



MMIC REFLECTIONLESS

Low Pass Filter

XLF-132H+

Mini-Circuits

50Ω DC to 1300 MHz

THE BIG DEAL

- Match to 50Ω in the stop band, eliminates undesired reflections
- Cascadable
- Excellent stopband rejection, 48 dB typ.
- Temperature stable, up to +105°C
- Small size, 4 x 4 mm
- Protected by US Patents 8,392,495; 9,705,467, additional patent pending
- Protected by China Patent 201080014266.1
- Protected by Taiwan Patent I581494



Generic photo used for illustration purposes only

CASE STYLE: DG1847

+RoHS Compliant

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

APPLICATIONS

- Cellular
- ISM applications
- Radio location
- CATV

PRODUCT OVERVIEW

Mini-Circuits' XLF-132H+ three-section reflectionless filter employs a novel filter topology which absorbs and terminates stop band signals internally rather than reflecting them back to the source. This new capability enables unique applications for filter circuits beyond those suited to traditional approaches. Traditional filters are reflective in the stop band, sending signals back to the source at 100% of the power level. These reflections interact with neighboring components and often result in inter-modulation and other interferences. Reflectionless filters eliminate stop band reflections, allowing them to be paired with sensitive devices and used in applications that otherwise require circuits such as isolation amplifiers or attenuators.

KEY FEATURES

Features	Advantages
Reflectionless Technology	Reflectionless filters absorb unwanted signals, preventing reflections back to the source. This reduces generation of additional unwanted signals without the need for extra components like attenuators, improving system dynamic range and saving board space.
50Ω Match in Stopband	Reflectionless filters maintain good impedance matching in the stopband, allowing for integration with high gain, wideband amplifiers without the risk of creating out-of-band instabilities.
Excellent RF Performance Repeatability	Fabricated on a GaAs process, X-series filters are inherently repeatable for large-volume production.
Excellent Stability over temperature	With ±0.3 dB variation over temperature, is ideal for use in wide temperature range applications without the need for additional temperature compensation.
Excellent Power Handling in a Compact Package	High power handling extends the usability of these filters to the transmit path for inter-stage filtering.

REV. A
 ECO-020598
 XLF-132H+
 MCL-NY
 240117





ELECTRICAL SPECIFICATIONS¹ AT +25°C

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit	
Passband	Insertion Loss	DC - F1	DC - 1300	—	1.8	2.9	dB
	Frequency Cut-off	F2	1680	—	3.0	—	
	VSWR	DC - F1	DC - 1300	—	1.3	—	
Stopband	Rejection	F3 - F3'	2700 - 3000	13	30	—	dB
		F3' - F4	3000 - 10000	32	48	—	
		F4 - F5	10000 - 19000	—	43	—	
	VSWR	F3 - F3'	2700 - 3000	—	1.3	—	:1
		F3' - F4	3000 - 10000	—	1.3	—	
		F4 - F5	10000 - 19000	—	2.3	—	

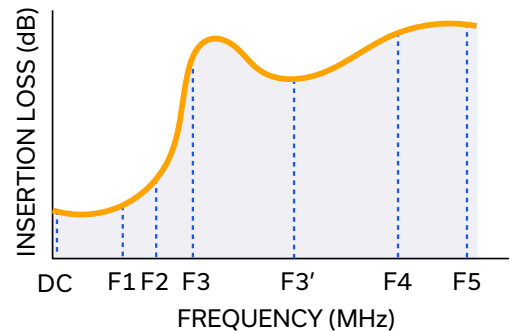
1. Measured on Mini-Circuits Characterization Test Board TB-952-132H+

ABSOLUTE MAXIMUM RATINGS²

Parameter	Ratings
Operating Temperature	-55°C to +105°C
Storage Temperature	-65°C to +150°C
RF Power Input, Passband (DC-F1) ²	7.9 W at 25°C
RF Power Input, Stopband (F2-F5) ³	1.58 W at 25°C

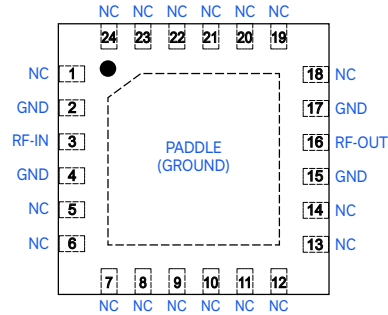
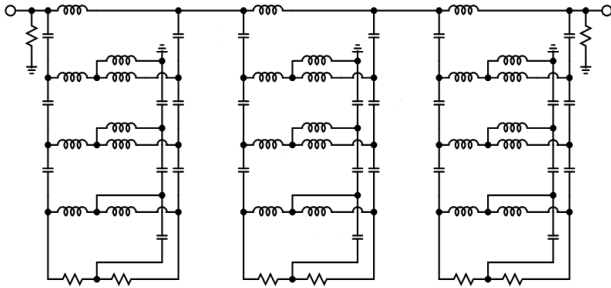
3. Passband rating derates linearly to 3.9 W at 105°C ambient
 4. Stopband rating derates linearly to 0.75 W at 105°C ambient
 2. Permanent damage may occur if any of these limits are exceeded.

