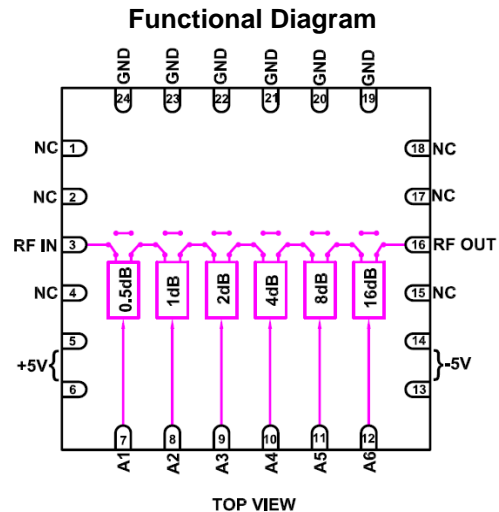


0.5 - 4 GHz 6-Bit Digital Attenuator

Features

- ◆ Frequency Range : 0.5 to 4 GHz
- ◆ 31.5dB Attenuation Range
- ◆ 0.5dB resolution
- ◆ 4.5 dB Insertion loss max.
- ◆ ± 0.4 dB Attenuation Error
- ◆ 50 Ω Impedance
- ◆ 10⁰ Typical Phase variation
- ◆ 0.2 dB RMS Error
- ◆ Integral TTL Driver
- ◆ 24 Lead 6 x 6 x 0.75 mm QFN Package



Typical Applications

- ◆ Radar
- ◆ Military & Space
- ◆ Instrumentation
- ◆ Test and Measurements
- ◆ Instrumentation Applications

Description

The AMT2321014P is a high performance 6-bit digital attenuator MMIC offering an attenuation range of 31.5dB in steps 0.5dB. This device is in 24 lead TQLMP 6 x 6mm QFN Package. The attenuator bit values are 0.5dB (LSB), 1,2,4,8 and 16dB (MSB) for a total attenuation of 31.5dB. The attenuator features good attenuation accuracy of ± 0.4 dB over all 64 states. The attenuator provides an integral TTL driver facilitating a 6-bit control. The driver operates on +5/-5V voltages with minimal DC power consumption.

Absolute Maximum Ratings ⁽¹⁾

| 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 ⁽¹⁾ @ T_A = 25 °C, Z_o =50 Ω

