

QSFP-DD

Test Development Kit

Summary

The **MultiLane QSFP-DD Development Kit** provides the necessary development tools and reference modules required for the development of QSFP-DD based products. This kit is essential for development, testing and characterization of QSFP-DD based products. It can also be used for testing 400G CDRs, 400G Gearbox devices, 400G QSFP-DD ports on routers and line-cards, electro-optical modules, and QSFP-DD active optical cables.

Complete QSFP-DD Development Kit

- **ML4062-MCB** 8x50G Module Compliance Board
- **ML4062-MCB-MXP** 8x50G Module Compliance Board
- **ML4062-MCB-LB** 8x50G Module Compliance Board
- **ML4062-BO** 8x50G Break-out Module
- **ML4062-HCB1** 4x50G 4 Channels Host Compliance Board
- **ML4062-HCB2** 4x50G 4 Channels Host Compliance Board
- **ML4062-SLB** 8x50G Passive Loopback Module
- **ML4062-CNT** QSFP-DD Controller
- **ML4066-QDD** QSFP-DD to QSFP-DD Adapter
- **ML4054-QDD** CFP8 to QSFP-DD Adapter
- **ML4062-S-T1** Thermal Load Gen 2 in Type-1 shell

Upcoming Products:

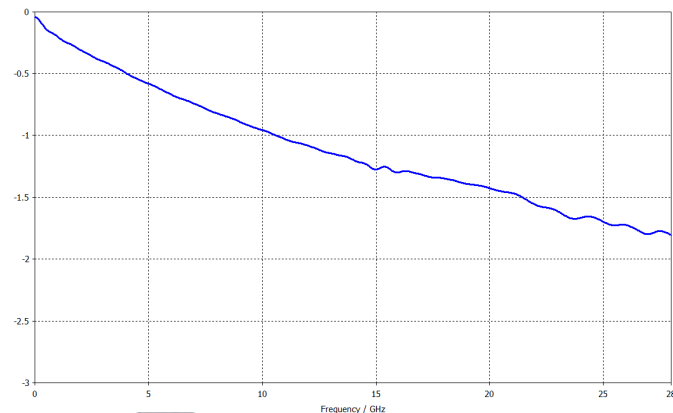
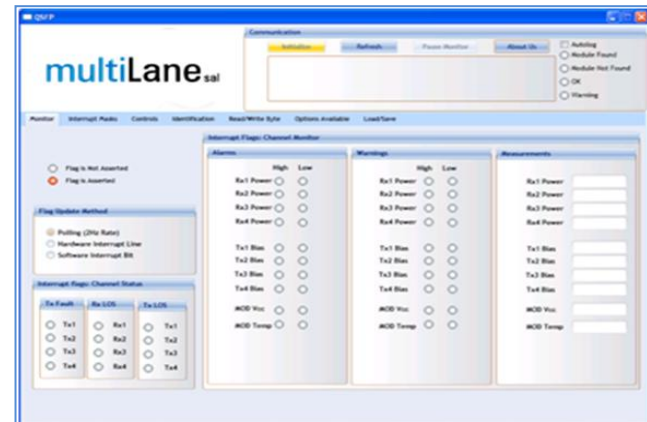
- **ML4062-ANA** QSFP-DD Loopback and state machine analyzer
- **ML4062-EO** 8x50G Eye Opener Active Loopback
- **ML4062-S-T2** Thermal Load Gen 2 in Type-2 shell

ML4062-MCB QSFP-DD Module Compliance Board

ML4062-MCB is designed to provide an efficient and easy method of programming and testing 400G QSFP-DD transceivers and active optical cables. It includes a complete user-friendly GUI supporting all features defined by QSFP-DD MSA and simplifying configuration processes to enable intuitive memory map programming and testing. It is designed to simulate an ideal environment for QSFP-DD transceivers module testing, characterization and manufacturing.

