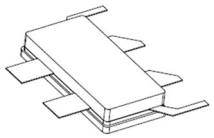
Gallium Nitride 50V, 700W,1.8-2.0GHz RF Power Transistor

STCV20700BY4V



Description

The STCV20700BY4V is a 700-watt, internally matched GaN HEMT, designed for 5G cellular applications with frequencies from 1.8-2.0GHz, **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 100 to 115W average power, according to normal 8 to 8.5dB back off.

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

- Typical **1805-1880MHz** Doherty Pulsed CW and 1C W--CDMA Characterization Performance:

V_{DD} = **50** Vdc, I_{DQA} =150mA, V_{GSB} = –5.5Vdc,

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

Freq (MHz)	Pout (dBm)	CCDF (dB)	Ppeak (dBm)	Ppeak (W)	ACPR (dBc)	Gain (dB)	Eff (%)
1805	50.5	8.40	58.90	776.8	-28.2	13.9	58.0
1842.5	50.5	8.55	59.05	804.0	-29.0	13.6	57.7
1880	50.5	8.67	59.15	822.4	-28.0	14.1	56.7

- Typical **1930-2000MHz** Doherty Pulsed CW and 1C W--CDMA Characterization Performance:

V_{DD} = **55** Vdc, I_{DQA} =160mA, V_{GSB} = –5.7Vdc,

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

Freq (MHz)	Pout (dBm)	CCDF (dB)	Ppeak (dBm)	Ppeak (W)	ACPR (dBc)	Gain (dB)	Eff (%)
1930	50.5	8.88	59.39	868.7	-32.2	15.9	54.8
1965	50.5	9.18	59.66	925.2	-31.7	16.3	54.2
2000	50.5	9.13	59.61	913.9	-29.2	15.7	54.0

Recommended driver: Doherty (1 stage discrete solution): STBV27070C6

Applications

- Asymmetrical Doherty amplifier within N3 5G band and B3 4G band
- 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

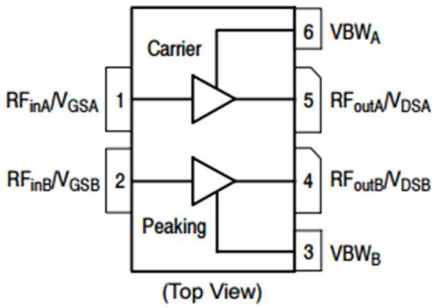


Table 1. Maximum Ratings

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	92	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=100W, 1.84GHz Doherty application board	$R_{\theta JC}$	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=36mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 36mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=140mA, Measured in Functional Test	$V_{GS(Q)}$		-3.08		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=56mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 56mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=250mA Measured in Functional Test	$V_{GS(Q)}$		-3.1		V

Ruggedness Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	1.84GHz, Pout=100W WCDMA 1 Carrier in Doherty circuit All phase, No device damages	VSWR		10:1		

