

SFF specifications are available at <http://www.snia.org/sff/specifications>  
or <ftp://ftp.seagate.com/sff>

**This specification was developed by the SFF Committee prior to it becoming the SFF TA (Technology Affiliate) TWG (Technical Working Group) of SNIA (Storage Networking Industry Association).**

The information below should be used instead of the equivalent herein.

POINTS OF CONTACT:

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If you are interested in participating in the activities of the SFF TWG, the membership application can be found at:

<http://www.snia.org/sff/join>

The complete list of SFF Specifications which have been completed or are currently being worked on can be found at:

<http://www.snia.org/sff/specifications/SFF-8000.TXT>

The operations which complement the SNIA's TWG Policies & Procedures to guide the SFF TWG can be found at:

<http://www.snia.org/sff/specifications/SFF-8032.PDF>

Suggestions for improvement of this specification will be welcome, they should be submitted to:

<http://www.snia.org/feedback>

SFF Committee documentation may be purchased in electronic form.  
SFF specifications are available at ftp://ftp.seagate.com/sff

SFF Committee

**SFF-8635**

Specification for

**QSFP+ 4X 10 Gb/s Pluggable Transceiver Solution (QSFP10)**

Rev 0.6     June 29, 2015

Secretariat: SFF Committee

Abstract: This specification defines a 10 Gb/s QSFP+ Pluggable Solution popularly known as QSFP10. It gathers the appropriate/unique Base Electrical, Optical, Common Management, Module/Plug Formfactor, Host connector and cage specifications into a clearly delineated solution for users.

There are multiple generations of QSFP+

Forwarded to Standardization		
10 Gb/s	QSFP10	EIA-964/SFF-8436
Continuing Projects		
10 Gb/s	QSFP10	SFF-8635
14 Gb/s	QSFP14	SFF-8685
28 Gb/s	QSFP28	SFF-8665

This document provides a common specification for systems manufacturers, system integrators, and suppliers. This is an internal working document of the SFF Committee, an industry ad hoc group.

This specification is made available for public review, and written comments are solicited from readers. Comments received by the members will be considered for inclusion in future revisions of this specification.

Support: This specification is supported by the identified member companies of the SFF Committee.

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### EXPRESSION OF SUPPORT BY MANUFACTURERS

The following member companies of the SFF Committee voted in favor of this industry specification.

Emulex  
FCI  
Finisar  
Foxconn  
Hewlett Packard  
HGST  
Molex  
Oclaro  
TE Connectivity  
Volex

The following member companies of the SFF Committee voted to abstain on this industry specification.

Amphenol  
Dell Computer  
EMC  
IBM  
Luxshare-ICT  
MGE  
NetApp  
Pioneer  
Sandisk  
Seagate  
Toshiba

### Change History

Rev 0.4

- Produced from SFF-8685 with appropriate data rate changes to the text.

Rev 0.5

- Add multiple generations table to Abstract.

Rev 0.6

- Modified Figure 3-1 to include explanatory details.

## Foreword

The development work on this specification was done by the SFF Committee, an industry group. The membership of the committee since its formation in August 1990 has included a mix of companies which are leaders across the industry.

When 2 1/2" diameter disk drives were introduced, there was no commonality on external dimensions e.g. physical size, mounting locations, connector type, connector location, between vendors.

The first use of these disk drives was in specific applications such as laptop portable computers and system integrators worked individually with vendors to develop the packaging. The result was wide diversity, and incompatibility.

The problems faced by integrators, device suppliers, and component suppliers led to the formation of the SFF Committee as an industry ad hoc group to address the marketing and engineering considerations of the emerging new technology.

During the development of the form factor definitions, other activities were suggested because participants in the SFF Committee faced more problems than the physical form factors of disk drives. In November 1992, the charter was expanded to address any issues of general interest and concern to the storage industry. The SFF Committee became a forum for resolving industry issues that are either not addressed by the standards process or need an immediate solution.

