2 Way-90° Power Splitter QCS-722+

50Ω 4000 to 7200 MHz

CASE STYLE: GE0805C-1

The Big Deal

- High Power handling (15W)
- Low Unbalance, 0.2 dB & 2 deg. typ.
- Industry leading combination of size/bandwidth

Product Overview

Mini-Circuits new 90° Power Splitter, model: QCS-722+, offers an industry leading combination of operating bandwidth and size; supporting nearly an octave band in a miniature EIA-0805 form factor. 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-722+ 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 0.2 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 15W, the LTCC construction of the QCS-722+ makes this 90° hybrid a robust, rugged product that can be used effectively in either the transmit or receive paths.

Notes
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Ultra-Small Ceramic LTCC

Power Splitter/Combiner

QCS-722+

2 Way-90° 50Ω 4000 to 7200 MHz

Generic photo used for illustration purposes only

CASE STYLE: GE0805C-1

+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 100°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	15W* max.

*Derate linearly to 7W at 100°C ambient.

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

Pin Connections

SUM PORT	1
PORT 1 (0°)	4
PORT 2 (+90°)	6
GROUND	2,5
50 OHM TERM EXTERNAL	3

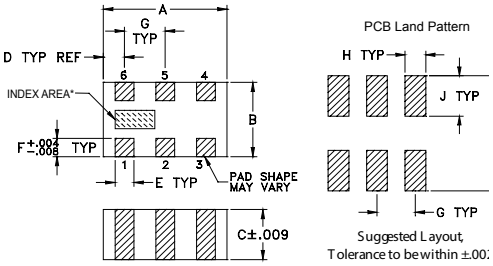
Features

- Low insertion loss, 0.6 dB typ.
- High isolation, 17 dB typ.
- Miniature size, 0.079"x0.049"x0.033"
- LTCC construction
- High power

Applications

- Balanced amplifiers
- Modulators
- DCS, PCS, UMTS
- WiMax
- WiFi • ISM
- Phase Shifter
- Attenuator
- Point to Point

Outline Drawing

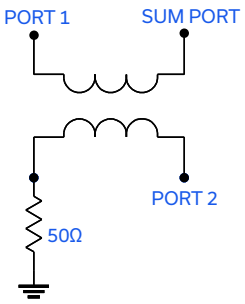


Outline Dimensions (inch / mm)

A	B	C	D	E	F
.079	.049	.033	.014	.012	.012
2.01	1.24	0.84	0.36	0.30	0.30

G	H	J	K	wt
.026	.014	.039	.110	grams
0.66	0.36	1.00	2.80	.008

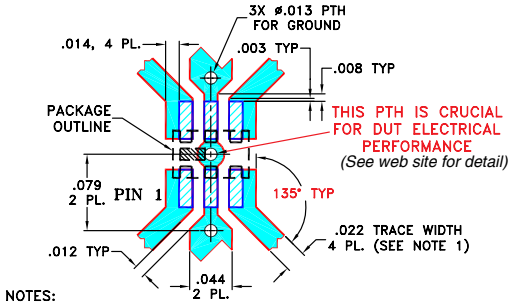
Electrical Schematic



Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency		4000		7200	MHz
Insertion Loss (Avg. Of Coupled Outputs) above 3 dB	4000-4500		0.5	0.8	dB
	4500-5100		0.5	0.9	
	5100-5700		0.6	0.9	
	5700-5900		0.6	0.9	
	5900-6400		0.7	0.9	
	6400-6800		0.7	0.9	
	6800-7200		0.8	1.1	
Isolation	4000-4500	14	18		dB
	4500-5100	14	18		
	5100-5700	15	21		
	5700-5900	17	23		
	5900-6400	18	25		
	6400-6800	17	25		
	6800-7200	13	17		
Phase Unbalance	4000-4500		2.0	7.0	Degree
	4500-5100		2.0	7.0	
	5100-5700		2.0	7.0	
	5700-5900		2.0	7.0	
	5900-6400		2.0	7.0	
	6400-6800		2.0	8.0	
	6800-7200		5.0	10.0	
Amplitude Unbalance	4000-4500		0.4	1.2	dB
	4500-5100		0.5	0.7	
	5100-5700		0.2	0.6	
	5700-5900		0.2	0.6	
	5900-6400		0.2	0.6	
	6400-6800		0.5	1.0	
	6800-7200		0.5	1.4	
VSWR	4000-7200		1.2		:1

