

Frequency Mixer

TUF-R3LHSM+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB)		
		@LO (dBm)		
		+7	+10	+13
10.1	40.1	4.94	4.90	4.74
30.1	60.1	5.22	5.02	4.87
50.1	80.1	5.18	4.97	4.88
70.1	100.1	5.13	4.93	4.86
90.1	120.1	5.11	4.95	4.86
110.1	140.1	5.17	4.99	4.93
130.1	160.1	5.28	5.10	5.01
150.1	180.1	5.34	5.14	5.05
170.1	200.1	5.23	5.10	5.02
190.1	220.1	5.26	5.10	5.02
210.1	240.1	5.42	5.20	5.07
230.1	260.1	5.55	5.29	5.12
250.1	280.1	5.60	5.42	5.27
270.1	300.1	5.64	5.49	5.37
290.1	320.1	5.69	5.52	5.39
310.1	340.1	5.74	5.53	5.41
330.1	360.1	5.88	5.64	5.52
350.1	380.1	6.06	5.73	5.60
370.1	400.1	6.29	5.81	5.60
390.1	420.1	6.62	6.08	5.71
410.1	440.1	6.98	6.51	5.99
430.1	460.1	7.11	6.67	6.16
450.1	480.1	7.08	6.63	6.14
470.1	500.1	7.27	6.80	6.38
490.1	520.1	7.39	6.93	6.57
510.1	540.1	7.40	6.96	6.66
530.1	560.1	7.33	6.95	6.71
550.1	580.1	7.43	7.10	6.87
570.1	600.1	7.52	7.23	7.03
580.1	610.1	7.61	7.33	7.12
600.1	630.1	7.84	7.59	7.41
610.1	640.1	7.78	7.60	7.50
630.1	660.1	8.08	7.94	7.87
640.1	670.1	8.41	8.27	8.20
660.1	690.1	8.76	8.66	8.63
670.1	700.1	8.75	8.69	8.72
690.1	720.1	9.23	9.18	9.22
700.1	730.1	9.63	9.61	9.64
720.1	750.1	10.14	10.14	10.19
730.1	760.1	10.27	10.25	10.29

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)		
		@LO (dBm)		
		+7	+10	+13
10.1	40.1	18.80	20.90	22.91
30.1	60.1	18.72	19.43	21.40
50.1	80.1	21.57	23.32	27.56
70.1	100.1	20.97	21.57	25.38
90.1	120.1	20.64	22.06	22.47
110.1	140.1	19.49	23.39	16.83
130.1	160.1	27.36	18.71	16.43
150.1	180.1	18.35	24.40	17.76
170.1	200.1	18.35	15.45	15.07
190.1	220.1	15.14	12.83	12.74
210.1	240.1	18.63	15.17	15.03
230.1	260.1	19.89	18.08	16.92
250.1	280.1	15.34	14.05	14.72
270.1	300.1	15.08	14.10	13.84
290.1	320.1	15.34	13.96	13.47
310.1	340.1	14.74	12.99	13.94
330.1	360.1	13.46	13.22	15.41
350.1	380.1	12.97	14.01	16.61
370.1	400.1	10.45	14.03	16.82
390.1	420.1	7.11	11.16	16.44
410.1	440.1	5.68	7.77	13.03
430.1	460.1	5.79	7.46	10.58
450.1	480.1	5.99	7.61	9.25
470.1	500.1	6.69	8.21	9.71
490.1	520.1	7.12	8.47	10.22
510.1	540.1	7.74	8.88	11.38
530.1	560.1	8.36	9.98	13.41
550.1	580.1	8.36	11.11	16.04
570.1	600.1	9.02	13.34	17.42
580.1	610.1	9.35	14.13	16.48
600.1	630.1	10.58	16.82	14.63
610.1	640.1	11.34	15.72	14.21
630.1	660.1	12.73	14.73	13.97
640.1	670.1	13.05	14.41	14.29
660.1	690.1	13.46	14.38	14.44
670.1	700.1	12.95	13.63	14.01
690.1	720.1	12.53	12.95	13.43
700.1	730.1	12.77	13.04	13.29
720.1	750.1	12.66	12.50	13.06
730.1	760.1	11.82	11.80	12.40

