MMIC SURFACE MOUNT WIDEBAND

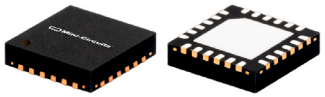
Double Balanced Mixer

MDB-73H+

Level 15 (LO Power 15dBm) 2200-7000 MHz

THE BIG DEAL

- Wide bandwidth 2200 to 7000 MHz
- High L-I Isolation, 46 dB typ. at 4 GHz
- Useable as Up & Down Converter
- Small Size 4 mm x 4mm x 1mm
- Aqueous washable
- Footprint Compatible with Hittite HMC129LC4[a,b]



CASE STYLE: DG1847

Generic photo used for illustration purposes only

+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

APPLICATIONS

- Satellite up and down converters
- Defense radar & communication
- VSAT

PRODUCT OVERVIEW

MDB-73H+ is an advanced wideband frequency mixer fabricated using InGap HBT technology with inte-grated LO and RF Baluns. It has repeatable performance making it suitable for volume production. It is packaged in tiny 4 mm x 4mm x 1mm MCLP™ Package having Tin Silver Nickel finish passing tin whisker test.

KEY FEATURES

Feature	Advantages
Double Balanced	Results in excellent LO-RF (34-39 dB typical) & LO-IF (33-55 dB typical) Isolations mini-mizing need for external filtering
Wide Bandwidth, 2.2 to 7 GHz	Useful in wideband systems or in in several narrowband systems. Reducing inventory
Wide IF Bandwidth DC-1600 MHz	Usable in first (high IF~860 MHz)) and second down (low IF~70 MHz) converter applica-tions. IF as low as DC enables use in phase detector applications.
Low Thermal Resistance Tj=88°C typical at 85°C ground lead temperature & LO=+15 dBm	Extremely High Reliability improving overall system reliability
4 mm x 4 mm, 24 lead MCLP Package	Low Inductance, repeatable transitions, excellent thermal contact to PCB

Notes:
a. Suitability for model replacement within a particular system must be determined by and is solely the responsibility of the customer based on, among other things, electrical performance criteria, stimulus conditions, application, compatibility with other components and environmental conditions and stresses.
b. The Hittite HMC129LC4 part number is used for identification and comparison purposes only.

REV. C
ECO-009182
MDB-73H+
MCL NY
210820

Double Balanced Mixer MDB-73H+

ELECTRICAL SPECIFICATIONS[1] AT 25°C, UNLESS NOTED

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
RF Frequency Range	-	2.2	-	7.0	GHz
LO Frequency Range	-	2.2	-	7.0	GHz
IF Frequency Range	-	DC	-	1.6	GHz
LO Power	-		+15		dBm
Conversion Loss (at IF=0.03 GHz)	2.2	-	8.8	-	dB
	3.0	-	7.4	-	
	4.0	-	8.2	-	
	5.0	-	8.7	-	
	6.0	-	9.3	-	
	7.0	-	8.9	9.8	
LO-RF Isolation	2.2	-	38	-	dB
	3.0	-	35	-	
	4.0	34	39	-	
	5.0	-	39	-	
	6.0	-	35	-	
	7.0	-	34		
LO-IF Isolation	2.2	-	36	-	dB
	3.0	-	42	-	
	4.0	35	46	-	
	5.0	-	55	-	
	6.0	-	46	-	
	7.0	-	33		
RF-IF Isolation	2.2	-	8	-	dB
	3.0	-	13	-	
	4.0	-	17	-	
	5.0	-	15	-	
	6.0	-	13	-	
	7.0	-	12	-	
Input at 1dB Compression	2.2-7.0	-	10	-	dBm
Noise Figure	2.2	-	8.9	-	dB
	4.0	-	9.0	-	
Thermal Resistance (junction-to-ground lead)			105		°C/W

Measured on Mini-Circuits Characterization test board TB-746+. See Characterization Test Circuit Figure 1

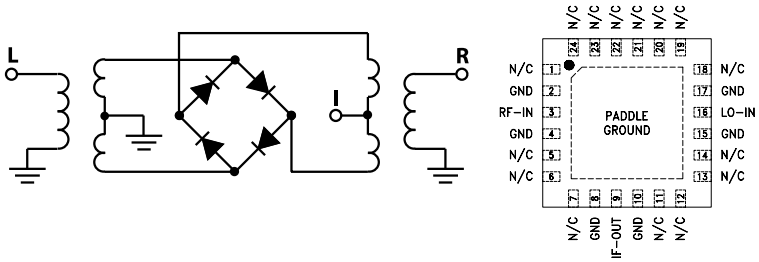
MAXIMUM RATINGS[2]

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-65°C to 150°C
RF Power	21 dBm
LO Power	21 dBm
IF Current	30 mA

2. Permanent damage may occur if any of these limits are exceeded.
Electrical maximum ratings are not intended for continuous normal operation.

Double Balanced Mixer MDB-73H+

SIMPLIFIED SCHEMATIC AND BONDING PAD DESCRIPTION



PAD CONNECTIONS

Function	Pad Number	Description
RF-IN	3	RF input
LO-IN	16	LO input
IF-OUT	9	IF input
GND	2,4,8,10,15,17, Paddle	Connect to Ground
NC	1, 5-7, 11-14, 18-24	No connection, not used

CHARACTERIZATION TEST CIRCUITS

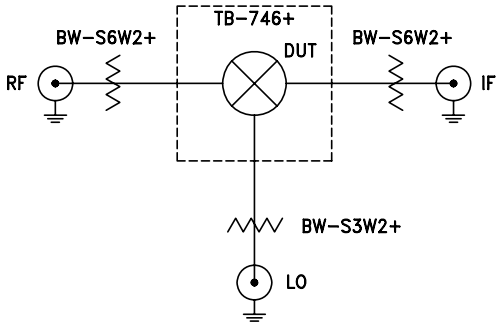


Figure 1A.
Block Diagram of Test Circuit used for characterization of Conversion Loss, Isolations (LO-RF, LO-IF, RF-IF) and Return Loss (LO, RF, IF)

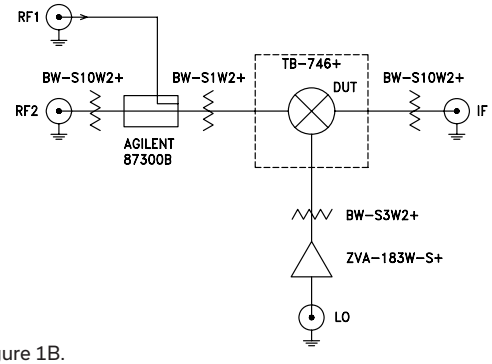


Figure 1B.
Block Diagram of Test Circuit used for characterization of Input IP3

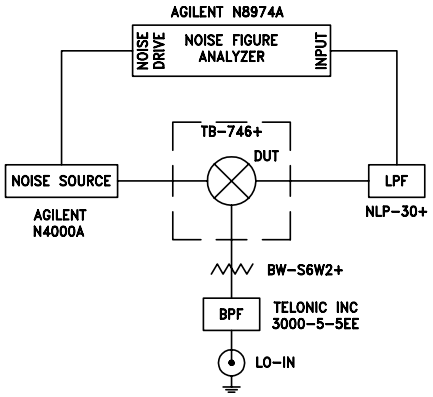
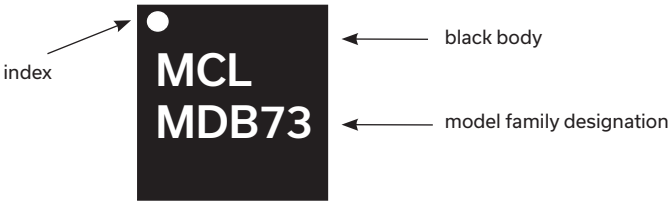


Figure 1C.
Block Diagram of Test Circuit used for characterization of Noise Figure.

