

Product Overview

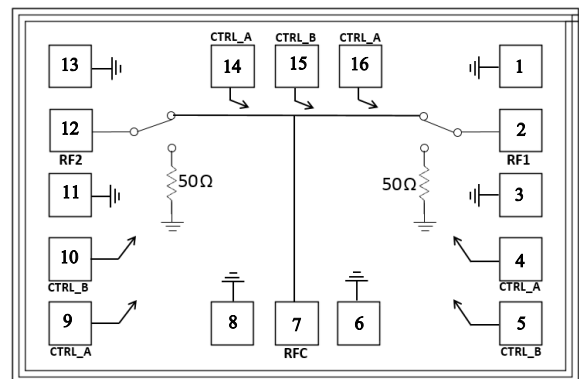
The MMS006AA device is a DC-to-20 GHz, non-reflective gallium arsenide (GaAs) pseudomorphic high-electron mobility transistor (pHEMT), high isolation single pole double throw (SPDT) monolithic microwave integrated circuit (MMIC) chip.

The switch delivers over 40 dB of isolation across the entire DC-to-20 GHz frequency range, while maintaining a low insertion loss of less than 2 dB. The MMS006AA device operates using two negative control voltage logic lines of -5V and 0V, respectively. It requires no VEE, and consumes essentially zero current. The RF ports are internally matched to 50Ω, which allows for easy integration into multi-chip modules (MCMs).

Key Features

- Wide operating range: DC–20 GHz
- Low insertion loss: <2 dB
- High input P1dB: 24 dBm
- Excellent isolation: >40 dB
- High input IP3: 42 dBm
- Fast switching: <10 ns
- Non-reflective topology
- Compact die size: 0.85 mm × 1.30 mm × 0.1 mm

Functional Block Diagram



Applications

- Test instrumentation
- Military radar, radio, EW, and ECM applications
- General purpose microwave applications

Table 1. Performance Overview

Parameter	Typ	Units
Input frequency	DC–20	GHz
Insertion loss	<2	dB
Isolation	< -40	dB
Input P1dB	24	dBm

Export Classification: EAR99

Insertion Loss

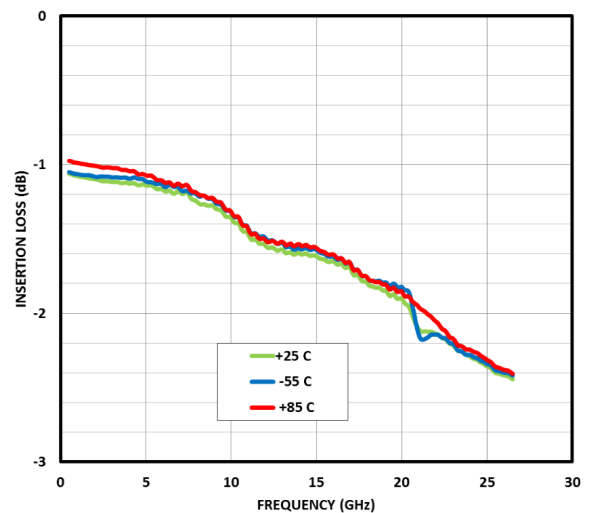


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1. Electrical Specifications

1.1 Typical Electrical Performance

Table 1-1. Typical Electrical Performance at 25 °C, Vcontrol = 0V / – 5V (Unless otherwise mentioned).

Parameter	Test Conditions	Min	Typ.	Max	Units
Frequency range		DC		20	GHz
Insertion loss (all states)	DC–20 GHz			2.0	dB
Isolation loss (all states)	DC–20 GHz	–40			dB
Input P1dB	DC–20 GHz		24		dBm
Input IP3	DC–20 GHz (2-tones, 7 dBm per tone)		42		dBm
T _{RISE} , T _{FALL}	DC–20 GHz (10% to 90% and 90% to 10% RF)			10	ns
T _{ON} , T _{OFF}	DC–20 GHz (50% control to 90% RF, and 50% control to 90% RF)		10		ns
Return loss (all states)	DC–20 GHz		–15		dB
Control voltage	Low	–3.0		0	V
	High	–5.0		–4.2	V

1.2 Typical Performance Curves

The following graphs show the typical performance curves of the MMS006AA device at +25 °C, 0 /–5V control voltage (Unless otherwise indicated).

