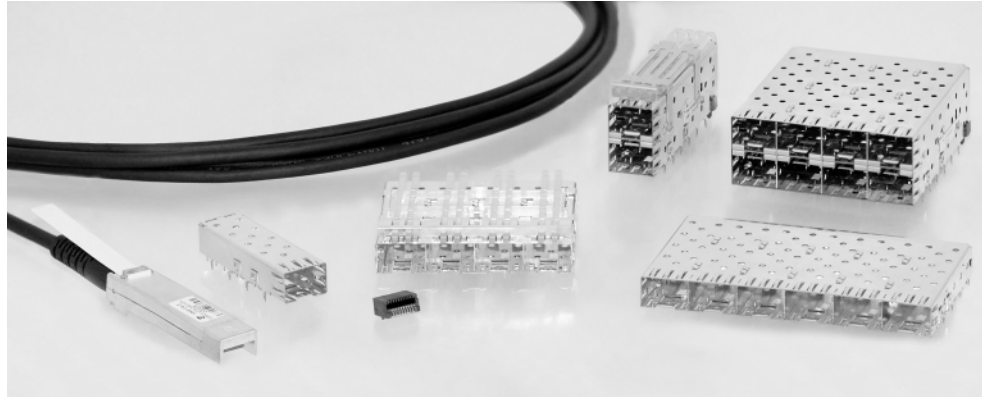


SFP (Small Form-factor Pluggable) Products



As a founding member and innovator for the Small Form-factor Pluggable (SFP) Multi-Source Agreement (MSA), Tyco Electronics supports the market with a full range of SFP products.

From the original 20 position pluggable transceiver (PT) connector and single port cage, the product has expanded rapidly to include many other options to increase functionality.

Lightpipes:

Tyco Electronics provides a complete line of lightpipes for single cages, ganged (single row), and stacked (double row) SFP products.

Enhanced EMI fingers:

As the data rates using the SFP form factor increase, the need for increased EMI suppression becomes imperative. Addressing both cabinet and module-generated noise, tests suggest Tyco Electronics'

enhanced EMI fingers on the SFP cages can potentially add up to 20dB of margin.

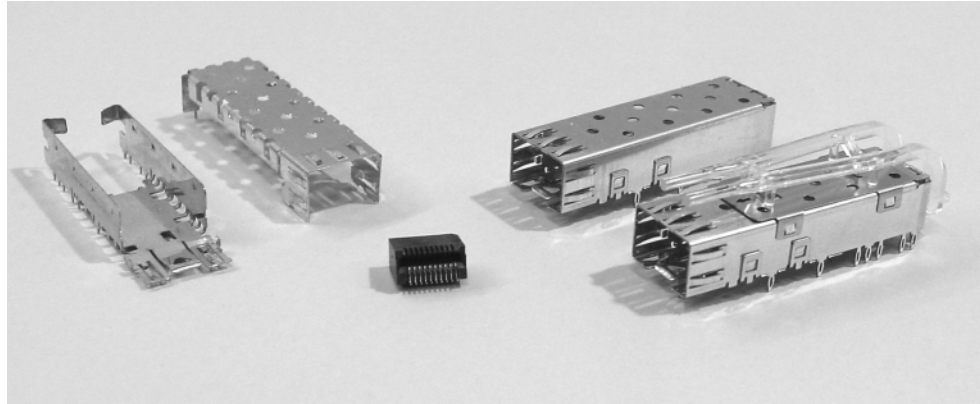
Riding Heat Sinks:

Tyco Electronics addresses the need for increased thermal dissipation by incorporating patented riding heat sink technology. The riding heat sinks use direct contact to the pluggable module to draw heat away from its source.

SFP Single Port Cages and Connectors

Product Facts

- Full metal shield for grounding and EMI suppression
- Solder and Press Fit cage configurations available
- Single piece and two piece cages available
- Used in conjunction with 20 pin SMT SFP Connector
- Hot Swappable
- Compatible with SFP MSA Compliant Modules
- UL/CSA Report File E28476



Tyco Electronics offers various termination options for SFP cages, including press-fit, wave solder and IR reflow compatible with tape and reel packaging. The connector is a reliable

20 position interface offered in 0.38 μm (15 μinch) and 0.76 μm (30 μinch) gold plating thicknesses. The connector is packaged in tape and reel for pick and place SMT application.

The cage material is a copper alloy with nickel sub-plate and a matte tin finish.

Technical Documents

Instruction Sheet

408-8495 SFP Connector and Cage Assembly

Application Specification

114-13017 SFP Connector and 2-piece Cage Assembly
 114-13120 SFP Connector and Press Fit Cage Assy

