

DXG1CH08A-560EF

RF Power GaN Transistor



1. Product profile

1.1 General description

DXG1CH08A-560EF is a 560 W RF GaN HEMT Transistor with first generation RF GaN technology from Dynax, which is ideal for cellular base station applications at frequencies from 758 MHz to 821 MHz.

Table 1. Typical performance

Freq (MHz)	P_{sat}^1 (dBm)	P_{avg}^2 (dBm)	η_D^2 (%)	G_P^2 (dB)	ACPR ² (dBc)
758~803	57.0	49.0	56.0	18.0	-28.0

¹ Test condition: Pulsed CW, Pulse width = 100 μ s, Duty cycle = 10 %.

² Typical Doherty performance in Dynax Demo with the device soldered onto the heatsink, test condition: $V_{DS} = 48$ V, $I_{DQA} = 500$ mA, $V_{GSB} = -5.2$ V, Single-Carrier W-CDMA, IQ magnitude clipping, Input signal PAR = 7.5 dB @ 0.01 % probability on CCDF. ACPR measured in 3.84 MHz channel bandwidth @ ± 5 MHz offset.

1.2 Features and benefits

- High efficiency, high gain
- Internally matched for broadband performance
- Designed for Digital Pre-Distortion error correction systems
- Optimized for Doherty applications

1.3 Applications

- RF power amplifier for base stations and multi carrier applications in the 758 MHz to 821 MHz frequency range

1.4 Lead-free and RoHS compliant



2. Pinning information

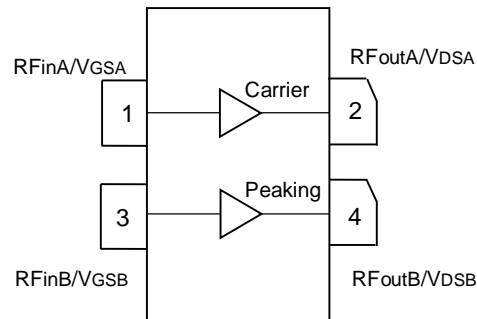


Fig 1. Pin configuration (Top view)

3. Ordering information

Table 2. Ordering information

Part number	Marking	Package type	Packaging information
DXG1CH08A-560EF	DXG1CH08A-560EF	780P2GB	Tray: Suffix = 20 units Tape and Reel: Suffix = 100 units; 44 mm Tape width; 13-inch Reel

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}	56.0	mA
Storage Temperature Range	T_{STG}	- 65 ~ +150	°C
Operating Junction Temperature	T_J	225	°C
Absolute Maximum Channel Temperature ¹	T_{MAX}	275	°C

¹ Functional operation above 225°C has not been characterized and is not implied. Operation at T_{MAX} (275°C) 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
Side A, Carrier			
Thermal Resistance at Average Power by Infrared Measurement, Active Die Surface-to-Case $T_{\text{base-plate}} = 85^{\circ}\text{C}$, $P_D = 55.6\text{ W}$	$R_{\text{thjc}}(\text{IR})$	1.1	$^{\circ}\text{C/W}$
Thermal Resistance at Average Power by Finite Element Analysis, Junction-to-Case $T_{\text{base-plate}} = 85^{\circ}\text{C}$, $P_D = 55.6\text{ W}$	$R_{\text{thjc}}(\text{FEA})$	1.4	$^{\circ}\text{C/W}$
Side B, Peaking			
Thermal Resistance at Average Power by Infrared Measurement, Active Die Surface-to-Case $T_{\text{base-plate}} = 85^{\circ}\text{C}$, $P_D = 14.0\text{ W}$	$R_{\text{thjc}}(\text{IR})$	1.0	$^{\circ}\text{C/W}$
Thermal Resistance at Average Power by Finite Element Analysis, Junction-to-Case $T_{\text{base-plate}} = 85^{\circ}\text{C}$, $P_D = 14.0\text{ W}$	$R_{\text{thjc}}(\text{FEA})$	1.3	$^{\circ}\text{C/W}$

