

High Power Bi-Directional Coupler

50Ω 20dB Coupling DC Pass 5000 to 6000 MHz

MBD-20-63HP+



Generic photo used for illustration purposes only

CASE STYLE: JM1360

+RoHS Compliant

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

Maximum Ratings

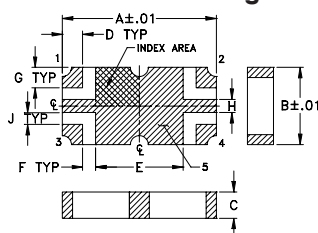
*Operating Temperature, Case	-55°C to 100°C
Storage Temperature	-55°C to 100°C
DC Current	1A

* Case temperature is defined as temperature on ground leads.
Permanent damage may occur if any of these limits are exceeded.

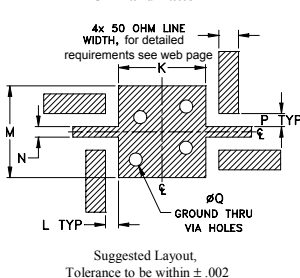
Pin Connections

INPUT	1
OUTPUT	2
COUPLED (forward)	3
COUPLED (reverse)	4
GROUND	5

Outline Drawing



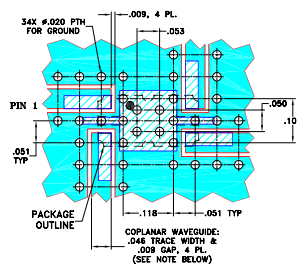
PCB Land Pattern



Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H
.236	.118	.040	.031	.134	.020	.031	.020
5.99	3.00	1.02	0.79	3.40	0.51	0.79	0.51
J	K	L	M	N	P	Q	wt
.018	.134	.020	.140	.016	.020	.020	grams
0.46	3.40	0.51	3.56	0.41	0.51	0.51	0.04

Demo Board MCL P/N: TB-482+ Suggested PCB Layout (PL-291)



- NOTES: 1. TRACE WIDTH IS SHOWN FOR OAK-602 WITH DIELECTRIC THICKNESS .022" ± .0015". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
3. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
4. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

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 therein. 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

Features

- high power handling, 20 watts typ.
- low mainline loss, 0.18 dB typ.
- excellent VSWR, 1.10:1 typ.
- excellent directivity, 20 dB typ.
- wideband frequency, 4000 to 7000 MHz

Applications

- instrumentation
- ISM, WiMAX
- defense communications
- federal communications
- fixed satellite

Bi-Directional Coupler Electrical Specifications at 25°C

FREQ. (MHz)	COUPLING (dB)		MAINLINE LOSS ¹ (dB)		DIRECTIVITY (dB)		VSWR (:1)	POWER ² INPUT (W)
	Nom.	Flatness	Typ.	Max.	Typ.	Min.		
f _L -f _U								
5000-6000	20±0.5	±0.4	0.18	0.25	20	14	1.10	20

1. Mainline loss includes theoretical power loss at coupled port and does not include test fixture thru loss.

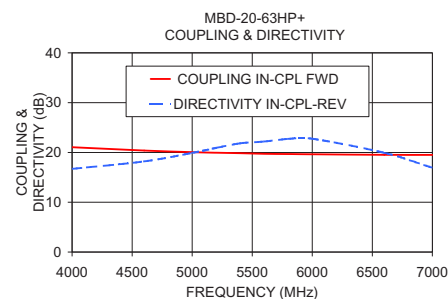
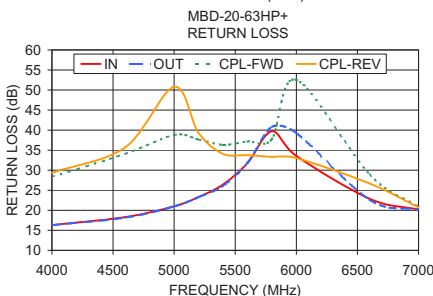
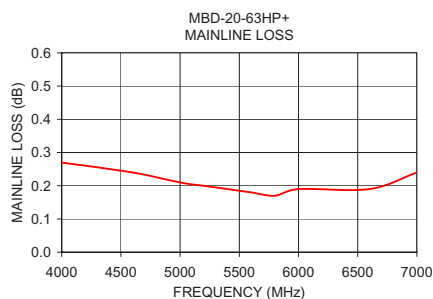
2. The user must provide adequate means of heat removal to limit the temperature of ground connection 5 to 100°C, in order to ensure proper performance. At 25°C ambient temperature this requires thermal resistance of the user's PC board heat sink to be 70°C/W or less when the unit is driven at maximum specified RF input power, 20W. At higher ambient temperature, with the same heat sink, input power in watts must not exceed 20W x (100°C - T_{AMBIENT}) ÷ 75°C.

