



Mini-Circuits

STRIPLINE SURFACE MOUNT

Bi-Directional Coupler **MBDA-30-451HP+**

50Ω 225 to 450 MHz 30 dB 200W

KEY FEATURES

- High power handling, up to 200W
- Excellent return loss, 30 dB
- Low insertion loss, 0.15 dB
- High directivity, 24 dB

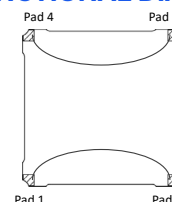
APPLICATIONS

- Power amplifiers
- Antenna feeds
- VHF/UHF radios
- Defense and military



Generic photo used for illustration purposes only

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' MBDA-30-451HP+ is a high-power bi-directional coupler providing high power handling up to 200 W and insertion loss of 0.15 dB. High directivity of 24 dB provides accurate sampling from the coupled port, and 30 dB return loss provides excellent matching over full frequency range. Covering frequencies from 225 to 450 MHz, the model supports a wide variety of applications from power amplifiers and antenna feeds to various digital communications and more. The coupler is designed into an open printed laminate (1.00" x 1.00" x 0.051") with wrap-around terminations for good solderability and easy visual inspection.

ELECTRICAL SPECIFICATIONS^{1,2} AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Frequency Range		225		450	MHz
Insertion Loss ³	225-450	-	0.15	0.25	dB
Coupling Nominal	225-450	-	30.5±1.5	-	dB
Coupling Flatness (±)	225-450	-	±0.85	±1.00	dB
Directivity	225-450	18	24	-	dB
Return Loss (Input/Output)	225-450	20	30	-	dB
Return Loss (Coupled Forward/Reverse)	225-450	20	30	-	dB
Thermal Resistance ⁴	225-450	-	0.4	-	°C/W

1. Tested on Evaluation Board TB-MBDA30451HP+. De-embedded to the device reference plane.

2. Model is symmetrical and all ports are interchangeable, see Port Function Description/Configuration table for details and S-Parameters for actual performance.

3. Does not include theoretical loss due to coupling. Nominal theoretical loss is 0.01 dB.

4. Thermal Resistance is defined as, example (°C)= (Hot Spot Temperature on DUT - Base Plate Temperature)/Input Power)

ABSOLUTE MAXIMUM RATINGS⁵

Operating Case Temperature ⁶		-55 °C to +105 °C
Storage Temperature		-55 °C to +105 °C
Power Input	+85 °C case	200 W
	+95 °C case	180 W
	+105 °C case	150 W
DC Current		2 A

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

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

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REV. A
ECO-024406
RDF-2170
MBDA-30-451HP+
MCIL
250205

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STRIPLINE SURFACE MOUNT

Bi-Directional Coupler

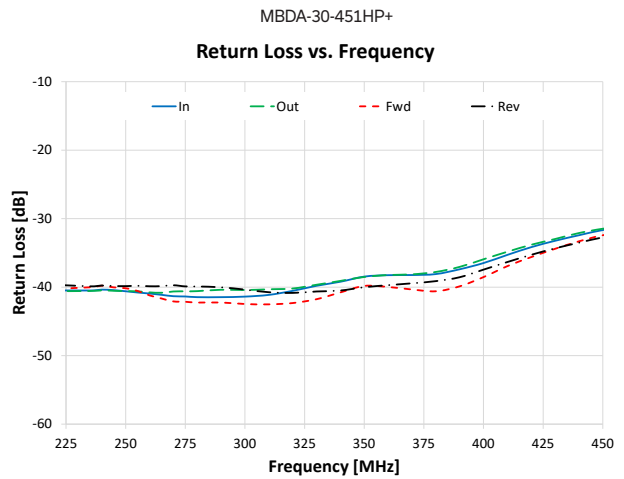
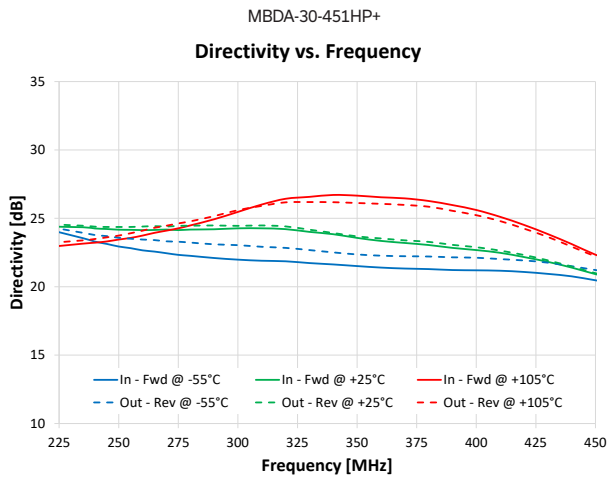
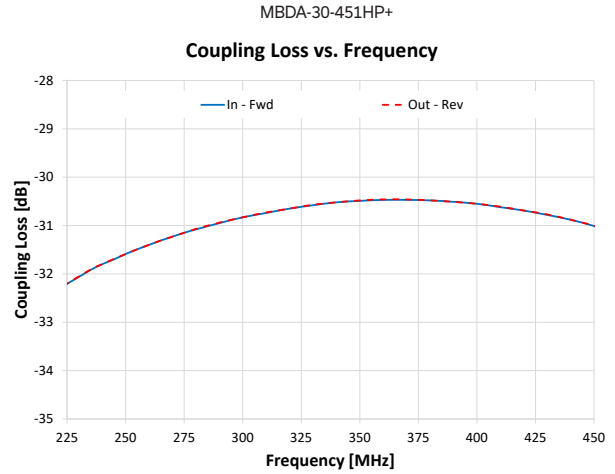
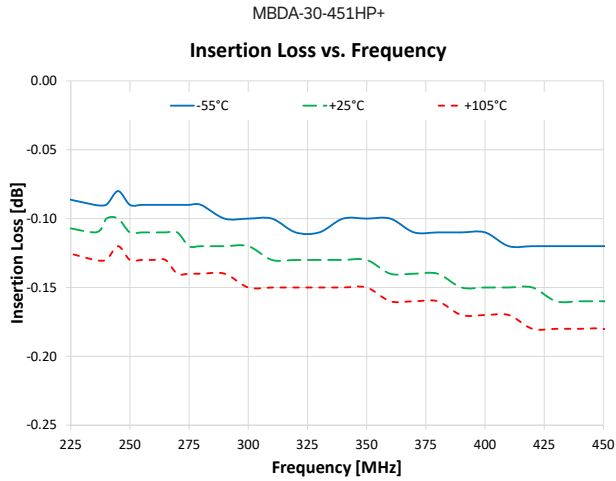
MBDA-30-451HP+

Mini-Circuits

50Ω 225 to 450 MHz 30 dB 200W

TYPICAL PERFORMANCE GRAPHS

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





STRIPLINE SURFACE MOUNT

Bi-Directional Coupler MBDA-30-451HP+

50Ω 225 to 450 MHz 30 dB 200W

FUNCTIONAL DIAGRAM

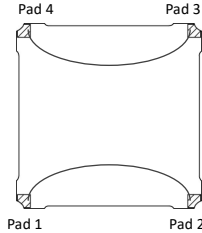


Figure 1. MBDA-30-451HP+ Functional Diagram

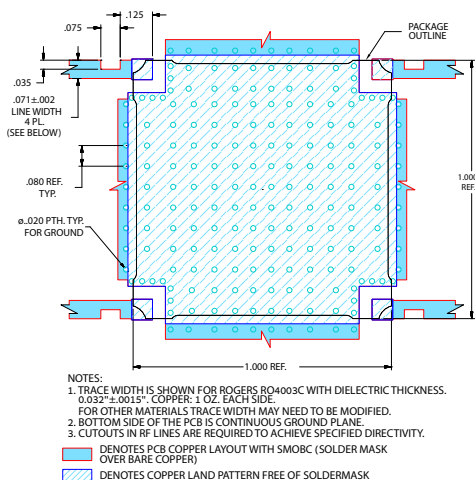
PAD DESCRIPTION/CONFIGURATION ⁷

Function	Pad Number	Description
Input	1	Connects to RF Input Port
Output	2	Connects to RF Output Port
Coupled Forward	4	Connects to Coupled Forward Port
Coupled Reverse	3	Connects to Coupled Reverse Port
Ground	5	Connects to Ground

Configuration	Input	Output	Coupled Forward	Coupled Reverse
A	1	2	4	3
B	2	1	3	4
C	3	4	2	1
D	4	3	1	2

7. Model is symmetrical and all ports are interchangeable, see Port Function Description/Configuration table for details and S-Parameters for actual performance.

SUGGESTED PCB LAYOUT (PL-468)



NOTES:

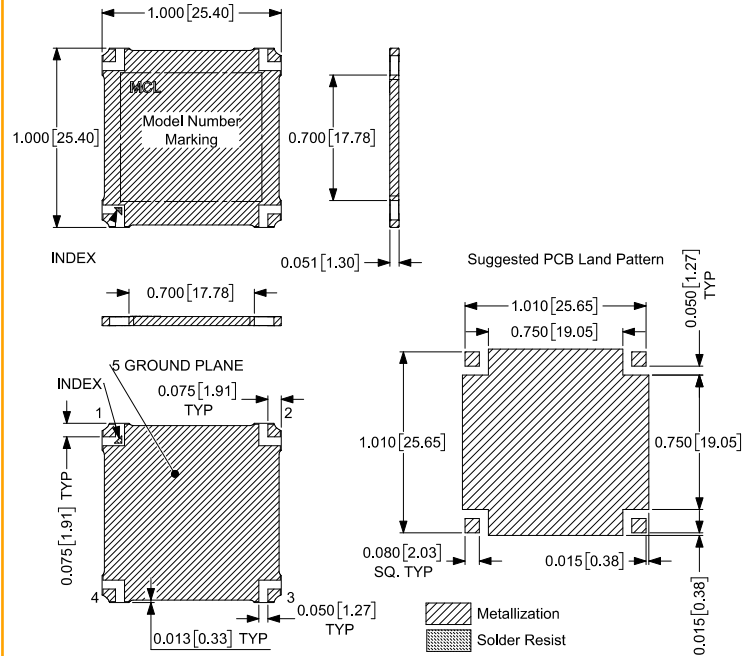
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4003C WITH DIELECTRIC THICKNESS, 0.032" ± 0.015". COPPER: 1 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
3. CUTOUTS IN RF LINES ARE REQUIRED TO ACHIEVE SPECIFIED DIRECTIVITY.

■ DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

■ DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

Figure 2. Suggested PCB Layout PL-468

CASE STYLE DRAWING (PQ2074)



NOTES:

1. Base material: Printed wiring laminate.
2. Termination finish: 2-5 pinch (.05-.13 microns) Immersion Gold.
3. Dimensions: Inches [mm]. Tolerances 2 Pl. ±.03 inch; 3 Pl. ±.015 inch.
4. Weight: 4.0 grams
5. Marking may contain other features or characters for internal lot control.

PRODUCT MARKING*: MBDA-30-451HP+

*Marking may contain other features or characters for internal lot control.



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MBDA-30-451HP+

50Ω 225 to 450 MHz 30 dB 200W

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD.

[CLICK HERE](#)

Performance Data & Graphs	Data
	Graphs
	S-Parameter (S4P Files) Data Set (.zip file) De-embedded to device pads
Case Style	PQ2074 Lead Finish: 2-5 μinch (0.05-0.13 microns) Immersion Gold.
RoHS Status	Compliant
Tape and Reel	F117
Suggested Layout for PCB Design	PL-468
Evaluation Board	TB-MBDA30451HP+
	Gerber File
Environmental Rating	ENV02T8

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-Circuits' 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/terms/viewterm.html



Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = -55°C, Configuration A.

Freq. (MHz)	I. Loss (dB) In - Out	Coupling (dB)		Directivity (dB) In - Fwd	Return Loss (dB)			
		In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.08	-32.94	-32.94	25.07	-35.80	-34.54	-38.45	-39.35
235	-0.09	-31.92	-31.93	23.55	-34.01	-34.05	-38.02	-37.16
240	-0.09	-31.81	-31.81	23.30	-33.94	-34.13	-38.12	-36.92
245	-0.08	-31.69	-31.70	23.13	-34.05	-34.44	-38.29	-36.84
250	-0.09	-31.59	-31.59	22.94	-34.10	-34.61	-38.39	-36.79
255	-0.09	-31.49	-31.49	22.82	-34.22	-34.83	-38.68	-36.62
260	-0.09	-31.40	-31.40	22.66	-34.34	-35.23	-39.06	-36.66
265	-0.09	-31.31	-31.31	22.57	-34.61	-35.59	-39.52	-36.73
270	-0.09	-31.22	-31.22	22.45	-34.96	-36.11	-40.39	-36.76
275	-0.09	-31.14	-31.15	22.33	-35.27	-36.63	-40.99	-36.92
280	-0.09	-31.07	-31.07	22.26	-35.54	-37.27	-41.67	-36.98
290	-0.10	-30.93	-30.93	22.10	-36.04	-37.99	-42.59	-37.02
300	-0.10	-30.81	-30.82	21.98	-36.25	-38.64	-42.75	-37.01
310	-0.10	-30.71	-30.72	21.90	-36.51	-39.25	-42.98	-37.16
320	-0.11	-30.63	-30.63	21.86	-36.88	-40.27	-43.51	-37.47
330	-0.11	-30.55	-30.56	21.73	-37.23	-41.41	-44.44	-37.75
340	-0.10	-30.50	-30.50	21.63	-37.62	-42.49	-44.91	-38.13
350	-0.10	-30.46	-30.46	21.51	-37.85	-43.49	-44.64	-38.33
360	-0.10	-30.43	-30.44	21.40	-38.36	-45.14	-46.00	-38.73
370	-0.11	-30.43	-30.43	21.33	-38.88	-47.43	-47.94	-39.20
380	-0.11	-30.44	-30.44	21.29	-39.19	-49.58	-50.02	-39.62
390	-0.11	-30.47	-30.47	21.22	-39.14	-50.08	-49.37	-40.10
400	-0.11	-30.51	-30.51	21.20	-39.03	-48.64	-47.56	-40.01
410	-0.12	-30.56	-30.57	21.17	-38.73	-46.48	-45.43	-40.08
420	-0.12	-30.64	-30.64	21.08	-38.35	-44.57	-44.02	-39.91
430	-0.12	-30.72	-30.73	20.94	-37.90	-42.81	-42.49	-39.49
440	-0.12	-30.82	-30.83	20.76	-37.18	-40.79	-40.90	-38.96
450	-0.12	-30.94	-30.95	20.47	-36.24	-39.33	-39.41	-38.24
460	-0.12	-31.09	-31.10	20.20	-35.59	-38.19	-38.59	-37.65
470	-0.12	-31.24	-31.25	19.93	-34.94	-37.04	-37.77	-37.05
480	-0.13	-31.42	-31.42	19.63	-34.26	-36.02	-37.07	-36.40
485	-0.13	-31.52	-31.52	19.48	-33.85	-35.42	-36.58	-35.91
490	-0.13	-31.62	-31.62	19.32	-33.43	-34.82	-36.09	-35.42
495	-0.14	-31.73	-31.73	19.13	-32.91	-34.17	-35.38	-34.84
500	-0.14	-31.83	-31.84	18.93	-32.39	-33.52	-34.66	-34.26
505	-0.14	-31.95	-31.96	18.72	-31.85	-32.87	-33.92	-33.63
510	-0.14	-32.07	-32.08	18.51	-31.30	-32.22	-33.17	-33.00
515	-0.14	-32.20	-32.21	18.29	-30.77	-31.62	-32.53	-32.39
520	-0.14	-32.33	-32.34	18.07	-30.23	-31.02	-31.89	-31.77
525	-0.14	-32.47	-32.48	17.81	-29.73	-30.47	-31.29	-31.22
530	-0.14	-32.61	-32.62	17.55	-29.23	-29.92	-30.68	-30.67

Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = -55°C, Configuration B.

