multiLane

Innovation for the next generation

ML4039-BTP

4 Lane 8.5-15 & 21-30 Gbps 100G Bit Error Rate Tester

Vertical & Horizontal Eye Closure | Bathtub Curve Measurement | Eye Contour Measurement | Receiver Sensitivity | Jitter Tolerance |

Summary

With the accelerated growth of hyperscale datacenters, the performance demands on Ethernet network infrastructure is increasing exponentially, and customer expectations for high-speed data throughput is at an all-time high. As a result, Bit Error Rate Testers (BERT) have become a cornerstone for physical layer testing, from qualifying bit transmission for fiber optic and copper-wire digital data transmission lines to testing signal integrity.

A BERT generates a sequence of bits through a communication channel and the received bits are then compared against the transmitted bits. A Bit Error Ratio (BER) evaluates the full end-to-end performance of a connectivity system and assures communication reliability.

The ML4039-BTP is a 4x30 Gbps BERT that supports NRZ signal generation required for 100G measurements. It is ideally suited for the production testing of systems, components, and Electro-Optical Modules. It supports the required test patterns defined by IEEE and OIF. Other features include signal-to-noise ratio (SNR) and histogram measurements, as well as transmitter and receiver equalizers.

ML4039-BTP

4 Channel 30 Gbps BERT

Introduction

The ML4039 series is a state-of-the-art 4 Lane Pulse Pattern Generator and Error Detector with Jitter Generator as well as Equalizer up to 30 Gbps. It is fully equipped for lab and production testing of systems, components, and Electro-Optical Modules and O-optical modules.

Key Features

Transmit

- Data Rates: 8.5-15 & 21-30 Gbps
- Low intrinsic jitter
- Ability to tune the bit rate in steps of 100 kbps and find the RX PLL locking margin
- Automated J2/J9 measurement
- Independent control of inner eye levels
- Up to 0.8 Vppd output swing

Available patterns are:
- PRBS 7/8/15/23/31 and their inverses
- Error injection
- 3-tap LUT-based Pre- and Post-emphasis or

Receive

- Programmable front-end attenuator
- Error-detection on following patterns:
  - PRBS 7/9/15/16/23/31
- Automatic pattern detects
- LOS indicators.

General

- LabView driver and Python wrapper available.
- API libraries with documentation.
- Same product available in ATE format for Advantest 93K system.

Target Applications

- Production testing of transceivers.
- Functional and SI testing

ML BERT GUI

- Tests 4-channel BER test at the same time
- Supports BER curve
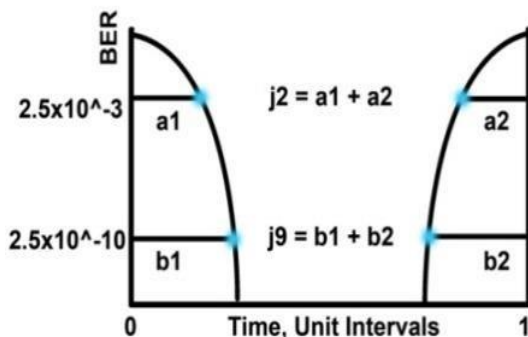- Provides multiple and single layouts of bathtub and eye contour
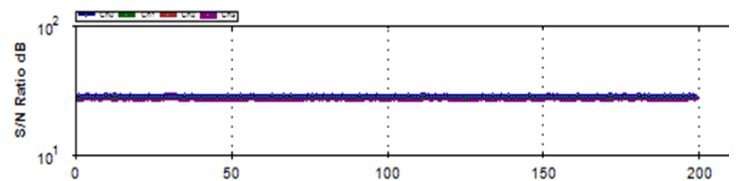

Figure 1: Bathtub curve for J2/J9
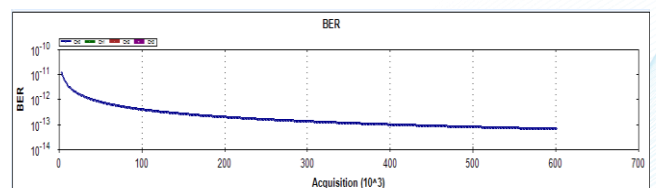

Figure 2: S/N Ratio over 200 captures

Figure 3: BER curve for one channel with 1 error inserted at the MSB and LSB respectively

