Ultra-Small Ceramic LTCC

Power Splitter/Combiner QCS-162+

2 Way-90° 50Ω 1550 to 1620 MHz

The Big Deal

- High Power handling (3W)
- Low Unbalance, 0.5 dB & 2 deg. typ.

CASE STYLE: GE0805C-14

Product Overview

Mini-Circuits new 90° Power Splitter, model: QCS-162+, offers an industry leading combination of operating bandwidth and size. The outstanding phase and amplitude unbalance make this component a versatile building block for use in a variety of systems and sub-system designs.

Key Features

Feature	Advantages
Small Size	Offered in the EIA-0805 package size, the QCS-162+ offers an industry leading combination of size, bandwidth and frequency. The small footprint (2.0mm x1.25mm) allows for reduced parasitics in systems with improved performance and simplified layout.
Low Phase and Amplitude Unbalance	Supporting 2 deg. and 0.5 dB unbalance make this 90° hybrid applicable for use in higher level integrated components such as image reject mixers, single sideband modulators, phase shifters, variable attenuators, and balance amplifiers.
High Power Handling	Capable of operating up to 3W, the LTCC construction of the QCS-162+ makes this 90° hybrid a robust, rugged product that can be used effectively in either the transmit or receive paths.

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Power Splitter/Combiner

QCS-162+

2 Way-90° 50Ω 1550 to 1620 MHz

Generic photo used for illustration purposes only

CASE STYLE: GE0805C-14

+RoHS Compliant

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

Available Tape and Reel at no extra cost

Reel Size	Devices/Reel
7"	20, 50, 100, 200, 500,1000, 2000

Maximum Ratings

Operating Temperature	-55°C to 125°C
Storage Temperature	-55°C to 125°C
Power Input (as a splitter)	3W max.

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

Pin Connections

SUM PORT	2
PORT 1 (0°)	4
PORT 2 (+90°)	3
50 OHM TERM EXTERNAL	1

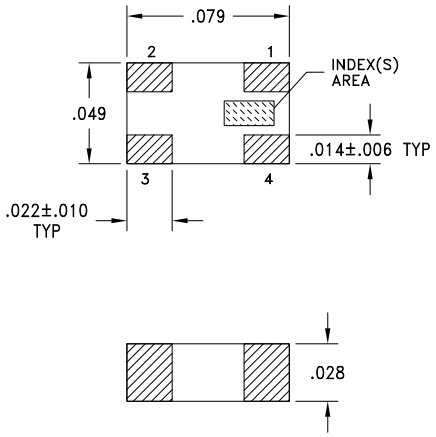
Features

- Low Insertion Loss, 0.5 dB typ
- High Isolation, 15 dB typ
- Miniature size, 0.079"x0.049"x0.028
- LTCC Construction

Applications

- Satcom
- Aeronautics

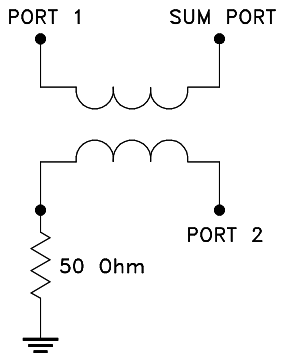
Outline Drawing



Outline Dimensions (inch / mm)

A	B	C	D	E	wt
.079	.049	.028	.022	.014	grams
2.01	1.24	0.71	0.56	0.36	.008

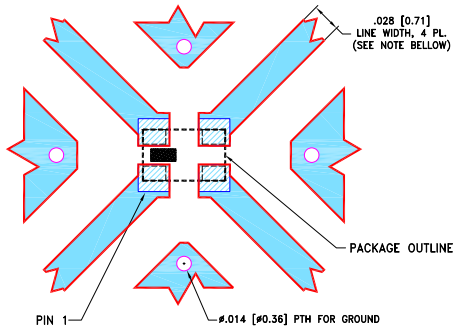
Electrical Schematic



Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency		1550		1620	MHz
Insertion Loss (Avg. Of Coupled Outputs) above 3 dB	1550-1620	—	0.5	0.9	dB
Isolation	1550-1620	15	20	—	dB
Phase Unbalance	1550-1620	—	2	5	Degree
Amplitude Unbalance	1550-1620	—	0.5	1.2	dB
Return Loss	1550-1620	10	14	—	dB

