



LTCC SURFACE MOUNT

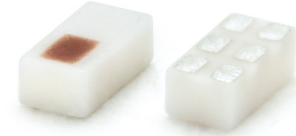
Directional Coupler

DCW-20-722+

50Ω 6.35 to 7.20 GHz 20 dB

THE BIG DEAL

- Wideband, 6350 to 7200 MHz
- Low mainline loss, 0.17 dB typical
- High-power handling 8 W maximum
- 0603 Surface Mount Footprint

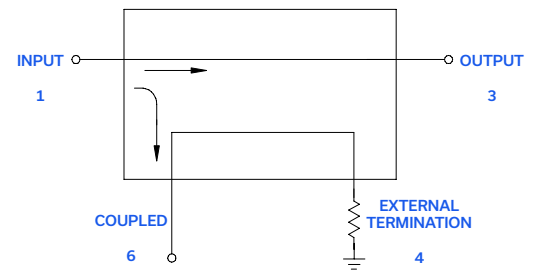


Generic photo used for illustration purposes only

APPLICATIONS

- Telecommunications
- Satellite Communications
- 5G

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' DCW-20-722+ is a miniature low temperature co-fired ceramic (LTCC) directional coupler operating from 6.35 to 7.20 GHz. This model exhibits low typical mainline loss of 0.17 dB, due to its rugged monolithic construction. 0603 surface mountable form factor, the DCW-20-722+ offers an industry leading combination of high-power handling and miniature size. The low mainline loss makes this component a versatile building block for use in various systems, including subsystem designs in 5G New Radio, among others. The LTCC fabrication process ensures minimal RF performance variation while delivering a product well-suited for environmental extremes, including high humidity and temperature.

KEY FEATURES

Features	Advantages
High Power Handling Capability	Able to handle up to 8 Watts CW.
Small, 0603 Surface Mount Footprint	Saves space in dense circuit board layouts and minimizes the effects of parasitics.
Low Mainline Losses	Enables minimal impact to main signal while sampling.
LTCC Construction	Provides repeatable performance in a rugged, ceramic package, well suited for tough environments with high humidity and temperature extremes.

REV. OR
ECO-026018
DCW-20-722+
MCL NY
250627





LTCC SURFACE MOUNT

Directional Coupler

DCW-20-722+

50Ω 6.35 to 7.20 GHz 20 dB

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

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Units
Frequency Range		6.35		7.20	GHz
Mainline Loss	6.35 – 7.20		0.17	0.30	dB
Coupling Nominal	6.35 – 7.20	18.2	19.7	21.5	dB
Directivity	6.35 – 7.20		16		dB
Return Loss (Input)	6.35 – 7.20	14.3	16.3		dB
Return Loss (Output)	6.35 – 7.20	14.3	16.3		dB
Return Loss (Coupled)	6.35 – 7.20	12.3	14.3		dB

1. Tested on Evaluation Board TB-DCW-20-722+. Fixture losses de-embedded using TRL.
2. Symmetrical, all ports are interchangeable. See Pad Configuration Table and S-Parameters for actual performance.

