Non-Catalog Model

Frequency Mixer TUF-5HSM

Level 17 (LO Power +17 dBm)

Important Note

This is a non-catalog model and can be manufactured on specific request.
Pricing and delivery information can be supplied upon request.

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CASE STYLE : NNN150

ELECTRICAL SPECIFICATIONS 50Ω @ +25°C					
Parameter		**Min.**	**Typ.**	**Max.**	**Units**
Frequency	**LO** (fL to fU)	20		1500	MHz
	RF (fL to fU)	20		1500	MHz
	IF	0		1000	MHz
Conversion Loss	**mid band**		7.5	8.5	dB
	Total Range			9.0	dB
LO-RF Isolation	**Low Range**	55	62		dB
	Mid Range	40	50		dB
	Upper Range	25	38		dB
LO-IF Isolation	**Low Range**	25	40		dB
	Mid Range	18	29		dB
	Upper Range	8	20		dB
1 dB Comp. Input Power			+14		dBm

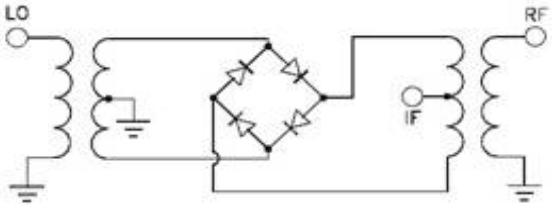
Notes: Low Range = [fL to 10fL] Mid Range = [10fL to fU/2] Upper Range = [fU/2 to fU]
mid band = [2fL to fU/2]

Non-hermetic

MAXIMUM RATINGS	
Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
RF Power	200mW
IF Current	40mA

PIN CONNECTIONS	
LO	4
RF	1
IF	2
GROUND	3

Electrical Schematics



Frequency Mixer TUF-5HSM

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB) @LO (dBm)		
		+14	+17	+20
10.1	40.1	7.63	6.39	6.06
70.7	100.7	7.06	6.20	5.72
131.3	161.3	6.97	6.03	5.63
191.9	221.9	6.94	6.03	5.71
252.5	282.5	6.88	6.12	5.80
313.1	343.1	6.91	6.20	5.91
373.7	403.7	7.01	6.32	6.06
434.3	464.3	7.09	6.41	6.11
474.7	504.7	7.14	6.48	6.22
535.2	565.2	7.43	6.66	6.37
575.6	605.6	7.73	6.83	6.40
636.2	666.2	8.16	7.28	6.73
676.6	706.6	8.49	7.58	7.06
737.2	767.2	9.19	7.99	7.42
777.6	807.6	9.68	8.18	7.47
838.2	868.2	10.47	8.30	7.26
878.6	908.6	10.76	8.33	7.25
939.2	969.2	10.41	8.66	7.41
979.6	1009.6	9.86	8.64	7.47
1040.2	1070.2	9.28	8.48	7.70
1080.6	1110.6	9.01	8.37	7.73
1141.2	1171.2	8.67	8.19	7.72
1181.6	1211.6	8.50	8.10	7.75
1242.2	1272.2	8.34	7.94	7.66
1282.6	1312.6	8.18	7.79	7.53
1343.2	1373.2	8.07	7.55	7.28
1383.6	1413.6	8.16	7.52	7.20
1444.2	1474.2	8.28	7.45	6.95
1484.6	1514.6	8.32	7.31	6.79
1545.1	1575.1	8.26	6.97	6.67
1585.5	1615.5	8.40	6.95	6.71
1646.1	1676.1	8.02	6.97	6.80
1686.5	1716.5	8.32	7.10	6.90
1747.1	1777.1	8.96	7.38	7.14
1787.5	1817.5	9.58	7.69	7.34
1848.1	1878.1	11.30	8.11	7.57
1888.5	1918.5	13.05	8.56	7.66
1949.1	1979.1	14.44	9.21	7.83
1989.5	2019.5	15.99	9.75	8.05
2050.1	2080.1	16.87	10.23	8.20

