# Product Specification

## *RS1155 High Power SP5T*

## General Description

The RS1155 is a SP5T high power RF switch supporting wireless applications up to 3 GHz. It offers maximum power handling of 43 dBm continuous wave (CW). It delivers high linearity and excellent harmonics performance. No blocking capacitors are required if DC voltage is not present on the RF ports.

## Applications

- Wireless infrastructure
- Military and high reliability applications
- Test equipment
- Pin diode replacement
- Land Mobile Radio

## Features

- Dual mode operation: SP5T or SP3T
- Low insertion loss: 0.35 dB typical to 2 GHz
- High power handling at $T_{CASE}$ = 85°C,VDD=5V
  - CW power: 43 dBm
  - Peak power: 46 dBm
- High ESD
  - 2kV HBM on all pins
- Single positive supply: 5 V
- Positive control, CMOS/TTL compatible
- 32-leads, 5 mm × 5 mm QFN package

## Functional Block Diagram

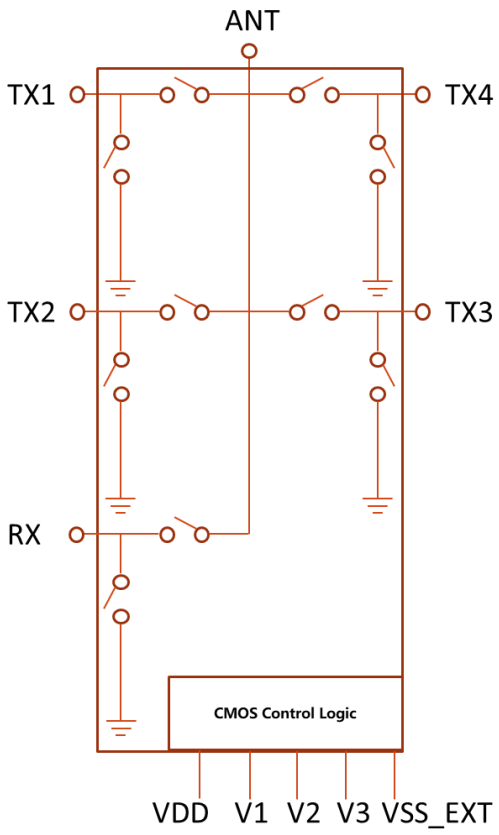



**Figure 1**

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## Absolute Maximum Ratings

**Table 1**

| Parameter | Min | Max | Units |
|---|---|---|---|
| VDD to GND | -0.3 | 5.5 | V |
| Vctrl to GND | -0.3 | 5.5 | V |
| VSS_EXT | -3.6 | 0 | V |
| Maximum Junction Temperature | | 120 | °C |
| Storage Temperature Range | -65 | 150 | °C |
| Lead Temperature (soldering, 10s) | | 260 | °C |
| ESD Voltage– HBM (Per JESD22-A114) | | Class 2 (2000V) | |
| ESD Voltage – CDM (Per JESD22-C101) | | Class IV (500V) | |

*Stresses above those listed above may cause permanent damage to the device. Functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

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## Recommended Operating Conditions

**Table 2**

| Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Supply Voltage | | 3 | | 5.25 | V |
| VSS_EXT*** | | -3.6 | | -3.2*** | V |
| Operating Temp Range | Case Temperature | -40 | | 85 | °C |
| RF Frequency Range | | 30 | | 3000 | MHz |
| Input CW Power, TX mode | 800MHz, VDD=5V | | | 43 | dBm |
| Input pulse Power, TX mode | 800MHz ,10%Pulse Signal(500us-50us),VDD=5V | | | 46 | dBm |
| Input CW Power, RX mode | 800MHz, VDD=5V | | | 30 | dBm |
| Input pulse Power, RX mode | 800MHz, 10%Pulse Signal(500us-50us),VDD=5V | | | 33 | dBm |

Note:***If better spur performance is required, an external negative voltage is recommended to be applied on VSS_EXT pin. Otherwise, VSS_EXT should be connected to ground

*Operation should be restricted to the limits in the Recommended Operating Conditions table. Operation between operating range maximum and absolute maximum for extended periods may reduce reliability.*

## Specification

Typical Application Circuit(No Match), Normal mode (VDD=5V), $T_C$ = +25°C, PCB board trace and connector losses are de-embedded unless otherwise noted.