Demo Board MCL P/N: TB-489-722+
Suggested PCB Layout (PL-304)



NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010" ± .001"; COPPER: 1/2 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 SOLDER MASK

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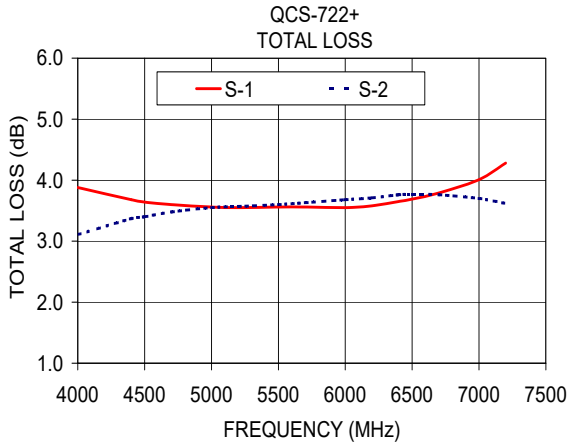
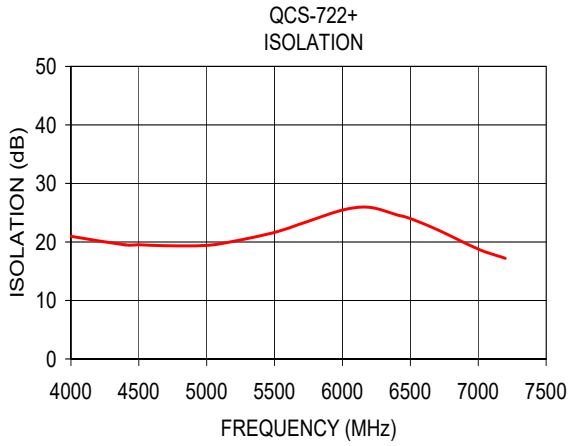
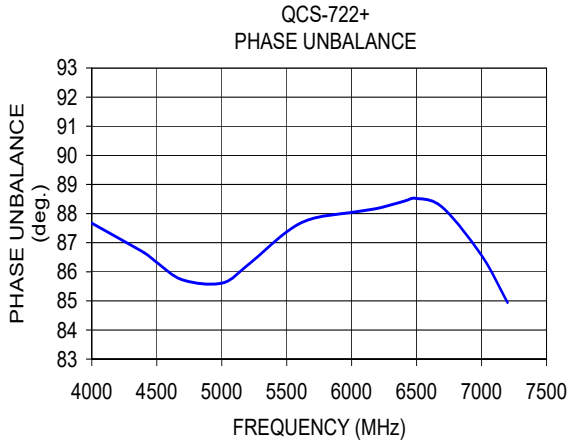
Typical Performance Data

Frequency (MHz)	Total Loss[1] (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
4000.00	3.88	3.11	0.77	20.95	87.67	1.16	1.22	1.18
4400.00	3.68	3.37	0.31	19.50	86.66	1.20	1.28	1.24
4500.00	3.64	3.40	0.24	19.53	86.32	1.20	1.28	1.23
4700.00	3.60	3.48	0.12	19.36	85.72	1.22	1.28	1.22
5000.00	3.56	3.55	0.01	19.42	85.61	1.22	1.30	1.21
5200.00	3.55	3.57	0.02	20.11	86.23	1.21	1.29	1.19
5500.00	3.56	3.60	0.04	21.64	87.37	1.19	1.22	1.21
5700.00	3.56	3.63	0.07	23.15	87.83	1.20	1.18	1.24
6000.00	3.55	3.68	0.13	25.45	88.04	1.20	1.15	1.26
6200.00	3.58	3.71	0.13	25.92	88.18	1.22	1.15	1.27
6400.00	3.65	3.76	0.11	24.64	88.42	1.23	1.19	1.27
6500.00	3.69	3.77	0.08	23.99	88.52	1.24	1.22	1.26
6700.00	3.79	3.76	0.02	22.07	88.21	1.25	1.31	1.26
7000.00	4.01	3.70	0.31	18.77	86.56	1.28	1.45	1.30
7200.00	4.28	3.62	0.66	17.20	84.94	1.31	1.56	1.33