Product Specifications

108-1949 SFP Connector
 108-1950 SFP Cage

SFP Standard

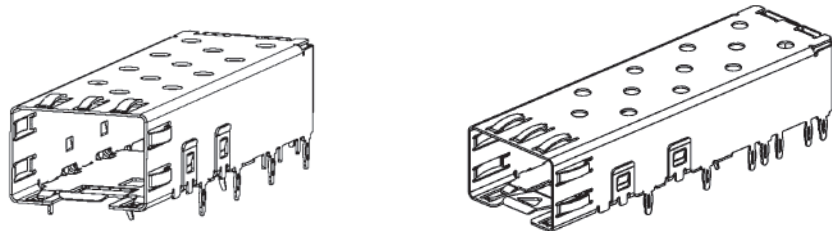
SFF Document INF-8074

Cages

| Part Number | Description | Belly-to-Belly Applications |
|-------------|-------------------------------------|-----------------------------|
| 6367034-1 | SFP Cage Bottom (Reflow Solder) | Yes |
| 6367035-1 | SFP Cage Top | Yes |
| 1489669-1 | Press Fit, 8 Pins | Yes |
| 1489779-1 | Press Fit, 20 Pins | No |
| 1489962-1 | Reflow or Wave Solder, 3.55 mm Tail | No |
| 1489962-3 | Reflow or Wave Solder, 1.8 mm Tail | No |
| 1367629-1 | Press Fit w/ Lightpipes | No |

Connectors and Dust Plugs

| Part Number | Description |
|-------------|--|
| 1367073-1 | 20 pin, surface mount connector; 0.38 μm (15 μinch) gold plating |
| 1367073-2 | 20 pin, surface mount connector; 0.76 μm (30 μinch) gold plating |
| 1658197-1 | 20 pin, surface mount connector; 0.76 μm (30 μinch) gold plating with contact surface treatment |
| 1888247-1 | 20 pin, surface mount connector; 0.76 μm (30 μinch) higher speed SFP+ compliant |
| 1888247-2 | 20 pin, surface mount connector; 0.38 μm (15 μinch) higher speed SFP+ compliant |
| 1367147-1 | SFP Dust Cap with AMP product logo |
| 1367147-3 | SFP Dust Cap without AMP product logo |



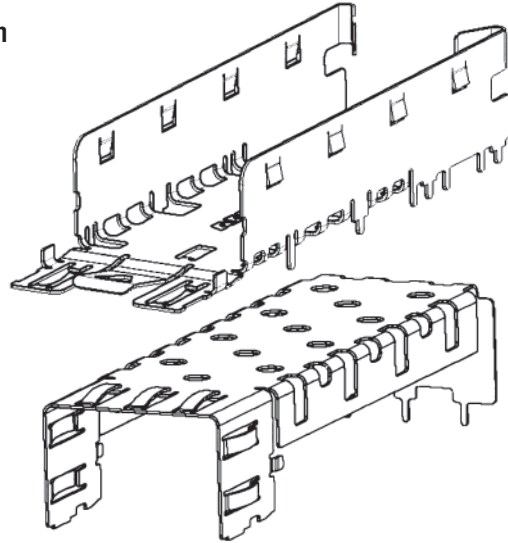
Note: All part numbers are RoHS compliant.

SFP Single Port Cages and Connectors (Continued)

SFP Cage Bottom
Part Number 6367034-1

Cage bottom supplied in
tape and reel packaging for
SMT processing

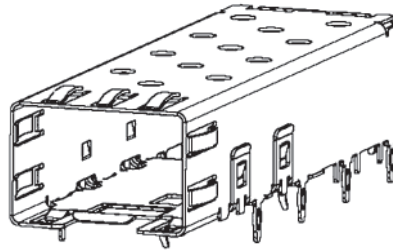
2 Piece Cage System



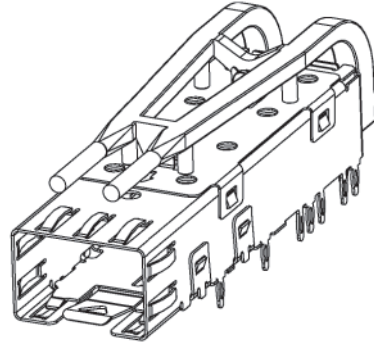
SFP Cage Top
Part Number 6367035-1

Cage top attached after
bottom is soldered

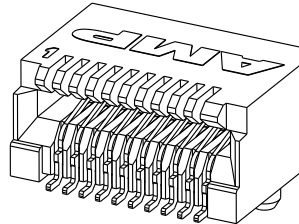
**SFP Press Fit
Cage Assembly**
Part Number 1489669-1



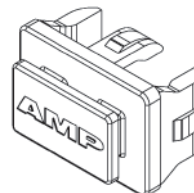
**SFP Press Fit Cage with
Lightpipe Assembly**
Part Number 1367629-1



Connector
Part Number 1367073-1



Dust Plug
Part Number 1367147-1

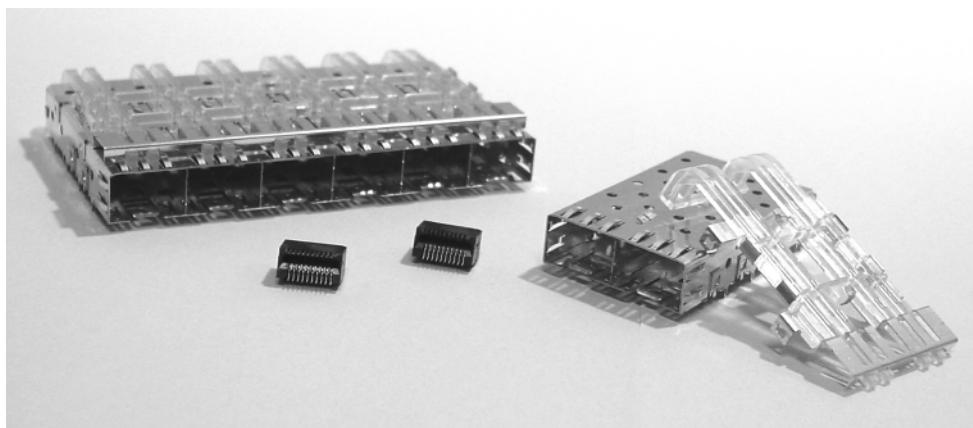


Note: All part numbers are RoHS
compliant.

