

Frequency Mixer

Level 13 (LO Power +13 dBm) 2500 to 6000 MHz

SKY-60MH+



Generic photo used for illustration purposes only

CASE STYLE: BJ398

+RoHS Compliant

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

Maximum Ratings

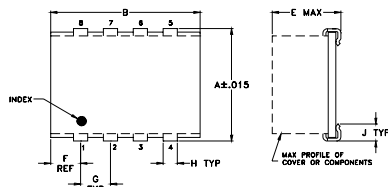
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	200mW
IF Current	40mA

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

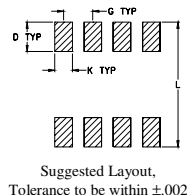
Pin Connections

LO	1
RF	5
IF	7
GROUND	2,3,4,6,8

Outline Drawing



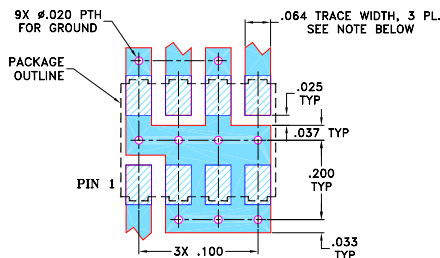
PCB Land Pattern



Outline Dimensions (inch)

A	B	C	D	E	F	G	H	J	K	L	wt
.305	.390	--	.100	.105	.045	.100	.047	.065	.065	.325	grams
7.75	9.91	--	2.54	2.67	1.14	2.54	1.19	1.65	1.65	8.26	0.20

Demo Board MCL P/N: TB-11 Suggested PCB Layout (PL-056)



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

Features

- low conversion loss, 6.2 dB typ.
- good L-R isolation, 28 dB typ.
- J-leads for strain relief

Applications

- line of sight links
- fixed satellite

Electrical Specifications

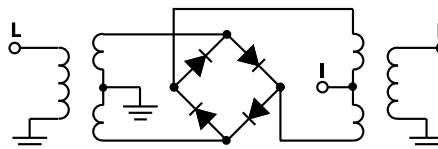
FREQUENCY (MHz)	CONVERSION LOSS (dB)	LO-RF ISOLATION (dB)	LO-IF ISOLATION (dB)	IP3 at center band (dBm)
LO/RF $f_L - f_U$	Mid-Band $\bar{X}$ Total Range Max. σ	Typ. Min.	Typ. Min.	Typ.
2500-6000 DC-1500	6.20 .20 9.5	28 17	14 8	19

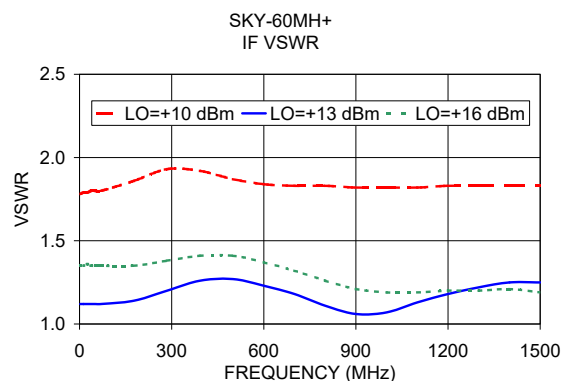
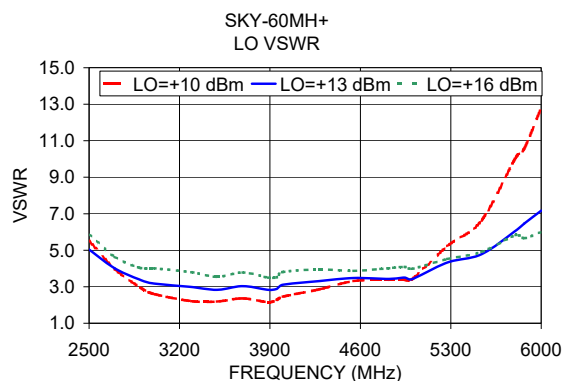
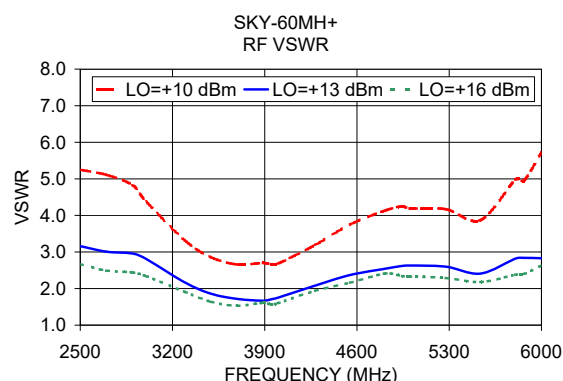
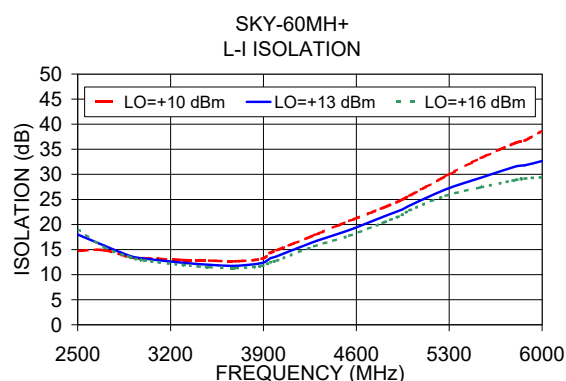
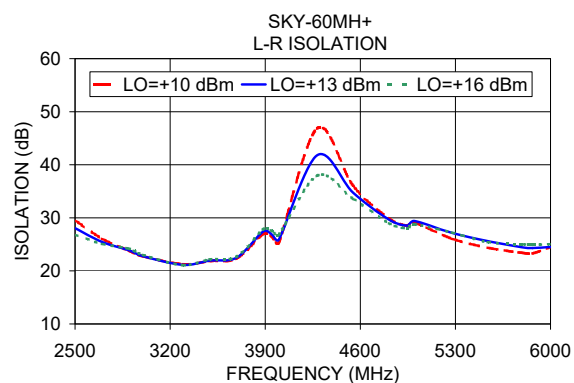
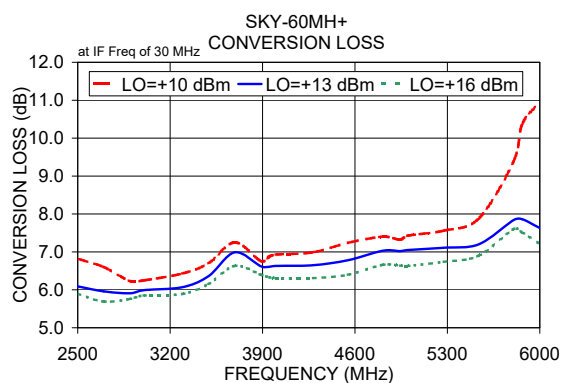
1 dB COMP.: +9 dBm typ.

