

Frequency Mixer

Level 13 (LO Power +13 dBm) 2 to 600 MHz

TUF-1MH+



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	200mW
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, 6.3 dB typ.
- high isolation, 50 dB typ. L-R, 48 dB typ. L-I
- rugged welded construction

Applications

- VHF/UHF
- defense & federal communications

Electrical Specifications

FREQUENCY (MHz)		CONVERSION LOSS (dB)				LO-RF ISOLATION (dB)						LO-IF ISOLATION (dB)					
LO/RF	IF	Mid-Band m		Total Range Max.		L	M	U				L	M	U			
f_L - f_U		$\bar{X}$	σ	Max.		Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.
2-600	DC-600	6.3	0.12	7.0	8.0	68	50	50	30	43	25	65	45	48	30	37	22

1 dB COMP.: +9 dBm typ.

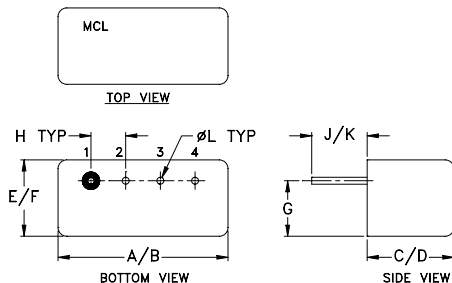
L = low range [f_L to $10 f_L$] M = mid range [$10 f_L$ to $f_U/2$] U = upper range [$f_U/2$ to f_U]

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

Typical Performance Data

Frequency (MHz)		Conversion Loss (dB)	VSWR RF Port (:1)	Frequency (MHz)	Isolation L-R (dB)	Isolation L-I (dB)	VSWR LO Port (:1)
RF	LO	LO +13dBm	LO +13dBm	LO	LO +13dBm	LO +13dBm	LO +13dBm
2.00	32.00	6.69	1.71	2.30	72.70	67.41	2.47
4.00	34.00	6.16	1.37	5.30	70.19	66.64	2.38
10.00	40.00	5.88	1.15	10.30	66.20	64.23	2.34
16.00	46.00	5.86	1.10	15.30	63.06	61.97	2.28
33.00	63.00	5.84	1.05	20.30	60.88	60.01	2.30
50.00	80.00	5.81	1.03	30.30	58.09	57.73	2.22
101.00	131.00	5.84	1.03	40.10	56.62	56.49	2.23
171.00	201.00	5.97	1.07	80.00	50.45	50.68	2.16
211.00	241.00	6.00	1.09	114.00	48.55	49.14	2.21
271.00	301.00	5.99	1.12	161.00	46.23	47.36	2.14
311.00	341.00	6.02	1.14	201.00	44.75	46.87	2.19
331.00	361.00	6.00	1.16	241.00	43.64	46.01	2.11
355.00	385.00	6.01	1.17	301.00	41.84	43.65	2.18
398.00	428.00	6.00	1.18	346.00	40.23	41.40	2.19
441.00	471.00	6.08	1.19	406.50	39.17	39.27	2.18
484.00	514.00	6.16	1.22	449.50	38.01	37.50	2.14
505.50	535.50	6.14	1.23	471.00	37.37	36.34	2.18
548.50	578.50	6.19	1.26	514.00	36.67	36.01	2.20
570.00	600.00	6.16	1.27	557.00	36.02	35.09	2.25
600.00	630.00	6.30	1.30	600.00	35.65	33.93	2.18

