



# Gallium Nitride 50V, 500W, 2.5-2.7GHz RF Power Transistor

## Description

The STBV27500BY4V is a 500-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 ≥ 200MHz.**

It can be configured as asymmetrical Doherty for 4G or 5G application, delivering 60 to 80W average power, according to normal 8 to 9dB back off.

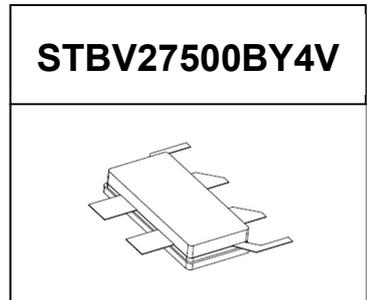
There is no guarantee of performance when this part is used in applications designed Outside of these frequencies.

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

$V_{DD} = 50\text{ Vdc}$ ,  $I_{DQA} = 150\text{ mA}$ ,  $V_{GSB} = -5.5\text{ Vdc}$ ,

(1) Pulsed condition: 20us and 10%,  $P_{sat} = P5\text{ dB}$

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



| Freq<br>(GHz) | Pulse CW Signal(1) |             |          | Pavg=49dBm WCDMA Signal(2) |        |                 |
|---------------|--------------------|-------------|----------|----------------------------|--------|-----------------|
|               | Psat<br>(dBm)      | Psat<br>(W) | Eff<br>% | Gp (dB)                    | Eff(%) | ACPR5M<br>(dBc) |
| 2.5           | 56.6               | 457.2       | 59.6     | 14.3                       | 52.2   | -27.3           |
| 2.6           | 57.06              | 507.9       | 63.2     | 14.6                       | 51.0   | -28.9           |
| 2.7           | 56.79              | 477.7       | 68.2     | 14.6                       | 50.4   | -27.1           |

Recommended driver:

- Class AB (1 stage discrete solution): STAV38061C6

## 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

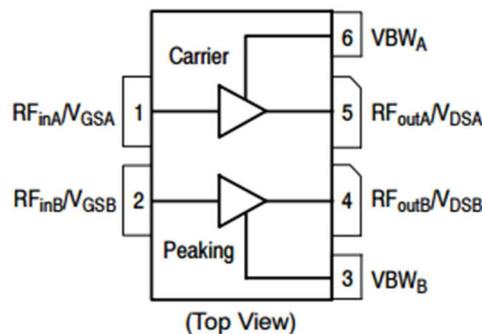
### Turning the device ON

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           | $I_{gs}$  | 22.4        | 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<br>$T_c=85^\circ\text{C}$ , $P_{out}=80\text{W}$ , 2.6GHz Doherty application board | $R_{\theta JC}$ | 1.25  | °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 | $V_{GS}=-8\text{V}$ ; $I_{DS}=21.6\text{mA}$                                 | $V_{DSS}$    |     | 200   |     | V    |
| Gate Threshold Voltage         | $V_{DS}=10\text{V}$ , $I_D=21.6\text{mA}$                                    | $V_{GS(th)}$ | -4  |       | -2  | V    |
| Gate Quiescent Voltage         | $V_{DS}=50\text{V}$ , $I_{DS}=150\text{mA}$ ,<br>Measured in Functional Test | $V_{GS(Q)}$  |     | -3.23 |     | V    |

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

| Characteristic                 | Conditions   | Symbol       | Min | Typ   | Max | Unit |
|--------------------------------|--|--------------|-----|-------|-----|------|
| Drain-Source Breakdown Voltage | $V_{GS}=-8\text{V}$ ; $I_{DS}=39.6\text{mA}$                                 | $V_{DSS}$    |     | 200   |     | V    |
| Gate Threshold Voltage         | $V_{DS}=10\text{V}$ , $I_D=39.6\text{mA}$                                    | $V_{GS(th)}$ | -4  |       | -2  | V    |
| Gate Quiescent Voltage         | $V_{DS}=50\text{V}$ , $I_{DS}=220\text{mA}$ ,<br>Measured in Functional Test | $V_{GS(Q)}$  |     | -3.23 |     | V    |

