# GaN HEMT 50V, 130W, 1.8-2.7GHz Power Transistor

**STAV27130C6**

## Description

The STAV27130C6 is a dual path 130W, internal matched GaN HEMT, operated from 1.8-2.7GHz.

It features high gain, high efficiency, wide band and low cost, in 10*6mm open cavity plastic package.

It can be configured as a single stage Doherty capable of delivering Pavg of 20W.

There is no guarantee of performance when this part is used outside of stated frequencies.

➢ Typical Doherty Single--Carrier W--CDMA Characterization Performance at 2.6GHz:

Input Signal :WCDMA 1 Carrier with PAR = 10 dB @ 0.01% Probability on CCDF , Pulsed CW: 20us, 10%

$V_{DD}$ = 50 Vdc, $I_{DQA}$ = 150mA, $V_{GSB}$ = –5.0Vdc,

| Freq (GHz) | Pavg=38dBm WCDMA Signal | | | Pavg=43dBm WCDMA Signal | | |
|---|---|---|---|---|---|---|
| | Gp (dB) | Eff (%) | ACPR5M (dBc) | Gp (dB) | Eff (%) | ACPR5M (dBc) |
| 2.5 | 16.01 | 34.62 | -40.46 | 14.87 | 56.43 | -31.17 |
| 2.6 | 16.27 | 37.00 | -40.06 | 14.93 | 57.61 | -32.30 |
| 2.7 | 15.73 | 37.45 | -41.59 | 14.54 | 56.19 | -36.29 |

## Applications

- 5G Doherty amplifier within 2.5-2.7, 2.1-2.2, 1.8-1.9G either as driver or as final
- S band power amplifier
- L band power amplifier

## Important Note: Proper Biasing Sequence for GaN HEMT Transistors

**Turning the device ON**

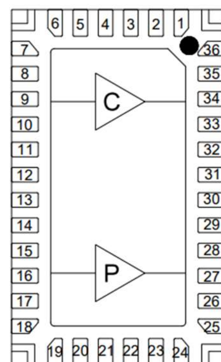
1. Set VGS to the pinch--off (VP) voltage, typically –5 V
2. Turn on VDS to nominal supply voltage
3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

**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**

**Transparent top view (Backside grounding for source)**




| Pin No. | Symbol | Description |
|---|---|---|
| 9,10 | RF IN/Vgs1 | RF Input, Vgs bias for main path |
| 15,16 | RF IN/Vgs2 | RF Input, Vgs bias for peak path |

| | | |
|---|---|---|
| 33,34 | RF OUT/VDD1 | RF Output, VDD bias for Main path |
| 27,28 | RF OUT/VDD2 | RF Output, VDD bias for Peak path |
| Rest pins | NC | No connection |
| 2,5,7,12,13,18,20,23,25,30,31,36, Package Base | GND | DC/RF Ground. Must be soldered directly to heatsink or copper coin for CW application. |

**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 | 9 | 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<br>$T_C$= 85°C, Pdiss=15W at Pavg=43dBm WCDMA 1 carrier | $R_{\theta JC}$ | 2.3 | °C /W |

Notes: Based on expected carrier amplifier efficiency of Doherty, Pavg assumes 10% peaking amplifier contribution of total average Doherty rated power. Thermal resistance is measured to package backside

**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=7.5mA | $V_{DSS}$ | | 200 | | V |
| Gate Threshold Voltage | VDS =10V, ID = 7.5mA | $V_{GS(th)}$ | -4 | | -2 | V |
| Gate Quiescent Voltage | VDS =50V, IDS=60mA, Measured in Functional Test | $V_{GS(Q)}$ | | -3.1 | | V |