ABSOLUTE MAXIMUM RATINGS³

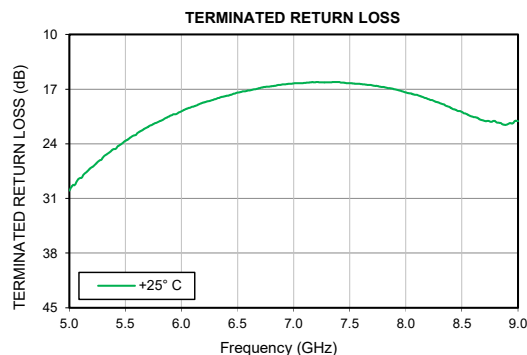
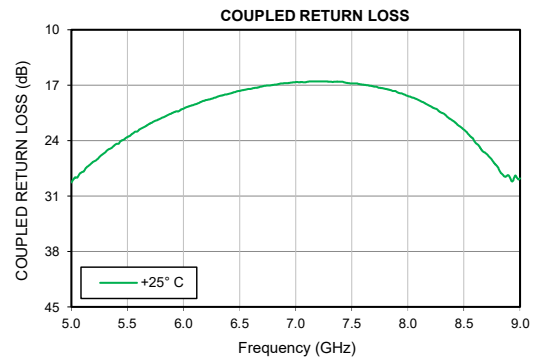
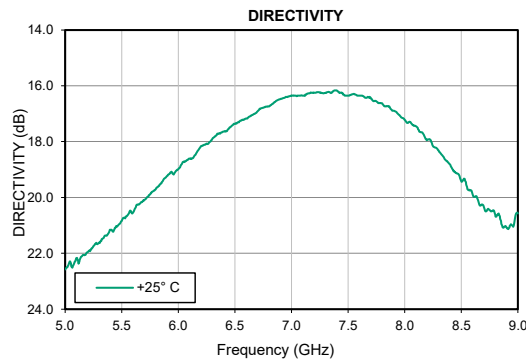
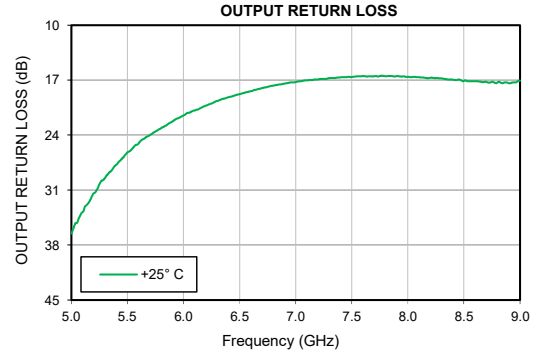
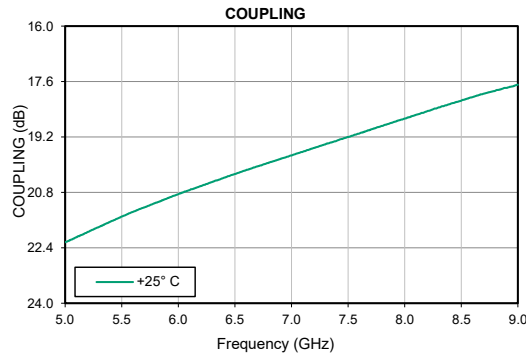
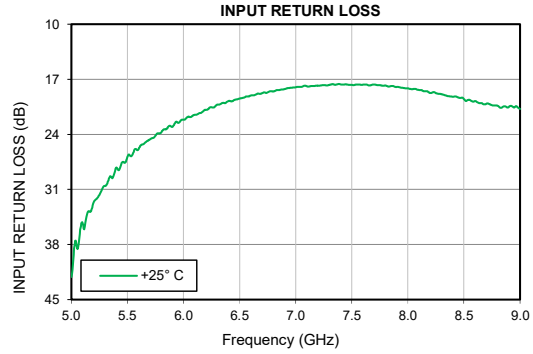
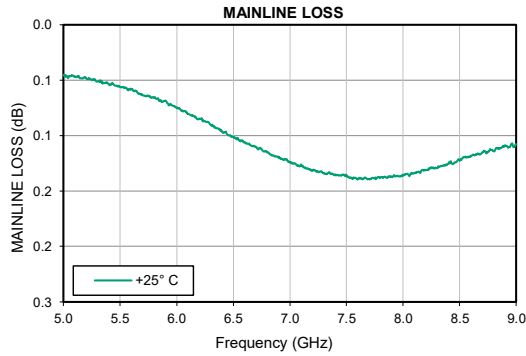
Parameter	Ratings
Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +125 °C
Input Power ⁴	8 W at +25 °C

3. Permanent damage may occur if any of these limits are exceeded.
4. Derate linearly to 3.2 W at +125 °C.





TYPICAL PERFORMANCE GRAPHS





FUNCTIONAL DIAGRAM

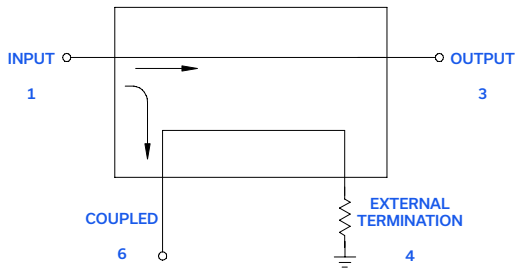
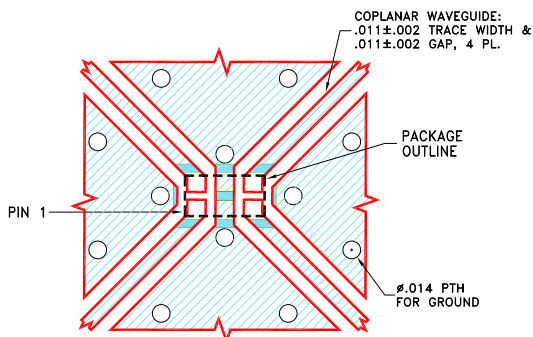


Figure 1. DCW-20-722+ Functional Diagram

PAD DESCRIPTION/CONFIGURATION²

Function	Pad Number	Description
Input	1	Connects to RF Input Port
Output	3	Connects to RF Output Port
Termination	4	Connects to EXTERNAL TERMINATION
Coupled	6	Connects to COUPLED
Ground	2, 5	Connects to GROUND

SUGGESTED PCB LAYOUT (PL-823)

