This document was developed by the SFF Committee prior to it becoming the SFF TA (Technology Affiliate) TWG (Technical Working Group) of the SNIA (Storage Networking Industry Association) in 2016.

The information below should be used instead of the equivalent herein.

POINTS OF CONTACT: SFF TA TWG Chair Email: sff-chair@snia.org.
LOCATION OF SFF DOCUMENTS: http://www.snia.org/sff/specifications.

Suggestions for improvement of this specification are welcome and should be submitted to http://www.snia.org/feedback.

If you are interested in participating in the activities of the SFF TA TWG, additional information and the membership application can be found at: http://www.snia.org/sff.

SFF Committee documentation may be purchased in hard copy or electronic form.
SFF specifications are available at ftp://ftp.seagate.com/sff

SFF Committee

SFF-8486 Specification

for

Serial Attachment 4X Unshielded Micro Connector

Rev 1.3 August 31, 2018

Secretariat: SFF Committee

Abstract: This specification defines the physical interface and general performance requirements for the Micro SAS connector that is designed for use in high speed serial interconnect applications. While designed for the Solid State Drive (SSD) industry, its use is not limited to that application.

This document provides a common specification for systems manufacturers, system integrators, and suppliers of drives. This is an internal working document of the SFF Committee, an industry ad hoc group.

This specification is made available for public review, and written comments are solicited from readers. Comments received by the members will be considered for inclusion in future revisions of this specification.

Support: This specification is supported by the identified member companies of the SFF Committee.

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EXPRESSION OF SUPPORT BY MANUFACTURERS

The following member companies of the SFF Committee voted in favor of this industry specification.

Cinch
EMC
FCI
Foxconn
Hewlett Packard
Hitachi GST
IBM
LSI
Molex
Seagate
Sun Microsystems
Toshiba
Tyco
Vitesse Semiconductor
Volex

The following member companies of the SFF Committee voted to abstain on this industry specification.

3M
AMCC
Amphenol
Arista Networks
ETRI
Finisar
Fujitsu CPA
NetApp
OpNext
Panasonic
Pioneer NewMedia
Sandisk
Sandisk/RAD

Revision History

Revision 1.2 Changes:
- -Removed several unused definitions in section 3.1
- -Removed all reference to the Micro-SATA/SAS plug
- -Took the current, voltage, temperature, and Humidity ratings out of Table 5.1
- -Removed reference to 500 cycle durability in Note 1 of Table 5.4
- -Added general tolerances to section 6
- -Re-arranged and enlarged all drawing views.

9/28/11 Removed '3 Gbs' in title

Rev 1.3 (August 31, 2018)
- Document to be withdrawn from EIA; other than the changes to the header and cover page, no content or formatting changes have been made since Rev 1.2 of this document.

Foreword

The development work on this specification was done by the SFF Committee, an industry group. The membership of the committee since its formation in August 1990 has included a mix of companies which are leaders across the industry.

When 2 1/2" diameter disk drives were introduced, there was no commonality on external dimensions e.g. physical size, mounting locations, connector type, and connector location, between vendors.

The first use of these disk drives was in specific applications such as laptop portable computers and system integrators worked individually with vendors to develop the packaging. The result was wide diversity, and incompatibility.

The problems faced by integrators, device suppliers, and component suppliers led to the formation of the SFF Committee as an industry ad hoc group to address the marketing and engineering considerations of the emerging new technology.

During the development of the form factor definitions, other activities were suggested because participants in the SFF Committee faced more problems than the physical form factors of disk drives. In November 1992, the charter was expanded to address any issues of general interest and concern to the storage industry. The SFF Committee became a forum for resolving industry issues that are either not addressed by the standards process or need an immediate solution.

Those companies which have agreed to support a specification are identified in the first pages of each SFF Specification. Industry consensus is not an essential requirement to publish an SFF Specification because it is recognized that in an emerging product area, there is room for more than one approach. By making the documentation on competing proposals available, an integrator can examine the alternatives available and select the product that is felt to be most suitable.

SFF Committee meetings are held during T10 weeks (see www.t10.org), and Specific Subject Working Groups are held at the convenience of the participants. Material presented at SFF Committee meetings becomes public domain, and there are no restrictions on the open mailing of material presented at committee meetings.

