# TXC Corporation Product Introduction

**Purpose**

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

**Objectives**

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

**Content**

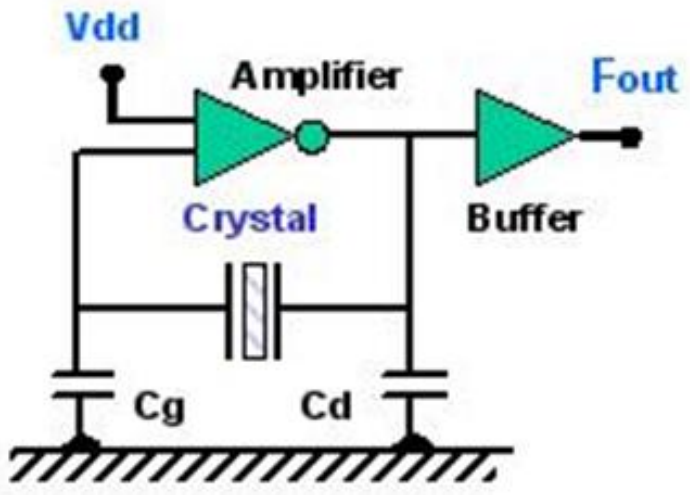
- 7 pages

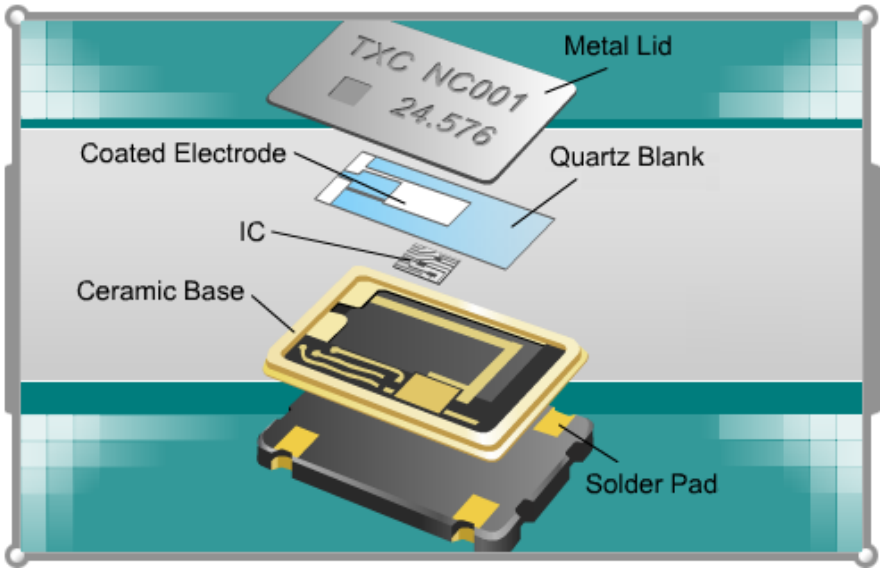
**Learning Time**

- 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.

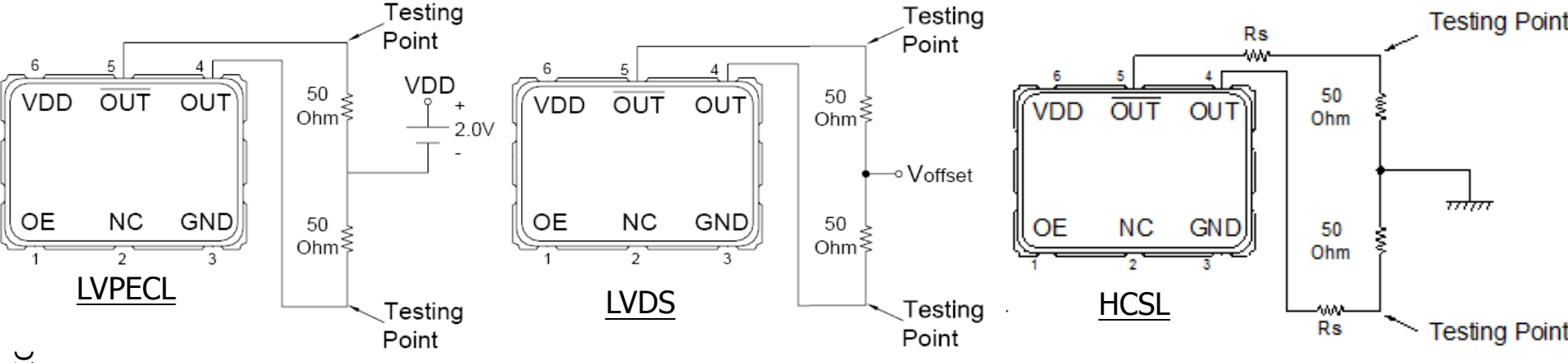



Schematic View of SMD Cystal Oscillator

# What are LVPECL, LVDS and Logic Output

- LVPECL stands for "Low-Voltage Positive Emitter-Coupled Logic".
- LVDS stands for "Low-Voltage Differential Signaling"
- HCSL stands for "High Speed Current Steering Logic"
- Specific termination circuits are required for LVPECL, LVDS and HCSL.



