REV LTR	DESCRIPTION	DATE	APPVD.
-	Orig. Release	4/12/22	MLG
A	Minor editorial changes	6/14/22	SPG
B	Increased Frequency to 200 MHz, Switched Pin number for Output & Comp. Output on Page 6. Added PDA for Frequency Aging.	7/05/22	MLG
C	Formatting changes to all paragraphs and screening tables. Updated Para. 1. and 4.1.	2/05/24	MLG

XSIS XD8K SERIES

LVDS OSCILLATORS

FOR SPACE APPLICATIONS

75 MHz to 200 MHz

(5 x 7 mm, SMD, 2.5V & 3.3V)

(Refer to Page 5 for Reduced QCI Models XD8E, XD8B & XD8P)

REV STATUS	REV																
OF SHEETS	SHEET NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

APPROVALS	DATE
PREP. S. Gupta	4/12/22
ENG. M. Gupta	4/12/22
Q. A. M. Gupta	4/12/22
CUST. ENG.	
CUST Q A.	

XSIS ELECTRONICS, INC.

12620 W. 63rd Street, Shawnee, KS 66216 USA

XD8K SERIES LVDS OSCILLATORS

FSC NO.	DWG. NO.
57051	XD8K

SCALE	SHEET
N/A	1 OF 11

1. SCOPE:

XD8K, LVDS series, high reliability hybrid microcircuit crystal oscillators are designed, produced and tested by Xsis Electronics, Inc. as MIL-PRF-38534 (modified), Class K equivalent devices, as described herein, for use in high reliability industrial, military, avionics and space applications. These devices are of hybrid microcircuit technology conforming to MIL-PRF-55310, Type 1, Class 2 oscillators.

1.1 ALTERNATE MODELS: Models XD8E, XD8B and XD8P with reduced QCI and/or reduced screening and shorter lead times are also offered as explained on page 5.

2. APPLICABLE DOCUMENTS:

MIL-PRF-55310F	Oscillator, Crystal Controlled, General Specifications for
MIL-PRF-38534K	Hybrid Microcircuits, General Specifications for
MIL-STD-883L	Test Methods and Procedures for Microelectronics

3. REQUIREMENTS:

3.1 General: The individual item requirements shall be as specified herein.

3.2 Package: Ceramic, 90% Min. Al_2O_3. Weight 0.4 g Max., Thermal Resistance, θ_{JC}: 40 °C / Watt.

3.2.1 Termination Finish: 1.27 μm minimum gold plate over 2.0 μm minimum nickel plate. Hot Solder tinning with Sn63/Pb37 solder per MIL-PRF-55310 is optional at an additional cost.

3.2.2 Reflow Soldering: Reflow soldering at 260 °C for 10 seconds shall not degrade the performance.

3.3 Hermeticity: Resistance welded, hermetically sealed, leak rate of $1 \times (10)^{-8}$ atm-cc/s Max.

3.4 Marking: As a minimum, the parts shall be marked with Xsis P/N, ESD symbol, date code and serial number.

3.5 Absolute Maximum Ratings: Unless otherwise specified, absolute maximum ratings shall be as follows:

Supply Voltage	-0.5 to +4.5 VDC
Operating Free-Air Temperature Range	-55°C to +125°C
Storage Temperature	-55°C to +125°C

3.6 Electrical Characteristics: See Table I

3.6.1 Total Dose Radiation: Hybrid Microcircuit Crystal Oscillators shall be capable of meeting the electrical characteristics of Para. 3.6 after being exposed to total ionizing dose radiation of 100 krads as per MIL-STD-883, method 1019.

3.7 Hybrid Elements:

3.7.1 Quartz Crystals: A high grade cultured quartz crystal shall be used. As an option, Xsis will use a premium Q swept quartz crystal at an additional charge, refer to part numbering example in paragraph 6 to specify swept quartz crystal. Crystal element evaluation shall be in accordance with MIL-PRF-55310.

3.7.2 Crystal Mounting: The crystal element shall be mounted at 4 points in such a manner as to provide adequate ruggedness and performance under extreme environments specified herein.

