Revision Record					
Rev	**ECO**	**Description**	**Drft**	**Chk**	**Date**
A		New	TS	TS	9/01/2009

3M(TM) *Ultra* Hard Metric (UHM) Connectors

PRODUCT

SPECIFICATION

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1.0 PURPOSE

This document details metrological, electrical, mechanical, and environmental specifications for the 3M UHM product line.

1.1 Scope

This specification covers the performance and testing of the 3M UHM product platform. This connector platform is a separable, two-part, electric device for use with printed circuit boards.

2.0 APPLICABLE DOCUMENTS

The following list of documents composes a portion of this specification, which is not defined within the bindings of this document.

2.1 International Industry Product Performance and Test Standards

IEC-61076-4-101 Connectors with assessed quality, for use in d.c. low-frequency analogue and in digital high speed data applications

Exceptions: clearance distance of .70mm for fixed connector between signal and ground circuitry (HSHM only)

Exceptions: signal contact width 0.50mm +.00/-.14mm (HSHM and HM)

IEC-60512-2 (test 1a) Visual Examination

IEC-60512-2 (test 1b) Examination of Dimensions and mass

IEC-60512-7 (test 13e) Polarizing Method

IEC-60512-3 (test 5b) Current-Temperature Derating

IEC-60512-2 (test 2a) Contact Resistance

IEC-60512-2 (test 3a) Insulation Resistance

IEC-60512-2 (test 4a) Voltage Proof

IEC-60512-7 (test 13a) Engaging and Separating Forces

IEC-60512-7 (test 15a) Contact Retention in an Insert

IEC-60512-4 (test 6d) Vibration

Exceptions: contact disturbance not measured throughout test

IEC-60512-2 (test 2e) Contact Disturbance

IEC-60512-4 (test 6c) Shock

Exceptions: contact disturbance not measured throughout test

IEC-60512-6 (test 11d) Rapid Change of Temperature

IEC-60512-6 (test 11a) Climatic Sequence

IEC-60512-6 (test 11i) Dry Heat

IEC-60512-6 (test 11m) Damp Heat Cyclic

IEC-60512-6 (test 11j) Cold

IEC-60512-6 (test 11k) Low Air Pressure

IEC-60512-8 (test 16e) Gauge Retention Force

IEC-60512-5 (test 9a) Mechanical Operation

IEC-60512-6 (test 11g) Corrosion, Industrial Atmosphere (Annex A 1076)

IEC-60512-5 (test 8a) Static Load, Transverse

Exceptions: only half size, “F” module tested

IEC-60512-6 (test 11c) Damp Heat, Steady State

Exceptions: 60 V d.c. polarizing voltage not applied throughout test

IEC-60512-5 (test 9b) Electrical Load and Temperature

Exceptions: not performed under 1A load

IEC-60512-8 (test 16f) Robustness of Terminations

Exceptions: 1.80 lbf (8.0N) min. retention, largest via

IEC-60512-6 (test 11e) Mold Growth

Exceptions: test not performed

IEC-60512-9 (test 20a) Flammability

2.2 Domestic Industry Product Performance and Test Standards

UL 1977 Standard for Safety Component Connectors for Use in Data, Signal, Control and Power Applications (Type 0 connectors)

EIA-364-04 Normal Force Test Procedure for Electrical Connectors (Non-Plotting)

3.0 REQUIREMENTS

3.1 Construction and Design

Product construction, design, and physical dimensions shall be those specified in this document and pertinent drawings.

