

# Surface Mount Frequency Mixer

## ADE-1LH+

Level 10 (LO Power +10 dBm) 0.5 to 500 MHz



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

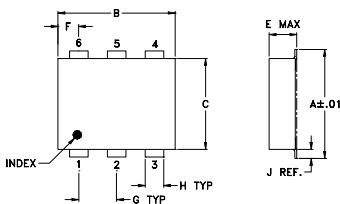
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	50mW
IF Current	40mA

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

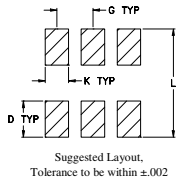
### Pin Connections

LO	6
RF	3
IF	2
GROUND	1,4,5

### Outline Drawing



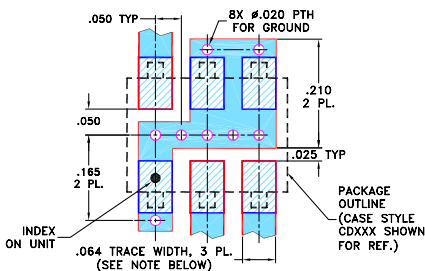
#### PCB Land Pattern



### 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:
- 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.
  - 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](http://www.minicircuits.com/MCLStore/terms.jsp)

### Features

- low conversion loss, 5.0 dB typ.
- excellent L-R isolation, 55 dB typ. and L-I isolation, 45 dB typ.
- good IP3, 15 dBm typ.
- aqueous washable
- protected by US Patent 6,133,525

### Applications

- VHF/UHF receivers

### Electrical Specifications

FREQUENCY (MHz)	CONVERSION LOSS (dB)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			IP3 at center band (dBm)						
		L	M	U	L	M	U							
0.5-500	DC-500	65	50	55	35	47	26	52	40	45	22	34	20	15

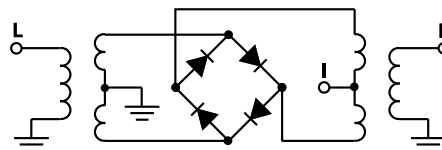
1 dB COMP.: +5 dBm typ.

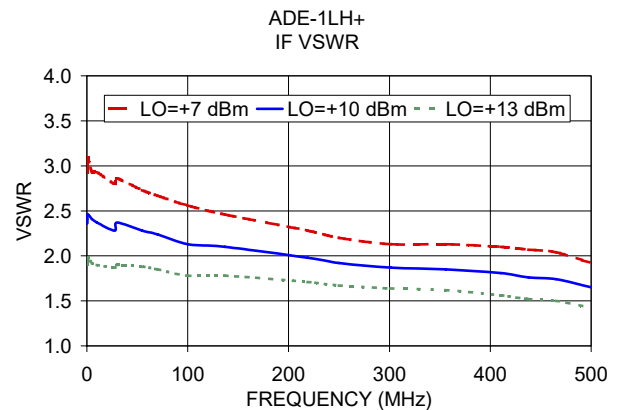
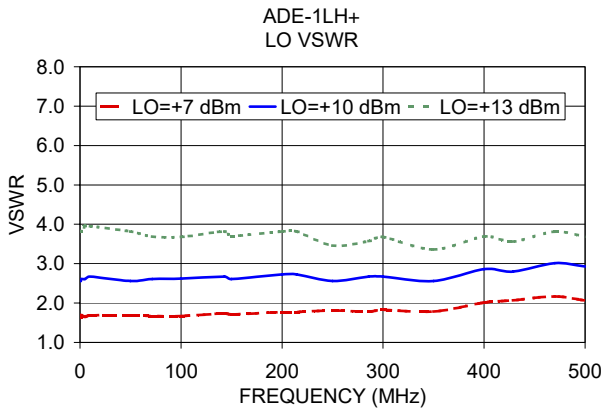
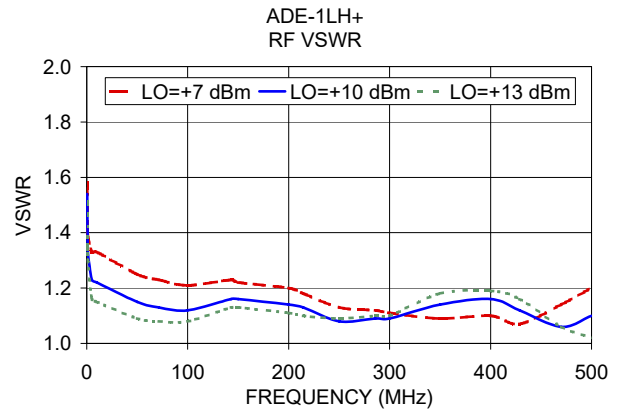
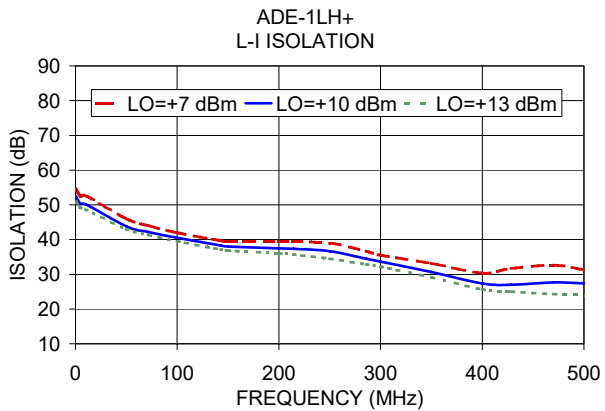
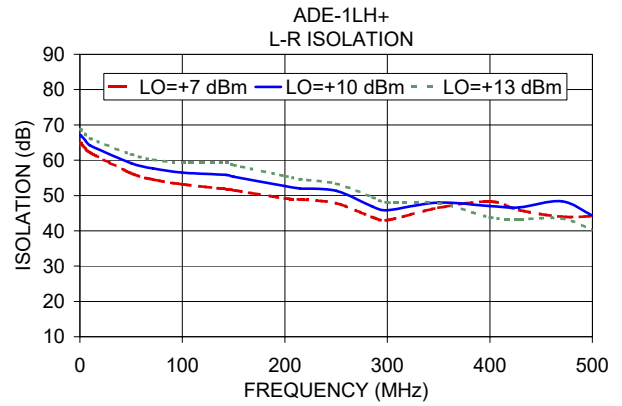
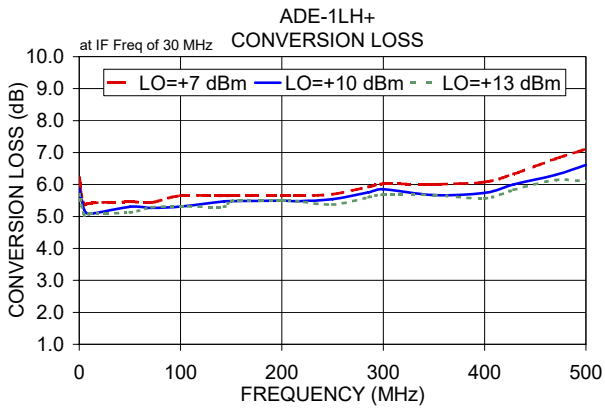
L = low range [ $f_l$  to  $10 f_l$ ]  
M = mid band [ $2f_l$  to  $f_u/2$ ]  
U = upper range [ $f_u/2$  to  $f_u$ ]

