Non-Catalog Model

Frequency Mixer TUF-2LHSM+

Level 10 (LO Power +10 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.

Please click "Back", and then click "Contact Us" for Applications support.

CASE STYLE : NNN150

ELECTRICAL SPECIFICATIONS 50Ω @ +25°C					
Parameter		**Min.**	**Typ.**	**Max.**	**Units**
Frequency	**LO** (fL to fU)	50		1000	MHz
	RF (fL to fU)	50		1000	MHz
	IF	0		1000	MHz
Conversion Loss	**mid band**		5.2	7.0	dB
	Total Range			8.5	dB
LO-RF Isolation	**Low Range**	40	58		dB
	Mid Range	30	44		dB
	Upper Range	25	39		dB
LO-IF Isolation	**Low Range**	35	60		dB
	Mid Range	25	50		dB
	Upper Range	20	38		dB
1 dB Comp. Input Power			+5		dBm

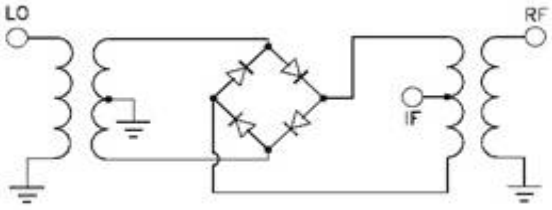
Notes: Low Range = 50 to 100 MHz Mid Range = 100 to 500 MHz Upper Range = 500 to 1000 MHz
mid band =100 to 500 MHz

Non-hermetic

MAXIMUM RATINGS	
Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
RF Power	50mW
IF Current	40mA

PIN CONNECTIONS	
LO	4
RF	1
IF	2
GROUND	3

Electrical Schematics



Frequency Mixer TUF-2LHSM+

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	5.98	5.49	5.30
51.1	81.1	6.50	5.97	5.71
92.0	122.0	6.49	5.93	5.68
133.0	163.0	6.29	5.84	5.61
173.9	203.9	6.39	5.89	5.65
214.9	244.9	6.25	5.76	5.59
255.8	285.8	6.24	5.82	5.63
296.8	326.8	6.22	5.80	5.61
337.7	367.7	6.21	5.80	5.63
378.7	408.7	6.14	5.80	5.65
419.6	449.6	6.17	5.77	5.61
440.1	470.1	6.13	5.76	5.58
481.1	511.1	6.26	5.86	5.68
501.5	531.5	6.20	5.85	5.68
542.5	572.5	6.31	5.93	5.73
563.0	593.0	6.26	5.92	5.74
603.9	633.9	6.31	5.98	5.81
624.4	654.4	6.31	5.96	5.83
665.3	695.3	6.40	6.06	5.92
685.8	715.8	6.38	6.11	5.98
726.8	756.8	6.45	6.19	6.05
747.2	777.2	6.45	6.20	6.06
788.2	818.2	6.53	6.24	6.07
808.7	838.7	6.63	6.26	6.10
849.6	879.6	6.77	6.41	6.23
870.1	900.1	6.86	6.49	6.28
911.1	941.1	6.94	6.50	6.26
931.5	961.5	7.06	6.53	6.28
972.5	1002.5	7.23	6.54	6.26
993.0	1023.0	7.40	6.60	6.30
1033.9	1063.9	7.74	6.83	6.41
1054.4	1084.4	7.84	6.90	6.43
1095.3	1125.3	8.17	7.17	6.61
1115.8	1145.8	8.43	7.36	6.73
1156.8	1186.8	8.91	7.80	7.02
1177.2	1207.2	9.10	8.00	7.19
1218.2	1248.2	9.65	8.53	7.62
1238.7	1268.7	9.80	8.77	7.80
1279.6	1309.6	10.43	9.42	8.51
1300.1	1330.1	10.75	9.84	8.93

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm) @LO (dBm)		
		+7	+10	+13
10.1	40.1	17.87	20.39	23.41
51.1	81.1	16.16	19.48	21.09
92.0	122.0	15.72	17.66	19.15
133.0	163.0	18.32	18.74	24.48
173.9	203.9	15.98	18.10	25.21
214.9	244.9	16.40	23.36	22.24
255.8	285.8	18.47	21.52	22.93
296.8	326.8	17.60	21.74	21.05
337.7	367.7	22.84	19.14	22.58
378.7	408.7	17.72	17.64	24.61
419.6	449.6	17.65	15.73	17.57
440.1	470.1	16.45	17.59	19.17
481.1	511.1	16.07	20.16	26.79
501.5	531.5	16.59	21.41	23.28
542.5	572.5	17.10	17.34	21.61
563.0	593.0	21.41	19.49	23.84
603.9	633.9	22.36	26.86	22.94
624.4	654.4	18.44	26.13	29.23
665.3	695.3	13.98	25.72	25.05
685.8	715.8	13.47	20.77	25.97
726.8	756.8	11.50	14.54	20.56
747.2	777.2	10.56	12.84	16.98
788.2	818.2	9.82	11.25	13.80
808.7	838.7	10.19	11.64	13.72
849.6	879.6	11.65	13.09	14.96
870.1	900.1	12.54	15.00	16.37
911.1	941.1	13.17	18.08	21.22
931.5	961.5	14.39	24.49	28.07
972.5	1002.5	12.70	26.53	21.32
993.0	1023.0	11.04	23.81	20.02
1033.9	1063.9	9.62	19.59	19.91
1054.4	1084.4	9.50	18.83	19.64
1095.3	1125.3	9.90	15.48	23.52
1115.8	1145.8	10.04	14.99	22.67
1156.8	1186.8	10.79	15.47	30.29
1177.2	1207.2	11.00	15.06	22.47
1218.2	1248.2	11.70	14.83	22.40
1238.7	1268.7	12.22	14.94	20.83
1279.6	1309.6	12.71	14.85	18.86
1300.1	1330.1	13.75	15.39	19.39

