Symmetricom makes rubidium and quartz oscillators that meet or exceed the complex, high reliability requirements for frequency references in the Space, Defense, and Avionics markets. Their small size, low power consumption, fast warm-up capability, superior stability and spectral purity make these devices ideal for critical applications in harsh environments whether airborne, maritime, ground-based, or space.

9400

Ovenized Master Oscillator

KEY FEATURES

- Output Frequency: 5 MHz - 25 MHz
- Space-Qualified and Radiation Rated to >100 krad (Si)
- Power Consumption: <3.6W @ 25ºC
- Frequency Aging @ 5MHz: <5.0E-11/Day, <1.5E-8/Year
- Temperature Range: -25ºC to +65ºC

OPTIONAL FEATURES

Available options for this product include:

- Improved phase noise (-122 dBc at 1 Hz offset vs. standard -116 dBc)
- DC/DC converter for input power conditioning
- Customized mechanical isolation systems for vibration & pyrotechnic shock
- Multiple RF output ports
- Crystal radiation preconditioning
- TTL or LVDS output
- Improved acceleration sensitivity

Contact Symmetricom to configure a 9400-series oscillator that will meet your specific needs.

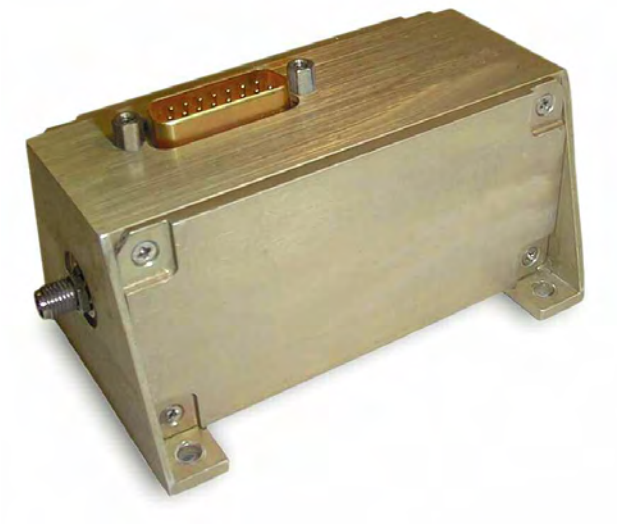
Symmetricom's 9400 Series is a master oscillator that produces a highly stable, low noise, reference frequency output.

The use of surface mount technology allows for the greatest possible reduction in size without compromises in performance or reliability. All discrete components manufactured to military standards are purchased from military certified and qualified vendors. The environmentally rugged 9400 features an ovenized SC-cut quartz resonator and sustaining electronics to achieve temperature insensitive performance. The 9400 master oscillator also exhibits excellent short-term stability, phase noise and aging characteristics.

Backed by an extensive oscillator legacy, the 9400 oscillator series meets the challenge of stringent specifications for frequency control, even under the most adverse environmental conditions.

These oscillators are suitable for direct installation as a component in equipment and systems as well as for use as a master frequency standard, local oscillator, or time base, satisfying a range of applications such as:

- Shipboard timing references
- Satellite on-board timing and frequency standard
- Land-mobile system frequency reference
- Receivers/transmitters/LO



9400 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Standard Output Frequency: 5 MHz
- Initial Accuracy: ±2.0E-8
- Format: Sine wave (TTL or LVDS optional)
- Amplitude: 7.0 dBm ±1 dB
- Harmonic distortion: <-40 dBc
- Non-harmonic distortion: <-90 dBc
- Load impedance: 50 Ω
- VSWR: 1.5:1

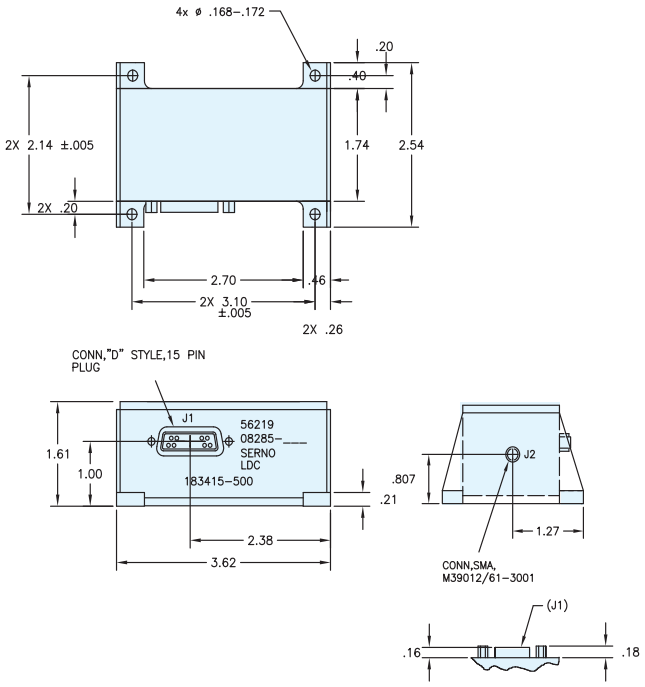
PERFORMANCE PARAMETERS

- Short-term stability
  - 1 second (Allan deviation): <3.0E-12
  - 10 second (Allan deviation): <1.0E-12
- SSB phase noise (static)
  - 1 Hz: -116 dBc
  - 10 Hz: -140 dBc
  - 100 Hz: -150 dBc
  - 1 kHz: -157 dBc
  - 10 kHz: -160 dBc
  - 100 kHz: -160 dBc
- Aging
  - Per day: <5.0E-11
  - Per year: <1.5E-8
- Frequency Retrace (after up to 24 hrs. off and 1 hour on at 25° C): ±1.0E-8
- Acceleration sensitivity
  - Per g, total gamma: 4.0E-9
  - Low g option, total gamma: 7.0E-10
- Frequency change vs. Temperature
  - -25° C to +65° C: ±4.0E-9
  - Warm-up time from +25° C: 15 minutes to within 2.0E-8 of final frequency
- Input Voltage
  - Range: 15 to 18 Vdc
  - Sensitivity: <2.0E-10 for ±5% voltage change
- Steady-state power consumption: <3.6 W at 25°C; <2.4 W at 25°C in vacuum
- Warm-up power consumption: <6 W
- Electronic Frequency Control (EFC) Range: ±4.0E-7 typical

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

- Operating Temperature: -25° C to +65° C
- Storage temperature: -40° C to +100° C
- Random vibration
  - Operating (endurance): 20 g rms
- Radiation Performance:
  - Total Dose: 100 krad (Si)
  - SEU: Compliant
  - Neutron Fluence: Compliant
  - Prompt Dose Rate: Compliant
- EMI/EMC Performance: Contact Factory
- MTBF: > 10 million hours
- Reliability specification: MIL-HDBK-217F
- Weight: 0.23 kg

9400 OUTLINE DRAWING



9400 CONNECTION DESCRIPTIONS

Pin No. J1	Function
1	No Connection
2	No Connection
3	No Connection
4	+ Elec Pwr Input
5	No Connection
6	No Connection
7	No Connection
8	No Connection
9	Oven Temp Monitor
10	Oven Temp Monitor
11	No Connection
12	+ Elec Pwr Input
13	Pwr Gnd
14	Pwr Gnd
15	Pwr Gnd
SMA J2	RF Output

9500

Ovenized Master Oscillator

KEY FEATURES

- Output Frequency: 4 MHz - 25 MHz
- Space-Qualified and Radiation Rated to >100 K Rad (Si)
- Power Consumption: <3.6W @ 25°C
- Size: 4.25" x 6.0" x 8.62"
- Frequency Aging @ 5MHz: <5.0E-11/Day, <1.5E-8/Year
- Temperature Range: -25°C to +60°C

OPTIONAL FEATURES

Available options for this product include:

- Serial DAC tuning – allows digital tuning over EFC range
- Discrete telemetry & control circuitry – enables analog readouts of output power, baseplate temperature, other functions
- Customized mechanical isolation systems
- Crystal radiation preconditioning
- Multiple RF output ports
- TTL or LVDS output
- Improved acceleration sensitivity
- Improved frequency change vs. temperature of ≤3.0E-12/°C

Contact Symmetricom to configure a 9500-series oscillator that will meet your specific needs.

Symmetricom's 9500 Series is a master oscillator that produces a highly stable, low noise reference frequency output. Particularly suited to space applications, it delivers the best stability performance available in a commercial product.

A mixture of through-hole and surface mount technology, along with the SC-cut quartz resonator, is completely enclosed in an insulating dewar and then kept at a precisely controlled temperature. The result is temperature-insensitive performance and excellent short-term stability, phase noise, and aging characteristics.

All EEE parts on the 9500 are selected in accordance with MIL-STD-975/PPL-21 for Grade 1 or Grade 2 applications, and are procured from approved QML/QPL sources of supply.

The environmentally rugged 9500 Series is suitable for direct installation as a component in equipment and systems as well as for use as a master frequency standard, local oscillator, or time base.

