

Frequency Mixer

Level 10 (LO Power +10 dBm) 2 to 600 MHz

TUF-1LH+



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

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

Features

- low conversion loss, 6.0 dB typ.
- high L-R & L-I isolation, 50 dB typ.
- rugged welded construction

Applications

- VHF/UHF
- defense & federal communications

Electrical Specifications

FREQUENCY (MHz)		CONVERSION LOSS (dB)				LO-RF ISOLATION (dB)						LO-IF ISOLATION (dB)						IP3 @ CENTER BAND (dBm)						
LO/RF	IF	Mid-Band m				L			M			U			L				M			U		
		$\overline{X}$	σ	Max.	Total Range Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.		Typ.	Min.	Typ.	Min.	Typ.	
2-600	DC-600	6.0	0.17	7.0	8.0	70	50	50	30	42	25	65	45	50	30	41	22	17						

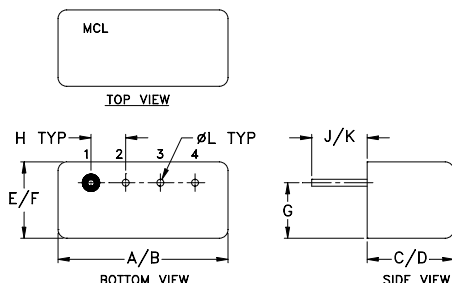
1 dB COMP: +5 dBm typ.

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

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
2.00	32.00	6.28	67.01	84.01	1.47	2.80
4.00	34.00	5.95	65.93	80.03	1.27	2.68
5.00	35.00	5.89	65.47	78.57	1.23	2.65
10.00	40.00	5.80	63.93	73.13	1.14	2.48
20.00	50.00	5.82	61.72	68.22	1.12	2.53
50.00	80.00	5.82	56.12	60.69	1.11	2.47
59.87	89.87	5.78	54.83	59.50	1.11	2.35
100.00	70.00	5.77	51.13	55.91	1.12	2.37
117.74	87.74	5.79	50.12	55.10	1.15	2.32
175.61	145.61	5.69	47.32	52.30	1.18	2.26
200.00	170.00	5.73	46.57	51.26	1.21	2.33
233.48	203.48	5.70	45.24	49.36	1.25	2.27
291.36	261.36	5.69	43.94	46.68	1.27	2.24
300.00	270.00	5.68	43.65	46.00	1.31	2.29
349.23	319.23	5.71	42.63	43.46	1.35	2.28
407.10	337.10	5.70	41.85	41.86	1.40	2.28
464.97	434.97	5.72	40.61	39.52	1.45	2.29
522.84	492.84	5.77	39.23	37.60	1.49	2.33
580.71	550.71	5.84	38.82	36.92	1.51	2.33
600.00	570.00	5.87	38.87	36.44	1.53	2.31

