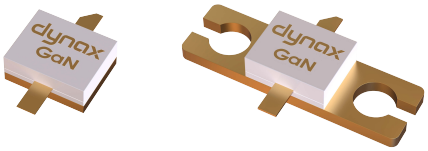
DXG1CH60B-45CF/DF

RF Power GaN Transistor



1. Product profile

1.1 General description

DXG1CH60B-45CF/DF is a 45 W RF GaN HEMT Transistor with first generation RF GaN technology from Dynax, which is ideal for general purpose applications at frequencies from DC to 6 GHz.

Table 1. Typical performance [1]

Freq (MHz)	P_{sat} (dBm)	η_D (%)	G_P [2] (dB)
2600	46.6	65.0	17.0

[1] Typical performance in Dynax Demo with the device soldered onto the heatsink, test condition: V_{DS} = 48 V, I_{DQ} = 80 mA; Input signal Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

[2] Measured at $P_{out} = P_{sat}$ - 6 dB.

1.2 Features and benefits

- High efficiency and linear gain operation
- Excellent stability

1.3 Applications

- Broadband amplifiers
- Test instrumentations
- Cellular infrastructure

1.4 Lead-free and RoHS compliant

2. Pinning information

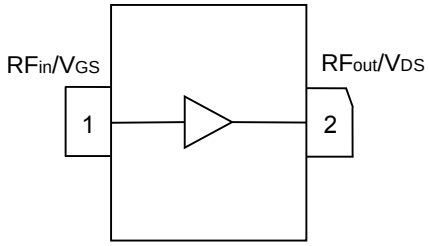


Fig 1. Pin configuration (Top view)

3. Ordering information

Table 2. Ordering information

Part number	Marking	Package type	Packaging information
DXG1CH60B-45CF	CX45A	200P1AA	Tray: Suffix = 60 units
DXG1CH60B-45DF	CX45B	200F1AA	Tray: Suffix = 40 units

4. Maximum ratings

Table 3. Maximum ratings

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DSS}	150	V
Gate-Source Voltage	V_{GS}	-10 ~ +2	V
Operating Voltage	V_{DS}	0 ~ +55	V
Maximum Forward Gate Current	I_{GMAX}	4.8	mA
Storage Temperature Range	T_{STG}	- 65 ~ +150	℃
Operating Junction Temperature	T_J	225	℃
Absolute Maximum Channel Temperature [1]	T_{MAX}	275	℃

[1] Functional operation above 225℃ has not been characterized and is not implied. Operation at T_{MAX} (275℃) reduces median time to failure by an order of magnitude; Operation beyond T_{MAX} could cause permanent damage.

5. Thermal characteristics

Table 4. Thermal characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance at Average Power by Infrared Measurement, Active Die Surface-to-Case $T_{base\text{-}plate}$ = 85℃, P_D = 21.0 W, Pulse width = 100 µs, Duty cycle = 10 %	R_{thjc}(IR)	2.9	℃/W
Thermal Resistance at Average Power by Finite Element Analysis, Junction-to-Case $T_{base\text{-}plate}$ = 85℃, P_D = 21.0 W, Pulse width = 100 µs, Duty cycle = 10 %	R_{thjc}(FEA)	3.8	℃/W

6. ESD protection characteristics

Table 5. ESD protection characteristics

Test methodology	Class
Human Body Model (per JS-001-2012)	1A (> 250 V)
Charged Device Model (per JESD22-C101F)	C3 (> 1000 V)

7. Moisture sensitivity level

Table 6. Moisture sensitivity level

Test methodology	Class
Moisture Sensitivity Level (per J-STD-020)	Level 1

8. Electrical characteristics (TA = 25℃ unless otherwise noted)

Table 7. DC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Drain-Source Leakage Current (V_{GS} = -10 V, V_{DS} = 150 V)	I_{DSS}	-	-	4.8	mA
Drain-Source Breakdown Voltage (V_{GS} = -10 V, I_D = 4.8 mA)	$V_{(BR)DSS}$	150	-	-	V
Gate Threshold Voltage (V_{DS} = 48 V, I_D = 4.8 mA)	$V_{GS(th)}$	-4.0	-3.2	-1.0	V
Gate Quiescent Voltage (V_{DS} = 48 V, I_D = 80 mA)	$V_{GS(Q)}$	-	-3.0	-	V

