



GaN HEMT 50V, HF-2GHz 120W, RF Power Transistor

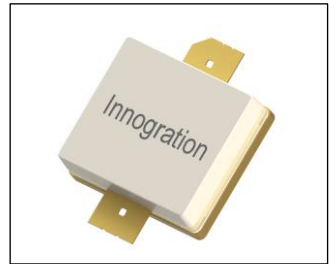
Description

The SG6012VS is a 120W GaN HEMT, designed for multiple application up to 2GHz

It can be used in CW, Pulse and any other modulation modes. There is no guarantee of performance when this part is used in applications designed Outside of these frequencies.

In typical broadband application, it can deliver 80W within 0.1-1GHz

- Typical class AB 0.1-1GHz RF Performance with device soldered



SG6012VS ^{V0} Vgs=-3.16V Vds=50V Idq=120mA CW								
Freq(MHz)	Pout(dBm)	Pout(W)	Ids(A)	Pin(dBm)	Gain(dB)	Eff(%)	2nd(dBc)	3rd(dBc)
100	49.07	80.72	2.50	31.87	17.2	64.58	-7.1	-13.2
200	49.86	96.83	2.55	32.08	17.78	75.94	-11.7	-10.6
300	49.37	86.50	2.45	30.75	18.62	70.61	-13.7	-14.2
400	49.47	88.51	2.30	31.04	18.43	76.97	-18.4	-13.4
500	49.04	80.17	2.03	31.58	17.46	78.98	-14.9	-17.5
600	50.12	102.80	3.26	31.37	18.75	63.07	-11.1	-33.2
700	50.18	104.23	2.95	31.8	18.38	70.67	-16.0	-44.7
800	50.2	104.71	3.26	31.96	18.24	64.24	-19.2	-30.7
900	49.23	83.75	3.27	32.54	16.69	51.23	-23.6	-16.6
1000	49.5	89.13	3.32	30.13	19.37	53.69	-43.4	-23.5

Applications

- L band power amplifier
- P band power amplifier
- ISM/RF Energy power amplifier

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
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 +0.5	Vdc
Operating Voltage	V _{DD}	50	Vdc
Maximum gate current	I _{gs}	16	mA
Storage Temperature Range	T _{stg}	-65 to +150	°C
Case Operating Temperature	T _C	+150	°C
Operating Junction Temperature	T _J	+225	°C



Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case by FEA $T_C = 85^{\circ}\text{C}$, at $P_{\text{diss}} = 80\text{W}$	$R_{\theta\text{JC}}$	1.9	$^{\circ}\text{C}/\text{W}$

Table 3. Electrical Characteristics ($T_A = 25^{\circ}\text{C}$ unless otherwise noted)

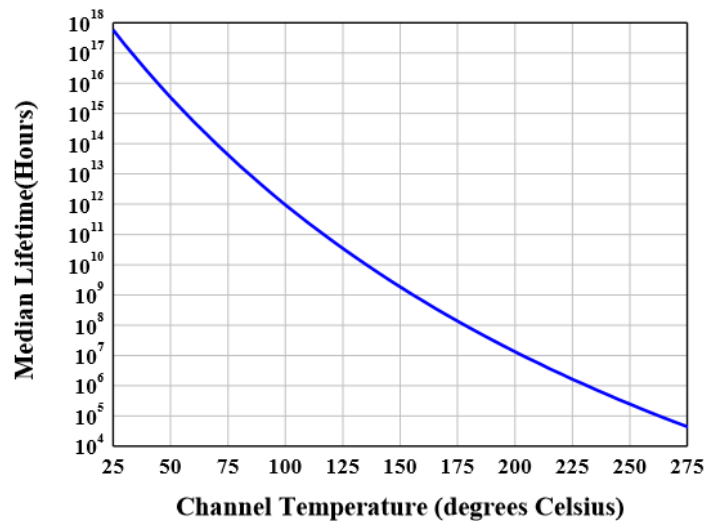
DC Characteristics (measured on wafer prior to packaging)

