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| GBUS-12-121S-12-282FCI | PRODUCT SPECIFICATION | GS 12-282194 |

| TITLE | PAGE | REVISION |
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| SCA Product Specificationerial Attached SCSI (SAS)erial ATA Connector | 1 of 16212121 | DJ |
| | AUTHORIZED BY: GL LOO | DATEDATE 13-05-03: 05 Jan 201113 MAY10 NOV.200305 MAR200804 |
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OBJECTIVE

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SCOPE

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GENERAL

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DEFINITIONS

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PROCEDURE

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REFERENCE DOCUMENTS **(If Applicable)**

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NOTES **(Optional)**

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## 1.0 OBJECTIVE

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This specification defines the performance, test, quality and reliability requirement of the SCA (Single Connect Attach) system.Serial Attached SCSIerial-ATA AShost host and device connectors.

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## 2.0 SCOPE

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This specification is applicable to the termination characteristics of the SCAATAS family of products which provideswhich provides for direct blind mate interconnection of disk drives to backplanes. both plug and receptacle of the Serial-ATA connector series, with Tin/Lead plated terminals. A new product specification for Serial-ATA connector series, with Lead-free plated terminal shall be stated otherwise.

## 3.0 GENERAL

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## 4.0 DEFINITIONAPPLICABLE DOCUMENTS

### 4.1 A Specificationpplication

4.1.1 Engineering drawings
4.1.2 Process drawings

### 4.2 Military Standards

4.2.1 MIL-STD-202F: Test Methods for Electronic Components Parts
4.2.2 MIL-STS-1344A : Test Methods for Electrical Connectors
4.2.3 MIL-C-45662 : Equipment Calibration
MIL-STD-2166 : Connections, Electrical and Compliant Pin

### 4.3 Federal Specifications Specifications and Test Standards

4.3.1 QQ-N-290 : Nickel Plating (Electrodeposited)
4.3.2 QQ-B-750: Phosphor Bronze Alloy StripHigh Speed Serial-ATA Specification Revision 1.0a
4.3.2 QQ-B-750 : Phosphor Bronze Alloy StripEIA Test Standards
4.3.3 QQ-B-xxx : Brass Alloy Strip
4.3.32 QQ-S-571 : Solder

### 4.3 4.4 Other Standards and Specifications

4.4.1 UL94-VO : Flammability
4.4.2 ASTM B-103: Phosphor Bronze
4.4.3 ISO 9000:
4.4.4 EIA P/N-3651: Single Connect Attach (SCA) Connectors
4.4.2 ASTM B-103 : Phosphor Bronze
4.4.3 ASTM B-xxx : Brass
4.4.52 EIA 364 : Electrical cConnector/sSocket tTest pProcedures Including Environmental
including environmental cClassifications
4.4.63 Serial-ATASFF-8045482 : 40 pin SCA connector w/parallelInternal Serial Attac selection
4.4.7 SFF-8046: 80 pin SCA connector for SCSI disk drives
4.4.8 SFF-8047: 40 pin SCA-2 connector w//serial selection
4.4.9 SFF-8048: 80 pin SCA-2 connector w/parallel ESI
4.4.10 SFF-8451: SCA-2 Unshielded Connections hment Connector (R1.0a1.5)3
4.4.11 SS-00254: Test Methods for Electronic Components, Lead-Free Soldering Part Design Standards





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## 4.5 FCI SpecificationsFCI Specifications

4.5.1 BUS-03-114-: Capacitance Measurement
4.5.2 BUS-03-404-: Normal Force Measurement
4.5.3 BUS-03-405-: Insertion / Withdrawal Force Measurement
4.5.4 BUS-16-016: Phosphor Bronze Strip
4.5.5 BUS-16-068: Liquid Crystal Polymer
4.5.6 BUS-19-002: Solderability (GS-19-037)
4.5.7 BUS-19-020: Porosity (GS-19-049)
4.5.8 BUS-19-040: Plating Adhesion (GS-19-039)
4.5.9 BUS-19-122: Solder Joint Reliability
4.5.4 BUS-15-002/X : Nickel Plating
4.5.5 BUS-15-006/X : Tin/Lead Plating
4.5.6 BUS-15-003/X : Electrodeposited Tin
BUS-15-005/X : Gold in Contact Plating
BUS-16-016: Phosphor Bronze Strip
4.5.7 BUS-19-002: Solderability
4.5.8 BUS-19-020: Porosity
4.5.9 BUS-19-040: Plating Adhesion
4.5.10 BUS-19-122: Solder Joint Reliability

4.5.11 GS-19-027: Moisture Sensitivity Level
4.5.12 GS-22-011: Pb-free Solder Heat Resistance Procedure – Convection Oven Flow
4.5.13 GS-22-012: Pb-free Solder Heat Resistance Procedure – Wave Solder

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## 5.0 PROCEDUREREQUIREMENTS

### 5.1 Qualification

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Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein. Unless otherwise specified, all measurements shall be performed within the following lab conditions :
in the following clauses. As general, connectors furnished under this specification shall meet functional requirements under operating conditions specified herein:

Temperature : 15 to 35°C

Relative Humidity : 20% to 80%

Atmospheric Pressure : 650mm to 800mm of Hg (86 ~106Kpa)

Temperature: 15°C ~ 35°C
Relative Humidity: 20 ~ 80%
Atmospheric Pressure: 86 ~ 106kPa (equivalent to 650 ~ 800mmHg)

### 5.2 Material

Material for each part shall be specified herein, or equivalent. Substitute material shall meet the performance requirements of this specification.

5.2.1 Receptacle Terminal. The base material shall be C51000 /C5210phosphor-bronze strip or equivalent.

5.2.2 Plug Terminal. The base material shall be C51000 phosphor bronze2600/C2680 brass or equivalent5100 phosphor bronze.

5.2.3 Plug and Receptacle Insulator Housings. The insulators for the plug connectors and receptacle connectors shall be molded of liquid crystal polymer (LCP)glass filled high performance polyplastic that is rated UL94V-0 or better in accordance with UL-94. See applicable product drawing for material.The insulator for the receptacle connector shall be molded of a High Temperature Nylon (HTN) or LCP that is rated UL94V-0 or better in accordance with UL-94. See applicable product drawing for material.

