



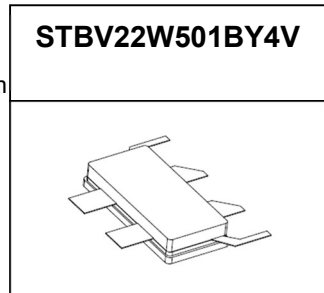
GaN HEMT 50V, 500W, 1.8-2.2GHz Full band RF Power Transistor

Description

The STBV22W501BY4V is a dual path 500watt, Internally matched GaN HEMT, ideal for applications from 1.8 to 2.2GHz full band operation especially for LTE/5G

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

- Typical RF performance on **1.8-2.2GHz** full band asymmetrical Doherty with device soldered VDS= 50V, IDQ=350mA(Vgm=-3.17V, Vgp=-6.0V)



Freq (GHz)	Pulse CW Signal ⁽¹⁾			P _{avg} =49dBm WCDMA Signal ⁽²⁾		
	P1-Gain (dB)	P5 (dBm)	P5 (W)	Gp (dB)	η _D (%)	ACPR _{5M} (dBc)
1.8	14.53	57.80	602	14.78	53.53	-24.26
1.85	14.38	57.06	508	14.22	54.10	-25.02
1.9	14.53	57.03	505	13.99	54.70	-26.10
2.0	14.38	57.34	542	13.72	52.28	-29.18
2.1	14.91	57.63	579	14.50	52.96	-30.40
2.15	15.22	57.45	560	14.89	52.80	-29.79
2.2	15.99	56.99	500	15.16	53.11	-28.09

(1) Pulsed condition: 100us and 10%,

(2) 1C WCDMA; Signal PAR = 10 dB @ 0.01% Probability on CCDF.

Recommended driver: Class AB (1 stage discrete solution): STBV38061C6

Applications

- Asymmetrical Doherty amplifier within 1.8-2.2GHz full band
- Sub-2GHz power amplifier
- CW or pulsed 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

Figure 1: Pin Connection definition

Transparent top view (Backside grounding for source)

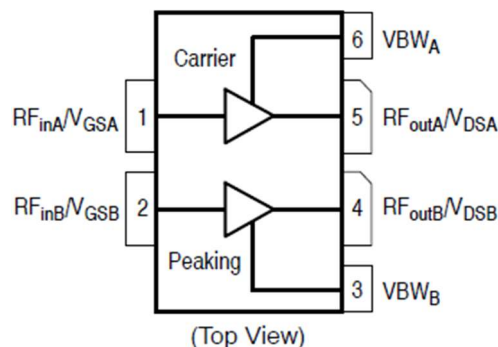




Table 1. Maximum Ratings

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	I_{gs}	61	mA
Storage Temperature Range	T_{stg}	-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 $P_d=90\text{W}$, on Doherty application board	$R_{\theta JC}$	0.9	°C /W

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

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

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS}=-8\text{V}$; $I_{DS}=30\text{mA}$	V_{DSS}		200		V
Gate Threshold Voltage	$V_{DS}=10\text{V}$, $I_D=30\text{mA}$	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	$V_{DS}=50\text{V}$, $I_{DS}=350\text{mA}$, Measured in Functional Test	$V_{GS(Q)}$		-3.15		V

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

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS}=-8\text{V}$; $I_{DS}=39.6\text{mA}$	V_{DSS}		200		V
Gate Threshold Voltage	$V_{DS}=10\text{V}$, $I_D=39.6\text{mA}$	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	$V_{DS}=50\text{V}$, $I_{DS}=130\text{mA}$, Measured in Functional Test	$V_{GS(Q)}$		-3.3		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	2.14GHz, $P_{out}=80\text{W}$ WCDMA 1 Carrier in Doherty circuit All phase, No device damages	VSWR		10:1		

Figure 2: Median Lifetime vs. Channel Temperature

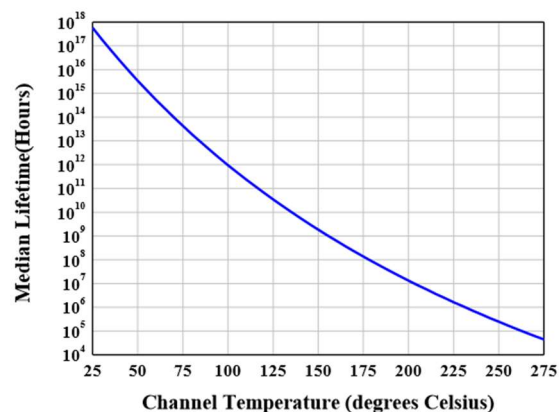




Figure 3: Efficiency and power gain as function of Pout (1.8-2.2GHz Doherty)

