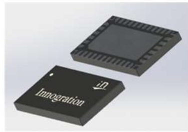
GaN HEMT 50V, 100W, 1.8-2.7GHz Power Transistor

STAV27100C6



Description

The STAV27100C6 is a dual path 100W, 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 16W.
There is no guarantee of performance when this part is used outside of stated frequencies.

➢ Typical Doherty Single--Carrier W--CDMA Characterization Performance
Input Signal :WCDMA 1 Carrier with PAR = 10 dB @ 0.01% Probability on CCDF , Pulsed CW: 20us, 10%

- V_{DD} = 50 Vdc, I_{DQA} = 45 mA, V_{GSB} = –5.0Vdc,

Freq (GHz)	Pulse CW Signal			Pavg=42dBm WCDMA Signal		
	P1-Gain (dB)	Psat (dBm)	Psat (W)	Gp (dB)	Eff (%)	ACPR5M (dBc)
2.5	14.16	50.08	101.7	14.20	59.86	-27.95
2.6	14.89	50.01	101.2	14.75	60.46	-29.67
2.7	15.04	50.07	101.6	15.07	59.55	-32.22

- V_{DD} = 50 Vdc, I_{DQA} = 45 mA, V_{GSB} = –5.0Vdc,

Freq (GHz)	Pulse CW Signal			Pavg=42dBm WCDMA Signal		
	P1-Gain (dB)	Psat (dBm)	Psat (W)	Gp (dB)	Eff (%)	ACPR5M (dBc)
2.3	15.07	50.77	119.32	15.14	59.95	-27.42
2.35	15.12	50.82	120.89	15.10	60.50	-28.83
2.4	15.11	50.64	115.86	14.91	59.46	-30.75

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

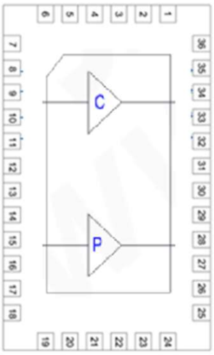
1. Set VGS to the pinch--off (VP) voltage, typically –5 V
2. Turn on VDS to nominal supply voltage
3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

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_{DSS}	+200	Vdc
Gate--Source Voltage	V_{GS}	-8 to +0.5	Vdc
Operating Voltage	V_{DD}	55	Vdc
Maximum gate current	Igs	9	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, Pdiss=10.5W at Pavg=42dBm WCDMA 1 carrier	$R_{\theta JC}$	2.5	°C /W

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

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=5mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 5mA	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	VDS =50V, IDS=45mA, Measured in Functional Test	$V_{GS(Q)}$		-3.1		V

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

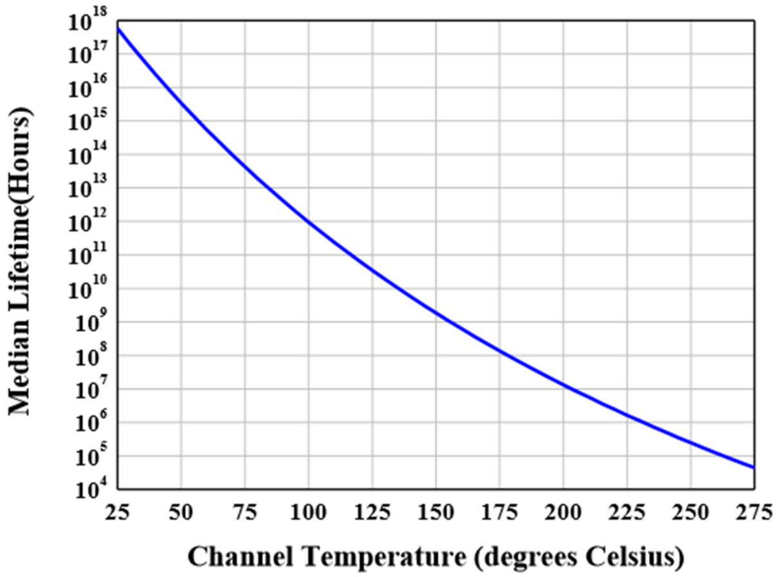
Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	VGS=-8V; IDS=7.5mA	V_{DSS}		200		V
Gate Threshold Voltage	VDS =10V, ID = 7.5mA	$V_{GS(th)}$	-4		-2	V