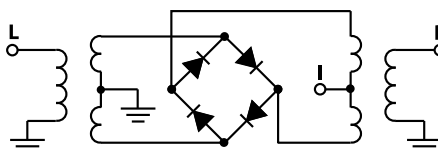
Outline Drawing



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

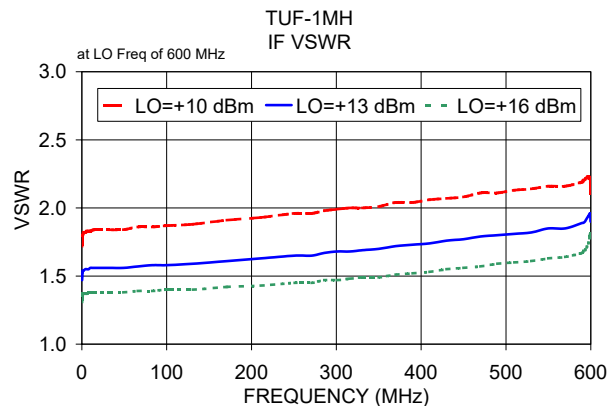
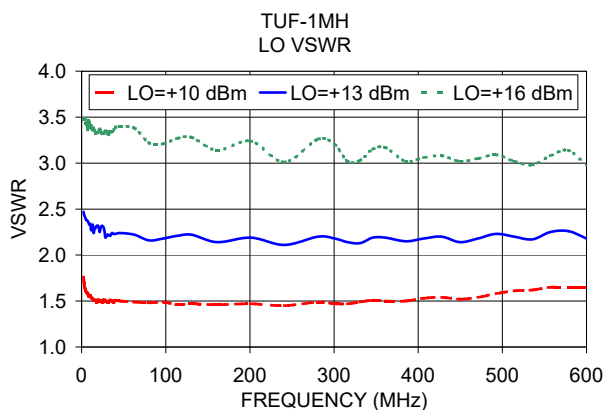
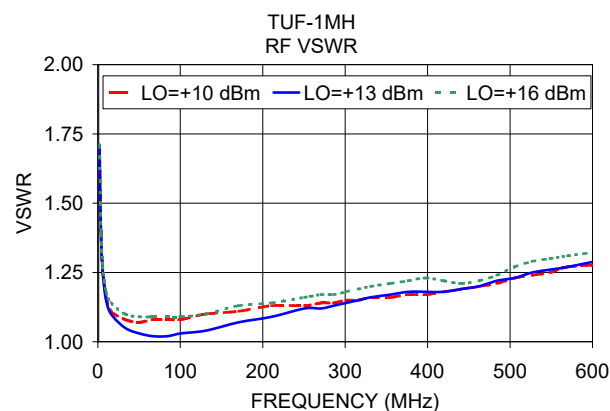
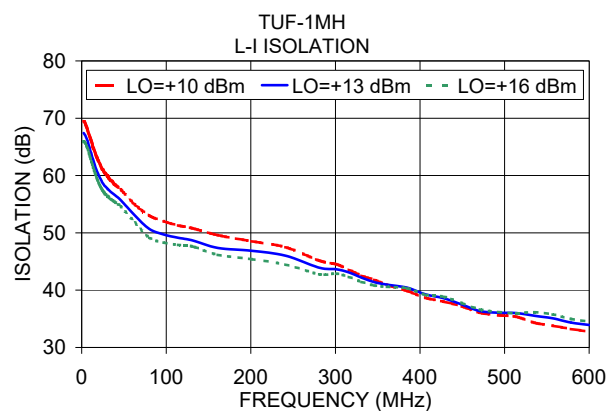
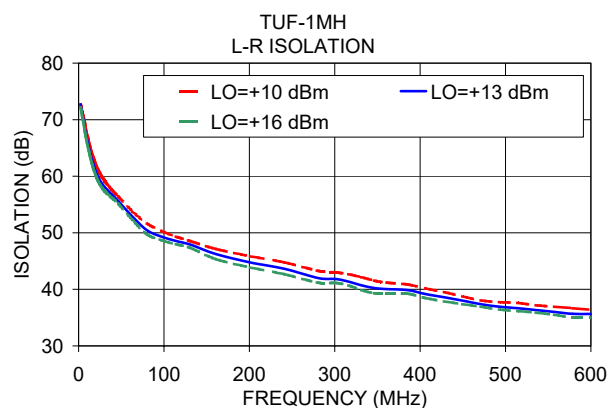
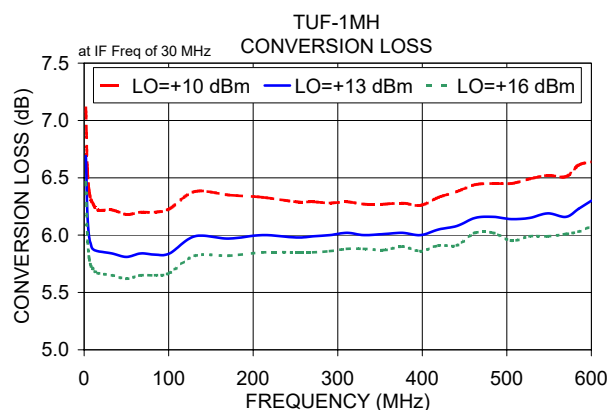
Electrical Schematic



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.
 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-1MH+