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)	C2 (> 500 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°C unless otherwise noted)

Table 7. DC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Side A, Carrier					
Drain-Source Leakage Current (V _{GS} = -10 V, V _{DS} = 150 V)	I _{DSS}	-	-	28.0	mA
Drain-Source Breakdown Voltage (V _{GS} = -10 V, I _D = 28.0 mA)	V _{(BR)DSS}	150	-	-	V
Gate Threshold Voltage (V _{DS} = 48 V, I _D = 28.0 mA)	V _{GS(th)}	-3.9	-3.2	-2.5	V
Gate Quiescent Voltage (V _{DS} = 48 V, I _D = 650 mA)	V _{GS(Q)}	-3.7	-3.0	-2.3	V
Side B, Peaking					
Drain-Source Leakage Current (V _{GS} = -10 V, V _{DS} = 150 V)	I _{DSS}	-	-	28.0	mA
Drain-Source Breakdown Voltage (V _{GS} = -10 V, I _D = 28.0 mA)	V _{(BR)DSS}	150	-	-	V
Gate Threshold Voltage (V _{DS} = 48 V, I _D = 28.0 mA)	V _{GS(th)}	-3.9	-3.2	-2.5	V
Gate Quiescent Voltage (V _{DS} = 48 V, I _D = 650 mA)	V _{GS(Q)}	-3.7	-3.0	-2.3	V

Table 8. RF characteristics (Typical Doherty performance – 803 MHz) ¹

Parameter	Symbol	Min.	Typ.	Max.	Unit
Peak Output Power ²	P _{sat}	55.2	56.2	-	dBm
Drain Efficiency ³	η _D	52.8	59.8	-	%
Power Gain ³	G _P	18.8	20.4	22.0	dB

¹ Typical Doherty performance in Dynax DXG1CH08A-560EF production test fixture, test condition: V_{DS} = 48 V, I_{DQA} = 200 mA, V_{GSB} = -2.1 V + V_{GSQ} @ 100 mA.

² Test condition: Pulsed CW, Pulse width = 100 μs, Duty cycle = 10 %.

³ Test condition: P_{avg} = 49.0 dBm, Single-Carrier W-CDMA, IQ magnitude clipping, Input signal PAR = 7.5 dB @ 0.01 % probability on CCDF.

Table 9. Load mismatch

Parameter	Result
VSWR 10:1 at V _{DS} = 48 V, 500 W Pulsed CW output power, Pulse width = 100 μs, Duty cycle = 10%.	No device damage

9. Impedance information

Table 10. Typical impedance of carrier ¹

Maximum Output Power						
Freq (MHz)	Z _S (Ω)	Z _L (Ω)	G _P (dB)	P _{sat} (dBm)	P _{sat} (W)	η _D (%)
758	2.5 - j5.2	3.6 + j1.2	24.3	55.0	316	73.8
790	2.7 - j5.8	3.3 + j1.5	24.0	55.1	323	73.2
821	3.0 - j6.6	3.4 + j1.5	23.8	55.1	323	74.1
Maximum Drain Efficiency						
Freq (MHz)	Z _S (Ω)	Z _L (Ω)	G _P (dB)	P _{sat} (dBm)	P _{sat} (W)	η _D (%)
758	2.5 - j5.2	5.7 + j5.3	26.5	52.0	158	84.2
790	2.7 - j5.8	5.8 + j5.6	26.4	52.1	162	84.5
821	3.0 - j6.6	5.3 + j5.5	25.8	51.9	154	85.1