1805-1880MHz Typical Performance

Figure 3: Efficiency and power gain as function of Pout

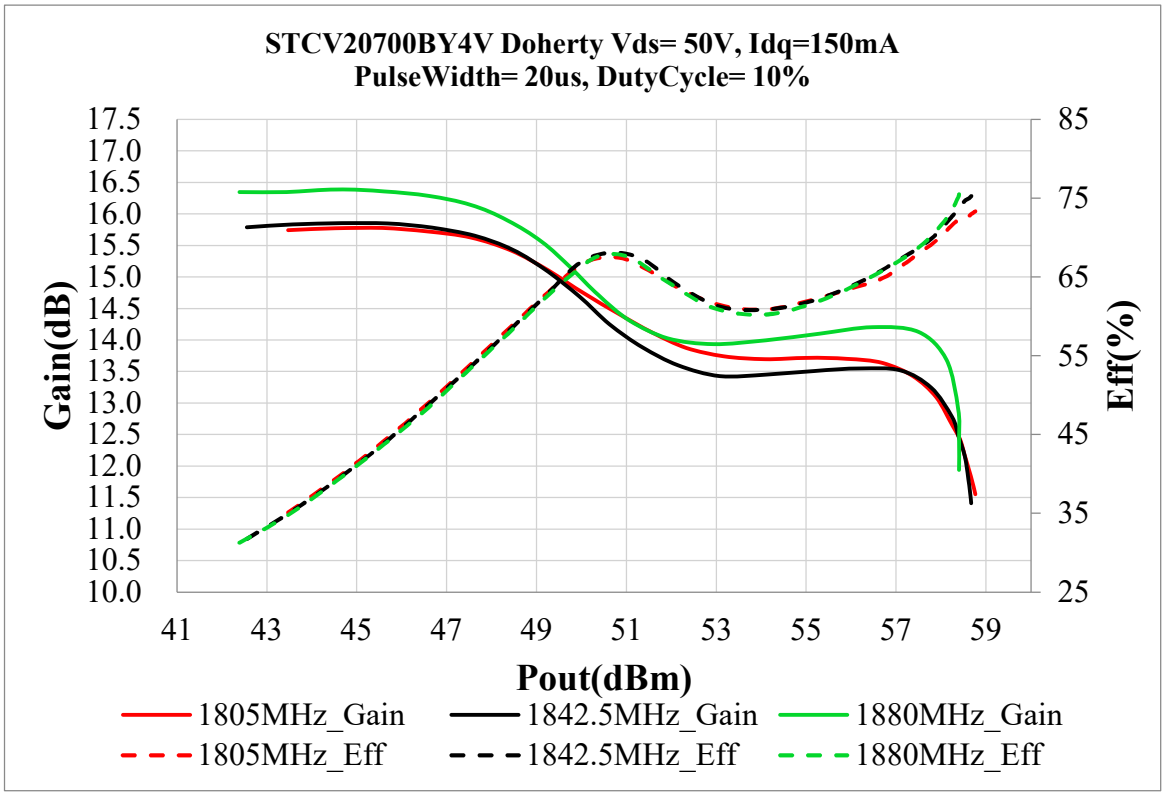


Figure 4: Network analyzer output, S11 and S21 (1.8GHz Doherty)

