

GTH2r-2731150S**50V, 2.7–3.1GHz, 150W GaN HEMT****FEATURES**

- Operating Frequency Range: 2.7 – 3.1 GHz
- Operating Drain Voltage: 50V
- Maximum Output Power (P_{SAT}): 150W
- Surface Mount Plastic Package
- Suitable for Pulsed, Linear applications
- 100% DC & RF Production Tested



6 Pin 6.5x7 mm DFN Package

DESCRIPTION

The GTH2r-2731150S is a 150W (P3dB) pre-matched discrete GaN-on-SiC HEMT which operates from 2.7 to 3.1 GHz on a 50V supply rail. The wide bandwidth of the GTH2r-2731150S makes it suitable for radar, avionics, satellite communications and pulse operations.



The device is housed in an industry-standard 6.5x7 mm surface mount DFN package. Lead-free and RoHS compliant.

Typical Performances 1 Tone pulsed CW (10% duty cycle, 100 μ s width), Measured on 1.2-1.4 GHz Evaluation Board

Freq. (GHz)	Pout (dBm)	Pout (W)	D.E. (%)	Gt(dB)
2.7	52.99	199.2	63.2	13.3
2.8	52.9	195.1	67.2	14
2.9	52.7	186.3	67.1	14.4
3.0	52.53	179.2	69.2	14.4
3.1	51.96	157.2	70.4	14.9

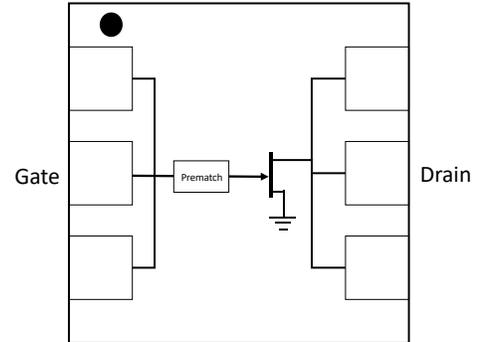
GTH2r-2731150S **50V, 2.7–3.1GHz, 150W GaN HEMT**

ABSOLUTE MAXIMUM RATINGS^(1, 2)

Parameter	Rating	Symbols and Units
Drain Source Voltage	150	V_{DS} (V)
Gate Source Voltage	-8 to +2	V_{GS} (V)
Operating Voltage	55	V_{dsq} (V)
Junction Temperature	+225	T_{JUNC} (°C)
Storage Temperature	-65 to +150	$T_{STORAGE}$ (°C)
Case Operating Temperature	-40 to +105	T_{CASE} (°C)

1. Exceeding any of these limits may cause permanent damage to this device or seriously limit the life time (MTTF)
2. GalliumSemi does not recommend sustained operation above maximum operating conditions.

BLOCK DIAGRAM



ELECTRICAL SPECIFICATIONS: $T_A = 25^\circ\text{C}$

Parameter	Min.	Typ.	Max.	Symbols and Units	Test conditions
Frequency Range	2700		3100	MHz	
DC Characteristics					
Drain Source Breakdown Voltage	150			V_{BDSS} (V)	
Drain Source Leakage Current		9		I_{DLK} (mA)	$V_{gs} = -8V, V_{ds} = 50V$
Gate Threshold Voltage	-3.4		-1.5	V_{GS} (V)	$V_{ds} = 50V$
Operating Conditions					
Drain Voltage		50		V_{DSQ} (V)	
Quiescent Drain Current		100		I_{DQ} (mA)	

GTH2r-2731150S**50V, 2.7–3.1GHZ, 150W GaN HEMT**

RF ELECTRICAL SPECIFICATIONS: $T_A = 25^\circ\text{C}$, $V_{DS} = 50\text{ V}$, $I_{DQ} = 100\text{mA}$, Freq= 2900MHz
Note: Performance⁽¹⁾ in GalliumSemi Production Test Fixture, 50 Ω system

