SME6005V GaN TRANSISTOR

Document Number: SME6005V
Preliminary Datasheet V1.1

Gallium Nitride 50V 50W, RF Power Transistor

SME6005V

Description

The SME6005V is a 50-watt, unmatched GaN HEMT, designed for multiple applications with frequencies up to 4000MHz.

It can support CW, pulsed and any modulation applications

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

- Typical performance (on fixture with device soldered)：

V_{DS}=50V I_{DQ}=10mA, Pulse CW, Pulse Width=100us, Duty cycle=10% ..

Freq(MHz)	Pin(dBm)	Psat(dBm)	Psat(W)	IDS(A)	Gain(dB)	Eff(%)
3400	35.55	48.25	66.8	0.2	12.7	66.83%
3450	35.05	47.91	61.8	0.19	12.86	65.05%
3500	35.54	47.65	58.2	0.18	12.11	64.68%
3550	35.88	47.5	56.2	0.17	11.62	66.16%
3600	35.6	47.32	54.0	0.16	11.72	67.44%

- Typical performance (on fixture with device soldered)：

V_{DS}=50V I_{DQ}=100mA,CW

Freq	P1dB	P1dB	P1dB Eff	P1dB	P3dB	P3dB	P3dB Eff	2nd	3rd
(MHz)	(dBm)	(W)	(%)	Gain(dB)	(dBm)	(W)	(%)	(dBc)	(dBc)
30	44.22	26.4	77.76	18.46	45.11	32.45	83.34	-14.4	-13.04
100	43.72	23.55	68.7	20.55	44.76	29.94	74.53	-16.15	-13.72
200	43.91	24.58	59.74	20.33	45.18	32.97	67.04	-17.77	-13.71
300	44.64	29.09	55.35	19.61	46.02	39.99	62.96	-15.29	-14.1
400	45.15	32.74	53.13	19.09	46.68	46.55	61.65	-14.5	-15.2
500	44.78	30.05	43.99	18.28	46.83	48.24	53.18	-12.58	-14.11
600	45.45	35.11	47.85	18.15	47.31	53.87	57.77	-13.15	-13.34
700	45.22	33.24	47.33	18.16	47.41	55.13	58.63	-17.2	-26.82
800	45.98	39.61	55.02	18.33	47.55	56.83	62.27	-12.08	-28.61
900	46	39.79	49.72	17.37	47.78	60.03	57.06	-19.52	-19.52
1000	45.91	39	51.62	17.11	47.95	62.34	62.4	/	/
1100	45.05	31.98	46.97	17.2	47.57	57.11	60.06	/	/
1200	45.13	32.55	46.88	17.81	47.11	51.45	55.99	/	/
1300	44.49	28.15	42.31	17.88	46.95	49.55	53.52	/	/
1400	44.23	26.48	39.66	17.18	46.87	48.65	50.58	/	/
1500	44.11	25.74	38.58	16.97	46.51	44.74	48.08	/	/

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

SME6005V GaN TRANSISTOR

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	7.5	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	$R_{\theta JC}$	5	℃/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}=7.5mA	V_{DSS}		200		V
Gate Threshold Voltage	V_{DS} = 10V, I_D = 7.5mA	V_{GS}(th)	-4	-	-2	V
Gate Quiescent Voltage	V_{DS} =50V, I_{DS}=10mA, Measured in Functional Test	$V_{GS(Q)}$		-3.1		V

Functional Tests (In Innogration broadband Test Fixture, 50 ohm system) : V_{DD} = 50 Vdc, I_{DQ} = 10 mA, f = 3500 MHz, CW

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain @ P3dB	Gp		11.5		dB
Drain Efficiency@P3dB$_t$	Eff		63		%
3dB Compressed point	P3dB		47		dBm
Input Return Loss	IRL		-7		dB
Mismatch stress at all phases(No device damage)	VSWR		10:1		φ

