

High IP3

Frequency Mixer

Level 17 (LO Power +17 dBm) 100 to 1800 MHz

TUF-18DHSM+

Maximum Ratings

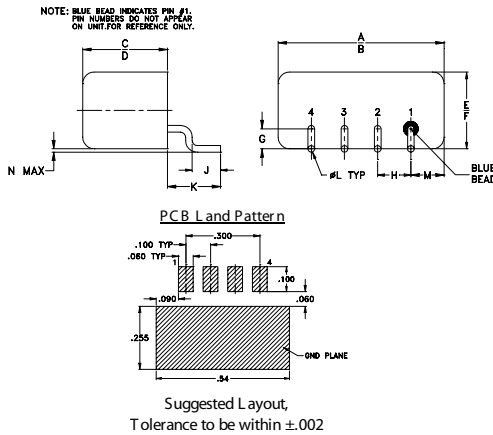
Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
RF Power	200mW
IF Current	40mA

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

LO	4
RF	1
IF	2
GROUND	3
CASE GROUND	3

Outline Drawing

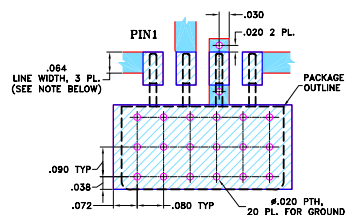


Outline Dimensions (inch/mm)

A	B	C	D	E	F	G
.50	.48	.255	.240	.23	.21	.06
12.70	12.19	6.48	6.10	5.84	5.33	1.52

H	J	K	L	M	N	wt
.100	.09	.16	.020	.09	.005	grams
2.54	2.29	4.06	0.51	2.29	0.13	1.9

Demo Board MCL PIN : TB-201 Suggested PCB Layout (PL-081)



- 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.
 3. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
 4. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Notes

- Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
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Features

- low conversion loss, 7.3 dB typ.
- excellent L-R isolation, 41 dB typ.
- high IP3, 27 dBm typ.
- wideband, 100 to 1800 MHz
- rugged welded construction

Applications

- airphone
- cellular
- PCS
- PCN



Generic photo used for illustration purposes only

CASE STYLE: NNN150

+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Electrical Specifications

FREQUENCY (MHz)		CONVERSION LOSS (dB)				LO-RF ISOLATION (dB)		LO-IF ISOLATION (dB)		IP3 @ CENTER BAND (dBm)
LO/RF	IF	Mid-Band m	σ	Max.	Total Range Max.	Typ.	Min.	Typ.	Min.	
f_L - f_U		$\bar{X}$								Typ.
100-1800	50-750	7.3	0.15	8.5	9.0	41	23	33	20	27

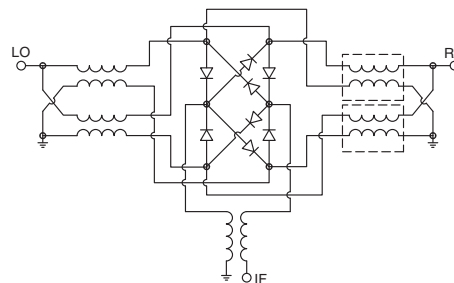
1 dB COMP.: +10 dBm typ.

m= mid band [$2f_L$ to $f_U/2$]

Typical Performance Data

Frequency (MHz)		Conversion Loss (dB)	Isolation L-R (dB)	Isolation L-I (dB)	VSWR RF Port (:1)	VSWR LO Port (:1)
RF	LO	LO +17dBm	LO +17dBm	LO +17dBm	LO +17dBm	LO +17dBm
100.00	130.00	7.20	48.50	35.20	2.27	1.15
230.77	260.77	7.23	51.20	35.80	2.23	1.11
300.00	330.00	7.08	52.30	36.30	2.25	1.16
361.54	391.54	7.12	50.40	36.90	1.89	1.18
492.31	522.31	7.10	48.70	36.00	1.92	1.29
500.00	530.00	7.09	48.50	36.00	1.84	1.28
600.00	630.00	7.11	48.10	34.80	1.61	1.28
623.08	653.08	7.07	47.50	34.70	1.52	1.30
700.00	730.00	7.06	46.20	33.60	1.44	1.36
753.85	783.85	7.07	45.90	32.80	1.56	1.38
884.62	914.62	7.09	43.80	31.70	1.27	1.46
1000.00	1030.00	7.04	44.40	30.10	1.22	1.51
1015.39	1045.39	7.03	43.80	30.00	1.25	1.51
1146.15	1176.15	7.23	43.40	29.50	1.32	1.77
1276.92	1306.92	7.31	42.20	28.80	1.68	2.25
1407.69	1437.69	7.34	39.20	29.40	2.30	2.68
1500.00	1530.00	7.38	37.00	29.10	3.57	2.96
1538.46	1568.46	7.38	36.80	28.60	3.57	2.96
1669.23	1699.23	7.39	36.20	28.10	2.92	2.76
1800.00	1830.00	7.83	35.40	28.40	2.76	2.55