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
2.0	32.0	7.06	6.55	6.24	10.1	40.1	23.62	26.66	28.16	10.1	40.1	1.42	1.19	1.02
5.0	35.0	6.49	6.06	5.82	50.4	80.4	22.21	25.36	26.08	50.4	80.4	1.22	1.00	0.85
10.0	40.0	6.42	5.98	5.73	90.7	120.7	21.08	22.75	25.58	90.7	120.7	1.11	0.99	0.85
50.4	80.4	6.11	5.76	5.61	131.0	161.0	22.18	24.86	28.27	131.0	161.0	1.22	1.02	0.82
90.7	120.7	6.06	5.72	5.57	171.3	201.3	21.15	25.17	28.52	171.3	201.3	1.16	0.96	0.81
131.0	161.0	5.97	5.66	5.54	211.5	241.5	23.34	28.18	25.34	211.5	241.5	1.16	0.92	0.75
171.3	201.3	6.04	5.68	5.55	251.8	281.8	26.47	23.17	24.20	251.8	281.8	1.16	0.91	0.75
211.5	241.5	5.88	5.63	5.52	292.1	322.1	24.45	22.71	25.31	292.1	322.1	1.16	0.88	0.76
251.8	281.8	5.94	5.68	5.57	332.4	362.4	21.91	24.22	33.79	332.4	362.4	1.12	0.85	0.72
292.1	322.1	5.93	5.67	5.55	372.7	402.7	21.88	21.61	23.26	372.7	402.7	1.09	0.83	0.70
332.4	362.4	5.94	5.69	5.59	413.0	443.0	19.62	23.45	25.86	413.0	443.0	1.01	0.80	0.66
372.7	402.7	5.98	5.73	5.61	453.3	483.3	19.03	20.76	28.05	453.3	483.3	0.95	0.74	0.65
413.0	443.0	5.95	5.69	5.60	493.6	523.6	21.07	22.16	24.38	493.6	523.6	1.05	0.79	0.68
453.3	483.3	6.06	5.79	5.62	533.9	563.9	23.43	28.72	37.10	533.9	563.9	1.05	0.84	0.69
493.6	523.6	6.05	5.82	5.69	574.2	604.2	20.82	27.79	28.58	574.2	604.2	1.20	1.00	0.82
574.2	604.2	6.12	5.82	5.69	614.4	644.4	17.22	22.59	29.92	614.4	644.4	1.25	1.06	0.91
614.4	644.4	6.24	5.92	5.73	654.7	684.7	16.34	17.95	22.24	654.7	684.7	1.40	1.13	0.96
654.7	684.7	6.29	6.05	5.85	695.0	725.0	15.77	16.41	17.85	695.0	725.0	1.55	1.23	1.05
695.0	725.0	6.33	6.12	5.99	735.3	765.3	15.56	16.87	17.52	735.3	765.3	1.75	1.39	1.20
735.3	765.3	6.45	6.27	6.13	775.6	805.6	15.46	17.54	20.13	775.6	805.6	1.93	1.52	1.33
775.6	805.6	6.49	6.30	6.16	815.9	845.9	15.99	19.65	24.40	815.9	845.9	1.97	1.59	1.38
815.9	845.9	6.54	6.31	6.16	856.2	886.2	16.98	21.92	26.93	856.2	886.2	2.08	1.63	1.39
856.2	886.2	6.68	6.29	6.15	896.5	926.5	15.98	23.14	33.25	896.5	926.5	1.98	1.67	1.40
896.5	926.5	6.99	6.36	6.17	916.6	946.6	15.17	24.50	26.29	916.6	946.6	1.86	1.74	1.45
916.6	946.6	7.26	6.49	6.22	956.9	986.9	13.10	21.67	26.43	956.9	986.9	1.62	1.70	1.48
956.9	986.9	7.65	6.66	6.31	977.1	1007.1	11.91	21.28	27.16	977.1	1007.1	1.46	1.72	1.52
977.1	1007.1	8.01	6.79	6.35	1017.3	1047.3	11.80	17.87	27.97	1017.3	1047.3	1.24	1.59	1.53
1017.3	1047.3	8.48	7.20	6.54	1037.5	1067.5	12.19	17.33	26.76	1037.5	1067.5	1.15	1.48	1.50
1037.5	1067.5	8.50	7.28	6.55	1077.8	1107.8	12.86	15.24	25.77	1077.8	1107.8	0.84	1.10	1.33
1077.8	1107.8	9.07	7.93	6.98	1097.9	1127.9	13.54	15.87	22.57	1097.9	1127.9	0.75	0.99	1.22
1097.9	1127.9	9.12	8.10	7.19	1138.2	1168.2	14.10	16.66	20.19	1138.2	1168.2	0.54	0.75	0.95
1138.2	1168.2	9.45	8.53	7.66	1158.4	1188.4	14.59	16.84	21.10	1158.4	1188.4	0.52	0.67	0.89
1158.4	1188.4	9.69	8.81	7.92	1198.7	1228.7	14.94	16.80	20.25	1198.7	1228.7	0.56	0.56	0.74
1218.8	1248.8	9.93	9.34	8.61	1218.8	1248.8	15.70	17.38	21.22	1218.8	1248.8	0.54	0.53	0.67
1259.1	1289.1	10.04	9.51	8.96	1259.1	1289.1	16.02	16.70	20.94	1259.1	1289.1	0.70	0.63	0.70
1279.2	1309.2	10.05	9.60	9.08	1279.2	1309.2	16.13	17.06	21.37	1279.2	1309.2	0.65	0.61	0.69
1319.5	1349.5	10.14	9.72	9.31	1319.5	1349.5	16.27	17.76	22.06	1319.5	1349.5	0.68	0.68	0.72
1339.7	1369.7	10.30	9.87	9.51	1339.7	1369.7	16.50	17.68	21.52	1339.7	1369.7	0.67	0.67	0.68
1380.0	1410.0	10.32	10.04	9.79	1380.0	1410.0	17.02	19.22	22.95	1380.0	1410.0	0.61	0.58	0.57
1400.1	1430.1	10.30	10.07	9.93	1400.1	1430.1	17.05	19.96	23.01	1400.1	1430.1	0.64	0.52	0.44

