



GaN 50V, 165W, 2.45GHz RF Power Transistor



Description

The STBV25165C9 is a single ended 165watt capable, GaN HEMT, ideal for ISM applications at 2.45GHz. The device offers a more cost effective solution than traditional ceramic device, housed in 12*10mm cost effective plastic open cavity package, and heat dissipated by copper flange directly.

2 pieces of STBV25165C9 combined could be a cost effective option for 300W power amplifier

There is no guarantee of performance when this part is used outside of stated frequencies.

- Typical RF performance at 2.4-2.5GHz applications with device soldered on heatsink under air cooling

$V_{DD} = 50V_{dc}$, $V_{gs} = -3.7V$, $I_{dq} = 1mA$

Pulse CW: Pulse width=20us, duty cycle=20%

Freq (MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
2400	52.27	168.5	68.9	15.87	53.1	204.1	74
2450	52.07	161.1	72.3	16.06	52.87	193.4	77
2500	51.23	132.8	71.0	16.54	52.42	174.4	78

CW:

Freq (MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
2400	51.92	155.5	65.3	15.63	52.86	193.1	71
2450	51.77	150.2	68.8	15.89	52.66	184.5	74
2500	50.53	113.0	64.5	16.45	52.18	165.3	75

Applications

- 2.45GHz RF Energy
- S band power amplifier

Important Note: Proper Biasing Sequence for GaN HEMT Transistors

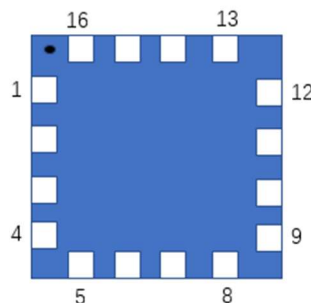
Turning the device ON

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

Pin Configuration and Description (Top view)





Pin No.	Symbol	Description
5-8	RF IN/Vgs	RF Input/Gate bias
13-16	RF OUT/Vds	RF Output/Drain bias
1-4,9-12	NC	Can be left as either no use or grounding
Package Base	GND	DC/RF Ground. Proposed to be soldered to heatsink plane directly for the best CW thermal and RF performance. Soldered through vias or copper coin allowed for pulsed CW applications, but will result in excessive junction temperatures and different RF performance

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}	55	Vdc
Maximum gate current	I_{gs}	21.6	mA
Storage Temperature Range	Tstg	-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 $P_d = 55\text{W}$	$R_{\theta JC}$	1.6	°C /W

Table 3. Electrical Characteristics (TA = 25°C unless otherwise noted)

DC Characteristics (Each path, measured on wafer prior to packaging)

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = -8\text{V}$; $I_{DS} = 22.5\text{mA}$	V_{DSS}		200		V
Gate Threshold Voltage	$V_{DS} = 10\text{V}$, $I_D = 22.5\text{mA}$	$V_{GS(th)}$	-4	-	-2	V
Gate Quiescent Voltage	$V_{DS} = 48\text{V}$, $I_{DS} = 150\text{mA}$, Measured in Functional Test	$V_{GS(Q)}$		-3.3		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	2.45GHz, $P_{out} = 165\text{W}$ pulse CW All phase, No device damages	VSWR		10:1		



TYPICAL CHARACTERISTICS

Figure 1: Efficiency and power gain as function of Pout
(VDD = 50Vdc, IdQ = 1mA, Pulse width=20us, duty cycle=20%)

