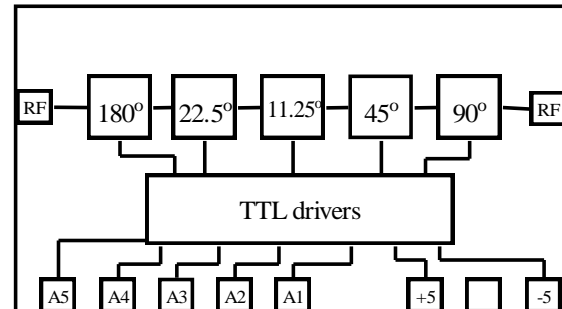


## 6.0 - 18.0 GHz 5-Bit Digital Phase Shifter

### Features

- ◆ 11.25 deg. phase shift resolution
- ◆ 0 - 360 deg. phase shift range
- ◆ Return losses < 10 dB
- ◆ 11 dB mid-band insertion loss
- ◆ Low RMS phase error
- ◆ On-chip TTL drivers
- ◆ 0.5µm InGaAs pHEMT technology
- ◆ Chip Size : 4.8 mm x 2.4 mm x 0.1 mm

Functional diagram



### Typical Applications

- ◆ RADAR
- ◆ Instrumentation

### Description

The AMT2251011 is a wideband phase shifter operating in the 6-18 GHz frequency range. The phase shifter offers a phase shift range of 0 to 360° with a phase shift resolution of 11.25°. The phase shifter offers a mid-band insertion loss of 11 dB and a VSWR of 2:1 over the operating bandwidth. The on-chip integrated TTL interface provides easy access to control the phase shift with a 5-bit digital command. The TTL driver operates on +5/-5V supplies with minimal DC power consumption. The die is fabricated using a robust 0.5µm InGaAs pHEMT technology.

### Absolute Maximum Ratings <sup>(1)</sup>

Parameter	Absolute Maximum	Units
RF Input Power	20	dBm
Positive Supply Voltage	+6	V
Negative Supply Voltage	-6	V
Control Voltage	-0.5 to +5.5	V
Operating Temperature	-55 to +85	°C
Storage Temperature	-65 to +150	°C

