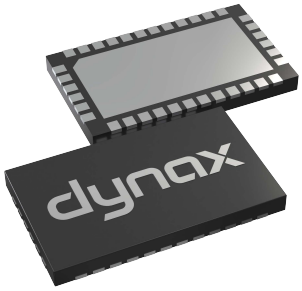
# DXG2MH50A-50N

## RF Power GaN Transistor




## 1. Product profile

### 1.1 General description

DXG2MH50A-50N is a 50 W RF GaN HEMT Transistor with second generation RF GaN technology from Dynax, which is ideal for cellular base station applications at frequencies from 4700 MHz to 5000 MHz.

**Table 1. Typical performance [1]**

| Freq (MHz) | $P_{sat}$ [2] (dBm) | $P_{avg}$ [3] (dBm) | $\eta_D$ [3] (%) | $G_P$ [3] (dB) | ACPR [3] (dBc) |
|---|---|---|---|---|---|
| 4700 | 47.0 | 39.0 | 41.0 | 27.9 | -34.0 |
| 4800 | 47.1 | 39.0 | 40.8 | 28.3 | -36.0 |
| 4900 | 47.1 | 39.0 | 40.5 | 28.3 | -36.0 |
| 5000 | 47.0 | 39.0 | 40.3 | 28.3 | -36.0 |

[1] Typical Doherty performance in Dynax Demo with the device soldered onto the heatsink, test condition: $V_{DS}$ = 48 V, IDQ_Driver = 25 mA, IDQ_Carrier = 65 mA, VGS_Peaking = - 5.1 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 4700 MHz to 5000 MHz frequency range

### 1.4 Lead-free and RoHS compliant

## 2. Pinning information

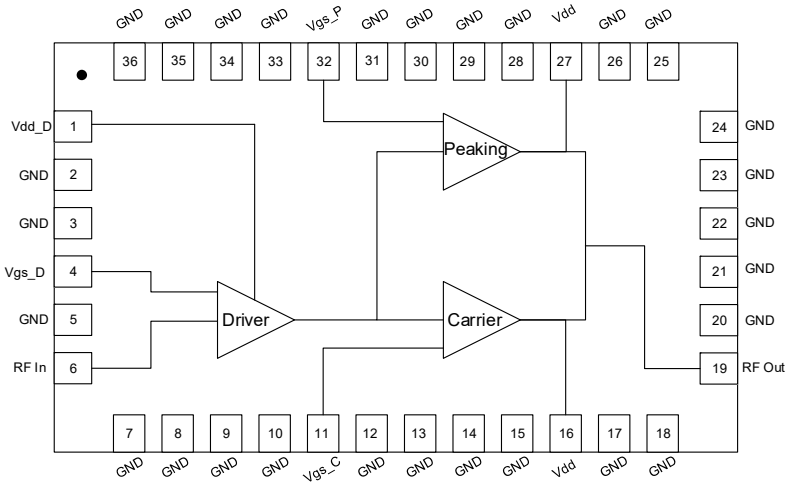



Fig 1. Pin configuration (Top view)

## 3. Ordering information

### Table 2. Ordering information

| Part number | Marking | Package type | Packaging information |
|---|---|---|---|
| DXG2MH50A-50N | LS12A | LGA 6×10mm | Tray: Suffix = 20 units |
| | | | Tape and Reel:<br>Suffix = 100 units; 44 mm Tape width;<br>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 | $I_{GMAX}$ | 7.7 | 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<br>$T_{base\text{-}plate}$ = 85℃, $P_D$ = 8.8 W | $R_{thjc}$(IR) | 8.2 | ℃/W |
| Thermal Resistance at Average Power by Finite Element Analysis, Junction-to-Case<br>$T_{base\text{-}plate}$ = 85℃, $P_D$ =8.8 W | $R_{thjc}$(FEA) | 11.0 | ℃/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) | 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<br>($V_{GS}$ = -10 V, $V_{DS}$ = 150 V) | $I_{DSS}$ | - | - | 2.5 | mA |
| Drain-Source Breakdown Voltage<br>($V_{GS}$ = -10 V, $I_D$ = 2.5 mA) | $V_{(BR)DSS}$ | 150 | - | - | V |
| Gate Threshold Voltage<br>($V_{DS}$ = 48 V, $I_D$ = 2.5 mA) | $V_{GS(th)}$ | -4.0 | -3.2 | -1.0 | V |
| **Side B, Peaking** | | | | | |
| Drain-Source Leakage Current | $I_{DSS}$ | - | - | 4.2 | mA |

| | | | | | |
|---|---|---|---|---|---|
| ($V_{GS}$ = -10 V, $V_{DS}$ = 150 V) | | | | | |
| Drain-Source Breakdown Voltage ($V_{GS}$ = -10 V, $I_D$ = 4.2 mA) | $V_{(BR)DSS}$ | 150 | - | - | V |
| Gate Threshold Voltage ($V_{DS}$ = 48 V, $I_D$ = 4.2 mA) | $V_{GS(th)}$ | -4.0 | -3.2 | -1.0 | V |
| **Side C, Driver** | | | | | |
| 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 ($V_{DD}$ = 48 V, $I_D$ = 25 mA) | $V_{GS(Q)}$ | - | -3.0 | - | V |

