Surface Mount

Voltage Controlled Oscillator

SOS-1000-519+

5V Tuning for PLL IC's 980 to 1050 MHz

Features

- low phase noise
- linear tuning characteristics
- low pushing
- low pulling
- small size 0.3" x 0.3"
- aqueous washable

Applications

- wireless communications
- GPS reseiver



CASE STYLE: FZ990

+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.
SOS-1000-519+	980	1050	-6.3	-74	-99	-120	-140	0.5	3	57-60	23	335	-90	-35	-25	0.5	0.5	3	14

Pin Connections

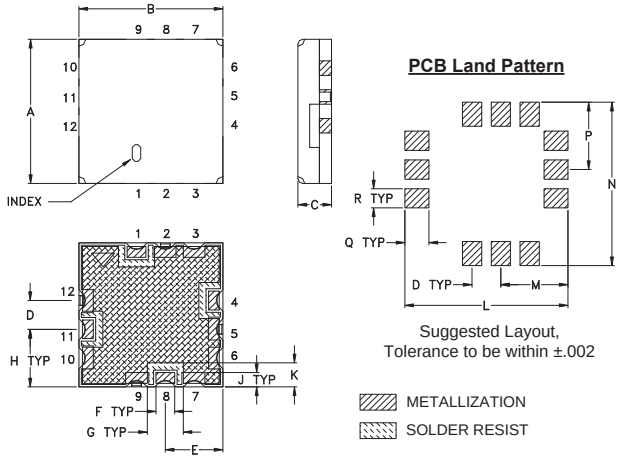
RF OUT	8
VCC	11
V-TUNE	1
GROUND	2,3,4,5,6,7,9,10,12

Maximum Ratings

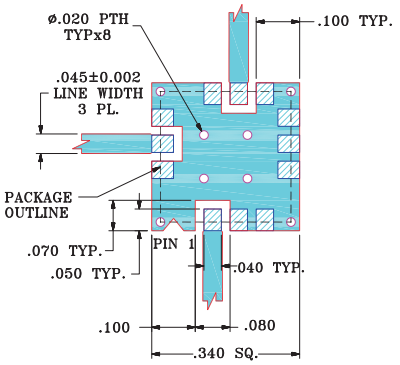
Operating Temperature	-55°C to 85°C
Storage Temperature	-55°C to 100°C
Absolute Max. Supply Voltage (Vcc)	5V
Absolute Max. Tuning Voltage (Vtune)	4V
All specifications	50 ohm system

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

Outline Drawing



Demo Board MCL P/N: TB-271
Suggested PCB Layout (PL-143)



NOTE:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025"±.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	R	wt.
.300	**.300**	**.100**	**.060**	**.120**	**.039**	**.075**	**.120**	**.030**	**.050**	**.340**	**.140**	**.340**	**.140**	**.050**	**.040**	grams
7.62	7.62	2.54	1.52	3.05	0.99	1.91	3.05	0.76	1.27	8.64	3.56	8.64	3.56	1.27	1.02	.25

Notes

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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

