



# 9960

## Hybrid Space-Qualified TCXO

### KEY FEATURES

- Choose between fixed-frequency or voltage-controlled TCXO's.
- 10 MHz to 225 MHz Output Frequency
- MIL-PRF-38534 class K Certified
- Exceptional Long Term Frequency Accuracy
- Temperature Stability better than  $\pm 1$ ppm
- Low Aging and Phase Noise
- Radiation Hardened
- Environmentally Robust

### OPTIONS

Available options for this product include:

- Output frequency
- Ddip package height (9961 vs. 9962)

Contact Symmetricom to configure a 9960-series oscillator that will meet your specific needs.

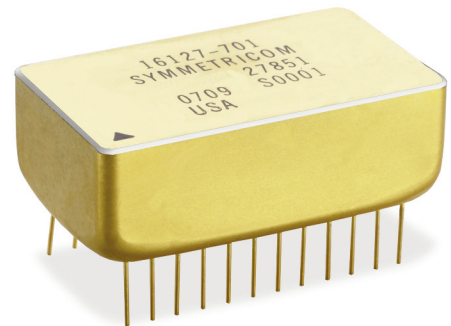
Symmetricom has a 35-year legacy of high-reliability and high-performance quartz oscillators, and these oscillators are now available in hybrid construction for applications that require minimal size, weight and power. The model 9960 is a temperature compensated crystal oscillator (TCXO) capable of fixed frequency or voltage controlled operation.

The 9960 series utilizes 3rd or 5th overtone AT-cut crystals in a Colpitts configuration with optional multiplication circuitry and output amplifier or driver stages. The precision crystals are contained within hermetic or vacuum sealed packages housed within the hybrid circuit package, resulting in the lowest end-of-life frequency drift possible. Compensation is achieved by characterization of the individual crystals over temperature, and the incorporation of specific components to offset the effect of changes in the temperature.

These hybrid oscillators are based on heritage designs and manufacturing techniques proven for reliability in numerous space applications. The hybrids are manufactured in a mil-prf-38534 class K facility, in a class 100,000 clean room that provides for maximum reliability.

Output frequency and package style can be chosen to meet a wide variety of standard and custom applications.

The 9960 series has demonstrated excellent performance after exposure to high levels of shock, vibration, and radiation, consistent with the rigorous requirements of space applications.



## 9960 SPECIFICATIONS

### ELECTRICAL SPECIFICATIONS

	9960	9961	9962
• Standard Output Frequency	10 MHz	100 MHz	100 MHz
• Available Output Frequency	8 MHz to 20 MHz	10 MHz to 225 MHz	10 MHz to 225 MHz
• Initial Accuracy	Settable to $\pm 0.1$ ppm via external voltage or resistor	Settable to $\pm 0.1$ ppm via external voltage or resistor	Settable to $\pm 0.1$ ppm via external voltage or resistor
• Format	Sine wave	Sine wave	Sine wave
• Amplitude	$\geq 7.0$ dBm	$\geq 7.0$ dBm	$\geq 7.0$ dBm
• Harmonic distortion	$< -20$ dBc	$< -20$ dBc	$< -20$ dBc
• Subharmonic distortion	$< -20$ dBc	$< -20$ dBc	$< -20$ dBc
• Non-harmonic distortion	$< -65$ dBc	$< -65$ dBc	$< -65$ dBc
• Load impedance	50 $\Omega$	50 $\Omega$	50 $\Omega$
• Load VSWR	2.0:1	2.0:1	2.0:1