**Ruggedness Characteristics**

| Characteristic           | Conditions  | Symbol | Min | Typ  | Max | Unit |
|--------------------------|---|--------|-----|------|-----|------|
| Load mismatch capability | 2.6GHz, $P_{out}=80\text{W}$ WCDMA 1<br>Carrier in Doherty circuit<br>All phase,<br>No device damages | VSWR   |     | 10:1 |     |      |

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

$V_{dd}=50\text{V}$ ,  $P_{out}=49\text{dBm}$ , Center Frequency=2.6GHz

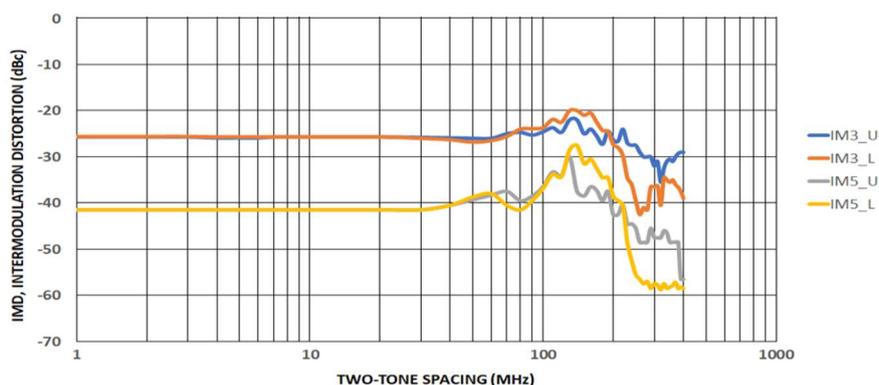


Figure 3: Efficiency and power gain as function of Pout (2.5-2.7GHz Doherty)

