

# 40G QSFP-4\*SFP Passive Direct Copper Cables

## ND-P5CXX-XXX

### 1. Applications

- 10G/40G Ethernet
- InfiniBand, Fiber Channel 4G/8G/10G
- Sonet Multiplatform support
- High Performance Computing Clusters
- High End Servers
- Metro Network Switch/Cross Connect



### 2. Features

- Passive Copper (Paddle cards plus Copper cable) (Cable Length: 1~5m)
- 4-Channel Full Passive Copper Cable Transceiver
- QSFP+ conforms to the Small Form Factor SFF-8436 and SFF-8431
- Support for multi-gigabit data rates up to 10.5Gbps
- Data rates backward compatible to 1Gbps
- Maximum aggregate data rate: 40 Gbps (4 x 10Gbps)
- Hot-Density QSFP 38-PIN footprint
- I/O Connector designed for high speed differential signal applications
- Improved Pluggable Form Factor(IPF) compliant for enhanced EMI/EMC performance
- Compatible with industry standard SFP cages +Switches
- EEPROM signature can be customized.
- Temperature Range: 0~ 70 °C
- RoHS-6 Compliant

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### **3. Description**

NEM Engine's ND-P5CXX-XXX High Speed 40G QSFP+ to 4 × 10G SFP+ Direct Attach Cable copper cable assemblies are a low cost alternative for short reach 4X applications. They are designed to be fully compatible in form factor and optical/electrical connections according to the QSFP Multi-Source Agreement.

QSFP+ connectors provide four channels of data in one pluggable interface. Each channel is capable of transferring data at 10Gbps and supports a total of aggregate 40Gbps as specified for QSFP+. These interconnects have three times the density of SFP+ interconnects (MSA) and have been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference.

QSFP+ cable assemblies are hot swappable and the programmed EEPROM signature enables the host to differentiate

between a copper cable assembly and a fiber optic module.

Low power consumption assists in making the passive copper cable assembly an economic solution for withinrack, or rack-to-rack applications.

### **4. standard**

- Compliant with electrical standards IEEE 802.3ba
- Compliant with mechanical standard SFF-8436 and SFF-8431
- Compliant with EEPROM standard SFF-8472
- RoHS Compliant

## 5. Performance Specifications

### 5.1. Absolute Maximum Ratings

These values represent the damage threshold of the module. Stress in excess of any of the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

*Table.1 Absolute maximum ratings*

Parameter	Symbol	Min	Max	Unit
Maximum Supply Voltage	Vcc	0	3.6	V
Storage Temperature	Ts	-40	85	°C
Relative Humidity	RH	5	95	%

### 5.2. Recommended Operating Conditions

*Table.2 Recommended Operating Conditions*

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Standard Tc	0	25	70	°C
Storage Temperature	Ts	0		70	°C
Relative Humidity	RH	5		95	%
Data Rate			10/40		Gbps

### 5.3. Product Characteristics

*Table.3 Product Characteristics*

Test Type	Test Item	Target		Reference
	Differential Impedence	100+/- 10ohm (Rise time of 50 ps (20 %-80 %))		IEEE Std.802.3ba
Electrical Characteristics	Differential Mode RL	Frequency(GHz) 0.1-1.0 1.0-4.1	SDD11 & SDD22(max) -10 -(12-2*sqrt(f))	Per table 10 of 1B Cable MOL.v 0.68
	Differential IL	Frequency 100MHz 200MHz 625MHz 1250MHz 1875MHz 2500MHz	SDD21(min) -8 -8 -8.5 -12.1 -14.7 -17	Ref table 43 of Infiniband Architecture Spec, V2
	NEXT	≥26dB @ 10MHz to 5.0GHz		/
	Intra-Pair Skew	≤100 ps(TDT Method) Rise time of 35 ps		(20 %- 80 %)
	Intra-Pair Skew	≤400 ps(TDT Method) Rise time of 35 ps		(20%~80 %)
Environmental Characteristics	Operating Temperature	-40~85°C		Cable operating temp. range
	Thermal Shock	No evidence of physical damage		EIA-364-32 Test
	Cyclic Temp. & Humidity	No evidence of physical damage		EIA-364-31 Method III, Test Cond A
	Salt spray	48 hours salt spraying after shell corrosive area less than 5%		EIA-364-26
	Temperature Life	Performance meets the specification requirement		EIA-364-17, Method A, Test Cond 3 at 105°±2° C
Mechanical Characteristics	Mechanical Vibration	Performance meets the specification requirement		EIA-364-28E.11 TC-VII, Test Cond. D 15minutes in X,Y,Z axis.
	Cable Flex	Performance meets the specification requirement		EIA-444-1B
	Mechanical Shock	Performance meets the specification requirement		EIA-364-27B, TG-G. 3 times in 6 directions, 100g, 6ms
	Cable plug Insertion	40N Max.		Per QSFP MSA Rev 1.0
	Cable plug extraction	30N Max.		Per QSFP MSA Rev 1.0.
	Latch retention force	50N Min. No evidence of physical damage		EIA-364-13
	Durability	50 Time. No evidence of physical damage		EIA-364-09; perform plug&unplug cycles