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm) @LO (dBm)		
		+14	+17	+20
10.1	40.1	21.78	24.66	26.34
70.7	100.7	23.24	26.78	28.24
131.3	161.3	24.23	28.03	23.23
191.9	221.9	23.72	22.65	22.26
252.5	282.5	24.59	20.37	21.87
313.1	343.1	20.45	20.27	22.39
373.7	403.7	18.81	20.35	22.23
434.3	464.3	18.05	19.62	23.85
474.7	504.7	18.37	19.53	21.65
535.2	565.2	17.16	20.71	22.65
575.6	605.6	16.11	20.28	24.66
636.2	666.2	16.26	17.90	21.84
676.6	706.6	17.09	18.24	20.45
737.2	767.2	18.20	19.74	21.21
777.6	807.6	17.60	19.99	21.98
838.2	868.2	15.89	20.36	25.36
878.6	908.6	15.30	21.28	25.65
939.2	969.2	16.50	20.39	23.38
979.6	1009.6	18.58	20.11	22.21
1040.2	1070.2	20.15	20.64	20.52
1080.6	1110.6	20.56	20.57	19.48
1141.2	1171.2	21.80	20.53	19.16
1181.6	1211.6	23.51	21.28	19.45
1242.2	1272.2	25.15	21.79	21.00
1282.6	1312.6	24.50	21.81	23.69
1343.2	1373.2	23.18	25.22	23.89
1383.6	1413.6	21.98	25.33	22.62
1444.2	1474.2	20.06	22.75	22.07
1484.6	1514.6	19.39	20.26	21.85
1545.1	1575.1	20.08	19.19	24.15
1585.5	1615.5	19.85	20.27	25.41
1646.1	1676.1	17.47	22.63	29.70
1686.5	1716.5	17.34	23.10	29.33
1747.1	1777.1	17.46	23.83	29.73
1787.5	1817.5	18.25	25.00	29.08
1848.1	1878.1	22.78	24.82	32.04
1888.5	1918.5	17.49	24.54	30.89
1949.1	1979.1	14.29	22.79	30.60
1989.5	2019.5	12.17	22.27	26.65
2050.1	2080.1	11.23	23.47	24.46

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+14dBm (dB) @LO (dBm)		
		+14	+17	+20
10.1	40.1	0.50	0.30	0.25
70.7	100.7	0.89	0.42	0.25
131.3	161.3	1.08	0.47	0.27
191.9	221.9	1.13	0.50	0.25
252.5	282.5	1.20	0.52	0.24
313.1	343.1	1.13	0.41	0.22
373.7	403.7	1.21	0.44	0.23
434.3	464.3	1.27	0.52	0.34
474.7	504.7	1.29	0.62	0.39
535.2	565.2	1.27	0.83	0.50
575.6	605.6	1.29	0.91	0.66
636.2	666.2	1.27	0.77	0.68
676.6	706.6	1.10	0.64	0.54
737.2	767.2	0.74	0.54	0.41
777.6	807.6	0.29	0.43	0.43
838.2	868.2	-0.39	0.44	0.66
878.6	908.6	-0.70	0.56	0.76
939.2	969.2	-0.56	0.27	0.67
979.6	1009.6	-0.23	0.11	0.56
1040.2	1070.2	0.08	0.09	0.34
1080.6	1110.6	0.33	0.16	0.28
1141.2	1171.2	0.52	0.19	0.24
1181.6	1211.6	0.67	0.24	0.23
1242.2	1272.2	0.90	0.36	0.29
1282.6	1312.6	1.00	0.49	0.41
1343.2	1373.2	1.30	0.68	0.54
1383.6	1413.6	1.38	0.73	0.58
1444.2	1474.2	1.37	0.78	0.65
1484.6	1514.6	1.59	0.92	0.67
1545.1	1575.1	1.65	1.13	0.52
1585.5	1615.5	1.84	1.26	0.46
1646.1	1676.1	2.06	1.16	0.40
1686.5	1716.5	2.04	1.18	0.42
1747.1	1777.1	1.81	1.10	0.42
1787.5	1817.5	1.58	1.17	0.42
1848.1	1878.1	0.51	1.15	0.42
1888.5	1918.5	-0.67	1.11	0.48
1949.1	1979.1	-1.47	0.95	0.56
1989.5	2019.5	-2.52	0.75	0.49
2050.1	2080.1	-3.19	0.58	0.58

