MMIC WIDEBAND

Bias Tee Die

MBT-44-D+

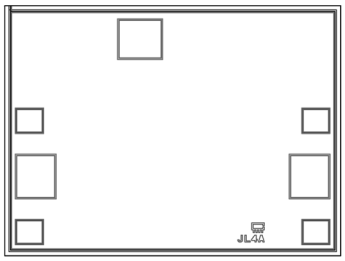
50Ω 10 to 40 GHz

THE BIG DEAL

- Ultra Wideband, 10-40 GHz
- Low Insertion Loss, 1 dB Typ.
- Good Return Loss, 15 dB Typ.
- Excellent Isolation, 46 dB Typ.

APPLICATIONS

- Biasing Amplifiers
- Biasing Laser Diodes
- Biasing of Active Antennas



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

SEE ORDERING INFORMATION ON THE LAST PAGE

PRODUCT OVERVIEW

Mini-Ciruits' MBT-44-D+ is an ultra-wideband MMIC bias tee die covering applications from 10 GHz to 40 GHz with low insertion loss, good return loss, and high DC-RF isolation over its entire operating frequency range. This model is capable of handling up to +30 dBm (1W) RF Input power and DC input current up to 500 mA.

KEY FEATURES

Feature	Advantages
Ultra-wideband, 10 to 40 GHz	Supports a wide range of applications with a single device, including biasing broadband amplifier, laser diodes, active antennas and more.
Excellent DC-RF isolation • 35 dB, 10-25 GHz • 43 dB, 25-30 GHz • 46 dB, 30-40 GHz	Minimizes RF Leakage and Interference with other elements in the system.
Good Return Loss, 15 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.
Low Insertion Loss, 1dB Typ.	Minimizes RF leakage and interference with other elements in the system.

REV. OR
ECO-010128
MBT-44-D+
MCL NY
211014

ELECTRICAL SPECIFICATIONS[1] AT 25°C, UNLESS NOTED

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Frequency Range		10000		40000	MHz
Insertion Loss	10000-25000	-	0.5	-	dB
	25000-30000	-	0.8	-	
	30000-35000	-	1.1	-	
	35000-40000	-	1.0	-	
Return Loss	10000-25000	-	24.4	-	dB
	25000-30000	-	17.9	-	
	30000-35000	-	13.1	-	
	35000-40000	-	15.3	-	
Isolation (RF Port to DC Port)	10000-25000	-	34.2	-	dB
	25000-30000	-	43.0	-	
	30000-35000	-	46.2	-	
	35000-40000	-	45.4	-	
DC resistance from DC to RF & DC port		-	1.3	-	Ohm

1. Die Model is packaged in 2.5x 2.5mm 8L MCLP and soldered on Mini-Circuits Test Board TB-MBT-44+. See Characterization Test Circuit. (Figure 1)

MAXIMUM RATINGS[2]

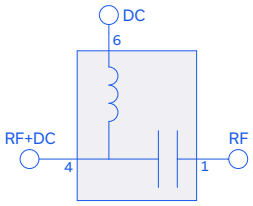
Parameter	Ratings
Operating Temperature	-40°C to 85°C
RF Power at DC & RF Port	30 dBm
Voltage at DC Port	35V
Current at DC Port	500 mA

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

Bias Tee Die

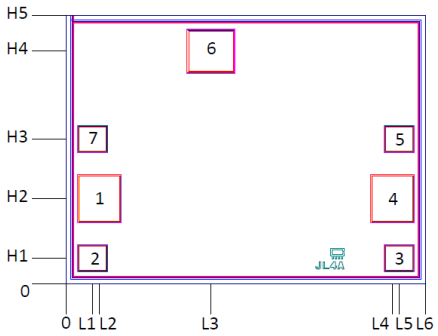
MBT-44-D+

SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pad Number	Description (Fig. 1)
RF	1	RF Pad
RF + DC	4	RF+DC Pad
DC	6	DC Pad, Connects DC Port Via C1
Ground	2,3,5,7 & Bottom of Die	Connects to Ground