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







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2 Way-90° Power Splitter/Combiner QCS-722+

Typical Performance Data

FREQ. (MHz)	TOTAL LOSS[1] (dB)		AMP. UNBAL. (dB)	ISOLATION (dB)	PHASE UNBAL. (Deg.)
	S-1	S-2		1-2	
4000.0	3.88	3.11	0.77	20.95	87.67
4100.0	3.81	3.18	0.63	20.62	87.46
4200.0	3.76	3.25	0.51	20.26	87.22
4300.0	3.72	3.32	0.40	19.85	86.96
4400.0	3.68	3.37	0.31	19.50	86.66
4500.0	3.64	3.40	0.24	19.53	86.32
4600.0	3.63	3.45	0.18	19.22	86.00
4700.0	3.60	3.48	0.12	19.36	85.72
4800.0	3.57	3.50	0.07	19.41	85.54
4900.0	3.58	3.54	0.04	19.24	85.50
5000.0	3.56	3.55	0.01	19.42	85.61
5100.0	3.56	3.57	0.01	19.66	85.86
5200.0	3.55	3.57	0.02	20.11	86.23
5300.0	3.55	3.58	0.03	20.45	86.59
5400.0	3.57	3.60	0.03	20.85	87.00
5500.0	3.56	3.60	0.04	21.64	87.37
5600.0	3.55	3.61	0.06	22.52	87.63
5700.0	3.56	3.63	0.07	23.15	87.83
5800.0	3.55	3.65	0.10	24.04	87.92
5900.0	3.56	3.68	0.12	24.51	87.99
6000.0	3.55	3.68	0.13	25.45	88.04
6100.0	3.56	3.70	0.14	26.06	88.08
6200.0	3.58	3.71	0.13	25.92	88.18
6300.0	3.61	3.73	0.13	25.62	88.32
6400.0	3.65	3.76	0.11	24.64	88.42
6500.0	3.69	3.77	0.08	23.99	88.52
6600.0	3.74	3.78	0.04	23.12	88.41
6700.0	3.79	3.76	0.02	22.07	88.21
6800.0	3.85	3.75	0.10	20.77	87.82
6900.0	3.92	3.73	0.19	19.65	87.26
7000.0	4.01	3.70	0.31	18.77	86.56
7100.0	4.13	3.66	0.47	18.00	85.76
7200.0	4.28	3.62	0.66	17.20	84.94

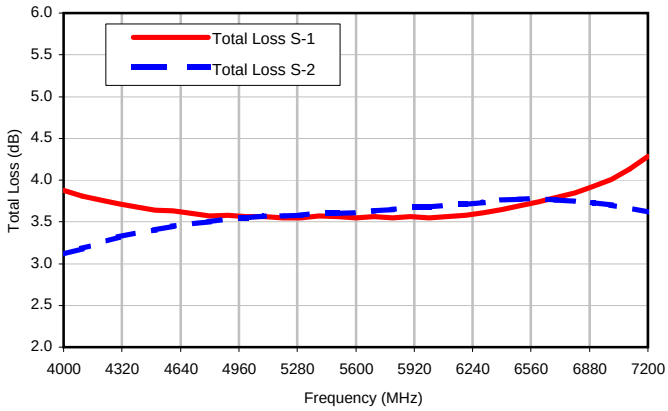
FREQ. (MHz)	VSWR (:1)		
	S	1	2
4000.0	1.16	1.22	1.18
4100.0	1.16	1.23	1.21
4200.0	1.17	1.25	1.22
4300.0	1.19	1.26	1.23
4400.0	1.20	1.28	1.24
4500.0	1.20	1.28	1.23
4600.0	1.23	1.29	1.22
4700.0	1.22	1.28	1.22
4800.0	1.22	1.29	1.21
4900.0	1.23	1.29	1.21
5000.0	1.22	1.30	1.21
5100.0	1.22	1.29	1.20
5200.0	1.21	1.29	1.19
5300.0	1.21	1.27	1.19
5400.0	1.21	1.24	1.20
5500.0	1.19	1.22	1.21
5600.0	1.18	1.20	1.22
5700.0	1.20	1.18	1.24
5800.0	1.20	1.17	1.25
5900.0	1.20	1.16	1.25
6000.0	1.20	1.15	1.26
6100.0	1.20	1.15	1.26
6200.0	1.22	1.15	1.27
6300.0	1.21	1.16	1.27
6400.0	1.23	1.19	1.27
6500.0	1.24	1.22	1.26
6600.0	1.26	1.27	1.25
6700.0	1.25	1.31	1.26
6800.0	1.27	1.36	1.27
6900.0	1.27	1.40	1.28
7000.0	1.28	1.45	1.30
7100.0	1.29	1.50	1.32
7200.0	1.31	1.56	1.33