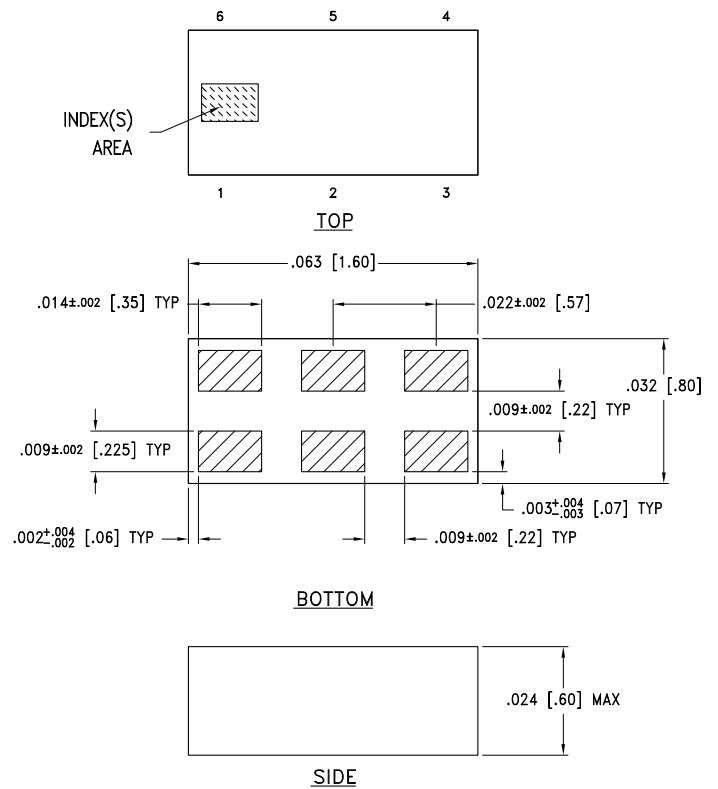


- NOTES:
- PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
 - TRACE WIDTH & GAP ARE SHOWN FOR 0.006 FR4 IT-180A, COPPER: 1/2 OZ. EACH LAYER. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.

- 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-823

CASE STYLE DRAWING



Weight:.002 grams
Dimensions are in inches [mm]. Tolerances: ±0.005 Inches

PRODUCT MARKING*: N/A

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



LTCC SURFACE MOUNT

Directional Coupler

DCW-20-722+

50Ω 6.35 to 7.20 GHz 20 dB

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD.

[CLICK HERE](#)

Performance Data & Graphs	Data Graphs S-Parameter (S4P Files) Data Set (.zip file) De-embedded to device pads
Case Style	JC0603C-9 Lead Finish: Tin Plate over Nickel Plate
RoHS Status	Compliant
Tape and Reel	F74
Suggested Layout for PCB Design	PL-823
Evaluation Board	TB-DCW-20-722+ Gerber File
Environmental Rating	ENV06T10

