X3 Frequency Multiplier

50Ω Output 3000 to 4500 MHz

AMK-3-452+

Generic photo used for illustration purposes only

CASE STYLE: CD636

+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
13"	500, 1000

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input Power	20 dBm

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

Pin Connections

INPUT	6
OUTPUT	3
GROUND	1,4,5
NOT USED	2

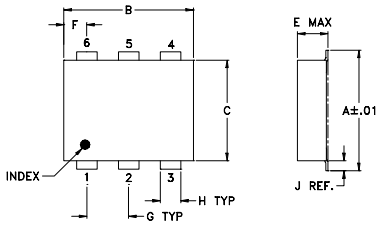
Features

- broadband
- low conversion loss, 14.5 dB typ.
- high rejection, F2 and F4, -55 dBc typ.
- low cost
- aqueous washable

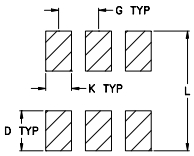
Applications

- synthesizers
- local oscillators
- satellite up and down converters

Outline Drawing



PCB Land Pattern



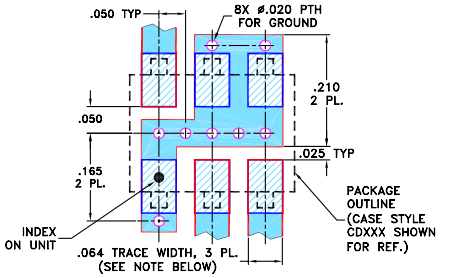
Suggested Layout,
Tolerance to be within ±.002

Outline Dimensions (inch / mm)

A	B	C	D	E	F	G
.272	.310	.220	.100	.162	.055	.100
6.91	7.87	5.59	2.54	4.11	1.40	2.54

H	J	K	L	wt
.030	.026	.065	.300	grams
0.76	0.66	1.65	7.62	0.25

Demo Board MCL P/N: TB-03
Suggested PCB Layout (PL-052)



NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; 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

Electrical Specifications

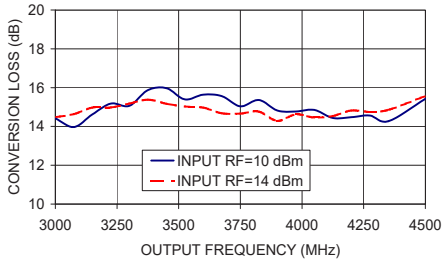
MULTIPLICATION FACTOR	FREQUENCY (MHz)		INPUT POWER (dBm)		CONVERSION LOSS (dB)		*HARMONIC OUTPUT (dBc)					
	F1	F3					F1		F2		F4	
	Input	Output	Min.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.
3	1000-1500	3000-4500	10	14	14.5	17.5	-2	-10	55	40	55	40

