multiLane

DATASHEET

Innovation for the next generation

AT4039EML

4-Channel | 56 Gbaud PAM4 & NRZ | Bit Error Ratio Tester 400G | Integrated EML Laser Driver |SE

SSPRQ, PRBS13Q & PRBS31Q | TX and RX Equalizers | Signal SNR and Histogram | High Voltage Amplitude |

Summary

The Multilane AT line of automated test equipment products are highly integrated solutions for the Advantest V93000 system and fit right underneath the load board, in the cavity of the test head extender. Due to its compact design, the signal path from high-speed instrument to the DUT is kept extremely short which is extremely important for sourcing and measuring signals at these ultrahigh data rates.

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

AT4039EML

Introduction

The AT4039EML is a full featured 400G BERT that can be configured as four-channel single-ended PAM4 56 GBaud Tx lanes or four-channel single-ended NRZ 56 Gbps Tx lanes, with four channel differential RX lanes.

Half rates around 28 GBd are also supported.

The GUI allows you to individually control each TX level, equalization, eye balance, pattern and Gray coding. The user may also inject error sequences into the stream. The receiver features CTLE and FFE equalization; it also allows advanced troubleshooting capabilities by showing separate LSB and MSB BER, offering targeted error-insertion and allowing real-time monitoring of the received signal levels histogram, SNR and receiver equalizer tap values.

Key Features

- Low cost, instrument-grade BERT optimized for high-speed data analysis of 100G/200G/400G transceivers
- The wide range of bitrate coverage allows PHY testing for Ethernet, HDMI 2, USB 3.1, PCIe, Fiber-Channel and other high-speed serial bus standards
- Ability to tune the bit rate in very fine steps to facilitate finding the locking margin
- FEC support
- PRBS13Q/15Q/31Q support and user-defined patterns support
- Advantest SmarTest API library, sample code and Python wrapper.

Target Applications

High-speed Transceiver Testing

- Validation Test
- Production Wafer Sort Test
- Production Package Test
- Multisite Testing

Mechanical Dimensions

The AT4039EML is customized to fit and seamlessly function inside an Advantest HSIO test head extender. Each instrument cassette can host up to 2x AT4039EML; you can fit a total of 4 such cassettes in a V93K tester for a 32-lane count configuration.

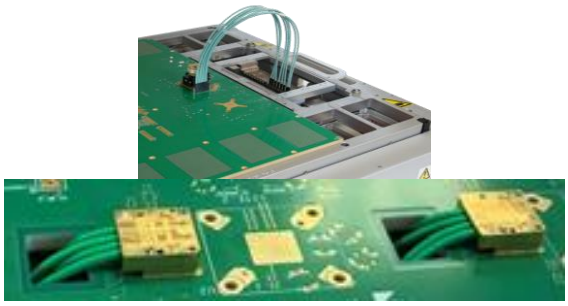
4-ch single-ended Tx and 4-ch differential Rx are accessed from the DUT loadboard through high-speed cables to SMPM blind mate connectors

Figure 1: Four ML cassettes mounted in an Advantest V93K HSIO test head extender frame

Cables

Because the AT4039EML is located directly below the loadboard, shorter cables can be used. To connect the instrument through the stiffener to the device load board, some cable set examples are shown here. Check with Multilane for the best cabling options for your application:

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



- 1x8 coreHC to 1.85mm cable combined with a 1.85mm to SMPM cable, allowing direct blindmate connection between instrument and load board or external source

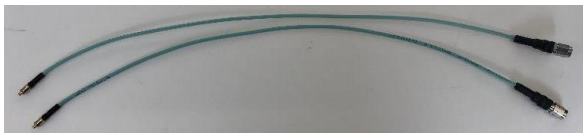


Figure 2: MultiLane SMPM-BM to 1.85mm cable

Figure 3: 8 channel coreHC to 1.85mm cable

Electrical Specifications

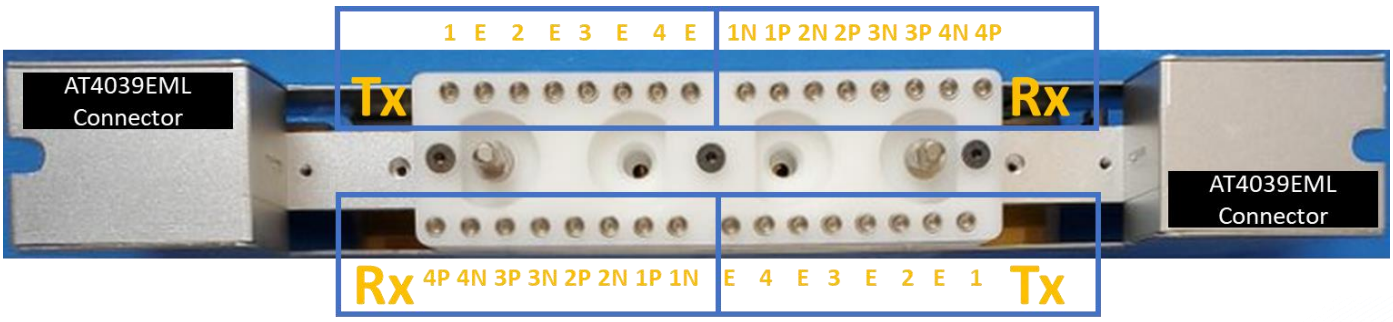
Parameter	Specifications
Bit Rates	23 – 29 GBaud and 46 – 58 GBaud (PAM4 or NRZ)
TX Amplitude (SE)	0 - 1800 mV
Patterns	PRBS 7/9/11/13/15/16/23/31/58 - PRBS13Q, 31Q and SSPRQ Square wave, User Defined
TX Amplitude Adjustment	Steps of 1 mV
Pre- / Post-emphasis	6 dB
Pre-Emphasis Resolution	1000 steps
Equalizing Filter Spacing	1UI
Random Jitter RMS	230 fs
Rise/ Fall Time (20–80%)[1]	10 ps
Coding	DFE Pre-coding and Gray coding supported
Output Return Loss up to 10GHz	< -15dB
Output Return Loss (16-25GHz)	< -10dB
Error Detector input range	50 mV– 800 mV diff.
Total DFE/FFE/CTLE Equalization	Up to 13 dB

[1] With appropriate pre and post emphasis settings and 50 GHz scope

Error-detector VGA dynamic range	± 2 dB
TX/RX connectors	SMPM (M) Mating connector is SMPM (F)
Monitor clock Output	Rate div 16/32/128/256
Diff. Input Return Loss	Maximum -10 dB
Histogram	160 levels. Reports Counts/level based on 2^{20} bits
Clock Input Range	Up to 4.4 GHz
Clock Input Amplitude	200 - 1000 mV
Input Impedance	50 Ω
Instrument Automatic Shutoff	70 °C
Normal Operating Temperature	0 - 60 °C
Air Supply Flow	0.6 – 3 CFM
Air Temperature	0 - 40 °C
Power	12 V, 1.35A

AT4039EML Pinout

Tx is single-ended. Rx is differential. Channels are numerated as shown in the below picture, taking as reference the backplane connector, beginning by TX row with TX1 to TX4, leaving 1 pin empty between adjacent channels, and then by RX row with RX1-N, RX1-P to RX4-N, RX4-P. Below picture shows 2 AT4039EML installed into a cassette, but 1 AT4039EML can also be installed with a different Multilane instrument on the other cassette side.



Ordering Information

Option	Description
AT4039EML	4-Lane BERT
1YW	1-year standard warranty
3YW	3-year warranty
CAL	Single calibration
3YWC	3-year warranty + 3 annual calibrations

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