REV LTR	DESCRIPTION	DATE	APPVD.
-	Orig.	3/15/2022	MLG

XD673N SERIES

(XD673N-Nx, XD673N-Lx)

LVDS OSCILLATORS

FOR SPACE & HI-REL APPLICATIONS

75 MHz to 200 MHz

(7 x 9 mm, Straight Leads, 2.5V, 3.3V & 5.0V)

QCI & SCREENING PER EEE-INST-002

(Refer to Page 5 for Reduced QCI Models XD673E, XD673B & XD673P)

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

APPROVALS	DATE	
PREP. S. Gupta	3/15/22	XSIS ELECTRONICS, INC. 12620 W. 63rd Street, Shawnee, KS 66216 USA
ENG. M. Gupta	3/15/22	XD673N SERIES LVDS OSCILLATORS
Q. A. M. Gupta	3/15/22	FSC NO. 57051 / DWG. NO. XD673N
CUST. ENG.		
CUST Q A.		SCALE N/A / SHEET 1 OF 9

1. SCOPE:

XD673N, LVDS series, high reliability hybrid microcircuit crystal oscillators are designed, produced and tested by Xsis Electronics, Inc. as MIL-PRF-55310, Class “S” equivalent devices for use in advanced industrial, military, avionics and space applications. These devices are of hybrid microcircuit technology conforming to MIL-PRF-55310, Type 1, Class 2 oscillators.

100% Screening and QCI are performed per **EEE-INST-002**.

1.1 ALTERNATE MODELS: Alternate models, XD673E, XD673B and XD673P 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
EEE-INST-002	Instructions for EEE Parts Selection, Screening, Qualification and Derating

3. REQUIREMENTS:

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

3.2 Package: Ceramic, 90% Min. AL_2O_3., Weight: 0.6 Gms Max., Thermal Resistance, θ_{JC}: 28 °C / Watt.

3.2.1 Lead Material & finish: Kovar, 50 to 85 micro-inches gold over 100 to 250 micro-inches nickel. 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 $1(10)^{-8}$ 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: High grade cultured quartz crystal shall be used. As an option, Xsis will use 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: 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 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 Microcircuit die used in the oscillator shall be from wafer lot that has been successfully tested in the oscillator for ionizing radiation of up to100 krads and is known to be Single Event Latch-up immune for LET of up to 95 Mev-cm2/mg.

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

3.7.7 Lot Traceability: 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, and 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: The 100% screening shall be performed in accordance with EEE-INST-002 and as specified in Table II. In addition, MIL-PRF-38534 Group B Option 1 in-line inspection for bond strength and die shear shall be performed at pre-seal inspection. PDA requirements for nondestructive bond pull, burn-in and frequency aging shall be as specified below.

4.2 PDA for Non-destruct Bond Pull: Unless otherwise specified, PDA shall be 2% of total number of wires or 1 wire whichever is greater.

4.3 PDA for Burn-in and Frequency Aging Failures: Unless otherwise specified, PDA for burn-in failures, applicable to +23 °C and/or +25 °C static tests only, and frequency aging failures combined shall be 5% or 1 part whichever is greater. In addition, delta calculations for input current shall be performed after burn-in at the specified nominal supply voltage. All parts that exceed the specified limits below shall be rejected and be counted for PDA.

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Input Current	10% change Maximum
Frequency Aging/30 days	Refer to the specified limit in Table I

4.4 Qualification Inspection: Devices shall be capable of meeting the qualification inspection shown in Table III. When required by the purchase order, qualification inspection shall be performed as per Table III on sample units selected from the units that have successfully passed 100% screening specified herein. Number of sample units shall be as specified in Table III. With customer approval, generic qualification inspection data on similar parts may be used to satisfy this requirement, except for Subgroup 5 which needs to be performed on a lot specific basis unless otherwise specified by the customer.

4.5 DPA: When required by the purchase order, Destructive physical analysis as per GFSC S-311-M-70 shall be performed on a number of sample units as required by the purchase order by a laboratory approved by the customer.

4.6 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 other than XD673N)

Model XD673N:

Certificate of Conformance
Summary of 100% Screening Test Results
PDA Calculations for Non-Destruct Bond Pull, Burn-in and Frequency Aging
Summary of Elements Lot Traceability
Electrical Tests data taken during 100% screening
Radiographic Inspection Certificate
Qualification data if required by the purchase order
DPA report if required by the purchase order
Qualification and DPA test samples as applicable

Model XD673E:

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

Model XD673B:

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

Model XD673P:

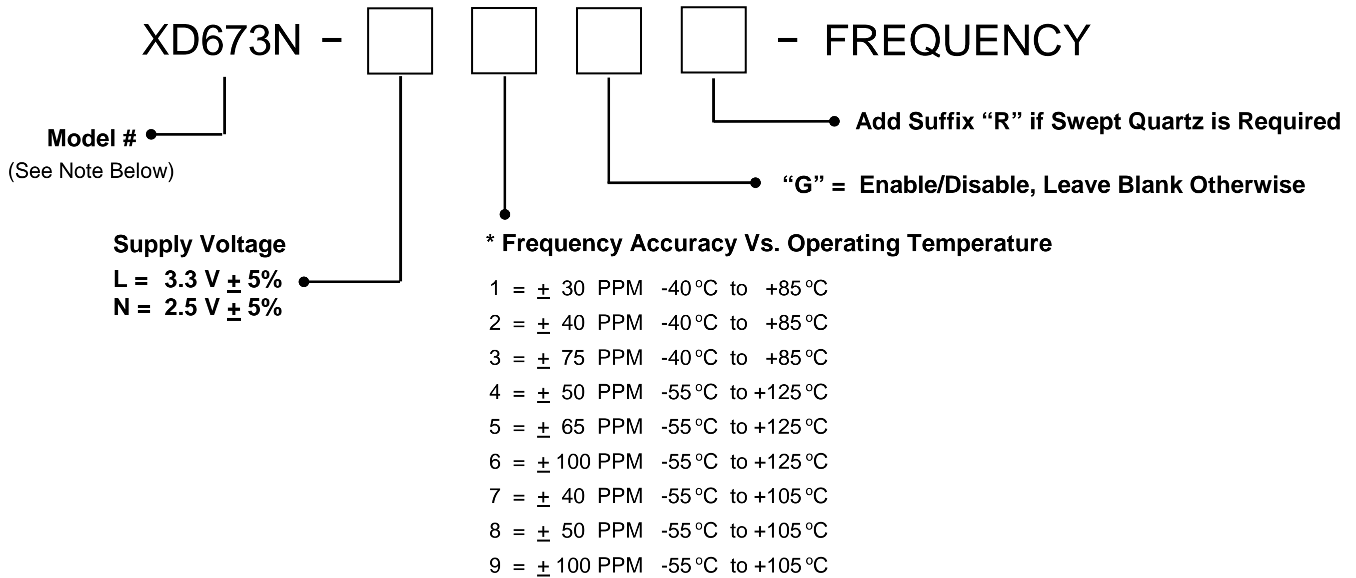
Certificate of Conformance

4.7 The following test and inspection options are available at customer request.

Customer Source Inspection for Pre-Cap and Final
DPA (Destructive Physical Analysis)
Qualification Inspection per Table III

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:



* Frequency Accuracy with refertence to nominal frequency includes initial accuracy at 25 °C, ± 5% Supply Voltage and ± 10% load variations

P/N Example: XD673N - L4 - 100.000 MHz = 100.000 MHz, 3.3V Oscillator, ± 50 PPM Frequency Accuracy compared to specified nominal frequency over an operating temperature range of -55 °C to +125 °C.

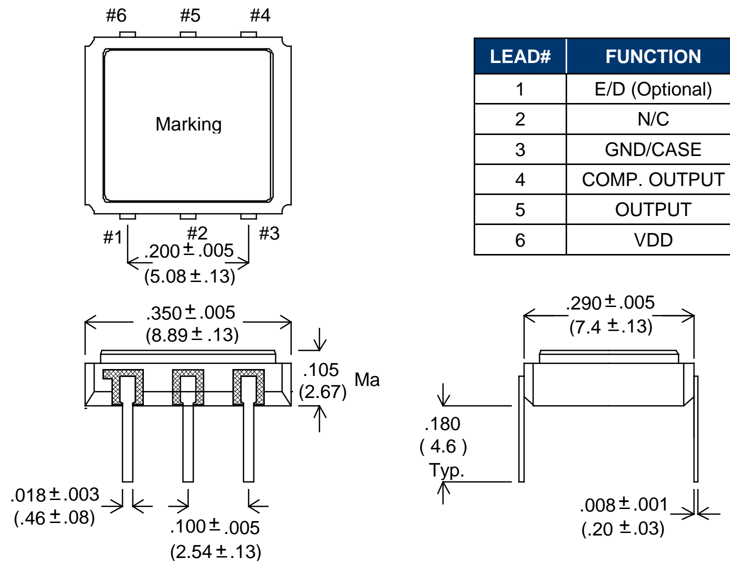
NOTE: Besides **Model XD673N** above, the following additional models are available for applications that can accommodate reduced level of Elements, Screening and Quality Conformance inspection:

XD673E: **Model XD673E** uses the same design & elements as **Model XD673N** except as follows,
100% screening is as per Table IV 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

XD673B: **Model XD673B** is same as **Model XD673E** except as follows:
Active and Passive Elements are as per MIL-PRF-38534, Class H. Microcircuit die is similar to the one used in **Model XD673N** but is not from radiation tested wafer lot.
Radiographic Inspection is not applicable.