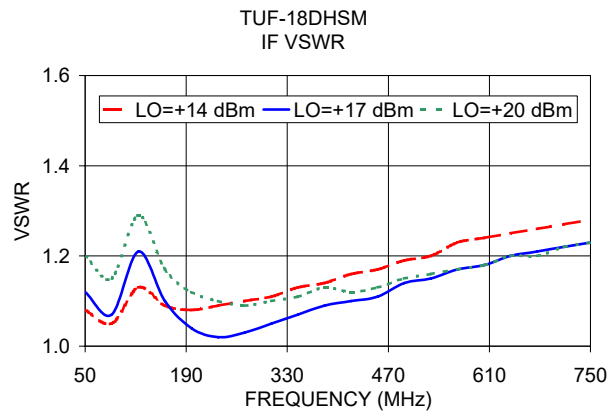
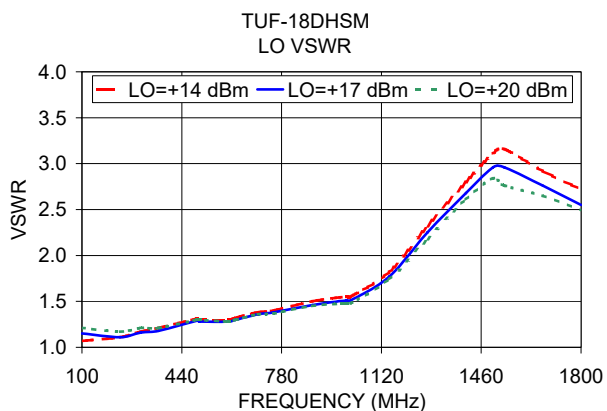
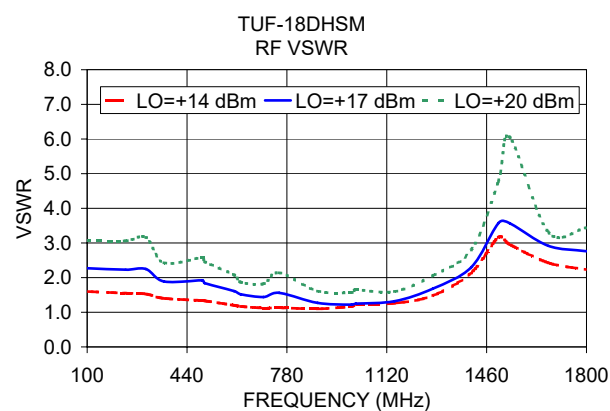
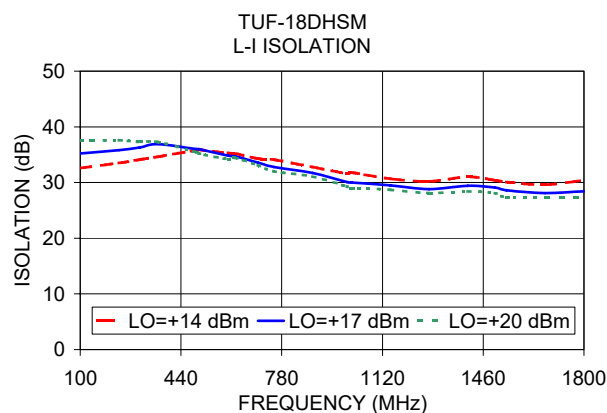
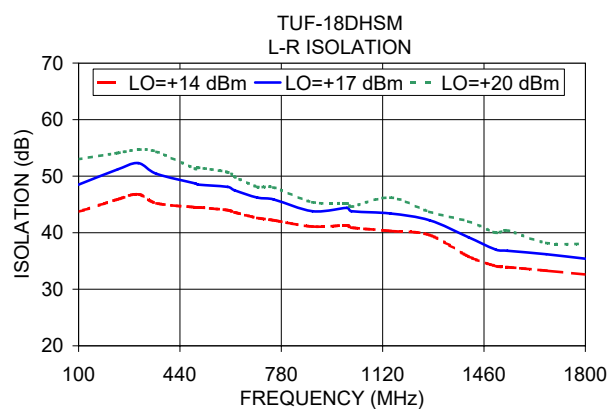
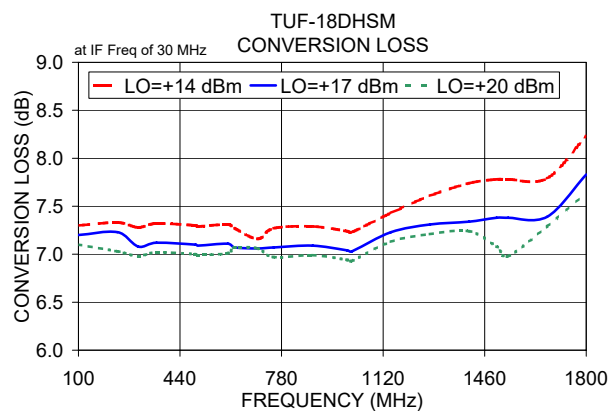
Electrical Schematic



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M151107
TUF-18DHSM+
DJ/TD/CP/AM
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Frequency Mixer

TUF-18DHSM+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=50MHz (dB)		
		@LO (dBm)		
		+14	+17	+20
10.1	60.1	7.78	7.48	7.32
110.3	160.3	7.15	6.95	6.88
210.6	260.6	7.26	7.02	6.89
310.8	360.8	7.26	6.99	6.87
411.1	461.1	7.39	7.10	6.94
511.3	561.3	7.31	7.04	6.91
611.5	661.5	7.34	7.05	6.91
711.8	761.8	7.33	7.06	6.91
812.0	862.0	7.44	7.12	6.95
912.3	962.3	7.70	7.35	7.16
1012.5	1062.5	7.75	7.37	7.17
1112.7	1162.7	7.95	7.52	7.29
1233.0	1283.0	8.10	7.66	7.42
1333.3	1383.3	8.16	7.73	7.49
1453.5	1503.5	8.25	7.88	7.65
1553.8	1603.8	8.28	7.94	7.74
1674.1	1724.1	8.19	7.83	7.63
1774.3	1824.3	8.12	7.73	7.52
1894.6	1944.6	8.32	7.84	7.55
1994.8	2044.8	8.07	7.66	7.43
2115.1	2165.1	7.82	7.48	7.28
2215.4	2265.4	7.77	7.50	7.29
2335.7	2385.7	7.55	7.31	7.20
2435.9	2485.9	7.47	7.25	7.16
2556.2	2606.2	7.42	7.25	7.17
2656.4	2706.4	7.43	7.24	7.15
2776.7	2826.7	7.44	7.23	7.14
2876.9	2926.9	7.49	7.29	7.21
2997.2	3047.2	7.63	7.42	7.35
3097.5	3147.5	7.75	7.52	7.44
3217.8	3267.8	7.84	7.63	7.56
3318.0	3368.0	7.99	7.71	7.56
3438.3	3488.3	8.13	7.81	7.68
3538.5	3588.5	8.29	7.91	7.68
3658.8	3708.8	8.88	8.40	8.12
3759.0	3809.0	9.40	8.93	8.62
3879.3	3929.3	9.62	8.99	8.60
3979.6	4029.6	9.49	8.77	8.40
4099.9	4149.9	9.80	8.98	8.51
4200.1	4250.1	9.77	8.92	8.45