Demo Board MCL P/N: TB-QCS-162+
Suggested PCB Layout (PL-696)



NOTES:
1. LINE WIDTH IS SHOWN FOR FR4 IT-180A, DIELECTRIC THICKNESS: .016±.001; COPPER: 1/2 OZ. ON EACH SIDE. FOR OTHER MATERIALS LINE 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 SOLDER MASK.

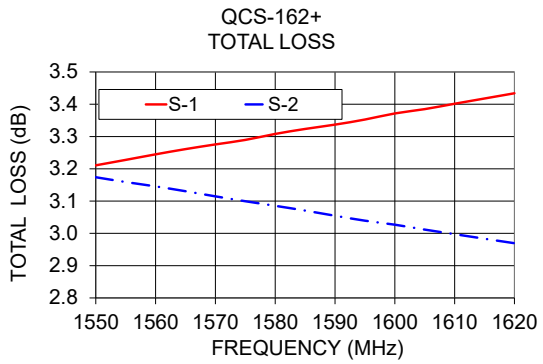
Notes

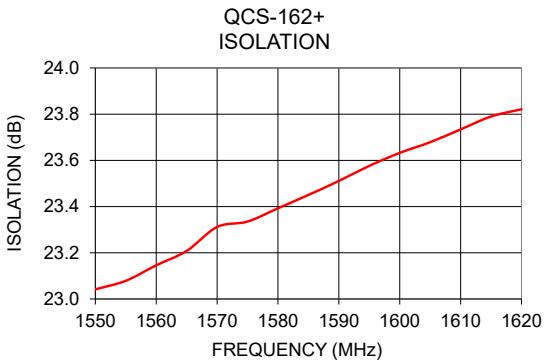
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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

