CMD256

Frequency Doubler, 14-20 GHz Input

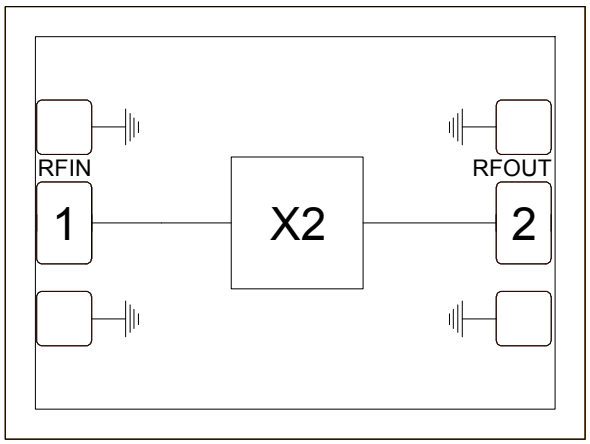
Features

- ► Low conversion loss
- ► Excellent Fo isolation
- ► Broadband performance
- ► No bias required
- ► Small die size

Description

The CMD256 die is a broadband MMIC GaAs x2 passive frequency multiplier. When driven by a +15 dBm signal, the multiplier provides 15 dB conversion loss at an output frequency of 34 GHz. The Fo isolation is 38 dBc. The CMD256 is a 50 ohm matched design eliminating the need for RF port matching.

Functional Block Diagram



Electrical Performance - T_A = 25 °C, Pin = +15 dBm, Fin = 17 GHz

Parameter	Min	Typ	Max	Units
Frequency Range, Input		14 - 20		GHz
Frequency Range, Output		28 - 40		GHz
Conversion Loss		15		dB
Fo Isolation (with respect to input level)		38		dB

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Specifications

Absolute Maximum Ratings

Parameter	Rating
RF Input Power	+27 dBm
Operating Temperature	-55 to 85 °C
Storage Temperature	-55 to 150 °C

Exceeding any one or combination of the maximum ratings may cause permanent damage to the device.

Electrical Specifications - T_A = 25 °C, Pin = +15 dBm

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range, Input	14 - 20			16 - 18			GHz
Frequency Range, Output	28 - 40			32 - 36			GHz
Conversion Loss		16	20		15	19	dB
Fo Isolation (with respect to input level)	32	40		32	40		dB

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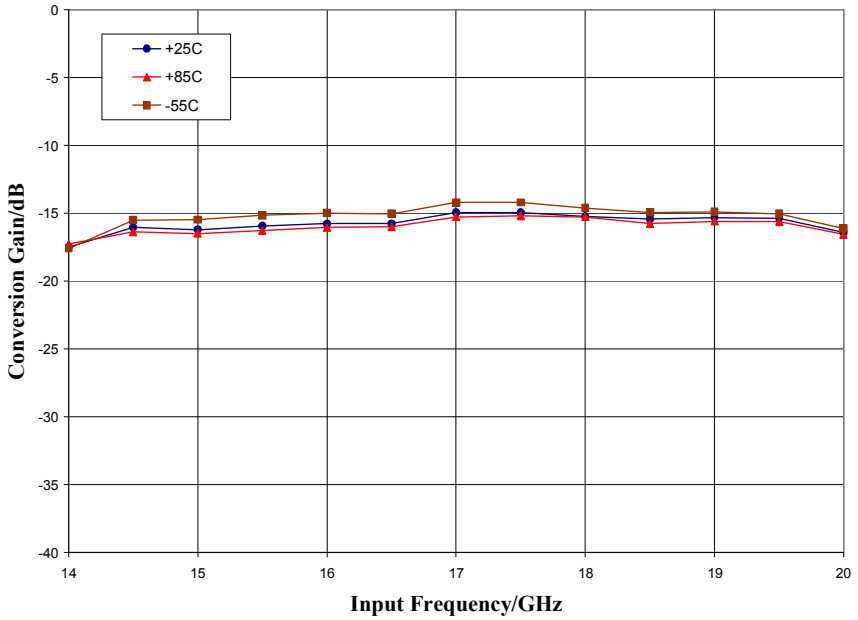
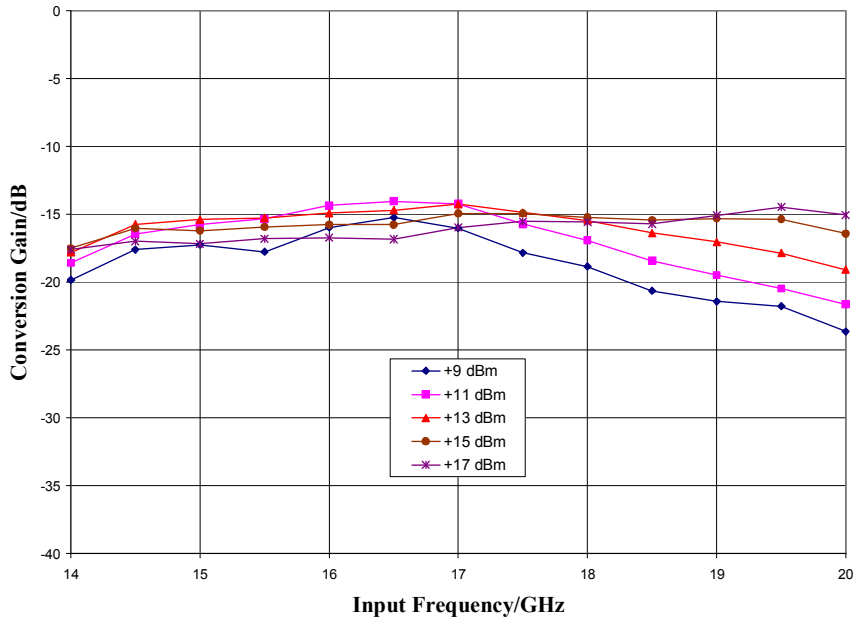
Typical Performance

Conversion Gain vs. Temperature @ +15 dBm Drive Level



Conversion Gain vs. Drive Level, T_A = 25 °C



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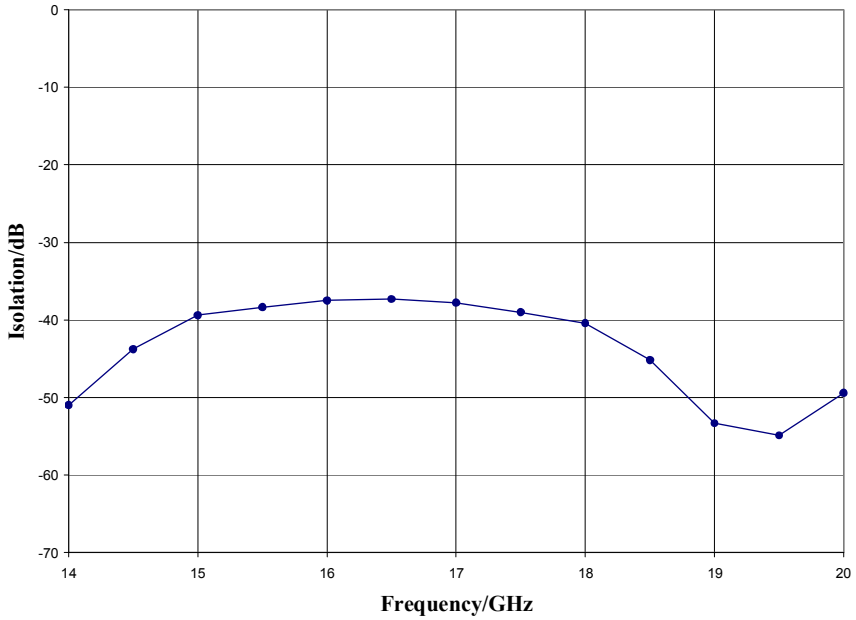
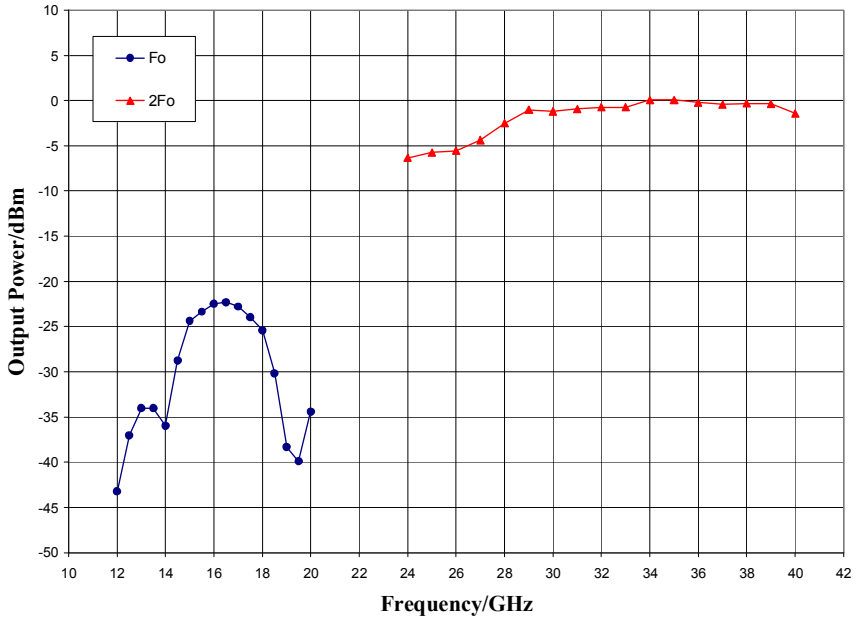
Typical Performance

Fo Isolation (with respect to input level) @ +15 dBm Drive Level, T_A = 25 °C



Output Spectrum @ +15 dBm Drive Level, T_A = 25 °C



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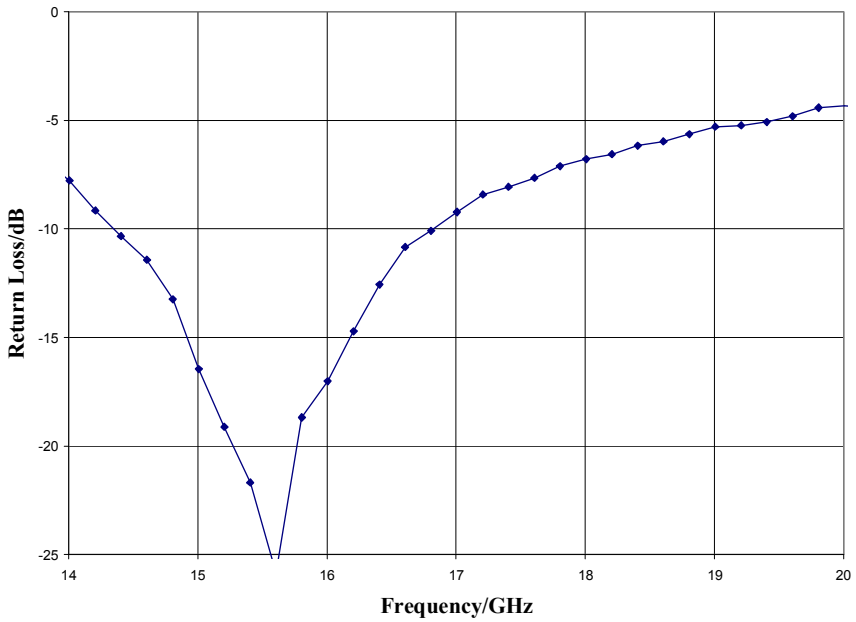
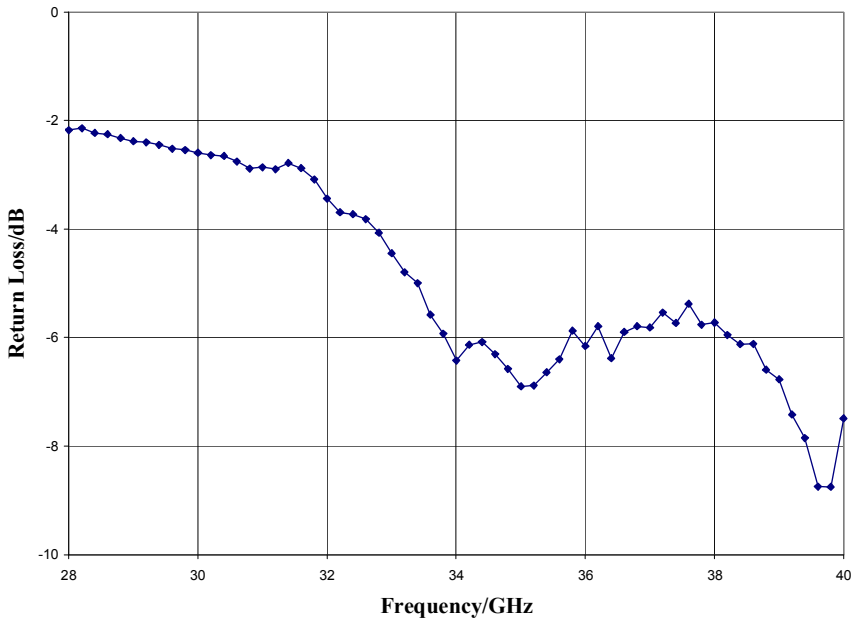
Typical Performance

Input Return Loss @ +15 dBm Drive Level, T_A = 25 °C



Output Return Loss @ +15 dBm Drive Level, F = 11.5 GHz Input, T_A = 25 °C



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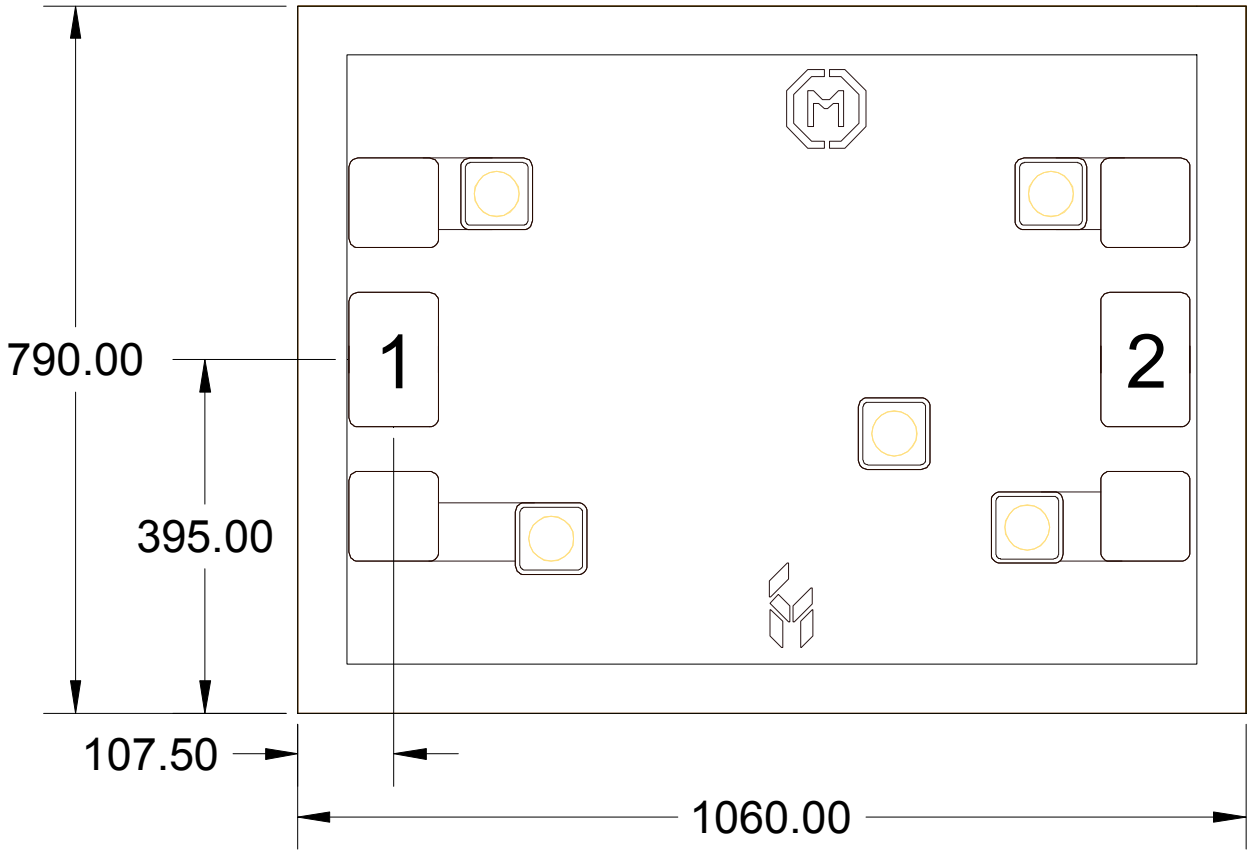
Mechanical Information

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 100 microns thick
5. RF bond pads are 100 x 150 microns

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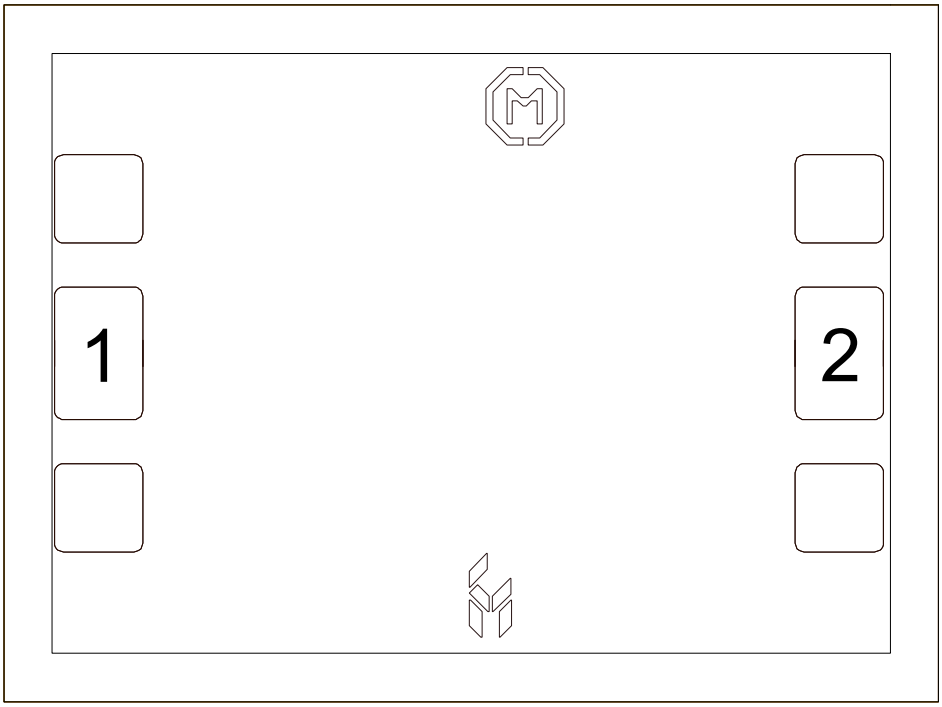
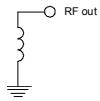
Pin Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	Pad is DC coupled and 50 ohm matched	
2	RF out	Pad is DC coupled and 50 ohm matched	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

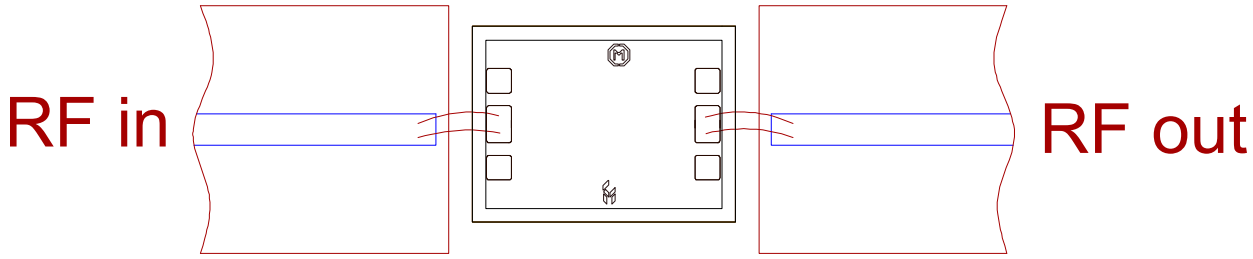
Assembly Guidelines

The backside of the CMD256 is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy or eutectic attach. 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.

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 double bond wires as shown.

The semiconductor is 100 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.

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CMD227C3

Frequency Doubler, 8-15 GHz Input

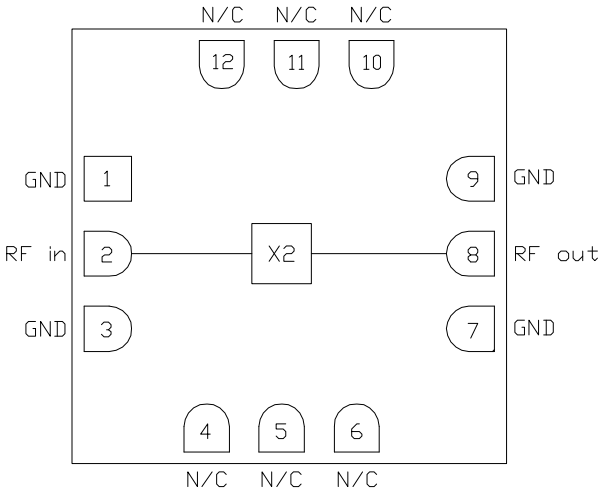
Features

- ► Low conversion loss
- ► Excellent Fo isolation
- ► Broadband performance
- ► No bias required
- ► Pb-free RoHS compliant 3x3 SMT package

Description

The CMD227C3 is a broadband MMIC GaAs x2 passive frequency multiplier in a ceramic, QFN-style package. When driven by a +15 dBm signal, the multiplier provides 11 dB conversion loss at an output frequency of 23 GHz. The Fo and 3Fo isolations are 38 dBc and 49 dBc respectively. The CMD227C3 is a 50 ohm matched design eliminating the need for RF port matching.

Functional Block Diagram



Electrical Performance – T_A = 25 °C, Pin = +15 dBm, Fin = 11.5 GHz

Parameter	Min	Typ	Max	Units
Frequency Range, Input		8 – 15		GHz
Frequency Range, Output		16 – 30		GHz
Conversion Loss		11		dB
Fo Isolation (with respect to input level)		38		dB
3Fo Isolation (with respect to input level)		49		dB

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Specifications

Absolute Maximum Ratings

Parameter	Rating
RF Input Power	+27 dBm
Operating Temperature	-40 to 85 °C
Storage Temperature	-55 to 150 °C

Exceeding any one or combination of the maximum ratings may cause permanent damage to the device.

