

Surface Mount Frequency Mixer

Level 13 (LO Power +13 dBm) 5 to 1500 MHz

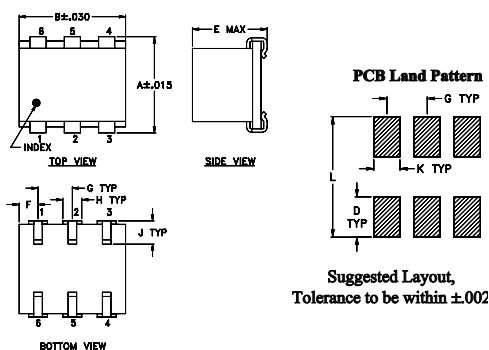
Maximum Ratings

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	6
RF	3
IF	2
GROUND	1,4,5

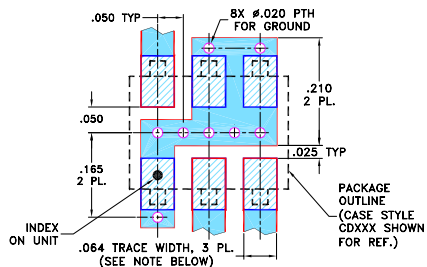
Outline Drawing



Outline Dimensions (inch)

A	B	C	D	E	F	G
.280	.310	--	.100	.225	.055	.100
7.11	7.87	--	2.54	5.72	1.40	2.54
H	J	K	L	wt		
.047	.065	.065	.300	grams		
1.19	1.65	1.65	7.62	0.45		

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

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, 5.7 dB typ.
- miniature surface mount
- J-leads for strain relief and excellent solderability

Applications

- up & down converters for receivers & transmitters
- satellite distribution
- cellular/ISM/GSM

JMS-5MH+



Generic photo used for illustration purposes only

CASE STYLE: BH292

+RoHS Compliant

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

Electrical Specifications

FREQUENCY (MHz)		CONVERSION LOSS (dB)				LO-RF ISOLATION (dB)						LO-IF ISOLATION (dB)						IP3 at center band (dBm)
LO/RF	IF	Mid-Band			Total Range Max.	L	M			U	L	M			U			
		$\bar{X}$	σ	Max.			Typ.	Min.	Typ.			Min.	Typ.	Min.		Typ.	Min.	
		f_L - f_U																
5-1500	DC-1000	5.7	.10	8.0	9.5	67	40	57	25	35	20	60	40	35	18	15	8	19

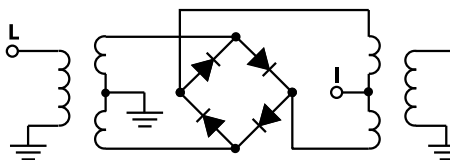
1 dB COMP: +9 dBm typ.
Phase detection, positive polarity

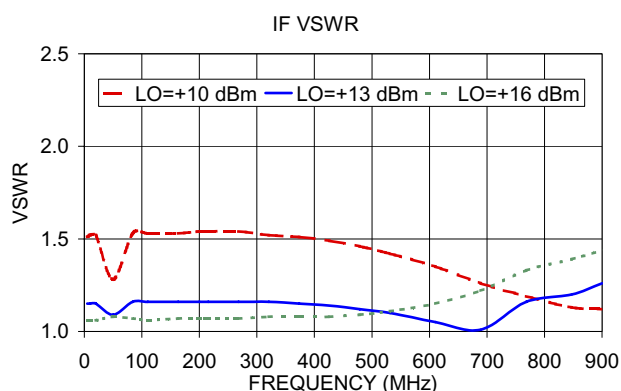
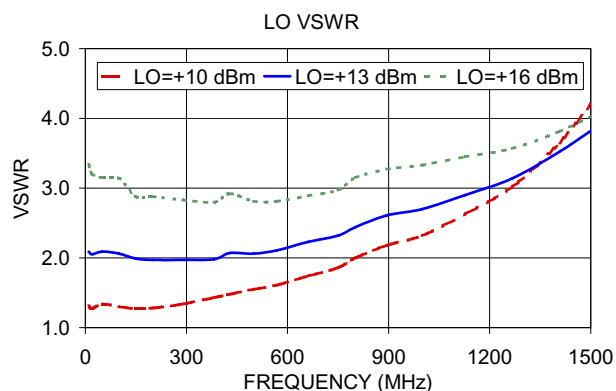
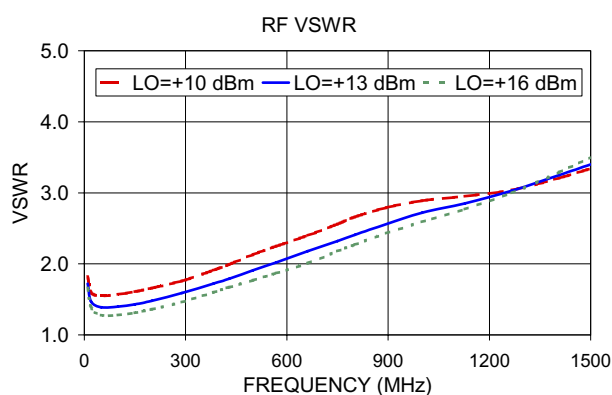
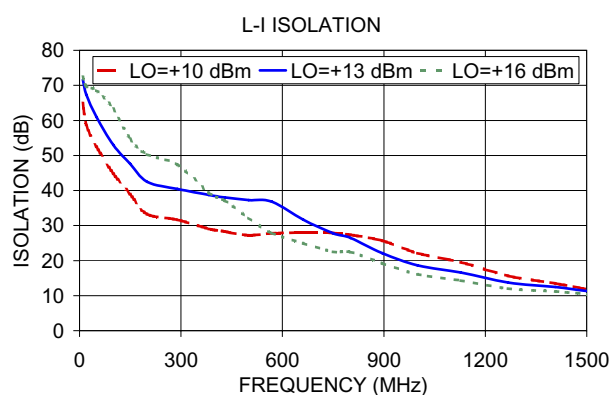
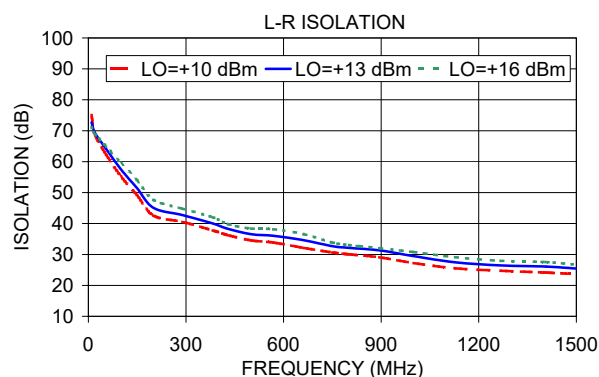
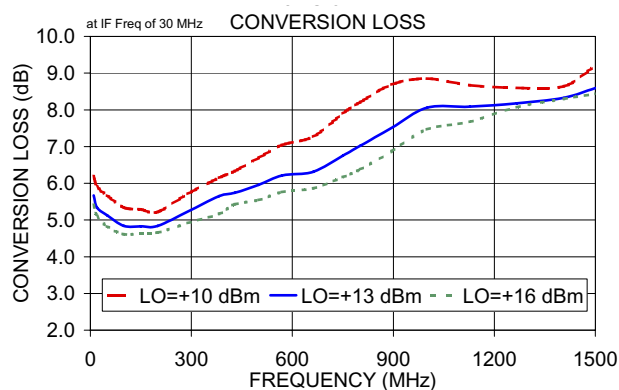
L = low range [f_L to $10 f_L$]
M = mid range [$10 f_L$ to $f_U/2$]
U = upper range [$f_U/2$ to f_U]

