NON-CATALOG

Surface Mount

Voltage Controlled Oscillator

MOS-2220-119+

5V Tuning for PLL ICs 2060 to 2220 MHz

Features

- linear tuning characteristics
- low phase noise
- low pulling
- low pushing
- aqueous washable

Applications

- W-CDMA
- MW & MMW

CASE STYLE: CZ682

+RoHS Compliant

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

Electrical Specifications

MODEL NO.	FREQ. (MHz)		POWER OUTPUT (dBm)	PHASE NOISE dBc/Hz SSB at offset frequencies,kHz Typ.				TUNING VOLTAGE RANGE (V)		SENSI-TIVITY (MHz/V)	PORT CAP (pF)	3 dB MODULATION BANDWIDTH (MHz)	NON HARMONIC SPURIOUS (dBc)	HARMONICS (dBc)		PULLING pk-pk @12 dBr (MHz)	PUSHING (MHz/V)	DC OPERATING POWER Vcc (volts)	DC OPERATING POWER Current (mA)
	Min.	Max.	Typ.	1	10	100	1000	Min.	Max.	Typ.	Typ.	Typ.	Typ.	Typ.	Max.	Typ.	Typ.		Max.
MOS-2220-119+	2060	2220	+1	-73	-99	-120	-140	0.5	5	55-79	20	50	-90	-35	-20	2.5	4	5	33

Pin Connections

RF OUT	5
VCC	3
V-TUNE	1
GROUND	2,4,6,7,8

Maximum Ratings

Operating Temperature	-55°C to 85°C
Storage Temperature	-55°C to 100°C
Absolute Max. Supply Voltage (Vcc)	7V
Absolute Max. Tuning Voltage (Vtune)	7V
All specifications	50 ohm system

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

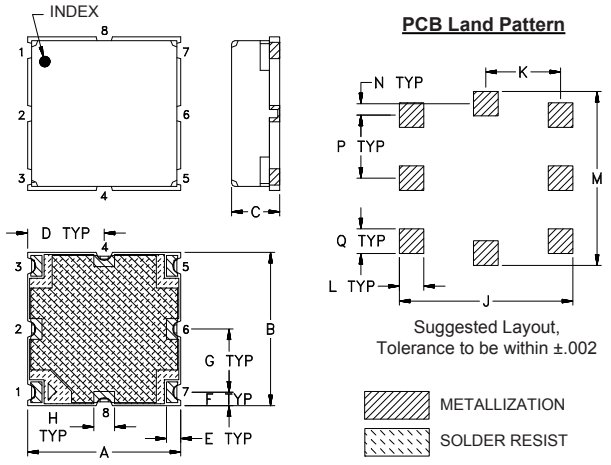
Tape & Reel: F60

7" Reels with 10, 20, 50, 100 devices

13" Reels with 200, 500, 1000 devices

Environmental Ratings: ENV65

Outline Drawing

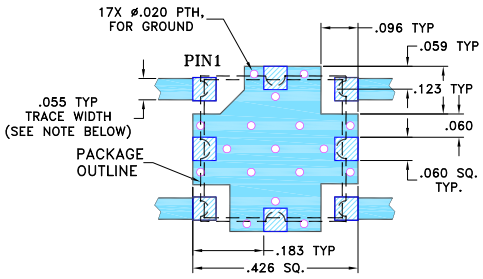


PCB Land Pattern

Suggested Layout,
Tolerance to be within ±.002

Demo Board MCL P/N: TB-128

Suggested PCB Layout (PL-023)



NOTE: 1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; 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

Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	wt.
.375	**.375**	**.131**	**.188**	**.035**	**.033**	**.154**	**.050**	**.425**	**.183**	**.060**	**.425**	**.028**	**.154**	**.060**	grams
9.52	9.52	3.33	4.77	0.89	0.84	3.91	1.27	10.80	4.65	1.52	10.80	0.71	3.91	1.52	.60

