PRODUCT SPECIFICATION

1.0 SCOPE

This product specification covers the 2.54 mm (0.100 inch) centerline (pitch) dual row STAC64 unsealed wire to board connection system terminated with 22 to 20 AWG wire using crimp technology.

2.0 PRODUCT DESCRIPTION

2.1 PRODUCT NAME AND SERIES NUMBERS

Product Name	Series
20 Way Right Angle Header Assembly	34691
16 Way Right Angle Header Assembly	34691
12 Way Right Angle Header Assembly	34691
8 Way Right Angle Header Assembly	34691
20 Way Vertical Header Assembly	34690
16 Way Vertical Header Assembly	34690
12 Way Vertical Header Assembly	34690
8 Way Vertical Header Assembly	34690
20 Way Receptacle Connector Assembly	34729
16 Way Receptacle Connector Assembly	34729
12 Way Receptacle Connector Assembly	34729
8 Way Receptacle Connector Assembly	34729

2.2 ASSOCIATED TERMINALS

Product Description	Vendor Part Number
Molex CTX Large Grip CTX Female Receptacle Terminal (20ga)	34803-0212
Molex CTX Small Grip Female Receptacle Terminal (22ga)	34803-0211

2.2 DIMENSIONS, MATERIALS, PLATINGS AND MARKINGS

Harness Housings: 30% glass fiber polyester
TPAs: 30% glass fiber polyester
Header Housing: 30% glass fiber SPS
Pins: Copper alloy C26000
Tin Plating: Overall Tin with Nickel under-plate

2.3 SAFETY AGENCY APPROVALS

UL File Number	Not Applicable
CSA File Number	Not Applicable
TUV License number	Not Applicable

3.0 APPLICABLE DOCUMENTS AND SPECIFICATIONS

Description	Document Number
8,12,16, & 20 way right angle sales drawing (charted)	SD-34691-100
8,12,16,& 20 way vertical sales drawing (charted)	SD-34690-100
8-20 way harness sales drawing (charted)	CU5T-14489-DA
Female 'CTX' Terminal Molex Sales Drawing (charted)	SD-502306-001
Tray packaging specification	PK-31300-892
Tube packaging specification	PK-31301-063
Carton packaging specification	PK-31301-201
Application specification	AS-34729-020

4.0 RATINGS

4.1 VOLTAGE

500 VDC MAXIMUM; Per GMW3191, All measured isolation resistances shall be >100MΩ
14 VDC MAXIMUM; Per NDS24012, An initial leak current of ≤ 10μA and a post endurance leak current of ≤ 1mA.

4.2 CURRENT AND APPLICABLE WIRES

Current is dependent on connector size, ambient temperature, blade size and related factors. Actual maximum current rating is application dependent and should be evaluated for each use.

The current listed below is expected to cause a 40ºC average temperature rise in a fully populated 20 circuit connection system per RSA 36-05-019 Rev. G requirement.

AWG	Amperes	Wire range Insulation Diameter
20	6.1	1.40 - 1.90 mm (0.055 - 0.075 inch)
22	5.8	1.50 - 1.65 mm (0.059 - 0.065 inch)

4.3 TEMPERATURE

Operating: - 40 Cº to + 105 Cº
Non-operating: - 40 Cº to + 105 Cº

5.0 PERFORMANCE

5.1 ELECTRICAL PERFORMANCE

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	**Contact Resistance (Low Level)**	Mate connectors: limiting the open circuit voltage of **20** mV and a maximum current of **100** mA.	**6** milliohms MAXIMUM
2	**Contact Resistance @ Rated Current (Voltage Drop)**	Mate connectors: apply a **5** ampere/ **1.0** mm^2 current	**10** milliohms MAXIMUM
3	**Isolation Resistance**	Apply a voltage of **500** VDC between adjacent terminals and between terminals to ground.	**100** Meg ohms MINIMUM
4	**Temperature Rise (via Current Cycling)**	Mate terminals: measure the temperature rise at the rated current after: **1008** hours of bench top testing (**45** minutes ON and **15** minutes OFF per hour)	Temperature rise over Ambient: **+40** C° MAXIMUM

