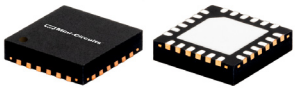
MMIC SURFACE MOUNT

X2 Frequency Multiplier CY2-143+

50Ω Output 4 to 14 GHz

THE BIG DEAL

- Ultra-Wideband, Output from 4 to 14 GHz
- Wide Input Power Range, +12 to +18 dBm
- Low Conversion Loss, 12 dB Typ.
- Good Fundamental and Harmonic Suppression: F1, 30 dBc; F3, 32 dBc
- Tiny Size, 4 x 4 x 1 mm
- Low Cost



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

- Synthesizers
- Local Oscillators

PRODUCT OVERVIEW

Mini-Circuits' CY2-143+ is an ultra-wideband MMIC frequency doubler, converting input frequencies from 2 to 7 GHz into output frequencies from 4 to 14 GHz. Its wide output range makes this model suitable for broadband systems as well as a wide variety of narrowband applications. Utilizing GaAs HBT technology, the multiplier comes housed in a tiny 4 x 4 x 1 mm MCLP package and offers excellent repeatability, low inductance, good thermal efficiency, and low cost.

KEY FEATURES

Features	Advantages
Broadband, 4 to 14 GHz Output	With an output frequency range spanning 4 to 14 GHz, this multiplier supports broadband applications such as defense and instrumentation as well as a wide range of narrowband system requirements.
Low Conversion Loss, 12 dB Typ.	With a low conversion loss, CY2-143+ produces higher output power, reducing the need for amplification.
Excellent Fundamental and Harmonic Suppression: • F1, 30 dBc • F3, 32 dBc • F4, 17 dBc	Reduces spurious signals and the need for additional filtering.
Wide Input Power Range, +12 to +18 dBm	Wide input power signal range accommodates different input signal levels while still maintaining a low conversion loss.
4 x 4 mm, 24 Lead MCLP Package	Low inductance, repeatable transitions, and excellent thermal contact to the PCB
Low Cost	Provides an easy, cost-effective solution for generating high-frequency signals from a lower frequency signal source.

X2 Frequency Multiplier CY2-143+

50Ω Output 4 to 14 GHz

ELECTRICAL SPECIFICATIONS AT +25°C

Parameter		Input Frequency (GHz)	Min.	Typ.	Max.	Unit
Multiplier Factor				2		
Frequency Range, Input (F1)			2 4		4 7	GHz
Frequency Range, Output (F2)			4 8		8 14	GHz
Input Power			+12		+18	dBm
Conversion Loss		2 - 4 4 - 7		12 13	14.5 19.2	dB
Harmonic Output[1]	F1	2 - 4 4 - 7	19 17	30 27		dBc
	F3	2 - 4 4 - 7	20 21	32 39		
	F4	2 - 4 4 - 7	11 12	17 27		

1. Harmonics of input frequency below the power level of F2.

ABSOLUTE MAXIMUM RATINGS[2]

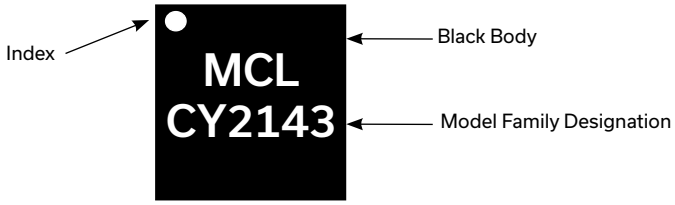
Parameter	Ratings
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C
RF Input Power	+21 dBm