The 9500 series satisfies a range of applications that include:

- Navigation payload frequency reference
- GPS space borne frequency reference
- Land-mobile system frequency reference
- Satellite on-board frequency standard
- Remote station primary frequency standard

9500 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Standard Output Frequency 5 MHz
- Initial Accuracy ±2.0E-8
- Format Sine wave (TTL or LVDS optional)
- Amplitude 7.0 dBm ±1 dB
- Harmonic distortion <-50 dBc
- Non-harmonic distortion <-90 dBc
- Load impedance 50 Ω
- VSWR 1.5:1

PERFORMANCE PARAMETERS

- Short-term stability
  - 1 second (Allan deviation): <1.0E-12
  - 10 second (Allan deviation): <5.0E-13
  - 100 second (Allan deviation): <5.0E-13
  - 1000 second (Allan deviation): <1.0E-12
- SSB phase noise (static)
  - 1 Hz -116 dBc
  - 10 Hz -140 dBc
  - 100 Hz -150 dBc
  - 1 kHz -157 dBc
  - 10 kHz -165 dBc
  - 100 kHz -165 dBc
- Aging
  - Per day: <5.0E-11
  - Per year: <1.5E-8
- Frequency Retrace (after up to 24 hrs. off and 1 hour on at 25° C): ±1.0E-8
- Acceleration sensitivity
  - Per g, total gamma: 4.0E-9
  - Low g option, total gamma 2.0E-9
- Frequency change vs. Temperature
  - -25° C to +60° C: ±3.0E-10
  - Warm-up time from +25° C: 60 minutes to within 2.0E-8 of final frequency
- Input Voltage
  - Range: 22 to 38 Vdc
  - Sensitivity: <2.0E-9 for ±5% voltage change
- Steady-state power consumption: <3.6 W at 25°C; <2.9 W at 25°C in vacuum
- Warm-up power consumption: <8 W
- Electronic Frequency Control (EFC) Range ±2.0E-7 typical

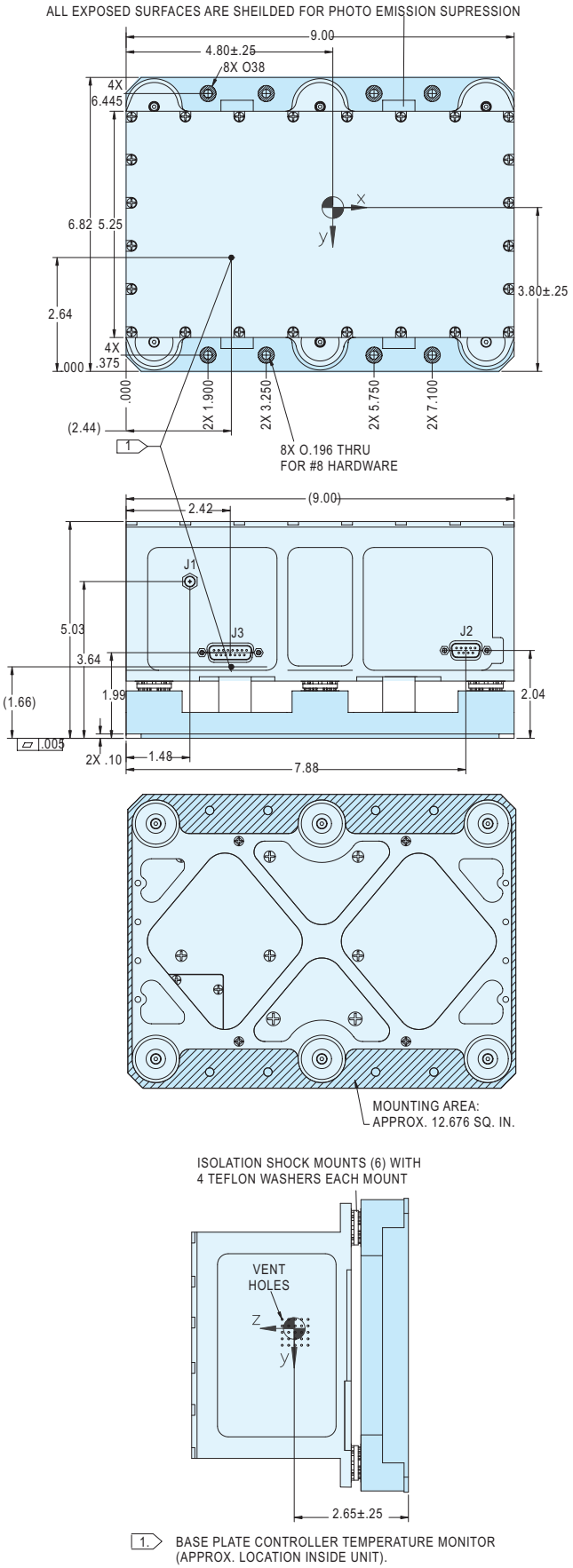
ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

- Operating Temperature: -25° C to +60° C
- Storage temperature: -40° C to +100° C
- Random vibration
  - Operating (endurance): 20 g rms
- Pyrotechnic shock: 3000 g
- Radiation Performance:
  - Total Dose: 100 krad (Si)
  - SEU: Compliant
  - Neutron Fluence: Compliant
  - Prompt Dose Rate: Compliant
- EMI/EMC Performance: Contact Factory
- MTBF > 10 million hours
- Reliability specification: MIL-HDBK-217F
- Weight: 2.73 kg

9500 CONNECTION DESCRIPTIONS

PIN NO.	FUNCTION
J1-SMA	RF OUT
J2	D CONN 9 PINS
J3	D CONN 15 SOCKETS

9500 OUTLINE DRAWING



9600

Ultra-miniature Space and Military OCXO Series

KEY FEATURES

- Output Frequency: 4 MHz - 60 MHz
- Warm-Up Time: ≤5 Minutes From 25°C
- Fast Warm-Up Option Available
- Low Power Consumption: <1.3W @ 25°C (In Vacuum)
- Compact Sizes -Typical: 1.33" x 1.33" x 1.33"
- Frequency Aging:
  5 MHz: <5.0E-11/day
  10 MHz: <3.0E-10/day
- Frequency Change vs. Temperature: ±4.0E-9 (-40°C to +65°C)
- Low g-sensitivity Option Available

OPTIONAL FEATURES

Available options for this product include:

- Output frequency (4 MHz to 60 MHz available)
- Output format (Sine wave, TTL, or LVDS)
- Panel-mount or PCB-mount package style
- Component screening to space (grade 1) requirements
- Fast warm-up time: ≤5 minutes to within 2.0E-8 of final frequency from -40°C (+25°C is standard). Warm-up power increases to approx. 14 W.
- Low acceleration sensitivity of ≤2.0E-10 at 10 MHz
- Crystal radiation preconditioning

Contact Symmetricom to configure a 9600-series oscillator that will meet your specific needs.

Symmetricom's 9600 is an ultra-miniature ovenized crystal oscillator designed to provide a high stability output for a wide variety of military and space applications.

The use of hybrid circuity allows for the greatest possible reduction in size without compromises in performance or reliability.

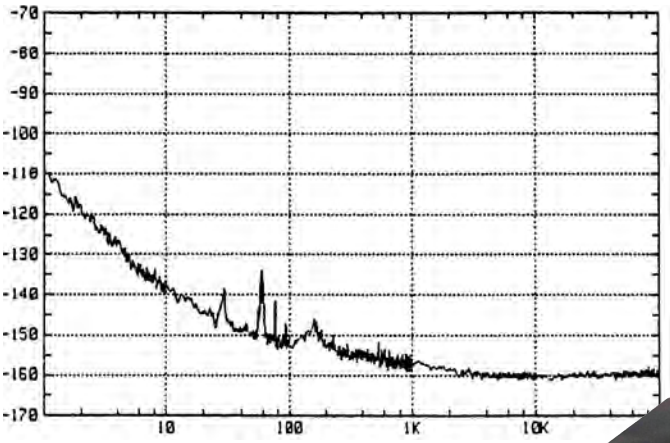
Assembly is performed by skilled operators certified to NASA approved workmanship standards. Hybrid circuits are produced at facilities qualified to MIL-PRF-38534C. All discrete components are manufactured and tested standard to grade 2 or optionally to grade 1 requirements per MIL-STD-975.

The rugged 9600 features a SC-cut quartz resonator and sustaining electronics that are controlled at a precise temperature to achieve temperature-insensitive performance, and excellent short term stability, phase noise, and aging characteristics. This allows it to meet the challenges of many military and space specifications for time and frequency, even under the most adverse environmental conditions.

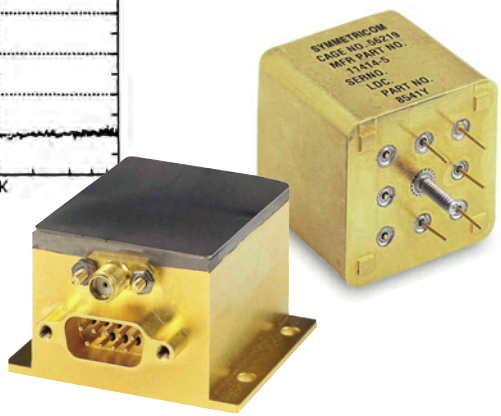
Backed by an extensive oscillator legacy, the 9600 series can be customized in output frequency, warm-up time, g-sensitivity, and other characteristics, making it useful for applications such as:

- Radio navigation
- Radar warning receivers
- Satellite transmission
- Satellite tracking and guidance

This rugged, compact crystal oscillator is especially advantageous when utilized in mobile transportable and portable applications where fast warm-up, low power consumption and small size are required.



