

SX3040RVP GaN TRANSISTOR

Document Number: SX3040RVP
Preliminary Datasheet V1.3

Gallium Nitride 50V, 400W, RF Power Transistor

Description

The SX3040RVP is a 400-watt, unmatched GaN HEMT in form of push-pull configuration, designed for general purposes and wide band amplifier applications with frequencies from HF to 2GHz. There is no guarantee of performance when this part is used in applications designed outside of these frequencies.



• Typical Performance (On Innogrations broadband application board):

$I_{DQ} = 150 \text{ mA, CW}$

| Freq(MHz) | Drain Voltage(V) | Psat(W) | Gain(dB) | Eff(%) |
|-----------|------------------|---------|----------|--------|
| 225-512 | 50 | 360-400 | >19 | 68~76 |
| 500-800 | 50 | 380-420 | >18 | 68~75 |
| 400-680* | 48 | 400-500 | >19 | 62~80 |

*Back off linearity optimized

Applications and Features

- Suitable for wireless communication infrastructure, wideband amplifier, EMC testing, ISM etc.
- High Efficiency and Linear Gain Operations
- Thermally Enhanced Industry Standard Package
- High Reliability Metallization Process
- Excellent thermal Stability and Excellent Ruggedness
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

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 (50V)
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 | Vdc |
| Operating Voltage | V_{DD} | 0 to 55 | Vdc |
| Maximum forward gate current | I_{gf} | 50 | mA |
| Storage Temperature Range | T_{stg} | -65 to +150 | C |
| Case Operating Temperature | T_C | -55 to +150 | C |
| Operating Junction Temperature | T_J | +225 | C |

Table 2. Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|-----------------|-------|------|
| Thermal Resistance, Junction to Case $T_C = 85^\circ\text{C}, T_J = 200^\circ\text{C}, \text{DC Power Dissipation, FEA}$ | $R_{\theta JC}$ | 0.7 | C/W |

Table 3. Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

DC Characteristics

| Characteristic | Conditions | Symbol | Min | Typ | Max | Unit |
|--------------------------------|---|-----------|-----|-----|-----|------|
| Drain-Source Breakdown Voltage | $V_{GS} = -8\text{V}; I_{DS} = 50\text{mA}$ | V_{DSS} | | 200 | | V |

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| | | | | | | |
|------------------------|--|--------------|----|-------|----|---|
| Gate Threshold Voltage | $V_{DS} = 10V, I_D = 50mA$ | $V_{GS(th)}$ | -4 | - | -3 | V |
| Gate Quiescent Voltage | $V_{DS} = 50V, I_{DS} = 200mA,$ Measured in Functional Test | $V_{GS(Q)}$ | | -3.12 | | V |

