ML4064-XD-TL
Technical Reference

OSFP-XD Electrical Passive Loopback Module
CMIS Compliant

Table of Contents

1 Overview

ML4064-XD-TL is used for testing OSFP-XD transceiver ports under board level tests, by substituting a full-featured OSFP-XD transceiver with the ML4064-XD-TL. The **ML4064-XD-TL** covers all OSFP-XD power classes.

The **ML4064-XD-TL** is packaged in a standard MSA housing compatible with all OSFP-XD ports. It provides an economical way to exercise OSFP-XD ports during R&D validation, production testing, and field testing. It follows the **CMIS** standard.

Note: The **ML4064-XD-TL** operates as a thermal load and does not have capabilities to perform a highspeed loopback.

1.1 ML4064-XD-TL OSFP-XD Thermal Load | Key Features

- OSFP-XD MSA Form Factor
- MSA Compatible Configuration and EEPROM
- Programmable MSA memory pages
- Custom memory maps
- I2C Interface
- I2C control from edge connectors and from rear pin header
- Controller card with I2C Master, supports multiple modules, USB master
- Sixteen independent power spots (maximum number of 11 spots can be activated simultaneously) dissipating up to 44 W
- Seven temperature sensors
- Voltage sensor
- Temperature Monitor and alarms warning
- Cut-off temperature preventing module overheating

1.2 Recommended Operating Conditions

Parameter	Symbol	Notes/Conditions	Min	Typ	Max	Units
Operating Temperature	T_A		-40		105	°C
Supply Voltage	VCC	Main Supply Voltage	7	12	15	V
Input/output Load Resistance	RL	AC-Coupled, Differential	90	100	110	Ω
Power Class		Programmable to Emulate all power classes	0		44	W

2   Pin Header

**Pin Header (Thermal
Dissipation/Diagnostics)**

The **ML4064-XD-TL** module can be inserted into a controller board from the front pin header connector, providing power and allowing I2C communication with the controller board, as detailed in section .

2.1   Mapping of Pins

The Pin header connector mapping is shown below:
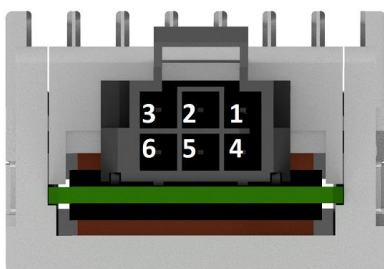
Pin #	Description
1 - 4	12 V
3 - 6	GND
2	I2C-SCL
5	I2C-SDA

Connector Front View

3   Functional Description

3.1   Management Data Interface – I2C

The **ML4064-XD-TL** supports the I2C interface.

3.2 I2C Signals, Addressing and Frame Structure

3.2.1 I2C Frame

Figure 1: QSFP-DD Timing Diagram
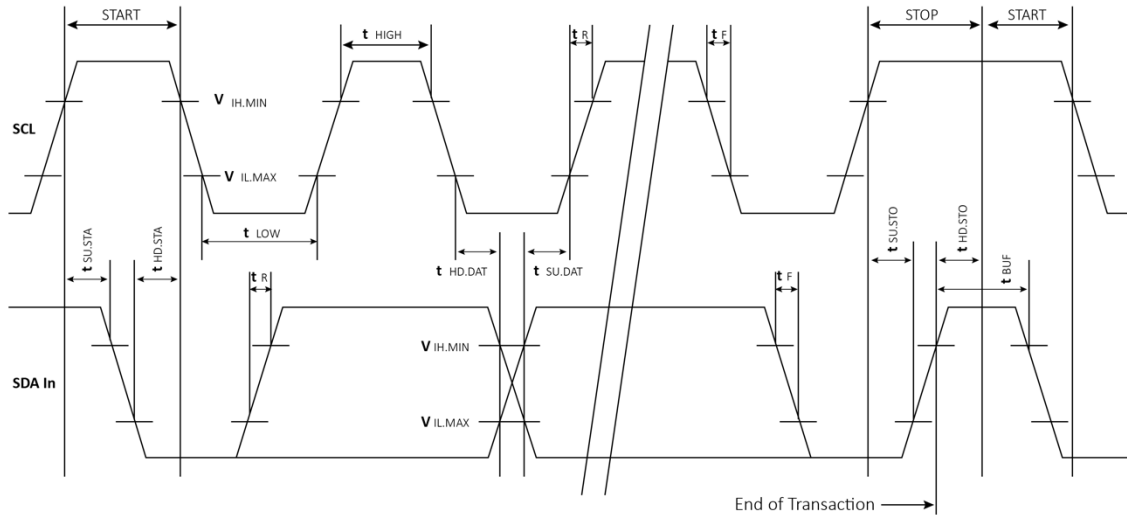
Access to multiple OSFP-XD modules on the same 2-wire serial bus is always allowed.

3.2.2 Management Timing Parameters

The timing parameters for the 2-Wire interface to the OSFP-XD module are shown in the table below:

Parameter	Symbol	Min	Typ	Max	Condition
Clock Frequency	f_{SCL}			400 KHz	
Clock Pulse Width Low	t_{LOW}	1.3 us			
Clock Pulse Width High	t_{High}	0.6 us			
Time bus free before new transmission can start	t_{BUF}	1.3 us			
START Hold Time	$t_{HD.STA}$	600 ns			
START Set-up Time	$t_{SU.STA}$	600 ns			
Data In Hold Time	$t_{HD.DAT}$	0 us	0.9 us		
Data in Set-up Time	$t_{SU.DAT}$	100 ns			
STOP Set-up Time	$t_{SU.STO}$	600 ns			
Serial Interface Clock Holdoff (Clock Stretching)	$T_{\_clock\_hold}$			50 us	
Complete Single or Sequential Write					Complete (up to) 8-byte Write

3.2.3   Memory Specifications

OSFP-XD memory transaction timings are given in the above table.