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

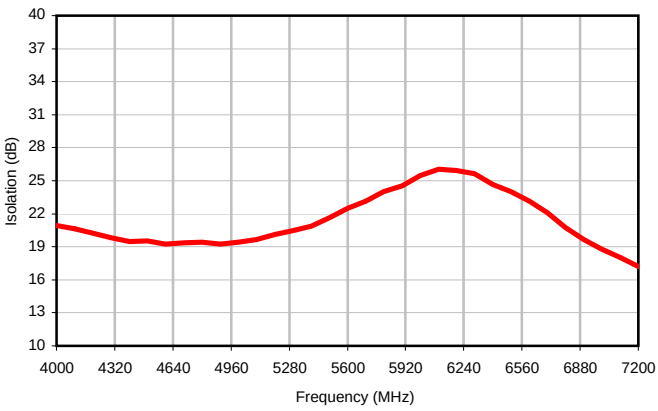
2 Way-90° Power Splitter/Combiner QCS-722+

Typical Performance Curves

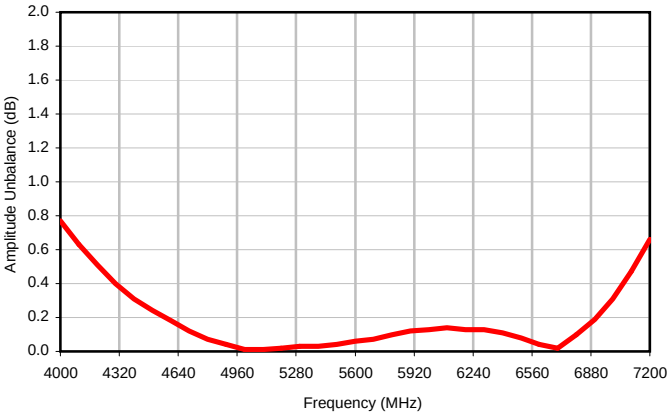
Total Loss



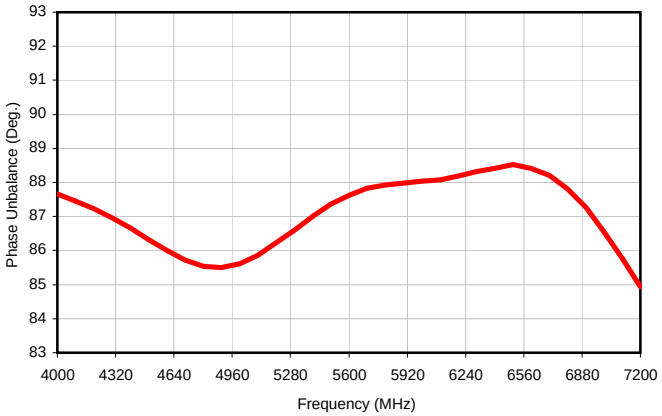
Isolation



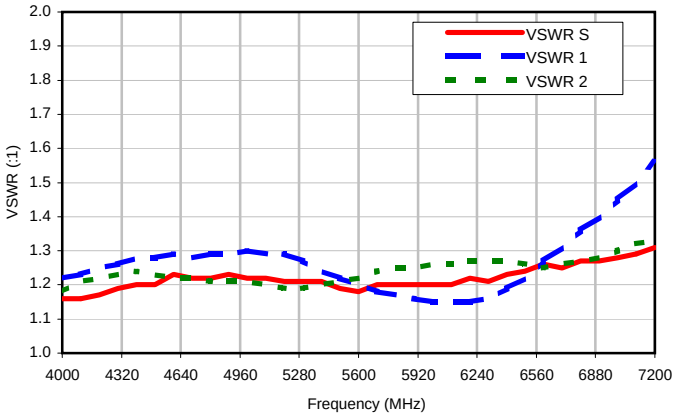
Amplitude Unbalance



Phase Unbalance

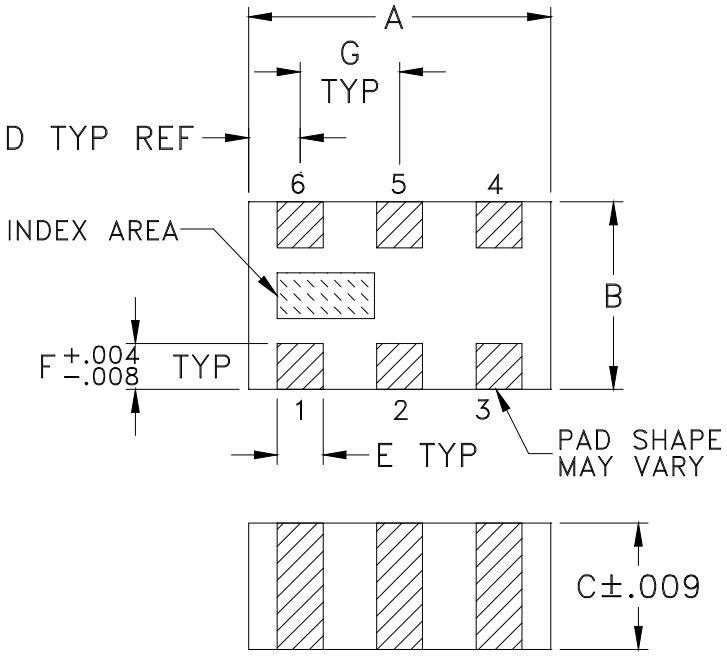


VSWR

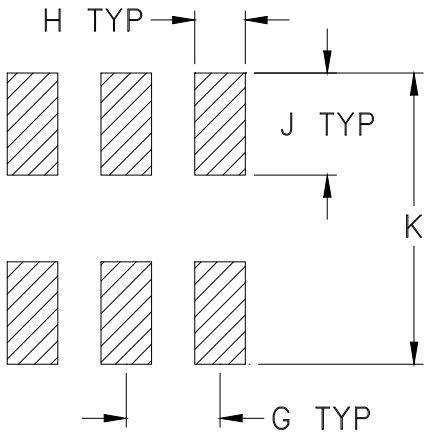


GE0805C-1

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #	A	B	C	D	E	F	G	H	J	K	WT. GRAM
GE0805C-1	.079 (2.00)	.049 (1.25)	.033 (0.84)	.014 (0.35)	.012 (0.30)	.012 (0.30)	.026 (0.65)	.014 (0.35)	.039 (1.00)	.110 (2.80)	.008

Dimensions are in inches (mm). Tolerances: 2Pl. ± .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.
   For RoHS-5 Case Style: Tin-lead plate. All models, no (+) suffix.

