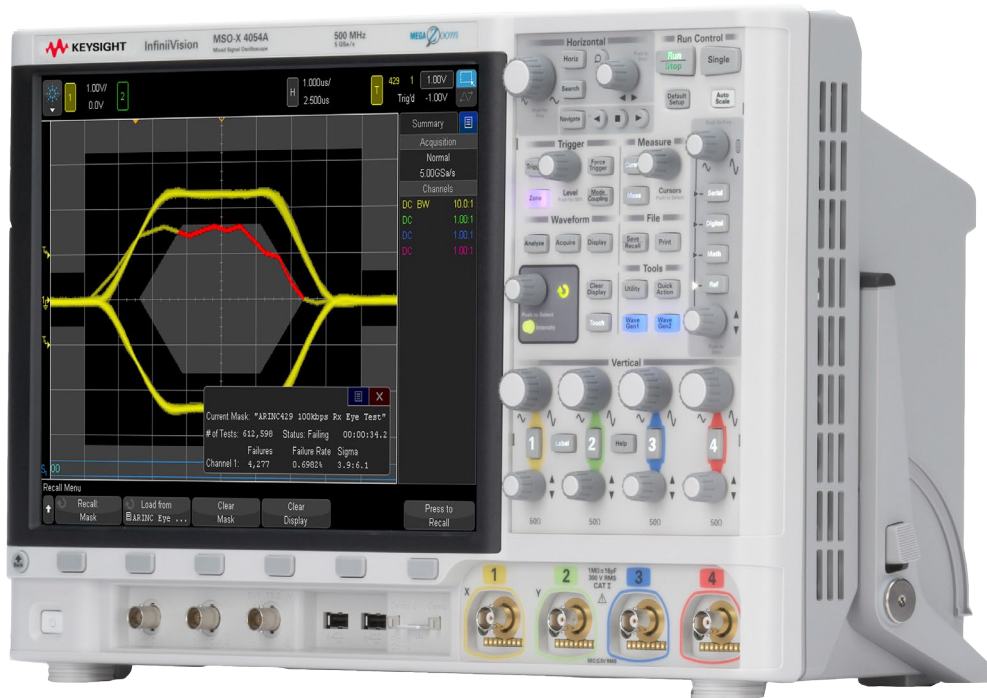


# Keysight Technologies

## Mask/Waveform Limit Testing for InfiniiVision Series Oscilloscopes

Data Sheet



## Introduction

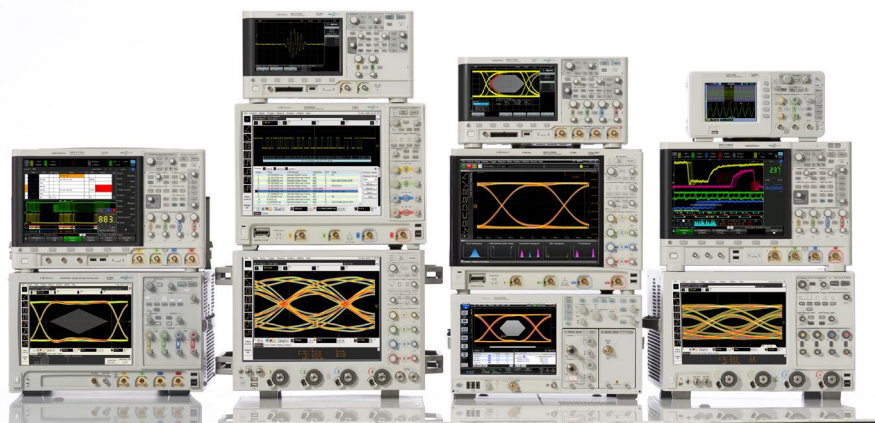
If you need to validate the quality and stability of your electronic components and systems, the Keysight Technologies, Inc. mask test option for InfiniiVision Series oscilloscopes can save you time and provide pass/fail statistics almost instantly. The mask test option offers a fast and easy way to test your signals to specified standards, as well as the ability to uncover unexpected signal anomalies, such as glitches. Mask testing on other oscilloscopes is usually based on software-intensive processing technology, which tends to be slow.

