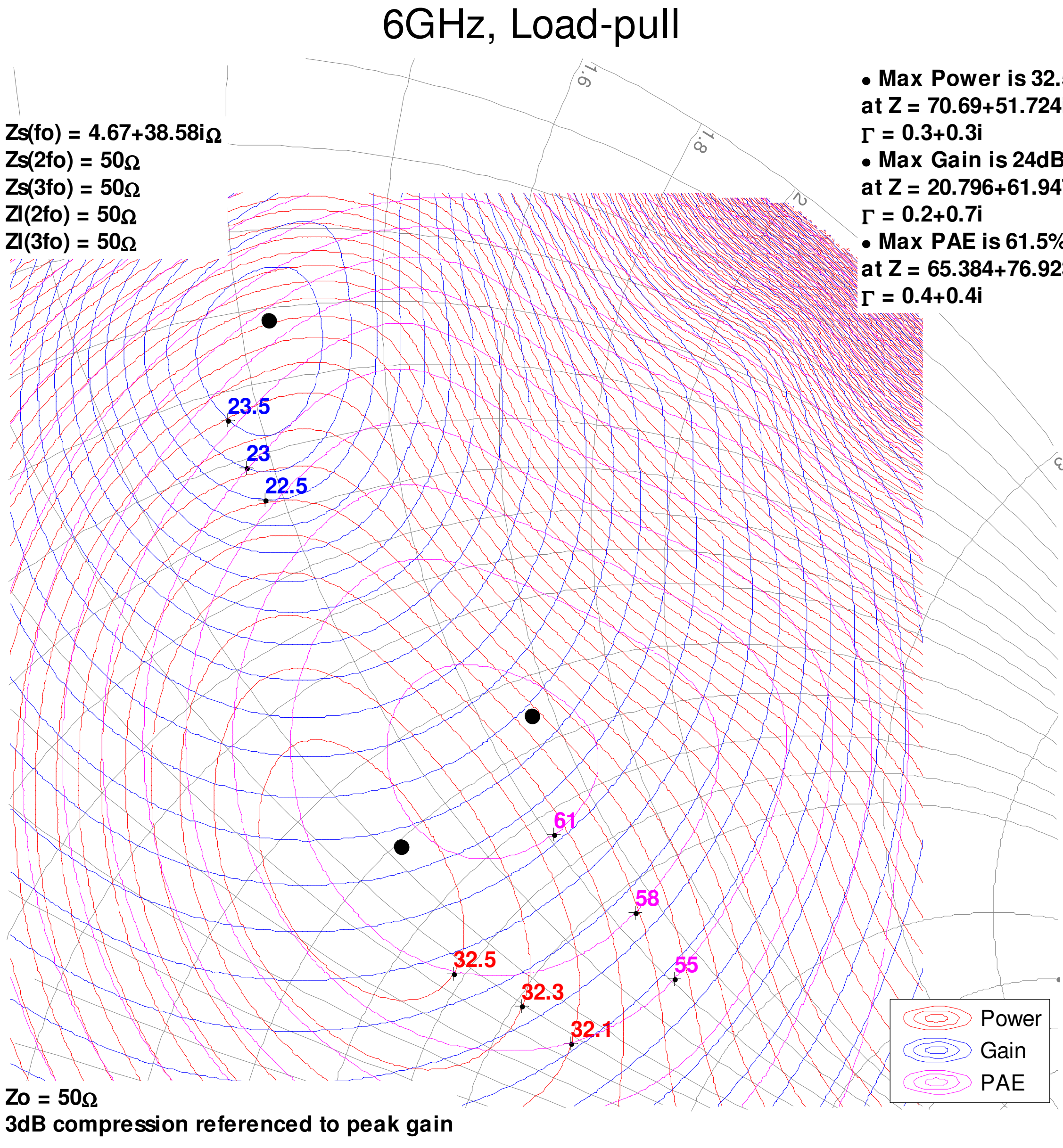
Load-Pull Smith Charts[1, 2]

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



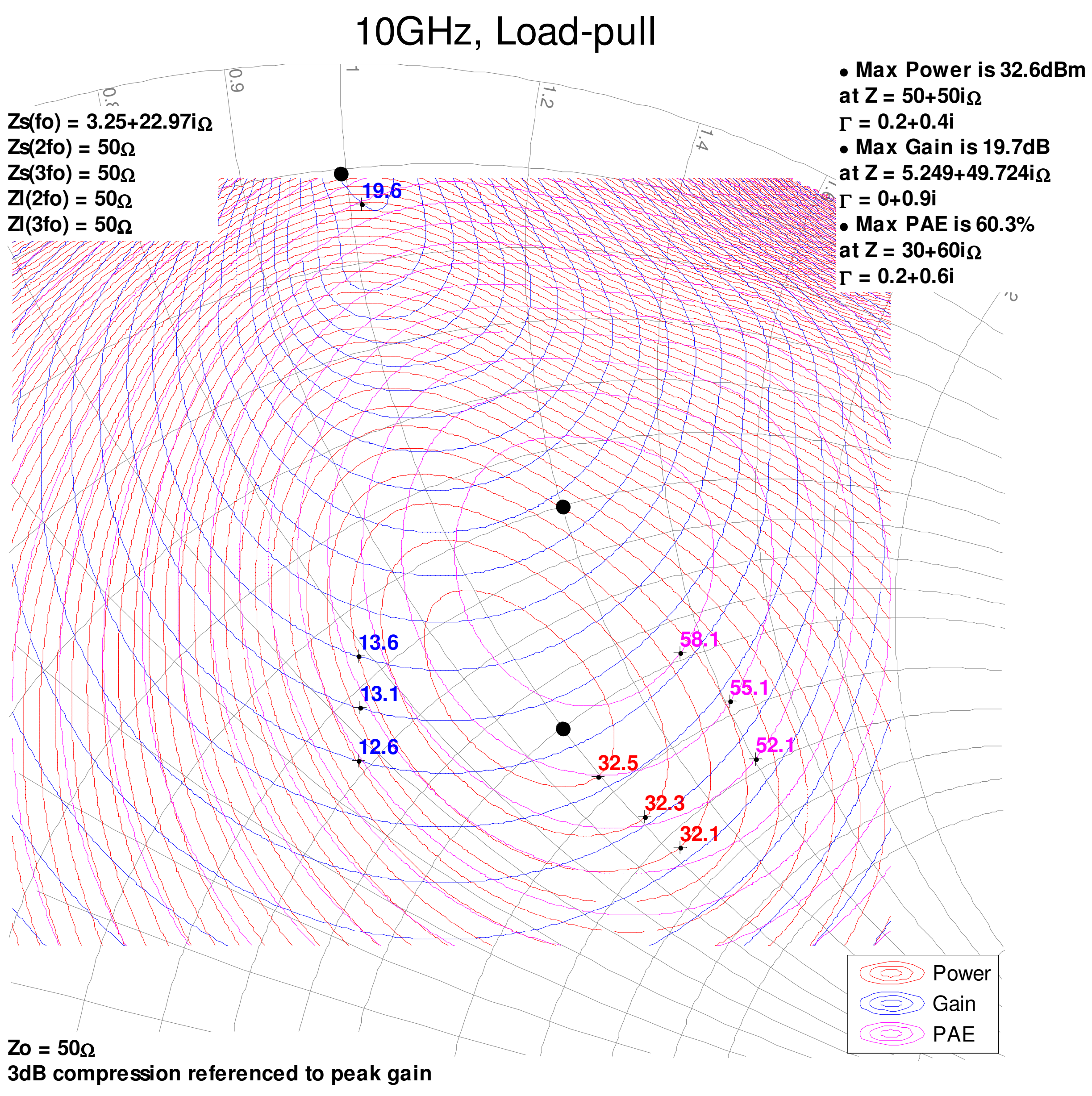
Load-Pull Smith Charts[1, 2]