Table 8. RF characteristics (Typical performance – 2600 MHz) [1]

Parameter	Symbol	Min.	Typ.	Max.	Unit
Peak Output Power	P_{sat}	46.1	47.0	-	dBm
Drain Efficiency	η_D	61.8	69.8	-	%
Power Gain [2]	G_P	15.8	17.4	19.0	dB

[1] Typical performance in Dynax DXG1CH60B-45CF/DF production test fixture, test condition: V_{DS} = 48 V, I_{DQ} = 80 mA, Input signal Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

[2] Measured at $P_{out} = P_{sat}$ - 6 dB.

Table 9. Load mismatch

Parameter	Result
VSWR 10:1 at V_{DS} = 48 V, 45 W Pulsed CW output power, Pulse width = 100 µs, Duty cycle = 10%.	No device damage

9. Test information

9.1 Typical application circuit

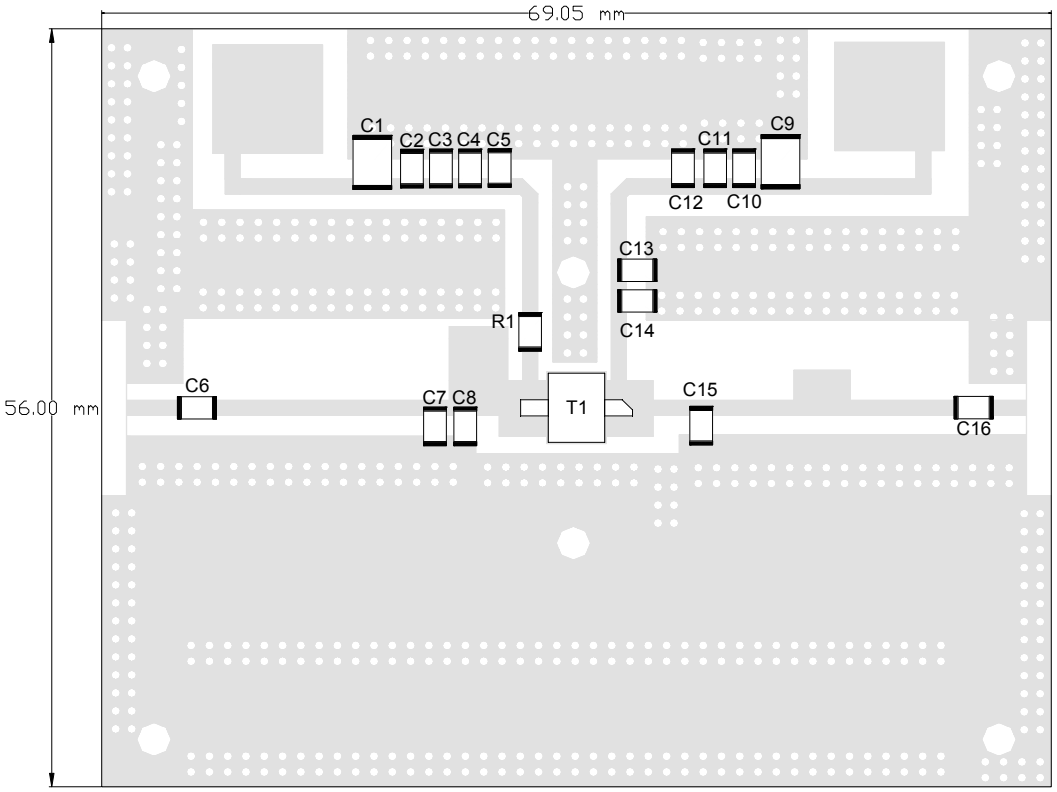


Fig 2. Component layout

Table 10. List of components

S/N	Type	Designator	Description	Value	Vendor
1	Cap	C1,C9	ATC600F100JT250XT	10 uF	ATC
2	Cap	C2,C10	GRM21BR72A333KA01L	33 nF	ATC
3	Cap	C3,C4,C11,C12	ATC600F101JT250XT	100 pF	ATC
4	Cap	C5,C6,C14,C16	ATC600F8R2JT250XT	8.2 pF	ATC
5	Cap	C8,C15	ATC600F1R3JT250XT	1.3 pF	ATC
6	Cap	C7	ATC600F0R2JT250XT	0.2 pF	ATC
7	Cap	C13	ATC600F0R5JT250XT	0.5 pF	ATC
8	Res	R1	RC1206FR_0710RL	10 Ω	Yageo
9	Transistor	T1	DXG1CH60B-45CF	/	Dynax
10	PCB	/	Rogers4350B	20mil	Rogers

