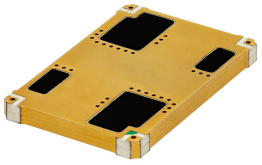
DC Pass, High Power

Dual-Directional Coupler

DDCH-50-13+

50Ω 50dB Coupling 120W* 20 to 1000 MHz



CASE STYLE: PQ2100

The Big Deal

- High power handling, up to 120W
- Low insertion loss, 0.15 dB
- Excellent return loss, 30 dB (In/Out)
- High directivity, 24.5 dB

Product Overview

Mini-Circuits DDCH-50-13+ is a high-power (120W), wide band (20-1000MHz) dual-directional coupler which features low insertion loss (0.15 dB), 50 dB coupling and excellent mainline return loss (30 dB). The Dual directional design allows monitoring forward and reverse power and guarantees good directivity, flatness and coupling accuracy.

The DDCH-50-13+ supports a wide variety of applications from military to VHF/UHF radio, various cellular base station applications and more.

The coupler is fabricated using laminated PCB process (1.5 x 1.0 x 0.128”) and includes wrap-around terminations for good solderability and easy visual inspection.

Key Features

Feature	Advantages
High power handling*: 120W @ 85°C 80W @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.
Dual-Directional Coupler	Ideally suited for simultaneous monitoring of both forward and reverse power of a system, and reflectometer measurements. The Directivity is not affected by coupling ports mismatch.
Low insertion loss, 0.15 dB	Used primarily in high power transmission applications, the excellent through-path signal loss maximizes the power transmitted to the antenna.
High directivity, 24.5 dB	High directivity with 50 dB coupling allows accurate signal sampling through the coupled port with minimal measurement error.
Excellent return loss, 30 dB. (input and output)	Provides excellent matching for 50Ω systems.
DC current passing, up to 4 A	Suitable for use in systems requiring DC voltage on the RF line, such as supplying bias to remote circuit via the antenna cable.

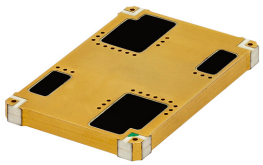
*See power derating on page 2

DC Pass, High Power

Dual-Directional Coupler

DDCH-50-13+

50Ω 50dB Coupling 120W* 20 to 1000 MHz



CASE STYLE: PQ2100

Maximum Ratings

Operating Temperature, case**	-55°C to 105°C
Storage Temperature	-55°C to 105°C
DC Current	4A
RF power *	120W @+85°C, case

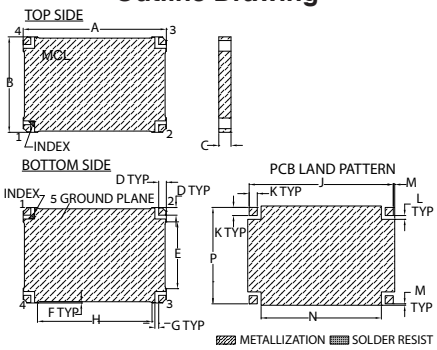
* Derates to 100W at 95°C and 80W@105°C case temperature. Power derates liniary from 520 MHz to 50% at 1000MHz.
**Case temperature is defined as temperature on base plate. Permanent damage may occur if any of these limits are exceeded.

Pad Connections***

INPUT	4
OUTPUT	2
COUPLED FORWARD	1
COUPLED REVERSE	3
GROUND	5

***Model is Dual-directional, input and output are interchangeable.

Outline Drawing



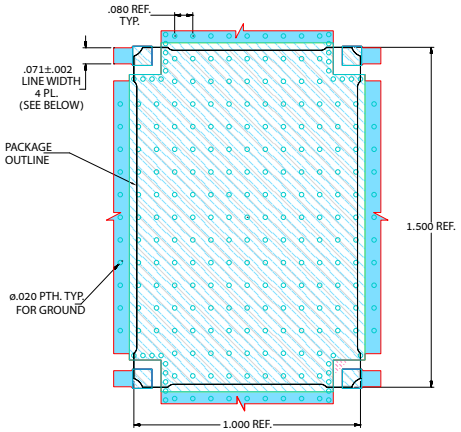
Base material: Printed wiring laminate.
Termination Finish: 2-5 µinch (0.05-0.13 microns) Gold over 120-240 µinch (3.05-6.10 microns) Nickel

Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H
1.500	**1.000**	**.128**	**.080**	**.700**	**.013**	**.040**	**1.200**
38.10	25.40	3.25	2.03	17.78	0.33	1.02	30.48

J	K	L	M	N	P	wt.
1.510	**.085**	**.040**	**.015**	**1.260**	**1.010**	grams
38.35	2.16	1.02	0.38	32.00	25.65	12.0

Demo Board MCL P/N: TB-865
Suggested PCB Layout (PL-471)



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4003C WITH DIELECTRIC THICKNESS. 0.032"±.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.
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

Features

- high power, up to 120W
- ultra wide band 20 to 1000 MHz
- low insertion loss, 0.15 dB Typ.
- excellent in/out return loss, 30 dB Typ
- high directivity, 24.5 dB Typ.
- DC current pass through input to output

Applications

- UHF/VHF high power radio
- transmission signal monitoring
- simultaneous monitoring of forward and reverse power
- antenna reflection monitoring
- defense and military

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

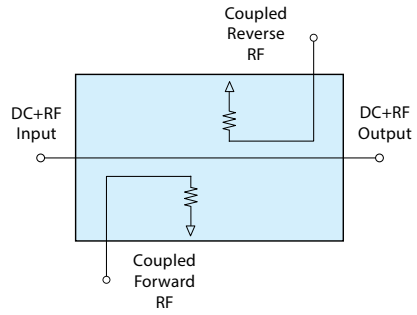
Electrical Specifications @ +25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		20		1000	MHz
Insertion Loss	20 - 520	—	0.1	0.2	dB
	20 - 1000	—	0.15	0.35	
Coupling	20 - 1000	—	50 ± 1.5	—	dB
Coupling Flatness	20 - 520	—	±0.9	—	dB
	30 - 1000	—	±0.65	—	
Directivity	20 - 1000	20	24.5	—	dB
Return Loss (Input)	20 - 1000	27	30	—	dB
Return Loss (Output)	20 - 1000	27	30	—	dB
Return Loss (Coupling)	20 - 1000	—	12.5	—	dB
Input RF Power* @+85°C, case	20 - 520	—	—	120	W
	1000	—	—	60	
Input RF Power* @+95°C, case	20 - 520	—	—	100	
	1000	—	—	50	
Input RF Power* @+105°C, case	20 - 520	—	—	80	
	1000	—	—	40	
Thermal Resistance	20 - 1000	—	0.5	—	°C/W

* Power derates liniary from 520 MHz to 50% at 1000MHz.