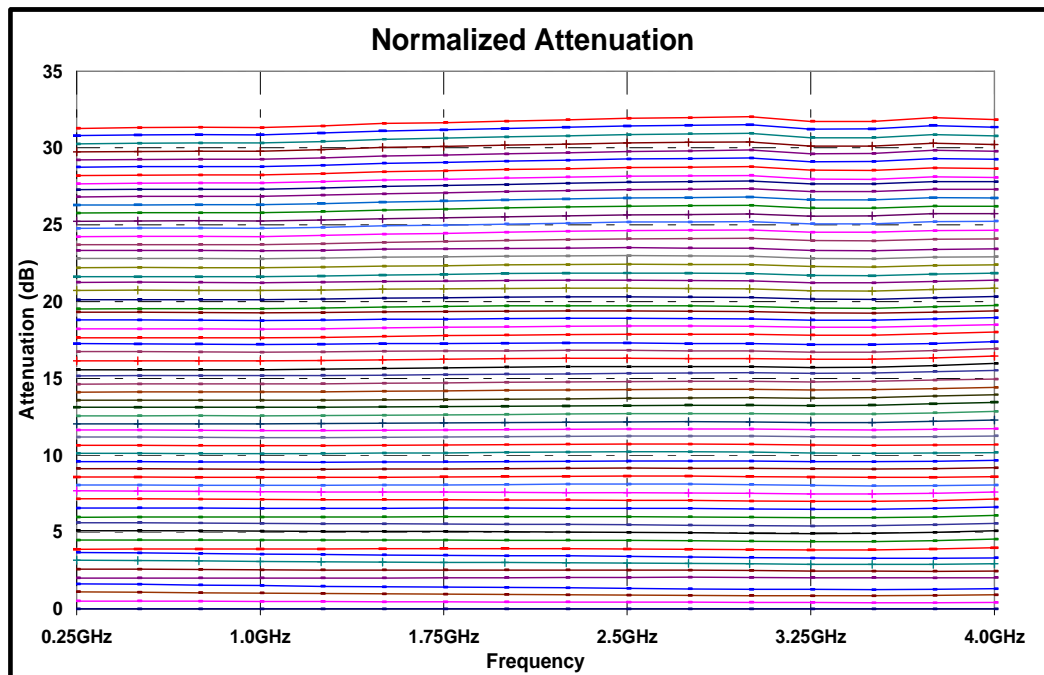
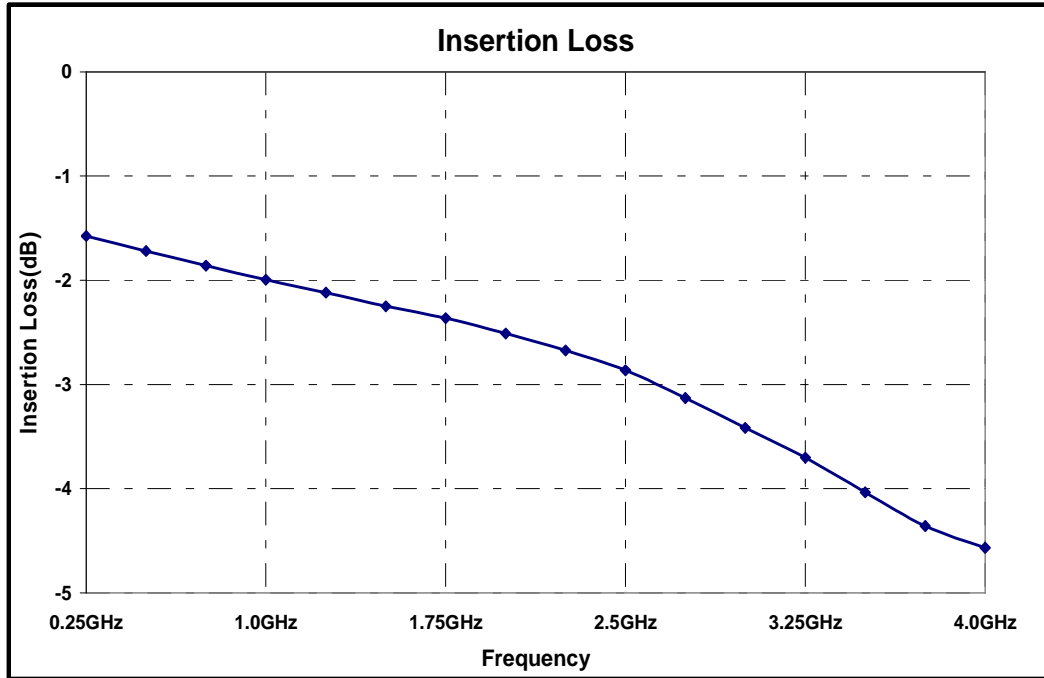
| Parameter | Min. | Typ. | Max. | Units |
|--|------|---------|------|-------|
| Frequency | 0.5 | - | 4 | GHz |
| Insertion Loss | - | 4.5 | - | dB |
| Attenuation Range | 0 | - | 31.5 | dB |
| Attenuation step | - | 0.5 | - | dB |
| Attenuation Accuracy (All States) | - | ± 0.4 | - | dB |
| Phase variation 1 - 32 States 32 - 64 States | - | 4 10 | - | deg |
| RMS Error | - | 0.2 | - | dB |
| Input/Output Return Loss | 10 | 15 | - | dB |
| Input Power for 1dB Compression | - | 24 | - | dBm |
| DC Bias Voltages | - | +5, -5 | - | V |
| Control Voltage | - | 0 / +5 | - | V |

Note:

1. The above mentioned electrical specifications are measured on PCB mounted QFN package.

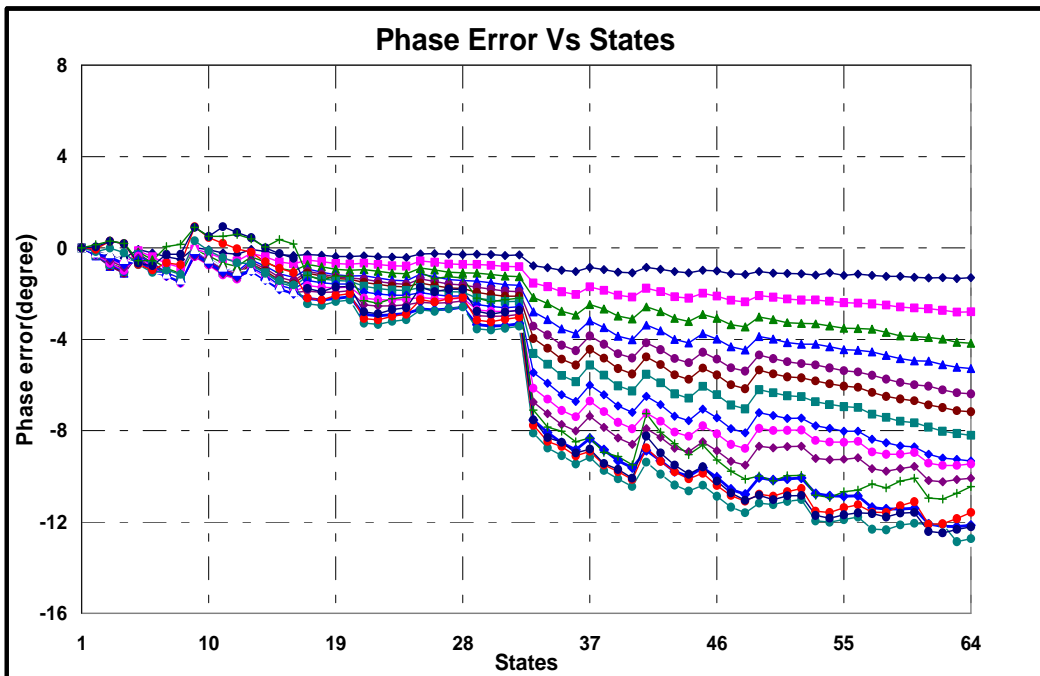
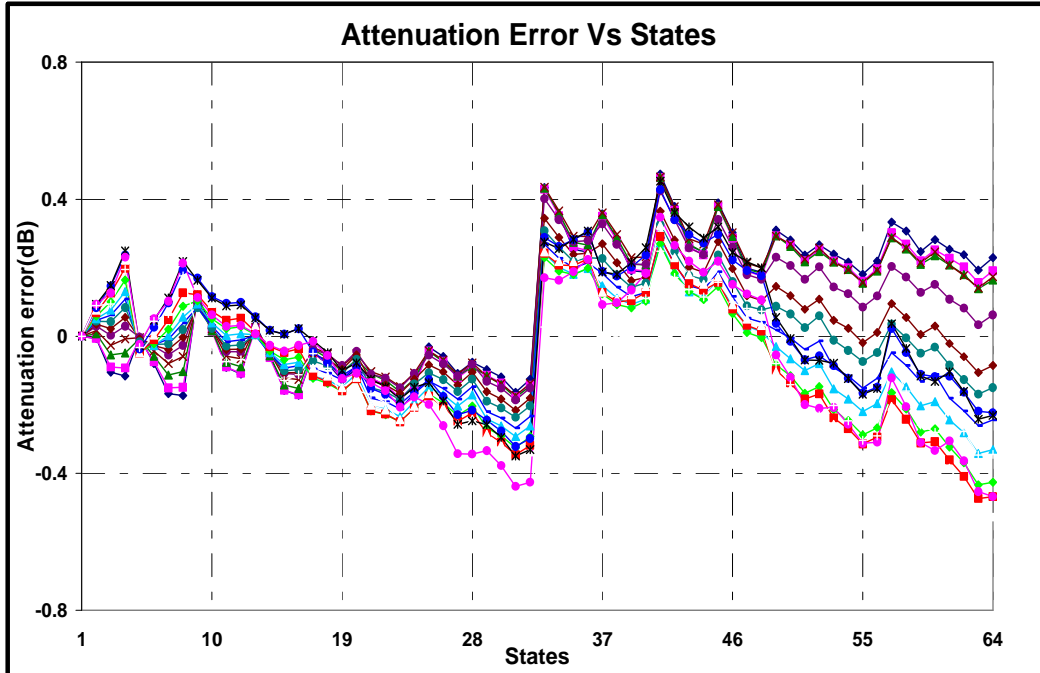
Test Fixture data

