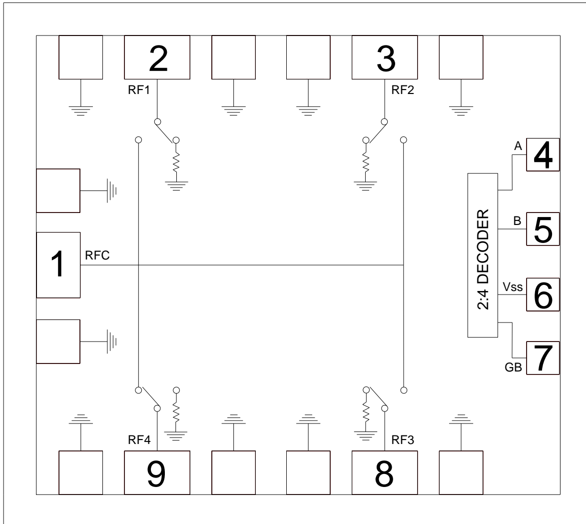
CMD203

DC-20 GHz SP4T Non-reflective Switch

Features

- ► Low loss broadband performance
- ► High isolation
- ► Non-reflective design
- ► Integrated 2:4 TTL decoder
- ► Small die size

Functional Block Diagram



Description

The CMD203 is a broadband MMIC SP4T switch in die form. The CMD203 covers DC to 20 GHz and offers a low insertion loss of 2.4 dB and high isolation of 39 dB at 10 GHz. The switch also includes an on board binary decoder circuit which reduces the number of required logic control lines from four to two. The CMD203 operates using complementary control voltage logic lines of 0/-5 V and consumes little DC current.

Electrical Performance - V_{ctl} = 0/-5 V, Vss = -5 V, T_A = 25 °C, F = 10 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		DC - 20		GHz
Insertion Loss		2.4		dB
Isolation		45		dB
Return Loss - On State		9		dB
Return Loss RF1, RF2, RF3, RF4 - Off State		11		dB
Input P1dB		21		dBm
Switching Speed		66		ns

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Specifications

Absolute Maximum Ratings

Parameter	Rating
RF Input Power	+27 dBm
Bias Voltage (Vss)	-7V
Control Voltage Range (A,B)	+0.5V to -7.5V
Channel Temperature, Tch	150 °C
Operating Temperature	-40 to 85 °C
Storage Temperature	-55 to 150 °C

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

Bias Voltage & Current

Vss Range = -5.0V ± 10%		
Vss (V)	Iss (Typ) (mA)	Iss (Max) (mA)
-5	4.5	8.0

TTL/CMOS Control Voltages

State	Bias Condition
Low	-1V to 0V @ 0.5 mA Typ
High	-7V to -3V @ 1 uA Typ

Truth Table

Control Input		Signal Path State
A	B	RFC to:
High	High	RF1
Low	High	RF2
High	Low	RF3
Low	Low	RF4

Electrical Specifications - V_{ctl} = 0/-5 V, Vss = -5 V T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		DC - 6			DC - 14			DC - 20		GHz
Insertion Loss		2	2.4		2.9	3.4		3.2	3.6	dB
Isolation	50	60		36	42		35	40		dB
Return Loss - On State		11			8			8		dB
Return Loss - Off State		11			12			15		dB
Input P1dB		19.5			21			22		dBm
Input IP3		28			30			30		dBm
Switching Speed		66			66			66		ns

