

Surface Mount Image Reject Mixer

Level 10 (LO Power +10dBm) 80 to 168 MHz

RCIR-161LH+



CASE STYLE: HU1416

Maximum Ratings

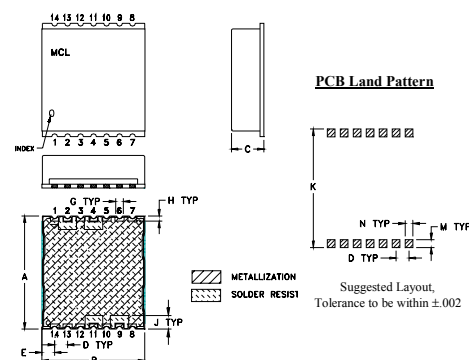
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	100mW
IF Current	40mA

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

Pad Connections

LO	2
RF	9
IF	4
GROUND	1,3,4,5,6,7,8,10,12,13,14
50 OHM TERM EXTERNAL	11

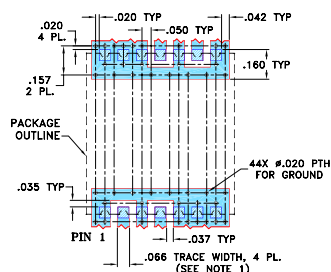
Outline Drawing



Outline Dimensions (inch)

A	B	C	D	E	F	G	H
.870	.800	.25	.100	.097	--	.060	.040
22.10	20.32	6.35	2.54	2.46	--	1.52	1.02
J	K	L	M	N	P	wt	
.105	.910	--	.060	.060	--	grams	
2.67	23.11	--	1.52	1.52	--	2.85	

Demo Board MCL P/N: TB-516+ Suggested PCB Layout (PL-298)



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .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

Notes

- A. 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.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
C. The parts covered by this specification document are subject to Mini-Circuit's standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuit's website at www.minicircuits.com/MCLStore/terms.jsp

Features

- excellent image rejection, 32 dB typ.
- low conversion loss, 6.1 dB typ.
- aqueous washable

