SG1435VS GaN TRANSISTOR

Document Number: SG1435VS
Preliminary Datasheet V1.0

GaN HEMT 50V, 350W, L band RF Power Transistor

Description

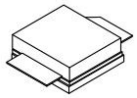
The SG1435VS is a 350-watt, internally matched GaN HEMT, designed for pulsed amplifier applications with frequencies from 960MHz to 1400MHz.

When used in narrower band 1030-1090MHz, it can be a 400W transistor.

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

It is recommended to use this device only at pulse condition, and power rating will be different according to different pulse width and duty cycle

SG1435VS



Earless

- Typical **pulse** Performance (On Innogration fixture with device soldered):

V_{DD} = 50 Volts, I_{DQ} = 420 mA, Pulse CW, Pulse width=20us, Duty cycle=10%.

Freq (MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
960	54.47	279.9	54.4	16.06	56.19	415.7	65.0
1010	56.25	421.6	68.9	16.27	56.79	478.0	70.7
1060	55.94	393.0	66.9	16.34	56.9	489.3	69.3
1110	54.75	298.9	61.9	16.65	56.21	417.4	67.6
1160	54.16	260.8	62.5	16.89	55.86	385.8	70.9
1225	53.94	247.8	64.8	16.84	55.5	354.8	71.8

- Typical **pulse** Performance (On Innogration fixture with device soldered):

V_{DD} = 50 Volts, I_{DQ} = 420 mA, Pulse CW, Pulse width=20us, Duty cycle=10%.

Freq (MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
1200	57.17	521.5	66.7	15.85	58.02	633.5	71.0
1300	55.9	388.6	67.9	16.4	56.87	486.6	71.4
1400	54.86	306.5	65.6	15.66	56.06	403.4	69.3

Applications and Features

- Suitable for broad band application in L band data link, Avionics applications.
- 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 (50 V)
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 @ T_C = 25°C	Igmax	54	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,P_{OUT}=350W @1.2GHz by FEA 20us/10%, Tcase=85°C, 50 Vdc, I_{DQ} =420 mA	$R_{\theta JC}$	0.6	°C/W

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

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS}=-8V; I_{DS}=54mA	V_{DSS}	——	200	——	V
Gate Threshold Voltage	V_{DS} = 10V, I_D = 54mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	V_{DS} =50V, I_{DS}=420mA, Measured in Functional Test	$V_{GS(Q)}$	——	-3.14	——	V

Functional Tests (In Innogration Test Fixture, 50 ohm system) :V_{DD} = 50Vdc, I_{DQ} =420 mA, f = 1200MHz, Pulse CW, Pulse width=20us, Duty cycle=20%.

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain @ $P_{\_3dB}$	G_P	——	14	——	dB
Drain Efficiency@P_{3dB}	η_D	——	65	——	%
3dB compression Power	P_{3dB}	——	350	——	W
Input Return Loss	IRL	——	-4	——	dB

