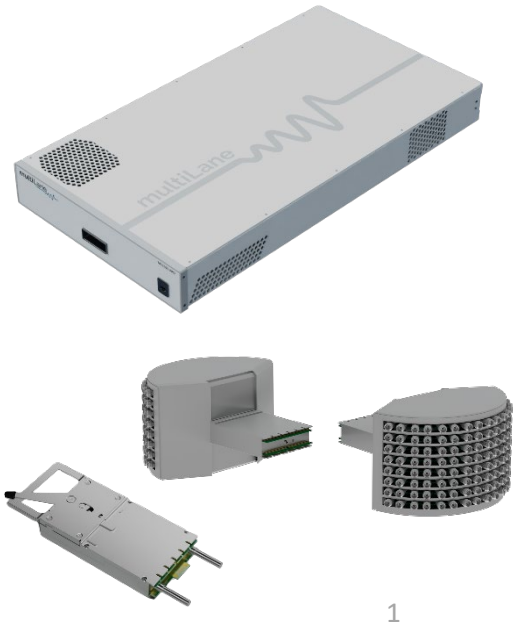
XPO Testing Ecosystem

Preliminary Product Sheet

In a rapidly evolving data center landscape, emerging form factors such as XPO are enabling unprecedented bandwidth scaling to support next-generation AI applications.

With up to 64 lanes operating at 224 Gbps, these systems introduce significant challenges in signal integrity, power dissipation, and thermal management.

To address these demands, MultiLane offers a comprehensive XPO test ecosystem —including loopback modules, HCBs, and Host Emulators— designed to enable accurate characterization, functional validation, and cooling performance evaluation of XPO-based systems.



Port Testing and Characterization

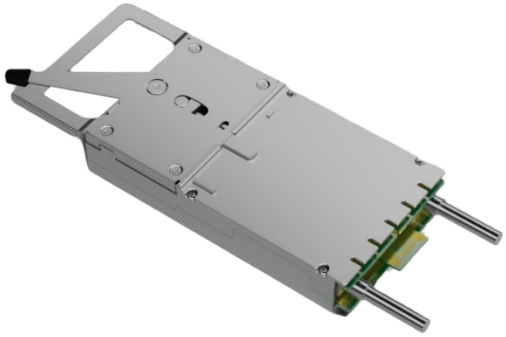
XPO Loopback Module

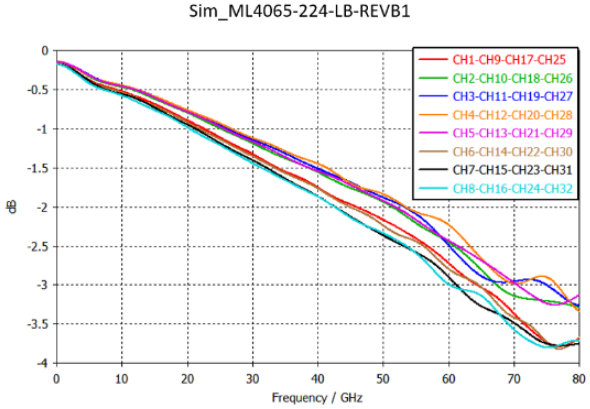
ML4065-LB-224

ML4065-LB-224 is a passive loopback, fully CMIS compliant module that features two cards with a combined total of 16 power spots, 64 lanes at 224 Gbps, and up to 500 W of power dissipation. Designed to test the host XPO port in production to emulate an expensive XPO optical module.

Features:

- 12.8 T (224 per lane), all 64 channels supported
- Compliant with XPO spec V1.0
- XPO register access and identification
- CMIS compliant module
- I2C interface; optional I3C support
- IL @ 50GHz: 1.8-2.3 dB
- Superior SI performance designed for 224G support
- Two paddle cards (A and B) each with 250W power dissipation separated to 8 spots
- Programmable power dissipation up to 500W
- Shell-level thermal monitoring for accurate case temperature tracking, using temperature sensors at each heat spot
- PWR input monitoring (50V)
- Regulated 3.3V rail monitoring for stable, accurate power delivery, with ±1% voltage accuracy
- Temperature Monitor and alarms warning
- Full host control and status interface for seamless system integration, using control signals per Paddle Card
- Cut-off temperature 85 preventing module overheating
- Integrated liquid cooling with quick disconnects





XPO Host Compliance Board

The HCB enables host-side compliance access of XPO switch ports at 224 Gbps per channel. Available in multiple variants configuration to match different test bench needs.

