**AMT1616**
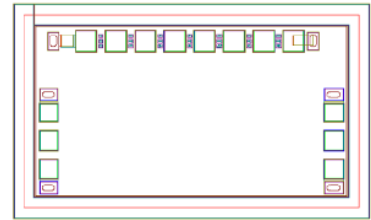**0 - 40GHz Digital Attenuator Chip**



## Key Features :

- Frequency range : 0 – 40GHz
- Insertion loss : 3dB
- Attenuation range : 0 ~ 15.5dB
- Attenuation RMS : 0.5dB
- Attenuation additive phase shift : $\pm 8°$
- Input/output standing wave : 1.4/1.4
- Control method : TTL
- Chip dimensions : 1.4mm x 1mm x 0.1mm
- Applications : wireless communication, transceiver module, radio telecommunication etc.

## Description :

AMT1616 is a 5 bit digital control attenuator, it is designed by Gallium Arsenide (GaAs) process. This chip is designed with ground through metal vias on the back technology, it covers a frequency range of 0 ~ 40GHz, typical insertion loss is 3dB, typical attenuation RMS is 0.5dB, it uses TTL control. This chip is for microwave transceiver module, to realize transceiver signal amplitude control function.

### Absolute Maximum Ratings (Ta = 25°C)

| Symbol | Parameter | Value | Remark |
|--------|-----------|-------|--------|
| Pin | Input Power | 25dBm | |
| Tch | Operating Temperature | -55 ~ +125°C | |
| Tm | Sintering Temperature | 310°C | 30s, $N_2$ protection |
| Tstg | Storage Temperature | -65 ~ +150°C | |

[1] Operation outside any of the Absolute Maximum Ratings may cause permanent device damage.

### Electrical Characteristics (Ta = 25°C)

| Symbol | Parameter | Test Conditions | Value | | | Unit |
|--------|-----------|-----------------|-----|---------|-----|------|
| | | | Min | Typical | Max | |
| IL | Insertion Loss | | - | 3 | - | dB |
| ATT | Attenuation range | | - | 0.5 ~ 15.5 | - | dB |
| $\Delta ps$ | Attenuation additive phase shift | VEE = -5V | - | $\pm 8$ | - | ° |
| RMS | 32 state attenuation RMS error | F : 0 – 40GHz | - | 0.5 | - | dB |
| VSWRin | Input Standing Wave | | - | 1.4 | - | - |
| VSWRout | Output Standing Wave | | - | 1.4 | - | - |

