Gallium Nitride 50V, 530W, 3.7-4.2GHz RF Power Transistor

STCV40530CY4V

Description

The STCV40530CY4V is a 530-watt, internally matched GaN HEMT, designed for 5G cellular applications with frequencies from 3.7-4.2GHz, **enabled by wide band VBW capability to support IBW up to 200MHz.**.

It can be configured as asymmetrical Doherty for 4G or 5G application, delivering 55-70W average power, according to normal 8.5 to 9dB back off.

There is no guarantee of performance when this part is used in applications designed Outside of these frequencies.

- Typical 3.7-4.0GHz Doherty Pulsed CW and 1C W--CDMA Characterization Performance:

V_{DD} = 48 Vdc, I_{DQA} =270 mA, V_{GSB} = –5.2Vdc,

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

Freq (GHz)	Pulse CW Signal(1)				P_{avg}=48.5dBm WCDMA Signal(2)		
	P3 (dBm)	P3 (W)	P4.5 (dBm)	P4.5 (W)	Gp (dB)	η_D (%)	$ACPR_{5M}$ (dBc)
3.7	57.13	517	57.40	550	11.47	43.00	-28.74
3.8	56.45	442	57.20	525	12.12	45.64	-32.33
3.9	56.35	429	57.18	523	11.90	44.38	-36.40
4.0	56.73	471	57.10	513	12.09	42.20	-40.24

- Typical 3.8-4.2GHz Doherty Pulsed CW and 1C W--CDMA Characterization Performance:

V_{DD} = 50 Vdc, I_{DQA} =280 mA, V_{GSB} = –5.2Vdc,

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

Freq (GHz)	Pulse CW Signal(1)				P_{avg}=47.5dBm WCDMA Signal(2)		
	P3 (dBm)	P3 (W)	P5 (dBm)	P5 (W)	Gp (dB)	η_D (%)	$ACPR_{5M}$ (dBc)
3.8	56.60	457	57.22	527	11.40	39.96	-31.66
3.9	56.30	425	57.23	528	12.30	42.50	-33.67
4.0	56.60	457	57.30	537	12.20	41.80	-37.25
4.1	57.27	533	57.28	534	12.00	40.80	-43.23
4.2	57.20	525	57.22	527	11.85	38.10	-36.56

Applications

- Asymmetrical Doherty amplifier within N77/78 5G band
- S 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

Turning the device OFF

1. Turn RF power off
2. Reduce VGS down to VP, typically –5 V

3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

3. Reduce VDS down to 0 V
4. Turn off VGS

Figure 1: Pin Connection definition

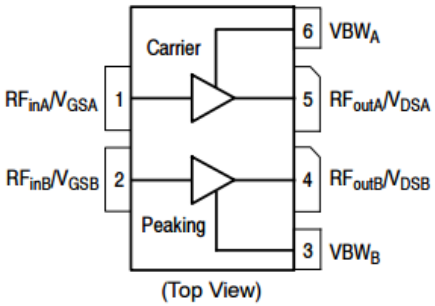


Table 1. Maximum Ratings

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	65.2	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, Pout=70W, 3.8GHz 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=25mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 25mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=270mA, Measured in Functional Test	$V_{GS(Q)}$		-3.3		V