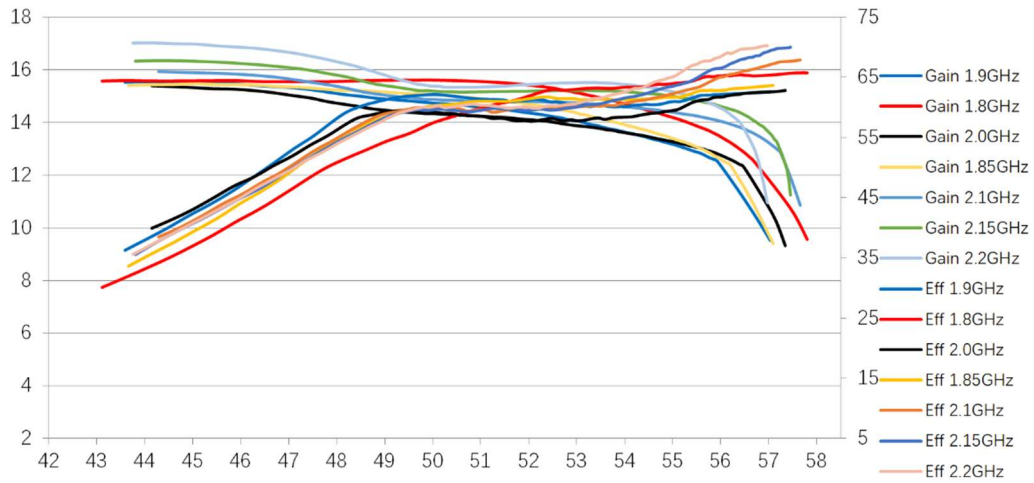


Figure 4: Network analyzer output, S11 and S21 (1.8-2.2GHz Doherty)

