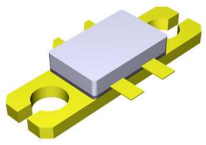
NR6006H GaN TRANSISTOR

Document Number: NR6006H
Preliminary Datasheet V1.1

Gallium Nitride 28V 50W, RF Power Transistor

NR6006H



Description

The NR6006H is a 50W, push pull configured 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.

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

VDS=28V Idq=200mA CW， VGS=-2.45V							△F=5MHZ POUT=41dBm	
F (MHz)	Pin （dBm）	Pout （dBm）	Pout （W）	I(A)	Gain （dB）	Eff(%)	IMD3 (-dBc）	IMD5 (-dBc)
225	30.3	45.5	35.5	2.33	15.2	54.39	35.00	32.00
250	30.2	45.9	38.9	2.61	15.7	53.24	32.50	33.00
300	31.5	47.5	56.2	3.5	16	57.38	28.90	30.00
350	31.6	48	63.1	3.8	16.4	59.30	29.80	36.70
400	30.7	47.5	56.2	3.5	16.8	57.38	28.70	34.00
450	30.3	47.4	55.0	3.2	17.1	61.33	29.30	34.00
500	29.7	46.9	49.0	2.8	17.2	62.47	29.80	34.50
550	28.5	46.6	45.7	2.6	18.1	62.79	33.40	34.60
600	29	46.4	43.7	2.47	17.4	63.12	37.00	31.80
650	30.2	46.2	41.7	2.1	16	70.90	35.00	31.00
678	32.6	46	39.8	1.82	13.4	78.10	34.00	31.00

• 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	12	mA
Storage Temperature Range	Tstg	-65 to +150	°C
Case Operating Temperature	T_C	+150	°C
Operating Junction Temperature(See note 1)	T_J	+225	°C

Total Device Power Dissipation (Derated above 25°C, see note 2)	Pdiss	80	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)	$R_{\theta JC\text{-}DC}$	2.3	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}=12mA	V_{DSS}	150			V
Gate Threshold Voltage	V_{DS} = 28V, I_D = 12mA	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 broadband Test Fixture, 50 ohm system) :V_{DD} = 28 Vdc, I_{DQ} = 100 mA, f = 1300 MHz, CW

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain@ P_{Sat}	Gp		18		dB
Drain Efficiency @ P_{sat}	Eff	65	70		%
Saturated power	P_{SAT}		50	60	W
Input Return Loss	IRL		-7		dB
Mismatch stress at all phases (Device no damage)	VSWR		10:1		Ψ

Loadpull data (half section only):

Test condition: (100us, 10% duty cycle), Vds=28V, Idq=65mA，Gain is defined as compressed gain at Pout

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

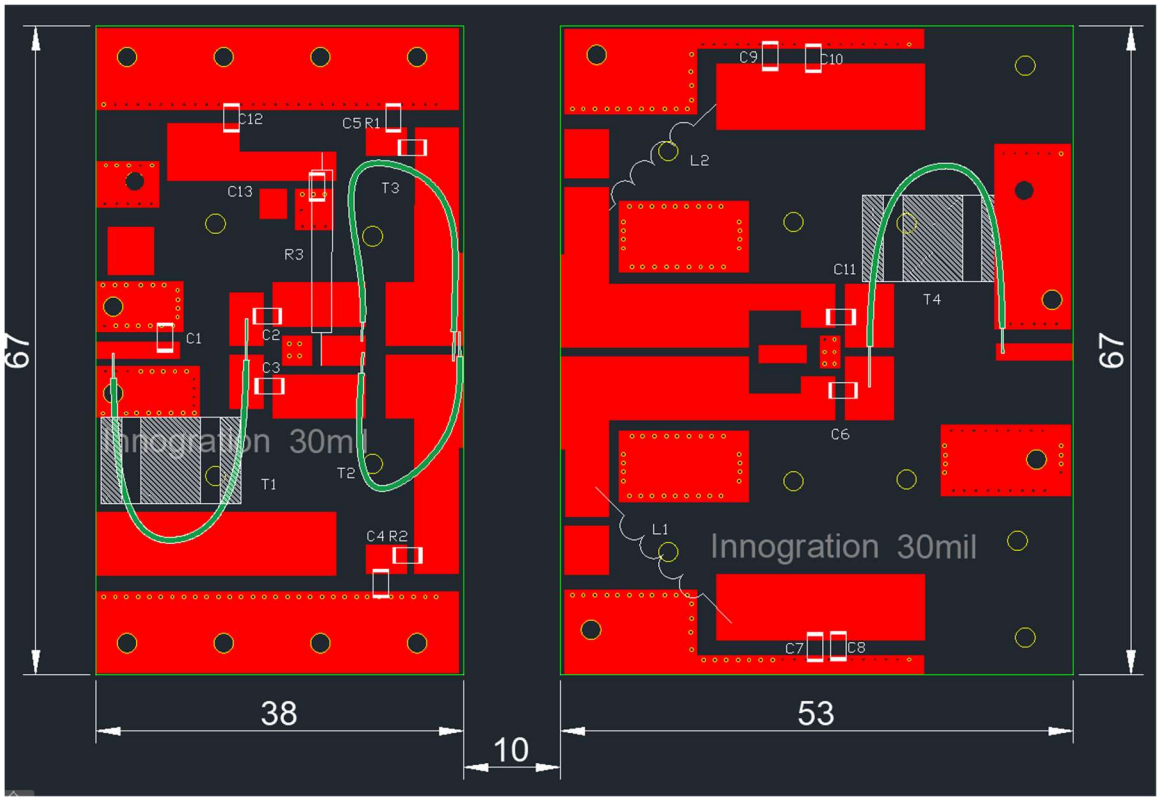
NME6003H 4GHz	Freq (MHz)	VDD (V)	Idq (mA)	Zsource (ohms)	Zload (ohms)	Pout (dBm)	Gain (dB)	Eff (%)
MXP	4000	28	65	3.2-j*8.4	6.8-j*8.3	45.76	11.40	66.68
MXE	4000	28	65	3.2-j*8.4	3.5-j*3.6	43.41	12.47	78.60
Trade Off	4000	28	65	3.2-j*8.4	6.7-j*6.6	45.56	12.01	70.30

