

# Frequency Mixer

# SAM-1+

## 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
1.0	31.0	7.31	7.00	6.81	10.0	40.0	20.64	26.26	22.48	10.0	40.0	0.84	0.60	0.43
5.0	35.0	6.05	5.81	5.66	50.3	80.3	17.89	22.75	24.44	50.3	80.3	1.17	0.81	0.67
10.0	40.0	5.70	5.42	5.30	90.6	120.6	25.93	22.16	26.15	90.6	120.6	0.96	0.75	0.55
50.3	80.3	6.12	5.85	5.70	130.9	160.9	24.28	21.58	22.31	130.9	160.9	1.00	0.73	0.55
90.6	120.6	6.14	5.89	5.70	171.2	201.2	22.43	22.49	23.86	171.2	201.2	0.89	0.70	0.52
130.9	160.9	6.12	5.90	5.77	211.5	241.5	20.75	23.21	25.82	211.5	241.5	0.83	0.60	0.47
171.2	201.2	6.19	5.89	5.78	251.8	281.8	25.88	22.31	20.81	251.8	281.8	0.89	0.64	0.49
211.5	241.5	6.16	5.93	5.81	292.0	322.0	20.48	22.71	21.40	292.0	322.0	0.86	0.64	0.52
251.8	281.8	6.24	6.01	5.86	332.3	362.3	19.10	20.88	25.72	332.3	362.3	0.81	0.59	0.45
292.0	322.0	6.25	6.02	5.89	372.6	402.6	20.33	21.30	24.03	372.6	402.6	0.86	0.59	0.48
332.3	362.3	6.38	6.16	6.03	412.9	442.9	23.69	23.00	21.64	412.9	442.9	0.96	0.74	0.58
372.6	402.6	6.45	6.21	6.07	453.2	483.2	16.98	21.01	20.96	453.2	483.2	1.07	0.84	0.65
412.9	442.9	6.52	6.20	6.10	493.5	523.5	16.86	16.27	19.70	493.5	523.5	1.21	0.95	0.74
453.2	483.2	6.66	6.40	6.21	533.8	563.8	15.70	15.04	19.63	533.8	563.8	1.51	1.13	0.91
493.5	523.5	6.77	6.54	6.37	574.1	604.1	19.06	23.22	24.77	574.1	604.1	1.71	1.32	1.12
533.8	563.8	6.97	6.72	6.57	614.4	644.4	16.75	20.57	25.72	614.4	644.4	1.88	1.52	1.32
574.1	604.1	7.05	6.73	6.55	654.7	684.7	15.18	22.24	22.82	654.7	684.7	1.97	1.72	1.50
614.4	644.4	7.19	6.78	6.56	695.0	725.0	13.36	17.83	24.92	695.0	725.0	2.00	1.80	1.54
654.7	684.7	7.52	6.94	6.65	735.3	765.3	12.37	16.36	20.39	735.3	765.3	1.77	1.68	1.55
695.0	725.0	7.80	7.14	6.66	775.6	805.6	12.57	15.66	19.35	775.6	805.6	1.65	1.62	1.53
735.3	765.3	8.19	7.42	6.87	815.9	845.9	13.04	15.00	18.92	815.9	845.9	1.43	1.37	1.34
815.9	845.9	8.68	7.99	7.34	856.1	886.1	13.99	13.82	16.40	856.1	886.1	1.33	1.24	1.17
856.1	886.1	8.88	8.25	7.67	896.4	926.4	13.20	15.07	18.93	896.4	926.4	1.36	1.24	1.13
896.4	926.4	8.87	8.31	7.73	916.6	946.6	13.23	15.71	19.04	916.6	946.6	1.35	1.24	1.14
916.6	946.6	8.98	8.40	7.82	956.9	986.9	16.02	16.99	17.42	956.9	986.9	1.50	1.31	1.18
956.9	986.9	8.94	8.30	7.72	977.0	1007.0	16.64	20.92	20.28	977.0	1007.0	1.51	1.37	1.21
1017.3	1047.3	8.88	8.32	7.91	1017.3	1047.3	18.08	22.68	21.79	1017.3	1047.3	1.52	1.30	1.13
1037.5	1067.5	8.87	8.42	8.03	1037.5	1067.5	18.99	18.50	17.66	1037.5	1067.5	1.43	1.19	1.14
1077.8	1107.8	9.12	8.79	8.47	1077.8	1107.8	23.85	18.88	21.69	1077.8	1107.8	1.10	0.92	0.89
1097.9	1127.9	9.24	8.92	8.68	1097.9	1127.9	20.02	24.42	21.11	1097.9	1127.9	0.99	0.71	0.75
1138.2	1168.2	9.45	9.17	8.98	1138.2	1168.2	19.07	21.31	18.32	1138.2	1168.2	0.85	0.57	0.44
1158.3	1188.3	9.49	9.25	9.09	1158.3	1188.3	23.29	24.37	24.45	1158.3	1188.3	0.85	0.52	0.38
1198.6	1228.6	9.67	9.42	9.28	1198.6	1228.6	19.11	20.44	20.44	1198.6	1228.6	0.80	0.48	0.39
1218.8	1248.8	9.79	9.49	9.29	1218.8	1248.8	21.72	21.16	23.77	1218.8	1248.8	0.71	0.46	0.33
1259.1	1289.1	10.10	9.78	9.62	1259.1	1289.1	18.80	21.38	21.05	1259.1	1289.1	0.77	0.44	0.30
1279.2	1309.2	10.32	9.97	9.79	1279.2	1309.2	23.84	19.82	21.38	1279.2	1309.2	0.75	0.40	0.29
1319.5	1349.5	10.50	10.22	10.06	1319.5	1349.5	19.30	17.84	19.08	1319.5	1349.5	0.69	0.39	0.20
1339.7	1369.7	10.81	10.44	10.21	1339.7	1369.7	19.88	18.66	18.19	1339.7	1369.7	0.77	0.42	0.21
1380.0	1410.0	11.17	10.73	10.52	1380.0	1410.0	17.55	17.76	22.35	1380.0	1410.0	0.75	0.43	0.26
1400.1	1430.1	11.33	10.88	10.63	1400.1	1430.1	15.76	23.56	20.53	1400.1	1430.1	0.71	0.44	0.32