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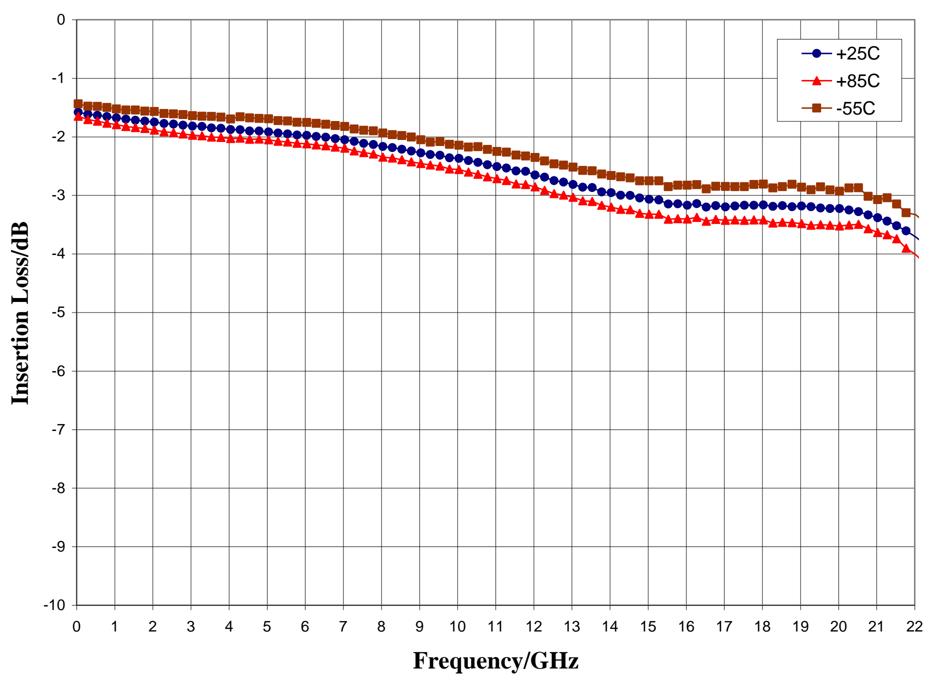
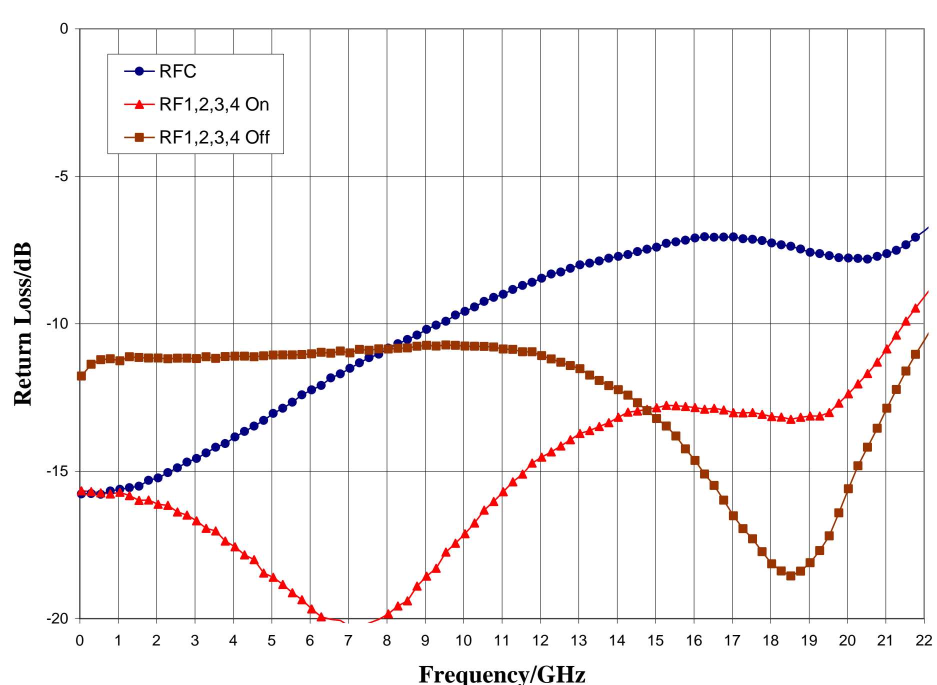
Typical Performance