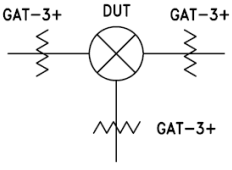
Figure 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-746+). Conversion Loss, Isolations; L-R, L-I & R-I are measured using R&S ZVA 24 microwave network analyzer. Input IP3 is measured Agilent MXA N9020A spectrum Analyzer and PSG E8257D Signal Generators.
NF is measured using Agilent's N8975A NF Analyzer

Conditions (Down Converter):
1. Conversion Loss, Isolations (L-R, L-I & R-I): RF= 0 dBm, LO=+15 dBm, IF=30 MHz
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.
3. Noise Figure: LO=+15 dBm

PRODUCT MARKING



APPLICATION CIRCUIT



ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS CLICK HERE

Performance Data	Data Table Swept Graphs S-Parameter (S1P Files) Data Set (.zip file)
Case Style	DG1847 Plastic package, exposed paddle, lead finish: tin/silver/nickel
Tape & Reel **Standard quantities available on reel**	F68 7" reels with 20, 50, 100, 200, 500 or 1K devices 13" Reels with 2K, 3K, 4K devices
Suggested Layout for PCB Design	PL-413
Evaluation Board	TB-746+
Environmental Ratings	ENV08T1

ESD RATING

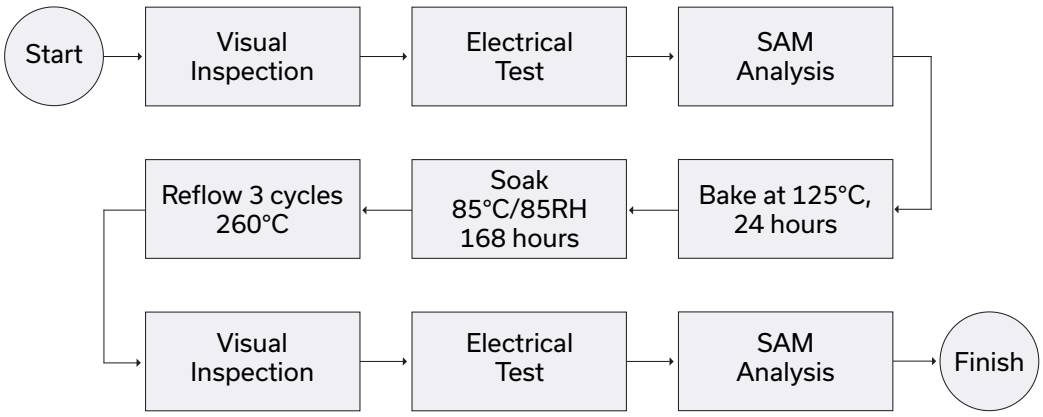
Human Body Model (HBM): Class 1B (500 to <1000V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M3 (200 to <400V) in accordance with ANSI/ESD STM5.2-1999

MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

MSL TEST FLOW CHART



NOTES

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard. Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

Frequency Mixer MDB-73H+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB)		
		@LO (dBm)		
		+12	+15	+18
1000.1	1030.1	14.3	13.8	13.6
1180.1	1210.1	14.0	13.6	13.3
1380.1	1410.1	15.7	14.6	13.6
1580.1	1610.1	14.9	13.0	11.8
1780.1	1810.1	12.6	11.2	10.6
1980.1	2010.1	11.3	10.3	9.9
2180.1	2210.1	9.8	8.9	8.7
2380.1	2410.1	8.7	8.2	8.1
2600.1	2630.1	8.0	7.7	7.6
2760.1	2790.1	7.7	7.4	7.3
2960.1	2990.1	7.6	7.3	7.2
3160.1	3190.1	7.6	7.2	7.3
3360.1	3390.1	7.6	7.2	7.1
3560.1	3590.1	7.9	7.3	7.2
3820.1	3850.1	8.0	7.5	7.5
3960.1	3990.1	8.7	7.7	7.6
4160.1	4190.1	9.3	8.0	7.9
4360.1	4390.1	9.5	8.3	8.2
4540.1	4570.1	9.5	8.3	8.2
4740.1	4770.1	9.5	8.4	8.3
4940.1	4970.1	9.8	8.7	8.5
5140.1	5170.1	9.8	8.8	8.6
5340.1	5370.1	10.1	8.9	8.7
5540.1	5570.1	10.2	9.1	8.9
5740.1	5770.1	10.6	9.4	9.0
5940.1	5970.1	10.3	9.3	9.0
6120.1	6150.1	10.0	9.2	9.0
6320.1	6350.1	9.2	8.6	8.6
6520.1	6550.1	9.1	8.6	8.6
6720.1	6750.1	9.1	8.7	8.7
6920.1	6950.1	9.2	8.7	8.7
7120.1	7150.1	9.5	9.0	9.0
7320.1	7350.1	10.4	9.9	9.8
7520.1	7550.1	11.3	10.5	10.2
7720.1	7750.1	12.0	10.9	10.4
7900.1	7930.1	12.5	11.1	10.4
8100.1	8130.1	12.7	11.1	10.3
8300.1	8330.1	14.0	11.5	10.6
8500.1	8530.1	16.1	12.0	10.8
8700.1	8730.1	17.7	12.7	11.0
8900.1	8930.1	17.9	12.7	11.0
9100.1	9130.1	17.7	12.6	11.0
9300.1	9330.1	16.2	12.1	10.8
9500.1	9530.1	15.0	11.8	10.7

RF (IN) (MHz)	LO (MHz)	IP-3 INPUT (dBm)		
		@LO (dBm)		
		+12	+15	+18
1000.1	1030.1	23.1	19.7	20.9
1180.1	1210.1	18.0	17.6	19.1
1380.1	1410.1	12.7	15.0	18.3
1580.1	1610.1	14.0	18.7	23.5
1780.1	1810.1	17.5	21.3	23.7
1980.1	2010.1	16.1	17.9	19.1
2180.1	2210.1	15.5	18.2	19.7
2380.1	2410.1	15.7	17.2	18.3
2600.1	2630.1	15.2	16.9	18.0
2760.1	2790.1	14.1	16.8	18.2
2960.1	2990.1	13.6	15.5	17.5
3160.1	3190.1	13.9	15.2	16.8
3360.1	3390.1	15.5	16.5	17.3
3560.1	3590.1	17.2	19.1	21.6
3760.1	3790.1	20.1	21.9	24.4
3960.1	3990.1	25.8	24.4	24.3
4160.1	4190.1	21.1	22.6	21.9
4360.1	4390.1	20.0	20.7	20.7
4540.1	4570.1	21.5	21.3	21.6
4740.1	4770.1	26.6	22.1	22.2
4940.1	4970.1	24.1	26.0	24.1
5140.1	5170.1	20.3	23.9	23.4
5340.1	5370.1	19.5	24.5	21.9
5540.1	5570.1	20.1	28.4	23.1
5740.1	5770.1	21.2	31.8	26.2
5940.1	5970.1	24.0	23.6	22.6
6120.1	6150.1	23.0	23.4	23.1
6320.1	6350.1	19.5	23.4	24.1
6520.1	6550.1	19.4	23.6	25.1
6720.1	6750.1	18.7	23.0	26.2
6920.1	6950.1	19.5	22.5	24.8
7120.1	7150.1	19.7	23.0	25.2
7320.1	7350.1	19.0	21.5	24.5
7520.1	7550.1	19.4	21.9	24.0
7720.1	7750.1	21.0	22.3	22.7
7900.1	7930.1	21.5	21.2	20.7
8100.1	8130.1	21.0	21.1	19.7
8300.1	8330.1	17.4	19.5	20.8
8500.1	8530.1	19.5	16.5	18.7
8700.1	8730.1	18.0	15.8	19.9
8900.1	8930.1	13.6	16.7	21.0
9100.1	9130.1	13.9	19.2	22.6
9300.1	9330.1	13.4	19.7	22.0
9500.1	9530.1	17.0	21.1	20.6

