

Frequency Mixer

TUF-5HSM

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=+14dBm (dB)		
		@LO (dBm)					@LO (dBm)					@LO (dBm)		
		+14	+17	+20			+14	+17	+20			+14	+17	+20
10.1	40.1	7.63	6.39	6.06	10.1	40.1	21.78	24.66	26.34	10.1	40.1	0.50	0.30	0.25
70.7	100.7	7.06	6.20	5.72	70.7	100.7	23.24	26.78	28.24	70.7	100.7	0.89	0.42	0.25
131.3	161.3	6.97	6.03	5.63	131.3	161.3	24.23	28.03	23.23	131.3	161.3	1.08	0.47	0.27
191.9	221.9	6.94	6.03	5.71	191.9	221.9	23.72	22.65	22.26	191.9	221.9	1.13	0.50	0.25
252.5	282.5	6.88	6.12	5.80	252.5	282.5	24.59	20.37	21.87	252.5	282.5	1.20	0.52	0.24
313.1	343.1	6.91	6.20	5.91	313.1	343.1	20.45	20.27	22.39	313.1	343.1	1.13	0.41	0.22
373.7	403.7	7.01	6.32	6.06	373.7	403.7	18.81	20.35	22.23	373.7	403.7	1.21	0.44	0.23
434.3	464.3	7.09	6.41	6.11	434.3	464.3	18.05	19.62	23.85	434.3	464.3	1.27	0.52	0.34
474.7	504.7	7.14	6.48	6.22	474.7	504.7	18.37	19.53	21.65	474.7	504.7	1.29	0.62	0.39
535.2	565.2	7.43	6.66	6.37	535.2	565.2	17.16	20.71	22.65	535.2	565.2	1.27	0.83	0.50
575.6	605.6	7.73	6.83	6.40	575.6	605.6	16.11	20.28	24.66	575.6	605.6	1.29	0.91	0.66
636.2	666.2	8.16	7.28	6.73	636.2	666.2	16.26	17.90	21.84	636.2	666.2	1.27	0.77	0.68
676.6	706.6	8.49	7.58	7.06	676.6	706.6	17.09	18.24	20.45	676.6	706.6	1.10	0.64	0.54
737.2	767.2	9.19	7.99	7.42	737.2	767.2	18.20	19.74	21.21	737.2	767.2	0.74	0.54	0.41
777.6	807.6	9.68	8.18	7.47	777.6	807.6	17.60	19.99	21.98	777.6	807.6	0.29	0.43	0.43
838.2	868.2	10.47	8.30	7.26	838.2	868.2	15.89	20.36	25.36	838.2	868.2	-0.39	0.44	0.66
878.6	908.6	10.76	8.33	7.25	878.6	908.6	15.30	21.28	25.65	878.6	908.6	-0.70	0.56	0.76
939.2	969.2	10.41	8.66	7.41	939.2	969.2	16.50	20.39	23.38	939.2	969.2	-0.56	0.27	0.67
979.6	1009.6	9.86	8.64	7.47	979.6	1009.6	18.58	20.11	22.21	979.6	1009.6	-0.23	0.11	0.56
1040.2	1070.2	9.28	8.48	7.70	1040.2	1070.2	20.15	20.64	20.52	1040.2	1070.2	0.08	0.09	0.34
1080.6	1110.6	9.01	8.37	7.73	1080.6	1110.6	20.56	20.57	19.48	1080.6	1110.6	0.33	0.16	0.28
1141.2	1171.2	8.67	8.19	7.72	1141.2	1171.2	21.80	20.53	19.16	1141.2	1171.2	0.52	0.19	0.24
1181.6	1211.6	8.50	8.10	7.75	1181.6	1211.6	23.51	21.28	19.45	1181.6	1211.6	0.67	0.24	0.23
1242.2	1272.2	8.34	7.94	7.66	1242.2	1272.2	25.15	21.79	21.00	1242.2	1272.2	0.90	0.36	0.29
1282.6	1312.6	8.18	7.79	7.53	1282.6	1312.6	24.50	21.81	23.69	1282.6	1312.6	1.00	0.49	0.41
1343.2	1373.2	8.07	7.55	7.28	1343.2	1373.2	23.18	25.22	23.89	1343.2	1373.2	1.30	0.68	0.54
1383.6	1413.6	8.16	7.52	7.20	1383.6	1413.6	21.98	25.33	22.62	1383.6	1413.6	1.38	0.73	0.58
1444.2	1474.2	8.28	7.45	6.95	1444.2	1474.2	20.06	22.75	22.07	1444.2	1474.2	1.37	0.78	0.65
1484.6	1514.6	8.32	7.31	6.79	1484.6	1514.6	19.39	20.26	21.85	1484.6	1514.6	1.59	0.92	0.67
1545.1	1575.1	8.26	6.97	6.67	1545.1	1575.1	20.08	19.19	24.15	1545.1	1575.1	1.65	1.13	0.52
1585.5	1615.5	8.40	6.95	6.71	1585.5	1615.5	19.85	20.27	25.41	1585.5	1615.5	1.84	1.26	0.46
1646.1	1676.1	8.02	6.97	6.80	1646.1	1676.1	17.47	22.63	29.70	1646.1	1676.1	2.06	1.16	0.40
1686.5	1716.5	8.32	7.10	6.90	1686.5	1716.5	17.34	23.10	29.33	1686.5	1716.5	2.04	1.18	0.42
1747.1	1777.1	8.96	7.38	7.14	1747.1	1777.1	17.46	23.83	29.73	1747.1	1777.1	1.81	1.10	0.42
1787.5	1817.5	9.58	7.69	7.34	1787.5	1817.5	18.25	25.00	29.08	1787.5	1817.5	1.58	1.17	0.42
1848.1	1878.1	11.30	8.11	7.57	1848.1	1878.1	22.78	24.82	32.04	1848.1	1878.1	0.51	1.15	0.42
1888.5	1918.5	13.05	8.56	7.66	1888.5	1918.5	17.49	24.54	30.89	1888.5	1918.5	-0.67	1.11	0.48
1949.1	1979.1	14.44	9.21	7.83	1949.1	1979.1	14.29	22.79	30.60	1949.1	1979.1	-1.47	0.95	0.56
1989.5	2019.5	15.99	9.75	8.05	1989.5	2019.5	12.17	22.27	26.65	1989.5	2019.5	-2.52	0.75	0.49
2050.1	2080.1	16.87	10.23	8.20	2050.1	2080.1	11.23	23.47	24.46	2050.1	2080.1	-3.19	0.58	0.58