9.2 Graphic data

9.2.1 Pulsed CW

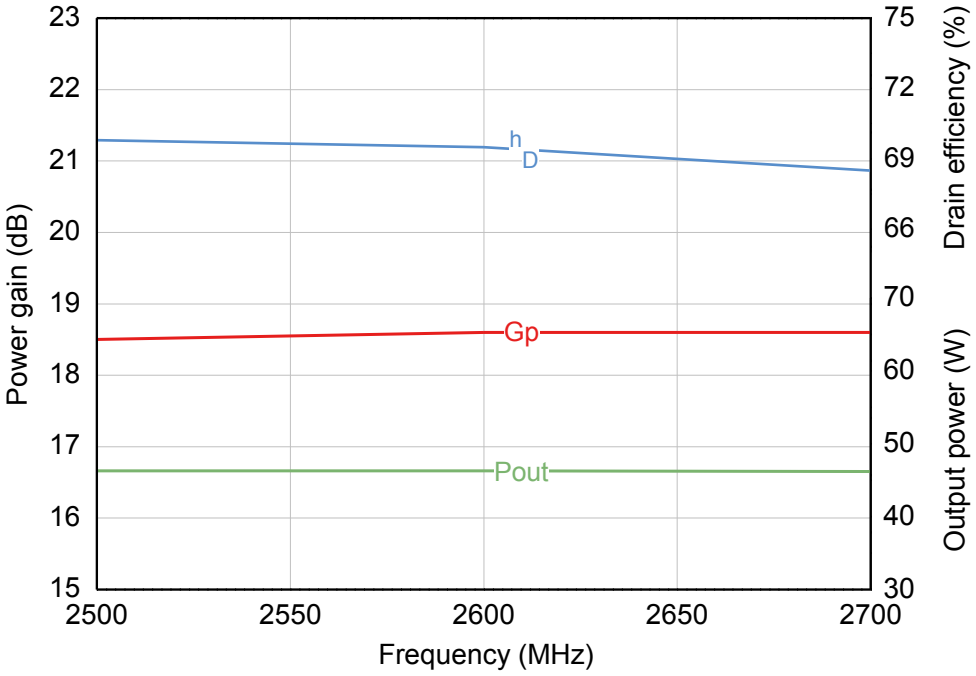


Fig 3. Power gain, Drain efficiency and CW Output power vs. Frequency at a constant input power

