X4 Frequency Multiplier RKK-4-252+

50Ω Output 1720 to 2520 MHz

The Big Deal

- Broadband, output from 1720 to 2520 MHz
- Low conversion loss, 25 dB
- Good harmonic suppression: F3, 30 dBc; F5, 35 dBc

CASE STYLE: CK1246

Product Overview

Mini-Circuits' RKK-4-252+ frequency multiplier provides a multiplication factor of 4, converting input frequencies from 430 to 630 MHz into output frequencies from 1720 to 2520 MHz, supporting applications including synthesizers, local oscillators, satellite up and down converters and more. This model provides an input power range from +16 to +19 dBm, low conversion loss and good harmonic suppression. The multiplier comes housed in a miniature, shielded surface-mount package (0.50 x 0.50 x 0.18") with wrap-around terminations for excellent solderability.

Key Features

Feature	Advantages
Low conversion loss, 25 dB typ.	With a low conversion loss, RKK-4-252+ produces higher output power, reducing the need for amplification.
Very good harmonic suppression • F3, 30 dBc • F5, 35 dBc	Reduces spurious signals and the need for additional filtering.
Broadband, 1720 to 2520 MHz output	With an output frequency range spanning 1720 to 2520 MHz, this multiplier covers a wide range of applications.
Input power range from+16 to +19 dBm	Wide input power signal range accommodates different input signal levels while still maintaining a low conversion loss.
Low cost	Provides an easy, cost-effective solution for generating high-frequency signals from a lower frequency signal source.
Small size, 0.50 x 0.50 x 0.18"	Saves space in crowded PCB layouts.

X4 Frequency Multiplier

RKK-4-252+

50Ω Output 1720 to 2520 MHz

Generic photo used for illustration purposes only

CASE STYLE: CK1246

+RoHS Compliant

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

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input Power	20dBm

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

Pin Connections

INPUT	2
OUTPUT	10
GROUND	1,3,4,5,6,7,8,9,11,12,13,14,15,16

Features

- broadband
- high rejection F1, 33 dBc typ; F2, 32 dBc typ; F3, 30 dBc typ; F5, 35 dBc typ.
- aqueous washable

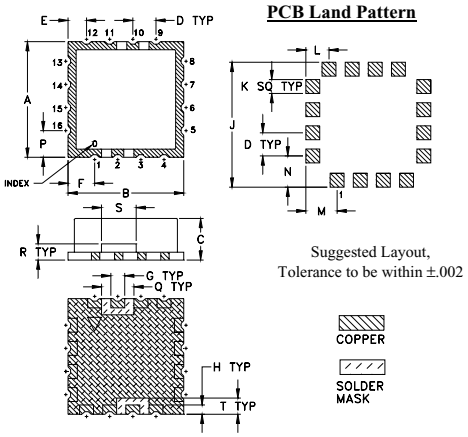
Applications

- synthesizers
- local oscillators
- satellite up and down converters
- radio astronomy
- private and public land mobil

Available Tape and Reel at no extra cost

Reel Size	Devices/Reel
7"	10, 20, 50, 100
13"	200, 500

Outline Drawing

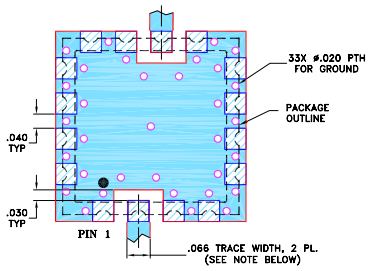


Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K
.500	.500	.180	.100	.080	.115	.060	.040	.540	.060
12.70	12.70	4.57	2.54	2.03	2.92	1.52	1.02	13.72	1.52

L	M	N	P	Q	R	S	T	wt.
.100	.135	.135	.115	.140	.070	.150	.070	grams
2.54	3.43	3.43	2.92	3.56	1.78	3.81	1.78	1.0

Demo Board MCL P/N: TB-435+
Suggested PCB Layout (PL-267)



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

Electrical Specifications

Parameter		Min.	Typ.	Max.	Unit
Multiplier Factor			4		
Frequency Range, Input (F1)		430	—	630	MHz
Frequency Range, Output (F4)		1720	—	2520	MHz
Input Power		16	—	19	dBm
Conversion Loss		—	25	30	dB
Harmonic Output	F1	22	33	—	dBc
	F2	20	32	—	
	F3	20	30	—	
	F5	25	35	—	

* Harmonics of input frequency below the power level of F4.