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

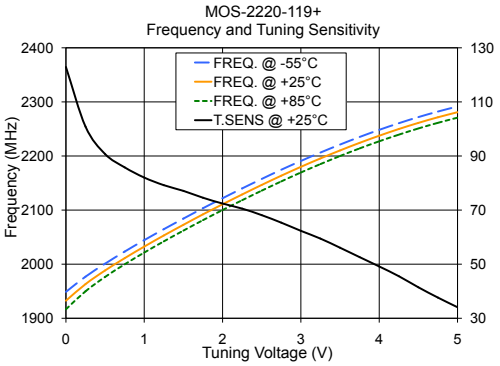
NON-CATALOG

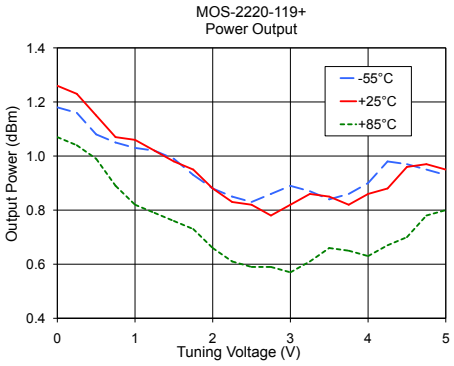
Performance Data & Curves*

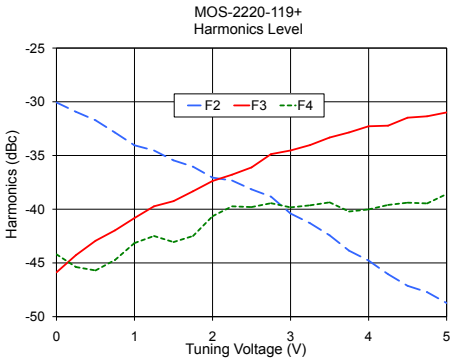
MOS-2220-119+

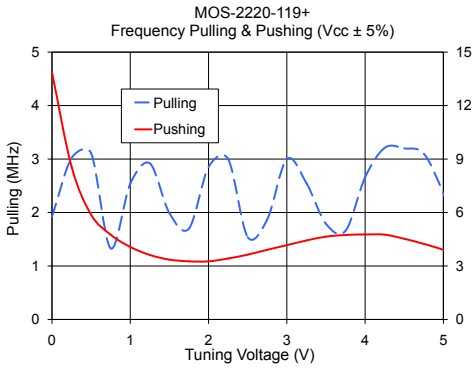
V TUNE	TUNE SENS (MHz/V)	FREQUENCY (MHz)			POWER OUTPUT (dBm)			Icc (mA)	HARMONICS (dBc)			FREQ. PUSH (MHz/V)	FREQ. PULL (MHz)	PHASE NOISE (dBc/Hz) at offsets				FREQ OFFSET (KHz)	PHASE NOISE at 2140 MHz (dBc/Hz)
		-55°C	+25°C	+85°C	-55°C	+25°C	+85°C		F2	F3	F4			1kHz	10kHz	100kHz	1MHz		
0.00	122.90	1948.8	1932.4	1916.6	1.18	1.26	1.07	26.93	-30.1	-45.9	-44.2	13.87	1.92	-68.21	-95.0	-117.2	-137.2	1.0	-73.03
0.50	90.73	2000.9	1988.4	1976.5	1.08	1.15	0.99	27.02	-31.7	-42.9	-45.7	5.88	3.11	-72.05	-98.6	-120.4	-140.4	2.0	-81.67
0.75	85.79	2023.2	2011.1	1999.8	1.05	1.07	0.89	27.04	-32.9	-42.0	-44.7	4.76	1.33	-72.88	-99.4	-120.5	-140.6	3.5	-88.21
1.00	82.03	2044.3	2032.5	2021.4	1.03	1.06	0.82	27.05	-34.1	-40.8	-43.2	4.07	2.54	-73.17	-99.1	-120.8	-140.8	6.0	-93.65
1.25	79.22	2064.6	2053.0	2042.1	1.02	1.02	0.79	27.07	-34.5	-39.7	-42.5	3.62	2.92	-74.31	-99.1	-120.9	-140.9	8.5	-97.56
1.50	77.09	2084.3	2072.8	2062.1	0.99	0.98	0.76	27.09	-35.5	-39.3	-43.1	3.36	1.99	-72.74	-99.2	-120.9	-141.0	10.0	-99.34
1.75	74.56	2103.4	2092.1	2081.4	0.93	0.95	0.73	27.11	-36.0	-38.3	-42.5	3.26	1.70	-72.89	-99.2	-120.9	-140.9	20.8	-106.67
2.00	72.40	2121.9	2110.7	2100.2	0.88	0.88	0.66	27.13	-37.1	-37.4	-40.7	3.26	2.85	-75.09	-99.6	-121.1	-141.0	35.5	-111.65
2.25	70.55	2140.0	2128.8	2118.3	0.85	0.83	0.61	27.14	-37.3	-36.8	-39.7	3.42	3.00	-73.56	-99.4	-121.0	-140.9	60.7	-116.38
2.50	68.12	2157.6	2146.5	2135.9	0.83	0.82	0.59	27.16	-38.2	-36.1	-39.8	3.64	1.54	-73.25	-99.0	-120.8	-141.0	86.7	-119.52
2.75	65.34	2174.5	2163.5	2153.0	0.86	0.78	0.59	27.18	-38.8	-34.9	-39.4	3.91	1.87	-72.84	-99.1	-120.8	-141.0	100.0	-120.76
3.00	62.33	2190.8	2179.8	2169.4	0.89	0.82	0.57	27.21	-40.4	-34.5	-39.8	4.17	3.00	-73.85	-98.9	-120.6	-140.7	148.1	-124.38
3.25	59.46	2206.4	2195.4	2185.1	0.87	0.86	0.61	27.24	-41.3	-34.0	-39.6	4.43	2.55	-72.44	-99.0	-120.6	-140.7	177.0	-125.85
3.50	56.07	2221.2	2210.3	2199.9	0.84	0.85	0.66	27.27	-42.4	-33.3	-39.4	4.65	1.79	-72.88	-98.8	-120.6	-140.6	211.6	-127.41
3.75	52.58	2235.1	2224.3	2214.0	0.86	0.82	0.65	27.30	-43.9	-32.9	-40.2	4.74	1.66	-72.81	-98.9	-120.4	-140.6	302.4	-130.52
4.00	49.14	2248.3	2237.5	2227.2	0.90	0.86	0.63	27.34	-44.8	-32.3	-40.0	4.77	2.66	-72.96	-98.6	-120.4	-140.7	361.5	-132.00
4.25	45.55	2260.6	2249.7	2239.4	0.98	0.88	0.67	27.36	-46.1	-32.2	-39.6	4.76	3.21	-72.36	-98.7	-120.1	-140.2	507.5	-135.02
4.50	41.44	2271.8	2261.1	2250.8	0.97	0.96	0.70	27.40	-47.1	-31.5	-39.4	4.53	3.20	-72.02	-98.5	-120.4	-140.4	606.7	-136.57
4.75	37.63	2282.1	2271.5	2261.3	0.95	0.97	0.78	27.43	-47.7	-31.4	-39.5	4.24	3.10	-73.07	-98.6	-120.6	-140.7	851.6	-139.32
5.00	34.07	2291.5	2280.9	2270.8	0.93	0.95	0.80	27.45	-48.7	-31.0	-38.6	3.91	2.36	-73.57	-98.7	-120.6	-140.6	1000.0	-140.74