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes	
Small Signal Gain	G_{SS}		17.5		dB		
Power Gain	G_{SAT}		14.4		dB		
Saturated Drain Efficiency	$DEff_{SAT}$		67		%		
Saturated Output Power	P_{SAT}		52.7		dBm		
Ruggedness Output mismatch	Ψ	VSWR = tbd, all angles					No damage or shift in performances

1. 1 Tone Pulse CW, pulse width 100us, duty cycle 10%

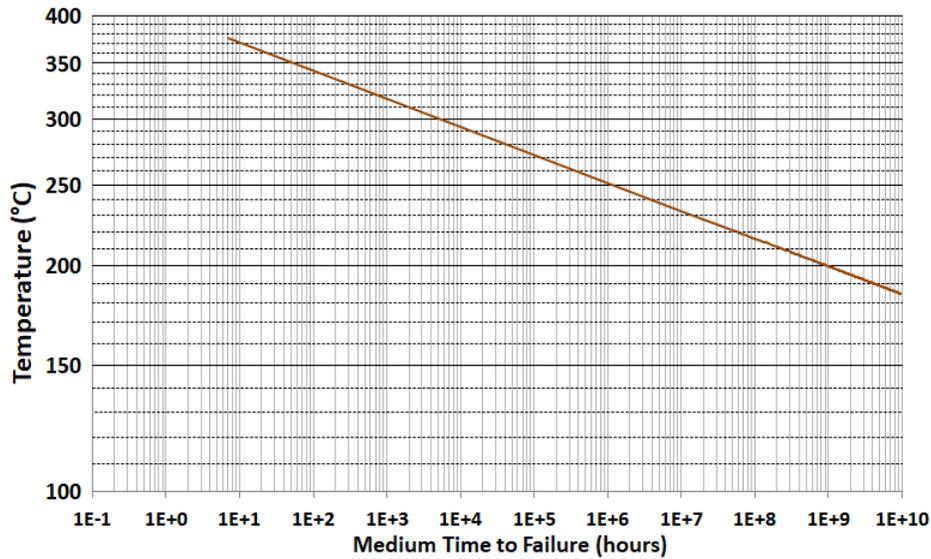
GTH2r-2731150S **50V, 2.7–3.1GHZ, 150W GaN HEMT**

THERMAL AND RELIABILITY INFORMATION (1, 2, 3)

$$R_{th}(\text{°C/W}) = 0.0038 \times P_{diss}(\text{W}) + 1.676$$

Parameter	Test condition	Value	Units
Channel Temperature, T _{ch} ⁽²⁾		172.5	°C
R _{th}	T_c = 80.4°C	0.76	°C/W
R _{sur}	P_{diss} = 120 W 100 us PW, 10% Duty Cycle	0.4	°C/W
MTTF		>1.0E10	Hrs
Channel Temperature, T _{ch} ⁽²⁾	T_c = 80.4°C	190	°C
R _{th}	P_{diss} = 120 W 1 ms PW, 10% Duty Cycle	0.91	°C/W
R _{sur}		0.55	°C/W
MTTF		4.0E+09	Hrs

1. Using 5um thermal grease - 4W/m-K.
2. Thermal Resistance using Finite Element Analysis (FEA) simulation, calibrated with Infrared measurement on surface temperature.
3. R_{sur}: Thermal resistance based on Surface Temperature, only provided as a reference.



GTH2r-2731150S **50V, 2.7–3.1GHz, 150W GaN HEMT**

LOADPULL MEASUREMENT, $V_{ds} = 50V$ $I_{dq} = 100\text{ mA}$
 1 Tone Pulse CW, pulse width 100us, duty cycle 10%

For Optimum Peak Power @ 2.5dB Compression

Freq-MHz	Zin_F0	ZI_F0	Gain-dB	Pout-dBm	Pout-W	Eff-%	AMPM-deg
2700							
2800							
2900							
3000							
3100							