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 +13dBm	LO +13dBm	LO +13dBm	LO +13dBm	LO +13dBm
10.00	40.00	5.67	72.72	71.62	1.72	2.09
20.00	50.00	5.34	69.32	67.42	1.47	2.05
50.00	80.00	5.13	64.80	61.00	1.39	2.09
100.00	70.00	4.84	57.53	52.99	1.40	2.06
149.69	119.69	4.83	51.47	47.61	1.43	1.99
200.00	170.00	4.84	45.11	42.45	1.48	1.97
289.38	259.38	5.23	42.74	40.45	1.59	1.97
382.50	352.50	5.65	40.00	38.72	1.72	1.98
429.06	399.06	5.74	38.30	38.06	1.79	2.07
500.00	470.00	5.96	36.54	37.26	1.91	2.06
568.75	538.75	6.21	36.02	36.79	2.02	2.11
661.88	631.88	6.31	34.63	31.64	2.18	2.23
750.00	720.00	6.75	32.69	27.81	2.32	2.32
801.56	771.56	7.02	32.12	26.48	2.41	2.44
894.69	864.69	7.51	31.35	22.10	2.56	2.61
1000.00	970.00	8.06	29.45	18.64	2.72	2.70
1127.50	1097.50	8.09	27.46	16.61	2.85	2.90
1267.19	1237.19	8.18	26.47	13.75	3.03	3.14
1406.88	1376.88	8.33	26.08	12.44	3.25	3.52
1500.00	1470.00	8.59	25.44	11.30	3.40	3.82

Electrical Schematic





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Frequency Mixer

JMS-5MH+

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=+9dBm (dB)		
		@LO (dBm)					@LO (dBm)					@LO (dBm)		
		+10	+13	+16			+10	+13	+16			+10	+13	+16
10.1	40.1	6.11	5.70	5.49	10.1	40.1	20.46	23.85	28.59	10.1	40.1	1.33	1.11	0.94
50.1	80.1	5.81	5.42	5.22	50.1	80.1	20.78	21.92	19.46	50.1	80.1	1.68	1.41	1.29
90.1	120.1	5.70	5.32	5.15	90.1	120.1	19.63	17.40	18.48	90.1	120.1	1.73	1.46	1.36
150.1	180.1	5.73	5.41	5.24	150.1	180.1	15.25	16.55	19.39	150.1	180.1	1.80	1.51	1.42
190.1	220.1	5.80	5.47	5.29	190.1	220.1	14.94	17.29	20.14	190.1	220.1	1.82	1.58	1.47
250.1	280.1	5.90	5.56	5.35	250.1	280.1	14.92	17.63	20.83	250.1	280.1	1.87	1.65	1.61
290.1	320.1	5.96	5.59	5.38	290.1	320.1	15.40	18.52	21.94	290.1	320.1	1.92	1.69	1.68
350.1	380.1	6.09	5.67	5.43	350.1	380.1	15.80	19.11	22.51	350.1	380.1	2.06	1.75	1.84
390.1	420.1	6.25	5.79	5.52	390.1	420.1	15.85	19.59	24.64	390.1	420.1	2.05	1.82	1.82
450.1	480.1	6.32	5.91	5.64	450.1	480.1	17.06	19.76	23.14	450.1	480.1	2.27	2.02	1.95
490.1	520.1	6.34	5.88	5.60	490.1	520.1	17.55	21.57	25.22	490.1	520.1	2.37	2.11	2.08
550.1	580.1	6.57	5.96	5.56	550.1	580.1	15.76	20.61	24.61	550.1	580.1	2.41	2.29	2.20
590.1	620.1	6.73	6.10	5.69	590.1	620.1	15.90	19.30	23.07	590.1	620.1	2.36	2.23	2.18
650.1	680.1	6.95	6.34	5.92	650.1	680.1	16.92	18.77	20.90	650.1	680.1	2.32	2.16	2.16
690.1	720.1	7.08	6.40	5.96	690.1	720.1	16.77	18.33	20.17	690.1	720.1	2.38	2.29	2.24
750.1	780.1	7.38	6.57	6.08	750.1	780.1	15.81	18.00	19.54	750.1	780.1	2.14	2.22	2.22
790.1	820.1	7.51	6.70	6.21	790.1	820.1	14.99	17.14	18.77	790.1	820.1	1.93	2.12	2.07
850.1	880.1	7.56	6.83	6.34	850.1	880.1	14.33	15.83	17.80	850.1	880.1	1.79	1.88	1.91
890.1	920.1	7.40	6.77	6.30	890.1	920.1	14.43	15.44	17.12	890.1	920.1	1.74	1.73	1.77
950.1	980.1	7.35	6.86	6.42	950.1	980.1	14.80	14.88	16.50	950.1	980.1	1.64	1.49	1.53
990.1	1020.1	7.34	6.94	6.54	990.1	1020.1	14.95	14.70	15.81	990.1	1020.1	1.54	1.35	1.36
1050.1	1080.1	7.31	6.96	6.67	1050.1	1080.1	15.99	14.85	15.27	1050.1	1080.1	1.52	1.23	1.16
1090.1	1120.1	7.26	6.93	6.70	1090.1	1120.1	17.63	15.66	15.56	1090.1	1120.1	1.55	1.15	1.07
1150.1	1180.1	7.25	6.90	6.69	1150.1	1180.1	18.99	18.22	16.95	1150.1	1180.1	1.53	1.10	0.98
1190.1	1220.1	7.25	6.87	6.65	1190.1	1220.1	18.28	19.17	18.71	1190.1	1220.1	1.58	1.10	0.98
1250.1	1280.1	7.22	6.78	6.55	1250.1	1280.1	16.94	18.02	20.29	1250.1	1280.1	2.12	1.48	1.27
1290.1	1320.1	7.26	6.75	6.51	1290.1	1320.1	16.13	17.08	19.83	1290.1	1320.1	1.85	1.23	0.95
1350.1	1380.1	7.33	6.75	6.50	1350.1	1380.1	15.44	16.75	19.68	1350.1	1380.1	1.93	1.23	0.92
1390.1	1420.1	7.48	6.78	6.53	1390.1	1420.1	15.47	16.70	20.01	1390.1	1420.1	2.08	1.25	0.91
1450.1	1480.1	7.63	6.83	6.60	1450.1	1480.1	15.57	17.55	21.38	1450.1	1480.1	2.11	1.25	0.91
1490.1	1520.1	7.91	6.92	6.65	1490.1	1520.1	15.49	18.40	21.29	1490.1	1520.1	2.09	1.27	0.86
1550.1	1580.1	8.39	7.19	6.85	1550.1	1580.1	15.44	19.39	23.10	1550.1	1580.1	1.97	1.28	0.86
1590.1	1620.1	9.08	7.46	7.04	1590.1	1620.1	15.54	19.94	22.87	1590.1	1620.1	1.83	1.37	0.97
1650.1	1680.1	10.17	7.86	7.29	1650.1	1680.1	18.51	20.19	24.05	1650.1	1680.1	1.31	1.36	0.95
1690.1	1720.1	11.31	8.14	7.42	1690.1	1720.1	16.17	19.36	23.45	1690.1	1720.1	0.73	1.31	0.92
1750.1	1780.1	12.96	8.62	7.60	1750.1	1780.1	10.38	18.35	21.59	1750.1	1780.1	-0.29	1.25	0.90
1790.1	1820.1	14.46	8.95	7.69	1790.1	1820.1	7.53	17.64	20.07	1790.1	1820.1	-1.22	1.29	1.02
1850.1	1880.1	16.45	9.44	7.70	1850.1	1880.1	4.55	16.21	18.69	1850.1	1880.1	-2.77	1.16	1.05
1890.1	1920.1	17.95	9.84	7.77	1890.1	1920.1	2.89	15.53	17.86	1890.1	1920.1	-3.78	1.02	1.07
1950.1	1980.1	20.43	10.29	7.92	1950.1	1980.1	0.87	14.69	16.74	1950.1	1980.1	-5.58	0.78	1.09