Those companies which have agreed to support a specification are identified in the first pages of each SFF Specification. Industry consensus is not an essential requirement to publish an SFF Specification because it is recognized that in an emerging product area, there is room for more than one approach. By making the documentation on competing proposals available, an integrator can examine the alternatives available and select the product that is felt to be most suitable.

SFF Committee meetings are held during T10 weeks (see [www.t10.org](http://www.t10.org)), and Specific Subject Working Groups are held at the convenience of the participants. Material presented at SFF Committee meetings becomes public domain, and there are no restrictions on the open mailing of material presented at committee meetings.

Most of the specifications developed by the SFF Committee have either been incorporated into standards or adopted as standards by EIA (Electronic Industries Association), ANSI (American National Standards Institute) and IEC (International Electrotechnical Commission).

If you are interested in participating or wish to follow the activities of the SFF Committee, the signup for membership and/or documentation can be found at:  
[www.sffcommittee.com/ie/join.html](http://www.sffcommittee.com/ie/join.html)

The complete list of SFF Specifications which have been completed or are currently being worked on by the SFF Committee can be found at:  
<ftp://ftp.seagate.com/sff/SFF-8000.TXT>

If you wish to know more about the SFF Committee, the principles which guide the activities can be found at:  
<ftp://ftp.seagate.com/sff/SFF-8032.TXT>

Suggestions for improvement of this specification will be welcome. They should be sent to the SFF Committee, 14426 Black Walnut Ct, Saratoga, CA 95070.

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SFF Committee --

## QSFP+ 4X 10 Gb/s Pluggable Transceiver Solution (QSFP10)

### 1 Scope

In an effort to broaden the applications for storage devices, an ad hoc industry group of companies representing system integrators, peripheral suppliers, and component suppliers decided to address the issues involved.

The SFF Committee was formed in August, 1990 and the first working document was introduced in January, 1991.

#### 1.1 Application Specific Criteria

This solution is capable of meeting the interface requirements for the operation of:

- IEEE Std 802.3ba
- InfiniBand IBTA QDR
- SAS-2.1

### 2 References

The interface standards and specifications below are relevant to this Specification.

#### 2.1 Industry Documents

The following interface standards and specifications are relevant to this Specification.

- GR-253-CORE
- IEEE Std 802.3ba
- InfiniBand Architecture Specifications QDR
- SAS-2.1
- ESD specifications EN61000-4-2, JEDEC JESD22-A114-B
- Optical Connectors: MPO:IEC 61754-7, Dual LC: IEC 61754-20
- Aligned key (Type B) MPO patch cords: TIA-568
- Dual LC optical patch cord: TIA/EIA-604-10A
- Thermal specifications: NEBS GR-63
- SFF-8661 QSFP+ 14 Gb/s 4X Pluggable Module
- SFF-8682 QSFP+ 14 Gb/s 4X Connector
- SFF-8683 QSFP+ 14 Gb/s Cage
- SFF-8636 Shielded Cables Common Management Interface
- SFF-8679 QSFP+ 4X Base Electrical Specification

#### 2.2 SFF Specifications

There are several projects active within the SFF Committee. The complete list of specifications which have been completed or are still being worked on are listed in the specification at <ftp://ftp.seagate.com/sff/SFF-8000.TXT>

#### 2.3 Sources

Those who join the SFF Committee as an Observer or Member receive electronic copies of the minutes and SFF specifications (<http://www.sffcommittee.com/ie/join.html>).

Copies of ANSI standards may be purchased from the InterNational Committee for Information Technology Standards (<http://www.techstreet.com/incitsgate.tmpl>).

## 2.4 Conventions

The ISO convention of numbering is used i.e., the thousands and higher multiples are separated by a space and a period is used as the decimal point. This is equivalent to the English/American convention of a comma and a period.

American	French	ISO
0.6	0,6	0.6
1,000	1 000	1 000
1,323,462.9	1 323 462,9	1 323 462.9

### 3 Introduction

This specification provides the required SFF documents necessary to implement a 10 Gb/s transceiver module. It includes mechanical specifications required by the host i.e. the host connector, the host card cage and mechanical specifications of the pluggable module. In addition, the SFF documents necessary to implement the module management interface and the common electrical/optical base specifications are referenced

The specifications provide a common solution for combined four-channel ports that support SONET/SDH and/or Ethernet and/or Infiniband and/or Fibre Channel and/or SAS specifications. This specification encompasses design(s) capable of supporting multimode and single mode modules, passive copper, active copper and active optical cables.