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+10dBm (dB)		
		@LO (dBm)		
		+12	+15	+18
1000.1	1030.1	0.2	-0.1	0.0
1180.1	1210.1	-0.2	-0.2	-0.1
1380.1	1410.1	-1.1	-0.7	-0.3
1580.1	1610.1	-1.7	-0.6	-0.2
1780.1	1810.1	-0.7	-0.2	-0.1
1980.1	2010.1	0.0	0.1	0.1
2180.1	2210.1	1.1	0.8	0.5
2380.1	2410.1	1.6	1.0	0.6
2600.1	2630.1	1.8	1.3	0.8
2760.1	2790.1	1.9	1.4	0.9
2960.1	2990.1	1.7	1.3	0.9
3160.1	3190.1	1.4	1.0	0.7
3360.1	3390.1	1.0	0.7	0.5
3560.1	3590.1	0.8	0.5	0.4
3800.1	3830.1	0.8	0.4	0.3
3960.1	3990.1	0.6	0.4	0.3
4160.1	4190.1	0.3	0.3	0.2
4360.1	4390.1	0.3	0.3	0.2
4540.1	4570.1	0.5	0.4	0.3
4740.1	4770.1	0.4	0.4	0.3
4940.1	4970.1	0.5	0.3	0.3
5140.1	5170.1	0.4	0.3	0.2
5340.1	5370.1	0.4	0.3	0.2
5540.1	5570.1	0.2	0.3	0.2
5740.1	5770.1	0.0	0.2	0.2
5940.1	5970.1	0.2	0.3	0.3
6120.1	6150.1	0.6	0.4	0.4
6320.1	6350.1	1.0	0.5	0.4
6520.1	6550.1	1.2	0.5	0.4
6720.1	6750.1	1.2	0.5	0.3
6920.1	6950.1	1.2	0.5	0.3
7120.1	7150.1	1.1	0.5	0.3
7320.1	7350.1	1.1	0.6	0.4
7520.1	7550.1	0.9	0.6	0.5
7720.1	7750.1	0.7	0.5	0.5
7900.1	7930.1	0.9	0.7	0.7
8100.1	8130.1	1.0	0.8	0.8
8300.1	8330.1	1.2	1.1	0.9
8500.1	8530.1	0.3	1.5	0.9
8700.1	8730.1	-0.9	1.4	0.9
8900.1	8930.1	-1.3	1.3	0.9
9100.1	9130.1	-1.4	1.1	0.9
9300.1	9330.1	-0.6	1.0	1.0
9500.1	9530.1	-0.2	1.0	0.9

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=3200.1MHz (dB) @LO (dBm) +15
1850.0	1350.1	10.59
1770.0	1430.1	10.09
1680.0	1520.1	9.50
1600.0	1600.1	8.81
1510.0	1690.1	8.40
1430.0	1770.1	8.14
1340.0	1860.1	7.93
1260.0	1940.1	7.73
1170.0	2030.1	7.52
1080.0	2120.1	7.26
1000.0	2200.1	7.15
910.0	2290.1	7.11
830.0	2370.1	7.12
740.0	2460.1	7.14
660.0	2540.1	7.13
570.0	2630.1	7.18
490.0	2710.1	7.22
400.0	2800.1	7.27
310.0	2890.1	7.21
230.0	2970.1	7.26
140.0	3060.1	7.21
60.0	3140.1	7.24
10.0	3210.1	7.65
50.0	3250.1	7.15
100.0	3300.1	7.17
140.0	3340.1	7.21
190.0	3390.1	7.15
240.0	3440.1	7.15
280.0	3480.1	7.08
330.0	3530.1	7.01
380.0	3580.1	7.00
420.0	3620.1	7.02
470.0	3670.1	7.04
520.0	3720.1	7.10
560.0	3760.1	7.07
610.0	3810.1	7.11
660.0	3860.1	7.20
700.0	3900.1	7.28
750.0	3950.1	7.37
800.0	4000.1	7.47
840.0	4040.1	7.44
890.0	4090.1	7.51
940.0	4140.1	7.53
980.0	4180.1	7.56

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=2600.1MHz (dB) @LO (dBm) +15
10.0	2610.1	8.07
40.0	2640.1	7.62
80.0	2680.1	7.64
120.0	2720.1	7.71
150.0	2750.1	7.75
190.0	2790.1	7.72
230.0	2830.1	7.76
260.0	2860.1	7.80
300.0	2900.1	7.84
340.0	2940.1	7.86
370.0	2970.1	7.92
410.0	3010.1	8.05
450.0	3050.1	8.04
480.0	3080.1	8.07
520.0	3120.1	8.16
560.0	3160.1	8.17
590.0	3190.1	8.17
630.0	3230.1	8.15
670.0	3270.1	8.12
700.0	3300.1	8.11
740.0	3340.1	8.12
780.0	3380.1	8.08
810.0	3410.1	8.11
850.0	3450.1	8.07
890.0	3490.1	8.17
920.0	3520.1	8.17
960.0	3560.1	8.20
1000.0	3600.1	8.20
1030.0	3630.1	8.21
1070.0	3670.1	8.23
1110.0	3710.1	8.28
1140.0	3740.1	8.32
1180.0	3780.1	8.34
1220.0	3820.1	8.38
1250.0	3850.1	8.42
1290.0	3890.1	8.41
1330.0	3930.1	8.56
1360.0	3960.1	8.58
1400.0	4000.1	8.78
1440.0	4040.1	8.82
1470.0	4070.1	8.95
1510.0	4110.1	8.96
1550.0	4150.1	9.18
1590.0	4190.1	9.18

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=3800.1MHz (dB) @LO (dBm) +15
2030.0	1770.1	11.66
1990.0	1810.1	11.21
1940.0	1860.1	10.59
1890.0	1910.1	9.93
1850.0	1950.1	9.64
1800.0	2000.1	9.43
1750.0	2050.1	9.35
1710.0	2090.1	9.38
1660.0	2140.1	9.26
1610.0	2190.1	9.10
1570.0	2230.1	8.90
1520.0	2280.1	8.68
1470.0	2330.1	8.69
1420.0	2380.1	8.52
1380.0	2420.1	8.43
1330.0	2470.1	8.31
1280.0	2520.1	8.14
1240.0	2560.1	8.11
1190.0	2610.1	8.16
1140.0	2660.1	8.12
1100.0	2700.1	8.08
1050.0	2750.1	7.98
1000.0	2800.1	7.96
950.0	2850.1	7.90
910.0	2890.1	7.83
860.0	2940.1	7.80
810.0	2990.1	7.70
770.0	3030.1	7.60
720.0	3080.1	7.53
670.0	3130.1	7.52
630.0	3170.1	7.50
580.0	3220.1	7.60
530.0	3270.1	7.61
480.0	3320.1	7.62
440.0	3360.1	7.67
390.0	3410.1	7.74
340.0	3460.1	7.78
300.0	3500.1	7.78
250.0	3550.1	7.76
200.0	3600.1	7.77
160.0	3640.1	7.62
110.0	3690.1	7.61
60.0	3740.1	7.56
10.0	3790.1	7.92

