22 GHz to 38 GHz, GaAs, MMIC, Double Balanced Mixer

Data Sheet **HMC329A**

FEATURES

- **Downconverter**
  - **Conversion loss**
    - **9 dB typical for 22 GHz to 29 GHz**
    - **11 dB typical for 29 GHz to 38 GHz**
  - **LO to RF isolation**
    - **37 dB typical for 22 GHz to 29 GHz**
    - **36 dB typical for 29 GHz to 38 GHz**
  - **LO to IF isolation**
    - **30 dB typical for 22 GHz to 29 GHz**
    - **27 dB typical for 29 GHz to 38 GHz**
  - **RF to IF isolation**
    - **31 dB typical for 22 GHz to 29 GHz**
    - **34 dB typical for 29 GHz to 38 GHz**
  - **Input IP3**
    - **17 dBm typical for 22 GHz to 29 GHz**
    - **21 dBm typical for 29 GHz to 38 GHz**
- **IF range**
  - **DC to 8 GHz**
- **Passive, no dc bias required**
- **Small size**
  - **0.87 × 0.58 × 0.102 mm**

APPLICATIONS

- **Point to point radios**
- **Point to multipoint radios and very small aperture terminal (VSAT) radios**
- **Test equipment and sensors**
- **Military end use**

FUNCTIONAL BLOCK DIAGRAM

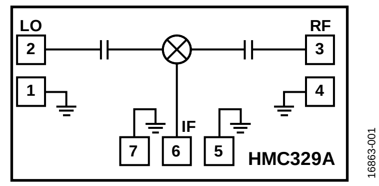

Figure 1.

GENERAL DESCRIPTION

The HMC329A chip is a general-purpose, double balanced mixer that can be used as an upconverter or downconverter from 22 GHz to 38 GHz in a small chip area of 0.87 mm × 0.58 mm. This mixer requires no external component or matching circuitry. The HMC329A provides excellent local oscillation (LO) to radio frequency (RF) and LO to intermediate frequency (IF) suppression due to optimized balun structures. The mixer operates with LO drive levels at 13 dBm or above.

Rev. 0 **Document Feedback**

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700

Technical Support **www.analog.com**

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REVISION HISTORY

7/2018—Revision 0: Initial Version

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS—22 GHz TO 29 GHz RF FREQUENCY RANGE

T_A = 25°C, IF = 1 GHz, LO drive level = 13 dBm, RF frequency range = 22 GHz to 29 GHz, all measurements performed as a downconverter with the upper sideband selected, unless otherwise noted.

Table 1.

Parameter	Symbol	Min	Typ	Max	Unit
FREQUENCY RANGE					
Radio Frequency	RF	22		29	GHz
Local Oscillator	LO	22		29	GHz
Intermediate Frequency	IF	DC		8	GHz
CONVERSION LOSS			9	12.5	dB
NOISE FIGURE	NF		11		dB
ISOLATION					
LO to RF			37		dB
LO to IF		20	30		dB
RF to IF		19	31		dB
INPUT THIRD-ORDER INTERCEPT	IP3	10	17		dBm
INPUT SECOND-ORDER INTERCEPT	IP2		42		dBm
INPUT POWER					
1 dB Compression	P1dB		9.5		dBm
UPCONVERTER PERFORMANCE					
Conversion Loss			7		dB
Input Third-Order Intercept	IP3		16		dBm
RETURN LOSS					
RF			8		dB
LO			9.5		dB

ELECTRICAL SPECIFICATIONS—29 GHz TO 38 GHz RF FREQUENCY RANGE

T_A = 25°C, IF = 1 GHz, LO drive level = 13 dBm, RF frequency range = 29 GHz to 38 GHz, all measurements performed as a downconverter with the upper sideband selected, unless otherwise noted.

Table 2.

Parameter	Symbol	Min	Typ	Max	Unit
FREQUENCY RANGE					
Radio Frequency	RF	29		38	GHz
Local Oscillator	LO	29		38	GHz
Intermediate Frequency	IF	DC		8	GHz
CONVERSION LOSS			11	14.5	dB
NOISE FIGURE	NF		14		dB
ISOLATION					
LO to RF			36		dB
LO to IF		18	27		dB
RF to IF		19	34		dB
INPUT THIRD-ORDER INTERCEPT	IP3	16	21		dBm
INPUT SECOND-ORDER INTERCEPT	IP2		46		dBm
INPUT POWER					
1 dB Compression	P1dB		13.5		dBm
UPCONVERTER PERFORMANCE					
Conversion Loss			10		dB
Input Third-Order Intercept	IP3		14		dBm
RETURN LOSS					
RF			8.5		dB
LO			6.5		dB

ABSOLUTE MAXIMUM RATINGS

Table 3.

Parameter	Rating
RF Input Power	18 dBm
LO Input Power	27 dBm
IF Input Power	18 dBm
IF Source and Sink Current	2 mA
Channel Temperature	150°C
Continuous Power Dissipation, P_{DISS} (T_A = 85°C, Derate 5.88 mW/°C Above 85°C)	382 mW
Storage Temperature Range	−65 to +150°C
Operating Temperature Range	−55 to +85°C
Electrostatic Discharge (ESD) Sensitivity	
Human Body Model (HBM)	1500 V
Field Induced Charged Device Model (FICDM)	1250 V

Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

THERMAL RESISTANCE

Thermal performance is directly linked to printed circuit board (PCB) design and operating environment. Careful attention to PCB thermal design is required.

Table 4. Thermal Resistance

Package Type	θ_{JC}	Unit
C-7-5	170	°C/W

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

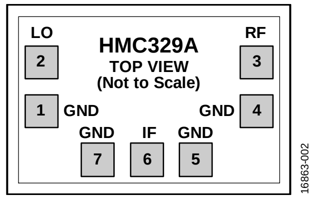

Figure 2. Pin Configuration

Table 5. Pin Function Descriptions

Pin No.	Mnemonic	Description
1, 4, 5, 7, Die Bottom	GND	Ground. These pads and die bottom must be connected to RF and dc ground. See Figure 3 for the GND interface schematic.
2	LO	Local Oscillator Port. This pin is ac-coupled and matched to 50 Ω. See Figure 4 for the LO interface schematic.
3	RF	Radio Frequency Port. This pin is ac-coupled and matched to 50 Ω. See Figure 6 for the RF interface schematic.
6	IF	Intermediate Frequency Port. This pin is dc-coupled. For applications not requiring operation to dc, dc block this port externally using a series capacitor with a value selected to pass the necessary IF frequency range. For operation to dc, this pin must not source or sink more than 2 mA of current or die malfunction and possible die failure can result. See Figure 5 for the IF interface schematic.