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+5dBm (dB)		
		@LO (dBm)		
		+7	+10	+13
10.1	40.1	1.69	1.34	1.20
30.1	60.1	1.49	1.11	0.84
50.1	80.1	1.60	1.22	0.93
70.1	100.1	1.57	1.21	0.95
90.1	120.1	1.45	1.13	0.84
110.1	140.1	1.45	1.06	0.82
130.1	160.1	1.33	0.99	0.80
150.1	180.1	1.30	0.98	0.79
170.1	200.1	1.33	1.04	0.78
190.1	220.1	1.28	0.98	0.76
210.1	240.1	1.14	0.87	0.67
230.1	260.1	1.15	0.93	0.70
250.1	280.1	1.26	0.98	0.79
270.1	300.1	1.36	1.05	0.86
290.1	320.1	1.47	1.11	0.93
310.1	340.1	1.65	1.27	1.03
330.1	360.1	1.97	1.42	1.13
350.1	380.1	2.17	1.58	1.22
370.1	400.1	2.27	1.82	1.44
390.1	420.1	2.23	1.92	1.52
410.1	440.1	2.18	1.86	1.62
430.1	460.1	2.20	1.93	1.77
450.1	480.1	2.32	2.11	1.96
470.1	500.1	2.17	1.98	1.85
490.1	520.1	2.07	1.91	1.74
510.1	540.1	2.18	1.95	1.75
530.1	560.1	2.23	1.95	1.75
550.1	580.1	2.22	1.85	1.72
570.1	600.1	2.11	1.71	1.61
580.1	610.1	2.16	1.73	1.63
600.1	630.1	2.09	1.63	1.49
610.1	640.1	2.10	1.59	1.42
630.1	660.1	1.89	1.39	1.18
640.1	670.1	1.76	1.24	1.02
660.1	690.1	1.58	1.04	0.84
670.1	700.1	1.63	1.05	0.79
690.1	720.1	1.53	0.93	0.67
700.1	730.1	1.39	0.78	0.59
720.1	750.1	1.25	0.70	0.53
730.1	760.1	1.34	0.77	0.62

Frequency Mixer

TUF-R3LHSM+

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=210.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=10MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=410.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+10			+10			+10
200.1	10.0	5.35	10.1	20.1	4.91	400.1	10.0	6.50
195.2	14.9	5.35	29.8	39.8	4.65	390.1	20.0	6.37
190.4	19.7	5.22	49.6	59.6	4.59	380.1	30.0	6.28
185.5	24.6	5.24	69.3	79.3	4.73	370.1	40.0	6.20
180.6	29.5	5.17	89.1	99.1	4.75	360.1	50.0	6.18
175.7	34.4	5.11	108.8	118.8	4.78	350.1	60.0	6.15
170.9	39.2	5.12	128.6	138.6	4.92	340.1	70.0	6.14
166.0	44.1	5.09	148.3	158.3	4.97	330.1	80.0	6.08
161.1	49.0	5.10	168.0	178.0	4.99	320.1	90.0	6.06
156.3	53.8	5.14	187.8	197.8	4.97	310.1	100.0	6.10
151.4	58.7	5.09	207.5	217.5	4.95	300.1	110.0	6.09
146.5	63.6	5.11	227.3	237.3	5.00	290.1	120.0	6.03
141.6	68.5	5.12	247.0	257.0	5.04	280.1	130.0	6.04
136.8	73.3	5.09	266.8	276.8	5.20	270.1	140.0	6.07
131.9	78.2	5.06	286.5	296.5	5.53	260.1	150.0	6.02
127.0	83.1	5.09	306.3	316.3	5.52	250.1	160.0	6.05
122.2	87.9	5.06	326.0	336.0	5.47	240.1	170.0	6.11
117.3	92.8	5.06	345.7	355.7	5.28	230.1	180.0	6.06
112.4	97.7	5.13	365.5	375.5	5.29	220.1	190.0	6.06
107.5	102.6	5.07	385.2	395.2	5.20	210.1	200.0	6.14
102.7	107.4	5.08	405.0	415.0	5.23	200.1	210.0	6.21
97.8	112.3	5.12	424.7	434.7	5.34	190.1	220.0	6.14
92.9	117.2	5.05	444.5	454.5	5.34	180.1	230.0	6.14
88.0	122.1	5.06	464.2	474.2	5.39	170.1	240.0	6.20
83.2	126.9	5.09	483.9	493.9	5.44	160.1	250.0	6.20
78.3	131.8	5.04	503.7	513.7	5.49	150.1	260.0	6.16
73.4	136.7	5.10	523.4	533.4	5.45	140.1	270.0	6.18
68.6	141.5	5.14	543.2	553.2	5.34	130.1	280.0	6.18
63.7	146.4	5.11	562.9	572.9	5.39	120.1	290.0	6.11
58.8	151.3	5.13	582.7	592.7	5.82	110.1	300.0	6.13
53.9	156.2	5.13	602.4	612.4	5.66	100.1	310.0	6.17
49.1	161.0	5.08	622.2	632.2	6.16	90.1	320.0	6.14
44.2	165.9	5.11	641.9	651.9	6.18	80.1	330.0	6.09
39.3	170.8	5.10	661.6	671.6	6.61	70.1	340.0	6.11
34.5	175.6	5.07	681.4	691.4	6.82	60.1	350.0	6.04
29.6	180.5	5.13	701.1	711.1	7.30	50.1	360.0	5.93
24.7	185.4	5.13	720.9	730.9	7.84	40.1	370.0	5.90
19.8	190.3	5.14	740.6	750.6	8.75	30.1	380.0	5.91
15.0	195.1	5.25	760.4	770.4	9.51	20.1	390.0	5.93
10.1	200.0	5.34	780.1	790.1	10.41	10.1	400.0	6.17