3.2.4   Device Addressing and Operation

Clock and Data Transitions: The SDA pin is normally pulled high with an external device. Data on the SDA pin may change only during SCL low time periods. Data changes during SCL high periods indicate a START or STOP condition. All addresses and data words are serially transmitted to and from the OSFP-XD in 8-bit words. Every Byte on the SDA line must be 8-bits long. Data is transferred with the most significant bit (MSB) first.

START Condition: A high-to-low transition of SDA with SCL high is a START condition, which must precede any other command.

STOP Condition: A low-to-high transition of SDA with SCL high is a STOP condition.

Acknowledge: After sending each 8-bit word, the transmitter releases the SDA line for one-bit time, during which the receiver is allowed to pull SDA low (zero) to acknowledge (ACK) that it has received each word.

Memory (Management Interface) Reset: After an interruption in protocol, power loss, or system reset, the OSFP-XD Module management interface can be reset. Memory reset only resets the OSFP-XD transceiver management interface (to correct a hung bus) leaving all other module functionality intact.

Device Addressing: OSFP-XD devices require an 8-bit device address word following a start condition to enable a read or write operation. The device address word consists of a mandatory sequence for the first seven most significant bits in Figure 2. This is common to all OSFP-XD devices.

1	0	1	0	0	0	0	R/W
MSB							LSB
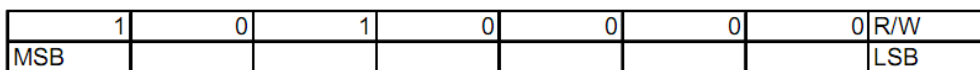
Figure 2: QSFP-DD Device Address

The eighth bit of the device address is the read/write operating select bit. A read operation is initiated if this bit is set high and a write operation is initiated if this bit is set low. Upon compare of the device address (with ModSelL in the low state) the OSFP-XD Module will output a zero (ACK) on the SDA line to acknowledge the address.

Parameter	Symbol	Min	Typ	Max	Unit
Serial Interface Clock Holdoff "Clock Stretching"	T_clock_hold		10		us
Complete Single Write	tWR	5			ms

3.3 OSFP-XD Memory Map

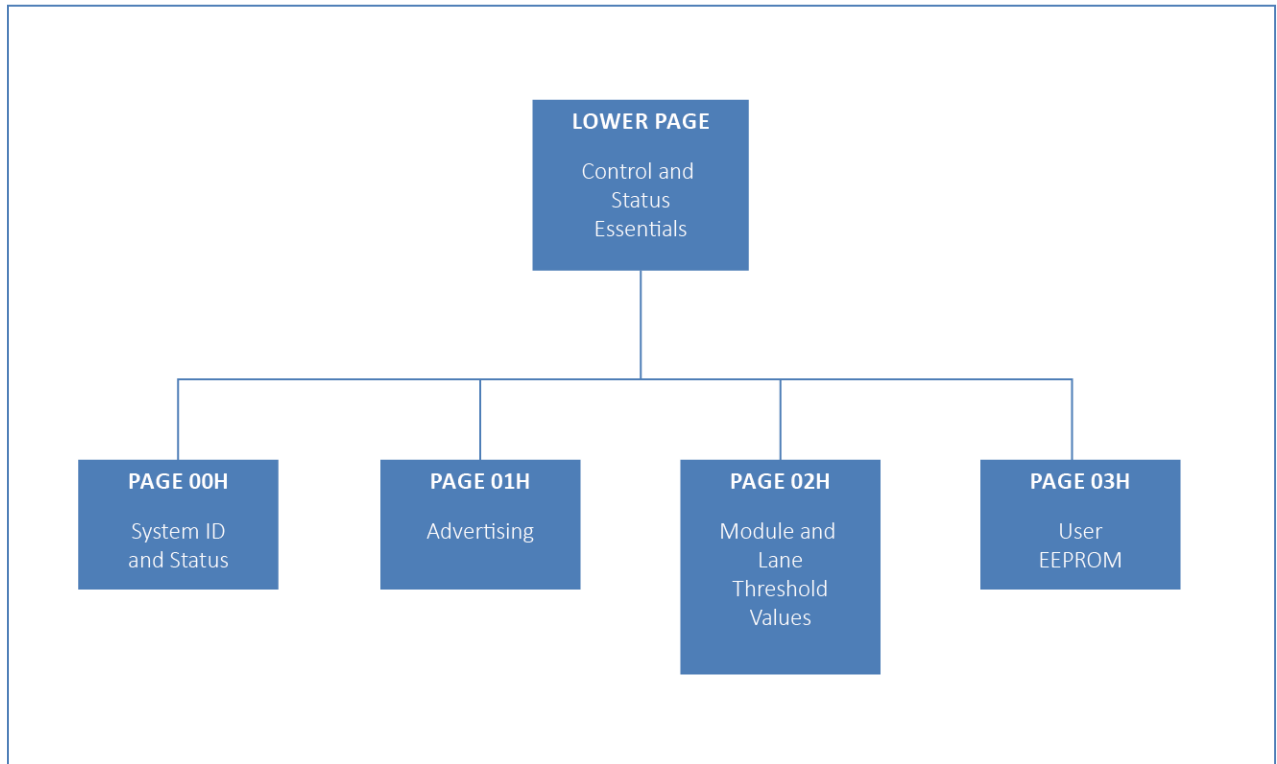#### 3.3.1 ML4064-XD-TL Memory Map

Figure 4: Implemented Memory Map

3.3.2 Memory Content

The table below shows the memory content.