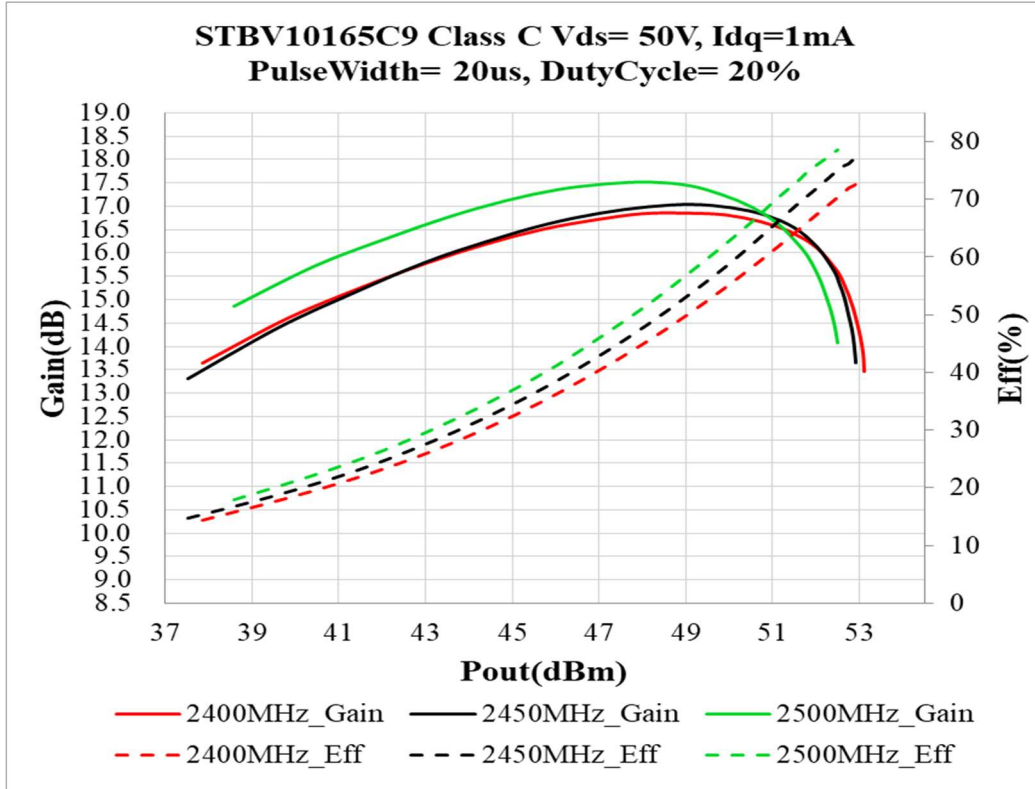


Figure 2: S11/S21 output from Network analyser

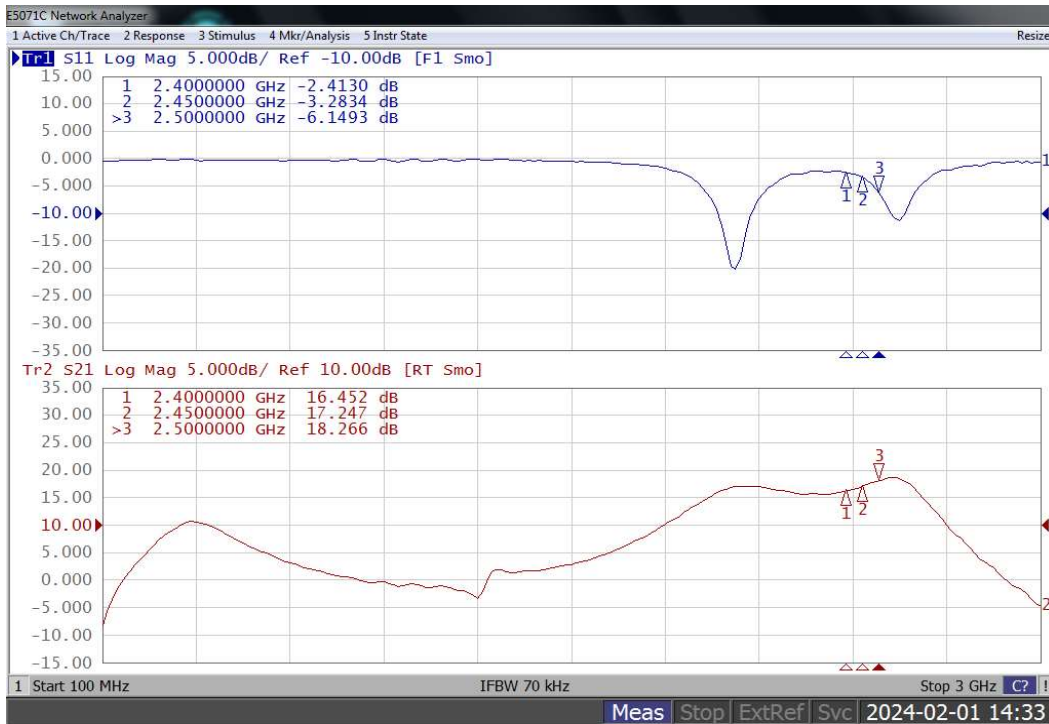
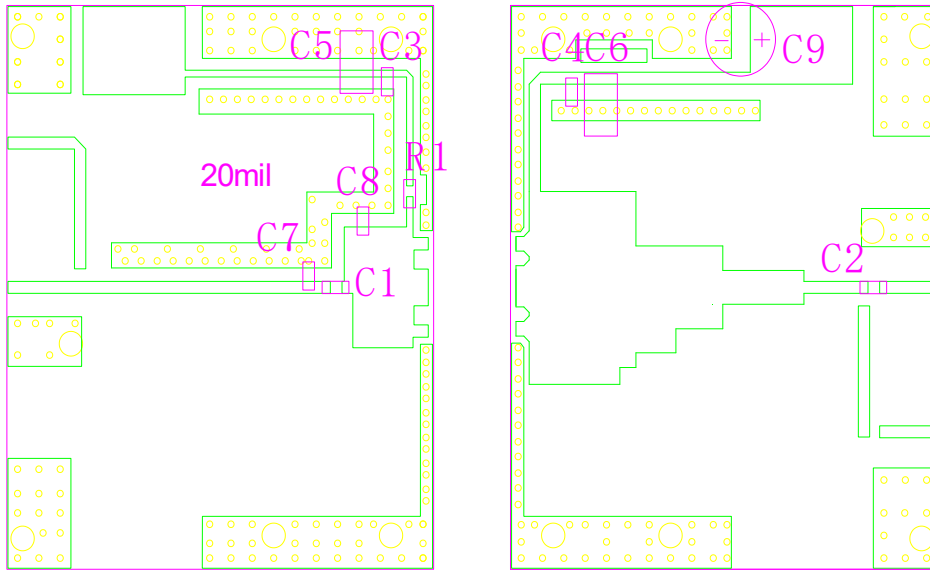


