

DC Pass, High Power

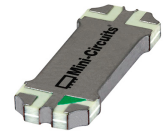
Bi-Directional Coupler

MBDC-13-63HP

50Ω 13dB Coupling 180W 2000 to 6000 MHz

The Big Deal

- High power handling, up to 180W
- Ultra wideband, 2000 to 6000 MHz
- Low insertion loss, 0.10 dB
- High directivity, 20 dB



Generic photo used for illustration purposes only
CASE STYLE: PQ2099

Product Overview

Mini-Circuits MBDC-13-63HP high-power bi-directional coupler provides high power handling up to 180W and mainline loss of 0.10 dB. Covering frequencies from 2000 to 6000 MHz, it supports a wide variety of applications from power amplifiers to antenna feeds and more. High directivity of 20 dB provides accurate sampling from the coupled port, and 23 dB return loss provides excellent matching over full frequency range. The coupler is designed into an open printed laminate (0.56 x 0.2 x 0.051") with wrap-around terminations for good solderability and easy visual inspection.

Key Features

Feature	Advantages
High power handling: 180W @ 85°C 100W @105°C	Usable in many systems with high-power requirements such as antenna feeds, power amplifiers, and others that require sampling a high power RF signal.
Low insertion loss, 0.10 dB	Used primarily in high power transmission applications, the excellent through-path signal loss maximizes the power transmitted to the antenna.
High directivity, 20 dB	Good directivity allows accurate signal sampling through the coupled port with minimal measurement error
Good return loss, 23 dB	Provides good matching for 50Ω systems.
DC current passing, 2A max	Suitable for use in systems requiring DC voltage on the RF line, such as supplying bias to remote circuit via the antenna cable.



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Maximum Ratings

Operating Temperature, case** -55°C to 105°C

Storage Temperature -55°C to 105°C

DC Current 2A

Power Input* 180W @ +85°C, case

*Derate to 130W at +95°C and 100W at +105°C case temperature

**Case temperature is defined as temperature on base plate.

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

Pad Connections***

INPUT 1

OUTPUT 2

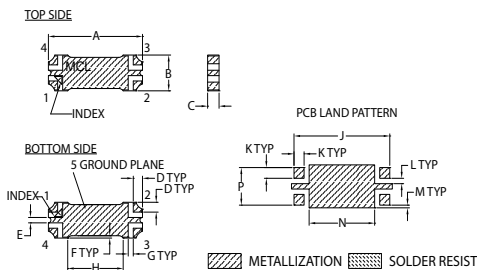
COUPLED FORWARD 4

COUPLED REVERSE 3

GROUND 5

***Model is symmetrical and all ports are interchangeable, see port configuration table.

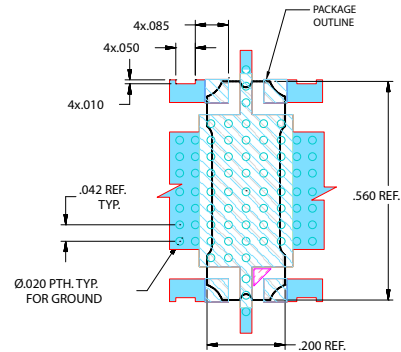
Outline Drawing



Outline Dimensions (inch mm)

A	B	C	D	E	F	G	H
.560	.200	.051	.055	.030	.013	.030	.330
14.22	5.08	1.30	1.40	0.76	0.33	0.76	8.38
J	K	L	M	N	P	wt.	
.570	.060	.030	.015	.390	.210		grams
14.48	1.52	0.76	0.38	9.91	5.33		1.0

Demo Board MCL P/N: TB-864-1+ Suggested PCB Layout (PL-625)



NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS RO5880 WITH DIELECTRIC THICKNESS.

0.020±.0015" COPPER; 1 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)

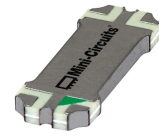
4. DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

Features

- High power, up to 180W
- Ultra wideband, 2000 - 6000 MHz
- Low insertion loss, 0.10 dB
- DC current pass through input to output

Applications

- Power Amplifiers
- Antenna Feeds



Generic photo used for illustration purposes only

CASE STYLE: PQ2099

+RoHS Compliant

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

Electrical Specifications @ +25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		2000		6000	MHz
Insertion Loss ¹	2000 - 6000	—	0.10	0.25	dB
Coupling	2000 - 6000	—	12.8±1.0	—	dB
Coupling Flatness	2000 - 6000	—	±1.3	±1.6	dB
Directivity	2000 - 6000	15	20	—	dB
Return Loss (Input)	2000 - 6000	16	23	—	dB
Return Loss (Output)	2000 - 6000	16	23	—	dB
Return Loss (Coupling)	2000 - 6000	16	23	—	dB
Input RF Power	@+85°C, case	2000 - 6000	—	180	W
	@+95°C, case	2000 - 6000	—	130	
	@+105°C, case	2000 - 6000	—	100	
Thermal Resistance	2000 - 6000	—	0.25	—	°C/W

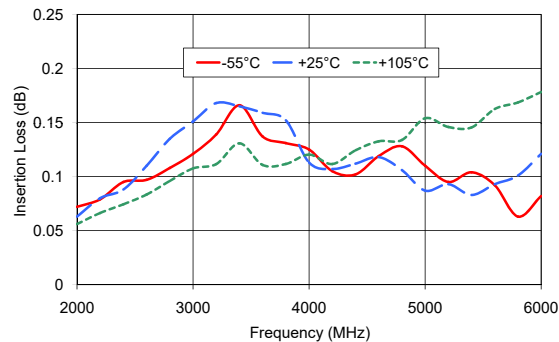
1. Does not include theoretical loss. Nominal theoretical

