



## GaN HEMT 50V, 600W, 1.8-2.2GHz Full band RF Power Transistor

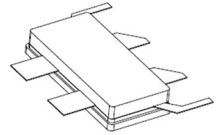
### Description

The STCV22W600BY4V is a dual path 600watt, 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= 53V, IDQ=350mA(Vgm=-3.07V, Vgp=-6.3V)

**STCV22W600BY4V**



Freq (GHz)	Pulse CW Signal <sup>(1)</sup>				P <sub>avg</sub> =49.5dBm WCDMA Signal <sup>(2)</sup>		
	P3 (dBm)	P3 (W)	P5 (dBm)	P5 (W)	Gp (dB)	η <sub>D</sub> (%)	ACPR <sub>5M</sub> (dBc)
1.80	57.68	586	58.09	644	14.35	51.24	-25.40
1.85	57.83	606	58.17	656	14.26	51.28	-26.38
1.90	57.99	629	58.25	668	13.91	50.69	-28.07
2.00	58.31	678	58.40	692	13.90	52.12	-29.31
2.10	58.35	683	58.38	688	13.55	50.89	-31.62
2.15	58.30	675	58.33	680	13.72	50.70	-31.61
2.20	57.99	629	58.02	634	13.75	50.89	-30.06

(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

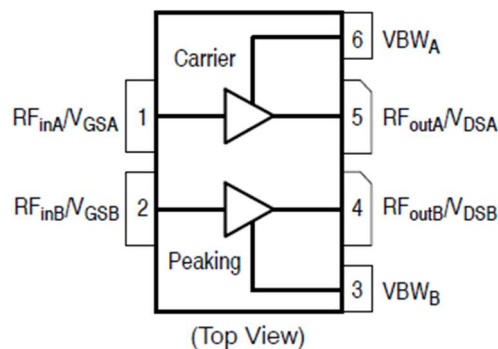
1. Set VGS to the pinch-off (VP) voltage, typically -5 V
2. Turn on VDS to nominal supply voltage
3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

#### 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	$I_{gs}$	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 (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	$V_{GS}=-8\text{V}$ ; $I_{DS}=36\text{mA}$	$V_{DSS}$		200		V
Gate Threshold Voltage	$V_{DS} =10\text{V}$ , $I_D = 36\text{mA}$	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	$V_{DS} =50\text{V}$ , $I_{DS}=350\text{mA}$ , Measured in Functional Test	$V_{GS(Q)}$		-3.1		V

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

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS}=-8\text{V}$ ; $I_{DS}=47\text{mA}$	$V_{DSS}$		200		V
Gate Threshold Voltage	$V_{DS} =10\text{V}$ , $I_D = 47\text{mA}$	$V_{GS(th)}$	-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**

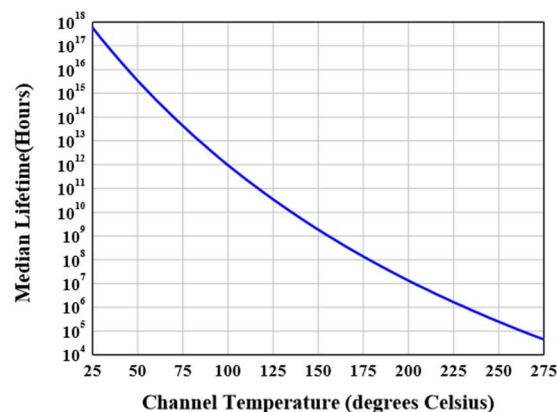




Figure 3: Efficiency and power gain as function of Pout (1.8-2.2GHz Doherty)

