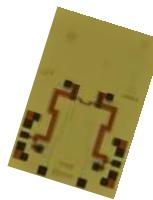




CMD172

18-40 GHz Voltage-Variable Attenuator

Let Performance Drive



Features

- Ultra wideband performance
- Low insertion loss
- Wide attenuation range
- Small die size

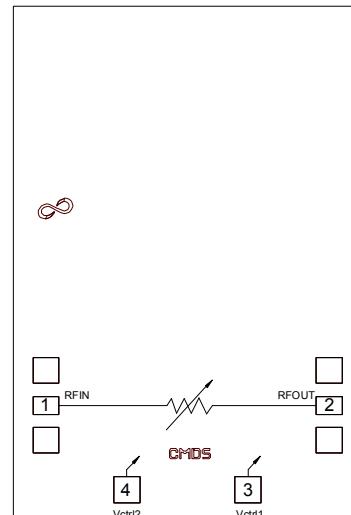
Applications

- Point-to-Point and VSAT radios
- Microwave sensors
- Test instrumentation
- Military and space

Description

The CMD172 is wideband GaAs MMIC absorptive Voltage-Variable Attenuator (VVA) die which operates from 18 to 40 GHz. The VVA uses a single DC control voltage of -3V to 0V to control RF signal levels over a 37 dB dynamic range. The CMD172 has an extremely low insertion loss of 1.6 dB and is a 50 ohm matched design which eliminates the need for RF port matching. The CMD172 offers full passivation for increased reliability and moisture protection.

Functional Block Diagram



Electrical Performance - $V_{ctrl} = -3.0$ V to 0 V, $T_A = 25$ °C, F=30 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		18 - 40		GHz
Insertion Loss		1.6		dB
Attenuation Range		37		dB
Input Return Loss		12		dB
Output Return Loss		12		dB
Input IP3		25		dBm

ver 1.0 1112

Specifications

Absolute Maximum Ratings

Parameter	Rating
Control Voltage, Vctl	-8 V
RF Input Power	30 dBm
Operating Temperature	-55 to 85 °C
Storage Temperature	-55 to 150 °C

Operation of this device outside the maximum ratings may cause permanent damage.