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+5dBm (dB) @LO (dBm)		
		+7	+10	+13
10.1	40.1	0.80	0.56	0.41
51.1	81.1	0.71	0.44	0.36
92.0	122.0	0.70	0.42	0.33
133.0	163.0	0.63	0.45	0.33
173.9	203.9	0.64	0.46	0.32
214.9	244.9	0.68	0.44	0.31
255.8	285.8	0.72	0.47	0.32
296.8	326.8	0.72	0.47	0.32
337.7	367.7	0.75	0.44	0.31
378.7	408.7	0.76	0.45	0.30
419.6	449.6	0.70	0.47	0.33
440.1	470.1	0.73	0.45	0.31
481.1	511.1	0.65	0.41	0.29
501.5	531.5	0.71	0.41	0.30
542.5	572.5	0.71	0.44	0.30
563.0	593.0	0.77	0.44	0.32
603.9	633.9	0.77	0.46	0.32
624.4	654.4	0.86	0.50	0.33
665.3	695.3	0.91	0.57	0.35
685.8	715.8	0.91	0.56	0.34
726.8	756.8	1.06	0.65	0.43
747.2	777.2	1.10	0.66	0.44
788.2	818.2	1.17	0.78	0.57
808.7	838.7	1.14	0.77	0.56
849.6	879.6	1.23	0.84	0.62
870.1	900.1	1.22	0.82	0.61
911.1	941.1	1.36	0.94	0.69
931.5	961.5	1.38	0.95	0.70
972.5	1002.5	1.38	1.05	0.76
993.0	1023.0	1.38	1.07	0.75
1033.9	1063.9	1.31	1.12	0.82
1054.4	1084.4	1.24	1.10	0.82
1095.3	1125.3	1.07	1.04	0.81
1115.8	1145.8	1.00	1.01	0.83
1156.8	1186.8	0.81	0.93	0.86
1177.2	1207.2	0.72	0.88	0.89
1218.2	1248.2	0.49	0.73	0.89
1238.7	1268.7	0.42	0.68	0.92
1279.6	1309.6	0.21	0.50	0.81
1300.1	1330.1	0.11	0.39	0.72

Mini-Circuits®
IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED RoHS compliant
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=500.1MHz (dB)
		@LO (dBm)
		+10
400.0	100.1	5.95
390.3	109.9	5.91
380.5	119.6	5.88
370.8	129.4	5.87
361.0	139.1	5.83
351.3	148.9	5.78
341.5	158.6	5.80
331.8	168.4	5.83
322.0	178.1	5.78
312.3	187.9	5.80
302.5	197.6	5.78
292.8	207.4	5.74
283.0	217.1	5.72
273.3	226.9	5.72
263.5	236.6	5.75
253.8	246.4	5.72
244.0	256.1	5.73
234.3	265.9	5.78
224.5	275.6	5.78
214.8	285.4	5.76
205.0	295.1	5.81
195.3	304.9	5.79
185.5	314.6	5.76
175.8	324.4	5.77
166.0	334.1	5.78
156.3	343.9	5.78
146.5	353.6	5.76
136.8	363.4	5.78
127.0	373.1	5.82
117.3	382.9	5.77
107.5	392.6	5.78
97.8	402.4	5.81
88.0	412.1	5.80
78.3	421.9	5.77
68.5	431.6	5.83
58.8	441.4	5.85
49.0	451.1	5.85
39.3	460.9	5.84
19.8	480.4	5.91
10.0	490.1	6.08

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=50.1MHz (dB)
		@LO (dBm)
		+10
10.0	60.1	6.12
30.0	80.1	5.99
50.0	100.1	5.94
70.0	120.1	5.95
90.0	140.1	6.00
110.0	160.1	5.95
130.0	180.1	6.04
150.0	200.1	5.98
170.0	220.1	6.00
190.0	240.1	5.97
210.0	260.1	6.03
230.0	280.1	6.10
250.0	300.1	6.03
270.0	320.1	6.01
290.0	340.1	6.04
310.0	360.1	6.10
330.0	380.1	6.06
350.0	400.1	6.05
370.0	420.1	6.07
390.0	440.1	5.97
410.0	460.1	6.03
430.0	480.1	6.09
450.0	500.1	6.07
470.0	520.1	6.02
510.0	560.1	6.09
530.0	580.1	6.12
570.0	620.1	6.20
590.0	640.1	6.23
630.0	680.1	6.34
650.0	700.1	6.30
690.0	740.1	6.19
710.0	760.1	6.22
750.0	800.1	6.14
770.0	820.1	6.07
810.0	860.1	6.05
830.0	880.1	6.03
870.0	920.1	5.91
890.0	940.1	5.91
930.0	980.1	5.84
950.0	1000.1	5.84

