

Frequency Mixer

TUF-5MHSM

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	6.12	5.68	5.46	10.1	40.1	19.72	21.85	25.11	10.1	40.1	1.39	1.15	0.99
70.4	100.4	5.98	5.59	5.38	70.4	100.4	20.29	22.74	20.70	70.4	100.4	1.53	1.28	1.08
130.6	160.6	5.85	5.50	5.34	130.6	160.6	19.90	17.74	18.70	130.6	160.6	1.63	1.33	1.12
190.9	220.9	5.94	5.57	5.38	190.9	220.9	16.05	16.73	19.18	190.9	220.9	1.57	1.27	1.07
251.1	281.1	5.97	5.61	5.43	251.1	281.1	14.67	16.80	20.03	251.1	281.1	1.61	1.29	1.10
311.4	341.4	6.09	5.70	5.50	311.4	341.4	14.52	17.04	20.77	311.4	341.4	1.57	1.32	1.12
371.6	401.6	6.21	5.81	5.58	371.6	401.6	14.68	17.30	22.08	371.6	401.6	1.60	1.37	1.21
431.9	461.9	6.21	5.80	5.59	431.9	461.9	14.76	20.12	25.09	431.9	461.9	1.68	1.48	1.28
492.1	522.1	6.35	5.93	5.68	492.1	522.1	14.99	17.43	21.91	492.1	522.1	1.84	1.58	1.43
552.4	582.4	6.62	6.07	5.82	552.4	582.4	15.68	19.45	22.08	552.4	582.4	1.97	1.77	1.56
612.6	642.6	6.96	6.20	5.78	612.6	642.6	13.67	21.85	23.74	612.6	642.6	1.89	1.88	1.75
672.9	702.9	7.25	6.60	6.10	672.9	702.9	13.99	16.85	22.49	672.9	702.9	1.70	1.65	1.64
733.1	763.1	7.64	6.94	6.43	733.1	763.1	15.52	17.35	19.89	733.1	763.1	1.65	1.53	1.53
793.4	823.4	7.83	7.05	6.61	793.4	823.4	14.77	16.20	17.12	793.4	823.4	1.55	1.52	1.44
853.6	883.6	7.71	6.87	6.39	853.6	883.6	13.74	15.65	17.67	853.6	883.6	1.53	1.62	1.58
913.9	943.9	7.76	6.79	6.31	913.9	943.9	14.21	16.42	19.02	913.9	943.9	1.45	1.73	1.57
974.1	1004.1	7.86	6.94	6.36	974.1	1004.1	15.29	15.54	16.77	974.1	1004.1	1.21	1.47	1.48
1034.4	1064.4	7.61	6.97	6.45	1034.4	1064.4	16.32	15.87	15.96	1034.4	1064.4	1.23	1.28	1.32
1094.6	1124.6	7.40	6.93	6.49	1094.6	1124.6	16.65	16.24	15.38	1094.6	1124.6	1.25	1.20	1.17
1154.9	1184.9	7.37	6.89	6.51	1154.9	1184.9	17.36	16.32	15.43	1154.9	1184.9	1.32	1.17	1.14
1215.1	1245.1	7.30	6.90	6.55	1215.1	1245.1	17.46	16.43	14.80	1215.1	1245.1	1.36	1.12	1.07
1275.4	1305.4	7.14	6.76	6.50	1275.4	1305.4	17.19	15.72	14.85	1275.4	1305.4	1.33	1.15	1.06
1335.6	1365.6	7.23	6.76	6.49	1335.6	1365.6	16.02	16.38	15.55	1335.6	1365.6	1.47	1.18	1.08
1395.9	1425.9	7.32	6.81	6.48	1395.9	1425.9	15.06	16.67	19.56	1395.9	1425.9	1.53	1.15	1.05
1456.2	1486.2	7.23	6.67	6.29	1456.2	1486.2	15.07	20.63	17.99	1456.2	1486.2	1.38	1.13	0.99
1516.4	1546.4	7.23	6.48	6.12	1516.4	1546.4	16.10	16.79	18.30	1516.4	1546.4	1.66	1.28	0.89
1576.7	1606.7	7.21	6.31	6.11	1576.7	1606.7	15.19	17.56	21.01	1576.7	1606.7	2.04	1.26	0.73
1636.9	1666.9	6.84	6.26	6.12	1636.9	1666.9	15.01	20.21	22.15	1636.9	1666.9	2.05	1.09	0.64
1697.2	1727.2	6.96	6.35	6.17	1697.2	1727.2	14.67	20.06	21.02	1697.2	1727.2	2.16	1.10	0.69
1757.4	1787.4	7.77	6.54	6.26	1757.4	1787.4	13.46	20.69	23.37	1757.4	1787.4	2.22	1.35	0.81
1817.7	1847.7	8.31	6.81	6.39	1817.7	1847.7	15.86	18.91	23.99	1817.7	1847.7	1.82	1.38	0.84
1877.9	1907.9	8.76	7.05	6.56	1877.9	1907.9	19.16	17.87	21.09	1877.9	1907.9	1.53	1.35	0.90
1938.2	1968.2	10.07	7.35	6.71	1938.2	1968.2	13.43	17.28	19.38	1938.2	1968.2	0.97	1.38	0.91
1998.4	2028.4	11.26	7.70	6.82	1998.4	2028.4	10.17	16.83	18.34	1998.4	2028.4	0.21	1.39	1.00
2058.7	2088.7	11.25	7.94	6.94	2058.7	2088.7	10.31	16.25	17.71	2058.7	2088.7	0.19	1.28	1.03
2118.9	2148.9	12.50	8.36	6.99	2118.9	2148.9	8.04	16.24	16.64	2118.9	2148.9	-0.52	1.21	1.07
2199.3	2229.3	13.59	8.91	7.21	2199.3	2229.3	6.79	16.86	15.54	2199.3	2229.3	-1.35	0.99	1.01
2259.5	2289.5	15.67	9.75	7.53	2259.5	2289.5	4.35	16.62	16.21	2259.5	2289.5	-2.81	0.76	0.89
2339.8	2369.8	15.06	9.71	7.74	2339.8	2369.8	5.41	17.56	16.72	2339.8	2369.8	-2.28	0.76	0.80
2400.1	2430.1	17.75	10.61	7.97	2400.1	2430.1	3.09	14.25	17.68	2400.1	2430.1	-3.48	0.68	0.98



