



Gallium Nitride 28V 4W, General purpose RF Power Transistor

Description

The GTAH80004PD is a 4W GaN HEMT, designed for multiple applications, up to 10GHz.

The transistor is available in a highly cost effective 4mm*4mm, surface mount, DFN package with 100% DC production test to ensure the quality and consistency.

It can be used in CW, Pulse and any other modulation modes, especially LTE-U/WIFI 6/WIFI 6E etc. There is no guarantee of performance when this part is used in applications designed Outside of these frequencies.

- Typical Performance of class AB circuit (On Innegration fixture):

$V_{DD} = 28\text{ V}$, $I_{DQ} = 10\text{ mA}$, Pulsed CW, 100us, 10%

| Freq(MHz) | Pin(dBm) | Psat(dBm) | Psat(W) | Ids(A) | Gain(dB) | Eff(%) |
|-----------|----------|-----------|---------|--------|----------|--------|
| 9000 | 31.0 | 36.3 | 4.3 | 0.040 | 5.3 | 38.4 |
| 9100 | 31.0 | 36.4 | 4.4 | 0.040 | 5.4 | 39.2 |
| 9200 | 31.0 | 36.2 | 4.2 | 0.041 | 5.2 | 36.6 |
| 9300 | 31.1 | 36.3 | 4.3 | 0.042 | 5.2 | 36.3 |
| 9400 | 31.1 | 36.6 | 4.5 | 0.042 | 5.5 | 38.6 |
| 9500 | 31.1 | 36.6 | 4.6 | 0.040 | 5.5 | 40.7 |
| 9600 | 31.2 | 36.5 | 4.5 | 0.039 | 5.3 | 40.9 |
| 9700 | 31.2 | 36.6 | 4.6 | 0.039 | 5.4 | 41.9 |
| 9800 | 31.2 | 36.6 | 4.5 | 0.038 | 5.4 | 42.7 |
| 9900 | 31.2 | 36.4 | 4.3 | 0.036 | 5.2 | 42.8 |
| 10000 | 31.2 | 36.0 | 4.0 | 0.034 | 4.8 | 41.8 |

- Typical Performance of class AB circuit (On Innegration fixture):

$V_{DD} = 32\text{ V}$, $I_{DQ} = 10\text{ mA}$, Pulsed CW,

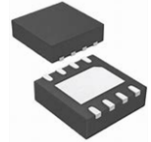
| Freq(MHz) | Pin(dBm) | Psat(dBm) | Psat(W) | Ids(A) | Gain(dB) | Eff(%) |
|-----------|----------|-----------|---------|--------|----------|--------|
| 7200 | 28 | 36.94 | 4.9 | 0.0333 | 8.94 | 46.39 |
| 7300 | 26.64 | 36.64 | 4.6 | 0.0318 | 10 | 45.33 |
| 7400 | 26.5 | 36.99 | 5.0 | 0.0333 | 10.49 | 46.93 |
| 7500 | 26.28 | 37.08 | 5.1 | 0.0339 | 10.8 | 47.06 |
| 7600 | 26.5 | 37.1 | 5.1 | 0.0339 | 10.6 | 47.28 |
| 7700 | 27.41 | 36.91 | 4.9 | 0.033 | 9.5 | 46.49 |
| 7800 | 27.95 | 36.82 | 4.8 | 0.0305 | 8.87 | 49.27 |

Other application data available upon request: 1.8-2.2GHz, 2.3-2.7, 3.4-3.8GHz

Applications and Features

- Suitable for wireless communication infrastructure, wideband amplifier, EMC testing, ISM etc.
- High Efficiency and Linear Gain Operations
- Thermally Enhanced Industry Standard Package
- High Reliability Metallization Process
- Excellent thermal Stability and Excellent Ruggedness
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

