

Super Wideband Double Balanced Mixer Die

MDB-653H-D+

Level 15 (LO Power 15dBm) 20 to 65 GHz

The Big Deal

- Super Wideband RF & LO, 20-65 GHz
- Super wideband IF, DC-20 GHz
- High L-R Isolation, 45 dB typ.
- Excellent Input IP3, 20dBm Typ.
- Usable as Up & Down Converter



Product Overview

MDB-653H-D+ is super-wideband double balanced mixer die fabricated using InGaP HBT technology. The MDB-653H-D+ mixer functions as an up converter or down converter for LO and RF frequencies from 20 to 65GHz and covers IF bandwidths from DC-20GHz. The Mixer operates with 15dBm LO power level while providing 11dB conversion loss, 45dB LO/RF isolation and 20 dBm input IP3. The mixer is ideal for use in wideband millimeter wave systems for communications, defense and test and measurement applications.

Key Features

Feature	Advantages
Double Balanced	Results in excellent LO-RF (35-55 dB typical) & LO-IF (23-52 dB typical) Isolations, minimizing need for external filtering.
Super Wideband, 20 to 65 GHz	Useful in wideband systems or in in several narrowband systems, reducing inventory.
Wide IF Bandwidth DC-20 GHz	Usable in first and second down converter applications. IF as low as DC enables use in phase detector applications.
Unpackaged die	Enables users to integrate it directly into hybrid.



Super Wideband Double Balanced Mixer Die

MDB-653H-D+

Level 15 (LO Power 15dBm) 20 to 65 GHz

Product Features

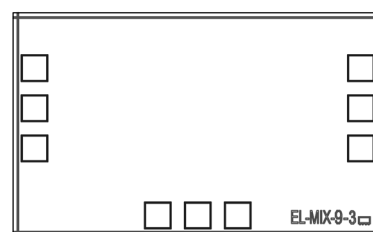
- Super Wideband RF & LO, 20-65GHz
- Super wideband IF, DC-20GHz
- High L-R Isolation, 45 dB typ.
- Excellent input IP3, 20 dBm typ.
- Usable as Up & Down Converter

Typical Applications

- Satellite up and down converters
- Defense radar & communication
- WiGig
- 5G
- ISM

Product Overview

MDB-653H-D+ is super-wideband double balanced mixer die fabricated using InGaP HBT technology. The MDB-653H-D+ mixer functions as an up converter or down converter for LO and RF frequencies from 20 to 65GHz and covers IF bandwidths from DC-20GHz. The Mixer operates with 15dBm LO power level while providing 11dB conversion loss, 45dB LO/RF isolation and 20 dBm input IP3. The mixer is ideal for use in wideband millimeter wave systems for communications, defense and test and measurement applications.

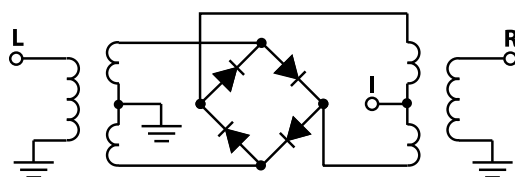


+RoHS Compliant

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

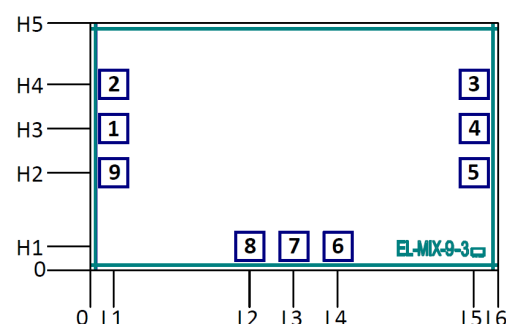
Ordering Information: Refer to Last Page

Simplified Schematic and Pad description



Pad#	Function
1	RF
2,3,5,6,8,9 & Bottom of Die	GROUND
4	LO
7	IF

Bonding Pad Position



Dimensions in μm , Typical

L1	L2	L3	L4	L5	L6	H1	H2	H3	H4	H5
81	543	693	843	1306	1386	81	331	481	631	838

Thickness	Die size	Pad size
100	1386 x 838	1-9 92 x 92



Electrical Specifications¹ at 25°C, Z₀ =50Ω

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
RF Frequency Range		20		65	GHz
LO Frequency Range		20		65	GHz
IF Frequency Range		DC		20	GHz
LO Power		14	15	16	dBm
Conversion Loss (at IF=2 GHz)	20		9.5		dB
	30		9.7		
	40		11.0		
	50		9.9		
	60		11.4		
	65		13.4		
LO-RF Isolation	20		38		dB
	30		41		
	40		38		
	50		54		
	60		44		
	65		38		
LO-IF Isolation	20		34		dB
	30		48		
	40		39		
	50		24		
	60		32		
	65		30		
RF-IF Isolation	20		32		dB
	30		30		
	40		24		
	50		20		
	60		29		
	65		34		
Pin at 1dB Compression	20 - 60		10		dBm
Input IP3	20 - 60		20		dBm

1. Die performance is measured in Die Characterization Test Board. See Assembly Diagram.

Absolute Maximum Ratings²

Parameter	Ratings
Operating Temperature	-40°C to 85°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.