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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)
		+17			+17			+17
710.0	40.1	6.63	10.0	30.1	6.71	1000.0	500.1	8.56
692.1	58.0	6.68	30.2	50.3	6.59	979.8	520.3	8.46
674.1	76.0	6.89	50.4	70.5	6.57	959.6	540.5	8.40
656.2	93.9	6.76	70.6	90.7	6.73	939.4	560.7	8.43
638.2	111.9	6.71	90.8	110.9	6.57	919.2	580.9	8.36
620.3	129.8	6.59	111.0	131.1	6.49	899.0	601.1	8.41
602.3	147.8	6.67	131.2	151.3	6.54	878.8	621.3	8.39
584.4	165.7	6.66	151.4	171.5	6.60	858.6	641.5	8.48
566.4	183.7	6.82	171.6	191.7	6.47	838.4	661.7	8.54
548.5	201.6	6.81	191.8	211.9	6.46	818.2	681.9	8.47
530.5	219.6	6.89	212.0	232.1	6.47	798.0	702.1	8.49
512.6	237.5	6.88	232.2	252.3	6.36	777.8	722.3	8.35
494.6	255.5	6.98	252.4	272.5	6.41	757.6	742.5	8.31
476.7	273.4	6.99	272.7	292.8	6.36	737.3	762.8	8.03
458.7	291.4	7.09	292.9	313.0	6.33	717.1	783.0	8.01
440.8	309.3	7.16	313.1	333.2	6.32	696.9	803.2	8.00
422.8	327.3	7.11	333.3	353.4	6.30	676.7	823.4	7.85
404.9	345.2	7.03	353.5	373.6	6.36	656.5	843.6	7.83
386.9	363.2	7.04	373.7	393.8	6.29	636.3	863.8	7.75
369.0	381.1	7.11	393.9	414.0	6.28	616.1	884.0	7.65
351.0	399.1	7.22	434.3	454.4	6.29	575.7	924.4	7.47
333.1	417.0	7.23	454.5	474.6	6.34	555.5	944.6	7.50
315.1	435.0	7.26	494.9	515.0	6.30	515.1	985.0	7.47
297.2	452.9	7.26	515.1	535.2	6.24	494.9	1005.2	7.50
279.2	470.9	7.35	555.5	575.6	6.34	454.5	1045.6	7.69
261.3	488.8	7.44	575.7	595.8	6.31	434.3	1065.8	7.71
243.3	506.8	7.41	616.1	636.2	6.40	393.9	1106.2	7.78
225.4	524.7	7.45	636.3	656.4	6.52	373.7	1126.4	7.84
207.4	542.7	7.45	676.7	696.8	6.54	333.3	1166.8	7.78
189.5	560.6	7.52	696.9	717.0	6.54	313.1	1187.0	7.84
171.5	578.6	7.48	737.3	757.4	6.73	272.7	1227.4	7.85
153.6	596.5	7.59	757.6	777.7	6.67	252.4	1247.7	7.84
135.6	614.5	7.61	798.0	818.1	6.73	212.0	1288.1	7.77
117.7	632.4	7.74	818.2	838.3	6.76	191.8	1308.3	7.69
99.7	650.4	7.77	858.6	878.7	6.84	151.4	1348.7	7.64
81.8	668.3	7.90	878.8	898.9	6.91	131.2	1368.9	7.57
63.8	686.3	7.90	919.2	939.3	7.15	90.8	1409.3	7.49
45.9	704.2	7.96	939.4	959.5	7.31	70.6	1429.5	7.52
27.9	722.2	7.95	979.8	999.9	7.58	30.2	1469.9	7.44
10.0	740.1	8.13	1000.0	1020.1	7.61	10.0	1490.1	7.50

