HIGH SPEED INPUT/OUTPUT SOLUTIONS
QUICK REFERENCE GUIDE

The pluggable I/O interface offers significant advantages as a high speed I/O interconnect. With a standard equipment I/O interface and the flexibility of pluggable modules come the options for fiber and copper links, and various data rates and protocols.

TE Connectivity (TE) has always been at the forefront of development of pluggable I/O standards. TE continues to be engaged in new pluggable interface standards to support the rapidly changing market needs for higher bandwidth, and remains at the forefront with the technical expertise required to deliver superior designs for signal integrity and EMI at higher data rates.

FEATURES AND BENEFITS

- High speed I/O solutions that support higher data rates than traditional copper interfaces (e.g. RJ45)

- Provides a standard interface at the equipment and allows customer to choose between transceiver modules and direct attach cable assemblies based on the application

- All cages are full metal shielded for grounding and EMI suppression

- Standards supported include Fibre Channel, Ethernet, and InfiniBand, and SAS

PRODUCT APPLICATIONS

- Cellular Infrastructure
- Access Routers/ Switches
- High End Servers
- Medical Diagnostic Equipment
- Network Hubs

www.te.com/pluggableio

High Speed I/O Solutions

PT Connectors												
SFP	SFP+	zSFP+	X2	XFP	QSFP/QSFP+	zQSFP+	micro QSFP	CFP	CFP2	CFP4	CXP	CDFP
1367073-X 1658197-1	1888247-X 2110759-1	2170088-X	1367337-X 1658198-1	788862-1 1367500-1	1761987-9 2110819-1	1551920-2	2291538-1	2057630-1	2274845-1	2288229-1	Included in Assembly	Included in Assembly

SFP Products

- Supports data rates up to 4 Gbps
- 20 position PT (Pluggable Transceiver) connector
- Single port, ganged, and stacked cages available
- Standard and low profile options available for stacked ports

Reference Part Numbers:

1367073-1
1658391-2
2227302-1

SFP+ Products

- Supports data rates up to 16 Gbps
- 20 position PT connector
- EMI spring or gasket, light pipes, and heat sink options
- Connector and cable assembly are backward compatible with SFP

Reference Part Numbers:

2110759-1
2007198-1
2170680-1

zSFP+ Products

- Supports data rates up to 28 Gbps
- 20 position PT connector
- EMI spring or gasket, light pipes and heat sinks options
- Connector and 1xN cages are backward compatible to SFP+

Reference Part Numbers:

2170088-X
2274001-1
2180324-2

QSFP/QSFP+ Products

- Supports data rates up to 40 Gbps with 10 Gbps per channel
- Four-channel package offering 3X the density of traditional SFP ports
- 38 Position SMT connector
- Through-bezel and behind-bezel cage options available

Reference Part Numbers:

2110819-1
1888631-2
2214574-4

zQSFP+ Products

- Supports data rates of more than 100 Gbps with 28 Gbps per channel
- New connector design to provide superior signal integrity
- Press-fit pin layout support belly-to-belly applications
- Share the same mating interface as the QSFP+ form factor

Reference Part Numbers:

1551920-2
2170790-2
2227670-1

microQSFP Products

- 4 x 28 Gbps solution provides QSFP28 functionality in a smaller, generally SFP-sized form factor
- 33% higher density than QSFP to fit more ports (up to 72) on a standard line card
- 14.25mm port-to-port pitch
- Integrated module thermal solution offers significantly better thermal performance than QSFP28 solutions

Reference Part Numbers:

2291536-1
2297551-1
2297550-1

HIgh Speed Pluggable I/O Solutions
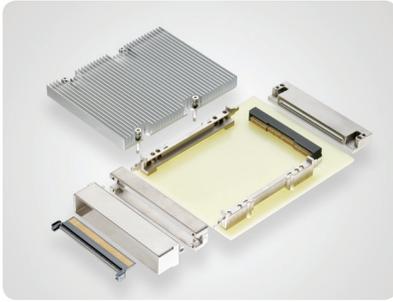
CFP Products

