DXG1PH60B-10N2

RF Power GaN Transistor

1. Product profile

1.1 General description

DXG1PH60B-10N2 is a 10 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)
3500	40.3	32.3	20.2	14.6	20.8

[1] Typical Doherty performance in Dynax Demo with the device soldered onto the heatsink, test condition: V_{DS} = 48 V, I_{DQ} = 30 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

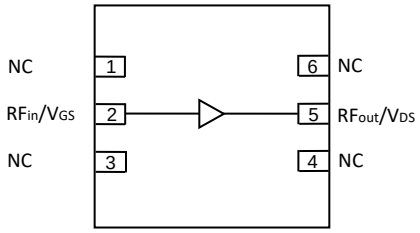

Fig 1. Pin configuration (Top view)

3. Ordering information

Table 2. Ordering information

Part number	Marking	Package type	Packaging information
DXG1PH60B-10N2	DC1C	DFN 4×4mm	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}	1.0	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 = 3.7 W	R_{thjc}(IR)	14.6	℃/W
Thermal Resistance at Average Power by Finite Element Analysis, Junction-to-Case $T_{base\text{-}plate}$ = 85℃, P_D = 3.7 W	R_{thjc}(FEA)	20.4	℃/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 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}	-	-	1.0	mA
Drain-Source Breakdown Voltage (V_{GS} = -10 V, I_D = 1.0 mA)	$V_{(BR)DSS}$	150	-	-	V
Gate Threshold Voltage (V_{DS} = 48 V, I_D = 1.0 mA)	$V_{GS(th)}$	-4.0	-3.2	-1.0	V
Gate Quiescent Voltage (V_{DS} = 48 V, I_D = 30 mA)	$V_{GS(Q)}$	-	-3.0	-	V

Table 8. RF characteristics (Typical performance – 1805 MHz) [1]

Parameter	Symbol	Min.	Typ.	Max.	Unit
Peak Output Power [2]	P_{sat}	38.9	40.0	-	dBm
Drain Efficiency [3]	η_D	24.5	30.5	-	%
Power Gain [3]	G_P	18.1	19.9	21.7	dB

[1] Typical performance in Dynax DXG1PH60B-10N2 production test fixture, test condition: V_{DS} = 48 V, I_{DQ} = 30 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 %.