Electrical Schematic

Dual–Directional Coupler (DC THRU)*



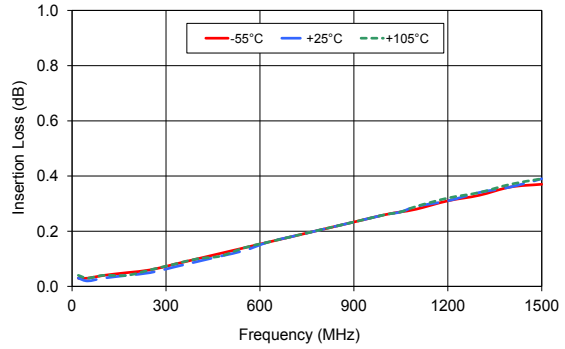
*Mainline is DC coupled.
*Coupling ports are DC coupled to internal terminations.

Typical Performance Data *

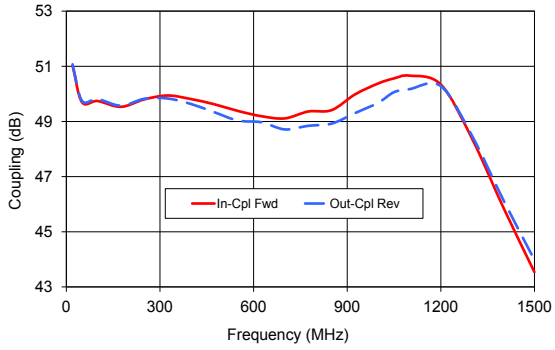
FREQUENCY (MHz)	Insertion Loss (dB) In - Out			Coupling (dB)		Directivity (dB)						Return Loss (dB)			
				In -	Out -	In-Cpl Rev			Out-Cpl Fwd			In	Out	Cpl	Cpl
	-55°C	+25°C	+105°C	Cpl Fwd	Cpl Rev	-55°C	+25°C	+105°C	-55°C	+25°C	+105°C			Fwd	Rev
20.0	0.03	0.03	0.04	51.02	51.07	23.35	23.24	23.26	21.96	22.27	22.25	59.74	54.06	7.22	7.37
50.0	0.03	0.02	0.03	49.70	49.75	23.84	23.12	22.78	22.38	22.21	22.09	50.13	46.80	7.17	7.33
100.0	0.04	0.03	0.04	49.74	49.81	24.51	23.36	22.05	23.00	22.16	21.95	42.98	41.38	9.85	10.02
175.0	0.05	0.04	0.04	49.53	49.57	24.31	23.57	22.56	24.07	22.73	22.03	37.59	36.36	11.69	11.79
250.0	0.06	0.05	0.06	49.80	49.82	24.35	23.78	24.23	23.48	23.55	22.45	34.51	33.73	12.41	12.51
325.0	0.08	0.07	0.08	49.94	49.83	24.08	24.82	25.18	22.87	23.97	23.20	32.73	32.25	12.77	12.87
400.0	0.10	0.09	0.10	49.81	49.63	23.73	24.81	24.43	22.35	23.77	23.22	32.00	31.63	13.00	13.07
475.0	0.12	0.11	0.11	49.62	49.33	24.69	25.85	25.16	23.59	24.29	25.65	32.00	31.41	13.12	13.17
520.0	0.13	0.13	0.13	49.48	49.16	24.12	25.35	25.53	23.52	24.40	25.14	32.14	31.69	13.17	13.19
600.0	0.16	0.15	0.15	49.20	48.83	24.79	31.74	25.92	28.70	24.47	27.42	32.51	32.29	13.25	13.27
675.0	0.17	0.17	0.17	49.16	48.78	26.24	25.65	26.77	25.38	24.61	25.93	33.15	32.49	13.28	13.27
750.0	0.19	0.19	0.19	48.95	48.74	26.33	27.44	27.15	33.25	25.08	28.06	33.39	32.98	13.26	13.26
825.0	0.21	0.21	0.22	49.31	48.88	27.26	25.54	26.90	28.78	26.44	28.69	33.87	33.18	13.24	13.22
900.0	0.23	0.23	0.24	49.93	49.02	26.36	28.00	26.91	29.28	28.39	27.92	33.96	33.21	13.16	13.15
975.0	0.25	0.25	0.25	50.14	49.52	27.51	26.78	26.45	28.27	29.06	26.32	34.10	32.88	13.05	13.05
1000.0	0.26	0.26	0.26	50.38	49.68	31.15	28.24	28.20	29.70	30.00	25.41	34.23	33.03	13.02	13.01
1100.0	0.28	0.29	0.29	50.66	50.17	23.69	24.36	27.19	26.33	24.07	23.10	34.76	32.90	12.77	12.76
1200.0	0.31	0.31	0.32	50.34	50.28	17.53	21.57	14.15	18.82	21.95	22.40	36.23	33.60	12.49	12.45
1300.0	0.33	0.34	0.34	48.38	48.48	17.26	18.01	14.58	17.65	19.87	14.62	37.82	34.19	12.08	12.07
1400.0	0.36	0.36	0.37	45.89	46.16	16.86	15.79	15.02	15.85	17.56	15.48	36.77	34.07	11.61	11.58
1500.0	0.37	0.39	0.39	43.54	43.98	16.35	16.36	15.10	16.96	16.28	16.70	33.46	32.81	10.99	11.03

* Data at +25°C unless specified otherwise.

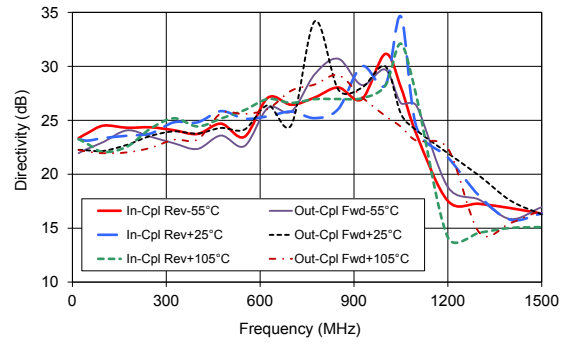
DDCH-50-13+
Insertion Loss (dB)



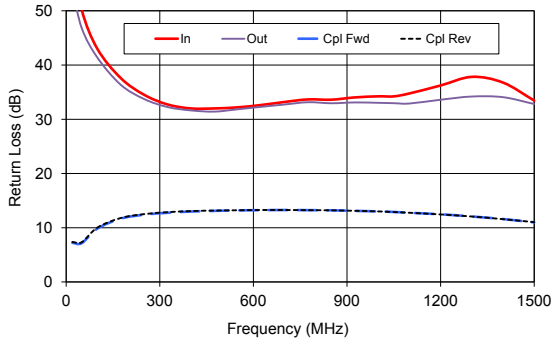
DDCH-50-13+
Coupling (dB)



DDCH-50-13+
Directivity (dB)



DDCH-50-13+
Return Loss (dB)



