MMIC BALUN

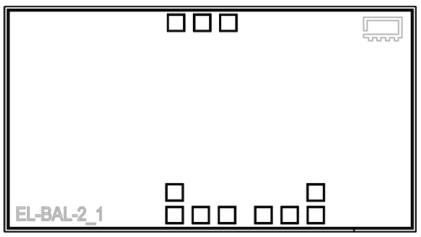
RF Transformer Die

MTX2-133-D+

50Ω 1500 to 13000 MHz

THE BIG DEAL

- Wideband, 1500 to 13000 MHz
- Low insertion loss, 1.9 dB typ. (above theoretical) at 7000 MHz
- Excellent Common Mode Rejection, 34 dB typ.



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

SEE ORDERING INFORMATION ON THE LAST PAGE

APPLICATIONS

- Cellular Infrastructure
- Instrumentation
- RADAR
- Satcom
- Electronic Warfare
- Mixers & Modulators

PRODUCT OVERVIEW

Mini-Circuits MTX2-133-D+ is a wideband MMIC balun transformer die with an impedance ratio of 1:2 applicable for a wide range of applications from 1500 to 13000 MHz. Fabricated using GaAs HBT process technology, this model provides outstanding repeatability with low insertion loss, low amplitude unbalance, low phase unbalance, and excellent common mode rejection.

KEY FEATURES

Feature	Advantages
Wideband, 1500 to 13000 MHz	MTX2-133-D+ supports a broad variety of applications including instrumentation, WLAN, WiMAX, WiBRO, ISM, radar and more.
Low insertion loss • 1.9 dB typ. (above theoretical) at 7000 MHz	Enables excellent signal power transmission from input to output.
Low unbalance • 0.3 dB typ. amplitude unbalance • 1.2° typ. phase unbalance	Low unbalance can improve a system's electromagnetic compatibility by rejecting unwanted common-mode noise.
Excellent Common Mode Rejection • 34 dB typ.	Enables rejection of undesired signals
Unpackaged Die	Enables the user to integrate the balun directly into hybrids.

REV. OR
ECO-010992
MTX2-133-D+
MCLNY
211207

ELECTRICAL SPECIFICATIONS[1] AT 25°C, 50Ω, UNLESS OTHERWISE NOTED.

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Impedance Ratio (secondary / primary)			2		
Frequency Range		1500		13000	MHz
Insertion Loss (Above 3 dB Theoretical)	1500-3000 3000-10000 10000-13000		2.3 1.9 2.9		dB
Amplitude Unbalance	1500-3000 3000-10000 10000-13000		0.6 0.2 0.4		dB
Phase Unbalance[2]	1500-3000 3000-10000 10000-13000		3.0 0.8 1.2		Degree
Common Mode Rejection Ratio	1500-3000 3000-10000 10000-13000		28 36 33		dB
Input Return Loss	1500-3000 3000-10000 10000-13000		11 14 17		dB

1. Measured on X-Microwave Die Characterization test board.
2. Relative to 180°

MAXIMUM RATINGS[3]

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Input RF Power	33 dBm at 25°C

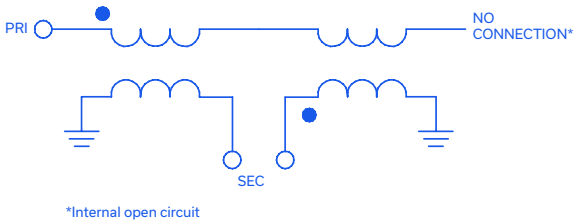
3. Permanent damage may occur if any of these limits are exceeded.

MMIC BALUN

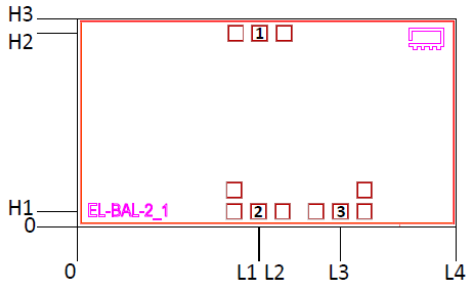
RF Transformer Die

MTX2-133-D+

SIMPLIFIED SCHEMATIC



BONDING PAD POSITION



PAD DESCRIPTION

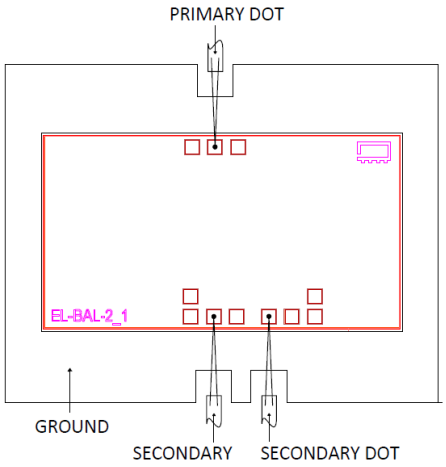
Pad Number	Description
1	Primary Dot
2	Secondary
3	Secondary Dot

DIE DIMENSIONS IN µm

L1	L2	L3	L4	H1	H2	H3
1131	1139	1643	2370	96	1207	1300

Thickness	Die Size	Pad Size 1,2 & 3
100	2370 x 1300	89 x 89

ASSEMBLY DIAGRAM



ASSEMBLY PROCEDURE

1. Storage
   Dice should be stored in a dry nitrogen purged desiccators or equivalent.

2. ESD
   MMIC GaAs HBT RF Transformer 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 worksta tion. 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 84-1 LMISR4 or equivalents. 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.

