

Non-Catalog Model

Frequency Mixer

TUF-11ALH

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 : B02

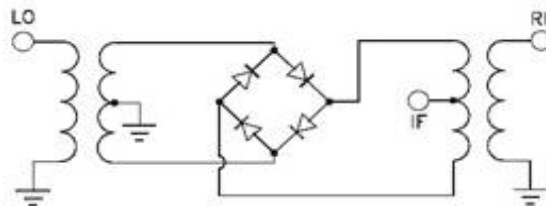
ELECTRICAL SPECIFICATIONS 50Ω @ +25°C					
Parameter		Min.	Typ.	Max.	Units
Frequency	LO (fL to fU)	1400		1900	MHz
	RF (fL to fU)	1400		1900	MHz
	IF	40		500	MHz
Conversion Loss			7.0	8.6	dB
LO-RF Isolation		20	36		dB
LO-IF Isolation		15	28		dB
1 dB Comp. Input Power			+5		dBm

Note: 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-11ALH

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=40MHz (dB)		
		@LO (dBm)		
		+7	+10	+13
800.1	840.1	10.73	10.10	9.76
880.6	920.6	8.99	8.59	8.38
961.1	1001.1	8.03	7.72	7.55
1041.6	1081.6	7.76	7.47	7.29
1122.1	1162.1	7.86	7.56	7.42
1202.6	1242.6	8.07	7.72	7.59
1283.1	1323.1	8.34	7.81	7.60
1363.6	1403.6	8.45	7.80	7.50
1444.1	1484.1	8.35	7.64	7.27
1524.6	1564.6	8.21	7.40	7.01
1605.1	1645.1	8.01	7.13	6.74
1685.6	1725.6	7.90	6.96	6.56
1766.1	1806.1	7.81	6.95	6.56
1846.6	1886.6	7.81	6.91	6.51
1927.1	1967.1	7.74	6.84	6.50
2007.6	2047.6	7.68	6.88	6.52
2088.2	2128.2	7.63	6.85	6.51
2168.7	2208.7	7.77	6.99	6.58
2249.2	2289.2	7.89	7.09	6.76
2329.7	2369.7	7.94	7.14	6.75
2410.2	2450.2	7.95	7.27	6.86
2490.7	2530.7	8.00	7.35	6.97
2571.2	2611.2	8.05	7.42	7.09
2651.7	2691.7	8.10	7.52	7.21
2732.2	2772.2	8.17	7.62	7.29
2812.7	2852.7	8.24	7.67	7.34
2893.2	2933.2	8.25	7.70	7.38
2973.7	3013.7	8.27	7.74	7.47
3054.2	3094.2	8.34	7.76	7.47
3134.7	3174.7	8.44	7.83	7.52
3215.2	3255.2	8.63	7.94	7.56
3295.7	3335.7	8.92	8.15	7.70
3376.2	3416.2	9.30	8.54	8.01
3456.7	3496.7	9.60	8.75	8.23
3537.2	3577.2	9.83	8.93	8.40
3637.8	3677.8	10.29	9.21	8.76
3718.3	3758.3	10.75	9.36	8.94
3819.0	3859.0	11.41	9.65	9.16
3899.5	3939.5	12.32	9.83	9.15
4000.1	4040.1	13.77	10.48	9.30

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)		
		@LO (dBm)		
		+7	+10	+13
800.1	840.1	20.20	23.37	24.54
880.6	920.6	19.32	20.89	20.90
961.1	1001.1	17.40	19.24	21.09
1041.6	1081.6	18.30	19.61	21.34
1122.1	1162.1	18.63	21.17	22.20
1202.6	1242.6	20.32	21.51	22.89
1283.1	1323.1	22.98	22.75	22.41
1363.6	1403.6	22.30	26.19	23.95
1444.1	1484.1	19.30	21.54	23.37
1524.6	1564.6	17.57	19.57	20.91
1605.1	1645.1	16.75	18.19	18.92
1685.6	1725.6	16.05	18.02	18.95
1766.1	1806.1	15.29	16.90	17.57
1846.6	1886.6	14.60	16.17	17.94
1927.1	1967.1	14.86	16.37	18.05
2007.6	2047.6	15.35	17.30	18.11
2088.2	2128.2	15.74	17.19	19.01
2168.7	2208.7	15.60	16.93	18.84
2249.2	2289.2	15.46	16.60	18.15
2329.7	2369.7	15.93	17.62	19.00
2410.2	2450.2	17.81	17.64	18.87
2490.7	2530.7	17.91	18.80	19.39
2571.2	2611.2	17.65	19.49	19.76
2651.7	2691.7	17.92	18.64	19.25
2732.2	2772.2	19.32	20.32	20.30
2812.7	2852.7	19.45	20.48	20.62
2893.2	2933.2	19.34	21.48	21.41
2973.7	3013.7	20.02	21.11	23.30
3054.2	3094.2	19.48	23.88	23.13
3134.7	3174.7	19.92	21.85	24.41
3215.2	3255.2	17.94	20.29	21.95
3295.7	3335.7	19.53	20.30	22.81
3376.2	3416.2	19.86	19.41	20.70
3456.7	3496.7	19.78	22.38	20.82
3537.2	3577.2	20.18	21.07	20.04
3637.8	3677.8	19.44	25.85	23.29
3718.3	3758.3	18.10	21.16	22.63
3819.0	3859.0	16.98	20.19	23.31
3899.5	3939.5	15.14	17.53	23.47
4000.1	4040.1	14.39	19.54	19.94