Table 9. Load mismatch

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

9. Test information

9.1 Typical application circuit

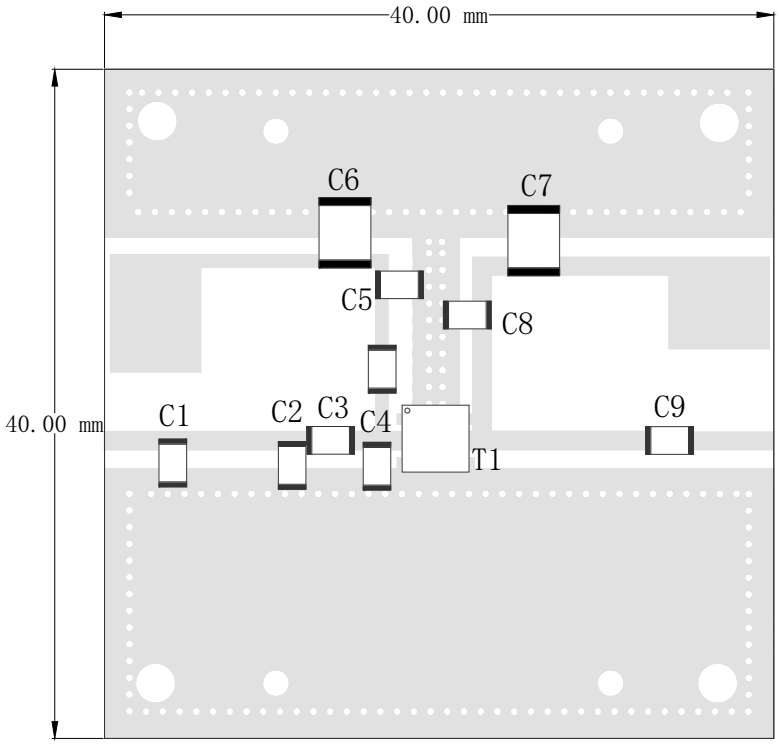

Fig 2. Component layout

Table 10. List of components

S/N	Type	Designator	Description	Value	Vendor
1	Cap	C5,C8,C9	ATC600F6R8JT250XT	6.8 pF	ATC
2	Cap	C1,C2	ATC600F1R0JT250XT	1.0 pF	ATC
3	Cap	C3	ATC600F2R0JT250XT	2.0 pF	TDK
4	Cap	C4	ATC600F1R5JT250XT	1.5 pF	Yageo
5	Cap	C6,C7	GRM32ER72A225KA35L	2.2 uF	Murata
6	Res	R1	RC1206FR_0710RL	10 Ω	Yageo
7	Transistor	T1	DXG1PH60B-10N2	/	Dynax

9.2 Graphic data

9.2.1 Pulsed CW

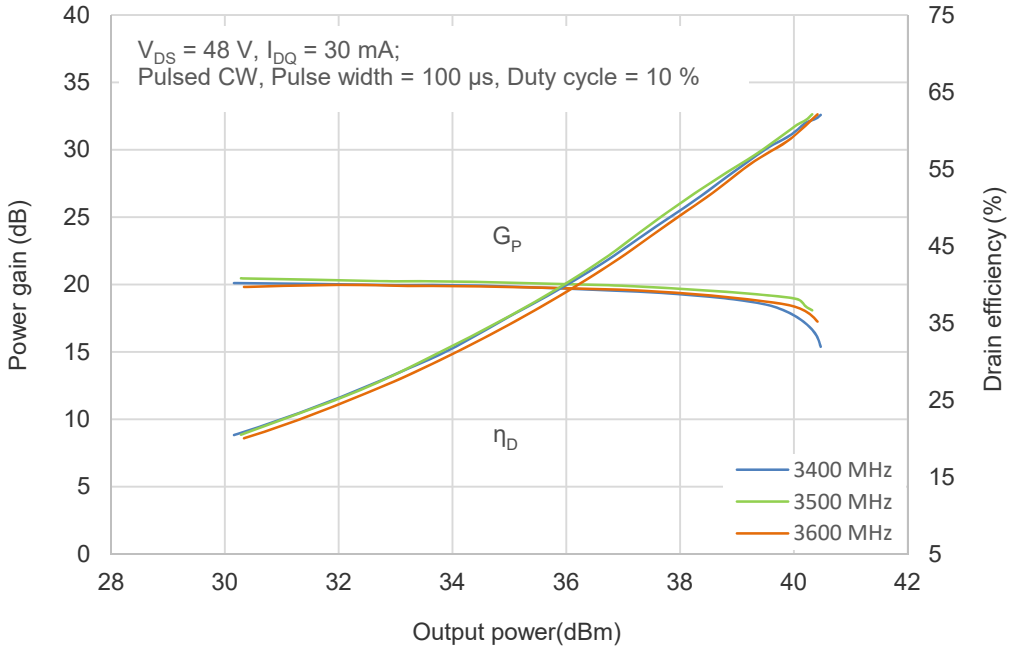

Fig 3. Power gain, Drain efficiency vs. Pulse output power

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 (%)
2100	3.6 + j18.0	39.9 + j42.5	25.1	40.9	11	62.2
2600	7.5 + j11.5	29.4 + j38.0	24.6	40.8	11	62.1
3500	5.4 + j5.3	31.7 + j34.3	21.1	40.7	11	60.5
Maximum Drain Efficiency						
Freq (MHz)	Z_S (Ω)	Z_L (Ω)	G_P (dB)	P_{sat} (dBm)	P_{sat} (W)	η_D (%)
2100	3.6 + j18.0	27.8 + j61.3	27.9	39.8	9	71.5
2600	7.5 + j11.5	15.8 + j53.8	27.2	39.8	9	70.9
3500	5.4 + j5.3	24.4 + j43.9	22.6	39.7	9	68.1

[1] V_{DS} = 48 V, I_{DQ} = 30 mA, Pulsed CW, Pulse width = 100 µs, Duty cycle = 10 %.