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{\text{GS}} = -8\text{V}$; $I_{\text{DS}} = 16\text{mA}$	V_{DSS}		200		V
Gate Threshold Voltage	$V_{\text{DS}} = 10\text{V}$, $I_{\text{D}} = 16\text{mA}$	$V_{\text{GS(th)}}$	-4		-2	V
Gate Quiescent Voltage	$V_{\text{DS}} = 28\text{V}$, $I_{\text{DS}} = 220\text{mA}$, Measured in Functional Test	$V_{\text{GS(Q)}}$		-3.2		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	1.5GHz, $P_{\text{out}} = 150\text{W}$ Pulsed CW All phase, No device damages	VSWR		10:1		

Figure 2: Median Lifetime vs. Channel Temperature





0.1-1GHz Typical performance

Figure 3: Network analyzer output S11/S21

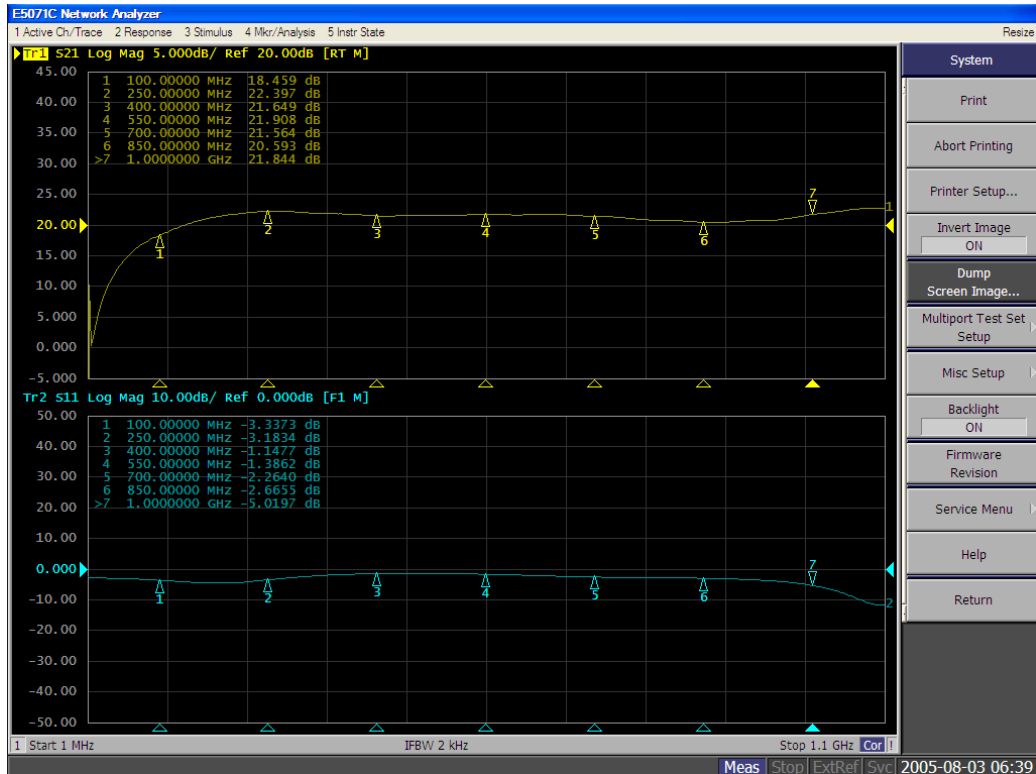
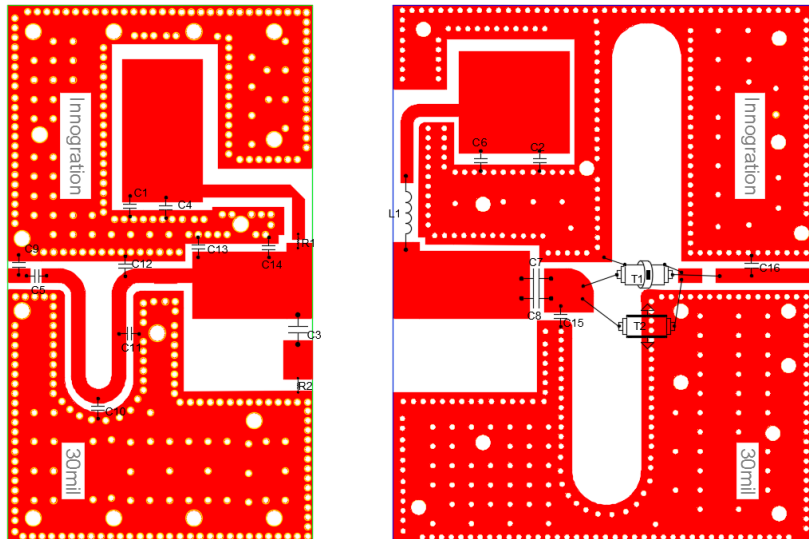


