multiLane

DATASHEET

Innovation for the next generation

AT4025

Electrical Sampling Oscilloscope for Advantest 93K platform | 4 channels

Supports 400GAUI PAM4 Transmitter qualification | High throughput | High sensitivity | Cost effective | SMPM blind-mate RF interface

Summary

The AT line of products is highly integrated for the Advantest V93000 system and fits right underneath the load board, in the cavity of the test head extender. Due to this, the signal path to the DUT is kept extremely short.

The AT line of instruments is made to work for packaged silicon systems as well as for wafer probing and is meant to enable at-speed testing of SerDes, transceivers, amplifiers and other active and passive high-speed digital components. The AT family consists of pattern generators, error detectors and sampling oscilloscopes.

AT4025

Introduction

The AT4025 is a fully featured, cost effective four channels equivalent time sampling oscilloscope with an analog bandwidth of 35 GHz. The memory depth is 256 MSamples. Samples are 16-bit.

Typical Applications

- General time domain measurements of high-speed digital communication signals
- High-speed SerDes testing
- High port count burn-in testing
- Transceiver manufacturing test
- Transceiver evaluation and validation
- Qualification of PAM-N and NRZ drivers.
- TP1-a stress calibration

Key Features

The AT4025 family of DSOs is truly powerful, boasting an extensive set of features and functions that are unique in the industry. These include:

- Up to 100 MHz sampling rate
- Less than 5 seconds TDECQ on a SSPRQ pattern
- Fast pattern capture and DSP thanks to an FPGA-based architecture
- An extensive library of built-in DSP filters such as Bessel-Thomson, CTLE, DFE, FFE, de-embedding and component emulation, all available free of charge in the standard GUI.
- User-writable calibration constants
- Can be calibrated up to the DUT to include losses of test fixtures and cables
    - Built-in standard masks library
    - A complete set of APIs and multiple SmarTest sample code to speed up integration

Electrical Specifications

Parameter	Specifications
Data format support	NRZ and PAM-4
Intrinsic jitter	200 fs rms
Input Swing Max	1400 mVpp
Rise/Fall Time	9.5 ps
Vertical resolution	16 bits
Electrical channel bandwidth	35 GHz
Electrical channel connectors	SMPM blind mates
Clock input bandwidth	0.1 – 4.4 GHz
Clock input swing	225 ~ 1800 mVpp
Sampling frequency	70 ~ 100 MHz
Input and Output	AC coupled
Memory	256x16 MSa. (shared bw. 4 channels)
Pattern Capture	Up to PRBS-16 and SSPRQ
SFDR (sine wave) 50 mVpp 1 GS/s	-58 dBc at 10 GHz -53 dBc at 30 GHz
Normal Operating Temperature	0 - 60 °C
Instrument Automatic Shutoff	65 °C (manual reboot is needed to turn it back on)
Air Supply Flow	0.6 – 3 CFM
Air Temperature	0 - 40 °C
Power rating	12V, 1.26A

Supported Measurements

Coding	Measurement
PAM-4	TDECQ
	SNDR
	RLM
	OMA_{outer}
	Eye Height by BER
	Eye Width by BER
NRZ	Top & Base
	Min & Max
	One & Zero
	Transition Time
	Crossing %
	AOP
	OMA
	Mask Margin
	Peak to Peak
	Eye Amplitude
	Eye Height
	Eye Width
	Jitter
	SNR
	ER
	VEC
	Vrms
	DJ & RJ
	Noise

Supported DSP Functions

- Frequency response correction of O/E & analog front end.
- Bessel Thomson 4th Order
- CTLE Adaptive/manual
- FFE Adaptive/manual
- DFE Adaptive/manual
- De-embedding S4P
- Emulating S4P
- Normalizing Filter
- Moving average

Applying Filters

Several filters including FFE, DFE, CTLE, Bessel-Thomson, etc are available in NRZ as well as PAM mode. Concatenation of several filters is also possible, and the effect of each filter is shown immediately on the eye or pattern.

