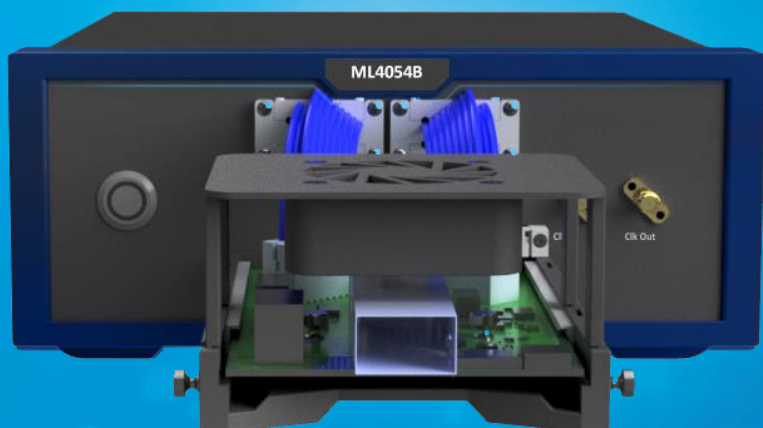


Innovation for the next generation



ML4054B

400G BERT Production Tester |
QSFP-DD, OSFP, QSFP MSA
Compliant Interfaces |

Benchtop version | Low-profile version for in-situ
oven tests | PAM4 & NRZ BERT | Replaceable
adapters |

Summary

[Preliminary datasheet](#)

The latest introduction to the MultiLane BERT family is the ML4054B. It is a fully featured 400G BERT that directly includes an MSA compliant adapter for either QSFP-DD, OSFP or QSFP. These adapters are suitable for volume transceiver testing, since they can be replaced easily after exceeding the insertion lifetime of the connector. ML4054B simplifies production testing by eliminating the external cabling and is designed for 400G applications.

The passive MSA compliant adapters drive the signals from the BERT to the QSFP-DD, OSFP or QSFP host connectors and support all QSFP-DD, OSFP, QSFP features and pin mappings. At the receiver side, an octal port CDR device is implemented, able to recover up to 53.125 Gbps PAM4 or 26.5625 Gbps NRZ signals.

MultiLane offers other MSA compliant adapters as well. The exposed adapter can function in a wide range of temperatures for thermal validation purposes. A unique feature of MultiLane's 400G BERT is the ability to offer real hardware FEC testing and quantify the true performance margin of an optical transceiver or transmission link.

ML4054B

400G Manufacturing BERT

Introduction

The ML4054B is a fully featured 400G BERT. It has a cabled interface to QSFP-DD, OSFP and other adapters that are at the same time connector savers and are suitable for testing in an oven and can be replaced by the customer on the fly.

This instrument facilitates production testing since no external cabling is needed. It comes in two different form factors: benchtop and low profile. The low-profile version can be directly mounted on the door of the temperature chamber, as per description below.

The GUI allows you to individually control each TX level, equalization, eye balance, pattern and coding. The user may also inject error sequences into the stream. The receiver features CTLE and FFE equalization for up to 14 dB of loss at Nyquist; it also allows advanced troubleshooting capabilities.

Key Features

- Low cost, instrument-grade bit error rate tester optimized for high-speed data analysis of 200G/400G transceivers.
- Cabled interface to the adapter for optimum signal integrity.
- Adapters available are QSFP-DD, OSFP, QSFP and a host of other types upon request
- Integrated BERT and host controller enable:
 - RX CTLE tuning
 - TX Equalization control
 - Current sensing per module
 - Voltage sense
- Ability to tune the bit rate in very fine steps to facilitate finding the locking margin.
- Excellent insertion loss characteristics of the connector saver

- Supports PRBS13Q/31Q and user-defined patterns.
- Performs all the measurement functions of the BERT, and a QDD/OSFP/others host in terms of I2C control for configuration, monitoring and functions.
- Features industrial components, suitable for reliability testing inside an oven over a wide temperature range.
- Low power consumption.
- API library, sample code and Python wrapper.

Target Applications

- Production testing of transceivers
- Benchtop testing for functional and SI functionality
- On-the-go testing of transceivers in the field
- The exposed adapter can be used from -5 to 85C for in-situ AC tests
- Transceiver functional tester, for simple validation