All measurements done with Agilent 4-port PNA Analyzer (Model N5230A), with calibration done using E-CAL (Model N4433A) with port extension.

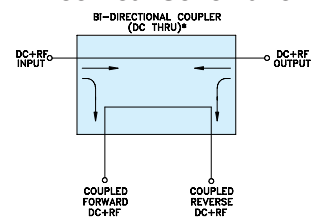
Typical Performance Data

Frequency (MHz)	Mainline Loss* (dB)	Coupling (dB)		Directivity (dB)		Return Loss (dB)			
	In-Out	In-Cpl Fwd	Out-Cpl Rev	Out-Cpl Fwd	In-Cpl Rev	In	Out	Cpl Fwd	Cpl Rev
4000.00	0.27	21.06	21.10	20.20	16.70	16.30	16.28	28.35	29.32
4600.00	0.24	20.39	20.45	24.73	18.19	18.30	18.14	34.08	35.71
5000.00	0.21	20.06	20.10	27.03	19.91	20.98	20.96	38.78	50.81
5200.00	0.20	19.94	19.94	27.05	20.91	23.32	23.28	37.66	39.28
5400.00	0.19	19.85	19.84	26.30	21.84	26.43	26.07	36.34	34.07
5600.00	0.18	19.73	19.72	23.89	22.19	31.76	31.82	37.16	33.74
5800.00	0.17	19.68	19.65	21.76	22.72	39.73	40.80	37.76	33.32
6000.00	0.19	19.63	19.61	20.27	22.76	33.56	39.28	52.55	33.03
6600.00	0.19	19.52	19.41	16.62	19.93	22.87	22.61	28.93	26.69
7000.00	0.24	19.51	19.41	14.18	16.94	20.19	20.12	20.85	20.72

*Data shown includes test fixture thru loss.



Electrical Schematic



* ELECTRICAL SCHEMATIC IS FOR BI-DIRECTIONAL COUPLER WITHOUT INTERNAL TRANSFORMERS AND RESISTORS.

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REV. A
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200814