Additional 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

Dual-Directional Coupler DDCH-50-13+

Typical Performance Data

TEST CONDITIONS: INPUT POWER =+5 dBm @Temperature = -55°C

FREQ. (MHz)	INSERTION LOSS (dB)	COUPLING (dB)		DIRECTIVITY (dB)	RETURN LOSS (dB)			
	In - Out	In - Fwd	Out - Rev	In - Rev	In	Out	Rev	Fwd
10	0.03	55.04	55.09	21.88	47.21	47.88	10.90	11.07
20	0.03	50.95	51.02	21.96	42.92	42.69	7.13	7.28
30	0.03	49.81	49.87	22.08	40.59	39.68	6.33	6.45
50	0.03	49.74	49.80	22.38	37.90	37.11	7.11	7.21
75	0.03	49.90	49.96	22.86	38.07	37.82	8.65	8.77
100	0.04	49.76	49.85	23.00	40.88	39.12	9.84	10.05
125	0.04	49.56	49.65	23.54	42.64	41.91	10.73	11.00
150	0.04	49.30	49.48	27.12	48.09	49.50	11.41	11.68
175	0.05	49.50	49.58	24.07	42.55	48.14	11.98	12.18
200	0.06	49.61	49.68	23.88	40.80	45.23	12.38	12.51
225	0.06	49.75	49.76	23.34	42.29	49.15	12.59	12.71
250	0.06	49.84	49.83	23.48	47.02	53.73	12.73	12.82
275	0.07	49.89	49.88	23.14	52.12	53.11	12.90	12.95
300	0.08	49.98	49.90	22.68	58.49	47.46	13.01	13.04
325	0.08	49.98	49.88	22.87	47.74	41.16	13.02	13.08
350	0.08	49.96	49.84	22.76	40.13	37.01	12.99	13.04
375	0.09	49.91	49.76	22.91	36.94	34.93	13.03	13.05
400	0.10	49.92	49.71	22.35	35.99	33.77	13.08	13.07
425	0.11	49.75	49.62	23.41	35.30	32.57	13.08	13.12
450	0.11	49.77	49.53	24.22	34.04	31.78	13.04	13.14
475	0.12	49.69	49.42	23.59	33.71	31.74	13.06	13.18
500	0.13	49.61	49.34	23.58	34.06	32.12	13.12	13.23
520	0.13	49.56	49.27	23.52	34.08	32.02	13.14	13.24
550	0.14	49.51	49.19	22.61	32.80	31.29	13.09	13.17
575	0.14	49.35	49.02	23.85	31.92	30.89	13.09	13.10
600	0.16	49.21	48.85	28.70	31.56	30.89	13.14	13.10
625	0.16	49.39	48.98	26.15	31.72	30.78	13.19	13.12
650	0.17	49.31	48.89	25.53	31.55	30.59	13.19	13.11
675	0.17	49.25	48.82	25.38	31.54	30.71	13.21	13.10
700	0.18	49.20	48.76	25.82	32.03	31.22	13.29	13.12
725	0.19	49.02	48.72	25.82	33.20	32.13	13.37	13.17
750	0.19	49.57	48.70	33.25	34.06	32.78	13.39	13.20
775	0.20	49.48	48.76	29.28	34.52	33.21	13.40	13.19
800	0.21	49.50	48.83	29.37	34.68	33.55	13.44	13.22
825	0.21	49.55	48.87	28.78	35.00	34.15	13.47	13.26
850	0.22	49.58	48.88	30.70	34.61	34.42	13.45	13.31
875	0.22	49.76	48.98	29.24	33.88	34.68	13.42	13.31
900	0.23	49.80	49.07	29.28	33.24	34.76	13.41	13.32
925	0.24	49.90	49.17	28.27	32.84	34.65	13.40	13.33
950	0.24	49.99	49.25	28.45	32.66	34.33	13.36	13.31
975	0.25	50.10	49.36	28.27	32.74	34.28	13.29	13.23
1000	0.26	50.23	49.66	29.70	32.82	33.81	13.27	13.17
1025	0.27	50.42	50.16	26.83	32.68	33.18	13.24	13.12
1050	0.27	50.49	50.35	26.59	32.88	32.67	13.17	13.08
1100	0.28	50.72	50.25	26.33	33.40	32.30	13.02	12.94
1150	0.29	50.59	50.36	25.09	33.59	32.37	12.86	12.78
1200	0.31	50.67	50.20	18.82	34.71	33.35	12.61	12.57
1250	0.32	49.59	49.32	17.76	36.20	33.82	12.39	12.37
1300	0.33	48.49	48.49	17.65	39.76	34.47	12.11	12.08
1350	0.35	47.22	47.53	16.17	45.71	35.20	11.84	11.84
1400	0.36	45.66	46.29	15.85	52.77	37.20	11.52	11.49
1450	0.37	44.61	44.97	16.89	45.53	38.51	11.26	11.25
1500	0.37	43.39	43.80	16.96	41.70	37.29	10.92	10.90
1550	0.38	42.39	43.04	17.69	37.75	35.32	10.60	10.64

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Dual-Directional Coupler DDCH-50-13+

Typical Performance Data

TEST CONDITIONS: INPUT POWER =+5 dBm @Temperature = +25°C

FREQ. (MHz)	INSERTION LOSS (dB)	COUPLING (dB)		DIRECTIVITY (dB)	RETURN LOSS (dB)			
	In - Out	In - Fwd	Out - Rev	In - Rev	In	Out	Rev	Fwd
10	0.04	55.17	55.24	22.41	57.04	57.88	10.95	11.09
20	0.03	51.02	51.07	22.27	59.74	54.06	7.22	7.37
30	0.03	49.83	49.90	22.06	56.02	50.30	6.40	6.55
50	0.02	49.70	49.75	22.21	50.13	46.80	7.17	7.33
75	0.03	49.86	49.91	22.37	45.44	44.69	8.70	8.87
100	0.03	49.74	49.81	22.16	42.98	41.38	9.85	10.02
125	0.03	49.57	49.62	22.42	39.36	39.23	10.68	10.82
150	0.03	49.47	49.49	23.27	40.29	38.89	11.26	11.37
175	0.04	49.53	49.57	22.73	37.59	36.36	11.69	11.79
200	0.05	49.62	49.64	22.91	36.09	35.50	12.00	12.09
225	0.05	49.72	49.74	23.02	35.07	34.69	12.23	12.33
250	0.05	49.80	49.82	23.55	34.51	33.73	12.41	12.51
275	0.06	49.91	49.83	23.44	33.75	32.98	12.57	12.66
300	0.07	49.96	49.80	23.32	33.10	32.50	12.68	12.77
325	0.07	49.94	49.83	23.97	32.73	32.25	12.77	12.87
350	0.08	49.92	49.77	23.85	32.51	32.10	12.86	12.94
375	0.08	49.87	49.70	23.84	32.31	31.82	12.94	13.01
400	0.09	49.81	49.63	23.77	32.00	31.63	13.00	13.07
425	0.10	49.74	49.53	23.93	31.92	31.40	13.05	13.11
450	0.10	49.72	49.37	24.57	31.92	31.33	13.08	13.14
475	0.11	49.62	49.33	24.29	32.00	31.41	13.12	13.17
500	0.12	49.54	49.25	24.46	32.04	31.61	13.14	13.18
520	0.13	49.48	49.16	24.40	32.14	31.69	13.17	13.19
550	0.13	49.38	49.03	24.14	32.20	31.84	13.21	13.22
575	0.14	49.31	48.88	24.37	32.46	32.09	13.24	13.25
600	0.15	49.20	48.83	24.47	32.51	32.29	13.25	13.27
625	0.16	49.19	48.97	26.39	32.63	32.29	13.25	13.27
650	0.16	49.23	48.88	25.30	32.79	32.31	13.26	13.26
675	0.17	49.16	48.78	24.61	33.15	32.49	13.28	13.27
700	0.18	49.11	48.71	24.57	33.19	32.72	13.28	13.27
725	0.19	49.07	48.62	24.72	33.43	32.90	13.27	13.27
750	0.19	48.95	48.74	25.08	33.39	32.98	13.26	13.26
775	0.20	49.36	48.84	34.18	33.66	33.14	13.25	13.24
800	0.21	49.36	48.85	27.37	33.78	33.17	13.25	13.23
825	0.21	49.31	48.88	26.44	33.87	33.18	13.24	13.22
850	0.22	49.41	48.92	27.84	33.61	32.95	13.22	13.21
875	0.22	49.91	48.91	30.30	33.96	33.09	13.18	13.18
900	0.23	49.93	49.02	28.39	33.96	33.21	13.16	13.15
925	0.24	49.98	49.30	28.01	34.03	33.10	13.12	13.12
950	0.24	50.04	49.43	28.30	33.85	32.77	13.09	13.10
975	0.25	50.14	49.52	29.06	34.10	32.88	13.05	13.05
1000	0.26	50.38	49.68	30.00	34.23	33.03	13.02	13.01
1025	0.27	50.53	49.75	27.10	34.19	33.03	12.97	12.95
1050	0.27	50.56	50.06	25.61	34.22	32.96	12.92	12.89
1100	0.29	50.66	50.17	24.07	34.76	32.90	12.77	12.76
1150	0.30	50.49	50.21	22.23	34.87	33.20	12.63	12.62
1200	0.31	50.34	50.28	21.95	36.23	33.60	12.49	12.45
1250	0.33	49.40	49.41	18.89	36.41	33.85	12.29	12.27
1300	0.34	48.38	48.48	19.87	37.82	34.19	12.08	12.07
1350	0.36	47.83	47.62	22.59	37.49	34.44	11.83	11.85
1400	0.36	45.89	46.16	17.56	36.77	34.07	11.61	11.58
1450	0.38	44.85	44.89	19.07	35.15	33.81	11.31	11.32
1500	0.39	43.54	43.98	16.28	33.46	32.81	10.99	11.03
1550	0.39	42.40	42.47	16.07	31.93	31.93	10.97	10.73

