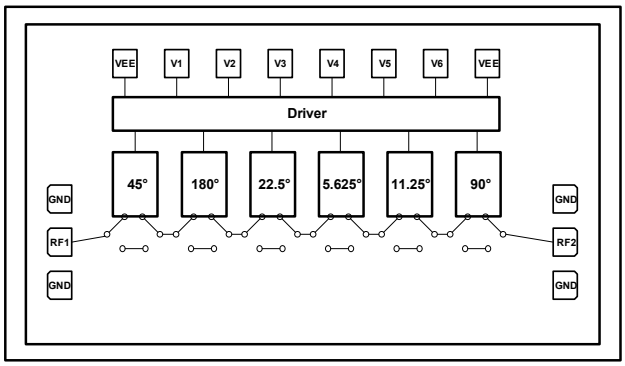
1. Description

- The M0055 is a 6-bit digital phase shifter fabricated on GaAs MMIC process. It operates over 0.35-2GHz and provides 360° of phase coverage with a LSB of 5.625°. It also achieves a low RMS phase error of 4.5° and RMS amplitude error of 1.5dB, with an insertion loss less than 10dB.



M0055-PDS-F01

Figure 1. M0055 Functional Block Diagram

2. Applications

- TX/RX Modules
- Radar
- Defense

3. Features[1]

- Frequency Range: 0.35 - 2GHz
- 6-Bit Digital Phase Shifter
- 360°Coverage with a LSB of 5.625°
- Insertion Loss: -10dB
- Input/Output VSWR: 1.8
- RMS Phase Error: 4.5°
- RMS Amplitude Error: 0.7dB
- Control Voltage: 0/+5V
- Die Size: 5 x 4 x 0.08mm

[1] On-wafer Test

4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	0.35-2GHz	Units
Insertion Loss	-10	dB
Input/Output Return Loss	-10	dB
RMS Phase Error	4.5	°
RMS Amplitude Error	0.7	dB

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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
Operating Frequency	0.35	-	2	GHz
Control Voltage, V1-V6	-	0/5	-	V
Supply Voltage, VE	-	-5	-	V

6. RF Characteristics (T_C = 25˚C)

Table 3. RF Characteristics[1]

Parameter	Symbol	Min.	Typ.	Max.	Units
Frequency Range	Freq.	0.35	-	2	GHz
Insertion Loss	IL	-7	-	-10	dB
Input Return Loss	RL_{IN}	-	-12	-9	dB
Output Return Loss	RL_{OUT}	-	-12	-9	dB
RMS Phase Error	RMS (°)	-	4	4.5	°
RMS Amplitude Error	ΔIL	-	0.75	1.5	dB