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

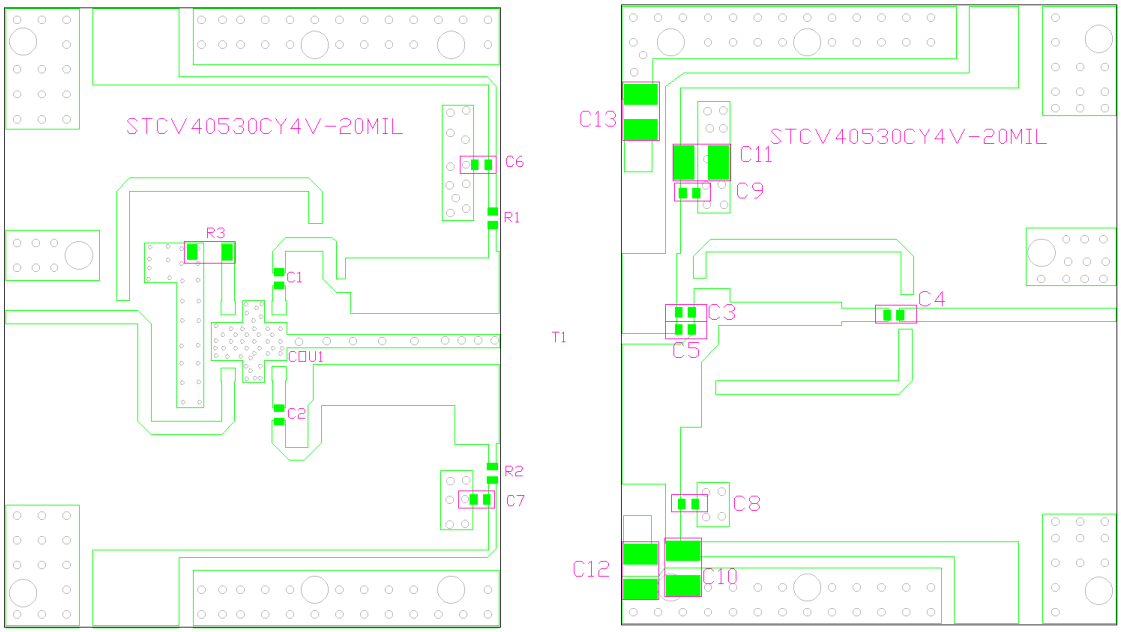
Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	VGS=-8V; IDS=40mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 40mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=400mA Measured in Functional Test	$V_{GS(Q)}$		-3.3		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	3.8GHz, Pout=70W WCDMA 1 Carrier in Doherty circuit All phase, No device damages	VSWR		10:1		

3.7-4.0GHz

Figure 3: Picture of application board Doherty circuit for 3.7-4GHz



Part	Quantity	Description	Part Number	Manufacture
C1,C2,C4,C6, C7,C8,C9	7	8.2pFHigh Q Capacitor	251SHS8R2BSE	TEMEX
C3,C5	2	1.0pFHigh Q Capacitor	ATC600S1R1	ATC
C10,C11,C12,C13	4	10uF MLCC	RS80R2A106M	MARUWA
R1,R2	2	10Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	51Ω Power Resistor	RFR50-20CT0421B	YT
COUT1	1	3 dB Bridge	XC3500P-03S	ANAREN
T1	1	530W GaN Dual Transistor	STCV404530CY4V	Innogration