SFP Ganged (Single Row) Cages

Product Facts

- Full metal shield for grounding and EMI reduction
- Solder and Press Fit configurations available
- Used in conjunction with 20 pin SMT SFP Connector
- Hot Swappable
- Compatible with SFP MSA Compliant Modules
- UL/CSA Report File E28476
- Application tooling available for press fit SFP cages



The Ganged SFP product line allows for single row, high density port designs to maximize the horizontal I/O space. The design allows for belly-to-belly orientation to maximize port density. The lateral port-to-port spacing is minimized to 14.25mm, compared to

16.25mm required spacing between single port cages. Port configurations include 1x2, 1x4 and 1x6, with lightpipes optional.

Application tooling is required for press fit configurations to provide support during insertion into the board.

Technical Documents

Instruction Sheet

- 408-8848 SFP Cage Assembly Seating Tool
 408-8849 SFP Cage Assembly Extraction Tool

Application Specification

- 114-13017 SFP Connector and 2-piece Cage Assembly
 114-13120 SFP Connector and Press Fit Cage Assy

Product Specifications

- 108-1949 SFP Connector
 108-1950 SFP Cage

| Part Number | Port Configuration | PCB Attachment | Lightpipes Included |
|-------------|--------------------|----------------|---------------------|
| 1761014-1 | 1x2 | Press Fit | No |
| 1761007-1 | 1x2 | Press Fit | Yes |
| 1658744-1 | 1x4 | Press Fit | No |
| 1658723-1 | 1x4 | Solder Tail | No |
| 1761008-1 | 1x4 | Press Fit | Yes |
| 1761015-1 | 1x6 | Press Fit | No |
| 1658939-1 | 1x6 | Press Fit | Yes |

Note: Tyco Electronics lightpipe assemblies are packaged with the SFP cage assembly. The lightpipes attach to the top of the SFP cage for clear visibility in a high density application.

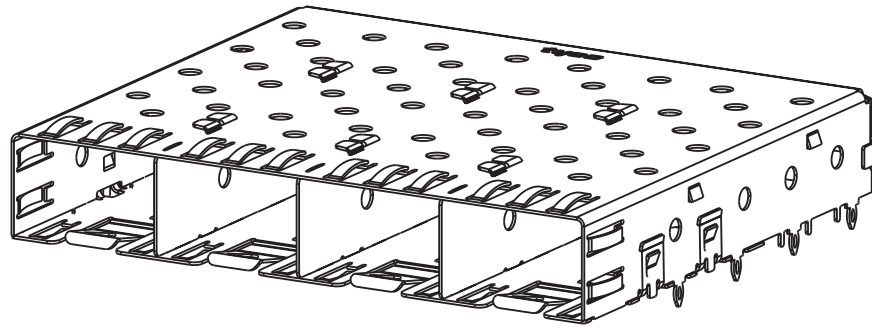
Connectors and Dust Plugs

| Part Number | Description |
|-------------|---|
| 1367073-1 | 20 pin, surface mount connector; 0.38 μ m (15 μ in) gold plating |
| 1367073-2 | 20 pin, surface mount connector; 0.76 μ m (30 μ in) gold plating |
| 1658197-1 | 20 pin, surface mount connector; 0.76 μ m (30 μ in) gold plating with contact surface treatment |
| 1888247-1 | 20 pin, surface mount connector; 0.76 μ m (30 μ in) higher speed SFP+ compliant |
| 1888247-2 | 20 pin, surface mount connector; 0.38 μ m (15 μ in) higher speed SFP+ compliant |
| 1761394-1 | SFP Dust Cap |

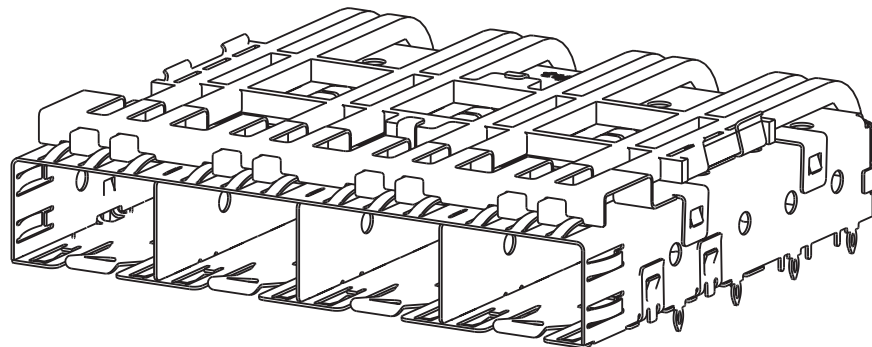
Note: All part numbers are RoHS compliant.