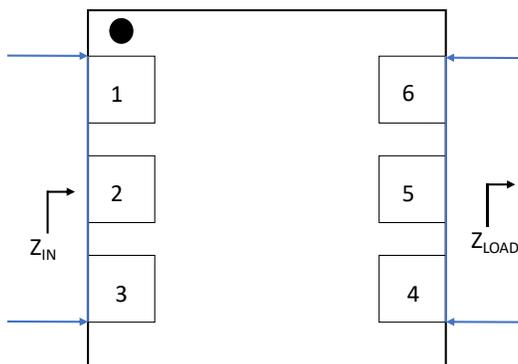
For Optimum Peak Efficiency @ 2.5dB Compression

Freq-MHz	Zin_F0	ZI_F0	Gain-dB	Pout-dBm	Pout-W	Eff-%	AMPM-deg
2700							
2800							
2900							
3000							
3100							

LOADPULL MEASUREMENT NOTES

Load impedance @ 2nd Harmonic are set to 10 Ohms
 With proper 2nd Harmonic termination, expect +5% Efficiency with Drain 2nd Harmonic.
 Z_{LOAD} : Measured Impedance presented to the output of the device in the reference plane
 Z_{IN} : Measured input Impedance at the input of the device in the reference plane

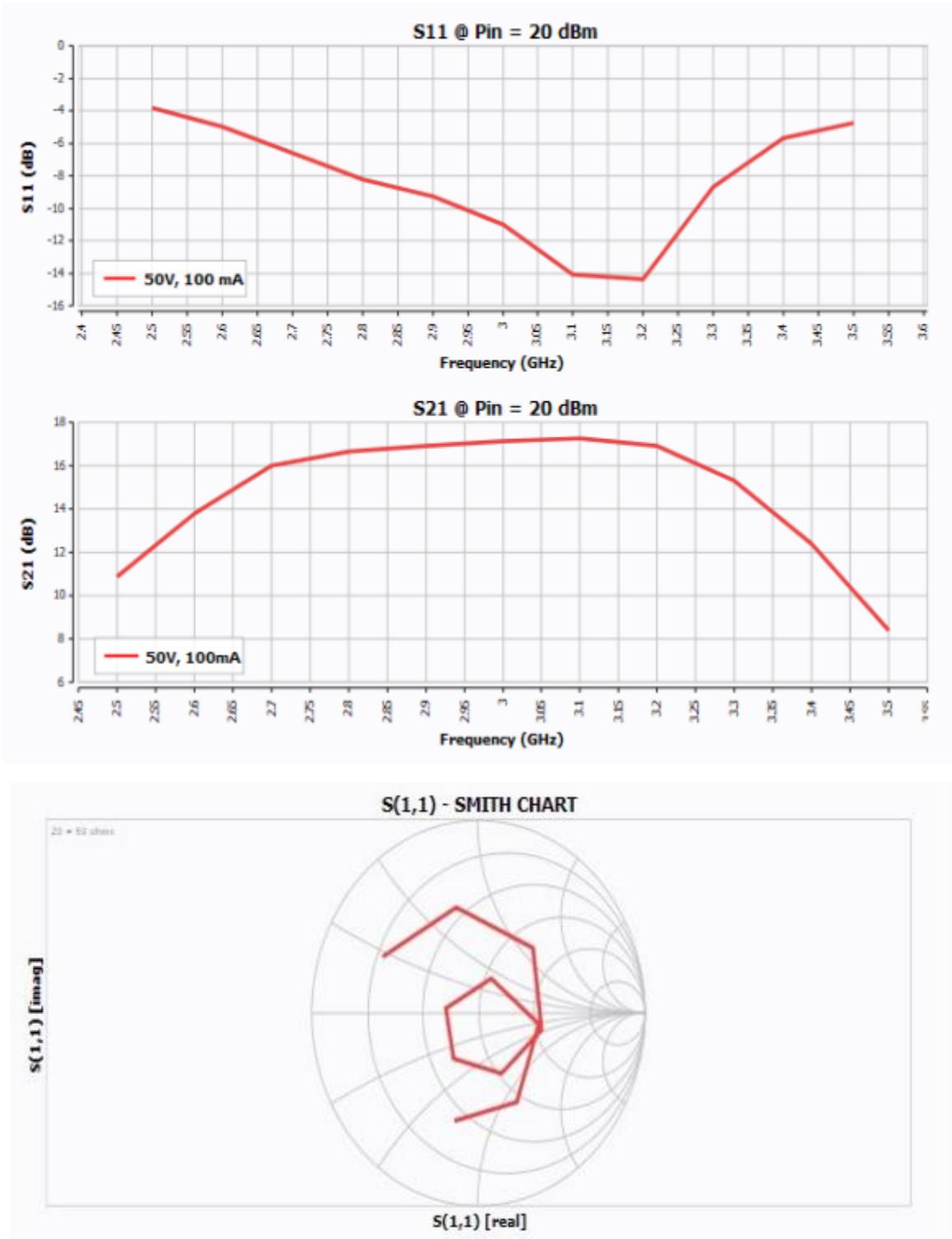
Impedance Reference Plane



Raw data and full Loadpull measurement report available at request: sales@galliumsemi.com

GTH2r-2731150S **50V, 2.7–3.1GHz, 150W GaN HEMT**

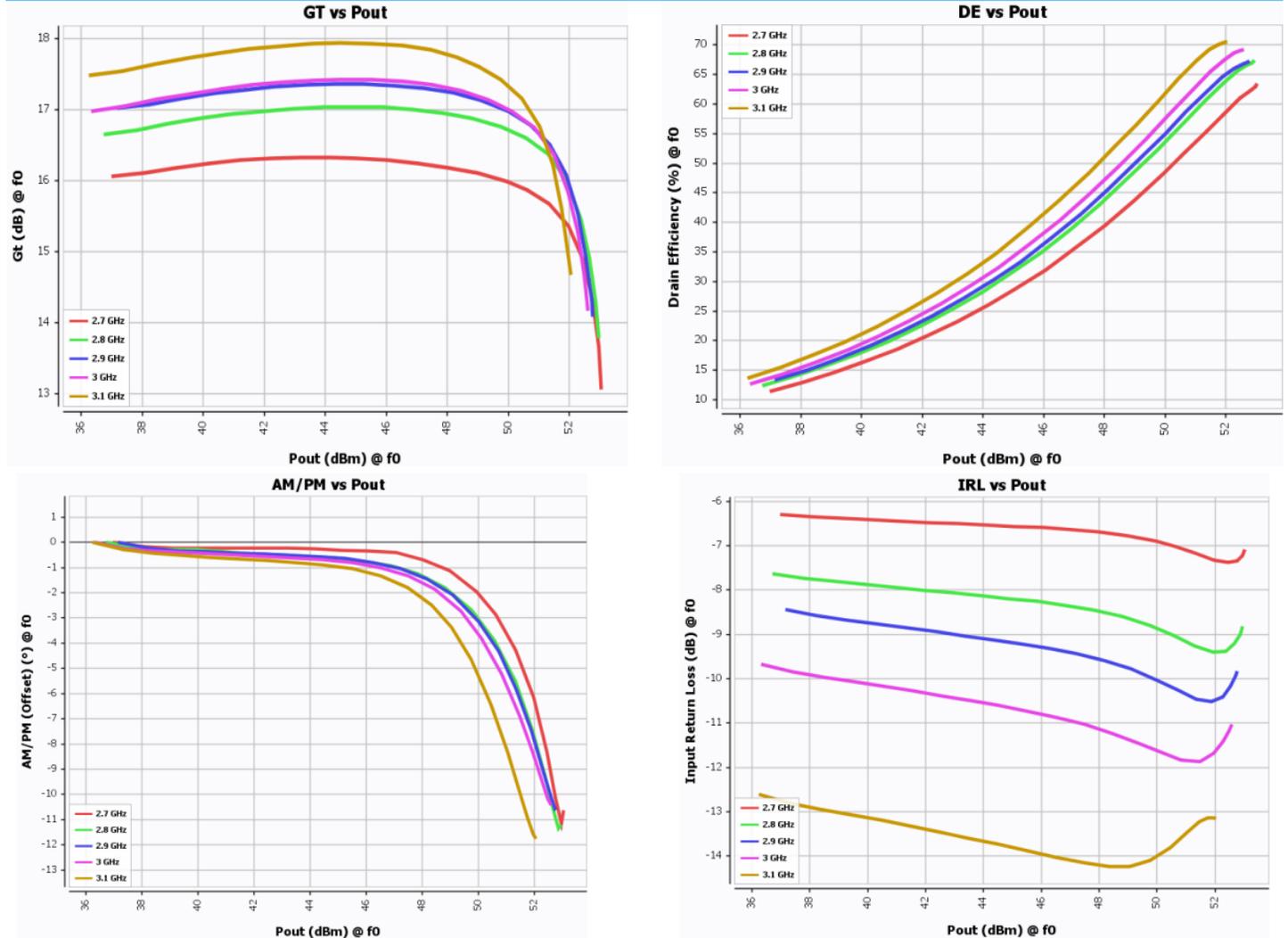
SMALL SIGNAL PERFORMANCE AT 2.7 TO 3.1 GHz EVB, $V_{ds} = 50V$ $I_{dq} = 100$ mA pulse width 100us, duty cycle 10%