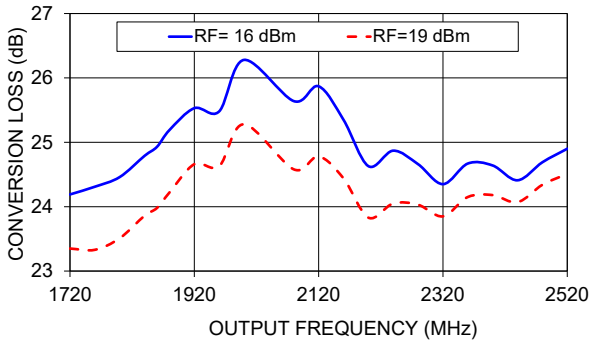
Typical Performance Data

Input Frequency (MHz)	INPUT RF= 16Bm Conversion Loss (dB)	Harmonic Output Below F4 (-dBc)				INPUT RF= 19dBm Conversion Loss (dB)	Harmonic Output Below F4 (-dBc)			
	F4	F1	F2	F3	F5	F4	F1	F2	F3	F5
430	24.19	44.41	40.49	50.22	38.44	23.35	42.95	42.84	54.44	43.79
440	24.31	43.77	40.01	47.67	41.23	23.33	42.38	42.49	50.83	42.49
450	24.46	43.16	39.38	44.54	37.97	23.51	41.76	41.86	46.59	37.87
460	24.79	42.59	38.66	42.10	39.98	23.86	41.20	41.16	43.94	40.44
465	24.93	42.33	38.26	41.43	42.23	23.98	40.95	40.50	43.36	42.21
470	25.19	41.90	37.74	40.41	41.16	24.22	40.55	39.90	42.49	41.01
480	25.53	41.09	36.81	36.69	43.45	24.66	39.65	38.90	38.62	42.89
490	25.48	40.67	36.15	35.40	42.95	24.63	39.27	38.27	36.84	41.59
500	26.28	39.51	34.62	34.83	40.55	25.28	38.30	37.02	36.30	39.02
520	25.64	39.32	33.87	36.25	40.36	24.58	38.17	36.40	37.24	39.46
530	25.87	38.57	33.05	35.70	42.53	24.78	37.62	35.66	36.60	40.74
540	25.35	38.58	33.06	36.08	40.36	24.44	37.59	35.46	36.24	39.67
550	24.63	38.88	33.08	38.61	40.35	23.83	37.78	35.42	37.99	39.52
560	24.87	38.31	32.12	39.36	40.98	24.05	37.12	34.54	39.20	40.62
570	24.66	38.21	31.89	37.43	40.19	24.03	36.84	34.12	37.87	39.90
580	24.35	38.39	31.39	38.84	40.57	23.85	36.83	33.51	38.51	41.29
590	24.67	37.88	30.35	39.86	40.23	24.15	36.30	32.47	40.17	41.69
600	24.64	37.63	29.73	37.45	40.31	24.18	36.00	31.73	38.76	42.66
610	24.41	37.58	29.03	37.97	41.87	24.07	35.84	30.94	39.38	44.99
620	24.69	37.04	27.55	35.31	41.89	24.34	35.29	29.41	36.65	45.68
630	24.90	36.57	26.73	33.12	43.96	24.51	34.81	28.57	34.91	49.04