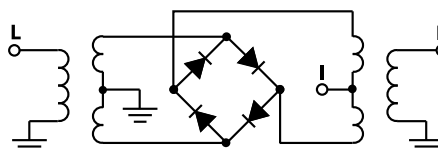
Outline Drawing



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

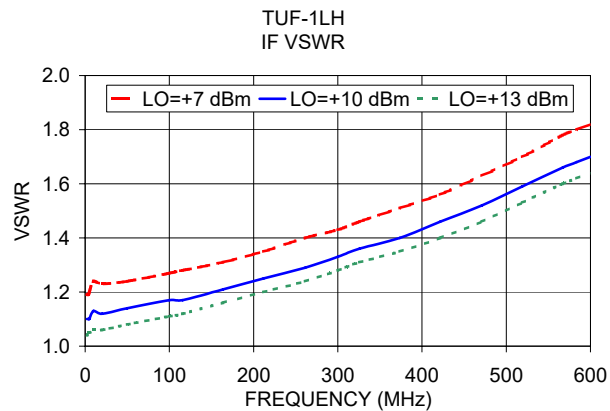
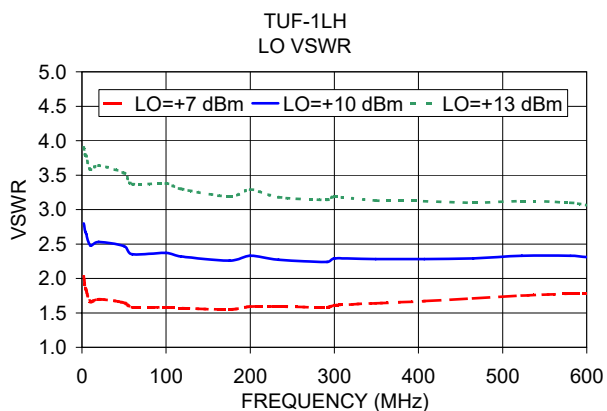
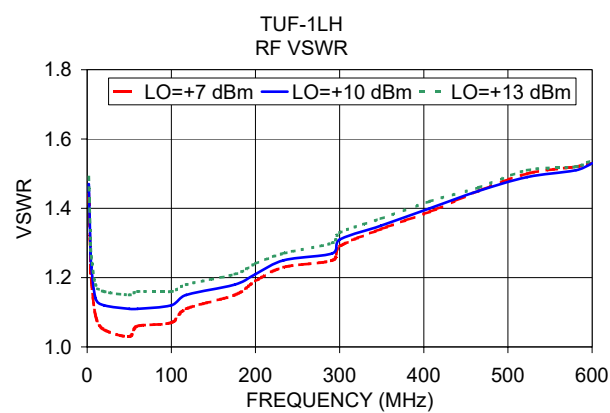
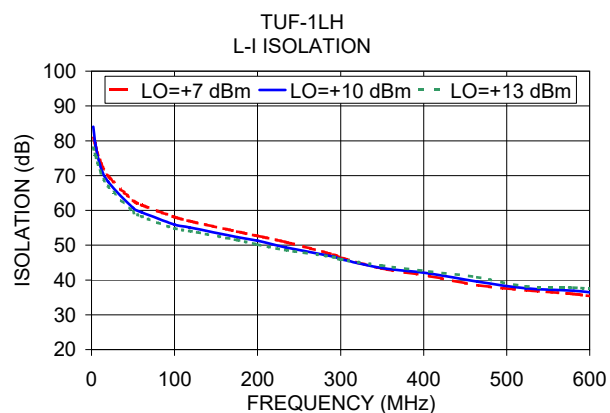
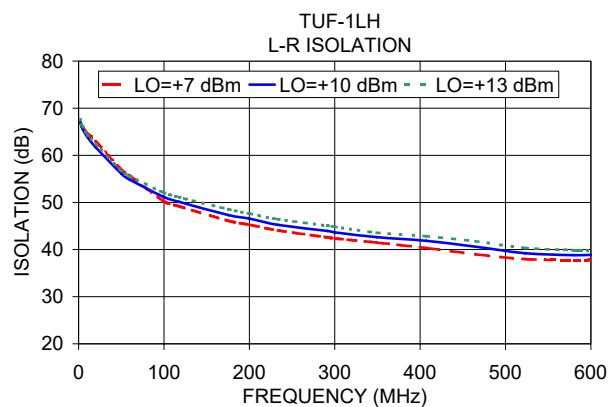
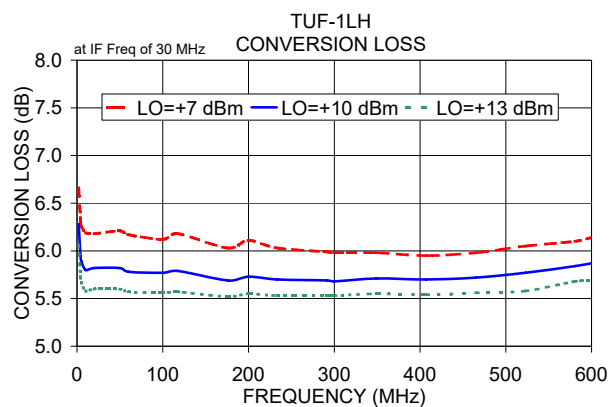
Electrical Schematic



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.
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Frequency Mixer

TUF-1LH+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB)		
		@LO (dBm)		
		+7	+10	+13
2.0	32.0	6.66	6.28	6.06
4.0	34.0	6.32	5.95	5.72
5.0	35.0	6.26	5.89	5.67
10.0	40.0	6.19	5.80	5.58
50.3	80.3	6.27	5.88	5.69
90.6	120.6	6.19	5.83	5.64
130.9	160.9	6.15	5.82	5.64
171.2	201.2	6.13	5.80	5.63
211.5	241.5	6.11	5.76	5.62
251.8	281.8	6.14	5.79	5.63
292.0	322.0	6.14	5.82	5.63
372.6	402.6	6.16	5.81	5.67
412.9	442.9	6.16	5.83	5.66
453.2	483.2	6.25	5.93	5.74
493.5	523.5	6.29	5.95	5.76
533.8	563.8	6.32	5.96	5.81
574.1	604.1	6.34	6.03	5.81
614.4	644.4	6.38	6.06	5.87
654.7	684.7	6.41	6.13	5.96
695.0	725.0	6.49	6.21	6.04
775.6	805.6	6.79	6.40	6.21
815.9	845.9	7.05	6.54	6.29
856.1	886.1	7.40	6.65	6.38
896.4	926.4	7.83	6.89	6.45
916.6	946.6	8.11	7.06	6.54
956.9	986.9	8.55	7.42	6.72
977.0	1007.0	8.77	7.64	6.86
1017.3	1047.3	9.18	8.02	7.19
1037.5	1067.5	9.37	8.25	7.37
1077.8	1107.8	9.62	8.58	7.71
1097.9	1127.9	9.73	8.71	7.86
1138.2	1168.2	9.88	8.97	8.17
1158.3	1188.3	9.94	9.09	8.31
1198.6	1228.6	10.07	9.32	8.59
1259.1	1289.1	10.25	9.56	8.91
1279.2	1309.2	10.30	9.65	9.02
1319.5	1349.5	10.44	9.81	9.22
1339.7	1369.7	10.50	9.89	9.34
1380.0	1410.0	10.70	10.18	9.72
1400.1	1430.1	10.78	10.35	9.90