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)		
		@LO (dBm)		
		+14	+17	+20
10.1	60.1	21.76	20.99	21.01
110.3	160.3	22.88	23.34	22.12
210.6	260.6	23.39	19.77	21.33
310.8	360.8	18.20	19.73	23.59
411.1	461.1	17.25	20.32	24.76
511.3	561.3	19.50	23.04	28.33
611.5	661.5	19.89	24.11	29.32
711.8	761.8	24.31	28.69	27.84
812.0	862.0	23.31	26.86	29.93
912.3	962.3	22.34	25.52	27.97
1012.5	1062.5	24.92	26.48	26.07
1112.7	1162.7	22.82	25.09	25.91
1233.0	1283.0	22.71	24.44	24.91
1333.3	1383.3	22.77	22.82	23.35
1453.5	1503.5	22.55	22.45	22.97
1553.8	1603.8	21.82	23.21	23.38
1674.1	1724.1	21.34	22.89	23.74
1774.3	1824.3	21.38	21.36	21.84
1894.6	1944.6	19.49	19.90	19.52
1994.8	2044.8	18.18	18.47	17.87
2115.1	2165.1	18.04	18.27	17.44
2215.4	2265.4	17.59	17.77	17.49
2335.7	2385.7	18.37	18.64	18.03
2435.9	2485.9	18.04	18.74	18.79
2556.2	2606.2	18.12	18.91	19.35
2656.4	2706.4	18.17	19.01	19.78
2776.7	2826.7	19.03	20.04	20.62
2876.9	2926.9	18.74	20.50	21.80
2997.2	3047.2	19.32	19.79	20.38
3097.5	3147.5	18.42	19.67	20.87
3217.8	3267.8	18.96	19.92	21.30
3318.0	3368.0	19.90	20.27	21.57
3438.3	3488.3	21.22	20.62	22.06
3538.5	3588.5	23.36	23.12	23.96
3658.8	3708.8	21.22	24.72	25.51
3759.0	3809.0	20.97	22.89	24.08
3879.3	3929.3	23.86	23.60	22.73
3979.6	4029.6	19.51	20.26	20.69
4099.9	4149.9	19.43	18.81	19.08
4200.1	4250.1	18.53	18.15	18.48

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+10dBm (dB)		
		@LO (dBm)		
		+14	+17	+20
10.1	60.1	0.44	0.29	0.20
110.3	160.3	0.36	0.18	0.09
210.6	260.6	0.36	0.17	0.09
310.8	360.8	0.35	0.18	0.11
411.1	461.1	0.34	0.22	0.13
511.3	561.3	0.38	0.25	0.16
611.5	661.5	0.38	0.25	0.17
711.8	761.8	0.50	0.33	0.22
812.0	862.0	0.56	0.37	0.25
912.3	962.3	0.52	0.36	0.25
1012.5	1062.5	0.63	0.45	0.30
1112.7	1162.7	0.55	0.42	0.30
1233.0	1283.0	0.49	0.36	0.25
1333.3	1383.3	0.48	0.37	0.27
1453.5	1503.5	0.49	0.37	0.29
1553.8	1603.8	0.53	0.39	0.31
1674.1	1724.1	0.69	0.56	0.46
1774.3	1824.3	0.78	0.64	0.55
1894.6	1944.6	0.58	0.56	0.52
1994.8	2044.8	0.72	0.64	0.59
2115.1	2165.1	0.88	0.74	0.67
2215.4	2265.4	0.88	0.72	0.63
2335.7	2385.7	1.04	0.83	0.68
2435.9	2485.9	0.95	0.76	0.63
2556.2	2606.2	0.83	0.64	0.53
2656.4	2706.4	0.74	0.56	0.47
2776.7	2826.7	0.73	0.49	0.40
2876.9	2926.9	0.75	0.47	0.37
2997.2	3047.2	0.69	0.40	0.27
3097.5	3147.5	0.68	0.37	0.25
3217.8	3267.8	0.69	0.39	0.24
3318.0	3368.0	0.64	0.39	0.26
3438.3	3488.3	0.60	0.34	0.21
3538.5	3588.5	0.65	0.45	0.32
3658.8	3708.8	0.59	0.47	0.37
3759.0	3809.0	0.69	0.48	0.36
3879.3	3929.3	0.78	0.50	0.40
3979.6	4029.6	1.13	0.80	0.62
4099.9	4149.9	0.95	0.73	0.59
4200.1	4250.1	0.97	0.76	0.64

Frequency Mixer

TUF-18DHSM+

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=900.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=100.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1800.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+17			+17			+17
700.0	200.1	7.29	50.0	150.1	6.96	750.0	1050.1	7.95
683.3	216.8	7.30	67.9	168.0	6.96	732.1	1068.0	7.96
666.7	233.4	7.33	85.9	186.0	6.94	714.1	1086.0	7.99
650.0	250.1	7.38	103.8	203.9	6.91	696.2	1103.9	8.04
633.3	266.8	7.38	121.8	221.9	6.83	678.2	1121.9	8.07
616.7	283.4	7.40	139.7	239.8	6.84	660.3	1139.8	8.05
600.0	300.1	7.41	157.7	257.8	6.79	642.3	1157.8	8.07
583.3	316.8	7.33	175.6	275.7	6.83	624.4	1175.7	8.07
566.7	333.4	7.35	193.6	293.7	6.79	606.4	1193.7	8.09
550.0	350.1	7.34	211.5	311.6	6.78	588.5	1211.6	8.07
533.3	366.8	7.38	229.5	329.6	6.73	570.5	1229.6	8.07
516.7	383.4	7.35	247.4	347.5	6.73	552.6	1247.5	8.01
500.0	400.1	7.37	265.4	365.5	6.72	534.6	1265.5	8.00
483.3	416.8	7.32	283.3	383.4	6.75	516.7	1283.4	7.93
466.7	433.4	7.31	301.3	401.4	6.72	498.7	1301.4	7.96
450.0	450.1	7.34	319.2	419.3	6.70	480.8	1319.3	7.84
433.3	466.8	7.24	337.2	437.3	6.67	462.8	1337.3	7.84
416.7	483.4	7.25	355.1	455.2	6.67	444.9	1355.2	7.74
400.0	500.1	7.24	373.1	473.2	6.65	426.9	1373.2	7.81
383.3	516.8	7.19	391.0	491.1	6.66	409.0	1391.1	7.77
366.7	533.4	7.21	409.0	509.1	6.66	391.0	1409.1	7.84
350.0	550.1	7.23	426.9	527.0	6.65	373.1	1427.0	7.75
333.3	566.8	7.25	444.9	545.0	6.63	355.1	1445.0	7.79
316.7	583.4	7.22	462.8	562.9	6.62	337.2	1462.9	7.73
300.0	600.1	7.22	480.8	580.9	6.64	319.2	1480.9	7.78
283.3	616.8	7.21	498.7	598.8	6.61	301.3	1498.8	7.73
266.7	633.4	7.19	516.7	616.8	6.62	283.3	1516.8	7.73
250.0	650.1	7.21	534.6	634.7	6.60	265.4	1534.7	7.67
233.3	666.8	7.19	552.6	652.7	6.61	247.4	1552.7	7.70
216.7	683.4	7.20	570.5	670.6	6.59	229.5	1570.6	7.69
200.0	700.1	7.17	588.5	688.6	6.63	211.5	1588.6	7.72
183.3	716.8	7.19	606.4	706.5	6.61	193.6	1606.5	7.72
166.7	733.4	7.16	624.4	724.5	6.64	175.6	1624.5	7.69
150.0	750.1	7.17	642.3	742.4	6.60	157.7	1642.4	7.63
133.3	766.8	7.15	660.3	760.4	6.63	139.7	1660.4	7.63
116.7	783.4	7.20	678.2	778.3	6.61	121.8	1678.3	7.63
100.0	800.1	7.17	696.2	796.3	6.66	103.8	1696.3	7.61
83.3	816.8	7.21	714.1	814.2	6.66	85.9	1714.2	7.64
66.7	833.4	7.19	732.1	832.2	6.70	67.9	1732.2	7.61
50.0	850.1	7.29	750.0	850.1	6.68	50.0	1750.1	7.70

