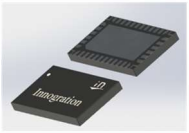
# Gallium Nitride 50V, 80W, 0.1-3.8GHz RF Power Transistor

**STAV38080C6**



## Description

The STAV38080C6 is a 80watt, GaN HEMT, ideal for general applications from 0.1 to 3.8GHz.

It features high gain, wide band and low cost, in 10*6mm plastic open cavity package, enabling surface mounted on PCB through grounding vias or soldered on heatsink directly.

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

- Typical Class AB pulse CW performance across 3.3-3.6GHz/3.4-3.8GHz:

Pulse width=50us, duty cycle=20% (On innogration wideband application board with device soldered)

| $V_{DS}$= 50V，$I_{DQ}$=120mA，$V_{GS}$ =-3.26V | | | | | | | |
|---|---|---|---|---|---|---|---|
| FREQ (MHZ) | P1dB (dBm) | P1dB (W) | P1dB Eff (%) | P1dB Gain (dB) | P3dB (dBm) | P3dB (W) | P3dB Eff (%) |
| 3300 | 48.79 | 75.60 | 52.57 | 17.05 | 50.11 | 102.5 | 56.50 |
| 3400 | 48.93 | 78.20 | 56.22 | 16.70 | 49.99 | 99.70 | 59.33 |
| 3500 | 48.33 | 68.01 | 55.96 | 16.66 | 49.58 | 90.84 | 59.67 |
| 3600 | 47.95 | 62.30 | 55.25 | 16.63 | 49.17 | 82.68 | 58.59 |

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|---|---|---|---|---|---|---|---|
| FREQ (MHZ) | P1dB (dBm) | P1dB (W) | P1dB Eff (%) | P1dB Gain (dB) | P3dB (dBm) | P3dB (W) | P3dB Eff (%) |
| 3400 | 48.69 | 73.90 | 50.73 | 16.19 | 50.02 | 100.57 | 55.55 |
| 3500 | 48.50 | 70.81 | 52.50 | 16.75 | 50.01 | 100.20 | 58.09 |
| 3600 | 48.41 | 69.29 | 54.50 | 16.93 | 49.79 | 95.21 | 58.52 |
| 3700 | 48.16 | 65.40 | 54.89 | 16.76 | 49.35 | 86.18 | 56.81 |
| 3800 | 47.53 | 56.68 | 51.73 | 16.18 | 49.23 | 83.75 | 57.67 |

Other application result upon request: 1.8-2.2, 2.3-2.7GHz etc

## Applications

- 5G, 4G wireless infrastructure
- Wideband or narrowband power amplifier
- Test instruments
- Jammer

## 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

**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 | 10 | 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<br>$T_C$= 85°C, at Pavg=5W WCDMA 1 carrier | $R_{\theta JC}$ | 2.9 | °C /W |

**Table 3. Electrical Characteristics (TA = 25℃ unless otherwise noted)**

**DC Characteristics (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 | -3 | -2 | V |
| Gate Quiescent Voltage | VDS =50V, IDS=100mA, Measured in Functional Test | $V_{GS(Q)}$ | | -3.2 | | V |

**Ruggedness Characteristics**

| Characteristic | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Load mismatch capability | 3.8GHz, Pout=80W pulse CW<br>All phase,<br>No device damages | VSWR | | 10:1 | | |

**Figure 1:Pin Definition(Top View)**


| Pin No. | Symbol | Description |
|---|---|---|
| 8,9,10,11,14,15,16,17 | Vgs/RF In | Vgs and RF input |
| 26,27,28,29,32,33,34,35 | Vds/RF out | Vds and RF output |
| 2,5,7,12,13,18,20,23,25,30,31,36 | GND | DC/RF Ground |
| Others | NC | No connection |
| Package Base | GND | DC/RF Ground. |

