



Gallium Nitride 50V, 600W, 3.7-4.0GHz RF Power Transistor

Description

The STCV40600CY4V is a 600-watt, internally matched GaN HEMT, designed for 5G cellular applications with frequencies from 3.7-4.0GHz, **enabled by wide band VBW capability to support IBW up to 200MHz.**

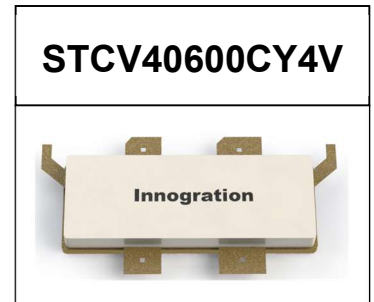
It can be configured as asymmetrical Doherty for 4G or 5G application, delivering 80W average power, according to normal 9dB back off.

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

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

$V_{DD} = 50 \text{ Vdc}$, $I_{DQA} = 280 \text{ mA}$, $V_{GSB} = -6.0 \text{ Vdc}$,

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



Freq (GHz)	Pulse CW Signal ⁽¹⁾			$P_{avg} = 49.0 \text{ dBm}$ WCDMA Signal ⁽²⁾		
	GainP1 (dB)	P3 (dBm)	P3 (W)	Gp (dB)	η_D (%)	ACPR _{5M} (dBc)
3.7	10.90	58.13	650	11.42	41.05	-29.84
3.8	11.95	58.00	630	11.94	44.86	-32.27
3.9	11.78	57.83	606	11.39	43.42	-34.54
4.0	10.83	57.85	609	11.20	41.89	-35.00

Driver option SMAV3640-100 (2 stage Integrated Doherty MCM)

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
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

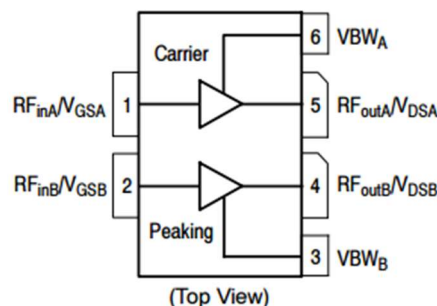




Table 1. Maximum Ratings

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	I_{gs}	85	mA
Storage Temperature Range	T_{stg}	-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 $T_c=85^\circ\text{C}$, $P_{out}=80\text{W}$, 3.8GHz Doherty application board	$R_{\theta JC}$	0.8	°C /W

Table 3. Electrical Characteristics (TA = 25°C unless otherwise noted)

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

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS}=-8\text{V}$; $I_{DS}=34\text{mA}$	V_{DSS}		200		V
Gate Threshold Voltage	$V_{DS}=10\text{V}$, $I_D=34\text{mA}$	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	$V_{DS}=50\text{V}$, $I_{DS}=280\text{mA}$, Measured in Functional Test	$V_{GS(Q)}$		-3.2		V