Characterization Test and Applications Circuits

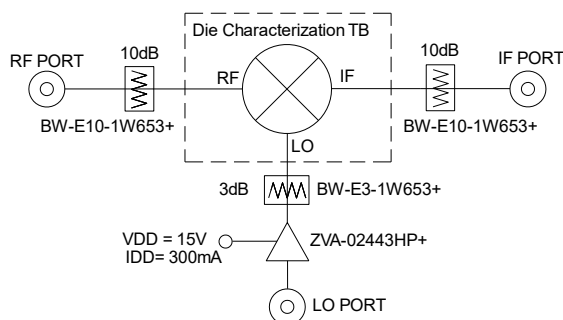


Figure 1A. Block Diagram of Test Circuit used for characterization of Conversion Loss, Isolation (L-R, L-I, R-I) & VSWR from 20 to 35 GHz.

Test Condition:

RF = -10dBm, LO = 15dBm, IF = 30MHz, 2GHz & 3GHz

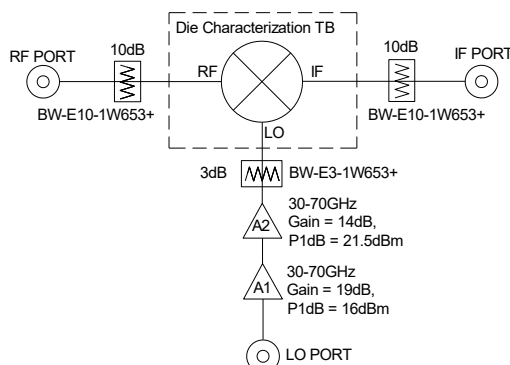


Figure 1B. Block Diagram of Test Circuit used for characterization of Conversion Loss, Isolation (L-R, L-I, R-I) & VSWR from 35 to 65 GHz.

Test Condition:

RF = -10dBm, LO = 15dBm, IF = 30MHz, 2GHz & 3GHz

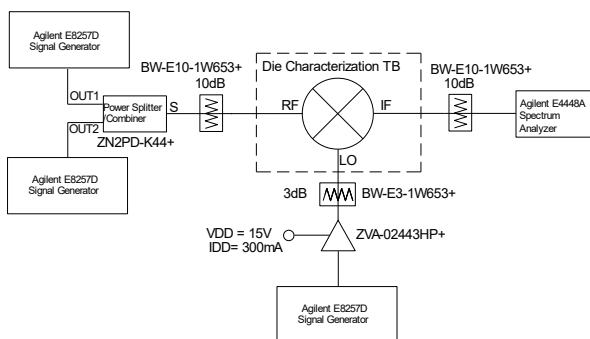


Figure 1C. Block Diagram of Test Circuit used for characterization of Input IP3 from 20 to 35GHz

Test Condition: RF = -10dBm/Tone, LO = 15dBm, IF = 2GHz Input IP3 (IIP3): Two tones, spaced 1MHz apart

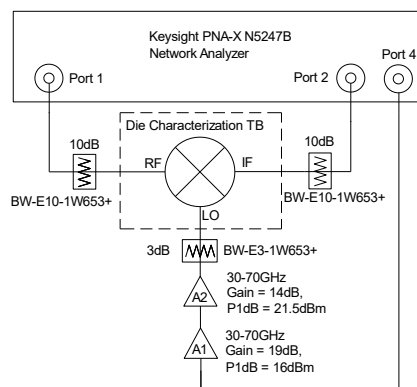


Figure 1D. Block Diagram of Test Circuit used for characterization of Input IP3 from 35 to 65 GHz

Test Condition:

RF = -10dBm/Tone, LO = 15dBm, IF = 2GHz Input IP3 (IIP3): Two tones, spaced 1MHz apart

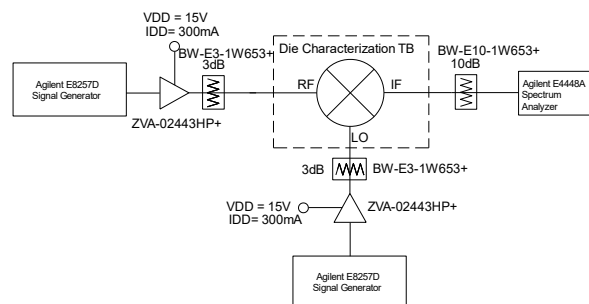


Figure 1E. Block Diagram of Test Circuit used for characterization of Compression from 20 to 35 GHz

Test Condition:

RF = 10dBm & -10dBm, LO = 15dBm, IF = 2GHz
Compression = CL(RF=10dBm) - CL(RF=-10dBm)

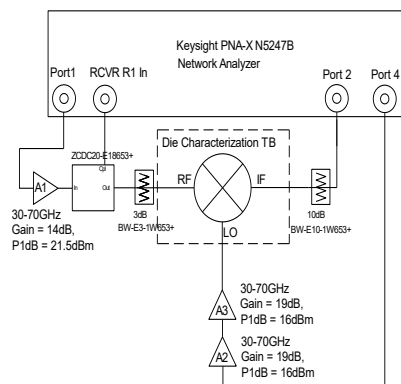
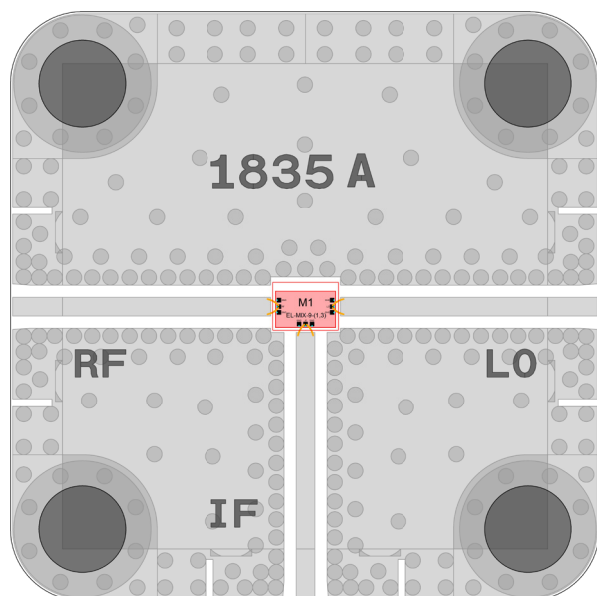