5	**Dielectric Strength**	Apply an AC rms voltage of 1000V at 60 Hz across each adjacent cavity and between the terminals to ground	No dielectric breakdown or flash-over shall occur between cavities or between the cavities and the outside of a connector at any time during the test.
6	**Connector Current Capability (Electrical)**	Mate connectors per durability; Expose to **504** cycles of 45 minutes ON and 15 minutes OFF at 6.1 amps (20awg) and 5.8 amps (22awg) for 105ºc. Perform **Contact Resistance @ Rated Current (Voltage Drop)** Expose to a second set of **504** cycles of 45 minutes ON and 15 minutes OFF at 6.1 amps (20awg) and 5.8 amps (22awg) for 105ºc. Record **Contact Resistance (Low Level)** at least once a day, at the 30th. Minute of the ON cycle Perform **Contact Resistance @ Rated Current (Voltage Drop)**	**First 504 Cycles**: The temperature measured on each connection shall not exceed 105ºc **Voltage Drop** **20** milliohms MAXIMUM **Second 504 Cycles**: The value shall not exceed a Delta Temperature of 70ºc **Dry Circuit Resistance** **10** milliohms MAXIMUM **Voltage Drop** **20** milliohms MAXIMUM
7	**Connector Current Capability (Mechanical)**	Subject connectors to **Connector Current Capability (Electrical).** Perform **Terminal Retention Force (in Housing)** for 20awg and 22awg	TPA in Final-Lock **80** Newtons MINIMUM 22awg wire breakage can occur at less than 80N*
8	**Connector - Connector Leak Current**	A pair of mated connectors shall be left in a Humidity Chamber for **1 hour at 60 ± 5 °C and 90 - 95 %RH**. During the humidity exposure, power adjacent terminals to **14 VDC.** Measure Initial Leak Current after 1 hour while still in chamber. After humidity exposure, power adjacent terminals to **14 VDC** and measure post endurance leak current	**Initial Leak Current** Less than 10µA **Post Endurance Leak Current** Less than 1mA

9	**Connector - Connector Overcurrent Loading**	Pass the following current for the specified time below through only one circuit that is arbitrarily selected: (20awg) Current (Amps) — Time **16.5** — **60 Minutes** **20.2** — **200 Seconds** **22.5** — **5 Seconds** **30** — **1 Second**	Housing shall not start burning

5.2 MECHANICAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	**Connector Mate/ Unmate Forces**	Mate and Unmate connector (male to female) at a rate of **50 ± 6** mm (**2 ± ¼** inch) per minute.	Mate **60** Newtons MAXIMUM
			Unmate w/o latch **75** Newtons MAXIMUM
			Unmate w/latch **120** Newtons MINIMUM
2	**Terminal Retention Force (in Housing)**	Axial pullout force on the terminal in the housing at a rate of **50 ± 6** mm (**2 ± ¼** inch) per minute.	TPA in Pre-Lock **60** Newtons MINIMUM
			TPA in Final-Lock **80** Newtons MINIMUM
3	**Terminal Insertion Force (into Housing)**	Apply an axial insertion force on the terminal at a rate of **50 ± 6** mm (**2 ± ¼** inch) per minute.	**6** Newtons MAXIMUM
4	**Connector Audible Feedback**	The connector lock must provide audible feedback during connector mating at a rate of **50 ± 6** mm (**2 ± ¼** inch) per minute.	**7**dB over Ambient (C scale)
5	**Polarization Feature Effectiveness**	Connector must be polarized to prevent mating with similar connectors - **0° Misorientation for all possible header and receptacle configurations**	**120** Newtons MINIMUM
			110 Newton Minimum 12 Ckt: Pol C to Pol A
6	**Terminal Position Assurance (TPA) Insertion Force (into housing)**	The TPA is designed to resist seating during shipment and must be actuated by the operator in order to fully seat. The force to either insert the TPA from the preload (as shipped) position to the final position or extract the TPA from final to preload at a rate of **50 ± 6** mm (**2 ± ¼** inch) per minute.	**TPA Insertion w/o terminals: 180** Newtons MINIMUM
			TPA Insertion with terminals: 20 Newtons MAXIMUM
			TPA Extraction – 1st Cycle: 15 Newtons MAXIMUM
			TPA Extraction – 2nd Cycle: 20 Newtons MINIMUM