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Dual-Directional Coupler DDCH-50-13+

Typical Performance Data

TEST CONDITIONS: INPUT POWER =+5 dBm @Temperature = +105°C

FREQ. (MHz)	INSERTION LOSS (dB)	COUPLING (dB)		DIRECTIVITY (dB)	RETURN LOSS (dB)			
	In - Out	In - Fwd	Out - Rev	In - Rev	In	Out	Rev	Fwd
10	0.04	55.31	55.34	22.18	55.98	56.54	10.97	11.09
20	0.04	51.08	51.14	22.25	52.59	50.90	7.29	7.43
30	0.03	49.86	49.91	22.15	48.81	49.39	6.46	6.62
50	0.03	49.67	49.73	22.09	46.64	49.79	7.23	7.45
75	0.03	49.83	49.90	22.13	45.06	49.95	8.79	9.02
100	0.04	49.73	49.79	21.95	43.43	50.33	9.95	10.10
125	0.04	49.56	49.61	21.87	38.86	41.39	10.73	10.75
150	0.04	49.49	49.54	22.04	37.70	37.26	11.25	11.15
175	0.04	49.55	49.57	22.03	34.04	33.44	11.63	11.47
200	0.05	49.65	49.65	21.99	31.82	31.41	11.88	11.75
225	0.06	49.76	49.73	22.10	30.44	29.91	12.06	12.00
250	0.06	49.83	49.81	22.45	29.55	28.89	12.20	12.22
275	0.07	49.88	49.80	23.10	29.04	28.41	12.34	12.43
300	0.08	49.95	49.84	22.71	28.82	28.28	12.45	12.62
325	0.08	49.92	49.85	23.20	28.82	28.29	12.55	12.79
350	0.08	49.90	49.75	23.51	28.80	28.38	12.64	12.90
375	0.09	49.87	49.73	23.69	28.76	28.47	12.75	12.97
400	0.10	49.87	49.70	23.22	28.77	28.48	12.82	13.01
425	0.10	49.69	49.55	24.94	28.79	28.42	12.89	13.03
450	0.11	49.68	49.44	26.58	28.75	28.38	12.96	13.04
475	0.11	49.58	49.33	25.65	28.90	28.55	13.05	13.05
500	0.12	49.51	49.23	25.71	29.18	28.89	13.12	13.07
520	0.13	49.46	49.17	25.14	29.46	29.09	13.16	13.10
550	0.14	49.36	49.02	25.58	29.88	29.41	13.19	13.15
575	0.14	49.14	48.93	27.10	30.40	29.95	13.24	13.21
600	0.15	49.30	48.97	27.42	31.07	30.59	13.28	13.28
625	0.16	49.20	48.86	26.05	31.81	30.93	13.31	13.33
650	0.16	49.12	48.79	26.04	32.23	31.15	13.32	13.37
675	0.17	49.04	48.75	25.93	32.54	31.53	13.33	13.38
700	0.18	48.95	48.71	27.75	32.80	31.96	13.34	13.38
725	0.19	49.41	48.70	30.66	33.32	32.29	13.36	13.37
750	0.19	49.40	48.68	28.06	33.42	32.50	13.36	13.37
775	0.20	49.33	48.70	28.32	33.65	32.70	13.34	13.35
800	0.21	49.33	48.72	28.02	33.62	32.82	13.32	13.33
825	0.22	49.40	48.77	28.69	34.00	33.01	13.29	13.30
850	0.22	49.49	48.80	29.18	34.14	32.97	13.28	13.28
875	0.23	49.61	48.86	27.77	34.67	33.31	13.26	13.26
900	0.24	49.69	48.96	27.92	34.78	33.73	13.24	13.26
925	0.24	49.79	49.08	27.16	34.71	33.89	13.20	13.24
950	0.25	49.95	49.19	27.40	34.51	33.78	13.17	13.22
975	0.25	50.04	49.28	26.32	34.62	33.87	13.13	13.18
1000	0.26	50.16	49.51	25.41	34.34	34.00	13.11	13.15
1025	0.27	50.27	49.70	25.02	33.72	33.94	13.05	13.10
1050	0.27	50.30	49.90	24.41	33.69	33.72	13.00	13.04
1100	0.29	50.39	49.98	23.10	34.01	33.10	12.92	12.90
1150	0.30	50.07	50.45	20.97	33.83	32.62	12.79	12.76
1200	0.32	50.97	51.24	22.40	34.86	32.56	12.62	12.61
1250	0.33	50.09	49.80	14.70	34.52	32.33	12.43	12.43
1300	0.34	48.37	48.43	14.62	35.19	32.57	12.21	12.21
1350	0.36	47.02	47.20	15.32	35.06	33.16	11.97	11.99
1400	0.37	45.67	45.97	15.48	35.69	33.61	11.68	11.69
1450	0.38	44.54	44.82	16.22	34.95	33.89	11.38	11.41
1500	0.39	43.39	43.72	16.70	34.19	33.26	11.07	11.09
1550	0.40	42.36	42.29	16.26	32.87	32.31	10.99	10.80