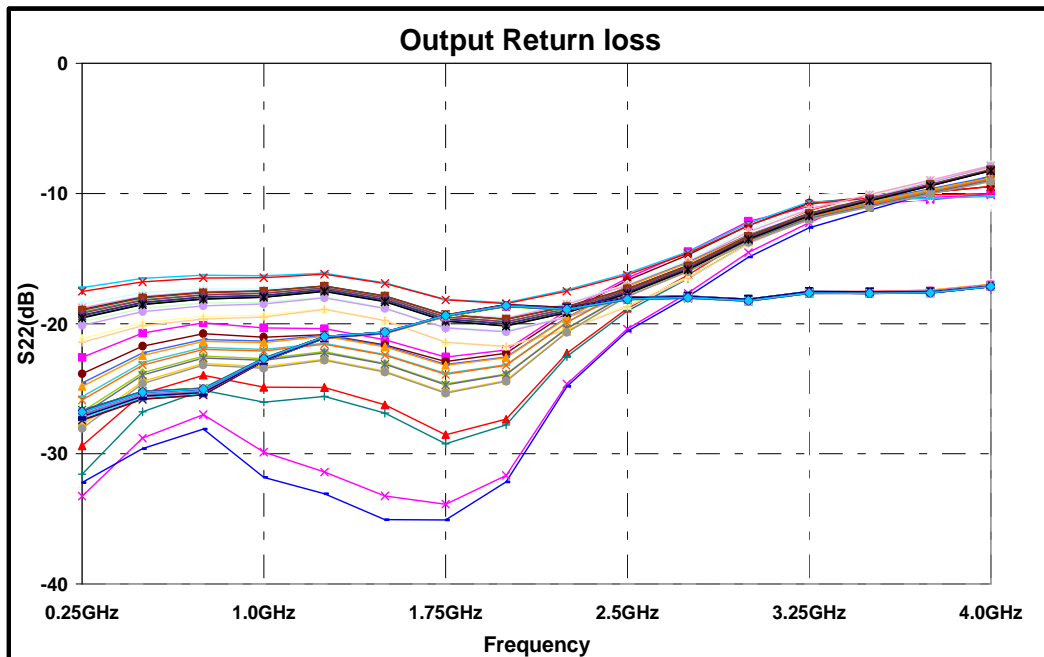
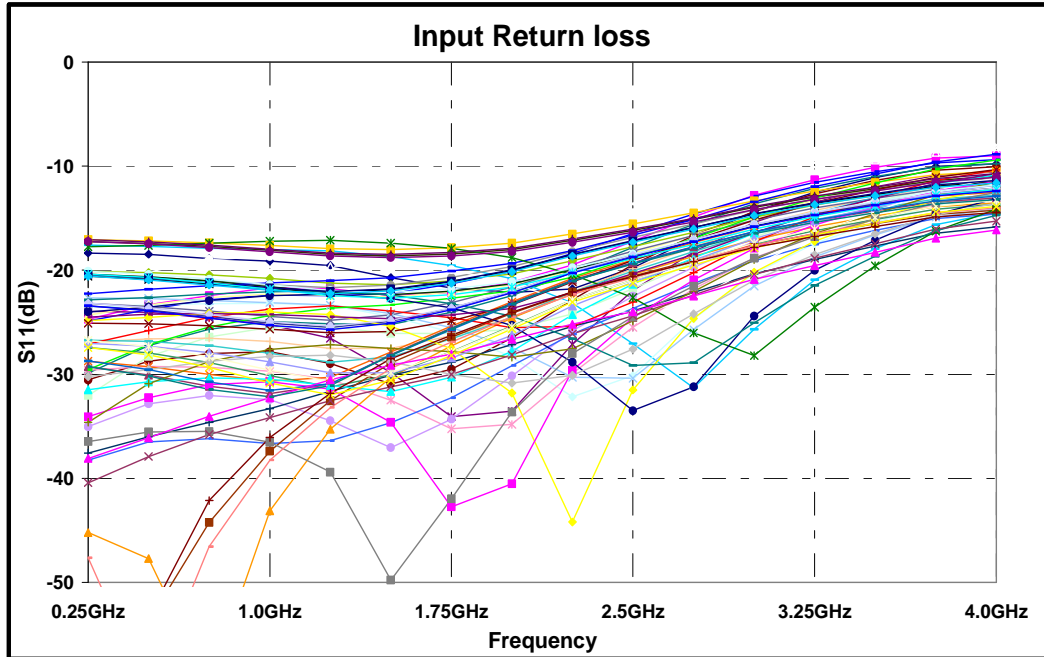
$T_A = 25^\circ\text{C}$