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5.2.4 Plug ESD ClipClipHold-down Terminal. The base material shall be C51000 phosphor bronze.C2600/C2680 brass or equivalent.

5.2.5 Receptacle ESD ClipHold-downClip Terminal.— The base material shall be C51000 C5100/C5210 phosphor-bronze. or C2600/C2680 brass. See applicable product drawing for material. receptacle connector housing shall be molded of PA9T that is rated UL94V-0 for Flame Retardant capability. See applicable product drawings for material.

5.3 Finish

The plug and receptacle terminals

5.3.1 Plated finished for qualification components shshall be plated in the contact area with 0,76um/30u" palladium nickel with gold flash minimum or 0,76um/30u" gold minimum over 1,27um/50u" minimum nickel. as specified herein or equivalent. The plug and receptacle terminals shall be plated in the contact area to the minimum gold or palladium nickel with gold flash plating thickness specified on product prints (over 1,27um/50u" minimum nickel underplate). The plug and receptacle terminal soldertail sections shall be plated with 2,541.27um/1050u" 90/10 tin-lead minimum or 2,54um/100u" tin minimum over as specified on product print (over 1,27um/50u" nickel minimum nickel. The terminal areas outside off the contact areas and the soldertail areas shall be plated with 1,27um/50u" nickel minimum. underplate). The plug and receptacle plug and 'ss–5,08um/200u" 90/10 tin-lead minimum or The plug's terminals soldertail sections shall be plated with 1,91um/75u" tin as specified on product prints (over 1,27um/50u" nickel minimum – 2,54umunderplate). pterminal press fit sectionsarea shall be plated with 0,5um/20u" min.imum ,–11,5um/60u" max. 90/10 tin-lead or 0,5um/20u" min. –1,5um/60u" max. tin over 1,27um/50u" minimum nickel. jmum 90/10 tin-lead or tin (over 1,27um/50u" nickel minimum underplate). No plating at cut-off point. See applicable product drawing.

The press fit areas shall be plated with 0,5um/20u' minimum – 1,5um/60u" maximum 90/10 tin-lead or tin.

5.3.2 The ESD metal hold-down terminals for the plug and receptacle connectors shall be plated with 2,541.27um/1050u" 90/10 tin-lead minimumor or 2,54um/100u" 5,08um/200u" 90/10 tin-lead minimum or tin minimum as specified on product prints (over 1,27um/50u"m minimum nickel underplate) For press fit area, the plating shall be 1,27um/50u" minimum – 3,81 um/150u" Tin (over 1,27um/50u" minimum nickel underp. See applicable product drawing.No plating at cut-off point.late).

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- The receptacle terminal shall be plated with 1.27µm of Nickel all over the terminal as under-plating, as illustrated by area 'D'.
- Press-fit or solder area shall be over-plate with 0.5µm(min)~1.5µm(max) of Alloy 90/10 Tin/Lead, as illustrated by area 'E'.
- Contact or mating area shall be over-plate with 0.76µm(min) of Gold, as illustrated by area 'B'.
- Near contact end tip area shall be over-plate with 0.05µm(min) of Gold Flash, as illustrated by area 'A'.

## 5.4 Design and Construction

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The receptacle plug receptacle connector shall be a multi-piece assembly having two single doublesingle rows s of contacts in the connector mating area which transition out to a 1.905mm (0.075") row-to-row x 1,27mm (0.050") column-to-column offset stagger through hole pattern. matinThe contact pattern in the mating area will have short and long terminals in a specific pattern that results in a 0.5mm (0.020") differential between contact points in the long and short terminals. (This allows for first mate-last break capability – see respective product prints for location of short and long terminals.) The receptacle ESD clip terminal has the "active" beam of the ESD grounding system and also has board retention features that secures the connector to the board in preparation for solder reflow (through-hole) or board termination (press-fit).

A polarization peg (optional) on the bottom of the connector housing assures proper connector orientation during board mounting. The receptacle through hole connector is designed to accommodate P.C. board thicknesses of 1,57mm (0.062"), 2,36mm (0.093") and 3,18mm (0.125"). The receptacle press-fit connector is designed to terminate to board thicknesses of 2,36mm (0.093") and 3,18mm (0.125"). Visual examination of connectors to be done per EIA 364-18. g area which dividing into two signal segments (S1-S7, S8-S14) and power segment (P1-P15) or either one which transition out to either surface mount style or solder style soldertail to accommodate various P.C. board thickness. The second row consists of another signal segment (S8-S14), which transition out to either surface mount style or solder style soldertailsl to accommodate various P.C. board thickness..The contact pattern in the mating area will have short and long terminals in a specific pattern that results in a 0.5mm (0.020') differential between contact points in the long and short terminals. (This allows for first mate-last break capability – see respective product prints for location of short and long terminals.) consists of two sets of contacts, power supply portion and signal portion.

The plug receptacle connector shall be aF multi-piece assembly having two rows of singledoublesingle rows of contacts in the mating area which, transition out to a straddle mounting style with the contact soldertails on 1,27mm (0.050") centers. The ESD terminal has termination legs that are designed to accept P.C. boards and compliment the straddle mount style. Features on the connector housing (and the pattern required on the routed edge of the P.C. board) assure proper connector mounting and orientation. The straddle mount plug connector is designed to accommodate various P.C. board thicknesses. See applicable product drawing for specified P.C. board thickness. dividing into two signal segments in the first row,are dingeda (S1-S7, S8-S14)

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and a power segment (P1-P15) or either one which transitionr out to a in-line or stagger through hole pattern or surface mount pad. The second row consists of another signal segment (S8-S14 ), which transit out to an in-line through hole or surface mount pad. The contact pattern in the mating area will have short and long terminals in a specific pattern that results in a 0.5mm (0.020") differential between contact points in the long and short terminals. (This allows for first mate-last break capability – see respective product prints for location of short and long terminals.) The receptacle hold down terminal has the board retention features that securess the connector to the board in preparation for solder reflow (through-hole) or board termination (press-fit or SMT).

A polarization peg (optional) on the bottom of the connector housing assures proper connector orientation during board mounting . The receptacle through hole connector and press fit connector are designed to terminate to board thickness of 1.57mm (0.062"), 2.36mm (0.093") and 3.18mm (0.125"). Visual examination of connectors examinations of connectors are to be done per EIA 364-18.power supply portion, solder tail side consists of staggered terminals, and mating side consists of first (1st) mate and second (2nd) mate contacts.