225-512MHz

Figure 2. Network analyzer output S11/S21 $V_{DS} = 50V$ $I_{DQ} = 300mA$

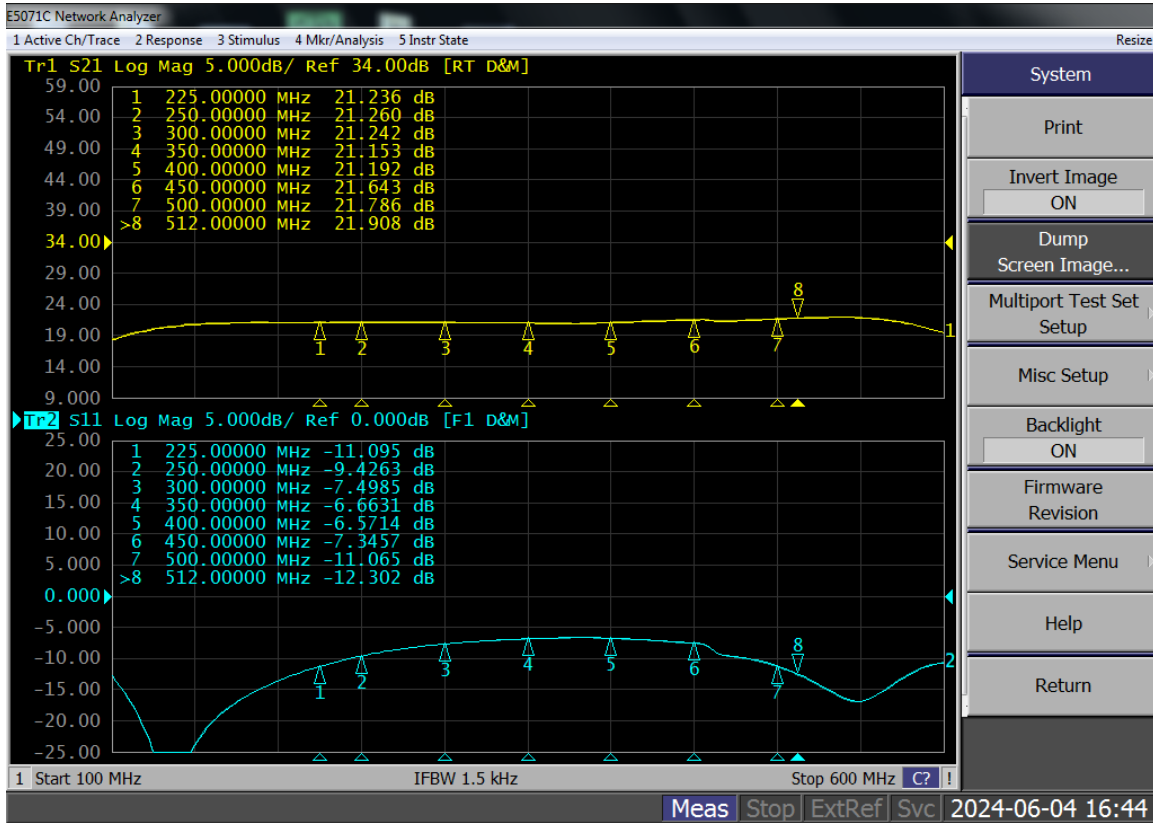
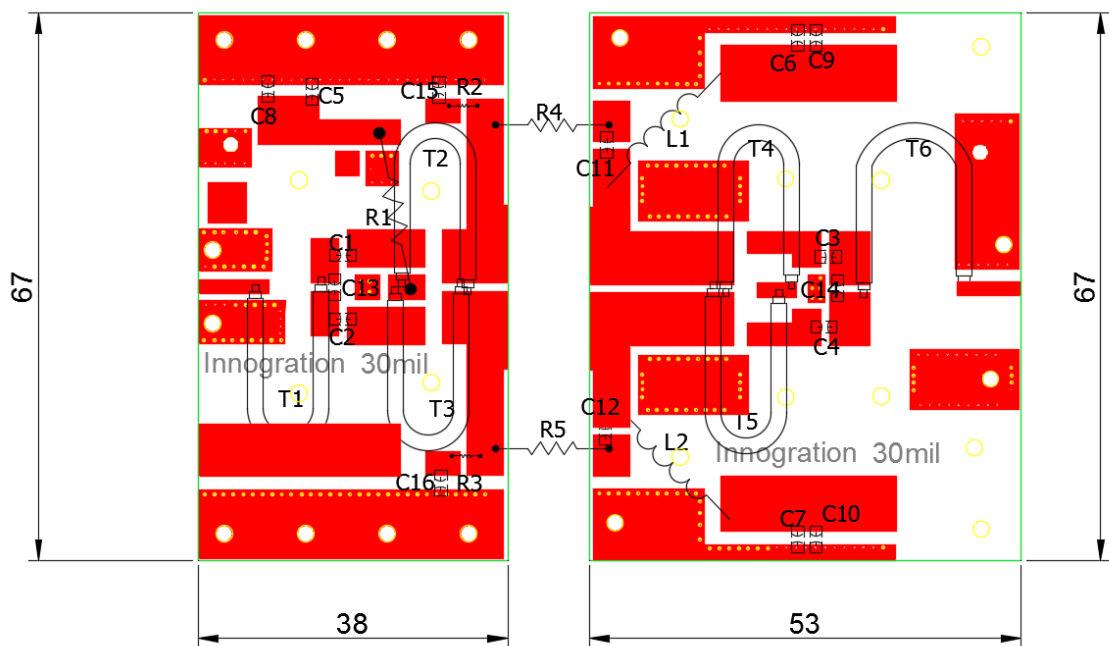


