

Frequency Mixer

TUF-2LHSM+

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=+5dBm (dB)		
		@LO (dBm)					@LO (dBm)					@LO (dBm)		
		+7	+10	+13			+7	+10	+13			+7	+10	+13
10.1	40.1	5.98	5.49	5.30	10.1	40.1	17.87	20.39	23.41	10.1	40.1	0.80	0.56	0.41
51.1	81.1	6.50	5.97	5.71	51.1	81.1	16.16	19.48	21.09	51.1	81.1	0.71	0.44	0.36
92.0	122.0	6.49	5.93	5.68	92.0	122.0	15.72	17.66	19.15	92.0	122.0	0.70	0.42	0.33
133.0	163.0	6.29	5.84	5.61	133.0	163.0	18.32	18.74	24.48	133.0	163.0	0.63	0.45	0.33
173.9	203.9	6.39	5.89	5.65	173.9	203.9	15.98	18.10	25.21	173.9	203.9	0.64	0.46	0.32
214.9	244.9	6.25	5.76	5.59	214.9	244.9	16.40	23.36	22.24	214.9	244.9	0.68	0.44	0.31
255.8	285.8	6.24	5.82	5.63	255.8	285.8	18.47	21.52	22.93	255.8	285.8	0.72	0.47	0.32
296.8	326.8	6.22	5.80	5.61	296.8	326.8	17.60	21.74	21.05	296.8	326.8	0.72	0.47	0.32
337.7	367.7	6.21	5.80	5.63	337.7	367.7	22.84	19.14	22.58	337.7	367.7	0.75	0.44	0.31
378.7	408.7	6.14	5.80	5.65	378.7	408.7	17.72	17.64	24.61	378.7	408.7	0.76	0.45	0.30
419.6	449.6	6.17	5.77	5.61	419.6	449.6	17.65	15.73	17.57	419.6	449.6	0.70	0.47	0.33
440.1	470.1	6.13	5.76	5.58	440.1	470.1	16.45	17.59	19.17	440.1	470.1	0.73	0.45	0.31
481.1	511.1	6.26	5.86	5.68	481.1	511.1	16.07	20.16	26.79	481.1	511.1	0.65	0.41	0.29
501.5	531.5	6.20	5.85	5.68	501.5	531.5	16.59	21.41	23.28	501.5	531.5	0.71	0.41	0.30
542.5	572.5	6.31	5.93	5.73	542.5	572.5	17.10	17.34	21.61	542.5	572.5	0.71	0.44	0.30
563.0	593.0	6.26	5.92	5.74	563.0	593.0	21.41	19.49	23.84	563.0	593.0	0.77	0.44	0.32
603.9	633.9	6.31	5.98	5.81	603.9	633.9	22.36	26.86	22.94	603.9	633.9	0.77	0.46	0.32
624.4	654.4	6.31	5.96	5.83	624.4	654.4	18.44	26.13	29.23	624.4	654.4	0.86	0.50	0.33
665.3	695.3	6.40	6.06	5.92	665.3	695.3	13.98	25.72	25.05	665.3	695.3	0.91	0.57	0.35
685.8	715.8	6.38	6.11	5.98	685.8	715.8	13.47	20.77	25.97	685.8	715.8	0.91	0.56	0.34
726.8	756.8	6.45	6.19	6.05	726.8	756.8	11.50	14.54	20.56	726.8	756.8	1.06	0.65	0.43
747.2	777.2	6.45	6.20	6.06	747.2	777.2	10.56	12.84	16.98	747.2	777.2	1.10	0.66	0.44
788.2	818.2	6.53	6.24	6.07	788.2	818.2	9.82	11.25	13.80	788.2	818.2	1.17	0.78	0.57
808.7	838.7	6.63	6.26	6.10	808.7	838.7	10.19	11.64	13.72	808.7	838.7	1.14	0.77	0.56
849.6	879.6	6.77	6.41	6.23	849.6	879.6	11.65	13.09	14.96	849.6	879.6	1.23	0.84	0.62
870.1	900.1	6.86	6.49	6.28	870.1	900.1	12.54	15.00	16.37	870.1	900.1	1.22	0.82	0.61
911.1	941.1	6.94	6.50	6.26	911.1	941.1	13.17	18.08	21.22	911.1	941.1	1.36	0.94	0.69
931.5	961.5	7.06	6.53	6.28	931.5	961.5	14.39	24.49	28.07	931.5	961.5	1.38	0.95	0.70
972.5	1002.5	7.23	6.54	6.26	972.5	1002.5	12.70	26.53	21.32	972.5	1002.5	1.38	1.05	0.76
993.0	1023.0	7.40	6.60	6.30	993.0	1023.0	11.04	23.81	20.02	993.0	1023.0	1.38	1.07	0.75
1033.9	1063.9	7.74	6.83	6.41	1033.9	1063.9	9.62	19.59	19.91	1033.9	1063.9	1.31	1.12	0.82
1054.4	1084.4	7.84	6.90	6.43	1054.4	1084.4	9.50	18.83	19.64	1054.4	1084.4	1.24	1.10	0.82
1095.3	1125.3	8.17	7.17	6.61	1095.3	1125.3	9.90	15.48	23.52	1095.3	1125.3	1.07	1.04	0.81
1115.8	1145.8	8.43	7.36	6.73	1115.8	1145.8	10.04	14.99	22.67	1115.8	1145.8	1.00	1.01	0.83
1156.8	1186.8	8.91	7.80	7.02	1156.8	1186.8	10.79	15.47	30.29	1156.8	1186.8	0.81	0.93	0.86
1177.2	1207.2	9.10	8.00	7.19	1177.2	1207.2	11.00	15.06	22.47	1177.2	1207.2	0.72	0.88	0.89
1218.2	1248.2	9.65	8.53	7.62	1218.2	1248.2	11.70	14.83	22.40	1218.2	1248.2	0.49	0.73	0.89
1238.7	1268.7	9.80	8.77	7.80	1238.7	1268.7	12.22	14.94	20.83	1238.7	1268.7	0.42	0.68	0.92
1279.6	1309.6	10.43	9.42	8.51	1279.6	1309.6	12.71	14.85	18.86	1279.6	1309.6	0.21	0.50	0.81
1300.1	1330.1	10.75	9.84	8.93	1300.1	1330.1	13.75	15.39	19.39	1300.1	1330.1	0.11	0.39	0.72



