

# X2 Frequency Multiplier

50Ω Output 5000 to 10000 MHz

## KSX2-14+



Generic photo used for illustration purposes only

CASE STYLE: HV1195

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

### Maximum Ratings

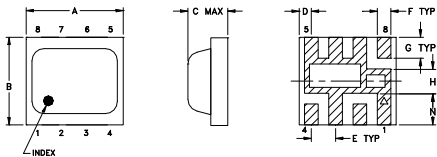
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input, 25°C	100 mW

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

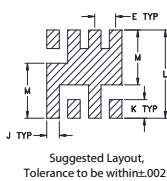
### Pin Connections

INPUT	4
OUTPUT	8
50Ω TERMINATE EXT.	2
GROUND	1,3,5,6,7

### Outline Drawing



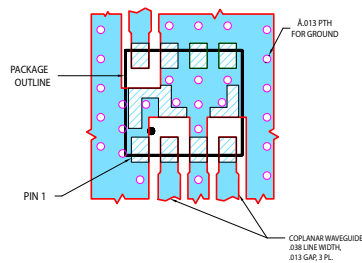
#### PCB Metal Land Pattern



### Outline Dimensions (inch)

A	B	C	D	E	F	G
.200	.180	.087	.025	.050	.028	.043
5.08	4.57	2.2098	0.64	1.27	0.71	1.09
H	J	K	L	M	N	wt
.050	.030	.043	.204	.127	0.065	grams
1.27	0.76	1.09	5.18	3.23	1.65	0.08

### Demo Board MCL P/N: TB-473+ Suggested PCB Layout (PL-287)



- NOTES:**
- TRACE WIDTH AND GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .007±.0015; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
  - BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- 

### Features

- low conversion loss, 12 dB typ.
- high fundamental & harmonic suppression, F1, 22 dBc typ.; F3, 30 dBc typ.; F4, 15 dBc typ.
- LTCC design
- low profile, 0.085"
- aqueous washable

### Applications

- synthesizers
- local oscillators

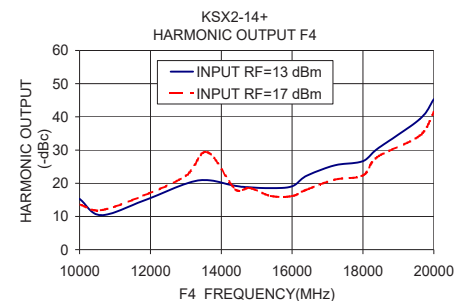
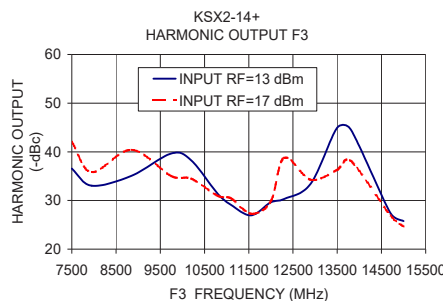
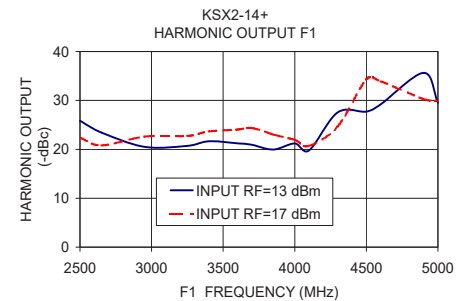
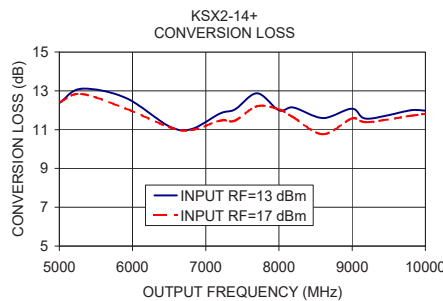
### Electrical Specifications