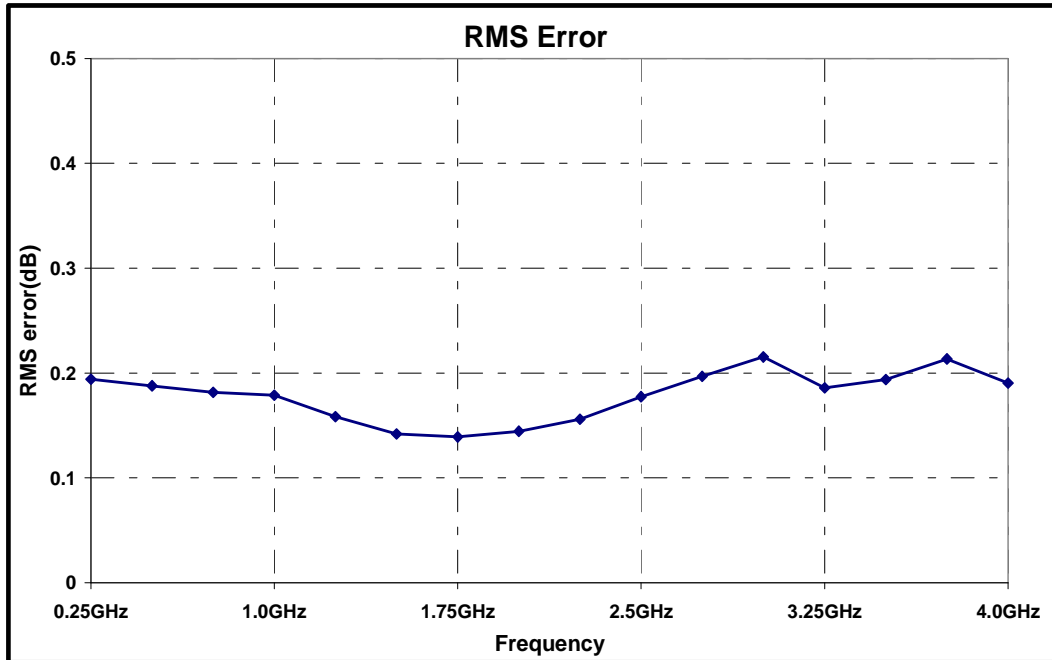


Test Fixture data

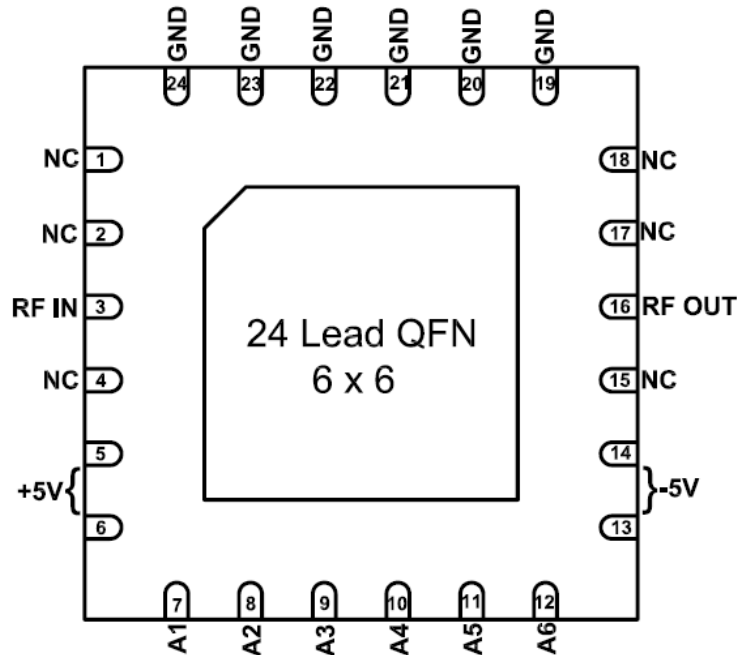
$T_A = 25^\circ\text{C}$



Test Fixture data $T_A = 25^\circ\text{C}$ 

Test Fixture data $T_A = 25^\circ\text{C}$ 

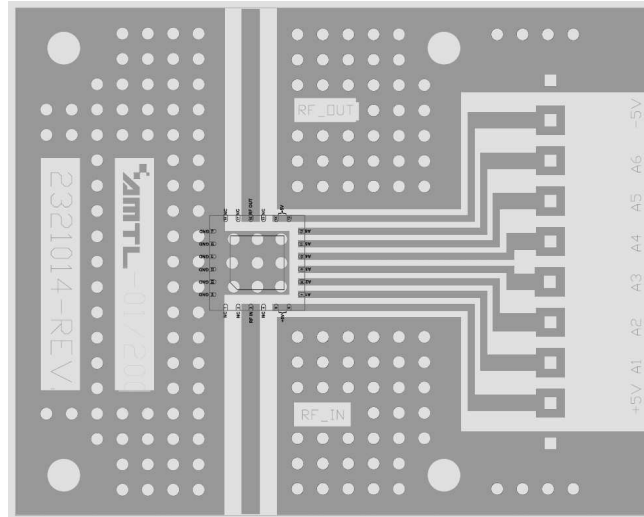
Pin Configuration (Top View)



Pin Descriptions

| PIN | Function | Description |
|-------|----------|--------------------|
| 1,2 | NC | No Connections |
| 3 | RF IN | RF Input |
| 4 | NC | No Connection |
| 5,6 | +5V | DC Supply Voltage |
| 7 | A1 | DC Control Voltage |
| 8 | A2 | DC Control Voltage |
| 9 | A3 | DC Control Voltage |
| 10 | A4 | DC Control Voltage |
| 11 | A5 | DC Control Voltage |
| 12 | A6 | DC Control Voltage |
| 13,14 | -5V | DC Supply Voltage |
| 15 | NC | No Connection |
| 16 | RF OUT | RF Output |
| 17,18 | NC | No Connections |
| 19-24 | GND | Ground |