Frequency Mixer

TUF-1MH+

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)
		+13			+13			+13
290.0	10.1	5.86	10.0	20.1	5.46	590.0	10.1	6.18
282.8	17.3	5.88	24.9	35.0	5.44	575.1	25.0	6.07
275.6	24.5	5.81	39.7	49.8	5.47	560.3	39.8	6.07
268.5	31.6	5.83	54.6	64.7	5.52	545.4	54.7	6.04
261.3	38.8	5.76	69.5	79.6	5.55	530.5	69.6	6.00
254.1	46.0	5.81	84.4	94.5	5.58	515.6	84.5	6.01
246.9	53.2	5.73	99.2	109.3	5.55	500.8	99.3	5.95
239.7	60.4	5.80	114.1	124.2	5.57	485.9	114.2	5.91
232.6	67.5	5.79	129.0	139.1	5.56	471.0	129.1	5.84
225.4	74.7	5.75	143.8	153.9	5.55	456.2	143.9	5.87
218.2	81.9	5.74	158.7	168.8	5.63	441.3	158.8	5.87
211.0	89.1	5.74	173.6	183.7	5.62	426.4	173.7	5.88
203.8	96.3	5.73	188.5	198.6	5.64	411.5	188.6	5.82
196.7	103.4	5.75	203.3	213.4	5.62	396.7	203.4	5.81
189.5	110.6	5.72	218.2	228.3	5.59	381.8	218.3	5.84
182.3	117.8	5.69	233.1	243.2	5.59	366.9	233.2	5.82
175.1	125.0	5.67	247.9	258.0	5.63	352.1	248.0	5.86
167.9	132.2	5.66	262.8	272.9	5.62	337.2	262.9	5.84
160.8	139.3	5.68	277.7	287.8	5.62	322.3	277.8	5.89
153.6	146.5	5.62	292.6	302.7	5.64	307.4	292.7	5.88
146.4	153.7	5.65	307.4	317.5	5.61	292.6	307.5	5.86
139.2	160.9	5.64	322.3	332.4	5.66	277.7	322.4	5.86
132.1	168.0	5.69	337.2	347.3	5.62	262.8	337.3	5.85
124.9	175.2	5.65	352.1	362.2	5.63	247.9	352.2	5.91
117.7	182.4	5.63	366.9	377.0	5.67	233.1	367.0	5.87
110.5	189.6	5.63	381.8	391.9	5.67	218.2	381.9	5.91
103.3	196.8	5.65	396.7	406.8	5.70	203.3	396.8	5.91
96.2	203.9	5.68	411.5	421.6	5.62	188.5	411.6	5.92
89.0	211.1	5.63	426.4	436.5	5.68	173.6	426.5	5.92
81.8	218.3	5.63	441.3	451.4	5.70	158.7	441.4	5.92
74.6	225.5	5.62	456.2	466.3	5.67	143.8	456.3	5.92
67.4	232.7	5.66	471.0	481.1	5.72	129.0	471.1	5.93
60.3	239.8	5.63	485.9	496.0	5.71	114.1	486.0	5.95
53.1	247.0	5.63	500.8	510.9	5.76	99.2	500.9	5.90
45.9	254.2	5.61	515.6	525.7	5.72	84.4	515.7	5.90
38.7	261.4	5.66	530.5	540.6	5.76	69.5	530.6	5.91
31.5	268.6	5.67	545.4	555.5	5.74	54.6	545.5	5.89
24.4	275.7	5.67	560.3	570.4	5.79	39.7	560.4	5.88
17.2	282.9	5.64	575.1	585.2	5.78	24.9	575.2	5.88
10.0	290.1	5.81	590.0	600.1	5.75	10.0	590.1	6.05