Electrical Specifications – T_A = 25 °C, Pin = +15 dBm

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range, Input	8 – 15			10 – 13			GHz
Frequency Range, Output	16 – 30			20 – 26			GHz
Conversion Loss		13	19		11	15.5	dB
Fo Isolation (with respect to input level)	37	44		37	44		dB
3Fo Isolation (with respect to input level)	37	44		37	44		dB

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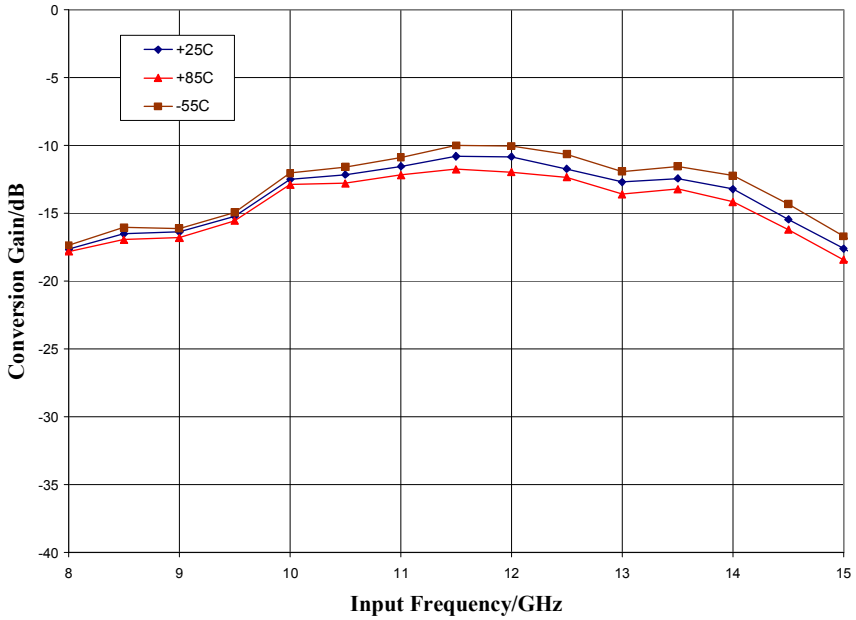
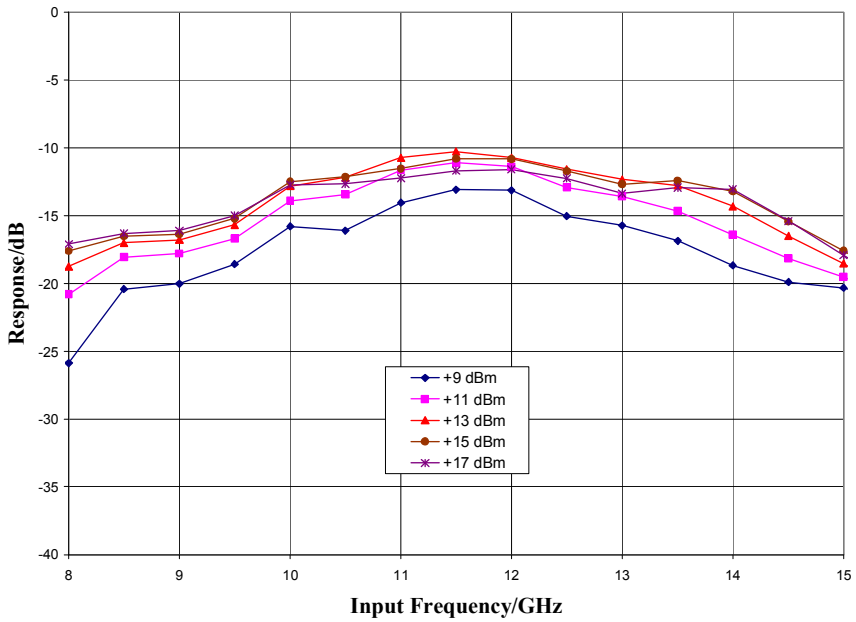
Typical Performance

Conversion Gain vs. Temperature @ +15 dBm Drive Level



Conversion Gain vs. Drive Level, T_A = 25 °C



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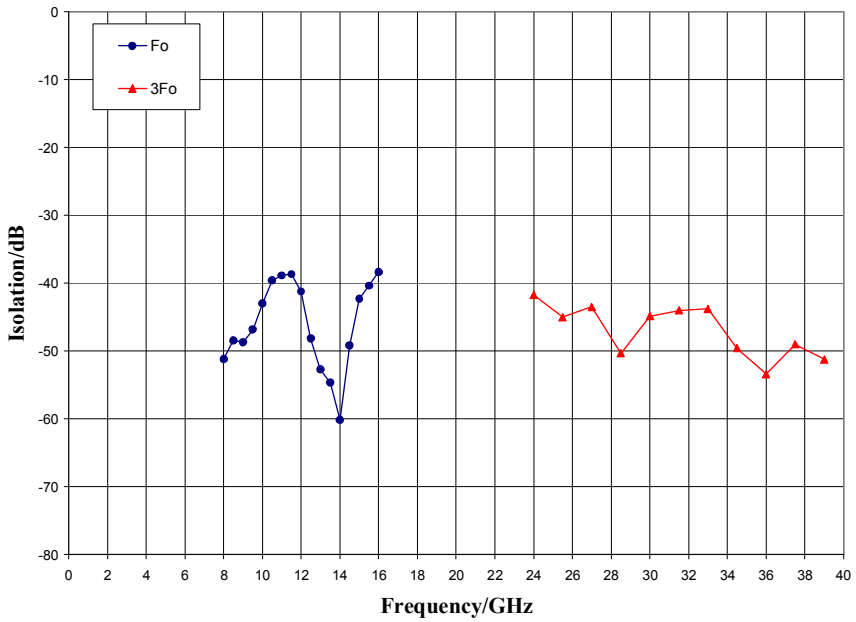
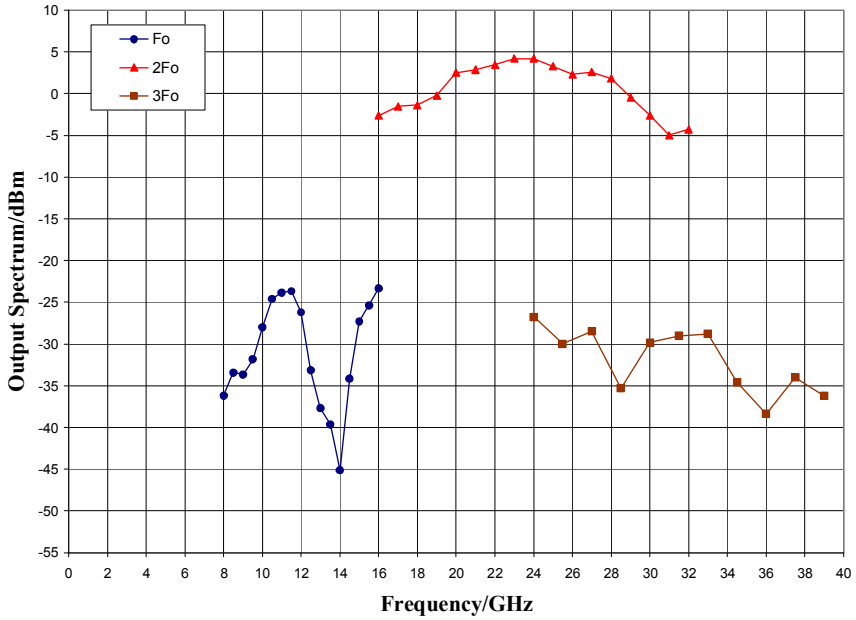
Typical Performance

Isolation (with respect to input level) @ +15 dBm Drive Level, T_A = 25 °C



Output Spectrum @ +15 dBm Drive Level, T_A = 25 °C



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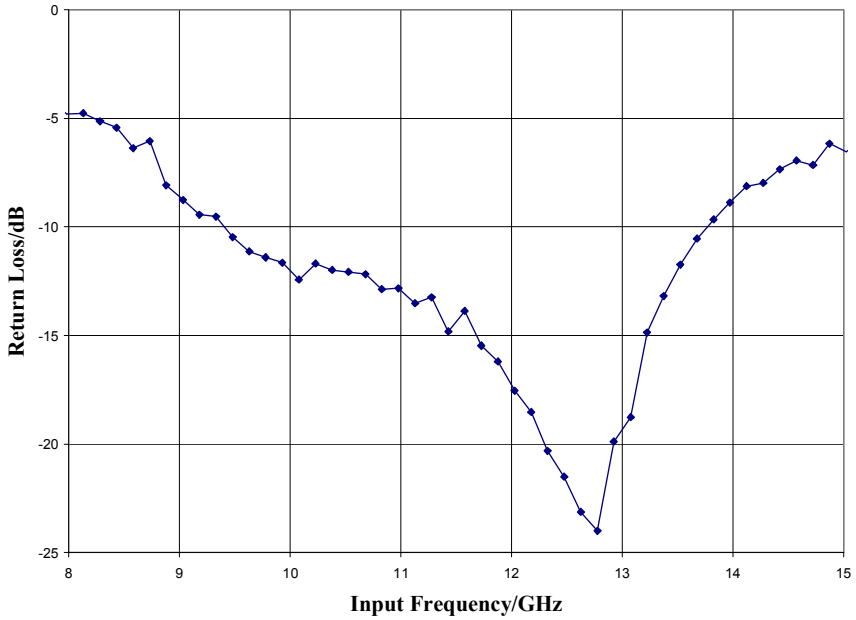
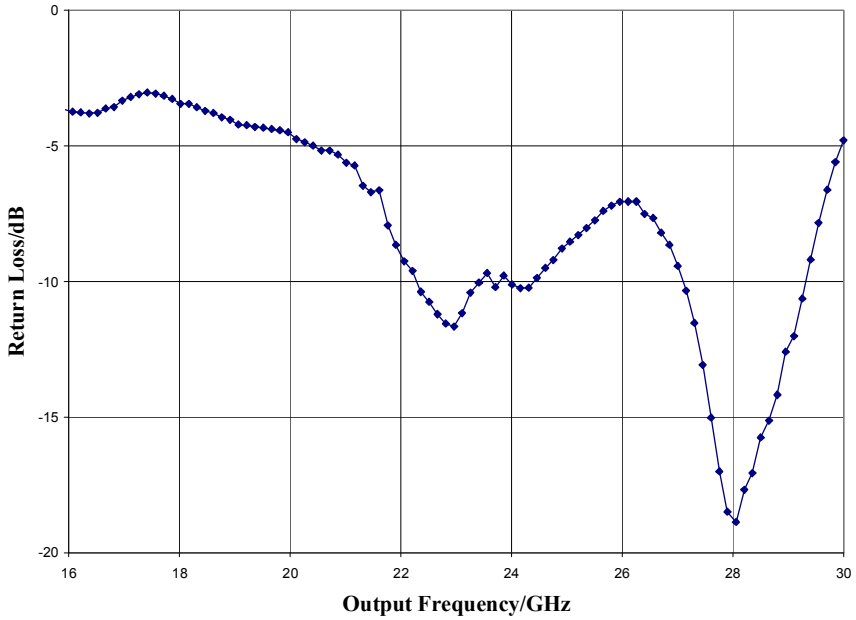
Typical Performance

Input Return Loss @ +15 dBm Drive Level, T_A = 25 °C



Output Return Loss @ +15 dBm Drive Level, F = 11.5 GHz Input, T_A = 25 °C



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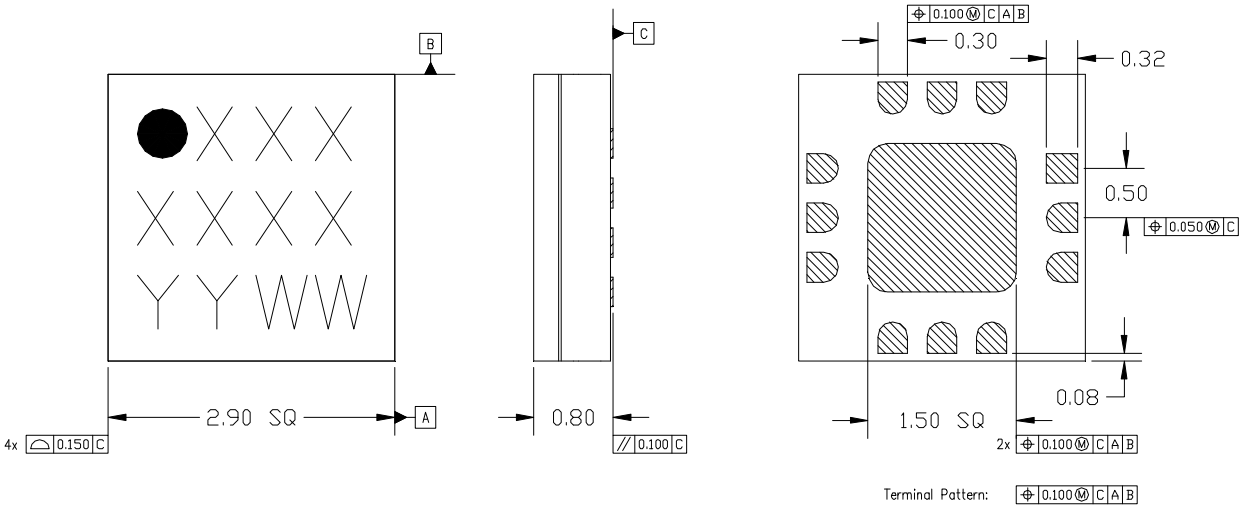
Mechanical Information

Package Information and Dimensions



NOTES:
1. ALL DIMENSIONS SHOWN IN mm.
2. MATERIAL: BLACK ALUMINA
3. LEAD FINISH:
   3.1. Ni: 8.89um MAX, 1.27um MIN
   3.2. Pd: 0.17um MAX, 0.07um MIN
   3.3. Au: 0.254um MAX, 0.03um MIN
4. MARKING
   4.1. LINE 1: PART NUMBER
      4.1.1. EXAMPLE: CMD177C3 SHALL BE MARKED AS 177
   4.2. LINE 2: LOT NUMBER
   4.3. LINE 3: DATE CODE - LAST 2 DIGITS OF THE YEAR OF MANUFACTURE FOLLOWED BY A 2 DIGIT WEEK CODE
5. ALTERNATE PIN #1 IDENTIFIER IS A SINGLE SQUARE PAD
6. ALTERNATE DIE PADDLE MAY HAVE CHAMFERED CORNERS

Recommended PCB Land Pattern

Custom MMIC Design Services recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Custom MMIC Application Note AN 105 for a recommended land pattern approach.

Recommended Solder Reflow Profile

Custom MMIC Design Services recommends screen printing with belt furnace reflow to ensure proper solder reflow and device attach. Please review Custom MMIC Application Note AN 102 for a recommended solder reflow profile.

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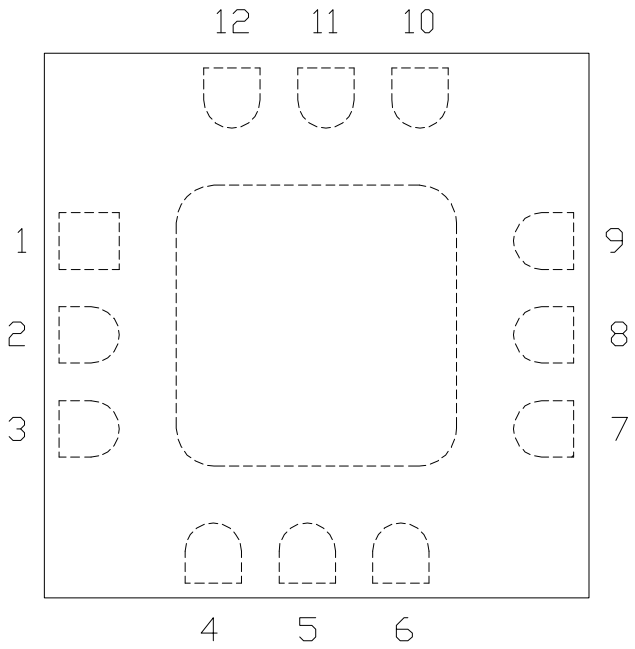
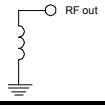
Pin Description

Pin Diagram



Functional Description

Pad	Function	Description	Schematic
1, 3, 7, 9 and die paddle	Ground	Connect to RF / DC ground	
2	RF in	Pin is DC coupled and 50 ohm matched	
4-6, 10-12	N/C	No connection required. These pins may be connected to RF/DC ground	
8	RF out	Pin is DC coupled and 50 ohm matched	

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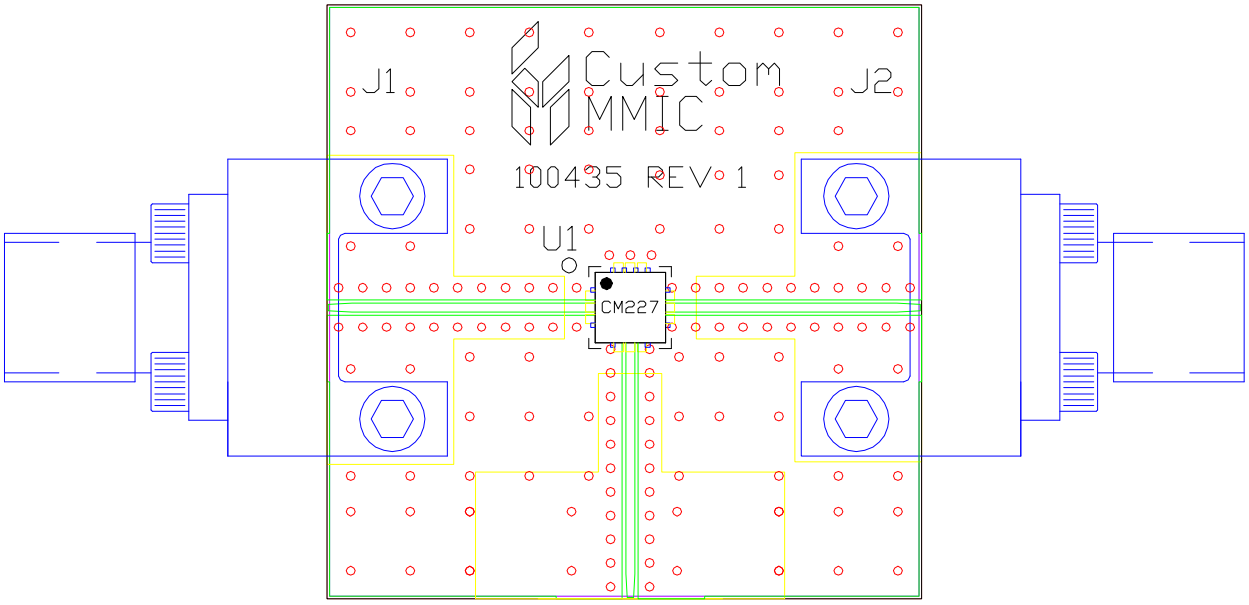
Applications Information

Evaluation Board

The circuit board shown has been developed for optimized assembly at Custom MMIC. A sufficient number of via holes should be used to connect the top and bottom ground planes. As surface mount processes vary, careful process development is recommended.



Bill of Material

Designator	Value	Description
J1 - J2		SMA End Launch Connector
U1		CMD227C3 Frequency Doubler
PCB		100435 Evaluation PCB

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

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CMD227

Passive Frequency Doubler, 8-15 GHz Input

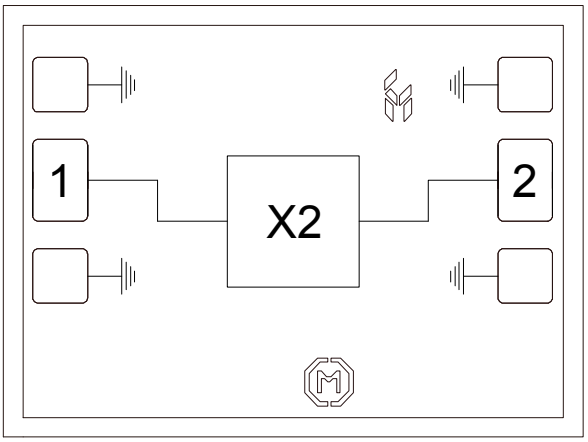
Features

- Low conversion loss
- Excellent Fo isolation
- Broadband performance
- No bias required
- Small die size

Description

The CMD227 die is a broadband MMIC GaAs x2 passive frequency multiplier. When driven by a +15 dBm signal, the multiplier provides 11 dB conversion loss at an output frequency of 23 GHz. The Fo and 3Fo isolations are 40 dBc and 43 dBc respectively. The CMD227 is a 50 ohm matched design eliminating the need for RF port matching.

Functional Block Diagram



Electrical Performance - T_A = 25 °C, Pin = +15 dBm, Fin = 11.5 GHz

Parameter	Min	Typ	Max	Units
Frequency Range, Input		8 - 15		GHz
Frequency Range, Output		16 - 30		GHz
Conversion Loss		11		dB
Fo Isolation (with respect to input level)		40		dB
3Fo Isolation (with respect to input level)		43		dB

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Specifications

Absolute Maximum Ratings

Parameter	Rating
RF Input Power	+27 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.

Electrical Specifications - T_A = 25 °C, Pin = +15 dBm

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range, Input	8 - 15			10 - 13			GHz
Frequency Range, Output	16 - 30			20 - 26			GHz
Conversion Loss		13	19		11	15.5	dB
Fo Isolation (with respect to input level)	36	44		36	44		dB
3Fo Isolation (with respect to input level)	37	44		37	44		dB

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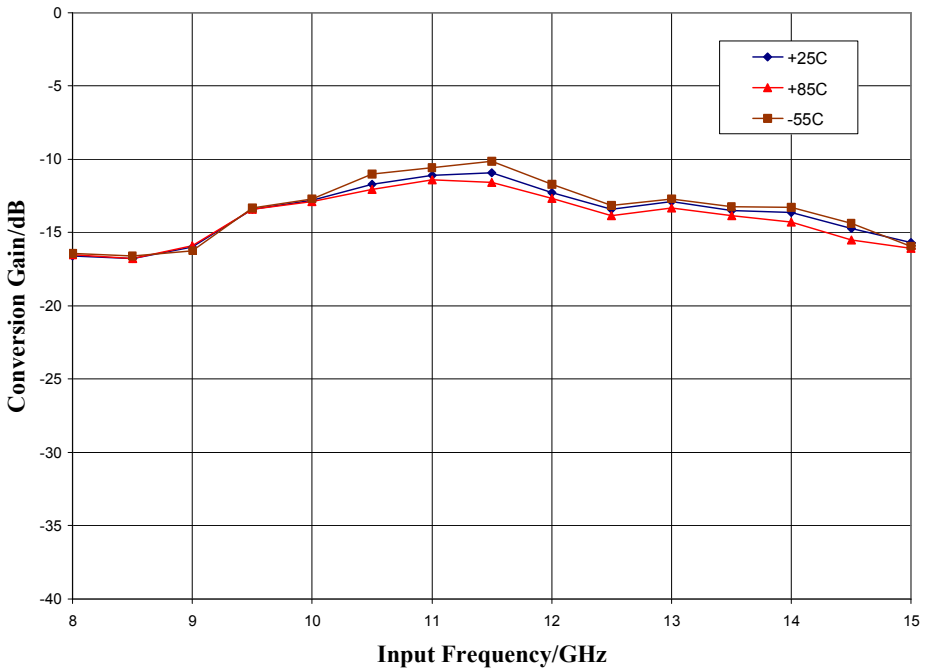
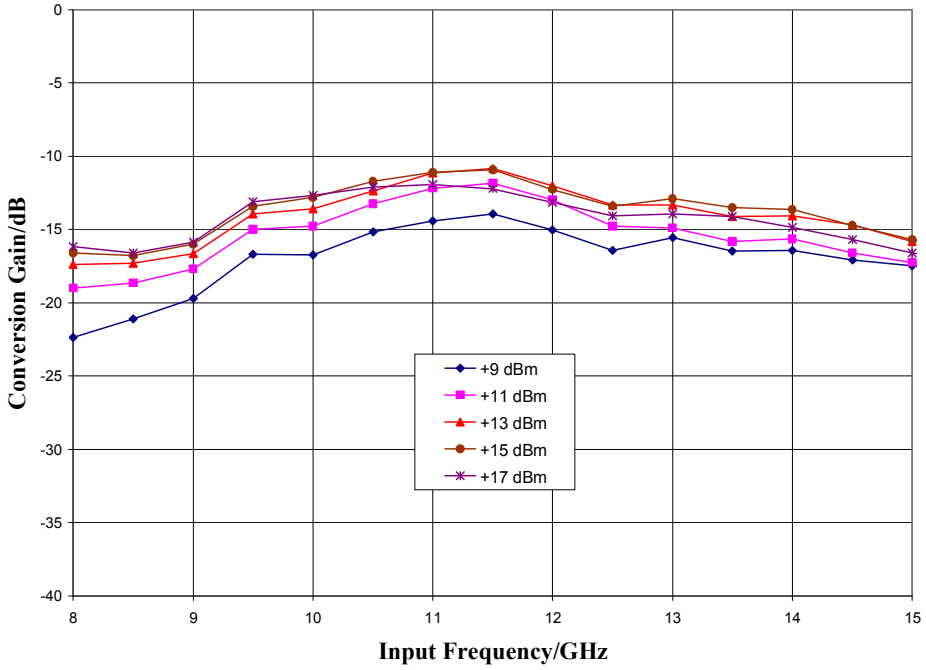
Typical Performance