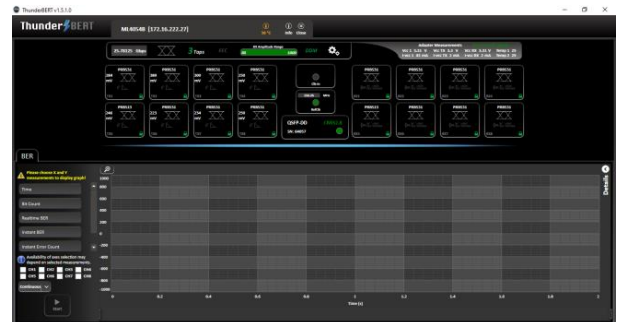


Figure 1: ML4054 - ThunderBERT GUI tab



Figure 2: Digital Diagnostic Monitoring (DDM) tab

Block Diagram – Schematic

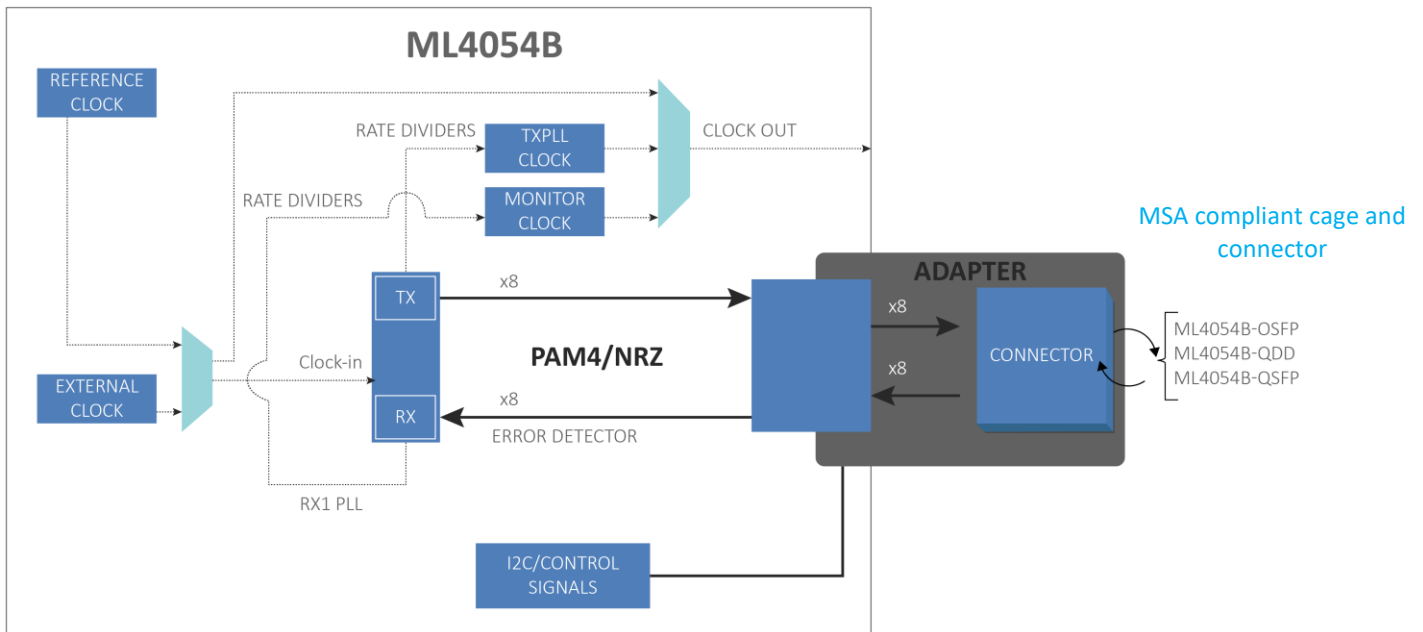


Figure 3: ML4054B with adapters

ThunderBERT GUI

The ThunderBERT GUI is intuitive and responsive to perform different kinds of tests and measurements as well as the control of every aspect of the 5054B platform.

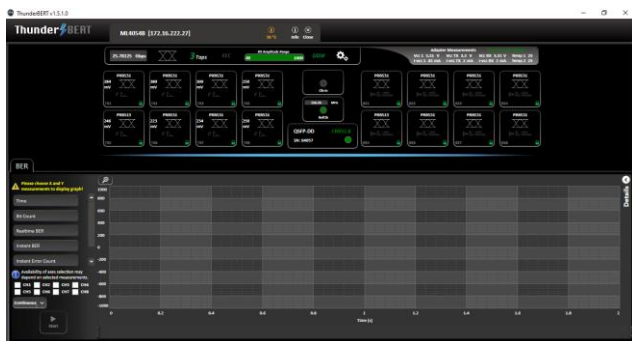


Figure 4: Main GUI

Low-profile Version

Features the same hardware inside a special enclosure that mounts on the door of a MultiLane-approved temperature chamber, which is part of MultiLane’s MLT8000 thermal solutions.