### Typical Performance Data

Frequency (MHz)		Conversion Loss (dB)	Isolation L-R (dB)	Isolation L-I (dB)	VSWR RF Port (:1)	VSWR LO Port (:1)
RF	LO	LO +10dBm	LO +10dBm	LO +10dBm	LO +10dBm	LO +10dBm
0.50	30.50	5.87	67.00	52.50	1.54	2.56
0.80	30.80	5.68	66.83	52.17	1.37	2.56
1.00	31.00	5.70	67.01	52.00	1.33	2.61
5.00	35.00	5.21	65.67	50.33	1.23	2.61
10.00	40.00	5.08	64.17	50.17	1.22	2.67
50.00	80.00	5.30	59.16	43.84	1.15	2.56
71.52	101.52	5.27	57.66	42.17	1.13	2.61
100.00	130.00	5.31	56.51	40.51	1.12	2.62
142.94	172.94	5.47	55.83	38.33	1.16	2.67
150.00	180.00	5.48	55.34	38.00	1.16	2.61
200.00	230.00	5.49	52.67	37.50	1.14	2.73
214.36	244.36	5.48	52.01	37.34	1.13	2.73
250.00	280.00	5.54	51.34	36.67	1.08	2.56
285.79	315.79	5.76	46.84	34.51	1.09	2.67
300.00	330.00	5.85	45.83	33.67	1.09	2.67
350.00	380.00	5.67	48.00	30.67	1.14	2.56
400.00	430.00	5.74	47.01	27.33	1.16	2.86
428.63	458.63	6.00	46.66	27.00	1.12	2.80
470.00	500.00	6.30	48.34	27.67	1.06	3.01
500.00	530.00	6.61	44.33	27.33	1.10	2.93