As for signal portion, solder tail side consists of in-line terminals, and mating side consists of first (1st) mate and second (2nd) mate contacts.

5.4.1 Mating. The connectors shall be capable of mating and unmating manually without the use of special tools.

5.4.2 Workmanship. Connectors shall be uniform in quality and shall be free from burrs, scratches, cracks, voids, chips, blisters, pin holes, sharp edges, and other defects that will adversely affect product's life or serviceability.

## REFERENCE DOCUMENTS (If Applicable)ELECTRICAL CHARACTERISTIC 6

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6.1 Current Rating. The temperature rise above ambient shall not exceed 30°C at any point in the system when contact positions specified are powered at the levels specified in Table 2. Specific contact positions are also specified in Table 2. Applicable temperature rise de-rating graph is shown in Figure 1. The following details shall apply.power levels specified herein:

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Ambient Conditions : still air at 25 degrees° C

bb) Reference: EIA 364-70, method BCurrent Rating :Rating : 1.5A min per contact, continuous

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cc) Preparation : (i) Mount) theMount the connector to a test PCB.

(ii) Wire) Wire power pins P1, P2, P8 and P9 in parallel for power.

(iii) Wire ground pins P4, P5, P6, P10 and P12 in parallel for return.

(iv) Supply 6A in total of DC current to the power pins in parallel, returning from the parallel ground pins (P4, P5, P6, P10 and P12).

(v) Measure and record the temperature after 96 hours (45 minutes ON and 15 minutes OFF per hour). Record temperature rise when thermal equilibrium is reached.

Measure and record the temperature after 96 hours (45 minutes ON and 15 minutes OFF per hour)

d) Reference : EIA-364-70A

Reference : EIA 364-70A

6.2 Low Level Contact Resistance. The low-level contact resistance of an SCA receptacle connector mated with an SCA plug n Serialerial ATAS receptacle connector mated with a Serialerial ATAS plug connector shall not exceed a change of 15 30milliohmsΩ after environmental exposure when measured in accordance with EIA 364-23. The following details shall apply:maximum initial signal contact resistance is prior to test. A maximum incremental change of 1305mΩ shall not be exceeded after environmental exposure when measured in accordance with EIA 364-23. The following details shall apply:

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a) Method of Connection: see current and voltage lead set-ups as shown in Figure 2.Test Voltage :Voltage : DC 20mV DC maximum at open circuit.

b) Test Voltage: 50 millivolts maximum open circuitCurrent :Current : not tonot to exceed 100mA.

c) Test Current; Not to exceed 100 milliamps

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6.3 Insulation Resistance. The insulation resistance of mated connectors shallconnectors shall notbenot be less than 1000 megaohmsmMΩ when measured in accordance with EIA 364-21 in accordance with EIA 364-21. The following details shall apply:

a) Test Voltage : 500 voltsV DC

b) Preperation :aration : The connectors shall be mated but not solderednot soldered to a P.C. board

c) Electrification Time : 21 minutes, unless otherwise specified.

Point of Measurement : Between adjacent contacts.

d)

6.4 Dielectric Withstanding Voltage. - There shall be no temperature rise shall not exceed 30°C, evidence of arc-over, insulation breakdown, or excessive leakage current ( > 1 milliampere0.5mA max) wh) when the mated connectors are tested in accordance with EIA 364-20, Mmethod B. The following details shall apply:

a) Test Voltage : DC 500V or5500 volts (DC)V ACor AC 500$V_{rms}$:

b) Test Duration : 601 seconds minute

c) Preparation :Preparation : The connectors shall be mated but not soldered to a PC board

d) Test Condition :Condition : 1 (760 Torr, or sea level)

e) Points of measurement :measurement : Between adjacent contacts

6.5LL LContact Resistance, Low Level (LLCR) :Press-fit Interface ResistanceContact Resistance, Lowow(LLCR).Contact Resistance (Press-fit). The interface between is characteristic shall apply to compliant (compliant section andsection and plated through hole. press-fit) are and plated through hole. The change in low levellow-level contact resistance shall not exceed 1.0 milliohmmΩ after environmental exposure when measured in accordance with EIA 364-TP-23, Method 3002.1. The following details shall apply:

Method of Connection – Attach current and voltage leads as shown in Figure 2.Method of connection: Measurement taken in between recept acle terminal and plated through hole at PWB.





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a) Test Voltage : DC 20mV DC maximum at open circuit.

b) Test Voltage – 20 millivolts DC max open circuitCurrent : not to exceed 100mA.

c) Test Current – not to exceed 100 milliamps

Insulation Resistance. The insulation resistance of mated connectors throughout the test shall not be less than 1000MΩ when measured in acordance with EIA 364-21. The following details shall apply:

- Test Voltage: DC 500V
- Preperation: The connectors shall be mated but not soldered to a PC board
- Electrification Time: 2 minutes, unless otherwise specified
- Point of Measurement: Between adjacent contacts.

## 7.0. MECHANICAL REQUIREMENTSCHARACTERISTIC

7.1 Mating / Unmating Force (Insertion / Removal) – The force to mate a receptacle connector and compatible plug connector shall not exceed 120 grams maximum per contact position. The unmating force shall not be less than 15 grams minimum per contact position. The following details shall apply:

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Dielectric Withstanding Voltage. There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current (0.5mA or more) when mated connectors are in accordance with EIA 364-20, method B. The following details shall apply:

- Test Voltage: DC 500V or AC 500$V_{rms}$:
- Test Duration: 60seconds
- Preperation: The connectors shall be mated but not soldered to a PC board
- Test Condition: 1 (760 Torr, or sea level)
- Points of measurement: Between adjecent contacts

Operating Temperature Range: 0°C ~ +65°C

Storage Temperature Range: -50°C ~ +100°C

NOTES (Optional)MECHANICAL CHARACTERISTIC

- Mating / Unmating Force:WithdrawRemov) :): The force tomate a receptacle connector and compatible plug connector shall not exceed 45N (4.6kgf). The unmating force shall be less than 10N (1.0kgf). The following details shall apply:
- CCross Head Speed : max. rate 2512.5 mm per minute
  - Cross Head Speed – 0.5 inch per minuteMating and unmating speed: 25mm per minute
  - Utilise free floating fixtures
  - a)
  - a) Utilize free floating fixturesReference: EIA 364-13
  - b)
  - c) Reference - EIA 364-13

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Backplane/Blindmate : The force to mate a receptacle connector and compatible plug connector shall not exceed 50N (5.1kgf). The unmating force shall not be less than 5N (0.51kgf) after 500 cycles.