INTERFACE SCHEMATICS

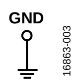

Figure 3. GND Interface Schematic

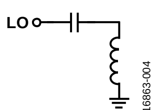

Figure 4. LO Interface Schematic

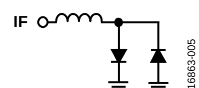

Figure 5. IF Interface Schematic

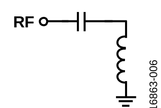

Figure 6. RF Interface Schematic

TYPICAL PERFORMANCE CHARACTERISTICS

DOWNCONVERTER PERFORMANCE AT IF = 1 GHz, UPPER SIDEBAND

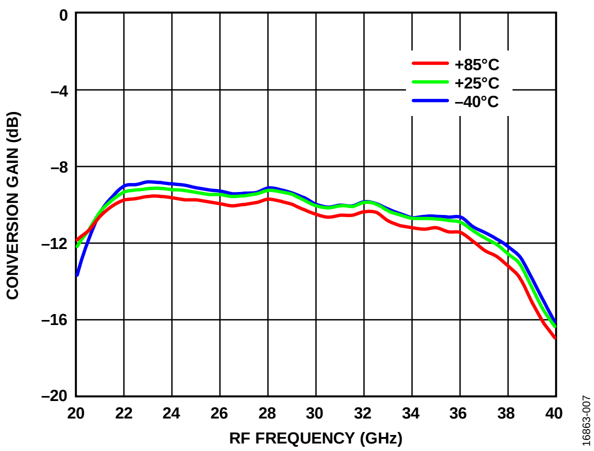

Figure 7. Conversion Gain vs. RF Frequency at Various Temperatures LO = 13 dBm

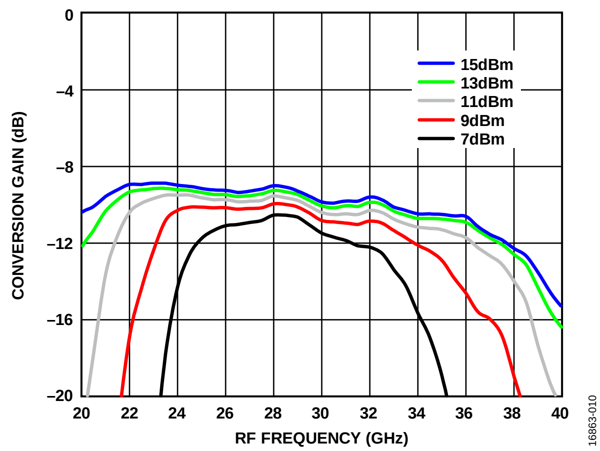

Figure 10. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

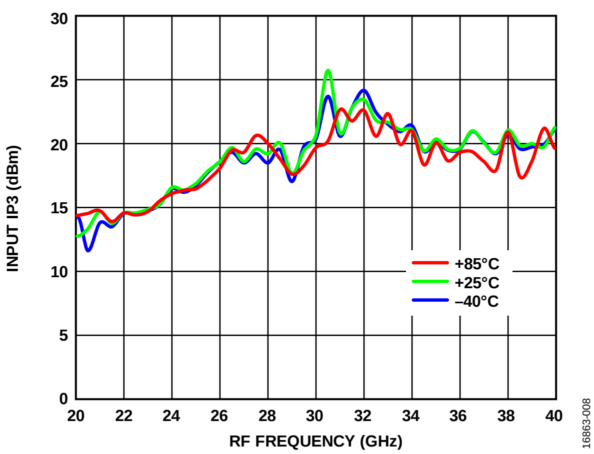

Figure 8. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

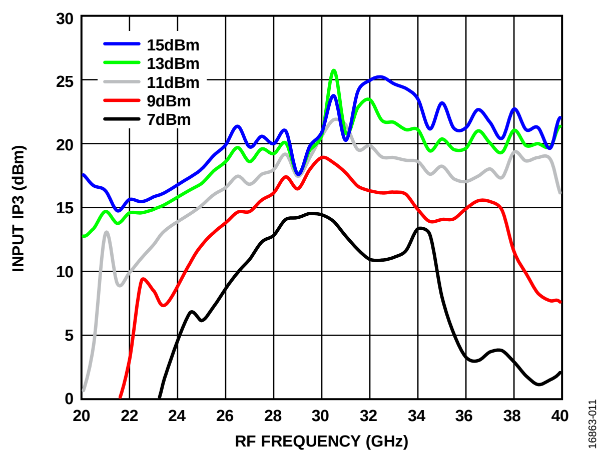

Figure 11. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

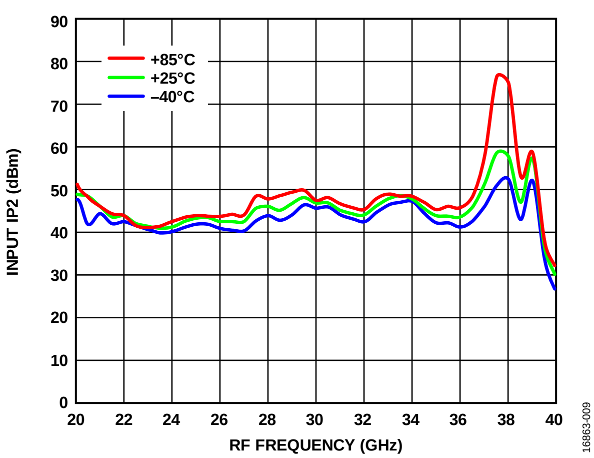

Figure 9. Input IP2 vs. RF Frequency at Various Temperatures, LO = 13 dBm

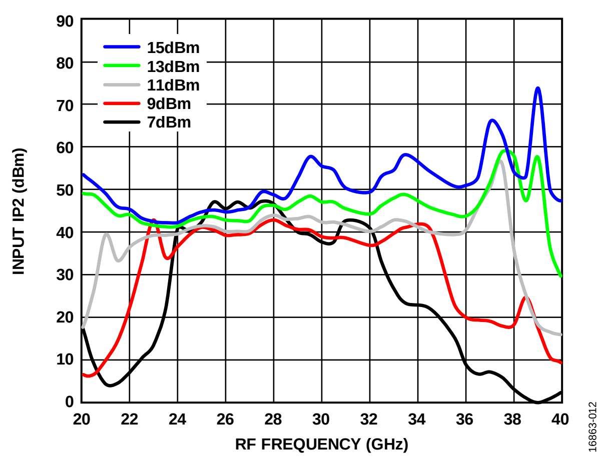

Figure 12. Input IP2 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

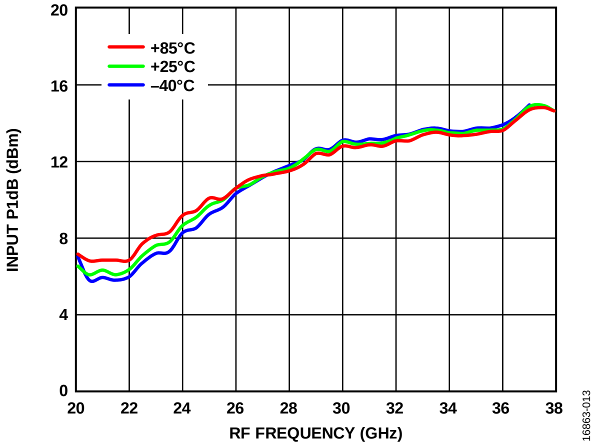

Figure 13. Input P1dB vs. RF Frequency at Various Temperatures, LO = 13 dBm

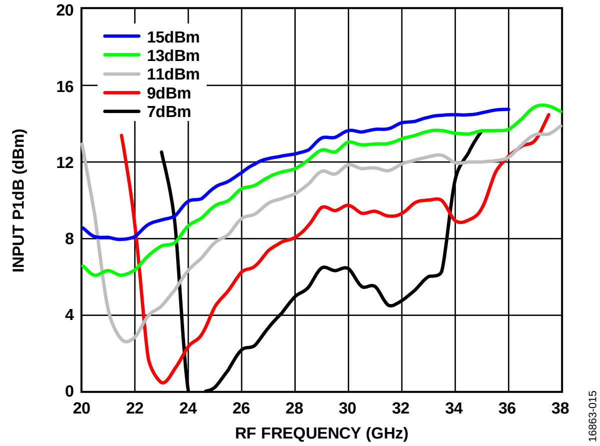

Figure 15. Input P1dB vs. RF Frequency at Various LO Power Levels, T_A = 25°C

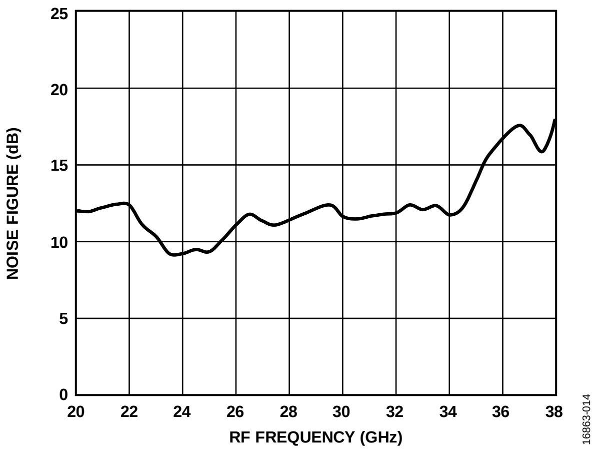

Figure 14. Noise Figure vs. RF Frequency at T_A = 25°C, LO = 13 dBm

DOWNCONVERTER PERFORMANCE AT IF = 4 GHz, UPPER SIDEBAND

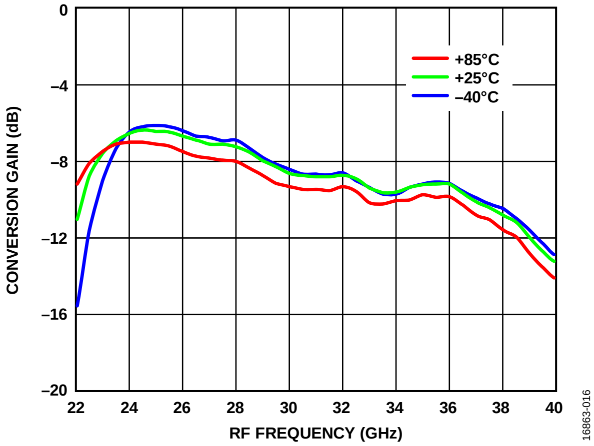

Figure 16. Conversion Gain vs. RF Frequency at Various Temperatures, LO = 13 dBm