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



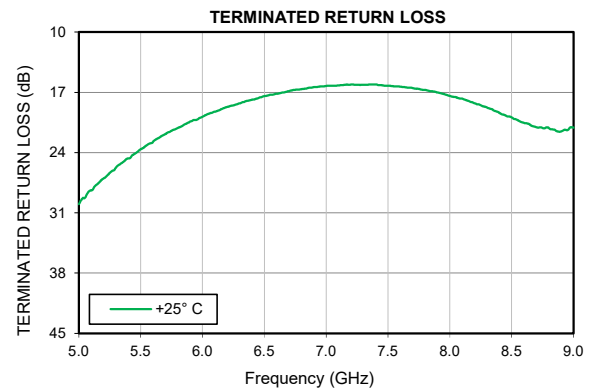
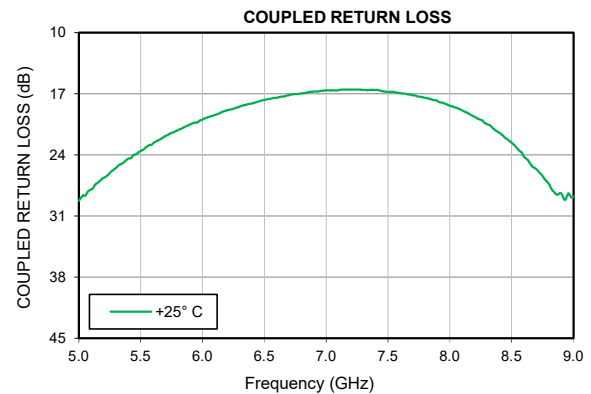
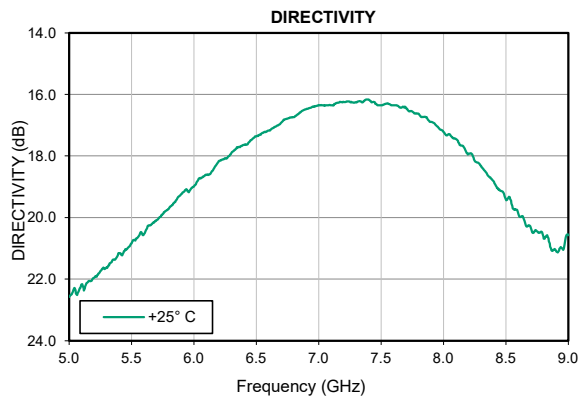
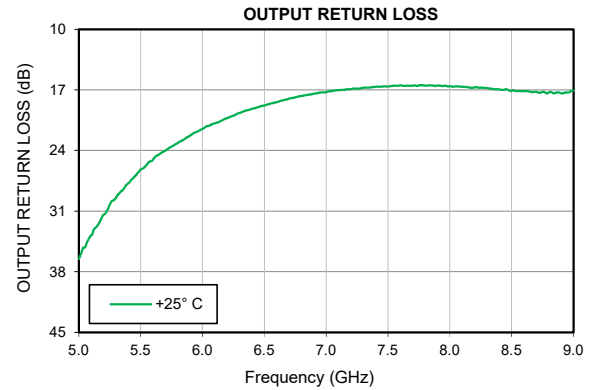
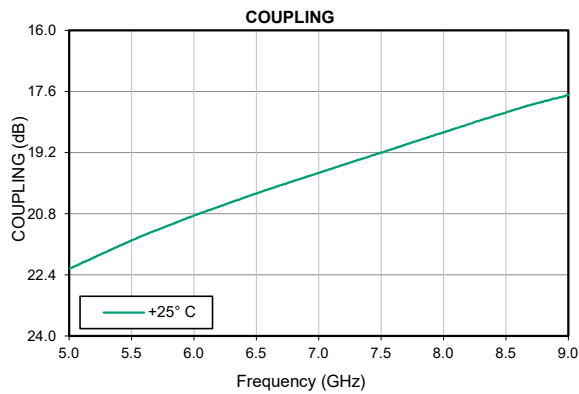
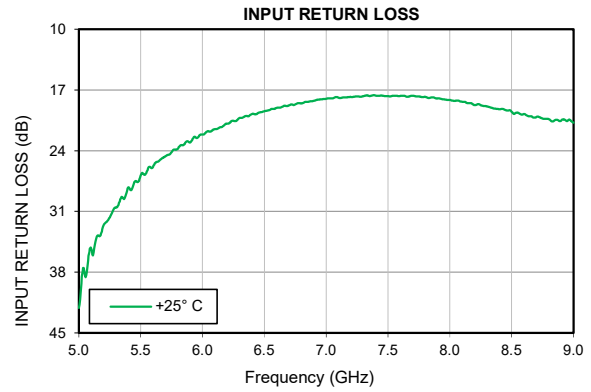
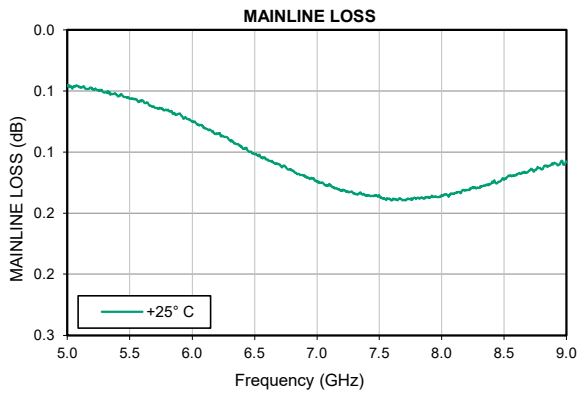
Directional Coupler