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1000.1MHz (dB)
		@LO (dBm)
		+10
950.0	50.1	7.40
930.0	70.1	7.54
910.0	90.1	7.55
890.0	110.1	7.39
870.0	130.1	7.29
850.0	150.1	7.36
830.0	170.1	7.38
810.0	190.1	7.30
790.0	210.1	7.28
770.0	230.1	7.21
750.0	250.1	7.20
730.0	270.1	7.27
710.0	290.1	7.24
690.0	310.1	7.24
670.0	330.1	7.20
650.0	350.1	7.23
630.0	370.1	7.28
610.0	390.1	7.26
590.0	410.1	7.21
570.0	430.1	7.16
550.0	450.1	7.19
530.0	470.1	7.14
510.0	490.1	7.12
490.0	510.1	7.12
450.0	550.1	7.17
430.0	570.1	7.12
390.0	610.1	7.00
370.0	630.1	6.96
330.0	670.1	6.85
310.0	690.1	6.89
270.0	730.1	6.85
250.0	750.1	6.90
210.0	790.1	7.05
190.0	810.1	7.06
150.0	850.1	7.05
130.0	870.1	6.99
90.0	910.1	6.86
70.0	930.1	6.82
30.0	970.1	6.73
10.0	990.1	6.86

Mini-Circuits®
IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED RoHS compliant
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB) @LO (dBm)			LO-IF ISOLATION (dB) @LO (dBm)		
	+7	+10	+13	+7	+10	+13
10.1	68.52	71.56	74.73	55.59	58.82	60.04
51.1	59.61	61.65	63.09	56.07	56.19	54.64
92.0	54.96	56.54	57.96	53.07	51.62	50.26
133.0	52.11	53.74	55.42	50.15	48.42	47.15
173.9	49.78	51.51	53.11	48.65	46.70	45.44
214.9	48.19	49.98	51.72	46.91	45.08	44.12
255.8	46.89	48.88	50.46	45.65	44.18	42.88
296.8	45.77	47.71	49.36	44.41	42.90	41.90
337.7	45.08	46.91	48.32	42.91	41.44	40.21
378.7	44.31	46.51	48.11	41.36	40.19	39.20
419.6	43.54	45.79	47.34	39.86	39.12	38.08
440.1	43.03	45.14	46.47	38.59	37.94	37.27
481.1	42.03	43.83	45.45	37.48	36.71	36.40
501.5	41.65	43.31	45.06	36.68	35.79	35.54
542.5	41.17	42.61	44.18	35.67	34.97	34.29
563.0	40.98	42.36	43.76	35.03	34.55	33.98
603.9	40.76	42.61	44.20	34.42	34.13	33.75
624.4	40.78	42.64	44.20	33.87	33.63	33.37
665.3	40.79	42.58	43.80	33.01	32.81	32.78
685.8	40.88	42.84	44.17	32.70	32.31	32.12
726.8	40.73	42.50	43.81	31.83	31.58	30.92
747.2	40.32	41.76	42.82	31.36	31.23	30.60
788.2	39.74	40.89	41.83	30.51	30.68	30.09
808.7	39.45	40.64	41.56	30.01	30.26	29.85
849.6	39.27	40.68	41.63	29.05	29.51	29.37
870.1	38.71	40.36	41.36	28.66	29.33	29.29
911.1	37.86	39.58	40.79	27.70	28.59	28.93
931.5	37.26	39.05	40.22	27.29	28.28	28.68
972.5	36.24	38.08	39.50	26.36	27.28	28.01
993.0	35.61	37.58	39.18	26.03	26.95	27.72
1033.9	34.98	36.99	38.77	25.13	25.81	26.74
1054.4	34.37	36.49	38.49	24.95	25.44	26.34
1095.3	33.82	36.00	38.28	24.56	24.79	25.49
1115.8	33.54	35.80	38.20	24.31	24.60	25.15
1156.8	33.07	35.37	38.03	23.86	24.24	24.74
1177.2	32.93	35.22	37.95	23.75	24.16	24.63
1218.2	32.65	35.06	37.99	23.28	23.82	24.30
1238.7	32.41	34.90	37.94	23.15	23.80	24.20
1279.6	32.16	34.83	38.13	22.84	23.63	24.09
1300.1	32.08	34.78	38.18	22.81	23.62	24.18

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB) @LO (dBm)		
		+7	+10	+13
10.1	40.1	49.43	47.24	48.79
51.1	81.1	37.79	37.92	37.54
92.0	122.0	33.01	33.00	33.10
133.0	163.0	30.27	30.43	30.64
173.9	203.9	28.55	28.92	29.05
214.9	244.9	27.33	27.73	27.98
255.8	285.8	26.92	27.26	27.50
296.8	326.8	27.01	27.40	27.44
337.7	367.7	26.95	27.81	28.10
378.7	408.7	27.15	28.08	28.71
419.6	449.6	27.76	28.32	28.79
440.1	470.1	28.65	29.18	29.26
481.1	511.1	30.02	29.99	30.10
501.5	531.5	30.79	30.80	30.98
542.5	572.5	29.75	30.20	31.05
563.0	593.0	28.10	29.06	29.82
603.9	633.9	25.04	25.57	26.15
624.4	654.4	23.48	23.57	24.10
665.3	695.3	21.65	21.40	21.46
685.8	715.8	20.74	20.49	20.44
726.8	756.8	19.49	19.14	18.92
747.2	777.2	19.13	18.73	18.41
788.2	818.2	18.35	17.94	17.56
808.7	838.7	18.11	17.63	17.34
849.6	879.6	17.52	17.05	16.71
870.1	900.1	17.22	16.75	16.44
911.1	941.1	16.88	16.46	16.19
931.5	961.5	16.69	16.33	16.09
972.5	1002.5	16.45	16.24	16.16
993.0	1023.0	16.28	16.16	16.13
1033.9	1063.9	16.02	15.96	16.01
1054.4	1084.4	15.94	15.91	15.95
1095.3	1125.3	15.69	15.75	15.85
1115.8	1145.8	15.57	15.72	15.80
1156.8	1186.8	15.25	15.49	15.68
1177.2	1207.2	15.13	15.49	15.66
1218.2	1248.2	14.84	15.24	15.47
1238.7	1268.7	14.66	15.09	15.34
1279.6	1309.6	14.38	14.79	15.02
1300.1	1330.1	14.15	14.58	14.79

