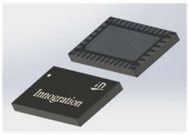
GaN HEMT 50V, 140W, 1.8-2.7GHz Power Transistor

STAV27140C6



Description

The STAV27140C6 is a dual path 140W, 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 asymmetrical 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 1.8GHz:

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

V_{DD} = 50 Vdc, I_{DQA} = 60mA, V_{GSB} = –5.5Vdc,

Freq (MHz)	Pulse CW Signal			Pavg=43dBm WCDMA Signal		
	P1-Gain (dB)	Psat (dBm)	Psat (W)	Gp (dB)	Eff (%)	ACPR5M (dBc)
1805	15.22	51.60	144.43	15.70	58.80	-29.85
1842.5	15.28	51.62	145.23	15.66	59.42	-30.69
1880	15.21	51.54	142.56	15.57	59.38	-32.59

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

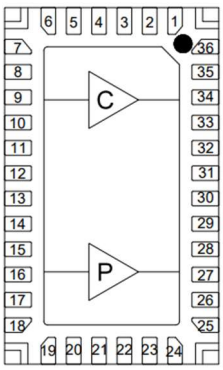
1. Set VGS to the pinch--off (VP) voltage, typically –5 V
2. Turn on VDS to nominal supply voltage
3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

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	17.5	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, Pdiss=15W at Pavg=43dBm WCDMA 1 carrier	$R_{\theta JC}$	2.2	°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

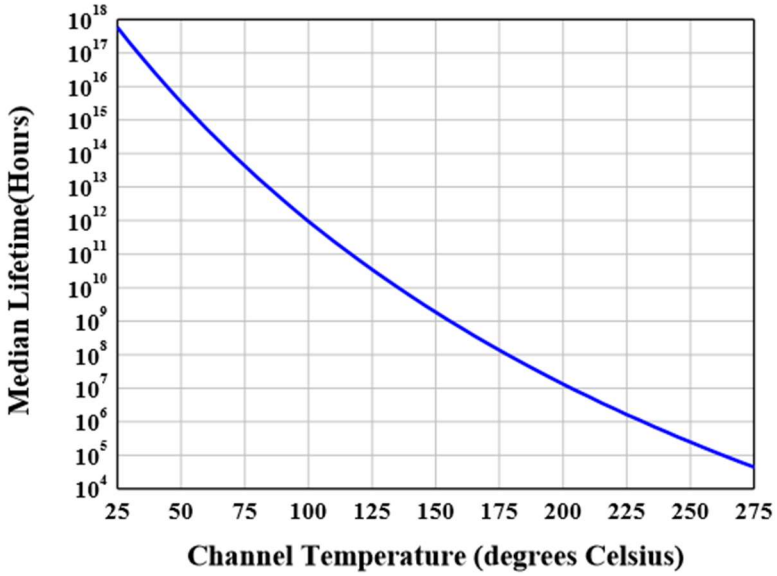
DC Characteristics (peak path, measured on wafer prior to packaging)

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	VGS=-8V; IDS=10mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 10mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=90mA, 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=43dBm WCDMA 1 Carrier, All phase, No device damages	VSWR		10:1		

