

# TXC Corporation Product Introduction

## Purpose

- To introduce TXC's LVPECL/LVDS logic output crystal oscillator products

## Objectives

- Crystal oscillator (XO) simplified block diagram
- What are LVPECL and LVDS logic output
- Phase noise performance by various solutions
- Product features
- Manufacturing process flow
- TXC Core Competence

## Content

- 7 pages

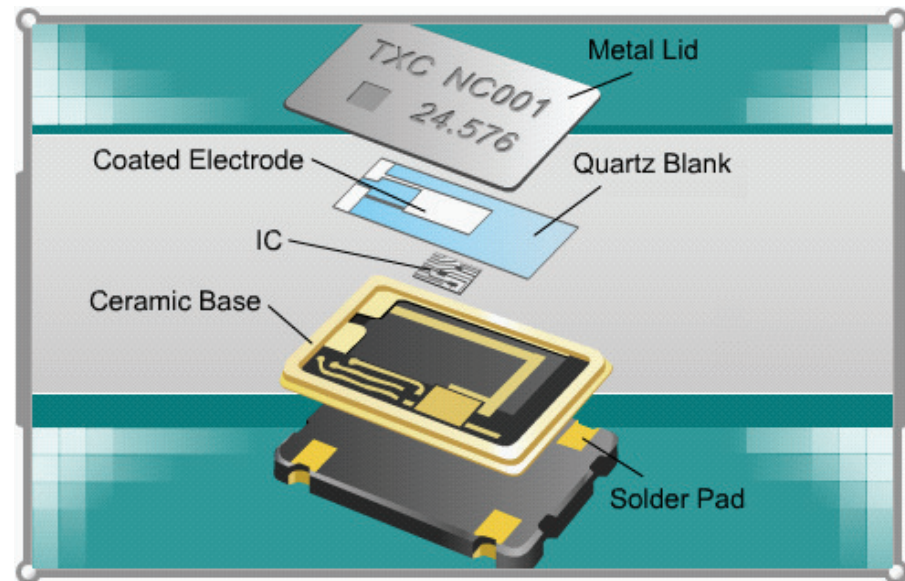
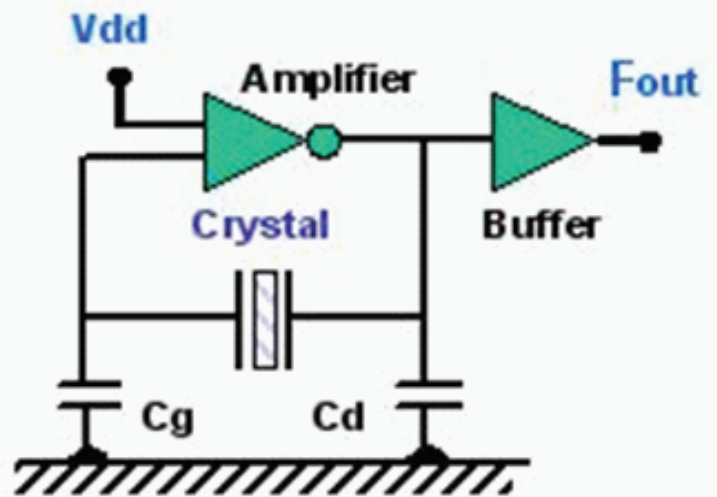
## Learning Time

- 10 minutes



# Crystal Oscillator (XO) Simplified Block Diagram

- XO is comprised of a quartz crystal resonator with an oscillation circuit IC integrated in a hermetically-sealed leadless ceramic package.
- The resonator can be a traditional quartz crystal resonator or a SAW (Surface Acoustic Wave) resonator.
- Pre-matching and pre-optimizing the resonator and the oscillation circuit provide accurate, stable and clean frequency output signal.

