



### Gallium Nitride 50V, 500W,0.6-1GHz RF Power Transistor

#### Description

The STBV10500BY4 is a 500watt Doherty pair capable, GaN HEMT, ideal for for 4G/5G cellular applications from 0.6 to 1GHz..

It can be configured as asymmetrical Doherty delivering 80W average power, according to normal 8dB back off.

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

- Typical Pulse CW performance on 758-821MHz Doherty

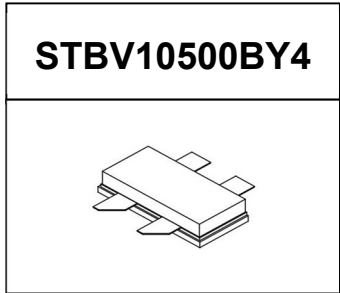
V<sub>DD</sub> = 50 Vdc, I<sub>DQ\_main</sub> = 280mA, V<sub>gs\_peak</sub>=-4.9V, Pulse condition: 100us 10%

Freq (MHz)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)	P3dB Gain(dB)	P5dB (dBm)	P5dB (W)	P5dB Eff(%)
758	56.02	400.2	72.8	15.83	57.06	508.4	73.7
789.5	55.27	336.3	71.4	16.55	57.46	557.6	80.1
821	56.65	462.5	75.7	15.67	57.00	501.4	79.7

Typical WCDMA 1 carrier performance on 758-803MHz Doherty

V<sub>DD</sub> = 50 Vdc, I<sub>DQ\_main</sub> = 280mA, V<sub>gs\_peak</sub>=-4.9V, T<sub>c</sub>=25°C

Freq (MHz)	Pout (dBm)	CCDF (dB)	ACPR (dBc)	Gain (dB)	Efficiency (%)
758	49	7.04	-27.8	17.5	65.5
789.5	49	7.54	-27.4	17.6	66.8
821	49	7.71	-28.0	17.0	65.2



#### Applications

- Asymmetrical Doherty amplifier within 0.6-1GHz
- UHF TV

#### Important Note: Proper Biasing Sequence for GaN HEMT Transistors

##### Turning the device ON

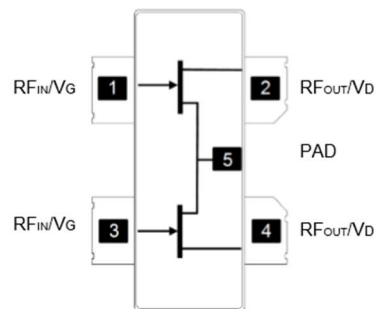
1. Set V<sub>GS</sub> to the pinch--off (V<sub>P</sub>) voltage, typically -5 V
2. Turn on V<sub>DS</sub> to nominal supply voltage
3. Increase V<sub>GS</sub> until I<sub>DS</sub> current is attained
4. Apply RF input power to desired level

##### Turning the device OFF

1. Turn RF power off
2. Reduce V<sub>GS</sub> down to V<sub>P</sub>, typically -5 V
3. Reduce V<sub>DS</sub> down to 0 V
4. Turn off V<sub>GS</sub>

Figure 1: Pin Connection definition

Transparent top view (Backside grounding for source)





**Table 1. Maximum Ratings**

Rating	Symbol	Value	Unit
Drain--Source Voltage	$V_{DS}$	+200	Vdc
Gate--Source Voltage	$V_{GS}$	-8 to +0.5	Vdc
Operating Voltage	$V_{DD}$	55	Vdc
Maximum gate current	$I_{gs}$	62	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 $P_d = 40\text{W}$ , on Doherty application board	$R_{\theta JC}$	1.7	°C /W

**Table 3. Ruggedness Characteristics**

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	800MHz, $P_{out} = 80\text{W}$ pulse CW for All phase, No device damages	VSWR		10:1		