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



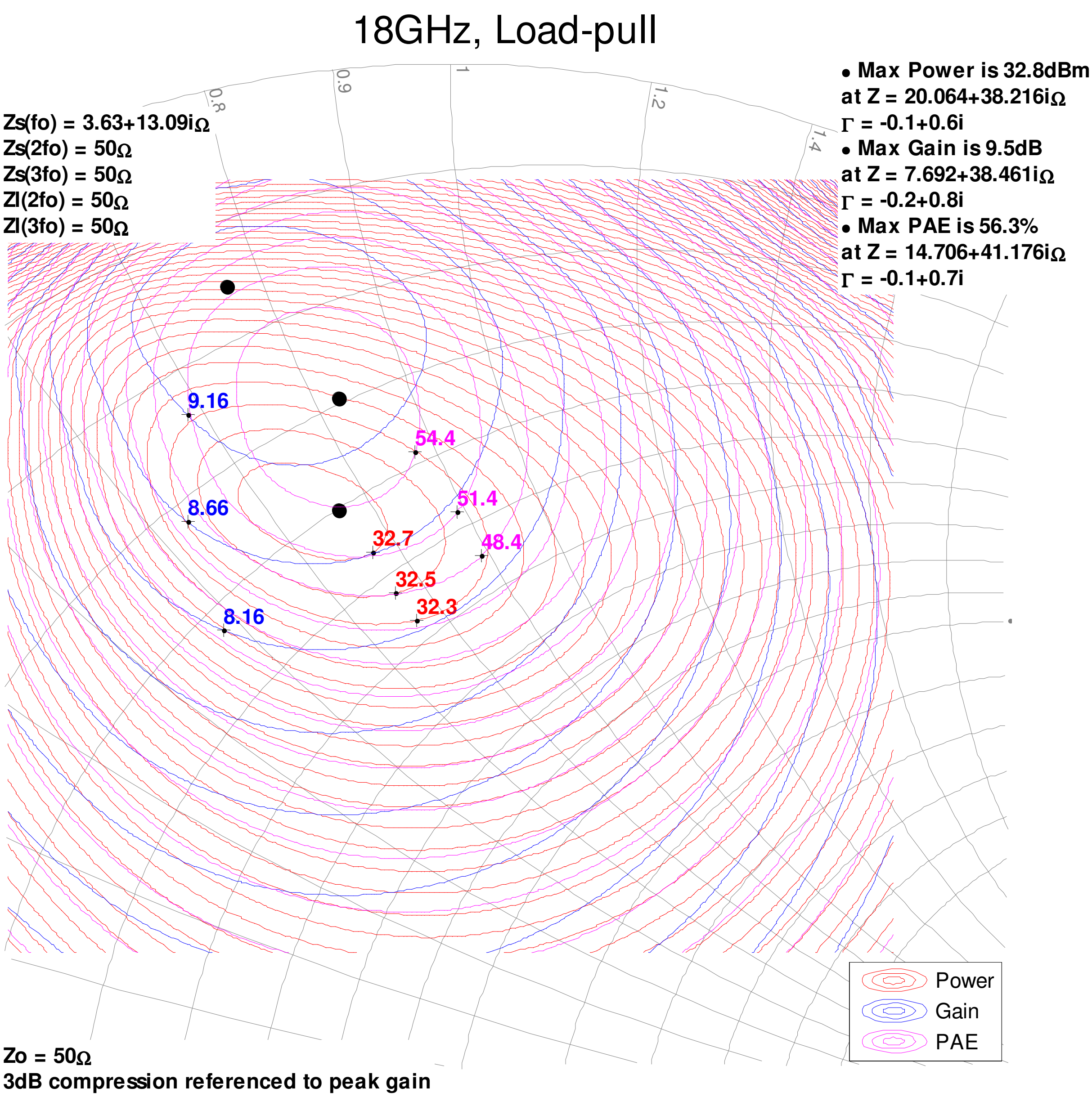
Load-Pull Smith Charts[1, 2]

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



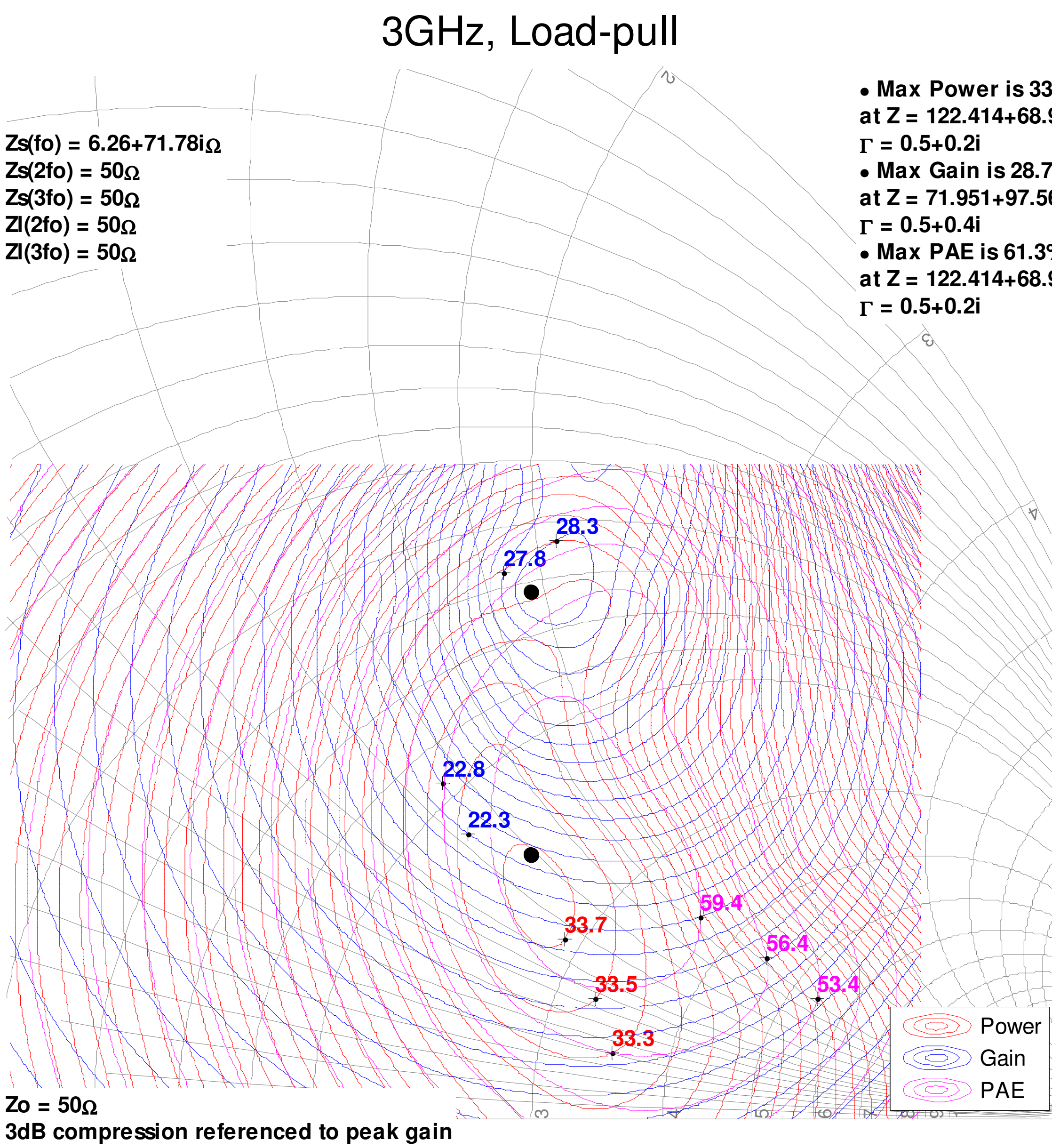
Load-Pull Smith Charts[1, 2]