Applications

- VHF
- military and avionics

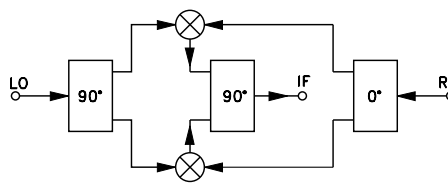
Electrical Specifications at 25°C

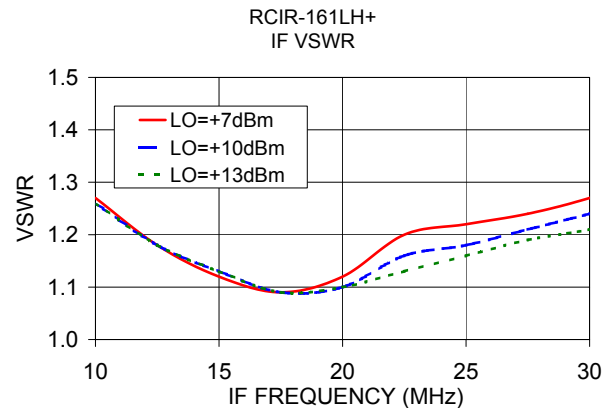
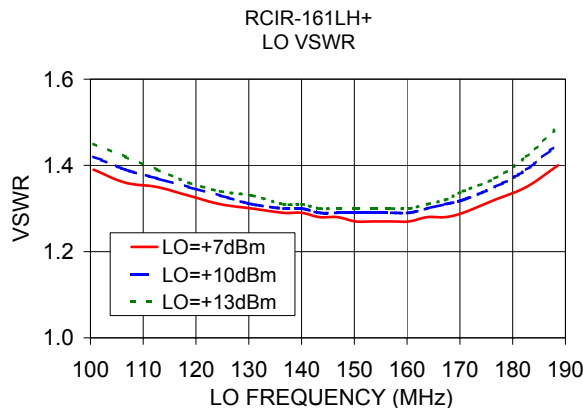
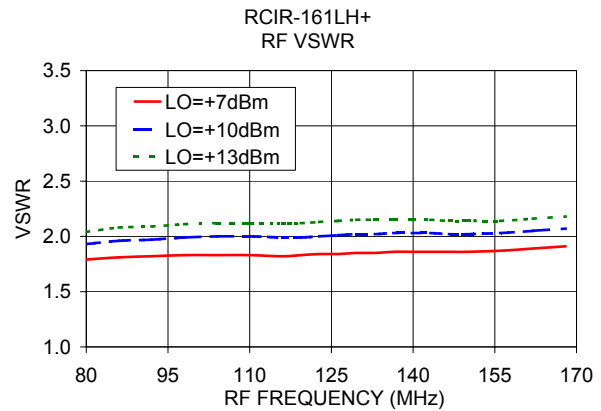
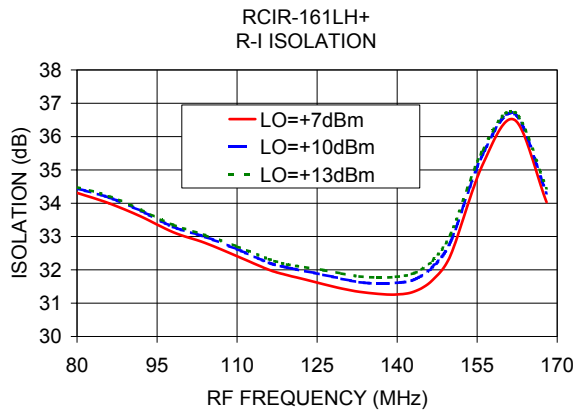
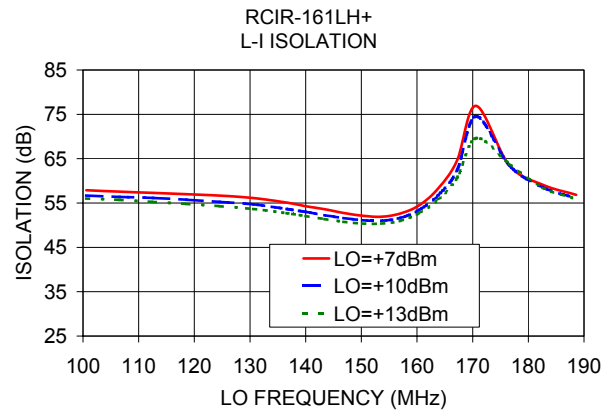
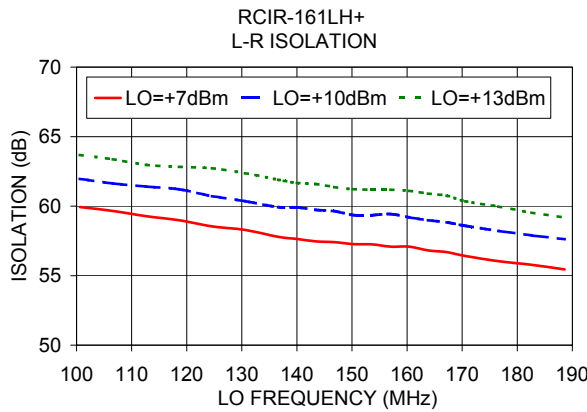
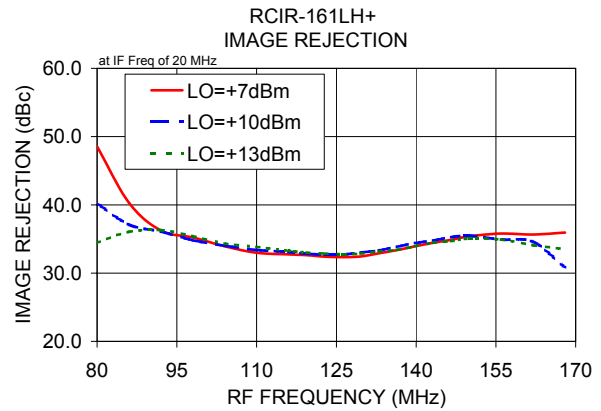
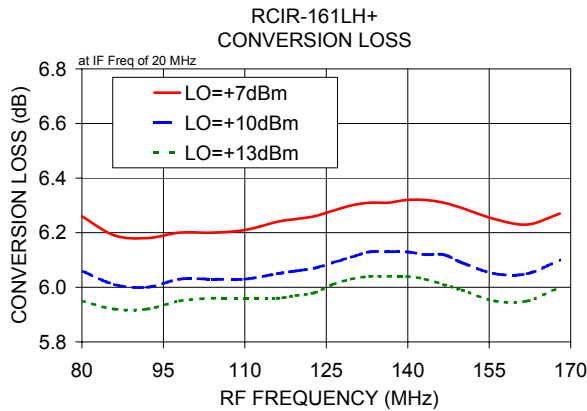
Parameter	Condition (MHz)	Min.	Typ.	Max.	Unit
Frequency Range, RF		80	—	168	MHz
Frequency Range, LO		100	—	188	MHz
Frequency Range, IF		18	—	22	MHz
Conversion Loss (RF<LO)	80-168	—	6.1	7.3	dB
Image Rejection (RF>LO)	120-208	18	31	—	dBc
LO to RF Isolation	100-188	45	58	—	dB
LO to IF Isolation	100-188	32	48	—	dB
RF to IF Isolation	80-168	18	31	—	dB
IP3	80-168	—	17	—	dBm
RF Input Power at 1 dB	80-168	—	+1	—	dBm

