

NUMBER <b>GS-12-1234</b>	TYPE <b>PRODUCT SPECIFICATION</b>		
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## **1.0 OBJECTIVE**

This specification defines the performance, test, quality, and reliability requirements of the Griplet product:  
 10150494 - for solid and stranded **16-20 AWG** insulated wires.  
 10127850- for solid and stranded **20-32 AWG** insulated wires.

## **2.0 SCOPE**

This specification is applicable to the termination characteristics of the Griplet family of products which provides a means to attach an insulated wire to a printed circuit board, without the necessity of first removing the wire's insulation in order to expose the conductor.

## **3.0 RATINGS**

- 3.1 Operating Voltage Rating = 300 Volts maximum
- 3.2 Operating Current Rating = 1.5 to 15 Amps maximum (wire-dependent), 30 degrees maximum t-rise above ambient, no air-flow.
- 3.3 Operating Temperature Range = -40C to +105C

## **4.0 APPLICABLE DOCUMENTS**

- 4.1 FCI Specifications
  - 4.1.1 Engineering drawings
    - FCI product customer drawing 10127850
    - FCI product customer drawing 10150494
  - 4.1.2 Process drawings
    - FCI product inspection drawing 10127850
    - FCI product inspection drawing 10150494

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- 4.1.3 Application specification
  - GS-20-0421 Application Specification
- 4.1.4 Packaging specification
  - GS-14-2410 Packaging Specification
- 4.2 National or International Standards
  - 4.3.1 UL94-V0: Tests for Flammability of Plastic Materials in Devices and Appliances
  - 4.3.2 EIA 364: Electrical Connector/Socket Test Procedures Including Environmental Classifications.
- 4.3 FCI Laboratory Reports - Supporting Data
  - EL-2015-02-003, Rev B (12 May 2015)
  - *Lab test report not complete*
- 4.5 Safety Agency Approvals
  - UL / CSA certified, ECBT2.E66906.

## 5.0 REQUIREMENTS

### 5.1 Qualification

Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein.

### 5.2 Material

The base material for each component shall be as specified herein or equivalent.

- Contacts: Copper Alloy
- Pick & Place Molded Cap (High Temperature Thermoplastic UL 94V-0 Compliant)

### 5.3 Finish

The finish for applicable components shall be as specified herein or equivalent.

- Plating: Lead-Free Tin over Nickel

### 5.4 Design and Construction

Connectors shall be of the design, construction, and physical dimensions specified on the applicable product drawing. There shall be no cracks, burrs, or other physical defects that impair performance.

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## 6.0 ELECTRICAL CHARACTERISTICS

### 6.1 Contact Resistance, Low Level (LLCR)

The low level contact resistance shall not exceed 60 milliohms initially. The low level contact resistance shall also not exceed 10 milliohms increase in resistance (from the initial measurement) after any treatment and/or environmental exposure. Measurements shall be in accordance with EIA 364-23.

The following details shall apply:

- Test Voltage - 20 milli-volts DC max open circuit.
- Test Current - Not to exceed 100 milli-amperes.

### 6.2 Contact Resistance, Specified Current

The contact resistance at a specified current shall not exceed 60 milliohms initially.

The increase in contact resistance at a specified current shall also not exceed 10 milliohms (from initial measurement) after any treatment and/or environmental exposure.

Measurements shall be in accordance with EIA 364-06.

The following details shall apply:

- Test Current 32AWG – 1.5 amperes DC.
- Test Current 30AWG – 2.0 amperes DC.
- Test Current 28AWG – 2.7 amperes DC.
- Test Current 26AWG – 3.6 amperes DC.
- Test Current 24AWG – 4.8 amperes DC.
- Test Current 22AWG – 6.4 amperes DC.
- Test Current 20AWG – 8.5 amperes DC.
- Test Current 18AWG – 11 amperes DC.
- Test Current 16AWG – 15 amperes DC.

### 6.3 Current Rating

The temperature rise above ambient\* shall not exceed 30 deg C at any point in the system when a single contact is powered. Terminals mounted, on 5mm pitch, on test PCB w/ 2 ounce copper traces. Reference Customer drawing 10127850C for pad design.

