# z-QUAD SMALL FORM-FACTOR PLUGGABLE PLUS (zQSFP+ OR QSFP28/56) INTERCONNECT SYSTEM

## Quick Reference Guide

**te.com/products/QSFP**

## Introducing zQSFP+ Interconnect System

TE Connectivity's (TE) zQSFP+ interconnects offer an increased data rate of 28 Gbps NRZ and 56 Gbps PAM-4 in an industry standard, scalable design that allows for backwards compatibility with QSFP+ cables and transceivers, providing a simple upgrade path from 10 Gbps to 28 Gbps and 56 Gbps. The complete portfolio of interconnects deliver a large range of simple and customizable design options to meet most customer requirements.

## Features and Benefits

### Increased Data Rates

- Data transfer rates of 28 Gbps NRZ and 56 Gbps PAM-4
- Supports Ethernet and InfiniBand (IB) Enhanced Data Rate (EDR) requirements
- Supports single channel, dual channel and quad channel implementations

### Industry Standard and Customizable Design

- Industry standard interface
- Backwards compatible with QSFP+ cables and transceivers
- Improved loss budget for optics and copper cables at 10 Gbps

### Comprehensive Portfolio and Inventory

- Dual sourced product available through Molex, LLC.
- Features behind and through bezel cages with various lightpipe and heat sink options
- Well-stocked distribution channel

### Improved EMI Performance

- Increased data rates make EMI protection more challenging
- Provide excellent EMI protection through 56 Gbps

## Applications

### Product Applications

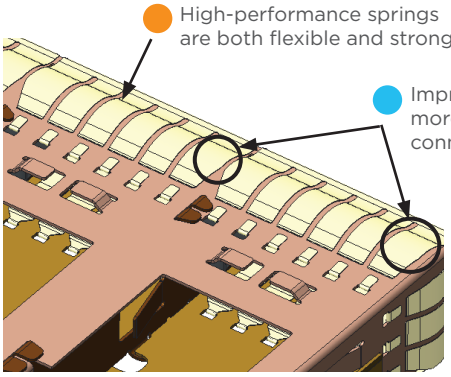
- Network Interface
- Switches
- Servers
- Routers
- Wireless Base Stations
- Test and Measurement Equipment

### Applications by Protocol

- 50, 100 and 200 Gigabit Ethernet
- 100 Gbps InfiniBand (IB) Enhanced Data Rate (EDR) requirements
- 128G Fibre Channel
- 25G/50G Consortium
- 25G NRZ and 56G PAM-4

# Enhanced zQSFP+ (QSFP28/56) Cages

## EMI Enhanced




Reference base part number 2170709 on page 7

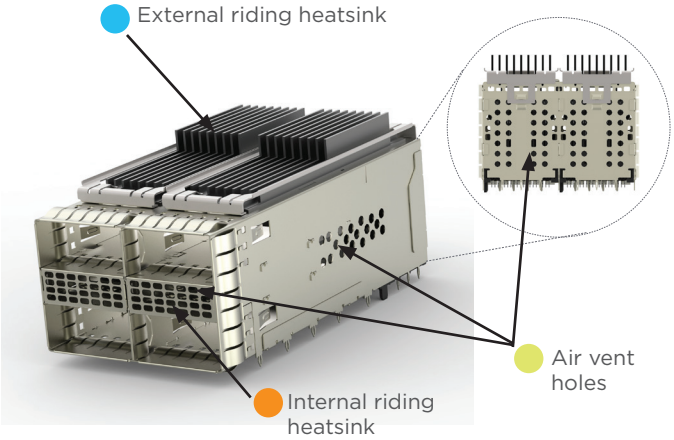
### Lower Assembly Insertion Force

Help increase assembly throughput by providing a 55% reduction in force needed to insert the line card into the front bezel. The reduction in insertion force makes assembly easier, faster, and reduces the risk for damage which can lead to reduced EMI performance.

### Improved EMI Performance

EMI sealing enhancements on these new cages provide 10 dB EMI performance improvement over current QSFP28 products.