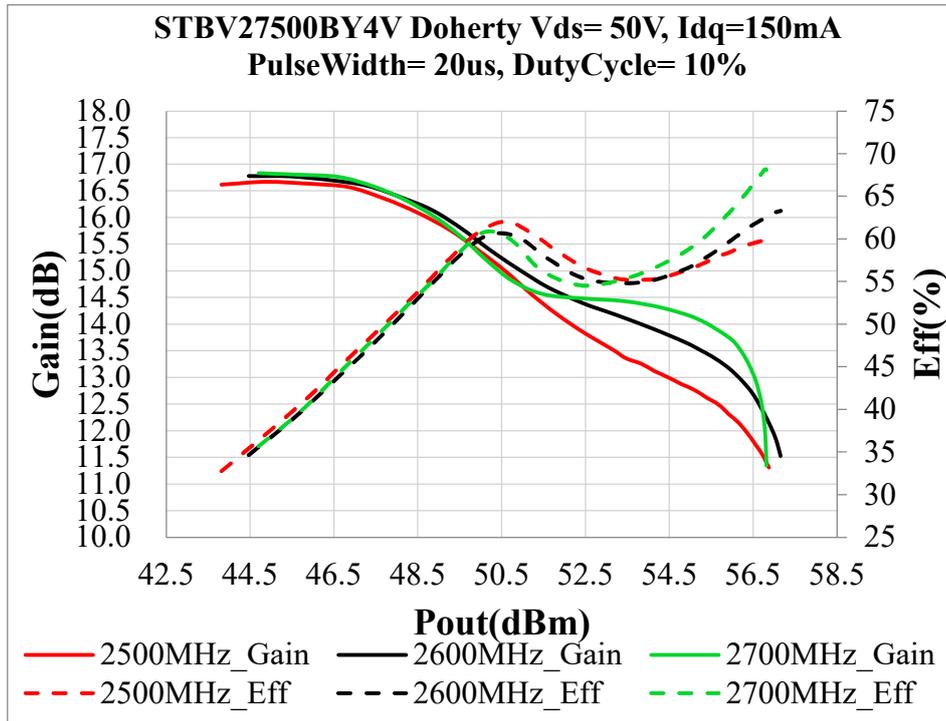
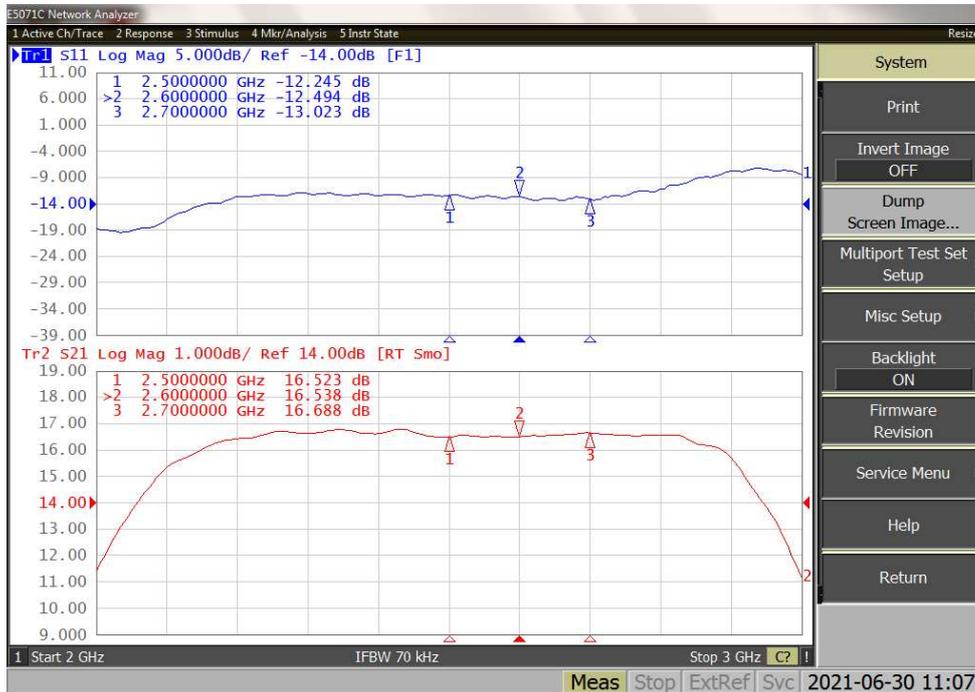
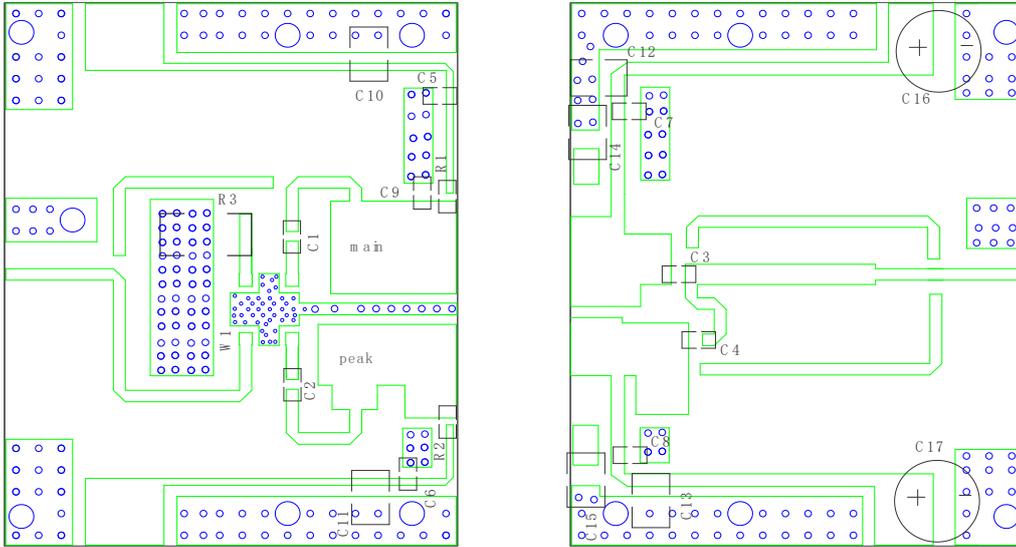


Figure 4: Network analyzer output, S11 and S21 (2.5-2.7GHz Doherty)



