MILLER MMIC

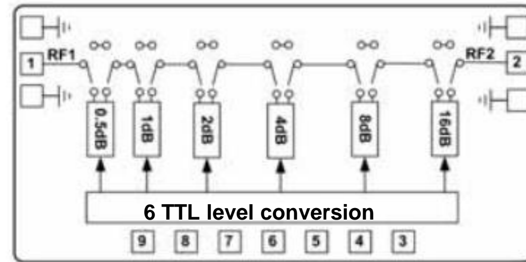
V1.0.0

**GaAs pHEMT MMIC**
**6-Bit Digital Control Attenuator**
**0.5-18GHz**

## Features

- Integrated 6 TTL level conversion circuit
- Attenuation Range: 0.5dB -31.5dB
- Attenuation Accuracy: ±0.5dB
- Insertion Loss : 5.4dB
- Attenuation Additional Phase Shift: ±4°
- Impedance: 50Ω
- Die Size: 2.5 x 1.5 x 0.1 mm

## Functional Block Diagram



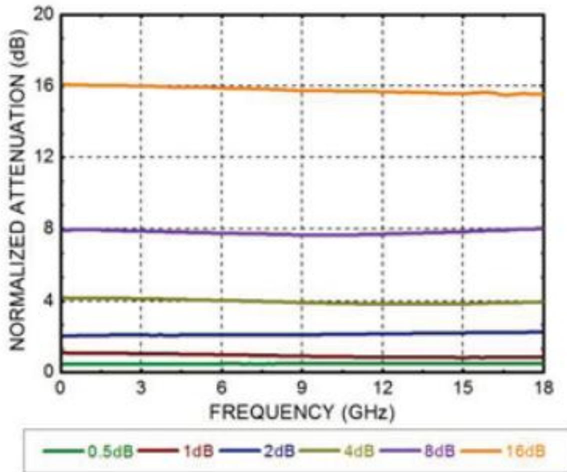

## Typical Applications

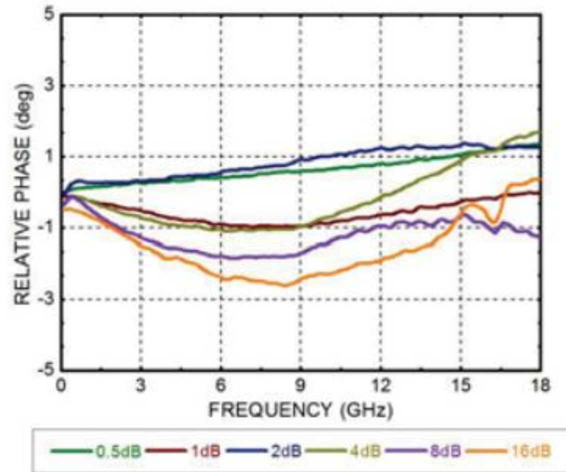
- Test Instrumentation
- Microwave Radio & VSAT
- Military & Space
- Telecom Infrastructure
- Fiber Optics