Gate Quiescent Voltage	VDS =50V, IDS=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, Pout=42dBm WCDMA 1 Carrier, All phase, No device damages	VSWR		10:1		

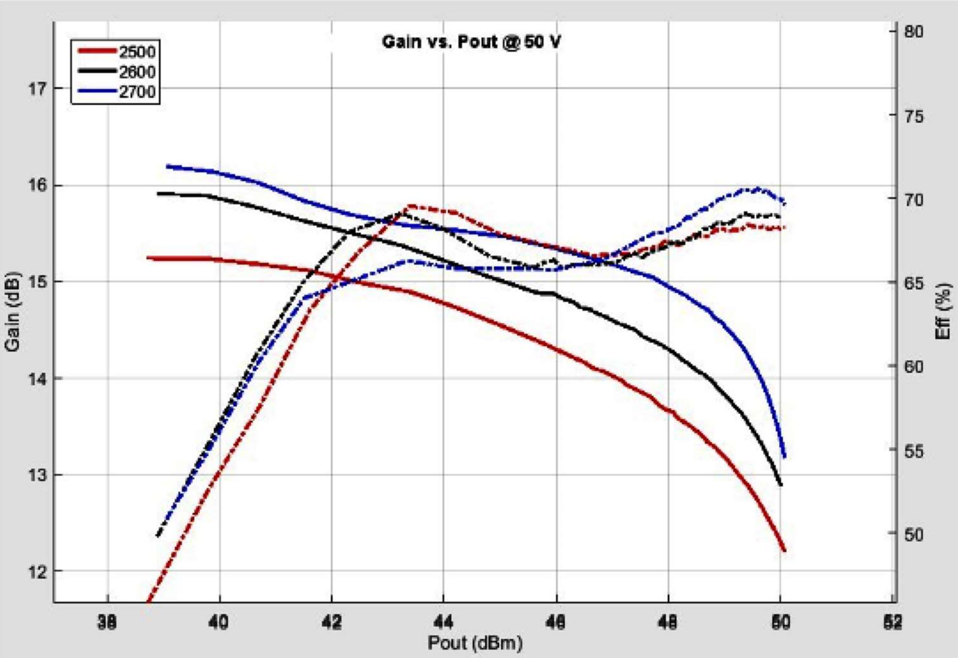
Figure 2: Median Lifetime vs. Channel Temperature



Typical performance

2500-2700MHz Doherty

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



Freq(MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
2500	46.52	44.90	66.68	14.16	50.08	101.76	68.22
2600	45.61	36.43	65.86	14.89	50.01	100.21	68.78
2700	47.73	59.33	67.89	15.04	50.07	101.65	69.56