Frequency Mixer

TUF-R3LHSM+

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+7	+10	+13	+7	+10	+13
40.1	50.77	49.37	48.06	54.88	51.73	49.96
60.1	49.82	48.71	47.50	53.13	51.20	50.11
80.1	48.40	47.34	46.20	50.02	49.27	48.59
100.1	47.28	46.11	45.11	48.08	48.00	47.73
120.1	45.81	44.51	43.52	47.12	47.17	46.61
140.1	44.29	42.82	42.01	45.06	45.45	45.22
160.1	43.86	42.57	41.58	45.23	45.30	44.63
180.1	42.79	41.54	40.71	44.21	44.74	44.05
200.1	41.41	40.25	39.35	43.99	44.18	43.07
220.1	40.37	39.30	38.70	43.91	44.04	43.25
240.1	40.15	38.88	38.09	43.37	42.55	41.22
260.1	40.52	38.92	37.82	42.13	40.71	39.35
280.1	40.19	38.56	37.32	40.54	39.38	37.72
300.1	40.86	39.22	38.07	40.05	38.60	37.17
320.1	39.92	38.36	37.07	38.72	37.03	35.42
340.1	40.46	39.22	38.22	39.11	35.89	33.33
360.1	39.57	38.70	37.88	37.57	33.67	31.38
380.1	39.75	39.45	39.00	37.09	31.95	29.47
400.1	39.52	38.60	37.87	35.01	30.42	28.11
420.1	40.67	39.74	39.27	34.10	29.53	26.78
440.1	40.85	39.81	38.28	32.74	29.44	26.23
460.1	40.93	40.30	38.97	32.32	29.31	26.05
480.1	40.60	40.17	38.06	30.90	28.30	25.11
500.1	39.95	39.93	37.75	30.59	27.62	24.21
520.1	39.57	39.08	36.34	29.60	26.31	22.61
540.1	38.21	37.50	34.37	28.96	25.07	21.03
560.1	37.28	36.04	32.50	27.52	22.86	19.03
580.1	35.19	32.94	29.86	25.59	20.87	17.58
600.1	34.32	31.63	28.56	23.96	19.55	16.56
610.1	33.22	30.65	27.72	23.06	19.01	16.12
630.1	31.49	29.07	26.40	21.79	18.28	15.61
640.1	30.47	28.26	25.88	21.10	17.73	15.35
660.1	28.55	26.67	24.49	19.77	17.07	14.70
670.1	27.77	25.88	23.81	19.22	16.60	14.39
690.1	26.18	24.71	22.82	18.12	15.89	13.73
700.1	25.13	23.78	22.15	17.56	15.47	13.62
720.1	23.74	22.98	21.45	16.54	15.08	13.22
730.1	23.01	22.34	20.84	16.12	14.79	12.99
750.1	22.04	21.33	19.97	15.47	14.17	12.53
760.1	21.59	20.91	19.63	15.25	14.01	12.41