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 +13dBm	LO +13dBm	LO +13dBm	LO +13dBm	LO +13dBm
2500.00	2530.00	6.09	28.06	18.01	3.16	5.04
2698.11	2728.11	5.96	25.47	15.81	3.01	4.01
2896.23	2926.23	5.91	23.88	13.71	2.96	3.38
3000.00	3030.00	5.99	22.77	13.21	2.81	3.18
3292.45	3322.45	6.07	21.14	12.38	2.17	2.99
3490.57	3520.57	6.36	21.92	11.97	1.86	2.83
3688.68	3718.68	6.99	22.48	11.77	1.72	3.03
3886.79	3916.79	6.62	27.45	12.31	1.67	2.83
3952.83	3982.83	6.61	26.77	13.27	1.71	2.88
4000.00	4030.00	6.63	25.89	13.66	1.75	3.11
4283.02	4253.02	6.65	41.81	16.55	2.08	3.31
4547.17	4517.17	6.78	34.72	18.89	2.37	3.48
4811.32	4781.32	7.03	29.66	21.64	2.54	3.43
4943.40	4913.40	7.02	28.54	22.96	2.62	3.50
5000.00	4970.00	7.05	29.40	23.76	2.63	3.42
5273.58	5243.58	7.11	27.17	27.00	2.60	4.33
5537.74	5507.74	7.20	25.62	29.31	2.41	4.78
5801.89	5771.89	7.84	24.40	31.57	2.82	6.07
5867.92	5837.92	7.86	24.32	31.80	2.84	6.46
6000.00	5970.00	7.63	24.50	32.65	2.83	7.17

Electrical Schematic





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Frequency Mixer

SKY-60MH+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB)		
		@LO (dBm)		
		+10	+13	+16
1660.1	1690.1	20.89	10.98	7.21
1820.6	1850.6	13.31	7.21	6.04
1981.1	2011.1	7.71	5.93	5.57
2141.7	2171.7	6.28	5.43	5.22
2302.2	2332.2	5.60	5.04	4.86
2462.7	2492.7	5.40	4.98	4.80
2623.2	2653.2	5.47	5.18	5.02
2783.7	2813.7	5.48	5.27	5.18
2944.2	2974.2	5.77	5.50	5.40
3104.8	3134.8	6.13	5.81	5.61
3265.3	3295.3	6.16	5.83	5.62
3425.8	3455.8	6.52	6.13	5.87
3586.3	3616.3	6.68	6.32	6.09
3746.8	3776.8	6.44	6.14	5.96
3907.3	3937.3	6.46	6.19	6.03
4067.9	4097.9	6.38	6.12	6.00
4228.4	4258.4	6.50	6.13	6.00
4388.9	4418.9	7.12	6.57	6.28
4549.4	4579.4	7.45	6.92	6.54
4709.9	4739.9	7.47	7.07	6.73
4870.5	4900.5	7.18	6.82	6.68
5031.0	5061.0	6.75	6.09	5.97
5191.5	5221.5	7.44	6.45	6.19
5352.0	5382.0	9.95	8.05	7.34
5512.5	5542.5	9.13	7.43	6.84
5673.0	5703.0	9.86	7.28	6.74
5833.6	5863.6	10.49	6.92	6.43
5994.1	6024.1	9.87	6.55	6.08
6154.6	6184.6	9.79	6.30	5.88
6315.1	6345.1	9.85	6.08	5.73
6475.6	6505.6	8.77	6.03	5.70
6636.2	6666.2	8.69	6.01	5.71
6796.7	6826.7	7.40	5.90	5.74
6957.2	6987.2	6.96	6.01	5.93
7117.7	7147.7	8.07	6.78	6.58
7258.2	7288.2	7.54	6.93	6.80
7418.7	7448.7	8.68	7.70	7.53
7559.1	7589.1	9.05	8.31	8.12
7719.6	7749.6	9.86	9.36	9.21
7860.1	7890.1	10.99	10.48	10.37

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)		
		@LO (dBm)		
		+10	+13	+16
1660.1	1690.1	1.11	11.16	16.46
1820.6	1850.6	5.13	16.55	15.20
1981.1	2011.1	18.26	15.63	15.81
2141.7	2171.7	18.20	16.12	15.62
2302.2	2332.2	18.59	17.46	17.27
2462.7	2492.7	16.57	19.39	18.62
2623.2	2653.2	18.18	20.28	17.68
2783.7	2813.7	17.43	17.69	16.67
2944.2	2974.2	15.82	16.72	18.30
3104.8	3134.8	15.74	16.38	16.58
3265.3	3295.3	16.34	14.95	14.08
3425.8	3455.8	15.98	16.80	16.23
3586.3	3616.3	14.50	15.83	16.90
3746.8	3776.8	15.40	16.83	18.53
3907.3	3937.3	17.09	19.98	25.79
4067.9	4097.9	14.64	20.51	27.32
4228.4	4258.4	15.45	15.50	19.11
4388.9	4418.9	17.62	16.52	18.51
4549.4	4579.4	20.26	17.60	17.21
4709.9	4739.9	18.65	18.61	18.04
4870.5	4900.5	15.54	18.57	19.54
5031.0	5061.0	14.72	19.16	18.18
5191.5	5221.5	16.62	16.03	17.26
5352.0	5382.0	14.27	21.51	24.12
5512.5	5542.5	13.67	17.25	17.98
5673.0	5703.0	12.14	15.96	16.80
5833.6	5863.6	8.83	14.51	15.74
5994.1	6024.1	9.27	13.94	15.63
6154.6	6184.6	8.78	13.86	15.85
6315.1	6345.1	8.55	15.68	16.89
6475.6	6505.6	10.37	15.27	17.42
6636.2	6666.2	10.96	15.48	16.82
6796.7	6826.7	13.43	15.93	17.61
6957.2	6987.2	16.02	17.85	19.29
7117.7	7147.7	21.09	18.38	20.02
7258.2	7288.2	17.10	17.72	18.47
7418.7	7448.7	19.64	19.12	20.06
7559.1	7589.1	17.03	18.83	19.95
7719.6	7749.6	17.63	19.34	19.80
7860.1	7890.1	17.59	19.31	19.70

