# COMPONENT SPECIFICATION

**M40 SERIES CONNECTORS**

**AUGUST 2012**

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COMPONENT SPECIFICATION
M40 SERIES CONNECTORS

1. DESCRIPTION OF CONNECTOR AND INTENDED APPLICATION.
A selection of 1.00mm pitch connectors, comprising vertical board to board surface mount plugs and sockets.

2. MARKING OF THE CONNECTOR AND/OR PACKAGE (ORDER CODE).
The marking (order code) shall appear on the package and shall be of the following style:

```
Product Group  M40
Connector Style XXX
No. of Ways XX
Contact Finish XX
Packaging X
```

Connector Style:
- Surface Mount Plug ....................... 600
- Surface Mount Socket .................... 620
- Surface Mount Socket .................... 310
- Surface mount Pin Header ............... 320

No. of Ways, Finish & Packaging:
See individual drawings

3. RATINGS.

3.1. MATERIAL & FINISH.
Materials:
- Mouldings:
  - M40-310/320 ................................................................. Glass-Filled PA6T, UL94V-0
  - M40-600/620 ................................................................. LCP, UL94V-0
- Contacts ................................................................. Phosphor Bronze
- Retainer ................................................................. Brass
Finish: .......................................................................... See Individual Drawings

3.2. ENVIRONMENTAL CHARACTERISTICS.
Temperature Range:
- M40-310/320 ................................................................. -40°C to +105°C
- M40-600/620 ................................................................. -20°C to +125°C
3. RATINGS (continued).

3.3. ELECTRICAL CHARACTERISTICS.
Current Rating:
M40-310 .................................................................................................................. 1.0A AC/DC
M40-320 .................................................................................................................. 1.0A AC/DC
M40-600/620 .......................................................................................................... 0.5A AC/DC
Voltage Rating: ................................................................................................... 150V AC/DC
Contact Resistance (initial):
M40-310/320 ......................................................................................................... 20 mΩ max
M40-600/620 ......................................................................................................... 50 mΩ max
Contact Resistance (after conditioning):
M40-310/320 ......................................................................................................... 30 mΩ max
M40-600/620 ......................................................................................................... 75 mΩ max
Dielectric Withstanding Voltage:
M40-310/320 ......................................................................................................... 500V AC for 1 minute
M40-600/620 ......................................................................................................... 250V AC for 1 minute
Insulation resistance:
M40-310/320 ......................................................................................................... 1,000 MΩ min
M40-600/620 ......................................................................................................... 500 MΩ min

3.4. MECHANICAL CHARACTERISTICS.
Contact Retention in moulding:
M40-320 ................................................................................................................. 1.47N min
M40-600 ................................................................................................................. 4.9N min
M40-620 ................................................................................................................. 5.9N min
Retainer retention in moulding:
M40-600/620 ......................................................................................................... 7.8N min
Soldered retainer retention on PC Board:
M40-600/620 ......................................................................................................... 29.4N min
Insertion force (per contact):
M40-310/320 ......................................................................................................... 1.5N max
M40-600/620 ......................................................................................................... 2.7N max
Withdrawal force (per contact):
M40-310/320 ......................................................................................................... 0.1N min
M40-600/620 ......................................................................................................... 0.4N min
Durability
M40-310/320 ......................................................................................................... 300 cycles
M40-600/620 ......................................................................................................... 30 cycles
COMPONENT SPECIFICATION
M40 SERIES CONNECTORS (continued)

APPENDIX A - TEST METHODS AND PERFORMANCE – M40-310/320.

A1.1. TEST CONDITIONS.
Unless otherwise specified, all tests and measurements shall be performed under the conditions and in accordance with EIA 364.

A1.2. TEST METHODS.
A1.2.1. Electrical.
i) Contact Resistance.
Test Method .................................................................................................................. EIA 364-23
Solder a plug and a socket to PC Boards and mate them together. Measure the contact resistance between the two mated boards. Apply the low-level condition of 20mV max. for the open circuit voltage and 100mA max. for the closed circuit current. Contact resistance must not exceed the values stated in section 3.3.

ii) Dielectric Withstanding Voltage.
Mate a plug and socket together (not soldered to a PC Board). Apply between neighbouring contacts a 500V AC current for 1 minute in accordance with EIA 364-20. No creeping discharge, flash-over or insulator break-down is allowed. Current leakage must be less than 0.5mA.

iii) Insulation Resistance.
Mate a plug and socket together (not soldered to a PC Board). Apply between neighbouring contacts a 500V DC voltage for 1 minute. Measurement is taken in accordance with EIA 364-21. Insulation resistance must not be less than the value stated in section 3.3.