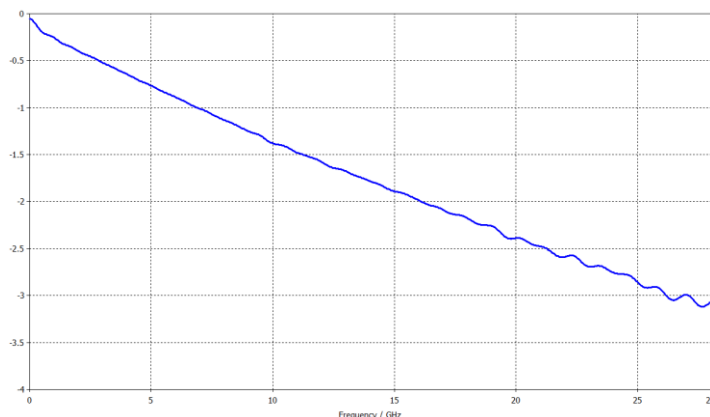
- Supports 8x50G interfaces
 - I2C master driven from both on board microcontroller or external pin headers
 - 40 GHz Bo-Jiang 2.92mm K Connectors
 - Current Sense
 - Matched differential trace length
 - All 8 channels comes with matching trace length
 - High performance signal integrity traces from K connectors to QSFP-DD host connector.
 - On-board LEDs display MSA output alarm states
 - On-board buttons/jumpers for MSA input control signals
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- User friendly GUI for I2C R/W commands and loading custom MSA memory maps
 - Four corner testing capability
 - USB interface

Application: Module Testing



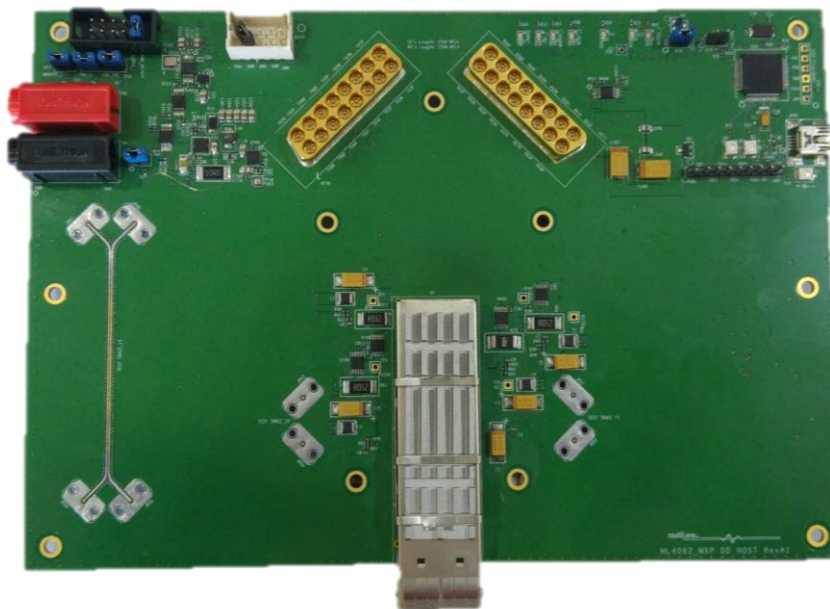
ML4062-MCB-MXP QSFPDD Module Compliance Board

- Supports 8x50G interfaces
- I2C master driven from both on board microcontroller or external pin headers
- 2x8 Huber+Suhner MXP Connector rows
- Current Sense
- Internal noise injection option through a programmable switching regulator
- Power can be fed through an external source
- Power margining between 3.1V and 3.6V
- Matched differential trace length
- All 8 channels comes with matching trace length
- High performance signal integrity traces from MXP connectors to QSFP-DD host connector.
- On-board LEDs display MSA output alarm states
- On-board buttons/jumpers for MSA input control signals



- User friendly GUI for I2C R/W commands and loading custom MSA memory maps
- Four corner testing capability
- USB interface

Application: Module Testing



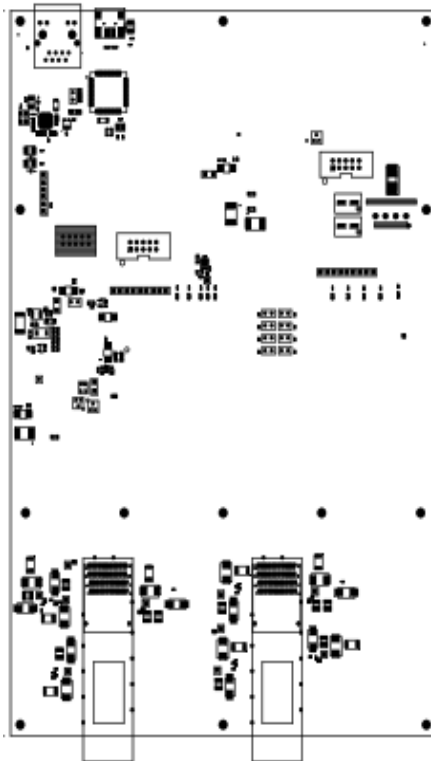
MultiLane SAL, QSFP-DD Test Development Kit rev.3.6

Multilane SAL reserves the right to make changes to its product specifications at any time without notice. The information furnished herein is believed to be accurate; however, no responsibility is assumed for its use.