Frequency Mixer

TUF-18DHSM+

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+14	+17	+20	+14	+17	+20
10.1	30.84	34.66	38.44	24.07	25.87	27.53
110.3	47.18	54.27	64.61	33.09	36.09	38.50
210.6	54.21	66.20	60.46	34.29	36.85	37.89
310.8	60.02	56.34	53.03	34.24	35.63	35.00
411.0	55.72	50.69	48.57	34.74	33.84	32.56
511.3	50.56	47.42	45.69	33.42	31.70	30.12
611.5	49.19	45.58	43.82	32.18	29.86	28.41
711.8	48.36	44.60	42.45	30.91	28.50	26.91
812.0	47.43	43.70	41.23	29.91	27.27	25.56
912.2	48.57	44.11	41.42	28.35	25.73	24.31
1012.5	51.61	46.21	42.82	27.71	24.92	23.41
1112.7	46.71	46.29	43.08	26.95	24.39	22.84
1233.0	42.29	42.95	42.43	26.33	23.90	22.48
1333.2	40.06	40.86	40.21	25.73	23.37	21.99
1453.5	38.27	39.45	39.70	25.43	23.07	21.61
1553.7	37.15	38.22	38.75	25.35	23.11	21.68
1674.0	35.87	36.63	36.91	24.70	22.73	21.60
1774.3	34.47	35.13	35.52	24.57	22.74	21.77
1894.6	32.96	33.78	34.36	24.76	23.17	22.25
1994.8	32.29	33.27	34.10	25.56	24.06	22.99
2115.1	31.98	33.28	34.53	26.46	25.05	24.04
2215.3	32.39	33.71	35.24	27.33	25.77	24.87
2335.6	33.76	35.84	37.78	28.50	27.10	26.04
2435.8	34.92	37.87	40.70	30.18	28.36	27.47
2556.1	36.41	40.05	44.16	32.34	30.21	29.00
2656.4	37.14	40.72	45.57	32.89	31.17	29.99
2776.6	42.81	49.04	62.15	34.59	32.56	31.57
2876.9	46.49	55.11	55.09	35.27	33.53	32.71
2997.2	50.50	50.70	47.05	35.30	33.87	33.27
3097.4	50.16	46.89	43.53	36.24	34.79	33.75
3217.7	46.63	45.63	43.03	36.99	34.97	33.62
3317.9	45.59	47.05	44.25	37.01	35.26	33.73
3438.2	48.16	46.88	44.57	38.64	35.73	33.70
3538.4	48.43	46.53	44.75	40.13	36.76	34.35
3658.7	42.64	42.38	42.58	40.45	36.81	34.76
3759.0	41.47	41.56	41.93	39.86	36.69	34.92
3879.2	50.26	53.53	55.69	38.69	35.63	33.77
3979.5	47.11	44.47	43.17	37.26	35.08	33.42
4099.8	35.77	34.62	34.23	34.22	32.70	31.67
4200.0	30.55	29.48	29.20	33.43	32.31	31.30

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+14	+17	+20
10.1	60.1	18.52	18.46	18.66
110.1	160.1	22.35	22.37	22.36
210.1	260.1	23.18	23.19	23.27
310.1	360.1	23.93	24.03	24.04
410.1	460.1	24.80	24.87	24.91
510.1	560.1	25.80	25.85	25.82
610.1	660.1	26.46	26.54	26.47
710.1	760.1	27.25	27.14	26.75
810.1	860.1	28.28	27.56	26.93
910.1	960.1	28.67	27.89	27.20
1010.1	1060.1	28.49	27.62	26.93
1110.1	1160.1	29.15	28.29	27.56
1210.1	1260.1	30.63	29.92	29.17
1310.1	1360.1	33.09	32.38	31.63
1410.1	1460.1	36.52	35.38	34.15
1510.1	1560.1	39.67	38.50	36.97
1630.1	1680.1	42.80	40.78	38.89
1730.1	1780.1	43.12	40.91	39.17
1850.1	1900.1	44.42	39.67	37.56
1950.1	2000.1	41.53	38.26	36.50
2070.1	2120.1	38.56	36.67	35.17
2170.0	2220.0	33.96	32.80	32.07
2290.0	2340.0	32.06	31.06	30.60
2390.0	2440.0	30.81	29.75	29.33
2510.0	2560.0	29.67	28.64	27.93
2610.0	2660.0	28.56	28.00	27.71
2730.0	2780.0	26.62	26.25	26.03
2830.0	2880.0	25.99	25.85	25.76
2950.0	3000.0	24.70	24.63	24.69
3050.0	3100.0	25.11	24.76	24.53
3170.0	3220.0	25.41	25.12	24.97
3270.0	3320.0	25.61	25.15	24.67
3390.0	3440.0	25.71	25.37	25.01
3490.0	3540.0	24.96	24.68	24.39
3610.0	3660.0	24.00	23.98	23.89
3710.0	3760.0	25.12	24.85	24.48
3830.0	3880.0	27.49	27.10	26.73
3930.0	3980.0	29.69	28.81	28.23
4050.0	4100.0	29.80	28.93	28.45
4150.0	4200.0	27.95	27.14	26.94