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+5dBm (dB)		
		@LO (dBm)		
		+7	+10	+13
800.1	840.1	0.52	0.51	0.46
880.6	920.6	1.37	1.13	0.92
961.1	1001.1	1.39	1.13	0.91
1041.6	1081.6	1.08	0.76	0.57
1122.1	1162.1	0.84	0.48	0.35
1202.6	1242.6	0.83	0.49	0.34
1283.1	1323.1	0.96	0.71	0.51
1363.6	1403.6	1.13	0.92	0.74
1444.1	1484.1	1.38	1.24	1.06
1524.6	1564.6	1.62	1.50	1.31
1605.1	1645.1	1.80	1.76	1.50
1685.6	1725.6	2.00	1.87	1.64
1766.1	1806.1	2.00	1.87	1.60
1846.6	1886.6	2.01	1.83	1.57
1927.1	1967.1	2.08	1.86	1.61
2007.6	2047.6	1.99	1.79	1.54
2088.2	2128.2	2.10	1.79	1.55
2168.7	2208.7	2.08	1.74	1.49
2249.2	2289.2	2.07	1.71	1.43
2329.7	2369.7	1.86	1.63	1.36
2410.2	2450.2	1.77	1.45	1.26
2490.7	2530.7	1.94	1.54	1.28
2571.2	2611.2	1.93	1.48	1.17
2651.7	2691.7	1.96	1.44	1.12
2732.2	2772.2	1.84	1.36	1.03
2812.7	2852.7	1.89	1.32	1.09
2893.2	2933.2	2.11	1.43	1.04
2973.7	3013.7	2.17	1.38	1.00
3054.2	3094.2	2.26	1.36	0.97
3134.7	3174.7	2.41	1.43	0.95
3215.2	3255.2	2.39	1.39	0.91
3295.7	3335.7	2.46	1.34	0.86
3376.2	3416.2	2.64	1.35	0.78
3456.7	3496.7	2.69	1.37	0.72
3537.2	3577.2	2.62	1.27	0.62
3637.8	3677.8	2.59	1.28	0.48
3718.3	3758.3	2.73	1.49	0.61
3819.0	3859.0	2.16	1.49	0.58
3899.5	3939.5	1.53	1.55	0.63
4000.1	4040.1	0.60	1.28	0.57

Frequency Mixer

TUF-11ALH

Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1650.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1400.1MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=1900.1MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+10			+10			+10
250.0	1400.1	6.74	40.0	1440.1	7.71	500.0	1400.1	6.20
237.4	1412.7	6.81	51.8	1451.9	7.69	488.2	1411.9	6.22
224.7	1425.4	6.82	63.6	1463.7	7.75	476.4	1423.7	6.20
212.1	1438.0	6.77	75.4	1475.5	7.70	464.6	1435.5	6.23
199.5	1450.6	6.84	87.2	1487.3	7.75	452.8	1447.3	6.22
186.8	1463.3	6.81	99.0	1499.1	7.82	441.0	1459.1	6.23
174.2	1475.9	6.82	110.8	1510.9	7.77	429.2	1470.9	6.27
161.6	1488.5	6.86	122.6	1522.7	7.76	417.4	1482.7	6.29
148.9	1501.2	6.82	134.4	1534.5	7.81	405.6	1494.5	6.28
136.3	1513.8	6.87	146.2	1546.3	7.76	393.8	1506.3	6.31
123.7	1526.4	6.90	157.9	1558.0	7.84	382.1	1518.0	6.29
111.1	1539.0	6.86	169.7	1569.8	7.90	370.3	1529.8	6.29
98.4	1551.7	6.93	181.5	1581.6	7.85	358.5	1541.6	6.34
85.8	1564.3	6.94	193.3	1593.4	7.90	346.7	1553.4	6.33
73.2	1576.9	6.91	205.1	1605.2	7.94	334.9	1565.2	6.35
60.5	1589.6	7.02	216.9	1617.0	7.88	323.1	1577.0	6.40
47.9	1602.2	7.03	228.7	1628.8	7.91	311.3	1588.8	6.39
35.3	1614.8	7.10	240.5	1640.6	7.89	299.5	1600.6	6.39
22.6	1627.5	7.32	252.3	1652.4	7.81	287.7	1612.4	6.45
10.0	1640.1	7.79	264.1	1664.2	7.86	275.9	1624.2	6.42
10.0	1660.1	7.67	275.9	1676.0	7.86	264.1	1636.0	6.42
22.6	1672.7	7.09	287.7	1687.8	7.80	252.3	1647.8	6.47
35.3	1685.4	7.08	299.5	1699.6	7.82	240.5	1659.6	6.46
47.9	1698.0	7.05	311.3	1711.4	7.80	228.7	1671.4	6.50
60.5	1710.6	7.03	323.1	1723.2	7.76	216.9	1683.2	6.58
73.2	1723.3	7.09	334.9	1735.0	7.78	205.1	1695.0	6.54
85.8	1735.9	7.04	346.7	1746.8	7.75	193.3	1706.8	6.60
98.4	1748.5	7.04	358.5	1758.6	7.73	181.5	1718.6	6.66
111.1	1761.2	7.08	370.3	1770.4	7.79	169.7	1730.4	6.59
123.7	1773.8	7.03	382.1	1782.2	7.79	157.9	1742.2	6.64
136.3	1786.4	7.06	393.8	1793.9	7.80	146.2	1753.9	6.66
148.9	1799.0	7.06	405.6	1805.7	7.82	134.4	1765.7	6.65
161.6	1811.7	6.99	417.4	1817.5	7.77	122.6	1777.5	6.73
174.2	1824.3	7.01	429.2	1829.3	7.75	110.8	1789.3	6.77
186.8	1836.9	6.97	441.0	1841.1	7.74	99.0	1801.1	6.73
199.5	1849.6	6.95	452.8	1852.9	7.68	87.2	1812.9	6.79
212.1	1862.2	6.96	464.6	1864.7	7.70	75.4	1824.7	6.82
224.7	1874.8	6.94	476.4	1876.5	7.71	63.6	1836.5	6.80
237.4	1887.5	6.96	488.2	1888.3	7.65	51.8	1848.3	6.91
250.0	1900.1	7.00	500.0	1900.1	7.64	40.0	1860.1	6.95