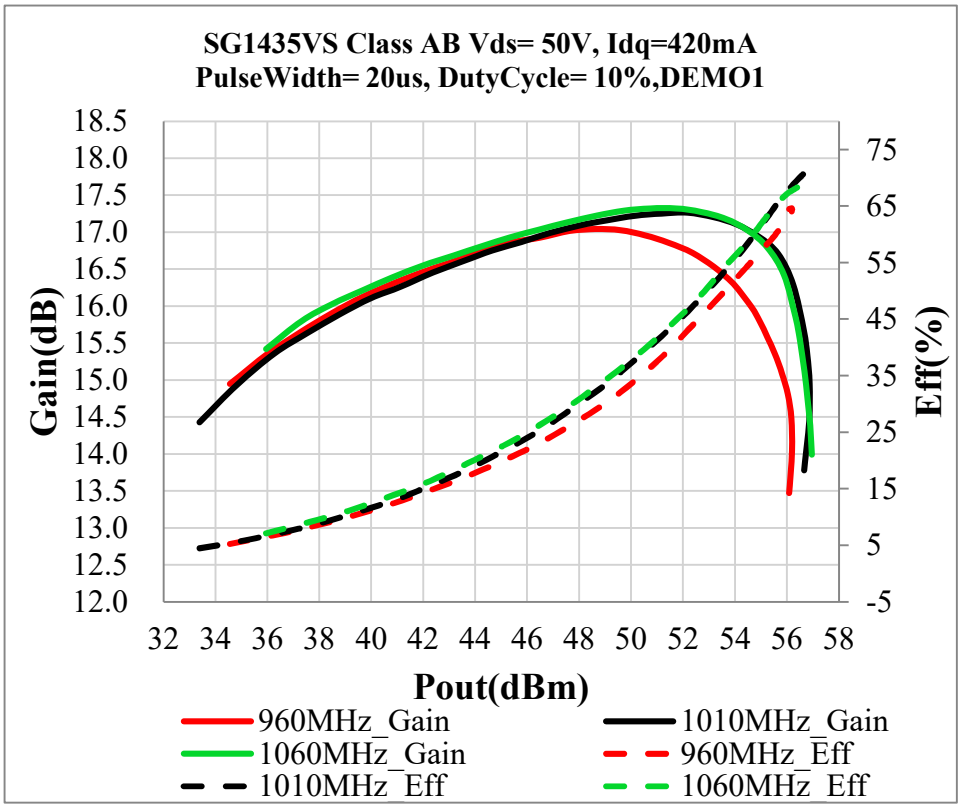
Load Mismatch (In Innogration Test Fixture, 50 ohm system): V_{DD} = 50 Vdc, I_{DQ} = 4200 mA, f = 1200 MHz

