SFF TA TWG Changes Coming to a Server Near You

Presented by

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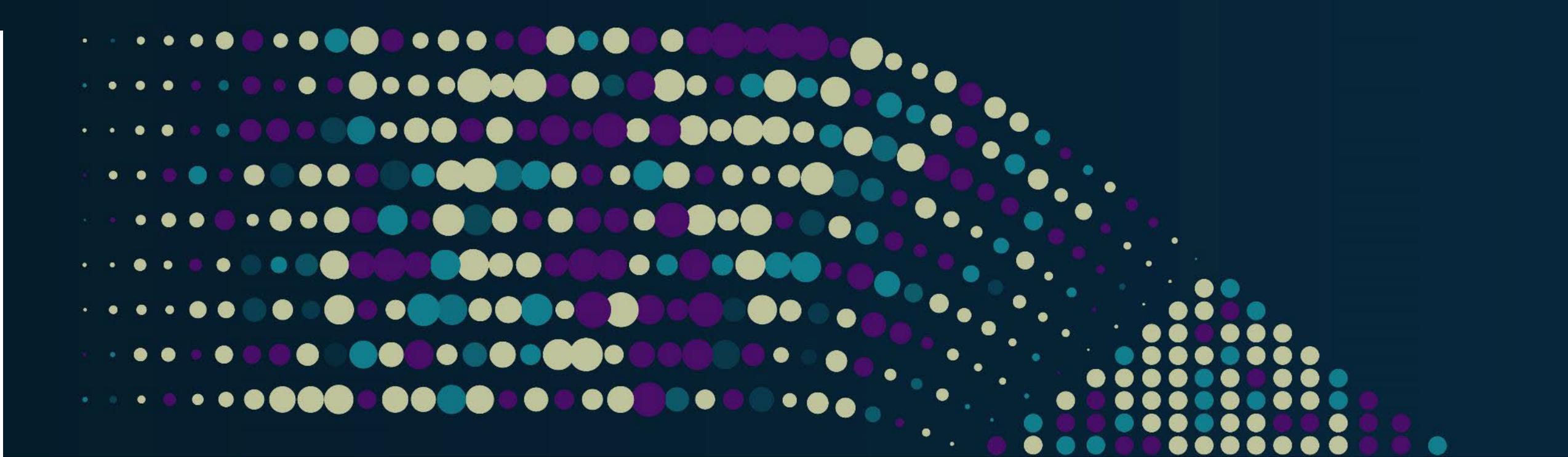
About SFF TA TWG

# First Off: What is the SFF TA TWG?

- **SFF TA TWG develops technical specifications for:**
  - Storage media
  - Storage networks
  - Pluggable solutions
- **These specifications cover:**
  - Cables
  - Connectors and cages
  - Form factors
  - Management interfaces
  - Copper and Optical Transceiver modules
  - Electrical interfaces

**Figure 4-1 UBM Backplane Overview**
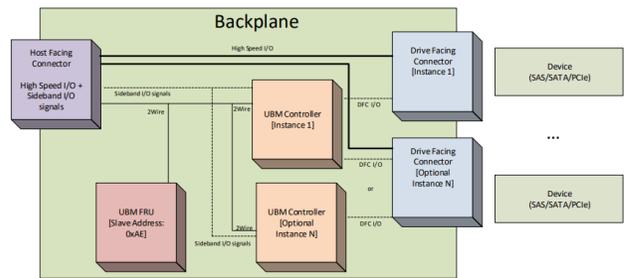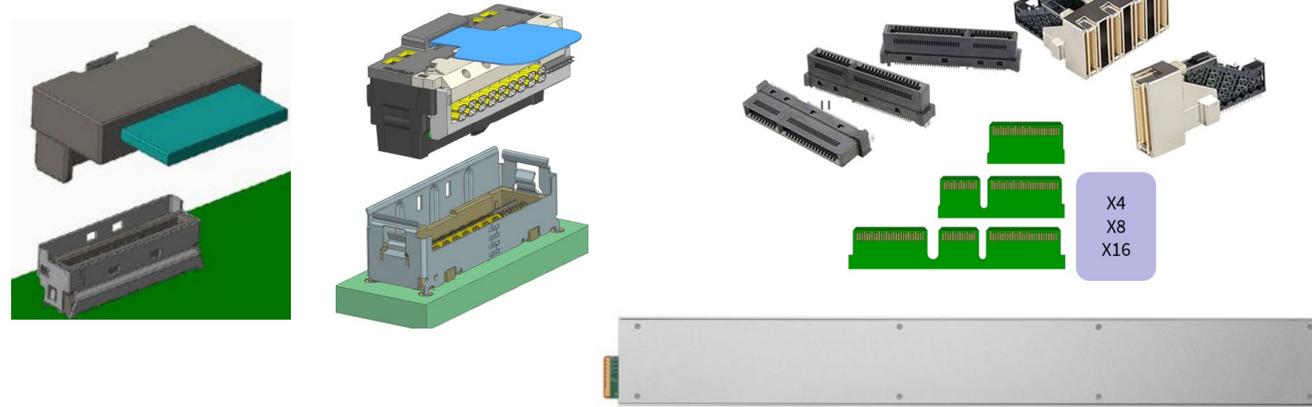
Who Are We?

Our members include participants involved in ASICs/CPUs, Data centers, interconnects, networking, research, server systems, storage devices, test equipment, and transceivers.

Our Stats

- 76 member companies
- Managing 149 published specifications
- Revising 14 published specifications
- Developing 9 new specifications

- Our specifications are used by SNIA/SFF members as well as organizations including: ECIA, ANSI, IEC, PCI-SIG, INCITS (SCSI, Fibre Channel, ATA), SATA-IO, JEDEC, OIF, OCP, IEEE (Ethernet), and InfiniBand