3.2 Materials

Insulators and Insulating Materials: 30% glass filled, high temperature liquid crystal polymer, 94V0 flame-retardant rating

Contacts and Conductors:

1. Headers shields: Phosphor Bronze alloy base metal (UNS C52100)
2. Signal headers pins: Phosphor Bronze alloy base metal (UNS C51000)
3. Signal sockets: Copper Nickel Silicon alloy base metal (UNS 70250)
4. Signal socket horizontal and vertical shields: Phosphor Bronze alloy base metal (UNS C51000)
5. Signal socket tail shields: Nickel Silver alloy base metal (UNS 77000)

3.3 Finishes

Socket and header finish per customer request (TG30 and KR)

TG30= 0.76 um (30 uinch) Gold on contact area
2.54 um (100 uinch) Tin-Lead on terminal area
1.27 um (50 uinch) Nickel underplating all over

KR= 0.76 um (30 uinch) hard Gold on contact area
5.08 um (200 uinch) Matte Tin on terminal area
1.27 um (50 uinch) Nickel underplating all over

4.0 METROLOGY

4.1 3M UHM Introduction

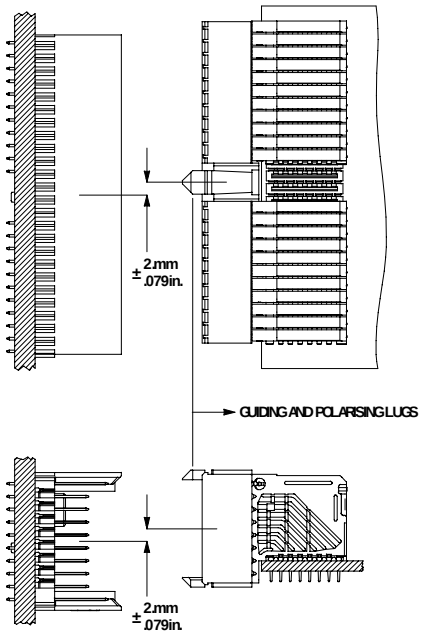
The Ultra Hard Metric (UHM), connector system contains 2.00-millimeter grid, two-piece, separable interface connectors. This connector family is modular and end-to-end stackable. The form factor for these connectors evolved from the well-established Eurocard standard (IEEE 1101.1).

The 3M UHM product offering incorporates shielding in the horizontal and vertical axis of the connector to significantly improve electrical performance and eliminates the need for dedicated ground pins, without sacrificing density. This is accomplished while maintaining the original connector form-factor.

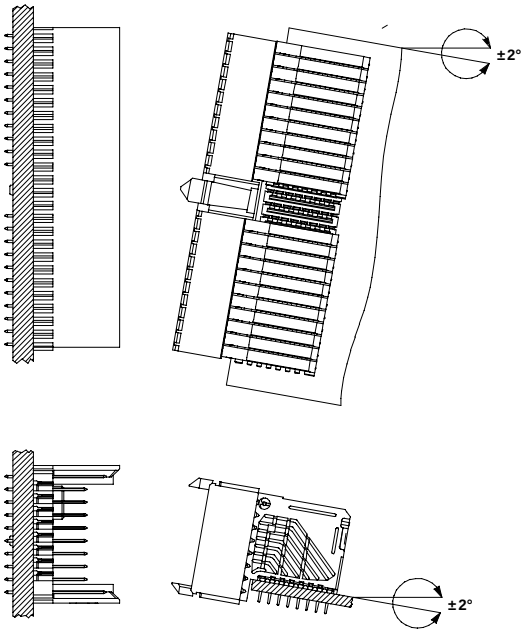
Because of the modular nature of the connector system, it is important to follow the guidelines outlined in the IEC-61076-4-101 for guidance and alignment. Following the guidelines will reduce the possibility of pin damage or other mechanical failure.

The guidance, polarization, and keying features for the entire connector primarily reside in a style “A” (5 row) and “D” (8 row) modules. These modules provide the capture and angular misalignment tolerance for the whole connector.