3.7.3 Passive Elements: Established Reliability (ER) QPL components, failure level R minimum shall be used or element lot evaluation shall be as per MIL-PRF-55310, class S, or MIL-PRF-38534, Appendix C, Class K as applicable.

3.7.4 The microcircuit die shall be from lots that have passed the element evaluation per MIL-PRF-38534, Level K. In addition, ionizing radiation testing shall be performed at the oscillator level as explained in paragraph 3.7.5 herein.

3.7.5 The Microcircuit die shall be from wafer lots that have been successfully tested in the oscillator for ionizing radiation up to 100 krads. Xsis Electronics has also performed SET & SEL testing on the microcircuit die. The die is SEL immune for LET of up to 95 Mev-cm^2/mg. Test reports are available on request.

3.7.6 Workmanship, Rework and Process controls shall be in accordance with the requirements of MIL-PRF-55310 and MIL-PRF-38534 as applicable.

3.7.7 Lot Traceability: The production lot for these oscillators shall be homogenous. Each element used in the production lot shall be traceable to a single lot. Swept quartz shall be traceable to the quartz bar, and its applicable processing details.

3.7.8 Prohibited Materials: The following items shall not be used in these oscillators: Pure Tin (Sn >97%), Cadmium, Zinc, Mercury, Selenium, Silver as under plate. Gold Plating without a nickel barrier.

3.7.9 Element Derating: All active and passive elements shall be derated in accordance with the applicable Hybrid microcircuit requirements of MIL-STD-975. Elements shall not operate in access of derated values.

3.7.10 Material Outgassing: All materials shall meet a TML of 1% Max. and a CVCM of 0.1% Max., when tested in accordance with ASTM E595.

4. QUALITY ASSURANCE PROVISIONS: The quality assurance provisions shall be as specified herein.

4.1 100% Screening: Screening shall be performed as per Table II. PDA requirements for nondestructive bond pull, burn-in and frequency aging shall be as specified below.

4.2 PDA for Nondestruct Bond Pull: Unless otherwise specified, PDA shall be 2% of total number of wires or one wire whichever is greater.

4.3 PDA for Burn-in: Unless otherwise specified, PDA for burn-in #2 shall be 2% or 1 oscillator whichever is greater and shall be applicable to +23 ^{o}C and/or +25 ^{o}C static tests only. In addition Delta Calculation shall be performed after Burn-in and shall count for PDA. All measured values for Delta Calculation shall be recorded. Parts that exceed the specified delta limits shall be rejected and be counted for PDA. Delta Calculation shall be performed at 2.5 VDC or 3.3 VDC as applicable for the following parameters:

Input Current	10% change Maximum
Output High Level	10% change Maximum
Output Low Level	0.1V change Maximum

4.4 PDA for Frequency Aging: 5% or 1 oscillator whichever is greater. Delta limit for frequency aging shall be as specified in Table I.

4.5 Group A inspection shall be performed as per Table III.

4.6 Group B inspection shall be performed as per Table IV.

4.7 If required by the purchase order, Group C inspection shall be performed as per Table V.

NOTE: Frequency accuracy limit after life test shall be increased by 10 PPM to allow for Accelerated frequency aging at +125^{o}C.

4.8 Group D inspection per Table VI is omitted because it is performed as a part of receiving inspection of packages.

4.9 Inspection and Test Data: Unless otherwise specified in the purchase order, the following Inspection and test data documentation shall be supplied with the parts.

(See Page 5 for the description of the Model Numbers XD8E, XD8B, & XD8P)

Model XD8K:

Certificate of Conformance
Summary of Screening Test Results per Table II
PDA Calculations for Non-Destruct Bond Pull and Burn-in
Summary of Elements Lot Traceability
Electrical Tests before and after Burn-in
Group A Inspection Summary
Group B Inspection Data
Group C Inspection Data, if required by the purchase order
Group D Inspection Data
Radiographic Inspection Certificate

Model XD8E:

Certificate of Conformance
Summary of Screening Test Results per Table VII
Summary of Elements Lot Traceability
Group A Inspection Summary
Radiographic Inspection Certificate

Model XD8B:

Certificate of Conformance
Summary of Screening Test Results per Table VII
Group A Inspection Summary
Radiographic Inspection Certificate, if required by the Purchase Order

Model XD8P:

Certificate of Conformance

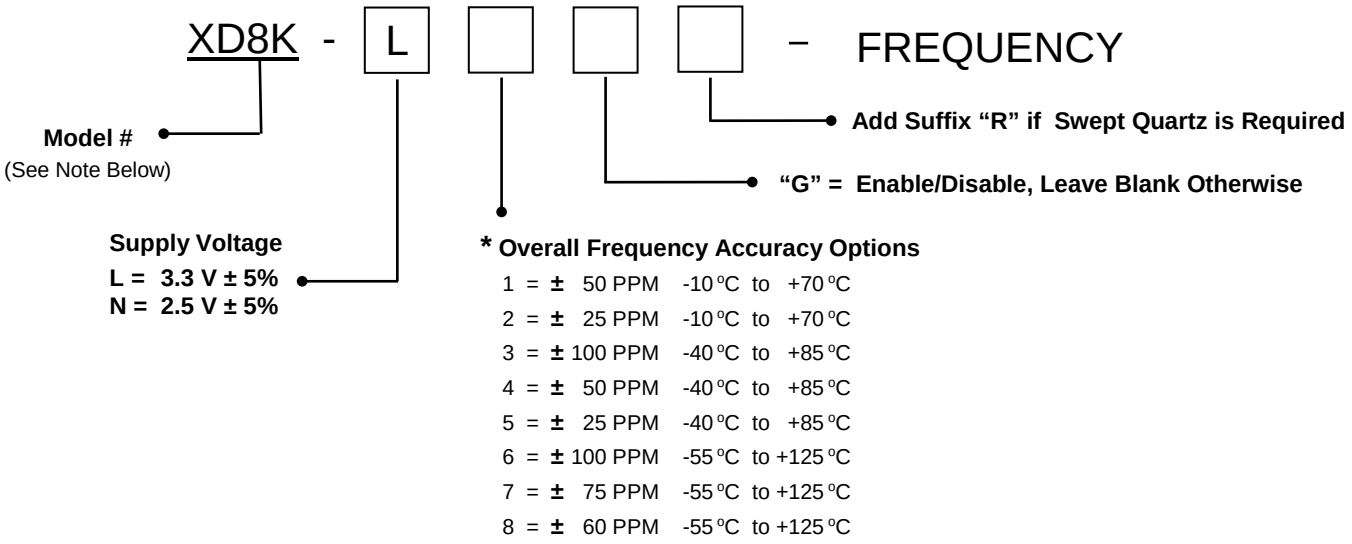
4.10 The following test and inspection options are available at customer request:

Customer Source Inspection for Pre-Cap and Final
DPA (Destructive Physical Analysis)
Group C testing per Table V

5. PRESERVATION, PACKAGING AND PACKING:

The oscillators shall be clean, dry and packaged in a manner to provide adequate protection against electrostatic discharge, corrosion, deterioration and physical damage during shipment.

6. PART NUMBERING EXAMPLE:



* Overall Frequency Accuracy includes effects of Operating Temperature, Supply Voltage, Load variations and 5 year aging

P/N Example: XD8K- L8 -100.000 MHz = 100.000 MHz, 3.3V Oscillator, ± 60 PPM Overall Frequency Accuracy over operating temperature range of -55 °C to +125 °C,

NOTE: Besides model **XD8K** above, the following additional models are available for applications that can accommodate reduced level of Elements, Screening and Quality Conformance inspection:

XD8E: **Model XD8E** uses the same design and elements as **Model XD8K** except as follows:

- 100% screening is as per Table VII herein
- PDA for Burn-in is 10% or 1 unit whichever is greater
- Delta measurements of paragraph 4.3 are not applicable
- Group A inspection is as per MIL-PRF-55310, Class B
- Group B, Group C & Group D inspections are not applicable

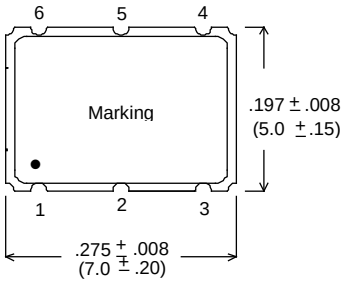
XD8B: **Model XD8B** is same as **Model XD8E** except as follows:

- Active and Passive Elements are as per MIL-PRF-55310, Class B. Microcircuit die is the same as in Model XE7K but is not from a radiation tested wafer lot.
- Radiographic Inspection is not applicable, unless required by the Purchase Order at additional cost.