MULTIPLICATION FACTOR	FREQUENCY (MHz)		INPUT POWER (dBm)		CONVERSION LOSS (dB)		*HARMONIC OUTPUT (dBC)					
	F1 Input	F2 Output	Min.	Max.	Typ.	Max.	F1 Typ.	F1 Min.	F3 Typ.	F3 Min.	F4 Typ.	F4 Min.
2	2500-3600	5000-7200	13	17	12	15	22	15	33	22	12	7
	3600-5000	7200-10000	13	17	12	15	22	15	29	20	19	12

\* Harmonics of input frequency below the power level of F2

### Typical Performance Data

Input Frequency (MHz)	INPUT RF= 13 dBm				INPUT RF= 17 dBm			
	Conversion Loss (dB) F2	Harmonic Output Below F2 (-dBc) F1	Harmonic Output Below F2 (-dBc) F3	Harmonic Output Below F2 (-dBc) F4	Conversion Loss (dB) F2	Harmonic Output Below F2 (-dBc) F1	Harmonic Output Below F2 (-dBc) F3	Harmonic Output Below F2 (-dBc) F4
2500.00	12.37	25.84	36.55	15.32	12.41	22.40	42.01	13.59
2650.00	13.11	23.43	33.03	10.38	12.84	20.79	35.80	11.88
2950.00	12.65	20.52	35.09	14.71	12.10	22.60	40.40	16.25
3250.00	11.17	20.69	39.66	19.86	11.13	22.72	35.01	22.27
3400.00	11.02	21.65	38.24	20.97	10.97	23.66	34.49	29.39
3600.00	11.84	21.22	31.35	19.22	11.46	24.06	30.95	18.17
3700.00	12.04	20.92	29.07	18.76	11.46	24.38	30.44	18.57
3850.00	12.87	19.94	26.95	18.55	12.21	23.02	27.31	16.18
4000.00	12.00	21.20	29.60	19.09	12.05	21.96	29.80	16.13
4100.00	12.14	19.80	30.30	22.19	11.63	20.70	38.78	18.02
4300.00	11.60	27.55	33.42	25.38	10.76	24.67	34.27	21.10
4500.00	12.08	27.72	44.95	26.65	11.58	34.31	36.29	22.37
4600.00	11.56	29.19	44.66	30.33	11.38	33.92	38.18	27.85
4900.00	12.00	35.63	27.43	39.29	11.71	30.26	26.93	34.31
5000.00	11.98	29.52	25.76	45.31	11.81	29.92	24.65	41.43



### 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.
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# Frequency Multiplier (Doublers)