A flow chart of the required SFF documents and potential future specifications is shown in Figure 3-1.

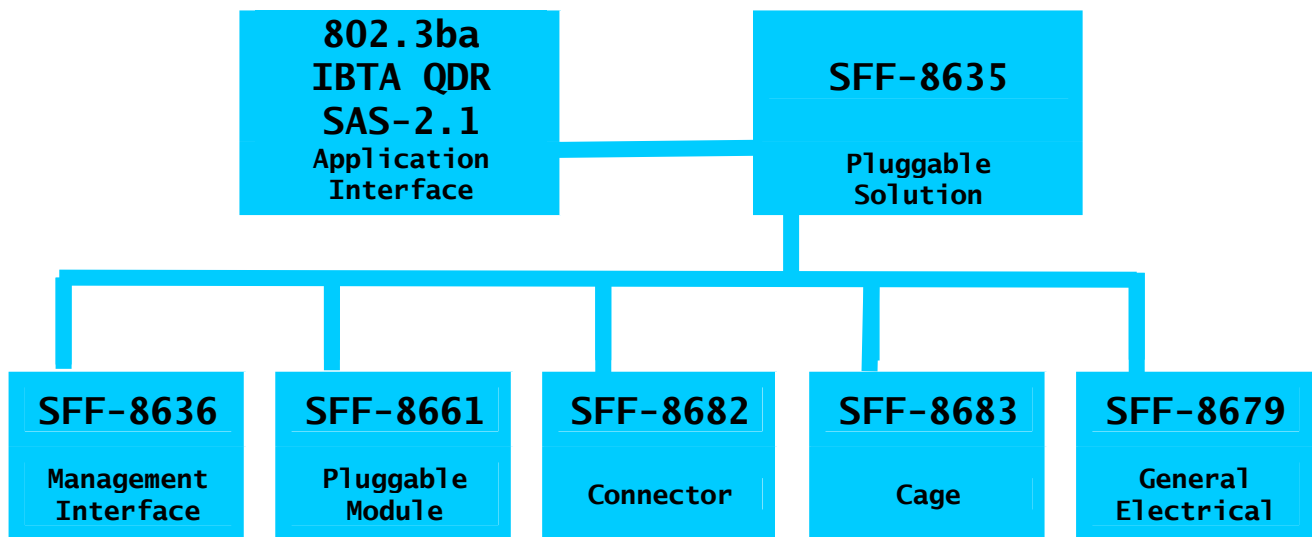


FIGURE 3-1 SPECIFICATIONS NEEDED TO IMPLEMENT A 10 GB/S PLUGGABLE TRANSCEIVER



## 4 Overview of Referenced Specifications

### 4.1 SFF-8636

The Shielded Cables Common Management Interface specification defines a common management interface for 4-lane cable assemblies. It defines a common non-volatile memory map and protocol utilized for managed external cable interface implementations.

Memory map details and communication protocol used to transfer the information are described within this document. This approach facilitates a common memory map and management interface for applications with different mechanical, physical layer and otherwise different implementations.