Conversion Gain vs. Temperature @ +15 dBm Drive Level



Conversion Gain vs. Drive Level, T_A = 25 °C



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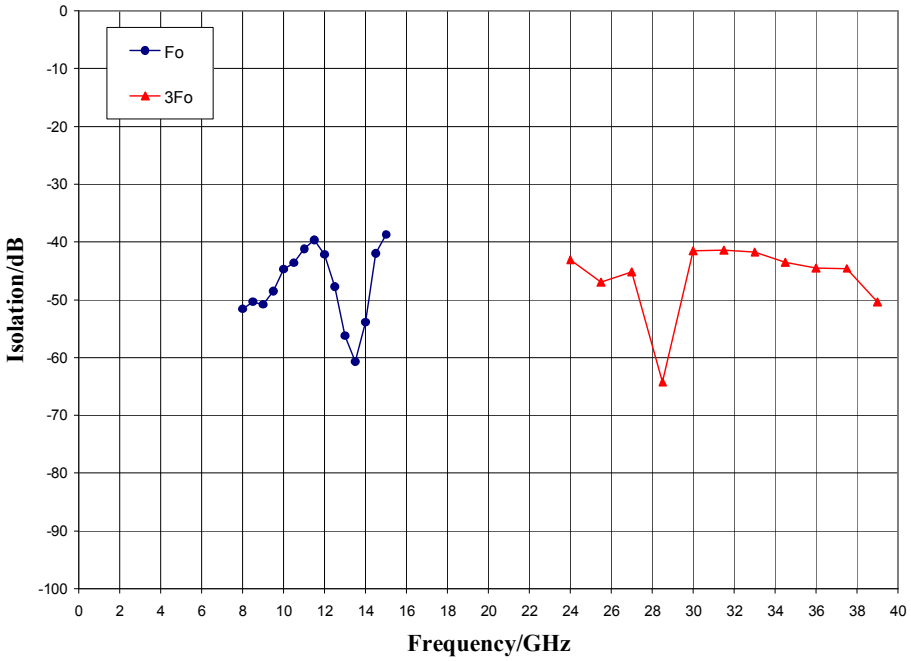
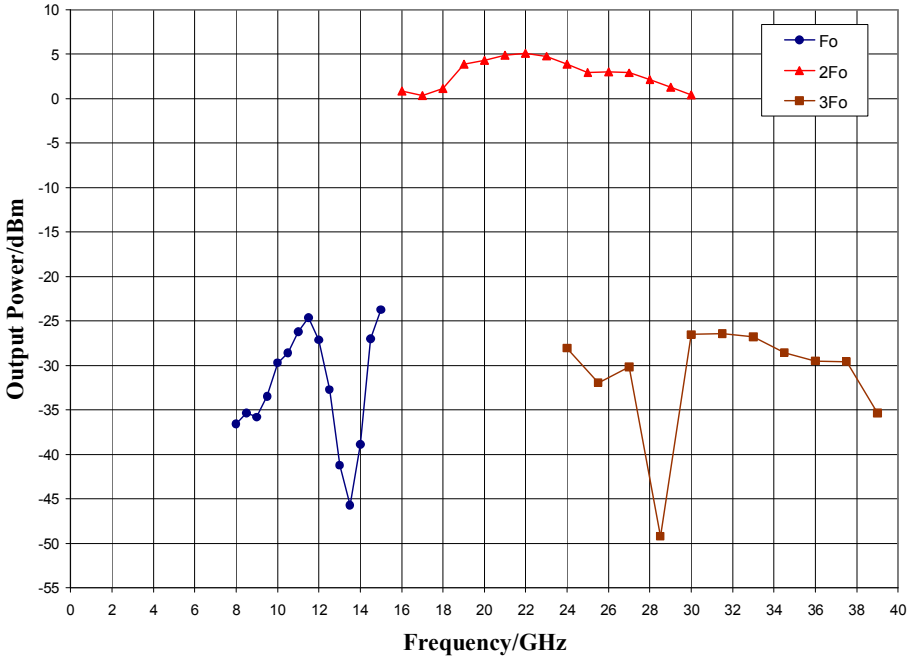
Typical Performance

Isolation (with respect to input level) @ +15 dBm Drive Level, T_A = 25 °C



Output Spectrum @ +15 dBm Drive Level, T_A = 25 °C



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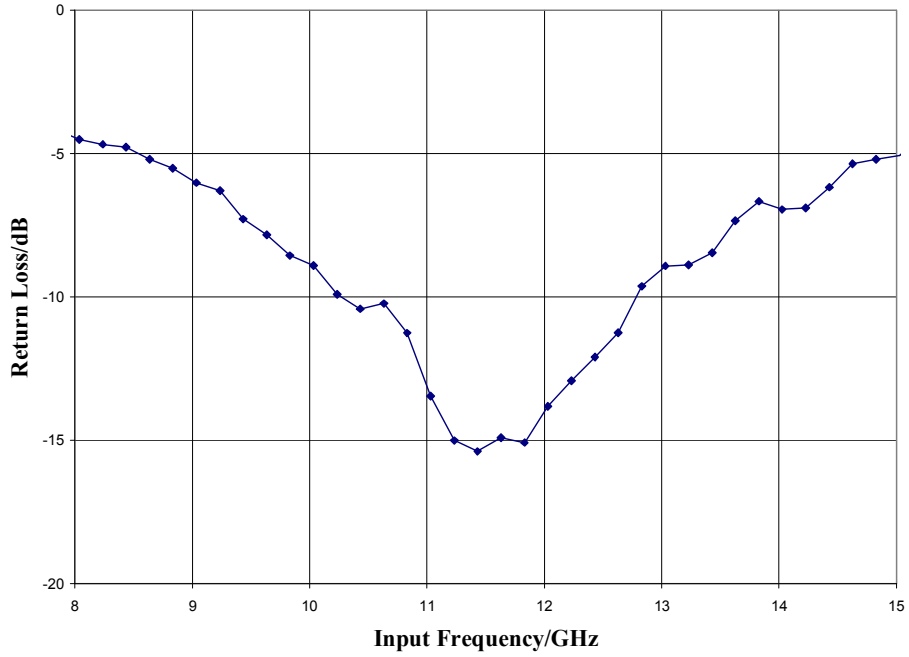
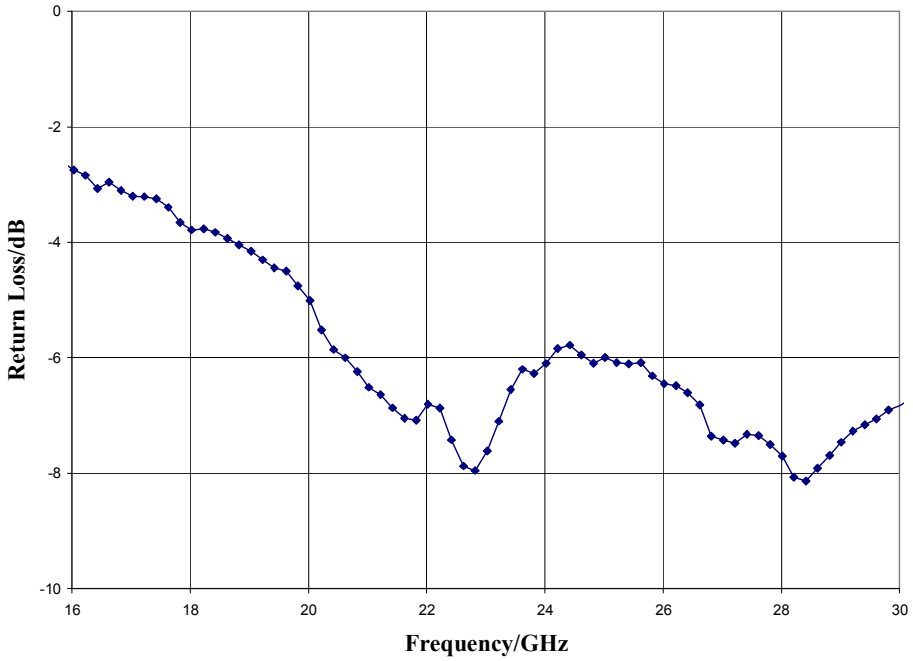
Typical Performance

Input Return Loss @ +15 dBm Drive Level, T_A = 25 °C



Output Return Loss @ +15 dBm Drive Level, F = 11.5 GHz Input, T_A = 25 °C



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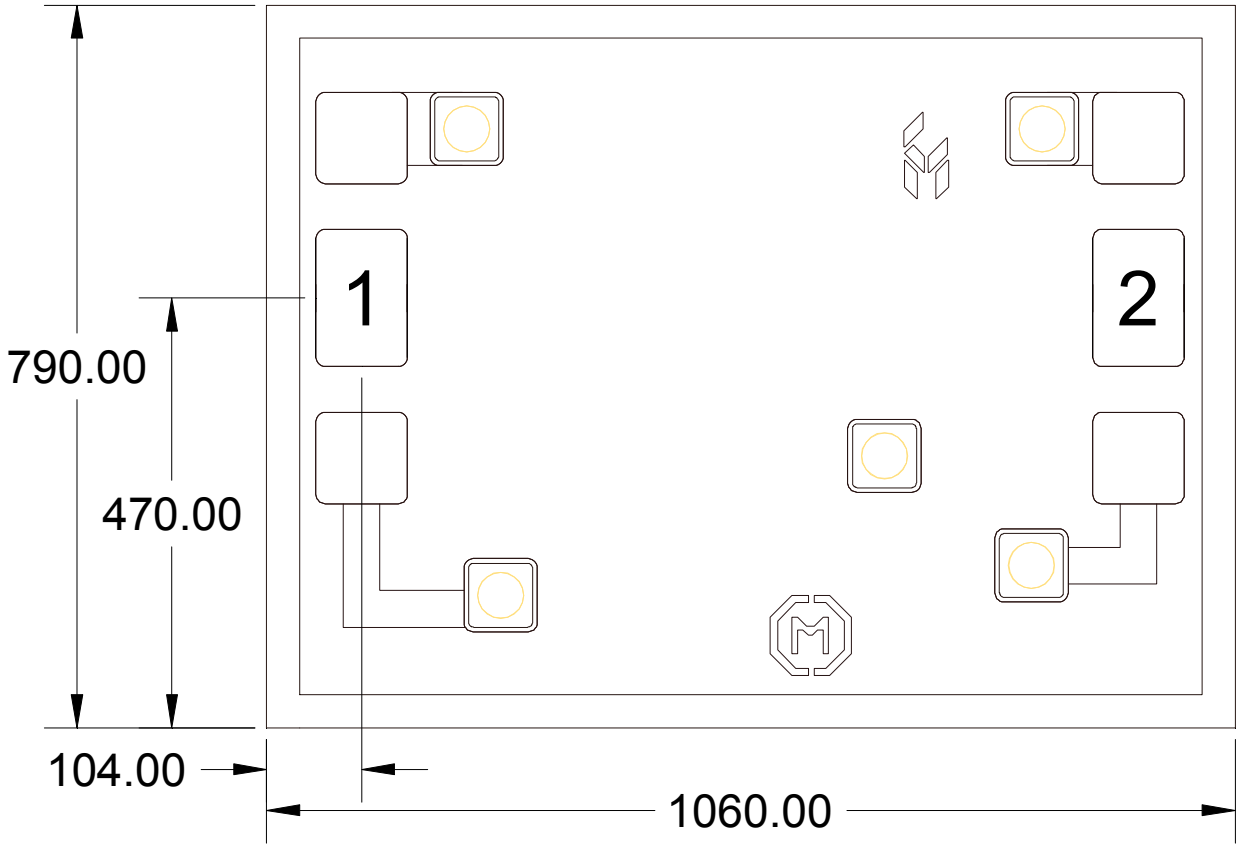
Mechanical Information

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 100 microns thick
5. RF bond pads are 100 x 150 microns

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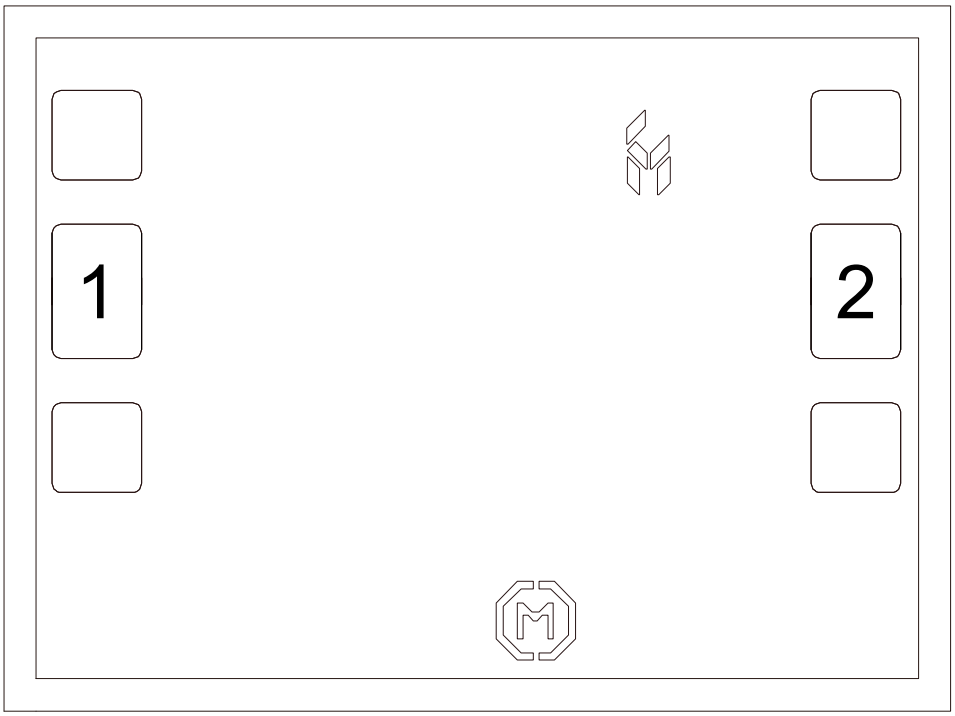
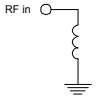
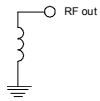
Pin Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	Pad is DC coupled and 50 ohm matched	
2	RF out	Pad is DC coupled and 50 ohm matched	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

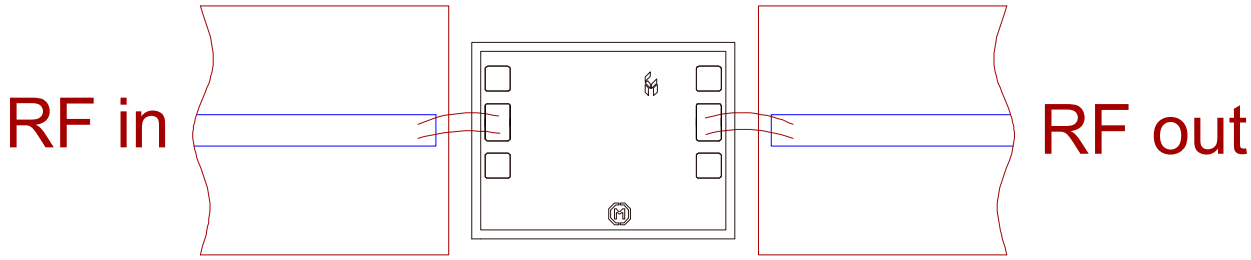
Assembly Guidelines

The backside of the CMD227 is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy or eutectic attach. 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.

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 double bond wires as shown.

The semiconductor is 100 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.

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CMD226C3

Frequency Doubler, 7-11 GHz Input

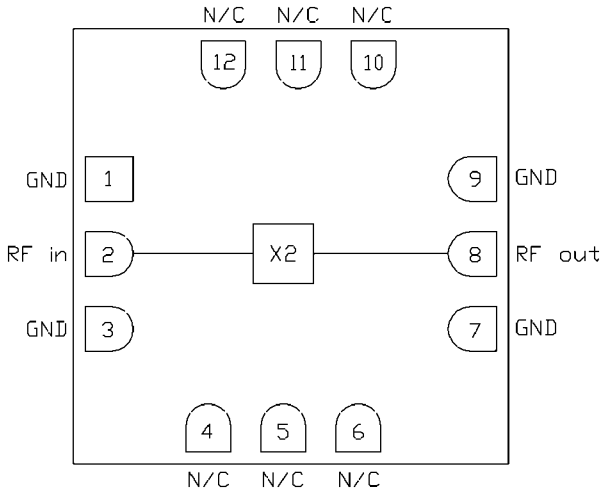
Features

- ► Low conversion loss
- ► Excellent Fo isolation
- ► Broadband performance
- ► No bias required

Description

The CMD226C3 is a broadband MMIC GaAs x2 passive frequency multiplier in a ceramic, QFN-style package. When driven by a +15 dBm signal, the multiplier provides 10.5 dB conversion loss at an output frequency of 18 GHz. The Fo and 3Fo isolations are 44 dBc and 46 dBc respectively. The CMD226C3 is a 50 ohm matched design eliminating the need for RF port matching.

Functional Block Diagram



Electrical Performance – T_A = 25 °C, Pin = +15 dBm, Fin = 9 GHz

Parameter	Min	Typ	Max	Units
Frequency Range, Input		7 – 11		GHz
Frequency Range, Output		14 – 22		GHz
Conversion Loss		9		dB
Fo Isolation (with respect to input level)		44		dB
3Fo Isolation (with respect to input level)		48		dB
4Fo Isolation (with respect to input level)		50		dB

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Specifications

Absolute Maximum Ratings

Parameter	Rating
RF Input Power	+22 dBm
Operating Temperature	-40 to 85 °C
Storage Temperature	-55 to 150 °C
Thermal resistance, Θ_{JC}	689.2 ºC/W

Exceeding any one or combination of the maximum ratings may cause permanent damage to the device.

Electrical Specifications – T_A = 25 °C, Pin = +15 dBm

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range, Input	7 – 11			8 – 10			GHz
Frequency Range, Output	14 – 22			16 – 20			GHz
Conversion Loss		11	17		10.5	13	dB
Fo Isolation (with respect to input level)	33	44		33	44		dB
3Fo Isolation (with respect to input level)	37	50		45	52		dB
4Fo Isolation (with respect to input level)	22	45		35	45		dB

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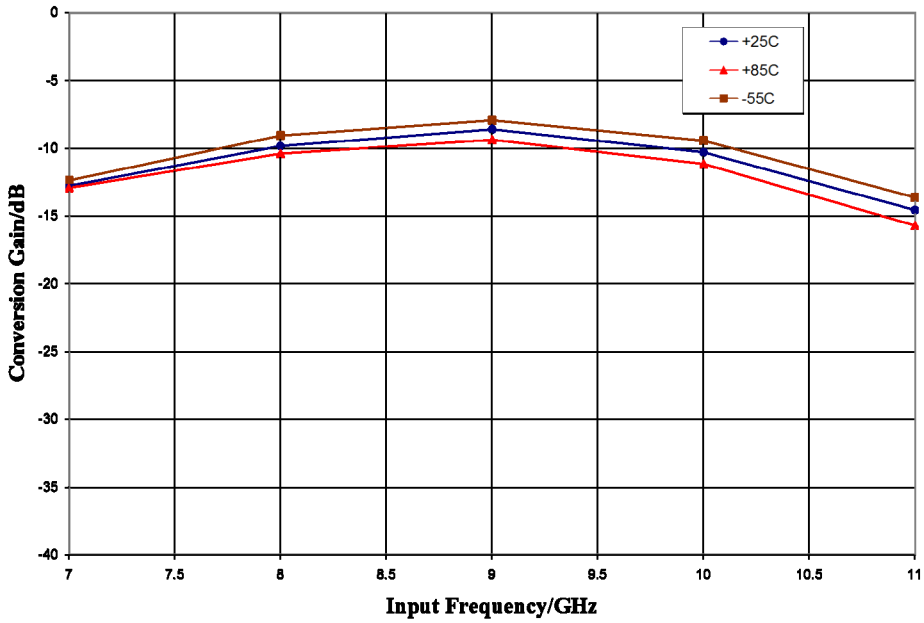
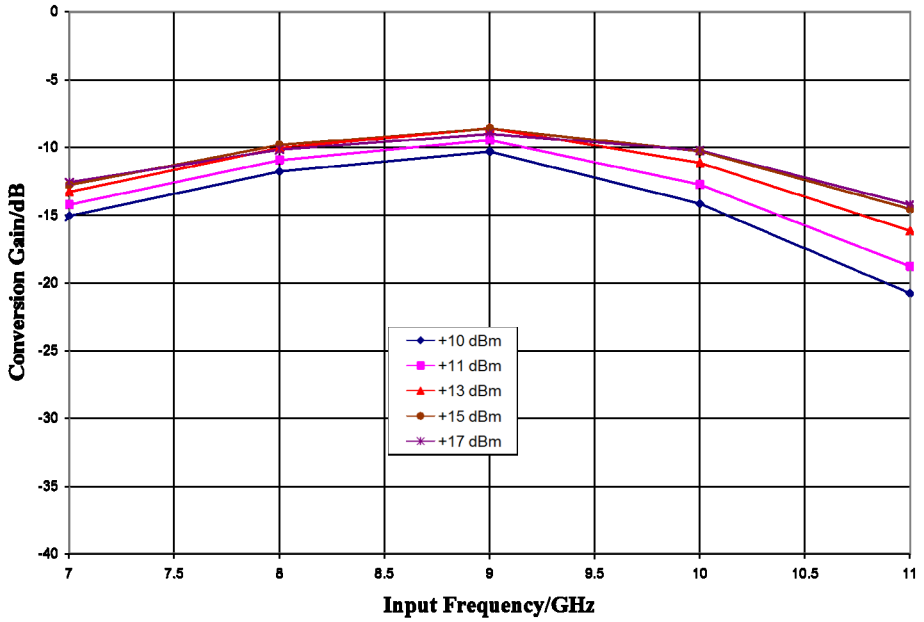
Typical Performance

Conversion Gain vs. Temperature @ +15 dBm Drive Level



Conversion Gain vs. Drive Level, T_A = 25 °C



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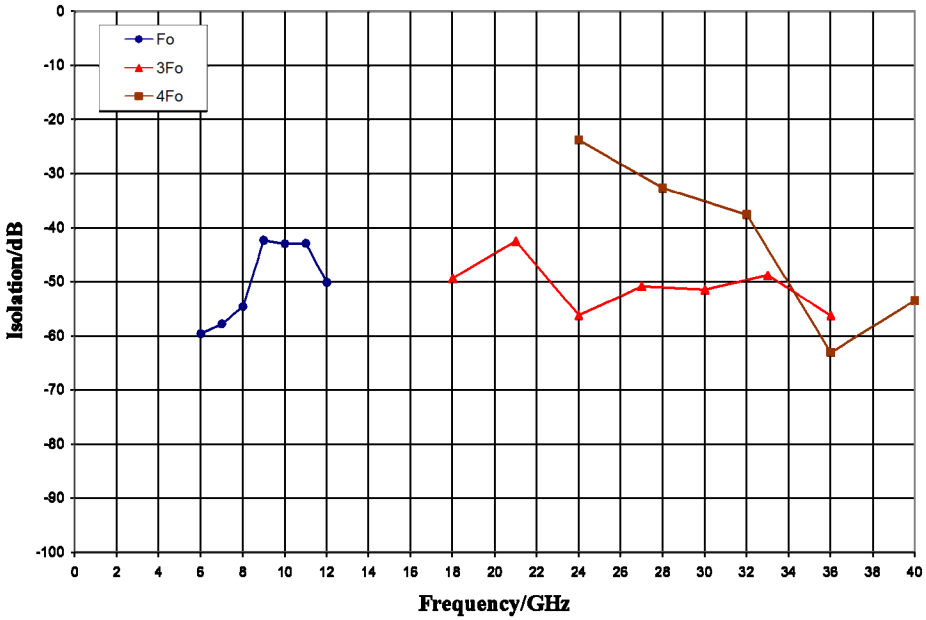
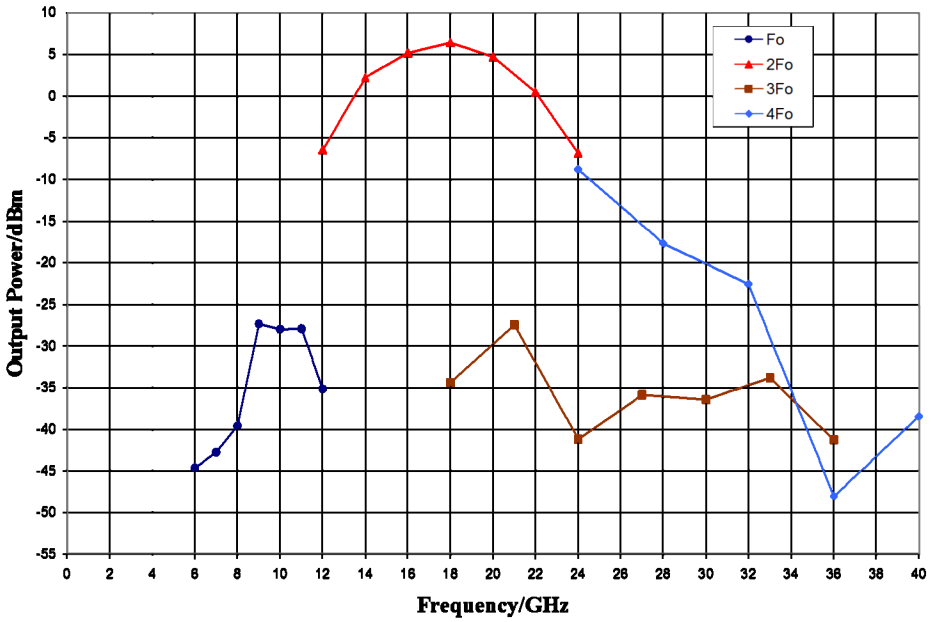
Typical Performance

