Limit and Mask Test Application Module

DPO4LMT/MDO3LMT Datasheet

Key features

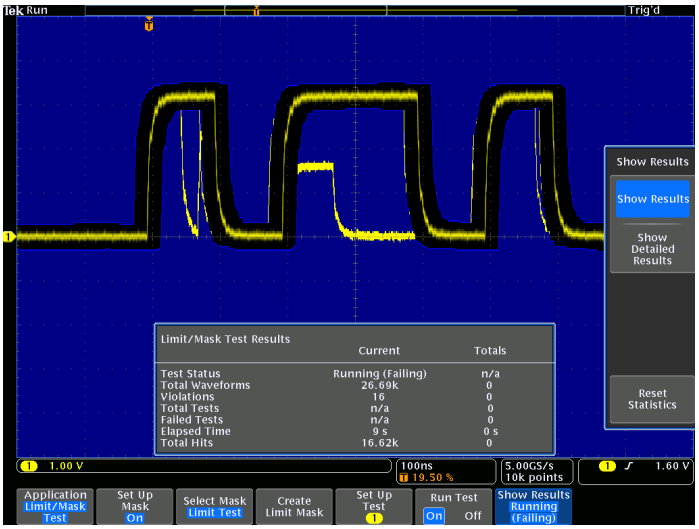
- Conduct limit test Pass/Fail testing against a “golden” waveform with tolerances
- Perform mask testing on ITU-T, ANSI T1.102, and USB standards
- Perform mask testing on custom user-defined masks
- Detailed test statistics provide insight into true signal behavior
- Customizable tests allow for multiple actions upon violations or test failures
- High waveform capture rates enable thousands of waveforms to be tested per second

Automated pass/fail testing

Validating signal quality is an important part of any embedded system design. One way to determine how well your signals conform to expected signal quality is to use mask testing. A mask defines a portion, or portions, of the oscilloscope display that a signal must not enter. Whether you need to test to a well-defined telecommunication or computer standard or are interested in validating how your signals are performing compared to a known good condition, the Limit and Mask Test Application Modules for the MDO/MSO/DPO4000 and MDO3000 Series provide instant automated statistical analysis of signal quality. The Limit and Mask Test capability makes testing against telecommunication and computer industry standards easy by making mask definition quick and accurate, allowing flexible testing configurations, and providing detailed statistical test results.

Limit test

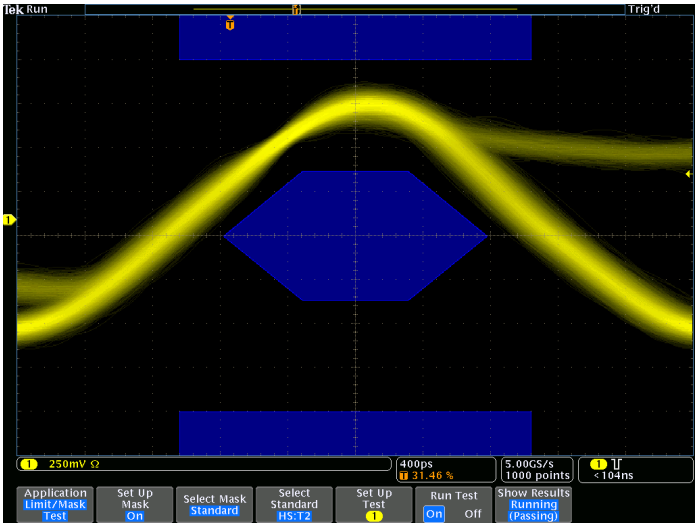
A common method for understanding your signal quality is to test against a known good or “golden” waveform. You can apply horizontal and vertical tolerances to the golden waveform to create a mask that can be used for quick, accurate Pass/Fail testing. This method is also a great way to perform go/no-go testing on a manufacturing line by enabling repeatable, fast decisions on the quality of a component or system. The Limit and Mask Test Application Module allows you to save your limit test mask for use later across multiple oscilloscopes in a lab or on a production line.



Limit Test finds infrequent glitches and runt signals using a mask created by adding vertical and horizontal tolerances around a golden waveform. Quickly test your signals against a golden waveform and quickly gain insight into anomalous behavior.