**Figure 2: Median Lifetime vs. Channel Temperature**

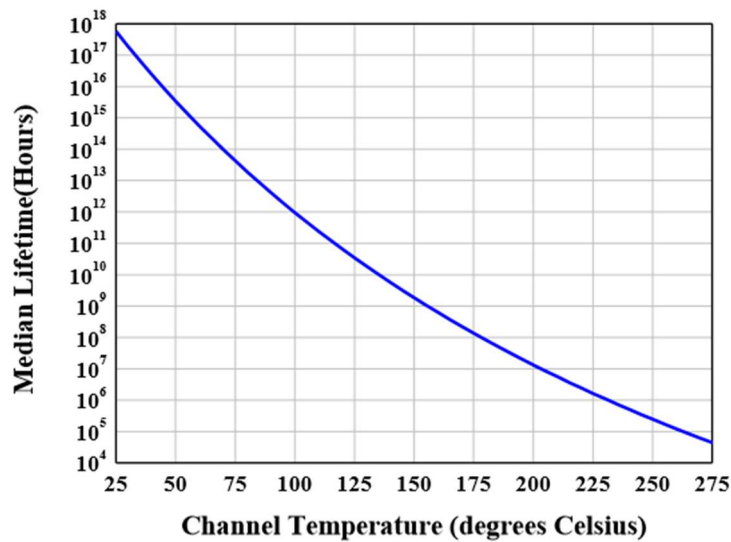




Figure 3: Efficiency and power gain as function of Pout (758-821MHz Doherty)

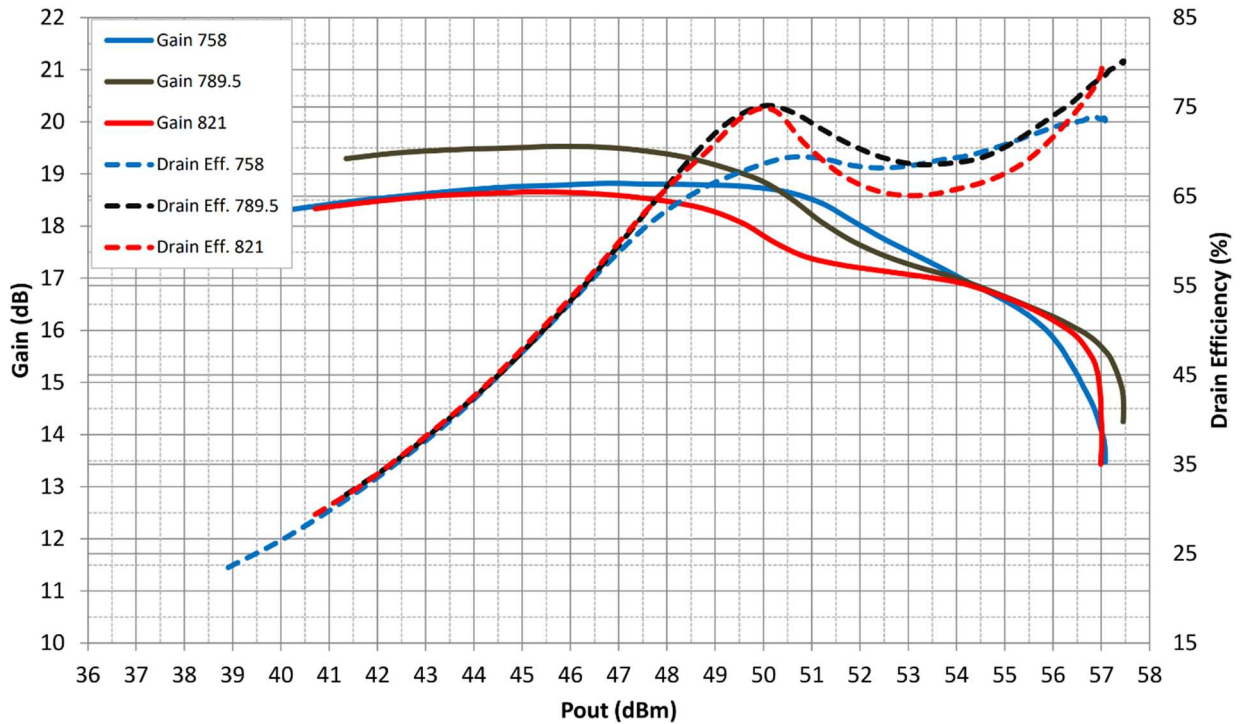


Figure 4: Network analyzer output, S11 and S21 (758-821MHz Doherty)