SPECIFICATION DEFINITION



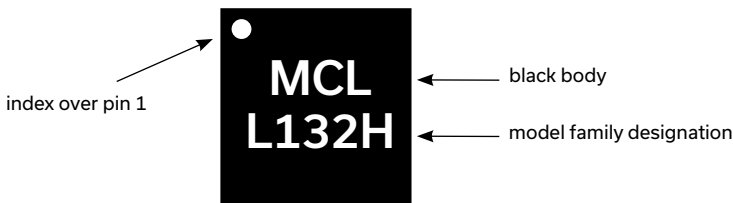


SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pad Number	Description
RF-IN	3	RF Input Pad
RF-OUT	16	RF Output Pad
GND	2,4,15,17 & paddle	Connected to ground
NC (GND Externally)	1, 5-14,18-24	No internal connection

PRODUCT MARKING



Marking may contain other features or characters for internal lot control



MMIC REFLECTIONLESS

Low Pass Filter

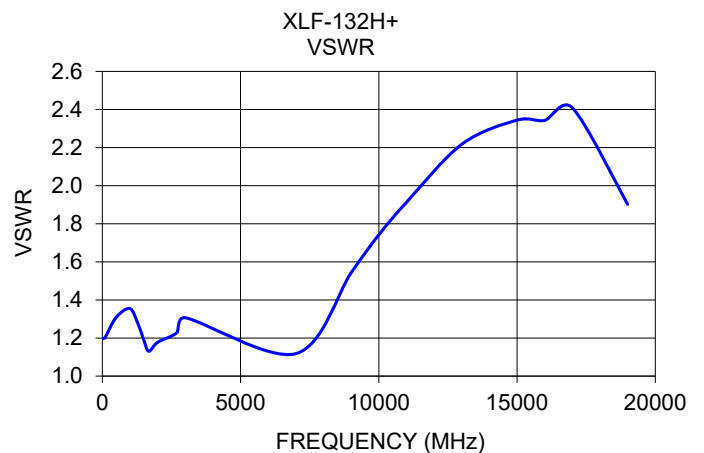
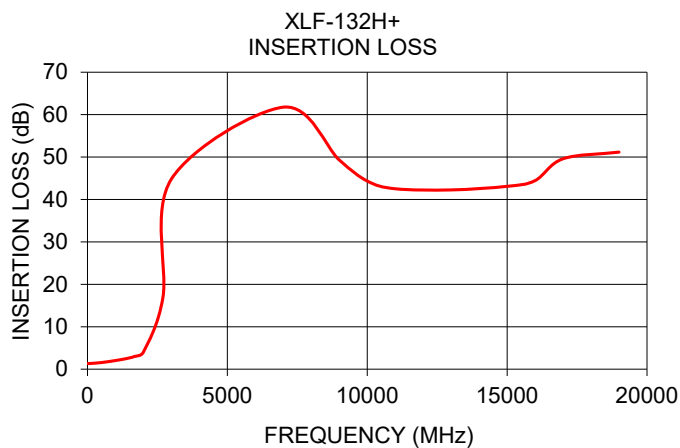
XLF-132H+

Mini-Circuits

50Ω DC to 1300 MHz

TYPICAL PERFORMANCE DATA AT +25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)
10	1.32	1.20
100	1.35	1.20
500	1.56	1.31
1000	2.03	1.35
1300	2.38	1.27
1500	2.66	1.19
1680	3.00	1.13
2000	4.03	1.18
2700	17.05	1.23
3000	44.82	1.31
7000	61.76	1.12
9000	49.31	1.54
10000	44.35	1.74
11000	42.53	1.91
13000	42.26	2.22
15000	43.10	2.34
16000	44.45	2.34
17000	49.60	2.41
19000	51.16	1.90





MMIC REFLECTIONLESS

Low Pass Filter

XLF-132H+

Mini-Circuits

50Ω DC to 1300 MHz

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS [CLICK HERE](#)

Performance Data and Graphs	Data Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	DQ1225 Plastic package, exposed paddle lead finish: matte-tin
Tape & Reel Standard quantities available on reel	F68 7" reels with 20, 50, 100, 200, 500 ,1000 devices 13" reels with 2000, 3000, 4000 devices
Suggested Layout for PCB Design	PL-519
Evaluation Board	TB-952-132H+
Environmental Ratings	ENV82