## 3.3-3.6GHz

**Figure 2: Efficiency and power gain as function of Pout (**Measured on 3.3-3.6GHz application board)

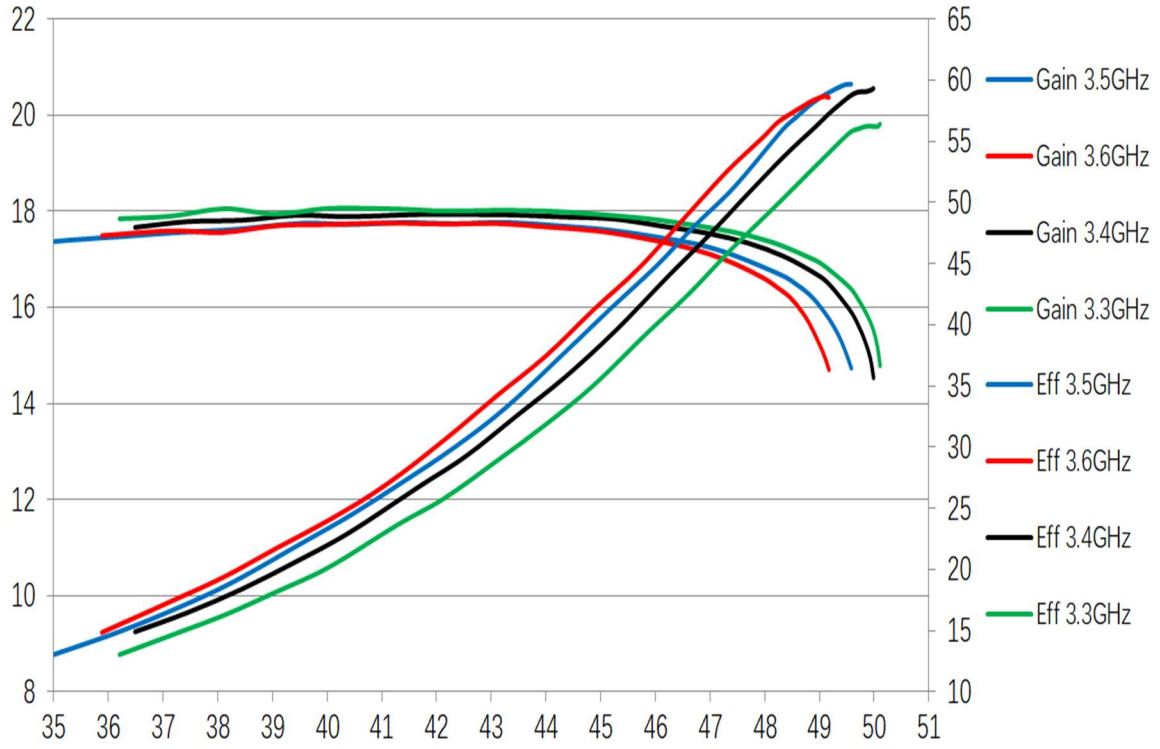



**Figure 3: Network plot for S11/S21**

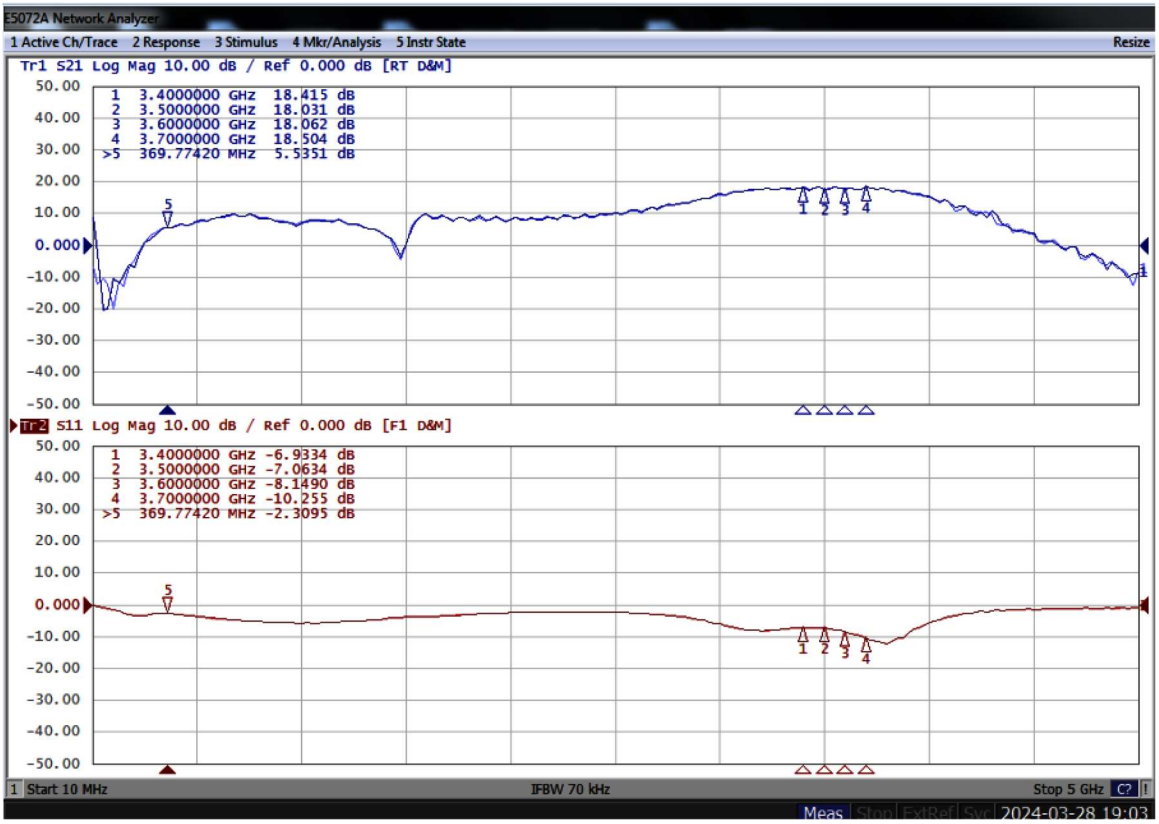



**Figure 4: Picture of application board of 3.3-3.6GHz**

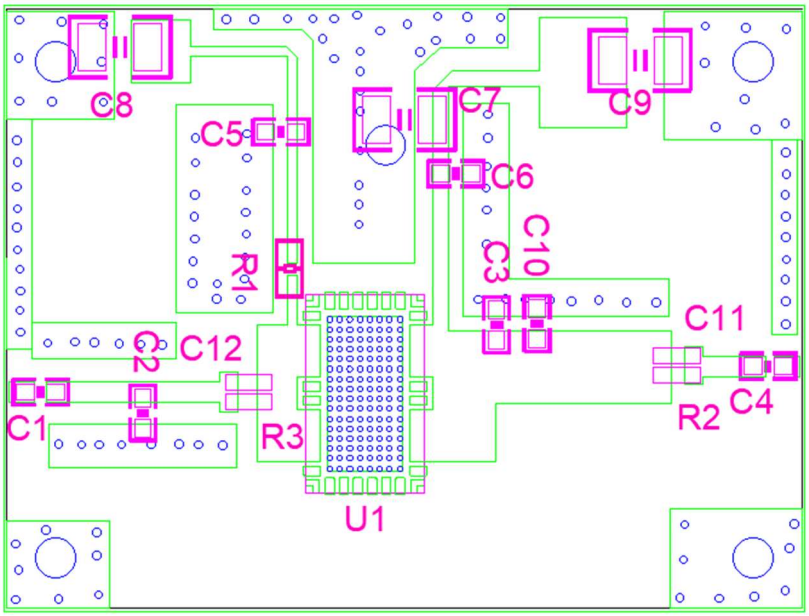



**Table 4. Bill of materials of application board (PCB layout upon request)**

| Part | Quantity | Description | Part Number | Manufacture |
|---|---|---|---|---|
| C1,C4,C5,C6 | 4 | 8.2pFHigh Q Capacitor | 251SHS8R2BSE | TEMEX |
| C2 | 1 | 0.7pFHigh Q | 251SHS0R7BSE | TEMEX |