Typical phase noise test results for the 10MHz oscillator



9600 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

	5 MHz	10 MHz
• Standard Output Frequency		
• Initial Accuracy	±5.0E-8	±5.0E-8
• Format	Sine wave (TTL or LVDS optional)	Sine wave (TTL or LVDS optional)
• Amplitude	7.0 dBm ±1 dB	7.0 dBm ±1 dB
• Harmonic distortion	<-30 dBc	<-30 dBc
• Non-harmonic distortion	<-90 dBc	<-90 dBc
• Load impedance	50 Ω	50 Ω
• VSWR	1.5:1	1.5:1

PERFORMANCE PARAMETERS

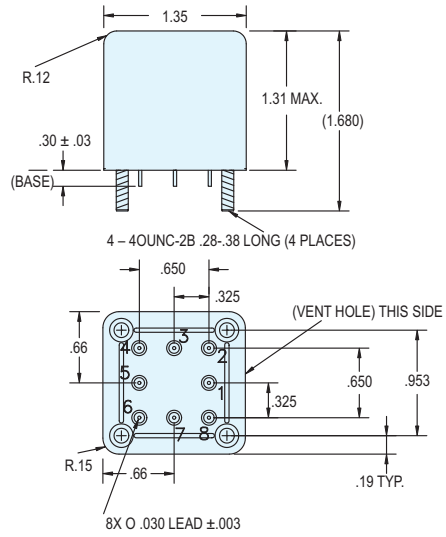
• Short-term stability		
1 second (Allan deviation):	<2.0E-12	<5.0E-12
10 second (Allan deviation):	<2.0E-12	<5.0E-12
100 second (Allan deviation):	<5.0E-12	<1.0E-11
• SSB phase noise (static)		
1 Hz	-112 dBc	-100 dBc
10 Hz	-140 dBc	-125 dBc
100 Hz	-150 dBc	-145 dBc
1 kHz	-157 dBc	-150 dBc
10 kHz	-160 dBc	-155 dBc
100 kHz	-160 dBc	-155 dBc
Aging		
Per day:	<5.0E-11	<3.0E-10
Per year:	<1.5E-8	<4.0E-8
10 years:	<2.0E-7	<1.0E-6
• Frequency Retrace (after up to 24 hrs.off and 1 hour on at 25° C):	±1.0E-8	±1.0E-8
• Acceleration sensitivity		
Per g, total gamma:	3.0E-9	≤1.5E-9
Low g option, total gamma	N/A	≤2.0E-10
• Frequency change vs. Temperature		
-40° C to +65° C:	±4.0E-9	
• Warm-up time from +25° C:	≤5 minutes to within 2.0E-8 of final frequency	
• Input Voltage		
Range:	12 to 15 Vdc	
Sensitivity:	<5.0E-10 for ±5% voltage change	
• Steady-state power consumption at 25° C:	<1.3 W in vacuum	
• Warm-up power consumption:	4 to 8 W	
• Electronic Frequency Control (EFC) Range	±4.0E-7 minimum	
EFC Input	0 to 5 Vdc, (+) sensing	
EFC Linearity	10% typical	
• Load change sensitivity:	±1.0E-9 for ±5% load change	

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

• Operating Temperature:	-40° C to +65° C
• Storage temperature:	-55° C to +100° C
• Random vibration	
Operating (endurance):	35 g rms
• Pyrotechnic shock:	3000 g
• Radiation Performance:	
Total Dose:	100 kRad (Si)
ELDRS:	Compliant
SEL:	Compliant
Neutron Fluence:	Contact Factory
Prompt Dose Rate:	Contact Factory
• EMI/EMC Performance:	Contact Factory
• EEE Parts Screening Level	NASA Grade 2 equivalent
• MTBF	>6,000,000 hours
• Reliability specification:	MIL-HDBK-217F
• Weight:	0.10 kg

9600 OUTLINE DRAWING

PCB-MOUNT PACKAGE STYLE



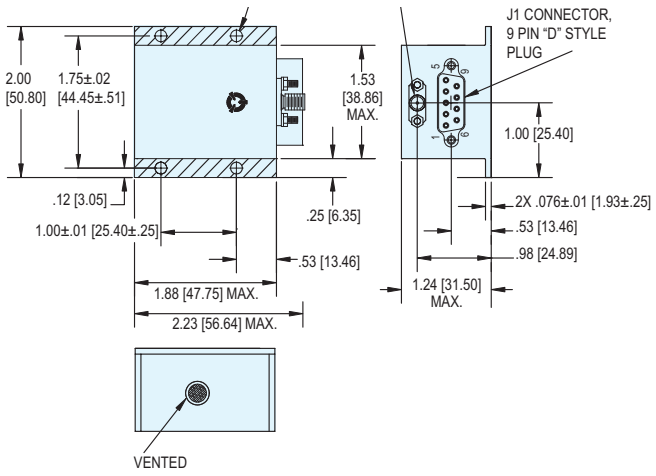
CONNECTION DESCRIPTIONS

PCB-MOUNT PACKAGE STYLE

PIN NO.	FUNCTION
1	RF OUTPUT
2	N/C
3	N/C
4	GROUND/CHASSIS GROUND
5	+12 VDC TO +15VDC
6	EFC TUNING VOLTAGE INPUT
7	N/C
8	+12 VDC TO +15VDC

9600 OUTLINE DRAWING

PANEL-MOUNT PACKAGE STYLE



CONNECTION DESCRIPTIONS

PANEL-MOUNT PACKAGE STYLE

PIN NO.	FUNCTION
J1-1	POWER +12VDC TO +15VDC
J1-2	N/C
J1-3	N/C
J1-4	GROUND/CHASSIS GROUND
J1-5	EFC TUNING VOLTAGE INPUT
J1-6	GROUND/CHASSIS GROUND
J1-7	POWER +12VDC TO +15VDC
J1-8	N/C
J1-9	N/C
J2-1	RF OUTPUT

9700

Ultra-miniature Space-Qualified OCXO Series

KEY FEATURES

- Output Frequency: 4 MHz - 60 MHz
- Warm-up Time: ≤5 minutes from 25°C
- Fast Warm-up Option Available
- Low Power Consumption: <1.3W @ 25°C (In Vacuum)
- Compact Sizes-Typical: 1.33" x 1.33" x 1.33"
- Frequency Aging:
  5 MHz: <5.0E-11/day
  10 MHz: <3.0E-10/day
- Frequency Change vs. Temperature: ±4.0E-9 (-40°C to +65°C)
- Radiation Rated: 100 krad (Si)

OPTIONAL FEATURES

Available options for this product include:

- Output frequency (4 MHz to 60 MHz available)
- Output format (Sine wave, TTL, or LVDS)
- Panel-mount or PCB-mount package style
- Fast warm-up time: ≤5 minutes to within 2.0E-8 of final frequency from -40°C (+25°C is standard). Warm-up power increases to approx. 14 W.
- Crystal radiation preconditioning

Contact Symmetricom to configure a 9700-series oscillator that will meet your specific needs.

Symmetricom's 9700 is an ultra-miniature ovenized crystal oscillator designed to provide a high stability output for a wide variety of space-qualified applications.

The use of hybrid circuity allows for the greatest possible reduction in size without compromises in performance or reliability.

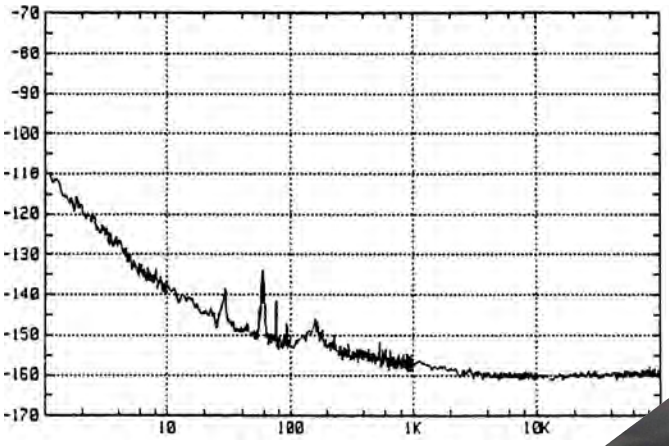
Assembly is performed by skilled operators certified to NASA approved workmanship standards. Hybrid circuits are produced at facilities qualified to MIL-PRF-38534C. All discrete components are manufactured and tested to Grade 1 requirements per MIL-STD-975.

The rugged 9700 features an SC-cut quartz resonator and sustaining electronics that are controlled at a precise temperature to achieve temperature insensitive performance, and excellent short term stability, phase noise, and aging characteristics. This allows it to meet the challenges of space specifications for time and frequency standards, even under the most adverse environmental conditions.

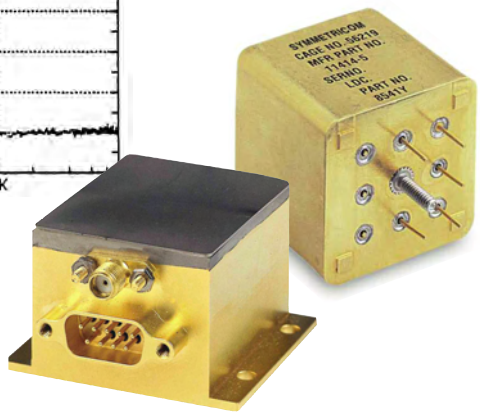
Backed by an extensive oscillator legacy the 9700 series can be customized in output frequency, warm-up time, g-sensitivity, and other characteristics, making it useful for applications such as:

- Radio navigation
- Satellite transmission
- Satellite tracking and guidance

This rugged, compact crystal oscillator is especially advantageous when utilied in applications where fast warm-up, low power consumption, and small size are required.



Typical phase noise test results for the 10MHz oscillator



9700 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

	5 MHz	10 MHz
• Standard Output Frequency		
• Initial Accuracy	±5.0E-8	±5.0E-8
• Format	Sine wave (TTL or LVDS optional)	Sine wave (TTL or LVDS optional)
• Amplitude	7.0 dBm ±1 dB	7.0 dBm ±1 dB
• Harmonic distortion	<-30 dBc	<-30 dBc
• Non-harmonic distortion	<-90 dBc	<-90 dBc
• Load impedance	50 Ω	50 Ω
• VSWR	1.5:1	1.5:1