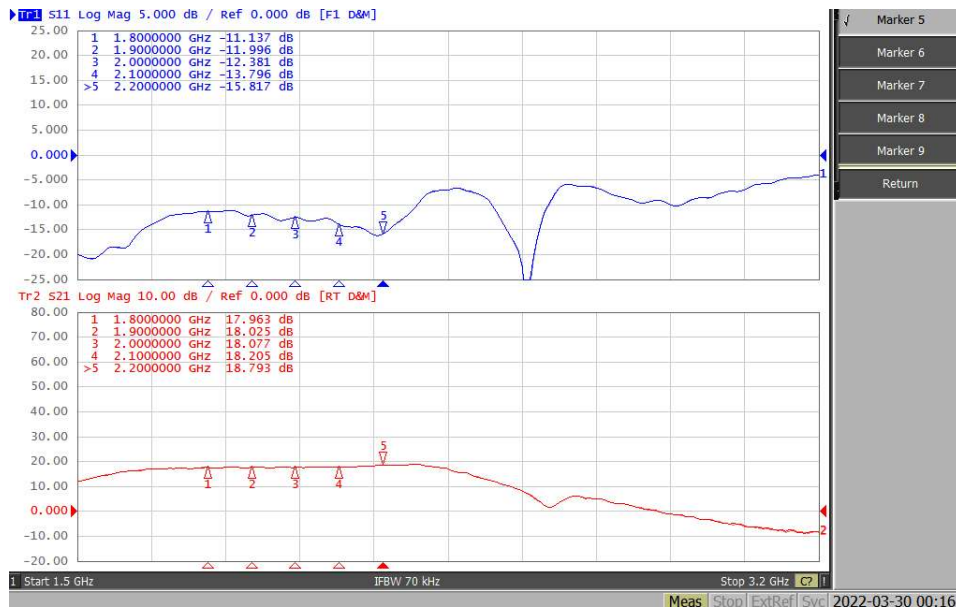


Figure 5: Intermodulation Distortion Products versus Two--Tone Spacing

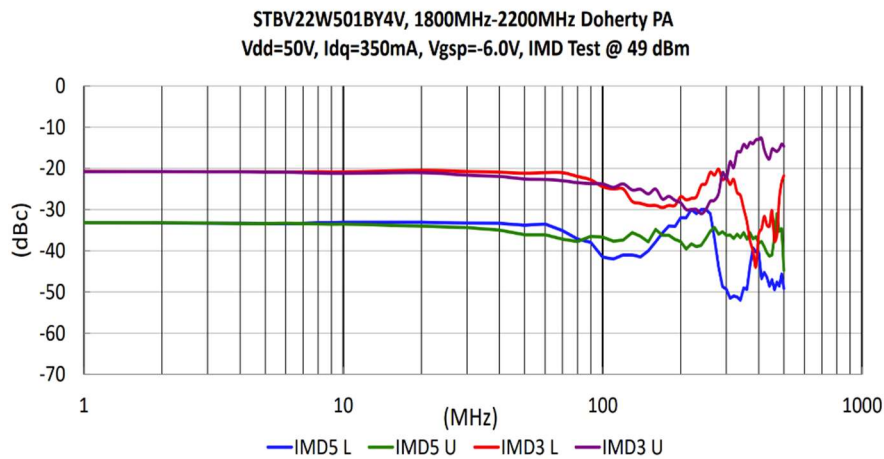


Figure 6: Picture of application board Doherty circuit for 1.8-2.2GHz

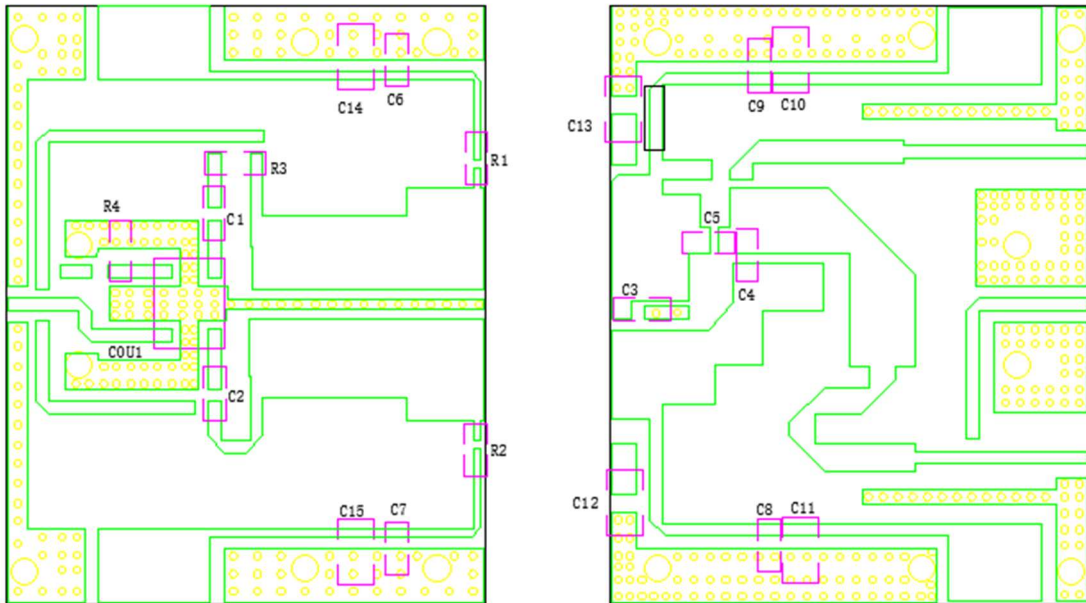
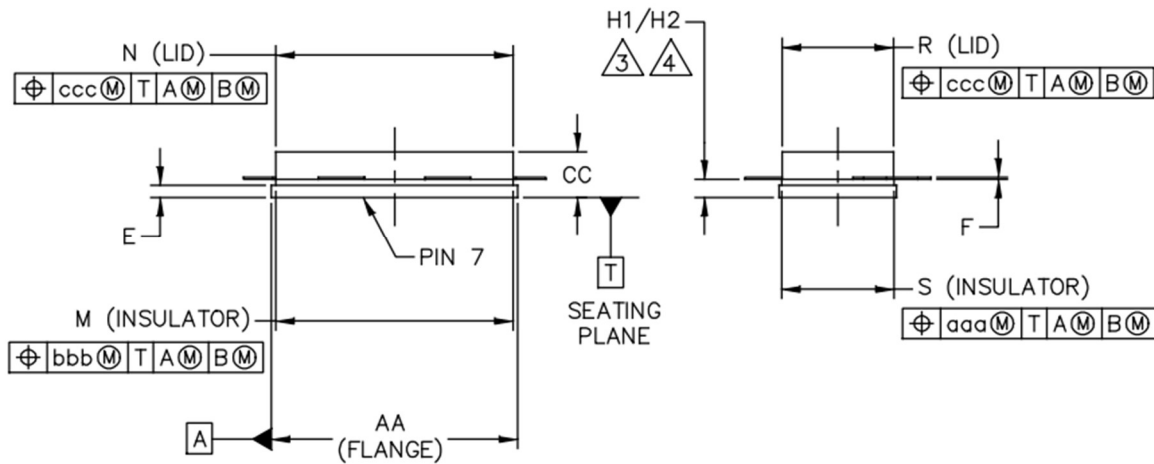
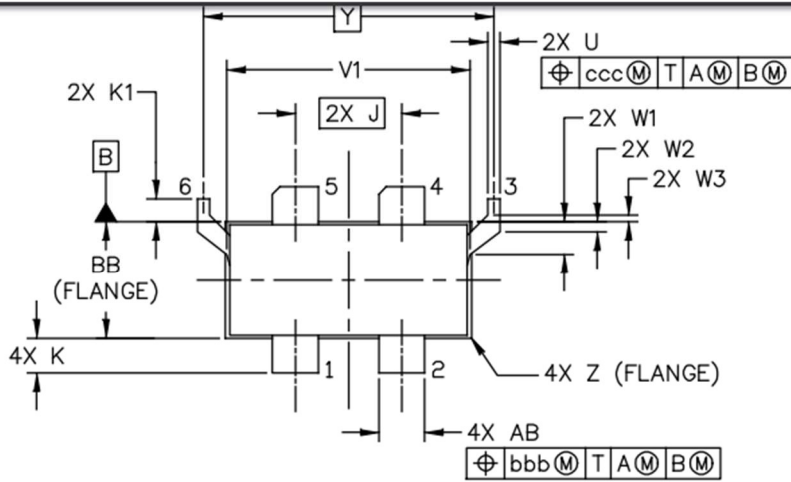