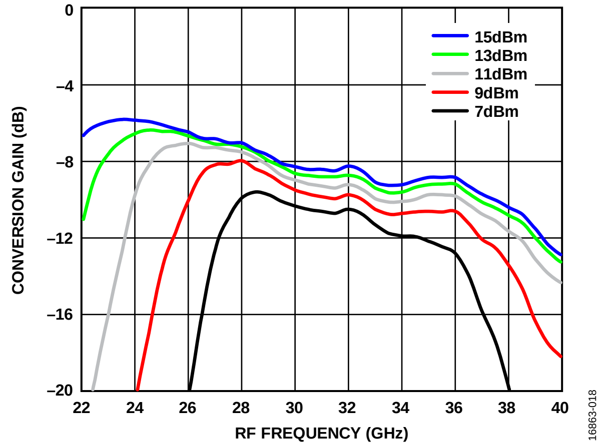

Figure 18. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

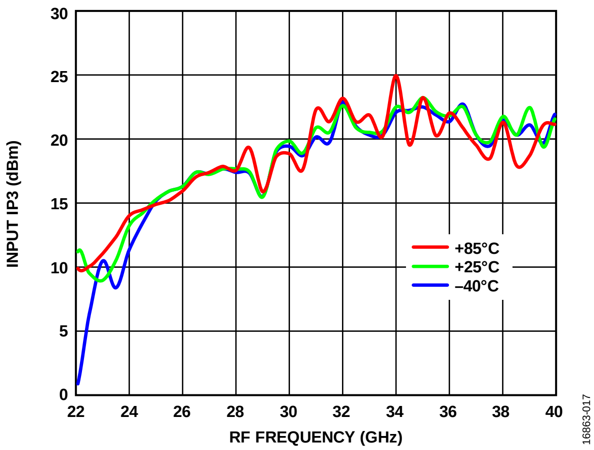

Figure 17. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

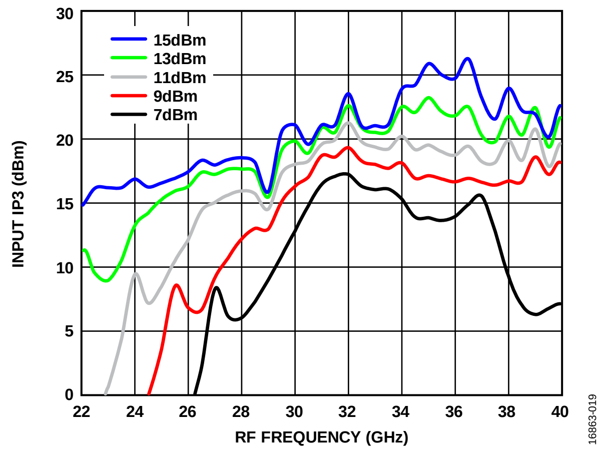

Figure 19. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

DOWNCONVERTER PERFORMANCE AT IF = 8 GHz, UPPER SIDEBAND

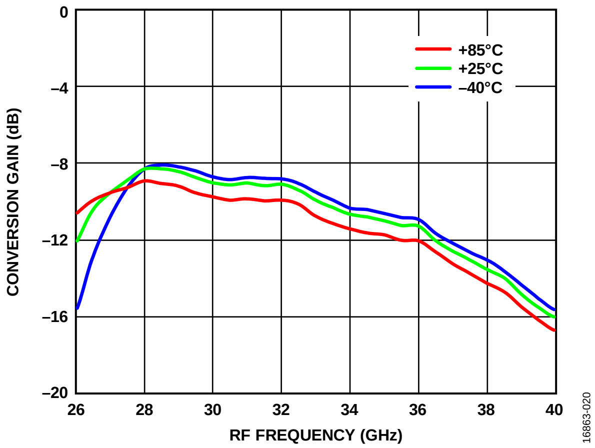

Figure 20. Conversion Gain vs. RF Frequency at Various Temperatures, LO = 13 dBm

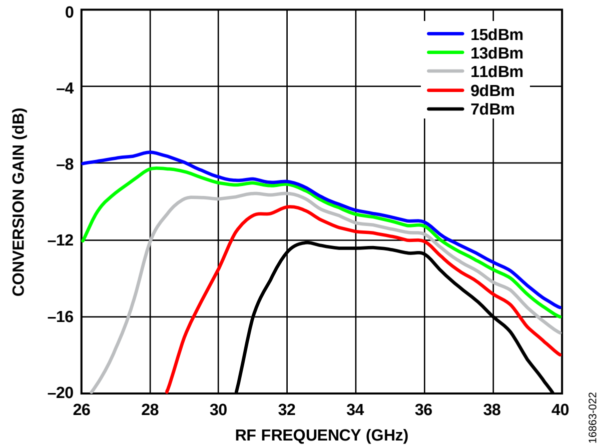

Figure 22. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

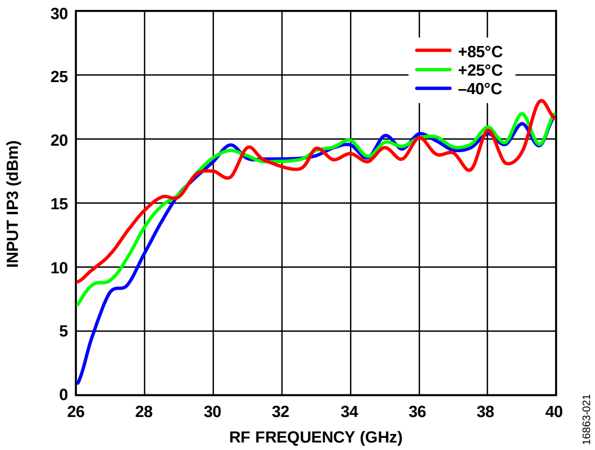

Figure 21. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

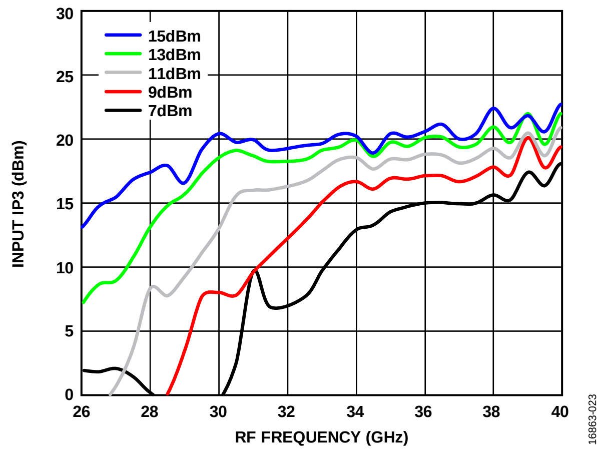

Figure 23. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

DOWNCONVERTER PERFORMANCE AT IF = 1 GHz, LOWER SIDEBAND

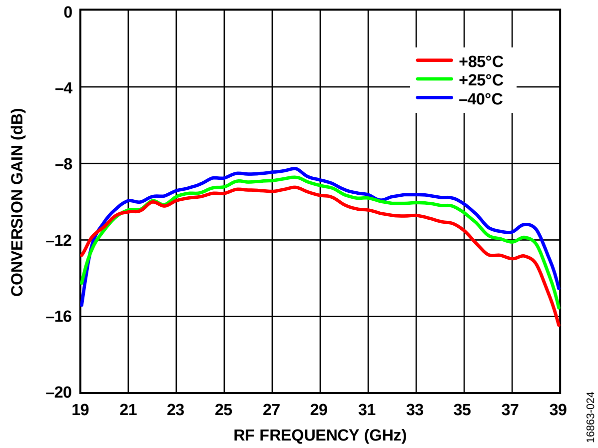

Figure 24. Conversion Gain vs. RF Frequency at Various Temperatures, LO = 13 dBm

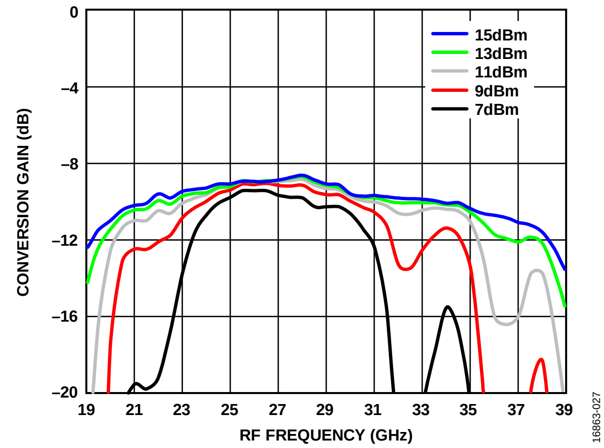

Figure 27. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

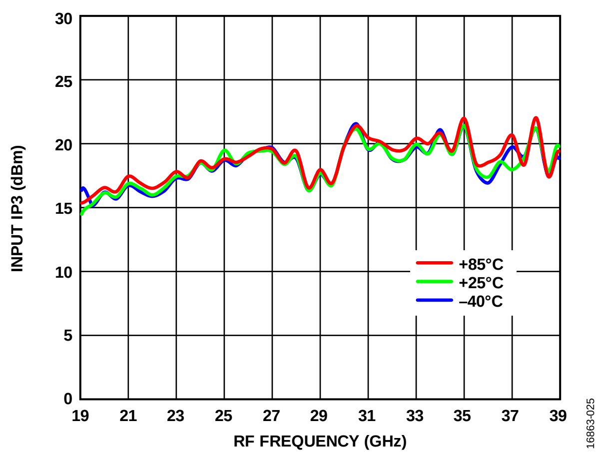

Figure 25. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

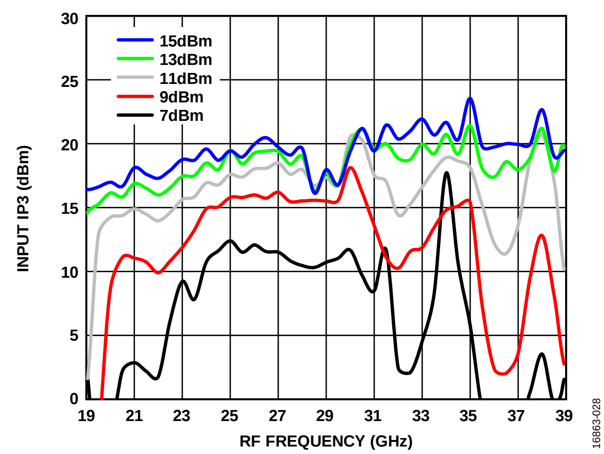

Figure 28. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

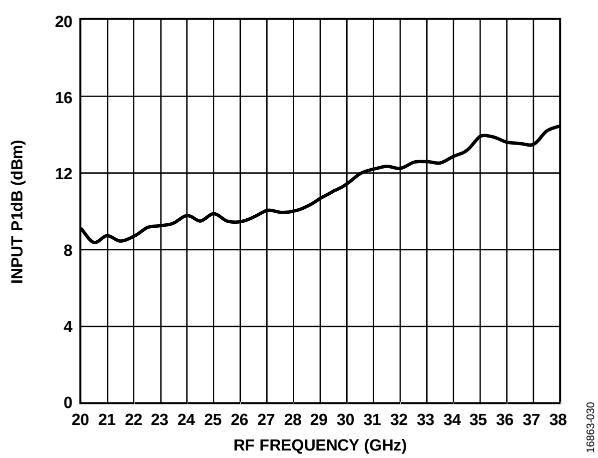

Figure 26. Input P1dB vs. RF Frequency, LO = 13 dBm

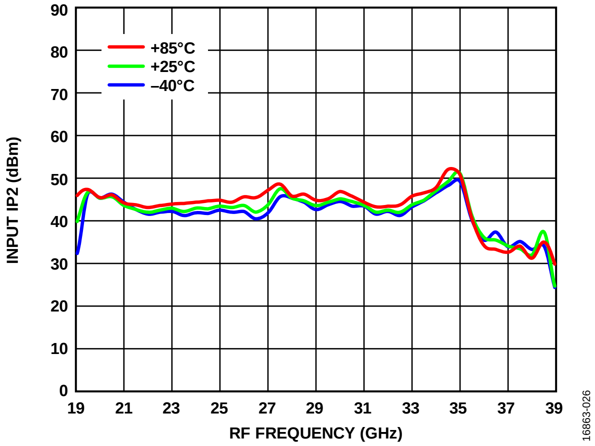

Figure 29. Input IP2 vs. RF Frequency at Various Temperatures, LO = 13 dBm

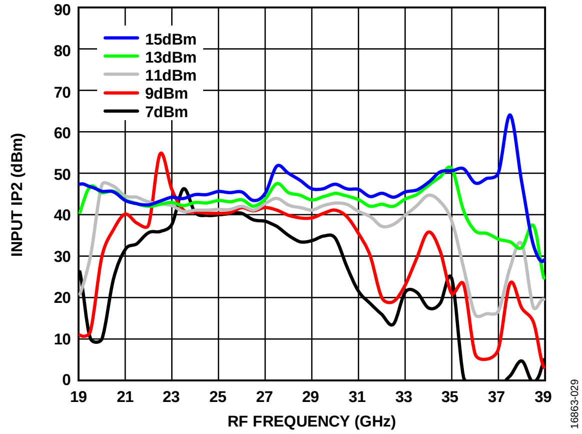

