



# MINI-SAS HIGH DENSITY

Connectors & Cable Assemblies

TE Connectivity's (TE's) Mini-SAS HD (high density) product family includes compact, high-speed I/O solutions for SAS applications: storage, rack-mount servers, workstations, storage racks, high performance computing, HBAs (host bus adapters), RAID (redundant arrays of inexpensive disks), switches and more. The product family supports speeds up to 12 Gb/s and includes the following interfaces:

- Internal receptacles and copper cable assemblies
- External receptacles and copper cable assemblies

The interfaces are adopted for the SAS-2.1 and SAS-3 standards. The reduced size of the interconnects saves additional 30% to 50% PCB space; a low profile PCIe card can accommodate 4 Mini-SAS HD connectors versus 2 SAS connectors.

### Internal Mini-SAS HD Connector

TE's *internal* Mini-SAS HD connector is a 12 Gb/s high-density, high-speed interface capable of supporting an aggregate data rate of 48 Gb/s per connector (12G x 4 lanes) with a version capable of transferring an aggregate data rate of 192 Gb/s. Designed to be approximately 30 % smaller than conventional internal Mini-SAS connectors, the internal Mini-SAS HD connector enables you to save precious PCB space. Additionally, the connector has been adopted by SAS 2.1 and SAS 3 specifications.

Featuring both right angle and vertical orientations, TE's internal Mini-SAS HD interconnects suit a variety of architectures in multiple applications: enterprise storage, high-performance computing, networking and data centers. The connector supports direct passive and active copper cable assemblies.

#### Electrical

- Signal integrity performance meets SAS-2.1 at 6 Gb/s and SAS-3 at 12 Gb/s requirements
- Voltage rating: 30 volts AC
- Current rating: Signal application only

#### Mechanical

- Plug insertion force: 50N Max
- Plug extraction force: 25N Max
- Latch retention: 50N Min
- Durability: 250 cycles

#### Materials

- Receptacle housing: LCP
- Contacts: Copper Alloy
- Chicklets: LCP



#### Features

- **High Density, High-Speed:** Aggregate data transfer of 48 Gb/s; capable of transferring 192 Gb/s in the 1x4 version
- **Compact Size:** 0.75mm contact pitch that's 30% smaller than existing products
- **Faster Installation:**
  - Press-fit termination
  - Pre-assembled, one-piece connector
  - Keying for proper plug orientation
- **Flexibility:**
  - 1x1, 1x2 and 1x4 configurations available
  - Plug options for direct passive and active copper cable assemblies
  - Stacked board interface with 36 positions per 1x1
- **Error-Proof:** Screw mounted for additional retention
- 100 Ohm impedance

#### Protocols /Specifications

- SAS-2.1 at 6 Gb/s
- SAS 3.0 at 12 Gb/s
- SFF-8643

#### Technical Documents

- Product Specification: 108-32038
- Application Specification: 114-32101

### Internal Mini SAS HD Connector Part Numbers

Part Number	Orientation	Configuration	Impedance	
2227580-1	Right Angled Press-fit	1x1	100 Ohms	
2227581-1	Right Angled Press-fit	1x2	100 Ohms	
2227582-1	Right Angled Press-fit	1x4	100 Ohms	
2227595-1	Vertical Press-fit	1x1	100 Ohms	
2227640-1	Vertical Press-fit	1x2	100 Ohms	
2227642-1	Vertical Press-fit	1x4	100 Ohms	

### Internal Mini-SAS HD Cable Assembly

TE's *internal* Mini-SAS HD cable assembly offers system designers with a high speed connection packaged in an extremely flexible, small design. Performing at 12 Gb/s per lane at four lanes, the product transfers data at a total rate of 48 Gb/s. Paired with our internal Mini-SAS HD receptacle, the connector can drive higher aggregate data rates of 192G.

Designed with ultra-slim Madison Cable brand TurboTwin cable and a short 18mm connector (plug), the cable assembly improves airflow while saving additional PCB space. These advantages are critical for internal, inside-the-box applications that demand efficient space usage.

The cable assembly is available in multiple lengths ranging from .3m to 1m and is designed for reliability through use of an abrasion- and cut-resistant cable jacket. This jacket additionally shields isolation to maintain signal integrity.

#### Electrical

- Compliant to SAS 3.0 at 12 Gb/s ; SAS 2.1 at 6 Gb/s
- Attenuation: 100 Ohm 3.7 dB/m at 6 GHz ; 85 Ohm 4.3 dB/m at 6 GHz

#### Mechanical

- Compliant to SFF-8643
- Cable construction consists of 8 differential pair bundles:  
2 cables with 4 pairs in each cable
- Durability: 250 mating cycles
- Latch retention: 40N min
- Right angle pull: 15N min

#### Materials

- PVC or Halogen-free (class 3) PCBA cable jacket options
- UL VW-1 Rated
- REACH and RoHS II compliant