# Frequency Mixer

# SAM-1+

## Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=300.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=10.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=600.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+7			+7			+7
290.0	10.1	6.09	10.0	20.1	5.47	590.0	10.1	6.82
282.8	17.3	6.09	24.9	35.0	5.41	575.1	25.0	6.69
275.6	24.5	6.04	39.7	49.8	5.43	560.3	39.8	6.67
268.5	31.6	6.04	54.6	64.7	5.50	545.4	54.7	6.61
261.3	38.8	5.97	69.5	79.6	5.51	530.5	69.6	6.59
254.1	46.0	5.98	84.4	94.5	5.53	515.6	84.5	6.55
246.9	53.2	5.99	99.2	109.3	5.49	500.8	99.3	6.49
239.7	60.4	5.95	114.1	124.2	5.51	485.9	114.2	6.51
232.6	67.5	5.92	129.0	139.1	5.51	471.0	129.1	6.48
225.4	74.7	5.91	143.8	153.9	5.55	456.2	143.9	6.54
218.2	81.9	5.92	158.7	168.8	5.61	441.3	158.8	6.54
211.0	89.1	5.91	173.6	183.7	5.60	426.4	173.7	6.54
203.8	96.3	5.93	188.5	198.6	5.62	411.5	188.6	6.51
196.7	103.4	5.91	203.3	213.4	5.59	396.7	203.4	6.50
189.5	110.6	5.91	218.2	228.3	5.60	381.8	218.3	6.54
182.3	117.8	5.88	233.1	243.2	5.62	366.9	233.2	6.52
175.1	125.0	5.89	247.9	258.0	5.66	352.1	248.0	6.54
167.9	132.2	5.91	262.8	272.9	5.70	337.2	262.9	6.55
160.8	139.3	5.89	277.7	287.8	5.70	322.3	277.8	6.60
153.6	146.5	5.87	292.6	302.7	5.72	307.4	292.7	6.57
146.4	153.7	5.89	307.4	317.5	5.68	292.6	307.5	6.60
139.2	160.9	5.93	322.3	332.4	5.73	277.7	322.4	6.60
132.1	168.0	5.95	337.2	347.3	5.73	262.8	337.3	6.60
124.9	175.2	5.93	352.1	362.2	5.74	247.9	352.2	6.66
117.7	182.4	5.92	366.9	377.0	5.84	233.1	367.0	6.63
110.5	189.6	5.94	381.8	391.9	5.82	218.2	381.9	6.68
103.3	196.8	5.94	396.7	406.8	5.84	203.3	396.8	6.65
96.2	203.9	5.96	411.5	421.6	5.78	188.5	411.6	6.66
89.0	211.1	5.94	426.4	436.5	5.90	173.6	426.5	6.66
81.8	218.3	5.94	441.3	451.4	5.97	158.7	441.4	6.69
74.6	225.5	5.95	456.2	466.3	6.05	143.8	456.3	6.77
67.4	232.7	5.95	471.0	481.1	6.08	129.0	471.1	6.78
60.3	239.8	5.96	485.9	496.0	6.11	114.1	486.0	6.83
53.1	247.0	5.95	500.8	510.9	6.15	99.2	500.9	6.83
45.9	254.2	5.96	515.6	525.7	6.11	84.4	515.7	6.87
38.7	261.4	5.97	530.5	540.6	6.16	69.5	530.6	6.89
31.5	268.6	6.01	545.4	555.5	6.09	54.6	545.5	6.90
24.4	275.7	6.01	560.3	570.4	6.11	39.7	560.4	6.91
17.2	282.9	6.03	575.1	585.2	6.00	24.9	575.2	6.84
10.0	290.1	6.01	590.0	600.1	5.90	10.0	590.1	6.94

## Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+4	+7	+10	+4	+7	+10
1.0	64.00	67.00	70.00	64.00	67.00	67.13
5.0	64.00	67.00	70.00	64.00	67.00	66.56
10.0	73.48	73.31	74.37	72.42	58.67	65.36
50.3	59.60	60.66	61.05	57.68	57.47	56.54
90.6	54.07	55.02	56.11	54.15	53.27	53.01
130.9	50.95	52.27	53.27	50.61	50.55	50.62
171.2	48.52	49.77	50.76	48.24	48.58	48.68
211.5	47.16	48.25	49.12	46.99	47.12	47.27
251.8	45.46	46.60	47.51	46.07	46.46	46.17
292.0	44.30	45.45	46.40	44.85	45.07	44.83
332.3	43.41	44.50	45.58	43.89	43.66	43.22
372.6	42.37	43.74	44.96	42.53	42.41	42.05
412.9	41.79	42.89	43.90	40.86	40.77	40.43
453.2	40.96	42.52	43.64	40.01	39.43	38.72
493.5	40.10	41.84	43.33	39.09	38.25	37.56
533.8	39.68	41.22	42.73	38.18	37.38	36.75
574.1	39.15	40.65	42.30	37.40	36.25	35.39
614.4	38.98	40.70	42.30	35.42	33.94	33.16
654.7	38.32	39.91	41.08	34.28	32.86	31.89
695.0	37.30	38.80	39.82	33.45	32.01	30.85
735.3	35.72	37.37	38.46	32.46	31.34	29.90
815.9	34.39	35.87	37.32	30.22	29.83	29.13
856.1	33.76	35.10	36.59	29.01	28.56	28.18
896.4	33.54	34.63	35.89	28.11	27.43	26.94
916.6	32.92	33.73	34.62	27.63	26.98	26.32
956.9	32.54	32.95	33.55	26.92	26.03	25.07
1017.3	32.04	32.09	32.55	25.31	23.96	22.72
1037.5	32.10	32.02	32.38	24.74	23.44	22.31
1077.8	32.75	32.30	32.55	23.92	22.75	21.67
1097.9	33.32	32.35	32.42	23.42	22.26	21.30
1138.2	34.29	32.90	32.54	22.82	21.69	20.71
1158.3	34.39	33.06	32.85	22.55	21.43	20.53
1198.6	34.26	32.97	32.59	22.03	21.00	20.04
1218.8	33.96	32.77	32.35	21.75	20.86	19.96
1259.1	33.56	32.37	32.01	21.45	20.56	19.67
1279.2	33.39	32.14	31.76	21.28	20.45	19.56
1319.5	33.34	31.85	31.46	20.95	20.17	19.35
1339.7	32.46	31.43	30.99	20.95	20.08	19.19
1380.0	32.74	31.47	30.96	20.65	19.98	19.19
1400.1	32.25	31.34	30.60	20.46	19.91	19.05

