



MMIC BALUN

# RF Transformer Die

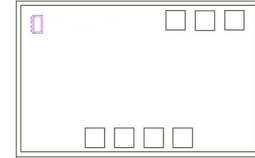
## MTX2-143-D+

Mini-Circuits

50Ω 5500 to 13500 MHz

### THE BIG DEAL

- Wideband, 5500 to 13500 MHz
- Low insertion loss, 0.8 dB to 11200 MHz
- Low unbalance, 1.0 dB, 4°
- Power handling up to +34 dBm



#### +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

- WiMAX/WiBRO
- ISM
- RADAR
- Satcom

### PRODUCT OVERVIEW

Mini-Circuits MTX2-143-D+ is a wideband MMIC balun transformer die with an impedance ratio of 2:1 covering a wide range of applications from 5500 to 13500 MHz. Fabricated using GaAs HBT process technology, this model provides outstanding repeatability with low insertion loss, low amplitude unbalance, low phase unbalance, and RF input power handling up to +34 dBm (2.5W).

### KEY FEATURES

Feature	Advantages
Wideband, 5500 to 13500 MHz	MTX2-143-D+ supports a broad variety of applications including WLAN, WiMAX, WiBRO, ISM, radar and more.
Low insertion loss • 0.8 dB, 5500 to 11200 MHz • 1.9 dB, 11200 to 13500 MHz	Enables excellent signal power transmission from input to output.
Low unbalance • 1.0 dB amplitude unbalance • 8° phase unbalance	Low unbalance can improve a system's electromagnetic compatibility by rejecting unwanted common-mode noise.
Unpackaged Die	Enables the user to integrate the balun directly into hybrids.

REV. A  
ECO-009930  
MTX2-143-D+  
RS/CP/AM  
092921



**ELECTRICAL SPECIFICATIONS<sup>1</sup> AT 25°C, 50Ω, UNLESS OTHERWISE NOTED.**

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Impedance Ratio (secondary / primary)			2		
Frequency Range		5500		13500	MHz
Insertion Loss <sup>2</sup>	5500 - 11200		0.8		dB
	11200 - 13500		1.3		
Amplitude Unbalance	5500 - 13500		1.0		dB
Phase Unbalance <sup>3</sup>	5500 - 13500		8		Degree

1. Measured on Mini-Circuits Characterization test board. Die is packaged in 3x3 mm, 12-lead MCL package and soldered on TB-900+.

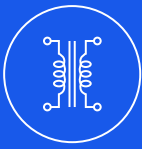
2. Insertion loss is referenced to mid-band loss, 1.5 dB.

3. Relative to 180°

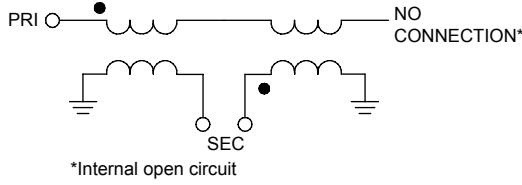
**ABSOLUTE MAXIMUM RATINGS**

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Input RF Power	34 dBm at 25°C

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

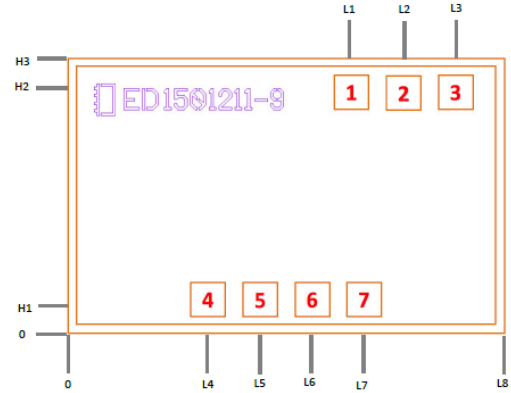


### SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Pad Number	Description
1,3,4,7	Ground
2	Primary DOT (Unbalanced)
5	Secondary DOT (Balanced)
6	Secondary (Balanced)