XD673P: **Model XD673P** is a form, fit and function equivalent prototype of **Model XD673N.**
Prototypes may use commercial grade elements. 100% screening and quality conformance inspection are not applicable.

7. PACKAGE OUTLINE:



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

Dimensions: Inches (mm)

E/D (Enable/Disable) Input: A “Low” level at the input disables the Output into a high impedance state.

E/D Input has internal pull-up, it can be left floating or connected to Vdd.

Figure 1 - Package Configuration & Pin Connections

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TABLE I – Electrical Characteristics for 2.5 V & 3.3V

Parameter	Spec. Limits
Frequency Range	75 MHz to 200 MHz
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
Enable/Disable (E/D) Input	≥ 0.7 V_{dd} or Open: Normal Output ≤ 0.3 V_{dd}: High Impedance
Start-up Time	10 mS Max.
Phase Jitter	0.3 pS rms typ, (10 KHz to 20 MHz Integrated)
Frequency Aging @ 70 °C ≤ 150 MHz	± 1.5 PPM Max./30 days ± 5 PPM Max. first year, ± 2 PPM Max/year thereafter
> 150 MHz	± 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 25°C, ± 5% Supply Voltage and ± 10% load variations.

Contact Xsis Engineering for any other special requirements.

Table II - Model XD673N 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 ºC), 48 hours minimum
Random Vibration	MIL-STD-883, Method 2026, Condition I- B
Thermal Shock	MIL-STD-883, Method 1011, Condition A
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. 4.8.2.2.3
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	+125 ºC, Nominal Supply Voltage and Burn-in load, 320 Hours Minimum
Post Burn-in Electrical Tests: Record as applicable	Refer to Table II-a below
External Visual	MIL-STD-883, Method 2009

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

2/ Fine & Gross leak test is also performed per MIL-PRF-55310, Para. 4.8.2.2 after lead forming operations.

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

Test Parameter	MIL-PRF-55310 Method	Pre BI 24 ± 1 ºC	Post BI 24 ± 1 ºC	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 II-b - Additional Electrical Measurements

Test Parameter	MIL-PRF-55310 Method	24 $\pm$ 1 °C	Low Temp	High Temp
Input Current	4.8.5	✓	✓	✓
Output Frequency	4.8.6	✓	✓	✓
Frequency Vs.Temperature Stability	4.8.10.1	Measure the output frequency at a minimum of 11 equispaced points over the specified operating temperature range.		
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	✓	✓	✓
Supply Voltage		✓		
Overvoltage Survivability		✓		

Table III - Qualification Inspection 3/

Test / Inspection	Test Methods	Qty
Group 1 1/ Frequency Aging	MIL-PRF-55310, Para. 4.8.35	8(0)
Group 2 2/ Vibration (Sinusoidal, non-operating) Shock (Non-operating)	MIL-STD-202, Method 204, Cond. G and MIL-PRF-55310, Para. 4.8.39.1 MIL-STD-202, Method 213, Cond. G and MIL-PRF-55310, Para. 4.8.41	8(0)
Group 3 2/ Thermal Shock	MIL-STD-202, Method 107 and MIL-PRF-55310, Para. 4.8.45	4(0)
Group 4 2/ Resistance to Soldering Heat Moisture Resistance Terminal Strength Solderability Resistance to Solvents	MIL-STD-202, Method 210 and MIL-PRF-55310, Para. 4.8.49 MIL-STD-202, Method 106 and MIL-PRF-55310, Para. 4.8.50 MIL-STD-883, Method 2004, Cond. D and MIL-PRF-55310, Para. 4.8.52 MIL-STD-202, Method 208, each pad MIL-STD-202, Method 215	2(0)
Group 5 Internal Water Vapor Content	MIL-STD-883, Method 1018, 5000 PPM at 100 °C	5(1) or 3(0)

1/ Aging Data from Screening may be used in lieu of testing.

2/ Samples for this Subgroup come from Group 1 samples.

3/ Generic data less than 1 year old is acceptable as a basis for qualification if it satisfies the requirements specified herein, however, Subgroup 5 must be performed on a lot specific basis.

Table IV - Models XD673E & XD673B, 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 XD673E only) 2/	MIL-STD-883, Method 2012, Class S
Pre Burn-in Electrical Tests	Refer to Table IV-a below
Burn-in	+125 °C, Nominal Supply Voltage and Burn-in load, 160 Hours Minimum
Post Burn-in Electrical Tests	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 XD673E only

Table IV-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	✓	✓	✓	✓

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