SFP Ganged (Single Row) Cages (Continued)

**Ganged 1x4
Configuration
Part Number 1658744-1**





**Ganged 1x4 w/ Lightpipes
Configuration
Part Number 1761008-1**

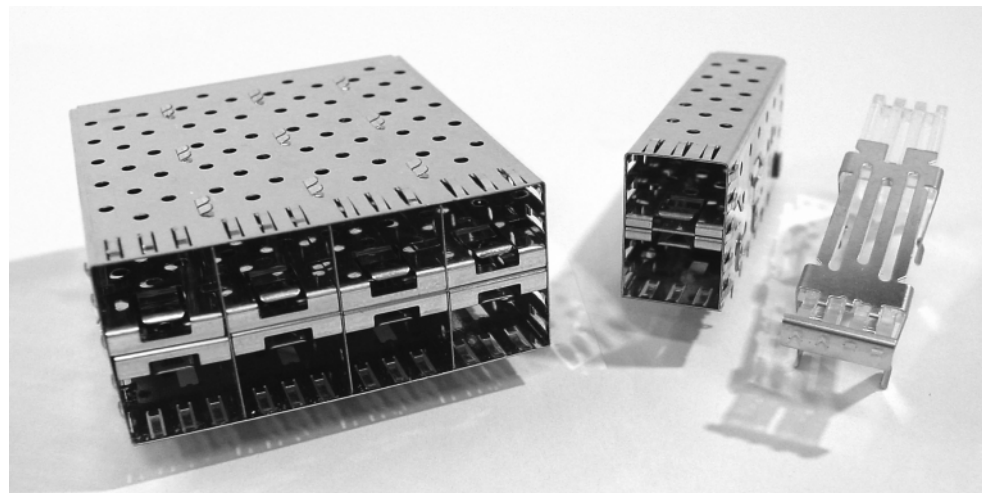


Note: All part numbers are RoHS compliant.

SFP Stacked (Dual Row) Cage/Connector Assemblies

Product Facts

- Utilizes integrated stacked connector with patented wafer construction
- Full metal shield for grounding and EMI reduction
- Incorporates press fit eye-of-the-needle contacts for both mechanical cages and electrical connector
- Hot Swappable
- Compatible with SFP MSA Compliant Modules
- Application tooling available
- UL/CSA Report File E28476  



The Stacked SFP product maximizes port density by Taking advantage of the reduced port spacing of the ganged SFP cages, with an added upper port row. The connector is integrated into the cage assembly,

using press-fit technology for one-step insertion for cage and connector. Two heights are offered for stacked SFP cages, and available in 2x1, 2x4, and 2x6 port configurations.

Technical Documents

Instruction Sheet

- 408-8848 SFP Cage Assembly Seating Tool
- 408-8849 SFP Cage Assembly Extraction Tool
- 408-8850 Stacked SFP Connector Extraction Tool

Application Specification

- 114-13103 Stacked SFP Connector & Cage Assembly

Product Specifications

- 108-2161 SFP Connector & Cage Assemblies

| Part Number | Port Configuration | Height Profile | Lightpipes Included |
|-------------|--------------------|----------------|---------------------|
| 1658391-1 | 2x1 | Standard | No |
| 1658628-1 | 2x1 | Low Profile | No |
| 1658859-1 | 2x1 | Low Profile | Yes |
| 1658390-1 | 2x4 | Standard | No |
| 1658629-1 | 2x4 | Low Profile | No |
| 1658758-1 | 2x4 | Low Profile | Yes |
| 1761327-1 | 2x6 | Standard | No |
| 1658894-1 | 2x6 | Low Profile | No |
| 1658895-1 | 2x6 | Low Profile | Yes |

Note: Tyco Electronics lightpipe assemblies are packaged with the SFP cage assembly. The lightpipes attach to the top of the SFP cage for clear visibility in a high density application.

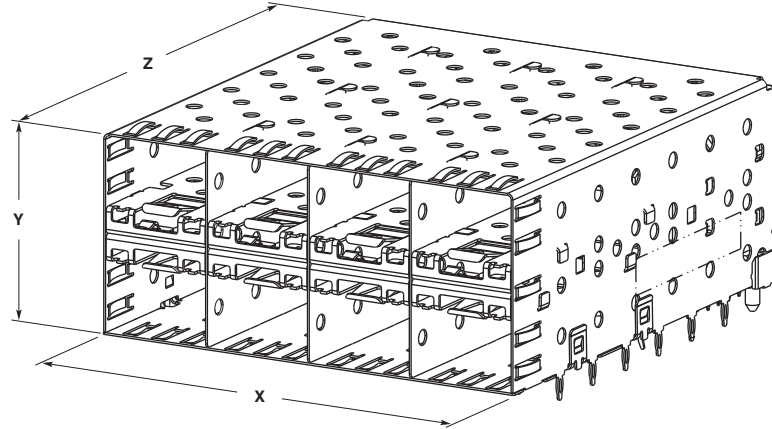
Related Products

| Part Number | Description |
|-------------|--------------|
| 1761394-1 | SFP Dust Cap |

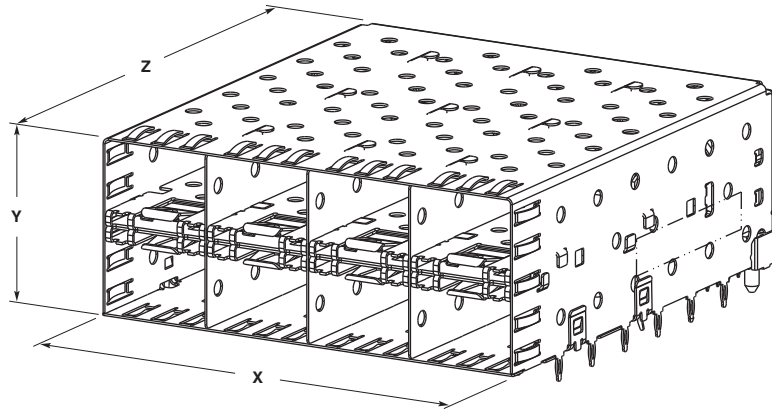
Note: All part numbers are RoHS compliant.

