## 1. Description

- The M5303 is a 40W ($IP_{-0.1dB}$) wideband SPDT switch fabricated on GaN HEMT MMIC process. It operates over 5-13GHz with -28V or -40V control voltage.

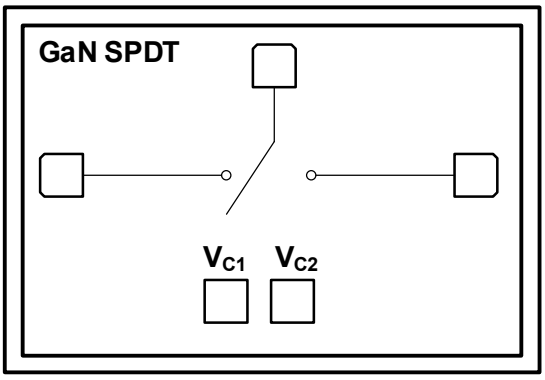



**Figure 1. M5303 Functional Block Diagram**

## 2. Applications

- TX/RX Modules

## 3. Features[1]

- Frequency Range: 5-13GHz
- Insertion Loss: 1.3dB
- Isolation: 30dB
- Input/Output Return Loss: -15dB
- Input Power ($IP_{-0.1dB}$): 46dBm (40W)
- Control Voltage: 0/-28V or 0/-40V
- Die Size: 1.78 x 1.78 x 0.08mm

[1] On-wafer Test

## 4. Brief Typical Performance

**Table 1. Brief Typical Performance**

| Parameter | 5-13GHz | Units |
|---|---|---|
| Insertion Loss | 1.3 | dB |
| Isolation | 30 | dB |
| Input/Output Return Loss | -15 | dB |
| Input Power for 0.1dB Compression | 46 | dBm |

- Test condition: Input signal Pulsed, Pulse width = 50μs, Duty cycle = 5%

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## 5. Recommended Operating Conditions

### Table 2. Recommended Operating Conditions

| Parameter | Min. | Typ. | Max. | Units |
|---|---|---|---|---|
| Operating Temperature Range | -55 | 25 | 125 | °C |
| Control Voltage, $V_{C1}/V_{C2}$ | - | 0/-28 or 0/-40V | - | V |

## 6. RF Characteristics ($T_C$ = 25˚C)

### Table 3. RF Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Insertion Loss | IL | - | -1.3 | - | dB |
| Isolation | ISO | - | 30 | - | dB |
| Input/Output Return Loss | $RL_{IN}$/ $RL_{OUT}$ | - | -15 | - | dB |
| Input Power for 0.1dB Compression | $IP_{-0.1dB}$ | - | 46 | - | dBm |