## Table 8. RF characteristics (Typical Doherty performance – 5000 MHz) [1]

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Peak Output Power [2] | $P_{sat}$ | 45.4 | 46.4 | - | dBm |
| Drain Efficiency [3] | $\eta_D$ | 26.5 | 33.5 | - | % |
| Power Gain [3] | $G_P$ | 21.4 | 24.6 | 27.8 | dB |

[1] Typical Doherty performance in Dynax DXG2MH50A-50N production test fixture, test condition: $V_{DS}$ = 48 V, IDQ_A = 60 mA, IDQ_C = 20 mA , VGS_B = -2.9 V + $V_{GSQ}$ @10 mA.

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

[3] Test condition: $P_{avg}$ = 39.0 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,<br>50 W Pulsed CW output power,<br>Pulse width = 100 µs, Duty cycle = 10%. | No device damage |

# 9. Test information

## 9.1 Typical application circuit

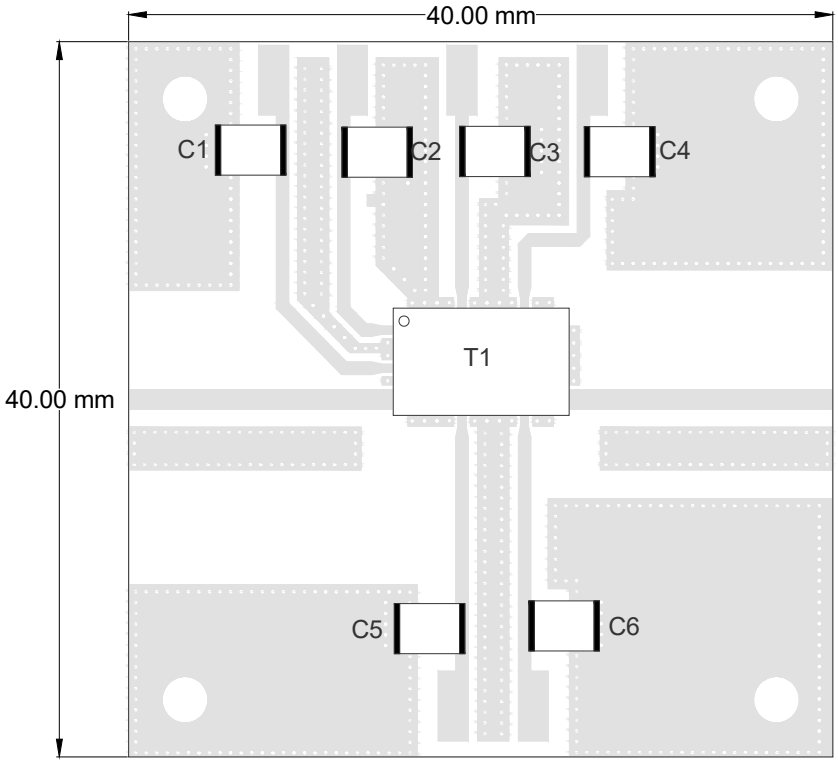



Fig 2. Component layout

**Table 10. List of components**

| S/N | Type | Designator | Description | Value | Vendor |
|---|---|---|---|---|---|
| 1 | Cap | C1,C2,C3,C4,C5,C6 | GRM31CZ72A475KE | 4.7 uF | Murata |
| 2 | Transistor | T1 | DXG2MH50A-50N | / | Dynax |
| 3 | PCB | | Rogers 4350B | 20 mil | Rogers |