* Harmonics of input frequency below the power level of F3

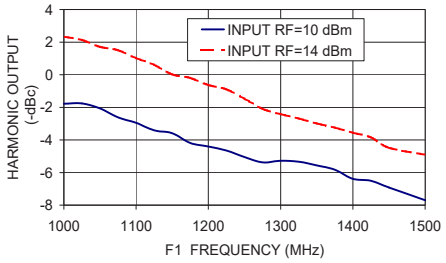
Typical Performance Data

	INPUT RF= 10 dBm				INPUT RF= 14 dBm			
Input Frequency (MHz)	Conversion Loss (dB)	Harmonic Output Below F3 (-dBc)			Conversion Loss (dB)	Harmonic Output Below F3 (-dBc)		
	F3	F1	F2	F4	F3	F1	F2	F4
1000.00	14.42	-1.78	66.74	63.78	14.48	2.33	61.25	64.54
1025.00	13.97	-1.76	65.56	62.33	14.64	2.13	58.51	62.11
1050.00	14.62	-2.06	62.78	59.95	14.97	1.71	54.89	59.68
1075.00	15.18	-2.61	55.64	47.55	14.98	1.50	54.04	55.77
1100.00	15.06	-2.95	53.98	54.12	15.18	1.02	56.41	54.30
1125.00	15.87	-3.41	56.68	59.70	15.38	0.61	57.57	60.48
1150.00	15.97	-3.59	56.36	58.48	15.17	0.02	58.34	59.21
1175.00	15.40	-4.19	55.24	59.64	15.03	-0.20	56.00	60.00
1200.00	15.64	-4.40	54.37	57.34	14.97	-0.63	53.87	58.89
1225.00	15.56	-4.65	53.05	56.57	14.68	-0.89	52.65	60.98
1250.00	15.04	-5.05	52.60	58.70	14.66	-1.47	52.35	62.39
1275.00	15.36	-5.38	51.97	59.52	14.76	-2.09	51.73	61.26
1300.00	14.82	-5.28	52.71	60.80	14.29	-2.42	51.72	62.21
1325.00	14.77	-5.34	52.47	62.02	14.62	-2.68	51.46	62.36
1350.00	14.85	-5.56	52.18	61.83	14.46	-2.99	51.68	61.33
1375.00	14.44	-5.83	53.05	61.01	14.54	-3.24	52.94	60.18
1400.00	14.48	-6.39	53.13	57.84	14.82	-3.56	52.94	59.01
1425.00	14.56	-6.51	54.06	60.46	14.75	-3.84	52.26	61.90
1450.00	14.27	-6.92	55.52	63.15	14.85	-4.48	52.09	64.87
1500.00	15.42	-7.70	56.27	54.19	15.56	-4.90	52.39	66.59

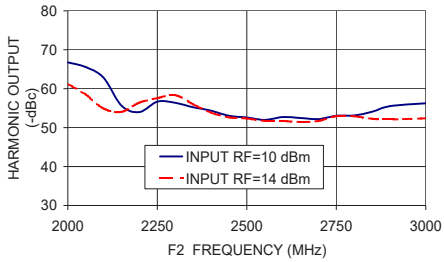
AMK-3-452+
CONVERSION LOSS



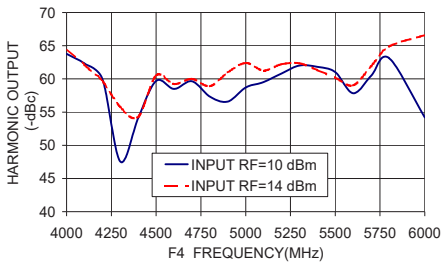
AMK-3-452+
HARMONIC OUTPUT F1



AMK-3-452+
HARMONIC OUTPUT F2



AMK-3-452+
HARMONIC OUTPUT F4



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

REV.A
M151107
AMK-3-452+
ED-11715/1
DJ/CP/AM
200423

Frequency Multiplier (Tripler) AMK-3-452+

Typical Performance Data

FREQUENCY (MHz)				RF IN=+10dBm			
				CONVERSION LOSS (dB)	HARMONIC OUTPUT* (-dBc)		
X 1 OUTPUT	X 2 OUTPUT	X 3 OUTPUT	X 4 OUTPUT	X 3 OUTPUT	X 1 OUTPUT	X 2 OUTPUT	X 4 OUTPUT
1000	2000	3000	4000	14.42	-1.78	66.74	63.78
1025	2050	3075	4100	13.97	-1.76	65.56	62.33
1050	2100	3150	4200	14.62	-2.06	62.78	59.95
1075	2150	3225	4300	15.18	-2.61	55.64	47.55
1100	2200	3300	4400	15.06	-2.95	53.98	54.12
1125	2250	3375	4500	15.87	-3.41	56.68	59.70
1150	2300	3450	4600	15.97	-3.59	56.36	58.48
1175	2350	3525	4700	15.40	-4.19	55.24	59.64
1200	2400	3600	4800	15.64	-4.40	54.37	57.34
1225	2450	3675	4900	15.56	-4.65	53.05	56.57
1250	2500	3750	5000	15.04	-5.05	52.60	58.70
1275	2550	3825	5100	15.36	-5.38	51.97	59.52
1300	2600	3900	5200	14.82	-5.28	52.71	60.80
1325	2650	3975	5300	14.77	-5.34	52.47	62.02
1350	2700	4050	5400	14.85	-5.56	52.18	61.83
1375	2750	4125	5500	14.44	-5.83	53.05	61.01
1400	2800	4200	5600	14.48	-6.39	53.13	57.84
1425	2850	4275	5700	14.56	-6.51	54.06	60.46
1450	2900	4350	5800	14.27	-6.92	55.52	63.15
1500	3000	4500	6000	15.42	-7.70	56.27	54.19

*Harmonic Output below power level of X 3 Output .