- Designed for Ethernet "long reach"
- Supports data rates up to 100 Gbps with 10 Gbps per channel
- 148 Position interconnect
- Excellent EMI shielding

Reference Part Numbers:
2057631-1
2057630-1
2057592-2

CFP2/CFP4 Products

- Up to 28 Gbps per lane; 100 Gbps per port
- Up to 4x data rate per 19" line card vs CFP
- Up to 60% lower power consumption vs CFP
- Pin counts: 104 pins (CFP2), 56 pins (CFP4)
- Ganged configurations available:
  - 1x1 and 1x2 cages for CFP2
  - 1x1 and 1x4 cages for CFP4
- **AVAILABLE IN 2017**

CXP Products
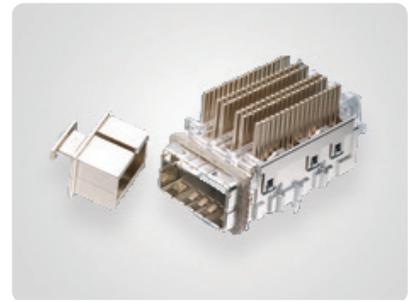
- Designed for Ethernet "short reach"
- Supports 150 Gbps solutions with 12 channels of 12.5 Gbps data
- Includes both EMI spring and an EMI gasket
- Set position integrated connector

Reference Part Numbers:
2149701-1
2149152-1
2149731-1

CDFP Products

- Up to 400 Gbps per port (16 lanes per port transfer up to 28 Gbps per lane)
- 0.75mm contact pitch
- Pre-assembled, one-piece press-fit connector and cage
- Support direct attach copper and active optical interfaces

Reference Part Numbers:
2291931-1
2274233-1

XFP Products

- Supports data rates up to 10 Gbps
- 30 Position SMT connector
- Gasket EMI containment features
- Patented riding heat sink for thermal dissipation

Reference Part Numbers:
1489951-1
1489948-2
2303074-1
1367500-1

X2 Products

- Design for a 10 Gbps solution (transmitting 4 channels of data at a rate of 3.125 Gbps each)
- TE connector and guide rails accept X2 MSA compliant module
- XAUI Interface
- 70 Position PT connector

Reference Part Numbers:
1367337-1
1367608-1
1367710-1

HIgh Speed Pluggable I/O Solutions

Mini-SAS and Mini-SAS HD Products

- Multi-lane solutions designed to support
  6 Gbps and 12Gbps data rates
- Meet the SAS 2.0 and SAS 2.1 specifications; Mini-SAS HD products have been proposed for the SAS 3.0 specification
- Mini-SAS products support both internal and external solutions
- Reduced size of the Mini-SAS HD system provides additional space for system designers
- Mini-SAS HD is a one-piece assembly featuring a cage and integrated connector

Reference Part Numbers:

1888321-2
1761987-7
2149375-1

Sliver Internal Cabled Interconnects

- Supports a choice of protocols (PCIe, SAS, SATA) for data rates up to 32 Gbps per channel
- 0.6mm pitch SMT connector design
- Flexible mounting and mating arrangements
- Supports present and future bandwidth needs without requiring requalification and redesign

Reference Part Numbers:

Vertical:	Right Angle:
2292096-1	2292055-1
2291316-1	2292069-1

High Speed Cable Assemblies

SFP+/QSFP+ Cable Assemblies

- MSA SFF-8431 compliant
- Supports serial data rates up to 10Gbps
- Enhanced EMI suppression
- 24AWG through 30AWG cable available
- Passive and active assemblies

Reference Part Numbers:

SFP+:	QSFP+:
2127931	2053638
2127932	2053453
2127934	2202165
2032757	

SFP28/QSFP28 Cable Assemblies

- Ethernet and InfiniBand compliant
- Supports data rates up to 28 Gbps per channel
- Low cost alternative to fiber optic assemblies
- 26 AWG through 33 AWG cable available
- QSFP28 to 4x SFP28 and QSFP28 to 2x QSFP28 hybrid cables

Reference Part Numbers:

| SFP28:	QSFP28:
2821262	2231368
2821222	2821033
2821223	2821309
2821224	2829040

microQSFP Cable Assemblies

- Compatible with 25G/50G/100G Ethernet and InfiniBand EDR
- Supports data rates up to 28 Gbps per channel in SFP sized form factor
- 28 AWG through 33 AWG cable available
- Straight, hybrid and breakout assembly configurations available

Reference Part Numbers:

2821236
2821783
2821779

Mini-SAS Cable Assemblies

- SFF-8088 and SAS 2.0 compliant
- Supports trained and untrained systems
- Up to 6Gbps data rate
- Universal key and standard key slots
- 24, 28 and 30AWG bulk cable

Reference Part Number:

1-2127833-4

Mini-SAS HD Cable Assemblies

- SFF-8644 and SAS 2.1 / 3.0 compliant
- Improved cable latch design
- Scalable 4x and 8x cable plug configurations
- 26, 28 and 30AWG bulk cable

Reference Part Numbers:

2202503
2202506
2202509

Sliver Cable Assemblies
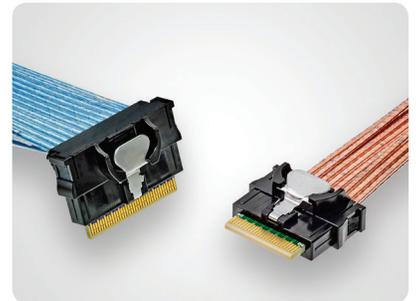
- Supports a choice of protocols (PCIe, SAS, SATA) for data rates up to 32 Gbps per channel
- Available in discrete pair or ribbon laminated 33 AWG cable
- 8x and 12x standard configurations available
- Robust latching for secure connections

Reference Part Numbers:

Straight:	Right Angle:
2820397-1	2820399-1
2820396-1	2821385-1

STANDARDS FOR HIGH SPEED I/O INTERFACES

Standard	Data Rate	Pluggable Interface														
		XFP	X2	SFP	SFP+	zSFP+	QSFP/ QSFP+	zQSFP+	micro QSFP	CFP	CFP2	CFP4	CXP	CDFP	Mini-SAS	Mini-SAS HD
Fibre Channel	1G			X	X	X										
	2G			X	X	X										
	4G			X	X	X										
	8G				X	X										
	16G*				X	X	X									
	32G					X	X	X								
	64G						X									
	128G							X								
Ethernet	1G			X	X	X										
	10G	X	X		X	X	X	X								
	25G*					X		X	X							
	40G						X	X		X						
	100G							X	X	X		X	X			
	200G										X			X		
	400G															
InfiniBand	2.5G															
	5G															
	10G															
	14G*						X	X								
	26G*						X		X							
	100G							X	X				X			
SAS	3G														X	
	6G						X								X	X
	12G															X
	24G															X
Copper Cable Availability				X	X		X	X						X	X	X