Frequency Mixer

TUF-18DHSM+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=1800.1MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+14	+17	+20		+14	+17	+20		+14	+17	+20
10.1	60.1	1.83	1.85	1.87	10.1	2.08	2.57	3.16	50.0	1.33	1.48	1.58
110.1	160.1	1.06	1.13	1.20	110.3	1.69	2.34	3.11	67.9	1.31	1.47	1.59
210.1	260.1	1.08	1.11	1.15	210.6	1.63	2.27	3.00	85.9	1.25	1.41	1.52
310.1	360.1	1.17	1.15	1.16	310.8	1.58	2.19	2.89	103.8	1.20	1.33	1.44
410.1	460.1	1.26	1.22	1.22	411.0	1.51	2.09	2.75	121.8	1.20	1.33	1.44
510.1	560.1	1.37	1.34	1.32	511.3	1.43	1.98	2.60	139.7	1.23	1.37	1.48
610.1	660.1	1.55	1.51	1.48	611.5	1.36	1.88	2.45	157.7	1.23	1.38	1.49
710.1	760.1	1.73	1.68	1.64	711.8	1.28	1.76	2.29	175.6	1.21	1.35	1.46
810.1	860.1	1.94	1.86	1.81	812.0	1.21	1.65	2.14	193.6	1.19	1.33	1.44
910.1	960.1	2.21	2.11	2.04	912.2	1.14	1.55	2.02	211.5	1.18	1.30	1.41
1010.1	1060.1	2.53	2.40	2.32	1012.5	1.07	1.48	1.92	229.5	1.18	1.29	1.39
1110.1	1160.1	2.80	2.64	2.52	1112.7	1.04	1.44	1.87	247.4	1.19	1.31	1.41
1210.1	1260.1	2.91	2.73	2.61	1233.0	1.13	1.47	1.89	265.4	1.20	1.33	1.44
1310.1	1360.1	2.98	2.80	2.67	1333.2	1.23	1.54	1.96	283.3	1.20	1.32	1.43
1410.1	1460.1	3.06	2.88	2.74	1453.5	1.35	1.68	2.11	301.3	1.17	1.29	1.39
1510.1	1560.1	3.03	2.84	2.70	1553.7	1.47	1.83	2.29	319.2	1.16	1.28	1.38
1630.1	1680.1	2.83	2.65	2.53	1674.0	1.61	2.02	2.51	337.2	1.17	1.29	1.39
1730.1	1780.1	2.75	2.58	2.46	1774.3	1.72	2.17	2.71	355.1	1.19	1.30	1.40
1850.1	1900.1	2.62	2.46	2.34	1894.6	1.88	2.39	2.96	373.1	1.18	1.29	1.38
1950.1	2000.1	2.38	2.24	2.12	1994.8	1.99	2.54	3.14	391.0	1.18	1.29	1.39
2070.1	2120.1	2.15	2.03	1.92	2115.1	2.14	2.73	3.35	409.0	1.19	1.31	1.41
2170.0	2220.0	2.00	1.90	1.81	2215.3	2.22	2.83	3.47	426.9	1.19	1.30	1.40
2290.0	2340.0	1.68	1.60	1.54	2335.6	2.25	2.87	3.50	444.9	1.17	1.28	1.37
2390.0	2440.0	1.52	1.45	1.41	2435.8	2.28	2.89	3.52	462.8	1.16	1.28	1.37
2510.0	2560.0	1.49	1.45	1.41	2556.1	2.28	2.86	3.45	480.8	1.19	1.30	1.39
2610.0	2660.0	1.44	1.39	1.35	2656.4	2.31	2.86	3.42	498.7	1.19	1.30	1.39
2730.0	2780.0	1.42	1.39	1.39	2776.6	2.31	2.84	3.36	516.7	1.18	1.29	1.38
2830.0	2880.0	1.52	1.52	1.53	2876.9	2.30	2.79	3.28	534.6	1.18	1.30	1.40
2950.0	3000.0	1.58	1.56	1.57	2997.2	2.33	2.77	3.22	552.6	1.18	1.29	1.39
3050.0	3100.0	1.57	1.54	1.53	3097.4	2.30	2.70	3.11	570.5	1.17	1.26	1.35
3170.0	3220.0	1.62	1.61	1.63	3217.7	2.25	2.58	2.93	588.5	1.17	1.26	1.34
3270.0	3320.0	1.65	1.62	1.63	3317.9	2.19	2.48	2.79	606.4	1.19	1.29	1.38
3390.0	3440.0	1.63	1.54	1.50	3438.2	2.09	2.34	2.60	624.4	1.21	1.31	1.40
3490.0	3540.0	1.59	1.46	1.39	3538.4	2.03	2.26	2.49	642.3	1.17	1.27	1.36
3610.0	3660.0	1.71	1.56	1.45	3658.7	1.92	2.14	2.35	660.3	1.13	1.23	1.31
3710.0	3760.0	1.80	1.66	1.55	3759.0	1.85	2.06	2.27	678.2	1.13	1.22	1.30
3830.0	3880.0	1.93	1.81	1.71	3879.2	1.79	2.00	2.21	696.2	1.16	1.24	1.32
3930.0	3980.0	2.02	1.87	1.77	3979.5	1.79	1.98	2.19	714.1	1.18	1.26	1.34
4050.0	4100.0	2.08	1.93	1.82	4099.8	1.81	1.97	2.15	732.1	1.17	1.27	1.36
4150.0	4200.0	2.06	1.90	1.79	4200.0	1.81	1.95	2.12	750.0	1.16	1.27	1.36

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	6	32	22	42	26	37	24	39	39	51
1	-	26	+0	29	14	36	22	38	29	35	37	49
2	79	49	57	51	41	56	44	60	45	59	40	48
3	>100	61	42	53	47	57	51	65	53	57	58	55
4	>100	78	68	71	60	61	62	68	62	72	63	74
5	>100	83	67	83	67	69	58	69	62	74	62	68
6	>100	85	73	80	75	77	69	73	74	83	71	79
7	>100	87	77	96	75	87	75	78	75	77	78	77
8	>100	93	88	93	89	88	89	84	81	84	85	97
9	>100	>98	91	96	95	>98	92	97	>98	88	91	90
10	100	>98	>98	>98	>98	>98	>98	>98	>98	94	91	89
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 950.10 MHz; +5.00 dBm.
LO IN: 1000.01 MHz; +17.00 dBm
IF OUT: 49.91 MHz; -2.33 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	+4	21	11	29	15	24	12	24	24	45
1	-	26	+0	30	14	35	22	36	29	32	35	44
2	90	60	67	58	51	62	56	72	54	70	49	55
3	>100	82	62	72	62	79	70	79	65	82	67	77
4	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
5	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
6	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
7	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
8	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
9	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
10	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions: RF IN: 950.10 MHz; -5.00 dBm.
LO IN: 1000.01 MHz; +17.00 dBm
IF OUT: 49.91 MHz; -12.42 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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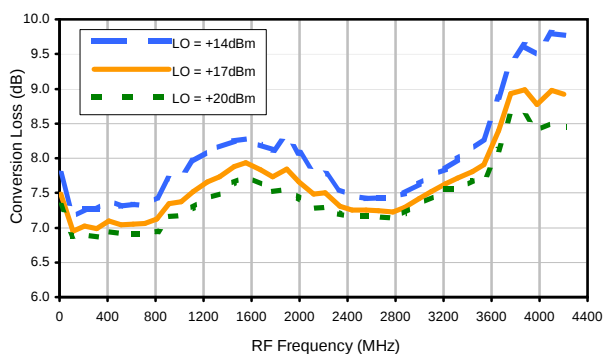