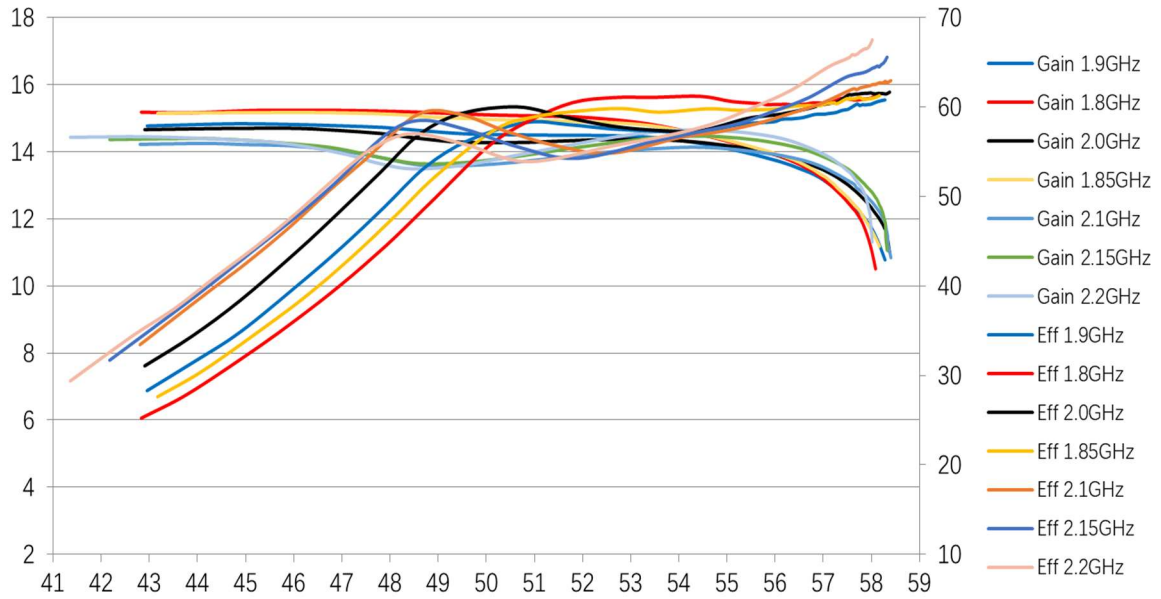
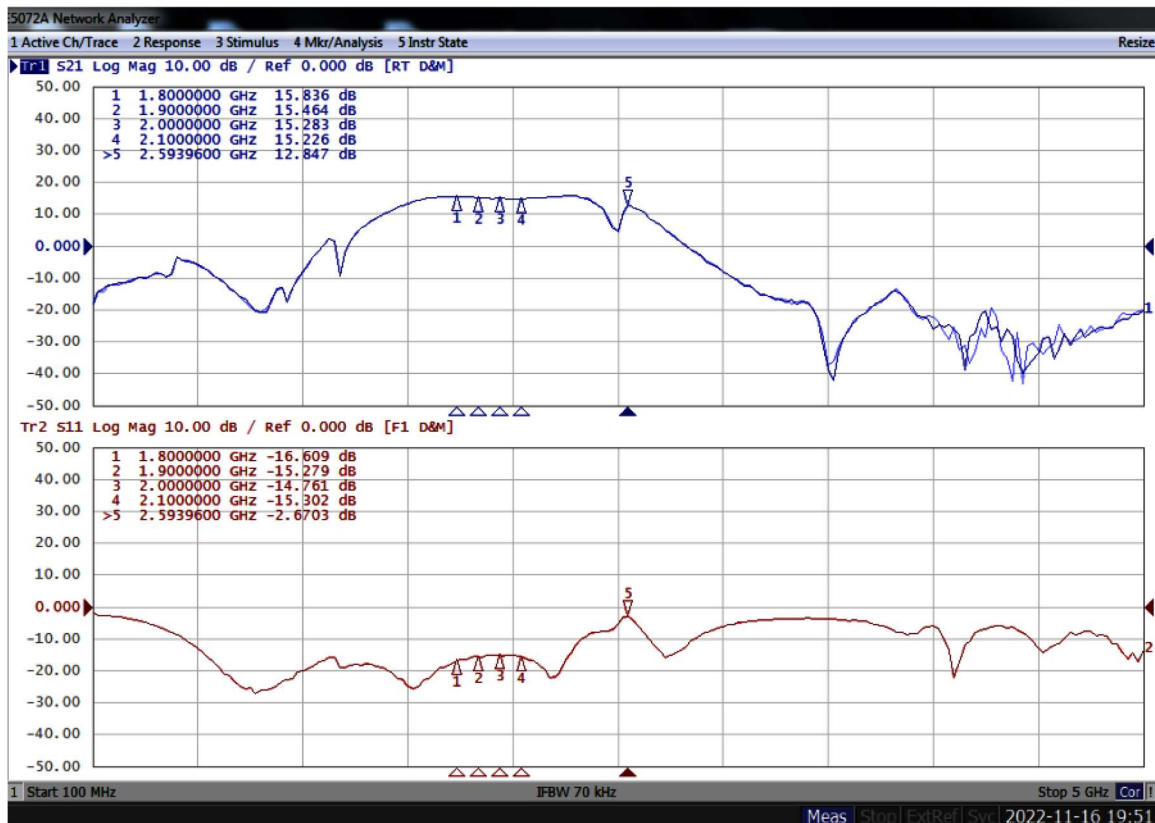