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+9dBm (dB)		
		@LO (dBm)		
		+10	+13	+16
1660.0	1690.0	-8.30	-0.64	1.63
1820.5	1850.5	-2.12	2.21	2.16
1981.0	2011.0	2.03	2.59	2.44
2141.6	2171.6	2.54	2.55	2.44
2302.1	2332.1	2.59	2.42	2.40
2462.6	2492.6	2.64	2.34	2.25
2623.1	2653.1	2.34	1.94	1.88
2783.6	2813.6	2.26	1.80	1.65
2944.1	2974.1	2.00	1.60	1.49
3104.7	3134.7	1.65	1.39	1.43
3265.2	3295.2	1.31	1.12	1.12
3425.7	3455.7	1.11	0.92	0.88
3586.2	3616.2	0.94	0.66	0.58
3746.7	3776.7	0.97	0.65	0.55
3907.2	3937.2	1.11	0.56	0.42
4067.8	4097.8	1.29	0.57	0.32
4228.3	4258.3	1.20	0.57	0.39
4388.8	4418.8	0.92	0.58	0.40
4549.3	4579.3	0.88	0.48	0.40
4709.8	4739.8	0.81	0.29	0.22
4870.4	4900.4	1.01	0.33	0.07
5030.9	5060.9	1.65	1.10	0.68
5191.4	5221.4	2.24	2.13	1.78
5351.9	5381.9	0.61	1.28	1.30
5512.4	5542.4	0.90	0.96	1.13
5672.9	5702.9	0.37	0.93	0.90
5833.5	5863.5	-0.34	1.14	0.90
5994.0	6024.0	-0.07	1.32	0.93
6154.5	6184.5	-0.29	1.16	0.82
6315.0	6345.0	-0.48	1.32	1.03
6475.5	6505.5	0.18	1.09	0.98
6636.1	6666.1	0.27	1.02	1.00
6796.6	6826.6	1.07	1.09	1.07
6957.1	6987.1	1.08	0.85	0.85
7117.6	7147.6	0.69	0.74	0.71
7258.1	7288.1	0.85	0.74	0.78
7418.6	7448.6	0.38	0.50	0.58
7559.0	7589.0	0.46	0.52	0.61
7719.5	7749.5	0.45	0.55	0.67
7860.0	7890.0	0.41	0.55	0.73

Frequency Mixer

SKY-60MH+

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=4250MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=2489.89MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=6010.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+13			+13			+13
2570.0	1680.0	10.97	10.1	2500.0	5.15	3050.1	2960.0	10.56
2442.0	1808.0	8.82	90.1	2580.0	4.95	2969.6	3040.5	10.03
2314.0	1936.0	7.86	170.1	2660.0	5.00	2889.0	3121.1	9.62
2186.0	2064.0	7.26	250.1	2740.0	5.17	2808.5	3201.6	9.16
2058.0	2192.0	6.81	330.1	2820.0	5.29	2728.0	3282.1	8.59
1930.0	2320.0	6.49	410.1	2900.0	5.41	2647.5	3362.6	8.13
1802.0	2448.0	6.33	490.1	2980.0	5.62	2566.9	3443.2	7.81
1674.0	2576.0	6.22	570.1	3060.0	5.96	2486.4	3523.7	7.58
1546.0	2704.0	6.31	650.1	3140.0	5.89	2405.9	3604.2	7.41
1418.0	2832.0	6.45	730.1	3220.0	5.86	2325.3	3684.8	7.26
1290.0	2960.0	6.87	810.1	3300.0	5.85	2244.8	3765.3	7.13
1162.0	3088.0	6.96	890.1	3380.0	5.83	2164.3	3845.8	7.16
1034.0	3216.0	6.73	970.1	3460.0	5.89	2083.7	3926.4	7.26
906.0	3344.0	6.42	1050.1	3540.0	5.87	2003.2	4006.9	7.40
778.0	3472.0	6.31	1130.1	3620.0	5.69	1922.7	4087.4	7.34
650.0	3600.0	6.21	1210.1	3700.0	5.54	1842.2	4167.9	7.10
522.0	3728.0	6.18	1290.1	3780.0	5.49	1761.6	4248.5	7.11
394.0	3856.0	6.25	1370.1	3860.0	5.57	1681.1	4329.0	7.27
266.0	3984.0	6.29	1450.1	3940.0	5.61	1600.6	4409.5	7.63
138.0	4112.0	6.26	1530.1	4020.0	5.65	1520.0	4490.1	8.25
10.0	4240.0	6.45	1610.1	4100.0	5.54	1439.5	4570.6	8.68
141.1	4391.1	6.48	1690.1	4180.0	5.47	1359.0	4651.1	8.85
294.1	4544.1	6.86	1770.1	4260.0	5.38	1278.4	4731.7	8.63
447.1	4697.1	6.88	1850.1	4340.0	5.25	1197.9	4812.2	8.14
622.0	4872.0	6.38	1930.1	4420.0	5.37	1117.4	4892.7	7.70
775.0	5025.0	6.47	2010.1	4500.0	5.56	1036.9	4973.2	7.50
949.9	5199.9	7.09	2090.1	4580.0	5.67	956.3	5053.8	7.39
1102.9	5352.9	7.28	2170.1	4660.0	5.58	875.8	5134.3	7.28
1277.7	5527.7	7.16	2250.1	4740.0	5.55	795.3	5214.8	7.37
1430.7	5680.7	7.30	2330.1	4820.0	5.52	714.7	5295.4	7.39
1605.6	5855.6	6.87	2410.1	4900.0	5.47	634.2	5375.9	7.19
1758.6	6008.6	6.62	2490.1	4980.0	5.59	573.8	5436.3	6.88
1933.4	6183.4	6.66	2570.1	5060.0	5.66	493.3	5516.8	6.50
2086.4	6336.4	7.61	2650.1	5140.0	5.81	432.9	5577.2	6.45
2261.3	6511.3	8.28	2730.1	5220.0	6.34	352.4	5657.7	6.49
2414.3	6664.3	8.77	2810.1	5300.0	7.16	292.0	5718.1	6.45
2589.1	6839.1	9.38	2890.1	5380.0	7.92	211.4	5798.7	6.43
2742.1	6992.1	9.38	2970.1	5460.0	8.59	151.0	5859.1	6.55
2917.0	7167.0	8.93	3050.1	5540.0	9.33	70.5	5939.6	6.52
3070.0	7320.0	10.50	3150.1	5640.0	10.72	10.1	6000.0	6.71