Typical Performance Data

Frequency (MHz)		Conversion Loss (dB)	Image Rejection (dBc)	Isolation (dB)			VSWR RF Port (:1)	VSWR LO Port (:1)
RF	LO			L-R	L-I	R-I		
80.00	100.60	6.06	40.21	61.96	56.69	34.44	1.93	1.42
86.00	106.60	6.01	37.10	61.63	56.38	34.17	1.96	1.39
92.00	112.60	6.00	36.09	61.41	56.14	33.77	1.97	1.37
98.00	118.60	6.03	34.82	61.21	55.74	33.29	1.99	1.35
104.00	124.60	6.03	34.01	60.72	55.24	32.99	2.00	1.33
110.00	130.60	6.03	33.39	60.36	54.69	32.62	2.00	1.31
116.00	136.60	6.05	33.10	59.93	53.65	32.21	1.99	1.30
119.40	140.00	6.06	32.84	59.91	53.00	32.07	1.99	1.30
122.80	143.40	6.07	32.71	59.73	52.26	31.96	2.00	1.29
126.20	146.80	6.09	32.72	59.64	51.62	31.85	2.01	1.29
129.60	150.20	6.11	33.02	59.36	51.11	31.73	2.02	1.29
133.00	153.60	6.13	33.32	59.35	51.02	31.63	2.02	1.29
136.40	157.00	6.13	33.86	59.43	51.64	31.59	2.03	1.29
139.80	160.40	6.13	34.40	59.19	53.46	31.61	2.03	1.29
143.20	163.80	6.12	34.77	58.99	56.74	31.71	2.03	1.30
146.60	167.20	6.12	35.26	58.84	62.35	32.08	2.02	1.31
150.00	170.60	6.09	35.48	58.58	74.54	32.83	2.02	1.32
156.00	176.60	6.05	34.92	58.22	63.49	35.45	2.03	1.35
162.00	182.60	6.05	34.60	57.89	58.54	36.68	2.05	1.39
168.00	188.60	6.10	30.83	57.62	56.10	34.30	2.07	1.45

Electrical Schematic





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Image Reject Mixer

RCIR-161LH+

Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=20.6 MHz (dB)			RF (IN) (MHz)	LO (MHz)	IMAGE REJECTION IF FIXED @IF(OUT)=20.6 MHz (dBc)			RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)			RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF=+1dBm (dB)		
		@LO (dBm)					@LO (dBm)					@LO (dBm)					@LO (dBm)		
		+7	+10	+13			+7	+10	+13			+7	+10	+13			+7	+10	+13
80.0	100.6	6.26	6.06	5.95	80.0	100.6	48.55	40.21	34.46	80.0	100.6	17.18	20.71	24.73	80.0	100.6	0.22	0.12	0.06
86.0	106.6	6.19	6.01	5.92	86.0	106.6	40.30	37.10	36.06	86.0	106.6	18.01	21.01	21.60	86.0	106.6	0.24	0.13	0.08
92.0	112.6	6.18	6.00	5.92	92.0	112.6	36.23	36.09	36.30	92.0	112.6	18.46	20.24	20.70	92.0	112.6	0.22	0.12	0.07
98.0	118.6	6.20	6.03	5.95	98.0	118.6	35.22	34.82	35.39	98.0	118.6	19.02	19.91	20.49	98.0	118.6	0.21	0.10	0.06
104.0	124.6	6.20	6.03	5.96	104.0	124.6	33.94	34.01	34.34	104.0	124.6	18.16	19.31	20.10	104.0	124.6	0.23	0.12	0.07
110.0	130.6	6.21	6.03	5.96	110.0	130.6	32.99	33.39	33.84	110.0	130.6	18.35	19.57	20.12	110.0	130.6	0.23	0.12	0.06
116.0	136.6	6.24	6.05	5.96	116.0	136.6	32.75	33.10	33.27	116.0	136.6	19.13	19.67	19.82	116.0	136.6	0.22	0.12	0.07
119.4	140.0	6.25	6.06	5.97	119.4	140.0	32.63	32.84	33.01	119.4	140.0	19.12	19.01	19.44	119.4	140.0	0.22	0.12	0.07
122.8	143.4	6.26	6.07	5.98	122.8	143.4	32.40	32.71	32.85	122.8	143.4	18.58	18.44	18.93	122.8	143.4	0.23	0.14	0.09
126.2	146.8	6.28	6.09	6.01	126.2	146.8	32.35	32.72	32.78	126.2	146.8	18.31	18.12	18.83	126.2	146.8	0.22	0.12	0.07
129.6	150.2	6.30	6.11	6.03	129.6	150.2	32.44	33.02	32.85	129.6	150.2	18.10	18.09	18.84	129.6	150.2	0.23	0.14	0.09
133.0	153.6	6.31	6.13	6.04	133.0	153.6	32.91	33.32	33.17	133.0	153.6	17.97	17.96	18.66	133.0	153.6	0.22	0.13	0.08
136.4	157.0	6.31	6.13	6.04	136.4	157.0	33.37	33.86	33.41	136.4	157.0	17.87	17.81	18.56	136.4	157.0	0.25	0.15	0.10
139.8	160.4	6.32	6.13	6.04	139.8	160.4	33.94	34.40	33.94	139.8	160.4	17.74	17.85	18.69	139.8	160.4	0.21	0.12	0.07
143.2	163.8	6.32	6.12	6.03	143.2	163.8	34.45	34.77	34.43	143.2	163.8	17.59	17.64	18.54	143.2	163.8	0.21	0.12	0.08
146.6	167.2	6.31	6.12	6.01	146.6	167.2	34.88	35.26	34.69	146.6	167.2	17.31	17.56	18.40	146.6	167.2	0.19	0.10	0.06
150.0	170.6	6.29	6.09	5.99	150.0	170.6	35.40	35.48	35.04	150.0	170.6	16.82	17.22	18.20	150.0	170.6	0.20	0.11	0.06
156.0	176.6	6.25	6.05	5.95	156.0	176.6	35.80	34.92	34.92	156.0	176.6	16.23	16.92	18.01	156.0	176.6	0.18	0.08	0.04
162.0	182.6	6.23	6.05	5.95	162.0	182.6	35.66	34.60	34.07	162.0	182.6	16.17	16.93	17.94	162.0	182.6	0.21	0.10	0.05
168.0	188.6	6.27	6.10	6.00	168.0	188.6	35.95	30.83	33.53	168.0	188.6	15.96	17.06	18.20	168.0	188.6	0.18	0.08	0.04