BONDING PAD POSITION

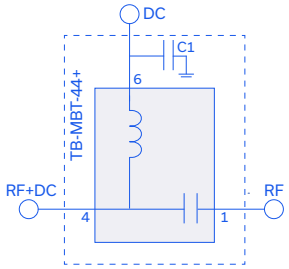


Dimensions in µm, Typical

L1	L2	L3	L4	L5	L6	H1	H2	H3	H4	H5
89	111	486	1094	1116	1205	85	285	485	780	900

Thickness	Die size	Pad size 1&4	Pad size 2,3,5,7	Pad size 6
100	1205 x 900	135 x 150	90 x 80	150 x 135

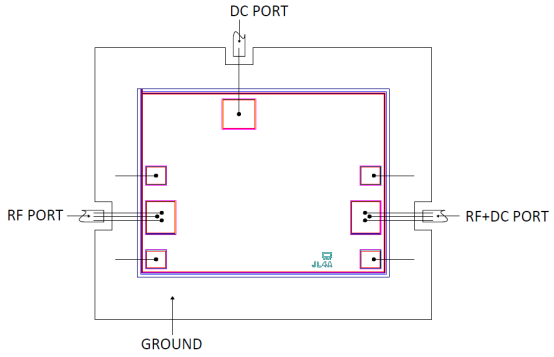
CHARACTERIZATION TEST & APPLICATION CIRCUIT



Component	Value	Size	Part Number	Manufacturer
C1	100pF	0402	GRM1555C1H101JA01D	Murata

Fig 1. Block Diagram of Test Circuit used for characterization. Die was packaged in 2.5 x 2.5mm 8L MCLP and soldered on Test Board TB-MBT-44+. Parameter to measure: Insertion Loss, Isolation, Return Loss Condition: Pin = 0 dBm

ASSEMBLY DIAGRAM



ASSEMBLY PROCEDURE

1. Storage
   Dice should be stored in a dry nitrogen purged desiccators or equivalent.
2. 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.
3. 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.
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. 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.

Bias Tee Die

MBT-44-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	Model No.
	Small, Gel - Pak: 5,10,50,100 KGD*	MBT-44-DG+
	Medium, Partial wafer: KGD*<1394	MBT-44-DP+
	Full wafer†	MBT-44-DF+
	†Available upon request contact sales representative	
	Refer to AN-60-067	
Environmental Ratings	ENV80	

*Known Good Die (KGD) means that the die 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 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 2.5x2.5mm, 8-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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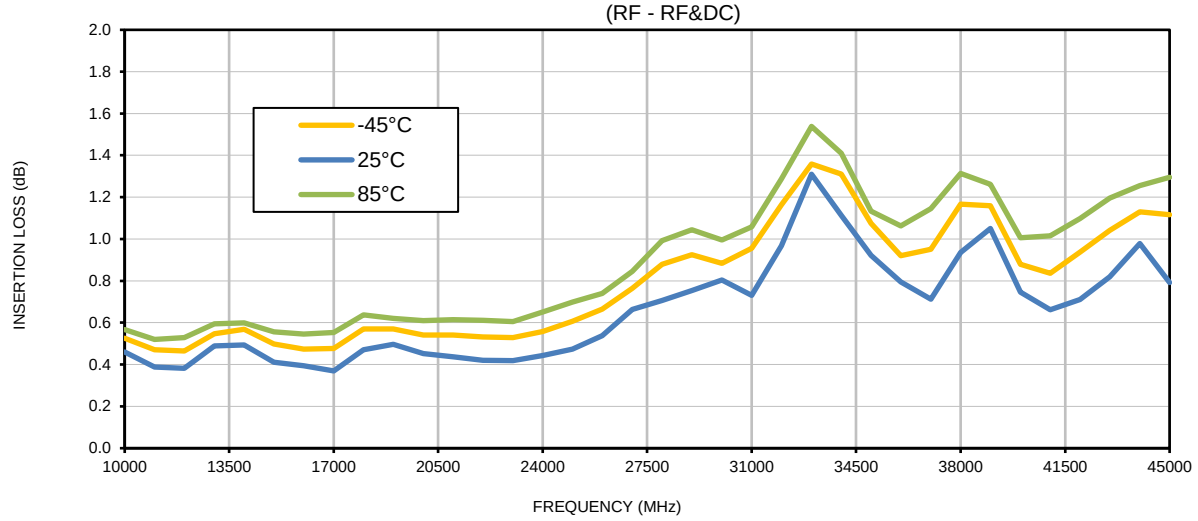
Typical Performance Curves