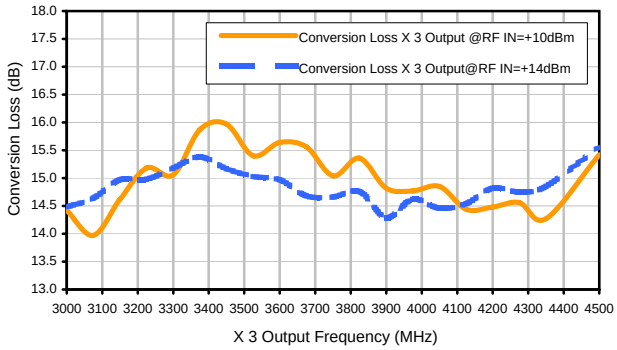
FREQUENCY (MHz)				RF IN=+14dBm			
				CONVERSION LOSS (dB)	HARMONIC OUTPUT* (-dBc)		
X 1 OUTPUT	X 2 OUTPUT	X 3 OUTPUT	X 4 OUTPUT	X 3 OUTPUT	X 1 OUTPUT	X 2 OUTPUT	X 4 OUTPUT
1000	2000	3000	4000	14.48	2.33	61.25	64.54
1025	2050	3075	4100	14.64	2.13	58.51	62.11
1050	2100	3150	4200	14.97	1.71	54.89	59.68
1075	2150	3225	4300	14.98	1.50	54.04	55.77
1100	2200	3300	4400	15.18	1.02	56.41	54.30
1125	2250	3375	4500	15.38	0.61	57.57	60.48
1150	2300	3450	4600	15.17	0.02	58.34	59.21
1175	2350	3525	4700	15.03	-0.20	56.00	60.00
1200	2400	3600	4800	14.97	-0.63	53.87	58.89
1225	2450	3675	4900	14.68	-0.89	52.65	60.98
1250	2500	3750	5000	14.66	-1.47	52.35	62.39
1275	2550	3825	5100	14.76	-2.09	51.73	61.26
1300	2600	3900	5200	14.29	-2.42	51.72	62.21
1325	2650	3975	5300	14.62	-2.68	51.46	62.36
1350	2700	4050	5400	14.46	-2.99	51.68	61.33
1375	2750	4125	5500	14.54	-3.24	52.94	60.18
1400	2800	4200	5600	14.82	-3.56	52.94	59.01
1425	2850	4275	5700	14.75	-3.84	52.26	61.90
1450	2900	4350	5800	14.85	-4.48	52.09	64.87
1500	3000	4500	6000	15.56	-4.90	52.39	66.59

*Harmonic Output below power level of X 3 Output .

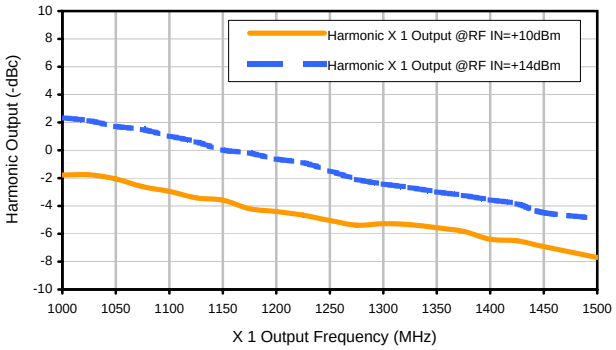
Frequency Multiplier (Tripler) AMK-3-452+