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=750.1MHz (dB) @LO (dBm) +17
710.0	40.1	6.63
692.1	58.0	6.68
674.1	76.0	6.89
656.2	93.9	6.76
638.2	111.9	6.71
620.3	129.8	6.59
602.3	147.8	6.67
584.4	165.7	6.66
566.4	183.7	6.82
548.5	201.6	6.81
530.5	219.6	6.89
512.6	237.5	6.88
494.6	255.5	6.98
476.7	273.4	6.99
458.7	291.4	7.09
440.8	309.3	7.16
422.8	327.3	7.11
404.9	345.2	7.03
386.9	363.2	7.04
369.0	381.1	7.11
351.0	399.1	7.22
333.1	417.0	7.23
315.1	435.0	7.26
297.2	452.9	7.26
279.2	470.9	7.35
261.3	488.8	7.44
243.3	506.8	7.41
225.4	524.7	7.45
207.4	542.7	7.45
189.5	560.6	7.52
171.5	578.6	7.48
153.6	596.5	7.59
135.6	614.5	7.61
117.7	632.4	7.74
99.7	650.4	7.77
81.8	668.3	7.90
63.8	686.3	7.90
45.9	704.2	7.96
27.9	722.2	7.95
10.0	740.1	8.13

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=20.1MHz (dB) @LO (dBm) +17
10.0	30.1	6.71
30.2	50.3	6.59
50.4	70.5	6.57
70.6	90.7	6.73
90.8	110.9	6.57
111.0	131.1	6.49
131.2	151.3	6.54
151.4	171.5	6.60
171.6	191.7	6.47
191.8	211.9	6.46
212.0	232.1	6.47
232.2	252.3	6.36
252.4	272.5	6.41
272.7	292.8	6.36
292.9	313.0	6.33
313.1	333.2	6.32
333.3	353.4	6.30
353.5	373.6	6.36
373.7	393.8	6.29
393.9	414.0	6.28
434.3	454.4	6.29
454.5	474.6	6.34
494.9	515.0	6.30
515.1	535.2	6.24
555.5	575.6	6.34
575.7	595.8	6.31
616.1	636.2	6.40
636.3	656.4	6.52
676.7	696.8	6.54
696.9	717.0	6.54
737.3	757.4	6.73
757.6	777.7	6.67
798.0	818.1	6.73
818.2	838.3	6.76
858.6	878.7	6.84
878.8	898.9	6.91
919.2	939.3	7.15
939.4	959.5	7.31
979.8	999.9	7.58
1000.0	1020.1	7.61

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1500.1MHz (dB) @LO (dBm) +17
1000.0	500.1	8.56
979.8	520.3	8.46
959.6	540.5	8.40
939.4	560.7	8.43
919.2	580.9	8.36
899.0	601.1	8.41
878.8	621.3	8.39
858.6	641.5	8.48
838.4	661.7	8.54
818.2	681.9	8.47
798.0	702.1	8.49
777.8	722.3	8.35
757.6	742.5	8.31
737.3	762.8	8.03
717.1	783.0	8.01
696.9	803.2	8.00
676.7	823.4	7.85
656.5	843.6	7.83
636.3	863.8	7.75
616.1	884.0	7.65
575.7	924.4	7.47
555.5	944.6	7.50
515.1	985.0	7.47
494.9	1005.2	7.50
454.5	1045.6	7.69
434.3	1065.8	7.71
393.9	1106.2	7.78
373.7	1126.4	7.84
333.3	1166.8	7.78
313.1	1187.0	7.84
272.7	1227.4	7.85
252.4	1247.7	7.84
212.0	1288.1	7.77
191.8	1308.3	7.69
151.4	1348.7	7.64
131.2	1368.9	7.57
90.8	1409.3	7.49
70.6	1429.5	7.52
30.2	1469.9	7.44
10.0	1490.1	7.50

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB) @LO (dBm)			LO-IF ISOLATION (dB) @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

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

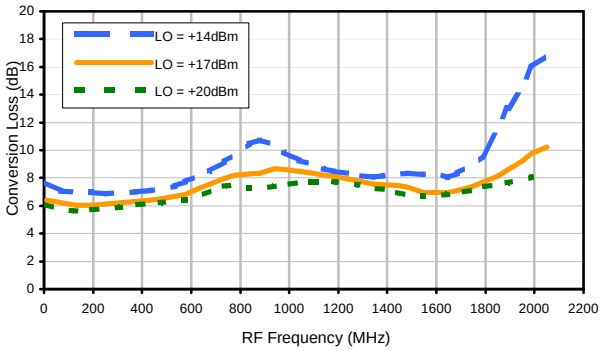
Test conditions: **RF IN: 750.1 MHz; 9.00 dBm.**
LO IN: 780.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; 1.59 dBm

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.