Allowable Misalignment and Inclination



ALLOWED MISALIGNMENT
TRANSVERSE AND LONGITUDINAL AXES

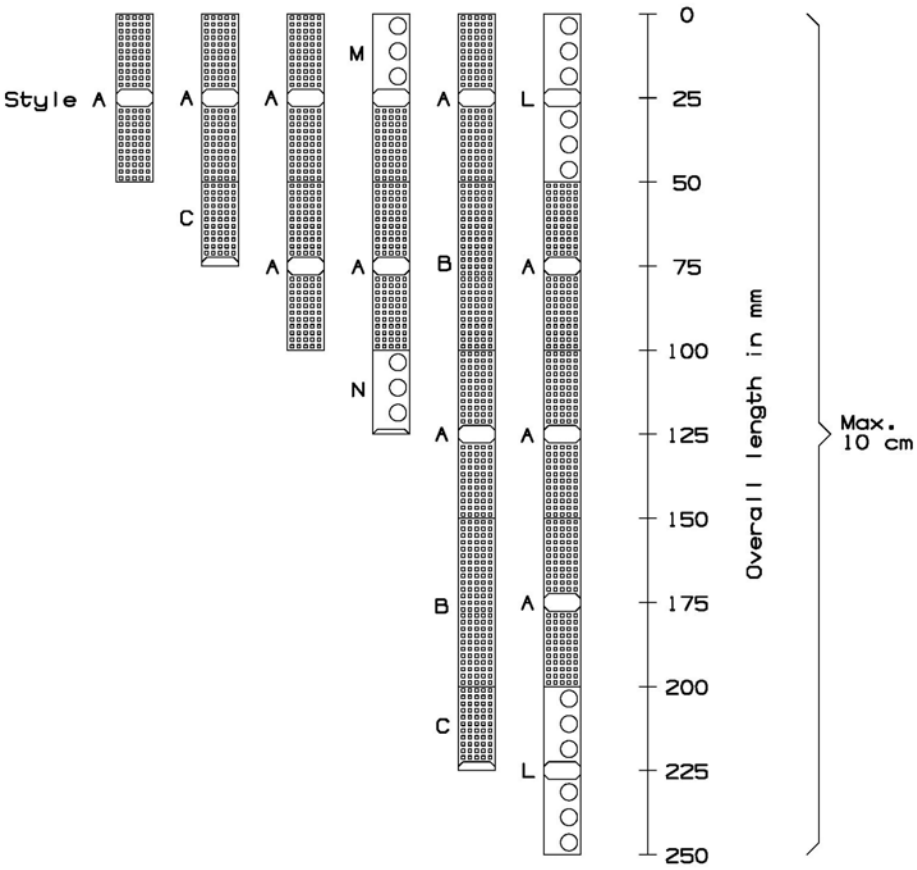


ALLOWED INCLINATION
TRANSVERSE AND LONGITUDINAL AXES

Layout Combinations

UHM connectors are built up of modules. The layout of the backplane and daughter cards with these modules should adhere to these restrictions:

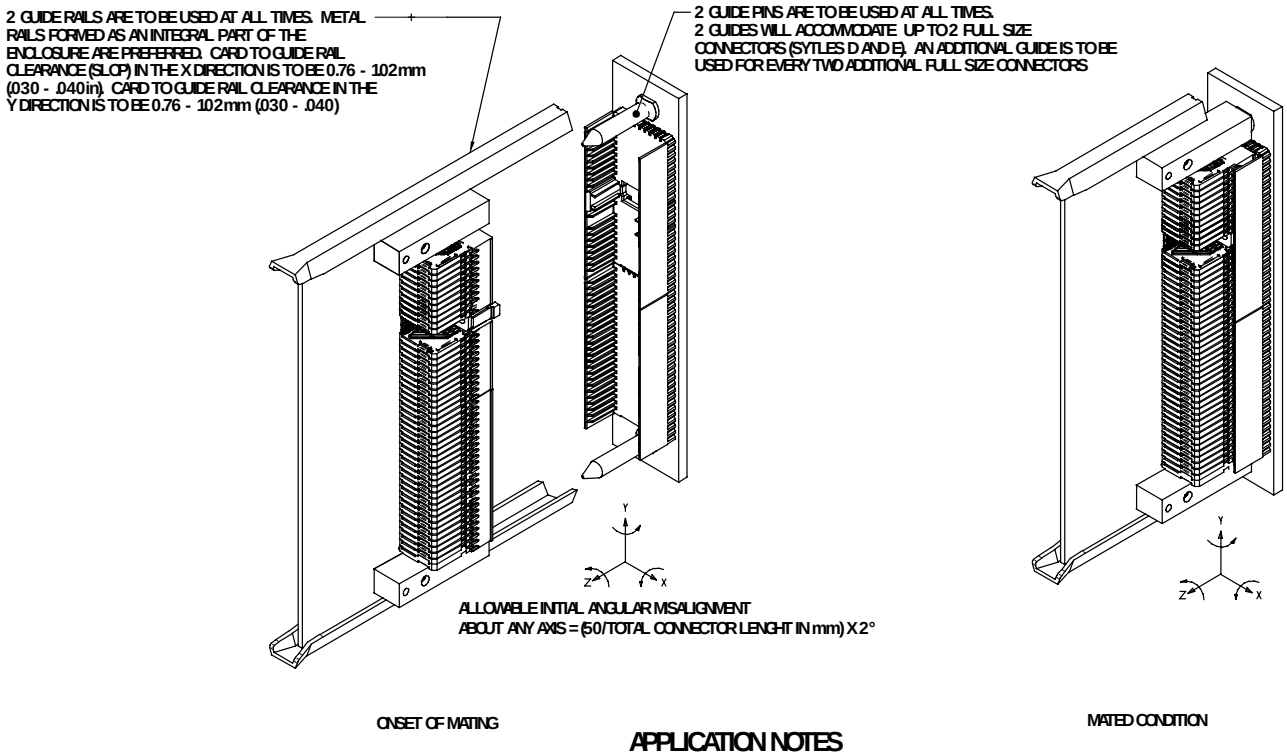
Styles B and E shall only be used between modules with a multi-purpose center, styles A and D. Extension modules, styles C and F, shall only be used at the top or bottom end of the connector with at least one style A or D module



Examples of allowed combinations

Additional guidelines for the UHM product are as shown below.

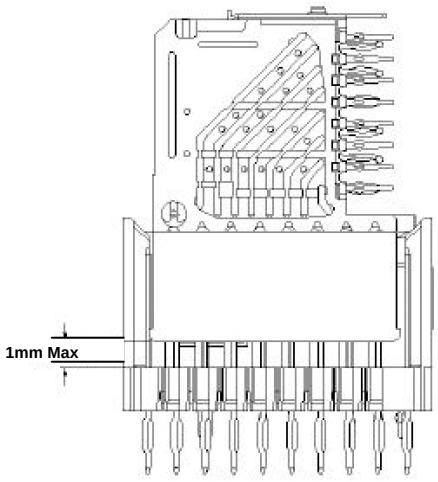
Primary Guidance Features: Guide Rails and Pin Guides



