



## Marketing Datasheet

# ML4006

### Single Channel Sampling Oscilloscope

Jitter Components Decomposition

Eye & Pattern Measurement

NRZ & PAM4 Eye Mask Test

S21 Measurements

Advanced Pattern Acquisition

Clock Recovery Option



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# ML4006

32/50GHz DSO

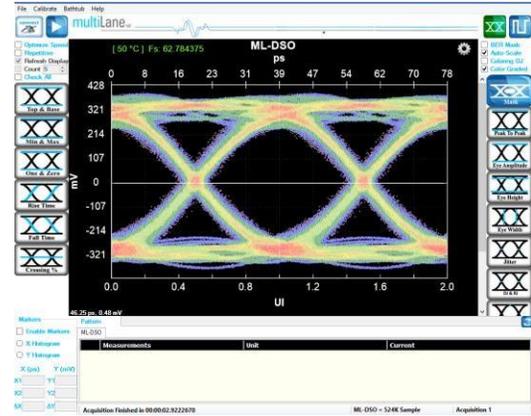
## Summary

The **ML4006** is a state of the art, ultra compact Digital Sampling Oscilloscope that can be ordered as either a 32 GHz or a 50 GHz bandwidth variant. The ML4006 is typically used +to characterize the quality of transmitters and receivers, implementing a statistical under-sampling technique with comprehensive software libraries used for eye measurements, jitter analysis and processing of NRZ and PAM4 data. With its extensive set of APIs, this scope is also very well suited for automated testing and quick go/no-go production validation.

## Key Features

- Low cost single-channel 32/50GHz equivalent-time sampling oscilloscope optimized for high speed data analysis.
- High Fidelity Signal Capture.
- Low intrinsic Jitter.
- User friendly GUI, high throughput APIs and libraries, supporting both Linux and Windows environments.
- Supports external API calls from other software such as LabView, Matlab, etc.
- Repeatable performance and traceability to standards.
- Single-ended and differential electrical inputs.
- Color graded persistence in eye and pattern capture modes.
- Capability to save statistical measurement and data files for multiple DSOs.
- Full eye measurements can be attained in the tens of milliseconds.
- Air-tight and robust shell made of machined aluminum, enables measuring in dusty and rough environments.

Single Channel Digital Sampling Oscilloscope providing SerDes testing & characterization for transmitter rates up to 50Gbps



## Applications

- High-Speed SerDes Testing & Characterization.
- Design/Verification of Telecom and Datacom Components and Systems.
- Electro-optical Transceiver Testing.
- Telecoms Equipment Test for Installation and Maintenance.
- Fiber Channel, 100G Ethernet, Infiniband, PON, Parallel Optics, etc.\* mask tests.
- Dusty and rough environments.

## DSO Measurements

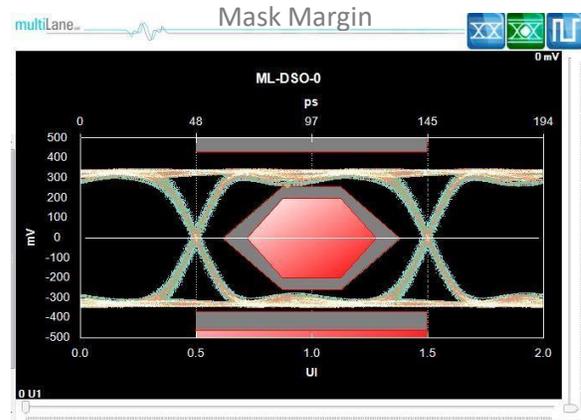
### NRZ Mode

- Total Jitter & Jitter decomposition:
  - DJ, RJ
- Mask Margin, alternate Mask Margin rules available.
- The mask margin (positive or negative) can be extracted for a defined number of points that fail, thus allowing for DUT quality assessment, control and binning.
- Number of failing points for a region can be returned as well as the actual points that failed.
- Eye opening, eye height and width, eye amplitude, top, base, max, min, peak to peak.
- Rise/ fall time, single edge measurement in pattern capture.

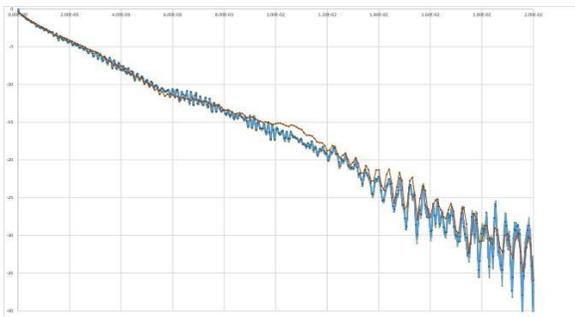
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- Statistics histograms and histogram measurements.
- Crossing percentage.
- Pre-emphasis positive & negative (amplitude width).
- Advanced Pattern Measurements
  - Eye measurements on specific properties of the pattern.
- Zooming, markers, X and Y histograms, overlays, and multiple measurements, statistics.