Figure 1F. Block Diagram of Test Circuit used for characterization of Compression from 35 to 65GHz

Test Condition:

RF = 10dBm & -10dBm, LO = 15dBm, IF = 2GHz
Compression = CL(RF=10dBm) - CL(RF=-10dBm)

Assembly Diagram



Note: Die is attached and wire-bonded on X-Microwave's Drop-In Evaluation Board. Please see the last page for P/N and website link to X-Microwave's Website to order.

Assembly and Handling Procedure

1. Storage
Dice should be stored in a dry nitrogen purged desiccators or equivalent.
2. ESD
MMIC InGap HBT mixer dice are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic protected material, which should be opened in clean room conditions at an appropriately grounded anti-static workstation. Devices need careful handling using correctly designed collets, vacuum pickup tips or sharp antistatic tweezers to deter ESD damage to dice.
3. Die Attach
The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are Ablestik 84-1LMISR4 or equivalent. Apply sufficient epoxy to meet required epoxy bond line thickness, epoxy fillet height and epoxy coverage around total die periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer's cure condition. It is recommended to use antistatic die pick up tools only.
4. Wire Bonding
Bond pad openings in the surface passivation above the bond pads are provided to allow wire bonding to the dice gold bond pads. Thermosonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1 mil diameter. Bonds must be made from the bond pads on the die to the package or substrate. All bond wires should be kept as short as low as reasonable to minimize performance degradation due to undesirable series inductance.

Additional Detailed Technical Information	
<i>additional information is available on our dash board.</i>	
Performance Data	Data Table
	Swept Graphs
Case Style	Die
Die Ordering and packaging information	Quantity, Package Model No.
	Small, Gel - Pak: 10,50,100 KGD* MDB-653H-DG+
	Medium†, Partial wafer: KGD*<1333 MDB-653H-DP+
	†Available upon request contact sales representative
	Refer to AN-60-067
Die TB Reference	XM-C9L2-0404D (Please check X-Microwave's Website)
Environmental Ratings	ENV-80

*Known Good Dice ("KGD") means that the dice are taken from PCM good wafer and then visually inspected per Mini-Circuits' criteria. Though this is not definitive, it does provide a higher degree of confidence that the dice are capable of meeting typical RF electrical parameters specified by Mini-Circuits

ESD Rating**

Human Body Model (HBM): Class 1A (250V) in accordance with ANSI/ESD STM 5.1 - 2001

** Tested in industry standard 12-lead, 3x3 mm MCLP package.

Additional Notes

- 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.
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Wideband Double Balanced Mixer Die

