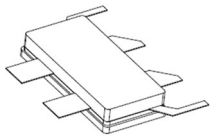
Gallium Nitride 50V, 600W,2.5-2.7GHz RF Power Transistor

Description

STCV27600BY4V



The STCV27600BY4V is a 600-watt, internally matched GaN HEMT, designed for 5G cellular applications with frequencies from 2.5-2.7GHz, **enabled by wide band VBW capability to support IBW up to 200MHz.**.

It can be configured as asymmetrical Doherty for 4G or 5G application, delivering 80 to 100W average power, according to normal 8 to 9dB back off.

There is no guarantee of performance when this part is used in applications designed Outside of these frequencies.

- Typical Doherty Pulsed CW and 1C W--CDMA Characterization Performance:

V_{DD} = 50 Vdc, I_{DQA} = 330 mA, V_{GSB} = –5.8Vdc,

(1)Pulsed condition: 20us and 10%

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

Freq (GHz)	Pulse CW Signal(1)			Pavg=49dBm WCDMA Signal(2)		
	P1-Gain (dB)	P3dB (dBm)	P3dB (W)	Gp (dB)	Eff (%)	ACPR5M (dBc)
2.5	14.24	57.90	616	13.64	51.5	-32.83
2.6	13.93	58.27	670	13.96	50.0	-34.41
2.7	13.93	57.83	607	14.15	50.0	-30.68

Recommended driver:

- Doherty (1 stage discrete solution): STBV27070C6

Applications

- Asymmetrical Doherty amplifier within N41 5G band and B41 4G band
- S band power 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

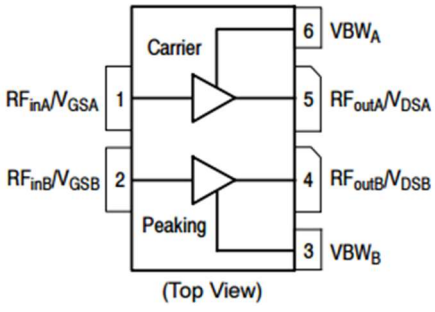


Table 1. Maximum Ratings

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, Pout=80W, 2.6GHz Doherty application board	$R_{\theta JC}$	0.95	°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=36mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 36mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=260mA, 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=47mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 47mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=300mA Measured in Functional Test	$V_{GS(Q)}$		-3.1		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	2.6GHz, Pout=80W WCDMA 1 Carrier in Doherty circuit All phase, No device damages	VSWR		10:1		

Figure 2: Intermodulation Distortion Products versus Two--Tone Spacing

Vdd=50V, Pout=49dBm, Center Frequency=2.6GHz

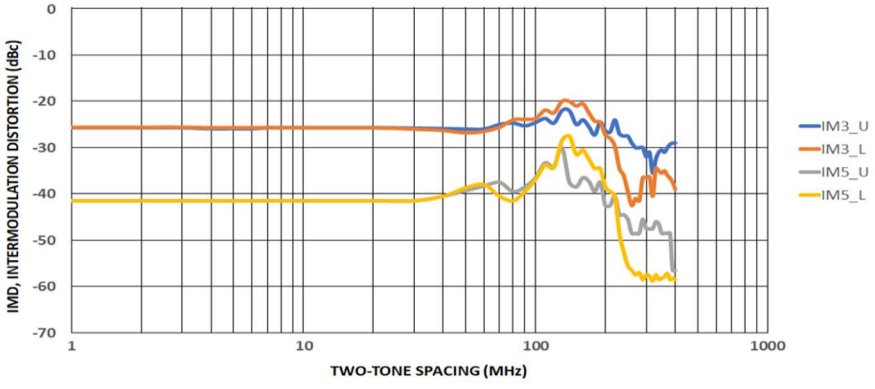
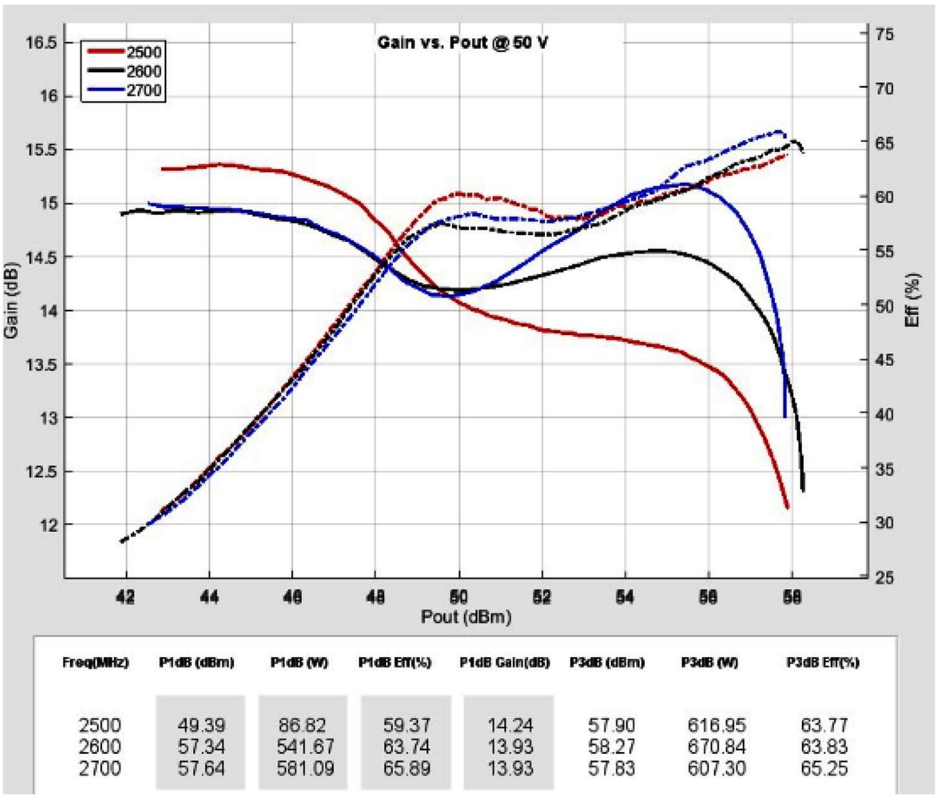