5.4. Pin Definitions

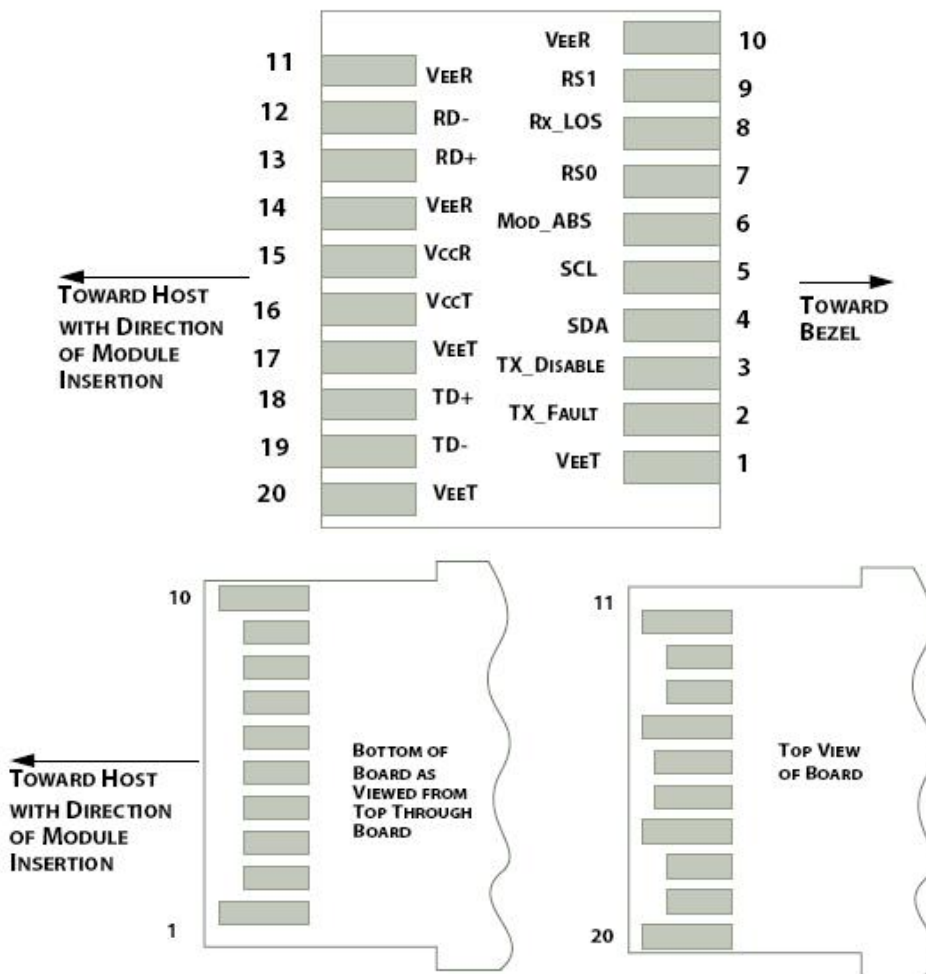
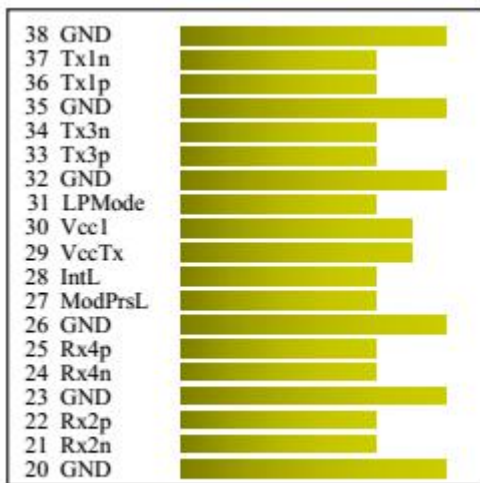