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)		
		@LO (dBm)		
		+7	+10	+13
10.0	40.0	20.43	20.35	20.32
50.3	80.3	18.27	22.03	21.98
90.6	120.6	19.47	20.24	20.33
130.9	160.9	18.76	19.31	25.47
171.2	201.2	17.48	20.97	30.03
211.5	241.5	18.34	22.93	25.38
251.8	281.8	19.23	23.48	23.68
292.0	322.0	19.37	22.80	24.83
332.3	362.3	21.81	21.86	25.71
372.6	402.6	18.92	19.94	20.42
412.9	442.9	17.38	18.56	23.77
453.2	483.2	18.77	18.84	21.61
493.5	523.5	20.50	25.64	31.26
533.8	563.8	19.52	23.25	24.01
574.1	604.1	15.80	19.86	27.54
614.4	644.4	15.39	16.15	19.96
654.7	684.7	15.12	15.64	17.95
695.0	725.0	14.44	15.50	17.10
735.3	765.3	13.85	16.19	18.35
775.6	805.6	12.84	16.51	20.68
815.9	845.9	10.79	16.67	23.11
856.1	886.1	8.89	14.78	23.47
896.4	926.4	8.03	13.13	19.85
916.6	946.6	8.21	12.80	20.28
956.9	986.9	8.66	12.24	21.19
977.0	1007.0	9.06	12.31	19.86
1017.3	1047.3	9.99	12.65	18.70
1037.5	1067.5	10.44	13.06	17.45
1077.8	1107.8	10.92	13.41	16.60
1097.9	1127.9	10.84	13.21	15.84
1138.2	1168.2	10.94	12.51	14.53
1158.3	1188.3	11.12	12.05	14.09
1198.6	1228.6	11.14	11.63	12.95
1218.8	1248.8	11.29	11.42	12.78
1259.1	1289.1	11.56	11.43	12.78
1279.2	1309.2	11.42	11.53	12.88
1319.5	1349.5	11.96	12.28	14.23
1339.7	1369.7	12.13	12.91	15.18
1380.0	1410.0	13.13	14.38	16.62
1400.1	1430.1	13.51	15.02	16.50

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+5dBm (dB)		
		@LO (dBm)		
		+7	+10	+13
10.0	40.0	0.61	0.42	0.27
50.3	80.3	0.67	0.39	0.26
90.6	120.6	0.51	0.38	0.24
130.9	160.9	0.56	0.37	0.24
171.2	201.2	0.52	0.35	0.22
211.5	241.5	0.57	0.37	0.24
251.8	281.8	0.58	0.38	0.25
292.0	322.0	0.58	0.34	0.24
332.3	362.3	0.58	0.35	0.23
372.6	402.6	0.56	0.36	0.24
412.9	442.9	0.52	0.33	0.23
453.2	483.2	0.51	0.33	0.24
493.5	523.5	0.53	0.34	0.24
533.8	563.8	0.60	0.39	0.28
574.1	604.1	0.67	0.44	0.30
614.4	644.4	0.73	0.47	0.31
654.7	684.7	0.80	0.49	0.33
695.0	725.0	0.93	0.59	0.39
735.3	765.3	1.02	0.64	0.43
775.6	805.6	1.17	0.77	0.52
815.9	845.9	1.23	0.87	0.59
856.1	886.1	1.12	0.91	0.62
896.4	926.4	0.91	0.89	0.66
916.6	946.6	0.79	0.84	0.67
956.9	986.9	0.51	0.68	0.63
977.0	1007.0	0.40	0.59	0.61
1017.3	1047.3	0.21	0.43	0.54
1037.5	1067.5	0.11	0.33	0.48
1077.8	1107.8	-0.03	0.18	0.31
1097.9	1127.9	-0.05	0.11	0.26
1138.2	1168.2	0.03	0.08	0.21
1158.3	1188.3	0.00	0.03	0.19
1198.6	1228.6	0.05	0.02	0.12
1218.8	1248.8	0.12	0.05	0.14
1259.1	1289.1	0.20	0.11	0.17
1279.2	1309.2	0.22	0.12	0.18
1319.5	1349.5	0.30	0.21	0.25
1339.7	1369.7	0.31	0.24	0.28
1380.0	1410.0	0.34	0.28	0.31
1400.1	1430.1	0.32	0.29	0.30