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IF/RF MICROWAVE COMPONENTS



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Image Reject Mixer

RCIR-161LH+

Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)			IMAGE REJECT ION IF FIXED @IF(OUT)=20.6	LO (MHz)	RF-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)					@LO (dBm)		
	+7	+10	+13	+7	+10	+13			+7	+10	+13
100.6	59.94	61.96	63.68	57.90	56.69	56.02	80.0	100.6	34.31	34.44	34.48
106.6	59.65	61.63	63.37	57.57	56.38	55.69	86.0	106.6	34.00	34.17	34.21
112.6	59.28	61.41	62.97	57.28	56.14	55.24	92.0	112.6	33.60	33.77	33.80
118.6	58.99	61.21	62.83	57.00	55.74	54.81	98.0	118.6	33.13	33.29	33.35
124.6	58.54	60.72	62.72	56.66	55.24	54.27	104.0	124.6	32.81	32.99	33.04
130.6	58.29	60.36	62.37	56.11	54.69	53.65	110.0	130.6	32.41	32.62	32.70
136.6	57.79	59.93	61.90	55.10	53.65	52.70	116.0	136.6	32.00	32.21	32.32
140.0	57.64	59.91	61.67	54.28	53.00	52.06	119.4	140.0	31.84	32.07	32.16
143.4	57.47	59.73	61.59	53.60	52.26	51.39	122.8	143.4	31.71	31.96	32.08
146.8	57.41	59.64	61.37	52.76	51.62	50.77	126.2	146.8	31.57	31.85	31.99
150.2	57.27	59.36	61.22	52.13	51.11	50.37	129.6	150.2	31.44	31.73	31.89
153.6	57.25	59.35	61.19	51.92	51.02	50.36	133.0	153.6	31.34	31.63	31.80
157.0	57.09	59.43	61.18	52.64	51.64	50.99	136.4	157.0	31.28	31.59	31.77
160.4	57.09	59.19	61.10	54.51	53.46	52.73	139.8	160.4	31.26	31.61	31.79
163.8	56.82	58.99	60.90	58.28	56.74	55.76	143.2	163.8	31.35	31.71	31.90
167.2	56.69	58.84	60.75	64.58	62.35	60.68	146.6	167.2	31.69	32.08	32.28
170.6	56.41	58.58	60.35	76.91	74.54	69.62	150.0	170.6	32.43	32.83	33.05
176.6	56.04	58.22	59.97	63.50	63.49	63.83	156.0	176.6	35.15	35.45	35.59
182.6	55.78	57.89	59.53	59.10	58.54	58.43	162.0	182.6	36.50	36.68	36.73
188.6	55.45	57.62	59.18	56.85	56.10	55.89	168.0	188.6	34.03	34.30	34.45



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IF/RF MICROWAVE COMPONENTS



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Image Reject Mixer

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Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+7	+10	+13		+7	+10	+13		+7	+10	+13
80.0	100.6	1.79	1.93	2.04	100.6	1.39	1.42	1.45	10.0	1.27	1.26	1.26
86.0	106.6	1.81	1.96	2.08	106.6	1.36	1.39	1.42	12.5	1.18	1.18	1.18
92.0	112.6	1.82	1.97	2.09	112.6	1.35	1.37	1.39	15.0	1.12	1.13	1.13
98.0	118.6	1.83	1.99	2.11	118.6	1.33	1.35	1.36	17.5	1.09	1.09	1.09
104.0	124.6	1.83	2.00	2.12	124.6	1.31	1.33	1.34	20.0	1.12	1.10	1.10
110.0	130.6	1.83	2.00	2.12	130.6	1.30	1.31	1.33	22.5	1.20	1.16	1.13
116.0	136.6	1.82	1.99	2.12	136.6	1.29	1.30	1.31	25.0	1.22	1.18	1.16
119.4	140.0	1.83	1.99	2.12	140.0	1.29	1.30	1.31	27.5	1.24	1.21	1.19
122.8	143.4	1.84	2.00	2.13	143.4	1.28	1.29	1.30	30.0	1.27	1.24	1.21
126.2	146.8	1.84	2.01	2.14	146.8	1.28	1.29	1.30	34.0	1.33	1.29	1.25
129.6	150.2	1.85	2.02	2.15	150.2	1.27	1.29	1.30	38.0	1.37	1.32	1.28
133.0	153.6	1.85	2.02	2.15	153.6	1.27	1.29	1.30	42.0	1.41	1.35	1.31
136.4	157.0	1.86	2.03	2.15	157.0	1.27	1.29	1.30	46.0	1.44	1.37	1.33
139.8	160.4	1.86	2.03	2.15	160.4	1.27	1.29	1.30	50.0	1.47	1.40	1.35
143.2	163.8	1.86	2.03	2.15	163.8	1.28	1.30	1.31	55.0	1.50	1.42	1.36
146.6	167.2	1.86	2.02	2.14	167.2	1.28	1.31	1.32	60.0	1.53	1.44	1.38
150.0	170.6	1.86	2.02	2.14	170.6	1.29	1.32	1.34	65.0	1.55	1.45	1.39
156.0	176.6	1.87	2.03	2.14	176.6	1.32	1.35	1.37	70.0	1.57	1.47	1.40
162.0	182.6	1.89	2.05	2.16	182.6	1.35	1.39	1.42	75.0	1.58	1.48	1.41
168.0	188.6	1.91	2.07	2.18	188.6	1.40	1.45	1.49	80.0	1.59	1.49	1.42