Figure 3. Test Circuit Component Layout



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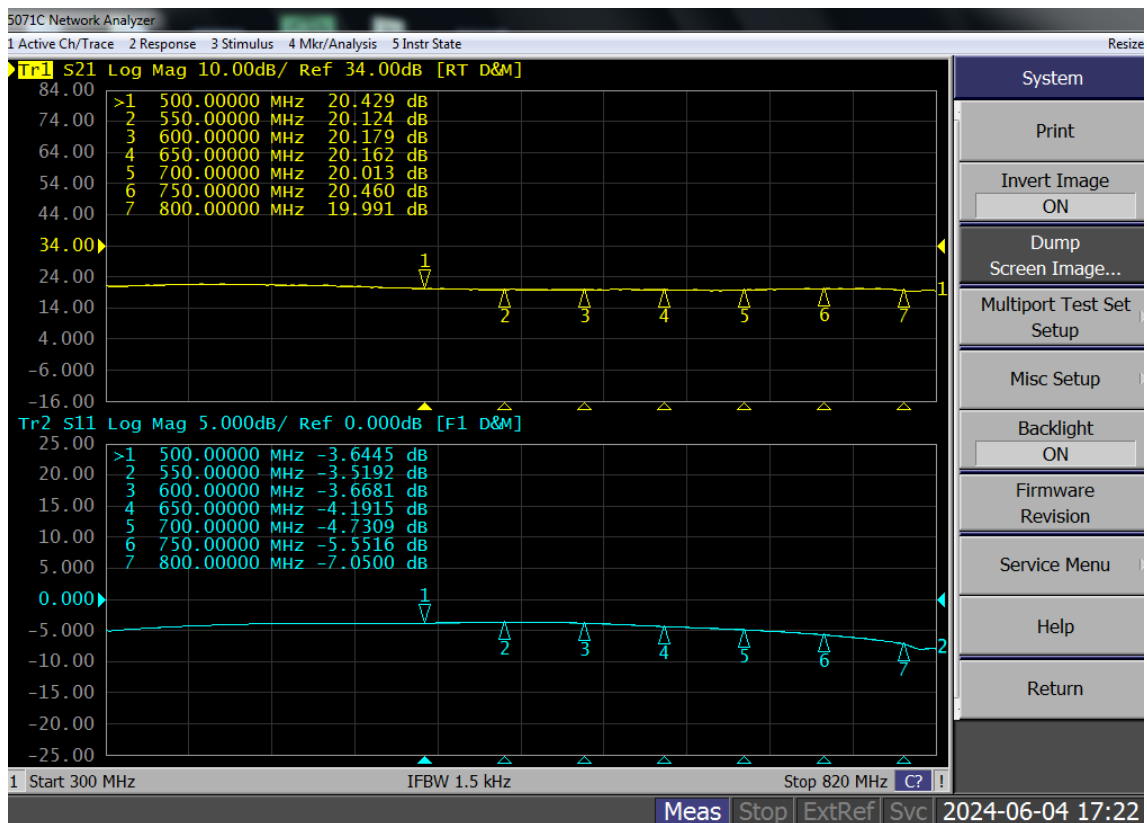
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Table 4. Test Circuit Component Designations and Values

| Component | Description | Suggestion |
|-----------------|-------------------------|------------------------------|
| C1~C7 | 200pF | MQ301111 |
| C8~C10 | 10uF/100V | Ceramic Multilayer Capacitor |
| C11,C12,C15,C16 | 1000pF | MQ301111 |
| C13 | 5.1pF | MQ301111 |
| C14 | 2pF | MQ301111 |
| R1 | 470 Ω | plug-in resistor |
| R2,R3 | 10 Ω 1812 | Chip Resistor |
| R4,R5 | 470 Ω | plug-in resistor |
| T1,T6 | 50ohm 60mm | RFSFBU-086-50 |
| T2,T3 | 16.7ohm 60mm | SFF-16.7-1.5 |
| T4,T5 | 25ohm 60mm | SFF-25-1.5 |
| L1,L2 | d=1.5mm, D=3mm, 2 turns | DIY |
| PCB | 30Mil Rogers4350 | |