ML4062-MCB-LB QSFPDD Module Compliance Board (Host Loopback)

- Supports 8x50G interfaces
 - I2C master driven from both on board microcontroller or external pin headers
 - Current Sense
 - Internal noise injection option through a programmable switching regulator
 - All TX channels are looped back to the RX side on host with ≈ 1 dB loss
 - Power can be fed through an external source
 - Power margining between 3.1V and 3.6V
 - On-board LEDs display MSA output alarm states
 - On-board buttons/jumpers for MSA input control signal
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- User friendly GUI for I2C R/W commands and loading custom MSA memory maps
 - Four corner testing capability
 - USB interface

Application: Module Testing

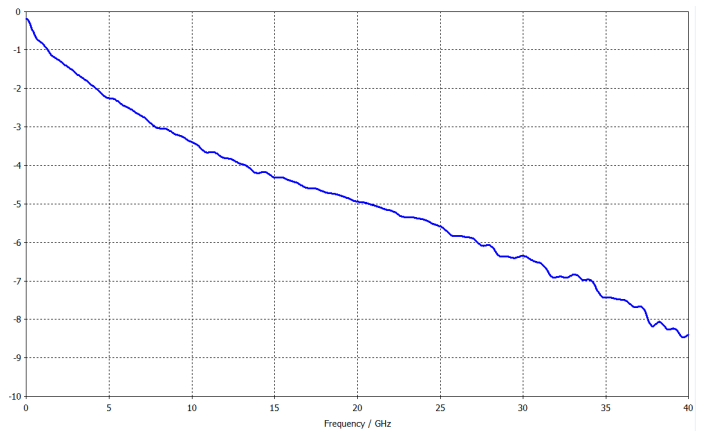


ML4062-BO QSFP-DD Breakout Modules

This Breakout module can be used for testing and characterizing 8x50G line cards and host interfaces.

- High Performance signal integrity traces
- QSFP-DD MSA Form Factor
- Low Insertion Loss
- Built with high performance PCB material
- Production friendly form factor
- Supports 8x50G TX and RX Lanes
- High speed signals accessible through 2x8 Huber+Suhner MXP Connector rows or multi-SMPM-Type A connectors
- Maximum Trace length 3923 mils
- Minimum Trace Length 2850 mils

Application: Line Card and Port Characterization



Insertion Loss for a 3400 mils Trace Length

ML4062-HCB1 QSFP-DD Host Compliance Board

- High Performance signal integrity traces
- QSFP-DD MSA Form Factor
- Same low Insertion Loss for all traces
- Built with high performance PCB material
- Production friendly form factor
- Supports 4x50 G
- 4 channels: Ch1, Ch2, Ch3, Ch4

Ch1		Ch2		Ch3		Ch4	
TX1	RX1	TX2	RX2	TX3	RX3	TX4	RX4

- Built with RO3003 PCB Material
- High speed signals accessible through K Connector rows

ML4062-HCB2 QSFP-DD Host Compliance Board

- High Performance signal integrity traces
- QSFP-DD MSA Form Factor
- Same low Insertion Loss for all traces
- Built with high performance PCB material
- Production friendly form factor
- Supports 4x50 G
- 4 channels: Ch5, Ch6, Ch7, Ch8