Image Reject Mixer

RCIR-161LH+

Typical Performance Curves

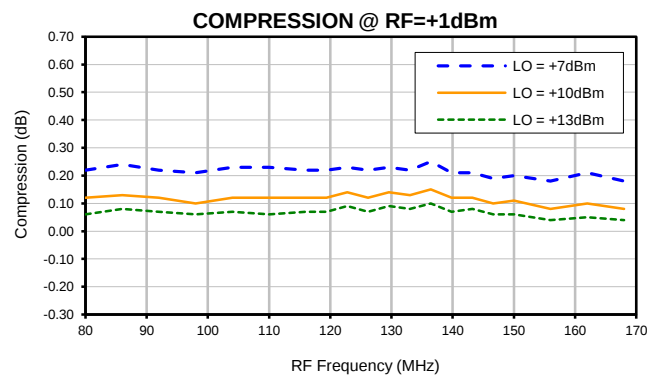
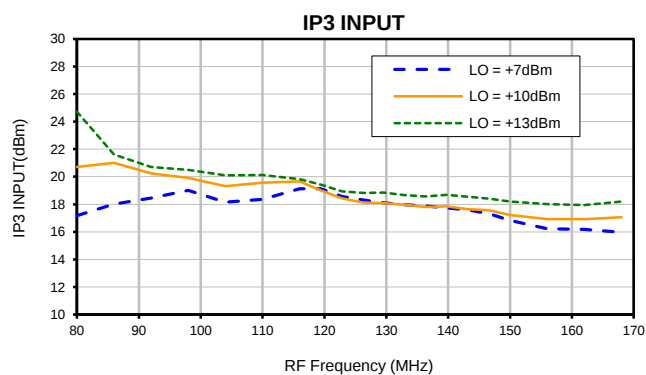
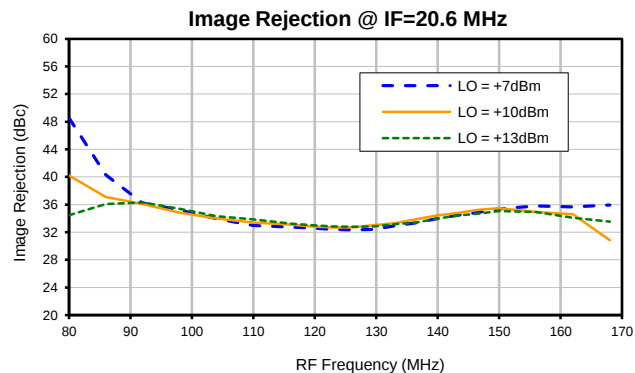
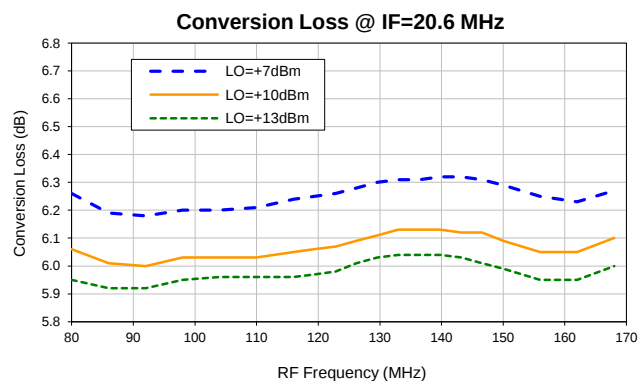
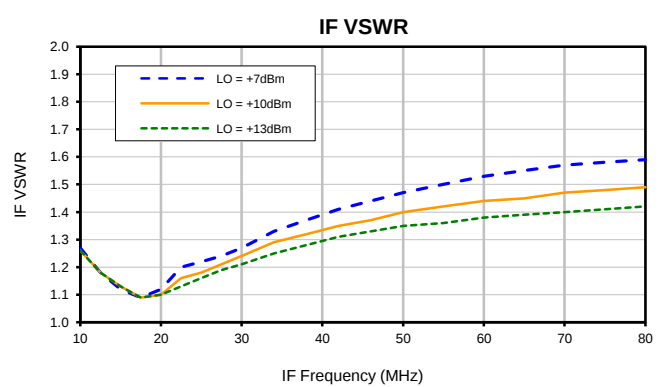
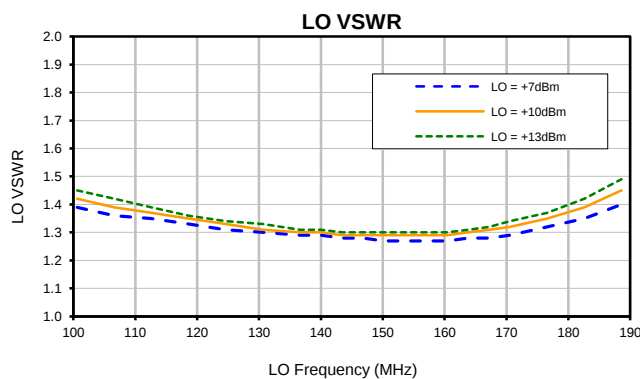
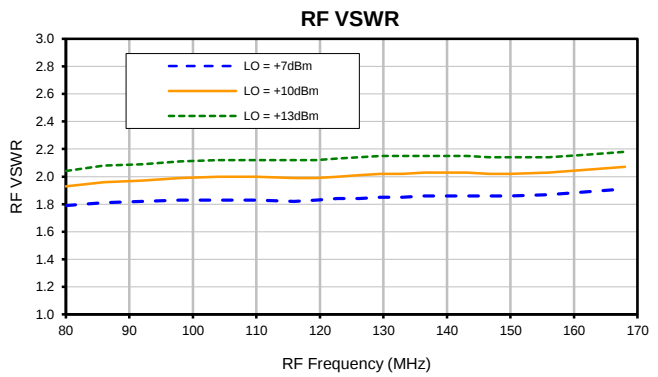
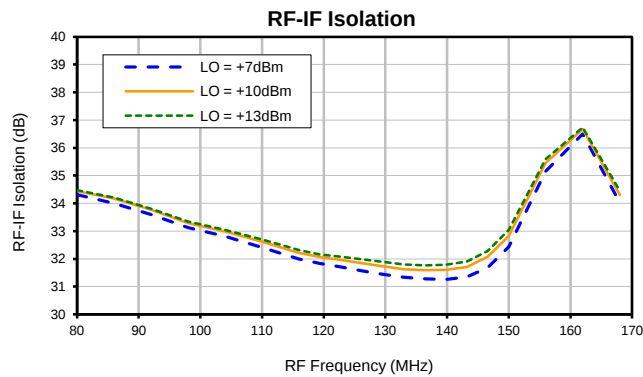
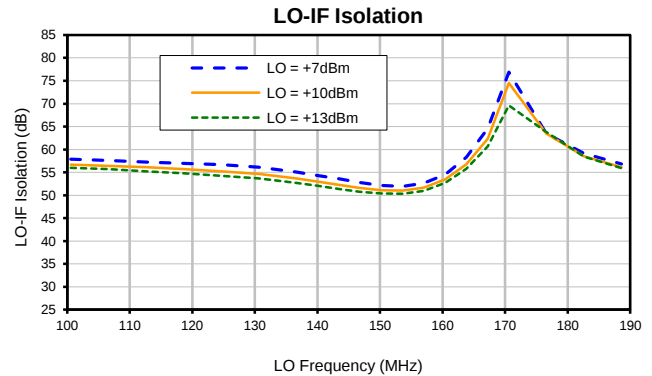
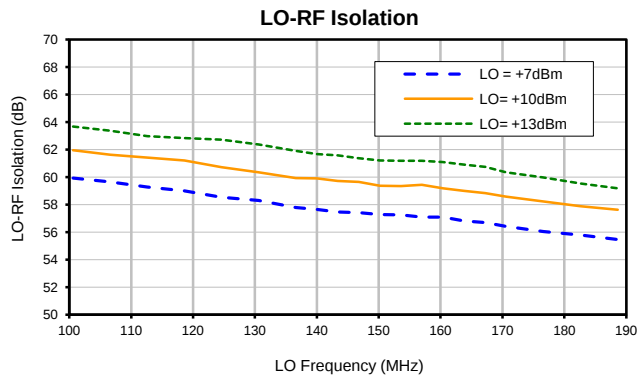