SFP Stacked (Dual Row) Cage/Connector Assemblies (Continued)

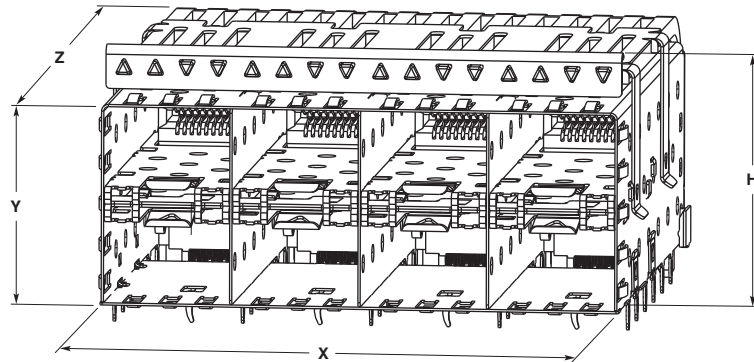
Standard Profile 2x4 Configuration
Part Number 1658390-1



Low Profile 2x4 Configuration
Part Number 1658629-1



Low Profile 2x4 with Lightpipe Configuration
Part Number 1658758-1



Nominal Dimensions

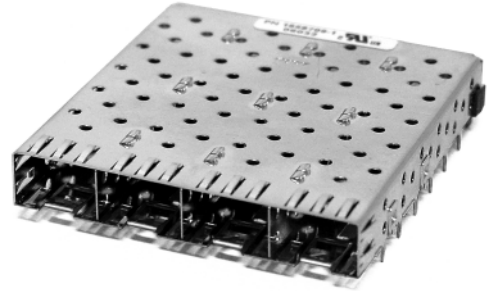
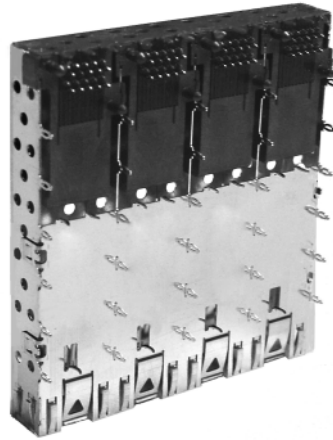
| Part Number | Description | X Dim | Y Dim | Z Dim | H Dim. |
|-------------|--|---------------|---------------|---------------|---------------|
| 1658391-1 | 2x1 SFP Cage | 14.50 [.571] | 25.50 [1.004] | 63.25 [2.490] | — |
| 1658628-1 | 2x1 Low Profile SFP Cage | 14.50 [.571] | 22.55 [.888] | 63.25 [2.490] | — |
| 1658859-1 | 2x1 Low Profile SFP Cage w/ Lightpipes | 14.50 [.571] | 28.35 [1.116] | 68.75 [2.707] | 28.60 [1.126] |
| 1658390-1 | 2x4 SFP Cage | 57.25 [2.254] | 25.50 [1.004] | 63.25 [2.490] | — |
| 1658629-1 | 2x4 Low Profile SFP Cage | 57.25 [2.254] | 22.55 [.888] | 63.25 [2.490] | — |
| 1658758-1 | 2x4 Low Profile SFP Cage w/ Lightpipes | 57.25 [2.254] | 28.35 [1.116] | 68.75 [2.707] | 28.60 [1.126] |
| 1761327-1 | 2x6 SFP Cage | 85.75 [3.376] | 25.50 [1.004] | 63.25 [2.490] | — |
| 1658894-1 | 2x6 Low Profile SFP Cage | 85.75 [3.376] | 22.55 [.888] | 63.25 [2.490] | — |
| 1658895-1 | 2x6 Low Profile SFP Cage w/ Lightpipes | 85.75 [3.376] | 28.35 [1.116] | 68.75 [2.707] | 28.60 [1.126] |

Note: All part numbers are RoHS compliant.