## 9.2 Graphic data

### 9.2.1 Pulsed CW

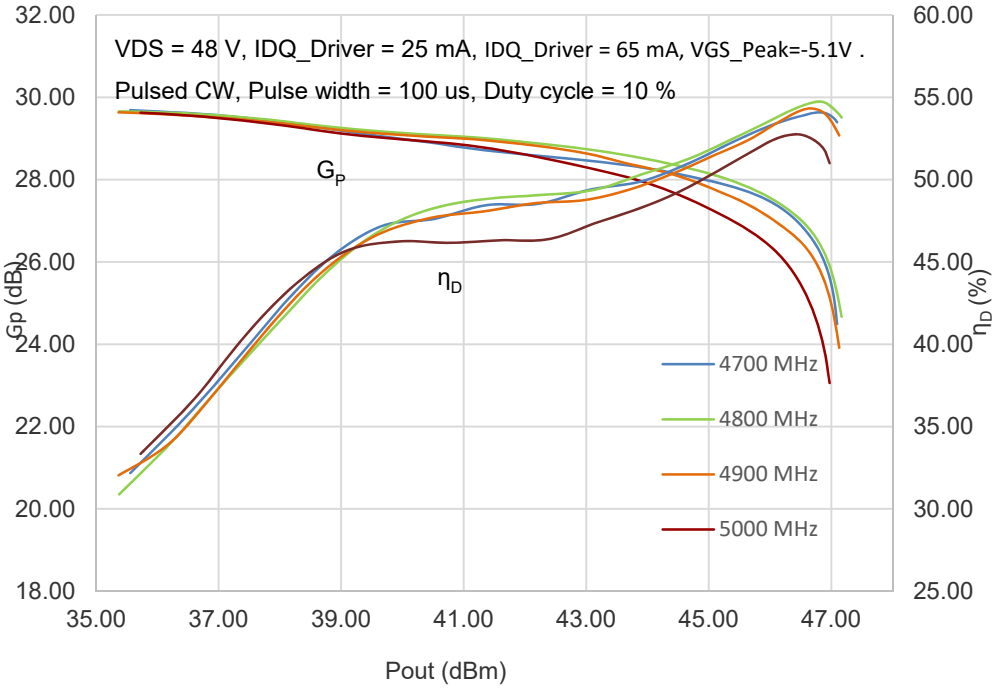



Fig 3. Power gain, Drain efficiency vs. Pulse output power

## 10. Median lifetime

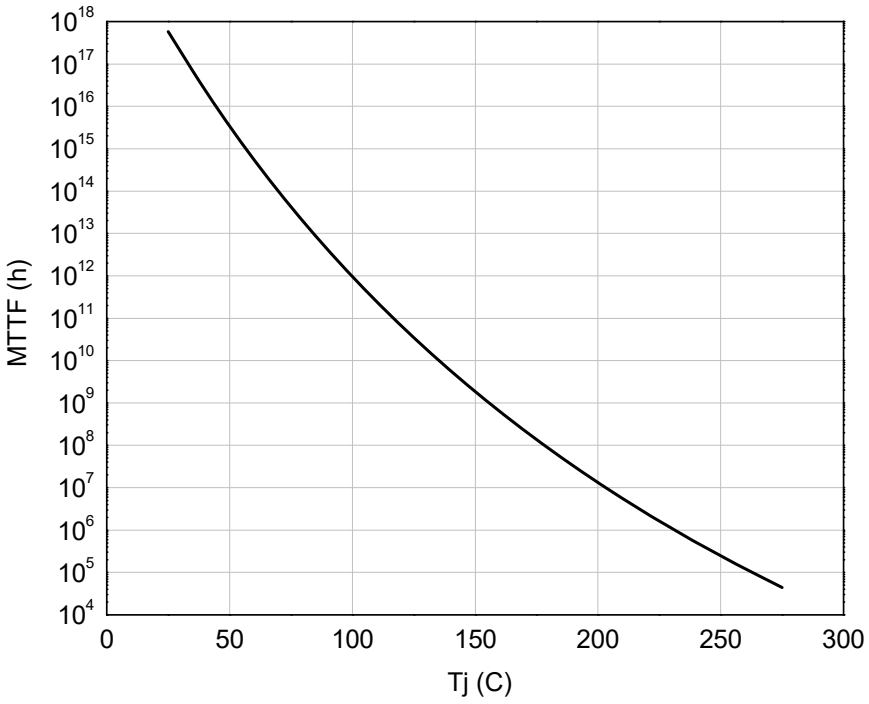



Fig 4. Median lifetime vs. channel temperature

# 11. Package outline

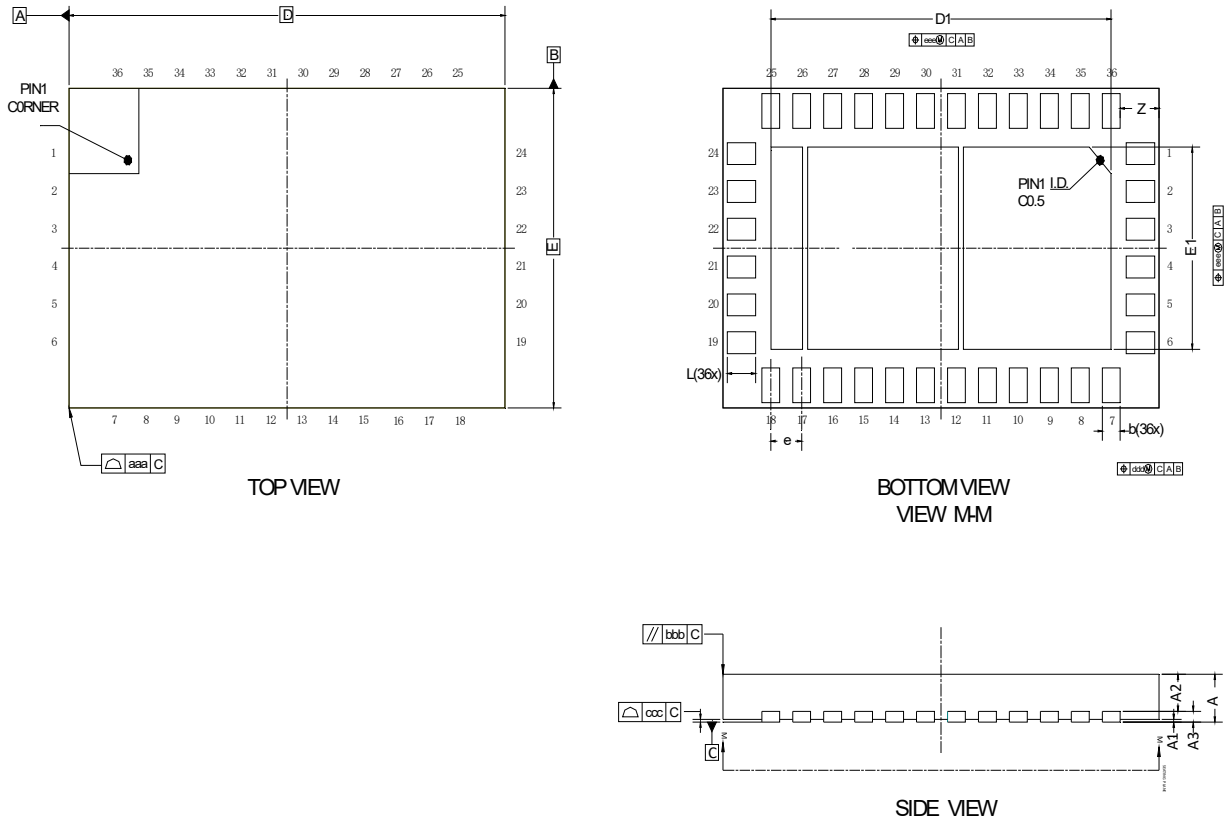



Fig 5. Package outline ——LGA 6×10mm

## Table 11. Package dimensions

| DESCRIPTION | | DIM | MILLIMETER | | |
|---|---|---|---|---|---|
| | | | MIN | NOM | MAX |
| TOTAL THICKNESS | | A | 0.85 | 0.90 | 0.95 |
| STAND OFF | | A1 | 0.00 | ----- | 0.05 |
| MOLD THICKNESS | | A2 | 0.525 | 0.60 | 0.675 |
| L/F THICKNESS | | A3 | | 0.30 REF | |
| BODY SIZE | X | D | 9.90 | 10.00 | 10.10 |
| | Y | E | 5.90 | 6.00 | 6.10 |
| LEAD PITCH | | e | | 0.71 BSC | |
| LEAD WIDTH | | b | 0.36 | 0.41 | 0.46 |
| LEAD LENGTH | | L | 0.60 | 0.65 | 0.70 |
| EP SIZE | X | D1 | 7.60 | 7.80 | 8.00 |
| | Y | E1 | 3.70 | 3.80 | 3.90 |
| LEAD EDGE TO PKG EDGE | | Z | | 0.89 BSC | |
| Tolerance of form and position | | | | | |
| PACKAGE EDGE TOLERANCE | | aaa | | 0.1 | |
| MOLD FLATNESS | | bbb | | 0.1 | |

(Continued)

| DESCRIPTION | DIM | MILLIMETER | | |
|---|---|---|---|---|
| | | MIN | NOM | MAX |
| LEAD COPLANARITY | ccc | | 0.08 | |
| LEAD POSITION OFFSET | ddd | | 0.1 | |
| EXPOSED PAD OFFSET | eee | | 0.1 | |

# 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. |

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