

NU6006H GaN TRANSISTOR

Document Number: NU6006H
Product Datasheet V1.4

Gallium Nitride 28V 60W, RF Power Transistor

Description

The NU6006H is a 60W, 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 its typical broadband application within 0.3-3GHz, it can deliver 50W CW across the full band

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

$V_{DD}=28V$ $I_{DQ}=300mA$, CW, (Psat defined as $I_g = 1\text{ mA}$)

Freq (MHz)	Pin (dBm)	Pout (dBm)	Pout (W)	Ids (A)	Eff (%)	Gain (dB@Psat)
2300	36.77	48.3	67.6	4.51	53.54	11.5
2400	35.91	48.5	71.9	4.18	61.47	12.6
2500	34.39	48.6	72.4	3.89	66.51	14.2
2600	34.38	48.2	66.1	3.52	67.03	13.8
2700	35.51	47.7	58.9	3.25	64.71	12.2

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

$V_{DD}=28V$ $I_{DQ}=200mA$, CW,

Freq (MHz)	Pout(dBm)	Pout(W)	Ids(A)	Pin(dBm)	Gain(dB)	Eff(%)
100	47.24	53.0	2.79	26.34	20.90	67.80
200	47.15	51.9	2.37	26.53	20.62	78.18
300	47.24	53.0	2.93	27.58	19.66	64.56
400	47.73	59.3	3.28	28.28	19.45	64.56
500	47.80	60.3	3.30	27.85	19.95	65.21
600	47.15	51.9	2.34	27.42	19.73	79.18
700	47.54	56.8	3.26	28.81	18.73	62.18

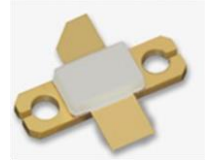
Recommended driver: ITEH40001P3

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

$V_{DD}=28V$ $I_{DQ}=200mA$, CW,

Freq (MHz)	Pout(dBm)	Pout(W)	Ids(A)	Pin(dBm)	Gain(dB)	Eff(%)
1300	47.99	63.0	3.90	34.5	13.5	57.6
1400	47.96	62.5	3.98	34.5	13.5	56.1
1500	47.96	62.5	3.94	34.5	13.5	56.7
1600	48.22	66.4	4.07	34.6	13.6	58.2
1700	48.16	65.5	3.96	34.4	13.8	59.0
1800	48.45	70.0	4.17	33.8	14.7	59.9
1900	48.05	63.8	3.95	33.9	14.2	57.7

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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_{DS}	150	Vdc
Gate--Source Voltage	V_{GS}	-10,+2	Vdc
Operating Voltage	V_{DD}	40	Vdc
Maximum Forward Gate Current	I_{gmax}	14.4	mA
Storage Temperature Range	T_{stg}	-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)	P_{diss}	70	W

1. Continuous operation at maximum junction temperature will affect MTTF
2. Bias Conditions should also satisfy the following expression: $P_{diss} < (T_j - T_c) / R_{JC}$ and $T_c = T_{case}$

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case $T_c = 85^\circ\text{C}$, $T_j = 200^\circ\text{C}$, DC Power Dissipation(See note 1)	$R_{\theta JC-DC}$	2.5	C/W

1. $R_{\theta JC-DC}$ 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 ($T_c = 25^\circ\text{C}$ unless otherwise noted)

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = -8\text{V}$; $I_{DS} = 14.4\text{mA}$	V_{DSS}	150			V
Gate Threshold Voltage	$V_{DS} = 28\text{V}$, $I_D = 14.4\text{mA}$	$V_{GS(th)}$		-2.7		V
Gate Quiescent Voltage	$V_{DS} = 28\text{V}$, $I_{DS} = 300\text{mA}$, Measured in Functional Test	$V_{GS(Q)}$		-2.29		V

Functional Tests (In Innogration broadband Test Fixture, 50 ohm system) : $V_{DD} = 28\text{ Vdc}$, $I_{DQ} = 300\text{ mA}$, $f = 1300\text{ MHz}$, CW