Typical Performance Curves

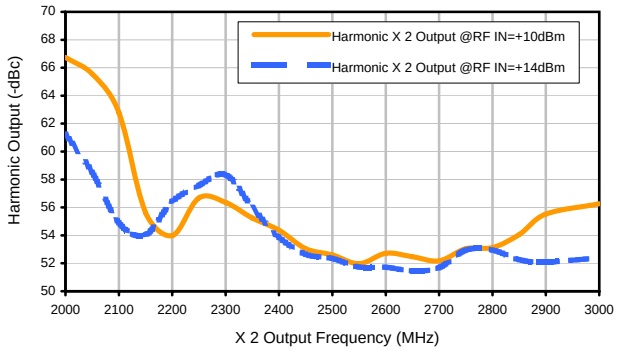
Conversion Loss X 3 Output



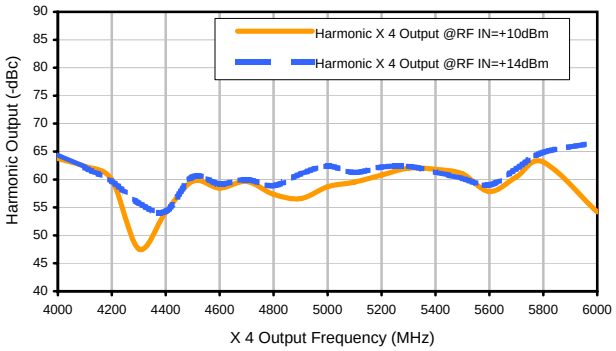
Harmonic X 1 Output



Harmonic X 2 Output



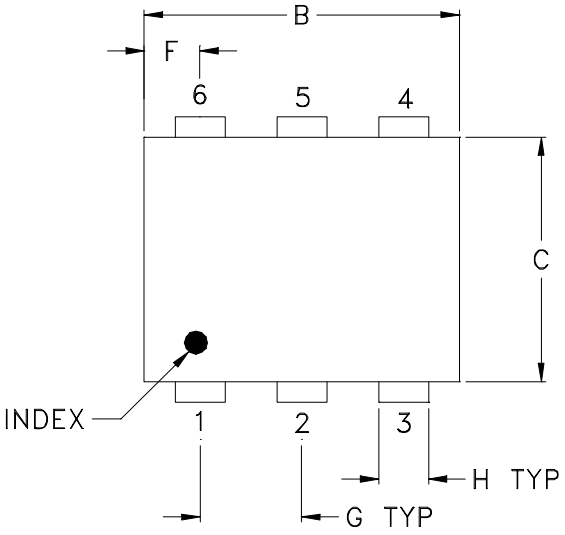
Harmonic X 4 Output

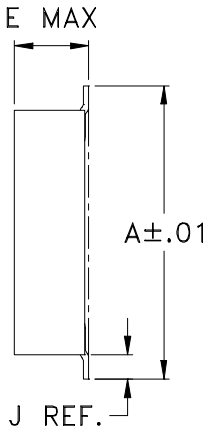


Case Style CD

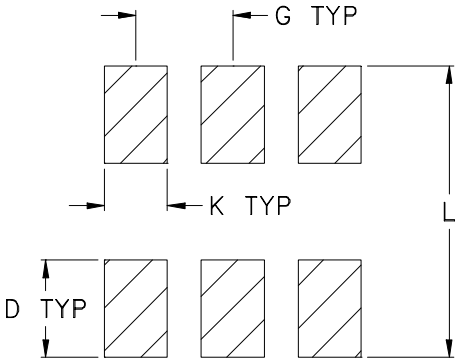
CD541
CD542
CD636
CD637

Outline Dimensions





PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE#	A	B	C	D	E	F	G	H	J	K	L	WT, GRAM
CD541	.272 (6.91)	.310 (7.87)	.220 (5.58)	.100 (2.54)	.082 (2.08)	.055 (1.40)	.100 (2.54)	.030 (0.76)	.026 (0.66)	.065 (1.65)	.300 (7.62)	.15
CD542					.112 (2.84)							.20
CD636					.162 (4.11)							.25
CD637					.206 (5.23)							.40

