GT030D 50V, DC – 6.0GHZ, 30W GAN HEMT

FEATURES

- Operating Frequency Range: DC to 6.0GHz
- Operating Drain Voltage: +50V
- Maximum Output Power (P_{SAT}): 50W
- Maximum Drain Efficiency: 69.9% (1)
- Efficiency-Tuned P3dB Gain: 22.4dB (1)
- Surface Mount Plastic Package

(1) Load pull P3dB performance at 1.8GHz

14 Pin 6x3 mm DFN Package

DESCRIPTION

The GT030D is a 30W (P3dB) unmatched discrete GaN-on-SiC HEMT which operates from DC to 6.0GHz on a 50V supply rail. The wide bandwidth of the GT030D makes it suitable for a variety of applications including cellular infrastructure, radar, communications, and test instrumentation, and can support both CW and pulsed mode of operations.

The device is housed in an industry-standard 6x3 mm surface mount DFN package. Lead-free and ROHS compliant.

TYPICAL PERFORMANCE: MAX POWER TUNED AT P3dB, T_A = 25°C (2)

Parameter	1.7 GHz	2.0 GHz	2.3 GHz	3.4 GHz	3.6 GHz	3.8 GHz
Gain (dB)	19.5	19.5	18.6	15.4	14.6	14.4
Saturated Output Power (W)	50	50	50	50	50	50
Drain Efficiency (%)	61	57	60	56	55	56

(2) Load pull at V_D = 50V, I_{DQ} = 47mA, pulsed CW (10% duty cycle, 100µs width)

TYPICAL PERFORMANCE: MAX EFFICIENCY TUNED AT P3dB, T_A = 25°C (3)

Parameter	1.7 GHz	2.0 GHz	2.3 GHz	3.4 GHz	3.6 GHz	3.8 GHz
Gain (dB)	21.6	22.4	20.5	16.8	16.3	15.8
Saturated Output Power (W)	37	37	37	37	37	37
Drain Efficiency (%)	69	68	67	65	63	63

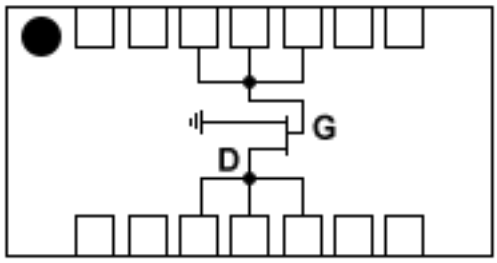
(3) Load pull at V_D = 50V, I_{DQ} = 47mA, pulsed CW (10% duty cycle, 100µs width)

GT030D 50V, DC – 6.0GHZ, 30W GAN HEMT

ABSOLUTE MAXIMUM RATINGS

Parameter	Rating	Units
Breakdown Voltage	>150	BV_{DG} (V)
Gate Source Voltage	-8 to +2	V_{GS} (V)
Operating Voltage	55	V (V)
Junction Temperature	+225	(°C)
Storage Temperature	-65 to +150	(°C)

BLOCK DIAGRAM



ELECTRICAL SPECIFICATIONS: T_A = 25°C

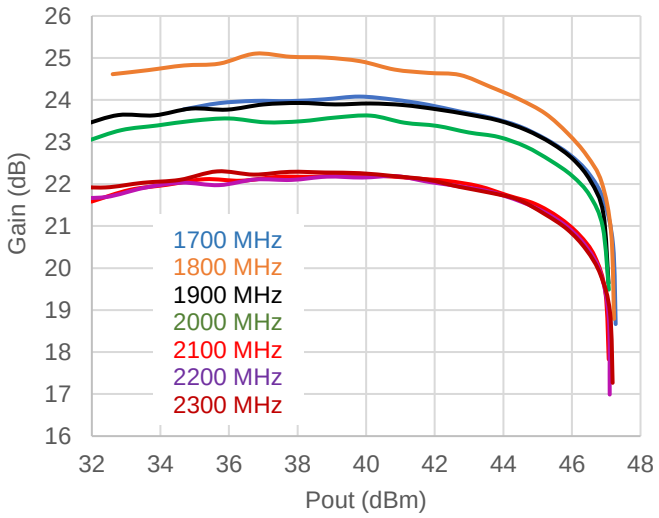
Parameter	Min.	Typ.	Max.	Units	Notes
Frequency Range	DC		6000	MHz	
DC Characteristics					
Drain Source Breakdown Voltage		>150		V_{DS} (V)	
Drain Source Leakage Current		0.47		I_{DS} (mA)	
Gate Threshold Voltage		-3.5 to -1.5		V_{GS} (V)	
Operating Conditions					
Gate Voltage		-2.5		V_G (V)	
Drain Voltage		50		V_D (V)	
Quiescent Drain Current		47		I_{DQ} (mA)	
Thermal Characteristics					
Thermal Resistance at Pave (1)		4.7		θ_{JC} (°C/W)	T_{case} = 85°C, T_{CH} = 141°C P_{diss} = 11.9W, P_{out} = 3.5W

(1) T_{case} is referred as temperature at the package back side. T_{CH} is modeled peak junction temperature that was verified with IR surface temperature measurement. Performance based on initial 3.6GHz evaluation board measurement at 10dB back off

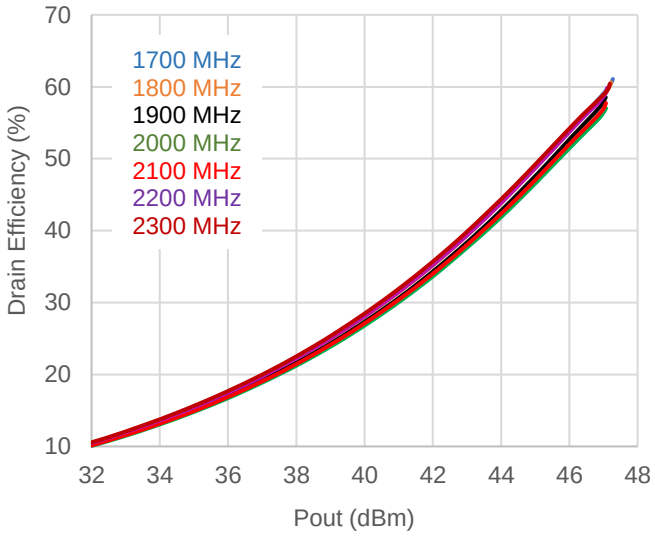
PERFORMANCE PLOTS: MAX POWER TUNED LOAD PULL

Test conditions: V_D = 50V, V_G = -2.67V, I_{DQ} = 47mA, T = +25°C, pulsed CW (10% duty cycle, 100µs width)

