

Voltage Controlled Oscillator

MOS-465+

50Ω 420 to 465 MHz

The Big Deal:

- Low Phase Noise
- Linear Tuning
- Robust design and construction
- Small size .375" x .375" x .131"



CASE STYLE: CZ682

Product Overview:

The MOS-465+ is a Voltage Controlled Oscillator, designed to operate from 420 to 465 MHz for radio applications. The MOS-465+ is packaged in a metal case (size of .375" x .375" x .131") to shield against unwanted signals and noise.

Key Features

Feature	Advantages
Low Current, 18 mA typ. at 3V VCC	At only 18mA, the MOS-465+ is ideal for applications with limited available power or densely packed applications where thermal and power management is critical.
Linear Tuning Sensitivity Ratio: 1.2:1 typ.	Optimal for loop filter design.
Low Phase Noise: -110 dBc/Hz typ at 10kHz offset	Low phase noise improves system EVM (Error Vector Magnitude).
Good Pulling, 0.3 MHz typ.	Improves immunity against changes in output load.
Good Pushing, 0.5 MHz/V typ.	Provides increased immunity against noisy DC lines and improves output frequency stability vs. variations in supply voltage.
Robust design and construction	Each internal component of the MOS-465+ is bonded to the substrate, providing better immunity to microphonics, reduced phase hit, and decreased tombstoning risk during subsequent reflow operations.
Small size, .375" x .375" x .131"	The small size enables the MOS-465+ to be used in compact designs.

Voltage Controlled Oscillator

MOS-465+

5V Tuning for PLL ICs 420 to 465 MHz

Features

- low phase noise, -110 dBc/Hz typ. @ 10kHz offset
- linear tuning characteristics
- low pulling, 0.3 MHz typ.
- low pushing, 0.5 MHz/V typ.
- aqueous washable

Applications

- wireless communications
- radio



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				TUNING					NON HARMONIC SPURIOUS (dBc)	HARMONICS (dBc)		PULLING pk-pk @12 dB _r (MHz)	PUSHING (MHz/V)	DC OPERATING POWER					
	Min.	Max.		1	10	100	1000	VOLTAGE RANGE (V)	SENSI- TIVITY (MHz/V)	PORT CAP (pF)	3 dB MODULATION BANDWIDTH (MHz)	Typ.		Typ.	Typ.			Typ.	Max.	Typ.	Max.	V _{cc} (volts)	Current (mA)
MOS-465+	420	465	+0.5	-85	-110	-130	-150	0.5	4.5	20 - 24	180	15	-90	-13	-	0.3	0.5	3	18				

Pin Connections

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

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Absolute Max. Supply Voltage (Vcc)	5V
Absolute Max. Tuning Voltage (Vtune)	6.5V
All specifications	50 ohm system

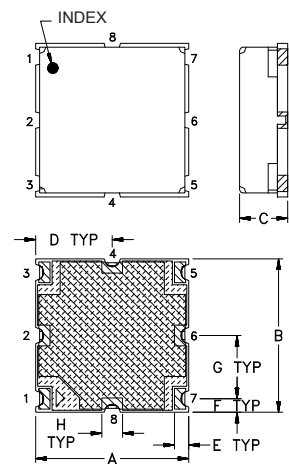
Permanent damage may occur if any of these limits are exceeded.