APPLICATION NOTES

NOTE: FOR ALTERNATE GUIDANCE USING STYLE "D" PARTS AND A GUIDE PIN CONTACT 3M ENGINEERING

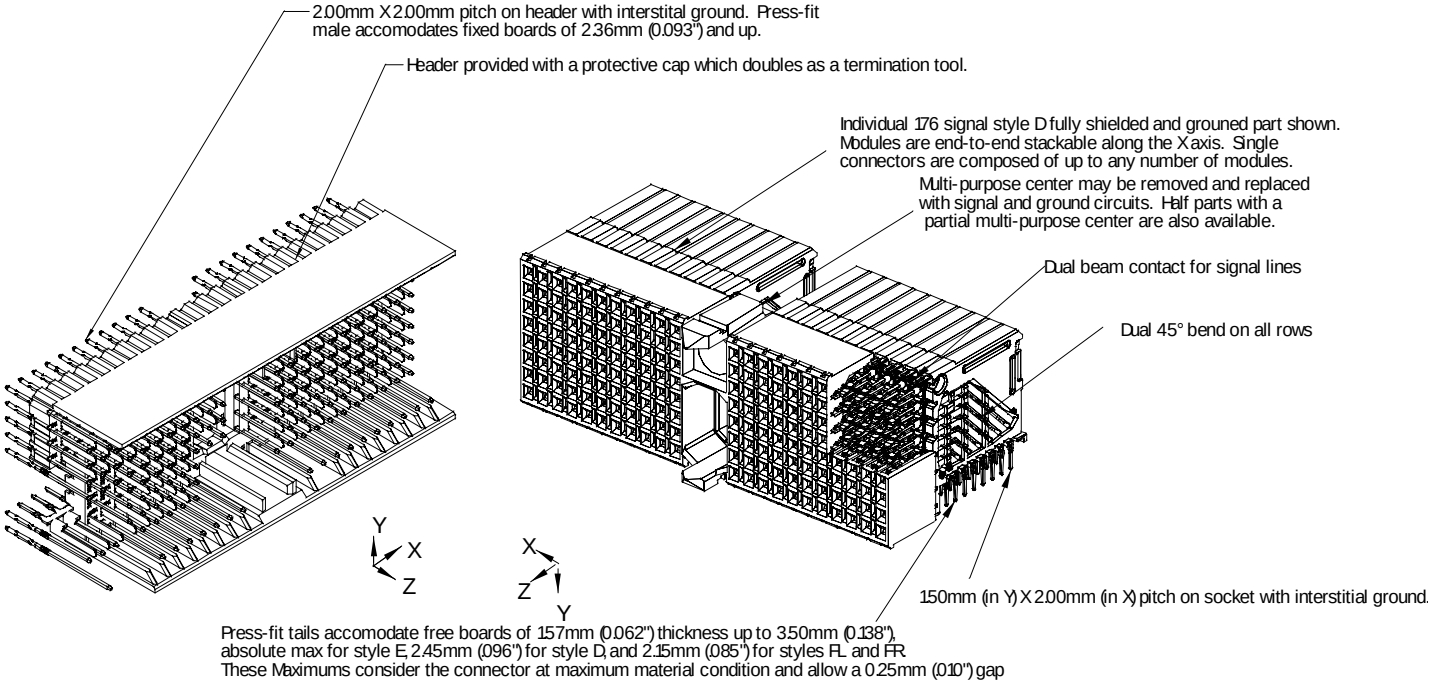
Maximum Allowable Underseat: 1.00 mm



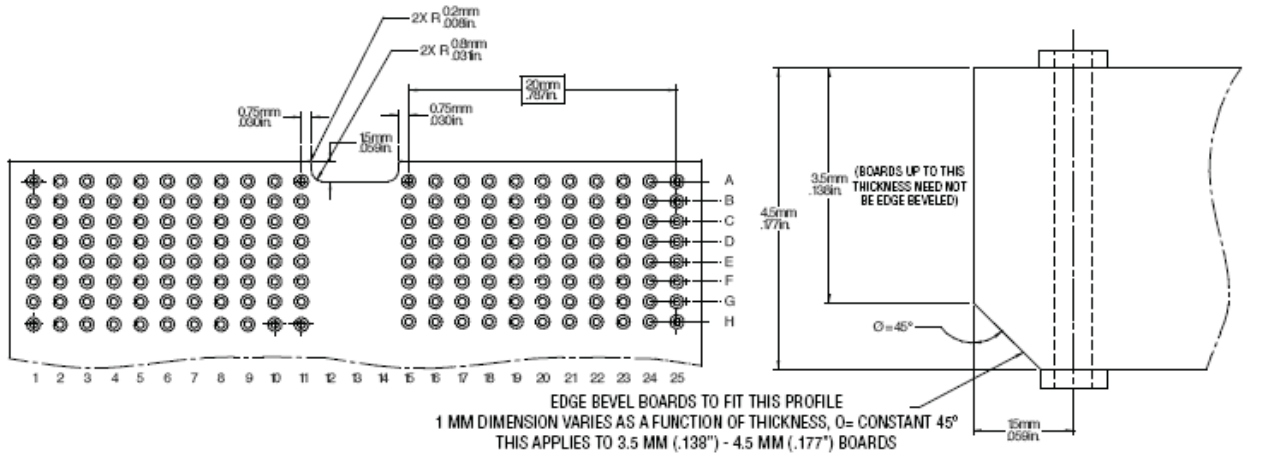
Note: Electrical performance will be impacted due to the under-seated gap. Contact 3M Engineering for specific information.

