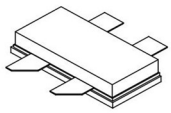
GaN HEMT 50V, 280W,2.3-2.7GHz RF Power Transistor

STBV27280BY4



Description

The STBV27280BY4 is a dual path 280watt, Input matched GaN HEMT, ideal for applications from 2.3 to 2.7GHz especially for LTE/5G

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

- Typical WCDMA 1 carrier performance on 2.5-2.7GHz asymmetrical Doherty with device soldered

VDS= 48V, IDQ=120mA(Vgm=-3.02V，Vgp=-5.7V)

Freq (GHz)	Pulse CW Signal(1)			P_{avg}=46.5dBm WCDMA Signal(2)		
	P1-Gain (dB)	P3 (dBm)	P3 (W)	Gp (dB)	η_D (%)	$ACPR_{5M}$ (dBc)
2.5	14.58	54.55	286	14.6	55.0	-28.16
2.6	14.68	54.78	301	14.3	56.1	-31.23
2.7	14.16	54.56	286	14.0	55.0	-31.79

- Typical WCDMA 1 carrier performance on 2.3-2.4GHz asymmetrical Doherty with device soldered

VDS= 48V, IDQ=180mA(Vgm=-3.02V，Vgp=-5.3V)

Freq (GHz)	Pulse CW Signal(1)			P_{avg}=46dBm WCDMA Signal(2)		
	P1-Gain (dB)	P3 (dBm)	P3 (W)	Gp (dB)	η_D (%)	$ACPR_{5M}$ (dBc)
2.3	14.61	55.34	342	14.81	55.60	-29.55
2.35	14.98	55.06	319	14.98	57.84	-31.80
2.4	14.48	54.47	280	14.91	55.50	-33.01

Applications

- Asymmetrical Doherty amplifier within 2.5-2.7GHz,2.3-2.4GHz
- Sub-3GHz S bandpower 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)

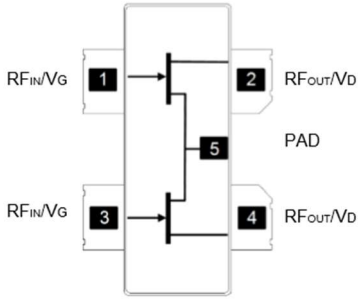


Table 1. Maximum Ratings

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	37	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=40W, on Doherty application board	$R_{\theta JC}$	2.2	°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=12mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 12mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=120mA, Measured in Functional Test	$V_{GS(Q)}$		-3.0		V

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

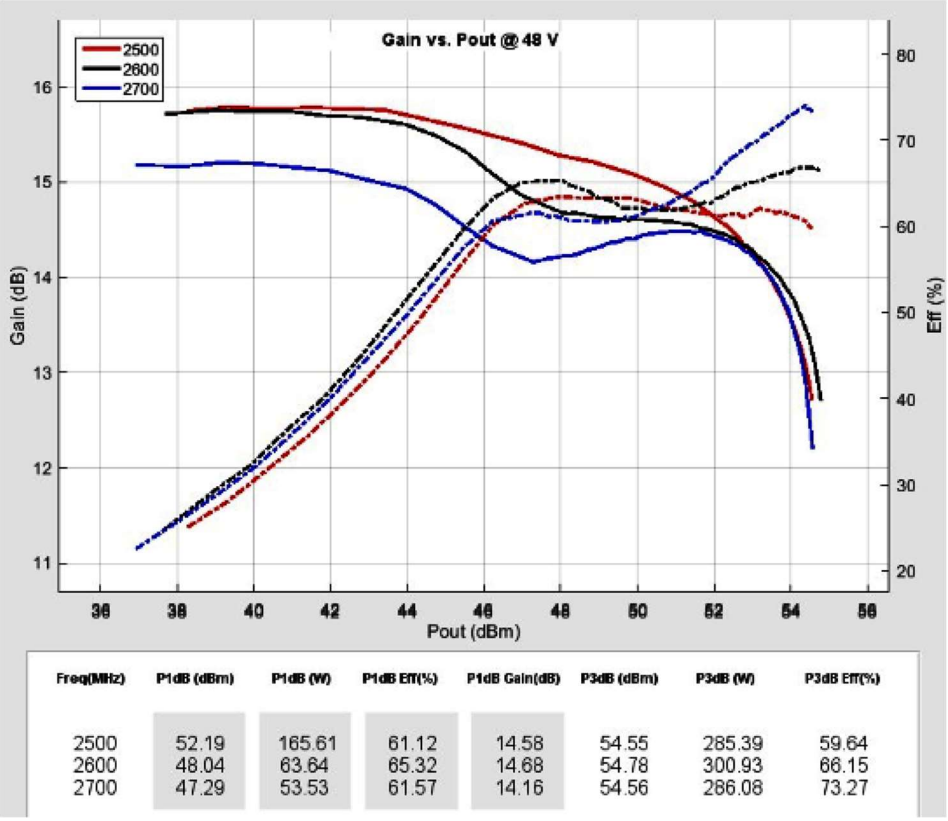
Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	VGS=-8V; IDS=25mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 25mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=240mA, Measured in Functional Test	$V_{GS(Q)}$		-3.0		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	2.6GHz, Pout=45W WCDMA 1 Carrier in Doherty circuit All phase, No device damages	VSWR		10:1		