Mini-Circuits®
IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED RoHS compliant
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1) @LO (dBm)		
		+7	+10	+13
10.1	40.1	1.13	1.06	1.09
51.1	81.1	1.15	1.03	1.05
92.0	122.0	1.15	1.06	1.08
133.0	163.0	1.15	1.09	1.12
173.9	203.9	1.20	1.13	1.15
214.9	244.9	1.21	1.17	1.20
255.8	285.8	1.24	1.21	1.23
296.8	326.8	1.29	1.25	1.26
337.7	367.7	1.30	1.27	1.29
378.7	408.7	1.31	1.29	1.31
419.6	449.6	1.33	1.30	1.31
440.1	470.1	1.36	1.33	1.34
481.1	511.1	1.39	1.36	1.37
501.5	531.5	1.41	1.40	1.41
542.5	572.5	1.46	1.44	1.45
563.0	593.0	1.47	1.46	1.47
603.9	633.9	1.49	1.49	1.51
624.4	654.4	1.49	1.50	1.52
665.3	695.3	1.48	1.49	1.52
685.8	715.8	1.48	1.49	1.51
726.8	756.8	1.45	1.45	1.47
747.2	777.2	1.44	1.43	1.45
788.2	818.2	1.46	1.43	1.44
808.7	838.7	1.48	1.45	1.45
849.6	879.6	1.52	1.48	1.48
870.1	900.1	1.55	1.51	1.50
911.1	941.1	1.64	1.59	1.58
931.5	961.5	1.71	1.66	1.64
972.5	1002.5	1.87	1.80	1.77
993.0	1023.0	1.96	1.87	1.84
1033.9	1063.9	2.17	2.05	1.99
1054.4	1084.4	2.25	2.11	2.04
1095.3	1125.3	2.46	2.29	2.20
1115.8	1145.8	2.56	2.39	2.28
1156.8	1186.8	2.78	2.60	2.45
1177.2	1207.2	2.89	2.70	2.54
1218.2	1248.2	3.13	2.93	2.75
1238.7	1268.7	3.22	3.04	2.85
1279.6	1309.6	3.43	3.26	3.08
1300.1	1330.1	3.51	3.36	3.18

LO (MHz)	LO VSWR (:1) @LO (dBm)		
	+7	+10	+13
10.1	1.51	2.10	2.95
51.1	1.57	2.37	3.44
92.0	1.49	2.19	3.14
133.0	1.53	2.30	3.31
173.9	1.50	2.19	3.11
214.9	1.52	2.22	3.16
255.8	1.52	2.24	3.18
296.8	1.50	2.18	3.07
337.7	1.56	2.27	3.20
378.7	1.54	2.23	3.12
419.6	1.56	2.25	3.15
440.1	1.58	2.27	3.17
481.1	1.59	2.23	3.09
501.5	1.60	2.25	3.11
542.5	1.65	2.31	3.17
563.0	1.65	2.32	3.19
603.9	1.69	2.31	3.16
624.4	1.71	2.35	3.19
665.3	1.74	2.34	3.14
685.8	1.75	2.34	3.14
726.8	1.80	2.41	3.22
747.2	1.83	2.44	3.28
788.2	1.84	2.40	3.19
808.7	1.87	2.44	3.23
849.6	1.92	2.46	3.22
870.1	1.93	2.45	3.20
911.1	1.96	2.46	3.19
931.5	1.99	2.50	3.24
972.5	2.04	2.49	3.18
993.0	2.07	2.51	3.20
1033.9	2.14	2.61	3.27
1054.4	2.15	2.62	3.30
1095.3	2.18	2.66	3.33
1115.8	2.19	2.69	3.35
1156.8	2.24	2.73	3.40
1177.2	2.26	2.74	3.41
1218.2	2.28	2.75	3.41
1238.7	2.30	2.76	3.42
1279.6	2.33	2.79	3.45
1300.1	2.34	2.78	3.43

IF (OUT) (MHz)	IF VSWR @LO=1000.1MHz (:1) @LO (dBm)		
	+7	+10	+13
10.0	1.99	1.58	1.38
30.2	1.87	1.47	1.30
50.4	1.79	1.41	1.25
70.6	1.85	1.47	1.31
90.8	1.88	1.51	1.36
111.0	1.92	1.52	1.37
131.2	1.97	1.56	1.41
151.4	1.92	1.54	1.40
171.6	1.88	1.52	1.39
191.8	1.96	1.58	1.45
212.0	2.02	1.64	1.51
232.2	1.95	1.59	1.47
252.4	1.92	1.57	1.46
272.7	2.00	1.65	1.54
292.9	2.02	1.68	1.59
313.1	2.01	1.66	1.57
333.3	2.03	1.68	1.59
353.5	2.06	1.73	1.64
373.7	2.04	1.72	1.65
393.9	2.04	1.72	1.64
434.3	2.08	1.78	1.72
454.5	2.05	1.75	1.69
494.9	2.13	1.83	1.77
515.1	2.09	1.79	1.75
555.5	2.18	1.86	1.81
575.7	2.17	1.86	1.82
616.1	2.16	1.83	1.78
636.3	2.19	1.87	1.83
676.7	2.20	1.85	1.79
696.9	2.21	1.86	1.80
737.3	2.15	1.81	1.76
757.6	2.25	1.88	1.81
798.0	2.18	1.81	1.73
818.2	2.16	1.79	1.70
858.6	2.22	1.85	1.75
878.8	2.24	1.84	1.72
919.2	2.17	1.80	1.67
939.4	2.14	1.78	1.66
979.8	2.32	1.92	1.76
1000.0	2.35	2.15	2.20