Notes
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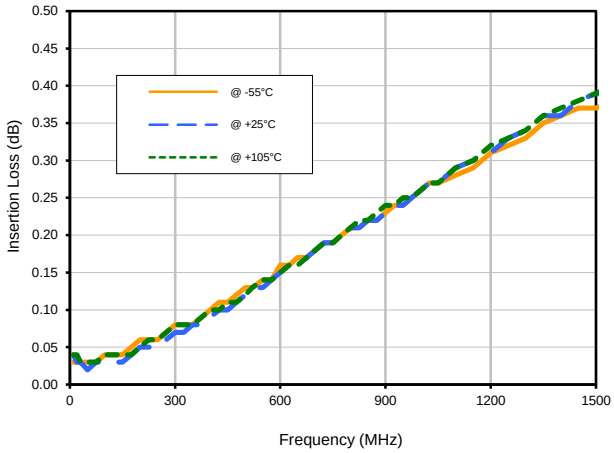
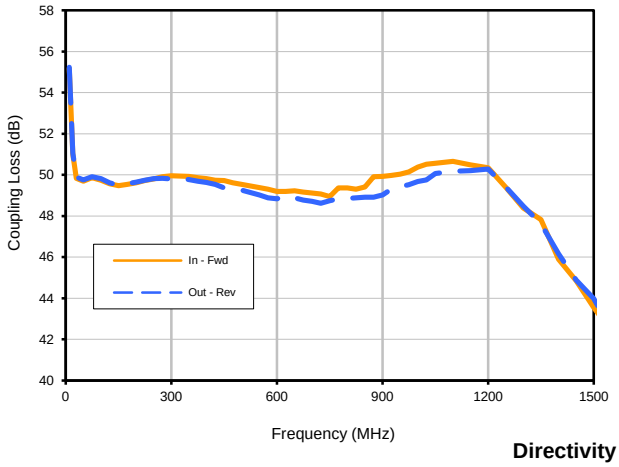
Dual-Directional Coupler DDCH-50-13+

Typical Performance Curves

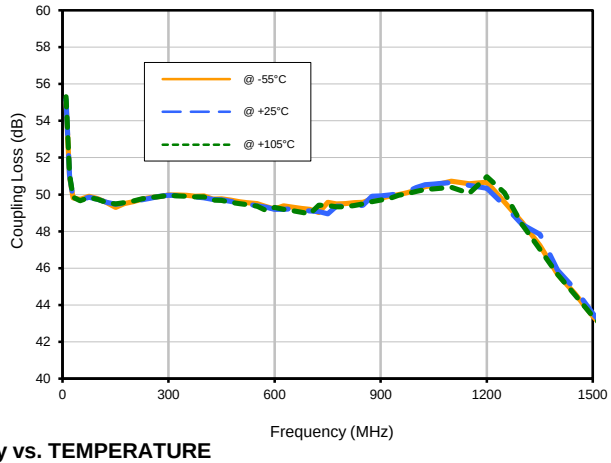
Insertion Loss vs. TEMPERATURE



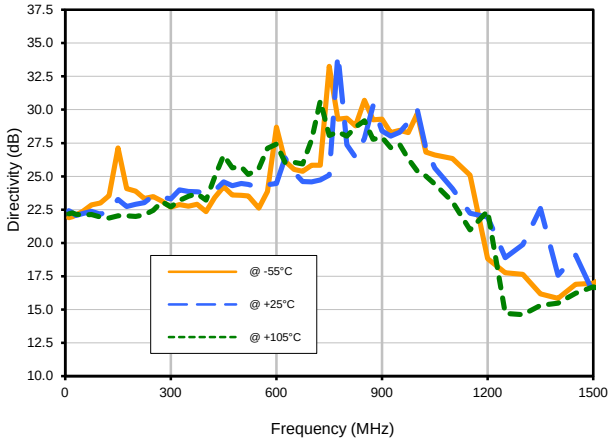
Coupling Loss



Coupling Loss vs. TEMPERATURE



Directivity vs. TEMPERATURE



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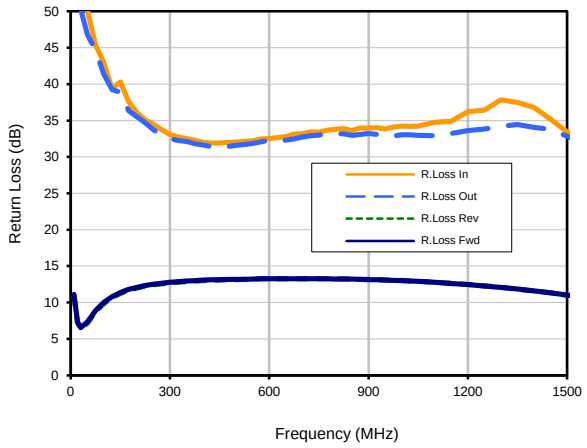
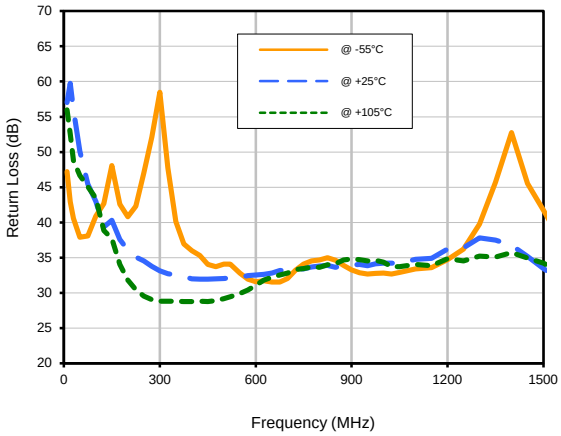
Typical Performance Curves