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C6, C9,C7,C8	6	20pF High Q Capacitor	251SHS200BSE	TEMEX
C5	1	8.2pF High Q Capacitor	ATC600F8R2	ATC
C3	1	1.2pF High Q Capacitor	ATC600S1R2	ATC
C15,C10,C11, C12,C13,C14	6	10uF MLCC	GRM32EC72A106ME05	Murata
C4	1	4.7pF High Q Capacitor	251SHS4R7BSE	TEMEX
R3	1	15 Ω Power Resistor	ESR03EZPF150	ROHM
R1,R2	2	10 Ω Power Resistor	ESR03EZPF100	ROHM
R4	1	50 Ω Power Resistor	S1206N	RN2
COU1	1	3 dB Bridge	HC2100P03H	YANTEL
T1	1	500W GaN Dual Transistor	STBV22W501BY4V	Innogrations



Earless Flanged Ceramic Package; 6 leads- BY4V



DIM	INCH		MILLIMETER		DIM	INCH		MILLIMETER	
	MIN	MAX	MIN	MAX		MIN	MAX	MIN	MAX
AA	.805	.815	20.45	20.70	R	.365	.375	9.27	9.53
BB	.380	.390	9.65	9.91	S	.365	.375	9.27	9.53
CC	.125	.170	3.18	4.32	U	.035	.045	0.89	1.14
E	.035	.045	0.89	1.14	V1	.795	.805	20.19	20.45
F	.004	.007	0.10	0.18	W1	.0975	.1175	2.48	2.98
H1	.057	.067	1.45	1.70	W2	.0225	.0425	0.57	1.08
H2	.054	.070	1.37	1.78	W3	.0125	.0325	0.32	0.83
J	.350 BSC		8.89 BSC		Y	.956 BSC		24.28 BSC	
K	.0995	.1295	2.53	3.29	Z	R.000	R.040	R0.00	R1.02
K1	.070	.090	1.78	2.29	AB	.145	.155	3.68	3.94
M	.774	.786	19.66	19.96	aaa	.005		0.13	
N	.772	.788	19.61	20.02	bbb	.010		0.25	
					ccc	.015		0.38	



Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2022/3/4	V1.0	Preliminary Datasheet Creation
2022/3/31	V1.1	Add VBW info and update according to latest application result

Application data based on: LWH-22-07

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