### Electrical Schematic





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# Frequency Mixer

# ADE-1LH+

## Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB)			RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)			RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+5dBm (dB)		
		@LO (dBm)					@LO (dBm)					@LO (dBm)		
		+7	+10	+13			+7	+10	+13			+7	+10	+13
0.5	30.5	6.21	5.87	5.70	10.1	40.1	25.05	32.61	26.45	10.1	40.1	1.49	1.18	0.94
0.8	30.8	6.02	5.68	5.52	30.1	60.1	22.60	27.70	25.25	30.1	60.1	1.54	1.29	1.04
1.0	31.0	5.86	5.70	5.53	50.1	80.1	24.73	26.00	24.27	50.1	80.1	1.62	1.25	1.06
5.0	35.0	5.37	5.21	5.04	70.1	100.1	23.25	24.38	24.45	70.1	100.1	1.70	1.31	1.08
10.0	40.0	5.42	5.08	5.08	90.1	120.1	21.94	24.86	19.49	90.1	120.1	1.61	1.27	1.04
30.1	60.1	5.21	4.97	4.81	110.1	140.1	23.72	20.80	17.79	110.1	140.1	1.61	1.21	1.00
50.1	80.1	5.19	4.98	4.84	130.1	160.1	22.16	19.60	16.78	130.1	160.1	1.49	1.23	1.04
70.1	100.1	5.18	4.98	4.84	150.1	180.1	20.89	15.81	14.59	150.1	180.1	1.70	1.20	1.02
90.1	120.1	5.23	5.01	4.87	170.1	200.1	21.47	19.54	17.48	170.1	200.1	1.41	1.14	0.93
130.1	160.1	5.29	5.11	4.97	190.1	220.1	15.99	14.44	15.43	190.1	220.1	1.48	1.16	0.97
150.1	180.1	5.33	5.15	5.01	210.1	240.1	14.02	12.69	12.65	210.1	240.1	1.52	1.14	0.95
170.1	200.1	5.36	5.17	5.02	230.1	260.1	15.29	14.05	14.03	230.1	260.1	1.50	1.14	0.92
190.1	220.1	5.38	5.20	5.04	250.1	280.1	15.88	15.45	17.13	250.1	280.1	1.35	1.14	0.93
210.1	240.1	5.34	5.18	5.05	270.1	300.1	12.47	12.89	16.55	270.1	300.1	1.24	1.09	0.96
230.1	260.1	5.40	5.20	5.04	290.1	320.1	13.55	12.59	12.91	290.1	320.1	1.13	1.04	0.90
250.1	280.1	5.50	5.21	5.01	310.1	340.1	15.07	14.80	15.71	310.1	340.1	1.34	1.10	0.92
270.1	300.1	5.66	5.38	5.10	330.1	360.1	15.81	15.86	15.32	330.1	360.1	1.53	1.23	1.05
290.1	320.1	5.69	5.50	5.27	350.1	380.1	15.10	13.68	16.03	350.1	380.1	1.85	1.44	1.14
330.1	360.1	5.67	5.48	5.27	370.1	400.1	14.00	14.69	17.04	370.1	400.1	1.94	1.48	1.25
350.1	380.1	5.61	5.37	5.19	390.1	420.1	14.58	15.51	17.21	390.1	420.1	1.99	1.63	1.39
370.1	400.1	5.63	5.37	5.22	410.1	440.1	14.29	16.45	18.28	410.1	440.1	2.37	1.75	1.59
390.1	420.1	5.68	5.45	5.30	430.1	460.1	9.01	14.74	18.75	430.1	460.1	2.25	2.03	1.70
410.1	440.1	5.87	5.53	5.35	450.1	480.1	5.96	9.68	15.89	450.1	480.1	2.42	2.11	1.86
430.1	460.1	6.15	5.65	5.38	470.1	500.1	4.76	6.66	10.79	470.1	500.1	2.24	2.17	2.03
450.1	480.1	6.48	5.96	5.51	510.1	540.1	4.44	5.34	6.81	510.1	540.1	2.31	2.13	2.04
470.1	500.1	6.66	6.23	5.66	530.1	560.1	4.75	5.55	6.51	530.1	560.1	2.40	2.17	2.11
530.1	560.1	7.18	6.68	6.13	570.1	600.1	5.88	7.04	9.49	570.1	600.1	2.23	2.16	1.99
570.1	600.1	7.35	6.59	6.02	590.1	620.1	7.18	9.25	13.53	590.1	620.1	2.24	2.14	1.98
590.1	620.1	7.25	6.51	5.89	630.1	660.1	11.07	15.91	17.14	630.1	660.1	2.27	2.18	2.06
630.1	660.1	6.99	6.29	5.77	650.1	680.1	13.13	20.45	15.58	650.1	680.1	2.40	2.18	2.02
650.1	680.1	6.85	6.21	5.82	690.1	720.1	14.17	18.02	15.87	690.1	720.1	2.45	2.09	1.91
690.1	720.1	6.73	6.34	6.07	710.1	740.1	14.06	17.51	17.38	710.1	740.1	2.30	1.95	1.75
710.1	740.1	6.84	6.51	6.28	750.1	780.1	14.02	15.13	16.95	750.1	780.1	2.31	1.87	1.64
750.1	780.1	7.06	6.79	6.61	770.1	800.1	13.11	14.12	16.28	770.1	800.1	1.83	1.66	1.48
770.1	800.1	7.28	7.01	6.83	810.1	840.1	11.42	12.39	14.44	810.1	840.1	1.82	1.64	1.44
830.1	860.1	7.94	7.73	7.64	830.1	860.1	11.05	11.94	14.93	830.1	860.1	1.81	1.56	1.36
870.1	900.1	8.57	8.41	8.31	870.1	900.1	11.16	13.07	16.76	870.1	900.1	1.82	1.51	1.29
890.1	920.1	8.95	8.78	8.67	890.1	920.1	11.55	13.76	17.32	890.1	920.1	1.89	1.50	1.29
930.1	960.1	9.84	9.61	9.43	930.1	960.1	12.67	15.27	17.62	930.1	960.1	1.69	1.38	1.30
950.1	980.1	10.31	10.02	9.85	950.1	980.1	13.30	16.38	17.54	950.1	980.1	2.06	1.37	1.37