Cable : The force to mate a receptacle connector and compatible plug connector shall not exceed 50N (5.1kgf). The unmating force shall not be less than 20N (2.04kgf) after 25 cycles.

7.2 Contact Retention – Individual contacts (signal and ESD) in the plug and receptacle housing shall withstand an axial load of 0.5lbs. (227 grams) minimum applied at a rate of 0.20 inches/minute without dislodging from the housing cavity.

a) Reference: EIA 364-29

Durability. EIA 364-09C

Durability. EIA 364-09C

Number of cycles: Device / Host Connectors : 500 cycles

Internal Cabled Connector : 25 cycles

Mating and unmating speed: 25mm per minute

Cycling Rates: Automated Equipment : 200 cycles per hour

Preconditioning Cycles : Device / Host connectors : 50 cycles

Internal Cabled Connector : 20 cycles

d) No physical damage shall be observed

and an initial contact resistance difference of not more than 15 mΩ.

7.3 CoNormal Force - The contact normal force shall not be less than 60 grams (nor greater than 200 grams) when tested in accordance with FCI test specification BUS-03-404.

ntact Retention : Individual contacts (signal and hold down terminal) in the plug and receptacle housing shall withstand an axial load of 1.1 lbs (500 grams) minimum applied at a rate of 0.20 inches/ minute without disloging from the housing cavity.





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Reference : EIA-364-29B

7.4 Individual Pin Insertion / Retention Force - The force required to insert an individual compliant pin into a plated thru hole in a printed circuit board at a rate of 0.2 inches/ minute shall not exceed 60N (13.5 pounds). The retention force in the axial direction opposite that of insertion shall not be less than 6.7N. (1.5 pounds).

Normal Force : The contact normal force shall not be less than 60 grams (nor greater than 200 grams) when tested in accordance with FCI test specification BUS-03-404.

Individual Pin Insertion / Retention Force : The force required to insert an individual compliant pin into a plated through hole in a printed circuit board at a rate of 5mm/ 0.2 inches per minute shall not exceed 50N. The retention force in the axial direction opposite that of insertion shall not be less than 5N.

7.5 PCB Hole Deformation Radius - Cross-section parallel to board surface. Photograph and measure the hole deformation (deformation on board material) radius at a point 0.25 mm/ 0.010" from the surface, and at the center of the compliant pin section. Include 10 holes. The minimum average (of 10 holes) hole deformation radius shall be no greater than 37.5um/ 0.0015" when measured from the drilled hole. The absolute maximum deformation radius shall not exceed 50um/ 0.002". Reference MIL-STD-2166.

7.6 PCB Hole Wall Damage : Cross-section perpendicular to board surface, and through the compliant section wear track. Photograph and measure the copper thickness remaining between the compliant section and the printed wiring board laminate. Include 10 holes. The minimum average (of 10 holes) copper thickness remaining between the compliant pin and the printed wiring board laminate shall not be less than 7.5um/ 0.0003". In addition, there shall be no copper cracks, separations between conductive interfaces, or laminate-to-copper separations. Reference MIL-STD-2166.





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Vibration (Random). EIA 364 - 28, Test Condition VII, Letter A

- Test Condition: Connectors mated and vibrate
- Random 50 Hz - 2000 Hz, 5.35 g's RMS overall
- Duration : 30 minutes per axis
- Direction : each of 3 orthogonal axis
- Power Spectral Density : 0.02$G^2$/Hz
- Mounting : Rigidly mount assemblies.

No discontinuities greater than 1 ms. And an initial contact resistance difference of less than 15 mΩ.

Shock (Mechanical). Connectors are mated and shock with the following conditions as per EIA 364.

- Test conditions: 50 g's with ½ sine wave (11 milliseconds) shock in each X,Y and Z axis (18 shocks total)
- No discontinuities greater than 1 ms. And an initial contact resistance difference of less than 15 mΩ.

7.5 Retention :Retention:7.6 force :force:7.7 Force :Force:7.8Radius :Radius:79

Durability. EIA 364-09C

- Number of Cycles; Device / Host connectors: 500 cycles
  Internal cabled application: 50 cycles
- Cycling Rates: Maximum 200 cycles/hour

EIA 364-29B. hold down terminal ESD))1.1 0.5 500227

a) Reference : EIA 364-29B

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7.7

perpendicular parallel , ogh 7.5um/ poaeae

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Visual and Dimensional Inspections: EIA 364-18

All visual, dimensional and functional per applicable quality inspection plan shall meet requirements in product drawing

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Cable Pull-out Test: EIA 364-38, Condition A

There shall not be any physical damage when the Serial ATA cable assembly under test is subjected to a 40N axial load for a minimum of one (1) minute while clamping one end of the cable plug.

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Cable Flexing Test: EIA 364-41

Condition I: Round cable.

Dimension x=3.7 x cable diameter, 100 cycles in each of two planes.

Condition II: Flat cable.

250 cycles using either Method 1 or Method 2.

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For both Condition I and Condition II, there shall be no physical damage, no discontinuity over 1 usec during flexing of the test cable-connector.

## 8.0 RECORD RETENTION (If Applicable)ENVIRONMENTAL CHARACTERISTIC

After exposure to the following environmental conditions in accordance with the specified test procedures and/or details, the product shall show no physical damage and shall meet the electrical and mechanical requirements per paragraphs 6.0 and 7.0 as specified in Figure 1.0 TableFigure 1.0 ttest ssequence. Product subjected to these environmental tests must be applied to printed circuit boards. Unless otherwise specified, the assemblies shall be mated during exposure.

