

|  |                               |   |                                      |
|--|-------------------------------|---|--------------------------------------|
| NUMBER<br>GS-12-625                                  | TYPE<br>Product Specification |  |                                      |
| TITLE<br>Terminal block- Plug and Socket, Fixed Plug |                               | PAGE<br>1 of 8  | REVISION<br>D                        |
|  |                               | AUTHORIZED BY<br>Jason Hsu  | DATE<br>Nov. 11 <sup>th</sup> , 2009 |
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## 1.0 SCOPE

This specification covers performance, test, and quality requirement for terminal block pluggable plug, socket and fixed plug. Centerline spacing are 3.50, 3.81, 5.00, 5.08, and 7.62mm.

## 2.0 APPLICABLE DOCUMENTS

### 2.1 Drawing

| Pitch  | Type   | FCI series name | Drawing number | FCI part number    | Poles  |
|--------|--------|-----------------|----------------|--------------------|--------|
| 3.50mm | Plug   | 01-350          | 20020004       | 20020004-CxxxxxxLF | 02~24p |
|        |        | 01-350          | 20020000       | 20020000-CxxxxxxLF | 02~24p |
|        |        | 02-350          | 20020009       | 20020009-CxxxxxxLF | 02~24p |
|        |        | 02-350          | 20020008       | 20020008-CxxxxxxLF | 02~24p |
|        | Socket | 06-350          | 20020107       | 20020107-CxxxxxxLF | 02~24p |
|        |        | 06-350          | 20020108       | 20020108-CxxxxxxLF | 02~24p |
|        |        | 06-350          | 20020111       | 20020111-CxxxxxxLF | 02~24p |
| 3.81mm | Plug   | 01-381          | 20020004       | 20020004-DxxxxxxLF | 02~24p |
|        |        | 01-381          | 20020000       | 20020000-DxxxxxxLF | 02~24p |
|        |        | 02-381          | 20020009       | 20020009-DxxxxxxLF | 02~24p |
|        |        | 02-381          | 20020008       | 20020008-DxxxxxxLF | 02~24p |
|        | Socket | 06-381          | 20020107       | 20020107-DxxxxxxLF | 02~24p |
|        |        | 06-381          | 20020108       | 20020108-DxxxxxxLF | 02~24p |
|        |        | 06-381          | 20020111       | 20020111-DxxxxxxLF | 02~24p |
| 5.00mm | Plug   | 01-500          | 20020006       | 20020006-GxxxxxxLF | 02~24p |
|        |        | 01-500          | 20020003       | 20020003-GxxxxxxLF | 02~24p |
|        |        | 02-500          | 20020009       | 20020009-GxxxxxxLF | 02~24p |
|        |        | 02-500          | 20020008       | 20020008-GxxxxxxLF | 02~24p |
|        | Socket | 06-500          | 20020107       | 20020107-GxxxxxxLF | 02~24p |
|        |        | 06-500          | 20020108       | 20020108-GxxxxxxLF | 02~24p |
|        |        | 06-500          | 20020111       | 20020111-GxxxxxxLF | 02~24p |
| 5.08mm | Plug   | 01-508          | 20020003       | 20020003-HxxxxxxLF | 02~24p |
|        |        | 01-508          | 20020006       | 20020006-HxxxxxxLF | 02~24p |
|        |        | 02-508          | 20020009       | 20020009-HxxxxxxLF | 02~24p |
|        |        | 06-508          | 20020108       | 20020108-HxxxxxxLF | 02~24p |
|        |        | 06-508          | 20020111       | 20020111-HxxxxxxLF | 02~24p |

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|--|-------------------------------|---|--------------------------------------|
| NUMBER<br>GS-12-625                                  | TYPE<br>Product Specification |  |                                      |
| TITLE<br>Terminal block- Plug and Socket, Fixed Plug |                               | PAGE<br>2 of 8  | REVISION<br>D                        |
|  |                               | AUTHORIZED BY<br>Jason Hsu  | DATE<br>Nov. 11 <sup>th</sup> , 2009 |
|  |                               | CLASSIFICATION<br>Unrestricted  |                                      |

