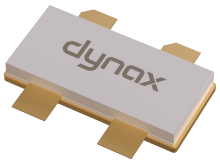
DXG2CH50A-450EF

RF Power GaN Transistor



1. Product profile

1.1 General description

DXG2CH50A-450EF is a 450 W RF GaN HEMT Transistor with second generation RF GaN technology from Dynax, which is ideal for cellular base station applications at frequencies from 4800 MHz to 5000 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)
4800	56.6	47.5	42.1	11.3	-29.5/-47.5
4900	56.6	47.5	42.6	11.8	-34.0/-49.5
5000	56.5	47.5	42.2	11.6	-31.0/-47.0

[1] Typical Doherty performance in Dynax Demo with the device soldered onto the heatsink, test condition: V_{DS} = 52 V, I_{DQA} = 300 mA, V_{GSB} = - 4.1 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 4800 MHz to 5000 MHz frequency range

1.4 Lead-free and RoHS compliant

Pb RoHS

2. Pinning information

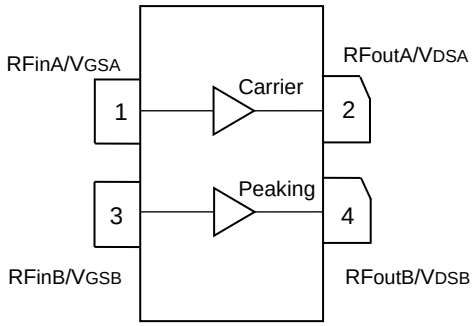


Fig 1. Pin configuration (Top view)

3. Ordering information

Table 2. Ordering information

Part number	Marking	Package type	Packaging information
DXG2CH50A-450EF	DXG2CH50A-450EF	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}	65.4	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 = 56.8 W	R_{thjc}(IR)	1.3	℃/W
Thermal Resistance at Average Power by Finite Element Analysis, Junction-to-Case $T_{base\text{-}plate}$ = 85℃, P_D = 56.8 W	R_{thjc}(FEA)	1.7	℃/W
Side B, Peaking			
Thermal Resistance at Average Power by Infrared Measurement, Active Die Surface-to-Case $T_{base\text{-}plate}$ = 85℃, P_D = 14.2 W	R_{thjc}(IR)	0.7	℃/W
Thermal Resistance at Average Power by Finite Element Analysis, Junction-to-Case $T_{base\text{-}plate}$ = 85℃, P_D = 14.2 W	R_{thjc}(FEA)	0.9	℃/W

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

Table 5. 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}	-	-	23.2	mA
Drain-Source Breakdown Voltage (V_{GS} = -10 V, I_D = 23.2 mA)	$V_{(BR)DSS}$	150	-	-	V
Gate Threshold Voltage (V_{DS} = 48 V, I_D = 23.2 mA)	$V_{GS(th)}$	-4.0	-2.6	-1.0	V
Gate Quiescent Voltage (V_{DS} = 48 V, I_D = 300 mA)	$V_{GS(Q)}$	-	-2.4	-	V
Side B, Peaking					
Drain-Source Leakage Current (V_{GS} = -10 V, V_{DS} = 150 V)	I_{DSS}	-	-	42.2	mA
Drain-Source Breakdown Voltage (V_{GS} = -10 V, I_D = 42.2 mA)	$V_{(BR)DSS}$	150	-	-	V
Gate Threshold Voltage (V_{DS} = 48 V, I_D = 42.2 mA)	$V_{GS(th)}$	-4.0	-2.6	-1.0	V
Gate Quiescent Voltage (V_{DS} = 48 V, I_D = 500 mA)	$V_{GS(Q)}$	-	-2.4	-	V

Table 6. Load mismatch

Parameter	Result
VSWR 10:1 at V_{DS} = 52 V, 56.2 W WCDMA output power.	No device damage