Gain vs. Output Power



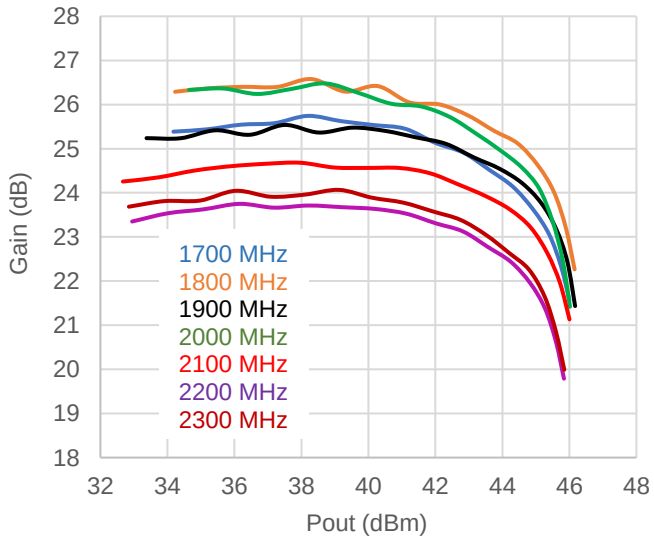
Drain Efficiency vs. Output Power



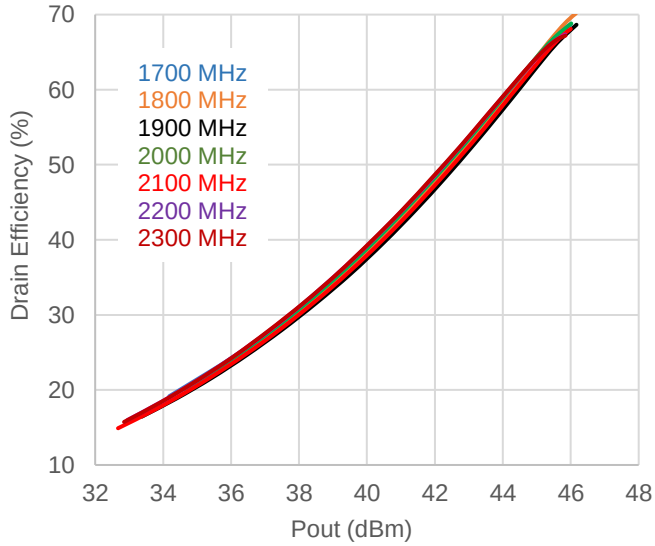
PERFORMANCE PLOTS: MAX EFFICIENCY TUNED LOAD PULL

Test conditions: V_D = 50V, V_G = -2.67V, I_{DQ} = 47mA, T = +25°C, pulsed CW (10% duty cycle, 100µs width)

Gain vs. Output Power



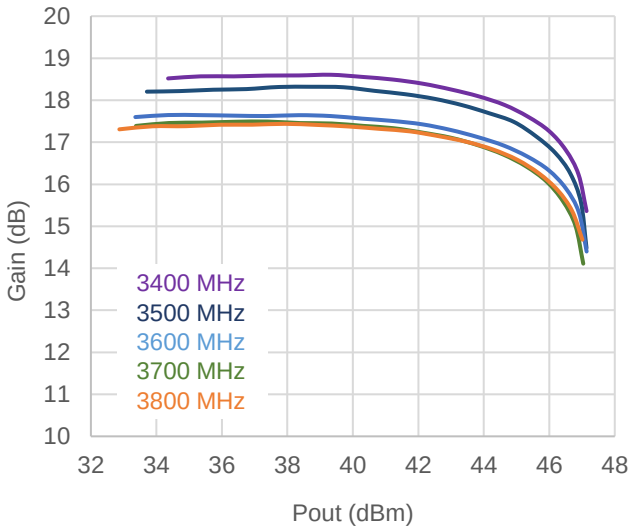
Drain Efficiency vs. Output Power



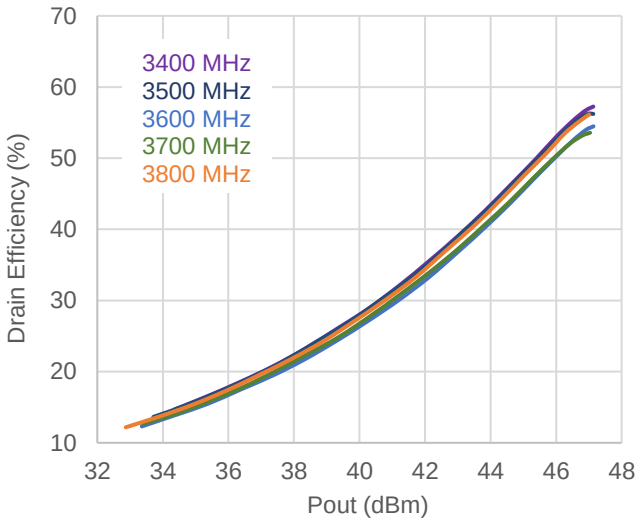
PERFORMANCE PLOTS: MAX POWER TUNED LOAD PULL

Test conditions: V_D = 50V, V_G = -2.67V, I_{DQ} = 47mA, T = +25°C, pulsed CW (10% duty cycle, 100µs width)

Gain vs. Output Power



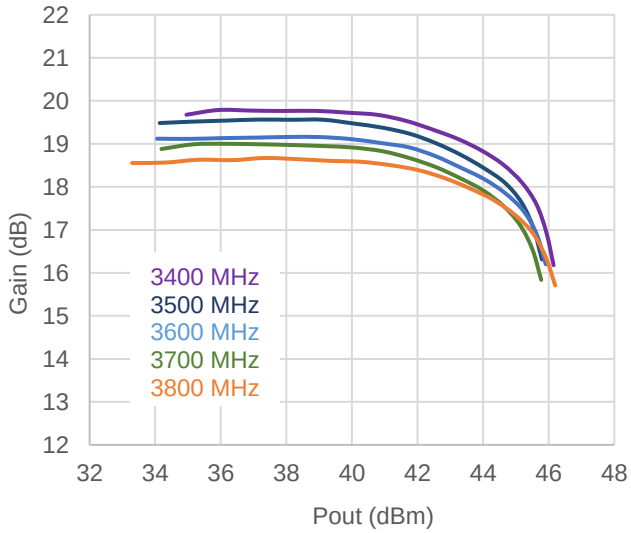
Drain Efficiency vs. Output Power



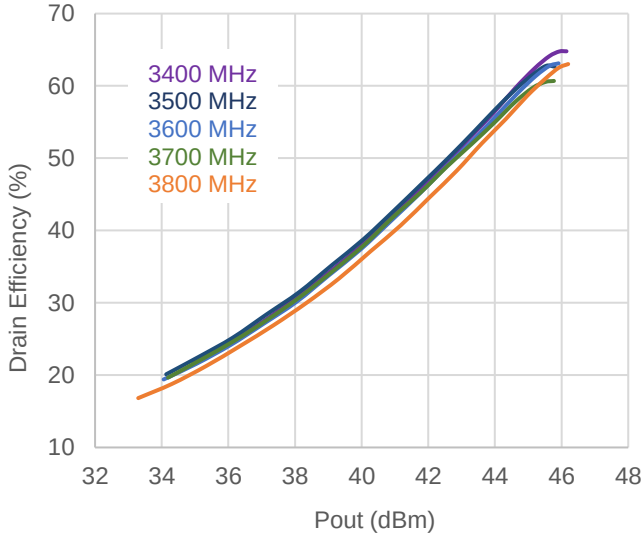
PERFORMANCE PLOTS: MAX EFFICIENCY TUNED LOAD PULL