GTAH80004PD



DFN 4*4mm



Note: Proper Biasing Sequence for GaN HEMT Transistors

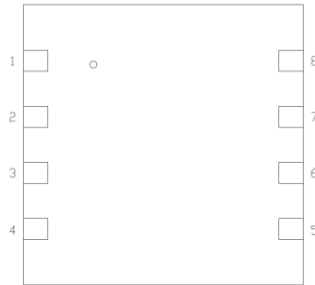
Turning the device ON

1. Set VGS to the pinch—off (VP) voltage, typically –5 V
2. Turn on VDS to nominal supply voltage (28V)
3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

Turning the device OFF

1. Turn RF power off
2. Reduce VGS down to VP, typically –5 V
3. Reduce VDS down to 0 V
4. Turn off VGS

Pin Configuration and Description(Top view)



| Pin No. | Symbol | Description |
|--------------|-------------|--|
| 2, 3 | RF IN /VGS | RF Input, Gate Bias |
| 6, 7 | RF OUT /VDS | RF Output, Drain Bias |
| 1, 4, 5, 8 | NC | No connection |
| Package Base | GND | DC/RF Ground. Must be soldered to EVB ground plane over array of vias for thermal and RF performance. Solder voids under Pkg Base will result in excessive junction temperatures causing permanent damage. |

Table 1. Maximum Ratings (Not simultaneous, TC = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|--|------------|-------------|------|
| Drain--Source Voltage | V_{DS} | 150 | Vdc |
| Gate--Source Voltage | V_{GS} | -10,+2 | Vdc |
| Operating Voltage | V_{DD} | 40 | Vdc |
| Maximum Forward Gate Current | I_{gmax} | 1 | mA |
| Storage Temperature Range | T_{stg} | -65 to +150 | °C |
| Case Operating Temperature | T_c | +150 | °C |
| Operating Junction Temperature(See note 1) | T_J | +225 | °C |

1. Continuous operation at maximum junction temperature will affect MTTF
2. Bias Conditions should also satisfy the following expression: $P_{diss} < (T_J - T_c) / R_{JC}$ and $T_c = T_{case}$

Table 2. Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|--------------------|-------|------|
| Thermal Resistance, Junction to Case $T_c = 85^\circ\text{C}$, $T_J = 200^\circ\text{C}$, DC Power Dissipation, FEA (See note 1) | $R_{\theta JC-DC}$ | 16 | C/W |

1. $R_{\theta JC-DC}$ is tested at only DC condition, it is related to the highest thermal resistor value among all test conditions. It might be differently lower in different RF operation conditions like CW signal ,pulsed RF signal etc.

Table 3. Electrical Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise noted)

DC Characteristics



| Characteristic | Conditions | Symbol | Min | Typ | Max | Unit |
|--------------------------------|---|--------------|-----|------|-----|------|
| Drain-Source Breakdown Voltage | $V_{GS} = -8V$; $I_{DS} = 1mA$ | V_{DSS} | | 150 | | V |
| Gate Threshold Voltage | $V_{DS} = 28V$, $I_D = 1mA$ | $V_{GS(th)}$ | -4 | | -2 | V |
| Gate Quiescent Voltage | $V_{DS} = 32V$, $I_{DS} = 10mA$, Measured in Functional Test | $V_{GS(Q)}$ | — | -2.4 | — | V |

Functional Tests (In Innegration broadband Test Fixture, 50 ohm system) : $V_{DD} = 32Vdc$, $I_{DQ} = 10 mA$, $f = 7500 MHz$, CW

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|--------|-----|------|-----|------|
| Power Gain @Psat | Gp | 8 | | | dB |
| Drain Efficiency @Psat | Eff | 45 | 49 | | % |
| Saturated Power | Psat | 4 | 5 | | W |
| Input Return Loss | IRL | | -7 | | dB |
| Mismatch stress at all phases(No device damage) | VSWR | | 10:1 | | Ψ |