Figure 3: Efficiency and power gain as function of Pout (2.5-2.7GHz Doherty)



Freq(MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
2500	49.39	86.82	59.37	14.24	57.90	616.95	63.77
2600	57.34	541.67	63.74	13.93	58.27	670.84	63.83
2700	57.64	581.09	65.89	13.93	57.83	607.30	65.25

Figure 4: Network analyzer output, S11 and S21 (2.5-2.7GHz Doherty)

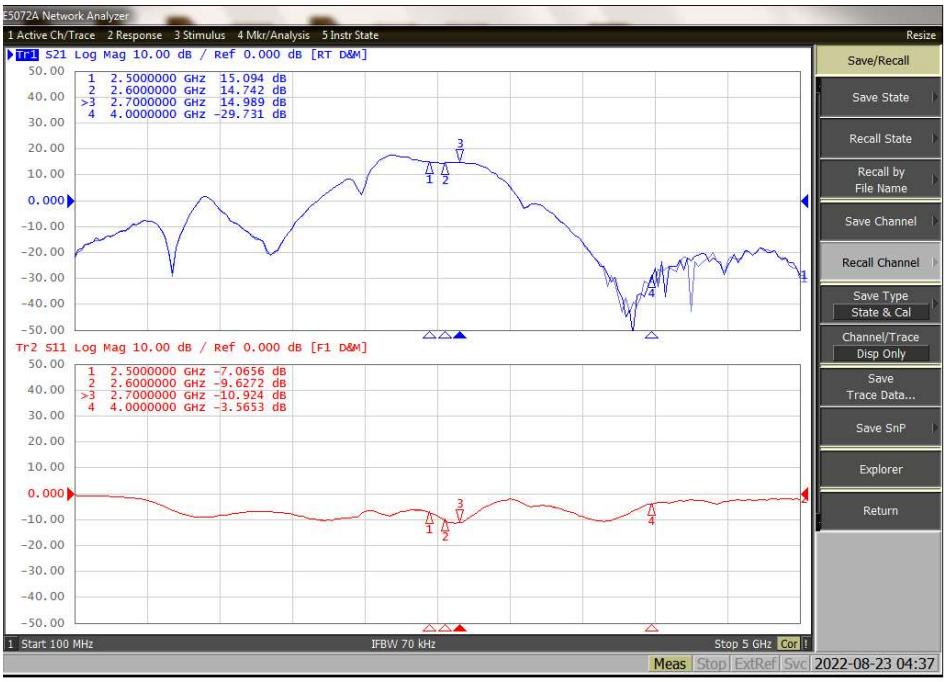


Figure 5: Picture of application board Doherty circuit for 2.5-2.7GHz

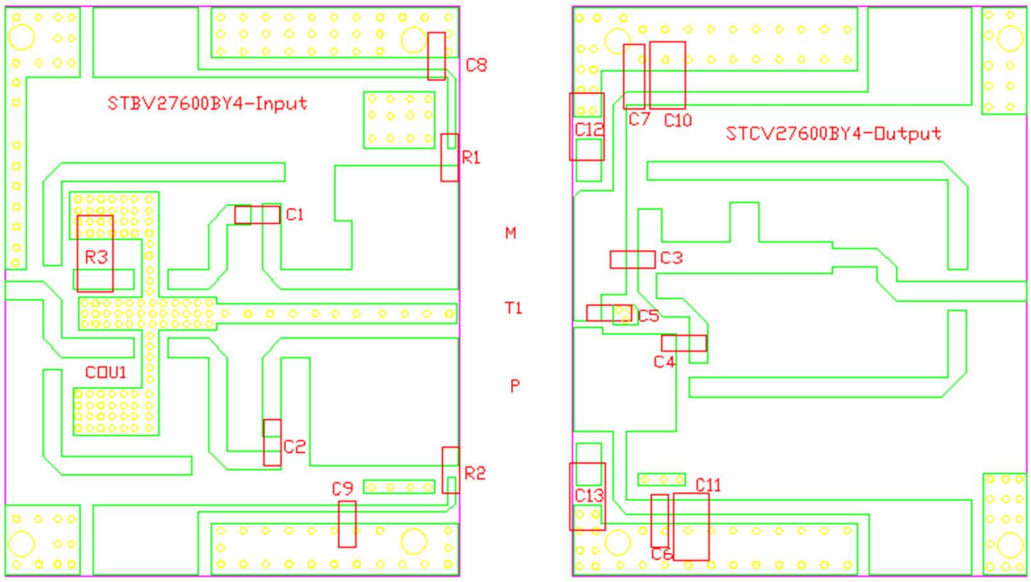
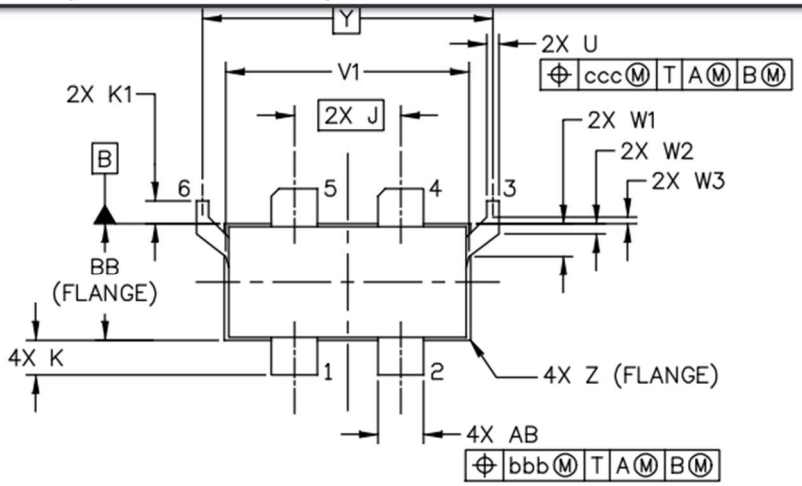
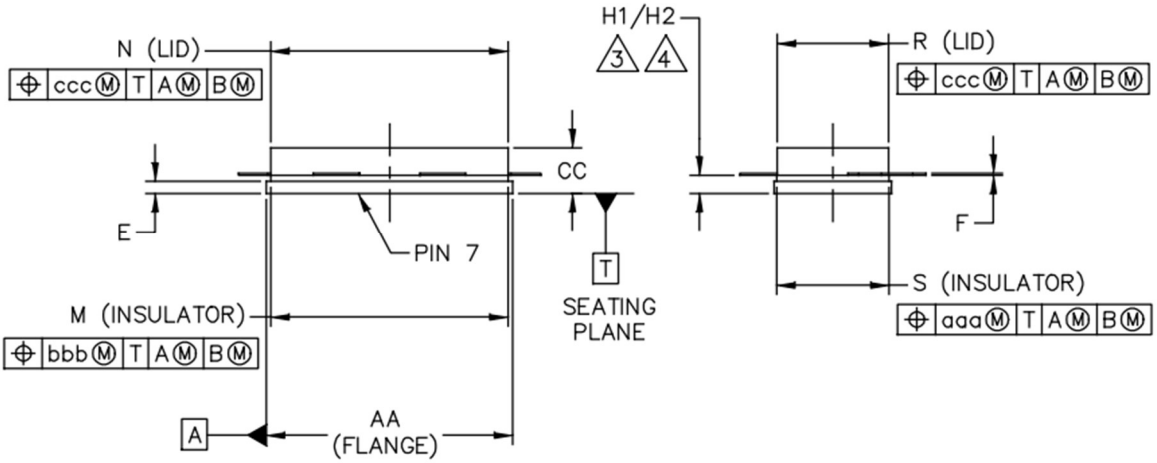


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 30mils)

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C4 C8,C9,C6,C7	7	10pFHigh Q Capacitor	251SHS100BSE	TEMEX
C3	1	6.8pFHigh Q Capacitor	251SHS6R8BSE	TEMEX
C5	1	1.2pFHigh Q Capacitor	ATC600S1R2	ATC
C12,C13,C11,C10	4	10uF MLCC	GRM32EC72A10	Murata
R1,R2	2	10Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	50Ω Power Resistor	S1206N	RN2
COU1	1	3 dB Bridge	CMX25Q03	RN2
T1	1	600W GaN Dual Transistor	STCV27600BY4V	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
2022/4/22	**V1.0**	**Preliminary Datasheet Creation**
2022/8/24	**V2.0**	**Update according to peak path modification**

Application data based on LWH-22-10

Notice