Test conditions: V_D = 50V, V_G = -2.67V, I_{DQ} = 47mA, T = +25°C, pulsed CW (10% duty cycle, 100µs width)

Gain vs. Output Power



Drain Efficiency vs. Output Power



LOAD PULL PERFORMANCE: MAX POWER TUNED

Frequency (MHz)	Source Impedance (Ω)	Load Impedance (Ω)	P3dB (dBm)	Drain Efficiency (%)	G3dB (dB)
1700	2.3 – j8.2	16.0 + j6.7	47.2	60.7	19.5
1800	1.9 – j7.5	14.3 + j6.8	47.1	60.0	20.2
1900	1.6 – j6.8	14.7 + j5.0	47.1	58.5	19.6
2000	1.5 – j6.5	14.3 + j3.8	47.1	57.0	19.5
2100	1.8 – j6.1	14.7 + j3.3	47.1	57.7	17.8
2200	1.9 – j5.7	14.0 + j4.5	47.1	59.3	18.6
2300	1.7 – j5.1	13.6 + j5.0	47.1	59.7	18.6
3400	1.3 + j1.1	10.1 + j5.3	47.1	56.4	15.4
3500	1.4 + j1.1	10.5 + j5.3	47.0	56.2	15.4
3600	1.4 + j1.2	10.0 + j3.5	47.1	54.4	14.6
3700	1.4 + j1.2	11.1 + j3.3	47.0	53.5	14.4
3800	1.4 + j1.3	10.3 + j3.4	47.1	56.1	14.4

LOAD PULL PERFORMANCE: MAX EFFICIENCY TUNED

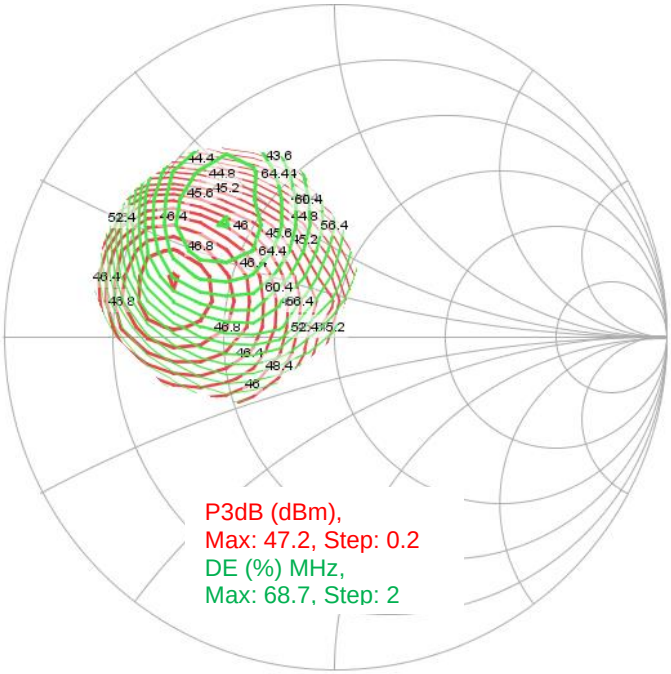
Frequency (MHz)	Source Impedance (Ω)	Load Impedance (Ω)	P3dB (dBm)	Drain Efficiency (%)	G3dB (dB)
1700	1.3 – j6.3	17.7 + j19.2	46.0	68.7	21.6
1800	1.0 – j5.6	16.5 + j17.5	46.0	69.9	22.4
1900	1.1 – j5.5	16.5 + j16.3	46.0	68.1	22.1
2000	0.9 – j5.0	14.4 + j16.5	45.8	68.1	22.4
2100	1.0 – j4.5	13.3 + j14.8	46.0	68.1	21.1
2200	1.1 – j4.2	13.2 + j15.3	45.7	67.0	20.2
2300	1.0 – j3.7	12.2 + j14.8	45.7	66.9	20.5
3400	1.1 + j1.6	8.6 + j12	46.0	64.8	16.8
3500	1.1 + j1.6	7.8 + j11.7	45.7	62.7	16.6
3600	1.1 + j1.7	7.4 + j10.1	45.9	63.1	16.3
3700	1.1 + j1.7	7.5 + j10	45.7	60.6	16.1
3800	1.2 + j1.8	7.7 + j8.3	46.2	62.7	15.8

Test conditions: V_D = +50V, I_{DQ} = 47mA, T = +25°C, pulsed CW (10% duty cycle, 100µs width). Harmonics not optimized

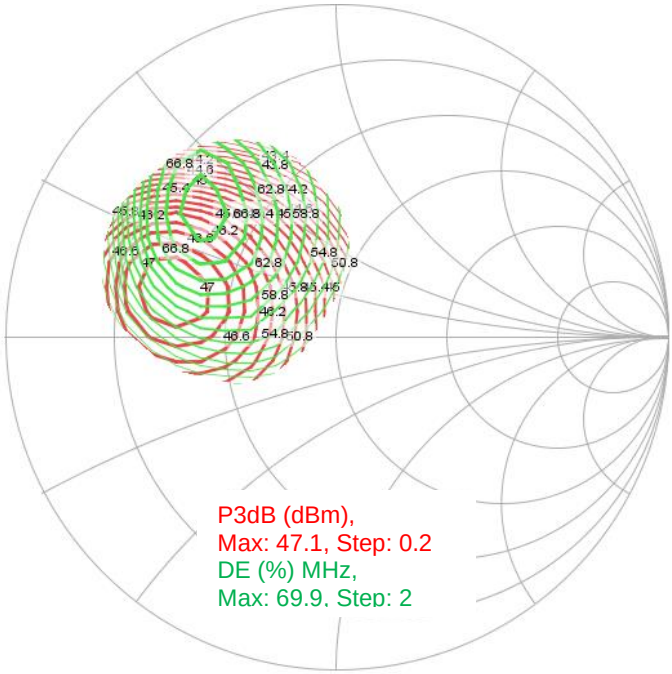
LOADPULL CONTOURS

Test conditions: V_D = +50V, I_{DQ} = 47mA, T = +25°C, pulsed CW (10% duty cycle, 100µs width).
Harmonics not optimized