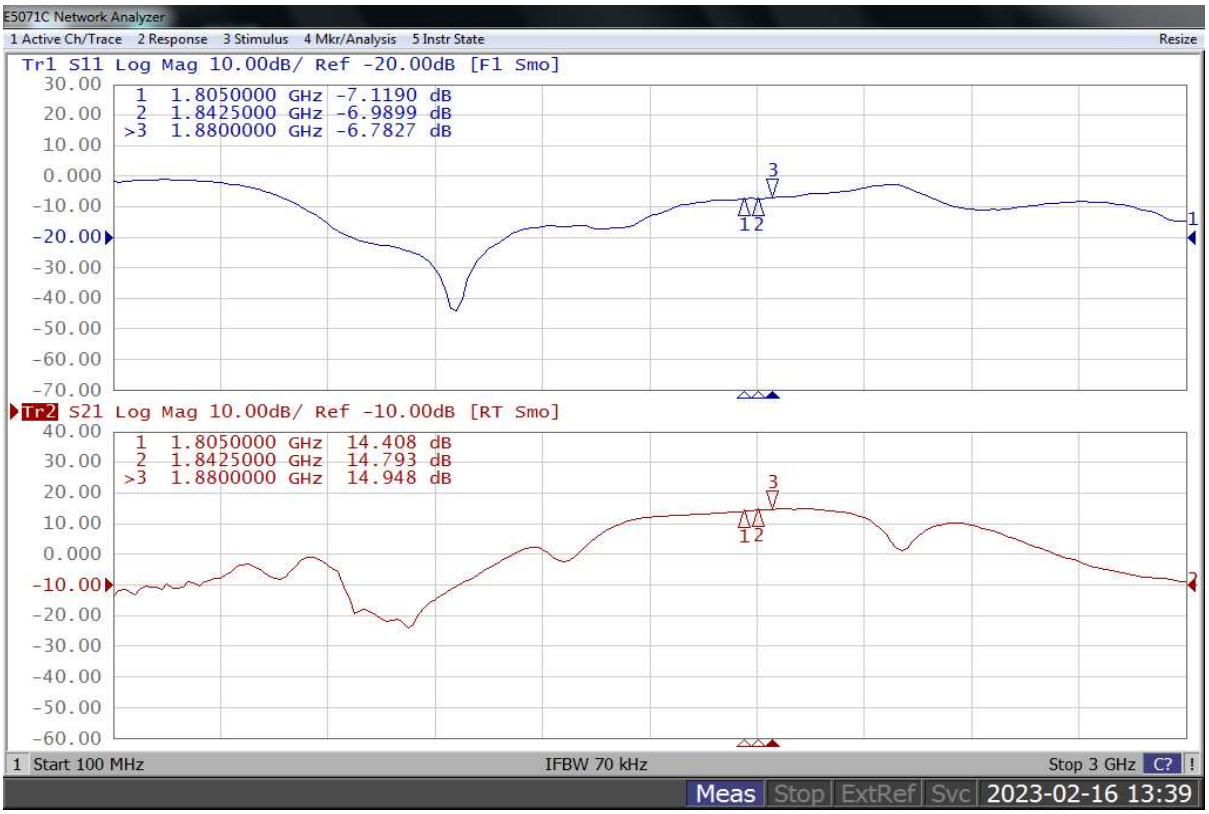


Figure 5: Picture of application board Doherty circuit

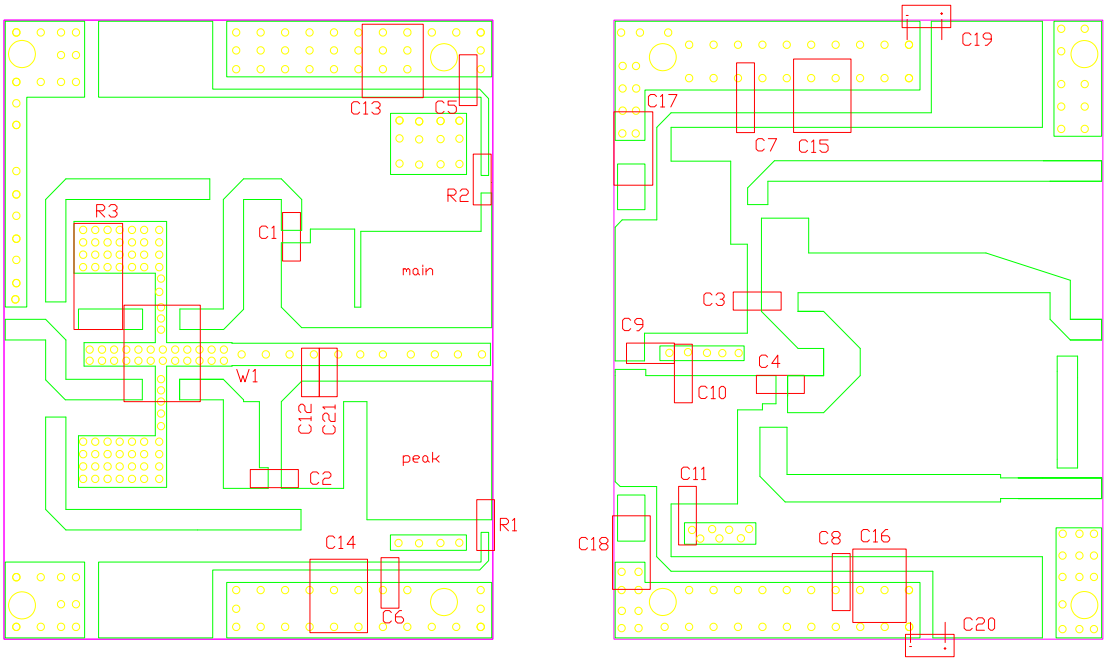


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Designator	Footprint	Comment	Quantity
C1, C2, C3, C4, C5, C6, C7, C8	0805	20 pF	8
C9, C10,	0805	1.5 pF	2
C11	0805	0.2 pF	1
C12, C21	0805	0.5 pF	2
C13, C14, C15, C16, C17, C18	1210	10uF/100V	6
C19, C20		100uF/63V	2
R1,R2	0603	10R	2
R3	2512	51R	1
W1		DC20F02（YANTEL 2dB)	1

(pF capacitors are ATC 600F series)

