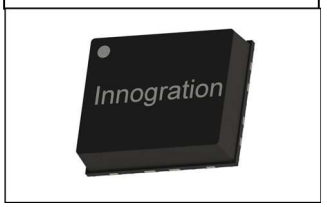
GaN HEMT 50V, 200W,2.3-2.7GHz Full band RF Power Transistor

STBV27W200C9



Description

The STBV27W200C9 is a dual path 200watt, Internally matched GaN HEMT, ideal for applications from 2.3 to 2.7GHz full band operation especially for LTE/5G

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

- Typical RF performance on **2.3-2.62GHz** full band asymmetrical Doherty with device soldered

VDS= 50V, IDQ=100mA(Vgm=-3.22V，Vgp=-5.3V)

ACPR @45dBm_1C-WCDMA			
Freq (MHz)	ACPR (dBc)	Gain (dB)	Efficiency (%)
2300	-31.35	14.97	56.78
2460	-33.23	14.77	56.06
2620	-29.47	14.08	56.36

- Typical RF performance on **2.3-2.4GHz** full band asymmetrical Doherty with device soldered

VDS= 50V, IDQ=100mA(Vgm=-3.22V，Vgp=-5.3V)

ACPR @45dBm_1C-WCDMA			
Freq (MHz)	ACPR (dBc)	Gain (dB)	Efficiency (%)
2300	-30.04	14.37	58.14
2350	-30.78	14.32	57.44
2400	-30.26	14.47	57.67

- Typical RF performance on **2.5-2.7GHz** full band asymmetrical Doherty with device soldered

VDS= 50V, IDQ=120mA(Vgm=-3.1V，Vgp=-5.1V)

ACPR @45dBm_1C-WCDMA			
Freq (MHz)	ACPR (dBc)	Gain (dB)	Efficiency (%)
2500	-31.02	14.17	57.18
2600	-35.16	14.00	56.00
2700	-34.97	14.06	56.25

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

Applications

- Asymmetrical Doherty amplifier within 2.3-2.4,2.5-2.7GHz full band
- Sub-3GHz S band power amplifier
- CW or pulsed Amplifier

Important Note: Proper Biasing Sequence for GaN HEMT Transistors

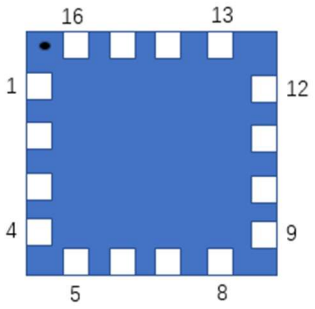
Turning the device ON

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

Pin Configuration and Description （Top view）



Pin No.	Symbol	Description
1,2	RF IN/Vgs of Main	RF Input/Gate bias of main path
3,4	RF IN/Vgs of Peak	RF Input/Gate bias of peak path
9,10	RF OUT/Vds of Peak	RF Output/Drain bias of peak path
11,12	RF OUT/Vds of Main	RF Output/Drain bias of main path
Other Pins	GND	Grounding
Package Base	GND	DC/RF Ground. Proposed to be soldered to heatsink plane directly for the best CW thermal and RF performance. Soldered through vias or copper coin allowed for pulsed CW and back off applications, but will result in higher junction temperatures

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 Pd=25W, on Doherty application board	$R_{\theta JC}$	2.7	°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=100mA, Measured in Functional Test	$V_{GS(Q)}$		-3		V

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

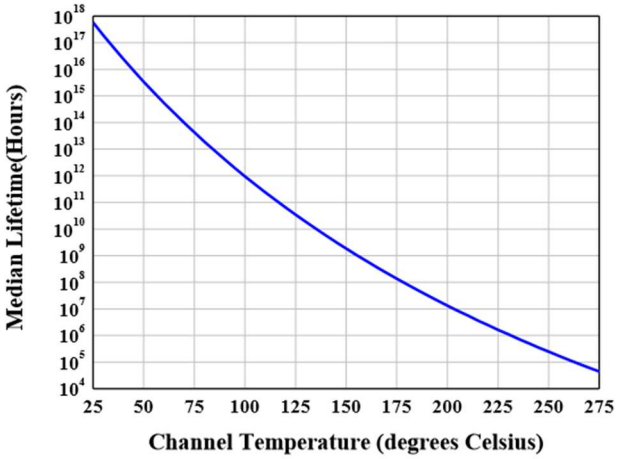
Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	VGS=-8V; IDS=17mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 17mA	$V_{GS(th)}$	-4		-2	V

Gate Quiescent Voltage	VDS =50V, IDS=150mA, Measured in Functional Test	$V_{GS(Q)}$		-3		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	2.6GHz, Pout=30W WCDMA 1 Carrier in Doherty circuit All phase, No device damages	VSWR		10:1		

Figure 2: Median Lifetime vs. Channel Temperature



2.3-2.7GHz Full Band

Figure 3: Efficiency and power gain as function of Pout (2.3-2.62GHz Doherty)