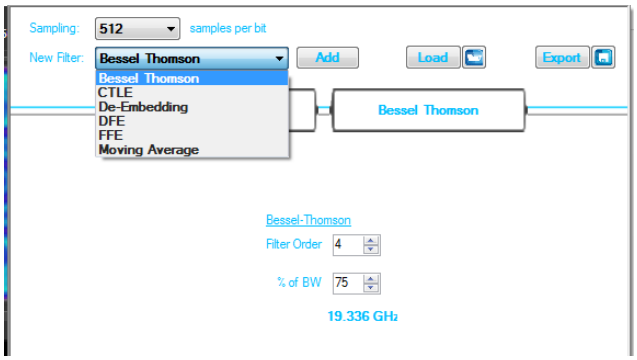


Figure 1: Applying Filters

One may also import s2p or s4p files to de-embed fixtures.

A very useful function in determining the ideal CTLE gain for a given trace or the FFE number of taps for a certain target amplitude is the adaptive equalization feature available in the DSO.

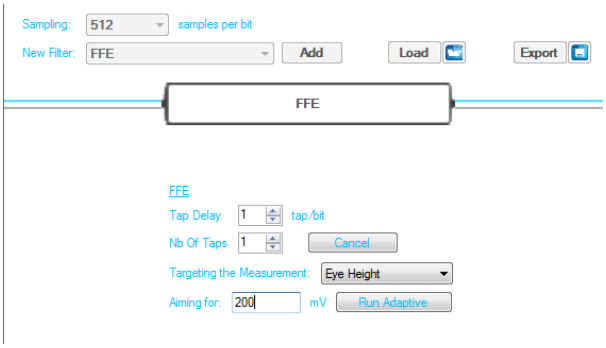


Figure 2: FFE Filter

Measuring Insertion Loss

If you have a source such as an ML BERT, you can measure the insertion loss (S21) of your device using the DSO. The available dynamic range is 70 dB. The user is guided through the process by a wizard.

Figure 3: S Parameter Mode

Spectrum Analysis view & THD

The DSO uses DFT to derive the spectral content of the signal present at the input. It also calculates the Total Harmonic Distortion figure.

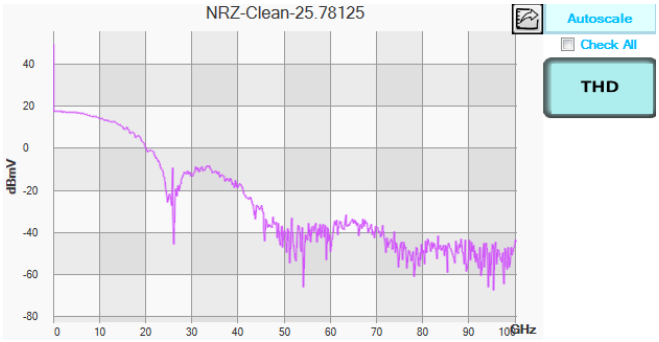


Figure 4: Frequency Domain Mode

Mechanical Dimensions

The AT4025 is customized to fit and seamlessly function inside an Advantest HSIO test head extender. One cassette can host two AT4025; you can fit a total of 4 such cassettes in a V93K tester.