Frequency Mixer

TUF-5MHSM

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)=20.1MHz (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
710.0	40.1	6.17	10.0	30.1	6.00	1000.0	500.1	7.54
692.1	58.0	6.24	30.2	50.3	5.84	979.8	520.3	7.44
674.1	76.0	6.34	50.4	70.5	5.84	959.6	540.5	7.37
656.2	93.9	6.31	70.6	90.7	5.91	939.4	560.7	7.33
638.2	111.9	6.39	90.8	110.9	5.83	919.2	580.9	7.27
620.3	129.8	6.38	111.0	131.1	5.81	899.0	601.1	7.25
602.3	147.8	6.46	131.2	151.3	5.80	878.8	621.3	7.18
584.4	165.7	6.48	151.4	171.5	5.84	858.6	641.5	7.18
566.4	183.7	6.59	171.6	191.7	5.78	838.4	661.7	7.22
548.5	201.6	6.59	191.8	211.9	5.76	818.2	681.9	7.22
530.5	219.6	6.59	212.0	232.1	5.76	798.0	702.1	7.24
512.6	237.5	6.53	232.2	252.3	5.72	777.8	722.3	7.19
494.6	255.5	6.58	252.4	272.5	5.77	757.6	742.5	7.20
476.7	273.4	6.55	272.7	292.8	5.74	737.3	762.8	7.03
458.7	291.4	6.64	292.9	313.0	5.73	717.1	783.0	7.04
440.8	309.3	6.65	313.1	333.2	5.73	696.9	803.2	7.05
422.8	327.3	6.60	333.3	353.4	5.71	676.7	823.4	6.95
404.9	345.2	6.52	353.5	373.6	5.76	656.5	843.6	6.92
386.9	363.2	6.53	373.7	393.8	5.73	636.3	863.8	6.88
369.0	381.1	6.52	393.9	414.0	5.73	616.1	884.0	6.79
351.0	399.1	6.62	434.3	454.4	5.75	575.7	924.4	6.64
333.1	417.0	6.61	454.5	474.6	5.78	555.5	944.6	6.64
315.1	435.0	6.60	494.9	515.0	5.78	515.1	985.0	6.52
297.2	452.9	6.61	515.1	535.2	5.74	494.9	1005.2	6.52
279.2	470.9	6.57	555.5	575.6	5.84	454.5	1045.6	6.58
261.3	488.8	6.71	575.7	595.8	5.79	434.3	1065.8	6.53
243.3	506.8	6.71	616.1	636.2	5.83	393.9	1106.2	6.66
225.4	524.7	6.74	636.3	656.4	5.90	373.7	1126.4	6.67
207.4	542.7	6.72	676.7	696.8	5.95	333.3	1166.8	6.69
189.5	560.6	6.70	696.9	717.0	6.02	313.1	1187.0	6.79
171.5	578.6	6.70	737.3	757.4	6.18	272.7	1227.4	6.85
153.6	596.5	6.73	757.6	777.7	6.16	252.4	1247.7	6.86
135.6	614.5	6.66	798.0	818.1	6.26	212.0	1288.1	6.88
117.7	632.4	6.68	818.2	838.3	6.23	191.8	1308.3	6.79
99.7	650.4	6.61	858.6	878.7	6.33	151.4	1348.7	6.79
81.8	668.3	6.82	878.8	898.9	6.37	131.2	1368.9	6.80
63.8	686.3	6.86	919.2	939.3	6.42	90.8	1409.3	6.80
45.9	704.2	6.92	939.4	959.5	6.58	70.6	1429.5	6.85
27.9	722.2	6.90	979.8	999.9	6.79	30.2	1469.9	6.73
10.0	740.1	7.09	1000.0	1020.1	6.84	10.0	1490.1	6.86