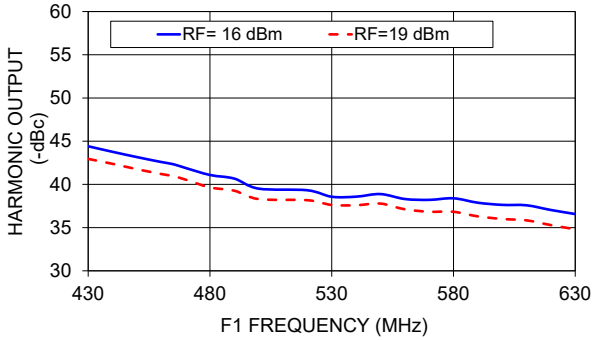
Notes

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

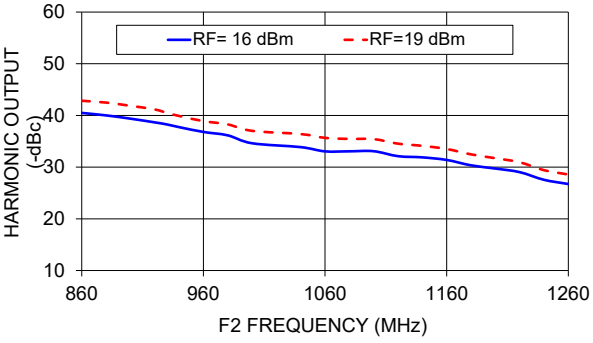
RKK-4-252+
CONVERSION LOSS



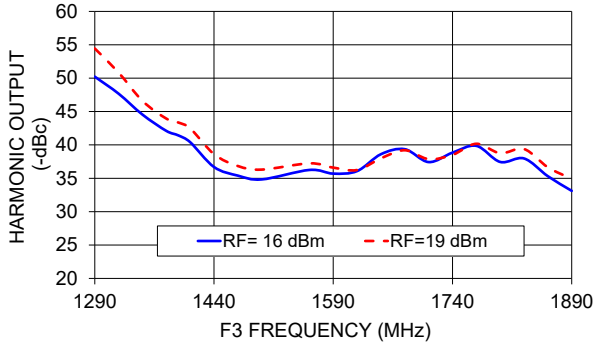
RKK-4-252+
HARMONIC OUTPUT F1



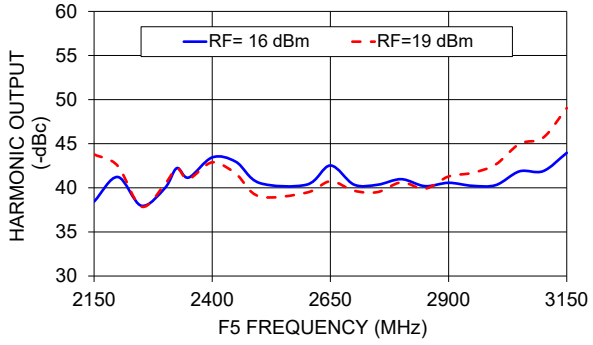
RKK-4-252+
HARMONIC OUTPUT F2



RKK-4-252+
HARMONIC OUTPUT F3



RKK-4-252+
HARMONIC OUTPUT F5



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Frequency Multiplier (X4) RKK-4-252+