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

PAD CONNECTIONS

INPUT	3
OUTPUT	16
GROUND	2,4,15,17, Paddle
NO CONNECTIONS	All Others

PRODUCT MARKING



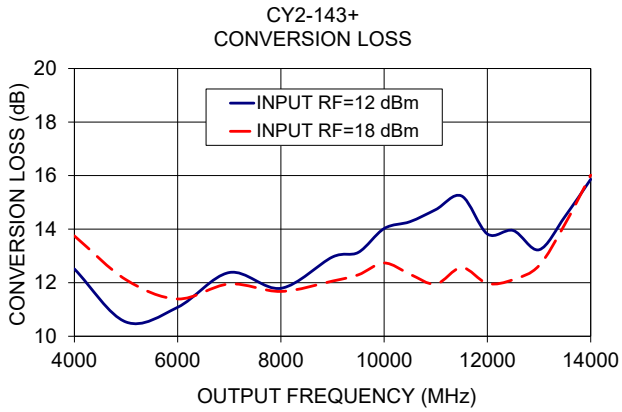
Marking may contain other features or characters for internal lot control.

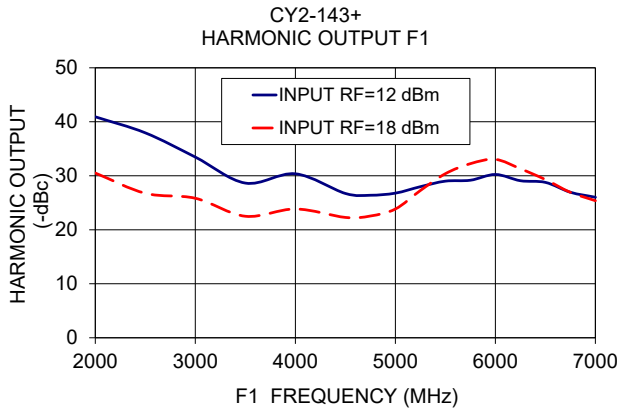
X2 Frequency Multiplier CY2-143+

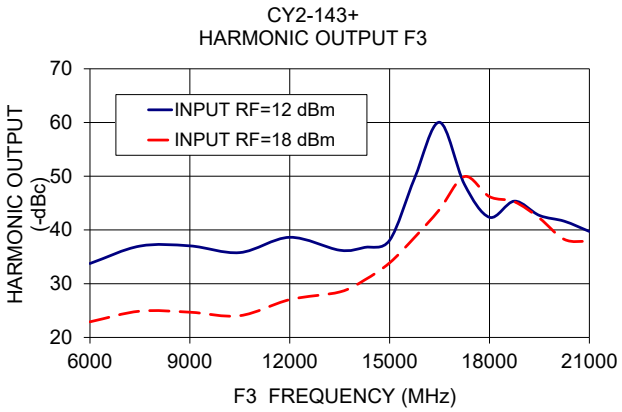
50Ω Output 4 to 14 GHz

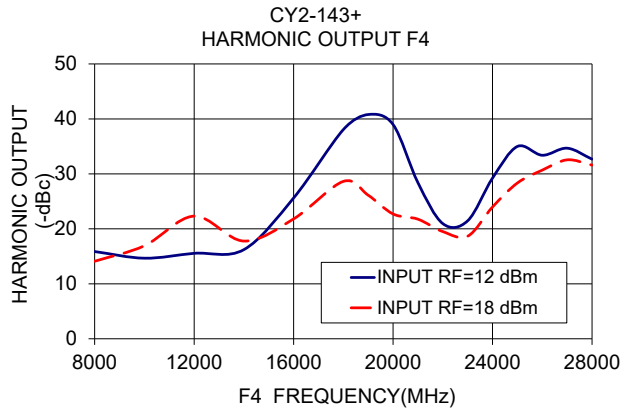
TYPICAL PERFORMANCE DATA

Input Frequency (MHz)	INPUT RF= +12 dBm Conversion Loss (dB) F2	Harmonic Output Below F2 (-dBc) F1	F3	F4	INPUT RF= +18 dBm Conversion Loss (dB) F2	Harmonic Output Below F2 (-dBc) F1	F3	F4
2000	12.51	40.92	33.76	15.87	13.75	30.50	22.90	14.10
2500	10.53	37.94	37.00	14.66	12.11	26.75	24.89	16.92
3000	11.08	33.46	37.04	15.55	11.39	25.83	24.69	22.32
3500	12.38	28.64	35.79	16.22	11.95	22.50	24.04	17.78
4000	11.79	30.37	38.63	25.62	11.68	23.85	27.03	21.81
4500	12.96	26.72	36.23	38.06	12.06	22.28	28.45	28.64
4750	13.13	26.39	36.75	40.80	12.30	22.55	30.69	26.12
5000	14.02	26.78	38.07	38.98	12.74	23.84	33.88	22.71