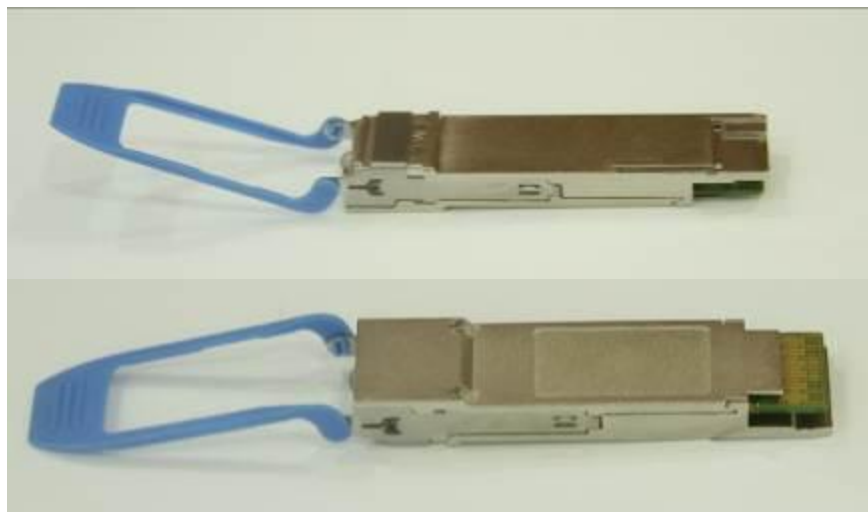
Ch5		Ch6		Ch7		Ch8	
TX5	RX5	TX6	RX6	TX7	RX7	TX8	RX8

- Built with RO3003 PCB Material
- High speed signals accessible through K Connector rows



ML4062-SLB QSFP-DD Passive Loopback Modules

The ML4062 is packaged in a standard MSA housing compatible with all QSFP-DD ports. Transmit data from the host is electrically routed, (internal to the loopback module), to the receive data outputs and back to the host. It provides an economical way to exercise QSFP-DD ports during R&D validation, production testing, and field testing.



- Supports 8x50G electrical interface
- QSFP-DD MSA Form Factor
- Microcontroller programmed to maintain user specified PD or constant temperature
- 2 Thermistors on PCBA
- 4 independent power heaters, with 0.1W resolution, up to 14W
- Temperature Monitor and alarms warning
- Superior SI performance
- MSA Compatible Configuration and EEPROM
- Loops back TX to RX on all 8 ports
- I2C Interface
- Programmable MSA memory pages
- I2C control from edge connectors and from rear pin header
- 2 status LED Indicator
- Insertions counter
- Hot Pluggable module
- Thermal resistor
- Cutoff temperature preventing module overheating
- Cable assemblies for power & I2C Control
- Custom memory maps

Applications

- 8x50G Electrical module testing and characterization
- QSFP-DD Port compliant testing

ML4062-CNT QSFP-DD Controller

1. The ML4062-CNT is a host board to supply power to the QSFP-DD thermal loads, and an I2C master that allows to read/write the registers, it comes with a GUI.1. The controller is powered using a 24 V external power supply.

2. Two thermal loads modes are available: Constant temperature and Constant power dissipation.

a. Constant temperature

Option 1: Used to fix the total temperature of the module (Enter the temperature value and click Set).

Option 2: Used to fix the temperature of a specified spot in the module (Select the spot that you need to fix its temperature, enter the temperature value and click Set).

b. Constant Power Dissipation

Used to set the power value of the desired spot using the corresponding slider.

3. The user can set the temperature cut-off value using the Cut-off temperature field

4. Module VCC can be set to 3.3 or 3.5 V.

The temperature values can be logged. The Interval indicates the time spent between consecutive temperature measurements. And the Total duration indicates the total time of logging temperature values.

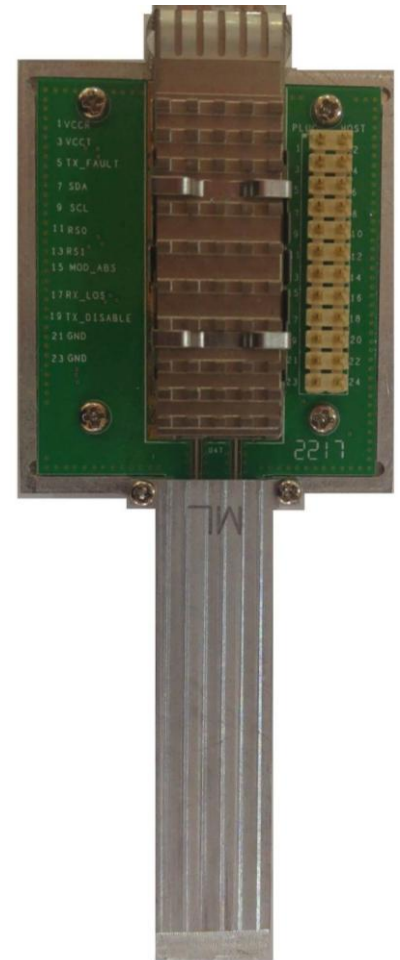
After the logging is done, you can view the graph that shows the temperature in time.