SFF TA TWG

Co-Chairs:
- Paul Coddington
- Anthony Constantine

Connectors Subgroup

Co-Chairs:
- Paul Coddington
- Anthony Constantine

Transceivers Subgroup

Chair:
- Tom Palkert
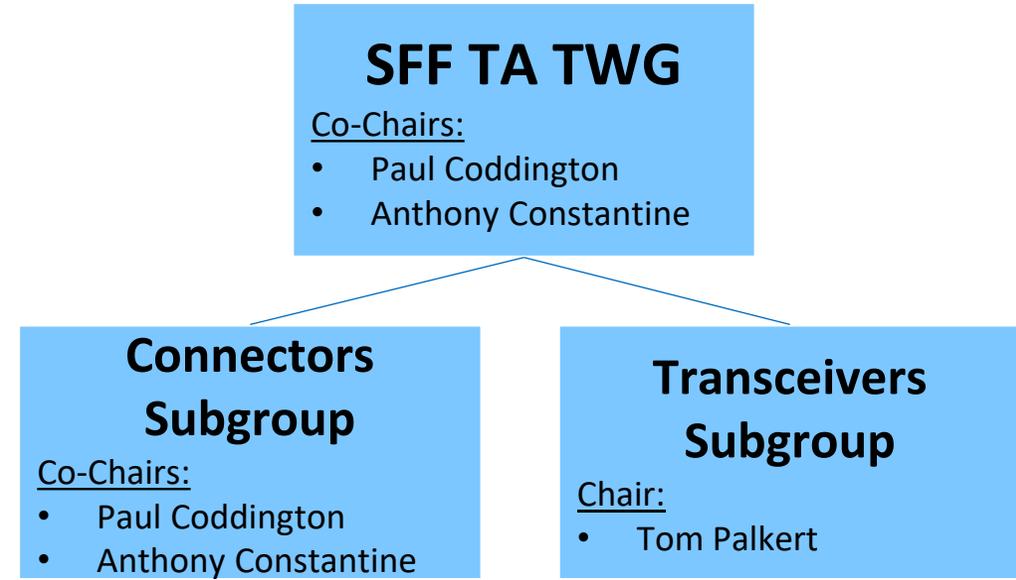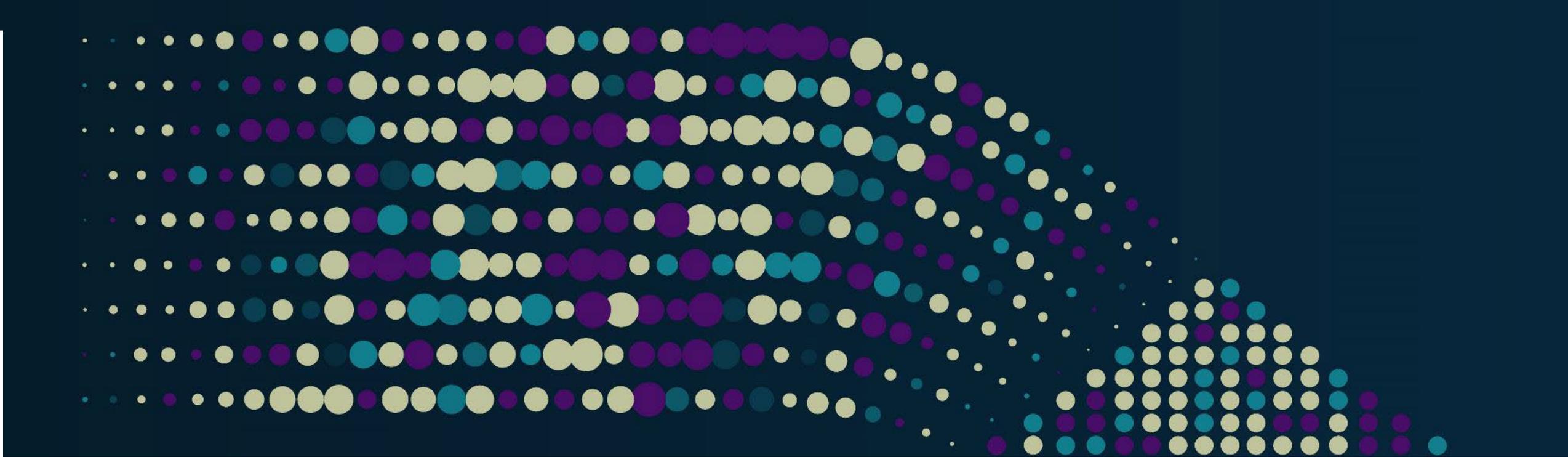
Our Latest Publications

What Have We Done Lately?

- In the last year, we published 4 new specifications
  - SFF-TA-1033: Internal High-Speed Cable / Modular Connector System
  - SFF-TA-1031: SFP2 Cage, Connector, & Module Specification
  - SFF-TA-1027: QSFP2 Connector, Cage, & Module Specification
  - SFF-8612: MiniLink 4/8X Shielded Connector
- We also published revisions of 7 specifications
  - SFF-TA-1016: Internal Unshielded High Speed Connector System
  - SFF-TA-1009: Enterprise and Datacenter Standard Form Factor Pin and Signal Specification (EDSFF)
  - SFF-TA-1002: Protocol Agnostic Multi-Lane High Speed Connector
  - SFF-8636: Management Interface for 4-lane Modules and Cables
  - SFF-8614: Mini Multilane 4/8X Shielded Cage/Connector (HDsh)
  - SFF-8402: SFP+ 1X Pluggable Transceiver Solutions
  - SFF-8024: SFF Module Management Reference Code Tables

SFF-TA-1033: Internal High-Speed Cable / Modular Connector System

- **This specification defines requirements for an Internal High-Speed Cable / Modular Connector System**
  - Designed to provide an internal cable and connector solution that supports both high-speed and power transmission
  - Enables broad compatibility across future generations of host process modules.
- **Compatible with SFF-TA-1016.**

- **Typical Applications:** Interconnect for in-box differential cables (PCIe, SAS)
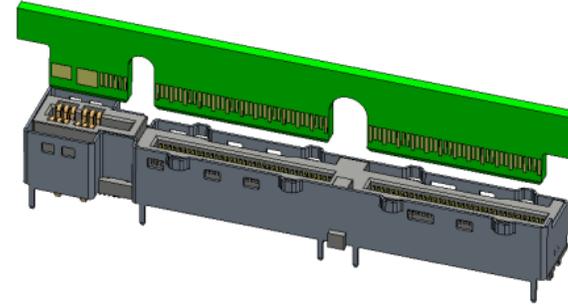