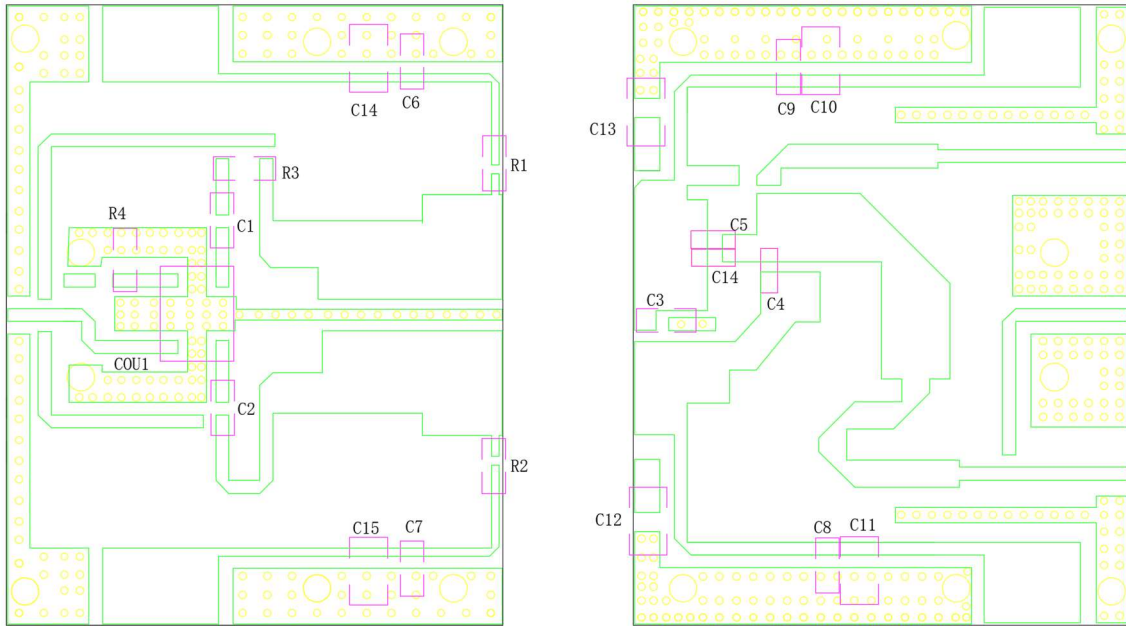