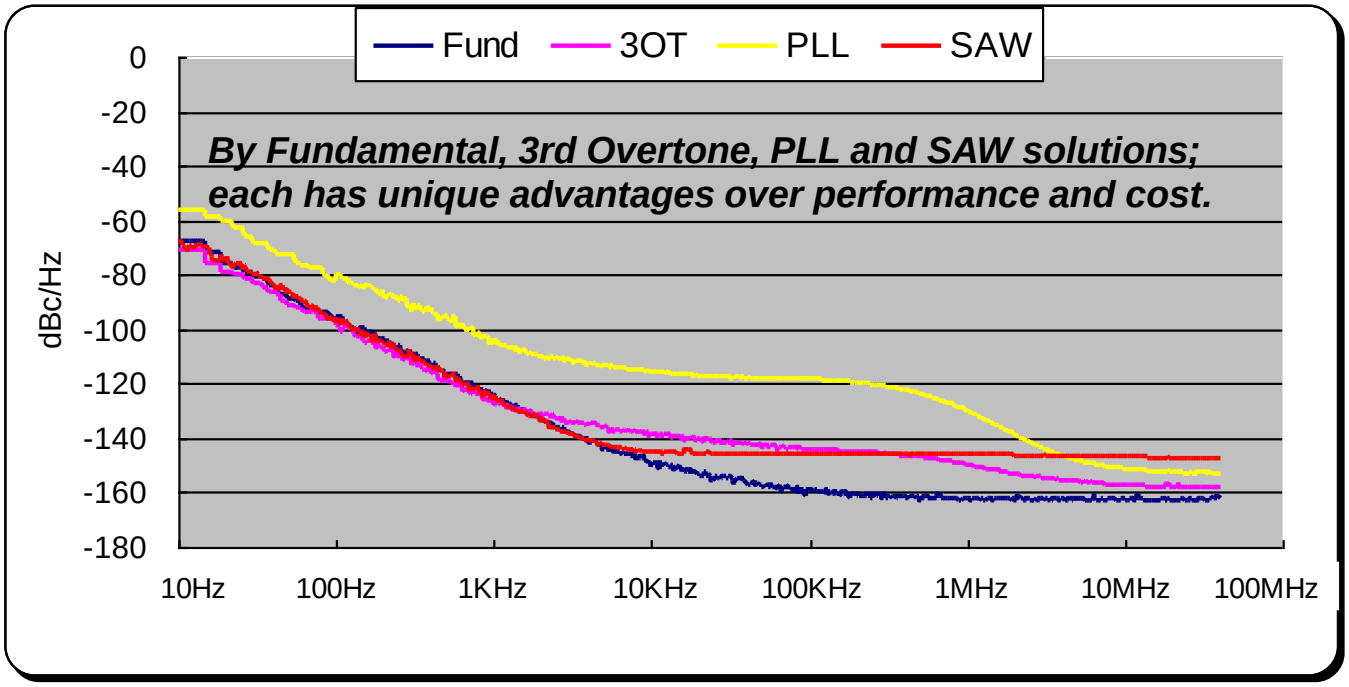

| | CMOS | LVPECL | LVPECL | LVDS | HCSL |
|---|---|---|---|---|---|
| Supply Voltage | 3.3V | 3.3V | 2.5V | 3.3V / 2.5V | 3.3V / 2.5V |
| Output Load | 15pF (Typ.) | 50Ω to VDD – 2V | 50Ω to VDD – 2V | 100Ω | 50ohm to GND |
| Output Voltage High (VOH) | 2.97V | 2.35V | 1.55V | 1.43V | 0.73V |
| Output Voltage Low (VOL) | 0.33V | 1.60V | 0.80V | 1.1V | 0V |

# Phase Noise Performance by Various Solutions

**156.25MHz Oscillator**

| DUT \ Items | 10Hz | 100Hz | 1KHz | 10KHz | 100KHz | 1MHz | 10MHz | 20MHz | Jitter *(pS) |
|---|---|---|---|---|---|---|---|---|---|
| Fund | -68 | -96 | -124 | -151 | -159 | -162 | -162 | -163 | 0.049 |
| 3OT | -70 | -100 | -127 | -138 | -144 | -150 | -158 | -158 | 0.116 |
| PLL | -55 | -85 | -105 | -115 | -118 | -130 | -150 | -151 | 0.572 |
| SAW | -68 | -97 | -126 | -145 | -146 | -146 | -147 | -147 | 0.295 |

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

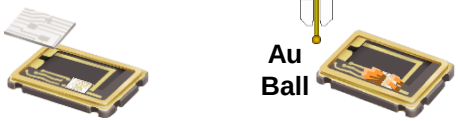


# Product Features

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

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

# Manufacturing Process Flow

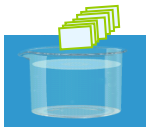


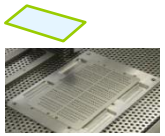

Semi-Product Assembly

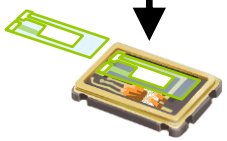
IC Die Bond 1

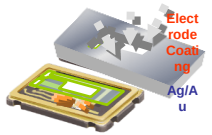
Wire Bond 2

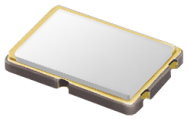
Product Assembly









Blank Cleaning 1 → Blank Alignment 2 → Blank Sputtering 3 → Blank Mount 4 → Frequency Adjust 5 → Seam Sealing 6

Aging Process 7 → Reflow Process 8 → Gross Leak 9 → Fine Leak 10

Physical Characteristic Testing

Side Pad Test 11 → Temp. Test 12 → Final Test 13 → Marking 14 → Taping 15

Electrical Characteristic Testing

# 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*