Tape & Reel: F60

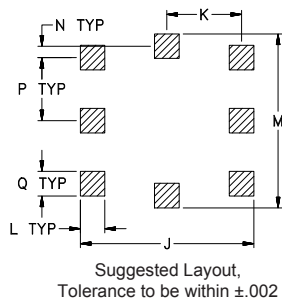
7" Reels with 10, 20, 50, 100 devices
13" Reels with 200, 500, 1000 devices

Environmental Ratings: ENV65T2

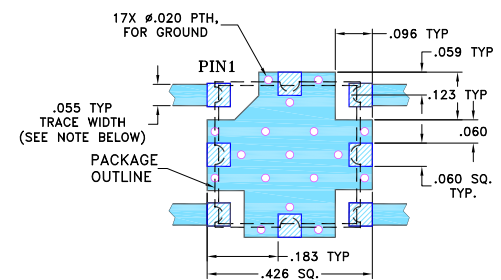
Outline Drawing



PCB Land Pattern



METALLIZATION
 SOLDER RESIST

Demo Board MCL P/N: TB-128
Suggested PCB Layout (PL-023)

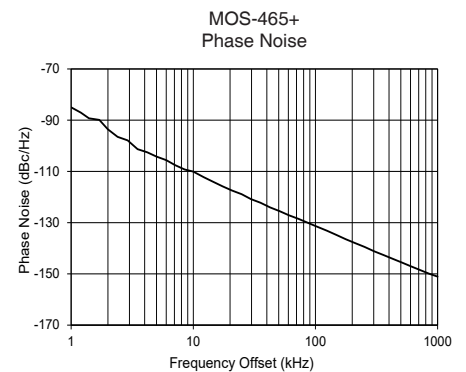
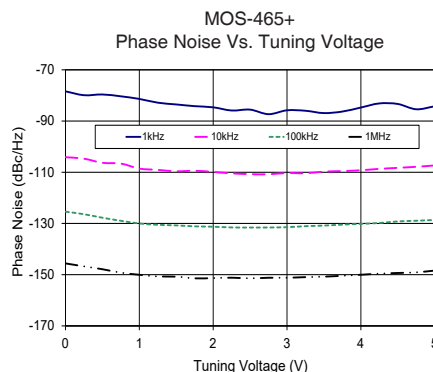
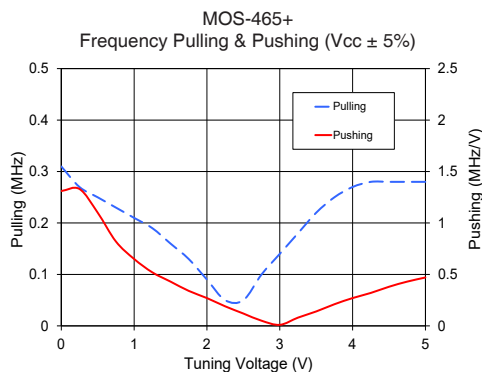
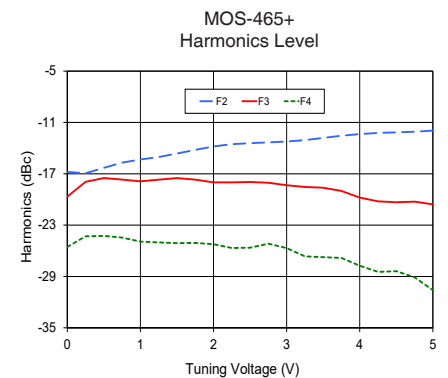
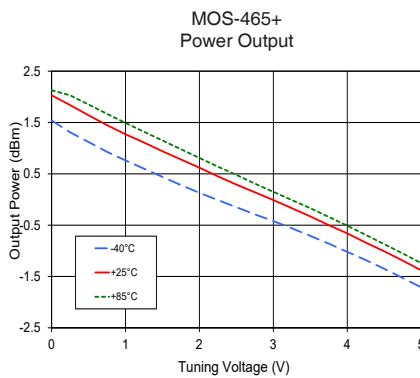
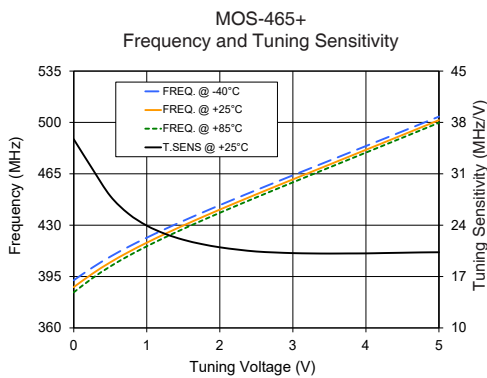
- NOTE: 1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
 DENOTES COPPER 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