Address Detailed	Hex	Decimal	ASCII	MSA Description
LowMem0 (00h)	19	25		Identifier
LowMem1 (01h)	28	40	(	Revision Compliance
LowMem2 (02h)	4	4		CLEI code present
LowMem3 (03h)				Module State
LowMem4 (04h)	0	0		Bank 0 flag summary
LowMem5 (05h)	0	0		Bank 1 flag summary
LowMem6 (06h)	0	0		Bank 2 flag summary
LowMem7 (07h)	0	0		Bank 3 flag summary
LowMem8 (08h)	0	0		Latched module state and FW error and flag for CDB completion
LowMem9 (09h)	50	80	P	Latched VCC3.3/Temp Alarm and Warning
LowMem10 (0Ah)	0	0		Latched AUX1/2 Alarm and Warning

LowMem11 (0Bh)	0	0		Latched Vendor Defined/AUX3 Alarm and Warning
LowMem12 (0Ch)				Internally measured Temperature 1 MSB
LowMem13 (0Dh)				Internally measured Temperature 1 LSB
LowMem14 (0Eh)				Internally measured Temperature 2 MSB
LowMem15 (0Fh)				Internally measured Temperature 2 LSB
LowMem16 (10h)				Internally measured Supply 3.3v MSB
LowMem17 (11h)				Internally measured Supply 3.3v LSB
LowMem18 (12h)	0	0		Internally measured AUX1 MSB
LowMem19 (13h)	0	0		Internally measured AUX1 LSB
LowMem20 (14h)	0	0		Internally measured AUX2 MSB
LowMem21 (15h)	0	0		Internally measured AUX2 LSB
LowMem22 (16h)	0	0		Internally measured AUX3 MSB
LowMem23 (17h)	0	0		Internally measured AUX3 LSB
LowMem24 (18h)				Internally measured Custom MSB
LowMem25 (19h)				Internally measured Custom LSB
LowMem26 (1Ah)				Software reset
LowMem27 (1Bh)	0	0		Reserved
LowMem28 (1Ch)	0	0		Reserved
LowMem29 (1Dh)	0	0		Custom
LowMem30 (1Eh)	0	0		Custom
LowMem31 (1Fh)	0	0		State Changed Mask
LowMem32 (20h)	0	0		Voltage/Temperature Mask
LowMem33 (21h)	0	0		AUX2/AUX1 mask
LowMem34 (22h)	0	0		Vendor Defined/AUX3 Mask
LowMem35 (23h)	0	0		Reserved
LowMem36 (24h)	0	0		Custom
LowMem37 (25h)	0	0		CDB command status
LowMem38 (26h)	0	0		CDB command status
LowMem39 (27h)	0	0		Module Active Firmware Version number
LowMem40 (28h)	0	0		Module Active Firmware Version number
LowMem41 (29h)	0	0		Fault cause for entering ModuleFault state
LowMem42-63 (2Ah-3Fh)	0	0		Reserved
LowMem64-84 (40h-54h)	0	0		Custom

LowMem85 (55h)	0	0		Module Type Advertising Code
LowMem86-117 (56h-75h)	0	0		Cable Host-Media Interfaces Advertising Option
LowMem118-125 (76h-7Dh)	0	0		Password area
LowMem126 (7Eh)	0	0		Bank Select Byte
LowMem127 (7Fh)	0	0		Page Select Byte
Page00 128 (80h)	19	25		Identifier
Page00 129 (81h)	4D	77	M	Vendor Name
Page00 130 (82h)	55	85	U	Vendor Name
Page00 131 (83h)	4C	76	L	Vendor Name
Page00 132 (84h)	54	84	T	Vendor Name
Page00 133 (85h)	49	73	I	Vendor Name
Page00 134 (86h)	4C	76	L	Vendor Name
Page00 135 (87h)	41	65	A	Vendor Name
Page00 136 (88h)	4E	78	N	Vendor Name
Page00 137 (89h)	45	69	E	Vendor Name
Page00 138 (8Ah)	20	32		Vendor Name
Page00 139 (8Bh)	20	32		Vendor Name
Page00 140 (8Ch)	20	32		Vendor Name
Page00 141 (8Dh)	20	32		Vendor Name
Page00 142 (8Eh)	20	32		Vendor Name
Page00 143 (8Fh)	20	32		Vendor Name
Page00 144 (90h)	20	32		Vendor Name
Page00 145 (91h)	0	0		Vendor OUI
Page00 146 (92h)	0	0		Vendor OUI
Page00 147 (93h)	0	0		Vendor OUI
Page00 148 (94h)	4D	77	M	Vendor PN
Page00 149 (95h)	4C	76	L	Vendor PN
Page00 150 (96h)	34	52	4	Vendor PN
Page00 151 (97h)	30	48	0	Vendor PN
Page00 152 (98h)	36	54	6	Vendor PN
Page00 153 (99h)	34	52	4	Vendor PN
Page00 154 (9Ah)	2D	45	-	Vendor PN
Page00 155 (9Bh)	58	88	X	Vendor PN

