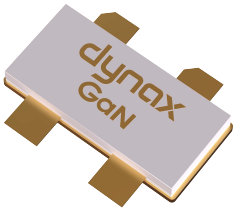
DXG1CHD8A-F2EF

RF Power GaN Transistor



1. Product profile

1.1 General description

DXG1CHD8A-F2EF is a 500 W RF GaN HEMT Transistor with first generation RF GaN technology from Dynax, which is ideal for cellular base station applications at frequencies from 3300 MHz to 3800 MHz.

Table 1. Typical performance [1]

Freq (MHz)	P_{sat} [2] (dBm)	P_{avg} [3] (dBm)	η_D [3] (%)	G_P [3] (dB)	ACPR [3] (dBc)
3400	57.1	48.5	41.9	15.1	-27.0
3500	57.0	48.5	41.4	15.0	-36.0
3600	56.6	48.5	41.2	14.7	-39.0

[1] Typical Doherty performance in Dynax Demo with the device soldered onto the heatsink, test condition: V_{DS} = 52 V, I_{DQA} = 400 mA , V_{GSB} = - 5.2 V.

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

[3] Test condition: 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 3400 MHz to 3600 MHz frequency range

1.4 Lead-free and RoHS compliant

Pb RoHS

2. Pinning information

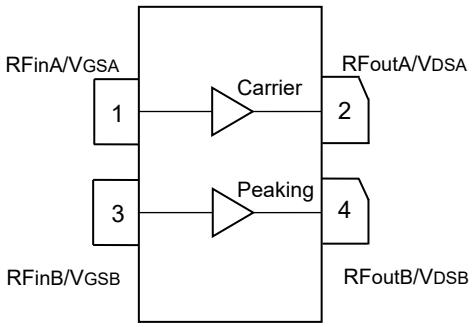


Fig 1. Pin configuration (Top view)

3. Ordering information

Table 2. Ordering information

Part number	Marking	Package type	Packaging information
DXG1CHD8A-F2EF	DXG1CHD8A-F2EF	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}	53.4	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
Side A, Carrier			
Thermal Resistance at Average Power by Infrared Measurement, Active Die Surface-to-Case $T_{base\text{-}plate}$ = 85℃, P_D = 79.6 W	R_{thjc}(IR)	1.5	℃/W
Thermal Resistance at Average Power by Finite Element Analysis, Junction-to-Case $T_{base\text{-}plate}$ = 85℃, P_D = 79.6 W	R_{thjc}(FEA)	1.9	℃/W
Side B, Peaking			
Thermal Resistance at Average Power by Infrared Measurement, Active Die Surface-to-Case $T_{base\text{-}plate}$ = 85℃, P_D = 19.9 W	R_{thjc}(IR)	0.9	℃/W
Thermal Resistance at Average Power by Finite Element Analysis, Junction-to-Case $T_{base\text{-}plate}$ = 85℃, P_D = 19.9 W	R_{thjc}(FEA)	1.1	℃/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℃ 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}	-	-	21.8	mA
Drain-Source Breakdown Voltage (V_{GS} = -10 V, I_D = 21.8 mA)	$V_{(BR)DSS}$	150	-	-	V
Gate Threshold Voltage (V_{DS} = 48 V, I_D = 21.8 mA)	$V_{GS(th)}$	-4.0	-3.2	-1.0	V
Gate Quiescent Voltage (V_{DS} = 48 V, I_D = 400 mA)	$V_{GS(Q)}$	-	-3.0	-	V
Side B, Peaking					
Drain-Source Leakage Current (V_{GS} = -10 V, V_{DS} = 150 V)	I_{DSS}	-	-	31.6	mA
Drain-Source Breakdown Voltage (V_{GS} = -10 V, I_D = 31.6 mA)	$V_{(BR)DSS}$	150	-	-	V
Gate Threshold Voltage (V_{DS} = 48 V, I_D = 31.6 mA)	$V_{GS(th)}$	-4.0	-3.2	-1.0	V
Gate Quiescent Voltage (V_{DS} = 48 V, I_D = 600 mA)	$V_{GS(Q)}$	-	-3.0	-	V

Table 8. RF characteristics (Typical Doherty performance – 3600 MHz) [1]

Parameter	Symbol	Min.	Typ.	Max.	Unit
Peak Output Power [2]	P_{sat}	54.3	55.3	-	dBm
Drain Efficiency [3]	η_D	38.6	45.6	-	%
Power Gain [3]	G_P	12.2	13.8	15.4	dB

[1] Typical Doherty performance in Dynax DXG1CHD8A-F2EF production test fixture, test condition: V_{DS} = 48 V, I_{DQA} = 400 mA, V_{GSB} = -2.4 V + V_{GSQ} @200 mA.