# KSX2-14+

## Typical Performance Data

Frequency (MHz)				RF IN = 13dBm			
				Conversion Loss (dB)	Harmonic Output* (-dBc)		
X1 Output	X2 Output	X3 Output	X4 Output	X2 Output	X1 Output	X3 Output	X4 Output
2500.00	5000.00	7500.00	10000.00	12.37	25.84	36.55	15.32
2550.00	5100.00	7650.00	10200.00	12.64	24.98	35.60	14.81
2600.00	5200.00	7800.00	10400.00	12.65	24.20	35.12	12.66
2650.00	5300.00	7950.00	10600.00	13.11	23.43	33.03	10.38
2700.00	5400.00	8100.00	10800.00	13.39	22.50	32.89	11.01
2750.00	5500.00	8250.00	11000.00	13.05	22.10	34.79	11.93
2800.00	5600.00	8400.00	11200.00	12.87	21.71	35.23	12.57
2850.00	5700.00	8550.00	11400.00	13.10	21.17	32.67	12.50
2900.00	5800.00	8700.00	11600.00	13.29	20.70	31.93	12.67
2950.00	5900.00	8850.00	11800.00	12.65	20.52	35.09	14.71
3000.00	6000.00	9000.00	12000.00	12.13	20.64	35.59	16.98
3050.00	6100.00	9150.00	12200.00	12.08	20.50	38.46	18.85
3100.00	6200.00	9300.00	12400.00	11.89	20.49	38.98	18.67
3150.00	6300.00	9450.00	12600.00	11.79	20.51	39.55	18.72
3200.00	6400.00	9600.00	12800.00	11.50	20.52	40.79	18.88
3250.00	6500.00	9750.00	13000.00	11.17	20.69	39.66	19.86
3300.00	6600.00	9900.00	13200.00	11.01	21.00	39.78	21.26
3350.00	6700.00	10050.00	13400.00	10.87	21.47	39.32	21.91
3400.00	6800.00	10200.00	13600.00	11.02	21.65	38.24	20.97
3450.00	6900.00	10350.00	13800.00	11.31	21.56	37.05	20.74
3500.00	7000.00	10500.00	14000.00	11.61	21.38	33.46	21.60
3550.00	7100.00	10650.00	14200.00	11.64	21.35	31.91	20.48
3600.00	7200.00	10800.00	14400.00	11.84	21.22	31.35	19.22
3650.00	7300.00	10950.00	14600.00	11.86	21.25	30.18	18.49
3700.00	7400.00	11100.00	14800.00	12.04	20.92	29.07	18.76
3750.00	7500.00	11250.00	15000.00	12.52	20.28	27.98	18.87
3800.00	7600.00	11400.00	15200.00	12.63	20.05	26.35	18.59
3850.00	7700.00	11550.00	15400.00	12.87	19.94	26.95	18.55
3900.00	7800.00	11700.00	15600.00	12.52	20.42	28.23	18.66
3950.00	7900.00	11850.00	15800.00	12.41	20.65	28.91	19.16
4000.00	8000.00	12000.00	16000.00	12.00	21.20	29.60	19.09
4100.00	8200.00	12300.00	16400.00	12.14	19.80	30.30	22.19
4200.00	8400.00	12600.00	16800.00	11.67	22.12	31.20	24.49
4300.00	8600.00	12900.00	17200.00	11.60	27.55	33.42	25.38
4400.00	8800.00	13200.00	17600.00	12.10	29.40	35.24	26.79
4500.00	9000.00	13500.00	18000.00	12.08	27.72	44.95	26.65
4600.00	9200.00	13800.00	18400.00	11.56	29.19	44.66	30.33
4700.00	9400.00	14100.00	18800.00	11.65	31.34	34.02	38.98
4800.00	9600.00	14400.00	19200.00	12.06	34.44	29.79	37.50
4900.00	9800.00	14700.00	19600.00	12.00	35.63	27.43	39.29
5000.00	10000.00	15000.00	20000.00	11.98	29.52	25.76	45.31

\*Harmonic Output below power level of X2 Output.



