NU3020V GaN TRANSISTOR

Document Number: NU3020V
Preliminary Datasheet V1.2

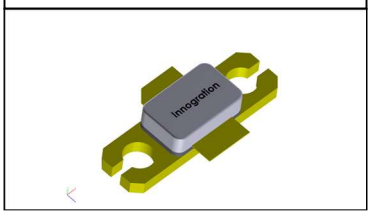
Gallium Nitride 50V 200W, RF Power Transistor

Description

The NU3020V is a 200W single ended unmatched GaN HEMT, designed for multiple applications with frequencies up to 2.2GHz.

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

NU3020V



•Typical performance (on Innogration narrow band production fixture with device screwed) V_{DD}=50V I_{DQ}=100mA, CW

Freq(MHz)	Gp (dB)	P_{3dB}W)	Efficiency (%)
2000	15	200	65

- Typical performance (on L band 1.2-1.4GHz fixture with device soldered)：V_{DD}=50V I_{DQ}=100mA, Pout=P3dB

Freq(MHz)	Pin(dBm)	Pout(dBm)	Pout(W)	Gain(dB)	EFF(%)
1200	37.8	53.95	249	16.1	71.3%
1300	37.5	53.68	233	16.2	76.2%
1400	36.9	52.54	179	15.7	74.1%

- Typical performance (on wideband 0.8-2GHz fixture with device soldered)：V_{DD}=50V I_{DQ}=100mA, CW, Pout=Psat

Freq (MHz)	Pin (dBm)	Pout(dBm)	Pout (W)	Gain (dB)	Eff (%)
800	38.5	51.8	151.4	13.3	55.8%
900	36.9	51.8	151.4	14.9	53.6%
1000	38.4	51.8	151.4	13.4	58.8%
1100	39.8	51.8	151.4	12	64.5%
1200	38.7	51.8	151.4	13.1	64.5%
1300	37.6	51.8	151.4	14.2	55.3%
1400	37.9	51.8	151.4	13.9	56.2%
1500	40.1	51.8	151.4	11.7	57.1%
1600	39.8	51.8	151.4	12	52.0%
1700	39.3	51.8	151.4	12.5	53.5%
1800	39.4	51.8	151.4	12.4	55.8%
1900	39.6	51.8	151.4	12.2	55.5%
2000	40.1	51.8	151.4	11.7	54.2%

Applications and Features

- Suitable for wireless communication infrastructure, wideband amplifier, EMC testing, ISM etc.
- High Efficiency and Linear Gain Operations
- High Reliability Metallization Process
- Excellent thermal Stability and Excellent Ruggedness
- Compliant to Restriction of Hazardous Substances

- Thermally Enhanced Industry Standard Package (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 (50V)
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

Rating	Symbol	Value	Unit
Drain--Source Voltage	V_{DSS}	+200	Vdc
Gate--Source Voltage	V_{GS}	-8 to 0	Vdc
Operating Voltage	V_{DD}	0 to 55	Vdc
Maximum forward gate current	Igf	25.2	mA
Storage Temperature Range	Tstg	-65 to +150	C
Case Operating Temperature	T_C	-55 to +150	C
Operating Junction Temperature	T_J	+225	C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case T_C= 85°C, T_J=200°C, DC Power Dissipation, FEA	$R_{\theta JC}$	1.3	C/W

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}=25.2mA	V_{DSS}		200		V
Gate Threshold Voltage	V_{DS} = 10V, I_D = 25.2mA	V_{GS}(th)		-3.4		V
Gate Quiescent Voltage	V_{DS} =50V, I_{DS}=100mA, Measured in Functional Test	$V_{GS(Q)}$		-3.3		V

Functional Tests (In Innogration broadband Test Fixture, 50 ohm system) : V_{DD} = 50 Vdc, I_{DQ} = 100 mA, f = 2000 MHz, CW

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain @ P3dB	Gp		15		dB
Drain Efficiency@P3dB$_t$	Eff		65		%
3dB Compressed point	P3dB		200		W
Input Return Loss	IRL		-7		dB
Mismatch stress at all phases(No device damage)	VSWR		10:1		Ψ