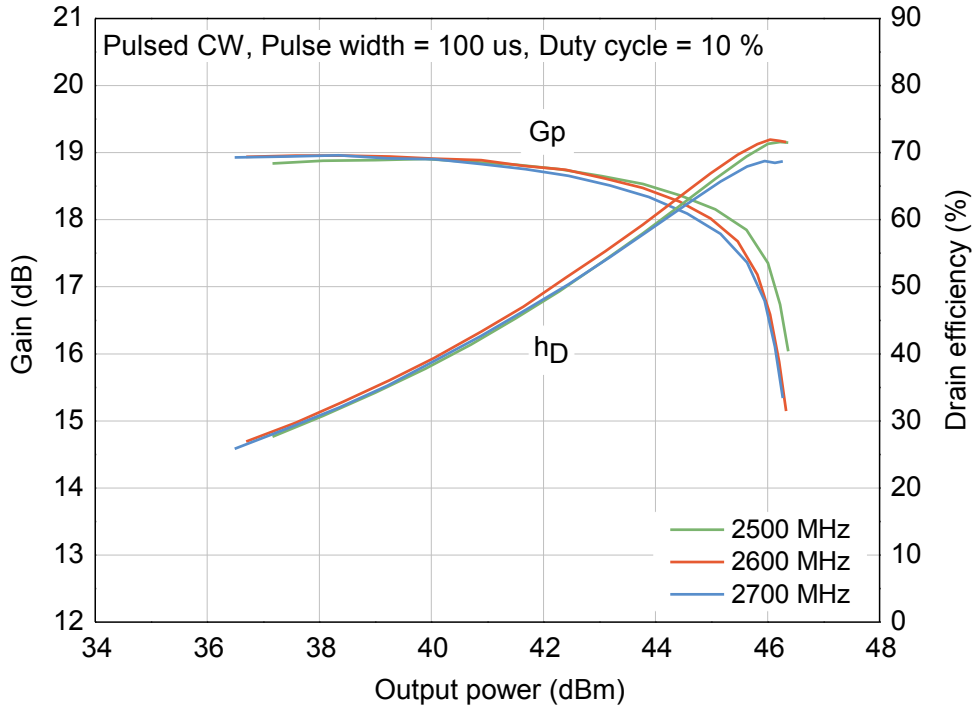


Fig 4. Power gain, Drain efficiency vs. CW Output power and Frequency

9.2.2 1-Carrier W-CDMA

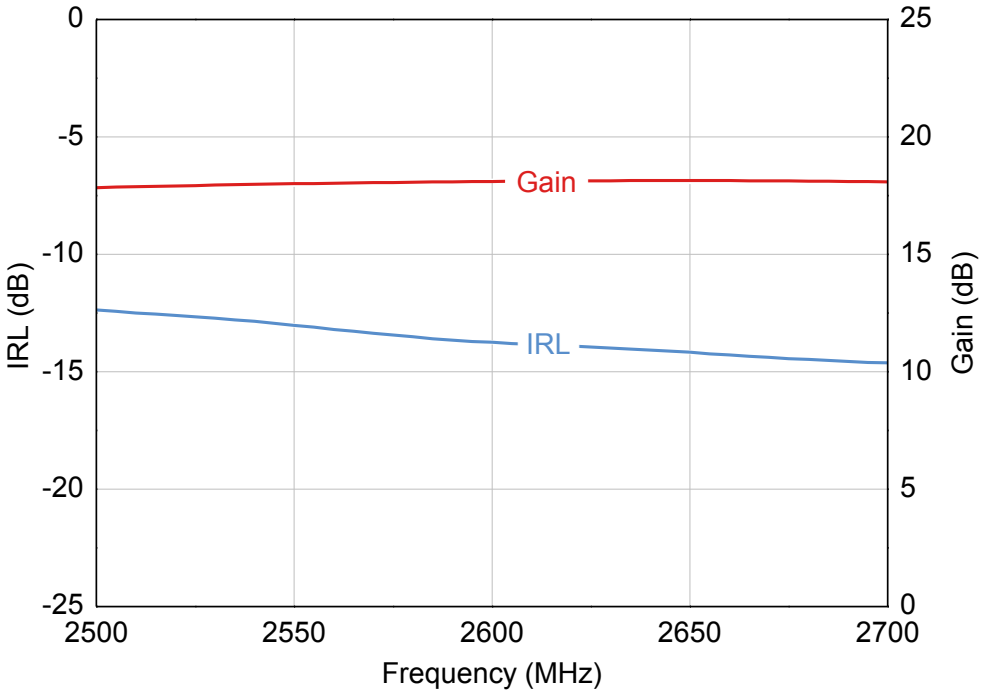


Fig 5. Small signal gain and Input return loss vs. Frequency

10. Impedance information

Table 11. Typical impedance [1]

Maximum Output Power						
Freq (MHz)	Z_S (Ω)	Z_L (Ω)	G_P (dB)	P_{sat} (dBm)	P_{sat} (W)	η_D (%)
1800	5.6 + j2.2	14.8 + j0.3	21.3	47.3	53	69.1
2600	5.7 - j4.0	13.1 + j4.6	18.1	47.5	55	68.1
3600	5.8 - j10.5	14.9 + j2.4	15.6	47.3	53	64.8
Maximum Drain Efficiency						
Freq (MHz)	Z_S (Ω)	Z_L (Ω)	G_P (dB)	P_{sat} (dBm)	P_{sat} (W)	η_D (%)
1800	5.6 + j2.2	10.7 + j17.2	22.0	44.5	28	83.4
2600	5.7 - j4.0	6.3 + j10.7	19.3	46.0	39	75.5
3600	5.8 - j10.5	11.8 + j7.3	16.3	46.8	47	71.4