Most of the specifications developed by the SFF Committee have either been incorporated into standards or adopted as standards by EIA (Electronic Industries Association), ANSI (American National Standards Institute) and IEC (International Electrotechnical Commission).

If you are interested in participating or wish to follow the activities of the SFF Committee, the signup for membership and/or documentation can be found at:
www.sffcommittee.com/ie/join.html

The complete list of SFF Specifications which have been completed or are currently being worked on by the SFF Committee can be found at:
ftp://ftp.seagate.com/sff/SFF-8000.TXT

If you wish to know more about the SFF Committee, the principles which guide the activities can be found at:
ftp://ftp.seagate.com/sff/SFF-8032.TXT

Suggestions for improvement of this specification will be welcome. They should be sent to the SFF Committee, 14426 Black Walnut Ct, Saratoga, CA 95070.

TABLE OF CONTENTS

FIGURES

TABLES

1. Scope

This specification defines the terminology and physical requirements for the mating interface and physical characteristics of the Micro SAS Connector System. It is designed to support high speed serial signals and power. While designed specifically for the smaller, 1.8” form factor drives, including solid state drives, it should not be considered as limited to those. Its use will be governed by applicable industry standards, e.g. Serial Attached SCSI (SAS).

In an effort to broaden the applications for storage devices, an ad hoc industry group of companies representing system integrators, peripheral suppliers, and component suppliers decided to address the issues involved.

The SFF Committee was formed in August, 1990 and the first working document was introduced in January, 1991.

1.1 Description of Clauses

Clause 1 contains the Scope

Clause 2 contains Referenced and Related Standards and SFF Specifications

Clause 3 contains the Definitions and Conventions

Clause 4 contains the General Description

Clause 5 contains the Connector Specifications and performance

Clause 6 contains the Connector Mating Details

2. References

The SFF Committee activities support the requirements of the storage industry, and it is involved with several standards.

2.1 Industry Documents

The following interface standards and specifications are relevant to this Specification.

- Serial ATA
- Serial Attached SCSI
- SFF-8147
- SFF 8482
- ASME Y14.5M Dimensioning and Tolerancing

2.2 SFF Specifications

There are several projects active within the SFF Committee. The complete list of specifications which have been completed or are still being worked on are listed in the specification at ftp://ftp.seagate.com/sff/SFF-8000.TXT

2.3 Sources

Those who join the SFF Committee as an Observer or Member receive electronic copies of the minutes and SFF specifications (http://www.sffcommittee.com/ie/join.html).

Copies of ANSI standards may be purchased from the InterNational Committee for Information Technology Standards (http://tinyurl.com/c4psg).

Copies of SFF, ASC T10 (SCSI), T11 (Fibre Channel) and T13 (ATA/SATA) standards and standards still in development are available on the HPE version of CD_Access (http://tinyurl.com/85fts).

2.4 Conventions

The ISO convention of numbering is used i.e., the thousands and higher multiples are separated by a space and a period is used as the decimal point. This is equivalent to the English/American convention of a comma and a period.

English	French	ISO
0.6	0,6	0.6
1,000	1 000	1 000
1,323,462.9	1 323 462,9	1 323 462.9

3. Definitions and Conventions

3.1 Definitions

For the purpose of this specification, the following definitions apply:

Board Termination Technologies: Surface mount single row, surface mount dual row, through hole, hybrid, and straddle mount.

Fixed: Used to describe the gender of the mating side of the connector that accepts its mate upon mating. This gender is frequently, but not always, associated with the common terminology "receptacle". Other terms commonly used are "female" and "socket connector". The term "fixed" is adopted from EIA standard terminology as the gender that most commonly exists on the fixed end of a connection, for example, on the board or bulkhead side. In this document "fixed" is specifically used to describe the mating side gender illustrated in FIGURE 3.1.

FIGURE 3.1 Mating Side Gender Definition

Free: Used to describe the gender of the mating side of the connector that penetrates its mate upon mating. This gender is frequently, but not always, associated with the common terminology "plug". Other terms commonly used are "male" and "pin connector". The term "free" is adopted from EIA standard terminology as the gender that most commonly exists on the free end of a connection, for example, on the cable side. In this document "free" is specifically used to describe the mating side gender illustrated in Figure 4-1.

Height: Distance from board surface to farthest overall connector feature.

