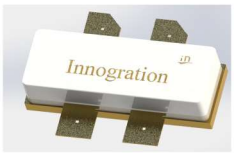
GaN HEMT 50V, 200W,4.4-5GHz RF Power Transistor

STCV50201L4



Description

The STCV50201L4 is a dual path 200watt, GaN HEMT, ideal for applications from 4.4 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, Idq_main = 130 mA, Vgs_peak=-5.6V

Freq (GHz)	Pulse CW Signal(1)			P_{avg}=44.5dBm WCDMA Signal(2)		
	P1-Gain (dB)	P3 (dBm)	P3 (W)	Gp (dB)	η_D (%)	$ACPR_{5M}$ (dBc)
4.40	10.96	53.29	213	11.24	39.88	-30.89
4.50	11.32	53.10	204	11.43	39.60	-35.87
4.60	11.89	53.09	203	11.86	41.99	-38.94
4.70	11.83	53.06	203	11.95	44.20	-36.74
4.80	12.11	52.99	200	11.66	44.09	-33.70
4.90	11.72	53.23	210	11.13	42.15	-32.32
5.00	10.30	53.35	216	10.60	39.80	-29.38

(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)

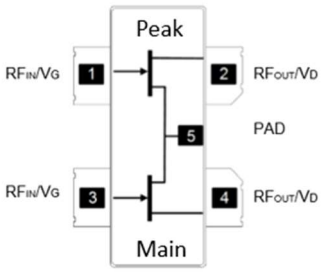


Table 1. Maximum Ratings

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 (4.4-5GHz Doherty)

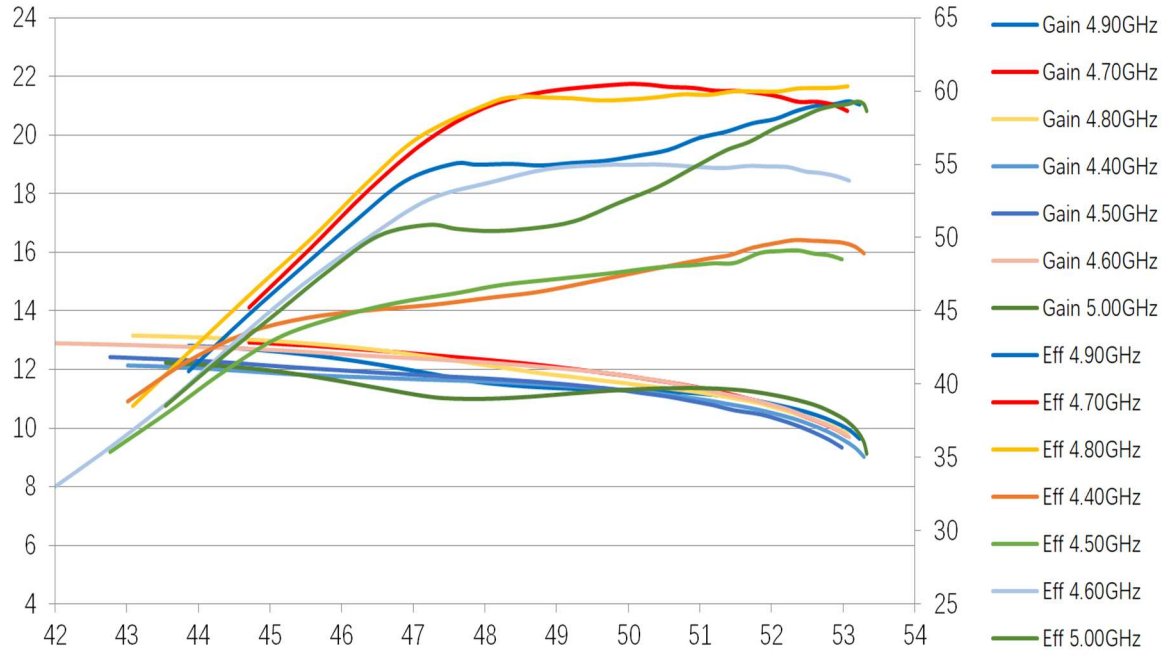


Figure 4: Network analyzer output, S11 and S21 (4.4-5GHz Doherty)