Freq. (MHz)	I. Loss (dB) In - Out	Coupling (dB)		Directivity (dB) In - Fwd	Return Loss (dB)			
		In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.08	-32.94	-32.94	25.01	-34.54	-35.80	-39.35	-38.45
235	-0.08	-31.93	-31.92	23.94	-34.05	-34.01	-37.16	-38.02
240	-0.08	-31.81	-31.81	23.78	-34.13	-33.94	-36.92	-38.12
245	-0.08	-31.70	-31.69	23.70	-34.44	-34.05	-36.84	-38.29
250	-0.08	-31.59	-31.59	23.58	-34.61	-34.10	-36.79	-38.39
255	-0.08	-31.49	-31.49	23.51	-34.83	-34.22	-36.62	-38.68
260	-0.08	-31.40	-31.40	23.45	-35.23	-34.34	-36.66	-39.06
265	-0.09	-31.31	-31.31	23.41	-35.59	-34.61	-36.73	-39.52
270	-0.09	-31.22	-31.22	23.32	-36.11	-34.96	-36.76	-40.39
275	-0.09	-31.15	-31.14	23.29	-36.63	-35.27	-36.92	-40.99
280	-0.09	-31.07	-31.07	23.23	-37.27	-35.54	-36.98	-41.67
290	-0.09	-30.93	-30.93	23.10	-37.99	-36.04	-37.02	-42.59
300	-0.09	-30.82	-30.81	23.04	-38.64	-36.25	-37.01	-42.75
310	-0.10	-30.72	-30.71	22.92	-39.25	-36.51	-37.16	-42.98
320	-0.10	-30.63	-30.63	22.84	-40.27	-36.88	-37.47	-43.51
330	-0.10	-30.56	-30.55	22.68	-41.41	-37.23	-37.75	-44.44
340	-0.10	-30.50	-30.50	22.51	-42.49	-37.62	-38.13	-44.91
350	-0.10	-30.46	-30.46	22.36	-43.49	-37.85	-38.33	-44.64
360	-0.10	-30.44	-30.43	22.27	-45.14	-38.36	-38.73	-46.00
370	-0.10	-30.43	-30.43	22.23	-47.43	-38.88	-39.20	-47.94
380	-0.11	-30.44	-30.44	22.21	-49.58	-39.19	-39.62	-50.02
390	-0.11	-30.47	-30.47	22.15	-50.08	-39.14	-40.10	-49.37
400	-0.11	-30.51	-30.51	22.12	-48.64	-39.03	-40.01	-47.56
410	-0.11	-30.57	-30.56	22.02	-46.48	-38.73	-40.08	-45.43
420	-0.11	-30.64	-30.64	21.92	-44.57	-38.35	-39.91	-44.02
430	-0.12	-30.73	-30.72	21.76	-42.81	-37.90	-39.49	-42.49
440	-0.12	-30.83	-30.82	21.50	-40.79	-37.18	-38.96	-40.90
450	-0.12	-30.95	-30.94	21.22	-39.33	-36.24	-38.24	-39.41
460	-0.12	-31.10	-31.09	20.95	-38.19	-35.59	-37.65	-38.59
470	-0.12	-31.25	-31.24	20.67	-37.04	-34.94	-37.05	-37.77
480	-0.12	-31.42	-31.42	20.32	-36.02	-34.26	-36.40	-37.07
485	-0.13	-31.52	-31.52	20.15	-35.42	-33.85	-35.91	-36.58
490	-0.13	-31.62	-31.62	19.97	-34.82	-33.43	-35.42	-36.09
495	-0.13	-31.73	-31.73	19.75	-34.17	-32.91	-34.84	-35.38
500	-0.13	-31.84	-31.83	19.52	-33.52	-32.39	-34.26	-34.66
505	-0.13	-31.96	-31.95	19.28	-32.87	-31.85	-33.63	-33.92
510	-0.13	-32.08	-32.07	19.04	-32.22	-31.30	-33.00	-33.17
515	-0.14	-32.21	-32.20	18.77	-31.62	-30.77	-32.39	-32.53
520	-0.14	-32.34	-32.33	18.50	-31.02	-30.23	-31.77	-31.89
525	-0.14	-32.48	-32.47	18.19	-30.47	-29.73	-31.22	-31.29
530	-0.14	-32.62	-32.61	17.87	-29.92	-29.23	-30.67	-30.68

Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = -55°C, Configuration C.

Freq. (MHz)	I. Loss (dB)	Coupling (dB)		Directivity (dB)	Return Loss (dB)			
	In - Out	In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.06	-32.95	-32.94	25.20	-39.35	-38.45	-34.54	-35.80
235	-0.07	-31.93	-31.92	23.62	-37.16	-38.02	-34.05	-34.01
240	-0.07	-31.82	-31.80	23.38	-36.92	-38.12	-34.13	-33.94
245	-0.07	-31.70	-31.69	23.16	-36.84	-38.29	-34.44	-34.05
250	-0.07	-31.60	-31.58	23.02	-36.79	-38.39	-34.61	-34.10
255	-0.07	-31.50	-31.48	22.83	-36.62	-38.68	-34.83	-34.22
260	-0.07	-31.41	-31.39	22.72	-36.66	-39.06	-35.23	-34.34
265	-0.07	-31.32	-31.30	22.58	-36.73	-39.52	-35.59	-34.61
270	-0.07	-31.23	-31.22	22.46	-36.76	-40.39	-36.11	-34.96
275	-0.08	-31.15	-31.14	22.38	-36.92	-40.99	-36.63	-35.27
280	-0.08	-31.08	-31.06	22.28	-36.98	-41.67	-37.27	-35.54
290	-0.08	-30.94	-30.93	22.13	-37.02	-42.59	-37.99	-36.04
300	-0.08	-30.82	-30.81	21.99	-37.01	-42.75	-38.64	-36.25
310	-0.09	-30.72	-30.71	21.91	-37.16	-42.98	-39.25	-36.51
320	-0.09	-30.64	-30.62	21.86	-37.47	-43.51	-40.27	-36.88
330	-0.09	-30.57	-30.55	21.71	-37.75	-44.44	-41.41	-37.23
340	-0.09	-30.51	-30.49	21.63	-38.13	-44.91	-42.49	-37.62
350	-0.09	-30.47	-30.45	21.48	-38.33	-44.64	-43.49	-37.85
360	-0.09	-30.44	-30.43	21.40	-38.73	-46.00	-45.14	-38.36
370	-0.09	-30.44	-30.42	21.34	-39.20	-47.94	-47.43	-38.88
380	-0.09	-30.45	-30.44	21.29	-39.62	-50.02	-49.58	-39.19
390	-0.10	-30.48	-30.46	21.29	-40.10	-49.37	-50.08	-39.14
400	-0.10	-30.52	-30.50	21.23	-40.01	-47.56	-48.64	-39.03
410	-0.10	-30.58	-30.56	21.19	-40.08	-45.43	-46.48	-38.73
420	-0.10	-30.65	-30.63	21.09	-39.91	-44.02	-44.57	-38.35
430	-0.10	-30.74	-30.72	20.93	-39.49	-42.49	-42.81	-37.90
440	-0.10	-30.84	-30.82	20.76	-38.96	-40.90	-40.79	-37.18
450	-0.10	-30.96	-30.94	20.50	-38.24	-39.41	-39.33	-36.24
460	-0.11	-31.11	-31.09	20.23	-37.65	-38.59	-38.19	-35.59
470	-0.11	-31.25	-31.24	19.95	-37.05	-37.77	-37.04	-34.94
480	-0.11	-31.43	-31.41	19.66	-36.40	-37.07	-36.02	-34.26
485	-0.12	-31.53	-31.51	19.50	-35.91	-36.58	-35.42	-33.85
490	-0.12	-31.63	-31.61	19.34	-35.42	-36.09	-34.82	-33.43
495	-0.12	-31.74	-31.72	19.15	-34.84	-35.38	-34.17	-32.91
500	-0.12	-31.85	-31.83	18.95	-34.26	-34.66	-33.52	-32.39
505	-0.12	-31.97	-31.95	18.74	-33.63	-33.92	-32.87	-31.85
510	-0.12	-32.09	-32.07	18.52	-33.00	-33.17	-32.22	-31.30
515	-0.12	-32.22	-32.20	18.30	-32.39	-32.53	-31.62	-30.77
520	-0.12	-32.34	-32.32	18.07	-31.77	-31.89	-31.02	-30.23
525	-0.13	-32.49	-32.46	17.81	-31.22	-31.29	-30.47	-29.73
530	-0.13	-32.63	-32.60	17.55	-30.67	-30.68	-29.92	-29.23

Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = -55°C, Configuration D.

Freq. (MHz)	I. Loss (dB) In - Out	Coupling (dB)		Directivity (dB) In - Fwd	Return Loss (dB)			
		In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.07	-32.94	-32.95	24.79	-38.45	-39.35	-35.80	-34.54
235	-0.07	-31.92	-31.93	23.88	-38.02	-37.16	-34.01	-34.05
240	-0.07	-31.80	-31.82	23.72	-38.12	-36.92	-33.94	-34.13
245	-0.07	-31.69	-31.70	23.60	-38.29	-36.84	-34.05	-34.44
250	-0.07	-31.58	-31.60	23.45	-38.39	-36.79	-34.10	-34.61
255	-0.08	-31.48	-31.50	23.36	-38.68	-36.62	-34.22	-34.83
260	-0.08	-31.39	-31.41	23.30	-39.06	-36.66	-34.34	-35.23
265	-0.08	-31.30	-31.32	23.26	-39.52	-36.73	-34.61	-35.59
270	-0.08	-31.22	-31.23	23.22	-40.39	-36.76	-34.96	-36.11
275	-0.08	-31.14	-31.15	23.15	-40.99	-36.92	-35.27	-36.63
280	-0.08	-31.06	-31.08	23.09	-41.67	-36.98	-35.54	-37.27
290	-0.08	-30.93	-30.94	22.95	-42.59	-37.02	-36.04	-37.99
300	-0.09	-30.81	-30.82	22.87	-42.75	-37.01	-36.25	-38.64
310	-0.09	-30.71	-30.72	22.81	-42.98	-37.16	-36.51	-39.25
320	-0.09	-30.62	-30.64	22.75	-43.51	-37.47	-36.88	-40.27
330	-0.09	-30.55	-30.57	22.64	-44.44	-37.75	-37.23	-41.41
340	-0.09	-30.49	-30.51	22.45	-44.91	-38.13	-37.62	-42.49
350	-0.09	-30.45	-30.47	22.25	-44.64	-38.33	-37.85	-43.49
360	-0.09	-30.43	-30.44	22.18	-46.00	-38.73	-38.36	-45.14
370	-0.10	-30.42	-30.44	22.16	-47.94	-39.20	-38.88	-47.43
380	-0.10	-30.44	-30.45	22.13	-50.02	-39.62	-39.19	-49.58
390	-0.10	-30.46	-30.48	22.07	-49.37	-40.10	-39.14	-50.08
400	-0.10	-30.50	-30.52	22.00	-47.56	-40.01	-39.03	-48.64
410	-0.11	-30.56	-30.58	21.93	-45.43	-40.08	-38.73	-46.48
420	-0.11	-30.63	-30.65	21.88	-44.02	-39.91	-38.35	-44.57
430	-0.11	-30.72	-30.74	21.69	-42.49	-39.49	-37.90	-42.81
440	-0.11	-30.82	-30.84	21.46	-40.90	-38.96	-37.18	-40.79
450	-0.11	-30.94	-30.96	21.16	-39.41	-38.24	-36.24	-39.33
460	-0.12	-31.09	-31.11	20.87	-38.59	-37.65	-35.59	-38.19
470	-0.12	-31.24	-31.25	20.57	-37.77	-37.05	-34.94	-37.04
480	-0.12	-31.41	-31.43	20.28	-37.07	-36.40	-34.26	-36.02
485	-0.12	-31.51	-31.53	20.10	-36.58	-35.91	-33.85	-35.42
490	-0.12	-31.61	-31.63	19.92	-36.09	-35.42	-33.43	-34.82
495	-0.12	-31.72	-31.74	19.70	-35.38	-34.84	-32.91	-34.17
500	-0.12	-31.83	-31.85	19.48	-34.66	-34.26	-32.39	-33.52
505	-0.13	-31.95	-31.97	19.24	-33.92	-33.63	-31.85	-32.87
510	-0.13	-32.07	-32.09	19.00	-33.17	-33.00	-31.30	-32.22
515	-0.13	-32.20	-32.22	18.74	-32.53	-32.39	-30.77	-31.62
520	-0.13	-32.32	-32.34	18.47	-31.89	-31.77	-30.23	-31.02
525	-0.13	-32.46	-32.49	18.16	-31.29	-31.22	-29.73	-30.47
530	-0.13	-32.60	-32.63	17.85	-30.68	-30.67	-29.23	-29.92

Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = +25°C, Configuration A.

Freq. (MHz)	I. Loss (dB)	Coupling (dB)		Directivity (dB)	Return Loss (dB)			
	In - Out	In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.10	-32.93	-32.92	24.46	-40.43	-40.63	-40.56	-39.31
235	-0.11	-31.92	-31.91	24.35	-40.49	-40.56	-40.02	-39.88
240	-0.10	-31.80	-31.80	24.26	-40.36	-40.47	-39.78	-39.76
245	-0.10	-31.70	-31.69	24.22	-40.44	-40.53	-40.03	-39.83
250	-0.11	-31.59	-31.59	24.17	-40.60	-40.58	-40.16	-39.85
255	-0.11	-31.49	-31.49	24.16	-40.78	-40.61	-40.56	-39.80
260	-0.11	-31.40	-31.40	24.14	-40.93	-40.76	-41.20	-39.87
265	-0.11	-31.31	-31.31	24.15	-41.12	-40.82	-41.65	-39.85
270	-0.11	-31.23	-31.23	24.18	-41.32	-40.63	-42.08	-39.72
275	-0.12	-31.15	-31.15	24.14	-41.36	-40.61	-42.13	-39.89
280	-0.12	-31.08	-31.07	24.18	-41.46	-40.58	-42.25	-39.90
290	-0.12	-30.95	-30.94	24.20	-41.46	-40.38	-42.24	-40.02
300	-0.12	-30.83	-30.83	24.27	-41.38	-40.42	-42.46	-40.36
310	-0.13	-30.74	-30.73	24.27	-41.13	-40.31	-42.51	-40.74
320	-0.13	-30.65	-30.65	24.21	-40.54	-40.20	-42.32	-40.84
330	-0.13	-30.58	-30.57	24.01	-39.80	-39.65	-41.76	-40.63
340	-0.13	-30.52	-30.52	23.84	-39.21	-39.09	-40.77	-40.49
350	-0.13	-30.49	-30.48	23.57	-38.46	-38.51	-39.82	-40.01
360	-0.14	-30.47	-30.46	23.35	-38.25	-38.23	-39.97	-39.71
370	-0.14	-30.47	-30.46	23.20	-38.23	-38.13	-40.34	-39.44
380	-0.14	-30.48	-30.48	23.05	-38.09	-37.78	-40.60	-39.12
390	-0.15	-30.51	-30.51	22.84	-37.39	-37.04	-39.88	-38.55
400	-0.15	-30.55	-30.55	22.68	-36.48	-35.93	-38.53	-37.44
410	-0.15	-30.62	-30.61	22.48	-35.29	-34.83	-36.93	-36.33
420	-0.15	-30.69	-30.69	22.17	-34.16	-33.81	-35.61	-35.28
430	-0.16	-30.78	-30.77	21.82	-33.23	-32.97	-34.40	-34.33
440	-0.16	-30.88	-30.88	21.40	-32.42	-32.10	-33.31	-33.51
450	-0.16	-31.01	-31.00	20.92	-31.66	-31.47	-32.42	-32.73
460	-0.16	-31.16	-31.15	20.50	-31.19	-31.07	-32.03	-32.21
470	-0.16	-31.31	-31.30	20.08	-30.71	-30.66	-31.63	-31.69
480	-0.17	-31.49	-31.48	19.64	-30.34	-30.28	-31.41	-31.27
485	-0.17	-31.59	-31.58	19.42	-30.13	-30.03	-31.23	-31.01
490	-0.17	-31.69	-31.68	19.20	-29.91	-29.77	-31.05	-30.74
495	-0.17	-31.81	-31.80	18.95	-29.61	-29.46	-30.71	-30.42
500	-0.17	-31.92	-31.91	18.70	-29.31	-29.14	-30.37	-30.09
505	-0.18	-32.04	-32.03	18.45	-28.98	-28.80	-29.96	-29.75
510	-0.18	-32.16	-32.15	18.19	-28.64	-28.46	-29.55	-29.40
515	-0.18	-32.29	-32.28	17.91	-28.28	-28.14	-29.18	-29.07
520	-0.18	-32.42	-32.41	17.63	-27.92	-27.82	-28.80	-28.73
525	-0.18	-32.57	-32.55	17.34	-27.60	-27.52	-28.44	-28.44
530	-0.18	-32.71	-32.69	17.05	-27.28	-27.21	-28.07	-28.15

Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = +25°C, Configuration B.

