



► **COMMUNICATIONS, DATA, CONSUMER DIVISION**

## **DISK DRIVE INTERFACE CONNECTORS**

### **SAS, SATA & SCA-2**

With operations in 30 countries, FCI is a leading manufacturer of connectors. Our 13,500 employees are committed to providing customers with high-quality, innovative products for a wide range of consumer and industrial applications.

## INTRODUCTION

FCI offers a wide range of connector options to support the implementation of industry-standard interfaces between hard disk drives (HDDs) and the backplanes or drive carrier boards commonly used in enterprise storage applications in servers and storage systems. FCI has long been recognized as a leading supplier of device plugs to the HDD industry. This brochure highlights FCI's complementary offering of receptacle connectors for use in the enterprise systems that employ Serial Attached SCSI (SAS), Serial ATA (SATA), or FibreChannel drives for data storage.

- The SAS connectors conform to SFF-8482 and enable the implementation of the Serial Attached SCSI hard disk drive interface. A SAS receptacle accepts either SAS or SATA drives, giving users the option of deploying higher-performance SAS drives for mission-critical applications or cost-effective SATA drives for bulk storage.
- The 22-position SATA connectors can be used to extend the use of low-cost, high-capacity SATA drives to low-end enterprise storage applications in servers and storage systems. The SATA receptacle accepts a SATA drive, but is keyed to block the installation of a SAS drive.
- The SCA2 (Single Connect Attachment-2) connector system enables the hard disk drive to backplane interface for FibreChannel and SCSI. The 40-position backplane receptacles are designed to accept Fibre Channel drives, while 80-position receptacles accept SCSI drives. The interface is governed by SFF-8451 and SFF-8454.

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# SERIAL-ATTACHED SCSI (SAS) CONNECTORS

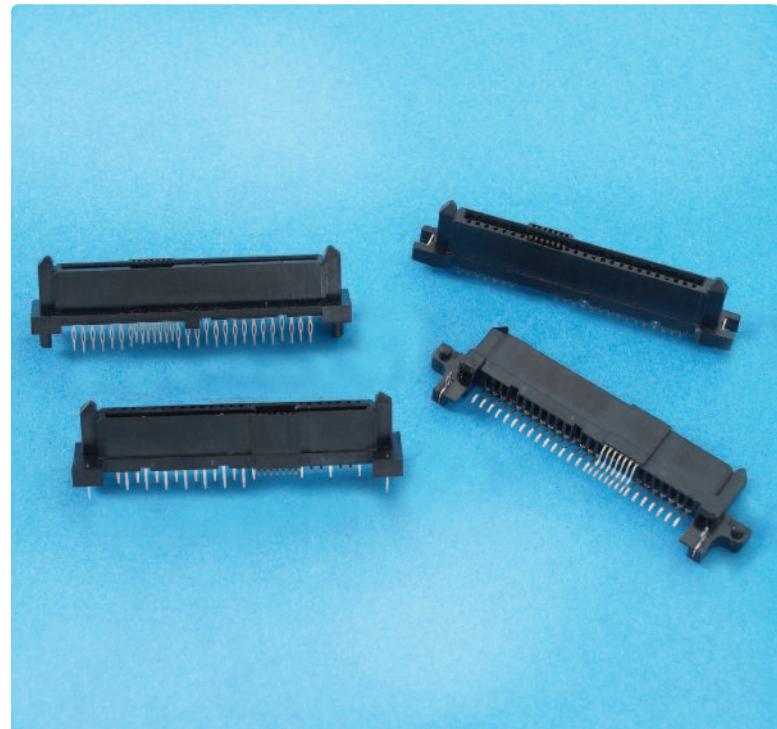
## DESCRIPTION

The 29-position, SAS receptacle and plug connectors enable the implementation of the high-speed, Serial Attached SCSI (SAS) hard disk drive (HDD) interface that is replacing the SCSI drive connection in enterprise storage applications in servers and storage systems.

The SAS connector system is designed to support hot plugging and blind mating of HDDs. Staggered contact lengths provide sequential mating of contacts to enable hot plugging. Molded guide posts provide angled lead-in to compensate for connector misalignment, allowing the device plug and the receptacle to self align during the mating process. Most connectors also feature stamped retention clips that provide additional mechanical strength for robust PCB attachment. FCI also offers wide-base housing options on vertical backplane receptacles for even more stability.