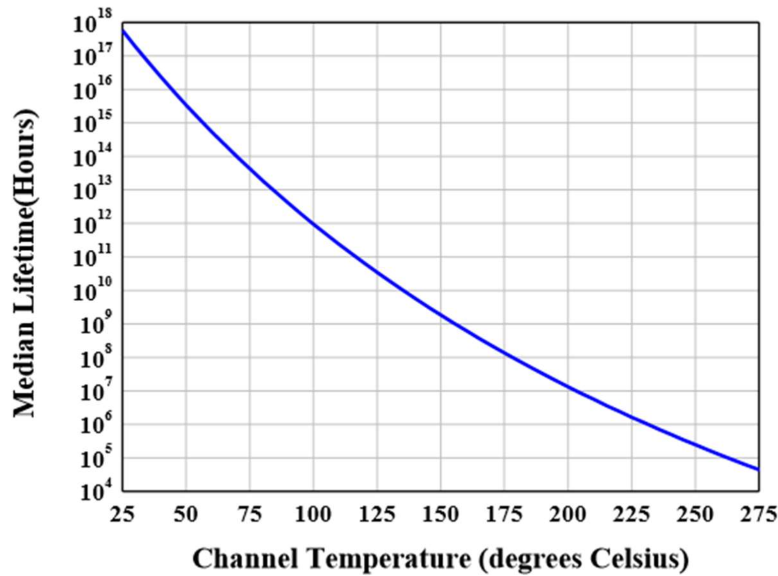
**DC Characteristics (peak path, measured on wafer prior to packaging)**

| Characteristic | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | VGS=-8V; IDS=7.5mA | $V_{DSS}$ | | 200 | | V |
| Gate Threshold Voltage | VDS =10V, ID = 7.5mA | $V_{GS(th)}$ | -4 | | -2 | V |
| Gate Quiescent Voltage | VDS =50V, IDS=60mA, 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=42dBm WCDMA<br>1 Carrier, All phase,<br>No device damages | VSWR | | 10:1 | | |

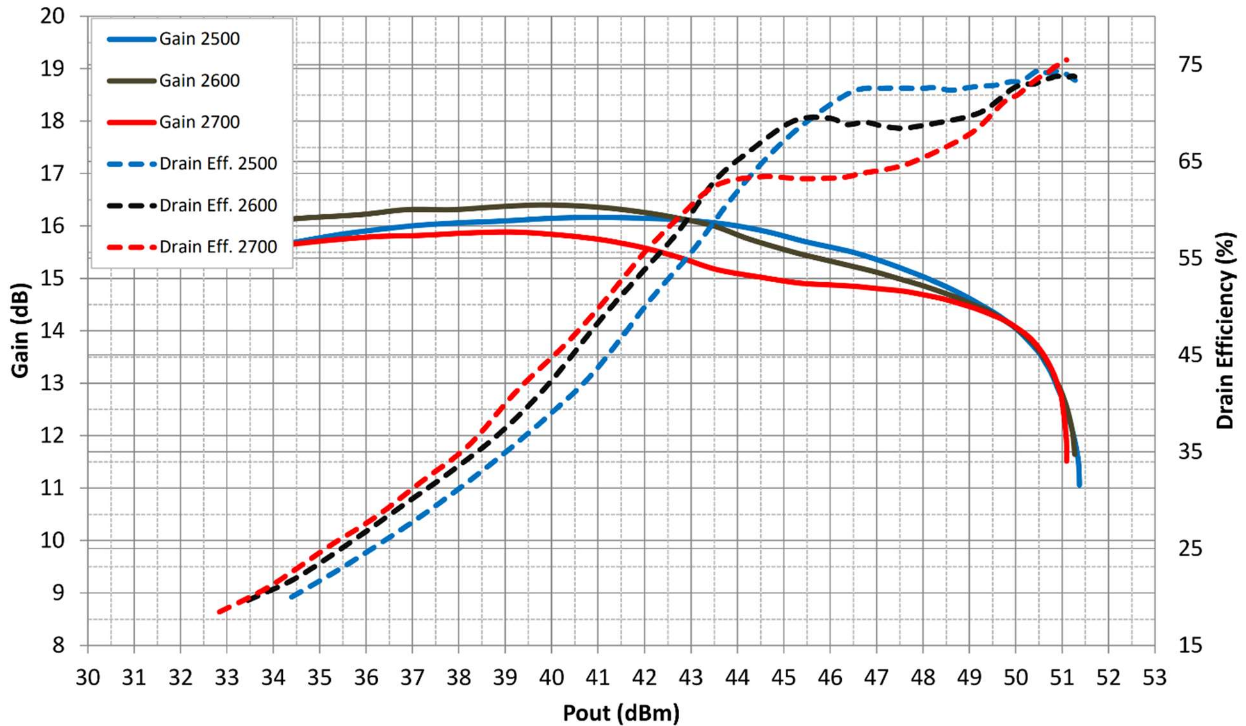
**Figure 2: Median Lifetime vs. Channel Temperature**