Typical Performance Data

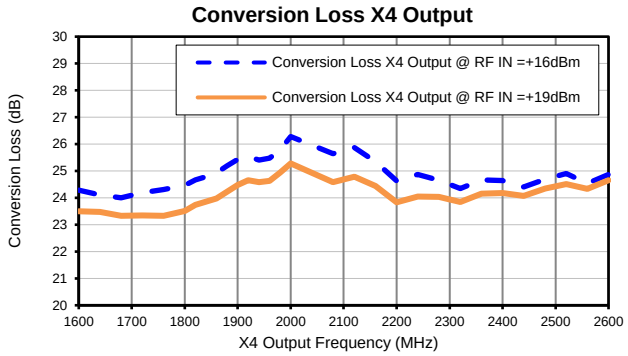
FREQUENCY (MHz)					CONVERSION LOSS (dB)	RF IN = +16 dBm HARMONIC OUTPUT* (-dBc)			
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X5 OUTPUT	X4 OUTPUT	X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X5 OUTPUT
400	800	1200	1600	2000	24.29	45.63	41.37	56.52	32.46
410	820	1230	1640	2050	24.11	45.29	41.30	53.36	35.38
420	840	1260	1680	2100	24.00	45.01	41.03	51.32	37.97
430	860	1290	1720	2150	24.19	44.41	40.49	50.22	38.44
440	880	1320	1760	2200	24.31	43.77	40.01	47.67	41.23
450	900	1350	1800	2250	24.46	43.16	39.38	44.54	37.97
455	910	1365	1820	2275	24.67	42.81	39.02	42.93	37.99
460	920	1380	1840	2300	24.79	42.59	38.66	42.10	39.98
465	930	1395	1860	2325	24.93	42.33	38.26	41.43	42.23
470	940	1410	1880	2350	25.19	41.90	37.74	40.41	41.16
475	950	1425	1900	2375	25.43	41.44	37.24	38.51	40.28
480	960	1440	1920	2400	25.53	41.09	36.81	36.69	43.45
485	970	1455	1940	2425	25.41	40.95	36.56	35.68	45.71
490	980	1470	1960	2450	25.48	40.67	36.15	35.40	42.95
495	990	1485	1980	2475	25.79	40.17	35.51	35.40	41.11
500	1000	1500	2000	2500	26.28	39.51	34.62	34.83	40.55
520	1040	1560	2080	2600	25.64	39.32	33.87	36.25	40.36
530	1060	1590	2120	2650	25.87	38.57	33.05	35.70	42.53
540	1080	1620	2160	2700	25.35	38.58	33.06	36.08	40.36
550	1100	1650	2200	2750	24.63	38.88	33.08	38.61	40.35
560	1120	1680	2240	2800	24.87	38.31	32.12	39.36	40.98
570	1140	1710	2280	2850	24.66	38.21	31.89	37.43	40.19
580	1160	1740	2320	2900	24.35	38.39	31.39	38.84	40.57
590	1180	1770	2360	2950	24.67	37.88	30.35	39.86	40.23
600	1200	1800	2400	3000	24.64	37.63	29.73	37.45	40.31
610	1220	1830	2440	3050	24.41	37.58	29.03	37.97	41.87
620	1240	1860	2480	3100	24.69	37.04	27.55	35.31	41.89
630	1260	1890	2520	3150	24.90	36.57	26.73	33.12	43.96
640	1280	1920	2560	3200	24.54	36.60	26.06	32.89	43.72
650	1300	1950	2600	3250	24.87	35.94	24.52	32.58	45.49

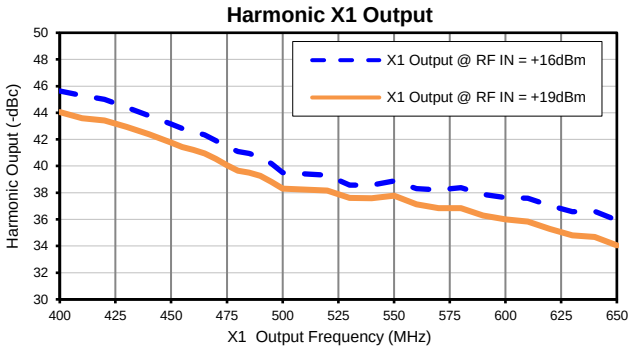
* Harmonic Output below power level of X4 Output.