MDB-653H-D+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @ IF(OUT)=30MHz (dB)			RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @ IF(OUT)=2GHz (dB)			RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @ IF(OUT)=3GHz (dB)		
		@LO (dBm)					@LO (dBm)					@LO (dBm)		
		+14	+15	+16			+14	+15	+16			+14	+15	+16
18000	18030	10.6	10.6	10.7	18000	20000	11.7	11.7	11.7	18000	21000	11.8	11.8	11.8
19000	19030	10.0	9.9	9.9	19000	21000	10.1	10.1	10.1	19000	22000	9.9	10.0	10.2
20000	20030	9.7	9.6	9.5	20000	22000	9.4	9.4	9.5	20000	23000	9.6	9.7	9.9
21000	21030	9.8	9.7	9.6	21000	23000	9.5	9.6	9.7	21000	24000	9.5	9.6	9.7
22000	22030	9.6	9.5	9.6	22000	24000	9.4	9.4	9.5	22000	25000	9.5	9.6	9.9
23000	23030	9.9	9.9	10.1	23000	25000	9.7	9.8	10.0	23000	26000	10.1	10.2	10.4
24000	24030	11.0	11.0	11.0	24000	26000	11.2	11.3	11.5	24000	27000	11.3	11.6	12.0
25000	25030	11.7	11.8	12.0	25000	27000	12.1	12.3	12.6	25000	28000	12.0	12.2	12.5
26000	26030	11.7	11.8	12.2	26000	28000	11.7	11.9	12.2	26000	29000	11.6	12.1	12.8
27000	27030	11.3	11.5	12.0	27000	29000	11.1	11.5	12.3	27000	30000	11.1	11.2	11.5
28000	28030	10.5	10.7	11.2	28000	30000	10.5	10.6	10.9	28000	31000	10.4	10.6	11.1
29000	29030	10.5	11.0	11.9	29000	31000	10.2	10.4	10.9	29000	32000	10.2	10.4	10.9
30000	30030	9.7	9.9	10.3	30000	32000	9.6	9.8	10.3	30000	33000	9.6	9.8	10.2
31000	31030	9.5	9.8	10.5	31000	33000	9.6	9.8	10.2	31000	34000	9.7	10.1	11.0
32000	32030	8.9	9.2	9.8	32000	34000	9.1	9.6	10.5	32000	35000	9.1	9.0	9.2
33000	33030	8.9	9.1	9.5	33000	35000	9.0	8.9	9.0	33000	36000	9.6	9.4	9.3
34000	34030	8.8	9.3	10.3	34000	36000	9.7	9.5	9.4	34000	37000	9.3	9.5	10.1
35000	35030	9.3	9.2	9.3	35000	37000	9.3	9.5	10.1	35000	38000	12.1	11.4	10.0
36000	36030	8.8	8.6	8.7	36000	38000	11.2	10.7	9.3	36000	39000	8.7	8.7	8.9
37000	37030	8.6	8.6	8.8	37000	39000	8.5	8.5	8.7	37000	40000	8.3	8.2	8.3
38000	38030	9.8	9.7	9.8	38000	40000	9.7	9.6	9.6	38000	41000	9.2	9.4	10.0
39000	39030	10.2	10.2	10.4	39000	41000	10.0	10.2	10.7	39000	42000	9.5	9.5	9.8
40000	40030	10.4	10.3	10.3	40000	42000	9.9	9.9	10.1	40000	43000	9.7	9.7	10.1
42000	42030	10.7	10.7	10.9	42000	44000	10.7	10.7	11.0	42000	45000	10.5	10.5	10.7
44000	44030	10.8	10.9	11.2	44000	46000	10.8	10.9	11.2	44000	47000	10.5	10.6	11.0
46000	46030	10.5	10.5	10.9	46000	48000	10.4	10.5	10.7	46000	49000	10.2	10.3	10.6
48000	48030	10.2	10.3	10.5	48000	50000	10.3	10.3	10.4	48000	51000	9.9	10.0	10.5
50000	50030	9.9	9.9	10.1	50000	52000	10.0	10.1	10.4	50000	53000	9.7	9.7	10.1
52000	52030	8.7	8.9	9.3	52000	54000	9.0	9.1	9.5	52000	55000	8.6	8.7	9.1
54000	54030	9.4	9.5	9.9	54000	56000	9.0	9.2	9.6	54000	57000	8.8	9.0	9.4
56000	56030	9.9	10.0	10.3	56000	58000	10.1	10.3	10.7	56000	59000	9.8	9.8	9.9
58000	58030	11.7	11.9	12.4	58000	60000	11.9	11.9	12.1	58000	61000	11.7	11.4	11.2
60000	60030	11.4	11.5	11.7	60000	62000	11.4	11.4	11.6	60000	63000	10.8	10.8	11.1
62000	62030	11.0	11.0	11.2	63000	65000	12.5	12.4	12.6	62000	65000	10.6	10.6	10.8
65000	65030	13.0	13.0	13.2	64000	66000	---	---	---	63900	66900	---	---	---

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	IP-3 INPUT (dBm)			RF (IN) (MHz)	LO (MHz)	COMPRESSION @ RF IN=+10dBm (dB)		
		@LO (dBm)					@LO (dBm)		
		+14	+15	+16			+14	+15	+16
20000	22000	19.22	19.56	20.34	20000	22000	0.89	0.88	0.77
21000	23000	20.02	20.07	20.29	21000	23000	0.70	0.64	0.56
22000	24000	19.74	19.75	19.93	22000	24000	0.69	0.64	0.64
23000	25000	23.63	23.21	23.64	23000	25000	0.49	0.41	0.35
24000	26000	24.62	24.84	25.35	24000	26000	0.78	0.81	0.58
25000	27000	27.49	27.76	28.78	25000	27000	0.29	0.28	0.32
26000	28000	24.63	25.54	26.93	26000	28000	0.28	0.22	0.20
27000	29000	25.75	25.41	26.24	27000	29000	0.24	0.18	0.14
28000	30000	22.91	22.84	23.31	28000	30000	0.42	0.36	0.30
29000	31000	23.23	23.15	24.24	29000	31000	0.42	0.37	0.26
30000	32000	23.02	22.84	22.72	30000	32000	0.41	0.40	0.32
31000	33000	21.54	21.55	21.83	31000	33000	0.46	0.40	0.35
32000	34000	21.64	21.57	21.35	32000	34000	0.37	0.31	0.21
33000	35000	23.21	23.46	23.75	33000	35000	0.43	0.37	0.30
34000	36000	25.07	23.99	24.19	34000	36000	0.18	0.17	0.13
35000	37000	21.77	21.29	21.56	35000	37000	0.33	0.33	0.27
36000	38000	21.56	21.09	21.43	36000	38000	0.42	0.37	0.49
37000	39000	21.60	21.47	21.39	37000	39000	1.03	0.89	0.80
38000	40000	22.86	21.34	22.65	38000	40000	0.95	0.81	0.84
39000	41000	23.88	23.23	23.82	39000	41000	0.62	0.59	0.41
40000	42000	19.55	19.11	20.52	40000	42000	0.89	0.83	0.87
41000	43000	27.73	23.97	22.57	41000	43000	0.48	0.48	0.78
42000	44000	19.53	19.34	23.12	42000	44000	0.80	0.72	0.58
43000	45000	23.73	21.02	20.58	43000	45000	0.77	0.73	0.75
44000	46000	19.20	18.97	28.28	44000	46000	0.36	0.32	0.39
45000	47000	21.49	19.57	19.01	45000	47000	0.94	0.90	0.88
46000	48000	18.96	18.90	25.52	46000	48000	0.72	0.72	0.71
47000	49000	20.29	17.97	17.92	47000	49000	1.13	0.86	0.95
48000	50000	20.68	16.64	16.93	48000	50000	1.25	1.19	1.22
49000	51000	19.01	18.89	19.79	49000	51000	0.57	0.51	0.78
50000	52000	23.33	14.86	14.62	50000	52000	1.44	1.55	1.56
51000	53000	18.92	18.97	21.80	51000	53000	1.09	1.11	1.03
52000	54000	29.43	17.65	17.33	52000	54000	1.00	1.46	1.44
53000	55000	18.10	17.95	20.64	53000	55000	1.16	1.27	1.19
54000	56000	27.09	19.12	19.15	54000	56000	1.27	1.24	1.13
56000	58000	23.50	22.67	21.83	56000	58000	0.58	0.93	0.92
58000	60000	22.21	22.76	23.52	58000	60000	2.30	2.17	2.08
60000	62000	20.34	16.07	15.87	60000	62000	2.67	2.37	2.13