Image Reject Mixer

Typical Performance Curves

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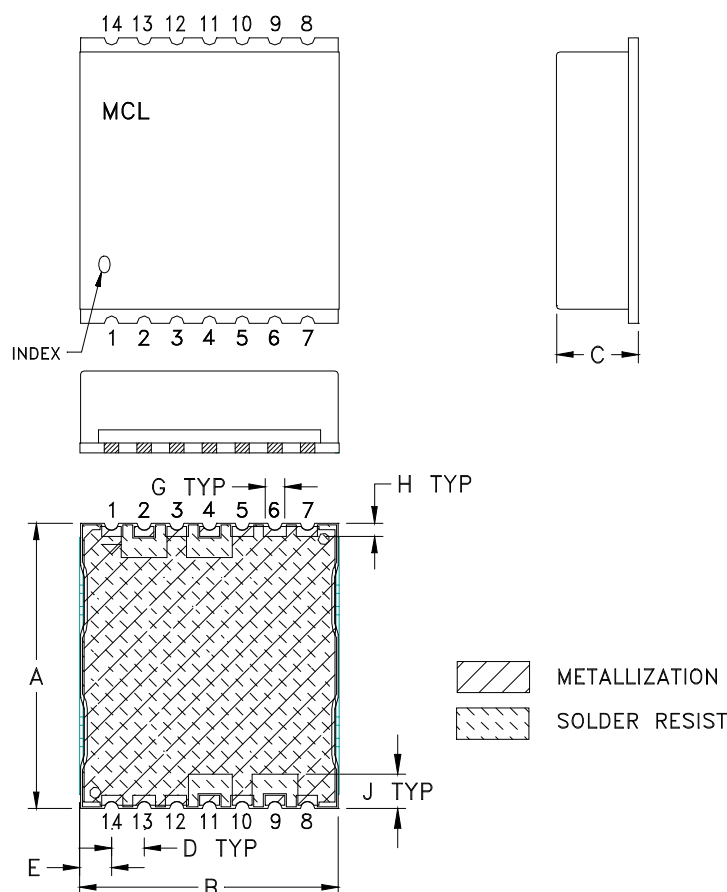
IF/RF MICROWAVE COMPONENTS