Freq. (MHz)	I. Loss (dB) In - Out	Coupling (dB)		Directivity (dB) In - Fwd	Return Loss (dB)			
		In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.10	-32.92	-32.93	24.73	-40.63	-40.43	-39.31	-40.56
235	-0.10	-31.91	-31.92	24.46	-40.56	-40.49	-39.88	-40.02
240	-0.10	-31.80	-31.80	24.39	-40.47	-40.36	-39.76	-39.78
245	-0.10	-31.69	-31.70	24.37	-40.53	-40.44	-39.83	-40.03
250	-0.10	-31.59	-31.59	24.37	-40.58	-40.60	-39.85	-40.16
255	-0.10	-31.49	-31.49	24.37	-40.61	-40.78	-39.80	-40.56
260	-0.11	-31.40	-31.40	24.40	-40.76	-40.93	-39.87	-41.20
265	-0.11	-31.31	-31.31	24.43	-40.82	-41.12	-39.85	-41.65
270	-0.11	-31.23	-31.23	24.40	-40.63	-41.32	-39.72	-42.08
275	-0.11	-31.15	-31.15	24.45	-40.61	-41.36	-39.89	-42.13
280	-0.11	-31.07	-31.08	24.46	-40.58	-41.46	-39.90	-42.25
290	-0.12	-30.94	-30.95	24.48	-40.38	-41.46	-40.02	-42.24
300	-0.12	-30.83	-30.83	24.45	-40.42	-41.38	-40.36	-42.46
310	-0.13	-30.73	-30.74	24.48	-40.31	-41.13	-40.74	-42.51
320	-0.13	-30.65	-30.65	24.41	-40.20	-40.54	-40.84	-42.32
330	-0.13	-30.57	-30.58	24.17	-39.65	-39.80	-40.63	-41.76
340	-0.13	-30.52	-30.52	23.93	-39.09	-39.21	-40.49	-40.77
350	-0.13	-30.48	-30.49	23.68	-38.51	-38.46	-40.01	-39.82
360	-0.13	-30.46	-30.47	23.53	-38.23	-38.25	-39.71	-39.97
370	-0.14	-30.46	-30.47	23.39	-38.13	-38.23	-39.44	-40.34
380	-0.14	-30.48	-30.48	23.28	-37.78	-38.09	-39.12	-40.60
390	-0.14	-30.51	-30.51	23.06	-37.04	-37.39	-38.55	-39.88
400	-0.15	-30.55	-30.55	22.89	-35.93	-36.48	-37.44	-38.53
410	-0.15	-30.61	-30.62	22.64	-34.83	-35.29	-36.33	-36.93
420	-0.15	-30.69	-30.69	22.32	-33.81	-34.16	-35.28	-35.61
430	-0.15	-30.77	-30.78	21.93	-32.97	-33.23	-34.33	-34.40
440	-0.15	-30.88	-30.88	21.47	-32.10	-32.42	-33.51	-33.31
450	-0.15	-31.00	-31.01	20.99	-31.47	-31.66	-32.73	-32.42
460	-0.16	-31.15	-31.16	20.56	-31.07	-31.19	-32.21	-32.03
470	-0.16	-31.30	-31.31	20.13	-30.66	-30.71	-31.69	-31.63
480	-0.16	-31.48	-31.49	19.69	-30.28	-30.34	-31.27	-31.41
485	-0.17	-31.58	-31.59	19.47	-30.03	-30.13	-31.01	-31.23
490	-0.17	-31.68	-31.69	19.24	-29.77	-29.91	-30.74	-31.05
495	-0.17	-31.80	-31.81	18.99	-29.46	-29.61	-30.42	-30.71
500	-0.17	-31.91	-31.92	18.74	-29.14	-29.31	-30.09	-30.37
505	-0.17	-32.03	-32.04	18.48	-28.80	-28.98	-29.75	-29.96
510	-0.17	-32.15	-32.16	18.21	-28.46	-28.64	-29.40	-29.55
515	-0.18	-32.28	-32.29	17.92	-28.14	-28.28	-29.07	-29.18
520	-0.18	-32.41	-32.42	17.63	-27.82	-27.92	-28.73	-28.80
525	-0.18	-32.55	-32.57	17.33	-27.52	-27.60	-28.44	-28.44
530	-0.18	-32.69	-32.71	17.02	-27.21	-27.28	-28.15	-28.07

Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = +25°C, Configuration C.

Freq. (MHz)	I. Loss (dB)	Coupling (dB)		Directivity (dB)	Return Loss (dB)			
	In - Out	In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.09	-32.94	-32.93	24.50	-39.31	-40.56	-40.63	-40.43
235	-0.10	-31.93	-31.92	24.40	-39.88	-40.02	-40.56	-40.49
240	-0.10	-31.81	-31.81	24.28	-39.76	-39.78	-40.47	-40.36
245	-0.10	-31.70	-31.70	24.24	-39.83	-40.03	-40.53	-40.44
250	-0.10	-31.60	-31.59	24.25	-39.85	-40.16	-40.58	-40.60
255	-0.10	-31.50	-31.50	24.18	-39.80	-40.56	-40.61	-40.78
260	-0.10	-31.40	-31.40	24.18	-39.87	-41.20	-40.76	-40.93
265	-0.11	-31.32	-31.32	24.18	-39.85	-41.65	-40.82	-41.12
270	-0.11	-31.24	-31.24	24.17	-39.72	-42.08	-40.63	-41.32
275	-0.11	-31.16	-31.16	24.19	-39.89	-42.13	-40.61	-41.36
280	-0.11	-31.09	-31.08	24.23	-39.90	-42.25	-40.58	-41.46
290	-0.11	-30.95	-30.95	24.23	-40.02	-42.24	-40.38	-41.46
300	-0.12	-30.84	-30.83	24.29	-40.36	-42.46	-40.42	-41.38
310	-0.12	-30.74	-30.74	24.31	-40.74	-42.51	-40.31	-41.13
320	-0.12	-30.66	-30.65	24.21	-40.84	-42.32	-40.20	-40.54
330	-0.13	-30.59	-30.58	24.05	-40.63	-41.76	-39.65	-39.80
340	-0.13	-30.53	-30.53	23.86	-40.49	-40.77	-39.09	-39.21
350	-0.13	-30.49	-30.49	23.57	-40.01	-39.82	-38.51	-38.46
360	-0.13	-30.47	-30.47	23.39	-39.71	-39.97	-38.23	-38.25
370	-0.13	-30.47	-30.47	23.23	-39.44	-40.34	-38.13	-38.23
380	-0.13	-30.49	-30.48	23.09	-39.12	-40.60	-37.78	-38.09
390	-0.14	-30.52	-30.51	22.95	-38.55	-39.88	-37.04	-37.39
400	-0.14	-30.56	-30.56	22.74	-37.44	-38.53	-35.93	-36.48
410	-0.14	-30.62	-30.62	22.53	-36.33	-36.93	-34.83	-35.29
420	-0.15	-30.70	-30.70	22.20	-35.28	-35.61	-33.81	-34.16
430	-0.15	-30.78	-30.78	21.84	-34.33	-34.40	-32.97	-33.23
440	-0.15	-30.89	-30.89	21.44	-33.51	-33.31	-32.10	-32.42
450	-0.15	-31.01	-31.01	20.98	-32.73	-32.42	-31.47	-31.66
460	-0.16	-31.16	-31.16	20.55	-32.21	-32.03	-31.07	-31.19
470	-0.16	-31.31	-31.31	20.12	-31.69	-31.63	-30.66	-30.71
480	-0.16	-31.49	-31.50	19.69	-31.27	-31.41	-30.28	-30.34
485	-0.17	-31.59	-31.60	19.47	-31.01	-31.23	-30.03	-30.13
490	-0.17	-31.69	-31.70	19.24	-30.74	-31.05	-29.77	-29.91
495	-0.17	-31.81	-31.81	19.00	-30.42	-30.71	-29.46	-29.61
500	-0.17	-31.92	-31.92	18.75	-30.09	-30.37	-29.14	-29.31
505	-0.17	-32.04	-32.04	18.49	-29.75	-29.96	-28.80	-28.98
510	-0.17	-32.16	-32.16	18.22	-29.40	-29.55	-28.46	-28.64
515	-0.17	-32.29	-32.29	17.94	-29.07	-29.18	-28.14	-28.28
520	-0.17	-32.42	-32.42	17.66	-28.73	-28.80	-27.82	-27.92
525	-0.18	-32.57	-32.57	17.36	-28.44	-28.44	-27.52	-27.60
530	-0.18	-32.71	-32.71	17.06	-28.15	-28.07	-27.21	-27.28

Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = +25°C, Configuration D.

Freq. (MHz)	I. Loss (dB)	Coupling (dB)		Directivity (dB)	Return Loss (dB)			
	In - Out	In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.10	-32.93	-32.94	24.52	-40.56	-39.31	-40.43	-40.63
235	-0.11	-31.92	-31.93	24.37	-40.02	-39.88	-40.49	-40.56
240	-0.11	-31.81	-31.81	24.27	-39.78	-39.76	-40.36	-40.47
245	-0.11	-31.70	-31.70	24.24	-40.03	-39.83	-40.44	-40.53
250	-0.11	-31.59	-31.60	24.16	-40.16	-39.85	-40.60	-40.58
255	-0.11	-31.50	-31.50	24.17	-40.56	-39.80	-40.78	-40.61
260	-0.11	-31.40	-31.40	24.19	-41.20	-39.87	-40.93	-40.76
265	-0.12	-31.32	-31.32	24.21	-41.65	-39.85	-41.12	-40.82
270	-0.12	-31.24	-31.24	24.25	-42.08	-39.72	-41.32	-40.63
275	-0.12	-31.16	-31.16	24.25	-42.13	-39.89	-41.36	-40.61
280	-0.12	-31.08	-31.09	24.25	-42.25	-39.90	-41.46	-40.58
290	-0.12	-30.95	-30.95	24.28	-42.24	-40.02	-41.46	-40.38
300	-0.13	-30.83	-30.84	24.24	-42.46	-40.36	-41.38	-40.42
310	-0.13	-30.74	-30.74	24.30	-42.51	-40.74	-41.13	-40.31
320	-0.13	-30.65	-30.66	24.30	-42.32	-40.84	-40.54	-40.20
330	-0.14	-30.58	-30.59	24.13	-41.76	-40.63	-39.80	-39.65
340	-0.14	-30.53	-30.53	23.84	-40.77	-40.49	-39.21	-39.09
350	-0.14	-30.49	-30.49	23.57	-39.82	-40.01	-38.46	-38.51
360	-0.14	-30.47	-30.47	23.42	-39.97	-39.71	-38.25	-38.23
370	-0.14	-30.47	-30.47	23.29	-40.34	-39.44	-38.23	-38.13
380	-0.15	-30.48	-30.49	23.18	-40.60	-39.12	-38.09	-37.78
390	-0.15	-30.51	-30.52	22.95	-39.88	-38.55	-37.39	-37.04
400	-0.15	-30.56	-30.56	22.76	-38.53	-37.44	-36.48	-35.93
410	-0.15	-30.62	-30.62	22.50	-36.93	-36.33	-35.29	-34.83
420	-0.16	-30.70	-30.70	22.25	-35.61	-35.28	-34.16	-33.81
430	-0.16	-30.78	-30.78	21.86	-34.40	-34.33	-33.23	-32.97
440	-0.16	-30.89	-30.89	21.40	-33.31	-33.51	-32.42	-32.10
450	-0.16	-31.01	-31.01	20.92	-32.42	-32.73	-31.66	-31.47
460	-0.17	-31.16	-31.16	20.48	-32.03	-32.21	-31.19	-31.07
470	-0.17	-31.31	-31.31	20.04	-31.63	-31.69	-30.71	-30.66
480	-0.17	-31.50	-31.49	19.62	-31.41	-31.27	-30.34	-30.28
485	-0.18	-31.60	-31.59	19.39	-31.23	-31.01	-30.13	-30.03
490	-0.18	-31.70	-31.69	19.15	-31.05	-30.74	-29.91	-29.77
495	-0.18	-31.81	-31.81	18.91	-30.71	-30.42	-29.61	-29.46
500	-0.18	-31.92	-31.92	18.67	-30.37	-30.09	-29.31	-29.14
505	-0.18	-32.04	-32.04	18.41	-29.96	-29.75	-28.98	-28.80
510	-0.18	-32.16	-32.16	18.14	-29.55	-29.40	-28.64	-28.46
515	-0.18	-32.29	-32.29	17.87	-29.18	-29.07	-28.28	-28.14
520	-0.18	-32.42	-32.42	17.59	-28.80	-28.73	-27.92	-27.82
525	-0.19	-32.57	-32.57	17.29	-28.44	-28.44	-27.60	-27.52
530	-0.19	-32.71	-32.71	16.98	-28.07	-28.15	-27.28	-27.21

Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = +105°C, Configuration A.

Freq. (MHz)	I. Loss (dB) In - Out	Coupling (dB)		Directivity (dB) In - Fwd	Return Loss (dB)			
		In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.11	-32.88	-32.88	22.55	-33.14	-33.03	-32.09	-31.64
235	-0.13	-31.89	-31.88	23.15	-31.86	-31.89	-30.88	-30.77
240	-0.13	-31.78	-31.77	23.22	-31.88	-31.85	-30.81	-30.73
245	-0.12	-31.67	-31.66	23.31	-31.86	-31.78	-30.89	-30.80
250	-0.13	-31.57	-31.56	23.45	-31.96	-31.84	-30.98	-30.85
255	-0.13	-31.47	-31.46	23.57	-32.04	-31.92	-31.16	-30.99
260	-0.13	-31.38	-31.37	23.74	-32.22	-32.00	-31.39	-31.12
265	-0.13	-31.29	-31.28	23.94	-32.32	-32.09	-31.56	-31.24
270	-0.14	-31.21	-31.20	24.10	-32.41	-32.11	-31.67	-31.40
275	-0.14	-31.14	-31.12	24.27	-32.57	-32.22	-31.82	-31.63
280	-0.14	-31.06	-31.05	24.48	-32.78	-32.31	-32.03	-31.89
290	-0.14	-30.93	-30.92	24.93	-33.31	-32.83	-32.64	-32.64
300	-0.15	-30.82	-30.81	25.47	-34.40	-33.70	-33.67	-33.78
310	-0.15	-30.72	-30.71	26.01	-35.96	-34.79	-35.02	-35.27
320	-0.15	-30.64	-30.63	26.43	-37.56	-35.89	-36.48	-36.75
330	-0.15	-30.57	-30.56	26.57	-39.49	-36.78	-37.77	-38.29
340	-0.15	-30.52	-30.51	26.71	-41.59	-37.60	-38.76	-39.95
350	-0.15	-30.48	-30.47	26.66	-43.33	-38.20	-39.55	-41.12
360	-0.16	-30.46	-30.45	26.54	-43.47	-38.47	-40.29	-41.66
370	-0.16	-30.46	-30.45	26.46	-42.24	-38.41	-40.17	-41.16
380	-0.16	-30.48	-30.47	26.27	-40.37	-37.79	-39.48	-39.85
390	-0.17	-30.51	-30.50	25.97	-38.11	-36.43	-37.71	-38.08
400	-0.17	-30.56	-30.55	25.61	-36.02	-34.93	-35.72	-35.96
410	-0.17	-30.62	-30.61	25.11	-34.08	-33.45	-33.92	-34.16
420	-0.18	-30.70	-30.69	24.52	-32.45	-32.13	-32.46	-32.69
430	-0.18	-30.79	-30.78	23.85	-31.17	-31.03	-31.24	-31.47
440	-0.18	-30.90	-30.88	23.12	-30.12	-29.98	-30.17	-30.45
450	-0.18	-31.02	-31.01	22.34	-29.21	-29.18	-29.27	-29.55
460	-0.19	-31.18	-31.17	21.70	-28.58	-28.59	-28.74	-28.94
470	-0.19	-31.34	-31.32	21.05	-27.95	-27.99	-28.21	-28.32
480	-0.20	-31.52	-31.51	20.42	-27.49	-27.48	-27.84	-27.81
485	-0.20	-31.62	-31.61	20.10	-27.25	-27.21	-27.63	-27.55
490	-0.20	-31.72	-31.71	19.78	-27.01	-26.93	-27.42	-27.29
495	-0.21	-31.84	-31.82	19.46	-26.72	-26.63	-27.12	-27.01
500	-0.21	-31.95	-31.93	19.13	-26.43	-26.33	-26.82	-26.73
505	-0.21	-32.08	-32.06	18.80	-26.13	-26.04	-26.51	-26.45
510	-0.21	-32.20	-32.18	18.46	-25.83	-25.75	-26.19	-26.16
515	-0.21	-32.33	-32.32	18.12	-25.52	-25.48	-25.92	-25.89
520	-0.21	-32.46	-32.45	17.78	-25.21	-25.20	-25.64	-25.62
525	-0.22	-32.61	-32.60	17.44	-24.95	-24.95	-25.38	-25.40
530	-0.22	-32.75	-32.74	17.09	-24.68	-24.69	-25.11	-25.17

NOTES:

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- 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 <https://www.minicircuits.com/terms/viewterm.html>



Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = +105°C, Configuration B.