[1]. Test condition: Input signal Pulsed, Pulse width = 50μs, Duty cycle = 5%

# 7. Typical Performance Curve

## ■ Small-signal Characteristics Curve (25℃)

- **On-wafer test，$V_C$=0V/-28V**

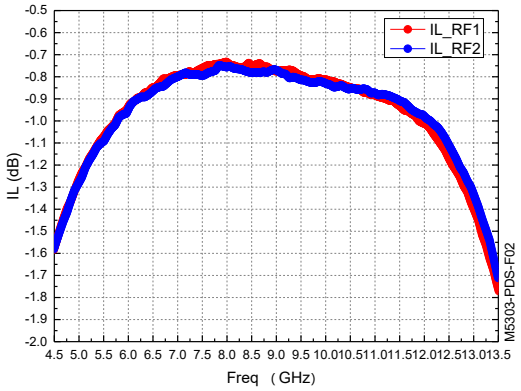



**Figure 2. Insertion Loss Characteristics**

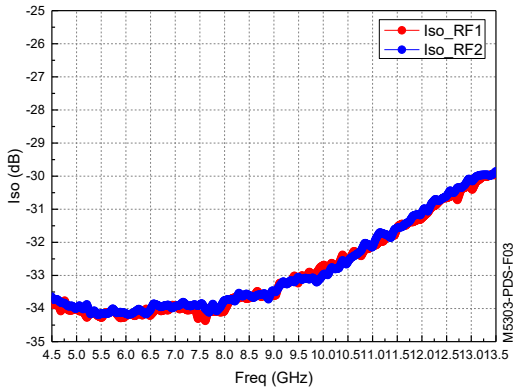



**Figure 3. Isolation Characteristics**

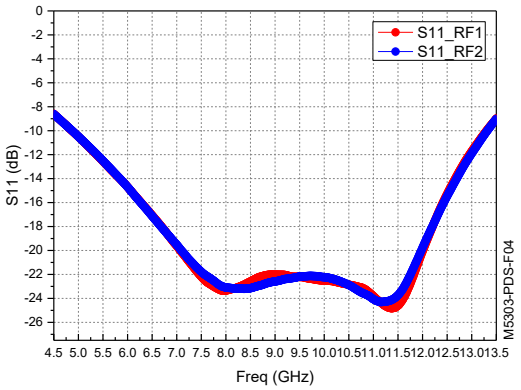



**Figure 4. Input Return Loss Characteristics**

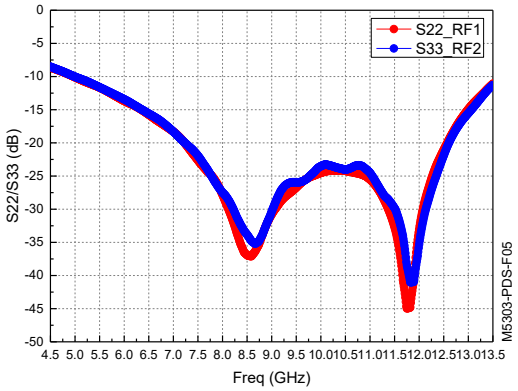



**Figure 5. Output Return Loss Characteristics**

- **On-wafer test，$V_C$=0V/-40V**

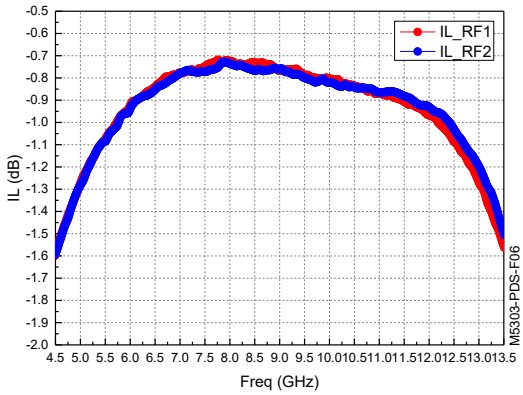



**Figure 6. Insertion Loss Characteristics**

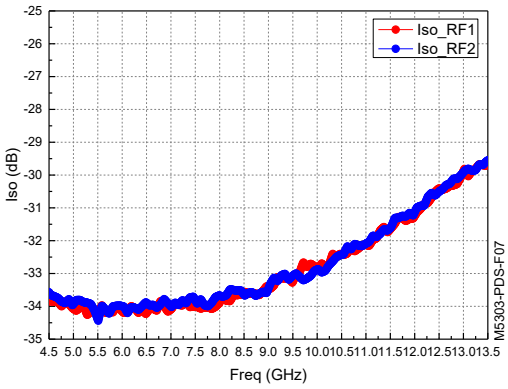



