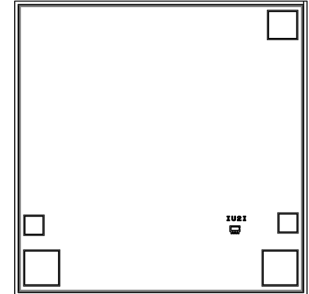


**THE BIG DEAL**

- Extremely Wideband, 1.5 to 20 GHz, Usable up to 28 GHz
- Very low insertion loss, 0.7 dB typ.
- Good return loss, 19 dB typ.
- Excellent Isolation, 48 dB typ.

**APPLICATIONS**

- Biasing Amplifiers
- Biasing laser diodes
- Biasing of active antennas

**+RoHS Compliant**

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

SEE ORDERING INFORMATION ON THE LAST PAGE

**PRODUCT OVERVIEW**

Mini-Circuits' MBT-283-D+ is an ultra-wideband MMIC surface mount bias tee die covering applications from 1.5 GHz to 20 GHz with low insertion loss, excellent return loss, and high DC-RF isolation over its entire frequency range. This model is capable of handling up to +30 dBm (1W) RF input power and DC input current up to 500mA.

**KEY FEATURES**

Feature	Advantages
Ultra-wideband, 1.5 to 20 GHz	Supports a wide range of applications with a single device, including biasing broadband amplifier, laser diodes, active antennas and more.
Low insertion loss, 0.7 dB	Preserves signal strength from input to output and minimizes overall system loss
Excellent return loss, 20 dB typ.	Provides excellent matching for 50Ω systems with minimal signal reflection.
RF power handling up to 1W	This model supports applications with a variety of power requirements.
Excellent DC-RF isolation <ul style="list-style-type: none"><li>• 50 dB, 1.5 to 10 GHz</li><li>• 48 dB, 10 to 20 GHz</li></ul>	Minimizes RF leakage and interference with other elements in the system.
Unpackaged Die	Enables users to integrate it directly into hybrids.



Mini-Circuits

MMIC WIDEBAND

# Bias Tee Die

**MBT-283-D+**

50Ω 1.5 to 20 GHz

## ELECTRICAL SPECIFICATIONS<sup>1</sup> AT +25°C, UNLESS NOTED OTHERWISE

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Frequency Range		1500		20000	MHz
Insertion Loss	1500 - 10000		0.7		dB
	10000 - 20000		0.7		
	20000 - 28000		2.1		
Isolation (RF Port to DC Port)	1500 - 10000		50		dB
	10000 - 20000		48		
	20000 - 28000		47		
Return Loss	1500 - 10000		19		dB
	10000 - 20000		18		
	20000 - 28000		8		
DC resistance from DC to RF & DC port			1.9		Ohm

1. Electrical specifications are measured Die Characterization Test Board

## ABSOLUTE MAXIMUM RATINGS<sup>2</sup>

Parameter	Ratings
Operating Temperature	-40°C to +85°C
RF Power	+30 dBm
Voltage at DC Port <sup>3</sup>	+35 V
Current at DC Port <sup>3</sup>	500 mA

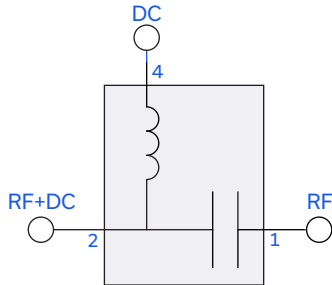
2. Permanent damage may occur if any of these limits are exceeded.

3. Die is packaged in 3.5 x 2.5mm, 16-lead MCLP package.





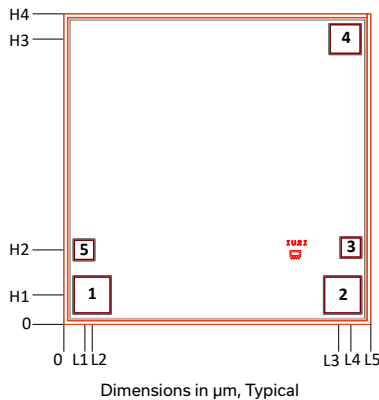
## SIMPLIFIED SCHEMATIC



## PAD CONNECTIONS

Pad Number	Description
1	RF PORT
2	RF+DC PORT
3,5 & Bottom of Die	GROUND
4	DC PORT