7. Test information

7.1 Typical application circuit

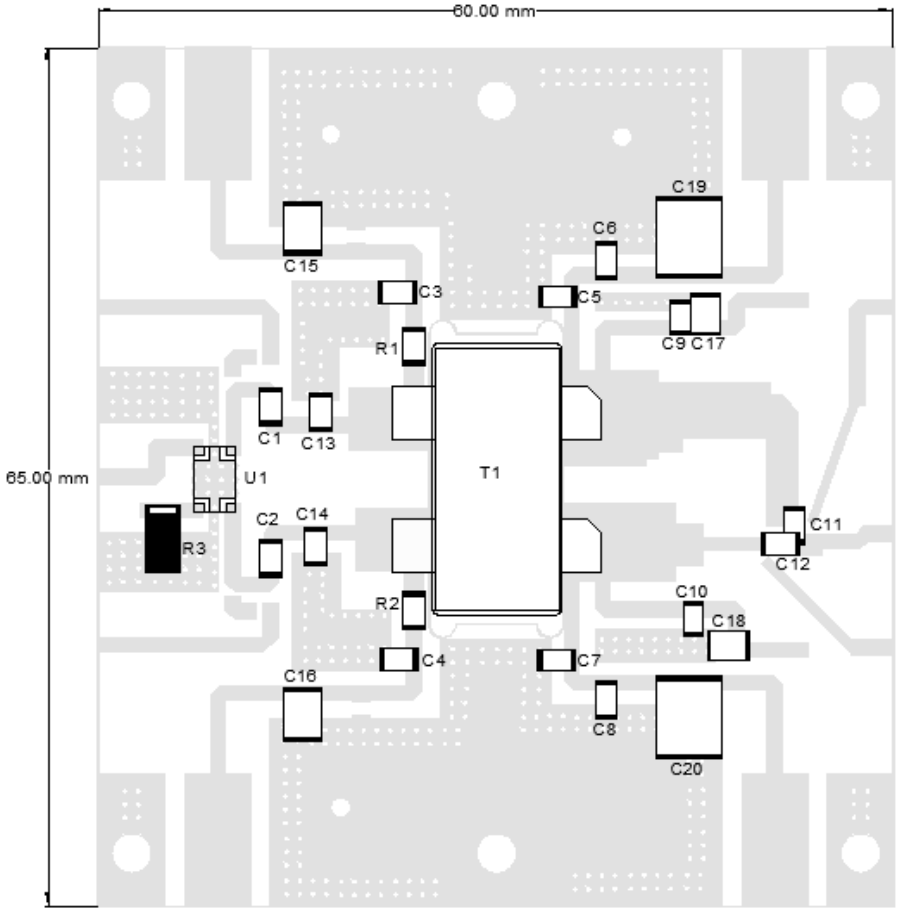


Fig 2. Component layout

Table 7. List of components

S/N	Type	Designator	Description	Value	Vendor
1	Cap	C1~C11	ATC600F3R9JT250XT	3.9 pF	ATC
2	Cap	C12	ATC600F1R0JT250XT	1.0 pF	ATC
3	Cap	C13	ATC600F0R6JT250XT	0.6 pF	ATC
4	Cap	C14	ATC600F0R9JT250XT	0.9 pF	ATC
5	Cap	C15~C18	GRM32ER72A225KA35L	2.2 uF	Murata
6	Cap	C19~C20	C5750X7S2A106KT	10.0 uF	TDK
7	Res	R1,R2	RC1206FR_10R0	10 Ω	Yageo
8	Termination	R3	S1020A	50 Ω	RN2
9	HyBrid coupler	U1	CMX45E03	3 dB	RN2
10	Transistor	T1	DXG2CH50A-450EF	/	Dynax
11	PCB		Rogers 4350B	20 mil	Rogers