Frequency Mixer

TUF-2LHSM+

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=500.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=50.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1000.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+10			+10			+10
400.0	100.1	5.95	10.0	60.1	6.12	950.0	50.1	7.40
390.3	109.9	5.91	30.0	80.1	5.99	930.0	70.1	7.54
380.5	119.6	5.88	50.0	100.1	5.94	910.0	90.1	7.55
370.8	129.4	5.87	70.0	120.1	5.95	890.0	110.1	7.39
361.0	139.1	5.83	90.0	140.1	6.00	870.0	130.1	7.29
351.3	148.9	5.78	110.0	160.1	5.95	850.0	150.1	7.36
341.5	158.6	5.80	130.0	180.1	6.04	830.0	170.1	7.38
331.8	168.4	5.83	150.0	200.1	5.98	810.0	190.1	7.30
322.0	178.1	5.78	170.0	220.1	6.00	790.0	210.1	7.28
312.3	187.9	5.80	190.0	240.1	5.97	770.0	230.1	7.21
302.5	197.6	5.78	210.0	260.1	6.03	750.0	250.1	7.20
292.8	207.4	5.74	230.0	280.1	6.10	730.0	270.1	7.27
283.0	217.1	5.72	250.0	300.1	6.03	710.0	290.1	7.24
273.3	226.9	5.72	270.0	320.1	6.01	690.0	310.1	7.24
263.5	236.6	5.75	290.0	340.1	6.04	670.0	330.1	7.20
253.8	246.4	5.72	310.0	360.1	6.10	650.0	350.1	7.23
244.0	256.1	5.73	330.0	380.1	6.06	630.0	370.1	7.28
234.3	265.9	5.78	350.0	400.1	6.05	610.0	390.1	7.26
224.5	275.6	5.78	370.0	420.1	6.07	590.0	410.1	7.21
214.8	285.4	5.76	390.0	440.1	5.97	570.0	430.1	7.16
205.0	295.1	5.81	410.0	460.1	6.03	550.0	450.1	7.19
195.3	304.9	5.79	430.0	480.1	6.09	530.0	470.1	7.14
185.5	314.6	5.76	450.0	500.1	6.07	510.0	490.1	7.12
175.8	324.4	5.77	470.0	520.1	6.02	490.0	510.1	7.12
166.0	334.1	5.78	510.0	560.1	6.09	450.0	550.1	7.17
156.3	343.9	5.78	530.0	580.1	6.12	430.0	570.1	7.12
146.5	353.6	5.76	570.0	620.1	6.20	390.0	610.1	7.00
136.8	363.4	5.78	590.0	640.1	6.23	370.0	630.1	6.96
127.0	373.1	5.82	630.0	680.1	6.34	330.0	670.1	6.85
117.3	382.9	5.77	650.0	700.1	6.30	310.0	690.1	6.89
107.5	392.6	5.78	690.0	740.1	6.19	270.0	730.1	6.85
97.8	402.4	5.81	710.0	760.1	6.22	250.0	750.1	6.90
88.0	412.1	5.80	750.0	800.1	6.14	210.0	790.1	7.05
78.3	421.9	5.77	770.0	820.1	6.07	190.0	810.1	7.06
68.5	431.6	5.83	810.0	860.1	6.05	150.0	850.1	7.05
58.8	441.4	5.85	830.0	880.1	6.03	130.0	870.1	6.99
49.0	451.1	5.85	870.0	920.1	5.91	90.0	910.1	6.86
39.3	460.9	5.84	890.0	940.1	5.91	70.0	930.1	6.82
19.8	480.4	5.91	930.0	980.1	5.84	30.0	970.1	6.73
10.0	490.1	6.08	950.0	1000.1	5.84	10.0	990.1	6.86