Mating side: The side of the connector that joins and separates from the mating side of a connector of opposite gender. Other terms commonly used in the industry are mating interface, separable interface and mating face.

Offset: An alignment shift from the centerline of the connector.

Optional: This term describes features that are not required by the SFF Specification. However, if any feature defined by the SFF Specification is implemented, it shall be done in the same way as defined by the Specification. Describing a feature as optional in the text is done to assist the reader. If there is a conflict between text and tables on a feature described as optional, the table shall be accepted as being correct.

Reserved: Where this term is used for defining the signal on a connector pin its actual function is set aside for future standardization. It is not available for vendor specific use. Where this term is used for bits, bytes, fields and code values; the bits, bytes, fields and code values are set aside for future standardization. The default value shall be zero. The originator is required to define a Reserved field or bit as zero, but the receiver should not check Reserved fields or bits for zero.

Right Angle: A connector design for use with printed circuit board assembly technology where the mating direction is parallel to the plane of the printed circuit board.

Single row: A connector design for use with surface mount printed circuit board assembly technology where the termination side points are arranged in one line.

SMT: Surface Mount Technology

Straddle mount: A connector design style and a printed circuit board design style that uses surface mount termination points on both sides of the board. The connector is frequently centered between the top and bottom surfaces of the board.

Straight: A connector design for use with printed circuit board assembly technology where the mating direction is perpendicular to the plane of the printed circuit. Board

Surface mount: A connector design and a printed circuit board design style where the connector termination points do not penetrate the printed circuit board and are subsequently soldered to the printed circuit board.

Termination side: The side of the connector opposite the mating side that is used for permanently attaching conductors to the connector. Due to pin numbering differences between mating side genders the termination side shall always be specified in conjunction with a mating side of a specific gender. Other terms commonly used in the industry are: back end, non-mating side, footprint, pc board side, and post side.

Through hole: A connector design and a printed circuit board design style where the connector termination points penetrates the printed circuit board and are subsequently soldered to the printed circuit board.

4. General Description

The internal Micro SAS connector is designed to enable connection of a slim 1.8” form factor HDD or SSD to the SAS interface.

The internal Micro SAS connector uses the same 1.27 mm pitch for both the signal and power segments as the Micro SATA connector as defined in the Serial ATA Specification. In addition, it contains a second signal segment on 0.8 mm pitch similar to the SAS internal connector as defined in SFF 8482. It contains an optional pair of contacts opposite the primary signal contact group. This pair is for OEM use and the voltage must be at or below 5 Volts. Also included is the same pair of optional manufacturing contacts as exists on the Micro SATA connector.

Care should be taken in the application of this drive so that excessive stress is not exerted on the drive or connector. Backplane configurations should pay particular attention so that the drive and connector are not damaged due to excessive misalignment.

4.1 Micro SAS Receptacle

The Micro SAS Receptacle accepts both Micro SAS and Micro SATA Plug connectors.

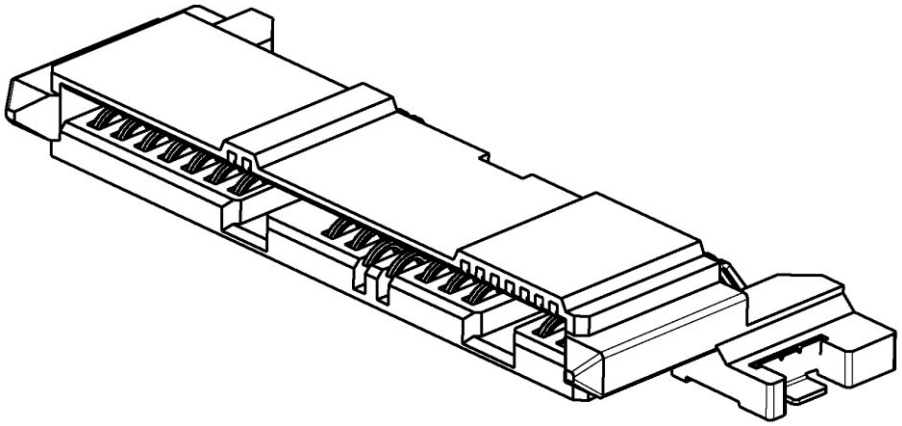


FIGURE 4.1 MICRO SAS RECEPTACLE

4.2 Micro SAS Plug

The Micro SAS Plug will mate with the Micro SAS Receptacle, but not the Micro SATA Receptacle.