5250	14.28	27.98	49.62	28.39	12.32	27.27	38.61	21.76
5500	14.73	29.00	60.05	20.95	11.95	30.39	43.81	19.50
5750	15.24	29.17	48.47	21.47	12.57	32.24	49.94	18.66
6000	13.82	30.24	42.36	29.24	11.98	33.03	46.20	23.98
6250	13.95	29.08	45.37	35.00	12.12	31.30	45.25	28.35
6500	13.23	28.77	42.70	33.39	12.64	29.29	42.22	30.69
6750	14.46	26.94	41.63	34.68	14.18	26.93	38.24	32.55
7000	15.86	26.02	39.73	32.68	16.02	25.38	37.86	31.60









X2 Frequency Multiplier CY2-143+

50Ω Output 4 to 14 GHz

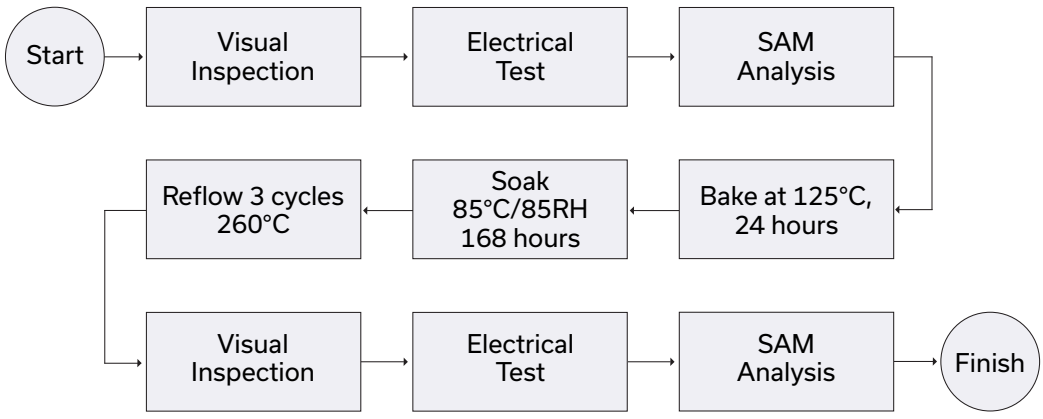
ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. TO ACCESS CLICK HERE

Performance Data	Data Table Swept Graphs S-Parameter (S3P Files) Data Set (.zip file)
Case Style	DG1847 Plastic package, exposed paddle lead finish: matte-tin
Tape & Reel **Standard Quantities Available on Reel**	F68 7" Reels with 20, 50, 100, 200, 500 or 1K devices
Suggested Layout for PCB Design	PL-476
Evaluation Board	TB-851-143+
Environmental Ratings	ENV08T1

ESD RATING

Human body model (HBM): Class 1C (1000 to <2000 V) in accordance with ANSI/ESD STM 5.1-2001