XD8P: **Model XD8P** is a form, fit and function equivalent prototype of **Model XD8K.**

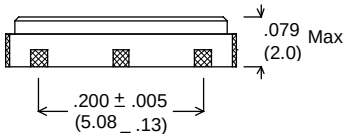
- Prototypes may use commercial grade elements and are not screened.
- Quality Conformance inspection is not applicable.

7. PACKAGE OUTLINE:



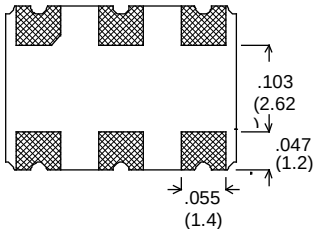
PAD#	FUNCTION
1	Tristate (Optional)
2	N/C
3	GND/CASE
4	COMP. OUTPUT
5	OUTPUT
6	VDD

Tristate Input: A "Low" level at the input disables the Output into a high impedance state. Tristate Input has internal pull-up.



Dimensions are in inches (mm)

An External 0.01uF Bypass Capacitor is required between VDD and GND.



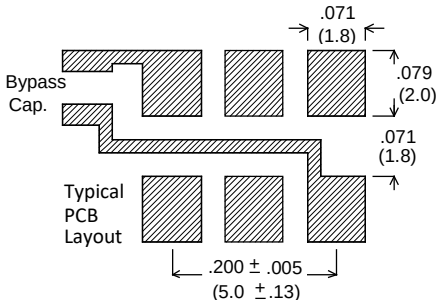


Figure 1 - Package Configuration & Pin Connections

Table I – Electrical Characteristics for 2.5 V & 3.3V

Parameter	Spec. Limits
Frequency Range	75 MHz to 200 MHz
Overall Frequency Accuracy 1/	See Options in Paragraph 6.0
Operating Temperature Range	See Options in Paragraph 6.0
Supply Voltage	See Options in Paragraph 6.0
Input Current (No Load)	65 mA Max.
Output Waveform	Square Wave
Output Duty Cycle	55/45% Max
Output Load	100 ohm across outputs
High Output Level	1.45V typical, 1.60 V Max.
Low Output Level	1.10V typical, 0.90 V Min.
Differential Output Voltage (Peak to Peak)	340 mV typical, 247 mV Min., 454 mV Max.
Offset Voltage	1.25 V typical, 1.125 V Min., 1.375 V Max.
Offset Error	50 mV Max.
Rise & Fall Times (20% to 80% Levels)	600 pS Max. over -55°C to +105°C 700 pS Max. over +105°C to +125°C
Tristate Input	> 0.7 Vdd or Open: Normal Output < 0.3 Vdd: High Impedance
Start-up Time	10 mS Max.
Phase Jitter	0.3 pS rms typ, (10 KHz to 20 MHz Integrated)
Frequency Aging @ 70ºC ≤ 150 MHz > 150 MHz	 ± 1.5 PPM Max./30 days ± 5 PPM Max. first year, ± 2 PPM Max/year thereafter ± 2.0 PPM Max./30 days ± 6 PPM Max. first year, ± 2.5 PPM Max/year thereafter

1/ Frequency Accuracy with reference to nominal frequency includes initial accuracy at 25ºC, ± 5% Supply Voltage and ± 10% load variations and 5 year aging.

Contact Xsis Engineering for any other special requirements.