7	**Terminal Position Assurance (TPA) Extraction Force (in housing)**	The force to completely extract the TPA from preload (as shipped) position at a rate of **50 ± 6** mm (**2 ± ¼** inch) per minute.	**50** Newtons MINIMUM
8	**Header Pin Retention Force (in Vertical & Right Angle Housing)**	Axial pushout force on the terminal in the housing at a rate of **50 ± 6** mm (**2 ± ¼** inch) per minute.	**15** Newtons MINIMUM
9	**Insertion / Removal Feeling**	Insert and remove the terminal or the connector, while checking the correctness of the insertion/removal feeling	Connector shall be free of detrimental cracking, rust, play, flaw, deformation, and other defects. Terminal shall be free of catching and / or other abnormality.
10	**Force-to-Seat Header to PCB (No Solder)**	The force to completely seat the Header to the PCB traveling a distance of 1.3mm	**100 N** Max
11	**Force-to-Remove Header from PCB (No Solder)**	The force to completely remove the Header from the PCB without solder	**10 N** Min
12	**Pry Resistance**	A pair of connectors shall have one of them secured and the other inserted. Under these conditions, they shall be pried axially, rectangularity, front and rear and right and left around the top with a force of 78 N After prying the connectors to two stages of fitting, pull them out. This is one cycle. Subject connectors to 10 cycles and Perform **Contact Resistance @ Rated Current (Voltage Drop)** and **Connector Mate/Unmate Forces** (with latch only)	While being tested, the connectors shall not have any problem in being made electrically alive **Voltage Drop** **10** milliohms MAXIMUM Mate **78** Newtons MAXIMUM Unmate w/latch **110** Newtons MINIMUM
13	**Pry Resistance II**	Pull the female connector wire at a 45º angle in the direction which minimizes the male and female terminal contact at a speed of 5mm/min to 100N. Then decrease the pulling load at the same speed to 0N (No Force)	There shall be no interruptions in the waveform
14	**Connector Drop Test**	**System Assembly (Mated & Fully populated) –** Subject the assembly to a fall of 1 meter on each face, except for electrical wire side, onto a concrete floor	No damage or incipient rupture shall be observed.

		Connector Assembly (Unmated & Fully Populated) - Subject the assembly to a fall of 1 meter on each face, except for electrical wire side, onto a concrete floor	No damage or incipient rupture shall be observed.

5.3 ENVIROMENTAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	**Durability**	Mate connectors up to **10** cycles prior to environmental tests.	**20** milliohms MAXIMUM
2	**Thermal Shock (Electrical)**	Mate connectors per durability; expose to **600** cycles of: Temperature Cº / Duration (Minutes) **-40 +0/-3** **30** **+105 +3/-0** **30** Perform **Contact Resistance (Low Level)**	**Dry Circuit Resistance** **10** milliohms MAXIMUM & Discontinuity < **1** microsecond
3	**Thermal Shock (Physical)**	Mate connectors per durability; expose to **300** cycles of: Temperature Cº / Duration (Minutes) **-40 +0/-3** **30** **+105 +3/-0** **30** Apply a voltage of **500** VDC per Isolation Resistance	**100** Meg ohms MINIMUM
		Apply an AC rms voltage of 1000V at 60 Hz per Dielectric Strength	No dielectric breakdown or flash-over shall occur between cavities or between the cavities and the outside of a connector at any time during the test.
4	**Thermal Shock (Mechanical)**	Mate connectors per durability; expose to **1000** cycles of: Temperature Cº / Duration (Minutes) **-40 +0/-3** **30** **+105 +3/-0** **30** Unmate connector per Connector Mate/ Unmate Forces	Unmate w/latch **85** Newtons MINIMUM

		Mate connectors per durability; expose to **1000** cycles of: Temperature Cº / Duration (Minutes) **-40 +0/-3 30** **+105 +3/-0 30** Extract terminal from housing per Terminal Retention Force (in Housing)	TPA in Final-Lock **85** Newtons MINIMUM
5	**Random Vibration / Mechanical Shock (Not Coupled to Engine - Electrical)**	Mate connectors per durability. Perform **Contact Resistance (Low Level)** Connector assembly shall be subject to the following vibration profile: **Mechanical Shock**: Acceleration: 25 Gs Nominal Shock Duration: 15ms Nominal Shock Shape: Half Sine Number of shocks per axis: 792 **Random Vibration with Thermal Cycling** Temperature Range: -40/+105ºC Test Duration: 24h for each X,Y,Z axis of the parts RMS Acceleration = **20.9m/s^2** Perform **Contact Resistance (Low Level)** Perform **Contact Resistance @ Rated Current (Voltage Drop)**	**Dry Circuit Resistance** **6** milliohms MAXIMUM No instantaneous disconnection of 7 Ω or more for 1 µs Max No instantaneous disconnection of 7 Ω or more for 1 µs Max **Dry Circuit Resistance** **15** milliohms MAXIMUM **Voltage Drop** **15** milliohms MAXIMUM
6	**Random Vibration with Thermal Cycling / Mechanical Shock (Not Coupled to Engine - Electrical)**	Mate connectors per durability. Perform **Contact Resistance (Low Level)** Condition parts for 48h at the maximum temperature of 4h@-40 and 6.5h@105ºC. Subject connectors to 16h vibration per axis in all 3 axes. Perform **Contact Resistance (Low Level)** Maintain for 12h at 85ºC and 75% humidity Perform **Contact Resistance (Low Level)** Perform **Contact Resistance @ Rated Current (Voltage Drop)**	**Dry Circuit Resistance** **6** milliohms MAXIMUM **Delta Dry Circuit Resistance** **5** milliohms MAXIMUM **Delta Final Dry Circuit Resistance** **7** milliohms MAXIMUM **Voltage Drop** **10** milliohms MAXIMUM