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+7	+10	+13
10.1	40.1	38.60	37.72	37.34
30.1	60.1	31.98	32.07	32.25
50.1	80.1	28.59	28.17	28.41
70.1	100.1	26.17	26.10	26.64
90.1	120.1	24.66	24.67	25.12
110.1	140.1	23.68	23.92	23.93
130.1	160.1	23.02	23.24	23.39
150.1	180.1	22.60	23.15	23.36
170.1	200.1	22.45	22.97	23.55
190.1	220.1	22.15	22.60	22.91
210.1	240.1	22.26	22.63	23.30
230.1	260.1	22.32	22.96	23.48
250.1	280.1	23.15	23.61	24.17
270.1	300.1	23.45	24.05	24.57
290.1	320.1	22.22	22.89	23.29
310.1	340.1	20.85	21.12	21.59
330.1	360.1	18.94	19.21	19.49
350.1	380.1	17.82	18.33	18.49
370.1	400.1	17.04	17.23	17.52
390.1	420.1	16.40	16.72	17.20
410.1	440.1	16.02	16.36	16.87
430.1	460.1	15.74	16.12	16.77
450.1	480.1	15.71	16.11	17.02
470.1	500.1	15.69	15.93	16.49
490.1	520.1	15.61	15.91	16.24
510.1	540.1	15.48	15.78	15.86
530.1	560.1	15.11	15.13	15.28
550.1	580.1	14.69	14.62	14.42
570.1	600.1	13.96	13.60	13.29
580.1	610.1	13.45	13.22	12.76
600.1	630.1	12.47	12.08	11.67
610.1	640.1	12.02	11.63	11.17
630.1	660.1	11.15	10.73	10.27
640.1	670.1	10.58	10.08	9.61
660.1	690.1	9.86	9.46	8.99
670.1	700.1	9.51	9.06	8.62
690.1	720.1	8.62	8.33	7.96
700.1	730.1	8.27	8.01	7.83
720.1	750.1	7.55	7.42	7.23
730.1	760.1	7.32	7.26	7.07

Frequency Mixer

TUF-R3LHSM+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=400MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+7	+10	+13		+7	+10	+13		+7	+10	+13
10.1	40.1	1.44	1.31	1.14	40.1	1.96	4.34	14.50	10.0	2.15	1.74	1.52
30.1	60.1	1.36	1.24	1.18	60.1	1.62	2.69	4.44	19.7	2.17	1.74	1.51
50.1	80.1	1.35	1.23	1.14	80.1	1.54	2.46	3.88	29.5	2.14	1.71	1.48
70.1	100.1	1.34	1.21	1.14	100.1	1.49	2.26	3.29	39.2	2.20	1.77	1.54
90.1	120.1	1.29	1.18	1.11	120.1	1.54	2.41	3.58	49.0	2.18	1.76	1.53
110.1	140.1	1.28	1.17	1.11	140.1	1.55	2.35	3.37	58.7	2.16	1.74	1.51
130.1	160.1	1.24	1.15	1.10	160.1	1.53	2.28	3.26	68.5	2.21	1.79	1.57
150.1	180.1	1.23	1.12	1.07	180.1	1.50	2.18	3.02	78.2	2.20	1.78	1.57
170.1	200.1	1.20	1.12	1.08	200.1	1.54	2.25	3.14	87.9	2.18	1.77	1.55
190.1	220.1	1.19	1.13	1.10	220.1	1.58	2.29	3.15	97.7	2.22	1.81	1.60
210.1	240.1	1.16	1.11	1.10	240.1	1.61	2.30	3.16	107.4	2.20	1.81	1.59
230.1	260.1	1.15	1.09	1.11	260.1	1.61	2.26	3.04	117.2	2.20	1.79	1.58
250.1	280.1	1.12	1.10	1.12	280.1	1.62	2.29	3.09	126.9	2.26	1.87	1.66
270.1	300.1	1.10	1.12	1.15	300.1	1.65	2.33	3.13	136.7	2.27	1.87	1.66
290.1	320.1	1.13	1.17	1.22	320.1	1.70	2.37	3.17	146.4	2.23	1.85	1.65
310.1	340.1	1.17	1.23	1.29	340.1	1.71	2.33	3.09	156.2	2.26	1.89	1.70
330.1	360.1	1.20	1.27	1.30	360.1	1.74	2.33	3.08	165.9	2.25	1.88	1.69
350.1	380.1	1.21	1.26	1.29	380.1	1.80	2.39	3.11	175.6	2.23	1.87	1.68
370.1	400.1	1.19	1.23	1.25	400.1	1.89	2.50	3.21	185.4	2.25	1.92	1.74
390.1	420.1	1.19	1.18	1.20	420.1	1.93	2.56	3.26	195.1	2.24	1.90	1.72
410.1	440.1	1.21	1.16	1.15	440.1	1.95	2.59	3.30	204.9	2.24	1.89	1.72
430.1	460.1	1.20	1.12	1.08	460.1	1.97	2.62	3.33	214.6	2.31	1.98	1.81
450.1	480.1	1.19	1.10	1.04	480.1	2.02	2.68	3.40	224.4	2.29	1.98	1.82
470.1	500.1	1.20	1.10	1.05	500.1	2.06	2.72	3.43	234.1	2.25	1.94	1.80
490.1	520.1	1.20	1.13	1.12	520.1	2.07	2.72	3.41	243.8	2.28	1.98	1.83
510.1	540.1	1.27	1.23	1.24	540.1	2.08	2.71	3.37	253.6	2.25	1.97	1.83
530.1	560.1	1.32	1.32	1.34	560.1	2.11	2.72	3.35	263.3	2.19	1.93	1.80
550.1	580.1	1.42	1.43	1.45	580.1	2.15	2.74	3.35	273.1	2.22	1.95	1.83
570.1	600.1	1.53	1.55	1.57	600.1	2.18	2.74	3.33	282.8	2.20	1.93	1.81
580.1	610.1	1.60	1.62	1.64	610.1	2.18	2.73	3.30	292.6	2.16	1.91	1.79
600.1	630.1	1.73	1.75	1.78	630.1	2.19	2.72	3.27	302.3	2.22	1.97	1.86
610.1	640.1	1.74	1.77	1.81	640.1	2.21	2.72	3.26	312.1	2.19	1.95	1.85
630.1	660.1	1.83	1.86	1.90	660.1	2.26	2.75	3.27	321.8	2.14	1.91	1.81
640.1	670.1	1.92	1.95	1.98	670.1	2.29	2.77	3.29	331.5	2.19	1.97	1.86
660.1	690.1	2.02	2.04	2.07	690.1	2.35	2.80	3.27	341.3	2.11	1.91	1.83
670.1	700.1	2.00	2.04	2.07	700.1	2.37	2.81	3.27	351.0	2.07	1.84	1.75
690.1	720.1	2.07	2.10	2.12	720.1	2.43	2.83	3.27	360.8	2.13	1.89	1.80
700.1	730.1	2.12	2.15	2.17	730.1	2.46	2.85	3.27	370.5	2.04	1.83	1.75
720.1	750.1	2.12	2.15	2.16	750.1	2.53	2.89	3.29	380.3	2.01	1.78	1.69
730.1	760.1	2.10	2.12	2.13	760.1	2.56	2.93	3.31	390.0	2.11	1.87	1.77