REV. X2

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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)=300.1MHz (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)=600.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+10			+10			+10
290.0	10.1	5.96	10.0	20.1	5.83	590.0	10.1	6.29
282.8	17.3	5.97	24.9	35.0	5.67	575.1	25.0	6.23
275.6	24.5	5.92	39.7	49.8	5.68	560.3	39.8	6.21
268.5	31.6	5.93	54.6	64.7	5.73	545.4	54.7	6.19
261.3	38.8	5.89	69.5	79.6	5.72	530.5	69.6	6.16
254.1	46.0	5.92	84.4	94.5	5.78	515.6	84.5	6.15
246.9	53.2	5.89	99.2	109.3	5.75	500.8	99.3	6.10
239.7	60.4	5.90	114.1	124.2	5.75	485.9	114.2	6.05
232.6	67.5	5.86	129.0	139.1	5.75	471.0	129.1	5.99
225.4	74.7	5.86	143.8	153.9	5.78	456.2	143.9	5.99
218.2	81.9	5.84	158.7	168.8	5.80	441.3	158.8	6.02
211.0	89.1	5.83	173.6	183.7	5.83	426.4	173.7	6.01
203.8	96.3	5.84	188.5	198.6	5.82	411.5	188.6	5.97
196.7	103.4	5.82	203.3	213.4	5.83	396.7	203.4	5.95
189.5	110.6	5.81	218.2	228.3	5.82	381.8	218.3	5.97
182.3	117.8	5.79	233.1	243.2	5.83	366.9	233.2	5.98
175.1	125.0	5.78	247.9	258.0	5.85	352.1	248.0	5.98
167.9	132.2	5.75	262.8	272.9	5.86	337.2	262.9	5.97
160.8	139.3	5.77	277.7	287.8	5.86	322.3	277.8	5.99
153.6	146.5	5.73	292.6	302.7	5.86	307.4	292.7	5.98
146.4	153.7	5.74	307.4	317.5	5.86	292.6	307.5	5.96
139.2	160.9	5.74	322.3	332.4	5.89	277.7	322.4	5.96
132.1	168.0	5.76	337.2	347.3	5.88	262.8	337.3	5.97
124.9	175.2	5.75	352.1	362.2	5.88	247.9	352.2	6.00
117.7	182.4	5.75	366.9	377.0	5.93	233.1	367.0	6.00
110.5	189.6	5.75	381.8	391.9	5.92	218.2	381.9	6.02
103.3	196.8	5.75	396.7	406.8	5.92	203.3	396.8	6.04
96.2	203.9	5.76	411.5	421.6	5.89	188.5	411.6	6.05
89.0	211.1	5.75	426.4	436.5	5.94	173.6	426.5	6.05
81.8	218.3	5.74	441.3	451.4	5.98	158.7	441.4	6.05
74.6	225.5	5.74	456.2	466.3	5.96	143.8	456.3	6.07
67.4	232.7	5.75	471.0	481.1	5.95	129.0	471.1	6.06
60.3	239.8	5.74	485.9	496.0	5.95	114.1	486.0	6.04
53.1	247.0	5.75	500.8	510.9	5.98	99.2	500.9	6.01
45.9	254.2	5.73	515.6	525.7	5.97	84.4	515.7	6.00
38.7	261.4	5.76	530.5	540.6	5.99	69.5	530.6	6.00
31.5	268.6	5.77	545.4	555.5	6.02	54.6	545.5	6.00
24.4	275.7	5.79	560.3	570.4	6.05	39.7	560.4	6.01
17.2	282.9	5.80	575.1	585.2	6.06	24.9	575.2	6.02
10.0	290.1	5.90	590.0	600.1	6.05	10.0	590.1	6.14

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Frequency Mixer

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Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+7	+10	+13	+7	+10	+13
2.0	66.96	67.01	67.63	80.76	84.01	77.93
4.0	66.09	65.93	66.27	79.49	80.03	76.17
5.0	65.82	65.47	66.09	78.22	78.57	75.39
10.0	64.67	63.93	64.36	74.47	73.13	71.36
50.3	54.55	55.16	56.52	53.02	51.61	52.00
90.6	50.49	50.78	52.95	50.44	49.20	48.95
130.9	47.75	48.15	50.98	48.81	46.93	47.11
171.2	45.74	46.43	49.44	47.27	45.21	45.79
211.5	44.24	44.81	48.29	46.11	44.16	44.73
251.8	43.20	43.57	47.38	44.46	42.73	43.49
292.0	42.00	42.41	46.38	43.04	41.38	42.45
372.6	40.57	40.91	45.57	39.15	38.35	40.23
412.9	39.54	39.83	44.62	37.22	36.84	39.13
453.2	38.57	38.73	43.36	35.76	35.24	37.37
493.5	37.92	37.89	42.36	34.55	34.39	36.69
533.8	37.56	37.44	42.04	33.14	33.39	36.05
574.1	37.57	37.40	42.31	32.27	32.54	35.55
614.4	37.51	37.32	43.24	31.41	31.69	34.56
654.7	37.23	36.84	43.05	30.33	30.85	33.76
695.0	36.73	36.22	41.98	29.47	30.15	33.16
775.6	35.60	35.27	40.11	27.49	28.72	32.48
815.9	35.09	34.79	39.37	26.51	27.78	31.62
856.1	34.67	34.53	38.70	25.63	26.73	30.36
896.4	34.41	34.37	38.19	25.33	26.06	29.47
916.6	34.33	34.35	37.97	25.05	25.65	28.98
956.9	34.25	34.27	37.34	24.73	25.30	28.24
977.0	34.32	34.26	37.29	24.54	25.09	28.04
1017.3	34.59	34.53	36.97	24.23	24.86	27.55
1037.5	34.66	34.51	36.73	23.94	24.64	27.28
1077.8	35.11	34.95	36.76	23.91	24.63	27.21
1097.9	35.41	35.29	36.91	23.72	24.57	27.17
1138.2	35.79	35.73	36.99	23.51	24.61	27.30
1158.3	36.14	35.96	37.20	23.55	24.73	27.59
1198.6	36.71	36.44	37.24	23.30	24.77	27.92
1259.1	37.50	36.86	36.62	22.97	24.57	27.93
1279.2	37.81	37.03	36.45	22.80	24.37	27.80
1319.5	38.32	37.35	35.80	22.58	24.06	27.39
1339.7	38.85	37.84	35.77	22.35	23.79	27.03
1380.0	39.13	38.46	35.44	22.24	23.70	26.88
1400.1	39.69	38.97	35.32	22.08	23.49	26.63