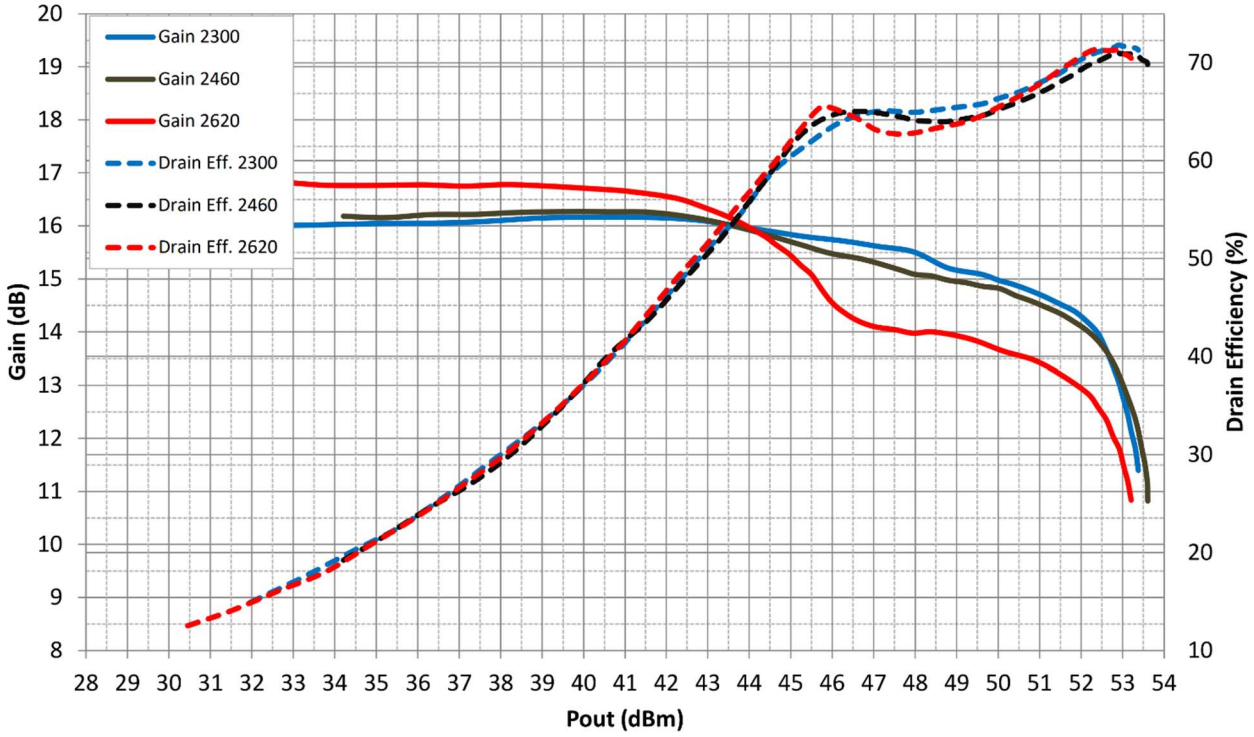


Figure 4: Network analyzer output, S11 and S21 (2.3-2.62GHz Doherty)