m1 freq=758.0 MHz dB(S(2,1))=20.286 dB(S(1,1))=-11.991	m2 freq=789.5 MHz dB(S(2,1))=20.996 dB(S(1,1))=-19.029	m3 freq=821.0 MHz dB(S(2,1))=19.878 dB(S(1,1))=-10.114	m4 freq=1.105 GHz dB(S(2,1))=17.972 dB(S(1,1))=-7.029
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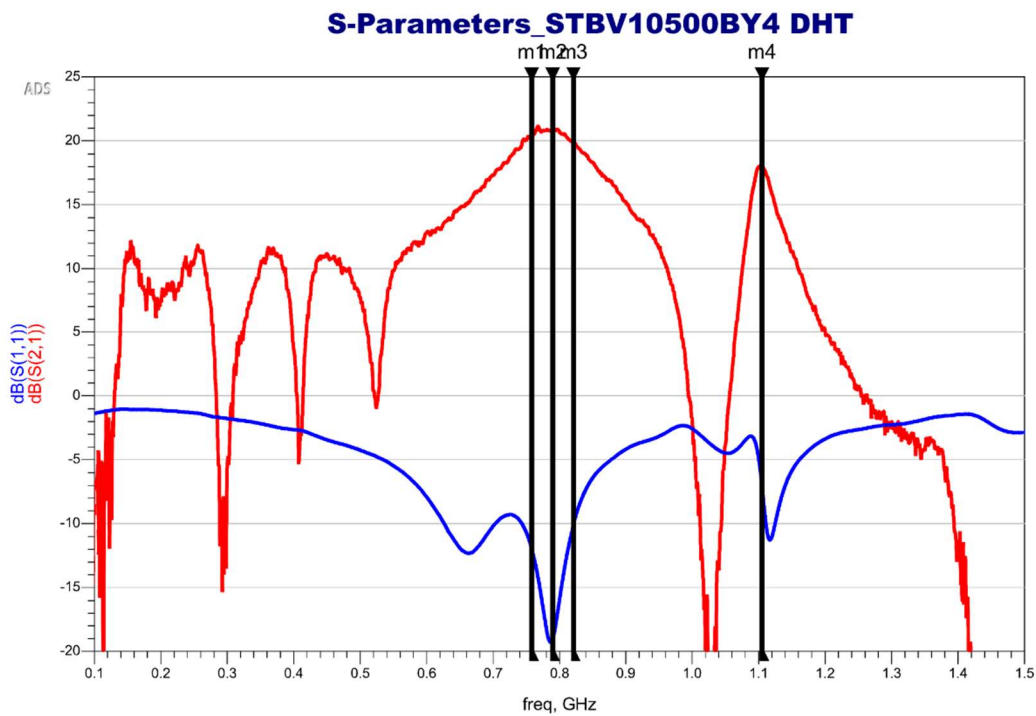