## Thermally Enhanced




Reference base part numbers 2299940, 2299870, 2299924, 2321666 and 2321630 on page 7

### Lower Port Cooling

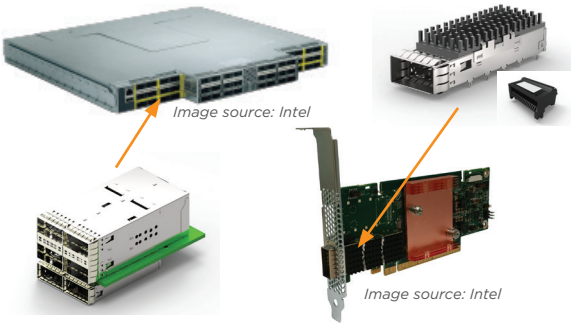
Internal riding heatsink in the seperator plate area provides enhanced cooling to the lower ports and a 12-15°C improvement over standard stacked zQSFP+ cages.

### Optimized Airflow

External riding heatsinks on the upper port are optimized for airflow direction (also available without heatsinks).

Air vent holes allow for air to pass through and exit out the sides and rear of the cage.

## Intel Omni-Path Architecture




Reference part numbers 2227670-7, 2300281-1, 2170704-1 and 1551920-2 on page 7

### Designed for Intel Omni-Path Architecture

These zQSFP+ 2x2 and 1x2 cages are specifically designed for Intel Omni-Path Architecture (OPA) switch architectures, and 1x1 zQSFP+ cages for OPA NIC cards. Designing with these cages allows access to proven technology to support high performance applications.

## Stacked Belly-to-Belly

Reference base part numbers 2314790, 2308171 and 2315050 on page 7

### High Density

Certain stacked cages can be used in belly-to-belly applications to support high density 2RU+ box designs and switch designs using next-gen 48 and 64 silicon ports.

### Low Cost

Using a stacked belly-to-belly design enables single PCB architecture versus two PCBs per line card, saving significant system costs.

# 1xN Mechanical Options

## Bezel Mount

- Behind bezel cages use a gasket applied by the customer to the cage or bezel sheet metal
- EMI spring versions and gasket versions share the same PCB footprint and bezel cutout
- TE offers low insertion force EMI springs to assist in assembly of high density products

Through Bezel with EMI Springs

Through Bezel with EMI Gasket

Behind Bezel (customer applies gasket)

Single

Dual

Quad

## Lightpipe Options

- TE offers 1, 2 or 4 lightpipe options per port
- Standard lightpipes are designed to support up to 1.00mm height 0805 style LEDs
- Lightpipes are shipped with an organizer to prevent optical cross-talk

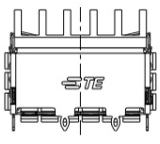
## Heat Sink Styles

- TE offers SAN, LAN and Networking height heatsinks
- Custom heatsinks are available upon request
- Height is max height of assembly from surface of PCB

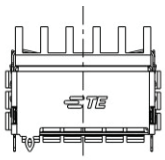
PCI (13.7mm height)

SAN (16.0mm height)

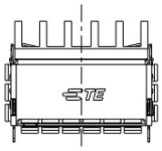
NET (23.0mm height)



2 rear EONs



1 rear EONs



0 rear EON's

## Rear EONs

- Rear pins are used to improve EMI grounding and cage retention to the PCB
- TE offers all styles outlined in the SFF-8662 footprint
- Rear EONs will be dependent upon the customer's routing preference and technical specifications

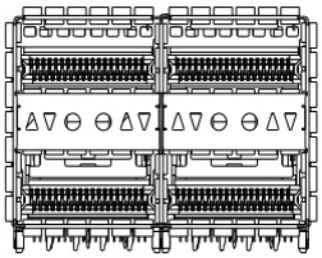
## 2xN Mechanical Options

### Bezel Mount

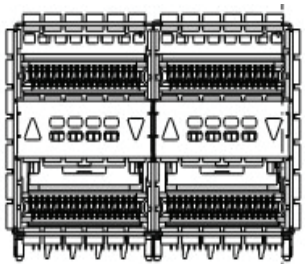
- Through bezel assemblies with EMI springs or EMI gaskets are available
- Custom gasketing options are available upon request

