GTH2e-2425300P 50V,2.4– 2.5GHz, 300W GaN HEMT

FEATURES

- Operating Frequency Range: 2.4 – 2.5 GHz
- Operating Drain Voltage: 50V
- Maximum Output Power (P_{SAT}): 300W
- Air Cavity Plastic Package (ACP)
- Input internally pre-matched F0 + 2F0
- Suitable for CW applications

ACP-800 4L Air Cavity Plastic

DESCRIPTION

The GTH2e-2425300P is a 300W (P3dB) pre-matched discrete GaN-on-SiC HEMT which operates from 2.4 to 2.5 GHz on a 50V supply rail. The wide bandwidth of the GTH2e-2425300P makes it suitable for Industrial Scientific Medical , RF Energy and CW operations.

The device is housed in an industry-standard ACP-800 4L Air Cavity Plastic package. Lead-free and RoHS compliant.

Typical Performances 1 Tone pulsed CW (10% duty cycle, 100µs width),

(1) Optimum Peak Power at 2.5dB in compression in Class AB Bias
(2) Optimum Peak Efficiency at 2.5dB in compression in Class AB Bias
(3) Optimum Peak Power at 2.5dB in compression in Class C Bias
(4) Optimum Peak Efficiency at 2.5dB in compression in Class C Bias

For 1 section of the device, Vds=50V, T_A = 25°C

Frequency (MHz)	Pout (dBm)	Pout (Watt)	Gain (dB)	Eff (%)
2400	54.0(1)	253(1)	17.1(2)	70.0(2)
2500	54.3(1)	268(1)	17.3(2)	70.8(2)
2500	54.2(3)	260(3)	14.9(4)	76.3(4)

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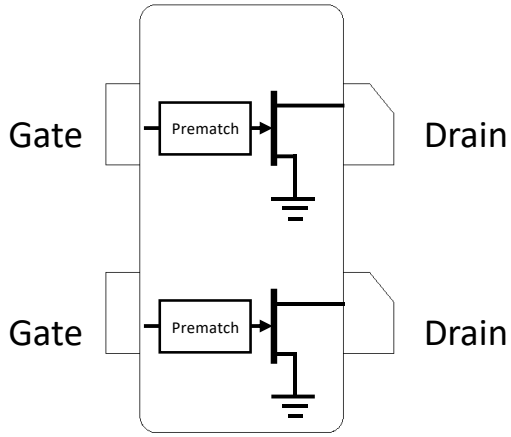
ABSOLUTE MAXIMUM RATINGS(1, 2)

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°C

Parameter	Min.	Typ.	Max.	Symbols and Units	Test conditions
Frequency Range	2400		2500	MHz	
DC Characteristics					
Drain Source Breakdown Voltage	150			V_{BDSS} (V)	
Drain Source Leakage Current		tbd		I_{DLK} (mA)	Vgs = -8V, Vds = 50V
Gate Threshold Voltage	-3.4		-1.5	V_{GS} (V)	Vds = 50V
Operating Conditions					
Gate Bias Voltage		-2.5		V_{GSQ} (V)	
Drain Voltage		50		V_{DSQ} (V)	
Quiescent Drain Current		600		I_{DQ} (mA)	

RF ELECTRICAL SPECIFICATIONS: T_A = 25°C, VDS = 50 V,IDQ = 100 mA, Freq= 2470MHz
Note: Performance(1) in GalliumSemi Production Test Fixture, 50 Ω system

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Small Signal Gain	G_{ss}		17		dB	Pulse (100 µsec, 10% Duty Cycle)
Power Gain	G_{SAT}		14		dB	
Saturated Drain Efficiency	$DEff_{SAT}$		75		%	
Saturated Output Power	P_{SAT}		55		dBm	
Ruggedness Output mismatch	Ψ	VSWR = 20:1, all angles				Pulse (100 µsec, 20% Duty Cycle) No damage or shift in performances

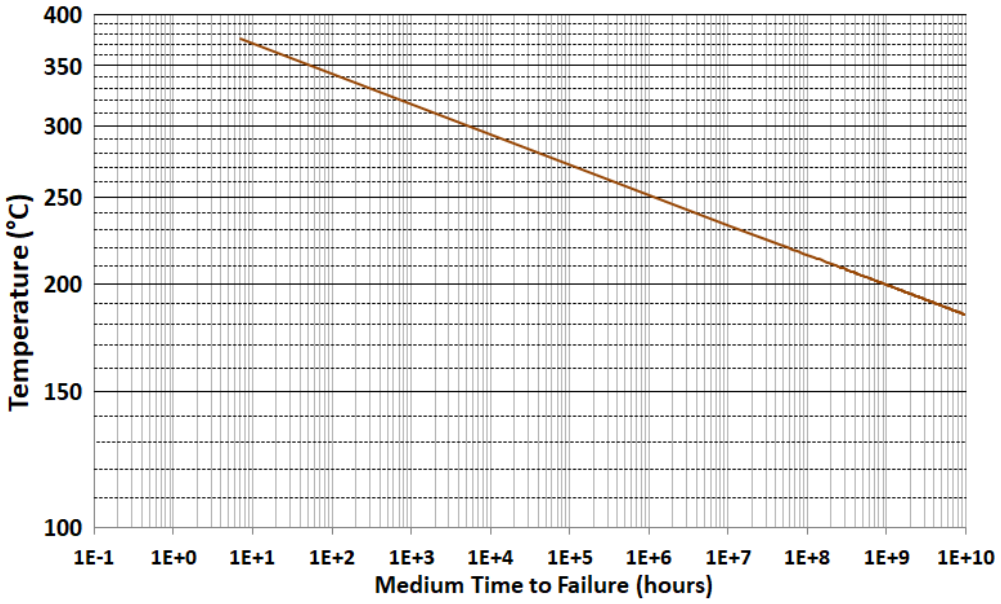
1. 1 Tone Pulse CW, pulse width 100us, duty cycle 20%

THERMAL AND RELABILITY INFORMATION -CW [1, 2]: T_c = 85°C

Rth(ºC/W)= TBD

Parameter	Test condition	Value	Units
Channel Temperature, Tch	129 W	172	°C
Rth		0.67	ºC/W
MTTF		> 1E10	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.