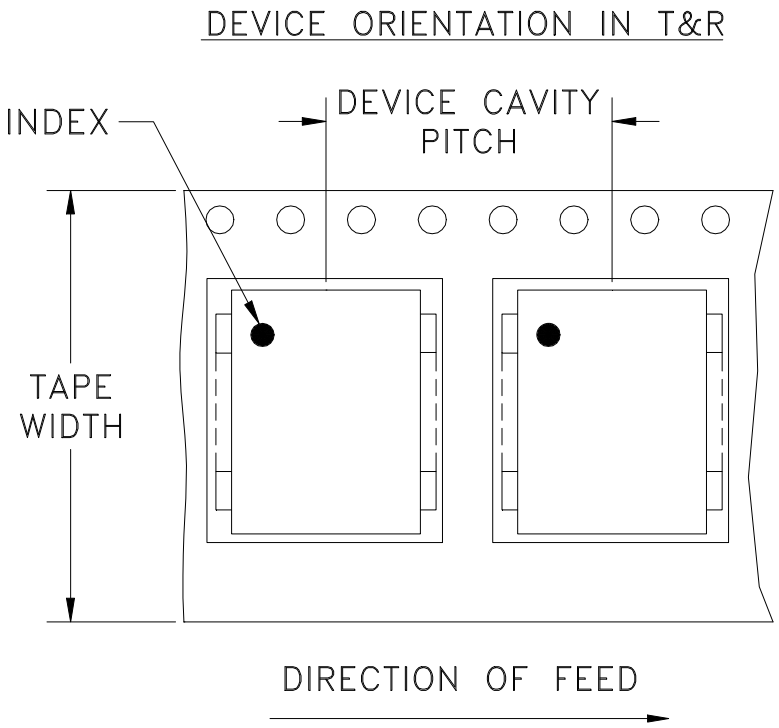
Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

Tape & Reel Packaging TR-F34



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
16	12	7	Small quantity standard (see note)	20
				50
				100
				200
		13	Standard	500
				1000

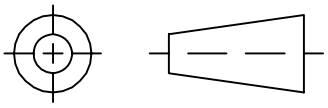
Note: Availability of small reel quantity varies by model.
Refer to pricing and availability on individual model dashboard.

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

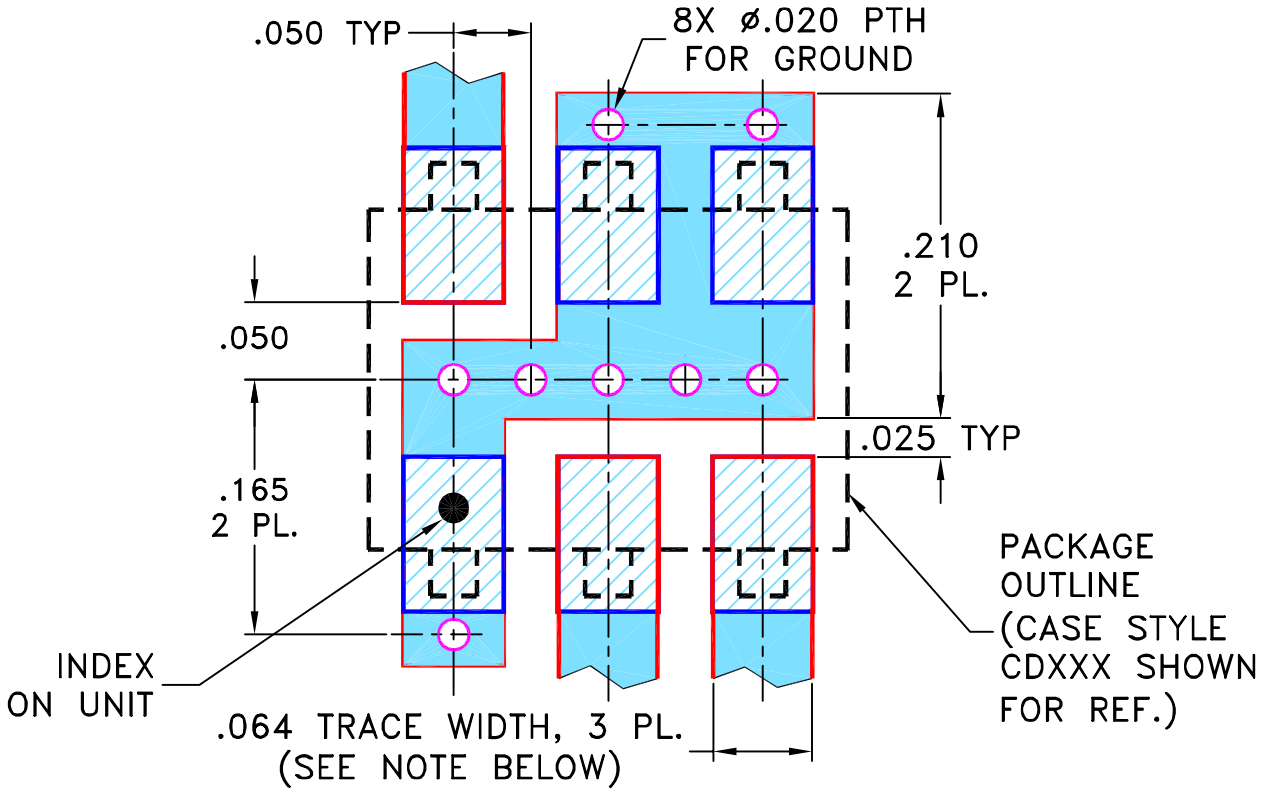
Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