## Chip Dimensions (Unit : μm)
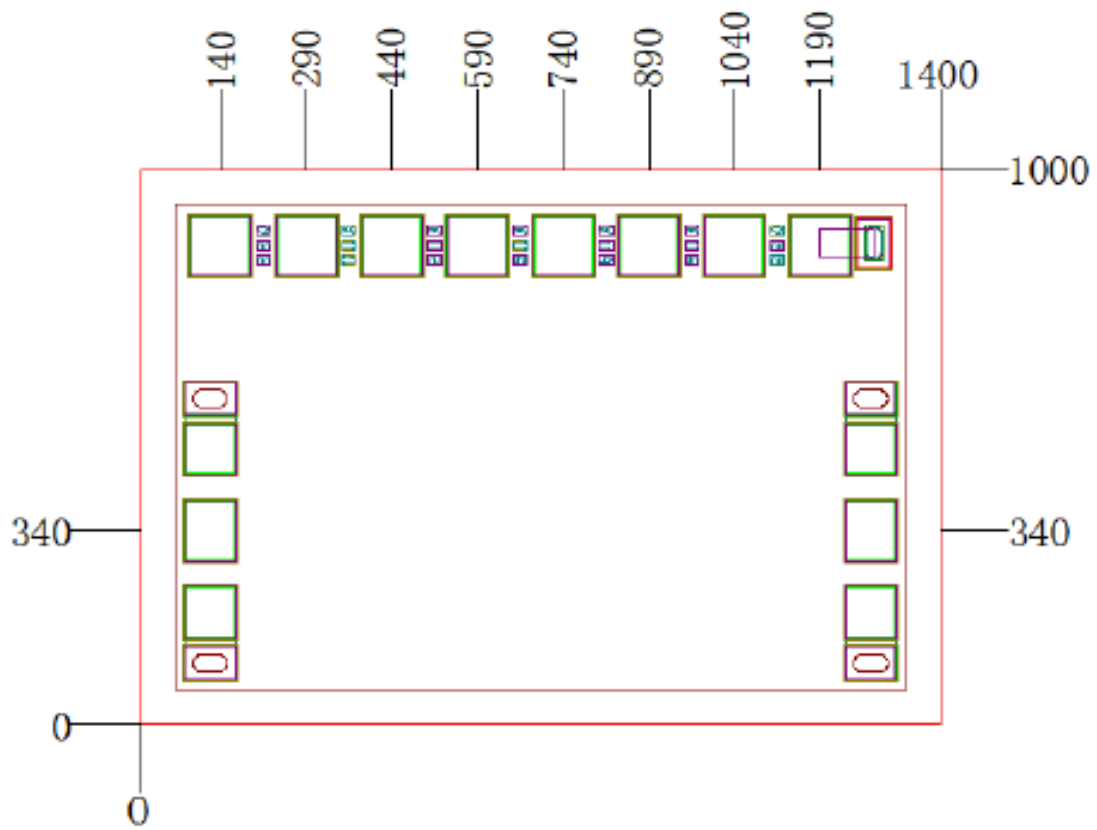


## Chip Layout Diagram



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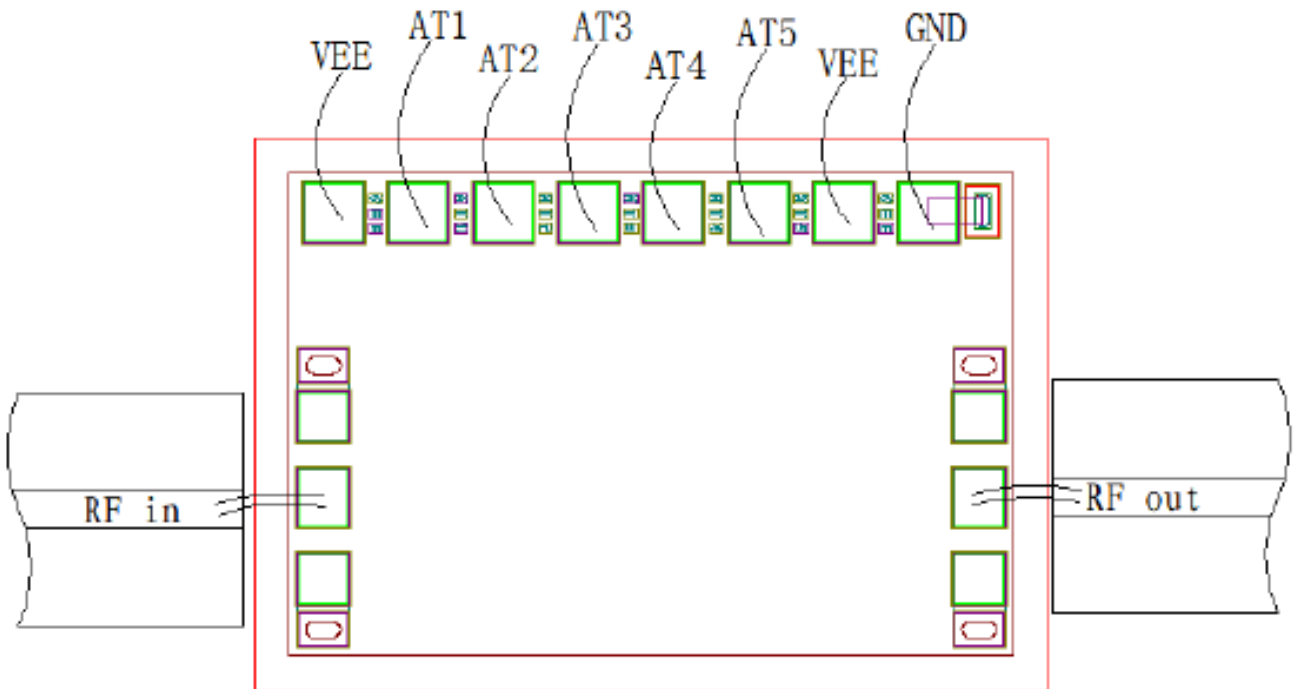
## Pad Definition

| Symbol | Function | Dimension |
|---|---|---|
| RFin | RF signal input port, external connect to 50Ω system, no DC blocking capacitor | 100μm*100μm |
| RFout | RF signal output port, external connect to 50Ω system, no DC blocking capacitor | 100μm*100μm |
| GND | Ground | 100μm*100μm |
| ATT1 | 0.5dB bit control | 100μm*100μm |
| ATT2 | 1 dB bit control | 100μm*100μm |
| ATT3 | 2 dB bit control | 100μm*100μm |
| ATT4 | 4 dB bit control | 100μm*100μm |
| ATT5 | 8 dB bit control | 100μm*100μm |
| VEE | -3V supply, applies at any one of the pad | 100μm*100μm |

## Truth Table

| Attenuation | 0.5dB | 1 dB | 2 dB | 4 dB | 8 dB |
|---|---|---|---|---|---|
| | ATT1 | ATT2 | ATT3 | ATT4 | ATT5 |
| Initial | 0 | 0 | 0 | 0 | 0 |
| 0.5dB | 1 | 0 | 0 | 0 | 0 |
| 1 dB | 0 | 1 | 0 | 0 | 0 |
| 2 dB | 0 | 0 | 1 | 0 | 0 |
| 4 dB | 0 | 0 | 0 | 1 | 0 |
| 8 dB | 0 | 0 | 0 | 0 | 1 |
| 15.5 dB | 1 | 1 | 1 | 1 | 1 |

Pleases see Appendix A for details.