8.1 Thermal Shock. EIA 364-32, Test Condition I

For mated connector:

a) Number of cycles: 105

b) Temperature Range :Range: Between -- 55°C +0/-3°C and ~ +1085°C +3/-0°C

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c) Time at Each Temperature : 30 minutes

Transfer Time : ( at room temperature of 25°C): Approx. 52~3 minutes, maximum

d) No damage notice and a maximum difference of 15mΩ from initial contact resistance.

8.2 Humidity-Temperature Cycling. EIA 364-31, Method III, Test Condition AB

For mated connctor:

a) Number of Duration of Cycles : 1096 dayshours

b) Duration of Cycle; 24 hoursRelative Humidity : 90% ~ 95%

c) Relative Humidity: 95% to 90% RH During dwells, 80% to 95% during tTeemperature Rangrampinge : +40°C ± 2°C

d) Temperature Range: between +25°C and +65°C

No damage notice and a maximum difference of 15mΩ from initial contact resistance

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8.3 High Temperature Life,. EIA 364-17, Test Condition 4III, Method A

a) Test Duration : 1,0500 hours

b) Temperature : -105+85°C ± 2°C

No damage notice and a maximum difference of 15mΩ from initial contact resistance

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I 8.4 Industrial Mixed Flowing Gas (IMFG) (IMFG). - EIA 364-65 , Class II A

Class: IIII 2

a) a) Class: IIATemperature: 30°C ± 1°C, 70± 2% RH

Duration: 20 days (mated)Gas Concentration : $Cl_2$ 10±3ppb, $NO_2$ 200±50ppb, $H_2S$ 10±5ppb, $SO_2$ 100±20ppb : 30°C ± 1°C, 70± 2% RH

b) Half of the samples are exposed unmated for seven days, then mated for remaining seven days. Other half of the samples are exposed mated during entire testing.

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8.5 Physical Shock- - EIA 364 - 27, Test Condition HA

a) Condition: AH ( 50G, 11 millisecond, half-sine)294 m/s$^2$ 30G, 11 msec, half-sine)

b) Shocks: 3 shocks in both directions along each of three orthogonal axes (18 total)

c) Mounting: Rigidly mount assemblies

d) No discontinuities greater than 1 microsecondμs and no physical damage observed.

e) SFree Figure 3from any defect such as break, deformation, loosing and falling off etc. on each portion of the connector.

8.6 Vibration (Random) – EIA 364 - 28, Test Condition V, Letter A

a) Test Condition : Random 50 Hz - 2000 Hz, 5.35 G Minimumg's RMS overall

b) Duration : 1 3hour per axis0 minutes per axis

c) Direction : each of 3 orthogonal axis

d) Power Spectral Density : 0.02G$^2$/Hz

e) Mounting : Rigidly mount assemblies .

f) No discontinuities greater than 1 microseconds.

g) See Figure 3

8.7 Durability – EIA 364-09

a) Number Cycles: 500 cycles

b) Cycling Rate: 600 cycles/hour

c) Preconditioning Cycles: 25

b) Gas Concentration : $Cl_2$ 10±3ppb, $NO_2$ 200±50ppb, $H_2S$ 10±5ppb, $SO_2$ 100±20ppb

c)

Half of the samples are exposed unmated for seven days, then mated for remaining seven days. Other half of the samples are mated during entire testing.

8.5 Physical Shock. EIA 364 - 27, Test Condition H

Condition: H ( 294 m/s$^2$ 30G, 11 msec, half-sine)





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- Shocks: 3 shocks in both direction along each of three orthogonal axes (18 total)
- Mounting: Rigidly mount assemblies
- No discontinuities greater than 1 µs sec, and no physical damage observed.
- Free from any defect such as break, deformation, loosing and falling off etc. on each portion of the connector.

8.6 Vibration (Random Vibration). EIA 364- - 28, Test Condition V, Letter A

- Test Condition : Random 50 Hz ~ 2000 Hz, ; 5.35 g's RMS overallG overall
- Duration : 30 minutes per axis
- Direction : each of All of the 3 orthogonal axis es, including axis normal to sitting plane (z-plane)
- Power Spectral Density : 0.02G$^2$/Hz
- Mounting : Rigidly mount assemblies.
- No discontinuities greater than 1 µsec

No physical damage shall be observed

8.7

Solderability. JIS C 0050 or ANSI J-002 Test Condition A

- Pre-heating : +150°C ± 10°C, 60 ~ 120 sec
- Soldering : 215°C ± 5°C MIN, 10 ± 1 sec
- Solder paste to be used is JIS Z 3282 H60A or H63A, compliant
- Soldering particle is more than 200 mesh.
- Flux used shall be from Inactive Rosin family
- Acceptable Wet Solder Coverage: 95% minimum

8.8758 Resistance to Soldering Heat. EIA 364-56

For Reflow Solder :

- Preheating : 100°C ~ 150°C , 60 seconds MAX
- Soldering : 210°C MIN , 60 seconds MAX





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~~The temperature shall be measured at contact terminal portion and the peak temperature on the upper surface of printed circuit board shall be less than 240°C~~

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~~For Dip and Wave Solder :~~

~~Reference : EIA 364-56 Test Condition E.~~

~~There shall be no evidence of physical or mechanical damage~~

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8.9 Solderability – ANSI-J-002, Test Condition A~~(Lead-Free)~~

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a) Steam Aging – 4 hours~~Pre-heating : +150°C ± 10°C, 60 ~ 120 sec~~

b) Contact areas evaluated shall meet the ANSI-J-002 requirements.~~Soldering : 230°C ± 5°C MIN, 10 ± 1 sec~~

c) Acceptable Coverage: 95% minimum~~Solder paste to be used is JIS Z 3282 H60A or H63A. Soldering particle is more than 200 mesh. Flux used shall be from Inactive Rosin family~~

d) ~~Acceptable Wet Solder Coverage: 95% minimum~~

8.9~~1068~~ Resistance to Soldering Heat - EIA 364-56~~(Lead-Free)~~

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Test Condition: E~~For reflow Solder :~~

a) ~~Pre-heating : 150°C ~ 200°C, 60 ~ 180 sec~~

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b) There shall be no evidence of physical or mechanical damage~~Soldering : 230°C min, 60 sec max~~

