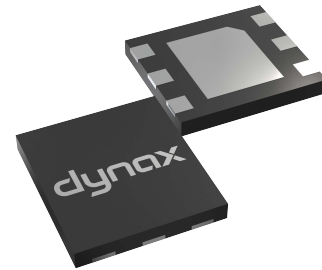# DXG2PH60B-14N

RF Power GaN Transistor

1. Product profile

1.1 General description

DXG2PH60B-14N is a 14 W RF GaN HEMT Transistor with first generation RF GaN technology from Dynax, which is ideal for cellular base station applications at frequencies from DC to 6 GHz.

Table 1. Typical performance [1]

Freq (MHz)	P_{sat} [2] (dBm)	η_D [3] (%)	G_P [3] (dB)	η_D [4] (%)	G_P [4] (dB)
3400	42.2	40.4	14.9	20.8	14.6
3500	42.2	41.8	15.4	22.0	15.1
3600	42.2	39.7	15.3	21.1	15.1

[1] Typical Doherty performance in Dynax Demo with the device soldered onto the heatsink, test condition: V_{DS} = 48 V, I_{DQ} = 20 mA.

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

[3] Test condition: P_{out} = P_{sat} - 6 dB, Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

[4] Test condition: P_{out} = P_{sat} - 13 dB, Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

1.2 Features and benefits

➢ High efficiency, high gain

➢ Internally matched for broadband performance

➢ Excellent electrical stability

1.3 Applications

➢ RF power amplifier for base stations in the DC to 6 GHz frequency range

1.4 Lead-free and RoHS compliant
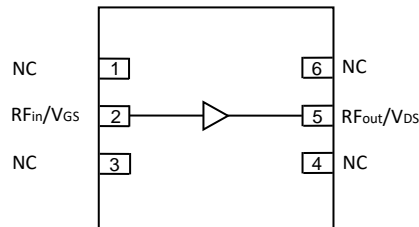
2. Pinning information

Fig 1.   Pin configuration (Top view)

3. Ordering information

Table 2.   Ordering information

Part number	Marking	Package type	Packaging information
DXG2PH60B-14N	DC14B	DFN 4×4.5mm	Tray: Suffix = 490 units
			Tape and Reel: Suffix = 1000 units; 12 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}	1.4	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
Thermal Resistance at Average Power by Infrared Measurement, Active Die Surface-to-Case $T_{base-plate}$ = 85℃, P_D = 4.4 W	R_{thjc}(IR)	10.4	℃/W
Thermal Resistance at Average Power by Finite Element Analysis, Junction-to-Case $T_{base-plate}$ = 85℃, P_D = 4.4 W	R_{thjc}(FEA)	15.0	℃/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 (≥ 500 V)

7. Moisture sensitivity level

Table 6.   Moisture sensitivity level

Test methodology	Class
Moisture Sensitivity Level (per J-STD-020)	Level 3

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}	-	-	1.4	mA
Drain-Source Breakdown Voltage (V_{GS} = -10 V, I_D = 1.4 mA)	$V_{(BR)DSS}$	150	-	-	V
Gate Threshold Voltage (V_{DS} = 48 V, I_D = 1.4 mA)	$V_{GS(th)}$	-4.0	-3.3	-1.0	V
Gate Quiescent Voltage (V_{DS} = 48 V, I_D = 20 mA)	$V_{GS(Q)}$	-	-3.0	-	V

Table 8. RF characteristics (Typical performance – 3700 MHz) [1]

Parameter	Symbol	Min.	Typ.	Max.	Unit
Peak Output Power [2]	P_{sat}	40.0	41.1	-	dBm
Drain Efficiency [3]	η_D	28.0	34.0	-	%
Power Gain [3]	G_P	13.9	15.7	17.5	dB

[1] Typical performance in Dynax DXG2PH60B-14N production test fixture, test condition: V_{DS} = 48 V, I_{DQ} = 20 mA.

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

[3] Test condition: P_{avg} = P_{sat} - 6 dB, Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

Table 9. Load mismatch

Parameter	Result
VSWR 10:1 at V_{DS} = 48 V, 14 W Pulsed CW output power, Pulse width = 100 µs, Duty cycle = 10%.	No device damage