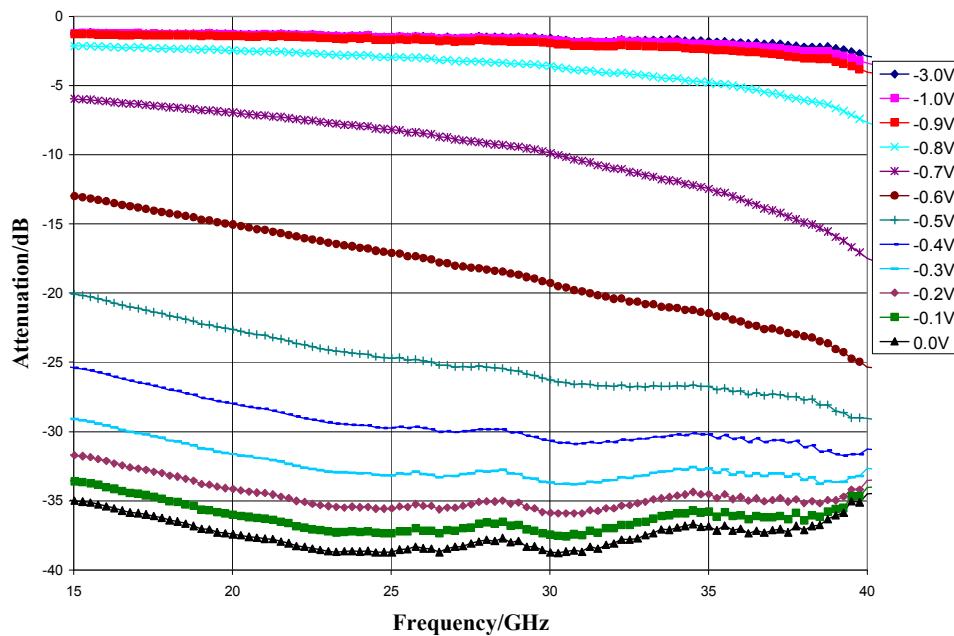
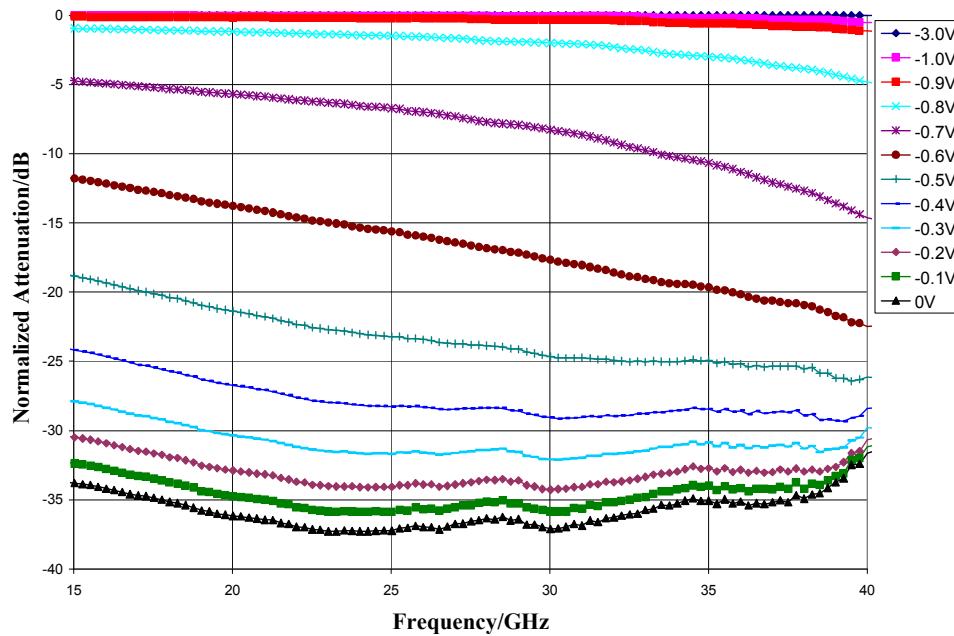
Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Vctl	-5.0	-3.0	0	V

