

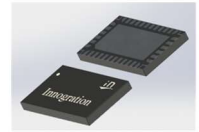


GaN HEMT 50V, 70W, 1.8-2.7GHz Power Transistor

STAV27070C6

Description

The STAV27070C6 is a dual path 70W, internal matched GaN HEMT, operated from 1.8-2.7GHz. It features high gain, high efficiency, wide band and low cost, in 10*6mm open cavity plastic package. It can be configured as a single stage Doherty capable of delivering Pavg of 10W.



➤ Typical Doherty Single--Carrier--CDMA Characterization Performance at 2.6/2.3/2.1/1.8GHz:
Input Signal :WCDMA 1 Carrier with PAR = 10 dB @ 0.01% Probability on CCDF , Pulsed CW: 20us, 10%

- VDD = 50 Vdc, IDQA = 45 mA, VGSB = -5.1Vdc,

Freq (GHz)	Pulse CW Signal			Pavg=40.5dBm WCDMA Signal		
	P1-Gain (dB)	Psat (dBm)	Psat (W)	Gp (dB)	Eff (%)	ACPR5M (dBc)
2.5	15.46	48.52	71.1	15.28	55.85	-29.42
2.6	15.70	48.52	71.1	15.48	56.16	-31.13
2.7	15.42	48.43	69.6	15.19	55.56	-32.66

- VDD = 50 Vdc, IDQA = 50mA, VGSB = -5.3Vdc,

Freq (GHz)	Pulse CW Signal			Pavg=40.5dBm WCDMA Signal		
	P1-Gain (dB)	Psat (dBm)	Psat (W)	Gp (dB)	Eff (%)	ACPR5M (dBc)
2.3	15.33	48.95	78.48	15.76	59.18	-30.61
2.35	15.77	48.88	77.23	15.87	59.76	-31.31
2.4	16.03	48.77	75.27	15.85	58.10	-31.01

- VDD = 50 Vdc, IDQA = 50mA, VGSB = -5.33Vdc

Freq (MHz)	Pulse CW Signal			Pavg=40.5dBm WCDMA Signal		
	P1-Gain (dB)	Psat (dBm)	Psat (W)	Gp (dB)	Eff (%)	ACPR5M (dBc)
2110	14.31	48.74	74.8	15.0	60.2	-32.6
2140	14.56	48.8	75.9	15.2	59.8	-33.8
2170	14.5	48.61	72.6	15.4	59.8	-34.2

- VDD = 50 Vdc, IDQA = 55 mA, VGSB = -6Vdc

Freq (MHz)	Pulse CW Signal			Pavg=40.5dBm WCDMA Signal		
	P1-Gain (dB)	Psat (dBm)	Psat (W)	Gp (dB)	Eff (%)	ACPR5M (dBc)
1805	15.31	48.66	73.5	15.6	55.4	-31.4
1842.5	15.15	48.61	72.6	15.4	55.1	-32.8
1880	14.98	48.67	73.6	15.2	55.4	-34.9

Applications

- 5G Doherty amplifier within 2.5-2.7, 2.3-2.4, 2.1-2.2, 1.8-1.9G either as driver or as final
- S band power amplifier
- L band power amplifier

Important Note: Proper Biasing Sequence for GaN HEMT Transistors

Turning the device ON

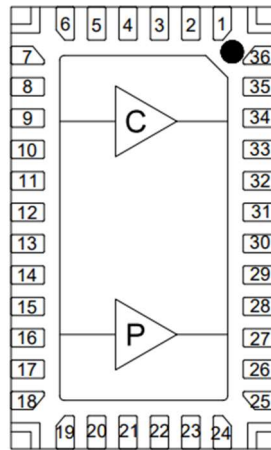
1. Set VGS to the pinch-off (VP) voltage, typically -5 V
2. Turn on VDS to nominal supply voltage
3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

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

Transparent top view (Backside grounding for source)



Pin No.	Symbol	Description
9,10	RF IN/Vgs1	RF Input, Vgs bias for main path
15,16	RF IN/Vgs2	RF Input, Vgs bias for peak path
33,34	RF OUT/VDD1	RF Output, VDD bias for Main path
27,28	RF OUT/VDD2	RF Output, VDD bias for Peak path
Rest pins	NC	No connection
2,5,7,12,13,18,20,23,25,30,31,36, Package Base	GND	DC/RF Ground. Must be soldered directly to heatsink or copper coin for CW application.

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain--Source Voltage	V_{DS}	+200	Vdc
Gate--Source Voltage	V_{GS}	-8 to +0.5	Vdc
Operating Voltage	V_{DD}	55	Vdc
Maximum gate current	I_{GS}	9	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°C, P _{diss} =9W at P _{avg} =40dBm WCDMA 1 carrier	R _{θJC}	5.5	°C /W

Notes: Based on expected carrier amplifier efficiency of Doherty, P_{avg} assumes 10% peaking amplifier contribution of total average Doherty rated power. Thermal resistance is measured to package backside

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} =-8V; I _{DS} =4mA	V _{DSS}		200		V
Gate Threshold Voltage	V _{DS} =10V, I _D = 4mA	V _{GS(th)}	-4		-2	V
Gate Quiescent Voltage	V _{DS} =50V, I _{DS} =45mA, Measured in Functional Test	V _{GS(Q)}		-3.1		V