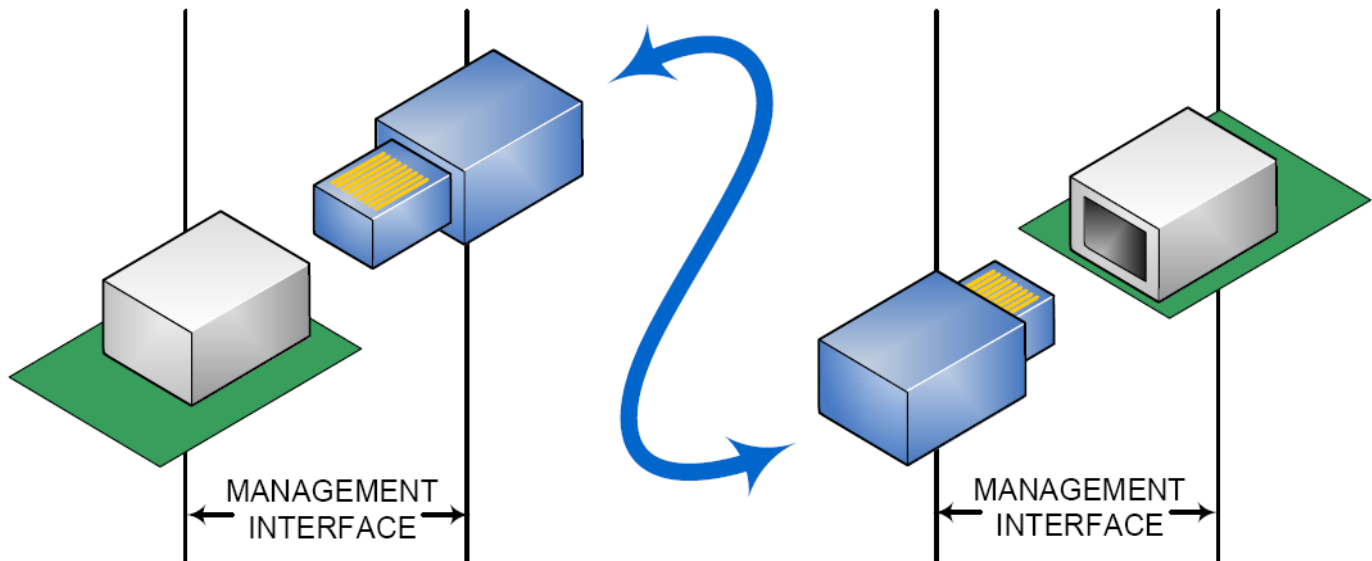


FIGURE 4-1 MANAGEMENT INTERFACE

### 4.2 SFF-8661

This specification defines the terminology and mechanical requirements for a pluggable transceiver module/plug.

It is also intended to facilitate the implementation of 1 x "n" ganged and the 2 x "n" stacked cage configurations based on the mechanical form factor defined in this specification.