7.2 Graphic data

7.2.1 Pulsed CW

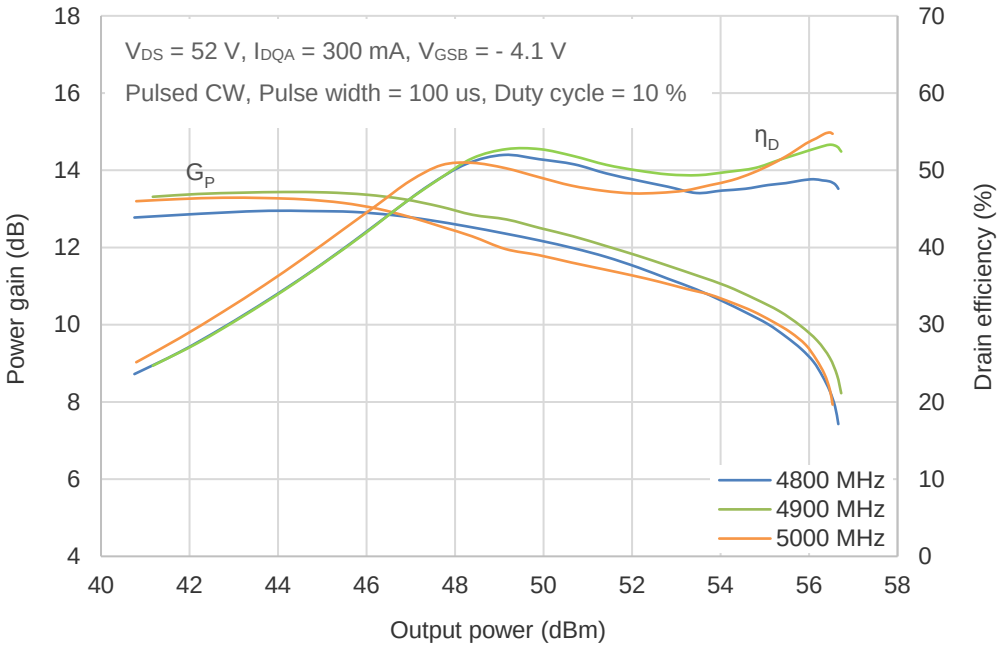


Fig 3. Power gain, Drain efficiency vs. Pulse output power

8. Impedance information

Table 8. 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 (%)
5000	18.2 + j1.2	3.6 - j2.4	17.2	53.0	200	58.9
Maximum Drain Efficiency						
Freq (MHz)	Z_S (Ω)	Z_L (Ω)	G_P (dB)	P_{sat} (dBm)	P_{sat} (W)	η_D (%)
5000	18.2 + j1.2	5.4 - j0.4	17.8	51.9	154	63.6

Table 9. 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 (%)
5000	20.8 - j0.4	3.6 - j0.8	16.1	55.1	323	55.8
Maximum Drain Efficiency						
Freq (MHz)	Z_S (Ω)	Z_L (Ω)	G_P (dB)	P_{sat} (dBm)	P_{sat} (W)	η_D (%)
5000	20.8 - j0.4	5.0 + j0.9	16.7	54.5	282	60.6

[1] V_{DS} = 48 V, I_{DQA} = 300 mA, Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

[2] V_{DS} = 48 V, I_{DQB} = 500 mA, Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