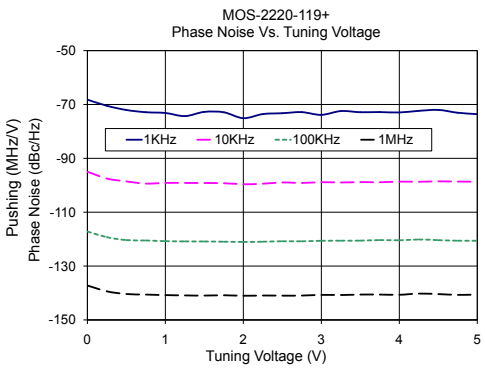
*at 25°C unless mentioned otherwise

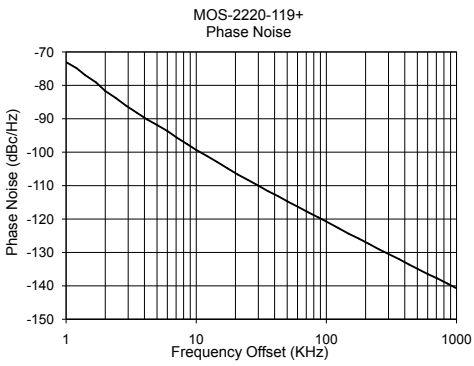












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Voltage Controlled Oscillator MOS-2220-119+