Table II - Model XD8K, Modified MIL-PRF-38534, Class K Screening (100%)

Test - Inspection	Test Method – Condition
Nondestructive Bond Pull	MIL-STD-883, Method 2023
Internal Visual	MIL-STD-883, Method 2017, Level S
Stabilization Bake (Prior to Seal) 1/	MIL-STD-883, Method 1008, Condition C (+150 °C), 48 hours minimum
Temperature Cycling	MIL-STD-883, Method 1010, Condition C
Constant Acceleration	MIL-STD-883, Method 2001, Condition A Y_1 axis only (5000 G)
Seal (Fine and Gross Leak)	MIL-PRF-55310, Para. 4.8.2.2.2
Particle Impact Noise Detection (PIND)	MIL-STD-883, Method 2020, Condition A
Radiographic Inspection	MIL-STD-883, Method 2012, Class S
Pre Burn-in Electrical Tests: Record as applicable	Refer to Table II-a below
Burn-in #1	Nominal Supply Voltage and Burn-in load, +125 °C, 160 Hours Minimum
Interim Electrical Tests: Record as applicable measurements.	Refer to Table II-a below
Burn-in #2	+125 °C, Nominal Supply Voltage and Burn-in load, 160 Hours Minimum
Post Burn-in Electrical Tests: Record as applicable.	Refer to Table II-a below
Frequency Aging 30 days	Per MIL-PRF-55310
Seal (Fine Leak)	MIL-STD-883, Method 1014, Cond. A1 or B1
Seal (Gross Leak)	MIL-STD-883, Method 1014, Cond. B3
External Visual	MIL-STD-883, Method 2009

1/ Vacuum bake and maintain oscillators in dry nitrogen per MIL-PRF-55310.

Table II-a - Pre, Interim & Post Burn-in Electrical Tests

Test Parameter	MIL-PRF-55310 Method	Pre BI 24 ± 1 °C	Interim BI 24 ± 1 °C	Post BI 24 ± 1 °C	Post BI Low Temp	Post BI High Temp
Input Current	4.8.5	✓	✓	✓	✓	✓
Output Frequency	4.8.6	✓	✓	✓	✓	✓
Frequency Vs. Temperature Stability	4.8.10.1	✓	✓	✓	✓	✓
Frequency Vs. Supply Voltage	4.8.14	✓	✓	✓	✓	✓
Output Voltage Levels	4.8.21.3	✓	✓	✓	✓	✓
Output Rise & Fall Times	4.8.22	✓	✓	✓	✓	✓
Output Duty Cycle	4.8.23	✓	✓	✓	✓	✓
Start-up time	4.8.29	✓	✓	✓	✓	✓
Enable/Disable, if applicable	4.8.28	✓	✓	✓	✓	✓

Table III - Model XD8K, Group A Inspection 1/

Test - Inspection	Test Method – Condition
Input Current Frequency Accuracy Frequency Vs. Supply Voltage Tolerance Output Waveform Output Voltage Levels Output Rise & Fall Times Output Duty Cycle Start-up time Output Enable/Disable Function if Applicable	+24 ± 1 °C, Applicable Method of MIL-PRF-55310
Frequency Vs. Temperature Stability	Measure output frequency at ten equispaced points of the operating temperature range.

1/ Any electrical tests performed as part of final electrical tests in 100% screening need not be repeated.

Table IV - Model XD8K, Group B Inspection 1/

Subgroup	Test - Inspection	MIL-STD-883		Quantity (Accept No.)
		Method	Condition	
1	Physical Dimensions	2016	-	2(0)
2	PIND 2/	2020	A	15(0)
3	Resistance to Solvents 3/	2015	-	3(0)
4	Internal Visual & Mechanical 4/	2014	-	1(0)
5	Bond Strength 5/	2011	C or D	2(0)
6	Die Shear Strength 6/	2019	-	2(0)
7	Solderability	2003	Solder Temp. 245 ± 5 °C	1(0)
8	Seal (Fine & Gross) 7/	1014	A1 or B1 & B3	15(0)

1/ Non-catastrophic screening rejects may be used for Group B testing.
2/ This test is performed during 100% screening.
3/ This test is performed on each lot of marking ink.
4/ Internal Visual inspection is performed at pre-seal on each unit.
5/ This test is performed prior to seal in accordance with Group B bond strength requirements of MIIL-PRF-38534.
6/ This test is performed prior to seal in accordance with Group B die shear strength requirements of MIIL-PRF-38534.
7/ Fine and Gross tests are being performed during 100% screening.