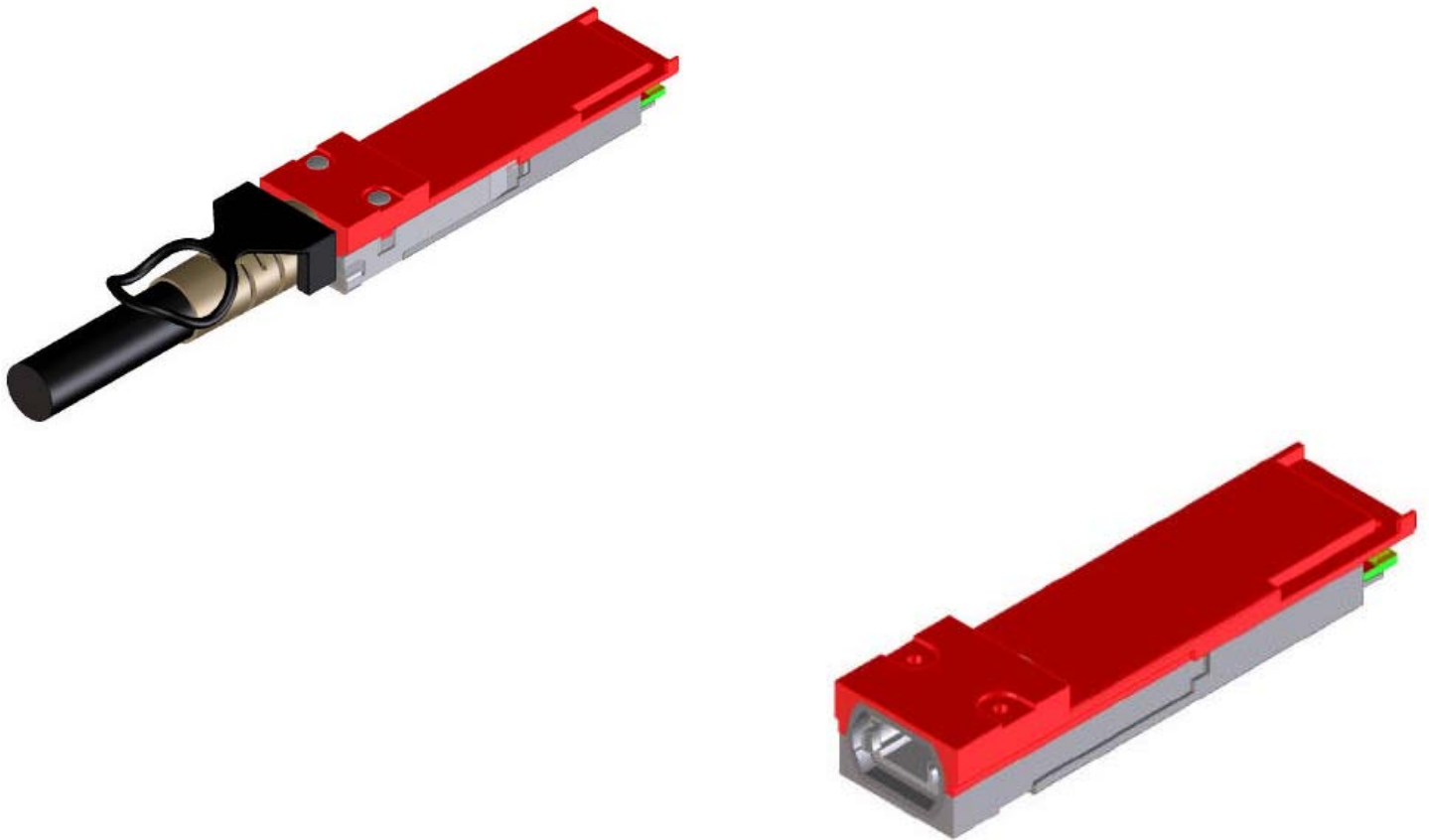


FIGURE 4-2 TYPICAL CABLE PLUG AND PLUGGABLE MODULE

### 4.3 SFF-8682

This specification defines the physical interface and general performance requirements of the receptacle that is designed for use in high speed serial interconnect applications. It is used as the mating interface of the cable plug and pluggable module.

The Ethernet, Fibre Channel, InfiniBand, SAS, SONET/SDH, and other standards define performance requirements on the characteristic impedance and ability to transmit multi-gigabit signals for cable assemblies and backplanes. The connectors used in such applications are subject to the requirements of the appropriate standard.