The high-speed, serial interface is designed to support differential signaling, initially at speeds of 3 Gb/s and evolving to 6 Gb/s. A SAS receptacle accepts either SAS or SATA (Serial ATA) drives, giving the system manufacturer the option to plug either drive to a backplane. Because both technologies have similar electrical interfaces, users have the choice of deploying cost-effective SATA drives for bulk storage or higher-performance SAS drives for mission-critical applications.

FCI offers a wide range of SAS plug and receptacle connectors for enterprise applications. Vertical and right angle connector configurations provide options for use in servers, server or storage blades, storage backplanes, HDD carriers, and HDDs.



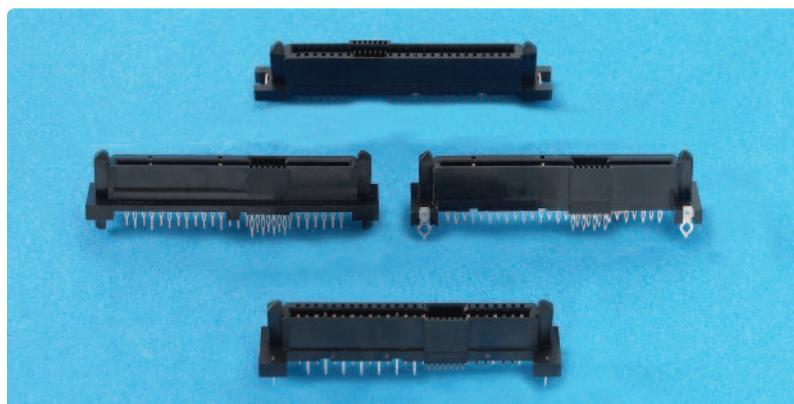
## FEATURES & BENEFITS

- For implementation of high-speed serial storage interfaces
- 29-position SAS connectors enable SFF-8482 HDD interface
- Provide dual signal ports (7 contacts/port) and 15 contacts for power
- SAS receptacles also accept SATA drives
- Designed to support hot-plugging and blind-mating of HDDs
- Connector retainers provide additional mechanical strength after soldering
- RoHS-compliant and compatible with lead-free processing temperatures

## TARGET MARKETS / APPLICATIONS

- Data
  - Servers
  - Server and storage blades
  - External storage systems
  - HDDs
  - HDD carriers
- Communications
  - Processor and storage blades
  - Mezzanine cards
- Industrial, Instrumentation & Medical
  - Embedded system boards

## SAS VERTICAL RECEPTACLES



### FEATURES & BENEFITS

- Typically used for storage backplane or HDD carrier applications
- Options for through-hole solder, press fit, surface mount (SMT), or hybrid (combination of SMT and TM leads) termination allow engineers to select the termination technique best suited to their design
- Wide-base housing options provide additional stability

Part Number	Termination Type			Other Features
	Power	Port 2	Port 1	
10039748-001LF*	thru-hole, staggered footprint			wide base with forklock retainers
10018182-001LF	thru-hole, in-line footprint			with forklock retainers
10038064-001LF*	press-fit, staggered footprint			wide base with molded posts and forklock/harpoon retainers
10045782-001LF	press-fit, staggered footprint			full-length, wide base with molded posts
10031077-003LF	press-fit, in-line footprint			with forklock/harpoon retainers
10036876-003LF*	thru-hole, staggered	SMT	signals: SMT grounds: thru-hole	wide base with molded posts and solder tab retainers, hybrid termination
10039845-001LF *	SMT			wide base with molded posts and solder tab retainers
10031567-001LF	SMT			with molded posts and SMT retainers
10038334-001LF	SMT			17.85mm extended height with molded posts and SMT retainers

\* connector mounts to PCB layout defined in SFF-8482 Specification

## SAS HEADERS



### FEATURES & BENEFITS

- Intended for interposer or port selector assemblies in removable HDD carriers
- Surface mount (SMT) termination
- Vertical connector positions the port selector PCB assembly perpendicular to the device plug on the HDD, which may be preferred with a 3.5-inch hard drive
- Right-angle connector allows the PCB assembly to be positioned in a plane that is parallel to the device plug on the HDD, which enables the use of a larger PCB within the smaller 2.5-inch drive form factor.

