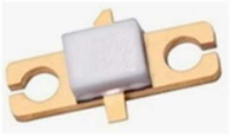
NME6004H GaN TRANSISTOR

Document Number: NME6004H
Preliminary Datasheet V1.0

Gallium Nitride 28V 35W, RF Power Transistor

NME6004H



Description

The NME6004H is a 35W, GaN HEMT, designed for multiple applications with frequencies up to 4GHz.

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

In typical application like 500-2500MHz wideband application, it can deliver >30W CW across the full band.

- Typical performance (on Innogration broadband band production fixture with device soldered)

NME6004H VDS=28V VGS=-2.25V IDQ=210mA , Singal:CW						
Freq(MHz)	Pin(dBm)	Pout(dBm)	Pout(W)	IDS(A)	Gain(dBm)	Eff(%)
225	28.0	42.0	15.8	1.09	14.0	51.9
300	29.5	43.1	20.4	1.6	13.6	45.6
400	31.0	44.5	28.2	2.3	13.5	44.1
500	30.0	45.2	33.1	2.6	15.2	45.3
600	27.3	46.1	40.7	2.9	18.8	50.2
700	30.1	46.0	39.8	2.5	15.9	56.0
800	29.4	46.3	42.2	2.6	16.9	59.1
900	30.3	46.3	42.7	2.6	16.0	57.9
1000	28.9	46.5	44.7	2.9	17.6	54.8
1100	29.9	46.7	46.8	2.9	16.8	58.2
1200	29.5	46.7	46.8	2.9	17.2	57.6
1300	30.0	46.5	44.7	2.7	16.5	60.2
1400	28.8	46.6	45.7	2.66	17.8	61.4
1500	29	46.3	42.7	2.38	17.3	64.0
1600	30.4	45.75	37.6	2.35	15.4	57.1
1700	30.2	45.8	38.0	2.62	15.6	51.8
1800	30	46.1	40.7	2.98	16.1	48.8
1900	31	45.9	38.9	3.03	14.9	45.9
2000	30.2	46	39.8	3.12	15.8	45.6
2100	31	45.9	38.9	2.97	14.9	46.8
2200	30.9	45.9	38.9	2.99	15.0	46.5
2300	32.5	46	39.8	2.97	13.5	47.9
2400	33.5	45.56	36.0	2.73	12.1	47.1
2500	33	45.3	33.9	2.33	12.3	51.9

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	8	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	55	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 T_C= 85°C, T_J=200°C, DC Power Dissipation(See note 1)	$R_{\theta JC\text{-}DC}$	3.3	C/W

1. **$R_{\theta JC\text{-}DC}$ 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℃ unless otherwise noted)

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS}=-8V; I_{DS}=8mA	V_{DSS}	150			V
Gate Threshold Voltage	V_{DS} = 28V, I_D = 8mA	V_{GS}(th)		-2.7		V
Gate Quiescent Voltage	V_{DS} =28V, I_{DS}=100mA, Measured in Functional Test	$V_{GS(Q)}$		-2.4		V

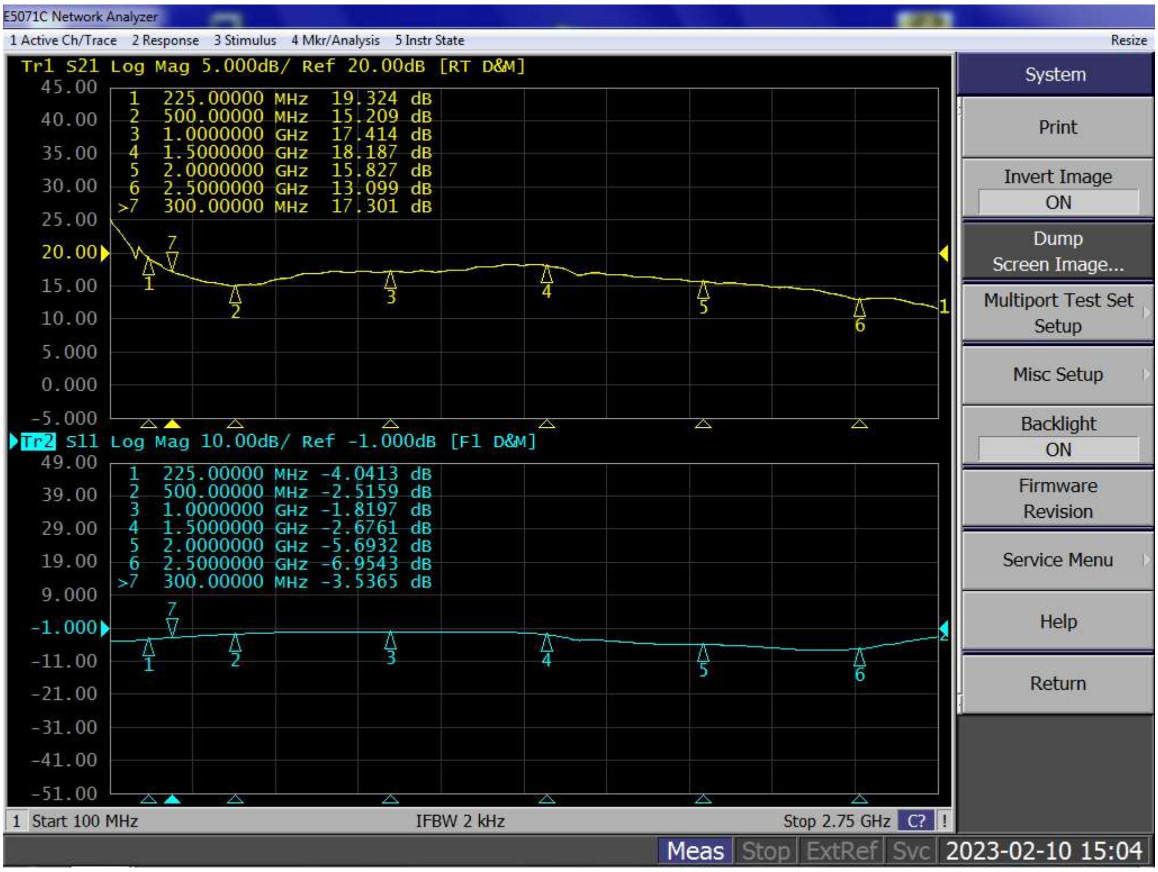
Functional Tests (In Innogration narrow band Test Fixture, 50 ohm system) :V_{DD} = 28 Vdc, I_{DQ} = 150 mA, f = 2000 MHz, CW