Insertion Loss vs. Temperature



Return Loss



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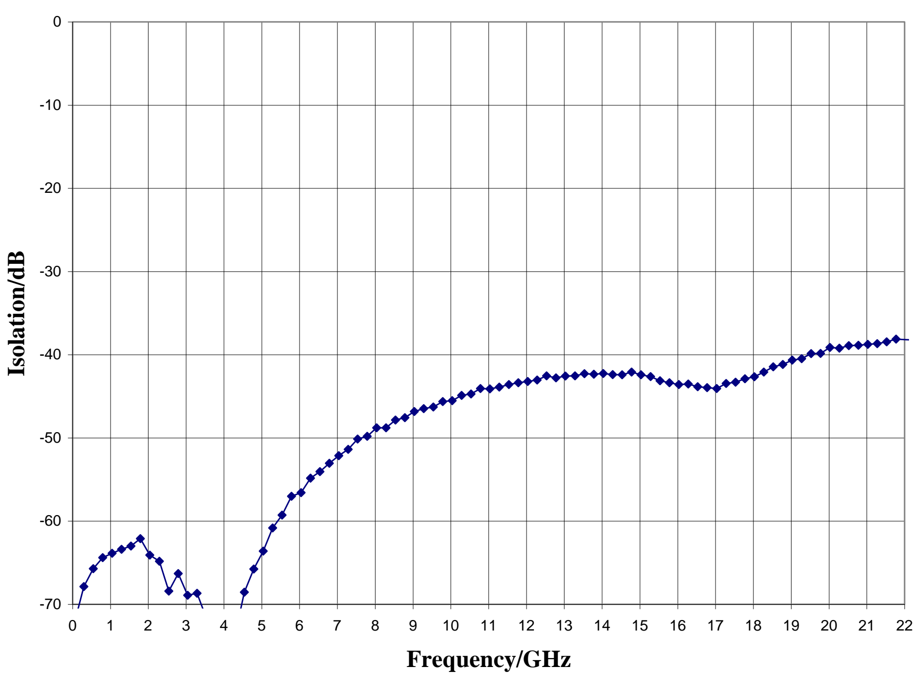
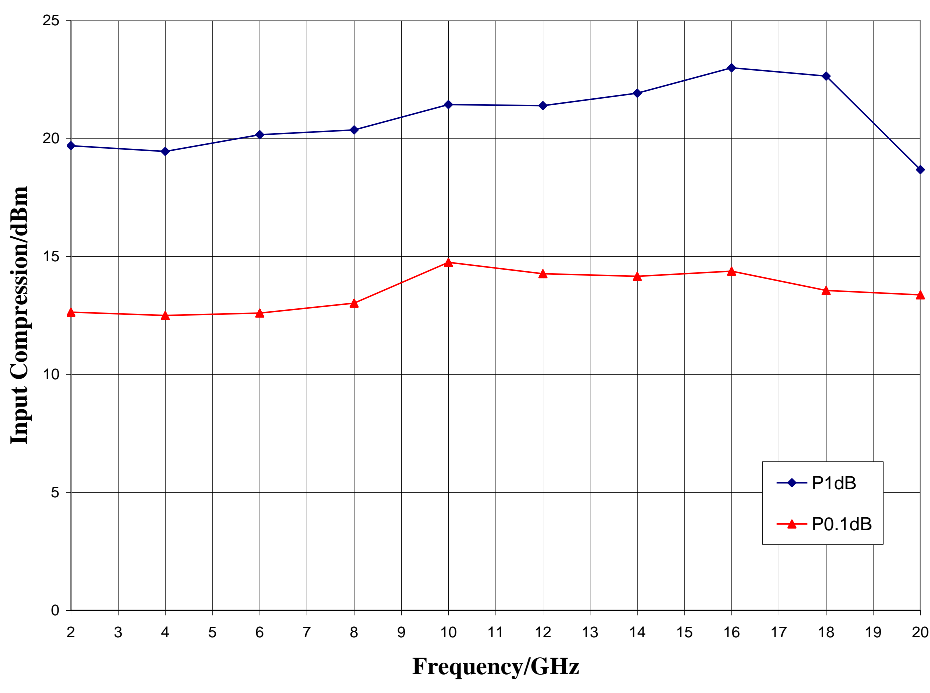
Typical Performance