Through Bezel with EMI Springs

Through Bezel with EMI Gasket



Single (per port)



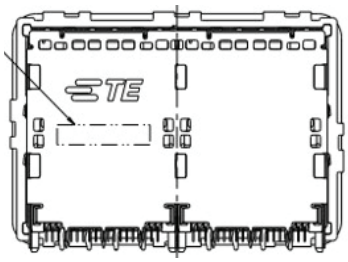
Dual (per port)

### Lightpipe Options

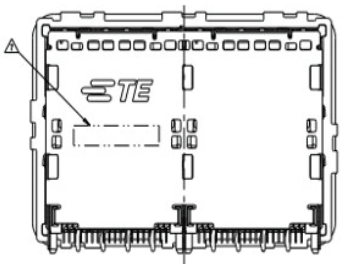
- TE offers zero, single and dual lightpipe options per port
- For higher lightpipe counts, the customer may add lightpipes underneath their PCB to indicate lower port activity
- The thermal footprint design offers 4x lightpipes assembled above the cage
- Lightpipes are designed to support up to 0.80mm height 0805 style LEDs

### Rear EONs

- Rear pins are used to improve EMI grounding and cage retention to the PCB
- TE offers zero or three rear pins per port column
- Rear EONs will be dependent upon the customer's routing preference and technical specifications



3 rear EONs



0 rear EONs

## Part Number Detail

### Cages

| Base Part Number | Ports | Cage Applications | EMI Suppression | Lightpipes Applied Per Port | | | Heat Sinks | Applied | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Single | Dual | Quad | NET | PCI | SAN |
| 2170754 | 1x1 | Through Bezel | EMI Gasket | Yes | Yes | Yes | Yes | Yes | Yes |
| 2170705 | 1x1 | Through Bezel | EMI Springs | Yes | Yes | Yes | Yes | Yes | Yes |
| 2170773 | 1x1 | Through Bezel | EMI Springs | Yes | Yes | Yes | No | No | No |
| 2170753 | 1x1 | Through Bezel | EMI Gasket | No | No | No | Yes | Yes | Yes |
| 2170752 | 1x1 | Through Bezel | EMI Gasket | No | No | No | No | No | No |
| 2170704 | 1x1 | Through Bezel | EMI Springs | No | No | No | Yes | Yes | Yes |
| 2170703 | 1x1 | Through Bezel | EMI Springs | No | No | No | No | No | No |
| 1551892 | 1x1 | Behind Bezel | C | No | No | No | Yes | Yes | Yes |
| 1551891 | 1x1 | Behind Bezel | C | No | No | No | No | No | No |
| 2170814 | 1x2 | Through Bezel | EMI Gasket | Yes | Yes | Yes | Yes | Yes | Yes |
| 2170813 | 1x2 | Through Bezel | EMI Gasket | Yes | Yes | Yes | No | No | No |
| 2170808 | 1x2 | Through Bezel | EMI Springs | Yes | Yes | Yes | Yes | Yes | Yes |
| 2170807 | 1x2 | Through Bezel | EMI Springs | Yes | Yes | Yes | No | No | No |
| 2170812 | 1x2 | Through Bezel | EMI Gasket | No | No | No | Yes | Yes | Yes |
| 2170811 | 1x2 | Through Bezel | EMI Gasket | No | No | No | No | No | No |
| 2170806 | 1x2 | Through Bezel | EMI Springs | No | No | No | Yes | Yes | Yes |
| 2170805 | 1x2 | Through Bezel | EMI Springs | No | No | No | No | No | No |
| 2227103 | 1x2 | Behind Bezel | C | Yes | Yes | No | Yes | Yes | Yes |
| 2227103 | 1x2 | Behind Bezel | C | No | No | No | Yes | Yes | Yes |
| 2227104 | 1x2 | Behind Bezel | C | No | No | No | Open Top | | |
| 2170769 | 1x3 | Through Bezel | EMI Gasket | Yes | Yes | Yes | Yes | Yes | Yes |
| 2170740 | 1x3 | Through Bezel | EMI Springs | Yes | Yes | Yes | Yes | Yes | Yes |
| 2170739 | 1x3 | Through Bezel | EMI Springs | Yes | Yes | Yes | No | No | No |
| 2170768 | 1x3 | Through Bezel | EMI Gasket | No | No | No | Yes | Yes | Yes |
| 2170767 | 1x3 | Through Bezel | EMI Gasket | No | No | No | No | No | No |
| 2170738 | 1x3 | Through Bezel | EMI Springs | No | No | No | Yes | Yes | Yes |
| 2170737 | 1x3 | Through Bezel | EMI Springs | No | No | No | No | No | No |
| 2173239 | 1x3 | Behind Bezel | C | No | No | No | Yes | Yes | Yes |
| 2173238 | 1x3 | Behind Bezel | C | No | No | No | Open Top | | |
| 2170785 | 1x4 | Through Bezel | EMI Gasket | Yes | Yes | Yes | Yes | Yes | Yes |
| 2170784 | 1x4 | Through Bezel | EMI Gasket | Yes | Yes | Yes | No | No | No |
| 2170747 | 1x4 | Through Bezel | EMI Springs | Yes | Yes | Yes | Yes | Yes | Yes |
| 2170746 | 1x4 | Through Bezel | EMI Springs | Yes | Yes | Yes | No | No | No |