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



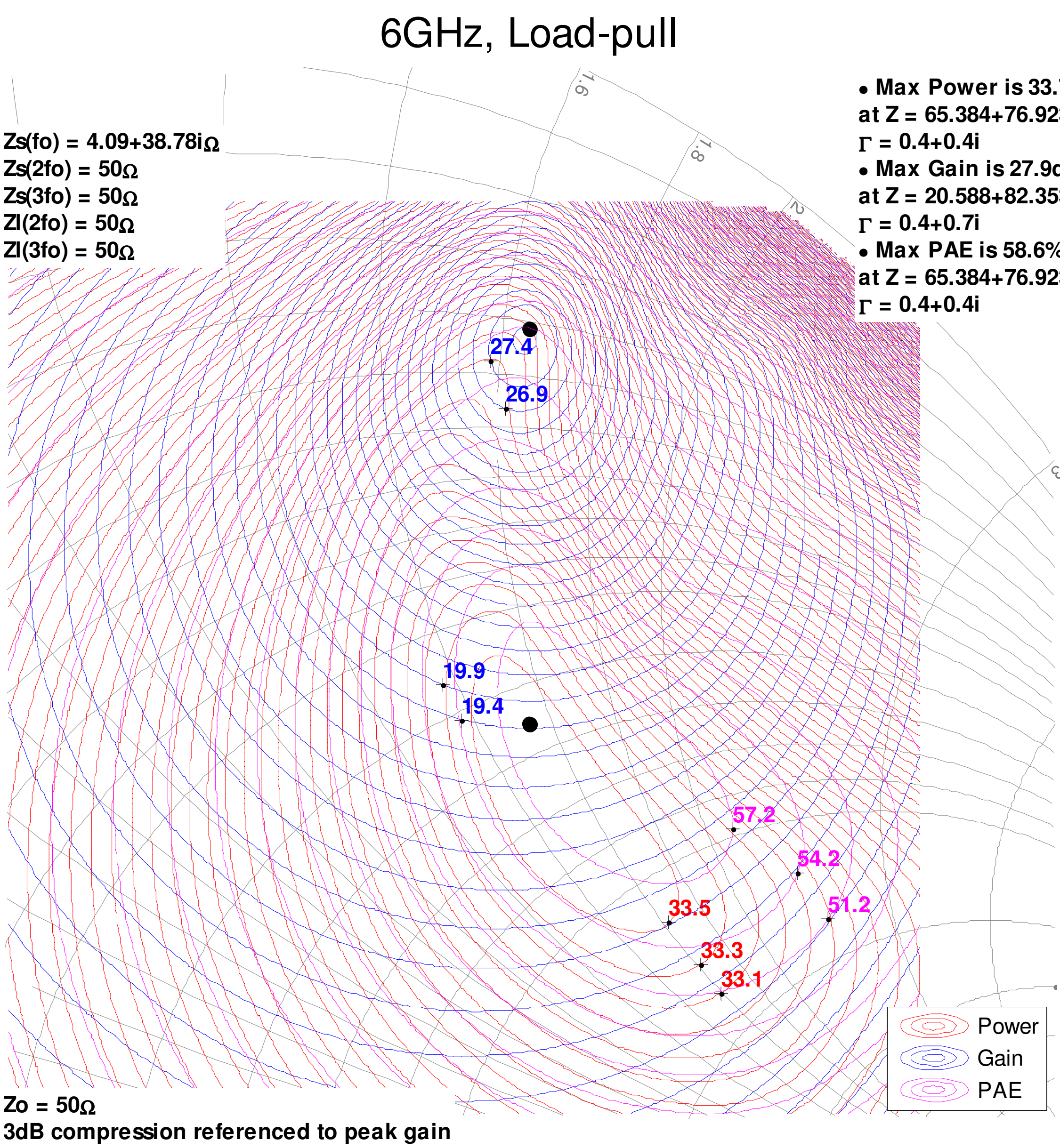
Load-Pull Smith Charts[1, 2]

Notes:
1. Test Conditions: V_D = 28 V, I_{DQ} = 40 mA, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.