Reference Circuit of Test Fixture Assembly Diagram

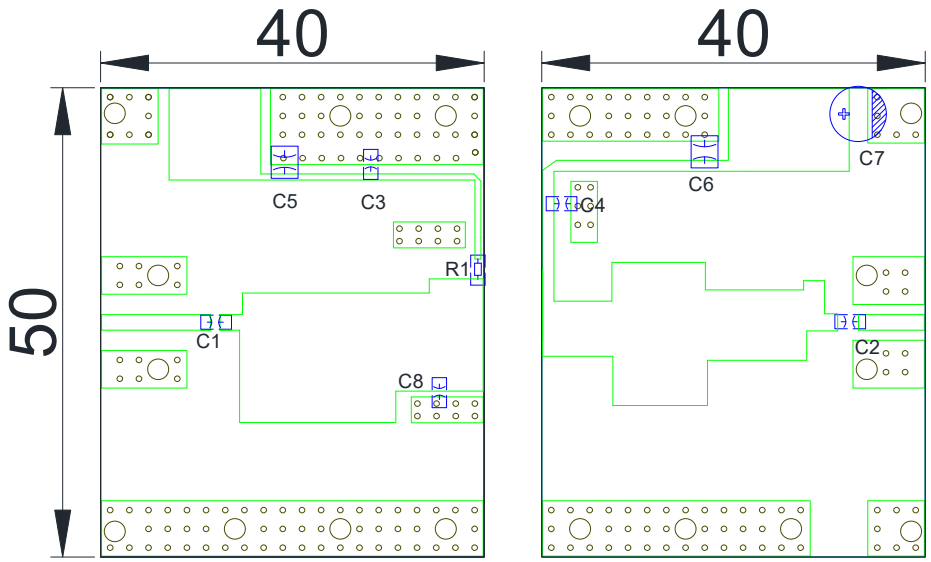


Figure 1. Test Circuit Component Layout (1200MHz~21400MHz)

Table 4. Test Circuit Component Designations and Values

Component	Description	Suggested Manufacturer
C1, C3, C4	39 pF	ATC600F
C2	39 pF	ATC800B
C8	2.0 pF	ATC600F
C5, C6	10 uF	1210
C7	1000 uF	
R1	10 Ohm	0805
PCB	0.76mm [0.030"] thick, εr=3.6, Rogers R4350, 1 oz. copper	

Figure 2. Pulse RF performance (1100MHz~1500MHz)