|        |            |        |          |                    |        |
|--------|------------|--------|----------|--------------------|--------|
|        | Socket     | 02-508 | 20020008 | 20020008-HxxxxxxLF | 02~24p |
|        |            | 06-508 | 20020107 | 20020107-HxxxxxxLF | 02~24p |
|        |            | 06-508 | 20020110 | 20020110-HxxxxxxLF | 02~24p |
| 7.62mm | Plug       | 04-762 | 20020516 | 20020516-MxxxxxxLF | 02~16p |
|        |            | 04-762 | 20020517 | 20020517-MxxxxxxLF | 02~16p |
|        | Socket     | 07-762 | 20020618 | 20020618-MxxxxxxLF | 02~16p |
|        |            | 07-762 | 20020619 | 20020619-MxxxxxxLF | 02~16p |
|        |            | 07-762 | 20020620 | 20020620-MxxxxxxLF | 02~16p |
|        |            | 07-762 | 20020621 | 20020621-MxxxxxxLF | 02~16p |
|        |            | 07-762 | 20020622 | 20020622-MxxxxxxLF | 02~16p |
| 3.50mm | Fixed Plug | 26-350 | 20020327 | 20020327-CxxxxxxLF | 02~24p |
| 3.81mm |            | 26-381 | 20020327 | 20020327-DxxxxxxLF | 02~24p |
| 5.00mm |            | 21-500 | 20020316 | 20020316-GxxxxxxLF | 02~24p |
| 5.08mm |            | 21-508 | 20020316 | 20020316-HxxxxxxLF | 02~24p |
|        |            | 21-508 | 20020336 | 20020336-HxxxxxxLF | 04~05p |
| 7.62mm |            | 12-762 | 20020705 | 20020705-MxxxxxxLF | 02~03p |

## 2.2 Other Standard and Specification

- 4.2.1 IEC 60998-1: Connecting Devices for Low Voltage Circuits for Household and Similar Purposes. Part 1: General Requirements.
- 4.2.2 IEC 60998-2-1: Connecting Devices for Low Voltage Circuits for Household and Similar Purposes. Part 2-1: Particular Requirements for Connecting Device as Separate Entities with Screw-type Clamping Units.
- 4.2.3 UL 1059: Terminal Blocks
- 4.2.4 EIA-364:

Electrical Connector/Socket Test Procedure Including Environmental Classifications

## 2.3 FCI SPECIFICATIONS

- 4.3.1 GES-03-601 Current Rating
- 4.3.2 GS-14 -1394 Package Specification

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| NUMBER<br>GS-12-625                                  | TYPE<br>Product Specification |  |                                      |
| TITLE<br>Terminal block- Plug and Socket, Fixed Plug |                               | PAGE<br>3 of 8  | REVISION<br>D                        |
|  |                               | AUTHORIZED BY<br>Jason Hsu  | DATE<br>Nov. 11 <sup>th</sup> , 2009 |
|  |                               | CLASSIFICATION<br><b>Unrestricted</b>   |                                      |

### 3.0 REQUIREMENTS

#### 3.1 Design and Construction

Connectors shall be of the design, construction and physical dimensions specified on the applicable product drawings and shall consider the requirements mentioned on IEC 998-2-1 paragraph 10, relevant to clamping units.

#### 3.2 Materials, Dimensions, Plating and Markings

All of these items are described on the individual drawings.

#### 3.3 Ratings

Voltage rating, current rating, operation temperature and rated screw torque are described on the individual drawings.

#### 3.4 Performance and Test Description

Product is designed to meet the electrical, mechanical and environment performance requirement list in section 3.5.

Unless otherwise specified, all tests shall be performed at ambient environmental conditions per IEC 160.

#### 3.5 Test Requirements and Procedures Summary

| 3.5.1 ELECTRICAL REQUIREMENTS              |  |   |
|--|--|---|
| DESCRIPTION                                | TEST CONDITION   | REQUIREMENT   |
| 3.5.1.1<br>Product Examination             | Visual, dimensional and functional   | Meet requirements of product drawing.                               |
| 3.5.1.2<br>Low Level Contact Resistance    | Mated connectors, apply a maximum voltage of 0.2 V between wire pole and terminated terminal.  | 20 milliohms maximum.   |
| 3.5.1.3<br>Insulation resistance           | IEC 60998-1, paragraph 13e 13.3.<br>Initial 1000Volts DC, or 500Volts DC after environment test applied between two adjacent contact with measurements made 1 minute after the application of the voltage. | 1) 5000 MΩ Min. initial.<br>2) 5 MΩ minimum after environment test. |
| 3.5.1.4<br>Dielectric Withstanding Voltage | IEC 60998-1, paragraph 13e 13.4.<br>Apply 1.6K VAC, Test between adjacent contacts of connector assemblies.  | No breakdown;<br>Current leakage < 5 mA                             |