Bi-Directional Coupler

MBD-20-63HP+

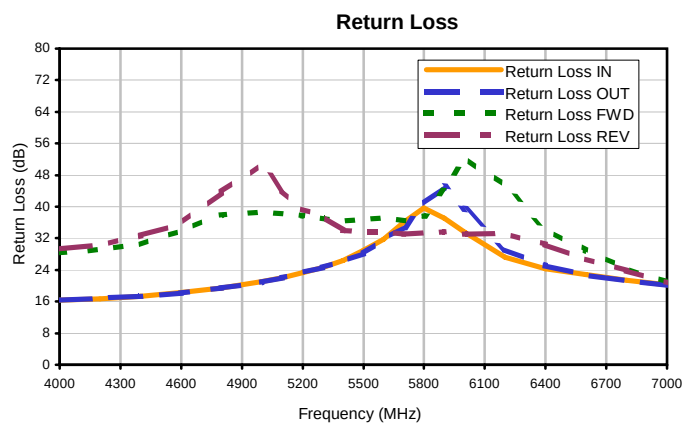
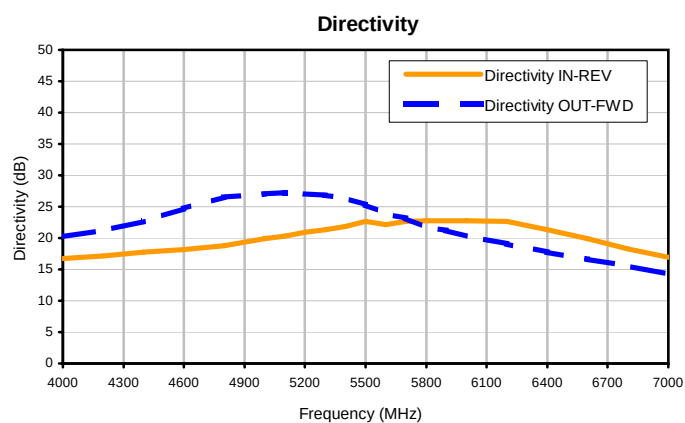
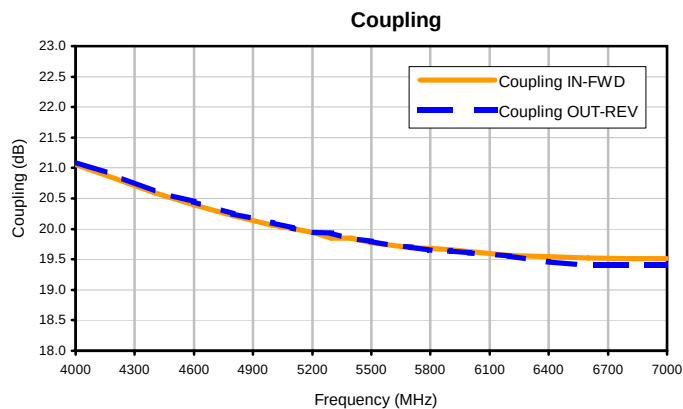
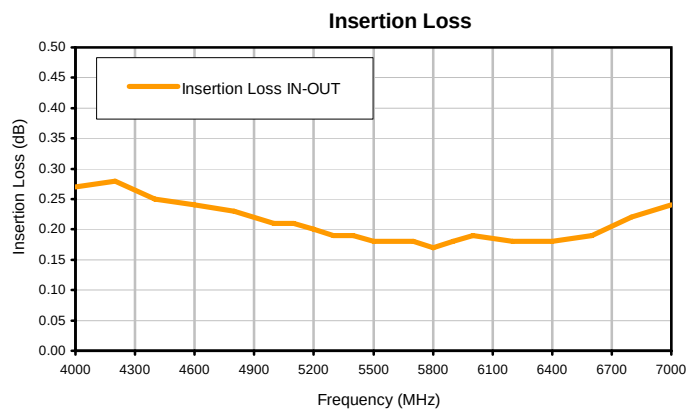
Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)	COUPLING (dB)		DIRECTIVITY (dB)		RETURN LOSS (dB)			
	IN-OUT	IN-FWD	OUT-REV	IN-REV	OUT-FWD	IN	OUT	FWD	REV
4000.0	0.27	21.06	21.10	16.70	20.20	16.30	16.28	28.35	29.32
4200.0	0.28	20.83	20.88	17.17	21.25	16.69	16.77	29.09	30.35
4400.0	0.25	20.59	20.62	17.76	22.66	17.38	17.27	30.50	32.74
4600.0	0.24	20.39	20.45	18.19	24.73	18.30	18.14	34.08	35.71
4800.0	0.23	20.22	20.25	18.76	26.51	19.47	19.36	37.87	43.69
5000.0	0.21	20.06	20.10	19.91	27.03	20.98	20.96	38.78	50.81
5100.0	0.21	20.01	20.02	20.27	27.28	21.97	22.06	38.14	44.17
5200.0	0.20	19.94	19.94	20.91	27.05	23.32	23.28	37.66	39.28
5300.0	0.19	19.85	19.93	21.30	26.88	24.63	24.59	37.16	37.66
5400.0	0.19	19.85	19.84	21.84	26.30	26.43	26.07	36.34	34.07
5500.0	0.18	19.78	19.80	22.68	25.29	28.97	28.13	36.73	33.61
5600.0	0.18	19.73	19.72	22.19	23.89	31.76	31.82	37.16	33.74
5700.0	0.18	19.69	19.70	22.69	23.14	36.11	34.76	36.37	33.03
5800.0	0.17	19.68	19.65	22.72	21.76	39.73	40.80	37.76	33.32
5900.0	0.18	19.66	19.64	22.75	21.20	37.01	45.03	44.03	33.71
6000.0	0.19	19.63	19.61	22.76	20.27	33.56	39.28	52.55	33.03
6200.0	0.18	19.57	19.55	22.62	19.07	27.15	29.21	45.38	33.21
6400.0	0.18	19.54	19.46	21.30	17.77	24.23	25.03	34.14	30.43
6600.0	0.19	19.52	19.41	19.93	16.62	22.87	22.61	28.93	26.69
6800.0	0.22	19.51	19.41	18.28	15.63	21.39	21.23	24.27	23.88
7000.0	0.24	19.51	19.41	16.94	14.18	20.19	20.12	20.85	20.72