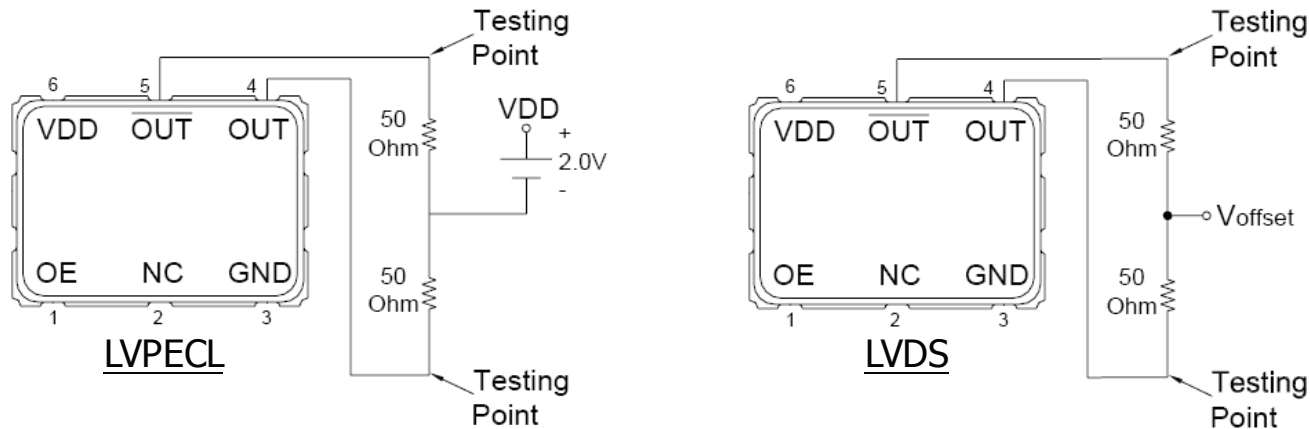


Schematic View of SMD Crystal Oscillator

*A quartz-based oscillator is comprised of a quartz crystal resonator and an oscillation circuit IC integrated in a hermetically-sealed leadless ceramic package. The resonator can be a traditional quartz crystal resonator or a SAW resonator. SAW stands for "Surface Acoustic Wave". By pre-matching and pre-optimizing the resonator and the oscillation circuit, TXC's oscillator can provide accurate, stable and clean frequency output signal.*

# What are LVPECL and LVDS Logic Output

- LVPECL stands for “Low-Voltage Positive Emitter-Coupled Logic”.
- LVDS stands for “Low-Voltage Differential Signaling”
- Specific termination circuits are required for LVPECL and LVDS.