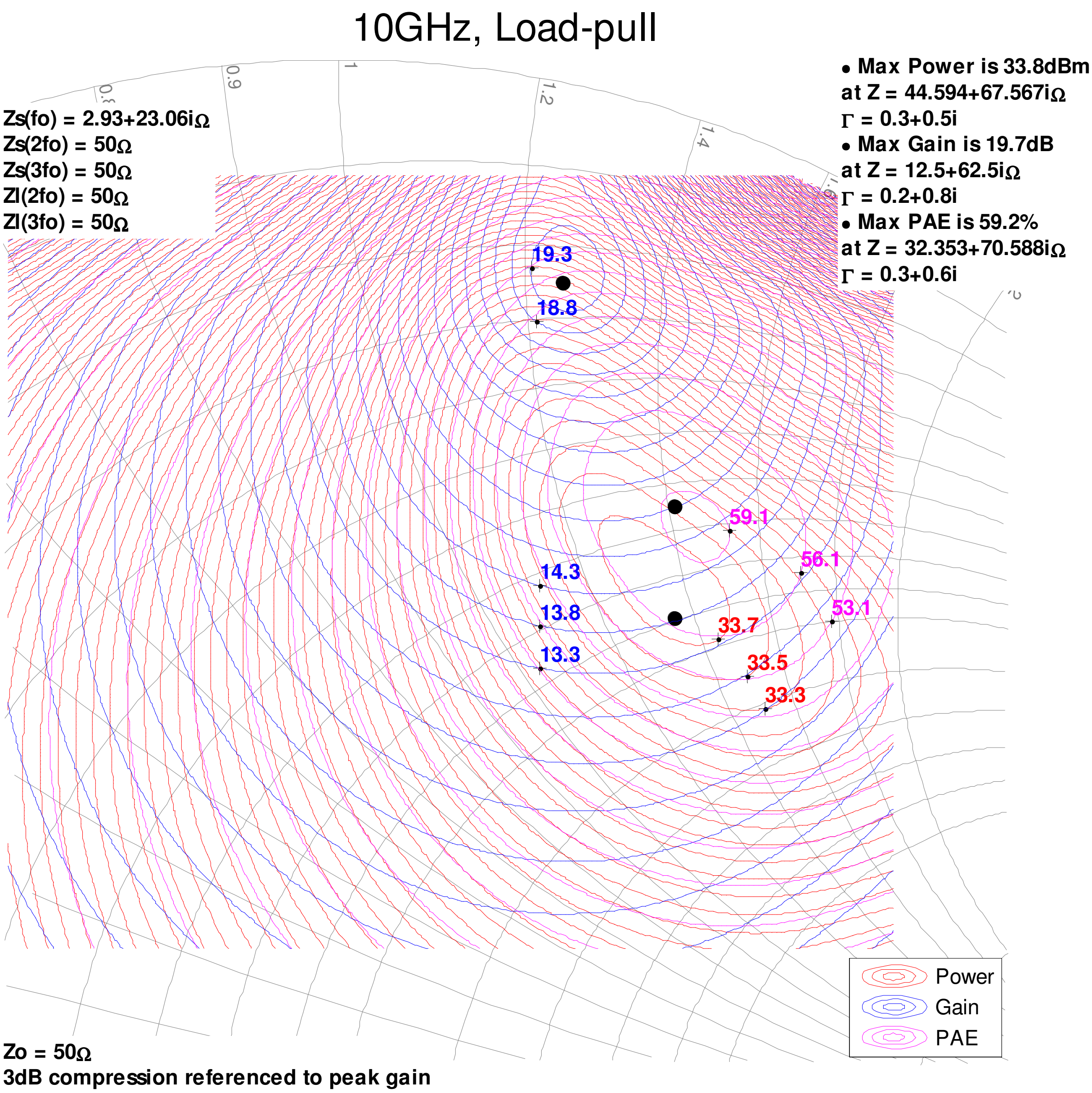
Load-Pull Smith Charts[1, 2]

Notes:
1. Test Conditions: V_D = 28 V, I_{DQ} = 20 mA, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.



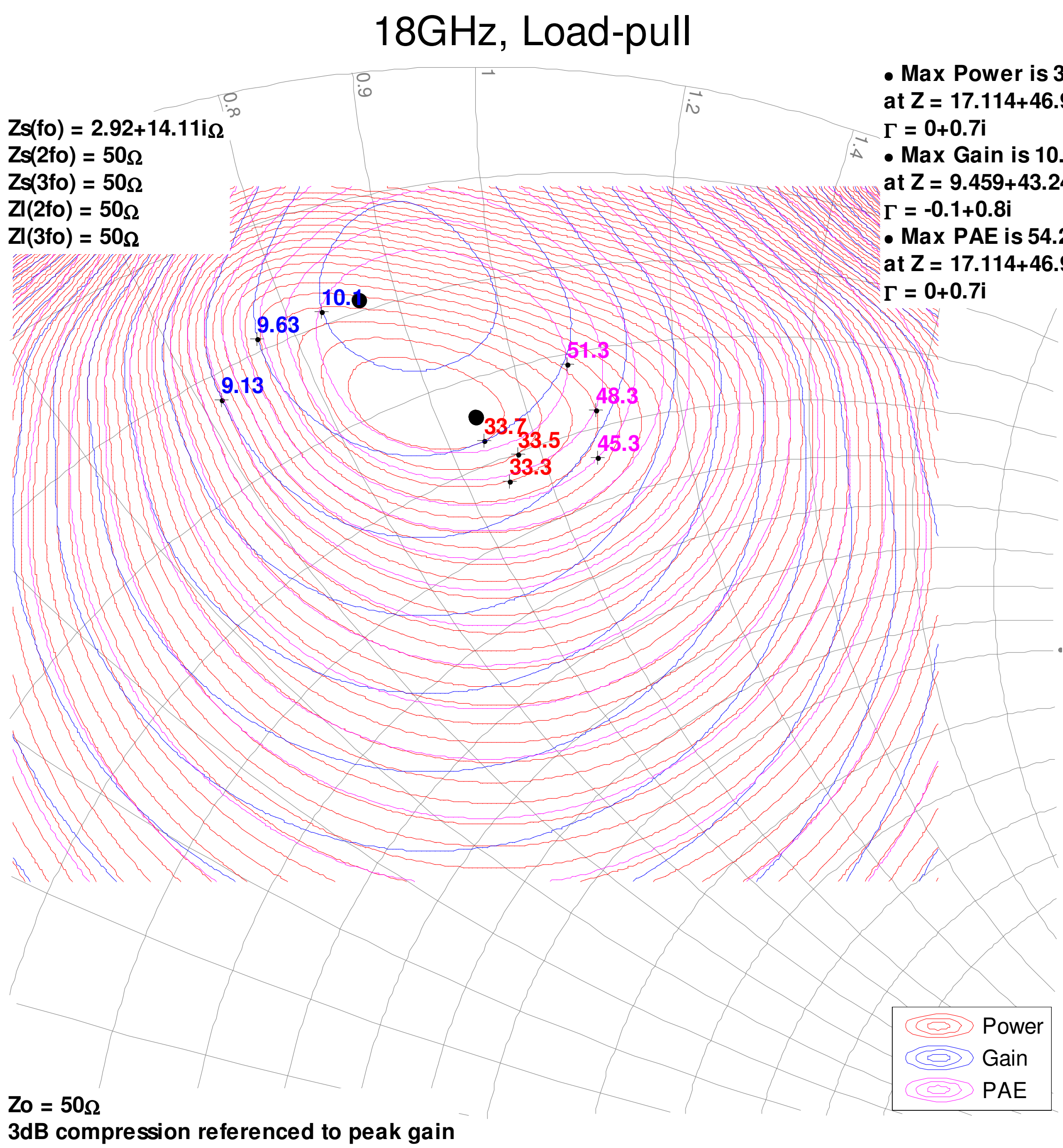
Load-Pull Smith Charts[1, 2]

Notes:
1. Test Conditions: V_D = 28 V, I_{DQ} = 20 mA, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.



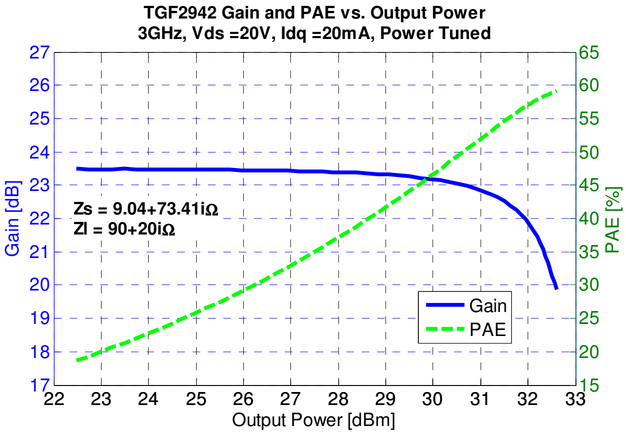
Load-Pull Smith Charts[1, 2]

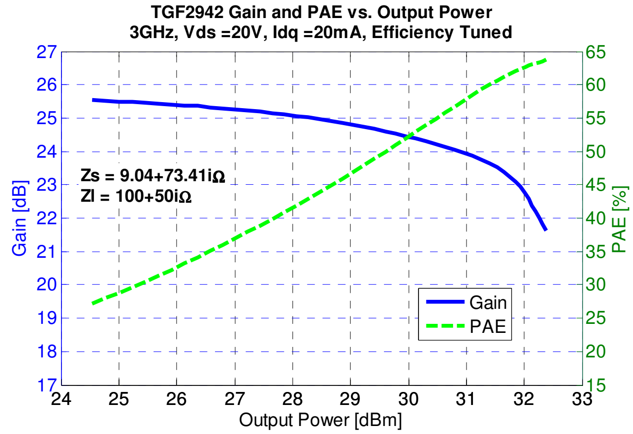
Notes:
1. Test Conditions: V_D = 28 V, I_{DQ} = 20 mA, CW, Bondwires not included
2. See page 22 for load pull reference planes where the performance was simulated.

