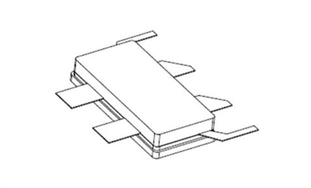
GaN HEMT 50V, 630W,1.8-1.9GHz RF Power Transistor

STBV20601BY4V



Description

The STBV20601BY4V is a dual path 630 watt , Internally matched GaN HEMT, ideal for applications from 1.8 to 1.9GHz especially for LTE/5G

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

- Typical WCDMA 1 carrier performance with device soldered

VDS= 50V, IDQ=300mA(Vgm=-3.11V，Vgp=-5.8V)

Freq (GHz)	Pulse CW Signal			Pavg=49dBm WCDMA Signal		
	P1-Gain (dB)	P3 (dBm)	P3 (W)	Gp (dB)	Eff (%)	ACPR5M (dBc)
1.81	16.19	58.00	630	15.99	54.3	-28.14
1.84	16.80	58.03	635	16.48	54.0	-27.70
1.88	17.37	57.84	608	16.94	53.9	-28.73

Applications

- Asymmetrical Doherty amplifier within 1.8-1.9GHz
- 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)

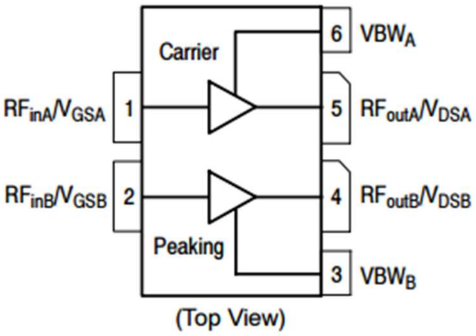


Table 1. Maximum Ratings

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	76	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=100W, on Doherty application board	RθJC	0.9	°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=300mA, Measured in Functional Test	$V_{GS(Q)}$		-3.11		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=39.6mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 39.6mA	$V_{GS(th)}$	-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	1.84GHz, Pout=80W WCDMA 1 Carrier in Doherty circuit All phase, No device damages	VSWR		10:1		

Figure 2: Median Lifetime vs. Channel Temperature

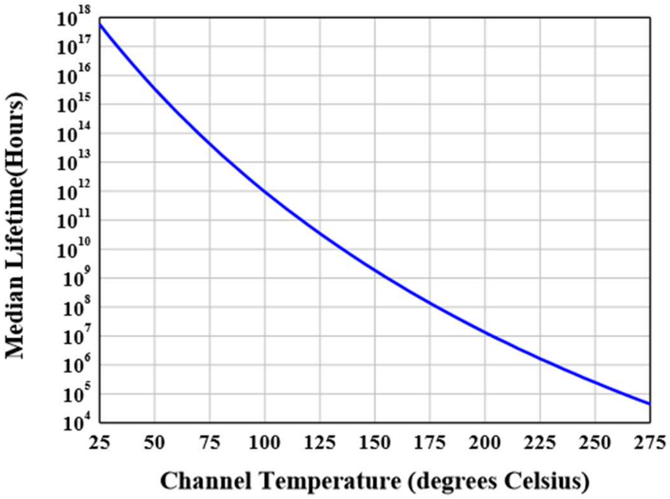
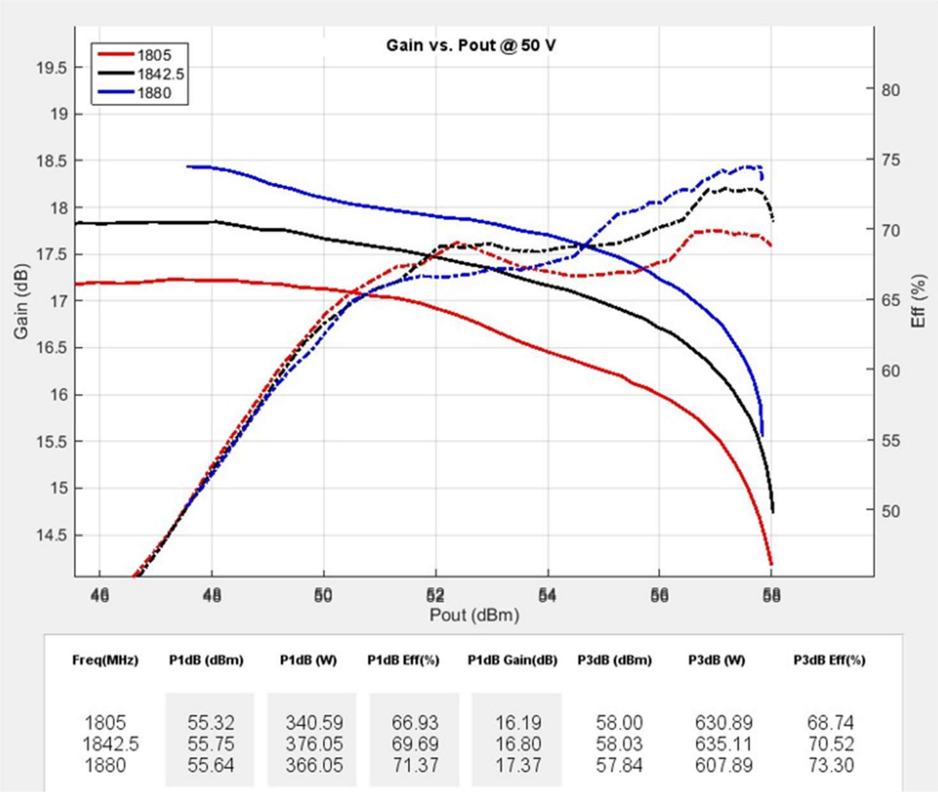


