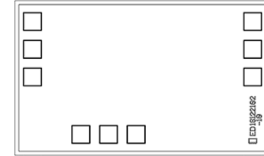
Wideband MMIC

Double Balanced Mixer Die

MDB-44H-D+

Level 15 (LO Power 15dBm) 10-40 GHz



The Big Deal

- High L-R Isolation, 37 dB typ
- Useable as Up & Down Converter

Product Overview

MDB-44H+ is an advanced wideband frequency mixer die fabricated using InGaP HBT technology with integrated LO and RF Baluns. It has repeatable performance making it suitable for volume production.

Key Features

Feature	Advantages
Double Balanced	Results in excellent LO-RF (30-39 dB typical) & LO-IF (27-37 dB typical) Isolations minimizing need for external filtering
Wide Bandwidth, 10 to 40 GHz	Useful in wideband systems or in in several narrowband systems. Reducing inventory
Wide IF Bandwidth DC-15 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.

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Product Features

- Wide bandwidth 10 to 40 GHz
- High L-R Isolation, 37 dB typ. at 25 GHz
- Useable as Up & Down Converter

Typical Applications

- Satellite up and down converters
- Defense radar & communication
- VSAT
- Line of sight links
- Federal fixed service
- 5G
- ISM

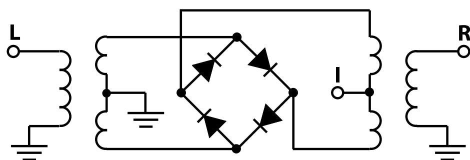
+RoHS Compliant
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Ordering Information: Refer to Last Page

General Description

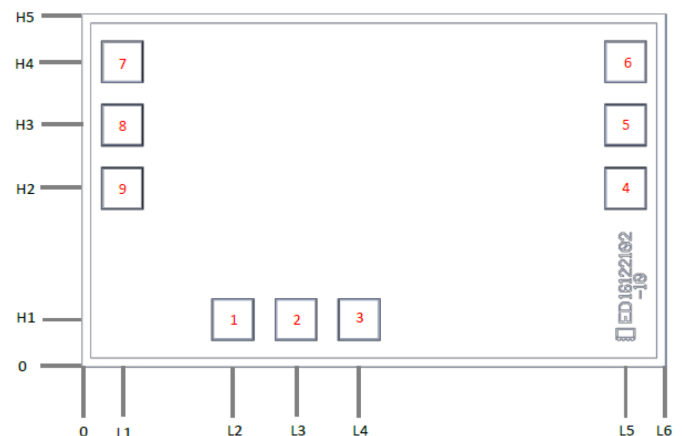
MDB-44H+ is an advanced wideband frequency mixer fabricated using InGaP HBT technology with integrated LO and RF Baluns. It has repeatable performance making it suitable for volume production.

Simplified Schematic and Pad Description



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

Bonding Pad Position



Dimensions in µm, Typical

L1	L2	L3	L4	L5	L6	H1	H2	H3	H4	H5	Thickness	Die Size	Bond pad #1 to #9 Size
95.5	358	508	658	1291	1386	113	424.5	574.5	724.5	838	100	1386 x 838	92 x 92

Electrical Specifications[1] at 25°C

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
RF Frequency Range		10		40	GHz
LO Frequency Range		10		40	GHz
IF Frequency Range		DC		15	GHz
LO Power			+15		dBm
Conversion Loss (at IF=30 MHz)	10 - 20		8.0		dB
	20 - 30		8.4		
	30 - 40		8.9		
LO-RF Isolation	10 - 20		39		
	20 - 30		37		
	30 - 40		30		
LO-IF Isolation	10 - 20		33		dB
	20 - 30		37		
	30 - 40		27		
RF-IF Isolation	10 - 20		24		dB
	20 - 30		16		
	30 - 40		31		
Input at 1dB Compression	10 - 40		10		dBm
Input IP3	10 - 20		20		dBm
Noise Figure	20		8.6		dB
Thermal Resistance (junction-to-ground lead)			105		°C/W

1. Die performance measured in industry standard 3x3mm, 12-lead package. See Characterization Test Circuit, Figure 1.

Absolute Maximum Ratings[2]