MSL TEST FLOW CHART



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/terms/viewterm.html

Frequency Multiplier (Doubler) CY2-143+

Typical Performance Data

Frequency (MHz)				RF IN = 12dBm			
				Conversion Loss (dB)	Harmonic Output* (-dBc)		
X1 Output	X2 Output	X3 Output	X4 Output	X2 Output	X1 Output	X3 Output	X4 Output
2000	4000	6000	8000	12.51	40.92	33.76	15.87
2500	5000	7500	10000	10.53	37.94	37.00	14.66
3000	6000	9000	12000	11.08	33.46	37.04	15.55
3500	7000	10500	14000	12.38	28.64	35.79	16.22
4000	8000	12000	16000	11.79	30.37	38.63	25.62
4500	9000	13500	18000	12.96	26.72	36.23	38.06
4750	9500	14250	19000	13.13	26.39	36.75	40.80
5000	10000	15000	20000	14.02	26.78	38.07	38.98
5250	10500	15750	21000	14.28	27.98	49.62	28.39
5500	11000	16500	22000	14.73	29.00	60.05	20.95
5750	11500	17250	23000	15.24	29.17	48.47	21.47
6000	12000	18000	24000	13.82	30.24	42.36	29.24
6250	12500	18750	25000	13.95	29.08	45.37	35.00
6500	13000	19500	26000	13.23	28.77	42.70	33.39
6750	13500	20250	27000	14.46	26.94	41.63	34.68
7000	14000	21000	28000	15.86	26.02	39.73	32.68

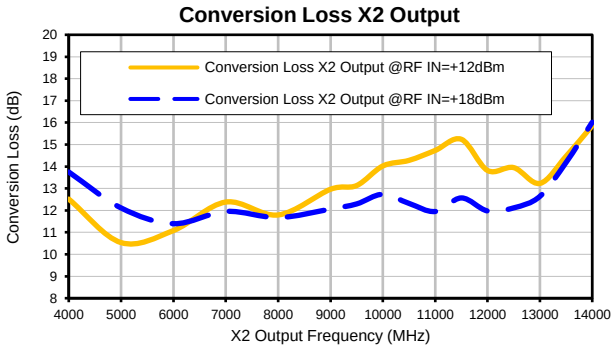
*Harmonic Output below power level of X2 Output .

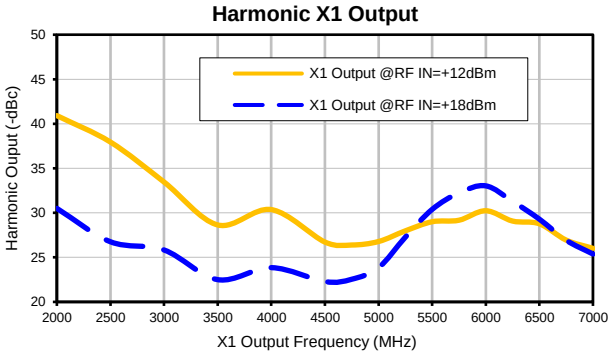
Frequency (MHz)				RF IN = 18dBm			
				Conversion Loss (dB)	Harmonic Output* (-dBc)		
X1 Output	X2 Output	X3 Output	X4 Output	X2 Output	X1 Output	X3 Output	X4 Output
2000	4000	6000	8000	13.75	30.50	22.90	14.10
2500	5000	7500	10000	12.11	26.75	24.89	16.92
3000	6000	9000	12000	11.39	25.83	24.69	22.32
3500	7000	10500	14000	11.95	22.50	24.04	17.78
4000	8000	12000	16000	11.68	23.85	27.03	21.81
4500	9000	13500	18000	12.06	22.28	28.45	28.64
4750	9500	14250	19000	12.30	22.55	30.69	26.12
5000	10000	15000	20000	12.74	23.84	33.88	22.71
5250	10500	15750	21000	12.32	27.27	38.61	21.76
5500	11000	16500	22000	11.95	30.39	43.81	19.50
5750	11500	17250	23000	12.57	32.24	49.94	18.66
6000	12000	18000	24000	11.98	33.03	46.20	23.98
6250	12500	18750	25000	12.12	31.30	45.25	28.35
6500	13000	19500	26000	12.64	29.29	42.22	30.69
6750	13500	20250	27000	14.18	26.93	38.24	32.55
7000	14000	21000	28000	16.02	25.38	37.86	31.60

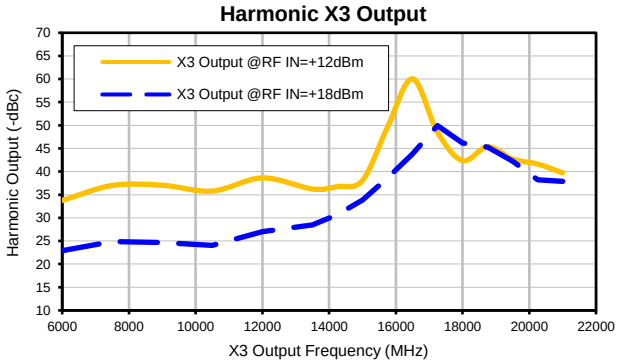
*Harmonic Output below power level of X2 Output .