Figure 3: Efficiency and power gain as function of Pout (1.8-1.9GHz Doherty)



Freq(MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
1805	55.32	340.59	66.93	16.19	58.00	630.89	68.74
1842.5	55.75	376.05	69.69	16.80	58.03	635.11	70.52
1880	55.64	366.05	71.37	17.37	57.84	607.89	73.30

Figure 4: Network analyzer output, S11 and S21 (1.8-1.9GHz Doherty)

```
Tr1 S11 Log Mag 10.00 dB / Ref 0.000 dB [F1 D&M]
  1  1.8000000 GHz -11.442 dB
  2  1.8500000 GHz -10.630 dB
  3  1.9000000 GHz -9.5498 dB
  4  2.1000000 GHz -9.1715 dB
 >5  2.2000000 GHz -5.5182 dB
```

```
Tr2 S21 Log Mag 10.00 dB / Ref 0.000 dB [RT D&M]
  1  1.8000000 GHz  18.455 dB
  2  1.8500000 GHz  18.953 dB
  3  1.9000000 GHz  19.016 dB
  4  2.1000000 GHz  14.317 dB
 >5  2.2000000 GHz  4.2945 dB
```

```
1  Start 1.5 GHz                IFBW 70 kHz                Stop 3.2 GHz  Cor
```