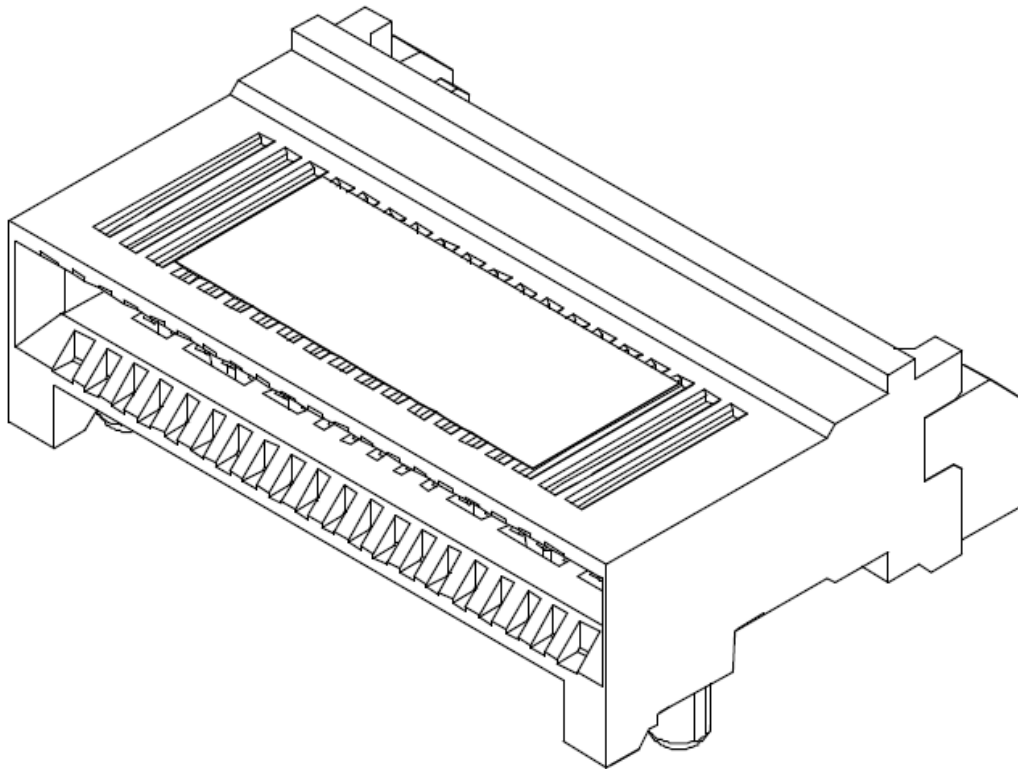


FIGURE 4-3 HOST CONNECTOR FIXED RECEPTACLE

#### 4.4 SFF-8683

This specification defines the mechanical specifications for the cage.

The mechanical dimensioning allows backwards mechanical compatibility between this form factor and the previous generations of cable plugs and pluggable modules.

This specification is also intended to facilitate the implementation of 1 x "n" ganged cages and the 2 x "n" stacked cage configurations.