DCW-20-722+

Typical Performance Data

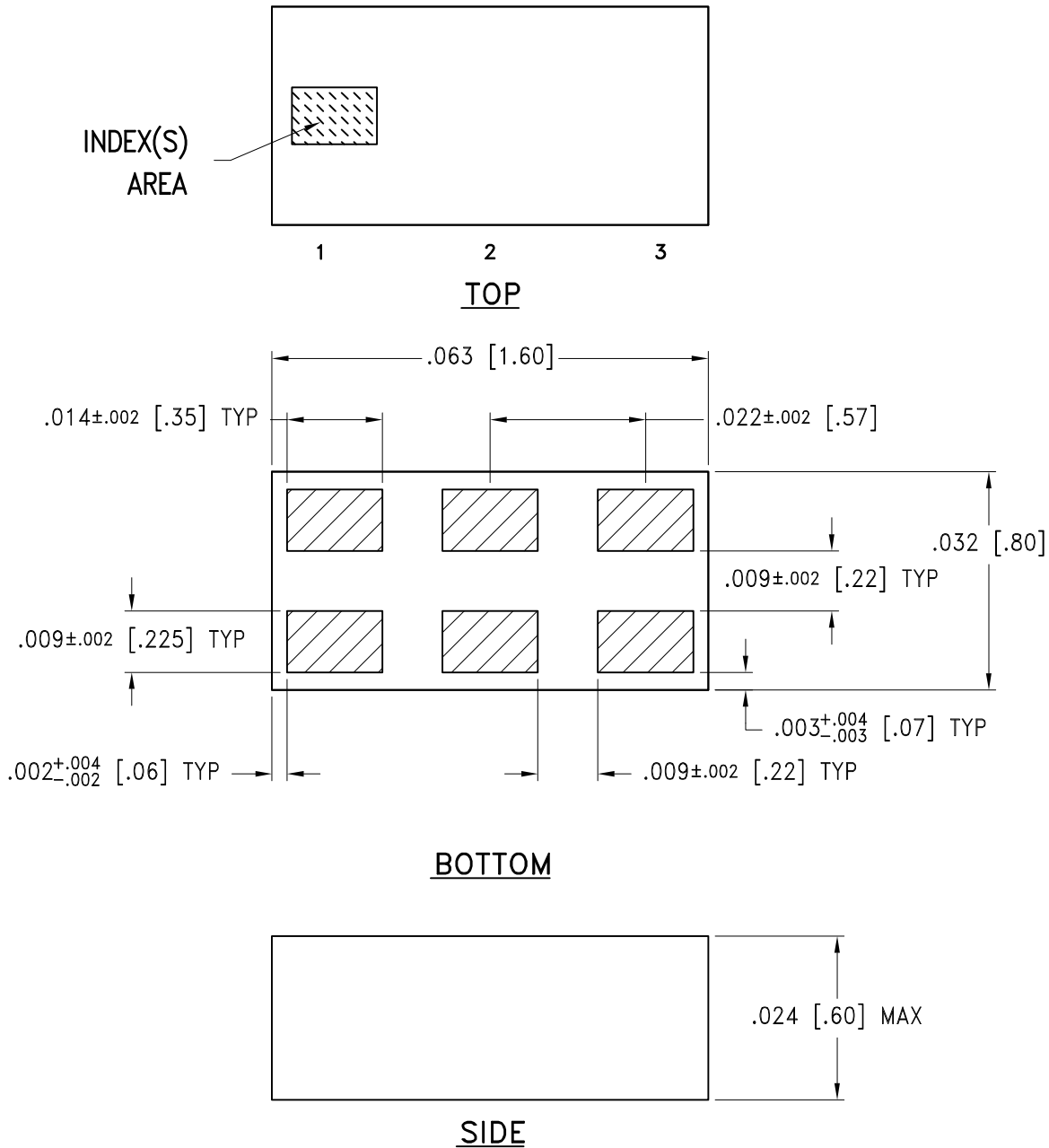
FREQUENCY (GHz)	MAINLINE LOSS (dB)	COUPLING (dB)	DIRECTIVITY (dB)	INPUT RETURN LOSS (dB)	OUTPUT RETURN LOSS (dB)	COUPLED RETURN LOSS (dB)	TERMINATED RETURN LOSS (dB)
5.00	0.054	22.238	22.578	42.115	36.527	29.268	29.978
5.05	0.055	22.171	22.356	38.365	35.180	28.684	29.259
5.10	0.056	22.093	22.178	35.231	33.800	27.938	28.376
5.15	0.058	22.022	22.093	33.805	32.660	27.227	27.670
5.20	0.057	21.944	21.957	32.601	31.409	26.647	27.012
5.25	0.060	21.871	21.744	31.688	30.285	26.104	26.368
5.30	0.062	21.796	21.611	30.549	29.469	25.524	25.766
5.35	0.063	21.720	21.370	29.327	28.645	24.997	25.187
5.40	0.064	21.647	21.171	28.237	27.785	24.438	24.675
5.45	0.066	21.574	21.030	27.603	27.028	23.961	24.146
5.50	0.068	21.501	20.851	26.873	26.198	23.546	23.615
5.55	0.069	21.430	20.633	26.404	25.613	23.071	23.133
5.60	0.070	21.360	20.529	25.832	25.025	22.691	22.752
5.65	0.073	21.296	20.246	25.178	24.446	22.279	22.256
5.70	0.076	21.232	20.080	24.630	24.003	21.859	21.836
5.75	0.077	21.169	19.889	24.149	23.541	21.483	21.449
5.80	0.079	21.101	19.704	23.767	23.135	21.185	21.149
5.85	0.082	21.041	19.492	23.285	22.722	20.853	20.783
5.90	0.082	20.977	19.232	23.035	22.283	20.503	20.401
5.95	0.087	20.909	19.144	22.504	21.874	20.319	20.190
6.00	0.090	20.850	18.990	22.144	21.502	19.966	19.837
6.05	0.093	20.791	18.709	21.761	21.150	19.669	19.498
6.10	0.097	20.732	18.606	21.506	20.854	19.431	19.245
6.15	0.099	20.675	18.477	21.276	20.573	19.153	18.979
6.20	0.102	20.618	18.168	20.868	20.254	18.891	18.685
6.25	0.104	20.558	18.074	20.537	19.978	18.717	18.507
6.30	0.108	20.497	17.896	20.217	19.653	18.470	18.265
6.35	0.112	20.445	17.718	19.981	19.406	18.276	18.038
6.40	0.116	20.383	17.637	19.741	19.180	18.116	17.865
6.45	0.119	20.325	17.513	19.638	18.985	17.906	17.663
6.50	0.122	20.270	17.362	19.438	18.788	17.720	17.441
6.55	0.126	20.213	17.249	19.237	18.583	17.567	17.280
6.60	0.127	20.157	17.166	19.053	18.415	17.453	17.165
6.65	0.130	20.103	17.049	18.888	18.200	17.321	17.008
6.70	0.132	20.049	16.909	18.762	18.016	17.155	16.838
6.75	0.135	19.997	16.790	18.680	17.867	17.030	16.695
6.80	0.138	19.940	16.740	18.538	17.710	16.978	16.637
6.85	0.141	19.892	16.579	18.349	17.577	16.843	16.507