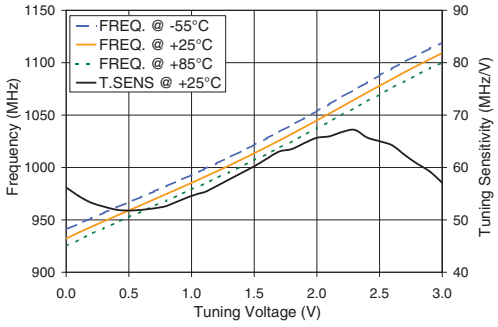
Performance Data & Curves*

SOS-1000-519+

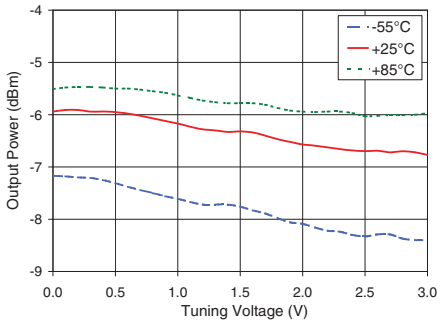
V TUNE	TUNE SENS (MHz/V)	FREQUENCY (MHz)			POWER OUTPUT (dBm)			Icc (mA)	HARMONICS (dBc)			FREQ. PUSH (MHz/V)	FREQ. PULL (MHz)	PHASE NOISE (dBc/Hz) at offsets				FREQ OFFSET (KHz)	PHASE NOISE at 1015 MHz (dBc/Hz)
		-55°C	+25°C	+85°C	-55°C	+25°C	+85°C		F2	F3	F4			1kHz	10kHz	100kHz	1MHz		
0.00	56.18	940.9	932.2	925.2	-7.17	-5.94	-5.51	8.43	-25.9	-36.0	-44.5	0.92	0.38	-75.6	-100.8	-121.9	-141.5	1.0	-74.41
0.10	54.55	946.3	937.8	931.0	-7.18	-5.91	-5.48	8.42	-26.6	-36.0	-44.1	0.96	0.40	-77.6	-101.5	-121.9	-141.5	2.0	-82.03
0.20	53.27	951.6	943.3	936.6	-7.20	-5.91	-5.47	8.40	-27.2	-36.0	-44.0	0.92	0.40	-76.6	-101.1	-121.8	-141.5	3.5	-88.93
0.30	52.53	956.7	948.6	942.1	-7.21	-5.94	-5.47	8.39	-27.9	-35.8	-43.7	0.80	0.40	-77.7	-100.7	-121.5	-141.6	6.0	-94.40
0.50	51.77	966.9	959.1	952.7	-7.31	-5.95	-5.50	8.36	-29.3	-35.4	-43.2	0.46	0.44	-77.2	-100.6	-121.7	-141.2	8.5	-97.63
0.60	51.91	972.0	964.3	958.0	-7.38	-5.98	-5.50	8.35	-29.9	-35.3	-43.2	0.26	0.46	-77.8	-100.9	-121.8	-142.9	10.0	-99.26
0.80	52.64	982.2	974.7	968.5	-7.50	-6.07	-5.55	8.32	-31.4	-35.1	-42.9	0.10	0.44	-75.0	-100.1	-121.6	-141.2	20.8	-106.63
1.00	54.60	992.9	985.3	979.0	-7.61	-6.17	-5.63	8.29	-33.0	-35.6	-42.9	0.39	0.37	-74.5	-100.0	-121.1	-141.5	35.5	-111.48
1.20	56.40	1004.0	996.3	989.9	-7.72	-6.28	-5.73	8.26	-34.9	-35.3	-43.0	0.57	0.32	-73.6	-100.0	-120.8	-140.6	60.7	-116.06
1.40	58.93	1015.6	1007.7	1001.2	-7.72	-6.33	-5.78	8.25	-37.1	-35.3	-42.5	0.63	0.33	-74.2	-99.5	-120.5	-140.3	86.7	-119.27
1.50	60.22	1021.6	1013.6	1006.9	-7.76	-6.32	-5.78	8.24	-38.3	-35.3	-42.0	0.63	0.34	-72.2	-98.9	-120.0	-139.5	100.0	-120.57
1.60	61.67	1027.8	1019.6	1012.8	-7.83	-6.34	-5.78	8.22	-39.6	-35.4	-41.5	0.60	0.43	-72.5	-99.1	-119.7	-140.5	148.1	-124.07
1.70	63.05	1034.1	1025.8	1018.8	-7.89	-6.40	-5.81	8.22	-40.6	-35.5	-40.4	0.54	0.50	-71.3	-98.2	-119.4	-139.3	211.6	-126.98
1.80	63.51	1040.6	1032.1	1024.9	-7.98	-6.47	-5.87	8.21	-41.6	-35.2	-39.3	0.46	0.57	-72.1	-97.8	-119.4	-139.7	253.0	-128.72
2.00	65.67	1053.8	1044.9	1037.4	-8.09	-6.57	-5.94	8.19	-42.2	-35.0	-37.0	0.33	0.69	-71.2	-97.0	-118.6	-137.9	302.4	-130.07
2.20	66.77	1067.4	1058.1	1050.2	-8.22	-6.63	-5.94	8.18	-41.8	-34.6	-34.8	0.15	0.79	-71.2	-97.3	-118.0	-138.8	361.5	-131.47
2.40	65.73	1081.1	1071.5	1063.2	-8.30	-6.68	-5.97	8.17	-40.8	-34.6	-34.9	0.20	0.85	-70.4	-96.3	-117.3	-137.5	507.5	-134.60
2.60	64.24	1094.5	1084.5	1076.0	-8.29	-6.69	-6.02	8.16	-39.7	-34.9	-36.3	0.56	0.84	-69.8	-95.6	-116.9	-137.1	606.7	-136.11
2.80	60.71	1107.2	1097.2	1088.5	-8.37	-6.70	-6.01	8.15	-39.1	-36.0	-38.7	0.99	0.85	-70.8	-94.4	-116.1	-135.8	851.6	-138.92
3.00	57.09	1119.2	1109.2	1100.2	-8.40	-6.77	-5.97	8.14	-38.7	-36.7	-40.7	1.53	0.88	-69.3	-94.7	-115.4	-135.3	1000.0	-139.78