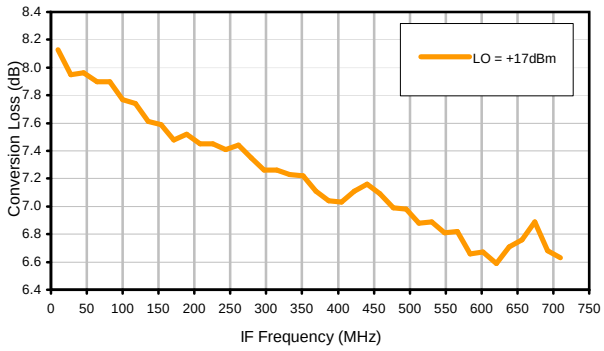
Frequency Mixer TUF-5HSM

Typical Performance Curves

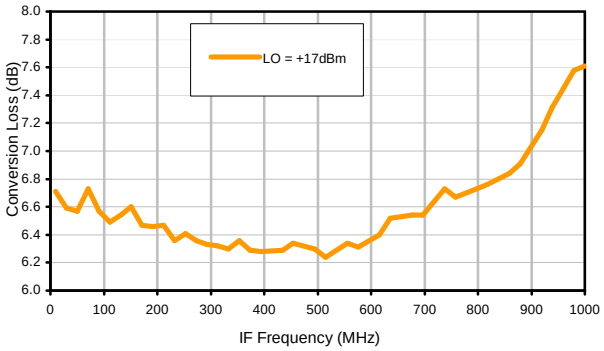
Conversion Loss @ IF=30MHz



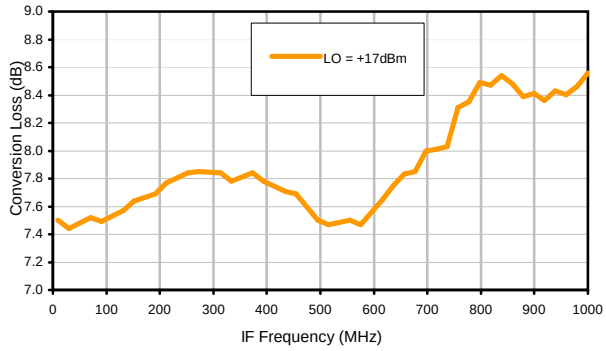
Conversion Loss vs. IF @ RF=750.1MHz



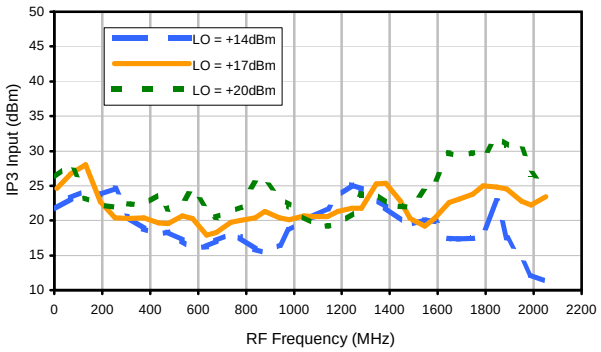
Conversion Loss vs. IF @ RF=20.1MHz



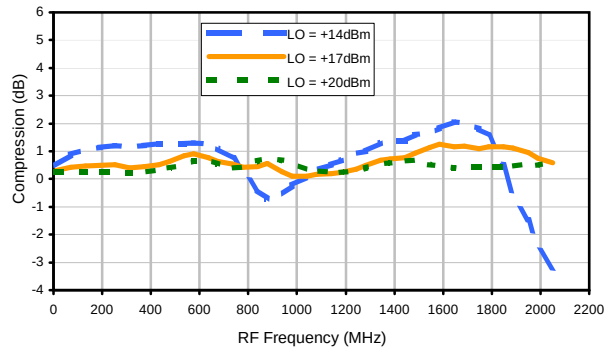
Conversion Loss vs. IF @ RF=1500.1MHz



IP3 Input