Isolation (with respect to input level) @ +15 dBm Drive Level, T_A = 25 °C



Output Spectrum @ +15 dBm Drive Level, T_A = 25 °C



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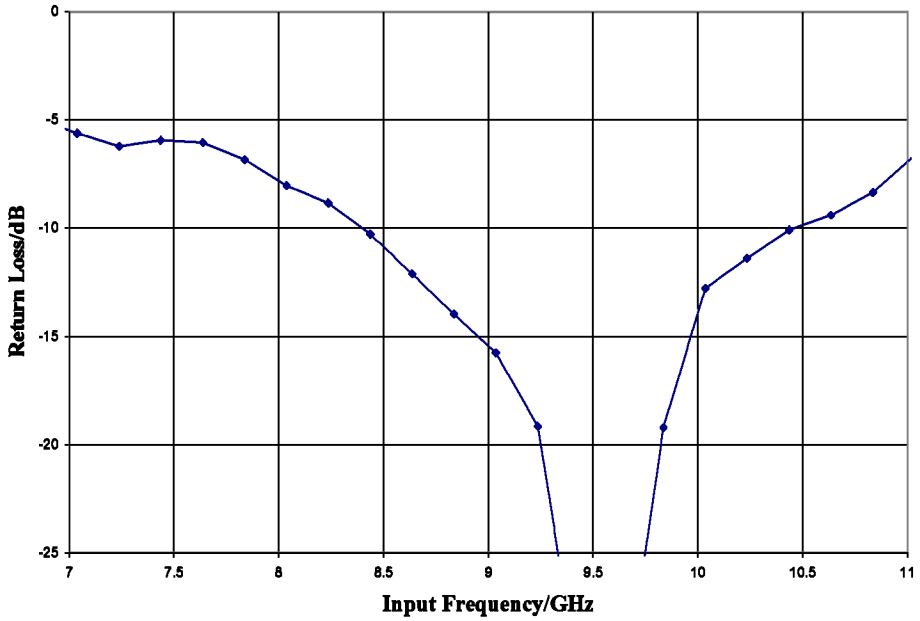
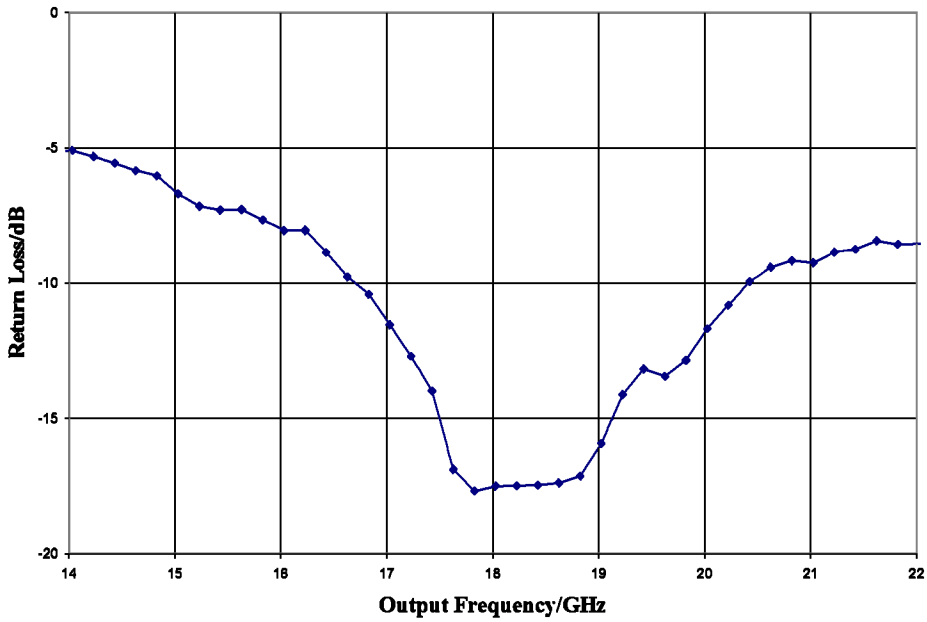
Typical Performance

Input Return Loss @ +15 dBm Drive Level, T_A = 25 °C



Output Return Loss @ +15 dBm Drive Level, F = 9 GHz Input, T_A = 25 °C



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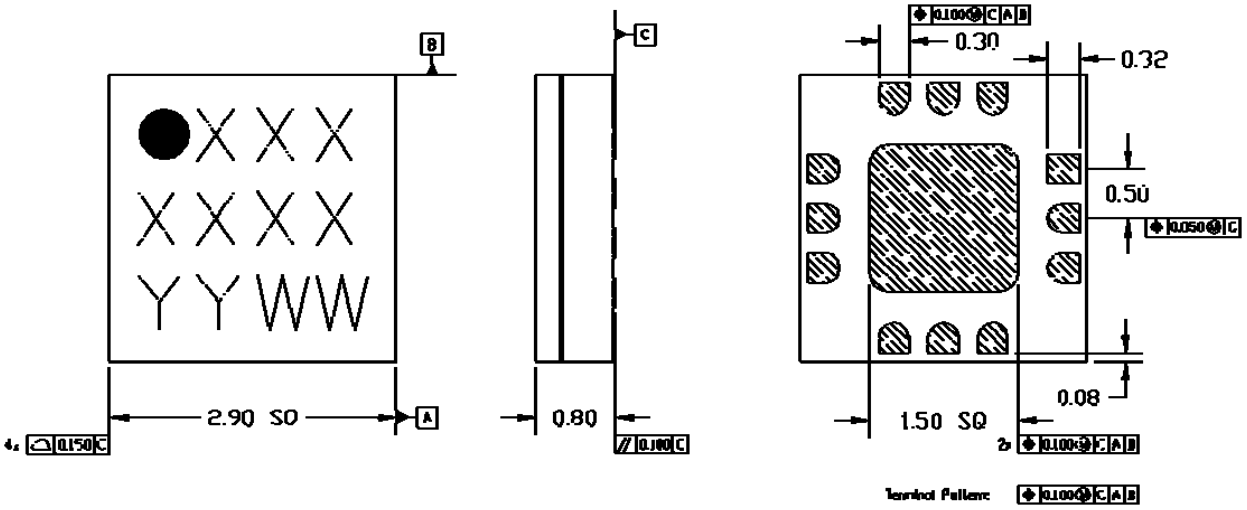
Mechanical Information

Package Information and Dimensions



NOTES:
1. ALL DIMENSIONS SHOWN IN mm.
2. MATERIAL: BLACK ALUMINA
3. LEAD FINISH:
   3.1. Ni: 8.89um MAX. 1.27um MIN
   3.2. Pd: 0.17um MAX. 0.07um MIN
   3.3. Au: 0.254um MAX. 0.03um MIN
4. MARKING
   4.1. LINE 1: PART NUMBER
      4.1.1. EXAMPLE: CMD177C3 SHALL BE MARKED AS 177
   4.2. LINE 2: LOT NUMBER
   4.3. LINE 3: DATE CODE - LAST 2 DIGITS OF THE YEAR OF MANUFACTURE FOLLOWED BY A 2 DIGIT WEEK CODE
5. ALTERNATE PIN #1 IDENTIFIER IS A SINGLE SQUARE PAD
6. ALTERNATE DIE PADDLE MAY HAVE CHAMFERED CORNERS

Recommended PCB Land Pattern

Custom MMIC Design Services recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Custom MMIC Application Note AN 105 for a recommended land pattern approach.

Recommended Solder Reflow Profile

Custom MMIC Design Services recommends screen printing with belt furnace reflow to ensure proper solder reflow and device attach. Please review Custom MMIC Application Note AN 102 for a recommended solder reflow profile.

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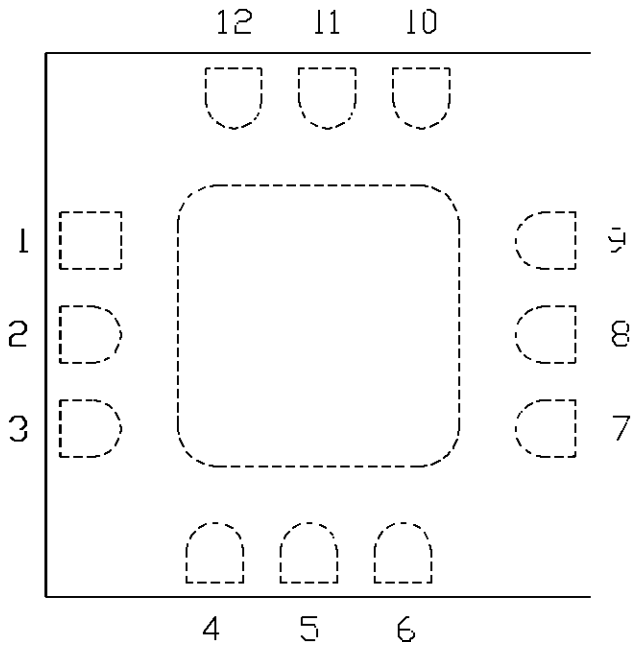
Pin Description

Pin Diagram



Functional Description

Pad	Function	Description	Schematic
1, 3, 7, 9 and die paddle	Ground	Connect to RF / DC ground	
2	RF in	Pin is DC coupled and 50 ohm matched	
4-6, 10-12	N/C	No connection required. These pins may be connected to RF/DC ground	
8	RF out	Pin is DC coupled and 50 ohm matched	

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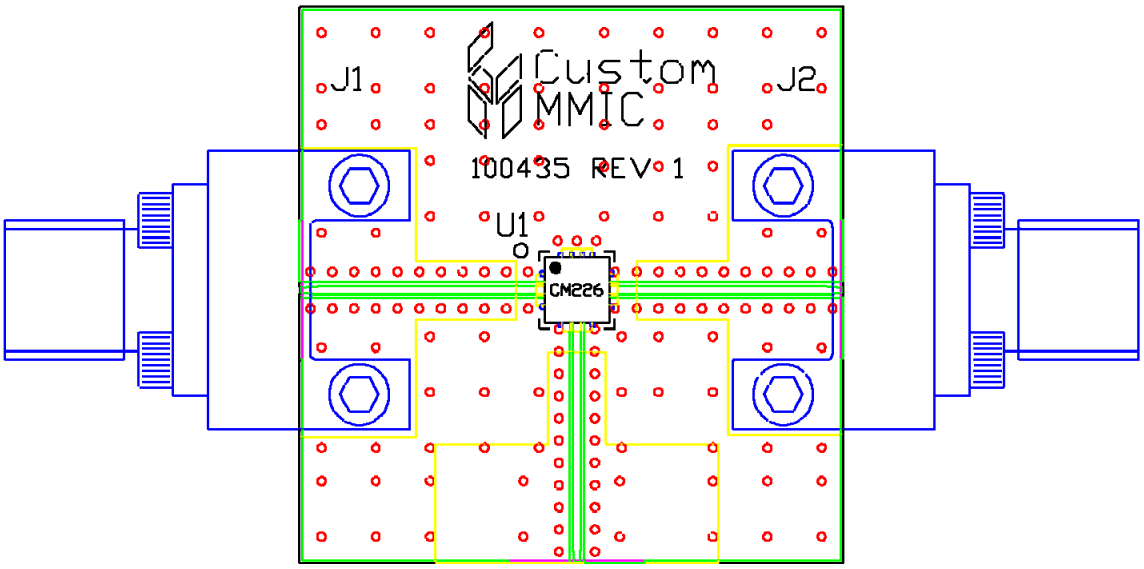
Applications Information

Evaluation Board

The circuit board shown has been developed for optimized assembly at Custom MMIC. A sufficient number of via holes should be used to connect the top and bottom ground planes. As surface mount processes vary, careful process development is recommended.



Bill of Material

Designator	Value	Description
J1 - J2		SMA End Launch Connector
U1		CMD226C3 Frequency Doubler
PCB		100435 Evaluation PCB

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CMD226

Passive Frequency Doubler, 7-11 GHz Input

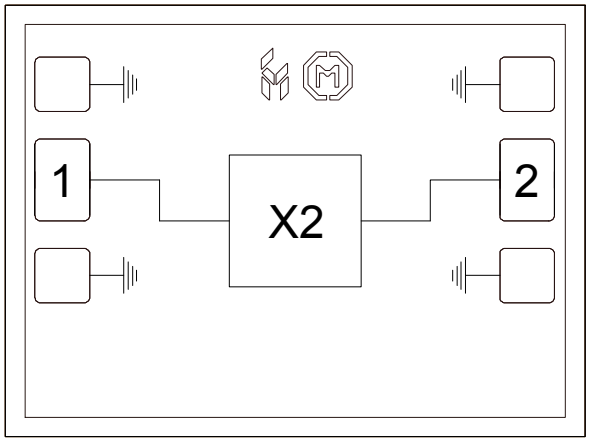
Features

- ► Low conversion loss
- ► Excellent Fo isolation
- ► Broadband performance
- ► No bias required
- ► Small die size

Description

The CMD226 die is a broadband MMIC GaAs x2 passive frequency multiplier. When driven by a +15 dBm signal, the multiplier provides 10.5 dB conversion loss at an output frequency of 18 GHz. The Fo and 3Fo isolations are 44 dBc and 46 dBc respectively. The CMD226 is a 50 ohm matched design eliminating the need for RF port matching.

Functional Block Diagram



Electrical Performance - T_A = 25 °C, Pin = +15 dBm, Fin = 9 GHz

Parameter	Min	Typ	Max	Units
Frequency Range, Input		7 - 11		GHz
Frequency Range, Output		14 - 22		GHz
Conversion Loss		10.5		dB
Fo Isolation (with respect to input level)		44		dB
3Fo Isolation (with respect to input level)		46		dB
4Fo Isolation (with respect to input level)		50		dB

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Specifications

Absolute Maximum Ratings

Parameter	Rating
RF Input Power	+27 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.

Electrical Specifications - T_A = 25 °C, Pin = +15 dBm

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range, Input	7 - 11			8 - 10			GHz
Frequency Range, Output	14 - 22			16 - 20			GHz
Conversion Loss		11	16		10.5	13	dB
Fo Isolation (with respect to input level)	33	44		33	44		dB
3Fo Isolation (with respect to input level)	37	48		40	48		dB
4Fo Isolation (with respect to input level)	25	45		33	45		dB

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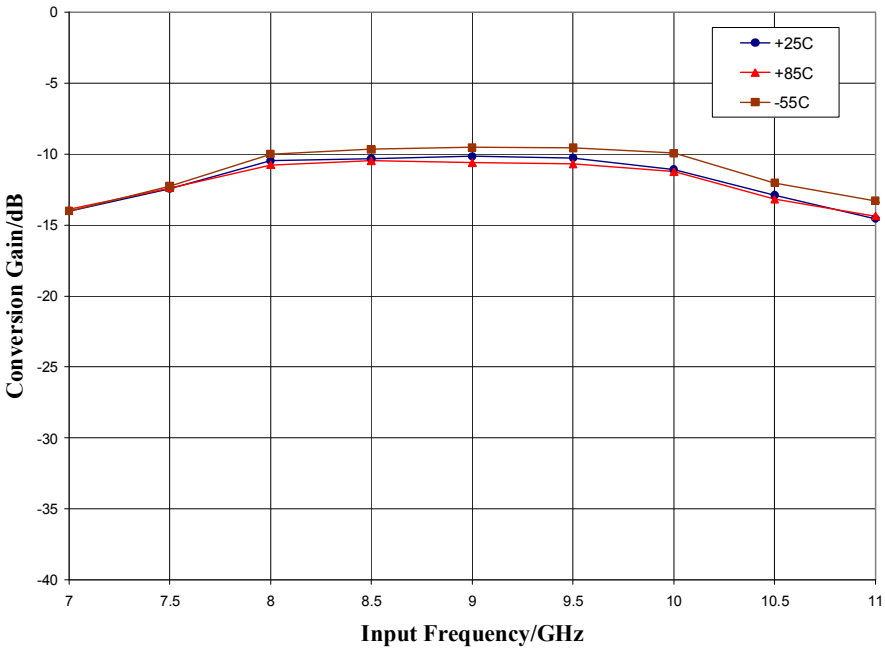
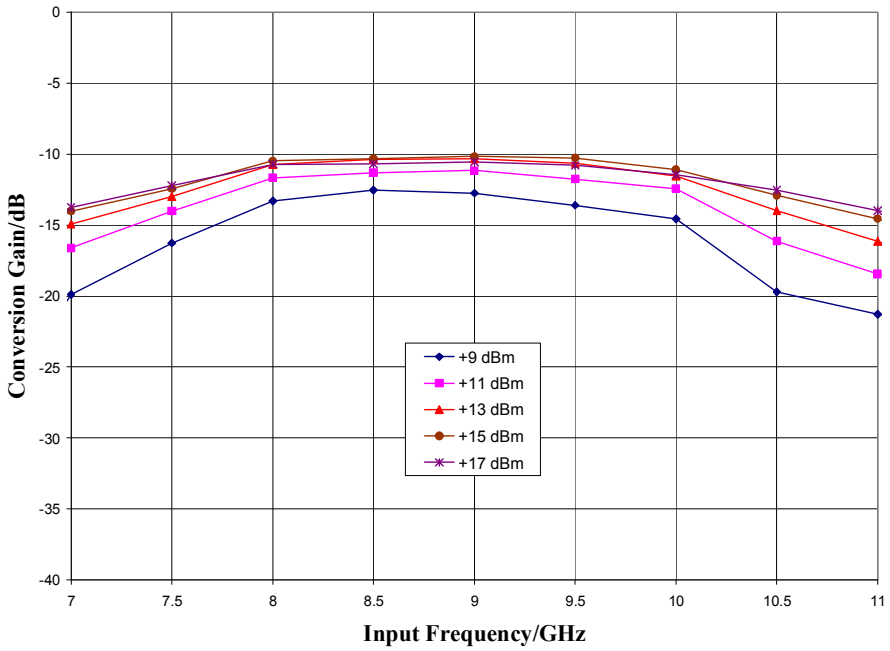
Typical Performance

Conversion Gain vs. Temperature @ +15 dBm Drive Level



Conversion Gain vs. Drive Level, T_A = 25 °C



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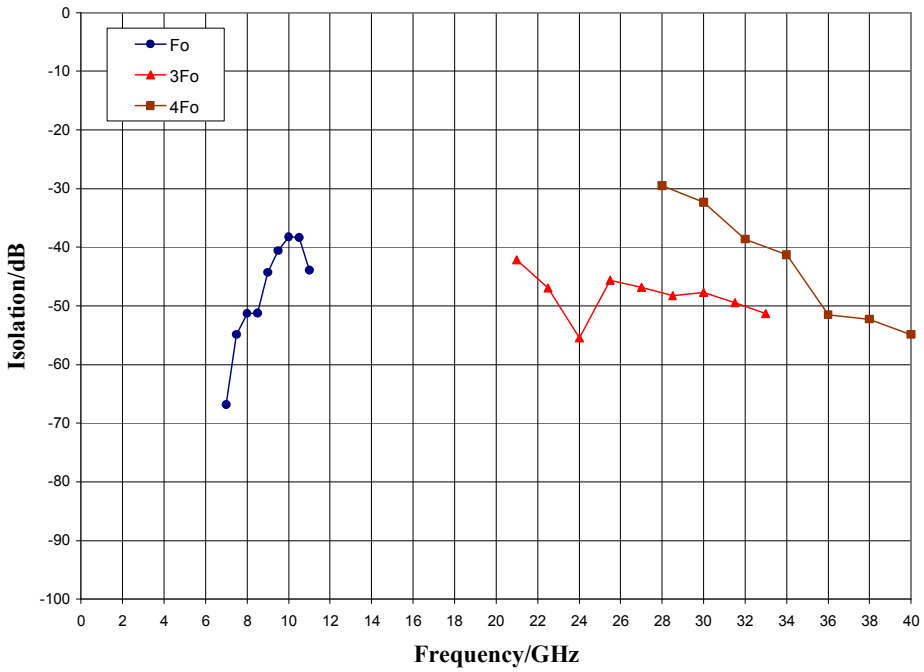
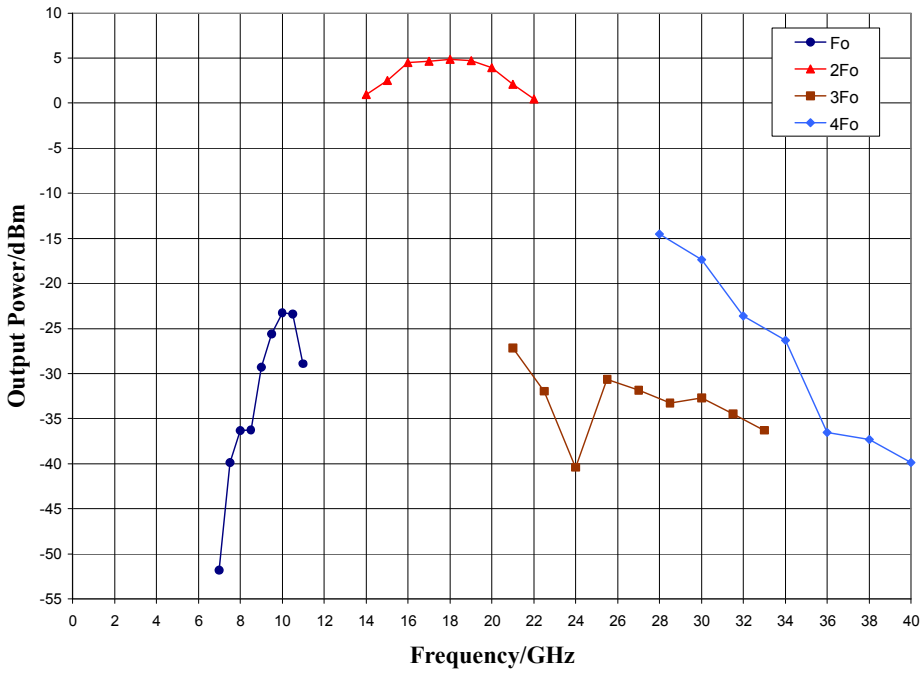
Typical Performance

Isolation (with respect to input level) @ +15 dBm Drive Level, T_A = 25 °C



Output Spectrum @ +15 dBm Drive Level, T_A = 25 °C



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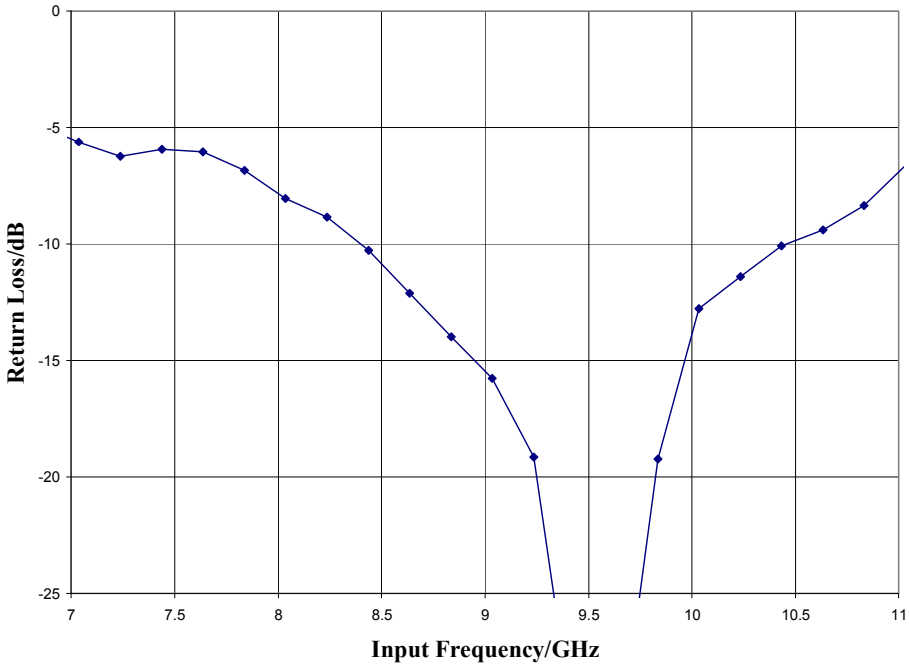
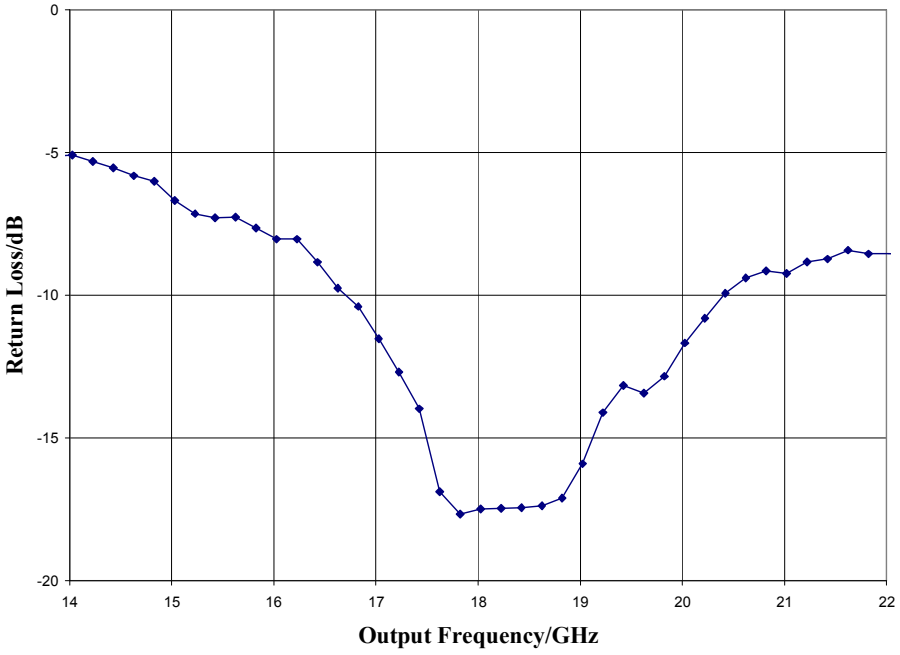
Typical Performance