Frequency Mixer

JMS-5MH+

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=750.1MHz (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)=1500.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+13			+13			+13
740.0	10.1	6.51	10.0	20.1	5.83	1000.0	500.1	8.71
721.3	28.8	6.49	30.0	40.1	5.70	979.8	520.3	8.55
702.6	47.5	6.46	50.0	60.1	5.76	959.6	540.5	8.43
683.8	66.3	6.54	70.0	80.1	5.77	939.4	560.7	8.31
665.1	85.0	6.58	90.0	100.1	5.75	919.2	580.9	8.20
646.4	103.7	6.62	110.0	120.1	5.72	899.0	601.1	8.13
627.7	122.4	6.63	130.0	140.1	5.69	878.8	621.3	8.06
609.0	141.1	6.58	150.0	160.1	5.74	858.6	641.5	8.01
590.3	159.8	6.59	170.0	180.1	5.75	838.4	661.7	7.92
571.5	178.6	6.61	190.0	200.1	5.75	818.2	681.9	7.84
552.8	197.3	6.58	210.0	220.1	5.76	798.0	702.1	7.77
534.1	216.0	6.55	230.0	240.1	5.75	777.8	722.3	7.67
515.4	234.7	6.51	250.0	260.1	5.83	757.6	742.5	7.66
496.7	253.4	6.50	270.0	280.1	5.85	737.3	762.8	7.41
477.9	272.2	6.48	290.0	300.1	5.87	717.1	783.0	7.39
459.2	290.9	6.50	310.0	320.1	5.89	696.9	803.2	7.41
440.5	309.6	6.47	330.0	340.1	5.90	676.7	823.4	7.37
421.8	328.3	6.43	350.0	360.1	5.94	656.5	843.6	7.37
403.1	347.0	6.39	370.0	380.1	5.97	636.3	863.8	7.35
384.4	365.7	6.39	390.0	400.1	6.00	616.1	884.0	7.32
365.6	384.5	6.28	430.0	440.1	6.05	575.7	924.4	7.25
346.9	403.2	6.31	450.0	460.1	6.11	555.5	944.6	7.24
328.2	421.9	6.32	490.0	500.1	6.14	515.1	985.0	7.20
309.5	440.6	6.32	510.0	520.1	6.14	494.9	1005.2	7.24
290.8	459.3	6.35	550.0	560.1	6.25	454.5	1045.6	7.27
272.1	478.0	6.33	570.0	580.1	6.28	434.3	1065.8	7.31
253.3	496.8	6.35	610.0	620.1	6.37	393.9	1106.2	7.29
234.6	515.5	6.32	630.0	640.1	6.45	373.7	1126.4	7.30
215.9	534.2	6.36	670.0	680.1	6.55	333.3	1166.8	7.32
197.2	552.9	6.36	690.0	700.1	6.62	313.1	1187.0	7.31
178.5	571.6	6.41	730.0	740.1	6.78	272.7	1227.4	7.28
159.7	590.4	6.46	750.0	760.1	6.85	252.4	1247.7	7.27
141.0	609.1	6.46	790.0	800.1	6.99	212.0	1288.1	7.18
122.3	627.8	6.51	810.0	820.1	7.06	191.8	1308.3	7.17
103.6	646.5	6.52	850.0	860.1	7.30	151.4	1348.7	7.09
84.9	665.2	6.60	870.0	880.1	7.42	131.2	1368.9	7.03
66.2	683.9	6.58	910.0	920.1	7.66	90.8	1409.3	6.97
47.4	702.7	6.60	930.0	940.1	7.81	70.6	1429.5	6.94
28.7	721.4	6.57	970.0	980.1	8.05	30.2	1469.9	6.87
10.0	740.1	6.74	990.0	1000.1	8.17	10.0	1490.1	6.93

REV. X2
JMS-5MH+
100817
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The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see



Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+10	+13	+16	+10	+13	+16
10.1	77.68	72.68	69.95	59.40	64.50	67.73
50.1	68.43	66.92	62.98	47.18	58.70	59.74
90.1	62.15	66.21	61.83	41.15	49.70	59.03
150.1	56.00	65.14	60.20	36.71	45.02	48.03
190.1	52.59	62.46	61.05	34.57	42.61	45.02
250.1	50.13	61.32	60.11	32.85	40.66	39.86
290.1	48.83	60.09	59.18	32.00	39.39	38.22
350.1	47.33	59.40	55.65	31.35	37.70	34.67
390.1	46.24	57.12	54.87	31.25	36.68	33.14
450.1	45.05	55.13	53.69	31.33	34.50	30.56
490.1	44.21	53.75	51.39	31.29	33.65	29.56
550.1	43.51	51.44	49.41	31.36	31.46	27.35
590.1	42.94	49.52	47.17	31.48	30.61	26.32
650.1	42.76	49.06	44.95	32.51	28.51	24.87
690.1	42.32	50.44	44.89	33.05	27.29	23.93
750.1	40.79	54.79	46.89	31.38	24.80	21.86
790.1	39.07	50.14	50.96	29.29	23.49	20.82
850.1	36.47	42.76	52.94	26.92	21.83	19.49
890.1	35.33	40.02	47.36	25.67	21.09	18.75
950.1	34.36	38.41	43.07	24.26	20.07	17.83
990.1	33.86	37.85	41.86	23.50	19.54	17.38
1050.1	33.05	36.91	41.04	22.47	18.94	16.95
1090.1	32.41	36.04	39.91	21.89	18.19	16.43
1150.1	31.81	35.27	38.99	20.84	17.56	15.63
1190.1	31.51	34.84	38.29	19.92	16.91	15.07
1250.1	31.12	34.36	37.59	18.29	15.92	14.19
1290.1	30.80	33.97	37.05	17.46	15.27	13.75
1350.1	30.37	33.40	36.17	16.25	14.40	13.06
1390.1	29.96	32.83	35.51	15.63	13.96	12.65
1450.1	29.23	31.91	34.40	14.68	13.11	12.15
1490.1	28.65	31.18	33.66	13.98	12.78	11.93
1550.1	27.93	30.21	32.64	13.28	12.35	11.52
1590.1	27.39	29.55	31.95	12.88	12.10	11.39
1650.1	26.56	28.45	30.64	12.43	11.82	11.12
1690.1	25.92	27.62	29.68	12.09	11.66	11.09
1750.1	25.24	26.81	28.75	11.79	11.47	10.86
1790.1	24.80	26.19	28.01	11.64	11.48	10.84
1850.1	24.28	25.48	27.22	11.44	11.38	10.83
1890.1	23.89	24.91	26.62	11.28	11.28	10.93
1950.1	23.36	24.44	26.11	11.04	11.23	10.99