Frequency Mixer

TUF-2LHSM+

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+7	+10	+13	+7	+10	+13
10.1	68.52	71.56	74.73	55.59	58.82	60.04
51.1	59.61	61.65	63.09	56.07	56.19	54.64
92.0	54.96	56.54	57.96	53.07	51.62	50.26
133.0	52.11	53.74	55.42	50.15	48.42	47.15
173.9	49.78	51.51	53.11	48.65	46.70	45.44
214.9	48.19	49.98	51.72	46.91	45.08	44.12
255.8	46.89	48.88	50.46	45.65	44.18	42.88
296.8	45.77	47.71	49.36	44.41	42.90	41.90
337.7	45.08	46.91	48.32	42.91	41.44	40.21
378.7	44.31	46.51	48.11	41.36	40.19	39.20
419.6	43.54	45.79	47.34	39.86	39.12	38.08
440.1	43.03	45.14	46.47	38.59	37.94	37.27
481.1	42.03	43.83	45.45	37.48	36.71	36.40
501.5	41.65	43.31	45.06	36.68	35.79	35.54
542.5	41.17	42.61	44.18	35.67	34.97	34.29
563.0	40.98	42.36	43.76	35.03	34.55	33.98
603.9	40.76	42.61	44.20	34.42	34.13	33.75
624.4	40.78	42.64	44.20	33.87	33.63	33.37
665.3	40.79	42.58	43.80	33.01	32.81	32.78
685.8	40.88	42.84	44.17	32.70	32.31	32.12
726.8	40.73	42.50	43.81	31.83	31.58	30.92
747.2	40.32	41.76	42.82	31.36	31.23	30.60
788.2	39.74	40.89	41.83	30.51	30.68	30.09
808.7	39.45	40.64	41.56	30.01	30.26	29.85
849.6	39.27	40.68	41.63	29.05	29.51	29.37
870.1	38.71	40.36	41.36	28.66	29.33	29.29
911.1	37.86	39.58	40.79	27.70	28.59	28.93
931.5	37.26	39.05	40.22	27.29	28.28	28.68
972.5	36.24	38.08	39.50	26.36	27.28	28.01
993.0	35.61	37.58	39.18	26.03	26.95	27.72
1033.9	34.98	36.99	38.77	25.13	25.81	26.74
1054.4	34.37	36.49	38.49	24.95	25.44	26.34
1095.3	33.82	36.00	38.28	24.56	24.79	25.49
1115.8	33.54	35.80	38.20	24.31	24.60	25.15
1156.8	33.07	35.37	38.03	23.86	24.24	24.74
1177.2	32.93	35.22	37.95	23.75	24.16	24.63
1218.2	32.65	35.06	37.99	23.28	23.82	24.30
1238.7	32.41	34.90	37.94	23.15	23.80	24.20
1279.6	32.16	34.83	38.13	22.84	23.63	24.09
1300.1	32.08	34.78	38.18	22.81	23.62	24.18