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

[3] Test condition: P_{avg} = 48.5 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, 450 W Pulsed CW output power, Pulse width = 100 µs, Duty cycle = 10%.	No device damage

9. Test information

9.1 Graphic data

9.1.1 Pulsed CW

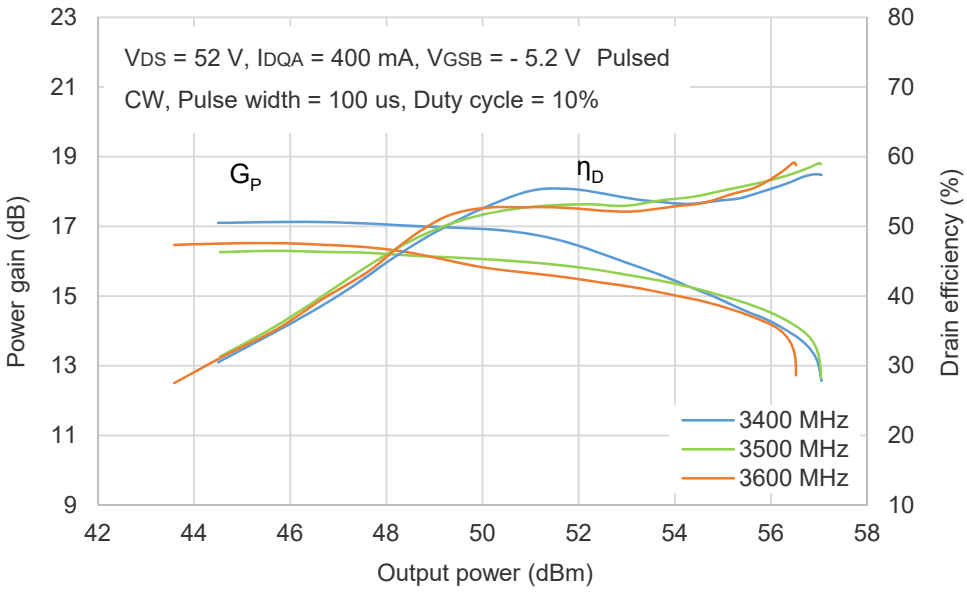


Fig 2. Power gain, Drain efficiency vs. Pulse output power

9.1.2 Single-Carrier W-CDMA

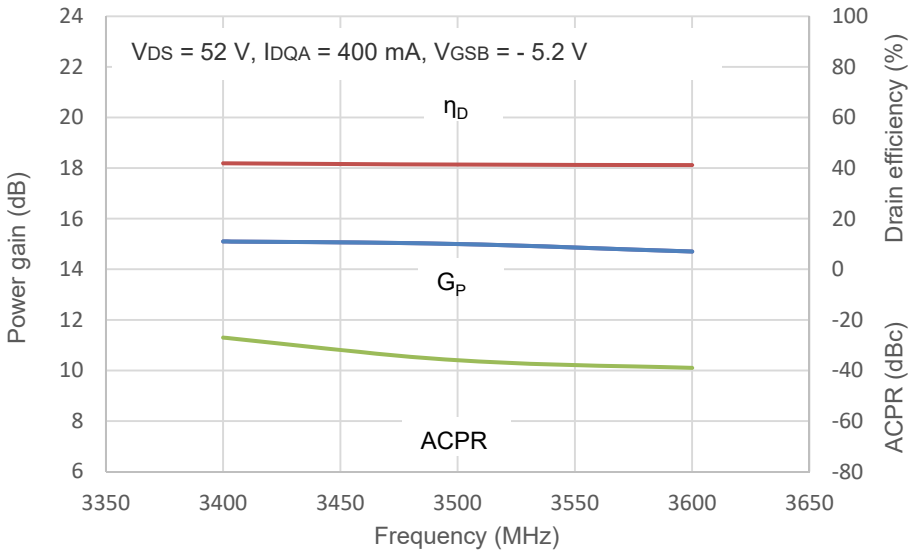


Fig 3. Single-Carrier WCDMA broadband performance @ Pout = 48.5 dBm Avg.