#### Technical Documents

- Product Specification: 108-32038



#### Features

- **High Speed:** Transfers data at 12 Gb/s; total aggregate data transfer per connector is 48 Gb/s
- **Greater Airflow + Space Savings**
  - Short 18mm length connector
  - Madison 4 pair 30AWG 12G TurboTwin composite flat twin axial cable (with side bands)
- **Design Flexibility**
  - 4x and 8x configurations
  - Lengths from 0.3m through 1m
  - Straight and right angle cable connector configurations
  - Available in either PVC or halogen-free cable jacket material
  - 85 or 100 Ohm impedance
- **Robust Design:** Cable jacketed for abrasion/cut resistance and shield isolation (no metallic edges)
- Webbed flat cable for separation in termination zone

#### Protocols / Specifications

- SAS-2.1 at 6 Gb/s
- SAS 3.0 at 12 Gb/s
- Compliant to SFF-8643
- Compatible with PCIe Gen 3

### Internal Mini-SAS HD Cable Assembly Part Numbers

Part Number	Cable Assembly Type	Assembly Length (MR)	Impedance	Halogen Free
2231171-1	4i, Straight to Straight plugs	0.3	100	No
2231171-2	4i, Straight to Straight plugs	0.5	100	No
2231171-3	4i, Straight to Straight plugs	0.7	100	No
2231171-4	4i, Straight to Straight plugs	1.0	100	No
2820350-1	4i, Straight to Straight plugs	0.3	100	Yes
2820350-2	4i, Straight to Straight plugs	0.5	100	Yes
2820350-3	4i, Straight to Straight plugs	0.7	100	Yes
2820350-4	4i, Straight to Straight plugs	1.0	100	Yes
2820328-1	4i, Right Angle to Right Angle plugs	0.3	100	No
2820328-2	4i, Right Angle to Right Angle plugs	0.5	100	No
2820328-3	4i, Right Angle to Right Angle plugs	0.7	100	No
2820328-4	4i, Right Angle to Right Angle plugs	1.0	100	No
2820329-1	4i, Right Angle to Right Angle plugs	0.3	100	Yes
2820329-2	4i, Right Angle to Right Angle plugs	0.5	100	Yes
2820329-3	4i, Right Angle to Right Angle plugs	0.7	100	Yes
2820329-4	4i, Right Angle to Right Angle plugs	1.0	100	Yes
2820332-1	4i, Straight to Right Angle plugs	0.3	100	No
2820332-2	4i, Straight to Right Angle plugs	0.5	100	No
2820332-3	4i, Straight to Right Angle plugs	0.7	100	No
2820332-4	4i, Straight to Right Angle plugs	1.0	100	No
2820333-1	4i, Straight to Right Angle plugs	0.3	100	Yes
2820333-2	4i, Straight to Right Angle plugs	0.5	100	Yes
2820333-3	4i, Straight to Right Angle plugs	0.7	100	Yes
2820333-4	4i, Straight to Right Angle plugs	1.0	100	Yes
2820337-1	8i, Straight to Straight plugs	0.3	100	No
2820337-2	8i, Straight to Straight plugs	0.5	100	No
2820338-1	8i, Straight to Straight plugs	0.3	100	Yes
2820338-2	8i, Straight to Straight plugs	0.5	100	Yes

### Internal Mini-SAS HD Cable Assembly Part Numbers

Part Number	Cable Assembly Type	Assembly Length (MR)	Impedance	Halogen Free
2820325-1	4i, Right Angle to Right Angle plugs	0.3	85	No
2820325-2	4i, Right Angle to Right Angle plugs	0.5	85	No
2820325-3	4i, Right Angle to Right Angle plugs	0.7	85	No
2820325-4	4i, Right Angle to Right Angle plugs	1.0	85	No
2820326-1	4i, Right Angle to Right Angle plugs	0.3	85	Yes
2820326-2	4i, Right Angle to Right Angle plugs	0.5	85	Yes
2820326-3	4i, Right Angle to Right Angle plugs	0.7	85	Yes
2820326-4	4i, Right Angle to Right Angle plugs	1.0	85	Yes
2820330-1	4i, Straight to Right Angle plugs	0.3	85	No
2820330-2	4i, Straight to Right Angle plugs	0.5	85	No
2820330-3	4i, Straight to Right Angle plugs	0.7	85	No
2820330-4	4i, Straight to Right Angle plugs	1.0	85	No
2820331-1	4i, Straight to Right Angle plugs	0.3	85	Yes
2820331-2	4i, Straight to Right Angle plugs	0.5	85	Yes
2820331-3	4i, Straight to Right Angle plugs	0.7	85	Yes
2820331-4	4i, Straight to Right Angle plugs	1.0	85	Yes
2820334-1	4i, Straight to Straight plugs	0.3	85	No
2820334-2	4i, Straight to Straight plugs	0.5	85	No
2820334-3	4i, Straight to Straight plugs	0.7	85	No
2820334-4	4i, Straight to Straight plugs	1.0	85	No
2820335-1	4i, Straight to Straight plugs	0.3	85	Yes
2820335-2	4i, Straight to Straight plugs	0.5	85	Yes
2820335-3	4i, Straight to Straight plugs	0.7	85	Yes
2820335-4	4i, Straight to Straight plugs	1.0	85	Yes
2820339-1	8i, Straight to Straight plugs	0.3	85	No
2820339-2	8i, Straight to Straight plugs	0.5	85	No
2820340-1	8i, Straight to Straight plugs	0.3	85	Yes
2820340-2	8i, Straight to Straight plugs	0.5	85	Yes

## External Applications

### External Mini-SAS HD Connector

TE's Mini-SAS HD **external** receptacle connector is a high-density, high-speed IO interface adopted for the SAS 2.1 standard and proposed for SAS 3.0 standard. The product is designed to support 6 Gb/s and 12 Gb/s SAS applications. The assembly is offered in 4x, 8x, and 16x versions.