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|--|-------------------------------|---|--------------------------------------|
| NUMBER<br>GS-12-625                                  | TYPE<br>Product Specification |  |                                      |
| TITLE<br>Terminal block- Plug and Socket, Fixed Plug |                               | PAGE<br>4 of 8  | REVISION<br>D                        |
|  |                               | AUTHORIZED BY<br>Jason Hsu  | DATE<br>Nov. 11 <sup>th</sup> , 2009 |
|  |                               | CLASSIFICATION<br><b>Unrestricted</b>   |                                      |


|   |  |                |
|---|--|----------------|
| 3.5.1.5<br>Temperature rise<br>VS current | UL 1059<br>Measurements are made when the specimen had reached thermal equilibrium at the rated current specified on individual drawing. | +30 °C Maximum |
|---|--|----------------|

| <b>3.5.2<br/>MECHANICAL REQUIREMENTS</b> |   |  |                      |
|--|---|--|----------------------|
| DESCRIPTION                              | TEST CONDITION  | REQUIREMENT  | Applicable           |
| 3.5.2.1<br>Mating force                  | Mate connector and measure the force required.  | 5.5N Maximum.<br>(Per mating pole.)                                  | Plug/socket          |
| 3.5.2.2<br>Unmating force                | Unmate connector and measure the force required.  | 1.0N Minimum.<br>(Per unmating pole.)                                | Plug/socket          |
| 3.5.2.3<br>Durability<br>(mate/unmate)   | After durability cycles, low level contact resistance shall be less than 20millionohm.  | 200 Cycles   | Plug/socket          |
| 3.5.2.4<br>Wire Pull Strength            | IEC 60998-2-1 paragraph 10.105,<br>Subject connector to a pull force for 1 minute in the axis of tapping connector.<br>Connector shall not slip out of the connecting device. | 10AWG: Min 80N<br>12AWG: Min 60N<br>16AWG: Min 30N<br>24AWG: Min 13N | Plug/Fixed<br>plug   |
| 3.5.2.5<br>Torque                        | UL1059<br>Apply the rated torque (refer to drawings) for wire attachment.   | No visible crack   | Plug/Fixed<br>Plug   |
| 3.5.2.6<br>Pin Retention                 | Force required to unload pin from the housing in the direction of plug entry.   | Min 20N.   | Socket               |
| 3.5.2.7<br>Solder ability                | Soldering time 5 second. (flux is applied)<br>Soldering temperature: 250±10°C   | 95% min of solder area and the plastics have not been melted         | Fixed<br>plug/Socket |

| <b>3.5.3<br/>ENVIRONMENT REQUIREMENTS</b> |  |  |
|---|--|--|
| DESCRIPTION                               | TEST CONDITION   | REQUIREMENT  |
| 3.5.3.1<br>Heat Resistance                | IEC 60998-2-1, paragraph 12.1<br>Subject specimens to 115±2°C for 168 hours and shall be left alone for 1 to 2 hours in a room ambient for next examination/testing.                           | No cracks visible.<br>No material becomes sticky.<br>No material becomes greasy.<br>Specimen shall not undergo any change impairing their further use. |
| 3.5.3.2<br>Cold resistance                | IEC 60998-2-1, paragraph 12.1<br>Subject specimens to -40±2°C for 168 hours and shall be left alone for 1 to 2 hours in a room ambient for next examination/testing..                          |  |
| 3.5.3.3<br>Humidity                       | IEC 60998-1, paragraph 12.2.<br>Subject specimens to 30±2°C, relative humidity 91%~95% for 48 hours and shall be left alone for 1 to 2 hours in a room ambient for next examination/testing... |  |
| 3.5.3.4<br>Salt Spray                     | EIA-364-26B, condition A<br>Salt concentration: 5%, temperature 32±2°C, 48hours.   |  |

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|--|-------------------------------|---|--------------------------------------|
| NUMBER<br>GS-12-625                                  | TYPE<br>Product Specification |  |                                      |
| TITLE<br>Terminal block- Plug and Socket, Fixed Plug |                               | PAGE<br>5 of 8  | REVISION<br>D                        |
|  |                               | AUTHORIZED BY<br>Jason Hsu  | DATE<br>Nov. 11 <sup>th</sup> , 2009 |
|  |                               | CLASSIFICATION<br><b>Unrestricted</b>   |                                      |