Page00 156 (9Ch)	44	68	D	Vendor PN
Page00 157 (9Dh)	2D	45	-	Vendor PN
Page00 158 (9Eh)	54	84	T	Vendor PN
Page00 159 (9Fh)	4C	76	L	Vendor PN
Page00 160 (A0h)	20	32		Vendor PN
Page00 161 (A1h)	20	32		Vendor PN
Page00 162 (A2h)	20	32		Vendor PN
Page00 163 (A3h)	20	32		Vendor PN
Page00 164 (A4h)	31	49	1	Vendor Rev
Page00 165 (A5h)	20	32		Vendor Rev
Page00 166 (A6h)	20	32		Vendor SN
Page00 167 (A7h)	20	32		Vendor SN
Page00 168 (A8h)	20	32		Vendor SN
Page00 169 (A9h)	20	32		Vendor SN
Page00 170 (AAh)	20	32		Vendor SN
Page00 171 (ABh)	20	32		Vendor SN
Page00 172 (ACh)	20	32		Vendor SN
Page00 173 (ADh)	20	32		Vendor SN
Page00 174 (AEh)	20	32		Vendor SN
Page00 175 (AFh)	20	32		Vendor SN
Page00 176 (B0h)	20	32		Vendor SN
Page00 177 (B1h)	20	32		Vendor SN
Page00 178 (B2h)	20	32		Vendor SN
Page00 179 (B3h)	20	32		Vendor SN
Page00 180 (B4h)	20	32		Vendor SN
Page00 181 (B5h)	20	32		Vendor SN
Page00 182 (B6h)	31	49	1	Date Code
Page00 183 (B7h)	30	48	0	Date Code
Page00 184 (B8h)	31	49	1	Date Code
Page00 185 (B9h)	30	48	0	Date Code
Page00 186 (BAh)	32	50	2	Date Code
Page00 187 (BBh)	30	48	0	Date Code
Page00 188 (BCh)	32	50	2	Date Code

Page00 189 (BDh)	32	50	2	Date Code
Page00 190-199 (BEh-C7h)	0	0		CLEI Code
Page00 200 (C8h)	E0	224	à	Module Power Characteristics
Page00 201 (C9h)	B0	176	°	Maximum Power
Page00 202-221 (CAh-DDh)	0	0		Cable Assembly Info (NVR)
Page00 222 (DEh)	90	144		Cable Assembly Info (NVR)
Page00 223-255 (DFh-FFh)	0	0		Cable Assembly Info (NVR)
Page01 128 (80h)	0	0		Major Firmware Revision
Page01 129 (81h)	06	6		Minor Firmware Revision
Page01 130 (82h)	01	1		Major Hardware Revision
Page01 131 (83h)	01	1		Minor Hardware Revision
Page01 132-254 (84h-FEh)	0	0		N/A
Page01 255 (FFh)	2	2		N/A
Page02 128 (80h)	50	80	P	Temperature monitor high alarm threshold MSB
Page02 129 (81h)	0	0		Temperature monitor high alarm threshold LSB
Page02 130 (82h)	0	0		Temperature monitor low alarm threshold MSB
Page02 131 (83h)	0	0		Temperature monitor low alarm threshold LSB
Page02 132 (84h)	4B	75	K	Temperature monitor high warning threshold MSB
Page02 133 (85h)	0	0		Temperature monitor high warning threshold LSB
Page02 134 (86h)	5	5		Temperature monitor low warning threshold MSB
Page02 135 (87h)	0	0		Temperature monitor low warning threshold LSB
Page02 136 (88h)	8D	141		Supply 3.3-volt monitor high alarm threshold MSB
Page02 137 (89h)	CC	204	Ì	Supply 3.3-volt monitor high alarm threshold LSB
Page02 138 (8Ah)	74	116	t	Supply 3.3-volt monitor low alarm threshold MSB
Page02 139 (8Bh)	4	4		Supply 3.3-volt monitor low alarm threshold LSB
Page02 140 (8Ch)	8B	139		Supply 3.3-volt monitor high warning threshold MSB
Page02 141 (8Dh)	D8	216	Ø	Supply 3.3-volt monitor high warning threshold LSB
Page02 142 (8Eh)	75	117	u	Supply 3.3-volt monitor low warning threshold MSB
Page02 143 (8Fh)	F8	248	ø	Supply 3.3-volt monitor low warning threshold LSB
Page02 144-254 (90h-FEh)	0	0		N/A
Page02 255 (FFh)	41	65	A	N/A
Page03 128-151 (80h-97h)	0	0		User EEPROM NVR

Page03 152 (98h)				Temperature Sensor 4 MSB
Page03 153 (99h)				Temperature Sensor 4 LSB
Page03 154 (9Ah)				Shell Temperature Sensor 1 MSB
Page03 155 (9Bh)				Shell Temperature Sensor 1 LSB
Page03 156 (9Ch)				Shell Temperature Sensor 2 MSB
Page03 157 (9Dh)				Shell Temperature Sensor 2 LSB
Page03 158 (9Eh)				Shell Temperature Sensor 3 MSB
Page03 159 (9Fh)				Shell Temperature Sensor 3 LSB
Page03 160-247 (A0h-F7h)	0	0		User EEPROM NVR
Page03 248 (F8h)				
Page03 249 (F9h)				
Page03 250 (FAh)	0	0		Power Spots 1
Page03 251 (FBh)	0	0		Power Spots 2
Page03 252 (FCh)	0	0		User EEPROM NVR
Page03 253 (FDh)	64	100	d	Temperature Cutoff
Page03 254-255 (FEh-FFh)	0	0		User EEPROM NVR

3.3.3   Memory Accessibility

The Memory Map registers types are shown in the table below:

Page Address	Address Range	Type
Lower Page	0-17	RO
	24-90	RO
	127	RW (VR)
Page 00h	128-165	RO
	166-199	RW (NVR)
	200-201	RO
	202-255	RW (NVR)
Page 01h	128-131	RO
	132-255	RW (VR)
Page 02h	128-143	RO
	144-255	RW (VR)
Page 03h	128-151	RW (NVR)
	152-159	RO
	160-247	RW (NVR)
	248-249	RO
	250-255	RW (NVR)

3.4 ML4064-XD-TL Specific Functions

3.4.1 Temperature Monitor

The **ML4064-XD-TL** has 7 internal temperature sensors, four on the PCBA and three others on the shell in order to continuously monitor the module temperature. Internally measured Module temperatures are represented as a 16-bit signed two's complement value in increments of 1/256 degrees Celsius, yielding a total range of −127 C to +128 °C that is considered valid between −40 and +125 °C.