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RF/IF MICROWAVE COMPONENTS



REV. X1  
 KSX2-14+  
 8/26/2008  
 Page 1 of 2

# Frequency Multiplier (Doublers)

# KSX2-14+

## Typical Performance Data

Frequency (MHz)				RF IN = 17dBm			
				Conversion Loss (dB)	Harmonic Output* (-dBc)		
X1 Output	X2 Output	X3 Output	X4 Output	X2 Output	X1 Output	X3 Output	X4 Output
2500.00	5000.00	7500.00	10000.00	12.41	22.40	42.01	13.59
2550.00	5100.00	7650.00	10200.00	12.48	21.83	37.92	13.07
2600.00	5200.00	7800.00	10400.00	12.41	21.28	36.23	12.32
2650.00	5300.00	7950.00	10600.00	12.84	20.79	35.80	11.88
2700.00	5400.00	8100.00	10800.00	12.98	20.16	35.23	12.26
2750.00	5500.00	8250.00	11000.00	12.65	19.99	33.92	12.80
2800.00	5600.00	8400.00	11200.00	12.55	19.78	33.08	13.72
2850.00	5700.00	8550.00	11400.00	12.81	19.25	32.50	13.83
2900.00	5800.00	8700.00	11600.00	12.96	18.96	32.67	13.80
2950.00	5900.00	8850.00	11800.00	12.10	22.60	40.40	16.25
3000.00	6000.00	9000.00	12000.00	11.78	22.70	41.08	18.84
3050.00	6100.00	9150.00	12200.00	11.85	22.61	40.77	19.02
3100.00	6200.00	9300.00	12400.00	11.65	22.59	38.42	18.29
3150.00	6300.00	9450.00	12600.00	11.67	22.63	37.82	18.60
3200.00	6400.00	9600.00	12800.00	11.35	22.67	37.04	19.61
3250.00	6500.00	9750.00	13000.00	11.13	22.72	35.01	22.27
3300.00	6600.00	9900.00	13200.00	10.97	22.98	34.85	25.24
3350.00	6700.00	10050.00	13400.00	10.84	23.34	34.89	27.49
3400.00	6800.00	10200.00	13600.00	10.97	23.66	34.49	29.39
3450.00	6900.00	10350.00	13800.00	11.03	23.70	33.98	27.31
3500.00	7000.00	10500.00	14000.00	11.21	23.77	32.70	21.36
3550.00	7100.00	10650.00	14200.00	11.34	23.90	31.65	19.34
3600.00	7200.00	10800.00	14400.00	11.46	24.06	30.95	18.17
3650.00	7300.00	10950.00	14600.00	11.53	24.22	30.52	17.99
3700.00	7400.00	11100.00	14800.00	11.46	24.38	30.44	18.57
3750.00	7500.00	11250.00	15000.00	11.75	24.13	29.18	18.30
3800.00	7600.00	11400.00	15200.00	11.92	23.45	27.41	17.51
3850.00	7700.00	11550.00	15400.00	12.21	23.02	27.31	16.18
3900.00	7800.00	11700.00	15600.00	12.24	22.87	28.38	15.27
3950.00	7900.00	11850.00	15800.00	12.20	22.41	29.04	15.45
4000.00	8000.00	12000.00	16000.00	12.05	21.96	29.80	16.13
4100.00	8200.00	12300.00	16400.00	11.63	20.70	38.78	18.02
4200.00	8400.00	12600.00	16800.00	10.98	23.17	36.79	20.52
4300.00	8600.00	12900.00	17200.00	10.76	24.67	34.27	21.10
4400.00	8800.00	13200.00	17600.00	11.24	28.67	33.35	22.03
4500.00	9000.00	13500.00	18000.00	11.58	34.31	36.29	22.37
4600.00	9200.00	13800.00	18400.00	11.38	33.92	38.18	27.85
4700.00	9400.00	14100.00	18800.00	11.36	33.71	32.17	35.81
4800.00	9600.00	14400.00	19200.00	11.44	31.54	31.09	35.32
4900.00	9800.00	14700.00	19600.00	11.71	30.26	26.93	34.31
5000.00	10000.00	15000.00	20000.00	11.81	29.92	24.65	41.43

\*Harmonic Output below power level of X2 Output.