10. 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 (%)
3300	13.5 - j8.5	4.8 - j3.1	19.6	53.4	221	61.3
3600	6.0 - j1.5	4.0 - j3.5	19.5	53.1	204	62.4
3800	2.1 - j4.4	3.3 - j5.8	18.3	53.0	199	60.5
Maximum Drain Efficiency						
Freq (MHz)	Z_S (Ω)	Z_L (Ω)	G_P (dB)	P_{sat} (dBm)	P_{sat} (W)	η_D (%)
3300	13.5 - j8.5	4.5 - j7.7	21.2	51.6	145	73.2
3600	6.0 - j1.5	8.0 - j7.1	21.2	51.3	135	71.3
3800	2.1 - j4.4	7.3 - j6.5	20.0	51.0	126	71.0

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 (%)
3300	3.5 - j15.0	5.0 - j7.0	19.3	55.0	316	60.3
3600	14.0 - j18.0	7.0 - j6.7	19.5	54.9	309	59.3
3800	10.1 - j2.0	6.4 - j5.4	19.3	54.8	302	59.3
Maximum Drain Efficiency						
Freq (MHz)	Z_S (Ω)	Z_L (Ω)	G_P (dB)	P_{sat} (dBm)	P_{sat} (W)	η_D (%)
3300	3.5 - j15.0	4.2 - j10.8	20.2	54.1	257	74.8
3600	14.0 - j18.0	4.3 - j12.1	20.2	53.3	214	72.6
3800	10.1 - j2.0	4.0 - j11.5	20.1	53.2	209	72.0

[1] V_{DS} = 48 V, I_{DQA} = 400 mA, Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

[2] V_{DS} = 48 V, I_{DQB} = 600 mA, Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

