



LTCC SURFACE MOUNT

Directional Coupler

HPCJ-20-43+

50Ω 3300 to 4000 MHz 20 dB

THE BIG DEAL

- High Input Power Handling, Max, 50 W
- Mainline Loss, Typ. 0.09 dB
- Coupling, Typ. 20 dB
- Directivity, Typ. 30 dB
- Small size: 0.125" x 0.2" x 0.047"

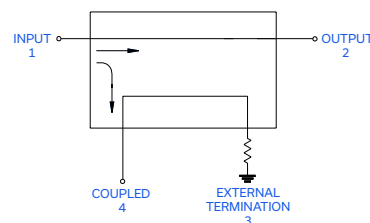


Generic photo used for illustration purposes only

APPLICATIONS

- 5G Sub6, MIMO, n78 Wireless Infrastructure Systems
- Microwave Backhaul Radio Systems
- Radar Systems
- Satellite Communications

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' HPCJ-20-43+ is an LTCC directional coupler from 3300 to 4000 MHz, supporting a variety of applications. This model provides 0.09 dB typical mainline loss, 20 dB coupling, and 30 dB directivity. It handles up to 50 W RF input power and provides a wide operating temperature range from -55 to +125°C. Housed in a small 0.125" x 0.2" x 0.047" form factor, the coupler is ideal for dense PCB layouts and with minimal performance variation due to parasitics.

KEY FEATURES

Features	Advantages
High Power Handling, 50 W Maximum	Capable of operating up to 50 W maximum, the construction of HPCJ-20-43+ makes this directional coupler a robust, rugged product that can be used effectively in either the transmit or receive paths.
Low Mainline Loss, 0.09 dB	Capable of being used to sample the power amplifier output with minimal loss.
High Directivity, 30 dB	High directivity minimizes coupling of reverse power and enables accurate sampling of thru-signal.
High operating temperature range, -55 to +125°C	Operation up to +125°C allows the coupler to be used near power amplifiers with minimal change in performance.

REV. OR
ECO-027040
HPCJ-20-43+
MCL NY
250922





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

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Frequency Range		3300		4000	MHz
Mainline Loss ³	3300 - 4000		0.09	0.15	dB
Coupling	3300 - 4000	18.5	20	21.5	dB
Directivity	3300 - 3800	20	30		dB
	3800 - 4000	18	26		
Return Loss (Input, Output, Coupled)	3300 - 4000	18	24		dB

1. Tested on Evaluation Board TB-HPCJ-20-43C+. De-embedded to the device reference plane using TRL.

2. Symmetrical, all ports are interchangeable. See Pad Configuration Table and S-Parameters for actual performance.

3. Mainline Loss includes coupling loss.

ABSOLUTE MAXIMUM RATINGS⁴

Parameter	Ratings
Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +125 °C
Input Power ⁵	50 W at +25 °C