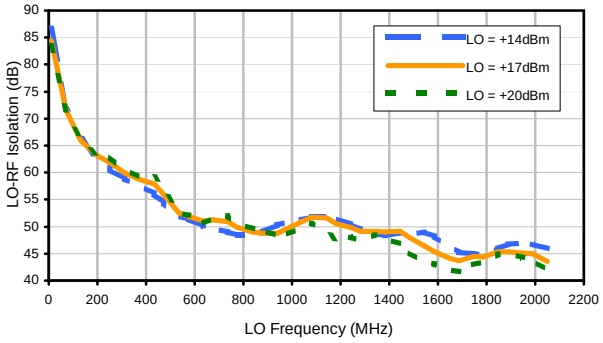


Compression @ RF IN=+14dBm

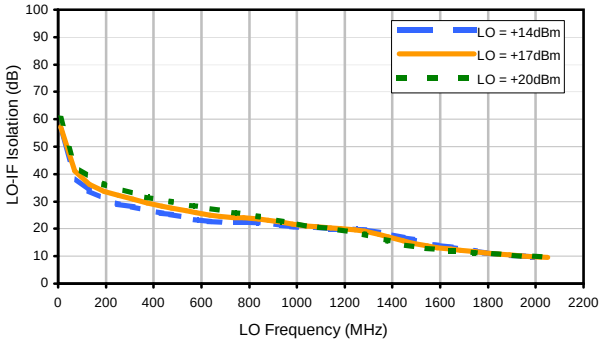


Typical Performance Curves

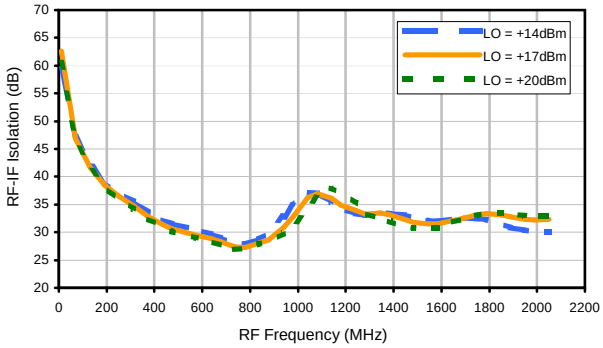
LO-RF Isolation



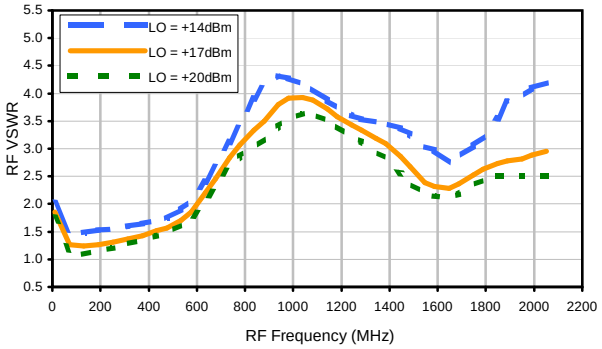
LO-IF Isolation



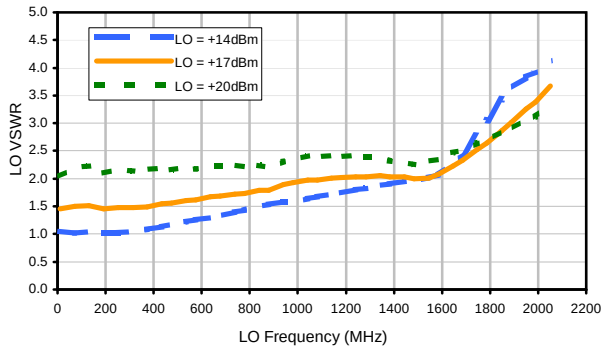
RF-IF Isolation



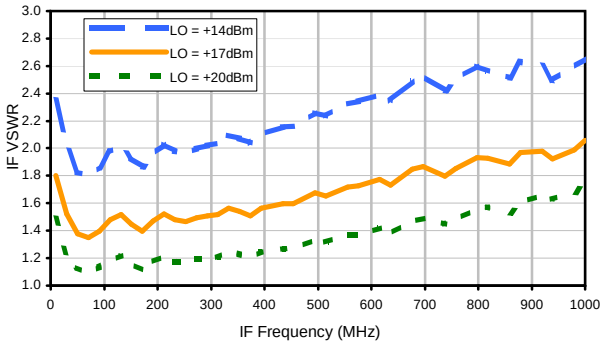
RF VSWR



LO VSWR



IF VSWR



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:

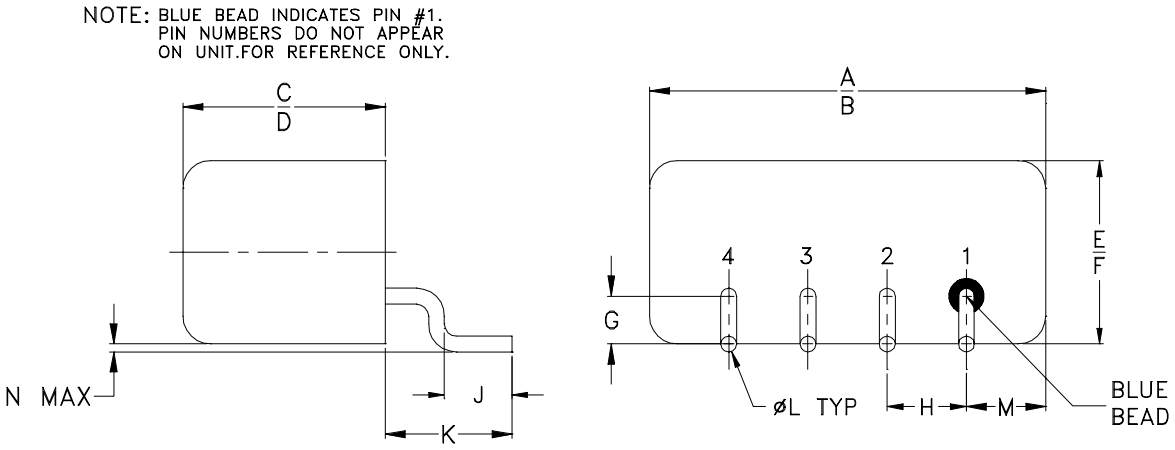
RF IN: 750.1 MHz; 9.00 dBm.
LO IN: 780.01 MHz; +17.00 dBm
IF OUT: 29.91 MHz; 1.59 dBm

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.

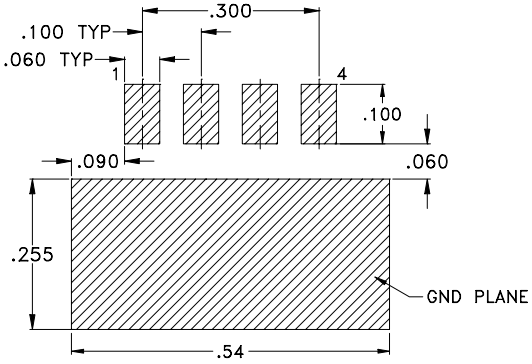
Case Style NNN

Outline Dimensions

NNN150



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #.	A	B	C	D	E	F	G	H	J	K	L	M	N	WT, GRAM
NNN150	.50 (12.70)	.48 (12.19)	.255 (6.48)	.240 (6.10)	.23 (5.84)	.21 (5.33)	.06 (1.52)	.100 (2.54)	.09 (2.29)	.16 (4.06)	.020 (0.51)	.09 (2.29)	.005 (0.13)	1.9

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .03; 3 Pl. ± .015

Notes:

1. Header material C.R.S. Pin material #52 alloy.
2. Finish: Electro-Tin, hot-oil flowed or electro-Tin-Silver.
3. Cover material: Cupro-Nickel.
4. Pin's meniscus 0.015 inch max.
5. Special Tolerances: Pin diameter ± .005 inch.