*at 25°C unless mentioned otherwise

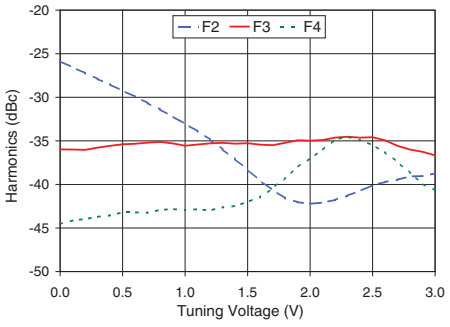
SOS-1000-519+
Frequency and Tuning Sensitivity



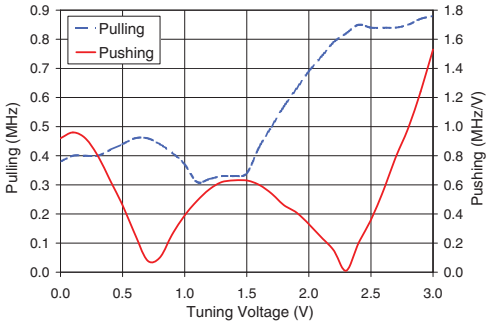
SOS-1000-519+
Power Output



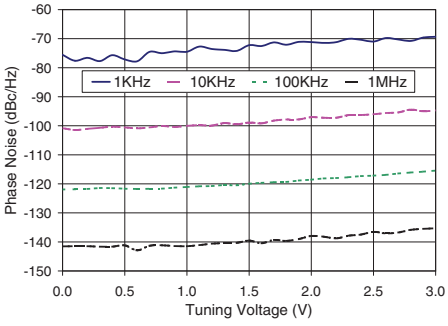
SOS-1000-519+
Harmonics Level



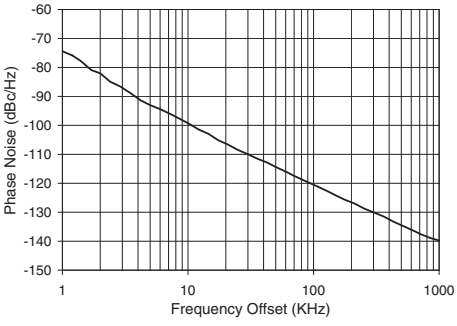
SOS-1000-519+
Frequency Pulling & Pushing (Vcc ± 5%)



SOS-1000-519+
Phase Noise Vs. Tuning Voltage



SOS-1000-519+
Phase Noise



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Voltage Controlled Oscillator SOS-1000-519+