Frequency Mixer

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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)		
	+10	+13	+16	+10	+13	+16			+10	+13	+16
2.0	65.69	61.53	59.57	70.00	62.13	57.11	10.1	40.1	48.16	47.69	48.31
5.0	64.70	60.97	59.24	70.00	60.92	56.61	50.4	80.4	36.45	36.16	36.35
10.0	64.09	60.65	59.12	70.00	60.61	56.57	90.7	120.7	31.53	31.70	31.81
50.4	61.80	62.59	63.40	60.04	57.75	56.52	131.0	161.0	28.78	29.07	29.12
90.7	56.73	57.49	58.19	54.93	53.01	51.75	171.3	201.3	27.02	27.29	27.50
131.0	53.32	54.45	55.06	51.61	49.54	48.40	211.5	241.5	25.95	26.25	26.35
171.3	51.03	51.93	52.78	49.36	47.38	46.45	251.8	281.8	25.24	25.56	25.67
211.5	49.19	50.29	50.95	47.23	45.82	45.10	292.1	322.1	25.09	25.40	25.56
251.8	47.66	48.93	49.55	45.75	44.79	44.07	332.4	362.4	25.02	25.48	25.75
292.1	46.65	47.67	48.06	45.17	44.27	43.27	372.7	402.7	25.01	25.60	26.02
332.4	45.89	46.53	46.96	44.53	43.12	42.12	413.0	443.0	25.51	26.02	26.49
372.7	44.34	45.43	45.87	43.83	42.40	40.48	453.3	483.3	26.48	26.71	26.91
413.0	43.44	43.93	44.07	43.37	41.54	40.31	493.6	523.6	27.75	27.98	28.08
453.3	42.87	43.39	43.26	44.28	41.09	38.73	533.9	563.9	28.46	28.98	29.42
493.6	42.35	42.49	42.89	41.62	40.51	38.68	574.2	604.2	27.21	28.43	29.43
574.2	43.71	42.98	42.24	40.09	37.18	35.87	614.4	644.4	24.88	25.61	26.64
614.4	43.85	44.14	43.33	40.06	35.76	33.81	654.7	684.7	22.78	22.87	23.11
654.7	42.75	43.24	42.73	41.29	36.86	33.46	695.0	725.0	21.27	21.08	20.92
695.0	41.71	42.06	41.92	39.97	37.82	34.81	735.3	765.3	20.03	19.67	19.33
735.3	40.37	40.72	40.74	37.54	35.75	34.10	775.6	805.6	18.94	18.46	17.97
775.6	39.22	39.48	39.52	37.00	34.90	33.04	815.9	845.9	18.02	17.42	16.98
815.9	38.45	38.72	39.10	35.64	33.26	31.14	856.2	886.2	17.16	16.62	16.32
856.2	39.11	40.43	41.15	33.56	31.14	28.91	896.5	926.5	16.67	16.09	15.76
896.5	39.73	41.37	41.86	33.04	29.83	27.74	916.6	946.6	16.53	16.01	15.70
916.6	39.02	41.28	42.39	33.64	29.50	27.37	956.9	986.9	16.13	15.71	15.46
956.9	38.49	40.53	41.41	34.40	29.87	27.08	977.1	1007.1	16.13	15.67	15.38
977.1	39.15	41.18	42.03	33.66	29.32	26.65	1017.3	1047.3	15.86	15.63	15.41
1017.3	38.86	40.55	41.49	33.55	30.33	26.92	1037.5	1067.5	15.75	15.63	15.55
1037.5	39.13	40.19	40.56	32.47	30.54	27.40	1077.8	1107.8	15.64	15.60	15.61
1077.8	39.23	39.83	39.92	31.24	30.62	28.34	1097.9	1127.9	15.54	15.51	15.55
1097.9	39.29	40.14	40.06	29.68	29.37	28.01	1138.2	1168.2	15.49	15.48	15.50
1138.2	38.80	39.50	39.32	28.84	28.16	26.79	1158.4	1188.4	15.42	15.42	15.43
1158.4	38.67	39.24	39.11	28.11	27.31	26.02	1198.7	1228.7	15.25	15.34	15.42
1218.8	36.83	37.01	36.92	27.36	26.53	25.11	1218.8	1248.8	15.18	15.28	15.34
1259.1	35.80	35.61	35.59	27.04	25.99	24.46	1259.1	1289.1	14.88	15.02	15.06
1279.2	35.39	35.17	35.14	26.74	26.11	24.42	1279.2	1309.2	14.76	14.93	14.96
1319.5	34.10	33.74	33.35	26.25	25.70	23.76	1319.5	1349.5	14.43	14.47	14.46
1339.7	33.58	33.12	32.66	25.91	25.14	22.81	1339.7	1369.7	14.26	14.25	14.23
1380.0	32.42	31.79	31.07	25.37	24.32	21.63	1380.0	1410.0	13.82	13.76	13.71
1400.1	31.68	31.03	30.11	25.07	23.29	20.61	1400.1	1430.1	13.63	13.51	13.34