SFP Cages with Integrated Connectors

Product Facts

- Utilizes fully integrated 20 position SFP connector
- Full metal shield for grounding and EMI reduction
- Incorporates press fit eye-of-the-needle contacts for both mechanical cages and electrical connector
- Hot Swappable
- Compatible with SFP MSA Compliant Modules
- Application tooling available
- UL/CSA Report File E28476

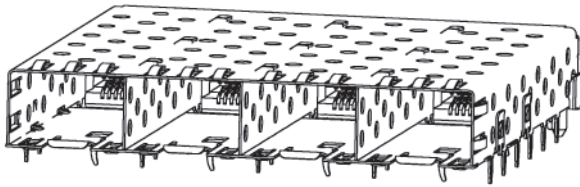


For increased flexibility, Tyco Electronics offers ganged (single Row) SFP cages with integrated connectors that are footprint

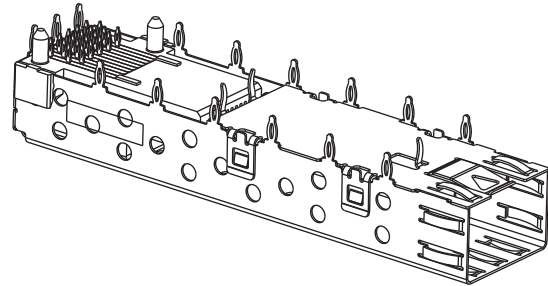
compatible with its Stacked SFP product line. The connector uses the same press fit technology as incorporated in the stacked

SFP cage/connector system, with one-step insertion in the board. Products currently offered are 1x1, 1x4 and 1x6 configurations.

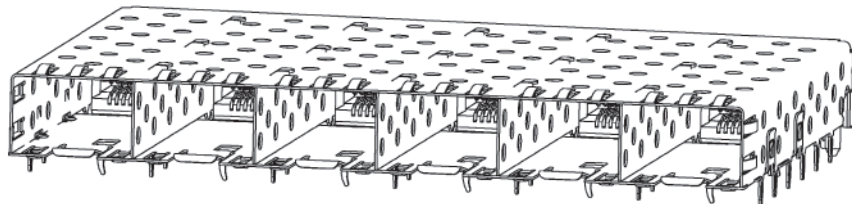
Part Number 1932069-1



Part Number 1888799-1



Part Number 1761967-1



Technical Documents

Instruction Sheet

- 408-8848 SFP Cage Assembly Seating Tool
- 408-8849 SFP Cage Assembly Extraction Tool
- 408-8850 Stacked SFP Connector Extraction Tool

Application Specification

- 114-13121 SFP Ganged Press Fit Connector & Cage Assembly

Product Specifications

- 108-2161 SFP Connector & Cage Assembly

| Part Number | Port Configuration | Footprint Compatible with Stacked SFP | Press Fit Exemption Tin Lead on I/O Contacts |
|-------------|--------------------|---------------------------------------|--|
| 1888799-1 | 1x1 | 1658391-1 1658628-1 | Yes |
| 1932069-1 | 1x4 | 1658390-1 1658629-1 | Yes |
| 1761967-1 | 1x6 | 1761327-1 1658894-1 | Yes |

Related Products

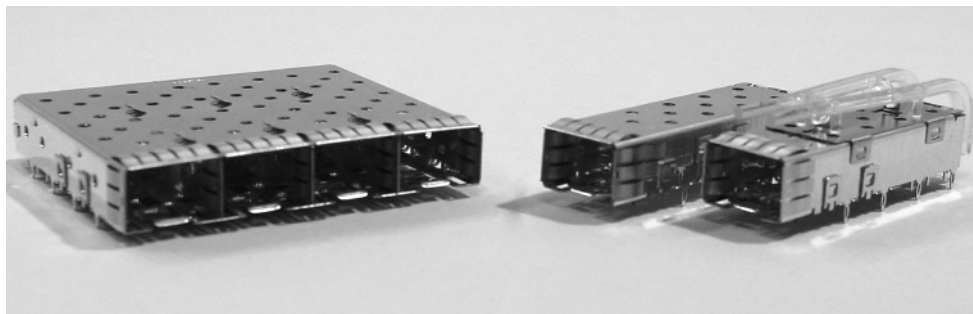
| Part Number | Description |
|-------------|--------------|
| 1761394-1 | SFP Dust Cap |

Note: All part numbers are RoHS compliant.

SFP Cages with Enhanced EMI Gaskets

Product Facts

- Full metal shield for grounding and EMI reduction
- Enhanced EMI spring gaskets increase the contact points between cage and bezel opening, cage and module
- 20dB EMI suppression improvement possible
- Compatible with existing SFP MSA compliant modules
- Used in conjunction with 20 pin SMT SFP connector



As data rates exceed 2.5 Gb/s, there is a greater need for higher EMI suppression. Enhanced EMI spring gaskets are added to the SFP cages to meet increased EMI requirements at higher data rates.

The SFP Cages with enhanced EMI Gaskets are compatible with the existing SFP MSA panel cutout. The enhanced EMI gaskets provide increased contact area for improved EMI suppression.

EMI gaskets are double sided (internal and external to the cage) to reduce

emissions between both cage and panel, and cage and SFP module. Testing shows a 20dB improvement on EMI suppression can be achieved.

