



GaN HEMT 50V, 650W, 1.8-2.2GHz Full band RF Power Transistor

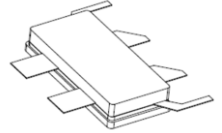
Description

The STDV22W650BY4V is a dual path 650watt, 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=200mA(Vgm=-3.05V, Vgp=-5.5V)

STDV22W650BY4V



Freq (GHz)	Pulse CW Signal ⁽¹⁾				P _{avg} =49.5dBm WCDMA Signal ⁽²⁾		
	P3 (dBm)	P3 (W)	P4 (dBm)	P4 (W)	Gp (dB)	η _D (%)	ACPR _{5M} (dBc)
1.80	58	631.5	58.57	719.9	14.7	56.6	-23.0
1.85	57.56	569.8	58.42	695.0	14.6	58.3	-24.4
1.90	57.11	514.6	58.17	656.8	14.7	59.0	-25.0
2.00	57.56	570.7	58.44	698.9	15.1	58.0	-26.2
2.11	57.92	619.4	58.41	694.1	15.3	57.1	-27.9
2.15	57.94	622.5	58.29	674.4	15.5	57.3	-27.6
2.175	57.68	585.5	58.15	653.1	15.4	56.7	-27.3

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

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

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

- Set VGS to the pinch-off (VP) voltage, typically -5 V
- Turn on VDS to nominal supply voltage
- Increase VGS until IDS current is attained
- Apply RF input power to desired level

Turning the device OFF

- Turn RF power off
- Reduce VGS down to VP, typically -5 V
- Reduce VDS down to 0 V
- Turn off VGS

Figure 1: Pin Connection definition

Transparent top view (Backside grounding for source)

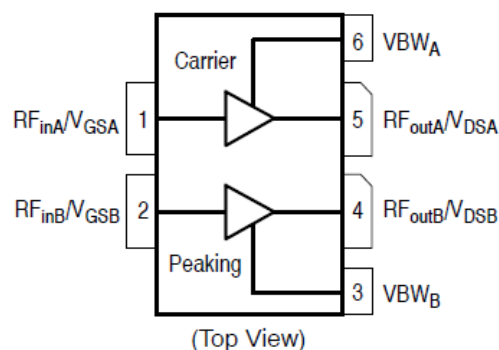




Table 1. Maximum Ratings

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}	83	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	$R_{\theta JC}$	0.85	°C /W

Table 3. Electrical Characteristics ($T_A = 25^\circ\text{C}$ 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	$V_{DS} = 10\text{V}$, $I_D = 3\text{mA}$	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	$V_{DS} = 50\text{V}$, $I_{DS} = 300\text{mA}$, Measured in Functional Test	$V_{GS(Q)}$		-3.1		V

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

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = -8\text{V}$; $I_{DS} = 56\text{mA}$	V_{DSS}		200		V
Gate Threshold Voltage	$V_{DS} = 10\text{V}$, $I_D = 56\text{mA}$	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	$V_{DS} = 50\text{V}$, $I_{DS} = 500\text{mA}$, Measured in Functional Test	$V_{GS(Q)}$		-3.1		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	2.14GHz, $P_{out} = 90\text{W}$ WCDMA 1 Carrier in Doherty circuit All phase, No device damages	VSWR		10:1		

Figure 2: Median Lifetime vs. Channel Temperature

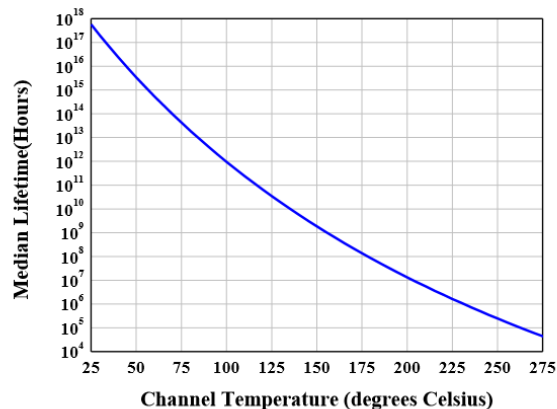




Figure 3: Efficiency and power gain as function of Pout (1.8-2.2GHz Doherty)