Frequency Mixer

TUF-1MH+

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)		
		+10	+13	+16		+10	+13	+16		+10	+13	+16
5.0	32.0	1.31	1.24	1.23	5.0	1.25	1.92	2.86	5.0	1.54	1.35	1.25
10.0	35.0	1.23	1.12	1.11	10.0	1.15	1.78	2.68	10.0	1.55	1.35	1.26
50.4	80.4	1.07	1.04	1.10	50.4	1.59	2.51	3.70	25.1	1.63	1.40	1.25
90.7	120.7	1.09	1.07	1.12	90.7	1.56	2.37	3.49	40.3	1.53	1.30	1.17
131.0	161.0	1.11	1.12	1.16	131.0	1.55	2.41	3.54	55.4	1.48	1.25	1.15
171.3	201.3	1.15	1.15	1.19	171.3	1.53	2.31	3.29	70.5	1.50	1.28	1.18
211.5	241.5	1.17	1.19	1.22	211.5	1.53	2.32	3.34	85.6	1.54	1.34	1.23
251.8	281.8	1.21	1.22	1.25	251.8	1.54	2.35	3.38	100.8	1.60	1.38	1.26
292.1	322.1	1.25	1.25	1.27	292.1	1.60	2.32	3.26	115.9	1.62	1.39	1.27
332.4	362.4	1.26	1.27	1.30	332.4	1.61	2.36	3.37	131.0	1.62	1.39	1.27
372.7	402.7	1.29	1.29	1.32	372.7	1.67	2.46	3.50	146.2	1.61	1.38	1.27
413.0	443.0	1.31	1.31	1.34	413.0	1.64	2.36	3.31	161.3	1.58	1.36	1.27
453.3	483.3	1.34	1.34	1.36	453.3	1.67	2.36	3.27	176.4	1.59	1.37	1.27
493.6	523.6	1.37	1.38	1.39	493.6	1.67	2.34	3.22	191.5	1.64	1.42	1.30
533.9	563.9	1.40	1.41	1.43	533.9	1.72	2.39	3.30	206.7	1.69	1.47	1.34
574.2	604.2	1.42	1.43	1.46	574.2	1.76	2.32	3.18	221.8	1.69	1.47	1.35
614.4	644.4	1.45	1.45	1.48	614.4	1.84	2.43	3.24	236.9	1.66	1.44	1.33
654.7	684.7	1.45	1.45	1.47	654.7	1.89	2.53	3.41	252.1	1.65	1.42	1.32
695.0	725.0	1.43	1.43	1.44	695.0	1.87	2.46	3.28	267.2	1.70	1.47	1.36
735.3	765.3	1.43	1.42	1.42	735.3	1.89	2.46	3.27	282.3	1.73	1.52	1.40
775.6	805.6	1.43	1.42	1.43	775.6	1.88	2.38	3.15	297.4	1.74	1.53	1.41
815.9	845.9	1.47	1.46	1.46	815.9	1.90	2.37	3.11	312.6	1.74	1.53	1.41
856.2	886.2	1.57	1.54	1.54	856.2	1.97	2.35	3.02	327.7	1.77	1.54	1.42
896.5	926.5	1.71	1.66	1.64	896.5	2.04	2.40	3.06	342.8	1.80	1.57	1.45
916.6	946.6	1.79	1.73	1.70	916.6	2.06	2.44	3.10	357.9	1.81	1.59	1.49
956.9	986.9	1.98	1.87	1.83	956.9	2.11	2.50	3.13	373.1	1.82	1.60	1.49
977.1	1007.1	2.11	1.96	1.91	977.1	2.17	2.59	3.22	388.2	1.83	1.61	1.50
1017.3	1047.3	2.30	2.13	2.04	1017.3	2.15	2.60	3.25	403.3	1.86	1.64	1.51
1037.5	1067.5	2.39	2.22	2.11	1037.5	2.20	2.63	3.21	418.5	1.89	1.67	1.54
1077.8	1107.8	2.59	2.43	2.28	1077.8	2.20	2.65	3.25	433.6	1.91	1.70	1.57
1097.9	1127.9	2.66	2.51	2.37	1097.9	2.14	2.57	3.18	448.7	1.92	1.70	1.58
1138.2	1168.2	2.82	2.67	2.55	1138.2	2.14	2.57	3.19	463.8	1.95	1.72	1.60
1158.4	1188.4	2.88	2.75	2.63	1158.4	2.18	2.63	3.26	479.0	1.98	1.75	1.63
1198.7	1228.7	2.98	2.88	2.78	1198.7	2.12	2.53	3.14	494.1	2.00	1.77	1.64
1218.8	1248.8	3.00	2.92	2.83	1218.8	2.15	2.57	3.16	509.2	1.98	1.76	1.63
1259.1	1289.1	3.05	2.98	2.92	1259.1	2.17	2.59	3.21	524.4	1.97	1.76	1.63
1279.2	1309.2	3.07	3.01	2.95	1279.2	2.09	2.46	3.05	539.5	2.01	1.79	1.66
1319.5	1349.5	3.10	3.05	2.99	1319.5	2.07	2.40	2.95	554.6	2.07	1.85	1.72
1339.7	1369.7	3.12	3.08	3.03	1339.7	2.06	2.41	3.00	569.7	2.13	1.90	1.77
1380.0	1410.0	3.11	3.07	3.05	1380.0	2.00	2.30	2.84	584.9	2.14	1.90	1.77
1400.1	1430.1	3.08	3.05	3.05	1400.1	1.99	2.35	2.89	600.0	2.12	2.08	2.10

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Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	17	28	20	31	20	34	31	53	37	46
1	-	19	+0	28	12	33	19	33	34	45	39	43
2	>100	66	57	64	58	67	57	65	51	63	60	75
3	>100	72	74	75	63	72	56	84	55	69	57	77
4	>100	86	84	84	82	84	80	>88	80	>88	82	>88
5	>100	85	82	>88	82	87	78	88	80	>88	78	88
6	>100	>88	>88	>88	>88	>88	88	86	>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	80	>88
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 300.1 MHz; -6.00 dBm.

LO IN: 330.01 MHz; +13.00 dBm

IF OUT: 29.91 MHz; -11.98 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	26	38	32	45	33	51	52	61	63	65
1	-	19	+0	29	12	34	20	35	33	52	49	53
2	95	64	49	70	50	65	50	57	45	58	54	93
3	>100	48	47	51	48	53	43	52	47	61	51	60
4	>100	66	87	64	70	65	68	66	62	91	60	71
5	>100	70	66	59	55	60	52	58	49	63	48	63
6	>100	82	77	84	77	79	87	76	79	77	72	90
7	>100	86	70	77	66	79	71	75	79	71	72	71
8	>100	96	93	92	93	96	91	89	86	86	88	82
9	>100	94	83	87	76	83	77	83	81	75	89	76
10	>100	>98	>98	>98	94	89	87	86	86	89	>98	>98
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 300.1 MHz; 4.00 dBm.