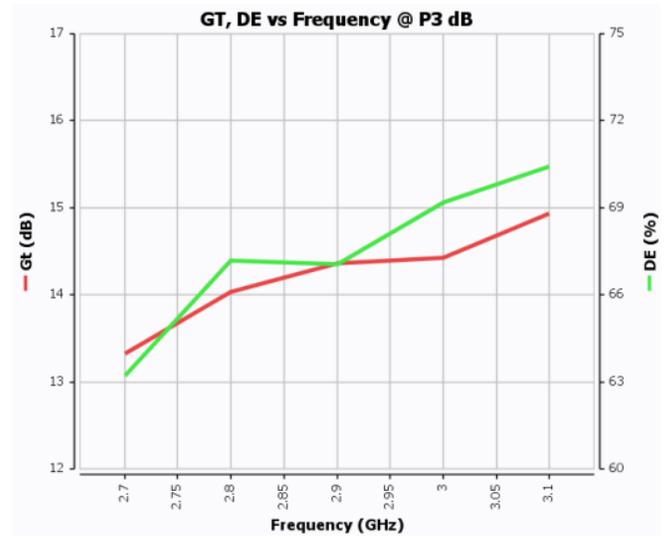
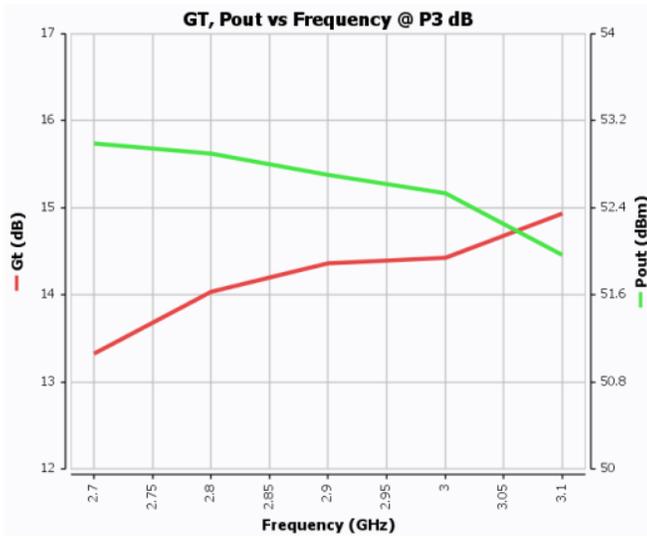
GTH2r-2731150S **50V, 2.7–3.1GHz, 150W GaN HEMT**