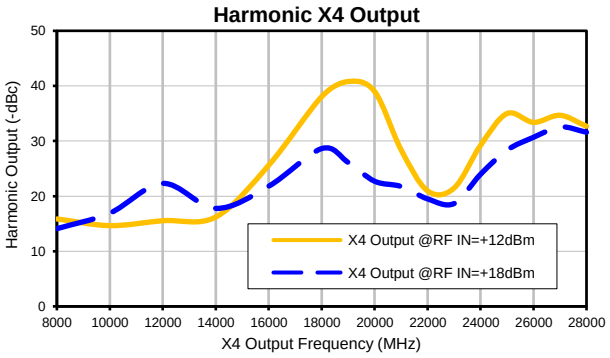
Frequency Multiplier (Doubler) CY2-143+

Typical Performance Curves





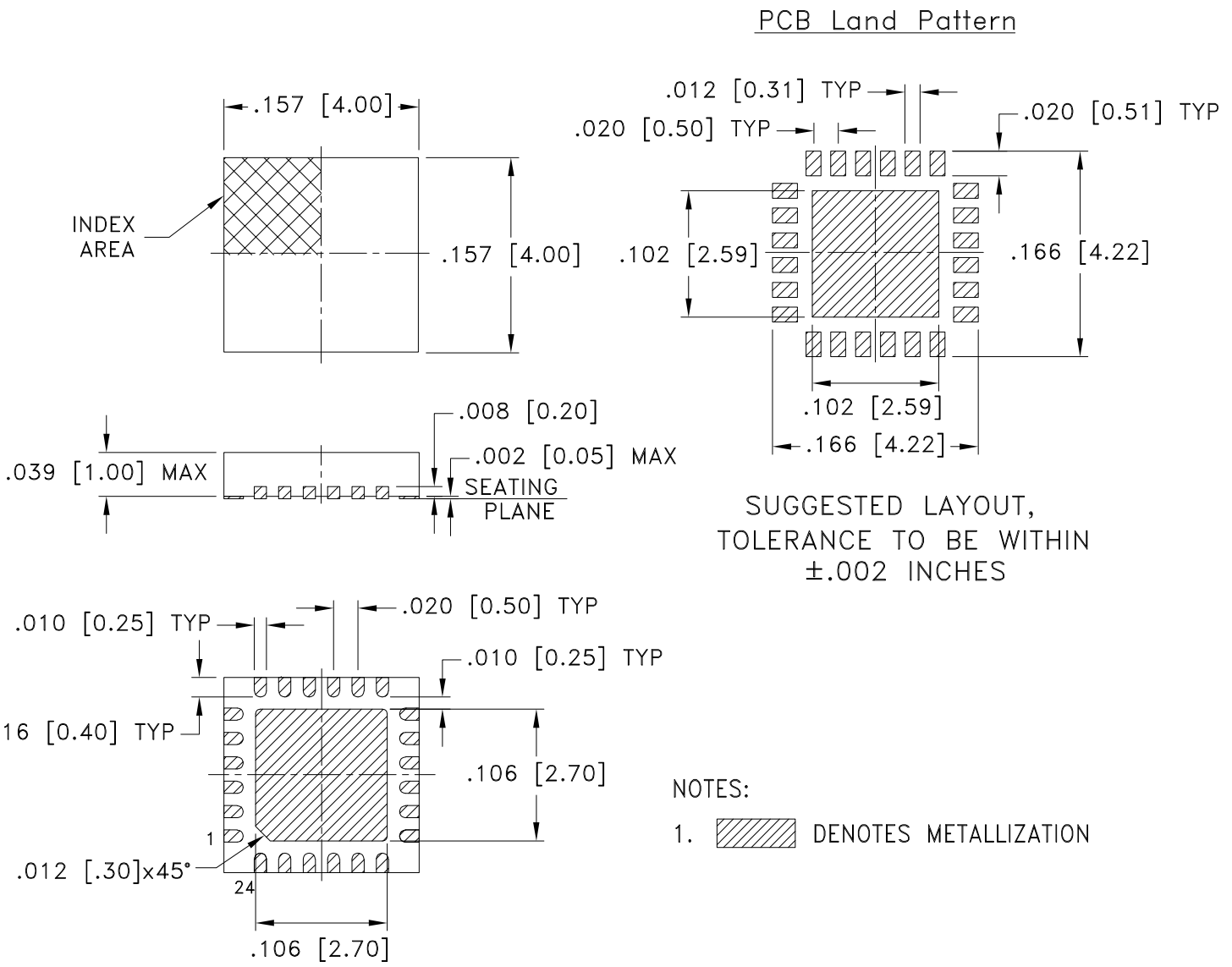




Case Style DG

Outline Dimensions

DG1847



Weight: .04 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.01; 3 Pl.