Input Return Loss @ +15 dBm Drive Level, T_A = 25 °C



Output Return Loss @ +15 dBm Drive Level, F = 9 GHz Input, T_A = 25 °C



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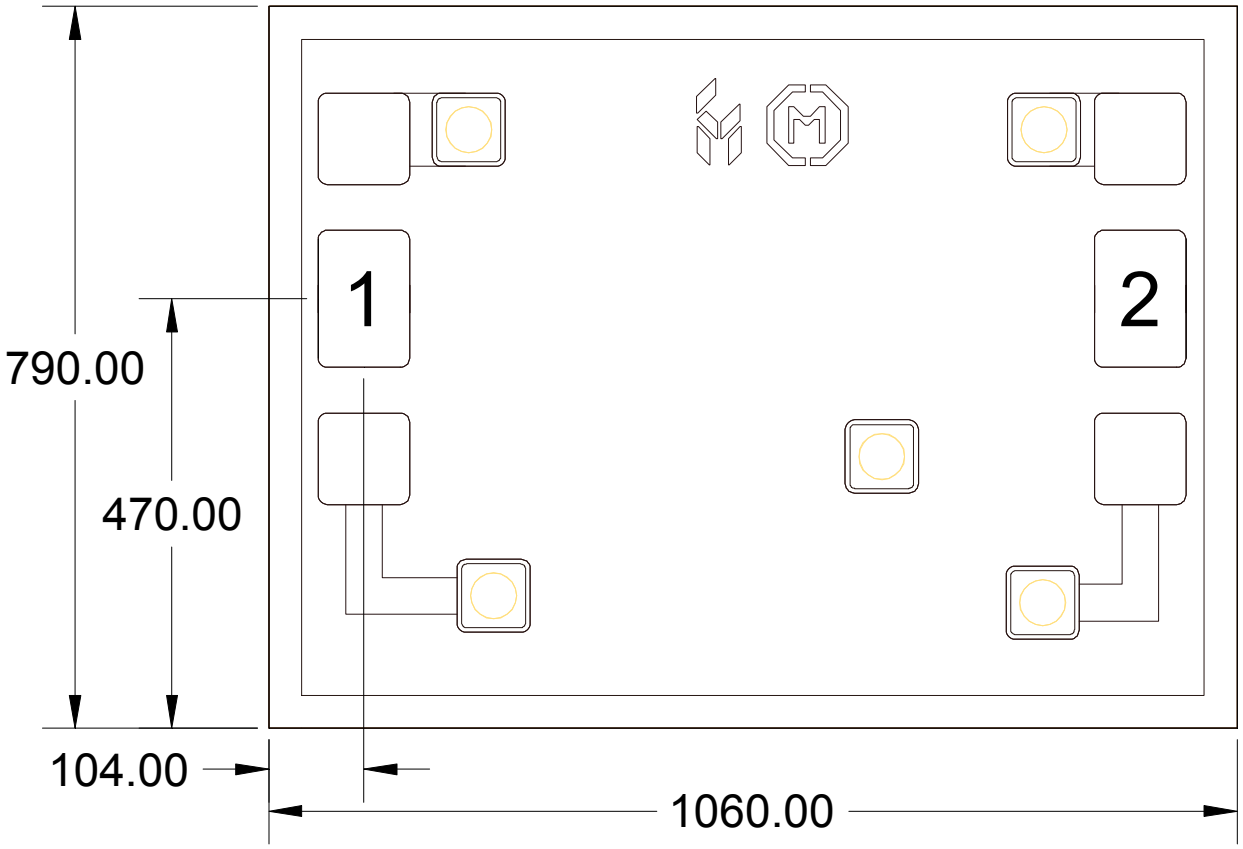
Mechanical Information

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 100 microns thick
5. RF bond pads are 100 x 150 microns

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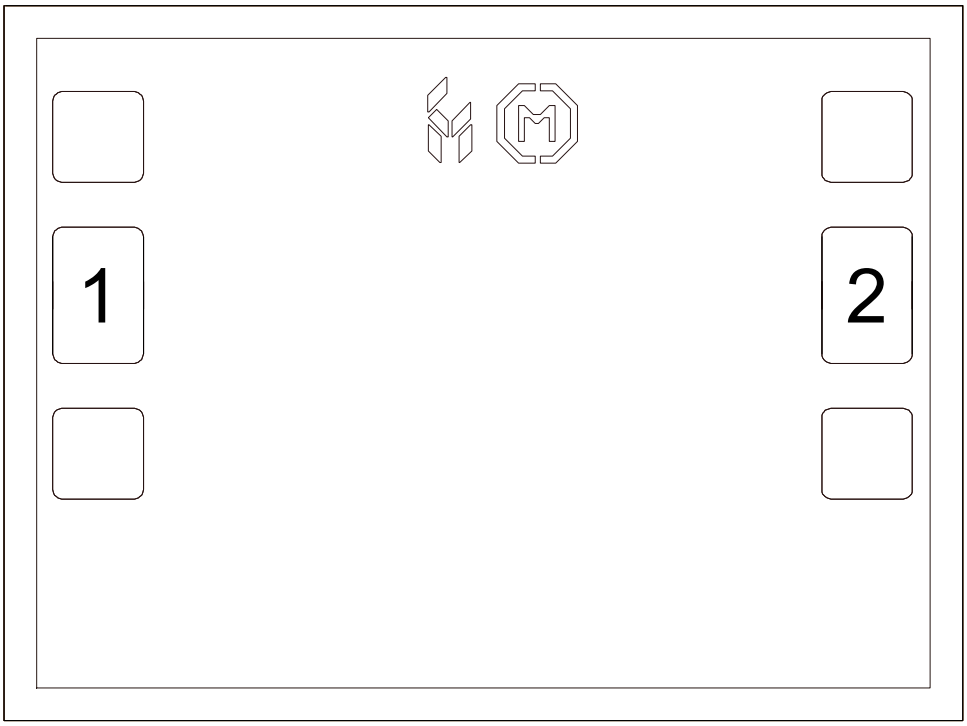
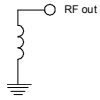
Pin Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	Pad is DC coupled and 50 ohm matched	
2	RF out	Pad is DC coupled and 50 ohm matched	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

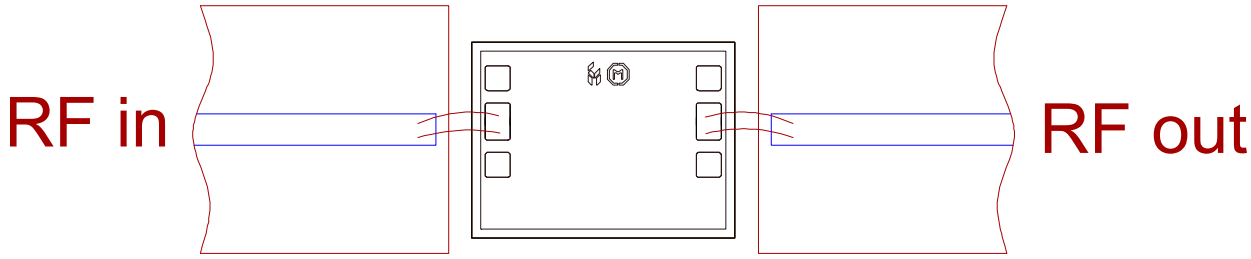
Assembly Guidelines

The backside of the CMD226 is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy or eutectic attach. 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.

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 double bond wires as shown.

The semiconductor is 100 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.

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CMD225C3

Passive Frequency Doubler, 4-8 GHz Input

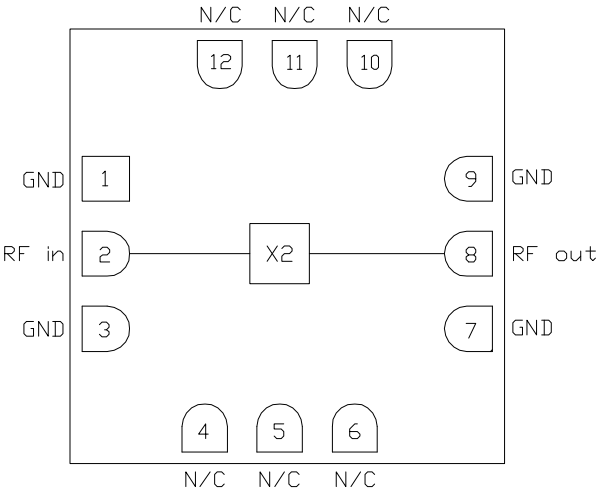
Features

- Low conversion loss
- Excellent Fo isolation
- Broadband performance
- No bias required
- Pb-free RoHs compliant 3x3 mm SMT package

Description

The CMD225C3 die is a broadband MMIC GaAs x2 passive frequency multiplier housed in a leadless surface mount package. When driven by a +15 dBm signal, the multiplier provides 13 dB conversion loss at an output frequency of 12 GHz. The Fo and 3Fo isolations are >47 dBc and >54 dBc respectively. The CMD225C3 is a 50 ohm matched design eliminating the need for RF port matching.

Functional Block Diagram



Electrical Performance - T_A = 25 °C, Pin = +15 dBm, Fin = 6 GHz

Parameter	Min	Typ	Max	Units
Frequency Range, Input		4 - 8		GHz
Frequency Range, Output		8 - 16		GHz
Conversion Loss		13		dB
Fo Isolation (with respect to input level)		47		dB
3Fo Isolation (with respect to input level)		54		dB
4Fo Isolation (with respect to input level)		50		dB

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Specifications

Absolute Maximum Ratings

Parameter	Rating
RF Input Power	+27 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.

Electrical Specifications - T_A = 25 °C, Pin = +15 dBm

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range, Input	4 - 8			5 - 7			GHz
Frequency Range, Output	8 - 16			10 - 14			GHz
Conversion Loss		13	20		13	17	dB
Fo Isolation (with respect to input level)	33	48		38	48		dB
3Fo Isolation (with respect to input level)	41	50		41	50		dB
4Fo Isolation (with respect to input level)	23	50		33	50		dB

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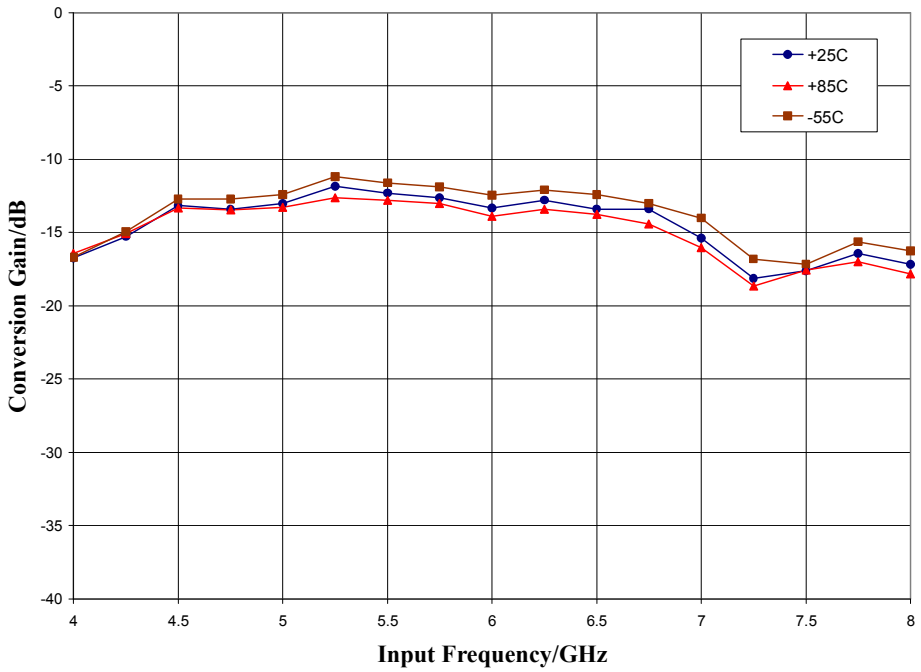
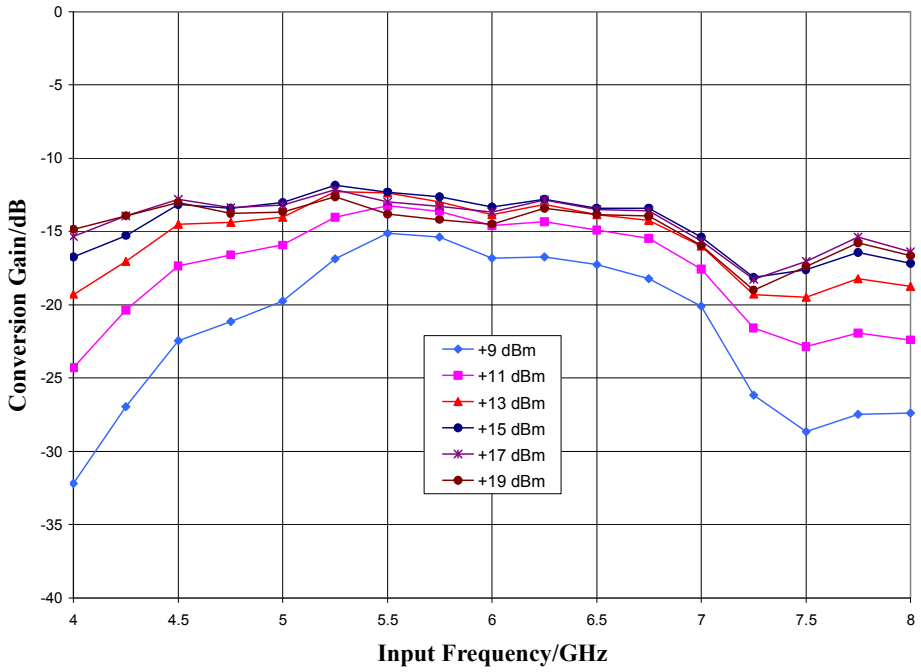
Typical Performance

Conversion Gain vs. Temperature @ +15 dBm Drive Level



Conversion Gain vs. Drive Level, T_A = 25 °C



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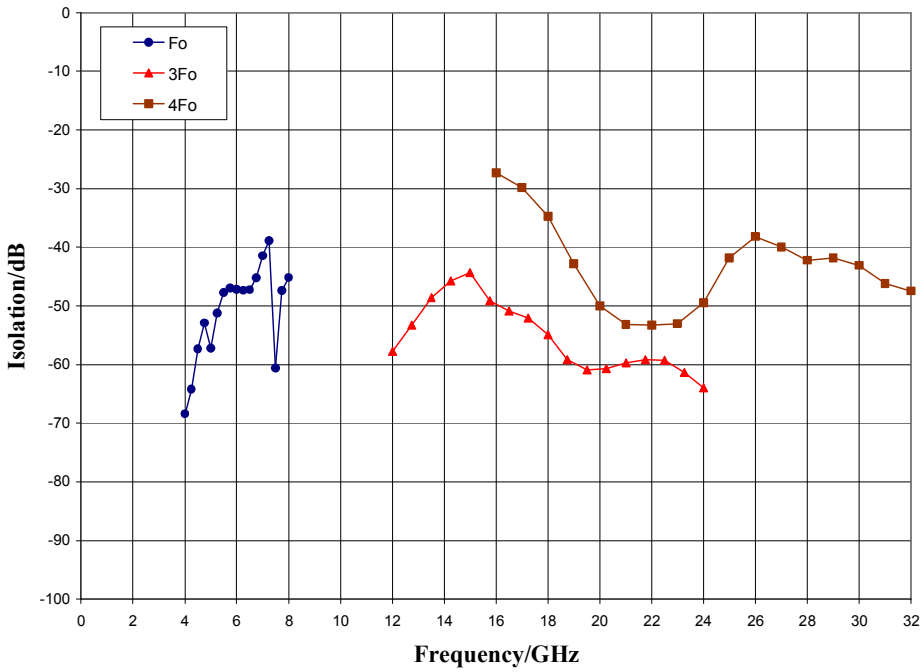
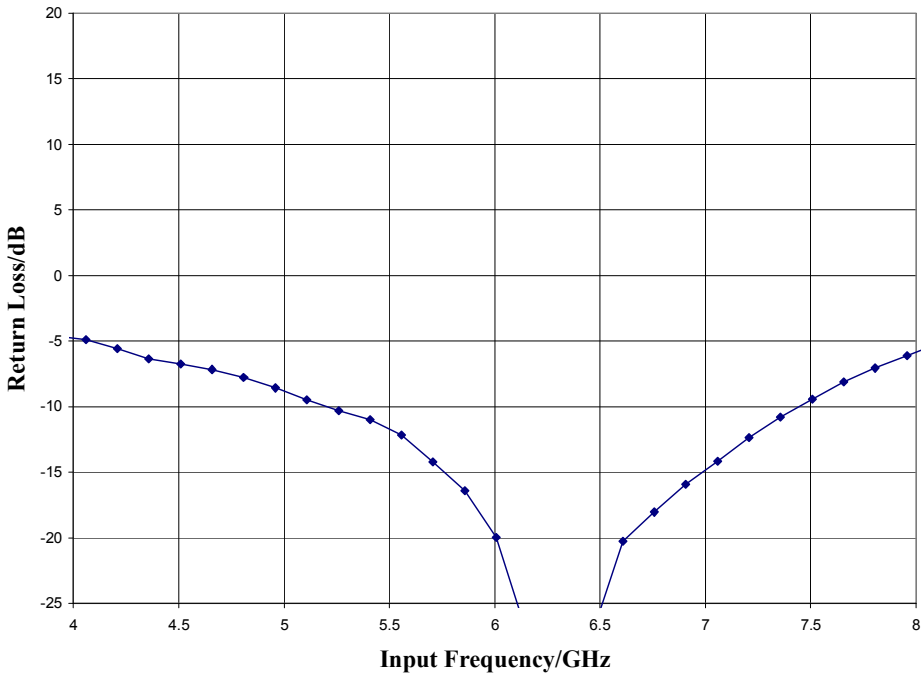
Typical Performance

Isolation (with respect to input level) @ +15 dBm Drive Level, T_A = 25 °C



Input Return Loss @ +15 dBm Drive Level, T_A = 25 °C



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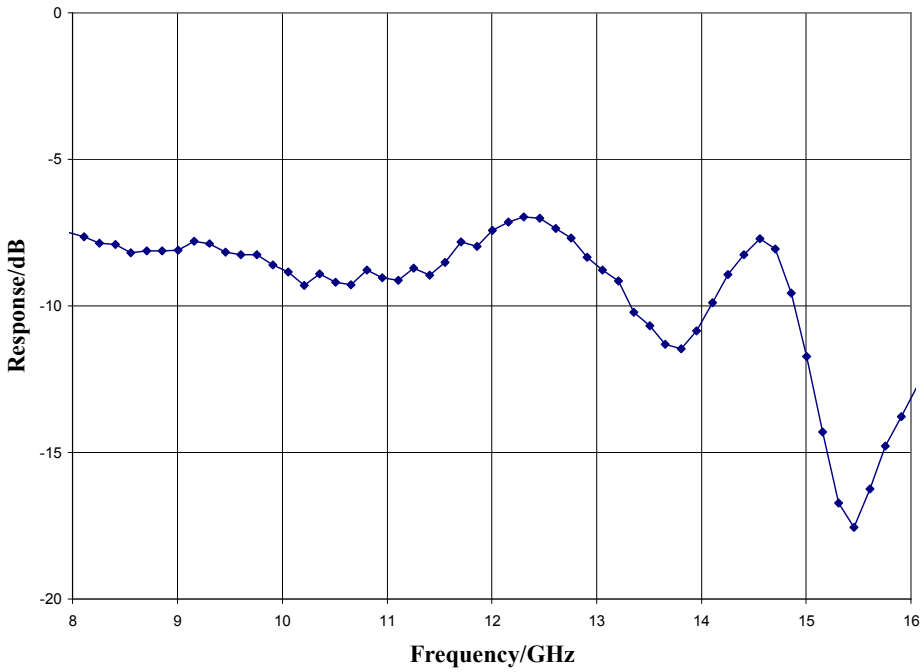
Typical Performance

Output Return Loss @ +15 dBm Drive Level, F = 6 GHz Input, T_A = 25 °C



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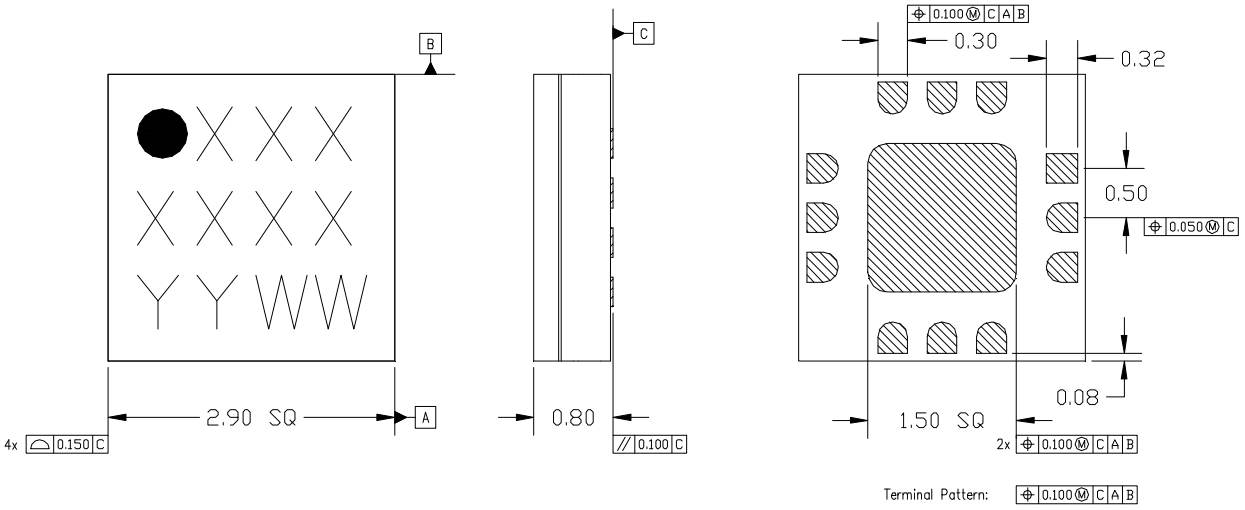
Mechanical Information

Package Information and Dimensions



NOTES:
1. ALL DIMENSIONS SHOWN IN mm.
2. MATERIAL: BLACK ALUMINA
3. LEAD FINISH:
   3.1. Ni: 8.89um MAX, 1.27um MIN
   3.2. Pd: 0.17um MAX, 0.07um MIN
   3.3. Au: 0.254um MAX, 0.03um MIN
4. MARKING
   4.1. LINE 1: PART NUMBER
      4.1.1. EXAMPLE: CMD177C3 SHALL BE MARKED AS 177
   4.2. LINE 2: LOT NUMBER
   4.3. LINE 3: DATE CODE - LAST 2 DIGITS OF THE YEAR OF MANUFACTURE FOLLOWED BY A 2 DIGIT WEEK CODE
5. ALTERNATE PIN #1 IDENTIFIER IS A SINGLE SQUARE PAD
6. ALTERNATE DIE PADDLE MAY HAVE CHAMFERED CORNERS

Recommended PCB Land Pattern

Custom MMIC Design Services recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Custom MMIC Application Note AN 105 for a recommended land pattern approach.