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

5. At +25°C derate linearly to 17 W at +125 °C.





LTCC SURFACE MOUNT

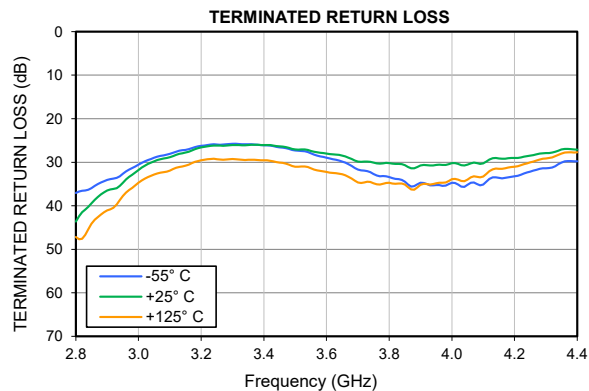
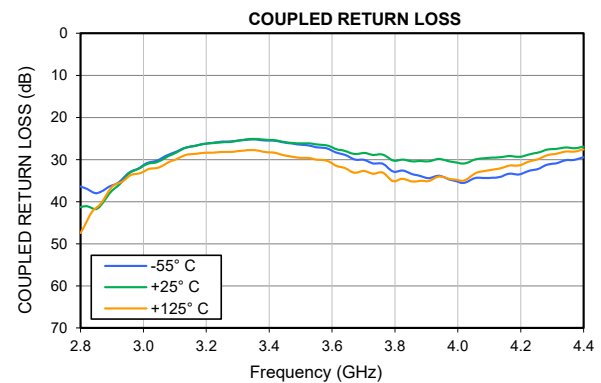
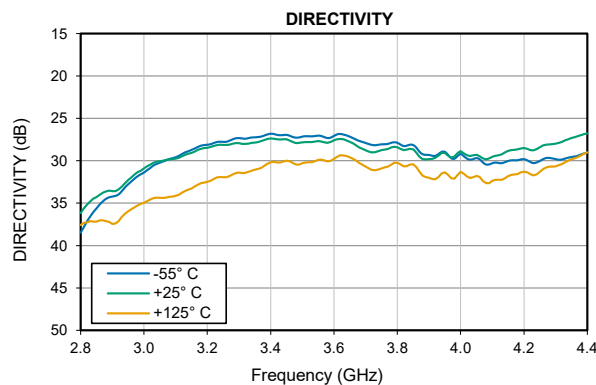
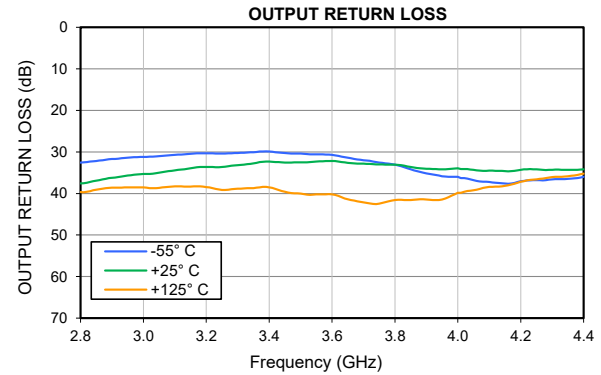
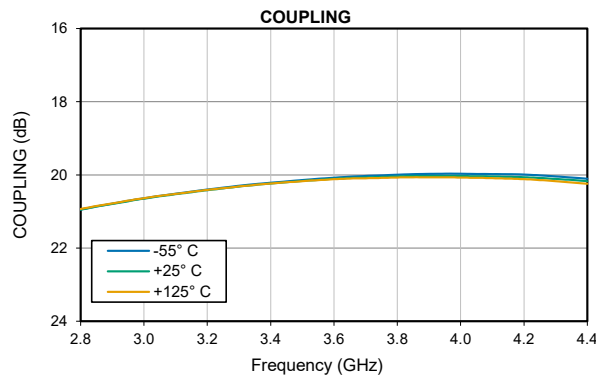
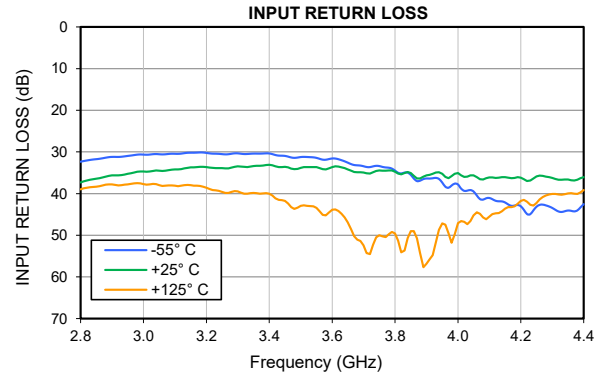
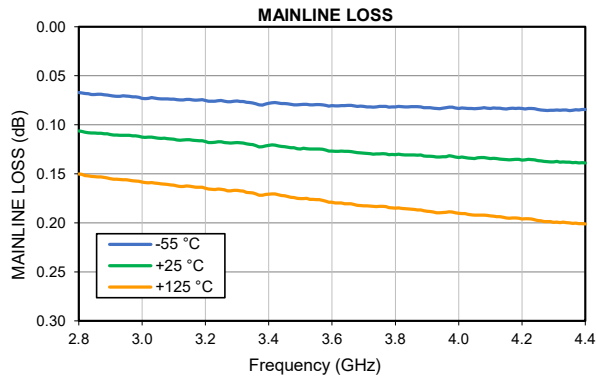
Directional Coupler

HPCJ-20-43+

Mini-Circuits

50Ω 3300 to 4000 MHz 20 dB

TYPICAL PERFORMANCE GRAPHS



Mini-Circuits



FUNCTIONAL DIAGRAM

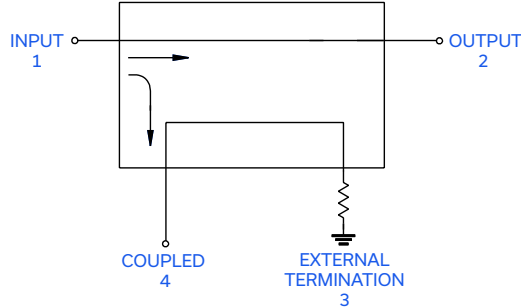
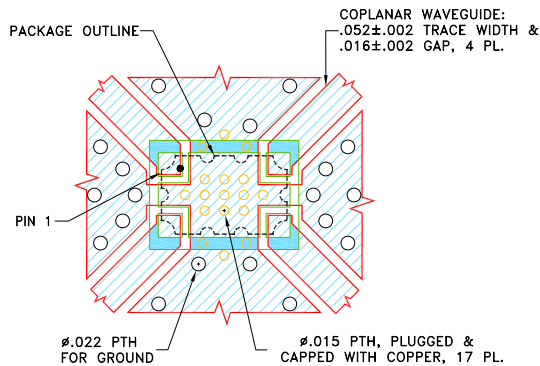