Typical Isolation Between Ports RFC and RF1/RF2/RF3/RF4



Input P1dB and P0.1dB Compression Point



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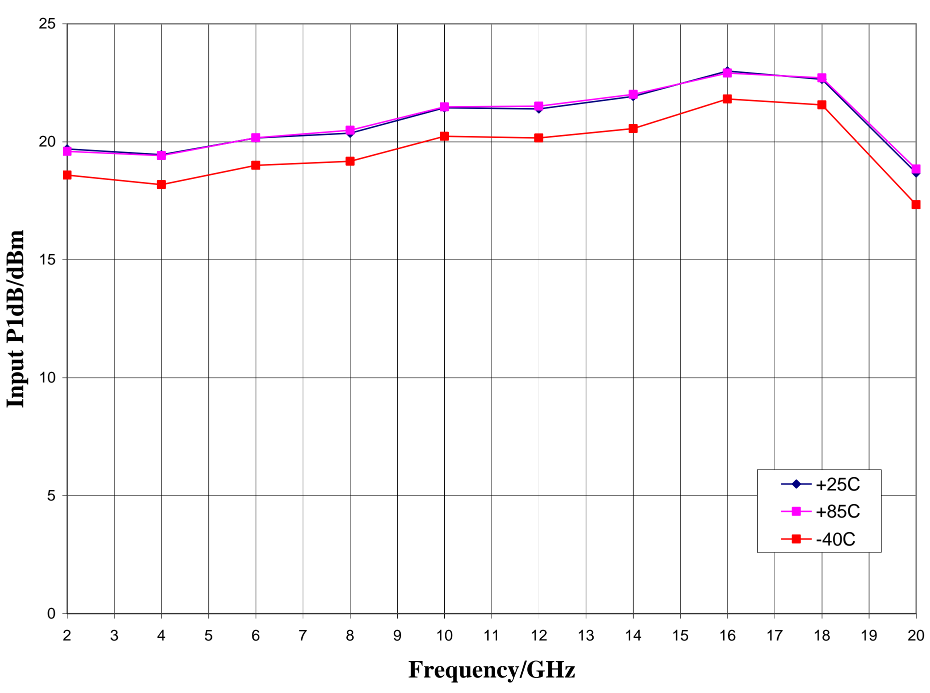
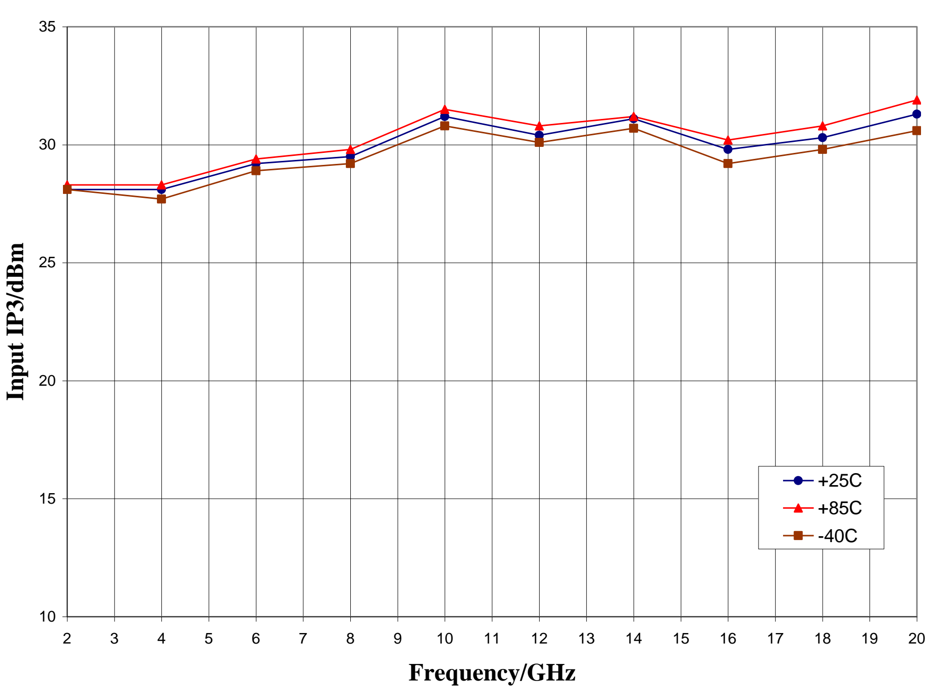
Typical Performance

Input P1dB vs. Temperature



Input Third Order Intercept Point vs. Temperature



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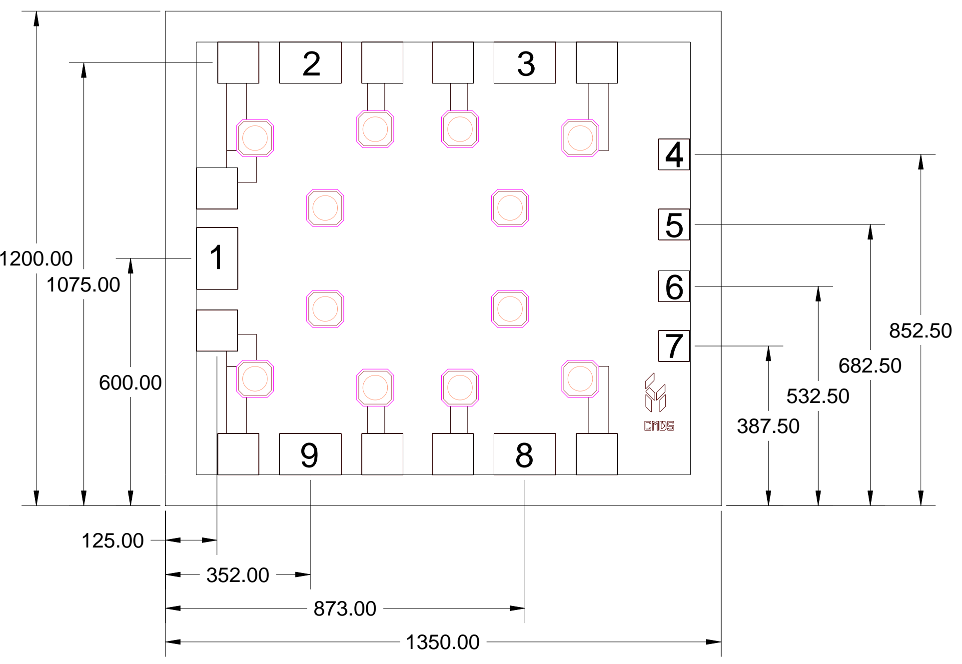
Mechanical Information