**Table 3**

| Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| TX Insertion Loss | 30MHz | | 0.2 | | dB |
| | 1000MHz | | 0.28 | | |
| | 2000MHz | | 0.355 | | |
| RX Insertion Loss | 30MHz | | 0.48 | | dB |
| | 1000MHz | | 0.51 | | |
| | 2000MHz | | 0.62 | | |
| TX-TX Isolation | 30MHz | | 68 | | dB |
| | 1000MHz | | 43 | | |
| | 2000MHz | | 31 | | |
| TX-RX Isolation | 30MHz | | 70 | | dB |
| | 1000MHz | | 44 | | |
| | 2000MHz | | 33 | | |
| Return Loss (RFC) | 30MHz – 2000MHz | | -21 | | dB |
| Return Loss (RFX) | 30MHz – 2000MHz | | -22 | | dB |
| Input 0.1dB Compression | 700MHz | | 45.5 | | dBm |
| Input IP2-TX | f1=2200MHz,f2=2300MHz@33dBm | | 120 | | dBm |
| Input IP3-TX | f1=1870MHz,f2=1990MHz@33dBm | | 79 | | dBm |
| 2nd and 3rd Harmonic (< 1.15:1 VSWR) | TX port, 40dBm Input Signal @ 700MHz | | -80 | | dBc |
| Switching Time-TX | 50% CTRL to 90% RF | | 3.7 | | us |
| | 50% CTRL to 10% RF | | 3.4 | | |
| Logic Input High Threshold | | 1.4 | | 5 | V |
| Logic Input Low Threshold | | -0.3 | | 0.6 | V |
| Logic Current | For each control pin | | 7 | | μA |
| DC Current (VDD) | 3.3V Logic | | 80 | | μA |

Note: Performance at 2-3GHz band can be tuned with external components.

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## Pin Diagram

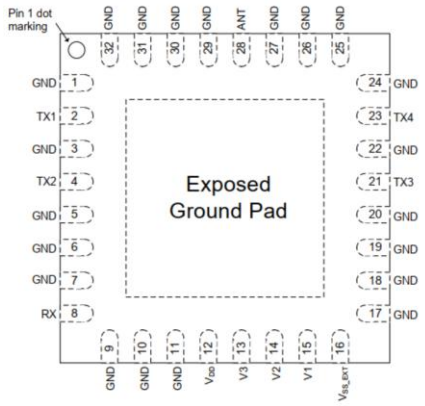



**Figure 2**

## Pin Description

**Table 4**

| Pin No. | Label | Description |
|---|---|---|
| 1, 3, 5–7, 9–11, 17–20, 22, 24–27, 29–32 | GND | Ground. |
| 2 | TX1 | Transmit pin 1 |
| 4 | TX2 | Transmit pin 2 |
| 21 | TX3 | Transmit pin 3 |
| 23 | TX4 | Transmit pin 4 |
| 28 | ANT | RF common port |
| 8 | RX | Receive pin |
| 12 | VDD | Positive power supply voltage. |
| 13 | V3 | Digital control logic input 3 |
| 14 | V2 | Digital control logic input 2 |
| 15 | V1 | Digital control logic input 1 |
| 16**** | VSS_EXT**** | External VSS negative voltage |

Note:****If better spur performance is required, an external negative voltage is recommended to be applied on VSS_EXT pin. Otherwise, VSS_EXT should be connected to ground

## Control Logic

**Table 5**

| Path | V3 | V2 | V1 |
|---|---|---|---|
| ALL OFF | L | L | L |
| ANT-TX1 | L | L | H |
| ANT-TX2 | L | H | L |
| ANT-TX1 and TX2 | L | H | H |
| ANT-RX | H | L | L |
| ANT-TX3 | H | L | H |
| ANT-TX4 | H | H | L |
| ANT-TX3 and TX4 | H | H | H |