Typical Performance Data

IF (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @ RF=40GHz (dB)		
		@LO (dBm)		
		+14	+15	+16
10	40010	10.5	10.4	10.4
1000	41000	10.4	10.5	10.9
2000	42000	10.2	10.2	10.4
3000	43000	10.3	10.4	10.7
4000	44000	10.6	10.5	10.7
5000	45000	10.7	10.6	10.9
6000	46000	11.0	11.0	11.1
7000	47000	11.1	11.1	11.4
8000	48000	11.4	11.3	11.4
9000	49000	11.2	11.1	11.4
10000	50000	11.6	11.4	11.5
11000	51000	11.8	11.9	12.4
12000	52000	11.8	11.9	12.3
13000	53000	11.9	12.0	12.4
14000	54000	12.0	12.1	12.6
15000	55000	12.7	12.7	13.3
16000	56000	13.2	13.2	13.7
17000	57000	13.2	13.2	13.8
18000	58000	13.3	13.5	14.1
19000	59000	14.0	13.8	13.8
20000	60000	14.4	14.2	14.5
21000	61000	15.9	15.2	14.9
22000	62000	15.4	15.2	15.3
23000	63000	14.6	14.6	14.8
24000	64000	15.3	15.4	15.7
25000	65000	17.0	17.1	17.3

IF (MHz)	RF (MHz)	CONVERSION LOSS VS. IF FREQUENCY @ LO=40GHz (dB)		
		@LO (dBm)		
		+14	+15	+16
10	40010	10.5	10.3	10.3
1000	41000	10.6	10.4	10.3
2000	42000	11.0	10.7	10.6
3000	43000	11.4	11.1	10.9
4000	44000	11.5	11.1	11.0
5000	45000	11.2	10.8	10.6
6000	46000	11.2	10.8	10.6
7000	47000	11.5	11.0	10.8
8000	48000	11.9	11.5	11.2
9000	49000	12.1	11.6	11.4
10000	50000	12.2	11.6	11.3
11000	51000	12.0	11.4	11.1
12000	52000	11.7	11.1	10.9
13000	53000	11.8	11.3	11.1
14000	54000	12.1	11.6	11.3
15000	55000	13.0	12.6	12.3
16000	56000	14.8	14.2	13.9
17000	57000	16.2	15.6	15.2
18000	58000	17.2	16.4	15.9
19000	59000	18.0	17.0	16.4
20000	60000	18.8	17.7	16.9
21000	61000	18.3	17.3	16.6
22000	62000	16.6	16.0	15.6
23000	63000	16.0	15.5	15.3
24000	64000	16.8	16.4	16.3
25000	65000	18.6	18.4	18.4