### PERFORMANCE PARAMETERS

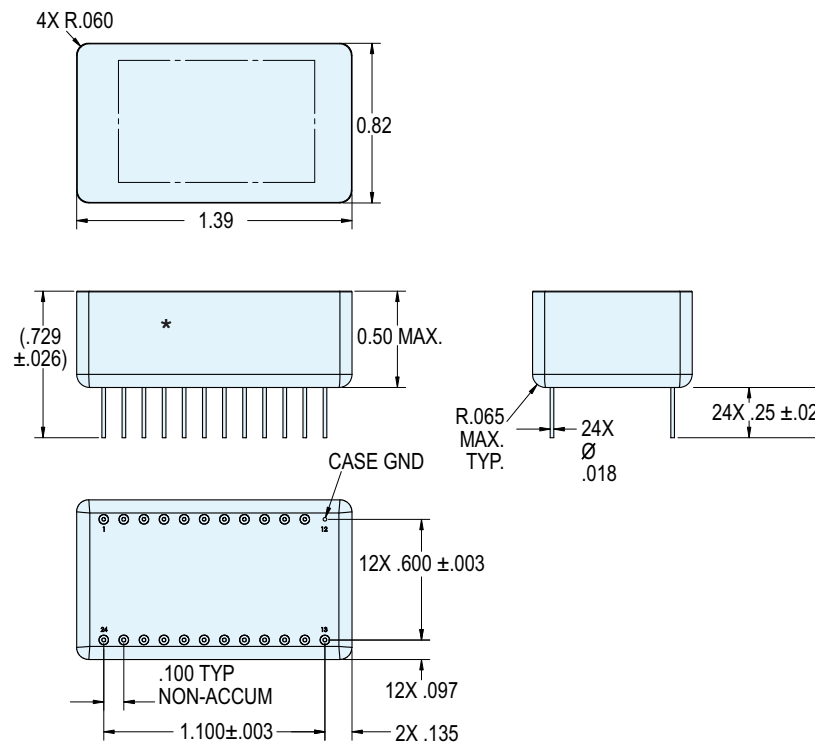
• SSB phase noise (static)			
1 Hz	-78 dBc	-45 dBc	-42 dBc
10 Hz	-108 dBc	-75 dBc	-74 dBc
100 Hz	-125 dBc	-105 dBc	-105 dBc
1 kHz	-142 dBc	-135 dBc	-135 dBc
10 kHz	-150 dBc	-150 dBc	-150 dBc
100 kHz	-150 dBc	-150 dBc	-150 dBc
• Aging			
Per year:	$\leq 0.5$ ppm	$\leq 1$ ppm	$\leq 1$ ppm
10 years:	$\leq 3$ ppm	$\leq 5$ ppm	$\leq 8$ ppm
• Acceleration sensitivity			
Per g, total gamma:	$\leq 2.0E-9$	$\leq 2.0E-9$	$\leq 3.0E-9$
• Frequency change vs. Temperature			
-40° C to +85° C:	N/A	$\pm 2$ ppm	$\pm 2$ ppm
-20° C to +70° C:	N/A	$\pm 1$ ppm	$\pm 1$ ppm
0° C to +50° C:	$\pm 0.5$ ppm	$\pm 0.5$ ppm	$\pm 0.5$ ppm
• Input Voltage			
Selectable range*:	8 - 15 Vdc	8 - 15 Vdc	8 - 15 Vdc
Sensitivity:	$< 0.1$ ppm for $\pm 5\%$ voltage change	$< 0.1$ ppm for $\pm 5\%$ voltage change	$< 0.1$ ppm for $\pm 5\%$ voltage change
• Steady-state power consumption:	220 mW	220 mW	220 mW
• Electronic Frequency Control (EFC) Range	$\pm 3$ ppm	$\pm 10$ ppm	$\pm 10$ ppm
EFC Input	0 to 6 Vdc	0 to 6 Vdc	0 to 6 Vdc
EFC Linearity	$\pm 10\%$	$\pm 10\%$	$\pm 10\%$
• Load change sensitivity:	$< 0.1$ ppm for $\pm 5\%$ load change	$< 0.1$ ppm for $\pm 5\%$ load change	$< 0.1$ ppm for $\pm 5\%$ load change

### ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

• Operating Temperature:	-55° C to +125° C	-55° C to +125° C	-55° C to +125° C
• Storage temperature:	-65° C to +125° C	-65° C to +125° C	-65° C to +125° C
• Random vibration			
Operating (endurance):	20 g rms	20 g rms	20 g rms
• Pyrotechnic shock:	500g for 1ms half-sine impulse	500g for 1ms half-sine impulse	500g for 1ms half-sine impulse
• Radiation Performance:			
Total Dose:	100 kRad (Si)	100 kRad (Si)	100 kRad (Si)
ELDRS:	Compliant	Compliant	Compliant
SEL:	Compliant	Compliant	Compliant
Neutron Fluence:	Contact Factory	Contact Factory	Contact Factory
Prompt Dose Rate:	Contact Factory	Contact Factory	Contact Factory
• EMI/EMC Performance:	Contact Factory	Contact Factory	Contact Factory
• MTBF	$> 20,000,000$ hours	$> 20,000,000$ hours	$> 20,000,000$ hours
• Reliability specification:	MIL-HDBK-217F	MIL-HDBK-217F	MIL-HDBK-217F
• Crystal:	T08	T05	Surface mount
• Package Style:	24-pin ddip, 0.5" profile	24-pin ddip, 0.5" profile	24-pin ddip, 0.3" profile
• Weight:	$< 30$ grams	$< 30$ grams	$< 30$ grams

Note: \*above specifications assume operation at +/- 5% from selected voltage

## 9960 / 9961 / 9962 OUTLINE DRAWING



\* The 9962 package height is a lower profile. The height is 0.30 MAX, compared with the 9960 and 9961 0.50 MAX.

## 9960 CONNECTION DESCRIPTIONS

PIN NO.	FUNCTION
1	EXTERNAL RESISTOR OR V TUNE
2	N/C
3	N/C
4	N/C
5	N/C
6	N/C
7	N/C
8	N/C
9	N/C
10	N/C
11	N/C
12	CASE GND
13	RF OUT
14	N/C
15	N/C
16	N/C
17	N/C
18	N/C
19	N/C
20	N/C
21	N/C
22	N/C
23	N/C
24	SUPPLY VOLTAGE



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