Table.4 SFP Pin Definitions

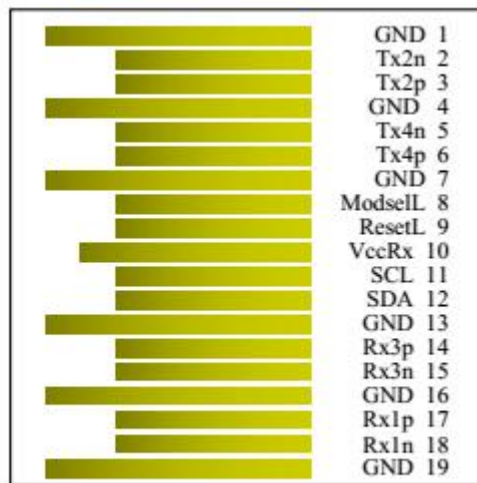
PIN	Symbol	Description	Remarks
1	V <sub>EE</sub> T	Transmitter ground (common with receiver ground)	Circuit ground is isolated from chassis ground
2	Tx_Fault	Transmitter Fault. Not supported	
3	Tx_Disable	Transmitter Disable. Laser output disable on high or open	Disabled: TDIS>2V or open Enabled: TDIS<0.8V
4	SDA	2-wire Serial Interface Data Line	Should Be pulled up with 4.7k – 10k ohm on host board to a voltage between 2V and 3.6V
5	SCL	2-wire Serial Interface Clock Line	
6	MOD_ABS	Module Absent. Grounded within the module.	
7	RS0	No connection required	
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation	LOS is open collector output
9	RS1	No connection required	

10	V <sub>EE</sub> R	Receiver ground (common with transmitter ground)	Circuit ground is isolated from chassis ground
11	V <sub>EE</sub> R	Receiver ground (common with transmitter ground)	
12	RD-	Receiver Inverted DATA out. AC coupled	
13	RD+	Receiver Non-inverted DATA out. AC coupled	
14	V <sub>EE</sub> R	Receiver ground (common with transmitter ground)	Circuit ground is isolated from chassis ground
15	V <sub>CC</sub> R	Receiver power supply	
16	V <sub>CC</sub> T	Transmitter power supply	
17	V <sub>EE</sub> T	Transmitter ground (common with receiver ground)	Circuit ground is isolated from chassis ground
18	TD+	Transmitter Non-Inverted DATA in. AC coupled	
19	TD-	Transmitter Inverted DATA in. AC coupled	
20	V <sub>EE</sub> T	Transmitter ground (common with receiver ground)	Circuit ground is isolated from chassis ground



Top Side (Viewed From Top)

Module Card Edge



Bottom Side (Viewed From Bottom)

**Table.5 QSFP Pin Definitions**

Pin number	Logic	Symbol	Signal	Description
1		GND	Signal Ground	Ground
2	CML-I	Tx2n	Tx2n	Transmitter Inverted Date Input.AC coupled
3	CML-I	Tx2p	Tx2p	Transmitter Non_Inverted Date Input.AC coupled
4		GND	Signal Ground	Ground
5	CML-I	Tx4n	Tx4n	Transmitter Inverted Date Input.AC coupled
6	CML-I	Tx4p	Tx4p	Transmitter Non_Inverted Date Input.AC coupled
7		GND	Signal Ground	Ground