6.90	0.143	19.836	16.481	18.261	17.465	16.747	16.392
6.95	0.146	19.785	16.399	18.097	17.318	16.701	16.326
7.00	0.149	19.732	16.341	18.005	17.233	16.611	16.252
7.05	0.151	19.678	16.354	17.951	17.125	16.604	16.225
7.10	0.151	19.623	16.343	17.875	17.044	16.596	16.204
7.15	0.155	19.570	16.271	17.858	16.975	16.532	16.118
7.20	0.158	19.517	16.246	17.779	16.918	16.546	16.100
7.25	0.159	19.462	16.243	17.722	16.826	16.542	16.119
7.30	0.160	19.412	16.247	17.711	16.762	16.569	16.125
7.35	0.160	19.358	16.258	17.698	16.731	16.570	16.096
7.40	0.163	19.307	16.165	17.622	16.652	16.567	16.079
7.45	0.163	19.255	16.254	17.620	16.635	16.706	16.175
7.50	0.163	19.200	16.346	17.710	16.618	16.774	16.234
7.55	0.166	19.151	16.290	17.643	16.521	16.809	16.283
7.60	0.167	19.096	16.342	17.689	16.496	16.927	16.347
7.65	0.167	19.041	16.425	17.754	16.514	17.022	16.414
7.70	0.167	18.990	16.430	17.668	16.516	17.165	16.506
7.75	0.167	18.930	16.557	17.729	16.496	17.355	16.616
7.80	0.165	18.882	16.629	17.777	16.510	17.465	16.724
7.85	0.165	18.828	16.721	17.865	16.488	17.641	16.862
7.90	0.165	18.774	16.889	17.977	16.500	17.847	17.022
7.95	0.164	18.721	17.032	18.075	16.536	18.070	17.189
8.00	0.162	18.669	17.223	18.132	16.589	18.361	17.415
8.05	0.162	18.617	17.299	18.238	16.608	18.601	17.559
8.10	0.160	18.562	17.443	18.333	16.646	18.906	17.744
8.15	0.160	18.508	17.659	18.526	16.686	19.251	18.000
8.20	0.157	18.452	17.919	18.722	16.696	19.627	18.264
8.25	0.154	18.401	18.148	18.742	16.760	19.971	18.499
8.30	0.155	18.351	18.317	18.880	16.787	20.482	18.761
8.35	0.153	18.301	18.586	19.093	16.908	20.970	19.047
8.40	0.150	18.251	18.817	19.217	16.925	21.468	19.376
8.45	0.150	18.197	19.118	19.309	16.939	22.070	19.684
8.50	0.147	18.149	19.421	19.502	17.096	22.629	19.913
8.55	0.143	18.097	19.620	19.597	17.162	23.344	20.234
8.60	0.142	18.047	19.887	19.765	17.122	24.193	20.552
8.65	0.140	17.997	20.109	20.018	17.203	25.001	20.785
8.70	0.138	17.950	20.343	20.108	17.226	25.659	21.054
8.75	0.137	17.902	20.446	20.272	17.231	26.424	21.136
8.80	0.137	17.864	20.611	20.346	17.291	27.300	21.134
8.85	0.135	17.822	20.849	20.471	17.361	28.380	21.387
8.90	0.131	17.777	21.071	20.520	17.394	28.418	21.540
8.95	0.131	17.736	20.992	20.565	17.293	28.593	21.400