Enhanced EMI product is offered in single port, 1x2 and 1x4 configurations.

| Part Number | Description |
|-------------|--|
| 1761783-1 | Cage Assy, Enhanced EMI, 11 Press Fit Pins |
| 1761896-1 | Cage Assy, 8 Press Fit Pins |
| 1761497-1 | Cage Assy, 20 Press Fit Pins |
| 1888424-1 | Cage Assy, 1x2 Press Fit |
| 1888425-1 | Cage Assy, 1x4 Press Fit |

Technical Documents

Application Specification

114-13120 SFP Connector and Press-Fit Cage Assembly

Product Specification

108-1950 SFP Cage

Connectors and Dust Plugs

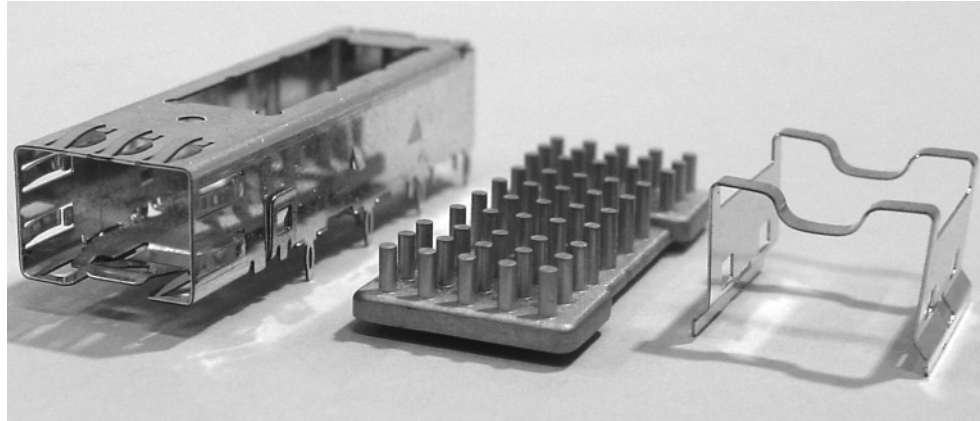
| Part Number | Description |
|-------------|--|
| 1367073-1 | 20 pin, surface mount connector; 0.38 μm (15 μin) gold plating |
| 1367073-2 | 20 pin, surface mount connector; 0.76 μm (30 μin) gold plating |
| 1658197-1 | 20 pin, surface mount connector; 0.76 μm (30 μin) gold plating with contact surface treatment |
| 1888247-1 | 20 pin, surface mount connector; 0.76 μm (30 μin) higher speed SFP+ compliant |
| 1888247-2 | 20 pin, surface mount connector; 0.38 μm (15 μin) higher speed SFP+ compliant |
| 1367147-1 | SFP Dust Cap with AMP product logo (single port only) |
| 1367147-3 | SFP Dust Cap without AMP product logo (single port only) |
| 1761394-1 | SFP Dust Cap (ganged cages) |

Note: All part numbers are RoHS compliant.

SFP Cages with Riding Heat Sinks

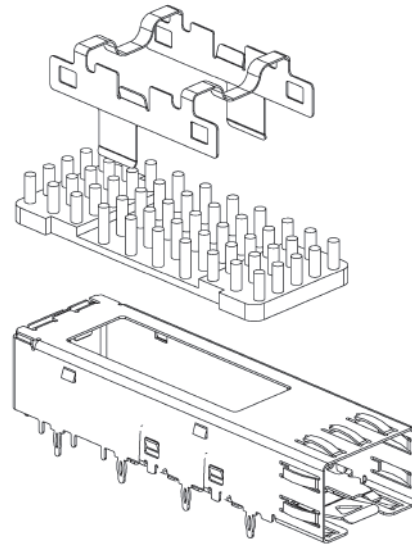
Product Facts

- Designed for DWDM Switch applications
- High Density application requiring additional Thermal Management
- Patented riding heat sink technology addresses thermal management
- Full metal shield for grounding and EMI reduction
- Incorporates press fit eye-of-the-needle contacts for mechanical cages
- Compatible with DWDM MSA compliant transceivers
- Uses 20 pin SMT SFP Connector



Tyco Electronics introduced an SFP system incorporating a riding heat sink to help manage excess heat when using SFP modules. This is especially suited for use with higher wattage transceivers, such as long reach applications like Dense Wavelength Division Multiplexing (DWDM).

The system features a press fit cage, a heat sink clip, and heat sink with various pin heights available.



Cages, Heatsinks, and Clips

| Part Number | Product Description |
|-------------|---|
| 1367643-1 | 1x1 SFP Cage for heatsink application |
| 1367646-1 | Heat Sink Clip |
| 1829903-2 | PCI Heat Sink (4.2mm) |
| 1829904-2 | SAN Heat Sink (6.5mm) |
| 1829905-2 | Networking Heat Sink (13.5mm) |
| 1367645-1 | Kit: Cage, Clip and PCI Heat Sink (4.2mm) |
| 1367645-2 | Kit: Cage, Clip and SAN Heat Sink (6.5mm) |
| 1367645-3 | Kit: Cage, Clip and Networking Heat Sink (13.5mm) |

Connectors and Dust Plugs

| Part Number | Description |
|-------------|---|
| 1367073-1 | 20 pin, surface mount connector; 0.38 μ m (15 μ in) gold plating |
| 1367073-2 | 20 pin, surface mount connector; 0.76 μ m (30 μ in) gold plating |
| 1658197-1 | 20 pin, surface mount connector; 0.76 μ m (30 μ in) gold plating with contact surface treatment |
| 1888247-1 | 20 pin, surface mount connector; 0.76 μ m (30 μ in) higher speed SFP+ compliant |
| 1888247-2 | 20 pin, surface mount connector; 0.38 μ m (15 μ in) higher speed SFP+ compliant |
| 1367147-1 | SFP Dust Cap with AMP product logo |
| 1367147-3 | SFP Dust Cap without AMP product logo |

PCI is a trademark of PCI-SIG.