Typical Performance Data

V TUNE	TUNE SENS (MHz/V)	FREQUENCY (MHz)			POWER OUTPUT (dBm)			HARMONICS (dBc)			FREQ. PUSH (MHz/V)
		-55ºC	+25ºC	+85ºC	-55ºC	+25ºC	+85ºC	F2	F3	F4	
0.00	105.88	1974.1	1959.6	1946.5	0.37	0.40	-0.10	-37.72	-48.71	-45.69	7.86
0.25	91.50	1998.8	1986.1	1974.3	0.42	0.41	0.10	-39.87	-47.48	-42.55	4.77
0.50	84.20	2021.0	2008.9	1997.8	0.40	0.45	0.15	-41.08	-46.63	-40.67	3.55
0.70	79.57	2037.4	2025.8	2014.9	0.32	0.42	0.18	-41.55	-46.09	-38.52	2.94
1.00	74.97	2060.7	2049.6	2039.1	0.35	0.32	0.11	-42.15	-44.61	-37.47	2.29
1.25	73.34	2079.4	2068.3	2058.0	0.45	0.38	0.10	-42.04	-44.53	-36.37	1.94
1.50	72.16	2097.7	2086.7	2076.3	0.51	0.48	0.17	-41.98	-42.95	-36.95	1.66
1.75	71.16	2115.7	2104.7	2094.3	0.54	0.51	0.26	-41.90	-43.08	-37.84	1.43
2.00	69.80	2133.4	2122.5	2112.0	0.45	0.51	0.31	-41.69	-42.91	-37.76	1.24
2.25	69.03	2150.7	2139.9	2129.5	0.42	0.43	0.29	-41.52	-41.22	-38.21	1.08
2.50	69.13	2168.1	2157.2	2146.7	0.47	0.39	0.22	-40.53	-40.94	-40.26	0.97
2.75	69.46	2185.5	2174.5	2163.8	0.60	0.51	0.23	-41.21	-39.77	-40.26	0.88
3.00	69.06	2202.9	2191.8	2181.0	0.67	0.61	0.36	-41.92	-39.73	-40.65	0.81
3.25	69.10	2220.3	2209.1	2198.3	0.68	0.66	0.47	-41.23	-38.07	-41.94	0.77
3.50	69.25	2237.7	2226.4	2215.4	0.72	0.69	0.51	-41.85	-38.46	-40.59	0.76
3.75	68.36	2255.0	2243.7	2232.6	0.69	0.72	0.56	-42.83	-37.29	-41.80	0.78
4.00	67.65	2272.2	2260.8	2249.6	0.68	0.70	0.54	-42.54	-37.04	-42.12	0.83
4.30	67.59	2292.8	2281.1	2269.8	0.75	0.70	0.55	-43.24	-35.13	-40.17	0.95
4.50	67.17	2306.5	2294.6	2283.2	0.78	0.76	0.55	-44.39	-35.07	-41.06	1.03
4.75	65.63	2323.2	2311.4	2299.9	0.78	0.76	0.62	-44.64	-35.46	-39.01	1.16
5.00	63.92	2339.6	2327.8	2316.2	0.69	0.76	0.61	-45.56	-34.09	-38.37	1.31
5.25	61.80	2355.6	2343.8	2332.2	0.60	0.69	0.59	-46.50	-34.10	-37.63	1.46
5.50	59.60	2370.9	2359.2	2347.7	0.49	0.58	0.53	-47.19	-33.48	-36.04	1.63
5.75	58.09	2385.9	2374.1	2362.7	0.47	0.46	0.40	-48.49	-34.39	-36.01	1.83
6.00	56.94	2400.7	2388.7	2377.1	0.50	0.44	0.29	-50.14	-32.95	-34.17	2.06
6.25	54.60	2414.9	2402.9	2391.1	0.50	0.46	0.26	-50.83	-33.17	-37.04	2.31
6.50	51.49	2428.3	2416.6	2404.9	0.33	0.45	0.28	-51.88	-33.27	-33.46	2.55
6.75	48.51	2441.0	2429.4	2418.0	0.15	0.31	0.25	-53.46	-34.29	-35.61	2.80
7.00	48.51	2453.1	2441.6	2430.3	-0.02	0.14	0.12	-53.98	-33.73	-35.67	3.05