THIRD ANGLE PROJECTION



REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
A	M101143	ADDED "gk" PIN CONNECTION, TT100 CASE STYLE & NOTE 2	10/10/05	MMG	DJ
B	M102713	ADDED "...WITH SMOBC"	01/17/06	MMG	IL
C	M108637	REMOVED "PIN 1" , ADDED INDEX ON UNIT	12/01/06	MYG	FL

SUGGESTED MOUNTING CONFIGURATION FOR BH292, CD541/542/636/637, TT100/240 CASE STYLES, "gk", "ht", "hu", "nd", "w" PIN CONNECTIONS



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; 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

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	MMG	07/17/02
TOLERANCES ON:	CHECKED	WL	08/02/02
2 PL DECIMALS ±	APPROVED	DJ	08/05/02
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

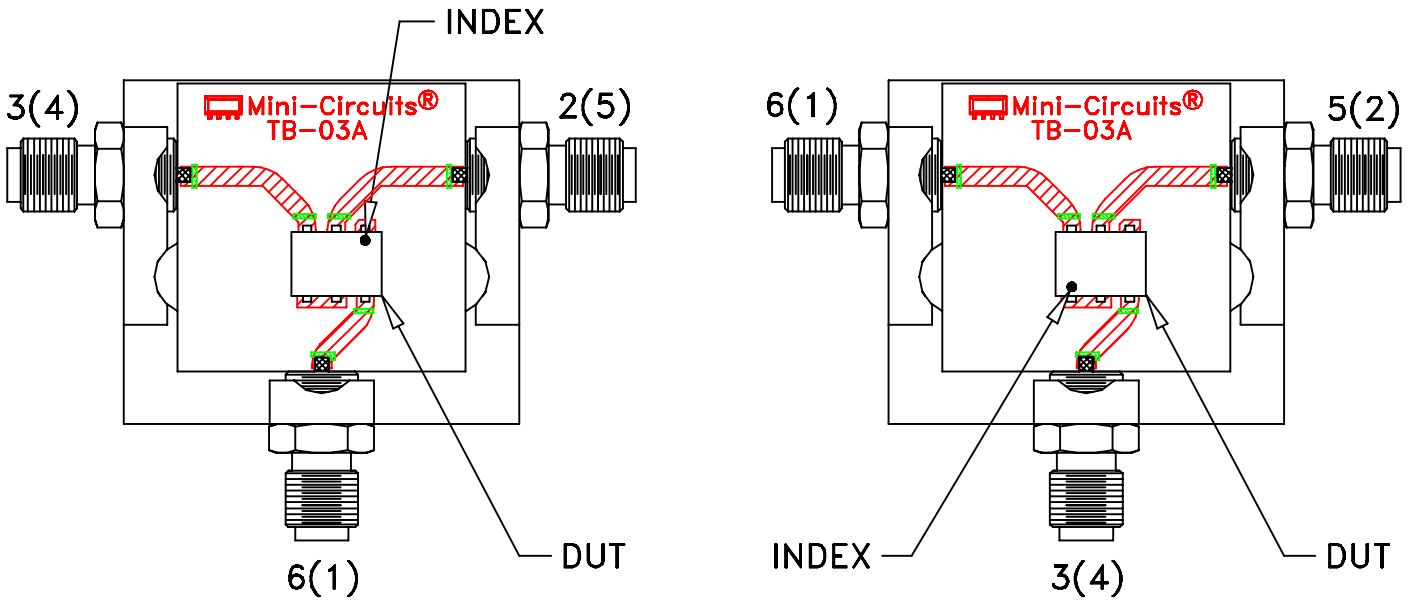
PL, gk/ht/hu/nd/w, BH292, CD541/542/636/637, TT100/240, TB-03