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+10	+13	+16
10.1	40.1	54.72	48.14	51.94
50.1	80.1	40.62	39.56	38.96
90.1	120.1	36.03	35.49	34.81
150.1	180.1	32.98	32.31	31.73
190.1	220.1	31.84	31.00	30.57
250.1	280.1	30.82	30.01	29.49
290.1	320.1	30.70	29.73	29.20
350.1	380.1	29.99	29.26	28.76
390.1	420.1	29.12	28.55	28.04
450.1	480.1	28.29	27.82	27.49
490.1	520.1	27.06	26.75	26.41
550.1	580.1	24.77	24.72	24.52
590.1	620.1	23.23	23.22	23.19
650.1	680.1	21.68	21.59	21.54
690.1	720.1	21.17	21.14	21.17
750.1	780.1	20.94	21.02	21.12
790.1	820.1	20.80	21.05	21.25
850.1	880.1	20.37	20.97	21.42
890.1	920.1	20.01	20.74	21.31
950.1	980.1	19.38	20.09	20.82
990.1	1020.1	18.97	19.65	20.34
1050.1	1080.1	18.61	19.24	19.91
1090.1	1120.1	18.49	19.06	19.67
1150.1	1180.1	18.61	19.10	19.61
1190.1	1220.1	18.87	19.30	19.78
1250.1	1280.1	19.50	19.92	20.35
1290.1	1320.1	20.08	20.54	20.94
1350.1	1380.1	21.12	21.62	22.03
1390.1	1420.1	21.64	22.17	22.61
1450.1	1480.1	21.62	22.22	22.76
1490.1	1520.1	21.02	21.65	22.16
1550.1	1580.1	19.65	20.17	20.60
1590.1	1620.1	18.67	19.22	19.60
1650.1	1680.1	17.49	18.10	18.42
1690.1	1720.1	16.85	17.62	17.87
1750.1	1780.1	16.09	17.13	17.42
1790.1	1820.1	15.74	17.00	17.30
1850.1	1880.1	15.47	16.92	17.43
1890.1	1920.1	15.49	16.92	17.61
1950.1	1980.1	15.66	16.97	18.03

Frequency Mixer

JMS-5MH+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=1500.1MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+10	+13	+16		+10	+13	+16		+10	+13	+16
10.1	40.1	1.81	1.73	1.70	10.1	1.61	2.30	3.35	10.1	1.35	1.10	1.21
50.1	80.1	1.28	1.18	1.14	50.1	1.62	2.48	3.62	30.1	1.38	1.06	1.12
90.1	120.1	1.26	1.13	1.08	90.1	1.56	2.34	3.37	50.1	1.34	1.04	1.16
150.1	180.1	1.24	1.14	1.08	150.1	1.58	2.39	3.43	70.1	1.33	1.05	1.18
190.1	220.1	1.26	1.17	1.12	190.1	1.55	2.32	3.31	90.1	1.37	1.07	1.16
250.1	280.1	1.32	1.23	1.18	250.1	1.60	2.37	3.35	110.1	1.40	1.10	1.15
290.1	320.1	1.37	1.28	1.23	290.1	1.60	2.34	3.26	130.1	1.38	1.13	1.20
350.1	380.1	1.45	1.37	1.31	350.1	1.66	2.39	3.28	150.1	1.37	1.15	1.22
390.1	420.1	1.52	1.43	1.37	390.1	1.68	2.37	3.21	170.1	1.38	1.13	1.20
450.1	480.1	1.64	1.55	1.49	450.1	1.75	2.42	3.22	190.1	1.40	1.13	1.19
490.1	520.1	1.73	1.63	1.56	490.1	1.77	2.41	3.17	210.1	1.43	1.19	1.23
550.1	580.1	1.95	1.81	1.70	550.1	1.84	2.45	3.17	230.1	1.45	1.22	1.25
590.1	620.1	2.11	1.96	1.83	590.1	1.88	2.46	3.15	250.1	1.42	1.22	1.26
650.1	680.1	2.37	2.21	2.08	650.1	1.93	2.48	3.14	270.1	1.40	1.23	1.29
690.1	720.1	2.56	2.37	2.22	690.1	1.97	2.49	3.11	290.1	1.43	1.26	1.32
750.1	780.1	2.84	2.61	2.46	750.1	2.05	2.51	3.07	310.1	1.45	1.27	1.32
790.1	820.1	2.99	2.76	2.60	790.1	2.11	2.54	3.07	330.1	1.43	1.29	1.35
850.1	880.1	3.11	2.92	2.77	850.1	2.18	2.60	3.09	350.1	1.43	1.31	1.38
890.1	920.1	3.10	2.95	2.81	890.1	2.22	2.63	3.11	370.1	1.43	1.30	1.36
950.1	980.1	3.08	2.95	2.82	950.1	2.27	2.67	3.14	390.1	1.42	1.29	1.35
990.1	1020.1	3.06	2.94	2.82	990.1	2.30	2.68	3.14	430.1	1.45	1.34	1.40
1050.1	1080.1	3.02	2.90	2.80	1050.1	2.38	2.73	3.16	450.1	1.42	1.32	1.38
1090.1	1120.1	2.99	2.86	2.77	1090.1	2.40	2.71	3.12	490.1	1.41	1.33	1.39
1150.1	1180.1	2.94	2.79	2.68	1150.1	2.49	2.75	3.13	510.1	1.42	1.33	1.39
1190.1	1220.1	2.92	2.75	2.63	1190.1	2.52	2.73	3.09	550.1	1.41	1.36	1.44
1250.1	1280.1	2.85	2.65	2.52	1250.1	2.62	2.77	3.09	570.1	1.41	1.36	1.43
1290.1	1320.1	2.82	2.58	2.44	1290.1	2.65	2.74	3.04	610.1	1.38	1.37	1.45
1350.1	1380.1	2.75	2.48	2.33	1350.1	2.78	2.79	3.06	630.1	1.40	1.39	1.47
1390.1	1420.1	2.75	2.44	2.29	1390.1	2.87	2.82	3.06	670.1	1.38	1.41	1.50
1450.1	1480.1	2.72	2.39	2.25	1450.1	3.09	2.95	3.14	690.1	1.39	1.43	1.53
1490.1	1520.1	2.81	2.42	2.27	1490.1	3.25	3.03	3.16	730.1	1.37	1.43	1.53
1550.1	1580.1	2.95	2.52	2.35	1550.1	3.58	3.22	3.29	750.1	1.39	1.46	1.56
1590.1	1620.1	3.14	2.60	2.42	1590.1	3.79	3.33	3.33	790.1	1.38	1.46	1.56
1650.1	1680.1	3.40	2.76	2.53	1650.1	4.13	3.55	3.47	810.1	1.36	1.47	1.58
1690.1	1720.1	3.65	2.84	2.58	1690.1	4.34	3.68	3.54	850.1	1.36	1.47	1.58
1750.1	1780.1	3.96	2.95	2.64	1750.1	4.61	3.95	3.68	870.1	1.35	1.48	1.60
1790.1	1820.1	4.18	3.01	2.66	1790.1	4.72	4.08	3.75	910.1	1.35	1.51	1.63
1850.1	1880.1	4.44	3.08	2.64	1850.1	4.92	4.36	3.95	930.1	1.34	1.50	1.63
1890.1	1920.1	4.52	3.13	2.61	1890.1	4.96	4.50	4.05	970.1	1.38	1.57	1.70
1950.1	1980.1	4.64	3.18	2.57	1950.1	5.06	4.68	4.24	990.1	1.39	1.59	1.73