Figure 1. HPCJ-20-43+ Functional Diagram

PAD DESCRIPTION/CONFIGURATION

Function	Pad Number	Description
Input	1	Connects to RF Input Port
Output	2	Connects to RF Output Port
Termination	3	Connects to External Termination
Coupled	4	Connects to Coupled Port

SUGGESTED PCB LAYOUT (PL-834)



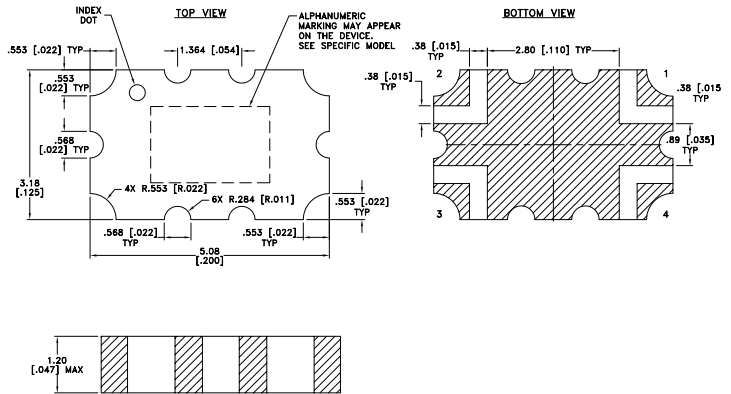
NOTES:

1. TRACE WIDTH & GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS: .030±.002; COPPER: 1/2 OZ. ON EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.

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

Figure 2. Suggested PCB Layout PL-834

CASE STYLE DRAWING



DENOTES METALLIZATION

Weight: 0.049 grams

Dimensions are in mm [inches]. Tolerances: 2 PL± 0.25; 3 PL± 0.127 mm

PRODUCT MARKING*: Z3

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



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ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD.

[CLICK HERE](#)

Performance Data & Graphs	Data Graphs S-Parameter (SXP Files) Data Set (.zip file) De-embedded to device pads
Case Style	AAE3610-1 Lead Finish: Tin over Nickel Plating
RoHS Status	Compliant
Tape and Reel	F110
Suggested Layout for PCB Design	PL-834
Evaluation Board	TB-HPCJ-20-43C+ Gerber File
Environmental Rating	ENV06T10

