

Frequency Mixer

TUF-2SM+

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=+1dBm (dB)		
		@LO (dBm)					@LO (dBm)					@LO (dBm)		
		+4	+7	+10			+4	+7	+10			+4	+7	+10
10.1	40.1	6.09	5.73	5.58	10.1	40.1	16.52	16.87	20.71	10.1	40.1	0.97	0.68	0.48
50.7	80.7	6.39	5.93	5.69	50.7	80.7	15.63	17.06	16.64	50.7	80.7	0.81	0.63	0.49
91.2	121.2	6.33	5.88	5.66	91.2	121.2	13.26	14.58	15.83	91.2	121.2	0.88	0.63	0.45
131.8	161.8	6.26	5.87	5.64	131.8	161.8	13.49	15.36	23.55	131.8	161.8	0.95	0.66	0.49
172.4	202.4	6.39	5.91	5.68	172.4	202.4	12.38	14.77	26.16	172.4	202.4	0.79	0.62	0.46
212.9	242.9	6.17	5.80	5.63	212.9	242.9	13.93	23.73	20.22	212.9	242.9	0.81	0.59	0.43
253.5	283.5	6.30	5.83	5.66	253.5	283.5	15.24	20.65	18.09	253.5	283.5	0.82	0.61	0.43
294.0	324.0	6.18	5.83	5.67	294.0	324.0	15.36	19.38	23.24	294.0	324.0	0.86	0.58	0.43
334.6	364.6	6.21	5.84	5.69	334.6	364.6	22.49	18.68	23.95	334.6	364.6	0.85	0.56	0.41
375.2	405.2	6.19	5.85	5.69	375.2	405.2	19.42	17.67	24.46	375.2	405.2	0.83	0.57	0.41
415.7	445.7	6.11	5.82	5.67	415.7	445.7	14.23	16.80	26.16	415.7	445.7	0.84	0.53	0.41
456.3	486.3	6.21	5.87	5.70	456.3	486.3	12.79	13.81	18.27	456.3	486.3	0.84	0.54	0.40
496.9	526.9	6.22	5.89	5.71	496.9	526.9	17.13	20.88	18.37	496.9	526.9	0.75	0.51	0.39
537.4	567.4	6.24	5.95	5.77	537.4	567.4	15.51	21.70	18.48	537.4	567.4	0.78	0.50	0.39
578.0	608.0	6.30	5.98	5.84	578.0	608.0	14.52	22.27	16.88	578.0	608.0	0.83	0.54	0.39
618.6	648.6	6.34	6.04	5.87	618.6	648.6	13.54	14.28	26.06	618.6	648.6	0.86	0.59	0.44
659.1	689.1	6.41	6.11	5.96	659.1	689.1	14.73	16.79	16.34	659.1	689.1	0.91	0.60	0.44
699.7	729.7	6.42	6.17	6.06	699.7	729.7	14.54	16.36	18.58	699.7	729.7	0.99	0.65	0.45
740.2	770.2	6.56	6.29	6.18	740.2	770.2	11.16	16.81	19.14	740.2	770.2	1.05	0.68	0.49
780.8	810.8	6.64	6.36	6.25	780.8	810.8	9.22	13.03	19.83	780.8	810.8	1.15	0.79	0.55
821.4	851.4	6.77	6.50	6.34	821.4	851.4	7.50	10.50	15.35	821.4	851.4	1.25	0.85	0.65
861.9	891.9	6.88	6.56	6.39	861.9	891.9	6.13	8.10	11.62	861.9	891.9	1.33	0.96	0.73
902.5	932.5	7.00	6.64	6.45	902.5	932.5	6.09	7.68	9.69	902.5	932.5	1.40	1.02	0.79
943.1	973.1	7.18	6.81	6.60	943.1	973.1	7.06	9.05	10.90	943.1	973.1	1.41	1.07	0.82
983.6	1013.6	7.29	6.81	6.55	983.6	1013.6	8.83	12.25	14.45	983.6	1013.6	1.46	1.10	0.87
1024.2	1054.2	7.36	6.84	6.59	1024.2	1054.2	11.50	17.31	20.61	1024.2	1054.2	1.47	1.11	0.88
1064.7	1094.7	7.52	6.89	6.63	1064.7	1094.7	15.08	17.76	15.83	1064.7	1094.7	1.47	1.13	0.88
1085.0	1115.0	7.65	6.98	6.69	1085.0	1115.0	13.98	15.98	15.82	1085.0	1115.0	1.46	1.12	0.86
1125.6	1155.6	7.86	7.13	6.80	1125.6	1155.6	13.40	16.93	15.98	1125.6	1155.6	1.37	1.11	0.84
1145.9	1175.9	8.04	7.26	6.91	1145.9	1175.9	13.86	15.26	15.57	1145.9	1175.9	1.26	1.03	0.78
1186.4	1216.4	8.35	7.50	7.09	1186.4	1216.4	11.25	15.98	13.63	1186.4	1216.4	1.19	1.01	0.78
1206.7	1236.7	8.47	7.66	7.22	1206.7	1236.7	11.57	14.32	14.52	1206.7	1236.7	1.08	0.96	0.75
1247.3	1277.3	8.85	7.93	7.40	1247.3	1277.3	10.81	12.75	14.50	1247.3	1277.3	0.96	0.93	0.75
1267.6	1297.6	9.04	8.10	7.55	1267.6	1297.6	10.50	12.37	13.58	1267.6	1297.6	0.92	0.89	0.75
1308.1	1338.1	9.52	8.54	7.91	1308.1	1338.1	9.56	11.65	13.10	1308.1	1338.1	0.83	0.87	0.80
1328.4	1358.4	9.72	8.74	8.09	1328.4	1358.4	9.50	11.53	12.53	1328.4	1358.4	0.77	0.83	0.81
1369.0	1399.0	10.25	9.32	8.60	1369.0	1399.0	9.27	11.29	13.72	1369.0	1399.0	0.63	0.76	0.81
1389.3	1419.3	10.49	9.60	8.90	1389.3	1419.3	9.20	11.72	12.56	1389.3	1419.3	0.58	0.74	0.83
1429.8	1459.8	11.15	10.41	9.67	1429.8	1459.8	9.65	10.67	13.40	1429.8	1459.8	0.35	0.55	0.72
1450.1	1480.1	11.39	10.70	10.08	1450.1	1480.1	9.24	10.59	13.41	1450.1	1480.1	0.26	0.43	0.58