Part Number 1551920-2: zQSFP+ Surface Mount Connector for use with all 1xN cages

**Notes:**
C = Customer Applied Gasket
1xN cages: require a SMT connector to complete the assembly
2xN cages: connectors and cages come as one integrated assembly
All cages use EMI Plug 1888810-2

## Cages (con't)

| Base Part Number | Ports | Cage Applications | EMI Suppression | Lightpipes Applied Per Port | | | Heat Sinks | Applied | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Single | Dual | Quad | NET | PCI | SAN |
| 2170783 | 1x4 | Through Bezel | EMI Gasket | No | No | No | Yes | Yes | Yes |
| 2170782 | 1x4 | Through Bezel | EMI Gasket | No | No | No | No | No | No |
| 2170745 | 1x4 | Through Bezel | EMI Springs | No | No | No | Yes | Yes | Yes |
| 2170744 | 1x4 | Through Bezel | EMI Springs | No | No | No | No | No | No |
| 2227249 | 1x4 | Behind Bezel | C | No | No | No | Yes | Yes | Yes |
| 2227250 | 1x4 | Behind Bezel | C | No | No | No | Open Top | | |
| 2315050 | 1x2 | Behind Bezel | EMI Springs | No | No | Yes | No | No | No |
| 2170790 | 1x4 | Through Bezel | EMI Springs | No | No | Yes | Custom Height | | |
| 2299940 | 2x1 | Through Bezel | EMI Springs | Yes | Yes | No | Custom Height | | |
| 2321666 | 2x1 | Through Bezel | EMI Springs | Yes | Yes | No | Single Piece Press Fit | | |
| 2299870 | 2x2 | Through Bezel | EMI Springs | Yes | Yes | No | Custom Height | | |
| 2321630 | 2x2 | Through Bezel | EMI Springs | Yes | Yes | No | Single Piece Press Fit | | |
| 2299924 | 2x3 | Through Bezel | EMI Springs | Yes | Yes | No | Custom Height | | |
| 2227670 | 2x2 | Belly-to-Belly | EMI Springs | No | No | No | No | No | No |
| 2300281 | 1x2 | Belly-to-Belly | EMI Springs | No | No | No | No | No | No |
| 2314790 | 2x1 | Belly-to-Belly | EMI Springs | Yes | Yes | Yes | No | No | No |
| 2308171 | 2x2 | Belly-to-Belly | EMI Springs | Yes | Yes | Yes | No | No | No |
| 2170708 | 1x6 | Through Bezel | EMI Springs | Yes | Yes | Yes | Yes | Yes | Yes |
| 2170734 | 1x6 | Through Bezel | EMI Springs | Yes | Yes | Yes | No | No | No |
| 2170707 | 1x6 | Through Bezel | EMI Springs | No | No | No | Yes | Yes | Yes |
| 2170706 | 1x6 | Through Bezel | EMI Springs | No | No | No | No | No | No |
| 2198373 | 2x1 | Through Bezel | EMI Gasket | 0/1 | | | No | No | No |
| 2227224 | 2x1 | Through Bezel | EMI Gasket | 0/1 | | | No | No | No |
| 2287054 | 2x1 | Through Bezel | EMI Gasket | 2 | | | No | No | No |
| 2227666 | 2x1 | Through Bezel | EMI Springs | 0/1 | | | No | No | No |
| 2227669 | 2x1 | Through Bezel | EMI Springs | 0/1 | | | No | No | No |
