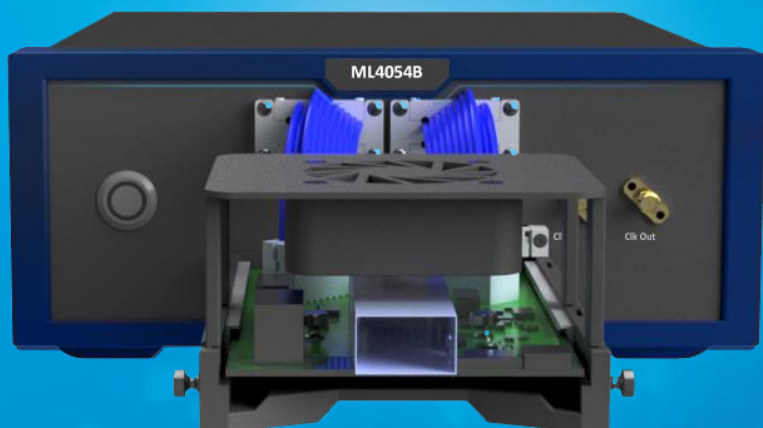


Innovation for the next generation



ML4054B

400G BERT Production Tester |
QSFP-DD, OSFP, QSFP MSA
Compliant Interfaces | CMIS 3.0/4.0

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

Summary

The ML4054B's is a 400G manufacturing BERT specifically designed to simplify production testing. This fully featured tester supports real hardware FEC testing, and can quantify the true performance margin of optical transceivers or transmission links. CMIS support allows the ML4054B to provide full visibility and control of the different CMIS variables the interface enables, and to test modules for CMIS compliance across all supported form factors. An octal port CDR device is implemented on the receiver side, which can recover up to 58 Gbps PAM4 or 29 Gbps NRZ signals.

The ML4054B's seamless design eliminates external cabling and includes a removable MSA compliant adapter, which can be configured for QSFP-DD, OSFP, and QSFP. These adapters drive the signals from the BERT to the host connectors and support all QSFP-DD, OSFP, or QSFP features and pin mapping. Adapters are easily replaceable after exceeding the insertion lifetime of the connector making the ML4054B ideal for volume transceiver testing. MultiLane can also fit the ML4054B with other MSA compliant adapters on request.

The ML4054B uses MultiLane's flagship ThunderBERT GUI, providing a comprehensive outlook of every aspect of the testing process.

ML4054B

400G Manufacturing BERT

Introduction

The ML4054B is a fully featured 400G BERT with an integrated module interface, ideal for product development and validation, plug-and-play characterization and production testing of QSFP-DD, OSFP, and QSFP transceivers. This instrument facilitates production testing and volume testing, and is equipped with a field-replaceable, MSA-compliant adapter.

The platform is available as a benchtop and low profile version, to enable versatile thermal testing use cases. The low-profile version can be directly mounted on the door of a MultiLane-approved temperature chamber. In addition, full CMIS control and compliance testing is enabled in this versatile BERT.

The GUI allows you to individually control each TX level, equalization, eye balance, pattern, coding, and 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

- High-value, 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
- QSFP-DD, OSFP, QSFP adapters are available, with other types upon request
- Integrated BERT and host controller enable:
 - RX CTLE tuning
 - TX Equalization control
 - Current and voltage sense
- Powerful Tx/Rx Equalization control for link optimization and minimizing power consumption

- Excellent insertion loss characteristics of the connector saver
- TP1a performance is compliant per IEEE802.3bs
- Real Hardware FEC implementation:
 - PAM4: KP4(200G, 100G and 50G), KR4(100G, 50G)
 - NRZ: KP4 (25G) and KR4 (25G)
- Supports PRBS13Q/31Q and user-defined patterns
- Provides full CMIS control in terms of I2C configuration, monitoring and other functions, and enables CMIS 3.0/4.0 compliance testing
- Features industrial components, suitable for reliability testing inside an oven over a wide temperature range
- 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
- Thermal testing of transceivers
- Transceiver functional tester, for simple validation

Using ThunderBERT GUI, both instant and accumulated measurements can be monitored:

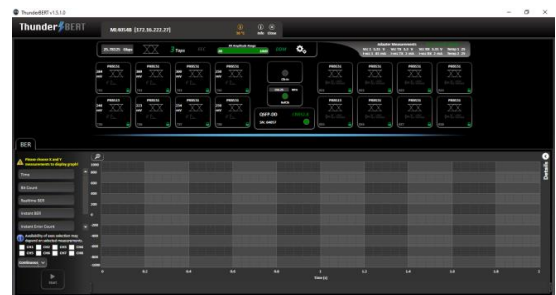


Figure 1: ML4054 - ThunderBERT GUI tab



Figure 2: Digital Diagnostic Monitoring (DDM) tab

Block Diagram – Schematic

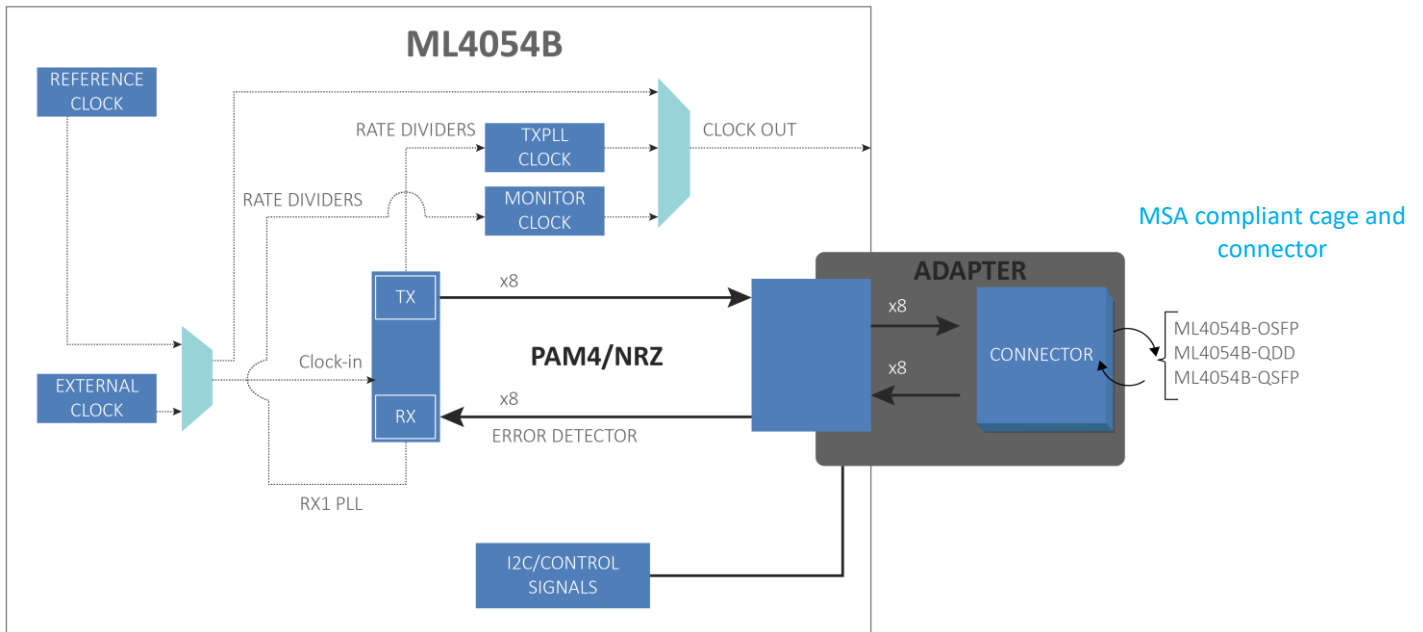


Figure 3: ML4054B with adapters

ThunderBERT GUI

The intuitive and responsive ThunderBERT GUI can perform all required tests and measurements as well as the control of every aspect of the ML4054B platform.