±.005 Inches

Notes:

1. Case material: Plastic.
2. Termination finish:

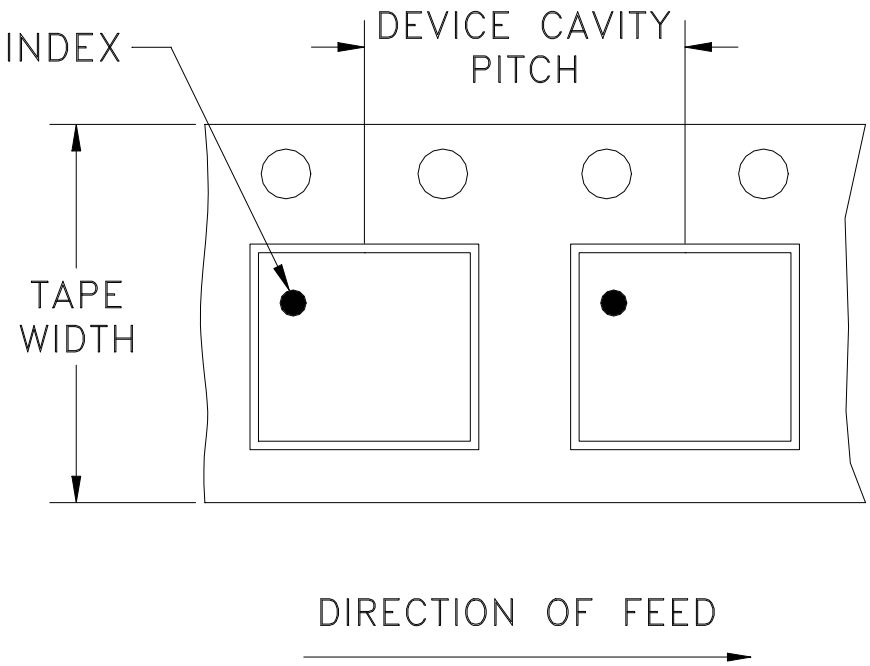
For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin or NiPdAu All models, (+) suffix. See model Data sheet.