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain@ P_{Sat}	G_p		18		dB
Drain Efficiency @ P_{Sat}	Eff		65		%

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Saturated power	P _{SAT}	60	70		W
Input Return Loss	IRL		-7		dB
Mismatch stress at all phases (Device no damage)	VSWR		10:1		Ψ

2300-2700MHz

Figure 1: Small singal gain and return loss Vs Frequency

V_{gs}=-2.29V, V_{ds}=28V, I_{dq}=300mA, input power=0dBm

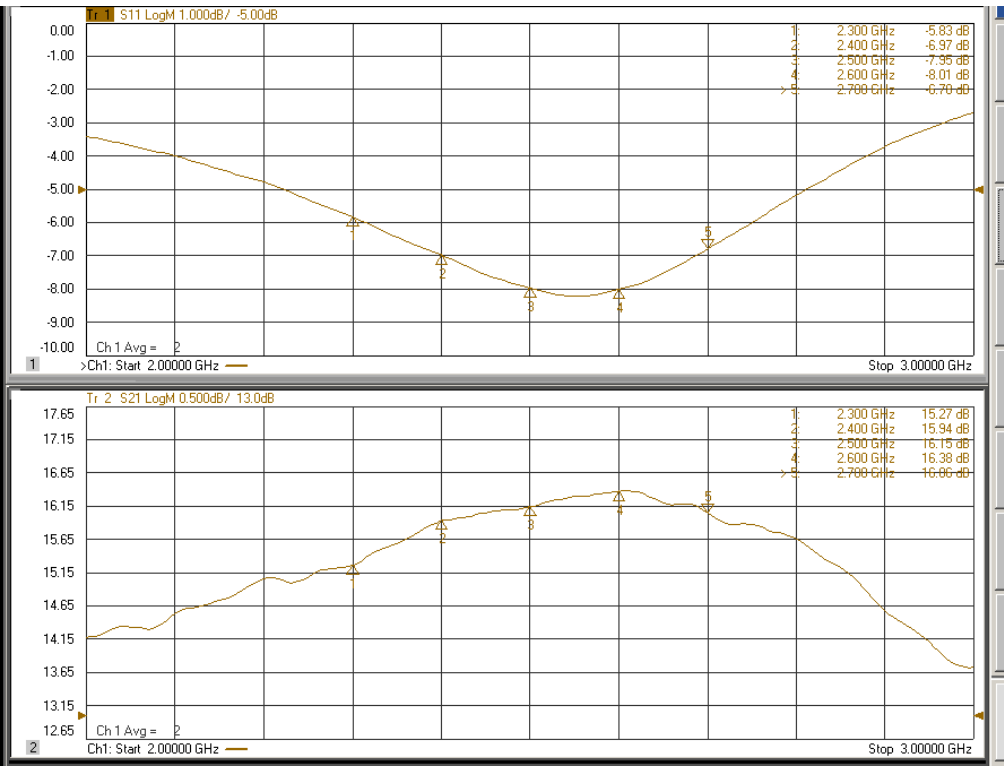
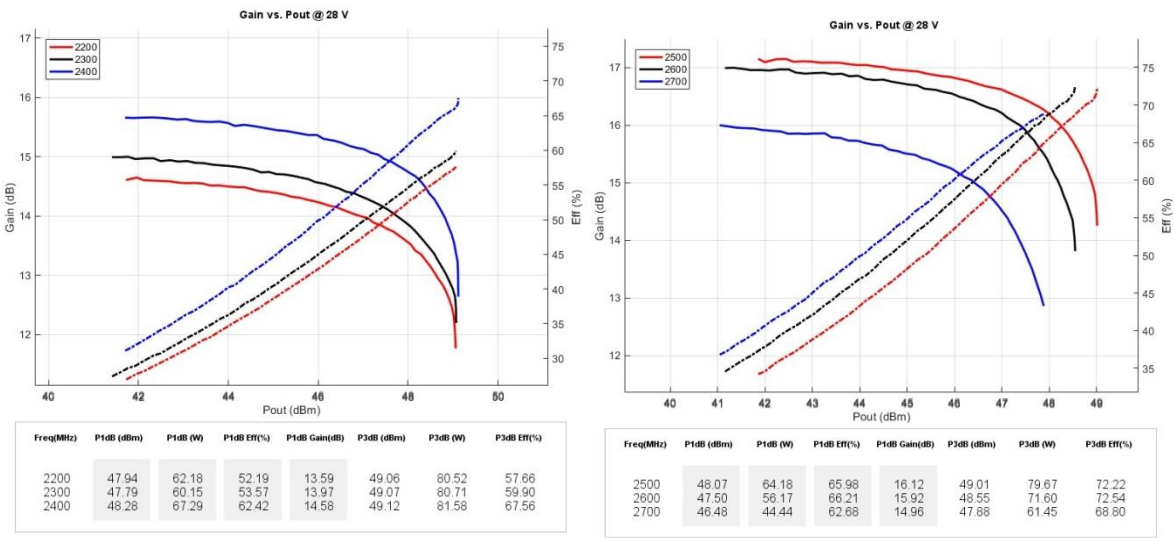