Note: All part numbers are RoHS compliant.

SFP Copper Cable Assemblies

Product Facts

- SFF 20 position PCB interface
- Cable wire size 28 through 30 AWG
- Active and passive assemblies available
- Data rates from 2.5Gbps to 4.25Gbps
- Robust pull to release latch mechanism
- Various standard cable assembly lengths
- Breakout cables to CX4 and HSSDC2 are available
- Compatible with MSA compliant SFP cages
- Uses MADISON TURBOTWIN copper cable



Tyco Electronics' SFP copper cable assemblies are high speed, high performance solutions for 2.5 Gbps and 4.25 Gbps applications. Tyco Electronics' SFP copper assemblies provide a cost effective solution

over Fiber for short reach I/O applications. These assemblies support multiple data transfer protocols such as Fibre Channel, InfiniBand Standard and Gigabit Ethernet.

Applications

- Switches, routers and host bus adapters (HBA's)
- Enterprise storage
- High density I/O's
- Multiple channel interconnects

SFP Direct Attach Cable Assembly Part Numbers

| Description | Part Number | Length | Equalization |
|-------------------|-------------|-----------|--------------|
| 2.5 Gbps Passive | 1902495-1 | 0.5 meter | Unequalized |
| | 1902495-2 | 1 meter | Unequalized |
| | 1902495-3 | 2 meter | Unequalized |
| | 1902495-4 | 3 meter | Equalized |
| | 1902495-5 | 4 meter | Equalized |
| | 1902495-6 | 5 meter | Equalized |
| | 1902495-7 | 6 meter | Equalized |
| 4.25 Gbps Passive | 1948134-1 | 0.5 meter | Unequalized |
| | 1948134-2 | 1 meter | Unequalized |
| | 1948134-3 | 2 meter | Equalized |
| | 1948134-4 | 3 meter | Equalized |
| | 1948134-5 | 4 meter | Equalized |
| 4.25 Gbps Active | 1948135-1 | 0.5 meter | N/A |
| | 1948135-2 | 1 meter | N/A |
| | 1948135-3 | 2 meter | N/A |
| | 1948135-4 | 3 meter | N/A |
| | 1948135-5 | 4 meter | N/A |
| | 1948135-6 | 5 meter | N/A |

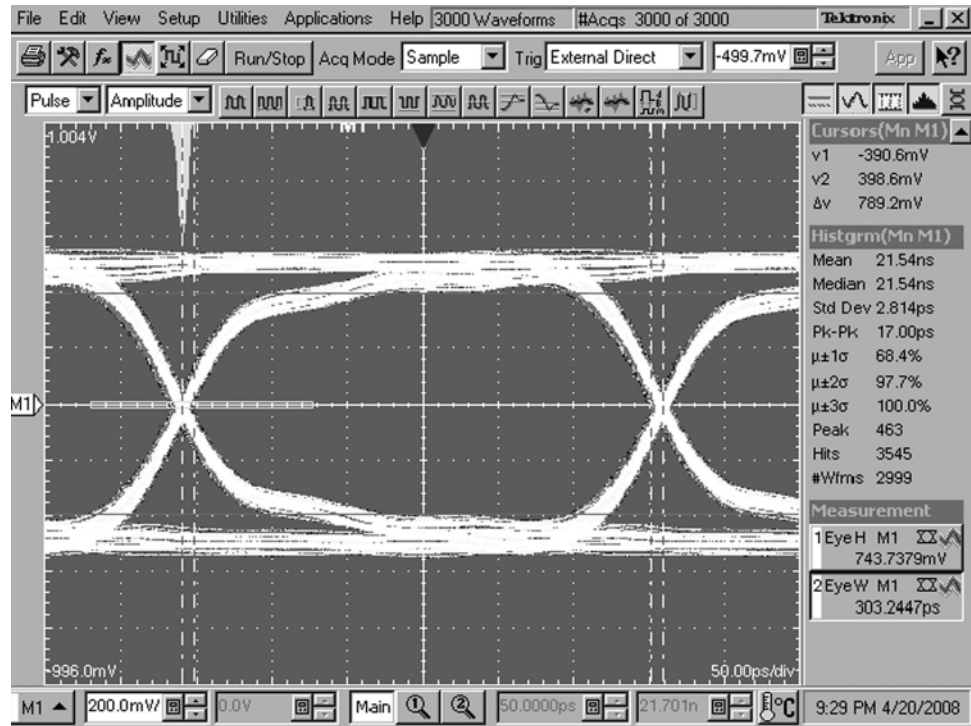
Fibre Channel is a trademark of the Fibre Channel Industry Association.
 INFINIBAND is a trademark of the InfiniBand Trade Association.

Note: All part numbers are RoHS compliant.

SFP Copper Cable Assemblies (Continued)

**4.25 Gbps Eye Pattern for
SFP Cable Assembly —
1 Meter**
Part Number 1948134-2

- Data Rate: 4.25 Gbps
- Input Voltage: 1000 mV
- Data Pattern: PRBS 31
- Eye Height: 744.7 mV
- Jitter: 17.0 ps
- 1 m 28 AWG SFP Equalized Cable Assembly



Note: All part numbers are RoHS compliant.