

DC to 50 GHz MMIC Low Power Voltage Controlled Attenuator

Features

- Wideband operation: DC to 50 GHz
- Low Insertion Loss (<5 dB)
- Good Input/Output Match
- High Attenuation (max. 27 dB)
- Very flat Attenuation
- Size: 1640 x 920 mm

Description

The MMS004AA is a low-power high-attenuation DC-50 GHz PHEMT FET attenuator. The performance of the device is controlled by two bias voltages, V_{series} and V_{shunt} . The bias voltages control the match and attenuation of the device when varied between -1V and +0.5V DC. Please refer to the tables of recommended bias settings optimized for flat insertion loss and flat attenuation for additional information.

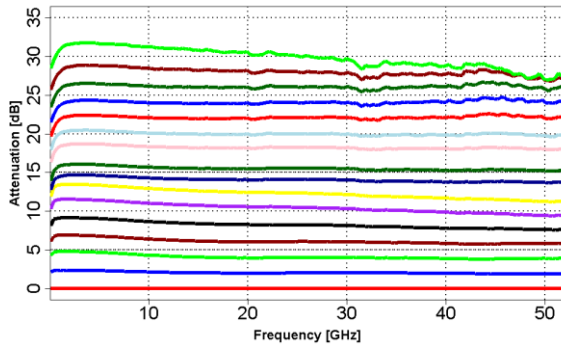
Application

The MMS004AA MMIC voltage controlled attenuator is ideal for high frequency and broadband applications in test equipment, commercial and military systems. The attenuator is especially suited for applications needing a large amount of adjustable attenuation and fast attenuation control from DC to millimeter frequencies. The device is also useful as a general purpose building block in communications systems.

Key Characteristics: $Z_0=50\Omega$

| Parameter | Description | Min | Typ | Max |
|----------------------|--------------------------------|-----|-----|-----|
| Attenuation (dB) | DC to 50GHz | 0 | - | 27 |
| Flatness (\pm dB) | DC to 50GHz | - | 1.0 | - |
| Insertion Loss (dB) | DC to 50GHz | - | - | 5 |
| S11 (dB) | DC to 50GHz | - | -12 | -10 |
| S22 (dB) | DC to 50GHz | - | -12 | -10 |
| P1dB (dBm) | 1dB Gain Compression 0 to 15dB | 5 | 6 | - |

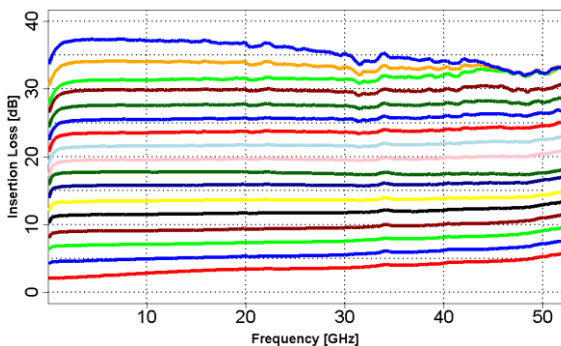
Optimized for Flat Attenuation (Typical)

MMS004AA Attenuation


Typical on wafer measured performance

| Vseries (V) | Vshunt (V) | Att. (dB)* |
|-------------|------------|------------|
| -0.637 | 0.5 | 30 |
| -0.6 | 0.5 | 28 |
| -0.575 | 0.062 | 26 |
| -0.555 | -0.142 | 24 |
| -0.539 | -0.252 | 22 |
| -0.527 | -0.334 | 20 |
| -0.509 | -0.375 | 18 |
| -0.478 | -0.425 | 15.5 |
| -0.463 | -0.45 | 14 |
| -0.512 | -0.506 | 12 |
| -0.505 | -0.534 | 10 |
| -0.45 | -0.55 | 8 |
| -0.288 | -0.562 | 6 |
| 0.25 | -0.588 | 4 |
| -0.25 | -0.65 | 2 |
| 0.5 | -1 | 0 |

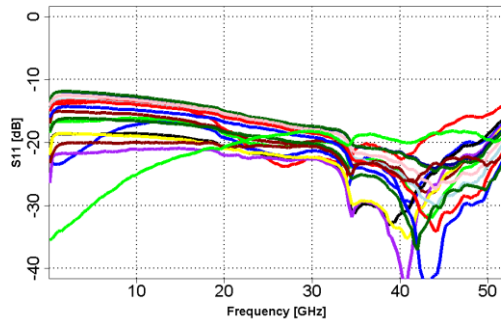
Optimized for Flat Insertion Loss (Typical)