3.4-3.6GHz
Reference Circuit of Test Fixture Assembly Diagram

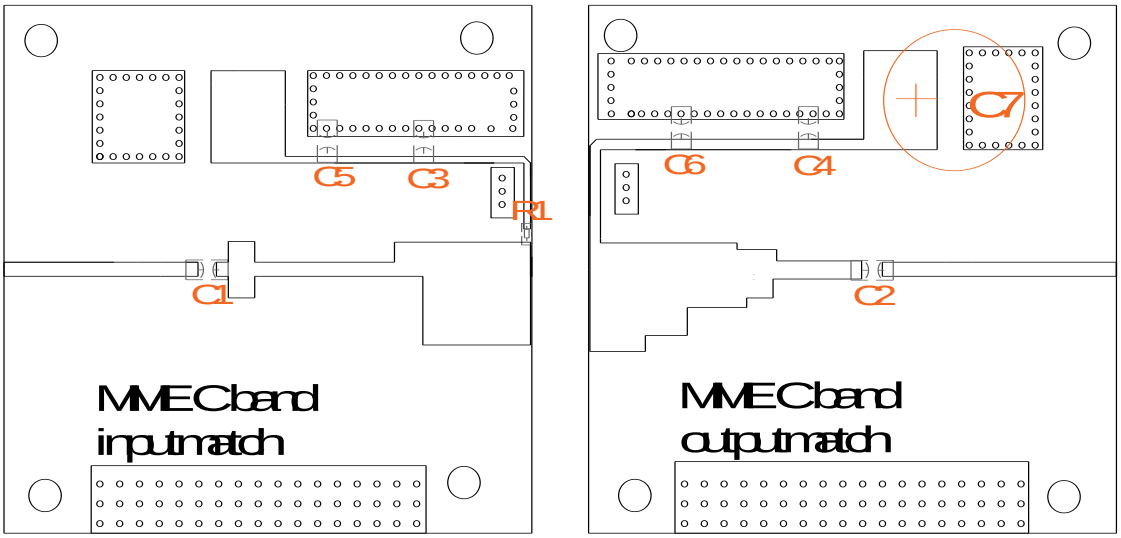


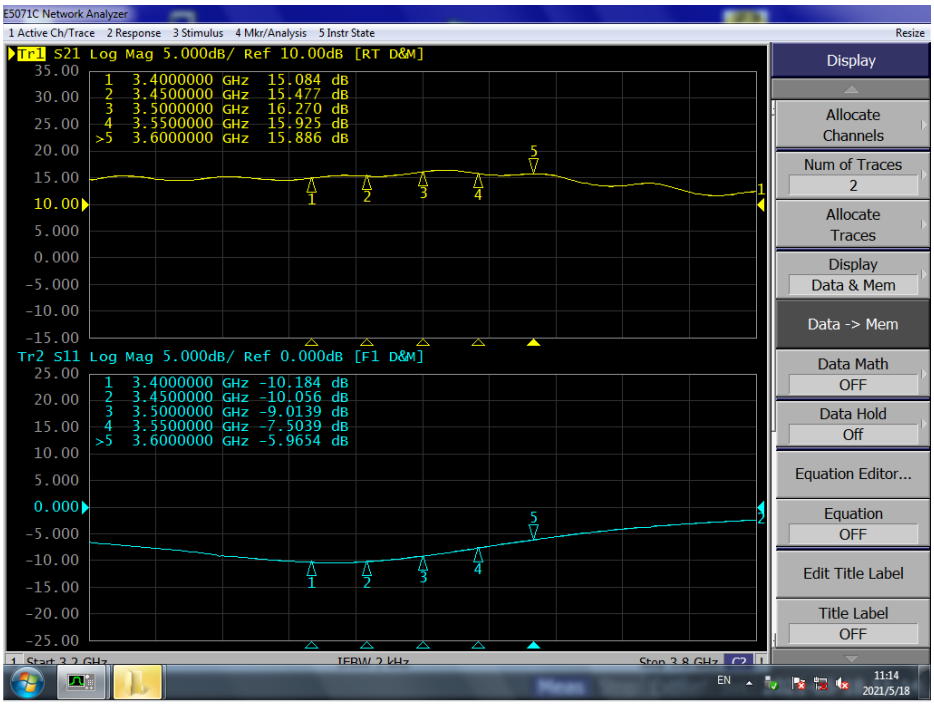
Figure 1. Test Circuit Component Layout (3400MHz~3600MHz)

Table 4. Test Circuit Component Designations and Values

Component	Description	Suggested Manufacturer
C1,C2,C3,C4	6.8pF	0805
C5 C6	Ceramic multilayer capacitor, 10uF, 100V	DLC75D
C7	470uF,63V	
R1	Chip Resistor,9.1 Ω	0603
PCB	0.508mm [0.020"] thick, εr=3.48, Rogers RO4350B, 1 oz. copper	

Figure 3. Network Analyzer result S11 and S21 (3400MHz~3600MHz)