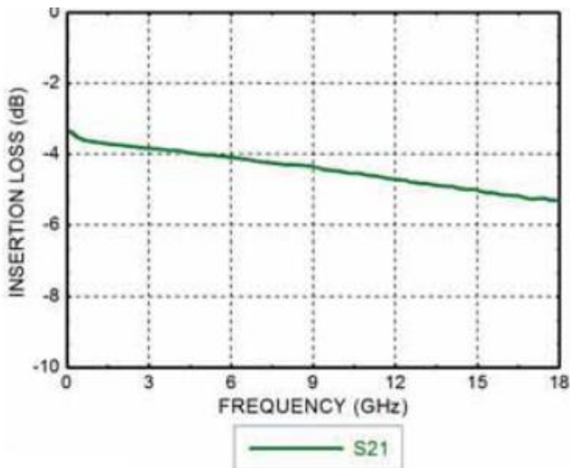
## Electrical Specifications

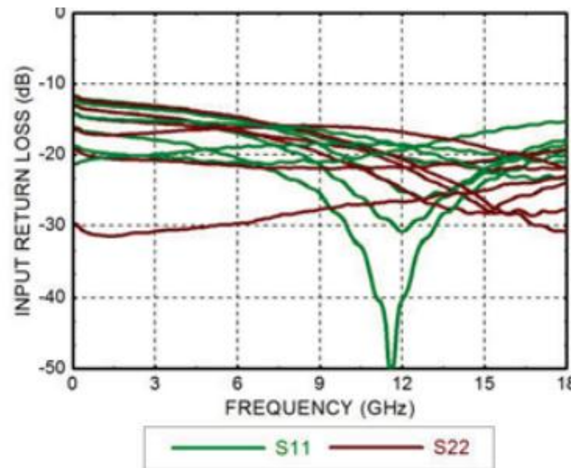
**TA = +25°C, Vctl = 0/5V**

| Parameters | Min. | Typ. | Max. | Units |
|---|---|---|---|---|
| Frequency | | 0.5-18 | | GHz |
| Insertion Loss | | 5.4 | | dB |
| Attenuation Range | 0.5 | | 31.5 | dB |
| Return Loss (Direct State) | | 20 | | dB |
| Return Loss (Attenuation State) | | 18 | | dB |
| Input 1dB Compression (P1dB) | | 24 | | dBm |
| Switching Speed | | 50 | | ns |


Attenuation
NORMALIZED ATTENUATION (dB)
FREQUENCY (GHz)
0.5dB
1dB
2dB
4dB
8dB
16dB

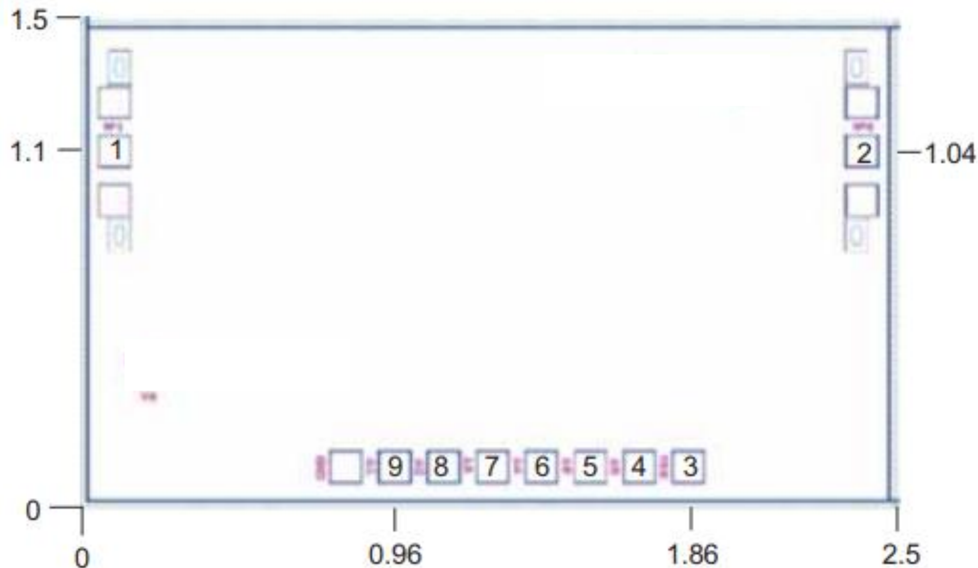

Relative Phase vs. Frequency
RELATIVE PHASE (deg)
FREQUENCY (GHz)
0.5dB
1dB
2dB
4dB
8dB
16dB