Figure 4: Efficiency and power gain as function of Pout

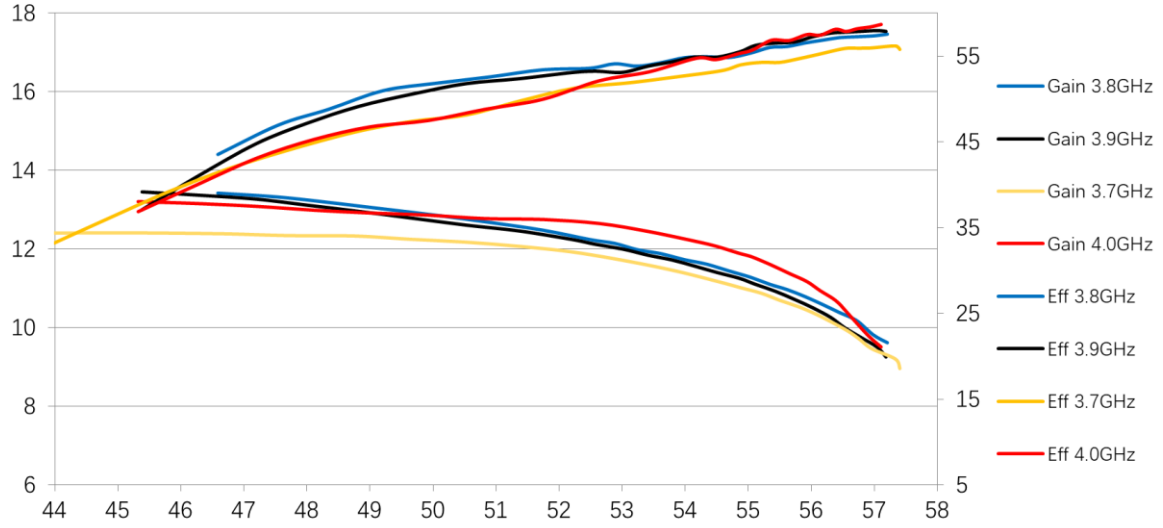