Frequency Mixer

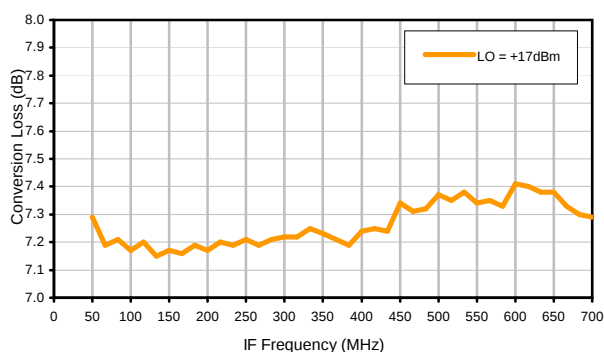
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Typical Performance Curves

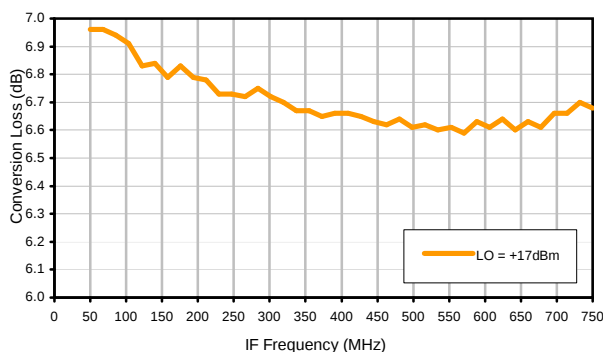
Conversion Loss @ IF=50MHz



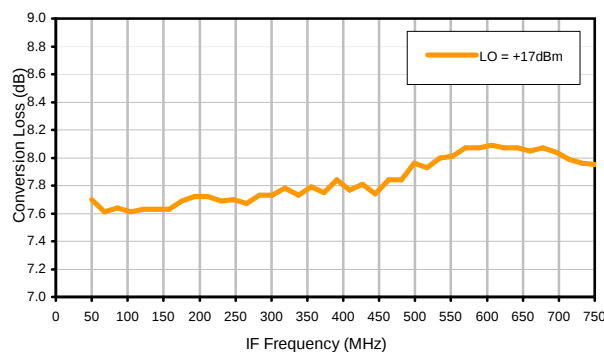
Conversion Loss vs. IF @ RF=900.1MHz



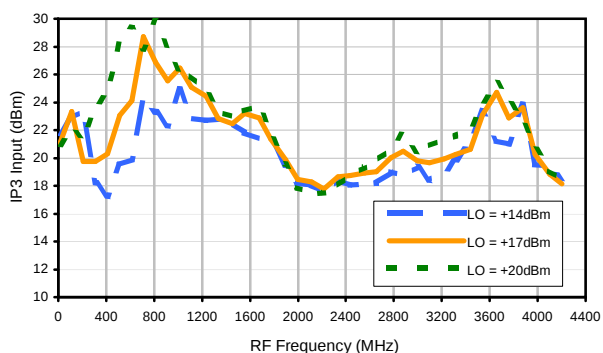
Conversion Loss vs. IF @ RF=100.1MHz



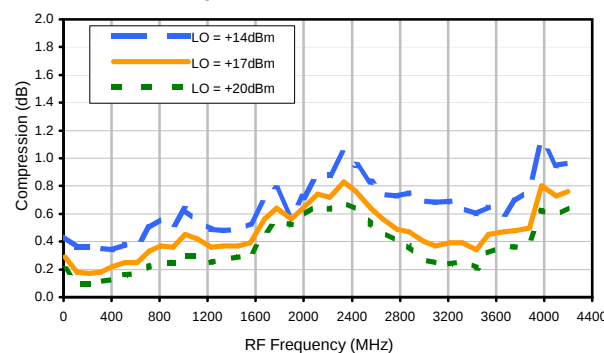
Conversion Loss vs. IF @ RF=1800.1MHz



IP3 Input

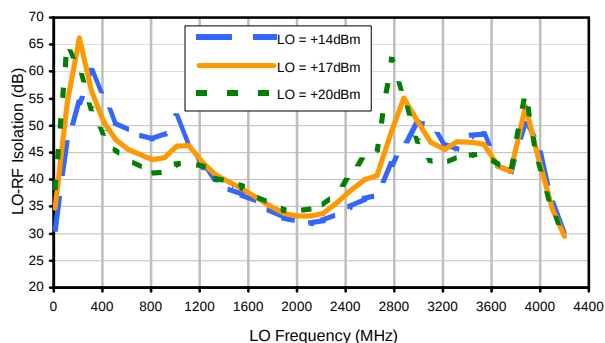


Compression @ RF IN=+10dBm

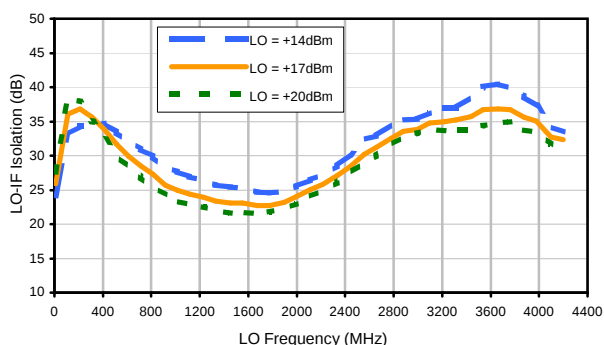


Typical Performance Curves

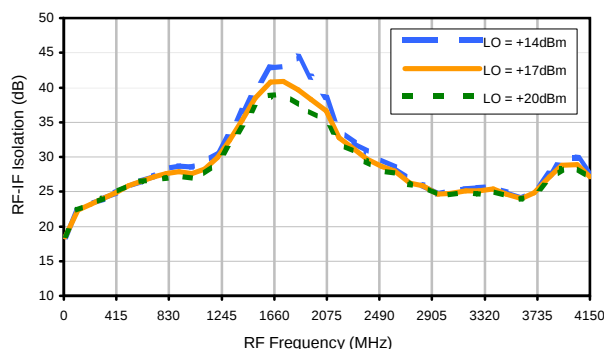
LO-RF Isolation



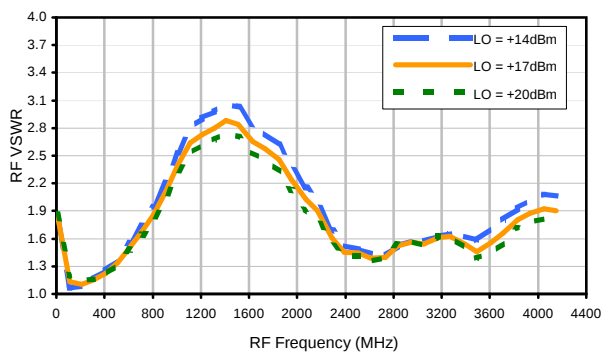
LO-IF Isolation



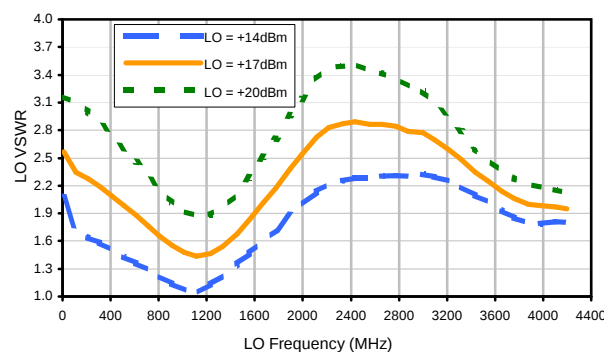
RF-IF Isolation



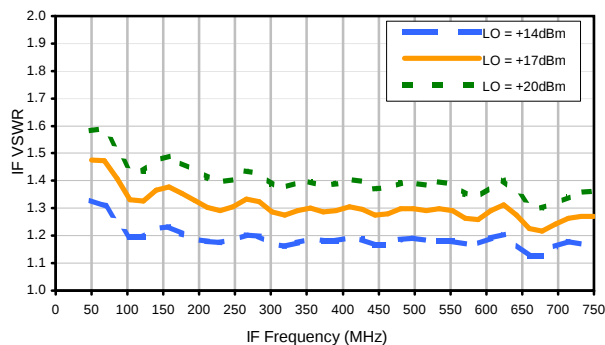
RF VSWR



LO VSWR



IF VSWR



Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	6	32	22	42	26	37	24	39	39	51
1	-	26	+0	29	14	36	22	38	29	35	37	49
2	79	49	57	51	41	56	44	60	45	59	40	48
3	>100	61	42	53	47	57	51	65	53	57	58	55
4	>100	78	68	71	60	61	62	68	62	72	63	74
5	>100	83	67	83	67	69	58	69	62	74	62	68
6	>100	85	73	80	75	77	69	73	74	83	71	79
7	>100	87	77	96	75	87	75	78	75	77	78	77
8	>100	93	88	93	89	88	89	84	81	84	85	97
9	>100	>98	91	96	95	>98	92	97	>98	88	91	90
