

Innovation for the next generation

# AT4039E

4-Channel 56 GBd PAM & NRZ |  
400G BERT

4 x 56 GBd NRZ/PAM-4 BERT | SSPRQ, PRBS13Q &  
PRBS31Q | TX and RX Equalizers | Signal SNR and  
histogram



## 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.

# AT4039E

## Introduction

The AT4039E is a fully featured 400G BERT that can be configured as a 4-channel PAM4 56 GBaud or 4-channel NRZ 56 Gbps lanes. Also, half rates of 28GBd are supported in PAM4 and NRZ modes.

The transmitters support all standard test patterns mandated by IEEE and OIF such as PRBS13Q, SSPRQ, PRBS31Q, etc...

The user may also program the TX to output a user-defined pattern up to 131 kb long.

## Key Features

- Low cost, instrument-grade BERT optimized for high-speed data analysis of 100G/200G/400G transceivers
- Ability to tune the bit rate in very fine steps to facilitate finding the locking margin
- FEC support
- Up to 0.8 Vppd output swing
- Supports Gray coding and polarity inversion
- PRBS13Q/15Q/31Q support and user-defined patterns support
- Advantest SmarTest API library, sample code and Python wrapper.
- Adaptive DFE and FFE with reflection canceller and MLSD
- Programmable front-end attenuator
- LOS indicators
- PAM histogram monitor
- PAM slicer threshold adjustable

## Target Applications

High-speed Transceiver Testing

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

## Mechanical Dimensions

The AT4039E is customized to fit and seamlessly function inside an Advantest HSIO test head extender. Each instrument cassette can host up to 2x AT4039E; you can fit a total of 4 such cassettes in a V93K tester for a 32-lane count configuration.

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

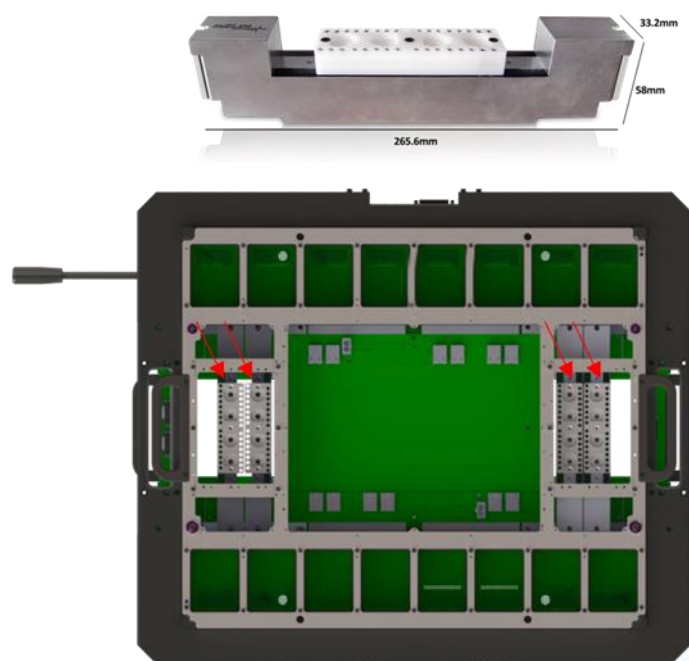
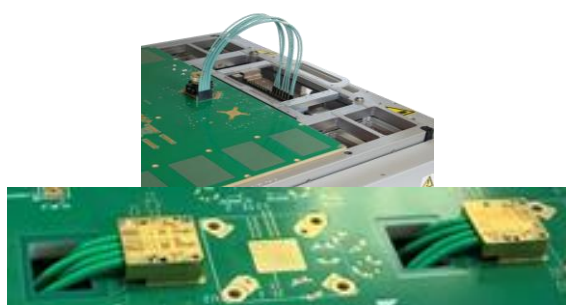


Figure 1: Four ML cassettes mounted in an Advantest V93K HSIO test head extender frame