Figure 4: Network analyzer output, S11 and S21 (1.8-2.2GHz Doherty)



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

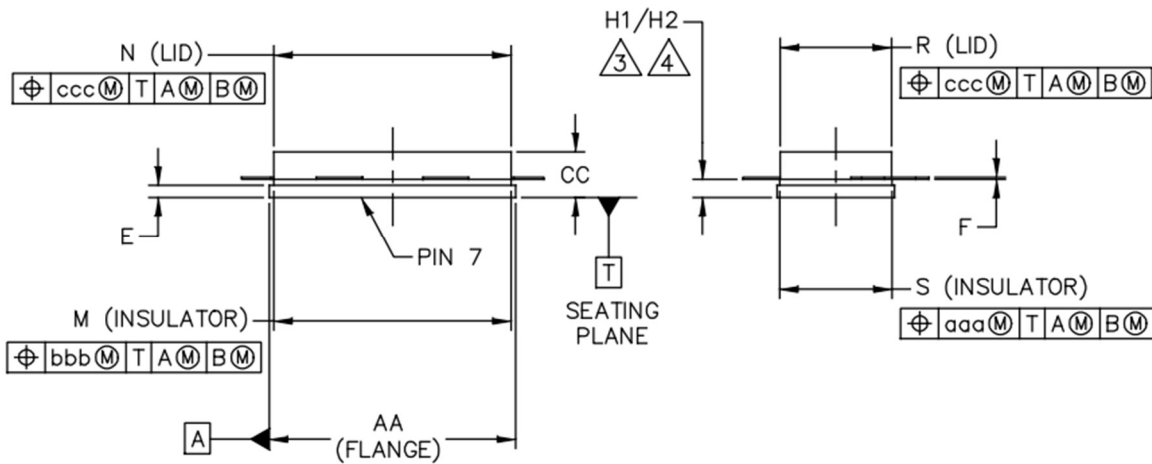
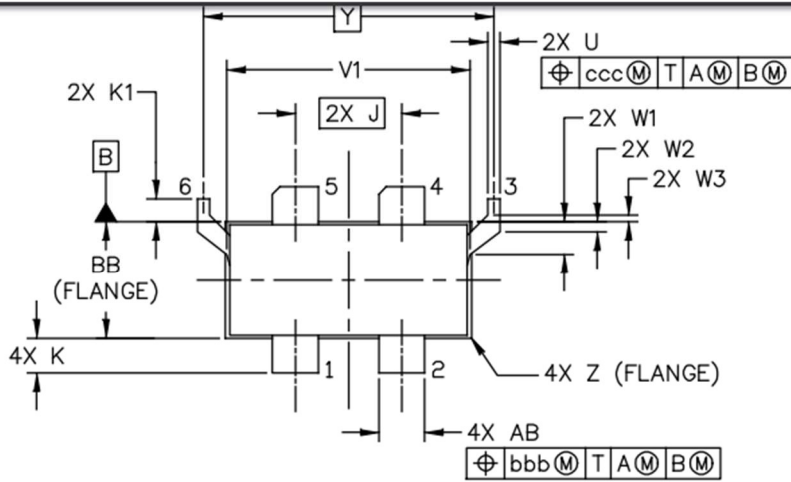


**Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)**

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C6, C9,C7,C8	6	20pF High Q Capacitor	251SHS200BSE	TEMEX
C5,C14	2	3.0pF High Q Capacitor	ATC600S3R0	ATC
C3	1	1.5pF High Q Capacitor	ATC600S1R5	ATC
C15,C10,C11, C12,C13,C14	6	10uF MLCC	GRM32EC72A106ME05	Murata
C4	1	5.6pF High Q Capacitor	251SHS5R6BSE	TEMEX
R1,R2,R3	3	10 Ω Power Resistor	ESR03EZPF100	ROHM
R4	1	50 Ω Power Resistor	S1206N	RN2
COU1	1	3 dB Bridge	HC2100P03H	YANTEL
T1	1	600W GaN Dual Transistor	STCV22W600BY4V	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
2022/11/17	V1.0	Preliminary Datasheet Creation

Application data based on: LWH-22-20

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