10	100	>98	>98	>98	>98	>98	>98	>98	>98	94	91	89
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions: RF IN: 950.10 MHz; +5.00 dBm.
LO IN: 1000.01 MHz; +17.00 dBm
IF OUT: 49.91 MHz; -2.33 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	+4	21	11	29	15	24	12	24	24	45
1	-	26	+0	30	14	35	22	36	29	32	35	44
2	90	60	67	58	51	62	56	72	54	70	49	55
3	>100	82	62	72	62	79	70	79	65	82	67	77
4	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
5	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
6	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
7	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
8	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
9	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
10	>100	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88	>88
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions: RF IN: 950.10 MHz; -5.00 dBm.
LO IN: 1000.01 MHz; +17.00 dBm
IF OUT: 49.91 MHz; -12.42 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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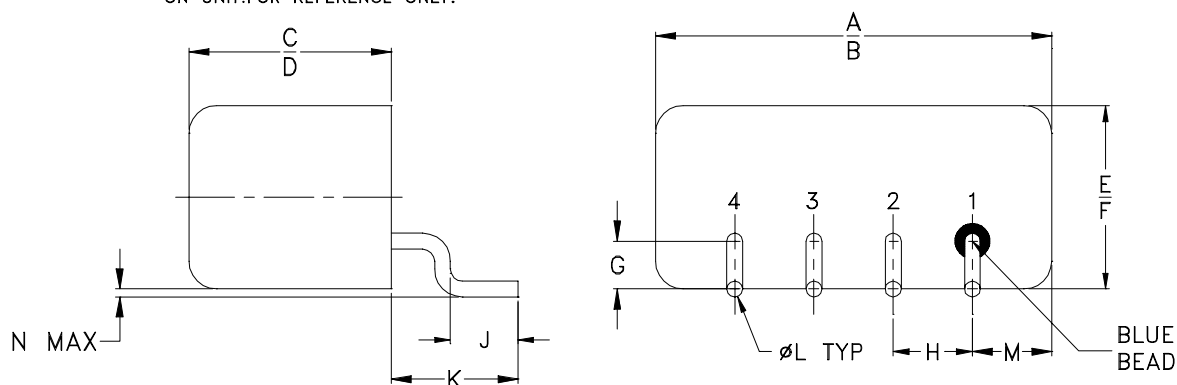
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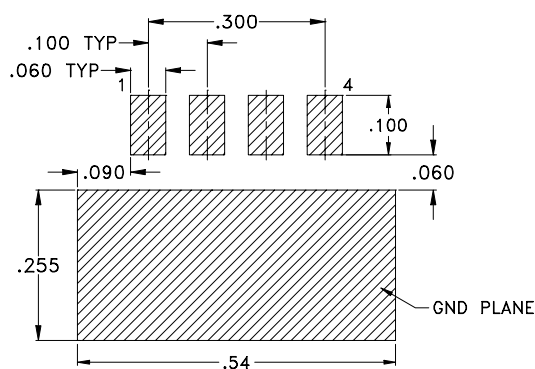
Outline Dimensions

NNN150

NOTE: BLUE BEAD INDICATES PIN #1.
PIN NUMBERS DO NOT APPEAR
ON UNIT.FOR REFERENCE ONLY.