Figure 2: Pulse CW performance across the band

V_{gs}=-2.29V, V_{ds}=28V, I_{dq}=300mA, Pin=36.5dBm (Pulse width:20us,duty cycle: 20%)



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Figure 3: CW performance across the band

$V_{gs} = -2.29V$, $V_{ds} = 28V$, $I_{dq} = 300mA$

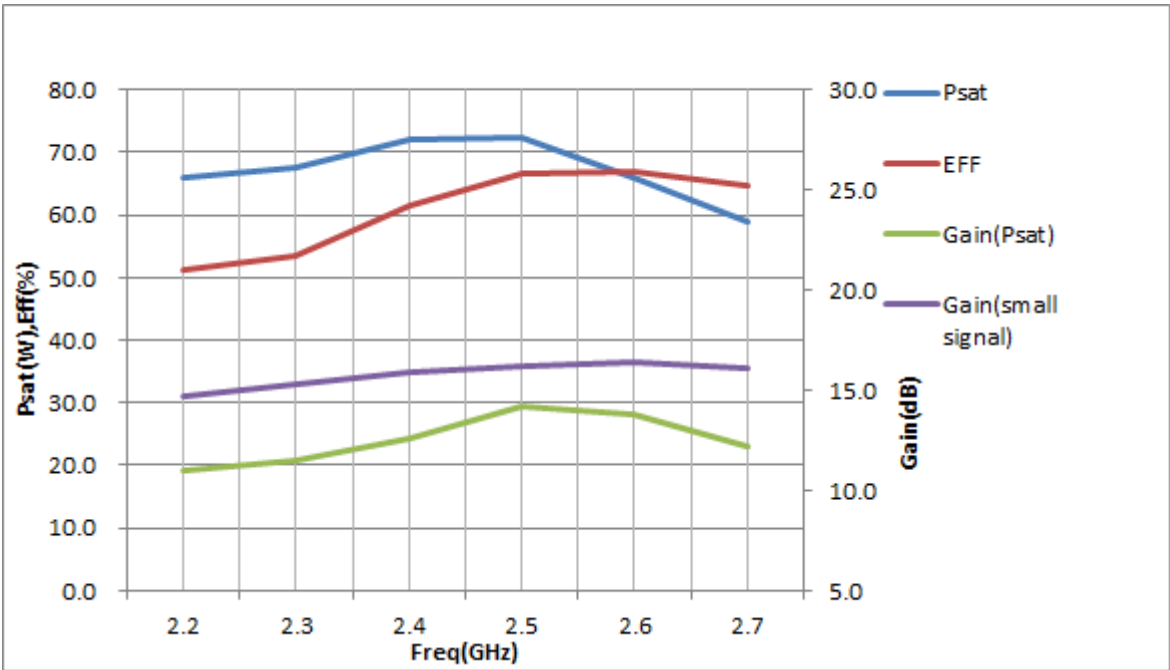
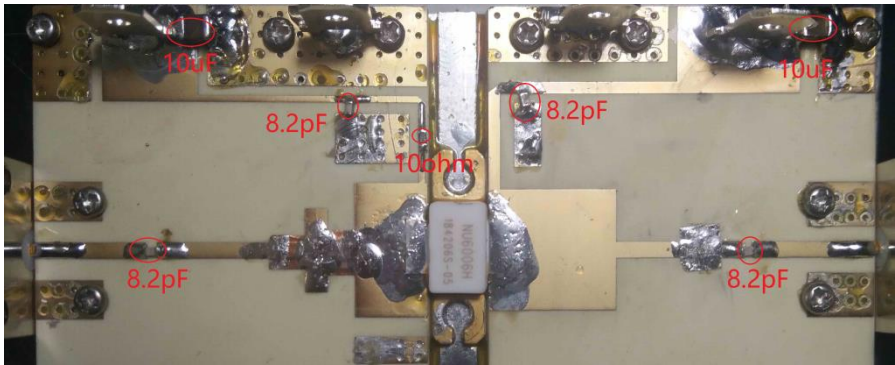
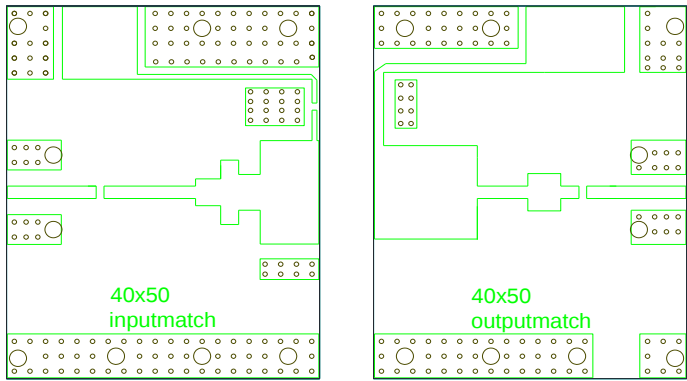


Figure 4: Photo of 2.3-2.7GHz application circuit



PCB: Rogers R4350B 30mil(Layout Gerber file upon request)



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100-700MHz

Figure 5: Small singal gain and return loss Vs Frequency
 $V_{gs}=-2.3V$, $V_{ds}=28V$, $I_{dq}=200mA$, input power=0dBm