Typical Performance Data *

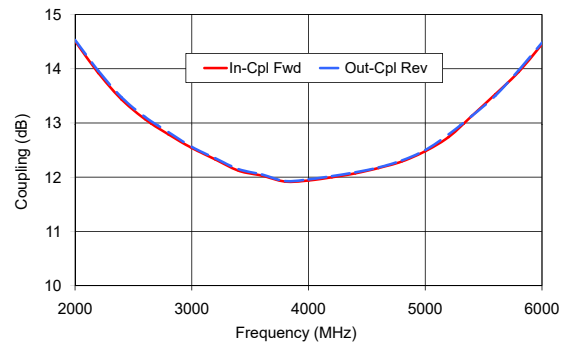
FREQUENCY (MHz)	Insertion Loss (dB)			Coupling (dB)		Directivity (dB)						Return Loss (dB)				
	In - Out			In-Cpl Fwd	Out-Cpl Rev	In-Cpl Fwd			Out-Cpl Rev			In	Out	Cpl Fwd	Cpl Rev	
	-55°C	+25°C	+105°C			-55°C	+25°C	+105°C	-55°C	+25°C	+105°C					
2000.0	0.07	0.06	0.06	14.51	14.53	18.85	17.41	25.13	19.00	17.45	17.31	25.49	25.23	25.48	25.21	
2200.0	0.08	0.08	0.07	13.92	13.96	18.60	16.90	24.44	18.84	17.08	16.87	23.24	22.81	23.19	22.97	
2400.0	0.10	0.09	0.07	13.43	13.47	18.20	16.66	23.66	18.41	17.01	16.86	21.42	20.95	21.78	21.60	
2600.0	0.10	0.11	0.08	13.07	13.11	18.74	16.95	23.64	19.28	17.18	16.82	19.90	19.66	20.72	20.60	
2800.0	0.11	0.14	0.10	12.79	12.83	19.68	16.67	23.65	20.05	17.04	16.51	18.84	18.72	19.93	19.84	
3000.0	0.12	0.15	0.11	12.54	12.56	19.82	16.35	23.53	19.87	16.71	15.78	18.33	18.10	19.45	19.37	
3200.0	0.14	0.17	0.11	12.33	12.35	19.41	15.99	23.28	19.17	16.32	15.69	18.00	17.80	19.17	19.17	
3400.0	0.17	0.17	0.13	12.12	12.15	18.97	16.21	24.56	19.06	16.41	16.22	17.83	17.82	19.11	19.14	
3600.0	0.14	0.16	0.11	12.03	12.05	19.03	17.08	25.71	19.46	17.33	17.22	17.97	17.82	19.07	19.25	
3800.0	0.13	0.15	0.11	11.92	11.93	19.97	18.27	27.85	20.34	18.22	17.98	18.53	18.40	19.62	19.62	
4000.0	0.13	0.11	0.12	11.94	11.96	20.64	18.79	29.46	21.03	18.99	18.87	19.25	19.49	19.92	20.06	
4200.0	0.11	0.11	0.11	12.00	12.02	20.43	19.00	32.35	21.04	19.18	19.89	20.43	20.77	20.79	20.78	
4400.0	0.10	0.11	0.12	12.07	12.09	19.06	19.53	31.96	20.15	19.81	21.92	22.10	22.14	21.92	21.85	
4600.0	0.12	0.12	0.13	12.17	12.18	18.09	21.20	29.81	19.41	21.77	25.61	25.52	25.12	22.82	22.31	
4800.0	0.13	0.11	0.13	12.29	12.31	19.21	24.16	25.63	21.56	25.46	30.07	28.74	28.46	24.34	23.60	
5000.0	0.11	0.09	0.15	12.48	12.50	21.95	27.95	22.67	24.12	31.90	31.55	33.05	34.43	25.32	25.17	
5200.0	0.10	0.09	0.15	12.74	12.79	26.46	31.57	20.10	30.29	34.89	28.76	49.61	38.31	26.98	26.33	
5400.0	0.10	0.08	0.15	13.13	13.13	34.81	32.69	18.75	36.19	36.52	23.46	35.51	35.77	29.46	28.20	
5600.0	0.09	0.09	0.16	13.53	13.50	34.32	27.58	16.57	32.97	30.96	21.14	31.83	30.89	28.04	28.35	
5800.0	0.06	0.10	0.17	13.94	13.97	29.07	24.77	15.31	26.99	26.45	18.91	32.70	30.31	28.93	29.16	
6000.0	0.08	0.12	0.18	14.45	14.48	20.70	23.75	14.01	21.19	23.94	17.67	34.00	30.22	26.64	27.08	

* Data corresponds to Configuration A at +25°C unless specified otherwise.

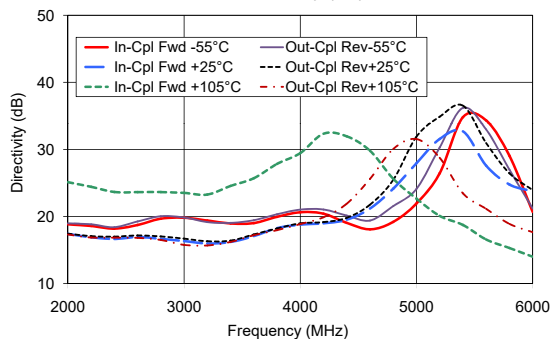
MBDC-13-63HP
Insertion Loss (dB)



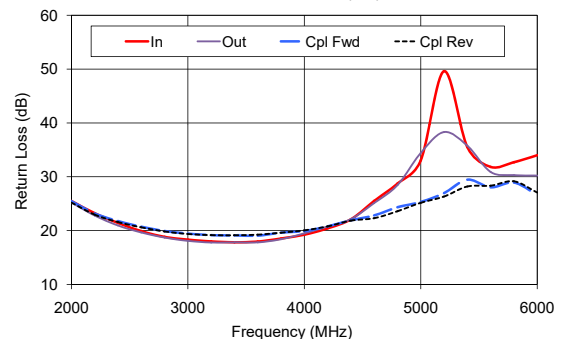
MBDC-13-63HP
Coupling (dB)



MBDC-13-63HP
Directivity (dB)



MBDC-13-63HP
Return Loss (dB)



Additional 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 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