VSWR 10:1 at 350W pulse CW Output Power	No Device Degradation

TYPICAL CHARACTERISTICS

960-1225MHz

Figure 1. Power Gain and Drain Efficiency as Function of Pulse Output Power



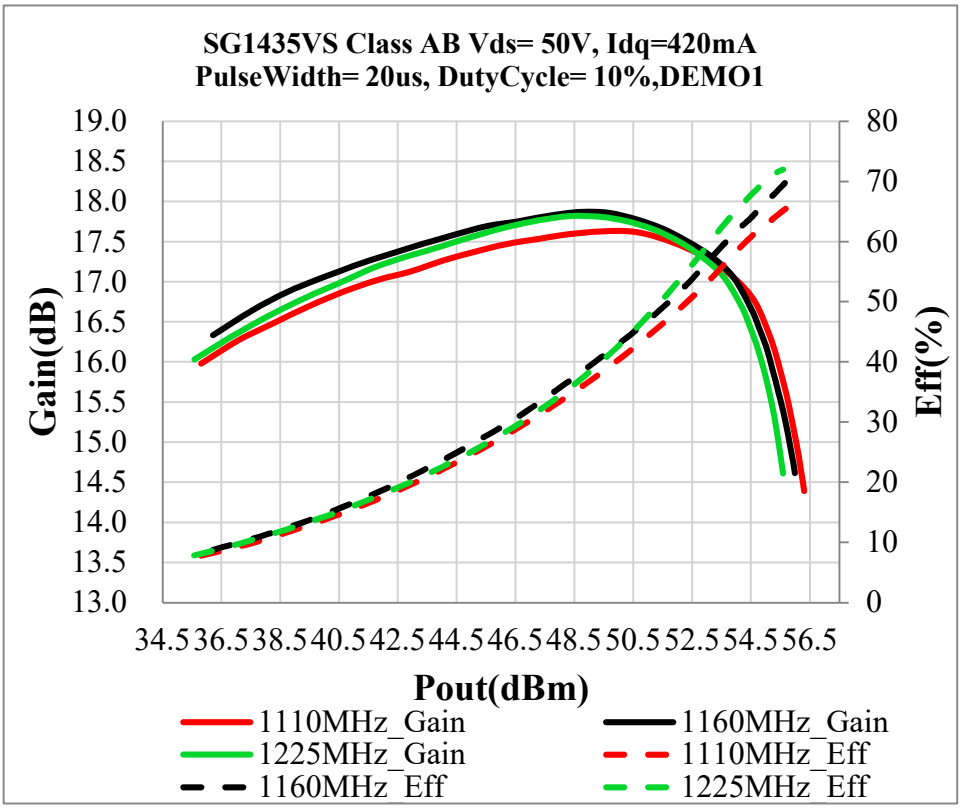


Figure 2. Network analyzer output S11/S21

VDS=50V IDQ=420mA VGS=-3.14V

Figure 3. Test Circuit Component Layout

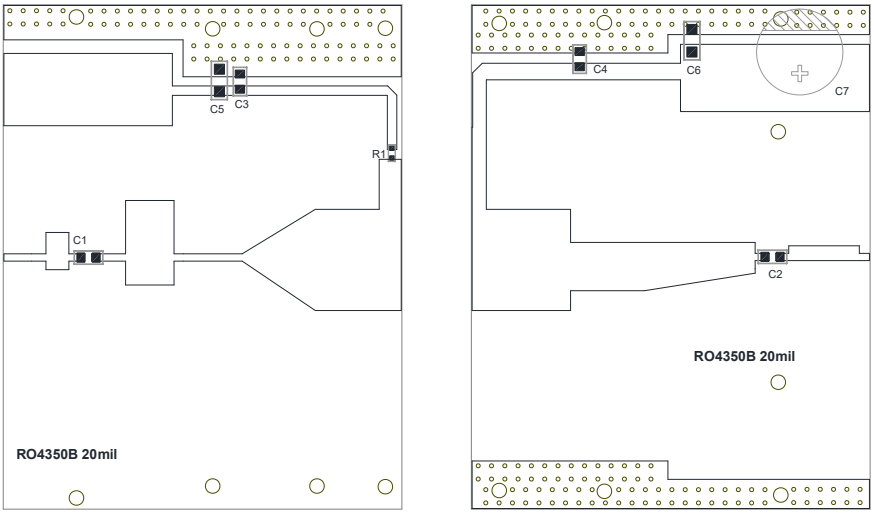


Table 4. Test Circuit Component Designations and Values

Component	Description	Suggested Manufacturer
C1,C2,C3,C4	82pF	DLC70B
C5,C6	Ceramic multilayer capacitor, 10uF, 100V	10uF/100V
C7	4700uF	63V/1000uF
R1	Chip Resistor,9.1 Ω	
PCB	20mil thick, εr=3.48, Rogers RO4350B, 1 oz. copper	