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Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+14	+17	+20	+14	+17	+20
10.1	86.73	84.43	83.51	56.04	57.24	60.21
70.7	71.74	71.49	71.46	38.92	41.03	43.06
131.3	66.20	65.95	66.48	33.81	36.23	38.84
191.9	63.03	63.29	63.71	30.94	33.55	36.23
252.5	60.51	61.81	62.96	29.08	32.14	34.51
313.1	58.86	59.95	60.47	27.96	30.80	32.98
373.7	57.53	58.67	59.19	26.95	29.46	31.62
434.3	56.11	57.94	59.08	25.72	28.36	30.50
474.7	54.46	55.83	56.79	25.13	27.55	29.84
535.2	52.02	52.60	52.59	24.01	26.58	28.66
575.6	51.41	51.79	52.03	23.33	26.03	28.22
636.2	50.12	51.02	50.66	22.64	24.99	27.52
676.6	49.71	51.20	51.54	22.50	24.42	26.69
737.2	48.96	50.89	52.05	22.42	24.09	25.84
777.6	48.42	49.84	50.54	22.37	24.02	25.46
838.2	48.30	49.04	49.61	22.09	23.65	24.47
878.6	48.98	48.80	49.22	21.85	23.24	23.72
939.2	50.28	48.76	48.46	21.15	22.38	22.61
979.6	50.85	49.54	48.49	20.80	21.76	21.87
1040.2	51.22	50.91	49.71	20.46	21.04	21.05
1080.6	51.73	51.78	50.68	20.46	20.81	20.65
1141.2	51.72	51.56	49.34	20.10	20.31	20.03
1181.6	51.47	50.52	47.46	20.03	20.04	19.66
1242.2	50.40	49.82	48.10	19.88	19.57	18.94
1282.6	49.53	49.12	47.50	19.55	19.07	18.02
1343.2	48.77	49.18	48.55	18.74	17.91	16.71
1383.6	48.32	48.95	47.66	17.92	16.99	15.59
1444.2	48.94	49.07	46.92	16.76	15.58	14.25
1484.6	48.67	47.96	45.14	16.07	14.82	13.56
1545.1	49.05	46.41	43.48	14.82	13.67	12.89
1585.5	48.19	45.39	43.06	14.11	13.16	12.42
1646.1	46.38	44.11	42.01	13.29	12.54	11.95
1686.5	45.17	43.65	41.69	12.64	12.21	11.64
1747.1	45.01	44.47	42.92	11.82	11.66	11.22
1787.5	44.74	44.33	43.44	11.26	11.20	11.02
1848.1	45.91	45.31	44.83	10.67	10.74	10.69
1888.5	46.80	45.34	45.08	10.29	10.42	10.51
1949.1	46.83	45.15	44.28	9.93	10.09	10.14
1989.5	46.79	44.99	43.67	9.73	9.90	10.04
2050.1	45.92	43.60	41.88	9.38	9.64	9.75