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Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	7	27	18	40	27	78	52	57	57	56
1	-	14	+0	38	27	38	37	53	52	69	51	56
2	78	38	28	41	28	50	37	53	47	69	60	64
3	>100	36	38	40	38	52	60	50	56	60	58	68
4	>100	56	48	53	44	47	46	54	50	60	64	95
5	>100	64	53	53	51	59	47	55	68	67	62	68
6	>100	73	64	59	61	64	50	59	49	80	55	70
7	>100	81	77	77	62	69	67	62	62	75	66	69
8	>100	86	83	83	79	75	72	66	58	65	62	73
9	>100	87	83	94	85	87	74	84	69	68	66	72
10	96	84	83	91	93	93	85	85	82	84	66	69
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 750.1 MHz; 4.00 dBm.

LO IN: 780.01 MHz; +13.00 dBm

IF OUT: 29.91 MHz; -2.44 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	+2	16	6	24	14	64	31	41	36	37
1	-	14	+0	35	26	33	33	44	41	51	42	60
2	98	50	38	54	37	58	41	53	47	68	53	54
3	>100	60	57	62	52	65	73	63	62	67	64	68
4	>100	86	80	87	67	75	66	87	68	76	72	82
5	>100	>88	>88	>88	>88	>88	83	>88	>88	86	84	>88
6	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
7	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
8	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
9	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
10	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 750.1 MHz; -6.00 dBm.

LO IN: 780.01 MHz; +13.00 dBm

IF OUT: 29.91 MHz; -12.29 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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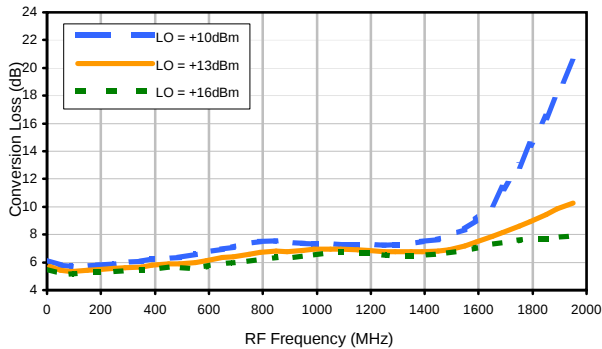


Frequency Mixer

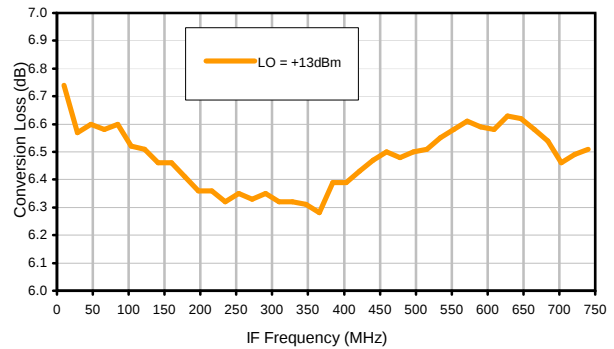
JMS-5MH+

Typical Performance Curves

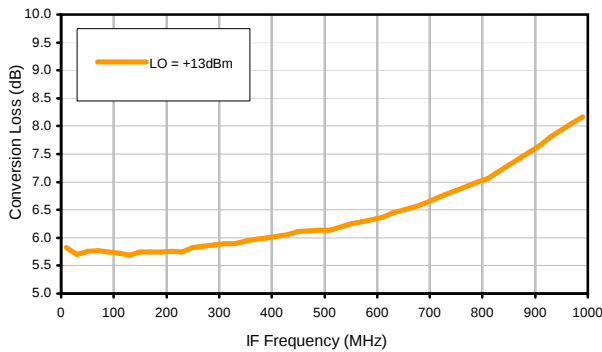
Conversion Loss @ IF=30MHz



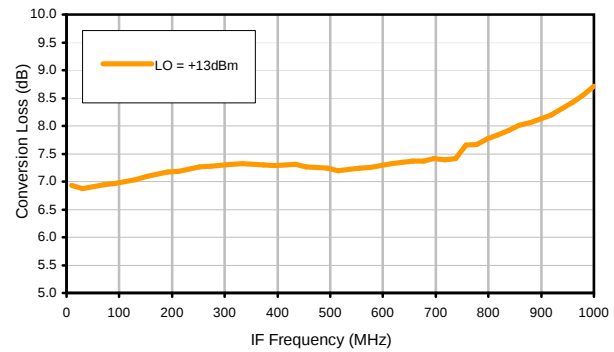
Conversion Loss vs. IF @ RF=750.1MHz



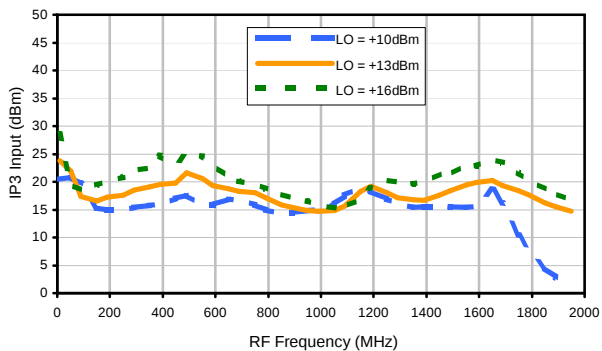
Conversion Loss vs. IF @ RF=10.1MHz



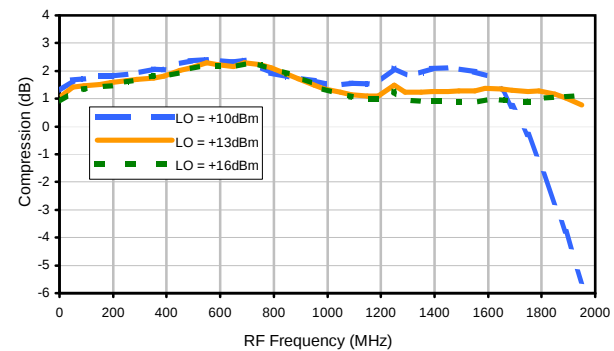
Conversion Loss vs. IF @ RF=1500.1MHz



IP3 Input



Compression @ RF IN=+9dBm



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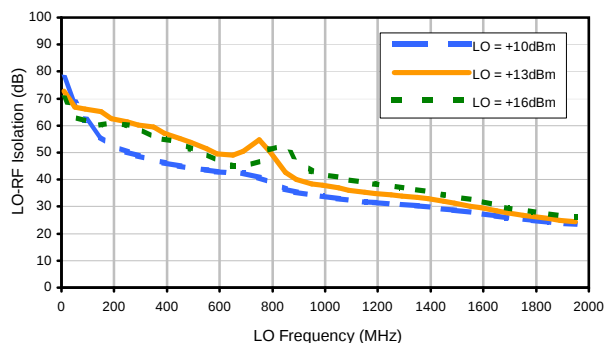