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8	LVTTTL-I	ModSelL	ModSelL	Module Select pin.Selected when held low by the host.
9	LVTTTL-I	ResetL	LPMoDe_Reset	Module Reset.A"low" pulse induces a reset on the module.
10		Vcc Rx	Vcc Rx	+3.3V Power Supply Receiver
11	LVC MOS-I/O	SCL	SCL	2-wire serial interface
12	LVC MOS-I/O	SDA	SDA	
13		GND	Signal Ground	Ground
14	CML-O	Rx3p	Rx3p	Receiver Non_Inverted Date Input.AC coupled
15	CML-O	Rx3n	Rx3n	Receiver Inverted Date Input.AC coupled
16		GND	Signal Ground	Ground
17	CML-O	Rx1p	Rx1p	Receiver Non_Inverted Date Input.AC coupled
18	CML-O	Rx1n	Rx1n	Receiver Inverted Date Input.AC coupled
19		GND	Signal Ground	Ground
20		GND	Signal Ground	Ground
21	CML-O	Rx2n	Rx2n	Receiver Inverted Date Input.AC coupled
22	CML-O	Rx2p	Rx2p	Receiver Non_Inverted Date Input.AC coupled
23		GND	Signal Ground	Ground
24	CML-O	Rx4n	Rx4n	Receiver Inverted Date Input.AC coupled
25	CML-O	Rx4p	Rx4p	Receiver Non_Inverted Date Input.AC coupled
26		GND	Signal Ground	Ground
27	LVTTTL-O	ModPrsL	ModPrsL	Module Present pin.Internally grounded inside the module.
28	LVTTTL-O	IntL	IntL	Interrupt by the QSFP module."Low"indicates an Alarm/Warning.
29		Vcc Tx	Vcc Tx	+3.3V Power Supply Transmitter
30		Vccl	Vccl	+3.3V Power Supply
31	LVTTTL-I	LPMoDe	LPMoDe	Low Power Mode
32		GND	Signal Ground	Ground
33	CML-I	Tx3p	Tx3p	Transmitter Non_Inverted Date Input.AC coupled
34	CML-I	Tx3n	Tx3n	Transmitter Inverted Date Input.AC coupled
35		GND	Signal Ground	Ground
36	CML-I	Tx1p	Tx1p	Transmitter Non_Inverted Date Input.AC coupled
37	CML-I	Tx1n	Tx1n	Transmitter Inverted Date Input.AC coupled
38		GND	Signal Ground	Ground
Housing			Chassis Ground	