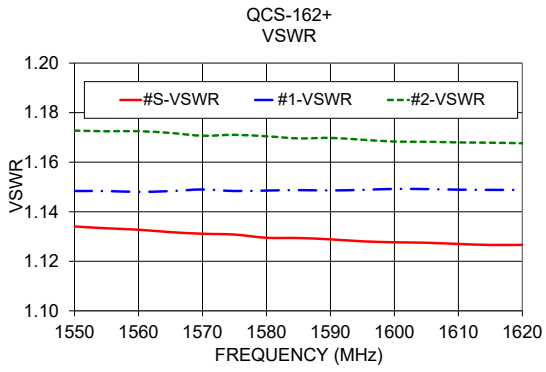
Typical Performance Data

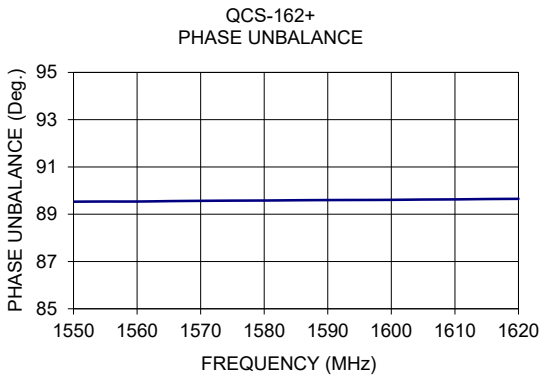
Frequency (MHz)	Total Loss[1] (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
1550	3.21	3.17	0.04	23.04	89.53	1.13	1.15	1.17
1555	3.23	3.16	0.07	23.08	89.54	1.13	1.15	1.17
1560	3.24	3.15	0.10	23.15	89.54	1.13	1.15	1.17
1565	3.26	3.13	0.13	23.21	89.55	1.13	1.15	1.17
1570	3.28	3.11	0.16	23.31	89.57	1.13	1.15	1.17
1575	3.29	3.10	0.19	23.34	89.58	1.13	1.15	1.17
1580	3.31	3.09	0.22	23.39	89.58	1.13	1.15	1.17
1585	3.32	3.07	0.25	23.45	89.59	1.13	1.15	1.17
1590	3.34	3.05	0.28	23.51	89.60	1.13	1.15	1.17
1595	3.35	3.04	0.31	23.58	89.60	1.13	1.15	1.17
1600	3.37	3.03	0.34	23.63	89.61	1.13	1.15	1.17
1605	3.38	3.01	0.37	23.68	89.62	1.13	1.15	1.17
1610	3.40	3.00	0.40	23.73	89.63	1.13	1.15	1.17
1615	3.42	2.98	0.43	23.79	89.64	1.13	1.15	1.17
1620	3.43	2.97	0.46	23.82	89.65	1.13	1.15	1.17

1. Total Loss = Insertion Loss + 3dB splitter loss.









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2 Way-90° Power Splitter/Combiner QCS-162+

Typical Performance Data

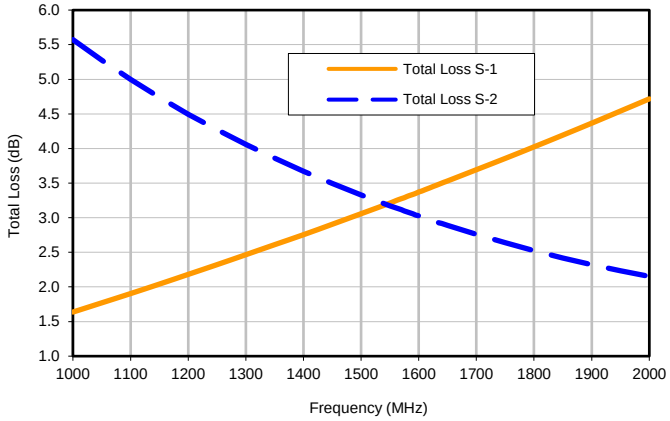
FREQ.	TOTAL LOSS[1]		AMP. UNBAL.	ISOLATION	PHASE UNBAL.	FREQ.	VSWR		
(MHz)	(dB)		(dB)	(dB)	(Deg.)	(MHz)	(:1)		
	S-1	S-2		1-2			S	1	2
1000	1.64	5.57	3.94	19.61	88.81	1000	1.13	1.13	1.14
1050	1.77	5.28	3.51	19.67	88.84	1050	1.14	1.14	1.15
1100	1.90	5.00	3.09	19.78	88.87	1100	1.14	1.14	1.16
1150	2.04	4.74	2.70	19.91	88.92	1150	1.14	1.15	1.16
1200	2.18	4.50	2.32	20.09	88.98	1200	1.15	1.15	1.17
1250	2.32	4.27	1.95	20.41	89.03	1250	1.15	1.15	1.17
1300	2.47	4.06	1.59	20.72	89.11	1300	1.15	1.15	1.17