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|--|---|--|
|  | Samples were measured after salt is removed by running water.   |  |
| 3.5.3.5<br>Fire Test<br>(Glow wire test) | Specimens with no visible flame and no sustained glowing; or flames and glowing on the specimen extinguished 30 seconds after the removal of the glow wire. | IEC 60695-2-10,-2-11,-2-12<br>Apply the glow-wire once for no longer than 5 seconds. |

#### 4.0 **QUALITY ASSUREANCE PROVISIONS**

##### 4.1 **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 QS9000.

##### 4.2 **Inspection Conditions**

Unless otherwise specified, all inspections shall be performed under the following conditions:

- a) Temperature: 25+/- 5°C
- b) Relative Humidity: 30% to 60%
- c) Barometric Pressure: Local ambient

##### 4.3 **Acceptance**

- 4.3.1 Electrical and Mechanical requirements shall be as indicated in Paragraphs 3.5 using test data and appropriate statistical techniques.
- 4.3.2 Failures attributed to equipment, test setup or operator error shall not disqualify the product.

##### 4.4 **Qualification Testing**

Qualification testing shall be performed on sample units predicted with equipment and procedures normally used in production. Test sequence are shown in Table 1(Pluggable plug), Table 2(pluggable socket), and Table3(Fixed plug).

|  |                               |   |                                      |
|--|-------------------------------|---|--------------------------------------|
| NUMBER<br>GS-12-625                                  | TYPE<br>Product Specification |  |                                      |
| TITLE<br>Terminal block- Plug and Socket, Fixed Plug |                               | PAGE<br>6 of 8  | REVISION<br>D                        |
|  |                               | AUTHORIZED BY<br>Jason Hsu  | DATE<br>Nov. 11 <sup>th</sup> , 2009 |
|  |                               | CLASSIFICATION<br><b>Unrestricted</b>   |                                      |

**TABLE 1: QUALIFICATION TESTING SEQUENCE for Pluggable Plug**

| TEST                              | PARA               | Test Group    |   |   |   |   |   |   |   |
|-----------------------------------|--------------------|---------------|---|---|---|---|---|---|---|
|                                   |                    | A             | B | C | D | E | F | G | H |
|                                   |                    | Test Sequence |   |   |   |   |   |   |   |
| Product examination               | 3.5.1.1            | 1             | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| LLCR                              | 3.5.1.2            | 2             |   |   |   |   |   | 3 |   |
| Insulation Resistance             | 3.5.1.3            | 3             |   |   | 3 | 3 | 3 | 4 |   |
| Dielectric withstanding voltage   | 3.5.1.4            | 4             |   | 4 | 4 | 4 | 4 |   |   |
| Mating/Un-mating force            | 3.5.2.1<br>3.5.2.2 |               | 2 |   |   |   |   |   |   |
| Torque                            | 3.5.2.5            |               | 3 |   |   |   |   |   |   |
| Wire Pull Strength                | 3.5.2.4            |               |   | 2 |   |   |   |   |   |
| Temperature rise                  | 3.5.1.5            |               |   | 3 |   |   |   |   |   |
| humidity test                     | 3.5.3.3            |               |   |   | 2 |   |   |   |   |
| Heat resistance                   | 3.5.3.1            |               |   |   |   | 2 |   |   |   |
| Cold resistance                   | 3.5.3.2            |               |   |   |   |   | 2 |   |   |
| Salt Spray                        | 3.5.3.4            |               |   |   |   |   |   | 2 |   |
| Fire Test<br>(Glow wire test)     | 3.5.3.5            |               |   |   |   |   |   |   | 2 |
| Qualification connector per group |                    | 3             | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

**TABLE 2: QUALIFICATION TESTING SEQUENCE-Pluggable Socket**

| TEST                            | PARA    | Test Group    |   |   |   |   |   |   |   |
|---------------------------------|---------|---------------|---|---|---|---|---|---|---|
|                                 |         | A             | B | C | D | E | F | G | H |
|                                 |         | Test Sequence |   |   |   |   |   |   |   |
| Product examination             | 3.5.1.1 | 1             | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Insulation Resistance           | 3.5.1.3 | 2             |   | 3 | 3 | 3 |   |   |   |
| Dielectric withstanding voltage | 3.5.1.4 | 3             |   | 4 | 4 | 4 |   |   |   |
| Pin Retention<br>(Pull force)   | 3.5.2.6 |               | 2 |   |   |   |   |   |   |
| Humidity                        | 3.5.3.3 |               |   | 2 |   |   |   |   |   |
| Heat resistance                 | 3.5.3.1 |               |   |   | 2 |   |   |   |   |
| Cold resistance                 | 3.5.3.2 |               |   |   |   | 2 |   |   |   |
| Salt Spray                      | 3.5.3.4 |               |   |   |   |   | 2 |   |   |
| Fire Test<br>(Glow wire test)   | 3.5.3.5 |               |   |   |   |   |   | 2 |   |
| Solder ability                  | 3.5.2.7 |               |   |   |   |   |   |   | 2 |