Table 11. Typical impedance of peaking ²

Maximum Output Power						
Freq (MHz)	Z _S (Ω)	Z _L (Ω)	G _P (dB)	P _{sat} (dBm)	P _{sat} (W)	η _D (%)
758	2.5 - j5.2	3.6 + j1.2	24.3	55.0	316	73.8
790	2.7 - j5.8	3.3 + j1.5	24.0	55.1	323	73.2
821	3.0 - j6.6	3.4 + j1.5	23.8	55.1	323	74.1
Maximum Drain Efficiency						
Freq (MHz)	Z _S (Ω)	Z _L (Ω)	G _P (dB)	P _{sat} (dBm)	P _{sat} (W)	η _D (%)
758	2.5 - j5.2	5.7 + j5.3	26.5	52.0	158	84.2
790	2.7 - j5.8	5.8 + j5.6	26.4	52.1	162	84.5
821	3.0 - j6.6	5.3 + j5.5	25.8	51.9	154	85.1

¹ V_{DS} = 48 V, I_{DQA} = 650 mA, Pulsed CW, Pulse width = 100 μs, Duty cycle = 10 %.

² V_{DS} = 48 V, I_{DQB} = 650 mA, Pulsed CW, Pulse width = 100 μs, Duty cycle = 10 %.