1350	2.61	3.86	1.25	21.11	89.17	1350	1.15	1.15	1.17
1400	2.75	3.67	0.92	21.57	89.26	1400	1.14	1.15	1.17
1450	2.91	3.50	0.59	22.01	89.34	1450	1.14	1.15	1.17
1500	3.06	3.33	0.27	22.45	89.44	1500	1.14	1.15	1.17
1550	3.21	3.17	0.04	23.04	89.53	1550	1.13	1.15	1.17
1555	3.23	3.16	0.07	23.08	89.54	1555	1.13	1.15	1.17
1560	3.24	3.15	0.10	23.15	89.54	1560	1.13	1.15	1.17
1565	3.26	3.13	0.13	23.21	89.55	1565	1.13	1.15	1.17
1570	3.28	3.11	0.16	23.31	89.57	1570	1.13	1.15	1.17
1575	3.29	3.10	0.19	23.34	89.58	1575	1.13	1.15	1.17
1580	3.31	3.09	0.22	23.39	89.58	1580	1.13	1.15	1.17
1585	3.32	3.07	0.25	23.45	89.59	1585	1.13	1.15	1.17
1590	3.34	3.05	0.28	23.51	89.60	1590	1.13	1.15	1.17
1595	3.35	3.04	0.31	23.58	89.60	1595	1.13	1.15	1.17
1600	3.37	3.03	0.34	23.63	89.61	1600	1.13	1.15	1.17
1605	3.38	3.01	0.37	23.68	89.62	1605	1.13	1.15	1.17
1610	3.40	3.00	0.40	23.73	89.63	1610	1.13	1.15	1.17
1615	3.42	2.98	0.43	23.79	89.64	1615	1.13	1.15	1.17
1620	3.43	2.97	0.46	23.82	89.65	1620	1.13	1.15	1.17
1625	3.45	2.96	0.50	23.87	89.66	1625	1.13	1.15	1.17
1630	3.47	2.94	0.52	23.90	89.67	1630	1.13	1.15	1.17
1635	3.48	2.93	0.55	23.95	89.67	1635	1.13	1.15	1.17
1640	3.50	2.92	0.58	23.98	89.69	1640	1.13	1.15	1.17
1645	3.52	2.90	0.61	24.04	89.68	1645	1.13	1.15	1.17
1650	3.53	2.89	0.64	24.07	89.69	1650	1.13	1.15	1.17
1700	3.69	2.76	0.93	24.37	89.76	1700	1.12	1.15	1.17
1750	3.86	2.64	1.22	24.63	89.82	1750	1.11	1.16	1.16
1800	4.02	2.52	1.50	24.49	89.88	1800	1.11	1.16	1.16
1850	4.19	2.42	1.77	24.12	89.92	1850	1.11	1.17	1.16
1900	4.37	2.32	2.04	23.59	89.95	1900	1.11	1.18	1.16
1950	4.54	2.23	2.31	22.78	89.98	1950	1.11	1.19	1.16
2000	4.72	2.15	2.56	21.76	89.98	2000	1.12	1.21	1.17