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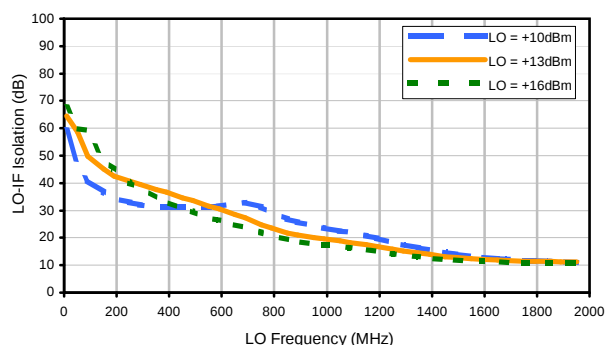


Typical Performance Curves

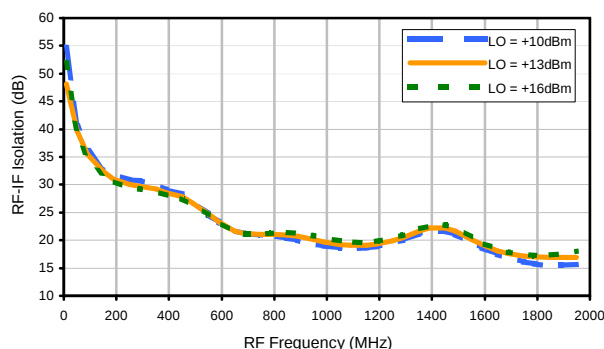
LO-RF Isolation



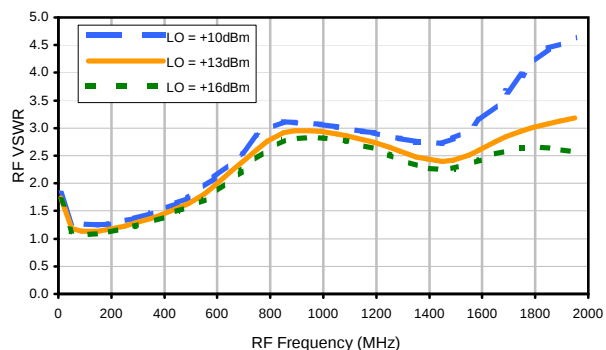
LO-IF Isolation



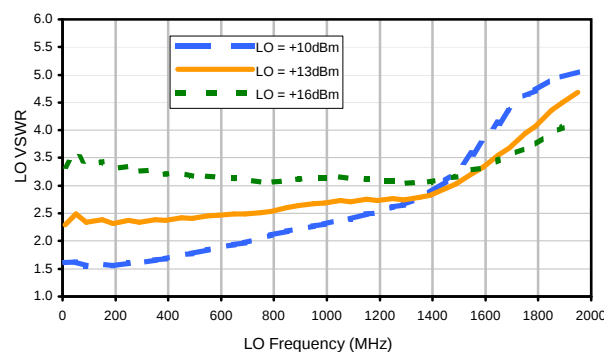
RF-IF Isolation



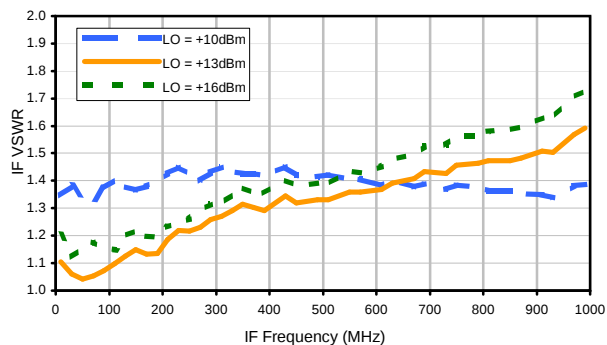
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	7	27	18	40	27	78	52	57	57	56
1	-	14	+0	38	27	38	37	53	52	69	51	56
2	78	38	28	41	28	50	37	53	47	69	60	64
3	>100	36	38	40	38	52	60	50	56	60	58	68
4	>100	56	48	53	44	47	46	54	50	60	64	95
5	>100	64	53	53	51	59	47	55	68	67	62	68
6	>100	73	64	59	61	64	50	59	49	80	55	70
7	>100	81	77	77	62	69	67	62	62	75	66	69
8	>100	86	83	83	79	75	72	66	58	65	62	73
9	>100	87	83	94	85	87	74	84	69	68	66	72
10	96	84	83	91	93	93	85	85	82	84	66	69
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions: RF IN: 750.1 MHz; 4.00 dBm.
LO IN: 780.01 MHz; +13.00 dBm
IF OUT: 29.91 MHz; -2.44 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	+2	16	6	24	14	64	31	41	36	37
1	-	14	+0	35	26	33	33	44	41	51	42	60
2	98	50	38	54	37	58	41	53	47	68	53	54
3	>100	60	57	62	52	65	73	63	62	67	64	68
4	>100	86	80	87	67	75	66	87	68	76	72	82
5	>100	>88	>88	>88	>88	>88	83	>88	>88	86	84	>88
6	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
7	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
8	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
9	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
10	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions: RF IN: 750.1 MHz; -6.00 dBm.
LO IN: 780.01 MHz; +13.00 dBm
IF OUT: 29.91 MHz; -12.29 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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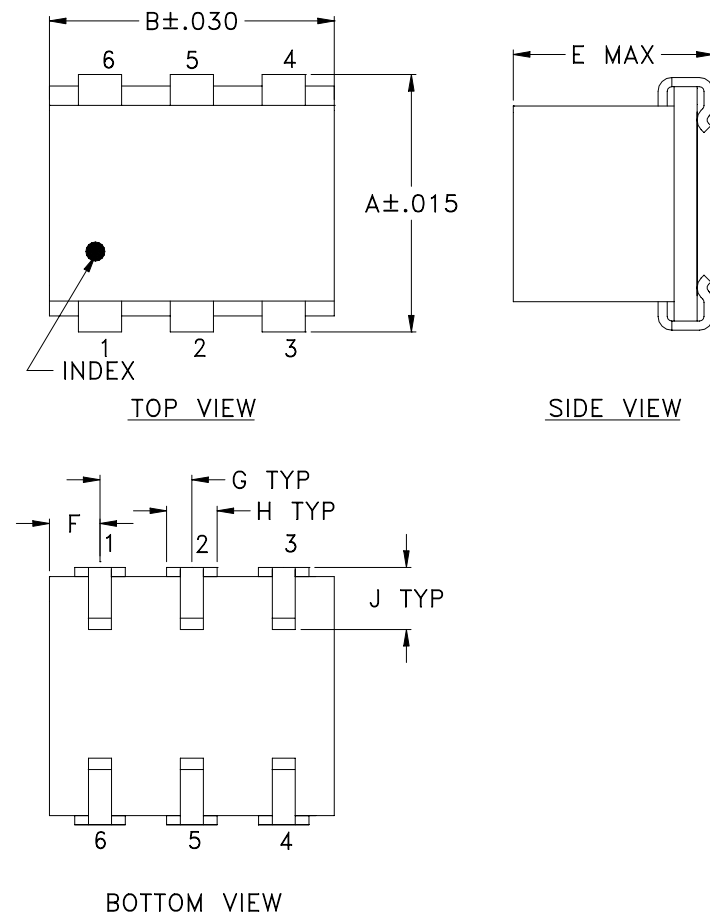
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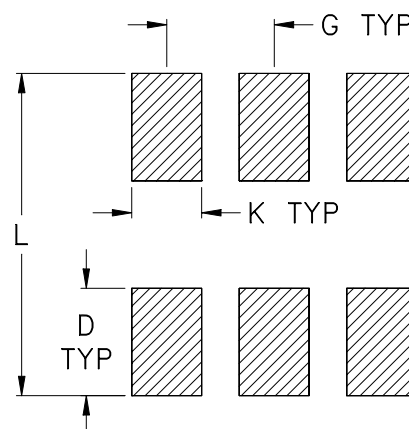
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Outline Dimensions