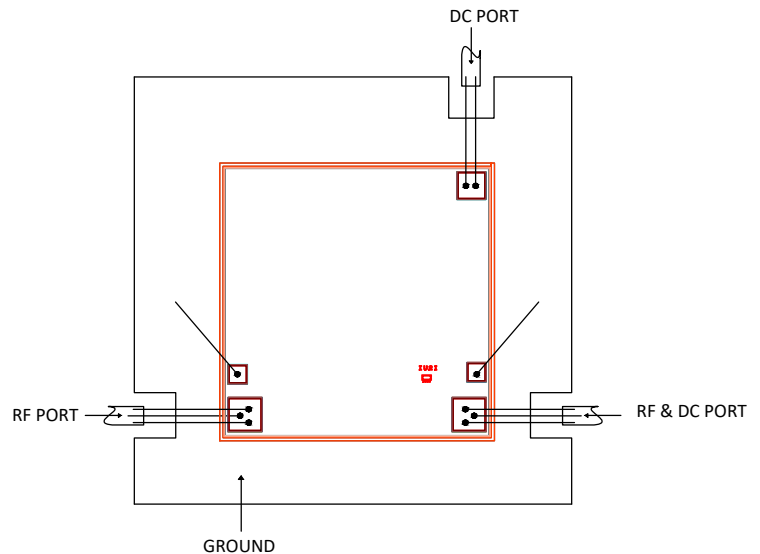
## BONDING PAD POSITION

Dimensions in  $\mu\text{m}$ , Typical

L1	L2	L3	L4	L5	H1	H2	H3	H4
85	119	1176	1211	1295	124	314	1204	1310

Thickness	Die size	Pad size 1&2	Pad size 3&5	Pad size 4
100	1295 x 1310	150 x 150	80 x 80	125 x 120

## ASSEMBLY DIAGRAM



## ASSEMBLY PROCEDURE

- Storage**  
Dice should be stored in a dry nitrogen purged desiccators or equivalent.
- ESD**  
MMIC bias-tee 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.
- Die Attach**  
The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are 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.
- 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.



Mini-Circuits

MMIC WIDEBAND

# Bias Tee Die

**MBT-283-D+**

50Ω 1.5 to 20 GHz

**ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD.**

Performance Data	Data Table	
	Swept Graphs	
	S-Parameter (S3P Files) Data Set with port extension (.zip file)	
Case Style	Die	
Die Ordering and packaging information	Quantity, Package	Model No.
	Small, Gel - Pak: 5,10,50,100 KGD*	MBT-283-DG+
	Medium†, Partial wafer: KGD*<1024	MBT-283-DP+
	†Available upon request contact sales representative	
Environmental Ratings	Refer to AN-60-067	
	ENV80	

\*Known Good Die ("KGD") means that the dice in question have been subjected to Mini-Circuits DC test performance criteria and measurement instructions and that the parametric data of such dice fall within a predefined range. While DC testing is not definitive, it does provide a higher degree of confidence that die are capable of meeting typical RF electrical parameters specified by Mini-Circuits.

## ESD RATING\*\*

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

\*\* Tested in 3.5x2.5mm, 16-lead MCLP package.

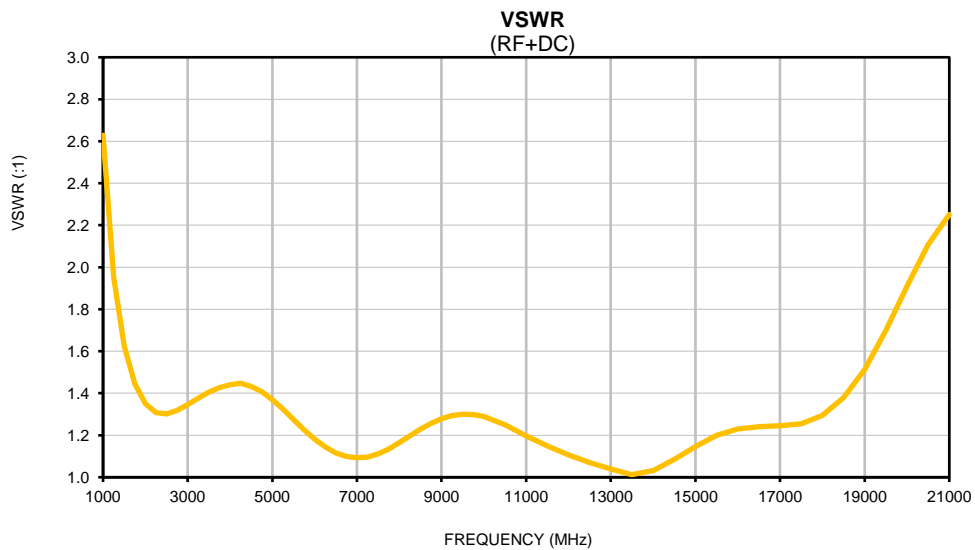
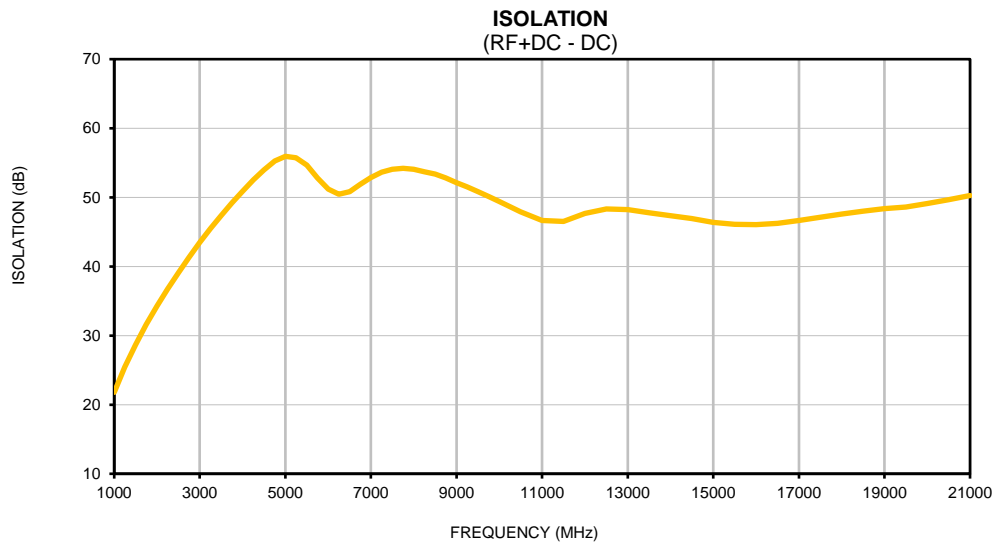
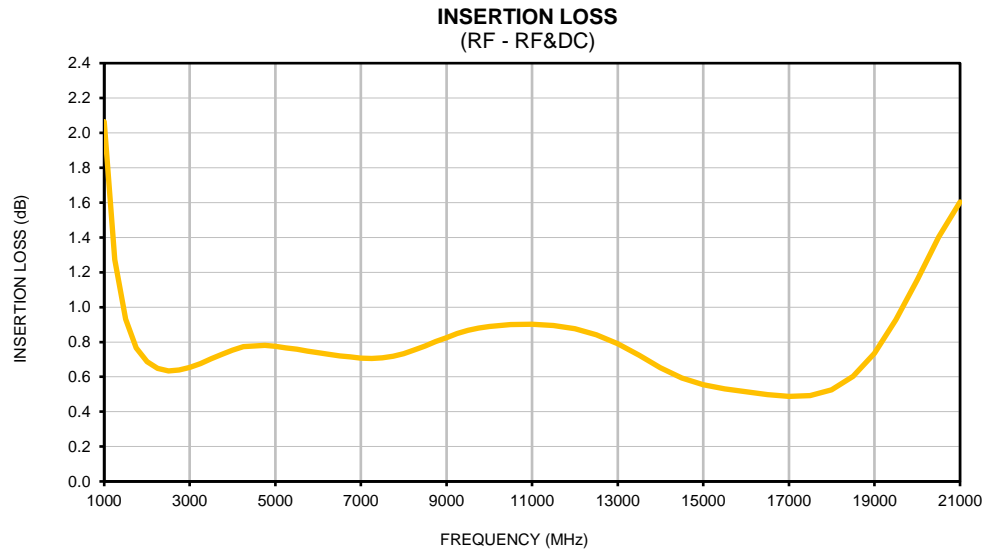
## NOTES