LARGE SIGNAL PERFORMANCE AT 2.7 TO 3.1 GHz EVB

1 Tone Pulse CW, pulse width 100us, duty cycle 10%

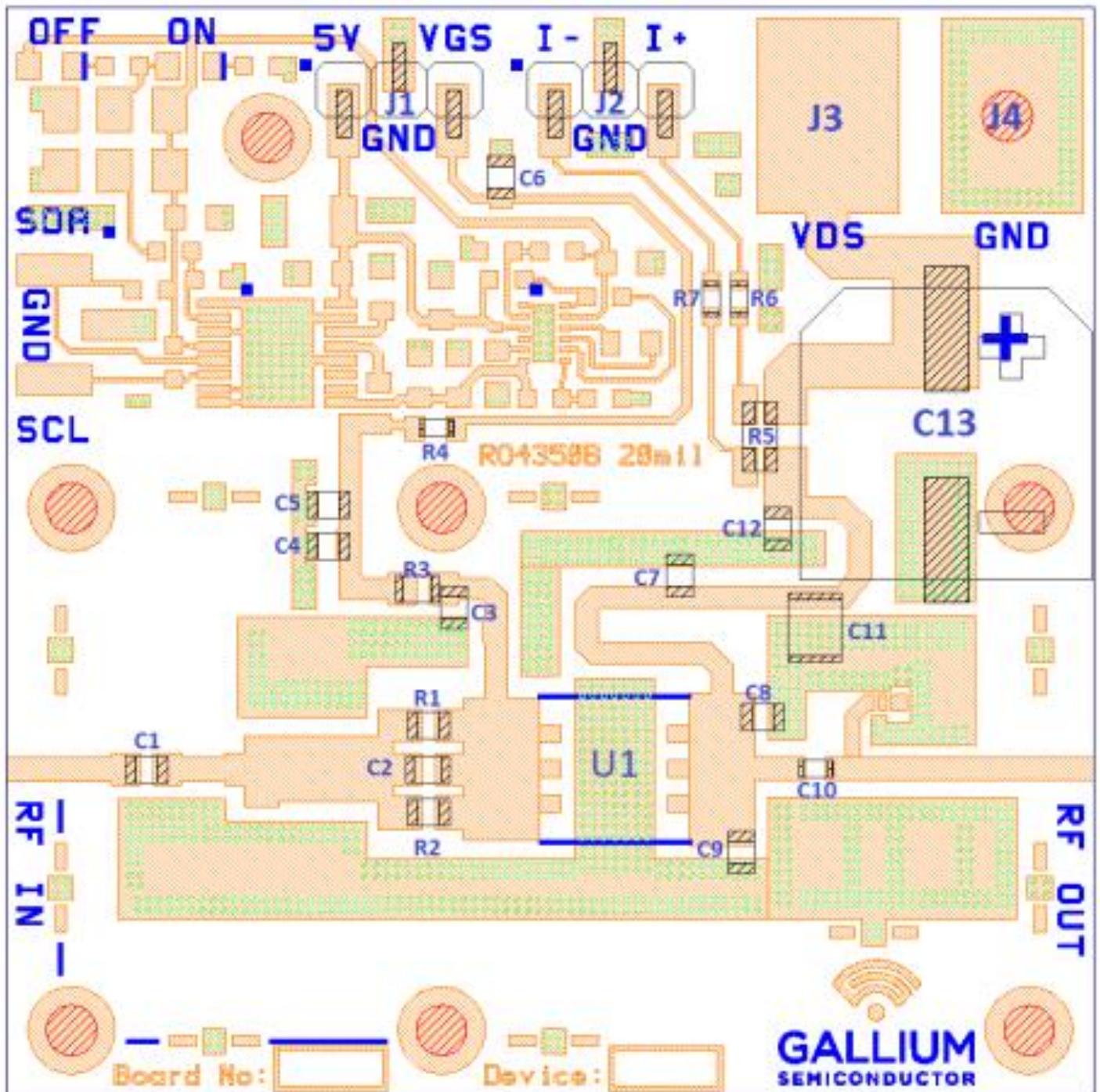


GTH2r-2731150S **50V, 2.7–3.1GHz, 150W GaN HEMT**



GTH2r-2731150S **50V, 2.7–3.1GHZ, 150W GaN HEMT**

1.2-1.4 GHZ EVALUATION BOARD LAYOUT AND BILL OF MATERIALS



GTH2r-2731150S**50V, 2.7–3.1GHZ, 150W GaN HEMT****BILL OF MATERIALS**

Designator	Description	Quant	Manufacture	Part Number
U1	RF Power Transistor	1	Gallium Semiconductor	GTH2r-2731150S
C1	CAP, SMD 47 pF +/- 5% 0805	1	ATC	600F470JT250WVDC
C2	CAP, SMD 3.3 pF +/- 0.1 pF 0805	1	ATC	600F3R3BT250WVDC
C3	CAP, SMD 10 pF +/- 5% 0603	1	ATC	600S100JT250WVDC
C4	CAP, SMD 100 pF +/- 5% 0805	1	ATC	600F101JT250WVDC
C5,C12	CAP, SMD 0.1 uF 100V 10% 0505	2	Murata	GCM21BR72A104KA37L