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RF/IF MICROWAVE COMPONENTS



REV. X1

KSX2-14+

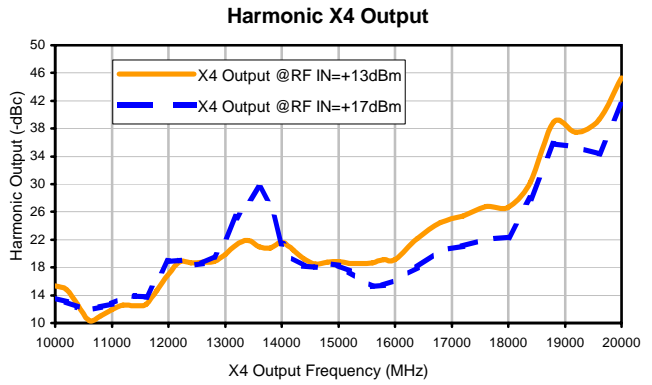
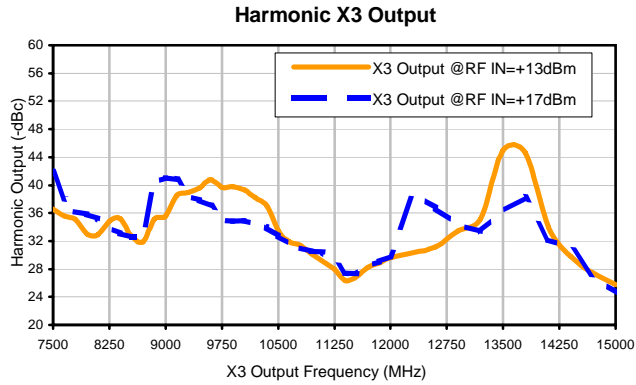
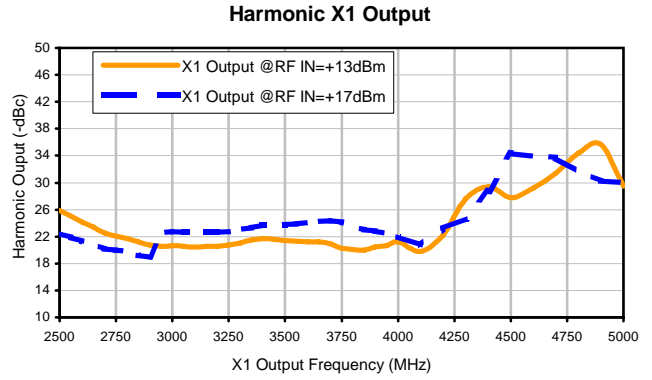
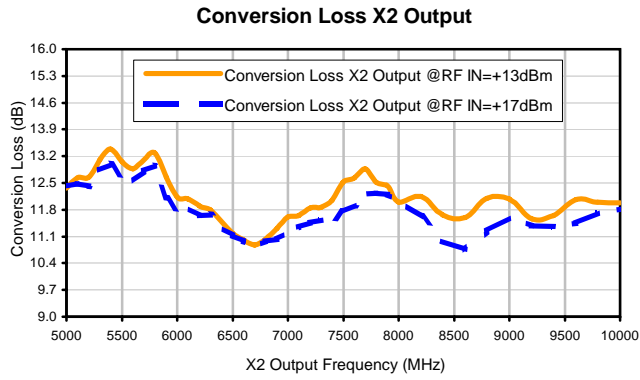
8/26/2008

Page 2 of 2

# Frequency Multiplier (Doublers)

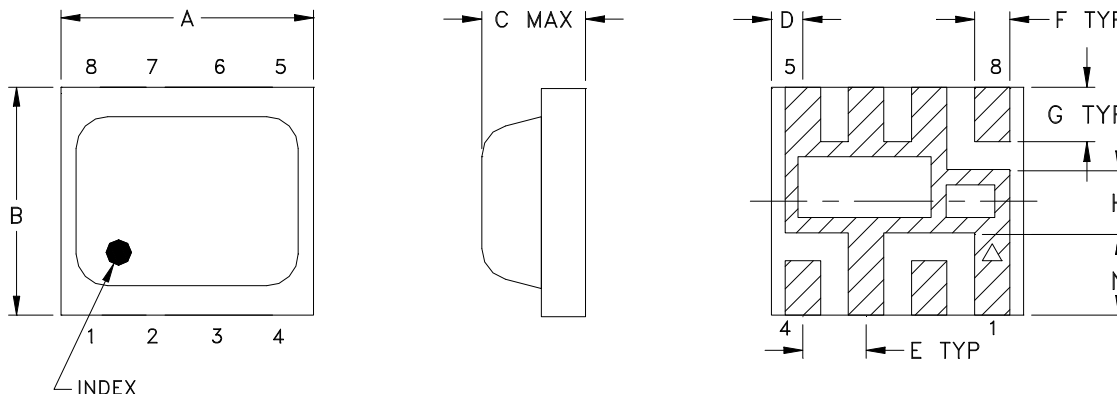
# KSX2-14+

## Typical Performance Curves

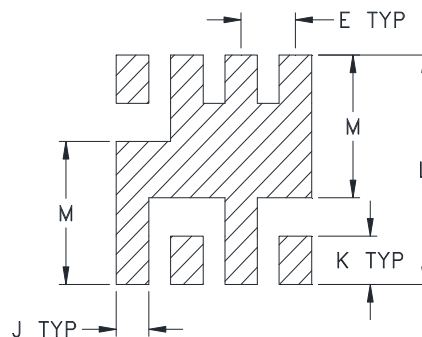


## Outline Dimensions

HV1195



## PCB Metal Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm 0.002$

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N
HV1195	0.200 (5.08)	0.180 (4.57)	0.087 (2.21)	0.025 (0.64)	0.050 (1.27)	0.028 (0.71)	0.043 (1.09)	0.050 (1.27)	0.030 (0.76)	0.043 (1.09)	0.204 (5.18)	0.127 (3.23)	0.065 (1.65)

