

Frequency Mixer

Level 10 (LO Power +10 dBm) 0.15 to 400 MHz

TUF-3LH+

Maximum Ratings

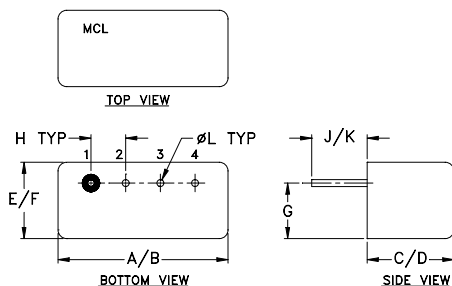
Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
RF Power	50mW
IF Current	40mA

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

Pin Connections

LO	4
RF	1
IF	2
GROUND	3
CASE GROUND	3

Outline Drawing



Outline Dimensions (inch/mm)

A	B	C	D	E	F
.480	.500	.240	.255	.210	.230
12.19	12.70	6.10	6.48	5.33	5.84
G	H	J	K	L	wt
.16	.100	.14	.20	.020	grams
4.06	2.54	3.56	5.08	0.51	1.9

Features

- low conversion loss, 4.8 dB typ.
- high isolation, 51 dB typ. L-R, 45 dB typ. L-I
- rugged welded construction

Applications

- HF/VHF
- defense & federal communications



Generic photo used for illustration purposes only

CASE STYLE: B02

+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)					
LO/RF	IF	Mid-Band		Total Range		L	M	U				L	M	U			
f_L - f_U		$\bar{X}$	σ	Max.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.
0.15-400	DC-400	4.8	0.37	7.0	8.0	67	50	51	30	40	25	67	40	45	25	34	20

1 dB COMP.: +5 dBm typ.

L = low range [f_L to $10 f_L$]

M = mid range [$10 f_L$ to $f_U/2$]

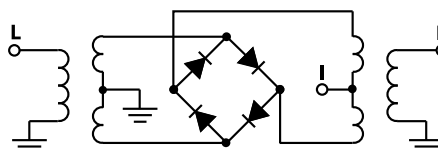
m = mid band [$2f_L$ to $f_U/2$]

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
0.15	30.15	4.98	69.38	85.98	1.21	2.67
0.30	30.30	4.90	69.38	85.28	1.15	2.64
0.50	30.50	4.83	69.26	86.26	1.10	2.57
1.00	31.00	4.74	69.26	83.06	1.06	2.52
1.50	31.50	4.69	69.08	80.98	1.03	2.36
2.00	32.00	4.66	68.95	78.75	1.02	2.40
5.00	35.00	4.62	68.20	71.20	1.01	2.33
10.00	40.00	4.59	66.47	65.07	1.02	2.31
20.00	50.00	4.68	63.23	59.53	1.02	2.25
50.00	80.00	4.66	56.07	50.61	1.02	2.25
57.27	87.27	4.67	54.97	49.44	1.01	2.29
100.00	70.00	4.67	50.23	45.42	1.01	2.25
114.39	84.39	4.68	48.98	45.06	1.01	2.28
171.51	14.15	4.80	45.17	42.49	1.01	2.33
200.00	170.00	4.81	42.29	40.27	1.01	2.44
228.64	198.64	4.90	41.00	37.35	1.04	2.39
285.76	255.76	5.11	48.00	34.00	1.09	2.41
342.88	312.88	5.17	39.79	33.43	1.20	2.58
385.72	356.72	5.29	34.24	31.62	1.23	2.76
400.00	370.00	5.48	34.34	30.09	1.27	2.78