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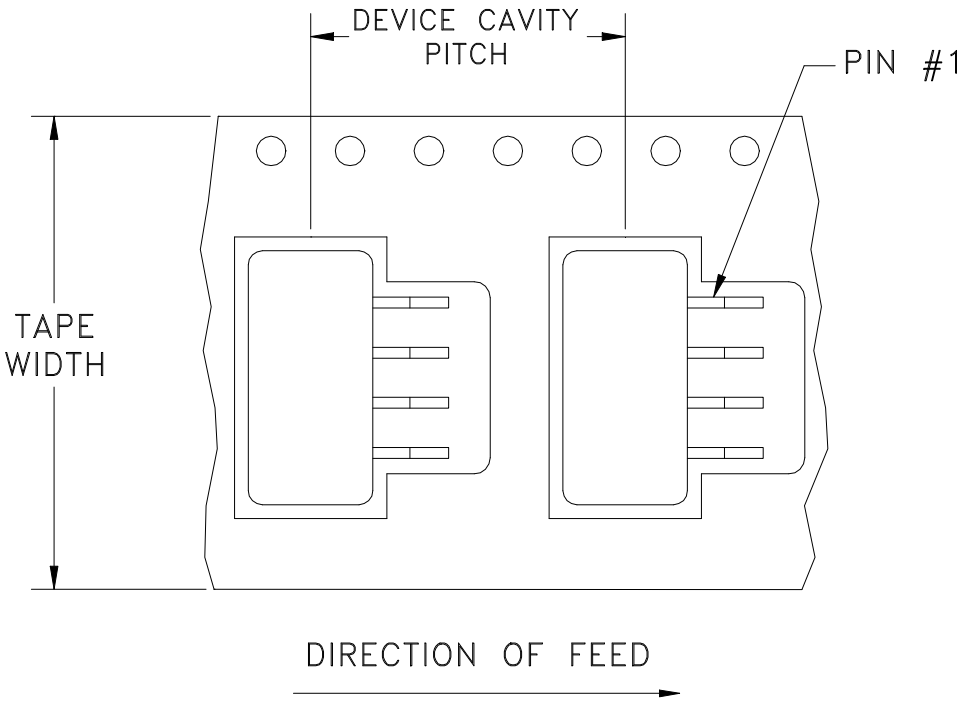
Tape & Reel Packaging TR-F9

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
24	16	13	500

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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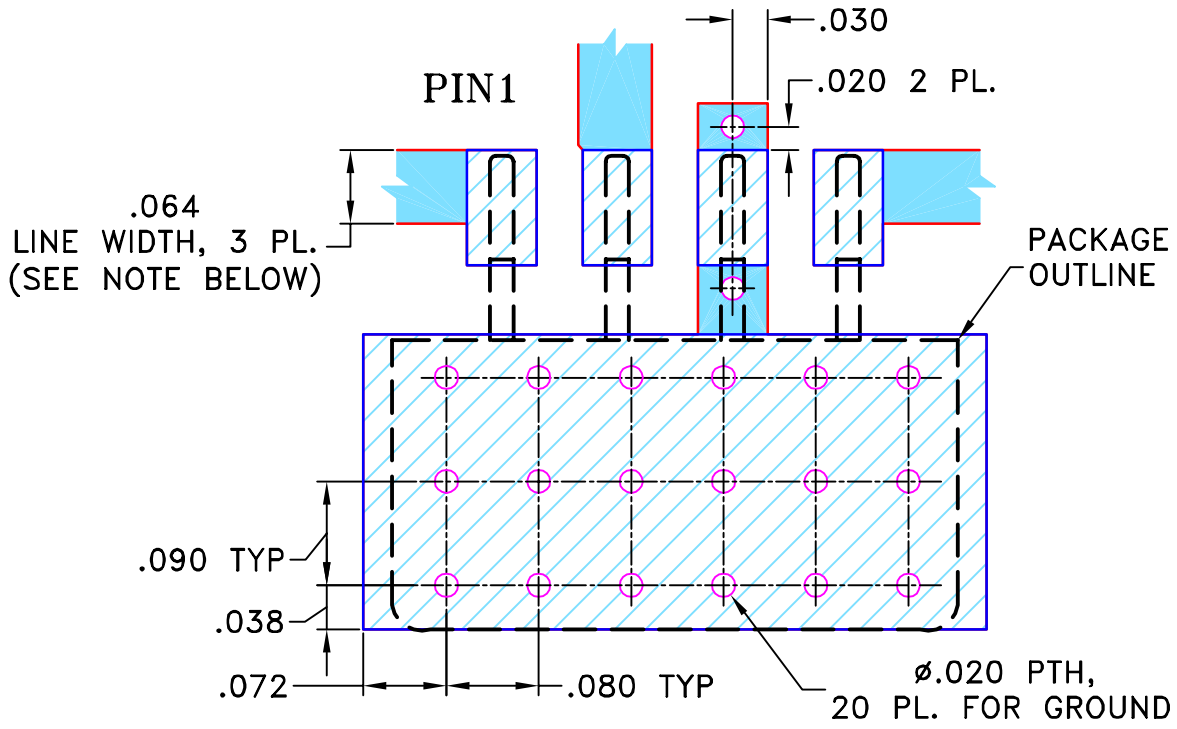
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M86549	NEW RELEASE	04/15/03	GF	DJ
A	M102713	UPDATED NOTES & DISCRIPTION	01/14/06	GF	IL

SUGGESTED MOUNTING CONFIGURATION
FOR NNN150 CASE STYLE, "z"/"cm" PIN CONNECTIONS.



