# NME6003H GaN TRANSISTOR

Document Number: NME6003H
Preliminary Datasheet V1.1

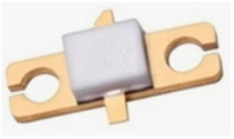
## Gallium Nitride 28V 25W, RF Power Transistor

### Description

The NME6003H is a 25W, unmatched GaN HEMT, designed for multiple applications with frequencies up to 6GHz.

There is no guarantee of performance when this part is used in applications designed Outside of these frequencies.

**NME6003H**



•Typical performance (on Innogration fixture with device soldered)

$V_{DD}$=28V, $I_{DQ}$=150mA, CW,

| Frequency(MHz) | Gp (dB) | $P_{SAT}$(W) | Efficiency (%) |
|---|---|---|---|
| 2000 | 19 | 25 | 76 |

### 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

### Important 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

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

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Drain--Source Voltage | $V_{DSS}$ | 150 | Vdc |
| Gate--Source Voltage | $V_{GS}$ | -10,+2 | Vdc |
| Operating Voltage | $V_{DD}$ | 40 | Vdc |
| Maximum Forward Gate Current | Igmax | 6 | mA |
| Storage Temperature Range | Tstg | -65 to +150 | °C |
| Case Operating Temperature | $T_C$ | +150 | °C |
| Operating Junction Temperature(See note 1) | $T_J$ | +200 | °C |
| Total Device Power Dissipation (Derated above 25°C,see note 2) | Pdiss | 43 | W |

1. **Continuous operation at maximum junction temperature will affect MTTF**
2. **Bias Conditions should also satisfy the following expression: Pdiss < (Tj – Tc) / RJC and Tc = Tcase**

**Table 2. Thermal Characteristics**

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case<br>$T_C$= 85°C, $T_J$=200°C, DC Power Dissipation(See note 1) | $R_{\theta JC\text{-}DC}$ | 4.6 | □C/W |

1. **$R_{\theta JC\text{-}DC}$ is tested at only DC condition, it is related to the highest thermal resistance 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℃ unless otherwise noted)

**DC Characteristics**

| Characteristic | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $V_{GS}$=-8V; $I_{DS}$=10mA | $V_{DSS}$ | 150 | | | V |
| Gate Threshold Voltage | $V_{DS}$ = 28V, $I_D$ = 5 mA | $V_{GS}$(th) | | -2.7 | | V |
| Gate Quiescent Voltage | $V_{DS}$ =28V, $I_{DS}$=150mA, Measured in Functional Test | $V_{GS(Q)}$ | —— | -2.44 | —— | V |

**Functional Tests (In Innogration broadband Test Fixture, 50 ohm system) :** $V_{DD}$ = 28 Vdc, $I_{DQ}$ = 150 mA, f = 2000 MHz, CW

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Power Gain | Gp | | 19 | | dB |
| Drain Efficiency@Psat | Eff | | 70 | | % |
| Saturated Power | Psat | | 25 | | W |
| Input Return Loss | IRL | | -7 | | dB |
| Mismatch stress at all phases(No device damage) | VSWR | | 10:1 | | Ψ |

## Loadpull data:

Test condition: (100us, 20% duty cycle)

| NME6003H 1GHz | Freq (MHz) | VDD (V) | Idq (mA) | Zsource (ohms) | Zload (ohms) | Pout (dBm) | Gain (dB) | Eff (%) |
|---|---|---|---|---|---|---|---|---|
| MXP | 1000 | 28 | 65 | 5.1+j*11.0 | 8.0-j*0.4 | 45.91 | 21.87 | 63.02 |
| MXE | 1000 | 28 | 65 | 5.1+j*11.0 | 6.0+j*4.8 | 43.82 | 23.92 | 76.67 |
| Trade Off | 1000 | 28 | 65 | 5.1+j*11.0 | 10.9+j*0.8 | 45.71 | 22.43 | 64.78 |

| NME6003H 2GHz | Freq (MHz) | VDD (V) | Idq (mA) | Zsource (ohms) | Zload (ohms) | Pout (dBm) | Gain (dB) | Eff (%) |
|---|---|---|---|---|---|---|---|---|
| MXP | 2000 | 28 | 65 | 1.3+j*1.0 | 8.4-j*2.0 | 45.81 | 18.21 | 63.11 |
| MXE | 2000 | 28 | 65 | 1.3+j*1.0 | 5.4+j*4.3 | 44.02 | 22.47 | 76.40 |
| Trade Off | 2000 | 28 | 65 | 1.3+j*1.0 | 11.0-j*2.5 | 45.61 | 18.95 | 65.29 |