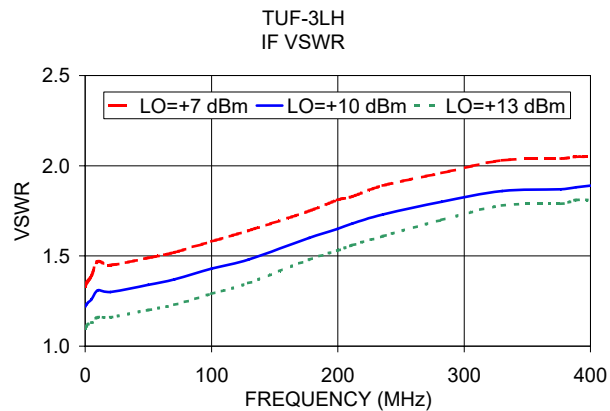
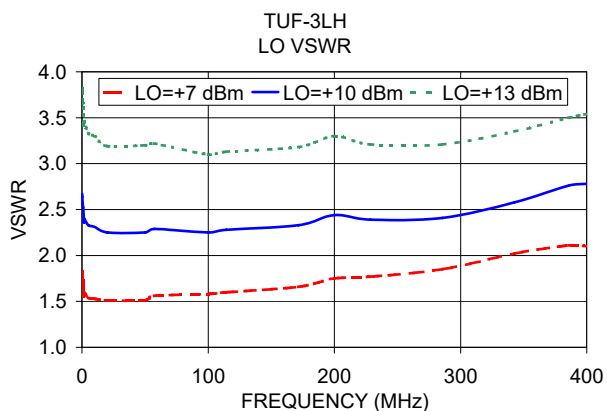
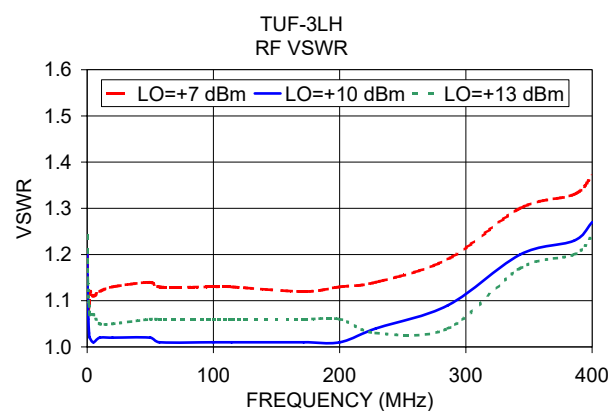
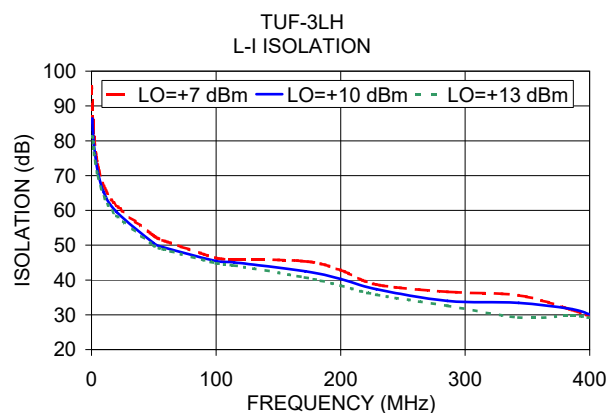
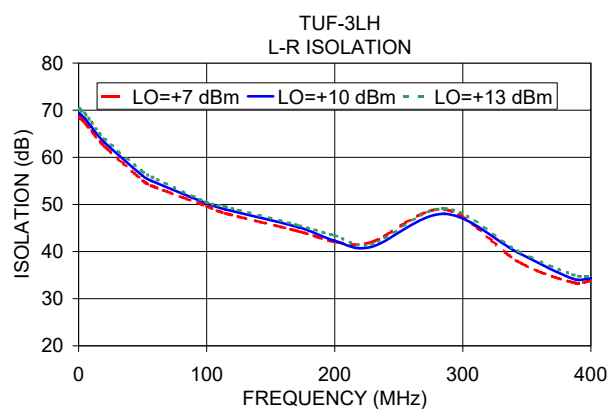
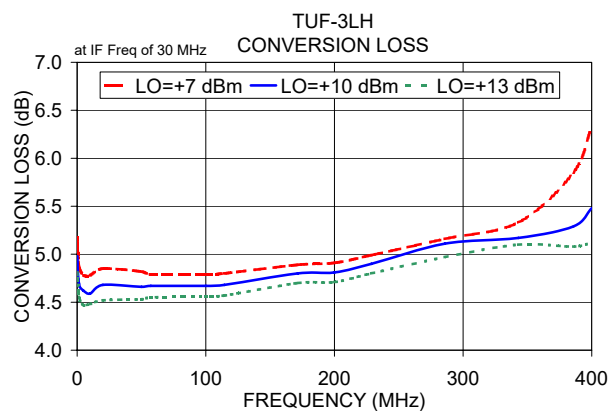
Electrical Schematic



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





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Frequency Mixer

TUF-3LH+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB)		
		@LO (dBm)		
		+7	+10	+13
0.2	30.2	5.18	4.98	4.81
0.3	30.3	5.09	4.90	4.75
0.5	30.5	5.02	4.83	4.68
1.0	31.0	4.92	4.74	4.59
1.5	31.5	4.86	4.69	4.55
2.0	32.0	4.84	4.66	4.52
5.0	35.0	4.78	4.62	4.47
10.0	40.0	4.78	4.59	4.48
29.1	59.1	4.99	4.78	4.68
48.0	78.0	5.03	4.82	4.74
67.0	97.0	4.96	4.82	4.72
86.0	116.0	5.00	4.85	4.76
105.0	135.0	5.04	4.86	4.78
142.9	172.9	5.07	4.90	4.81
161.9	191.9	5.09	4.97	4.86
199.8	229.8	5.13	4.98	4.88
218.8	248.8	5.26	5.03	4.88
237.8	267.8	5.43	5.23	5.02
256.8	286.8	5.46	5.31	5.16
275.7	305.7	5.40	5.25	5.16
294.7	324.7	5.41	5.25	5.19
313.7	343.7	5.50	5.32	5.26
351.6	381.6	5.75	5.43	5.30
370.6	400.6	6.07	5.57	5.31
389.6	419.6	6.33	5.74	5.36
408.6	438.6	6.47	6.02	5.50
446.5	476.5	6.83	6.33	5.88
465.5	495.5	7.06	6.55	6.11
484.5	514.5	7.23	6.73	6.32
503.4	533.4	7.38	6.87	6.45
541.4	571.4	7.25	6.88	6.56
560.4	590.4	7.28	7.01	6.77
579.3	609.3	7.49	7.27	7.12
598.3	628.3	7.71	7.58	7.43
617.3	647.3	7.94	7.85	7.79
655.2	685.2	8.43	8.40	8.42
674.2	704.2	8.84	8.81	8.90
693.2	723.2	9.34	9.36	9.43
712.2	742.2	9.89	9.85	9.91
750.1	780.1	10.89	10.78	10.78