Typical Performance
2.5-2.7GHz

Figure 3: Efficiency and power gain as function of Pout (2.5-2.7GHz Doherty)



Freq(MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
2500	52.19	165.61	61.12	14.58	54.55	285.39	59.64
2600	48.04	63.64	65.32	14.68	54.78	300.93	66.15
2700	47.29	53.53	61.57	14.16	54.56	286.08	73.27

Figure 4: Network analyzer output, S11 and S21 (2.5-2.7GHz Doherty)

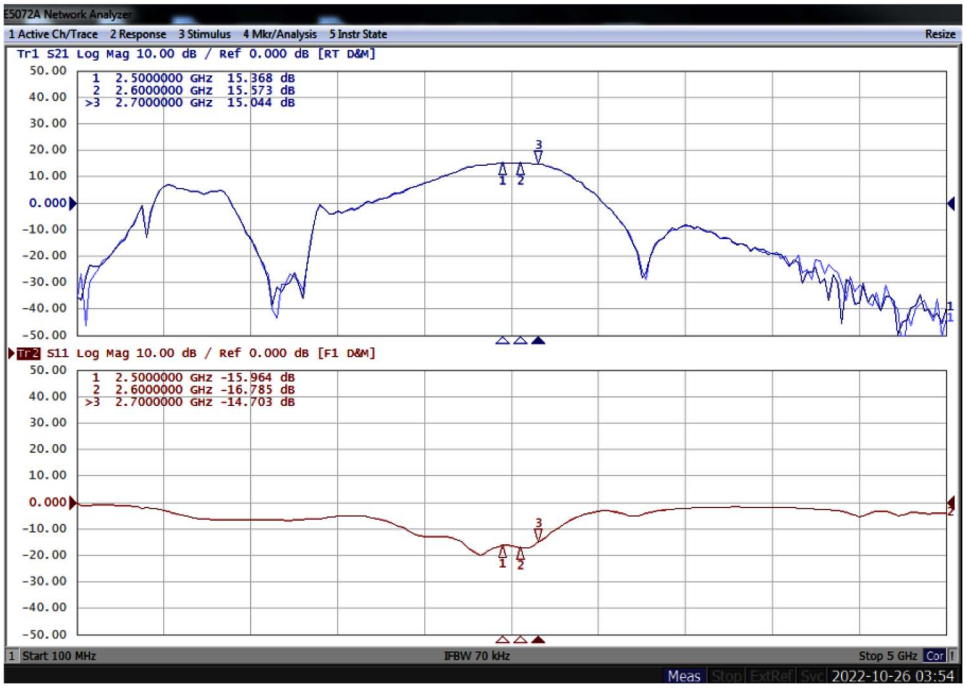


Figure 5: Picture of application board Doherty circuit for 2.5-2.7GHz

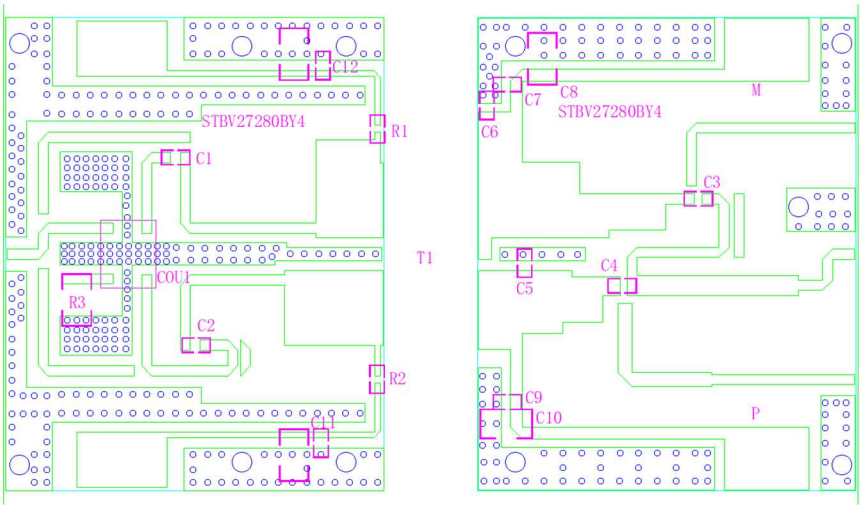