C6	CAP, SMD 10 uF 16V 10% 0805	1	Murata	GRM21BC71C106KE11L
C7	CAP, SMD 10 pF +/- 5% 0805	1	ATC	600F100JT250WVDC
C8	CAP, SMD 1.5 pF +/- 0.1 pF 0805	1	ATC	600F1R5BT250WVDC
C9	CAP, SMD 1.8 pF +/- 0.1 pF 0805	1	ATC	600F1R8BT250WVDC
C10	CAP, SMD 1.0 pF +/- 0.1 pF 0805	1	ATC	600F1R0BT250WVDC
C11	CAP, SMD 10 uF 100V 10% 210	1	Murata	GRM32EC72A106KE05L
C13	SMD 63VDC 220uF 20%	1	Panasonic	EEE-FK1J221AV
R1,R2	RES, SMD 100 ohm +/- 1% 0805	2	YAGEO	RC0805FR-7W100RL
R3	RES, SMD 5.11 ohm +/- 1% 0805	1	YAGEO	RC0805FR-7W5R11L
R4	RES, SMD 0 ohm +/- 5% 0603	1	YAGEO	RC0603JR-SK0RL
R5	SMD .01 OHM.25% 1/2W	1	Ohmite	LVK12R010CER
R6,R7	RES, SMD 1 K +/- 5% 0603	2	YAGEO	RC0603JR-SK1KRL
J1,J2	Pin header 5.1mm	2	Samtec	TSM-103-01- L-SV
J3,J4	Drain Pin	2	-	-