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB) @LO (dBm)			LO-IF ISOLATION (dB) @LO (dBm)		
	+12	+15	+18	+12	+15	+18
1030.1	34.2	37.1	39.2	31.4	30.2	30.2
1210.1	35.7	37.8	39.4	30.0	30.0	30.1
1410.1	36.7	38.0	39.0	30.8	30.4	30.1
1610.1	39.2	39.5	39.4	32.7	31.5	30.8
1810.1	41.4	40.8	39.7	33.9	32.2	31.4
2010.1	41.9	39.6	38.2	36.6	33.8	32.4
2210.1	43.4	40.0	38.4	40.7	36.3	34.3
2410.1	40.5	39.5	39.0	41.9	39.2	37.4
2630.1	39.1	38.8	38.8	40.7	39.9	39.1
2790.1	38.8	38.9	38.9	41.4	41.2	41.0
2990.1	37.1	37.4	38.2	40.8	41.3	41.8
3190.1	35.3	34.6	34.8	41.1	41.8	42.7
3390.1	37.9	36.9	36.1	43.5	44.2	44.9
3590.1	41.1	39.7	38.6	44.9	45.1	45.4
3850.1	43.1	42.3	41.4	45.8	46.5	47.1
3990.1	45.9	43.8	43.1	46.3	46.9	47.3
4190.1	49.2	47.2	45.0	49.6	50.5	50.2
4390.1	50.9	50.2	47.8	50.0	50.9	50.4
4570.1	51.0	49.9	46.8	54.5	54.8	54.0
4770.1	45.3	45.1	42.4	59.7	56.7	53.9
4970.1	42.6	41.0	40.4	67.2	59.1	54.4
5170.1	41.6	38.9	38.2	57.7	55.8	52.5
5370.1	40.9	38.8	37.1	53.8	52.4	49.8
5570.1	39.9	39.0	37.2	49.4	48.4	46.7
5770.1	39.2	38.9	38.1	49.2	48.5	46.9
5970.1	38.5	37.8	36.6	47.8	47.0	45.8
6150.1	37.1	36.3	35.0	46.0	44.6	43.1
6350.1	37.0	35.8	34.3	43.5	42.3	40.8
6550.1	35.3	34.5	33.4	41.3	39.3	37.6
6750.1	34.4	34.1	33.3	39.5	37.1	35.3
6950.1	34.7	34.8	34.4	38.6	35.9	34.0
7150.1	35.6	36.5	36.5	35.1	32.8	31.0
7350.1	36.8	38.4	39.2	33.8	31.8	30.1
7550.1	36.7	35.2	33.7	33.1	31.6	29.9
7750.1	33.1	30.4	28.6	31.3	30.3	28.8
7930.1	31.4	28.9	27.2	31.1	31.1	30.0
8130.1	28.3	26.9	25.3	29.3	30.2	29.6
8330.1	25.6	25.7	24.7	27.3	28.6	28.9
8530.1	23.6	24.1	23.5	26.3	27.8	28.1
8730.1	22.0	22.4	22.0	26.7	28.0	28.0
8930.1	21.6	21.6	21.3	27.5	28.7	28.3
9130.1	21.6	21.2	20.7	28.5	29.1	28.3
9330.1	21.8	21.3	20.3	30.9	30.8	29.6
9530.1	21.4	20.8	19.6	32.5	31.7	30.2

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB) @LO (dBm)		
		+12	+15	+18
1000.1	1030.1	11.5	12.3	13.0
1180.1	1210.1	10.6	11.3	12.1
1380.1	1410.1	9.8	10.4	10.8
1580.1	1610.1	8.6	9.0	9.2
1780.1	1810.1	8.4	8.6	8.7
1980.1	2010.1	8.4	8.4	8.4
2180.1	2210.1	8.3	8.2	8.2
2380.1	2410.1	9.0	8.9	8.9
2600.1	2630.1	10.5	10.5	10.4
2760.1	2790.1	11.7	11.8	11.7
2960.1	2990.1	12.8	12.9	12.9
3160.1	3190.1	13.8	13.8	13.7
3360.1	3390.1	15.4	15.0	14.7
3560.1	3590.1	16.1	15.4	15.0
3820.1	3850.1	16.5	15.6	15.3
3960.1	3990.1	17.3	16.4	16.1
4160.1	4190.1	17.5	16.9	16.6
4360.1	4390.1	16.4	16.0	15.8
4540.1	4570.1	16.0	15.7	15.6
4740.1	4770.1	15.6	15.4	15.3
4940.1	4970.1	15.4	15.2	15.2
5140.1	5170.1	15.4	15.5	15.5
5340.1	5370.1	14.4	14.5	14.6
5540.1	5570.1	14.6	14.7	14.8
5740.1	5770.1	14.3	14.5	14.6
5940.1	5970.1	13.5	13.7	13.8
6120.1	6150.1	13.7	13.9	14.0
6320.1	6350.1	13.6	13.8	14.0
6520.1	6550.1	12.6	12.9	13.1
6720.1	6750.1	13.3	13.6	13.8
6920.1	6950.1	12.8	13.2	13.4
7120.1	7150.1	11.7	12.0	12.3
7320.1	7350.1	12.4	12.6	12.8
7520.1	7550.1	12.3	12.6	12.8
7720.1	7750.1	11.9	12.4	12.8
7900.1	7930.1	13.1	13.7	14.2
8100.1	8130.1	13.6	14.2	14.8
8300.1	8330.1	14.6	15.2	15.7
8500.1	8530.1	16.2	16.8	17.1
8700.1	8730.1	18.0	18.3	18.5
8900.1	8930.1	19.8	19.5	19.3
9100.1	9130.1	21.3	20.6	19.9
9300.1	9330.1	22.0	21.0	19.9
9500.1	9530.1	22.3	21.3	20.3

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1) @LO (dBm)		
		+12	+15	+18
1000.1	1030.1	1.05	1.05	1.05
1180.1	1210.1	1.07	1.07	1.07
1380.1	1410.1	1.13	1.14	1.14
1580.1	1610.1	1.15	1.14	1.13
1780.1	1810.1	1.07	1.07	1.06
1980.1	2010.1	1.03	1.03	1.03
2180.1	2210.1	1.01	1.01	1.01
2380.1	2410.1	1.00	1.00	1.00
2600.1	2630.1	1.01	1.01	1.01
2760.1	2790.1	1.02	1.01	1.01
2960.1	2990.1	1.02	1.01	1.01
3160.1	3190.1	1.01	1.00	1.01
3360.1	3390.1	1.03	1.02	1.03
3560.1	3590.1	1.07	1.06	1.06
3820.1	3850.1	1.15	1.12	1.12
3960.1	3990.1	1.30	1.22	1.20
4160.1	4190.1	1.62	1.48	1.43
4360.1	4390.1	2.00	1.79	1.71
4540.1	4570.1	2.40	2.09	1.97
4740.1	4770.1	2.61	2.24	2.08
4940.1	4970.1	2.90	2.44	2.25
5140.1	5170.1	3.01	2.56	2.38
5340.1	5370.1	3.19	2.69	2.46
5540.1	5570.1	3.10	2.70	2.47
5740.1	5770.1	3.12	2.77	2.57
5940.1	5970.1	3.03	2.74	2.56
6120.1	6150.1	2.81	2.52	2.36
6320.1	6350.1	2.52	2.26	2.13
6520.1	6550.1	2.33	2.08	1.93
6720.1	6750.1	2.25	1.98	1.82
6920.1	6950.1	2.23	1.96	1.79
7120.1	7150.1	2.11	1.89	1.74
7320.1	7350.1	2.12	1.95	1.82
7520.1	7550.1	2.20	2.05	1.92
7720.1	7750.1	2.15	2.01	1.88
7900.1	7930.1	2.17	2.04	1.92
8100.1	8130.1	2.18	2.07	1.92
8300.1	8330.1	2.18	2.06	1.93
8500.1	8530.1	2.33	2.13	1.98
8700.1	8730.1	2.45	2.18	1.97
8900.1	8930.1	2.72	2.34	2.10
9100.1	9130.1	2.81	2.38	2.11
9300.1	9330.1	2.84	2.41	2.12
9500.1	9530.1	2.86	2.48	2.21