		Perform Unmate portion only of **Connector Mate/Unmate Forces**	Unmate w/latch **100** Newtons MINIMUM
7	**Temperature/ Humidity Cycling (Electrical)**	Mate connectors per durability. Subject connector system to **10** cycles of: **60%** RH **4** hours @ **23** C°; **97%** RH **10** hours @ **55** C°, **2** hour @ -**40** C°; **2** hours @ **105** C° Perform **Contact Resistance (Low Level)** Perform **Contact Resistance @ Rated Current (Voltage Drop)**	**Dry Circuit Resistance** **10** milliohms MAXIMUM **Voltage Drop** **10** milliohms MAXIMUM
8	**Temperature/ Humidity Cycling (Physical)**	Mate connectors per durability. Subject connector system to **10** cycles of: **60%** RH **4** hours @ **23** C°; **97%** RH **10** hours @ **55** C°, **2** hour @ -**40** C°; **2** hours @ **105** C° Apply a voltage of **500** VDC per Isolation Resistance	**100** Meg ohms MINIMUM
		Apply an AC rms voltage of 1000V at 60 Hz per Dielectric Strength	No dielectric breakdown or flash-over shall occur between cavities or between the cavities and the outside of a connector at any time during the test.
9	**Temperature/ Humidity Cycling (Mechanical)**	Mate connectors per durability. Subject connector system to **10** cycles of: **60%** RH **4** hours @ **23** C°; **97%** RH **10** hours @ **55** C°, **2** hour @ -**40** C°; **2** hours @ **105** C° Unmate connector per Connector Mate/ Unmate Forces	Unmate w/latch **85** Newtons MINIMUM
		Mate connectors per durability. Subject connector system to **10** cycles of: **60%** RH **4** hours @ **23** C°; **97%** RH **10** hours @ **55** C°, **2** hour @ -**40** C°; **2** hours @ **105** C° Extract terminal from housing per Terminal Retention Force (in Housing)	TPA in Final-Lock **85** Newtons MINIMUM
10	**High Temperature Exposure (Electrical)**	Mate connectors per durability. Subject connector system to **105** Cº for **1008** hours. Perform **Contact Resistance (Low Level)** Perform **Contact Resistance @ Rated Current (Voltage Drop)**	**Dry Circuit Resistance** **10** milliohms MAXIMUM **Voltage Drop** **10** milliohms MAXIMUM
11	**High Temperature Exposure (Physical)**	Mate connectors per durability. Subject connector system to **105** Cº for **1008** hours. Apply a voltage of **500** VDC per Isolation Resistance post 1008 hours	**100** Meg ohms MINIMUM

<table>
<tr><td></td><td></td><td>Apply an AC rms voltage of 1000V at 60 Hz per Dielectric Strength</td><td>No dielectric breakdown or flash-over shall occur between cavities or between the cavities and the outside of a connector at any time during the test.</td></tr>
<tr><td rowspan="2">12</td><td rowspan="2">High Temperature Exposure (Mechanical)</td><td>Mate connectors per durability. Subject connector system to 105 Cº for 1008 hours. Apply a force of 98N to wire bundle and pull on wire bundle in the following directions: Straight, +45° Vertical, -45° Vertical, +45° Horizontal, & -45° Horizontal</td><td>No breakage or electrical discontinuities at 98N or less</td></tr>
<tr><td>Mate connectors per durability. Subject connector system to 105 Cº for 1008 hours. Extract terminal from housing per Terminal Retention Force (in Housing)</td><td>TPA in Final-Lock
85 Newtons MINIMUM</td></tr>
<tr><td>13</td><td>Chemical Resistance (Electrical)</td><td>Perform Contact Resistance (Low Level).