MMIC BALUN

RF Transformer Die

MTX2-133-D+

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD.

Performance Data	Data Table	
	Swept Graphs	
	S-Parameter (S3P Files) Data Set with and without port extension(.zip file)	
Case Style	Die	
Die Ordering and packaging information	Quantity, Package Small, Gel - Pak: 5,10,50,100 KGD* Medium†, Partial wafer: KGD*<672	Model No. MTX2-133-DG+ MTX2-133-DP+
	†Available upon request contact sales representative Refer to AN-60-067	
Environmental Ratings	ENV80	

*Known Good Dice ("KGD") means that the dice are taken from PCM good wafer and visually inspected. 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.

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 there in. 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

D. Mini-Circuits does not warrant the accuracy or completeness of the information, text, graphics and other items contained within this document and same are provided as an accommodation and on an As is basis, with all faults.

E. Purchasers of this part are solely responsible for proper storing, handling, assembly and processing of Known Good Dice (including, without limitation, proper ESD preventative measures, die preparation, die attach, wire bonding and related assembly and test activities), and Mini-Circuits assumes no responsibility therefor or for environmental effects on Known Good Dice.

F. Mini-Circuits and the Mini-Circuits logo are registered trademarks of Scientific Components Corporation d/b/a Mini-Circuits. All other third-party trademarks are the property of their respective owners. A reference to any third-party trademark does not constitute or imply any endorsement, affiliation, sponsorship, or recommendation by any such third-party of Mini-Circuits or its products.