A1.2.2. Mechanical.
i) Contact Retention Force.
Test Method .................................................................................................................. EIA 364-29
Place a connector on a push-on/pull-off machine. Apply force onto the contact head and push the contact in the direction opposite to insertion. Measure the force when the contact dislodges from the moulding. Contact retention must conform to the figure stated in section 3.4.

ii) Insertion/Withdrawal Force.
Test Method .................................................................................................................. EIA 364-13
Place a mated connector pair on a push-on/pull-off machine. Repeat insertion and withdrawal for 30 cycles, at a speed of 50mm/min. along the mating axis. Insertion and withdrawal forces before, during and after the test must conform to those stated in section 3.4.

iii) Durability.
Place a mated connector pair on a push-on/pull-off machine. Repeat insertion and withdrawal for 300 cycles, at a speed of 200 cycles per hour, along the mating axis. Contact resistance before and after the test must meet the values stated in section 3.3.
COMPONENT SPECIFICATION
M40 SERIES CONNECTORS (continued)

APPENDIX A - TEST METHODS AND PERFORMANCE – M40-310/320 (continued).

A1.2. TEST METHODS (continued).

A1.2.3. Environmental.

i) Solderability
   Test Method ........................................................................................................... EIA-364-52 Category 3
   Steam Aging Temperature ................................................................................... 90 to 96°C
   Steam Aging Duration ....................................................................................... 8 Hours ±5 minutes
   Soldering Temperature ...................................................................................... 245°C ±5°C
   Soldering Time .................................................................................................... 4 to 5 seconds

   Result: More than 95% of the surface must have continuous solder coating.

ii) Vibration
   Test Method ................................................................. EIA-364-28, Condition V, Test letter A
   Test Condition .................................................................................................... Random
   Frequency ........................................................................................................... 50 - 2000Hz
   PSD Value .......................................................................................................... 3.13 G_{max} min
   Directions ........................................................................................................... Three mutually perpendicular directions
   Duration .............................................................................................................. 15 minutes / axis.

   Contact resistance before and after testing must meet the values specified in section 3.3. No electrical discontinuity greater than 1µS must occur during testing. Looseness amongst parts, chipping, breakage or other detrimental damage must not occur.

iii) Shock.
   Test Method ........................................................................................................ EIA-364-27, Condition H
   Wave form ......................................................................................................... Half-sinusoidal
   Peak acceleration .............................................................................................. 306 (294m/s²)
   Shock Duration .................................................................................................. 11 milliseconds
   Directions ........................................................................................................... Three mutually perpendicular directions
   Test Duration ...................................................................................................... 3 shocks in each direction, totalling 18 shocks

   Contact resistance before and after testing must meet the values specified in section 3.3. No electrical discontinuity greater than 1µS must occur during testing. Looseness amongst parts, chipping, breakage or other detrimental damage must not occur.

iv) Humidity.
   Test Method ....................................................................................................... EIA-364-31, Method III, Test Condition A
   Temperature ........................................................................................................ 25°C to 65°C
   Humidity ............................................................................................................. 90% to 95% RH
   Duration .............................................................................................................. 96 Hours

   Contact resistance before and after the test must meet the values stated in section 3.3. There must be no evidence of damage.

v) Thermal Shock.
   Test Method ....................................................................................................... EIA 364-32, Test Condition I
   Temperature ....................................................................................................... -55°C to +85°C
   Cycles ................................................................................................................ 5
   Exposure times at temperature extremes ............................................................. 30 Minutes

   Contact resistance before and after the test must meet the values stated in section 3.3. There must be no evidence of damage.
COMPONENT SPECIFICATION
M40 SERIES CONNECTORS (continued)

APPENDIX A - TEST METHODS AND PERFORMANCE – M40-310/320 (continued).

A1.2. TEST METHODS (continued).

A1.2.3. Environmental (continued).

vi) Salt Spray.

Test Method ................................................... EIA364-26, Test Condition A
Temperature .......................................................... 35°C ±1.1°C
Humidity .............................................................. 95 to 98% RH
PH Value ............................................................... 6.5 to 7.2
Duration ..................................................................... 8 Hours

Contact resistance before and after the test must meet the values stated in section 3.3. There must be no evidence of damage.

vii) Heat Resistant.