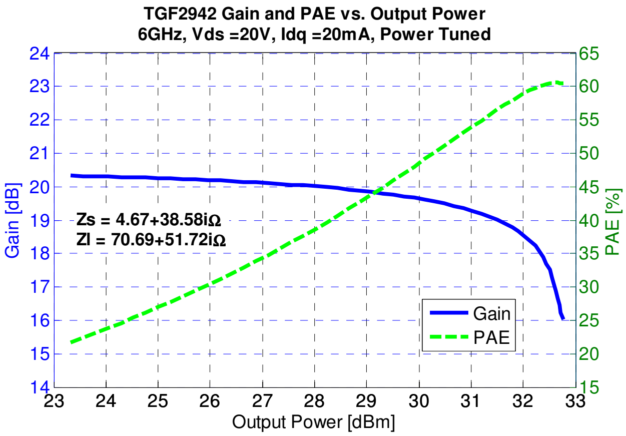


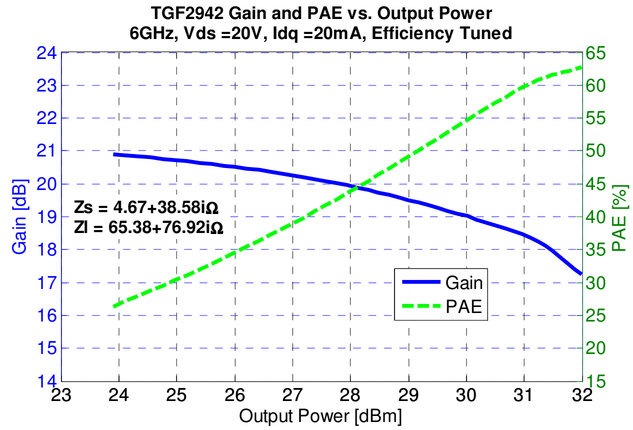
Typical Model Performance – Load-Pull Drive-up[1, 2]

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



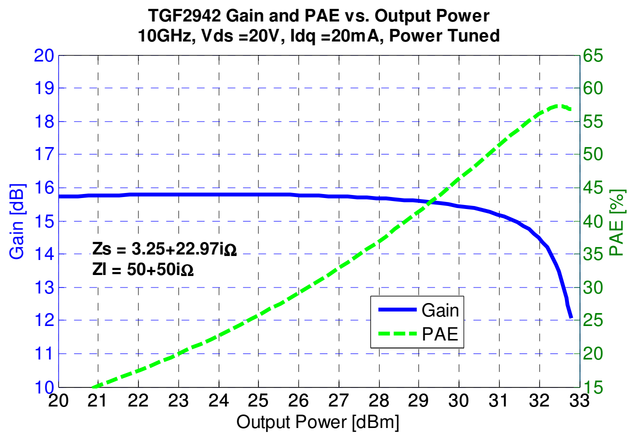


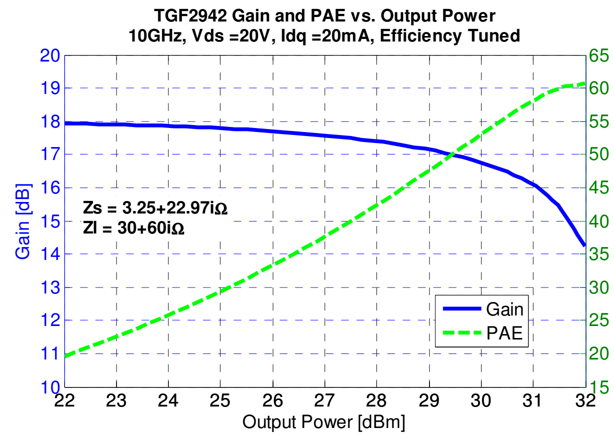


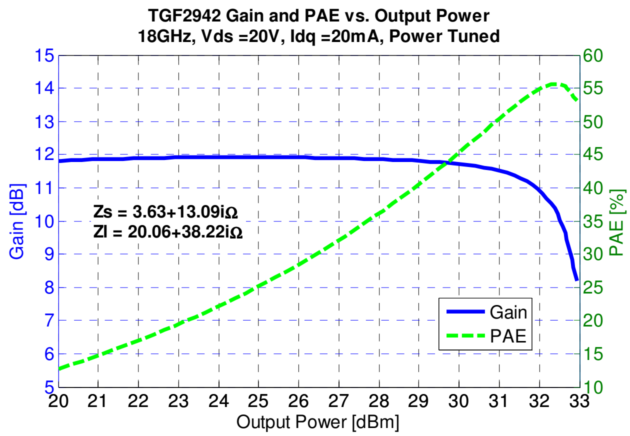


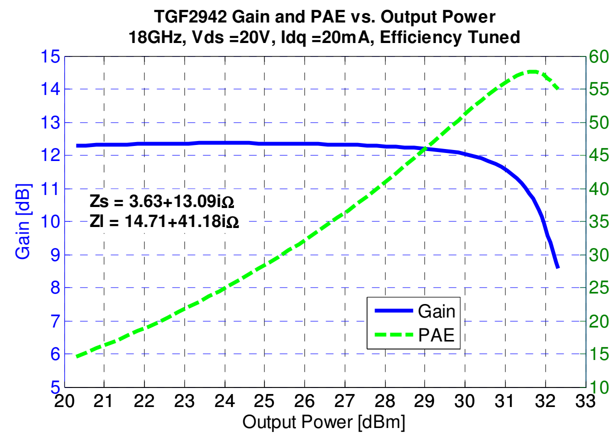
Typical Model Performance – Load-Pull Drive-up[1, 2]