Frequency Mixer

TUF-2SM+

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)
		+7			+7			+7
400.0	100.1	6.00	10.0	60.1	5.85	950.0	50.1	7.66
390.3	109.9	5.94	30.0	80.1	5.94	930.0	70.1	7.63
380.5	119.6	5.93	50.0	100.1	5.87	910.0	90.1	7.66
370.8	129.4	5.92	70.0	120.1	5.89	890.0	110.1	7.54
361.0	139.1	5.88	90.0	140.1	5.89	870.0	130.1	7.46
351.3	148.9	5.86	110.0	160.1	5.89	850.0	150.1	7.44
341.5	158.6	5.88	130.0	180.1	5.97	830.0	170.1	7.48
331.8	168.4	5.89	150.0	200.1	5.93	810.0	190.1	7.40
322.0	178.1	5.85	170.0	220.1	5.97	790.0	210.1	7.36
312.3	187.9	5.89	190.0	240.1	5.93	770.0	230.1	7.31
302.5	197.6	5.87	210.0	260.1	5.98	750.0	250.1	7.27
292.8	207.4	5.84	230.0	280.1	6.05	730.0	270.1	7.34
283.0	217.1	5.82	250.0	300.1	5.98	710.0	290.1	7.30
273.3	226.9	5.82	270.0	320.1	5.98	690.0	310.1	7.27
263.5	236.6	5.84	290.0	340.1	6.00	670.0	330.1	7.25
253.8	246.4	5.81	310.0	360.1	6.08	650.0	350.1	7.27
244.0	256.1	5.84	330.0	380.1	6.04	630.0	370.1	7.32
234.3	265.9	5.86	350.0	400.1	6.06	610.0	390.1	7.29
224.5	275.6	5.85	370.0	420.1	6.09	590.0	410.1	7.26
214.8	285.4	5.84	390.0	440.1	6.02	570.0	430.1	7.24
205.0	295.1	5.87	410.0	460.1	6.05	550.0	450.1	7.29
195.3	304.9	5.87	430.0	480.1	6.09	530.0	470.1	7.26
185.5	314.6	5.84	450.0	500.1	6.07	510.0	490.1	7.25
175.8	324.4	5.84	470.0	520.1	6.01	490.0	510.1	7.26
166.0	334.1	5.84	510.0	560.1	6.15	450.0	550.1	7.24
156.3	343.9	5.85	530.0	580.1	6.13	430.0	570.1	7.20
146.5	353.6	5.83	570.0	620.1	6.22	390.0	610.1	7.15
136.8	363.4	5.85	590.0	640.1	6.25	370.0	630.1	7.17
127.0	373.1	5.88	630.0	680.1	6.38	330.0	670.1	7.12
117.3	382.9	5.85	650.0	700.1	6.38	310.0	690.1	7.13
107.5	392.6	5.84	690.0	740.1	6.38	270.0	730.1	7.02
97.8	402.4	5.86	710.0	760.1	6.43	250.0	750.1	7.03
88.0	412.1	5.85	750.0	800.1	6.38	210.0	790.1	6.99
78.3	421.9	5.83	770.0	820.1	6.32	190.0	810.1	6.96
68.5	431.6	5.85	810.0	860.1	6.30	150.0	850.1	6.98
58.8	441.4	5.87	830.0	880.1	6.28	130.0	870.1	7.00
49.0	451.1	5.87	870.0	920.1	6.18	90.0	910.1	7.06
39.3	460.9	5.87	890.0	940.1	6.20	70.0	930.1	7.05
19.8	480.4	5.92	930.0	980.1	6.15	30.0	970.1	6.99
10.0	490.1	5.89	950.0	1000.1	6.11	10.0	990.1	6.87

