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Marketing Datasheet

ML4025-TDR

4-Lane Sampling Scope
4-Lane True-Differential TDR / TDT

Time Domain Reflectometry
Time Domain Transmission
Jitter Components Decomposition
Eye Pattern Measurement
Eye Mask Test
Advanced Pattern Acquisition
Pre and Post emphasis Measurement
CDR Option
Impedance Test
Cable Evaluation
Return loss and Insertion loss
THD

ML4025-TDR

4x35 GHz TDR/TDT and DSO

Summary

The **ML4025-TDR** is a state of the art TDR/TDT and at the same time a Digital Sampling Oscilloscope with CDR. The DSO automatically performs accurate eye-diagram analysis at 35 GHz 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/PAM4 data. The true-differential TDR/TDT is used to determine the impedance profile, reflection and transmission losses of components on 4 channels simultaneously. It is designed for characterization as well as manufacturing.

The ML4025-TDR is only ½U cPCI and can measure TDR or TDT very accurately up to 5 meters.

It has a pulse rise time of 12ps that allows to resolve impedance discontinuities as close as 1.5mm apart. The dynamic range is 60dB.

Figure 1: ML4025-TDR

Key Features

TDR/TDT features

- High Resolution TDR/TDT measurements
- Low cost quadruple 35 GHz Time Domain Reflectometry / Transmission optimized for high speed tests and measurements

- Impedance Profile Measurement
- Determination of the magnitude and polarity of any back reflected signal
- 4 ports per module expandable up to 32 and more
- 4x35 GHz analog bandwidth
- Low power dissipation
- Sample aperture jitter below 60 fs

S-parameters

- Return loss
- Insertion loss
- Crosstalk
- Accurate multiport S-parameters

DSO features

- Low cost quadruple 35 GHz Digital Sampling Scope optimized for high speed data analysis
- High Fidelity Signal Capture
- CDR up to 30 Gbps
- Low intrinsic Jitter
- cPCI friendly interface, allows control of multiple modules through Fast Ethernet.
- User friendly GUI, high throughput APIs and libraries. The software supports both Linux and Windows.
- Supports external API calls from other software e.g. LabView.
- Repeatable performance and traceable to standards
- Single ended and differential electrical inputs for each of the four channels
- Color graded persistence in eye and pattern capture modes
- Ability to analyze and load captured data into the Simulator
- Capability to save statistical measurement and data files for multiple DSOs
- Full eye measurements can be attained in the tens of milliseconds

4-Channel Digital Sampling Oscilloscope providing SerDes testing & characterization

De-embedding

ML4025-TDR software enables de-embedding the effects of cables connected between scope and DUT by means of s2p / s4p files

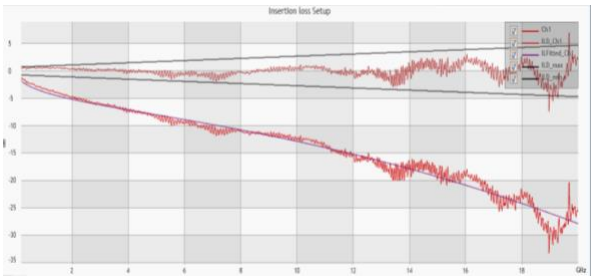


Figure 4: S21 + Mask

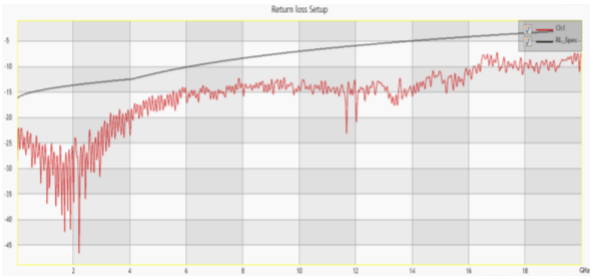
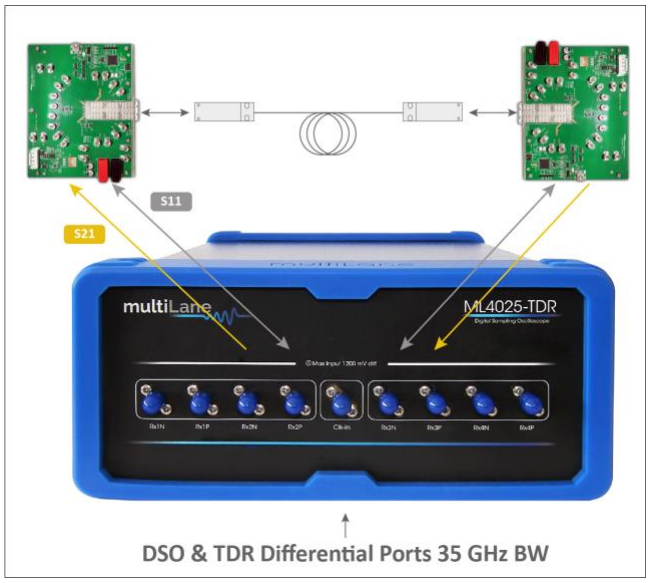