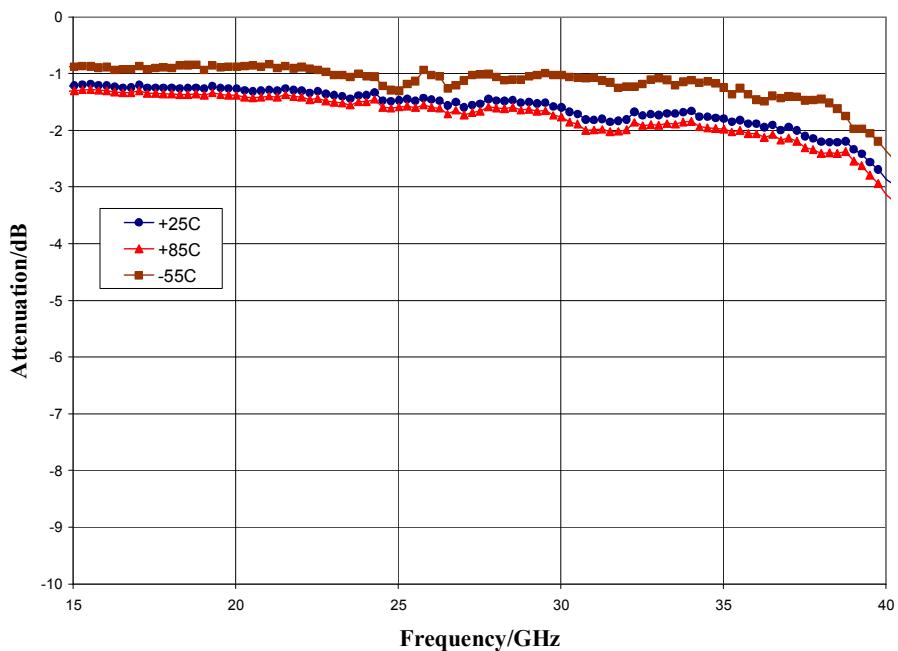
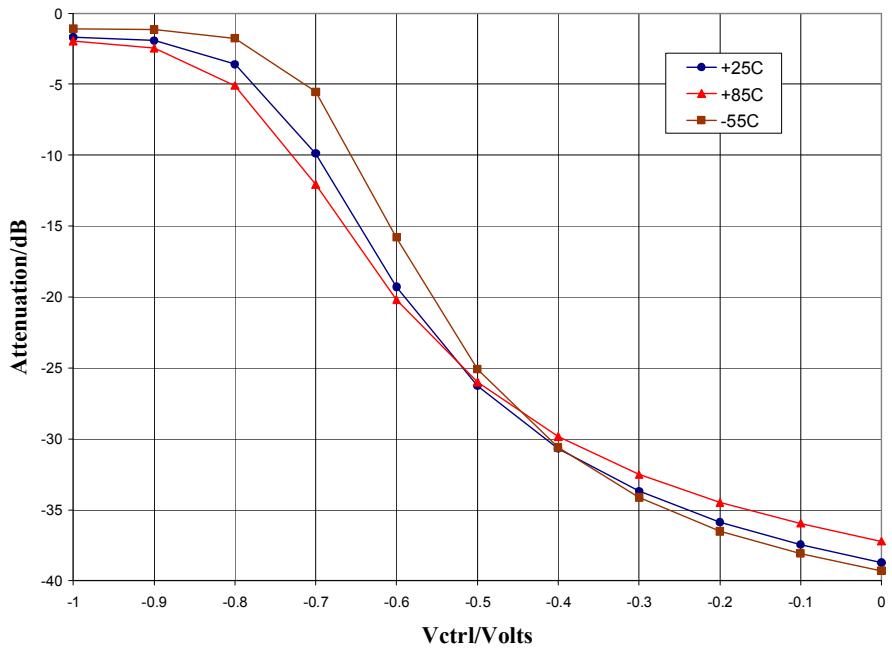
Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications, Vctl = -3.0 V to 0 V, TA = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	18 - 30			30 - 35			35 - 40			GHz
Insertion Loss		1.5	2		1.8	2.5		2.2	3.3	dB
Attenuation Range	33	38		32	37		30	37		dB
Input Return Loss		12			12			10		dB
Output Return Loss		12			12			10		dB
Input IP3		27			24			22		dBm

Typical Performance
Attenuation vs. Frequency over Control Voltage, $T_A = 25^\circ\text{C}$

Normalized Attenuation vs. Frequency over Control Voltage, $T_A = 25^\circ\text{C}$