Freq. (MHz)	I. Loss (dB) In - Out	Coupling (dB)		Directivity (dB) In - Fwd	Return Loss (dB)			
		In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.11	-32.88	-32.88	22.92	-33.03	-33.14	-31.64	-32.09
235	-0.12	-31.88	-31.89	23.39	-31.89	-31.86	-30.77	-30.88
240	-0.12	-31.77	-31.78	23.49	-31.85	-31.88	-30.73	-30.81
245	-0.12	-31.66	-31.67	23.61	-31.78	-31.86	-30.80	-30.89
250	-0.12	-31.56	-31.57	23.74	-31.84	-31.96	-30.85	-30.98
255	-0.12	-31.46	-31.47	23.91	-31.92	-32.04	-30.99	-31.16
260	-0.12	-31.37	-31.38	24.10	-32.00	-32.22	-31.12	-31.39
265	-0.13	-31.28	-31.29	24.31	-32.09	-32.32	-31.24	-31.56
270	-0.13	-31.20	-31.21	24.46	-32.11	-32.41	-31.40	-31.67
275	-0.13	-31.12	-31.14	24.63	-32.22	-32.57	-31.63	-31.82
280	-0.13	-31.05	-31.06	24.78	-32.31	-32.78	-31.89	-32.03
290	-0.13	-30.92	-30.93	25.16	-32.83	-33.31	-32.64	-32.64
300	-0.14	-30.81	-30.82	25.60	-33.70	-34.40	-33.78	-33.67
310	-0.14	-30.71	-30.72	25.91	-34.79	-35.96	-35.27	-35.02
320	-0.14	-30.63	-30.64	26.17	-35.89	-37.56	-36.75	-36.48
330	-0.15	-30.56	-30.57	26.19	-36.78	-39.49	-38.29	-37.77
340	-0.15	-30.51	-30.52	26.18	-37.60	-41.59	-39.95	-38.76
350	-0.14	-30.47	-30.48	26.12	-38.20	-43.33	-41.12	-39.55
360	-0.15	-30.45	-30.46	26.06	-38.47	-43.47	-41.66	-40.29
370	-0.15	-30.45	-30.46	25.98	-38.41	-42.24	-41.16	-40.17
380	-0.16	-30.47	-30.48	25.85	-37.79	-40.37	-39.85	-39.48
390	-0.16	-30.50	-30.51	25.55	-36.43	-38.11	-38.08	-37.71
400	-0.16	-30.55	-30.56	25.23	-34.93	-36.02	-35.96	-35.72
410	-0.16	-30.61	-30.62	24.80	-33.45	-34.08	-34.16	-33.92
420	-0.17	-30.69	-30.70	24.25	-32.13	-32.45	-32.69	-32.46
430	-0.17	-30.78	-30.79	23.64	-31.03	-31.17	-31.47	-31.24
440	-0.17	-30.88	-30.90	22.93	-29.98	-30.12	-30.45	-30.17
450	-0.18	-31.01	-31.02	22.22	-29.18	-29.21	-29.55	-29.27
460	-0.18	-31.17	-31.18	21.63	-28.59	-28.58	-28.94	-28.74
470	-0.18	-31.32	-31.34	21.03	-27.99	-27.95	-28.32	-28.21
480	-0.19	-31.51	-31.52	20.45	-27.48	-27.49	-27.81	-27.84
485	-0.19	-31.61	-31.62	20.15	-27.21	-27.25	-27.55	-27.63
490	-0.19	-31.71	-31.72	19.85	-26.93	-27.01	-27.29	-27.42
495	-0.20	-31.82	-31.84	19.54	-26.63	-26.72	-27.01	-27.12
500	-0.20	-31.93	-31.95	19.22	-26.33	-26.43	-26.73	-26.82
505	-0.20	-32.06	-32.08	18.89	-26.04	-26.13	-26.45	-26.51
510	-0.20	-32.18	-32.20	18.56	-25.75	-25.83	-26.16	-26.19
515	-0.20	-32.32	-32.33	18.22	-25.48	-25.52	-25.89	-25.92
520	-0.20	-32.45	-32.46	17.88	-25.20	-25.21	-25.62	-25.64
525	-0.21	-32.60	-32.61	17.52	-24.95	-24.95	-25.40	-25.38
530	-0.21	-32.74	-32.75	17.16	-24.69	-24.68	-25.17	-25.11

NOTES:

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Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = +105°C, Configuration C.

Freq. (MHz)	I. Loss (dB) In - Out	Coupling (dB)		Directivity (dB) In - Fwd	Return Loss (dB)			
		In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.11	-32.89	-32.89	22.58	-31.64	-32.09	-33.03	-33.14
235	-0.12	-31.89	-31.89	23.13	-30.77	-30.88	-31.89	-31.86
240	-0.12	-31.78	-31.78	23.20	-30.73	-30.81	-31.85	-31.88
245	-0.12	-31.67	-31.67	23.33	-30.80	-30.89	-31.78	-31.86
250	-0.12	-31.57	-31.57	23.47	-30.85	-30.98	-31.84	-31.96
255	-0.12	-31.47	-31.47	23.60	-30.99	-31.16	-31.92	-32.04
260	-0.13	-31.38	-31.38	23.80	-31.12	-31.39	-32.00	-32.22
265	-0.13	-31.30	-31.30	23.93	-31.24	-31.56	-32.09	-32.32
270	-0.13	-31.22	-31.21	24.12	-31.40	-31.67	-32.11	-32.41
275	-0.13	-31.14	-31.14	24.33	-31.63	-31.82	-32.22	-32.57
280	-0.13	-31.07	-31.07	24.55	-31.89	-32.03	-32.31	-32.78
290	-0.14	-30.94	-30.93	24.98	-32.64	-32.64	-32.83	-33.31
300	-0.14	-30.82	-30.82	25.52	-33.78	-33.67	-33.70	-34.40
310	-0.15	-30.73	-30.72	26.04	-35.27	-35.02	-34.79	-35.96
320	-0.15	-30.65	-30.65	26.43	-36.75	-36.48	-35.89	-37.56
330	-0.15	-30.58	-30.58	26.57	-38.29	-37.77	-36.78	-39.49
340	-0.15	-30.52	-30.52	26.73	-39.95	-38.76	-37.60	-41.59
350	-0.15	-30.48	-30.49	26.65	-41.12	-39.55	-38.20	-43.33
360	-0.15	-30.47	-30.47	26.62	-41.66	-40.29	-38.47	-43.47
370	-0.16	-30.46	-30.47	26.52	-41.16	-40.17	-38.41	-42.24
380	-0.16	-30.48	-30.49	26.34	-39.85	-39.48	-37.79	-40.37
390	-0.17	-30.51	-30.52	26.10	-38.08	-37.71	-36.43	-38.11
400	-0.17	-30.56	-30.56	25.69	-35.96	-35.72	-34.93	-36.02
410	-0.17	-30.62	-30.62	25.16	-34.16	-33.92	-33.45	-34.08
420	-0.17	-30.70	-30.70	24.58	-32.69	-32.46	-32.13	-32.45
430	-0.18	-30.79	-30.80	23.88	-31.47	-31.24	-31.03	-31.17
440	-0.18	-30.90	-30.90	23.16	-30.45	-30.17	-29.98	-30.12
450	-0.18	-31.02	-31.03	22.41	-29.55	-29.27	-29.18	-29.21
460	-0.19	-31.18	-31.19	21.75	-28.94	-28.74	-28.59	-28.58
470	-0.19	-31.33	-31.34	21.08	-28.32	-28.21	-27.99	-27.95
480	-0.19	-31.52	-31.52	20.47	-27.81	-27.84	-27.48	-27.49
485	-0.20	-31.62	-31.63	20.16	-27.55	-27.63	-27.21	-27.25
490	-0.20	-31.72	-31.73	19.84	-27.29	-27.42	-26.93	-27.01
495	-0.20	-31.84	-31.84	19.50	-27.01	-27.12	-26.63	-26.72
500	-0.20	-31.95	-31.95	19.15	-26.73	-26.82	-26.33	-26.43
505	-0.21	-32.07	-32.08	18.83	-26.45	-26.51	-26.04	-26.13
510	-0.21	-32.19	-32.20	18.50	-26.16	-26.19	-25.75	-25.83
515	-0.21	-32.33	-32.33	18.16	-25.89	-25.92	-25.48	-25.52
520	-0.21	-32.46	-32.46	17.81	-25.62	-25.64	-25.20	-25.21
525	-0.22	-32.61	-32.61	17.46	-25.40	-25.38	-24.95	-24.95
530	-0.22	-32.75	-32.75	17.11	-25.17	-25.11	-24.69	-24.68

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- 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 <https://www.minicircuits.com/terms/viewterm.html>



Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Data

Test Conditions: Input Power = +5 dbm, Temperature = +105°C, Configuration D.

Freq. (MHz)	I. Loss (dB) In - Out	Coupling (dB)		Directivity (dB) In - Fwd	Return Loss (dB)			
		In - Fwd	Out - Rev		In	Out	Fwd	Rev
200	-0.12	-32.89	-32.89	22.78	-32.09	-31.64	-33.14	-33.03
235	-0.13	-31.89	-31.89	23.32	-30.88	-30.77	-31.86	-31.89
240	-0.13	-31.78	-31.78	23.34	-30.81	-30.73	-31.88	-31.85
245	-0.13	-31.67	-31.67	23.45	-30.89	-30.80	-31.86	-31.78
250	-0.13	-31.57	-31.57	23.54	-30.98	-30.85	-31.96	-31.84
255	-0.13	-31.47	-31.47	23.68	-31.16	-30.99	-32.04	-31.92
260	-0.14	-31.38	-31.38	23.90	-31.39	-31.12	-32.22	-32.00
265	-0.14	-31.30	-31.30	24.06	-31.56	-31.24	-32.32	-32.09
270	-0.14	-31.21	-31.22	24.26	-31.67	-31.40	-32.41	-32.11
275	-0.14	-31.14	-31.14	24.40	-31.82	-31.63	-32.57	-32.22
280	-0.14	-31.07	-31.07	24.61	-32.03	-31.89	-32.78	-32.31
290	-0.15	-30.93	-30.94	24.91	-32.64	-32.64	-33.31	-32.83
300	-0.15	-30.82	-30.82	25.38	-33.67	-33.78	-34.40	-33.70
310	-0.15	-30.72	-30.73	25.76	-35.02	-35.27	-35.96	-34.79
320	-0.16	-30.65	-30.65	26.05	-36.48	-36.75	-37.56	-35.89
330	-0.16	-30.58	-30.58	26.15	-37.77	-38.29	-39.49	-36.78
340	-0.16	-30.52	-30.52	26.07	-38.76	-39.95	-41.59	-37.60
350	-0.16	-30.49	-30.48	25.94	-39.55	-41.12	-43.33	-38.20
360	-0.16	-30.47	-30.47	25.91	-40.29	-41.66	-43.47	-38.47
370	-0.17	-30.47	-30.46	25.83	-40.17	-41.16	-42.24	-38.41
380	-0.17	-30.49	-30.48	25.69	-39.48	-39.85	-40.37	-37.79
390	-0.17	-30.52	-30.51	25.44	-37.71	-38.08	-38.11	-36.43
400	-0.18	-30.56	-30.56	25.05	-35.72	-35.96	-36.02	-34.93
410	-0.18	-30.62	-30.62	24.64	-33.92	-34.16	-34.08	-33.45
420	-0.18	-30.70	-30.70	24.18	-32.46	-32.69	-32.45	-32.13
430	-0.19	-30.80	-30.79	23.56	-31.24	-31.47	-31.17	-31.03
440	-0.19	-30.90	-30.90	22.87	-30.17	-30.45	-30.12	-29.98
450	-0.19	-31.03	-31.02	22.14	-29.27	-29.55	-29.21	-29.18
460	-0.20	-31.19	-31.18	21.54	-28.74	-28.94	-28.58	-28.59
470	-0.20	-31.34	-31.33	20.94	-28.21	-28.32	-27.95	-27.99
480	-0.20	-31.52	-31.52	20.37	-27.84	-27.81	-27.49	-27.48
485	-0.21	-31.63	-31.62	20.08	-27.63	-27.55	-27.25	-27.21
490	-0.21	-31.73	-31.72	19.78	-27.42	-27.29	-27.01	-26.93
495	-0.21	-31.84	-31.84	19.47	-27.12	-27.01	-26.72	-26.63
500	-0.21	-31.95	-31.95	19.16	-26.82	-26.73	-26.43	-26.33
505	-0.22	-32.08	-32.07	18.82	-26.51	-26.45	-26.13	-26.04
510	-0.22	-32.20	-32.19	18.48	-26.19	-26.16	-25.83	-25.75
515	-0.22	-32.33	-32.33	18.16	-25.92	-25.89	-25.52	-25.48
520	-0.22	-32.46	-32.46	17.83	-25.64	-25.62	-25.21	-25.20
525	-0.22	-32.61	-32.61	17.48	-25.38	-25.40	-24.95	-24.95
530	-0.22	-32.75	-32.75	17.12	-25.11	-25.17	-24.68	-24.69

NOTES:

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- 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 <https://www.minicircuits.com/terms/viewterm.html>

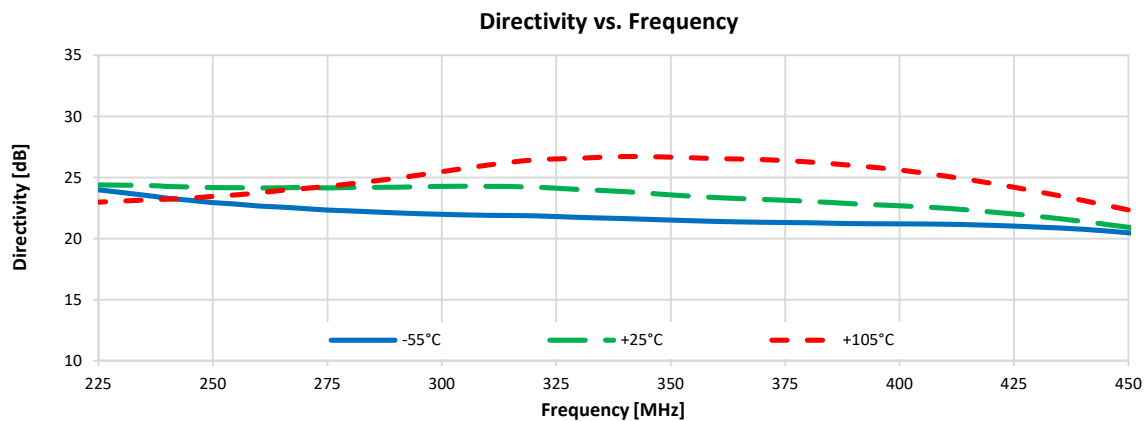
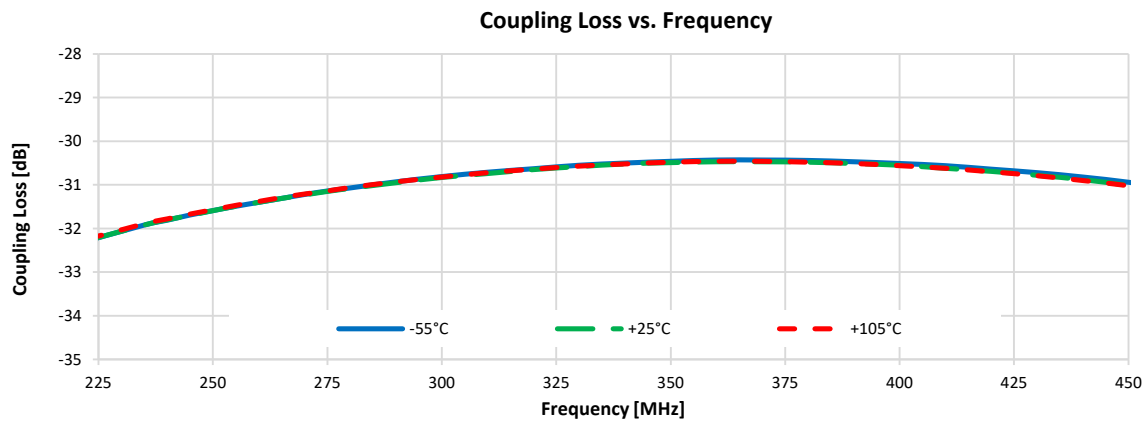
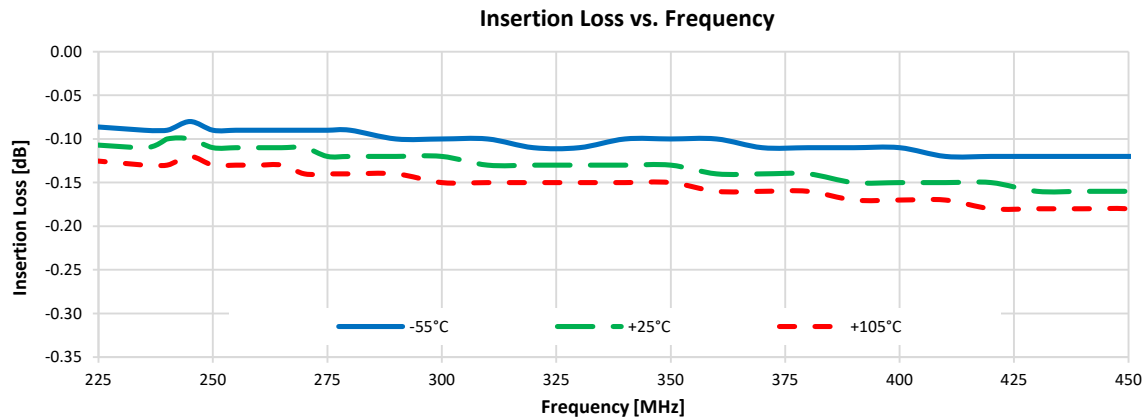


Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Graphs

Test Conditions: Input Power = +5 dbm, Configuration A.