MMS004AA Insertion Loss


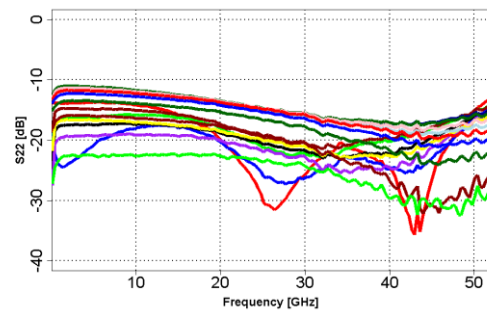
Typical on wafer measured performance

| Vseries (V) | Vshunt (V) | Att. (dB)* |
|-------------|------------|------------|
| -0.688 | 0.5 | 35.5 |
| -0.637 | 0.5 | 33.5 |
| -0.6 | 0.45 | 31.6 |
| -0.6 | -0.15 | 29.8 |
| -0.584 | -0.255 | 27.7 |
| -0.567 | -0.315 | 25.7 |
| -0.553 | -0.364 | 23.7 |
| -0.541 | -0.408 | 21.7 |
| -0.53 | -0.446 | 19.7 |
| -0.55 | -0.5 | 17.6 |
| -0.512 | -0.506 | 15.7 |
| -0.503 | -0.539 | 13.7 |
| -0.45 | -0.55 | 11.8 |
| -0.25 | -0.562 | 9.6 |
| -0.025 | -0.592 | 7.6 |
| 0.387 | -0.638 | 5.6 |
| 0.5 | -1 | 3.6 |

Note: (*) Midband

MMS004AA S11


Typical on wafer measured performance

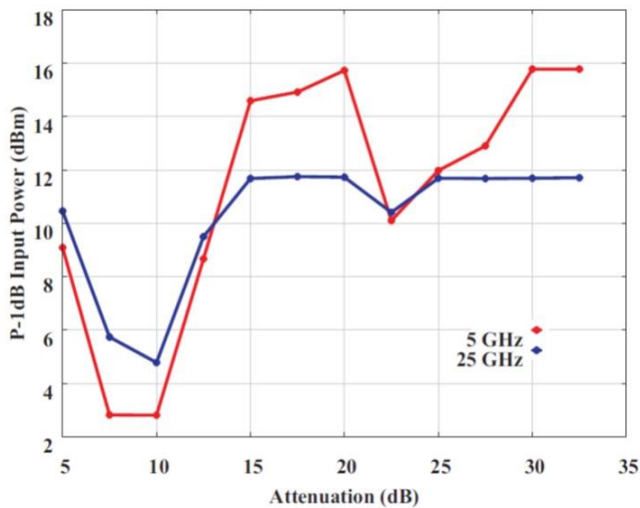
MMS004AA S22


Typical on wafer measured performance

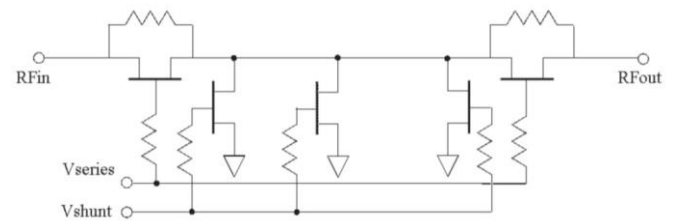
Table 1: Supplemental Specifications

| Parameter | Description | Min | Typ | Max |
|-----------|---------------------------------|-----|------------|-------|
| Vseries | Attenuation Control Voltage | -2V | - | 0.5V |
| Vshunt | Attenuation Control Voltage | -2V | - | 0.5V |
| Dcin | DC feedback circuit input | 0V | 0.2V | 1V |
| Dcout | DC feedback circuit output | 0V | 0.2V | 1V |
| GND | Backside Ground Plane | - | - | - |
| Tch | Channel Temperature | - | - | 150°C |
| Θch | Thermal Resistance (Tcase=85°C) | - | 60° C/Watt | - |

**Typical Measured Performance
on Evaluation Package**



MMS004AA Simplified Schematic Diagram



Pick-up and Chip Handling:

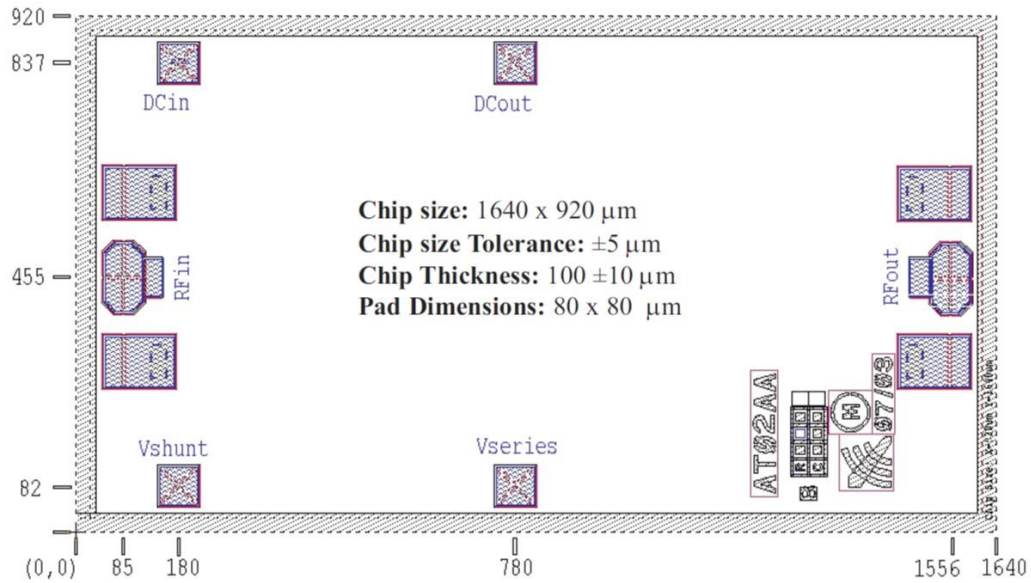
This MMIC has exposed air bridges on the top surface. **Do not pick up chip with vacuum on the die center**; handle from edges or use a collet.

ESD Handling and Bonding:

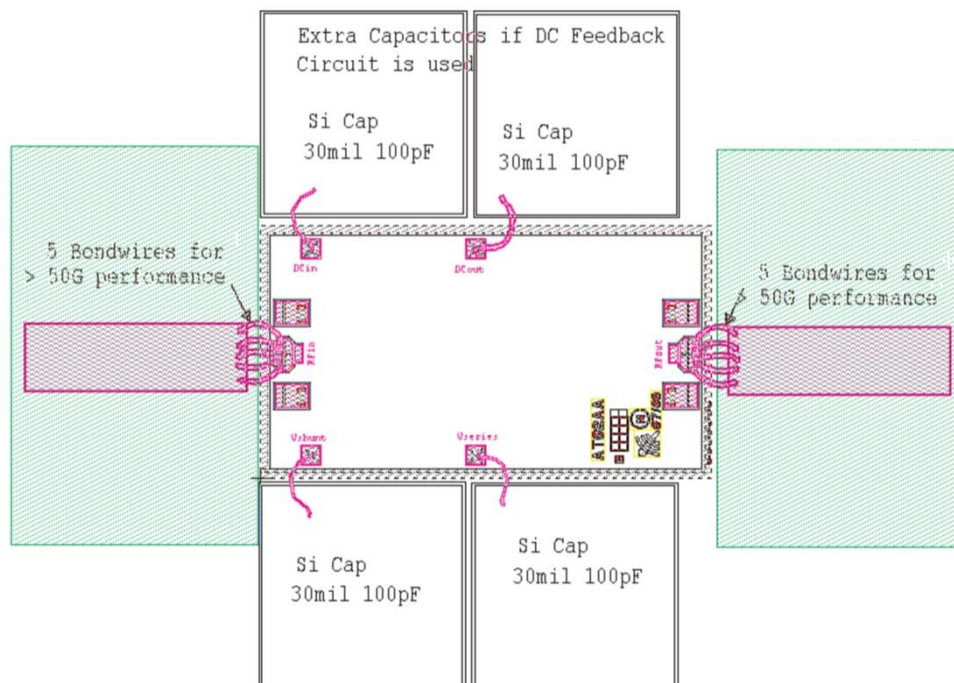
This MMIC is ESD sensitive; preventive measures should be taken during handling, die attach, and bonding.

Epoxy die attach is recommended. Please review our application note MM-APP-0001 handling and die attach recommendations, on our website for more handling, die attach and bonding information.

Physical Characteristics of MMS004AA



Assembly Diagram of MMS004AA



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