GaN HEMT 50V, 200W,4.7-5GHz RF Power Transistor

STCV50200L4

Description

The STCV50200L4 is a dual path 200watt, GaN HEMT, ideal for applications from 4.7 to 5GHz. It can be configured as asymmetrical Doherty for 5G application, delivering 25W average power according to normal 8.5dB back off.

It is housed in 15*5.5mm ceramic package with high thermally conductive flange.

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

- Typical RF performance on application board with device soldered
  VDS = 48 V, IDQmain = 130 mA, VGSpeak=-5.6V

Freq (GHz)	Pulse CW Signal(1)			P_{avg}=44.5dBm WCDMA Signal(2)		
	Gain P1 (dB)	P3 (dBm)	P3 (W)	Gp (dB)	η_D (%)	$ACPR_{5M}$ (dBc)
4.7	10.85	53.78	239	11.41	42.02	-28.35
4.8	12.12	53.40	219	12.30	45.38	-32.45
4.9	12.49	53.01	200	11.94	44.35	-33.66
5.0	11.64	53.22	209	11.49	41.90	-31.51

(1)Pulsed condition: 20us and 10%,

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

Applications

- N79 Doherty amplifier
- C band power amplifier application

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)

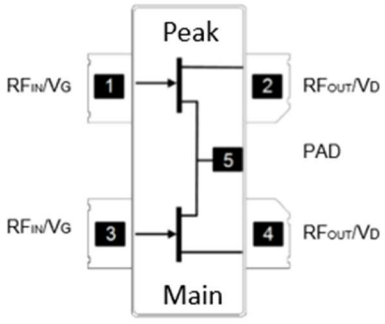


Table 1. Maximum Ratings

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	27	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 Pout=25W WCDMA	$R_{\theta JC}$	2.4	°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=10mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 10mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=110mA, 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=17mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 17mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=130mA Measured in Functional Test	$V_{GS(Q)}$		-3.13		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	5GHz, Pout=25W WCDMA on Doherty All phase, No device damages	VSWR		10:1		

Figure 3: Efficiency and power gain as function of Pout (4.7-5GHz Doherty)

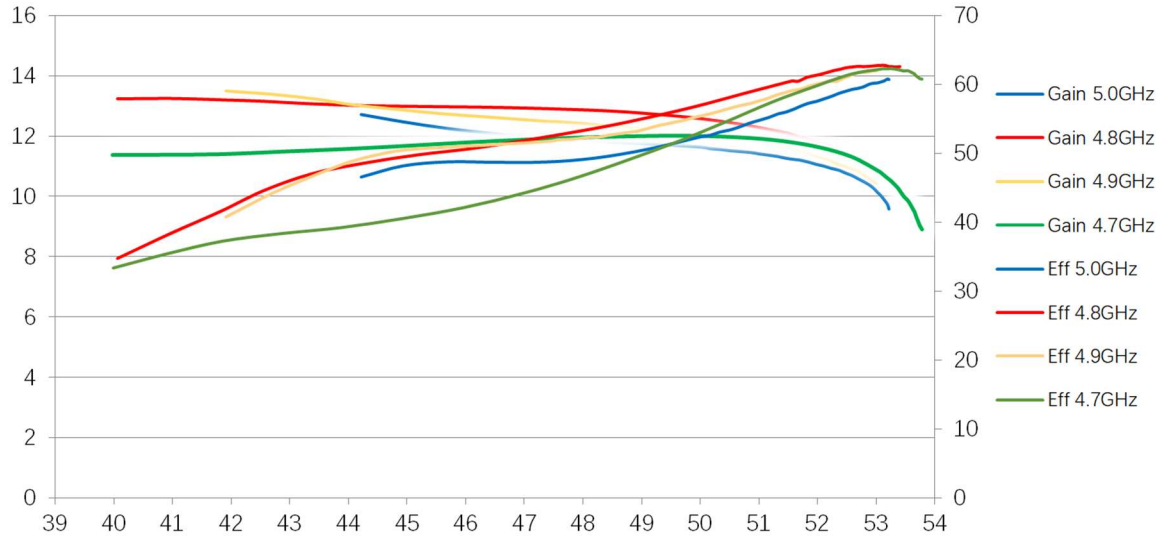


Figure 4: Network analyzer output, S11 and S21 (4.7-5GHz Doherty)