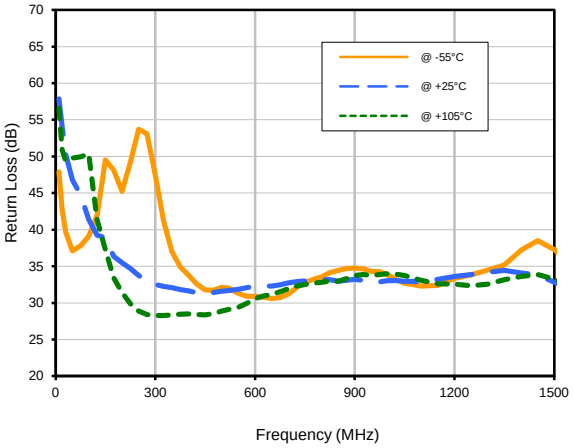
Return Loss



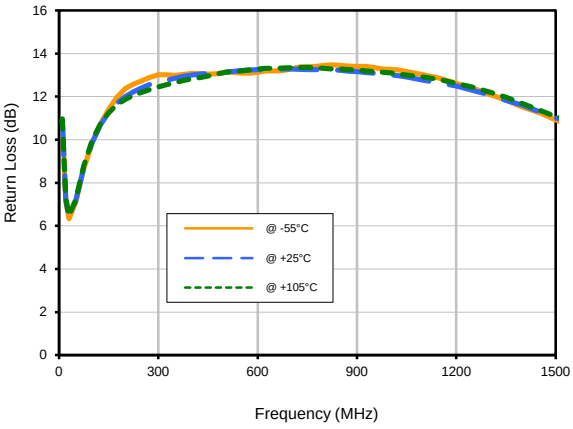
Return Loss In vs. TEMPERATURE



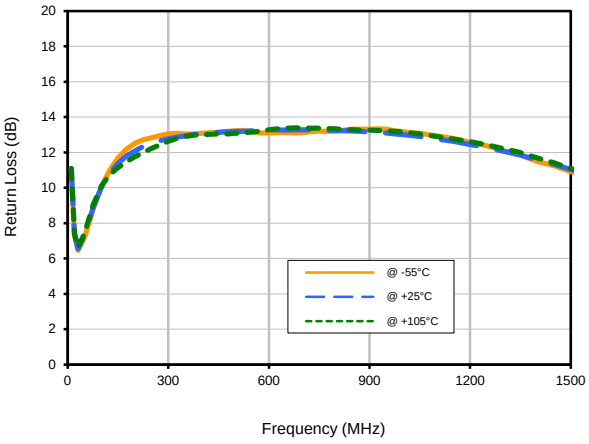
Return Loss Out vs. TEMPERATURE



Return Loss Reverse vs. TEMPERATURE



Return Loss Forward vs. TEMPERATURE



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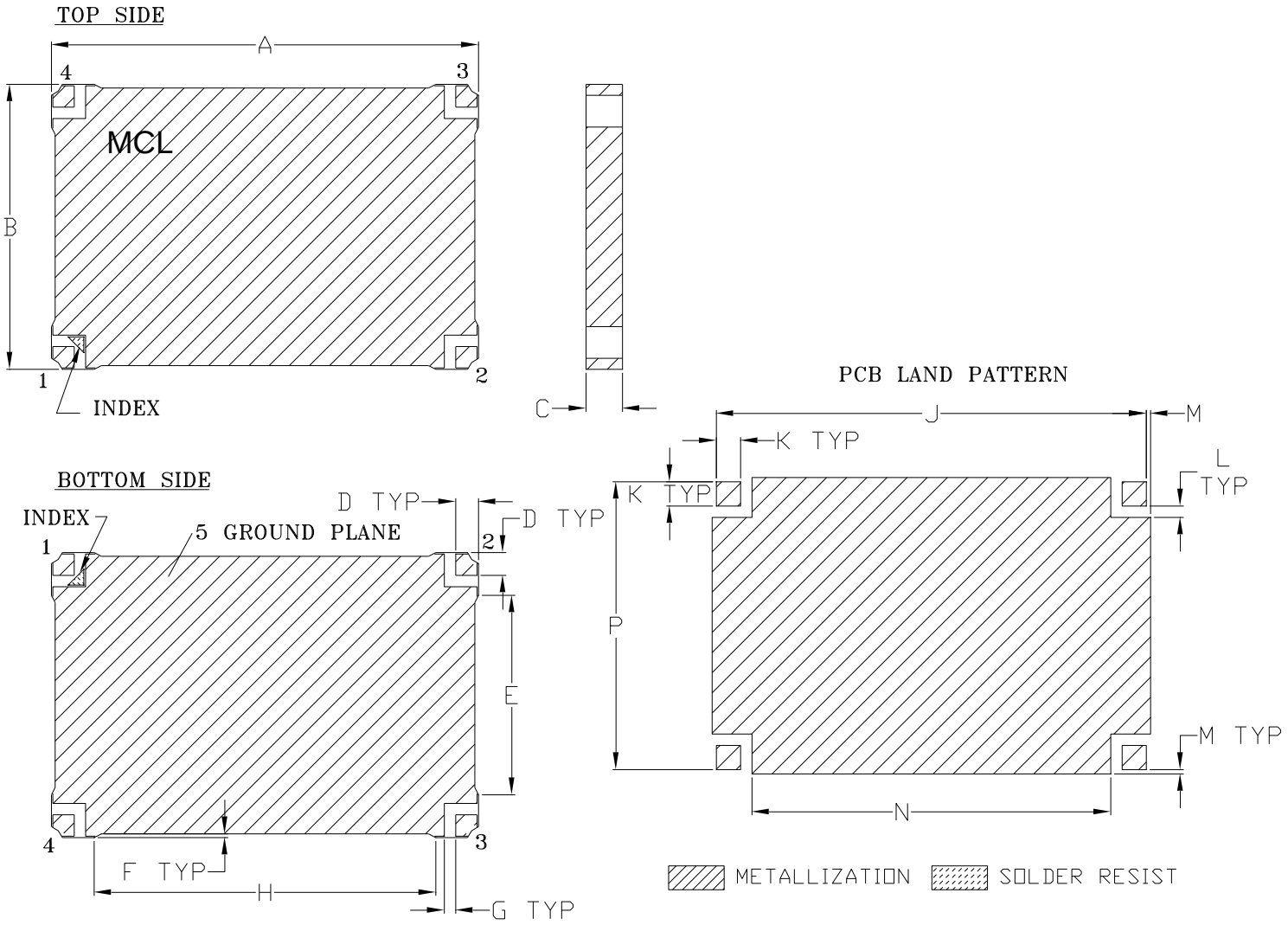
Case Style PQ

Outline Dimensions

PQ2100



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N	P	WT. GRAMS
PQ2100	1.500 (38.10)	1.000 (25.40)	.128 (3.25)	.080 (2.03)	.700 (17.78)	.013 (0.33)	.040 (1.02)	1.200 (30.48)	1.510 (38.35)	.085 (2.16)	.040 (1.02)	.015 (0.38)	1.260 (32.00)	1.010 (25.65)	12.0

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 µinch (.05-.13 microns) Immersion Gold.
   For RoHS-5 Cases, all models no (+) suffix: Tin-Lead plate.