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-Circuits' applicable established test performance criteria and measurement instructions.
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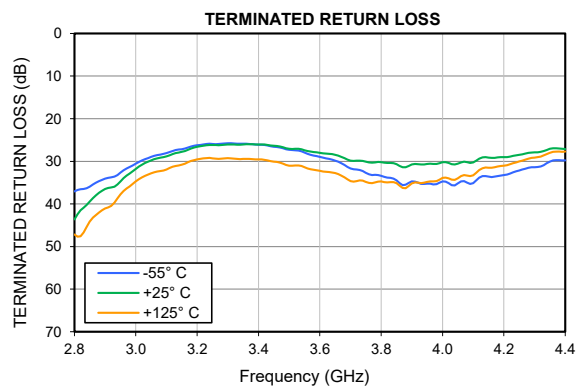
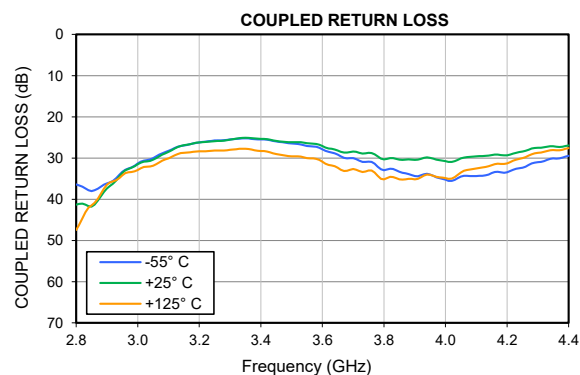
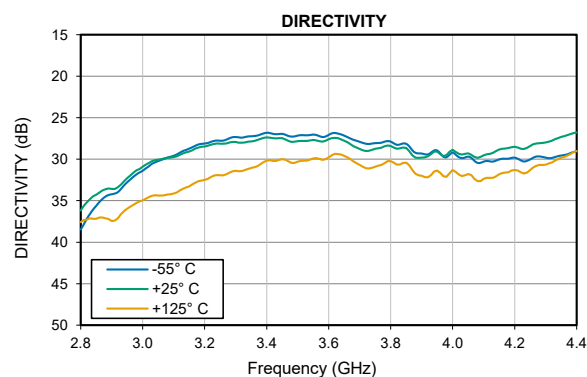
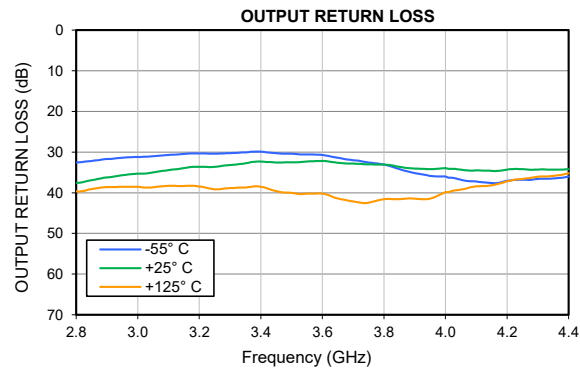
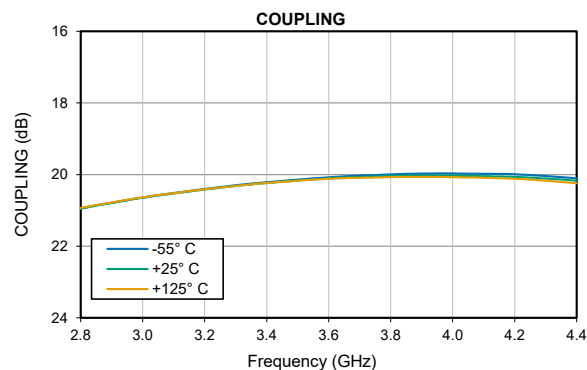
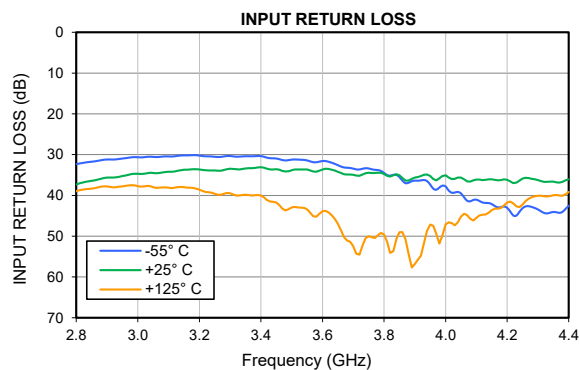
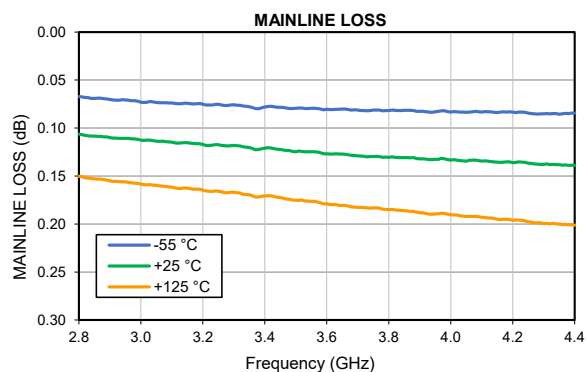
Directional Coupler