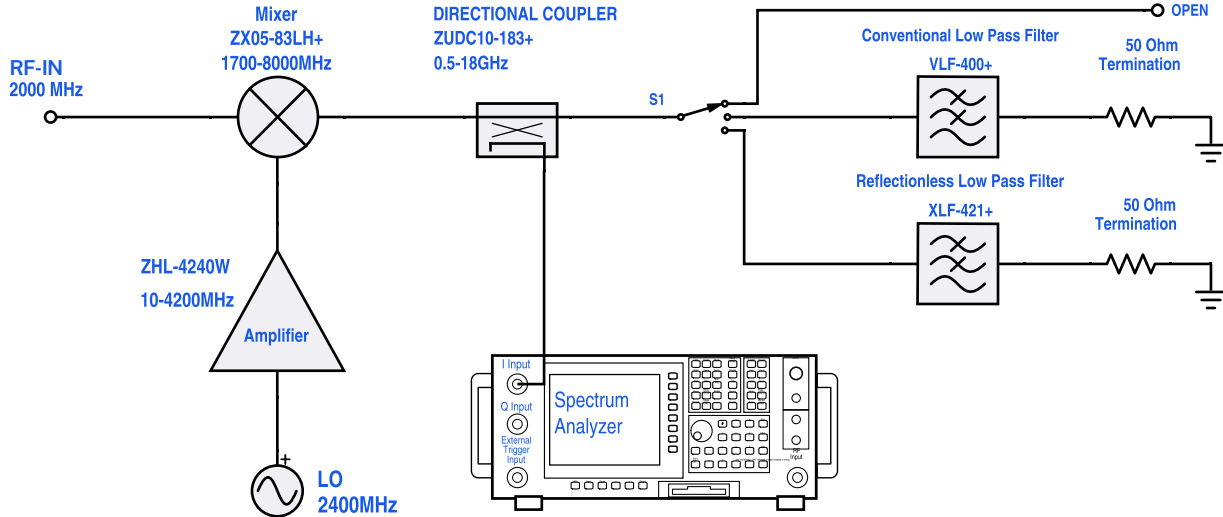
ESD RATING

Human body model (HBM): Class 1A (Pass 250V) in accordance with ANSI/ESD 5.1-2001



REFLECTIONLESS FILTER APPLICATION NOTE

Application Circuit Example: Pairing mixers with reflectionless filters to improve system dynamic range



Test block diagram: IF output reflection spectrum with single input frequency

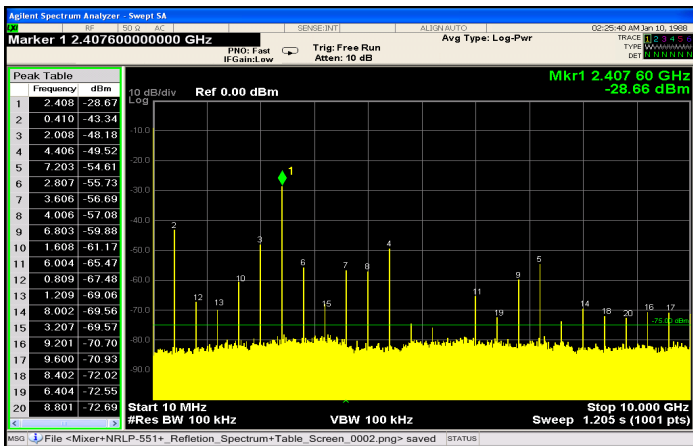


Figure 1. IF output reflection spectrum without filter

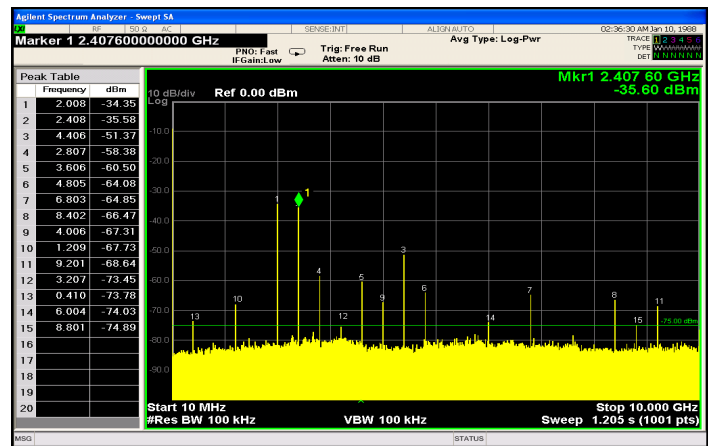
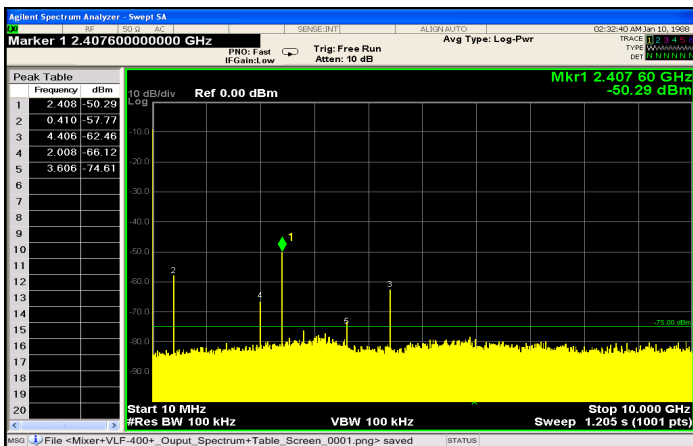


Figure 2. IF output reflection spectrum with conventional filter



An application circuit was assembled to measure the IF reflection spectrum at the output of a mixer when the mixer was paired with a conventional filter versus a reflectionless filter.