CASE#	WT, GRAM
HV1195	.08

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

### Notes:

1. Case material: Plastic encapsulation on Ceramic base.
2. Termination finish: Palladium Silver.



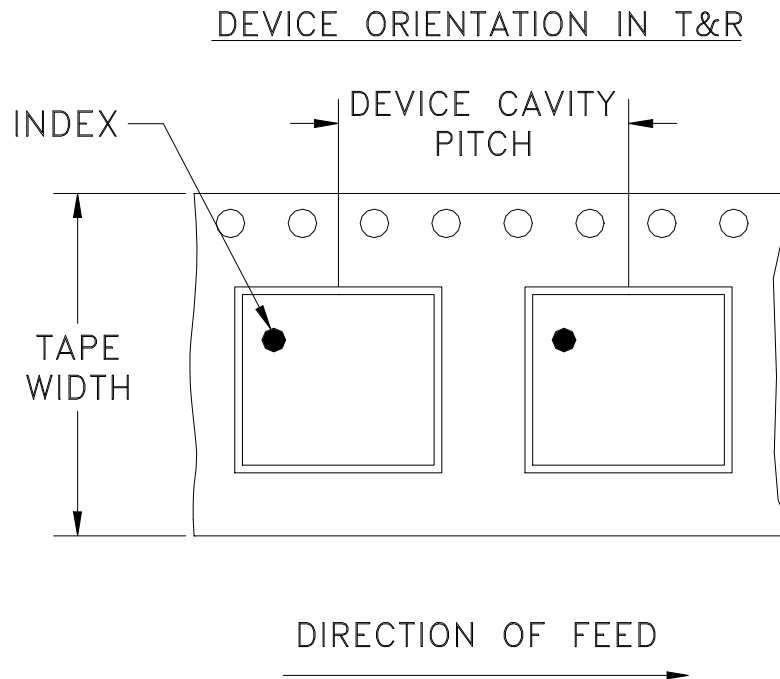
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RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F82