1930-2000MHz Typical Performance

Figure 6: Efficiency and power gain as function of Pout

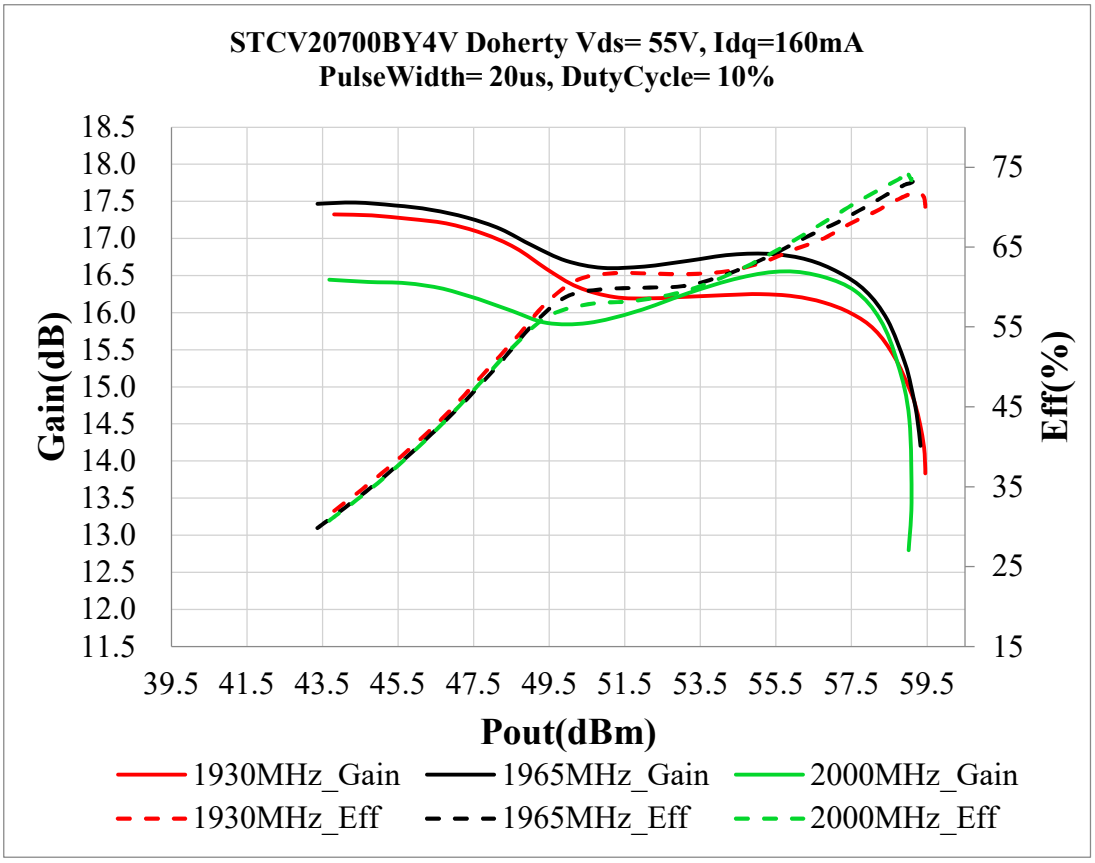


Figure 7: Network analyzer output, S11 and S21