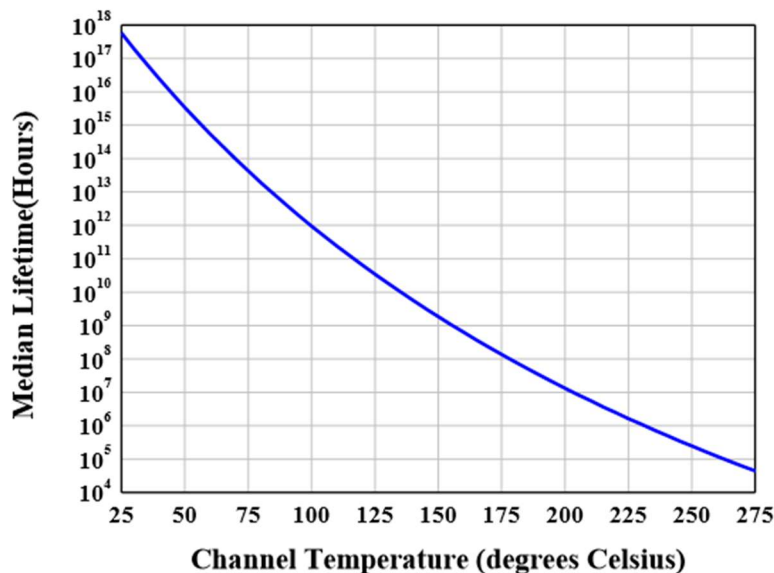
DC Characteristics (peak path, measured on wafer prior to packaging)

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V _{GS} =-8V; I _{DS} =5mA	V _{DSS}		200		V
Gate Threshold Voltage	V _{DS} =10V, I _D = 5mA	V _{GS(th)}	-4		-2	V
Gate Quiescent Voltage	V _{DS} =50V, I _{DS} =60mA, Measured in Functional Test	V _{GS(Q)}		-3.1		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	2.6GHz, P _{out} =40.5dBm WCDMA 1 Carrier, All phase, No device damages	VSWR		10:1		

Figure 2: Median Lifetime vs. Channel Temperature





Typical performance 2500-2700MHz Doherty

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

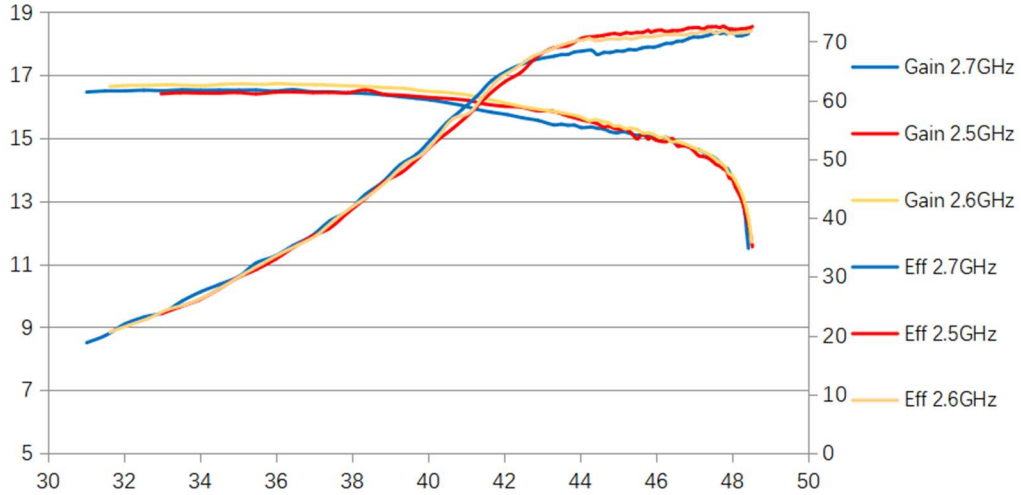


Figure 4: Network analyzer output, S11 and S21 (2.5-2.7GHz Doherty)