Frequency Mixer

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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	77.50	78.21	78.42	58.38	59.85	60.55
70.4	59.26	60.45	61.43	41.84	43.45	44.89
130.6	54.21	55.74	56.91	37.17	39.32	41.16
190.9	51.12	52.65	53.75	34.71	37.03	38.43
251.1	49.01	50.68	52.00	33.29	35.27	36.47
311.4	47.29	49.13	50.59	31.91	33.74	34.93
371.6	46.36	48.18	49.51	30.83	32.57	33.91
431.9	45.26	47.22	48.85	29.45	31.35	32.89
492.1	44.22	46.15	47.66	28.29	30.53	32.45
552.4	43.51	45.36	46.71	27.47	29.72	31.74
612.6	42.65	44.60	46.25	26.80	29.18	31.23
672.9	41.53	43.82	45.43	25.95	28.39	30.73
733.1	40.93	43.12	44.84	25.64	27.77	29.84
793.4	40.76	42.84	44.70	25.71	27.57	29.10
853.6	40.54	42.37	43.99	25.26	26.64	27.69
913.9	40.31	42.11	43.61	24.76	25.84	26.19
974.1	40.74	42.47	43.93	24.38	24.82	24.60
1034.4	40.97	42.99	44.57	23.77	23.92	23.29
1094.6	40.62	43.40	45.49	23.22	23.19	22.16
1154.9	40.66	43.50	46.11	22.45	22.10	21.07
1215.1	40.99	44.12	47.51	21.66	21.08	20.03
1275.4	40.48	43.91	48.20	21.09	20.13	19.25
1335.6	40.23	43.03	46.76	20.02	19.11	18.21
1395.9	40.34	43.08	47.07	18.60	17.81	16.97
1456.2	40.49	43.22	47.43	17.47	16.72	15.63
1516.4	40.22	43.23	46.41	16.27	15.43	14.48
1576.7	41.49	45.93	47.78	14.94	14.14	13.54
1636.9	43.24	49.05	48.59	13.98	13.36	12.93
1697.2	43.87	50.05	47.65	13.23	12.68	12.41
1757.4	46.34	52.31	47.49	12.42	12.28	12.03
1817.7	46.60	57.56	48.79	11.87	11.83	11.59
1877.9	44.39	58.77	49.55	11.49	11.48	11.27
1938.2	43.93	60.16	51.05	11.04	11.09	11.02
1998.4	44.15	56.81	49.84	10.77	10.82	10.79
2058.7	43.58	52.56	46.79	10.62	10.67	10.58
2118.9	42.43	49.80	45.38	10.40	10.57	10.65
2199.3	41.55	46.48	42.19	10.31	10.37	10.64
2259.5	41.69	44.02	39.81	10.20	10.38	10.58
2339.8	40.26	42.11	38.13	10.22	10.41	10.60
2400.1	39.22	40.79	37.61	10.25	10.42	10.80