Frequency Mixer

TUF-2SM+

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+4	+7	+10	+4	+7	+10
10.1	75.28	78.13	78.53	62.68	67.53	67.95
50.7	63.44	64.01	64.22	61.07	61.17	58.48
91.2	58.26	58.78	59.24	59.56	55.98	54.62
131.8	55.60	56.01	56.73	54.74	52.82	51.80
172.4	53.12	53.86	54.25	53.03	51.22	50.06
212.9	51.63	52.28	52.69	51.13	49.54	48.54
253.5	50.40	50.99	51.31	49.67	48.30	47.31
294.0	49.24	49.94	50.26	48.75	47.39	46.24
334.6	48.38	48.95	49.14	47.20	45.81	44.66
375.2	47.53	48.02	48.22	45.83	44.45	43.47
415.7	47.00	47.50	47.77	44.27	43.22	42.46
456.3	46.10	46.61	46.88	42.70	41.79	40.98
496.9	45.42	45.84	46.08	41.38	40.69	40.15
537.4	44.43	44.91	45.34	39.67	39.03	38.89
578.0	43.66	44.05	44.51	38.60	37.87	37.41
618.6	43.38	43.60	43.96	37.82	37.11	36.49
659.1	43.36	43.69	43.86	36.98	36.54	35.97
699.7	43.37	43.75	43.88	36.35	35.91	35.67
740.2	43.34	43.83	43.83	35.13	34.81	34.68
780.8	43.20	43.53	43.65	34.53	33.87	33.58
821.4	42.63	42.90	43.06	33.68	33.16	32.61
861.9	42.03	42.16	42.36	32.86	32.46	31.96
902.5	41.89	42.15	42.43	32.16	31.91	31.45
943.1	41.43	41.83	42.00	31.43	31.43	31.20
983.6	40.97	41.51	41.78	30.60	30.83	30.81
1024.2	40.41	41.10	41.46	29.81	30.06	30.22
1064.7	39.63	40.43	40.93	29.07	29.39	29.63
1085.0	39.37	40.21	40.82	28.68	28.99	29.30
1125.6	38.94	39.96	40.70	27.74	28.05	28.43
1145.9	38.66	39.76	40.61	27.39	27.58	27.99
1186.4	38.48	39.68	40.64	26.89	26.89	27.25
1206.7	38.25	39.55	40.62	26.59	26.57	26.89
1247.3	38.02	39.46	40.75	26.13	26.10	26.35
1267.6	37.81	39.34	40.71	25.92	25.83	26.08
1308.1	37.66	39.32	41.01	25.58	25.59	25.78
1328.4	37.51	39.33	41.22	25.34	25.36	25.58
1369.0	37.31	39.32	41.53	25.06	25.19	25.47
1389.3	37.30	39.36	41.79	24.91	25.06	25.37
1429.8	36.83	39.07	41.65	24.57	24.86	25.17
1450.1	36.73	39.09	41.81	24.44	24.76	25.16

