

SME6004V GaN TRANSISTOR

Document Number: SME6004V
Preliminary Datasheet V1.2

Gallium Nitride 50V 40W, RF Power Transistor

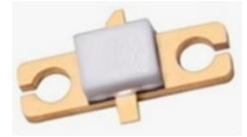
Description

The SME6004V is a 40-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.

SME6004V



- Typical 3.4-3.6GHz performance (on fixture with device soldered):

$V_{DD}=50V$ $I_{DQ}=100mA$, Pulse CW, Pulse Width=20 us, Duty cycle=10% ..

Freq(MHz)	P1dB(dBm)	P1dB Gain(dB)	P3dB(W)	EFF(%)@P3dB
3400	45.76	14.38	47.65	65.42
3500	45.43	14.73	45.45	63.70
3600	45.10	14.40	45.31	64.71

- Typical 1.1-1.7GHz performance (on fixture with device soldered):

$V_{DD}=50V$ $I_{DQ}=100mA$, Pulse CW, Pulse Width=20 us, Duty cycle=10% ..

FREQ (MHZ)	P1dB(dBm)	P1dB(W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB(dBm)	P3dB(W)	P3dB Eff(%)
1100	44.25	26.6	50.6	17.57	46.25	42.2	60.7
1200	45.81	38.1	58.0	17.44	47.49	56.2	67.8
1300	45.75	37.6	58.3	17.29	47.13	51.7	65.0
1400	45.72	37.3	59.1	17.43	46.93	49.3	63.0
1500	45.52	35.7	58.0	17.42	46.7	46.7	61.0
1600	45.04	31.9	54.8	17.25	46.38	43.5	60.4
1700	44.57	28.7	53.8	16.78	46.07	40.5	64.8

- Typical 1.30-1500MHz performance (on fixture with device soldered):

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

Freq (MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff (%)	P1dB Gain (dB)	P3dB (dBm)	P3dB (W)	P3dB Eff (%)	2nd (dBC)	3rd (dBC)
30	43.86	24.32	76.11	14.5	44.86	30.59	82.1	-13.17	-12.5
100	42.97	19.8	65.2	16.83	44.32	27.0	72.3	-15.24	-15.23
200	43.66	23.2	58.6	16.38	44.84	30.5	65.0	-14.02	-16.33
300	44.51	28.3	54.4	16.17	45.92	39.1	61.7	-13.36	-15.2
400	42.5	17.8	37.2	16.1	45.77	37.8	50.3	-18.67	-14.25
500	43.12	20.5	39.2	17.11	45.52	35.6	48.8	-11.72	-14.65
600	43.54	22.6	42.1	17.29	46.39	43.5	56.6	-9.76	-11.8
700	43.96	24.9	46.2	17.35	46.19	41.6	56.1	-13.46	-16.98
800	43.73	23.6	46.6	17.36	45.61	36.4	53.0	/	/
900	44.22	26.4	46.7	17.41	47.12	51.5	61.7	/	/
1000	45.28	33.8	57.0	18.16	46.95	49.6	66.6	/	/

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1100	43.94	24.8	48.8	18.52	46.11	40.8	59.0	/	/
1200	43.44	22.1	44.6	18.59	45.88	38.7	55.2	/	/
1300	42.95	19.7	39.6	18.2	45.74	37.5	50.7	/	/
1400	43.08	20.3	37.6	18	45.65	36.7	47.6	/	/
1500	43.17	20.7	41.7	19.13	45.6	36.3	52.3	/	/

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 (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_{DS}	+200	Vdc
Gate--Source Voltage	V_{GS}	-8 to 0	Vdc
Operating Voltage	V_{DD}	0 to 55	Vdc
Maximum forward gate current	I_{gf}	5	mA
Storage Temperature Range	T_{stg}	-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 $T_C = 85^\circ\text{C}$, $T_J = 200^\circ\text{C}$, DC Power Dissipation, FEA	$R_{\theta JC}$	6.2	C/W