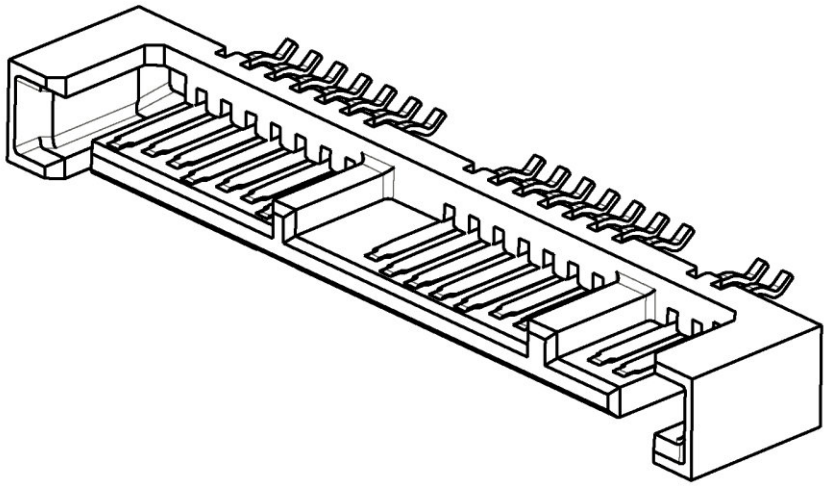


FIGURE 4.2 Micro SAS Plug

5. Connector Specifications

5.1 Electrical, Mechanical, and Environmental Requirements

Ratings
Current: 1.5A/contact
Voltage: 30 V AC/contact
Temperature: Operating: 0C to 55C
Non-operating: -40C to 85C
Humidity: 80% RH Maximum

The electrical and low frequency performance requirements are defined in Table 5-1, the mechanical requirements are listed in Table 5-2, and environmental requirements are listed in Table 5-3.

TABLE 5-1 Electrical Requirements

Parameter	Test Conditions	Specifications
Low level Contact resistance with conductor resistance – Initial	EIA 364-23: 20 mV,100 mA	30 mohm Maximum,initial 15 mohm Maximum change final
Insulation Resistance	EIA 364-21: 500 VDC held for 1 min	1000 Mohm Minimum between adjacent contacts
Dielectric withstanding voltage	EIA 364-20 Method B500 VAC minimum for 1 minute hold	No defect between adjacent contacts
Differential Impedance (Connector area)	EIA 364-108: Rise time: 50 ps (20-80%). Includes connector cable to connector interface and board termination pads and vias	90~110 ohm (distribution) 100±5 ohm (distribution of Average value)
Within pair skew	EIA 364-103	5 ps maximum (By design)
Near-End Isolation	EIA 364-90: 50 MHz to 6 GHz	-40 dB (Frequencies up to 3 GHz)
Insertion Loss	EIA 364-101: 50 MHz to 6 GHZ	1.0 dB maximum (Frequencies up to 1.6

TABLE 5-2 Mechanical Requirements

Items	Conditions	Acceptance Limits
Durability	EIA 364-09 Mate and unmate at a rate of 200 cycles per hour maximum for 500 cycles	No physical damage; 15 mohm maximum contact resistance change
Mating Force	EIA 364-13: Measurement speed: 12.5 mm per minute maximum	Maximum of 40 N
Unmating Force	EIA 364-13: Measurement speed: 12.5 mm per minute maximum with retention latch disengaged	Minimum of 2.5 N

TABLE 5-3 Environmental Requirements

Items	Conditions	Acceptance Limits
Vibration, random	EIA 364-28, Test Condition VII, Test Letter D. Subject mated specimens to 3.10 G's rms between 20-500 Hz for 15 minutes in each of 3 mutually perpendicular planes	No discontinuities greater than 1 microsecond
Physical shock	EIA 364-27, Method H. Subject mated specimens to 30 G's halfsine shock pulses of 11 milliseconds duration. 3 shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.	No discontinuities greater than 1 microsecond
Thermal shock	EIA 364-32C, condition I -55C to +85C	No physical damage, 15 mohm max contact resistance change
Temperature life	EIA 364-17, Test Condition III, Method A Subject mated connectors to +85C for 500 hours	No physical damage, 15 mohm max contact resistance change
Humidity	EIA 364-31 Method II Test Condition A. Subject mated connectors to 96 hours at 40C with 90 -95% RH	No physical damage
Mixed flowing gas	EIA 364-65, Class 2A. Half of the samples are exposed unmated for 7 days, then mated for remaining 7 days. The other half of the samples are mated for full 14 days.	No physical damage, 15 mohm max contact resistance change