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Tape & Reel Packaging TR-F74

DEVICE ORIENTATION IN T&R

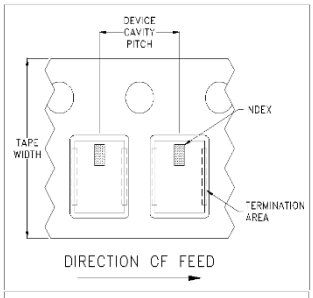

ILLUSTRATION 1

Applicable Case Styles
GE0805C-1
GE0805C-1AP
JV1210C-1
GU2939

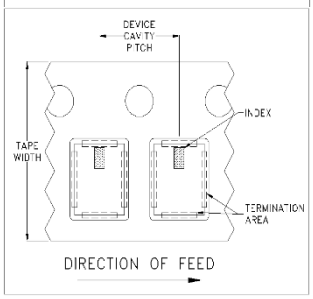

ILLUSTRATION 2

Applicable Case Styles
JV1210C
JV1210C-2
JV1210C-3
JV1210C-4
JV1210C-5
JV1210C-6
JV1210C-11

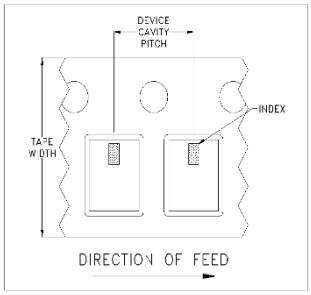

ILLUSTRATION 3

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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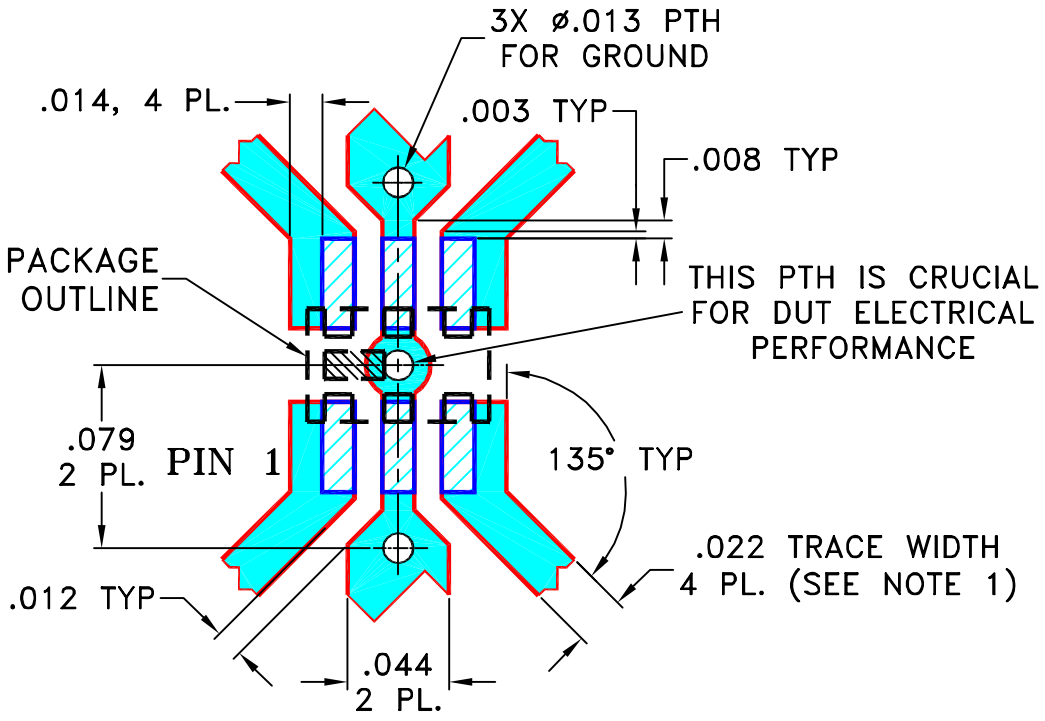
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M122595	NEW RELEASE	04/27/09	MMG	ABD

SUGGESTED MOUNTING CONFIGURATION FOR GE0805C-1 CASE STYLE, "06SQ07" PIN CODE



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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	MMG	04/27/09
TOLERANCES ON:	CHECKED	AV	04/27/09
2 PL DECIMALS ±	APPROVED	ABD	04/27/09
3 PL DECIMALS ± .005			
ANGLES ± 1°			
FRACTIONS ±			