Figure 4-1 Combo x16+21A Power AIC Application
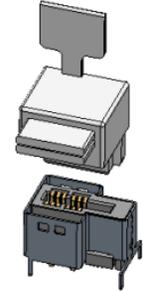
Figure 4-15 RRA 21A Power Cable Application
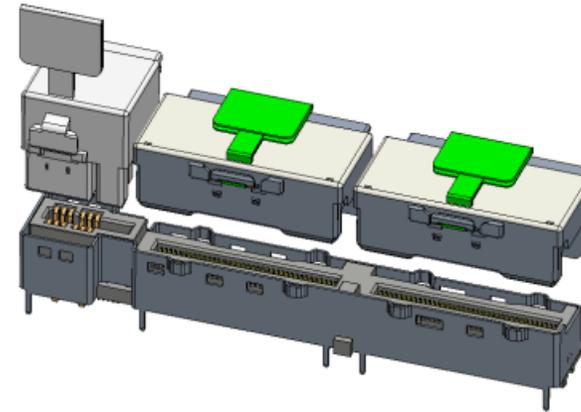
Figure 4-5 Separate RA 74 Pin Cables and a RA 21A Power Cable Application
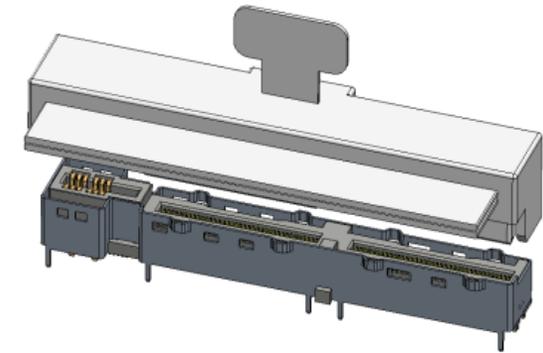
Figure 4-3 Combo x16+21A Power RRA Cable Application

SFF-TA-1031: SFP2 Cage, Connector, & Module Specification

- **This specification defines the SFP2 module, cage and connector system**
  - SFP2 is an updated version of SFP to support 112Gb/s and beyond over a single lane
- **Backwards compatible to SFP+/SFP28**
  - SFP2 cage and connectors are compatible with SFP+/SFP28 modules
  - Modules, connectors and cages for 50 Gb/s PAM4 marketed as "SFP56" can follow either this spec or SFF-8402

- **<u>Typical Applications:</u> Interconnect between network and storage switches, patch panels, and servers to fiber or Ethernet cables**
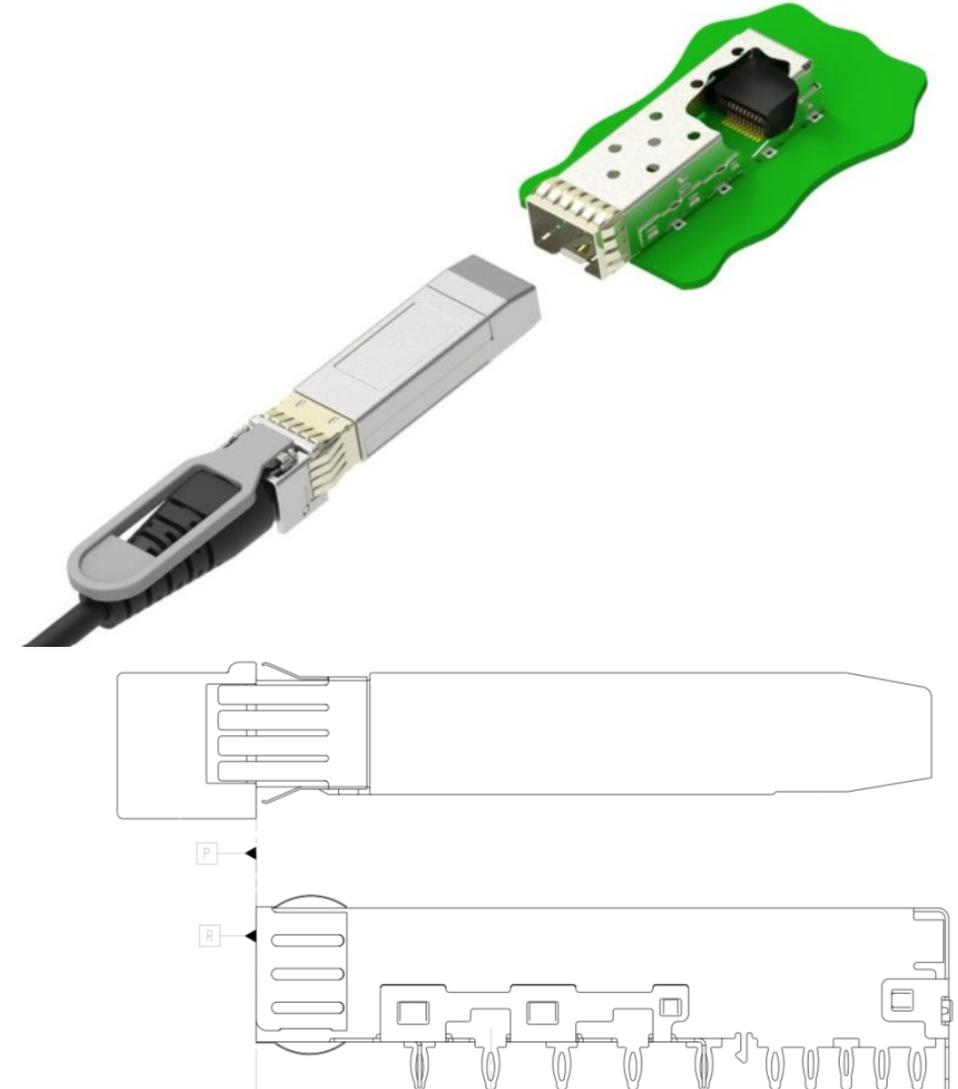
SFF-TA-1027: QSFP2 Connector, Cage, & Module Specification

- This specification defines the mechanical requirements of the pluggable QSFP2 cages, connectors, and modules
  - QSFP2 is an updated version of QSFP to support 112Gb/s and beyond over 4 lanes
  - Defines 1x1 & 2x1 connector and cage styles
  - Defines Type 1, 2, 2A, and 2B Modules
- Backwards compatible with:
  - QSFP28 and QSFP+ modules
  - QSFP, QSFP+, QSFP28, and QSFP56 hosts (with better thermals)