7.2-7.8GHz

TYPICAL CHARACTERISTICS

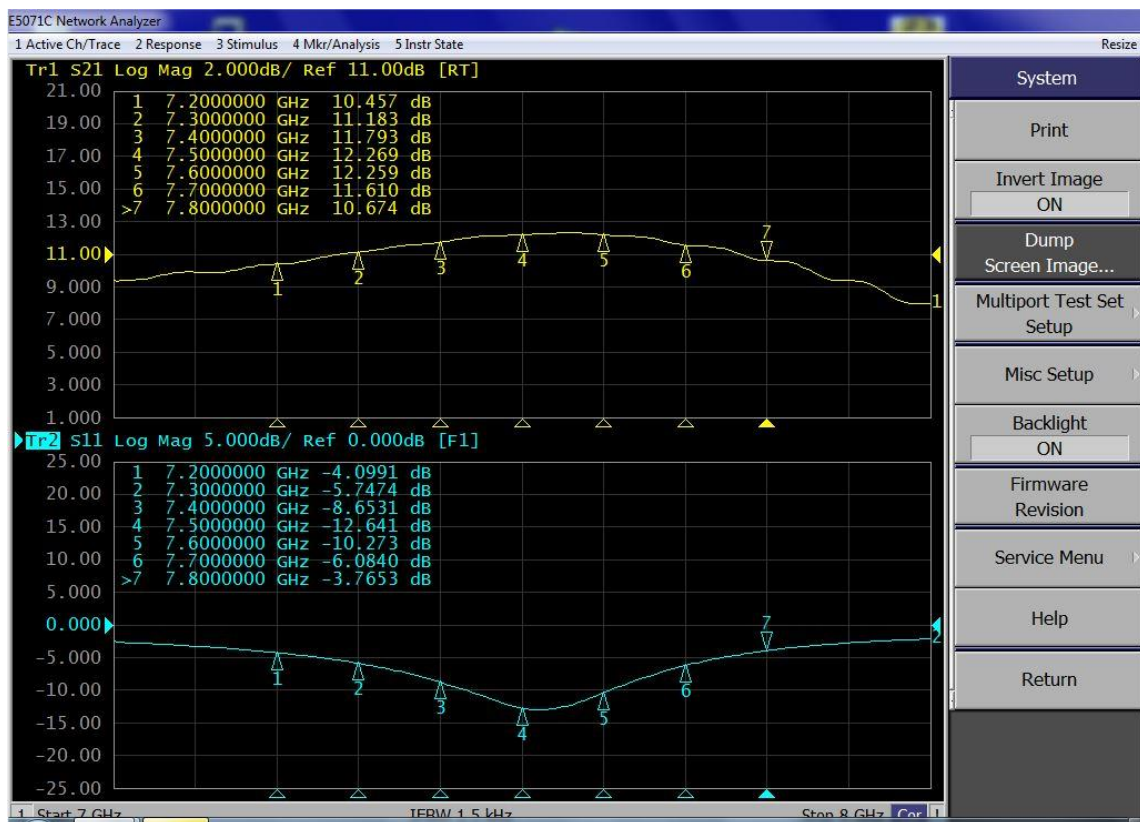


Figure 1. Network analyzer output S11/S21

Reference circuit of test fixture assembly diagram

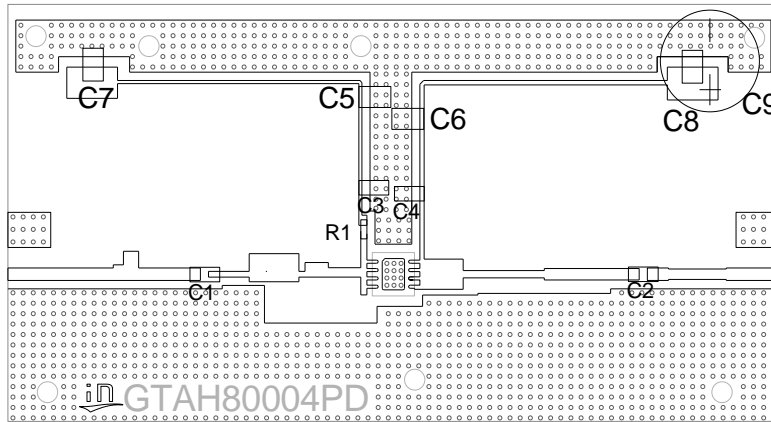


Figure 2. 7200-7800MHz fixture

Table 4: components designations and values of 7200-7800Mhz fixture

| Component | Description | Suggested Manufacturer |
|-------------|---|------------------------|
| C1、C2、C3、C4 | 1.8pF | DLC75D |
| C5、C6、C7、C8 | Ceramic multilayer capacitor, 10uF, 100V | 10uF/100V |
| C9 | 470UF | 63V/470UF |
| R1 | Chip Resistor, 11 Ω , 0603 | |
| PCB | 0.508mm [0.020"] thick, $\epsilon_r=3.5$, Rogers 4350B | |