Vds=50V Idq=100mA Vgs=-3V Input Power = 0dBm



30-1500MHz
Reference Circuit of Test Fixture Assembly Diagram

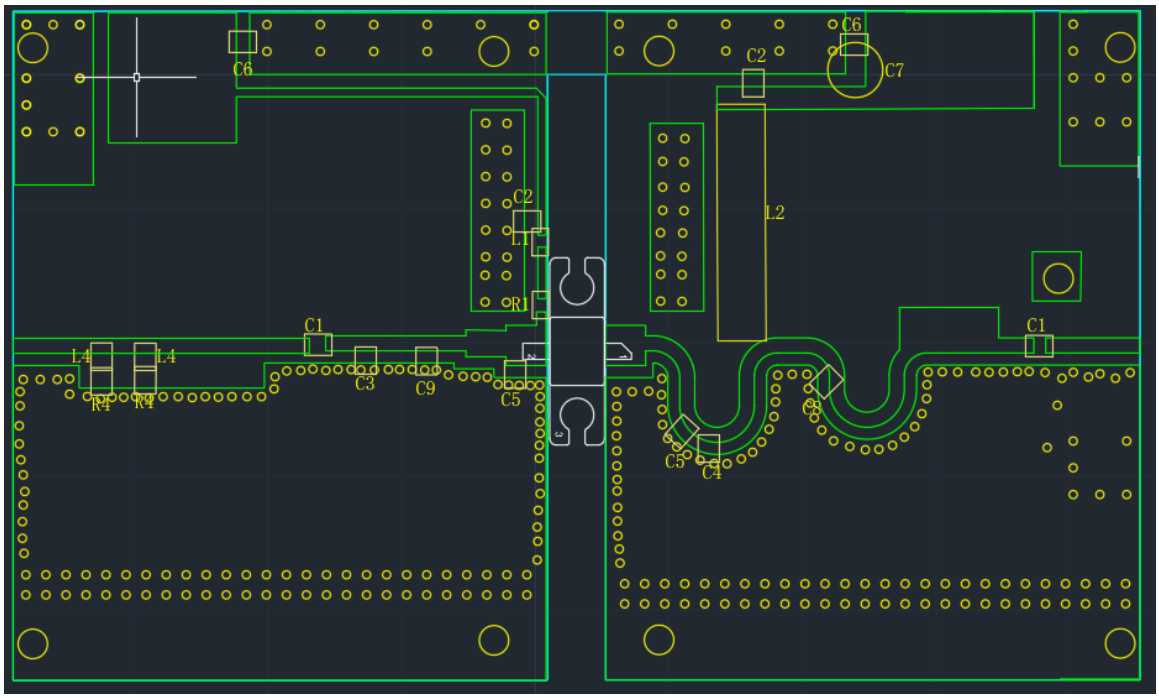


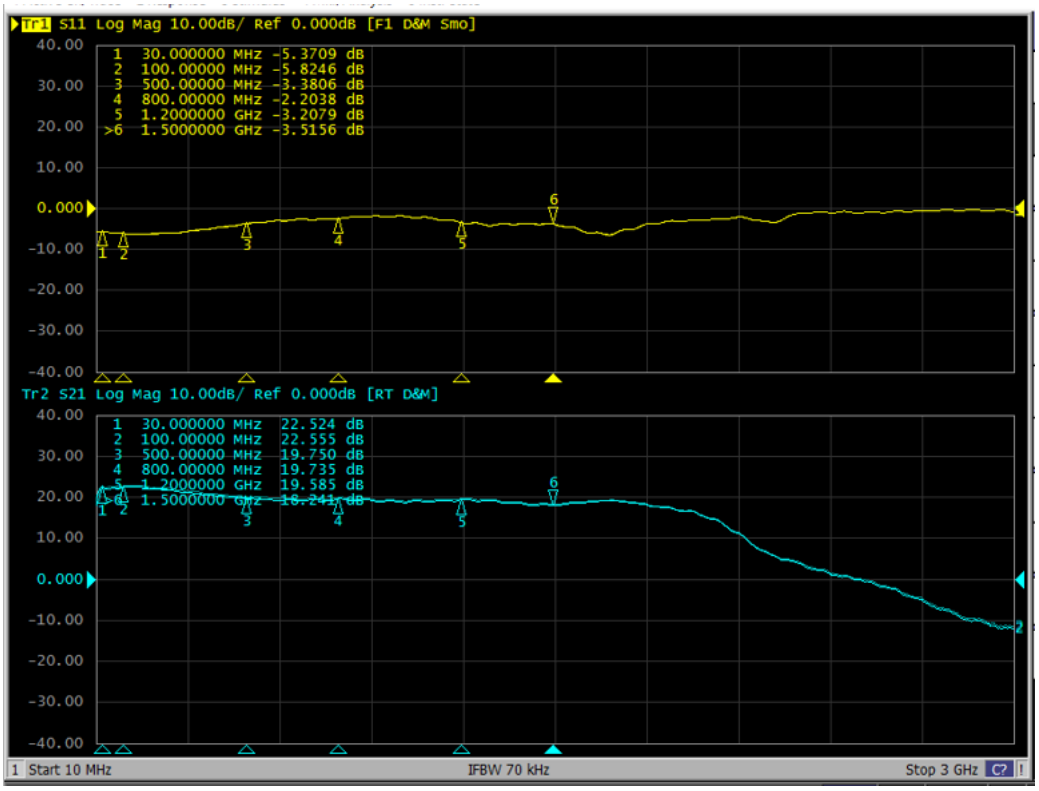
Figure 4. Test Circuit Component Layout

Table 5. Test Circuit Component Designations and Values

Component	Value	Quantity
C1	820pF	2
C2	1uF/63V	2
R1	50ohm	3
C7	470uF	1
C3	0.5pF	1
C4	1.2pF	1
C5	2pF	2
C6	10uF	2
L1	2.2nH	1
L2	1.3uH	1
L4	330nH	2
R4	56 ohm	2
C9	3.9pF	1
C8	1pF	1
PCB	RO4350B 20mils	

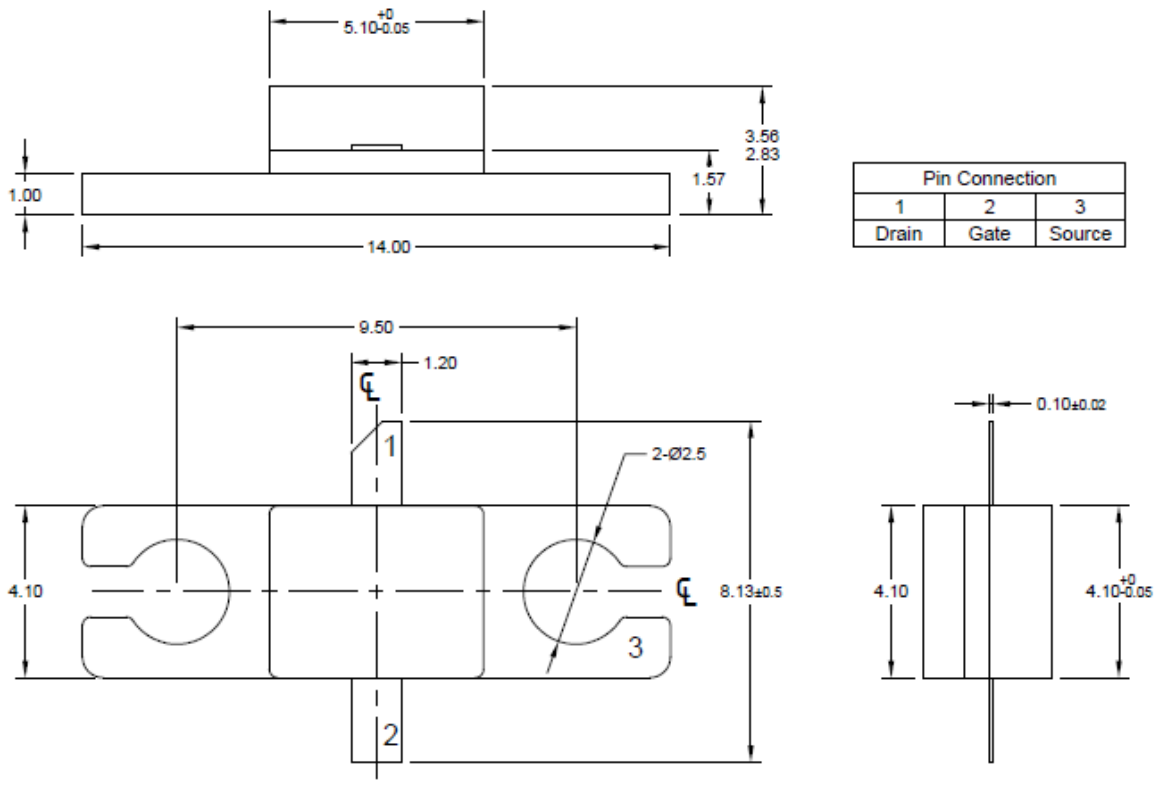
Figure 5. Network Analyzer result S11 and S21

Vds=50V Idq=100mA Vgs=-3V Input Power = 0dBm



Package Outline

Flanged ceramic package; 2 leads



Pin Connection		
1	2	3
Drain	Gate	Source

Unit: mm
Tolerances(unless specified): x.x ±0.25
x.xx ±0.13

OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-MME					10/10/2016

Figure 1. Package Outline PKG-MME

Revision history

Table 5. Document revision history

Date	Revision	Datasheet Status
2021/2/4	V1.0	Preliminary Datasheet Creation
2025/5/27	V1.1	Add 30-1500MHz data

Application data based on HL-21-17/ZXY-25-3

Notice