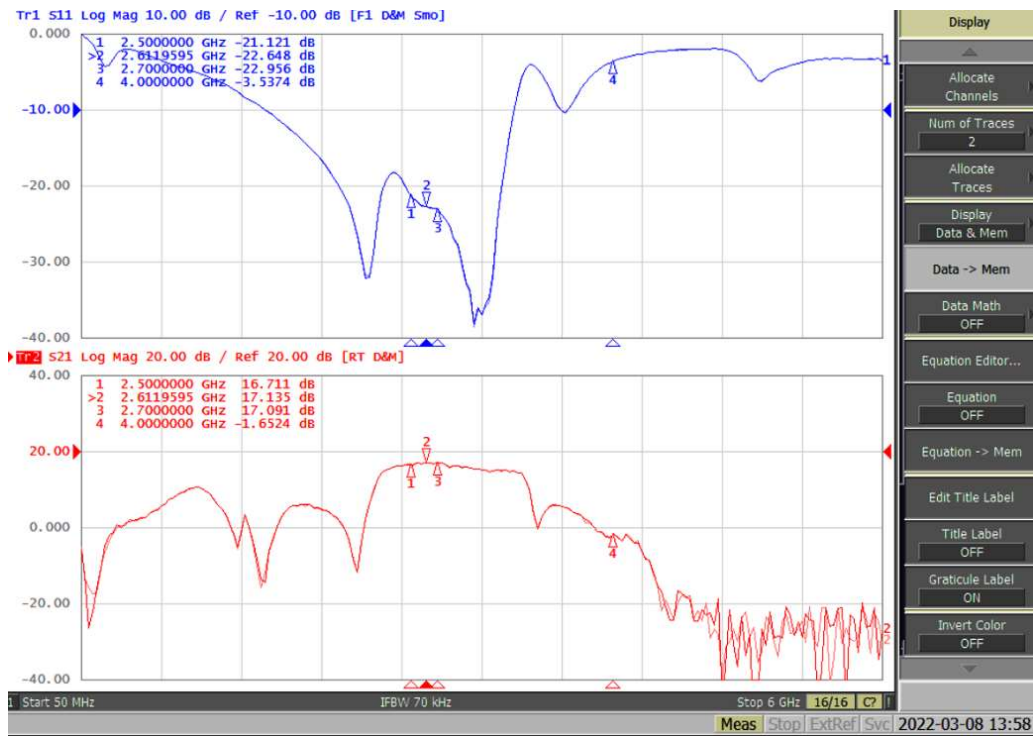


Figure 5: Picture of application board Doherty circuit for 2.5-2.7GHz

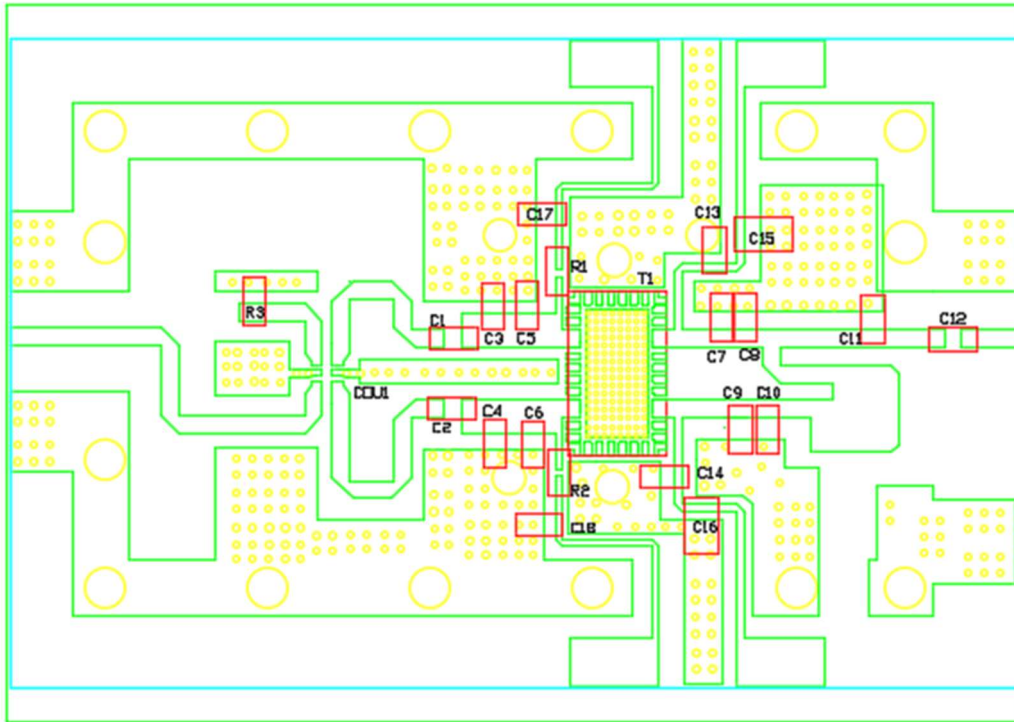


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C12,C13,C14,C17,C18	7	10pF High Q Capacitor	251SHS100BSE	TEMEX
C3,C4	2	0.5pF High Q Capacitor	251SHS0R5BSE	TEMEX
C5,C6,C8	3	1.2pF High Q Capacitor	251SHS1R2BSE	TEMEX
C15,C16	2	10uF MLCC	RS80R2A106M	MARUWA
C9	1	1.5pF High Q Capacitor	251SHS1R5BSE	TEMEX
C7,C10	2	0.3pF High Q Capacitor	251SHS0R3BSE	TEMEX
R1,R2	2	10 Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	51 Ω Power Resistor	ESR03EZPF510	ROHM
COU1	1	3dB bridge	C2327J50503AHF	ANAREN
T1	1	70W GaN	STAV27070C6	Innogrations



Typical performance
2110-2170MHz Doherty

Figure 6: Efficiency and power gain as function of Pout (2.1-2.2GHz Doherty)