## Typical performance

### 2500-2700MHz Doherty

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




| Freq (MHz) | P3dB (dBm) | P3dB (W) | P3dB Eff(%) | P1dB Gain(dB) | P5dB (dBm) | P5dB (W) | P5dB Eff(%) |
|---|---|---|---|---|---|---|---|
| 2500 | 50.78 | 119.81 | 74.16 | 15.06 | 51.37 | 137.21 | 73.12 |
| 2600 | 50.78 | 119.56 | 73.65 | 15.34 | 51.27 | 133.94 | 73.77 |
| 2700 | 50.99 | 125.65 | 75.16 | 14.87 | 51.10 | 128.71 | 75.48 |

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

| m1 | m2 | m3 |
|---|---|---|
| freq=2.500 GHz | freq=2.600 GHz | freq=2.700 GHz |
| dB(S(2,1))=16.096 | dB(S(2,1))=16.537 | dB(S(2,1))=16.182 |
| dB(S(1,1))=-19.174 | dB(S(1,1))=-16.152 | dB(S(1,1))=-13.952 |

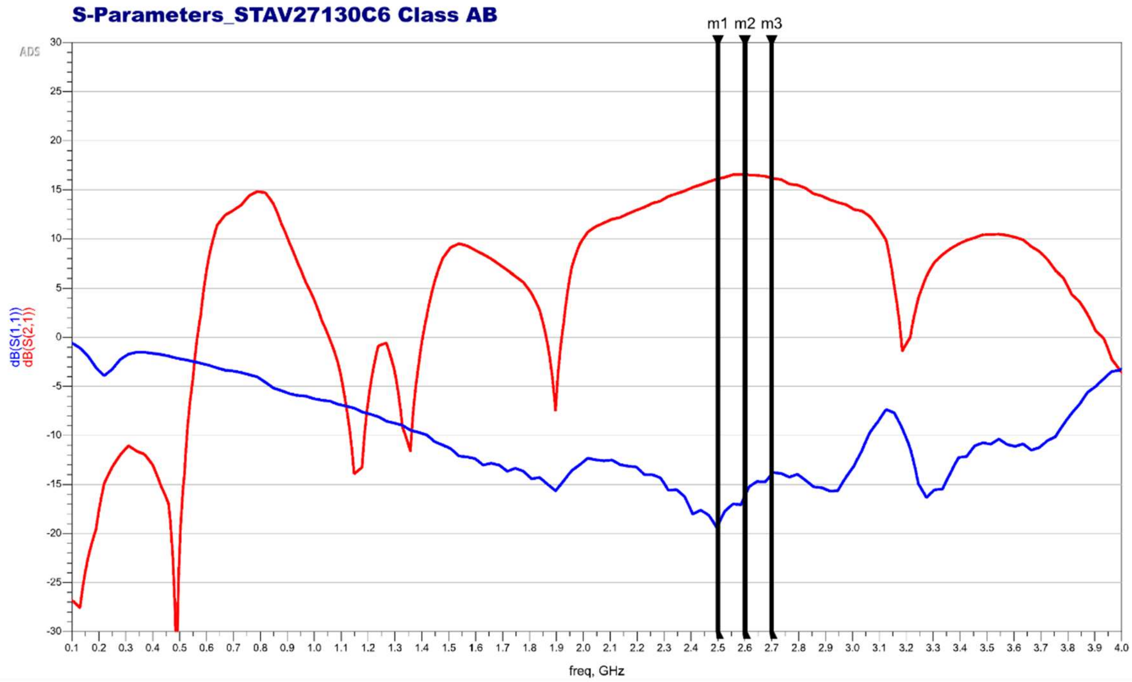



**Figure 5: Picture of application board Doherty circuit for 2.5-2.7GHz**

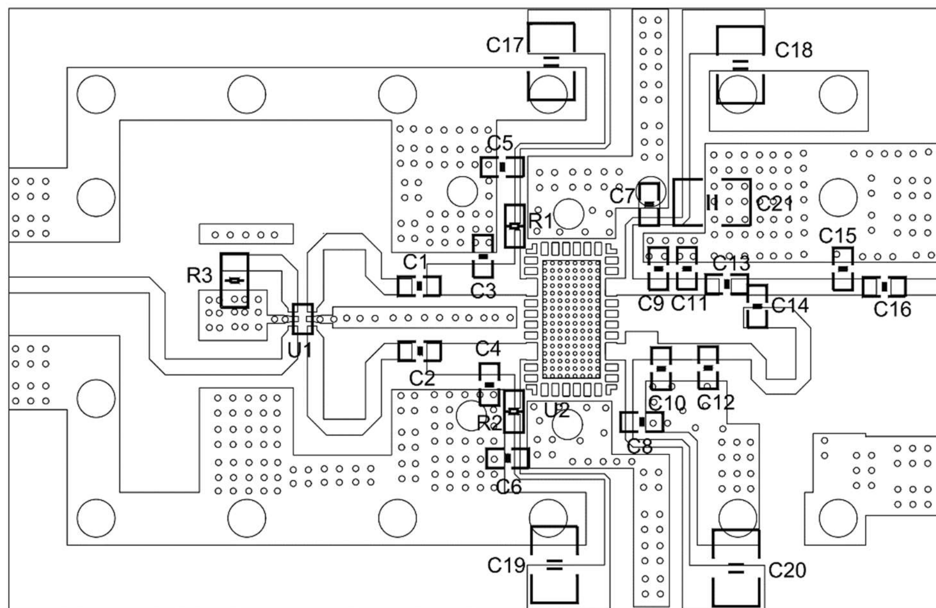


**Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)**

| Reference | Footprint | Value | Quantity |
|---|---|---|---|
| C1, C2, C5, C6, C7, C8, C14, C16 | 0603 | 10pF/250V | 8 |
| C3, C4 | 0603 | 1.2pF/250V | 2 |
| C9, C10 | 0603 | 0.6pF/250V | 2 |
| C11, C12 | 0603 | 1.5pF/250V | 2 |
| C13 | 0603 | 3.0pF/250V | 1 |
| C15 | 0603 | 1.0pF/250V | 1 |
| C17, C18, C19, C20, C21 | 1210 | 10uF/100V | 5 |
| R1, R2 | 0603 | 10R | 2 |
| R3 | 0805 | 51R | 1 |
| U1 | 0805 | C2327J50503AHF | 1 |
| U2 | C6 | STAV27130C6 | 1 |
| | | | |

**10*6 Plastic Package**

Notes:

1. All dimensions are in mm;
2. The tolerances unless specified are ±0.2mm.

## Revision history

**Table 4. Document revision history**

| Date | Revision | Datasheet Status |
|---|---|---|
| **2023/8/22** | **V1.0** | **Preliminary Datasheet Creation** |
| | | |
| | | |
| | | |

**Application data based on: ZBB-23-25**

## Notice

Specifications are subject to change without notice. Innogration believes the information within the data sheet to be reliable. Innogration makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose.
"Typical" parameter is the average values expected by Innogration in quantities and are provided for information purposes only. It can and do vary in different applications and related performance can vary over time. All parameters should be validated by customer's technical experts for each application.
Innogration products are not designed, intended or authorized for use as components in applications intended for surgical implant into the body or to support or sustain life, in applications in which the failure of the Innogration product could result in personal injury or death or in applications for planning, construction, maintenance or direct operation of a nuclear facility.
For any concerns or questions related to terms or conditions, please check with Innogration and authorized distributors

Copyright © by Innogration (Suzhou) Co.,Ltd.