## Application Circuit

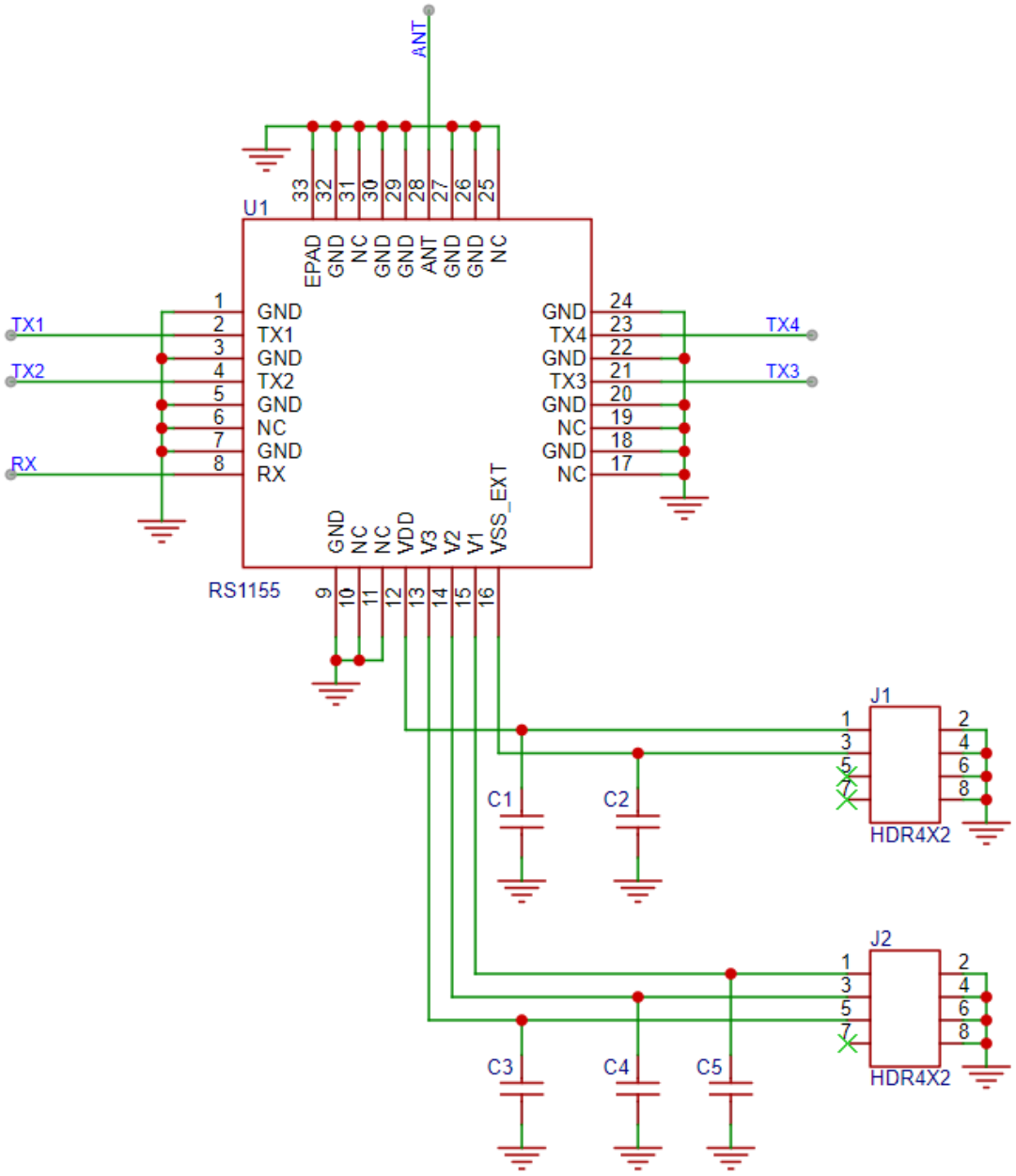



Figure 3

## Application Match to 3GHz

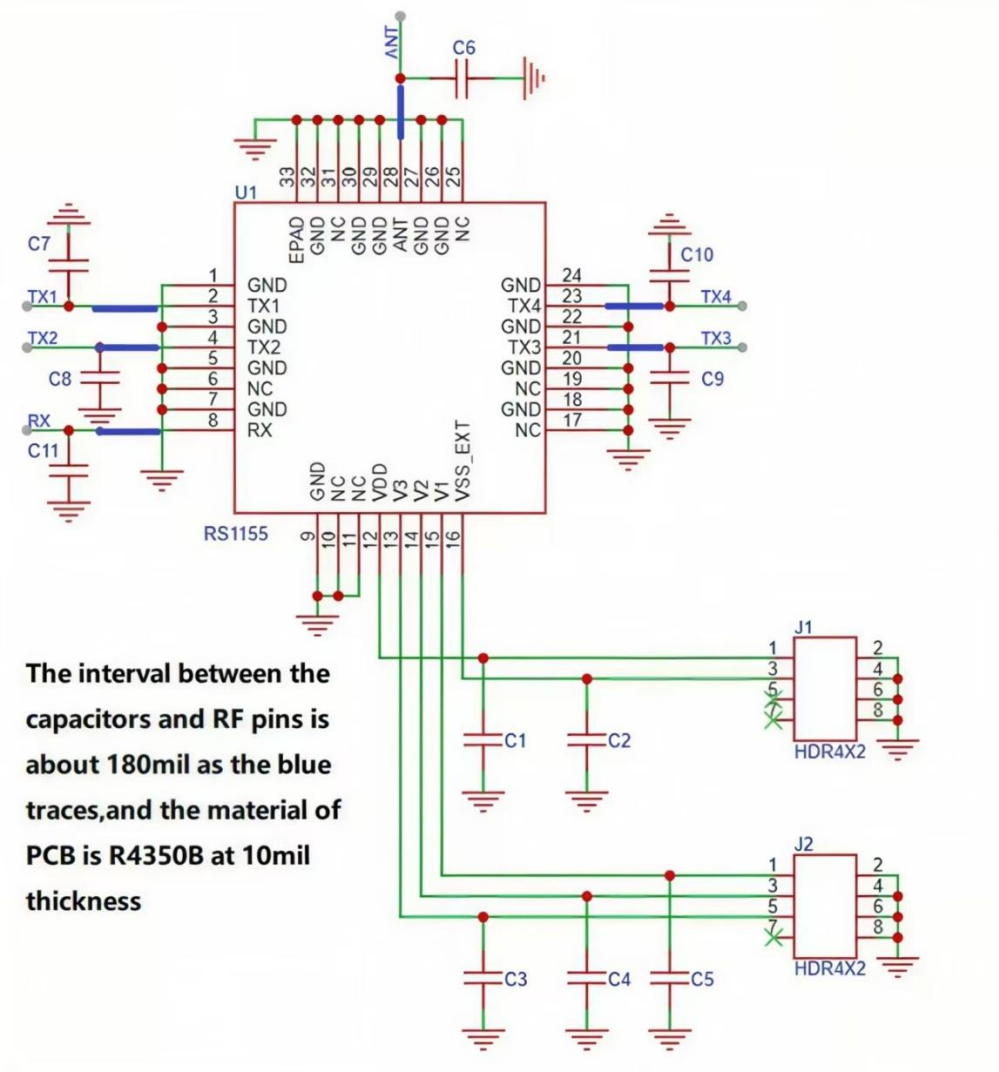



Figure 4

## BOM LIST

Table 6

| No. | Quantity | Part Lable | Value(No Match) | Value(Match to 3GHz) | Footprint |
|---|---|---|---|---|---|
| 1 | 1 | C1 | 100nF | 100nF | C0402 |
| 2 | 4 | C2,C3,C4,C5 | 100pF | 100pF | C0402 |
| 3 | 5 | C6,C7,C8,C9,C10 | NC | 0.5pF | C0402 |
| 4 | 2 | J1,J2 | | | HDR4X2 |
| 5 | 1 | U1 | RS1155 | | |