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+7	+10	+13
10.0	40.0	41.47	39.88	42.73
50.3	80.3	35.71	35.83	36.00
90.6	120.6	31.16	31.48	31.83
130.9	160.9	28.67	28.81	29.16
171.2	201.2	27.02	27.27	27.54
211.5	241.5	25.99	26.32	26.71
251.8	281.8	25.43	25.63	25.99
292.0	322.0	25.39	25.74	26.11
332.3	362.3	25.31	25.84	26.36
372.6	402.6	25.44	26.04	26.67
412.9	442.9	26.47	26.76	27.31
453.2	483.2	27.73	27.80	28.03
493.5	523.5	28.43	28.72	29.35
533.8	563.8	27.14	27.78	29.44
574.1	604.1	24.79	25.38	27.07
614.4	644.4	22.61	22.92	24.01
654.7	684.7	20.84	20.78	21.48
695.0	725.0	19.57	19.21	19.63
735.3	765.3	18.48	17.98	18.25
775.6	805.6	17.61	17.03	17.17
815.9	845.9	16.91	16.32	16.45
856.1	886.1	16.33	15.77	15.99
896.4	926.4	15.85	15.39	15.65
916.6	946.6	15.58	15.26	15.50
956.9	986.9	15.24	15.04	15.35
977.0	1007.0	15.09	14.93	15.30
1017.3	1047.3	14.88	14.82	15.30
1037.5	1067.5	14.77	14.77	15.35
1077.8	1107.8	14.60	14.67	15.33
1097.9	1127.9	14.53	14.62	15.32
1138.2	1168.2	14.40	14.56	15.28
1158.3	1188.3	14.33	14.50	15.22
1198.6	1228.6	14.10	14.34	15.01
1218.8	1248.8	13.96	14.22	14.87
1259.1	1289.1	13.67	13.91	14.49
1279.2	1309.2	13.51	13.76	14.24
1319.5	1349.5	13.25	13.38	13.67
1339.7	1369.7	13.12	13.12	13.32
1380.0	1410.0	12.75	12.53	12.58
1400.1	1430.1	12.55	12.26	12.18