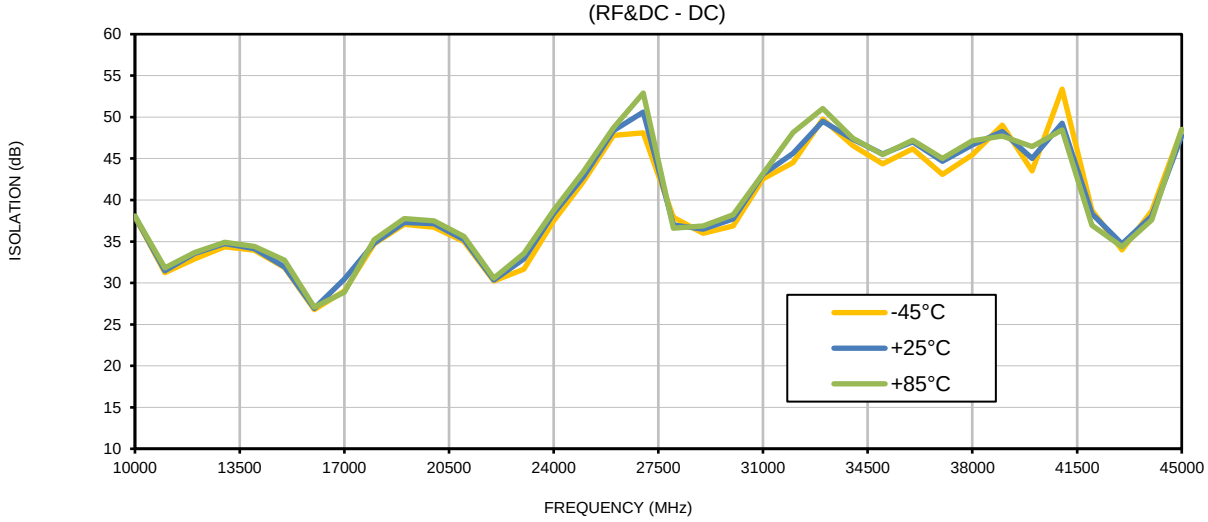
FREQ.	INSERTION LOSS RF - RF&DC (dB)			ISOLATION RF&DC - DC (dB)			VSWR RF&DC (:1)		
(MHz)	-45°C	25°C	85°C	-45°C	25°C	85°C	-45°C	25°C	85°C
10000	0.53	0.46	0.57	37.98	38.04	38.06	1.35	1.32	1.28
11000	0.47	0.39	0.52	31.24	31.45	31.81	1.11	1.12	1.12
12000	0.46	0.38	0.53	32.91	33.54	33.66	1.23	1.21	1.23
13000	0.55	0.49	0.59	34.36	34.76	34.90	1.39	1.33	1.29
14000	0.57	0.49	0.60	33.94	34.12	34.39	1.27	1.26	1.19
15000	0.50	0.41	0.56	31.87	31.95	32.74	1.09	1.09	1.10
16000	0.47	0.39	0.55	26.78	26.93	27.07	1.05	1.04	1.06
17000	0.48	0.37	0.55	29.03	30.47	28.90	1.10	1.12	1.13
18000	0.57	0.47	0.64	34.71	34.78	35.22	1.27	1.26	1.25
19000	0.57	0.50	0.62	37.08	37.30	37.78	1.30	1.23	1.18
20000	0.54	0.45	0.61	36.72	37.13	37.48	1.11	1.11	1.11
21000	0.54	0.44	0.61	34.98	35.20	35.59	1.16	1.13	1.14
22000	0.53	0.42	0.61	30.24	30.35	30.57	1.10	1.09	1.09
23000	0.53	0.42	0.60	31.68	32.89	33.54	1.09	1.06	1.03
24000	0.56	0.44	0.65	37.51	38.38	38.78	1.11	1.07	1.12
25000	0.61	0.47	0.70	42.23	42.82	43.43	1.14	1.15	1.19
26000	0.67	0.54	0.74	47.80	48.36	48.71	1.19	1.21	1.18
27000	0.76	0.66	0.85	48.10	50.61	52.90	1.38	1.31	1.27
28000	0.88	0.71	0.99	37.92	36.98	36.59	1.45	1.47	1.48
29000	0.92	0.75	1.04	35.98	36.48	36.86	1.52	1.52	1.53
30000	0.88	0.80	0.99	36.88	37.71	38.23	1.53	1.42	1.41
31000	0.96	0.73	1.06	42.54	43.07	43.14	1.36	1.41	1.36
32000	1.16	0.97	1.29	44.53	45.63	48.13	1.54	1.56	1.54
33000	1.36	1.31	1.54	49.76	49.51	51.02	1.99	1.79	1.84
34000	1.31	1.11	1.41	46.56	47.33	47.43	1.76	1.74	1.71
35000	1.08	0.92	1.13	44.37	45.54	45.50	1.50	1.48	1.36
36000	0.92	0.79	1.06	46.19	47.00	47.23	1.41	1.30	1.28
37000	0.95	0.71	1.15	43.10	44.67	45.03	1.32	1.38	1.46
38000	1.17	0.94	1.31	45.44	46.63	47.13	1.61	1.60	1.61
39000	1.16	1.05	1.26	49.04	48.27	47.72	1.69	1.53	1.46
40000	0.88	0.75	1.01	43.50	45.00	46.45	1.27	1.19	1.10
41000	0.84	0.66	1.01	53.37	49.25	48.43	1.17	1.11	1.17
42000	0.94	0.71	1.10	38.75	38.35	36.94	1.13	1.15	1.18
43000	1.04	0.82	1.20	33.97	34.71	34.35	1.20	1.14	1.14
44000	1.13	0.98	1.26	38.69	38.05	37.59	1.32	1.14	1.09
45000	1.12	0.79	1.30	48.44	47.75	48.52	1.12	1.15	1.16