Dimensions: 265.6 x 33.2 x 58 mm^3

Annex A: PAM4 and NRZ Sample Measurements

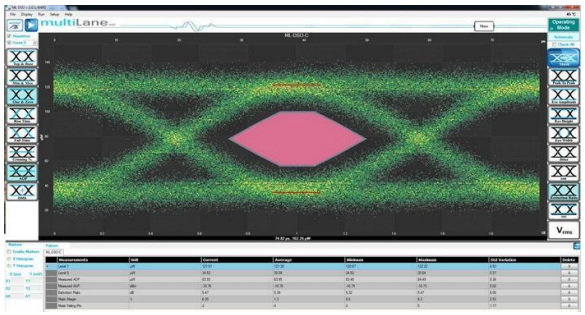


Figure 5: Mask Margin

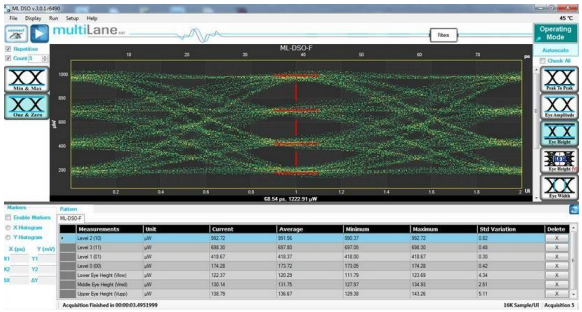


Figure 6: PAM4

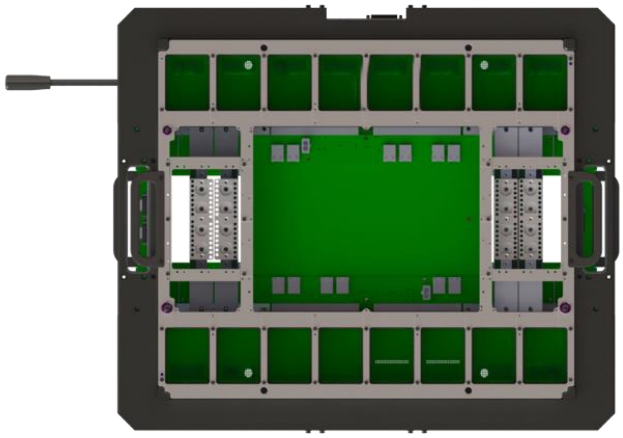
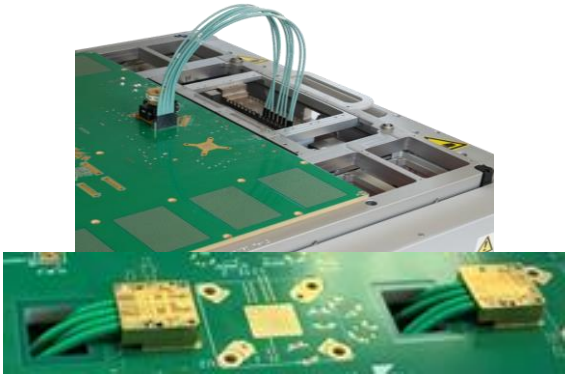


Figure 7: Four ML cassettes mounted in an Advantest V93K HSIO test head extender frame

Cables

In order to connect the instrument through the stiffener to the load board, two cables set can be used:

- Vertical or right angle 1x8 coreHC to SMPM cable: allowing direct connection between instrument and load board



- 1x8 coreHC to 1.85mm cable combined with a 1.85mm to SMPM cable (bought from MultiLane), allowing connection between instrument and load board or external source

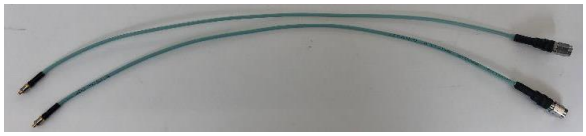


Figure 8: MultiLane SMPM-BM to 1.85mm cable

Figure 9: 8 channel coreHC to 1.85mm cable

AT4025 Pinout

Channels are numerated as shown in the below picture, taking as reference the backplane connector, beginning with RX1-N, RX1-P to RX4-N, RX4-P. Below picture shows 1 AT4025 installed into a cassette, but 1 AT4025 can also be installed with a different MultiLane instrument on the other cassette side.

Ordering Information

Option	Description
AT4025	4 CH Electrical Oscilloscope
1YW	1-year standard warranty
3YW	3-year warranty
CAL	Single calibration
3YWC	3-year warranty + 3 annual calibrations

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