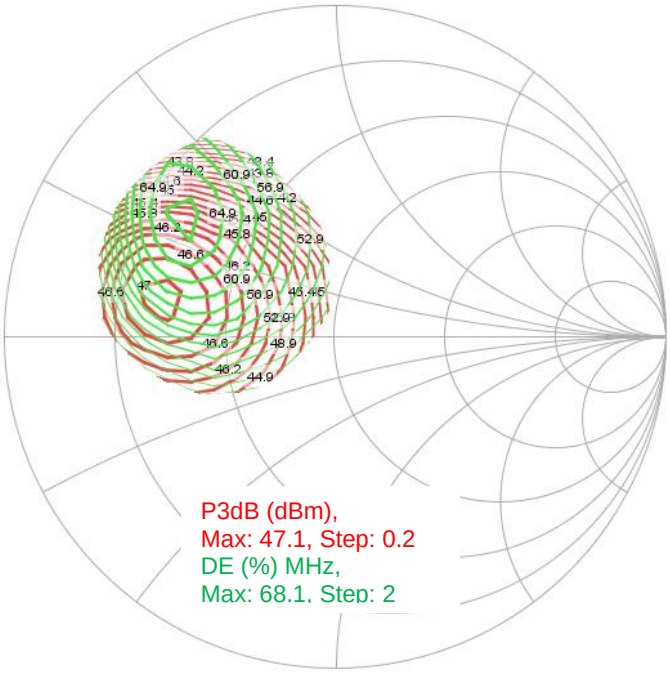
Contours at 1.7 GHz



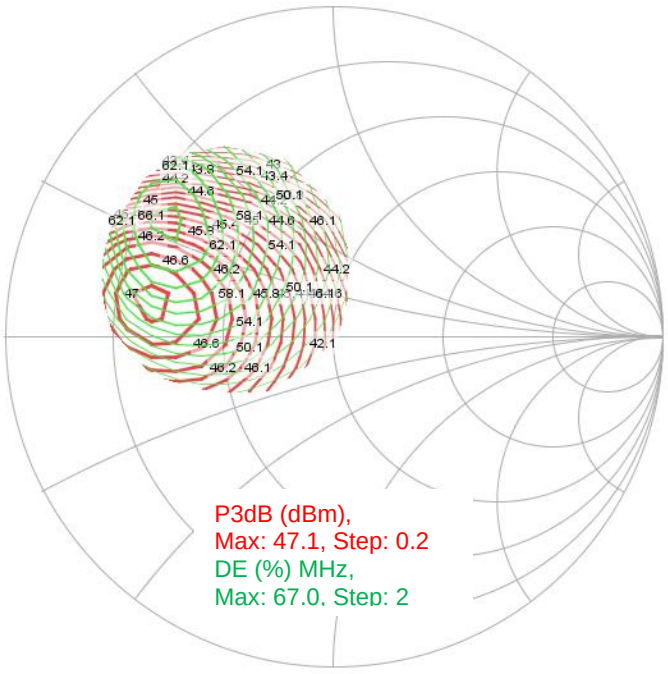
Contours at 1.8 GHz



Contours at 2.0 GHz



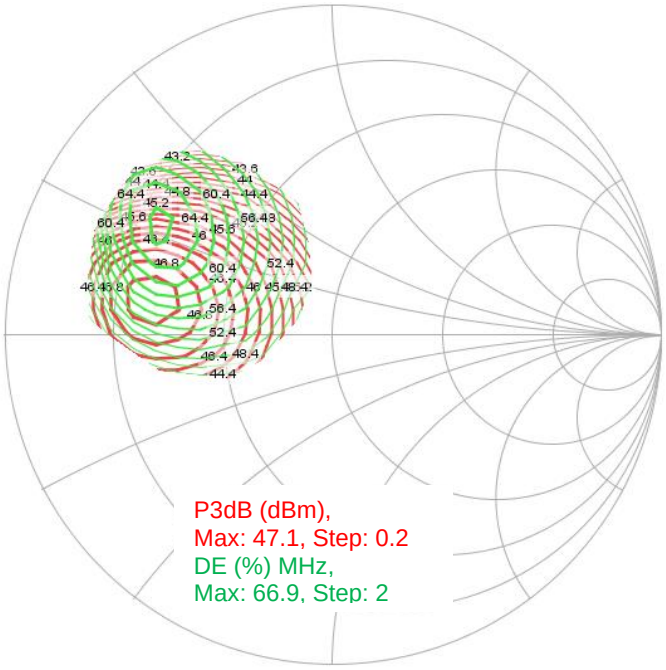
Contours at 2.2 GHz



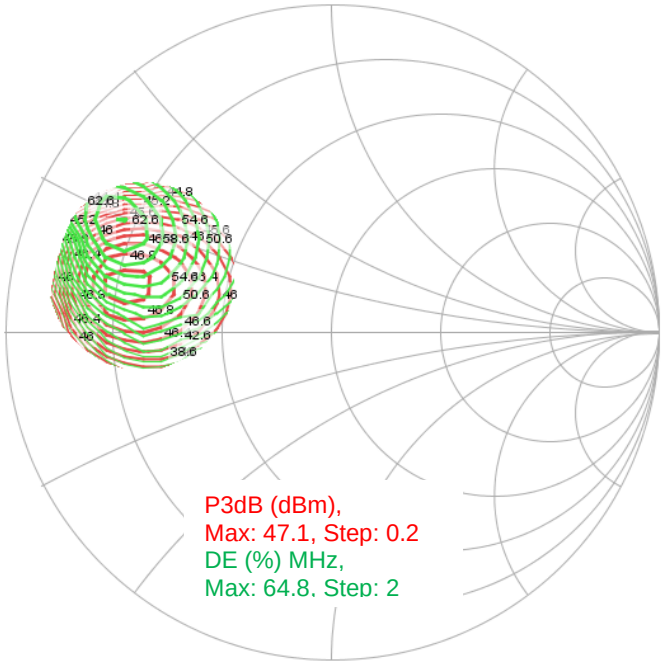
LOADPULL CONTOURS

Test conditions: V_D = +50V, I_{DQ} = 47mA, T = +25°C, pulsed CW (10% duty cycle, 100µs width). Harmonics not optimized