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain@ P_{Sat}	Gp		16		dB
Drain Efficiency @ P_{sat}	Eff		60		%
Saturated power	P_{SAT}		35		W
Input Return Loss	IRL		-5		dB
Mismatch stress at all phases (Device no damage)	VSWR		10:1		Ψ

Typical performance

225-2500MHz

Figure 3: Network analyzer output, S11 and S21（ VDS=28V VGS=-2.25V IDQ=210mA）



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Tr1 S21 Log Mag 5.000dB/ Ref 20.00dB [RT D&M]
 1  225.00000 MHz  19.324 dB
 2  500.00000 MHz  15.209 dB
 3  1.0000000 GHz  17.414 dB
 4  1.5000000 GHz  18.187 dB
 5  2.0000000 GHz  15.827 dB
 6  2.5000000 GHz  13.099 dB
>7  300.00000 MHz  17.301 dB

Tr2 S11 Log Mag 10.00dB/ Ref -1.000dB [F1 D&M]
 1  225.00000 MHz -4.0413 dB
 2  500.00000 MHz -2.5159 dB
 3  1.0000000 GHz -1.8197 dB
 4  1.5000000 GHz -2.6761 dB
 5  2.0000000 GHz -5.6932 dB
 6  2.5000000 GHz -6.9543 dB
>7  300.00000 MHz -3.5365 dB

1  Start 100 MHz          IFBW 2 kHz          Stop 2.75 GHz
Meas  Stop  ExtRef  Svc  2023-02-10 15:04
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Figure 4: Picture of application board 225-2500MHz class AB