Mini-Circuits®
IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED RoHS compliant
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

Harmonics Tables

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	19	35	25	43	45	47	55	62	63	71
1	-	25	+0	28	11	32	22	40	43	36	54	55
2	90	67	43	63	43	67	43	56	64	73	70	59
3	>100	57	52	67	53	58	43	56	53	57	56	47
4	>100	74	71	83	66	73	64	74	59	78	78	70
5	>100	74	65	69	63	67	57	65	55	64	60	82
6	>100	>94	86	86	81	85	85	85	78	84	76	85
7	>100	81	89	91	79	93	78	83	80	80	>94	83
8	>100	>94	>94	>94	>94	91	93	90	91	87	92	93
9	>100	>94	>94	>94	>94	>94	91	>94	89	>94	>94	>94
10	>100	>94	>94	>94	>94	>94	>94	>94	>94	>94	>94	>94
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:
RF IN: 500.1 MHz; 0.00 dBm.
LO IN: 530.01 MHz; +10.00 dBm
IF OUT: 29.91 MHz; -6.04 dBm

RF HARMONICS ORDER	(-dBm)	(-dBc)										
0	-	-	9	25	13	30	33	38	43	40	42	58
1	-	25	+0	29	11	30	21	37	40	31	48	50
2	98	84	51	75	51	77	50	66	72	72	74	60
3	>100	73	71	74	66	73	61	70	69	79	73	72
4	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
5	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
6	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
7	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
8	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
9	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
10	>100	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84	>84
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:
RF IN: 500.1 MHz; -10.00 dBm.
LO IN: 530.01 MHz; +10.00 dBm
IF OUT: 29.91 MHz; -16.02 dBm

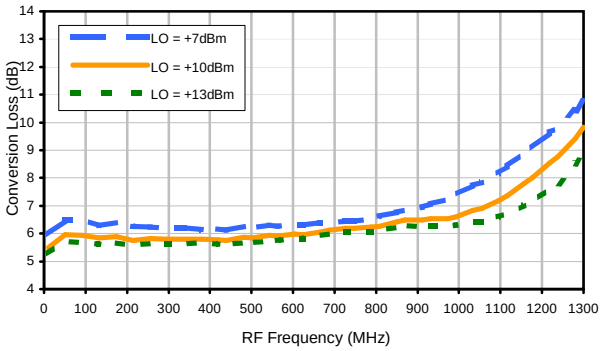
Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

Mini-Circuits®
IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED RoHS compliant
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