The following details shall apply:

- Test Current 32AWG – 1.5 amperes DC.
- Test Current 30AWG – 2.0 amperes DC.
- Test Current 28AWG – 2.7 amperes DC.
- Test Current 26AWG – 3.6 amperes DC.
- Test Current 24AWG – 4.8 amperes DC.
- Test Current 22AWG – 6.4 amperes DC.
- Test Current 20AWG – 8.5 amperes DC.
- Test Current 18AWG – 11 amperes DC.
- Test Current 16AWG – 15 amperes DC.

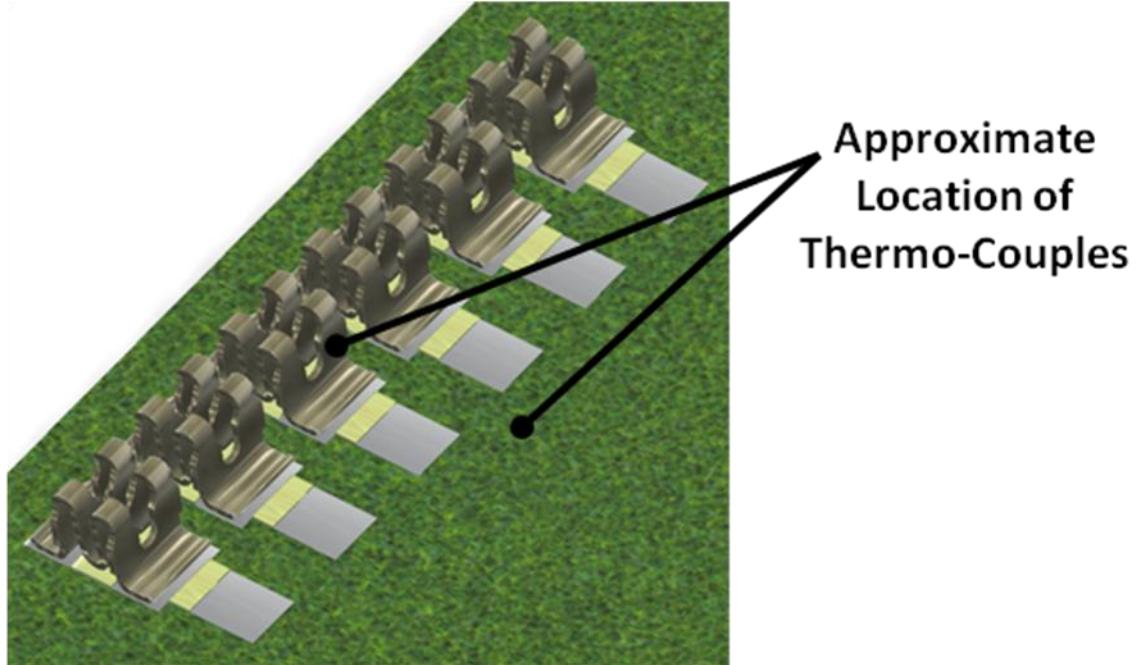
\* Ambient Conditions – 25 +/- 5 degrees C, no air-flow