REV. X2
TUF-11ALH
100818
Page 2 of 5

Frequency Mixer

TUF-11ALH

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+7	+10	+13	+7	+10	+13
800.1	43.47	46.79	49.27	23.04	22.27	21.88
880.6	40.06	43.90	48.13	23.06	22.39	21.92
961.1	37.68	41.30	45.54	23.27	22.51	22.05
1041.6	37.22	40.58	44.01	23.59	22.66	22.18
1122.1	36.99	39.85	42.77	24.17	23.09	22.53
1202.6	36.51	39.48	42.32	24.76	23.64	22.97
1283.1	35.75	39.04	42.32	25.51	24.36	23.43
1363.6	34.79	38.35	42.20	26.29	25.00	24.06
1444.1	33.95	37.41	41.35	27.12	25.68	24.61
1524.6	32.87	36.36	39.92	28.23	26.63	25.43
1605.1	32.35	35.61	38.86	29.16	27.65	26.25
1685.6	31.97	34.98	37.81	29.96	28.77	27.36
1766.1	31.61	34.18	36.71	30.69	30.12	29.08
1846.6	31.05	33.53	35.58	31.29	32.24	31.63
1927.1	30.71	33.03	34.36	32.30	35.66	35.82
2007.6	30.40	32.61	34.04	34.03	42.68	41.71
2088.2	30.31	32.17	33.84	38.86	48.12	36.52
2168.7	30.17	31.51	33.33	45.65	34.83	31.00
2249.2	29.98	31.10	32.64	35.00	29.46	27.49
2329.7	29.75	31.27	32.56	29.51	26.41	25.04
2410.2	29.48	31.19	33.04	26.28	24.42	23.60
2490.7	29.38	31.14	32.66	23.67	23.01	22.65
2571.2	29.19	31.27	32.79	21.95	21.79	21.80
2651.7	29.29	31.18	33.00	20.75	20.79	21.21
2732.2	29.34	31.34	33.12	19.81	20.18	20.64
2812.7	29.34	31.64	33.63	19.03	19.66	20.18
2893.2	29.47	31.90	34.27	18.56	19.27	19.91
2973.7	29.70	32.15	34.57	18.14	18.93	19.56
3054.2	29.95	32.25	34.59	17.79	18.54	19.25
3134.7	30.31	32.63	34.84	17.63	18.37	18.93
3215.2	30.68	32.94	35.31	17.56	18.24	18.79
3295.7	31.16	33.32	34.89	17.46	18.14	18.59
3376.2	31.60	34.15	36.08	17.42	17.99	18.39
3456.7	32.13	34.65	36.46	17.37	17.81	18.09
3537.2	32.40	34.78	36.21	17.42	17.74	17.96
3637.8	33.18	35.97	37.08	17.54	17.77	17.79
3718.3	33.56	36.35	38.01	17.63	17.64	17.68
3819.0	34.40	36.82	38.38	17.58	17.62	17.50
3899.5	35.39	37.75	38.49	17.60	17.51	17.23
4000.1	37.22	41.23	39.55	17.54	17.31	16.90