SAS Header for Interposer or Drive Carrier Assembly				Complementary Receptacle	
SAS Header Part Number	Orientation	Termination Type	Other Features	Receptacle Part Number	Receptacle Interface
10045105-001LF	vertical	SMT	rivet holes for PCB attachment	10045103-001LF	SATA
10045105-001LF	vertical	SMT	rivet holes for PCB attachment	10045103-002LF	SATA
10034524-001LF	right-angle	SMT	forklocks for PCB attachment SATA port away from PCB	10031569-001LF	SATA
10034524-001LF	right-angle	SMT	forklocks for PCB attachment port 1 (SATA) away from PCB	10035202-001LF	SAS

## SAS RIGHT-ANGLE RECEPTACLES



## FEATURES &amp; BENEFITS

- ▶ Address server blade, storage blade, embedded systems, or HDD carrier applications.
- ▶ Surface mount (SMT) termination
- ▶ A receptacle with 7.07mm offset from the surface of the carrier board provides 4.7mm nominal clearance for components to be mounted beneath an installed 2.5" hard drive

Part Number	Termination Type	Offset from Surface of Carrier PCB*	Other Features
10044002-001LF	SMT	7.07mm	port 1 (SATA) toward PCB, with molded posts and forklocks for 1.6mm thick host PCB
10044002-002LF	SMT	7.07mm	port 1 (SATA) toward PCB, with molded posts and solder-tab retainers
10044002-003LF	SMT	7.07mm	port 1 (SATA) toward PCB, with molded posts and forklocks for 1.8-1.93mm thick host PCB
10044002-004LF	SMT	7.07mm	port 1 (SATA) toward PCB, with molded posts and longer forklocks for 1.8-2.2mm thick PCB
10035202-001LF	SMT	0.35mm	port 1 (SATA) away from PCB, with forklocks
10036587-001LF	SMT	0.93mm	port 1 (SATA) toward PCB, with solder-tab retainers

\* Dimension measured from the PCB surface to the centerline of the molded guide posts on the receptacle connector.

## SAS DEVICE PLUGS



FCI is a major supplier of SAS device plugs to the HDD industry. As such, FCI has the capability to design and manufacture customized device plugs for specific hard disk drive applications, including combination headers that incorporate additional contacts for test or programming. Please contact your local sales representative or field application engineer for technical assistance.

## TECHNICAL INFORMATION

### MATERIALS

- Contact base metal: copper alloy
- Contact area finish: gold over nickel
- Solder area finish: tin over nickel
- Retainer clip base metal: copper alloy
- Retainer finish: tin over nickel
- Housing: high-temperature thermoplastic (UL 94V-0); color: black

### ELECTRICAL PERFORMANCE

- Contact resistance: 30 mΩ maximum initial; 15 mΩ maximum change after test
- Current rating: 1.5A minimum per contact with temperature rise not exceeding 30° C

### MECHANICAL PERFORMANCE

- Durability: 500 mating cycles
- Mating force: 50N maximum
- Unmating force: 5N minimum

### SPECIFICATIONS

- FCI product specification: GS-12-282
- SFF-8482 Specification for Unshielded Dual Port Serial Attachment Connector

### ENVIRONMENTAL

- Humidity: 96 hours at 40° C with 90-95% relative humidity. Per EIA 364-31, Method II, test condition A
- Temperature life: 85° C for 500 hours. Per EIA 364-17, test condition III, method A
- Thermal shock: 10 cycles between -55° C and +85° C. Per EIA 364-32, test condition I.
- Mixed flowing gas: expose 1/2 samples unmated for 7 days and then mated for 7 additional days; the other 1/2 samples are exposed mated for 14 days. Per EIA 364-65, class II A.