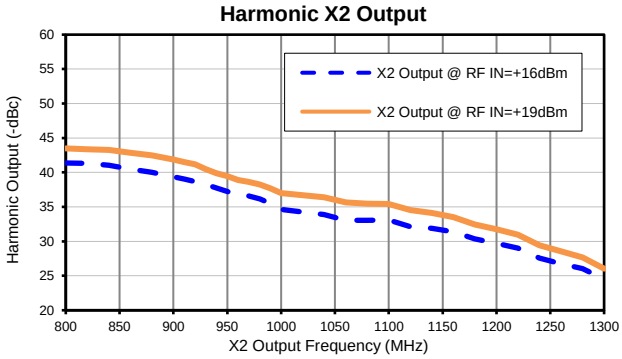
FREQUENCY (MHz)					CONVERSION LOSS (dB)	RF IN = +19 dBm HARMONIC OUTPUT* (-dBc)			
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X5 OUTPUT	X4 OUTPUT	X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X5 OUTPUT
400	800	1200	1600	2000	23.50	44.05	43.49	58.26	30.93
410	820	1230	1640	2050	23.48	43.58	43.38	54.85	39.27
420	840	1260	1680	2100	23.33	43.41	43.28	54.52	48.29
430	860	1290	1720	2150	23.35	42.95	42.84	54.44	43.79
440	880	1320	1760	2200	23.33	42.38	42.49	50.83	42.49
450	900	1350	1800	2250	23.51	41.76	41.86	46.59	37.87
455	910	1365	1820	2275	23.74	41.42	41.49	44.80	38.29
460	920	1380	1840	2300	23.86	41.20	41.16	43.94	40.44
465	930	1395	1860	2325	23.98	40.95	40.50	43.36	42.21
470	940	1410	1880	2350	24.22	40.55	39.90	42.49	41.01
475	950	1425	1900	2375	24.48	40.06	39.44	40.64	40.15
480	960	1440	1920	2400	24.66	39.65	38.90	38.62	42.89
485	970	1455	1940	2425	24.58	39.51	38.61	37.33	44.59
490	980	1470	1960	2450	24.63	39.27	38.27	36.84	41.59
495	990	1485	1980	2475	24.94	38.81	37.69	36.59	39.64
500	1000	1500	2000	2500	25.28	38.30	37.02	36.30	39.02
520	1040	1560	2080	2600	24.58	38.17	36.40	37.24	39.46
530	1060	1590	2120	2650	24.78	37.62	35.66	36.60	40.74
540	1080	1620	2160	2700	24.44	37.59	35.46	36.24	39.67
550	1100	1650	2200	2750	23.83	37.78	35.42	37.99	39.52
560	1120	1680	2240	2800	24.05	37.12	34.54	39.20	40.62
570	1140	1710	2280	2850	24.03	36.84	34.12	37.87	39.90
580	1160	1740	2320	2900	23.85	36.83	33.51	38.51	41.29
590	1180	1770	2360	2950	24.15	36.30	32.47	40.17	41.69
600	1200	1800	2400	3000	24.18	36.00	31.73	38.76	42.66
610	1220	1830	2440	3050	24.07	35.84	30.94	39.38	44.99
620	1240	1860	2480	3100	24.34	35.29	29.41	36.65	45.68
630	1260	1890	2520	3150	24.51	34.81	28.57	34.91	49.04
640	1280	1920	2560	3200	24.33	34.69	27.66	34.50	49.59
650	1300	1950	2600	3250	24.66	34.05	26.04	34.41	53.62

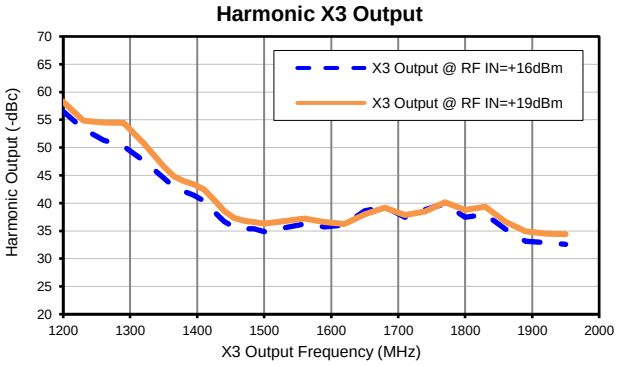
* Harmonic Output below power level of X4 Output.