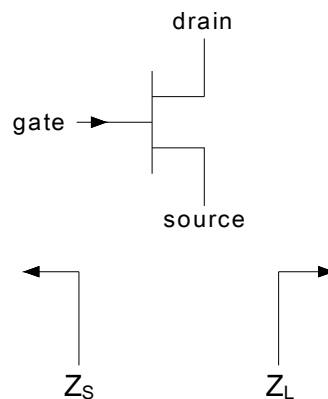


Fig 2. Definition of transistor impedance

10. Median lifetime

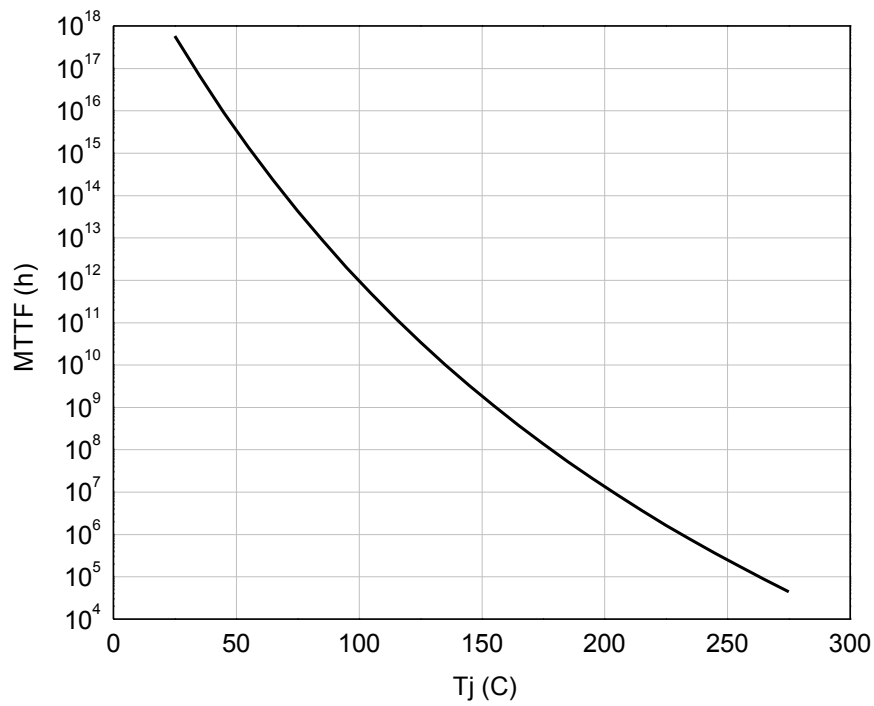
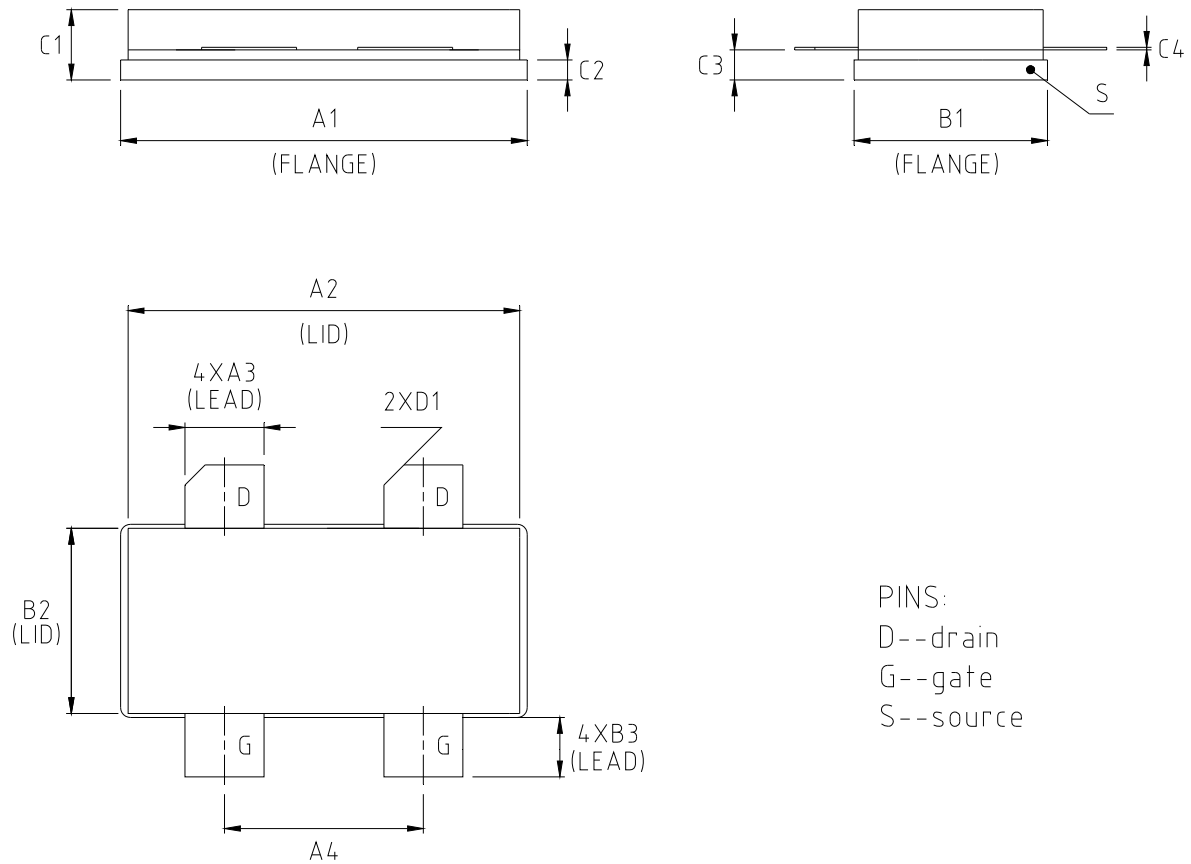


Fig 3. Median lifetime vs. channel temperature

11. Package outline



DIM	INCH		MILLIMETER	
	MIN	MAX	MIN	MAX
A1	0.805	0.815	20.45	20.70
A2	0.772	0.788	19.61	20.02
A3	0.153	0.162	3.87	4.13
A4	0.385	0.395	9.77	10.03
B1	0.380	0.390	9.65	9.91
B2	0.365	0.375	9.27	9.53
B3	0.108	0.128	2.75	3.25
C1	0.130	0.170	3.30	4.32
C2	0.035	0.045	0.89	1.14
C3	0.057	0.067	1.45	1.70
C4	0.003	0.006	0.08	0.15
D1	0.040 45° REF		1.02 45° REF	

Fig 4. Package outline — 780P2GB

12. Abbreviations

Table 12. 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

13. Legal information

13.1 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.

13.2 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.

13.3 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.

14. Contact information

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