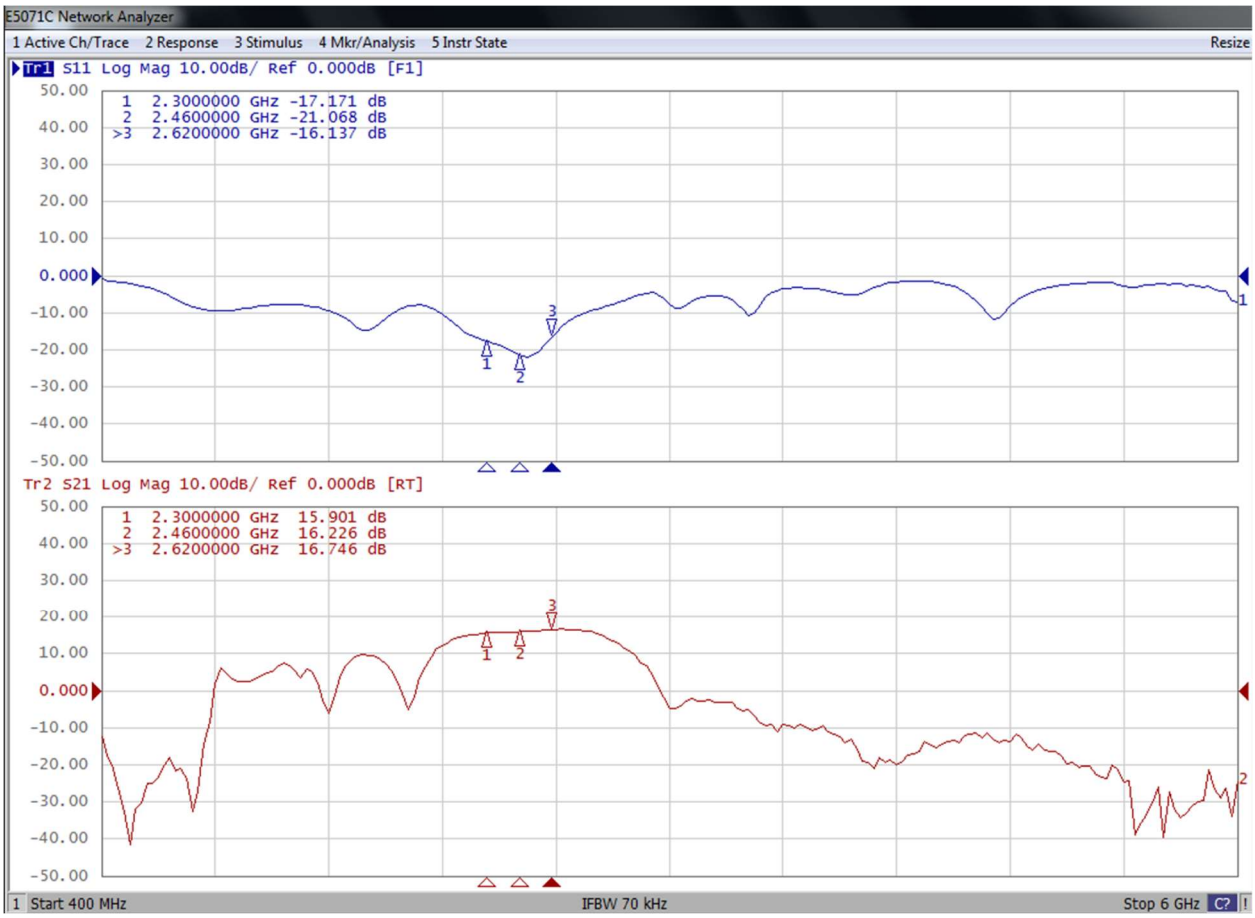


Figure 5: Picture of application board Doherty circuit for 2.3-2.62GHz

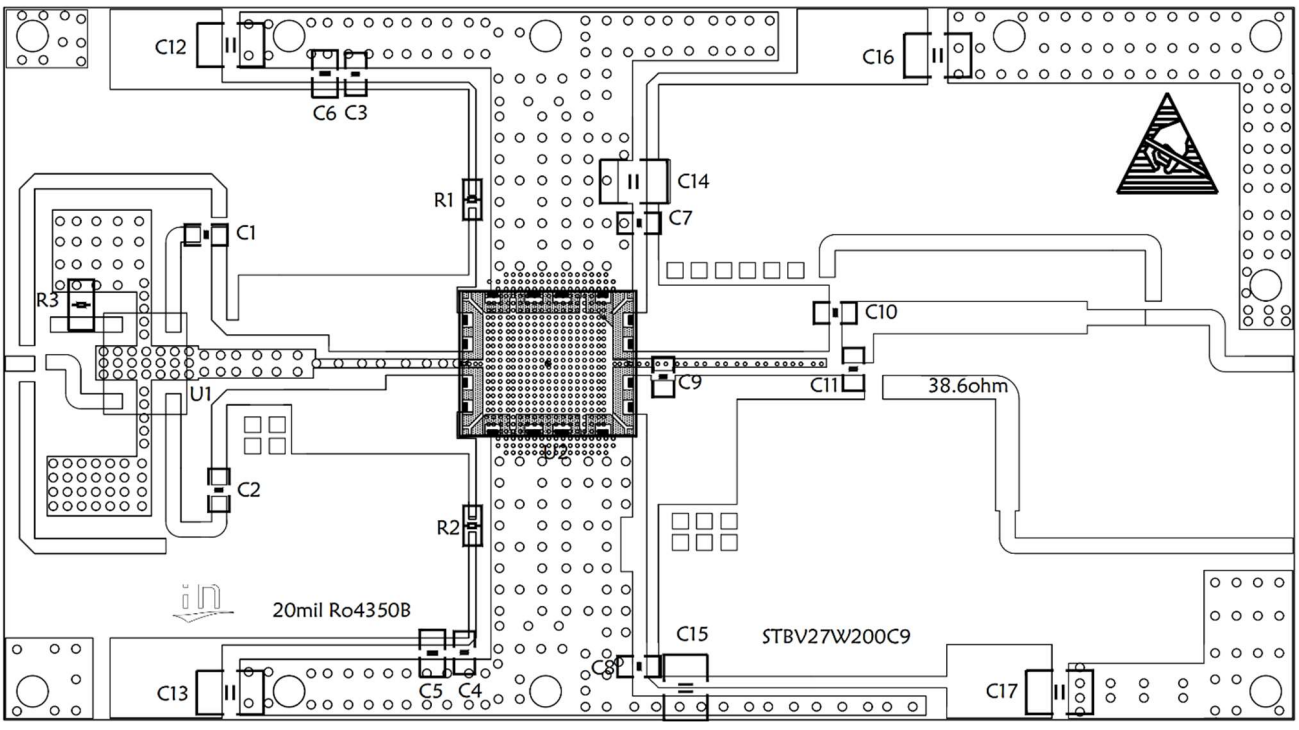


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Reference	Footprint	Value	Quantity
C1, C2, C3, C4, C7, C8, C10	0603	10pF/250V	7
C9	0603	1.2pF/250V	1
C10	0603	4.7pF/250V	1
C5, C6	0805	10uF/16V	2
C12, C13, C14, C15, C16, C17	1210	10uF/100V	6
R1, R2	0603	10R	2
R3	0805	50R	1
U1	6.35*5.08	HC2500P03	1
U2	C9	STBV27W200C9^{V0}	1