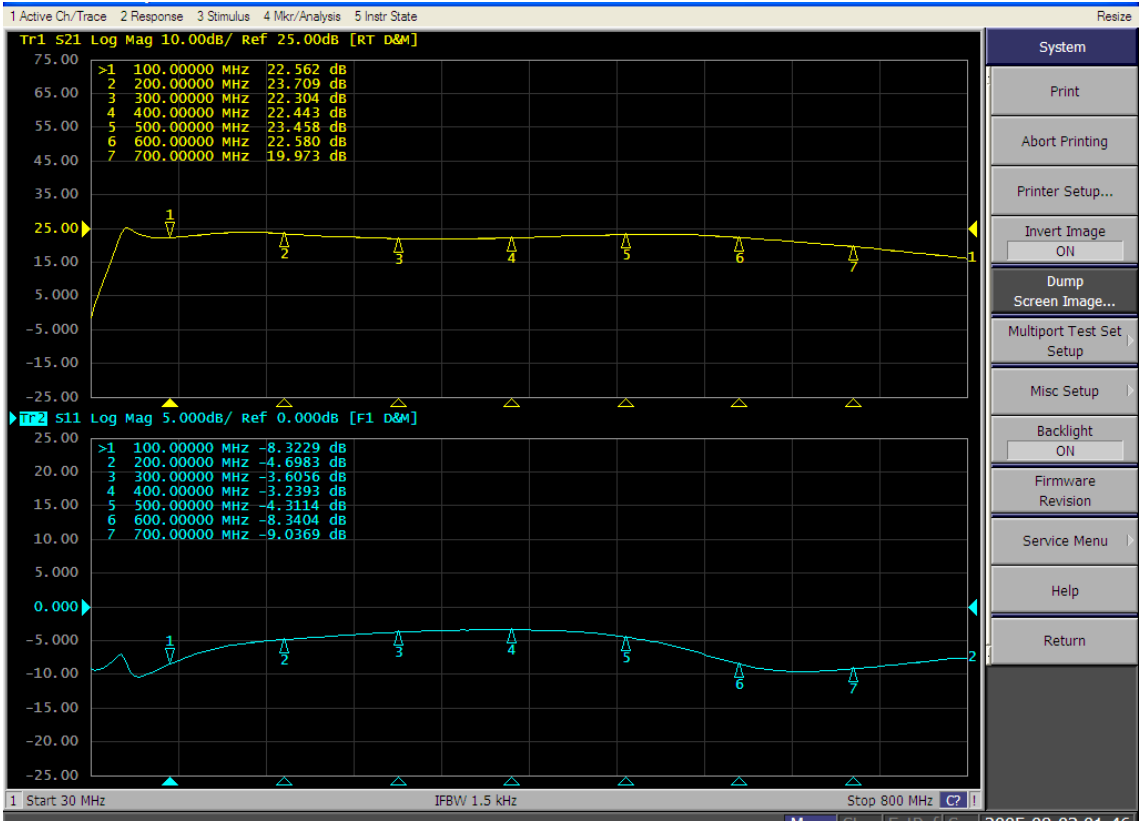