ML4066-QDD: QSFP-DD to QSFP-DD Adapter

Key Features

- All high speed signals are connected from the QSFP-DD Plug to the front QSFP-DD host connector with superior SI traces
- Low insertion loss PCB traces
- Power pins are accessible via pin headers and can be jumped to connect them to the plugged QSFP-DD transceiver
- All low speed management signals are accessible via pin headers, and can be jumped to connect them to the plugged QSFP-DD transceiver
- I2C SCL and SDA signals accessible via pin headers or can be jumped to connect them to the plugged QSFP-DD transceiver
- Ability to drive I2C from external pin headers, or connect I2C packet analyzer
- Ability to drive 3.3V from external source for power supply margining
- Ability to break 3.3V power from Host to module allowing voltage and current measurement
- Push button for Reset Signal
- Interface to connect SFF Analyzer board

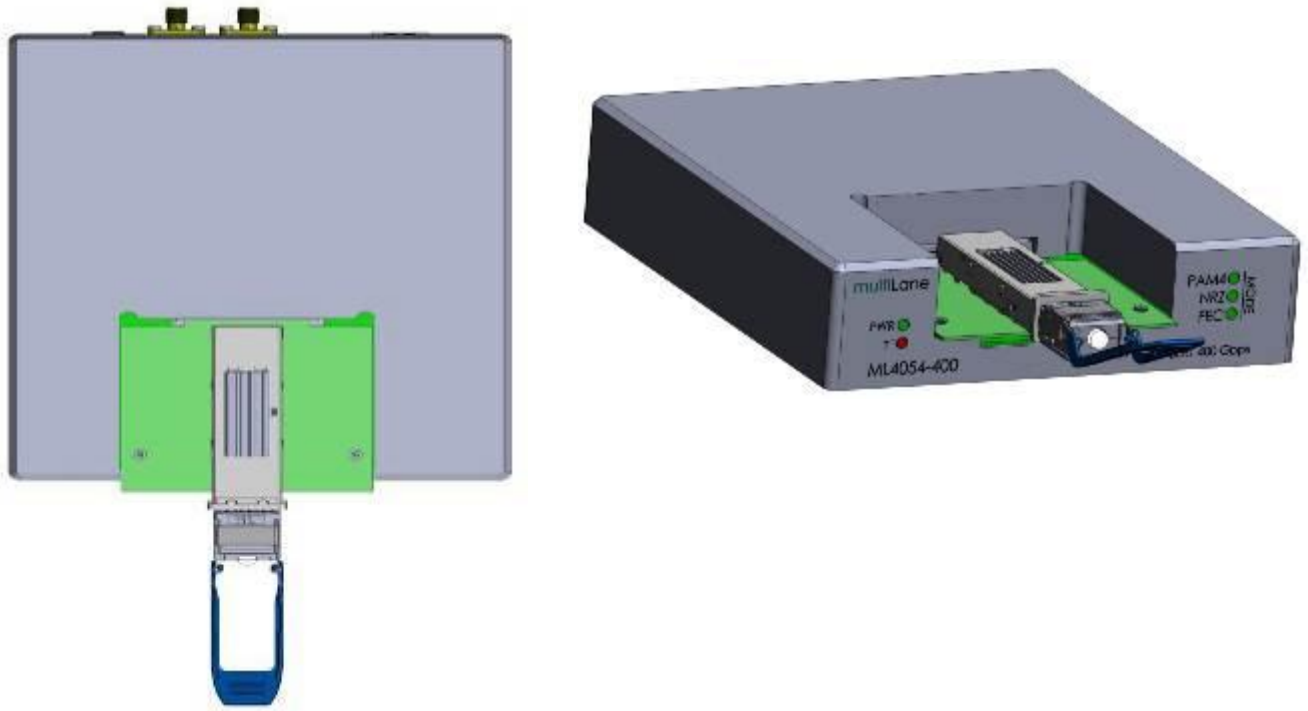


ML4066-QDD Pin headers

	Host Side	Module Side
1	VCC	VCC
2	VCC1	VCC1
3	VCC-TX	VCC-TX
4	VCC-RX	VCC-RX
5	MODSEL_L	MODSEL_L
6	RESET_L	RESET_L
7	SCL	SCL
8	SDA	SDA
9	MODPRS_L	MODPRS_L
10	INT_L	INT_L
11	LPMODE	LPMODE
12	GND	GND

ML4054-QDD CFP8 to QSFP-DD Adapter

High speed signals are connected from the CFP8 Plug to the front QSFP-DD host connector with superior SI traces.