500-800MHz

Figure 4. Network analyzer output S11/S21 VDS=50V IDQ=300mA



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Figure 5. Test Circuit Component Layout

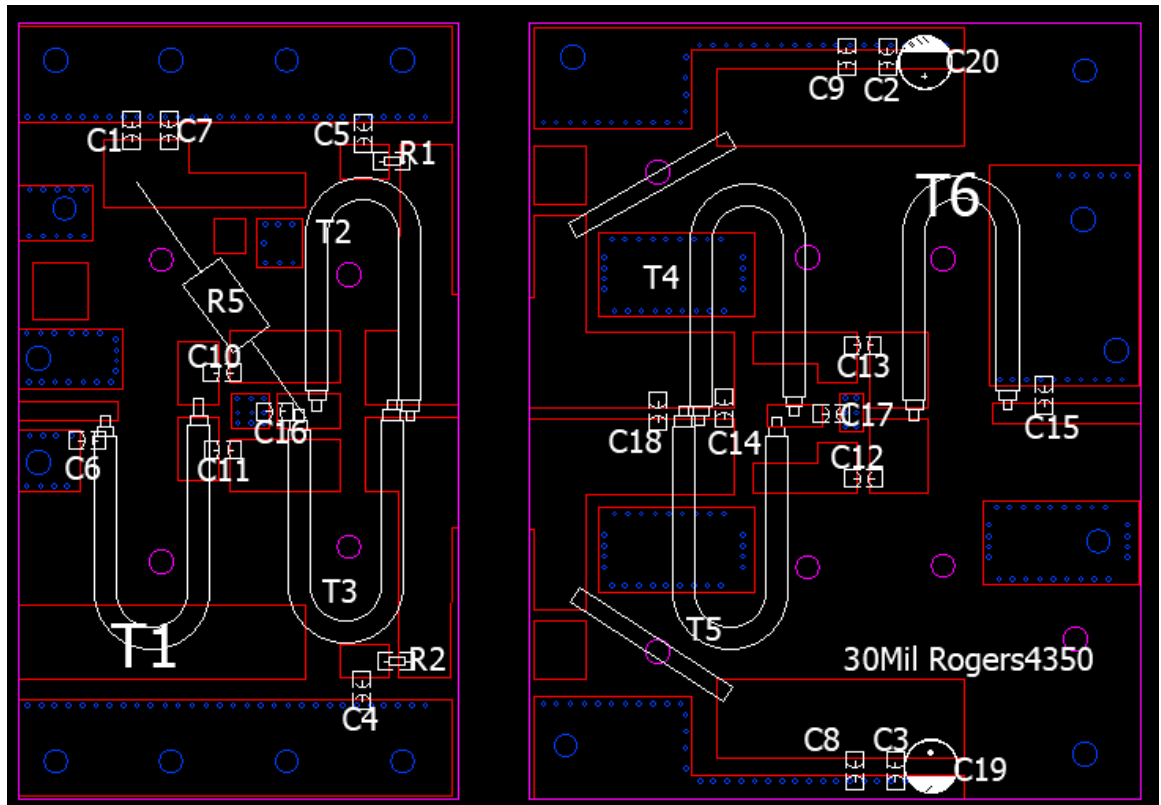


Table 5. Test Circuit Component Designations and Values

| Component | Description | Suggestion |
|-----------|------------------|------------------------|
| C1~C5 | 10uF | 10uF/100V |
| C6~C9 | 910pF | MQ101111 |
| C10,C11 | 39pF | MQ101111 |
| C12,C13 | 150pf | MQ101111 |
| C14 | 3pF | MQ101111 |
| C15 | 0.5pF | MQ101111 |
| C16,C17 | 560pF | MQ101111 |
| C18 | 2.4pF | MQ101111 |
| C19,C20 | 4700uF/50V | Electrolytic Capacitor |
| R1,R2 | 10 Ω | Chip Resistor |
| T1 | 50 ohm, 60mm | RFSFBU-086 |
| T2,T3 | 16.7 ohm, 60mm | SFF-16.7-1.5 |
| T4,T5 | 25 ohm, 60mm | SFF-25-1.5 |
| T6 | 50 ohm, 50mm | RFSFBU-086 |
| PCB | 30Mil Rogers4350 | |