Figure 30. Input IP2 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

DOWNCONVERTER PERFORMANCE AT IF = 4 GHz, LOWER SIDEBAND

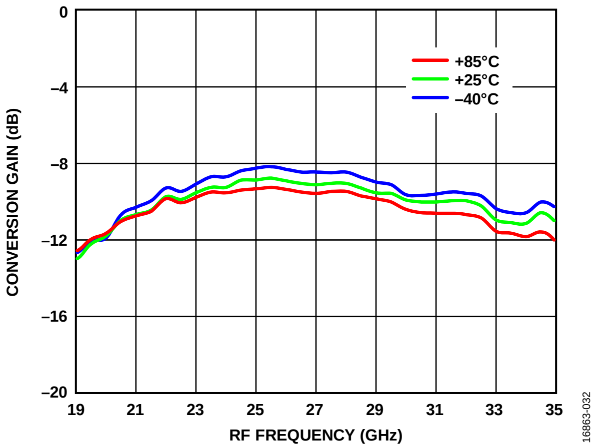

Figure 31. Conversion Gain vs. RF Frequency at Various Temperatures, LO = 13 dBm

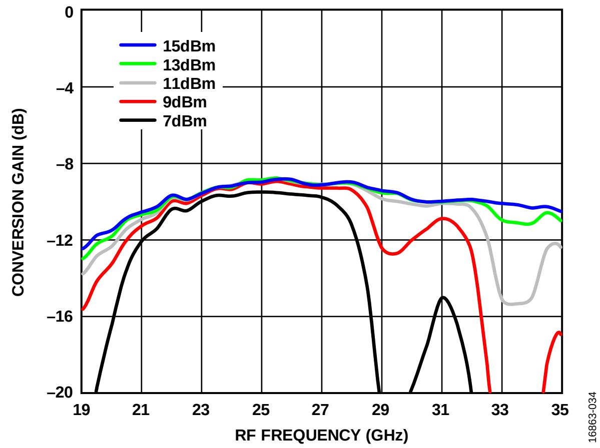

Figure 33. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

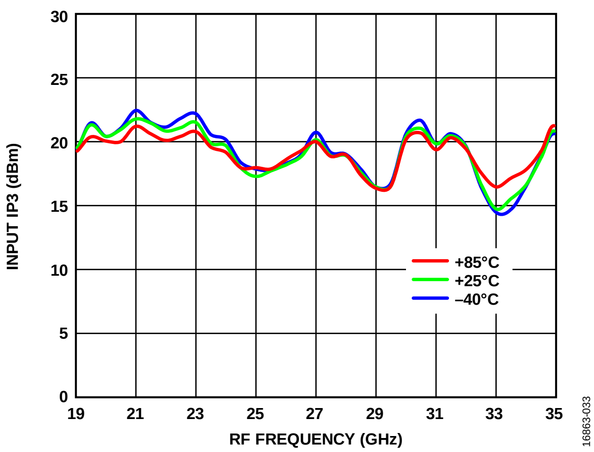

Figure 32. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

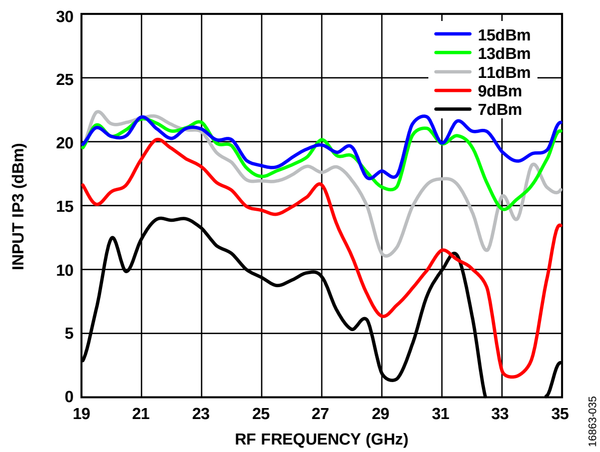

Figure 34. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

DOWNCONVERTER PERFORMANCE AT IF = 8 GHz, LOWER SIDEBAND

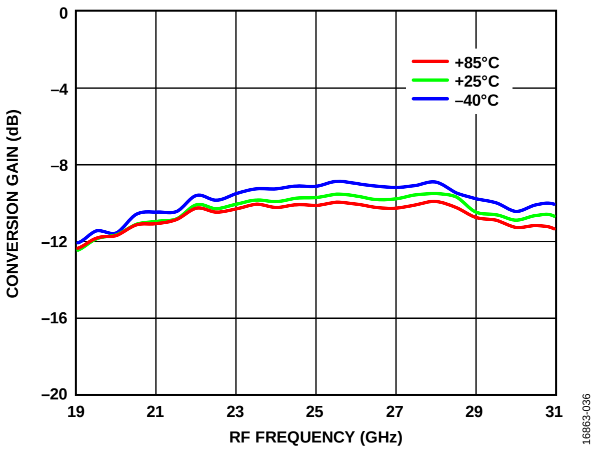

Figure 35. Conversion Gain vs. RF Frequency at Various Temperatures, LO = 13 dBm

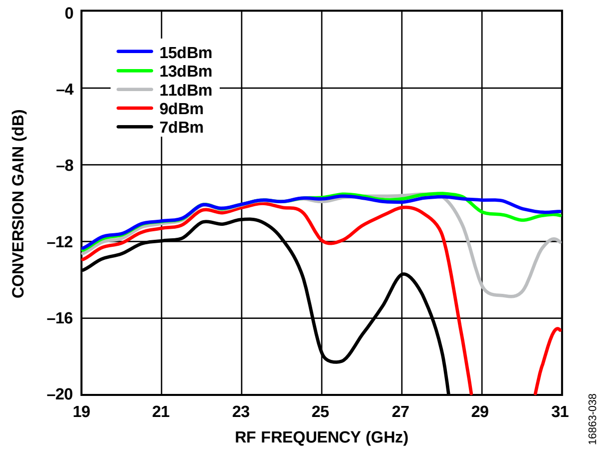

Figure 37. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

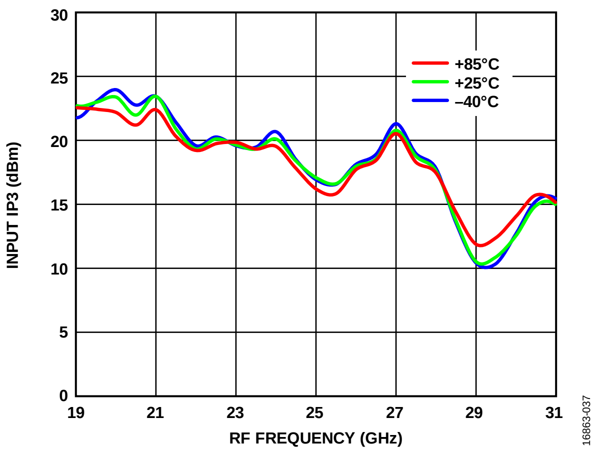

Figure 36. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

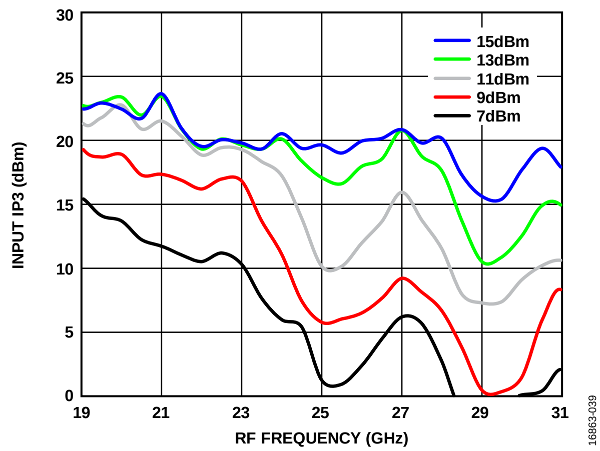

Figure 38. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

UPCONVERTER PERFORMANCE AT IF = 1 GHz, UPPER SIDEBAND

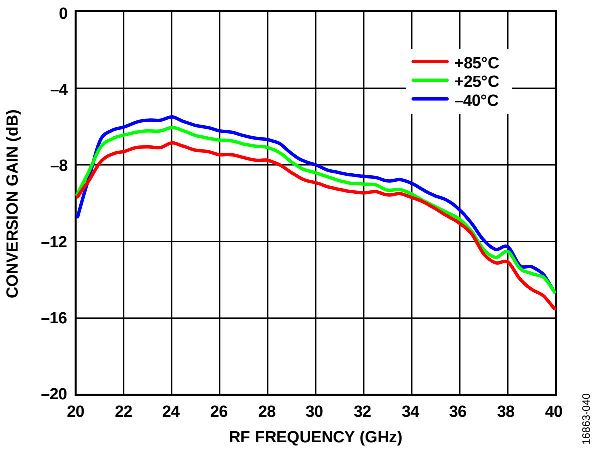

Figure 39. Conversion Gain vs. RF Frequency at Various Temperatures, LO = 13 dBm

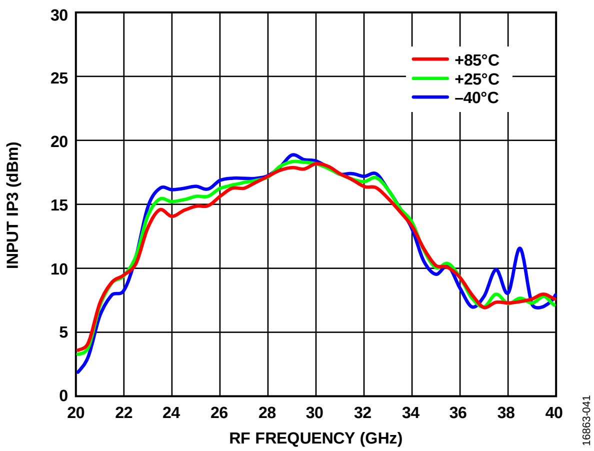

Figure 40. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

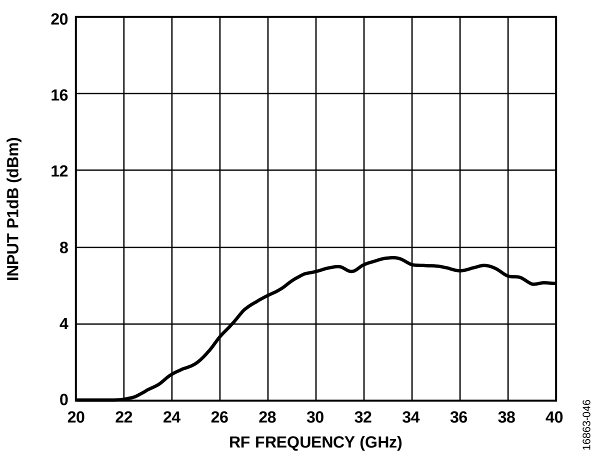

Figure 41. Input P1dB vs. RF Frequency, LO = 13 dBm

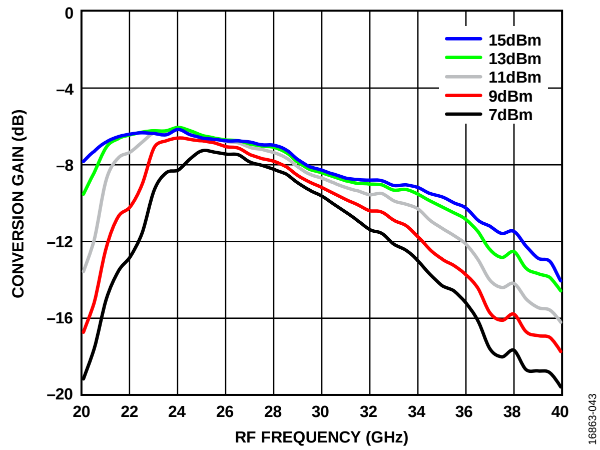

Figure 42. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

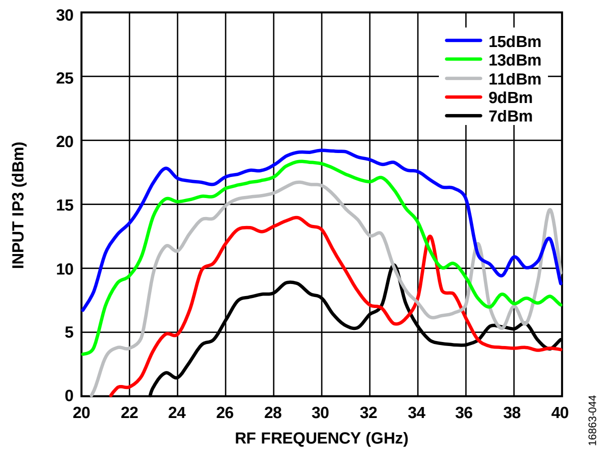