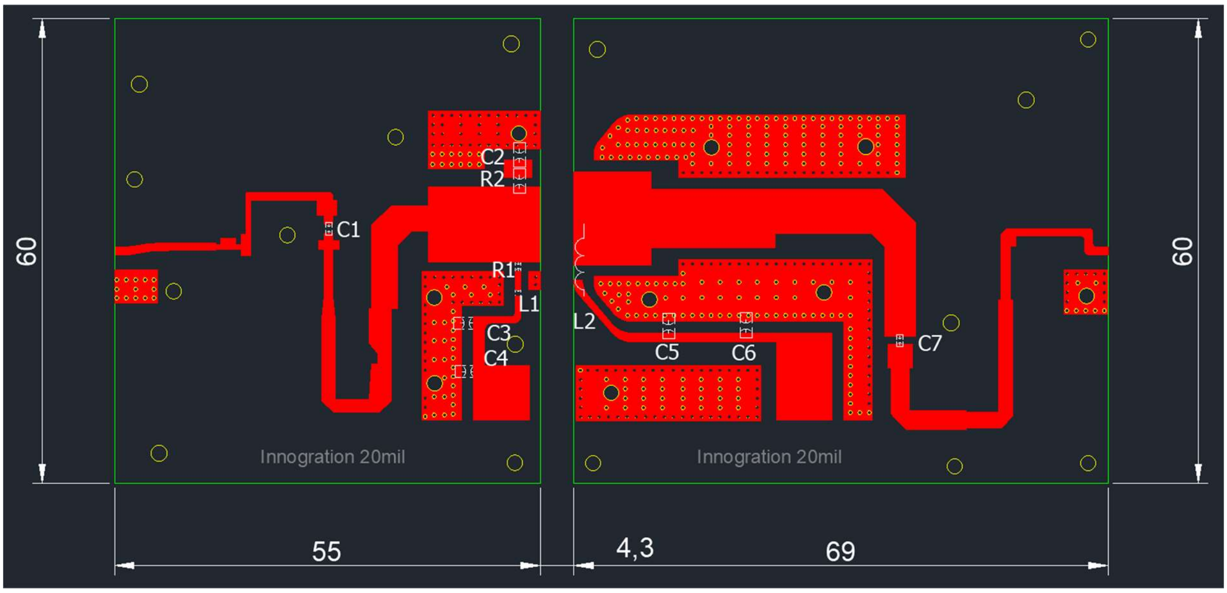
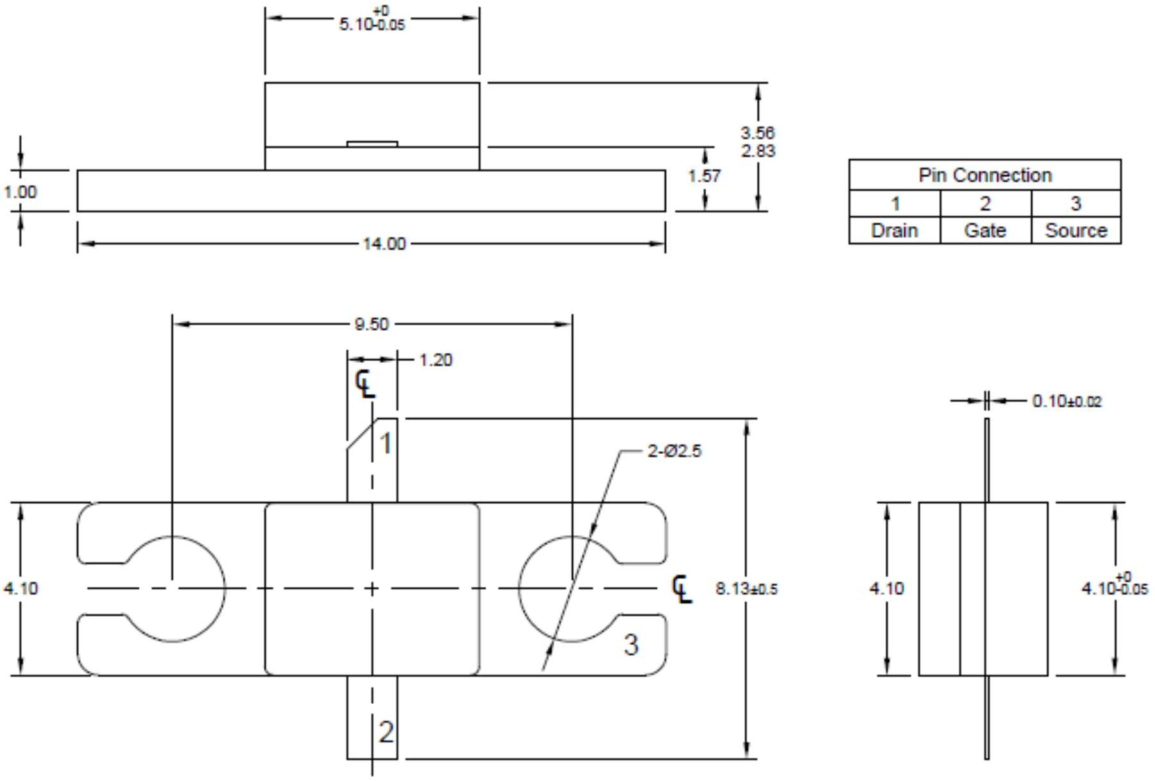


Table 4. Bill of materials of application board (PCB layout upon request)

Part	description	Model
C2,C4,C6	10uF/100V	Ceramic multilayer capacitor
C1,C7	82PF 600F	
R1	10Ω	Plug-in electric resistance
R2	24Ω	Chip Resistor
C3	300PF 100B	
C5	200PF 100B	
L1	7.5nH 0603	Plug-in electric resistance
L2	9turns,inductor, d=0.47mm	DIY air core inductance
PCB	0.508mm [0.030''] thick, εr=3.50, Rogers 4350B, 1 oz. copper	

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

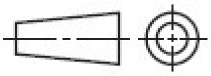
OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-MME					**10/10/2016**

Figure 1. Package Outline PKG-MME

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2023/2/13	V1.0	Preliminary Datasheet, migrated from NU6004H for package optimization

Application data based on SYX-23-03

Notice

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