Bi-Directional Coupler

MBD-20-63HP+

Typical Performance Curves



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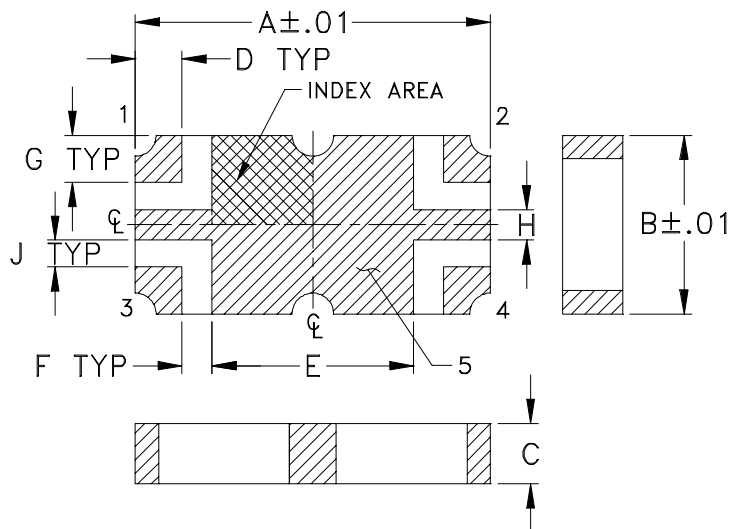
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINICIRCUITS At: www.minicircuits.com

RF/MICROWAVE COMPONENTS

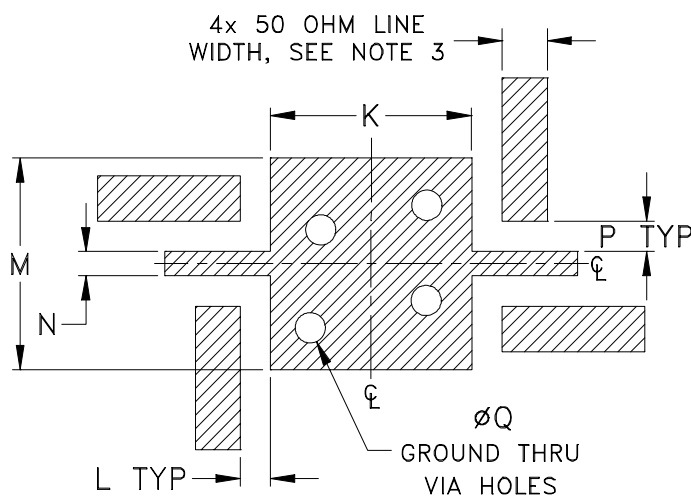
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MBD-20-63HP+
12/30/2008
Page 1 of 1

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	WT. GRAM
JM1360	.236 (5.99)	.118 (3.00)	.040 (1.02)	.031 (0.79)	.134 (3.40)	.020 (0.51)	.031 (0.79)	.020 (0.51)	.018 (0.46)	.134 (3.40)	.020 (0.51)	.140 (3.56)	.016 (0.41)	.020 (0.51)	.020 (0.51)	.04

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .01$; 3 Pl. $\pm .005$

Notes:

1. Open style, ceramic base.
2. Termination finish: 2-4 μ inch (.05-.10 microns) Gold over 110-140 μ inch (2.79-3.56 microns) Nickel plate.
3. 50 Ohm line width (micro strip feed line) depends on the material and the thickness of PCB.
e.g. If the PCB is made from FR4 having dielectric constant 4.4 and its thickness is .016 (.4mm)
The 50 Ohm line width results into .03 (.76mm).
4. Top and bottom view are same.