While the conventional filter reduces the reflections present when the mixer is used alone (no filter), the reflectionless filter virtually eliminates those reflections altogether.

The reflected signal at marker 1 in the figures above exhibits a reduction of more than 20 dB from -28.7 dBm to -50.3 dBm when the reflectionless filter is used as compared to the conventional filter, thus eliminating unwanted spurious mixing products and improving system dynamic range.

For more information, refer to application note [AN-75-007](#)

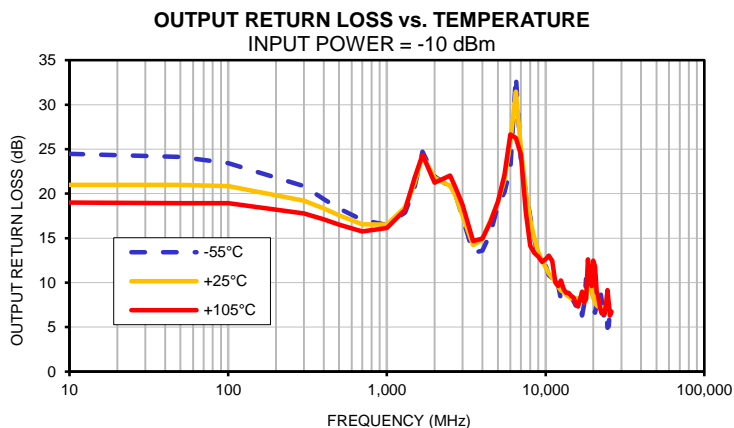
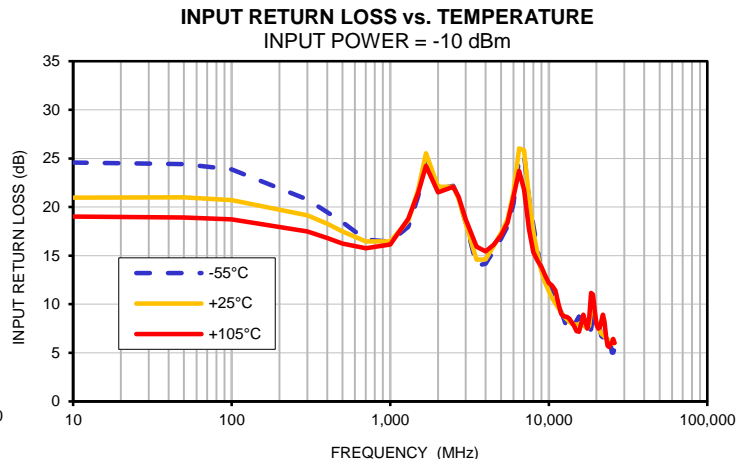
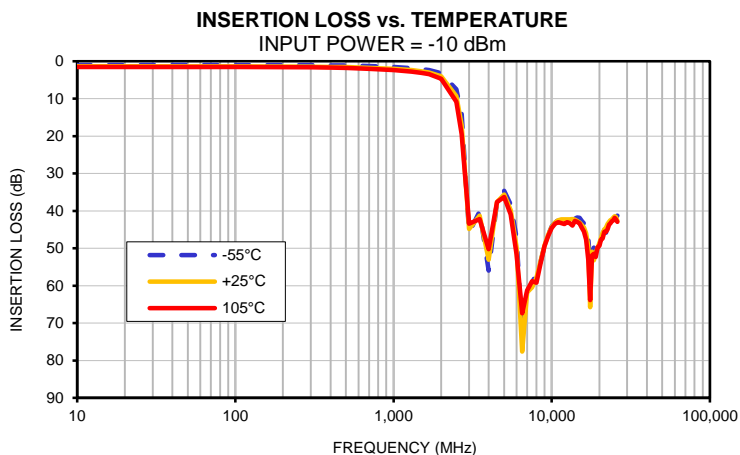
- NOTES
- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
 - B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
 - C. The parts covered by this specification document are subject to Mini-Circuits 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-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