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+4	+7	+10
10.0	40.0	49.47	45.95	44.25
50.3	80.3	39.14	39.06	40.42
90.6	120.6	34.70	34.94	35.30
130.9	160.9	32.17	32.56	32.57
171.2	201.2	30.58	30.98	31.22
211.5	241.5	29.61	30.02	30.15
251.8	281.8	29.09	29.65	29.95
292.0	322.0	29.03	29.70	30.18
332.3	362.3	28.68	29.21	29.59
372.6	402.6	28.55	29.00	29.20
412.9	442.9	28.49	29.29	29.78
453.2	483.2	28.61	29.51	30.11
493.5	523.5	27.92	28.54	29.08
533.8	563.8	26.21	26.46	26.83
574.1	604.1	24.36	24.33	24.50
614.4	644.4	22.84	22.59	22.62
654.7	684.7	21.96	21.62	21.48
695.0	725.0	21.68	21.41	21.11
735.3	765.3	21.61	21.43	20.92
775.6	805.6	21.74	21.53	21.01
815.9	845.9	22.10	21.73	21.10
856.1	886.1	22.55	21.99	21.31
896.4	926.4	22.52	21.81	21.08
916.6	946.6	22.21	21.52	20.75
956.9	986.9	21.17	20.23	19.34
977.0	1007.0	20.44	19.39	18.61
1017.3	1047.3	18.76	17.76	17.28
1037.5	1067.5	17.76	16.96	16.64
1077.8	1107.8	16.32	15.73	15.63
1097.9	1127.9	15.76	15.23	15.15
1138.2	1168.2	14.64	14.22	14.19
1158.3	1188.3	14.21	13.78	13.74
1198.6	1228.6	13.43	12.94	12.89
1218.8	1248.8	12.93	12.50	12.47
1259.1	1289.1	12.30	11.83	11.81
1279.2	1309.2	12.02	11.51	11.50
1319.5	1349.5	11.33	10.90	10.87
1339.7	1369.7	10.99	10.53	10.53
1380.0	1410.0	10.42	10.08	10.09
1400.1	1430.1	10.12	9.82	9.84