PERFORMANCE PARAMETERS

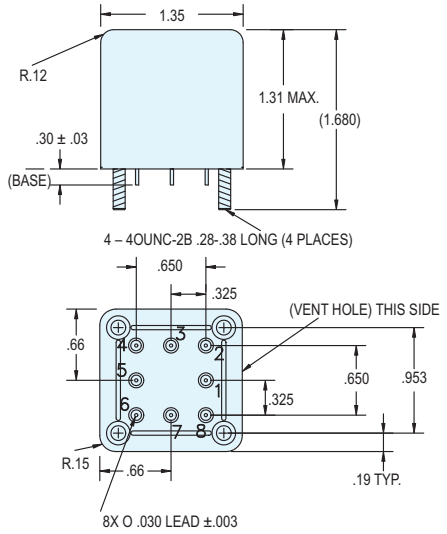
• Short-term stability		
1 second (Allan deviation):	<2.0E-12	<5.0E-12
10 second (Allan deviation):	<2.0E-12	<5.0E-12
100 second (Allan deviation):	<5.0E-12	<1.0E-11
• SSB phase noise (static)		
1 Hz	-112 dBc	-100 dBc
10 Hz	-140 dBc	-125 dBc
100 Hz	-150 dBc	-145 dBc
1 kHz	-157 dBc	-150 dBc
10 kHz	-160 dBc	-155 dBc
100 kHz	-160 dBc	-155 dBc
• Aging		
Per day:	<5.0E-11	<3.0E-10
Per year:	<1.5E-8	<4.0E-8
10 years:	<2.0E-7	<1.0E-6
• Frequency Retrace (after up to 24 hrs. off and 1 hour on at 25° C):	±1.0E-8	
• Acceleration sensitivity		
Per g, total gamma:	≤3.0E-9	≤1.5E-9
• Frequency change vs. Temperature		
-40° C to +65° C:	±4.0E-9	
• Warm-up time from +25° C:	≤5 minutes to within 2.0E-8 of final frequency	
• Input Voltage		
Range:	12 to 15 Vdc	
Sensitivity:	<5.0E-10 for ±5% voltage change	
• Steady-state power consumption at 25° C:	<1.3 W in vacuum	
• Warm-up power consumption:	4 to 8 W	
• Electronic Frequency Control (EFC) Range	±4.0E-7 minimum	
EFC Input	0 to 5 Vdc, (+) sensing	
EFC Linearity	10% typical	
• Load change sensitivity:	±1.0E-9 for ±5% load change	

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

• Operating Temperature:	-40° C to +65° C
• Storage temperature:	-55° C to +100° C
• Random vibration	
Operating (endurance):	35 g rms
• Pyrotechnic shock:	3000 g
• Radiation Performance:	
Total Dose:	100 kRad (Si)
ELDRS:	Compliant
SEL:	Compliant
Neutron Fluence:	Contact Factory
Prompt Dose Rate:	Contact Factory
• EMI/EMC Performance:	Contact Factory
• EEE Parts Screening Level	NASA Grade 1 equivalent
• MTBF	>6,000,000 hours
• Reliability specification:	MIL-HDBK-217F
• Weight:	0.10 kg

9700 OUTLINE DRAWING

PCB-MOUNT PACKAGE STYLE



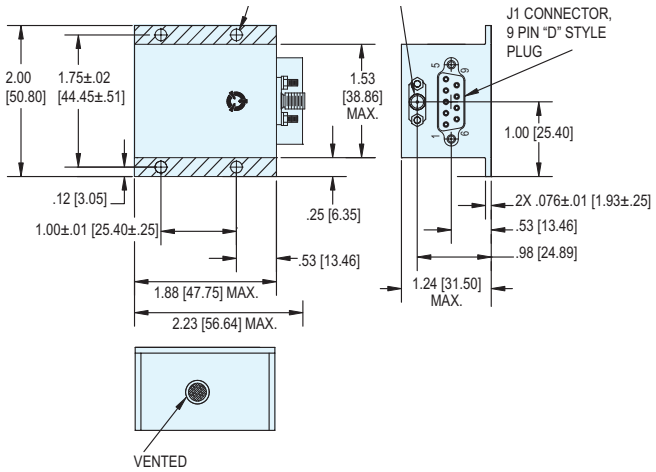
CONNECTION DESCRIPTIONS

PCB-MOUNT PACKAGE STYLE

PIN NO.	FUNCTION
1	RF OUTPUT
2	N/C
3	N/C
4	GROUND/CHASSIS GROUND
5	+12 VDC TO +15VDC
6	EFC TUNING VOLTAGE INPUT
7	N/C
8	+12 VDC TO +15VDC

9700 OUTLINE DRAWING

PANEL-MOUNT PACKAGE STYLE



CONNECTION DESCRIPTIONS

PANEL-MOUNT PACKAGE STYLE

PIN NO.	FUNCTION
J1-1	POWER +12VDC TO +15VDC
J1-2	N/C
J1-3	N/C
J1-4	GROUND/CHASSIS GROUND
J1-5	EFC TUNING VOLTAGE INPUT
J1-6	GROUND/CHASSIS GROUND
J1-7	POWER +12VDC TO +15VDC
J1-8	N/C
J1-9	N/C
J2-1	RF OUTPUT

9800

Ultra-miniature Space and Military VHF OCXO Series

KEY FEATURES

- Output Frequency: 50MHz - 200MHz
- Component Quality:
  B-Level (Military) Standard
  S-Level (Space) Optionally Available
- Warm-Up Time: <10 Minutes From 25ºC
- Fast Warm-up Option Available
- Low Power Consumption: <1.3W @ 25ºC (Vacuum)
- Compact Sizes
  Typical: 1.33" x 1.33" x 1.33"
- Frequency Aging @ 100 MHz:
  <-1.0E-6 in the first year
- Frequency Change vs. Temperature:
  ±5.0E-7 (-40°C to +65°C)
- Low Acceleration Sensitivity:
  ≤8.0E-10 per g

OPTIONAL FEATURES

Available options for this product include:

- Output frequency (50 MHz to 200 MHz available)
- Panel-mount or PCB-mount package style
- Component screening to B-level (military) or S-level (space) requirements
- Fast warm-up time: ≤10 minutes to within 2.0E-8 of final frequency from -40°C (+25°C is standard). Warm-up power increases to approx. 14 W.
- Crystal radiation preconditioning

Contact Symmetricom to configure a 9800-series oscillator that will meet your specific needs.

Symmetricom's 9800 is an ultra-miniature ovenized crystal oscillator that provides a high stability VHF sinewave output. The use of hybrid circuitry allows for the greatest possible reduction in size without compromises in performance or reliability.

Assembly is performed by skilled operators certified to NASA approved workmanship standards. Hybrid circuits are produced at facilities qualified to MIL-PRF-38534C. All discrete components are manufactured and tested to B-level standards, and S-level (space-qualified) is optionally available.

The rugged 9800 features an SC-cut quartz resonator and sustaining electronics that are controlled at a precise temperature to achieve temperature-insensitive performance, and excellent phase noise and aging characteristics. This allows it to meet the challenges of military or space specifications for time and frequency standards, even under the most adverse environmental conditions.

The 9800 is the obvious choice where a combination of excellent spectral purity and long term stability is essential. It contributes to simplification of system design because its low frequency aging extends the period of time needed between synchronization.

In addition to a choice between B-level or S-level component quality, the 9800 series can be customized in output frequency, warm-up time, and other characteristics, making it useful for applications such as:

- Radio navigation
- Radar warning receivers
- Satellite transmission
- Satellite tracking and guidance

This rugged, compact crystal oscillator is especially advantageous when utilized in mobile transportable and portable applications where fast warm-up, low power consumption and small size are required.

9800 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Standard Output Frequency: 100 MHz
- Initial Accuracy: ±2.0E-7
- Format: Sine wave
- Amplitude: 7.0 dBm ±1 dB
- Harmonic distortion: <-30 dBc
- Non-harmonic distortion: <-90 dBc
- Load impedance: 50 Ω
- VSWR: 1.5:1

PERFORMANCE PARAMETERS

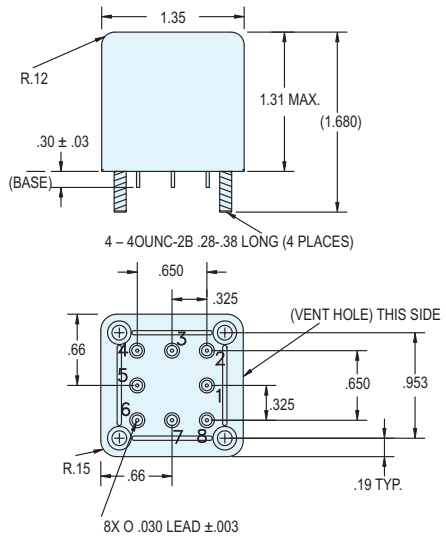
- SSB phase noise (static)
  - 1 Hz: -60 dBc
  - 10 Hz: -90 dBc
  - 100 Hz: -120 dBc
  - 1 kHz: -150 dBc
  - 10 kHz: -160 dBc
  - 100 kHz: -160 dBc
- Aging
  - Per day: <1.0E-9
  - Per year: <1.0E-6, first year, after 30 days operation
  - 10 years: <3.0E-6
- Frequency Retrace (after up to 24 hrs. off and 1 hour on at 25° C): ±1.0E-8
- Acceleration sensitivity
  - Per g, total gamma: 8.0E-10
- Frequency change vs. Temperature
  - -40° C to +65° C: ±5.0E-7
- Warm-up time from +25° C: 10 minutes to within 2.0E-8 of final frequency
- Input Voltage
  - Range: 12 to 15 Vdc
  - Sensitivity: <1.0E-7 for ±5% voltage change
- Steady-state power consumption at 25° C: <1.3 W in vacuum
- Warm-up power consumption: 4 to 8 W
- Electronic Frequency Control (EFC) Range: ± 6 ppm minimum
  - EFC Input: -10 to +10 Vdc, (-) sensing
  - EFC Linearity: 10% typical
- Load change sensitivity: ±5.0E-8 for ±5% load change

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

- Operating Temperature: -40° C to +65° C
- Storage temperature: -55° C to +100° C
- Random vibration
  - Operating (endurance): 35 g rms
- Pyrotechnic shock: 3000 g
- Radiation Performance:
  - Total Dose: 100 kRad (Si)
  - ELDRS: Compliant
  - SEL: Compliant
  - Neutron Fluence: Contact Factory
  - Prompt Dose Rate: Contact Factory
- EMI/EMC Performance: Contact Factory
- EEE Parts Screening Level: B-Level or S-Level, depending on application
- MTBF: >6,000,000 hours
- Reliability specification: MIL-HDBK-217F
- Weight: 0.10 kg