Figure 43. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

UPCONVERTER PERFORMANCE AT IF = 4 GHz, UPPER SIDEBAND

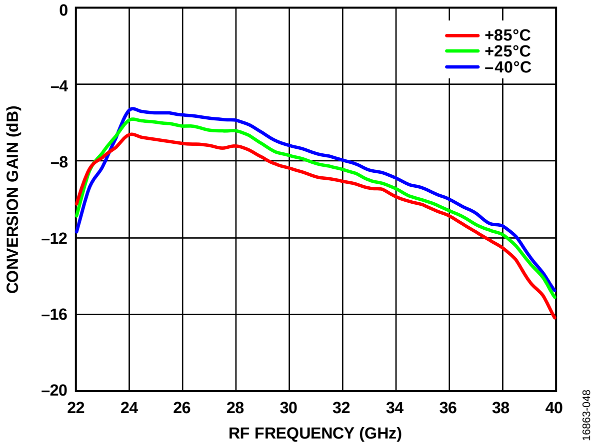

Figure 44. Conversion Gain vs. RF Frequency at Various Temperatures LO = 13 dBm

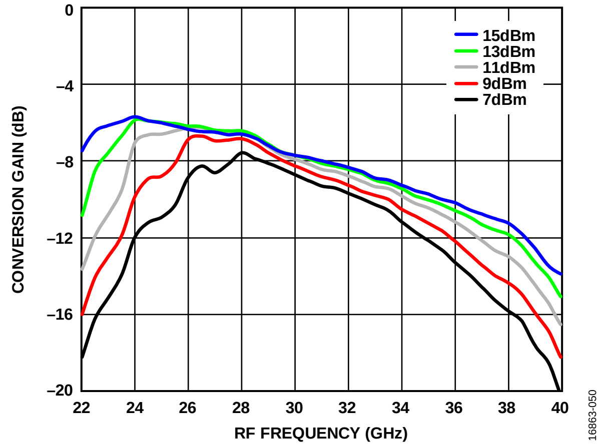

Figure 46. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

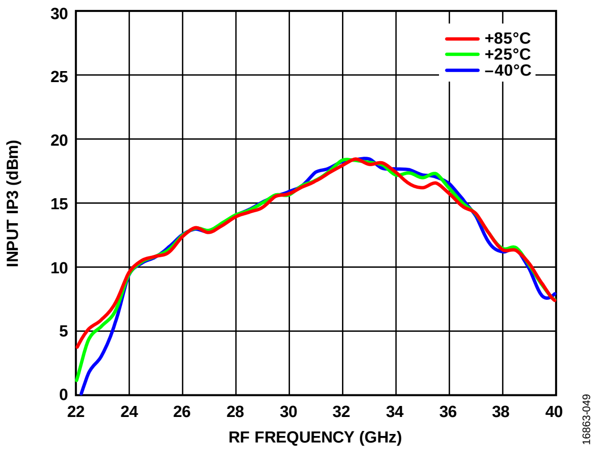

Figure 45. Input IP3 vs. RF Frequency at Various Temperatures LO = 13 dBm

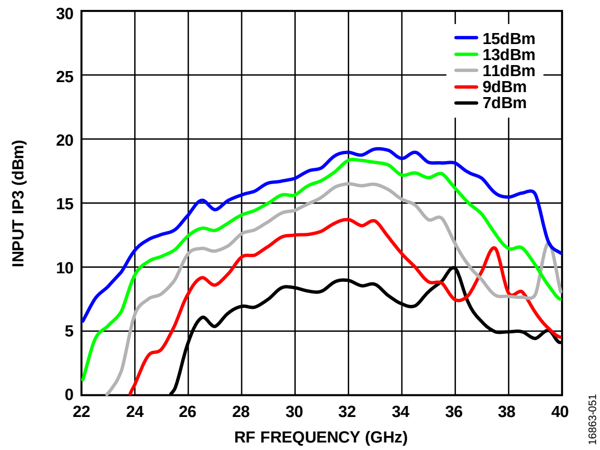

Figure 47. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

UPCONVERTER PERFORMANCE AT IF = 8 GHz, UPPER SIDEBAND

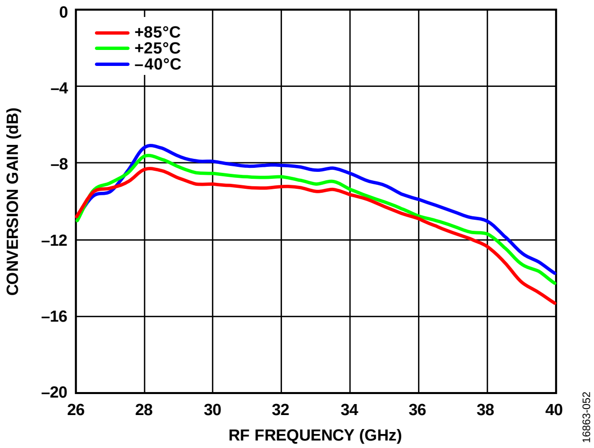

Figure 48. Conversion Gain vs. RF Frequency at Various Temperatures, LO = 13 dBm

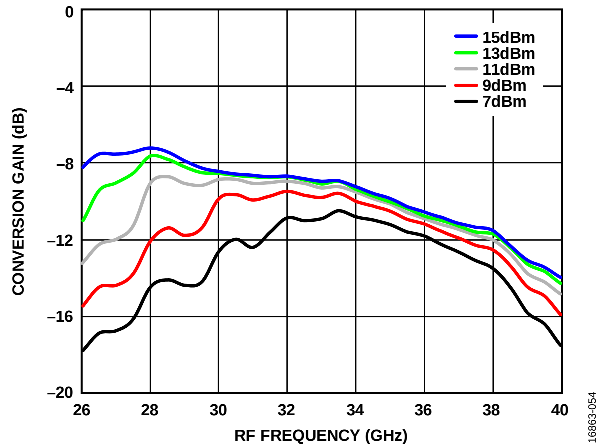

Figure 50. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

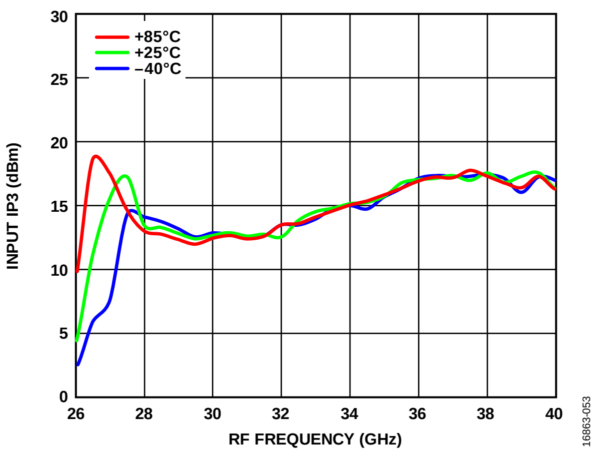

Figure 49. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

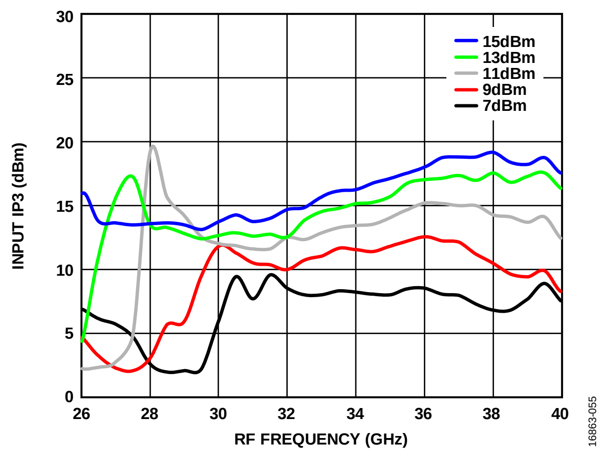

Figure 51. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

UPCONVERTER PERFORMANCE AT IF = 1 GHz, LOWER SIDEBAND

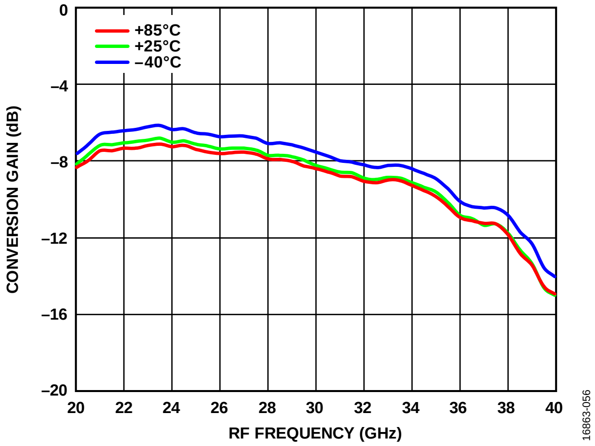

Figure 52. Conversion Gain vs. RF Frequency at Various Temperatures, LO = 13 dBm

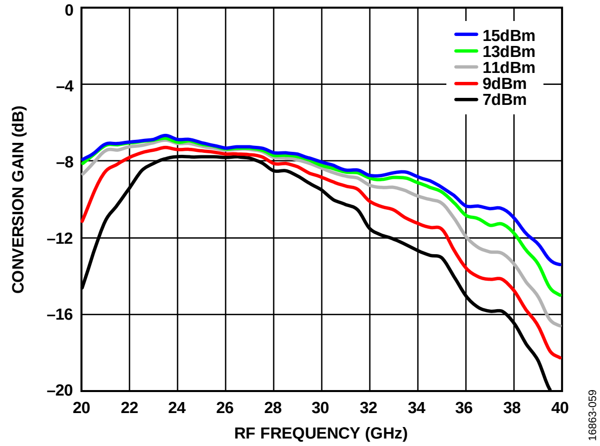

Figure 54. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

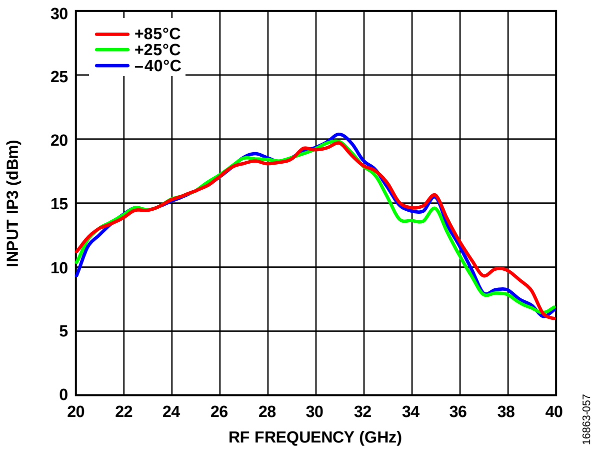

Figure 53. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

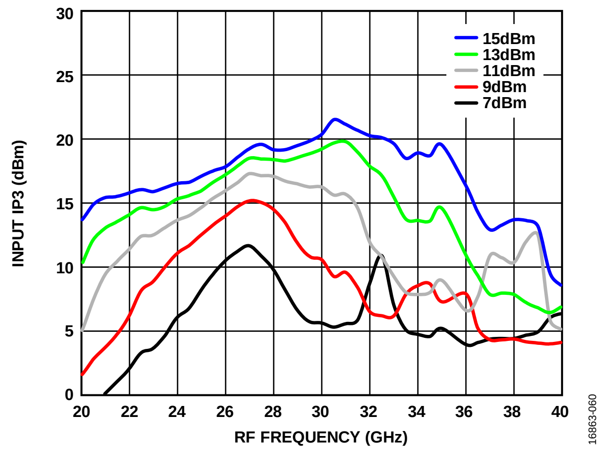

Figure 55. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

UPCONVERTER PERFORMANCE AT IF = 4 GHz, LOWER SIDEBAND