Typical Performance Data

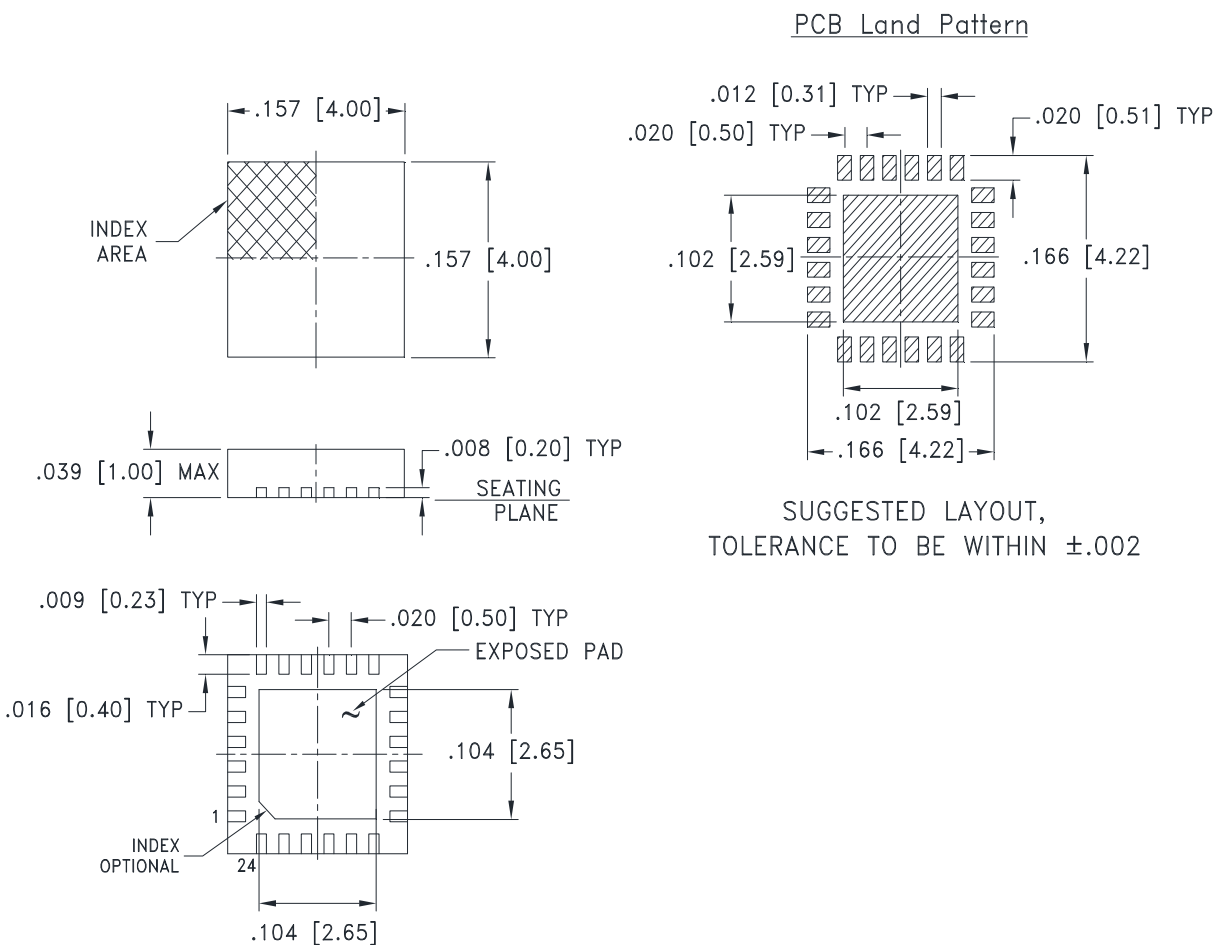
FREQ. (MHz)	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
	(dB)			(dB)			(dB)		
	@-55°C	@25°C	@+105°C	@-55°C	@+25°C	@+105°C	@-55°C	@+25°C	@+105°C
10	1.00	1.32	1.54	24.58	20.96	19.02	24.46	20.97	19.00
50	0.99	1.34	1.53	24.42	20.98	18.93	24.13	21.00	18.94
100	0.99	1.35	1.54	23.86	20.72	18.72	23.43	20.83	18.94
300	1.04	1.43	1.63	20.78	19.16	17.50	20.83	19.20	17.77
400	1.08	1.49	1.71	19.45	18.27	16.82	19.38	18.32	17.10
500	1.14	1.56	1.80	18.44	17.49	16.25	18.33	17.56	16.51
700	1.28	1.74	2.00	16.65	16.47	15.76	17.04	16.56	15.77
1000	1.54	2.04	2.34	16.42	16.45	16.16	16.48	16.52	16.14
1300	1.84	2.38	2.74	17.97	18.59	18.78	17.89	18.47	18.18
1500	2.07	2.66	3.07	21.14	21.81	21.46	20.82	21.25	21.83
1680	2.35	3.00	3.47	25.17	25.52	24.23	24.70	24.25	24.36
2000	3.20	4.03	4.67	21.87	22.09	21.49	21.94	21.78	21.23
2500	7.50	9.33	10.85	22.17	22.08	22.07	20.77	20.89	22.03
2700	13.94	17.05	19.47	20.95	20.87	21.06	20.00	19.79	20.72
3000	45.87	44.82	43.42	18.40	18.33	18.72	17.34	17.53	18.76
3500	40.12	41.30	42.19	13.98	14.57	15.91	13.35	14.23	14.67
4000	55.94	53.05	50.25	14.18	14.61	15.43	13.60	14.86	14.94
4500	37.62	37.66	37.59	15.47	16.00	16.13	15.54	17.01	16.84
5000	34.66	35.62	36.31	16.76	17.33	17.11	18.70	19.08	19.09
5500	38.26	39.82	40.98	18.03	18.73	18.42	20.16	21.56	22.11
6000	47.19	49.77	51.68	20.35	21.48	21.05	22.81	25.83	26.65
6500	73.09	77.63	67.38	24.97	26.03	23.70	33.25	31.46	26.25
7000	61.67	61.76	61.29	25.39	25.86	21.80	23.72	25.09	24.39
7500	59.15	60.46	58.78	20.90	20.96	17.71	20.19	20.16	17.89
8000	56.88	57.91	59.20	18.08	17.44	15.36	17.43	17.14	14.15
8500	53.77	53.52	54.17	15.54	15.10	14.44	14.96	15.04	13.33
9000	49.41	49.28	49.42	13.23	13.41	13.83	12.78	13.46	12.94
9500	46.45	46.34	46.71	12.21	12.22	12.95	11.98	12.44	12.33