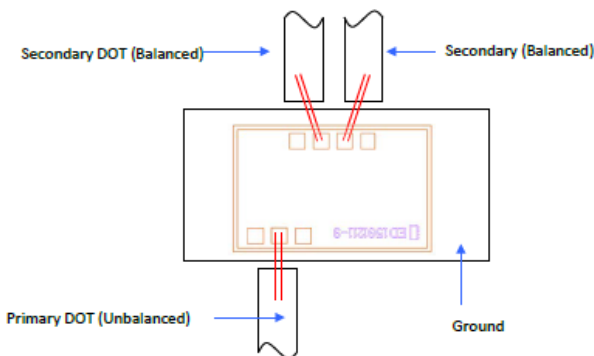
### BONDING PAD POSITION



### DIE DIMENSIONS IN $\mu\text{m}$

L1	L2	L3	L4	L5	L6	L7	L8	H1
815	965	1115	402	552	702	852	1254	96
H2	H3	Thickness		Die size		Bond pad #1 to #9 Size		
694	790	100		1254 x 790		92 x 92		

### ASSEMBLY DIAGRAM



### ASSEMBLY PROCEDURE

- Storage**  
Dice should be stored in a dry nitrogen purged desiccators or equivalent.
- ESD**  
MMIC GaAs HBT RF Transformer dice are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic protected material, which should be open in clean room conditions at an appropriately grounded anti-static workstation.
- Die Handling and Attachment**  
Devices need careful handling using correctly designed collets, it is recommended to handle the chip along the edges with a custom design collet. 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 periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer's cure condition. The surface of the chip has exposed air bridges and should not be touched with vacuum collet, tweezers or fingers.
- 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. Thermo-sonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1mil diameter. Bonds must be made from the bond pads on the die to the packaged 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 IS AVAILABLE ON OUR DASH BOARD.**

<b>Performance Data</b>	Data Table	
	Swept Graphs	
	S-Parameter (S3P Files) Data Set with and without port extension(.zip file)	
<b>Case Style</b>	Die	
<b>Die Ordering and packaging information</b>	Quantity, Package Small, Gel - Pak: 5,10,50,100 KGD* Medium†, Partial wafer: KGD*<1452 Large†, Full Wafer	Model No. MTX2-143-DG+ MTX2-143-DP+ MTX2-143-DF+
	†Available upon request contact sales representative Refer to AN-60-067	
<b>Environmental Ratings</b>	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.

**ESD RATING\*\***

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

\*\* Tested in industry standard 3 x 3mm, 12-lead MCLP package

**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.
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*Typical Performance Data*