Frequency Mixer

SKY-60MH+

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+10	+13	+16	+10	+13	+16
1690.1	29.31	31.13	29.45	10.39	11.54	14.51
1850.6	30.18	34.11	30.92	10.29	13.07	17.01
2011.1	36.70	33.89	31.09	11.85	16.23	20.60
2171.7	33.31	29.55	28.16	13.71	17.71	20.51
2332.2	29.05	26.71	26.15	14.16	16.68	17.53
2492.7	25.74	24.94	24.73	14.59	15.38	15.36
2653.2	24.26	23.85	23.49	13.32	13.73	13.48
2813.7	22.97	22.57	22.65	13.09	12.81	12.42
2974.2	22.83	22.84	23.09	13.30	12.59	12.06
3134.8	21.59	21.87	21.96	13.06	12.47	11.68
3295.3	22.67	22.89	23.21	13.50	12.42	11.73
3455.8	24.50	24.93	25.43	13.27	12.07	11.49
3616.3	25.71	26.50	27.43	13.78	12.52	11.83
3776.8	27.69	28.51	29.52	14.15	12.86	12.26
3937.3	32.27	33.94	35.15	14.49	13.52	12.86
4097.9	37.14	37.59	37.79	16.02	14.64	13.97
4258.4	37.57	36.00	34.94	17.19	15.73	15.07
4418.9	36.58	34.37	33.04	18.40	17.19	16.40
4579.4	39.56	36.10	33.42	20.62	18.96	18.02
4739.9	38.36	37.50	34.95	22.50	20.62	19.59
4900.5	33.67	33.94	32.29	25.23	22.56	21.28
5061.0	30.48	30.81	29.86	28.23	24.89	23.25
5221.5	28.61	29.13	28.79	30.68	26.45	24.60
5382.0	30.37	30.65	31.16	35.49	29.12	26.43
5542.5	29.52	29.24	29.60	38.42	30.48	27.51
5703.0	27.74	26.80	26.80	41.32	31.98	28.48
5863.6	25.27	23.95	24.07	45.00	32.95	28.86
6024.1	22.27	21.92	21.77	43.55	33.09	28.29
6184.6	19.58	19.97	19.93	41.08	32.29	27.85
6345.1	17.43	18.24	18.66	37.92	30.58	26.91
6505.6	15.48	16.57	17.16	34.23	28.36	25.41
6666.2	13.59	14.93	15.47	31.48	27.31	24.64
6826.7	12.41	13.72	14.31	29.36	25.67	23.50
6987.2	11.86	13.30	14.03	27.50	24.67	22.78
7147.7	11.00	12.80	13.68	25.04	24.69	22.42
7288.2	11.21	12.92	13.94	25.88	24.00	22.04
7448.7	11.22	12.92	14.43	25.89	23.62	22.27
7589.1	11.88	13.52	15.06	26.08	23.91	22.71
7749.6	13.16	14.56	15.78	25.98	24.25	23.21
7890.1	14.07	14.93	15.76	26.24	24.57	23.62

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+10	+13	+16
1660.1	1690.1	13.92	15.67	15.82
1820.6	1850.6	16.44	21.52	19.31
1981.1	2011.1	22.17	22.78	20.46
2141.7	2171.7	18.34	17.17	16.31
2302.2	2332.2	15.31	14.51	13.89
2462.7	2492.7	13.09	12.89	12.61
2623.2	2653.2	12.01	11.81	11.77
2783.7	2813.7	11.43	11.35	11.22
2944.2	2974.2	10.79	10.90	10.86
3104.8	3134.8	10.57	10.66	10.77
3265.3	3295.3	11.25	11.45	11.49
3425.8	3455.8	10.92	11.23	11.51
3586.3	3616.3	11.21	11.48	11.79
3746.8	3776.8	11.82	12.12	12.39
3907.3	3937.3	12.65	12.88	13.08
4067.9	4097.9	13.73	13.94	14.01
4228.4	4258.4	14.50	14.78	15.02
4388.9	4418.9	15.06	15.44	15.58
4549.4	4579.4	15.71	16.02	16.14
4709.9	4739.9	16.62	16.65	16.86
4870.5	4900.5	17.64	17.67	17.75
5031.0	5061.0	18.74	18.83	18.91
5191.5	5221.5	20.04	20.23	20.40
5352.0	5382.0	20.61	20.84	20.93
5512.5	5542.5	22.21	22.19	22.20
5673.0	5703.0	24.02	24.03	23.80
5833.6	5863.6	26.43	26.19	25.72
5994.1	6024.1	28.93	28.37	27.44
6154.6	6184.6	30.25	30.17	28.69
6315.1	6345.1	27.34	28.70	27.81
6475.6	6505.6	23.70	24.66	24.30
6636.2	6666.2	20.86	21.97	21.89
6796.7	6826.7	18.78	19.93	19.79
6957.2	6987.2	17.35	18.30	18.38
7117.7	7147.7	16.27	17.28	17.67
7258.2	7288.2	15.75	16.42	16.81
7418.7	7448.7	15.37	16.08	16.41
7559.1	7589.1	15.39	15.89	16.21
7719.6	7749.6	15.91	16.32	16.58
7860.1	7890.1	16.59	16.97	17.14