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

Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

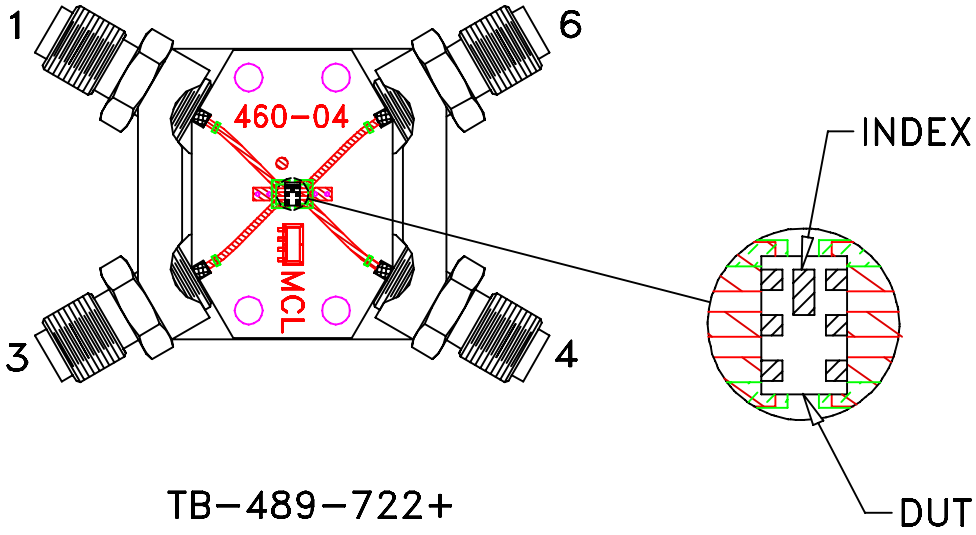
PL, 06SQ07, GE0805C-1, TB-489+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-304	OR

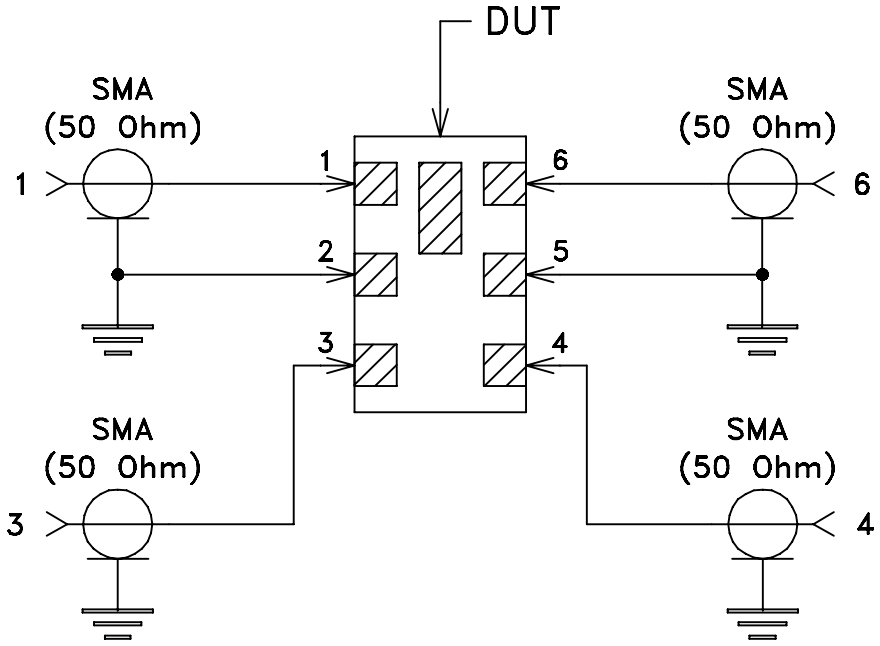
FILE:	SCALE:	SHEET:
98PL304	12:1	1 OF 1

Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



TB-489-722+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.010 inch.

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Environmental Specifications ENV06

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 100°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° 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 Eutetic Process: 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020, 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

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