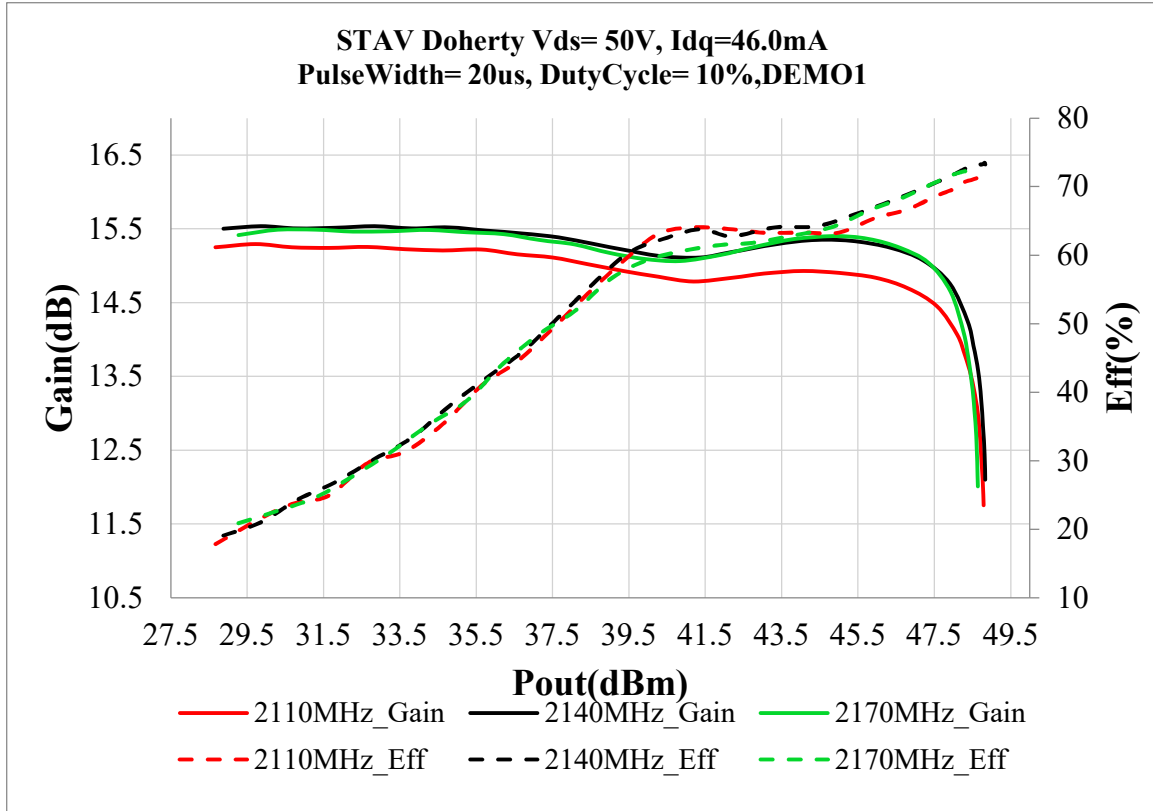


Figure 7: Network analyzer output, S11 and S21 (2.1-2.2GHz Doherty)