4.2 Standard UHM Connector System (section view of core product)

A. 8-Row



Note: For more detail see the module specific tech sheet. Board thickness of plus or minus 10% of the shown nominal is acceptable. Socket board thickness greater than those called out above are possible but require special notching and or chamfering.

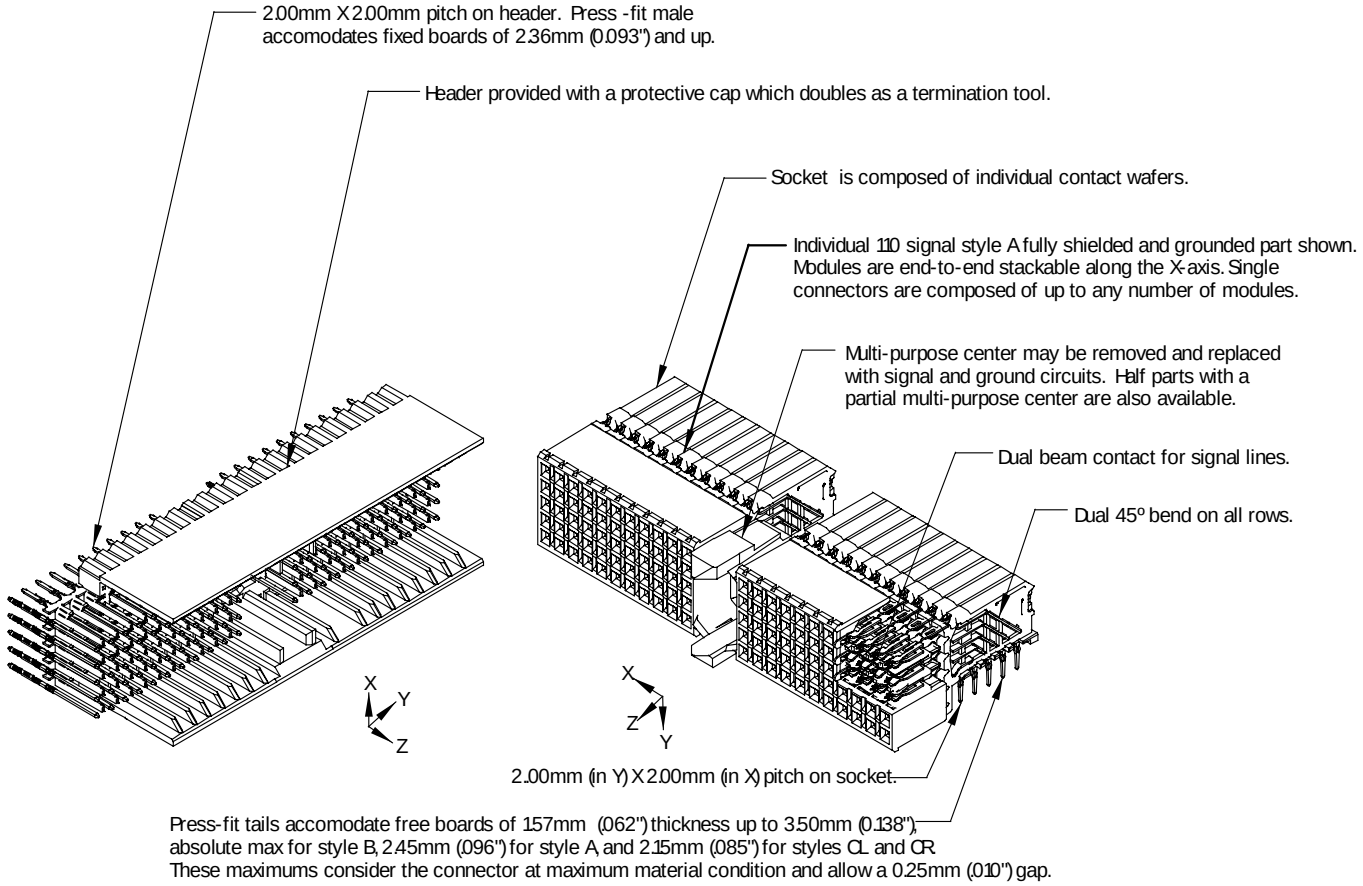


BOARD MODIFICATIONS FOR A,C,D AND F MODULES
TO INCREASE THICKNESS OF PCB ACCEPTED BY HEADER UP TO 3.5 MM (.138") BY EMPLOYING KEY SLOT