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|--|-------------------------------|---|--------------------------------------|--|--|
| NUMBER<br>GS-12-625                                  | TYPE<br>Product Specification |  |                                      |  |  |
| TITLE<br>Terminal block- Plug and Socket, Fixed Plug |                               | PAGE<br>7 of 8  | REVISION<br>D                        |  |  |
|  |                               | AUTHORIZED BY<br>Jason Hsu  | DATE<br>Nov. 11 <sup>th</sup> , 2009 |  |  |
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|                                   |   |   |   |   |   |   |   |   |   |
|-----------------------------------|---|---|---|---|---|---|---|---|---|
| Qualification connector per group | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
|-----------------------------------|---|---|---|---|---|---|---|---|---|

**TABLE 3: QUALIFICATION TESTING SEQUENCE-Fixed Plug**

| TEST                              | PARA    | Test Group    |   |   |   |   |   |   |   |   |  |
|-----------------------------------|---------|---------------|---|---|---|---|---|---|---|---|--|
|                                   |         | A             | B | C | D | E | F | G | H | J |  |
|                                   |         | Test Sequence |   |   |   |   |   |   |   |   |  |
| Product examination               | 3.5.1.1 | 1             | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |  |
| LLCR                              | 3.5.1.2 | 2             |   |   |   |   |   | 3 |   |   |  |
| Insulation Resistance             | 3.5.1.3 | 3             |   |   | 3 | 3 | 3 | 4 |   |   |  |
| Dielectric withstanding voltage   | 3.5.1.4 | 4             |   | 4 | 4 | 4 | 4 |   |   |   |  |
| Torque                            | 3.5.2.5 |               | 2 |   |   |   |   |   |   |   |  |
| Wire Pull Strength                | 3.5.2.4 |               |   | 2 |   |   |   |   |   |   |  |
| Temperature rise                  | 3.5.1.5 |               |   | 3 |   |   |   |   |   |   |  |
| humidity test                     | 3.5.3.3 |               |   |   | 2 |   |   |   |   |   |  |
| Heat resistance                   | 3.5.3.1 |               |   |   |   | 2 |   |   |   |   |  |
| Cold resistance                   | 3.5.3.2 |               |   |   |   |   | 2 |   |   |   |  |
| Salt Spray                        | 3.5.3.4 |               |   |   |   |   |   | 2 |   |   |  |
| Solder ability                    | 3.5.2.7 |               |   |   |   |   |   |   | 2 |   |  |
| Fire Test<br>(Glow wire test)     | 3.5.3.5 |               |   |   |   |   |   |   |   | 2 |  |
| Qualification connector per group |         | 3             | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |  |

|  |                               |   |                                      |
|--|-------------------------------|---|--------------------------------------|
| NUMBER<br><b>GS-12-625</b>                               | TYPE<br>Product Specification |  |                                      |
| TITLE<br><br>Terminal block- Plug and Socket, Fixed Plug |                               | PAGE<br>8 of 8  | REVISION<br>D                        |
|  |                               | AUTHORIZED BY<br>Jason Hsu  | DATE<br>Nov. 11 <sup>th</sup> , 2009 |
|  |                               | CLASSIFICATION<br><b>Unrestricted</b>   |                                      |

**REVISION RECORD**

| REV | PAGE | DESCRIPTION   | ECR#      | DATE                        |
|-----|------|---|-----------|-----------------------------|
| A   | All  | Initial Release   | DG09-0204 | Nov 11 <sup>th</sup> , 2009 |
| B   | 3    | 3.5.2.7 solderability test,<br>Temperature change form 260 +/- 5 °C to 250 +/- 10°C | T09-1162  | Dec 17 <sup>th</sup> , 2009 |
| C   | All  | Add phase-2 product series  | T10-0079  | Jun 15 <sup>th</sup> , 2010 |
| D   | 2    | Add p/n 20020336  |           | Jan 31 <sup>th</sup> , 2010 |

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