Figure 1-1. Insertion Loss

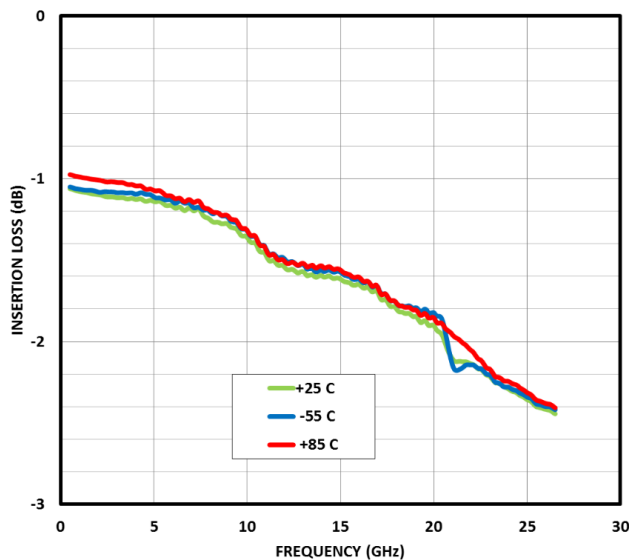


Figure 1-2. Isolation

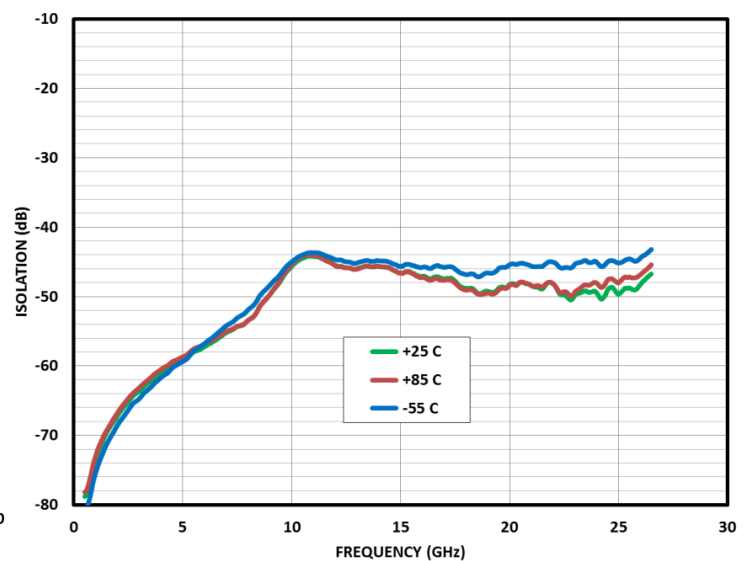


Figure 1-3. Compression

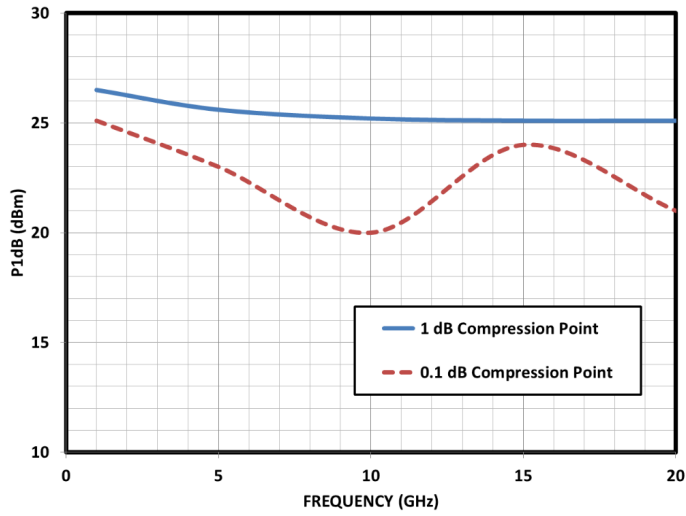


Figure 1-4. Input IP3

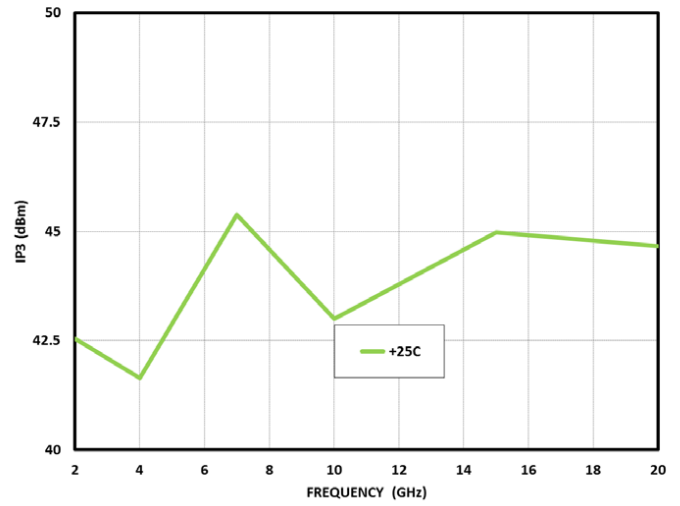
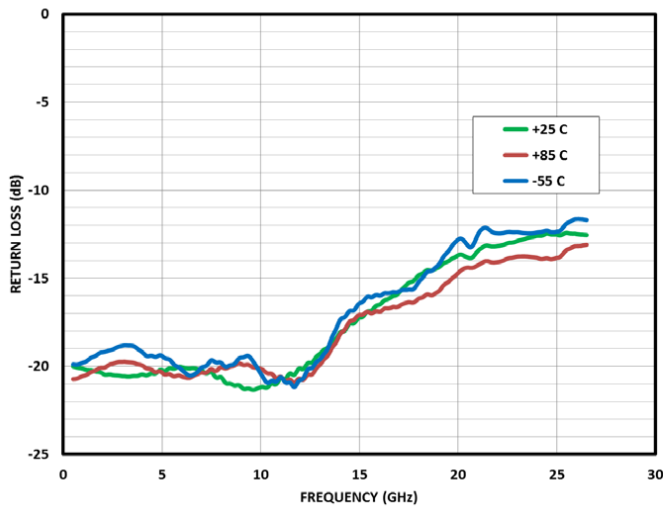


Figure 1-5. Return Loss



1.3 Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the MMS006AA device at 25 °C, unless otherwise specified. Exceeding one or any of the maximum ratings potentially could cause damage or latent defects to the device.

Table 1-2. Absolute Maximum Ratings

Parameter	Rating
Control voltage range (A/B)	+0.5V to -7.5V
Max RF input power	30 dBm
Hot switching power	27 dBm
Channel temperature	150 °C
Thermal resistance	18 °C/W
Operating temperature	-40 °C to +85 °C
Storage temperature	-65 °C to +150 °C
ESD HBM	Class 1A



ESD Sensitive Device

2. Die Specifications

The following illustration shows the chip outline of the MMS006AA device. Dimensions are shown in inches and millimeters. The minimum bond pad size is 100 μm \times 100 μm . Both the bond pad surface and the backside metal are 3 μm gold. The die thickness is 100 μm . The backside is the DC/RF ground. The airbridge keepout region is in crosshatch, and the unlabeled pads should not be bonded.

For additional packaging information, contact your Microchip sales representative.