2.3-2.4GHz Narrow Band

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

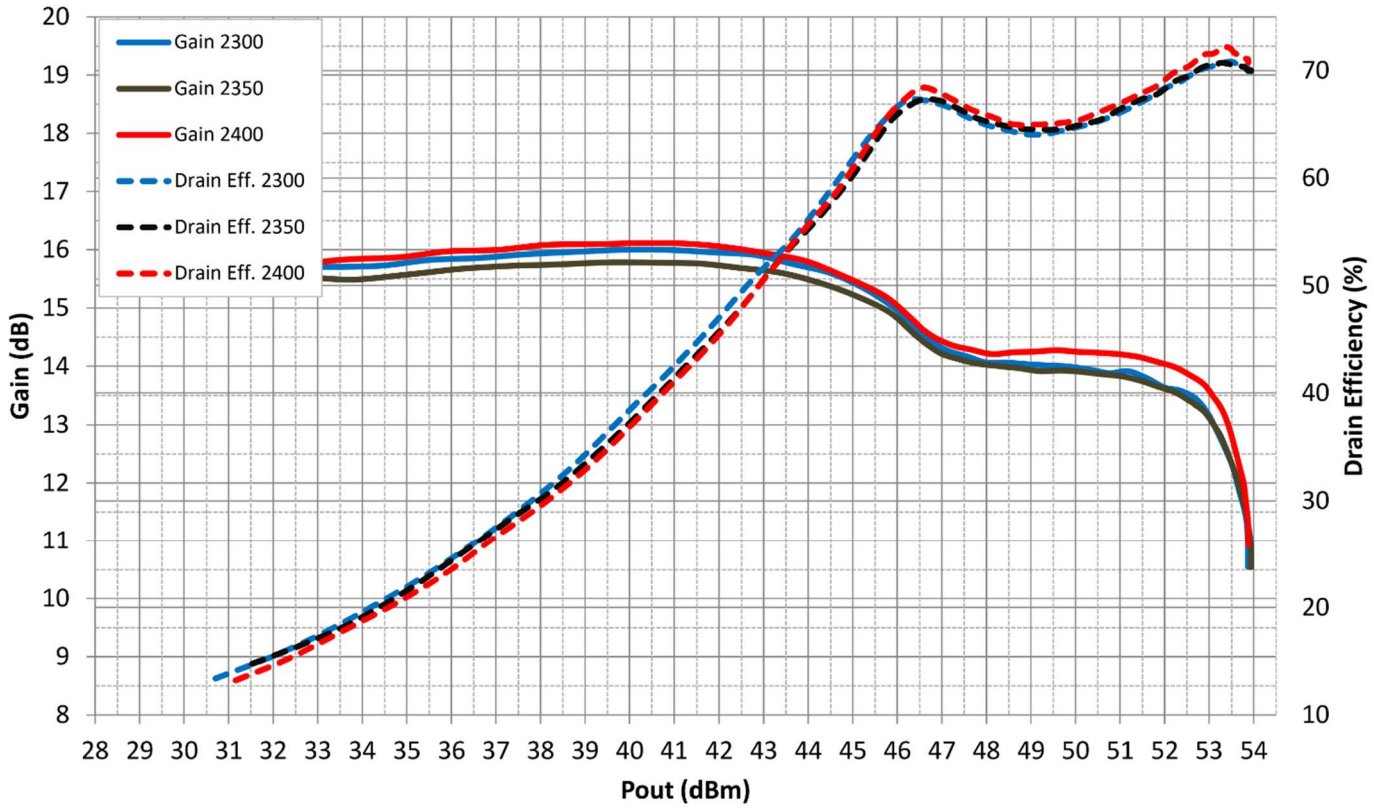


Figure 7: Network analyzer output, S11 and S21 (2.3-2.4GHz Doherty)