Typical Performance Curves



Outline Dimensions

JC0603C-9



Weight: .002 grams

Dimensions are in inches [mm]. Tolerances: ± 0.005 Inches

Notes:

1. Open style, ceramic base.
2. Termination finish:
For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.

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RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F74

DEVICE ORIENTATION IN T&R

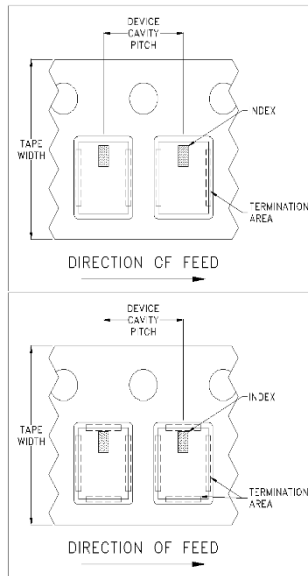


ILLUSTRATION 1

Applicable Case Styles

GE0805C-1
GE0805C-1AP
JV1210C-1
GU2939

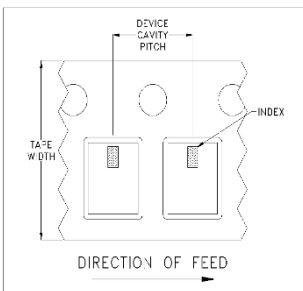


ILLUSTRATION 2

Applicable Case Styles

JV1210C
JV1210C-2
JV1210C-3
JV1210C-4
JV1210C-5
JV1210C-6
JV1210C-11

ILLUSTRATION 3

Applicable Case Styles

JC0603C-8
JC0603C-9
JV1210C-7
JV1210C-8
JV1210C-9
JV1210C-10
JV1210C-13
GE0805C-13
GE0805C-19
GE0805C-20

Tape Width, mm	Device Cavity Pitch, mm	Real Size, inches	Devices per Reel	
8	4	7	Small quantity standards (see note)	20
				50
				100
				200
				500
				1000
			Standard	2000
				4000

Note: Small reel availability varies by model. Refer to pricing and availability on individual model dashboard.

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



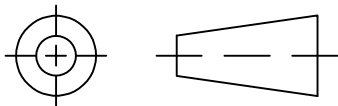
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THIRD ANGLE PROJECTION

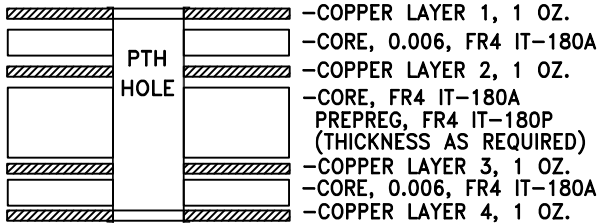


REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-025505	NEW RELEASE	05/14/25	ITG	IL

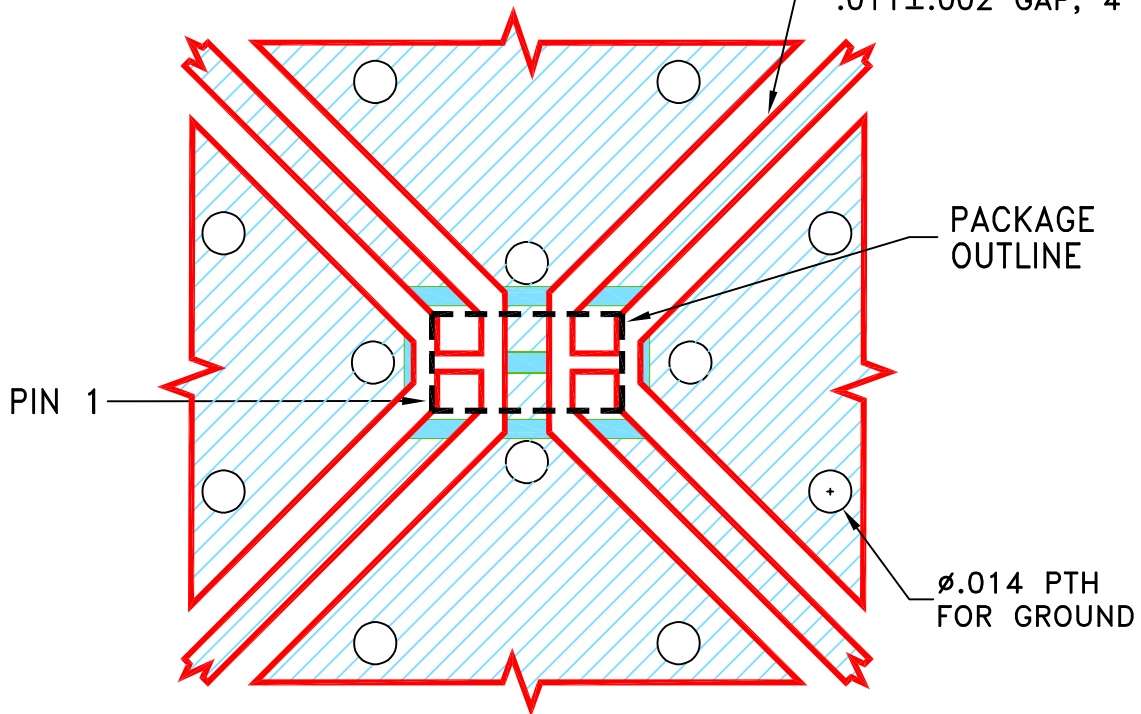
SUGGESTED MOUNTING CONFIGURATION
FOR JC0603C-9 CASE STYLE

STACK-UP DIAGRAM



1. TOTAL FINISHED THICKNESS 0.053±10%.
2. PTH HOLES PRESENT FROM COPPER LAYER 1 TO 4.
3. L2, L3 & L4 ARE CONTINUOUS GROUND PLANE.