V TUNE	TUNE SENS (MHz/V)	FREQUENCY (MHz)			POWER OUTPUT (dBm)			I _{cc} (mA)	HARMONICS (dBc)			FREQ. PUSH (MHz/V)	FREQ. PULL (MHz)	PHASE NOISE (dBc/Hz) at offsets				FREQ OFFSET (kHz)	PHASE NOISE at 443 MHz (dBc/Hz)
		-40°C	+25°C	+85°C	-40°C	+25°C	+85°C		F2	F3	F4			1kHz	10kHz	100kHz	1MHz		
0.00	35.72	392.5	387.8	384.2	1.54	2.03	2.13	11.04	-16.8	-19.7	-25.6	1.31	0.31	-78.42	-104.1	-125.4	-145.6	1.0	-84.98
0.50	27.98	408.5	404.7	401.9	1.12	1.64	1.85	11.31	-16.3	-17.5	-24.3	1.10	0.25	-79.64	-106.3	-127.8	-147.9	2.0	-93.59
0.75	25.55	415.3	411.7	409.1	0.93	1.45	1.67	11.34	-15.7	-17.7	-24.5	0.82	0.23	-80.36	-106.6	-129.0	-149.2	3.5	-101.32
1.00	23.94	421.5	418.1	415.6	0.76	1.27	1.49	11.36	-15.3	-17.9	-24.9	0.65	0.21	-81.38	-108.6	-130.0	-150.0	6.0	-105.58
1.25	22.82	427.3	424.0	421.7	0.60	1.11	1.32	11.37	-15.0	-17.7	-25.0	0.52	0.19	-82.84	-109.1	-130.5	-150.7	8.5	-109.26
1.50	22.01	432.9	429.7	427.5	0.44	0.94	1.15	11.37	-14.6	-17.5	-25.1	0.43	0.16	-83.53	-109.6	-130.7	-150.8	10.0	-110.08
1.75	21.42	438.4	435.2	433.0	0.28	0.78	0.98	11.37	-14.2	-17.7	-25.1	0.34	0.13	-84.20	-109.4	-131.1	-151.4	20.8	-117.49
2.00	20.98	443.6	440.6	438.4	0.13	0.62	0.81	11.36	-13.8	-18.0	-25.2	0.27	0.09	-84.65	-109.9	-131.3	-151.3	35.5	-122.23
2.25	20.66	448.8	445.8	443.7	-0.01	0.45	0.64	11.35	-13.5	-18.0	-25.7	0.19	0.05	-85.89	-110.4	-131.5	-151.2	60.7	-127.12
2.50	20.40	453.9	451.0	448.9	-0.15	0.29	0.48	11.34	-13.4	-18.0	-25.6	0.12	0.05	-85.55	-110.7	-131.6	-151.4	86.7	-130.06
2.75	20.28	459.0	456.1	454.1	-0.29	0.14	0.31	11.33	-13.3	-18.1	-25.2	0.05	0.10	-87.33	-110.8	-131.6	-151.2	100.0	-131.30
3.00	20.19	464.0	461.2	459.2	-0.42	-0.01	0.15	11.32	-13.2	-18.3	-25.7	0.01	0.14	-85.81	-110.3	-131.4	-151.2	148.1	-134.76
3.25	20.14	469.0	466.2	464.3	-0.56	-0.17	-0.01	11.31	-13.1	-18.5	-26.7	0.08	0.18	-85.99	-110.4	-131.1	-151.0	177.0	-136.46
3.50	20.13	473.9	471.3	469.3	-0.71	-0.33	-0.17	11.30	-12.8	-18.6	-26.8	0.14	0.22	-86.90	-109.8	-130.8	-150.8	211.6	-137.98
3.75	20.14	478.9	476.3	474.4	-0.86	-0.50	-0.34	11.29	-12.6	-19.0	-26.8	0.21	0.25	-86.30	-109.6	-130.4	-150.4	302.4	-141.19
4.00	20.15	483.9	481.3	479.5	-1.02	-0.66	-0.51	11.27	-12.4	-19.8	-27.8	0.27	0.27	-84.73	-109.2	-130.1	-150.0	361.5	-142.64
4.25	20.20	488.9	486.4	484.5	-1.18	-0.84	-0.69	11.26	-12.2	-20.2	-28.5	0.32	0.28	-83.13	-108.7	-129.8	-149.6	507.5	-145.53
4.50	20.24	493.9	491.4	489.6	-1.35	-1.01	-0.87	11.25	-12.2	-20.3	-28.4	0.38	0.28	-83.34	-108.3	-129.2	-149.3	606.7	-147.07
4.75	20.28	498.9	496.5	494.7	-1.53	-1.19	-1.05	11.24	-12.1	-20.3	-29.1	0.43	0.28	-85.41	-107.9	-128.9	-149.1	851.6	-149.90
5.00	20.30	504.0	501.5	499.8	-1.71	-1.38	-1.24	11.23	-12.0	-20.6	-30.6	0.47	0.28	-84.25	-107.4	-128.6	-148.4	1000.0	-151.06