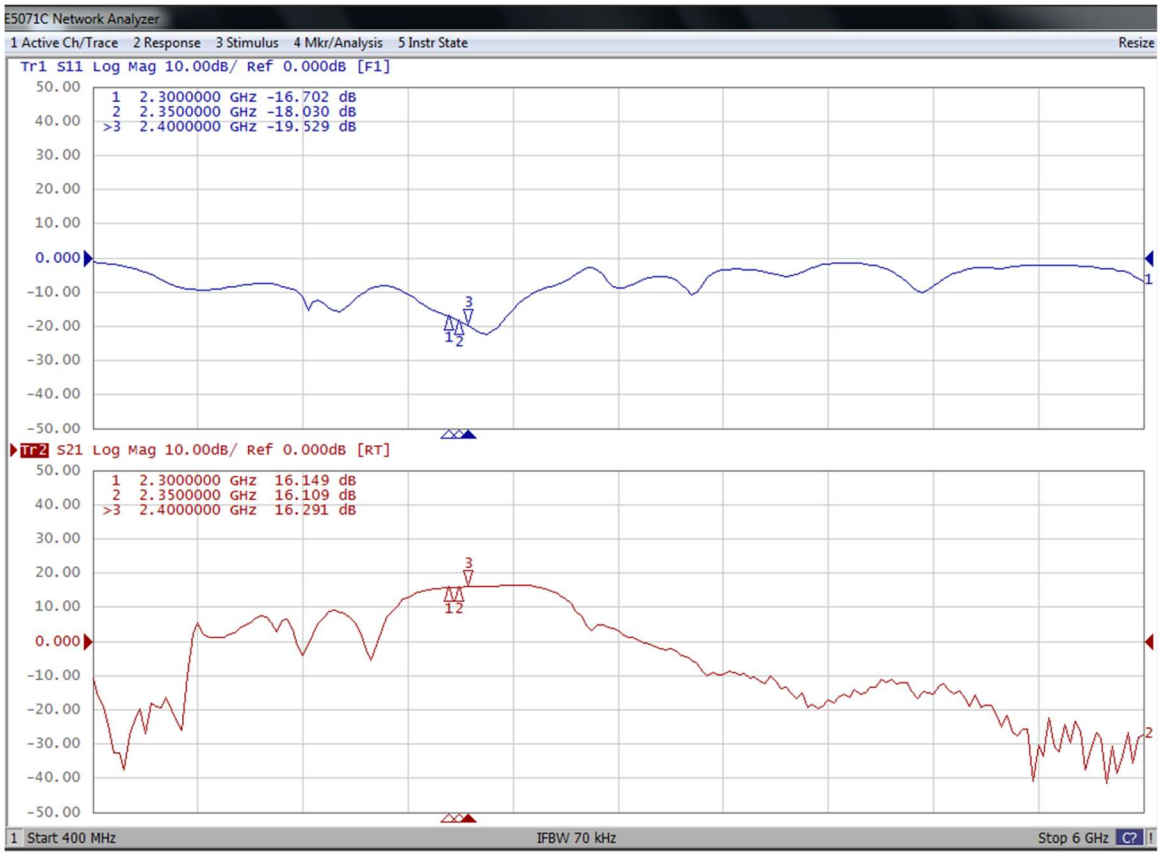


Figure 8: Picture of application board Doherty circuit for 2.3-2.4GHz

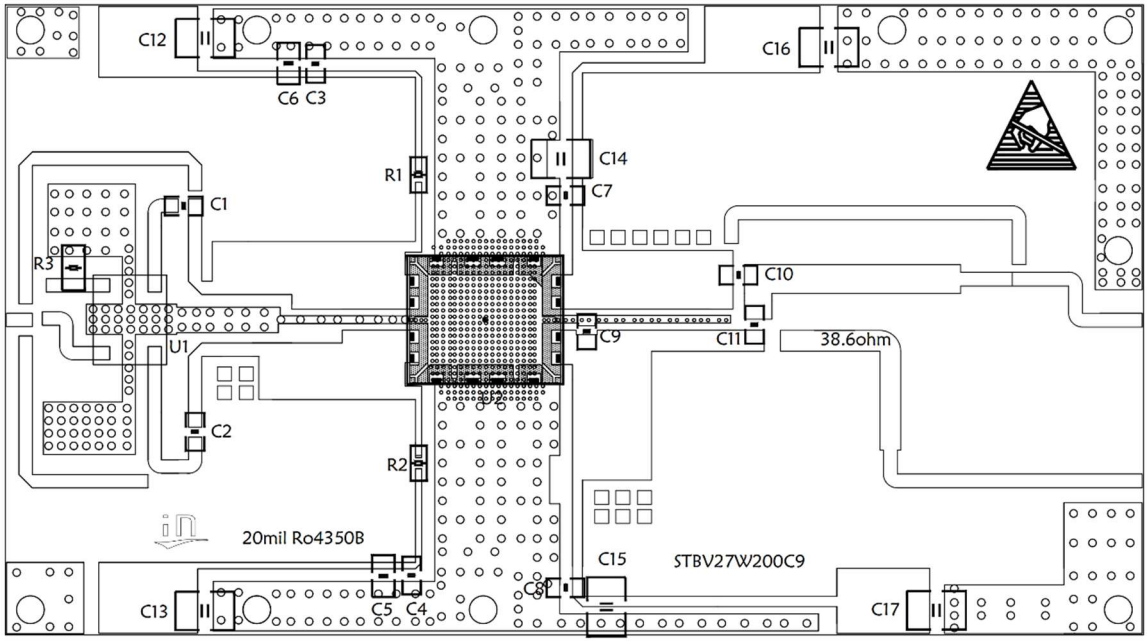


Table 5. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Reference	Footprint	Value	Quantity
C1, C2, C3, C4, C7, C8, C10	0603	10pF/250V	7
C9	0603	1.2pF/250V	1
C10	0603	5.6pF/250V	1
C5, C6	0805	10uF/16V	2
C12, C13, C14, C15, C16, C17	1210	10uF/100V	6
R1, R2	0603	10R	2
R3	0805	50R	1
U1	6.35*5.08	HC2500P03	1
U2	C9	STBV27W200C9^{V0}	1