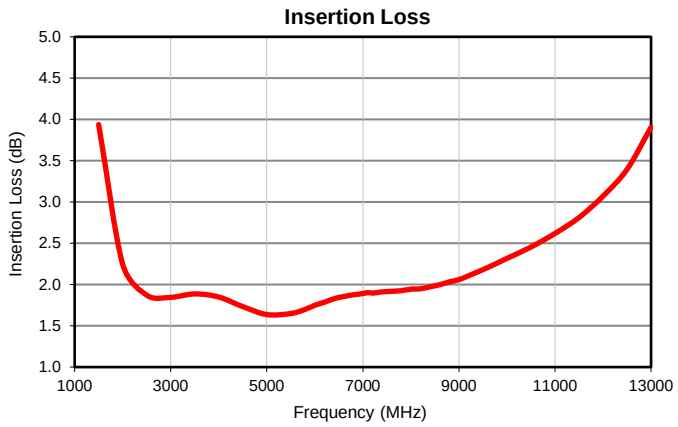
RF Transformer Die MTX2-133-D+

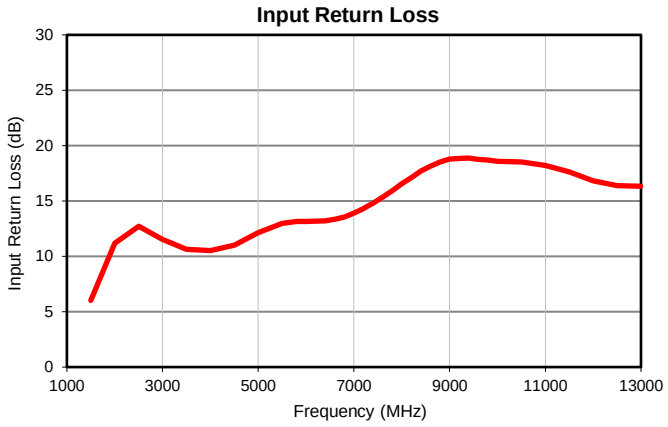
Typical Performance Data

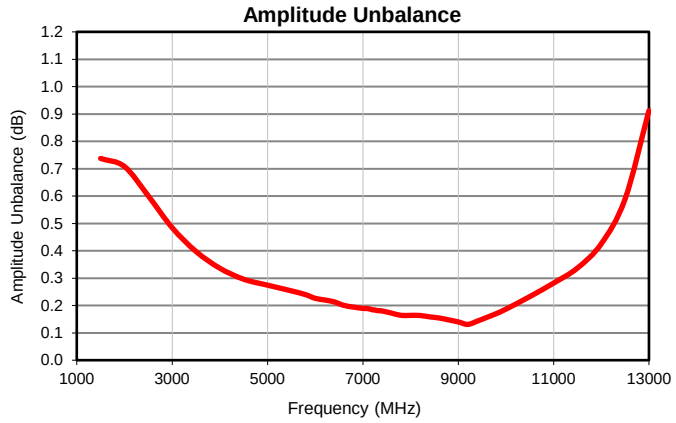
FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE[1] (deg.)	CMRR (dB)
1500	3.94	6.02	0.74	6.06	23.01
2000	2.25	11.19	0.71	3.30	26.68
2500	1.87	12.72	0.60	1.60	30.33
3000	1.85	11.53	0.48	0.74	31.95
3500	1.89	10.65	0.40	0.57	33.72
4000	1.85	10.51	0.34	0.60	33.78
4500	1.73	11.02	0.30	0.66	33.86
5000	1.64	12.13	0.27	0.66	35.56
5500	1.65	12.97	0.25	0.61	34.90
5800	1.70	13.14	0.24	0.60	36.64
6000	1.75	13.14	0.23	0.60	37.45
6200	1.79	13.17	0.22	0.59	38.28
6400	1.83	13.21	0.21	0.61	41.05
6600	1.85	13.37	0.20	0.63	42.78
6800	1.88	13.56	0.19	0.65	39.17
7000	1.89	13.91	0.19	0.65	38.23
7100	1.90	14.10	0.19	0.63	37.39
7200	1.90	14.32	0.18	0.64	37.04
7250	1.90	14.44	0.18	0.65	35.74
7300	1.90	14.57	0.18	0.66	34.56
7400	1.91	14.79	0.18	0.67	32.64
7600	1.92	15.35	0.17	0.71	36.41
7800	1.93	15.91	0.16	0.81	37.18
8000	1.94	16.55	0.16	0.94	36.61
8200	1.95	17.11	0.16	1.07	38.00
8400	1.97	17.72	0.16	1.18	38.80
8600	2.00	18.14	0.15	1.31	38.92
8800	2.03	18.53	0.15	1.39	39.13
9000	2.06	18.78	0.14	1.48	36.69
9200	2.11	18.85	0.13	1.53	36.29
9400	2.16	18.88	0.14	1.59	36.30
9600	2.21	18.75	0.16	1.62	35.36
9800	2.26	18.70	0.17	1.61	35.74
10000	2.32	18.58	0.19	1.56	34.68
10500	2.45	18.52	0.23	1.38	35.66
11000	2.62	18.22	0.28	1.17	32.69
11500	2.81	17.64	0.34	1.10	32.74
12000	3.07	16.82	0.43	1.11	34.62
12500	3.39	16.38	0.59	1.21	30.99
13000	3.90	16.34	0.91	1.50	25.71

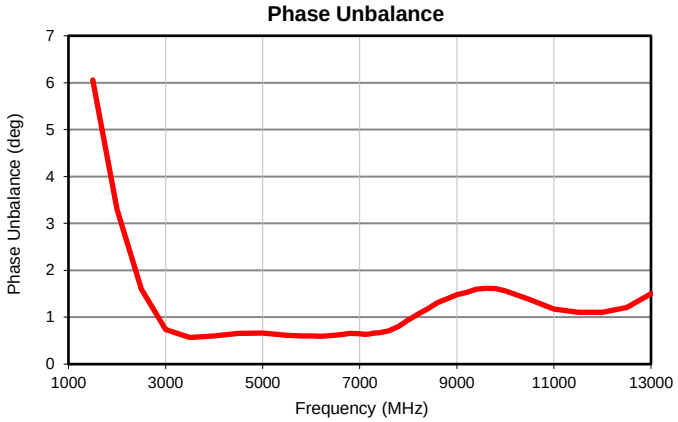
[1] Relative to 180°

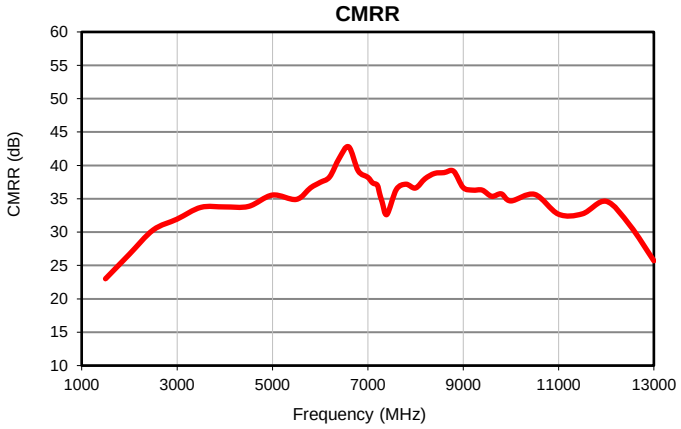
Typical Performance Data











Mini-Circuits

Environmental Specifications ENV80

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 or -45° to 105° C Ambient Environment	Refer to Individual Model Data Sheet
Storage Environment (Die)	-65° to 150°C	Individual Model Data Sheet
Storage Environment(Packaging)	-40° to 70°C and 40 to 60% humidity (In Factory Shipped Package)	