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+4	+7	+10
10.1	40.1	45.17	45.18	53.39
50.7	80.7	36.62	35.93	36.34
91.2	121.2	31.86	31.71	31.88
131.8	161.8	29.05	29.17	29.29
172.4	202.4	27.36	27.53	27.69
212.9	242.9	26.29	26.46	26.50
253.5	283.5	25.53	25.82	26.08
294.0	324.0	25.43	25.58	25.79
334.6	364.6	25.58	25.90	26.03
375.2	405.2	25.70	26.31	26.75
415.7	445.7	25.87	26.57	27.13
456.3	486.3	26.36	26.73	27.02
496.9	526.9	27.22	27.27	27.33
537.4	567.4	27.66	28.03	28.35
578.0	608.0	26.62	27.46	28.27
618.6	648.6	24.41	25.12	25.93
659.1	689.1	22.07	22.44	22.90
699.7	729.7	20.36	20.35	20.46
740.2	770.2	19.09	18.89	18.83
780.8	810.8	17.94	17.70	17.56
821.4	851.4	17.15	16.85	16.66
861.9	891.9	16.58	16.30	16.06
902.5	932.5	15.97	15.67	15.45
943.1	973.1	15.52	15.24	15.04
983.6	1013.6	15.24	14.99	14.83
1024.2	1054.2	15.20	15.02	14.90
1064.7	1094.7	15.06	14.96	14.95
1085.0	1115.0	15.04	15.00	15.00
1125.6	1155.6	14.77	14.75	14.76
1145.9	1175.9	14.74	14.74	14.66
1186.4	1216.4	14.59	14.64	14.68
1206.7	1236.7	14.56	14.61	14.68
1247.3	1277.3	14.42	14.57	14.63
1267.6	1297.6	14.36	14.53	14.62
1308.1	1338.1	14.08	14.32	14.42
1328.4	1358.4	14.00	14.19	14.31
1369.0	1399.0	13.75	13.93	13.99
1389.3	1419.3	13.56	13.73	13.77
1429.8	1459.8	13.22	13.28	13.32
1450.1	1480.1	13.01	13.03	12.99

Frequency Mixer

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Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)		
		@LO (dBm)		
		+4	+7	+10
10.1	40.1	1.10	1.09	1.13
50.7	80.7	1.09	1.03	1.08
91.2	121.2	1.10	1.06	1.11
131.8	161.8	1.10	1.09	1.14
172.4	202.4	1.12	1.11	1.17
212.9	242.9	1.12	1.15	1.20
253.5	283.5	1.15	1.17	1.23
294.0	324.0	1.17	1.20	1.25
334.6	364.6	1.19	1.24	1.29
375.2	405.2	1.21	1.26	1.31
415.7	445.7	1.23	1.28	1.33
456.3	486.3	1.25	1.28	1.32
496.9	526.9	1.27	1.30	1.33
537.4	567.4	1.29	1.32	1.36
578.0	608.0	1.30	1.35	1.40
618.6	648.6	1.32	1.37	1.42
659.1	689.1	1.34	1.40	1.44
699.7	729.7	1.34	1.40	1.45
740.2	770.2	1.32	1.38	1.43
780.8	810.8	1.28	1.32	1.36
821.4	851.4	1.24	1.26	1.29
861.9	891.9	1.23	1.24	1.26
902.5	932.5	1.25	1.25	1.25
943.1	973.1	1.31	1.29	1.29
983.6	1013.6	1.39	1.37	1.37
1024.2	1054.2	1.48	1.46	1.46
1064.7	1094.7	1.60	1.58	1.58
1085.0	1115.0	1.67	1.64	1.63
1125.6	1155.6	1.80	1.77	1.75
1145.9	1175.9	1.86	1.82	1.80
1186.4	1216.4	1.99	1.93	1.90
1206.7	1236.7	2.05	1.98	1.94
1247.3	1277.3	2.15	2.08	2.03
1267.6	1297.6	2.20	2.12	2.07
1308.1	1338.1	2.31	2.23	2.16
1328.4	1358.4	2.36	2.29	2.21
1369.0	1399.0	2.48	2.42	2.33
1389.3	1419.3	2.53	2.47	2.39
1429.8	1459.8	2.65	2.60	2.52
1450.1	1480.1	2.70	2.65	2.58