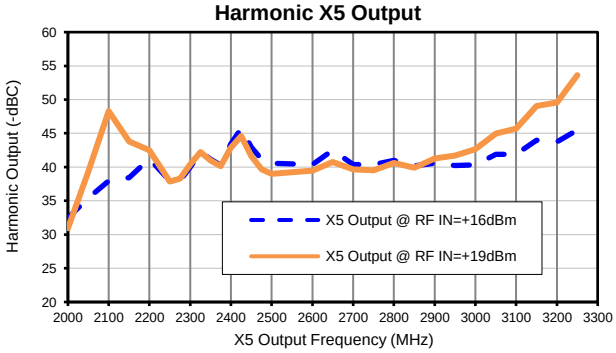
Typical Performance Curves







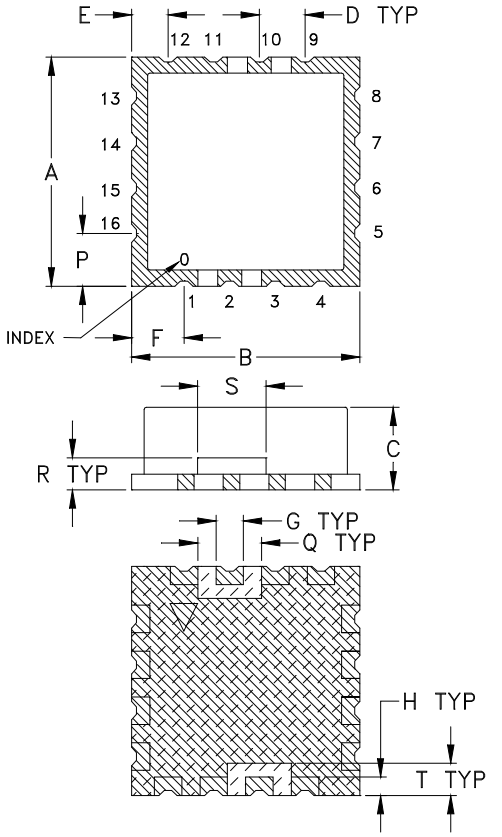




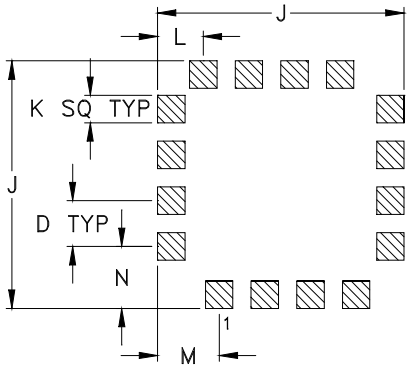
Case Style CK

CK1246

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

METALLIZATION

SOLDER RESIST

CASE #	A	B	C	D	E	F	G	H	J	K
CK1246	.500 (12.70)	.500 (12.70)	.180 (4.57)	.100 (2.54)	.080 (2.03)	.115 (2.92)	.060 (1.52)	.040 (1.02)	.540 (13.72)	.060 (1.52)

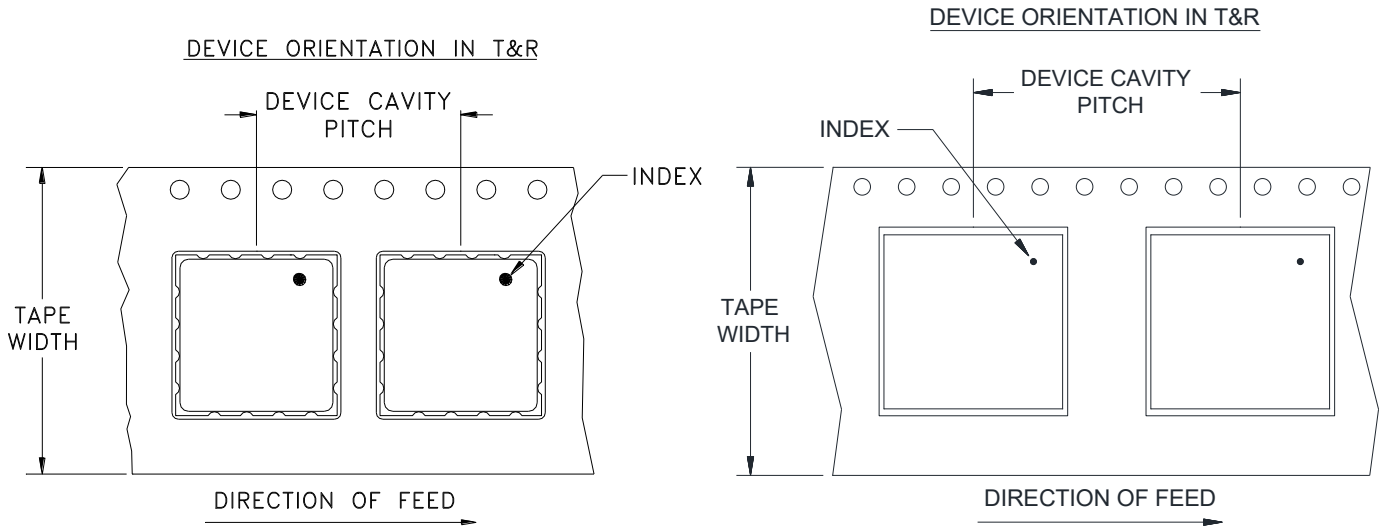
CASE #	L	M	N	P	Q	R	S	T	WT. GRAM
CK1246	.100 (2.54)	.135 (3.43)	.135 (3.43)	.115 (2.92)	.140 (3.56)	.070 (1.78)	.150 (3.81)	.070 (1.78)	1.0