Electrical Specifications

Parameter	Specifications
Bit Rates	8.5-15 and 21-30 Gbps
Bit Rate Accuracy	Better than ±20 ppm[1]
Data Format	NRZ
Pattern	PRBS 7, 9, 15, 23, 31, and User Defined Pattern 16 bits@10G & 40 bits@25G
TX Amplitude Differential	200 - 800 mV[2]
TX Amplitude Adjustment	Steps of 200 mV
Pre-Emphasis	6 dB
Pre-Emphasis Resolution	20 steps
Equalizing Filter Spacing	-
Total Jitter pk-pk @10G	10 ps (typical)
Total Jitter pk-pk @25G	12 ps (typical)
Rise/Fall Time (20–80%) @25G	< 14 ps[3]
Sinusoidal Phase Modulation	-
Sinusoidal Jitter Frequency	-
Random Jitter in Phase Modulation	-
Output Return Loss up to 10GHz	-15 dB
Output Return Loss (16-25GHz)	-8 dB
TX Skew Control Range	-
Lane to Lane Skew Resolution	-
Error Detector Phase Margin	5 ps
Error Detector Input Amplitude	110-1050 mVpp @11G, 1200 mVpp @25G
Error Detector Maximum Input	1200mV Diff
Error Detector Input Sensitivity	30 mVpp @ 10.3125G / 50 mVpp @ 28G
Phase Scan Resolution	7 bits
Vertical Scan Resolution	8 bits
Input CTLE Dynamic Range	10 dB
Reference Clock Output	Rate/32 for 8.5-15G and Rate/80 for 21-30G
Reference Clock Output Amplitude	550 - 850 mVpp
Reference Clock Input	Rate/32 for 8.5-15G and Rate/80 for 21-30G
Reference Clock Input Amplitude	300 - 1900 mVpp
Clock Data Recovery	Rate/N (user selectable from 8 and 16)
Power Requirement	21.5 Watt

---

[1] At bit rates between 19 and 30 Gbps

[2] Output amplitude setting error: ±50 mV ±17% of setting amplitude

[3] Test condition is differential, PRBS7, 70 GHz-bandwidth sampling scope with a 80 cm phase-matched K (2.92mm) cable pair.
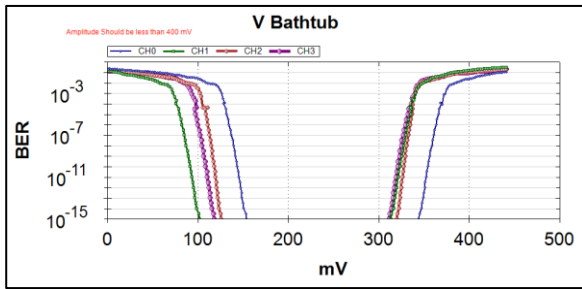
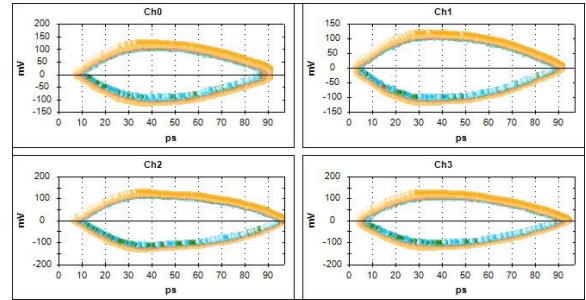Figure 4: Multiple layouts of bathtub for four channels

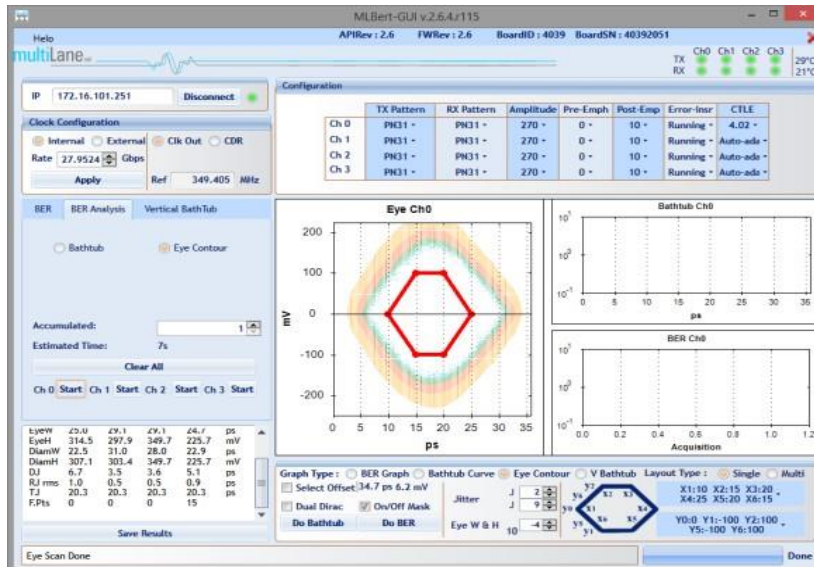Figure 5: Multiple layouts of eye contour for four channels

Figure 6: Single layout of Contour for one channel

Mechanical Dimensions

The ML4039 is a benchtop instrument that fits in a 19-inch 2U rack. Two ML4039s arranged side by side take up one 2U slot in your rack. MultiLane also supplies the needed brackets.

Ordering Information

Option	Description
ML4039	4 Channels 30 Gbps BERT
3YW	Total 3-year warranty
CAL	Single calibration
3YWC	Total 3-year warranty + 3 annual calibrations

Recommended Accessories

Instruments	Recommended *Phase matched cable pairs*	Alternative *Phase matched cable sets*	Comments
ML4039-BTP	8x MLCBPM-2.92-30	2x MLCBPM-2.92-30-8	2.92 mm connector 2x8 channel 30 cm
ML4039-BTP	8x MLCBPM-2.92-60	2x MLCBPM-2.92-60-8	2.92 mm connector 2x8 channel 60 cm

Please contact us at sales@multilaneinc.com.