**Figure 7. Isolation Characteristics**

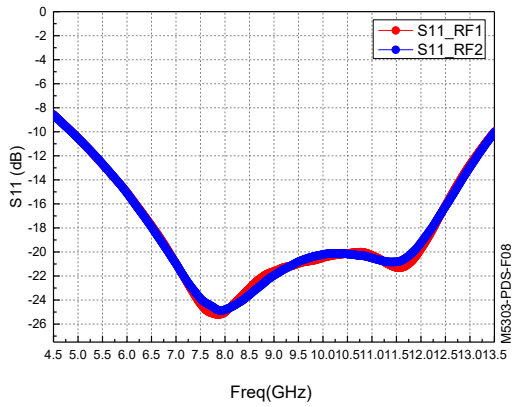



Figure 8. Input Return Loss Characteristics

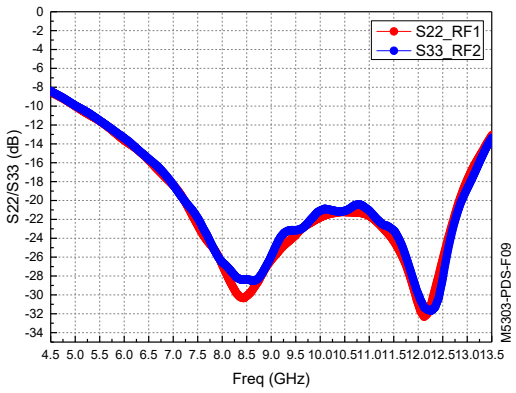



Figure 9. Output Return Loss Characteristics

## ■ Power Characteristic Curve (25℃)

- **On-Wafer Test，$V_C$=0V/-28V，50us Pulse width, 5% Duty cycle**

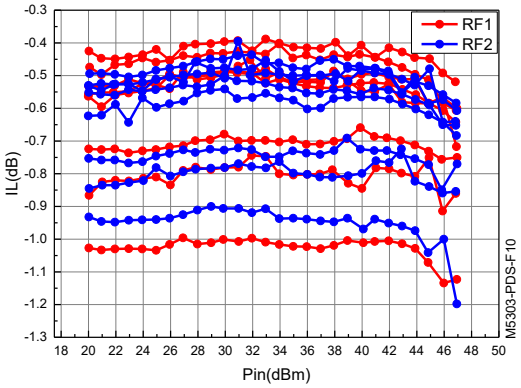



Figure 10. IL vs. $P_{in}$ Characteristics (Freq 6-13GHz，Step 1GHz)

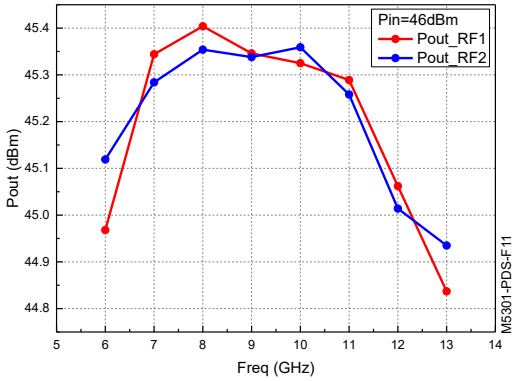



Figure 11. $P_{out}$ vs. Freq. ($P_{in}$=46dBm)

- **On-Wafer Test，$V_C$=0V/-40V，50us Pulse width, 5% Duty cycle**

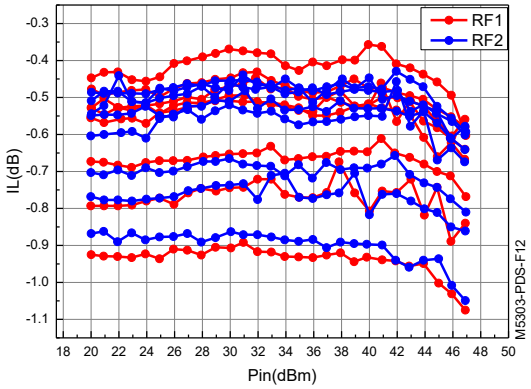



Figure 12. IL vs. $P_{in}$ Characteristics (Freq 6-13GHz，Step 1GHz)

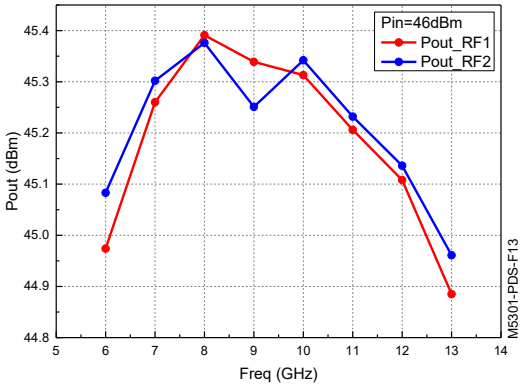
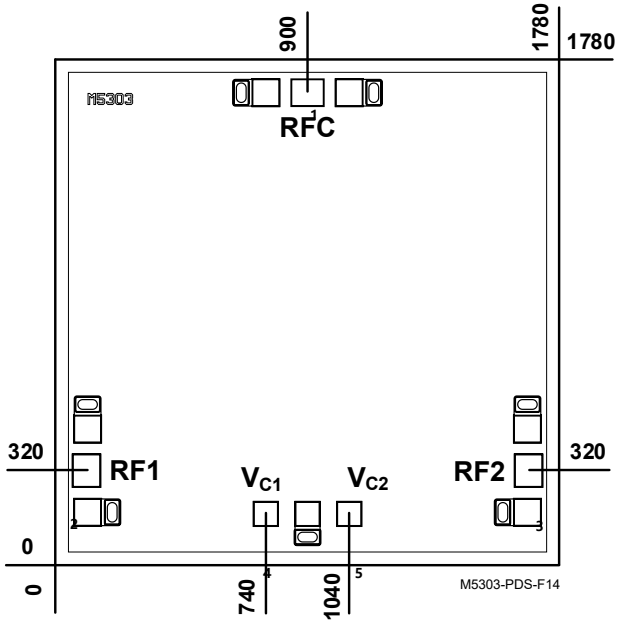