# Frequency Mixer

# ADE-1LH+

## Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=250.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=10.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=500.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+10			+10			+10
240.0	10.1	5.25	10.0	20.1	4.93	490.0	10.1	5.95
234.1	16.0	5.20	22.3	32.4	4.76	477.7	22.4	5.85
228.2	21.9	5.16	34.6	44.7	4.75	465.4	34.7	5.79
222.3	27.8	5.14	46.9	57.0	4.77	453.1	47.0	5.76
216.4	33.7	5.13	59.2	69.3	4.79	440.8	59.3	5.77
210.5	39.6	5.10	71.5	81.6	4.81	428.5	71.6	5.72
204.6	45.5	5.10	83.8	93.9	4.82	416.2	83.9	5.67
198.7	51.4	5.07	96.2	106.3	4.83	403.8	96.3	5.65
192.8	57.3	5.04	108.5	118.6	4.84	391.5	108.6	5.64
186.9	63.2	5.01	120.8	130.9	4.83	379.2	120.9	5.68
181.0	69.1	5.03	133.1	143.2	4.85	366.9	133.2	5.71
175.1	75.0	5.04	145.4	155.5	4.89	354.6	145.5	5.67
169.2	80.9	5.04	157.7	167.8	4.90	342.3	157.8	5.68
163.3	86.8	5.03	170.0	180.1	4.93	330.0	170.1	5.68
157.4	92.7	5.03	182.3	192.4	4.94	317.7	182.4	5.71
151.5	98.6	5.03	194.6	204.7	4.93	305.4	194.7	5.76
145.6	104.5	5.05	206.9	217.0	4.97	293.1	207.0	5.76
139.7	110.4	5.04	219.2	229.3	5.01	280.8	219.3	5.76
133.8	116.3	5.03	231.5	241.6	4.97	268.5	231.6	5.81
127.9	122.2	5.02	243.8	253.9	4.95	256.2	243.9	5.84
122.1	128.0	5.02	256.2	266.3	4.93	243.8	256.3	5.88
116.2	133.9	5.05	268.5	278.6	4.91	231.5	268.6	5.87
110.3	139.8	5.08	280.8	290.9	4.99	219.2	280.9	5.83
104.4	145.7	5.07	293.1	303.2	5.11	206.9	293.2	5.85
98.5	151.6	5.07	305.4	315.5	5.21	194.6	305.5	5.85
92.6	157.5	5.08	317.7	327.8	5.32	182.3	317.8	5.84
86.7	163.4	5.10	330.0	340.1	5.34	170.0	330.1	5.86
80.8	169.3	5.11	342.3	352.4	5.35	157.7	342.4	5.86
74.9	175.2	5.11	354.6	364.7	5.34	145.4	354.7	5.87
69.0	181.1	5.10	366.9	377.0	5.27	133.1	367.0	5.82
63.1	187.0	5.08	379.2	389.3	5.22	120.8	379.3	5.71
57.2	192.9	5.09	391.5	401.6	5.14	108.5	391.6	5.68
51.3	198.8	5.10	403.8	413.9	5.10	96.2	403.9	5.66
45.4	204.7	5.13	416.2	426.3	5.11	83.8	416.3	5.63
39.5	210.6	5.14	428.5	438.6	5.08	71.5	428.6	5.61
33.6	216.5	5.16	440.8	450.9	5.11	59.2	440.9	5.62
27.7	222.4	5.16	453.1	463.2	5.10	46.9	453.2	5.63
21.8	228.3	5.19	465.4	475.5	5.14	34.6	465.5	5.76
15.9	234.2	5.23	477.7	487.8	5.23	22.3	477.8	5.94
10.0	240.1	5.36	490.0	500.1	5.27	10.0	490.1	6.05

# Frequency Mixer

# ADE-1LH+

## Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+7	+10	+13	+7	+10	+13
0.5	64.67	67.00	68.67	54.67	52.50	50.99
0.8	64.67	66.83	68.67	54.17	52.17	50.83
1.0	64.84	67.01	68.67	54.00	52.00	50.66
5.0	63.34	65.67	67.34	52.50	50.33	49.16
10.0	62.17	64.17	66.17	52.67	50.17	48.66
30.1	63.35	65.13	66.38	64.27	60.27	57.87
50.1	59.42	60.71	62.44	61.45	55.82	53.86
70.1	56.14	58.15	59.71	57.32	52.81	50.99
90.1	54.38	56.33	58.10	53.77	50.31	48.85
130.1	51.95	54.18	55.89	48.59	47.00	46.07
150.1	51.06	52.87	54.39	47.41	46.03	45.07
170.1	50.53	52.70	54.39	46.58	45.36	44.47
190.1	49.34	51.46	53.26	45.32	44.50	43.75
210.1	48.31	50.24	51.78	45.20	44.00	42.67
230.1	48.22	50.10	51.60	44.77	43.80	42.16
250.1	48.13	49.86	51.14	44.90	43.70	42.10
270.1	48.46	50.62	52.31	44.82	43.10	41.11
290.1	47.13	49.63	51.55	45.66	43.07	40.38
330.1	44.92	46.85	48.76	41.25	39.95	38.59
350.1	43.66	45.62	47.55	40.09	38.76	37.52
370.1	42.67	44.29	45.97	38.21	36.66	35.22
390.1	41.64	43.67	45.92	36.38	34.52	33.17
410.1	41.31	43.50	45.23	35.08	32.65	31.34
430.1	41.68	44.08	45.89	34.89	31.55	30.01
450.1	41.29	44.11	45.91	37.20	31.37	29.55
470.1	40.48	43.88	46.19	42.24	31.86	29.18
530.1	42.23	46.18	47.80	40.13	34.63	30.29
570.1	42.24	44.15	41.95	38.62	33.46	29.07
590.1	41.26	41.37	38.97	37.92	31.66	26.70
630.1	38.82	36.64	34.35	35.07	26.69	22.64
650.1	37.50	35.02	33.29	32.21	25.14	22.06
690.1	35.30	33.43	31.93	28.38	23.83	21.39
710.1	34.78	32.50	30.95	27.54	23.05	20.91
750.1	34.44	31.24	28.83	25.55	22.17	19.79
770.1	34.19	30.19	27.91	24.41	21.20	19.06
830.1	30.71	26.72	24.61	21.39	19.34	17.64
870.1	27.81	24.53	22.60	19.97	18.59	17.07
890.1	26.09	23.42	21.53	19.04	18.13	16.63
930.1	23.77	21.66	19.83	17.81	17.41	16.03
950.1	22.79	20.85	19.17	17.23	17.09	15.81