1200-1400MHz

Figure 4. Power Gain and Drain Efficiency as Function of Pulse Output Power

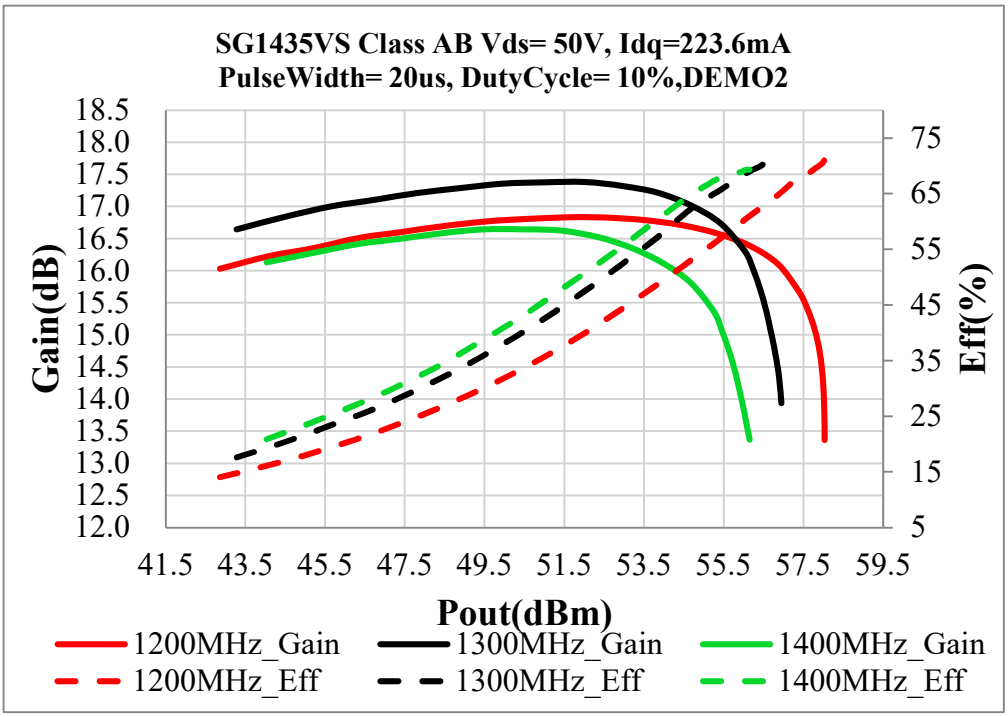


Figure 5. Network analyzer output S11/S21

VDS=50V IDQ=420mA VGS=-3.14V

Figure 6. Test Circuit Component Layout

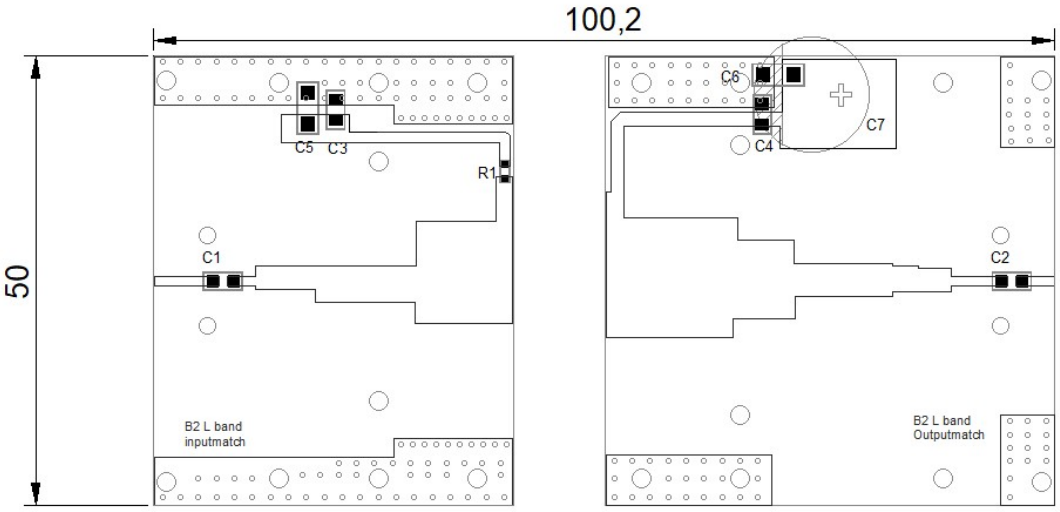
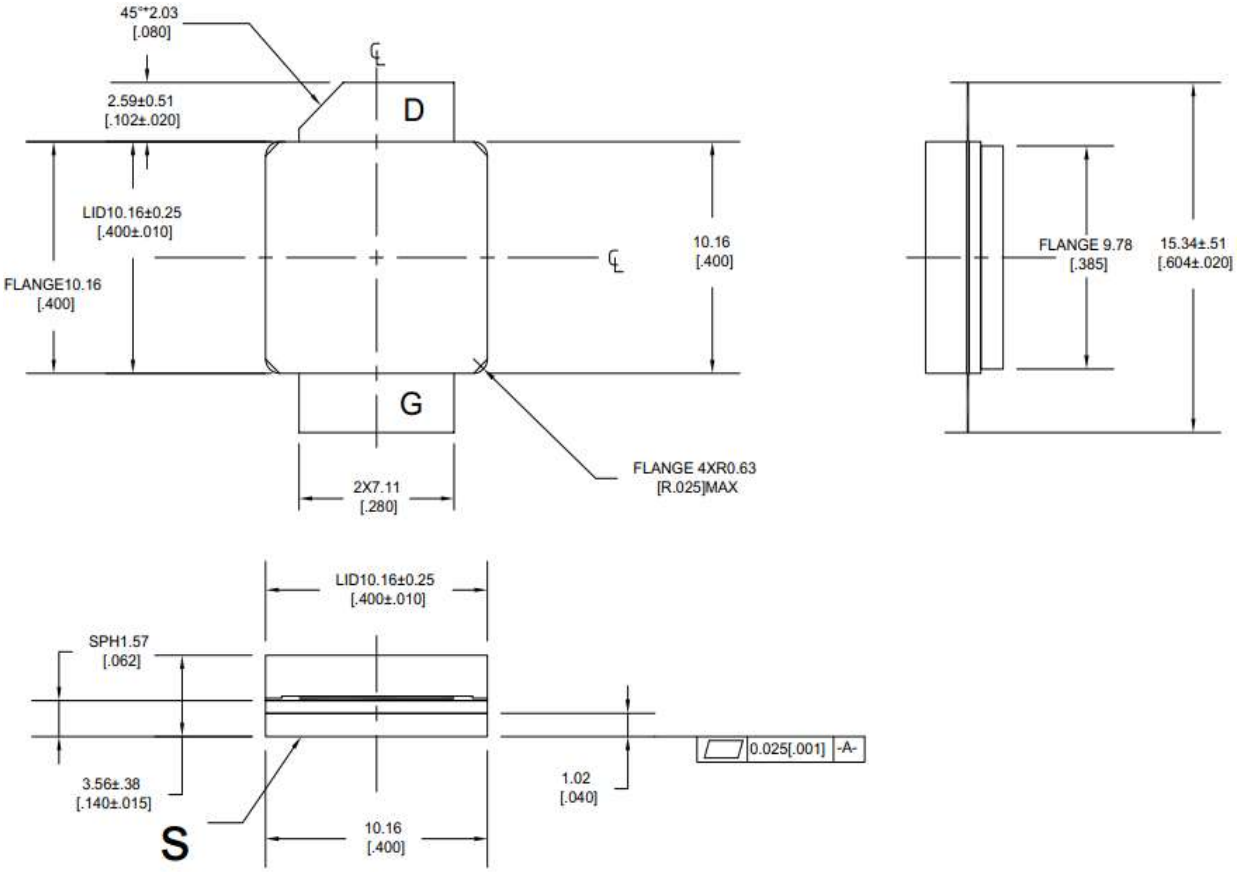


Table 5. Test Circuit Component Designations and Values

Component	Description	Suggested Manufacturer
C1,	10pF	DLC70B
C2,C3,C4	47pF	
C5,C6	Ceramic multilayer capacitor, 10uF, 100V	10uF/100V
C7	2200uF	63V/1000uF
R1	Chip Resistor,9.1 Ω	
PCB	20mil thick, εr=3.48, Rogers RO4350B, 1 oz. copper	

Earless Flanged Ceramic Package; 2 leads



Unit: mm [inch]

Tolerance .xx +/- 0.01 .xxx +/- 0.005 inches

Revision history

Table 5. Document revision history

Date	Revision	Datasheet Status
2022/2/14	Rev 1.0	Preliminary Datasheet based on SDCV technology

Application data based on HL-22-04/YHG-22-02

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