- <u>Typical Applications:</u> Interconnect between patch panels, switches, and servers to fiber or Ethernet cables
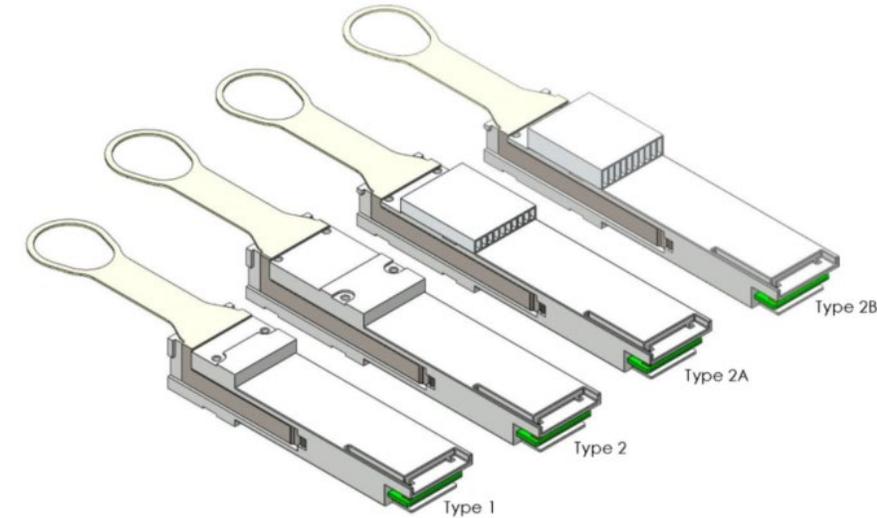
Figure 7-1 QSFP2 Module Types
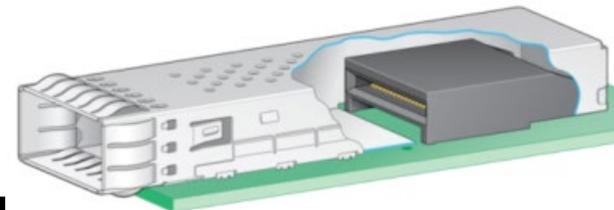
Figure 4-1 QSFP2 1x1 Cage and Connector
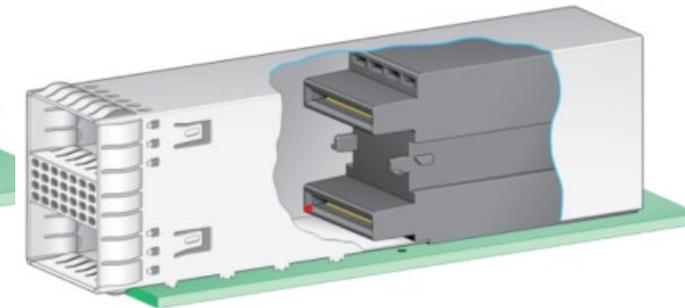
Figure 4-2 QSFP2 2x1 Stacked Cage and Connector

SFF-8612: MiniLink 4/8X Shielded Connector

- **Defines the mechanical requirements for MiniLink fixed receptacles**
  - Designed for use in high-speed serial, interconnect applications at multi-gigabit speeds

- **Mating plug is defined in SFF-8611**

- **Typical Applications: Interconnect for in-box differential cables (PCIe, SAS)**
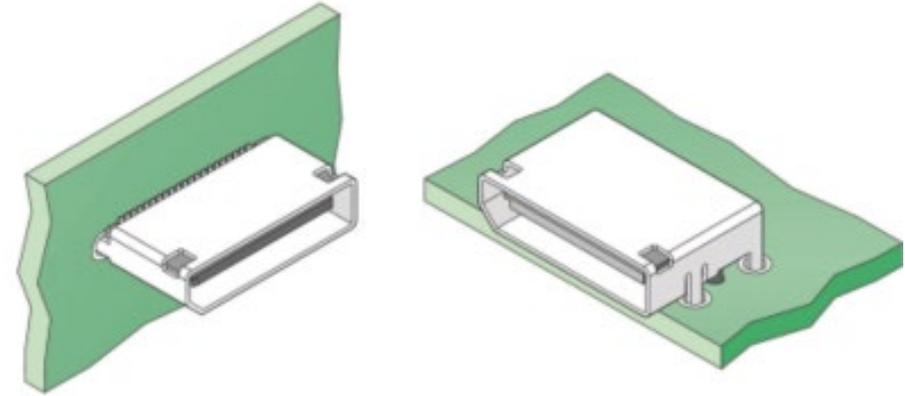
a) PTH shell
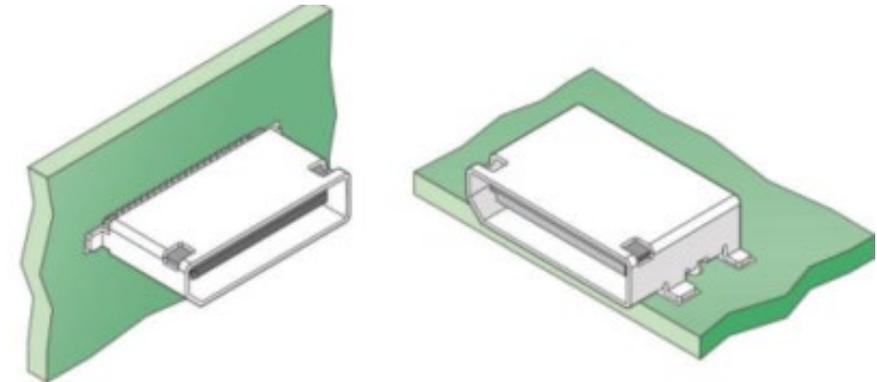
b) SMT shell

SFF-TA-1016: Internal Unshielded High Speed Connector System

- **Defines the connector system for several straight and right angle plugs and receptacles**
  - Options for 38, 74, 124, and 148 pin contacts
  - Application includes interconnect for in-box differential cables (PCIe, SAS)