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

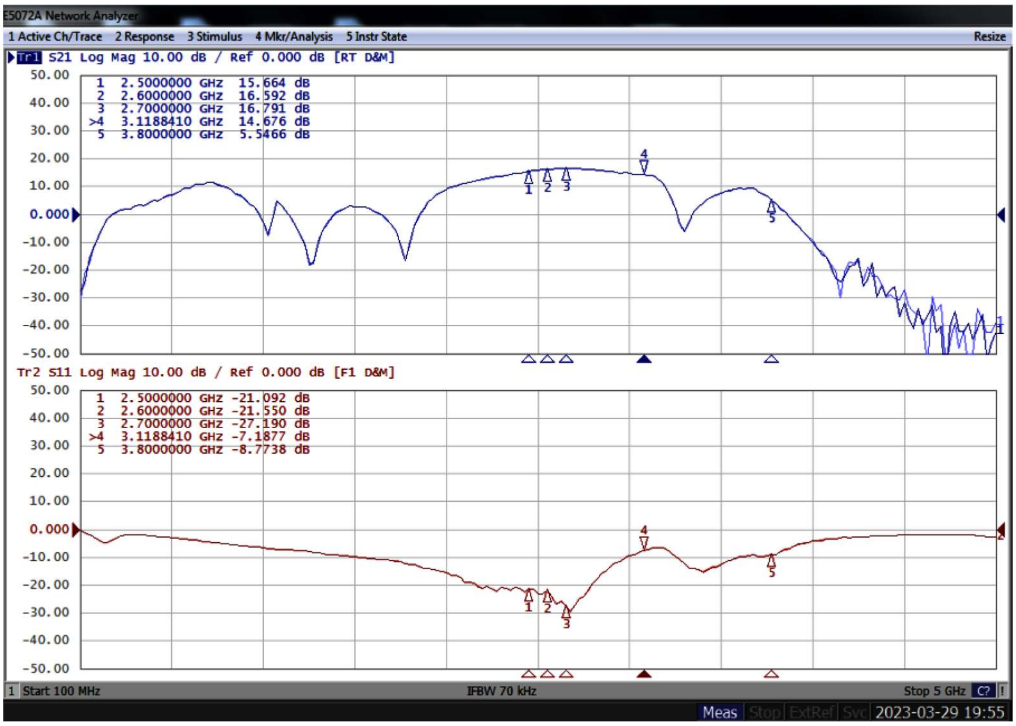


Figure 5: Picture of application board Doherty circuit for 2.5-2.7GHz

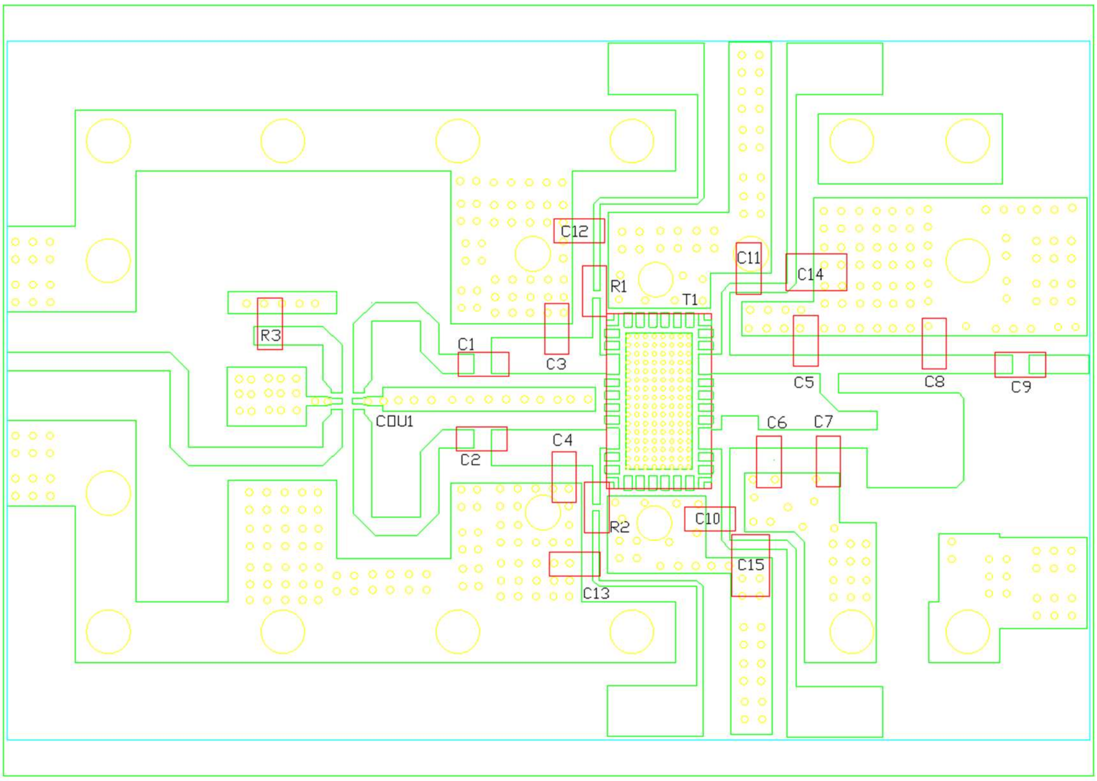


Table 4. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Part	Quantity	Description	Part Number	Manufacture
C1,C2,C9,C10,C11,C12,C13	7	10pFHigh Q Capacitor	251SHS100BSE	TEMEX
C3,C4	2	1.2pFHigh Q Capacitor	251SHS1R2BSE	TEMEX
C5	1	1.5pFHigh Q Capacitor	251SHS1R5BSE	TEMEX
C15,C14	2	10uF MLCC	RS80R2A106M	MARUWA
C6	1	2.0pFHigh Q Capacitor	251SHS2R0BSE	TEMEX
C8	1	1.1pFHigh Q Capacitor	251SHS1R1BSE	TEMEX
C7,	1	0.3pFHigh Q Capacitor	251SHS0R3BSE	TEMEX
R1,R2	2	10Ω Power Resistor	ESR03EZPF100	ROHM
R3	1	51Ω Power Resistor	ESR03EZPF510	ROHM
COU1	1	3dB bridge	C2327J50503AHF	ANAREN
T1	1	100W GaN	STAV27100C6	Innogration