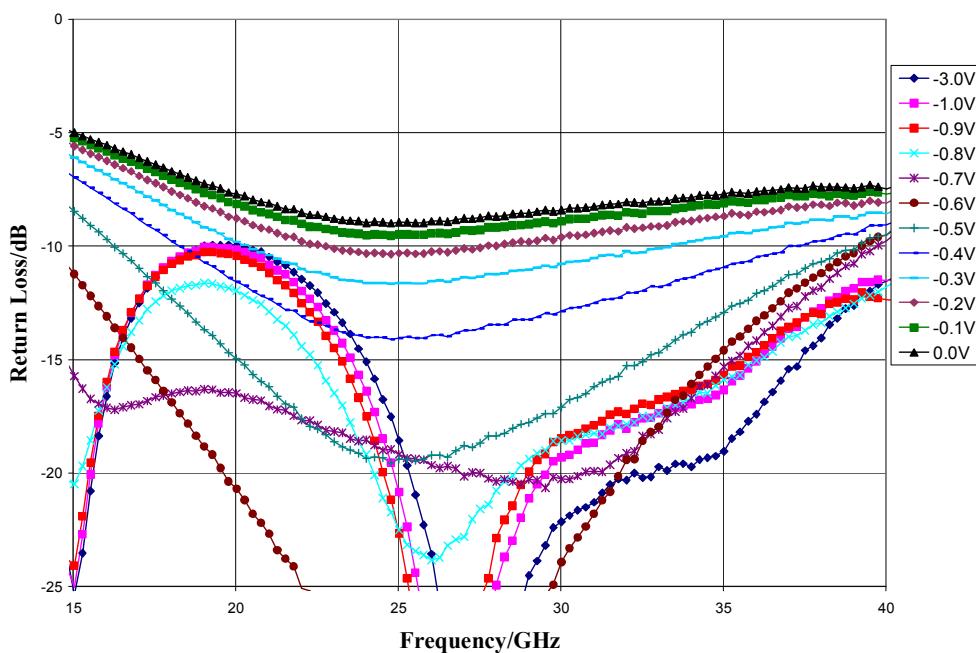
ver 1.0 1112

Typical Performance
Attenuation over Temperature, Insertion Loss State

Attenuation vs. Control Voltage over Temperature @ 30 GHz


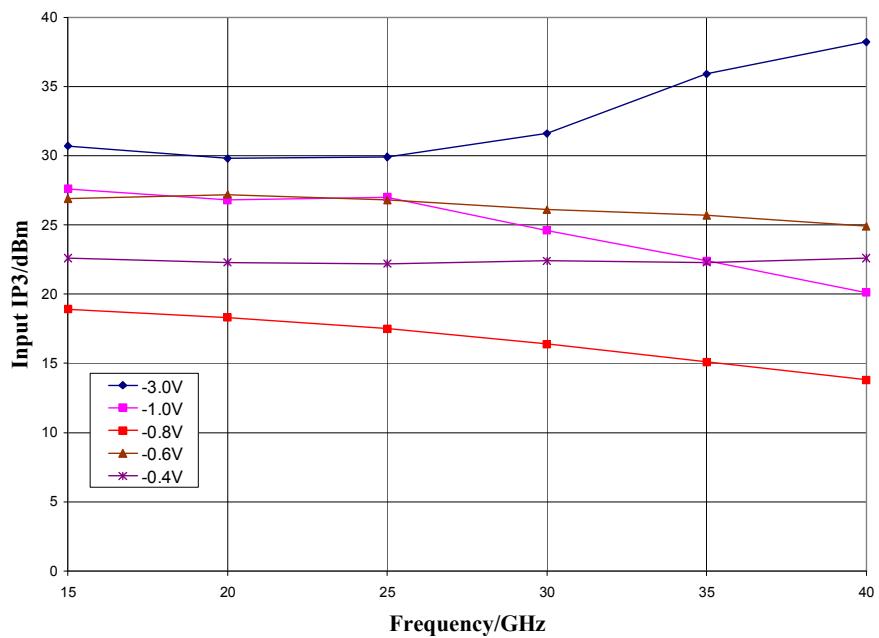
ver 1.0 1112

Typical Performance

Return Loss vs. Control Voltage, $T_A = 25^{\circ}\text{C}$