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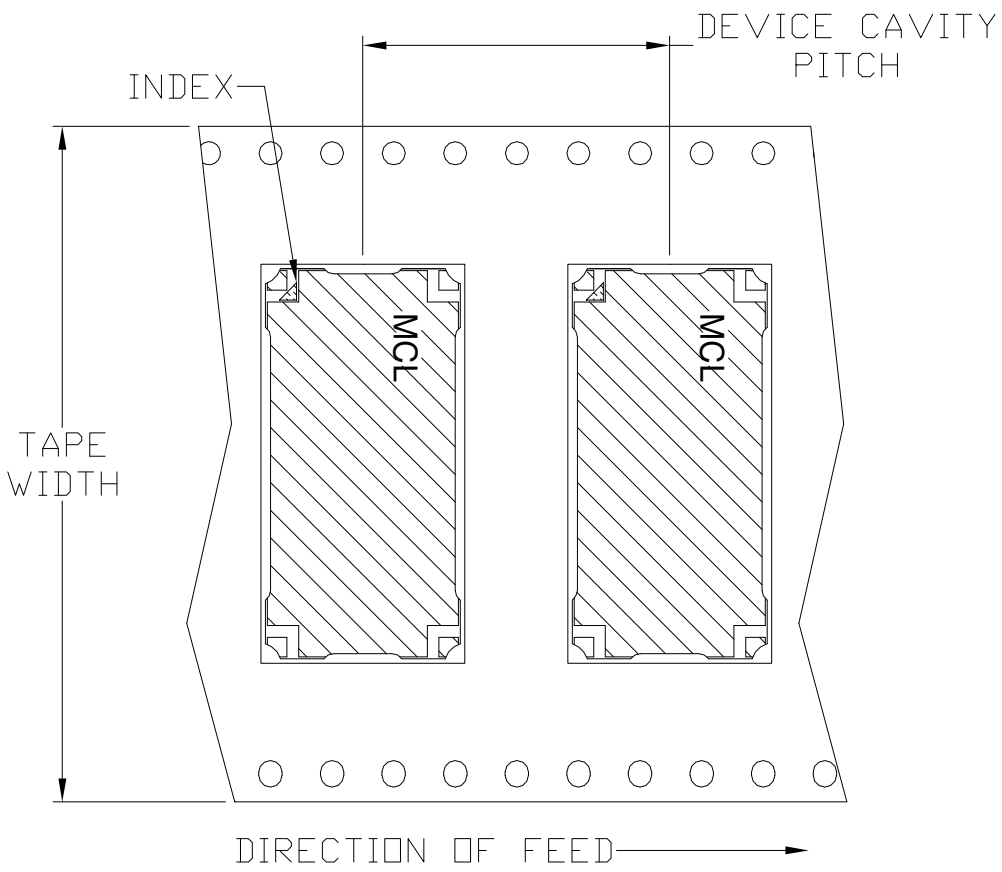
Tape & Reel Packaging TR-F119

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
56	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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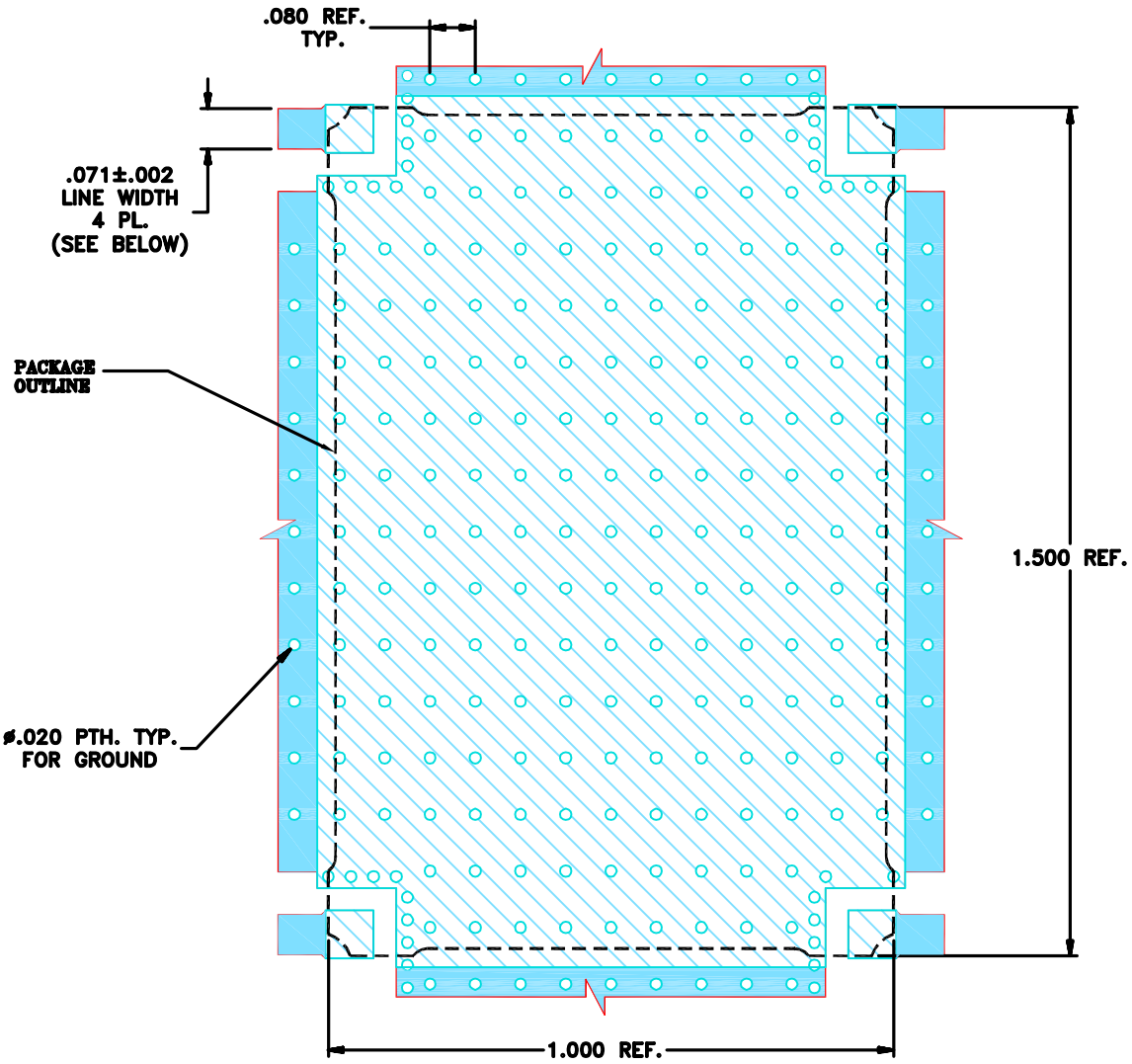
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M153642	NEW RELEASE	01/16	DK	YB
A	M156950	CHANGE PIN CONNECTION CODE	06/16	DK	YB
B	M159071	CH. MATERIAL, DIELECT.THK&COP. WEIGHT	12/16	DK	YB
B	R91223	CH. MATERIAL, DIELECT.THK&COP. WEIGHT	12/16	DK	YB

SUGGESTED MOUNTING CONFIGURATION
FOR PQ2100 CASE STYLE 04DC01 PIN CONNECTION, 50 OHM



NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS RO4003C WITH DIELECTRIC THICKNESS. .032"±.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.