## Typical Performance Characteristics

Figure 5. TX Insertion Loss

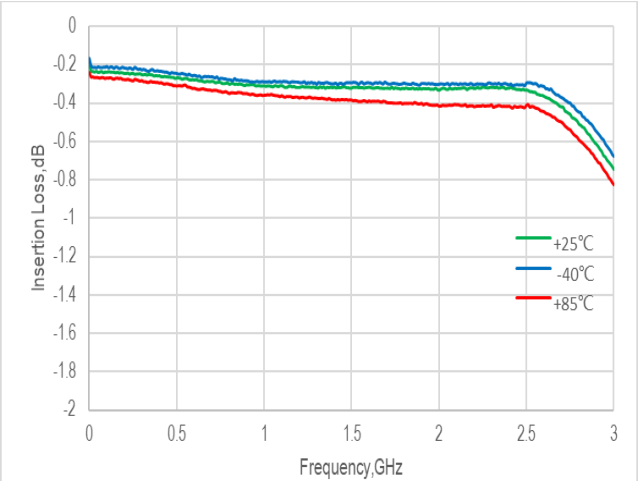



Figure 6. RX Insertion Loss

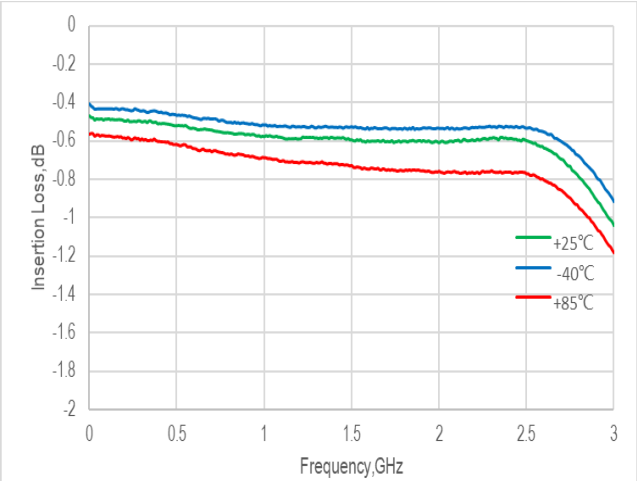



Figure 7. TX Return Loss

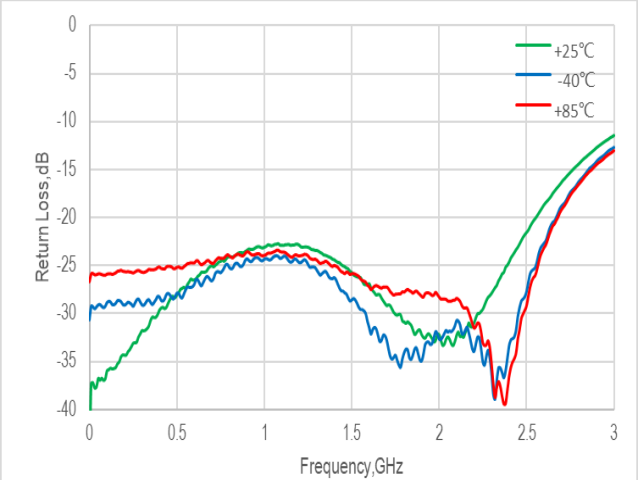



Figure 8. RX Return Loss

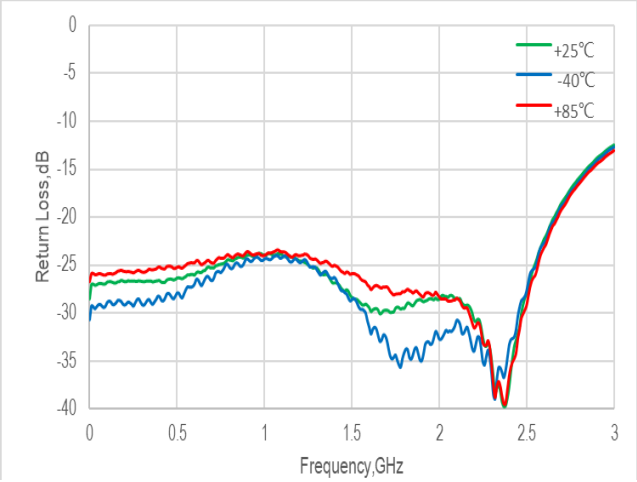



Figure 9. TX-TX Isolation

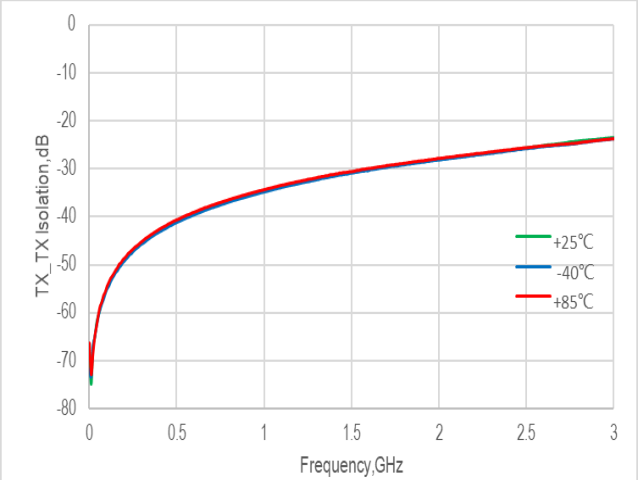
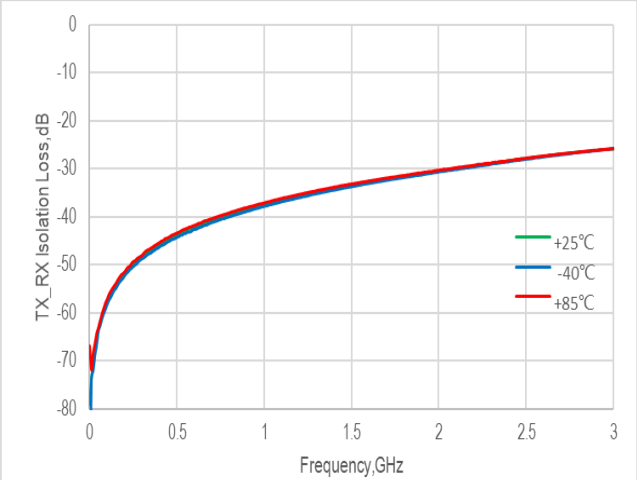