Test Method ................................................... EIA-364-17, Test Condition 3, Method A
Temperature .......................................................... 85°C ±2°C
Duration ..................................................................... 96 Hours

Contact resistance before and after the test must meet the values stated in section 3.3. There must be no evidence of damage.

viii) Resistance to Soldering Heat

Test Method ................................................... EIA-364-56, Procedure 3, Test Condition C
Temperature .......................................................... 260 ±5°C
Time ........................................................................ 5 to 10 seconds

Contact resistance before and after the test must meet the values stated in section 3.3. There must be no evidence of damage. Mechanical performance before and after the test must meet the values stated in section 3.4.

IR Reflow Temperature profile ................................ 220°C, 225°C, 230°C, 240°C, 265°C
Speed .............................................................. 8mm/second

At 217°C, the connector needs to stay in the IR Reflow oven for 90 seconds min.
At 260°C, the connector needs to stay in the IR Reflow oven for 5 seconds min.

Contact resistance before and after the test must meet the values stated in section 3.3. There must be no evidence of damage. Mechanical performance before and after the test must meet the values stated in section 3.4.
COMPONENT SPECIFICATION
M40 SERIES CONNECTORS

APPENDIX B - TEST METHODS AND PERFORMANCE - M40-600/620.

B1.1. TEST CONDITIONS.
Unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with EIA-364 Standards:
- Temperature: 15°C to 35°C
- Humidity: 45% to 75% RH
- Atmospheric pressure: 650 to 850 mmHg

B1.2. TEST METHODS.
B1.2.1. Electrical.
i) Contact Resistance.
Solder a plug and a socket to PC Boards and mate them together. Measure the contact resistance using the 4-terminal method as shown in Figure 1. Apply 10mV DC max. at a current of 10mA in accordance with EIA-364-06B. for the closed circuit current. Contact resistance must not exceed the values stated in section 3.3.

![Contact Resistance Diagram](image)

Figure 1: Contact Resistance
Note: Contact resistance is defined as \( R_{\text{th}} \), i.e. the electrical resistance from point A on the back face of the lower PCB, through contact point B, to point C on the back face of the upper PCB. \( d = 2.7 \text{mm} \) on the next line.

ii) Dielectric Withstanding Voltage.
Mate a plug and socket together (not soldered to a PC Board). Apply between neighbouring contacts a 250V AC rms current for 1 minute in accordance with EIA-364-20B. No creeping discharge, flashover or insulator break-down is allowed.

iii) Insulation Resistance.
Mate a plug and socket together (not soldered to a PC Board). Apply between neighbouring contacts a 100V DC voltage. Measurement is taken in accordance with EIA-364-21C. Insulation resistance must not be less than the value stated in section 3.3.
COMPONENT SPECIFICATION
M40 SERIES CONNECTORS (continued)

APPENDIX B - TEST METHODS AND PERFORMANCE - M40-600/620 (continued).

B1.2. TEST METHODS (continued).

B1.2.2. Environmental.

i) Heat Resistant.
Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to
the following environment:

Temperature......................................................................................................................+80° ±3°C
Duration..........................................................................................................................500 ±12 hours
Contact resistance before and after the test must meet the values stated in section 3.3.

ii) Cold Resistant.
Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to
the following environment:

Temperature......................................................................................................................-30° ±3°C
Duration..........................................................................................................................500 ±12 hours
Contact resistance before and after the test must meet the values stated in section 3.3.

iii) Thermal Shock.
Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to
the following environment:

Temperature......................................................................................................................-30° (30 min.) Normal temp. (5 min.)
..........................................................................................................................+70°C (30 min.) Normal temp. (5 min.)
Transition time ......................................................................................................................5 minutes max.
Number of cycles ..................................................................................................................5
Contact resistance before and after the test must meet the values stated in section 3.3. Detrimental
damage affecting the performance must not occur.

iv) Humidity.
Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to
the following environment in accordance with MIL-STD-202, Method 103 Condition B:

Temperature......................................................................................................................40° ±2°C
Humidity..........................................................................................................................90% to 95% RH
Duration..........................................................................................................................500 ±12 hours
Contact resistance before and after the test must meet the values stated in section 3.3.

v) Salt Spray.
Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to
the following environment in accordance with MIL-STD-202, Method 101 Condition B:

Temperature......................................................................................................................35°C
Salt water density................................................................................................................5% (by weight)
Duration..........................................................................................................................48 hours
Contact resistance before and after the test must meet the values stated in section 3.3. Detrimental
damage affecting the performance must not occur.
COMPONENT SPECIFICATION
M40 SERIES CONNECTORS (continued)

APPENDIX B - TEST METHODS AND PERFORMANCE - M40-600/620 (continued).