Figure 2: S11 + Mask

Applications

Direct Attach Copper Cable Testing



DSO Applications

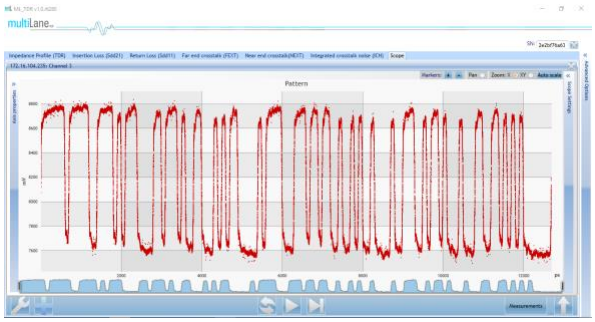
- High-Speed SerDes Testing & Characterization
- Design/Verification of Telecom and Datacom Components and Systems
- Electro-optical Transceiver Testing
- Multi-port system testing or Line Cards
- In-Situ testing of high port count systems
- Telecom Equipment Test for Installation and Maintenance.
- Fiber Channel, Ethernet, PON, Parallel Optics, etc*.
- High port count burn-in test.

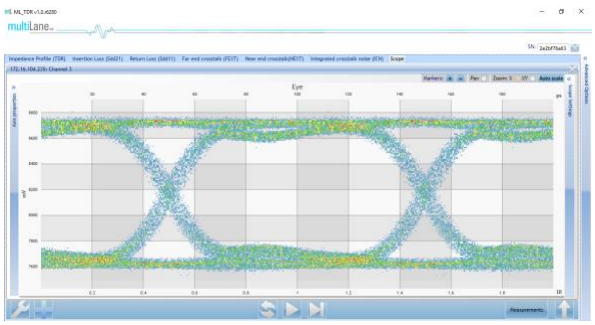
DSO Measurements

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

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…



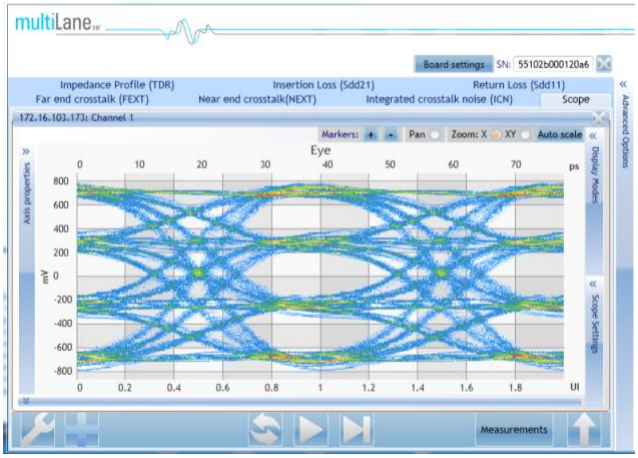


PAM4 Mode

PAM4 scope measurements are currently following the latest OIF contribution.

PAM4 Measurements

Statistics histograms and histogram measurements.



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Specifications

	Parameter	Symbol	Condition	Min	Typ	Max	Unit
DSO	Input Bandwidth (programmable)					35	**GHz**
	Input Amplitude		S.E./Diff.			600/1200	**mVpp**
	Input Rise / Fall Time (20% to 80%)	t_{RT}, t_{FT}			12		**pS**
	Vertical Resolution				12		**bits**
	Clock Input range (normal mode)			0.01		750	**MHz**
	Clock Input range (bypass mode)			0.01		125	**MHz**
	Clock Input Amplitude		SE	200		1000	**mV**
	Input Impedance	Z			50		**Ω**
	Intrinsic Jitter (excluding DDJ)		*Note[1]*			200	**fs rms**
	Amplitude Error (rms)		*Note[2]*		4		**mV rms**
	Data Format support		NRZ,PAM4				
	PRBS Pattern Capture		*Note[3]*			PRBS13	
	CDR sensitivity				100		**mV**
	Spurious-Free Dynamic Range (sine wave)	SFDR			58 at 10 GHz 53 at 30 GHz		**dBc**
	Memory depth				256k		**Samples**
TDR	Bandwidth (S&H)					35	**GHz**
	Input Voltage			-500		600	**mV**
	S&H Gain Flatness			-0.5		0.5	**dB**
	Diff Amplitude, step/PRBS		With 100Ω DUT termination	100		1000	**mVpp**
	TDR Resolution					1.5	**mm**
	Input/ Output Return Loss		2 GHz			-19	**dB**
			5 GHz			-19	**dB**
			10 GHz			-12	**dB**
			20 GHz			-8	**dB**
	Step Response, rise/fall		20% to 80%			12	**Ps**
	S&H Gain Flatness			-0.5		0.5	**dB**
	Feedthrough Rejection, TH2 holding		Clock Vppd = 0.5V		60		**dB**
	Clock Frequency		Square, >2V/ns slew	0		250	**MHz**
	Random Aperture Jitter					60	**fs**
	Power rating		1.6A @ 12 Vdc				

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