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
12	8	7	500

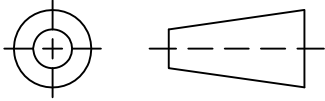
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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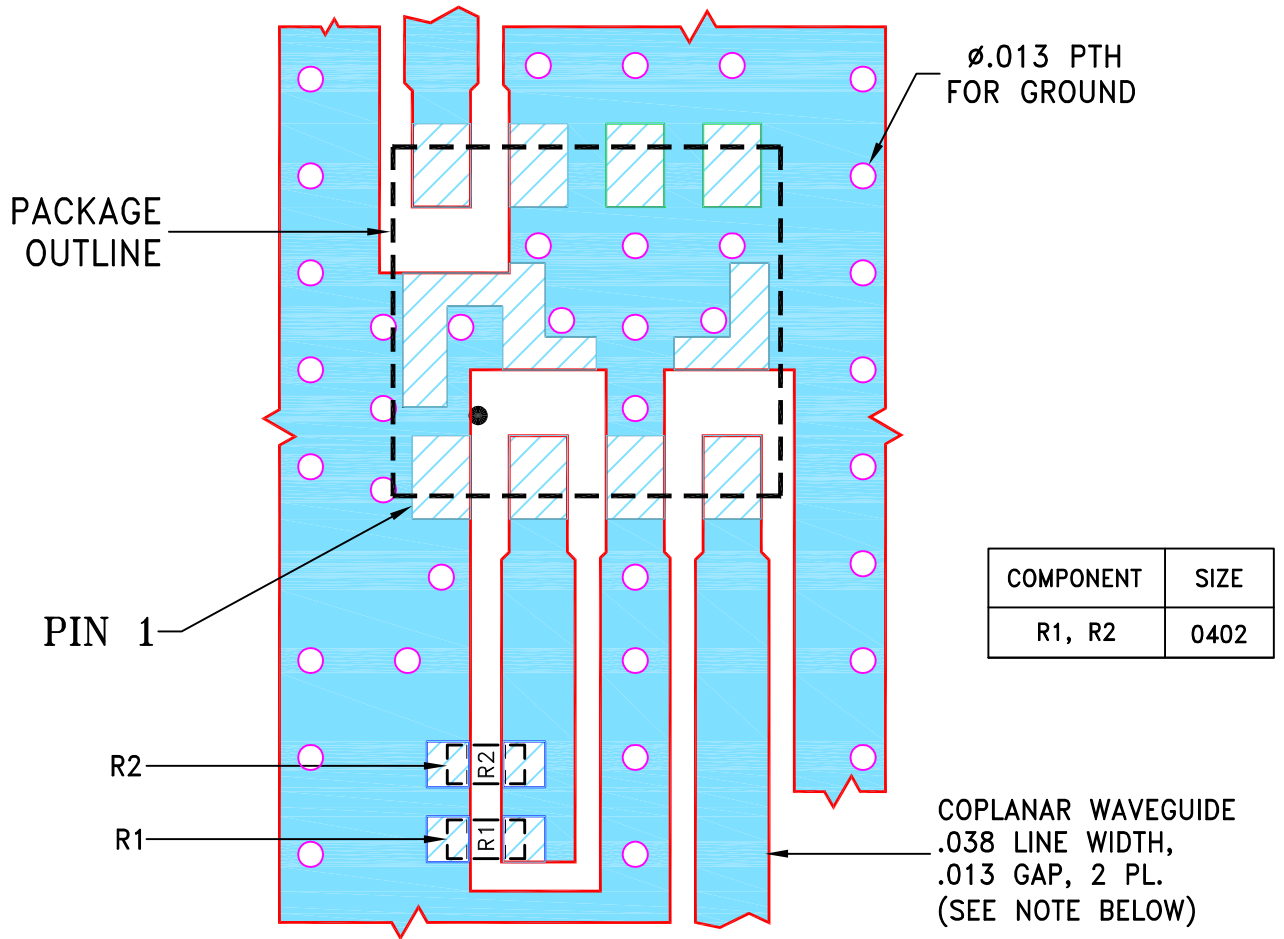
THIRD ANGLE PROJECTION



REVISIONS

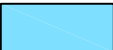
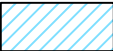
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M116926	NEW RELEASE	04/10/08	MMG	DJ
A	ECO-000060	MODIFIED CASE STYLE	10/16/19	ITG	RB

SUGGESTED MOUNTING CONFIGURATION FOR HV1195 CASE STYLE, "08FM01" PIN CONNECTION



NOTES:

1. TRACE WIDTH AND GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020"±.0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. CHIP COMPONENT FOOT PRINTS SHOWN FOR REFERENCE. FOR COMPONENT VALUES REFER TO TB-473+.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

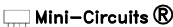
-  DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).
-  DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DRAWN	MMG	04/03/08
CHECKED	AV	04/10/08
APPROVED	DJ	04/10/08

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PL, 08FM01, HV1195, KSX2, TB-473+