B1.2. TEST METHODS (continued).
   B1.2.2. Environmental (continued).
   vi) Gas.
       Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to
       the following environment:
       Chamber temperature ................................................................. 25° ±2°C
       Gas ................................................................................................. H₂S, 10ppm
       Duration ....................................................................................... 24 hours
       Contact resistance before and after the test must meet the values stated in section 3.3. Detrimental
       damage affecting the performance must not occur.

   vii) Vibration.
       Solder a plug and a socket to PC Boards and mate them together. Place the mated connectors on a
       vibrator machine, and apply the following vibration in accordance with EIA-364-28D. Care should be
       taken to fix the boards firmly to the vibrator machine to avoid any unnecessary resonance of the
       boards. During the testing, run a 100mA DC current to check for any electrical discontinuity. The test
       cycle must cover the following parameters:
       a) Frequency .......................................................... 10Hz - 55Hz - 10Hz over 1 minute approx.
       b) Directions .......................................................... Three mutually perpendicular directions
       c) Total amplitude .......................................................... 1.50mm
       d) Sweep duration .......................................................... Two hours for each direction, totalling 6 hours.
       Contact resistance before and after testing must meet the values specified in section 3.3. No
       electrical discontinuity greater than 10µs must occur during testing. Looseness amongst parts,
       chipping, breakage or other detrimental damage must not occur.

   viii) Shock.
       Solder a plug and a socket to PC Boards and mate them together. Place the mated connectors on a
       shock machine, and apply the following shock in accordance with EIA-364-27B. Care should be taken
       to fix the boards firmly to the shock machine to avoid any unnecessary resonance of the boards.
       During the testing, run a 100mA DC current to check for any electrical discontinuity. The test cycle
       must cover the following parameters:
       a) Maximum shock .......................................................... 50g (490m/s²)
       b) Standard duration .......................................................... 11 milliseconds
       c) Wave form .......................................................... Half-sinusoidal
       No electrical discontinuity greater than 10µs must occur during testing. Looseness amongst parts,
       chipping, breakage or other detrimental damage must not occur.

   ix) Solderability.
       Dip the solder line of a plug and socket connector in a flux of RMA or R type for 5 to 10 seconds. Then
       dip the line into a solder bath (210°C ±5°C) for 5 ±0.5 seconds. This test is in accordance with MIL-
       STD-202, Method 208. More than 90% of the dipped surface must be evenly wet.
COMPONENT SPECIFICATION
M40 SERIES CONNECTORS (continued)

APPENDIX B - TEST METHODS AND PERFORMANCE - M40-600/620 (continued).

B1.2. TEST METHODS (continued).

B1.2.2. Environmental (continued).

x) Soldering Heat Resistance (Surface Mount).
Subject a surface mount connector to the following reflow soldering profile, no more than twice:

- Pre-heat: 150-216°C for 30-90 seconds
- Reflow solder: 235° ±5°C
- 220°C min. within 20 seconds
- 240°C max. within 5 seconds

Detrimental damage affecting the performance of the connector must not occur.

xi) Soldering Heat Resistance (Hand-soldered).
Hand-solder a plug and a socket connector to a PC Board, using a temperature of 350°C for no more than 3 seconds. Detrimental damage affecting the performance of the connector must not occur.

B1.2.3. Mechanical.
i) Contact Retention Force.
Place a connector on a push-on/pull-off machine. Apply force onto the contact head and push the contact in the direction opposite to insertion, at a speed of 25 ±3mm/min. Measure the force when the contact dislodges from the moulding. Plug and socket contact retention must conform to the figures stated in section 3.4.

ii) Retainer Retention Force.
Place a connector on a push-on/pull-off machine. Apply force onto the retainer in the direction opposite to insertion, at a speed of 25 ±3mm/min. Measure the force when the retainer dislodges from the connector. Retainer retention must conform to the figure stated in section 3.4.

iii) Soldered Retainer Retention Force.
Solder a connector to a PC Board, using only the retainers. Place the board onto a push-on/pull-off machine. Pull the connector at a speed of 25 ±3mm/min. Measure the force when the retainer breaks away from the board. Soldered retainer retention must conform to the figure stated in section 3.4.

Solder a plug and a socket to PC Boards. Place the boards onto a push-on/pull-off machine. Repeat insertion and withdrawal for 30 cycles, at a speed of 25 ±3mm/min along the mating axis. Insertion and withdrawal forces before, during and after the test must conform to those stated in section 3.4.

v) Electrical Continuity Durability.
Solder a plug and a socket to PC Boards. Place the boards onto a push-on/pull-off machine. Repeat insertion and withdrawal for 30 cycles, at a speed of 25 ±3mm/min along the mating axis. Contact resistance before and after the test must meet the values stated in section 3.3.