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)		
		@LO (dBm)		
		+7	+10	+13
10.1	40.1	19.69	22.65	24.11
29.1	59.1	22.54	31.79	22.32
48.0	78.0	23.63	25.01	24.22
67.0	97.0	22.77	26.02	26.85
86.0	116.0	17.53	26.25	23.98
105.0	135.0	20.59	22.42	18.00
123.9	153.9	22.46	19.34	18.23
142.9	172.9	18.24	19.99	18.90
161.9	191.9	20.56	19.17	18.85
180.9	210.9	14.98	13.99	13.21
199.8	229.8	17.44	13.99	16.28
218.8	248.8	19.64	15.90	17.73
237.8	267.8	19.14	17.27	19.04
256.8	286.8	15.65	14.41	14.63
275.7	305.7	16.81	13.63	15.68
294.7	324.7	16.44	13.55	14.52
313.7	343.7	16.79	13.15	17.29
332.7	362.7	14.78	13.47	20.94
351.6	381.6	14.96	15.19	23.35
370.6	400.6	10.02	15.82	22.19
389.6	419.6	6.60	11.55	16.80
408.6	438.6	5.46	8.06	11.70
427.5	457.5	5.24	6.25	9.14
446.5	476.5	5.86	5.84	9.05
465.5	495.5	6.39	5.96	9.35
484.5	514.5	7.68	6.46	11.56
503.4	533.4	8.68	7.42	15.09
522.4	552.4	9.87	8.89	24.54
541.4	571.4	10.65	10.35	21.51
560.4	590.4	11.44	12.04	17.04
579.3	609.3	12.65	14.02	16.12
598.3	628.3	12.83	14.56	15.96
617.3	647.3	13.25	14.52	16.32
636.3	666.3	12.95	15.08	16.82
655.2	685.2	13.23	15.57	17.24
674.2	704.2	13.90	16.74	17.32
693.2	723.2	14.24	16.80	18.11
712.2	742.2	14.66	15.19	18.09
731.1	761.1	14.58	14.45	17.89
750.1	780.1	14.33	14.11	17.70

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+5dBm (dB)		
		@LO (dBm)		
		+7	+10	+13
10.1	40.1	1.87	1.50	1.22
29.1	59.1	1.69	1.38	1.11
48.0	78.0	1.60	1.37	1.11
67.0	97.0	1.68	1.31	1.05
86.0	116.0	1.61	1.23	0.98
105.0	135.0	1.48	1.14	0.90
123.9	153.9	1.47	1.13	0.90
142.9	172.9	1.46	1.14	0.91
161.9	191.9	1.40	1.08	0.87
180.9	210.9	1.30	1.05	0.86
199.8	229.8	1.27	1.02	0.83
218.8	248.8	1.26	1.01	0.81
237.8	267.8	1.25	1.00	0.82
256.8	286.8	1.34	1.07	0.89
275.7	305.7	1.54	1.23	1.03
294.7	324.7	1.70	1.34	1.09
313.7	343.7	1.85	1.39	1.11
332.7	362.7	2.14	1.53	1.21
351.6	381.6	2.26	1.69	1.36
370.6	400.6	2.31	1.93	1.52
389.6	419.6	2.31	2.03	1.67
408.6	438.6	2.44	2.12	1.85
427.5	457.5	2.41	2.17	1.96
446.5	476.5	2.29	2.09	1.94
465.5	495.5	2.23	2.07	1.90
484.5	514.5	2.07	1.89	1.74
503.4	533.4	2.00	1.82	1.70
522.4	552.4	1.95	1.75	1.63
541.4	571.4	1.94	1.69	1.55
560.4	590.4	1.88	1.55	1.42
579.3	609.3	1.77	1.39	1.23
598.3	628.3	1.74	1.30	1.14
617.3	647.3	1.69	1.25	1.03
636.3	666.3	1.65	1.22	1.01
655.2	685.2	1.57	1.13	0.90
674.2	704.2	1.41	0.99	0.79
693.2	723.2	1.29	0.88	0.69
712.2	742.2	1.22	0.85	0.69
731.1	761.1	1.19	0.86	0.69
750.1	780.1	1.20	0.89	0.74

REV. X2

TUF-3LH+

100818

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IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS 9100 CERTIFIED • RoHS compliant

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Frequency Mixer

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Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=200.1MHz (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)=400.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+10			+10			+10
190.0	10.1	5.21	10.0	20.1	4.61	390.0	10.1	6.28
185.4	14.7	5.19	19.7	29.8	4.51	380.3	19.8	6.21
180.8	19.3	5.15	29.5	39.6	4.44	370.5	29.6	6.13
176.2	23.9	5.10	39.2	49.3	4.49	360.8	39.3	6.07
171.5	28.6	5.08	49.0	59.1	4.52	351.0	49.1	6.01
166.9	33.2	5.03	58.7	68.8	4.49	341.3	58.8	5.96
162.3	37.8	5.01	68.5	78.6	4.55	331.5	68.6	5.95
157.7	42.4	5.01	78.2	88.3	4.59	321.8	78.3	5.96
153.1	47.0	5.02	87.9	98.0	4.59	312.1	88.0	5.93
148.5	51.6	5.00	97.7	107.8	4.60	302.3	97.8	5.90
143.8	56.3	4.99	107.4	117.5	4.61	292.6	107.5	5.89
139.2	60.9	4.98	117.2	127.3	4.63	282.8	117.3	5.86
134.6	65.5	4.95	126.9	137.0	4.62	273.1	127.0	5.85
130.0	70.1	4.96	136.7	146.8	4.65	263.3	136.8	5.85
125.4	74.7	4.97	146.4	156.5	4.70	253.6	146.5	5.88
120.8	79.3	4.96	156.2	166.3	4.74	243.8	156.3	5.88
116.2	83.9	4.96	165.9	176.0	4.74	234.1	166.0	5.89
111.5	88.6	4.96	175.6	185.7	4.77	224.4	175.7	5.90
106.9	93.2	4.95	185.4	195.5	4.80	214.6	185.5	5.92
102.3	97.8	4.92	195.1	205.2	4.75	204.9	195.2	5.92
97.7	102.4	4.92	204.9	215.0	4.74	195.1	205.0	5.93
93.1	107.0	4.95	214.6	224.7	4.75	185.4	214.7	5.96
88.5	111.6	4.95	224.4	234.5	4.74	175.6	224.5	5.95
83.8	116.3	4.93	234.1	244.2	4.76	165.9	234.2	5.91
79.2	120.9	4.94	243.8	253.9	4.88	156.2	243.9	5.92
74.6	125.5	4.93	253.6	263.7	5.03	146.4	253.7	5.89
70.0	130.1	4.93	263.3	273.4	5.12	136.7	263.4	5.84
65.4	134.7	4.93	273.1	283.2	5.23	126.9	273.2	5.84
60.8	139.3	4.95	282.8	292.9	5.26	117.2	282.9	5.84
56.2	143.9	4.95	292.6	302.7	5.23	107.4	292.7	5.76
51.5	148.6	4.96	302.3	312.4	5.27	97.7	302.4	5.74
46.9	153.2	4.94	312.1	322.2	5.21	87.9	312.2	5.75
42.3	157.8	4.93	321.8	331.9	5.15	78.2	321.9	5.70
37.7	162.4	4.92	331.5	341.6	5.13	68.5	331.6	5.65
33.1	167.0	4.93	341.3	351.4	5.01	58.7	341.4	5.58
28.5	171.6	4.94	351.0	361.1	5.01	49.0	351.1	5.56
23.8	176.3	4.96	360.8	370.9	5.05	39.2	360.9	5.52
19.2	180.9	4.93	370.5	380.6	4.96	29.5	370.6	5.48
14.6	185.5	5.02	380.3	390.4	4.95	19.7	380.4	5.55
10.0	190.1	5.19	390.0	400.1	4.97	10.0	390.1	5.56