Address	Bit	Name	Description	Type
LowMem 12	All	Temperature MSB	Internally measured PCB TempSense1 (Top)	RO
LowMem 13	All	Temperature LSB	Internally measured PCB TempSense1 (Top)	
LowMem 14	All	Temperature MSB	Internally measured PCB TempSense2 (Top)	
LowMem 15	All	Temperature LSB	Internally measured PCB TempSense2 (Top)	
LowMem 24	All	Temperature MSB	Internally measured PCB TempSense3 (Bottom)	
LowMem 25	All	Temperature LSB	Internally measured PCB TempSense3 (Bottom)	
Page03 152	All	Temperature MSB	Internally measured PCB TempSense4 (Bottom)	
Page03 153	All	Temperature LSB	Internally measured PCB TempSense4 (Bottom)	
Page03 154	All	Temperature MSB	Internally measured shell TempSense1 (Top)	
Page03 155	All	Temperature LSB	Internally measured shell TempSense1 (Top)	
Page03 156	All	Temperature MSB	Internally measured shell TempSense2 (Bottom)	
Page03 157	All	Temperature LSB	Internally measured shell TempSense2 (Bottom)	
Page03 158	All	Temperature MSB	Internally measured shell TempSense3 (Top)	
Page03 159	All	Temperature LSB	Internally measured shell TempSense3 (Top)	

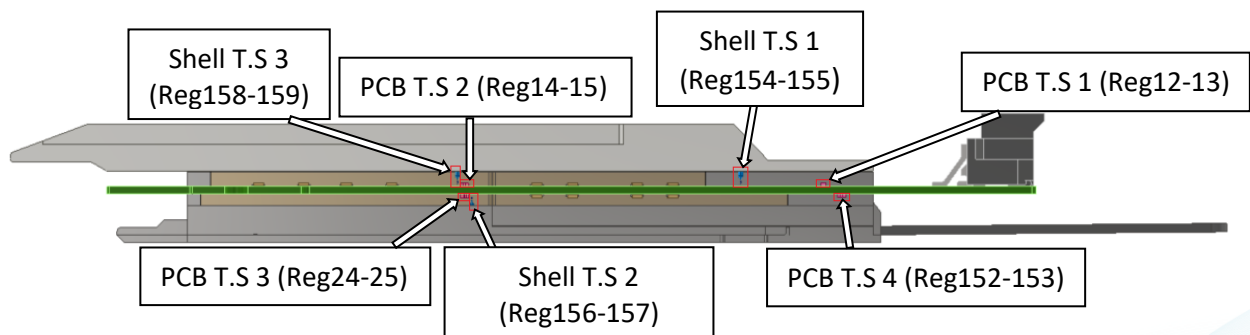The distribution of internal temperature sensors is shown in the figure.

Figure 5: Temperature sensor location

The temperature Alarms' and warnings' interrupt flags exist in lower page.

Address	Bit	Name	Description	Type
LowMem 9	3	L-Temp Low Warning	Latched low temperature warning flag	RO
	2	L-Temp High Warning	Latched high temperature warning flag	
	1	L-Temp Low Alarm	Latched low temperature alarm flag	
	0	L-Temp High Alarm	Latched high temperature alarm flag	

3.4.2   Voltage Sense

A voltage sense circuit is available in the **ML4064-XD-TL** that allows to measure the internal module supplied voltage Vcc, with LSB unit is 0.1 mV.

Address	Bit	Name	Description	Type
LowMem 16	All	Supply voltage MSB	Internally measured supply voltage	RO
LowMem 17	All	Supply voltage LSB	Internally measured supply voltage	

The Voltage Alarms and warnings interrupt flags exists in lower page.

Address	Bit	Name	Description	Type
LowMem 9	7	L-Vcc3.3v Low Warning	Latched low 3.3 volts supply voltage warning flag	RO
	6	L-Vcc3.3v High Warning	Latched low 3.3 volts supply voltage warning flag	
	5	L-Vcc3.3v Low Alarm	Latched low 3.3 volts supply voltage alarm flag	
	4	L-Vcc3.3v High Alarm	Latched low 3.3 volts supply voltage alarm flag	