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Frequency Mixer

TUF-1LH+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=600.1MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+7	+10	+13		+7	+10	+13		+7	+10	+13
2.0	32.0	1.44	1.47	1.49	2.0	2.03	2.80	3.90	2.0	1.19	1.10	1.04
4.0	34.0	1.23	1.27	1.30	4.0	1.86	2.68	3.79	4.0	1.19	1.10	1.05
5.0	35.0	1.19	1.23	1.26	5.0	1.83	2.65	3.78	5.0	1.20	1.10	1.05
10.0	40.0	1.09	1.14	1.18	10.0	1.66	2.48	3.58	10.0	1.24	1.13	1.06
50.3	80.3	1.09	1.03	1.08	50.3	1.47	2.24	3.24	25.1	1.66	1.43	1.22
90.6	120.6	1.11	1.06	1.10	90.6	1.43	2.12	3.03	40.3	1.67	1.40	1.22
130.9	160.9	1.13	1.09	1.13	130.9	1.44	2.16	3.10	55.4	1.64	1.41	1.23
171.2	201.2	1.16	1.13	1.16	171.2	1.44	2.12	3.00	70.5	1.67	1.42	1.25
211.5	241.5	1.18	1.16	1.19	211.5	1.46	2.13	3.00	85.6	1.67	1.44	1.26
251.8	281.8	1.22	1.20	1.22	251.8	1.48	2.15	3.02	100.8	1.71	1.46	1.27
292.0	322.0	1.25	1.23	1.25	292.0	1.50	2.13	2.96	115.9	1.71	1.47	1.28
332.3	362.3	1.27	1.26	1.29	332.3	1.54	2.18	3.03	131.0	1.73	1.48	1.29
372.6	402.6	1.29	1.28	1.31	372.6	1.57	2.18	2.99	146.2	1.73	1.48	1.30
412.9	442.9	1.31	1.30	1.33	412.9	1.61	2.21	3.01	161.3	1.72	1.48	1.31
453.2	483.2	1.35	1.34	1.35	453.2	1.64	2.23	3.02	176.4	1.74	1.49	1.32
493.5	523.5	1.39	1.38	1.40	493.5	1.69	2.24	3.01	191.5	1.76	1.51	1.34
533.8	563.8	1.42	1.42	1.44	533.8	1.74	2.28	3.03	206.7	1.78	1.53	1.36
574.1	604.1	1.44	1.44	1.47	574.1	1.78	2.29	3.01	221.8	1.78	1.53	1.36
614.4	644.4	1.45	1.46	1.48	614.4	1.83	2.34	3.05	236.9	1.78	1.53	1.37
654.7	684.7	1.45	1.46	1.47	654.7	1.88	2.35	3.04	252.1	1.79	1.54	1.38
695.0	725.0	1.44	1.44	1.45	695.0	1.92	2.36	3.03	267.2	1.81	1.57	1.40
735.3	765.3	1.44	1.43	1.43	735.3	1.98	2.38	3.03	282.3	1.84	1.60	1.43
775.6	805.6	1.45	1.42	1.42	775.6	2.03	2.38	2.99	297.4	1.85	1.60	1.44
815.9	845.9	1.51	1.46	1.45	815.9	2.08	2.41	2.99	312.6	1.85	1.61	1.44
856.1	886.1	1.62	1.55	1.54	856.1	2.16	2.47	3.01	327.7	1.86	1.62	1.45
896.4	926.4	1.78	1.68	1.64	896.4	2.21	2.52	3.05	342.8	1.88	1.64	1.48
916.6	946.6	1.87	1.77	1.71	916.6	2.22	2.55	3.07	357.9	1.91	1.66	1.51
956.9	986.9	2.06	1.93	1.85	956.9	2.25	2.59	3.11	373.1	1.93	1.69	1.54
977.0	1007.0	2.17	2.05	1.95	977.0	2.27	2.61	3.12	388.2	1.96	1.71	1.56
1017.3	1047.3	2.38	2.25	2.13	1017.3	2.30	2.62	3.14	403.3	1.98	1.73	1.57
1037.5	1067.5	2.50	2.36	2.24	1037.5	2.31	2.63	3.15	418.5	1.99	1.74	1.57
1077.8	1107.8	2.70	2.57	2.44	1077.8	2.34	2.64	3.15	433.6	1.98	1.74	1.58
1097.9	1127.9	2.79	2.67	2.53	1097.9	2.35	2.64	3.13	448.7	1.98	1.74	1.59
1138.2	1168.2	2.95	2.84	2.71	1138.2	2.36	2.63	3.11	463.8	2.02	1.78	1.63
1158.3	1188.3	3.01	2.92	2.78	1158.3	2.37	2.63	3.10	479.0	2.08	1.83	1.68
1198.6	1228.6	3.11	3.03	2.90	1198.6	2.39	2.60	3.04	494.1	2.13	1.88	1.72
1218.8	1248.8	3.14	3.06	2.94	1218.8	2.39	2.58	3.01	509.2	2.15	1.90	1.73
1259.1	1289.1	3.17	3.11	2.99	1259.1	2.40	2.55	2.96	524.4	2.14	1.89	1.72
1279.2	1309.2	3.18	3.13	3.02	1279.2	2.40	2.53	2.93	539.5	2.13	1.88	1.72
1319.5	1349.5	3.20	3.14	3.03	1319.5	2.40	2.48	2.86	554.6	2.14	1.90	1.74
1339.7	1369.7	3.21	3.15	3.04	1339.7	2.41	2.47	2.84	569.7	2.18	1.95	1.79
1380.0	1410.0	3.21	3.16	3.05	1380.0	2.42	2.46	2.83	584.9	2.25	2.00	1.85
1400.1	1430.1	3.21	3.16	3.06	1400.1	2.44	2.46	2.82	600.0	2.36	2.30	2.31

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Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	24	37	32	47	35	49	46	60	53	68
1	-	20	+0	29	12	34	20	36	32	48	49	48
2	85	67	47	64	46	64	46	70	48	60	62	74
3	>100	54	53	61	57	66	47	59	53	77	51	58
4	>100	76	65	75	64	80	65	76	63	87	63	75
5	>100	77	75	67	60	65	56	63	54	69	52	64
6	>100	85	79	88	83	92	86	94	85	90	80	94
7	>100	91	77	85	77	86	83	81	81	80	79	81
8	>100	>94	93	>94	>94	93	>94	>94	>94	>94	90	>94
9	>100	>94	90	91	81	84	80	88	79	93	81	92
10	>100	>94	>94	>94	>94	>94	>94	>94	>94	>94	81	>94
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 300.1 MHz; 0.00 dBm.

LO IN: 330.01 MHz; +10.00 dBm

IF OUT: 29.91 MHz; -5.99 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	16	28	19	38	22	34	32	50	34	47
1	-	20	+0	29	12	34	20	36	34	43	42	41
2	>100	69	52	69	53	70	52	84	54	67	66	79
3	>100	75	77	77	64	73	59	80	58	69	60	77
4	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	80	>84
5	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
6	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
7	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
8	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
9	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
10	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 300.1 MHz; -10.00 dBm.