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Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)					@LO (dBm)		
	+7	+10	+13	+7	+10	+13			+7	+10	+13
0.2	68.61	69.38	70.23	95.61	85.98	81.23	10.1	40.1	39.34	39.93	38.57
0.3	68.54	69.38	70.31	95.14	85.28	81.11	29.1	59.1	32.34	32.99	32.47
0.5	68.43	69.26	70.29	91.53	86.26	81.09	48.0	78.0	29.05	29.17	29.14
1.0	68.40	69.26	70.08	86.70	83.06	79.78	67.0	97.0	26.55	26.94	26.82
1.5	68.24	69.08	70.11	84.04	80.98	78.01	86.0	116.0	25.17	25.50	25.56
2.0	68.12	68.95	69.89	81.22	78.75	76.49	105.0	135.0	23.86	24.06	24.29
5.0	67.27	68.20	69.26	73.17	71.20	69.86	123.9	153.9	23.35	23.60	23.78
10.0	65.60	66.47	67.46	67.00	65.07	63.96	142.9	172.9	22.92	23.29	23.48
29.1	64.45	64.90	64.96	53.45	51.61	50.46	161.9	191.9	22.65	23.26	23.83
48.0	59.61	60.40	61.14	49.55	47.83	46.81	180.9	210.9	22.03	22.56	22.93
67.0	56.15	57.51	57.66	46.76	45.58	44.35	199.8	229.8	22.34	22.80	23.14
86.0	53.79	54.71	55.23	45.53	43.90	43.07	218.8	248.8	22.74	23.33	23.92
105.0	52.08	52.66	52.87	43.26	42.39	41.46	237.8	267.8	23.50	24.09	24.93
142.9	48.61	48.88	49.06	41.96	40.64	39.38	256.8	286.8	24.99	25.75	26.64
161.9	47.76	47.89	47.82	41.24	39.17	38.00	275.7	305.7	25.07	25.99	26.86
199.8	43.49	43.84	43.94	40.12	38.29	36.91	294.7	324.7	23.82	24.67	25.56
218.8	43.01	43.06	43.44	40.08	37.73	36.10	313.7	343.7	22.01	22.88	23.51
237.8	42.55	42.14	42.24	38.23	36.59	34.95	332.7	362.7	20.38	20.87	21.35
256.8	42.97	42.31	41.91	35.83	34.60	33.71	351.6	381.6	19.22	19.82	20.30
275.7	43.56	42.94	42.30	34.66	33.16	32.14	370.6	400.6	18.16	18.74	19.38
294.7	42.69	41.76	40.96	34.13	32.55	31.46	389.6	419.6	17.73	18.44	19.31
313.7	42.85	42.15	41.68	33.90	31.70	30.44	408.6	438.6	17.29	18.07	19.19
351.6	42.55	42.22	41.18	32.59	29.42	27.43	427.5	457.5	17.27	17.88	19.08
370.6	41.29	41.25	40.27	32.89	28.97	26.60	446.5	476.5	17.59	18.18	19.20
389.6	40.86	41.63	41.09	31.68	28.96	26.25	465.5	495.5	18.16	18.62	19.11
408.6	40.60	41.16	40.53	30.03	27.57	25.29	484.5	514.5	18.60	18.84	18.96
446.5	39.90	40.97	40.06	28.35	26.76	24.19	503.4	533.4	18.61	18.51	18.26
465.5	38.79	39.51	38.54	27.53	26.16	24.14	522.4	552.4	17.99	17.46	16.93
484.5	39.05	40.35	39.42	26.41	25.03	22.88	541.4	571.4	16.77	16.17	15.53
503.4	39.00	39.23	36.74	26.22	24.56	21.81	560.4	590.4	15.49	14.77	14.19
541.4	37.22	36.56	33.63	25.48	23.04	19.77	579.3	609.3	14.09	13.46	12.98
560.4	35.73	34.72	31.67	24.52	21.81	18.58	598.3	628.3	13.16	12.56	12.06
579.3	34.05	32.29	29.53	24.01	20.69	17.57	617.3	647.3	12.14	11.55	10.99
598.3	32.34	30.18	27.49	23.06	19.61	16.74	636.3	666.3	11.26	10.74	10.25
617.3	30.83	28.76	26.41	21.76	18.56	16.03	655.2	685.2	10.34	9.82	9.38
655.2	27.15	25.66	23.81	19.55	17.37	15.17	674.2	704.2	9.45	9.01	8.58
674.2	25.31	24.04	22.48	18.59	16.78	14.78	693.2	723.2	8.75	8.37	8.05
693.2	23.73	22.67	21.24	17.72	16.13	14.35	712.2	742.2	8.00	7.66	7.40
712.2	22.46	21.66	20.41	16.91	15.54	13.92	731.1	761.1	7.51	7.28	6.99
750.1	20.74	20.16	19.05	16.28	15.34	13.85	750.1	780.1	6.98	6.72	6.47