- **Changes made since prior publication:**
  - Tightened tolerances of PCB to Card slot CL
 - Added dimensions of plug bottom to card CL
  - Errata fix of 2 dimensional values that were swapped
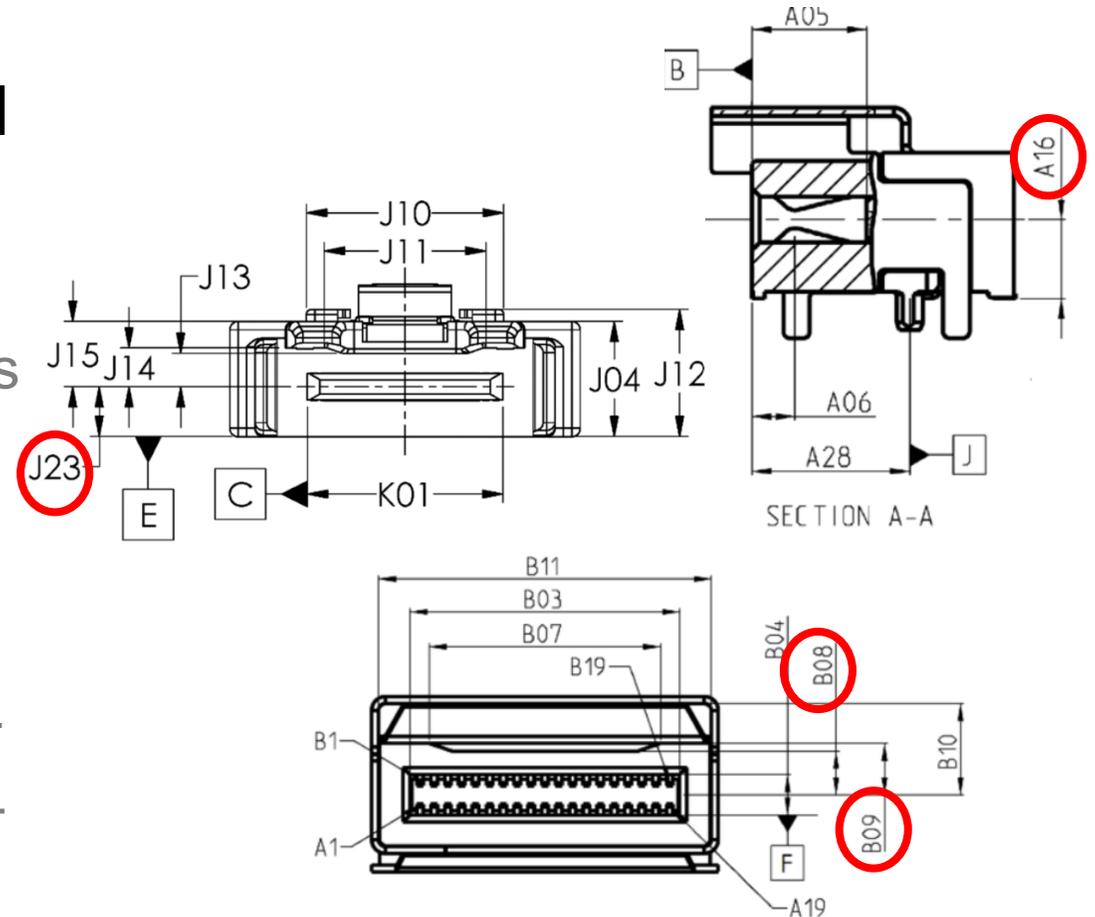
| B08 | Interface Card Slot Centerline to Housing Wall | 2.24 1.89 |
| B09 | Interface Card Slot Centerline to Housing Wall | 1.89 2.24 |

SFF-TA-1009: Enterprise and Datacenter Standard Form Factor Pin and Signal Specification (EDSFF)

- **This specification provides the pinout, features, and electricals for EDSFF**
  - Applications include SSDs, CXL devices, Accelerators, NICs
- **Changes made since prior publication**
  - Optional I3C supported added
  - Optional NIC sideband support added
  - Clarification on LED behavior

| Pin	Contact Sequence	Signal	Signal	Contact Sequence	Pin
BO1	2nd mate	NIC_PWR_GOOD	PERST2#	2nd mate	AO1
BO2	2nd mate	MAIN_PWR_EN	PERST3#	2nd mate	AO2
BO3	2nd mate	LD#	WAKE#	2nd mate	AO3
BO4	2nd mate	DATA_IN	RBT_ARB_IN	2nd mate	AO4
BO5	2nd mate	DATA_OUT	RBT_ARB_OUT	2nd mate	AO5
BO6	2nd mate	CLK	SLOT_ID1	2nd mate	AO6
BO7	2nd mate	SLOT_ID0	RBT_TX_EN	2nd mate	AO7
BO8	2nd mate	RBT_RXD1	RBT_TXD1	2nd mate	AO8
BO9	2nd mate	RBT_RXD0	RBT_TXD0	2nd mate	AO9
BO10	1st mate	GND	GND	1st mate	AO10
BO11	2nd mate	REFCLKn2	REFCLKn3	2nd mate	AO11
BO12	2nd mate	REFCLKp2	REFCLKp3	2nd mate	AO12
BO13	1st mate	GND/NIC_DETECT#	GND	1st mate	AO13
BO14	2nd mate	RBT_CRS_DV	RBT_CLK_IN	2nd mate	AO14
		Key	Key		
B1	2nd mate	12 V	GND	1st mate	A1
B2	2nd mate	12 V	GND	1st mate	A2
B3	2nd mate	12 V	GND	1st mate	A3
B4	2nd mate	12 V	GND	1st mate	A4
B5	2nd mate	12 V	GND	1st mate	A5
B6	2nd mate	12 V	GND	1st mate	A6
B7	2nd mate	MFG/BIF0#	SMBCLK/I3CCLK	2nd mate	A7
B8	2nd mate	RFU/BIF1#	SMBDATA/I3CDATA	2nd mate	A8

SFF-TA-1002: Protocol Agnostic Multi-Lane High Speed Connector

- **This specification defines an unshielded, I/O, card edge connector and mating card interface capable of operation up to 112GT/s PAM4**
  - 56, 84, 140, or 168 pin contacts
  - Applications include EDSFF, OCP NIC 3.0, OCP DC-CSM, and other board to board interconnects
- **Changes made since prior publication**
  - Added 32GT/s NRZ signal integrity requirements for the orthogonal connector
  - Updated a pin tolerance and added a note for soldermask keep out
  - Added 1 additional Straddle mount Host board thickness