Wideband Double Balanced Mixer Die

MDB-653H-D+

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			RF (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)					@LO (dBm)		
	+14	+15	+16	+14	+15	+16			+14	+15	+16
18000	32.9	33.4	33.8	30.1	30.5	31.0	18000	20000	27.0	27.8	28.5
19000	31.9	34.3	36.5	33.5	34.0	34.8	19000	21000	27.2	28.0	28.4
20000	37.4	37.8	37.8	33.2	34.3	36.2	20000	22000	31.6	32.5	32.9
21000	41.2	42.6	43.0	36.2	37.8	39.8	21000	23000	32.3	30.7	30.9
22000	42.3	42.8	42.6	35.1	36.6	38.7	22000	24000	36.6	33.7	31.1
23000	41.3	41.6	41.3	36.1	37.6	39.6	23000	25000	29.0	29.0	30.1
24000	43.0	43.7	43.9	36.1	37.3	38.6	24000	26000	29.7	29.0	29.7
25000	43.6	43.5	43.4	37.5	38.9	40.4	25000	27000	34.7	33.9	35.2
26000	44.6	44.4	44.1	38.2	39.6	41.0	26000	28000	38.0	38.0	39.0
27000	43.8	44.6	45.4	37.8	39.2	40.7	27000	29000	36.1	35.9	37.5
28000	42.6	43.7	44.8	38.6	40.0	41.3	28000	30000	36.8	36.8	36.6
29000	40.1	40.8	42.2	41.7	43.8	45.6	29000	31000	33.8	33.0	31.7
30000	39.9	40.7	41.6	47.1	48.3	49.2	30000	32000	32.9	32.8	32.5
31000	40.1	40.6	40.8	52.3	51.6	51.2	31000	33000	29.5	29.1	28.6
32000	40.2	40.4	39.9	56.1	52.0	50.2	32000	34000	29.6	29.5	29.2
33000	36.6	36.7	36.6	53.4	51.4	50.2	33000	35000	28.0	27.9	27.8
34000	36.5	37.0	36.6	50.5	48.0	47.0	34000	36000	27.3	27.4	27.5
35000	35.9	36.2	36.1	53.6	52.9	52.3	35000	37000	27.7	27.7	27.8
36000	34.6	34.7	34.8	53.1	52.7	52.5	36000	38000	25.9	26.3	26.7
37000	35.1	35.2	35.0	49.9	50.7	51.4	37000	39000	26.2	26.3	26.5
38000	36.2	36.2	35.9	45.2	46.3	47.4	38000	40000	25.1	25.4	25.5
39000	36.6	36.5	36.3	41.0	41.8	42.5	39000	41000	24.8	24.8	24.9
40000	38.0	38.1	38.0	38.3	39.1	39.8	40000	42000	24.1	24.2	24.1
42000	38.1	38.1	37.9	32.4	33.0	33.5	42000	44000	21.7	21.7	21.7
44000	38.3	38.2	38.1	28.0	28.4	28.7	44000	46000	20.1	20.1	20.1
46000	39.7	39.6	39.4	23.9	24.3	24.6	46000	48000	17.7	17.7	17.7
48000	42.1	41.9	41.8	21.7	22.0	22.4	48000	50000	16.5	16.6	16.7
50000	54.5	56.4	58.6	23.7	24.0	24.2	50000	52000	19.5	19.5	19.5
52000	51.3	49.9	48.7	25.7	25.7	25.8	52000	54000	22.4	22.4	22.3
54000	48.4	47.3	46.3	29.4	29.2	29.1	54000	56000	27.0	26.8	26.8
56000	44.7	44.2	43.8	28.7	28.5	28.4	56000	58000	26.1	26.1	26.1
58000	43.6	43.1	42.8	29.5	29.3	29.3	58000	60000	28.1	27.8	27.9
60000	44.0	43.4	43.0	31.9	31.6	31.5	60000	62000	29.5	29.8	29.7
62000	41.5	41.4	41.4	32.1	31.8	31.8	62000	64000	30.1	31.0	30.4
64900	38.4	38.6	38.7	30.2	30.2	30.0	64900	66900	38.7	39.3	39.8

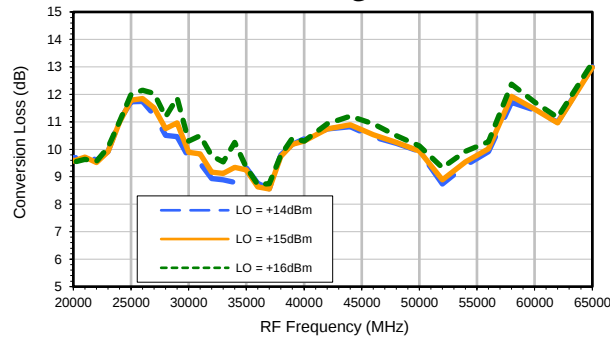
Wideband Double Balanced Mixer Die MDB-653H-D+

Typical Performance Data