### CERTIFICATIONS & APPROVALS

- UL

### PACKAGING

- Tray
- Tube
- Tape-on-reel (available upon request)

# SERIAL-ATA (SATA) CONNECTORS

## DESCRIPTION

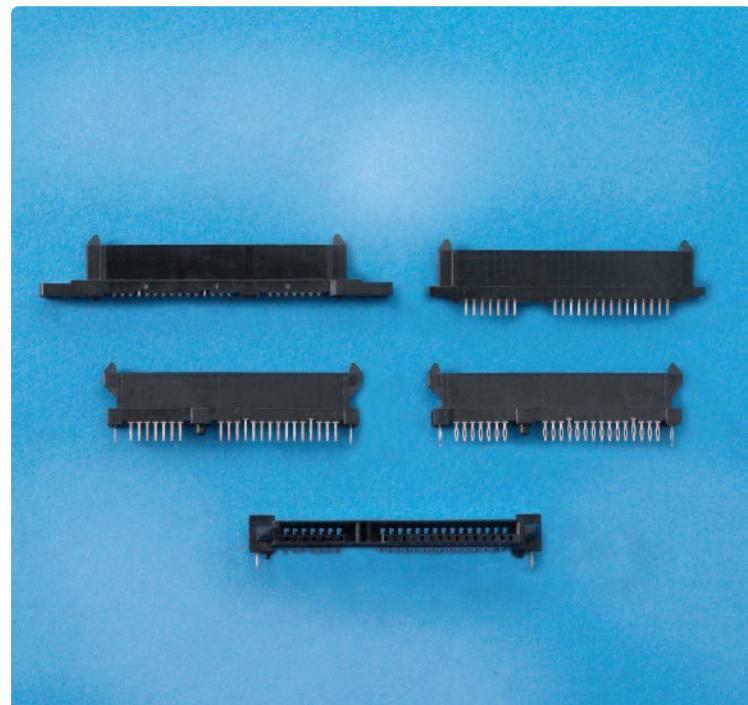
The 22-position, receptacle and plug connectors enable the implementation of the new high-speed, Serial ATA (SATA) hard disk drive (HDD) interface that is extending the use of low-cost, high-capacity SATA drives to low-end enterprise storage applications in servers and storage systems. The backplane receptacle accepts a SATA drive, but is keyed to block the installation of a Serial-Attached SCSI (SAS) drive.

The SATA connector system is designed for hot plugging and blind mating of HDDs. Staggered contact lengths provide sequential mating of contacts to enable hot plugging. Molded guide posts provide angled lead-in to compensate for connector misalignment, allowing the device plug and corresponding receptacle to self align during the mating process.

FCI offers options for through-hole solder, press fit, or surface-mount termination, allowing engineers to select the termination technique best suited to their backplane design and manufacturing process. Most backplane connectors also feature stamped retention clips that provide additional mechanical strength for robust PCB attachment.

The seven contacts that comprise the SATA port are designed to support differential signaling, initially at speeds of 1.5 Gb/s and evolving to 3.0 Gb/s. The power segment of the SATA backplane receptacle uses fifteen contacts to provide options for 3.3V, 5V or 12V power.

FCI offers a wide range of SATA plug and receptacle connector configurations. Vertical and right angle connector configurations provide options for use in servers, server or storage blades, storage backplanes, HDD carriers, and HDDs.



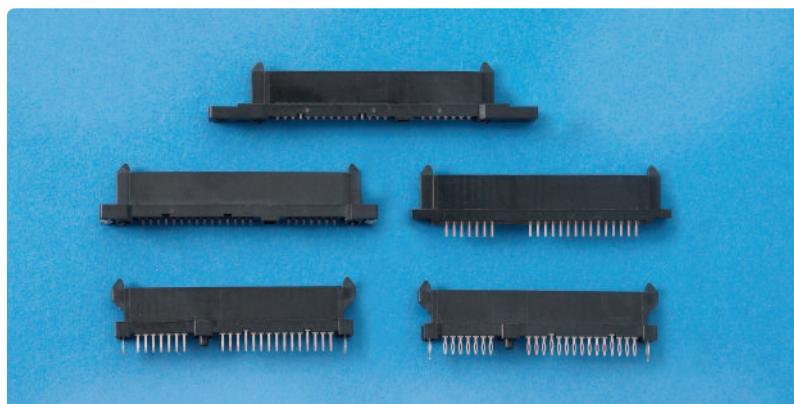
## FEATURES & BENEFITS

- For implementation of the high-speed Serial-ATA storage interface
- 22-position SATA connectors meet requirements of Serial ATA Specification
- Provides 7 contacts for signal port and 15 contacts for power
- Designed to support hot-plugging and blind-mating of HDDs
- Connector retainers provide additional mechanical strength after soldering
- RoHS-compliant and compatible with lead-free processing temperatures