	Insertion Loss	Return Loss	Power Sum Near End ~~and Far End~~ Crosstalk	Power Sum Far End Crosstalk	Intra-pair Skew
Line Rate 16GT/s NRZ					5ps Max
Line Rate 32 GT/s NRZ	-0.8-0.1375*f_dB (0≤f≤16 GHz) 3-0.375*f_dB (16≤f≤24 GHz)	-20+f_dB (0≤f≤4 GHz) -18.2+0.55*f_dB (4≤f≤16 GHz) -27+1.1*f_dB (16≤f≤20 GHz) -5_dB (20≤f≤24 GHz)	-50+1.25*f_dB (0≤f≤8 GHz) -40_dB (8≤f≤16 GHz) -53.3+0.83*f_dB (16≤f≤24 GHz)	-50+1.25*f_dB (0≤f≤8 GHz) -40_dB (8≤f≤16 GHz) -60+1.25*f_dB (16≤f≤24 GHz)	2 ps Max
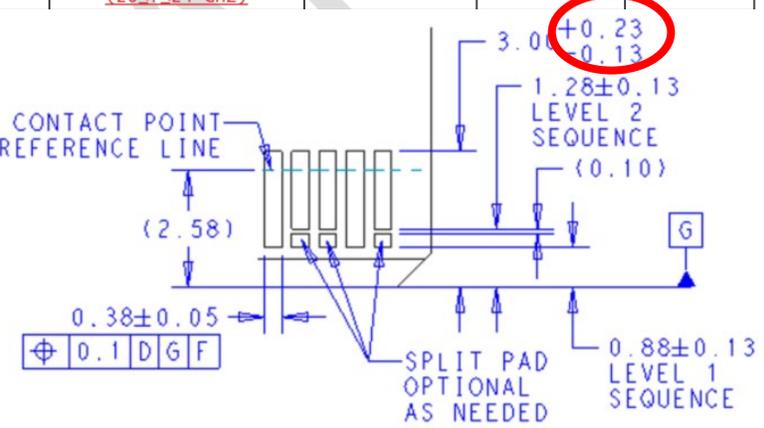
Notes: PCB Solder Mask should not be less than 2.87 mm from Datum G

STRADDLE MOUNT HOST BOARD THICKNESS AND OFFSET VARIANTS (MM)

| DIM T (HOST BOARD THICKNESS)	DIM U (OFFSET)
1.57±0.15 (.062")	0.00 (.0000")
1.93±0.19 (.076")	0.30 (.0118")
2.36±0.23 (.093")	0.00 (.0000")
3.05±0.30 (.120")	0.00 (.0000")

SFF-8636: Management Interface for 4-lane Modules and Cables

- **This specification defines a common management interface for 4-lane pluggable transceiver modules and cable assemblies.**
  - Provides commonality for modules or cable assemblies with different mechanical, physical layer, and other characteristics
  - Applications include QSFP, QSFP+, mini-multilane SAS connectors,
- **<u>Changes made since prior publication</u>**
  - Added transceiver subtype and Fiber Face type identifiers to Sub device properties (Byte 117)
  - Editorial changes and updated with new naming conventions
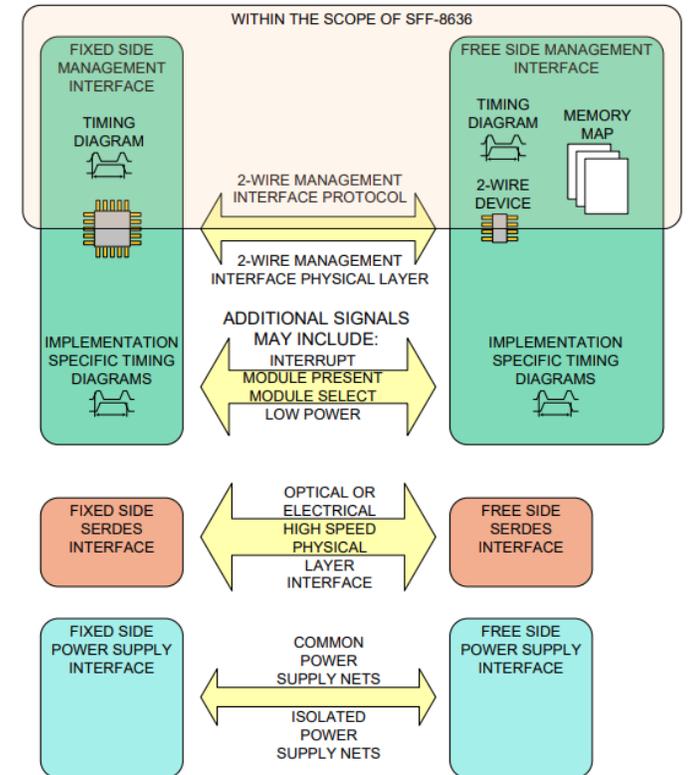
Figure 4-1 Common Management Interface Block Diagram

An additional sub-type identifier in Byte 117 bits 7-4 can be used to provide information to the host on mechanical and thermal implementation. Refer to SFF-8024 Transceiver Management for possible values and the hardware specification for more information on the listed sub-types. When applicable, the Fiber Face Type, byte 117, bits 1-0 are used to identify the fiber face type for the specific connector type. The values are listed in SFF-8024 Transceiver Management.

117	7-4	Transceiver Sub-type	Transceiver Sub-type code (See SFF-8024 Transceiver Management)	R	R	R	R
	3-2	Reserved		R	R	R	R
	1-0	Fiber Face Type	Fiber Face Type code (See SFF-8024 Transceiver Management)	R	R	R	R

SFF-8614: Mini Multilane 4/8X Shielded Cage/Connector (HDsh)