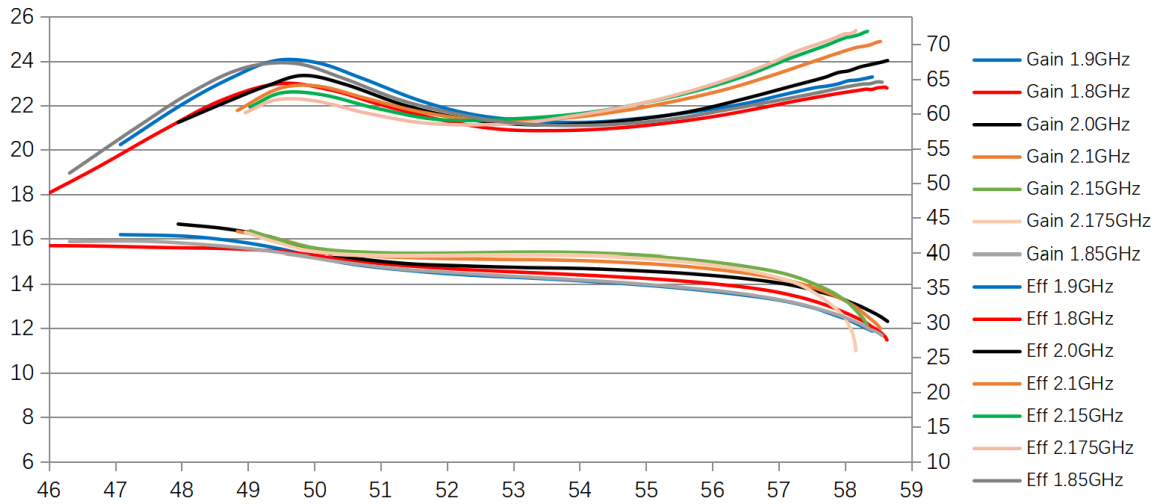


Figure 4: Network analyzer output, S11 and S21 (1.8-2.2GHz Doherty)