Pulse CW Pulse width 100us, duty cycle 10%

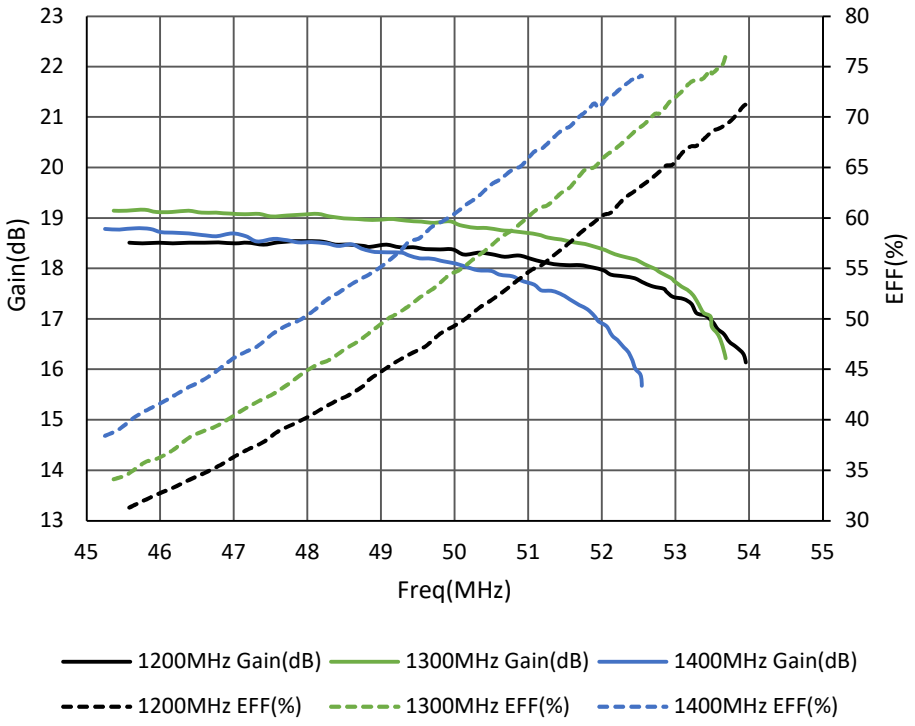
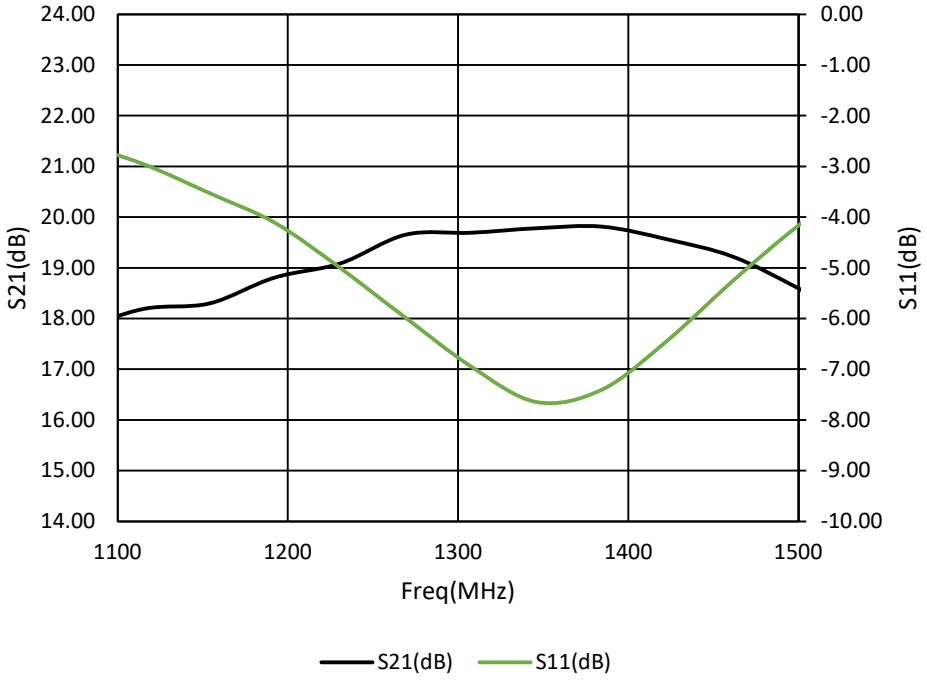
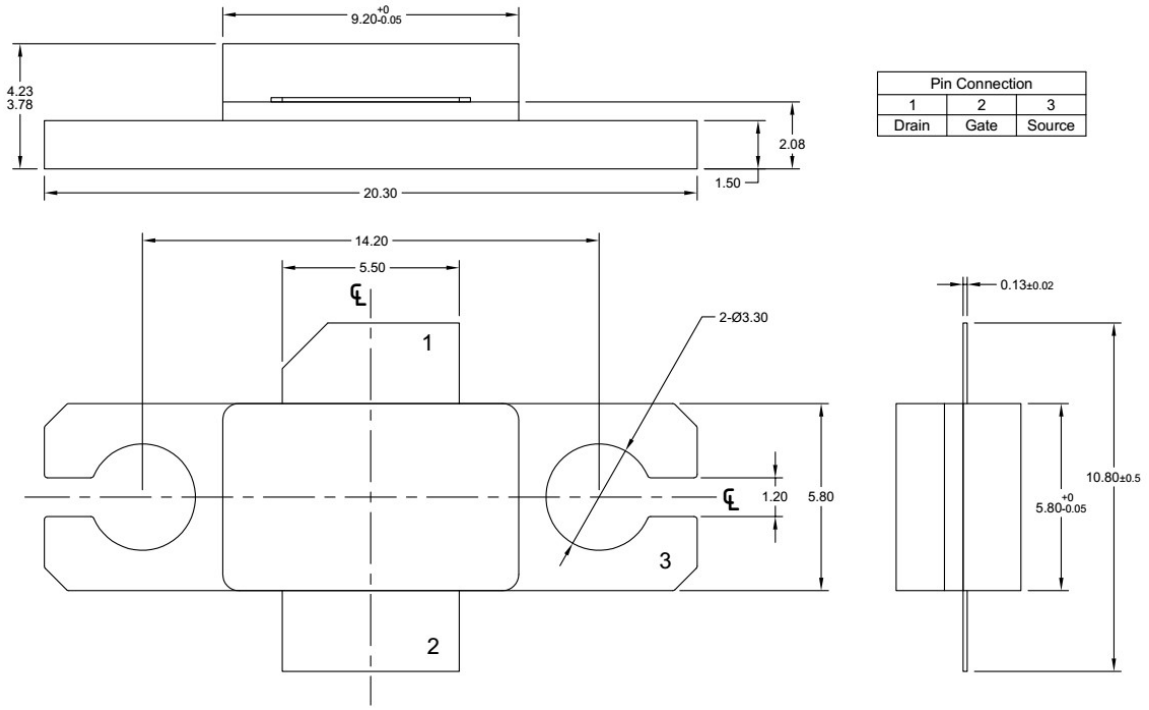


Figure 3. Network Analyzer result S11 and S21 (1200MHz~1400MHz) Vgs = -3.0V, VDS= 50V, IDQ = 500mA



Package Outline

Flanged ceramic package; 2 leads



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
2019/9/5	V1.0	Preliminary Datasheet
2020/1/2	V1.1	Modification on breakdown voltage rating
2020/4/15	V1.2	Modification of upper frequency limits

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