



# Reliability Qualification Report

Voltage Controlled Oscillators (VCOs)

Phase-Locked Loops (PLL)

## Products Qualified

All VCO Modules in T Packages  
All VCO Modules in U Packages  
All VCO Modules in K Packages  
All VCO Modules in W Packages  
All VCO Modules in X Packages  
All PLL Modules in PLL250 Packages  
All PLL Modules in PLL300 Packages  
All PLL Modules in PLL350 Packages  
All PLL Modules in PLL400 Packages

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# VCO & PLL Qualification Report

## I. Introduction

Sirenza Microdevices' Voltage-Controlled Oscillators are optimized for low phase noise and flat power and modulation sensitivity across the frequency band. They provide excellent phase noise in a low cost solution. The surface mount package is designed for ease of assembly on standard pick and place SMT equipment.

Sirenza Microdevices' Phase-Locked Loops are ideal for synthesizer applications for large infrastructure programs. This integrated solution has low phase noise, fast settling time, and excellent return loss. These PLLs are assembled in a surface mount package.

## II. Qualification Overview

Sirenza recognizes that the parts, processes, design rules and manufacturing techniques employed in the design reflect in the quality and reliability of the product. Since Sirenza's VCOs and PLLs are manufactured at the same site and uses the same major elements (processes and components), they are considered as one qualification family.

## III. Qualification Methodology

This qualification was executed using a T-package voltage controlled oscillator and a 350 Outline package phase-locked loop. The Sirenza Microdevices qualification process consists of a series of tests designed to stress various potential failure mechanisms. This testing is performed to ensure that Sirenza Microdevices products are robust against potential failure modes that could arise from the various package failure mechanisms stressed. The qualification testing is based on JEDEC and Mil-Std test methods common to the semiconductor industry. Qualification testing include extreme hot and cold environments (temperature cycling), vibration, and mechanical shock, and humidity conditions.

## IV. Qualification By Similarity

All products in a qualification family can be qualified by similarity provided that one family member passes qualification testing. Sirenza's VCO modules are also packaged in U, K, W, and X package styles that are similar to the T package style. Sirenza's PLL modules are also packaged in PLL250, PLL300, and PLL400 package styles that are similar to the PLL350 package. No new potential failure mechanisms are introduced when using the different package styles. Therefore, the following are qualified by similarity:

- All VCO Modules in T Packages
- All VCO Modules in U Packages
- All VCO Modules in K Packages
- All VCO Modules in W Packages
- All VCO Modules in X Packages
- All PLL Modules in PLL250 Packages
- All PLL Modules in PLL300 Packages
- All PLL Modules in PLL350 Packages
- All PLL Modules in PLL400 Packages



## V. Qualification Test Results

### Group 1.0 Sequential Stress testing (Qualification Vehicle: VCO)

Test Name	Test Condition/ Standard	Sample Size	Results
High Temperature Bake	125°C 24 hours Unbiased	10	Pass
Temperature-Humidity Soak	85°C/ 85%RH 168 hours	10	Pass
Reflow	3X @ 230°C	10	Pass
Temperature-Humidity Operating	85°C/ 85%RH 1000 hours Biased	10	Pass
Temperature Cycle	-40°C to +85°C 30 cycles	10	Pass

### Group 2.0 Sequential Stress testing (Qualification Vehicle: VCO)

Test Name	Test Condition/ Standard	Sample Size	Results
Aging	85°C 21 days Unbiased	10	Pass
Solder Heat Resistance	2X at 225°C	10	Pass
Reflow to board	63/37 solder 3X @ 230°C	10	Pass
Shear Test	1000 grams 30 sec	10	Pass

## V. Qualification Test Results (con't)

### Group 3.0 Sequential Stress testing (Qualification Vehicle: VCO)

Test Name	Test Condition/ Standard	Sample Size	Results
Mechanical Shock	50G's, 11mS	10	Pass
Random Vibration	10-3000Hz 6G 15min per axis	10	Pass

### Group 4.0 Sequential Stress testing (Qualification Vehicle: VCO)

Test Name	Test Condition/ Standard	Sample Size	Results
Coplanarity	Maximum 0.05mm	10	Pass
ESD	HBM 2000V	10	Pass

### Group 5.0 High Temperature Operating Life (Qualification Vehicle: VCO)

Test Condition	Test Standard	Sample Size	Results
Tamb=85°C Biased 2000 hours	-	50	Pass

## V. Qualification Test Results (con't)

### Group 1.0 Sequential Stress testing (Qualification Vehicle: PLL)

Test Condition	Test Standard	Sample Size	Results
Mechanical Shock (50G's, 11mS)	Mil-Std 202, Condition A, Method 213B	25	Pass
Solderability	Re-flow to evaluation board	25	Pass
Cold Resistance (-10°C, 96hrs)	Biased, -10°C, 96hrs	25	Pass
Thermal Shock	-35°C to +85°C 30' dwell 30 cycles	25	Pass
Random Vibration	10-2000Hz 6G 15min per axis	25	Pass
Temperature-Humidity Soak	85°C/ 85%RH 500 hours	25	Pass

### Group 2.0 Sequential Stress testing (Qualification vehicle: PLL)

Test Condition	Test Standard	Sample Size	Results
Aging	21 days @ 85°C	25	Pass
Resistance to Solder Heat	Re-flow 2x, 230°C peak	25	Pass
Solderability	Re-flow to evaluation board	25	Pass
Shear Test	Non-Destruct (1000 grams/30 sec, applied to cover orthogonally)	25	Pass