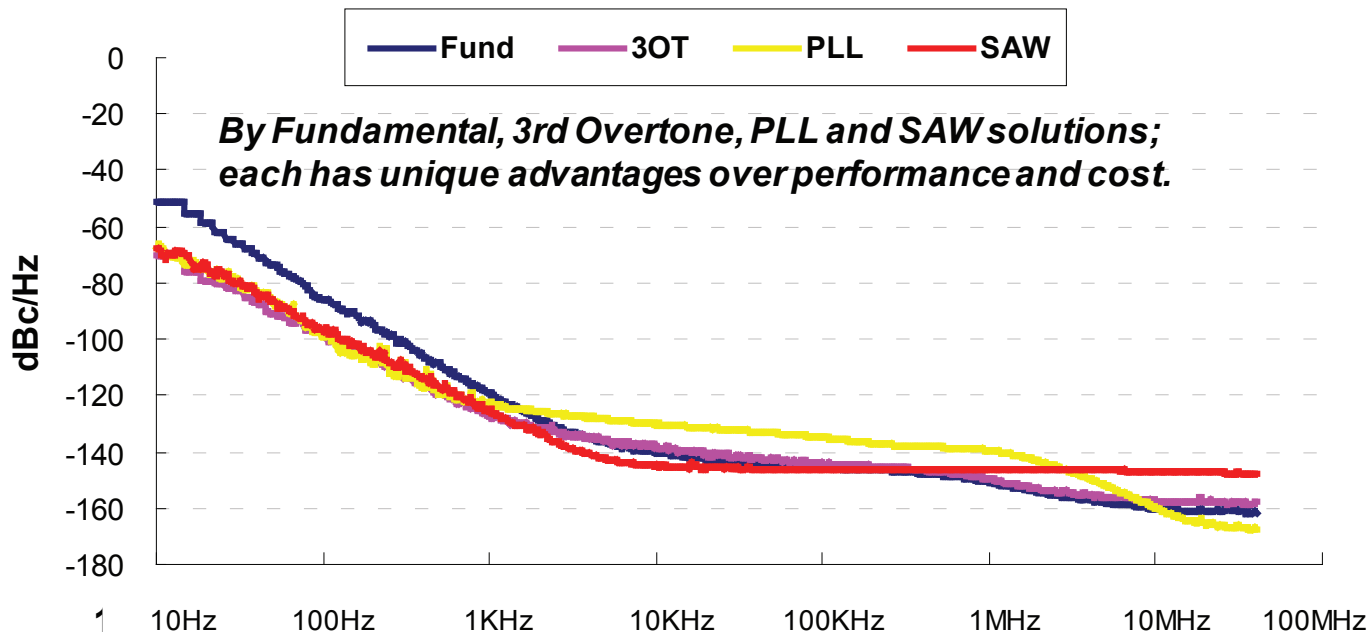
	CMOS	LVPECL	LVPECL	LVDS
Supply Voltage	3.3V	3.3V	2.5V	3.3V / 2.5V
Output Load	15pF (Typ.)	50Ω to VDD – 2V	50Ω to VDD – 2V	100Ω
Output Voltage High (VOH)	2.97V	2.35V	1.55V	1.43V
Output Voltage Low (VOL)	0.33V	1.60V	0.80V	1.1V

Crystal oscillators are available in single-ended logic output like CMOS and differential logic output like LVPECL, LVDS. Compared with single-ended signals, differential signals have the advantages of good noise immunity, lower EMI, and lower power consumption for high-speed data transmission systems. LVPECL stands for “Low-Voltage Positive Emitter-Coupled Logic” and LVDS stands for “Low-Voltage Differential Signaling”. Specific termination circuits are required for LVPECL and LVDS. LVPECL is terminated through 50-ohm pull-down resistors to the termination voltage of “VDD-2.0V” on both outputs. LVDS is terminated across a 100-ohm termination circuit.

# Phase Noise Performance by Various Solutions

156.25MHz Oscillator	10Hz	100Hz	1KHz	10KHz	100KHz	1MHz	10MHz	20MHz	Phase Jitter *(pS)
Fund	-51	-86	-119	-140	-145	-151	-160	-161	0.096
3OT	-70	-98	-127	-138	-144	-150	-157	-158	0.120
PLL	-68	-100	-123	-130	-135	-139	-162	-166	0.250
SAW	-68	-97	-126	-145	-146	-146	-147	-147	0.295

\* The phase jitter is integrated from 12KHz to 20MHz.



TXC offers crystal oscillators with fundamental, 3rd overtone, PLL and SAW technology solutions. Each solution has its unique advantages on phase noise and phase jitter characteristics in specific frequency ranges which allows designers to choose the most suitable one based on the system architecture and chipset requirements. The chart above shows the phase noise and phase jitter performance data of a 156.25MHz LVPECL crystal oscillator by various solutions.