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+7	+10	+13
10.1	40.1	41.82	43.86	43.79
30.1	60.1	35.97	36.22	36.37
50.1	80.1	31.91	32.07	32.46
70.1	100.1	29.44	29.67	29.78
90.1	120.1	27.53	27.85	28.07
110.1	140.1	26.31	26.69	26.85
130.1	160.1	25.26	25.54	25.78
150.1	180.1	24.68	24.84	25.10
170.1	200.1	24.47	24.70	24.92
190.1	220.1	23.87	24.51	24.94
210.1	240.1	23.54	23.88	24.35
230.1	260.1	23.50	23.94	24.39
250.1	280.1	23.47	23.97	24.45
270.1	300.1	23.37	23.73	24.18
290.1	320.1	24.06	24.42	24.78
310.1	340.1	24.09	24.61	24.95
330.1	360.1	24.04	24.53	25.25
350.1	380.1	22.76	23.63	24.18
370.1	400.1	21.36	21.82	22.14
390.1	420.1	20.03	20.26	20.46
410.1	440.1	18.46	18.60	18.71
430.1	460.1	17.61	17.56	17.64
450.1	480.1	17.13	17.08	17.11
470.1	500.1	16.67	16.56	16.56
510.1	540.1	16.57	16.61	16.75
530.1	560.1	16.85	16.97	17.26
570.1	600.1	18.11	18.38	18.65
590.1	620.1	18.54	18.52	18.53
630.1	660.1	17.67	17.17	16.78
650.1	680.1	16.77	16.23	15.80
690.1	720.1	14.80	14.31	13.91
710.1	740.1	13.94	13.43	13.06
750.1	780.1	12.24	11.80	11.35
770.1	800.1	11.43	10.99	10.53
810.1	840.1	9.97	9.53	9.08
830.1	860.1	9.27	8.86	8.47
870.1	900.1	7.96	7.53	7.18
890.1	920.1	7.36	6.96	6.59
930.1	960.1	6.30	5.90	5.58
950.1	980.1	5.86	5.43	5.17

# Frequency Mixer

# ADE-1LH+

## Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=500.1MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+7	+10	+13		+7	+10	+13		+7	+10	+13
0.5	30.5	1.58	1.54	1.51	0.5	1.65	2.56	3.81	0.1	3.01	2.46	1.95
0.8	30.8	1.42	1.37	1.35	0.8	1.65	2.56	3.81	0.3	2.93	2.36	1.90
1.0	31.0	1.39	1.33	1.30	1.0	1.69	2.61	3.81	0.5	3.00	2.41	1.95
5.0	35.0	1.33	1.23	1.16	5.0	1.65	2.61	3.95	1.0	3.09	2.46	1.98
10.0	40.0	1.33	1.22	1.15	10.0	1.69	2.67	3.95	5.0	2.93	2.41	1.92
30.1	60.1	1.26	1.15	1.09	30.1	1.62	2.44	3.50	10.0	2.93	2.37	1.90
50.1	80.1	1.26	1.15	1.08	50.1	1.61	2.42	3.42	22.4	2.92	2.24	1.71
70.1	100.1	1.24	1.14	1.08	70.1	1.57	2.33	3.28	34.7	2.61	2.08	1.60
90.1	120.1	1.24	1.13	1.07	90.1	1.56	2.30	3.24	47.0	2.72	2.11	1.65
110.1	140.1	1.21	1.12	1.06	110.1	1.57	2.34	3.28	59.3	2.71	2.12	1.64
130.1	160.1	1.21	1.11	1.06	130.1	1.60	2.39	3.35	71.6	2.69	2.12	1.64
150.1	180.1	1.20	1.12	1.07	150.1	1.60	2.37	3.30	83.9	2.69	2.14	1.66
170.1	200.1	1.16	1.08	1.03	170.1	1.60	2.34	3.25	96.3	2.65	2.12	1.64
190.1	220.1	1.17	1.08	1.03	190.1	1.61	2.36	3.26	108.6	2.61	2.10	1.64
210.1	240.1	1.15	1.08	1.05	210.1	1.66	2.42	3.36	120.9	2.68	2.15	1.69
230.1	260.1	1.14	1.07	1.05	230.1	1.69	2.46	3.42	133.2	2.69	2.16	1.71
250.1	280.1	1.14	1.06	1.04	250.1	1.70	2.45	3.37	145.5	2.68	2.16	1.71
270.1	300.1	1.15	1.07	1.04	270.1	1.72	2.45	3.34	157.8	2.62	2.13	1.68
290.1	320.1	1.12	1.05	1.02	290.1	1.76	2.51	3.43	170.1	2.62	2.13	1.68
310.1	340.1	1.07	1.02	1.04	310.1	1.81	2.59	3.56	182.4	2.63	2.14	1.70
330.1	360.1	1.03	1.04	1.11	330.1	1.84	2.62	3.60	194.7	2.64	2.18	1.74
350.1	380.1	1.04	1.12	1.19	350.1	1.84	2.60	3.54	207.0	2.63	2.17	1.75
370.1	400.1	1.09	1.16	1.21	370.1	1.83	2.57	3.50	219.3	2.60	2.15	1.74
390.1	420.1	1.10	1.17	1.21	390.1	1.87	2.60	3.55	231.6	2.55	2.10	1.71
410.1	440.1	1.09	1.15	1.18	410.1	1.95	2.69	3.65	243.9	2.52	2.08	1.71
430.1	460.1	1.10	1.11	1.14	430.1	2.07	2.79	3.73	268.6	2.56	2.13	1.75
450.1	480.1	1.16	1.10	1.10	450.1	2.15	2.86	3.76	280.9	2.53	2.12	1.75
470.1	500.1	1.22	1.14	1.08	470.1	2.20	2.95	3.83	293.2	2.48	2.09	1.73
510.1	540.1	1.34	1.25	1.16	510.1	2.26	3.08	4.05	305.5	2.43	2.05	1.70
530.1	560.1	1.40	1.30	1.19	530.1	2.28	3.10	4.09	317.8	2.42	2.04	1.70
570.1	600.1	1.52	1.38	1.29	570.1	2.29	3.08	4.04	330.1	2.40	2.03	1.71
590.1	620.1	1.56	1.43	1.37	590.1	2.30	3.09	4.03	342.4	2.41	2.02	1.72
630.1	660.1	1.67	1.59	1.56	630.1	2.30	3.05	3.96	354.7	2.39	2.01	1.71
650.1	680.1	1.73	1.67	1.65	650.1	2.28	3.01	3.94	367.0	2.35	1.98	1.68
690.1	720.1	1.89	1.86	1.85	690.1	2.28	3.05	4.00	379.3	2.33	1.96	1.67
710.1	740.1	1.98	1.95	1.94	710.1	2.31	3.08	4.02	391.6	2.34	1.97	1.68
750.1	780.1	2.12	2.09	2.08	750.1	2.43	3.18	4.09	403.9	2.32	1.96	1.68
770.1	800.1	2.17	2.14	2.12	770.1	2.53	3.25	4.15	416.3	2.27	1.93	1.67
810.1	840.1	2.25	2.19	2.17	810.1	2.76	3.40	4.23	428.6	2.23	1.88	1.64
830.1	860.1	2.25	2.20	2.16	830.1	2.87	3.47	4.26	440.9	2.19	1.86	1.62
870.1	900.1	2.26	2.18	2.12	870.1	3.14	3.62	4.35	453.2	2.18	1.85	1.62
890.1	920.1	2.25	2.16	2.10	890.1	3.26	3.70	4.37	465.5	2.20	1.86	1.62
930.1	960.1	2.27	2.16	2.10	930.1	3.50	3.81	4.38	477.8	2.22	1.87	1.63
950.1	980.1	2.28	2.15	2.09	950.1	3.60	3.86	4.39	490.1	2.21	1.86	1.62