LO (MHz)	LO VSWR (:1)		
	@LO (dBm)		
	+4	+7	+10
10.1	1.79	2.75	3.91
50.7	1.92	2.79	4.01
91.2	1.79	2.52	3.53
131.8	1.87	2.72	3.84
172.4	1.80	2.54	3.55
212.9	1.82	2.59	3.62
253.5	1.82	2.59	3.61
294.0	1.79	2.52	3.48
334.6	1.84	2.60	3.61
375.2	1.79	2.50	3.44
415.7	1.83	2.56	3.52
456.3	1.81	2.52	3.45
496.9	1.81	2.50	3.40
537.4	1.84	2.54	3.45
578.0	1.81	2.48	3.34
618.6	1.85	2.52	3.40
659.1	1.85	2.49	3.33
699.7	1.85	2.48	3.31
740.2	1.88	2.49	3.29
780.8	1.88	2.48	3.25
821.4	1.89	2.50	3.27
861.9	1.90	2.48	3.22
902.5	1.92	2.49	3.23
943.1	1.91	2.46	3.17
983.6	1.92	2.44	3.13
1024.2	1.92	2.41	3.07
1064.7	1.93	2.39	3.03
1085.0	1.94	2.41	3.04
1125.6	1.97	2.42	3.03
1145.9	1.98	2.42	3.02
1186.4	2.01	2.45	3.04
1206.7	2.02	2.46	3.04
1247.3	2.01	2.45	3.00
1267.6	2.02	2.45	3.01
1308.1	2.03	2.46	3.00
1328.4	2.02	2.44	2.98
1369.0	2.02	2.44	2.98
1389.3	2.03	2.44	2.98
1429.8	2.02	2.42	2.93
1450.1	2.01	2.41	2.93

IF (OUT) (MHz)	IF VSWR @LO=1000.1MHz (:1)		
	@LO (dBm)		
	+4	+7	+10
10.0	1.62	1.40	1.25
30.2	1.64	1.43	1.31
50.4	1.75	1.55	1.41
70.6	1.83	1.61	1.48
90.8	1.75	1.54	1.42
111.0	1.71	1.51	1.40
131.2	1.80	1.59	1.48
151.4	1.84	1.64	1.53
171.6	1.80	1.60	1.49
191.8	1.80	1.60	1.49
212.0	1.82	1.63	1.54
232.2	1.80	1.63	1.54
252.4	1.83	1.65	1.56
272.7	1.89	1.71	1.62
292.9	1.89	1.71	1.64
313.1	1.86	1.69	1.63
333.3	1.92	1.75	1.69
353.5	2.00	1.84	1.77
373.7	1.99	1.83	1.77
393.9	1.98	1.82	1.76
434.3	2.03	1.89	1.85
454.5	2.00	1.87	1.83
494.9	2.12	1.99	1.95
515.1	2.07	1.95	1.93
555.5	2.11	1.99	1.97
575.7	2.12	2.02	2.00
616.1	2.19	2.07	2.04
636.3	2.18	2.07	2.05
676.7	2.13	2.02	2.00
696.9	2.22	2.10	2.08
737.3	2.15	2.02	1.99
757.6	2.14	2.01	1.97
798.0	2.12	2.00	1.97
818.2	2.17	2.03	1.98
858.6	2.08	1.93	1.88
878.8	2.04	1.89	1.83
919.2	2.12	1.96	1.89
939.4	2.08	1.91	1.82
979.8	2.04	1.85	1.76
1000.0	2.11	2.21	2.37

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	13	25	20	40	36	45	39	38	34	52
1	-	21	+0	27	12	29	20	39	41	38	57	44
2	>100	74	58	74	59	76	57	74	70	>80	>80	68
3	>100	>80	70	>80	76	77	65	>80	>80	78	>80	71
4	>100	>80	>80	>80	>80	78	>80	>80	>80	>80	>80	>80
5	>100	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80
6	>100	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80
7	>100	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80
8	>100	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80
9	>100	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80
10	>100	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80	>80
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 500.1 MHz; -14.00 dBm.
 LO IN: 530.01 MHz; +7.00 dBm
 IF OUT: 29.91 MHz; -19.97 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	22	35	32	52	47	56	51	54	51	69
1	-	21	+0	27	12	30	21	43	42	44	63	51
2	99	68	50	65	50	77	52	69	65	73	73	60
3	>100	59	46	58	48	55	41	57	47	56	63	53
4	>100	>90	79	84	70	89	67	81	63	78	76	>90
5	>100	80	69	76	60	72	58	68	58	71	65	81
6	>100	>90	>90	>90	89	>90	84	>90	84	>90	>90	>90
7	>100	88	>90	>90	80	>90	89	>90	82	86	75	>90
8	>100	>90	>90	>90	>90	>90	>90	>90	>90	>90	>90	>90
9	>100	>90	>90	>90	>90	>90	>90	>90	89	>90	86	>90
10	>100	>90	>90	>90	>90	>90	>90	>90	>90	>90	>90	>90
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 500.1 MHz; -4.00 dBm.
 LO IN: 530.01 MHz; +7.00 dBm
 IF OUT: 29.91 MHz; -10.06 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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