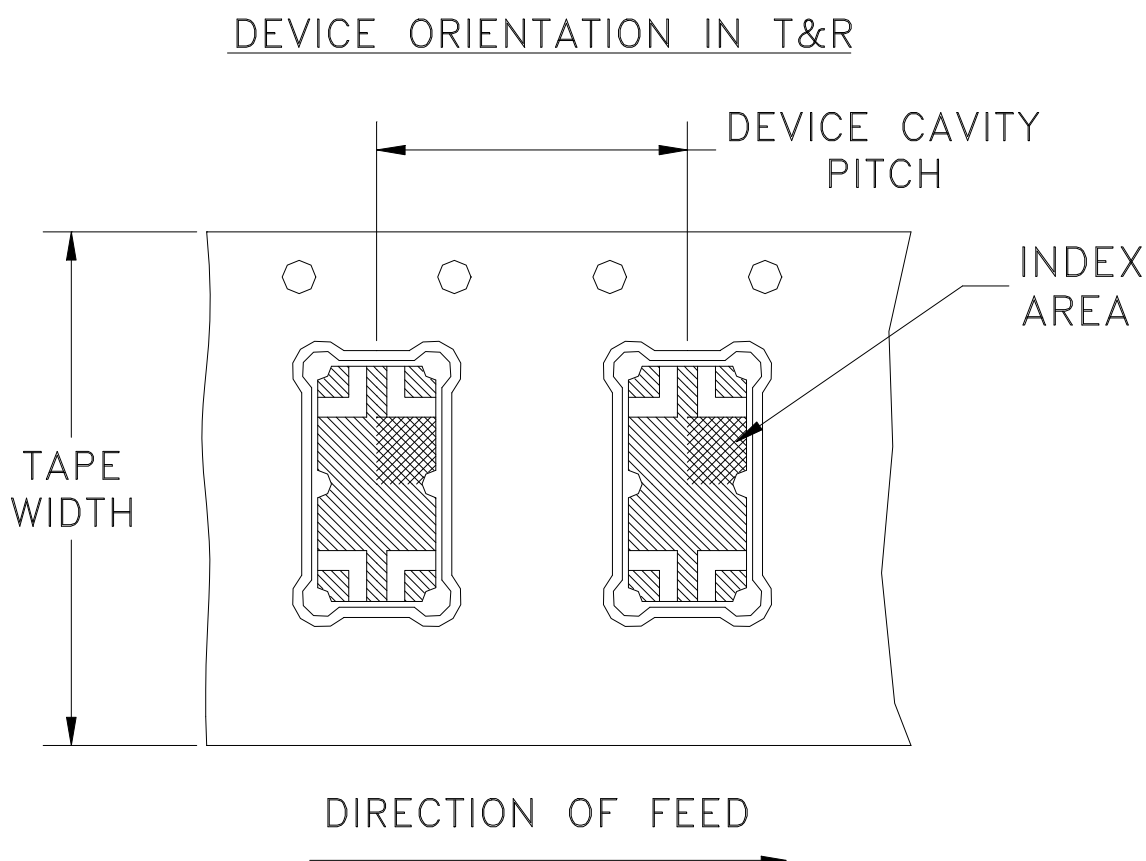
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Tape & Reel Packaging TR-F92