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LOADPULL MEASUREMENT FOR 1 SECTION OF THE DEVICE,

Typical Performances 1 Tone pulsed CW (10% duty cycle, 100µs width)

(1) 50V, Class AB Bias
(2) 50V, Class C Bias

For Optimum Peak Power @ 2.5dB Compression

Freq-MHz	Zin_F0	Zl_F0	Pout_W	Pout-dBm	Gain_dB	Eff-%
2400	15.4 – 0.4j(1)	2.1 – 2.8j(1)	253(1)	54.0(1)	15.8(1)	64(1)
2500	7.4 - 1.5j(1)	1.8 – 3.7j(1)	266(1)	54.3(1)	15.4(1)	62(1)
2500	17.1 + 3.7j(2)	2.2 – 4.2j(2)	261(2)	54.2(2)	13.3(2)	68(2)

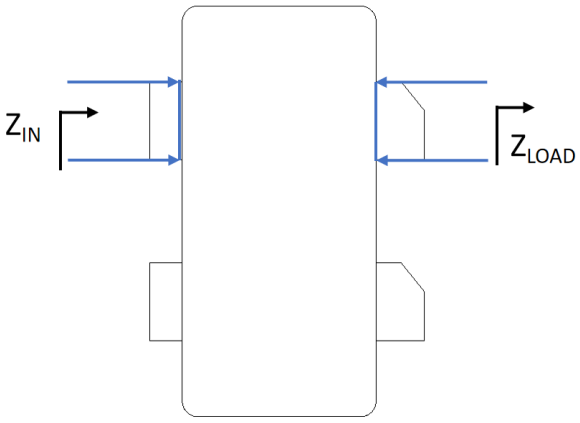
For Optimum Peak Efficiency @ 2.5dB Compression

Freq-MHz	Zin_F0	Zl_F0	Pout_W	Pout-dBm	Gain_dB	Eff-%
2400	15.4 – 0.4j(1)	2.0 – 1.8j(1)	173(1)	52.3(1)	17.1(1)	70.0(1)
2500	4.6 - 1.0j(1)	2.1 – 2.1j(1)	174(1)	52.4(1)	17.3(1)	70.8(1)
2500	13.6 – 3.1j(2)	1.9 – 2.5j(2)	198(2)	53.0(2)	14.9(2)	76.3(2)

LOADPULL MEASUREMENT NOTES

Source is internally Prematched in the package and therefore non sensitive to external matching,
Load impedance @ 2nd Harmonic are set to 10 Ohms.
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

GaN HEMT BIASING SEQUENCE

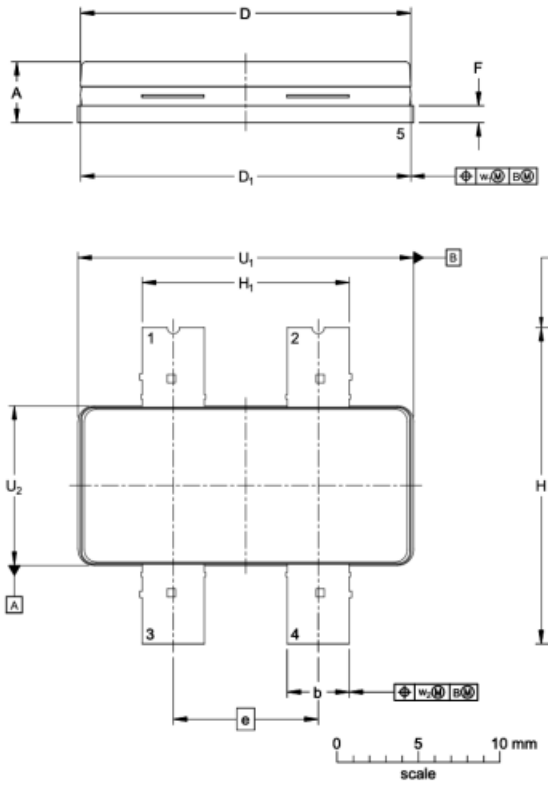
To turn the transistor ON

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 to target value.
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}

PACKAGE DIMENSIONS



Dimensions

Unit		A	b	c	D	D_1	E	E_1	e	F	H	H_1	Q(1)	U_1	U_2	v	w_1	w_2	y
mm	max	4.01	3.91	0.18	20.42	20.37	9.80	9.75		1.14	19.53	12.83	1.68	20.70	9.91	0.50	0.50	0.50	0.10
	nom								8.89										
	min	3.40	3.71	0.13	20.12	20.17	9.50	9.55		0.94	19.33	12.57	1.45	20.50	9.70				

Note:
1. Dimension Q is measured at 0.1 mm away from the flange.
2. Ringframe and/or ringframe glue shall not overhang at the side of the flange.

PIN CONFIGURATION

Pin	Input/Output
1, 2	RF Output / Drain Voltage
3, 4	RF Input / Gate Voltage
5 (flange)	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

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 1	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

REVISION HISTORY

Revision	Date	Datasheet Status	Modifications
A	04/20/2023	Advanced	Init
B	08/18/2023	Advanced	Updated Rth and Test Data

CONTACT INFORMATION

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

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