Figure 6: Low profile ML4054B, mounted on custom oven door (MLT8000)



Figure 5: Low profile ML4054B

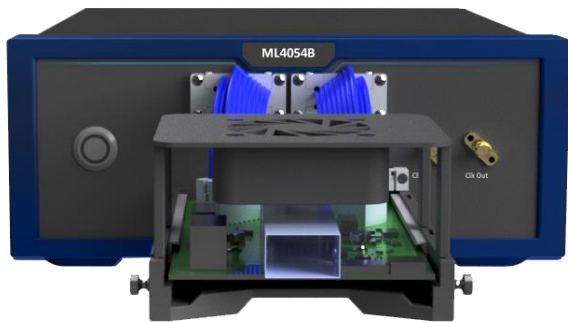


Figure 7: ML4054B with adapter

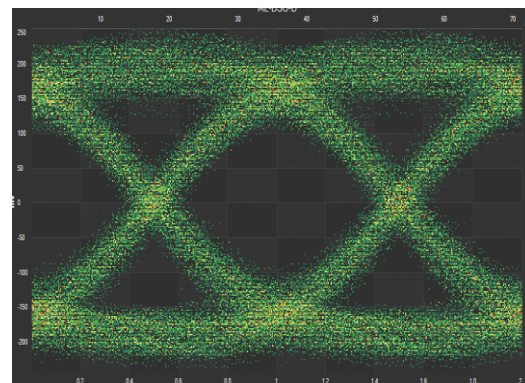


Figure 9: Raw un-equalized 28 Gbps Signal after passing through the QDD adapter followed by a QDD HCB and 40 cm SMA cables

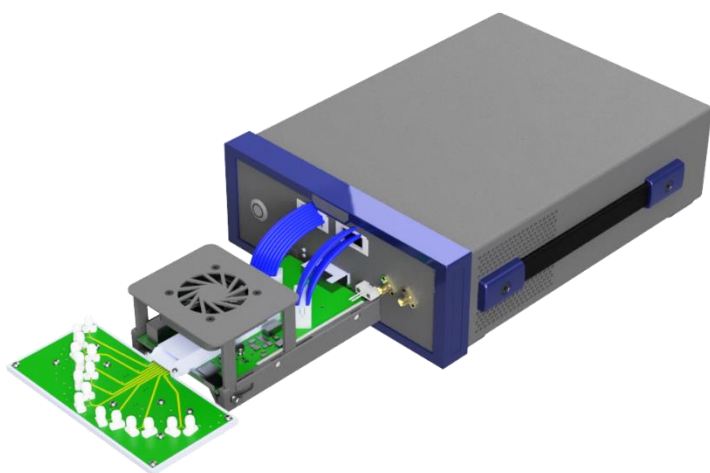


Figure 8: ML4054B with fan fixture and HCB (host compliance board)

Available Adapters

- ML4054B-OSFP
 - ML4054B-QDD
 - ML4054B-QSFP
- Other MSAs upon request

Electrical Specifications

Details	
Bit Rates	PAM-4: 7 – 29 GBaud NRZ: 1.12 – 1.54, 2.24 – 6.1 & 6.6 – 29 Gbps
TX Amplitude Differential	0-800 mVpp
Patterns	PRBS 7/9/11/13Q/15/23/31Q/58/9_4 JP083B, IEEE 802.3bs, OIF-CEI-3.1 User defined
TX Amplitude Adjustment	Steps of 2 mV
Pre-Emphasis Resolution	±1000 steps
Equalizing Filter Spacing	1UI
Random Jitter RMS	TBD
Rise / Fall Time (20–80%)	TBD
Coding	DFE Pre-coding Gray coding FEC –KP4, -KR4
Error Detector sensitivity	TBD
Error Detector CDR	Supported
Error Detector Equalizer	10 tap with gain and offset compensation. 3pre- and 6 post-cursors Or 1 tap FFE slicer And 1 tap optional DFE filter And optional 16 tap reflection canceller And level-dependent equalizer for the inner eye levels
Input Equalizer Dynamic Range	Up to 30 dB
TX/RX connectors	QSFP-DD, OSFP, QSFP, or other MSAs upon request
Reference clock Output	TBD
Eye histogram resolution	8 bits horizontal across 2UI / 9 bits vertical
Clock Input Range	Rate dependent
Clock Input Amplitude	200 - 1200 mV
Clock Input Impedance	50 Ω
Temperature range	-15 to 70 °C
Weight	~1.5 kg
Dimensions LxWxH (cm)	40 x 22 x 9
Adapter mating cycles	Over 300 cycles

Mechanical Dimensions

The ML4054B is a benchtop instrument that fits in a 19-inch 2U rack. Two ML4054Bs arranged side by side take up one 2U slot in your rack. MultiLane also supplies the needed brackets.



Ordering Information

Part Number	Description
ML4054B	Benchtop version
ML4054B-LP	Low profile version
ML4054B-TK	Thermal chamber kit, included in ML4054B-LP
3YW	Total 3-year warranty
CAL	Single calibration
3YWC	Total 3-year warranty with 3 annual calibrations
FEC	Real Hardware FEC Analysis

Recommended Accessories

Part Number	Description
ML4054B-QDD	QSFP-DD adapter
ML4054B-OSFP	OSFP adapter
ML4054B-QSFP	QSFP adapter

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