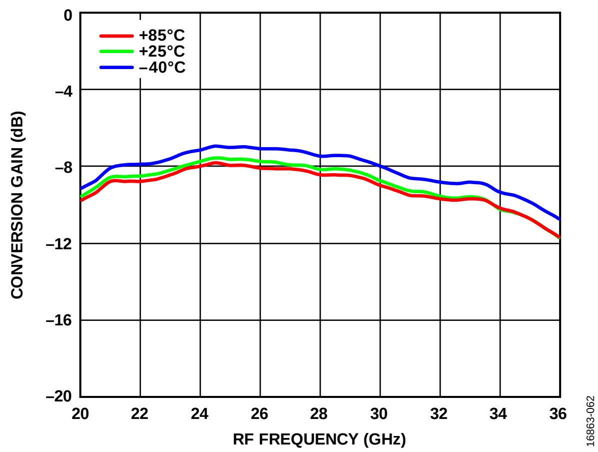

Figure 56. Conversion Gain vs. RF Frequency at Various Temperatures, LO = 13 dBm

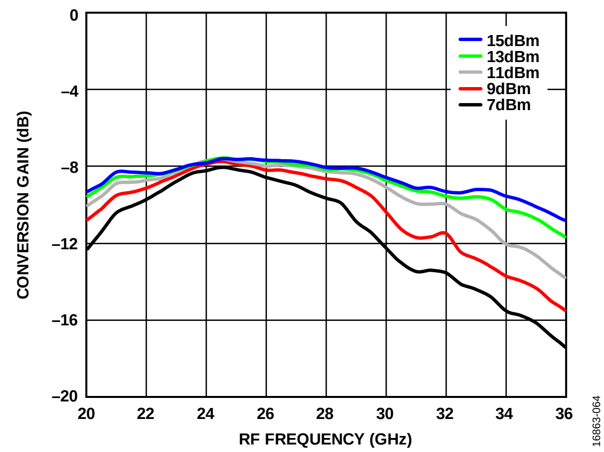

Figure 58. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

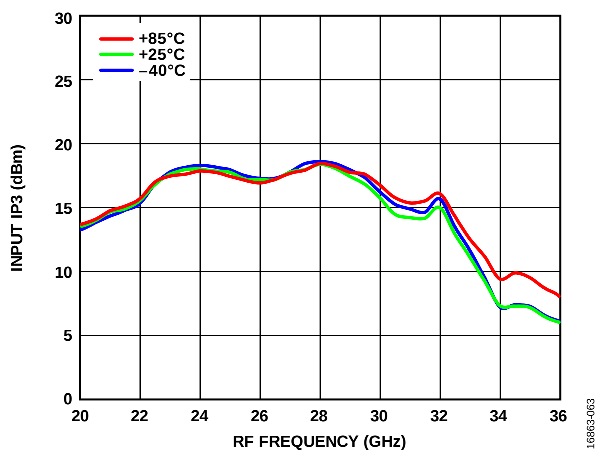

Figure 57. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

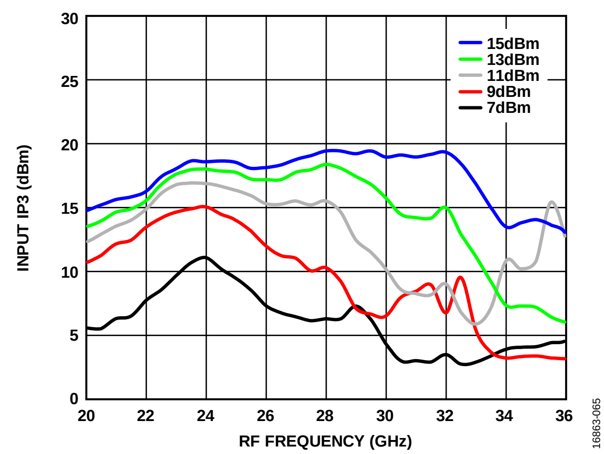

Figure 59. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

UPCONVERTER PERFORMANCE AT IF = 8 GHz, LOWER SIDEBAND

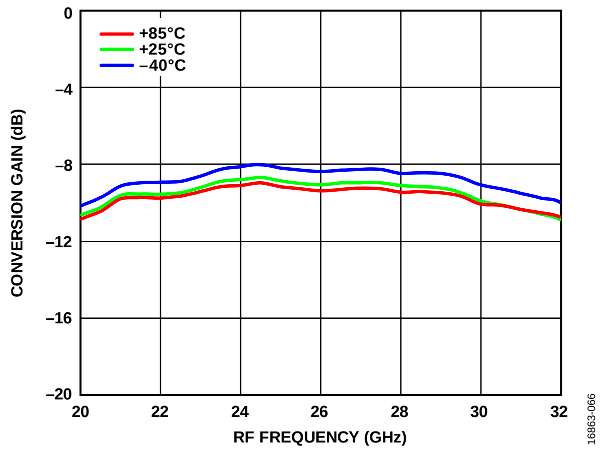

Figure 60. Conversion Gain vs. RF Frequency at Various Temperatures, LO = 13 dBm

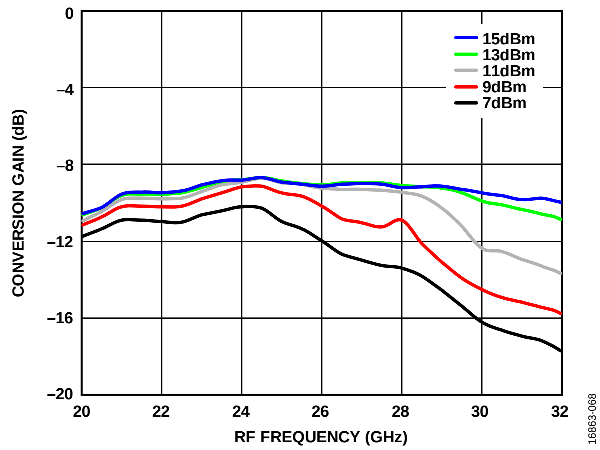

Figure 62. Conversion Gain vs. RF Frequency at Various LO Power Levels, T_A = 25°C

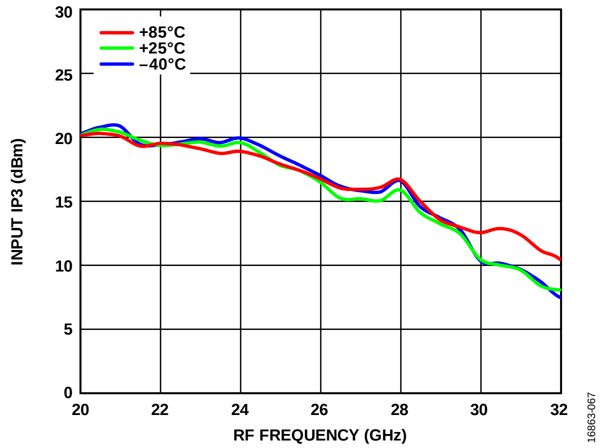

Figure 61. Input IP3 vs. RF Frequency at Various Temperatures, LO = 13 dBm

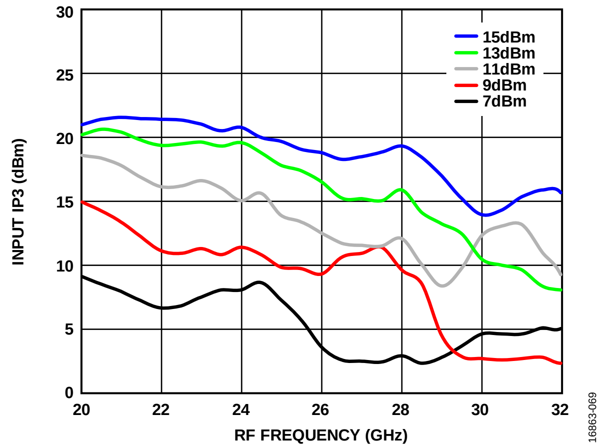

Figure 63. Input IP3 vs. RF Frequency at Various LO Power Levels, T_A = 25°C

ISOLATION AND RETURN LOSS

Downconverter performance at IF = 1 GHz, upper sideband (low-side LO).

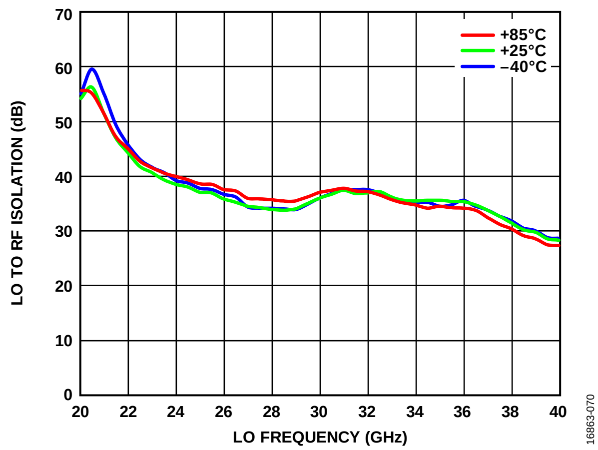

Figure 64. LO to RF Isolation vs. LO Frequency at Various Temperatures, LO = 13 dBm

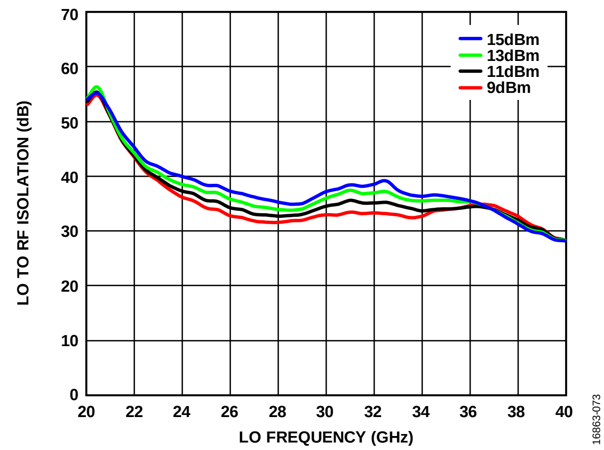

Figure 67. LO to RF Isolation vs. LO Frequency at Various LO Power Levels, T_A = 25°C

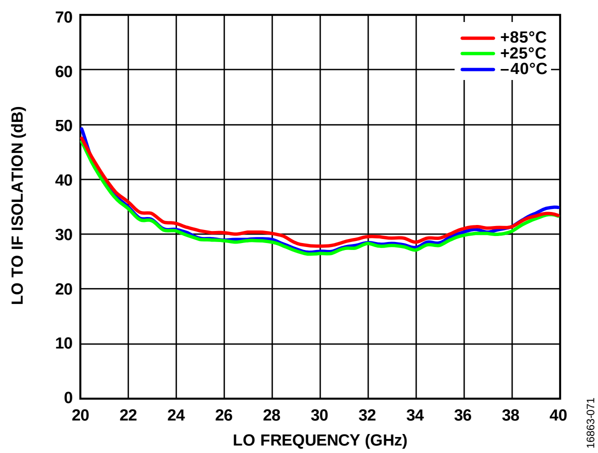

Figure 65. LO to IF Isolation vs. LO Frequency at Various Temperatures, LO = 13 dBm

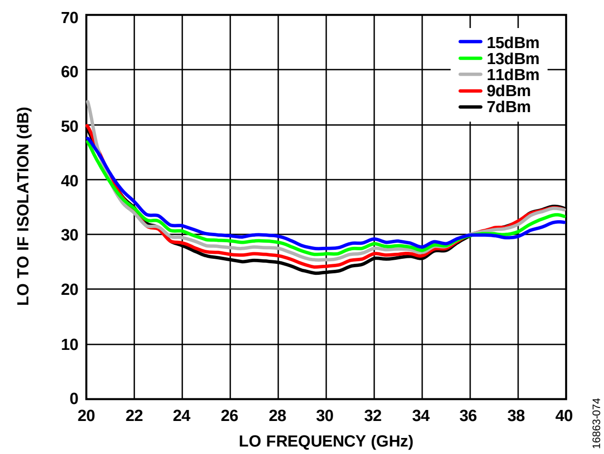

Figure 68. LO to IF Isolation vs. LO Frequency at Various LO Power Levels, T_A = 25°C