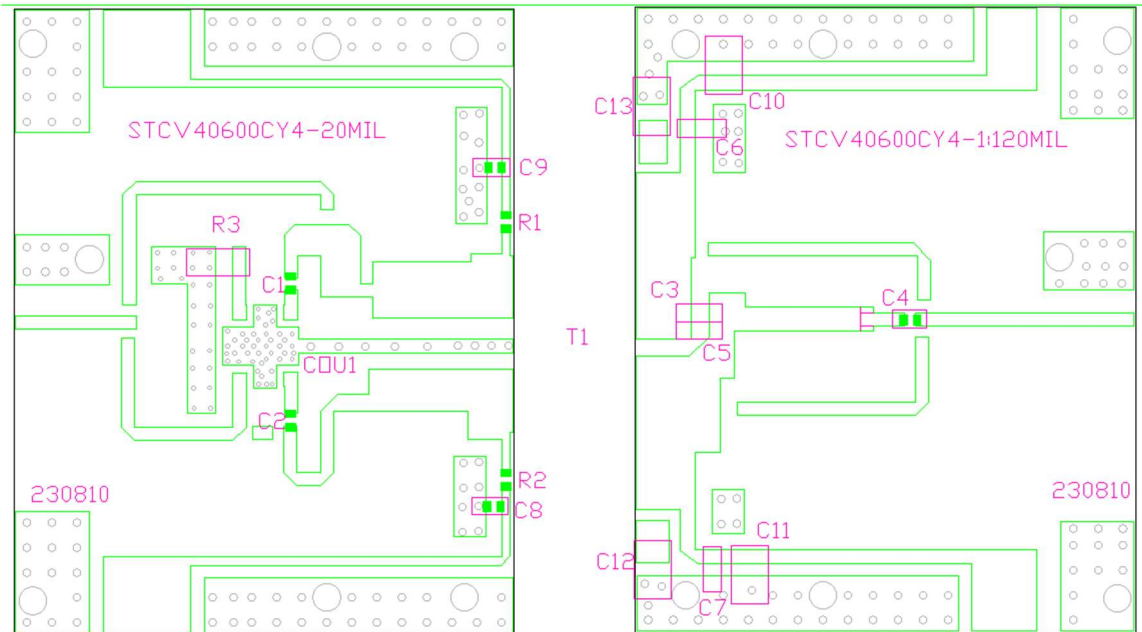
DC Characteristics (peak path, measured on wafer prior to packaging)

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS}=-8\text{V}$; $I_{DS}=51\text{mA}$	V_{DSS}		200		V
Gate Threshold Voltage	$V_{DS}=10\text{V}$, $I_D=51\text{mA}$	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	$V_{DS}=50\text{V}$, $I_{DS}=420\text{mA}$, Measured in Functional Test	$V_{GS(Q)}$		-3.2		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	3.8GHz, $P_{out}=80\text{W}$ WCDMA 1 Carrier in Doherty circuit All phase, No device damages	VSWR		10:1		

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	8.2pF High Q Capacitor	251SHS8R2BSE	TEMEX
C3,C5	2	1.1pF High Q Capacitor	ATC600S1R1	ATC
C10,C11,C12,C13	4	10uF MLCC	RS80R2A106M	MARUWA
R1,R2	2	5.1 Ω Power Resistor	ESR03EZPF5R10	ROHM
R3	1	51 Ω Power Resistor	RFR50-20CT0421B	YT
COU1	1	3 dB Bridge	XC3500P-03S	ANAREN
T1	1	600W GaN Dual Transistor	STCV404600CY4V	Innogrations