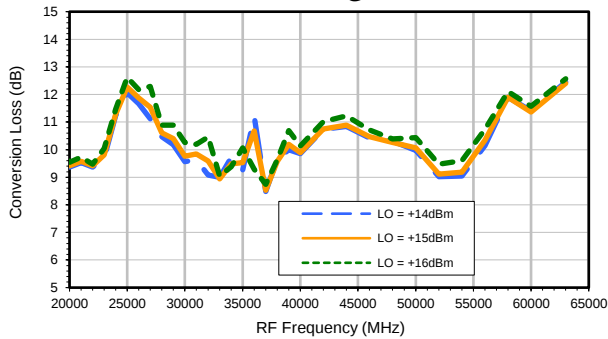
RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @ LO=2GHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+14	+15	+16		+14	+15	+16		+14	+15	+16
18000	20000	4.92	5.00	5.06	18000	5.69	5.20	4.89	10	1.07	1.04	1.01
19000	21000	3.31	3.52	3.63	19000	4.06	3.81	3.62	500	1.11	1.08	1.06
20000	22000	2.88	3.04	3.09	20000	3.07	2.97	2.90	1000	1.18	1.15	1.13
21000	23000	3.10	3.13	3.14	21000	2.57	2.54	2.52	2000	1.37	1.34	1.32
22000	24000	3.50	3.50	3.48	22000	2.41	2.38	2.37	3000	1.56	1.53	1.51
23000	25000	4.06	3.98	3.95	23000	2.32	2.32	2.35	4000	1.64	1.61	1.59
24000	26000	4.76	4.61	4.53	24000	2.03	2.09	2.14	5000	1.60	1.56	1.54
25000	27000	5.17	5.04	4.97	25000	1.80	1.89	1.96	6000	1.61	1.57	1.54
26000	28000	5.00	4.91	4.88	26000	1.58	1.68	1.74	7000	1.68	1.64	1.60
27000	29000	4.79	4.57	4.49	27000	1.55	1.61	1.64	8000	1.83	1.78	1.74
28000	30000	4.11	3.98	3.94	28000	1.63	1.64	1.65	9000	2.02	1.96	1.91
29000	31000	3.42	3.26	3.24	29000	1.78	1.75	1.72	10000	2.29	2.21	2.14
30000	32000	2.75	2.66	2.64	30000	1.89	1.82	1.78	11000	2.55	2.46	2.37
31000	33000	2.45	2.37	2.35	31000	1.91	1.82	1.77	12000	2.87	2.77	2.67
32000	34000	2.42	2.25	2.23	32000	2.00	1.87	1.79	13000	3.12	3.01	2.91
33000	35000	2.47	2.33	2.27	33000	2.03	1.90	1.81	14000	3.66	3.54	3.43
34000	36000	2.81	2.48	2.39	34000	2.26	2.12	2.02	15000	4.65	4.52	4.39
35000	37000	2.04	1.94	1.92	35000	2.88	2.61	2.44	16000	5.52	5.39	5.26
36000	38000	3.01	2.53	2.22	36000	3.27	3.01	2.83	17000	5.85	5.72	5.57
37000	39000	1.94	1.76	1.72	37000	5.08	4.08	3.83	18000	5.82	5.68	5.53
38000	40000	2.87	2.52	2.46	38000	7.98	5.59	5.01	19000	5.92	5.75	5.58
39000	41000	3.29	3.12	3.08	39000	7.12	5.12	4.62	20000	6.04	5.85	5.67
40000	42000	3.96	3.54	3.45	40000	5.64	4.25	3.89	21000	6.08	5.91	5.74
42000	44000	3.88	3.59	3.51	42000	3.68	3.00	2.83	22000	5.60	5.49	5.38
44000	46000	3.27	3.03	2.96	44000	3.70	2.91	2.67	23000	4.61	4.52	4.46
46000	48000	2.67	2.42	2.35	46000	2.96	2.51	2.36	24000	4.42	4.35	4.30
48000	50000	2.96	2.66	2.59	48000	3.62	2.94	2.76	25000	5.62	5.63	5.66
50000	52000	2.63	2.48	2.43	50000	3.76	3.06	2.86	26000	7.20	7.31	7.40
52000	54000	1.73	1.67	1.65	52000	2.24	2.00	1.94	27000	8.53	8.69	8.84
54000	56000	1.22	1.15	1.13	54000	2.19	1.86	1.77	---	---	---	---
56000	58000	1.72	1.68	1.66	56000	1.56	1.42	1.38	---	---	---	---
58000	60000	3.59	3.40	3.32	58000	1.90	1.70	1.63	---	---	---	---
60000	62000	3.19	2.96	2.85	60000	3.92	3.33	3.34	---	---	---	---
62000	64000	1.67	1.60	1.57	62000	3.20	2.77	2.62	---	---	---	---
64900	66900	6.17	5.30	5.04	65000	2.23	2.03	1.97	---	---	---	---