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

Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Termination finish:
   For RoHS Case Styles: 3-5 µ inch (.08-.13 microns) Gold over 120-240 µ inch (3.05-6.10 microns) Nickel plate. All models, (+) suffix.

Tape & Reel Packaging TR-F37



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
24	16	7	Small quantity standards (see note)	10
				20
				50
				100
		13	Standard	200
				500

Note: Please consult individual model data sheet to determine device per reel availability.

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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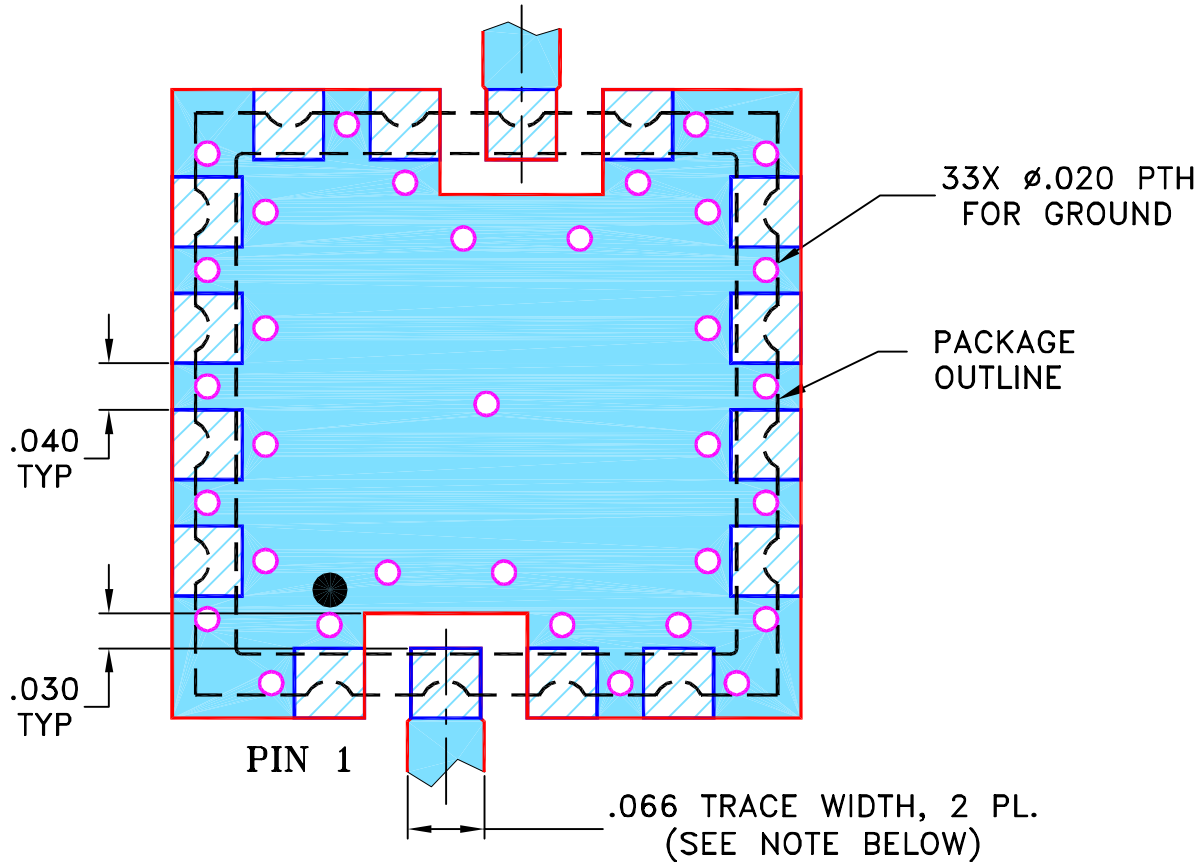
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M109402	NEW RELEASE	01/24/07	PW	DJ