Figure 5: Picture of application board Doherty circuit for 758-821MHz

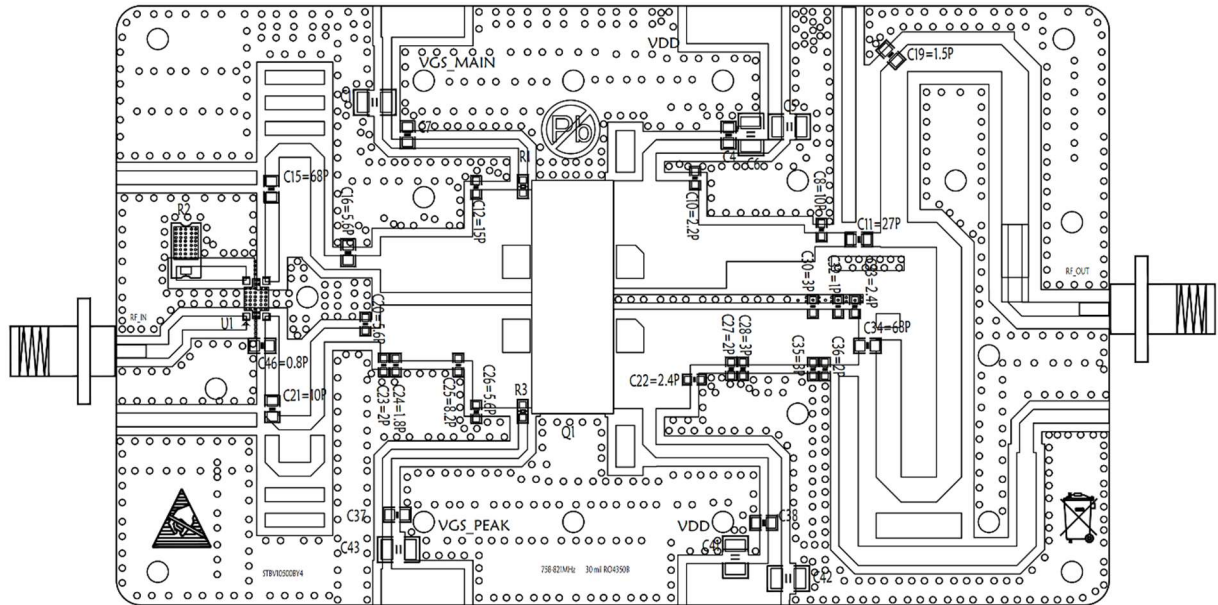
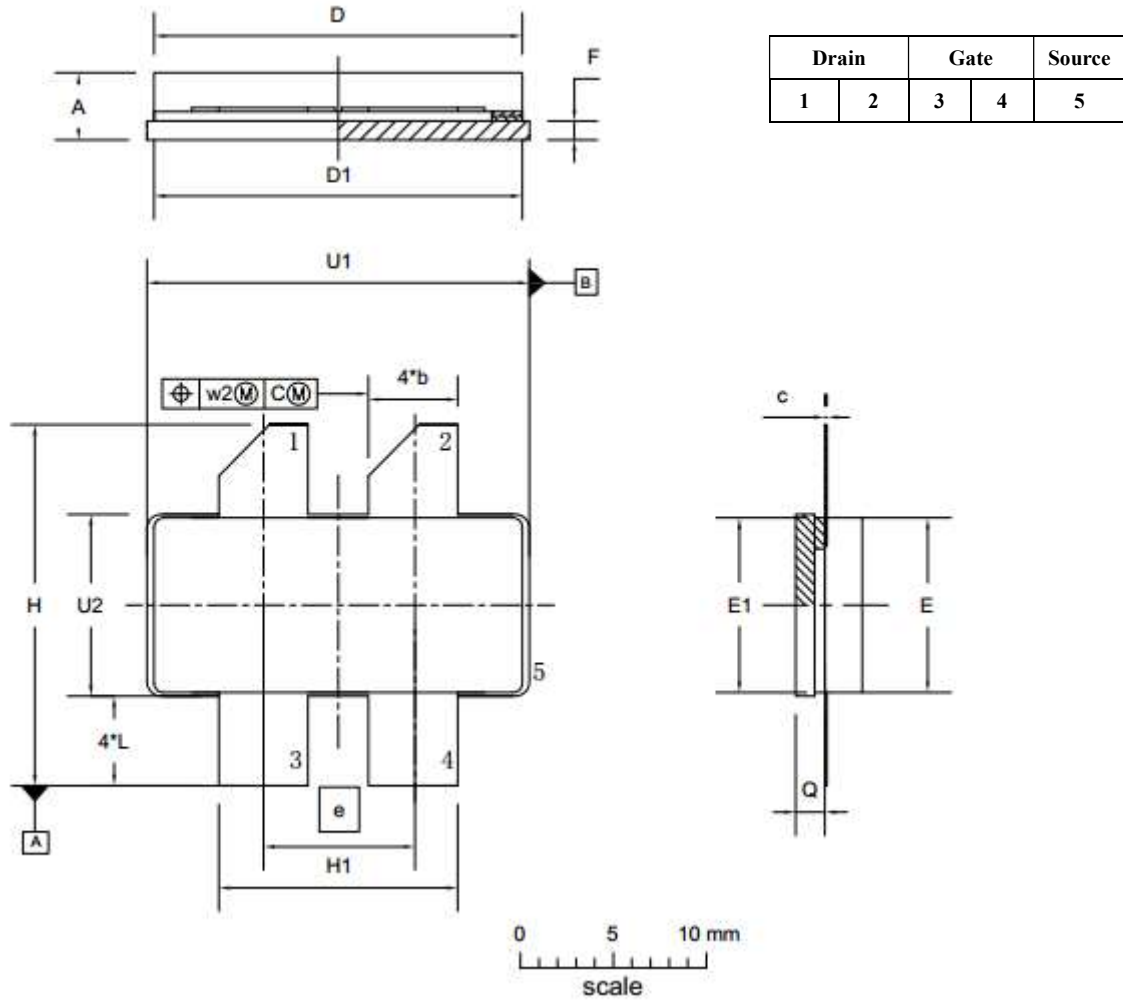