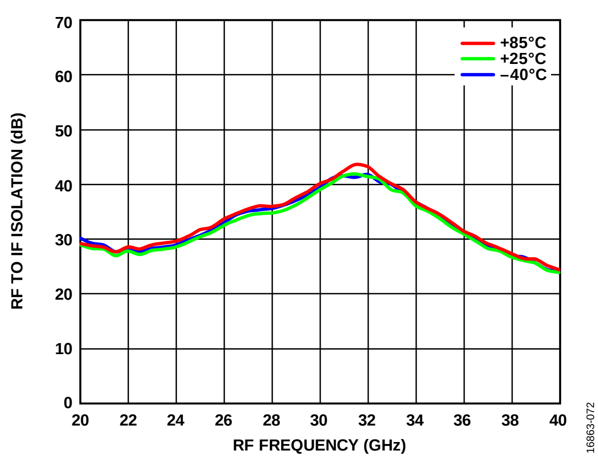

Figure 66. RF to IF Isolation vs. RF Frequency at Various Temperatures, LO = 13 dBm

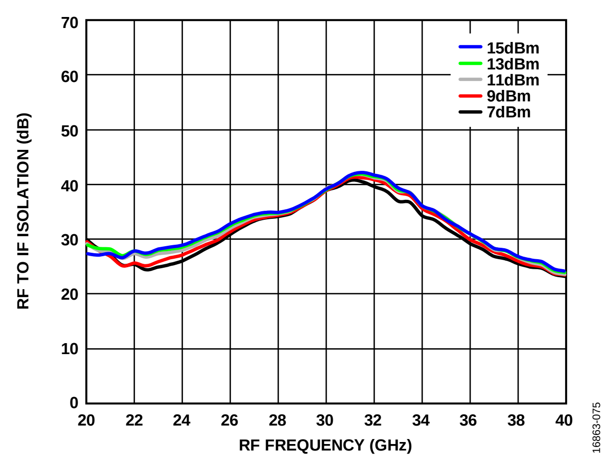

Figure 69. RF to IF Isolation vs. RF Frequency at Various LO Power Levels, T_A = 25°C

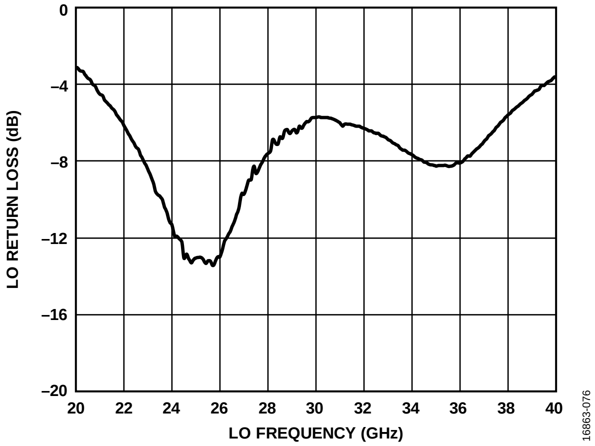

Figure 70. LO Return Loss vs. LO Frequency, LO = 13 dBm

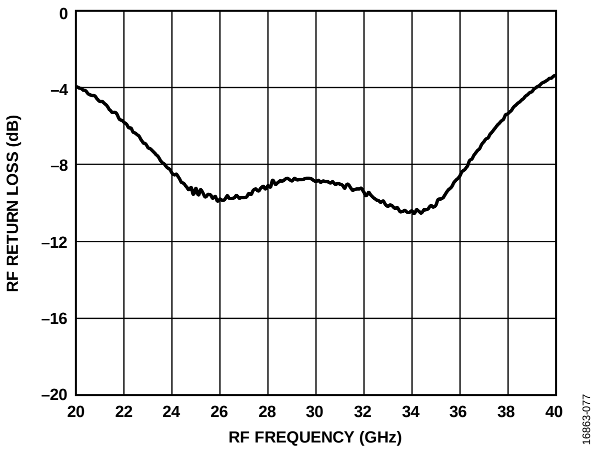

Figure 71. RF Return Loss vs. RF Frequency, LO = 26.5 GHz, 13 dBm

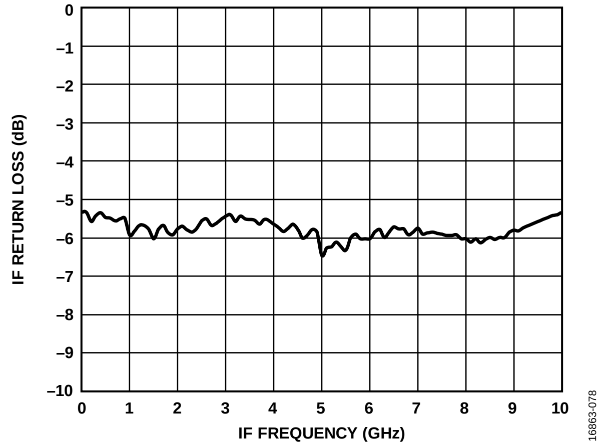

Figure 72. IF Return Loss vs. IF Frequency, LO = 26.5 GHz, 13 dBm

IF BANDWIDTH, DOWNCONVERTER

Upper sideband, LO frequency = 26.5 GHz.

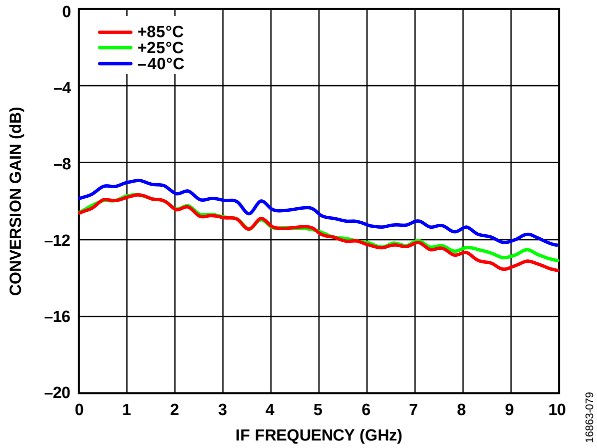

Figure 73. Conversion Gain vs. IF Frequency at Various Temperatures, LO = 13 dBm

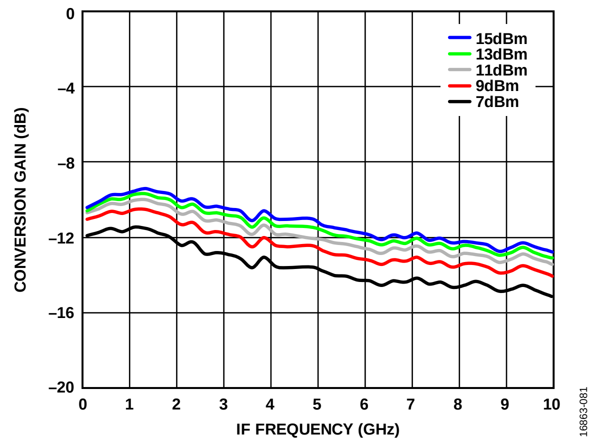

Figure 75. Conversion Gain vs. IF Frequency at Various LO Power Levels, T_A = 25°C

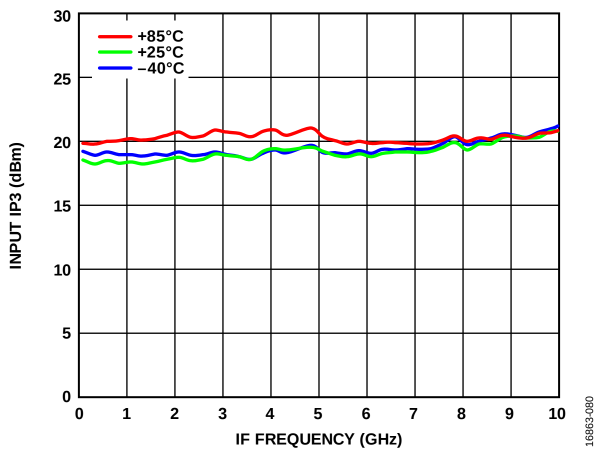

Figure 74. Input IP3 vs. IF Frequency at Various Temperatures, LO = 13 dBm

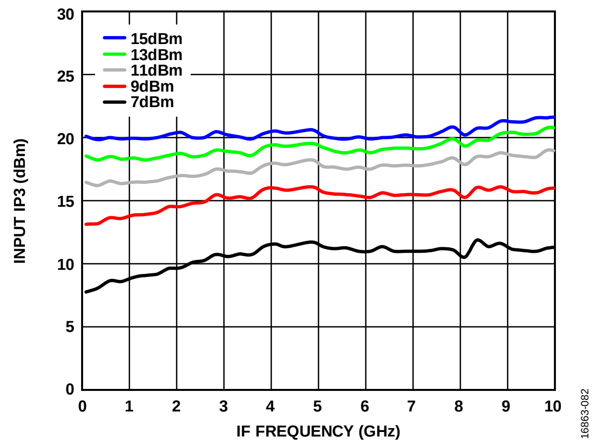

Figure 76. Input IP3 vs. IF Frequency at Various LO Power Levels, T_A = 25°C

SPURIOUS AND HARMONICS PERFORMANCE

Mixer spurious products are measured in dBc from the IF output power level. N/A means not applicable.

LO Harmonics

LO power = 13 dBm, T_A =25°C, and all valued are in dBc below the input LO level measured at the RF port.

Table 6. LO Harmonics

	N × LO Spur at the RF Port		
LO Frequency (GHz)	1	2	3
24	9	13	N/A
28	6	N/A	N/A
31	8	N/A	N/A

Downconverter, Upper Sideband, M × N Spurious Outputs

Mixer spurious products are measured in dBc from the IF output power level.

Spur values are (M × RF) − (N × LO).

IF = 1 GHz, RF = 32 GHz at −10 dBm, and LO = 31 GHz at +13 dBm.

		N × LO				
		0	1	2	3	4
M × RF	0	N/A	−5	N/A	N/A	N/A
	1	+32	0	+42	N/A	N/A
	2	N/A	+52	+59	+56	N/A
	3	N/A	N/A	+75	+81	+79
	4	N/A	N/A	N/A	+71	+85

IF = 4 GHz, RF = 32 GHz at −10 dBm, and LO = 28 GHz at +13 dBm.

		N × LO				
		0	1	2	3	4
M × RF	0	N/A	−5	N/A	N/A	N/A
	1	+32	0	+37	N/A	N/A
	2	N/A	+55	+60	+59	N/A
	3	N/A	N/A	+71	+77	+78
	4	N/A	N/A	N/A	+70	+79

IF = 8 GHz, RF = 32 GHz at −10 dBm, and LO = 24 GHz at +13 dBm.