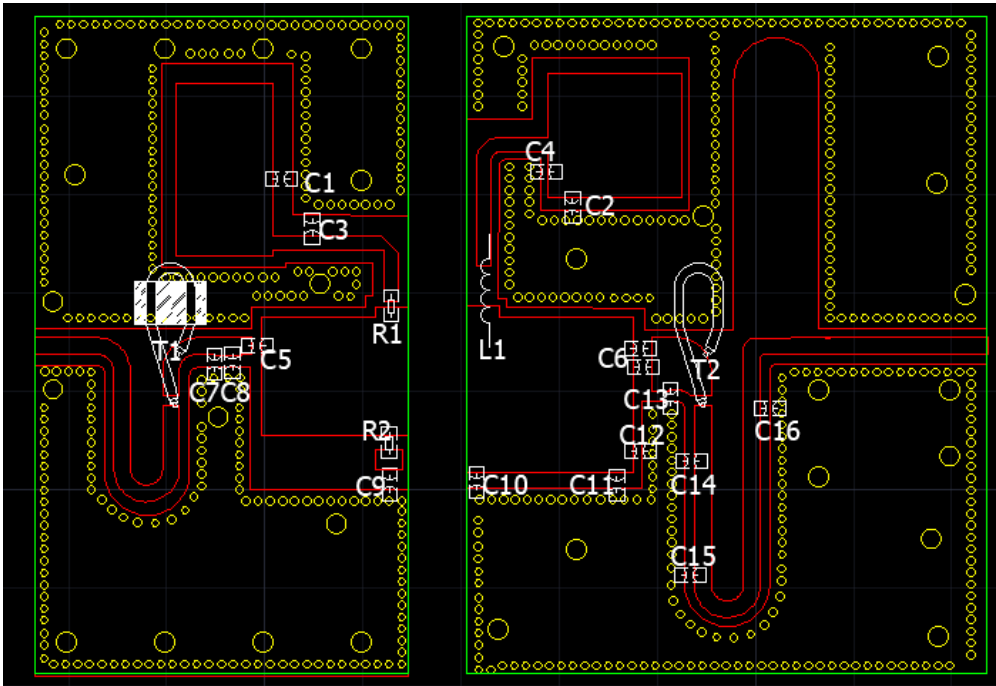