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+7	+10	+13
800.1	840.1	22.02	21.65	21.47
880.6	920.6	22.15	21.94	21.83
961.1	1001.1	22.55	22.71	22.87
1041.6	1081.6	23.14	23.47	23.75
1122.1	1162.1	22.81	23.09	23.23
1202.6	1242.6	21.99	22.20	22.28
1283.1	1323.1	21.75	21.97	22.10
1363.6	1403.6	21.78	22.01	22.19
1444.1	1484.1	22.60	22.83	23.06
1524.6	1564.6	24.10	24.34	24.58
1605.1	1645.1	26.35	26.68	26.97
1685.6	1725.6	29.33	29.62	30.05
1766.1	1806.1	33.42	33.81	34.15
1846.6	1886.6	38.17	38.17	38.61
1927.1	1967.1	39.04	38.32	37.64
2007.6	2047.6	36.19	35.13	34.02
2088.2	2128.2	33.49	32.23	30.94
2168.7	2208.7	31.91	30.75	29.13
2249.2	2289.2	30.53	29.16	28.06
2329.7	2369.7	29.62	27.90	26.76
2410.2	2450.2	28.97	27.61	26.39
2490.7	2530.7	28.64	27.20	26.27
2571.2	2611.2	28.66	27.19	26.20
2651.7	2691.7	28.28	27.20	26.33
2732.2	2772.2	27.98	27.07	26.04
2812.7	2852.7	27.77	27.02	26.26
2893.2	2933.2	27.61	26.95	26.14
2973.7	3013.7	27.57	26.97	26.39
3054.2	3094.2	27.37	26.77	26.20
3134.7	3174.7	27.04	26.67	26.27
3215.2	3255.2	26.58	26.47	26.33
3295.7	3335.7	26.23	25.62	25.45
3376.2	3416.2	25.91	25.38	25.18
3456.7	3496.7	25.56	25.04	24.86
3537.2	3577.2	24.91	24.53	24.21
3637.8	3677.8	24.17	23.81	23.46
3718.3	3758.3	23.60	23.49	23.00
3819.0	3859.0	22.67	22.72	22.17
3899.5	3939.5	21.88	22.35	21.86
4000.1	4040.1	20.92	21.89	21.58

Frequency Mixer

TUF-11ALH

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=1900.1MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+7	+10	+13		+7	+10	+13		+7	+10	+13
800.1	840.1	7.28	6.89	6.66	800.1	1.46	1.90	2.44	40.0	1.44	1.27	1.20
880.6	920.6	4.99	4.73	4.56	880.6	1.49	1.87	2.37	51.8	1.39	1.20	1.13
961.1	1001.1	3.52	3.30	3.19	961.1	1.53	1.86	2.34	63.6	1.34	1.16	1.09
1041.6	1081.6	2.83	2.69	2.63	1041.6	1.58	1.86	2.31	75.4	1.33	1.13	1.07
1122.1	1162.1	2.57	2.49	2.47	1122.1	1.62	1.84	2.26	87.2	1.36	1.16	1.06
1202.6	1242.6	2.41	2.37	2.37	1202.6	1.68	1.82	2.21	99.0	1.40	1.19	1.08
1283.1	1323.1	2.25	2.21	2.22	1283.1	1.75	1.83	2.17	110.8	1.41	1.20	1.08
1363.6	1403.6	2.01	1.95	1.94	1363.6	1.81	1.85	2.16	122.6	1.40	1.19	1.08
1444.1	1484.1	1.74	1.64	1.62	1444.1	1.84	1.85	2.14	134.4	1.39	1.18	1.08
1524.6	1564.6	1.55	1.43	1.39	1524.6	1.90	1.83	2.08	146.2	1.37	1.17	1.09
1605.1	1645.1	1.41	1.25	1.21	1605.1	1.94	1.81	2.00	157.9	1.37	1.16	1.08
1685.6	1725.6	1.30	1.12	1.06	1685.6	1.99	1.80	1.92	169.7	1.36	1.16	1.06
1766.1	1806.1	1.25	1.10	1.09	1766.1	2.02	1.79	1.84	181.5	1.35	1.15	1.04
1846.6	1886.6	1.31	1.22	1.23	1846.6	2.09	1.77	1.75	193.3	1.35	1.14	1.04
1927.1	1967.1	1.39	1.33	1.35	1927.1	2.15	1.75	1.65	205.1	1.36	1.15	1.06
2007.6	2047.6	1.46	1.42	1.44	2007.6	2.25	1.75	1.57	216.9	1.38	1.18	1.09
2088.2	2128.2	1.56	1.55	1.58	2088.2	2.27	1.75	1.49	228.7	1.39	1.18	1.10
2168.7	2208.7	1.71	1.71	1.73	2168.7	2.28	1.74	1.44	240.5	1.37	1.17	1.09
2249.2	2289.2	1.86	1.85	1.86	2249.2	2.26	1.73	1.41	252.3	1.34	1.14	1.07
2329.7	2369.7	1.93	1.90	1.89	2329.7	2.27	1.74	1.42	264.1	1.32	1.13	1.07
2410.2	2450.2	1.94	1.92	1.90	2410.2	2.27	1.75	1.44	275.9	1.32	1.13	1.08
2490.7	2530.7	1.99	1.97	1.97	2490.7	2.23	1.76	1.48	287.7	1.33	1.14	1.09
2571.2	2611.2	2.08	2.09	2.10	2571.2	2.22	1.78	1.54	299.5	1.34	1.15	1.08
2651.7	2691.7	2.15	2.15	2.17	2651.7	2.15	1.81	1.62	311.3	1.34	1.15	1.07
2732.2	2772.2	2.11	2.11	2.11	2732.2	2.12	1.84	1.70	323.1	1.33	1.13	1.07
2812.7	2852.7	2.05	2.04	2.04	2812.7	2.09	1.88	1.79	334.9	1.32	1.13	1.09
2893.2	2933.2	2.07	2.08	2.10	2893.2	2.04	1.90	1.87	346.7	1.31	1.14	1.11
2973.7	3013.7	2.18	2.23	2.27	2973.7	1.98	1.93	1.94	358.5	1.31	1.14	1.12
3054.2	3094.2	2.32	2.36	2.41	3054.2	1.94	1.97	2.04	370.3	1.31	1.13	1.10
3134.7	3174.7	2.38	2.41	2.43	3134.7	1.90	2.00	2.11	382.1	1.29	1.11	1.09
3215.2	3255.2	2.42	2.44	2.46	3215.2	1.86	2.02	2.17	393.8	1.27	1.10	1.10
3295.7	3335.7	2.54	2.55	2.57	3295.7	1.87	2.07	2.25	405.6	1.26	1.10	1.12
3376.2	3416.2	2.75	2.78	2.82	3376.2	1.96	2.19	2.40	417.4	1.26	1.11	1.13
3456.7	3496.7	2.95	2.98	3.02	3456.7	2.05	2.30	2.52	429.2	1.26	1.11	1.14
3537.2	3577.2	3.03	3.03	3.05	3537.2	2.11	2.36	2.60	441.0	1.25	1.10	1.13
3637.8	3677.8	3.07	2.99	3.02	3637.8	2.28	2.53	2.76	452.8	1.23	1.09	1.14
3718.3	3758.3	3.19	3.08	3.14	3718.3	2.44	2.66	2.90	464.6	1.21	1.09	1.16
3819.0	3859.0	3.50	3.28	3.37	3819.0	2.66	2.82	3.05	476.4	1.20	1.11	1.19
3899.5	3939.5	3.77	3.40	3.48	3899.5	2.89	2.99	3.19	488.2	1.21	1.13	1.20
4000.1	4040.1	4.05	3.48	3.45	4000.1	3.18	3.22	3.37	500.0	1.21	1.13	1.20