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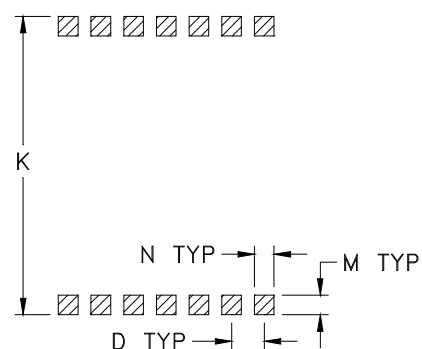
REV. OR
RCIR-161LH+
11/29/2012
Page 2 of 2

Outline Dimensions

HU1416



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	P	WT, GRAM
HU1416	.870 (22.10)	.800 (20.32)	.25 (6.35)	.100 (2.54)	.097 (2.46)	-	.060 (1.52)	.040 (1.02)	.105 (2.67)	.910 (23.11)	-	.060 (1.52)	.060 (1.52)	-	2.85

Dimensions are in inches (mm). Tolerances: 2PL. +/- .03; 3PL. +/- .015

Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Termination finish:

For RoHS Case Styles: 2-5 μ inch (.05-.13 microns) Gold over .120-.240 μ inch (3.05-6.10 microns) Nickel plate. All models (+) suffix.

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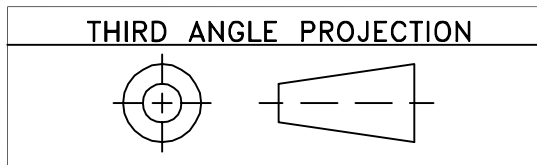
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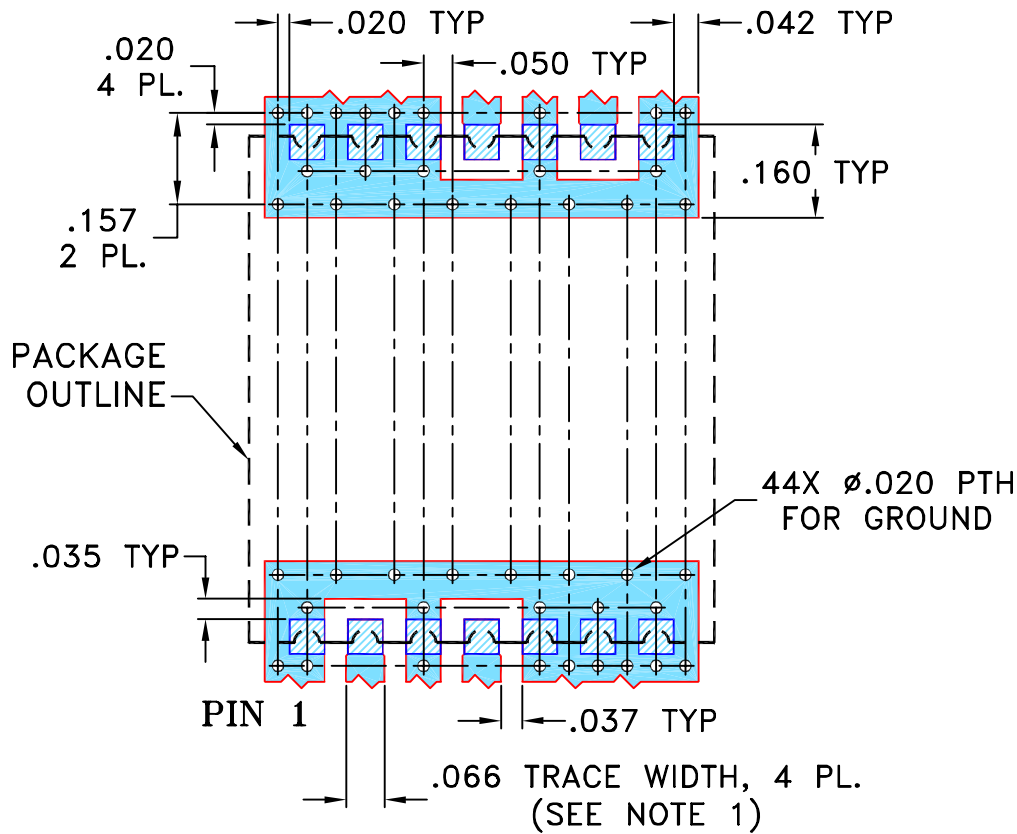
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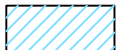