[1] V_{DS} = 48 V, I_{DQ} = 80 mA, Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

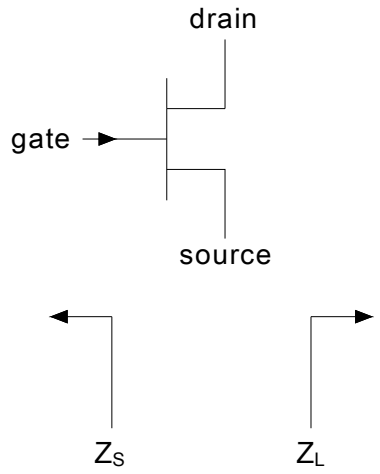


Fig 6. Definition of Transistor Impedance

11. Median lifetime

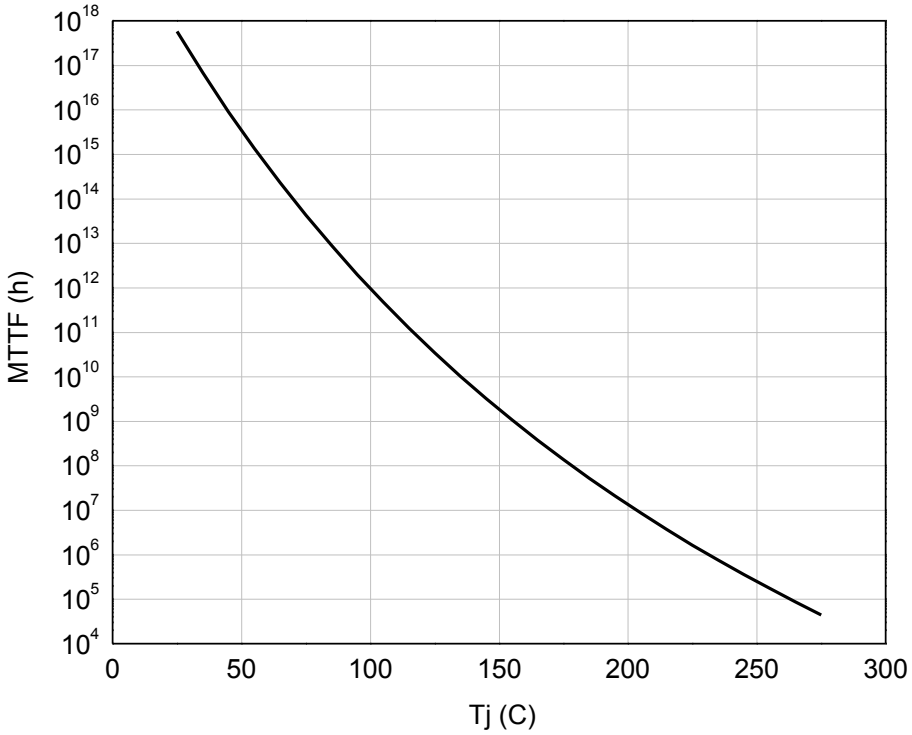
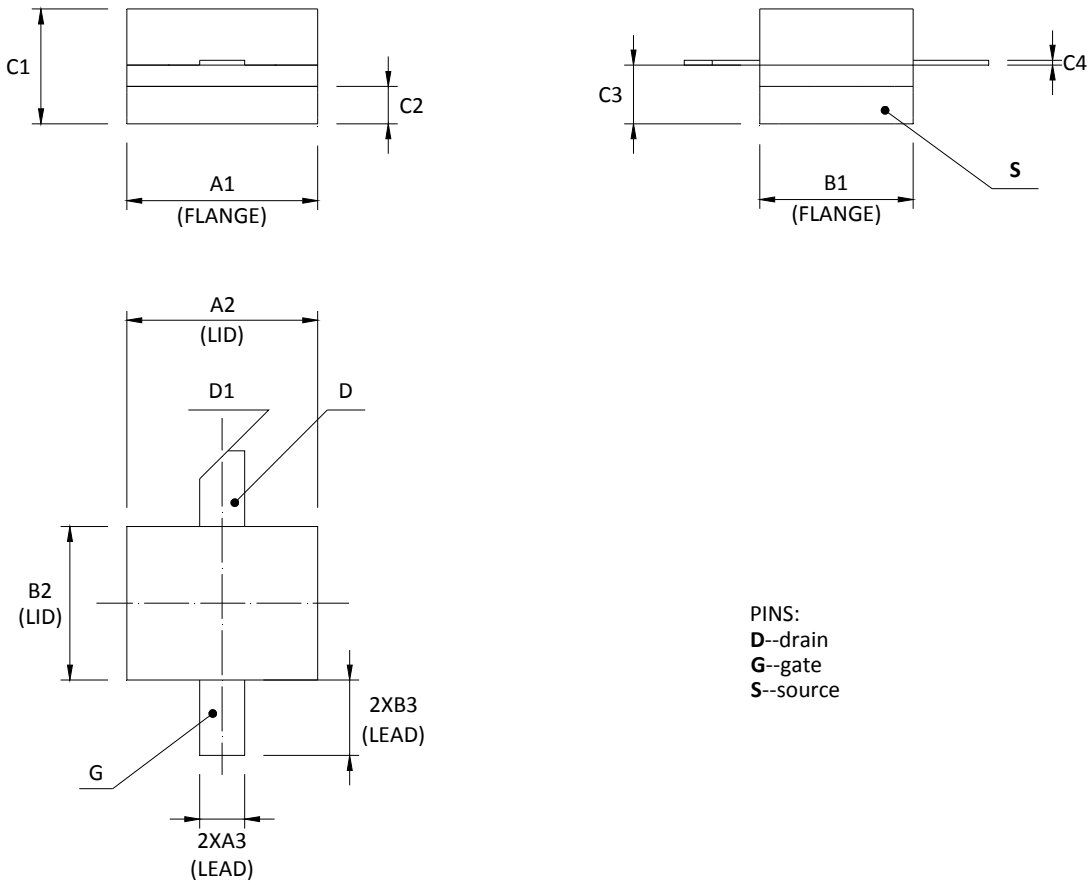