9800 OUTLINE DRAWING

PCB-MOUNT PACKAGE STYLE



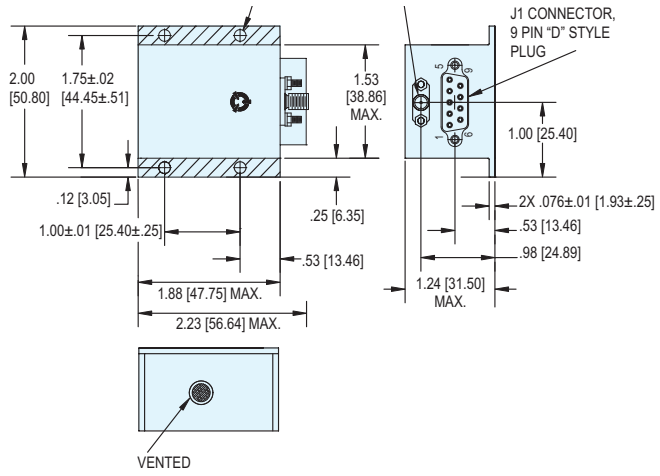
CONNECTION DESCRIPTIONS

PCB-MOUNT PACKAGE STYLE

PIN NO.	FUNCTION
1	RF OUTPUT
2	N/C
3	N/C
4	GROUND/CHASSIS GROUND
5	+12 VDC TO +15VDC
6	EFC TUNING VOLTAGE INPUT
7	N/C
8	+12 VDC TO +15VDC

9800 OUTLINE DRAWING

PANEL-MOUNT PACKAGE STYLE



CONNECTION DESCRIPTIONS

PANEL-MOUNT PACKAGE STYLE

PIN NO.	FUNCTION
J1-1	POWER +12VDC TO +15VDC
J1-2	N/C
J1-3	N/C
J1-4	GROUND/CHASSIS GROUND
J1-5	EFC TUNING VOLTAGE INPUT
J1-6	GROUND/CHASSIS GROUND
J1-7	POWER +12VDC TO +15VDC
J1-8	N/C
J1-9	N/C
J2-1	RF OUTPUT

9210B

Military OCXO

KEY FEATURES

- 5 or 10 MHz Output
- <1.0E-10 Per Day Aging (5 MHz)
- <4.0E-9 Per g Acceleration Sensitivity
- Random Vibration endurance of up to 30 g rms

OPTIONAL FEATURES

Available options for this product include:

- Output frequency: 5 MHz or 10 MHz
- Low acceleration sensitivity of ≤2.0E-10 per g (10 MHz model only)

Contact Symmetricom to configure a 9210B oscillator that will meet your specific needs.

As the military moves toward implementing more advanced communications, navigation and targeting systems, precision oscillators that can withstand a wide range of operating environments are becoming more critical.

The Symmetricom 9210B is a COTS military oven-compensated crystal oscillator (OCXO) designed for ground tactical and airborne applications where superior phase noise and frequency stability are required. Phase noise performance is critical in many radar applications, and precise frequency accuracy and stability are critical for secure communication and navigation applications.

The 9210B is based around a double oven SC-cut crystal resonator enclosed in an industry standard 2.0" x 2.0" x 1.25" package.

The standard oscillator is available in either 5 or 10 MHz output configurations, both of which provide excellent frequency stability and phase noise performance in static or dynamic environments.

For more challenging dynamic applications at 10 MHz where phase noise under vibration is a key specification, a low g sensitivity option is available that improves acceleration sensitivity to < 2.0E-10 per g.

9210B SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

	5 MHz	10 MHz
• Standard Output Frequency		
• Initial Accuracy	'±5.0E-8	'±5.0E-8
• Format	Sine wave	Sine wave
• Amplitude	7.0 dBm ±1 dB	7.0 dBm ±1 dB
• Harmonic distortion	<-30 dBc	<-30 dBc
• Non-harmonic distortion	<-80 dBc	<-80 dBc
• Load impedance	50 Ω	50 Ω
• VSWR	1.5:1	1.5:1

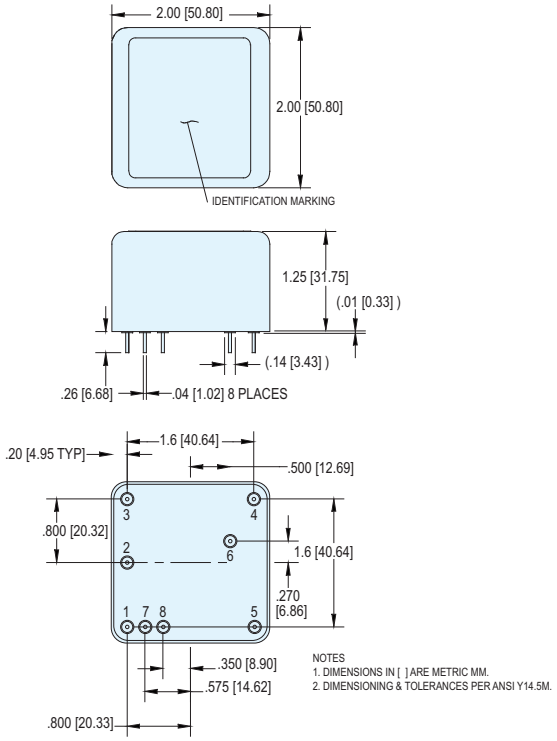
PERFORMANCE PARAMETERS

	5 MHz	10 MHz
• Short-term stability		
1 second (Allan deviation):	<2.0E-12	<5.0E-12
10 second (Allan deviation):	<2.0E-12	<5.0E-12
100 second (Allan deviation):	<5.0E-12	<1.0E-11
• SSB phase noise (static)		
1 Hz	-110 dBc	-100 dBc
10 Hz	-140 dBc	-130 dBc
100 Hz	-150 dBc	-145 dBc
1 kHz	-157 dBc	-155 dBc
10 kHz	-160 dBc	-157 dBc
100 kHz	-160 dBc	-157 dBc
• Aging		
Per day:	<1.0E-10	<3.0E-10
Per year:	<1.5E-8	<4.0E-8
10 years:	<2.0E-7	<1.0E-6
• Frequency Retrace (after up to 24 hrs. off and 1 hour on at 25° C):	±1.0E-8	±1.0E-8
• Acceleration sensitivity		
Per g, total gamma	≤4.0E-9	≤2.0E-9
Low g option, total gamma	N/A	≤2.0E-10
• Frequency change vs. Temperature		
-30° C to +70° C:	±1.0E-8	±1.0E-8
• Warm-up time from +25° C:	≤5 minutes to within 2.0E-8 of final frequency	
• Input Voltage		
Range	12 to 15 Vdc	
Sensitivity	<1.0E-9 for ±5% voltage change	
• Steady-state power consumption:	<3 W	
• Warm-up power consumption:	4 to 12 W	
• Electronic Frequency Control (EFC) Range	±5.0E-7 minimum	
EFC Input	Analog (0 to 5 Vdc)	
EFC Linearity	5% typical	
• Load change sensitivity:	±1.0E-9 for ±5% load change	

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

• Operating Temperature:	-40° C to +70° C
• Storage temperature:	-55° C to +100° C
• Operating Humidity:	95% RH up to 65° C
• Operating Altitude:	0 to 65,000 feet
• Random vibration Operating (endurance):	35 G RMS
• Shock:	20 g for 11 ms half-sine impulse
• EMI/EMC Performance:	Contact Factory
• MTBF	100,000 hours (ground fixed); 45,000 hours (ground mobile)
• Reliability specification:	MIL-HDBK-217F
• Weight:	0.12 kg

9210B OUTLINE DRAWING



9210B CONNECTION DESCRIPTIONS

PIN NO.	FUNCTION
1	EFC TUNING INPUT (0 TO +5 VDC)
2	REFERENCE VOLTAGE OUT (+8.5 TO +9 VDC)
3	RF OUTPUT
4	GND
5	SUPPLY (+12 TO +15 VDC)
6	GND
7	NC
8	NC

9250

Low-Profile Military OCXO

KEY FEATURES

- 10 MHz Output
- <3.0E-10 Per Day Aging
- ≤2.0E-9 per g Acceleration Sensitivity
- Low Phase Noise
- <0.9 Inches High

OPTIONAL FEATURES

Available options for this product include:

- Analog or IC EFC input
- Low acceleration sensitivity of 3.0E-10 per g

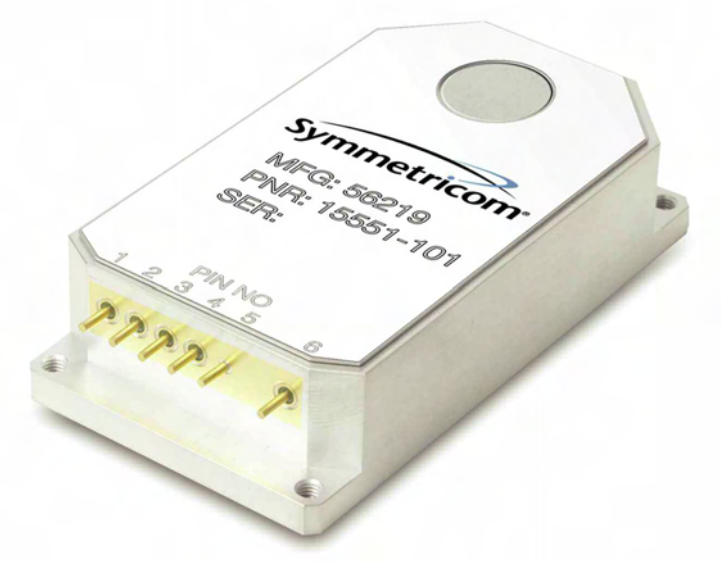
Contact Symmetricom to configure a 9250 oscillator that will meet your specific needs.

As the military moves toward implementing more advanced communications, navigation, and targeting systems, precision oscillators that can withstand a wide range of operating environments are becoming more critical.

The Symmetricom 9250 is a military OCXO designed for ground tactical and airborne applications where superior phase noise and frequency stability are required. Phase noise performance is critical in many radar applications, and precise frequency accuracy and stability are critical for secure communication and navigation applications.