LO (MHz)	LO VSWR (:1) @LO (dBm)		
	+12	+15	+18
1030.1	4.17	3.84	4.13
1210.1	2.04	2.34	2.78
1410.1	1.38	1.77	2.18
1610.1	1.12	1.42	1.76
1810.1	1.28	1.29	1.55
2010.1	1.59	1.33	1.43
2210.1	1.81	1.34	1.35
2410.1	2.16	1.55	1.38
2630.1	2.40	1.65	1.41
2790.1	2.63	1.77	1.45
2990.1	2.94	1.92	1.48
3190.1	2.99	1.99	1.56
3390.1	3.24	2.12	1.61
3590.1	3.49	2.22	1.64
3850.1	4.42	2.71	1.95
3990.1	4.07	2.57	1.86
4190.1	5.04	3.10	2.23
4390.1	4.12	2.68	2.00
4570.1	4.73	3.00	2.22
4770.1	5.00	3.24	2.54
4970.1	4.12	2.77	2.18
5170.1	4.92	3.37	2.82
5370.1	3.24	2.37	2.05
5570.1	4.35	3.22	2.88
5770.1	2.80	2.31	2.22
5970.1	3.75	3.06	2.85
6150.1	3.49	3.10	3.09
6350.1	2.11	1.86	1.85
6550.1	3.19	2.97	3.05
6750.1	1.53	1.55	1.70
6950.1	2.69	2.59	2.70
7150.1	1.67	1.90	2.14
7350.1	1.99	1.93	1.97
7550.1	2.15	2.44	2.70
7750.1	1.53	1.56	1.61
7930.1	2.23	2.36	2.48
8130.1	2.09	2.32	2.51
8330.1	2.00	2.08	2.16
8530.1	2.64	2.76	2.91
8730.1	2.09	2.09	2.11
8930.1	2.69	2.70	2.69
9130.1	1.93	1.88	1.83
9330.1	2.38	2.28	2.19
9530.1	1.46	1.36	1.27

IF (OUT) (MHz)	IF VSWR @LO=3800.1MHz (:1) @LO (dBm)		
	+12	+15	+18
10.1	1.87	1.48	1.33
90.1	1.87	1.46	1.31
180.1	1.86	1.45	1.30
270.1	1.79	1.40	1.26
360.1	1.74	1.36	1.23
440.1	1.67	1.31	1.19
530.1	1.58	1.24	1.13
620.1	1.48	1.16	1.05
710.1	1.40	1.12	1.04
800.1	1.32	1.13	1.13
880.1	1.30	1.18	1.20
970.1	1.33	1.26	1.27
1060.1	1.42	1.37	1.38
1150.1	1.50	1.48	1.49
1240.1	1.61	1.58	1.57
1320.1	1.71	1.66	1.65
1410.1	1.81	1.74	1.72
1500.1	1.86	1.75	1.73
1590.1	1.95	1.77	1.72
1680.1	2.10	1.85	1.77
1760.1	2.20	1.88	1.79
1850.1	2.37	1.98	1.87
1940.1	2.62	2.17	2.03
2030.1	2.81	2.34	2.21
2110.1	3.07	2.63	2.51
2200.1	3.51	3.09	2.98
2290.1	3.96	3.57	3.49
2380.1	4.41	4.14	4.10
2470.1	4.97	4.80	4.79
2550.1	5.46	5.37	5.40
2640.1	6.06	6.10	6.16
2730.1	6.81	6.92	7.00
2820.1	7.45	7.61	7.70
2910.1	8.26	8.48	8.57
2990.1	9.12	9.37	9.45
3080.1	10.06	10.34	10.42
3170.1	10.99	11.29	11.35
3260.1	11.52	11.78	11.82
3350.1	12.03	12.25	12.25
3430.1	12.51	12.64	12.62
3520.1	13.29	13.30	13.24
3610.1	14.01	13.95	13.88
3700.1	14.24	14.10	13.99
3790.1	15.44	15.19	15.07

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	---	---	20	32	30	46	57	63	64	69	---	---
1	---	7.5	---	34	32	45	56	53	60	67	54	---
2	115	70	64	52	67	73	62	72	80	84	77	76
3	113	71	58	53	42	53	62	69	74	77	76	80
4	113	93	94	84	79	66	81	88	80	93	92	102
5	112	105	97	95	93	75	64	74	76	90	86	93
6	110	109	106	113	97	99	84	80	89	96	93	105
7	108	110	110	111	114	110	107	96	80	93	93	111
8	106	104	109	110	110	114	108	110	96	92	100	112
9	105	---	104	110	110	112	116	114	115	105	107	105
10	105	---	---	106	109	110	113	115	114	116	112	102
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: **RF IN: 3200 MHz; 0 dBm.**
LO IN: 3230 MHz; +15.00 dBm
IF OUT: 30 MHz; -7.20 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	---	---	29	45	40	60	76	82	71	81	---	---
1	---	6.1	---	34	35	55	60	64	69	76	68	---
2	103	57	67	41	55	69	59	75	79	86	84	79
3	108	50	41	47	28	48	56	61	84	74	78	89
4	107	78	67	79	64	50	69	76	70	83	87	98
5	107	68	63	72	57	52	37	60	66	70	87	85
6	104	105	89	90	89	74	77	58	75	83	76	89
7	103	88	87	76	77	77	68	60	49	63	76	76
8	100	88	103	99	97	101	83	87	73	60	78	87
9	101	---	81	92	96	85	87	82	76	66	55	69
10	100	---	---	92	114	111	100	96	95	87	77	67
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

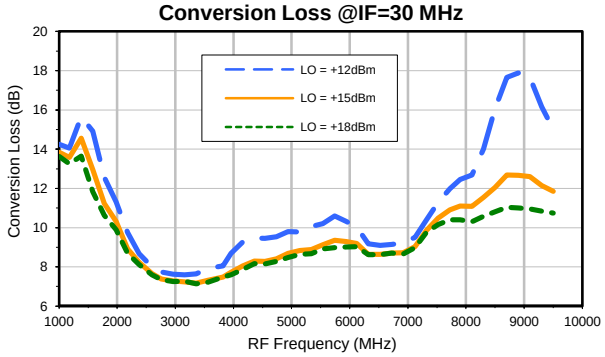
LO HARMONICS ORDER

Test conditions: **RF IN: 3200 MHz; 10 dBm.**
LO IN: 3230 MHz; +15.00 dBm
IF OUT: 30 MHz; 1.94 dBm

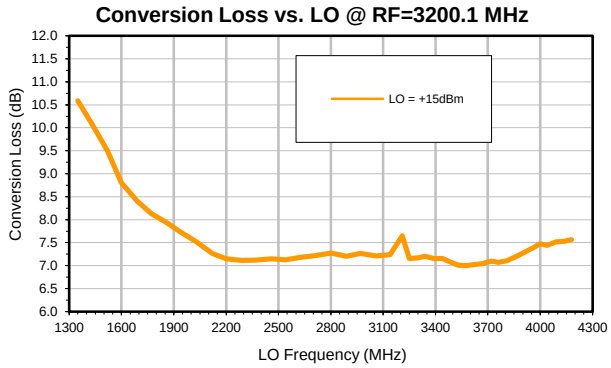
Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT
2. + entry denotes harmonics are in (dBc) above IF OUTPUT
3. RF Cal represents the Harmonics level of the RF Input Signal to the mixer