2.5-2.7GHz Narrow Band

Figure 9: Efficiency and power gain as function of Pout (2.5-2.7GHz Doherty)

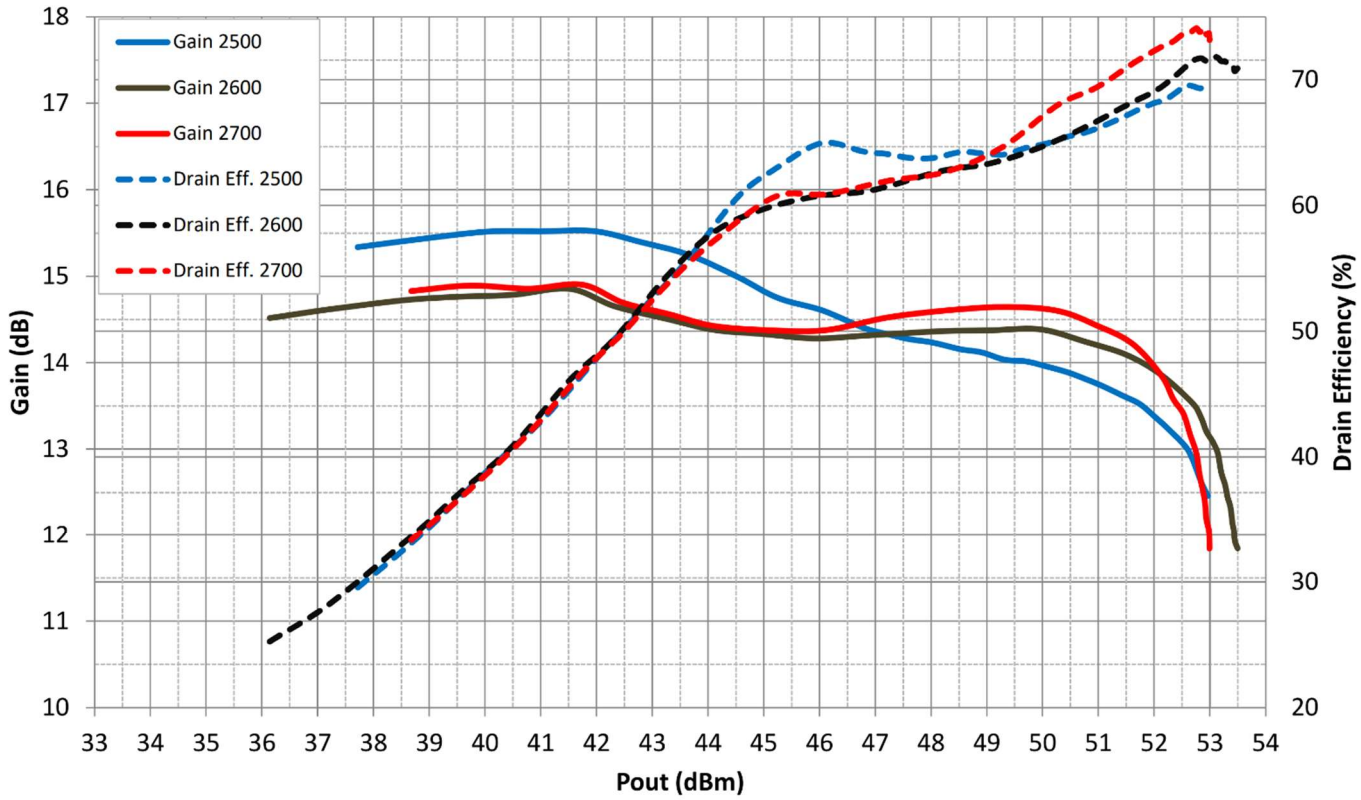


Figure 10: Network analyzer output, S11 and S21 (2.5-2.7GHz Doherty)