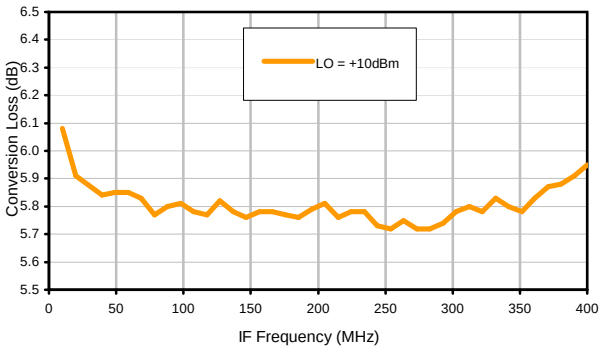
Frequency Mixer TUF-2LHSM+

Typical Performance Curves

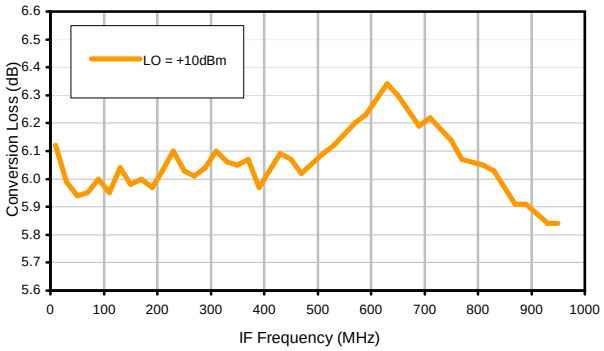
Conversion Loss @ IF=30MHz



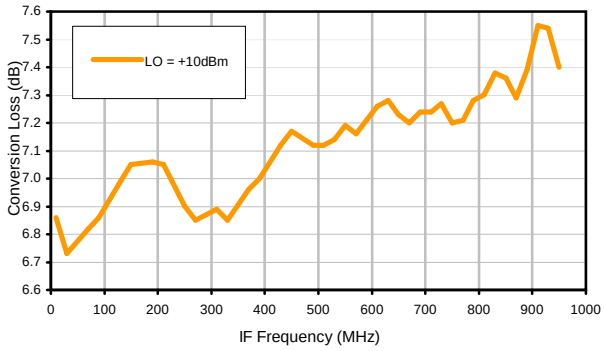
Conversion Loss vs. IF @ RF=500.1MHz



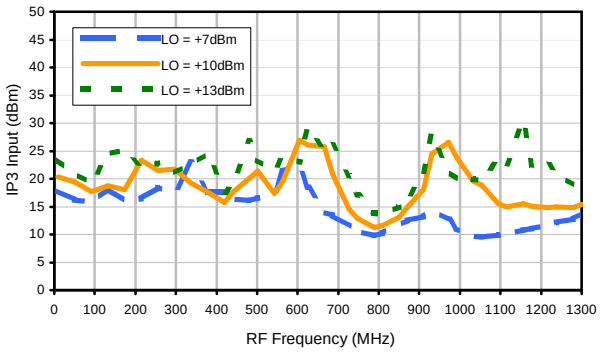
Conversion Loss vs. IF @ RF=50.1MHz



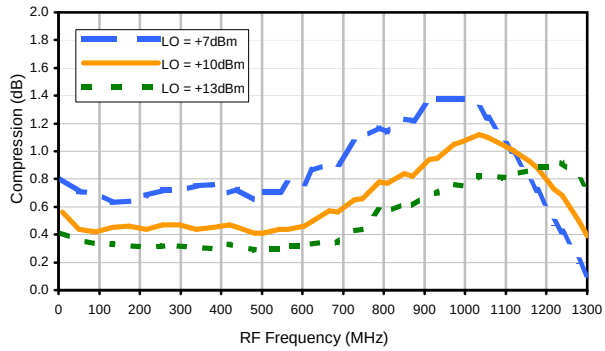
Conversion Loss vs. IF @ RF=1000.1MHz



IP3 Input



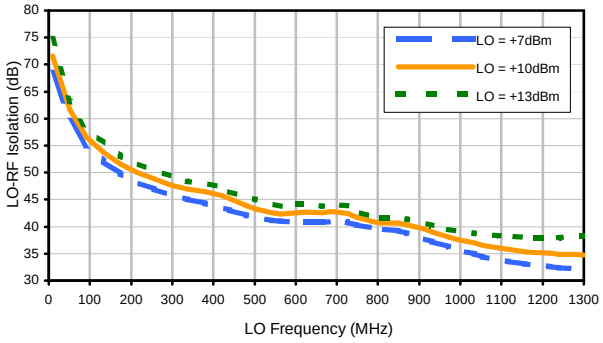
Compression @ RF IN=+5dBm



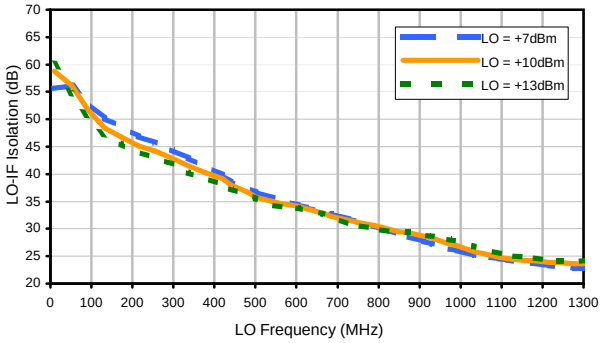
Mini-Circuits®
IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED RoHS compliant
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