1. Operation beyond these limits may cause permanent damage to the component

**Electrical Specifications <sup>(1)</sup> @ T<sub>A</sub> = 25 °C, Z<sub>o</sub> = 50 Ω**

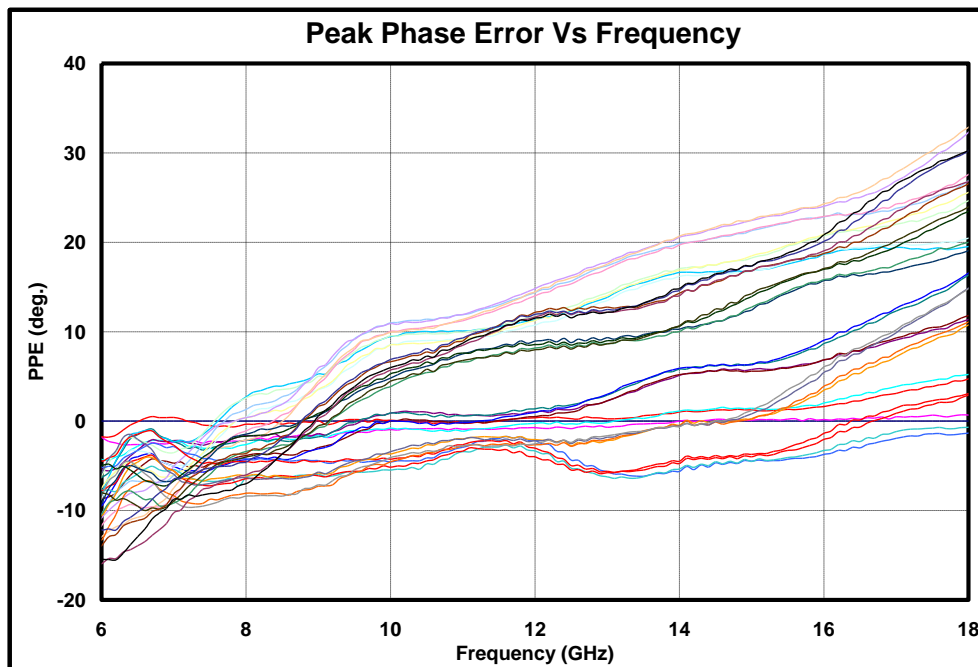
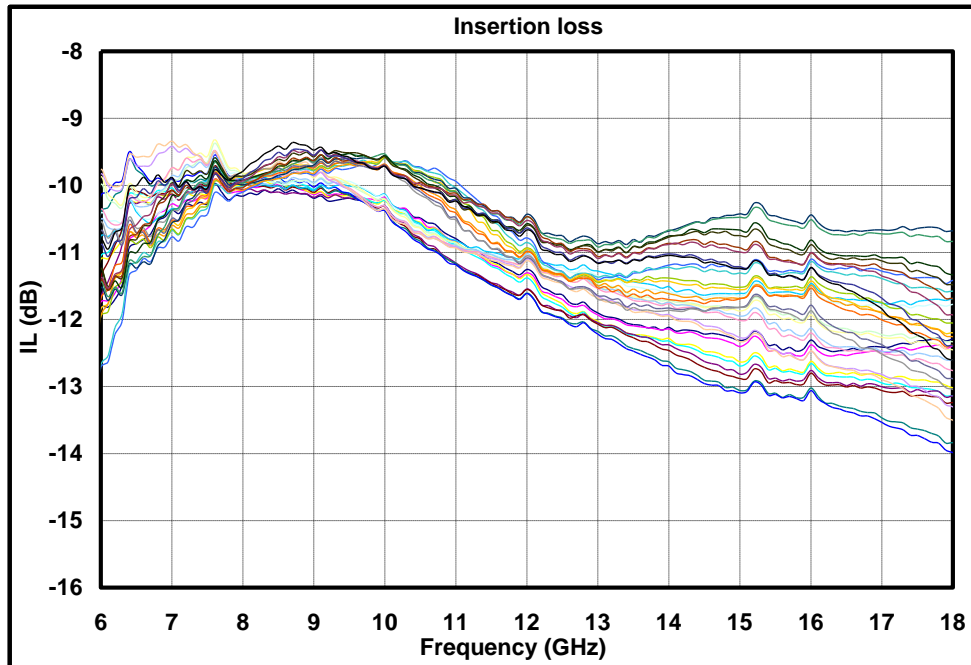
Parameter	Min.	Typ.	Max.	Units
Frequency range	6	-	18	GHz
Phase Shift range	0		360	deg.
Phase shift resolution	-	11.25	-	deg.
Mid-band Insertion Loss		11		dB
Insertion loss variation		±2.5		dB
RMS error		7		deg.
I/O VSWR		2:1		
Pin @ 1dB compression		13		dBm
Control Voltage	TTL compatible			
DC supply (driver)		+5/-5		V