S21 Measurements



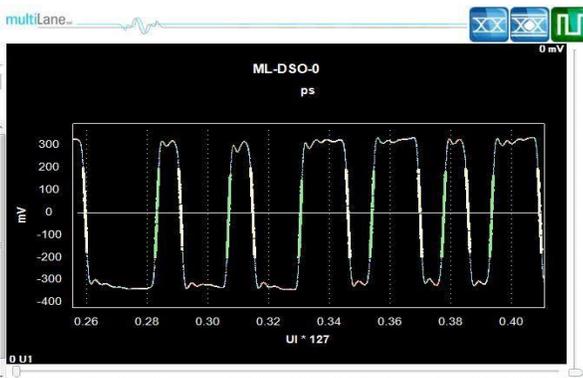
### PAM4 Mode

PAM4 scope measurements are currently following the OIF contribution: 2015.051.00

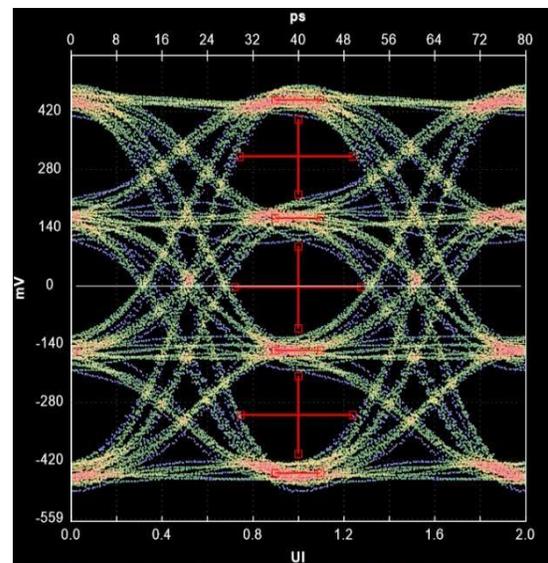
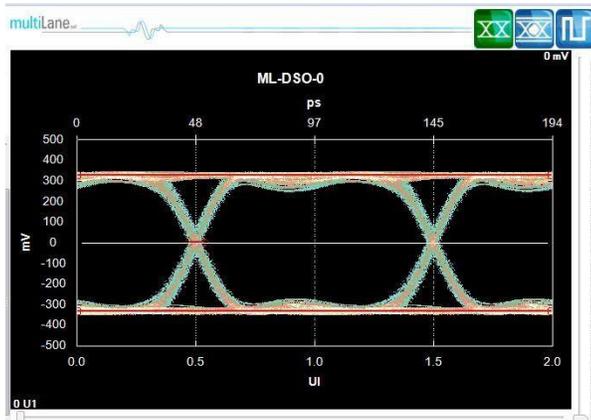
- PAM4 Measurements

PAM4 Measurements
Symbol Levels
Vertical Eye Amplitudes
Vertical Eye Openings
Horizontal Eye Openings
Vertical Eye Closure (dB)
Openings by BER
Max, Min, Peak-to-Peak...

Patten PN7 with PTB



Eye with PTB



- Statistics histograms and Histogram measurements.

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## Ordering Information

ML4006-32: 32GHz DSO

ML4006-32-CR: 32GHz DSO with clock recovery

ML4006-50: 50GHz DSO

ML4006-50-CR: 50GHz DSO with clock recovery

DSO Specifications						
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input Bandwidth (programmable)					32/50	GHz
Input Amplitude		S.E. / Diff.			600/1200	mVpp
Input Rise / Fall Time (20% to 80%)	$t_{RT}, t_{FT}$			14 for 32GHz 11 for 50GHz		pS
Diff. Input Return Loss		12.5 GHz 14 GHz	-22 -10			dB
Vertical Resolution				12		bits
Clock Input range (normal mode)			10KHz		750	MHz
Clock Input range (bypass mode)			10KHz		125	MHz
Clock Input Amplitude		SE	200		1000	mV
Clock Recovery				1 to 30.2		Gbps
Input Impedance	Z			50		$\Omega$
Intrinsic Jitter(excluding DDJ)		Note <sup>1</sup>			200fS	rms
Amplitude Error (rms)		Note <sup>2</sup>		4		mV <sub>rms</sub>
Data Format support		NRZ,PAM4				
PRBS Pattern Capture		Note <sup>3</sup>			PRBS13	
Spurious-Free Dynamic Range(sine wave)	SFDR		58 dBc at 10 GHz, 53 dBc at 30 GHz			
Memory depth				256k		Samples
Power rating				<1A @5Vdc		

1. Intrinsic Jitter is the additional jitter uncertainty of the DSO as the statistical sum of sampler, the timing generator and DSO interconnect.

2. Related to calibration time @600mV input over operating temperature range.

3. For all measurements that requires pattern lock. For all other measurements the DSO supports up to PRBS31.

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