Typical Performance Curves

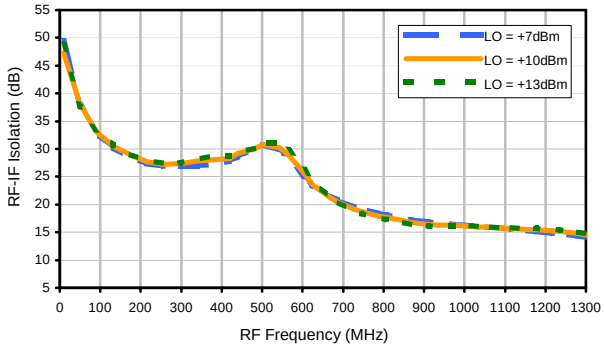
LO-RF Isolation



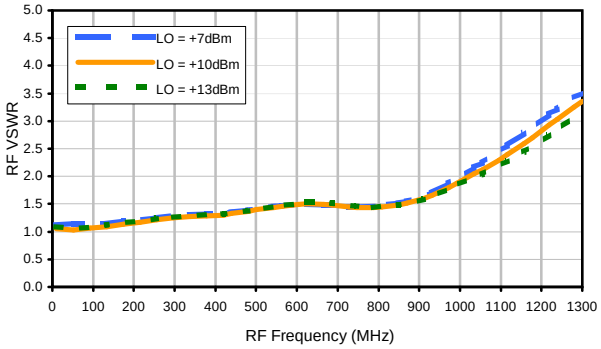
LO-IF Isolation



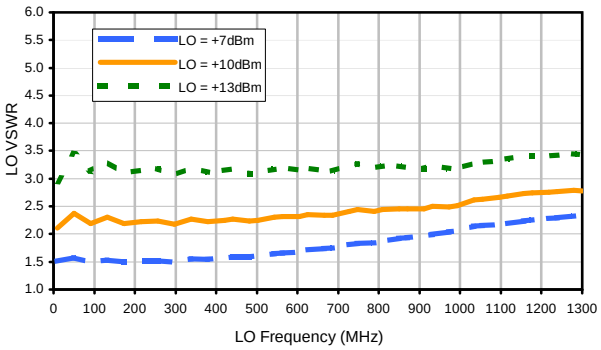
RF-IF Isolation



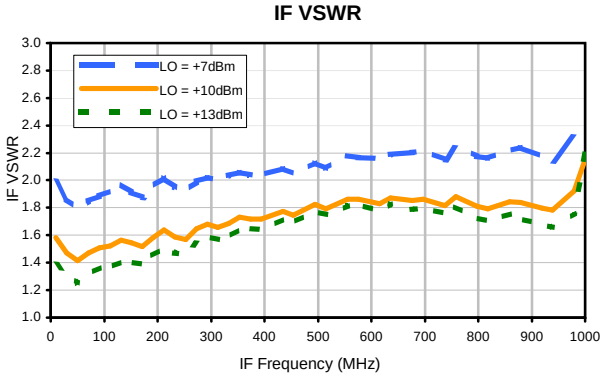
RF VSWR



LO VSWR



IF VSWR

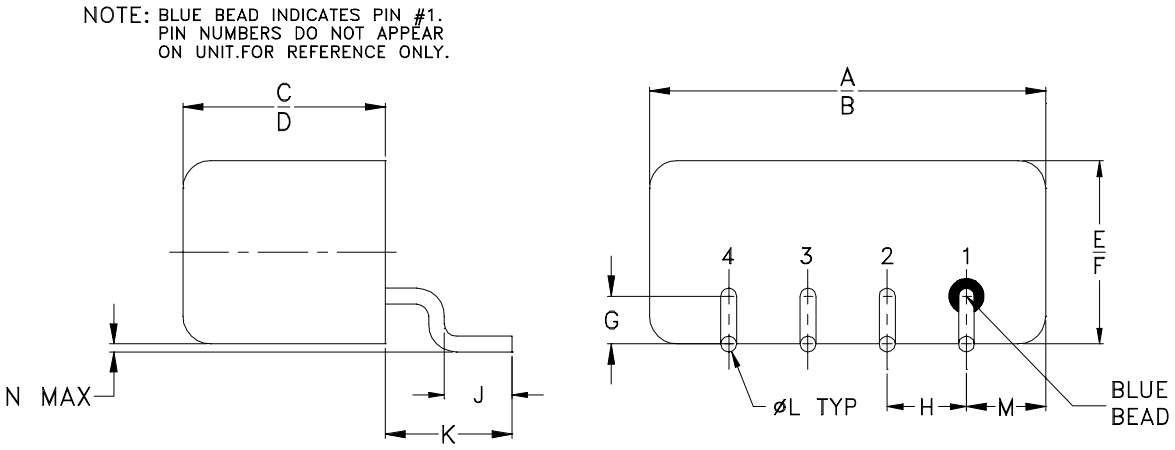


Mini-Circuits®
IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED RoHS compliant
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see minicircuits.com

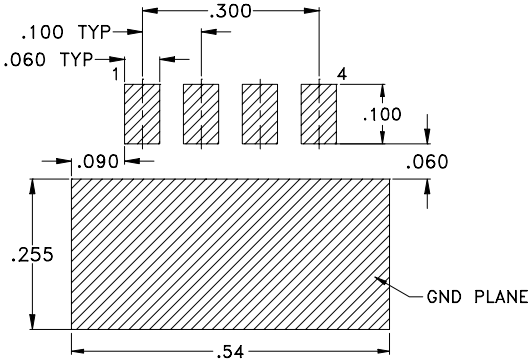
Case Style NNN

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:

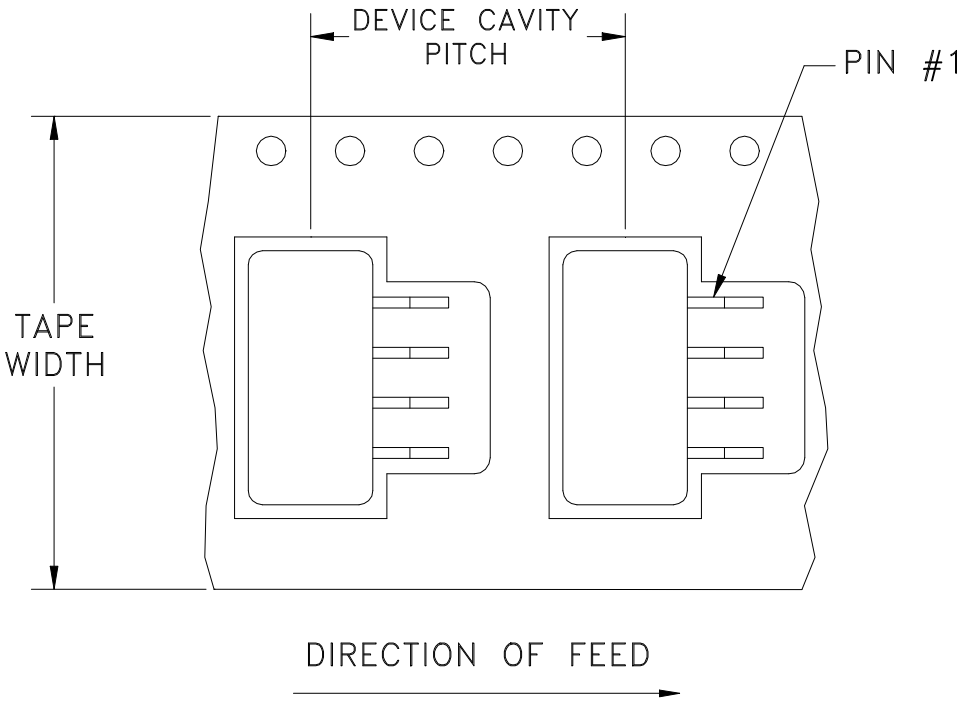
1. Header material C.R.S. Pin material #52 alloy.
2. Finish: Electro-Tin, hot-oil flowed or electro-Tin-Silver.
3. Cover material: Cupro-Nickel.
4. Pin's meniscus 0.015 inch max.
5. Special Tolerances: Pin diameter ± .005 inch.