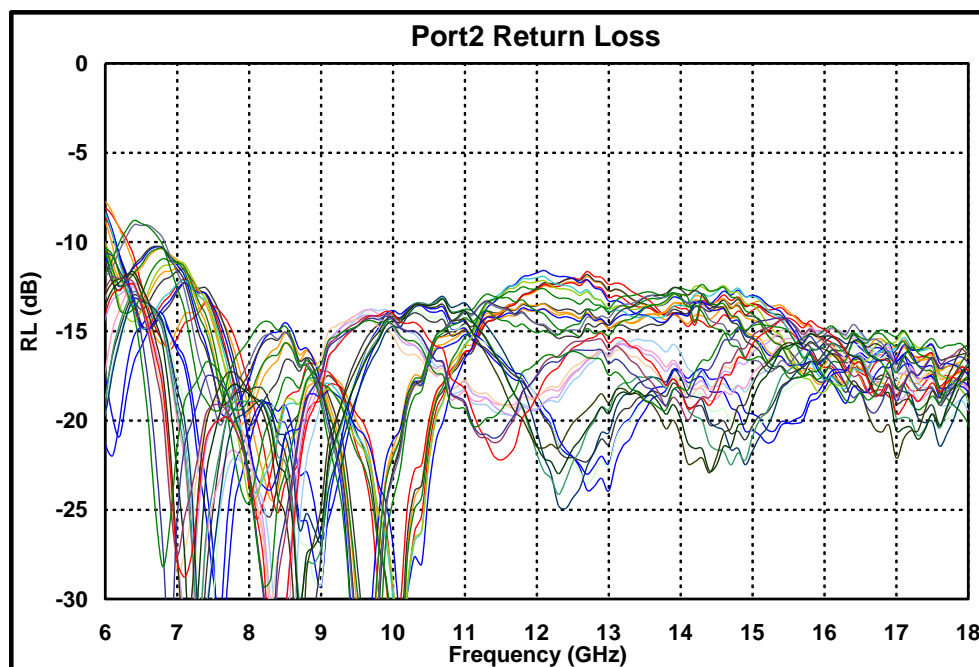
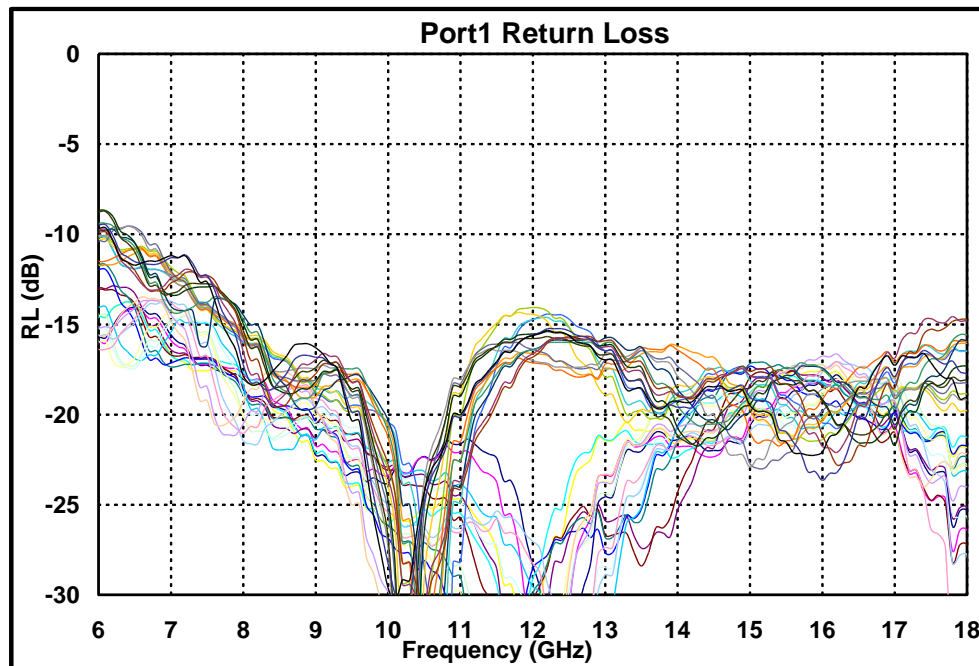
**Note:**

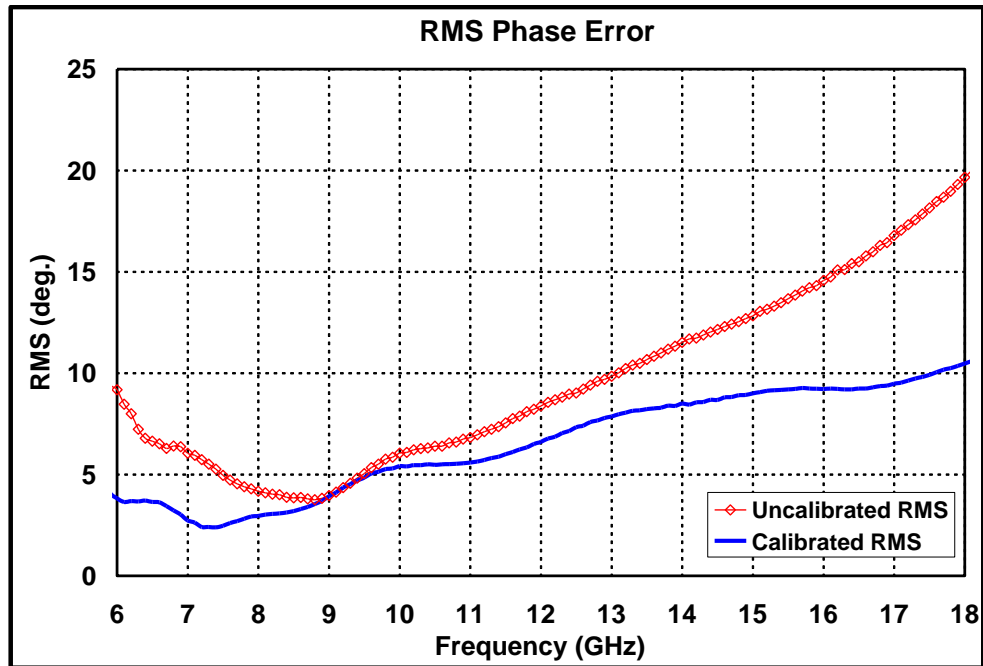
1. The above mentioned electrical specifications are measured On-Wafer.