[1]Total Loss = Insertion Loss + 3dB Splitter Loss

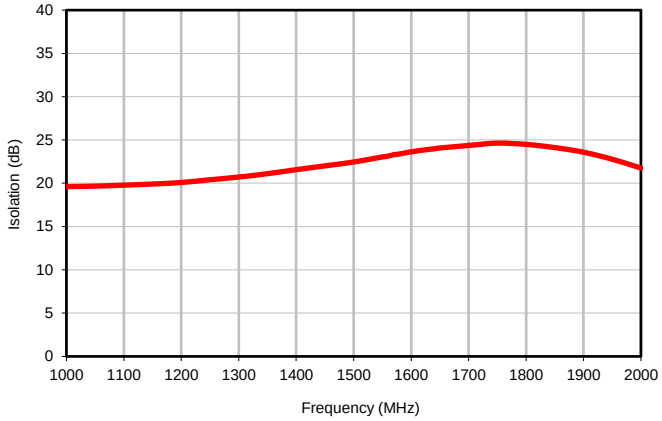
2 Way-90° Power Splitter/Combiner QCS-162+

Typical Performance Curves

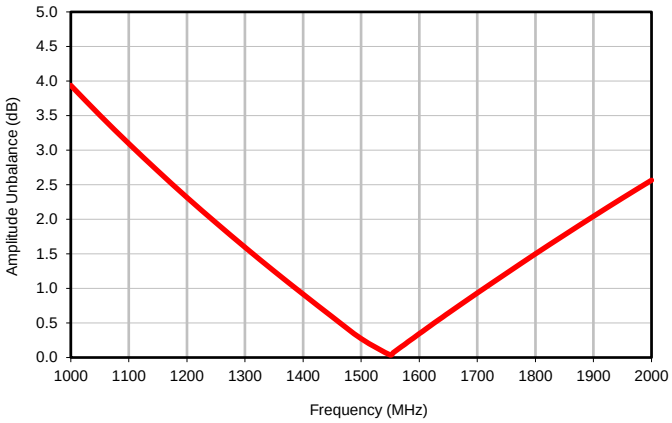
Total Loss



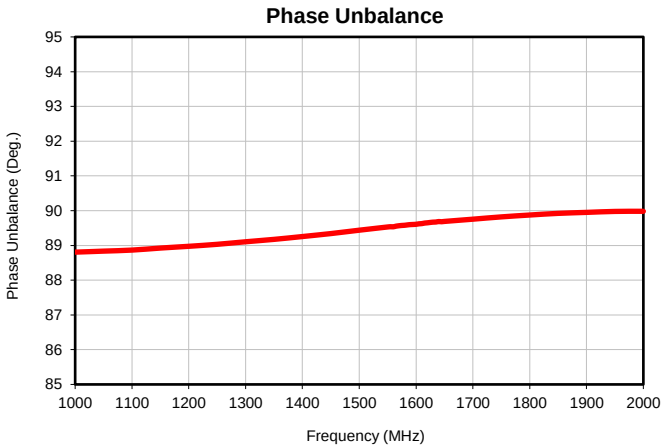
Isolation



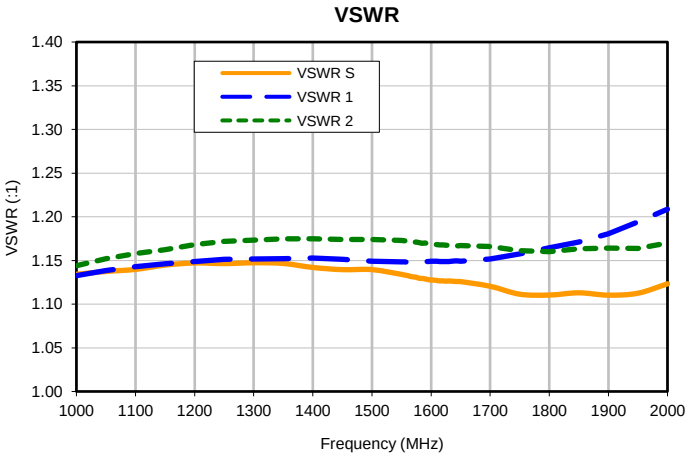
Amplitude Unbalance



Phase Unbalance



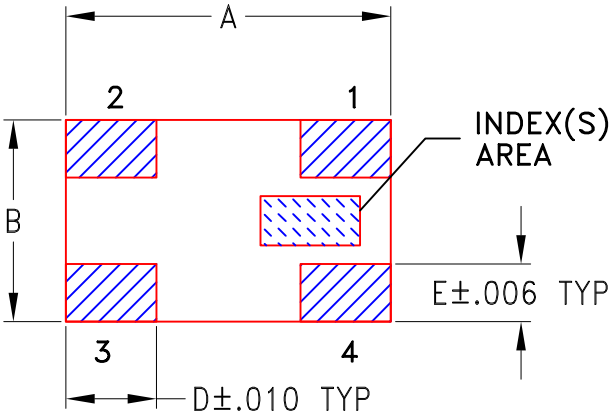
VSWR

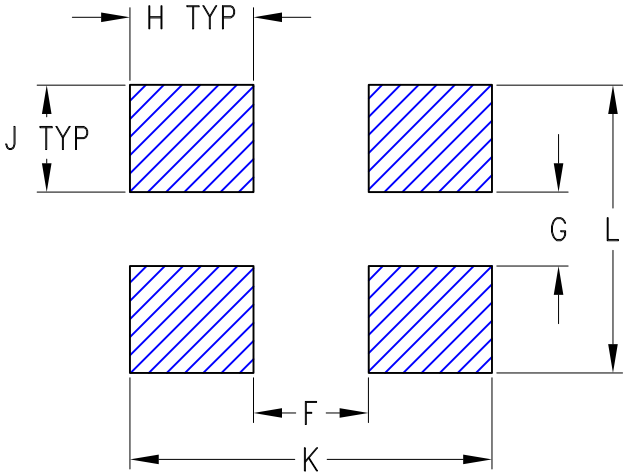


Case Style GE