Standard mask test

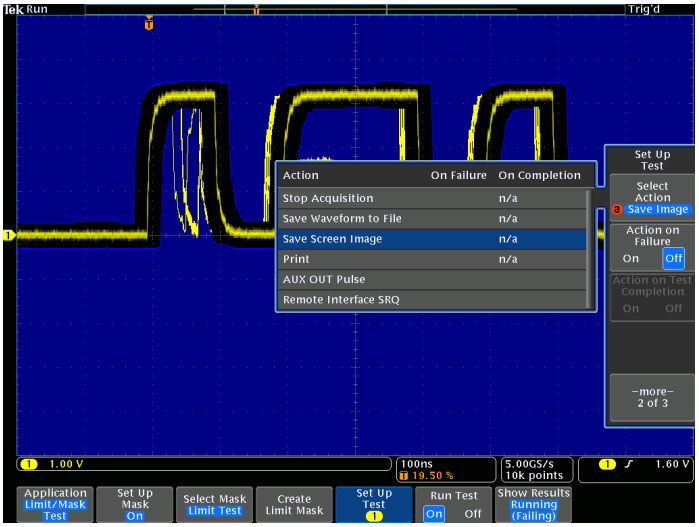
More than 40 standard telecommunications and computer industry standard masks are included with the DPO4LMT application module. Each standard mask is easily loaded from the oscilloscope internal memory and can be immediately used to conduct Pass/Fail testing. Adherence to a standard is determined pixel-by-pixel throughout the display. Masks for ITU-T up to 155 Mb/s data rates, ANSI T1.102 up to 155 Mb/s data rates, and high-speed USB 2.0 are included.



USB 2.0 high-speed standard mask showing results from a mask test. In the DPO4LMT application, a robust set of telecommunications and computer industry standard masks make testing to standards quick and accurate.

Flexible test configuration

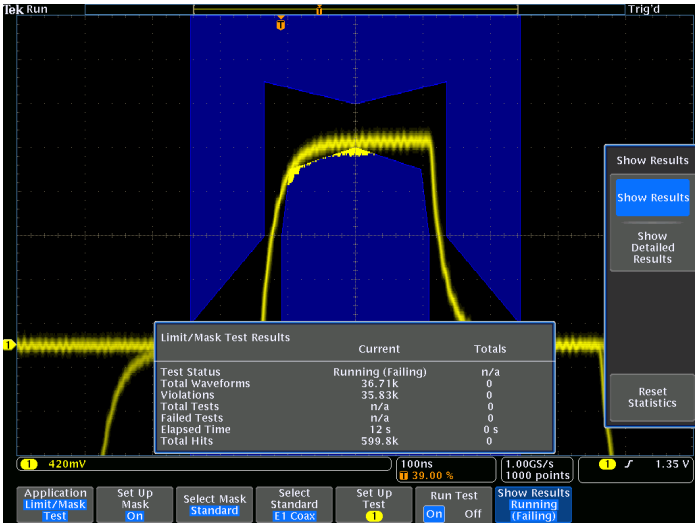
The Limit and Mask Test Application Module provides flexible test definitions, enabling you to tailor the test to your needs. You can run a test for a user-defined number of waveforms (up to 1,000,000) or for a user-defined amount of time (up to 48 hours), or set either criteria to infinity and run the test until you manually stop it. The Repeat Test and Pretest Delay capability enables swapping of test locations before proceeding with a test over multiple cycles of the test. You can set the number of violations that can occur before a test status is considered failed. The oscilloscope can perform a number of actions when a test fails or completes. Actions the oscilloscope can perform when a test fails include stopping the acquisition, saving a screen image to file, saving a waveform to file, printing a screen image, setting a trigger out pulse, and setting a remote interface service request (SRQ). Actions the oscilloscope can perform when a test completes include setting a trigger out pulse and setting a remote interface service request (SRQ).



The Limit and Mask Test Application Module enables multiple actions upon a test failure or the completion of a test, tailoring the test to your specific needs.

Detailed test results

The Limit and Mask Test Application Module provides statistical results from each test conducted. The results include Pass/Fail status of the test, number of waveforms tested, number of violations found, number of total tests run, number of tests that failed, total elapsed time, and the total number of hits within the mask. A detailed results table adds the number of hits for each mask segment enabling you to tell exactly where your signal may be operating out of intended parameters.



Detailed mask test results show statistical information for the current test and accumulated over all tests. The results include information on violations, test duration, total number of hits, and the number of hits in each mask segment.

Characteristics

All specifications apply to all models unless noted otherwise.

