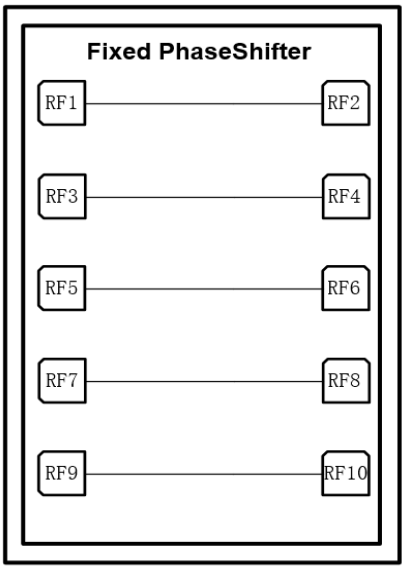
1. Description

- The M0078 is a fixed phase shifter fabricated on GaAs MMIC process. It operates over 5-13GHz and provides ±10° and ±20° phase shift, different phase shift bit can be achieved by connecting different ports through wire bonding. It provides phase error of 5° with an insertion loss less than 0.7dB and excellent power handling capability up to 10W.



M0078-PDS-F01

Figure 1. M0078 Functional Block Diagram

2. Applications

- Phased Array

3. Features[1]

- Frequency Range: 5-13GHz
- Insertion Loss: -0.7dB
- Input/Output Return Loss: -15dB
- Phase Error: ±5°
- Input/Output Impedance: 50Ohm
- Die Size: 1.7 x 1.1 x 0.10mm

[1] On-wafer Test

4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	5-13GHz	Units
Insertion Loss	-0.7	dB
Insertion Flatness	±0.2	dB
Input Return Loss	-15	dB
Output Return Loss	-15	dB
Phase Error	±5	°

- 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

6. RF Characteristics (T_C = 25°C)

Table 3. RF Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Frequencies	Freq.	5	-	13	GHz
Insertion Loss	IL	-	-	-0.7	dB
Insertion Loss Flatness	ΔIL	-	±0.2	-	dB
Input Return Loss	RL_{IN}	-	-15	-	dB
Output Return Loss	RL_{OUT}	-	-15	-	dB
Phase Error	RMS (°)			±5	°