### 5.6. Mechanical Dimensions

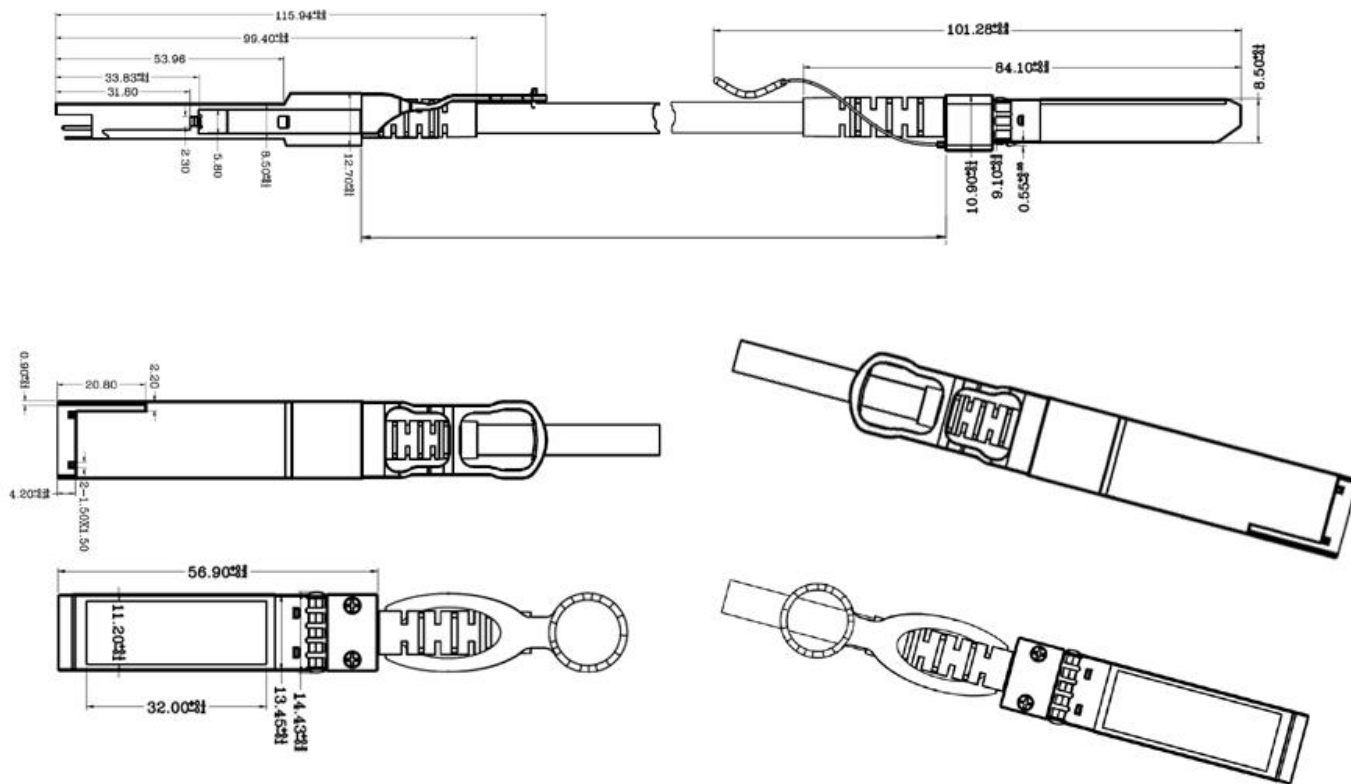


Diagram of Mechanical Dimensions



## 6. Application Cautions

### 6.1. ESD

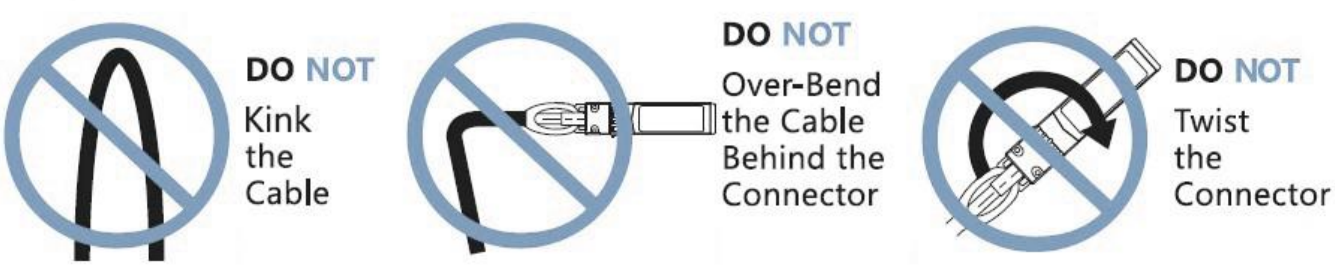
This transceiver is specified as ESD threshold 1kV for high speed pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

### 6.2. LASER SAFTY

This is a Class 1 Laser Product according to IEC 60825-1:1993:+A1:1997+A2:2001. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (July 26, 2001)

### 6.3. Important Notice


**Important Notice:**




**DO NOT** Kink the Cable

**DO NOT** Over-Bend the Cable Behind the Connector

**DO NOT** Twist the Connector



**ANTISTATIC**

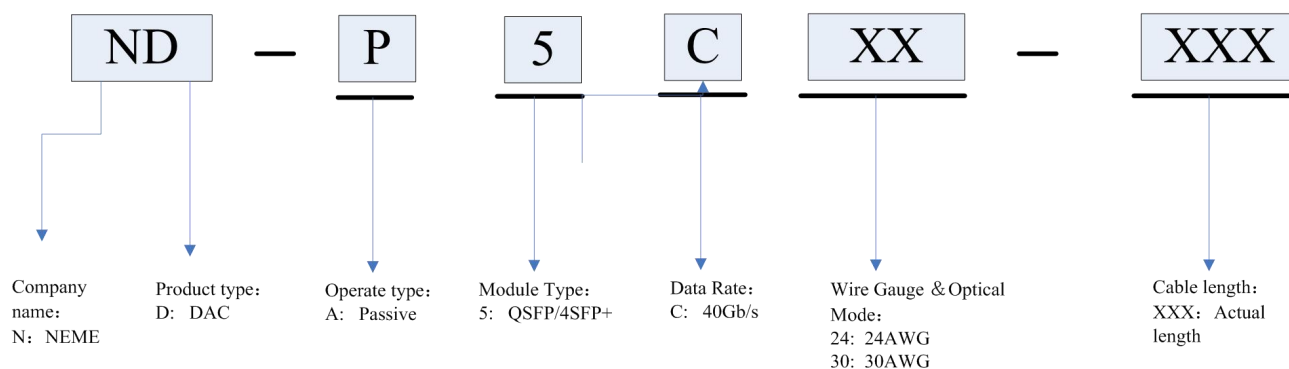


**FRAGILE**

Note:

- 1)Copper type maximum length recommended at 15 meters;
- 2)Various cable lengths available for all types;
- 3)Latch/tab available”on top”or”bottom”position.

## 7. Order Information



## Further Information

For further information, please contact NEME.

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