Typical Performance Data

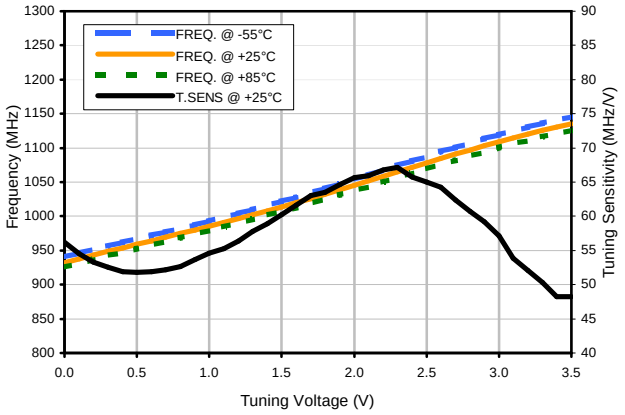
V TUNE	TUNE SENS (MHz/V)	FREQUENCY (MHz)			POWER OUTPUT (dBm)			HARMONICS (dBc)			FREQ. PUSH (MHz/V)
		-55ºC	+25ºC	+85ºC	-55ºC	+25ºC	+85ºC	F2	F3	F4	
0.0	56.18	940.9	932.2	925.2	-7.17	-5.94	-5.51	-25.9	-36.0	-44.5	0.92
0.1	54.55	946.3	937.8	931.0	-7.18	-5.91	-5.48	-26.6	-36.0	-44.1	0.96
0.2	53.27	951.6	943.3	936.6	-7.20	-5.91	-5.47	-27.2	-36.0	-44.0	0.92
0.3	52.53	956.7	948.6	942.1	-7.21	-5.94	-5.47	-27.9	-35.8	-43.7	0.80
0.4	51.93	961.8	953.9	947.4	-7.25	-5.94	-5.48	-28.5	-35.6	-43.6	0.63
0.5	51.77	966.9	959.1	952.7	-7.31	-5.95	-5.50	-29.3	-35.4	-43.2	0.46
0.6	51.91	972.0	964.3	958.0	-7.38	-5.98	-5.50	-29.9	-35.3	-43.2	0.26
0.7	52.19	977.0	969.4	963.2	-7.44	-6.02	-5.52	-30.7	-35.2	-43.2	0.08
0.8	52.64	982.2	974.7	968.5	-7.50	-6.07	-5.55	-31.4	-35.1	-42.9	0.10
0.9	53.64	987.5	979.9	973.7	-7.56	-6.12	-5.58	-32.2	-35.3	-42.8	0.26
1.0	54.60	992.9	985.3	979.0	-7.61	-6.17	-5.63	-33.0	-35.6	-42.9	0.39
1.1	55.26	998.3	990.8	984.4	-7.67	-6.23	-5.68	-33.9	-35.4	-42.9	0.49
1.2	56.40	1004.0	996.3	989.9	-7.72	-6.28	-5.73	-34.9	-35.3	-43.0	0.57
1.3	57.76	1009.7	1001.9	995.5	-7.72	-6.30	-5.76	-36.0	-35.2	-42.6	0.62
1.4	58.93	1015.6	1007.7	1001.2	-7.72	-6.33	-5.78	-37.1	-35.3	-42.5	0.63
1.5	60.22	1021.6	1013.6	1006.9	-7.76	-6.32	-5.78	-38.3	-35.3	-42.0	0.63
1.6	61.67	1027.8	1019.6	1012.8	-7.83	-6.34	-5.78	-39.6	-35.4	-41.5	0.60
1.7	63.05	1034.1	1025.8	1018.8	-7.89	-6.40	-5.81	-40.6	-35.5	-40.4	0.54
1.8	63.51	1040.6	1032.1	1024.9	-7.98	-6.47	-5.87	-41.6	-35.2	-39.3	0.46
1.9	64.67	1047.2	1038.4	1031.1	-8.06	-6.52	-5.92	-42.0	-34.9	-38.0	0.41
2.0	65.67	1053.8	1044.9	1037.4	-8.09	-6.57	-5.94	-42.2	-35.0	-37.0	0.33
2.1	65.94	1060.6	1051.5	1043.8	-8.16	-6.59	-5.95	-42.1	-34.9	-36.1	0.24
2.2	66.77	1067.4	1058.1	1050.2	-8.22	-6.63	-5.94	-41.8	-34.6	-34.8	0.15
2.3	67.19	1074.3	1064.7	1056.7	-8.24	-6.66	-5.94	-41.3	-34.5	-34.5	0.01
2.4	65.73	1081.1	1071.5	1063.2	-8.30	-6.68	-5.97	-40.8	-34.6	-34.9	0.20
2.5	65.02	1087.9	1078.0	1069.6	-8.33	-6.70	-6.03	-40.1	-34.6	-35.5	0.36
2.6	64.24	1094.5	1084.5	1076.0	-8.29	-6.69	-6.02	-39.7	-34.9	-36.3	0.56
2.7	62.41	1100.9	1091.0	1082.3	-8.29	-6.72	-6.01	-39.5	-35.6	-37.4	0.79
2.8	60.71	1107.2	1097.2	1088.5	-8.37	-6.70	-6.01	-39.1	-36.0	-38.7	0.99
2.9	59.24	1113.4	1103.3	1094.5	-8.40	-6.72	-6.00	-39.0	-36.3	-39.9	1.24
3.0	57.09	1119.2	1109.2	1100.2	-8.40	-6.77	-5.97	-38.7	-36.7	-40.7	1.53
3.1	53.82	1124.9	1114.9	1105.8	-8.41	-6.74	-5.98	-38.6	-37.2	-41.5	1.75
3.2	52.12	1130.5	1120.3	1111.2	-8.44	-6.73	-5.97	-38.4	-37.6	-42.8	2.06
3.3	50.32	1135.8	1125.5	1116.3	-8.42	-6.70	-5.95	-38.3	-38.3	-43.8	2.38
3.4	48.23	1140.7	1130.5	1121.2	-8.44	-6.72	-5.92	-38.1	-38.9	-44.3	2.78
3.5	48.23	1145.5	1135.3	1125.9	-8.45	-6.72	-5.89	-37.9	-39.1	-44.8	3.15