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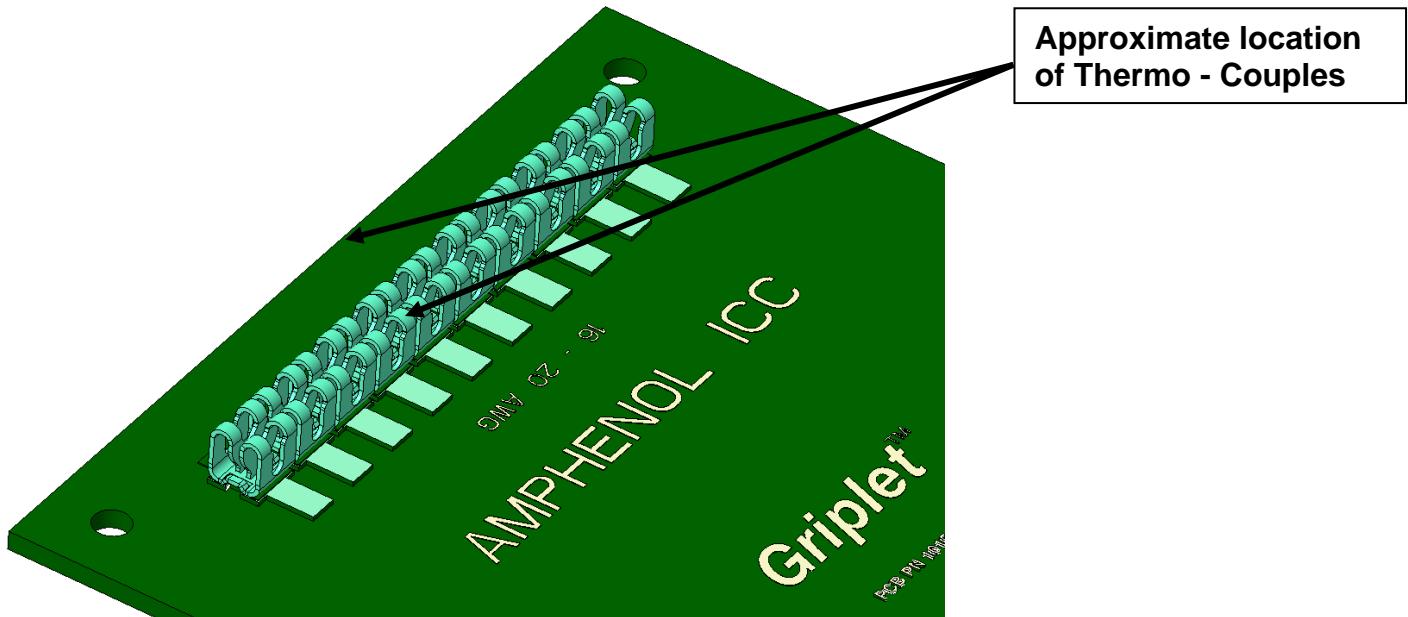
h. Reference - EIA 364-70

i. Test configuration for 10127850 (see *Figure - 1*)

**FIGURE - 1**



ii. Test configuration for 10150494 (see *Figure - 2*)



**FIGURE - 2**

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## 7.0 Mechanical Characteristics

### 7.1 Wire Maximum Insertion / Minimum Extraction Force – See Table 1

The following details shall apply:

- a. Cross Head Speed – 12.7 mm/minute.
- b. Lubrication - None
- c. Utilize free floating fixtures and hand-insertion tool FCI PN 10131832 for PN 10127850 and FCI PN 10151514 for PN 10150494
- d. Reference – IEC 60512-13-2 or EIA 364-13.
- e. Reinsert fresh / unused section of wire for each insertion.

**TABLE 1: Initial Wire Insertion / Extraction Force for 10127850**

AWG	Maximum Insertion Force (Newtons / Pounds)	Minimum Extraction Force (Newtons / Pounds)
20 Stranded	385 / 87	26.8 / 6.0
22 Stranded	181 / 41	14.3 / 3.2
24 Stranded	126 / 28	12.5 / 2.8
26 Stranded	77 / 17	9.7 / 2.2
28 Stranded	69 / 16	6.7 / 1.5
30 Stranded	68 / 15	5.7 / 1.3
32 Stranded	65 / 15	3.8 / 0.9
20 Solid	456 / 103	31.9 / 7.1
22 Solid	246 / 55	19.5 / 4.4
24 Solid	173 / 39	14.3 / 3.2
26 Solid	82 / 19	11.4 / 2.5
28 Solid	not tested	not tested
30 Solid	75 / 17	5.0 / 1.1
32 Solid	not tested	not tested

### Initial Wire Insertion / Extraction Force

AWG	Maximum Insertion Force (Newton / Pounds)	Minimum Extraction Force (Newton / Pounds)
16 Stranded	491	28
20 Stranded	203	23
16 Solid	446	14
20 Solid	209	20

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## 7.2 Repairability - IEC 60512-9-1 or EIA 364-09

A wire may be removed and replaced by another wire of same size and type a maximum of TWO times. The low level contact resistance shall also not exceed 10 milliohms increase in resistance from the initial measurement.