- **This specification defines the Mini Multilane connector for high-speed serial applications. This connector is also referred to as Mini-SAS HD**
  - 1x1, 1x2, and 1x4 configurations
  - Applications include PCIe and SAS cabling
- **<u>Changes made since prior publication</u>**
  - Added SMT footprint option
  - Clarified tolerances
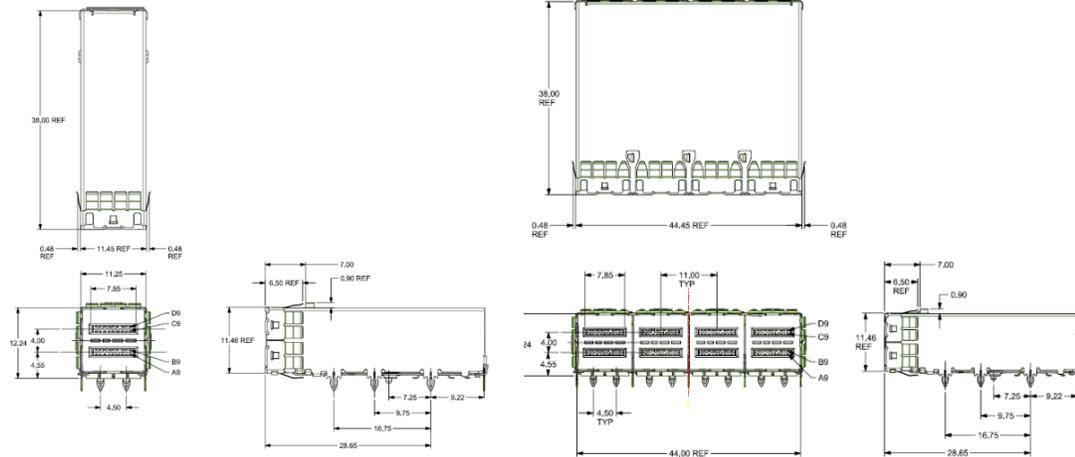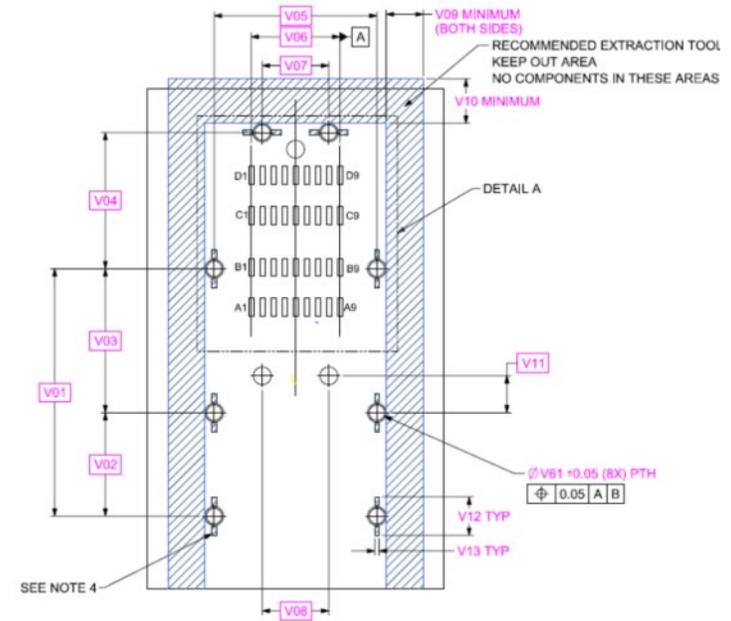
SFF-8402: SFP+ 1X Pluggable Transceiver Solutions

- This specification provides references to the required SFF specifications necessary to implement SFP transceiver 3 modules that operate at various speeds
  - Includes SFP+ (4 Gb/s), SFP10, SFP16, SFP28, SFP56, and SFP112
  - Applications include Interconnect between network and storage switches to fiber or Ethernet cables
- <u>Changes made since prior publication</u>
 - Clarification of SFF-8472 and general electricals
  - Editorial changes
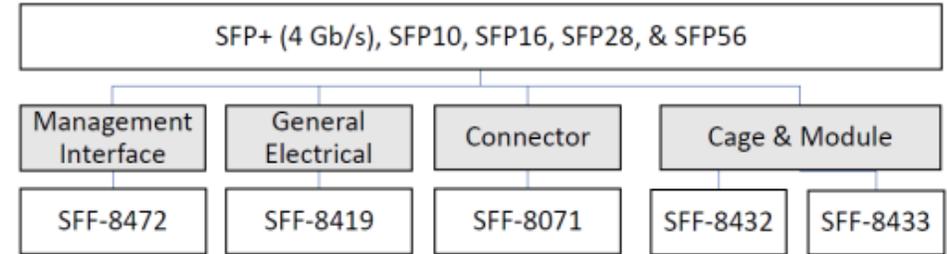
Figure 4-1 SFP+ (4 Gb/s), SFP10, SFP16, SFP28, and SFP56 Pluggable Transceiver Solutions
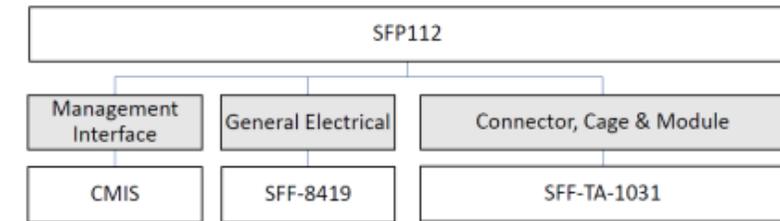
Figure 4-2 SFP112 Pluggable Transceiver Solution

SFF-8472 defines a common memory map, ~~the Management Interface~~ for 1-lane pluggable transceiver modules (SFP, SFP+/SFP10, SFP16, SFP28, SFP56) and 1-channel managed external cables ~~Modules and Cables Specification is intended for use by the modules~~ at 56 Gbps and below. It is backwards compatible to 1 Gbps INF-8074 modules.

~~Application reference model of SFP+, see Figure 5-1,~~ The application reference model for an SFP+ optical module in Figure 5-1 ~~-shows~~ shows the high-speed data interface between an ASIC and SFP+ modules. Not all optical modules or cables contain a Retimer or DSP.

SFF-8024: SFF Module Management Reference Code Tables

- **This specification provides reference tables for pluggable modules**
  - These tables are updated with additional codes reflecting industry developments
  - Reference source for identifiers assigned to interpret the memory maps of self-identifying modules
  - Applications include SFP and QSFP transceivers used in Interconnect between patch panels, switches, and servers to fiber or Ethernet cables
- <u>**Changes made since prior publication**</u>
  - Additional codes added for media interface
  - Clarifications added in several areas

Table 4-5 Host Electrical Interface IDs

ID	ID (Hex)	Host Electrical Interface (Specification Reference)	Application Bit Rate, Gb/s[2]	Lane Count	Lane Signaling Rate, GBd[2]	Modula-tion	b/ UI
		OTN (ITU-T)					
83	53	OTL4.2	112	2	27.9525	PAM4	2

Table 4-6 MMF media interface IDs

ID	ID (Hex)	MM Media Interface (Specification Reference)	Application Bit Rate, Gb/s	Lane Count	Lane Signaling Rate, GBd	Modula-tion	b/UI
32	20	800GBASE-VR8 (Placeholder)	850.00	8	53.125	PAM4	2