Table V - Model XD8K, Group C Inspection

Subgroup	Test - Inspection	MIL-STD-883		Quantity (Accept No.)
		Method	Condition	
1	External Visual	2009	-	5(0) **1/**
	PIND	2020	A	
	Temperature Cycling	1010	C, 20 cycles	
	Constant Acceleration	2001	5000G, Y_1 Axis	
	Seal (Fine Leak)	1014	A1 or B1	
	Seal (Gross Leak)	1014	B3	
	Visual Examination	1010	-	
	End Point Electricals	-	-	
2	End Point Electricals Steady State Life End Point Electricals **4/**	1005	1000 Hours at +125 °C	5(0) **2/**
3	Internal Gas Analysis	1018	-	3(0) **3/**

1/ Five units are used for Group C inspection in accordance with limited usage requirements of MIL-PRF-38534

2/ Subgroup 1 test samples are not recommended to be used for Subgroup 2 testing

3/ Subgroup 1 test samples shall be used for Subgroup 3 testing.

4/ Frequency accuracy limit shall be increased by 10 PPM to allow for accelerated frequency aging during life test.

Table VI - Model XD8K, Group D Inspection

Subgroup	Test - Inspection	MIL-STD-883		Quantity (Accept No.)
		Method	Condition	
1	Thermal Shock	1011	C	5(0)
	Stabilization Bake	1008	1 hour at 150 °C	5(0)
	Lead Integrity	2004	B2 (lead fatigue)	1(0)
	Seal (Fine & Gross)	1014	A1 or B1 & C	5(0)

Group D inspection is not required when package evaluation has been performed as a part of receiving inspection.

Table VII - Models XD8E & XD8B, Screening (100%)

Test - Inspection	Test Method – Condition
Nondestructive Bond Pull	MIL-STD-883, Method 2023
Internal Visual	MIL-STD-883, Method 2017, Level B
Stabilization Bake (Prior to Seal) **1/**	MIL-STD-883, Method 1008, Condition C (+150 °C), 24 hours minimum
Temperature Cycling	MIL-STD-883, Method 1010, Condition B
Constant Acceleration	MIL-STD-883, Method 2001, Condition A Y_1 axis only (5000 G)
Seal (Fine & Gross)	MIL-PRF-55310, Para. 4.8.2.2.2
Particle Impact Noise Detection (PIND)	MIL-STD-883, Method 2020, Condition A
Radiographic Inspection **(Model XD8E only)** **2/**	MIL-STD-883, Method 2012, Class S
Pre Burn-in Electrical Tests: Verify Measurements	Refer to Table VII-a below
Burn-in	Nominal Supply Voltage and Burn-in load, +125 °C, 160 Hours Minimum
Post Burn-in Electrical Tests: Verify Measurements	Refer to Table VII-a below
External Visual	MIL-STD-883, Method 2009

1/ Vacuum bake and maintain oscillators in dry nitrogen per MIL-PRF-55310.

2/ Radiographic Inspection is applicable to **Model XD8E** only.

Table VII-a – Pre & Post Burn-in Electrical Tests

Test Parameter	MIL-PRF-55310 Method	Pre BI 24 ± 1 °C	Post BI 24 ± 1 °C	Post BI Low Temp	Post BI High Temp
Input Current	4.8.5	✓	✓	✓	✓
Output Frequency at 23 to 25 °C	4.8.6	✓	✓	✓	✓
Frequency Vs. Temperature Stability	4.8.10.1	✓	✓	✓	✓
Frequency Vs. Supply Voltage	4.8.14	✓	✓	✓	✓
Output Voltage Levels	4.8.21.3	✓	✓	✓	✓
Output Rise & Fall Times	4.8.22	✓	✓	✓	✓
Output Duty Cycle	4.8.23	✓	✓	✓	✓
Start-up time	4.8.29	✓	✓	✓	✓
Enable/Disable, if applicable	4.8.28	✓	✓	✓	✓