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 Circuit

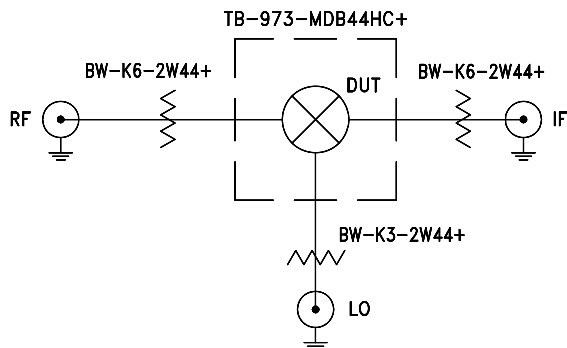


Figure 1A.
Block Diagram of Test Circuit used for characterization of Conversion

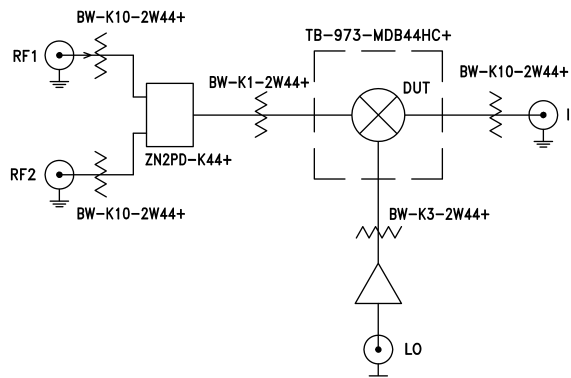


Figure 1B.
Block Diagram of Test Circuit used for characterization of Input IP3

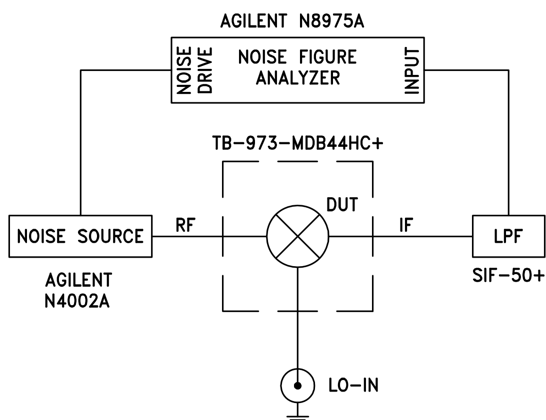
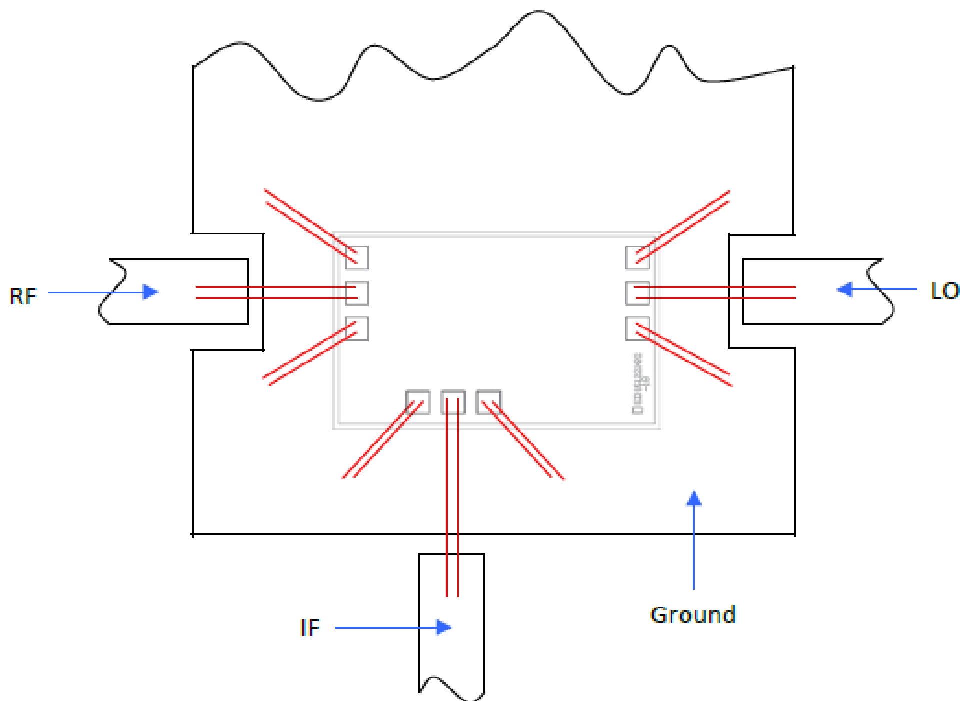


Figure 1C.
Block Diagram of Test Circuit used for characterization of Noise Figure

Figure 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-973-MDB44HC+). Conversion Loss, Isolations L-R, L-I & R-I, Input IP3 are measured using Agilent PSA E4448A 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

Assembly Diagram



Assembly and Handling Procedure

1. Storage
   Dice should be stored in a dry nitrogen purged desiccators or equivalent.
2. ESD
   MMIC 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 DieMat DM6030HK-PT/H579 or Ablestik 84-1LMISR4. 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

additional information is available on our dash board.

Performance Data	Data Table	
	Swept Graphs	
	S-Parameter (S3P Files)	
Case Style	Die	
Die Ordering and packaging information (Note 5)	Quantity, Package	Model No.
	Small, Gel - Pak: 5,10,50,100 KGD*	MDB-44H-DG+
	Medium†, Partial wafer: KGD*<1330	MDB-44H-DP+
	Large†, Full wafer	MDB-44H-DF+
	†**Available upon request contact sales representative** Refer to AN-60-067	
Environmental Ratings	ENV-80	

*Known Good Dice ("KGD") means that the dice are taken from PCM good wafer and visually inspected in question have been subjected to Mini-Circuits while this is not definitive, it does help to provide a higher degree of confidence that 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 3x3 mm, 12-lead MCLP package.

Additional Notes

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