Figure 6: Photo of 100-700MHz application circuit



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Component	Description	Suggestion
C1, C2	10uF/200V-1210	Ceramic multilayer capacitor
C3,C4,C9	10nF/200V-1812	Ceramic multilayer capacitor
C5	1000pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C6	68pF ×2	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ101111
C7	2pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ101111
C8	20pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ101111
C10,C11	6.2pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C12	3.9pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ101111
C13	5.6pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C14	1pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C15	1.2pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C16	1.5pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
L1	1mm wire, 3mm innerdiameter, 3turns	DIY
T1	12.5ohm -45mm;BN-61-1502	SFF-12.5-1.5,BN-61-1502
T2	16.7ohm-45mm	SFF-16.7-1.5
R1	100 Ω -1206	Chip Resistor
R1	51 Ω -1206	Chip Resistor
PCB	30Mil Rogers4350	

1300-1900MHz

Figure 7: Small singal gain and return loss Vs Frequency
 $V_{gs}=-2.3V$, $V_{ds}=28V$, $I_{dq}=200mA$, input power=0dBm

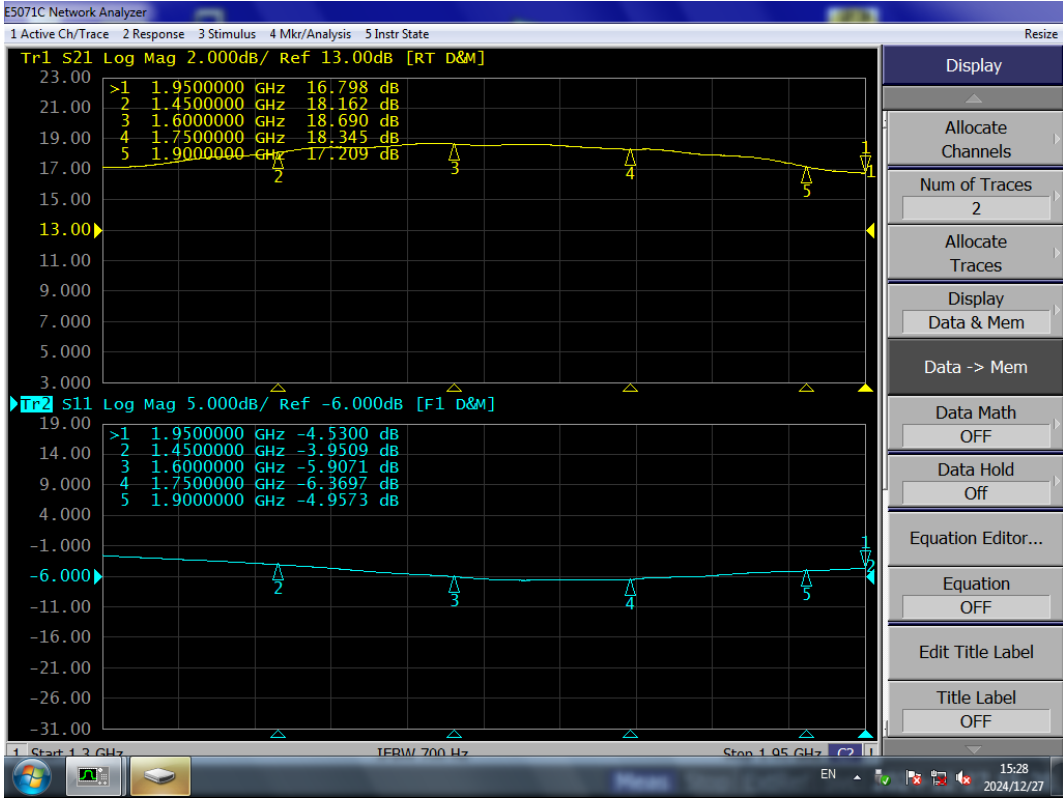
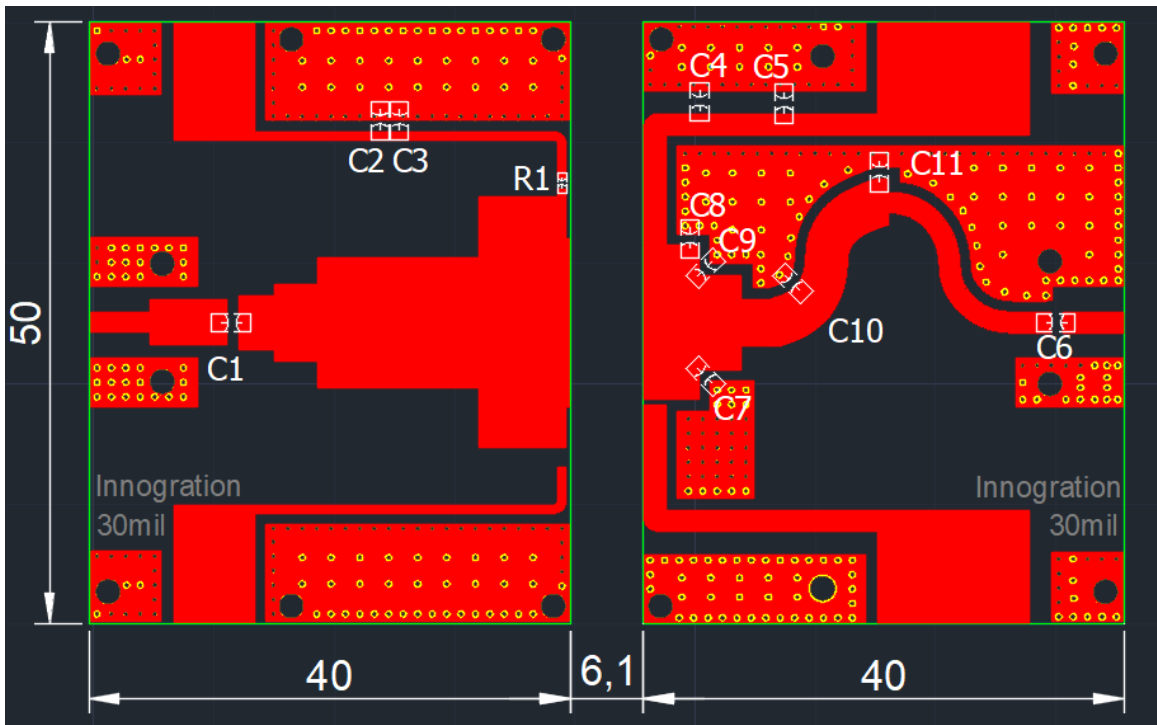