Figure 4: Efficiency and power gain as function of Pout

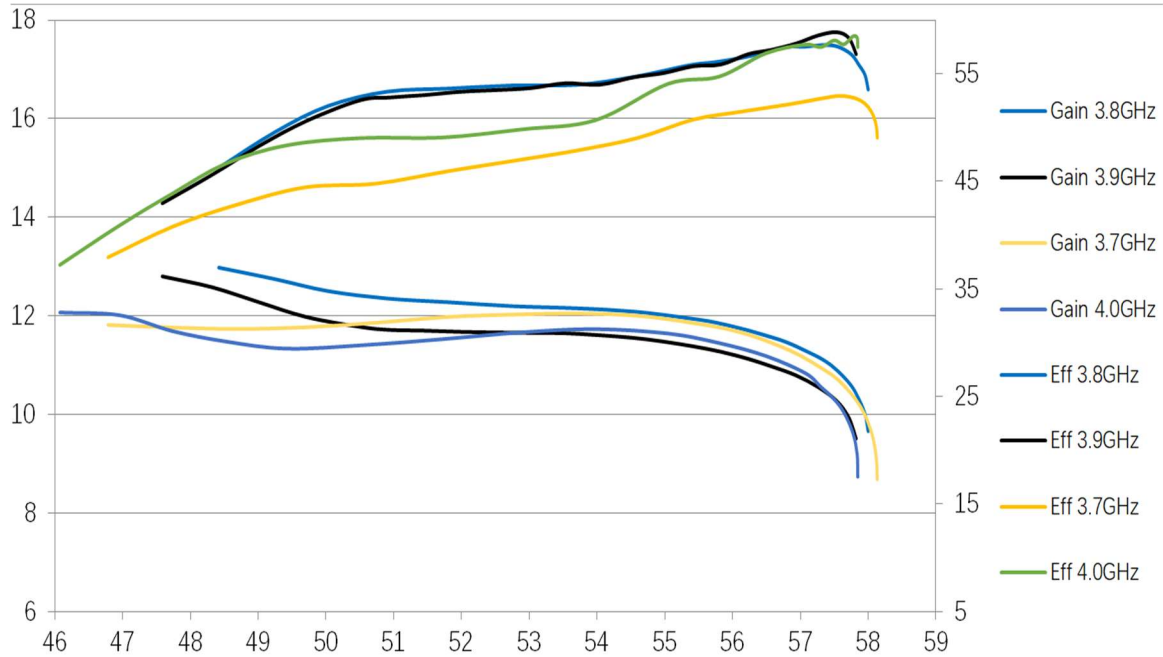
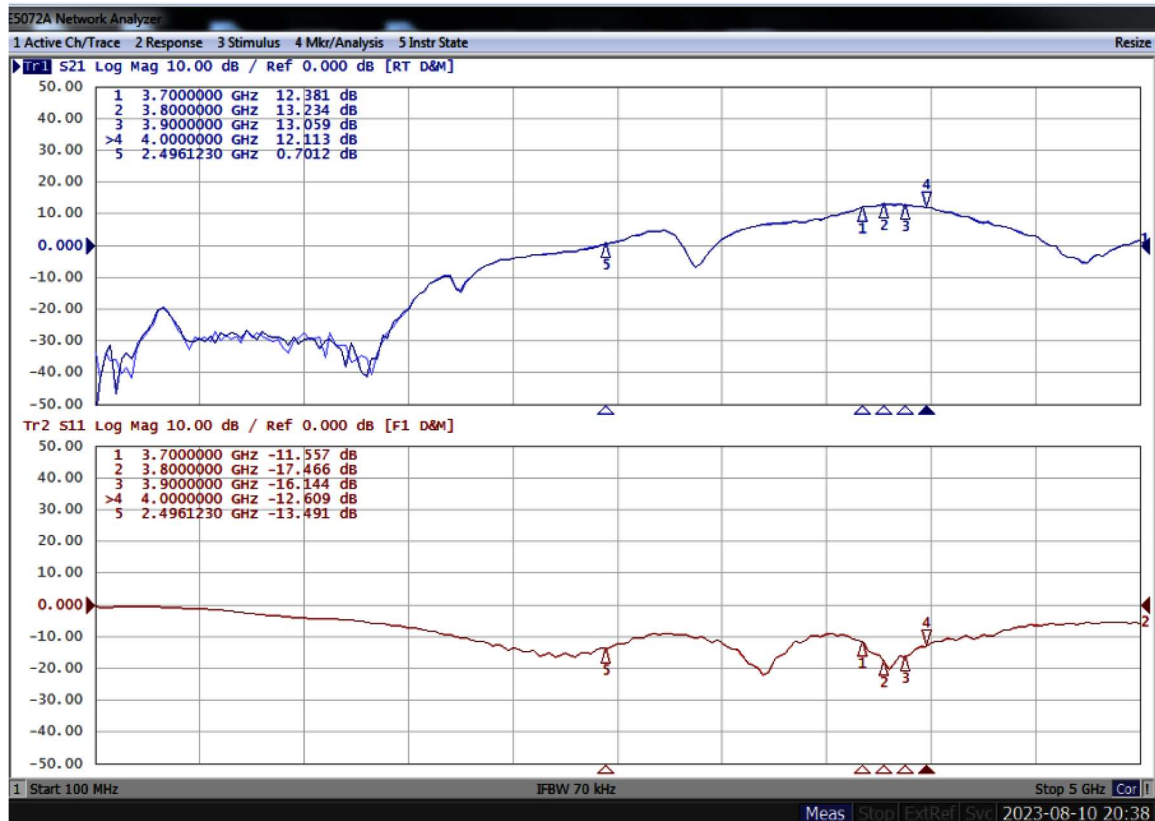
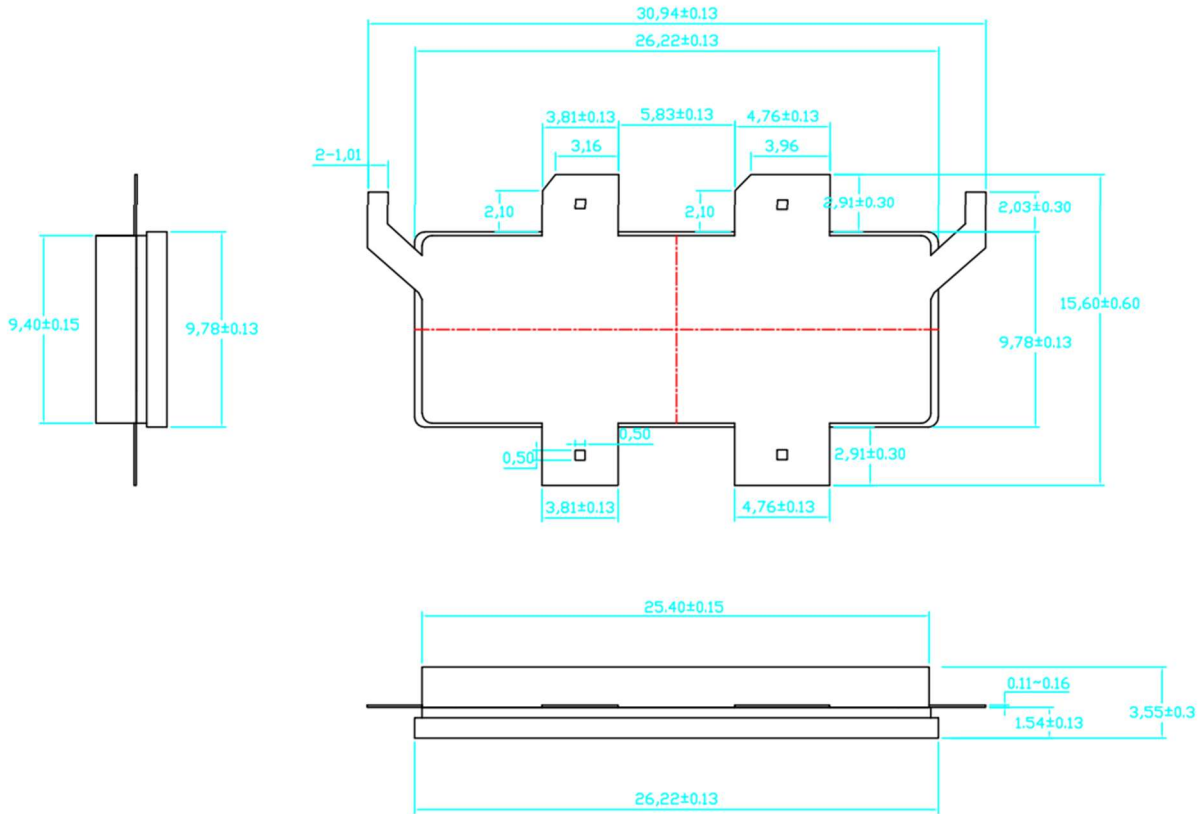


Figure 5: Network analyzer output, S11 and S21





Earless Flanged Ceramic Package; 6 leads- CY4V



Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2023/8/11	V1.0	Preliminary Datasheet Creation

Application data based on LWH-23-18

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