Gallium Nitride 50V, 170W,1.8-2.4GHz RF Power Transistor

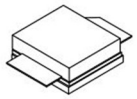
Description

The STAV22170AY2 is a single ended 170watt, GaN HEMT, ideal for applications from 1.8 to 2.2GHz.

It is an input matched transistor capable of supporting CW, pulse or any modulated signal.

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

STAV22170AY2



- Typical pulse CW performance across **1.8-2.4GHz Class AB**

V_{DD} = 50 Vdc, I_{DQ} = 200mA, Pulse width=20us, duty cycle=10%, Tc=25°C

(On innogration application board with device soldered)

Freq（MHz）	Gain（@P1dB）	P3dB（dBm）	P3dB（W）	Eff（%）
1800	16.06	52.92	195.67	57.80
1900	17.10	52.92	195.79	56.95
2000	17.57	52.93	196.30	56.38
2100	17.54	53.00	199.54	56.84
2200	17.66	53.11	204.64	58.76
2300	17.70	53.07	202.99	61.33
2400	17.91	53.23	210.21	67.53

Applications

- Sub-2GHz pulse or CW amplifier
- 4G LTE power amplifier
- Wideband jammer

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

Figure 1: Pin Connection definition

Transparent top view (Backside grounding for source)

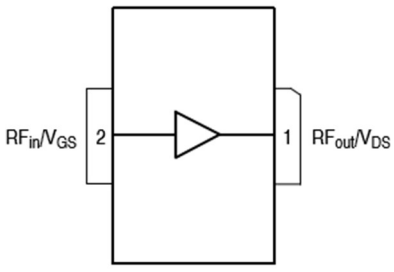


Table 1. Maximum Ratings

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	Igs	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°C, at Pd=65W	$R_{\theta JC}$	1.6	°C /W

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

DC Characteristics (measured on wafer prior to packaging)

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	VGS=-8V; IDS=21.6mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 21.6mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=200mA, Measured in Functional Test	$V_{GS(Q)}$		-3.12		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	2.1GHz, Pout=170W pulse CW All phase, No device damages	VSWR		10:1		

Figure 2: Median Lifetime vs. Channel Temperature

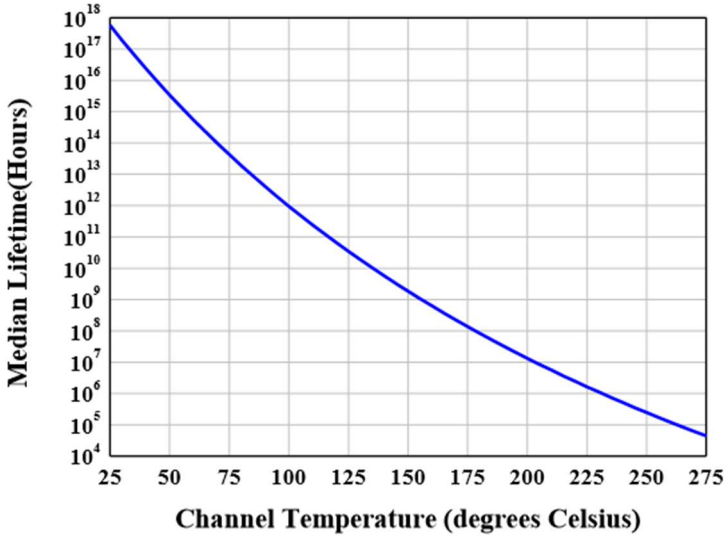
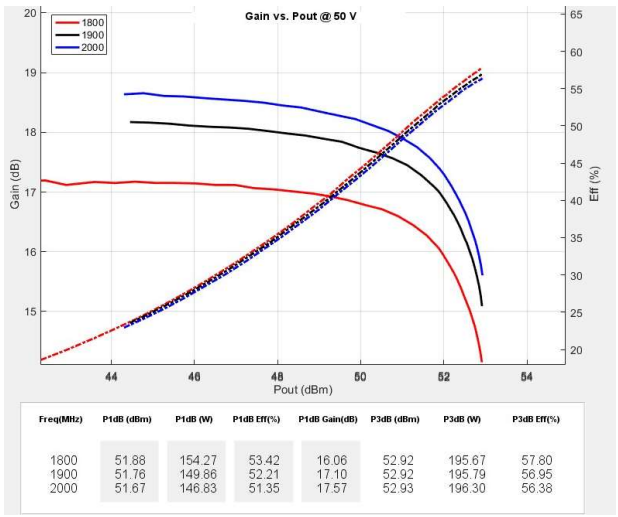
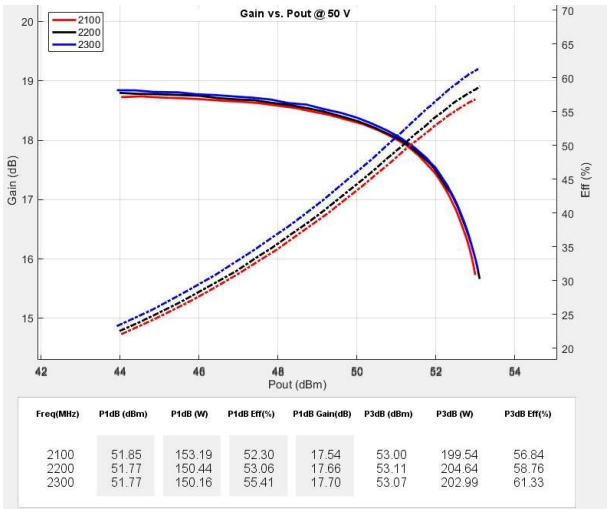