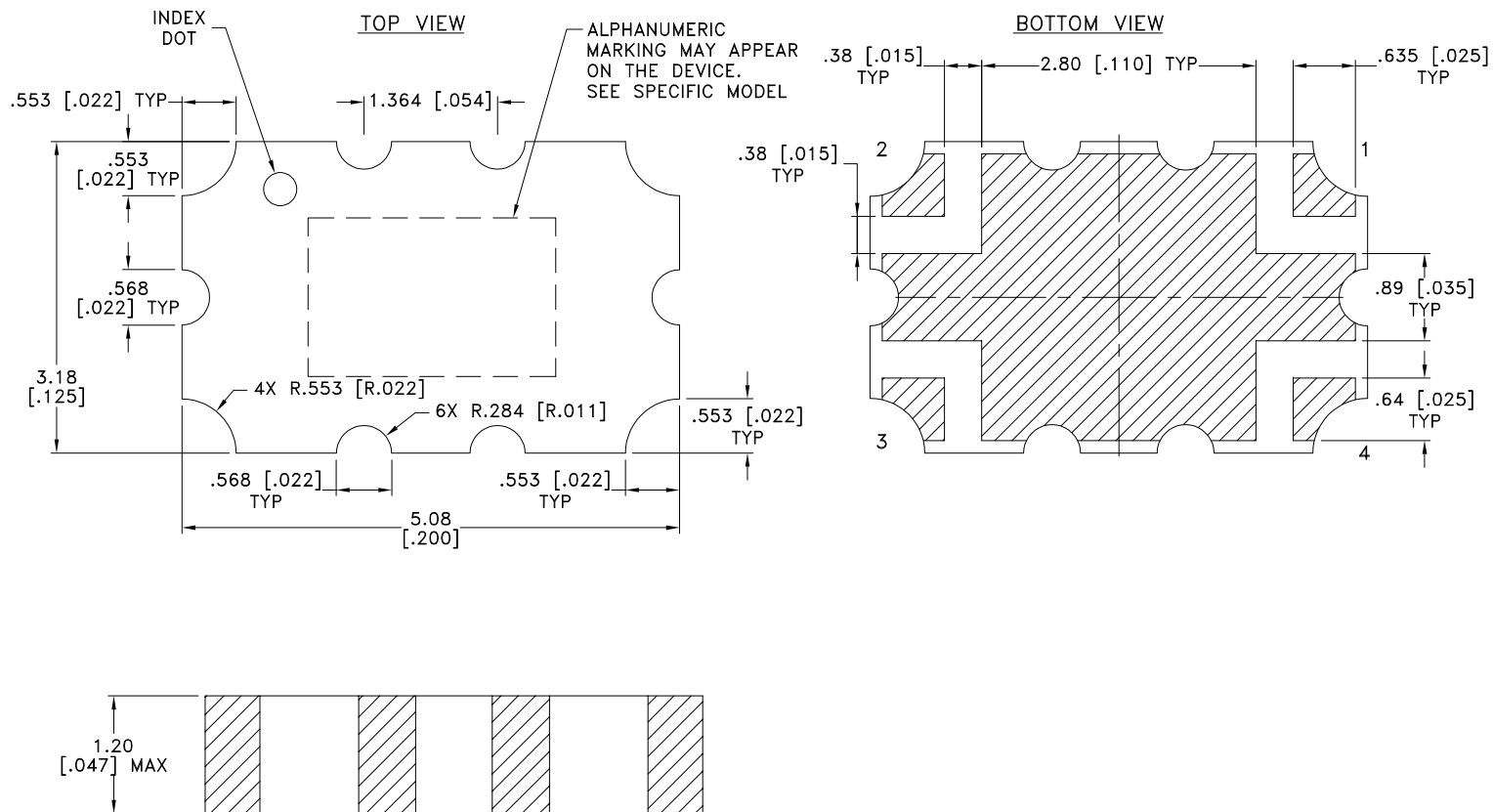
HPCJ-20-43+

Typical Performance Data

FREQUENCY (GHz)	MAINLINE LOSS (dB)	COUPLING (dB)	DIRECTIVITY (dB)	INPUT RETURN LOSS (dB)	OUTPUT RETURN LOSS (dB)	COUPLED RETURN LOSS (dB)	TERMINATED RETURN LOSS (dB)
2.00	0.081	22.873	36.816	55.450	51.295	47.344	47.678
2.05	0.082	22.707	35.498	50.924	49.008	43.877	48.389
2.10	0.085	22.551	34.692	51.435	48.998	43.200	44.065
2.15	0.086	22.402	34.966	50.995	49.346	43.202	39.463
2.20	0.088	22.255	35.283	49.059	48.789	38.840	38.373
2.25	0.090	22.115	35.065	48.077	46.301	36.206	37.069
2.30	0.091	21.980	35.129	45.868	44.934	35.575	35.227
2.35	0.093	21.857	36.026	44.988	44.440	35.375	33.753
2.40	0.094	21.737	37.971	45.174	44.043	33.473	33.204
2.45	0.097	21.617	39.039	43.998	42.149	32.873	33.371
2.50	0.099	21.507	39.480	41.502	40.844	33.096	32.754
2.55	0.100	21.402	43.529	40.534	40.159	33.778	32.510
2.60	0.103	21.305	47.570	40.301	40.079	33.889	34.156
2.65	0.102	21.214	41.866	39.601	39.010	34.754	36.243
2.70	0.105	21.125	41.554	37.889	38.282	37.927	37.794
2.75	0.107	21.036	39.119	37.074	37.733	43.251	40.290
2.80	0.106	20.952	36.174	37.324	37.567	41.328	43.632
2.85	0.108	20.868	34.285	36.447	36.913	41.802	39.438
2.90	0.110	20.794	33.580	35.612	36.214	37.383	36.502
2.95	0.111	20.720	32.267	35.249	35.659	33.570	34.708
3.00	0.113	20.650	30.922	34.701	35.312	31.516	31.788
3.05	0.114	20.585	30.043	34.496	34.967	30.425	29.791
3.10	0.115	20.529	29.754	34.213	34.407	28.509	28.832
3.15	0.115	20.473	29.069	33.724	33.925	26.927	27.785
3.20	0.117	20.417	28.458	33.615	33.611	26.212	26.607
3.25	0.117	20.368	28.137	33.907	33.623	25.903	26.143
3.30	0.118	20.319	27.937	33.461	33.208	25.558	26.034
3.35	0.120	20.276	27.853	33.407	32.741	25.095	26.063
3.40	0.121	20.236	27.359	33.083	32.312	25.339	26.049
3.45	0.122	20.201	27.479	33.584	32.549	25.873	26.358
3.50	0.125	20.167	27.836	33.807	32.471	26.166	27.077
3.55	0.125	20.134	27.678	33.657	32.321	26.409	27.388