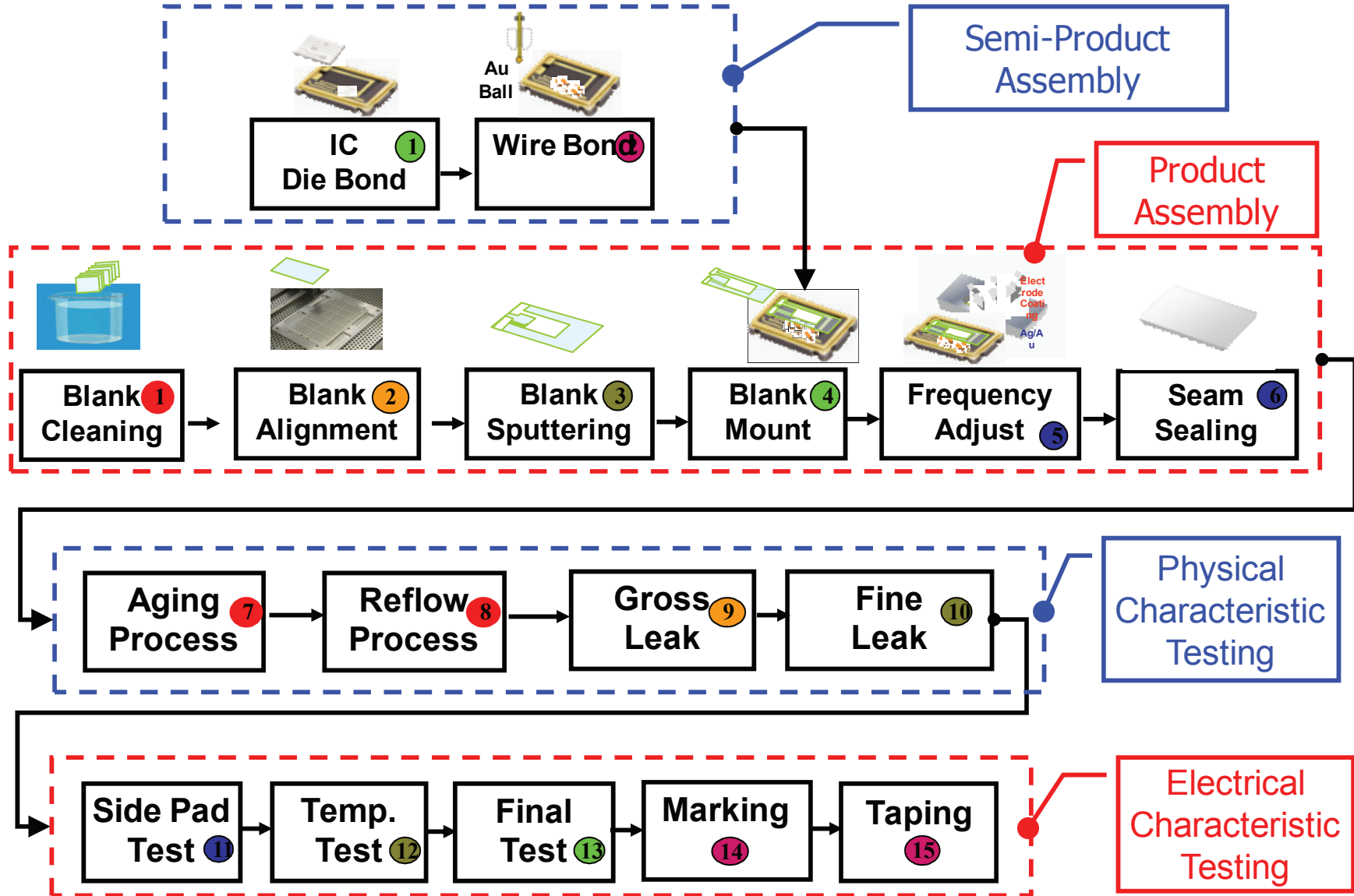
# Product Features

Oscillation Solution	Freq. Range	Features	Output Type	Voltage (V)	PKG (mm)
Crystal Fundamental	25MHz~200MHz	Stability $\pm 25\text{ppm}/\pm 50\text{ppm}$ OTR $-40^{\circ}\text{C}\sim 85^{\circ}\text{C}$ 156.25M, Phase Jitter Typ. 0.10pS	LVPECL LVDS	2.5 3.3	7.0*5.0 5.0*3.2 3.2*2.5
Crystal 3 <sup>rd</sup> Overtone	25MHz~200MHz	Stability $\pm 25\text{ppm}/\pm 50\text{ppm}$ OTR $-40^{\circ}\text{C}\sim 85^{\circ}\text{C}$ 156.25M, Phase Jitter Typ. 0.12pS			
Crystal PLL	75MHz~700MHz	Stability $\pm 25\text{ppm}/\pm 50\text{ppm}$ OTR $-40^{\circ}\text{C}\sim 85^{\circ}\text{C}$ 156.25M, Phase Jitter Typ. 0.25pS			
SAW Fundamental	75MHz~700MHz	Stability $\pm 50\text{ppm}/\pm 100\text{ppm}$ OTR $-5^{\circ}\text{C}\sim 85^{\circ}\text{C}/-10^{\circ}\text{C}\sim 70^{\circ}\text{C}$ 156.25M, Phase Jitter Typ. 0.30pS			

\* The phase jitter is integrated from 12KHz to 20MHz.

*TXC offers differential LVPECL and LVDS logic output crystal oscillators by different solutions in various package sizes, supply voltages, frequency stability over operating temperature range, and frequency range from 25MHz to 700MHz. Other frequencies and features are available upon request.*