LO IN: 330.01 MHz; +13.00 dBm

IF OUT: 29.91 MHz; -1.92 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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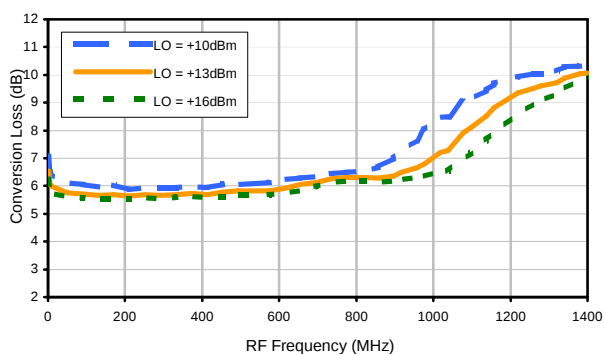


Frequency Mixer

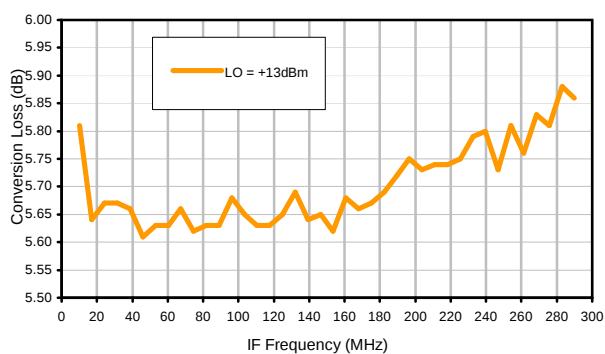
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Typical Performance Curves

