Oscilloscopes in Manufacturing Test

Pass/fail mask testing speeds up automated testing

Agilent's InfiniiVision 3000 X-Series oscilloscopes can be optionally configured with the industry's only hardware-based pass/fail mask testing capability to achieve fast and reliable test results in the manufacturing test environment.

Shipping reliable electronic products today often requires that various signals within products be tested under automated control to insure that they meet minimum internal and/or external specified requirements. The primary instrument used to test the parametric/analog characteristics of signals is typically a digital storage oscilloscope (DSO). Most of today's DSOs are fully programmable and come with downloadable IVI drivers. Whatever measurements that can be manually performed on the bench, can usually be performed under automated control. When selecting a scope for the manufacturing test environment, the most important characteristics of the scope are accurate test results, fast test results, and statistically reliable test results.

Although one method of testing is to transfer waveform arrays captured by the oscilloscope to a computer for further data crunching, a more efficient method is to let the oscilloscope do the data crunching, and then just transfer the results. Most of today's DSOs include built-in parametric measurement capabilities such as rise time, amplitude, and frequency measurements. Perhaps the only test requirement is to determine whether or not a digital signal meets a minimum rise time specification. Simply transfer the measured numeric rise time value and then compare the results against the specification.

Another method of automated waveform testing is pass/fail mask testing as shown in Figure 1. With built-in oscilloscope mask testing, pass/fail limit bands are either established within or transferred to the scope. Captured waveforms are then quickly compared against the limit bands (the mask). One advantage of mask testing is that

multiple characteristics of captured waveforms can be tested using a single mask. Rather than testing against a specific parameter, such a peak-to-peak voltage, mask testing will test the overall shape of a waveform that may include Vpp, rise time, pulse width characteristics, as well as maximum allowable noise.

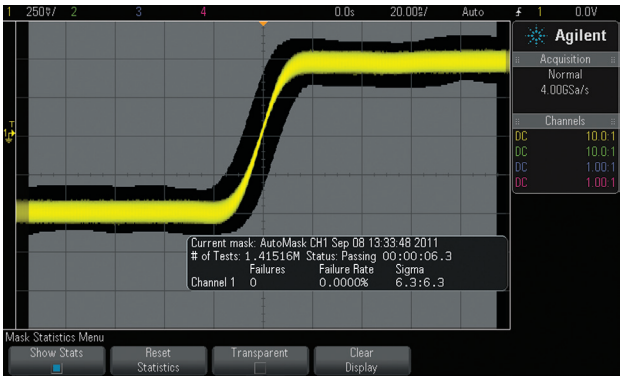

Figure 1: Mask testing can test multiple wave shape parameters at once including maximum allowable noise.

Another advantage when using the mask test capability in Agilent's InfiniiVision 2000 and 3000 X-Series oscilloscopes is their ability to provide statistically reliable test results faster than other scopes in the industry. With the oscilloscope industry's only hardware-based mask testing, the 3000 X-Series scopes can test and compare over 200,000 waveforms per second. Although one captured waveform may pass a particular mask test, what if you need to test a million waveforms to insure that you have statistically reliable test results? Will they all pass?

In addition to fast test results, these scopes are also the only scopes that can provide results in terms of Sigma quality standards. Desired manufacturing quality is often based on a 6σ standard, which relates to approximately 3 or fewer defects per million. Figure 2 shows the statistical test results of a mask test based on the capture and comparison of 5,000,000 waveforms. In this example the scope detected 6 failures, which relates to a Sigma quality of 6.2σ out of a possible 6.5σ.

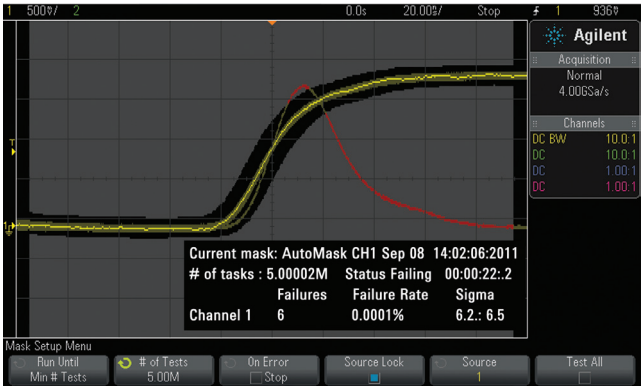

Figure 2: Hardware-based mask testing provides fast and statistically reliable test results that can be compared against 6σ standards

There are two different methods for creating a pass/fail mask. One method is to input a "golden" waveform into the scope and then have the scope automatically create the mask based on a user-specified time and voltage tolerance band around the "golden" waveform. This is the method that was used in the previous two examples shown in Figures 1 and 2.

Another method is to import a multi-region mask that has been previously created on a PC based on published standards. Figure 3 shows an example of an eye-diagram test based on an imported mask of an ARINC 429 serial bus signal which is common in the aerospace/defense industry. In this example we see that a significant number of pulses are failing the test.

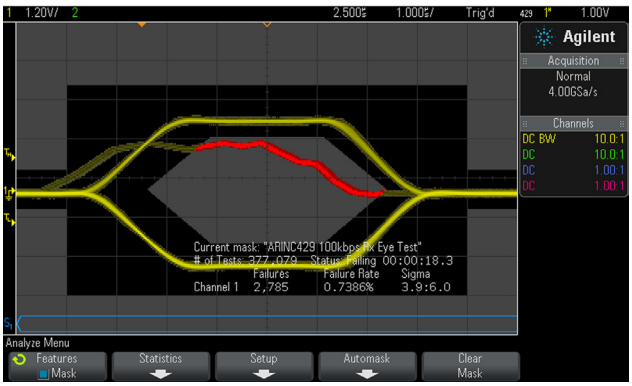

Figure 2: Pass/fail masks based on industry specifications can be created on a PC and then downloaded to the scope.

Agilent's InfiniiVision 3000 X-Series oscilloscopes

If you are in the market today to purchase your next oscilloscope, Agilent Technologies' 2000 & 3000 X-Series oscilloscopes come in various bandwidth models ranging from 70 MHz up to 1 GHz. These scopes come with a standard 3-year warranty, as well as an industry-first 2-year recommended calibration cycle. When purchased with the DSOX3MASK option, these scopes are the only scopes in the industry that can test over 200,000 waveforms per second to provide fast and statistically reliable test results.

To learn more about Agilent's InfiniiVision 2000 & 3000 X-Series oscilloscopes and mixed signal oscilloscopes, go to: www.agilent.com/find/morescope

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2011, 2012
Published in USA, March 20, 2012
5990-9176EN

Agilent Technologies