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
16	8	7	1000

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf



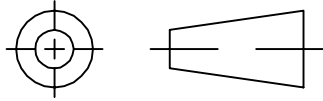
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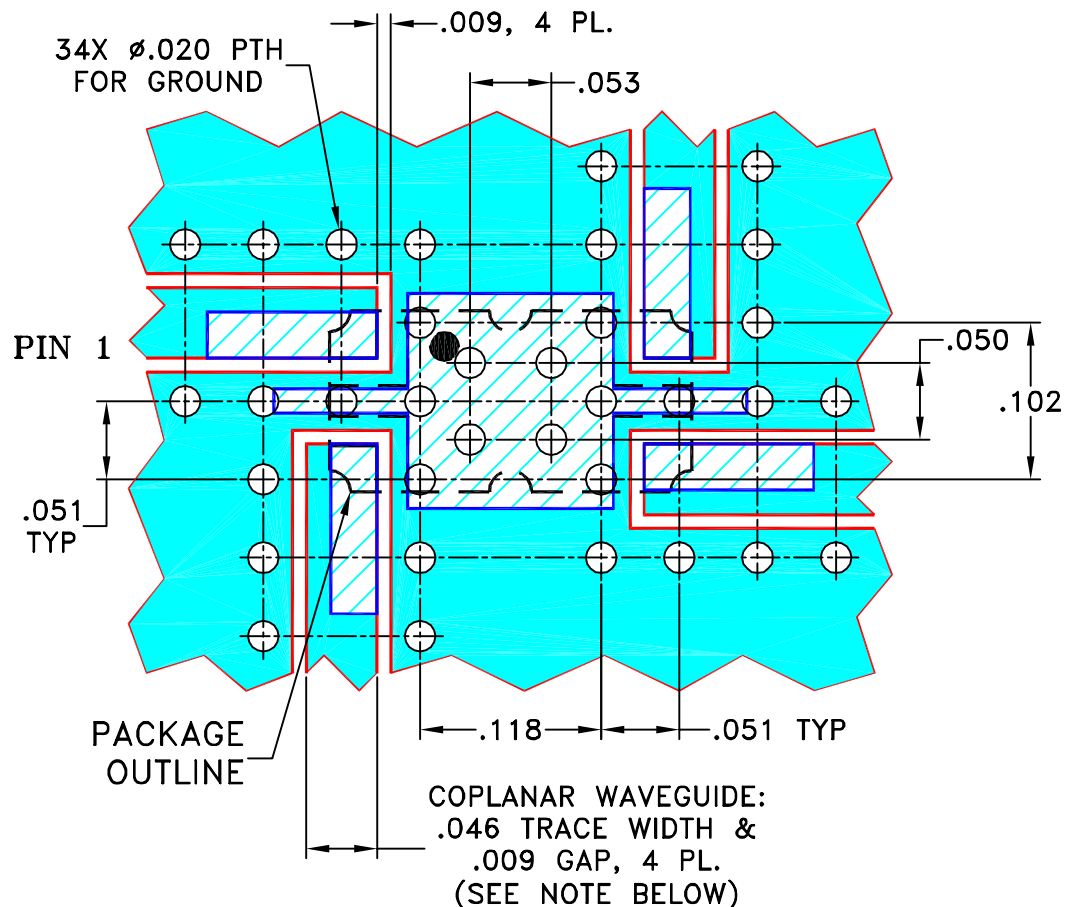
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M119428	NEW RELEASE	09/19/08	AV	HL

SUGGESTED MOUNTING CONFIGURATION FOR JM1360 CASE STYLE, "04DC01" PIN CODE



- NOTES: 1. TRACE WIDTH IS SHOWN FOR OAK-602 WITH DIELECTRIC THICKNESS .022" $\pm$.0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

-  DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
-  DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

DRAWN

AV

09/12/08

TOLERANCES ON:

CHECKED

MMG

09/19/08

2 PL DECIMALS $\pm$

APPROVED

HL

09/19/08

3 PL DECIMALS $\pm$.005ANGLES $\pm$ FRACTIONS $\pm$
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PL, 04DC01, JM1360, MBD-20, TB-482+