Limit test specific

Mask source	Any Ch1 - Ch4 or any R1 - R4
Test source	Any Ch1 - Ch4
Mask creation margins	Vertical tolerance from 0 to 1 division in 1 m (1/1000th) division increments Horizontal tolerance from 0 to 500 m division in 1 m (1/1000th) division increments

Mask test specific

Test source	Any Ch1 - Ch4

Mask test specific

Included standard masks (DPO4LMT only)

ITU-T	DS-0 Single (64 Kb/s) DS-0 Double (64 Kb/s) DS-0 Data Contra (64 Kb/s) DS-0 Timing (64 Kb/s) DS1 Rate (1.544 Mb/s) DS1 G.703 (1.544 Mb/s) E1 Sym Pair (2.048 Mb/s) E1 Coax Pair (2.048 Mb/s) Clk Int Sym (2.048 Mb/s) Clk Int Coax (2.048 Mb/s) DS2 Rate Sym (6.312 Mb/s) DS2 Rate Coax (6.312 Mb/s) E2 (8.448 Mb/s) 32Mb (32.064 Mb/s) E3 (34.368 Mb/s) DS3 Rate (44.736 Mb/s) DS3 G.703 (44.736 Mb/s) 97Mb (97.728 Mb/s) E4 Binary 0 (139.26 Mb/s) E4 Binary 1 (139.26 Mb/s) STM1E Binary 0 (155.52 Mb/s) STM1E Binary 1 (155.52 Mb/s) STM-0 HDBx (51.84 Mb/s) STM-0 CMI 0 (51.84 Mb/s) STM-0 CMI 1 (51.84 Mb/s)
ANSI T1.102	DS1 (1.544 Mb/s) DS1A (2.048 Mb/s) DS1C (3.152 Mb/s) DS2 (6.312 Mb/s) DS3 (44.736 Mb/s) DS4NA (139.26 Mb/s) DS4NA Max Output (138.26 Mb/s) STS-1 Pulse (51.84 Mb/s) STS-1 Eye (51.84 Mb/s) STS-3 (155.52 Mb/s) STS-3 Max Output (155.52 Mb/s)
USB	HS:T1 (480 Mb/s) HS:T2 (480 Mb/s) HS:T3 (480 Mb/s) HS:T4 (480 Mb/s) HS:T5 (480 Mb/s) HS:T6 (480 Mb/s)

Mask creation	Load custom mask from text file with up to eight segments DPO4LMT only: Select standard mask from internal memory DPO4LMT only: Copy a standard mask to custom mask
Custom mask vertical margin	From –50% to +50% A positive value spreads upper and lower segments apart, a negative value brings upper and lower segments closer together.

DPO limit and mask tests

Mask hit highlighting	Hits within a mask are highlighted for easy viewing
Mask scaling	Lock to Source ON: Mask automatically rescales with source-channel settings changes Lock to Source OFF: Mask does not rescale with source-channel settings changes
Test criteria run until	Minimum number of waveforms (from 1 to 1,000,000; Infinity) Minimum elapsed time (from 1 second to 48 hours; Infinity)
Pretest delay	From 0 to 200 s
Repeat on completion	ON: Test will repeat when the minimum number of waveforms or minimum amount of time is reached OFF: Test will run a single time and will not repeat
Violation threshold	Number of violations before a test status is considered failed (from 1 to 1,000,000)
Actions on test failure	Stop acquisition Save screen image to file Save waveform to file Print screen image Trigger out pulse Set remote interface service request (SRQ)
Actions on test complete	Trigger out pulse Set remote interface service request (SRQ)
Results display	All test results include values from the current test and the accumulated values from all tests: Test status Total waveforms tested Number of violations Number of total tests run Number of failed tests Total elapsed time Total hits Detailed results add the number of hits for each segment in the active mask

Ordering information

DPO4LMT or DPO3LMT	The Limit and Mask Testing Application Module for the MDO/MSO/DPO4000 Series (DPO4LMT) or for the MDO3000 Series (MDO3LMT) enables testing against limit masks generated from "golden" waveforms and mask testing using custom user-defined masks. The DPO4LMT module also enables mask testing using standard telecommunication and computer industry masks. ≥350 MHz bandwidth models are recommended for mask testing on telecomm standards >55 Mb/s. 1 GHz bandwidth models are recommended for mask testing on high-speed (HS) USB.
Recommended probes	Please refer to www.tek.com/probes for further information on the recommended models of probes and any necessary probe adapters.

CE

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Updated 10 April 2013

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25 Jun 2014

61W-26121-6

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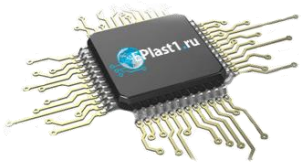

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