5.2 Sample Selection

Samples shall be prepared in accordance with applicable manufacturer's instructions and shall be selected at random from current production. Each test group shall provide 100 data points for a good statistical representation of the test result. Test groups shall consist of a minimum of five connector pairs. From these connector pairs, a maximum of 20 contact pairs per mated connector shall be selected and identified to obtain 100 data points.

5.3 Test Sequence

Table 5-4 summarizes the performance requirements, which need to be achieved in order to pass the test criteria.

TABLE 5-4 Performance Requirements

Test or Examination	Test Group				
	A	**B**	**C**	**D**	**E**
Examination of the Connector(s)	1,5	1,9	1,8	1,8	1,7
Low-Level Contact Resistance (LLCR)	2,4	3,7	2,4,6		4,6
Insulation Resistance				2,6	
Dielectric Withstanding Voltage				3,7	
Current Rating			7		
Insertion Force		2			
Removal Force		8			
Durability	3	4(1)			2(1)
Physical Shock		6			
Vibration		5			
Humidity				5	
Temperature Life			3		
Reseating (manually unplug/plug 3 times)			5		5
Mixed Flowing Gas					3
Thermal Shock				4	

Note -1.
Preconditioning, requirement, 50 cycles for the 500-durability cycle requirement. The insertion and removal cycle is at the maximum rate of 200 cycles per hour.

Note: Tests are performed in numerical sequence.

6. Connector Details

Unless otherwise stated, the following tolerances shall apply:
Linear dimensions = +/- 0.20 mm
Angular dimensions = +/- 3 degrees