Frequency Mixer

SKY-60MH+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=6000MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+10	+13	+16		+10	+13	+16		+10	+13	+16
1660.1	1690.1	14.87	6.24	4.09	1690.1	23.49	18.30	10.62	10.0	2.48	1.05	1.27
1820.6	1850.6	8.20	3.78	3.04	1850.6	19.11	10.25	7.76	90.5	2.23	1.02	1.33
1981.1	2011.1	3.68	2.60	2.33	2011.1	10.31	6.49	6.81	171.1	2.22	1.04	1.32
2141.7	2171.7	2.69	2.20	1.92	2171.7	6.32	5.28	6.05	251.6	2.26	1.03	1.30
2302.2	2332.2	2.24	1.90	1.69	2332.2	4.73	4.59	5.42	332.1	2.29	1.04	1.27
2462.7	2492.7	1.88	1.65	1.48	2492.7	3.76	4.24	5.20	412.7	2.35	1.07	1.23
2623.2	2653.2	1.70	1.55	1.45	2653.2	3.03	3.64	4.57	493.2	2.47	1.13	1.16
2783.7	2813.7	1.58	1.43	1.36	2813.7	2.58	3.40	4.40	573.8	2.54	1.17	1.14
2944.2	2974.2	1.52	1.37	1.32	2974.2	2.42	3.31	4.33	654.3	2.62	1.21	1.12
3104.8	3134.8	1.59	1.47	1.41	3134.8	2.31	3.14	4.03	734.8	2.75	1.28	1.14
3265.3	3295.3	1.81	1.62	1.47	3295.3	2.36	3.22	4.10	815.4	2.63	1.35	1.17
3425.8	3455.8	2.15	2.03	1.87	3455.8	2.42	3.22	4.11	895.9	2.73	1.42	1.22
3586.3	3616.3	2.34	2.20	2.03	3616.3	2.48	3.18	3.97	976.4	2.79	1.48	1.27
3746.8	3776.8	2.41	2.26	2.12	3776.8	2.55	3.24	4.07	1057.0	2.87	1.54	1.34
3907.3	3937.3	2.39	2.17	2.04	3937.3	2.52	3.17	4.01	1137.5	2.97	1.64	1.41
4067.9	4097.9	2.38	2.13	2.05	4097.9	2.88	3.34	4.03	1218.1	3.15	1.76	1.49
4228.4	4258.4	2.56	2.15	2.01	4258.4	3.29	3.67	4.33	1298.6	3.34	1.86	1.55
4388.9	4418.9	2.96	2.46	2.25	4418.9	3.69	4.01	4.66	1379.1	3.42	1.89	1.57
4549.4	4579.4	3.31	2.85	2.54	4579.4	4.15	4.35	4.87	1459.7	3.30	1.87	1.56
4709.9	4739.9	3.33	3.03	2.73	4739.9	4.60	4.63	5.23	1540.2	3.13	1.80	1.52
4870.5	4900.5	3.31	2.93	2.63	4900.5	5.39	4.95	5.39	1620.7	2.98	1.74	1.50
5031.0	5061.0	3.19	2.77	2.38	5061.0	7.08	5.93	6.03	1701.3	2.85	1.68	1.46
5191.5	5221.5	3.17	2.73	2.39	5221.5	8.05	6.32	6.46	1781.8	2.72	1.59	1.39
5352.0	5382.0	4.92	4.12	3.60	5382.0	10.75	6.97	6.56	1862.3	2.53	1.47	1.31
5512.5	5542.5	4.73	3.74	3.32	5542.5	11.69	7.31	6.71	1942.9	2.37	1.38	1.26
5673.0	5703.0	5.17	3.54	3.15	5703.0	12.99	7.44	6.53	2023.4	2.15	1.28	1.22
5833.6	5863.6	4.88	2.99	2.66	5863.6	14.74	7.97	6.44	2104.0	1.95	1.20	1.20
5994.1	6024.1	4.25	2.67	2.34	6024.1	14.03	7.60	6.07	2164.4	1.87	1.15	1.18
6154.6	6184.6	3.86	2.46	2.11	6184.6	13.29	7.31	5.68	2244.9	1.70	1.09	1.20
6315.1	6345.1	3.34	2.11	1.77	6345.1	12.35	6.83	5.19	2305.3	1.54	1.15	1.30
6475.6	6505.6	2.99	2.15	1.85	6505.6	10.50	5.75	4.47	2385.8	1.40	1.23	1.40
6636.2	6666.2	2.90	2.16	1.90	6666.2	9.08	5.16	3.95	2446.2	1.34	1.32	1.49
6796.7	6826.7	2.47	1.95	1.81	6826.7	7.47	4.29	3.33	2526.8	1.37	1.55	1.75
6957.2	6987.2	2.28	1.85	1.79	6987.2	5.85	3.47	2.71	2587.2	1.49	1.72	1.95
7117.7	7147.7	2.49	2.00	1.88	7147.7	5.68	3.13	2.29	2667.7	1.71	1.92	2.17
7258.2	7288.2	2.59	2.38	2.29	7288.2	4.16	2.47	1.90	2728.1	1.96	2.15	2.44
7418.7	7448.7	2.88	2.75	2.65	7448.7	3.46	2.05	1.62	2808.7	2.37	2.49	2.81
7559.1	7589.1	2.99	3.01	2.88	7589.1	2.61	1.66	1.46	2869.1	2.65	2.70	3.01
7719.6	7749.6	3.12	3.16	3.00	7749.6	1.99	1.46	1.51	2949.6	3.21	3.07	3.35
7860.1	7890.1	3.07	2.97	2.79	7890.1	1.81	1.49	1.65	3010.0	3.89	3.60	3.87

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	+9	21	17	48	23	---	---	---	---	---
1	-	9	+0	32	26	27	41	54	---	---	---	---
2	79	53	70	48	53	56	53	43	54	---	---	---
3	>90	65	66	66	59	68	65	70	66	>77	---	---
4	>90	77	>77	>77	>77	>77	>77	>77	>77	71	>77	---
5	>90	>77	>77	>77	>77	>77	>77	>77	>77	>77	>77	>77
6	---	---	>77	>77	>77	>77	>77	>77	>77	>77	>77	>77
7	---	---	---	>77	>77	>77	>77	>77	>77	>77	>77	>77
8	---	---	---	---	>77	>77	>77	>77	>77	>77	>77	>77
9	---	---	---	---	---	>77	>77	>77	>77	>77	>77	>77
10	---	---	---	---	---	---	>77	>77	>77	>77	>77	>77
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

Test conditions:

RF IN: 4250 MHz; -6.00 dBm.
LO IN: 4280 MHz; +13.00 dBm
IF OUT: 30 MHz; -12.58 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	1	30	29	48	43	---	---	---	---	---
1	-	9	+0	35	27	31	46	53	---	---	---	---
2	59	42	50	39	46	51	46	41	50	---	---	---
3	81	46	48	46	48	50	48	52	53	83	---	---
4	>90	56	86	68	63	65	56	61	63	50	75	---
5	>90	79	77	63	68	62	56	66	59	69	65	73
6	---	---	76	75	80	82	76	72	69	70	81	64
7	---	---	---	>87	>87	>87	84	78	70	82	70	80
8	---	---	---	---	>87	>87	>87	>87	>87	81	84	83
9	---	---	---	---	---	>87	>87	>87	>87	85	83	>87
10	---	---	---	---	---	---	>87	>87	>87	>87	>87	85
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:

RF IN: 4250 MHz; 4.00 dBm.
LO IN: 4280 MHz; +13.00 dBm
IF OUT: 30 MHz; -2.68 dBm

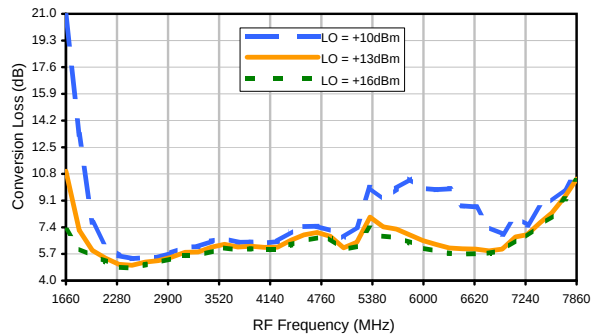
- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