SUGGESTED MOUNTING CONFIGURATION FOR CK1246 CASE STYLE, "rz" PIN CONNECTION



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	DRAWN	PW	01/19/07
TOLERANCES ON:	CHECKED	IL	01/24/07
2 PL DECIMALS ±	APPROVED	DJ	01/24/07
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

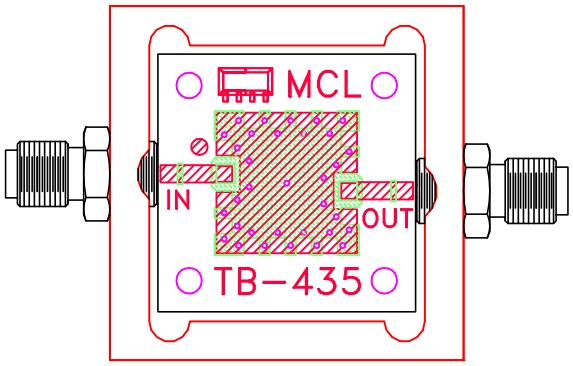
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, rz, CK1246, RKK, TB-435+

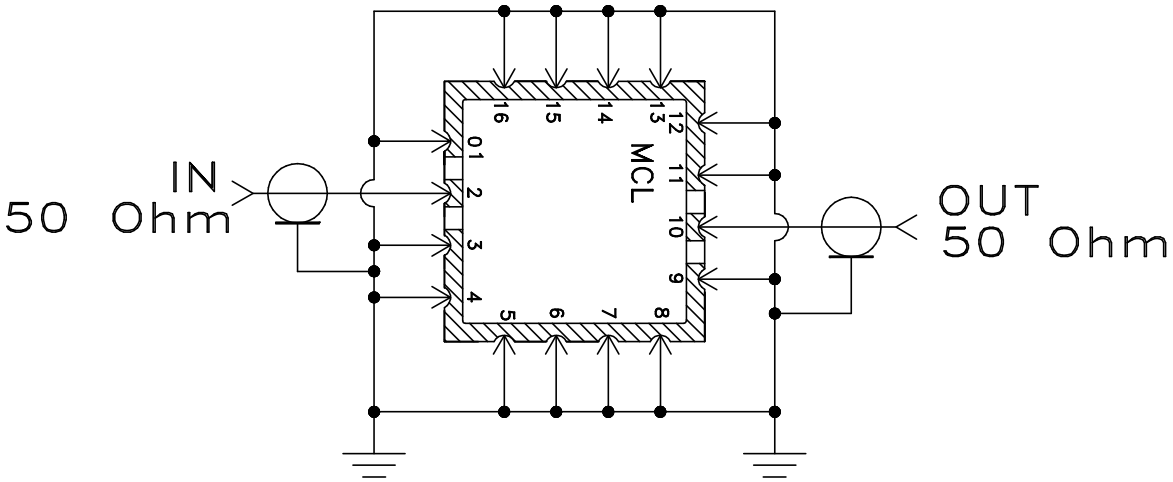
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-267	OR

FILE:	SCALE:	SHEET:
98PL267	6:1	1 OF 1

Evaluation Board and Circuit



TB-435+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

Mini-Circuits®

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Environmental Specifications ENV03T2

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
HAST	130°C, 85% RH, 96 hours	JESD22-A110
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 Eutectic Process: 225°C peak Pb-Free Process, 245°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Vibration (High Frequency)	20g peak, 20-2000 Hz, 4 times in each of three axes (total 12)	MIL-STD-883, Method 2007.3, Condition A
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