9-10GHz

TYPICAL CHARACTERISTICS

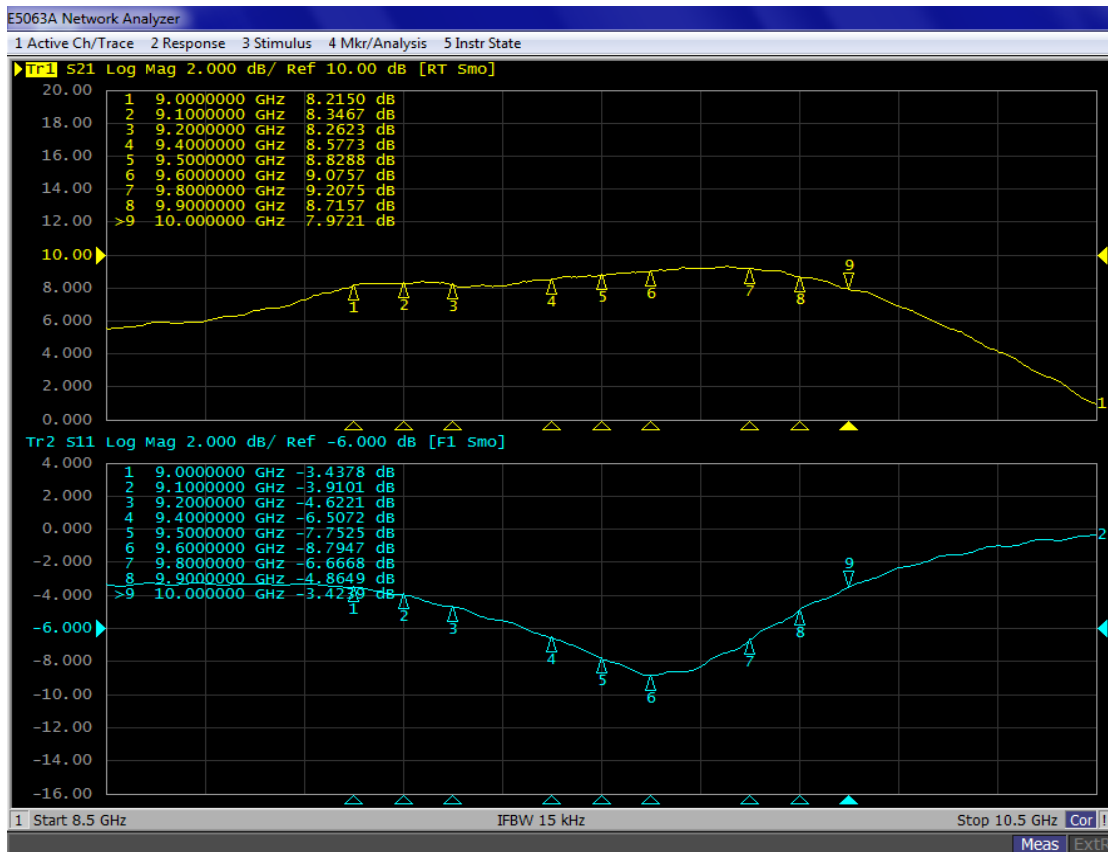


Figure 3. Network analyzer output S11/S21

Reference circuit of test fixture assembly diagram