3.4.3   Programmable Power Dissipation and Thermal Emulation

The **ML4064-XD-TL** module contains sixteen thermal spots positioned as shown in Figure 6, to allow the user to emulate the thermal behavior of an optical module.
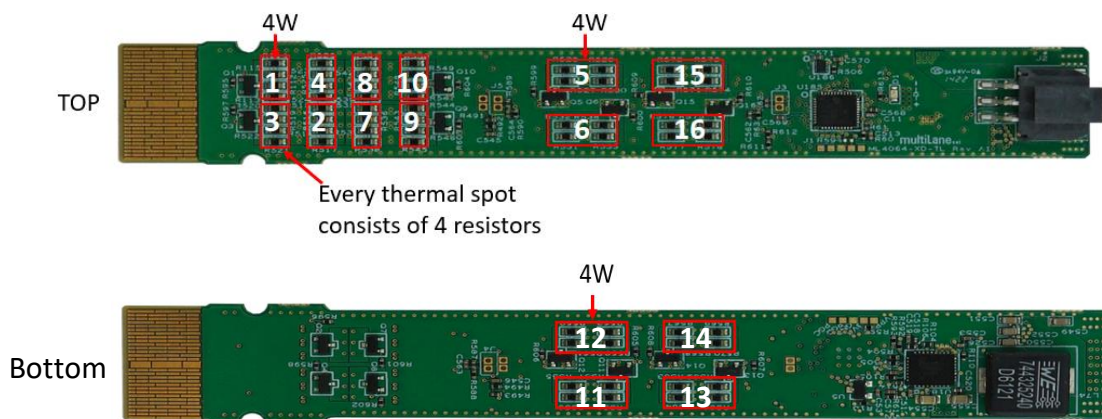
Figure 6: Thermal spots distribution

All power spots (1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16) are ON/OFF controlled.

Note that a maximum number of 11 spots can be activated simultaneously.

Registers 250 and 251, page 03h are used to control thermal spots over I2C. They are 8 bits data wide registers.
The consumed power changes accordingly when the values of these registers are changed (only in high power mode). In Low-power mode the module automatically turns off all power spots. The values written in these registers are permanently stored.

The control registers of the thermal spots are shown in the table below:

Power Spot	Register	Bit	Power Consumption	Control Type	Memory Type
1	250 **Page03**	0	4 W	ON/OFF	RW (NVR)
2		1	4 W		
3		2	4 W		
4		3	4 W		
5		4	4 W		
6		5	4 W		
7		6	4 W		
8		7	4 W		
9	251 **Page03**	0	4 W		
10		1	4 W		
11		2	4 W		
12		3	4 W		
13		4	4 W		
14		5	4 W		
15		6	4 W		
16		7	4 W		

Figure 7 below shows top and bottom views of the module assembly, which include copper plates (bronze color) and TIM (gray color). The TIM conductivity is 3 W/m.K., while the copper plate conductivity is 398 W/m.K.
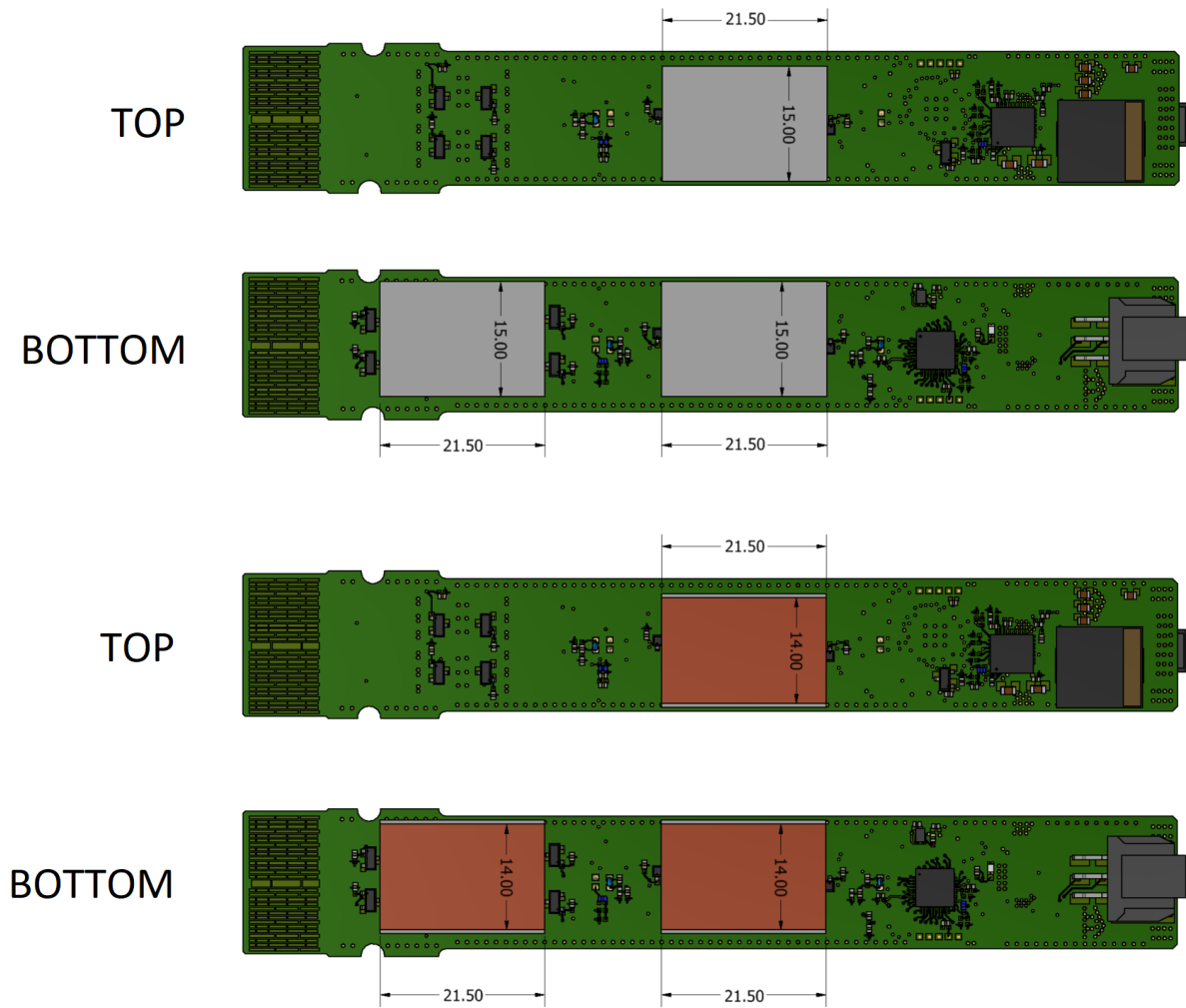
Figure 7: Module assembly top and bottom view with TIM pads and copper plates