*at 25°C unless mentioned otherwise



Additional Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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



Voltage Controlled Oscillator

MOS-465+

Typical Performance Data

V TUNE	TUNE SENS (MHz/V)	FREQUENCY (MHz)			POWER OUTPUT (dBm)			HARMONICS (dBc)			FREQ. PUSH (MHz/V)	FREQ OFFSET (kHz)	PHASE NOISE (dBc/Hz)
		-40°C	+25°C	+85°C	-40°C	+25°C	+85°C	F2	F3	F4			
0.00	35.7	392.5	387.8	384.2	1.5	2.0	2.1	-16.8	-19.7	-25.6	1.3	1	-85
0.25	31.8	400.9	396.7	393.7	1.3	1.8	2.0	-16.9	-17.9	-24.3	1.3	10	-110
0.50	28.0	408.5	404.7	401.9	1.1	1.6	1.9	-16.3	-17.5	-24.3	1.1	100	-130
0.75	25.6	415.3	411.7	409.1	0.9	1.5	1.7	-15.7	-17.7	-24.5	0.8	1000	-150
1.00	23.9	421.5	418.1	415.6	0.8	1.3	1.5	-15.3	-17.9	-24.9	0.7		
1.25	22.8	427.3	424.0	421.7	0.6	1.1	1.3	-15.0	-17.7	-25.0	0.5		
1.50	22.0	432.9	429.7	427.5	0.4	0.9	1.2	-14.6	-17.5	-25.1	0.4		
1.75	21.4	438.4	435.2	433.0	0.3	0.8	1.0	-14.2	-17.7	-25.1	0.3		
2.00	21.0	443.6	440.6	438.4	0.1	0.6	0.8	-13.8	-18.0	-25.2	0.3		
2.25	20.7	448.8	445.8	443.7	0.0	0.5	0.6	-13.5	-18.0	-25.7	0.2		
2.50	20.4	453.9	451.0	448.9	-0.2	0.3	0.5	-13.4	-18.0	-25.6	0.1		
2.75	20.3	459.0	456.1	454.1	-0.3	0.1	0.3	-13.3	-18.1	-25.2	0.1		
3.00	20.2	464.0	461.2	459.2	-0.4	0.0	0.2	-13.2	-18.3	-25.7	0.0		
3.25	20.1	469.0	466.2	464.3	-0.6	-0.2	0.0	-13.1	-18.5	-26.7	0.1		
3.50	20.1	473.9	471.3	469.3	-0.7	-0.3	-0.2	-12.8	-18.6	-26.8	0.1		
3.75	20.1	478.9	476.3	474.4	-0.9	-0.5	-0.3	-12.6	-19.0	-26.8	0.2		
4.00	20.1	483.9	481.3	479.5	-1.0	-0.7	-0.5	-12.4	-19.8	-27.8	0.3		
4.25	20.2	488.9	486.4	484.5	-1.2	-0.8	-0.7	-12.2	-20.2	-28.5	0.3		
4.50	20.2	493.9	491.4	489.6	-1.4	-1.0	-0.9	-12.2	-20.3	-28.4	0.4		
4.75	20.3	498.9	496.5	494.7	-1.5	-1.2	-1.1	-12.1	-20.3	-29.1	0.4		
5.00	20.3	504.0	501.5	499.8	-1.7	-1.4	-1.2	-12.0	-20.6	-30.6	0.5		
5.25	20.3	509.0	506.6	504.9	-1.9	-1.6	-1.4	-11.8	-21.3	-31.0	0.5		
5.50	20.3	514.0	511.7	510.0	-2.1	-1.8	-1.6	-11.7	-21.7	-31.4	0.6		
5.75	20.3	519.1	516.8	515.1	-2.2	-1.9	-1.8	-11.7	-21.9	-32.2	0.6		
6.00	20.3	524.1	521.9	520.3	-2.4	-2.1	-2.0	-11.5	-22.2	-33.8	0.6		
6.25	20.3	529.2	527.0	525.4	-2.6	-2.3	-2.2	-11.5	-22.7	-35.1	0.7		
6.50	20.3	534.3	532.0	530.5	-2.9	-2.5	-2.4	-11.3	-23.3	-36.7	0.7		
6.75	20.3	539.4	537.1	535.6	-3.1	-2.7	-2.6	-11.2	-23.8	-37.5	0.7		
7.00	20.3	544.5	542.2	540.7	-3.5	-2.9	-2.9	-11.1	-24.1	-39.8	0.6		