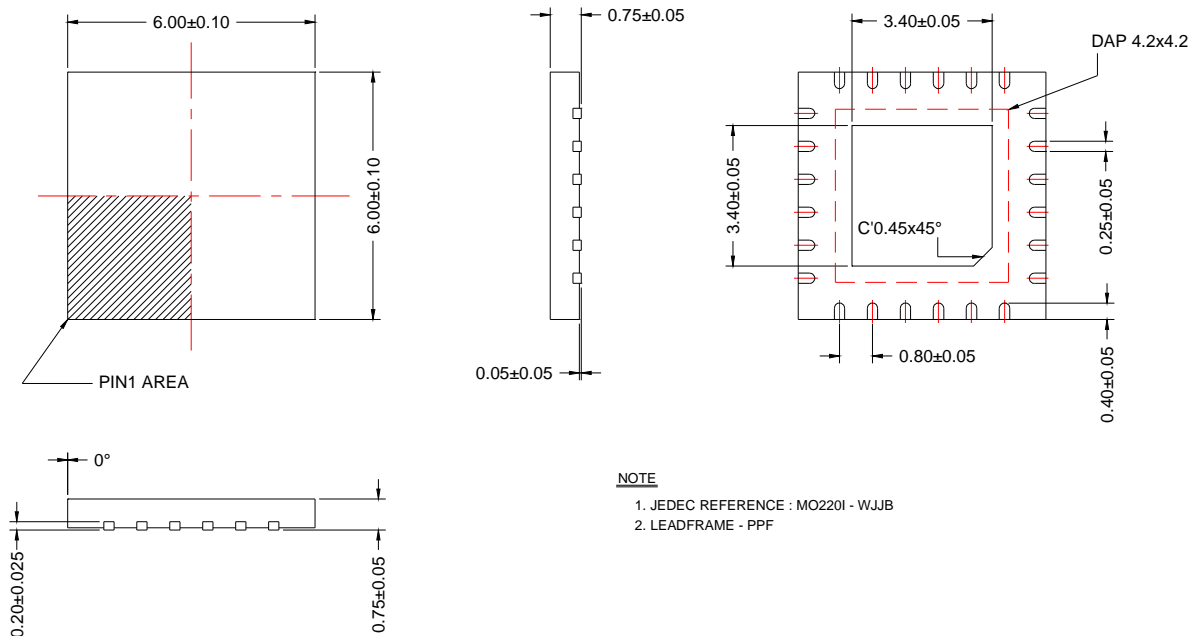
Test Board Pattern



Note:

1. Circuit board material: Rogers 4350
2. Input\Output signal lines have 50Ω impedance
3. No off chip component is required.

Package Outline Drawing



Truth Table

| State | Attenuation (dB) | TTL Control (1 = 3.5 to 5 V, 0 = 0 to 0.2 V) | | | | | |
|-------|------------------|--|--------|-------|--------|-------|----------|
| | | A6 (16) | A5 (8) | A4(4) | A3 (2) | A2(1) | A1 (0.5) |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 3 | 1.5 | 0 | 0 | 0 | 0 | 1 | 1 |
| 4 | 2 | 0 | 0 | 0 | 1 | 0 | 0 |
| 5 | 2.5 | 0 | 0 | 0 | 1 | 0 | 1 |
| 6 | 3 | 0 | 0 | 0 | 1 | 1 | 0 |
| 7 | 3.5 | 0 | 0 | 0 | 1 | 1 | 1 |
| 8 | 4 | 0 | 0 | 1 | 0 | 0 | 0 |
| 9 | 4.5 | 0 | 0 | 1 | 0 | 0 | 1 |
| 10 | 5 | 0 | 0 | 1 | 0 | 1 | 0 |
| 11 | 5.5 | 0 | 0 | 1 | 0 | 1 | 1 |
| 12 | 6 | 0 | 0 | 1 | 1 | 0 | 0 |
| 13 | 6.5 | 0 | 0 | 1 | 1 | 0 | 1 |
| 14 | 7 | 0 | 0 | 1 | 1 | 1 | 0 |
| 15 | 7.5 | 0 | 0 | 1 | 1 | 1 | 1 |
| 16 | 8 | 0 | 1 | 0 | 0 | 0 | 0 |
| 17 | 8.5 | 0 | 1 | 0 | 0 | 0 | 1 |
| 18 | 9 | 0 | 1 | 0 | 0 | 1 | 0 |
| 19 | 9.5 | 0 | 1 | 0 | 0 | 1 | 1 |
| 20 | 10 | 0 | 1 | 0 | 1 | 0 | 0 |
| 21 | 10.5 | 0 | 1 | 0 | 1 | 0 | 1 |
| 22 | 11 | 0 | 1 | 0 | 1 | 1 | 0 |
| 23 | 11.5 | 0 | 1 | 0 | 1 | 1 | 1 |
| 24 | 12 | 0 | 1 | 1 | 0 | 0 | 0 |
| 25 | 12.5 | 0 | 1 | 1 | 0 | 0 | 1 |
| 26 | 13 | 0 | 1 | 1 | 0 | 1 | 0 |
| 27 | 13.5 | 0 | 1 | 1 | 0 | 1 | 1 |
| 28 | 14 | 0 | 1 | 1 | 1 | 0 | 0 |
| 29 | 14.5 | 0 | 1 | 1 | 1 | 0 | 1 |
| 30 | 15 | 0 | 1 | 1 | 1 | 1 | 0 |
| 31 | 15.5 | 0 | 1 | 1 | 1 | 1 | 1 |
| 32 | 16 | 1 | 0 | 0 | 0 | 0 | 0 |
| 33 | 16.5 | 1 | 0 | 0 | 0 | 0 | 1 |
| 34 | 17 | 1 | 0 | 0 | 0 | 1 | 0 |
| 35 | 17.5 | 1 | 0 | 0 | 0 | 1 | 1 |