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Frequency Mixer

TUF-3LH+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=400.1MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+7	+10	+13		+7	+10	+13		+7	+10	+13
0.3	30.3	1.20	1.21	1.24	0.3	1.82	2.67	3.81	0.3	1.33	1.22	1.10
0.5	30.5	1.14	1.15	1.19	0.5	1.78	2.64	3.77	0.5	1.34	1.23	1.11
1.0	31.0	1.09	1.10	1.14	1.0	1.73	2.57	3.67	1.0	1.35	1.23	1.11
2.0	32.0	1.08	1.06	1.11	2.0	1.69	2.52	3.61	2.0	1.36	1.24	1.12
5.0	35.0	1.09	1.03	1.09	5.0	1.55	2.36	3.42	5.0	1.39	1.26	1.13
10.0	40.0	1.12	1.02	1.07	10.0	1.59	2.40	3.46	10.0	1.47	1.31	1.16
29.1	59.1	1.31	1.21	1.13	29.1	1.62	2.43	3.42	20.0	2.13	1.69	1.47
48.0	78.0	1.31	1.20	1.13	48.0	1.62	2.42	3.40	30.0	2.03	1.62	1.42
67.0	97.0	1.27	1.17	1.10	67.0	1.55	2.26	3.16	40.0	1.93	1.56	1.35
86.0	116.0	1.25	1.15	1.09	86.0	1.52	2.20	3.08	50.0	1.83	1.49	1.30
105.0	135.0	1.22	1.13	1.07	105.0	1.55	2.24	3.10	60.0	1.82	1.46	1.29
123.9	153.9	1.21	1.12	1.06	123.9	1.58	2.33	3.23	70.0	1.83	1.49	1.32
142.9	172.9	1.17	1.09	1.05	142.9	1.60	2.34	3.24	80.0	1.87	1.54	1.38
161.9	191.9	1.18	1.08	1.04	161.9	1.59	2.28	3.12	90.0	2.02	1.65	1.46
180.9	210.9	1.16	1.08	1.03	180.9	1.58	2.27	3.10	100.0	2.08	1.70	1.51
199.8	229.8	1.14	1.06	1.03	199.8	1.60	2.29	3.12	110.0	2.09	1.72	1.53
218.8	248.8	1.13	1.04	1.06	218.8	1.65	2.36	3.21	120.0	2.04	1.70	1.52
237.8	267.8	1.13	1.06	1.09	237.8	1.70	2.39	3.21	130.0	2.01	1.67	1.50
256.8	286.8	1.09	1.05	1.08	256.8	1.70	2.37	3.16	140.0	1.97	1.64	1.49
275.7	305.7	1.04	1.05	1.11	275.7	1.69	2.40	3.22	150.0	2.00	1.66	1.51
294.7	324.7	1.03	1.11	1.17	294.7	1.71	2.39	3.19	160.0	2.06	1.72	1.57
313.7	343.7	1.06	1.15	1.20	313.7	1.75	2.44	3.26	170.0	2.09	1.78	1.63
332.7	362.7	1.05	1.14	1.18	332.7	1.79	2.44	3.25	180.0	2.13	1.82	1.68
351.6	381.6	1.05	1.10	1.15	351.6	1.81	2.42	3.20	190.0	2.12	1.82	1.69
370.6	400.6	1.11	1.06	1.09	370.6	1.87	2.48	3.24	200.0	2.10	1.80	1.67
389.6	419.6	1.18	1.07	1.05	389.6	1.93	2.54	3.29	210.0	2.09	1.80	1.68
408.6	438.6	1.24	1.14	1.03	408.6	2.01	2.65	3.40	220.0	2.09	1.81	1.70
427.5	457.5	1.31	1.21	1.10	427.5	2.04	2.71	3.46	230.0	2.11	1.83	1.72
446.5	476.5	1.37	1.27	1.17	446.5	2.03	2.71	3.46	240.0	2.10	1.83	1.73
465.5	495.5	1.50	1.39	1.28	465.5	2.03	2.71	3.46	250.0	2.09	1.84	1.74
484.5	514.5	1.60	1.49	1.41	484.5	2.06	2.73	3.50	260.0	2.07	1.83	1.75
503.4	533.4	1.70	1.59	1.53	503.4	2.09	2.77	3.53	270.0	2.03	1.81	1.74
522.4	552.4	1.76	1.67	1.63	522.4	2.10	2.78	3.52	280.0	2.04	1.80	1.73
541.4	571.4	1.81	1.75	1.71	541.4	2.09	2.75	3.46	290.0	2.09	1.83	1.75
560.4	590.4	1.89	1.85	1.82	560.4	2.10	2.72	3.40	300.0	2.11	1.87	1.79
579.3	609.3	2.02	1.99	1.95	579.3	2.12	2.73	3.40	310.0	2.08	1.87	1.79
598.3	628.3	2.13	2.10	2.05	598.3	2.14	2.75	3.40	320.0	2.04	1.83	1.77
617.3	647.3	2.24	2.18	2.13	617.3	2.14	2.73	3.37	330.0	2.01	1.80	1.73
636.3	666.3	2.26	2.21	2.17	636.3	2.15	2.74	3.35	340.0	1.99	1.78	1.71
655.2	685.2	2.29	2.24	2.20	655.2	2.18	2.73	3.34	350.0	1.97	1.77	1.70
674.2	704.2	2.33	2.26	2.23	674.2	2.25	2.78	3.38	360.0	1.98	1.77	1.70
693.2	723.2	2.39	2.33	2.28	693.2	2.33	2.84	3.42	370.0	2.01	1.78	1.71
712.2	742.2	2.44	2.37	2.31	712.2	2.39	2.88	3.42	380.0	2.03	1.81	1.73
731.1	761.1	2.50	2.42	2.37	731.1	2.48	2.94	3.48	390.0	2.01	1.80	1.73
750.1	780.1	2.50	2.41	2.35	750.1	2.51	2.94	3.45	400.0	1.97	1.78	1.72