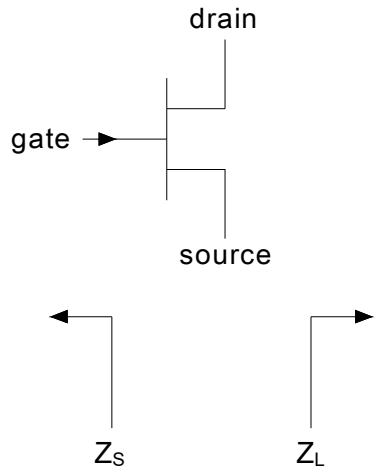

Fig 4. Definition of transistor impedance

11. Median lifetime

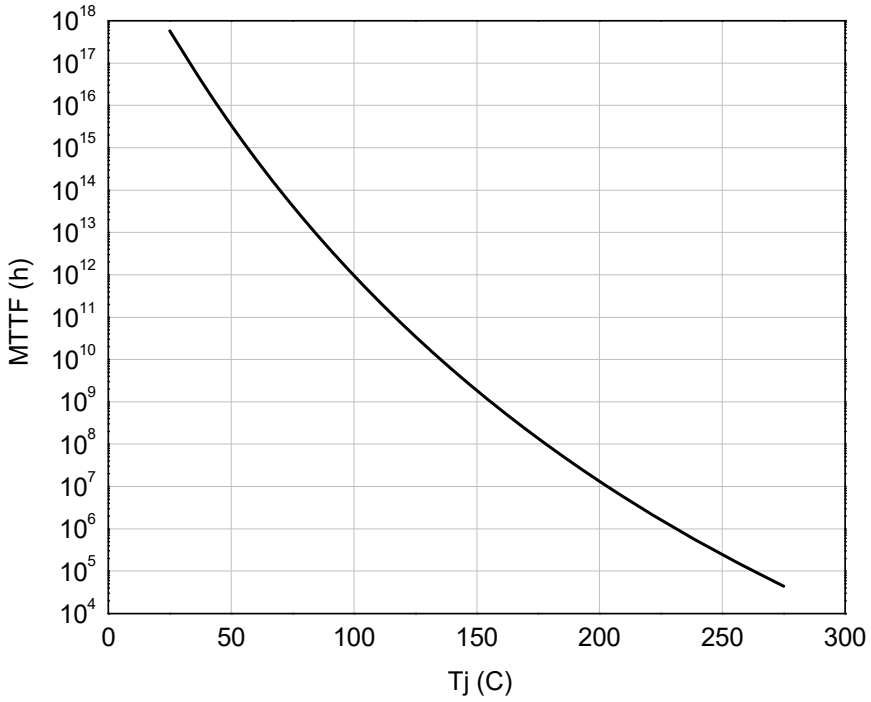

Fig 5. Median lifetime vs. channel temperature

12. Package outline

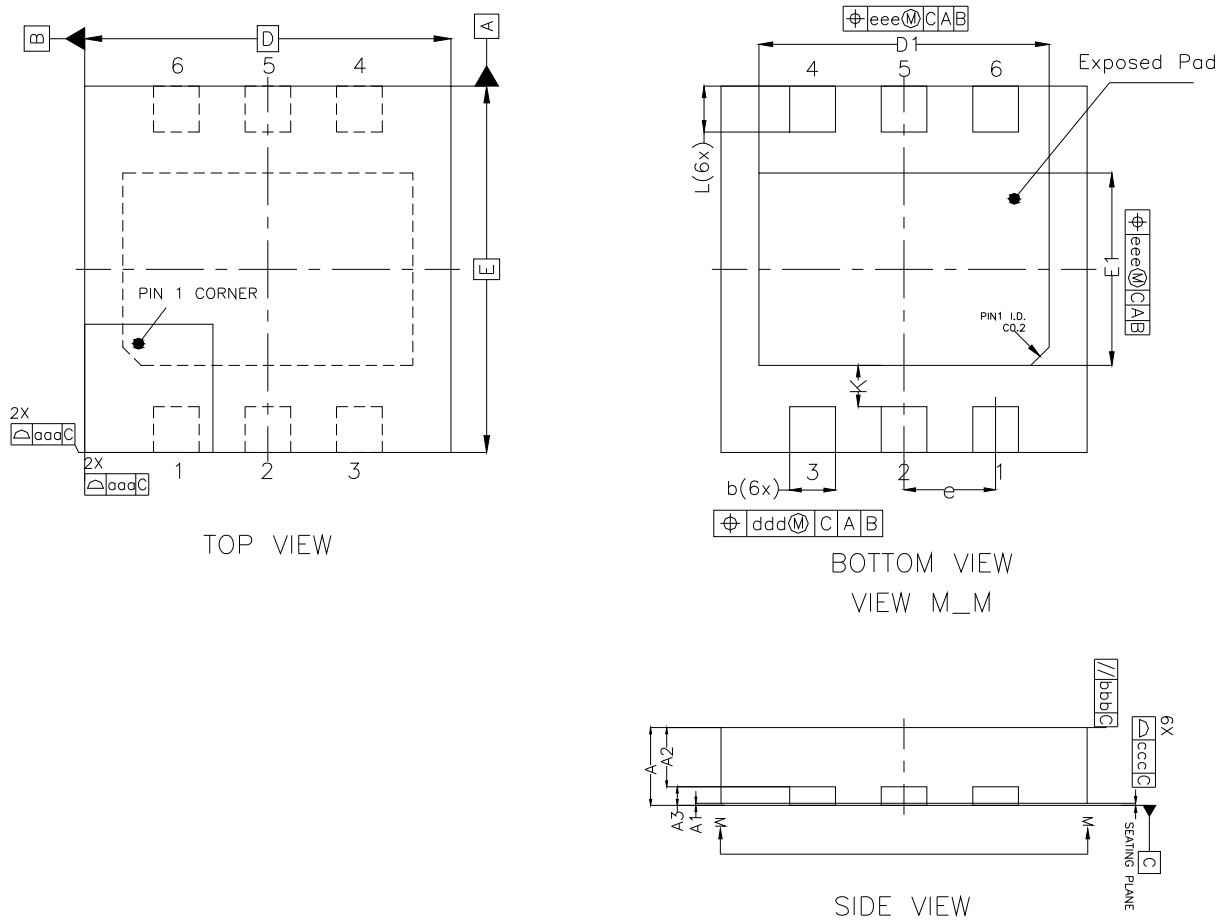

Fig 6. Package outline ——DFN 4×4mm

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		
LEAD WIDTH		b	0.45	0.50	0.55
BODY SIZE	X	D	3.90	4.00	4.10
	Y	E	3.90	4.00	4.10
LEAD PITCH		e	1.0 BSC		
LEAD LENGTH		L	0.45	0.50	0.55
EP SIZE	X	D1	3.12	3.17	3.22
	Y	E1	2.05	2.10	2.15
LEAD TIP TO EDGE		K	0.450 REF		
Tolerance of form and position					
PACKAGE EDGE TOLERANCE		aaa	0.1		

(Continued)

DESCRIPTION	DIM	MILLIMETER		
		MIN	NOM	MAX
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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