On Wafer data (32 states)

$T_A = 25\text{ }^\circ\text{C}$



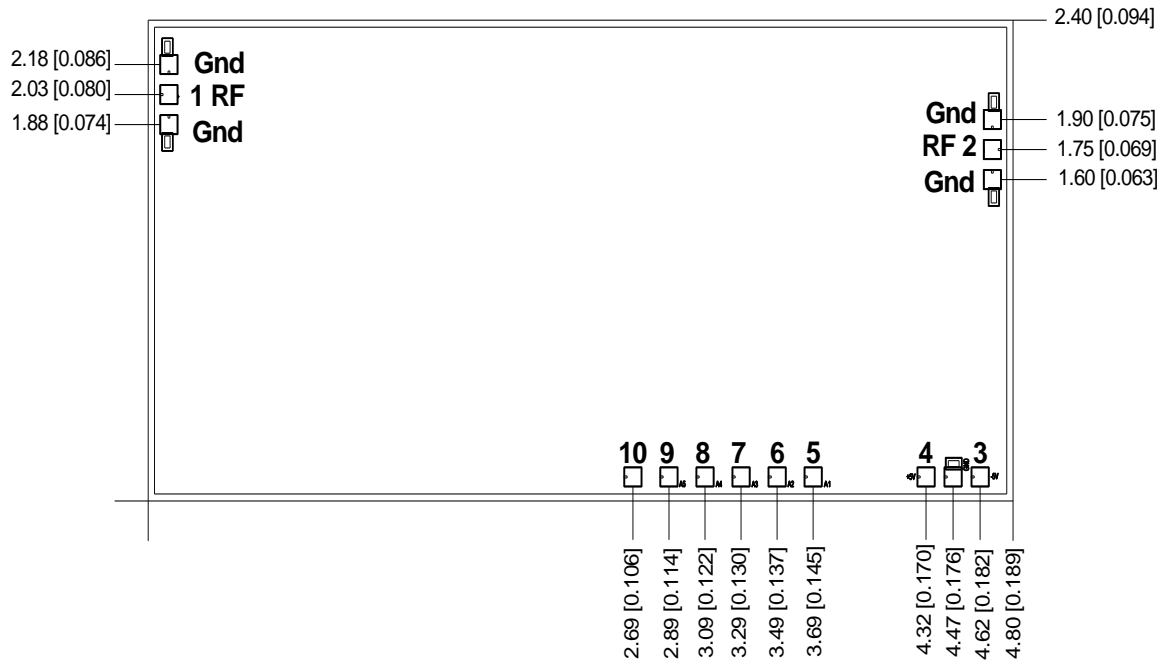
**On Wafer data (32 states)** $T_A = 25^\circ\text{C}$ 