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	12	29	19	44	31	45	55	55	57	82
1	-	23	+0	38	16	42	47	52	61	62	66	74
2	>100	48	43	41	55	61	45	60	52	63	64	69
3	>100	40	37	54	31	59	49	50	63	64	62	81
4	>100	70	65	71	53	49	67	67	67	71	71	67
5	>100	65	70	55	52	58	43	73	51	71	67	76
6	>100	75	75	78	83	71	58	60	75	70	76	78
7	>100	79	87	83	81	74	62	73	56	86	73	74
8	>100	85	84	90	85	87	86	77	67	64	90	81
9	>100	>93	84	>93	>93	85	88	76	72	74	64	87
10	>100	>93	92	91	>93	>93	>93	90	>93	82	71	73
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 1650.1 MHz; 0.00 dBm.
LO IN: 1690.01 MHz; +10.00 dBm
IF OUT: 39.91 MHz; -7.25 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	2	20	8	30	17	32	40	43	48	62
1	-	24	+0	39	15	33	46	43	52	53	49	55
2	>100	58	52	46	59	62	52	67	54	57	66	60
3	>100	64	57	77	49	>83	58	74	69	80	73	>83
4	>100	>83	>83	>83	80	79	>83	>83	>83	>83	81	>83
5	>100	>83	>83	>83	>83	>83	80	>83	>83	>83	>83	>83
6	>100	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83
7	>100	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83
8	>100	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83
9	>100	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83
10	>100	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83
RF CAL	0	1	2	3	4	5	6	7	8	9	10	

LO HARMONICS ORDER

Test conditions:

RF IN: 1650.1 MHz; -10.00 dBm.
LO IN: 1690.01 MHz; +10.00 dBm
IF OUT: 39.91 MHz; -17.15 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.