Recommended Solder Reflow Profile

Custom MMIC Design Services recommends screen printing with belt furnace reflow to ensure proper solder reflow and device attach. Please review Custom MMIC Application Note AN 102 for a recommended solder reflow profile.

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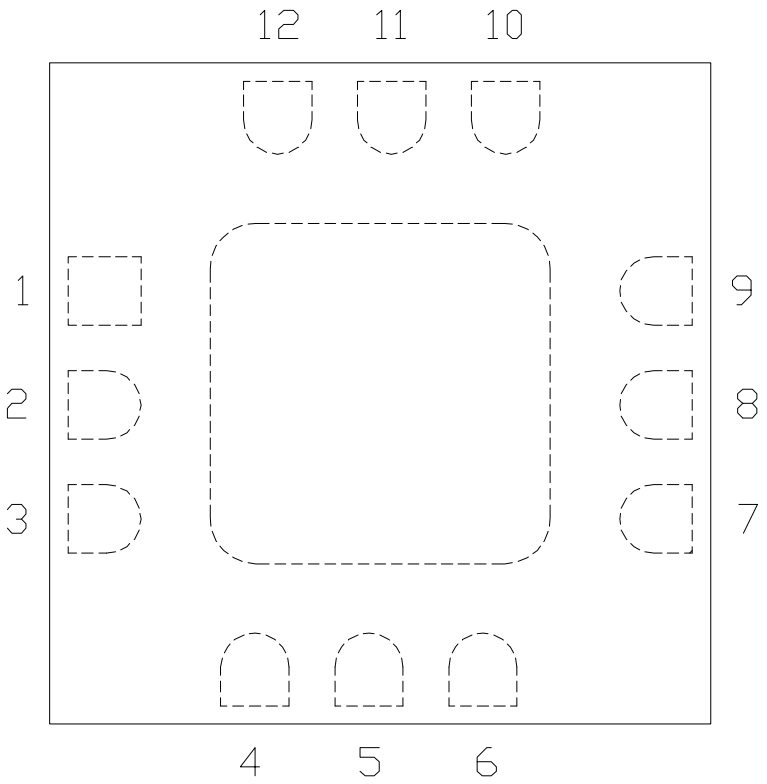
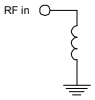
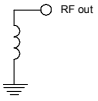
Pin Description

Pin Diagram



Functional Description

Pad	Function	Description	Schematic
1, 3, 7, 9 and die paddle	Ground	Connect to RF / DC ground	
2	RF in	Pin is DC coupled and 50 ohm matched	
4-6, 10-12	N/C	No connection required. These pins may be connected to RF/DC ground	
8	RF out	Pin is DC coupled and 50 ohm matched	

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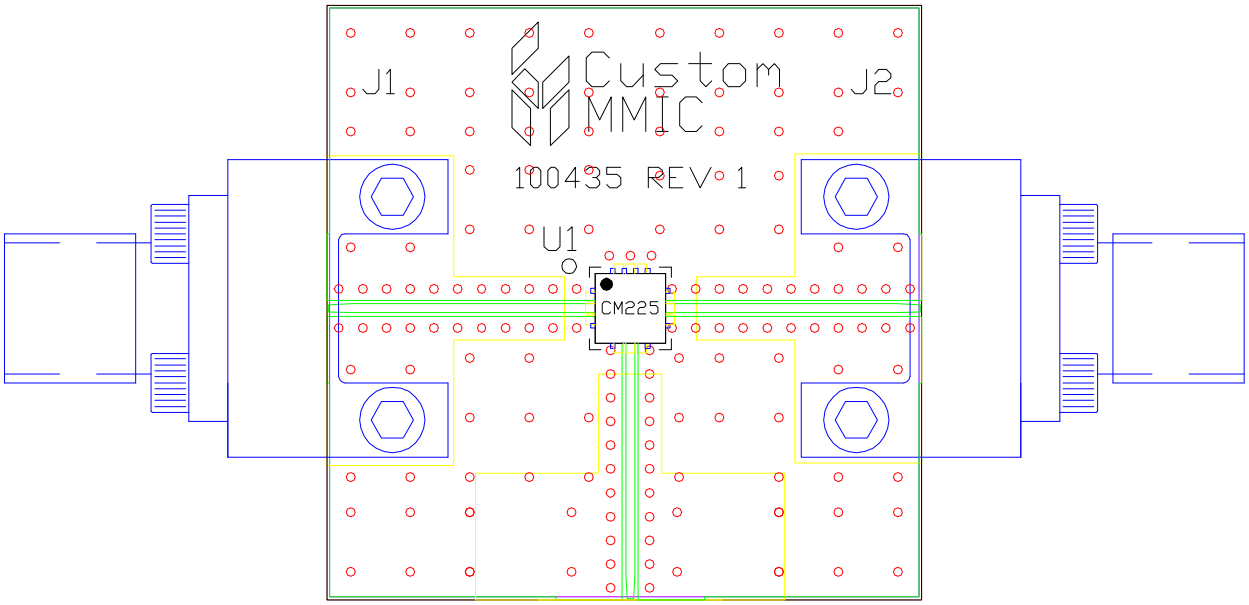
Applications Information

Evaluation Board

The circuit board shown has been developed for optimized assembly at Custom MMIC. A sufficient number of via holes should be used to connect the top and bottom ground planes. As surface mount processes vary, careful process development is recommended.



Bill of Material

Designator	Value	Description
J1 - J2		SMA End Launch Connector
U1		CMD225C3 Frequency Doubler
PCB		100435 Evaluation PCB

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

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CMD225

Passive Frequency Doubler, 4-8 GHz Input

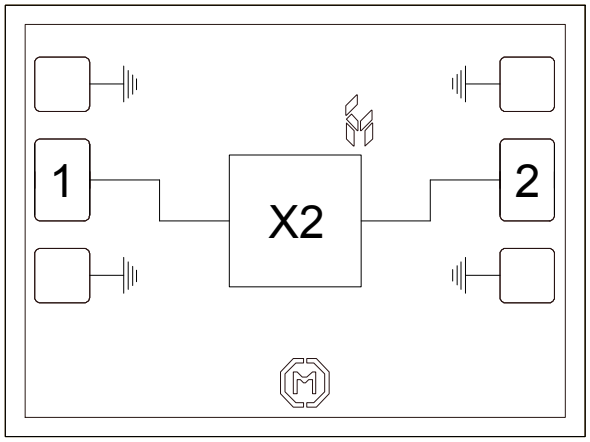
Features

- Low conversion loss
- Excellent Fo isolation
- Broadband performance
- No bias required
- Small die size

Description

The CMD225 die is a broadband MMIC GaAs x2 passive frequency multiplier. When driven by a +15 dBm signal, the multiplier provides 12 dB conversion loss at an output frequency of 12 GHz. The Fo and 3Fo isolations are >48 dBc and >51 dBc respectively. The CMD225 is a 50 ohm matched design eliminating the need for external DC blocks and RF port matching.

Functional Block Diagram



Electrical Performance - T_A = 25 °C, Pin = +15 dBm, Fin = 6 GHz

Parameter	Min	Typ	Max	Units
Frequency Range, Input		4 - 8		GHz
Frequency Range, Output		8 - 16		GHz
Conversion Loss		12		dB
Fo Isolation (with respect to input level)		48		dB
3Fo Isolation (with respect to input level)		50		dB
4Fo Isolation (with respect to input level)		50		dB

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Specifications

Absolute Maximum Ratings

Parameter	Rating
RF Input Power	+27 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.

Electrical Specifications - T_A = 25 °C, Pin = +15 dBm

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range, Input	4 - 8			5 - 7			GHz
Frequency Range, Output	8 - 16			10 - 14			GHz
Conversion Loss		12	19		12	16	dB
Fo Isolation (with respect to input level)	33	48		38	48		dB
3Fo Isolation (with respect to input level)	43	50		43	50		dB
4Fo Isolation (with respect to input level)	23	50		33	50		dB

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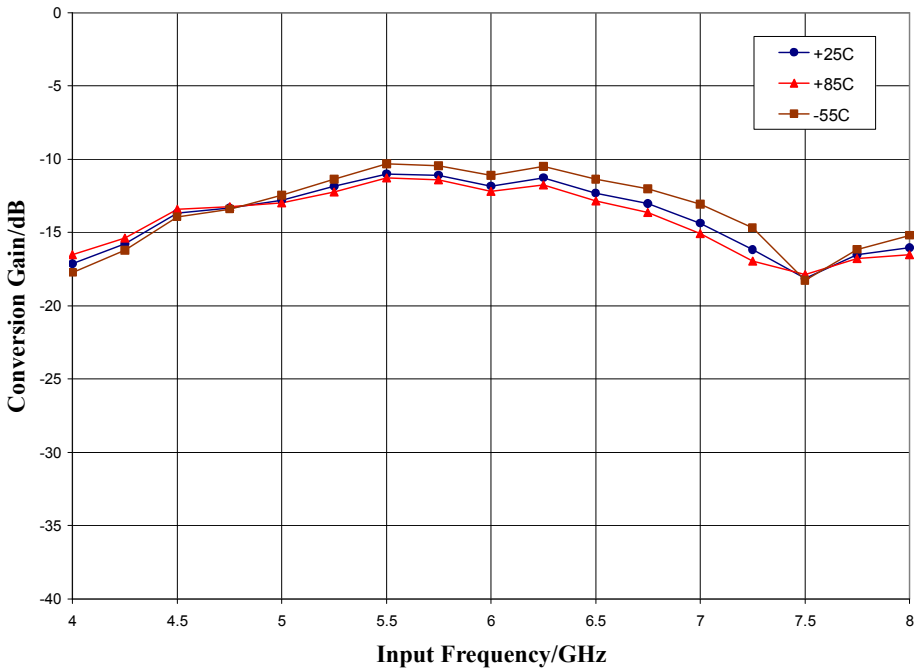
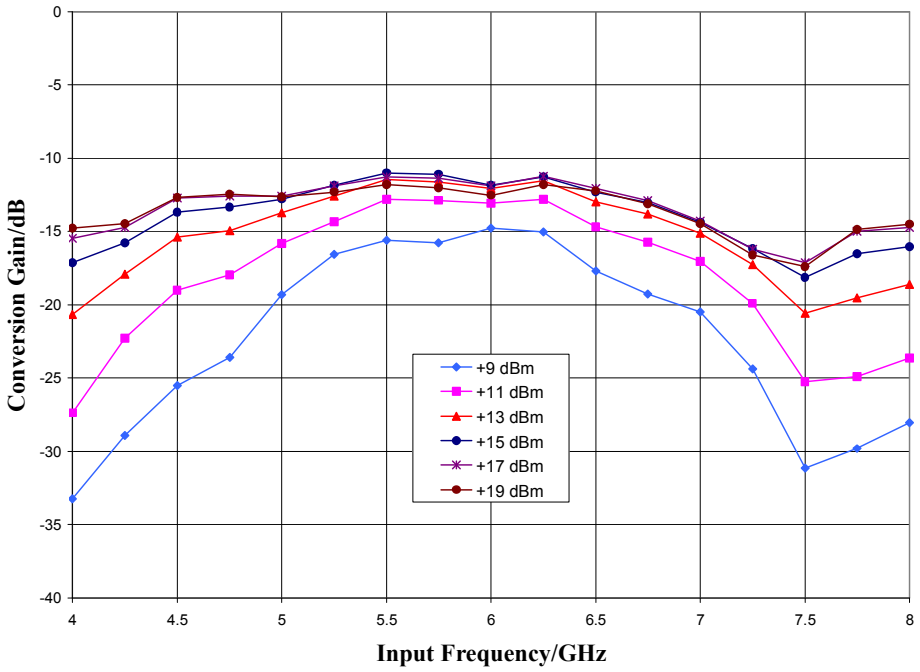
Typical Performance

Conversion Gain vs. Temperature @ +15 dBm Drive Level



Conversion Gain vs. Drive Level, T_A = 25 °C



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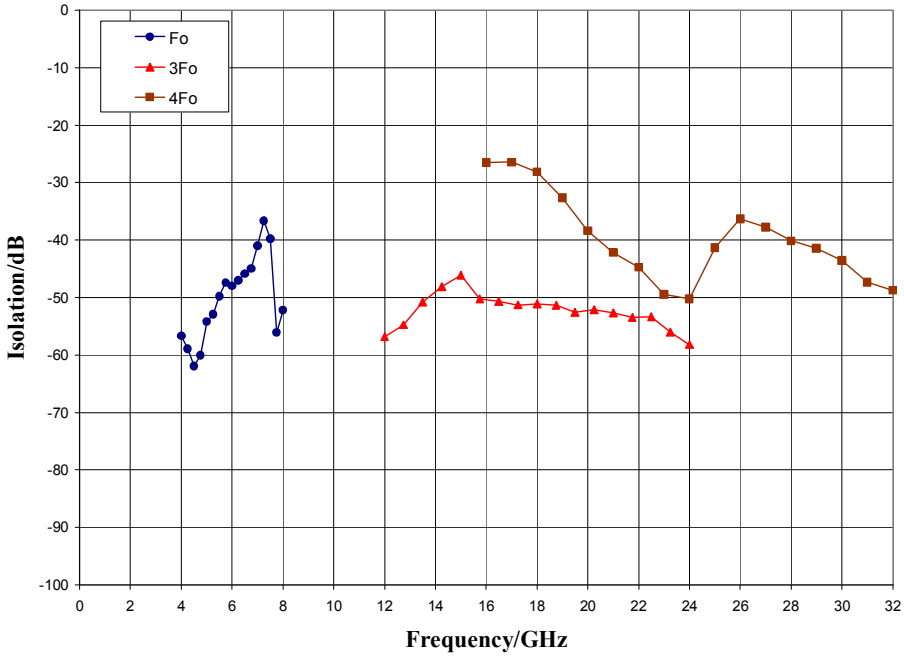
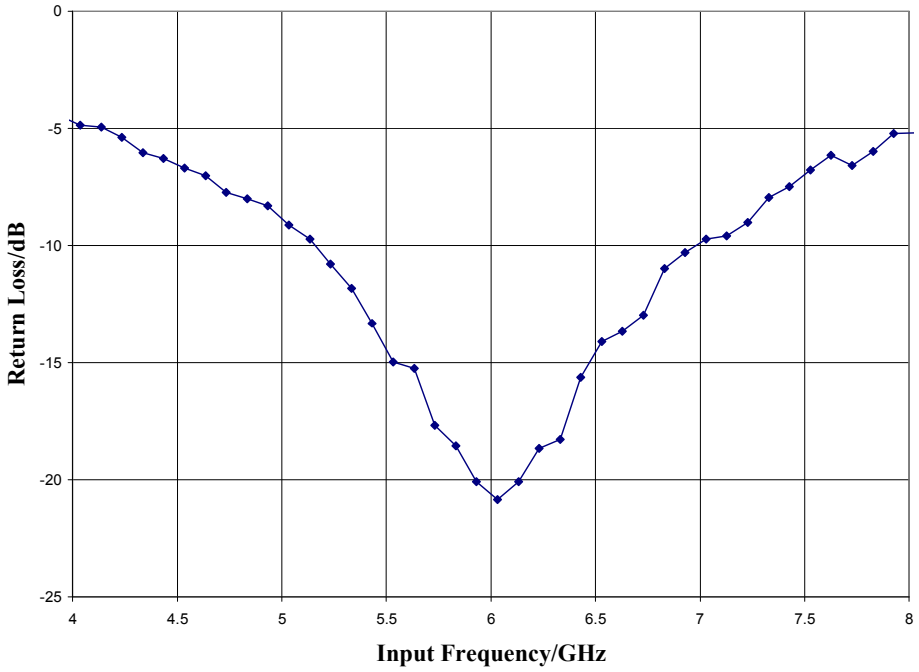
Typical Performance

Isolation (with respect to input level) @ +15 dBm Drive Level, T_A = 25 °C



Input Return Loss @ +15 dBm Drive Level, T_A = 25 °C



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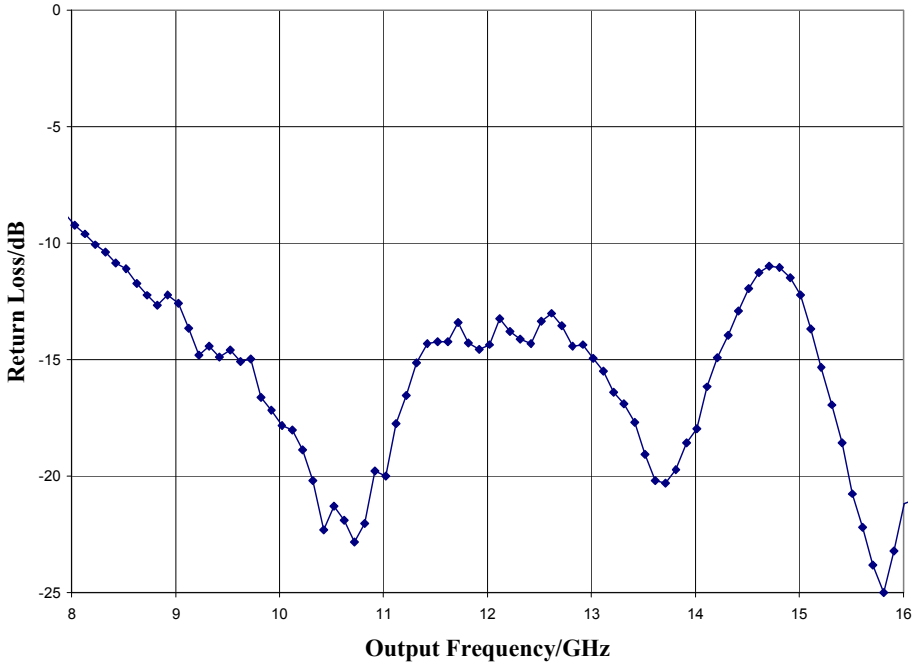
Typical Performance

Output Return Loss @ +15 dBm Drive Level, F = 6 GHz Input, T_A = 25 °C



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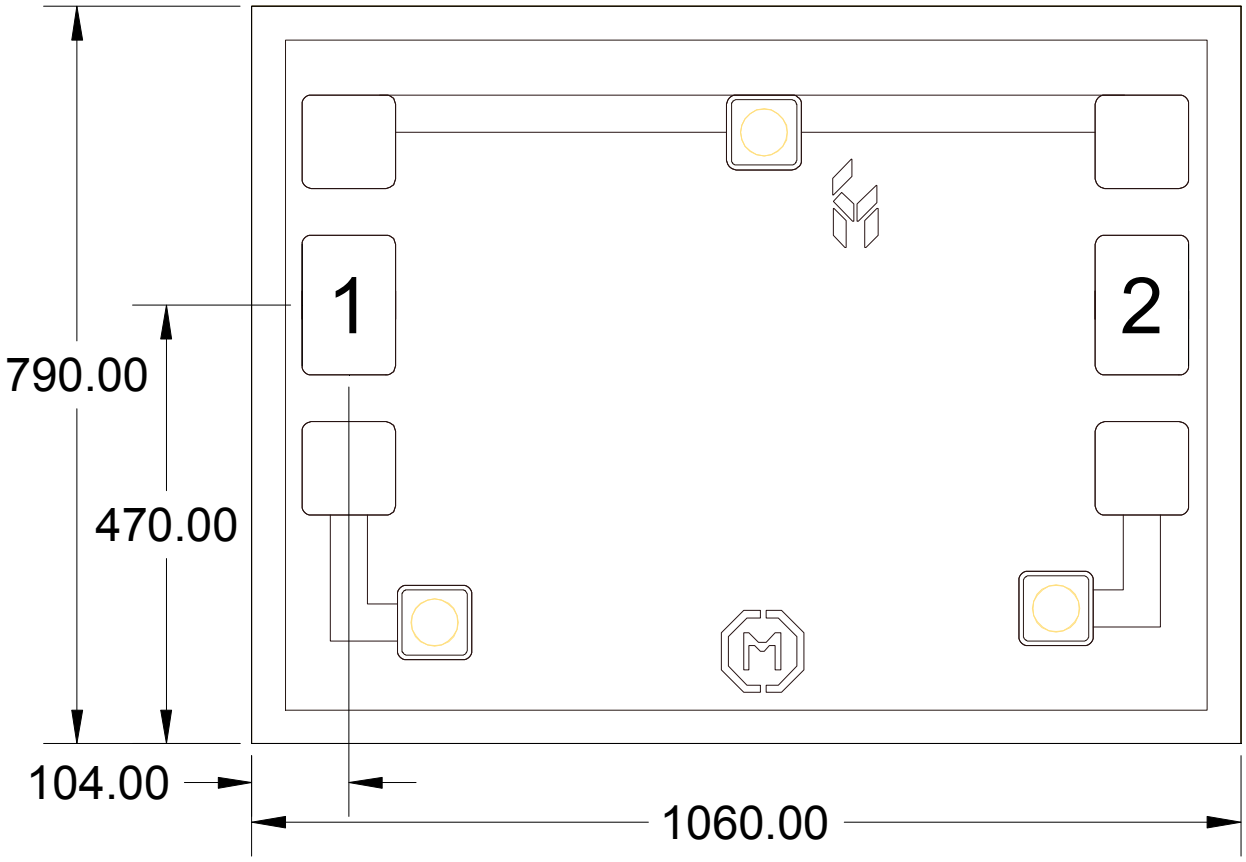
Mechanical Information

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 100 microns thick
5. DC bond pads are 100 microns square

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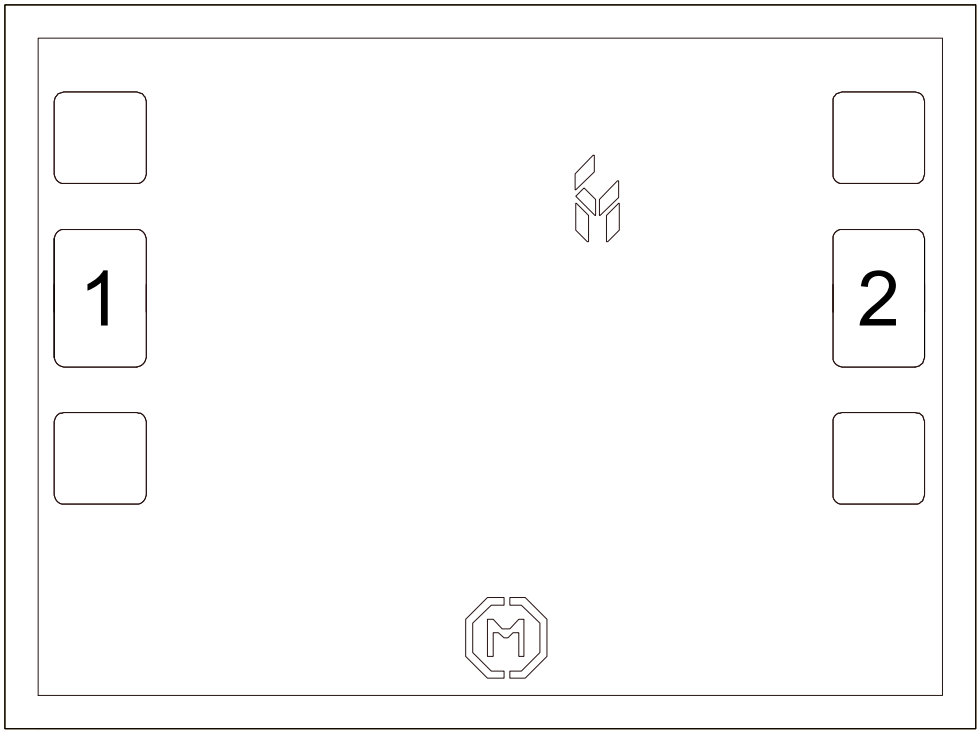
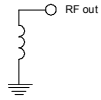
Pin Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	Pad is DC coupled and 50 ohm matched	
2	RF out	Pad is DC coupled and 50 ohm matched	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

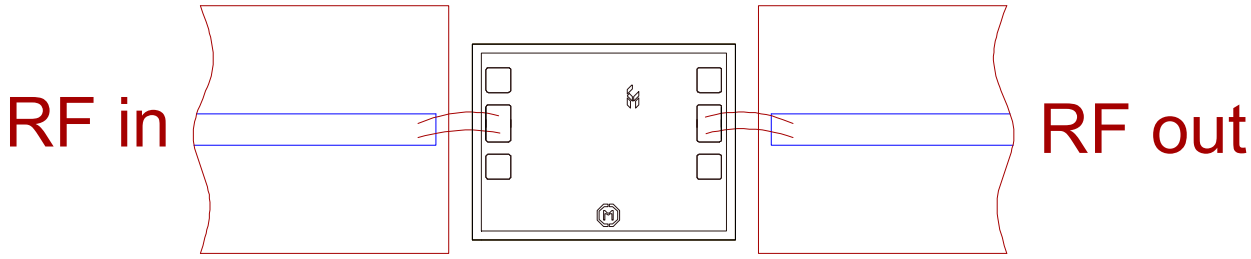
Assembly Guidelines

The backside of the CMD225 is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy or eutectic attach. 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.