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

7. Typical Performance Curve

■ Small-signal Characteristics Curve

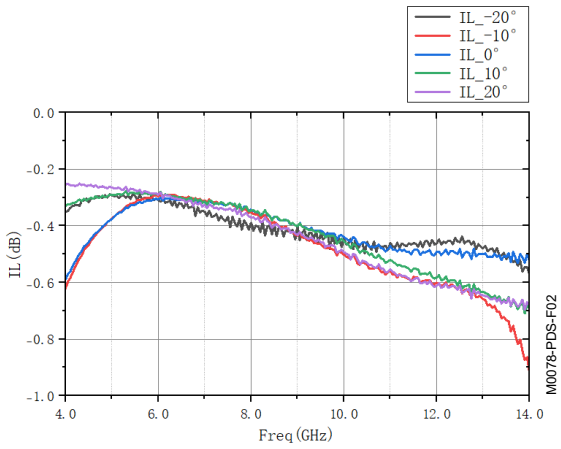


Figure 2. Insertion Loss Characteristics

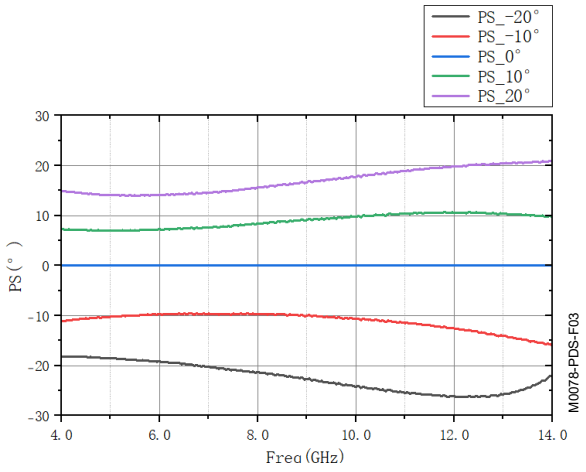


Figure 3. Phase Shift Characteristics

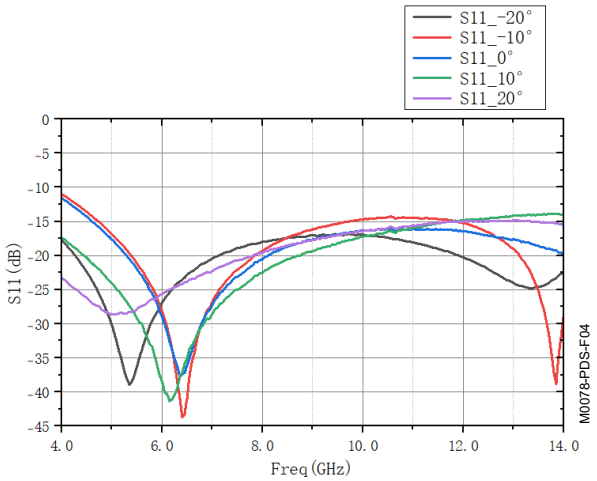


Figure 4. Input Return Loss Characteristics

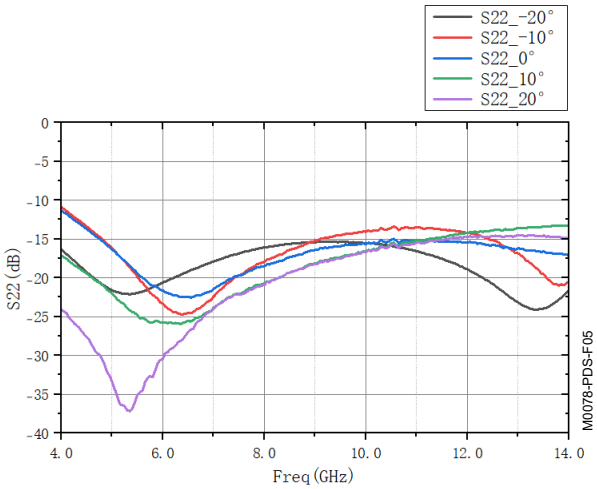
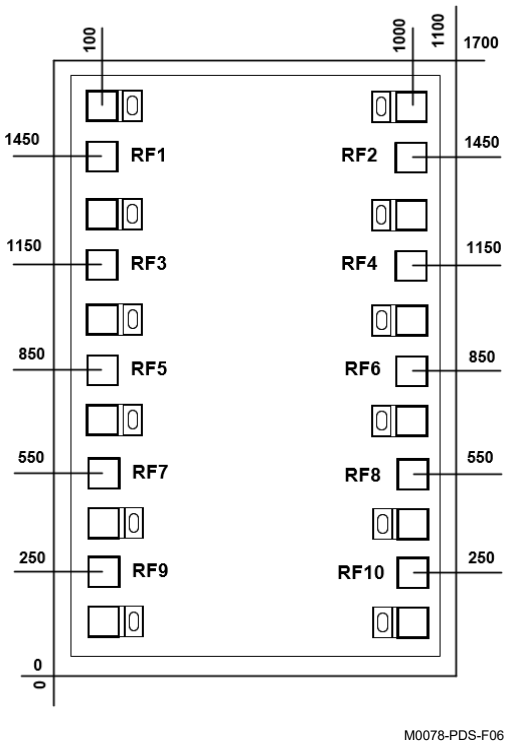


Figure 5. Output Return Loss Characteristics

8. Outline Dimensions



- Dimensions shown in micrometre

Figure 6. M0078 Outline Dimensions

Table 4. Pad Description

Pad	Symbol	Description
1	RF1, RF2	-20° Phase Shift RF Input/Output
2	RF3, RF4	-10° Phase Shift RF Input/Output
3	RF5, RF6	Phase Shift Ground State RF Input/Output
4	RF7, RF8	10° Phase Shift RF Input/Output
5	RF9, RF10	20° Phase Shift RF Input/Output

9. Assembly Information

■ Assembly Diagram

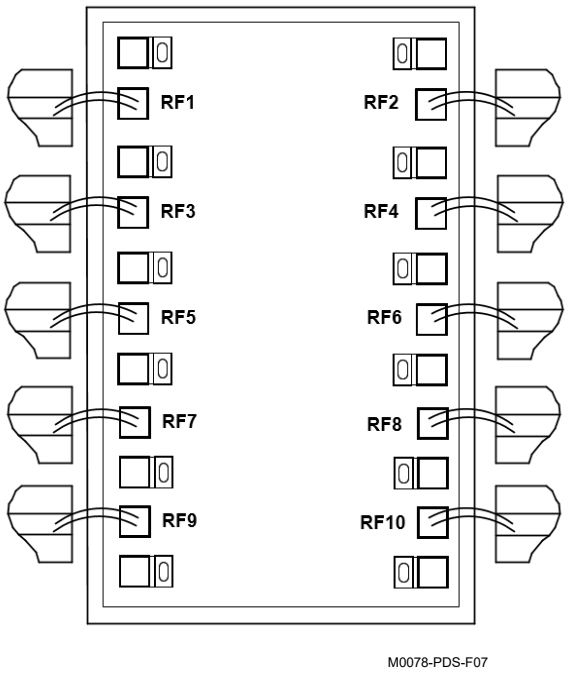


Figure 7. M0078 Assembly Diagram

- **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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