Bi-Directional Coupler

MBDC-13-63HP

Typical Performance Data

TEST CONDITIONS: INPUT POWER = +10 dBm @Temperature = -55°C

FREQ. (MHz)	INSERTION LOSS (dB)		COUPLING (dB)		DIRECTIVITY (dB)		RETURN LOSS (dB)			
	In - Out	Rev - Fwd	In Fwd	Rev - Out	In - Rev	Out - Fwd	In	Out	Rev	Fwd
1000	0.03	0.00	19.64	19.64	20.27	20.35	45.26	50.67	44.98	43.82
1200	0.03	0.01	18.19	18.19	20.25	20.29	41.20	47.02	40.82	43.83
1500	0.05	0.02	16.48	16.48	19.62	19.94	37.48	37.45	32.74	33.15
1800	0.06	0.04	15.18	15.18	19.60	19.78	28.93	28.25	27.93	27.53
1900	0.05	0.03	14.81	14.83	19.54	19.51	28.12	27.42	27.50	26.96
2000	0.07	0.04	14.47	14.49	18.86	19.09	27.12	26.44	26.50	26.20
2100	0.08	0.05	14.16	14.19	18.43	18.90	26.19	25.60	24.54	24.53
2200	0.08	0.06	13.89	13.91	18.61	18.89	25.27	24.73	23.70	23.41
2300	0.09	0.06	13.61	13.64	18.97	18.70	24.30	23.80	24.28	23.65
2400	0.10	0.06	13.36	13.39	18.28	18.52	23.40	22.87	23.03	23.01
2500	0.09	0.05	13.17	13.20	18.43	19.00	22.48	21.93	21.68	21.88
2600	0.10	0.05	13.00	13.03	18.92	19.60	21.63	21.07	21.61	21.48
2700	0.11	0.06	12.83	12.87	19.42	20.00	21.10	20.60	21.97	21.67
2800	0.11	0.06	12.66	12.69	19.84	20.37	21.02	20.64	22.40	21.93
2900	0.12	0.05	12.53	12.56	19.60	19.90	21.05	20.58	22.66	22.05
3000	0.12	0.05	12.38	12.41	19.88	19.93	21.05	20.57	22.74	22.22
3100	0.13	0.06	12.24	12.26	19.37	19.48	20.84	20.22	23.42	22.81
3200	0.14	0.05	12.19	12.22	19.35	19.08	20.65	20.11	24.44	23.62
3300	0.14	0.06	12.05	12.08	19.23	18.98	20.33	19.99	24.83	24.06
3400	0.17	0.07	11.98	12.02	18.96	19.04	20.03	19.86	24.76	24.42
3500	0.16	0.06	11.92	11.94	18.34	18.84	19.71	19.60	23.86	23.60
3600	0.14	0.08	11.86	11.89	19.00	19.51	19.52	19.57	22.97	22.87
3700	0.14	0.07	11.80	11.83	19.27	19.67	19.78	19.94	22.80	22.61
3800	0.13	0.05	11.77	11.79	19.98	20.43	20.20	20.46	23.04	22.88
3900	0.12	0.05	11.75	11.77	20.70	21.40	20.88	21.18	23.14	23.18
4000	0.13	0.08	11.82	11.83	20.53	21.00	21.72	21.99	22.52	22.79
4100	0.10	0.07	11.79	11.82	20.44	21.03	22.22	22.50	21.85	22.01
4200	0.11	0.07	11.83	11.89	20.13	20.80	22.63	22.87	21.99	22.02
4300	0.09	0.07	11.86	11.90	19.47	20.29	22.86	22.80	22.43	22.00
4400	0.10	0.06	11.92	11.94	18.78	19.85	22.74	22.47	22.21	21.91
4500	0.11	0.07	11.98	12.03	18.37	19.61	22.69	22.52	21.36	21.35
4600	0.12	0.08	12.03	12.05	17.98	19.23	23.19	23.32	20.93	20.67
4700	0.13	0.07	12.10	12.16	18.65	20.14	23.99	24.12	20.72	20.32
4800	0.13	0.08	12.17	12.20	19.19	21.51	25.35	24.93	20.87	20.27
4900	0.12	0.09	12.28	12.29	20.37	22.75	26.80	25.27	21.41	20.89
5000	0.11	0.08	12.35	12.38	21.90	24.18	28.76	26.23	20.94	20.53
5100	0.11	0.09	12.51	12.57	23.67	26.69	31.98	27.49	21.57	21.08
5200	0.10	0.08	12.60	12.63	25.87	29.53	36.57	27.72	22.89	22.22
5300	0.10	0.07	12.72	12.80	27.85	30.23	35.60	28.22	24.05	22.91
5400	0.10	0.05	12.94	12.99	32.32	33.47	33.13	28.88	25.86	24.00
5500	0.09	0.06	13.15	13.13	32.30	32.85	29.64	27.99	26.81	25.88
5600	0.09	0.06	13.31	13.35	32.09	30.65	27.95	26.31	27.24	27.03
5700	0.07	0.06	13.56	13.57	31.64	29.57	25.71	24.71	30.10	28.53
5800	0.06	0.05	13.76	13.77	27.27	25.47	24.27	23.81	35.64	31.72
5900	0.09	0.06	14.05	14.00	24.10	22.66	23.77	23.52	50.33	40.61
6000	0.08	0.05	14.20	14.22	20.01	20.36	24.01	24.09	43.19	43.39
6100	0.09	0.06	14.52	14.43	18.31	19.53	25.45	25.20	33.83	36.56
6200	0.10	0.05	14.77	14.77	17.33	18.36	27.56	25.82	32.00	35.34
6300	0.11	0.07	15.03	15.04	16.36	17.50	30.00	26.59	32.98	32.50
6400	0.12	0.09	15.31	15.37	16.47	17.14	34.75	26.45	28.80	28.45
6500	0.13	0.10	15.65	15.72	15.85	16.93	36.41	25.09	25.17	25.36
6700	0.14	0.12	16.42	16.54	14.10	15.71	28.93	23.03	21.73	21.75
6900	0.18	0.20	17.37	17.52	12.07	12.95	20.71	19.19	18.27	17.91
7000	0.21	0.24	18.05	18.17	11.78	12.24	18.48	17.42	16.50	16.24

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TEST CONDITIONS: INPUT POWER = +10 dBm @Temperature = +25°C