REV. X2
TUF-11ALH
100818
Page 5 of 5



Mini-Circuits®

IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED • RoHS compliant

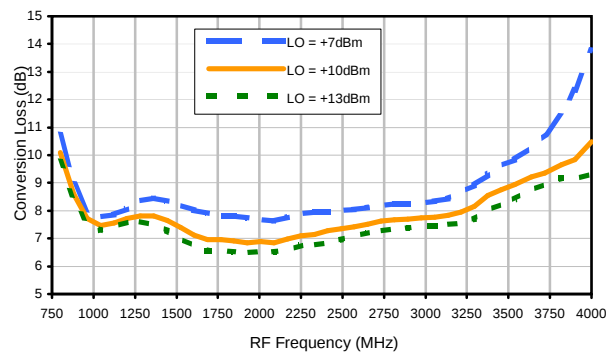
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

The Design Engineers Search Engine finds the model you need, instantly • For detailed performance specs & shopping online see

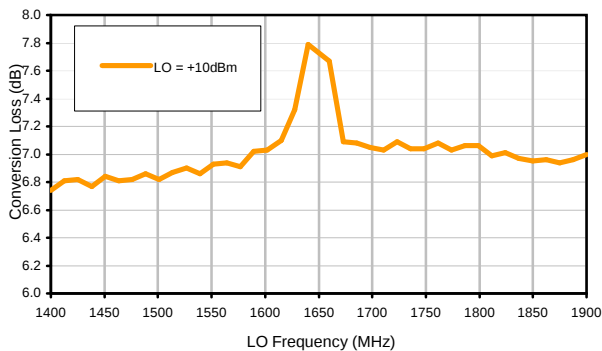


Typical Performance Curves

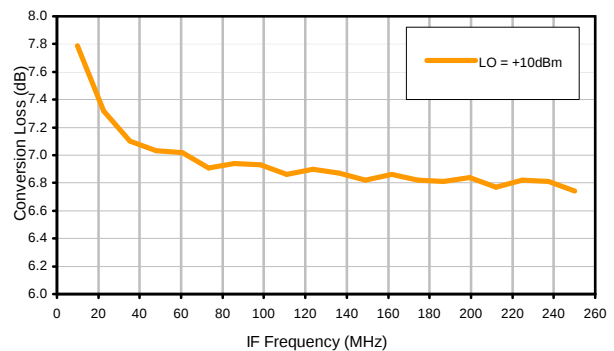
Conversion Loss @ IF=40MHz



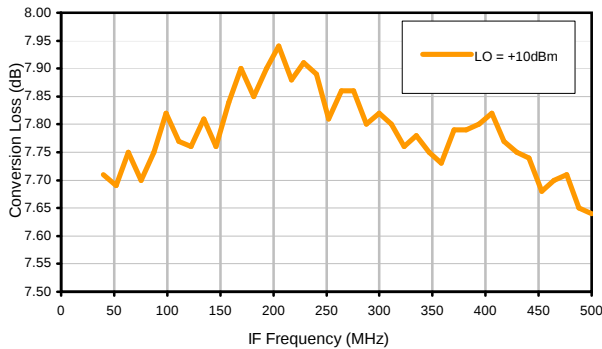
Conversion Loss vs. LO @ RF=1650.1MHz



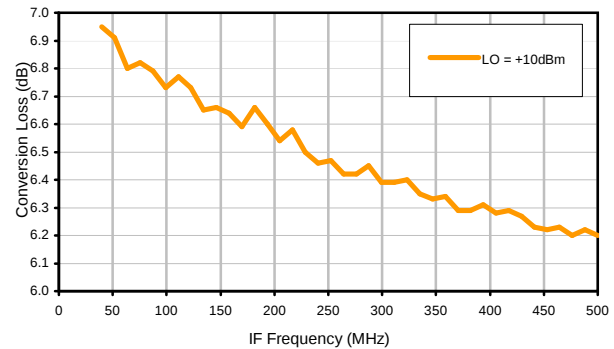
Conversion Loss vs. IF @ RF=1650.1MHz



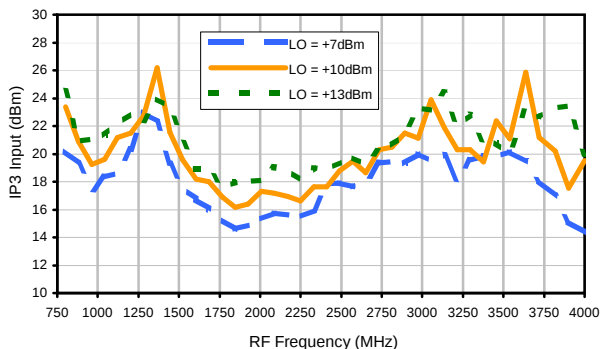
Conversion Loss vs. IF @ RF=1400.1MHz



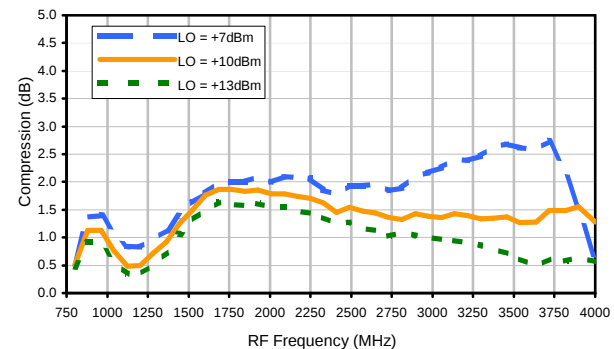
Conversion Loss vs. IF @ RF=1900.1MHz



IP3 Input

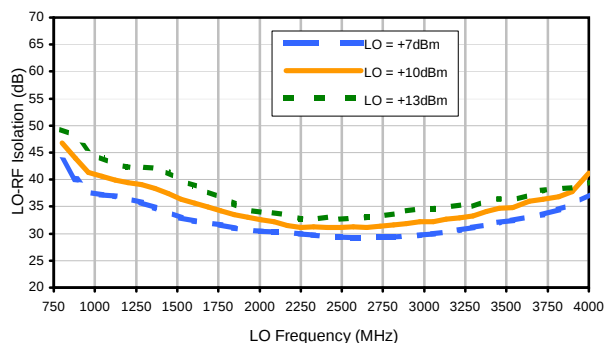


Compression @ RF IN=+5dBm