c) ~~Peak Temperature : 260°C ± 5°C MIN, 10 ± 1 sec~~

d) ~~Number of times : 3 times~~

e) ~~Reference : GS-22-011 Peak Reflow – 260 °C~~

~~For Dip and Wave Solder :~~

a) ~~Test Temperature : 260°C ± 5°C, 5 ~ 10 sec ± 1 sec~~

b) ~~Reference : GS-22-012~~

8.10 9711 WResistance to Solventshisker Test (Lead-Free) - EIA 364-11

Solvents: Trichloroethylene8.9.1 Thermal Shock

a) Temperature Range : -35°C to +125°C

b) Solvent Temperature: Boiling pointTime at Temperature : Min 7 minutes

c) Immersion Time: approximately 78 secondsTime Duration : 500 cycles ± 4 cycles

d) Number of Immersions: one

8.9.2 Humidity Steady State :

Temperature : +85°C

Relative Humidity : 95%

c) Test Duration : 500 hours ± 4 hours

No whisker growth greater than 50 µm

8.11 08 MSurface mount connector solder joint reliabilityoisture Sensitivity Testing (For lead free SMT ) – BUS-19-122

Refer to BUS-19-122 for specific test details, sample quantities and acceptance criteria8.10.1 Baking :.

a) Temperature : +125°C ± 5°C

b) Test Duration : 24 hours ± 2 hours

For Reflow Solder

8.10.2 Gas-Tight-Joint-Test – EIA 364-TP36Humidification :

a) Reference EIA-364-TP36 (nitric acid solution)Temperature : +85°C

b) Duration: 30 minutesRelative Humidity : 85%

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| GBUS-12-121S-12-282FCI | PRODUCT SPECIFICATION | GS-12-282194 |

| TITLE | PAGE | REVISION |
|---|---|---|
| SCA Product Specificationerial Attached SCSI (SAS)erial ATA Connector | 22 of 16212121 | DJ |
| | AUTHORIZED BY: GL LOO | DATEDATE 13-05-03: 05 Jan 201113 MAY10 NOV.200305 MAR200804 |
| | CLASSIFICATION: UNRESTRICTEDCONFIDENTIAL | |

c) -Temperature: 25° Cst Duration : 168 hours ± 4 hours

d) Relative Humidity: 75%

8.10.3 Solderability (Lead Free)Reflow Soldering

a) Reference SS-00254-2 (Reflow Solder)Pre-heating : 150°C ~ 200°C, 60 ~ 180 sec / GS-22-011

b) Reference SS-00254-1 (Dip and Wave Solder)Soldering : 217°C min, 60 ~ 150 sec / GS-22-012

c) Peak Temperature (at solder joint) : 260°C , 10 ± 1 sec

d) Number of times : 3 times

Reference : GS-19-027

a) GS-19-027

8.14 SWhisker Testalt Spray Test. After exposure of the mate connectors to a salt fog atmosphere, the LLCR shall not exceed 30 milliohms. The test shall be in accordance with EIA-364-26.

a) Reference: SS-00254-8 / GS-19-028Mate connectors

Salt Solution : 5 percent (by weight)

Test Condition (Duration) : B (48 hours)

Resistance to Solvents. EIA 364-11

Solvents : Trichloroethylene

Solvent Temperature : Boiling point

Immersion Time : Approximately 78 seconds

Number of Immersions : one

Solderability (Lead free). SS-00254





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- Pre heating : +150°C ± 10°C, 60 ~ 120 sec
- Soldering : 215°C ± 5°C MIN, 10 ± 1 sec
- Solder paste to be used is JIS Z 3282 H60A or H63A. Soldering particle is more than 200 mesh. Flux used shall be from Inactive Rosin family
- Acceptable Wet Solder Coverage: 95% minimum

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Resistance to Soldering Heat. EIA 364-56

For Reflow Solder :

- Preheating : 100°C ~ 150°C , 60 seconds MAX
- Soldering : 210°C MIN , 60 seconds MAX
- The temperature shall be measured at contact terminal portion and the peak temperature on the upper surface of printed circuit board shall be less than 240°C

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For Dip and Wave Solder

- Reference : EIA 364-56 Test Condition E.
- There shall be no evidence of physical or mechanical damage

Resistance to Solvents. EIA 364-11

- Solvents : Trichloroethylene
- Solvent Temperature : Boiling point
- Immersion Time : Approximately 78 seconds
- Number of Immersions : one

## 9.0 QUALITY ASSUANCE PROVISIONS

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9.1 Equipment Calibration. All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with MIL-C-45662 and ISO 9000.

9.2 Inspection Condition. Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions :

a) Temperature : 25 ± 5°C

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b) Relative Humidity : 30% ~ 680%

c) Barometric Pressure: Local ambient

9.3 Sample Quantity and Description

The numbers of samples to be tested in each group shown in Figure Table Figure 1 are defined as follows:

Groups 1 through 8127 :

5 5 samples in each group: All samples must be free of defects that would impair normal connector operation. All samples must meet dimensional requirements of connector.

Groups 9 through 11

5 samples in each group: All samples must be free of defects that would impair normal connector operation. All samples must meet dimensional requirements of connector. 25 contacts from each sample is to be tested. All contact positions should be tested under this distribution.

Group 12

5 samples in each group: All samples must be free of defects that would impair normal connector operation. All samples must meet whisker test requirements of connector.

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9.4 Acceptance

9.4.1

Electrical and mechanical requirements placed on test samples as indicated in Paragraphs 6.0 and 7.0 shall be established from test data using appropriate statistical techniques or shall otherwise be customer specified, and all samples tested in accordance with this product specification shall meet the stated requirements.

9.4.2 Failures attributed to equipment, test setup, or operator error shall not disqualify the product. If product failure occurs, corrective actions shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification.





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9.5 Qualification Testing.

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequence shall be as shown in Table 1.

Visual Examination : EIA-364-18

9.6 Requalification Testing.

If any of the following conditions occur, the responsible product engineer shall initiate requalification testing consisting of all applicable parts of the qualification test matrix,- Table 1.

a) A significant design change is made to the existing product -which impacts the product form, fit or function. Examples of significant changes shall include, but not be limited to, changes in the plating material composition or thickness, contact force, contact surface geometry, iinsulator design, contact base material, or contact lubrication requirements.

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b) A significant change is made to the manufacturing process, which impacts the product form, fit or function.

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c) A significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.