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+14	+17	+20
10.1	40.1	59.27	62.65	60.61
70.7	100.7	47.23	46.82	46.63
131.3	161.3	42.09	41.71	41.28
191.9	221.9	38.95	38.49	38.06
252.5	282.5	37.09	36.46	35.93
313.1	343.1	35.54	34.71	34.21
373.7	403.7	33.61	32.81	32.29
434.3	464.3	32.24	31.44	31.14
474.7	504.7	31.55	30.64	30.13
535.2	565.2	30.82	29.88	29.37
575.6	605.6	30.34	29.46	28.98
636.2	666.2	29.68	28.91	28.35
676.6	706.6	28.96	28.30	27.75
737.2	767.2	28.01	27.41	26.91
777.6	807.6	27.80	27.30	27.05
838.2	868.2	28.73	28.07	27.94
878.6	908.6	29.88	28.63	28.32
939.2	969.2	32.83	30.88	29.81
979.6	1009.6	34.80	32.83	31.22
1040.2	1070.2	37.14	36.23	34.37
1080.6	1110.6	37.10	36.99	36.43
1141.2	1171.2	35.47	36.08	37.93
1181.6	1211.6	34.21	34.83	37.11
1242.2	1272.2	33.39	33.92	35.22
1282.6	1312.6	32.99	33.22	33.40
1343.2	1373.2	33.54	33.44	32.54
1383.6	1413.6	33.39	33.08	31.97
1444.2	1474.2	33.10	32.28	31.11
1484.6	1514.6	32.62	31.74	30.71
1545.1	1575.1	32.07	31.49	30.84
1585.5	1615.5	31.98	31.54	30.88
1646.1	1676.1	32.35	32.15	31.89
1686.5	1716.5	32.53	32.48	32.29
1747.1	1777.1	32.49	33.19	33.06
1787.5	1817.5	32.34	33.31	33.37
1848.1	1878.1	31.47	33.17	33.47
1888.5	1918.5	30.85	32.81	33.34
1949.1	1979.1	30.34	32.29	33.02
1989.5	2019.5	30.15	32.26	32.99
2050.1	2080.1	30.03	32.29	33.05

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Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)		
		@LO (dBm)		
		+14	+17	+20
10.1	40.1	2.03	1.85	1.77
70.7	100.7	1.48	1.27	1.14
131.3	161.3	1.49	1.24	1.09
191.9	221.9	1.53	1.26	1.14
252.5	282.5	1.56	1.31	1.21
313.1	343.1	1.60	1.36	1.28
373.7	403.7	1.64	1.43	1.36
434.3	464.3	1.70	1.51	1.43
474.7	504.7	1.74	1.57	1.49
535.2	565.2	1.90	1.71	1.62
575.6	605.6	2.08	1.86	1.75
636.2	666.2	2.40	2.20	2.06
676.6	706.6	2.66	2.45	2.31
737.2	767.2	3.12	2.84	2.68
777.6	807.6	3.43	3.07	2.86
838.2	868.2	3.90	3.34	3.03
878.6	908.6	4.16	3.50	3.17
939.2	969.2	4.32	3.80	3.41
979.6	1009.6	4.28	3.91	3.54
1040.2	1070.2	4.17	3.92	3.64
1080.6	1110.6	4.09	3.88	3.63
1141.2	1171.2	3.88	3.72	3.50
1181.6	1211.6	3.74	3.58	3.40
1242.2	1272.2	3.60	3.43	3.24
1282.6	1312.6	3.54	3.34	3.13
1343.2	1373.2	3.48	3.19	2.95
1383.6	1413.6	3.46	3.09	2.82
1444.2	1474.2	3.37	2.86	2.55
1484.6	1514.6	3.27	2.67	2.37
1545.1	1575.1	3.05	2.39	2.20
1585.5	1615.5	2.97	2.32	2.14
1646.1	1676.1	2.75	2.28	2.12
1686.5	1716.5	2.85	2.36	2.18
1747.1	1777.1	3.06	2.52	2.34
1787.5	1817.5	3.22	2.63	2.44
1848.1	1878.1	3.55	2.74	2.51
1888.5	1918.5	3.84	2.78	2.52
1949.1	1979.1	3.94	2.81	2.50
1989.5	2019.5	4.09	2.88	2.51
2050.1	2080.1	4.19	2.96	2.52

LO (MHz)	LO VSWR (:1)		
	@LO (dBm)		
	+14	+17	+20
10.1	1.05	1.45	2.04
70.7	1.02	1.50	2.19
131.3	1.03	1.51	2.23
191.9	1.03	1.46	2.10
252.5	1.03	1.48	2.16
313.1	1.05	1.48	2.14
373.7	1.09	1.49	2.17
434.3	1.13	1.55	2.19
474.7	1.18	1.55	2.16
535.2	1.23	1.61	2.21
575.6	1.26	1.61	2.17
636.2	1.29	1.67	2.23
676.6	1.33	1.68	2.22
737.2	1.39	1.73	2.25
777.6	1.43	1.73	2.22
838.2	1.50	1.79	2.24
878.6	1.53	1.79	2.21
939.2	1.59	1.90	2.31
979.6	1.59	1.92	2.34
1040.2	1.64	1.98	2.41
1080.6	1.67	1.97	2.39
1141.2	1.72	2.01	2.42
1181.6	1.75	2.02	2.41
1242.2	1.80	2.04	2.42
1282.6	1.83	2.04	2.39
1343.2	1.88	2.06	2.39
1383.6	1.91	2.03	2.33
1444.2	1.95	2.03	2.30
1484.6	1.96	2.00	2.26
1545.1	2.02	2.01	2.32
1585.5	2.07	2.08	2.35
1646.1	2.29	2.23	2.47
1686.5	2.43	2.34	2.51
1747.1	2.82	2.53	2.65
1787.5	3.05	2.65	2.69
1848.1	3.43	2.87	2.86
1888.5	3.64	3.01	2.90
1949.1	3.83	3.26	3.08
1989.5	3.92	3.38	3.12
2050.1	4.13	3.67	3.34