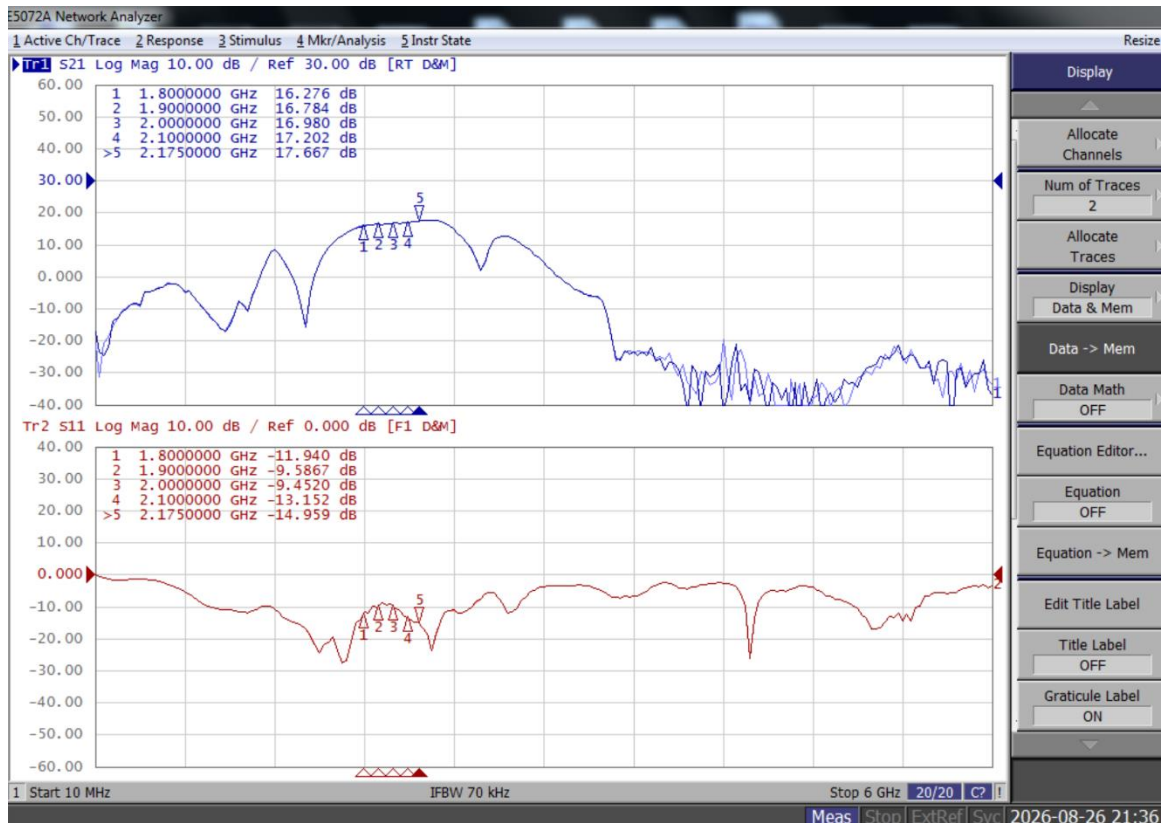


Figure 5: Picture of application board Doherty circuit for 1.8-2.2GHz

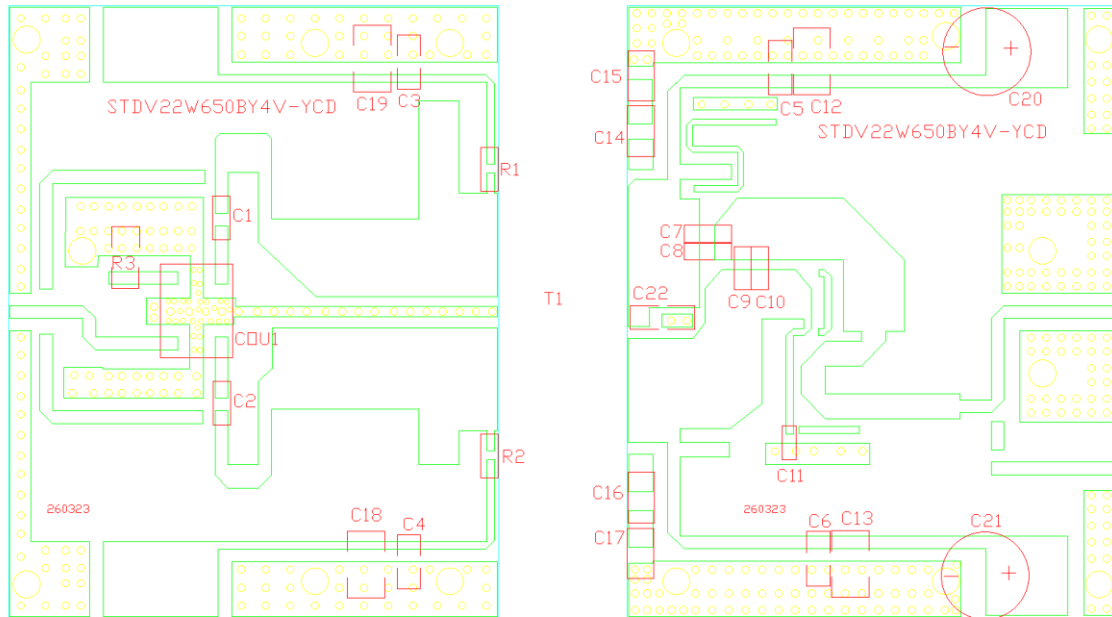
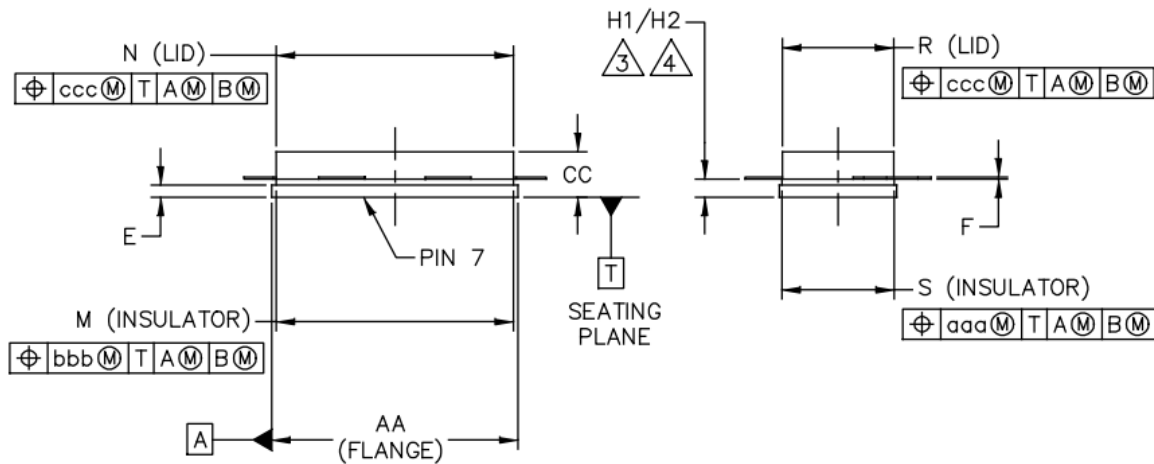
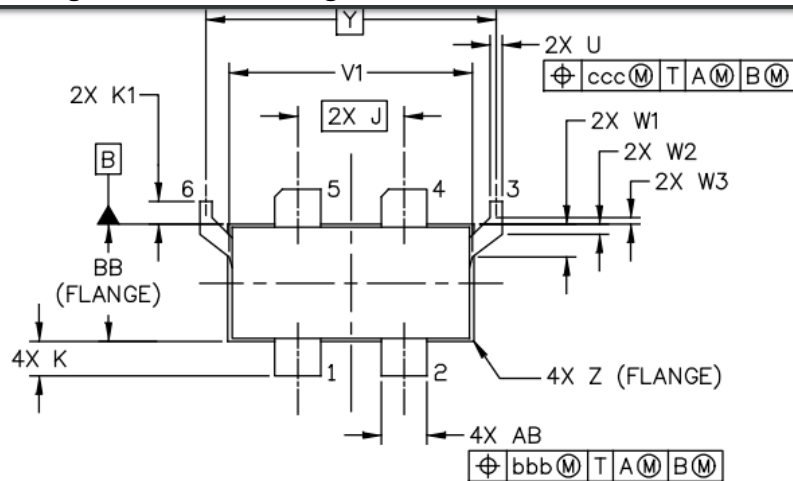


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C3,C4 C5,C6,C11	7	20pF High Q Capacitor	251SHS200BSE	TEMEX
C22	1	1.1pF High Q Capacitor	251SHS1R1BSE	TEMEX
C7,C8	2	4.7pF High Q Capacitor	251SHS4R7BSE	TEMEX
C9,C10	2	3.9pF High Q Capacitor	251SHF3R9BSE	TEMEX
C18,C19	2	4.7nF		
C20,C21	2	470uF		
C12,C13,C14,C15,C16,C17	6	10uF MLCC	GRM32EC72A106ME05	Murata
R1,R2	2	10 Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	50 Ω Power Resistor	RFR50-20CT0421B	YT
COU1	1	3 dB Bridge	HC2100P03H	YANTEL
T1	1	650W GaN Dual Transistor	STDV22W650BY4V	Innegration



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
2026/8/27	V1.0	Preliminary Datasheet Creation

Application data based on: LWH-26-24

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