| 2227669 | 2x1 | Through Bezel | EMI Springs | 2 | | | No | No | No |
| 2170608 | 2x1 | Through Bezel | EMI Gasket | 2** | | | Thermal Footprint | | |
| 2214593 | 2x2 | Through Bezel | EMI Gasket | 0/1 | | | No | No | No |
| 2227225 | 2x2 | Through Bezel | EMI Gasket | 0/1 | | | No | No | No |
| 2287054 | 2x2 | Through Bezel | EMI Gasket | 2 | | | No | No | No |
| 2227667 | 2x2 | Through Bezel | EMI Springs | 0/1 | | | No | No | No |
| 2227670 | 2x2 | Through Bezel | EMI Springs | 0/1 | | | No | No | No |
| 2289129 | 2x2 | Through Bezel | EMI Springs | 2 | | | No | No | No |
| 2214565 | 2x3 | Through Bezel | EMI Gasket | 0/1 | | | No | No | No |
| 2227226 | 2x3 | Through Bezel | EMI Gasket | 0/1 | | | No | No | No |
| 2287054 | 2x3 | Through Bezel | EMI Gasket | 2 | | | No | No | No |
| 2227668 | 2x3 | Through Bezel | EMI Springs | 0/1 | | | No | No | No |
| 2227671 | 2x3 | Through Bezel | EMI Springs | 0/1 | | | No | No | No |
| 2227671 | 2x3 | Through Bezel | EMI Springs | 2 | | | No | No | No |
| 2170610 | 2x3 | Through Bezel | EMI Gasket | 1/2** | | | Thermal Footprint | | |

Enhanced

Part Number 1551920-2: zQSFP+ Surface Mount Connector for use with all 1xN cages

**Notes:** C = Customer Applied Gasket
1xN cages: require a SMT connector to complete the assembly
2xN cages: connectors and cages come as one integrated assembly
All cages use EMI Plug 1888810-2

## Accessories

| Type | Description | Part Number(s) |
|---|---|---|
| Surface Mount Connector | zQSFP+ SMT connector (For use with all 1xN cages) | 1551920-2 |
| Behind Bezel | 1x1 Heat Sink Clip | 2007304-5 |
| | 1xN Heat Sink Clip | 2227644-3, -4, -6 |
| | 1x1 Single Lightpipe | 2173481-1 |
| | 1xN Single Lightpipe | 2173482-1, -2, -3, -7 |
| Through Bezel | 1x1 Heats Sink Clip | 2007304-5 |
| | 1xN Heat Sink Clip | 2227644-3, -4, -6 |
| | 1x1 Single Lightpipe | 2170720-1 |
| | 1x1 Dual Lightpipe | 2170762-1 |
| | 1x1 Quad Lightpipe | 2170777-1 |
| | 1xN Single Lightpipe | 2170720-1 |
| | 1xN Dual Lightpipe | 2170761-1 |
| | 1xN Quad Lightpipe | 2170762-1 |

## Specifications

### 1xN zQSFP+

- Cage and Connector Product Spec: 108-19428
- SMT Connector Application Spec: 114-32022
- Cage Assembly Applications Spec: 114-32023

### 2xN Stacked zQSFP+

- Product Spec: 108-60102
- Application Spec: 114-60015

## Direct Attach Copper Cable Assemblies

TE's QSFP28 and QSFP56 passive copper cable assemblies feature eight differential copper pairs, providing four data transmission channels at speeds up to 28 Gbps NRZ and 56 Gbps PAM-4, and meet 100G Ethernet, 200G Ethernet and Infiniband Enhanced Data Rate (EDR) requirements.