FREQ OFFSET (KHz)	PHASE NOISE (dBc/Hz)
1	-74
10	-99
100	-121
1000	-140

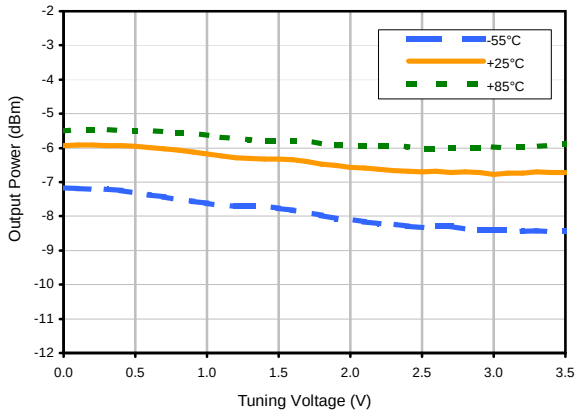
Voltage Controlled Oscillator SOS-1000-519+

Typical Performance Data

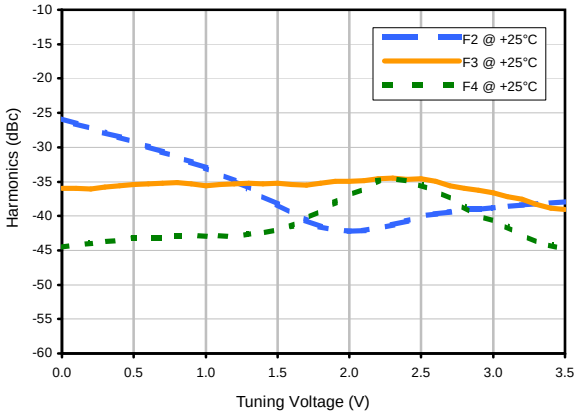
Frequency and Tuning Sensitivity



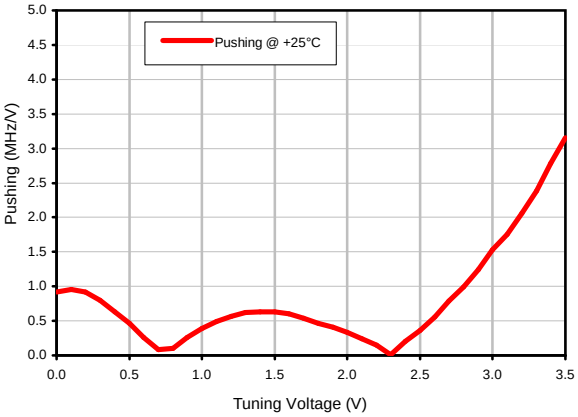
Power Output



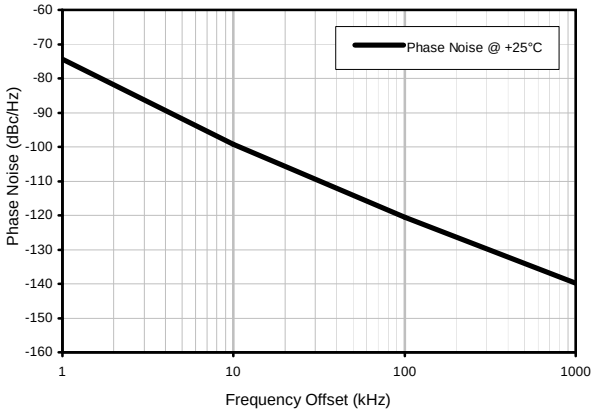
Harmonics Level



Frequency Pushing



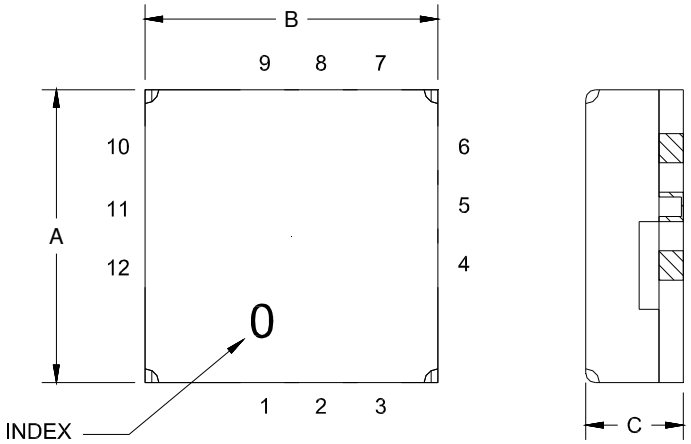
Phase Noise

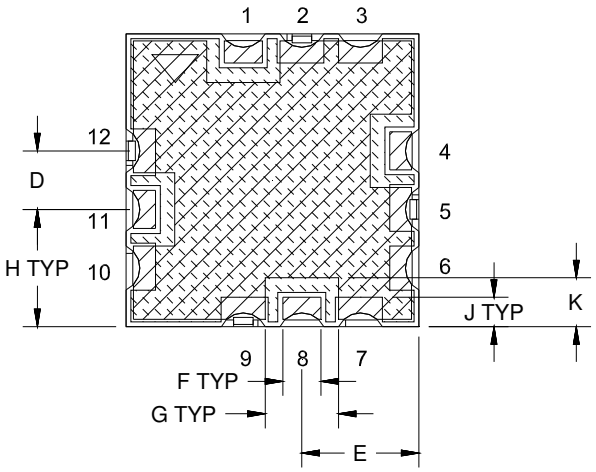


Case Style FZ

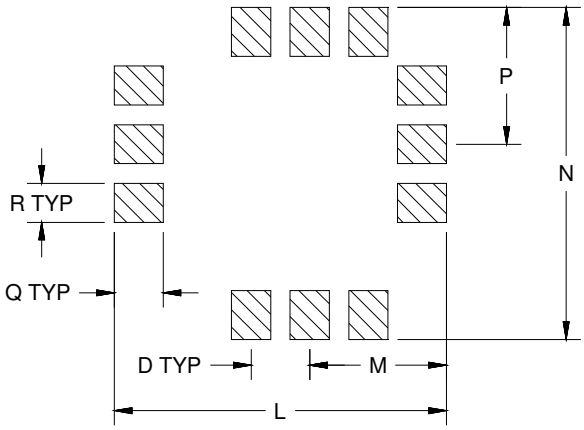