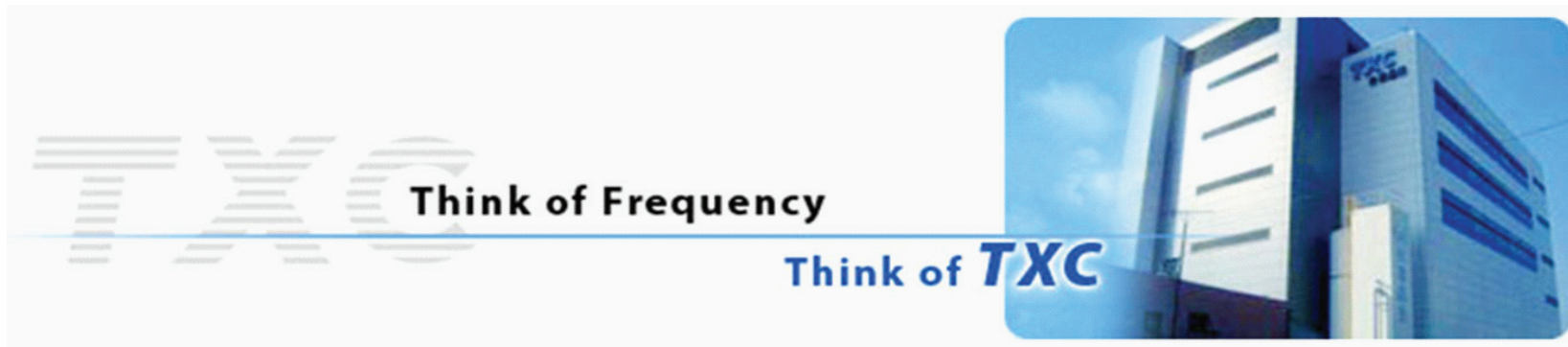
# Manufacturing Process Flow



*This slide presents the manufacturing process flow of the crystal oscillator from product assembly to testing. The stringent manufacturing process control, 100% electrical testing on resonator unit inside by side-pad package design, and 100% oscillator testing over temperature provide outstanding product performance and quality.*

# TXC Core Competence

- **Technology**  
*In-House Design, Simulation, and Processing Capabilities*
- **Quality**  
*Assurance on Design and Production*
- **Service**  
*Global Sales, Marketing and FAE Support*
- **Cost Efficiency**  
*Economy of Scale Production in both Taiwan and China Factories*
- **Time to Market**  
*Leader in Crystal & Oscillator Miniaturization*
- **Flexibility**  
*Agile Sampling Capability and Quick Ramp Up to Volume*



*TXC is proud to be considered by many as one of the best managed "Crystal & Oscillator" companies in the world based on Competitive Product Offering and Service Excellence to Customers, Growth Sustainability, Revenues-Profit Performance, Values to the Shareholders, Quality Brand Name, and Employee Satisfaction."*