Figure 10. TX-RX Isolation



## Typical Performance Characteristics

Figure 11. Noise Figure

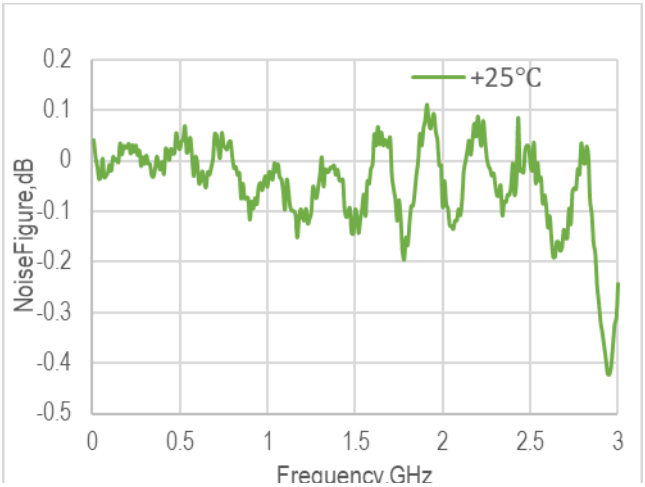



Figure 12. Spur_0.1GHz***

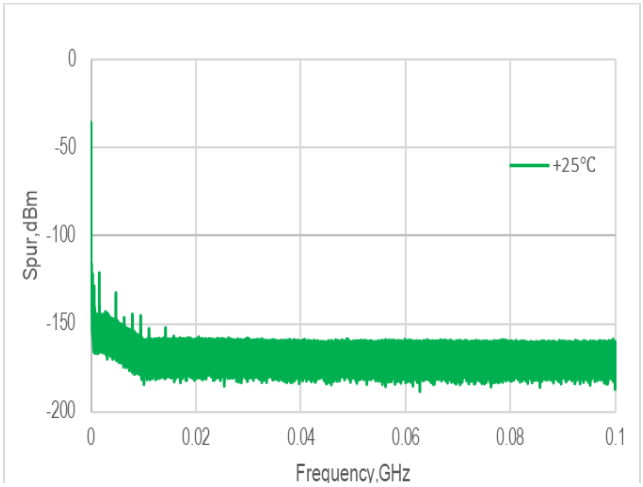



Figure 13. Spur 0.1_0.5GHz***

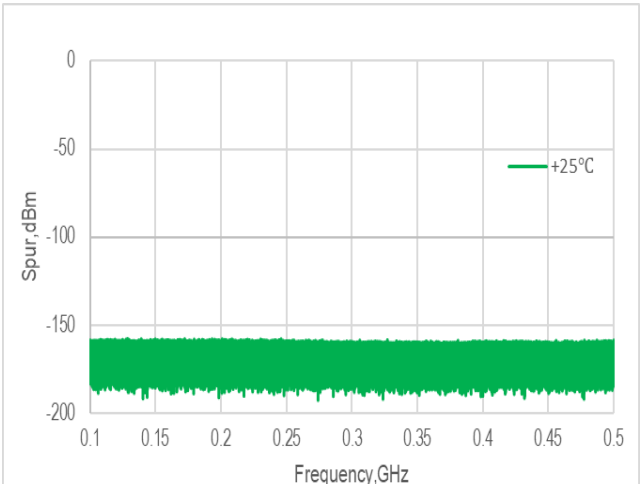
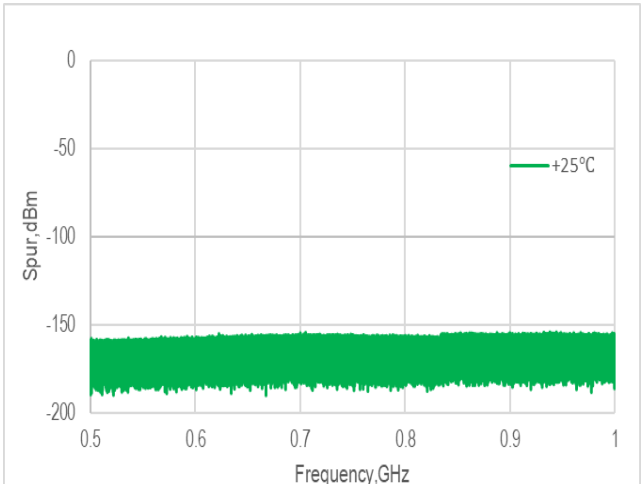
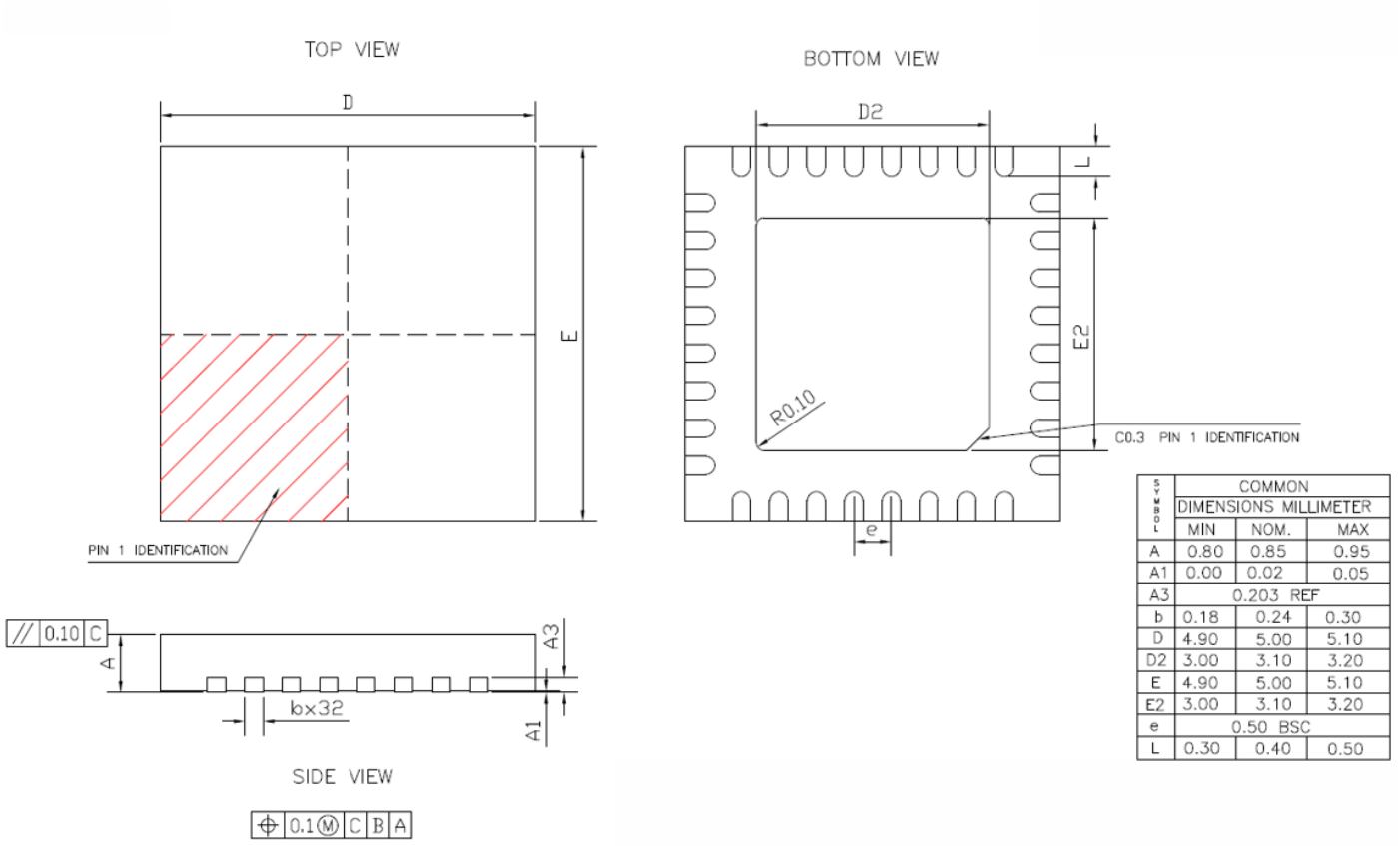