Figure 2-1. Die Outline Drawing mm[inches]

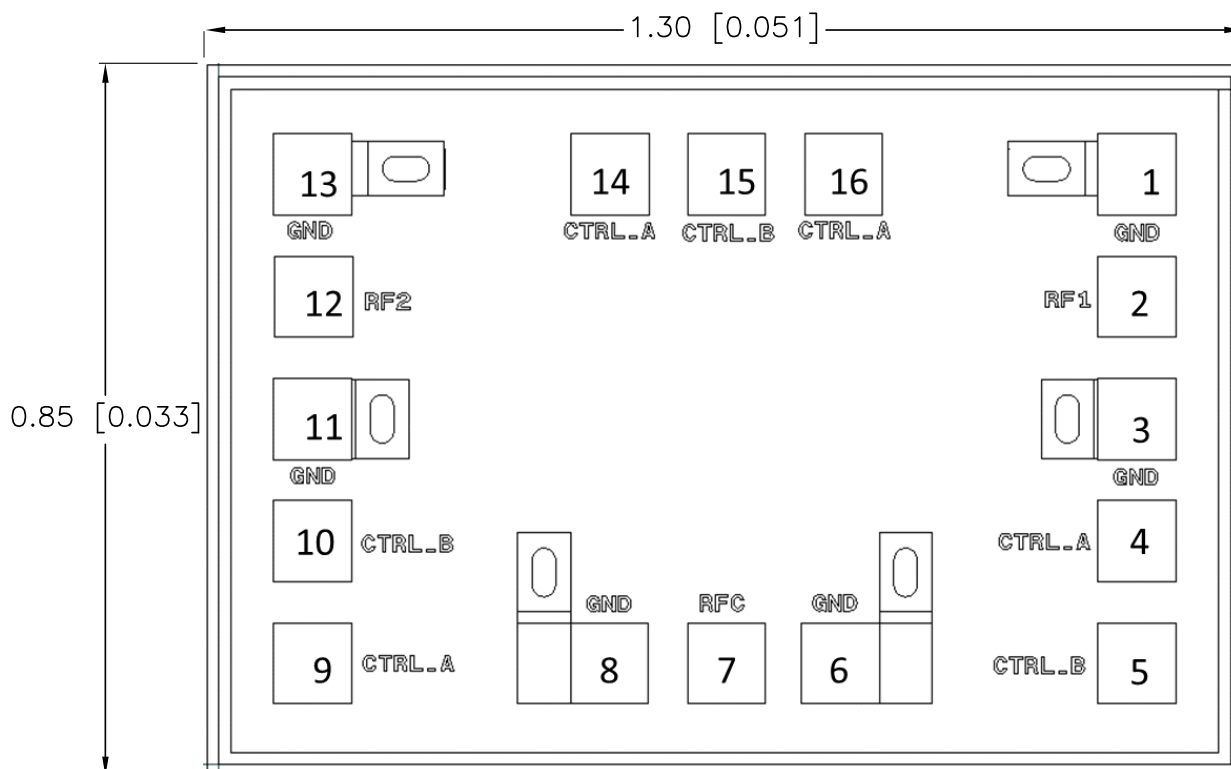


Table 2-1. I/O Pad Description

Pad Number	Pad Label	Description	Notes
7	RFC	RF common. DC coupled	Depending on switch state, a small (< 200 mV) DC voltage leaks to this pad.
2 & 12	RF1 & RF2	RF output 1 and RF Output 2. DC-coupled	Depending on switch state, a small (< 200 mV) DC voltage leaks to this pad.
4, 9, 14, 16	CTRL-A	DC control voltage	All CTRL-A Pads are connected together on chip.
5, 10, 15	CTRL-B	DC control voltage	All CTRL-B Pads are connected together on chip.
1, 3, 6, 8, 11, 13	GND	RF/DC ground	On chip connected to DC/RF GND
	Die backside	RF/DC ground	On chip connected to DC/RF GND

Table 2-2. Truth Table

Control Input		Signal Path	
A	B	RFC to RF1	RFC to RF2
High	Low	On	Off
Low	High	Off	On
High	High	Undefined	Undefined
Low	Low	Undefined	Undefined