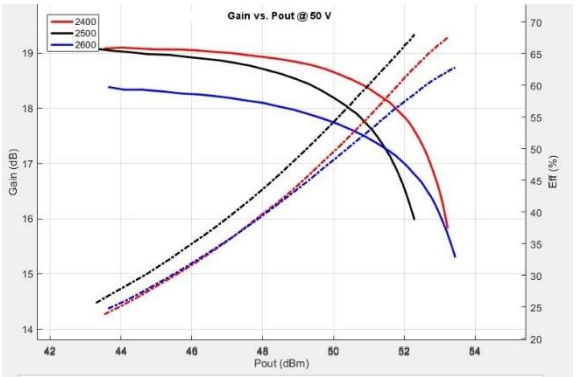
Figure 3: Efficiency and power gain as function of Pout



Freq(MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
1800	51.88	154.27	53.42	16.06	52.92	195.67	57.80
1900	51.76	149.86	52.21	17.10	52.92	195.79	56.95
2000	51.67	146.83	51.35	17.57	52.93	196.30	56.38



Freq(MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
2100	51.85	153.19	52.30	17.54	53.00	199.54	56.84
2200	51.77	150.44	53.06	17.66	53.11	204.64	58.76
2300	51.77	150.16	55.41	17.70	53.07	202.99	61.33



Freq(MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
2400	51.90	154.90	60.47	17.91	53.23	210.21	67.53
2500	50.36	108.67	56.28	18.05	52.29	169.39	68.02
2600	51.20	131.75	53.69	17.38	53.44	220.74	62.78

Figure 4: WCDMA back off performance across the band

(V_{DD} = 50 Vdc, I_{DQ} = 450 mA, **1.8-2.4GHz** application board) Pout=42dBm(Left), Pout=45dBm(Right)

Freq(MHz)	ACPR(dBc)	Gain(dB)	Efficiency(%)
1800	-43.77	16.25	19.09
1900	-43.93	17.15	18.94
2000	-43.86	17.54	18.59
2100	-44.75	17.77	18.67
2200	-45.46	17.79	18.94
2300	-46.46	17.85	19.55
2400	-48.32	18.24	20.92