Table 4-7 SMF media interface IDs

ID	ID (Hex)	SM Media Interface (Specification Reference)	Application Bit Rate, Gb/s	Lane Count	Lane Signaling Rate, GBd	Modula-tion	b/UI
85	55	400GBASE-DR4-2 (placeholder)	425.00	4	53.125	PAM4	2
86	56	800GBASE-DR8 (placeholder)	850.00	8	53.125	PAM4	2
87	57	800GBASE-DR8-2 (placeholder)	850.00	8	53.125	PAM4	2
		OTN (ITU-T)					
81	51	FOIC1.4-DO (G.709.3/Y.1331.3)[3]	126.28	1	31.5697	DP-QPSK	4
82	52	FOIC2.8-DO (G.709.3/Y.1331.3)[3]	252.56	1	31.5697	DP-16QAM	8
83	53	FOIC4.8-DO (G.709.3/Y.1331.3)[3]	505.12	1	63.1395	DP-16QAM	8
84	54	FOIC2.4-DO (G.709.3/Y.1331.3)[3]	252.56	1	63.1395	DP-QPSK	4

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Website Search Changes

- To make searching for our specifications easier, we updated our search
  - Made project status clearer
  - Filtering now pulls documents with multiple project states
- For more info, go to https://www.snia.org/sff/specifications

Items per page	Filter By...	Keyword/ID Search	Start Date	End Date		
20	- Any -				APPLY	RESET
			E.g., 2023-09-07	E.g., 2023-09-07		

Date ▾	ID	Title	Status
2023-09-07	SFF-TA-1033	Internal High-Speed Cable / Modular Connector System	Published 1.0
2023-09-05	SFF-TA-1027	QSFP2 Connector, Cage, & Module Specification	Published 1.0 Draft 1.0.1 New Project Initiated
2023-09-01	SFF-TA-1020	Cables and Connector Variants Based on SFF-TA-1002	Published 1.0 Draft 1.0.2
2023-08-30	SFF-TA-1002	Protocol Agnostic Multi-Lane High Speed Connector	Published 1.4 Draft 1.4.3
2023-08-23	SFF-TA-1035	Next Gen High Speed Cable Connector System	Draft 0.0.2
2023-08-18	SFF-TA-1026	Storage System High Speed Cable Interconnect	Published 1.0 New Project Initiated
2023-08-11	SFF-8690	Tunable SFP+ Memory Map for ITU Frequencies	Published 1.4 Draft 1.4.1
2023-08-08	SFF-8612	MiniLink 4/8X Shielded Connector	Published 1.0
2023-08-08	SFF-TA-1030	Next Gen QSFP Mechanical	Expired
2023-08-08	SFF-8621	MiniLink 4/8X 24 Gb/s Interconnect Solution	Expired
2023-08-03	SFF-8472	Management Interface for SFP+	Published 12.4 Draft 12.4.2 New Project Initiated
2023-07-14	SFF-TA-1037	Connectors For Pluggable Multi-Purpose Module	New Project Initiated

Looking Ahead

What New Projects Are We Working On?

- SFF-TA-1024: Test Procedure for SFF-TA-1016 Mated Cable Assembly
- SFF-TA-1025: QSFP56 Electrical
- SFF-TA-1028: QSFP112 Electrical
- SFF-TA-1029: Cabled QSFP Cage & Connector
- SFF-TA-1032: Multi-lane External High Speed Cable System
- SFF-TA-1034: Pluggable Multi-Purpose Module
- SFF-TA-1035: Next Gen High Speed Cable Connector System
- SFF-TA-1036: Cable Optimized Boot Peripheral Connector
- SFF-TA-1037: Connectors For Pluggable Multi-Purpose Module

What specifications are Being Revised?

- **SFF-8024: SFF Module Management Reference Code Tables**
  - Additional codes, IDs, other progress
- **SFF-8419: SFP+ Power and Low Speed Interface**
  - Editorial, I2C FM, other definitional additions
- **SFF-8472: Management Interface for SFP+**
  - Adding registers for latency and management
- **SFF-8613: Mini Multilane 4/8X Unshielded Connector (HDun)**
  - Errata fixes, clarifications, editorial
- **SFF-8665: QSFP+ 28 Gb/s 4X Pluggable Transceiver Solution (QSFP28)**
  - Reference additions
- **SFF-8679: QSFP+ 4X Hardware and Electrical Specification**
  - Additional test methods

What specifications are Being Revised (Cont'd)?

- SFF-8690: Tunable SFP+ Memory Map for ITU Frequencies
  - Register additions, self tuning bits, references, clarifications.
- SFF-TA-1002: Protocol Agnostic Multi-Lane High Speed Connector
  - PCIe 6.0 support, additional straddle thickness ,errata
- SFF-TA-1008: Enterprise and Datacenter Standard Form Factor (E3)
  - Addition of NIC sidebands, 2x1C, clarifications
- SFF-TA-1009: Enterprise and Datacenter Standard Form Factor Pin and Signal Specification (EDSFF)
  - PCIe 6.0 support, CXL LED, clarifications
- SFF-TA-1020: Cables and Connector Variants Based on SFF-TA-1002
  - Additional sizes, additional thickness, errata
- SFF-TA-1026: Storage System High Speed Cable Interconnect
  - Dual bay addition, errata, clarifications
- SFF-TA-1027: QSFP2 Connector, Cage, & Module Specification
  - Additional footprint, alternate latching, 224G support

Opinionated Plug

- Do you want to learn more details about the 10 new projects?
- Do you want to ask more details about the 14 specs being revised?
- Do you want to ask us to speculate on future projects?
- Do you want to tell us what we need to fix?

- Come to our BoF tonight and talk to our opinionated experts!
  - (there will be snacks and drinks)!

SDC 23

Want to Get Involved?

- Benefits:
  - Participation into development of SFF specifications, information documents, and reference guides
  - Ability to open new projects
  - Access to all presentations, all drafts, prior publications, and supplemental material relevant to all SFF projects
  - One of the lowest membership fees around ($1,500/year moving to **$1,200**/year in December)

- Resources:
  - How to Join: https://www.snia.org/sff/join
  - Public Site: https://www.snia.org/sff
  - Specifications: https://www.snia.org/sff/specifications
  - Questions about membership? Please send mail to membership@snia.org
  - Additional questions? Please send mail to sff_ta_twgchair@snia.org

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