FREQ OFFSET (KHz)	PHASE NOISE (dBc/Hz)
1	-72
10	-99
100	-120
1000	-140

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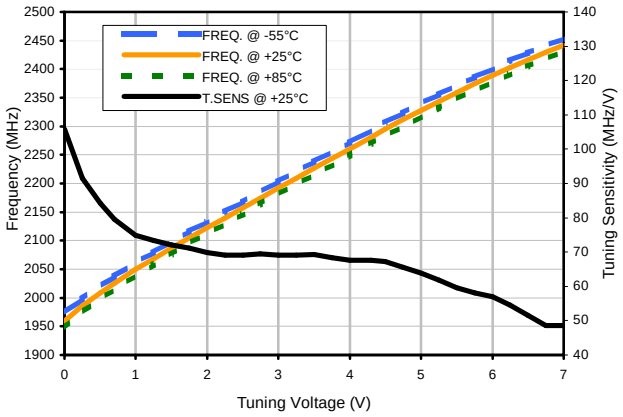
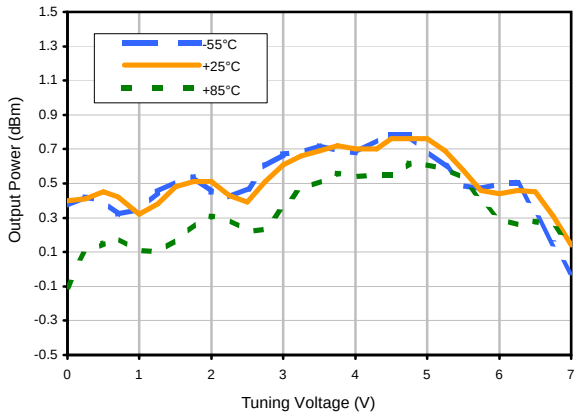
Voltage Controlled Oscillator MOS-2220-119+