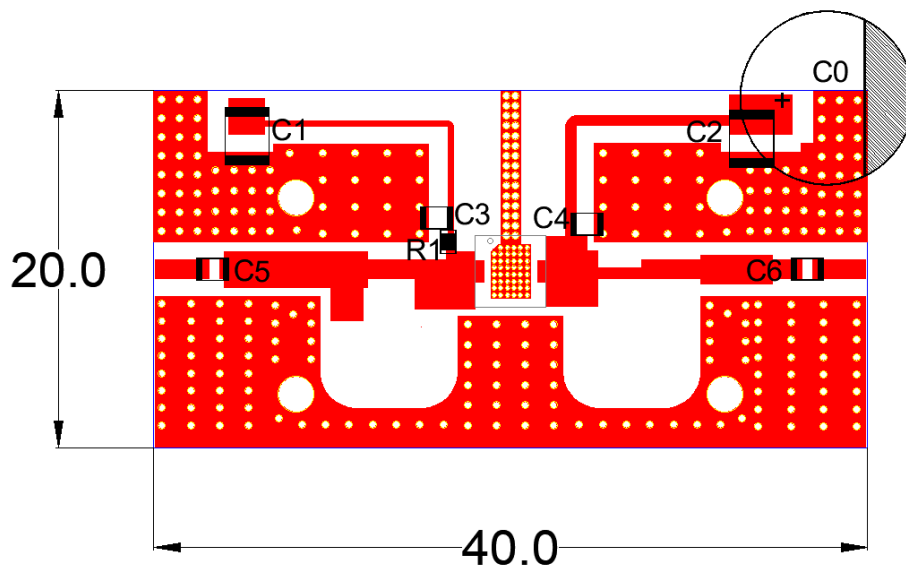




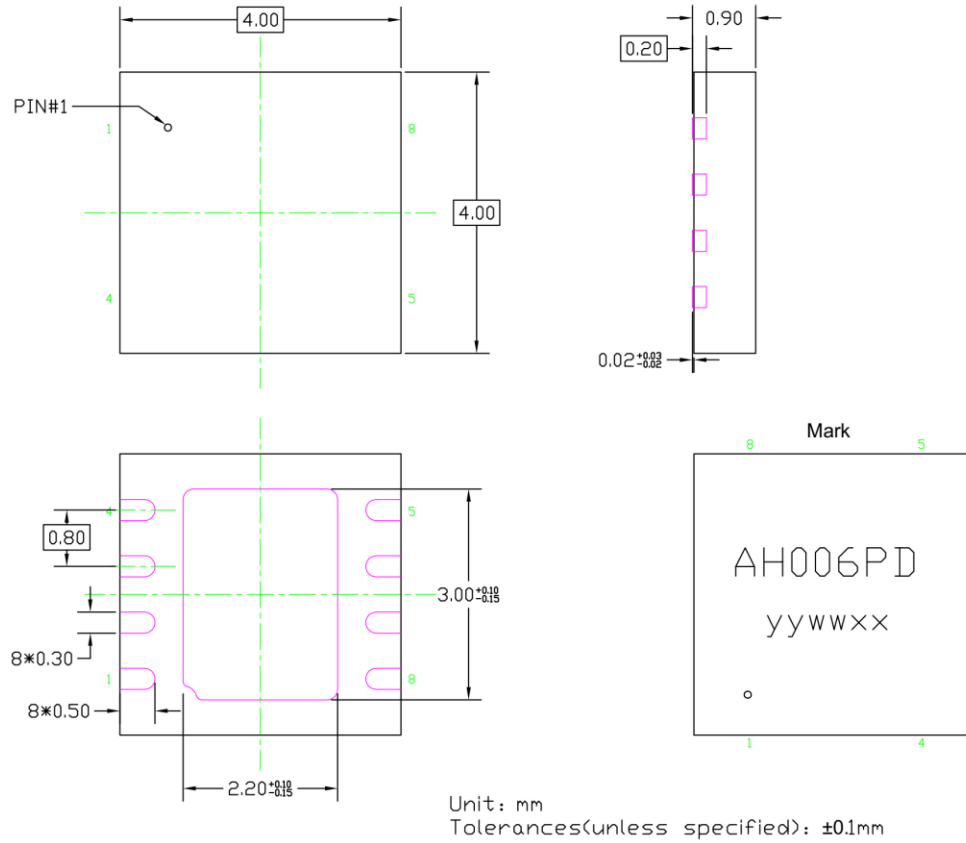
Table 5: components designations and values