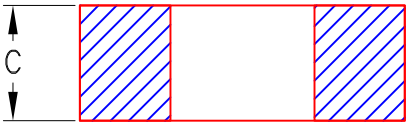
Outline Dimensions

GE0805C-14





SUGGESTED LAYOUT
FOR PCB LAND PATTERN
PATTERN TO BE WITHIN ±.002



METALLIZATION

CASE #	A	B	C	D	E	F	G	H	J	K	L	WT, GRAM
GE0805C-14	.079 (2.00)	.049 (1.25)	.028 (0.70)	.022 (0.56)	.014 (0.35)	.028 (0.70)	.018 (0.45)	.030 (0.75)	.026 (0.65)	.088 (2.20)	.070 (1.75)	0.008

Dimensions are in inches (mm). Tolerances: 2 Pl. ±.01; 3 Pl. ±.005

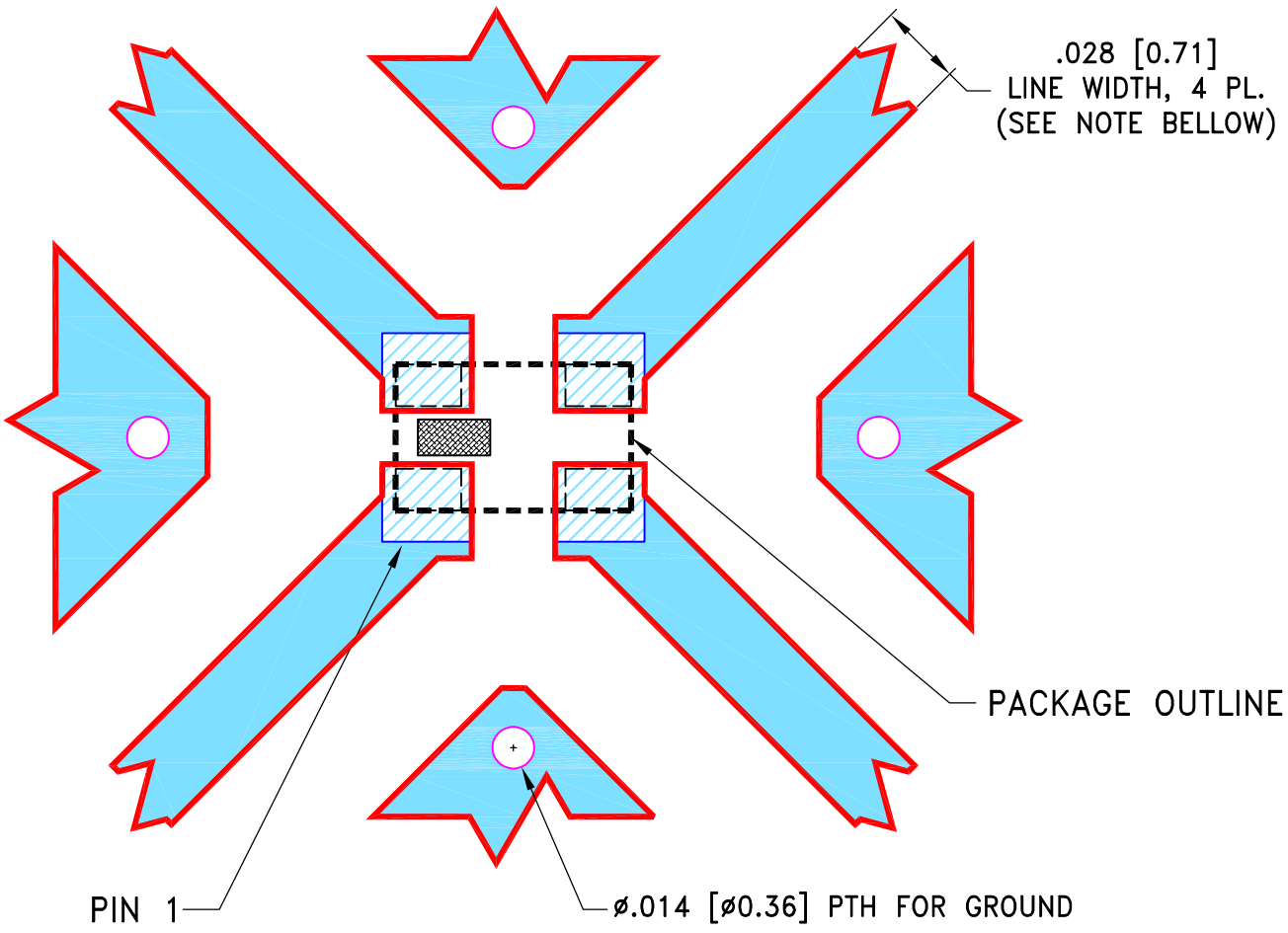
Notes:

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

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-004682	NEW RELEASE	10/24/20	ITG	SL

SUGGESTED MOUNTING CONFIGURATION FOR GE0805C-14 CASE STYLE



NOTES:

1. LINE WIDTH IS SHOWN FOR FR4 IT-180A, DIELECTRIC THICKNESS: .016±.001; COPPER: 1/2 OZ. ON EACH SIDE. FOR OTHER MATERIALS LINE 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 SOLDER MASK.

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	ITG	10/23/20
TOLERANCES ON:	CHECKED	GF	10/23/20
2 PL DECIMALS ±	APPROVED	SL	10/24/20
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

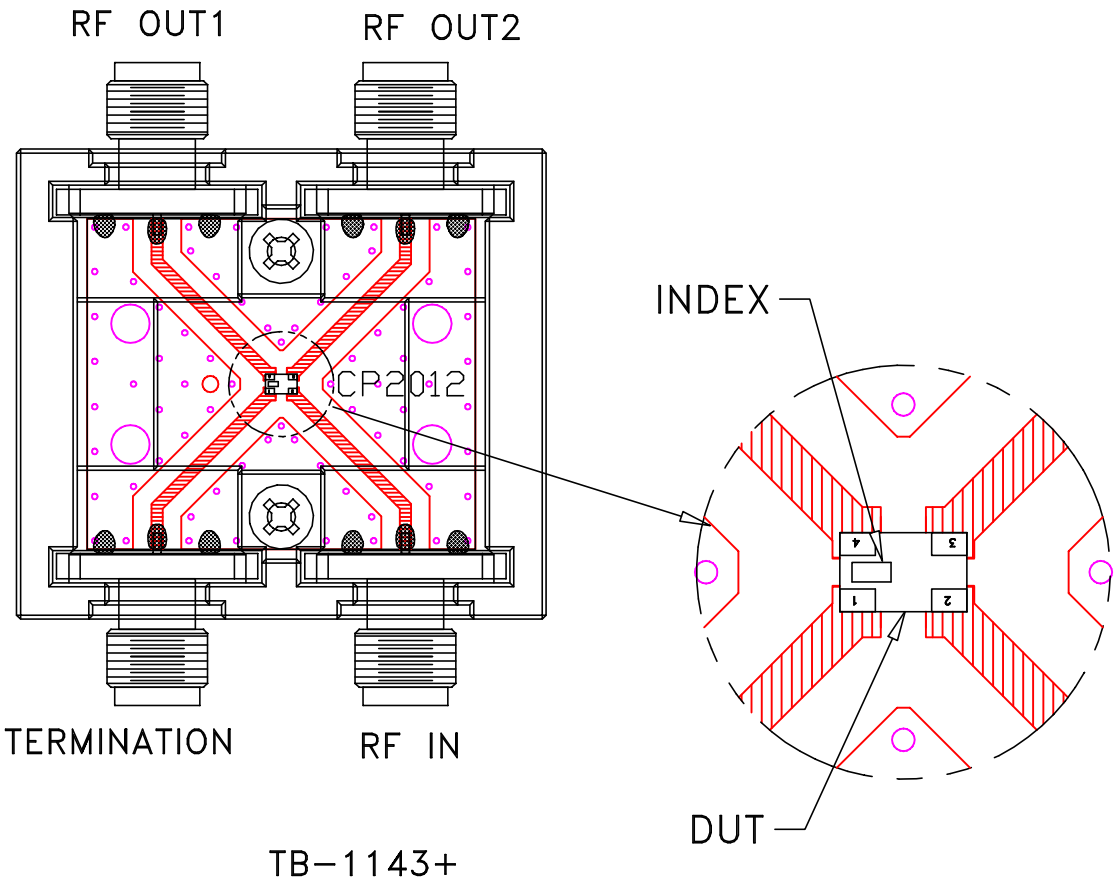
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, GE0805C-14, TB-1143+