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+7	+10	+13
10.1	40.1	49.43	47.24	48.79
51.1	81.1	37.79	37.92	37.54
92.0	122.0	33.01	33.00	33.10
133.0	163.0	30.27	30.43	30.64
173.9	203.9	28.55	28.92	29.05
214.9	244.9	27.33	27.73	27.98
255.8	285.8	26.92	27.26	27.50
296.8	326.8	27.01	27.40	27.44
337.7	367.7	26.95	27.81	28.10
378.7	408.7	27.15	28.08	28.71
419.6	449.6	27.76	28.32	28.79
440.1	470.1	28.65	29.18	29.26
481.1	511.1	30.02	29.99	30.10
501.5	531.5	30.79	30.80	30.98
542.5	572.5	29.75	30.20	31.05
563.0	593.0	28.10	29.06	29.82
603.9	633.9	25.04	25.57	26.15
624.4	654.4	23.48	23.57	24.10
665.3	695.3	21.65	21.40	21.46
685.8	715.8	20.74	20.49	20.44
726.8	756.8	19.49	19.14	18.92
747.2	777.2	19.13	18.73	18.41
788.2	818.2	18.35	17.94	17.56
808.7	838.7	18.11	17.63	17.34
849.6	879.6	17.52	17.05	16.71
870.1	900.1	17.22	16.75	16.44
911.1	941.1	16.88	16.46	16.19
931.5	961.5	16.69	16.33	16.09
972.5	1002.5	16.45	16.24	16.16
993.0	1023.0	16.28	16.16	16.13
1033.9	1063.9	16.02	15.96	16.01
1054.4	1084.4	15.94	15.91	15.95
1095.3	1125.3	15.69	15.75	15.85
1115.8	1145.8	15.57	15.72	15.80
1156.8	1186.8	15.25	15.49	15.68
1177.2	1207.2	15.13	15.49	15.66
1218.2	1248.2	14.84	15.24	15.47
1238.7	1268.7	14.66	15.09	15.34
1279.6	1309.6	14.38	14.79	15.02
1300.1	1330.1	14.15	14.58	14.79



Frequency Mixer

TUF-2LHSM+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)		
		@LO (dBm)		
		+7	+10	+13
10.1	40.1	1.13	1.06	1.09
51.1	81.1	1.15	1.03	1.05
92.0	122.0	1.15	1.06	1.08
133.0	163.0	1.15	1.09	1.12
173.9	203.9	1.20	1.13	1.15
214.9	244.9	1.21	1.17	1.20
255.8	285.8	1.24	1.21	1.23
296.8	326.8	1.29	1.25	1.26
337.7	367.7	1.30	1.27	1.29
378.7	408.7	1.31	1.29	1.31
419.6	449.6	1.33	1.30	1.31
440.1	470.1	1.36	1.33	1.34
481.1	511.1	1.39	1.36	1.37
501.5	531.5	1.41	1.40	1.41
542.5	572.5	1.46	1.44	1.45
563.0	593.0	1.47	1.46	1.47
603.9	633.9	1.49	1.49	1.51
624.4	654.4	1.49	1.50	1.52
665.3	695.3	1.48	1.49	1.52
685.8	715.8	1.48	1.49	1.51
726.8	756.8	1.45	1.45	1.47
747.2	777.2	1.44	1.43	1.45
788.2	818.2	1.46	1.43	1.44
808.7	838.7	1.48	1.45	1.45
849.6	879.6	1.52	1.48	1.48
870.1	900.1	1.55	1.51	1.50
911.1	941.1	1.64	1.59	1.58
931.5	961.5	1.71	1.66	1.64
972.5	1002.5	1.87	1.80	1.77
993.0	1023.0	1.96	1.87	1.84
1033.9	1063.9	2.17	2.05	1.99
1054.4	1084.4	2.25	2.11	2.04
1095.3	1125.3	2.46	2.29	2.20
1115.8	1145.8	2.56	2.39	2.28
1156.8	1186.8	2.78	2.60	2.45
1177.2	1207.2	2.89	2.70	2.54
1218.2	1248.2	3.13	2.93	2.75
1238.7	1268.7	3.22	3.04	2.85
1279.6	1309.6	3.43	3.26	3.08
1300.1	1330.1	3.51	3.36	3.18