Notes

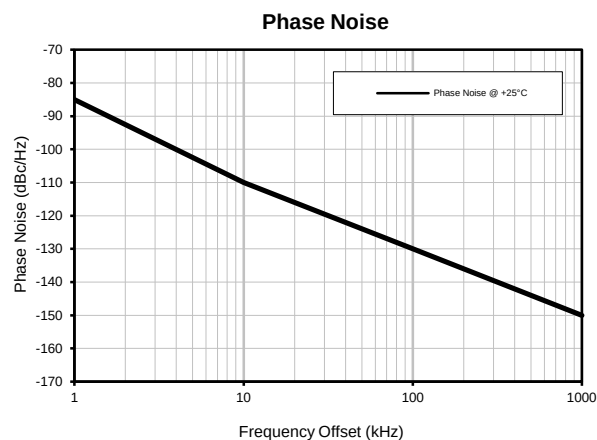
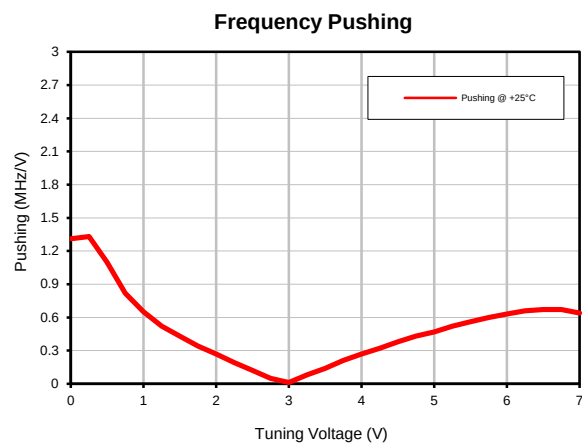
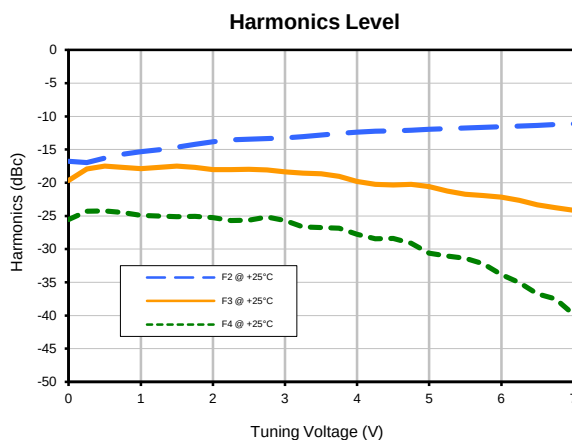
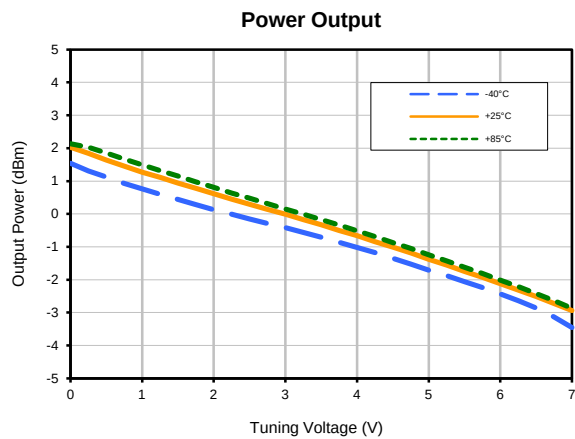
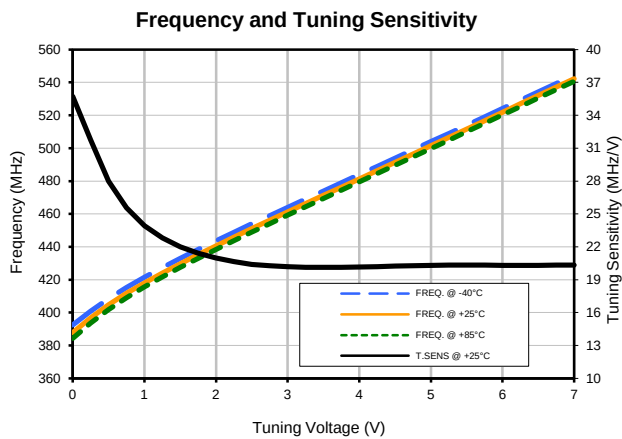
- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
 B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' 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/MCULStore/terms.jsp



