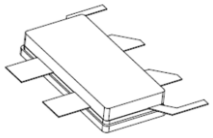
GaN HEMT 50V, 650W,1.8-2.2GHz Full band RF Power Transistor

STCV22W650BY4V



Description

The STCV22W650BY4V 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)

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	57.18	522.9	58.1	645.0	14.0	55.5	-23.1
1.85	56.04	401.8	58.26	669.6	13.9	57.2	-23.6
1.90	55.76	376.8	58.29	675.0	13.9	57.3	-23.8
2.00	56.83	482.4	58.20	660.6	14.2	56.7	-26.1
2.11	58.02	633.7	58.5	707.6	14.6	56.0	-26.8
2.15	57.98	628.3	58.32	679.2	14.9	55.7	-27.4
2.175	57.83	606.8	58.12	649.2	14.8	55.7	-27.0

(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)

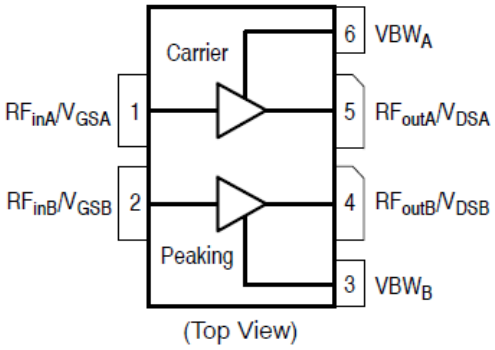


Table 1. Maximum Ratings

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	Igs	83	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=90W, on Doherty application board	$R_{\theta JC}$	0.85	°C /W

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

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

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	VGS=-8V; IDS=30mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 3mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=300mA, 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	VGS=-8V; IDS=56mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID =56mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=500mA, Measured in Functional Test	$V_{GS(Q)}$		-3.1		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	2.14GHz, Pout=90W WCDMA 1 Carrier in Doherty circuit All phase, No device damages	VSWR		10:1		

Figure 2: Median Lifetime vs. Channel Temperature

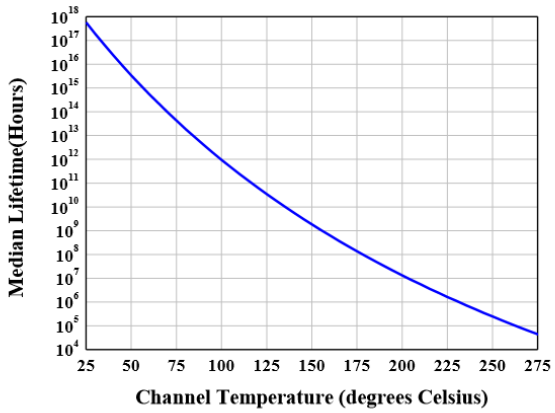


Figure 3: Efficiency and power gain as function of Pout (1.8-2.2GHz Doherty)

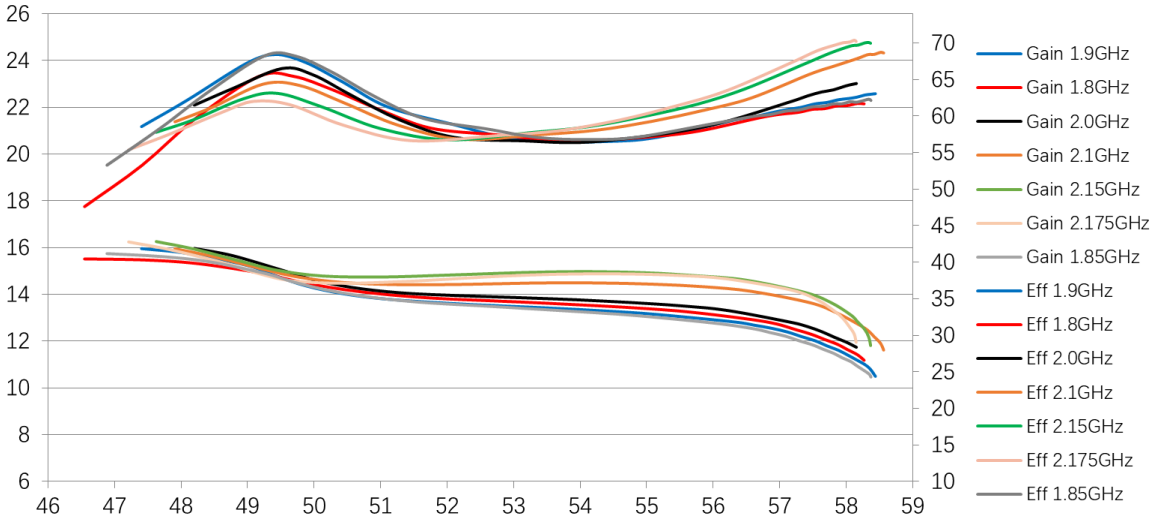


Figure 4: Network analyzer output, S11 and S21 (1.8-2.2GHz Doherty)