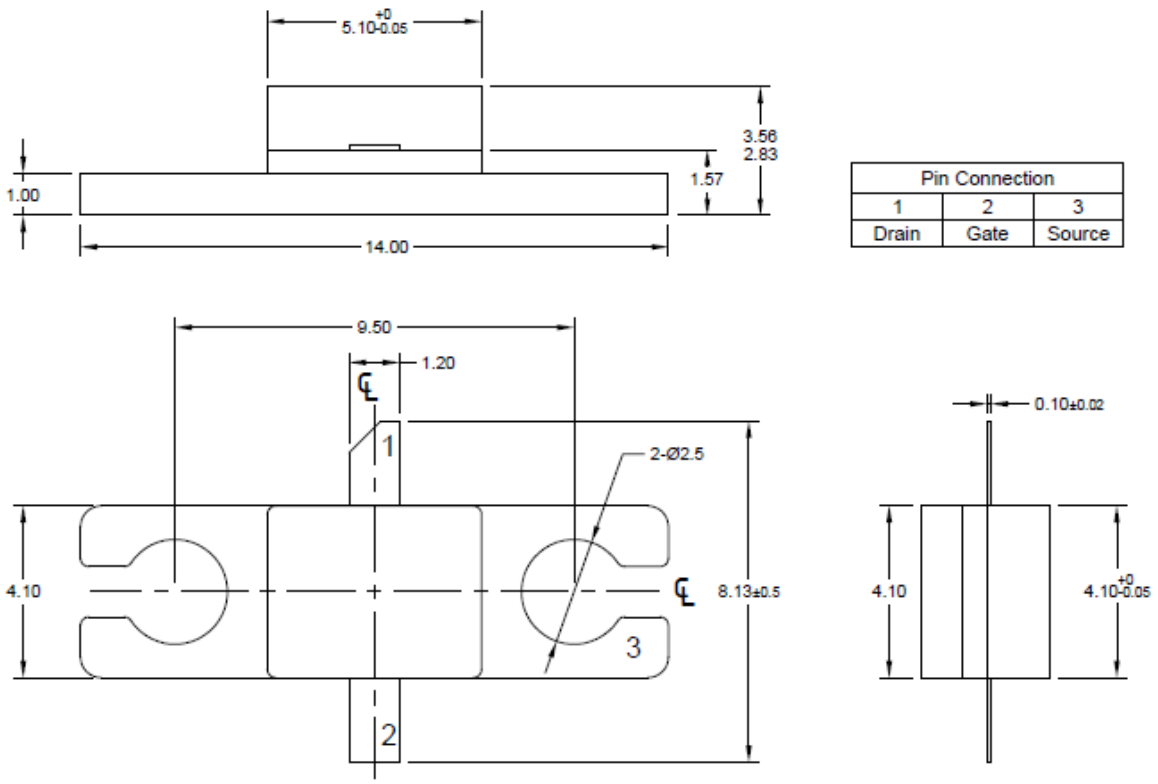
| NME6003H 3GHz | Freq (MHz) | VDD (V) | Idq (mA) | Zsource (ohms) | Zload (ohms) | Pout (dBm) | Gain (dB) | Eff (%) |
|---|---|---|---|---|---|---|---|---|
| MXP | 3000 | 28 | 65 | 1.9-j*4.5 | 6.6-j*3.9 | 45.82 | 14.37 | 68.54 |
| MXE | 3000 | 28 | 65 | 1.9-j*4.5 | 4.6+j*2.4 | 43.60 | 16.23 | 79.78 |
| Trade Off | 3000 | 28 | 65 | 1.9-j*4.5 | 6.6-j*1.6 | 45.62 | 15.15 | 72.34 |

| NME6003H 4GHz | Freq (MHz) | VDD (V) | Idq (mA) | Zsource (ohms) | Zload (ohms) | Pout (dBm) | Gain (dB) | Eff (%) |
|---|---|---|---|---|---|---|---|---|
| MXP | 4000 | 28 | 65 | 3.2-j*8.4 | 6.8-j*8.3 | 45.76 | 11.40 | 66.68 |
| MXE | 4000 | 28 | 65 | 3.2-j*8.4 | 3.5-j*3.6 | 43.41 | 12.47 | 78.60 |
| Trade Off | 4000 | 28 | 65 | 3.2-j*8.4 | 6.7-j*6.6 | 45.56 | 12.01 | 70.30 |

| NME6003H 5GHz | Freq (MHz) | VDD (V) | Idq (mA) | Zsource (ohms) | Zload (ohms) | Pout (dBm) | Gain (dB) | Eff (%) |
|---|---|---|---|---|---|---|---|---|
| MXP | 5000 | 28 | 65 | 8.5-j*18.9 | 6.4-j*14.8 | 45.68 | 9.42 | 62.80 |
| MXE | 5000 | 28 | 65 | 8.5-j*18.9 | 3.2-j*11.8 | 43.63 | 10.38 | 75.86 |
| Trade Off | 5000 | 28 | 65 | 8.5-j*18.9 | 5.3-j*13.7 | 45.48 | 9.81 | 66.23 |

## Package Outline

### Flanged ceramic package; 2 leads




| Pin Connection | | |
|---|---|---|
| 1 | 2 | 3 |
| Drain | Gate | Source |

Unit: mm
Tolerances(unless specified): x.x ±0.25
x.xx ±0.13

| OUTLINE VERSION | REFERENCE | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | |
| PKG-MME | | | | | 10/10/2016 |

**Figure 1. Package Outline PKG-MME**

## Revision history

**Table 4. Document revision history**

| Date | Revision | Datasheet Status |
|---|---|---|
| 2017/4/25 | V1.0 | Objective Datasheet Creation |
| 2017/6/19 | V1.0 | Preliminary datasheet creation |
| 2018/3/7 | V1.1 | Add loadpull data and specified at Psat |