| | | | | |
|---|---|---|---|---|
| | | Capacitor | | |
| C3 | 1 | 0.5pFHigh Q Capacitor | 251SHS0R5BSE | TEMEX |
| C10 | 1 | 0.2pFHigh Q Capacitor | 251SHS0R2BSE | TEMEX |
| C11,C12 | 2 | 3.9pFHigh Q Capacitor | 251SHS3R9BSE | TEMEX |
| | | | | |
| C7,C8,C9 | 3 | 10uF MLCC | GRM32EC72A106ME05 | Murata |
| R1 | 1 | 10Ω Power Resistor | ESR03EZPF100 | ROHM |
| R2,R3 | 2 | 51Ω Power Resistor | 0805 | ROHM |
| U1 | 1 | 80W GaN Transistor | STAV38080C6 | Innogration |

## 3.4-3.8GHz

**Figure 5: Efficiency and power gain as function of Pout (**Measured on 3.3-3.6GHz application board)

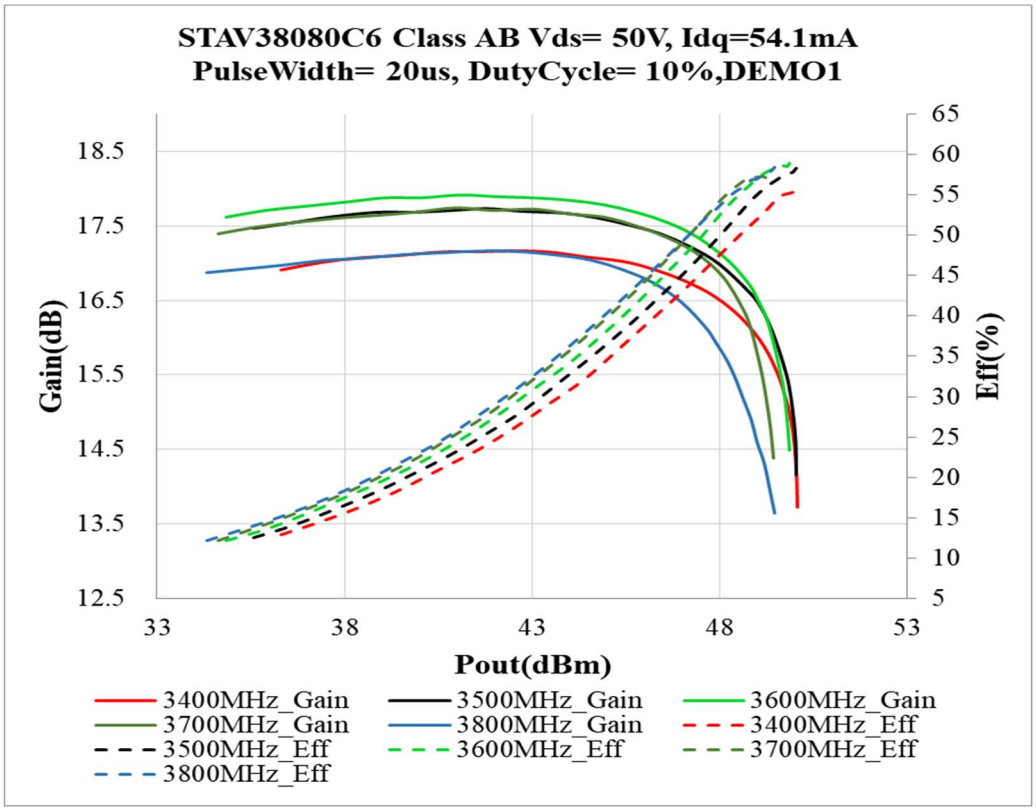