FZ990

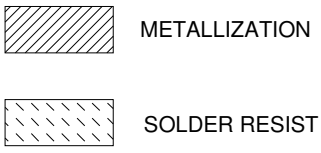
Outline Dimensions





PCB Land Pattern





CASE #	A	B	C	D	E	F	G	H	J	K
FZ990	.300 (7.62)	.300 (7.62)	.100 (2.54)	.060 (1.52)	.120 (3.05)	.039 (0.99)	.075 (1.91)	.120 (3.05)	.030 (0.76)	.050 (1.27)

CASE #	L	M	N	P	Q	R	WT. GRAM
FZ990	.340 (8.64)	.140 (3.56)	.340 (8.64)	.140 (3.56)	.050 (1.27)	.040 (1.02)	.25

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

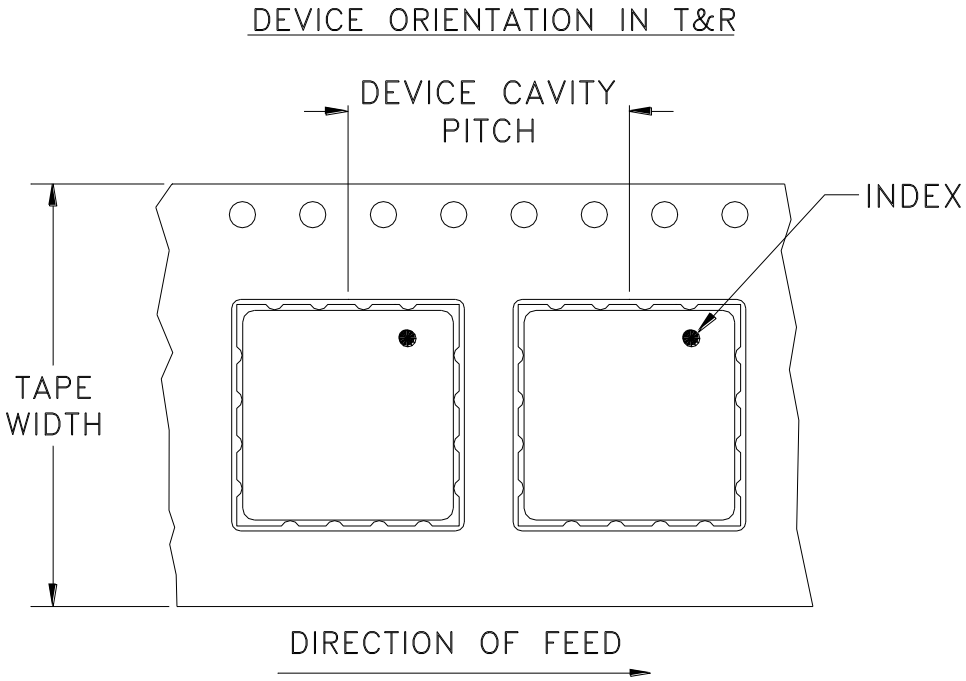
Notes:

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.