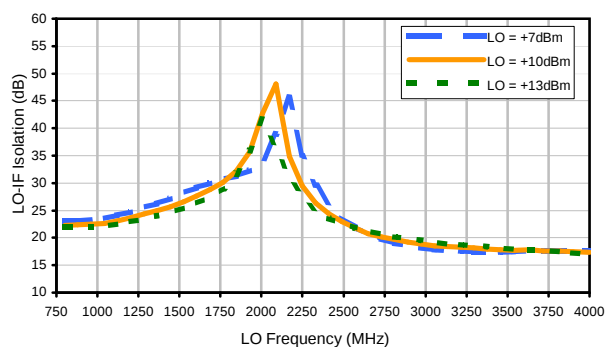


Typical Performance Curves

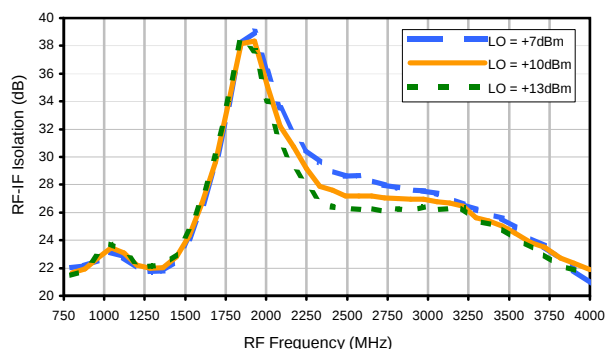
LO-RF Isolation



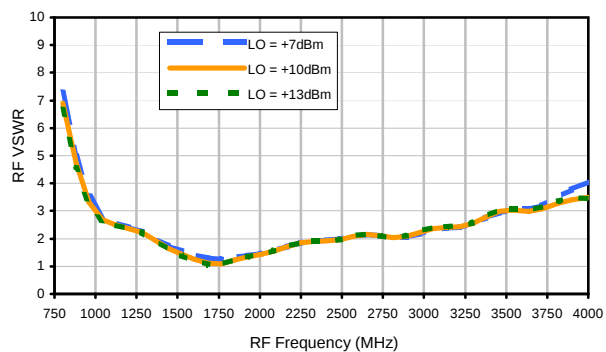
LO-IF Isolation



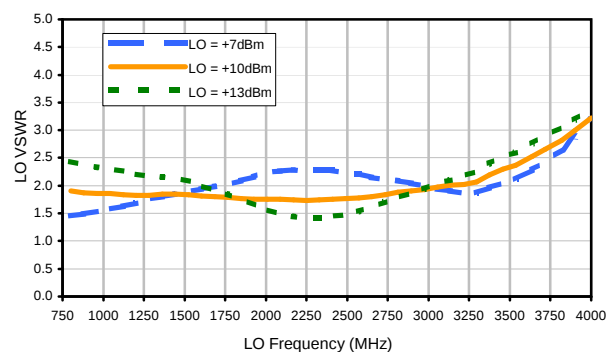
RF-IF Isolation



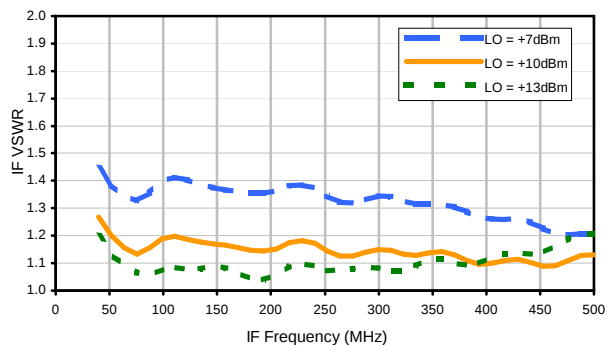
RF VSWR



LO VSWR



IF VSWR



Frequency Mixer

TUF-11ALH

Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	12	29	19	44	31	45	55	55	57	82
1	-	23	+0	38	16	42	47	52	61	62	66	74
2	>100	48	43	41	55	61	45	60	52	63	64	69
3	>100	40	37	54	31	59	49	50	63	64	62	81
4	>100	70	65	71	53	49	67	67	67	71	71	67
5	>100	65	70	55	52	58	43	73	51	71	67	76
6	>100	75	75	78	83	71	58	60	75	70	76	78
7	>100	79	87	83	81	74	62	73	56	86	73	74
8	>100	85	84	90	85	87	86	77	67	64	90	81
9	>100	>93	84	>93	>93	85	88	76	72	74	64	87
10	>100	>93	92	91	>93	>93	>93	90	>93	82	71	73
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:

RF IN: 1650.1 MHz; 0.00 dBm.
LO IN: 1690.01 MHz; +10.00 dBm
IF OUT: 39.91 MHz; -7.25 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	2	20	8	30	17	32	40	43	48	62
1	-	24	+0	39	15	33	46	43	52	53	49	55
2	>100	58	52	46	59	62	52	67	54	57	66	60
3	>100	64	57	77	49	>83	58	74	69	80	73	>83
4	>100	>83	>83	>83	80	79	>83	>83	>83	>83	81	>83
5	>100	>83	>83	>83	>83	>83	80	>83	>83	>83	>83	>83
6	>100	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83
7	>100	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83
8	>100	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83
9	>100	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83
10	>100	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83	>83
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

LO HARMONICS ORDER

Test conditions:

RF IN: 1650.1 MHz; -10.00 dBm.
LO IN: 1690.01 MHz; +10.00 dBm
IF OUT: 39.91 MHz; -17.15 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.

REV. X2
TUF-11ALH
100818
Page 3 of 3



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

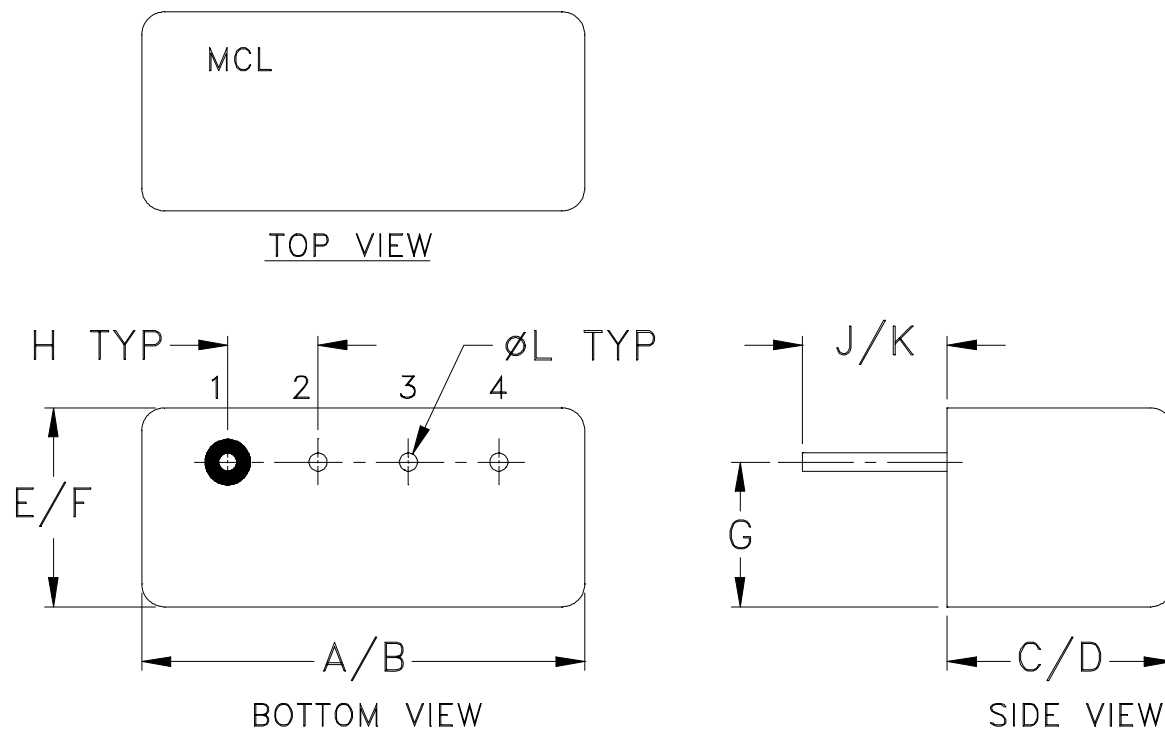
The Design Engineers Search Engine finds the model you need, instantly • For detailed performance specs & shopping online see



B02

B13

Outline Dimensions



CASE#	A	B	C	D	E	F	G	H	J	K	L	WT, GRAM
B02	.480 (12.19)	.500 (12.70)	.240 (6.10)	.255 (6.48)	.210 (5.33)	.230 (5.84)	.16 (4.06)	.100 (2.54)	.14 (3.56)	.20 (5.08)	.020 (.51)	1.9
B13			.390 (9.91)	.405 (10.29)								2.3

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

Notes:

- Header material: C.R.S.
Pin material: #52 alloy.
Cover material: Cupro-Nickel.
- Pin finish: Electro Tin-Silver.
- Tolerance on pin diameter $\pm .005$ inch.
- Glass meniscus 0.015 inch max.
- Blue bead indicates Pin 1. Pin numbers do not appear on unit, for reference only.



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



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