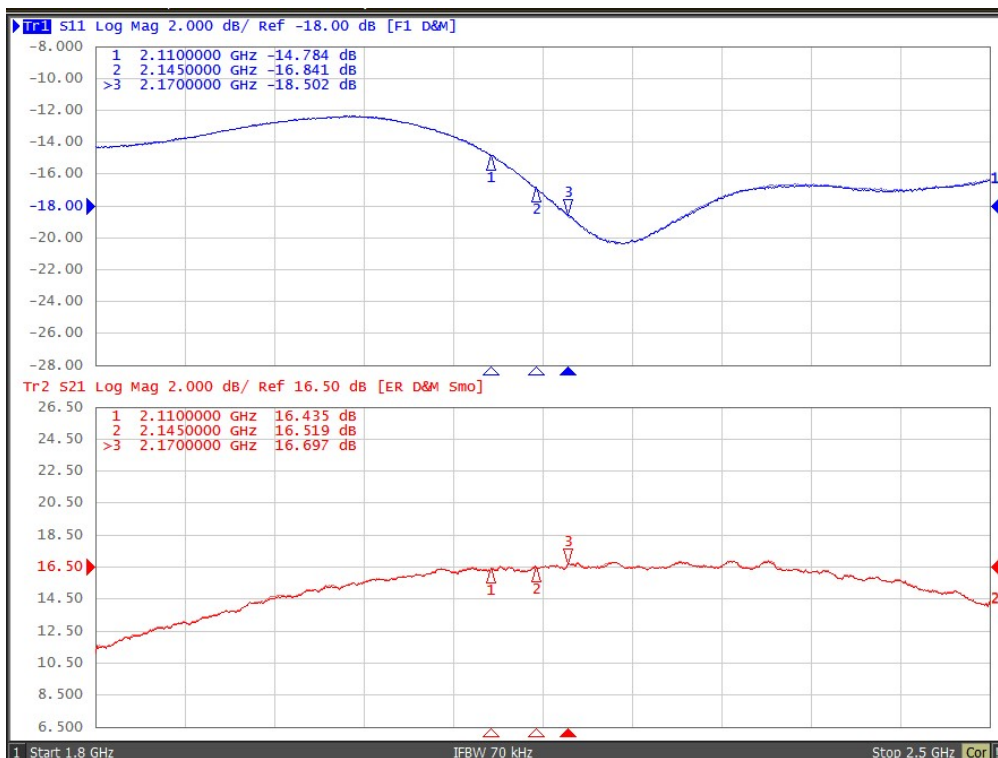


Figure 8: Picture of application board Doherty circuit for 2.1-2.2GHz

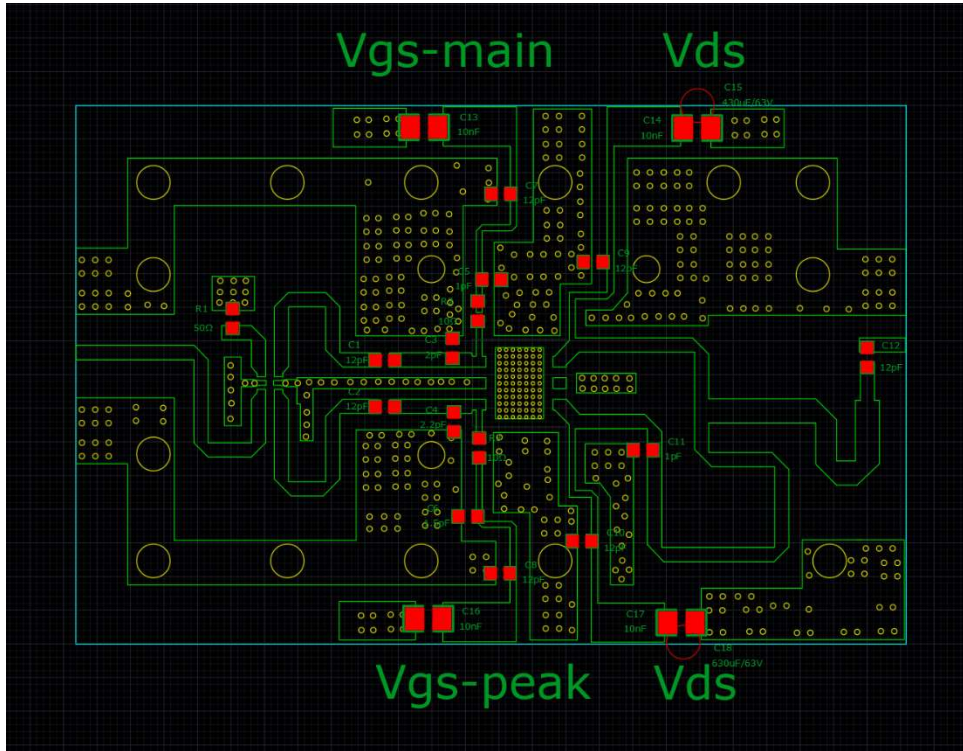


Table 5. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Component	Value	Quantity
U1	STAV27070C6	1
C6	1.5pF	1
C5、C11	1pF	2
C4	2.2pF	1
C3	2pF	1
C1、C2、C7、C8、C9、C10、C12	12pF	7
C13、C14、C16、C17	10nF	4
C15、C18	430uF/63V	2
R1	50 Ω	1
R2、R3	10 Ω	2

Typical performance
1805-1880MHz Doherty

Figure 9: Efficiency and power gain as function of Pout (1.8-1.9GHz Doherty)

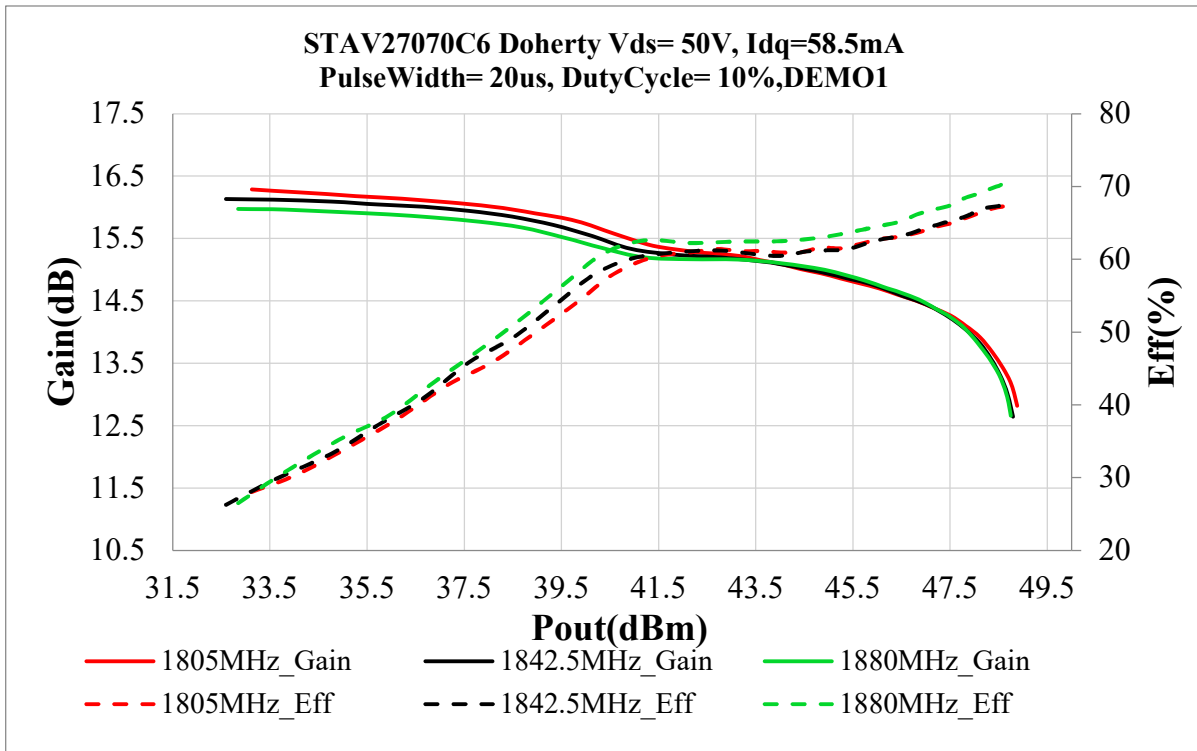


Figure 10: Network analyzer output, S11 and S21 (1.8-1.9GHz Doherty)