REVISIONS					
REV OR	ECN No.	DESCRIPTION	DATE	DR	AUTH
	M122600	NEW RELEASE	04/28/09	MMG	WL

**SUGGESTED MOUNTING CONFIGURATION FOR
HU1416 CASE STYLE, "14MX01" PIN CODE**



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .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 TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	DRAWN	MMG	04/28/09
	CHECKED	AY	04/28/09
	APPROVED	WL	04/28/09
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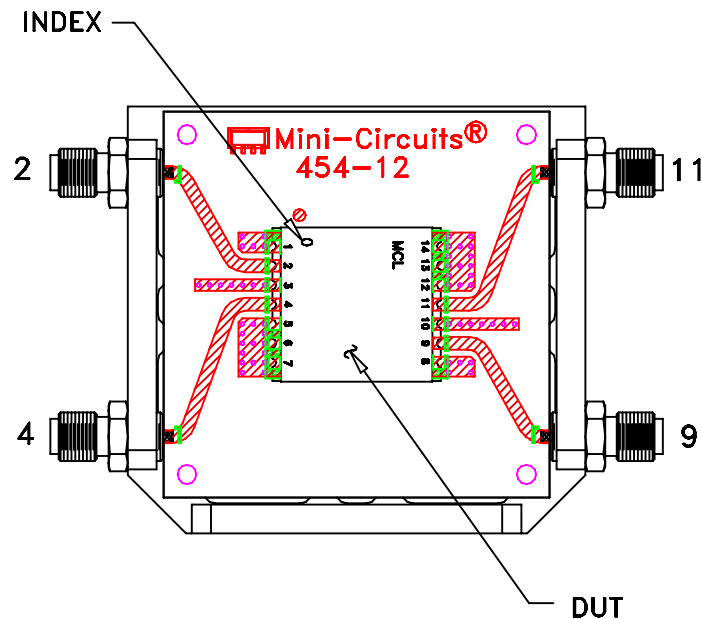
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PL, 14MX01, HU1416, TB-516+

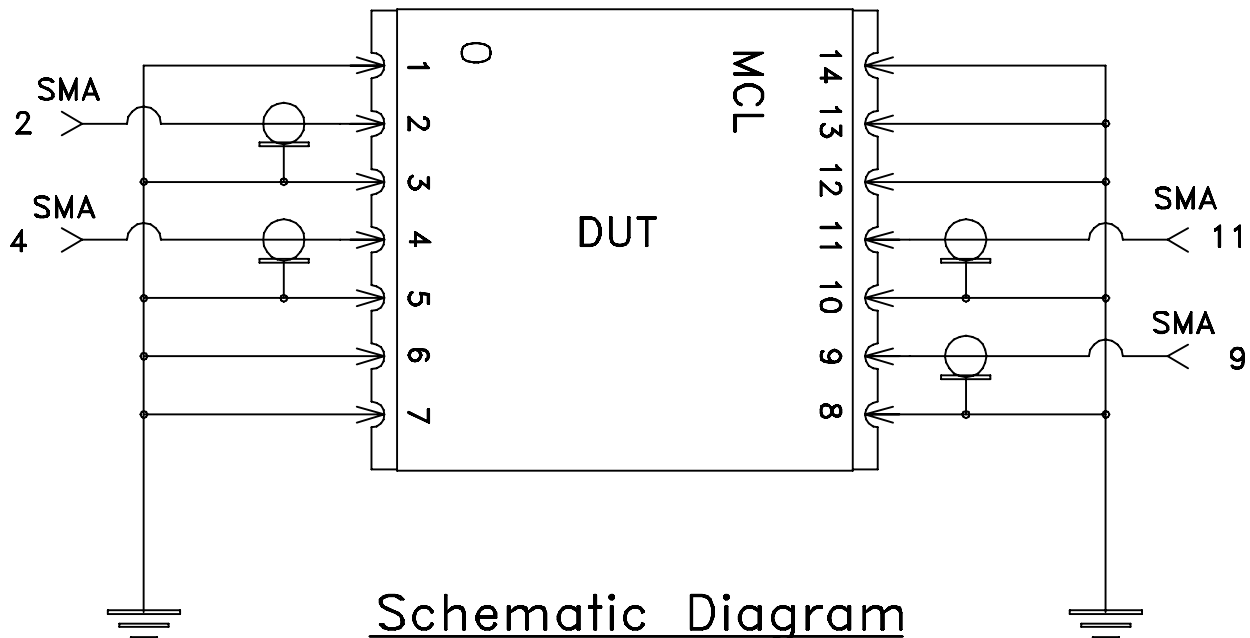
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-298	OR
FILE:	98PL298	SCALE:	SHEET:
		3:1	1 OF 1

Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



TB-516+



Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,
Dielectric Constant=3.5, Thickness=.030 inch.

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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	-40° to 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 240 hours, 50°C	MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutetic Process: 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, 95% Coverage
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
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