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



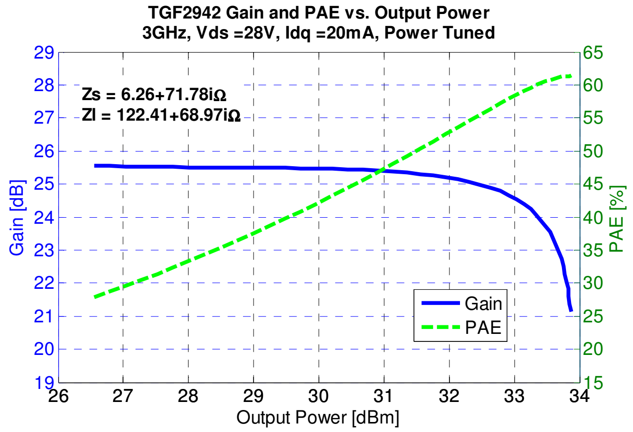


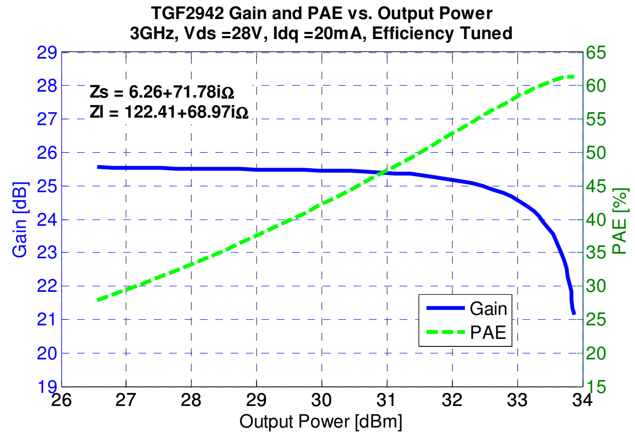


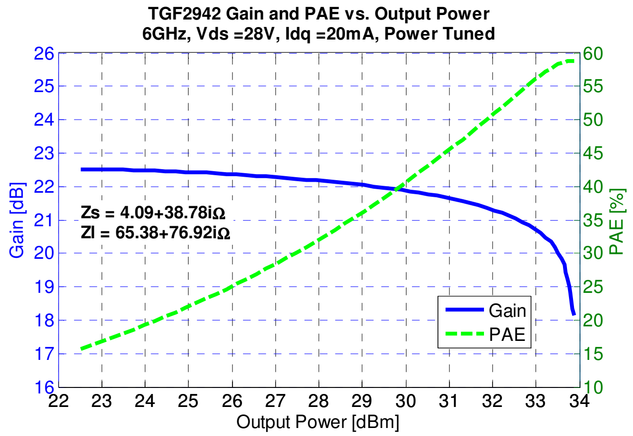


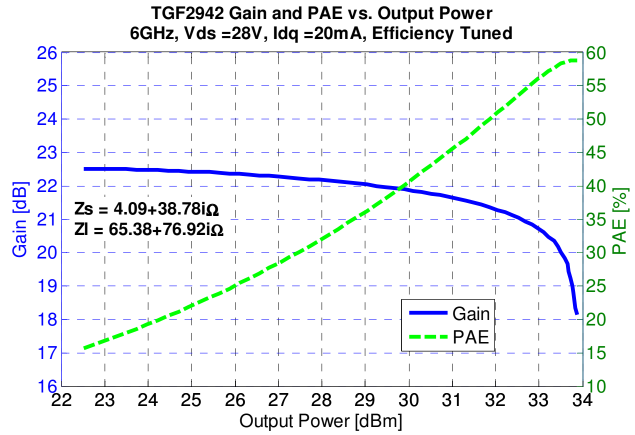
Typical Model Performance – Load-Pull Drive-up[1, 2]

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



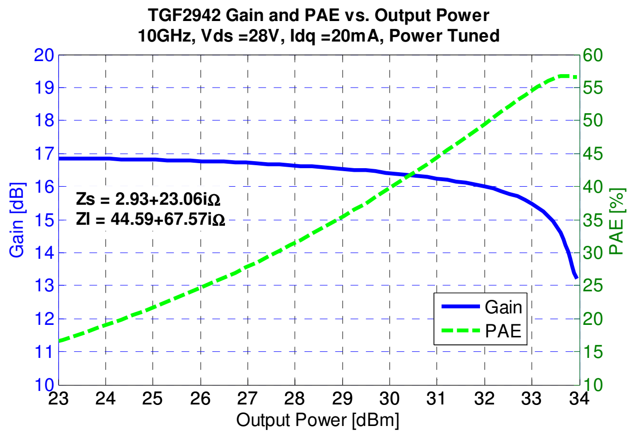


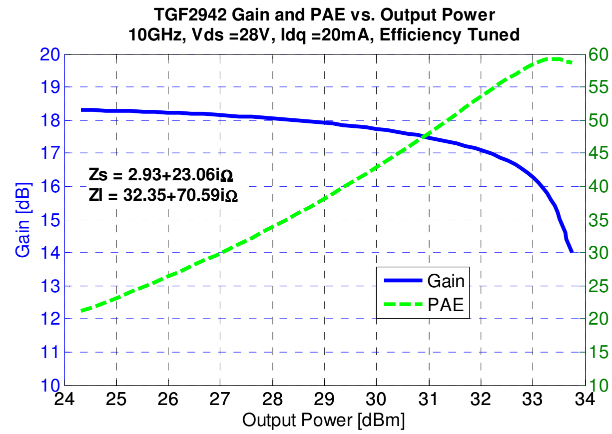


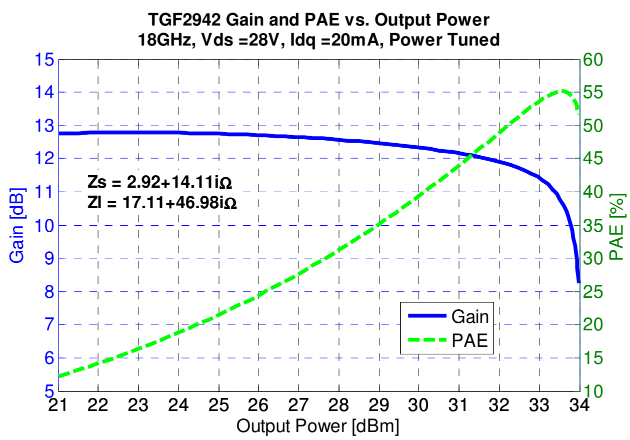


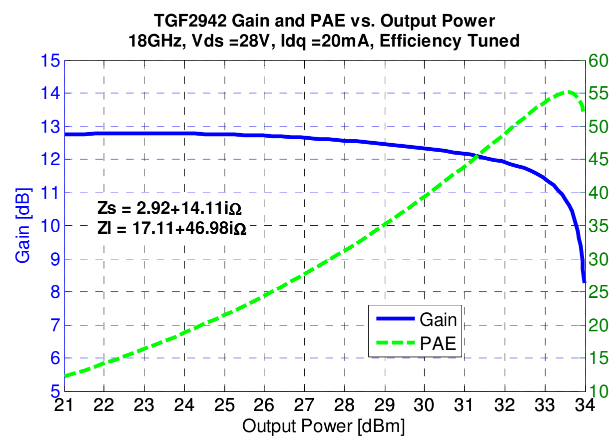
Typical Model Performance – Load-Pull Drive-up[1, 2]