Voltage Controlled Oscillator

Typical Performance Data

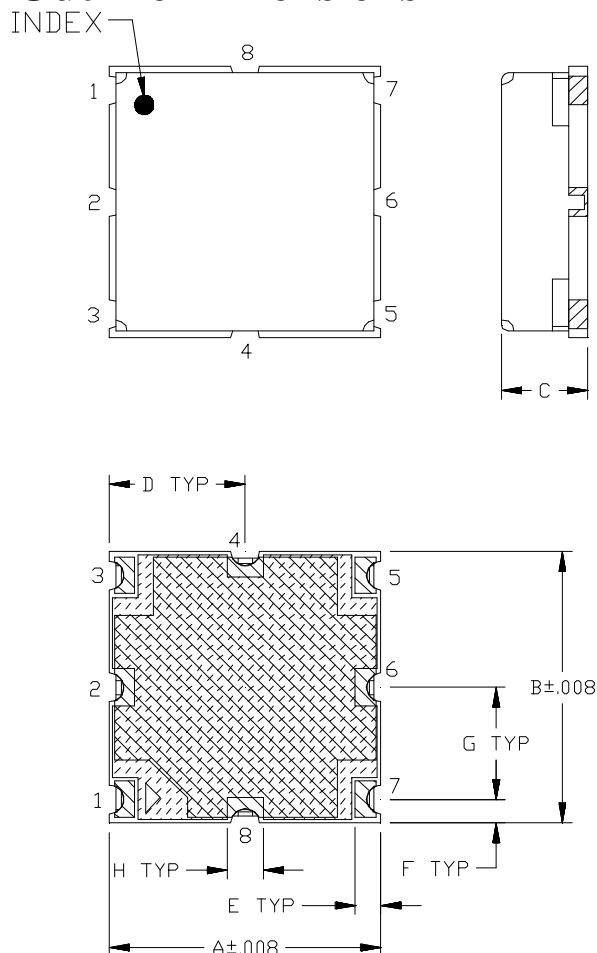
MOS-465+



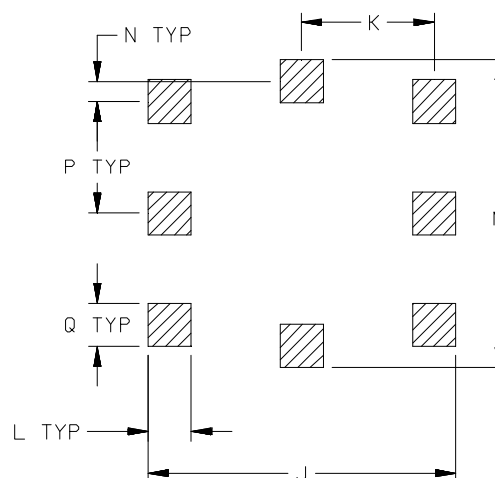
Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.
- 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/MCStore/terms.jsp

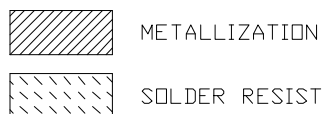
Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm.002$



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. $\pm .03$; 3Pl. $\pm .010$

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.