Figure 2: Median Lifetime vs. Channel Temperature



Typical performance

1805-1880MHz Doherty

Figure 3: Efficiency and power gain as function of Pout

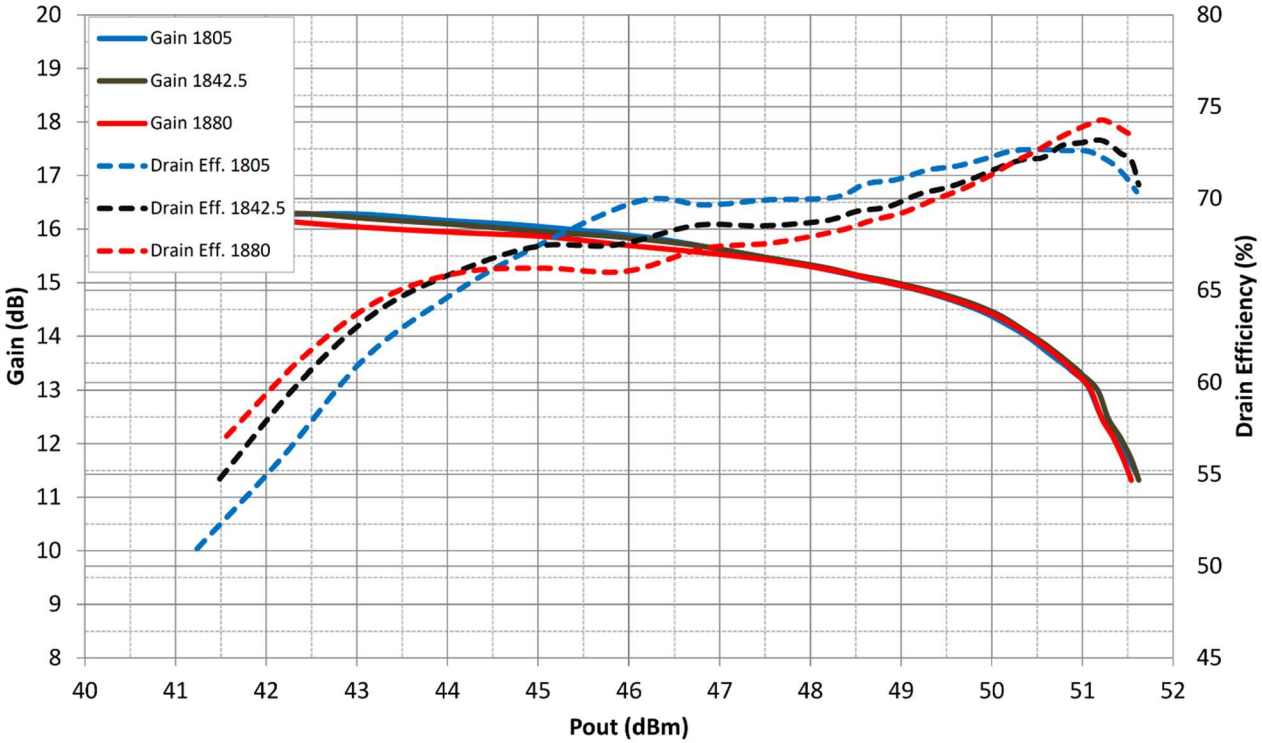


Figure 4: Network analyzer output, S11 and S21

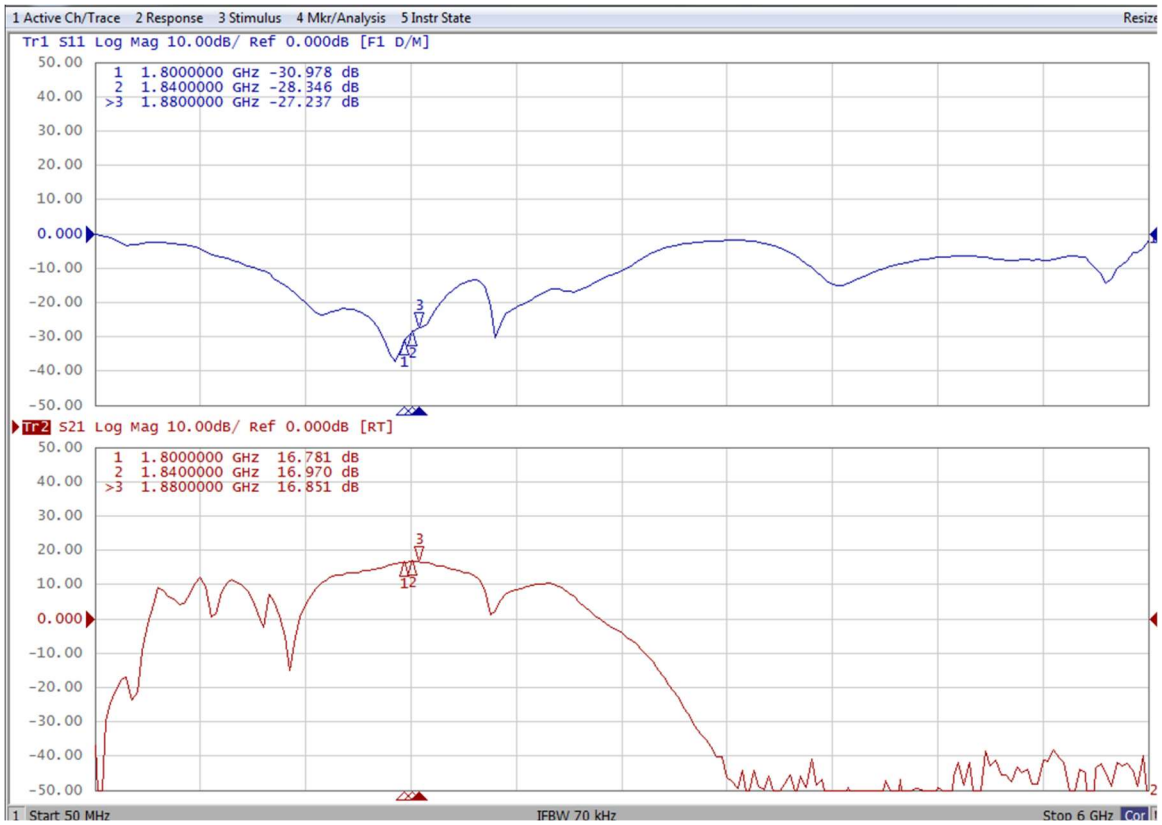


Figure 5: Picture of application board Doherty circuit

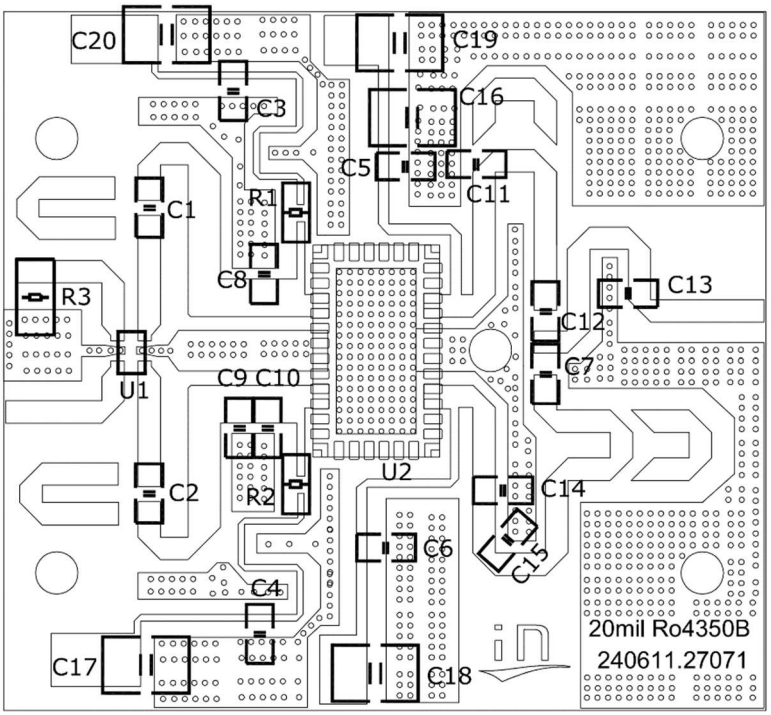
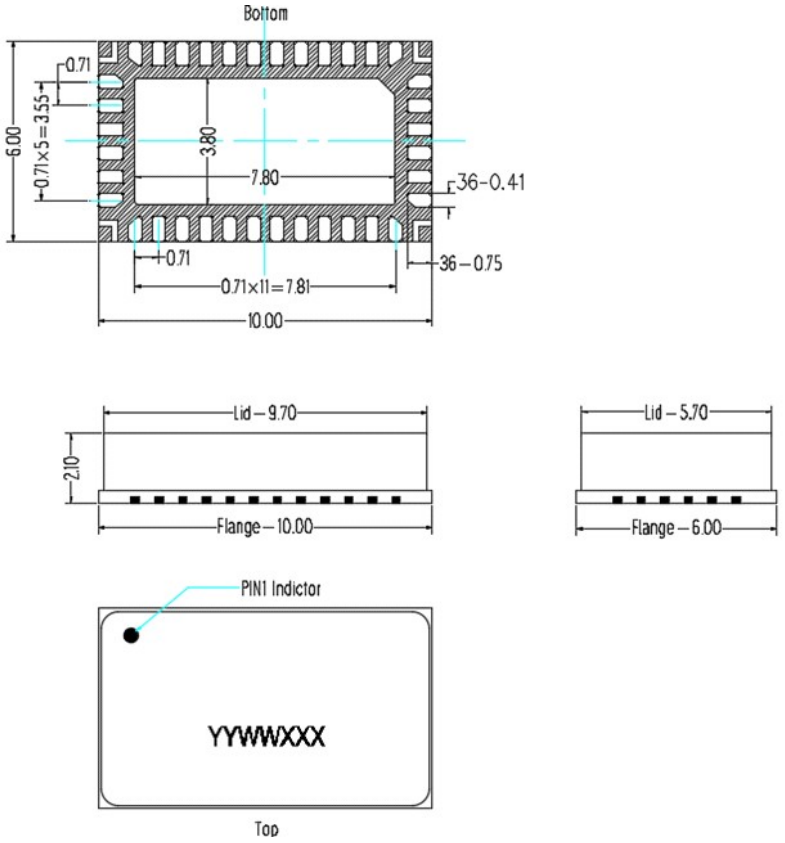


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Component	Value	Quantity
U1	C1720J5003AHF	1
U2	STAV27140C6	1
C1	8.2pF/250V	1
C8, C10	2.7pF/250V	2
C9	0.5pF/250V	1
C11, C15	2.0pF/250V	2
C14	0.9pF/250V	1
C12	4.3pF/250V	1
C13	1.3pF/250V	1
C2, C3, C4, C5, C6, C7	20pF/250V	6
C16, C17, C18, C19, C20	10 uF/100V	5
R3	50 Ω	1
R1、R2	10 Ω	2

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
2024/6/27	**V1.0**	**Preliminary Datasheet Creation**

Application data based on: ZBB-24-17

Notice