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C4 C3,C9,C7,C12,C11	8	10pFHigh Q Capacitor	251SHS100BSE	TEMEX
C6	1	0.5pFHigh Q Capacitor	251SHS0R5BSE	TEMEX
C5	1	0.2pFHigh Q Capacitor	251SHS0R2BSE	TEMEX
C8,C10	2	10uF MLCC	GRM32EC72A10	Murata
R1,R2	2	10Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	50Ω Power Resistor	S1206N	RN2
COU1	1	3 dB Bridge	X3C26P1-03S	Anaren
T1	1	280W GaN Dual Transistor	STBV27280BY4	Innogration

Typical Performance
2.3-2.4GHz

Figure 6: Efficiency and power gain as function of Pout (2.3-2.4GHz Doherty)

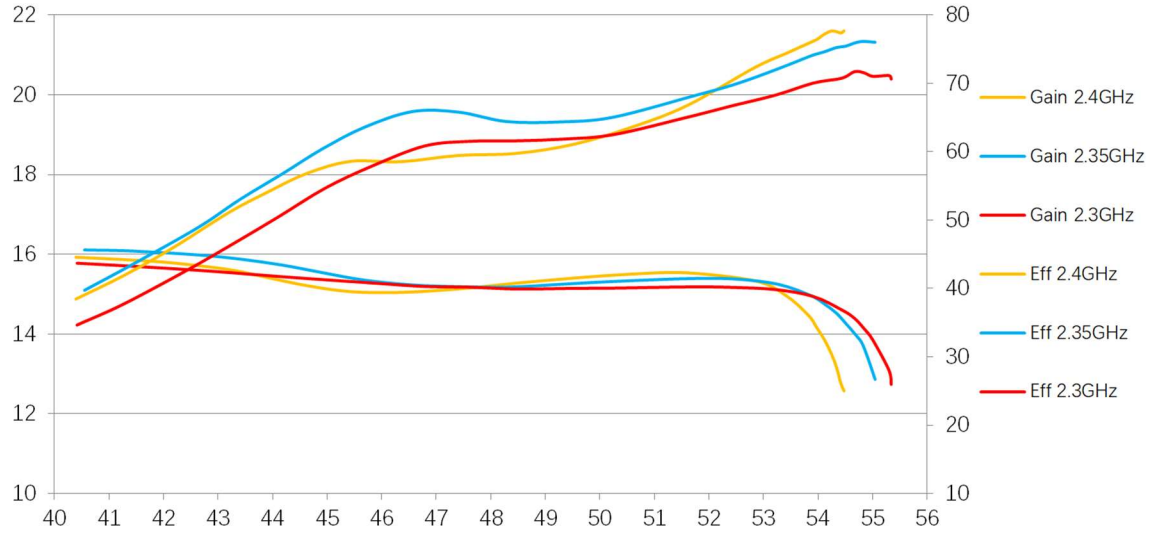


Figure 7: Network analyzer output, S11 and S21 (2.3-2.4GHz Doherty)