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	$V_{GS} = -8\text{V}$; $I_{DS} = 5\text{mA}$	V_{DSS}		200		V
Gate Threshold Voltage	$V_{DS} = 10\text{V}$, $I_D = 5\text{mA}$	$V_{GS(th)}$		-3.4		V
Gate Quiescent Voltage	$V_{DS} = 50\text{V}$, $I_{DS} = 60\text{mA}$, Measured in Functional Test	$V_{GS(Q)}$		-3		V

Functional Tests (In Innogration broadband Test Fixture, 50 ohm system) : $V_{DD} = 50\text{Vdc}$, $I_{DQ} = 100\text{mA}$, $f = 3500\text{MHz}$, CW

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain	Gp		12.5	13	dB
Drain Efficiency@P3dBt	Eff		65		%
3dB Compressed point	P3dB		45		W

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Input Return Loss	IRL		-7		dB
Mismatch stress at all phases(No device damage)	VSWR		10:1		Ψ

3.4-3.6GHz

Reference Circuit of Test Fixture Assembly Diagram

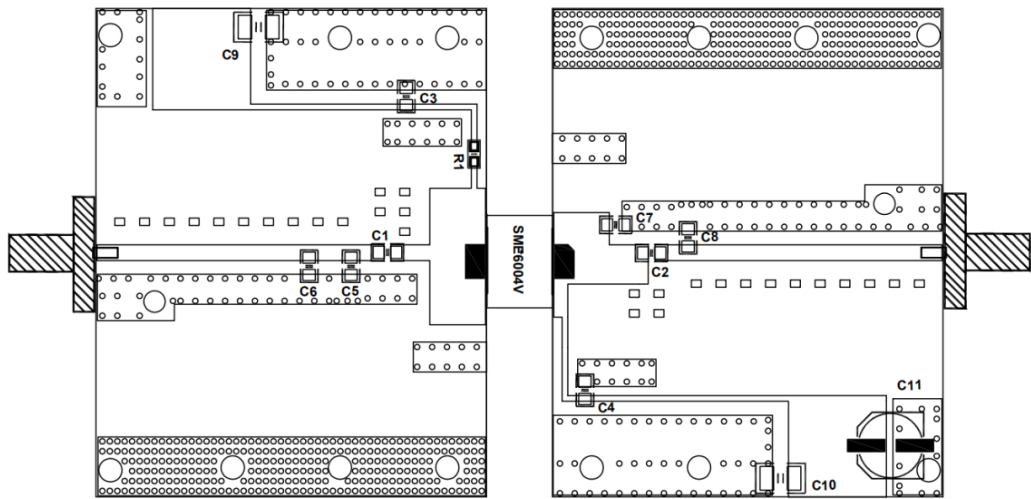


Figure 1. Test Circuit Component Layout (3400MHz~3600MHz)

Table 4. Test Circuit Component Designations and Values

BOM		
C1	3.3pF	ATC600F
C2,C3,C4	5.6pF	ATC600F
C5	1.0pF	ATC600F
C6,C7	0.5pF	ATC600F
C8	0.4pF	ATC600F
C9,C10	10uF/63V	
C11	470uF/63V	
R1	180 ohm	
PCB	30mils	RO4350B

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Figure 2. Pulse RF performance (3400MHz~3600MHz)