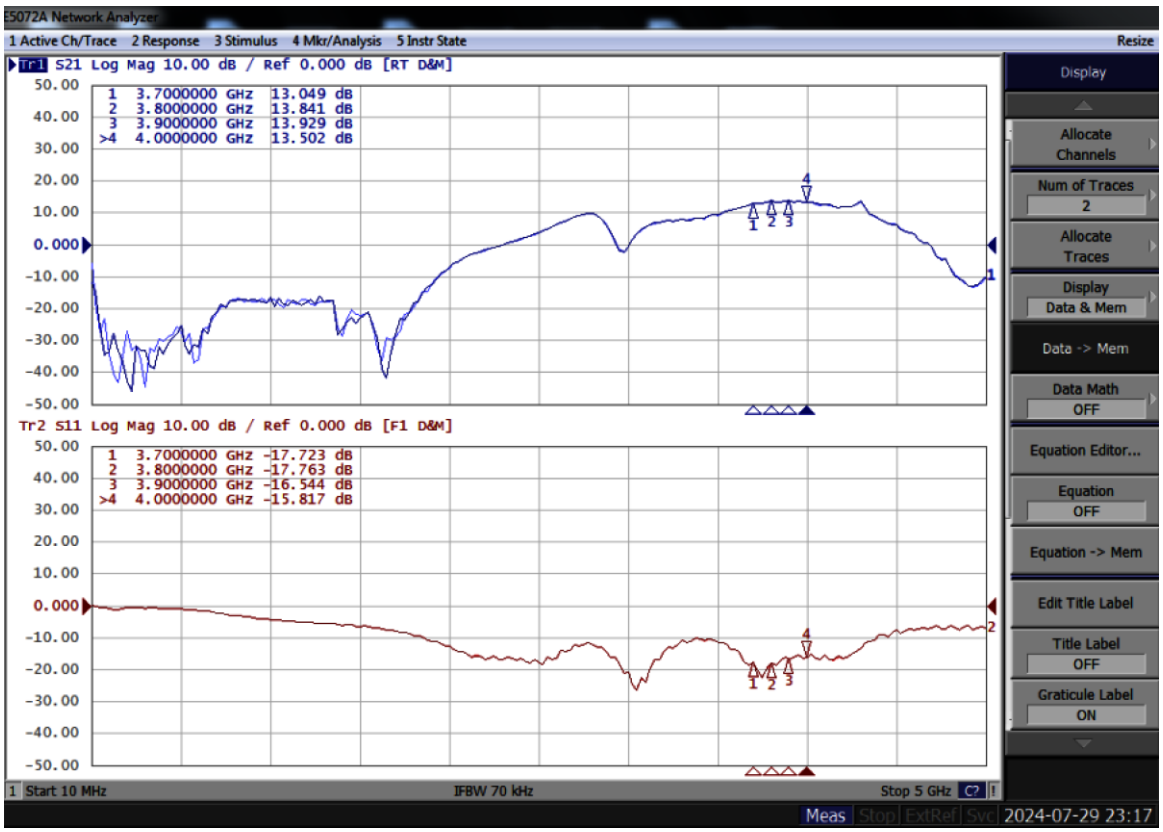
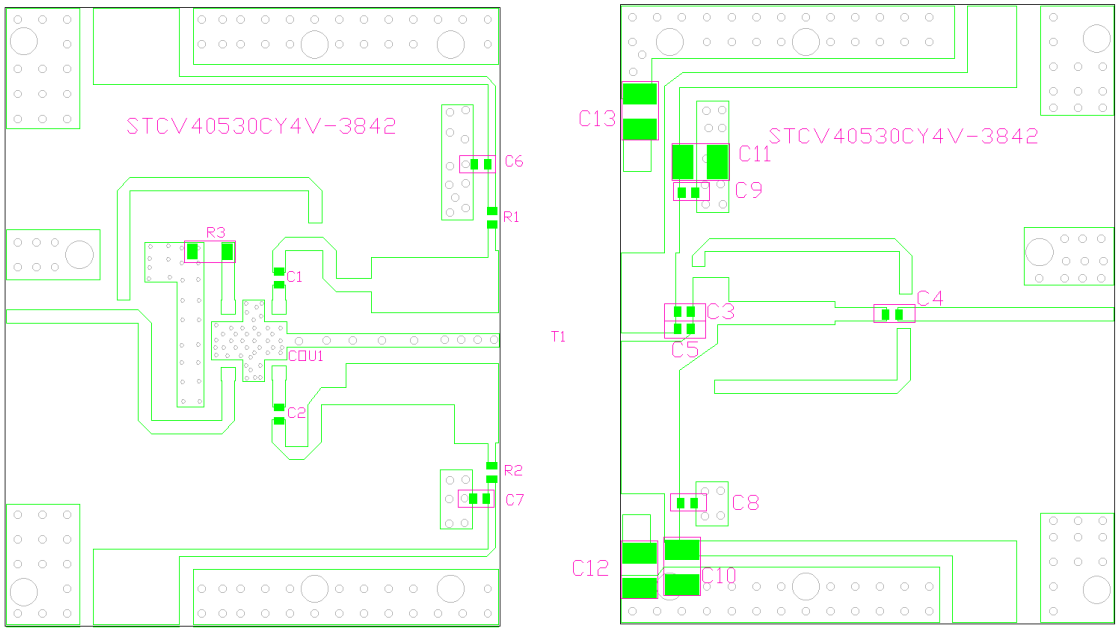