Summary of the Thermal Pads needed:
- 65 x 15 x 1 mm (TOP)
- 77 x 15 x 1.5 mm (BOTTOM)

Summary of the Copper Plates needed:
- 21.5 x 14 x 1 mm (TOP)
- 21.5 x 14 x 1 mm (TOP)
- 21.5 x 14 x 1 mm (TOP)
- 21.5 x 14 x 1 mm (BOTTOM)
- 21.5 x 14 x 1 mm (BOTTOM)

3.4.4 Cut-Off Temperature

To avoid overheating the module, a Cut-Off Temperature is pre-defined.
The module is continuously monitoring the temperature and checking its value against the Cut-Off temperature. Once the module temperature reaches the cut-off temperature, all power spots will automatically turn off in order to prevent overheating. Once the temperature is 5 degrees below cut-off value, the PWM goes back to its previous value.
The **ML4064-XD-TL** Cut-Off temperature is set to maximum by default, which is 100 °C. Cut-Off temperature can be programmed to any value (below maximum) from register 253 of memory page 03.

Address	Bit	Name	Description	Type
Page03 253	7:0	Cut-Off temperature	Module Cut-Off Temperature, LSB = 1 °C	RW (NVR)

3.4.5 Alarm and warning thresholds

Each A/D quantity has a corresponding high alarm, low alarm, high warning and low warning threshold. These factory-preset values allow you to determine when a particular value is exceeding the predefined limit. While Voltage LSB unit is 100 µV and Temperature LSB unit is 1/256 ˚C. Note that these addresses are of memory Page 02.

Address	Bit	Name	Default Value	Type
Page02 128	ALL	high temp alarm threshold (MSB)	80˚C	RO
Page02 129	ALL	high temp alarm threshold (LSB)		
Page02 130	ALL	low temp alarm threshold (MSB)	0 °C	
Page02 131	ALL	low temp alarm threshold (LSB)		
Page02 132	ALL	high temp warning threshold (MSB)	75˚C	
Page02 133	ALL	high temp warning threshold (LSB)		
Page02 134	ALL	low temp warning threshold (MSB)	5˚C	
Page02 135	ALL	low temp warning threshold (LSB)		
Page02 136	ALL	high volt alarm threshold (MSB)	3.63 V	
Page02 137	ALL	high volt alarm threshold (LSB)		
Page02 138	ALL	low volt alarm threshold (MSB)	2.97 V	
Page02 139	ALL	low volt alarm threshold (LSB)		
Page02 140	ALL	high volt warning threshold (MSB)	3.58 V	
Page02 141	ALL	high volt warning threshold (LSB)		
Page02 142	ALL	low volt warning threshold (MSB)	3.02 V	
Page02 143	ALL	low volt warning threshold (LSB)		

3.4.6   FW and HW Revision

Information about the FW and HW revision are present in registers 128-129 page01 and in registers 130-131 page 01 respectively, as described in the table below.

Address	Bit	Description	Type
Page01 128	All	Major FW Rev	RO
Page01 129	All	Minor FW Rev	
Page01 130	All	Major HW Rev	
Page01 131	All	Minor HW Rev	