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Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	20	38	24	49	33	55	39	50	50	54
1	-	18	+0	27	12	38	24	45	41	51	50	57
2	>100	59	42	57	42	52	42	55	68	61	50	65
3	>100	42	36	42	39	43	35	45	46	52	55	58
4	>100	66	54	71	53	64	53	69	50	66	76	70
5	>100	73	59	75	52	64	49	64	50	58	62	68
6	>100	85	69	>95	62	80	65	82	64	69	81	73
7	>100	81	78	74	70	71	64	74	60	65	56	73
8	>100	>95	87	90	89	81	72	85	67	79	68	75
9	>100	88	84	>95	78	85	74	84	79	91	72	77
10	>100	94	>95	>95	>95	>95	81	93	76	95	76	82
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 200.1 MHz; 0.00 dBm.

LO IN: 230.01 MHz; +10.00 dBm

IF OUT: 29.91 MHz; -5.23 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	11	27	12	41	22	41	24	37	36	40
1	-	17	+0	24	11	32	23	39	44	45	39	42
2	>100	68	45	56	44	64	44	63	70	74	55	63
3	>100	60	59	62	61	66	58	63	63	73	62	79
4	>100	82	79	82	74	78	71	81	72	>85	77	>85
5	>100	>85	82	>85	81	82	80	>85	77	>85	84	>85
6	>100	>85	>85	>85	>85	>85	82	>85	>85	>85	>85	>85
7	>100	>85	>85	>85	>85	>85	>85	74	>85	>85	>85	>85
8	>100	>85	>85	>85	>85	>85	>85	>85	65	>85	>85	>85
9	>100	>85	>85	>85	>85	>85	>85	>85	>85	71	>85	>85
10	>100	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 200.1 MHz; -10.00 dBm.

LO IN: 230.01 MHz; +10.00 dBm

IF OUT: 29.91 MHz; -15.2 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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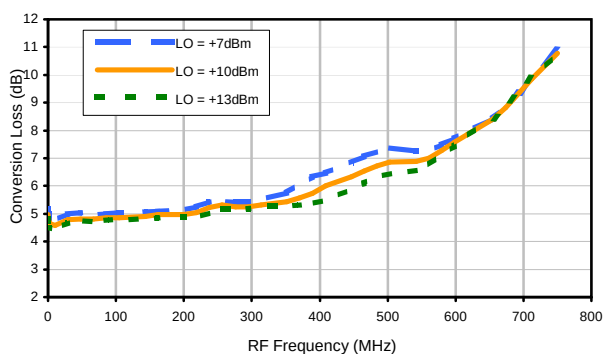


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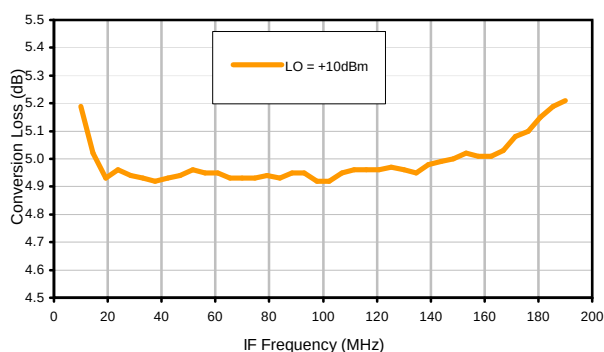