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100817  
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## Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	24	40	25	47	27	52	37	61	59	55
1	-	20	+0	29	12	34	23	41	38	52	59	57
2	93	61	41	79	42	59	42	58	45	72	55	75
3	>100	42	39	47	42	47	36	44	45	51	55	61
4	>100	87	59	67	56	71	56	71	52	62	58	70
5	>100	65	63	61	48	68	47	63	46	64	61	71
6	>100	85	77	87	75	81	73	80	67	73	75	76
7	>100	>95	78	77	73	67	66	69	65	64	56	63
8	>100	>95	94	>95	90	>95	81	85	76	82	72	81
9	>100	92	93	90	83	81	71	82	73	>95	70	80
10	>100	>95	>95	>95	>95	>95	88	90	84	94	86	88
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

### LO HARMONICS ORDER

Test conditions: RF IN: 250.1 MHz; 0.00 dBm.  
 LO IN: 280.01 MHz; +10.00 dBm  
 IF OUT: 29.91 MHz; -5.15 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	17	28	14	34	15	41	24	49	40	40
1	-	19	+0	27	11	32	21	35	37	47	45	47
2	>100	69	47	72	48	75	45	60	50	71	57	>85
3	>100	71	57	73	56	75	55	77	66	77	73	>85
4	>100	>85	>85	>85	>85	>85	82	>85	81	>85	>85	>85
5	>100	>85	>85	>85	>85	>85	>85	>85	82	>85	>85	>85
6	>100	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85
7	>100	>85	>85	>85	>85	>85	>85	83	>85	>85	>85	>85
8	>100	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85
9	>100	>85	>85	>85	>85	>85	>85	>85	>85	76	>85	>85
10	>100	>85	>85	>85	>85	>85	>85	>85	>85	>85	67	>85
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

### LO HARMONICS ORDER

Test conditions: RF IN: 250.1 MHz; -10.00 dBm.  
 LO IN: 280.01 MHz; +10.00 dBm  
 IF OUT: 29.91 MHz; -15.1 dBm

- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
 2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
 3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

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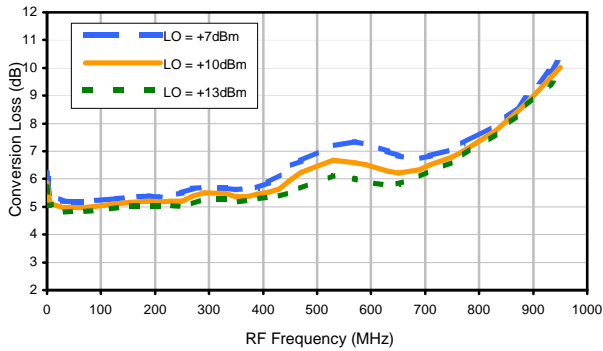