## TARGET MARKETS / APPLICATIONS

- Data
  - Notebook PCs
  - Servers
  - Server and storage blades
  - External storage systems
  - HDDs
  - HDD carriers
- Communications
  - Processor and storage blades
  - Mezzanine cards
- Industrial, Instrumentation & Medical
  - Embedded system boards
- Consumer
  - Audio/video storage

## SATA VERTICAL RECEPTACLES

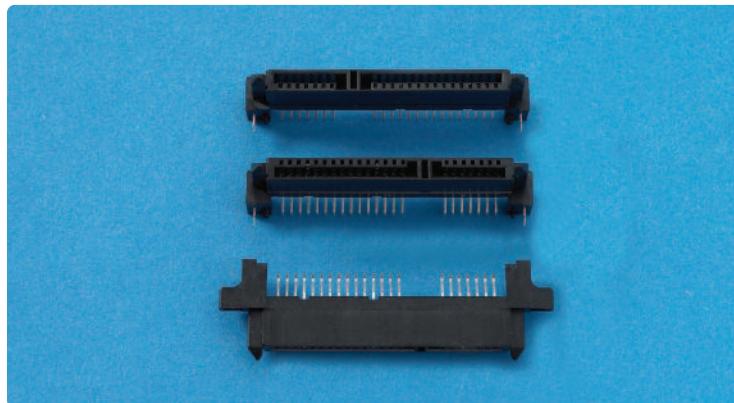


## FEATURES &amp; BENEFITS

- Typically used for storage backplane or HDD carrier applications
- Options for through-hole solder, press fit, or surface mount (SMT) termination allow engineers to select the termination technique best suited to their design

Part Number	Termination Type		Other Features
	Power	Signals	
10017660-001LF	thru-hole, in-line		with forklock/harpoon retainers
10017660-002LF	thru-hole, staggered	thru-hole, in-line	with forklock/harpoon retainers
10022676-001LF	press-fit, in-line		with forklock/harpoon retainers
10022676-002LF	press-fit, staggered	press-fit, in-line	with forklock/harpoon retainers
10029065-001LF	SMT, in-line		with molded posts and solder tab retainers
10042140-001LF	SMT, in-line		with molded posts and solder tab retainers
10043820-001LF	solder tab, in-line		cable connector
10045103-001LF	SMT, in-line		8.15mm height, rivet for PCB attachment
10045103-002LF	SMT, in-line		8.45mm height, rivet for PCB attachment

## SATA RIGHT-ANGLE RECEPTACLES



## FEATURES &amp; BENEFITS

- Address server blade, storage blade, embedded systems, or HDD carrier applications.
- Surface mount (SMT) termination

Part Number	Termination Type	Offset from Surface of Carrier PCB*	Other Features
10031569-001LF	SMT	0.35mm	SATA port away from PCB, with molded posts and forklocks
10029364-001LF	SMT	2.67mm	SATA port toward PCB, with molded posts and forklocks
10034814-001LF	SMT	3.75mm	SATA away from PCB, with molded posts and forklocks

\* Dimension measured from the PCB surface to the centerline of the molded guide posts on the receptacle connector.

## SATA HEADERS

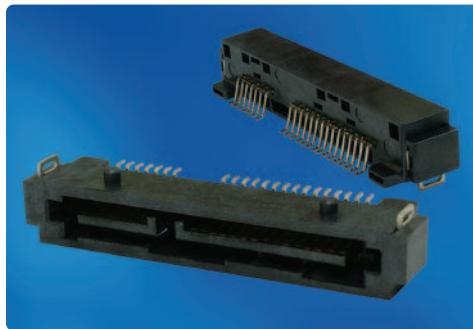


### FEATURES & BENEFITS

- Intended for interposer assemblies
- Surface mount (SMT) termination

Part Number	Orientation	Termination Type		Other Features
		Power	Signals	
10039651-001LF	right-angle		SMT	with molded posts and forklocks

## SATA DEVICE PLUGS



FCI is a major supplier of SATA device plugs to the HDD industry. As such, FCI has the capability to design and manufacture customized device plugs for specific hard disk drive applications, including combination headers that incorporate additional contacts for test or programming. Please contact your local sales representative or field application engineer for technical assistance.