Typical Performance Curves

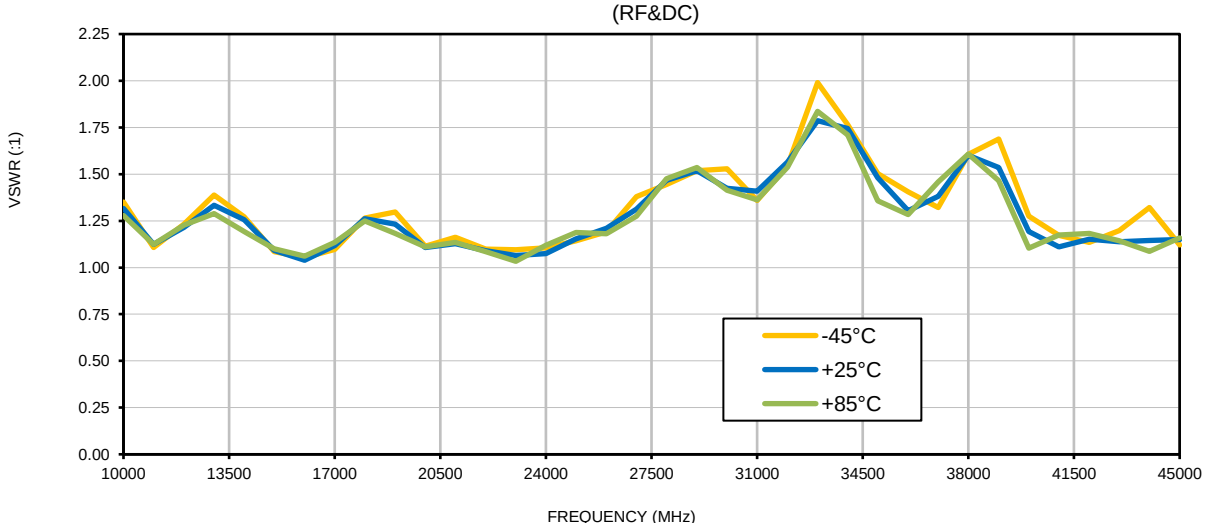
INSERTION LOSS
(RF - RF&DC)



ISOLATION
(RF&DC - DC)



VSWR
(RF&DC)



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)	

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