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	DRAWN	DK (RAVON)	11 JAN 16
TOLERANCES ON:	CHECKED	HH (RAVON)	11 JAN 16
2 PL DECIMALS ±	APPROVED	YB (RAVON)	11 JAN 16
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

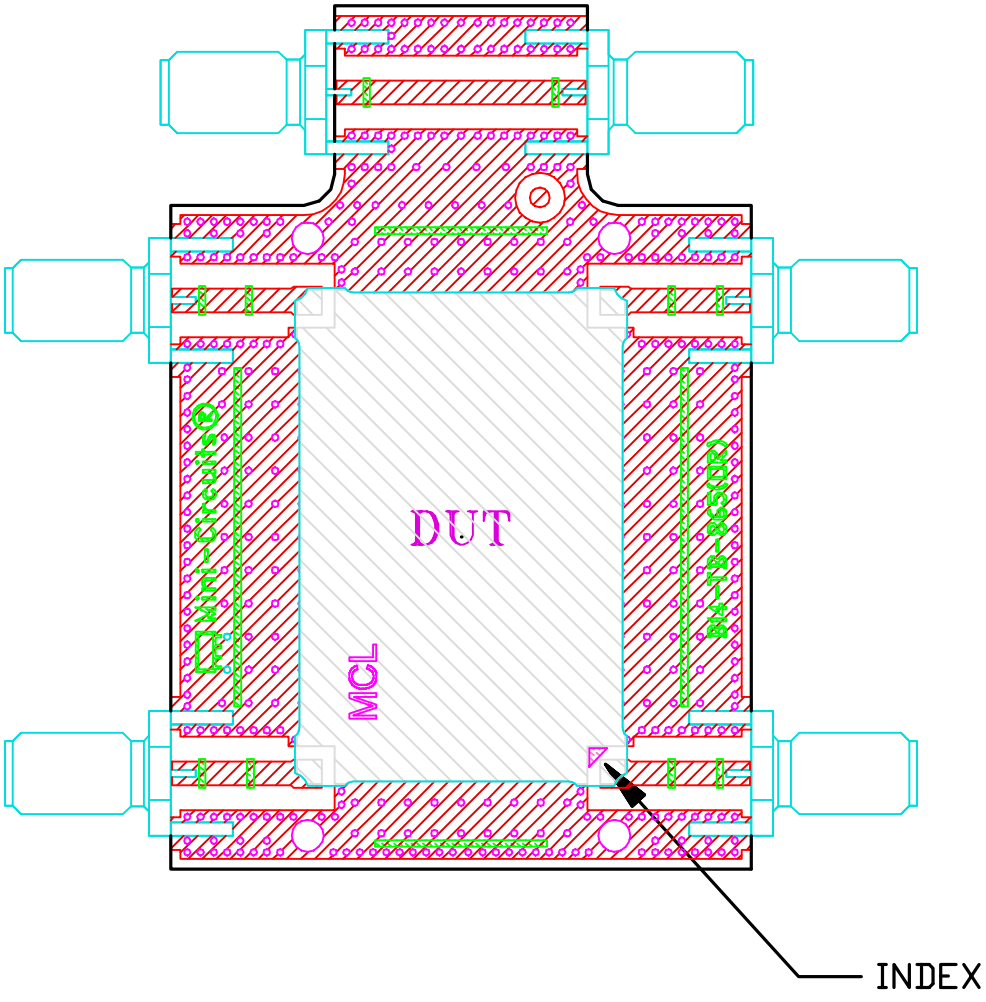
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 08DC07, 50, PQ2100, MBD, TB-865 (50 Ω)

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-471	B

FILE:	SCALE:	SHEET:
98PL471(B)	3:1	1 OF 1

Evaluation Board and Circuit



TB-865

NOTES:

1. SMA FEMALE CONNECTORS.
2. PCB MATERIAL: ROGERS RO4003C OR EQUIVALENT, DIELECTRIC CONSTANT=3.5, DIELECTRIC THICKNESS=.032 INCH.

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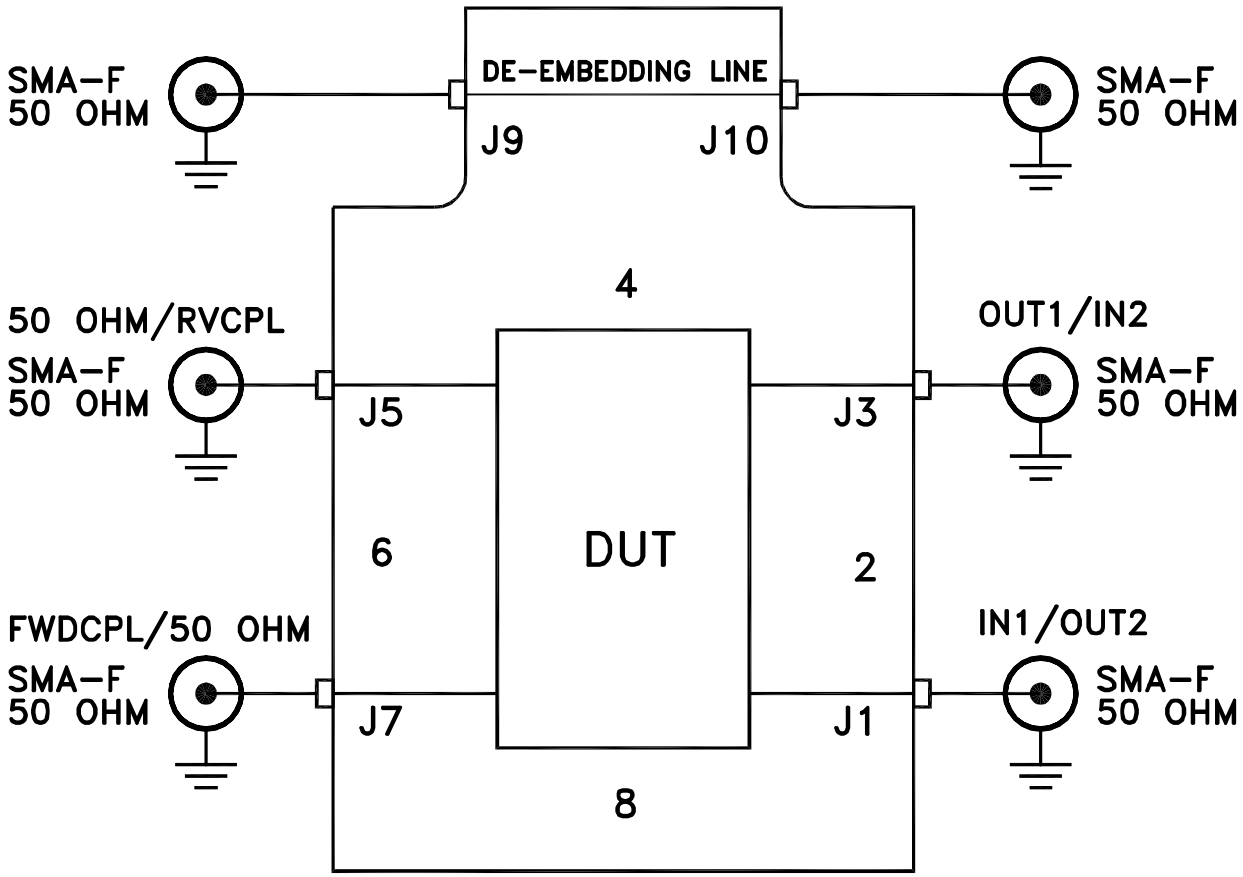

TB-865

Schematic Diagram

Mini-Circuits

Environmental Specifications **ENV02T8**

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

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