| Component | Description | Suggestion |
|----------------|---|---------------------------|
| C0 | 470uF/63V | Electrolytic Capacitor |
| C1, C2 | 10uF | 1210 |
| C3, C4, C5, C6 | 0.8pF | |
| R1 | Chip Resistor, 10Ω | 0603 |
| PCB | Rogers 4350B, thickness 20 mils, 1oz copper | |



Package Dimensions

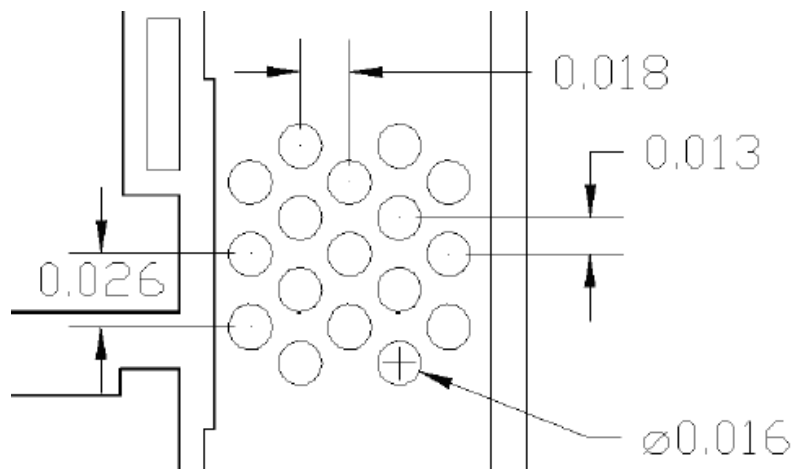
4*4 DFN Package



Notes:

1. All dimensions are in mm;
2. The tolerances unless specified are $\pm 0.1\text{mm}$.

Recommended vias layout: (all in inches)





Revision history

Table 4. Document revision history

| Date | Revision | Datasheet Status |
|------------|----------|---------------------------------------|
| 2021/4/20 | V1.0 | Preliminary Datasheet Creation |
| 2021/11/3 | V1.1 | 1.8-2.2,2.3-2.7,3.4-3.8GHz data ready |
| 2024/11/22 | V2.0 | Update the upper limits to 10GHz |

Application data based on YHG-21-10/ZXY, RXT-24-53

Notice

Specifications are subject to change without notice. Innogrations believes the information within the data sheet to be reliable. Innogrations makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose.

“Typical” parameter is the average values expected by Innogrations in quantities and are provided for information purposes only. It can and do vary in different applications and related performance can vary over time. All parameters should be validated by customer’s technical experts for each application.

Innogrations products are not designed, intended or authorized for use as components in applications intended for surgical implant into the body or to support or sustain life, in applications in which the failure of the Innogrations product could result in personal injury or death or in applications for planning, construction, maintenance or direct operation of a nuclear facility.

For any concerns or questions related to terms or conditions, please check with Innogrations and authorized distributors

Copyright © by Innogrations (Suzhou) Co.,Ltd.