Typical Performance Curves

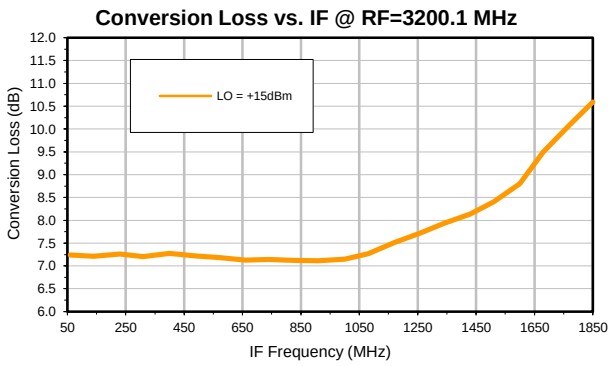
Conversion Loss @IF=30 MHz



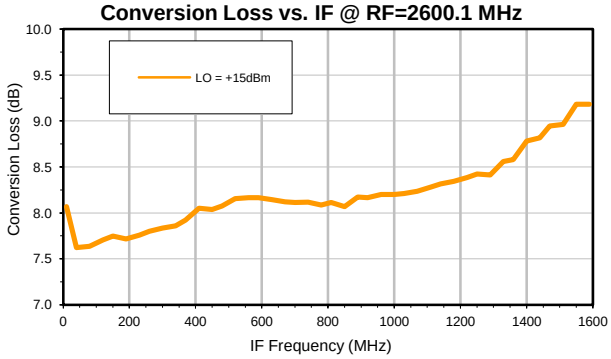
Conversion Loss vs. LO @ RF=3200.1 MHz



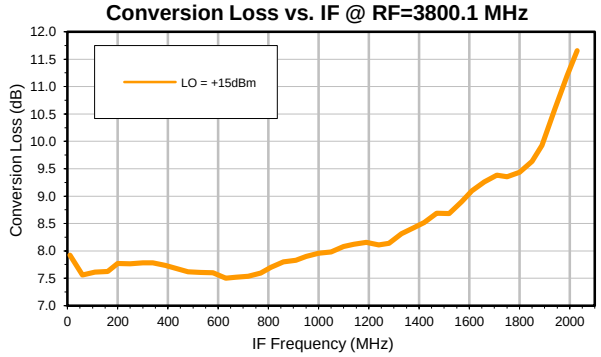
Conversion Loss vs. IF @ RF=3200.1 MHz



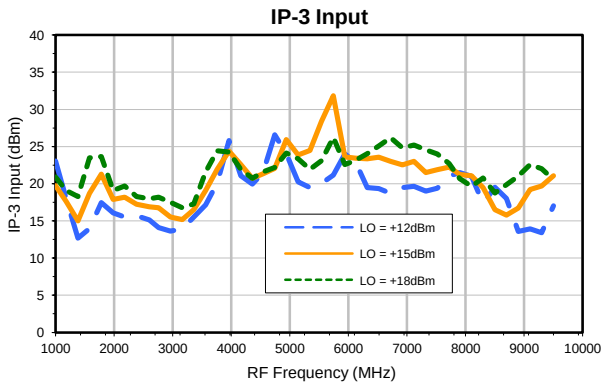
Conversion Loss vs. IF @ RF=2600.1 MHz



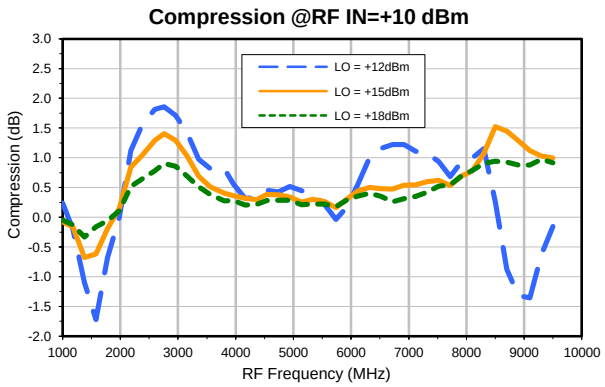
Conversion Loss vs. IF @ RF=3800.1 MHz



IP-3 Input

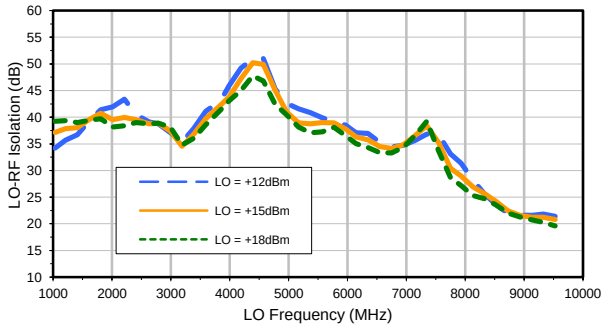


Compression @RF IN=+10 dBm

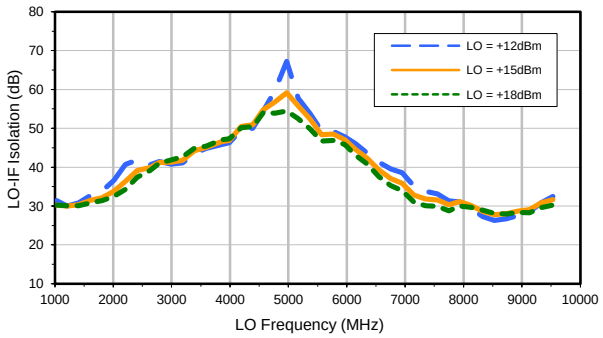


Typical Performance Curves

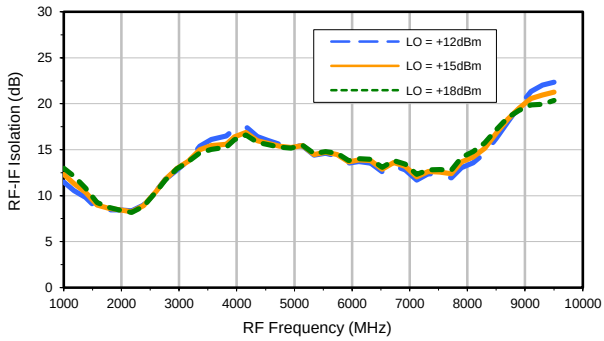
LO-RF Isolation



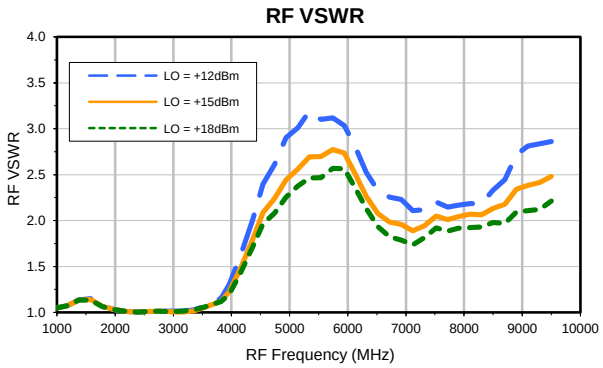
LO-IF Isolation



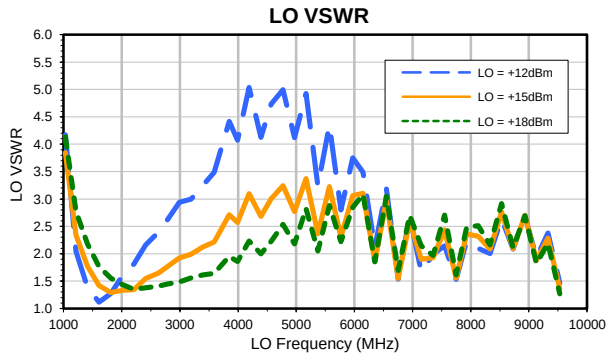
RF-IF Isolation



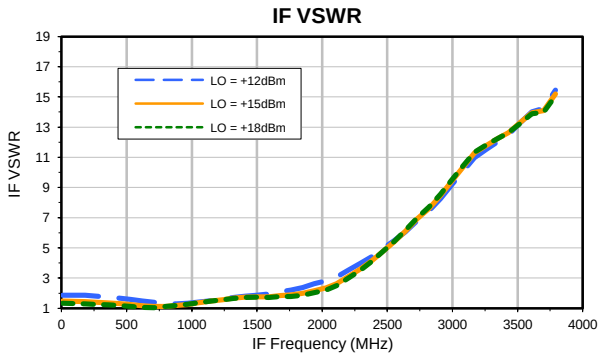
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	---	---	20	32	30	46	57	63	64	69	---	---
1	---	7.5	---	34	32	45	56	53	60	67	54	---
2	115	70	64	52	67	73	62	72	80	84	77	76
3	113	71	58	53	42	53	62	69	74	77	76	80
4	113	93	94	84	79	66	81	88	80	93	92	102
5	112	105	97	95	93	75	64	74	76	90	86	93
6	110	109	106	113	97	99	84	80	89	96	93	105
7	108	110	110	111	114	110	107	96	80	93	93	111
8	106	104	109	110	110	114	108	110	96	92	100	112
9	105	---	104	110	110	112	116	114	115	105	107	105
10	105	---	---	106	109	110	113	115	114	116	112	102
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: **RF IN: 3200 MHz; 0 dBm.**