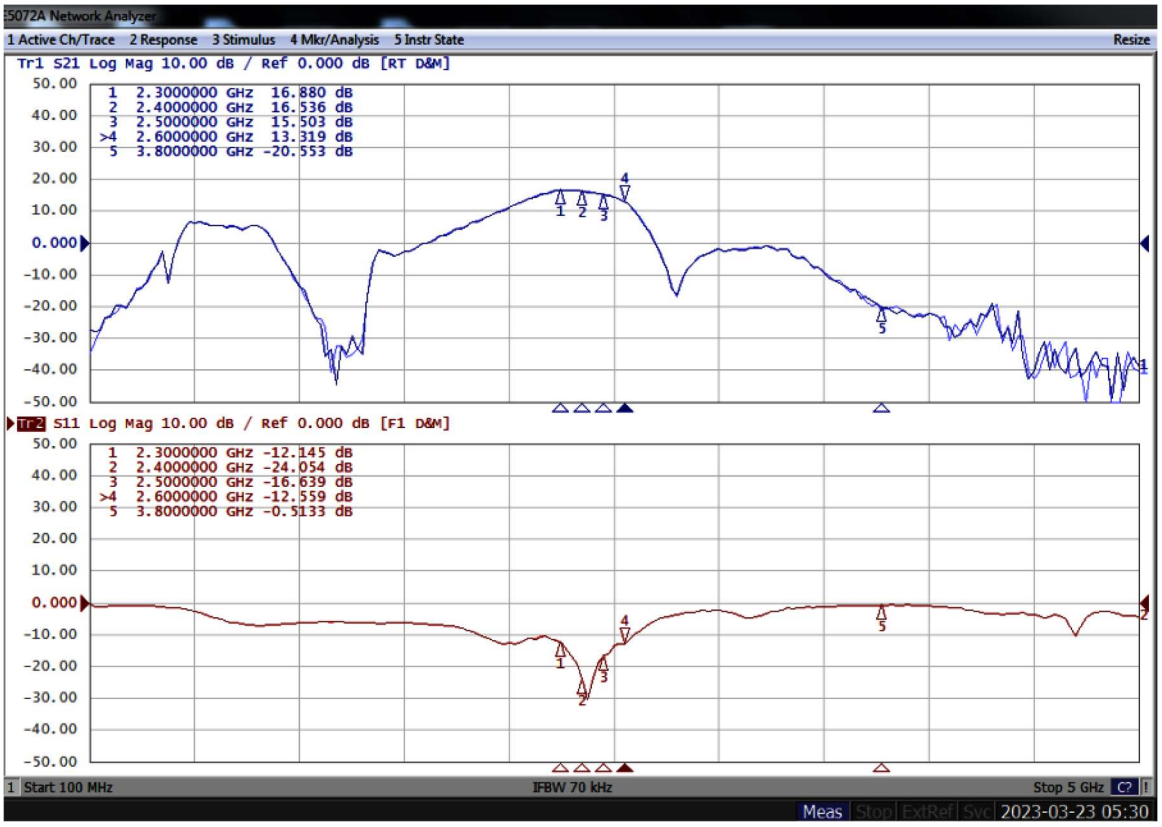


Figure 8: Picture of application board Doherty circuit for 2.3-2.4GHz

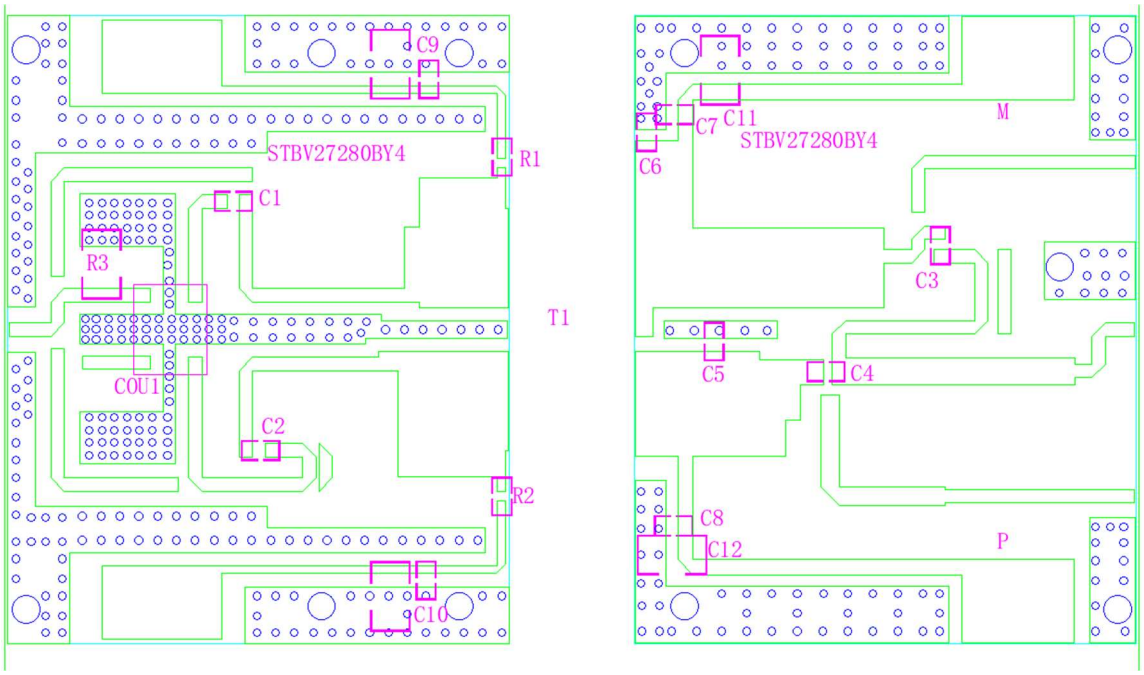
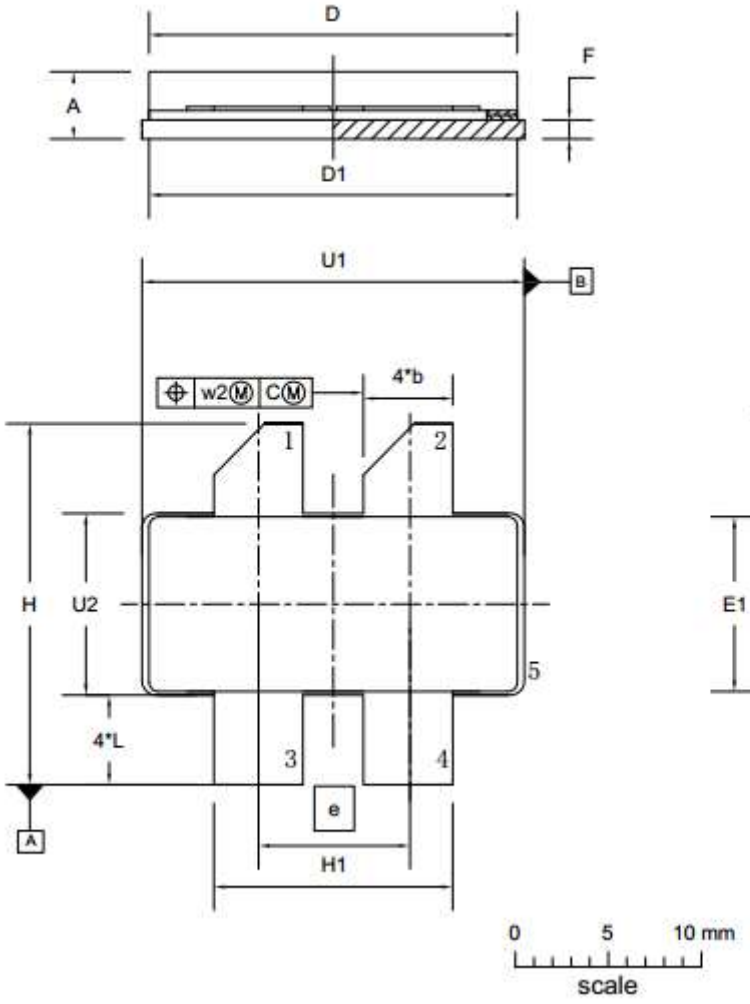


Table 5. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C3 C4,C7,C8,C9,C10	8	10pFHigh Q Capacitor	251SHS100BSE	TEMEX
C6	1	0.3pFHigh Q Capacitor	251SHS0R3BSE	TEMEX
C5	1	1.5pFHigh Q Capacitor	251SHS1R5BSE	TEMEX
C11,C12	2	10uF MLCC	GRM32EC72A10	Murata
R1,R2	2	10Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	50Ω Power Resistor	S1206N	RN2
COU1	1	3 dB Bridge	X3C26P1-03S	Anaren
T1	1	280W GaN Dual Transistor	STCV27280BY4	Innogration

Earless Flanged Ceramic Package; 4 leads



Drain		Gate		Source
1	2	3	4	5

UNIT	A	b	c	D	D_1	e	E	E_1	F	H	H1	L	Q	U_1	U_2	W_1	W_2
mm	4.72 3.43	4.67 4.93	0.15 0.08	20.02 19.61	19.96 19.66	7.90	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	12.98 12.73	5.33 4.32	1.70 1.45	20.70 20.45	9.91 9.65	0.25	0.51
inches	0.186 0.135	0.194 0.184	0.006 0.003	0.788 0.772	0.786 0.774	0.311	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.511 0.501	0.210 0.170	0.067 0.057	0.815 0.805	0.390 0.380	0.01	0.02

OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-B4					03/12/2013

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2022/10/26	V1.0	Preliminary Datasheet Creation
2023/3/24	V1.1	Add 2.3-2.4GHz application data
2023/1/24	V1.2	Modify 2.3-2.4GHz application data to improve the linearity at 2.3GHz

Application data based on: LWH-22-11/23-05/24-06

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