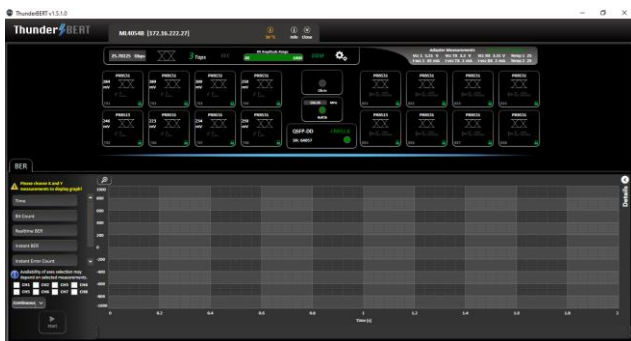


Figure 4: Main GUI

Low-Profile Version

The ML4054B-LP 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 5: ML4054B-LP



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

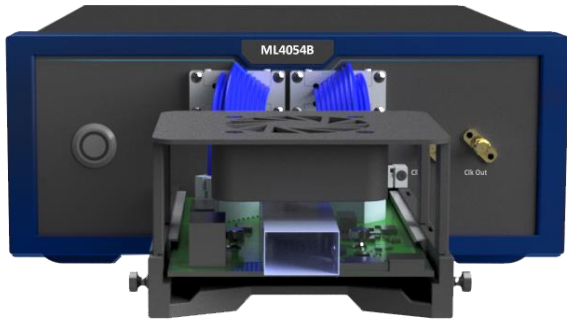


Figure 7: ML4054B with adapter

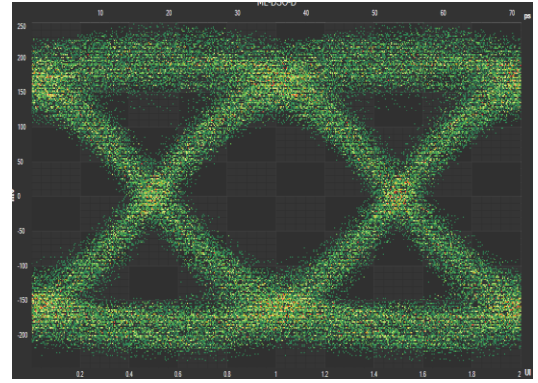


Figure 9: Raw un-equalized 28 Gbps Signal after passing through the QDD adapter followed by a QDD HCB and 40 cm 2.92 mm cables

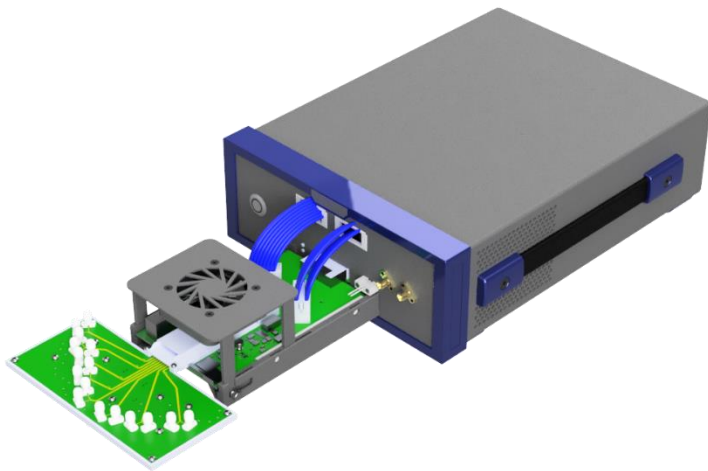


Figure 8: ML4054B with fan fixture and HCB (host compliance board)

Available Adapters

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



Figure 10: ML4054B is ideally suited to be used in conjunction with a thermal stream

Electrical Specifications

Details	
Bit Rates	PAM4: 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, LIN, CJT, SSPRQ User defined
TX Amplitude Adjustment	Steps of 1 mV
Pre-Emphasis Resolution	±1000 steps
Equalizing Filter Spacing	1UI
Random Jitter RMS	~300 fs
Rise / Fall Time (20–80%)	~8 ps
Coding	DFE Pre-coding Gray coding
Forward Error Correction (FEC)	NRZ – KP4 (25G), KR4 (25G) PAM4 – KP4 (200G, 100G and 50G), KR4 (100G, 50G)
Error Detector sensitivity	100 mV
Error Detector CDR	Supported
Error Detector Equalizer	Optional 16 Tap reflection canceller
TX/RX connectors	QSFP-DD, OSFP, QSFP, or other MSAs upon request
Reference clock Output	~600 mV
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
Ambient Temperature	-15 to 40 °C
Weight	~1.5 kg
Dimensions LxWxH (cm)	40 x 22 x 9
Adapter mating cycles	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 necessary 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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