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

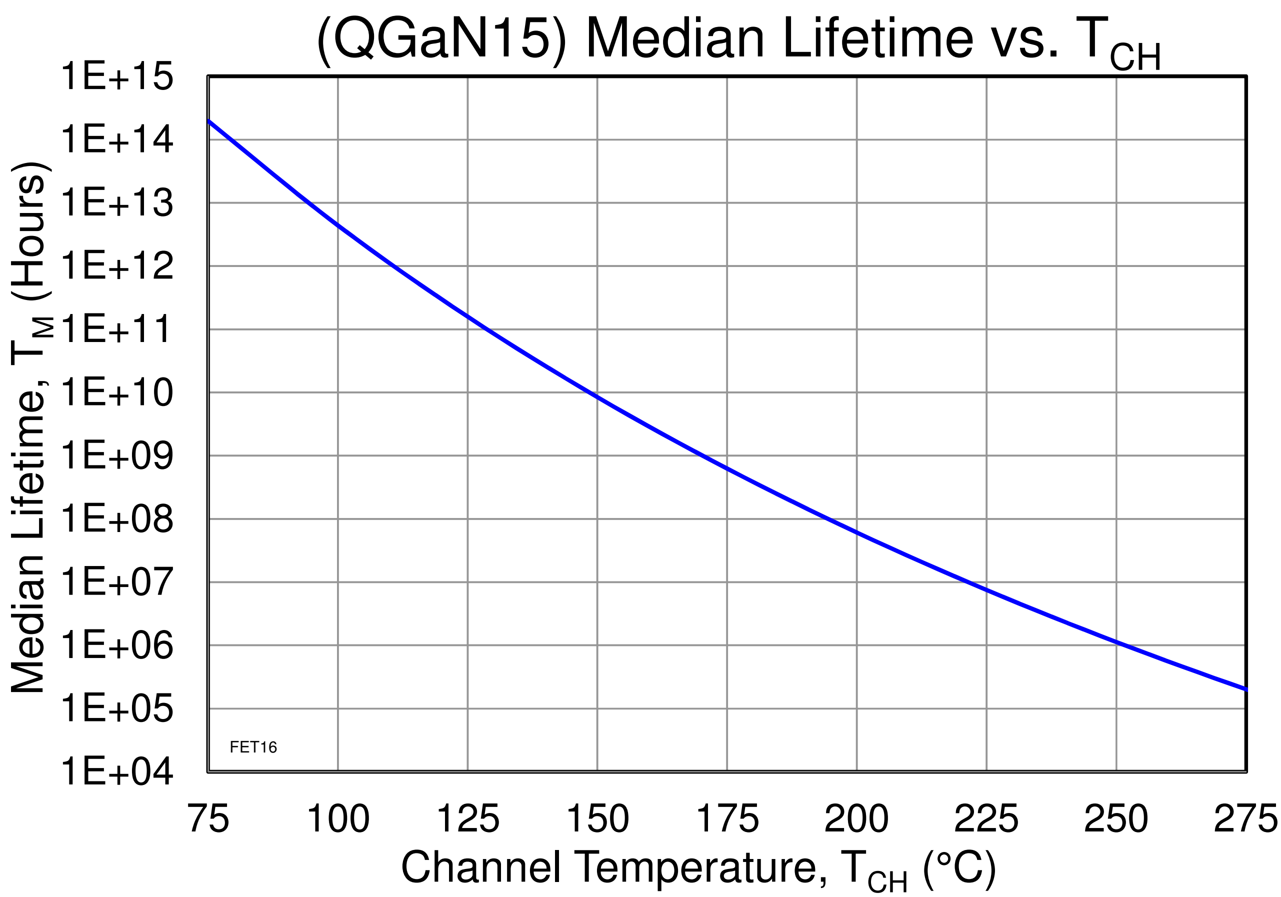






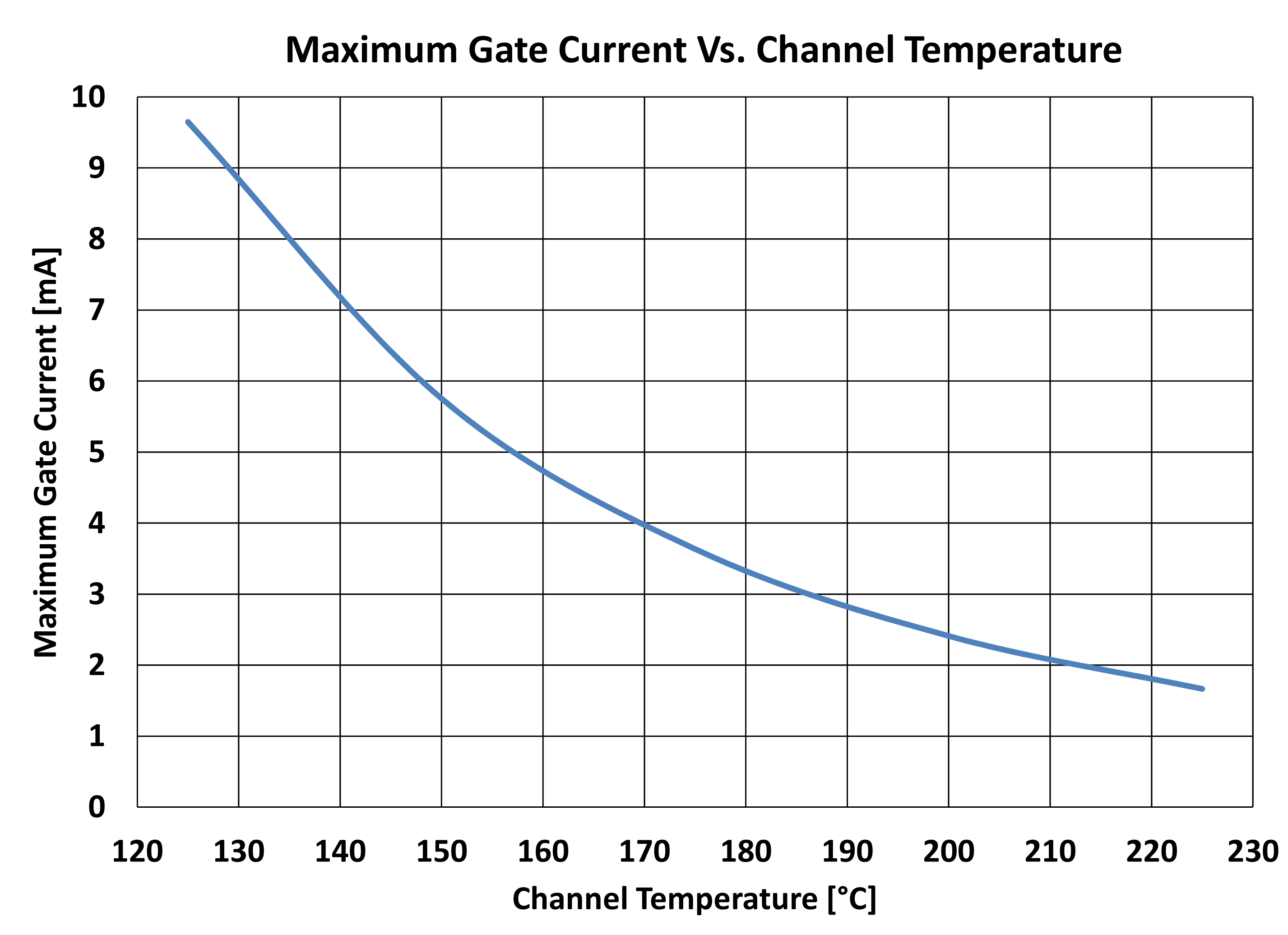


Median Lifetime[1]