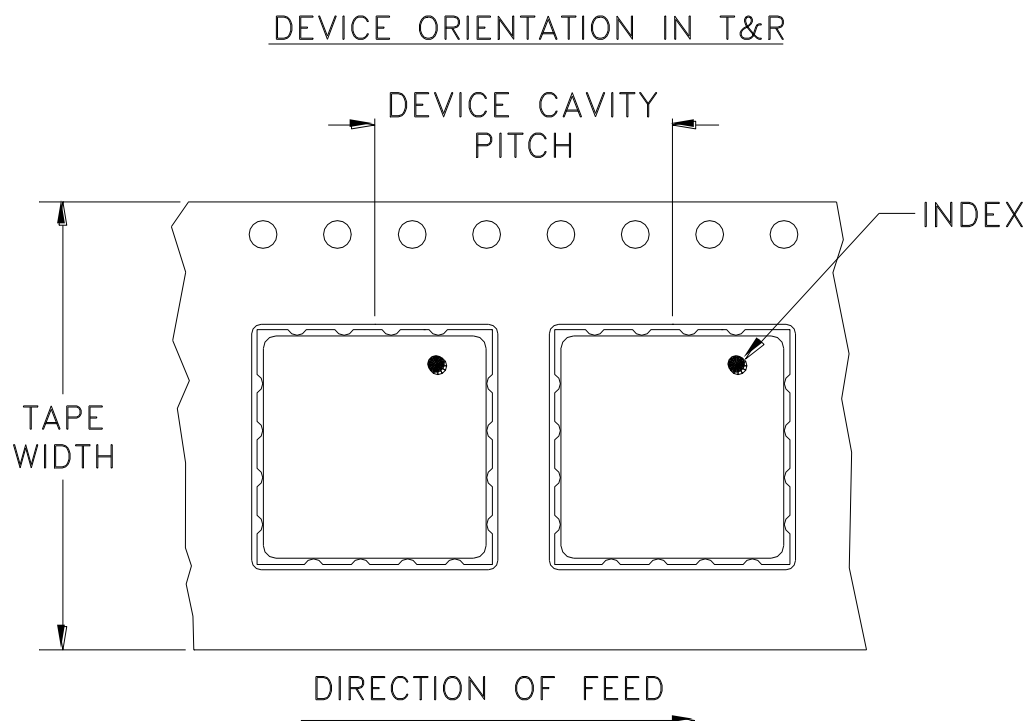


INTERNET <http://www.minicircuits.com>

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

Tape & Reel Packaging TR-F60



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



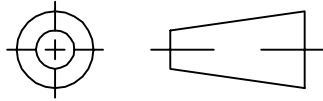
INTERNET <http://www.minicircuits.com>

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

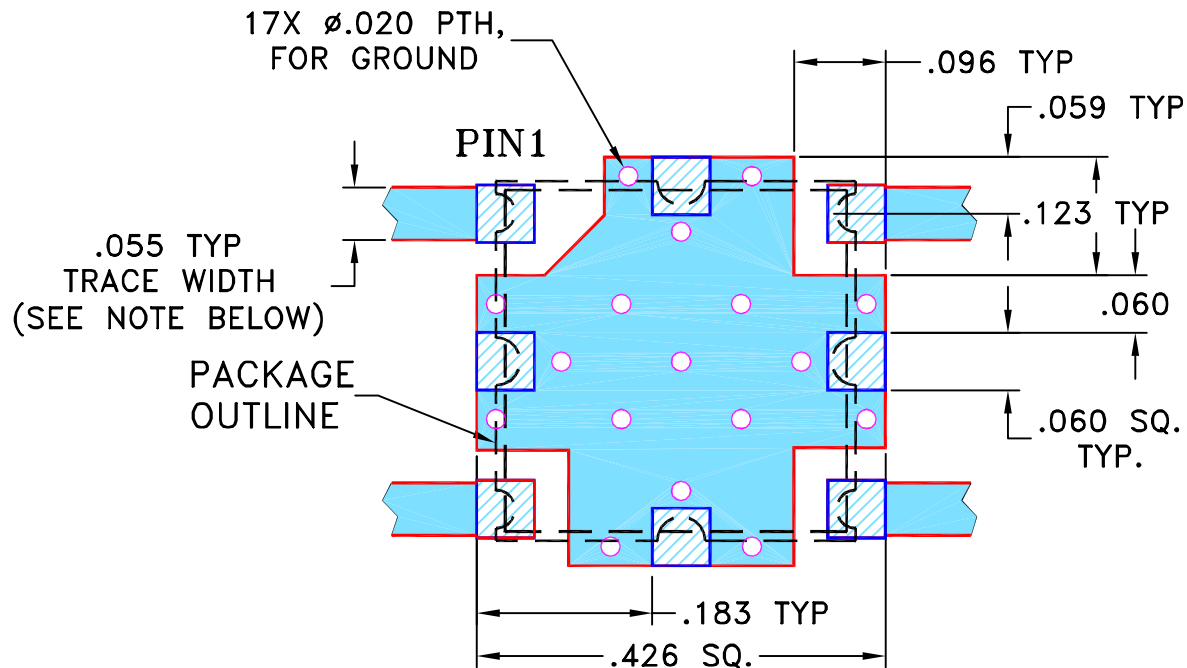
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	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 $0.030'' \pm 0.002''$; 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 $\pm$

APPROVED

HH (RAV)

03/27/01

3 PL DECIMALS $\pm$.005ANGLES $\pm$ FRACTIONS $\pm$
 Mini-Circuits®

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.

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


Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

PL, my, CZ682, MOS, TB-128

 SIZE
A

 CODE IDENT
15542

 DRAWING NO:
98-PL-023

 REV:
C

FILE: 98PL023

SCALE: 5:1

SHEET: 1 OF 1



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 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