[1]. Test condition: Input signal CW

7. Typical Performance Curve

■ **Small-signal Characteristics Curve**

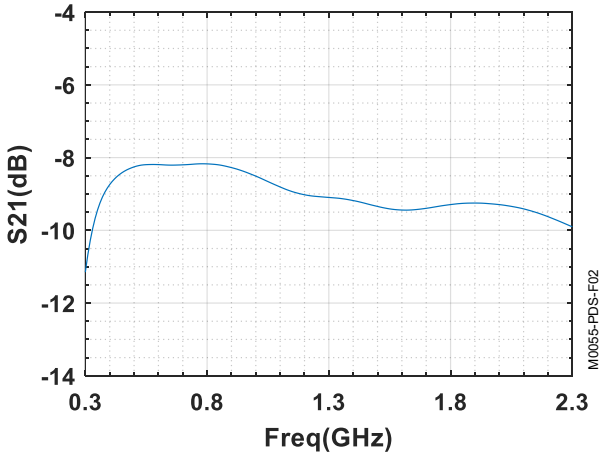


Figure 2. Reference State Insertion Loss Characteristics

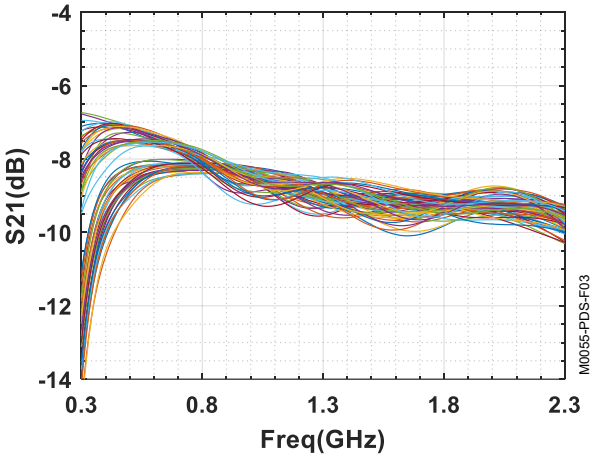


Figure 3. Full state Insertion Loss Characteristics

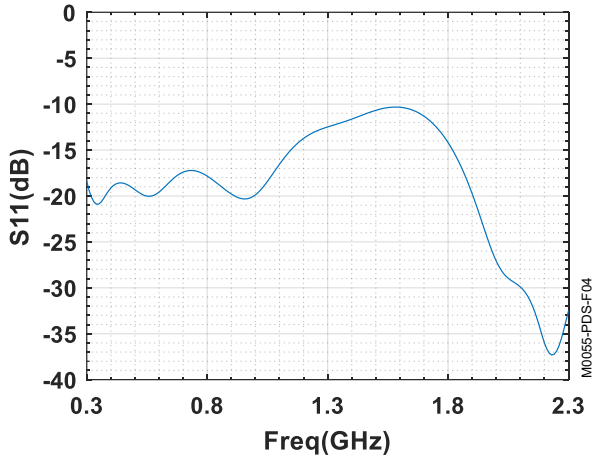


Figure 4. Reference State Input RL Characteristics

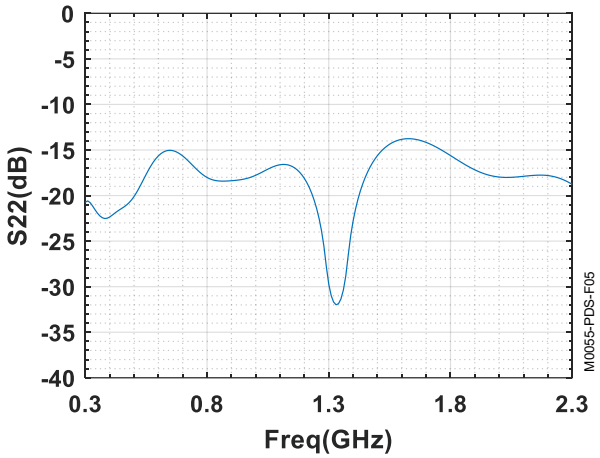