# Frequency Mixer

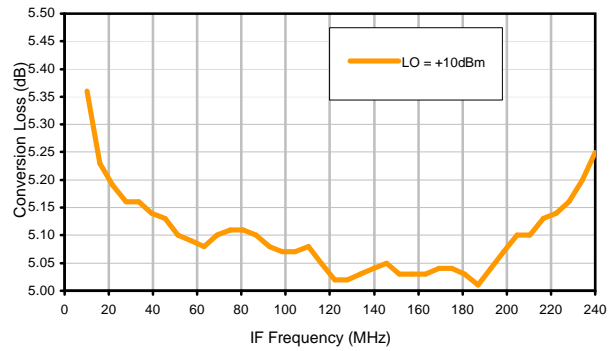
# ADE-1LH+

## Typical Performance Curves

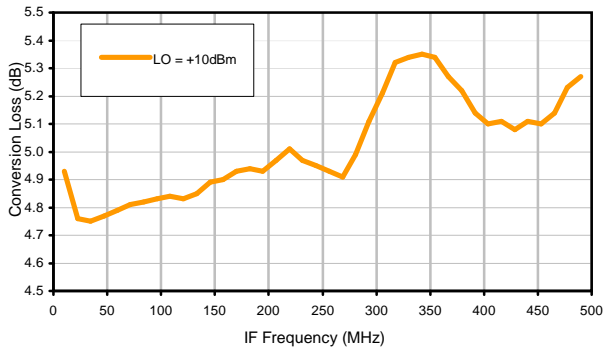
Conversion Loss @ IF=30MHz



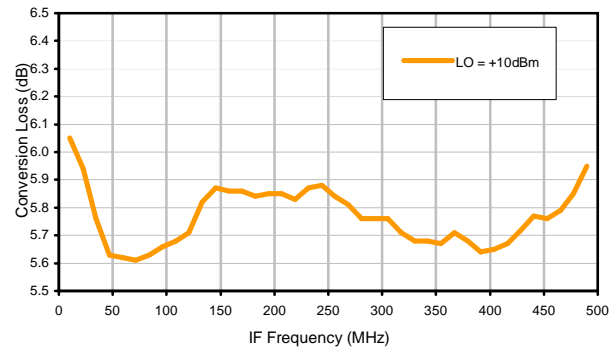
Conversion Loss vs. IF @ RF=250.1MHz



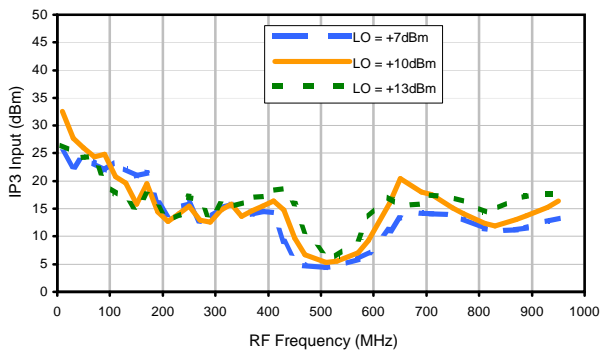
Conversion Loss vs. IF @ RF=10.1MHz



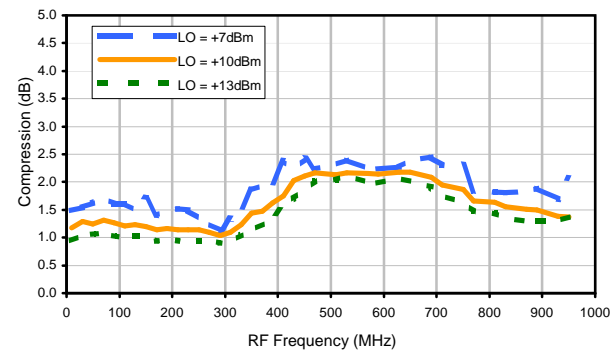
Conversion Loss vs. IF @ RF=500.1MHz



IP3 Input



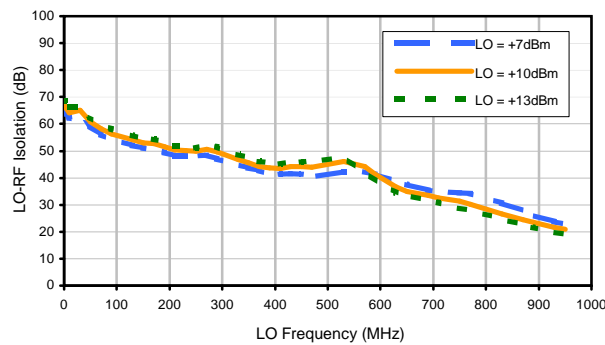
Compression @ RF IN=+5dBm



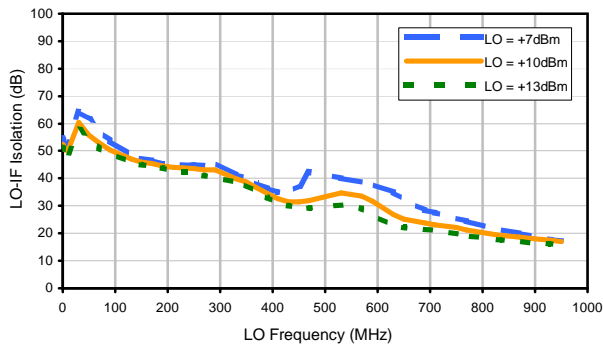


## Typical Performance Curves

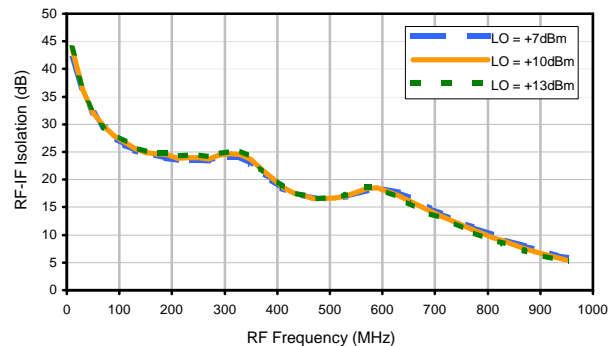
LO-RF Isolation



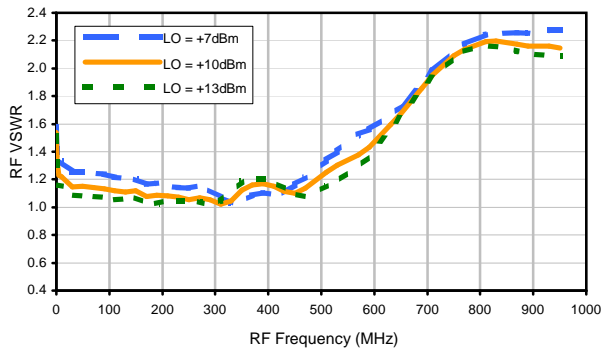
LO-IF Isolation



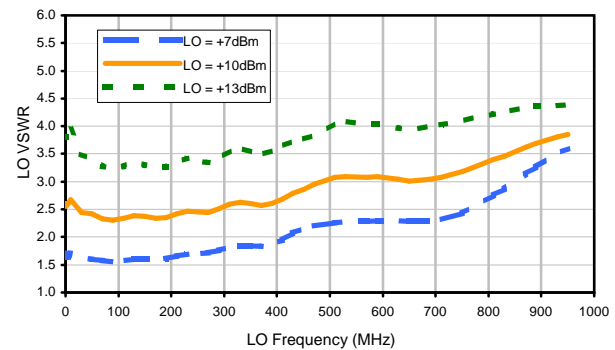
RF-IF Isolation



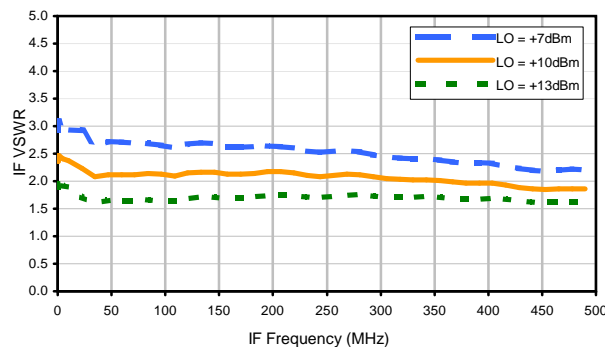
RF VSWR



LO VSWR



IF VSWR



## Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	24	40	25	47	27	52	37	61	59	55
1	-	20	+0	29	12	34	23	41	38	52	59	57
2	93	61	41	79	42	59	42	58	45	72	55	75
3	>100	42	39	47	42	47	36	44	45	51	55	61
4	>100	87	59	67	56	71	56	71	52	62	58	70
5	>100	65	63	61	48	68	47	63	46	64	61	71
6	>100	85	77	87	75	81	73	80	67	73	75	76
7	>100	>95	78	77	73	67	66	69	65	64	56	63
8	>100	>95	94	>95	90	>95	81	85	76	82	72	81
9	>100	92	93	90	83	81	71	82	73	>95	70	80
10	>100	>95	>95	>95	>95	>95	88	90	84	94	86	88
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

### LO HARMONICS ORDER

Test conditions: RF IN: 250.1 MHz; 0.00 dBm.  
 LO IN: 280.01 MHz; +10.00 dBm  
 IF OUT: 29.91 MHz; -5.15 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	17	28	14	34	15	41	24	49	40	40
1	-	19	+0	27	11	32	21	35	37	47	45	47
2	>100	69	47	72	48	75	45	60	50	71	57	>85
3	>100	71	57	73	56	75	55	77	66	77	73	>85
4	>100	>85	>85	>85	>85	>85	82	>85	81	>85	>85	>85
5	>100	>85	>85	>85	>85	>85	>85	>85	82	>85	>85	>85
6	>100	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85
7	>100	>85	>85	>85	>85	>85	>85	83	>85	>85	>85	>85