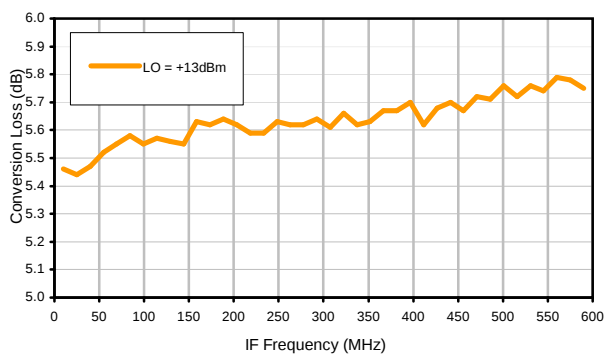
Conversion Loss @ IF=30MHz



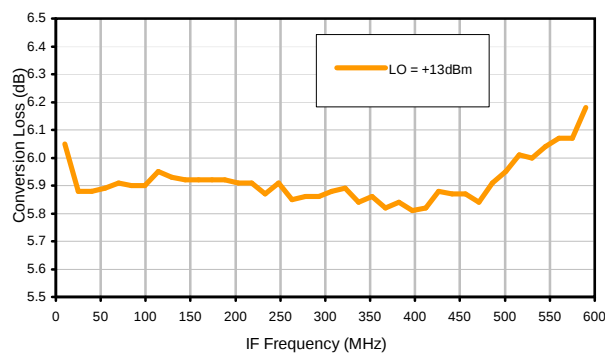
Conversion Loss vs. IF @ RF=300.1MHz



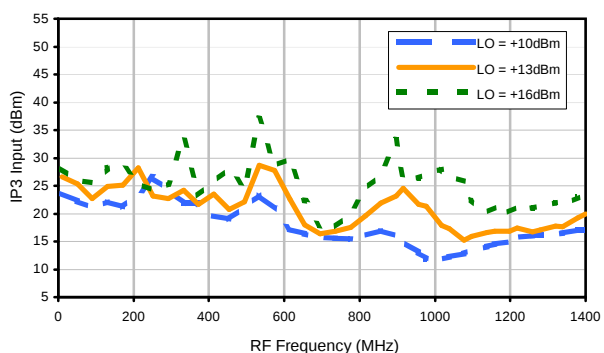
Conversion Loss vs. IF @ RF=10.1MHz



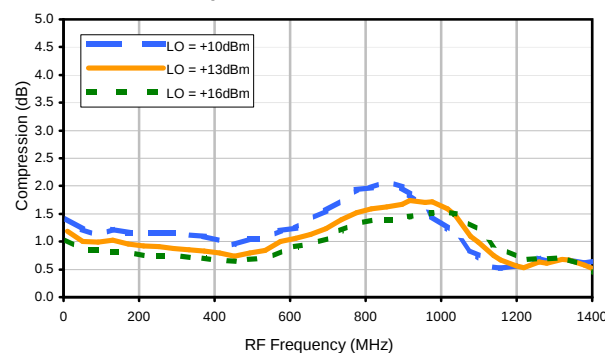
Conversion Loss vs. IF @ RF=600.1MHz



IP3 Input

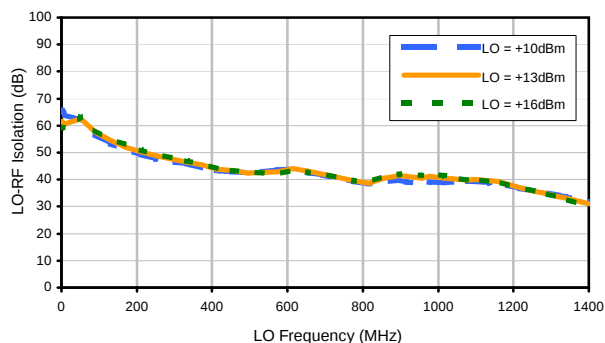


Compression @ RF IN=+9dBm

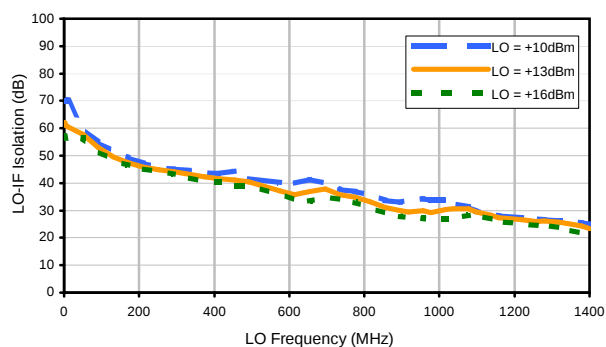


Typical Performance Curves

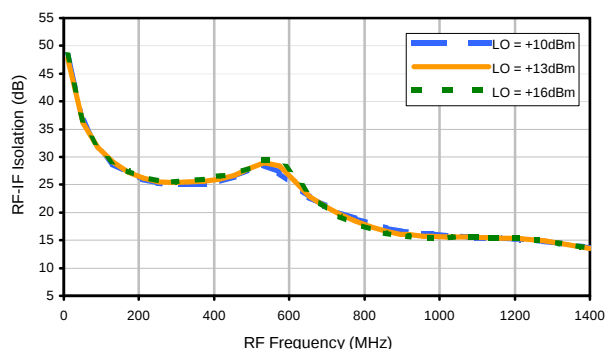
LO-RF Isolation



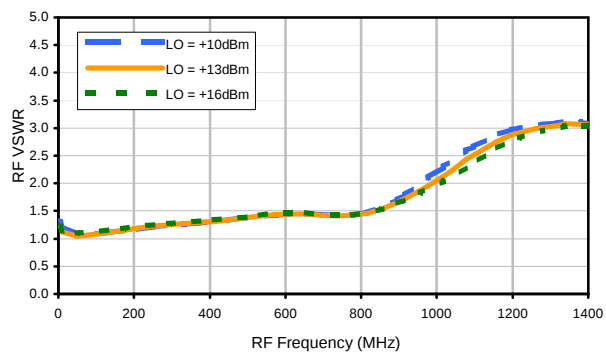
LO-IF Isolation



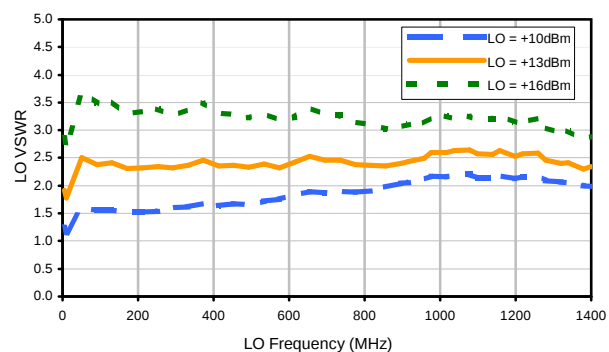
RF-IF Isolation



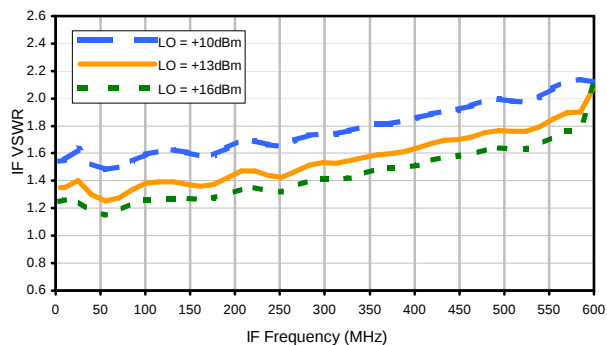
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	17	28	20	31	20	34	31	53	37	46
1	-	19	+0	28	12	33	19	33	34	45	39	43
2	>100	66	57	64	58	67	57	65	51	63	60	75
3	>100	72	74	75	63	72	56	84	55	69	57	77
4	>100	86	84	84	82	84	80	>88	80	>88	82	>88
5	>100	85	82	>88	82	87	78	88	80	>88	78	88
6	>100	>88	>88	>88	>88	>88	88	86	>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	80	>88
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 300.1 MHz; -6.00 dBm.

LO IN: 330.01 MHz; +13.00 dBm

IF OUT: 29.91 MHz; -11.98 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	26	38	32	45	33	51	52	61	63	65
1	-	19	+0	29	12	34	20	35	33	52	49	53
2	95	64	49	70	50	65	50	57	45	58	54	93
3	>100	48	47	51	48	53	43	52	47	61	51	60
4	>100	66	87	64	70	65	68	66	62	91	60	71
5	>100	70	66	59	55	60	52	58	49	63	48	63
6	>100	82	77	84	77	79	87	76	79	77	72	90
7	>100	86	70	77	66	79	71	75	79	71	72	71
8	>100	96	93	92	93	96	91	89	86	86	88	82
9	>100	94	83	87	76	83	77	83	81	75	89	76
10	>100	>98	>98	>98	94	89	87	86	86	89	>98	>98
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 300.1 MHz; 4.00 dBm.

LO IN: 330.01 MHz; +13.00 dBm

IF OUT: 29.91 MHz; -1.92 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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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



ENV30

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Specification	Test/Inspection Condition	Reference/Spec
Barometric Pressure	100,000 Feet	MIL-STD-202, Method 105, Condition D