Figure 5: Network analyzer output, S11 and S21



3.8-4.2GHz

Figure 6: Picture of application board Doherty circuit for 3.8-4.2GHz



Part	Quantity	Description	Part Number	Manufacturer
C1,C2 ,C4,C6,C7,C8,C9	7	8.2pFHigh Q Capacitor	251SHS8R2BSE	TEMEX
C3,C5	2	0.8pFHigh Q Capacitor	251SHS0R8BSE	TEMEX
C10,C11,C12,C13	4	10uF MLCC	GRM32EC72A106ME05	Murata
R1,R2	2	10Ω Power Resistor	ESR03EZPF10R0	ROHM
R3	1	51Ω Power Resistor	RFR50-20CT0421B	YT
COUT1	1	3 dB Bridge	XC3500P-03S	ANAREN
T1	1	530W GaN Dual Transistor	STCV40530CY4V	Innogration

Figure 7: Efficiency and power gain as function of Pout

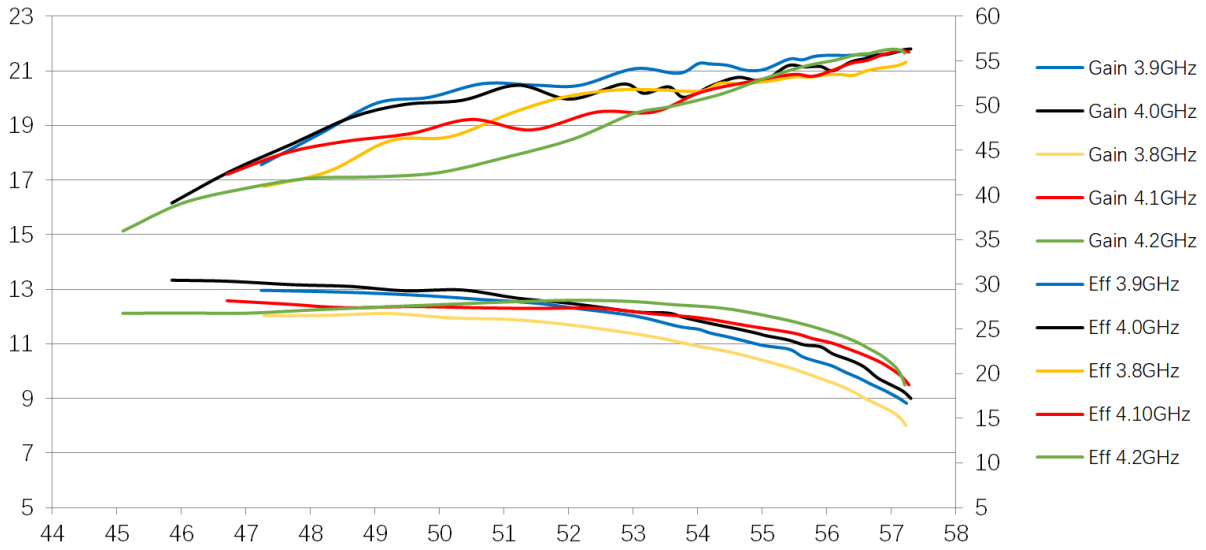
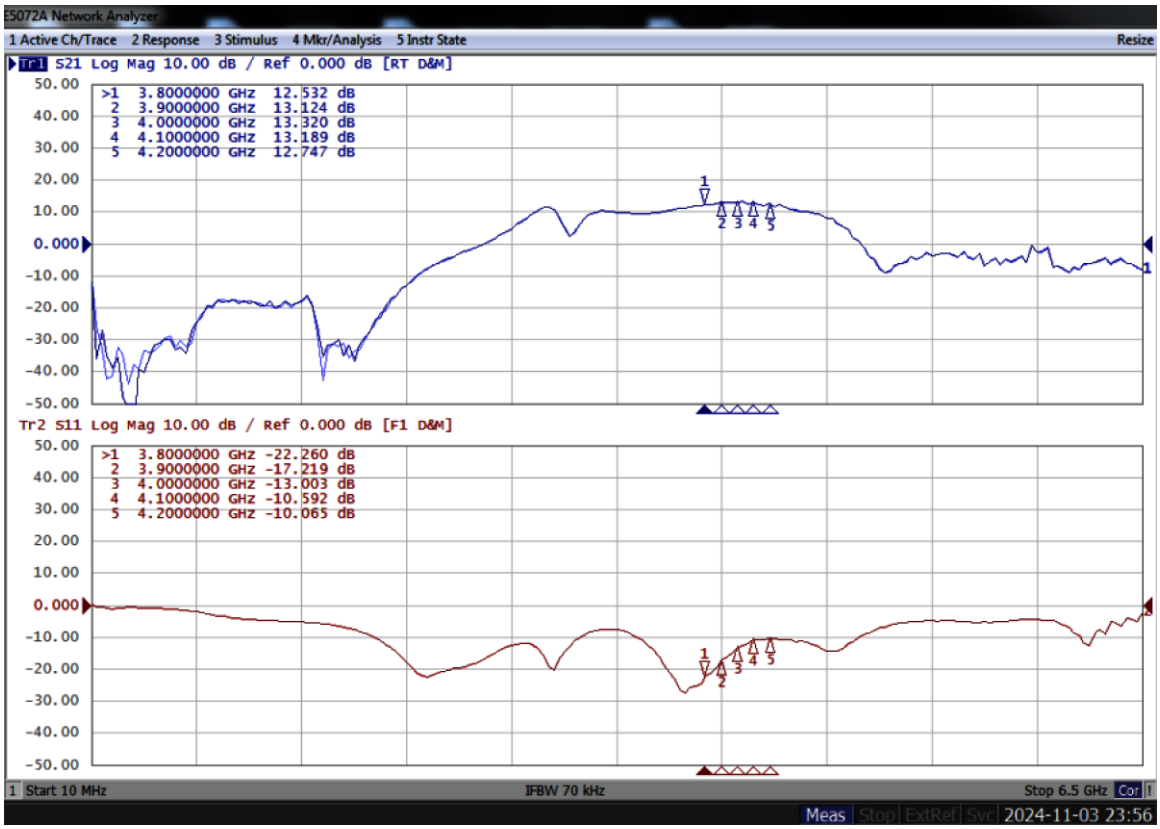
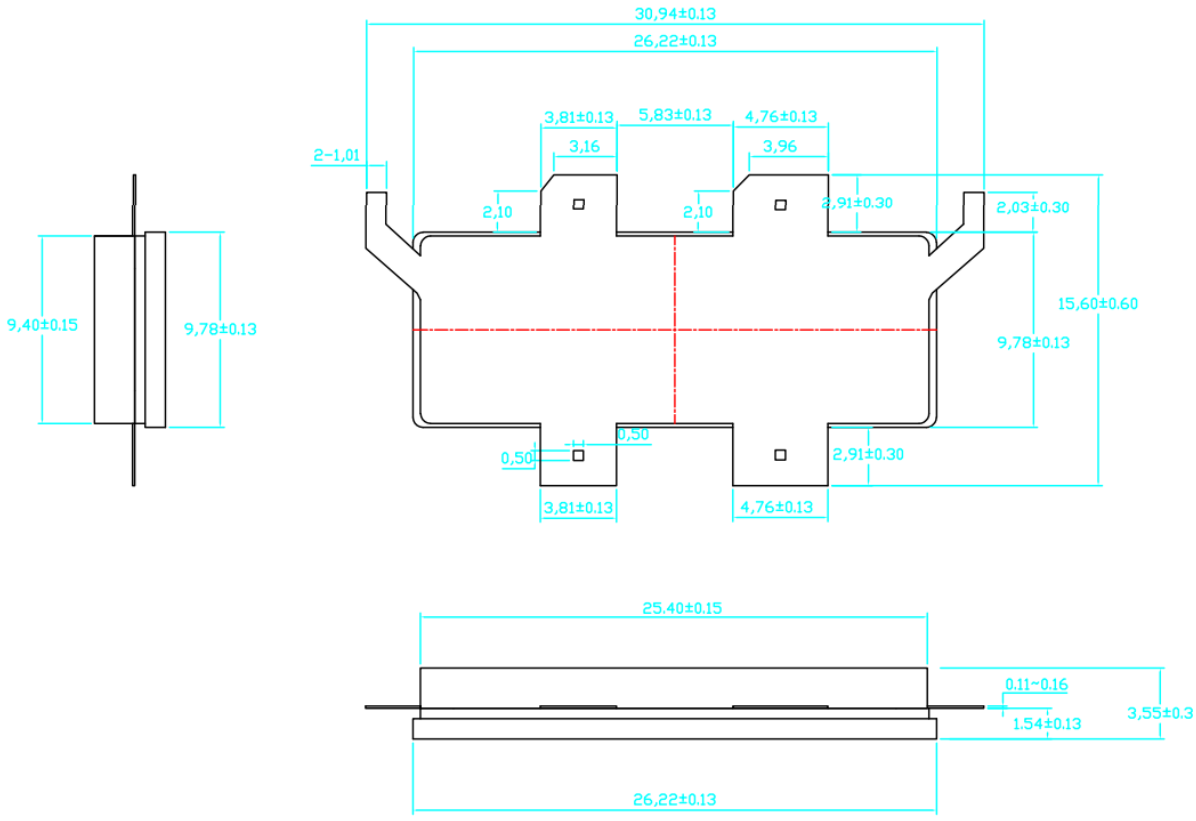


Figure 8: Network analyzer output, S11 and S21



Earless Flanged Ceramic Package; 6 leads- CY4V



Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2024/7/30	**V1.0**	**Preliminary Datasheet Creation**
2024/11/5	**V2.0**	**Extend to 4.2GHz support**

Application data based on LWH-24-27/40

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