Typical Performance Data

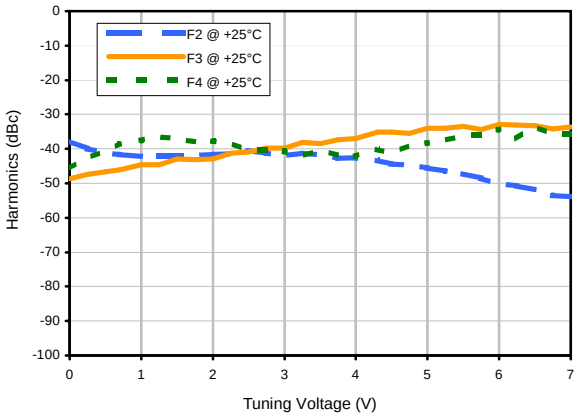
Frequency and Tuning Sensitivity



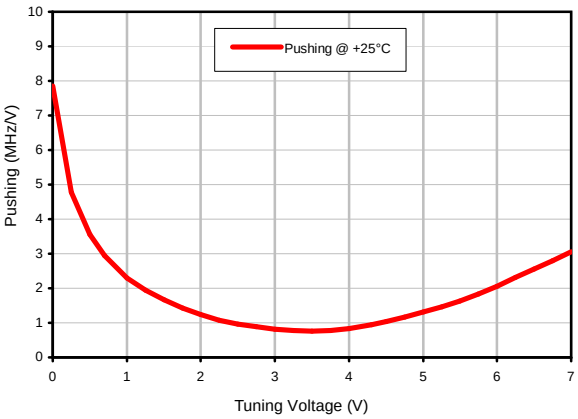
Power Output



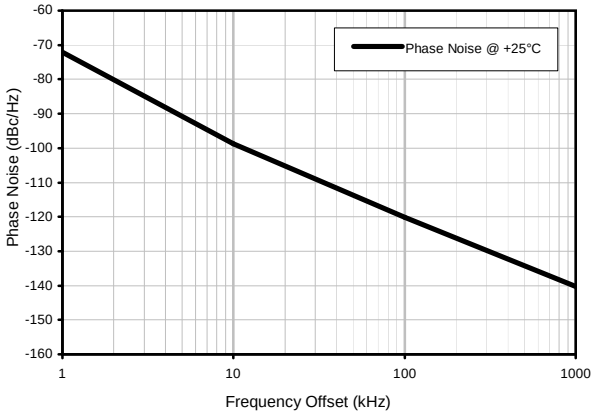
Harmonics Level



Frequency Pushing



Phase Noise



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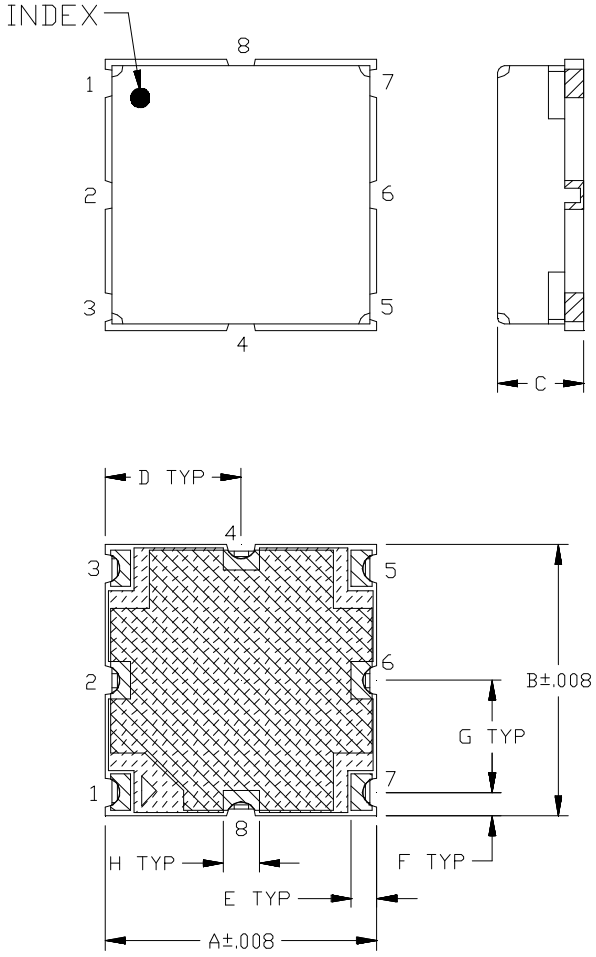
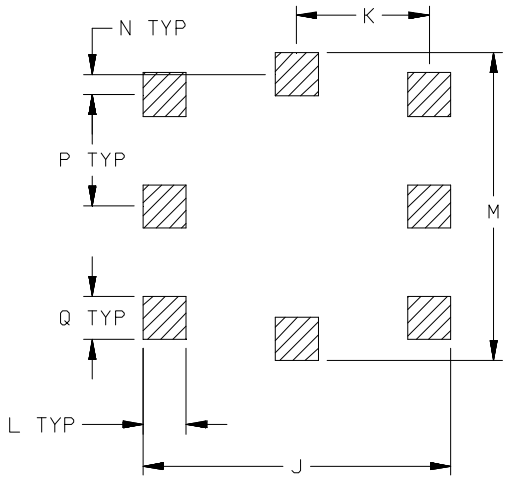
Case Style CZ

Outline Dimensions

CZ682



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

METALLIZATION

SOLDER RESIST

CASE #	A	B	C	D	E	F	G	H	J	K
CZ682	.375 (9.52)	.375 (9.52)	.131 (3.33)	.188 (4.77)	.035 (0.89)	.033 (0.84)	.154 (3.91)	.050 (1.27)	.425 (10.80)	.183 (4.65)

CASE #	L	M	N	P	Q	WT. GRAM
CZ682	.060 (1.52)	.425 (10.80)	.028 (0.71)	.154 (3.91)	.060 (1.52)	.60

Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .010

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
   For RoHS-5 Case Styles: Tin-Lead plate.

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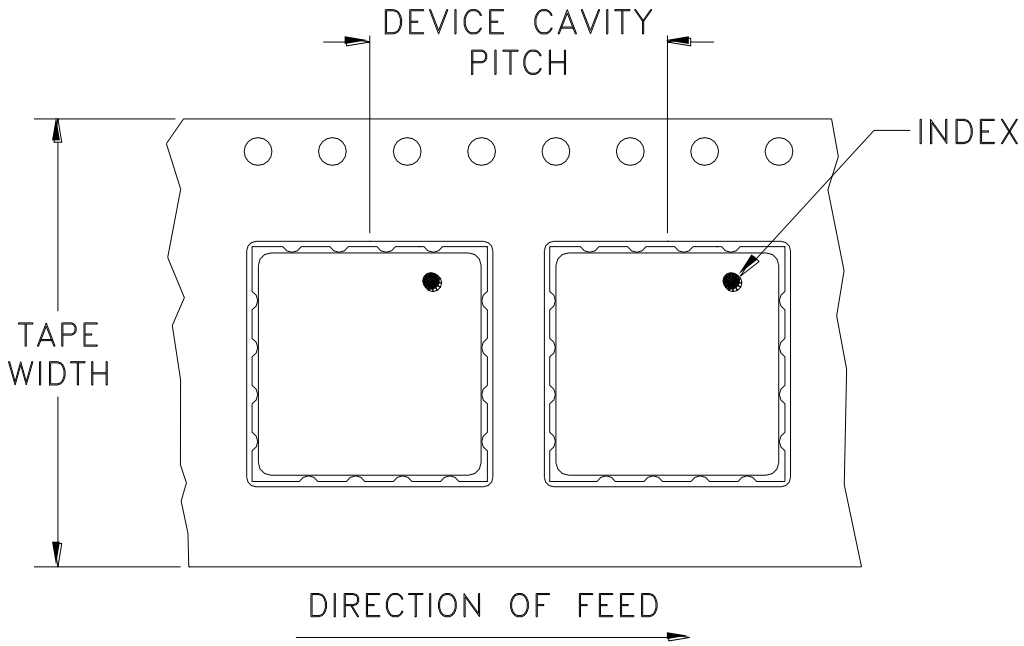
Tape & Reel Packaging TR-F60