9. Test information
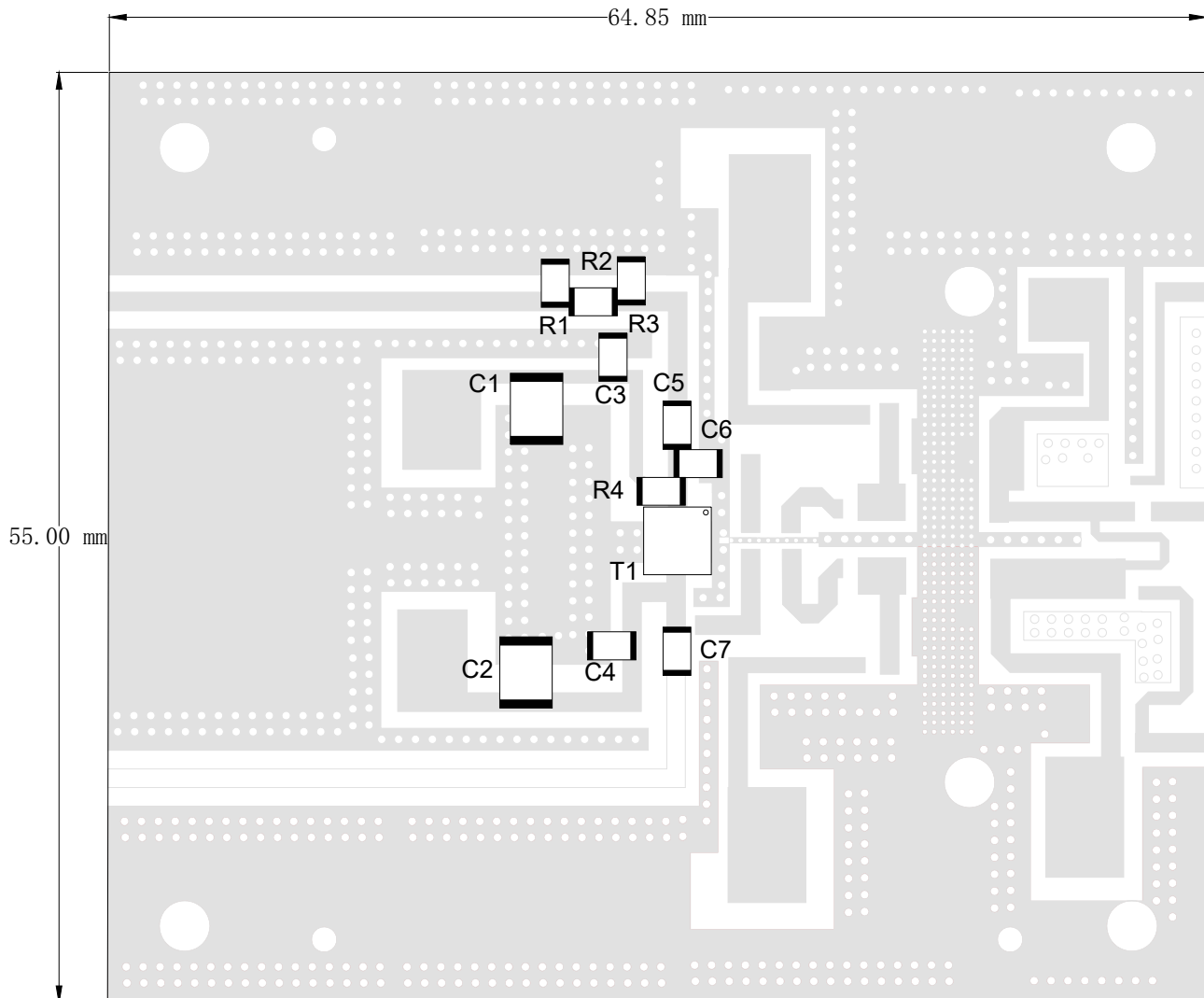
9.1 Typical application circuit

Fig 2.   Component layout

Table 10.   List of components

S/N	Type	Designator	Description	Value	Vendor
1	Cap	C1,C2	GRM32ER72A225KA	2.2 uF	Murata
2	Cap	C3,C4,C7	ATC600F5R6JT250XT	5.6 pF	ATC
3	Cap	C5	ATC600F2R0JT250XT	2.0 pF	ATC
4	Cap	C6	ATC600F0R3JT250XT	0.3 pF	ATC
5	Res	R1,R3	RC0805FR_07431RL	431 Ω	Yageo
6	Res	R2	RC0805FR_0712RL	12 Ω	Yageo
7	Res	R4	RC0805FR_0710RL	10 Ω	Yageo
8	Transistor	T1	DXG2PH60B-14N	/	Dynax