The 9250 is based around an ovenized 10 MHz, 3rd-overtone SC-cut crystal resonator enclosed in a hermetically sealed 1.50" x 2.76" x 0.9" package. All inputs and outputs are accessible via feed-through pins on the side of the chassis. The small, low profile package allows for easy integration into complex subsystems where space is at a premium.

Symmetricom has achieved this low-profile package without sacrificing performance. The 9250 achieves -100 dBc phase noise at 1 Hz offset from the 10 MHz carrier. Its low-g acceleration sensitivity also means it will maintain low phase noise under challenging dynamic applications.



9250 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

• Standard Output Frequency	10 MHz
• Initial Accuracy	'±5.0E-8
• Format	Sine wave
• Amplitude	7.0 dBm ±1 dB
• Harmonic distortion	<-30 dBc
• Non-harmonic distortion	<-80 dBc
• Load impedance	50 Ω
• VSWR	1.5:1

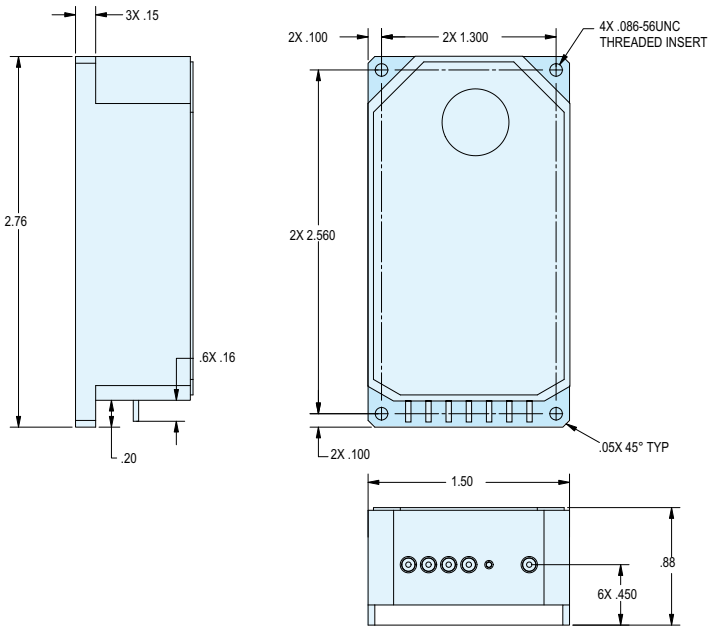
PERFORMANCE PARAMETERS

• Short-term stability	
1 second (Allan deviation):	<1.0E-11
10 second (Allan deviation):	<1.0E-11
• SSB phase noise (static)	
1 Hz	-100 dBc
10 Hz	-125 dBc
100 Hz	-140 dBc
1 kHz	-150 dBc
10 kHz	-155 dBc
100 kHz	-155 dBc
• Aging	
Per day:	<3.0E-10
Per year:	<4.0E-8
10 years:	<1.0E-6
• Frequency Retrace (after up to 24 hrs. off and 1 hour on at 25° C):	±1.0E-8
• Acceleration sensitivity	
Per g, total gamma:	2.0E-9
Low g option, total gamma	3.0E-10
• Frequency change vs. Temperature	
• -30° C to +70° C:	±4.0E-8
• Warm-up time from +25° C:	5 minutes to within 2.0E-8 of final frequency
• Input Voltage	
Range	12 to 15 Vdc
Sensitivity	<1.0E-9 for ±5% voltage change
• Steady-state power consumption:	<3 W
• Warm-up power consumption:	4 to 12 W
• Electronic Frequency Control (EFC) Range	±5.0E-7
EFC Input	Analog (0 to 5 Vdc) or IC
EFC Linearity	10% typical
• Load change sensitivity:	±1.0E-9 for ±5% load change

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

• Operating Temperature:	-40° C to +70° C
• Storage Temperature:	-55° C to +100° C
• Operating Humidity:	95% RH up to 50° C
• Operating Altitude:	0 to 65,000 feet
• Random vibration	
Operating (endurance):	35 g rms
• Shock:	20 g for 11 ms half-sine impulse
• EMI/EMC Performance:	Contact Factory
• MTBF	100,000 hours (ground fixed) 45,000 hours (ground mobile)
• Reliability specification:	MIL-HDBK-217F
• Weight:	0.09 kg

9250 OUTLINE DRAWING



9250 CONNECTION DESCRIPTIONS

PIN NO.	FUNCTION
1	EFC TUNING VOLTAGE INPUT
2	+ 12VDC to +15VDC
3	SCL
4	SDA
5	CHASSIS GND
6	10 MHZ SINE RF OUTPUT

9633

Ultra-miniature Military OCXO with Vibration Compensation

KEY FEATURES

- 10 MHz Output
- Electronic and Mechanical Vibration Compensation
- < 3.0E-10 Per Day Aging
- < 2.0E-11 Per g Acceleration Sensitivity
- Low Phase Noise
- Temperature Range: -40°C to +70°C

OPTIONAL FEATURES

Available options for this product include:

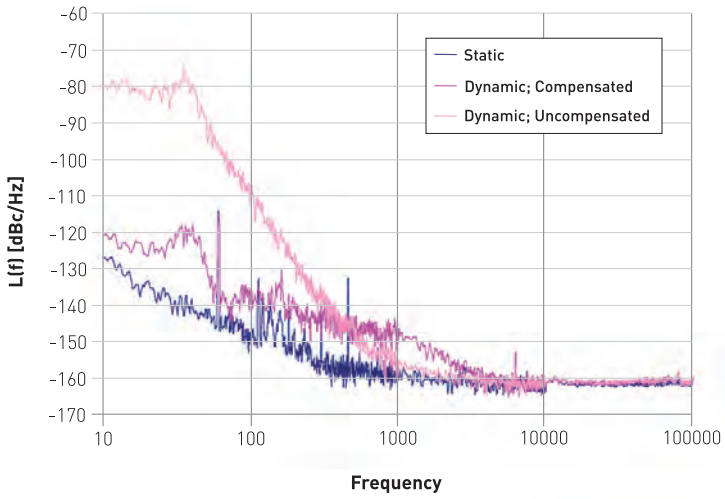
- Analog or IC EFC input

Contact Symmetricom to configure a 9633 oscillator that will meet your specific needs.

As the military moves toward implementing more advanced communications, navigation and targeting systems, precision oscillators that can withstand a wide range of operating environments are becoming more critical.

The Symmetricom 9633 is a military OCXO designed for ground tactical and airborne applications where superior frequency stability and phase noise in high-vibration environments are required. Both electronic and mechanical compensation techniques are utilized to provide up to 40dB of compensation when operating under vibration. Total gamma acceleration sensitivity of < 2.0E-11 per g can be achieved. The 9633 thus provides not only superior dynamic phase noise, but also frequency accuracy, and stability needed for today's radar, secure communications, and navigation applications.

The 9633 is based on an ovenized 10 MHz 3rd overtone SC-cut crystal resonator, enclosed in a hermetically sealed 1.60" x 3.00" x 1.58" H package.



Dynamic Phase Noise (typical performance)

9633 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

• Standard Output Frequency	10 MHz
• Initial Accuracy	±5.0E-8
• Format	Sine wave
• Amplitude	7.0 dBm ±1 dB
• Harmonic distortion	<-35 dBc
• Non-harmonic distortion	<-80 dBc
• Load impedance	50 Ω
• VSWR	1.5:1

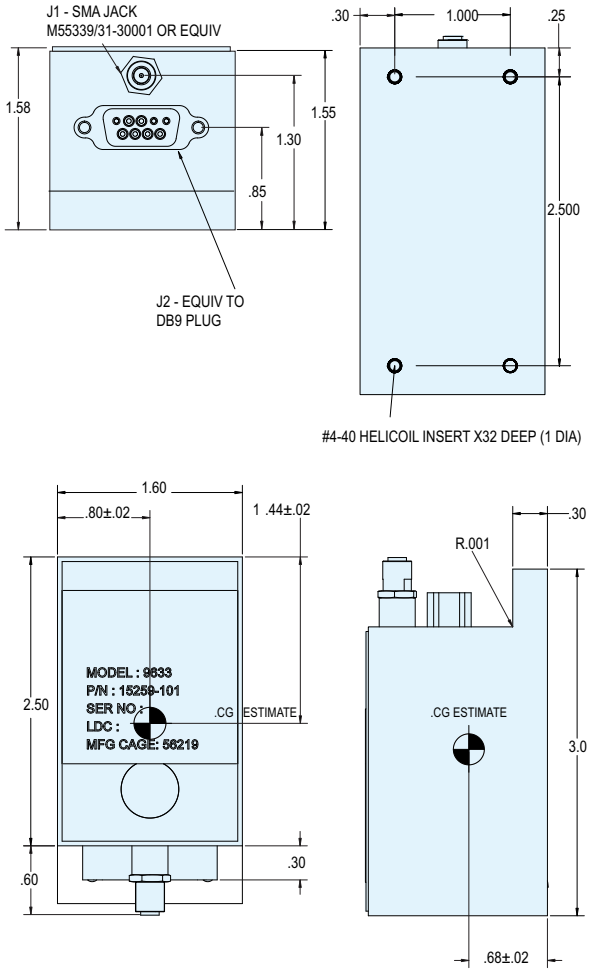
PERFORMANCE PARAMETERS

• Short-term stability	
1 second (Allan deviation):	<5.0E-12
10 second (Allan deviation):	<5.0E-12
100 second (Allan deviation):	<1.0E-11
• SSB phase noise (static)	
1 Hz	N/A
10 Hz	-120 dBc
100 Hz	-140 dBc
1 kHz	-150 dBc
10 kHz	-155 dBc
100 kHz	-155 dBc
• Aging	
Per day:	<3.0E-10
Per year:	<4.0E-8
10 years:	<1.0E-6
• Frequency Retrace (after up to 24 hrs. off and 1 hour on at 25° C):	±1.0E-8
• Acceleration sensitivity	
Per g, total gamma:	≤2.0E-11
• Frequency change vs. Temperature	
-30° C to +70° C:	±1.0E-8
Warm-up time from +25° C:	≤5 minutes to within 2.0E-8 of final frequency
• Input Voltage	
Range:	12 to 15 Vdc
Sensitivity:	<5.0E-10 for ±5% voltage change
• Steady-state power consumption:	<3 W
• Warm-up power consumption:	4 to 12 W
• Electronic Frequency Control (EFC)	
Range	±5.0E-7 minimum
EFC Input	Analog or I²C
EFC Linearity	10% typical
• Load change sensitivity:	±1.0E-9 for ±5% load change