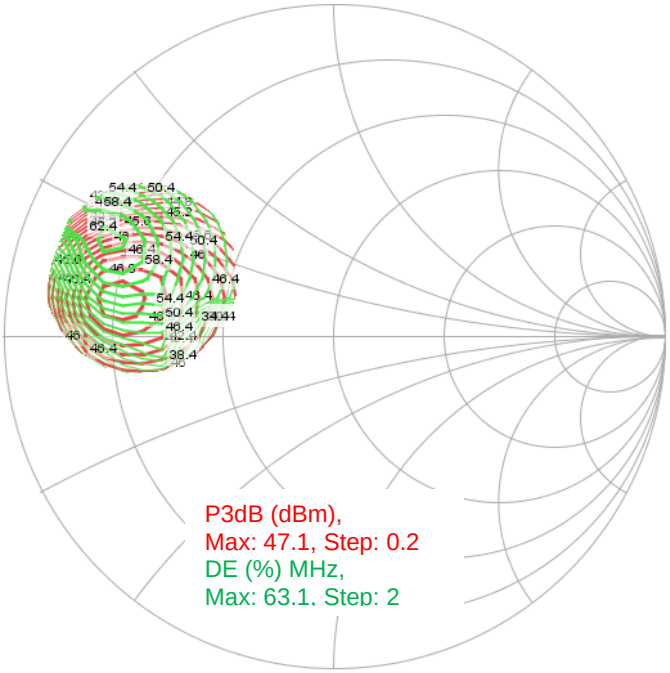
Contours at 2.3 GHz



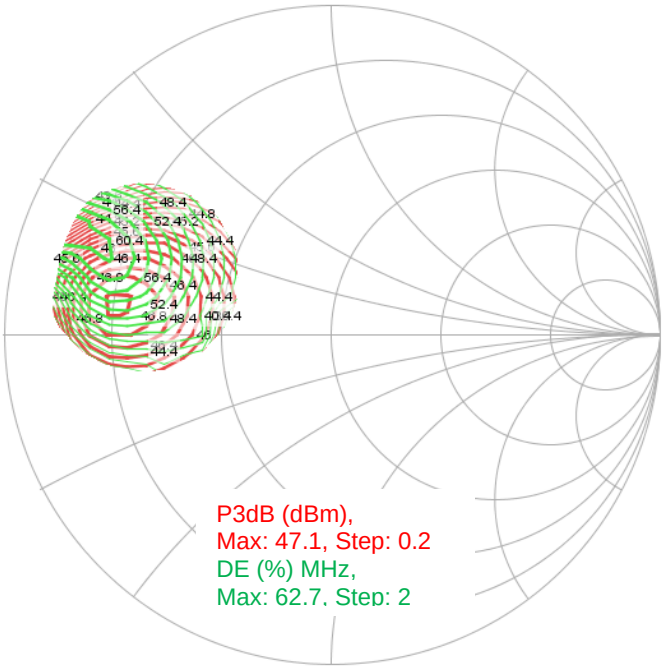
Contours at 3.4 GHz



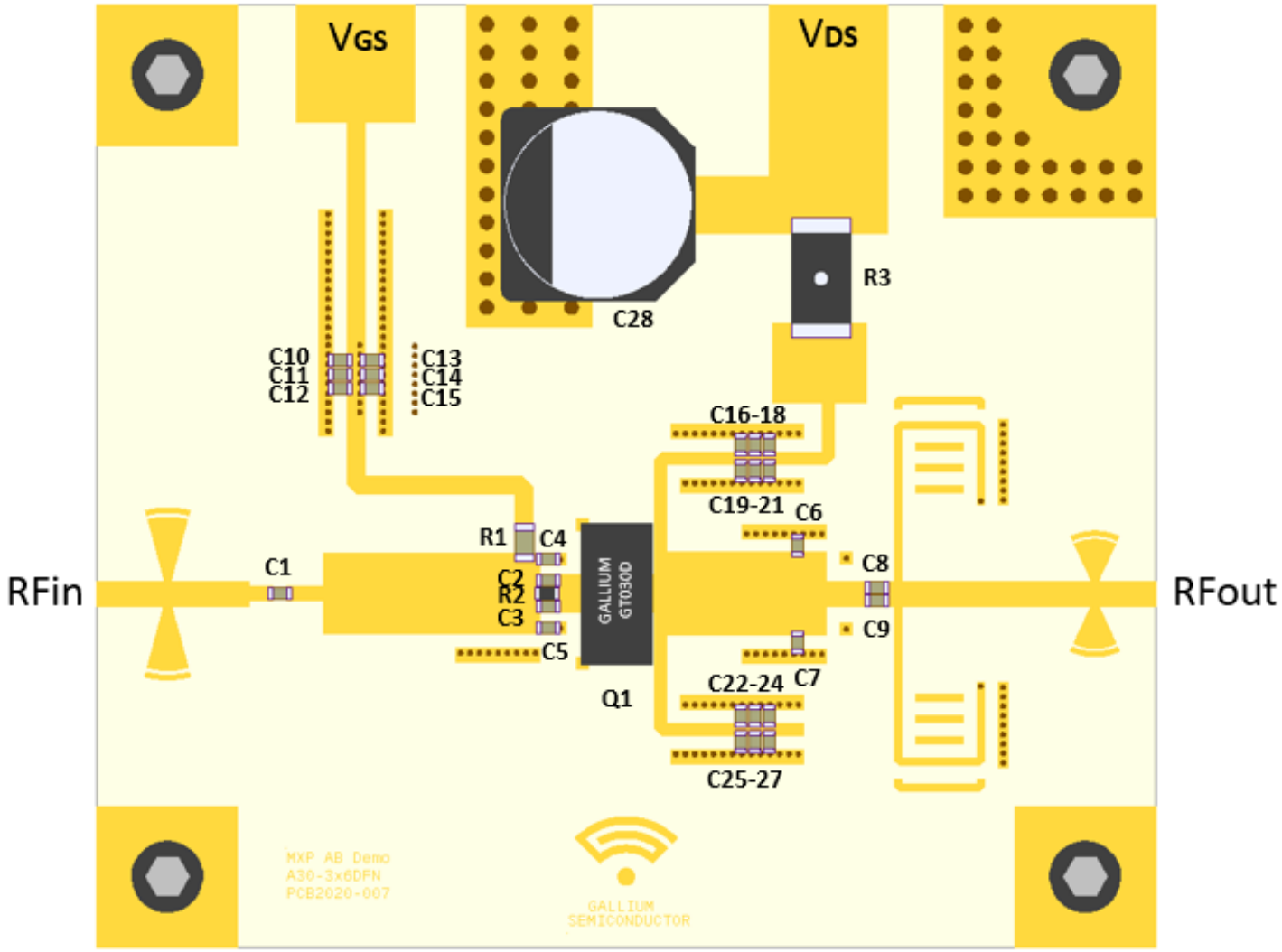
Contours at 3.6 GHz



Contours at 3.8 GHz



GT030D-EB1842-01 – 1.8 – 4.2 GHz BROAD BAND CLASS AB DEMONSTRATION TEST BOARD

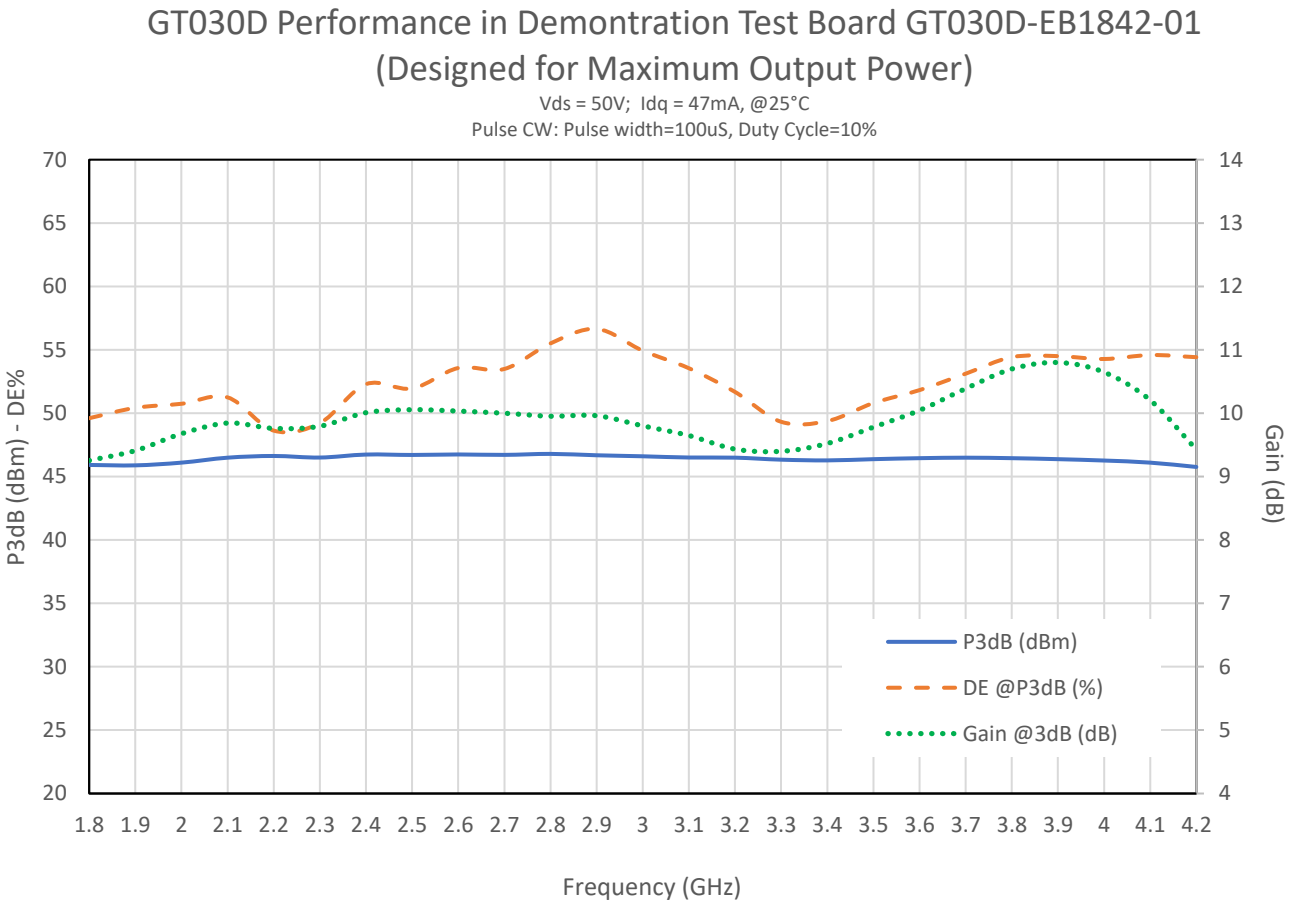


GT030D-EB1842-01 – 1.8 – 4.2 GHz BROAD BAND CLASS AB DEMONSTRATION TEST BOARD

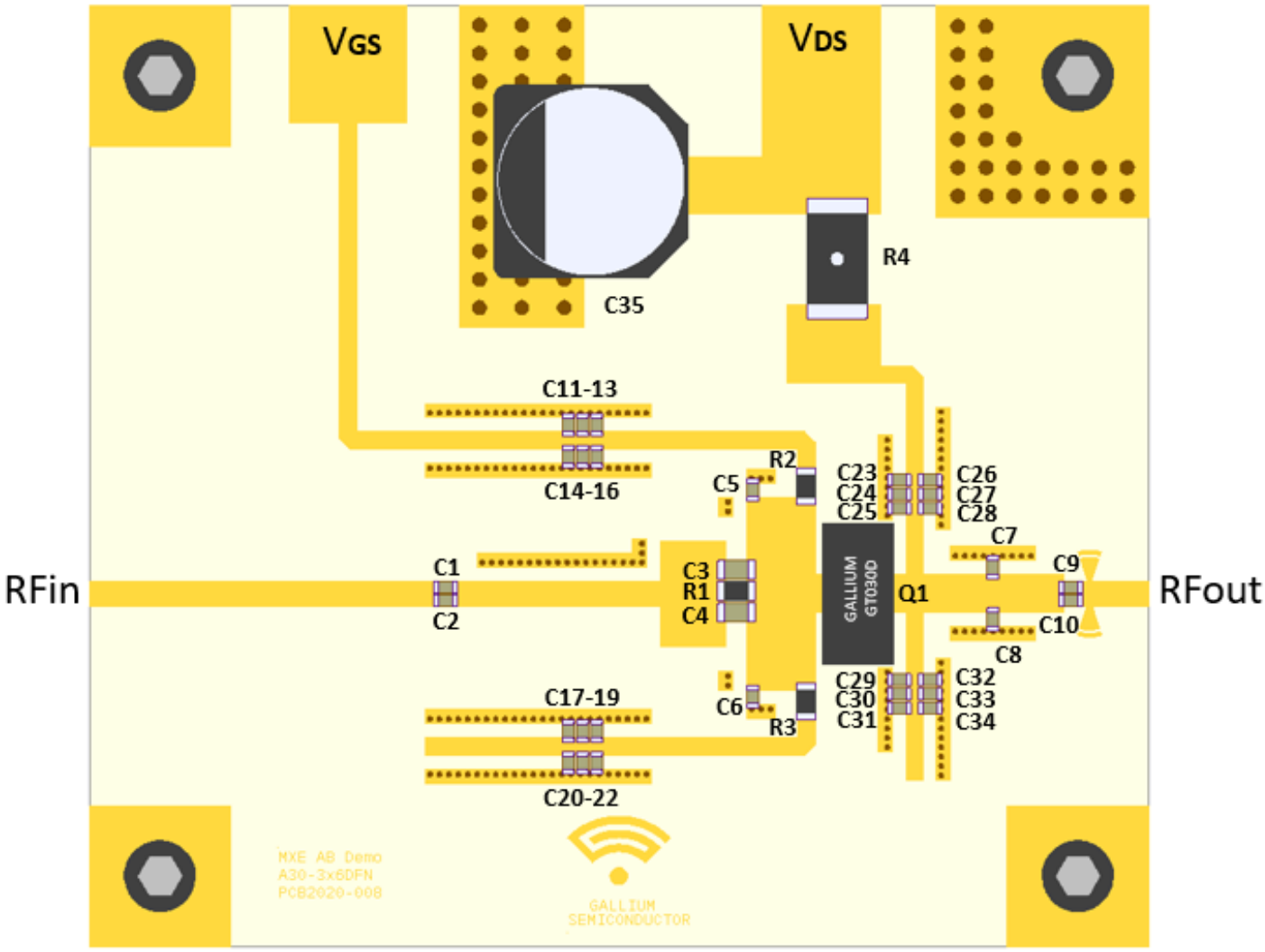
GT030-EB1842-01 – BILL OF MATERIALS

Designator	Description	Quant	Manufacture	Part Number
C1	CAP, SMD 5.6 pF +/-0.1pF 0402	1	Passive Plus	PPI DKD0402N KIT
C2, C3	CAP, SMD 5.1 pF +/-0.1pF 0402	2	Passive Plus	PPI DKD0402N KIT
C4, C5	CAP, SMD 0.5 pF +/-0.1pF 0402	2	Passive Plus	PPI DKD0402N KIT
C6, C7	CAP, SMD 0.4 pF +/-0.1pF 0402	2	Passive Plus	PPI DKD0402N KIT
C8, C9	CAP, SMD 0.9 pF +/-0.1pF 0402	2	Passive Plus	PPI DKD0402N KIT
C10 - C27	CAP, CER 10000PF 50V X5R 0402	18	Taiyo Yuden	UMK105BJ103KV-F
C28	CAP, ALUM 220UF 20% 50V SMD	1	Nichicon	UWT1H221MNL1GS
R1	RES, SMD 499 Ohm 1% 1/5W 0603	1	Panasonic	ERJP03F4990V
R2	RES, SMD 15 OHM 1% 1/5W 0402	1	Vishay Dale	CRCW040215R0FKEDHP
R3	RES, SMD 0.1 OHM 1% 1/2W 2010	1	Vishay Dale	WSL2010R1000FEA
Q1	50V, DC – 6.0GHZ, 30W GAN HEMT	1	Gallium Semi	GT030D
PCB	ROGERS RO4350 20mil 1oz Cu	1		