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 30mils)

Quantity	Reference	Value	PCB Footprint	Part number
2	R1,R3	10ohm	R0603	
1	C32	1.0pF	C0603	GQM1875C2E1R0BB12
1	C24	1.8pF	C0603	GQM1875C2E1R8BB12
2	C8,C21,	10pF	C0805	GQM2195G2E100GB12
6	C1,C5,C6,C41,C42,C43	10uF/C1210/100V	C1210	
1	C12	15pF	C0603	GQM1875C2E150GB12
1	C46	0.8pF	C0805	GQM2195C2E0R8BB12
1	C19	1.5pF	C0603	GQM1875C2E1R5BB12
3	C23,C27,C36	2.0pF	C0603	GQM1875C2E2R0BB12
1	C10	2.2pF	C0603	GQM1875C2E2R2BB12
2	C22,C33	2.4pF	C0603	GQM1875C2E2R4BB12
3	C28,C30,C35	3.0pF	C0603	GQM1875C2E3R0BB12
1	C11	27pF	C0603	GQM1875C2E270GB12
3	C16,C20,C26	5.6pF	C0603	GQM1875C2E5R6BB12
6	C4,C7,C15,C34,C37,C38	68pF	C0805	GQM2195C2E680GB12
1	C25	8.2pF	C0603	GQM1875C2E8R2BB12
1	U1	HC07F03	200X125	HC07F03
1	R2	51ohm	R2512	
1	Q1	STBV10500BY4	BY4	STBV10500BY4



Earless Flanged Ceramic Package; 4 leads



UNIT	A	b	c	D	D <sub>1</sub>	e	E	E <sub>1</sub>	F	H	H <sub>1</sub>	L	Q	U <sub>1</sub>	U <sub>2</sub>	W <sub>1</sub>	W <sub>2</sub>
mm	4.72	4.67	0.15	20.02	19.96	7.90	9.50	9.53	1.14	19.94	12.98	5.33	1.70	20.70	9.91	0.25	0.51
	3.43	4.93	0.08	19.61	19.66		9.30	9.25	0.89	18.92	12.73	4.32	1.45	20.45	9.65		
inches	0.186	0.194	0.006	0.788	0.786	0.311	0.374	0.375	0.045	0.785	0.511	0.210	0.067	0.815	0.390	0.01	0.02
	0.135	0.184	0.003	0.772	0.774		0.366	0.364	0.035	0.745	0.501	0.170	0.057	0.805	0.380		

OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-B4					03/12/2013



## Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2022/8/3	V1.0	Preliminary Datasheet Creation
2022/8/20	V2.0	Update according to main path redesign

Application data based on: ZBB-22-06

## Notice

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