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

• Operating Temperature:	-40° C to +70° C
• Storage temperature:	-55° C to +100° C
• Operating Humidity:	95% RH up to 65° C
• Operating Altitude:	0 to 65,000 feet
• Random vibration	
Operating (endurance):	35 g rms
• Shock:	20 g for 11 ms half-sine impulse
• EMI/EMC Performance:	Contact Factory
• MTBF	100,000 hours (ground fixed) 45,000 hours (ground mobile)
• Reliability specification:	MIL-HDBK-217F
• Weight:	0.16 kg

9633 OUTLINE DRAWING



CONNECTION DESCRIPTIONS

PIN NO.	FUNCTION
J1-1	RF OUT
J2-1	CHASSIS GROUND
J2-2	SCL I^2C - CLOCK
J2-3	SDA I ^2C - DATA
J2-4	CHASSIS GROUND
J2-5	CHASSIS GROUND
J2-6	DO NOT CONNECT
J2-7	DO NOT CONNECT
J2-8	PWR
J2-9	PWR

9638B

Low-Profile Ultra-miniature Military OCXO with Vibration Compensation

KEY FEATURES

- 10 MHz Output
- Electronic Vibration Compensation
- < 3.0E-10 Per Day Aging
- < 2.0E-11 Per g Acceleration Sensitivity
- Low Phase Noise
- Temperature Range: -40°C to +70°C

OPTIONAL FEATURES

Available options for this product include:

- Analog or IC EFC input

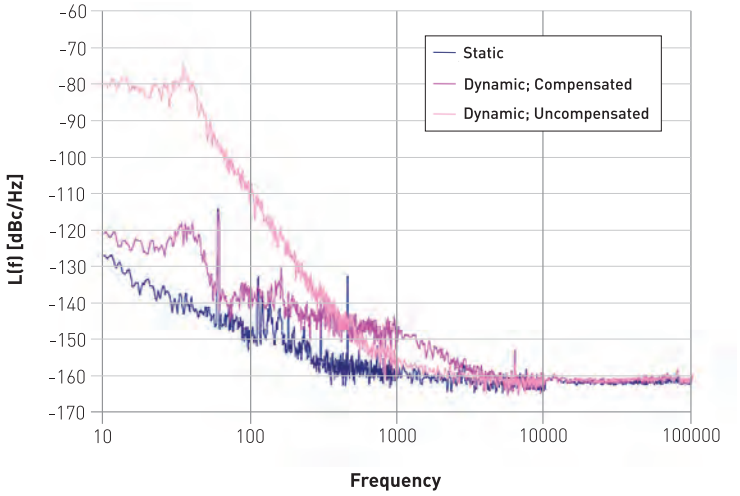
Contact Symmetricom to configure a 9638B oscillator that will meet your specific needs.

As the military moves toward implementing more advanced communications, navigation and targeting systems, precision oscillators that can withstand a wide range of operating environments are becoming more critical.

Like Symmetricom's 9633, the 9638B is a military OCXO designed for ground tactical and airborne applications where superior frequency stability and phase noise in high-vibration environments are required. But while the 9633 utilizes both electronic and mechanical compensation techniques to counter the effects of vibration, the 9638B uses only electronic compensation. The benefit is reduced package height — 1.01" for the 9638B vs. 1.58" for the 9633.

The 9638B thus provides a very small package that delivers superior dynamic phase noise, frequency accuracy, and stability for today's radar, secure communications, and navigation applications.

The 9638B is based on an ovenized 10 MHz 3rd overtone SC-cut crystal resonator, enclosed in a hermetically sealed package.



Dynamic Phase Noise (typical performance)

9638B SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Standard Output Frequency: 10 MHz
- Initial Accuracy: ±5.0E-8
- Format: Sine wave
- Amplitude: 7.0 dBm ±1 dB
- Harmonic distortion: <-35 dBc
- Non-harmonic distortion: <-80 dBc
- Load impedance: 50 Ω
- VSWR: 1.5:1

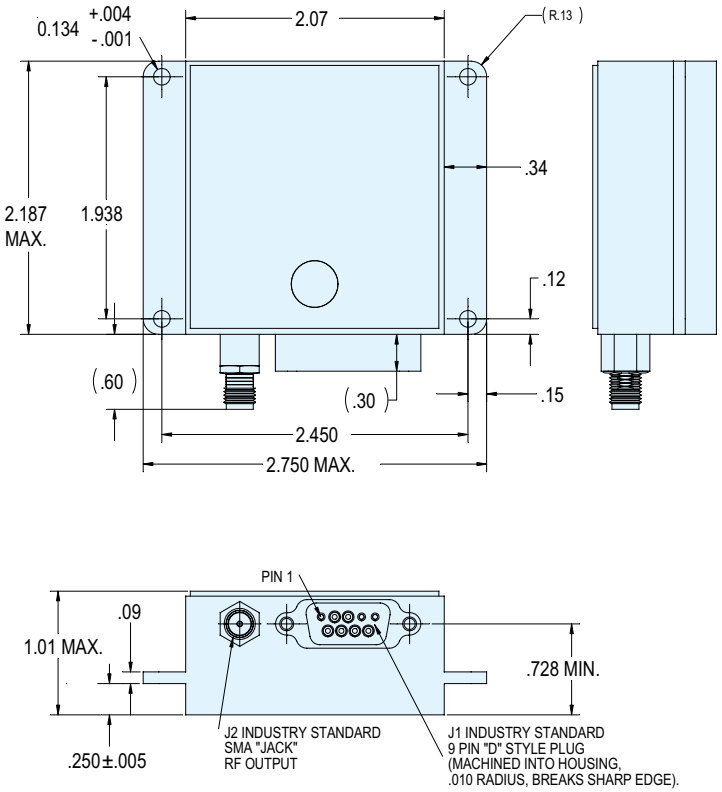
PERFORMANCE PARAMETERS

- Short-term stability
  - 1 second (Allan deviation): <5.0E-12
  - 10 second (Allan deviation): <5.0E-12
  - 100 second (Allan deviation): <1.0E-11
- SSB phase noise (static)
  - 1 Hz: N/A
  - 10 Hz: -120 dBc
  - 100 Hz: -140 dBc
  - 1 kHz: -150 dBc
  - 10 kHz: -155 dBc
  - 100 kHz: -155 dBc
- Aging
  - Per day: <3.0E-10
  - Per year: <4.0E-8
  - 10 years: <1.0E-6
- Frequency Retrace (after up to 24 hrs. off and 1 hour on at 25° C): ±1.0E-8
- Acceleration sensitivity
  - Per g, total gamma: 2.0E-11
- Frequency change vs. Temperature
  - -30° C to +70° C: ±1.0E-8
  - Warm-up time from +25° C: 5 minutes to within 2.0E-8 of final frequency
- Input Voltage
  - Range: 12 to 15 Vdc
  - Sensitivity: <5.0E-10 for ±5% voltage change
- Steady-state power consumption: <3 W
- Warm-up power consumption: 4 to 12 W
- Electronic Frequency Control (EFC)
  - Range: ±5.0E-7 minimum
  - EFC Input: Analog or I²C
  - EFC Linearity: 10% typical
- Load change sensitivity: ±1.0E-9 for ±5% load change

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

- Operating Temperature: -40° C to +70° C
- Storage temperature: -55° C to +100° C
- Operating Humidity: 95% RH up to 65° C
- Operating Altitude: 0 to 65,000 feet
- Random vibration
  - Operating (endurance): 35 g rms
- Shock: 20 g for 11 ms half-sine impulse
- EMI/EMC Performance: Contact Factory
- MTBF: 100,000 hours (ground fixed)
45,000 hours (ground mobile)
- Reliability specification: MIL-HDBK-217F
- Weight: 0.16 kg

9638B OUTLINE DRAWING



9638B CONNECTION DESCRIPTIONS

PIN NO.	FUNCTION
J2-1	10 MHz RF OUTPUT
J1-1	CHASSIS GND
J1-2	SCL I²C - CLOCK
J1-3	SDA I²C - DATA
J1-4	CHASSIS GND
J1-5	CHASSIS GND
J1-6	DO NOT CONNECT
J1-7	DO NOT CONNECT
J1-8	PWR
J1-9	PWR

9920 & 9940

Hybrid Space-Qualified XO and VCXO

KEY FEATURES

- Choose between 9920 series XO or 9940 series VCXO.
- 10 MHz to 1.2 GHz Output Frequency
- MIL-PRF-38534C Class H or K Certified
- Sine Wave or PECL Outputs
- Low Aging and Phase Noise
- Radiation Hardened
- Environmentally Robust

OPTIONAL FEATURES

Available options for these products include:

- Output frequency
- Output format (Sine wave or PECL) and corresponding package style
- Supply Voltage (PECL output units)
- Mil-PRF-38534C Class H or K certification

Contact Symmetricom to configure a 9920- or 9940-series oscillator that will meet your specific needs.

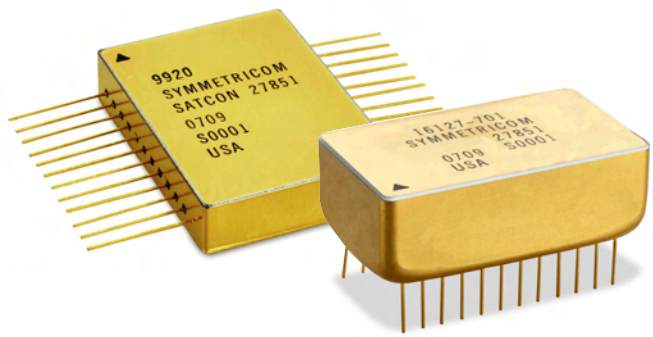
Symmetricom has a 35-year legacy of high-reliability and high-performance quartz oscillators, and these oscillators are now available in hybrid construction for applications that require minimal size, weight and power. Choose between the model 9920 Series crystal oscillator (XO) or 9940 Series voltage-controlled crystal oscillator (VCXO).