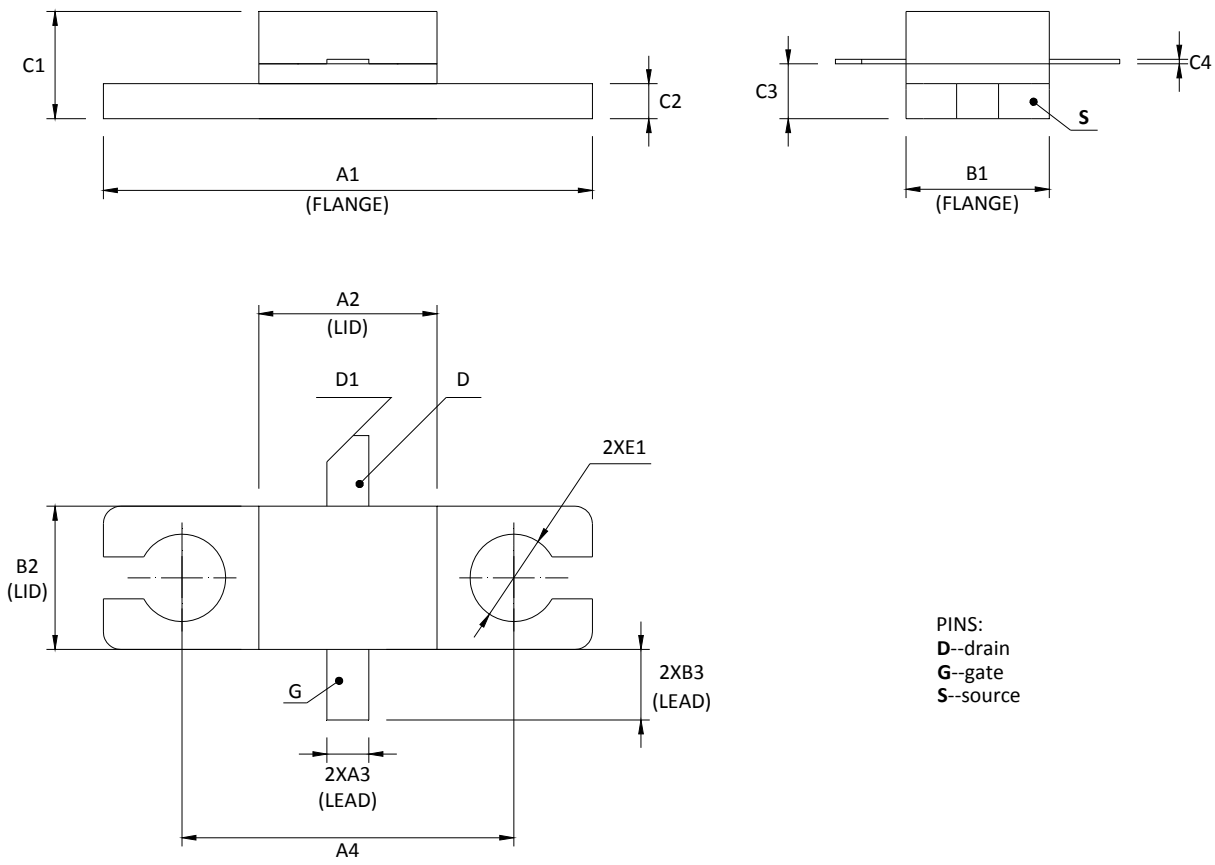
Fig 7. Median Lifetime vs. Channel Temperature