Figure 14. Spur 0.5_1GHz***




*Note:*** spur's test condition in noise floor:RBW=10Hz,VBW=1Hz*

## Package Drawing




| SYMBOL | COMMON DIMENSIONS MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM. | MAX |
| A | 0.80 | 0.85 | 0.95 |
| A1 | 0.00 | 0.02 | 0.05 |
| A3 | | 0.203 REF | |
| b | 0.18 | 0.24 | 0.30 |
| D | 4.90 | 5.00 | 5.10 |
| D2 | 3.00 | 3.10 | 3.20 |
| E | 4.90 | 5.00 | 5.10 |
| E2 | 3.00 | 3.10 | 3.20 |
| e | | 0.50 BSC | |
| L | 0.30 | 0.40 | 0.50 |

**Figure 15**

## Ordering Information

**Table 7**

| Order Code | Part Marking | Package | Shipping Method |
|---|---|---|---|
| RS1155-250 | 1155 | QFN5X5_32PIN | 250 units |
| RS1155-3000 | 1155 | QFN5X5_32PIN | 3000 units |

## Revision History

**Table 8**

| Revision Number | Revision Date | Description | Modifications |
|---|---|---|---|
| 0 | 2020/11/7 | Draft | — |
| 0.1 | 2020/12/8 | Initial release | |
| 0.2 | 2021/1/7 | Preliminary | Modify the format |
| 0.3 | 2021/8/15 | Preliminary | Add Plots. Update data |
| 0.4 | 2021/11/5 | Preliminary | Add Plots. Update data |
| 1.0 | 2023/1/29 | Released | |
| 1.1 | 2023/3/23 | Released | Modify table 4 |
| 1.3 | 2025/04/29 | Updata | Modify Package Drawing |

## Document Categories

### Advance Information

The product is in a formative or design stage. The datasheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

### Preliminary Specification

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### Product Specification

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