Both the 9920 and 9940 series utilize 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.

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-38534C class K facility, in a class 100,000 clean room that provides for maximum reliability.

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

The 9920 and 9940 series have demonstrated excellent performance after exposure to high levels of shock, vibration, and radiation, consistent with the rigorous requirements of space applications.



9920 & 9940 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

	9920	9940	9922	9942
• Standard Output Frequency	50 MHz	150 MHz	600 MHz	400 MHz
• Available Output Frequency	10 MHz to 500 MHz	10 MHz to 250 MHz	10 MHz to 1.2 GHz	10 MHz to 600 MHz
• Initial Accuracy	±10 ppm	Settable to ±1 ppm	±10 ppm	Settable to ±1 ppm
• Format	Sine wave	Sine wave	PECL	PECL
• Amplitude	7.0 dBm	7.0 dBm	N/A	N/A
• Harmonic distortion	<-20 dBc	<-20 dBc	N/A	N/A
• Subharmonic distortion	<-20 dBc	<-20 dBc	N/A	N/A
• Non-harmonic distortion	<-65 dBc	<-65 dBc	<-65 dBc	<-65 dBc
• Load impedance	50 Ω	50 Ω	50 Ω	50 Ω
• VSWR	2.0:1	2.0:1	2.0:1	2.0:1

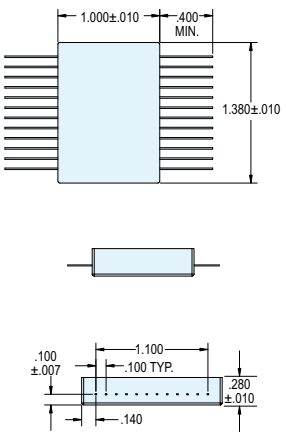
PERFORMANCE PARAMETERS

• SSB phase noise (static)				
10 Hz	-80 dBc	-56 dBc	-68 dBc	-50 dBc
100 Hz	-110 dBc	-90 dBc	-100 dBc	-80 dBc
1 kHz	-140 dBc	-128 dBc	-118 dBc	-110 dBc
10 kHz	-155 dBc	-138 dBc	-128 dBc	-130 dBc
100 kHz	-155 dBc	-142 dBc	-132 dBc	-138 dBc
• Aging				
Per year:	1 ppm	2 ppm	1 ppm	2 ppm
10 years:	5 ppm	15 ppm	8 ppm	15 ppm
• Acceleration sensitivityPer g, total gamma:	3.0E-9	3.0E-9	v3.0E-9	3.0E-9
• Frequency change vs. Temperature				
-40° C to +85° C:	±30 ppm	±40 ppm	±30 ppm	±30 ppm
-20° C to +70° C:	±20 ppm	±30 ppm	±20 ppm	±20 ppm
0° C to +50° C:	±5 ppm	±15 ppm	±10 ppm	±10 ppm
• Input Voltage				
Range:	8 - 15 Vdc	8 - 15 Vdc	+5 Vdc or +3.3 Vdc	+5 Vdc or +3.3 Vdc
Sensitivity:	<1 ppm for ±5% voltage change	<2.5 ppm for ±5% voltage change	<1 ppm for ±5% voltage change	<1 ppm for ±5% voltage change
• Steady-state power consumption:	220 mW	220 mW	375 mW	375 mW
• Electronic Frequency Control (EFC) Range	N/A	±50 ppm	N/A	±50 ppm
EFC Input	N/A	0.5 to 4.5 Vdc	N/A	0.5 to 4.5 Vdc (5V PECL); 0.3 to 3.3 Vdc (3.3V PECL)
EFC Linearity	±20%	±20%	±20%	±20%
• Load change sensitivity:	<0.1 ppm for ±5% load change	<0.1 ppm for ±5% load change	<0.1 ppm for ±5% load change	<0.1 ppm for ±5% load change

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

• Operating Temperature:	-55° C to +125° C	-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	-65° C to +125° C
• Random vibration operating (endurance):	20 g rms	20 g rms	20 g rms	20 g rms
• Pyrotechnic shock:	500 g for 6 ms half-sine impulse	500 g for 6 ms half-sine impulse	500 g for 6 ms half-sine impulse	500 g for 6 ms half-sine impulse
• Radiation Performance:				
Total Dose:	100 kRad (Si)	100 kRad (Si)	100 kRad (Si)	100 kRad (Si)
ELDRS:	Compliant	Compliant	Compliant	Compliant
SEL:	Compliant	Compliant	Contact Factory	Contact Factory
Neutron Fluence:	Contact Factory	Contact Factory	Contact Factory	Contact Factory
Prompt Dose Rate:	Contact Factory	Contact Factory	Contact Factory	Contact Factory
• EMI/EMC Performance:	Contact Factory	Contact Factory	Contact Factory	Contact Factory
• MTBF	>20,000,000 hours	>20,000,000 hours	>20,000,000 hours	>20,000,000 hours
• Reliability specification:	MIL-HDBK-217F	MIL-HDBK-217F	MIL-HDBK-217F	MIL-HDBK-217F
• Crystal:	T05	Surface mount	Surface mount	Surface mount
• Package Style:	24-pin ddip, 0.5" profile	24-pin ddip, 0.5" profile	24-pin flatpak, 0.3" profile	24-pin flatpak, 0.3" profile
• Weight:	<30 grams	<30 grams	<30 grams	<30 grams

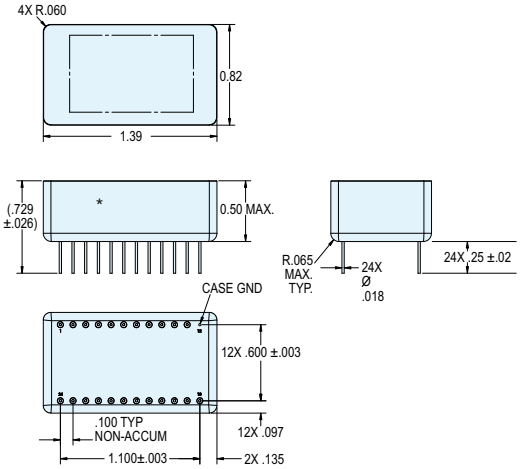
24-PIN FLATPAK OUTLINE DRAWING



24-PIN FLATPAK CONNECTION DESCRIPTIONS

PIN NO.	FUNCTION
1	VCXO OUTPUT
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	GROUND
13	Q
14	Q
15	GROUND
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	+5VDC(OR3.3VDC)

24-PIN DDIP OUTLINE DRAWING



24-PIN DDIP 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	8-15 VDC INPUT

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 ±1ppm
- 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.

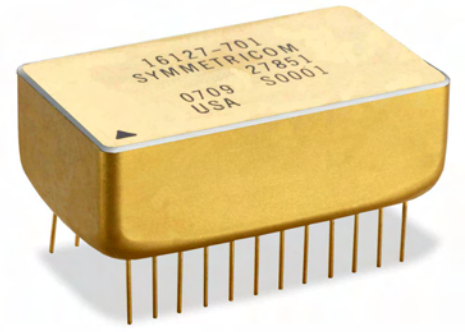
Symmetricom has a 35-year legacy of high-reliability and high-performance quartz oscillators, and these oscillators are now available in hybrid construction for applications that require minimal size, weight and power. The model 9960 is a temperature compensated crystal oscillator (TCXO) capable of fixed 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 ±0.1 ppm via external voltage or resistor	Settable to ±0.1 ppm via external voltage or resistor	Settable to ±0.1 ppm via external voltage or resistor
• Format	Sine wave	Sine wave	Sine wave
• Amplitude	≥7.0 dBm	≥7.0 dBm	≥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 Ω	50 Ω	50 Ω
• Load VSWR	2.0:1	2.0:1	2.0:1

PERFORMANCE PARAMETERS

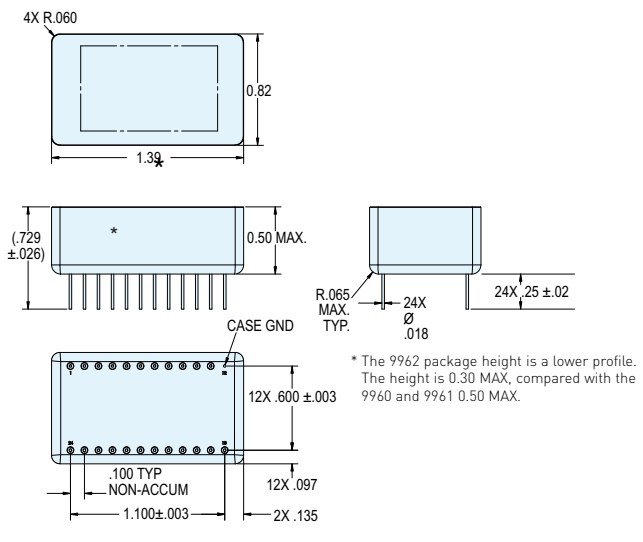
• SSB phase noise (static)			
1 Hz	-78 dBc	-45 dBc	-42 dBc
10 Hz	-108 dBc	-75 dBc	-74 dBc
100 Hz	-125 dBc	-105 dBc	-105 dBc
1 kHz	-142 dBc	-135 dBc	-135 dBc
10 kHz	-150 dBc	-150 dBc	-150 dBc
100 kHz	-150 dBc	-150 dBc	-150 dBc
• Aging			
Per year:	≤0.5 ppm	≤1 ppm	≤1 ppm
10 years:	≤3 ppm	≤5 ppm	≤8 ppm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

PIN NO.	FUNCTION
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