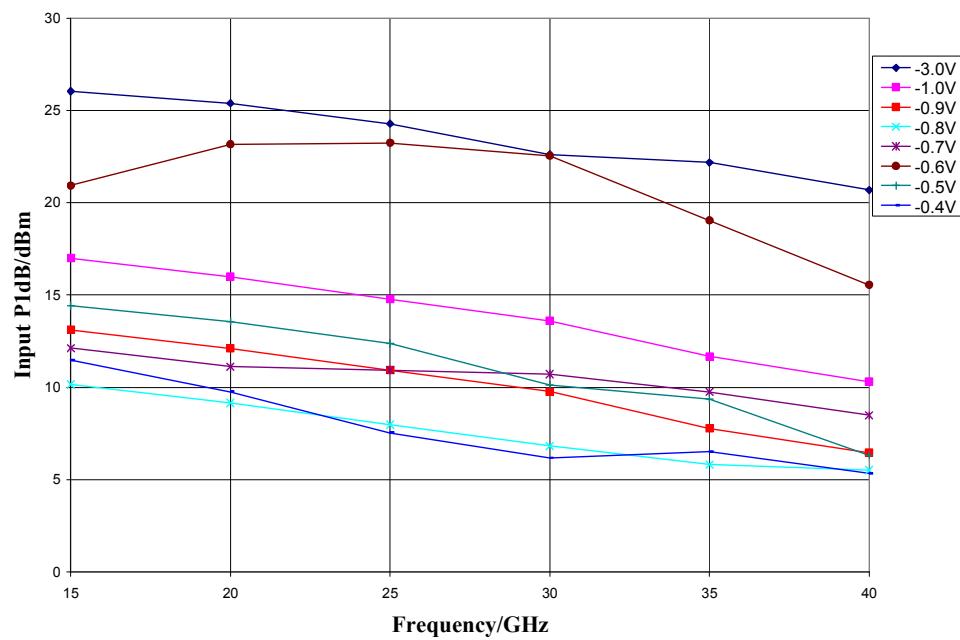
Input IP3 over Control Voltage



ver 1.0 1112

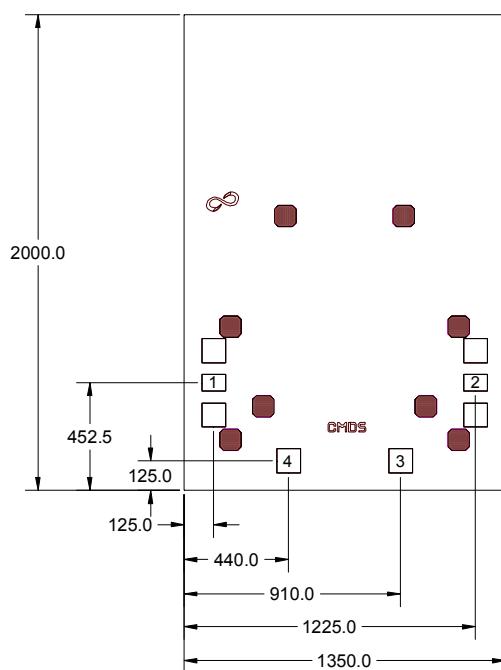
Typical Performance

Input P1dB over Control Voltage



Mechanical Information

Die Outline (all dimensions in microns)

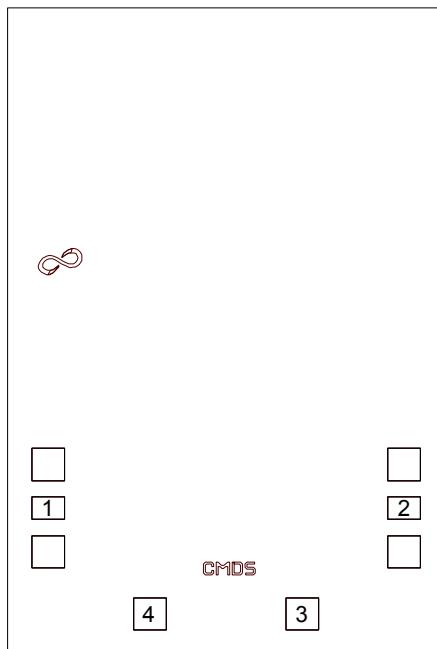


Notes:

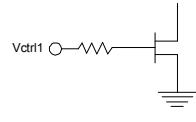
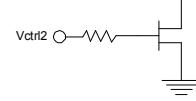
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 85 microns thick
5. DC bond pads are 100 microns square

Pad Description

Pad Diagram



Functional Description

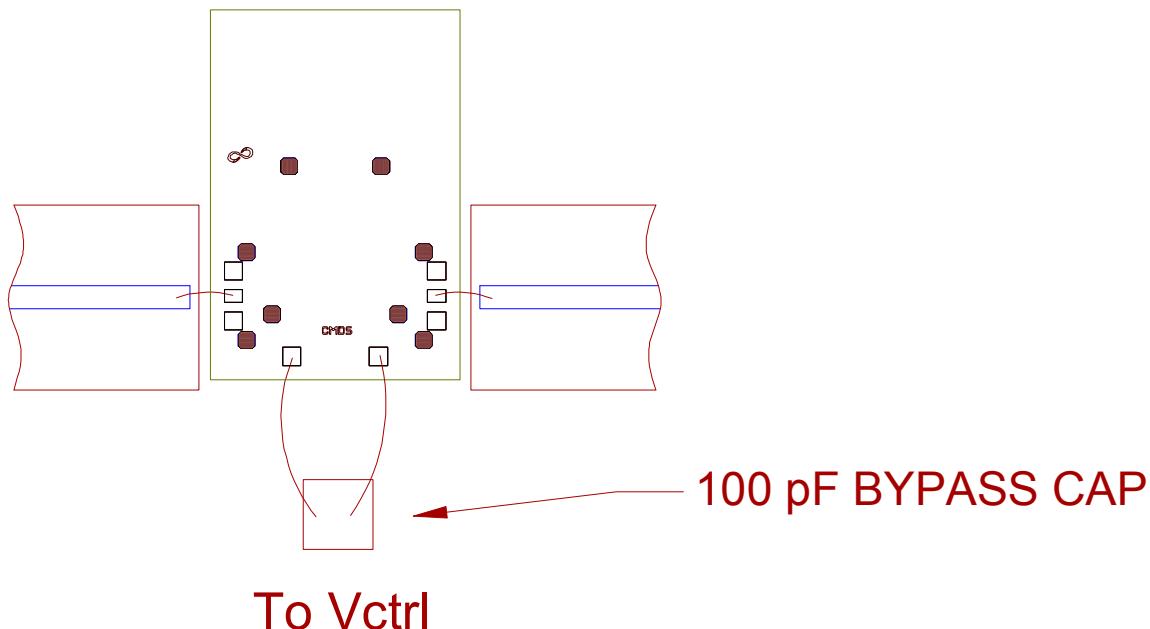
Pad	Function	Description	Schematic
1	RF in	DC blocked and 50 ohm matched	
2	RF out	DC blocked and 50 ohm matched	
3	Vctrl1	Control voltage 1	
4	Vctrl12	Control voltage 2	
Backside	Ground	Connect to RF / DC ground	

Applications Information**Assembly Guidelines**

The backside of the CMD172 is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy only. Eutectic attach is not recommended. Standard assembly procedures should be followed for high frequency devices. The top surface of the semiconductor should be made planar to the adjacent RF transmission lines, and the RF decoupling capacitors placed in close proximity to the DC connections on chip.

RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 0.8 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized. The RF input and output require a single bond wire as shown.

The semiconductor is 85 um thick and should be handled by the sides of the die or with a custom collet. Do not make contact directly with the die surface as this will damage the monolithic circuitry. Handle with care.

Assembly Diagram

GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

ver 1.0 1112



CMD172

18-40 GHz Voltage-Variable Attenuator

Applications Information

Biassing and Operation

The CMD172 has two control voltages (Vctrl1 and Vctrl2) that should be connected together. Full attenuation range is achieved when Vctrl is varied from -3 V to 0 V.

RF power can be applied at any time.

ver 1.0 1112