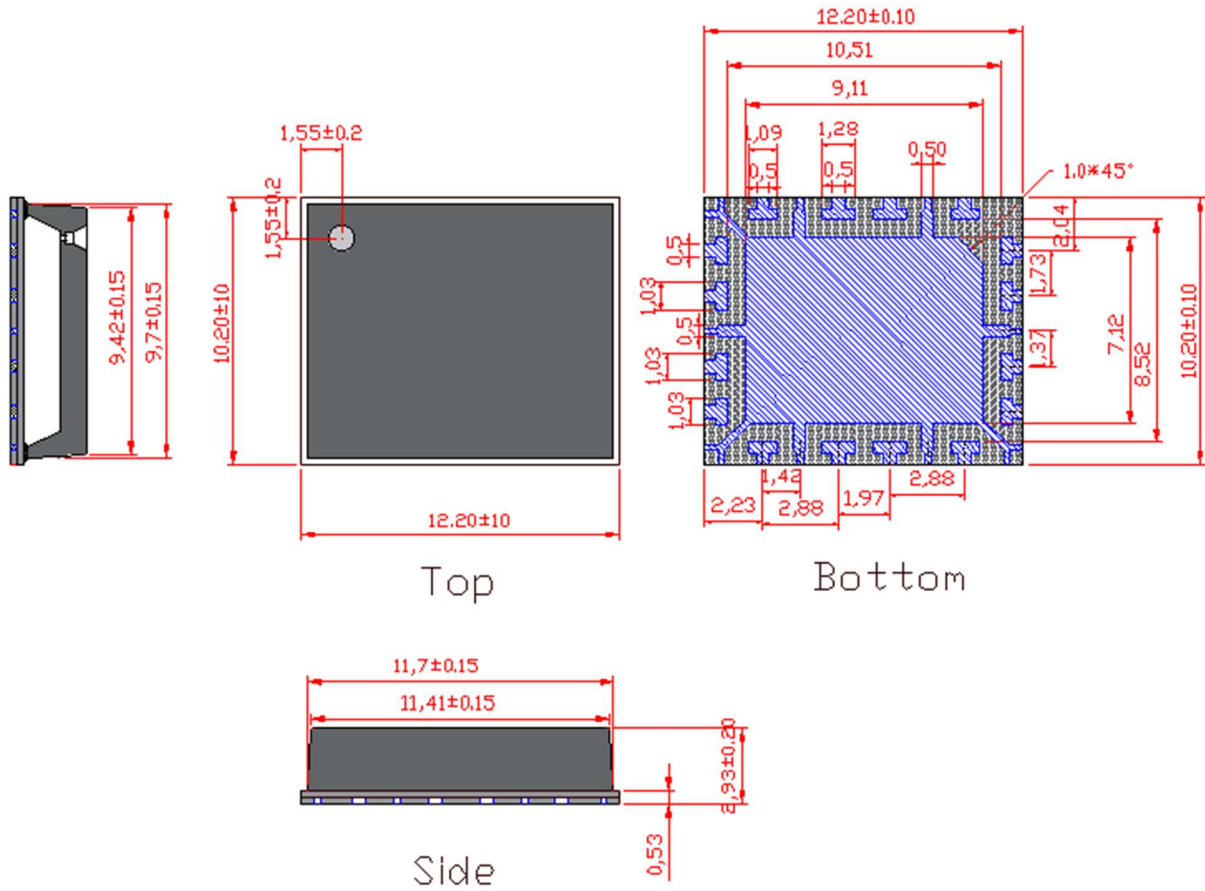
Figure 3: Reference design circuit (RO4350B 20mil, PCB DWG file upon request,)



Designator	Comment	Footprint	Quantity
C1, C2, C3, C4	12 pF	0603/0805	4
C5, C6	10 uF/100V	1210	2
C7	0.7pF	0603/0805	1
C8	2.0 pF	0603/0805	1
C9	470 uF/63V		1
R1	10 Ω	0603	1



Package Dimensions (Unit:mm)



Revision history

Table 1. Document revision history

Date	Revision	Datasheet Status
2023/2/1	Rev 1.0	Preliminary Datasheet

Application data based on LSM-24-06

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