FREQ. (MHz)	INSERTION LOSS (dB)		COUPLING (dB)		DIRECTIVITY (dB)		RETURN LOSS (dB)			
	In - Out	Rev - Fwd	In Fwd	Rev - Out	In - Rev	Out - Fwd	In	Out	Rev	Fwd
1000	0.02	0.01	19.66	19.66	19.27	19.44	42.53	44.98	45.50	52.85
1200	0.02	0.01	18.21	18.21	18.94	18.99	45.75	52.04	43.58	44.27
1500	0.04	0.03	16.51	16.51	18.98	19.11	36.25	36.01	33.92	33.88
1800	0.05	0.04	15.21	15.22	18.18	18.41	28.58	28.35	27.79	27.69
1900	0.05	0.05	14.85	14.86	17.84	17.94	27.10	26.89	26.57	26.37
2000	0.06	0.05	14.51	14.53	17.44	17.53	25.49	25.23	25.48	25.21
2100	0.07	0.07	14.21	14.24	17.15	17.25	24.31	23.96	24.37	24.05
2200	0.08	0.07	13.92	13.96	16.87	17.08	23.24	22.81	23.19	22.97
2300	0.09	0.07	13.66	13.69	16.72	17.01	22.25	21.73	22.50	22.27
2400	0.09	0.08	13.43	13.47	16.64	17.05	21.42	20.95	21.78	21.60
2500	0.10	0.08	13.25	13.29	16.91	17.20	20.62	20.27	21.23	21.07
2600	0.11	0.08	13.07	13.11	17.00	17.35	19.90	19.66	20.72	20.60
2700	0.12	0.09	12.91	12.95	16.88	17.26	19.25	19.06	20.22	20.18
2800	0.14	0.11	12.79	12.83	16.73	17.20	18.84	18.72	19.93	19.84
2900	0.15	0.12	12.66	12.69	16.53	16.94	18.48	18.29	19.65	19.53
3000	0.15	0.12	12.54	12.56	16.37	16.72	18.33	18.10	19.45	19.37
3100	0.15	0.11	12.42	12.44	16.04	16.40	18.16	17.91	19.20	19.24
3200	0.17	0.13	12.33	12.35	15.91	16.20	18.00	17.80	19.17	19.17
3300	0.16	0.13	12.21	12.24	16.01	16.23	17.94	17.86	19.15	19.10
3400	0.17	0.15	12.12	12.15	16.08	16.31	17.83	17.82	19.11	19.14
3500	0.17	0.15	12.08	12.11	16.34	16.64	17.89	17.87	19.08	19.16
3600	0.16	0.14	12.03	12.05	16.91	17.23	17.97	17.82	19.07	19.25
3700	0.15	0.12	11.96	11.98	17.54	17.71	18.19	18.00	19.32	19.42
3800	0.15	0.10	11.92	11.93	18.19	18.17	18.53	18.40	19.62	19.62
3900	0.13	0.11	11.94	11.94	18.50	18.57	18.98	18.99	19.77	19.78
4000	0.11	0.11	11.94	11.96	18.74	18.93	19.25	19.49	19.92	20.06
4100	0.11	0.11	11.96	11.99	18.67	18.89	19.81	20.11	20.29	20.34
4200	0.11	0.11	12.00	12.02	18.89	19.06	20.43	20.77	20.79	20.78
4300	0.11	0.10	12.01	12.03	19.14	19.21	21.16	21.32	21.45	21.22
4400	0.11	0.10	12.07	12.09	19.47	19.69	22.10	22.14	21.92	21.85
4500	0.11	0.09	12.10	12.11	20.00	20.34	23.56	23.28	22.21	22.06
4600	0.12	0.10	12.17	12.18	21.12	21.61	25.52	25.12	22.82	22.31
4700	0.11	0.10	12.22	12.24	22.60	23.39	27.28	26.78	23.66	22.82
4800	0.11	0.11	12.29	12.31	24.02	25.19	28.74	28.46	24.34	23.60
4900	0.09	0.10	12.38	12.40	26.59	28.61	30.38	31.13	25.35	24.79
5000	0.09	0.10	12.48	12.50	27.81	31.34	33.05	34.43	25.32	25.17
5100	0.09	0.11	12.61	12.64	29.13	33.49	38.93	38.08	25.57	25.51
5200	0.09	0.10	12.74	12.79	31.35	33.87	49.61	38.31	26.98	26.33
5300	0.09	0.09	12.93	12.96	32.90	34.82	39.89	37.97	28.85	27.64
5400	0.08	0.10	13.13	13.13	32.34	35.41	35.51	35.77	29.46	28.20
5500	0.08	0.10	13.32	13.33	30.43	34.28	32.66	31.97	28.73	28.57
5600	0.09	0.12	13.53	13.50	27.37	30.48	31.83	30.89	28.04	28.35
5700	0.10	0.13	13.71	13.71	25.44	28.19	31.46	30.32	28.08	28.59
5800	0.10	0.12	13.94	13.97	24.53	25.91	32.70	30.31	28.93	29.16
5900	0.11	0.12	14.20	14.20	24.19	24.31	33.23	29.74	28.55	28.73
6000	0.12	0.13	14.45	14.48	23.35	23.48	34.00	30.22	26.64	27.08
6100	0.12	0.13	14.72	14.72	22.16	22.63	35.16	30.66	25.50	25.83
6200	0.12	0.14	15.00	15.00	21.42	22.43	39.02	31.13	25.19	24.98
6300	0.12	0.13	15.31	15.30	21.24	22.32	43.65	32.20	25.08	24.29
6400	0.13	0.15	15.60	15.65	20.92	21.68	37.48	31.08	23.79	23.14
6500	0.15	0.17	15.99	16.02	19.73	21.11	33.71	29.35	21.94	22.25
6700	0.16	0.21	16.81	16.85	16.70	17.91	26.27	25.60	20.73	20.75
6900	0.19	0.23	17.76	17.81	14.20	15.39	21.20	20.87	18.95	18.88
7000	0.22	0.24	18.39	18.40	13.36	14.14	20.02	19.60	17.82	17.83

Notes

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Bi-Directional Coupler

MBDC-13-63HP

Typical Performance Data

TEST CONDITIONS: INPUT POWER =+10 dBm @Temperature = +105°C

FREQ. (MHz)	INSERTION LOSS (dB)		COUPLING (dB)		DIRECTIVITY (dB)		RETURN LOSS (dB)			
	In - Out	Rev - Fwd	In Fwd	Rev - Out	In - Rev	Out - Fwd	In	Out	Rev	Fwd
1000	0.04	0.04	19.76	19.74	22.35	23.96	32.28	30.74	30.53	30.01
1200	0.05	0.06	18.32	18.29	22.50	25.04	32.78	31.25	30.59	30.06
1500	0.05	0.06	16.63	16.61	22.76	26.21	33.22	32.87	30.51	29.90
1800	0.06	0.07	15.33	15.31	22.50	26.02	33.24	33.61	29.97	29.43
1900	0.07	0.07	14.98	14.96	22.46	25.73	33.12	33.48	29.61	29.10
2000	0.07	0.08	14.64	14.61	22.21	25.02	32.30	32.83	28.83	28.30
2100	0.07	0.09	14.33	14.32	22.13	24.63	30.93	31.36	28.20	27.76
2200	0.08	0.09	14.06	14.05	22.15	24.31	29.41	29.74	27.63	27.37
2300	0.08	0.08	13.80	13.79	22.28	23.89	28.26	28.65	27.18	27.00
2400	0.08	0.08	13.57	13.56	22.53	23.59	27.24	27.49	26.84	26.78
2500	0.08	0.09	13.35	13.33	22.74	23.23	26.38	26.49	26.76	26.82
2600	0.10	0.10	13.20	13.17	23.26	23.46	25.84	25.83	27.21	27.25
2700	0.11	0.11	13.00	12.99	23.86	23.31	24.85	24.96	27.27	27.64
2800	0.11	0.10	12.86	12.84	24.55	23.46	24.27	24.17	27.90	28.09
2900	0.11	0.09	12.72	12.69	25.08	23.27	23.76	23.66	28.22	28.53
3000	0.11	0.10	12.58	12.54	25.76	23.47	23.52	23.25	29.21	29.51
3100	0.13	0.09	12.47	12.43	26.36	23.59	23.40	23.22	30.26	31.15
3200	0.13	0.11	12.38	12.35	26.55	23.38	23.79	23.27	32.49	33.08
3300	0.13	0.11	12.31	12.28	28.74	24.01	24.21	23.77	35.73	36.85
3400	0.11	0.11	12.23	12.20	31.71	24.69	24.75	24.16	41.52	45.00
3500	0.12	0.11	12.16	12.13	35.32	25.19	25.57	24.92	53.75	55.55
3600	0.11	0.11	12.11	12.07	39.53	25.69	26.65	25.85	47.93	43.16
3700	0.13	0.12	12.08	12.04	42.53	25.78	28.27	26.84	39.78	37.73
3800	0.12	0.12	12.07	12.03	43.32	27.76	29.86	28.39	36.06	34.31
3900	0.14	0.14	12.06	12.03	39.59	27.10	32.40	30.24	33.58	32.86
4000	0.11	0.13	12.09	12.05	34.47	29.62	35.87	33.11	32.03	31.41
4100	0.12	0.13	12.12	12.09	31.35	31.44	35.99	34.17	30.44	30.35
4200	0.13	0.13	12.14	12.12	28.78	32.99	32.35	32.86	29.41	29.52
4300	0.13	0.15	12.18	12.14	26.23	33.40	29.62	30.53	28.83	29.31
4400	0.13	0.15	12.25	12.19	24.63	33.01	27.43	28.33	28.84	29.34
4500	0.13	0.15	12.33	12.27	23.20	31.53	25.56	26.13	28.94	29.64
4600	0.13	0.17	12.43	12.39	22.58	30.82	24.34	24.76	29.27	30.63
4700	0.16	0.19	12.49	12.44	20.86	27.56	23.09	23.95	30.00	32.42
4800	0.16	0.17	12.62	12.55	19.85	26.28	21.90	22.97	31.01	33.92
4900	0.14	0.18	12.71	12.61	18.57	24.01	21.63	22.48	31.58	37.04
5000	0.15	0.17	12.87	12.77	18.22	23.16	21.38	22.27	31.45	40.93
5100	0.17	0.18	13.07	12.91	17.79	22.18	21.62	22.35	32.41	38.74
5200	0.14	0.19	13.15	13.03	16.78	20.40	22.11	23.04	31.28	34.96
5300	0.17	0.20	13.34	13.20	16.44	19.72	22.89	24.23	30.48	31.85
5400	0.16	0.20	13.52	13.41	16.17	18.96	24.26	25.66	28.32	28.52
5500	0.17	0.22	13.70	13.56	15.71	18.01	26.84	28.76	25.89	25.94
5600	0.17	0.23	13.86	13.79	14.94	16.71	29.17	32.78	24.03	24.02
5700	0.20	0.25	14.13	14.01	14.30	16.03	30.89	41.04	22.33	22.14
5800	0.17	0.24	14.28	14.25	13.96	15.36	30.82	34.60	21.03	20.68
5900	0.17	0.27	14.51	14.57	13.75	14.62	26.57	27.15	19.96	19.70
6000	0.20	0.27	14.86	14.91	13.43	13.81	23.19	23.25	18.99	18.76
6100	0.23	0.28	15.19	15.14	13.21	13.39	20.31	20.28	18.26	18.06
6200	0.24	0.30	15.49	15.54	12.98	12.58	18.12	18.12	17.40	17.26
6300	0.30	0.32	15.92	15.93	12.56	12.07	16.38	16.50	16.61	16.50
6400	0.34	0.34	16.31	16.38	12.17	11.20	15.04	15.07	15.87	15.79
6500	0.39	0.37	16.72	16.88	11.75	10.84	13.93	13.86	15.22	15.16
6700	0.51	0.42	17.76	17.84	11.15	10.08	12.12	12.03	14.08	14.11
6900	0.63	0.45	18.96	19.14	10.25	8.86	10.72	10.56	13.44	13.44
7000	0.70	0.47	19.64	19.84	10.16	8.09	10.17	9.98	13.06	13.16