Frequency Mixer

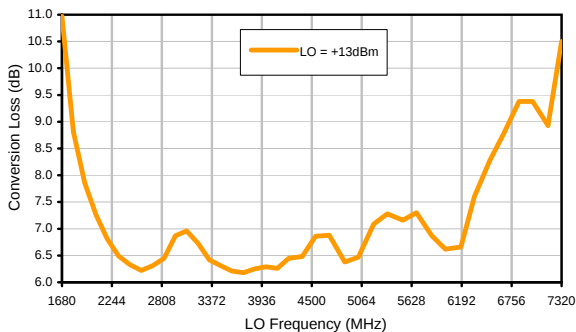
SKY-60MH+

Typical Performance Curves

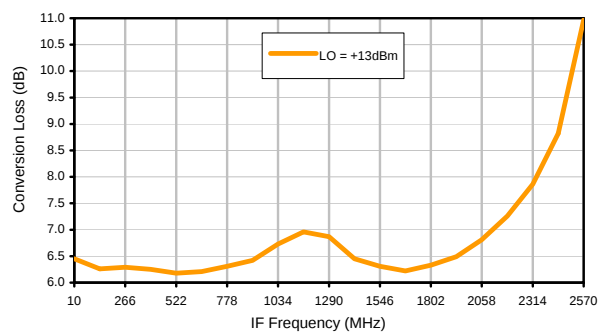
Conversion Loss @ IF=30MHz



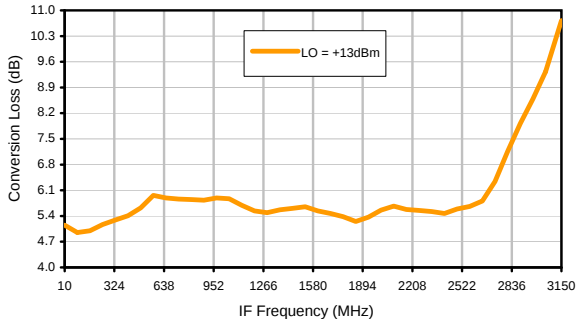
Conversion Loss vs. LO @ RF=4250MHz



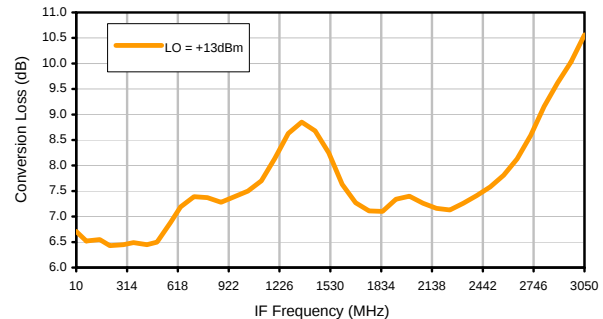
Conversion Loss vs. IF @ RF=4250MHz



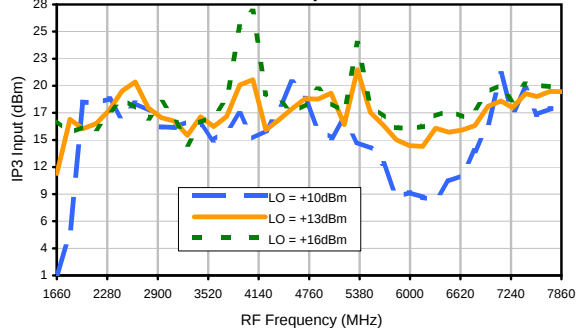
Conversion Loss vs. IF @ RF=2489.89MHz



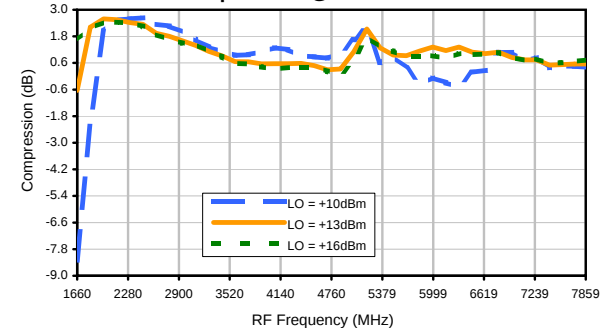
Conversion Loss vs. IF @ RF=6010.1MHz



IP3 Input



Compression @ RF IN=+9dBm



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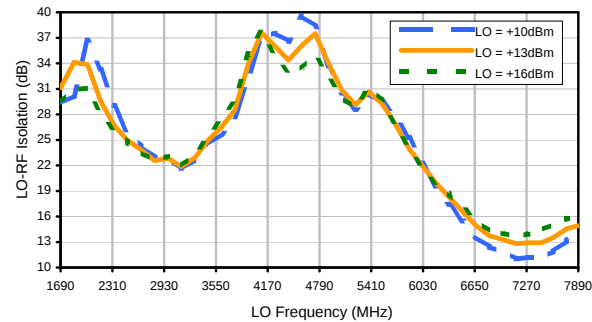
REV. X3
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Page 1 of 3

Frequency Mixer

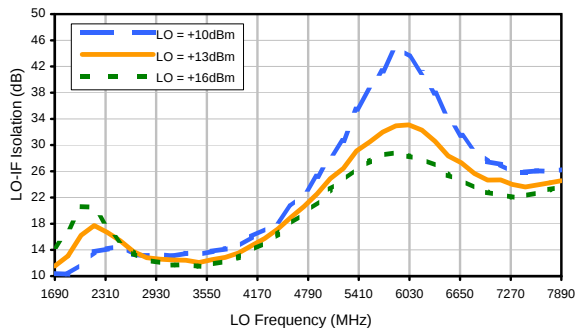
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Typical Performance Curves