Frequency Mixer

TUF-R3LHSM+

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	40	42	41	50	47	72	52	66	66	68
1	-	32	+0	42	34	65	47	66	68	74	80	79
2	85	77	61	61	67	79	74	93	96	>97	91	>97
3	>90	85	73	72	62	81	76	88	95	>97	95	>97
4	>90	>97	>97	>97	84	86	>97	>97	>97	>97	>97	>97
5	>90	>97	>97	>97	91	84	88	>97	>97	>97	>97	>97
6	>90	>97	>97	>97	>97	>97	86	>97	>97	>97	>97	>97
7	>90	>97	>97	>97	>97	>97	>97	77	95	>97	>97	>97
8	>90	>97	>97	>97	>97	>97	>97	92	71	>97	>97	>97
9	>90	>97	>97	>97	>97	>97	>97	>97	94	77	95	>97
10	>90	>97	>97	>97	>97	>97	>97	>97	>97	95	91	>97
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 200 MHz; -10.00 dBm.
 LO IN: 230 MHz; +10.00 dBm
 IF OUT: 30 MHz; 6.87 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	48	52	53	62	58	80	66	82	75	84
1	-	33	+0	44	35	70	49	72	67	80	83	90
2	65	67	57	53	64	71	74	78	92	102	88	102
3	>90	70	55	57	46	64	58	74	72	79	86	88
4	>90	90	84	84	66	69	74	82	79	97	>107	>107
5	>90	101	82	87	72	69	62	80	75	84	87	96
6	>90	105	98	94	93	92	73	82	87	87	93	104
7	>90	>107	99	102	89	96	86	77	79	94	81	104
8	>90	>107	>107	>107	106	102	102	98	78	101	103	101
9	>90	>107	>107	>107	>107	>107	97	98	98	65	99	98
10	>90	>107	>107	>107	>107	>107	>107	101	>107	98	97	104
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 200 MHz; 0.00 dBm.
 LO IN: 230 MHz; +10.00 dBm
 IF OUT: 30 MHz; 16.95 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.