LO (MHz)	LO VSWR (:1)		
	@LO (dBm)		
	+7	+10	+13
10.1	1.51	2.10	2.95
51.1	1.57	2.37	3.44
92.0	1.49	2.19	3.14
133.0	1.53	2.30	3.31
173.9	1.50	2.19	3.11
214.9	1.52	2.22	3.16
255.8	1.52	2.24	3.18
296.8	1.50	2.18	3.07
337.7	1.56	2.27	3.20
378.7	1.54	2.23	3.12
419.6	1.56	2.25	3.15
440.1	1.58	2.27	3.17
481.1	1.59	2.23	3.09
501.5	1.60	2.25	3.11
542.5	1.65	2.31	3.17
563.0	1.65	2.32	3.19
603.9	1.69	2.31	3.16
624.4	1.71	2.35	3.19
665.3	1.74	2.34	3.14
685.8	1.75	2.34	3.14
726.8	1.80	2.41	3.22
747.2	1.83	2.44	3.28
788.2	1.84	2.40	3.19
808.7	1.87	2.44	3.23
849.6	1.92	2.46	3.22
870.1	1.93	2.45	3.20
911.1	1.96	2.46	3.19
931.5	1.99	2.50	3.24
972.5	2.04	2.49	3.18
993.0	2.07	2.51	3.20
1033.9	2.14	2.61	3.27
1054.4	2.15	2.62	3.30
1095.3	2.18	2.66	3.33
1115.8	2.19	2.69	3.35
1156.8	2.24	2.73	3.40
1177.2	2.26	2.74	3.41
1218.2	2.28	2.75	3.41
1238.7	2.30	2.76	3.42
1279.6	2.33	2.79	3.45
1300.1	2.34	2.78	3.43

IF (OUT) (MHz)	IF VSWR @LO=1000.1MHz (:1)		
	@LO (dBm)		
	+7	+10	+13
10.0	1.99	1.58	1.38
30.2	1.87	1.47	1.30
50.4	1.79	1.41	1.25
70.6	1.85	1.47	1.31
90.8	1.88	1.51	1.36
111.0	1.92	1.52	1.37
131.2	1.97	1.56	1.41
151.4	1.92	1.54	1.40
171.6	1.88	1.52	1.39
191.8	1.96	1.58	1.45
212.0	2.02	1.64	1.51
232.2	1.95	1.59	1.47
252.4	1.92	1.57	1.46
272.7	2.00	1.65	1.54
292.9	2.02	1.68	1.59
313.1	2.01	1.66	1.57
333.3	2.03	1.68	1.59
353.5	2.06	1.73	1.64
373.7	2.04	1.72	1.65
393.9	2.04	1.72	1.64
434.3	2.08	1.78	1.72
454.5	2.05	1.75	1.69
494.9	2.13	1.83	1.77
515.1	2.09	1.79	1.75
555.5	2.18	1.86	1.81
575.7	2.17	1.86	1.82
616.1	2.16	1.83	1.78
636.3	2.19	1.87	1.83
676.7	2.20	1.85	1.79
696.9	2.21	1.86	1.80
737.3	2.15	1.81	1.76
757.6	2.25	1.88	1.81
798.0	2.18	1.81	1.73
818.2	2.16	1.79	1.70
858.6	2.22	1.85	1.75
878.8	2.24	1.84	1.72
919.2	2.17	1.80	1.67
939.4	2.14	1.78	1.66
979.8	2.32	1.92	1.76
1000.0	2.35	2.15	2.20

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	19	35	25	43	45	47	55	62	63	71
1	-	25	+0	28	11	32	22	40	43	36	54	55
2	90	67	43	63	43	67	43	56	64	73	70	59
3	>100	57	52	67	53	58	43	56	53	57	56	47
4	>100	74	71	83	66	73	64	74	59	78	78	70
5	>100	74	65	69	63	67	57	65	55	64	60	82
6	>100	>94	86	86	81	85	85	85	78	84	76	85
7	>100	81	89	91	79	93	78	83	80	80	>94	83
8	>100	>94	>94	>94	>94	91	93	90	91	87	92	93
9	>100	>94	>94	>94	>94	>94	91	>94	89	>94	>94	>94
10	>100	>94	>94	>94	>94	>94	>94	>94	>94	>94	>94	>94
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 500.1 MHz; 0.00 dBm.
 LO IN: 530.01 MHz; +10.00 dBm
 IF OUT: 29.91 MHz; -6.04 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	9	25	13	30	33	38	43	40	42	58
1	-	25	+0	29	11	30	21	37	40	31	48	50
2	98	84	51	75	51	77	50	66	72	72	74	60
3	>100	73	71	74	66	73	61	70	69	79	73	72
4	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>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: 500.1 MHz; -10.00 dBm.
 LO IN: 530.01 MHz; +10.00 dBm
 IF OUT: 29.91 MHz; -16.02 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.

REV. X2
 TUF-2LHSM+
 120215
 Page 5 of 5



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