Typical Performance

225-678MHz

Figure 4.Network analyzer output S11/S21

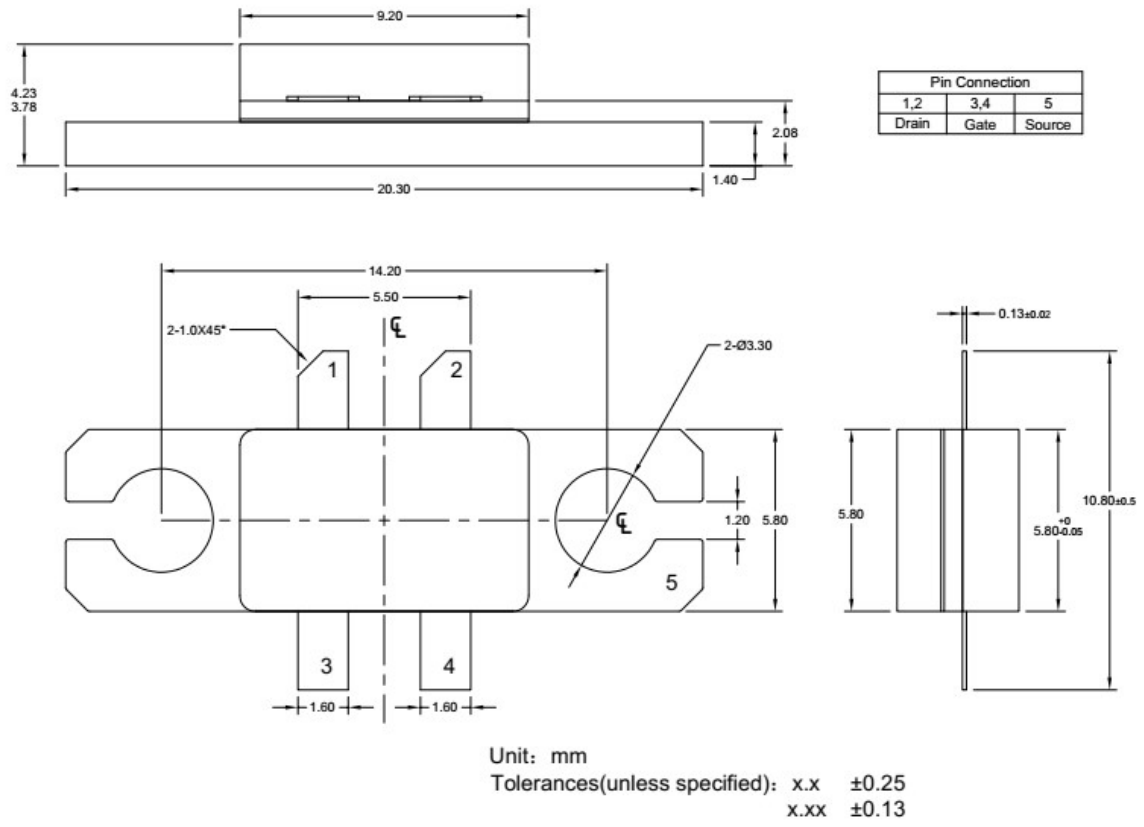
Reference Circuit of Test Fixture Assembly Diagram



Component	Description	Suggested Manufacturer
C1	2.2PF MQ200805	Beijing YN
C13、C6、C11、C7、C9	300pF MQ200805	Beijing YN
C5、C4	10NF 1210	
C2、C3	330pF MQ200805	Beijing YN
C8、C10、C12	10UF 1210	
T1	SFF-50-1.5 50mm BN-61-1502	
T2、T3	SFF-16.7-1.5 50mm	
T4	SFF-25-1.5 50mm BN-61-202	
L1、L2	Ψ0.67 漆包线 内径 3mm 8 turns	
R1、R2	10ohm 1206	
R3	1/8W 500Ω	
PCB	30mil Rogers4350B	

Package Outline

Flanged ceramic package; 2 mounting holes; 4 leads



OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-G4E					2018/01/19

Figure 1. Package Outline PKG-G4E

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2020/11/16	V1.0	Preliminary Datasheet
2022/8/17	V1.1	Use 225-678MHz data as carrier performance

Application data based on SYX-22-13

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