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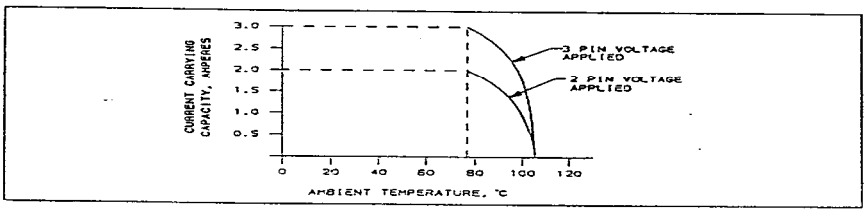


**FIGURE 1**

**CURRENT VS. TEMPERATURE RISE DERATING GRAPH**





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| NUMBER | TYPE | NUMBER |
|---|---|---|
| GBUS-12-121S-12-282FCI | PRODUCT SPECIFICATION | GS-12-282194 |

| TITLE | PAGE | REVISION |
|---|---|---|
| SCA Product Specificationerial Attached SCSI (SAS)erial ATA Connector | 27 of 16212121 | DJ |
| | AUTHORIZED BY: GL LOO | DATEDATE 13-05-03: 05 Jan 201113 MAY10 NOV.200305 MAR200804 |
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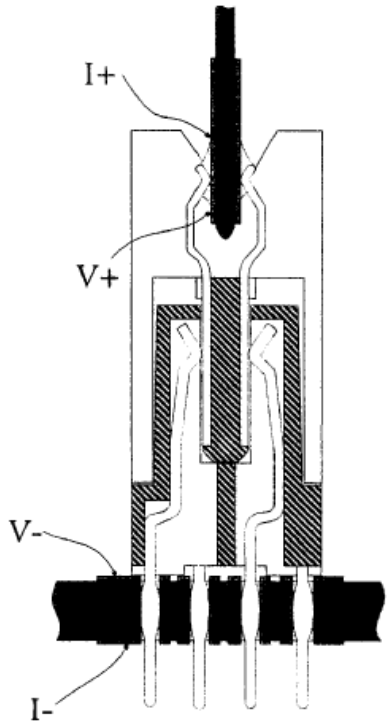


**FIGURE 2**
**Method of Connection, Contact Resistance**





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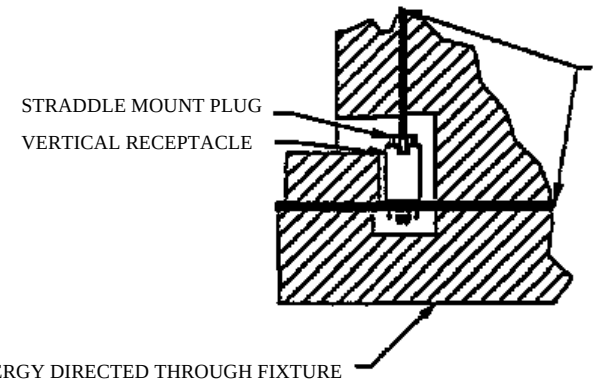


**FIGURE 3**
**VIBRATION AND PHYSICAL SHOCK TEST FIXTURE STRAIGHT TYPICAL**





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## Table 1- Test Groups and Sequences

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| | | TEST GROUP | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3a | 3b | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | PARA | | | | | | | | | | | | | |
| Examination of Product | 5.4 | 1,10 | 1,9 | 1,10 | 1,10 | 1,9 | 1,3 | 1,4 | 1,5 ,8 | 1,3 | 1 | 1,7 | 1 | 1, 3 |
| L. L. Contact Resistance | 6.2 | 3,8 | 3,7 | 3,6, 8 | | 3,7 | | | | | | 2,5 | | |
| Insulation Resistance | 6.3 | | | | 2,5, 8 | | | | | | | | | |
| Dielectric Withstanding V. | 6.4 | | | | 3,6, 9 | | | | | | | | | |
| Current Rating | 6.1 | | | | | | | | | | | | 2 | |
| L. L. Press Fit Interface Resist. | 6.5 | 4,9 | 4,8 | 4,9 | | 4,8 | | | | | | 3,6 | | |
| Mating/Unmating Force | 7.1 | 2 | 2 | 2 | | 2 | | | | | | | | |
| Normal Force | 7.3 | | | | | | | | 2,6 | | | | | |
| Contact Retention | 7.2 | | | | | | | | 3,7 | | | | | |
| Insertion Force (Press Fit Only ) | 7.4 | | | | | | | | | | 2,4 ,6 | | | |
| Retention Force (Press fit Only) | 7.4 | | | | | | | | | | 3,5 ,7 | | | |
| PCB Hole Deformation Radius | 7.5 | | | | | | | | | | 8 | | | |
| PCB Hole Wall Damage | 7.6 | | | | | | | | | | 9 | | | |
| Thermal Shock | 8.1 | | | 5 | 4 | | | | | | | | | |
| Humidity, Temperature Cycling | 8.2 | | | 7 | 7 | | | | | | | | | |
| High Temperature Life | 8.3 | | 6 | | | | | | 4 | | | | | |
| Industrial Mixed Flowing Gas | 8.4 | | | | | 6 | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vibration | 8.6 | 6 | | | | | | | | | | | | |
| Physical Shock | 8.5 | 7 | | | | | | | | | | | | |
| Durability | 8.7 | 5 | | | | | | | | | | | | |
| Solderability | 8.8 | | | | | | 2 | | | | | | | |
| Resistance to Soldering Heat | 8.9 | | | | | | | 2 | | | | | | |
| Resistance to Solvents | 8.10 | | | | | | | 3 | | | | | | |
| Solder Joint Reliability | 8.11 | | | | | | | | | 2 | | | | |
| Durability (Pre-Condition) | 8.7 | | 5 | | | 5 | | | | | 3 | | | |
| Gas-Tight Joint Test | 8.12 | | | | | | | | | | | 4 | | |
| Solderability (Lead Free) | 8.13 | | | | | | 2(a) | | | | | | | |
| Whisker Test | 8.14 | | | | | | | | | | | | | 2 |

NOTE : PRESS FIT RESISTANCE WAS MEASURED ON 50 OF THE 400 TERMINALS.