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Tape & Reel Packaging TR-F78



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note
16	12	7	10
			20
			50
			100
			200
		13	500, 1000

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

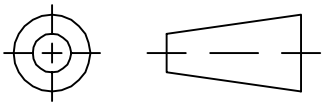
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

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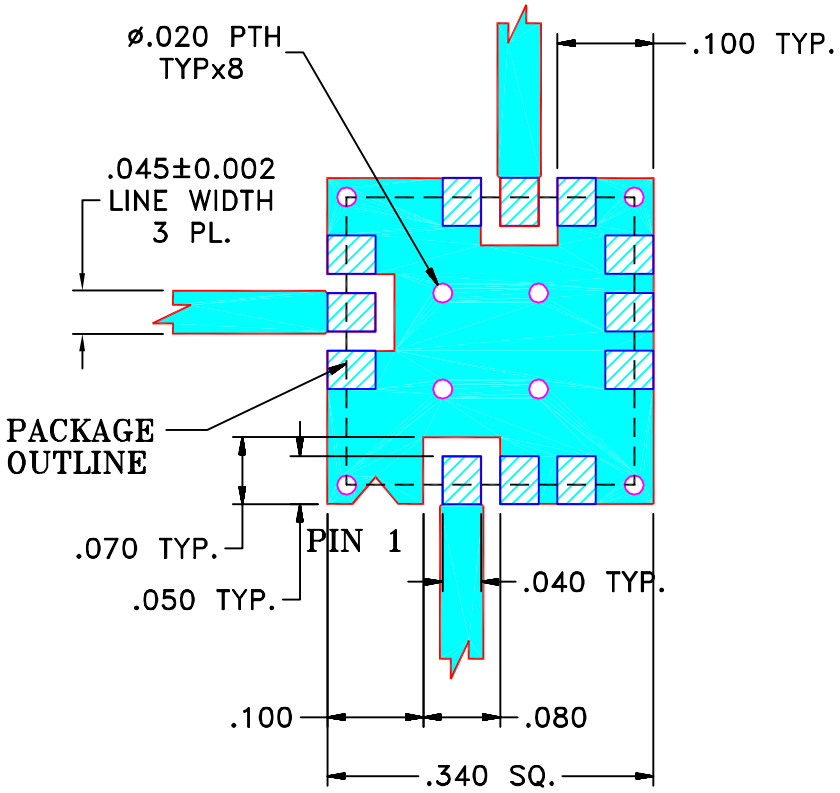
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THIRD ANGLE PROJECTION



REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M89039	NEW RELEASE (FROM RAVON)	01/04	DK	HH
OR	R54816	NEW RELEASE (FROM RAVON)	01/04	DK	HH
A	M102713	ADDED "...WITH SMOBC"	01/12/06	GF	IL

SUGGESTED MOUNTING CONFIGURATION
FOR FZ802/FZ990 CASE STYLE, pl PIN CONNECTION.



NOTE:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025"±.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)	19/01/04
TOLERANCES ON:	CHECKED	RZ (RAV)	19/01/04
2 PL DECIMALS ±	APPROVED	HH (RAV)	19/01/04
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

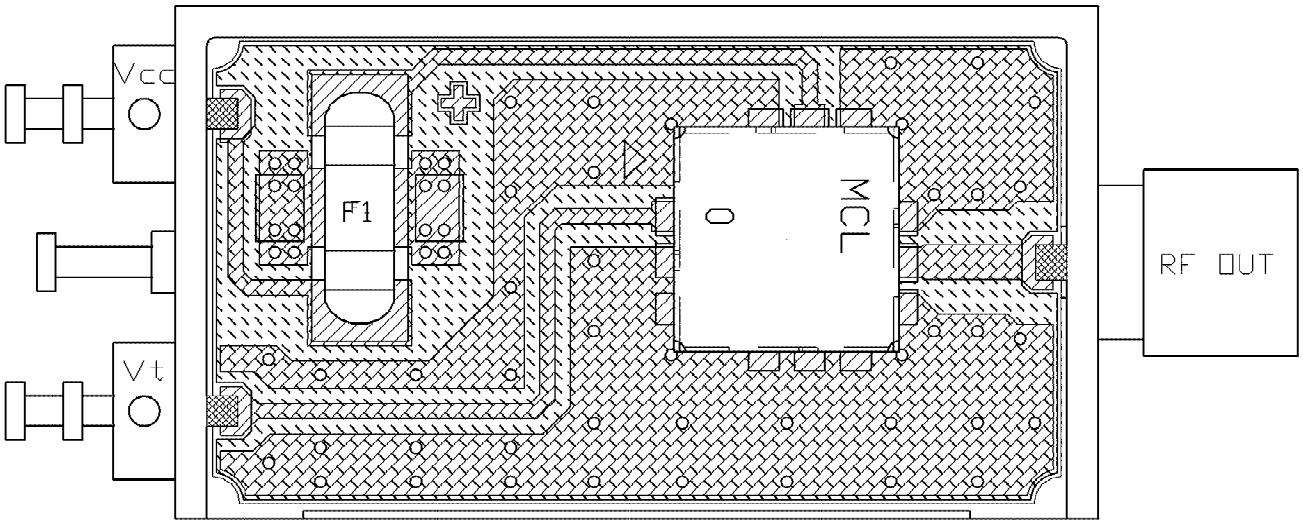
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, pl, FZ802/FZ990, SOS, TB-271