Offered in a broad range of wire gages – from 30AWG through 33AWG – this 100G copper cable assembly features low insertion loss and low cross talk. This next generation cable assembly shares the same mating interface with QSFP+ and QSFP28 form factors, making it backward compatible with existing QSFP ports. QSFP28 and QSFP56 form factors can be used with current 40G and 100G applications with substantial signal integrity margin.

### Features and Benefits

- Compatible with IEEE 802.3cd, IEEE 802.3bj, IEEE 802.3by and InfiniBand EDR
- Optimized construction to minimize insertion loss and cross talk
- Customized 360° cable braid termination limits EMI radiation
- Compatible with all existing QSFP connectors and cages
- Pull-to-release slide latch design
- 30AWG through 33AWG cable
- Straight and breakout assembly configurations available
- Customizable EEPROM mapping for cable signature
- RoHS compliant
- Contact your TE Representative for customized lengths

### Part Number Detail

**QSFP28 Cable Assemblies**

| Base Part Number | Description | AWG | Dash to Length (meters) | | |
|---|---|---|---|---|---|
| | | | 1 | 2 | 3 |
| 2829040 | InfiniBand EDR | 33 | -2 | | |
| | | 30 | -4 | -6 | |
| 2231368 | QSFP28 Straight 100G Ethernet (NRZ) | 33 | -16 | -18 | |
| | | 30 | -1 | -2 | -8 |
| 2821033 | QSFP28 Breakout to 4x SFP28 | 33 | -8 | | |
| | | 30 | -1 | -10 | -2 |
| 2821309 | QSFP28 Breakout to 2x QSFP28 | 33 | -7 | | |
| | | 30 | -1 | -2 | -4 |

**QSFP56 Cable Assemblies**

| Base Part Number | Description | AWG | Dash to Length (meters) | | |
|---|---|---|---|---|---|
| | | | 0.5 | 1 | 1.5 |
| 2323238 | QSFP56 Straight 200G Ethernet (NRZ) | 33 | -1 | -2 | |
| 2323239 | | 30 | -1 | -2 | -3 |
| 2323247 | QSFP56 Breakout to 4x SFP56 | 33 | -1 | -2 | |
| 2323248 | | 30 | -1 | -2 | -3 |
| 2325343 | QSFP56 Breakout to 2x QSFP56 | 33 | -1 | -2 | |
| 2325344 | | 30 | -1 | -2 | -3 |

## Frequently Asked Questions

### What data rate does zQSFP+ support?

zQSFP+ provides four data transmission channels at speeds up to 28 Gbps NRZ and 56 Gbps PAM-4 per channel.

### Is TE's footprint compatible with other suppliers?

TE's behind bezel cages are not compatible with all sources. TE through bezel 1xN and stacked products are footprint compatible and dual sourced with Molex, LLC. zQSFP+ connectors and cages are designed to meet SFF-8662.

### Are heat sinks available?

Yes, TE offers a generous portfolio of heat sink heights and styles, as well as custom heat sinks upon request.

### Is application tooling required?

Single port cage assemblies require only flat-rock tooling, while 1xN and stacked assemblies normally require specific application tooling.

## For More Information

### TE Technical Support Center

| | |
|---|---|
| USA: | 1.800.522.6752 |
| Canada: | 1 .905.475.6222 |
| Mexico: | 52.0.55.1106.0800 |
| Latin/S. America: | 54.0.11.4733.2200 |
| Germany: | 49.0.6251.133.1999 |
| UK: | 44.0.800.267666 |
| France: | 33.0.1.3420.8686 |
| Netherlands: | 31.0.73.6246.999 |
| China: | 86.0.400.820.6015 |

**te.com/products/qsfp**

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5-1773463-0 DND 02/2018

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