$V_{DD}=50V$ $I_{DQ}=60mA$, Pulse CW, Pulse Width=20 us, Duty cycle=10%

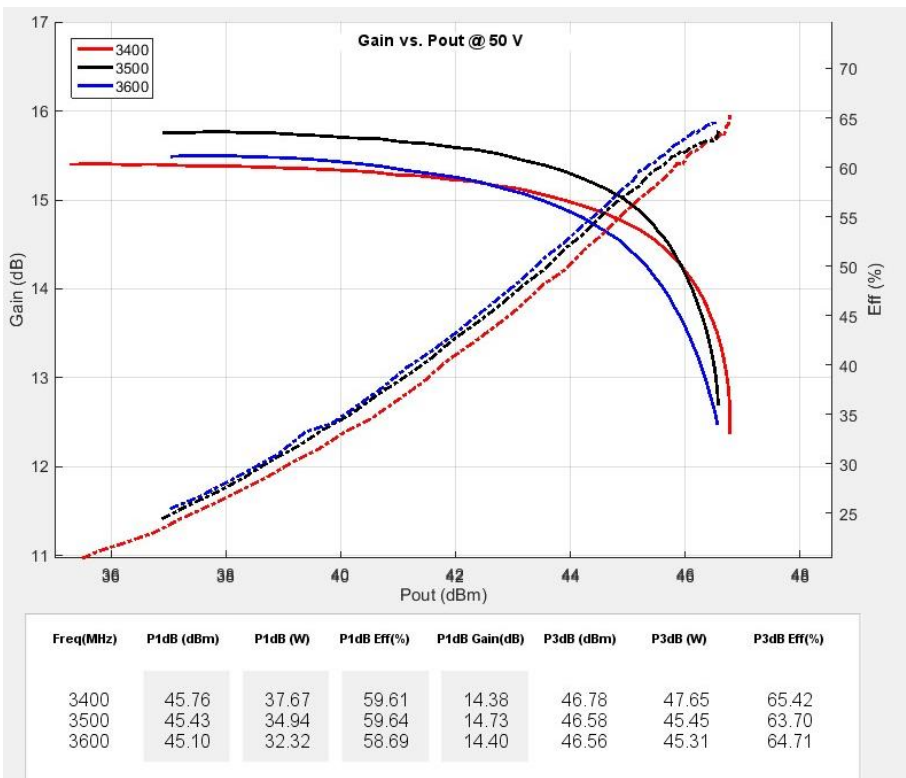
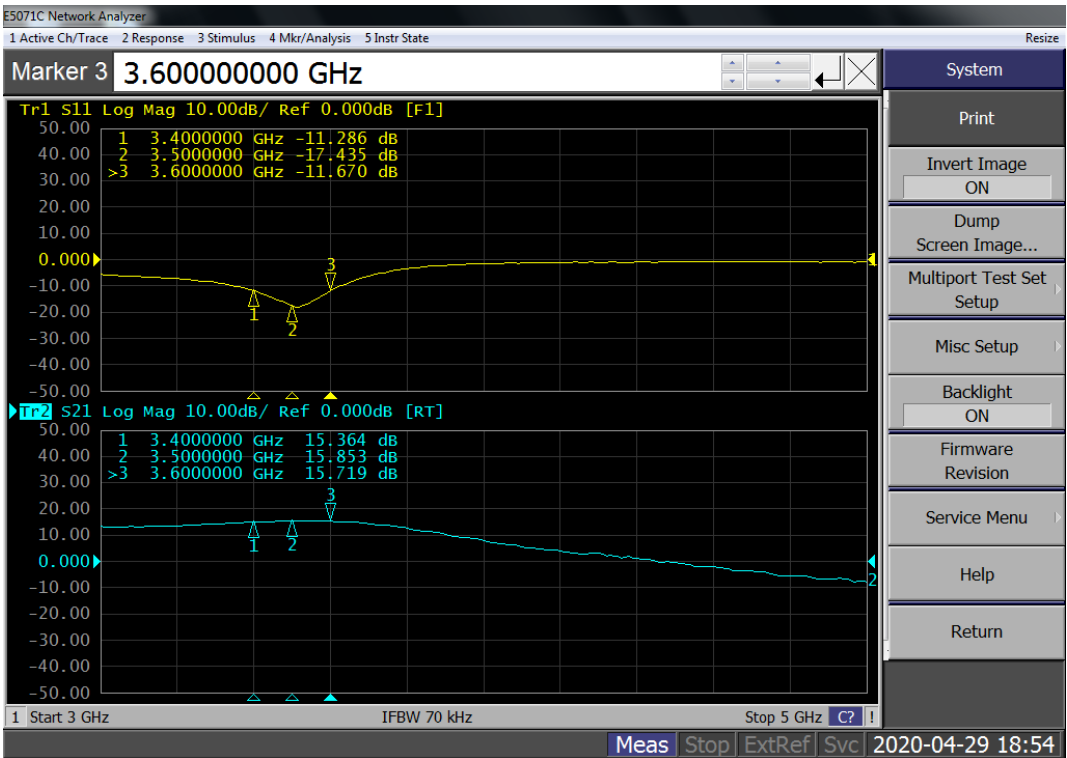