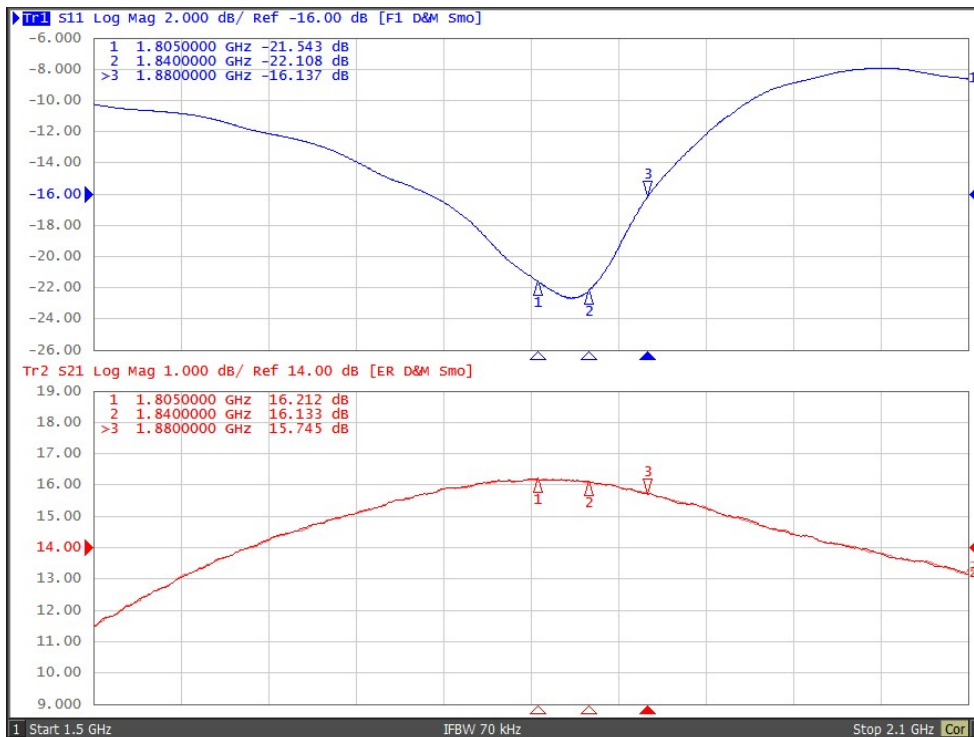


Figure 11: Picture of application board Doherty circuit for 1.8-1.9GHz

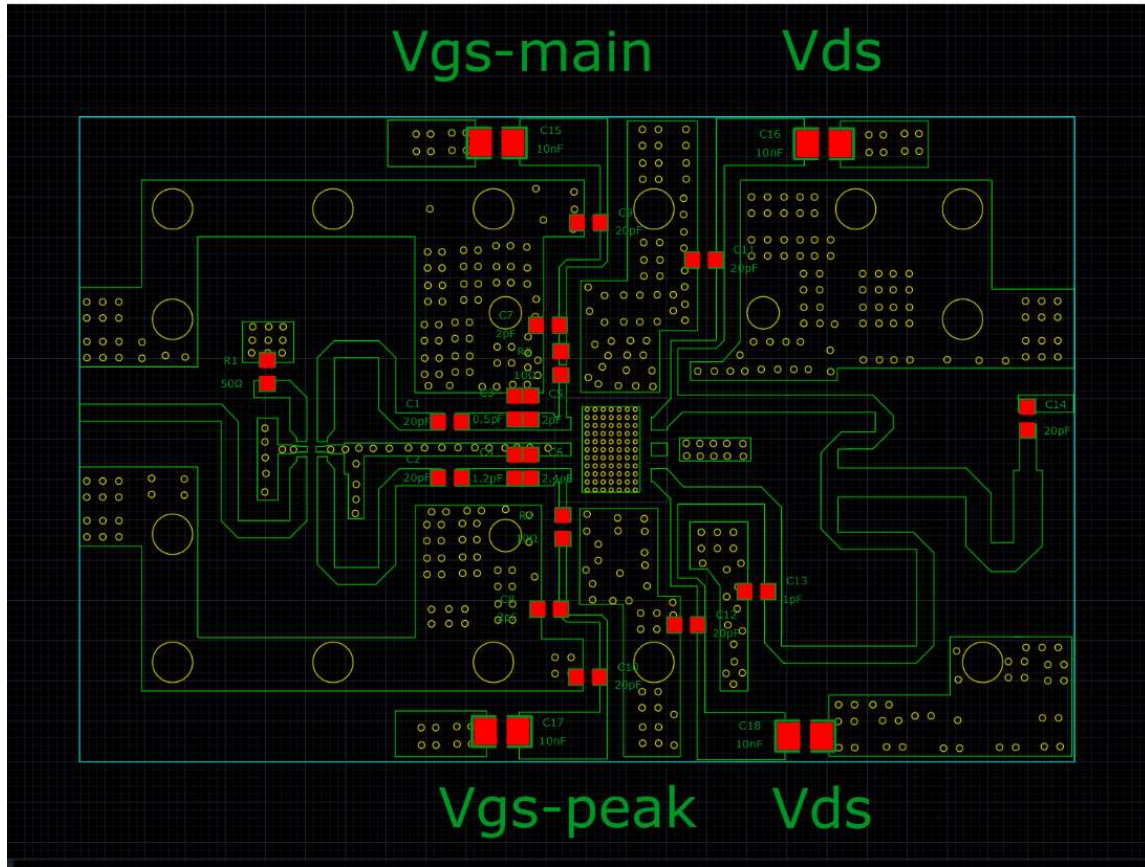


Table 6. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Component	Value	Quantity
T1	STAV27070C6	1
C3	0.5pF	1
C13	1pF	1
C4	1.2pF	1
C6	2.4pF	1
C5, C7, C8	2pF	3
C1, C2, C9, C10, C11, C12, C14	20pF	7
C15, C16, C17, C18	10nF	4
R1	50 Ω	1
R2, R3	10 Ω	2



Typical performance
2300-2400MHz Doherty

Figure 12: Efficiency and power gain as function of Pout (2.3-2.4GHz Doherty)