9.2 Graphic data

9.2.1 Pulsed CW
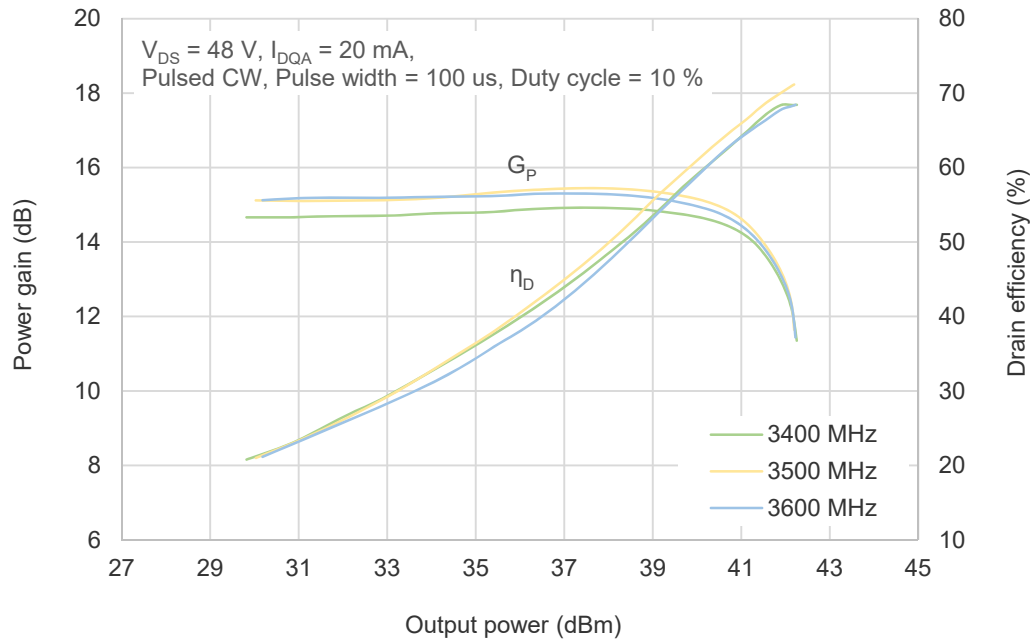

Fig 3.   Power gain, Drain efficiency vs. Pulse output power

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 (%)
3400	8.4 + j3.8	29.0 + j26.0	19.7	42.4	17	67.4
3600	7.8 - j0.0	29.3 + j27.2	19.5	42.3	17	67.4
3800	7.8 - j0.0	26.1 + j21.8	19.5	42.3	17	65.6
Maximum Drain Efficiency						
Freq (MHz)	Z_S (Ω)	Z_L (Ω)	G_P (dB)	P_{sat} (dBm)	P_{sat} (W)	η_D (%)
3400	8.4 + j3.8	17.2 + j42.9	20.4	41.0	12	76.9
3600	7.8 - j0.0	20.5 + j39.9	20.0	41.4	13	75.5
3800	7.8 - j0.0	18.7 + j39.2	19.8	40.8	12	71.5

[1] V_{DS} = 48 V, I_{DQA} = 20 mA, Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.
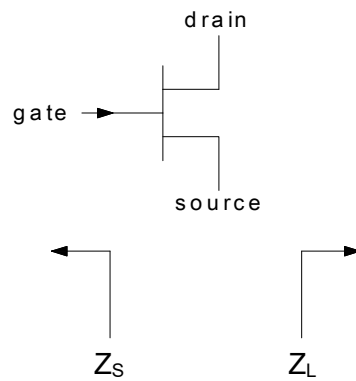

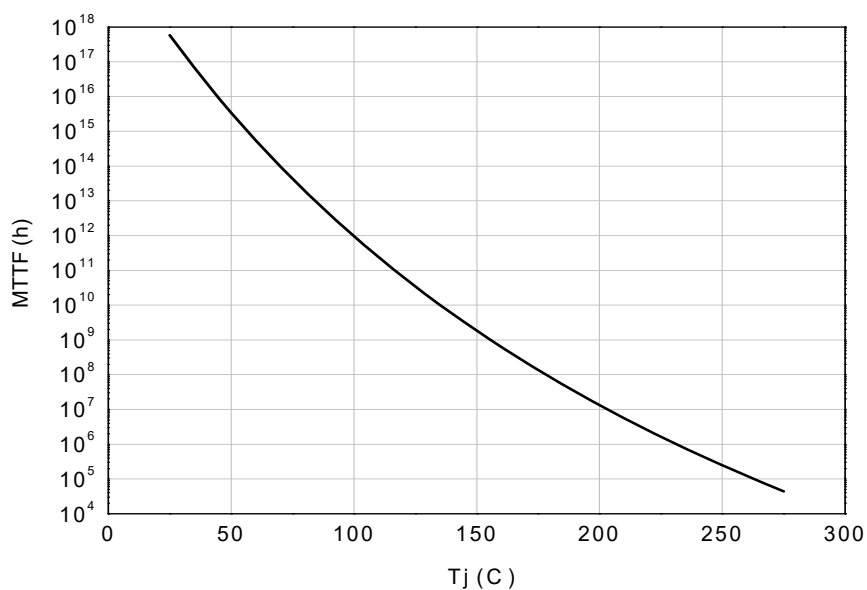Fig 4.   Definition of transistor impedance