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

This document and its contents are the property of Mini-Circuits

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.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

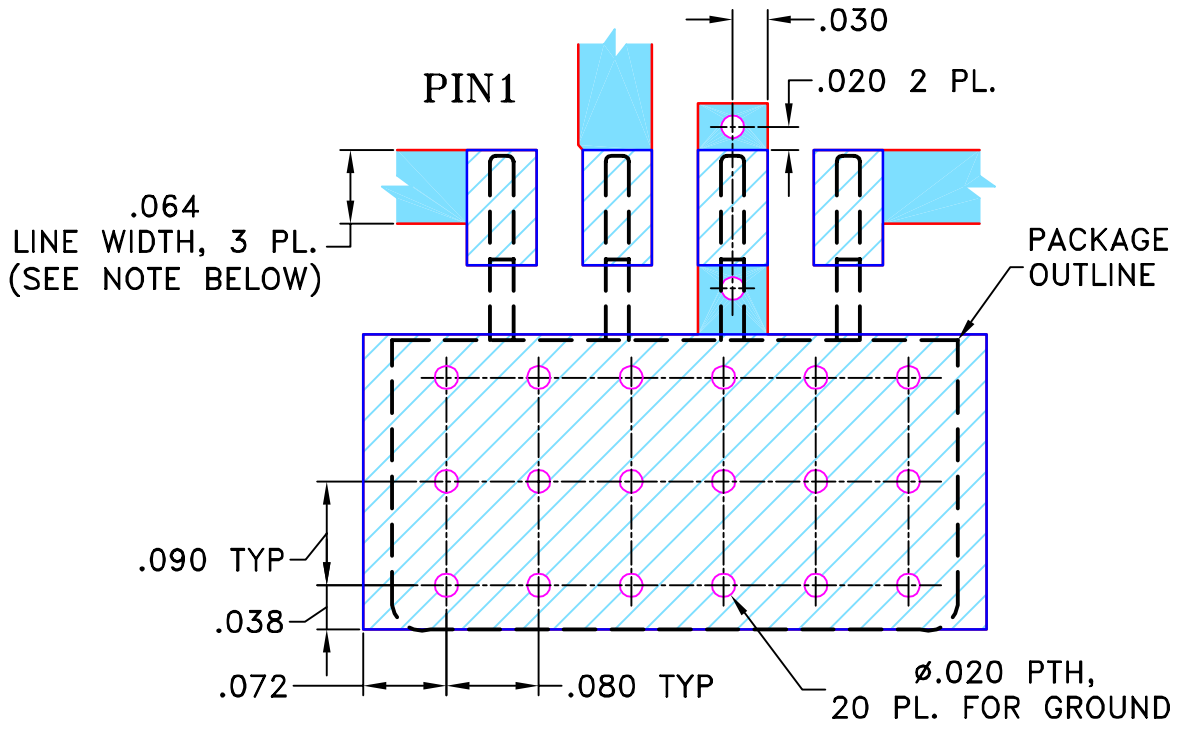
Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

This document and its contents are the property of Mini-Circuits.

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 ±			

Mini-Circuits ®
THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE , MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

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

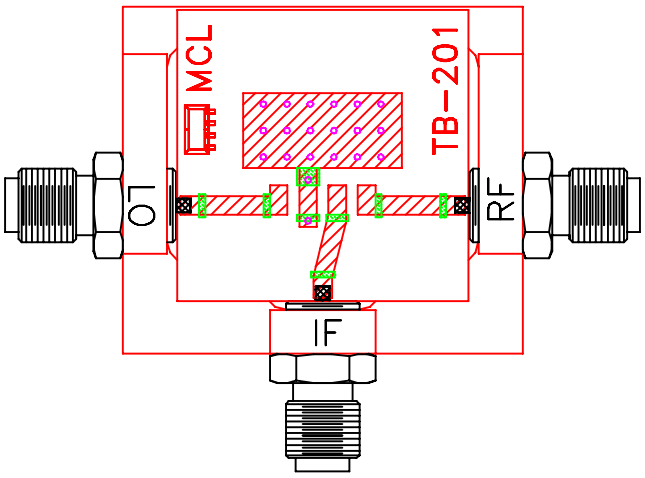
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

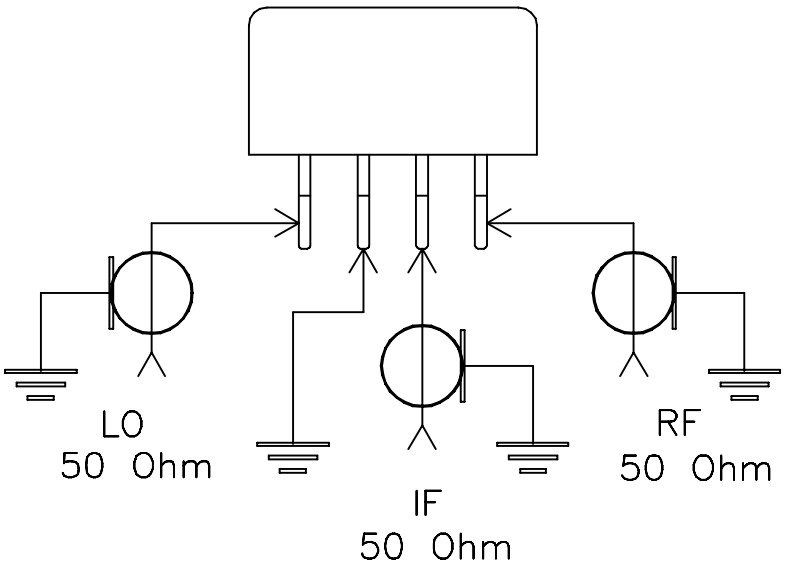
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-081	A

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.

Mini-Circuits®

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS.

Mini-Circuits

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

This document and its contents are the property of Mini-Circuits.

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

This document and its contents are the property of Mini-Circuits.