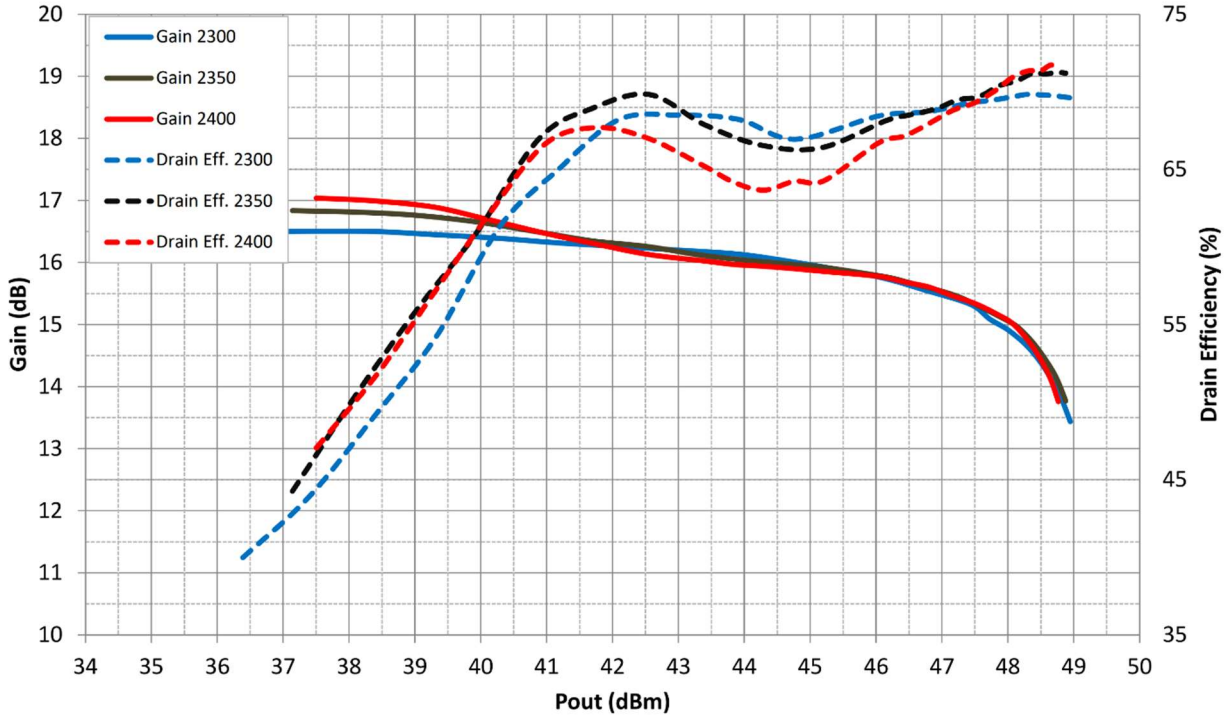


Figure 13: Network analyzer output, S11 and S21 (2.3-2.4GHz Doherty)