6.1 Micro SAS Receptacle

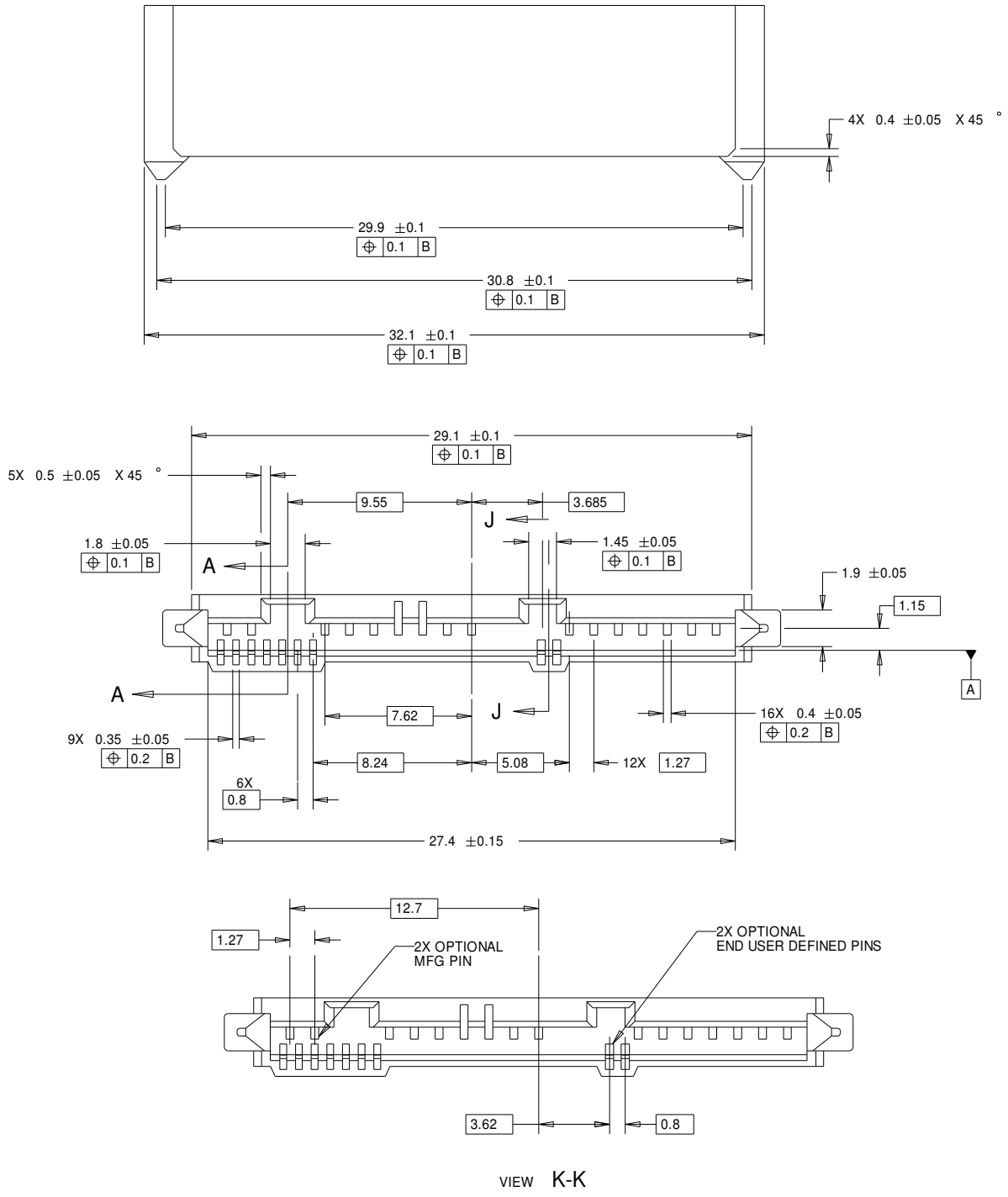


FIGURE 6.1 Micro SAS Receptacle

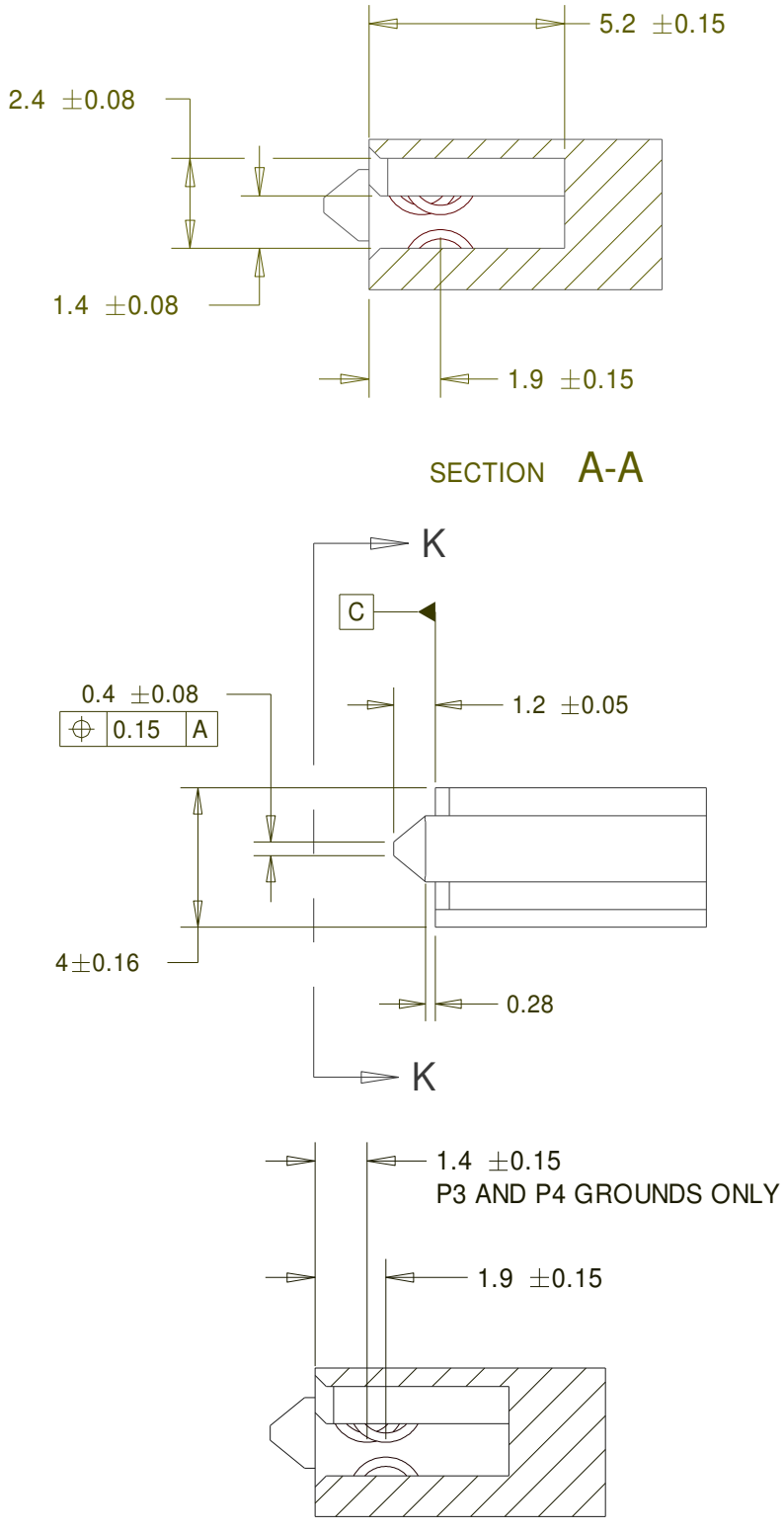