11. Median lifetime

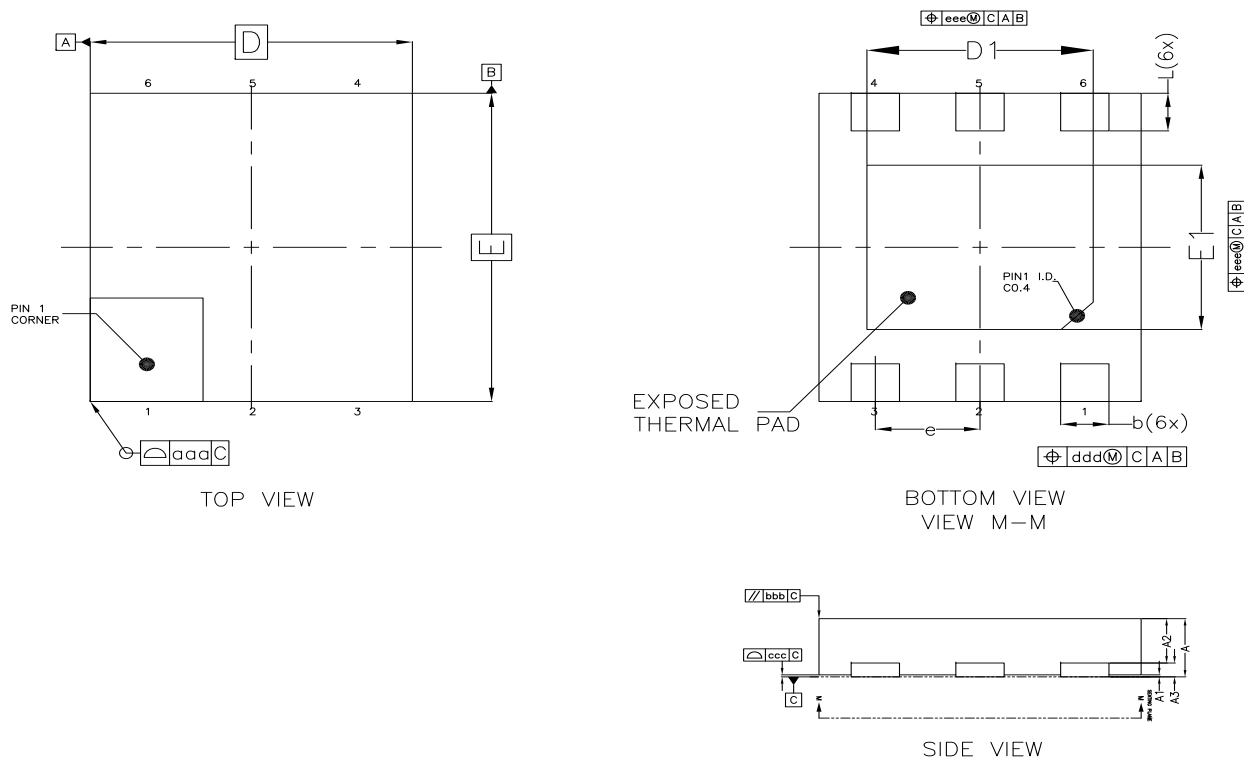Fig 5.   Median lifetime vs. channel temperature

12. Package outline

Fig 6.   Package outline —— DFN 4×4.5mm

Table 12.   Package dimensions

DESCRIPTION		DIM	MILLIMETER		
			MIN	NOM	MAX
TOTAL THICKNESS		A	0.80	0.85	0.90
STAND OFF		A1	0.00	-----	0.05
MOLD THICKNESS		A2	0.60	0.65	0.70
L/F THICKNESS		A3	0.203 REF		
BODY SIZE	X	D	3.95	4.00	4.05
	Y	E	4.45	4.50	4.55
LEAD PITCH		e	1.30 BSC		
LEAD WIDTH		b	0.55	0.60	0.65
LEAD LENGTH		L	0.50	0.55	0.60
EP SIZE		D1	2.76	2.81	2.86
		E1	2.35	2.40	2.45
Tolerance of form and position					
PACKAGE EDGE TOLERANCE		aaa	0.1		
MOLD FLATNESS		bbb	0.1		
LEAD COPLANARITY		ccc	0.08		
LEAD POSITION OFFSET		ddd	0.1		
EXPOSED PAD OFFSET		eee	0.1		

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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