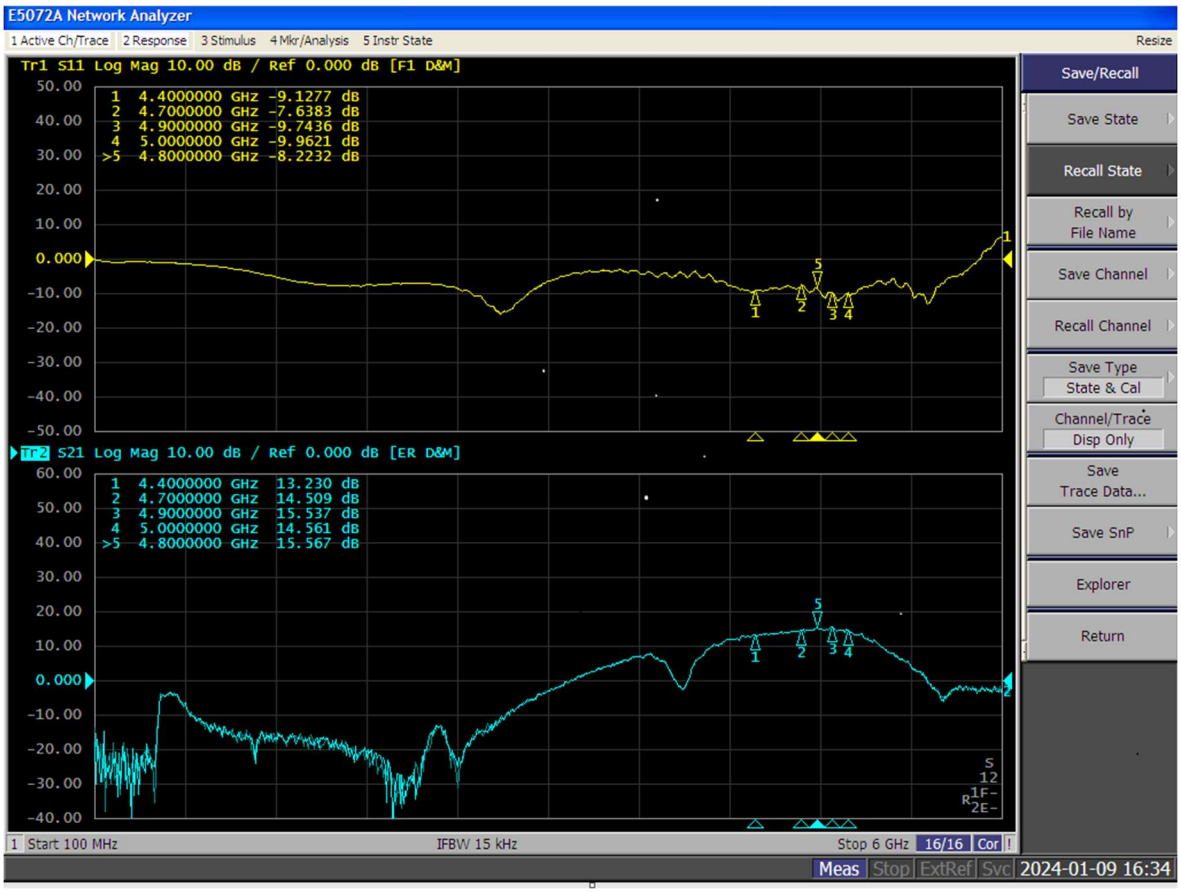


Figure 5: Picture of application board Doherty circuit

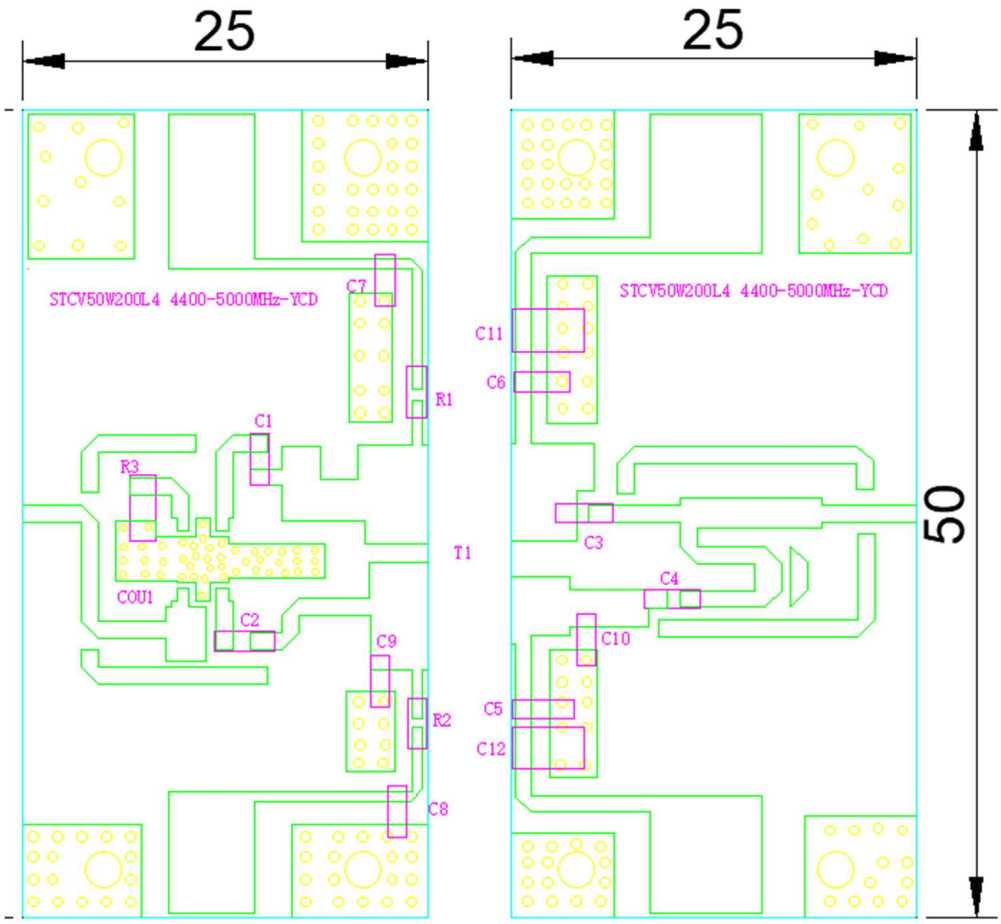
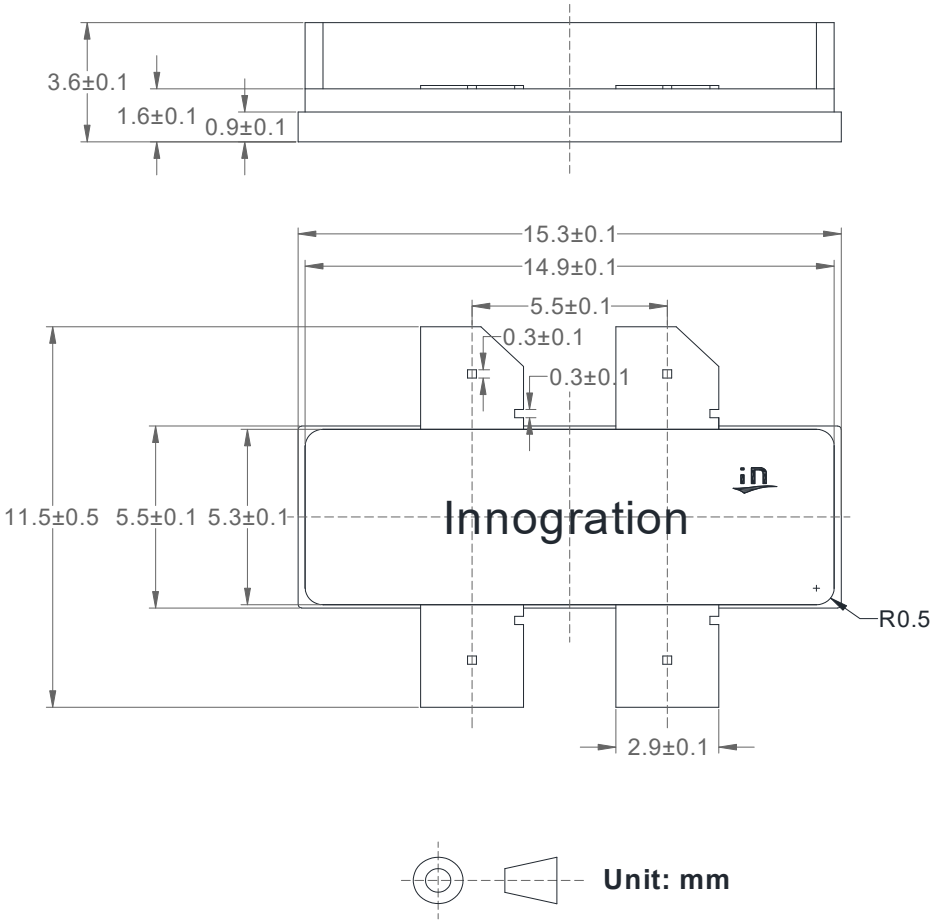


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

C3	1	8.2pFHigh Q Capacitor	251SHS8R2BSE	TEMEX
C10	1	0.2pFHigh Q Capacitor	251SHS0R2BSE	TEMEX
C1,C2,C4,C5,C6,C7,C8	7	3.9pFHigh Q Capacitor	251SHS3R9BSE	TEMEX
C11,C12	2	10uF MLCC	GRM32EC72A106ME 05	Murata
C9	1	0.3pFHigh Q Capacitor	251SHS0R3BSE	TEMEX
R1,R2	2	10Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	51Ω Power Resistor	S1206N	RN2
COUT1	1	3 dB Bridge	X3C45F1-03S	Anaren
T1	1	200W GaN Dual Transistor	STCV50W201L4	Innogration

Earless Flanged Ceramic Package; 4 leads



Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2024/1/10	**V1.0**	**Preliminary Datasheet Creation**

Application data based on LWH-24-01

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