Figure 5: Picture of application board Doherty circuit for 1.8-1.9GHz

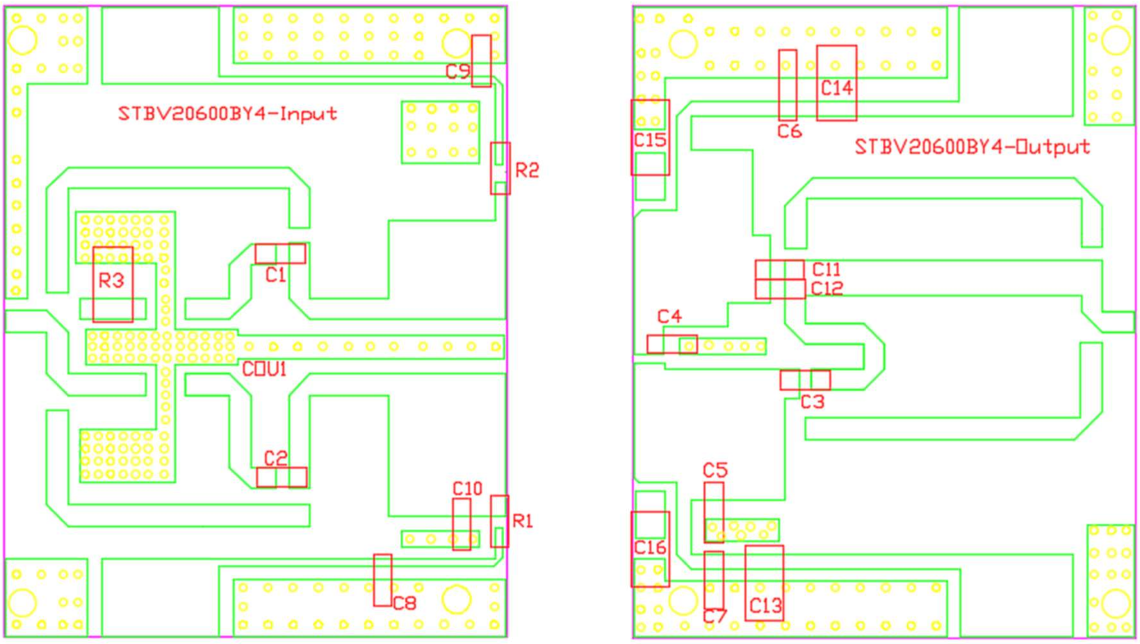
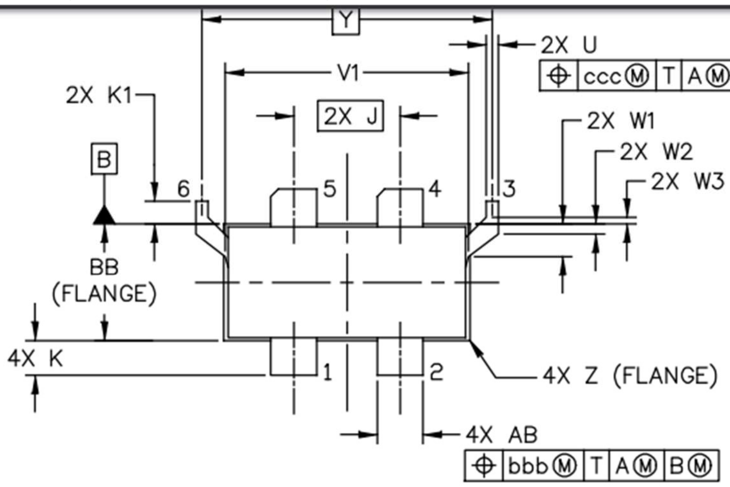
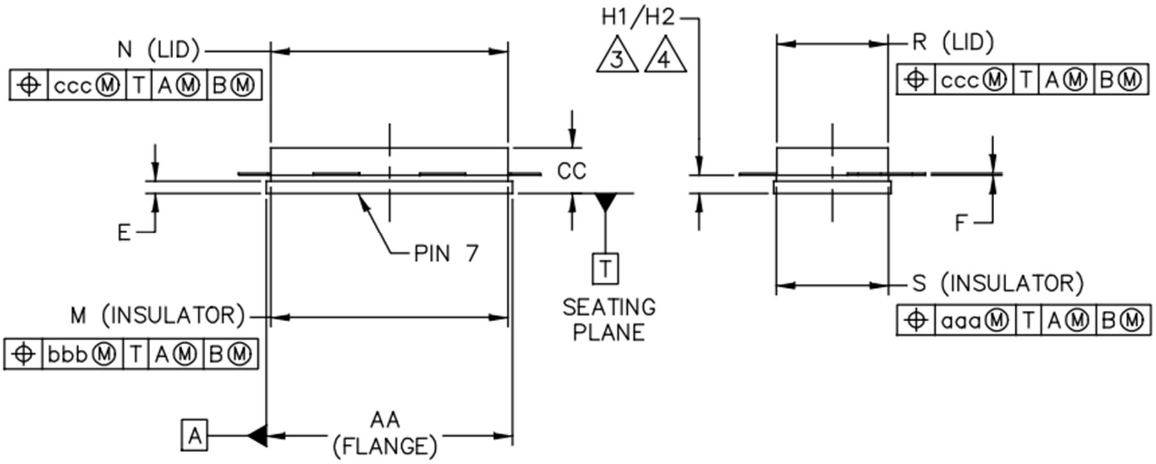


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 30mils)

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C3, C6,C7,C8,C9	7	20pFHigh Q Capacitor	251SHS200BSE	TEMEX
C4,C5,C10	3	1.5pFHigh Q Capacitor	251SHS1R5BSE	TEMEX
C11,C12	2	3.9pFHigh Q Capacitor	251SHS3R9BSE	TEMEX
C4,C5,C10	3	1.5pFHigh Q Capacitor	251SHS1R5BSE	TEMEX
C13,C14,C15,C16	4	10uF MLCC	RS80R2A106M	MARUWA
R1,R2	2	10Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	51Ω Power Resistor	S1206N	RN2
COU1	1	3 dB Bridge	HC2100P03H	YANTEL
T1	1	600W GaN Dual Transistor	STBV20601BY4V	Innogration

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
2022/01/12	**V1.0**	**Preliminary Datasheet Creation**

Application data based on: LWH-22-02

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