PCB Land Pattern



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

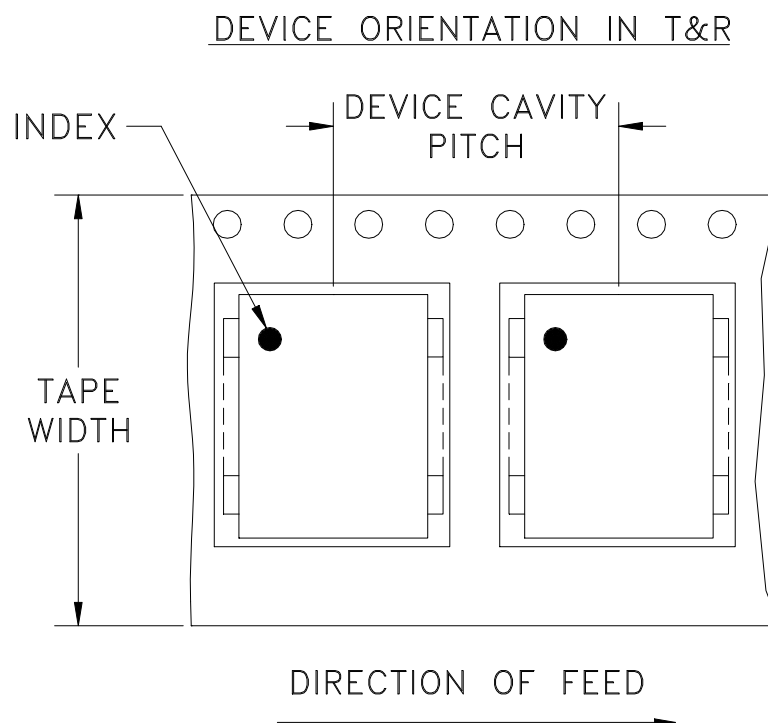
CASE #	A	B	C	D	E	F	G	H	J	K	L	WT. GRAM
BH292	.280 (7.11)	.310 (7.87)	- -	.100 (2.54)	.225 (5.72)	.055 (1.40)	.100 (2.54)	.047 (1.19)	.065 (1.65)	.065 (1.65)	.300 (7.62)	.45

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

Notes:

- Case material: Ceramic.
- 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.

Tape & Reel Packaging TR-F24



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
16	12	13	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.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf



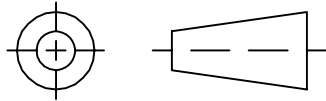
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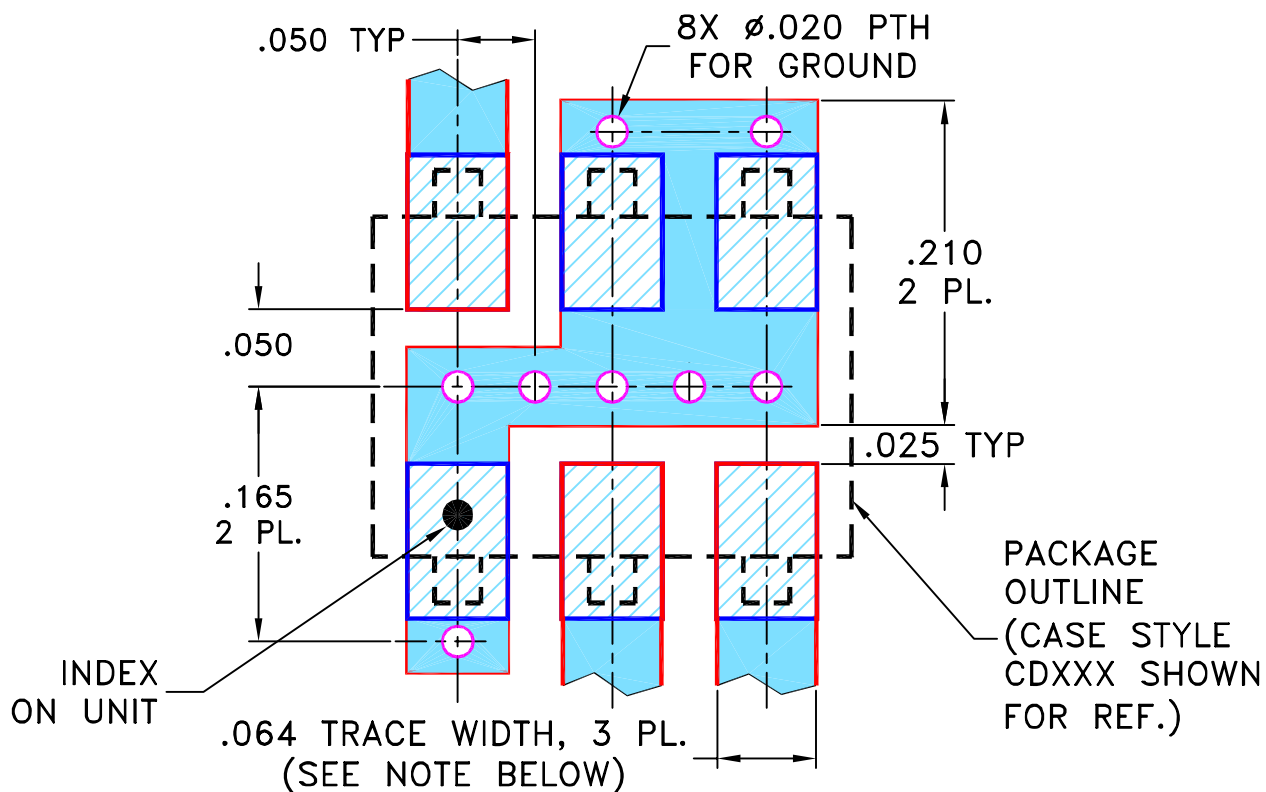
THIRD ANGLE PROJECTION