DEVICE ORIENTATION IN T&R



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
				1000

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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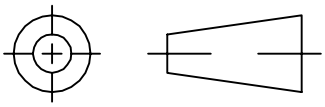
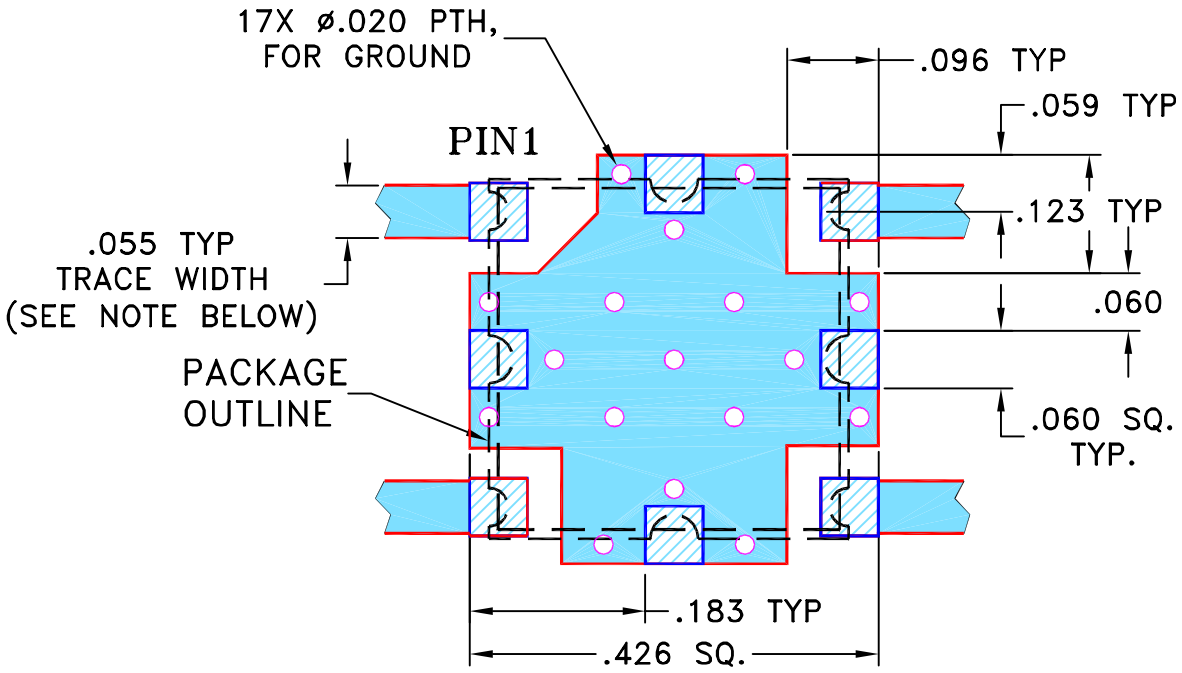
THIRD ANGLE PROJECTION



REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M76040	NEW RELEASE (FROM RAVON)	03/01	DK	HH
A	M82575	UPDATED DRAWING	08/08/02	GF	MM
B	M101142	ADDED NOTE 2 & TB-128 TO DESCRIPTION	10/10/05	MMG	MM
C	M102713	ADDED "...WITH SMOBC"	01/12/06	GF	IL