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**Table 1ABLE 1 Qualification Testing Matrix QUALIFICATION TESTING MATRIX**

| POSITION | CURRENT, AMPS | VOLTAGE, VOLTS | CONTACT POSITION (+ ) ENERGIZED ( IN PARALLEL) | CONTACT POSITIONS (- ) |
|---|---|---|---|---|
| | | | | |
| 40 | 2 | 5 | 19,20 | 32,35 |
| 40 | 2,5 | 12 | 2,3,4 | 22,23,26,29 |
| 80 | 2 | 5 | 34,35 | 75,76 |
| 80 | 3 | 12 | 2,3,4 | 41,42,43 |

**TABLE 2**
**CONTACT CURRENT RATING**

* Press Fit Connector

| NUMBER | TYPE | NUMBER | |
|---|---|---|---|
| GBUS-12-121S-12-282FCI | PRODUCT SPECIFICATION | GS-12-282194 | |
| TITLE | | PAGE | REVISION |
| SCA Product Specificationerial Attached SCSI (SAS)erial ATA Connector | | 32 of 16212121 | DJ |
| | | AUTHORIZED BY | DATEDATE 13-05-03 |
| | | GL LOO | 05 Jan 201113 MAY10 NOV.200305 MAR200804 |
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## REVISION RECORD

| REV | PAGE | DESCRIPTION | EC# | DATE |
|---|---|---|---|---|
| A | ALL | New Release | V80296 | 02/16/98 |
| B | 14 | Add test group 8 into chart/table | V80889 | 05/29/98 |
| C | 2 | Delete Plug & Receptacle 71292,71780,71781,87566 & 87567 and add 4.1.2 | V80977 | 06/09/98 |

| NUMBER | TYPE | NUMBER |
|---|---|---|
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| | | | | |
|---|---|---|---|---|
| D | 2,3,4,6,7,8 | Add 4.4.10, Modify 5.2.3 to add LCP. Modify 5.4 noting Straddle Mount plug for various PCB thickness. 7.1 "per contact position" to "per contact pair". 8.0 state " applied" to PCB. 8.6a to 50-2000Hz, 5.35B minmum. | V82162 | 12/23/98 |
| E | ALL | Revised format to be consistent with GS-01-001, and change BERG, Dupont, etc. references to FCI. | V01904 | 08/03/00 |
| F | 3 | Add to Section 5.3.1- "The Plug and receptacle terminal press-fit sections shall be plated with 0,5um/20u" min. –1,5um/60u" max. 90/10 tin-lead" | V02700 | 11/10/00 |
| | 2 Section 4.5 | Replaced GES-19-002 with BUS-19-122 | | |
| G | 14 | 5.3.1 – Add contact area with 0.76um/30u" gold minimum , soldertail section with 2,54um/100u" tin minimum and press fit section with 0,5um/20u" min – 1,5um/60u" max. tin over 1.27um/50u" minimum nickel. No plating at cutting point. Add 8.13, 8.14 & test group 12 | S04-0281 | 12/29/04 |
| H | 6 | 7.4 - Individual Pin Insertion shall not exceed 60N (13.5 pounds) was 6 pounds. | S05-0061 | 02/28/05 |
| J | ALL | Revised format to the latest FCI document form. | ECN-ELX-S-002406-1 | 01/05/11 |
| | 2, 9 | 4.5.6, 4.5.7 & 4.5.8: Add (GS-19-037), (GS-19-049) & (GS-19-039) respectively; 8.13 & 8.14: Add GS-22-011, GS-22-012 & GS-19-028 respectively | | |
| | 6 | 7.1- …The force to mate a receptacle…shall not exceed 120 grams max.… was 90 grams max… | | |





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| REV. | PAGE | DESCRIPTION | ECR # | DATE |
|---|---|---|---|---|
| AA1 | ALL | New Release New ReleasePreliminary | S03-0106 | S05-0028 0822 JUL 0305 Marr 045 |
| B | 2 | Remove 4.4.4 SS-00254, Add 4.5.12 GS-22-011, 4.5.13 GS-22-012 | S05-0128 | 28APR05 |
| | 8, 9 | Update 8.7, 8.8, 8.9 and 8.10 to GS specs | | |
| C | 6 | 7.4 Normal force: … shall not be less than 60 grams | S05-0346 | 23NOV05 (was GS-12-194 Rev 1 by H.Shindo)A 1.1 |
| | 6,7,9 to 12 | Add Clauses 7.3 to 7.7, 8.9 to 8.11 | TBA | 26 SEP 03 |
| | | Test Group 8 to 12 | | |
| A 1.2 | 6 | 7.3 Retention 5N was 7N | TBA | 10 NOV 03 |
| A 1.3 | 7 | 7.1 The unmating force shall not be less Than 10N (1.0kgf). Was .. shall not be less than 30grams | TBA | 06 FEB 04 |
| D | ALL | Update the spec. to the latest company logo | S08-0142 | 13MAY08 |
| | 11 | Table 1 - cancell the repeated test group 11 | | |

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| NUMBER | TYPE | NUMBER | |
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| GBUS-12-121S-12-282FCI | PRODUCT SPECIFICATION | GS 12-282194 | |
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| SCA Product Specificationerial Attached SCSI (SAS)erial ATA Connector | | 35 of 16212121 | DJ |
| | | AUTHORIZED BY | DATEDATE 13-05-03 |
| | | GL LOO | 05 Jan 201113<br>MAY10<br>NOV.200305<br>MAR200804 |
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**The following constitutes the recommended order and paragraph numbering scheme in compliance with GS-01-001. Paragraphs that are not needed shall be eliminated, and subsequent paragraphs renumbered.**
**Please delete this note after reading.**

**1.0OBJECTIVE** — Formatted: Bullets and Numbering

**2.0SCOPE** — Formatted: Bullets and Numbering

**3.0GENERAL** — Formatted: Bullets and Numbering

**4.0DEFINITIONS** — Formatted: Bullets and Numbering

**5.0PROCEDURE** — Formatted: Bullets and Numbering

**6.0REFERENCE DOCUMENTS (If Applicable)** — Formatted: Bullets and Numbering

**7.0NOTES (Optional)** — Formatted: Bullets and Numbering

**8.0RECORD RETENTION (If Applicable)** — Formatted: Bullets and Numbering

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