Three variants:

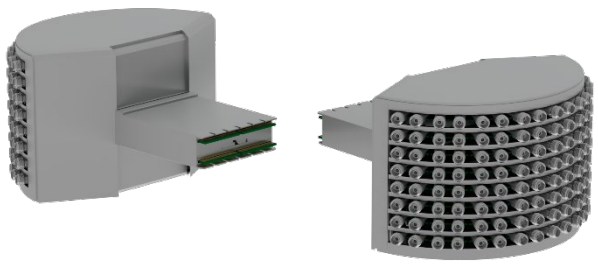
1. **HCB Quadrant - Coax based: ML4065-HCB-Q-224-X or ML4065-HCB-2Q-224-X**
   - Supports 1:4 of 64 channels (16 channels per paddle card); 224G
   - Available with 1.00 mm or 1.85 mm coax connector interface
   - IEEE MSA compliant: 3.8 dB HCB loss @ 53.125 GHz

2. **HCB Half Channel – Coax based: ML4065-HCB-H-224-X**
   - Supports half of 64 channels (32 channels per paddle card); 224G
   - Available with 1.00 mm or 1.85 mm coax connector interface
   - IEEE MSA compliant: 3.8 dB HCB loss @ 53.125 GHz

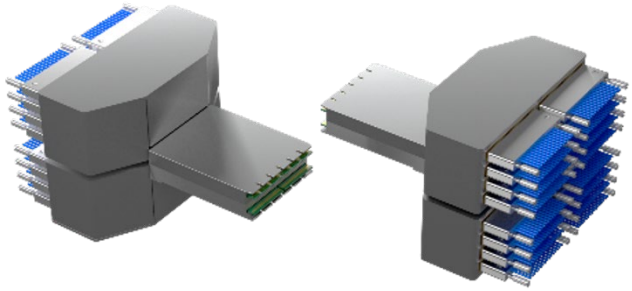
3. **SMPX based – Full channel coverage: ML4065-HCB-X-224-SMPX**
   - All 64 channels supported, 224Gbps per channel
   - 1x16 SMPX connectors

Applications:

- Test XPO switches
- Channel-level signal integrity characterization (insertion loss, return loss)



ML4065-HCB-H-224-X



ML4065-HCB-X-224-SMPX

Module Testing

XPO Host Emulator

MultiLane's 64-channel XPO Host Emulators, built around a 224G SerDes ASIC for module validation and performance testing.

It's offered in 13 variants across multiple groups: **ML5105-XPO** with integrated DSP for high-speed testing; **ML5102-XPO** for high-speed signal integrity testing; and **ML5101-XPO** for low-speed control and CMIS validation, and each configurable with liquid cooling and analyzer options to match different stages of module development, from early bring-up through full system-level qualification.

Each variant:

- Supports Real-Time Control and Monitoring of XPO Signals
- Communicates With the DUT Via I2C/I3C
- Provides A Full CMIS Testing and Validation Interface
- Confirms DUT Physical/Electrical Compatibility Through the XPO Port; To Support Customer Product development from Early-Stage Validation Through Qualification

ML5105 XPO Group: Integrated DSP for High-speed Testing



ML5105-XPO

Features:	Applications:
▪ 64-channel high-speed XPO Host Emulator with DSP integrated high-speed board ▪ Supports XPO Specification Rev. 1.0 compliance ▪ Block Error Ratio (BLER) bin calculation measurement ▪ XPO connector cables directly mounted to UPXR footprint near the chip ▪ Controlled liquid cooling for XPO module and coolant temperature monitoring	▪ High-speed signal testing at 224 Gbps/lane, alongside CMIS and low-speed control-path validation ▪ Thermal performance validation for liquid-cooled XPO modules under controlled coolant conditions ▪ High-volume production and qualification testing, reducing per-channel test time

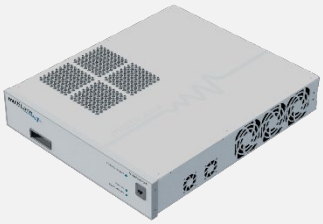
Full and detailed specifications for each variant are available in a dedicated Host Emulator data-sheet document

ML5102 XPO Group: High-Speed Signal Integrity Testing



ML5102-XPO

Features:	Applications:
▪ XPO Host Emulator with coax MCB interface, 224 Gbps, full CMIS testing ▪ Available with 1.00 mm / 1.85 mm precision connectors ▪ Validated MCB loss 4.95 dB @ 53.125 GHz (IEEE 802.3dj) — loss attributable to DUT, not fixture	▪ Bring-up/debug of new high-speed module designs ▪ Reduces cost/complexity of early channel qualification



ML5102-XPO-C

Features:	Applications:
▪ Coaxial interface MCB ▪ Thermal emulation via liquid cooling ▪ Coolant discharge/fill capability ▪ Configurable liquid temperature and flow rate	▪ Thermal design validation for high-speed modules



ML5102-XPO-A

Features:	Applications:
▪ Coaxial interface MCB ▪ State-machine / data-path analysis ▪ CMIS register validation via analyzer ▪ Power-spike detection at state transitions ▪ Real-time voltage/current/inrush sampling ▪ Voltage noise measurement	▪ High speed testing and link quality assessment; CMIS testing ▪ Firmware and state-machine debugging



ML5102-XPO-CA

- Coaxial interface MCB
- Thermal capability set + full analyzer capability set

Applications:

- High speed testing
- CMIS testing under realistic thermal conditions

ML5101 XPO Group: Low-Speed Control and CMIS Validation



ML5101-XPO

Features:	Applications:
▪ Capability to test, configure, and monitor XPO low-speed control signals in real time ▪ Capability to configure and communicate with the DUT via I2C and I3C ▪ Full CMIS testing and validation interface	▪ Simplify early-stage testing ▪ Real-time visibility into module behavior ▪ Lower cost of early validation ▪ Pre-qualification screening



ML5101-XPO-C

Features:	Applications:
▪ Thermal emulation via liquid cooling ▪ Coolant discharge/fill capability ▪ Configurable liquid temperature ▪ Variable coolant flow rates ▪ Power margin testing (above/below nominal threshold)	▪ Combined thermal + protocol validation in one setup ▪ CMIS/control-path validation under thermal load ▪ Flexible thermal stress testing across temp/flow ranges ▪ Power margin / stress testing



ML5101-XPO-A

Features:	Applications:
▪ CMIS register sweep via analyzer ▪ State-machine / data-path state machine analysis ▪ Voltage noise measurement ▪ Power-spike detection at state transitions ▪ Real-time voltage/current/inrush sampling ▪ I2C read/write packet-level analysis	▪ Host port characterization (I2C, low-speed signals) ▪ I2C sniffer interoperability testing ▪ Faster root-cause debugging ▪ CMIS compliance and register validation



ML5101-XPO-CA

▪ All cooling and analyzer capabilities combined in a single fixture; operating at low-speed

Applications:

- Host/system port characterization
- I2C sniffer interoperability testing
- Full thermal + diagnostic validation in one fixture
- Power transition / inrush current analysis under thermal load

Ordering Information

XPO Loopback Module	
Part Number	**Description**
ML4065-LB-224	XPO Loopback, 64 channels, 224G per lane, with thermal loads

XPO Host Compliance Board	
Part Number	**Description**
ML4065-HCB-Q-224-18F	16x224G XPO quad HCB, covers half channels of paddle card A or B; 1.85 mm female connector
ML4065-HCB-2Q-224-18F	2x16x224G XPO HCB, includes 2 sets of quad HCB plugs; 1.85 mm female connector
ML4065-HCB-Q-224-10F	16x224G XPO quad HCB, covers half channels of paddle card A or B; 1.00 mm female connector
ML4065-HCB-2Q-224-10F	2x16x224G XPO HCB, includes 2 sets of quad HCB plugs; 1.00 mm female connector
ML4065-HCB-H-224-18F	32x224G XPO HCB, covers all channels of paddle card A or B; 1.85 mm female connector,
ML4065-HCB-H-224-10F	32x224G XPO HCB, covers all channels of paddle card A or B; 1.00 mm female connector
ML4065-HCB-A-224-SMPX	32x224G XPO HCB A, covers all channels of paddle card A; 1x16 SMPX female connector
ML4065-HCB-B-224-SMPX	32x224G XPO HCB B, covers all channels of paddle card B; 1x16 SMPX female connector
ML4065-HCB-AB-224-SMPX	64x224G XPO HCB AB, covers all channels of both paddle card A and B; 1x16 SMPX female connector

XPO Host Emulator	
Part Number	**Description**
ML5105XPO	XPO Host Emulator, 64 channels, 224G per lane

ML5102-XPO-10F	XPO Host Emulator, with coax MCB interface, 224Gbps, with 1.00 mm female connectors
ML5102-XPO-18F	XPO Host Emulator, with coax MCB interface, 224Gbps, with 1.85 mm female connectors
ML5102-XPO-C-10F	XPO Host Emulator, with coax MCB interface, 224Gbps, with 1.00 mm female connectors, with integrated liquid cooling
ML5102-XPO-C-18F	XPO Host Emulator, with coax MCB interface, 224Gbps, with 1.85 mm female connectors, with integrated liquid cooling
ML5102-XPO-A-10F	XPO Host Emulator, with coax MCB interface, 224Gbps, with 1.00 mm female connectors, with CMIS and analyzer test features
ML5102-XPO-A-18F	XPO Host Emulator, with coax MCB interface, 224Gbps, with 1.85 mm connectors, with CMIS and analyzer test features
ML5102-XPO-CA-10F	XPO Host Emulator, with coax MCB interface, 224Gbps, with 1.00 mm female connectors, with integrated liquid cooling and analyzer test features
ML5102-XPO-CA-18F	XPO Host Emulator, with coax MCB interface, 224Gbps, with 1.85 mm female connectors, with integrated liquid cooling and analyzer test features

ML5101-XPO	XPO Host Emulator with CMIS test features
ML5101-XPO-C	XPO Host Emulator with CMIS and integrated liquid cooling
ML5101-XPO-A	XPO Host Emulator with CMIS and analyzer test features
ML5101-XPO-CA	XPO Host Emulator with integrated liquid cooling, CMIS and analyzer test features

Who is this for?

- Hyperscalers and Data center customers
- Optical module manufacturers
- Signal integrity and Firmware engineering teams
- Hardware engineering teams
- Thermal/mechanical engineering teams
- Power electronics/reliability engineering teams
- Production test/QA engineering teams
- Compliance/standards engineering teams
- Systems integrators