## TECHNICAL INFORMATION

### MATERIALS

- Contact base metal: copper alloy
- Contact area finish: gold over nickel
- Solder area finish: tin over nickel
- Retainer clip base metal: copper alloy
- Retainer finish: tin over nickel
- Housing: high-temperature thermoplastic (UL 94V-0); color: black

### ELECTRICAL PERFORMANCE

- Contact resistance: 30 mΩ maximum initial; 15 mΩ maximum change after test
- Current rating: 1.5A minimum per contact with temperature rise not exceeding 30° C

### MECHANICAL PERFORMANCE

- Durability: 500 mating cycles
- Mating force: 45N maximum
- Unmating force: 10N minimum

### SPECIFICATIONS

- FCI product specification: GS-12-194
- Serial ATA Specification from SATA-IO

### ENVIRONMENTAL

- Humidity: 96 hours at 40° C with 90-95% relative humidity. Per EIA 364-31, Method II, test condition A
- Temperature life: 85° C for 500 hours. Per EIA 364-17, test condition III, method A
- Thermal shock: 10 cycles between -55° C and +85° C. Per EIA 364-32, test condition I.
- Mixed flowing gas: expose 1/2 samples unmated for 7 days and then mated for 7 additional days; the other 1/2 samples are exposed mated for 14 days. Per EIA 364-65, class II A.

### CERTIFICATIONS & APPROVALS

- UL

### PACKAGING

- Tray / Tube / Tape-on-reel (available upon request)

# SCA-2 CONNECTOR SYSTEM

## DESCRIPTION

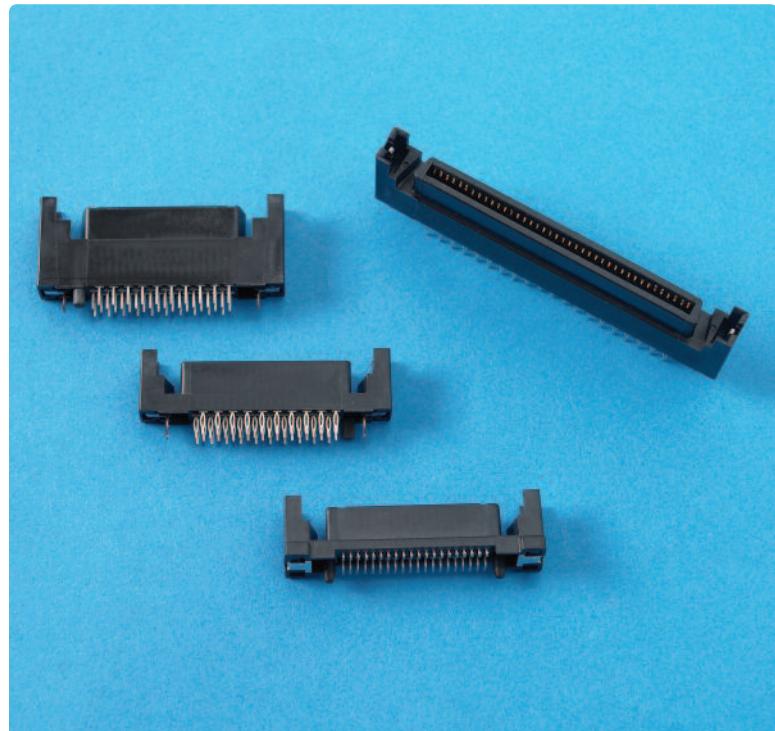
The SCA-2 (Single Connect Attachment-2) connector system consists of device plugs and vertical receptacles that enable the hard disk drive (HDD) to backplane interface in enterprise storage systems. The device plug resides on the HDD, while the receptacle is attached to the backplane. 40-position backplane receptacles are designed to accept Fibre Channel drives, while 80-position receptacles accept SCSI drives. The interface is governed by the Small Form Factor (SFF) standard SFF-8451.

Enhanced SCA-2 receptacle connectors also conform to the requirements of SFF-8454. Internal design enhancements and modified PCB terminations improve impedance and insertion loss and reduce crosstalk, which allow the connectors to operate at the speeds required by 4G and 8G Fibre Channel applications.

The SCA-2 connector interface utilizes high-reliability, dual-row, blade-on-beam contacts spaced on 1.27mm pitch. First-mate/last-break (FMLB) contacts provide sequential mating in accordance with SFF requirements. Robust alignment and polarization features at the drive interface allow blind-mating. Dual ESD contacts provide paths for static discharge protection.