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+10	+13	+16
10.1	40.1	54.32	57.37	56.00
70.4	100.4	48.00	48.29	47.07
130.6	160.6	43.44	43.10	42.82
190.9	220.9	40.97	40.25	40.15
251.1	281.1	39.53	38.53	38.25
311.4	341.4	38.23	37.16	36.92
371.6	401.6	36.59	35.63	35.17
431.9	461.9	34.88	34.28	33.83
492.1	522.1	33.90	33.36	33.06
552.4	582.4	32.59	32.01	31.63
612.6	642.6	30.96	30.55	30.11
672.9	702.9	29.91	29.47	29.09
733.1	763.1	29.26	28.74	28.48
793.4	823.4	28.86	28.63	28.37
853.6	883.6	27.92	27.95	27.71
913.9	943.9	26.81	27.19	27.15
974.1	1004.1	25.68	26.19	26.47
1034.4	1064.4	24.62	24.83	25.20
1094.6	1124.6	23.73	23.84	24.16
1154.9	1184.9	23.15	23.22	23.37
1215.1	1245.1	22.44	22.54	22.66
1275.4	1305.4	21.95	22.11	22.27
1335.6	1365.6	21.50	21.79	21.89
1395.9	1425.9	21.01	21.51	21.71
1456.2	1486.2	21.21	21.69	22.05
1516.4	1546.4	21.66	22.28	22.58
1576.7	1606.7	22.39	23.09	23.31
1636.9	1666.9	23.54	24.06	24.21
1697.2	1727.2	24.32	24.97	25.29
1757.4	1787.4	24.65	25.67	26.19
1817.7	1847.7	25.03	26.40	26.98
1877.9	1907.9	25.52	27.01	27.74
1938.2	1968.2	25.69	27.48	28.46
1998.4	2028.4	26.06	28.26	29.32
2058.7	2088.7	27.23	29.56	30.99
2118.9	2148.9	28.16	31.21	33.48
2199.3	2229.3	30.14	34.40	38.84
2259.5	2289.5	31.76	37.79	45.58
2339.8	2369.8	37.84	54.88	40.60
2400.1	2430.1	43.43	42.71	35.03

Frequency Mixer

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Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)		
		@LO (dBm)		
		+10	+13	+16
10.1	40.1	1.61	1.55	1.53
70.4	100.4	1.20	1.09	1.05
130.6	160.6	1.19	1.08	1.04
190.9	220.9	1.26	1.15	1.12
251.1	281.1	1.32	1.23	1.20
311.4	341.4	1.40	1.32	1.28
371.6	401.6	1.50	1.41	1.37
431.9	461.9	1.60	1.51	1.46
492.1	522.1	1.73	1.64	1.57
552.4	582.4	1.92	1.80	1.74
612.6	642.6	2.20	2.03	1.90
672.9	702.9	2.53	2.36	2.20
733.1	763.1	2.87	2.68	2.53
793.4	823.4	3.14	2.91	2.77
853.6	883.6	3.29	2.99	2.82
913.9	943.9	3.41	3.07	2.90
974.1	1004.1	3.53	3.21	3.00
1034.4	1064.4	3.47	3.24	3.02
1094.6	1124.6	3.35	3.17	2.98
1154.9	1184.9	3.27	3.06	2.89
1215.1	1245.1	3.16	2.96	2.78
1275.4	1305.4	3.04	2.84	2.67
1335.6	1365.6	2.99	2.77	2.57
1395.9	1425.9	2.89	2.64	2.42
1456.2	1486.2	2.70	2.39	2.18
1516.4	1546.4	2.50	2.16	2.00
1576.7	1606.7	2.35	1.99	1.87
1636.9	1666.9	2.14	1.90	1.78
1697.2	1727.2	2.11	1.88	1.75
1757.4	1787.4	2.27	1.91	1.77
1817.7	1847.7	2.33	1.92	1.77
1877.9	1907.9	2.32	1.92	1.76
1938.2	1968.2	2.47	1.94	1.77
1998.4	2028.4	2.61	2.00	1.80
2058.7	2088.7	2.56	2.02	1.81
2118.9	2148.9	2.63	2.06	1.79
2199.3	2229.3	2.60	2.04	1.76
2259.5	2289.5	2.67	2.05	1.76
2339.8	2369.8	2.53	1.99	1.79
2400.1	2430.1	2.69	2.08	1.84