Figure 3. Network Analyzer result S11 and S21 (3400MHz~3600MHz)



1.1-1.7GHz

Reference Circuit of Test Fixture Assembly Diagram

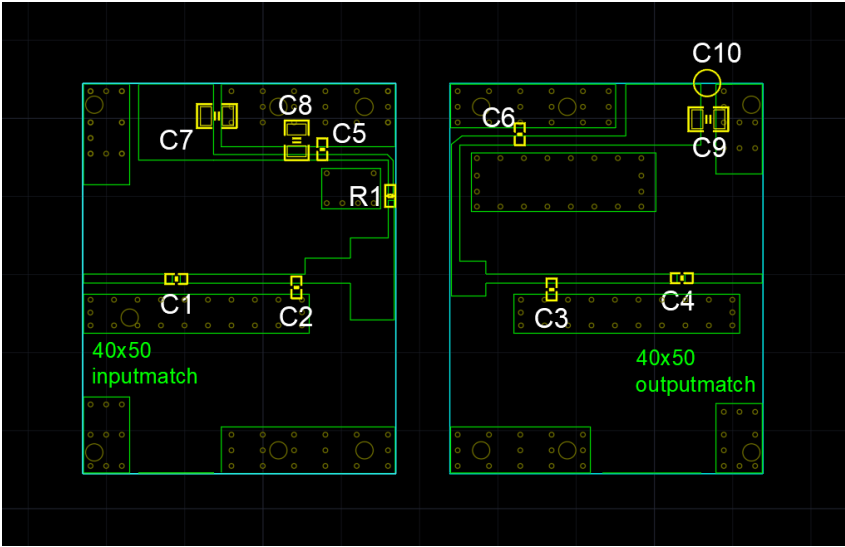


Figure 4. Test Circuit Component Layout (1100MHz~1700MHz)

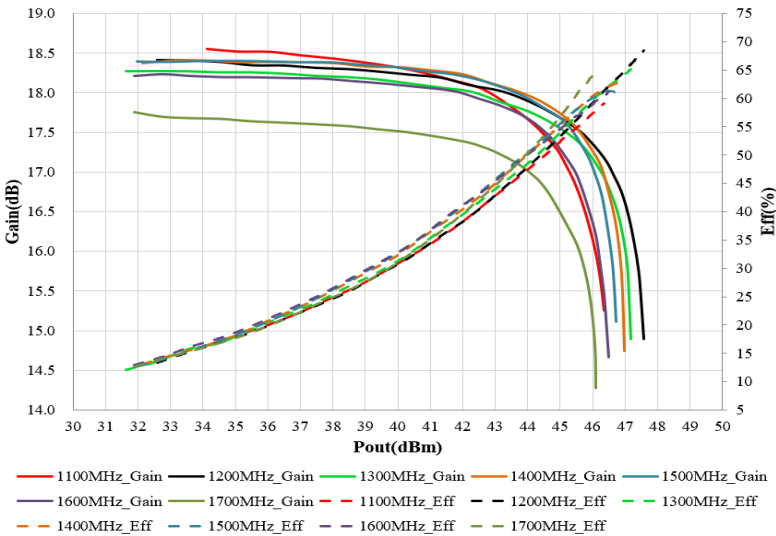
Table 5. Test Circuit Component Designations and Values