Vertical backplane receptacles are available with 11.5mm and 17.5mm extended body heights with options for through-hole solder, press-fit, or surface-mount (SMT) board termination.

Available SCA-2 device plugs are designed for straddle-mount board termination.



## FEATURES & BENEFITS

- Meet requirements of SFF-8451 specification
- Options for through-hole solder, press-fit or SMT board termination
- Enhanced SMT receptacle meets requirements of SFF-8454 specification
- Enhanced version improves impedance and insertion loss profiles and reduces crosstalk
- Blade-on-beam contact design delivers high reliability
- Molded alignment and polarization features enable blind mating
- First-Mate-Last-Break (FMLB) contacts in accordance with SFF requirements
- ESD contacts provide static discharge paths to prevent damage
- Vertical receptacle range includes 11.5mm and 17.5mm body heights
- High temperature plastic suitable for wave or reflow soldering
- Lead-free and RoHS-compliant versions are available

## TARGET MARKETS / APPLICATIONS

- Data
  - Storage backplanes
  - External storage systems
  - Servers
  - HDDs

## TECHNICAL INFORMATION

### MATERIALS

- Contact base metal: copper alloy
- Contact area finish: gold or GXT (gold flash over palladium-nickel alloy) over nickel
- Solder area finish: tin or tin-lead over nickel
- ESD contact base metal: copper alloy
- ESD contact finish: tin or tin-lead over nickel
- Housing: high-temperature thermoplastic (UL 94V-0); color: black

### ELECTRICAL PERFORMANCE

- Contact resistance: 35mΩ maximum for signal contacts
- Current rating: 1A/contact minimum for 2 or 3 powered signal contact pairs with temperature rise not exceeding 30° C

### MECHANICAL PERFORMANCE

- Durability: 500 mating cycles
- Mating force: 90g maximum per contact
- Unmating force: 15g minimum per contact

### SPECIFICATIONS

- FCI product specification: BUS-12-121
- SFF-8451 Specification for SCA-2 Unshielded Connectors
- SFF-8484 Specification for SCA-2 Enhanced HSS Signals

### ENVIRONMENTAL

- Operating temperature range: -55°C to +105°C
- Humidity-temperature cycling: 10 cycles between 25°C and 65°C with 90-95% relative humidity during dwells. Per EIA 364-31, Method III, test condition B
- Temperature life: 105° C for 1000 hours. Per EIA 364-17, test condition 4
- Thermal shock: 5 cycles between -55°C and +105°C. Per EIA 364-32
- Mixed flowing gas: samples are exposed mated for 20 days. Per EIA 364-65, class II

### CERTIFICATIONS & APPROVALS

- UL & CSA

### PACKAGING

- Tray

### PART NUMBERS

HDD Interface	Number of Contacts	Connector Type	Orientation	Receptacle Body Height	Termination Type	Base Number
Fibre Channel	40	receptacle	vertical	11.5mm	through-hole solder	71781
Fibre Channel	40	receptacle	vertical	11.5mm	press-fit	87567
Fibre Channel *	40	receptacle*	vertical	11.5mm	surface-mount	10038339
Fibre Channel	40	receptacle	vertical	17.5mm	through-hole solder	72437
Fibre Channel	40	receptacle	vertical	17.5mm	press-fit	72443
Fibre Channel	40	plug	right-angle	N/A	straddle-mount	72547
SCSI	80	receptacle	vertical	11.5mm	through-hole solder	71780
SCSI	80	receptacle	vertical	11.5mm	press-fit	87566
SCSI	80	receptacle	vertical	17.5mm	through-hole solder	72436
SCSI	80	receptacle	vertical	17.5mm	press-fit	72442
SCSI	80	plug	right-angle	N/A	straddle-mount	71292

Note: \* symbol designates enhanced SCA-2 receptacle for 4G or 8G Fibre Channel applications

Use the base numbers to reference the product drawings at [www.fciconnect.com](http://www.fciconnect.com). The connector drawings provide detailed dimensions, describe available options for tail length and other product features, and the complete FCI part numbers.

For more information on FCI sales offices,  
headquarters, agents and local distributors,  
visit [www.fciconnect.com](http://www.fciconnect.com)



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