For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

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RF/IF MICROWAVE COMPONENTS

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

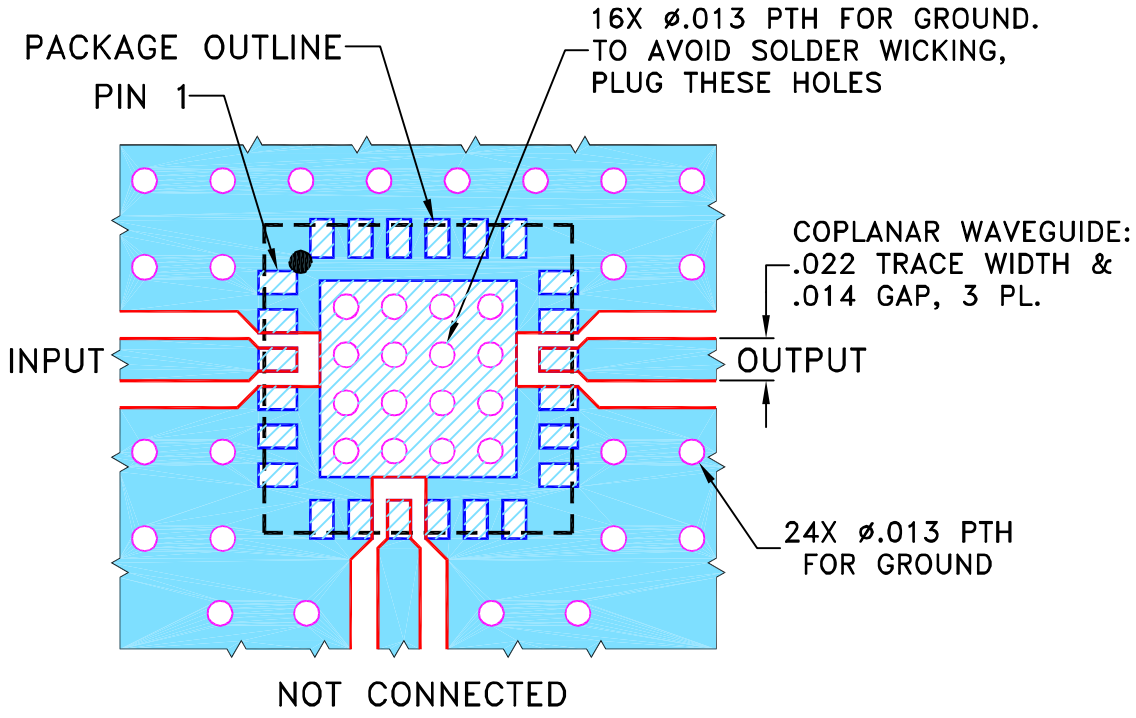
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THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M154678	NEW RELEASE	01/15/16	GF	JX

SUGGESTED MOUNTING CONFIGURATION FOR DG1847 CASE STYLE, "24FM01" PIN CODE



NOTES:

1. TRACE WIDTH PARAMETERS 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.
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	01/14/16
TOLERANCES ON:	CHECKED	IL	01/15/16
2 PL DECIMALS ±	APPROVED	JX	01/15/16
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

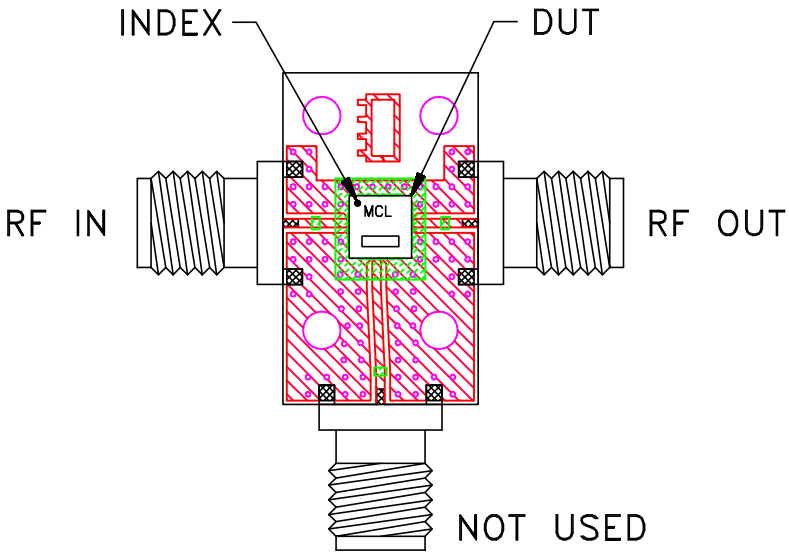
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 24FM01, DG1847, TB-851+