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-052	C

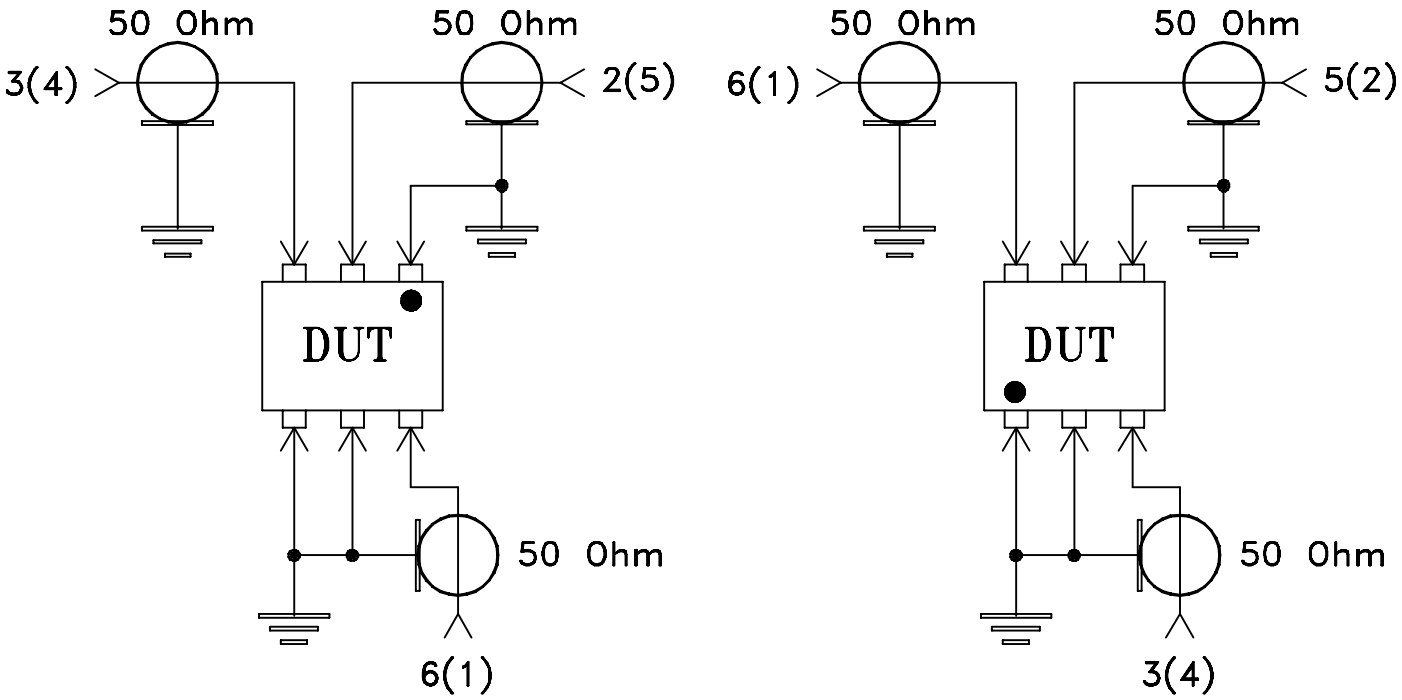
FILE:	SCALE:	SHEET:
98PL052	8:1	1 OF 1

Evaluation Board and Circuit

For Pin Connections and DUT Orientation Refer to Data Sheet of the DUT



TB-03



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

Mini-Circuits®

Mini-Circuits

Environmental Specifications ENV02T1

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	-40° to 85°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
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
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, 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
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