3.60	0.127	20.107	27.577	33.621	32.175	27.103	27.989
3.65	0.127	20.084	27.757	34.179	32.596	28.163	28.480
3.70	0.129	20.069	28.779	34.956	32.838	28.452	29.841
3.75	0.130	20.057	28.744	34.430	33.018	28.771	30.091
3.80	0.131	20.043	28.402	34.744	33.076	30.318	30.201
3.85	0.131	20.031	28.666	35.056	33.647	30.397	30.663
3.90	0.132	20.030	29.806	35.600	34.041	30.431	30.737
3.95	0.133	20.032	29.088	35.272	34.191	29.947	30.614
4.00	0.133	20.032	28.874	35.087	33.924	30.784	30.189
4.05	0.134	20.040	29.296	35.646	34.334	30.115	30.550
4.10	0.134	20.045	29.536	36.092	34.512	29.588	30.274
4.15	0.136	20.053	28.838	36.047	34.623	29.275	29.109
4.20	0.136	20.065	28.514	36.177	34.291	29.337	29.034
4.25	0.136	20.086	28.411	35.887	34.191	28.457	28.486
4.30	0.138	20.112	27.988	36.268	34.286	27.517	27.890
4.35	0.138	20.139	27.322	36.629	34.320	27.176	27.089
4.40	0.139	20.172	26.780	36.054	34.188	26.952	27.116
4.45	0.139	20.213	26.483	35.989	33.858	26.076	26.799
4.50	0.139	20.241	26.047	36.430	34.085	26.211	26.366
4.55	0.139	20.274	25.323	36.006	34.115	26.170	26.381
4.60	0.139	20.308	25.383	36.305	34.029	26.689	26.744
4.65	0.139	20.348	25.162	35.518	33.536	26.433	27.081
4.70	0.139	20.390	24.993	35.639	33.568	27.016	27.860
4.75	0.139	20.437	24.683	34.693	33.521	28.141	28.381
4.80	0.140	20.491	25.549	36.425	33.633	28.672	29.755
4.85	0.140	20.549	25.678	35.533	33.208	29.411	28.899
4.90	0.141	20.609	25.682	34.758	33.314	30.347	29.374
4.95	0.142	20.671	26.477	35.410	33.225	30.637	29.274
5.00	0.142	20.736	27.394	35.995	33.602	28.628	28.736

Typical Performance Curves





DENOTES METALLIZATION

Weight: 0.049 grams

Dimensions are in mm [inches]. Tolerances: 2 PL ± 0.25 ; 3 PL ± 0.127 mm

Notes:

1. Case material - Ceramic.
2. Termination finish - Tin over Nickel Plating.

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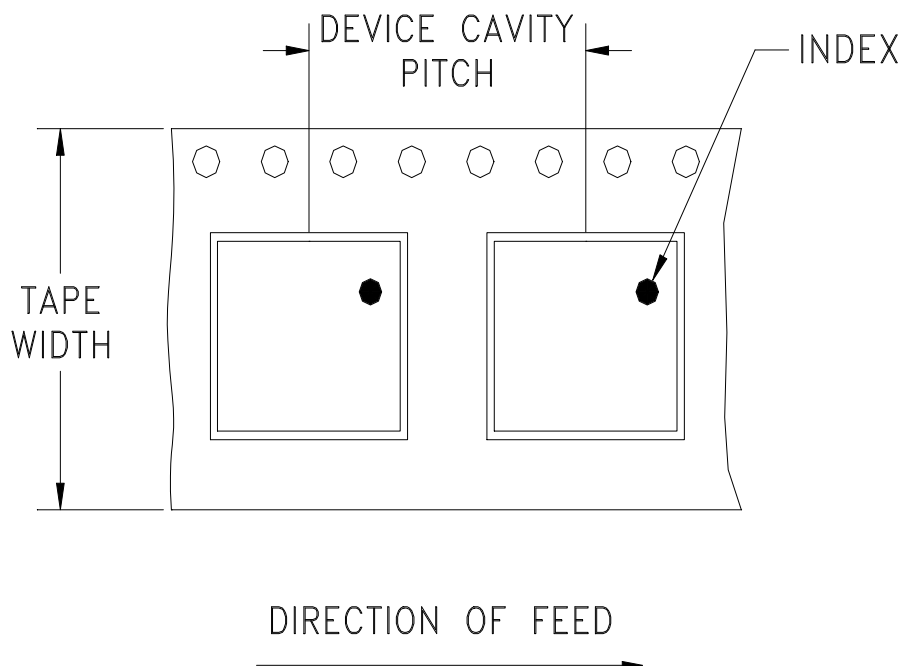
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS



Tape & Reel Packaging TR-F110

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
12	8	7	Small quantity standard (see note)	20
				50
				100
				200
				500
		13	Standard (see note)	1000
				2000
				3000

Note: Please consult individual model datasheet to determine device per reel availability

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



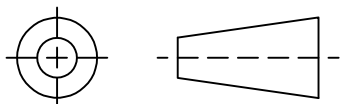
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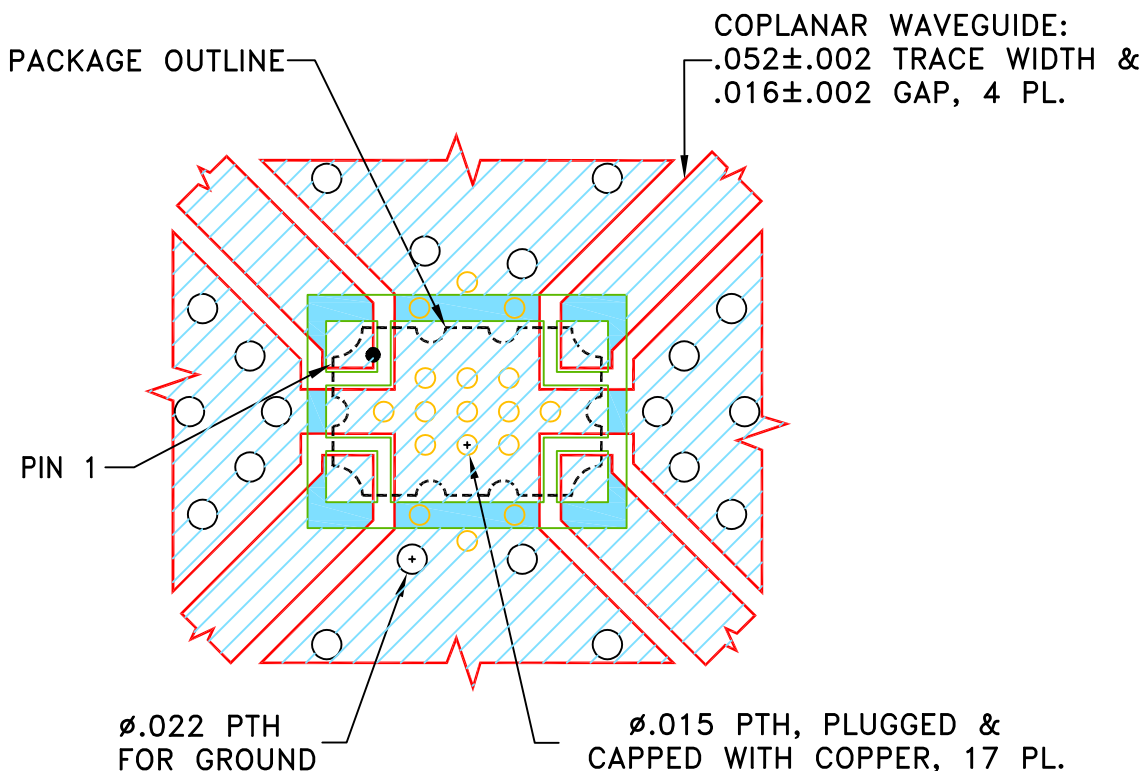
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-026852	NEW RELEASE	09/05/25	ITG	IL
A	ECO-027246	UPDATED ITEM NAME	10/08/25	ITG	TK

SUGGESTED MOUNTING CONFIGURATION
FOR AAE3610-1 CASE STYLE

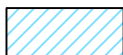


NOTES:

1. TRACE WIDTH & GAP ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS:
.030±.002; COPPER: 1/2 OZ. ON EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.