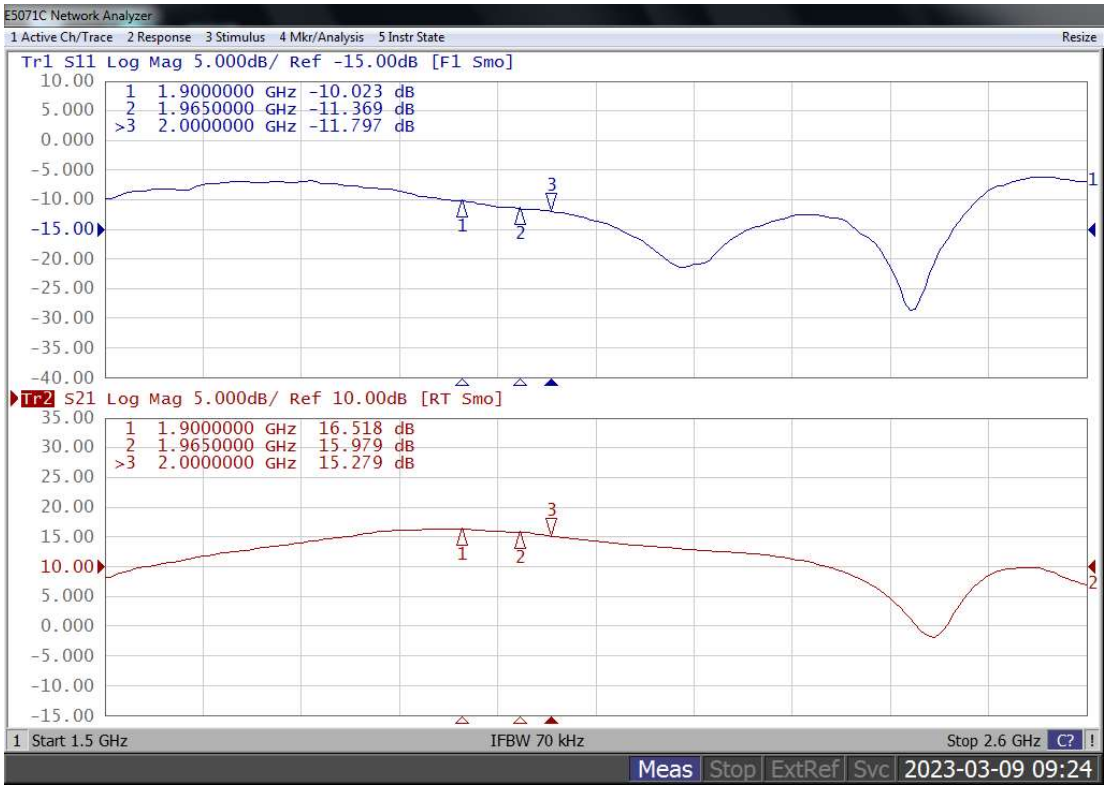


Figure 5: Picture of application board Doherty circuit

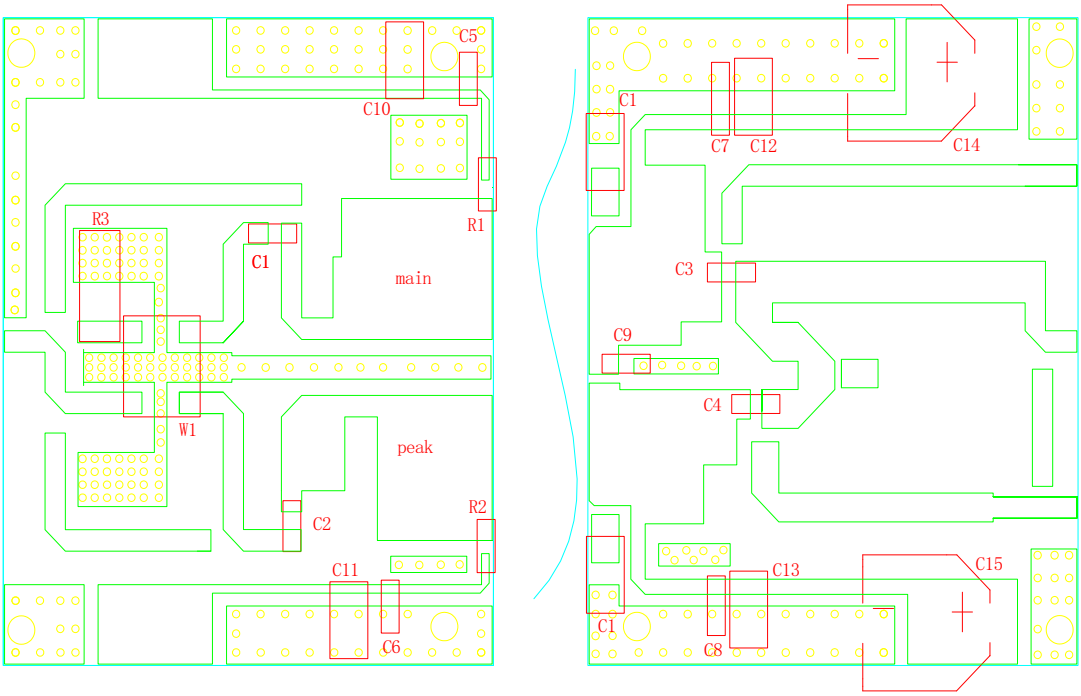
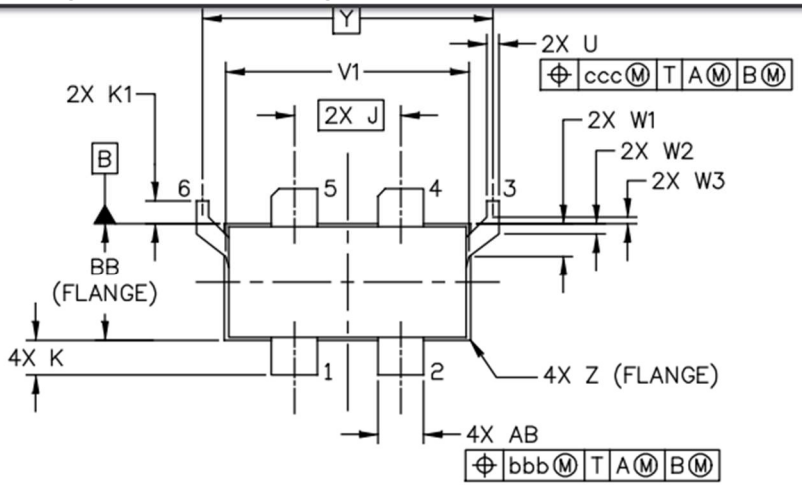