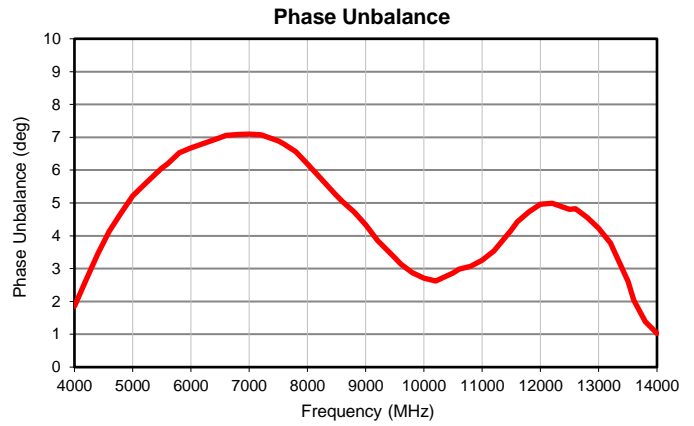
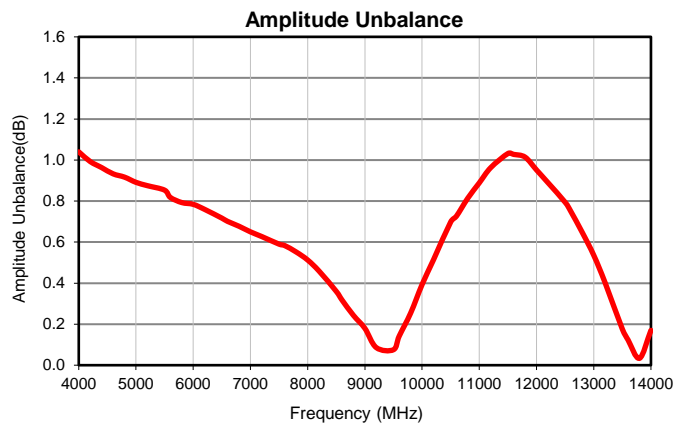
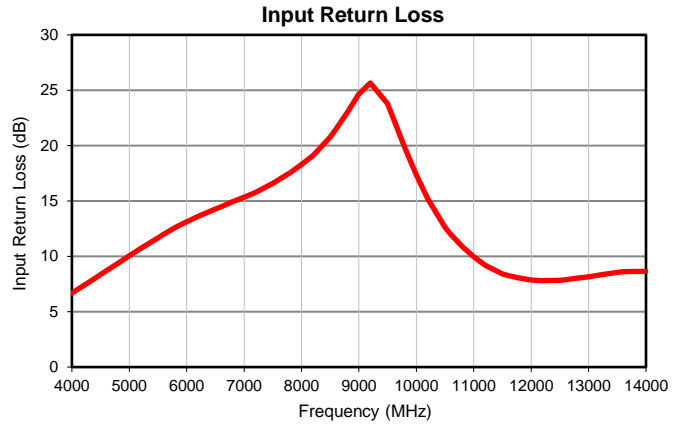
FREQUENCY (MHz)	INSERTION LOSS <sup>(1)</sup> (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE <sup>(2)</sup> (deg.)
4000	1.52	6.68	1.04	1.85
4200	1.29	7.33	0.99	2.67
4400	1.10	8.00	0.96	3.45
4600	0.93	8.69	0.93	4.14
4800	0.78	9.36	0.92	4.70
5000	0.65	10.06	0.89	5.21
5200	0.53	10.72	0.87	5.56
5500	0.38	11.66	0.85	6.07
5600	0.33	12.00	0.82	6.19
5800	0.25	12.59	0.79	6.53
6000	0.18	13.12	0.78	6.68
6200	0.12	13.61	0.76	6.81
6500	0.04	14.27	0.72	6.99
6600	0.01	14.49	0.70	7.05
6800	0.03	14.94	0.68	7.09
7000	0.06	15.36	0.65	7.10
7200	0.08	15.79	0.63	7.07
7500	0.11	16.60	0.59	6.89
7600	0.12	16.90	0.58	6.80
7800	0.13	17.53	0.55	6.55
8000	0.14	18.28	0.51	6.19
8200	0.14	19.11	0.46	5.80
8500	0.14	20.78	0.36	5.22
8600	0.13	21.51	0.32	5.04
8800	0.12	23.04	0.24	4.73
9000	0.13	24.65	0.18	4.34
9200	0.12	25.66	0.09	3.86
9500	0.09	23.79	0.08	3.34
9600	0.07	22.46	0.14	3.13
9800	0.03	19.79	0.25	2.87
10000	0.04	17.33	0.39	2.71
10200	0.13	15.17	0.51	2.63
10500	0.29	12.61	0.70	2.86
10600	0.35	11.98	0.73	2.98
10800	0.49	10.88	0.81	3.07
11000	0.63	9.96	0.89	3.25
11200	0.77	9.19	0.96	3.54
11500	0.95	8.42	1.03	4.17
11600	1.00	8.27	1.03	4.42
11800	1.09	8.02	1.01	4.73
12000	1.15	7.87	0.95	4.96
12200	1.20	7.79	0.89	4.99
12500	1.25	7.83	0.79	4.81
12600	1.26	7.88	0.75	4.82
12800	1.30	8.02	0.65	4.56
13000	1.34	8.16	0.54	4.23
13200	1.39	8.34	0.40	3.79
13500	1.51	8.57	0.18	2.61
13600	1.55	8.61	0.12	2.04
13800	1.66	8.65	0.03	1.39
14000	1.79	8.63	0.17	1.03

<sup>(1)</sup> Insertion Loss is referenced to mid-band loss, 1.5 dB

<sup>(2)</sup> Relative to 180°

Note: Testdata of Die packaged in 3x3 mm, 12-lead MCL package

## Typical Performance Data



Note: Testdata of Die packaged in 3x3 mm, 12-lead MCL package

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)	