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

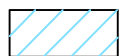
SUGGESTED MOUNTING CONFIGURATION
FOR BH292, CD541/542/636/637, TT100/240 CASE
STYLES, "gk", "ht", "hu", "nd", "w" PIN CONNECTIONS



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



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

TOLERANCES ON:

2 PL DECIMALS $\pm$ 3 PL DECIMALS $\pm$.005ANGLES $\pm$ FRACTIONS $\pm$

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

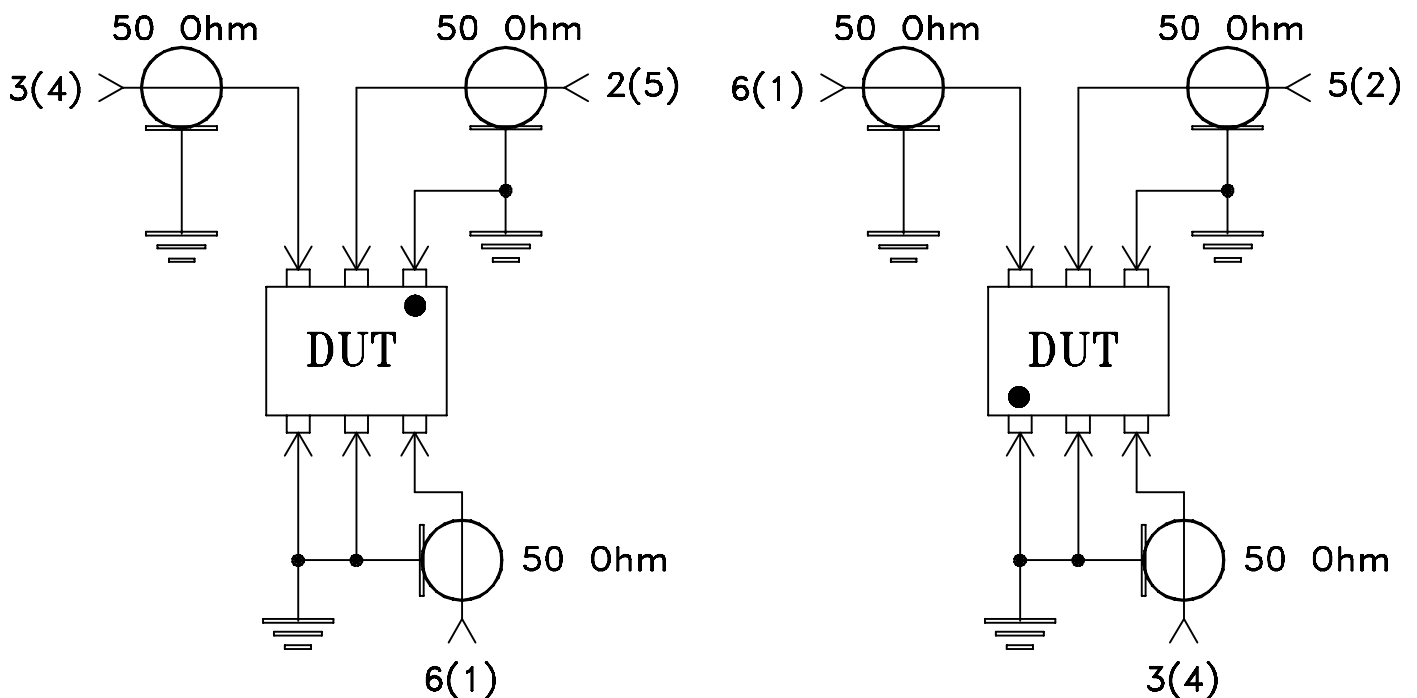
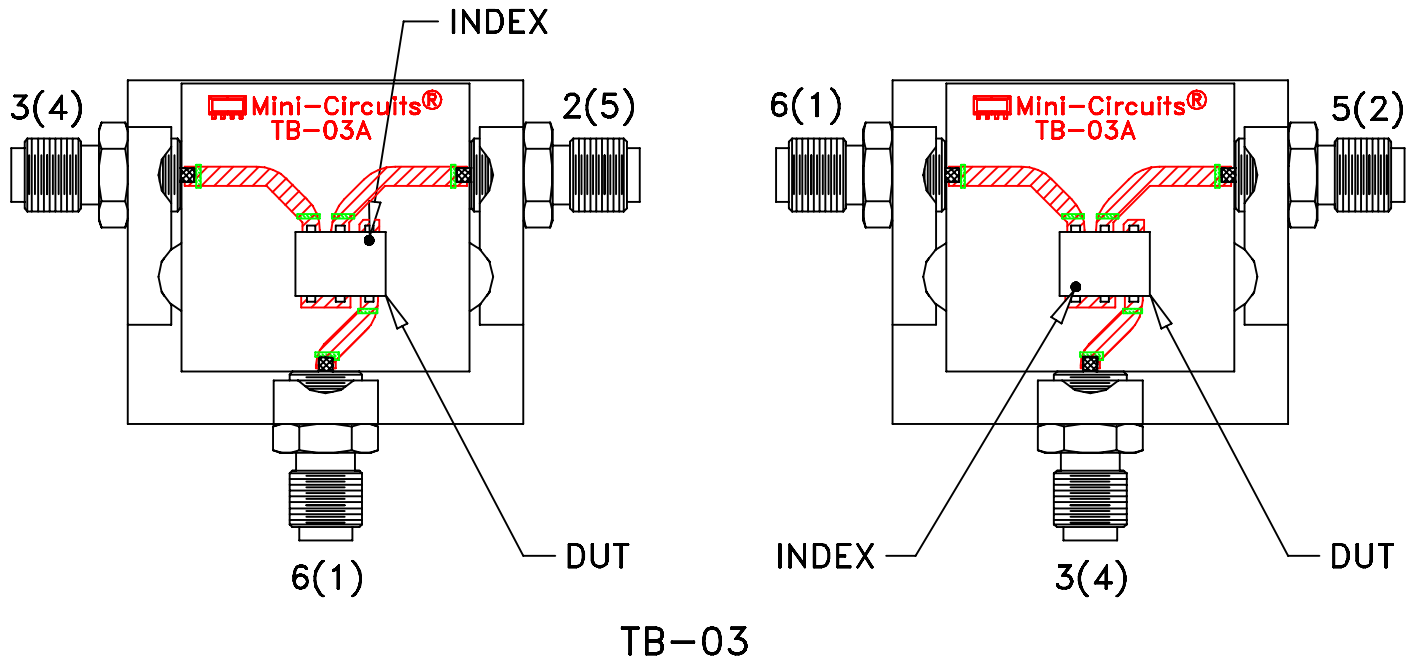
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ASHEETA1.DWG REV:A DATE:01/12/95

Evaluation Board and Circuit

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



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