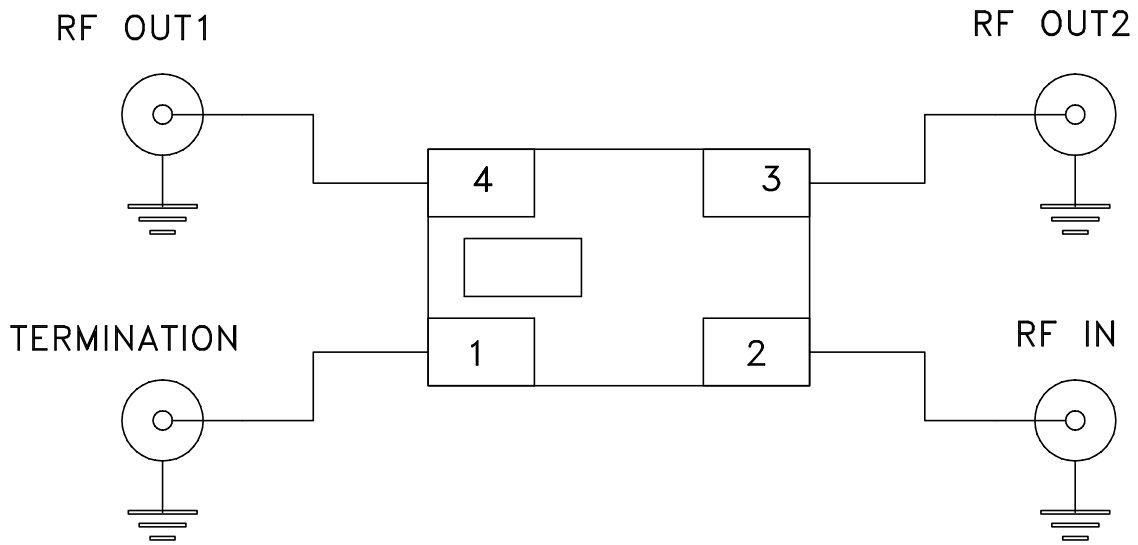
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-696	OR

FILE:	SCALE:	SHEET:
98PL696	15:1	1 OF 1

Evaluation Board and Circuit



TB-1143+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: FR4 or equivalent,
   Dielectric Constant=4.5, Thickness=.016 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: 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-202, Method 204, Condition D
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A