Figure 13. $P_{out}$ vs. Freq. ($P_{in}$=46dBm)

## 8. Outline Dimensions




- Dimensions shown in micrometre

**Figure 14. M5303 Outline Dimensions**

### Table 4. Pad Description

| Pad | Symbol | Description |
|---|---|---|
| 1 | RFC | RF Input |
| 2,3 | RF1/RF2 | RF Output 1 / RF Output 2 |
| 4,5 | $V_{C1}$/$V_{C2}$ | Control Voltage |

### Table 5. Truth Table

| $V_{C1}$ | $V_{C2}$ | RFC to RF1 | RFC to RF2 |
|---|---|---|---|
| -28V/-40V | 0V | ON | OFF |
| 0V | -28V/-40V | OFF | ON |

## 9. Assembly Information

### ■ Assembly Diagram

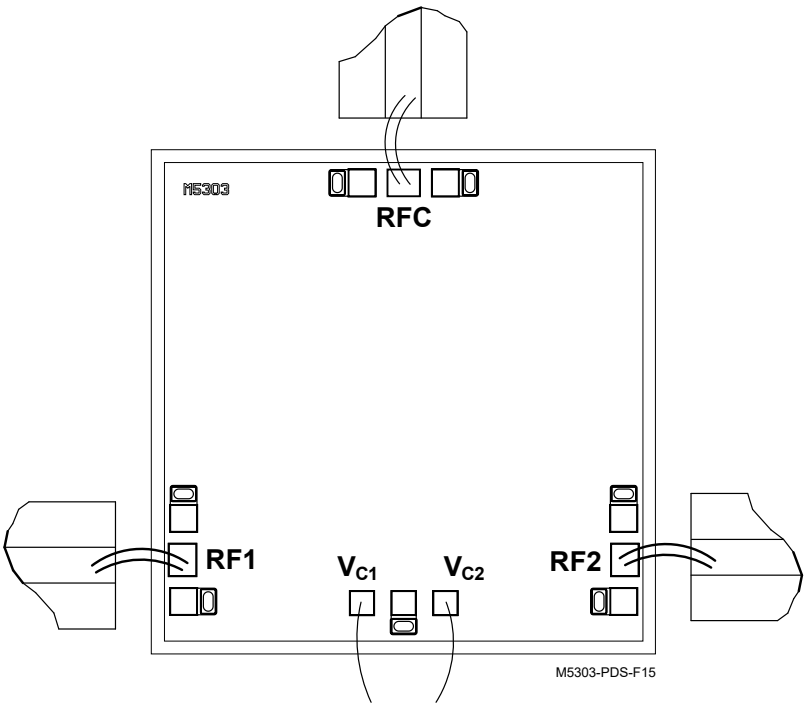



**Figure 15. M5303 Assembly Diagram**

- **Eutectic Die Attach:** It is best to use an 80% Au/20% Sn preform. Do not expose the chip to a temperature greater than 300°C for more than 30sec.
- **Wire Bonding:** RF bonds made with 1mil gold wire are recommended for the RF ports. Keep all bonds as short as possible, less than 0.35mm.

## 10. Handling Precautions

### ■ Storage

All bare dies ship in either Waffle or Gel Pak, which is an ESD protective container, and then sealed in an ESD protective bag. After opening the sealed ESD protective bag, all dies must be stored in a dry nitrogen environment.

### ■ Cleanliness

Handle the dies in a clean environment. Never use liquid cleaning systems to clean the dies.

### ■ ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore proper ESD precautions should be taken to avoid performance degradation or loss of functionality.



## 11. Contact Information

For the latest specifications, additional product information, technical support and sales support, please contact:

- **Email:** RF.support@raytrontek.com
- **Web:** www.raytrontek.com

## 12. Disclaimer

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