- a. Number Cycles - 2 reinsertions
- b. Cycling Rate – N/A (hand-tool used)
- c. Reinsert fresh / unused section of wire for each insertion.
- d. Use free floating fixtures where applicable and hand-insertion tool FCI PN 10131832 for PN 10127850 and FCI PN 10151514 for PN 10150494.

## 8.0 Environmental Conditions

After exposure to the following environmental conditions in accordance with the specified test procedure 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 the Table 1 test sequences. Unless specified otherwise, wires shall be mated during exposure.

### 8.1 Thermal Shock – EIA 364-32.

- a. Number of Cycles - 25
- b. Temperature Range - Between -40 and 105 deg C
- c. Time at Each Temperature - 30 minutes minimum
- d. Transfer Time – 30 seconds maximum

### 8.2 Heat & Humidity Cycling – EIA 364-31, method IV (cyclic temperature).

Samples subject to 50 cycles of 10-hour duration for a total of 500 hours.

A cycle consists of the following steps:

- a. 2 hour ramp up from 25 deg C at 80%-98% RH to 65 deg C at 90%-98% RH.
- b. 4 hour dwell at 65 deg C at 90%-98% RH.
- c. 2 hour ramp down to 25 deg C at 80% to 98% RH.
- d. 2 hour dwell at 25 deg C at 80% to 98% RH.

### 8.3 Temperature Life – EIA 364-17.

- a. Test Temperature - 105 deg C
- b. Test Duration - 500 hours

### 8.4 Mixed Flowing Gas corrosion (MFG) – EIA 364-65, class IIA, 4-gas

- a. Duration - 20 days
- b. Temperature – 30 deg C
- c. Humidity – 70%
- d. Mated

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- 8.5 Vibration Sinusoidal – EIA 364-28, Test Condition II
  - a. Vibration Amplitude – 1.5mm double amplitude or 10G acceleration
  - b. Frequency Range - 10 to 500 to 10 hertz
  - c. Sweep Time and Duration - 15 minutes per sweep, 8 hours along each of three orthogonal axes (24 hours total)
  - d. Mounting - Rigidly mount test boards; a minimum cable length of 8" shall be unsupported.
  - e. No discontinuities greater than 1 microsecond.
- 8.6 Mechanical Shock – EIA 364-27, test condition H
  - a. Amplitude – half sine 30G
  - b. Duration – 11 milliseconds
  - c. Shocks – 3 shocks along each of three orthogonal axes (18 shocks total)
  - d. Mounting - Rigidly mount test boards; a minimum cable length of 8" shall be unsupported.
  - e. No discontinuities greater than 1 microsecond.
- 8.7 Solderability – IPC/ECA J-STD-002.
  - a. Test Condition S1
  - b. Dry aging – 4 hours at 155C.
  - c. Minimum solder coverage on underside of terminal, 95% of perimeter.

## 9.0 QUALITY ASSURANCE PROVISIONS

### 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 ANSI Z-540 and ISO 9000.

### 9.2 Inspection Conditions

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

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

### 9.3 Sample Quantity and Description for 10127850

- a. Griplet terminal PN 10127850-101LF (Rev A), total quantity = 430. See table 4 for quantity breakdown per test group.
- b. Stranded and solid wires, with individually plated copper conductors. See table 2 below for additional wire detail.