Truth Table

| State | Attenuation (dB) | TTL Control (1 = 3.5 to 5 V, 0 = 0 to 0.2 V) | | | | | |
|-------|------------------|--|--------|-------|--------|-------|----------|
| | | A6 (16) | A5 (8) | A4(4) | A3 (2) | A2(1) | A1 (0.5) |
| 36 | 18.0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 37 | 18.5 | 1 | 0 | 0 | 1 | 0 | 1 |
| 38 | 19 | 1 | 0 | 0 | 1 | 1 | 0 |
| 39 | 19.5 | 1 | 0 | 0 | 1 | 1 | 1 |
| 40 | 20 | 1 | 0 | 1 | 0 | 0 | 0 |
| 41 | 20.5 | 1 | 0 | 1 | 0 | 0 | 1 |
| 42 | 21 | 1 | 0 | 1 | 0 | 1 | 0 |
| 43 | 21.5 | 1 | 0 | 1 | 0 | 1 | 1 |
| 44 | 22 | 1 | 0 | 1 | 1 | 0 | 0 |
| 45 | 22.5 | 1 | 0 | 1 | 1 | 0 | 1 |
| 46 | 23 | 1 | 0 | 1 | 1 | 1 | 0 |
| 47 | 23.5 | 1 | 0 | 1 | 1 | 1 | 1 |
| 48 | 24 | 1 | 1 | 0 | 0 | 0 | 0 |
| 49 | 24.5 | 1 | 1 | 0 | 0 | 0 | 1 |
| 50 | 25 | 1 | 1 | 0 | 0 | 1 | 0 |
| 51 | 25.5 | 1 | 1 | 0 | 0 | 1 | 1 |
| 52 | 26 | 1 | 1 | 0 | 1 | 0 | 0 |
| 53 | 26.5 | 1 | 1 | 0 | 1 | 0 | 1 |
| 54 | 27 | 1 | 1 | 0 | 1 | 1 | 0 |
| 55 | 27.5 | 1 | 1 | 0 | 1 | 1 | 1 |
| 56 | 28 | 1 | 1 | 1 | 0 | 0 | 0 |
| 57 | 28.5 | 1 | 1 | 1 | 0 | 0 | 1 |
| 58 | 29 | 1 | 1 | 1 | 0 | 1 | 0 |
| 59 | 29.5 | 1 | 1 | 1 | 0 | 1 | 1 |
| 60 | 30 | 1 | 1 | 1 | 1 | 0 | 0 |
| 61 | 30.5 | 1 | 1 | 1 | 1 | 0 | 1 |
| 62 | 31 | 1 | 1 | 1 | 1 | 1 | 0 |
| 63 | 31.5 | 1 | 1 | 1 | 1 | 1 | 1 |



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