Insertion Loss
INSERTION LOSS (dB)
FREQUENCY (GHz)
S21


Return Loss
INPUT RETURN LOSS (dB)
FREQUENCY (GHz)
S11
S22

## Outline Drawing:

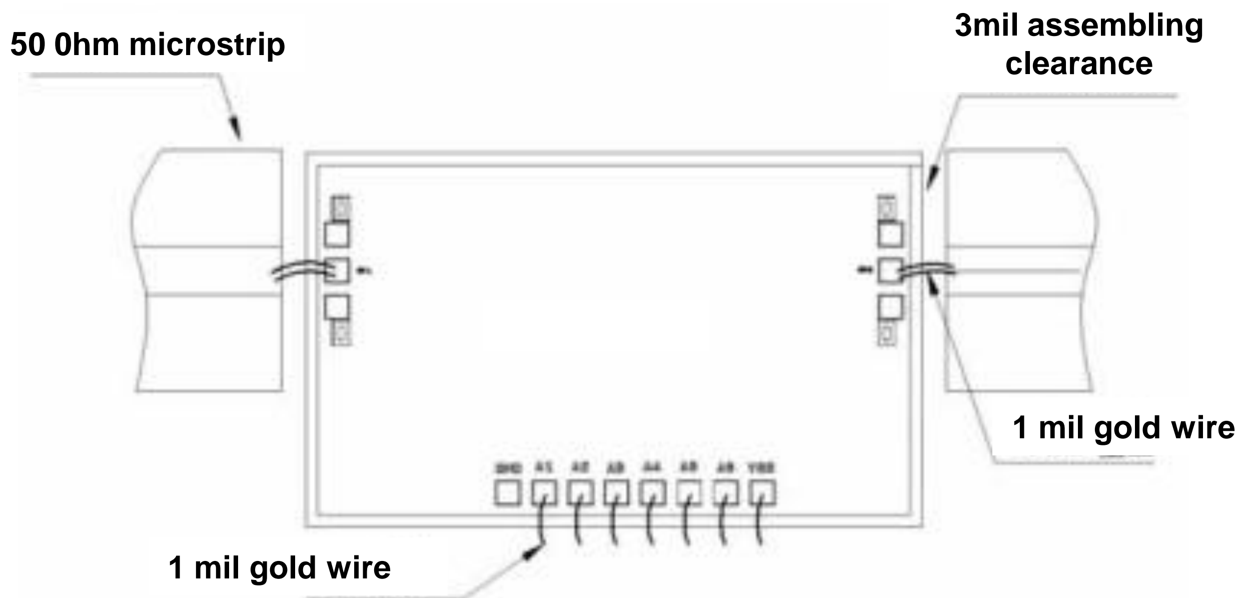
All Dimensions in mm




## Pad Description

| PAD | Function | Description |
|---|---|---|
| 1, 2 | RF1, RF2 | This pad is RF port and matched to 50Ω Impedance |
| 3 | VSS | This pad is TTL level converter power port, connected to -5v power supply. |
| 4 | 16dB Damping Control End A6 | A6=0V 16dB Attenuator OFF<br>A6=5V 16dB Attenuator ON |
| 5 | 8dB Damping Control End A5 | A5=0V 8dB Attenuator OFF<br>A5=5V 8dB Attenuator ON |
| 6 | 4dB Damping Control End A4 | A4=0V 4dB Attenuator OFF<br>A4=5V 4dB Attenuator ON |
| 7 | 2dB Damping Control End A3 | A3=0V 2dB Attenuator OFF<br>A3=5V 2dB Attenuator ON |
| 8 | 1dB Damping Control End A2 | A2=0V 1dB Attenuator OFF<br>A2=5V 1dB Attenuator ON |
| 9 | 0.5dB Damping Control End A1 | A1=0V 0.5dB Attenuator OFF<br>A1=5V 0.5dB Attenuator ON |
| Die Bottom | GND | Die bottom must be connected to RF/DC ground |

## Assembly Drawing




**Notes:**
1. Die thickness: 100um
2. Typical bond pad is 100*100 $\mu m^2$
3. Bond pad metalization: Gold
4. Backside metalization: Gold
5. Backside of the die (GND)
6. No connection required for unlabeled bond pads

**Maximum Ratings:**
1. RF input power: +24dBm
2. Storage temperature: -65℃ to +175℃
3. Operating temperature: -55℃ to +85℃