Notes

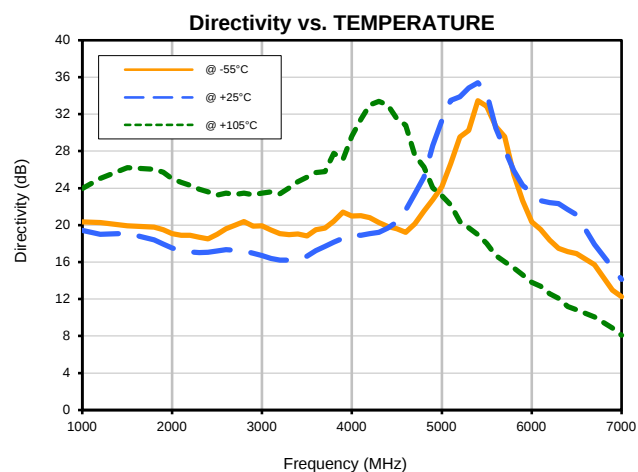
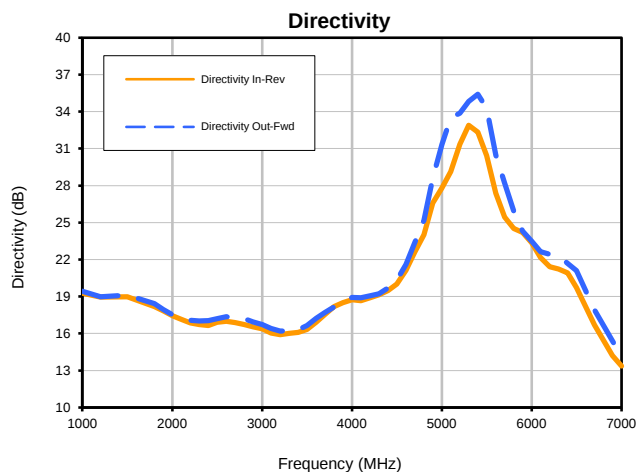
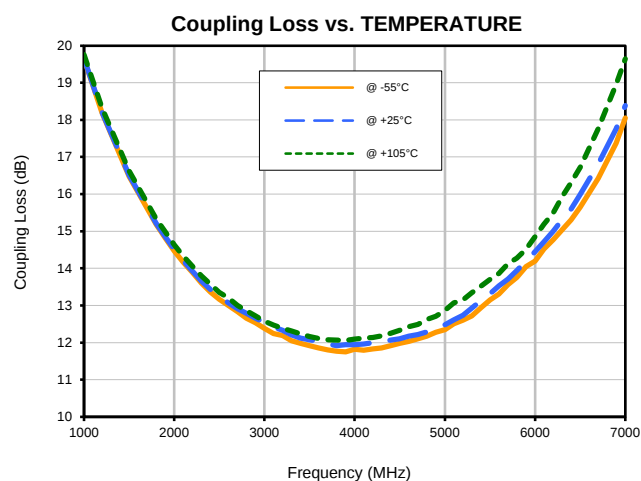
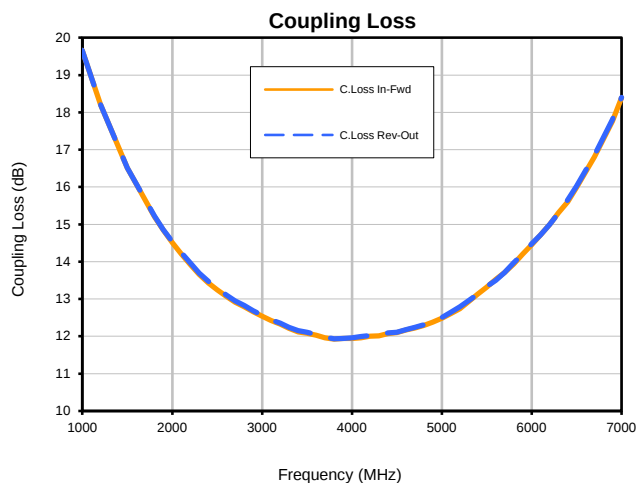
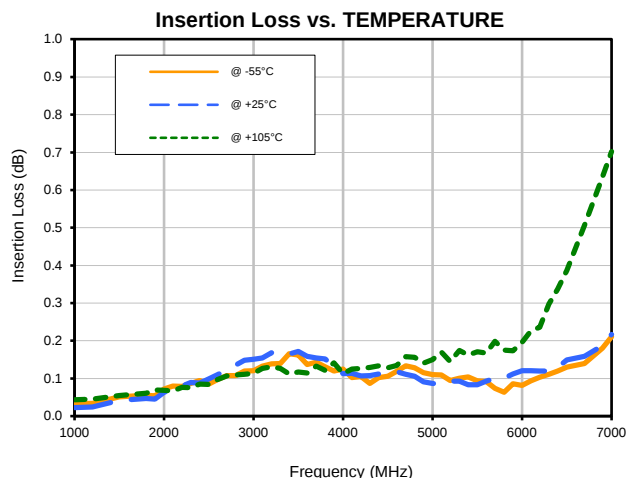
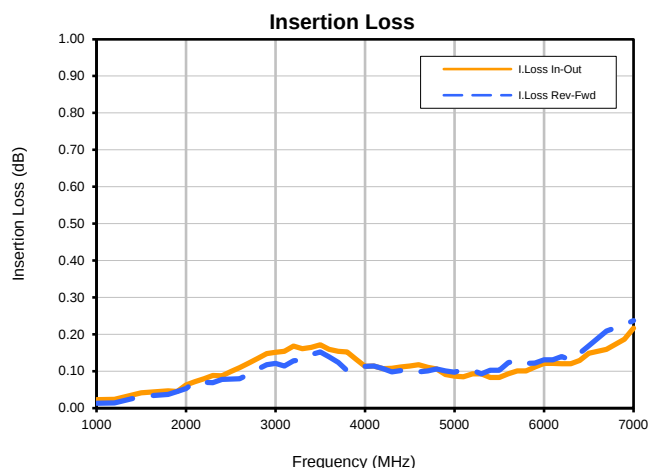
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Bi-Directional Coupler