10000	44.17	44.35	44.64	11.98	11.35	12.18	11.91	11.70	12.66
10500	43.22	43.08	43.41	11.07	10.66	11.94	10.82	11.03	13.02
11000	42.41	42.53	43.01	9.95	10.08	11.41	10.53	10.56	12.43
11500	41.87	42.31	43.25	9.53	9.60	10.00	11.19	10.06	10.03
12000	42.14	42.25	43.54	9.19	9.14	8.98	9.73	9.58	9.61
12500	42.58	42.28	43.01	8.42	8.74	8.73	8.11	9.14	10.26
13000	42.50	42.26	43.24	7.56	8.44	8.69	8.09	8.91	9.27
13500	42.52	42.22	43.92	7.27	8.20	8.50	8.26	8.63	8.84
14000	42.09	42.39	42.70	7.33	8.01	8.13	8.12	8.44	8.84
14500	41.77	42.67	42.91	7.65	7.94	7.70	8.43	8.24	8.49
15000	41.87	43.10	43.35	8.29	7.92	7.25	7.92	8.19	8.31
15500	42.73	43.75	44.51	8.74	7.93	7.16	7.42	8.14	7.60
16000	43.33	44.45	45.49	8.44	7.92	7.99	8.30	8.26	7.31
16500	44.83	46.00	47.67	7.95	7.88	8.92	7.69	8.20	8.19
17000	47.37	49.60	53.04	7.84	7.68	8.22	6.29	8.05	8.99
17500	53.97	65.80	63.88	7.71	7.51	7.50	7.59	7.79	7.77
18000	52.24	50.91	51.94	7.11	7.82	8.62	10.40	8.14	8.15
18500	49.85	53.25	51.45	7.46	9.60	11.17	9.42	9.94	12.63
19000	50.89	51.16	52.29	8.80	10.15	10.99	9.18	10.49	10.33
19500	49.61	49.93	49.72	8.02	9.05	9.28	10.38	9.11	9.60
20000	47.98	48.51	49.32	7.65	8.19	7.94	7.19	8.33	12.46
20500	46.64	47.30	47.65	7.80	7.65	7.47	6.61	7.73	11.80
21000	46.61	45.96	47.41	7.54	7.31	7.61	7.55	7.44	9.05
21500	45.14	44.89	45.58	6.72	6.97	8.25	7.62	7.28	8.23
22000	45.81	44.55	45.62	6.58	6.85	8.94	9.28	7.33	7.17
22500	44.05	43.53	44.95	6.91	6.70	8.23	8.13	7.11	6.56
23000	41.46	42.92	43.71	7.36	6.52	6.76	5.70	7.15	6.81
23500	41.21	42.57	43.33	7.25	6.40	5.74	7.13	7.26	6.40
24000	41.29	42.30	42.78	6.80	6.20	5.59	7.65	7.16	7.50
24500	42.34	41.78	42.52	6.04	6.06	5.91	4.92	7.08	9.17
25000	42.17	41.49	41.84	5.03	6.00	6.06	5.12	7.06	7.72
25500	41.66	41.65	42.26	5.01	5.94	6.44	6.96	6.94	6.29
26000	41.32	42.73	42.95	5.37	6.03	6.02	6.52	6.75	6.70