## Cables

Because the AT4039E 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

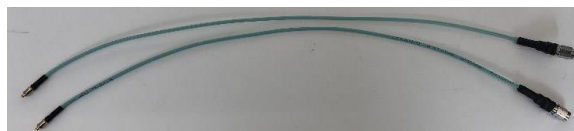


Figure 2: MultiLane SMPM-BM to 1.85mm cable

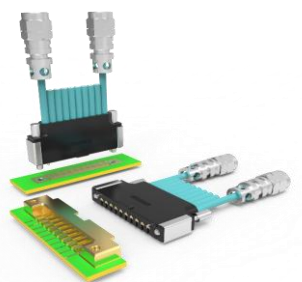


Figure 3: 8 channel coreHC to 1.85mm cable

## Electrical Specifications

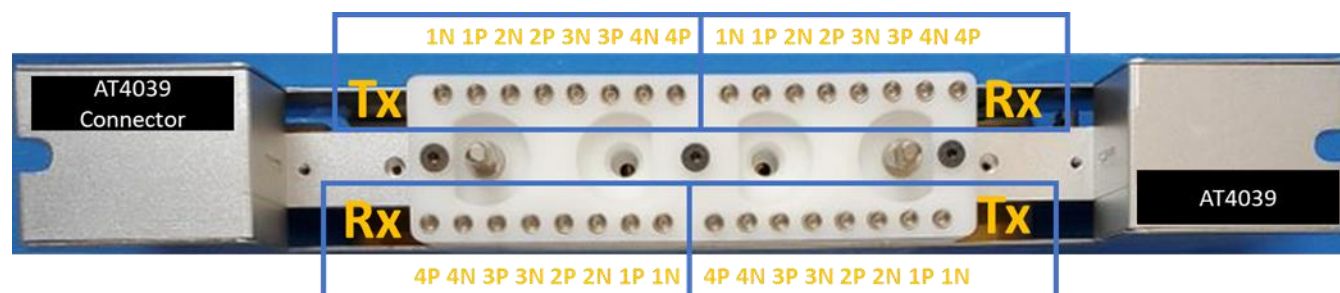
Parameter	Specifications
Bit Rates	23 – 29 GBaud and 46 – 58 GBaud
TX Amplitude Differential	0 - 800 mVpp
Patterns	PRBS 7/9/11/13/15/16/23/31/58 PRBS13Q, 31Q and SSPRQ Square wave
TX Amplitude Adjustment	Steps of 1 mV
Pre- / Post-emphasis	6 dB
Pre-Emphasis Resolution	1000 steps
Equalizing Filter Spacing	1UI
Random Jitter RMS	<290 fs <sup>1</sup>
Rise/ Fall Time (20–80%)	<10 ps
Coding	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
TX/RX connectors	Blind-mate SMPM
Reference clock Output	Rate div 16/32/128/256
Differential Input Return Loss	Better than 10 dB
Clock out amplitude (SE/Diff)	0.9/1.6 Vpp

<sup>1</sup> With appropriate pre and post emphasis settings and 50 GHz scope. Trigger from adjacent data channel rate/8

Parameter	Specifications
Eye monitor resolution	8 bits horizontal across 2UI / 9 bits vertical
Clock Input Range	Up to 4.4 GHz
Clock Input Amplitude (SE/Diff)	1/2 Vpp
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, 0.88A

## AT4039E Pinout

Channels are numerated as shown in the below picture, taking as reference the backplane connector, beginning by TX row with TX1-N, TX1-P to TX4-N, TX4-P, and then by RX row with RX1-N, RX1-P to RX4-N, RX4-P. Below picture shows 2 AT4039E installed into a cassette, but 1 AT4039E can also be installed with a different MultiLane instrument on the other cassette side.



## Ordering Information

Option	Description
AT4039E	400G BERT (4 CH 56 GBd NRZ/PAM4)
1YW	1-year standard warranty
3YW	3-year warranty
CAL	Single calibration
3YWC	3-year warranty + 3 annual calibrations

Please contact us at [sales@multilaneinc.com](mailto:sales@multilaneinc.com)