# Frequency Mixer

# SAM-1+

## Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=600.5MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+4	+7	+10		+4	+7	+10		+4	+7	+10
1.0	31.0	1.24	1.34	1.30	1.0	1.91	2.92	4.23	5.0	1.37	1.22	1.13
5.0	35.0	1.11	1.23	1.19	5.0	1.85	2.84	4.07	10.0	1.37	1.22	1.13
50.3	80.3	1.02	1.08	1.13	50.3	1.91	2.77	3.86	25.1	1.96	1.71	1.52
90.6	120.6	1.04	1.12	1.18	90.6	1.79	2.52	3.52	40.3	1.84	1.61	1.44
130.9	160.9	1.08	1.15	1.21	130.9	1.85	2.65	3.64	55.4	1.77	1.54	1.38
171.2	201.2	1.11	1.19	1.24	171.2	1.79	2.51	3.39	70.5	1.80	1.58	1.41
211.5	241.5	1.15	1.22	1.27	211.5	1.82	2.55	3.43	85.6	1.84	1.62	1.45
251.8	281.8	1.17	1.24	1.30	251.8	1.84	2.56	3.43	100.8	1.89	1.66	1.49
292.0	322.0	1.19	1.26	1.32	292.0	1.83	2.51	3.33	115.9	1.92	1.68	1.52
332.3	362.3	1.20	1.26	1.31	332.3	1.90	2.59	3.40	131.0	1.92	1.68	1.52
372.6	402.6	1.24	1.30	1.35	372.6	1.89	2.57	3.37	146.2	1.89	1.66	1.50
412.9	442.9	1.29	1.37	1.44	412.9	1.94	2.59	3.34	161.3	1.87	1.65	1.49
453.2	483.2	1.30	1.38	1.43	453.2	1.96	2.59	3.31	176.4	1.88	1.66	1.50
493.5	523.5	1.30	1.36	1.40	493.5	1.99	2.62	3.33	191.5	1.93	1.71	1.55
533.8	563.8	1.28	1.32	1.35	533.8	2.03	2.65	3.35	206.7	1.98	1.76	1.60
574.1	604.1	1.22	1.26	1.29	574.1	2.03	2.61	3.27	221.8	1.98	1.76	1.60
614.4	644.4	1.20	1.22	1.25	614.4	2.09	2.66	3.32	236.9	1.94	1.72	1.57
654.7	684.7	1.28	1.27	1.28	654.7	2.13	2.69	3.31	252.1	1.93	1.72	1.57
695.0	725.0	1.44	1.40	1.39	695.0	2.21	2.76	3.38	267.2	1.97	1.76	1.61
735.3	765.3	1.66	1.58	1.53	735.3	2.27	2.83	3.43	282.3	2.00	1.79	1.64
775.6	805.6	1.87	1.76	1.68	775.6	2.29	2.84	3.42	297.4	2.01	1.81	1.66
815.9	845.9	2.08	1.95	1.84	815.9	2.35	2.90	3.48	312.6	2.02	1.81	1.66
856.1	886.1	2.25	2.12	2.00	856.1	2.36	2.89	3.46	327.7	2.03	1.82	1.68
896.4	926.4	2.33	2.20	2.06	896.4	2.39	2.92	3.48	342.8	2.04	1.84	1.70
916.6	946.6	2.36	2.22	2.08	916.6	2.41	2.92	3.48	357.9	2.04	1.84	1.70
956.9	986.9	2.33	2.20	2.07	956.9	2.41	2.90	3.45	373.1	2.03	1.84	1.70
977.0	1007.0	2.31	2.19	2.08	977.0	2.41	2.89	3.43	388.2	2.03	1.84	1.70
1017.3	1047.3	2.26	2.17	2.07	1017.3	2.46	2.95	3.49	403.3	2.04	1.85	1.71
1037.5	1067.5	2.23	2.15	2.07	1037.5	2.43	2.90	3.43	418.5	2.05	1.86	1.73
1077.8	1107.8	2.19	2.14	2.07	1077.8	2.45	2.91	3.43	433.6	2.07	1.87	1.74
1097.9	1127.9	2.15	2.14	2.08	1097.9	2.48	2.93	3.45	448.7	2.07	1.88	1.75
1138.2	1168.2	2.11	2.13	2.10	1138.2	2.59	3.02	3.54	463.8	2.07	1.88	1.75
1158.3	1188.3	2.10	2.13	2.12	1158.3	2.65	3.07	3.57	479.0	2.07	1.88	1.76
1198.6	1228.6	2.13	2.17	2.17	1198.6	2.73	3.11	3.57	494.1	2.06	1.88	1.75
1218.8	1248.8	2.16	2.21	2.22	1218.8	2.79	3.16	3.61	509.2	2.05	1.86	1.74
1259.1	1289.1	2.24	2.29	2.31	1259.1	2.92	3.25	3.67	524.4	2.05	1.86	1.74
1279.2	1309.2	2.29	2.33	2.35	1279.2	2.96	3.26	3.67	539.5	2.07	1.88	1.76
1319.5	1349.5	2.39	2.43	2.46	1319.5	3.10	3.35	3.73	554.6	2.10	1.91	1.78
1339.7	1369.7	2.45	2.48	2.51	1339.7	3.19	3.45	3.81	569.7	2.12	1.92	1.80
1380.0	1410.0	2.57	2.58	2.62	1380.0	3.27	3.47	3.79	584.9	2.10	1.91	1.78
1400.1	1430.1	2.62	2.65	2.68	1400.1	3.33	3.50	3.81	600.0	1.97	1.81	1.72

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## Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	16	21	25	38	27	43	35	32	36	35
1	-	23	+0	32	12	46	17	35	44	55	41	58
2	>100	67	58	65	58	66	57	69	64	>80	65	67
3	>100	71	64	71	64	78	59	77	64	77	>80	>80
4	>100	>80	>80	>80	>80	>80	>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: 300.1 MHz; -14.00 dBm.  
 LO IN: 330.01 MHz; +7.00 dBm  
 IF OUT: 29.91 MHz; -20.19 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	25	31	37	47	39	55	50	45	49	49
1	-	24	+0	33	12	42	19	40	46	65	40	66
2	92	70	50	61	52	69	53	68	60	77	61	61
3	>100	51	43	53	47	59	41	63	43	56	69	76
4	>100	69	71	68	70	70	70	72	66	87	75	>90
5	>100	74	70	81	56	74	55	78	55	70	60	86
6	>100	>90	88	84	87	85	86	85	85	84	>90	>90
7	>100	>90	86	88	85	>90	78	87	77	88	68	84
8	>100	>90	>90	>90	>90	>90	>90	89	82	89	>90	>90
9	>100	>90	>90	>90	89	>90	84	>90	85	>90	86	>90
10	>100	>90	>90	>90	>90	>90	>90	>90	>90	>90	84	>90
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

### LO HARMONICS ORDER

Test conditions: RF IN: 300.1 MHz; -4.00 dBm.  
 LO IN: 330.01 MHz; +7.00 dBm  
 IF OUT: 29.91 MHz; -10.13 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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