Freq(MHz)	ACPR(dBc)	Gain(dB)	Efficiency(%)
1800	-39.72	15.77	27.10
1900	-38.95	16.62	26.52
2000	-38.88	16.98	26.13
2100	-39.07	17.21	26.19
2200	-39.28	17.25	26.65
2300	-39.43	17.33	27.61
2400	-39.86	17.86	29.88

Figure 5: S11 / S21 output from network analyzer on 1.8-2.4GHz application board

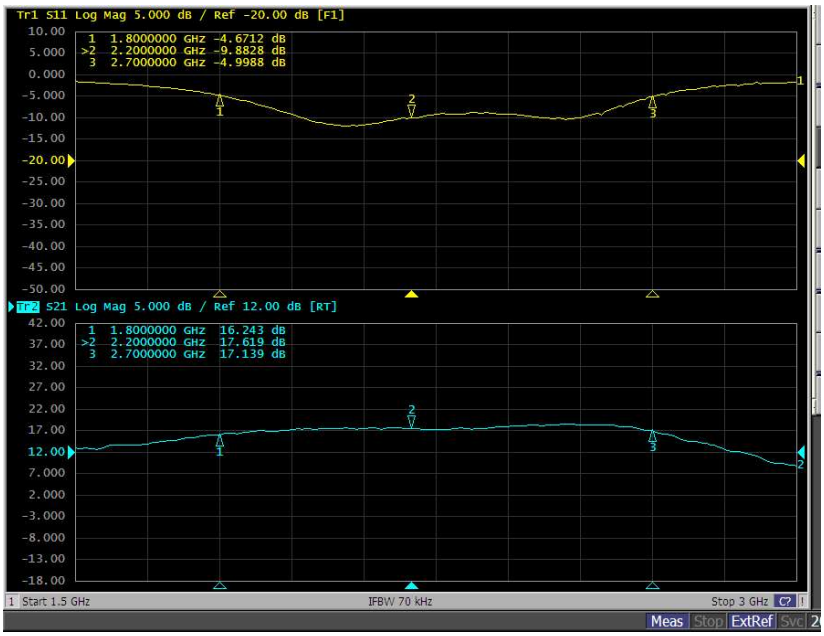


Figure 6: Picture of application board of 1.8-2.7GHz

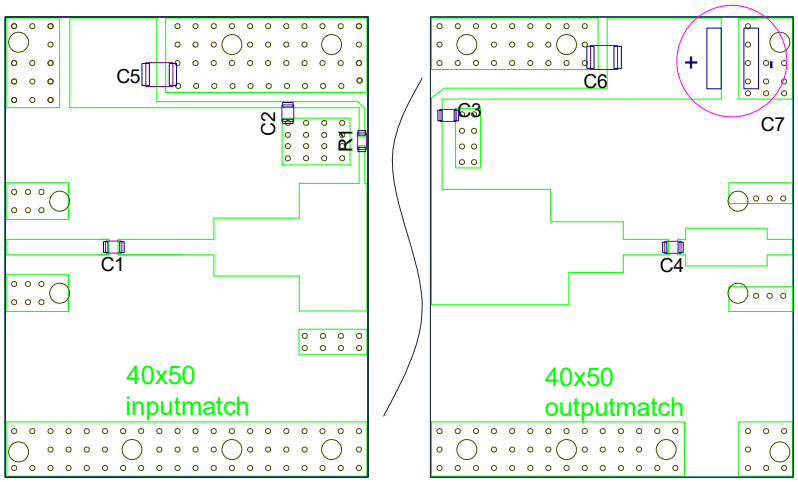
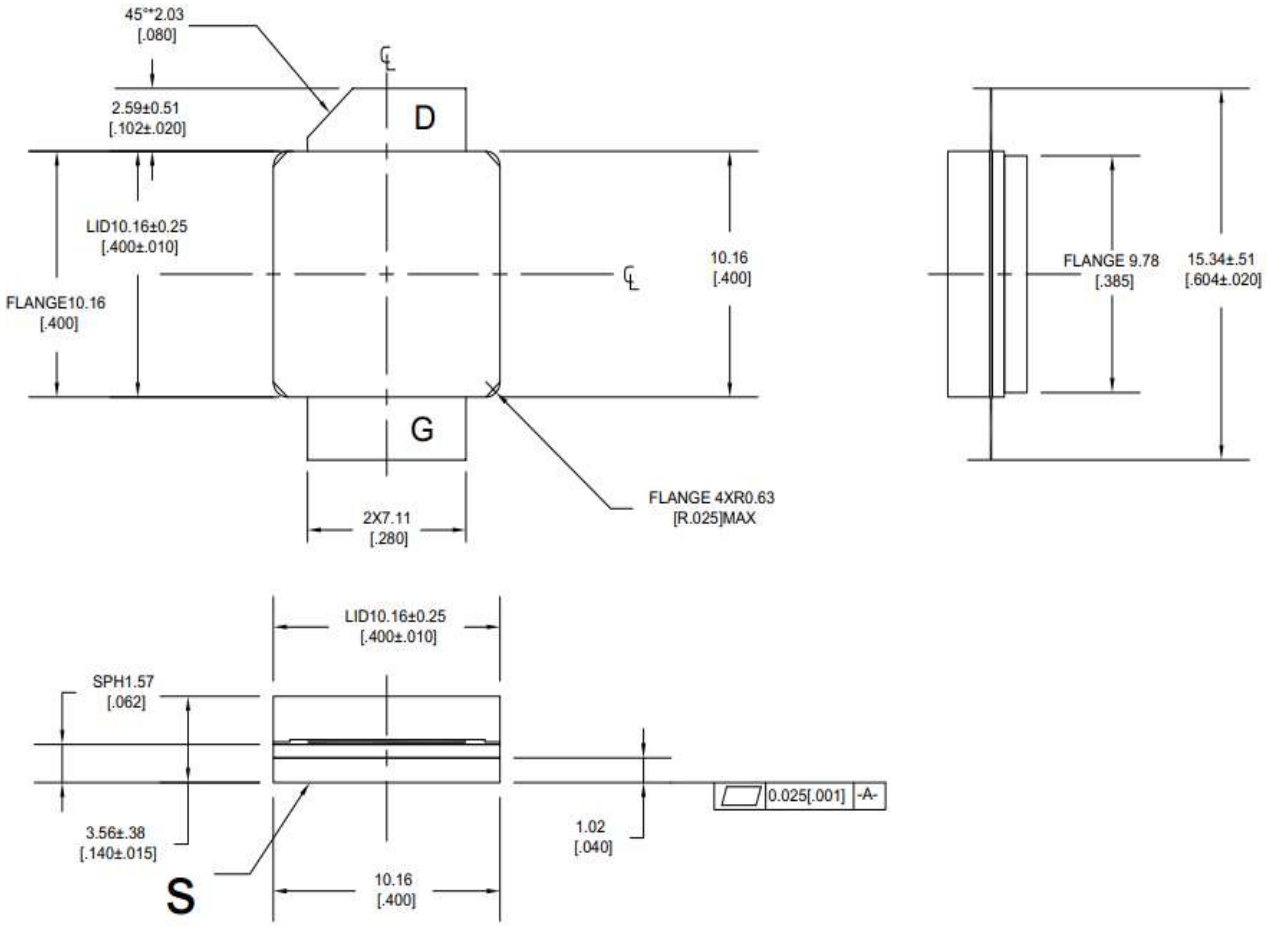


Table 4. Bill of materials of application board (PCB layout upon request)

Designator	Value	Package	Quantity
C1, C2, C3, C4	10pF	0805	4
C5, C6	10uF	1210	2
R1	10 Ω	0603	1
C7	100uF/63V		1
PCB	30mils	RO4350B	

Earless Flanged Ceramic Package; 2 leads



Unit：mm [inch]

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

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2020/7/2	**V1.0**	**Preliminary Datasheet Creation, Rename STAV22180A2 to STAV22170AY2**

Application data based on: LSM-19-21

Notice