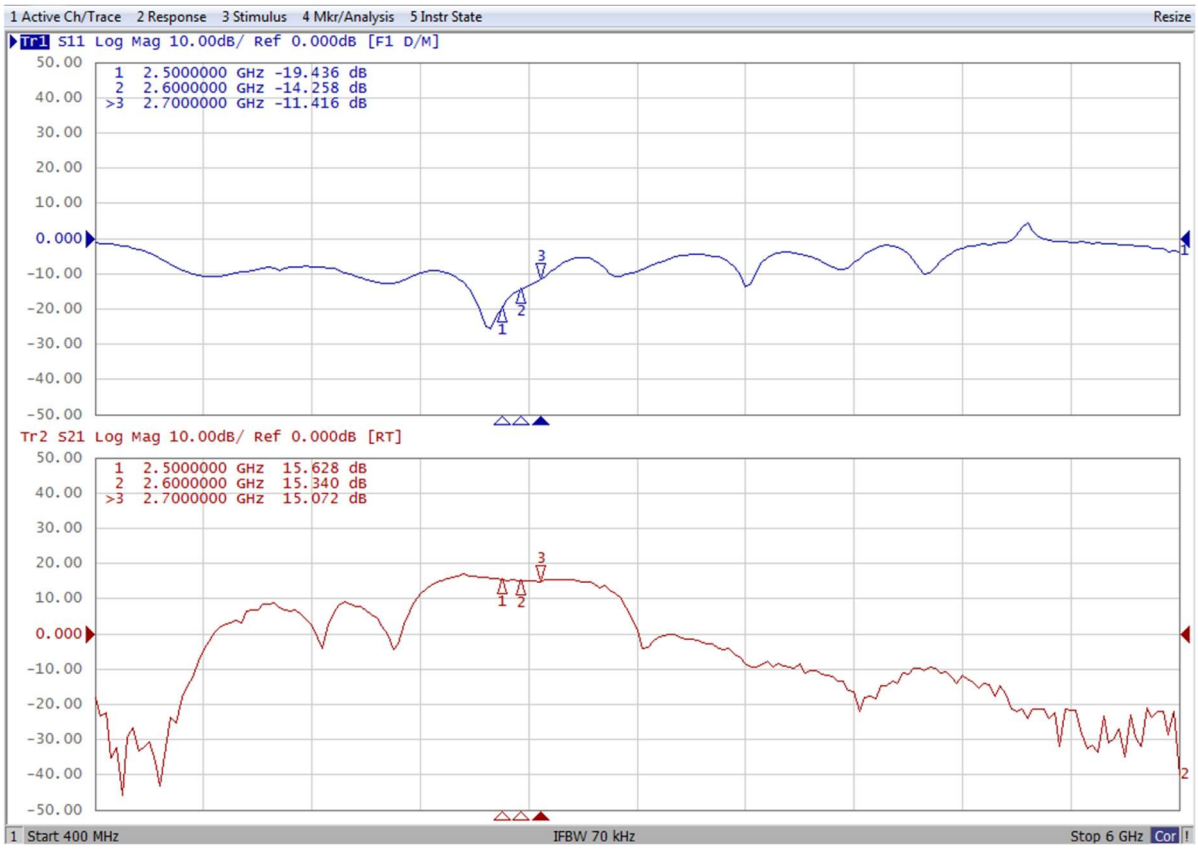


Figure 11: Picture of application board Doherty circuit for 2.5-2.7GHz

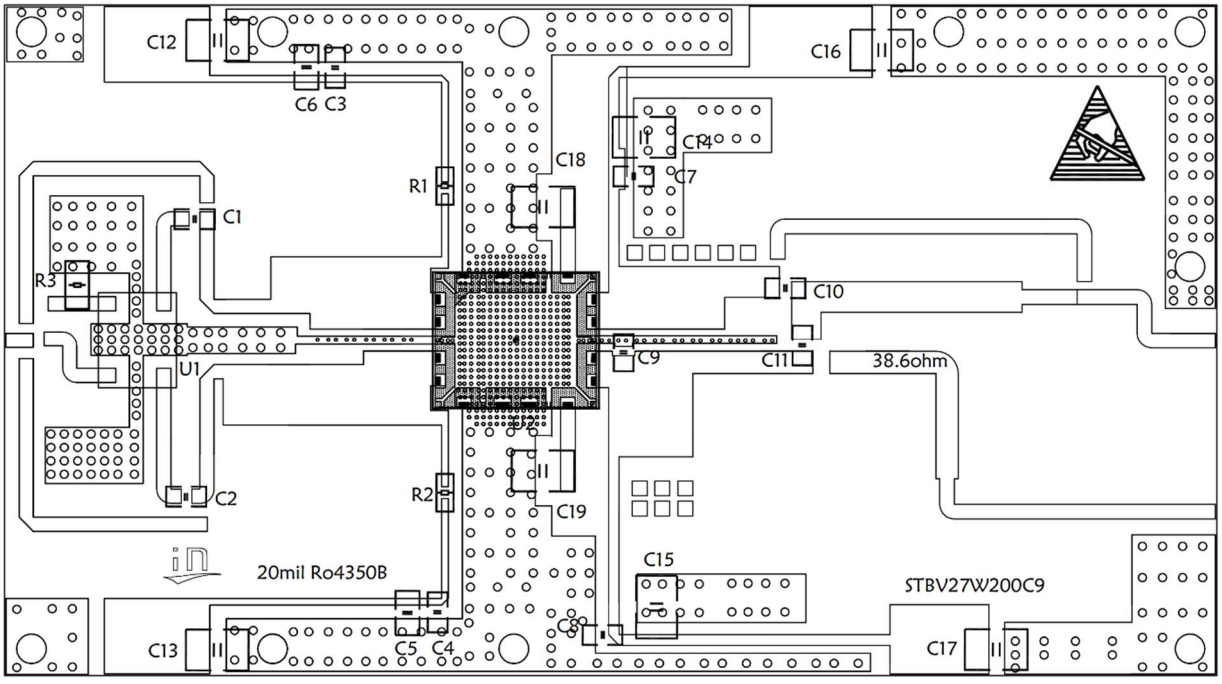
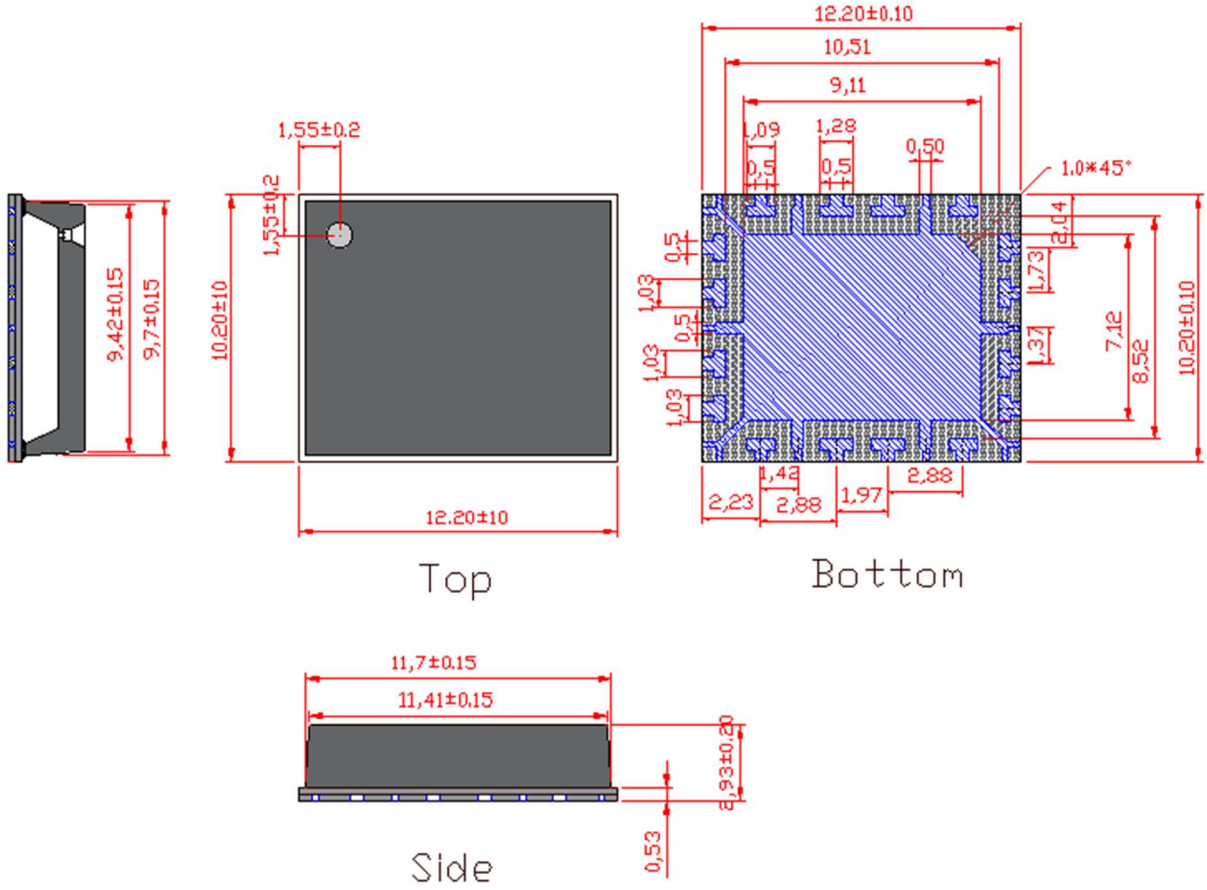


Table 6. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Reference	Footprint	Value	Quantity
C1, C2, C3, C4, C7, C8, C11	0603	10pF/250V	7
C9	0603	0.6pF/250V	1
C10	0603	2.7pF/250V	1
C5, C6	0805	10uF/16V	2
C12, C13, C14, C15, C16, C17, C18, C19	1210	10uF/100V	8
R1, R2	0603	10R	2
R3	0805	50R	1
U1	6.35*5.08	HC2500P03	1
U2	C9	STBV27W200C9^{V0}	1

Package Dimensions （Unit:mm）



Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2023/12/13	**V1.0**	**Preliminary Datasheet Creation**
2024/2/6	**V1.1**	**Add 2.5-2.7G application data**

Application data based on: ZBB-23-38/24-06

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