LO IN: 3230 MHz; +15.00 dBm
IF OUT: 30 MHz; -7.20 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	---	---	29	45	40	60	76	82	71	81	---	---
1	---	6.1	---	34	35	55	60	64	69	76	68	---
2	103	57	67	41	55	69	59	75	79	86	84	79
3	108	50	41	47	28	48	56	61	84	74	78	89
4	107	78	67	79	64	50	69	76	70	83	87	98
5	107	68	63	72	57	52	37	60	66	70	87	85
6	104	105	89	90	89	74	77	58	75	83	76	89
7	103	88	87	76	77	77	68	60	49	63	76	76
8	100	88	103	99	97	101	83	87	73	60	78	87
9	101	---	81	92	96	85	87	82	76	66	55	69
10	100	---	---	92	114	111	100	96	95	87	77	67
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

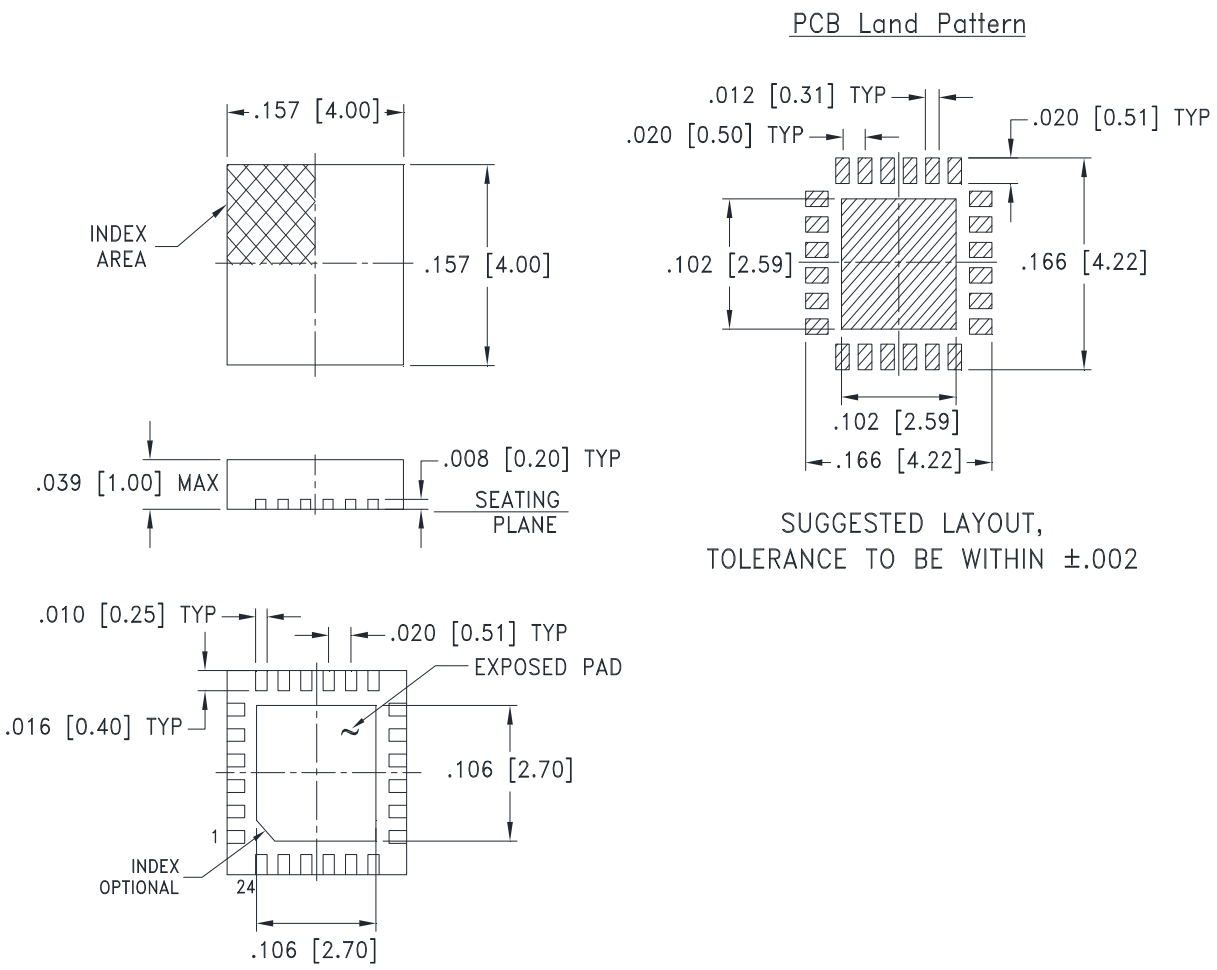
Test conditions: **RF IN: 3200 MHz; 10 dBm.**
LO IN: 3230 MHz; +15.00 dBm
IF OUT: 30 MHz; 1.94 dBm

Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT
2. + entry denotes harmonics are in (dBc) above IF OUTPUT
3. RF Cal represents the Harmonics level of the RF Input Signal to the mixer

Case Style DG

DG1847

Outline Dimensions



Weight: .04 Grams

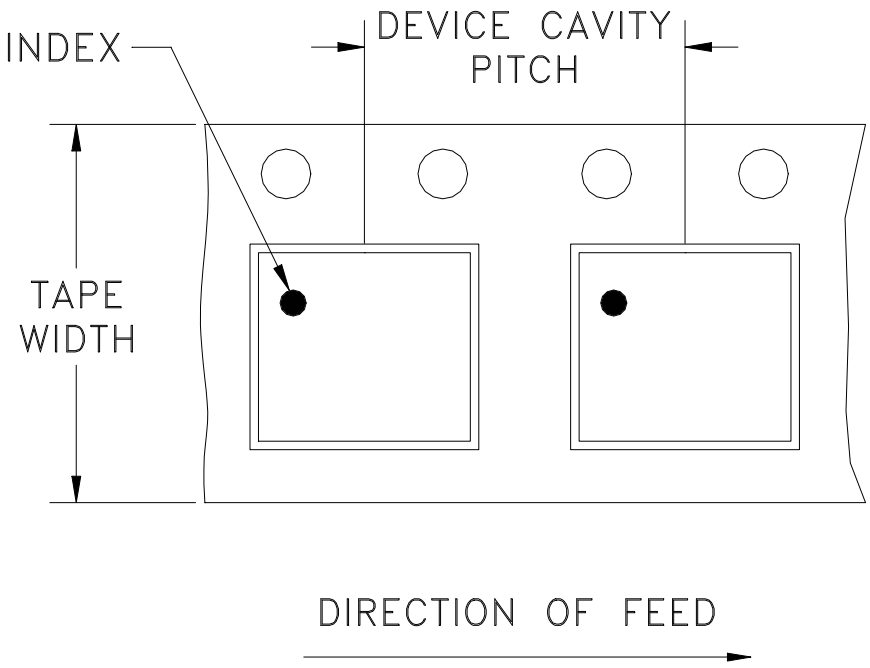
Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin. All models, (+) suffix. See model Data sheet.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

Tape & Reel Packaging TR-F68

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
12	8	7	Small quantity standard	20
				50
				100
				200
				500
		7	Standard	1000
		13	Standard	2000
				3000
				4000