Component	Value	Quantity
U1	SME6004V	1
C1、C4、C5、C6	20pF	4
C2、C3	2pF	2
C7、C8、C9	10uF/63V	3
C10	470uF/63V	1
R1	10 Ω	1

Figure 4. Pulse RF performance

$V_{DD}=50V$ $I_{DQ}=60mA$, Pulse CW, Pulse Width=20 us, Duty cycle=10%

SME6004V Class AB $V_{ds}=50V$, $I_{dq}=83.5mA$
PulseWidth= 20us, DutyCycle= 10%, DEMO1



30-1500MHz

Reference Circuit of Test Fixture Assembly Diagram

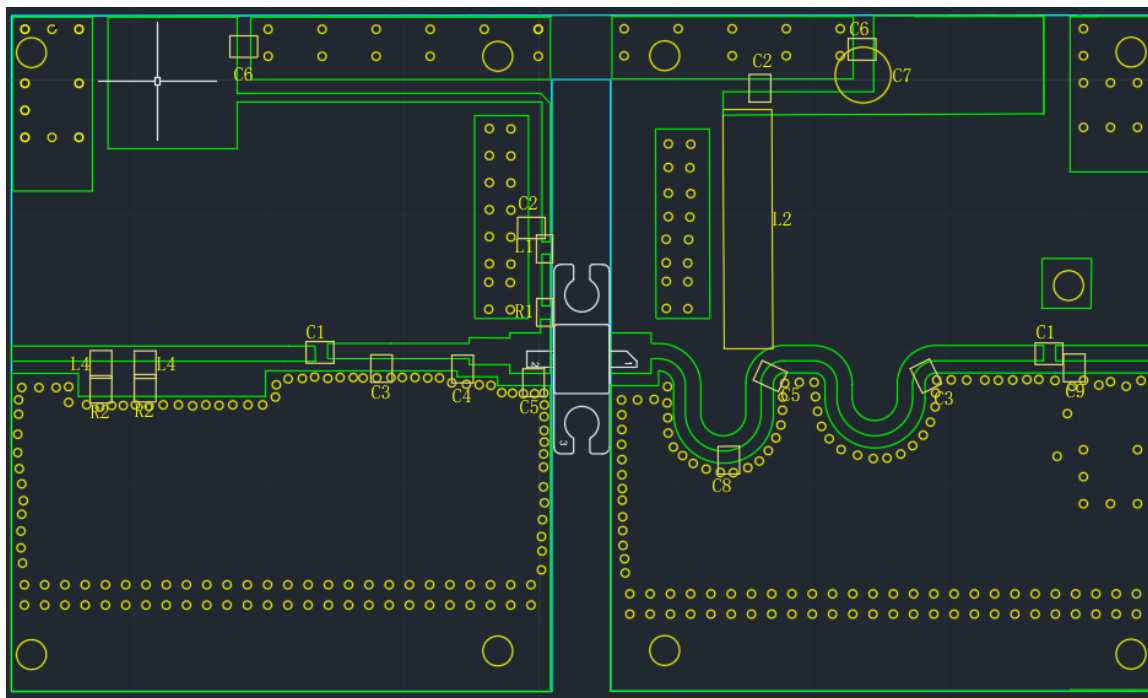