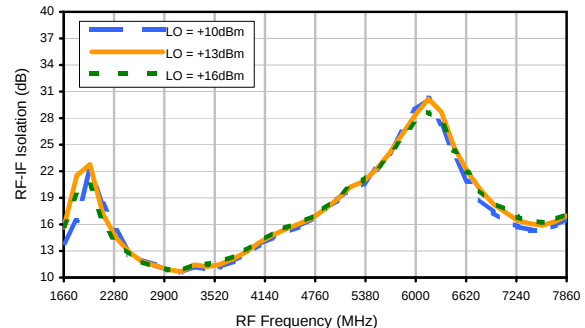
LO-RF Isolation



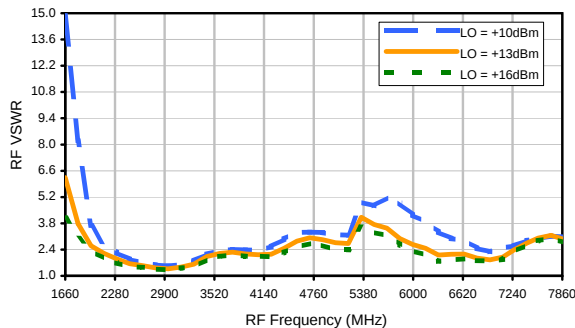
LO-IF Isolation



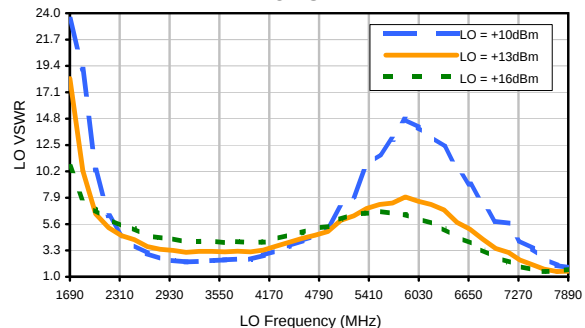
RF-IF Isolation



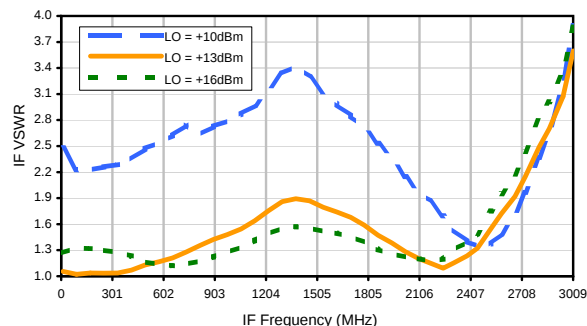
RF VSWR



LO VSWR



IF VSWR



Frequency Mixer

SKY-60MH+

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	+9	21	17	48	23	---	---	---	---	---
1	-	9	+0	32	26	27	41	54	---	---	---	---
2	79	53	70	48	53	56	53	43	54	---	---	---
3	>90	65	66	66	59	68	65	70	66	>77	---	---
4	>90	77	>77	>77	>77	>77	>77	>77	>77	71	>77	---
5	>90	>77	>77	>77	>77	>77	>77	>77	>77	>77	>77	>77
6	---	---	>77	>77	>77	>77	>77	>77	>77	>77	>77	>77
7	---	---	---	>77	>77	>77	>77	>77	>77	>77	>77	>77
8	---	---	---	---	>77	>77	>77	>77	>77	>77	>77	>77
9	---	---	---	---	---	>77	>77	>77	>77	>77	>77	>77
10	---	---	---	---	---	---	>77	>77	>77	>77	>77	>77
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

Test conditions: RF IN: 4250 MHz; -6.00 dBm.
LO IN: 4280 MHz; +13.00 dBm
IF OUT: 30 MHz; -12.58 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	1	30	29	48	43	---	---	---	---	---
1	-	9	+0	35	27	31	46	53	---	---	---	---
2	59	42	50	39	46	51	46	41	50	---	---	---
3	81	46	48	46	48	50	48	52	53	83	---	---
4	>90	56	86	68	63	65	56	61	63	50	75	---
5	>90	79	77	63	68	62	56	66	59	69	65	73
6	---	---	76	75	80	82	76	72	69	70	81	64
7	---	---	---	>87	>87	>87	84	78	70	82	70	80
8	---	---	---	---	>87	>87	>87	>87	>87	81	84	83
9	---	---	---	---	---	>87	>87	>87	>87	85	83	>87
10	---	---	---	---	---	---	>87	>87	>87	>87	>87	85
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 4250 MHz; 4.00 dBm.
LO IN: 4280 MHz; +13.00 dBm
IF OUT: 30 MHz; -2.68 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.

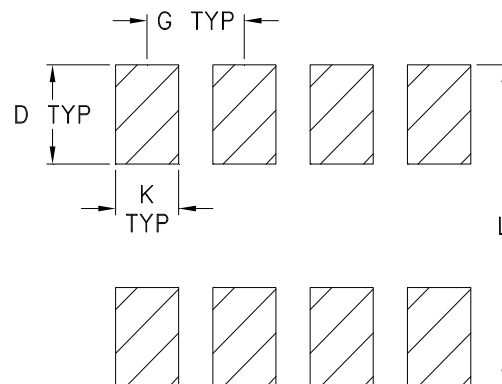
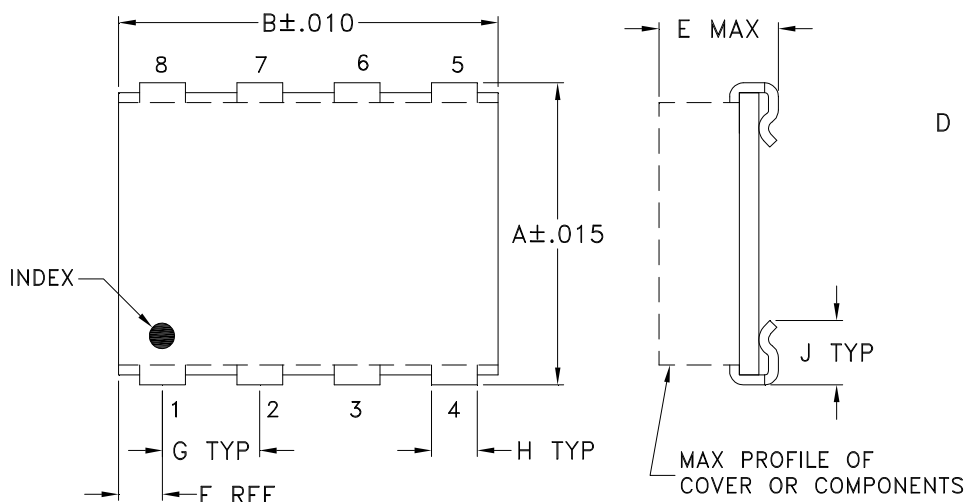


Outline Dimensions

BJ293

BJ398

PCB Land Pattern



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

CASE#	A	B	C	D	E	F	G	H	J	K	L	WT. GRAMS
BJ293	.395 (10.03)	.500 (12.70)	-- --	.100 (2.54)	.230 (5.84)	.100 (2.54)	.100 (2.54)	.047 (1.19)	.065 (1.65)	.065 (1.65)	.425 (10.80)	.80
BJ398	.305 (7.75)	.390 (9.91)	-- --	.100 (2.54)	.105 (2.67)	.045 (1.14)	.100 (2.54)	.047 (1.19)	.065 (1.65)	.065 (1.65)	.325 (8.26)	.20

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

Notes:

- Case material: Plastic.
- Base material: Printed wiring laminate.
- 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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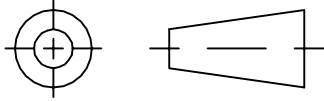
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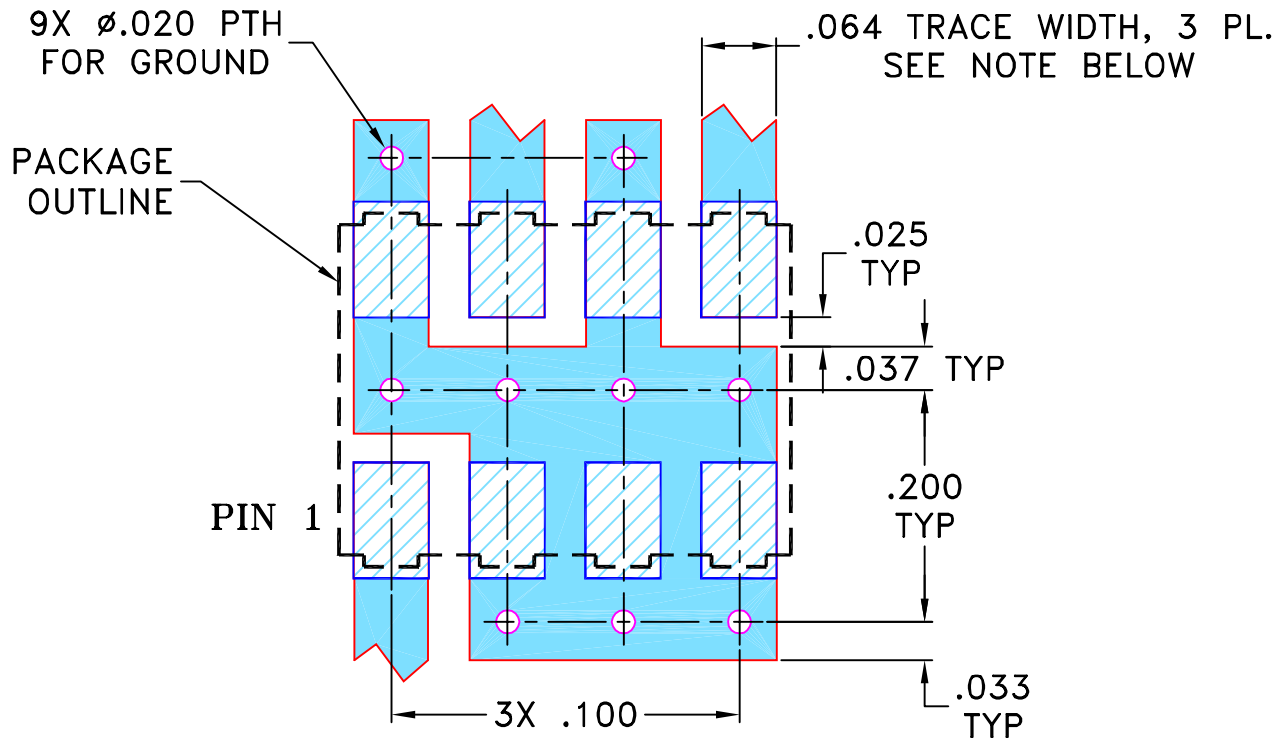
THIRD ANGLE PROJECTION



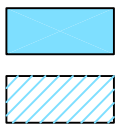
REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M88233	NEW RELEASE	08/06/03	AV	WL
A	M102713	UPDATED NOTES, ADDED "...WITH SMOBC"	01/16/06	GT	IL

**SUGGESTED MOUNTING CONFIGURATION
FOR BJ398 CASE STYLE, "je/hp" PIN CONNECTIONS**

**NOTES:**

1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030" $\pm$.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.



SOLID BLUE DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
HATCHED BLUE DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

TOLERANCES ON:
2 PL DECIMALS $\pm$
3 PL DECIMALS $\pm$.005
ANGLES $\pm$
FRACTIONS $\pm$

INITIALS

DATE

DRAWN

AV

07/28/03

CHECKED

IL

08/06/03

APPROVED

WL

08/06/03

**Mini-Circuits®**13 Neptune Avenue
Brooklyn NY 11235**PL, je/hp, BJ398, SKY, TB-11**SIZE
ACODE IDENT
15542DRAWING NO:
98-PL-056REV:
A

FILE: 98PL056

SCALE: 6:1

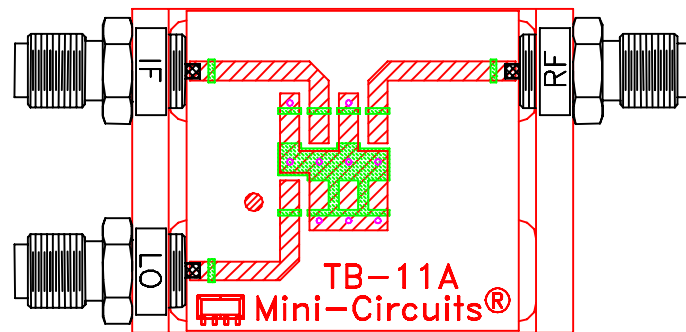
SHEET: 1 OF 1

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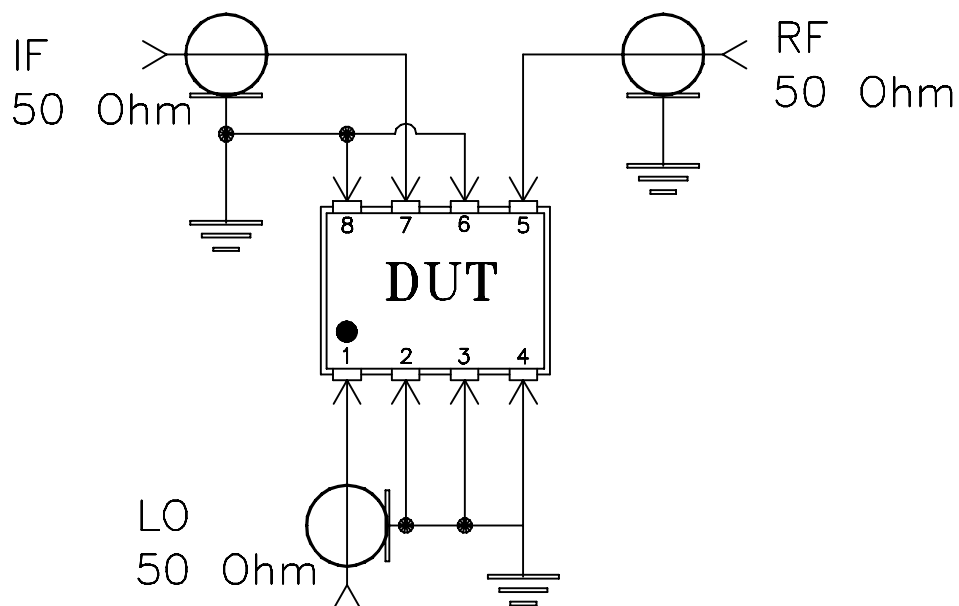
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ASHEETA1.DWG REV:A DATE:01/12/95

Evaluation Board and Circuit



TB-11



Schematic Diagram

Notes:

1. 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