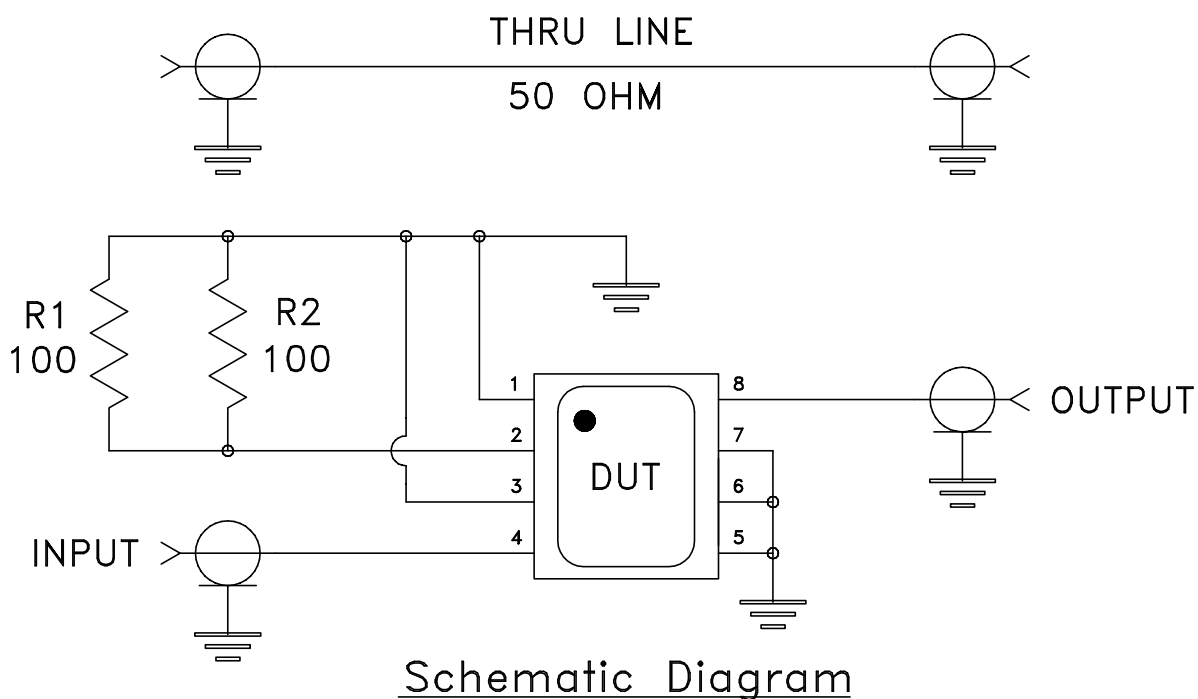
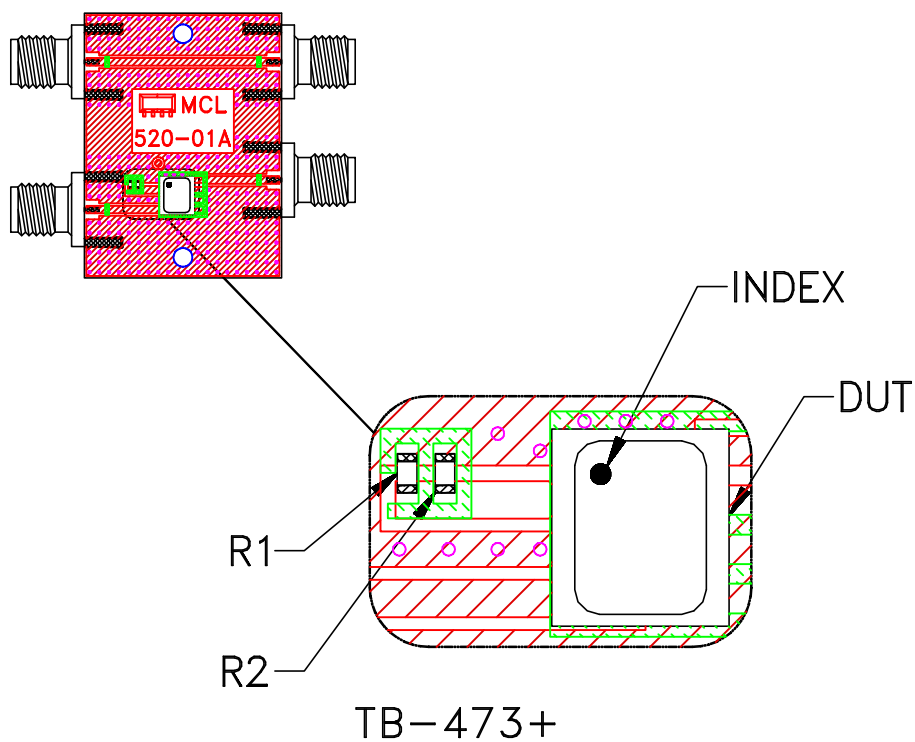
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FILE: 98PL287	SCALE: 10:1	SHEET: 1 OF 1	

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


# Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.020 inch.

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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 Case Temperature	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102-C, Condition C
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutectic Process: 225°C peak Pb-Free Process: 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
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