Figure 4. Test Circuit Component Layout

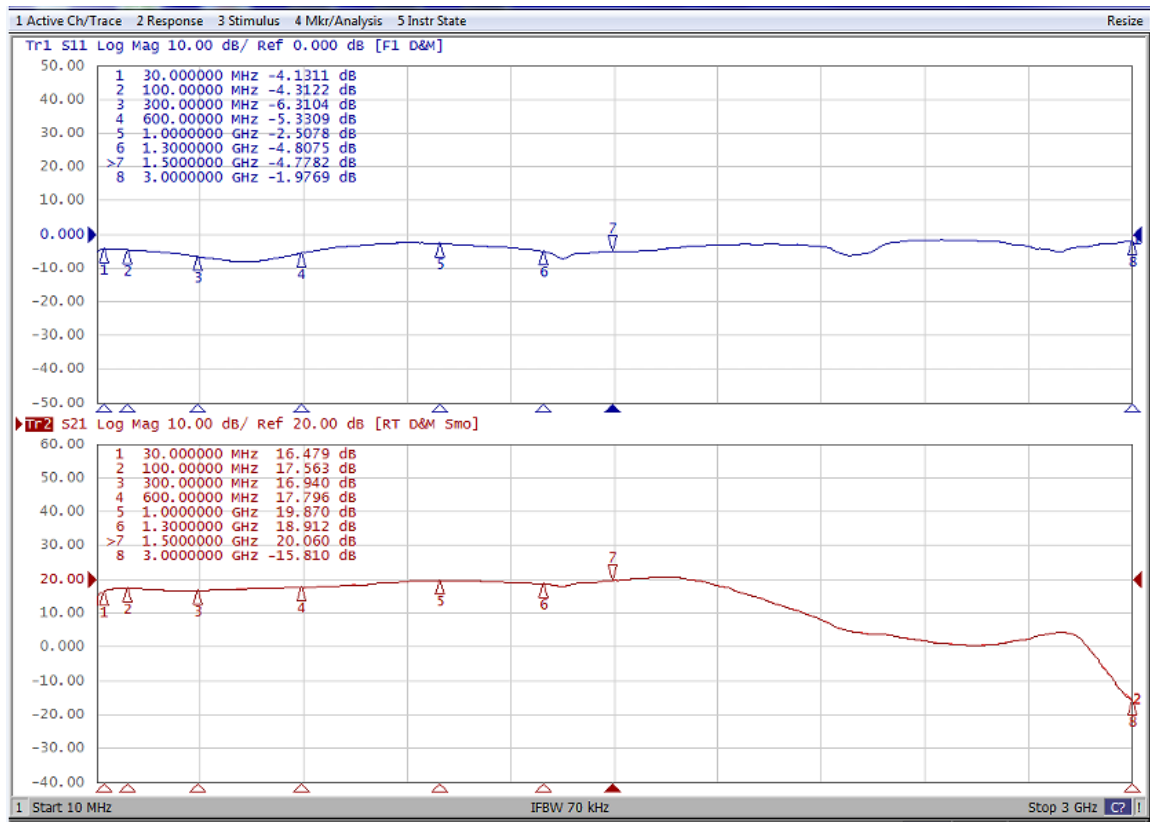
Table 6. Test Circuit Component Designations and Values

Component	Value	Quantity
C1	820pF	2
C2	1uF/63V	2
R1	50ohm	4
C7	470uF	1
C3	3pF	2
C4	3.9pF	1
C5	2pF	2
C6	10uF	2
L1	2.2nH	1
L2	1.3uH	1
L4	330nH	2
R2	56 ohm	2
C9	1pF	1
C8	2.4pF	1

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Figure 5. Network analyzer output S11/S21