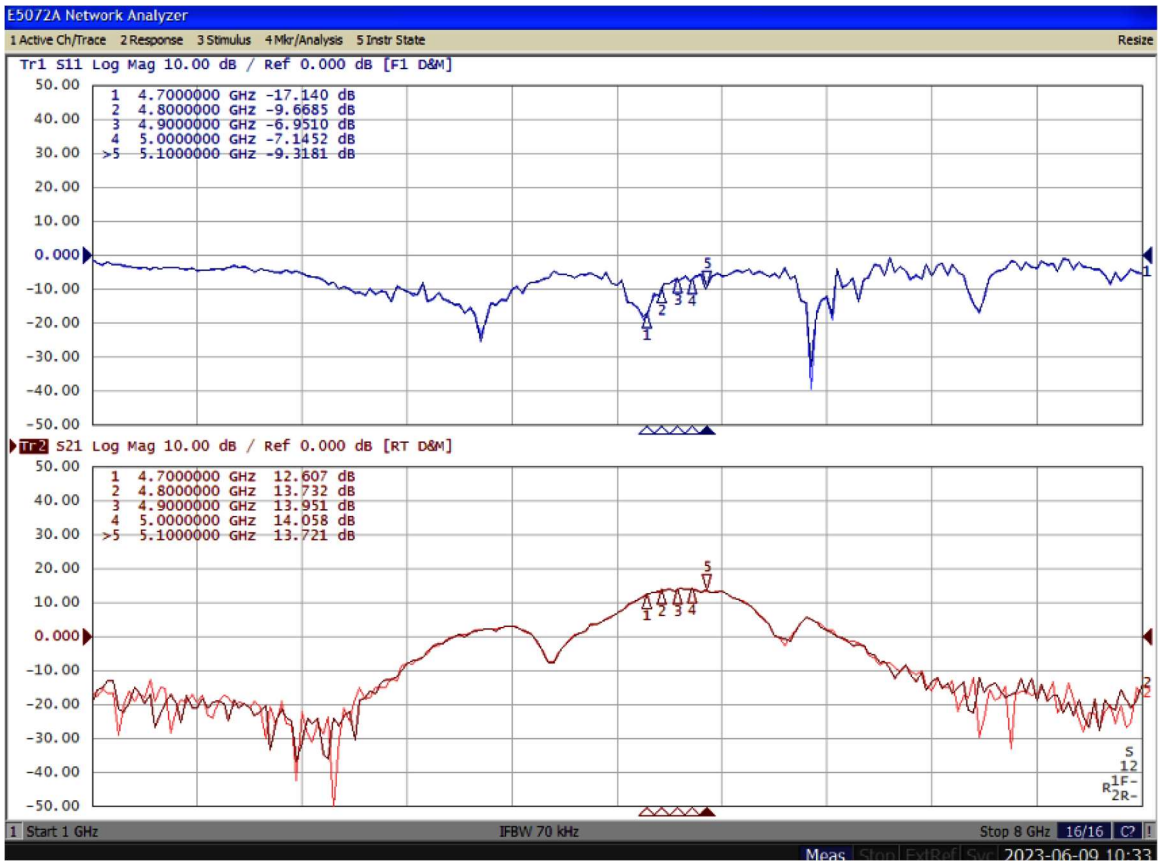


Figure 5: Picture of application board Doherty circuit

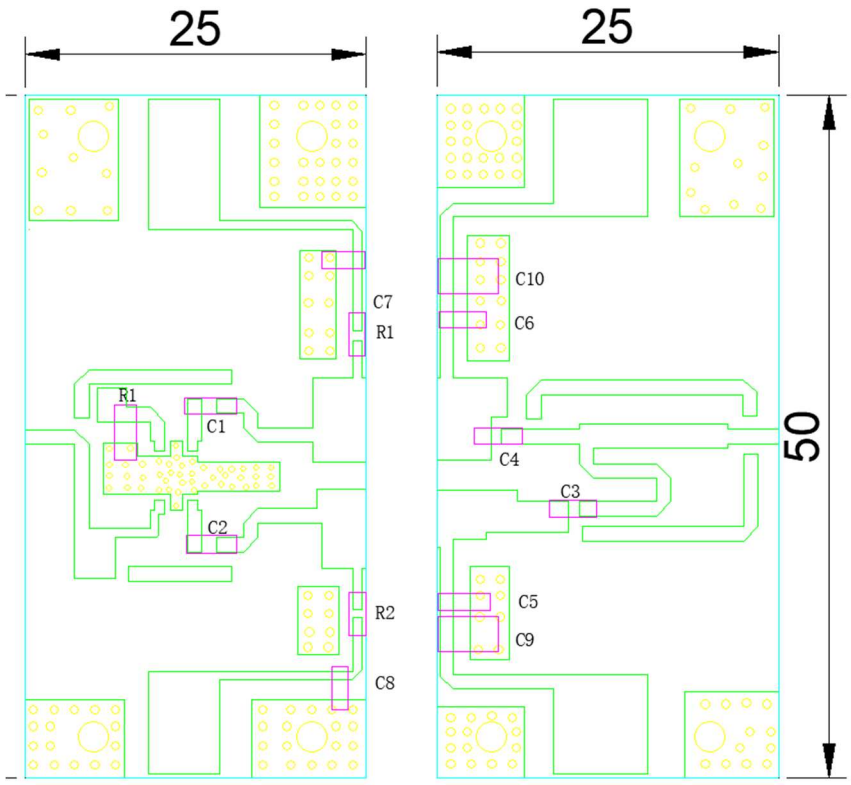
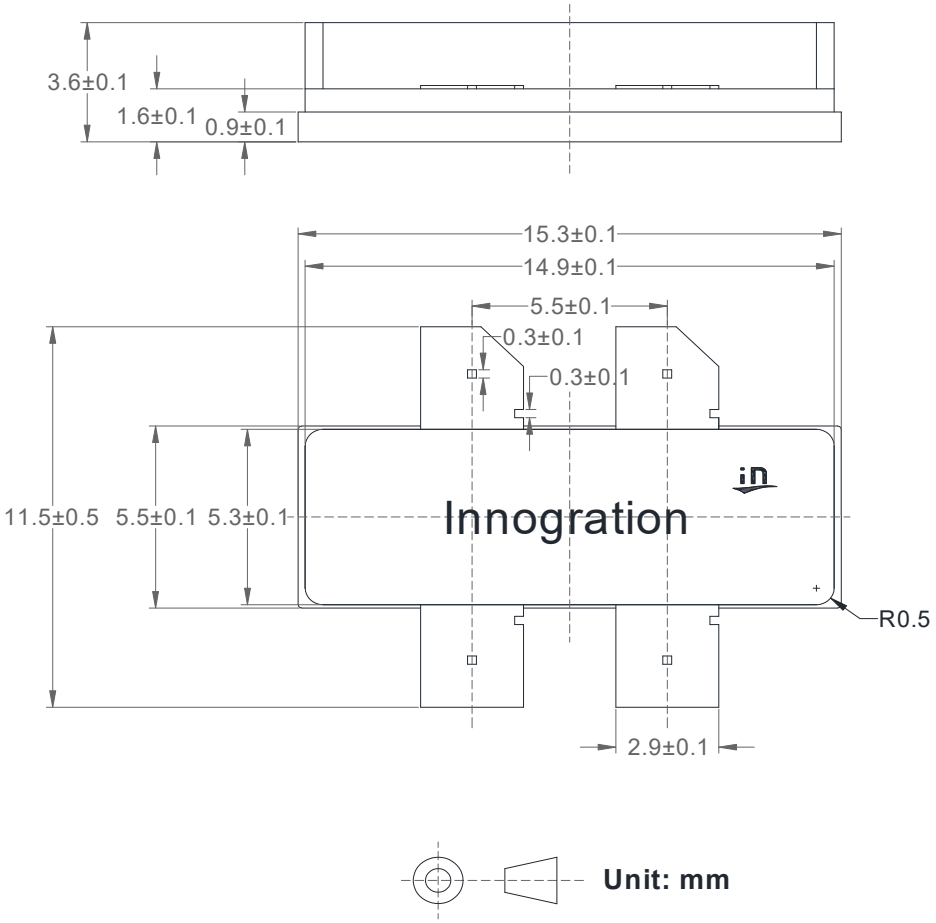


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C3,C5,C6, C7,C8	7	3.9pFHigh Q Capacitor	251SHS3R9BSE	TEMEX
C4	1	8.2pFHigh Q Capacitor	251SHS8R2BSE	TEMEX
C9,C10	2	10uF MLCC	GRM32EC72A106M E05	Murata
R1,R2	2	10Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	51Ω Power Resistor	S1206N	RN2
COUT1	1	3 dB Bridge	HC55F03	Yantel
T1	1	200W GaN Dual Transistor	STCV50200L4	Innogration

Earless Flanged Ceramic Package; 4 leads



Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2022/5/24	V1.0	Preliminary Datasheet Creation
2022/6/24	V1.1	Application update after input hybrid change
2023/5/18	V2.0	Change name to STCV50200L4
2023/6/15	V2.1	Modify the frequency low end to 4.7GHz

Application data based on LWH-22-15/23-16

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