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

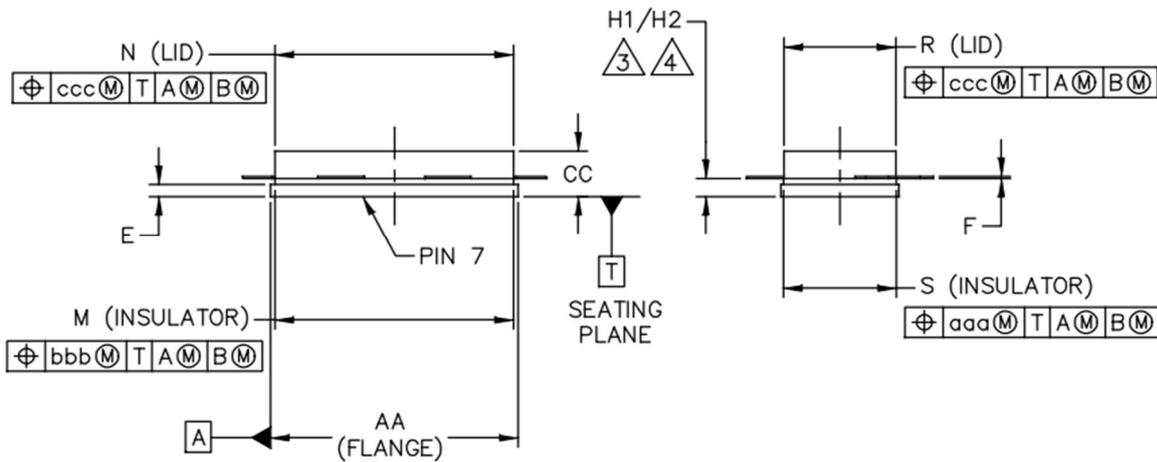
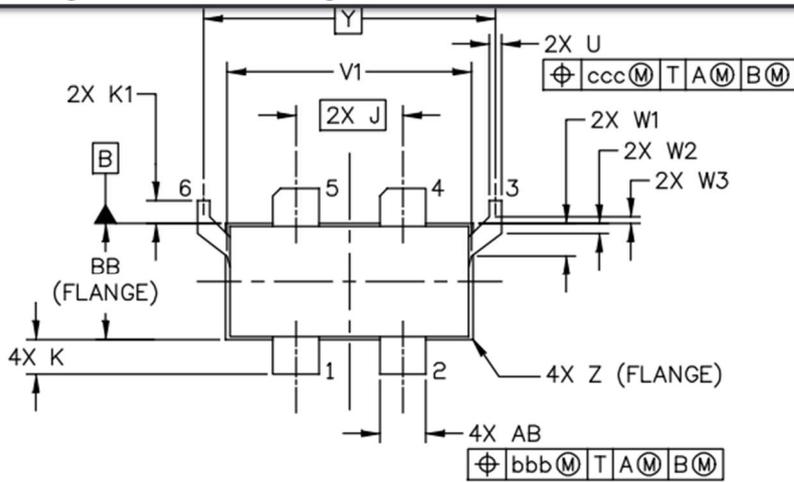


**Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)**

| Designator                      | Comment    | Footprint   | Quantity |
|---------------------------------|------------|-------------|----------|
| C1,C2, C4, C5,<br>C6, C7, C8    | 15pF       | 0805        | 7        |
| C3                              | 10 pF      | 0805        | 1        |
| C9                              | 0.5 pF     | 0603        | 1        |
| C10, C11, C12,<br>C13, C14, C15 | 10 uF/100V | 1210        | 6        |
| C16, C17                        | 100 uF/63V |             | 2        |
| R1, R2                          | 10 Ω       | 0603        | 2        |
| R3                              | 51 Ω       | 2512        | 1        |
| W1                              | 1P603S     | 5.08x6.35mm | 1        |



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               |
|-----------|----------|--------------------------------|
| 2021/6/30 | V1.0     | Preliminary Datasheet Creation |
|           |          |                                |
|           |          |                                |
|           |          |                                |

Application data based on LSM-21-15

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