Typical Performance Curves

MBDC-13-63HP



Notes

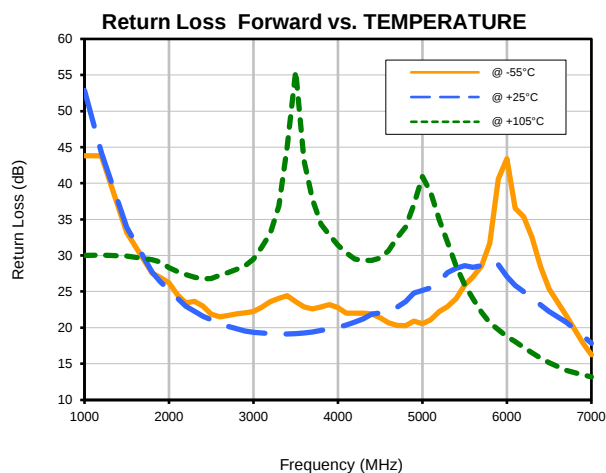
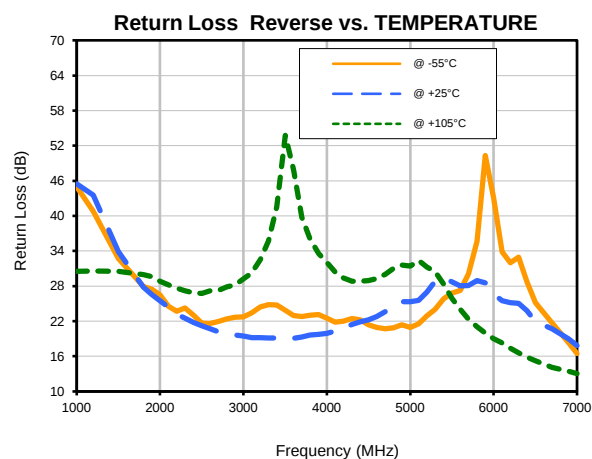
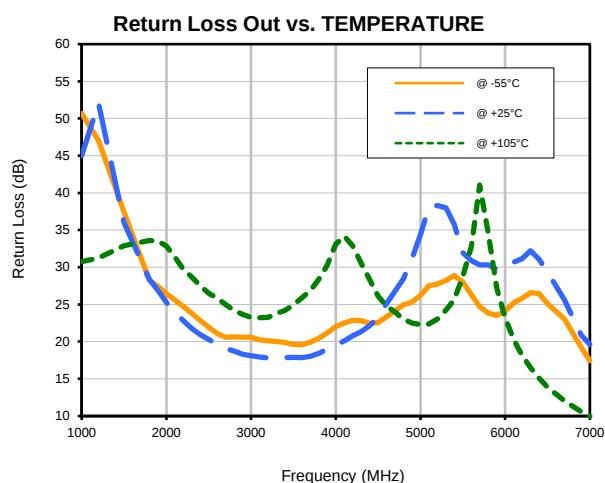
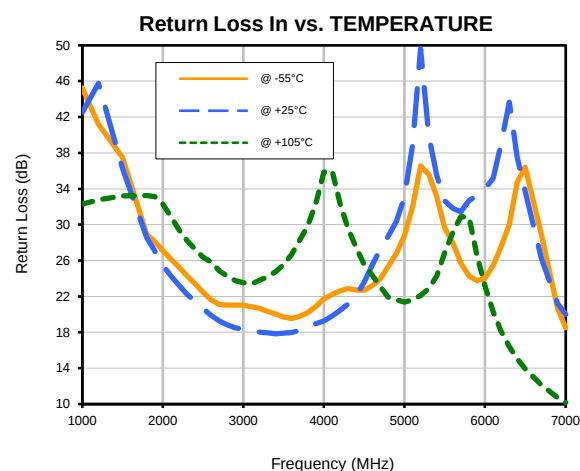
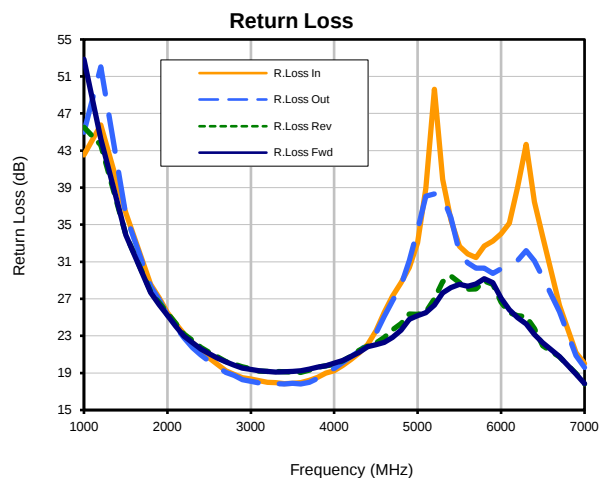
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Bi-Directional Coupler