* Data rate per lane

Components of a High Speed I/O Interface

Lightpipe

Heat sink clip

Cage

Heat sink

Direct Attach Copper Cable

PT Connector
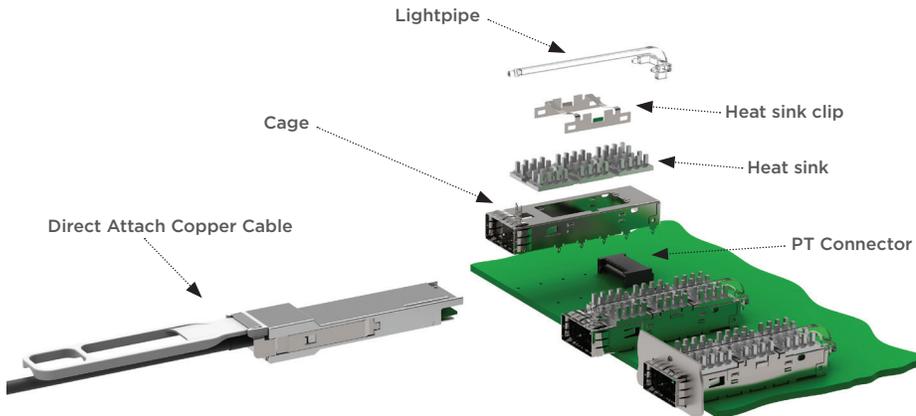
Typical Cage Port Configurations

Single Port
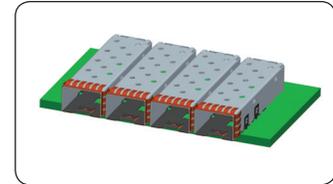
Ganged
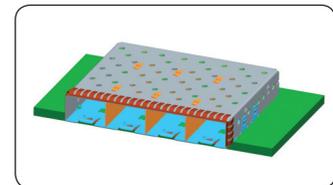
Belly-to-Belly
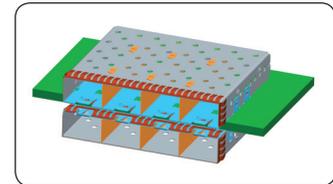
Stacked
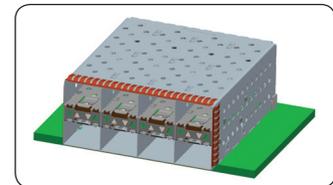
Features

EMI Springs
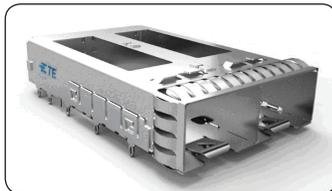
- Lower cost
- Less force applied to bezel

EMI Gasket

- Tighter tolerances between board edge and bezel are required
- Shielding slightly better in single row cage designs
- Less susceptible to damage

Accessories

Lightpipe Application: TE provides surface mounted LED bulbs on the PCB that carry light signal through the lightpipe clipped onto the cage to the faceplate. Lightpipes are available in standard, low profile, reduced length or square.

Lightpipes
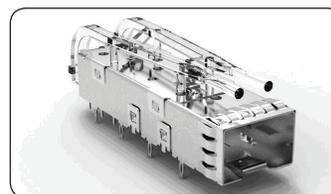
Heat Sinks
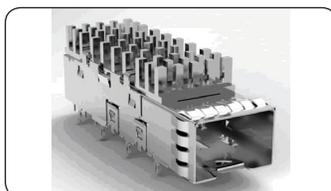
Heat Sink Technology for Thermal Management:
The riding heat sinks use direct contact to the pluggable module to draw heat away from the source. TE heat sinks are available in three standards networking, SAN, PCI, or can be designed to customer specifications.

Questions to Ask at Design In:

What standard and data rate is required?

Please reference the standards for high speed I/O interface table on page 5.

Does the application have specific density requirements?

Assemblies can be configured by the number of ports and to meet height/width restrictions.

Does the application require light pipes?

Light pipes are available for SFP, SFP+, QSFP/QSFP+ and CXP.

Does the application require thermal dissipation?

Heat sinks are available for SFP, SFP+, QSFP/QSFP+, XFP, CFP and CXP. There are also several thermal designs available in the SFP+, zSFP+ and the zQSFP+ product set. Please see www.te.com/pluggableio for part numbers.

What are your cable requirements?

Depending on the pluggable I/O interface, copper cable assemblies are available in different cable lengths and options.

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*as defined www.te.com/leadfree

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