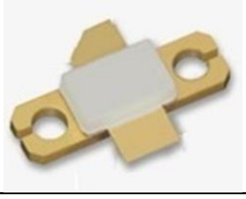
NU4012H GaN TRANSISTOR

Document Number: NU4012H
Preliminary Datasheet V1.2

Gallium Nitride 28V 120W, RF Power Transistor

NU4012H



Description

The NU4012H is a 120W 28V, GaN HEMT, designed for multiple applications with frequencies up to 3GHz.

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

•Typical performance (on Innogration narrow band fixture with device soldered)
V_{DD}=28V I_{DQ}=700mA, CW.

Frequency(MHz)	Gp (dB)	P_{SAT} (W)	Efficiency (%)
1300	18	120	65

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	27	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	110	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)	$R_{\theta JC-DC}$	1.6	C/W

$R_{\theta JC-DC}$ 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℃ unless otherwise noted)

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS}=-8V; I_{DS}=27mA	V_{DSS}	150			V
Gate Threshold Voltage	V_{DS} = 28V, I_D =27 mA	V_{GS}(th)		-2.7		V
Gate Quiescent Voltage	V_{DS} =28V, I_{DS}=700mA, 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} = 700 mA, f = 1300 MHz, CW

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain	Gp		19		dB
Drain Efficiency @ P_{SAT}	Eff		65		%
Saturated Power	P_{SAT}		120		W
Input Return Loss	IRL		-7		dB
Mismatch stress at all phases (Device no damage)	VSWR		10:1		Ψ

Loadpull data:

Test condition: (100us, 20% duty cycle), Vds=28V, Idq=350mA

1GHz	Freq (MHz)	VDD (V)	Idq (mA)	Zsource (ohms)	Zload (ohms)	Pout (dBm)	Gain (dB)	Eff (%)
MXP	1000	28	350	0.4+j*2.7	2.4-j*0.9	51.85	22.03	69.93
MXE	1000	28	350	0.4+j*2.7	4.6+j*0.6	50.54	21.89	79.47
Trade Off	1000	28	350	0.4+j*2.7	2.9-j*0.6	51.65	22.27	72.48

2GHz	Freq (MHz)	VDD (V)	Idq (mA)	Zsource (ohms)	Zload (ohms)	Pout (dBm)	Gain (dB)	Eff (%)
MXP	2000	28	350	0.8-j*2.5	2.0-j*3.1	51.65	16.85	66.94
MXE	2000	28	350	0.8-j*2.5	2.4-j*1.0	49.56	17.85	77.60
Trade Off	2000	28	350	0.8-j*2.5	2.3-j*2.6	51.45	17.32	69.96

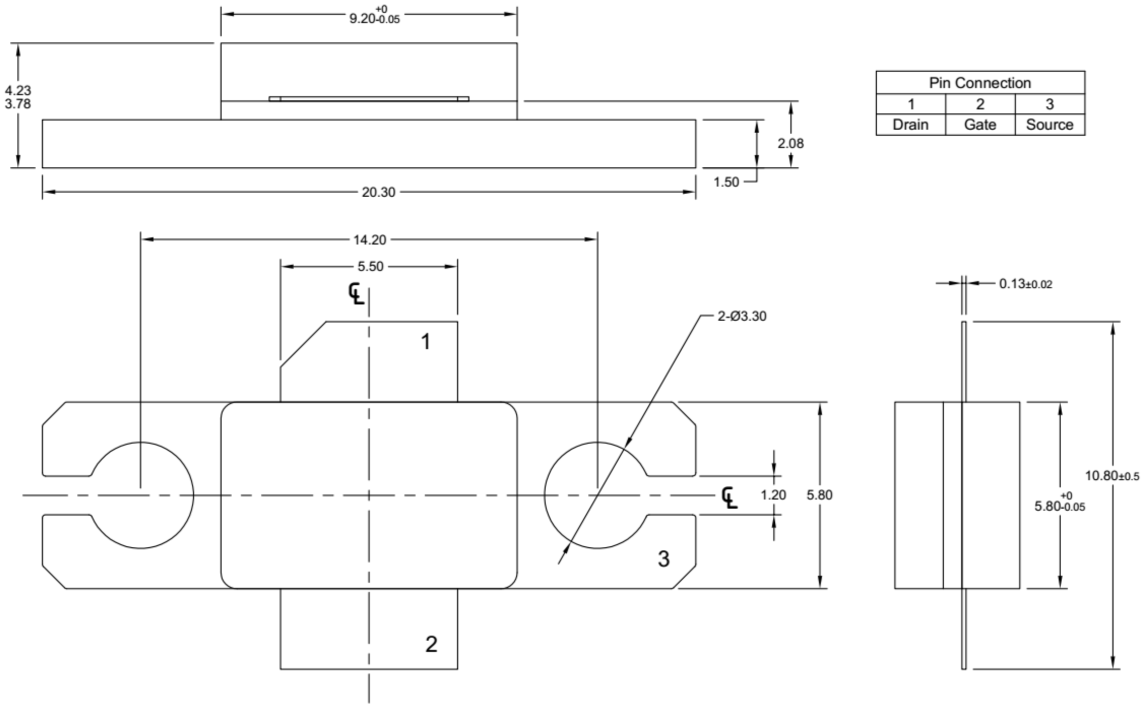
2p5GHz	Freq (MHz)	VDD (V)	Idq (mA)	Zsource (ohms)	Zload (ohms)	Pout (dBm)	Gain (dB)	Eff (%)
MXP	2500	28	350	1.5-j*1.9	1.8-j*4.0	51.49	13.09	69.89
MXE	2500	28	350	1.5-j*1.9	1.5-j*2.0	48.99	13.72	77.66
Trade Off	2500	28	350	1.5-j*1.9	1.8-j*3.2	51.29	13.63	75.80

3GHz	Freq (MHz)	VDD (V)	Idq (mA)	Zsource (ohms)	Zload (ohms)	Pout (dBm)	Gain (dB)	Eff (%)
MXP	3000	28	350	1.8-j*5.7	2.1-j*5.5	51.81	12.40	66.26
MXE	3000	28	350	1.8-j*5.7	1.7-j*3.6	49.53	13.04	75.56
Trade Off	3000	28	350	1.8-j*5.7	2.1-j*5.2	51.61	12.68	69.3

3p5GHz	Freq (MHz)	VDD (V)	Idq (mA)	Zsource (ohms)	Zload (ohms)	Pout (dBm)	Gain (dB)	Eff (%)
MXP	3500	28	350	2.5-j*6.5	2.7-j*7.7	50.94	10.18	60.74
MXE	3500	28	350	2.5-j*6.5	2.2-j*5.8	49.69	10.66	67.43
Trade Off	3500	28	350	2.5-j*6.5	2.5-j*6.9	50.74	10.52	63.08

Package Outline

Flanged ceramic package; 2 leads



Pin Connection		
1	2	3
Drain	Gate	Source

Unit：mm
Tolerances(unless specified)：x.x ±0.1
x.xx ±0.05

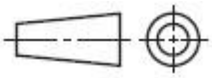
OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-GXB					**10/10/2017**

Figure 1. Package Outline PKG-G2E

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2017/3/10	V1.0	Objective Datasheet Creation
2017/6/19	V1.1	Preliminary Datasheet Creation
2018/1/9	V1.2	Add loadpull data

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