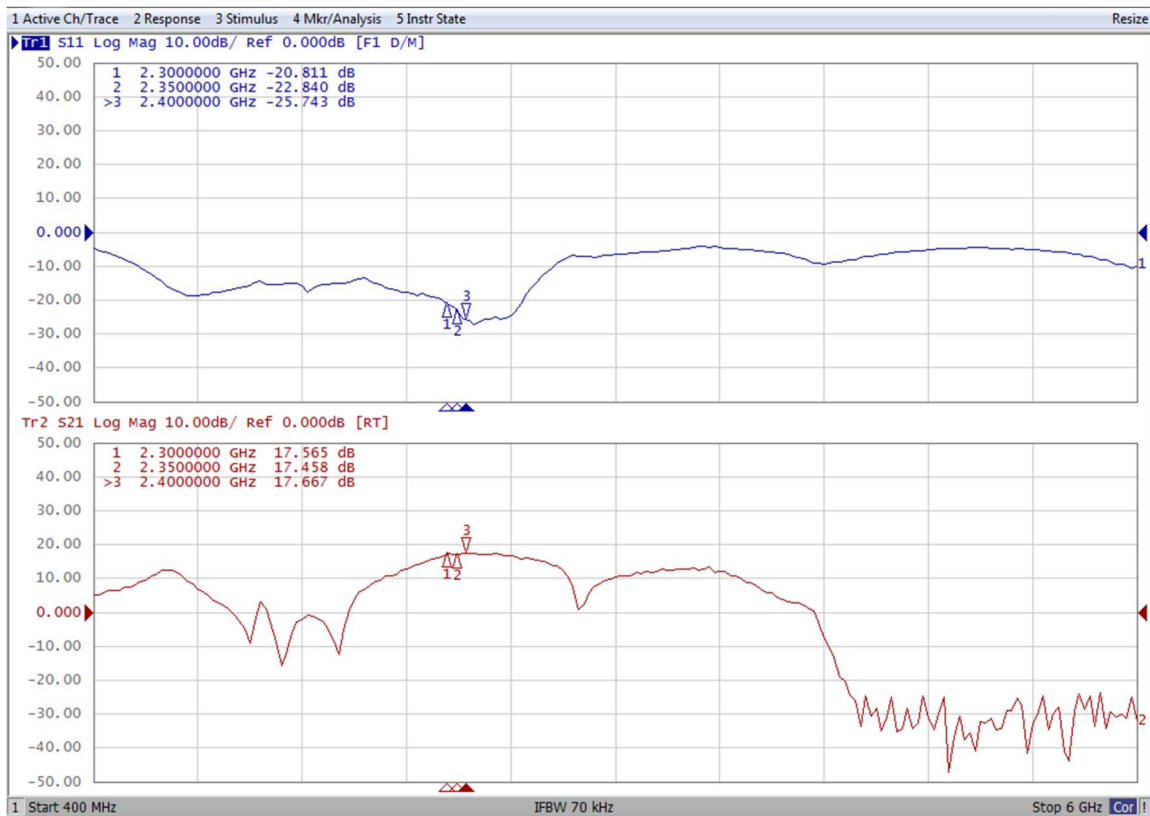


Figure 14: Picture of application board Doherty circuit for 2.3-2.4GHz

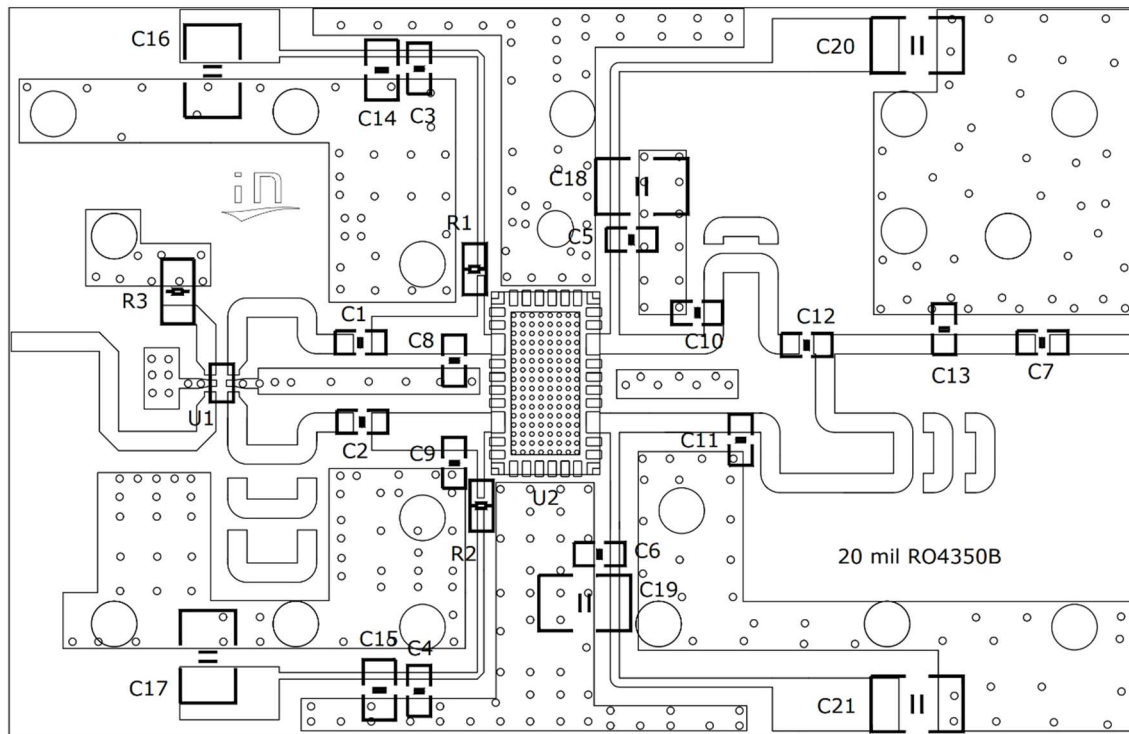
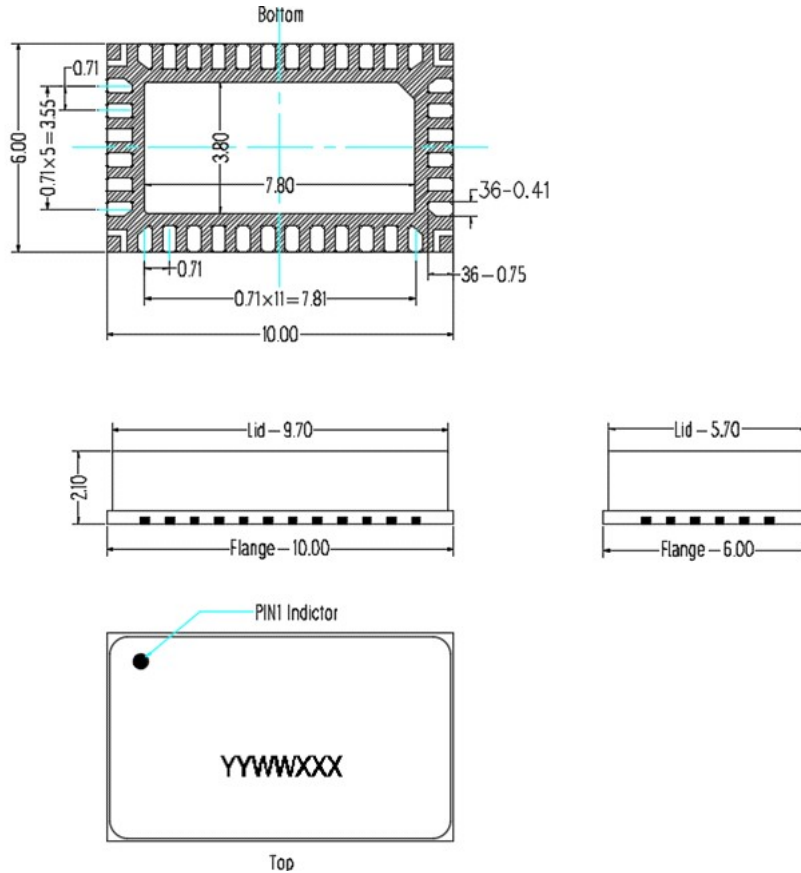


Table 7. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Reference	Footprint	Value	Quantity
C1, C2, C3, C4, C5, C6, C7	0805	10pF/250V	7
C8	0805	1.0pF/250V	1
C9, C11	0805	1.5pF/250V	2
C10	0805	0.8pF/250V	1
C12	0805	3.9pF/250V	1
C13	0805	1.1pF/250V	1
C14, C15	0805	10uF/16V	2
C16, C17, C18, C19, C20, C21	1210	10uF/100V	6
R1, R2	0603	10R	2
R2	0805	51R	1
U1	0805	C2327J50503AHF	1
U2	C6	STAV27070C6	1



10*6 Plastic Package



Notes:

1. All dimensions are in mm;
2. The tolerances unless specified are ± 0.2 mm.

Revision history

Table 8. Document revision history

Date	Revision	Datasheet Status
2022/3/8	V1.0	Preliminary Datasheet Creation
2022/4/13	V1.1	Add 1.8GHz application data
2022/4/20	V1.2	Add 2.1GHz application data
2022/12/9	V1.3	Update on Pin Definition
2024/1/26	V1.4	Add 2.3GHz application data

Application data based on: LWH-22-08/ZYX-22-04, ZBB-24-04

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