IF (OUT) (MHz)	IF VSWR @LO=1500.1MHz (:1)		
	@LO (dBm)		
	+14	+17	+20
10.0	2.35	1.80	1.49
30.2	2.03	1.52	1.22
50.4	1.82	1.38	1.13
70.6	1.80	1.35	1.09
90.8	1.86	1.40	1.13
111.0	1.98	1.48	1.18
131.2	2.02	1.52	1.22
151.4	1.93	1.45	1.16
171.6	1.87	1.40	1.11
191.8	1.96	1.47	1.17
212.0	2.03	1.52	1.21
232.2	1.98	1.48	1.17
252.4	1.96	1.46	1.17
272.7	2.00	1.49	1.19
292.9	2.02	1.51	1.20
313.1	2.03	1.52	1.20
333.3	2.09	1.56	1.25
353.5	2.07	1.54	1.23
373.7	2.04	1.51	1.20
393.9	2.10	1.56	1.25
434.3	2.15	1.60	1.26
454.5	2.16	1.60	1.27
494.9	2.26	1.68	1.33
515.1	2.24	1.65	1.32
555.5	2.33	1.72	1.37
575.7	2.34	1.73	1.37
616.1	2.39	1.77	1.42
636.3	2.35	1.73	1.38
676.7	2.49	1.85	1.47
696.9	2.53	1.87	1.49
737.3	2.42	1.80	1.45
757.6	2.50	1.86	1.48
798.0	2.60	1.93	1.56
818.2	2.56	1.93	1.57
858.6	2.52	1.89	1.53
878.8	2.63	1.97	1.61
919.2	2.60	1.98	1.66
939.4	2.50	1.92	1.63
979.8	2.59	1.99	1.67
1000.0	2.66	2.06	1.76

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	+2	31	16	37	11	45	34	50	41	56
1	-	20	+0	35	32	34	23	63	42	57	45	51
2	83	71	60	67	53	63	50	76	48	60	52	66
3	>100	84	56	72	50	74	62	77	66	76	65	84
4	>100	>91	89	>91	81	85	81	>91	83	88	81	87
5	>100	>91	>91	>91	>91	>91	78	>91	>91	>91	89	>91
6	>100	>91	>91	>91	>91	>91	>91	>91	>91	>91	>91	>91
7	>100	>91	>91	>91	>91	>91	>91	>91	>91	>91	>91	>91
8	>100	>91	>91	>91	>91	>91	>91	>91	>91	>91	>91	>91
9	>100	>91	>91	>91	>91	>91	>91	>91	>91	>91	>91	>91
10	>100	>91	>91	>91	>91	>91	>91	>91	>91	>91	>91	>91
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 750.1 MHz; -1.00 dBm.
 LO IN: 780.01 MHz; +17.00 dBm
 IF OUT: 29.91 MHz; -8.91 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	9	41	26	51	26	53	41	66	56	76
1	-	20	+0	36	27	38	33	59	45	69	53	59
2	72	61	39	63	36	62	50	61	48	61	52	74
3	>100	60	38	51	31	53	43	59	41	67	57	74
4	>100	77	65	71	46	65	44	66	59	74	51	87
5	>100	72	63	66	67	67	54	65	64	63	54	75
6	>100	82	74	80	91	78	60	72	63	78	69	72
7	>100	95	81	85	67	77	64	79	58	75	74	82
8	>100	>102	92	88	77	89	85	85	65	82	63	80
9	>100	98	>102	>102	87	94	84	95	73	78	67	78
10	>100	>102	>102	>102	100	>102	85	97	95	83	68	78
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 750.1 MHz; 9.00 dBm.
 LO IN: 780.01 MHz; +17.00 dBm
 IF OUT: 29.91 MHz; 1.59 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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