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 100 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.

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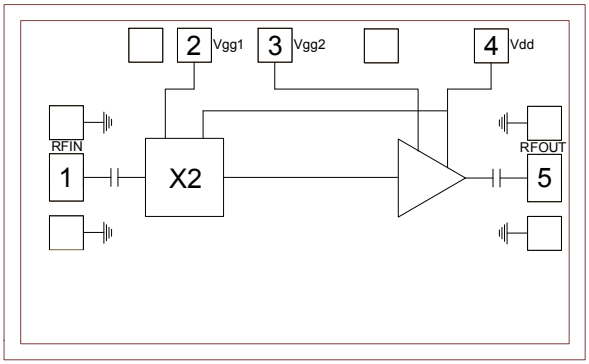
CMD214

24-36 GHz Active Frequency Doubler

Features

- High output power
- Excellent Fo isolation
- Broadband performance
- Small die size

Functional Block Diagram



Description

The CMD214 die is a broadband MMIC GaAs x2 active frequency multiplier. When driven by a +13dBm signal, the multiplier provides +17 dBm output power from 24 to 36 GHz. The Fo and 3Fo isolations are >32 dBc and >25 dBc respectively at 26 GHz. The CMD214 is a 50 ohm matched design eliminating the need for external DC blocks and RF port matching.

Electrical Performance - V_{dd} = 5 V, V_{gg1} = -1.8 V, V_{gg2} = -0.7 V, T_A = 25 °C, Pin = 13 dBm

Parameter	Min	Typ	Max	Units
Frequency Range, Input		12 - 18		GHz
Frequency Range, Output		24 - 36		GHz
Output Power		17		dBm
Fo Isolation (with respect to output level)		32		dBc
3Fo Isolation (with respect to output level)		25		dBc
Input Return Loss		15		dB
Output Return Loss		13		dB
Supply Current		40		mA

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CMD214

24-36 GHz Active Frequency Doubler

Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	6.0 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	337 mW
Thermal Resistance	192 °C/W
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
Vdd	3.0	5.0	5.5	V
Idd		40		mA
Vgg1		-1.8		V
Vgg2		-0.7		V

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

Electrical Specifications - V_{dd} = 5 V, V_{gg1} = -1.8 V, V_{gg2} = -0.7 V, T_A = 25 °C, Pin = 13 dBm

Parameter	Min	Typ	Max	Units
Frequency Range, Input		12 - 18		GHz
Frequency Range, Output		24 - 36		GHz
Output Power	14	17		dBm
Fo Isolation (with respect to output level)	27	32		dBc
3Fo Isolation (with respect to output level)		25		dBc
Input Return Loss		15		dB
Output Return Loss		13		dB
Supply Current		40		mA

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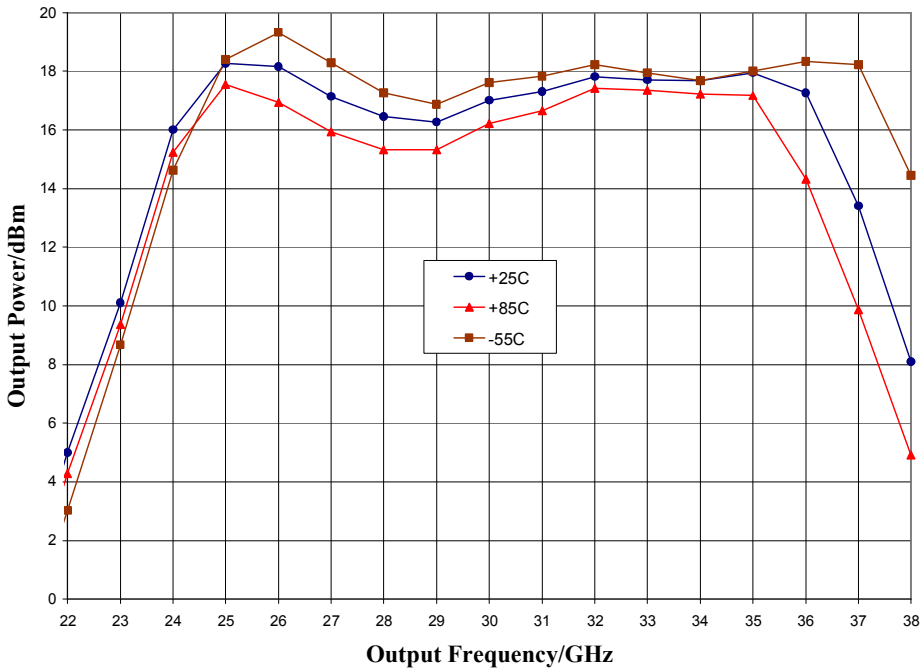
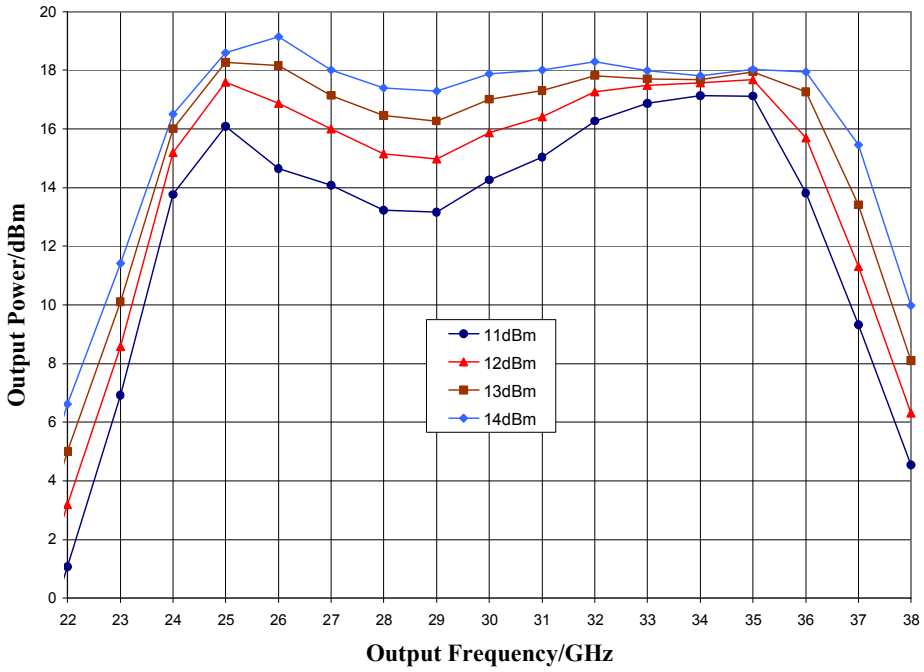
Typical Performance

Output Power vs. Temperature @ 13 dBm Drive Level



Output Power vs. Drive Level, T_A = 25 °C



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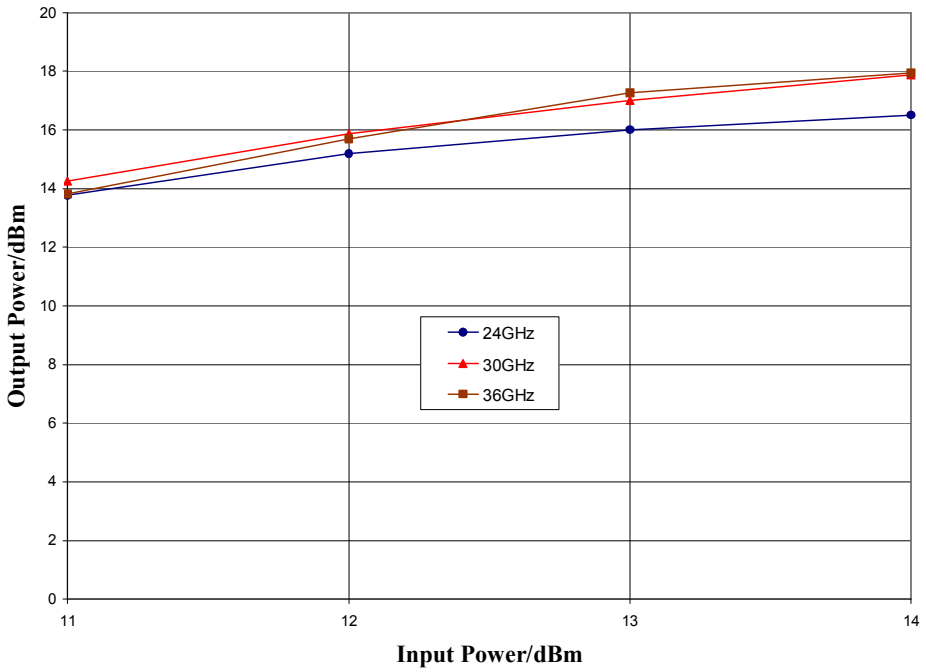
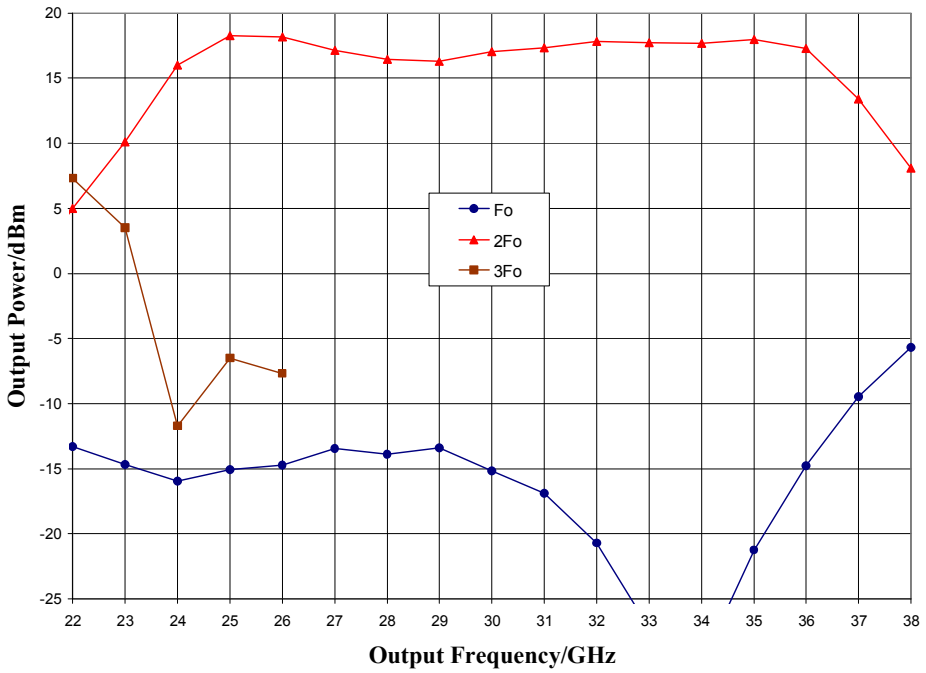
Typical Performance

Output Power vs. Input Power, T_A = 25 °C



Isolation @ 13 dBm Drive Level, T_A = 25 °C



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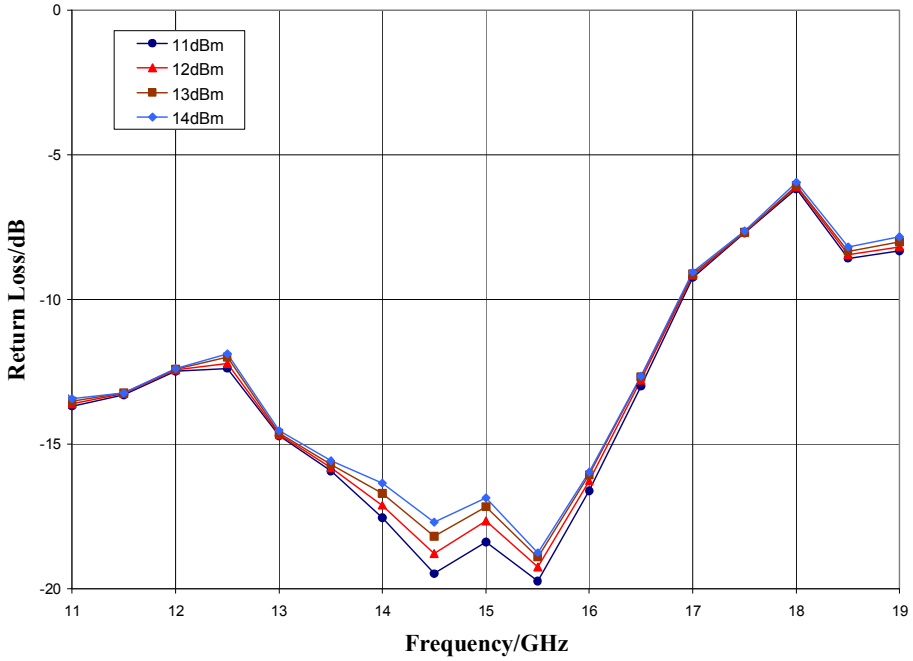
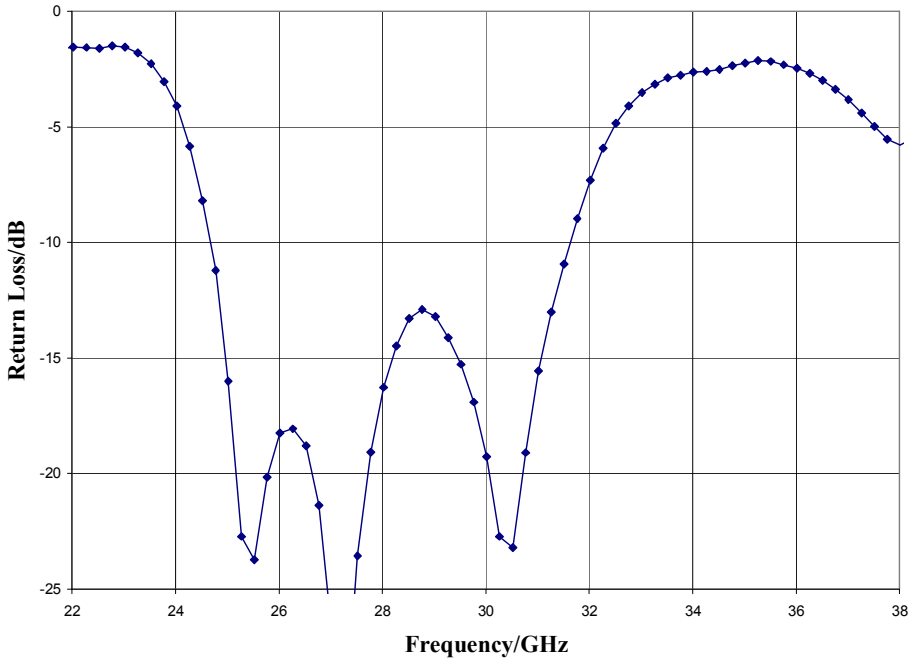
Typical Performance

Input Return Loss vs. Drive Level, T_A = 25 °C



Output Return Loss, T_A = 25 °C



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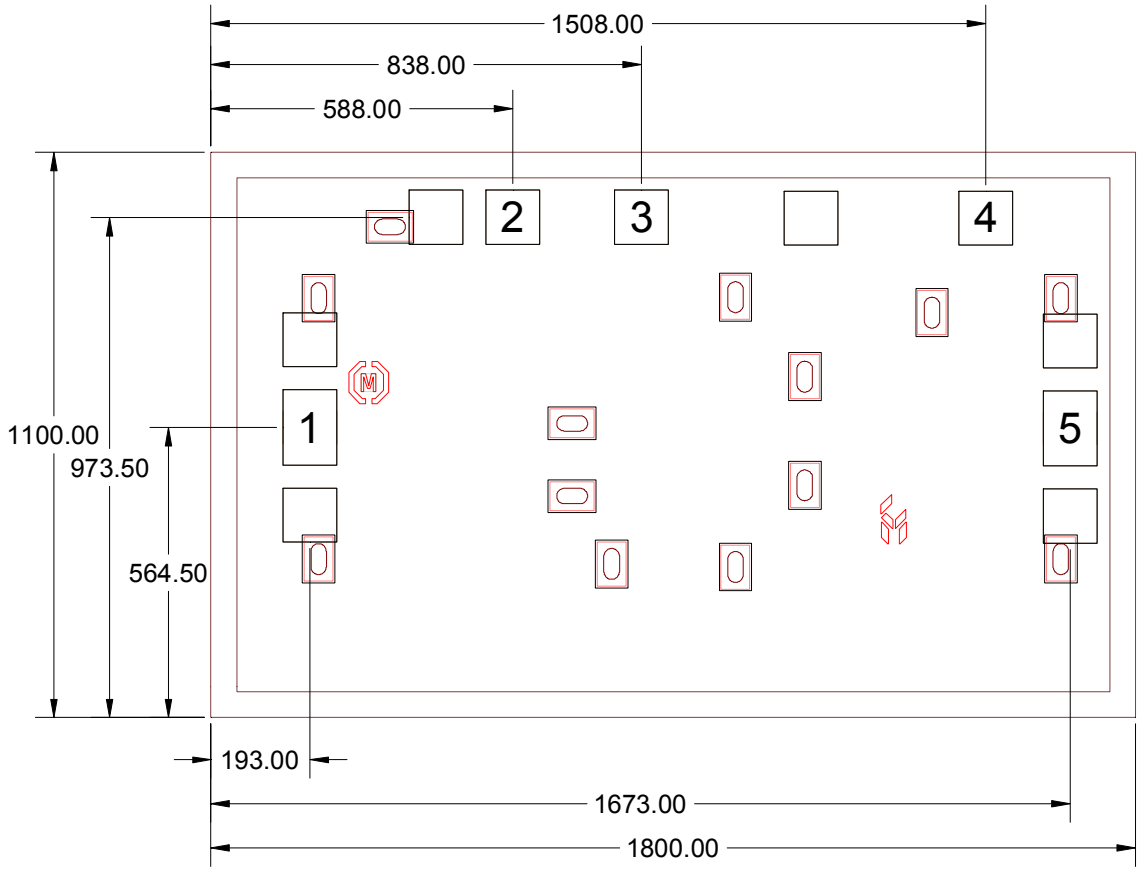
Mechanical Information

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 100 microns thick
5. DC bond pads are 100 microns square

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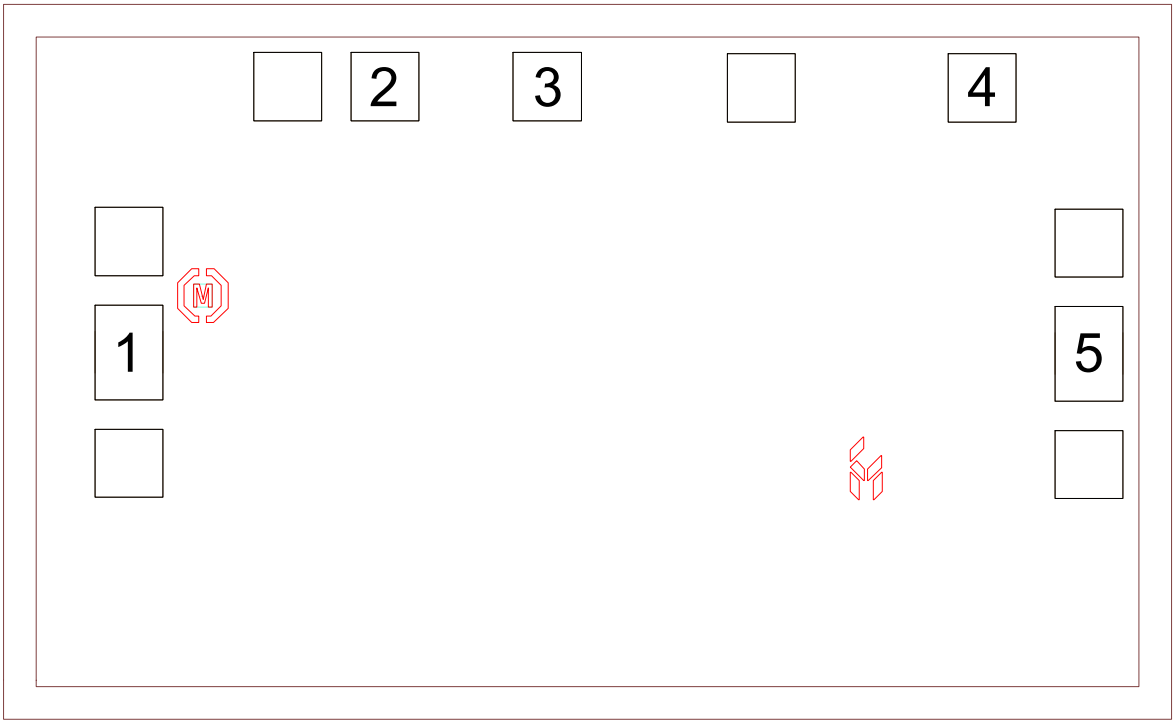
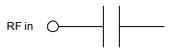
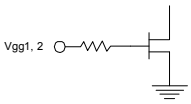
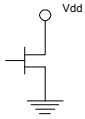
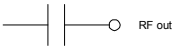
ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

Pin Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	DC blocked and 50 ohm matched	
2, 3	Vgg1, 2	Power supply voltage Decoupling and bypass caps required	
4	Vdd	Power supply voltage Decoupling and bypass caps required	
5	RF out	DC blocked and 50 ohm matched	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

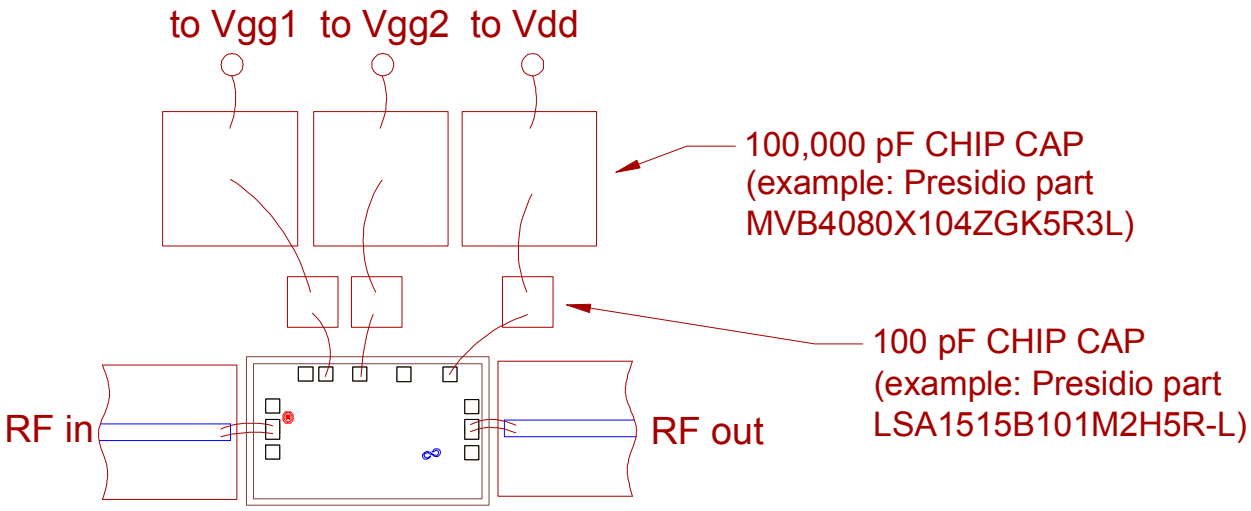
Assembly Guidelines

The backside of the CMD214 is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy or eutectic attach. 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 100 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.