SIZE
ACODE IDENT
15542DRAWING NO:
98-PL-291REV:
OR

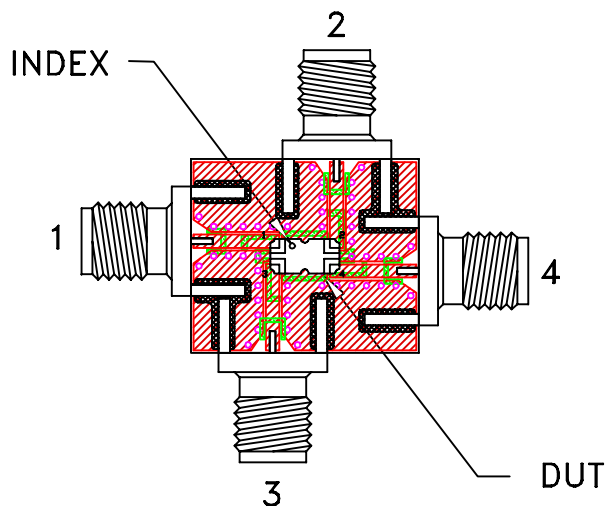
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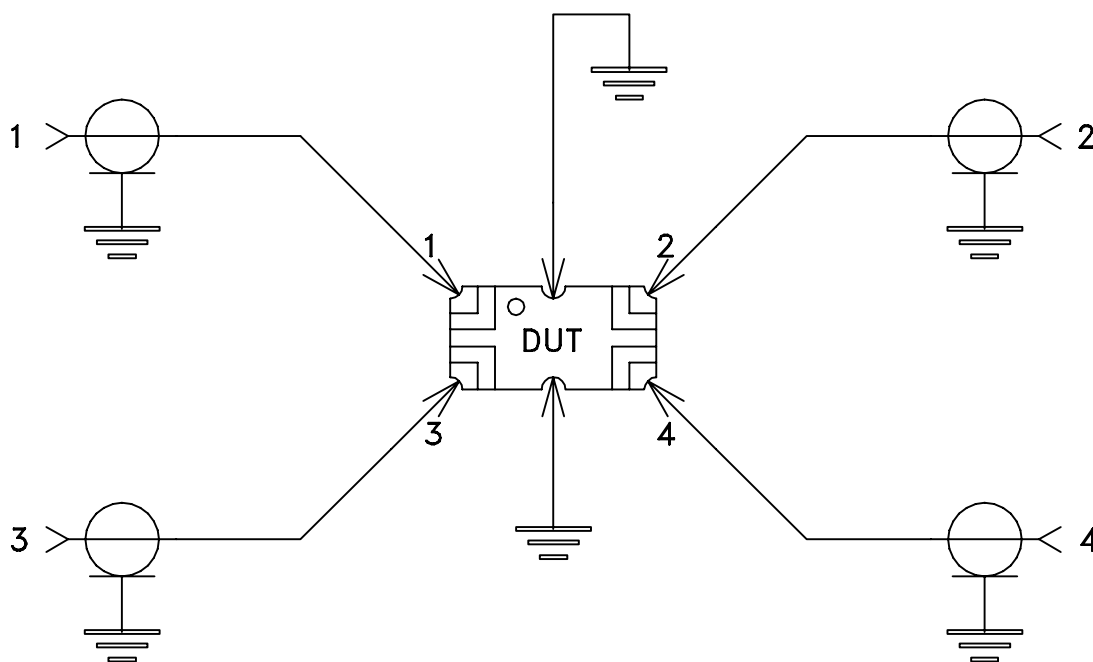
SHEET: 1 OF 1

Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



TB-482+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: Rogers OAK-602 or equivalent,
Dielectric Constant=2.5, Thickness=.022 inch.

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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	-55° to 100°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Barometric Pressure	100,000 Feet	MIL-STD-202, Method 105, Condition D
Humidity	90% RH, 65°C Units may require bake-out after humidity to restore full performance.	MIL-STD-202, Method 103
Thermal Shock	-65° to 125°C, 5 cycles	MIL-STD-202, Method 107, Condition B
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D
Mechanical Shock	100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18)	MIL-STD-202, Method 213, Condition I