LO IN: 330.01 MHz; +10.00 dBm

IF OUT: 29.91 MHz; -15.91 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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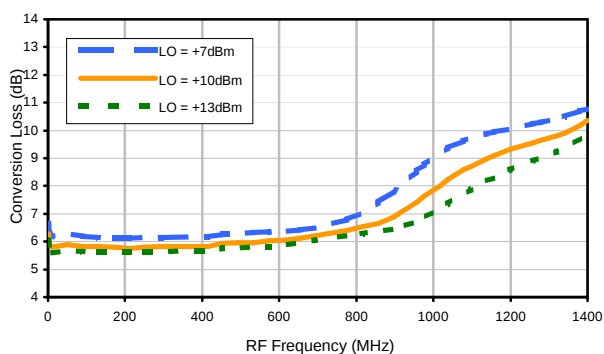


Frequency Mixer

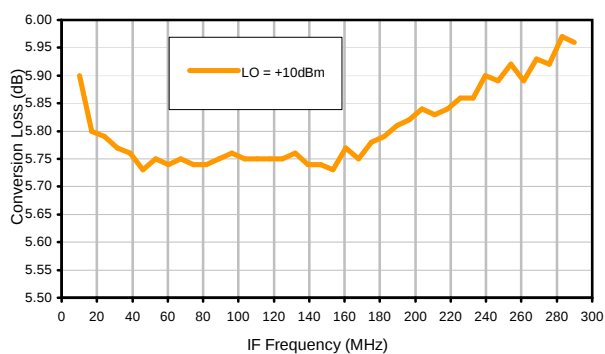
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Typical Performance Curves

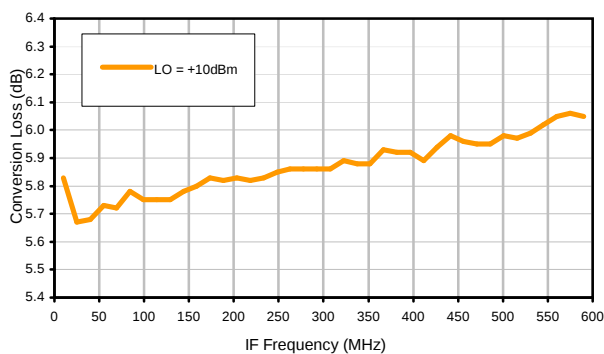
Conversion Loss @ IF=30MHz



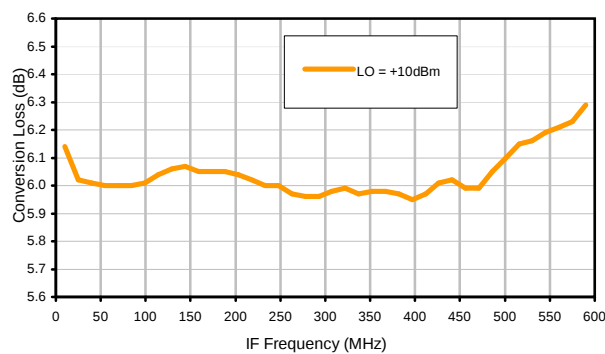
Conversion Loss vs. IF @ RF=300.1MHz



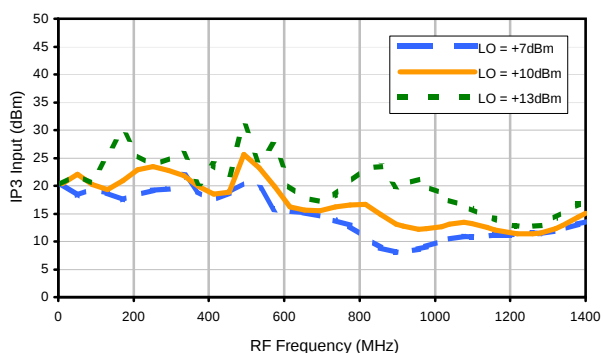
Conversion Loss vs. IF @ RF=10.1MHz



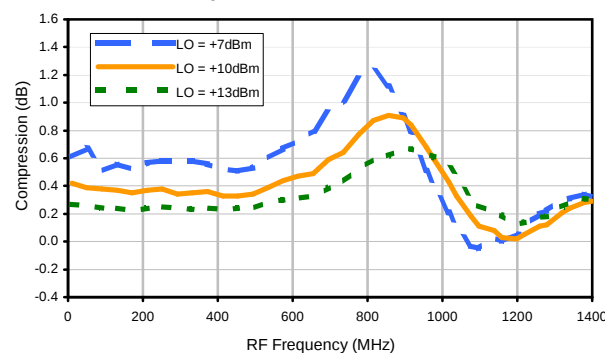
Conversion Loss vs. IF @ RF=600.1MHz



IP3 Input



Compression @ RF IN=+5dBm



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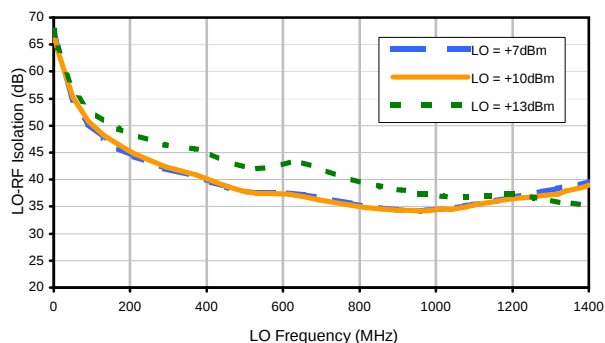