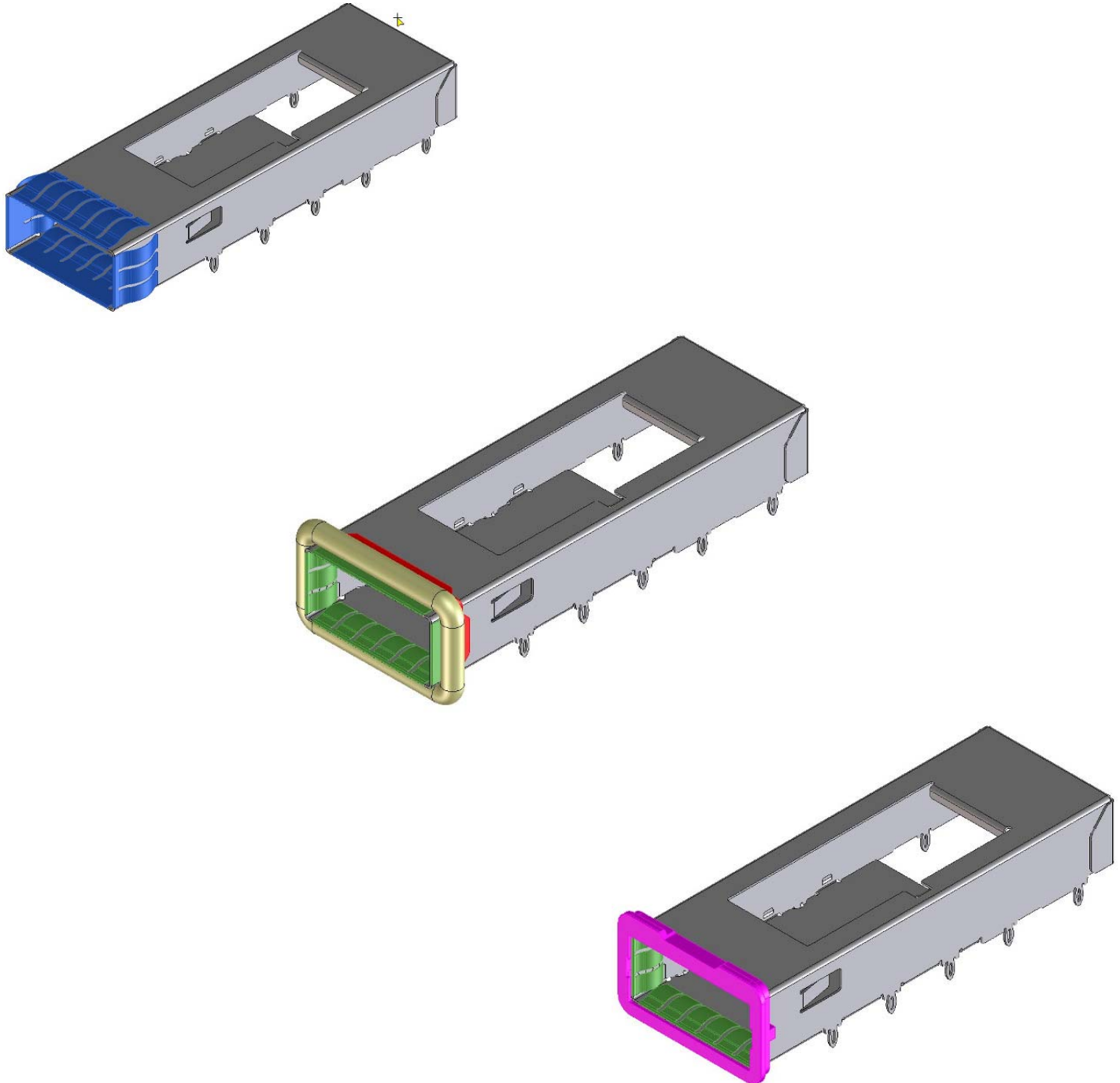


FIGURE 4-4 PLUGGABLE MODULE CAGES

### 4.5 SFF-8679

This specification defines the pin outs, the electrical, the optical, the power supply, the ESD and the thermal characteristics of the cable plugs and pluggable modules.

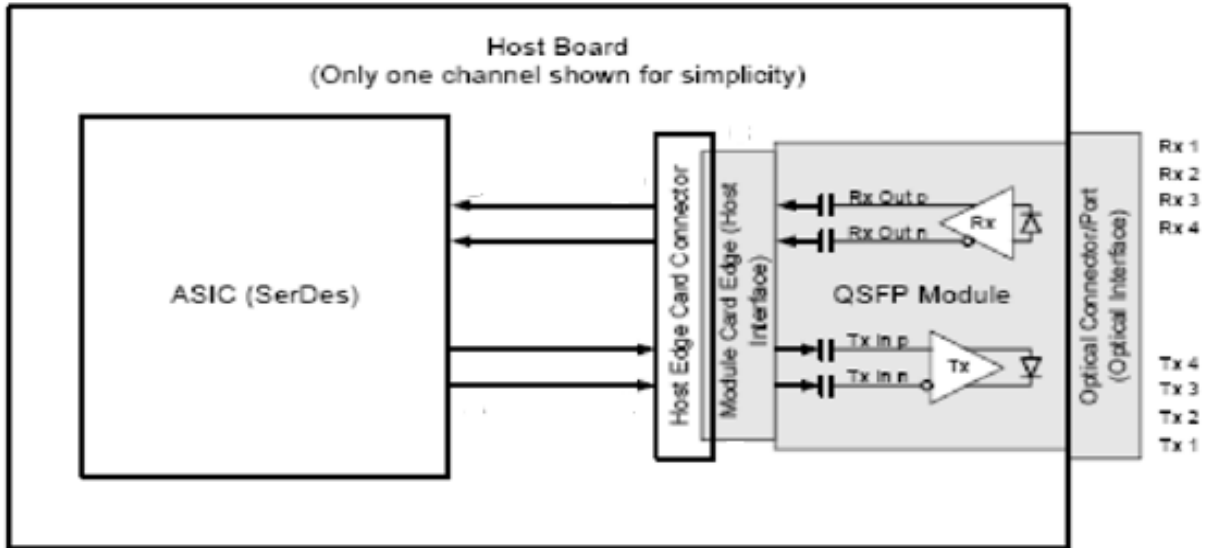


FIGURE 4-5 APPLICATION REFERENCE MODEL