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400-680MHz

Figure 6. Network analyzer output S11/S21 VDS=50V IDQ=600mA

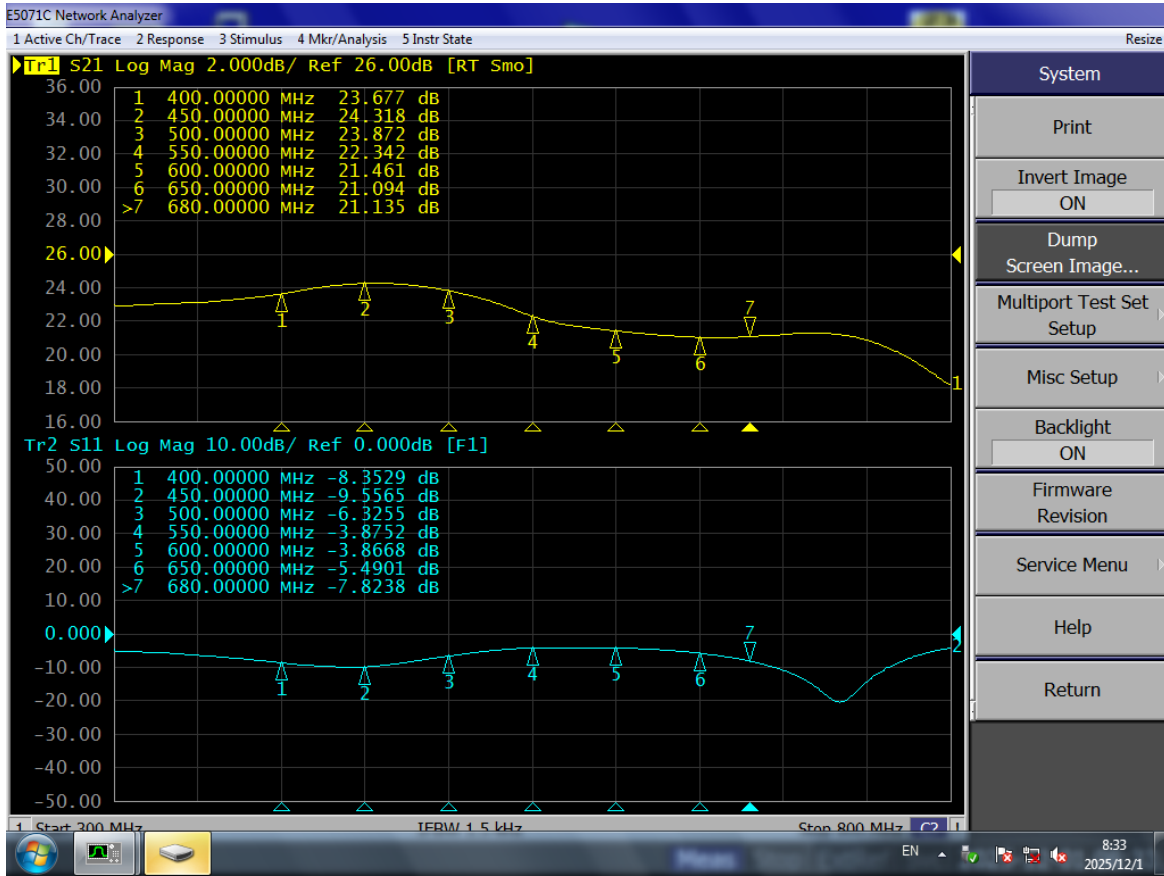
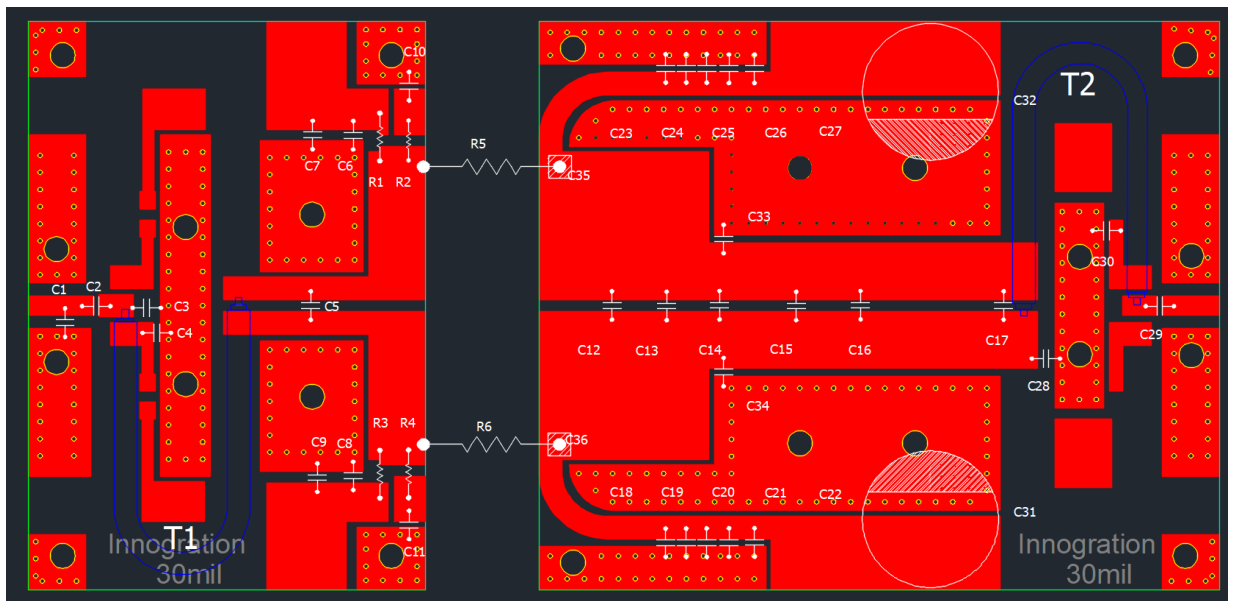