**On Wafer data (32 states)** $T_A = 25^\circ\text{C}$ 

**Truth Table**

State	Phase Shift (deg.)	TTL Control ( 1 = 3.5 to 5 V, 0 = 0 to 0.5 V )				
		A5 (180)	A4 (90)	A3 (45)	A2 (22.5)	A1 (11.25)
0	0	0	0	0	0	0
1	11.25	0	0	0	0	1
2	22.5	0	0	0	1	0
3	33.75	0	0	0	1	1
4	45	0	0	1	0	0
5	56.25	0	0	1	0	1
6	67.5	0	0	1	1	0
7	78.75	0	0	1	1	1
8	90	0	1	0	0	0
9	101.25	0	1	0	0	1
10	112.5	0	1	0	1	0
11	123.75	0	1	0	1	1
12	135	0	1	1	0	0
13	146.25	0	1	1	0	1
14	157.5	0	1	1	1	0
15	168.75	0	1	1	1	1
16	180	1	0	0	0	0
17	191.25	1	0	0	0	1
18	202.5	1	0	0	1	0
19	213.75	1	0	0	1	1
20	225	1	0	1	0	0
21	236.25	1	0	1	0	1
22	247.5	1	0	1	1	0
23	258.75	1	0	1	1	1
24	270	1	1	0	0	0
25	281.25	1	1	0	0	1
26	292.5	1	1	0	1	0
27	303.75	1	1	0	1	1
28	315	1	1	1	0	0
29	326.25	1	1	1	0	1
30	337.5	1	1	1	1	0
31	348.75	1	1	1	1	1

## Mechanical Characteristics

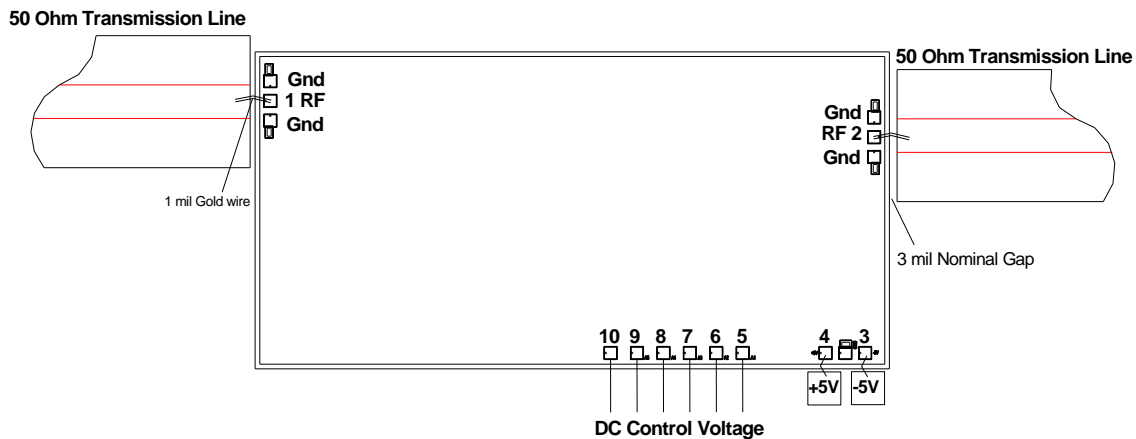


**Units:** millimeters (inches)

**Note:**

1. All RF and DC bond pads are 100µm x 100µm
2. Pad no. 1 : RF In
3. Pad no. 2 : RF Out
4. Pad no. 3 : -5 V
5. Pad no. 4 : +5 V
6. Pad no. 5 to 9 : A1 to A5 (Control bits from LSB to MSB)
7. Pad no. 10 : NC

## Recommended Assembly Diagram



### Note :

1. Two 1 mil (0.0254mm) bond wires of minimum length should be used for RF input and output.
2. The RF input & output ports are DC coupled.

**Die attach:** For Epoxy attachment, use of a two-component conductive epoxy is recommended. An epoxy fillet should be visible around the total die periphery. If Eutectic attachment is preferred, use of fluxless AuSn (80/20) 1-2 mil thick preform solder is recommended. Use of AuGe preform should be strictly avoided.

**Wire bonding:** For DC pad connections use either ball or wedge bonds. For best RF performance, use of 150 - 200µm length of wedge bonds is advised. Single Ball bonds of 250-300µm though acceptable, may cause a deviation in RF performance.



**GaAs MMIC devices are susceptible to Electrostatic discharge. Proper precautions should be observed during handling, assembly & testing**

All information and Specifications are subject to change without prior notice

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Page 8 of 8

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