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



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

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



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

INITIALS

DATE

DRAWN	ITG	09/05/25
CHECKED	GF	09/05/25
APPROVED	IL	09/05/25



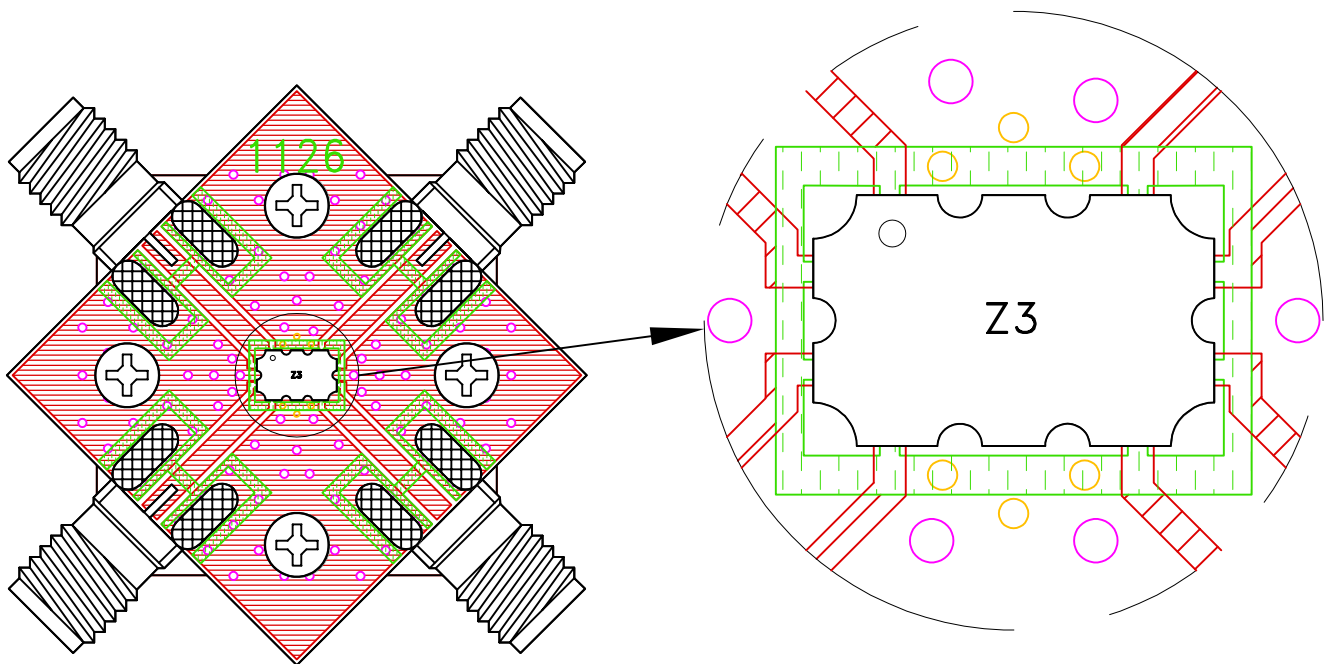
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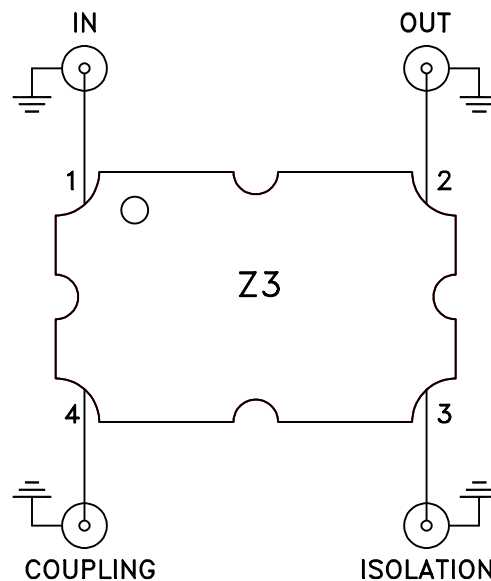
PL, AAE3610-1, TB-HPCJ-XX-43+

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-834	REV: A
FILE: 98PL834	SCALE: 7:1	SHEET: 1 OF 1	

Evaluation Board and Circuit



TB-HPCJ-20-43C+



Schematic Diagram

1. 50 Ohm SMA Female end Launch connectors.
2. PCB Material: ROGERS RO4350B or equivalent, Dielectric Constant= 3.48 Thickness=.030 inch.

 **Mini-Circuits®**



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 125° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 125° 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
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, Test B,B1, 95% Coverage
Thermal Shock	-55° to +125°C, 15 min dwell,250 cycles	MIL-STD-202, Method 107
Bend Test	1mm, deflection for 5 seconds Span of bending: 2.75"	--
High Temp Storage	125°C to 1000 Hrs	---