12. Package outline



DIM	INCH		MILLIMETER	
	MIN	MAX	MIN	MAX
A1	0.195	0.205	4.953	5.207
A2	0.195	0.205	4.953	5.207
A3	0.042	0.052	1.070	1.330
B1	0.155	0.165	3.937	4.191
B2	0.155	0.165	3.937	4.191
B3	0.060	0.100	1.524	2.540
C1	0.110	0.130	2.794	3.302
C2	0.034	0.044	0.870	1.130
C3	0.057	0.067	1.447	1.700
C4	0.004	0.006	0.101	0.150
D1	0.03 45° REF		0.75 45° REF	

Fig 8. Package outline —— 200P1AA



DIM	INCH		MILLIMETER	
	MIN	MAX	MIN	MAX
A1	0.546	0.556	13.87	14.13
A2	0.195	0.206	4.97	5.23
A3	0.042	0.052	1.07	1.33
A4	0.374 REF		9.50 REF	
B1	0.156	0.166	3.97	4.23
B2	0.156	0.166	3.97	4.23
B3	0.070	0.089	1.77	2.27
C1	0.112	0.142	2.84	3.60
C2	0.034	0.044	0.87	1.13
C3	0.057	0.067	1.44	1.70
C4	0.004	0.006	0.11	0.15
D1	0.03 45° REF		0.75 45° REF	
E1	ø 0.098 REF		ø 2.50 REF	

Fig 9. Package outline —— 200F1AA

13. Abbreviations

Table 13. Abbreviations

Acronym	Description
CW	Continuous Waveform
ESD	Electro-Static Discharge
GaN	Gallium Nitride
HEMT	High Electron Mobility Transistor
MTTF	Median Time To Failure
VSWR	Voltage Standing Wave Ratio

14. Legal information

14.1 Datasheet status

Document status	Product status	Definition
Objective [short] datasheet	Engineering sample	This document contains data from the objective specification for product development.
Preliminary [short] datasheet	Engineering sample	This document contains data from the preliminary specification.
Production [short] datasheet	Mass product	This document contains the product specification.

14.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Dynax does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short datasheet — A short datasheet is an extract from a full datasheet with the same product type number(s) and title. A short datasheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full datasheet, which is available on request via the local Dynax sales office. In case of any inconsistency or conflict with the short datasheet, the full datasheet shall prevail.

Product specification — The information and data provided in a Product datasheet shall define the specification of the product as agreed between Dynax and its customer, unless Dynax and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Dynax product is deemed to offer functions and qualities beyond those described in the Product datasheet.

14.3 Disclaimers

Information in this document is believed to be accurate and reliable. However Dynax does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Dynax takes no responsibility for the content in this document if provided by an information source outside of Dynax.

All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Dynax 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.

Applications that are described herein for any of these products are for illustrative purposes only. Dynax makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using Dynax products, and Dynax accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Dynax product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Dynax products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a Dynax product can reasonably be expected to result in personal injury, death or severe property or environmental damage.

Unless this datasheet expressly states that this specific Dynax product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements.

This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

15. Contact information

For more information, please visit: http://www.dynax-semi.com