Figure 5. Reference State Output RL Characteristics

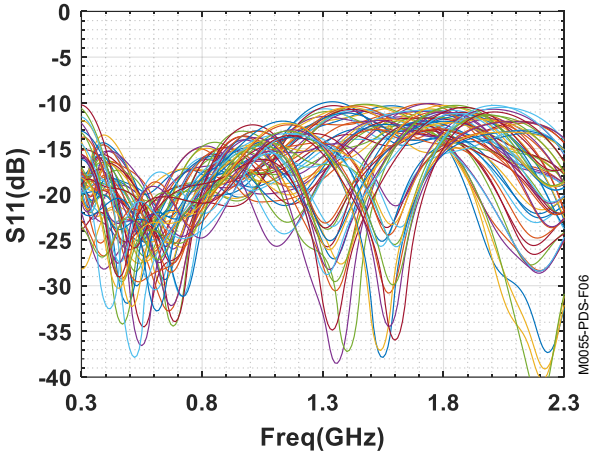


Figure 6. Full State Input RL Characteristics

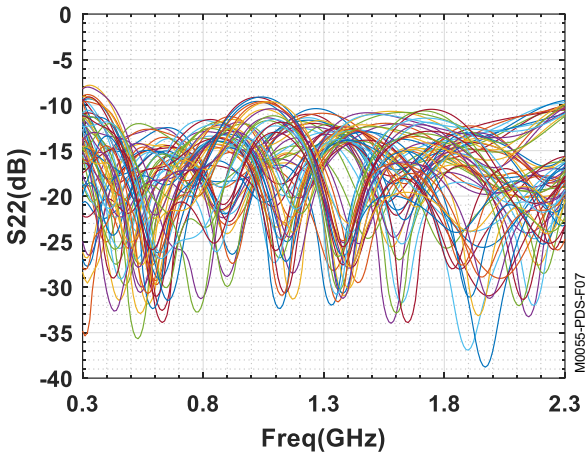


Figure 7. Full State Output RL Characteristics

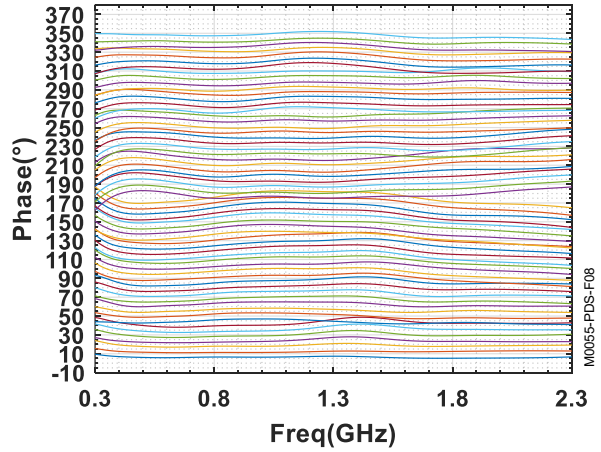


Figure 8. Full State Phase Shift Characteristics

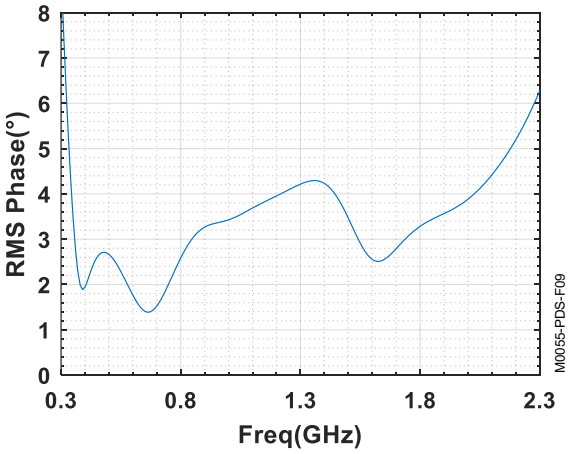


Figure 9. RMS Phase Error Characteristics

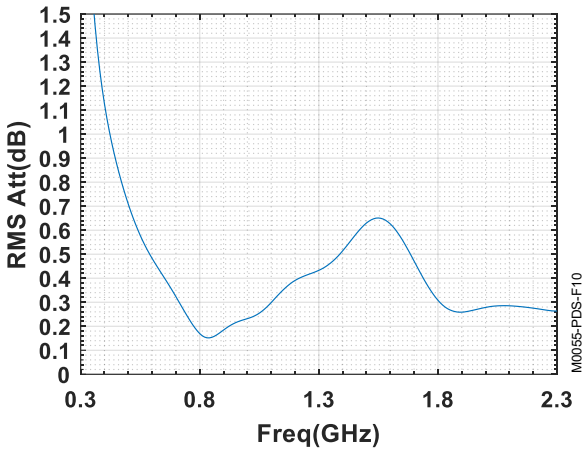
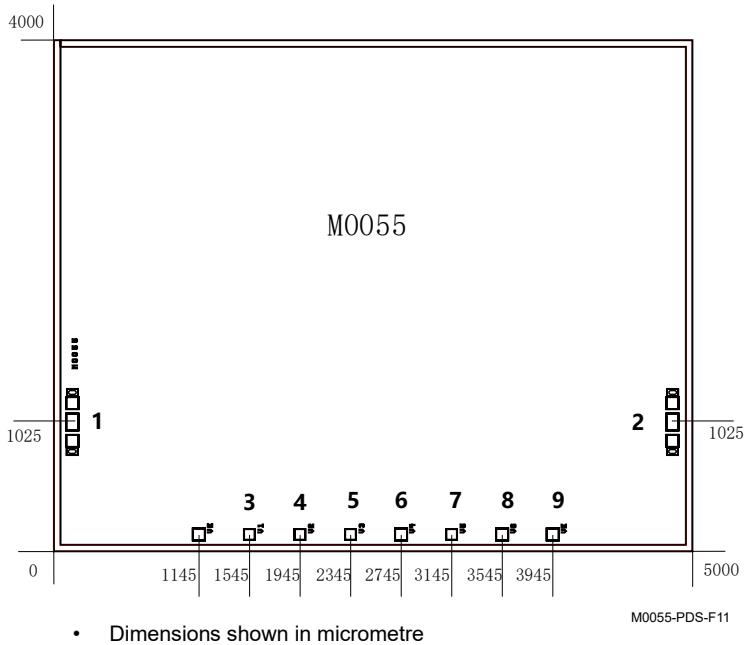