Figure 7. Test Circuit Component Layout



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Table 6. Test Circuit Component Designations and Values

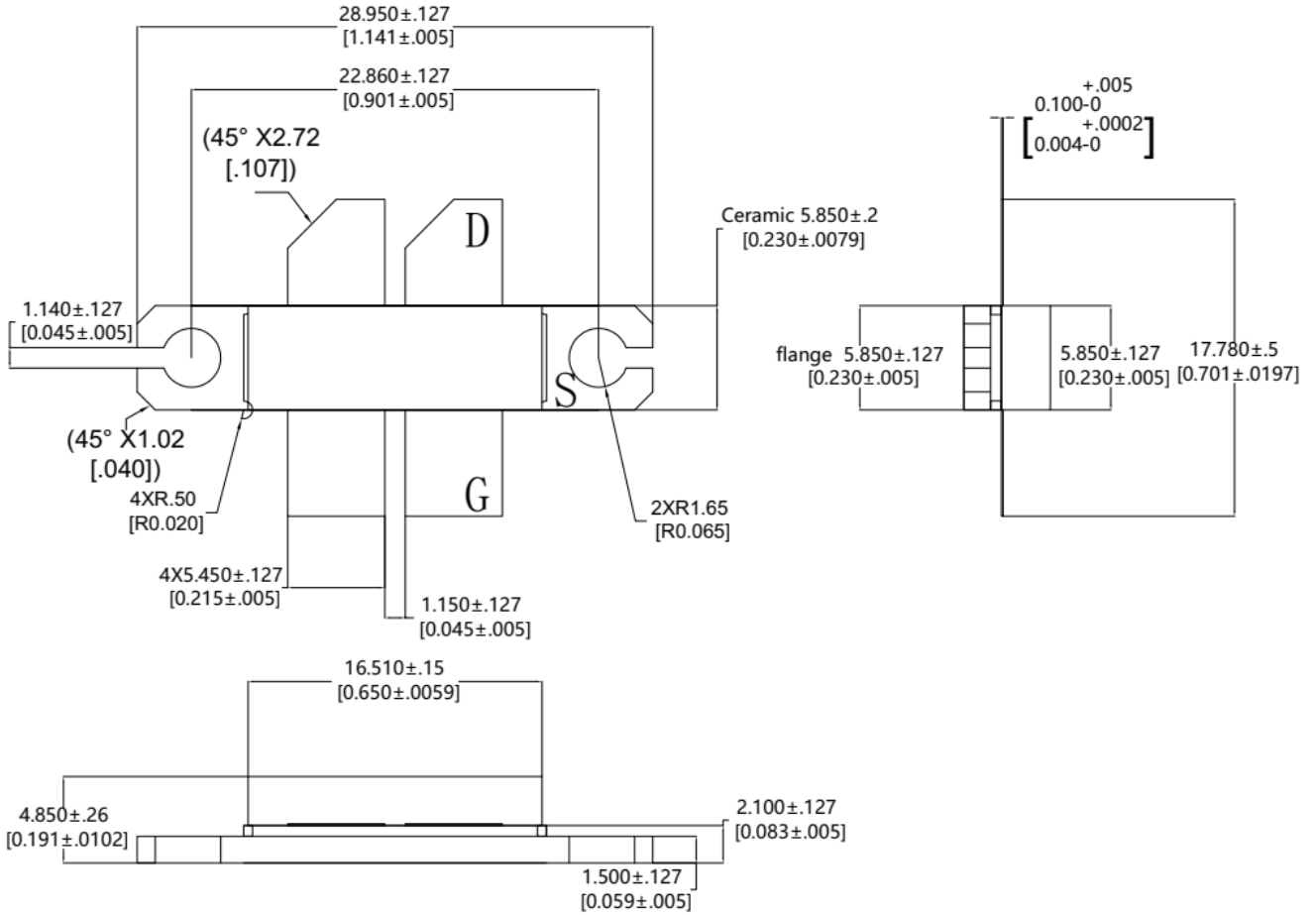
| Component | Description | Suggestion |
|--------------------------------------|-------------------------|------------------------------|
| C7,C9~C11,C35~C36 C20~C22,C25~C27 | 10uF/1210 | Ceramic Multilayer Capacitor |
| C19,C24 | 10nF/1210 | Ceramic Multilayer Capacitor |
| C1,C3 | 2.7pF/MQ301111 | |
| C2,C29 | 220pF/MQ301111 | |
| C4,C30 | 100pF/MQ301111 | |
| C5 | 18pF/MQ301111 | |
| C6,C8 | 39pF/MQ301111 | |
| C12,C16 | 2.4pF/MQ301111 | |
| C13 | 2.0pF/MQ301111 | |
| C14,C15 | 4.8(3.3+1.5)pF/MQ301111 | |
| C17 | 1.2pF/MQ301111 | |
| C28 | 1.5pF/MQ301111 | |
| C33,C34 | 3.0pF/MQ301111 | |
| C31,C32 | 2200uF/63V | Electrolytic capacitor |
| T1,T2 | 25ohm 65mm | SFRFBU-086-25 |
| R1~R4 | 18 Ω /1206 | Pulg-in Resistor |
| R5,R6 | 220 Ω /2W | Pulg-in Resistor |
| PCB | 30Mil Rogers4350 | |

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Package Outline

Flanged ceramic package; 2 mounting holes; 4 leads



| OUTLINE VERSION | REFERENCE | | | EUROPEAN PROJECTION | ISSUE DATE |
|--------------------|-----------|-------|-------|------------------------|------------|
| | IEC | JEDEC | JEITA | | |
| PKG-LB/LBB | | | | | 05/21/2021 |

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Revision history

Table 4. Document revision history

| Date | Revision | Datasheet Status |
|-----------|----------|--|
| 2022/8/5 | Rev 1.0 | Preliminary Datasheet (NX/SX shared) |
| 2023/5/5 | Rev 1.1 | Modify the upper limits of frequency to 2GHz |
| 2024/6/4 | Rev 1.2 | Modify the application with latest result |
| 2025/12/1 | Rev 1.3 | Add 400-680MHz application data |

Application data based on HL-22-32/24-20, TC-24-35, SYX-25-58

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