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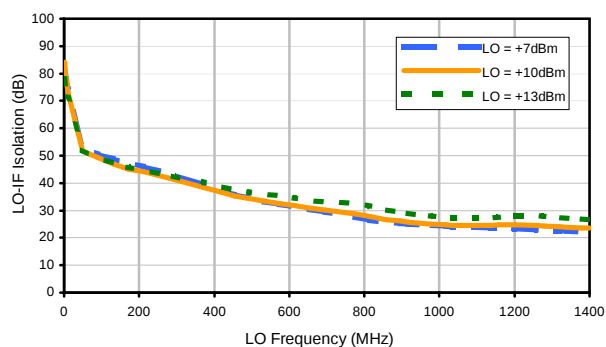


Typical Performance Curves

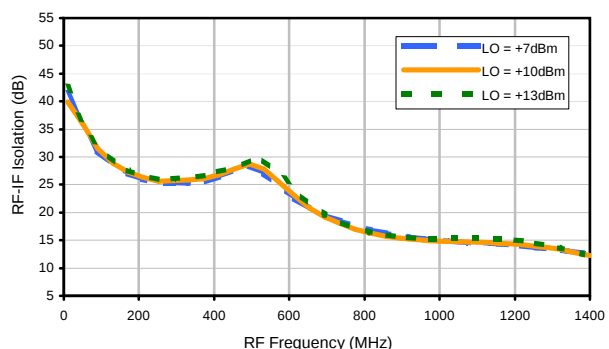
LO-RF Isolation



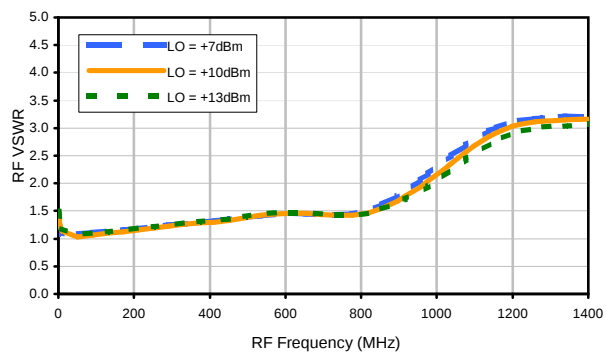
LO-IF Isolation



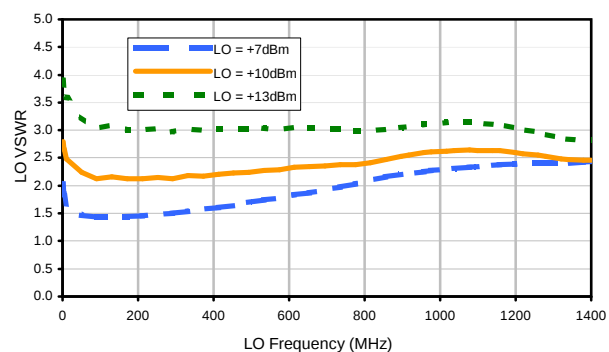
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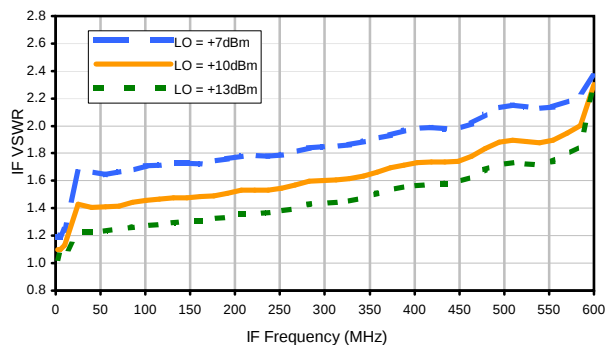
RF VSWR



LO VSWR



IF VSWR



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Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	24	37	32	47	35	49	46	60	53	68
1	-	20	+0	29	12	34	20	36	32	48	49	48
2	85	67	47	64	46	64	46	70	48	60	62	74
3	>100	54	53	61	57	66	47	59	53	77	51	58
4	>100	76	65	75	64	80	65	76	63	87	63	75
5	>100	77	75	67	60	65	56	63	54	69	52	64
6	>100	85	79	88	83	92	86	94	85	90	80	94
7	>100	91	77	85	77	86	83	81	81	80	79	81
8	>100	>94	93	>94	>94	93	>94	>94	>94	>94	90	>94
9	>100	>94	90	91	81	84	80	88	79	93	81	92
10	>100	>94	>94	>94	>94	>94	>94	>94	>94	>94	81	>94
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:

RF IN: 300.1 MHz; 0.00 dBm.

LO IN: 330.01 MHz; +10.00 dBm

IF OUT: 29.91 MHz; -5.99 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	16	28	19	38	22	34	32	50	34	47
1	-	20	+0	29	12	34	20	36	34	43	42	41
2	>100	69	52	69	53	70	52	84	54	67	66	79
3	>100	75	77	77	64	73	59	80	58	69	60	77
4	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	80	>84
5	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
6	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
7	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
8	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
9	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
10	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:

RF IN: 300.1 MHz; -10.00 dBm.

LO IN: 330.01 MHz; +10.00 dBm

IF OUT: 29.91 MHz; -15.91 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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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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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



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