GT030D-EB1842-01 – 1.8 – 4.2 GHz BROAD BAND CLASS AB DEMONSTRATION TEST BOARD



GT030D-EB3040-01 – 3.0 – 4.0 BROAD BAND CLASS AB DEMONSTRATION TEST BOARD

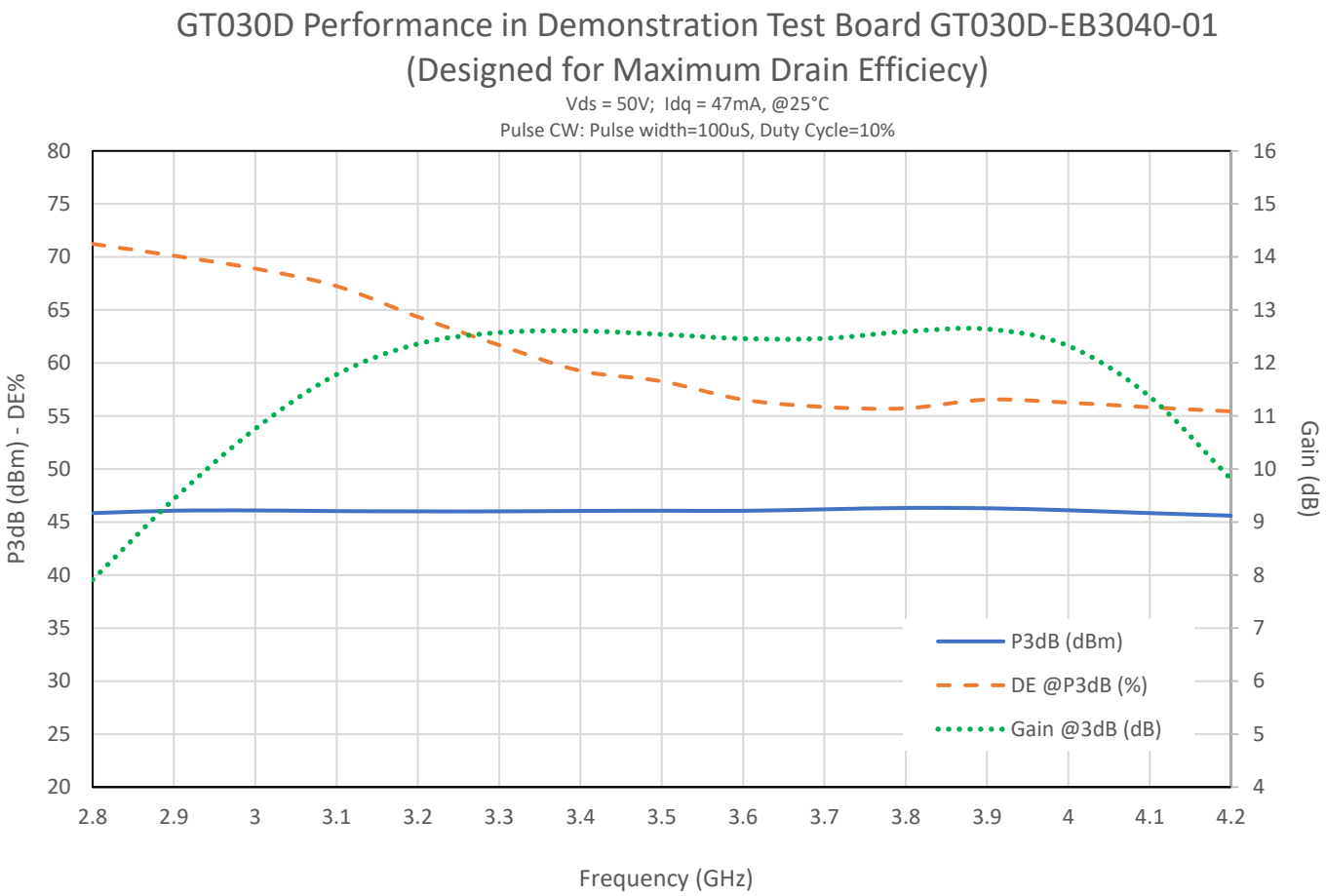


GT030D-EB3040-01 – 3.0 – 4.0 BROAD BAND CLASS AB DEMONSTRATION TEST BOARD

GT030D-EB3040-01 – BILL OF MATERIALS

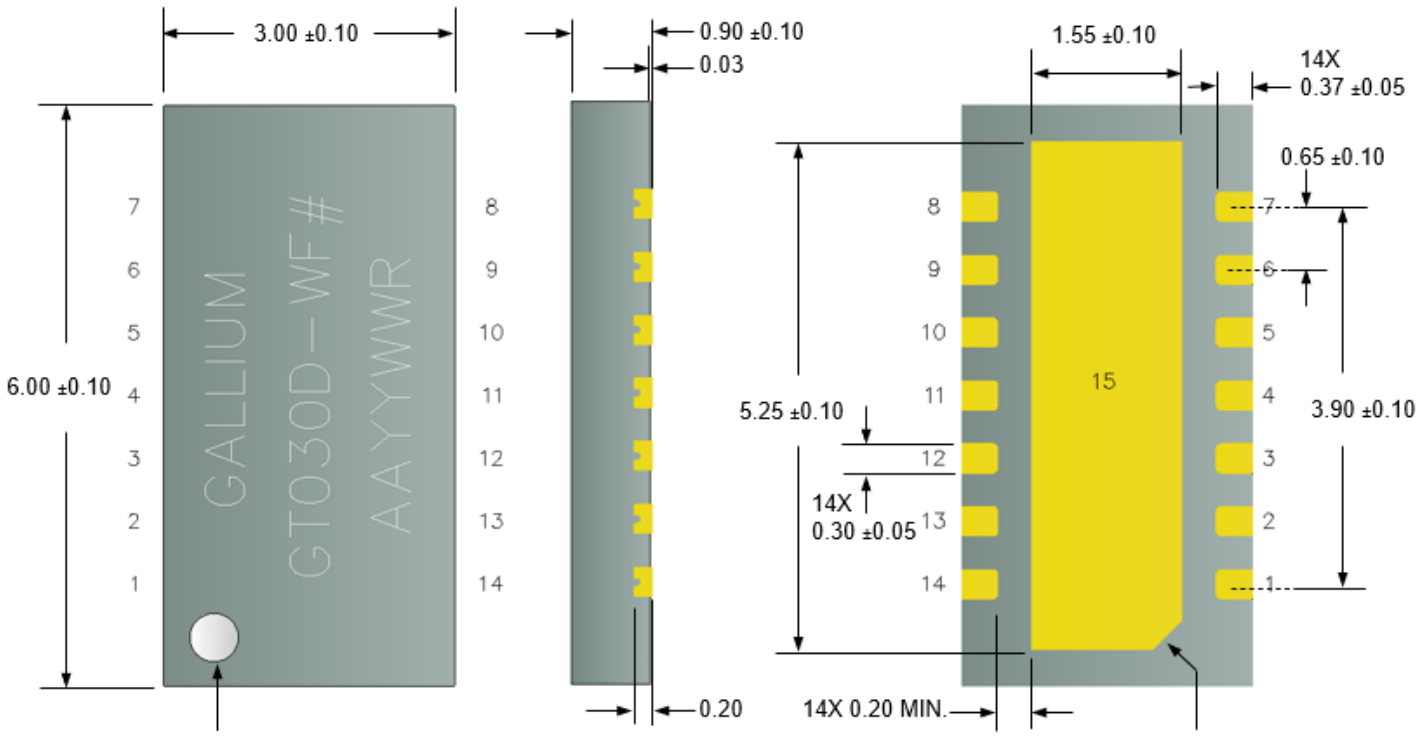
Designator	Description	Quant	Manufacture	Part Number
C1	CAP, SMD 0.4 pF +/-0.1pF 0402	1	Passive Plus	PPI DKD0402N KIT
C2	CAP, SMD 0.3 pF +/-0.1pF 0402	1	Passive Plus	PPI DKD0402N KIT
C3, C4	CAP, SMD 1.0 pF +/-0.1pF 0603	2	Passive Plus	PPI DKD0402N KIT
C5, C6	CAP, SMD 0.5 pF +/-0.1pF 0402	2	Passive Plus	PPI DKD0402N KIT
C7	CAP, SMD 0.6 pF +/-0.1pF 0402	1	Passive Plus	PPI DKD0402N KIT
C8	CAP, SMD 0.7 pF +/-0.1pF 0402	1	Passive Plus	PPI DKD0402N KIT
C9, C10	CAP, SMD 1.9 pF +/-0.1pF 0402	2	Passive Plus	PPI DKD0402N KIT
C11 – C34	CAP, CER 10000PF 50V X5R 0402	24	Taiyo Yuden	UMK105BJ103KV-F
C35	CAP, ALUM 220UF 20% 50V SMD	1	Nichicon	UWT1H221MNL1GS
R1	RES, SMD 180 OHM 1% 1/5W 0603	1	TE Connectivity	CRGH0603F180R
R2, R3	RES SMD 49.9 OHM 1% 1/4W 0603	2	Vishay Dale	RCS060349R9FKEA