For additional details please refer to the following datasheet:

<https://multilaneinc.com/wp-content/uploads/2016/09/ML4054-CFP8-v1-9-Datasheet.pdf>

ML4062-S-T1 Thermal Load in Type-1 Shell

Key Features

- QSFP-DD Gen 2 Thermal load 1 with regular shell (MSA Type 1)
- Front pin headers for I2C and power
- Compatible with existing ML4062-CNT
- Easy and fast configuration via a software interface with a graphical model
- Three heat spots: 2.01 W, 1.61W, 1.21W
- I2C register bit to turn ON/OFF the heat spots
- A spot on the thermal model to turn ON/OFF any spot of the thermal model displayed on the GUI
- Thermal model can be saved to a configuration file and then loaded to other modules
- For external I2C master cases, the list of registers and data values for any configuration can be generated by the GUI
- TIM thermal pad for heat conduction to the shell
- Controller on the module to turn ON/OFF the spots and control their power draw
- Total power programmable and limited to 14W by the controller to be compatible with MSA limits for class 8
- 14W can be surpassed by the user based on his application



Type 1 Thermal Module

Upcoming Products

ML4062-ANA QSFP-DD Loopback and state machine analyzer

- Front USB Interface
- Windows based GUI and API Library
- Detection and Measure of pull up + pull down resistors on low speed signals
- Host VCC rails sampling Measurement
- VCC spectral Noise Analysis
- Thermal loads, Ability to monitor Host VCC vs load power

- I2C Analyzer:
 - Bus Speed
 - ACK/ NACK Detection
 - Clock Stretching Analysis
 - Time Event Logging

- Functional Tests:
 - Control Signals
 - Configuration Registers
 - Ability to emulate optical module by loading Identification Registers with Custom Data
 - Loops back TX & RX with good performance SI Traces
 - Built with advanced PCB Material (Rogers/ Megtron)
 - MSA Compliant Shell latching mechanism
 - Four thermal spots
 - Can emulate all 4 QSFP power classes
 - Can dissipate up to 16W via the thermal loads
 - Temp sense
 - I2C Terminated by microcontroller, I2C slave compliant with MSA
 - Implements MSA Memory map, and programmable new pages
 - Ability to control/ monitor all low speed signals
 - Insertion Counter
 - Front LED Indicator
 - Hot Pluggable
 - AC coupled High Speed Interface
 - Cut-off temperature preventing Module Overheating



I2C Analysis Results

Decoded Bytes	30				
Detected Bus Errors	11				
Index	Time	Hex	Bin	Dec	ASCII
0	0.0s	START			
1	5.950s	0xaa	0b00001010	170	a
2	6.70s	NACK			
3	12.70s	0x55	0b00000101	85	U
4	13.450s	ACK			
5	19.450s	0xaa	0b00001010	170	a
6	20.20s	NACK			
7	26.20s	0x55	0b00000101	85	U
8	26.950s	ACK			

ML4062-S-T2 Thermal Load Gen 2 in Type-2 shell

QSFP-DD Gen2 Thermal load 2 with extended shell (MSA Type 2) with the same key features as the ML4062-S-T1



Type 2 Thermal module – extended length

ML4062-EO QSFP-DD Eye Opener Active Loopback

The ML4062-EO is an eye opener active loopback, packaged in a standard MSA housing compatible with all QSFP-DD ports. Transmit data from the host is passing through the eye opener and is electrically routed, (internal to the loopback module), to the receive data outputs and back to the host. It provides an economical way to exercise QSFP-DD ports during R&D validation, production testing, and field testing.

Worldwide

MultiLane SAL

Houmal Technology Park
141 Main Road
Houmal, Lebanon
+961 5 941668

Website: www.multilaneinc.com

North America & Europe

MultiLane Inc

48511 Warm Springs Blvd, Suite 203
Fremont, CA 94539
USA
+1 510573 6388

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