NOTES: 1.TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.

2.BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	GF	04/11/03
TOLERANCES ON:	CHECKED	AV	04/15/03
2 PL DECIMALS ±	APPROVED	DJ	04/15/03
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

ASHEETA1.DWG REV:A DATE:01/12/95

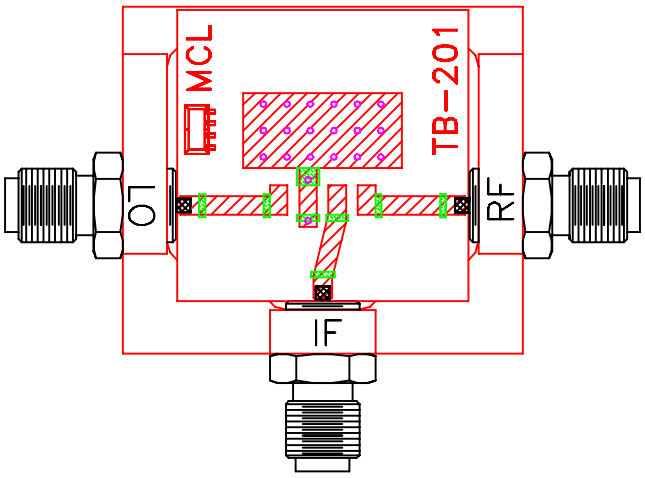
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, z/cm NNN150, TUF/TFAS-SM, TB-201

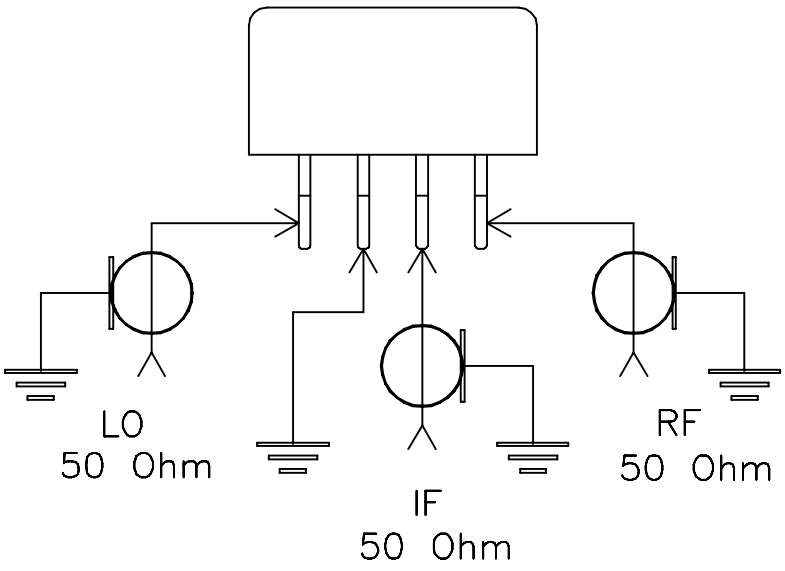
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-081	A

FILE:	SCALE:	SHEET:
98PL081	6:1	1 OF 1

Evaluation Board and Circuit



TB-201



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

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Environmental Specifications ENV30

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-55° to 100°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Moisture Resistance	10 cycles, 24 hours per cycle	MIL-STD-202, Method 106, Condition A, except 50°C and end point electrical test done within 12 hours
Solderability	10X Magnification	J-STD-002, 95% Coverage
Resistance to Solder Heat	260°C for 10 seconds	MIL-STD-202, Method 210, Condition B
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215
Terminal Strength	4 1/2 Pound Pull	MIL-STD-202, Method 211, Condition A

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Barometric Pressure	100,000 Feet	MIL-STD-202, Method 105, Condition D