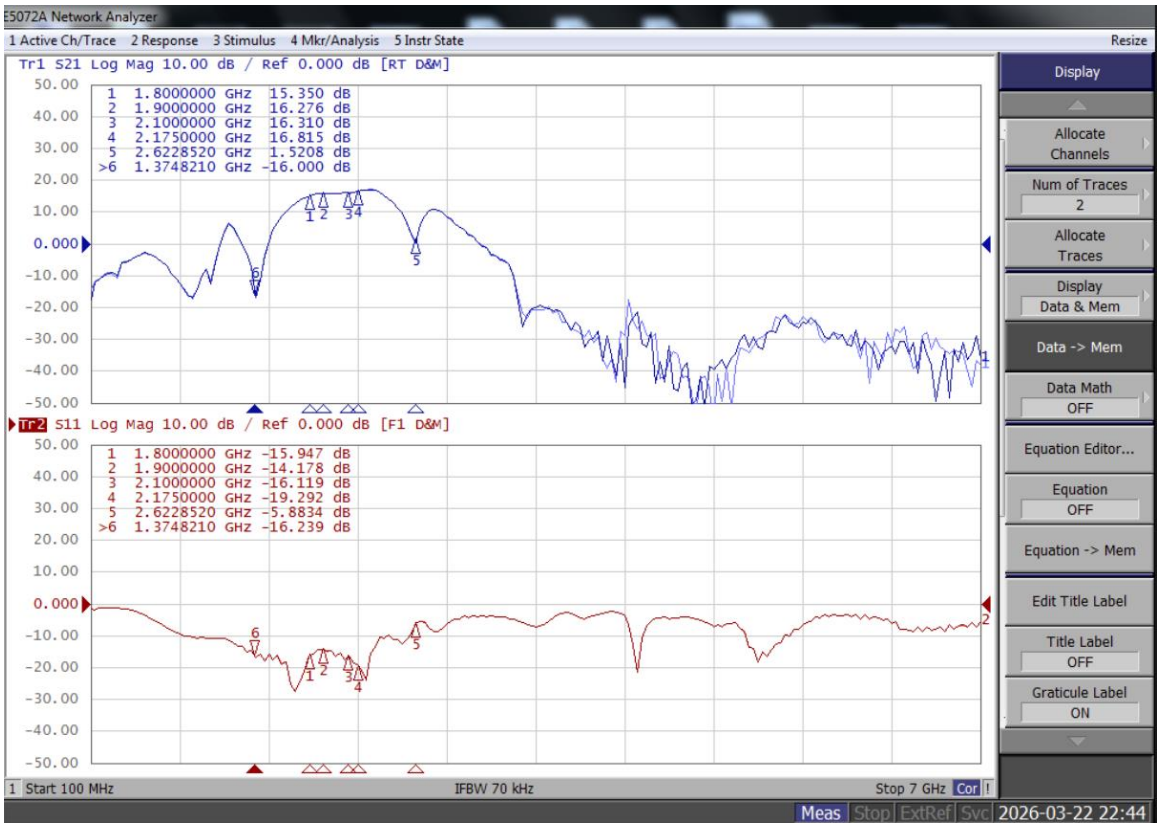


Figure 5: Picture of application board Doherty circuit for 1.8-2.2GHz

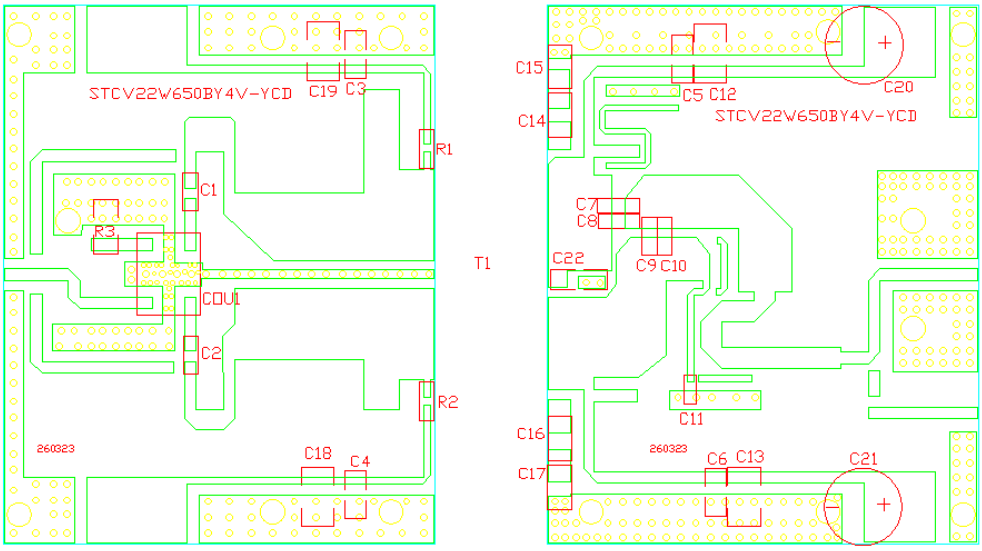
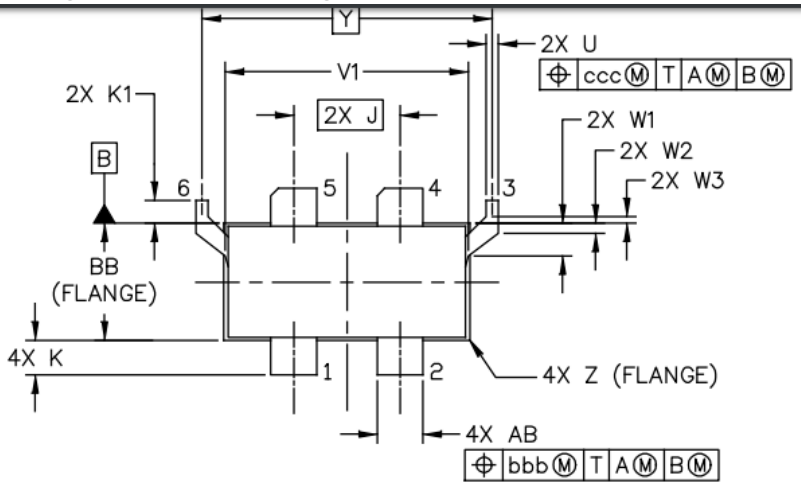
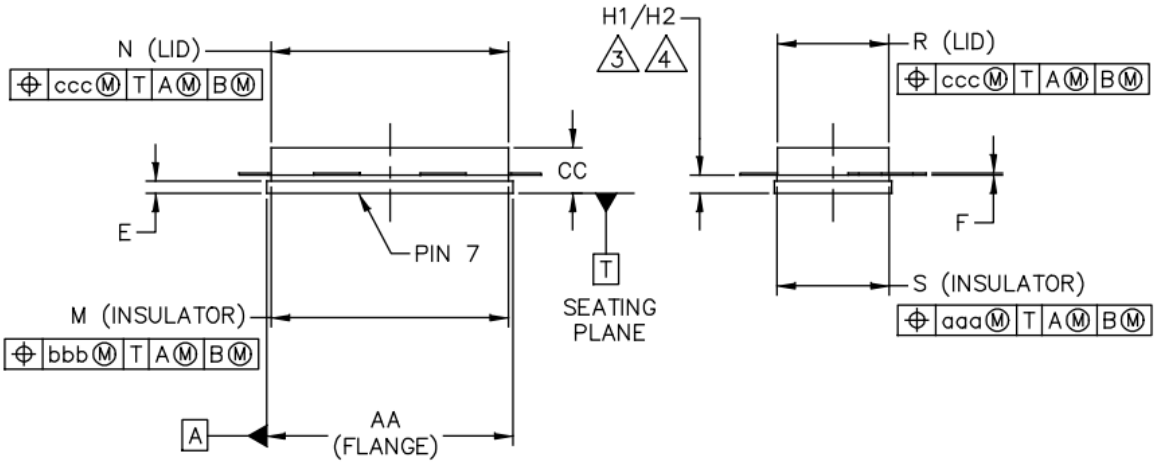


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C3,C4 C5,C6,C11	7	20pFHigh Q Capacitor	251SHS200BSE	TEMEX
C22	1	1.1pFHigh Q Capacitor	251SHS1R1BSE	TEMEX
C7,C8	2	6.2pFHigh Q Capacitor	251SHS6R2BSE	TEMEX
C9,C10	2	3.9pFHigh Q Capacitor	251SHF3R9BSE	TEMEX
C18,C19	2	4.7nF		
C20,C21	2	470uF		
C12,C13,C14,C15,C16,C17	6	10uF MLCC	GRM32EC72A106ME05	Murata
C5	1	10pFHigh Q Capacitor	251SHS100BSE	TEMEX
R1,R2	2	10Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	50Ω Power Resistor	RFR50-20CT0421B	YT
COU1	1	3 dB Bridge	HC2100P03H	YANTEL
T1	1	650W GaN Dual Transistor	STCV22W650BY4V	Innogration

Earless Flanged Ceramic Package; 6 leads- BY4V





DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX	DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER 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
2024/3/13	V1.0	Preliminary Datasheet Creation
2024/4/3	V1.1	Application optimization
2026/3/24	V2.0	Application optimization on main path

Application data based on: LWH-24-10/12/26-08

Notice