LO (MHz)	LO VSWR (:1)		
	@LO (dBm)		
	+10	+13	+16
10.1	1.48	2.19	3.06
70.4	1.58	2.36	3.37
130.6	1.59	2.42	3.47
190.9	1.56	2.33	3.31
251.1	1.58	2.35	3.33
311.4	1.57	2.32	3.25
371.6	1.68	2.46	3.41
431.9	1.69	2.40	3.29
492.1	1.70	2.37	3.19
552.4	1.81	2.48	3.30
612.6	1.87	2.47	3.19
672.9	1.87	2.46	3.16
733.1	1.94	2.51	3.19
793.4	2.03	2.53	3.15
853.6	2.07	2.48	3.04
913.9	2.12	2.51	3.05
974.1	2.24	2.65	3.16
1034.4	2.29	2.72	3.19
1094.6	2.26	2.66	3.13
1154.9	2.34	2.73	3.17
1215.1	2.39	2.74	3.15
1275.4	2.39	2.69	3.08
1335.6	2.43	2.68	3.06
1395.9	2.45	2.67	3.01
1456.2	2.46	2.59	2.90
1516.4	2.44	2.51	2.81
1576.7	2.47	2.57	2.88
1636.9	2.66	2.70	2.93
1697.2	2.94	2.83	3.00
1757.4	3.21	3.02	3.14
1817.7	3.41	3.15	3.21
1877.9	3.70	3.31	3.29
1938.2	3.89	3.49	3.42
1998.4	3.97	3.58	3.47
2058.7	4.24	3.82	3.64
2118.9	4.37	3.95	3.73
2199.3	4.60	4.22	3.91
2259.5	4.82	4.40	4.14
2339.8	4.96	4.67	4.38
2400.1	5.13	4.79	4.51

IF (OUT) (MHz)	IF VSWR @LO=1500.1MHz (:1)		
	@LO (dBm)		
	+10	+13	+16
10.0	1.80	1.52	1.27
30.2	1.55	1.24	1.06
50.4	1.40	1.15	1.15
70.6	1.37	1.09	1.11
90.8	1.42	1.14	1.11
111.0	1.49	1.19	1.03
131.2	1.53	1.22	1.06
151.4	1.46	1.16	1.06
171.6	1.41	1.12	1.09
191.8	1.48	1.18	1.06
212.0	1.53	1.22	1.04
232.2	1.48	1.18	1.08
252.4	1.46	1.18	1.12
272.7	1.48	1.19	1.09
292.9	1.48	1.18	1.06
313.1	1.48	1.19	1.10
333.3	1.52	1.23	1.13
353.5	1.50	1.21	1.10
373.7	1.47	1.18	1.12
393.9	1.50	1.23	1.15
434.3	1.52	1.23	1.13
454.5	1.52	1.25	1.16
494.9	1.58	1.30	1.16
515.1	1.55	1.28	1.18
555.5	1.59	1.30	1.17
575.7	1.59	1.31	1.17
616.1	1.62	1.35	1.24
636.3	1.57	1.30	1.19
676.7	1.64	1.37	1.24
696.9	1.66	1.39	1.26
737.3	1.58	1.34	1.27
757.6	1.60	1.36	1.25
798.0	1.66	1.43	1.33
818.2	1.64	1.43	1.36
858.6	1.58	1.37	1.30
878.8	1.64	1.42	1.35
919.2	1.62	1.46	1.43
939.4	1.56	1.42	1.43
979.8	1.56	1.40	1.39
1000.0	1.59	1.46	1.45

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	12	52	34	50	27	55	42	70	50	76
1	-	24	+0	42	22	52	42	58	50	72	55	69
2	78	54	39	53	38	65	57	71	47	66	56	77
3	>100	56	37	53	35	56	43	64	42	74	58	75
4	>100	74	71	66	52	62	54	70	66	88	66	80
5	>100	65	57	72	55	74	51	83	59	79	56	74
6	>100	84	71	78	90	72	65	70	62	79	73	79
7	>100	89	76	92	66	85	59	73	55	75	66	85
8	>100	>97	>97	>97	79	91	87	88	67	79	68	88
9	>100	>97	>97	>97	96	90	80	96	72	84	71	>97
10	>100	>97	>97	>97	>97	>97	83	91	92	82	74	80
	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; -2.91 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	1	36	26	42	14	44	33	60	39	61
1	-	25	+0	38	24	47	36	52	46	59	49	58
2	93	63	55	59	52	68	59	>87	57	73	56	80
3	>100	78	57	73	52	75	59	>87	58	76	71	85
4	>100	>87	>87	>87	86	>87	83	>87	>87	>87	78	>87
5	>100	>87	>87	>87	>87	>87	84	>87	>87	>87	86	>87
6	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
7	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
8	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
9	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
10	>100	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87	>87
	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; -13.18 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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