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-143	A

FILE:	SCALE:	SHEET:
98PL143	5:1	1 OF 1

Evaluation Board and Circuit

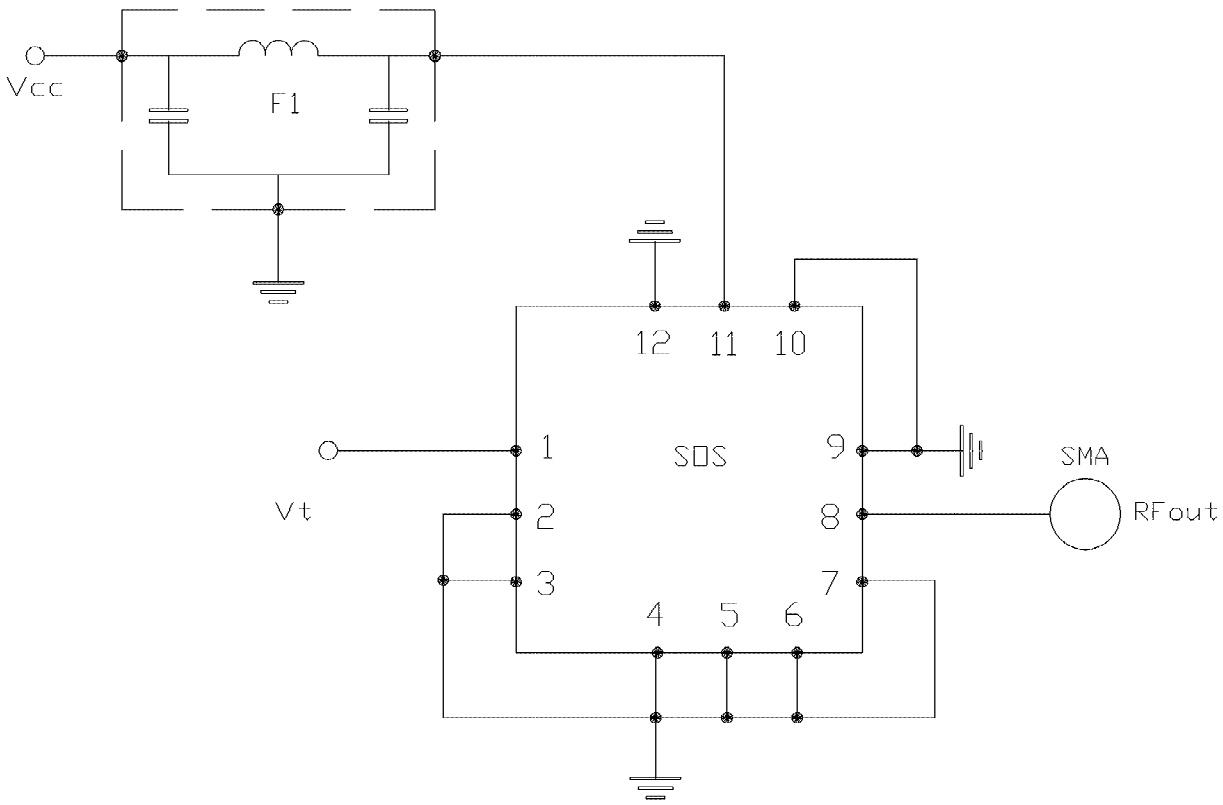


TB-271

NOTES:

1. SMA FEMALE CONNECTORS.
2. PCB MATERIAL: RO4350B OR EQUIVALENT, DIALECTRIC CONSTANT=3.48, DIALECTRIC THICKNESS=.020 INCH.

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Schematic Diagram

Mini-Circuits

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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