**Figure 6: Network plot for S11/S21**

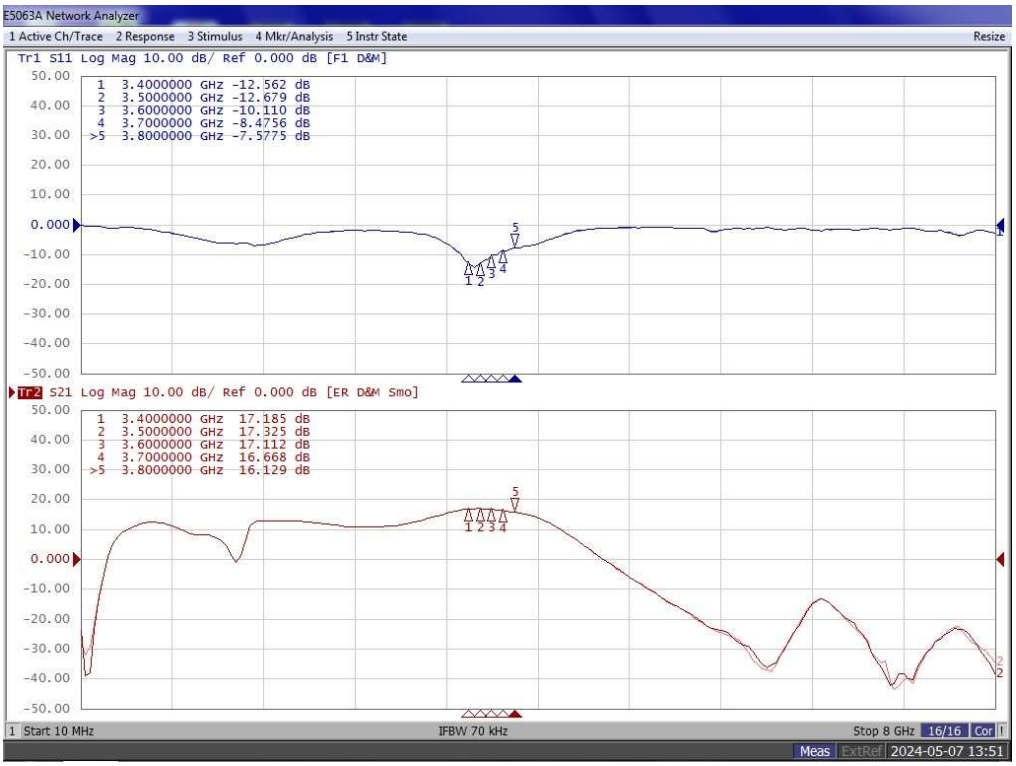



**Figure 7: Picture of application board of 3.4-3.8GHz**

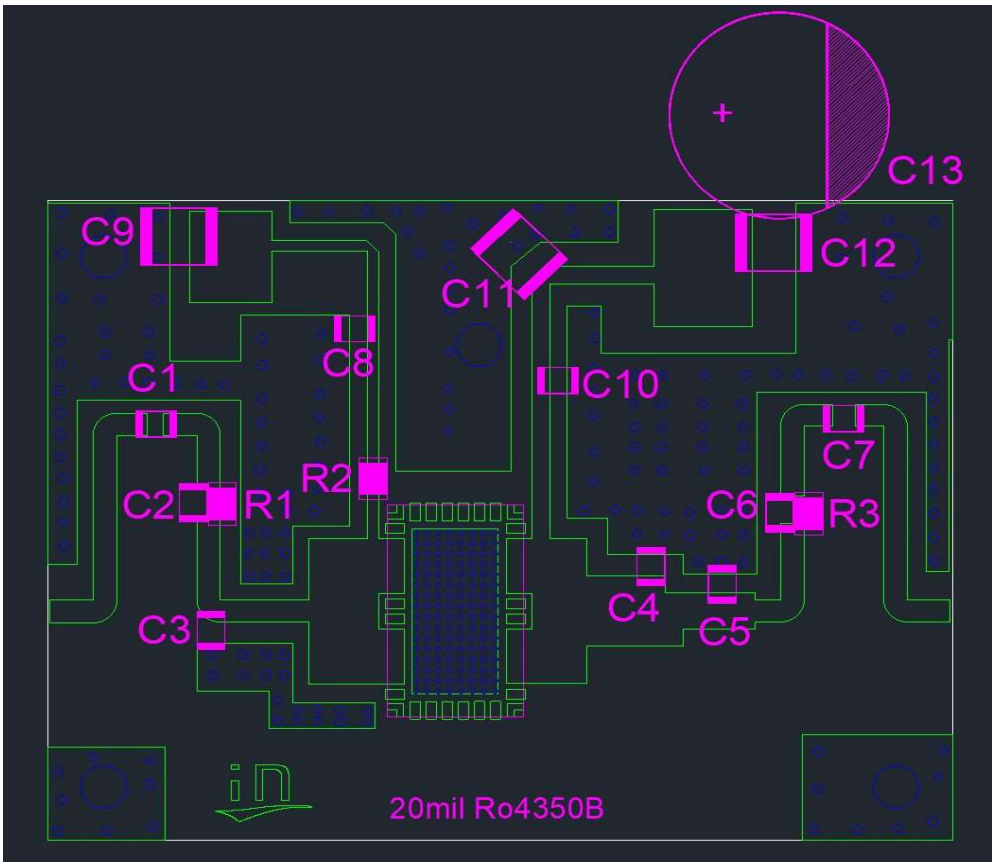
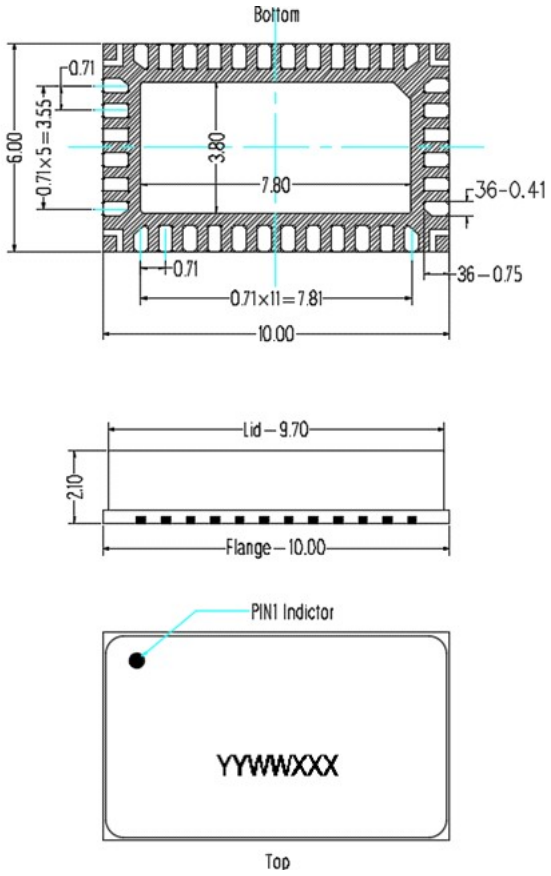


**Table 5. Bill of materials of application board (PCB layout upon request)**

| Component | Value | Quantity |
|---|---|---|
| U1 | STAV38080C6 | 1 |
| C1 | 3.3pF | 1 |
| C2、C6、C7、C8、C10 | 8.2pF | 5 |
| C3 | 0.8pF | 1 |
| C4 | 0.6pF | 1 |
| C5 | 0.5pF | 1 |
| C9、C11、C12 | 10uF | 3 |
| C13 | 470uF/63V | 1 |
| R1、R2、R3 | 10Ω | 3 |

# Package Dimensions

**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 |
|---|---|---|
| 2024/3/29 | V1.0 | Preliminary Datasheet Creation from STBV38081C6 ,due to thermal optimization |
| 2024/4/11 | V1.1 | Add 3.4-3.8GHz application data |
| 2024/5/11 | V1.2 | Modify 3.4-3.8G Application data by RC network to decrease LF gain |

**Application data based on: HJ-21-07/Light-21-43/ZYX-24-03/LWH-24-11/ZYX-24-31/CWZ-24-7**

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