Keysight's InfiniiVision scopes mask test option is based on hardware-accelerated technology, meaning that InfiniiVision Series oscilloscopes can perform up to 270,000 real-time waveform pass/fail tests per second. This makes your testing throughput orders of magnitude faster than you can achieve on other oscilloscope mask test solutions.

### Features

- Test up to 270,000 waveforms per second with the industry's fastest hardware-accelerated mask testing technology
- Automatic mask creation using input standard
- Easily download multi-region masks and setups based on industry standards
- Detailed pass/fail statistics
- Test to high-quality standards based on sigma
- Multiple user-selectable test criteria

Test waveforms to specified standards in seconds instead of hours using hardware-accelerated mask testing



### Keysight Oscilloscopes

Multiple form factors from 20 MHz to > 90 GHz | Industry leading specs | Powerful applications

## Using AutoMask

Figure 1 shows an example where we automatically created a pulse-shaped mask using an input signal standard. You can easily specify horizontal and vertical tolerance bands in either divisions or absolute volts and seconds. We set up the mask test to run continuously in order to accumulate valid pass/fail statistics. In this example, we quickly detected an infrequent glitch. After running the test for just a few seconds, the mask test statistics showed that the scope performed the pass/fail mask test on more than 1,000,000 waveforms and detected just two errors for a computed error rate of 0.0002%. In addition, we can see that this particular signal has a sigma quality relative to the mask tolerance of approximately 6.1  $\sigma$ .

## Importing an industry-standard mask

Figure 2 shows an example of an eye-diagram mask test. This particular polygon-shape mask is based on a published standard and was created on a PC using a simple text editor. We then imported the mask and setup parameters into the scope via a USB memory stick.

## Multiple test criteria

When setting up your specific mask test criteria, you can choose from multiple options including:

- Run forever (with accumulated pass/fail statistics)
- Run until a specified number of tests
- Run until a specified time duration
- Run until a maximum ideal sigma standard
- Stop-on-failure
- Save-on-failure
- Print-on-failure
- Trigger out-on-failure

## Six Sigma mask testing

Keysight InfiniiVision Series scopes are the first in the industry that can report mask test pass/fail statistics in sigma quality. InfiniiVision's fast acquisition and waveform mask test rate of up to 270,000 waveforms/sec makes this possible and for the first time, practical. If waveform failures follow a random/Gaussian failure distribution, Six Sigma quality represents approximately three failures/defects or fewer out of a test sample of 1,000,000. InfiniiVision Series scopes can test up to a Six Sigma standard in as little as 1.1 seconds. To learn more about waveform mask testing to Six Sigma quality standards, refer to the application note, "Oscilloscope Mask Testing for Six Sigma Quality Standards" listed at the end of this document.

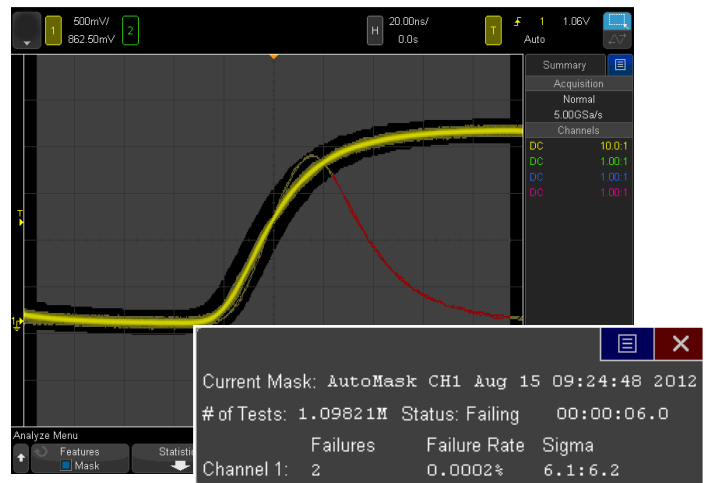


Figure 1. Mask testing uncovers an infrequent signal anomaly.