Typical Performance Curves



Outline Dimensions



Weight: .04 Grams

Dimensions are in inches (mm). Tolerances: 2 Pl. \pm .01; 3 Pl. \pm .005

Notes:

1. Case material: Plastic.
2. Termination finish:
 - For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin. All models, (+) suffix. See model Data sheet.
 - For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

Mini-Circuits®
ISO 9001 ISO 14001 CERTIFIED

ALL NEW
minicircuits.com

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

DG1847 Rev.: AH (16 FEB 23) ECO-016811 File: DG1847

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

Tape & Reel Packaging TR-F68

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
12	8	7	Small quantity standard	20
				50
				100
				200
				500
		7	Standard	1000
		13	Standard	2000
				3000
4000				

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



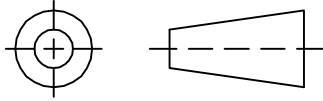
INTERNET <http://www.minicircuits.com>

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

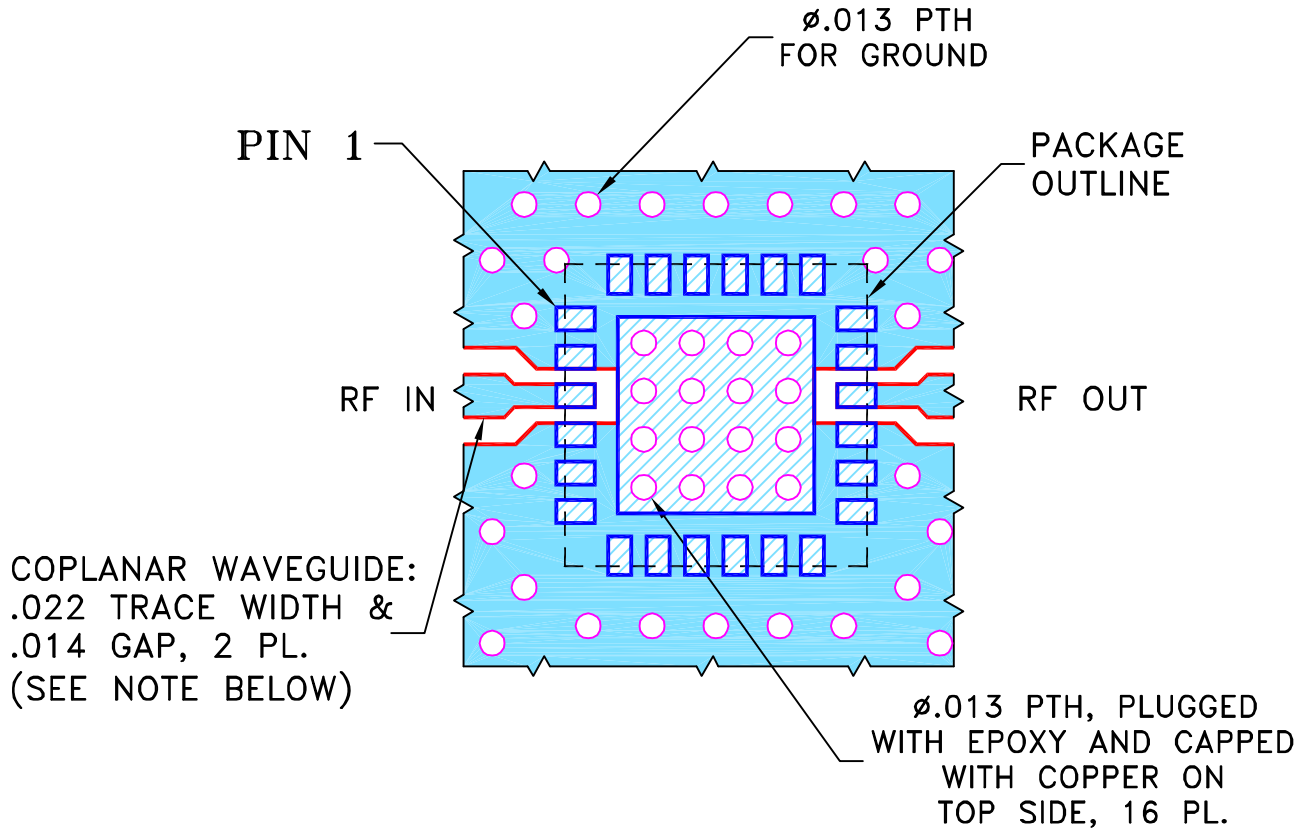
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M162496	NEW RELEASE	06/15/17	GF	RS

SUGGESTED MOUNTING CONFIGURATION FOR
DG1847 CASE STYLE, "24FL01" PIN CONNECTION



NOTES:

- TRACE WIDTH & GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010" ± .001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- 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	06/14/17
TOLERANCES ON:	CHECKED IL	06/15/17
2 PL DECIMALS ±	APPROVED RS	06/15/17
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