R4	RES, SMD 0.1 OHM 1% 1/2W 2010	1	Vishay Dale	WSL2010R1000FEA
Q1	50V, DC – 6.0GHZ, 30W GAN HEMT	1	Gallium Semi	GT030D
PCB	ROGERS RO4350 20mil 1oz Cu	1		

GT030D-EB3040-01 – 3.0 – 4.0 BROAD BAND CLASS AB DEMONSTRATION TEST BOARD



GT030D 50V, DC – 6.0GHZ, 30W GAN HEMT

PACKAGE DIMENSIONS



Note: Dimension in mm

PIN CONFIGURATION

Pin	Input/Output
1, 2	Not connected
3, 4, 5	RF Input / Gate Voltage
6, 7, 8, 9	Not connected
10, 11, 12	RF Output / Drain Voltage
13, 14	Not connected
15 (Paddle)	Ground

DEVICE LABEL

Line 1:	COMPANY NAME:	GALLIUM
Line 2:	PART NUMBER - WAFER #	
Line 3:	AA:	Assembly Code
	YYWW:	Assembly Date Code
	R:	Reserved code

GaN HEMT BIASING SEQUENCE

To turn the transistor ON

1. Set V_{GS} to -5V
2. Turn on V_{DS} to normal operation voltage (50V)
3. Slowly increase V_{GS} to set I_{DS} current (47mA)
4. Apply RF power

To turn the transistor OFF

1. Turn the RF power off
2. Decrease V_{GS} to -5V
3. Turn off $V_{D.}$ Wait a few seconds for drain capacitor to discharge
4. Turn off V_{GS}

CONTACT INFORMATION

To request latest information and samples, please contact us at:

Web: https://www.galliumsemi.com/

Email: sales@galliumsemi.com