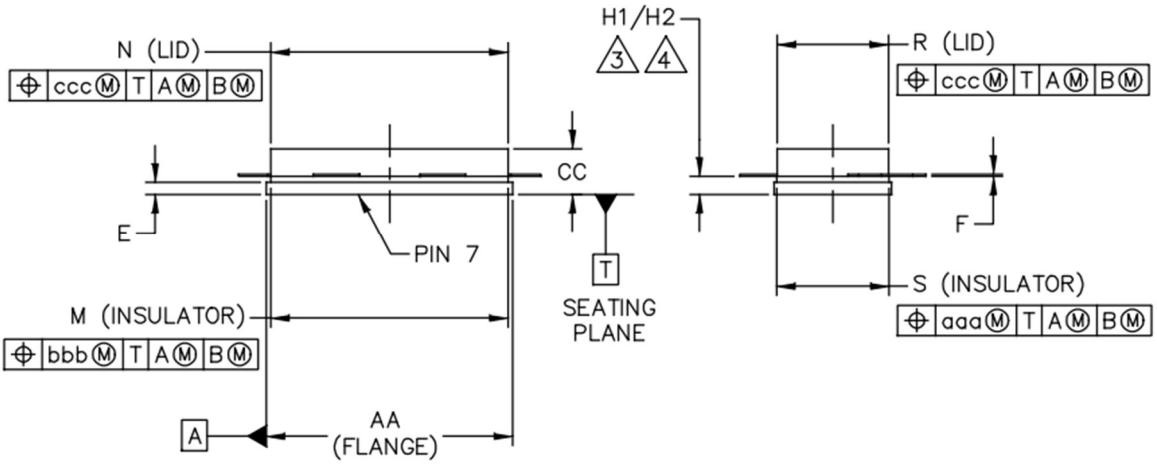
Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Designator	Description	Comment	Part Number	Manufacture	
C1, C2, C5, C6, C7, C8	15pF High Q Capacitor	15 pF	251SHS150JSE	TEMEX	6
C3	6.8pF High Q Capacitor	6.8 pF	251SHS6R8CSE	ATC	1
C4	15pF High Q Capacitor	15 pF	ATC600F150JT250XT	ATC	1
C9	1.1pF High Q Capacitor	1.1 pF	251SHS1R1BSE	TEMEX	1
C10, C11, C12, C13	10 uF MLCC	10uF/100V	RS80R2A106M	MARUWA	4
C14, C15		100uF/63V			2
R1,R2	10 Ω power resistor	10R	ESR03EZPF100	ROHM	2
R3	51 Ω power resistor	51R	S2512N	AN2	
W1	2 dB Bridge	2 dB	DC20F02	YANTEL	1

(pF capacitors are ATC 600F series)

Earless Flanged Ceramic Package; 6 leads- BY4V





DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX	DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX
AA	.805	.815	20.45	20.70	R	.365	.375	9.27	9.53
BB	.380	.390	9.65	9.91	S	.365	.375	9.27	9.53
CC	.125	.170	3.18	4.32	U	.035	.045	0.89	1.14
E	.035	.045	0.89	1.14	V1	.795	.805	20.19	20.45
F	.004	.007	0.10	0.18	W1	.0975	.1175	2.48	2.98
H1	.057	.067	1.45	1.70	W2	.0225	.0425	0.57	1.08
H2	.054	.070	1.37	1.78	W3	.0125	.0325	0.32	0.83
J	.350 BSC		8.89 BSC		Y	.956 BSC		24.28 BSC	
K	.0995	.1295	2.53	3.29	Z	R.000	R.040	R0.00	R1.02
K1	.070	.090	1.78	2.29	AB	.145	.155	3.68	3.94
M	.774	.786	19.66	19.96	aaa	.005		0.13	
N	.772	.788	19.61	20.02	bbb	.010		0.25	
					ccc	.015		0.38	

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2023/1/3	V1.0	Preliminary Datasheet Creation
2023/2/16	V2.0	Update according to device version V3
2023/3/9	V2.1	Add 1.93-2GHz application data

Application data based on LSM-23-01/09

Notice

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