SUGGESTED MOUNTING CONFIGURATION FOR CZ682 CASE STYLE, "my" PIN CONNECTION



NOTE: 1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; 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	DK (RAV)	03/22/01
TOLERANCES ON:	CHECKED	DE (RAV)	03/27/01
2 PL DECIMALS ±	APPROVED	HH (RAV)	03/27/01
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

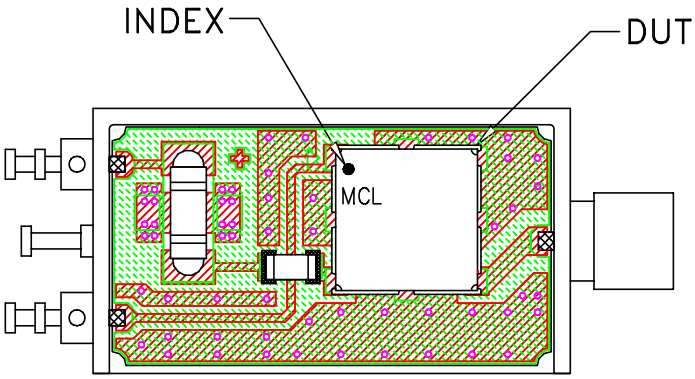
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, my, CZ682, MOS, TB-128

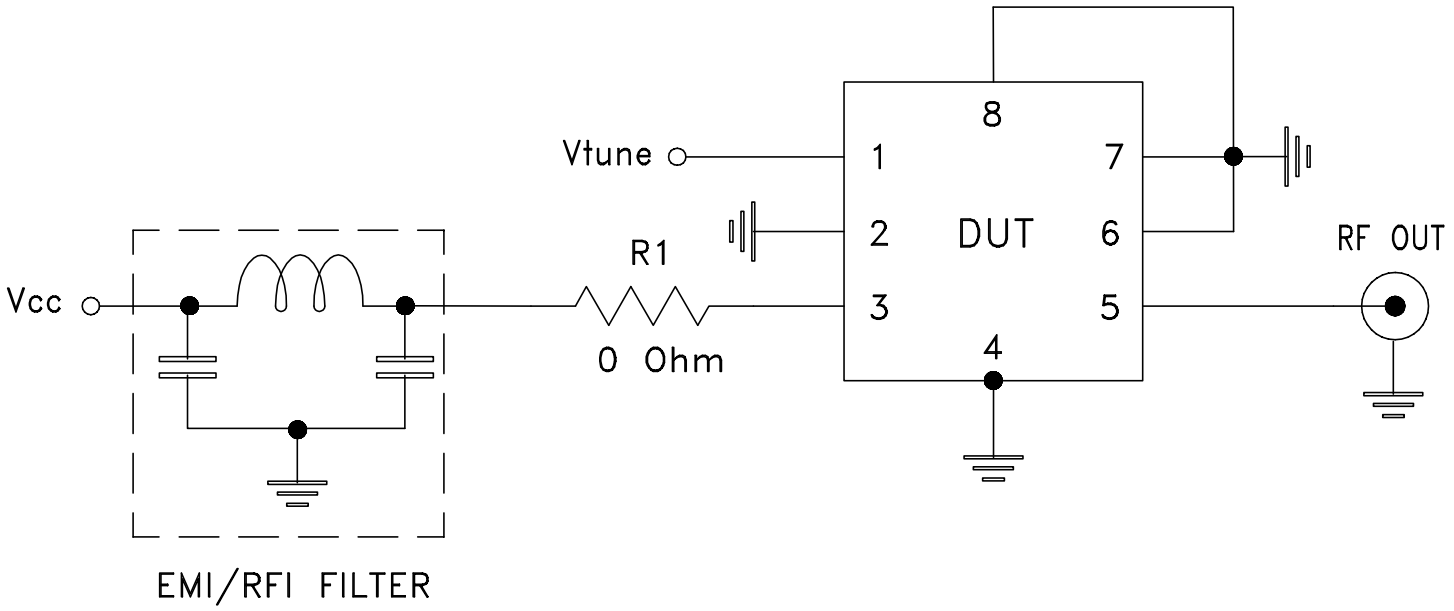
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-023	C

FILE:	SCALE:	SHEET:
98PL023	5:1	1 OF 1

Evaluation Board and Circuit



TB-128



Schematic Diagram

Notes:
1. SMA Female connectors.
2. PCB Material: ROGERS RO4350B or equivalent, Dielectric Constant=4.5, Thickness=.020 inch.

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Environmental Specifications ENV65

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 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 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

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