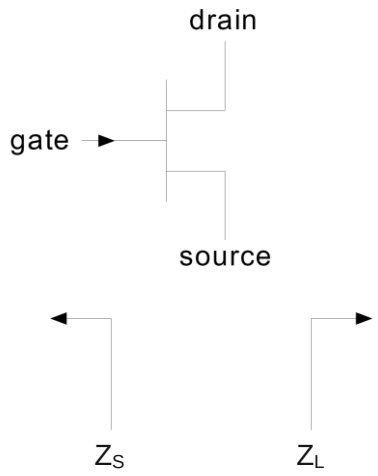


Fig 4. Definition of transistor impedance

9. Median lifetime

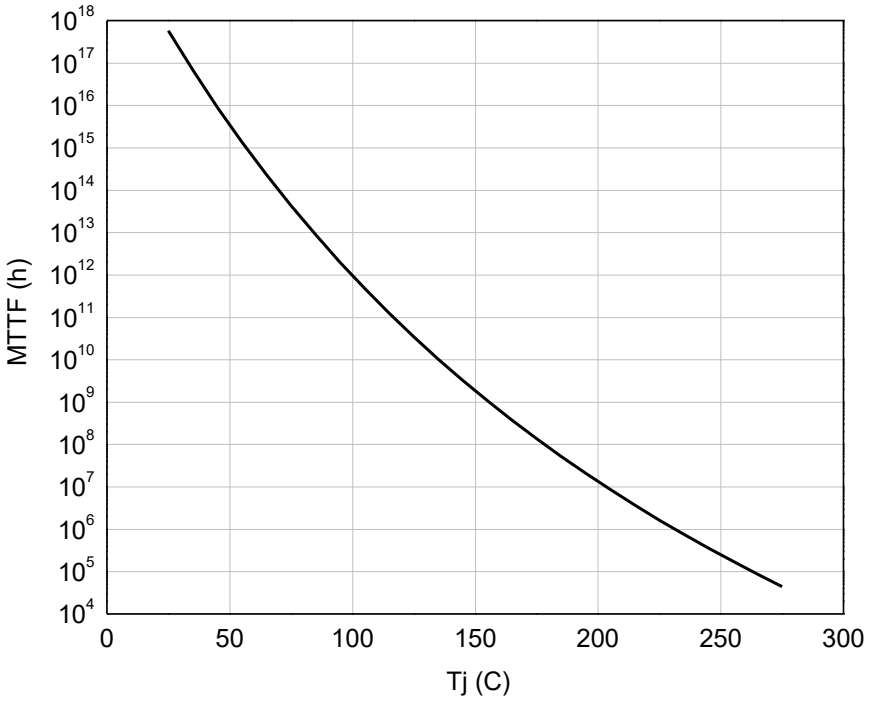


Fig 5. Median lifetime vs. channel temperature

10. Package outline

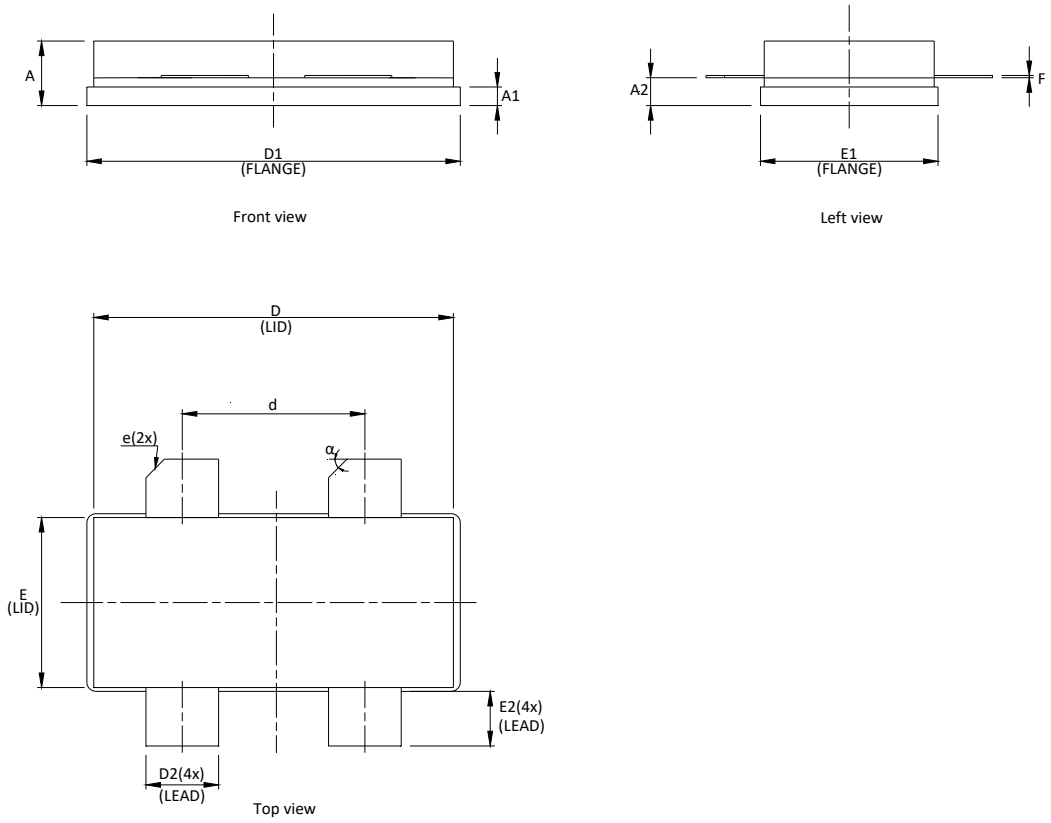


Fig 6. Package outline —— 780P2GB

Table 10. 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		

11. Abbreviations

Table 11. 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

12. Legal information

12.1 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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