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Package Outline

Flanged ceramic package; 2 leads

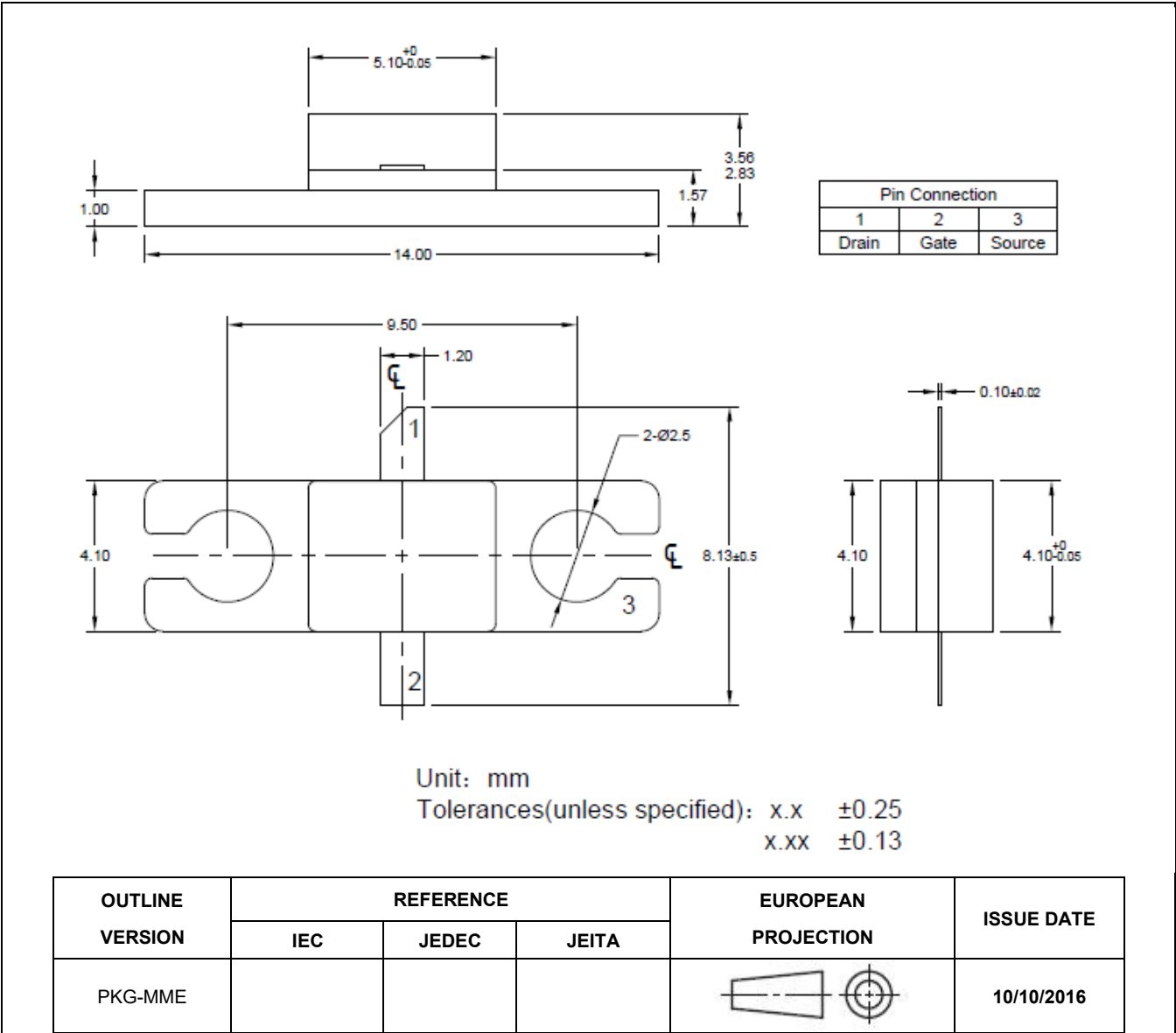


Figure 1. Package Outline PKG-MME

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Revision history

Table 5. Document revision history

Date	Revision	Datasheet Status
2020/5/6	V1.0	Preliminary Datasheet Creation
2024/5/28	V1.1	Add L band application data
2025/6/4	V1.2	Add 30-1500MHz application data

Application data based on ZBB-20-05/ZYX-24-41, ZXY-25-04

Notice

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