GTH2r-2731150S

50V, 2.7–3.1GHZ, 150W GaN HEMT

GaN HEMT BIASING SEQUENCE

To turn the transistor ON

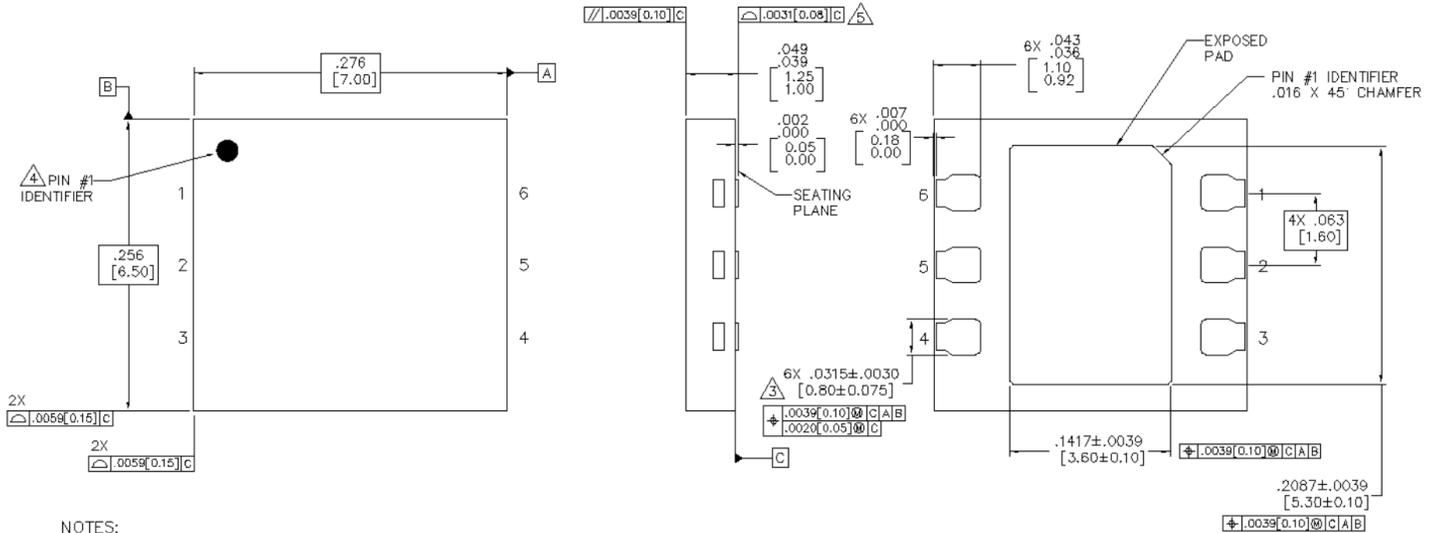
1. Set V_{GS} to -5V
2. Turn on V_{DS} to normal operation voltage (50V)
3. Slowly increase V_{GS} to set I_{DQ} current (100mA)
4. Apply RF power

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}

GTH2r-2731150S **50V, 2.7–3.1GHZ, 150W GaN HEMT**

PACKAGE DIMENSIONS



Note: Dimension in inch [mm]

PIN CONFIGURATION

Pin	Input/Output
1, 2, 3	RF Input / Gate Voltage
4, 5, 6	RF Output / Drain Voltage
7(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

GTH2r-2731150S**50V, 2.7–3.1GHZ, 150W GaN HEMT**

HANDLING PRECAUTIONS

Parameter	Symbol	Class	Test Methodology
ESD – Human Body Model	HBM	Class 1A (250 V)	ANSI/ESDA/JEDEC Standard JS-001
ESD – Charged Device Model	CDM	Class C3 (1500 V)	ANSI/ESDA/JEDEC Standard JS-002
MSL – Moisture Sensitivity Level	MSL	MSL 3	IPC/JEDEC Standard J-STD-020



RoHS COMPLIANCE

Gallium Semiconductor's Policy on EU RoHS available online:

https://www.galliumsemi.com/files/ugd/3748d3_1107b9788f9845f78f45d424097c4c97.pdf

GTH2r-2731150S**50V, 2.7–3.1GHZ, 150W GaN HEMT****REVISION HISTORY**

Revision	Date	Datasheet Status	Modifications
A	04/20/2023	Advanced	Init

CONTACT INFORMATION

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

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

Email: sales@galliumsemi.com

IMPORTANT NOTICE

Even though Gallium Semiconductor believes the material in this document to be reliable, it makes no guarantees as to its accuracy and disclaims all responsibility for any damages that may arise from using its contents. Contents in this document are subject to change at any time without prior notice. Customers should obtain and validate the most recent essential information prior to making orders for Gallium Semiconductor products. The information provided here or any use of such material, whether about the information itself or anything it describes, does not grant any party any patent rights, licenses, or other intellectual property rights. Without limiting the generality of the aforementioned, Gallium Semiconductor products are neither warranted nor approved for use as crucial parts in medical, lifesaving, or life-sustaining applications, or in any other applications where a failure would likely result in serious personal injury or death.

GALLIUM SEMICONDUCTOR DISCLAIMS ANY AND ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO SUCH PRODUCTS, WHETHER BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.