FIGURE 6.2 Micro SAS Receptacle

6.2 Micro SAS Plug

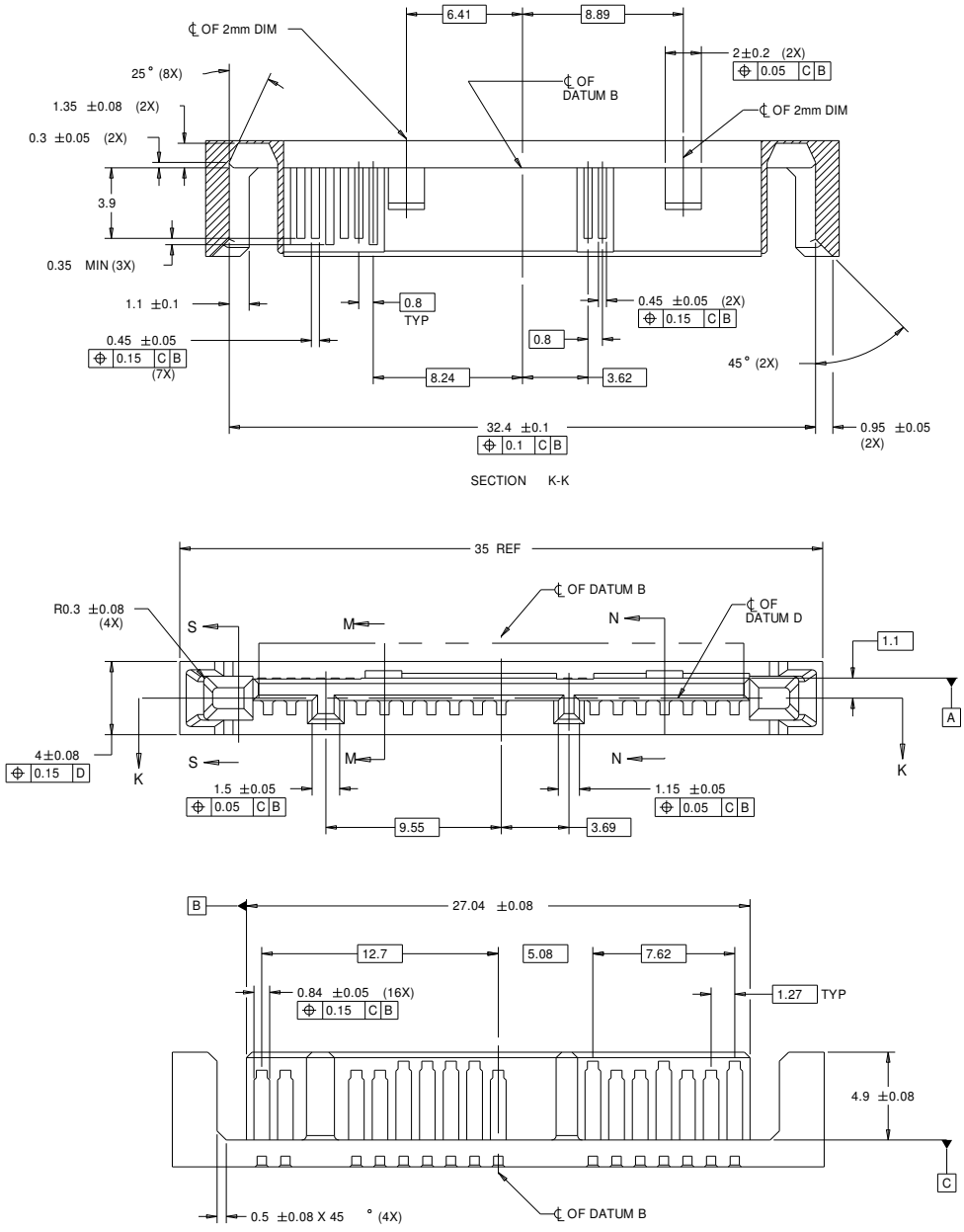
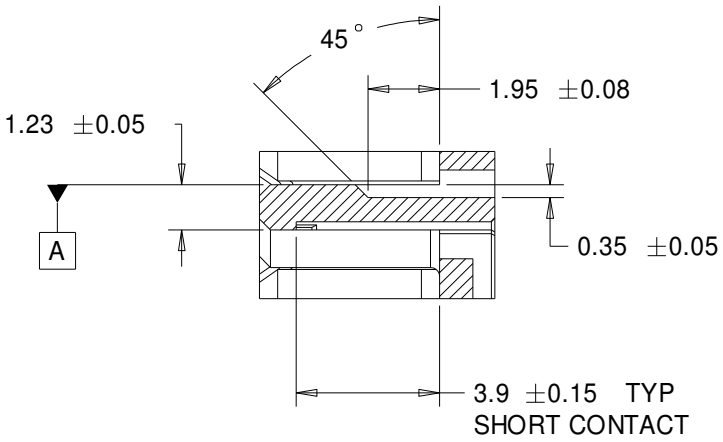
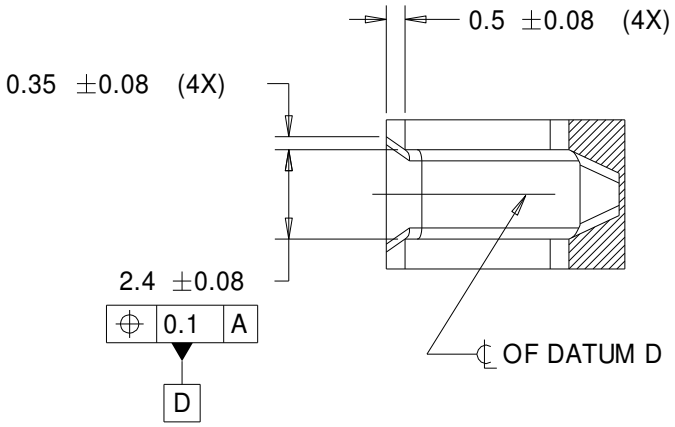


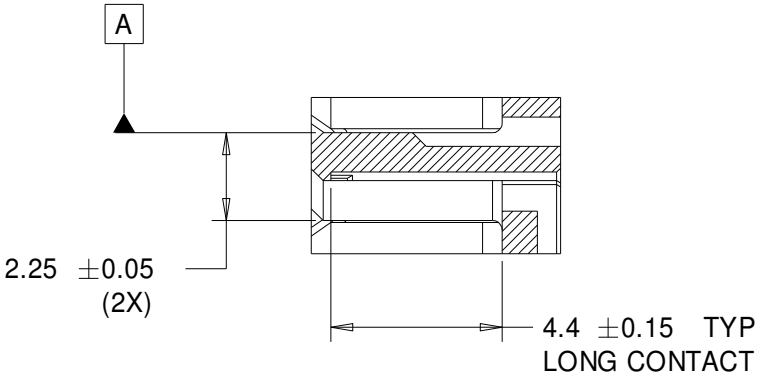
FIGURE 6.3 Micro SAS Plug



SECTION M-M



SECTION S-S



SECTION N-N
LONG CONTACT

FIGURE 6.4 Micro SAS Plug