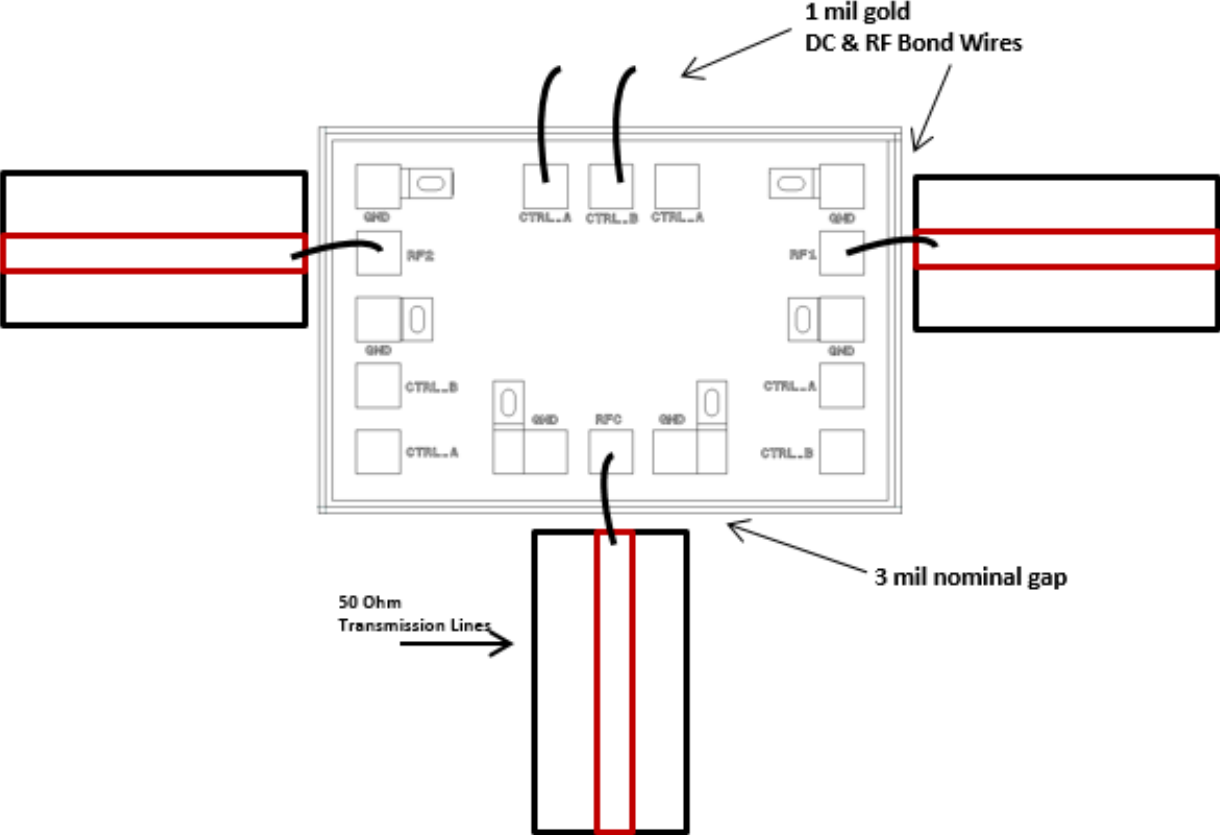
Table 2-3. Control Voltage

State	Bias Condition
Low	-3V to 0V
High	-5.0V to -4.2V

3. Application Circuits

The following illustration shows the assembly diagram of the MMS006AA device. Attach components using thermally conductive epoxy.

Figure 3-1. Assembly Diagram



4. Ordering, Shipping, and Handling

4.1 Handling Recommendations

Gallium arsenide integrated circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. It is recommended to follow all procedures and guidelines outlined in the Microsemi application note AN01: GaAs MMIC Handling and Die Attach Recommendations.

4.2 Ordering Information

For additional ordering information, contact your Microchip sales representative.

Part Number	Package	Note
MMS006AA	Die	
MMS006PP3	3 mm × 3 mm, 16L Plastic QFN	Refer to corresponding Datasheet

4.3 Packing Information

Standard Format	Optional Format
Waffle Pack	Gel Pack

Note: Contact your Microchip sales representative for the minimum quantity order

5. Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Table 5-1. Revision History

Revision	Date	Description
A	07/2022	Document migrated from Microsemi template to Microchip template; Assigned Microchip literature number DS-00004635A.
Initial release (Microsemi Revision A)	2016	Document created.

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