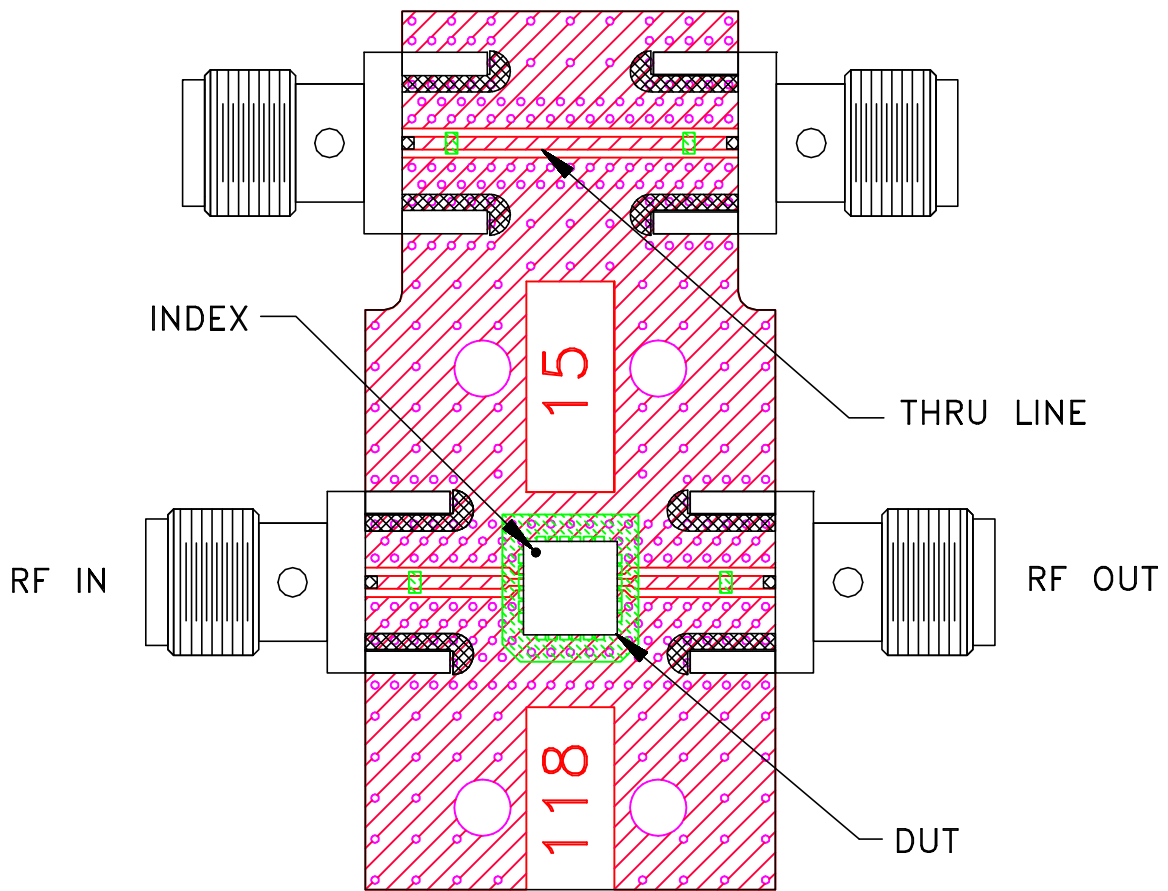
PL, 24FL01, DG1847, TB-952+

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.

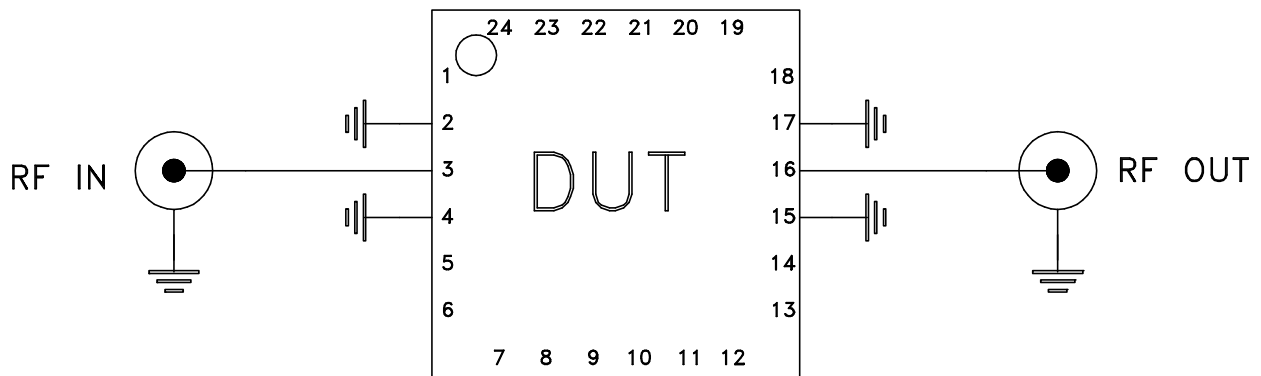
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-519	OR

FILE:	SCALE:	SHEET:
98PL519	10:1	1 OF 1

Evaluation Board and Circuit



TB-952-132H+




PINS 1,5-14,18-24 - NOT CONNECTED.

Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent,
Dielectric Constant=3.5, Thickness=.010 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 105°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-65° to 150° C Ambient Environment	Individual Model Data Sheet
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102-C, Condition C
Temperature Cycling	-65° to 150°C, 100 cycles	JESD22-A104
Temperature Humidity	85°C/ 85% RH, 168 hours	JESD22-113
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 240°C peak (Non-RoHS) or 260°C (RoHS)	J-STD-020C
Solderability	10X magnification, 95% coverage	JESD22-B102, Method 1: Dip and Look Test
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