Expose connectors to the following fluids for the specified duration of soak and dry time:
<table>
<tr><td>Resistance To Fluids:</td><td>Time / Temp. in Fluid</td><td>Time / Temp. Drying</td></tr>
<tr><td>Automatic Transmission Oil:</td><td>15 Seconds @ 23°C</td><td>24 Hours @ 105°C</td></tr>
<tr><td>Zinc Chloride:</td><td>15 Seconds @ 23°C</td><td>24 Hours @ 23°C</td></tr>
<tr><td>Fuel:</td><td>7 Days @ 23°C</td><td>7 Days @ 23°C</td></tr>
<tr><td>Engine Coolant:</td><td>5 Minutes @ 23°C</td><td>48 Hours @ 50°C</td></tr>
<tr><td>Windshield Washer Fluid:</td><td>5 Minutes @ 23°C</td><td>48 Hours @ 50°C</td></tr>
</table>
Perform Contact Resistance (Low Level) and Contact Resistance @ Rated Current (Voltage Drop).</td><td>No deformation or cracks shall be observed in connector

<u>Delta Dry Circuit Resistance</u>
6 milliohms MAXIMUM
<u>Voltage Drop</u>
8 milliohms MAXIMUM</td></tr>
</table>

<table>
<tr>
<td>14</td>
<td>Chemical Resistance (Mechanical)</td>
<td>Expose connectors to the following fluids for the specified duration of soak and dry time:
<table>
<tr><td>Resistance To Fluids:</td><td>Time / Temp. in Fluid</td><td>Time / Temp. Drying</td></tr>
<tr><td>Automatic Transmission Oil:</td><td>15 Seconds @ 23°C</td><td>24 Hours @ 105°C</td></tr>
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<tr><td>Windshield Washer Fluid:</td><td>5 Minutes @ 23°C</td><td>48 Hours @ 50°C</td></tr>
</table>
Unmate connector per Connector Mate/ Unmate Forces. (Hand Evaluation) Extract terminal from housing per Terminal Retention Force (in Housing)</td>
<td>No deformation or cracks shall be observed in connector

Unmate w/latch (hand evaluation) shall show no signs of functional degradation.

TPA in Final-Lock
80 Newtons MINIMUM</td>
</tr>
<tr>
<td rowspan="2">15</td>
<td rowspan="2">Chemical Resistance (Physical)</td>
<td>Expose connectors to the following fluids for the specified duration of soak and dry time:
<table>
<tr><td>Resistance To Fluids:</td><td>Time / Temp. in Fluid</td><td>Time / Temp. Drying</td></tr>
<tr><td>Automatic Transmission Oil:</td><td>15 Seconds @ 23°C</td><td>24 Hours @ 105°C</td></tr>
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<tr><td>Windshield Washer Fluid:</td><td>5 Minutes @ 23°C</td><td>48 Hours @ 50°C</td></tr>
</table>
Apply a voltage of 500 VDC per Isolation Resistance post 1008 hours</td>
<td>No deformation or cracks shall be observed in connector

100 Meg ohms MINIMUM

<u>NOT MET</u>
Zinc Chloride and Engine Coolant</td>
</tr>
<tr>
<td>Apply an AC rms voltage of 1000V at 60 Hz per Dielectric Strength</td>
<td>No dielectric breakdown or flash-over shall occur between cavities or between the cavities and the outside of a connector at any time during the test.</td>
</tr>
</table>

16	**Solderability**	Steam-age samples for 8 hours (Category 3), set at ambient for at least one hour, and its pins were dipped in ROL1 flux and 63/37 tin lead solder at **234ºC** per procedure of **SMES-152** Paragraph 5.3.4 Dip Coated. Criteria for passing visual was SMES-152 Rev E Paragraph 5.4.1.	Solder coverage: **95**% MINIMUM (per **SMES-152**)
17	**IR Process Soldering**	Molex IR Profile: **ES-40000-5013** Maximum Temperature: **260ºC**	Dimensional: Conformance to Sales Drawing requirements & Visual: No Damage

6.0 PACKAGING

Parts shall be packaged to protect against damage during handling, transit and storage.
TPAs may become seated during transit, please refer to PS-34646-001 for more information.

7.0 GAGES AND FIXTURES

All applicable gages and fixtures are referenced in the appropriate control plans.

8.0 OTHER INFORMATION

Products conform to the following environmental ratings:

Temperature: 105ºC
Vibration: On-Body
Sealing: Un-Sealed

To ensure compliance with our product validation, it is imperative that our product meet the print dimensions. Any non-conformance with the true position of the PCB pins or mating interface will create performance failures that include; PCB installation, increased mate/unmate forces and electrical discontinuities.

To this effect, Molex does not recommend or endorse the ganging of individual Stac64 header assemblies by our distribution partners or customers. We have developed a repeatable and efficient method of producing 2, 3, and 4 bay header assemblies that meet the print requirements to optimize product performance.