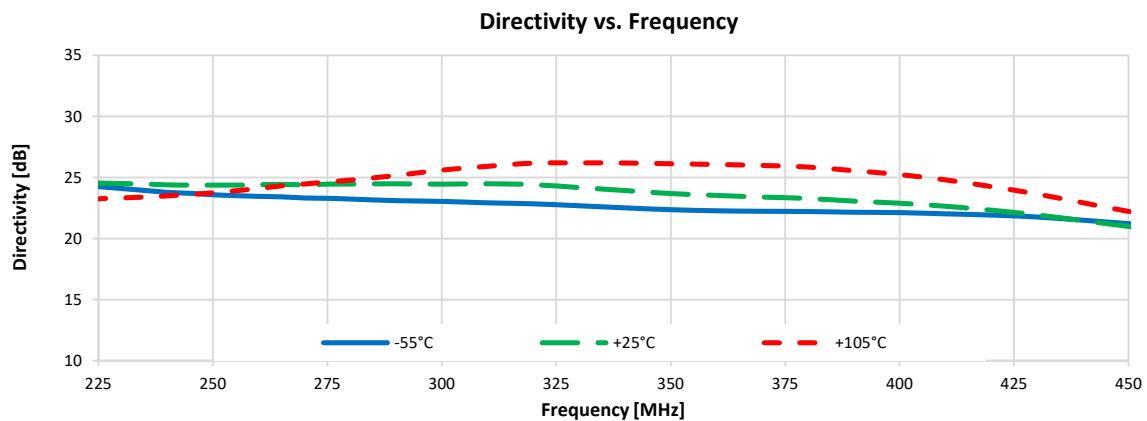
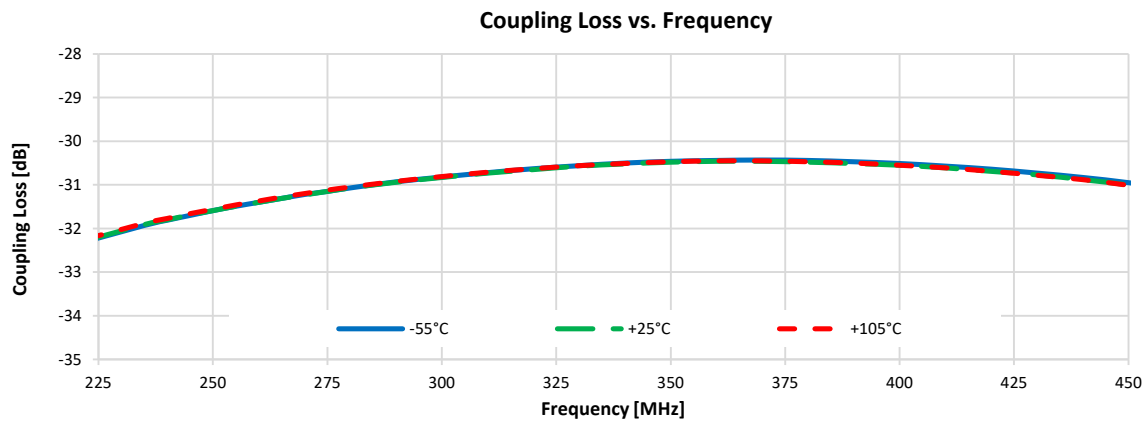
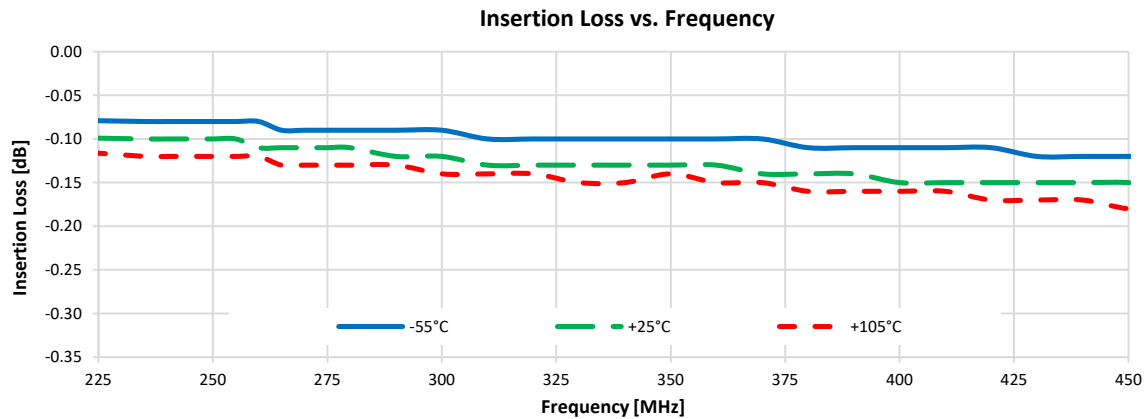


Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Graphs

Test Conditions: Input Power = +5 dbm, Configuration B.

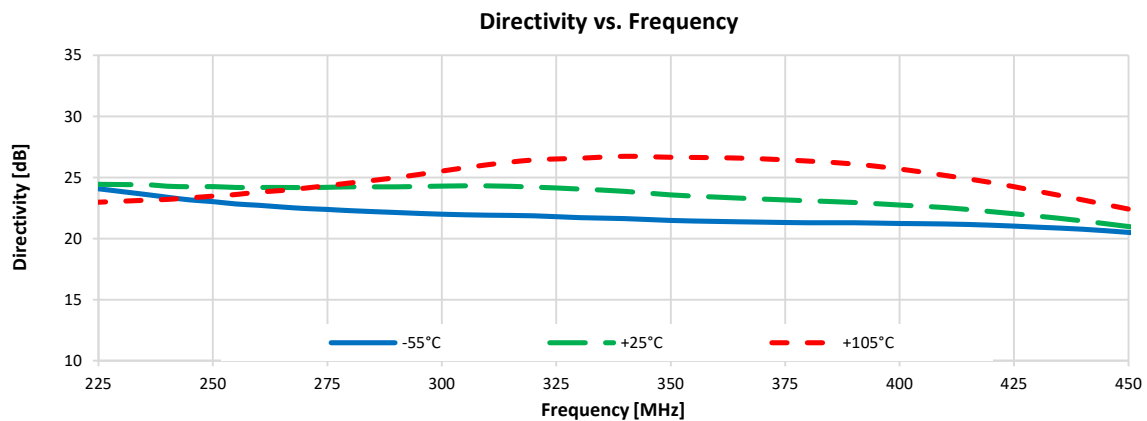
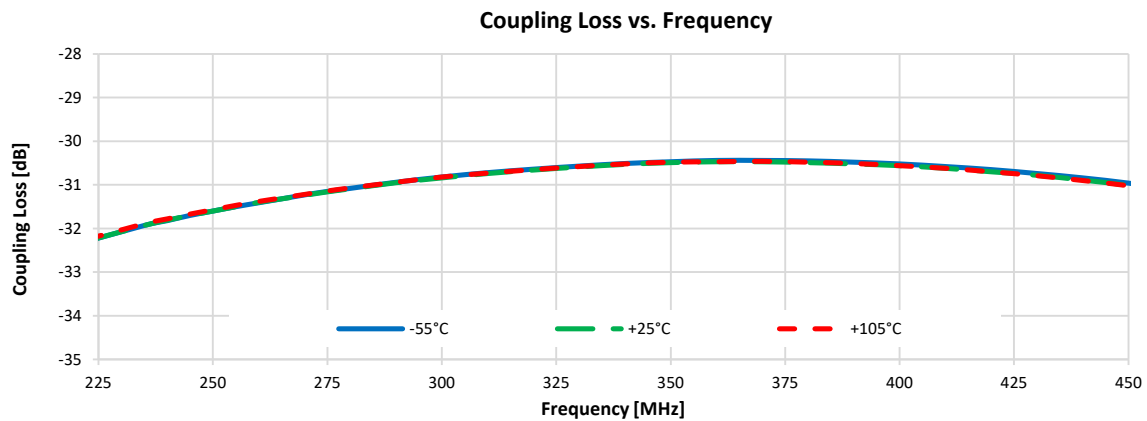
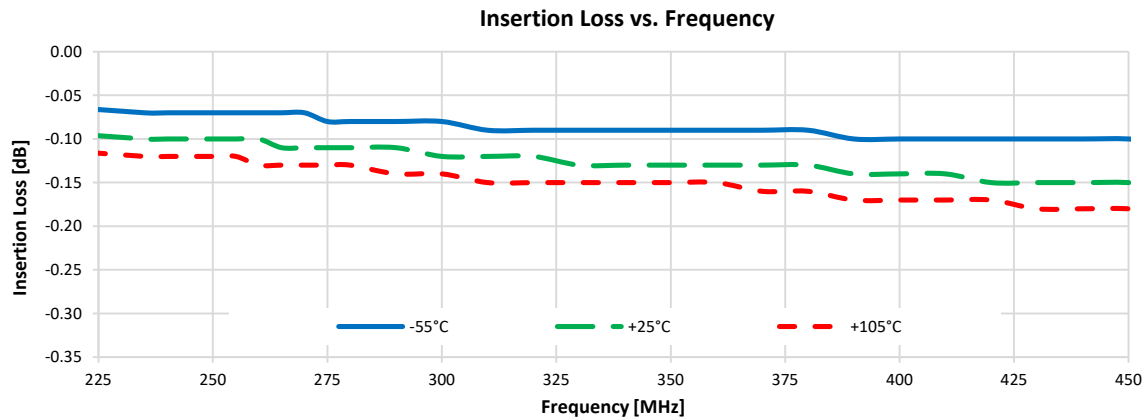


Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Graphs

Test Conditions: Input Power = +5 dbm, Configuration C.

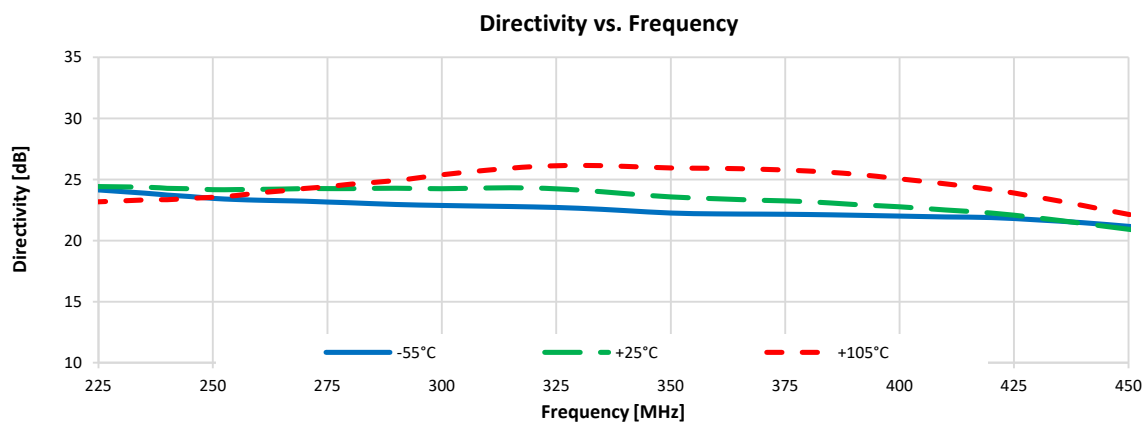
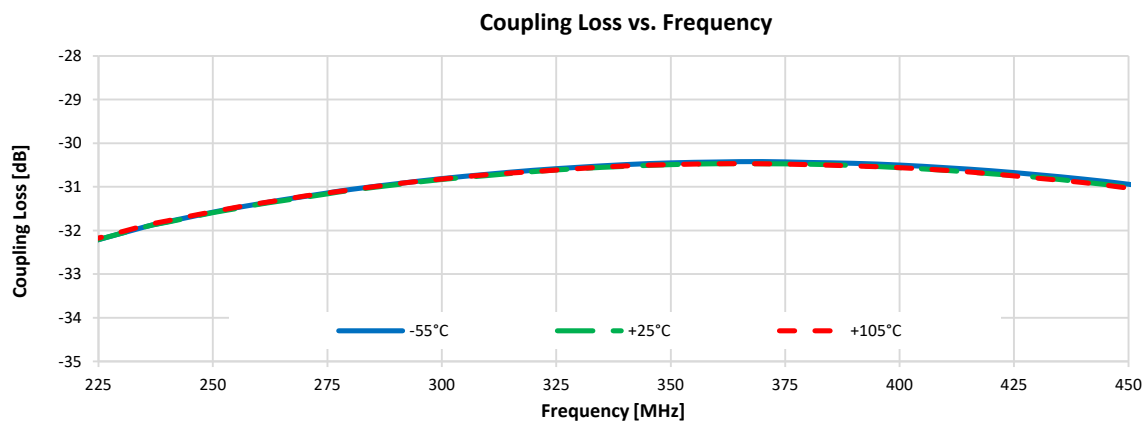
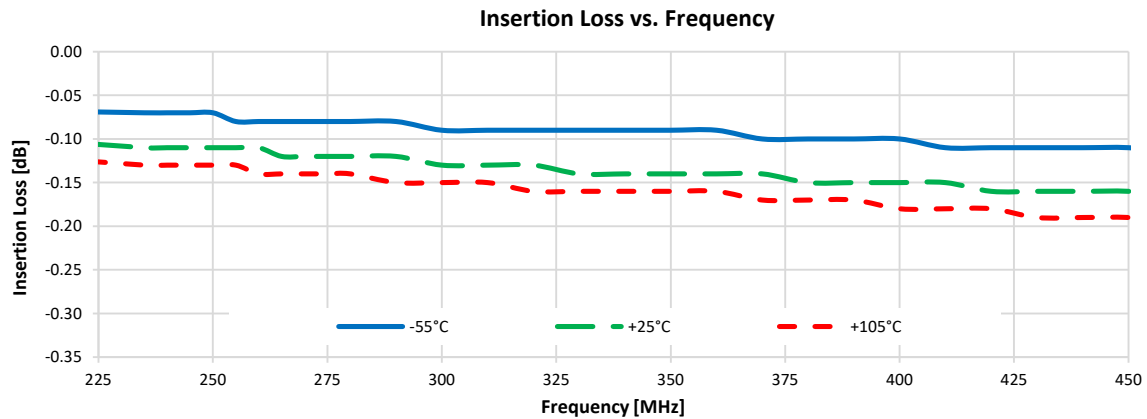


Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Graphs

Test Conditions: Input Power = +5 dbm, Configuration D.

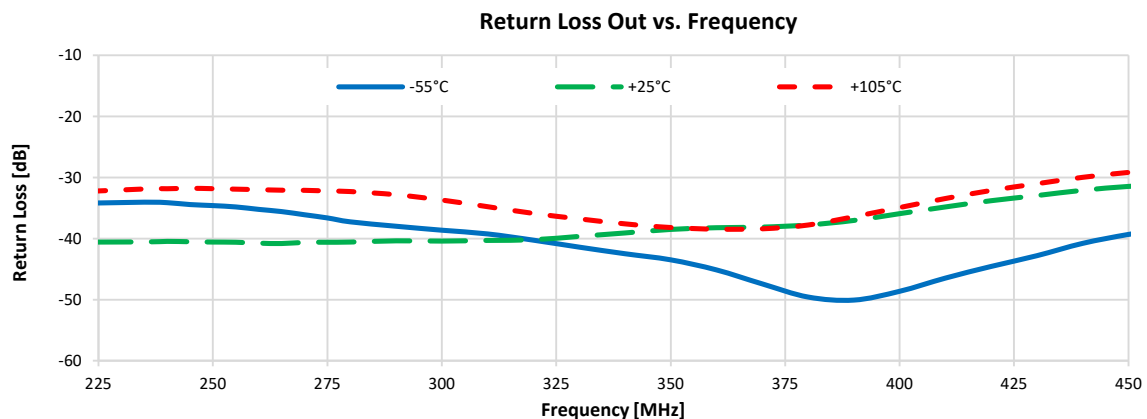
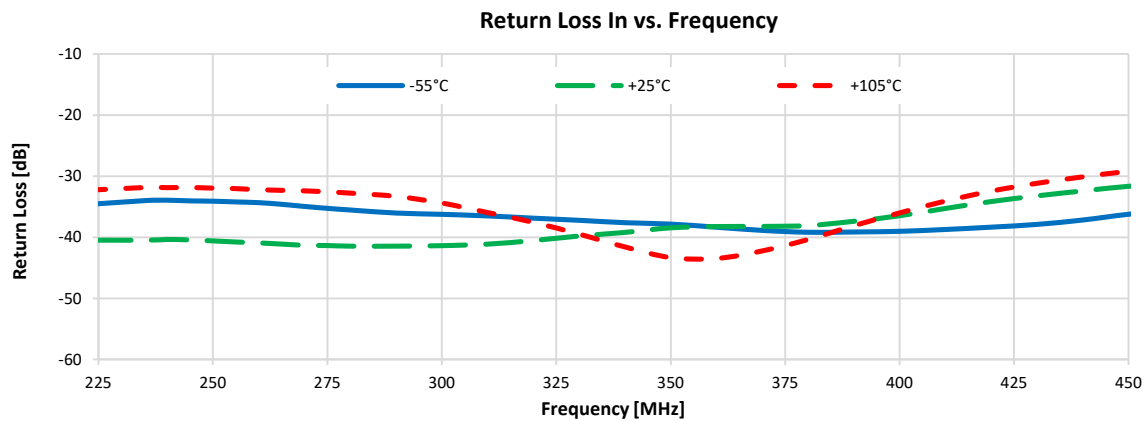
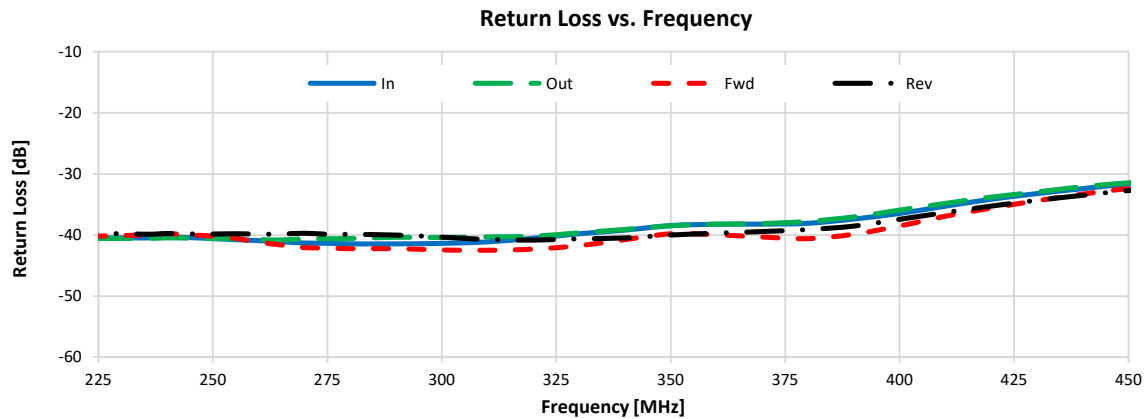


Bi-Directional Coupler

MBDA-30-451HP+

Typical Performance Graphs

Test Conditions: Input Power = +5 dbm, Configuration A.