### Electrical

- Connector signal integrity performance meets requirements of current SAS-2.1 at 6 Gb/s, and capable of compliance with SAS-3 at 12 Gb/s
- Voltage rating: 120 volts AC
- Current rating: Signal application only

### Mechanical

- Plug insertion force: 100N Max
- Plug extraction force: 50N Max
- Latch retention: 133.5N Min
- Durability: 250 cycles

### Materials

- Receptacle housing: LCP
- Shield assembly: Nickel Silver
- Contacts: Copper Alloy
- EMI Spring: Copper Alloy
- Threaded nut: Brass
- Chicklets: LCP

### External Mini SAS HD Connector Part Numbers

P/N	Description
2149027-1	1x1 Receptacle Assembly
2149966-1	1x2 Receptacle Assembly
2149375-1	1x4 Receptacle Assembly
2198484-1	1X1 Receptacle Assembly with lightpipe
2198483-1	1x2 Receptacle Assembly with lightpipe
2180736-1	1x4 Receptacle Assembly with lightpipe



### Features

- **High Speed:** Broadband design for 6 and 12 Gbps
- Board receptacle provides 1x1 (4x), 1x2 (8x) and 1x4 (16x) configurations
- **Easy Installation:** Preassembled, one-piece interconnect offers one-step placement onto PCB
- Lightpipe options available
- REACH and RoHS compliant
- Improved cable latch design
- Enhanced EMI skirt design
- **Scalable:** 4x and 8x cable plug options
- 26, 28, and 30 AWG bulk cable

### Protocols / Specifications

- SAS-2.1 at 6 Gb/s
- SAS-3 at 12 Gb/s
- SFF-8644

### Technical Documents

- Product Specification: 108-2462
- Application Specification: 114-3316

### External Mini-SAS HD Copper Cable Assembly

The passive direct attach **external** Mini-SAS HD copper cable assembly is designed for broadband operation optimized for 6 and 12 Gb/s. The EEPROM signature enables the host to identify what type and length of cable is connected to its port, and can be customized for any application. An improved latch design reduces the insertion force and increases the retention force. MADISON CABLE brand TurboTwin bulk cable, and the dual 4 pair cable exit backshell provide flexibility for routing.

#### Electrical

- Fully compliant to SAS 2.1 at 6 Gb/s , SAS 3.0 at 12 Gb/s and SFF-8644
- Impedance: 100 Ohm
- Shielded for EMI

#### Mechanical

- Cable backshell compliant to SFF-8644 mini-multilane interface specification
- Cable construction consists of 8 differential pairs bundles 2 cables with 4 pairs in each cable
- Durability: 250 mating cycles
- Latch retention: 44.5N min
- Rotational cable pull: 16.7N min

#### Materials

- Halogen free class 3 PCBA's used in all assemblies
- UL Type CL2 flammability rating
- REACH and RoHS II compliant

#### Part Numbers

P/N	Description	Data Rate	AWG	Minimum Length	Maximum Length
2202501-1 thru -8	4x Passive	6/12 G	26	0.5m	7m
2202502-1 thru -6	4x Passive	6/12 G	28	0.5m	5m
2202503-1 thru -4	4x Passive	6/12 G	30	0.5m	3m
2820306-1 thru -3	4x Passive	6/12 G	24	6m	8m
2202504-1 thru -8	8x Passive	6/12 G	26	0.5m	7m
2202505-1 thru -6	8x Passive	6/12 G	28	0.5m	5m
2202506-1 thru -4	8x Passive	6/12 G	30	0.5m	3m
2821025-1 thru -3	8x Passive	6/12 G	24	6m	8m
2202507-1 thru -8	4x Passive	6 G	26	0.5m	7m
2202508-1 thru -6	4x Passive	6 G	28	0.5m	5m
2202509-1 thru -4	4x Passive	6 G	30	0.5m	3m



#### Features

- **High-Speed:** Broadband design for 6 and 12 Gb/s
- **Improved Cable Management / Airflow:** Dual 4-pair cable design for flexibility and routability
- **Design Flexibility:**
  - Built with 12G Madison Brand TurboTwin cable and available in sizes 30 AWG, 28 AWG 26 AWG and 24 AWG
  - Cable lengths offered range from 0.5m to 8m
  - Offered in 4x and 8x configurations with EEPROM memory map compliance
- Enhanced latch design for increased retention force and reduced insertion force

#### Protocols / Specifications

- SAS-2.1 at 6 Gb/s
- SAS-3 at 12 Gb/s
- SFF-8644

#### Technical Documents

- Product Specification: 108-2462



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