Typical Performance Curves

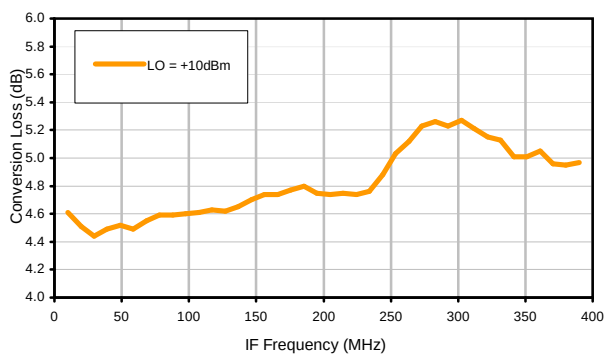
Conversion Loss @ IF=30MHz



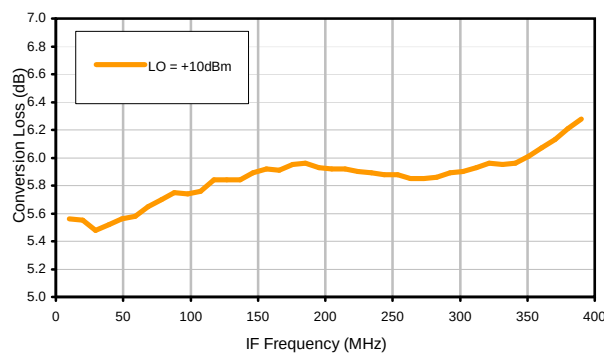
Conversion Loss vs. IF @ RF=200.1MHz



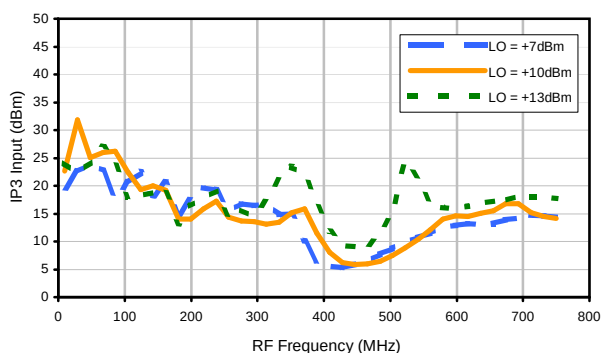
Conversion Loss vs. IF @ RF=10.1MHz



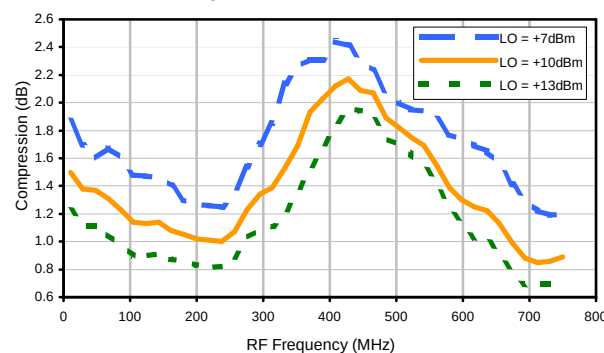
Conversion Loss vs. IF @ RF=400.1MHz



IP3 Input

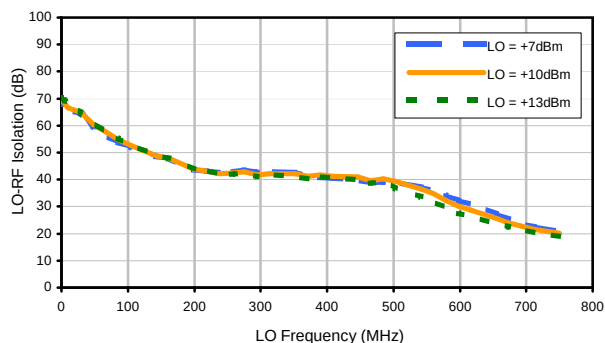


Compression @ RF IN=+5dBm

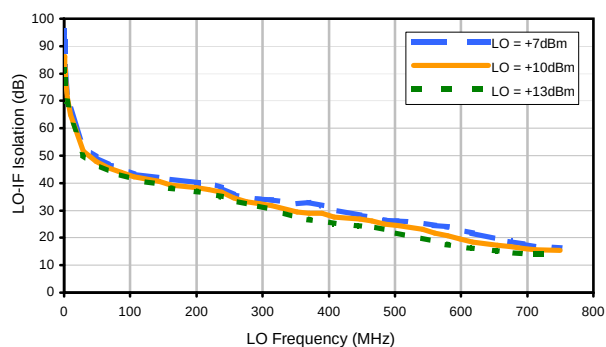


Typical Performance Curves

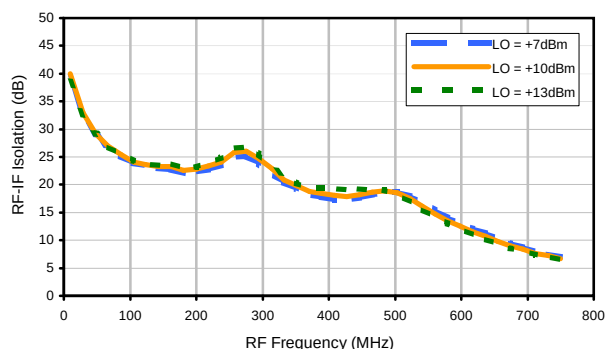
LO-RF Isolation



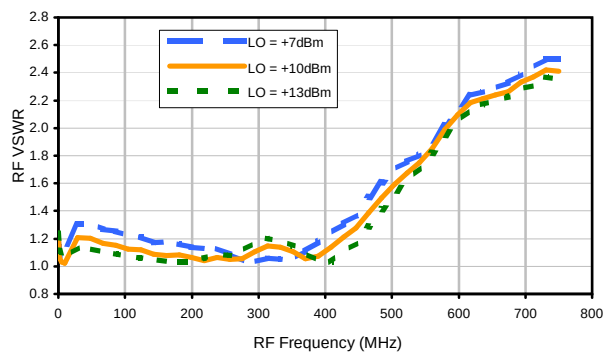
LO-IF Isolation



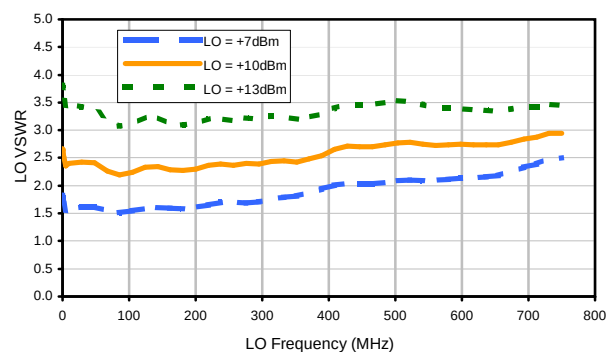
RF-IF Isolation



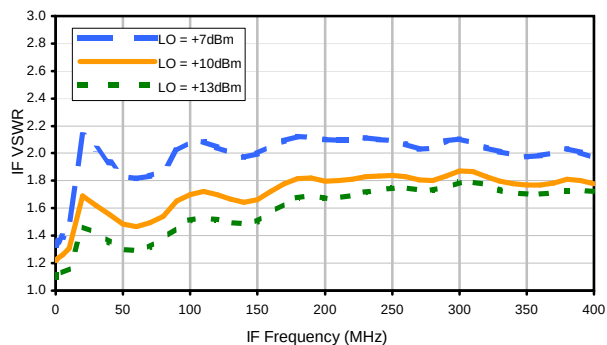
RF VSWR



LO VSWR



IF VSWR



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Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	20	38	24	49	33	55	39	50	50	54
1	-	18	+0	27	12	38	24	45	41	51	50	57
2	>100	59	42	57	42	52	42	55	68	61	50	65
3	>100	42	36	42	39	43	35	45	46	52	55	58
4	>100	66	54	71	53	64	53	69	50	66	76	70
5	>100	73	59	75	52	64	49	64	50	58	62	68
6	>100	85	69	>95	62	80	65	82	64	69	81	73
7	>100	81	78	74	70	71	64	74	60	65	56	73
8	>100	>95	87	90	89	81	72	85	67	79	68	75
9	>100	88	84	>95	78	85	74	84	79	91	72	77
10	>100	94	>95	>95	>95	>95	81	93	76	95	76	82
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 200.1 MHz; 0.00 dBm.