		N × LO				
		0	1	2	3	4
M × RF	0	N/A	−3	+21	N/A	N/A
	1	+34	0	+33	+31	N/A
	2	N/A	+64	+33	N/A	N/A
	3	N/A	N/A	+21	N/A	N/A
	4	N/A	N/A	N/A	N/A	N/A

Downconverter, Lower Sideband, M × N Spurious Outputs

Spur values are (M × RF) − (N × LO).

IF = 1 GHz, RF = 35 GHz at −10 dBm, and LO = 36 GHz at +13 dBm.

		N × LO				
		0	1	2	3	4
M × RF	0	N/A	2	N/A	N/A	N/A
	1	37	0	74	N/A	N/A
	2	N/A	59	61	74	N/A
	3	N/A	N/A	81	70	68
	4	N/A	N/A	N/A	83	89

Upconverter, Upper Sideband, M × N Spurious Outputs

Mixer spurious products are measured in dBc from the RF output power level.

IF_{IN} = 1 GHz at −10 dBm, and LO = 31 GHz at 13 dBm.

		N × LO				
		0	1	2	3	4
M × IF_{IN}	−4	92	81	N/A	N/A	N/A
	−3	83	72	N/A	N/A	N/A
	−2	75	50	N/A	N/A	N/A
	−1	25	0	N/A	N/A	N/A
	0	N/A	7	N/A	N/A	N/A
	+1	24	0	N/A	N/A	N/A
	+2	74	46	N/A	N/A	N/A
	+3	84	62	N/A	N/A	N/A
	+4	91	72	N/A	N/A	N/A

Upconverter, Lower Sideband, M × N Spurious Outputs

IF_{IN} = 1 GHz at −10 dBm, and LO = 36 GHz at 13 dBm.

		N × LO				
		0	1	2	3	4
M × IF_{IN}	−4	92	76	N/A	N/A	N/A
	−3	88	60	N/A	N/A	N/A
	−2	75	44	N/A	N/A	N/A
	−1	23	0	N/A	N/A	N/A
	0	N/A	1	N/A	N/A	N/A
	+1	23	0	N/A	N/A	N/A
	+2	75	42	N/A	N/A	N/A
	+3	91	66	N/A	N/A	N/A
	+4	92	71	N/A	N/A	N/A

THEORY OF OPERATION

The HMC329A is a general-purpose, double balanced mixer that can be used as an upconverter or a downconverter from 22 GHz to 38 GHz.

When used as a downconverter, the HMC329A downconverts radio frequencies between 22 GHz and 38 GHz to IF values between dc and 8 GHz.

When used as an upconverter, the mixer upconverts IF values between dc and 8 GHz to radio frequencies between 22 GHz and 38 GHz.

The mixer performs well with LO drive levels of 13 dBm or greater and provides excellent LO to RF and LO to IF suppression due to optimized balun structures.

APPLICATIONS INFORMATION

TYPICAL APPLICATION CIRCUIT

Figure 77 shows the typical application circuit for the HMC329A. The HMC329A is a passive device and does not require any external components. The LO and RF pins are internally ac-coupled. When IF operation is not required until dc, it is recommended to use an ac-coupled capacitor at the IF port.

ASSEMBLY DIAGRAM

The assembly diagram is shown in Figure 78.

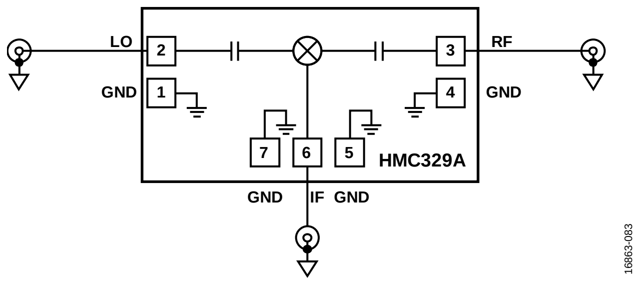

Figure 77.Typical Application Circuit

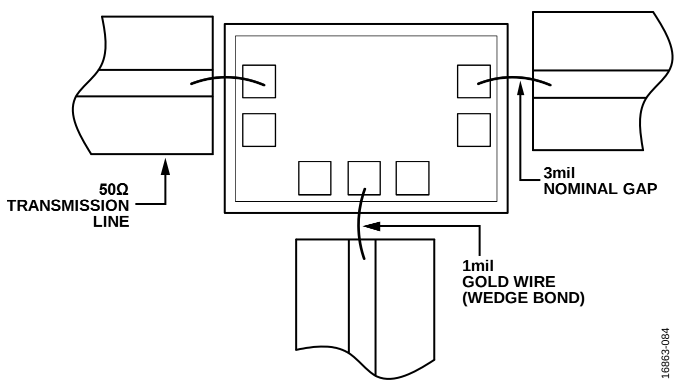

Figure 78. Assembly Diagram

MOUNTING AND BONDING TECHNIQUES FOR MILLIMETER WAVE GaAs MMICs

Attach the die directly to the ground plane eutectically or with conductive epoxy.

To bring RF to and from the chip, use 50 Ω microstrip transmission lines on 0.127 mm (0.005 inches) alumina thin film substrates (see Figure 79).

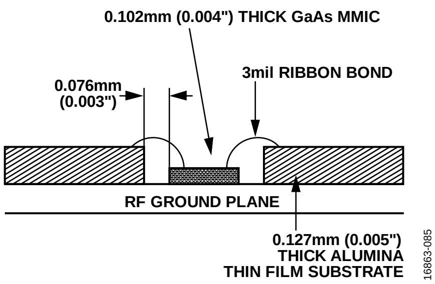

Figure 79. Routing RF Signals

If 0.254 mm (0.010 inches) alumina thin film substrates must be used, raise the die 0.152 mm (0.006 inches) so that the surface of the die is coplanar with the surface of the substrate.

One way to accomplish this coplanarity is to attach the 0.102 mm (0.004 inches) die to a 0.152 mm (0.006 inches) molybdenum heat spreader (moly tab), which is then attached to the ground plane (see Figure 80).

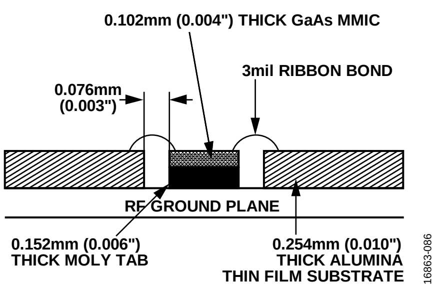

Figure 80. Routing RF Signals (Raised)

Bring the microstrip substrates as close to the die as possible to minimize ribbon bond length. Typical die to substrate spacing is 0.076 mm (0.003 inches). Gold ribbon of a 0.076 mm (0.003 inches) width and a <0.31 mm minimal length (<0.012 inches) is recommended to minimize inductance on the RF, LO, and IF ports.

HANDLING PRECAUTIONS

To avoid permanent damage, adhere to the following precautions.

Storage

All bare die ship in either waffle-based or gel-based ESD protective containers and are then sealed in an ESD protective bag. After opening the sealed ESD protective bag, all die must be stored in a dry nitrogen environment.

Cleanliness

Handle the chips in a clean environment. Never use liquid cleaning systems to clean the chip.

Static Sensitivity

Follow ESD precautions to protect against ESD strikes.

Transients

Suppress instrument and bias supply transients while bias is applied. To minimize inductive pickup, use shielded signal and bias cables.

General Handling

Handle the chip only on the edges, using a vacuum collet or with a sharp pair of bent tweezers. Because the surface of the chip has fragile air bridges, never touch the surface of the chip with a vacuum collet, tweezers, or fingers.

MOUNTING

The chip is back metallized and can be die mounted with gold/tin eutectic preforms or with electrically conductive epoxy. The mounting surface must be clean and flat.

Eutectic Die Attach

It is best to use an 80% gold/20% tin preform with a work surface temperature of 255°C and a tool temperature of 265°C. When hot 90% nitrogen/10% hydrogen gas is applied, maintain the tool tip temperature at 290°C. Do not expose the chip to a temperature greater than 320°C for more than 20 sec. No more than 3 sec of scrubbing is required for attachment.

Epoxy Die Attach

Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip after placing it into position. Cure the epoxy per the schedule provided by the manufacturer.

WIRE BONDING

RF bonds made with 0.003 inch × 0.005 inch gold ribbon are recommended for the RF ports. These bonds must be thermosonically bonded with a force of 40 g to 60 g. DC bonds of a 0.025 mm (0.001 inches) diameter, thermosonically bonded, are recommended. Create ball bonds with a force of 40 g to 50 g and wedge bonds with a force of 18 g to 22 g. Create all bonds with a nominal stage temperature of 150°C. Apply a minimum amount of ultrasonic energy to achieve reliable bonds. Keep all bonds as short as possible, less than 0.31 mm (0.012 inches).

OUTLINE DIMENSIONS

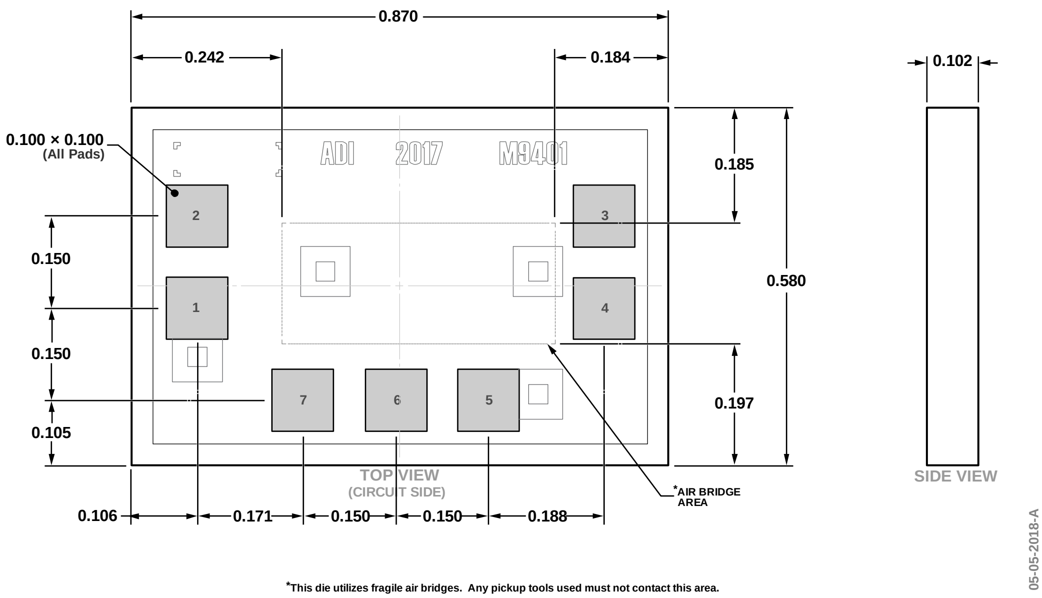

Figure 81. 7-Pad Bare Die [CHIP]
(C-7-5)
Dimensions shown in millimeter

ORDERING GUIDE

Model[1]	Temperature Range	Package Description	Package Option
HMC329A	−55°C to +85°C	7-Pad Bare Die [CHIP]	C-7-5
HMC329A-SX	−55°C to +85°C	7-Pad Bare Die [CHIP]	C-7-5

[1] The HMC329A and HMC329A-SX are RoHS compliant parts.