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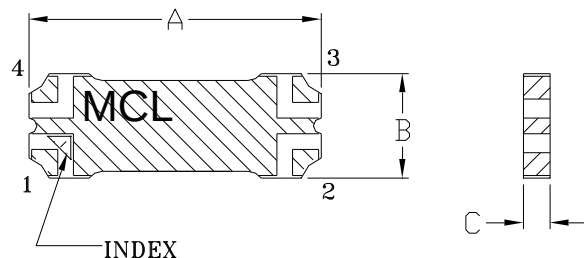
Case Style

PQ

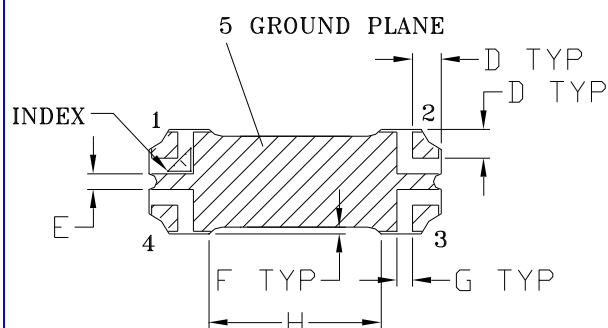
Outline Dimensions

PQ2099

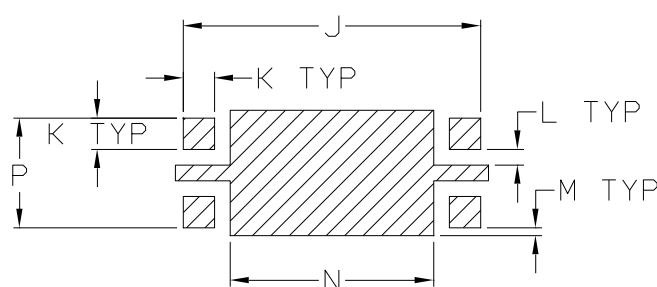
TOP SIDE



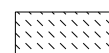
BOTTOM SIDE



PCB LAND PATTERN



METALLIZATION



SOLDER RESIST

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N	P	WT. GRAMS
PQ2099	.560 (14.22)	.200 (5.08)	.051 (1.30)	.055 (1.40)	.030 (0.76)	.013 (0.33)	.030 (0.76)	.330 (8.38)	.570 (14.48)	.060 (1.52)	.030 (0.76)	.015 (0.38)	.390 (9.91)	.210 (5.33)	1.0

Dimensions are in inches (mm). Tolerances: 2PL. +/- .03; 3PL. +/- .010

Notes:

1. Base material: Printed wiring laminate.

2. Termination finish:

For RoHS Cases, all models (+) suffix: 2-5 μ inch (.05-.13 microns) Immersion Gold.

For RoHS-5 Cases, all models no (+) suffix: Tin-Lead plate.



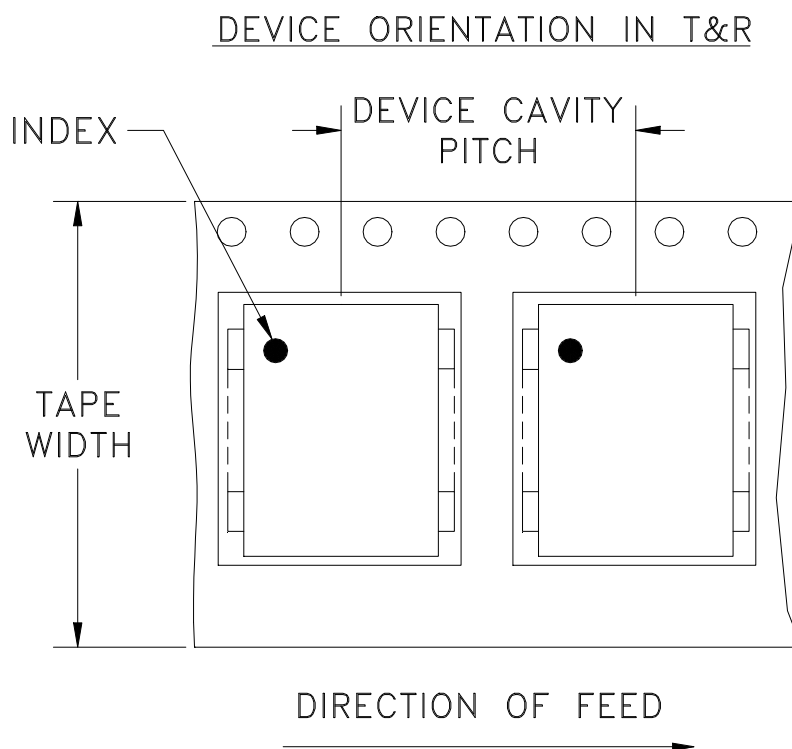
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Mini-Circuits ISO 9001 & ISO 14001 Certified

Tape & Reel Packaging TR-F48



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
24	12	13	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



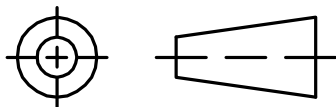
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THIRD ANGLE PROJECTION

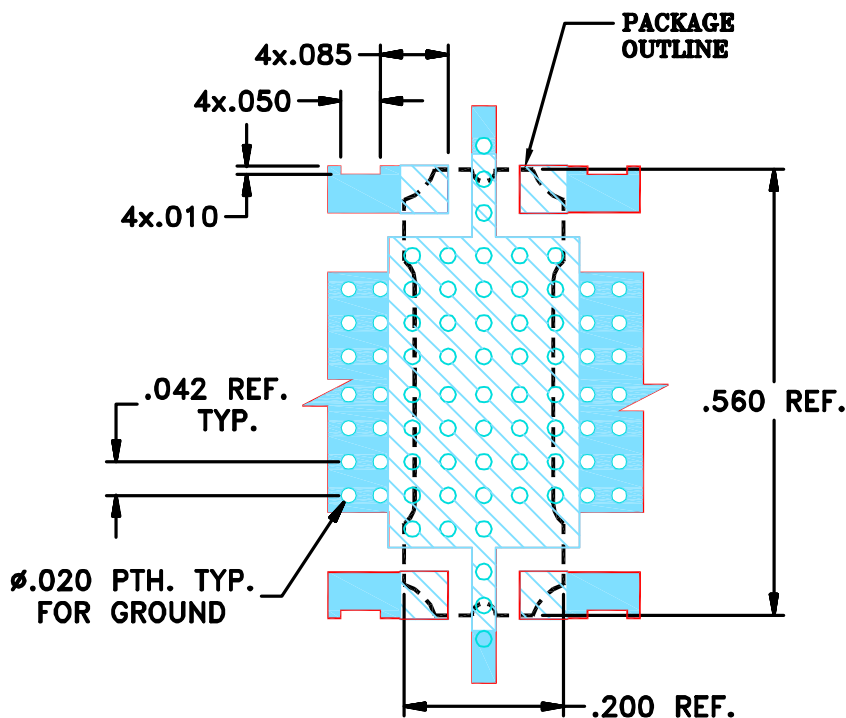


REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M172297	NEW RELEASE	02/19	DK	YB
OR	R94491	NEW RELEASE	02/19	DK	YB