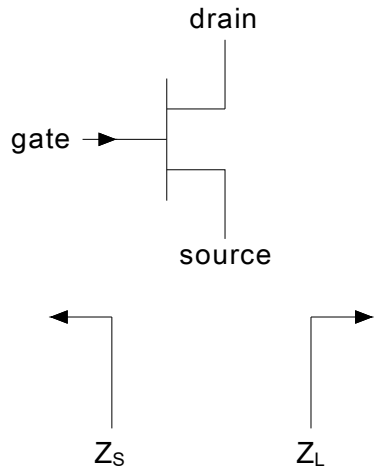


Fig 4. Definition of transistor impedance

11. Median lifetime

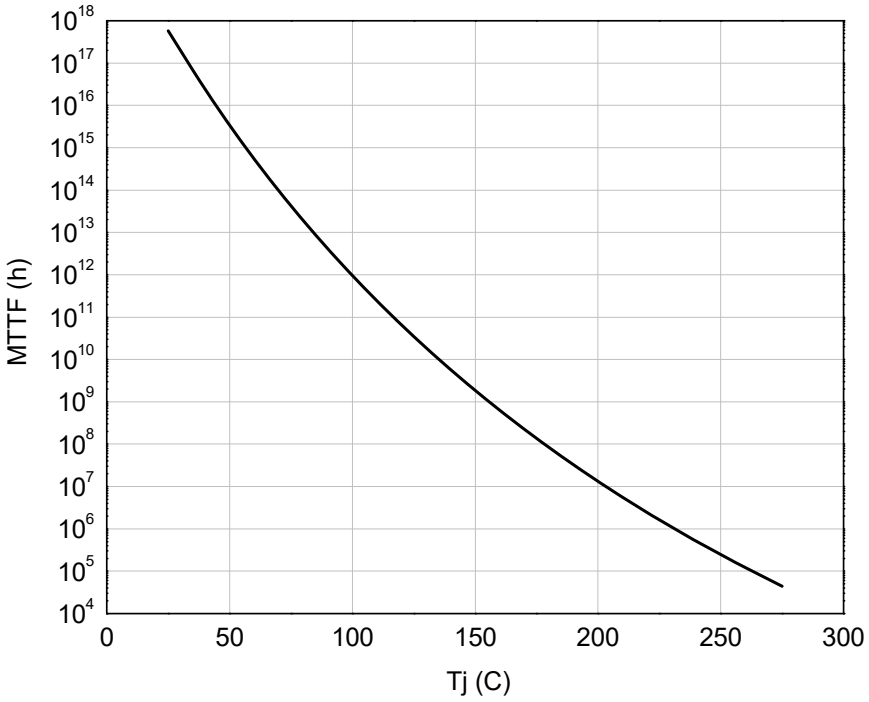


Fig 5. Median lifetime vs. channel temperature

12. Package outline

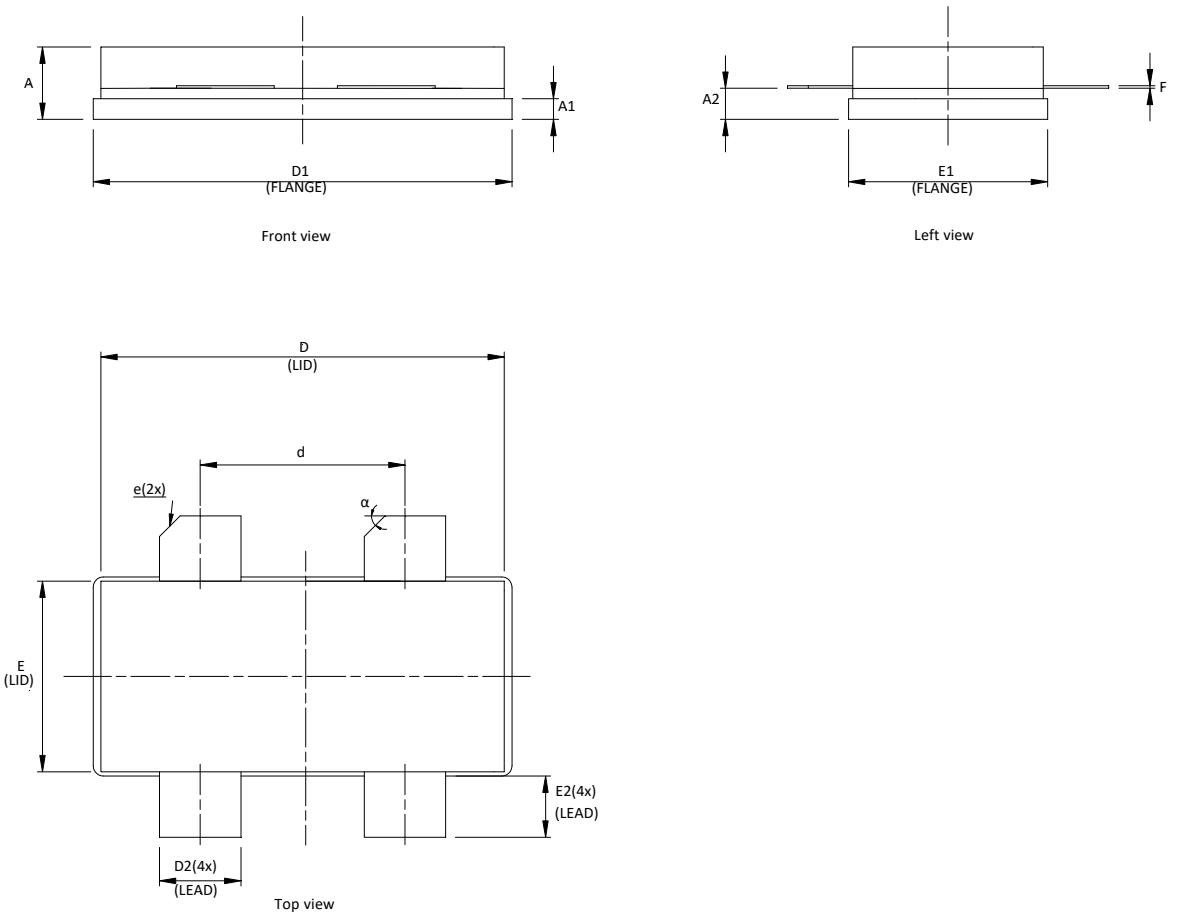


Fig 6. Package outline —— 780P2GB

Table 12. Package dimensions

DIM	INCH			MILLIMETER		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.134	0.144	0.154	3.40	3.65	3.90
A1	0.035	0.040	0.045	0.89	1.02	1.14
A2	0.057	0.062	0.067	1.45	1.58	1.70
D1	0.805	0.810	0.815	20.45	20.58	20.70
D2	0.153	0.158	0.162	3.87	4.00	4.13
d	0.385	0.390	0.395	9.77	9.90	10.03
D	0.772	0.780	0.788	19.61	19.82	20.02
E	0.365	0.370	0.375	9.27	9.40	9.53
E1	0.380	0.385	0.390	9.65	9.78	9.91
E2	0.098	0.118	0.138	2.50	3.00	3.50
F	0.003	0.005	0.006	0.08	0.12	0.15
e	TYP 0.04			TYP 1.02		
α	45° REF			45° REF		

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.

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