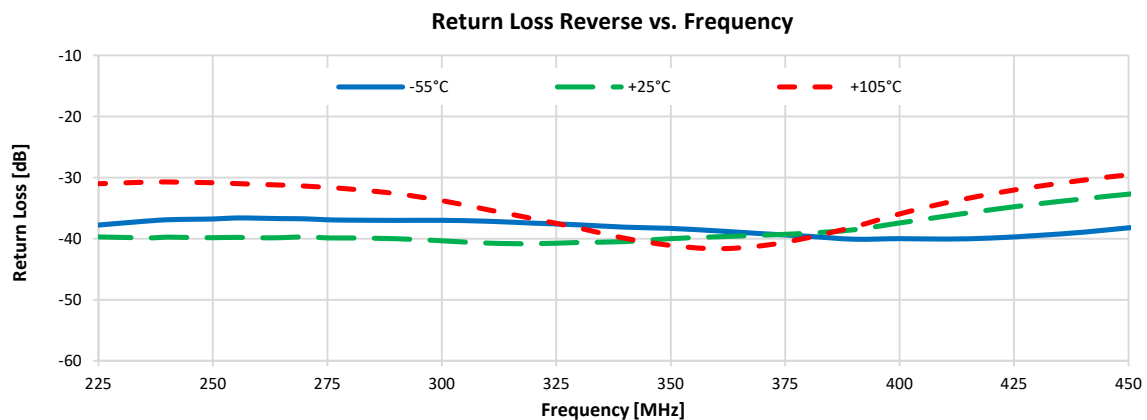
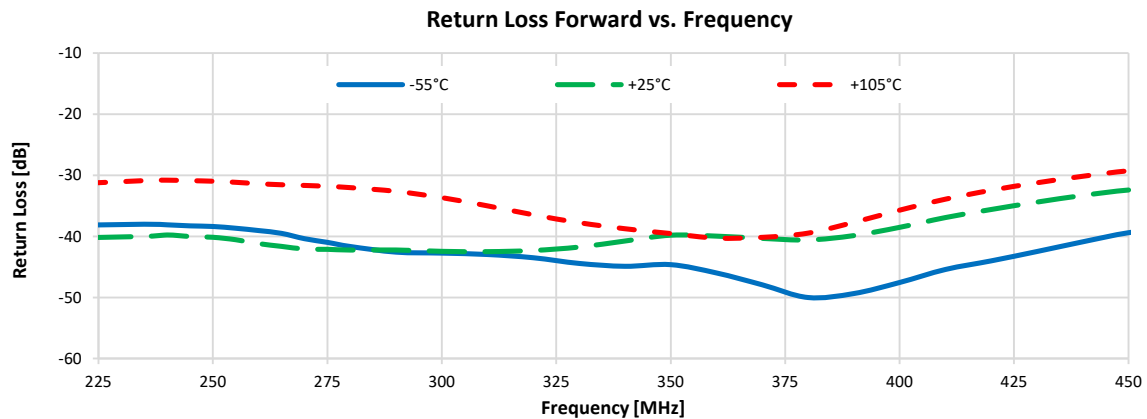
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Typical Performance Graphs

Test Conditions: Input Power = +5 dbm, Configuration A.



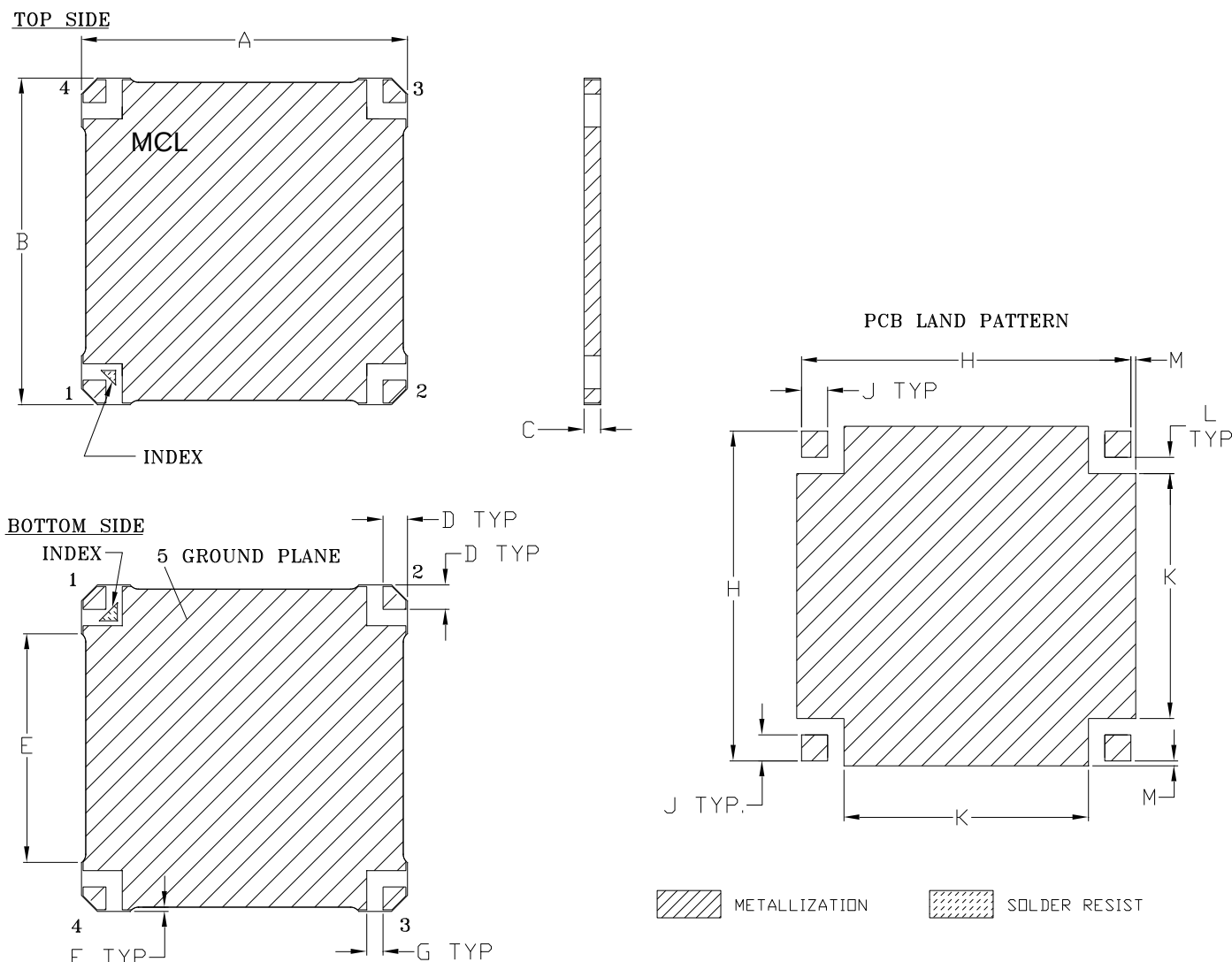
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Outline Dimensions

PQ2074



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	WT. GRAMS
PQ2074	1.000 (25.40)	1.000 (25.40)	.051 (1.30)	.075 (1.90)	.700 (17.78)	.013 (0.33)	.050 (1.27)	1.010 (26.65)	.080 (2.03)	.750 (19.05)	.050 (1.27)	.015 (0.38)	4.0

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

Notes:

- Base material: Printed wiring laminate.
- 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.



INTERNET <http://www.minicircuits.com>

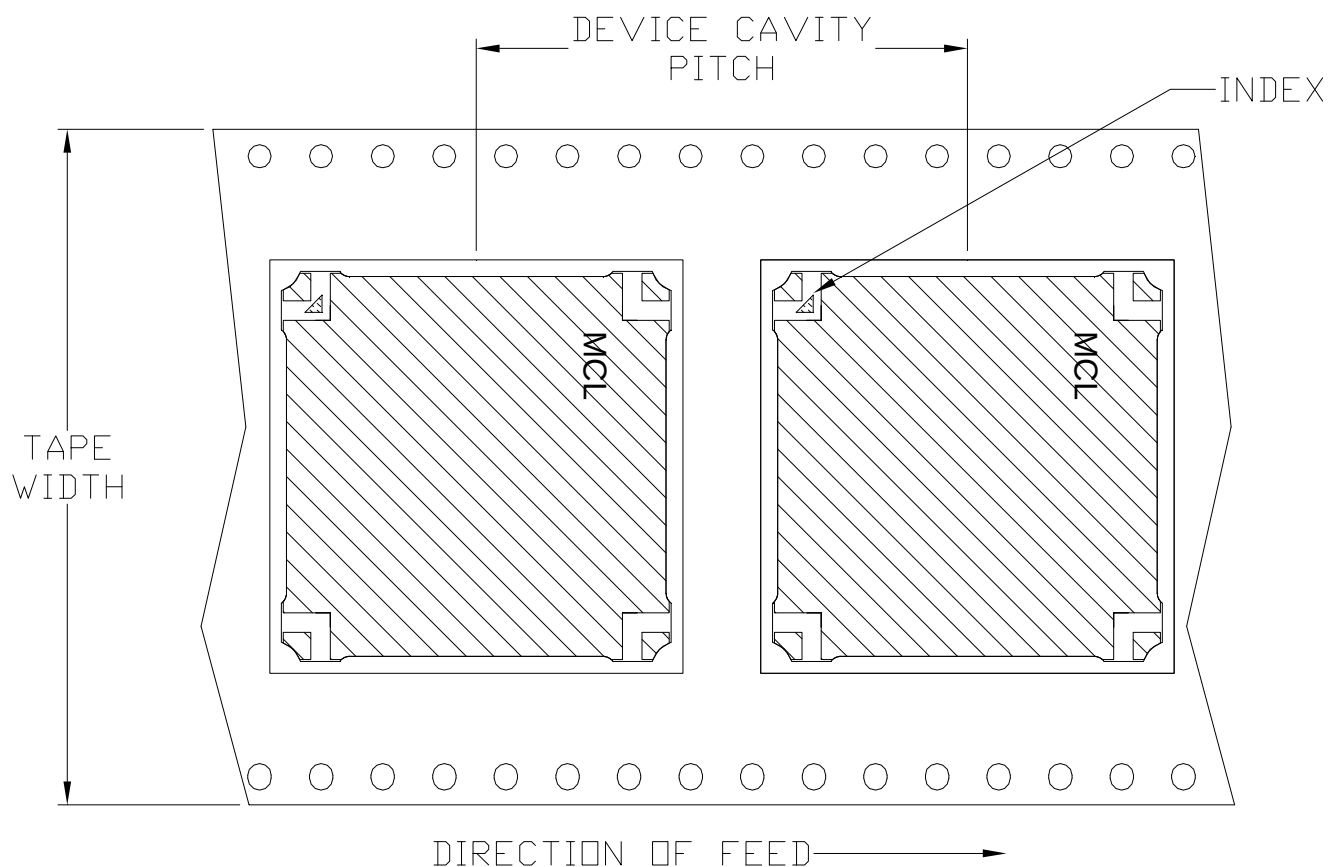
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

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Mini-Circuits ISO 9001 & ISO 14001 Certified

Tape & Reel Packaging TR-F117

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
44	32	13	500

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



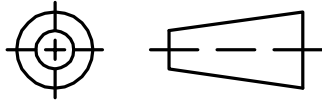
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THIRD ANGLE PROJECTION

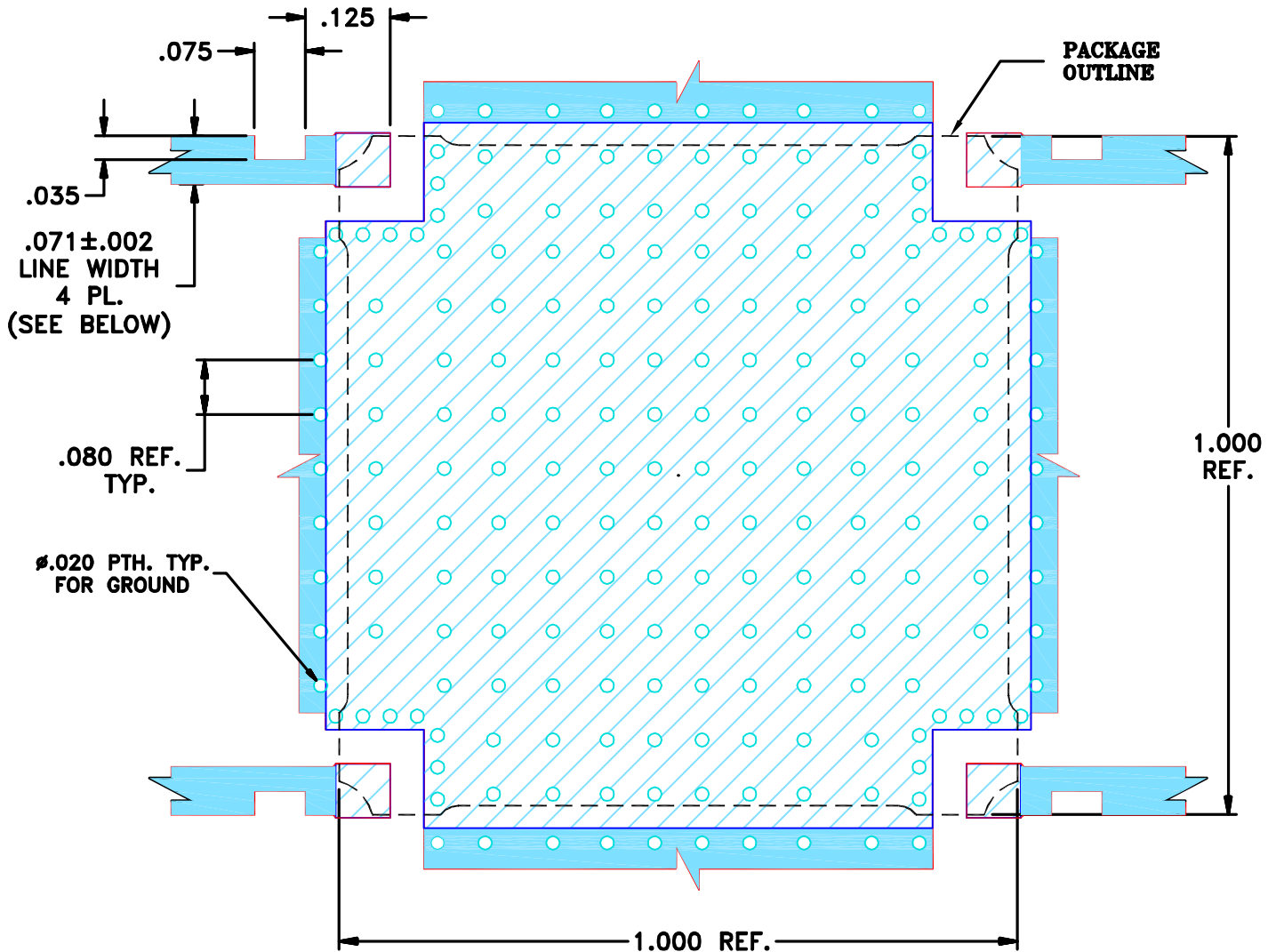


REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
A	M156950	CHANGE PIN CONNECTION CODE	06/16	DK	YB
B	M159071	CHANGE MATERIAL, THICK & COP WEIGHT	12/16	ZV	YB
C	M162783	CHANGE TUNING OF RF LINES	07/17	DK	HH
C	R92206	CHANGE TUNING OF RF LINES	07/17	DK	HH

SUGGESTED MOUNTING CONFIGURATION

FOR PQ2074/2074-1 CASE STYLE 04DC01 PIN CONNECTION, 50 OHM



NOTES:

- TRACE WIDTH IS SHOWN FOR ROGERS R04003C WITH DIELECTRIC THICKNESS. 0.032"±.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.
- CUTOUTS IN RF LINES ARE REQUIRED TO ACHIEVE SPECIFIED DIRECTIVITY.

 DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

 DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

TOLERANCES ON:
 2 PL DECIMALS ±
 3 PL DECIMALS ± .005
 ANGLES ±
 FRACTIONS ±

INITIALS

DRAWN ZV (RAYON)
 CHECKED HH (RAYON)
 APPROVED YB (RAYON)

DATE

08 DEC 16
 08 DEC 16
 08 DEC 16



Mini-Circuits® 13 Neptune Avenue
 Brooklyn NY 11235

PL FOR MBD PQ2074
 TB-861 (50 Ω)

SIZE
 A

CODE IDENT
 15542

DRAWING NO:
 98-PL-468

REV:
 C

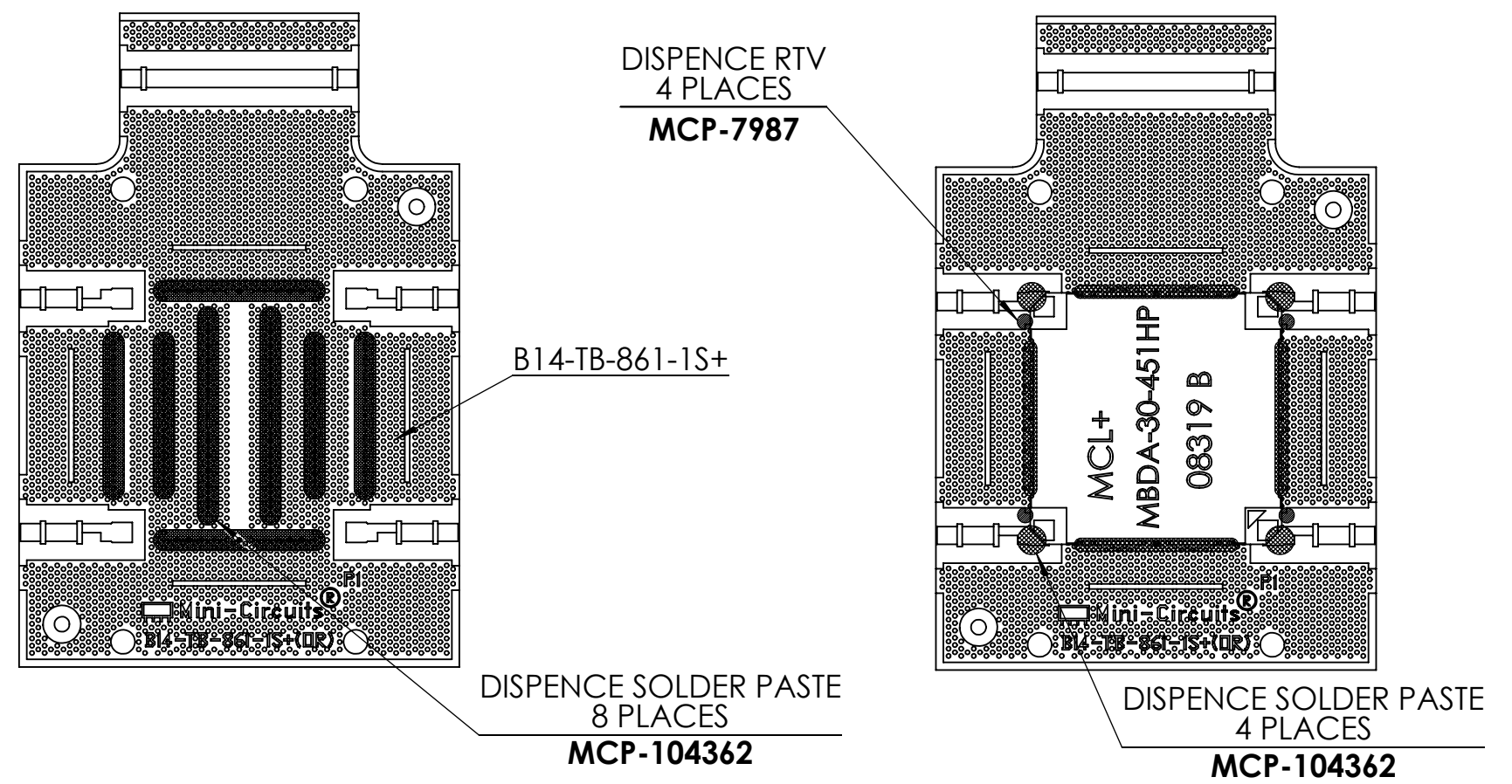
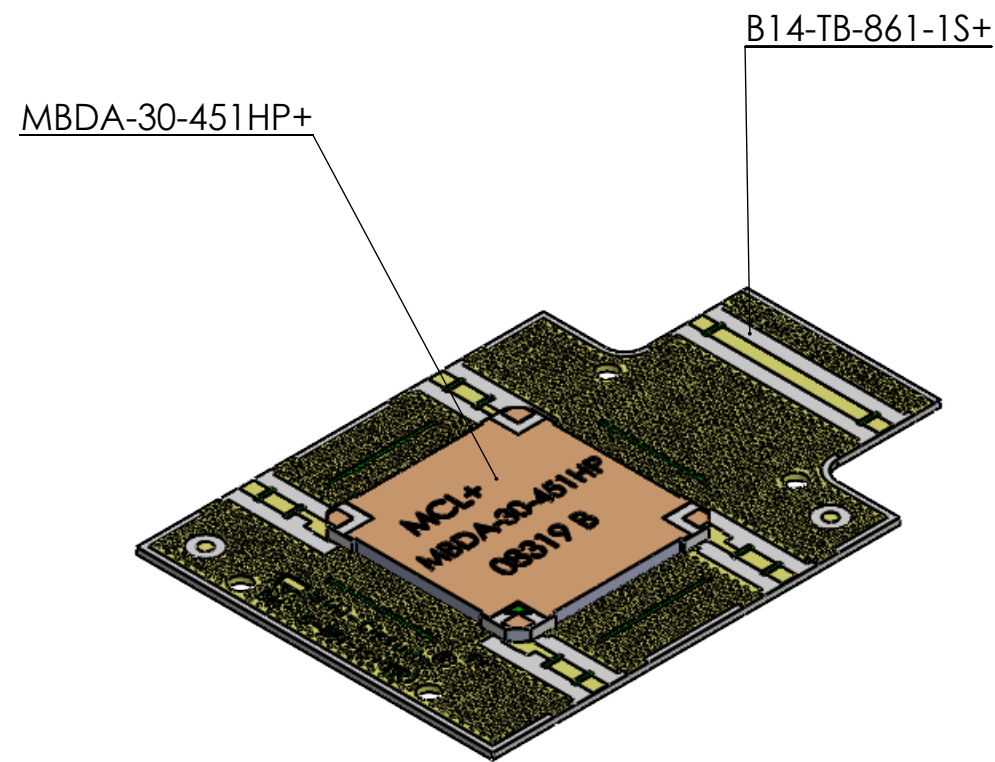
FILE: 98PL468(C)

SCALE: 4:1

SHEET: 1 OF 1

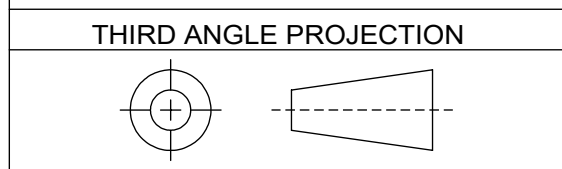
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ASHEETA1.DWG REV:A DATE:01/12/95



ASSEMBLY NOTES:

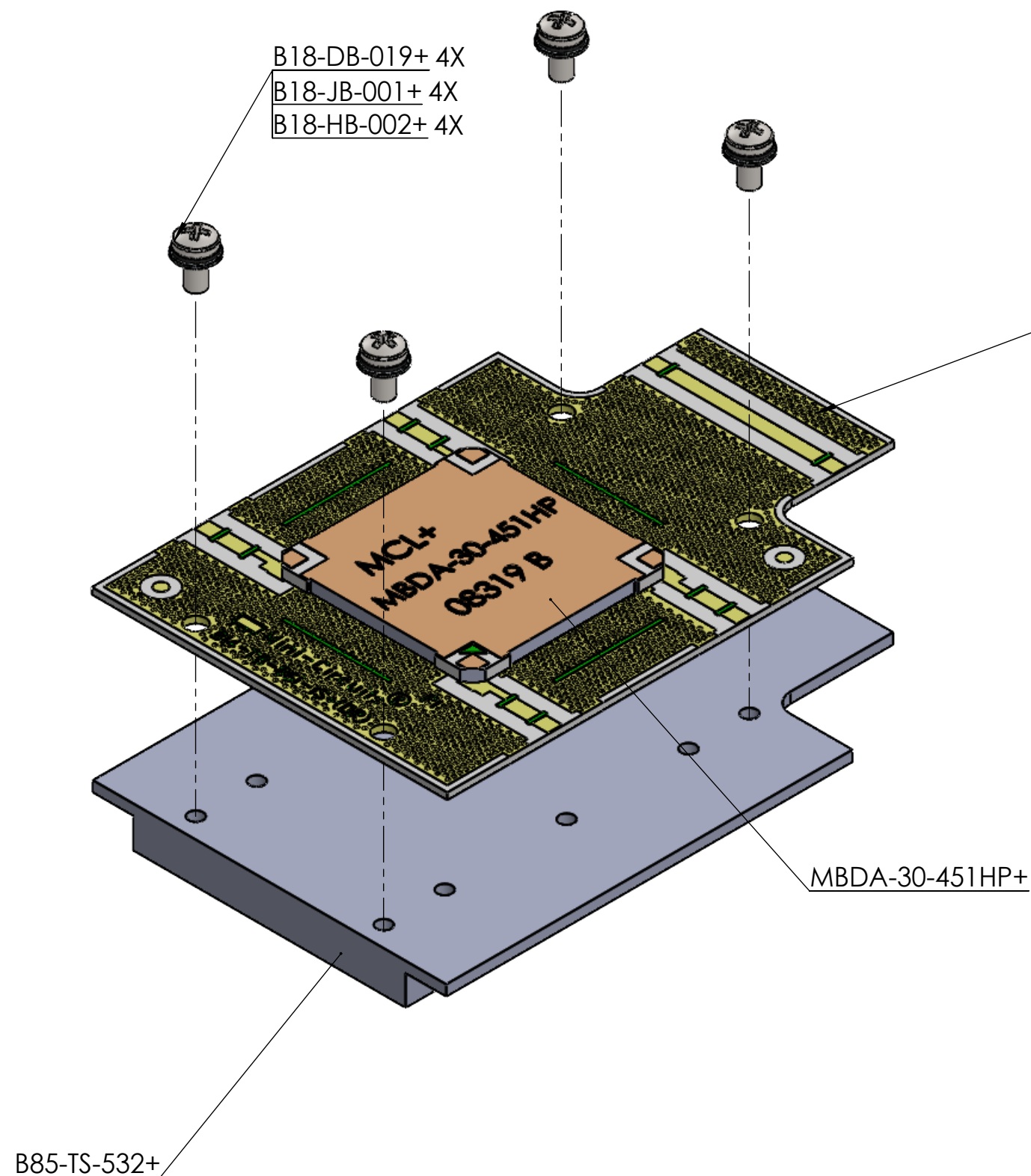
1. DISPENCE SOLDER PASTE ON PCB ACCORDING TO DRAWING.
2. REFLOW LdFr-245-UUH-ZXC PROGRAM WITH SMALL JIG FIXTURE.



A0	ECO-024068	NEW RELEASE	13 JAN 2025	AL	PG
REV	ECO No.	DESCRIPTION	DATE	DR	AUTH
REVISIONS					

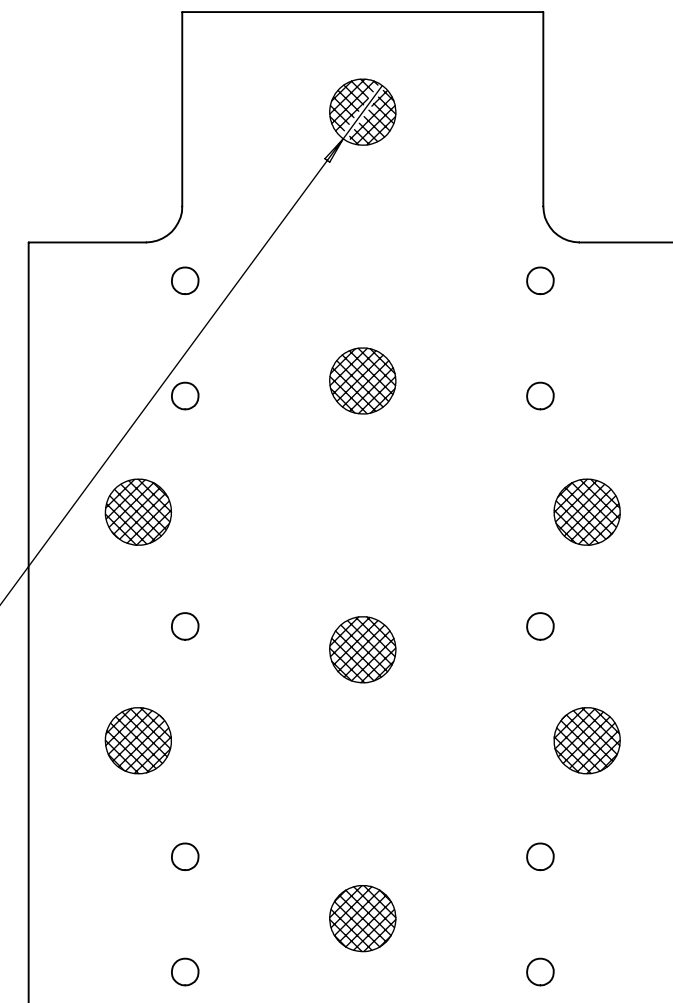
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	B85-TS-532+	SPACER 2.6 X 1.74 X .20 BRASS	1
2	B14-TB-861-1S+	PCB RO4003C 2.6X1.75X.032GS266	1
3	MBDA-30-451HP+	BI DIR COUP / SURF MT /	1
4	B18-DB-019+	SCREW PN HD #2-56 3/16"LG RoHS	4
5	B18-JB-001+	WASHER SPLIT LOCK #2 ROHS	8
6	B18-HB-002+	WASHER FL#2 OD.187/ID.096 RoHS	8
7	B20-14-F34+	CONN SMA-F END LAUNCH A .089"	6
8	B13-3902-1+	HTSK, BLK ANDZ 3.00X2.60X1.00	1
9	B18-DB-038+	SCREW PAN HD #2-56 3/8"LG ROHS	4
10	B16-10-53+	SIL THRM LBL .60X 1.10 RoHS	1

UNLESS OTHERWISE SPECIFIED		INITIALS		DATE	MODEL:		
DIMENSIONS ARE IN INCHES (MM) TOLERANCES ON: 2 PL DECIMALS ± .01 3 PL DECIMALS ± .005 ANGLES ± 1° FRACTIONS ± 1/32"		DRAWN	AL	13 Jan 2025	TB-MBDA30451HP+		
		CHECKED	PG	13 Jan 2025			
		APPROVED	HH	13 Jan 2025			
					ASSEMBLY DRAWING EVALUATION BOARD FOR MBDA-30-451HP+		
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SIZE	CODE IDENT	DRAWING NO:		REV:		A0	
B	15542	TB-MBDA30451HP+-20					
FILE:		SCALE:		SHEET:		1 OF 4	
TB-MBDA30451HP+(A0)		1:1					



TOP VIEW SOLDER PASTE LOCATION ON PCB

Ø0.172
8PLACES
MCP-104362



ASSEMBLY NOTES:

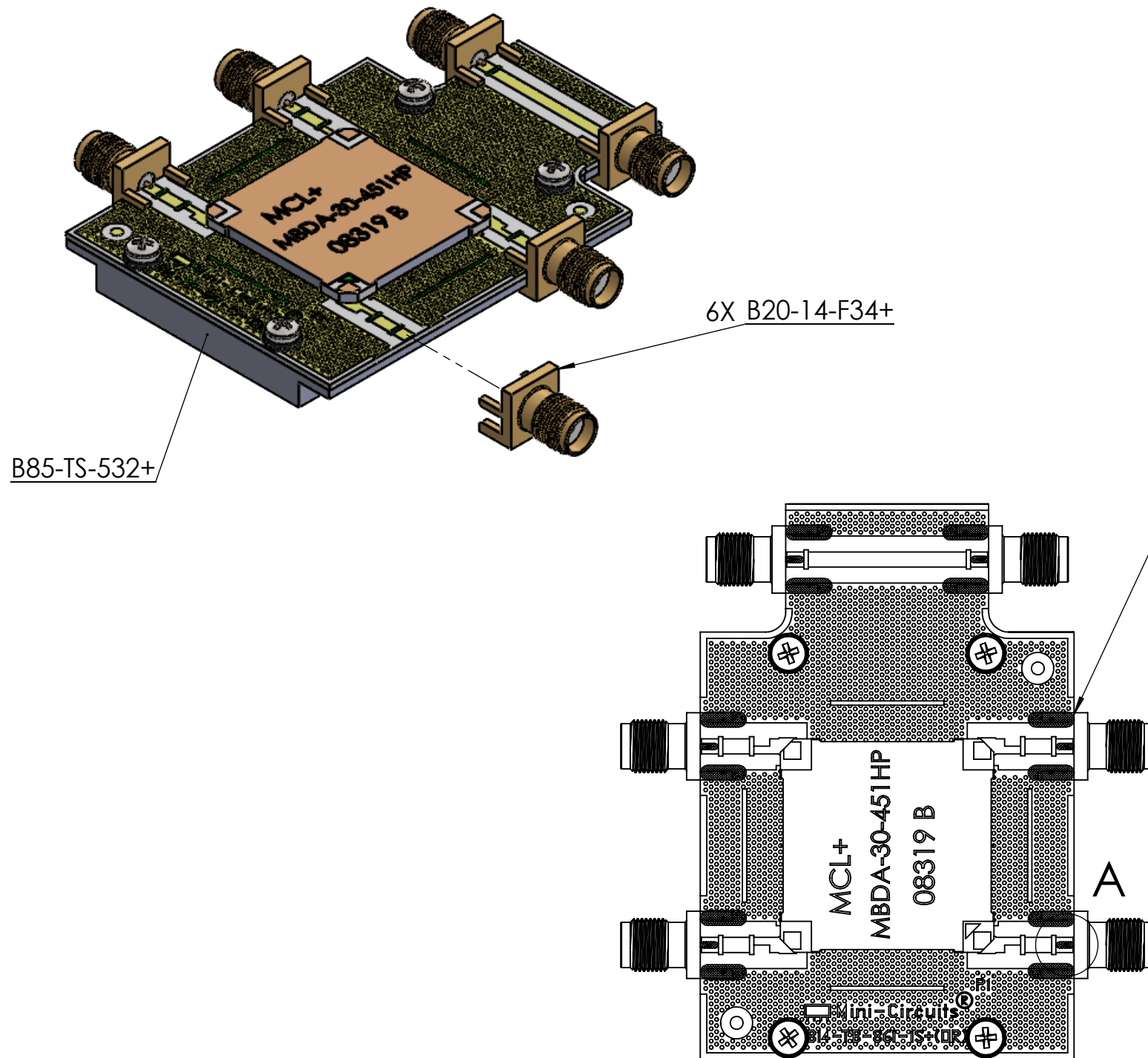
1. DISPENCE SOLDER DOTS AS SHOWN.
2. PUT PCB ON CARRIER.
3. IN ORER TO PREVENT MISALIGNMENT OF THE PCB USE SCREWS TO SECURE THE PCB.



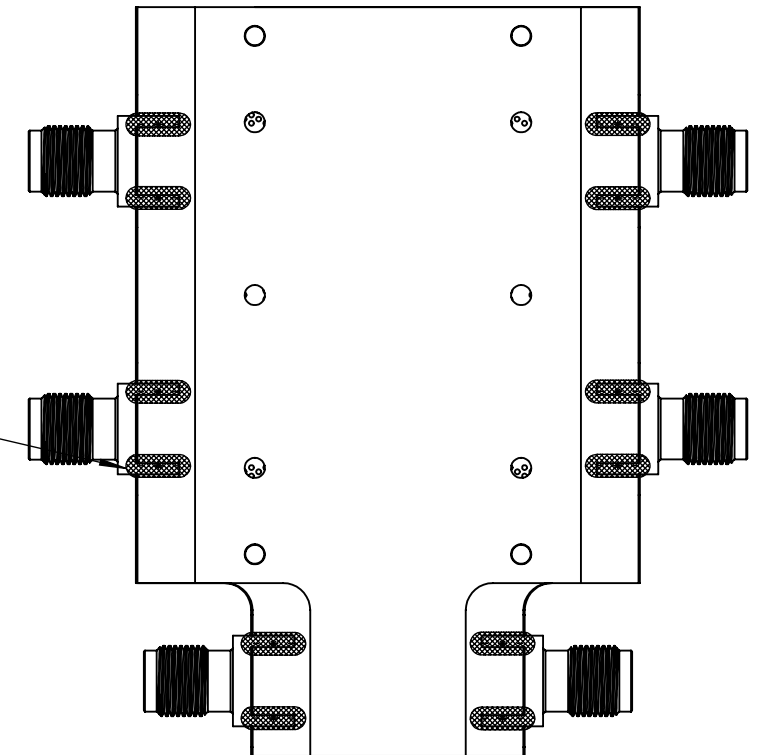
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ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED

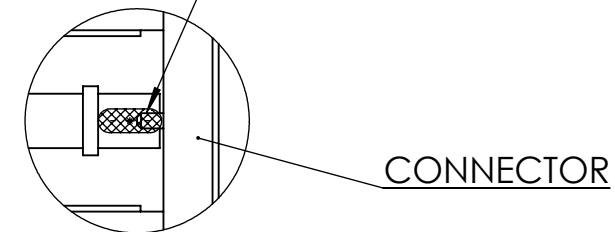
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B	15542	TB-MBDA30451HP+-20	A0
FILE: TB-MBDA30451HP+(A0)		SCALE: 2:1	SHEET: 2 OF 4



SOLDER CONNECTORS
FOR GROUNDING
MCP-5063



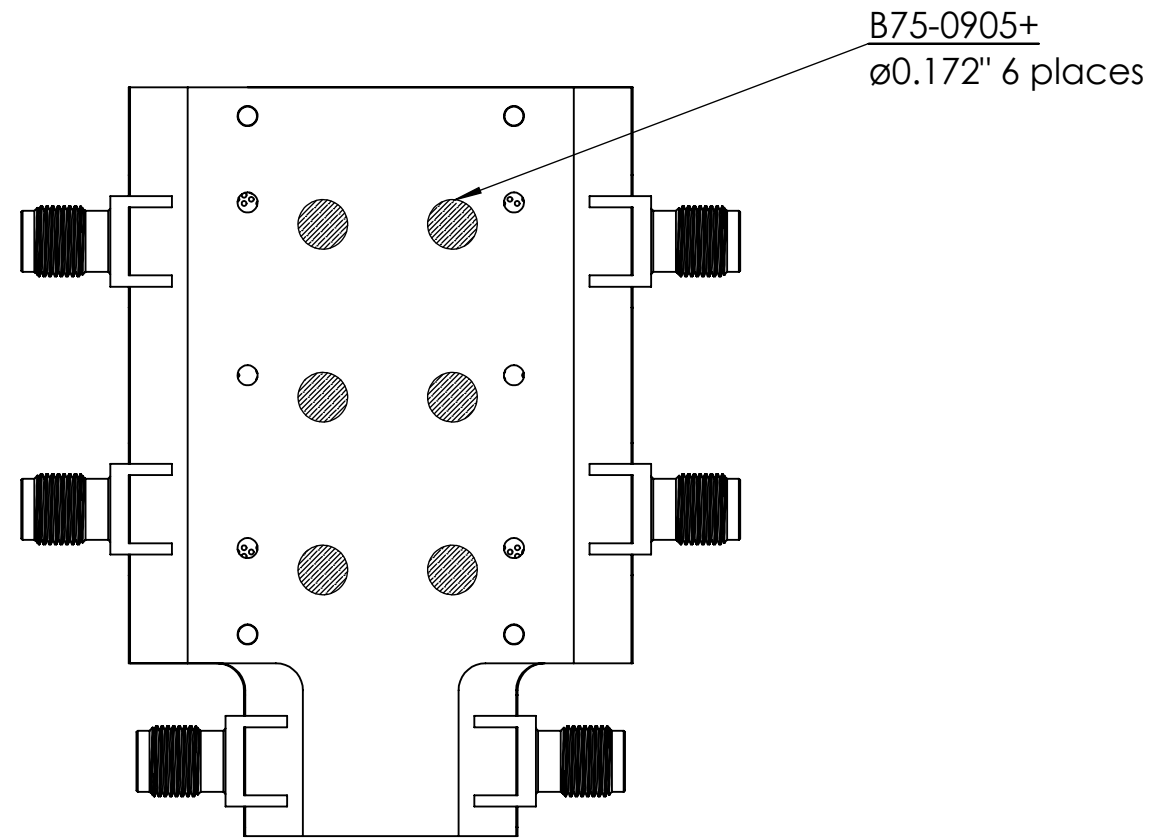
MANUALLY SOLDER PINS
TO PCB 6 PLACES
MCP-5063



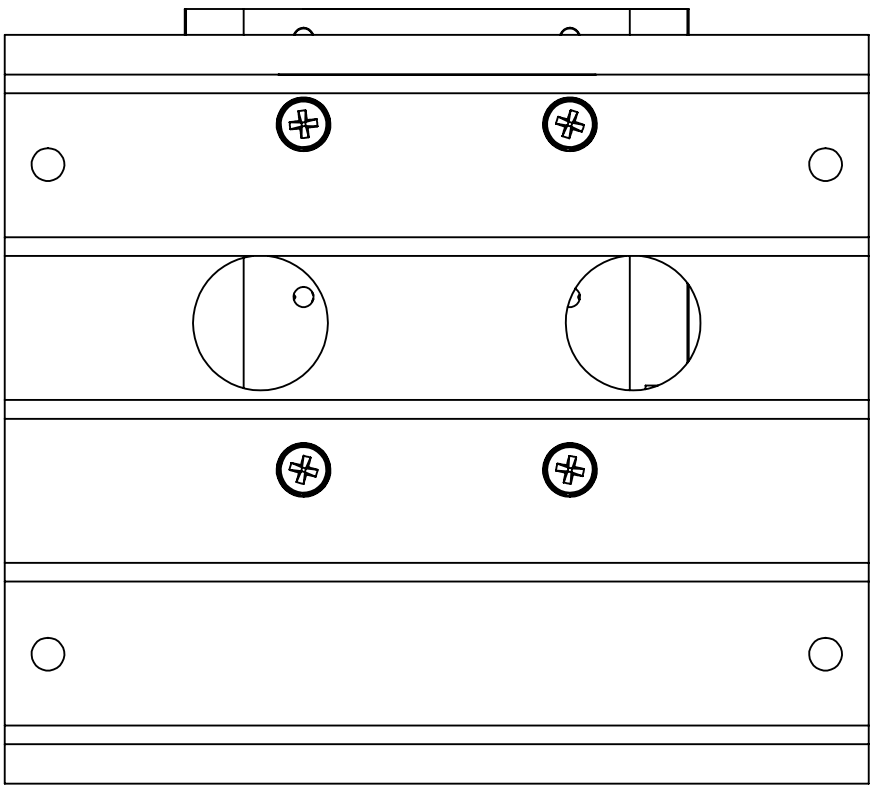
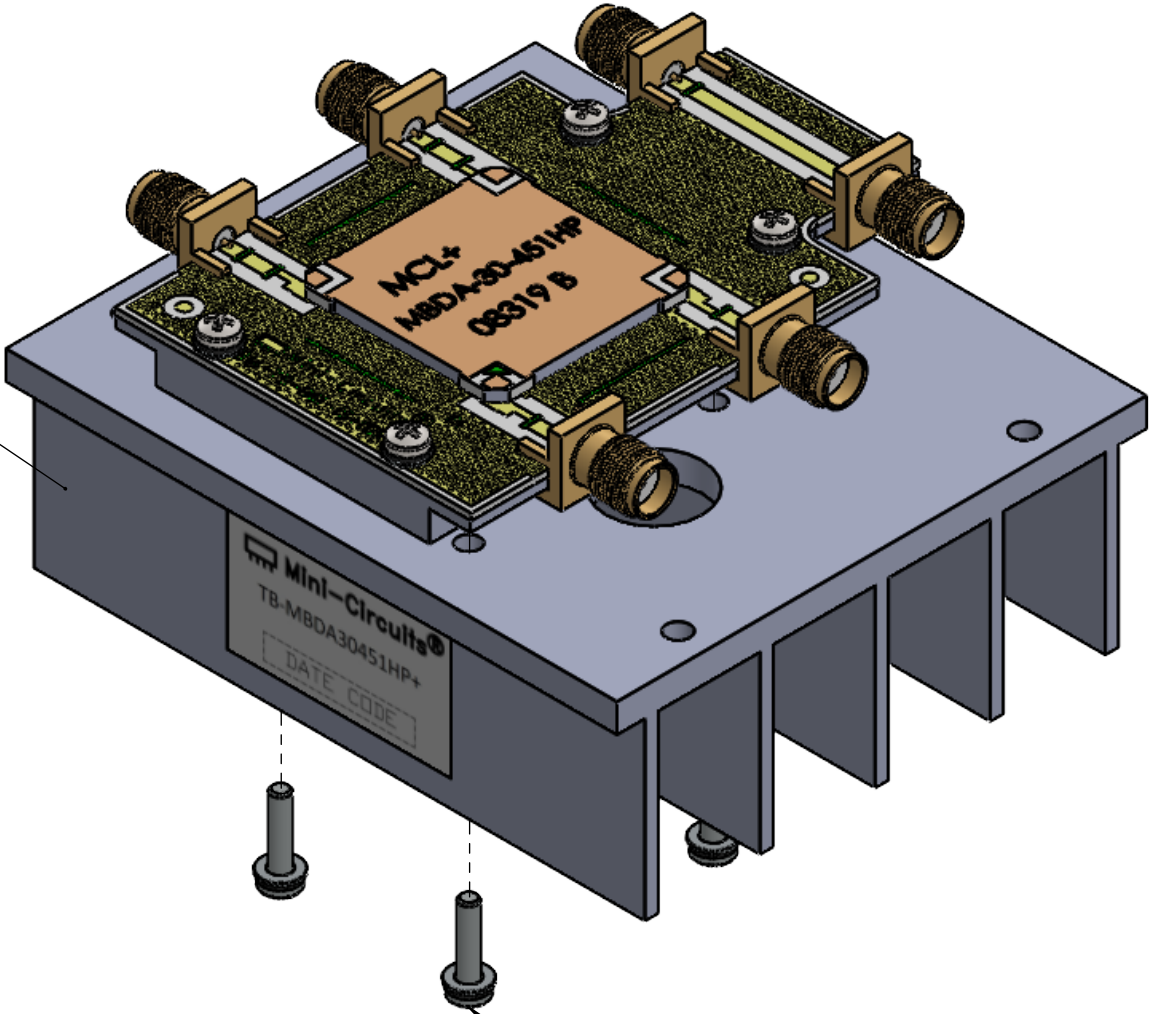
DETAIL A
SCALE 4 : 1

- ASSEMBLY NOTES:
TO PREVENT GAP BETWEEN CONNECTOR FORK AND PCB,
FOLLOW THESE ASSEMBLY STEPS:
1. SOLDER CONNECTOR FORK ON TOP SIDE OF PCB.
 2. SOLDER CONNECTOR FORK ON BOTTOM SIDE OF ASSEMBLY.
 3. SOLDER CONNECTOR CENTER PIN ON TOP SIDE OF PCB.

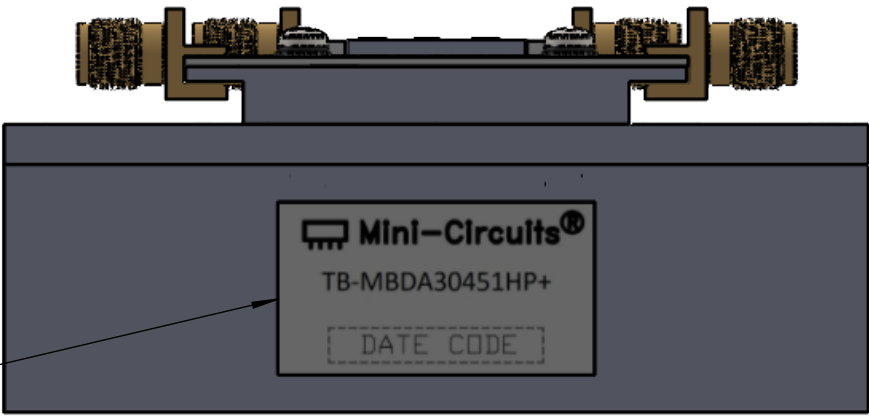
		ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED		
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FILE: TB-MBDA30451HP+(A0)		SCALE: 1:1	REV: A0	
		SHEET: 3 OF 4		



B13-3902-1+



B16-10-53+



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SIZE B	CODE IDENT 15542	DRAWING NO: TB-MBDA30451HP+-20		REV: A0
FILE: TB-MBDA30451HP+(A0)		SCALE: 1:1	SHEET: 4 OF 4	



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