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**TABLE 2: Test Wire Matrix**

AWG	Conductor Type	Strand Count	Strand Plating	Insulation Material	Insulation OD (Nominal) mm/inch
20	Stranded Copper	7	Lead-Free Tin	PVC	1.47/0.058
22	Stranded Copper	7	Lead-Free Tin	PVC	1.27/0.050
24	Stranded Copper	7	Lead-Free Tin	PVC	1.12/0.044
26	Stranded Copper	7	Lead-Free Tin	PVC	0.99/0.039
28	Stranded Copper	7	Lead-Free Tin	PVC	0.89/0.035
30	Stranded Copper	7	Lead-Free Tin	PVC	0.81/0.032
32	Stranded Copper	7	Lead-Free Tin	PVC	0.74/0.029
20	Solid Copper	1	Lead-Free Tin	PVC	1.62/.064
22	Solid Copper	1	Lead-Free Tin	PVC	1.47/.058
24	Solid Copper	1	Lead-Free Tin	PVC	1.34/.053
26	Solid Copper	1	Lead-Free Tin	PVC	0.96/.038
28	NA	NA	NA	NA	NA
30	Solid Copper	1	Silver	PVC	0.50/0.020
32	NA	NA	NA	NA	NA

9.4 Sample Quantity and Description for 10150494

- a. Griplet terminal PN 10150494-101LF (Rev 7),
- b. Stranded and solid wires, with individually plated copper conductors. See table 3 below for additional wire detail.

**TABLE 3: Test Wire Matrix**

AWG	Conductor Type	Strand Count	Strand Plating	Insulation Material	Insulation OD (Nominal) mm/inch
16	Stranded Copper	26	Tinned copper conductor	PVC	2.34/0.092
16	Solid Copper	1	Tinned copper conductor	PVC	2.11/0.083
20	Stranded Copper	10	Tinned copper conductor	PVC	1.75/0.069
20	Solid Copper	1	Tinned copper conductor	PVC	1.63/0.064

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## 9.5 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 action shall be taken and samples resubmitted for qualification.

## 9.6 Qualification Testing

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequences shall be as shown in the qualification test table. Data shall be provided with the samples noting production history: production lot codes for components and assemblies, components and assemblies produced to latest Griplet terminal drawing revision, verification of plating composition and thickness, etc.

## 9.7 Re-Qualification 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.

- 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, insulator design, contact base material, or contact lubrication requirements.
- b. A significant change is made to the manufacturing process which impacts the product form, fit or function.
- 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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#### 10.0 TABLE 4: QUALIFICATION TEST MATRIX

		GROUP 1A	GROUP 1B	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6	GROUP 7	GROUP 8
TEST DESCRIPTION	SECTION	Mechanical Shock & Vibration		Thermal Shock and Heat & Humidity	Mixed Flowing Gas	T-Rise and Contact Resistance @ Specified	Temp. Life	Insertion / Extraction Force	Repairability	Solderability
		1A	1B	2	3	4	5	6	7	8
VISUAL EXAMINATION	-	1,8	1,5	1,8	1,7	1,6	1,6	1,8	1,8	1,3
MATE WIRE TO TERMINAL	-	2	2	2	2,8	2	2			
<b>ELECTRICAL:</b>										
CONTACT RESISTANCE AT LOW LEVEL	6.1	3,5,7		3,5,7	3,5		3,5		3,5,7	
CONTACT RESISTANCE @ SPECIFIED LEVEL	6.2					3,5				
TEMPERATURE-RISE VS. CURRENT	6.3					4				
<b>ENVIRONMENTAL:</b>										
RANDOM VIBRATION	8.5	4	3							
MECHANICAL SHOCK	8.6	6	4							
THERMAL SHOCK	8.1			4						
HEAT & HUMIDITY	8.2			6						
MIXED FLOWING GAS	8.4				4					
TEMPERATURE LIFE	8.3						4			
SOLDERABILITY	8.7									2
<b>MECHANICAL:</b>										
INSERTION FORCE	7.1							2,4,6		
EXTRACTION FORCE	7.1							3,5,7		

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## 11.0 REVISION RECORD

<b>Rev</b>	<b>Page</b>	<b>Description</b>	<b>EC#</b>	<b>Date</b>
A		INITIAL RELEASE		18 AUG 2015
C		ADD GRIPLET GEN 2	F-34974	26 SEP 2019