SUGGESTED MOUNTING CONFIGURATION

FOR PQ2099/2099-1 CASE STYLE 04DC01 PIN CONNECTION, 50 OHM



NOTES:

- TRACE WIDTH IS SHOWN FOR ROGERS R05880 WITH DIELECTRIC THICKNESS. $.020 \pm .0015$ ". COPPER: 1 OZ. EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- 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 SOLDERMASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS $\pm$ 3 PL DECIMALS $\pm$.005ANGLES $\pm$ 1°FRACTIONS $\pm$

DRAWN

DK

10 FEB 19

CHECKED

RM

10 FEB 19

APPROVED

YB

10 FEB 19



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

PL FOR MBD PQ2099

TB-864-1+ (50 Ω)SIZE
ACODE IDENT
15542

DRAWING NO:

98-PL-625

REV:

OR

FILE: 98PL625(OR)

SCALE:

4:1

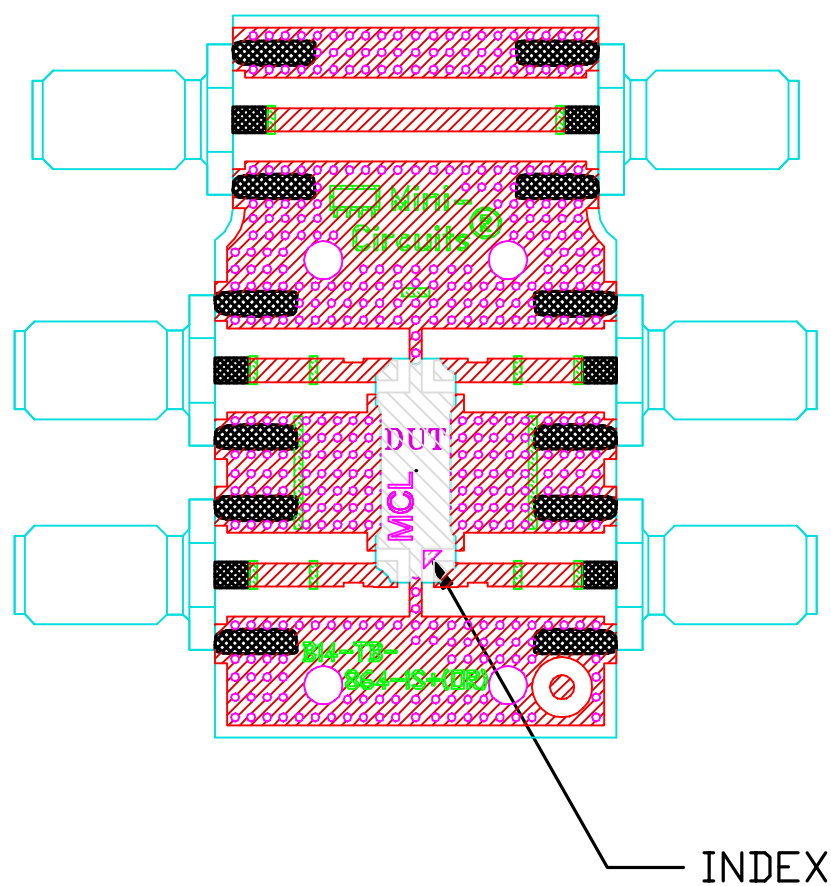
SHEET:

1 OF 1

ASHEETA1.DWG REV:A DATE:01/12/95

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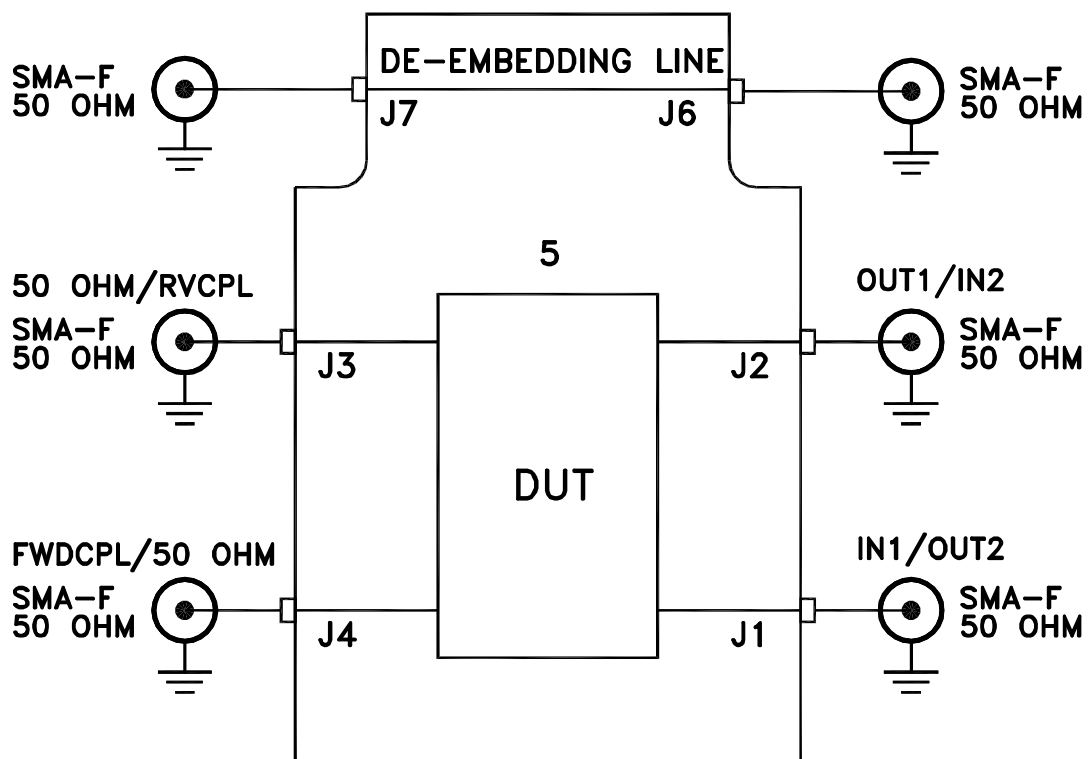
Evaluation Board and Circuit



TB-864-1+

NOTES:

1. SMA FEMALE CONNECTORS.
2. PCB MATERIAL: ROGERS RT/DUROID 5880 OR EQUIVALENT,
DIELECTRIC CONSTANT=2.2, DIELECTRIC THICKNESS=.020 INCH.



TB-864-1+
Schematic Diagram



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 105° C Case Environment	Individual Model Data Sheet
Storage Temperature	-55° to 105°C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 240 hours, 50°C	MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutectic Process 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020C, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Vibration (high Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-883, Method 2007.3, Condition A
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215