Figure 10. RMS Amplitude Error Characteristics

8. Outline Dimensions



- Dimensions shown in micrometre

Figure 11. M0055 Outline Dimensions

Table 4. Pad Description

Pad	Symbol	Description
1	RF1	RF Input
2	RF2	RF Output
3-8	V1-V6	Control Voltage
9	VE	Reference Voltage

Table 5. Truth Table (Logic "0"=0V, Logic"1"=+5V)

	V1	V2	V3	V4	V5	V6
0(Reference)	0	0	0	0	0	0
5.625°	1	0	0	0	0	0
11.25°	0	1	0	0	0	0
22.5°	0	0	1	0	0	0
45°	0	0	0	1	0	0
90°	0	0	0	0	1	0
180°	0	0	0	0	0	1

9. Assembly Information

■ Assembly Diagram

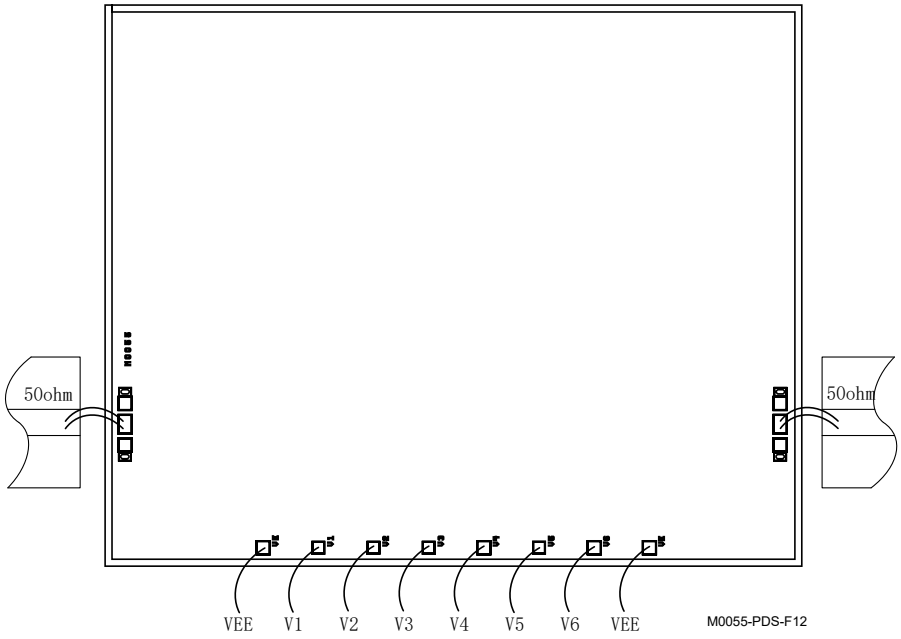


Figure 12. M0055 Assembly Diagram

- **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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