COPLANAR WAVEGUIDE:
.011±.002 TRACE WIDTH &
.011±.002 GAP, 4 PL.



NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP ARE SHOWN FOR 0.006 FR4 IT-180A, COPPER: 1/2 OZ. EACH LAYER. 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	INITIALS	DATE
DIMENSIONS ARE IN INCHES	ITG	05/13/25
TOLERANCES ON:	GF	05/13/25
2 PL DECIMALS ±	IL	05/13/25
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		

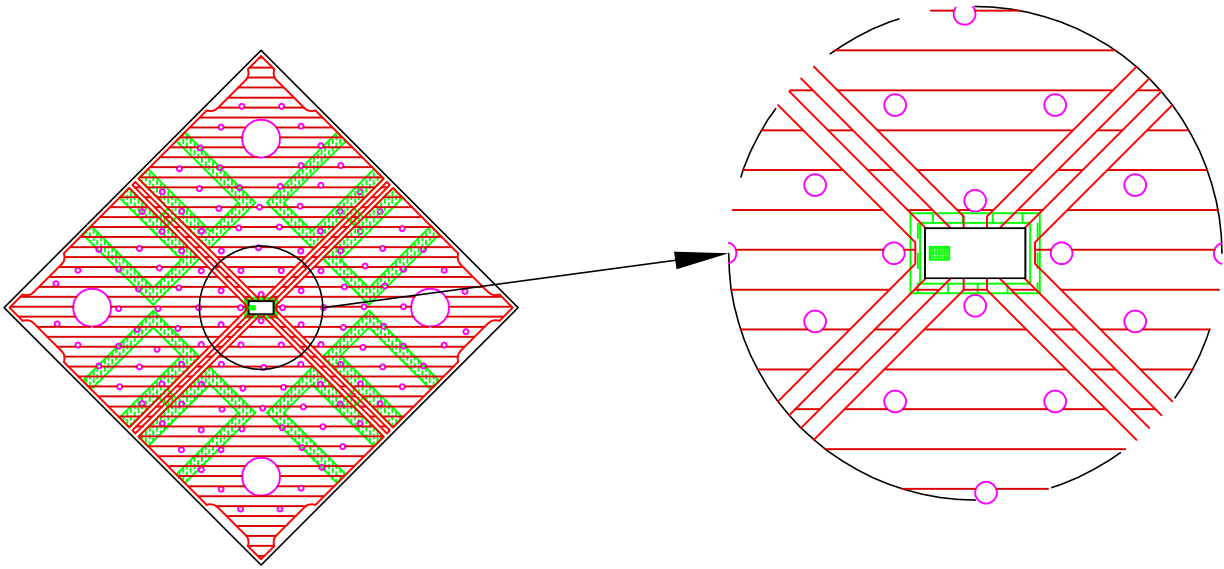
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Brooklyn NY 11235

PL, JC0603C-9, TB-DCW-20-722+

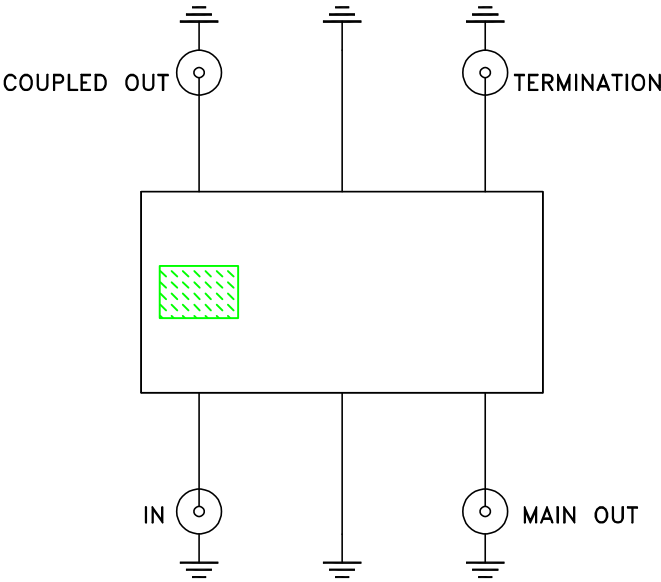
SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-823	REV: OR
FILE: 98PL823	SCALE: 15:1	SHEET: 1 OF 1	

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Evaluation Board and Circuit




TB-DCW-20-722+



Schematic Diagram

- 1. 50 Ohm SMA Female end Launch connectors.
- 2. PCB Material: FR4 IT-180A or equivalent, Dielectric Constant= 4.4 Thickness=.053 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	---