4   OSFP-XD Contact Pads

Critical dimensions for the contact pads are shown in Figure 8. The contacts are made in dual row, which mates with dual rows of the connector.
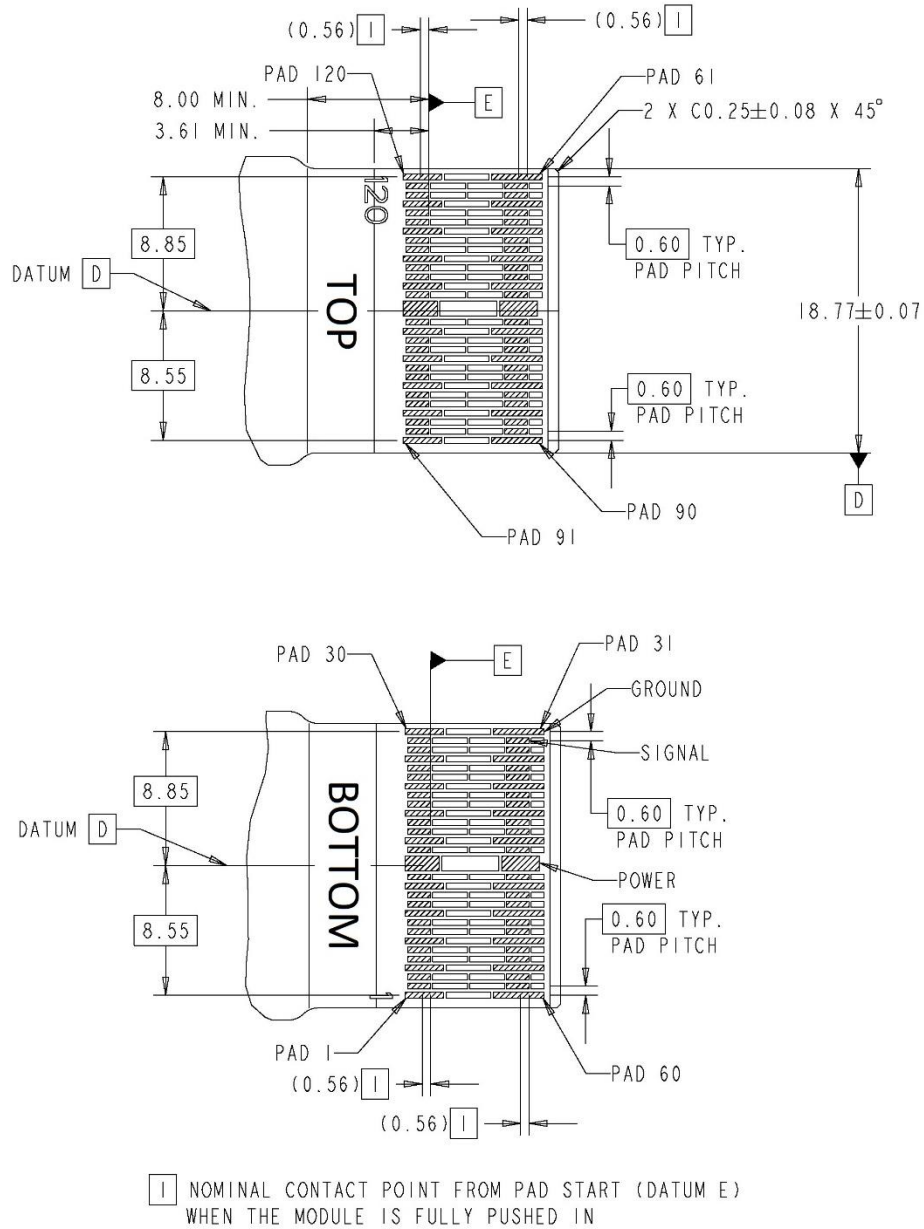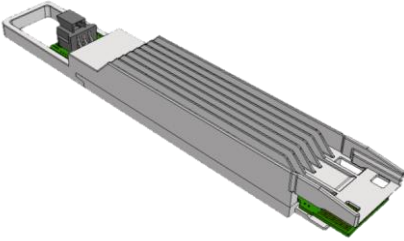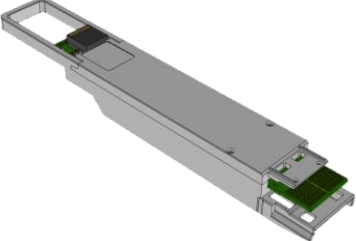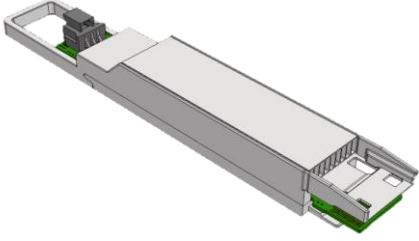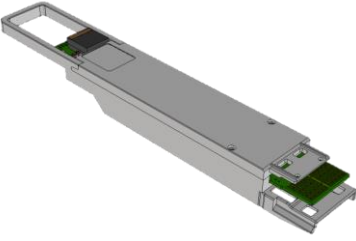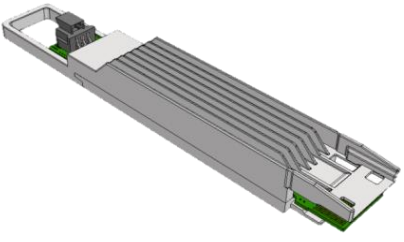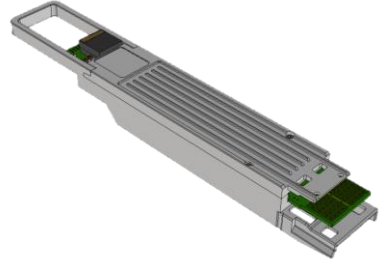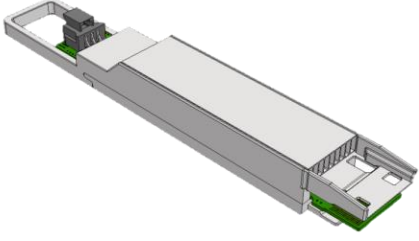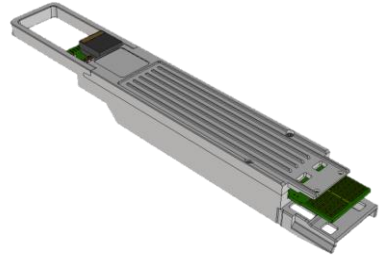
Figure 8: OSFP-XD Module Pad Layout

Note that all pads of the ML4064-XD-TL module are dummy pads. The current version of the module is operational only from the connector side.

5   Available Shell Options

Part Number	Top Shell	Bottom shell
ML4064-XD-TL2-A	Open Top Fin	Flat Bottom
ML4064-XD-TL2-B	Closed Top Heat Sink	Flat Bottom
ML4064-XD-TL2-C	Open Top Fin	Fin Bottom
ML4064-XD-TL2-D	Closed Top Heat Sink	Fin Bottom

6   Major FW Upgrades

Initial firmware release is **FW V0.6**.

Revision History

Revision number	Date	Description
0.1	9/15/2022	▪ Preliminary
0.2	12/8/2022	▪ Fix section 3.2.4 ▪ Fix section 3.4.3
0.3	5/9/2023	▪ Fix section 5