Figure 8: Photo of 100-700MHz application circuit



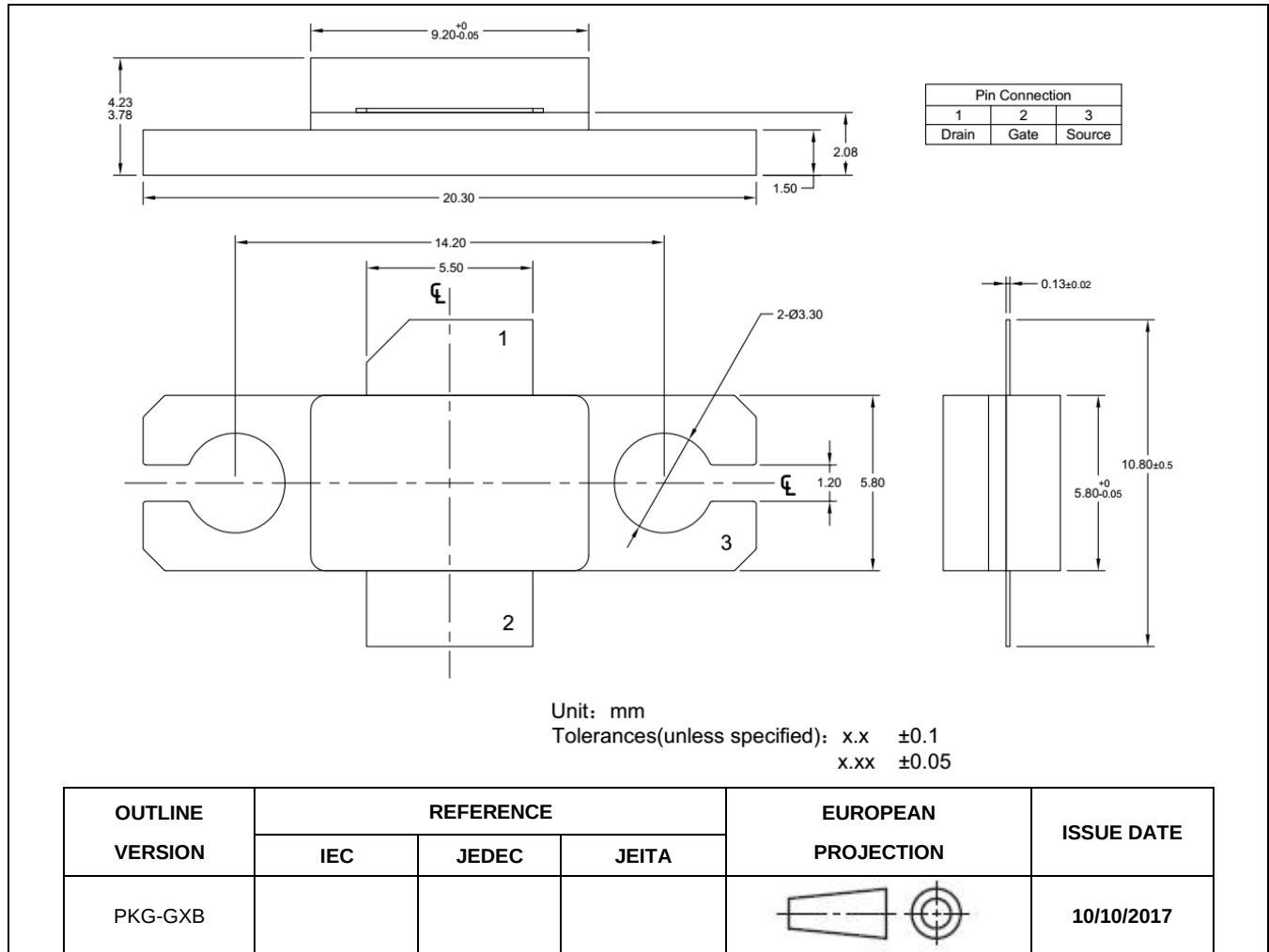
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Component	Description	Suggestion
C2,C5	10uF 0805	/
C3,C4	51pF MQ300805	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.
C6,C1	20pF MQ301111	/BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.
C9,C8,C9	1.5pF MQ300805	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.
C10,C11	1pF MQ300805	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.
R1	10 Ω ///0603	/
PCB	30Mil Rogers4350	

Package Outline

Flanged ceramic package; 2 leads



Package Outline PKG-G2E

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2018/10/26	V1.0	Product Datasheet Creation
2024/7/9	V1.1	Add 30-678MHz data
2024/10/10	V1.2	Use 100-700MHz data to replace 30-678MHz data
2024/12/28	V1.3	Add 1.3-1.9G application data
2025/4/27	V1.4	Highlight its 0.3-3GHz 50W CW performance on 1 st page

Application data based on HL-24-26/TC-24-64/SYX-24-50/YHG-25-17

Notice

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