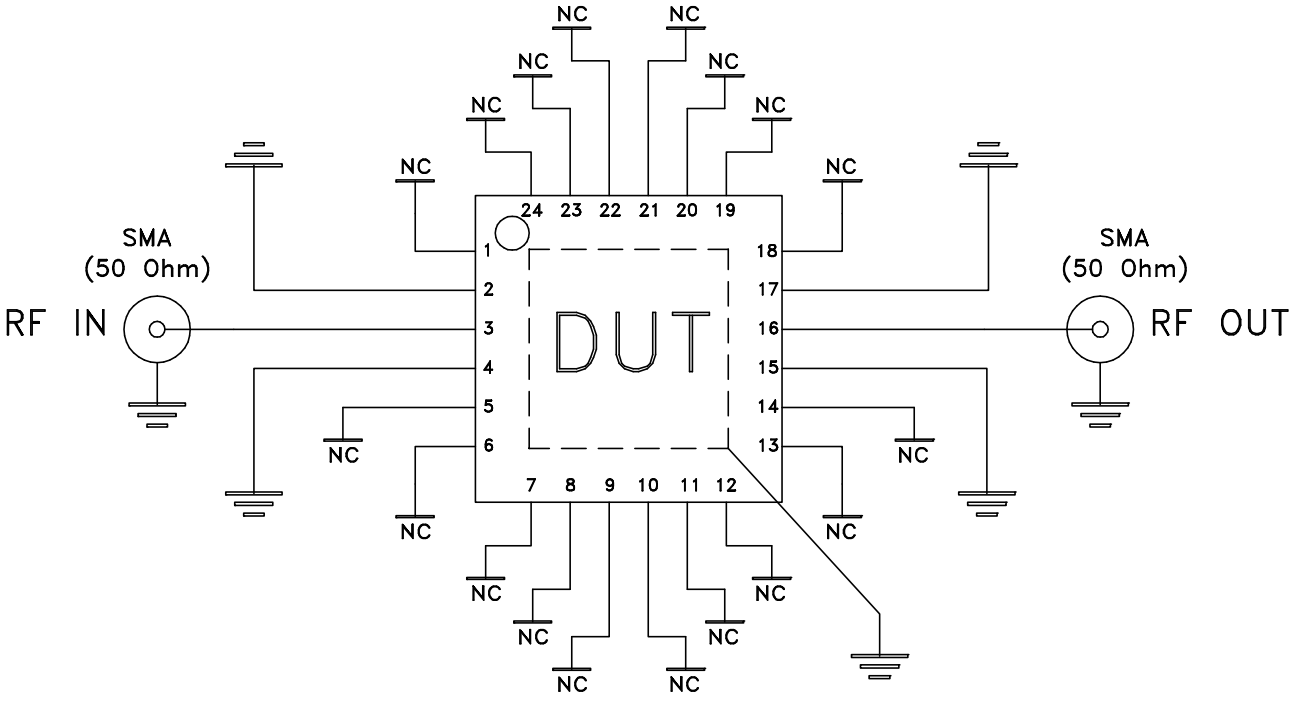
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-476	OR

FILE:	SCALE:	SHEET:
98PL476	10:1	1 OF 1

Evaluation Board and Circuit



TB-851-143+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.010 inch.
3. "NC" pads are connected to PCB ground, except pin 9.

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Mini-Circuits

Environmental Specifications **ENV08T1**

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 or -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
HTOL	1000 hours at 125°C	MIL-STD-883, Method 1005, Condition B
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Mechanical Shock	1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only	MIL-STD-883, Method 2002, Condition B, except Y1 direction only
Vibration (Variable Frequency)	50g peak	MIL-STD-883, Method 2007, Condition B
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102, Condition C
HAST	130°C, 85% RH, 96 hours	JESD22-A110
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
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 260°C peak	J-STD-020

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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
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

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