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Applications Information

Biasing and Operation

The CMD214 is biased with a positive drain supply and two negative gate supplies. Performance is optimized when the V_{dd} is set to +5.0 V, V_{gg1} is set to -1.8 V and V_{gg2} is set to -0.7 V.

Turn ON procedure:

1.Apply gate voltages V_{gg1} and V_{gg2} and set to -1.8 V
2.Apply drain voltage V_{dd} and set to +5 V
3.Adjust gate voltage V_{gg2} and set to -0.7 V

Turn OFF procedure:

1.Turn off drain voltage V_{dd}
2.Turn off gate voltages V_{gg1} and V_{gg2}

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CMD213

30-40 GHz Active Frequency Doubler

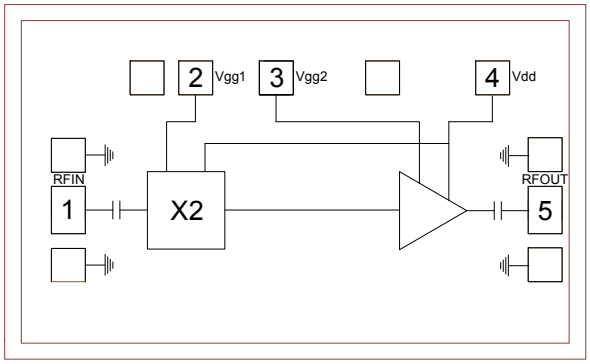
Features

- ► High output power
- ► Excellent Fo isolation
- ► Broadband performance
- ► Small die size

Description

The CMD213 die is a broadband MMIC GaAs x2 active frequency multiplier. When driven by a +17dBm signal, the multiplier provides +17 dBm output power from 30 to 40 GHz. The Fo isolation is greater than 46 dBc at 35 GHz. The CMD213 is a 50 ohm matched design eliminating the need for external DC blocks and RF port matching.

Functional Block Diagram



Electrical Performance - V_{dd} = 5 V, V_{gg1} = -1.8 V, V_{gg2} = -0.7 V, T_A = 25 °C, Pin = 17 dBm

Parameter	Min	Typ	Max	Units
Frequency Range, Input		15 - 20		GHz
Frequency Range, Output		30 - 40		GHz
Output Power		17		dBm
Fo Isolation (with respect to output level)		46		dBc
Input Return Loss		15		dB
Output Return Loss		7		dB
Supply Current		55		mA

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CMD213

30-40 GHz Active Frequency Doubler

Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	6.0 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	317 mW
Thermal Resistance	205 °C/W
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
Vdd	3.0	5.0	5.5	V
Idd		55		mA
Vgg1		-1.8		V
Vgg2		-0.7		V

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

Electrical Specifications - V_{dd} = 5 V, V_{gg1} = -1.8 V, V_{gg2} = -0.7 V, T_A = 25 °C, Pin = 17 dBm

Parameter	Min	Typ	Max	Units
Frequency Range, Input		15 - 20		GHz
Frequency Range, Output		30 - 40		GHz
Output Power	14	17		dBm
Fo Isolation (with respect to output level)	34	46		dBc
Input Return Loss		15		dB
Output Return Loss		7		dB
Supply Current		55		mA

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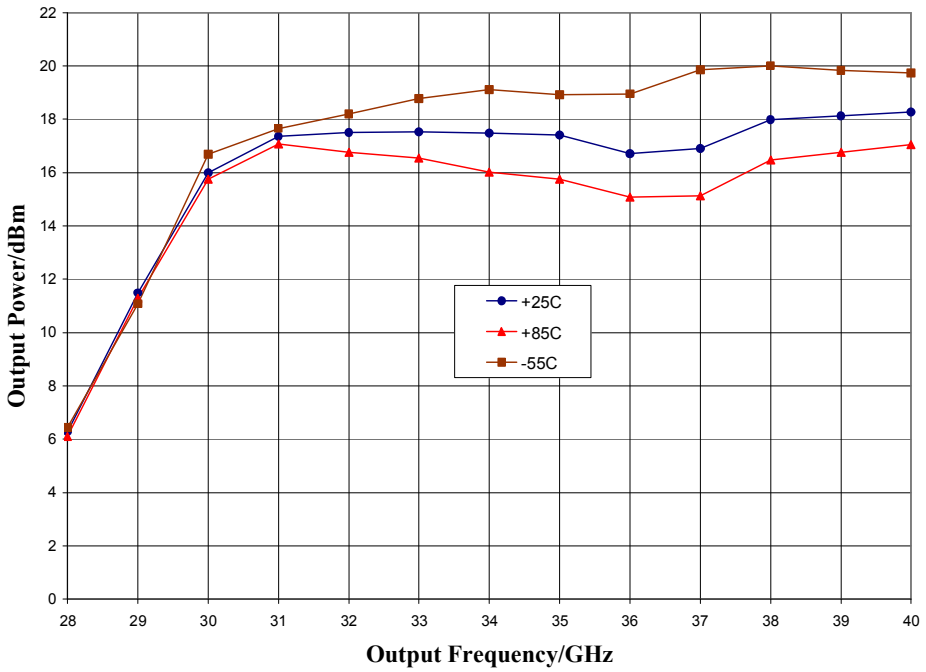
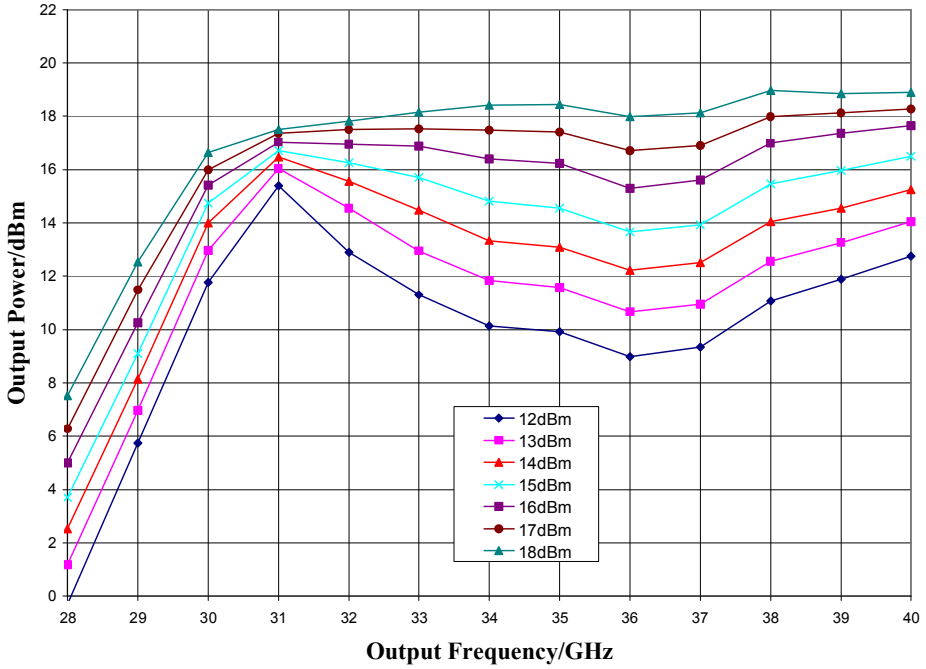
Typical Performance

Output Power vs. Temperature @ 17 dBm Drive Level



Output Power vs. Drive Level, T_A = 25 °C



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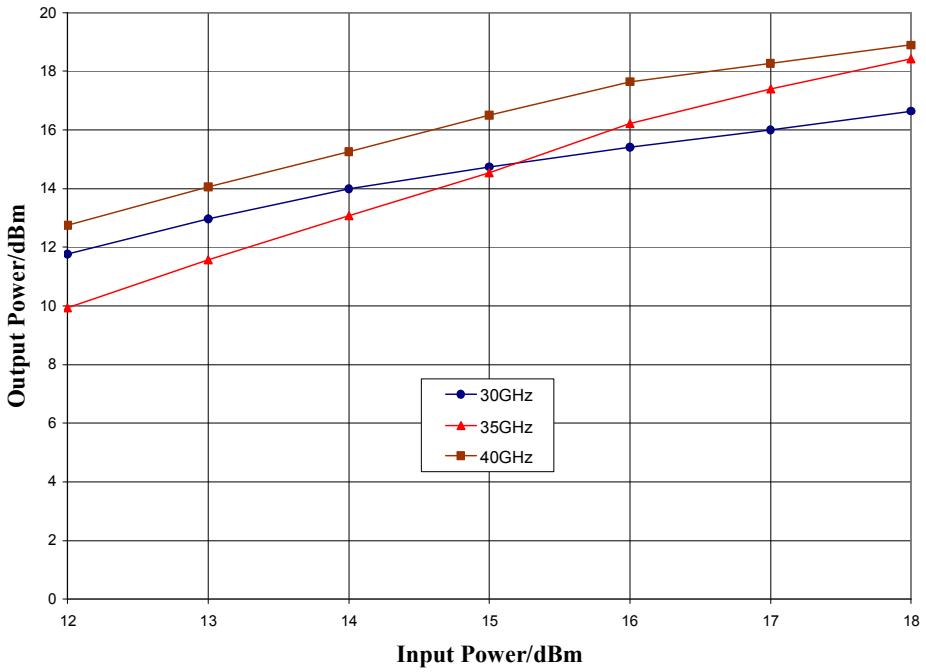
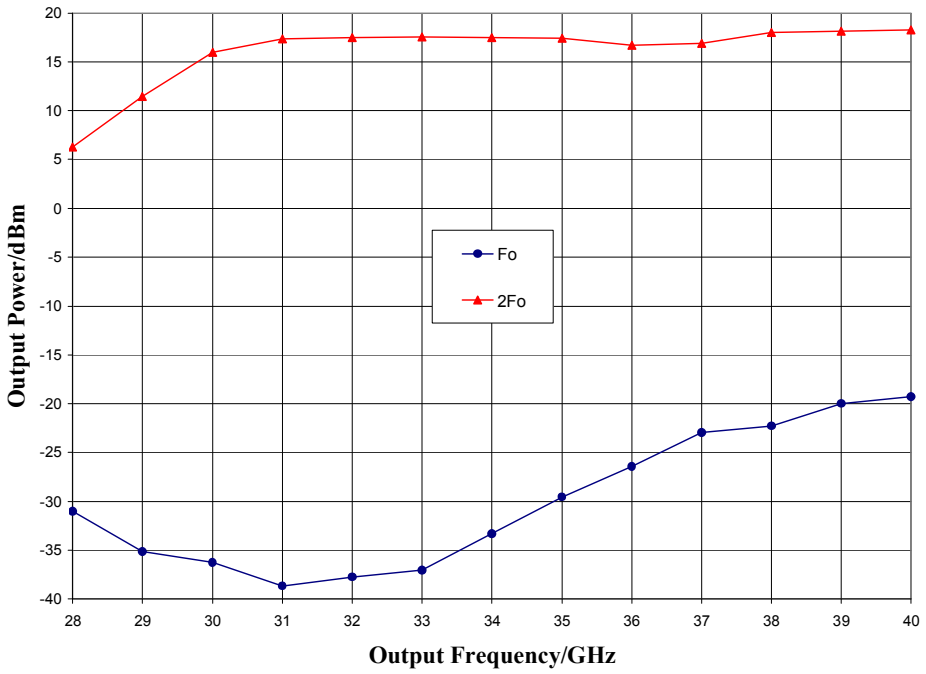
Typical Performance

Output Power vs. Input Power, T_A = 25 °C



Isolation @ 17 dBm Drive Level, T_A = 25 °C



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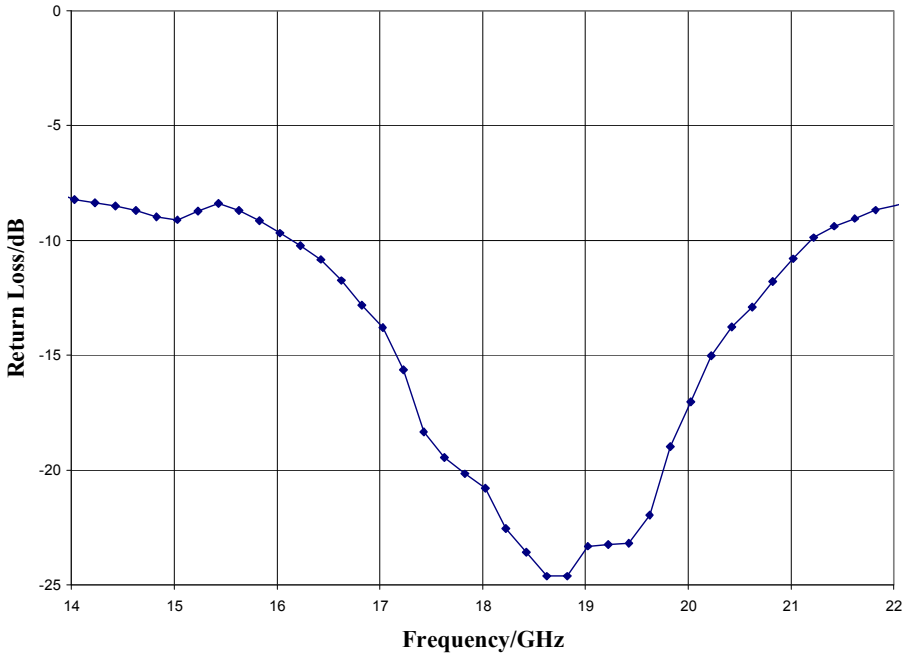
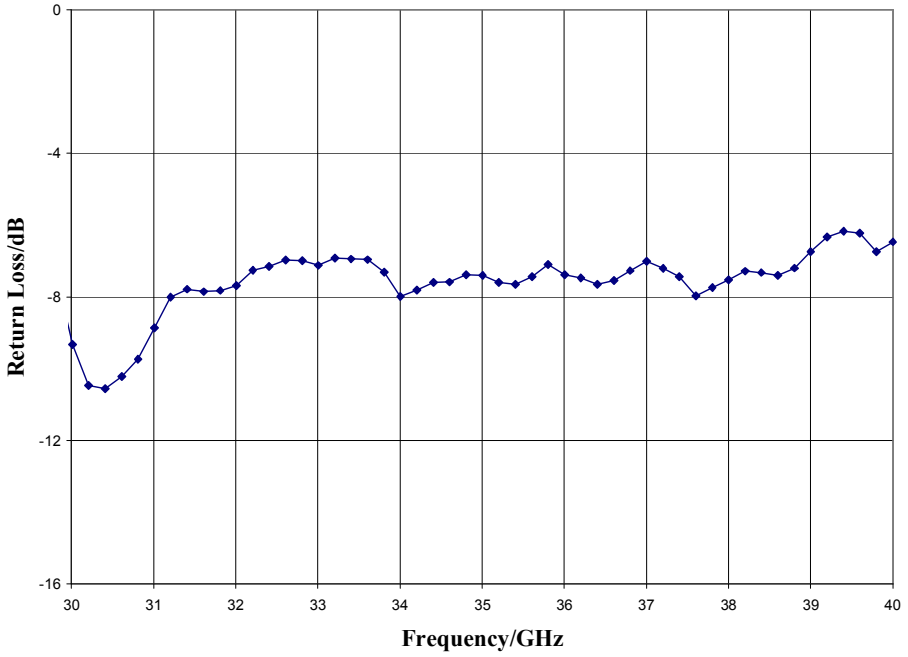
Typical Performance

Input Return Loss, T_A = 25 °C



Output Return Loss, T_A = 25 °C



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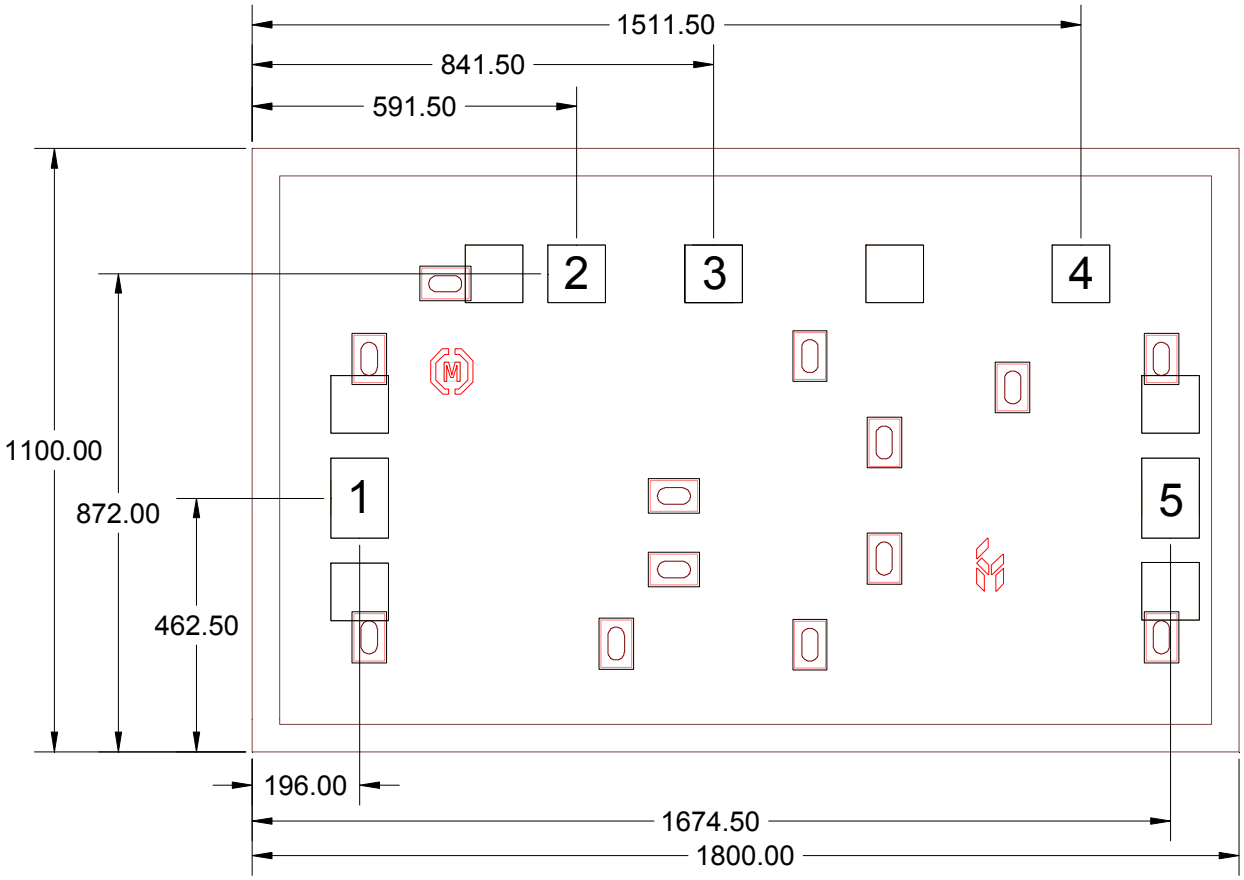
Mechanical Information

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 100 microns thick
5. DC bond pads are 100 microns square

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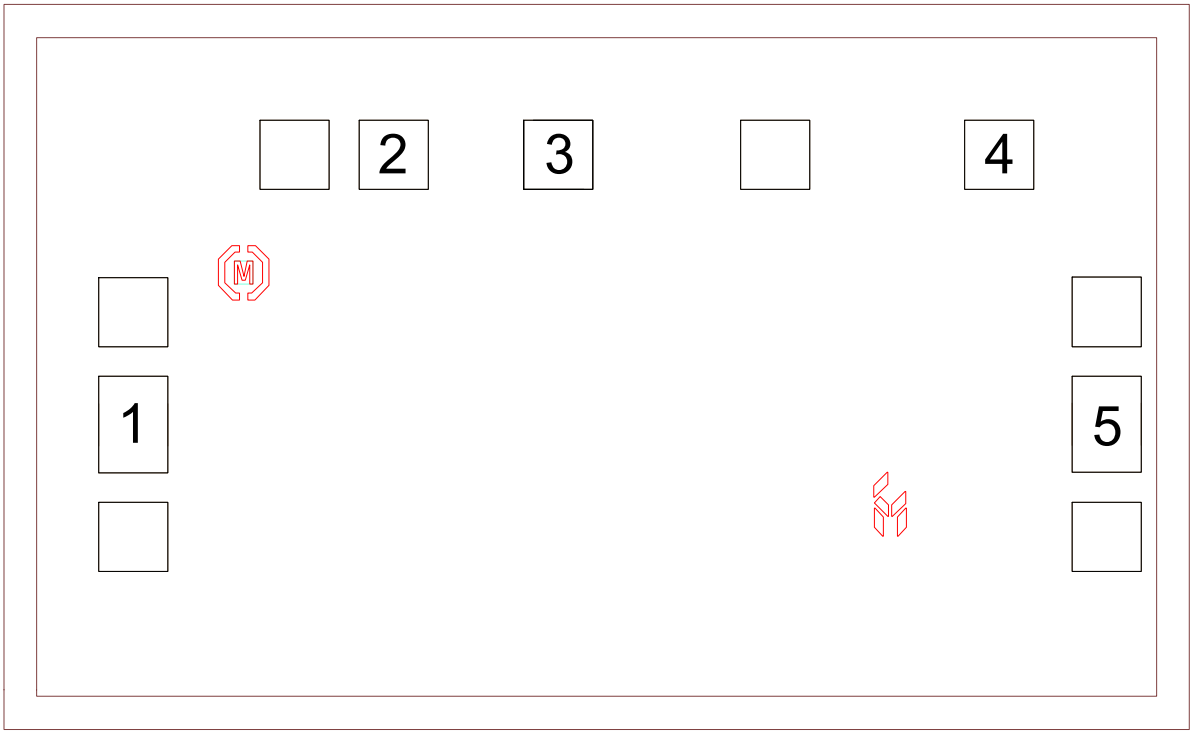

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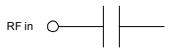
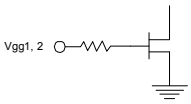
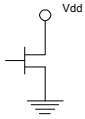
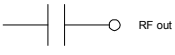
1	RF in	DC blocked and 50 ohm matched	
2, 3	Vgg1, 2	Power supply voltage Decoupling and bypass caps required	
4	Vdd	Power supply voltage Decoupling and bypass caps required	
5	RF out	DC blocked and 50 ohm matched	
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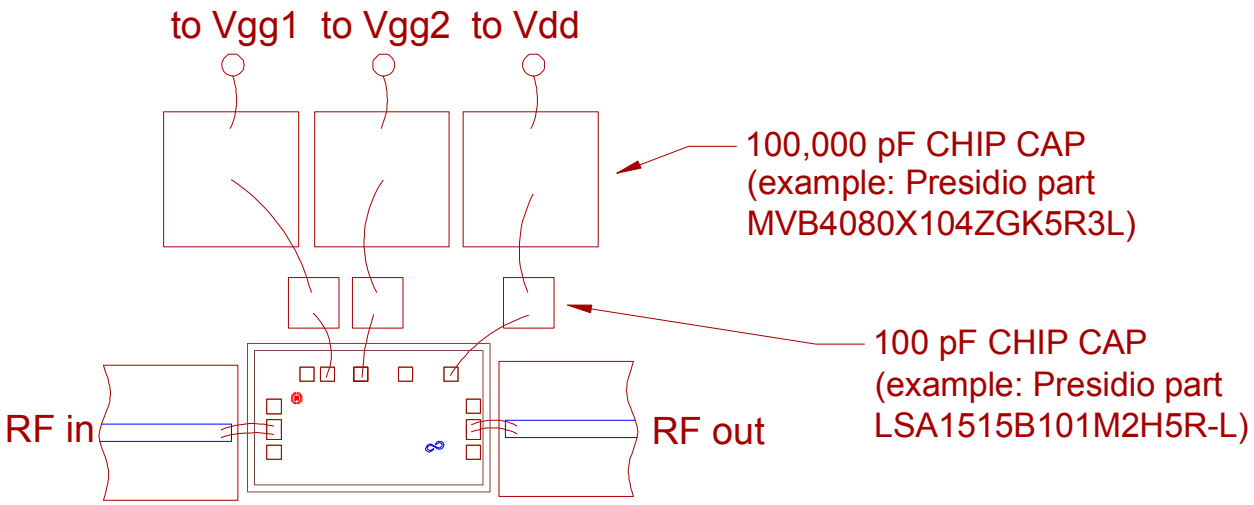

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