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

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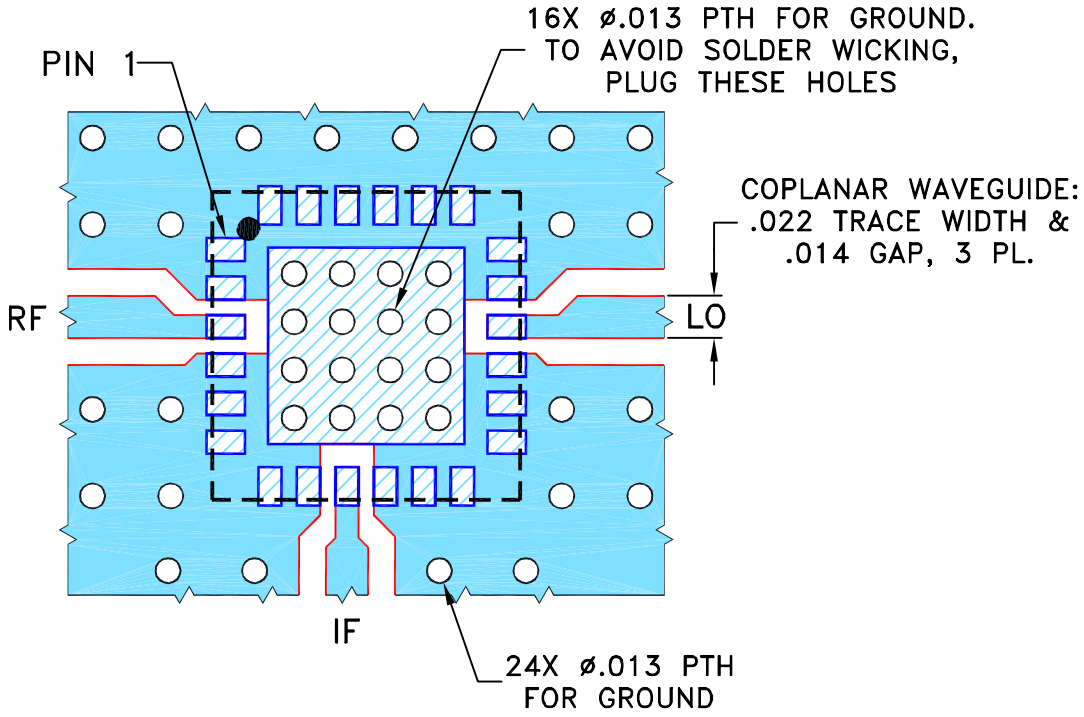
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M145005	NEW RELEASE	02/05/14	AV	AVB

SUGGESTED MOUNTING CONFIGURATION FOR DG1847 CASE STYLE, "24MX01" PIN CODE



NOTES:

1. TRACE WIDTH PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010"±.001". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	AV	01/28/14
TOLERANCES ON:	CHECKED	IL	02/03/14
2 PL DECIMALS ±	APPROVED	AVB	02/05/14
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

ASHEETA1.DWG REV:A DATE:01/12/95

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

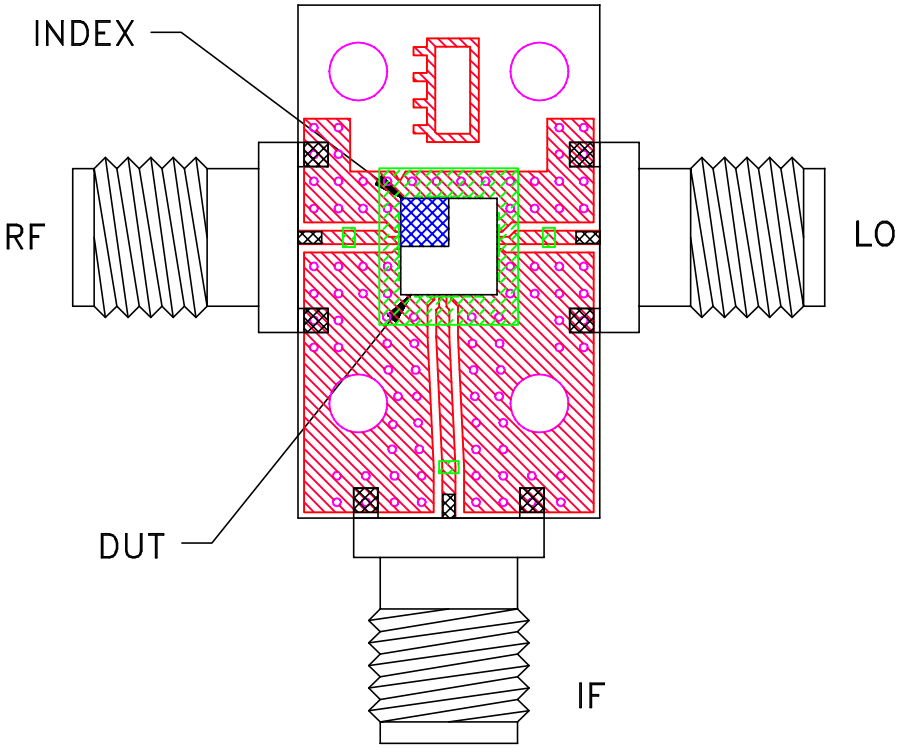
PL, 24MX01, DG1847, TB-746+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-413	OR

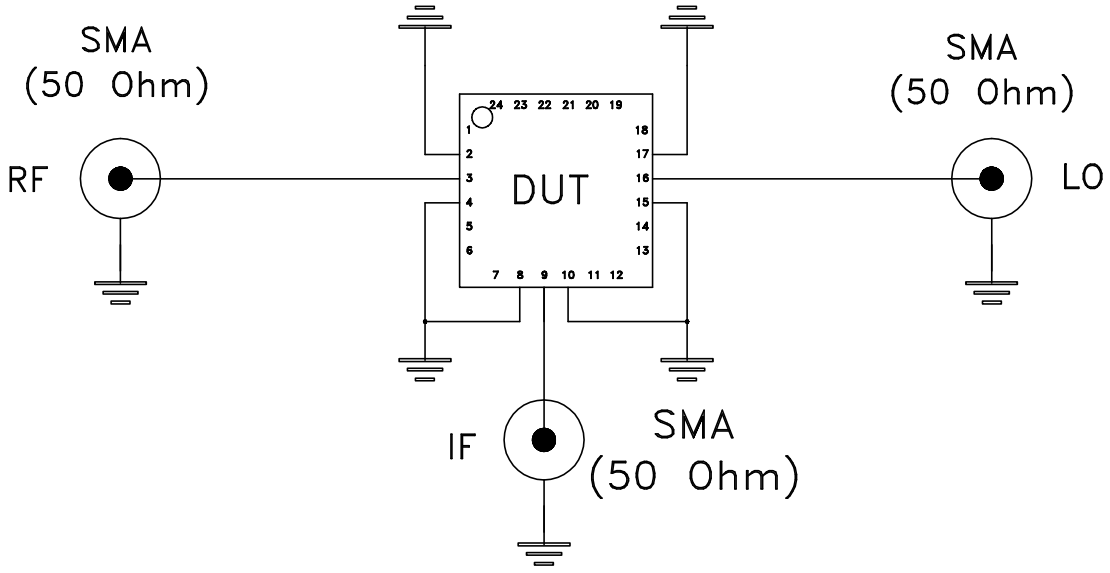
FILE:	SCALE:	SHEET:
98PL413	10:1	1 OF 1

Evaluation Board and Circuit

For Pin Connection refer to Data Sheet of the DUT



TB-746+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5, Thickness=.010 inch.

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Environmental Specifications ENV08T1

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85° C or -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
HTOL	1000 hours at 125°C	MIL-STD-883, Method 1005, Condition B
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Mechanical Shock	1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only	MIL-STD-883, Method 2002, Condition B, except Y1 direction only
Vibration (Variable Frequency)	50g peak	MIL-STD-883, Method 2007, Condition B
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102, Condition C
HAST	130°C, 85% RH, 96 hours	JESD22-A110
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak	J-STD-020

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215