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
6. RF bond pads are 100 x 150 micron

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

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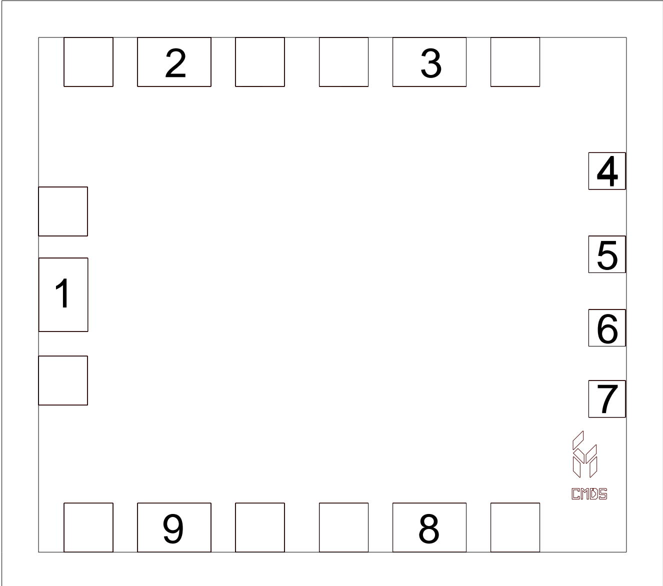
Pin Description

Pad Diagram



Functional Description

Pin	Function	Description	Schematic
1, 2, 3, 8, 9	RFC, RF1, RF2, RF3, RF4	These pins are DC coupled and matched to 50 Ohm. Blocking capacitors are required if RF line potential is not equal to 0V	
4	CTLA	See truth table and control voltage table	A, B Vss
5	CTLB	See truth table and control voltage table	
6	Vss	Power supply voltage	
7	GB	Connect to DC ground	
Backside	Ground	Connect to RF / DC ground	GND

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Applications Information

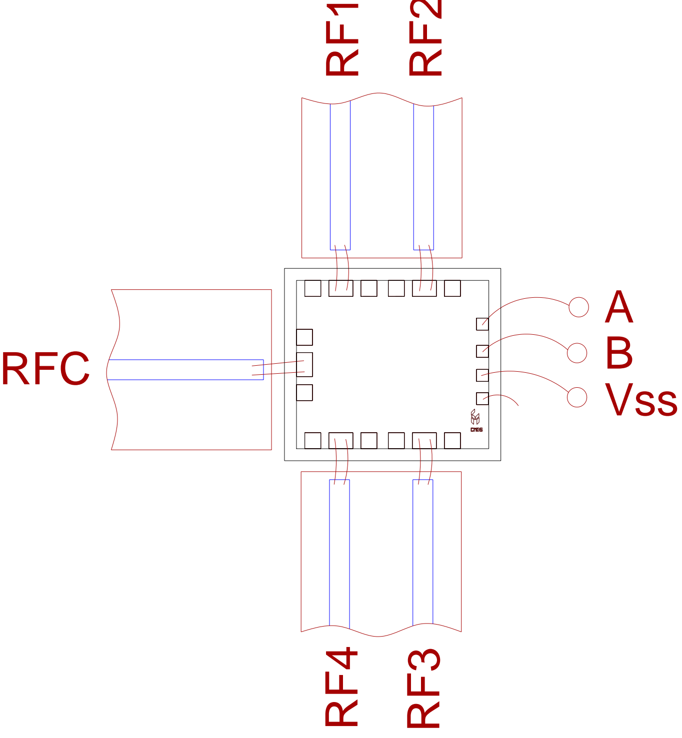
Assembly Guidelines

The backside of the CMD203 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 inputs and outputs require a double 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



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