LO IN: 230.01 MHz; +10.00 dBm

IF OUT: 29.91 MHz; -5.23 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	11	27	12	41	22	41	24	37	36	40
1	-	17	+0	24	11	32	23	39	44	45	39	42
2	>100	68	45	56	44	64	44	63	70	74	55	63
3	>100	60	59	62	61	66	58	63	63	73	62	79
4	>100	82	79	82	74	78	71	81	72	>85	77	>85
5	>100	>85	82	>85	81	82	80	>85	77	>85	84	>85
6	>100	>85	>85	>85	>85	>85	82	>85	>85	>85	>85	>85
7	>100	>85	>85	>85	>85	>85	>85	74	>85	>85	>85	>85
8	>100	>85	>85	>85	>85	>85	>85	>85	65	>85	>85	>85
9	>100	>85	>85	>85	>85	>85	>85	>85	>85	71	>85	>85
10	>100	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85	>85
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 200.1 MHz; -10.00 dBm.

LO IN: 230.01 MHz; +10.00 dBm

IF OUT: 29.91 MHz; -15.2 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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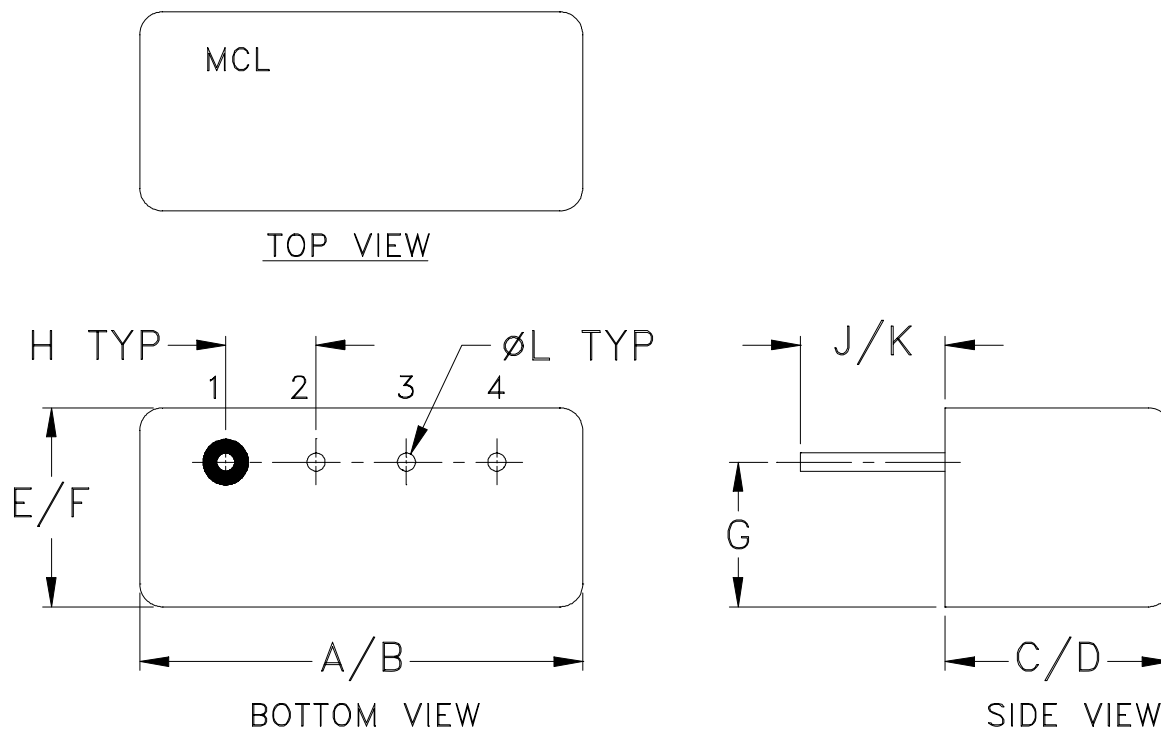
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B02

B13

Outline Dimensions



CASE#	A	B	C	D	E	F	G	H	J	K	L	WT, GRAM
B02	.480 (12.19)	.500 (12.70)	.240 (6.10)	.255 (6.48)	.210 (5.33)	.230 (5.84)	.16 (4.06)	.100 (2.54)	.14 (3.56)	.20 (5.08)	.020 (.51)	1.9
B13			.390 (9.91)	.405 (10.29)								2.3

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .03$; 3 Pl. $\pm .015$

Notes:

- Header material: C.R.S.
Pin material: #52 alloy.
Cover material: Cupro-Nickel.
- Pin finish: Electro Tin-Silver.
- Tolerance on pin diameter $\pm .005$ inch.
- Glass meniscus 0.015 inch max.
- Blue bead indicates Pin 1. Pin numbers do not appear on unit, for reference only.



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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	-55° to 100°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
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
Moisture Resistance	10 cycles, 24 hours per cycle	MIL-STD-202, Method 106, Condition A, except 50°C and end point electrical test done within 12 hours
Solderability	10X Magnification	J-STD-002, 95% Coverage
Resistance to Solder Heat	260°C for 10 seconds	MIL-STD-202, Method 210, Condition B
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
Terminal Strength	4 1/2 Pound Pull	MIL-STD-202, Method 211, Condition A



Environmental Specifications

ENV30

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
Barometric Pressure	100,000 Feet	MIL-STD-202, Method 105, Condition D