Figure 4: Picture of application board



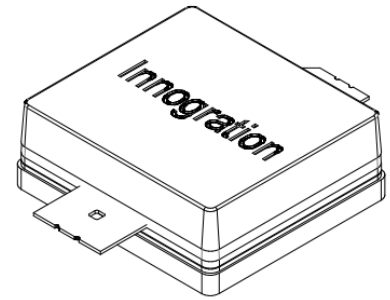
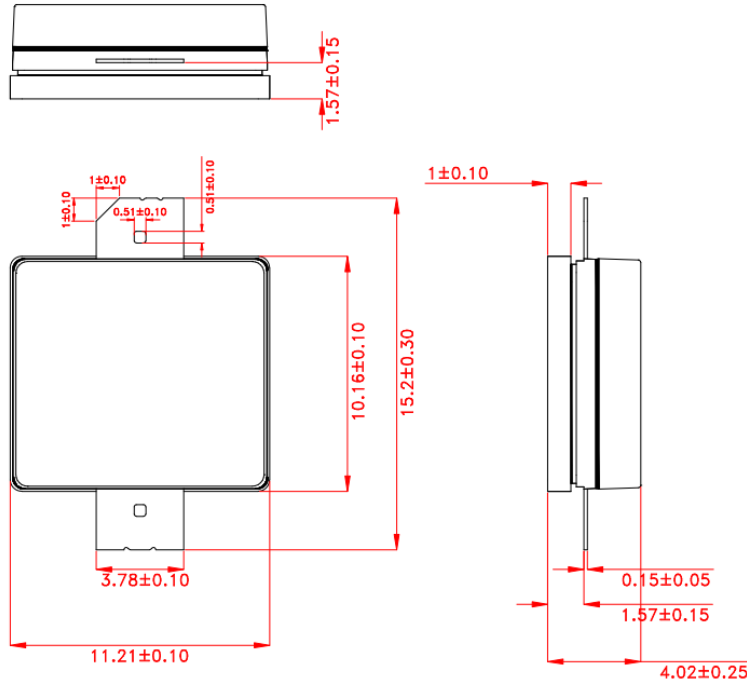
Component	Description	Suggestion
C1,C2	10uF/1210	Ceramic Multilayer Capacitor
C3	10uF/1822	Ceramic Multilayer Capacitor
C4,C5	1uF/0805	Ceramic Multilayer Capacitor
C6,C7,C8	10nF/1812	Ceramic Multilayer Capacitor



C9	1pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C10	2.2pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C11	1.8pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C12	3.6pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C13	3.8pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ101111
C14	10pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C15	5.6pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
C16	0.5pF	BEIJING YUANLU HONGYUAN ELECTRONIC TECHNOLOGY CO., LTD.MQ301111
T1	26mm	SFRFBU-086-25,Star Microwave & Magnetic Technology Co.Ltd(
T2	28mm	SFRFBU-086-25
L1	ϕ 1.5mm Inner diameter 3.5mm 7 turns	DIY
R1	10 Ω /1206	Chip Resistor
R2	51 Ω /1206	Chip Resistor
PCB	30Mil Rogers4350	



Package Dimensions (Unit:mm)



Unit:mm

Tolerance ±0.10mm, Except as Noted.

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2024/11/20	V1.0	Preliminary Datasheet Creation

Application data based on: HL-24-51

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