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

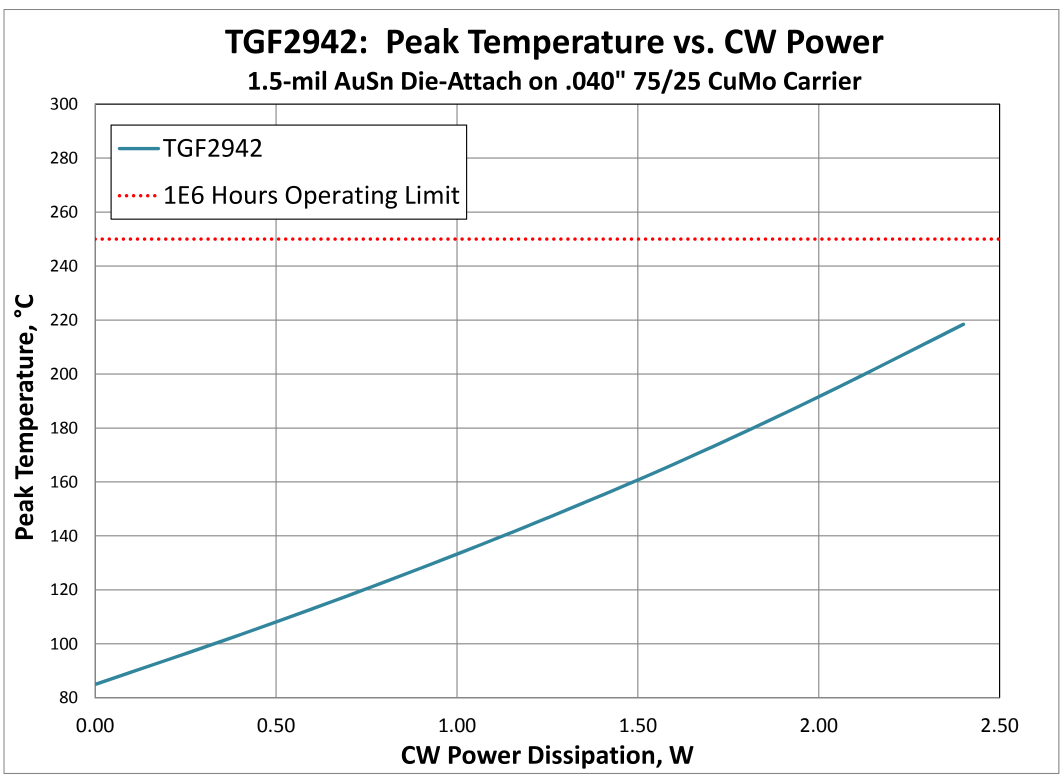
Maximum Gate Current



Thermal and Reliability Information

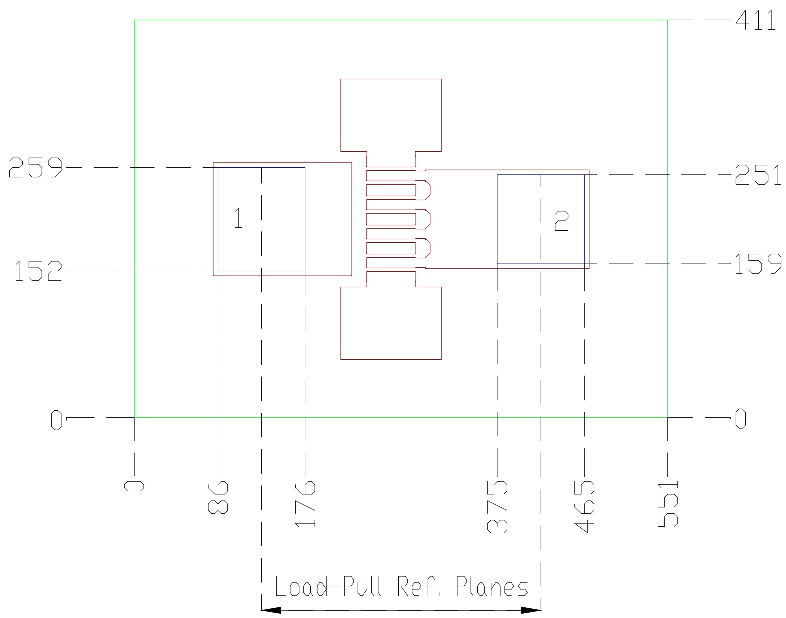
Parameter	Test Conditions	Value	Units
Thermal Resistance, θ_{JC} (1)	CW $T_{baseplate}$ = +85 °C P_{DISS} = 0.4 W	45.0	°C/W
Channel Temperature, T_{CH}		103	°C
Median Lifetime, T_M		2.9E12	Hrs
Thermal Resistance, θ_{JC} (1)	CW $T_{baseplate}$ = +85 °C P_{DISS} = 0.8 W	47.5	°C/W
Channel Temperature, T_{CH}		123	°C
Median Lifetime, T_M		2.0E11	Hrs
Thermal Resistance, θ_{JC} (1)	CW $T_{baseplate}$ = +85 °C P_{DISS} = 1.2 W	49.2	°C/W
Channel Temperature, T_{CH}		144	°C
Median Lifetime, T_M		1.7E10	Hrs
Thermal Resistance, θ_{JC} (1)	CW $T_{baseplate}$ = +85 °C P_{DISS} = 1.6 W	51.3	°C/W
Channel Temperature, T_{CH}		167	°C
Median Lifetime, T_M		1.4E9	Hrs
Thermal Resistance, θ_{JC} (1)	CW $T_{baseplate}$ = +85 °C P_{DISS} = 2.0 W	53.5	°C/W
Channel Temperature, T_{CH}		192	°C
Median Lifetime, T_M		1.2E8	Hrs
Thermal Resistance, θ_{JC} (1)	CW $T_{baseplate}$ = +85 °C P_{DISS} = 2.4 W	55.4	°C/W
Channel Temperature, T_{CH}		218	°C
Median Lifetime, T_M		1.3E7	Hrs

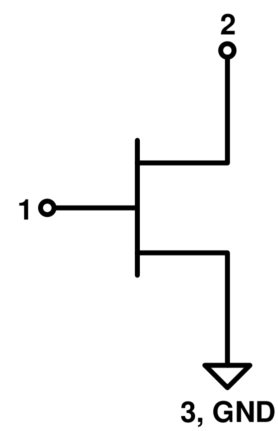
Notes:
1. Thermal resistance measured at back of package.



Pin Configuration and Description[1]

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





Pin Description

Pin	Symbol	Description	Dimension
1	RF IN / V_G	Gate	0.107 x 0.090 mm
2	RF OUT / V_D	Drain	0.092 x 0.090 mm
3	Source	Source / Ground	0.411 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
1. Set V_G to -4 V. 2. Set I_D limit to 25 mA. 3. Slowly adjust V_G until I_D reaches 20 mA. 4. Set I_D limit to 180 mA. 5. Apply RF signal.	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.

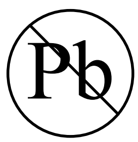
Contact plating: NiPdAu

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



Contact Information

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

Web: www.Qorvo.com **Tel:** **+1.972.994.8465**
Email: info-sales@qorvo.com **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.

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9