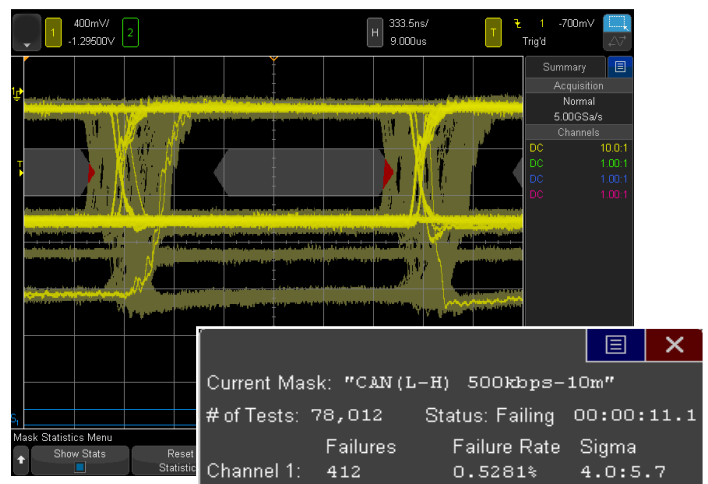


Figure 2. Testing an eye-diagram with an imported industry-standard mask.

## Performance Characteristics

Mask test source	Analog channels 1, 2, 3, or 4
Maximum test rate	5000, 6000, 7000 Series: Up to 100,000 waveforms tested per second 3000 and 4000 X-Series: Up to 270,000 waveforms tested per second 2000 X-Series: Up to 50,000 waveforms tested per second 6000 X-Series: Up to 130,000 waveforms tested per second
Acquisition modes	Real-time sampling–non-averaged, Real-time sampling–averaged
Mask creation	
– Automask-divisions	± X divisions, ± Y divisions
– Automask-absolute	± X seconds, ± Y volts
– Mask file import	Up to 8 failure regions (created in text editor)
Mask scaling	Source lock on (mask automatically re-scales with scope settings) Source lock off (mask scaling fixed relative to display when loaded or created)
Test criteria	Run until forever, Minimum number of tests, Minimum time, Minimum sigma
Action on error	Stop acquisitions, save image, print, perform measurements
Trigger output	On failure
Statistics display	Number of tests, Number of failures (for each channel tested), Failure rate (for each channel tested), Test time (hours – minutes – seconds), Sigma (actual versus maximum without failures)
Display formats	Mask – translucent gray, Failing waveform segments – red, Passing waveform segments – channel color
Save/recall	4 non-volatile internal registers (.msk format), USB memory stick (.msk format)

## Ordering Information

The mask/waveform limit test option is compatible with all Keysight InfiniiVision Series oscilloscopes.

InfiniiVision model	Mask test options
2000 X-Series	DSOX2MASK
3000T X-Series	DSOX3MASK
4000 X-Series	DSOX4MASK
6000 X-Series	DSOX6MASK
5000,60000, and 7000 Series	N5455A

## Related Keysight literature

Publication title	Publication number
InfiniiVision 6000 X-Series Oscilloscopes - Data Sheet	5991-4087EN
InfiniiVision 4000 X-Series Oscilloscopes - Data Sheet	5991-1103EN
InfiniiVision 3000T X-Series Oscilloscopes - Data Sheet	5992-0140EN
InfiniiVision 2000 X-Series Oscilloscopes - Data Sheet	5990-6618EN
InfiniiVision Oscilloscope Probes and Accessories - Selection Guide	5968-8153EN
Evaluating Oscilloscope Mask Testing for Six Sigma Quality Standards - Application Note	5990-3200EN
Oscilloscope Waveform Update Rate Determines Ability to Capture Elusive Events - Application Note	5989-7885EN
FlexRay Physical Layer Eye-diagram Mask Testing - Application Note	5990-4923EN
CAN Eye-Diagram Mask Testing - Application Note	5991-0484EN