8	>100	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85
9	>100	>85	>85	>85	>85	>85	>85	>85	>85	76	>85	>85
10	>100	>85	>85	>85	>85	>85	>85	>85	>85	>85	67	>85
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

### LO HARMONICS ORDER

Test conditions: RF IN: 250.1 MHz; -10.00 dBm.  
 LO IN: 280.01 MHz; +10.00 dBm  
 IF OUT: 29.91 MHz; -15.1 dBm

- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
 2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
 3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

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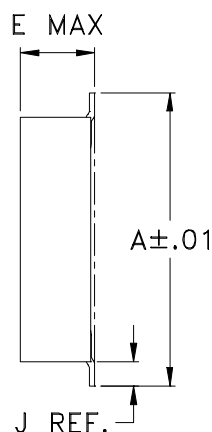
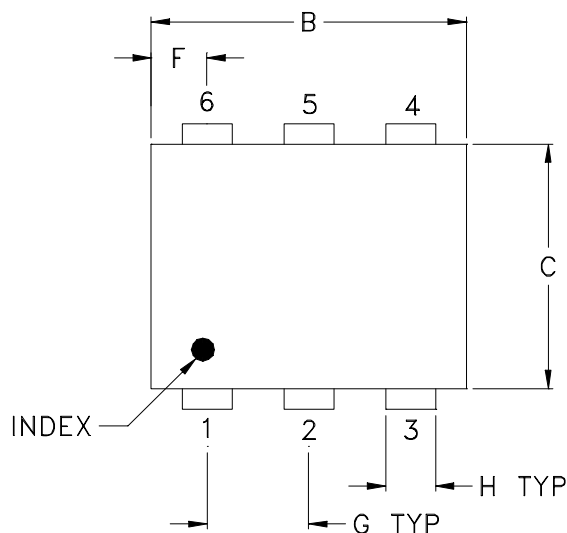
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# Case Style

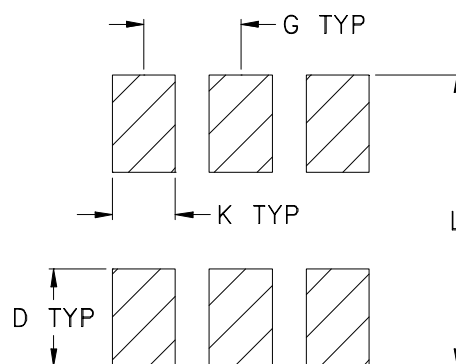
# CD

CD541  
CD542  
CD636  
CD637

## Outline Dimensions



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

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

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

### Notes:

- Case material: Plastic.
- 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.

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# 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.

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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 R04350B 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
DRAWN	MMG	07/17/02
CHECKED	WL	08/02/02
APPROVED	DJ	08/05/02

**Mini-Circuits®** 13 Neptune Avenue  
Brooklyn NY 11235

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

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-052	REV: C
FILE: 98PL052	SCALE: 8:1	SHEET: 1 OF 1	

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# 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 R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.030 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	-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