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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](http://www.minicircuits.com/MCLStore/terms.jsp)
- 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.
- 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.
- 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.



FREQ.	INSERTION LOSS RF - RF&DC	ISOLATION RF&DC - DC	VSWR RF&DC
(MHz)	(dB)	(dB)	(:1)
1000	2.06	21.78	2.63
1250	1.27	25.46	1.95
1500	0.93	28.70	1.62
1750	0.77	31.61	1.45
2000	0.69	34.27	1.35
2250	0.65	36.76	1.31
2500	0.63	39.09	1.30
2750	0.64	41.33	1.32
3000	0.65	43.46	1.35
3250	0.68	45.48	1.38
3500	0.70	47.37	1.41
3750	0.73	49.20	1.43
4000	0.75	50.87	1.44
4250	0.77	52.54	1.45
4500	0.78	53.97	1.43
4750	0.78	55.25	1.41
5000	0.77	55.94	1.37
5250	0.77	55.73	1.32
5500	0.76	54.67	1.27
5750	0.75	52.84	1.23
6000	0.74	51.22	1.18
6250	0.73	50.47	1.14
6500	0.72	50.83	1.12
6750	0.71	51.89	1.10
7000	0.71	52.84	1.09
7250	0.71	53.66	1.10
7500	0.71	54.09	1.11
7750	0.72	54.20	1.13
8000	0.73	54.07	1.16
8250	0.75	53.72	1.20
8500	0.78	53.36	1.23
8750	0.80	52.79	1.26
9000	0.83	52.12	1.28
9250	0.85	51.50	1.29
9500	0.87	50.84	1.30
9750	0.88	50.14	1.30
10000	0.89	49.37	1.29
10500	0.90	47.91	1.25
11000	0.90	46.64	1.20
11500	0.90	46.50	1.15
12000	0.88	47.70	1.11
12500	0.84	48.31	1.07
13000	0.79	48.23	1.04
13500	0.72	47.79	1.01
14000	0.65	47.33	1.03
14500	0.59	46.93	1.09
15000	0.55	46.40	1.15
15500	0.53	46.08	1.20
16000	0.51	46.04	1.23
16500	0.50	46.25	1.24
17000	0.49	46.64	1.25
17500	0.49	47.11	1.25
18000	0.52	47.58	1.29
18500	0.60	47.98	1.38
19000	0.74	48.37	1.51
19500	0.93	48.61	1.70
20000	1.16	49.09	1.91
20500	1.40	49.67	2.11
21000	1.60	50.26	2.25

## 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