Typical performance

2300-2400MHz Doherty

Figure 6: Efficiency and power gain as function of Pout

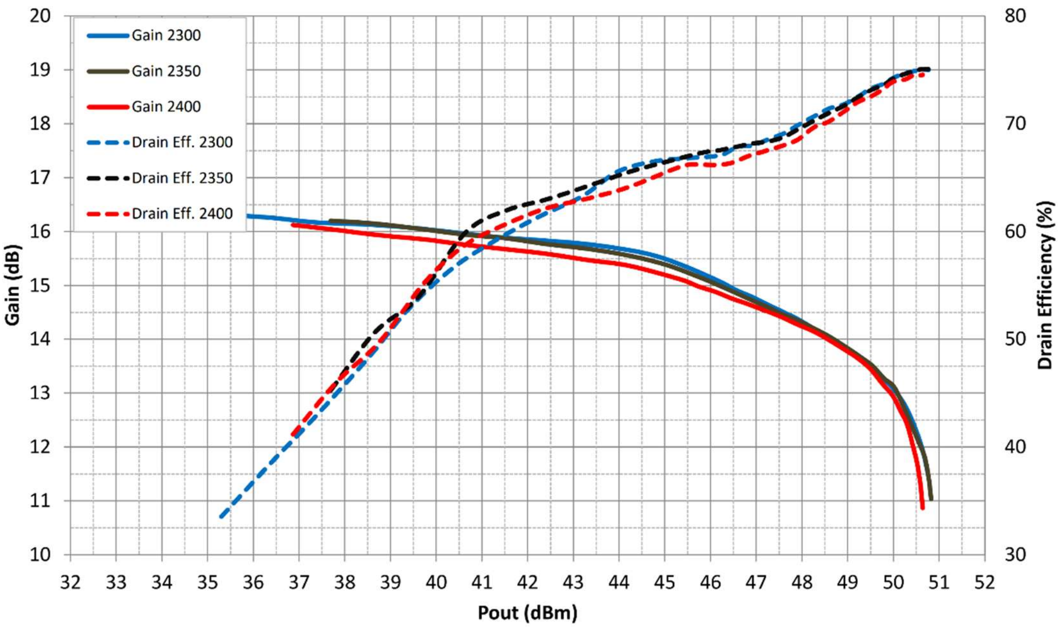


Figure 7: Network analyzer output, S11 and S21

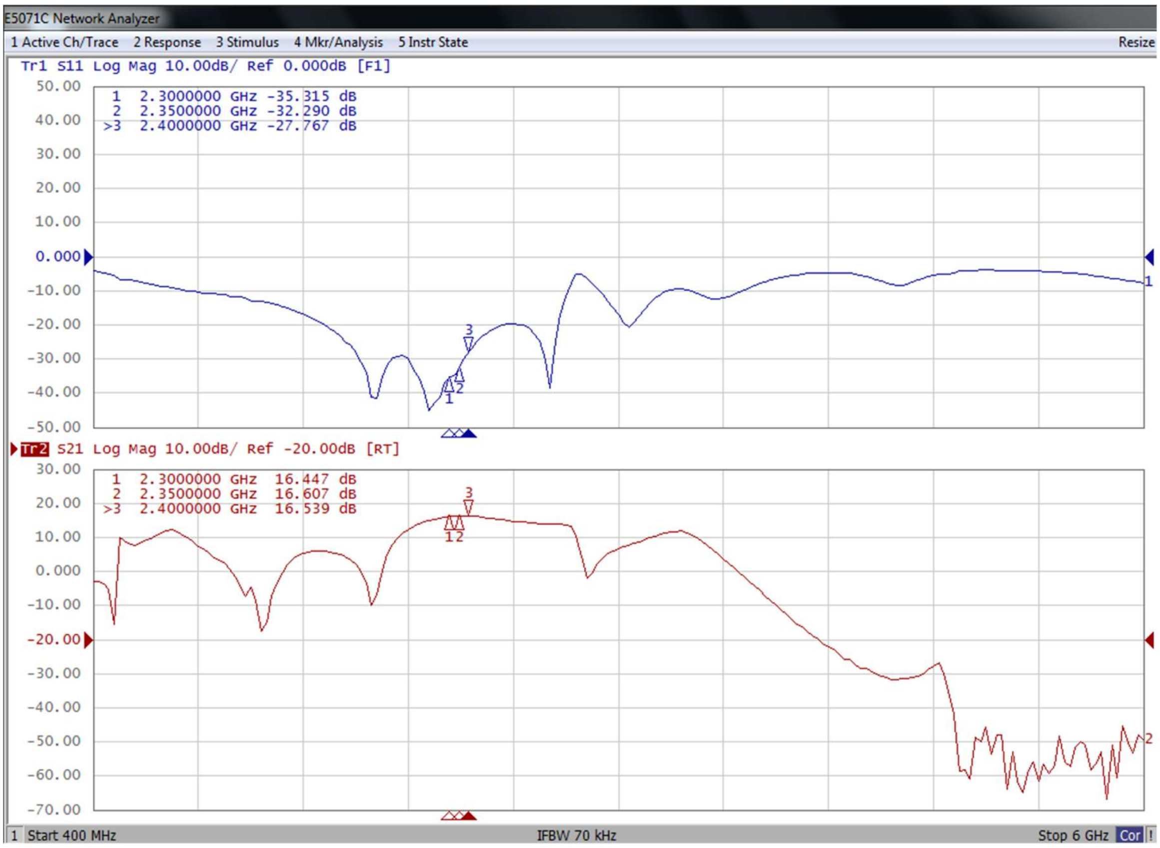


Figure 8: Picture of application board Doherty circuit

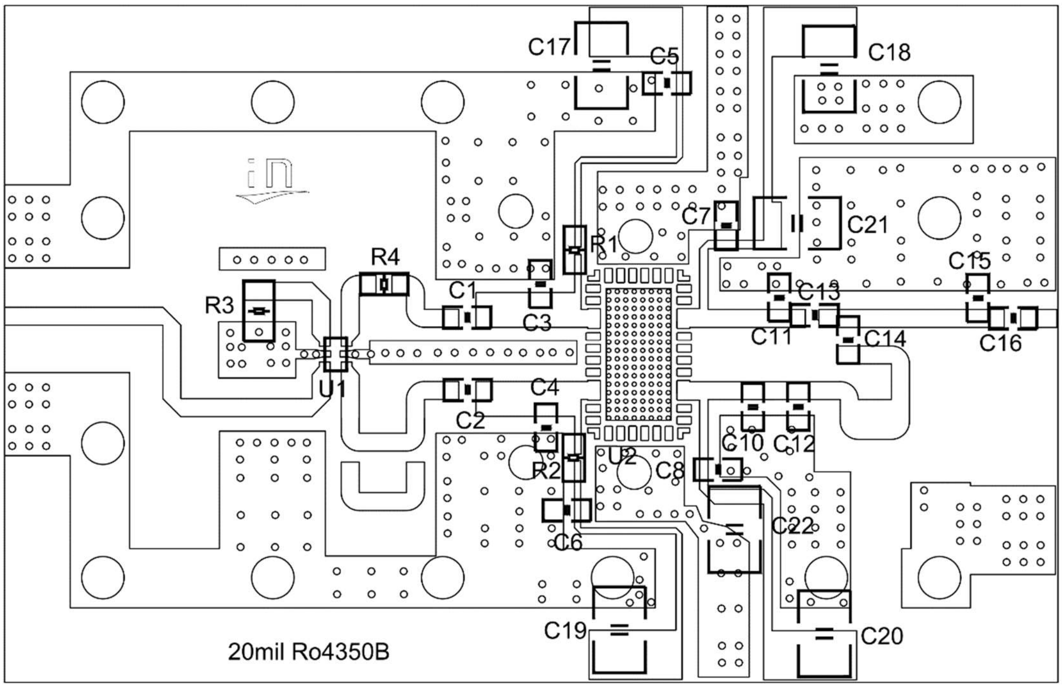
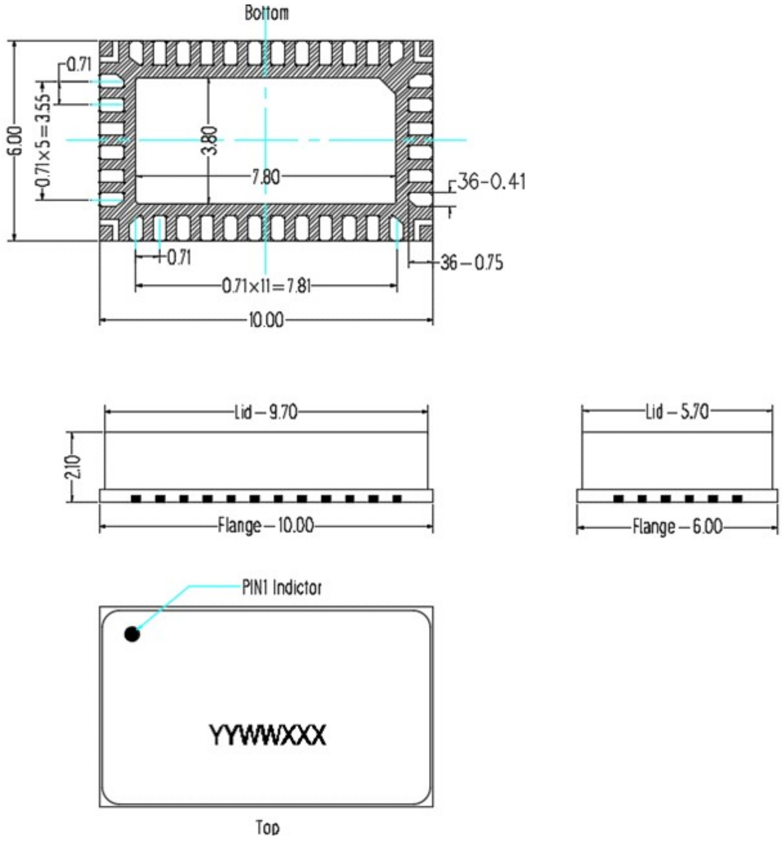


Table 5. Bill of materials of application board (PCB layout upon request, RO4350B 20mils)

Reference	Footprint	Value	Quantity
C1, C2, C5, C6, C7, C8, C13, C14, C16	0603	10pF/250V	9
C3, C10	0603	1.0pF/250V	2
C4, C12	0603	1.6pF/250V	2
C11	0603	1.5pF/250V	1
C15	0603	1.2pF/250V	1
C17, C18, C19, C20, C21, C22	1210	10uF/100V	6
R1, R2	0603	10R	2
R3	1206	50R	1
R4	0805	9.1R	1
U1	0805	C2327J5003AHF	1
U2	C6	STAV27100C6	1

10*6 Plastic Package



Notes:

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

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2023/3/30	V1.0	Preliminary Datasheet Creation
2023/12/2	V1.1	Add 2.3-2.4G application data

Application data based on: LWH-23-06/ZBB-23-36

Notice

Specifications are subject to change without notice. Innogration believes the information within the data sheet to be reliable. Innogration makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose.
"Typical" parameter is the average values expected by Innogration in quantities and are provided for information purposes only. It can and do vary in different applications and related performance can vary over time. All parameters should be validated by customer's technical experts for each application.
Innogration products are not designed, intended or authorized for use as components in applications intended for surgical implant into the body or to support or sustain life, in applications in which the failure of the Innogration product could result in personal injury or death or in applications for planning, construction, maintenance or direct operation of a nuclear facility.
For any concerns or questions related to terms or conditions, please check with Innogration and authorized distributors