Typical Performance Curves

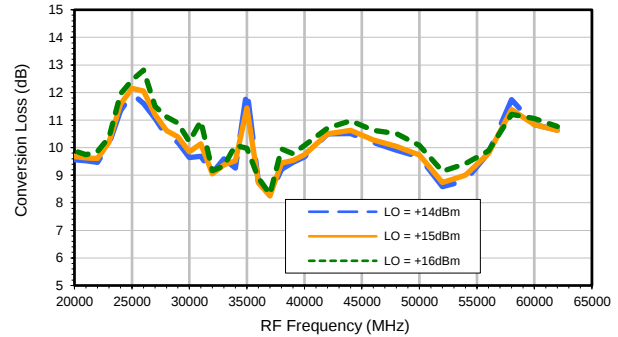
Conversion Loss @ IF=30 MHz



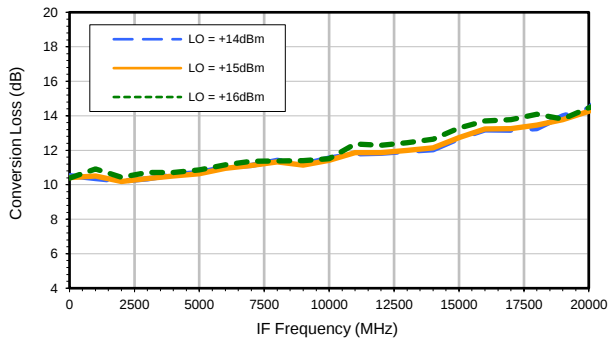
Conversion Loss @ IF=2GHz



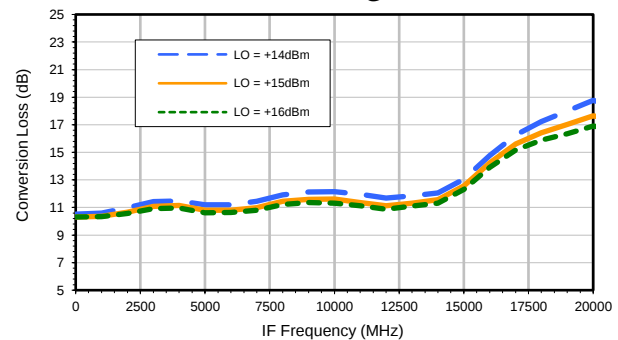
Conversion Loss @ IF=3GHz



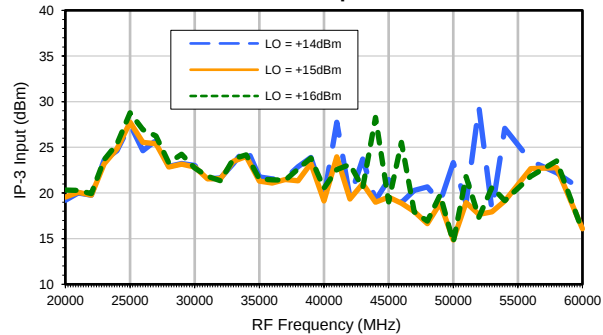
Conversion Loss vs. IF @ RF=40GHz



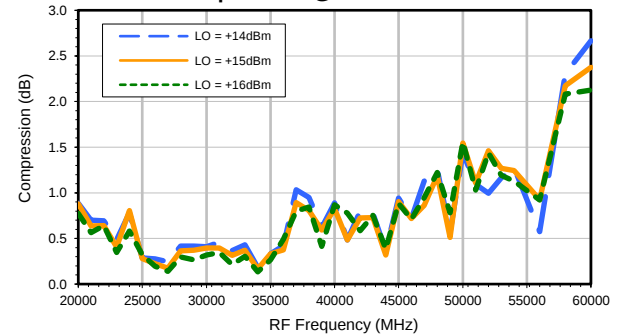
Conversion Loss vs. IF @ LO=40GHz



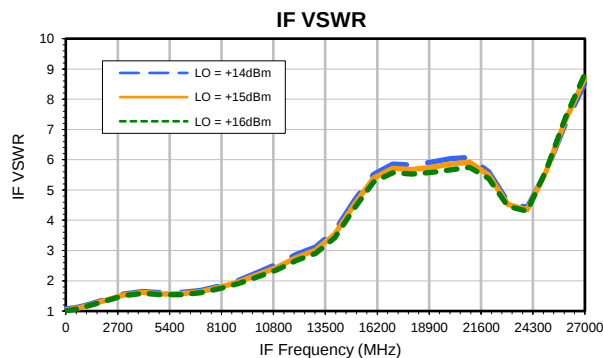
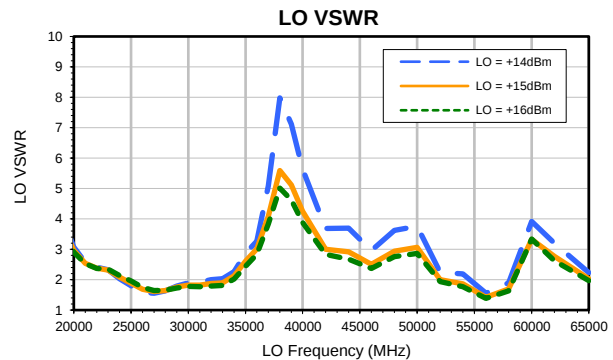
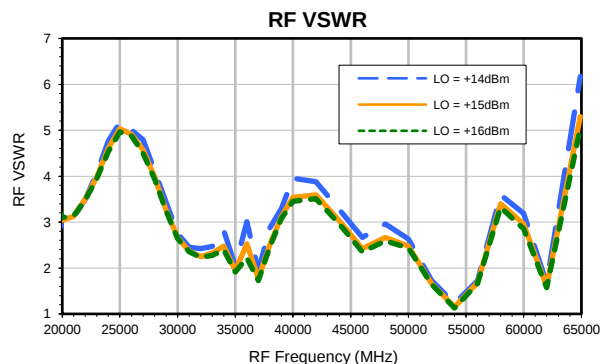
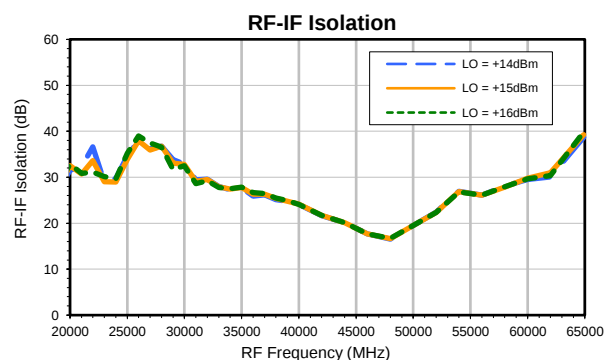
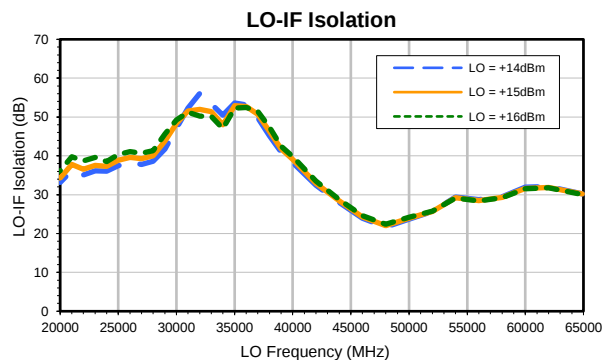
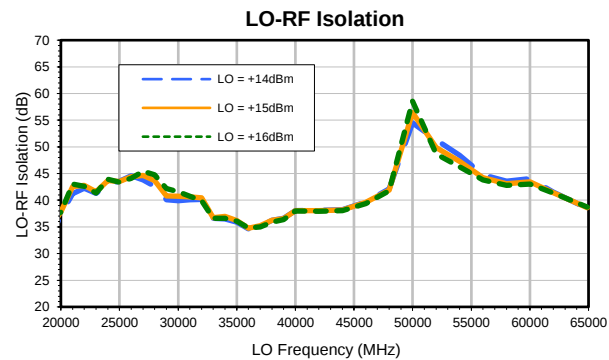
IP-3 Input



Compression @ RF IN=+10 dBm



Typical Performance Curves





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 -40° to 105° C or -55° to 105° C Ambient Environment	Refer to Individual Model Data Sheet
Storage Environment	20° to 35° C and 40 to 60% humidity (In Factory Shipped Package)	Individual Model Data Sheet