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm .002$

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. $\pm .03$; 3 Pl. $\pm .015$

Notes:

- Header material C.R.S. Pin material #52 alloy.
- Finish: Electro-Tin, hot-oil flowed or electro-Tin-Silver.
- Cover material: Cupro-Nickel.
- Pin's meniscus 0.015 inch max.
- Special Tolerances: Pin diameter $\pm .005$ inch.



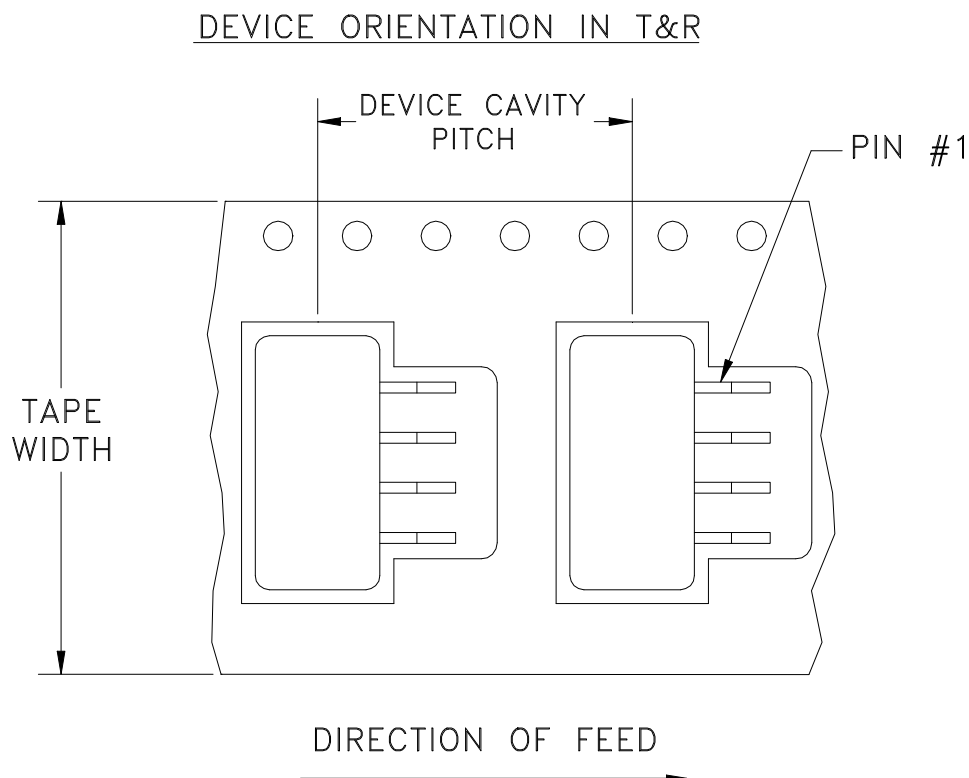
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REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M86549	NEW RELEASE	04/15/03	GF	DJ
A	M102713	UPDATED NOTES & DISCRPTION	01/14/06	GF	IL

Technical drawing of a PCB layout for a 16-pin package. The drawing shows a 4x4 grid of vias (PTH) with dimensions: .064 LINE WIDTH, 3 PL. (SEE NOTE BELOW); .030; .020 2 PL.; .090 TYP; .038; .072; .080 TYP; and Ø.020 PTH, 20 PL. FOR GROUND. The package outline is indicated by a dashed line.

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

 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

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

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Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

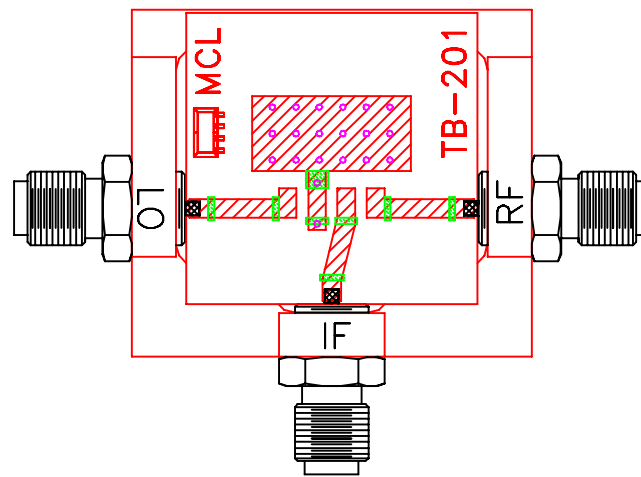
PL, z/cm NNN150, TUF/TFAS-SM, TB-201

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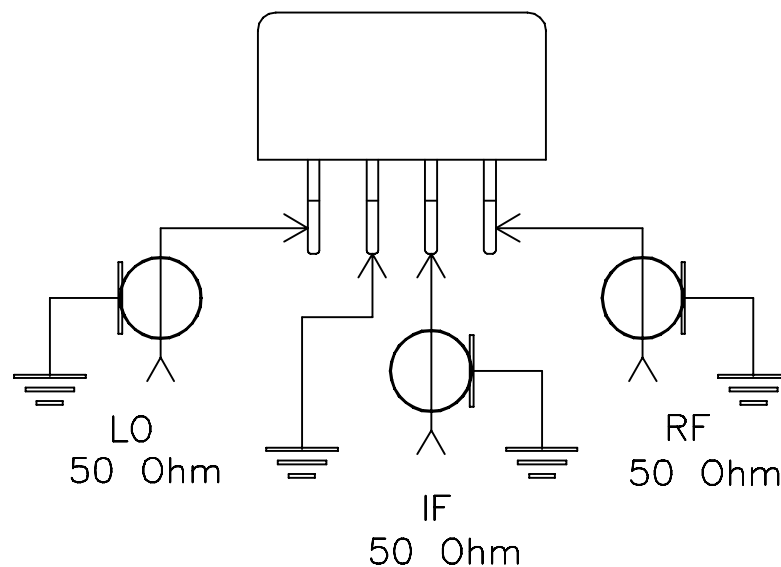
ASHEETA1.DWG REV:A DATE:01/12/95

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-081		REV: A
FILE: 98PL081		SCALE: 6:1	SHEET: 1 OF 1	

Evaluation Board and Circuit



TB-201



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,
Dielectric Constant=3.5, Thickness=.030 inch.

 **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
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



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
Barometric Pressure	100,000 Feet	MIL-STD-202, Method 105, Condition D