BOARD MODIFICATIONS FOR A,B,C,D,E AND F MODULES
TO INCREASE THICKNESS OF PCB ACCEPTED BY HEADER FROM 3.5 MM (.138") UP TO 4.5 MM (.177") BY EMPLOYING AN EDGE BEVEL IN CONJUNCTION WITH A KEY SLOT

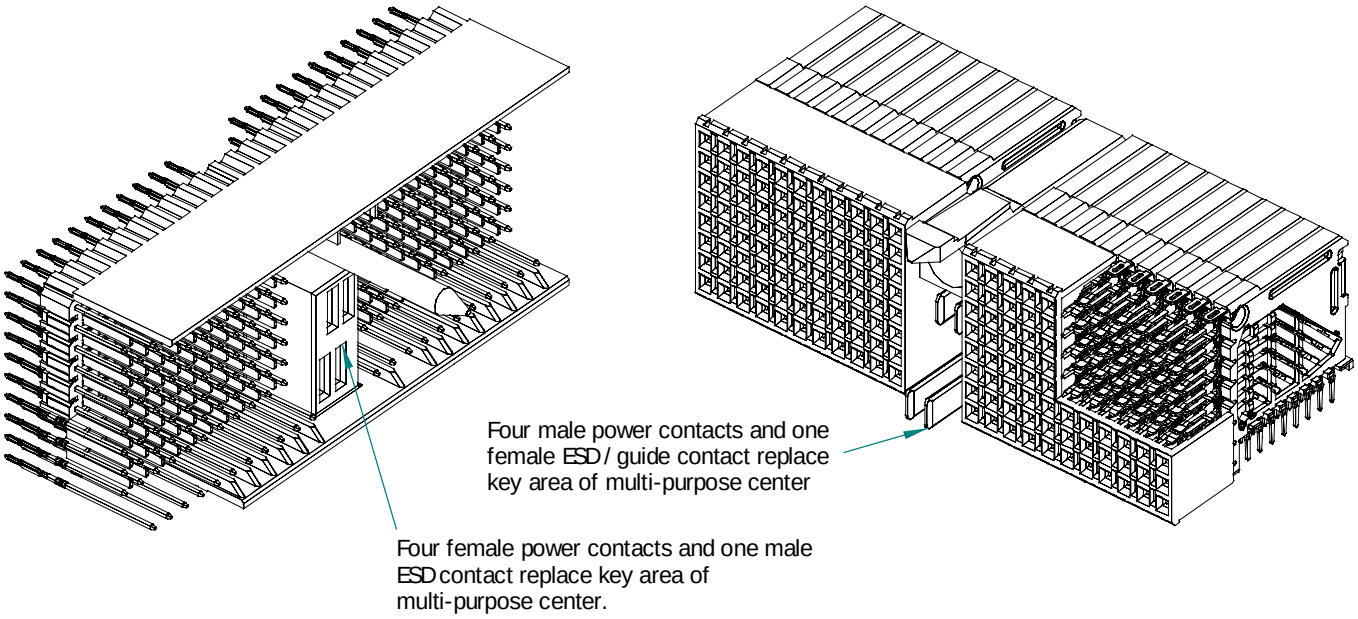
NOTE: FREE BOARD BOW CONSIDERATIONS ARE LEFT TO THE OEM
THESE MAXIMUMS CONSIDER CONNECTORS AT MAXIMUM MATERIAL CONDITION AND INCLUDE A 0.25 MM (.010") GAP

B. 5-Row



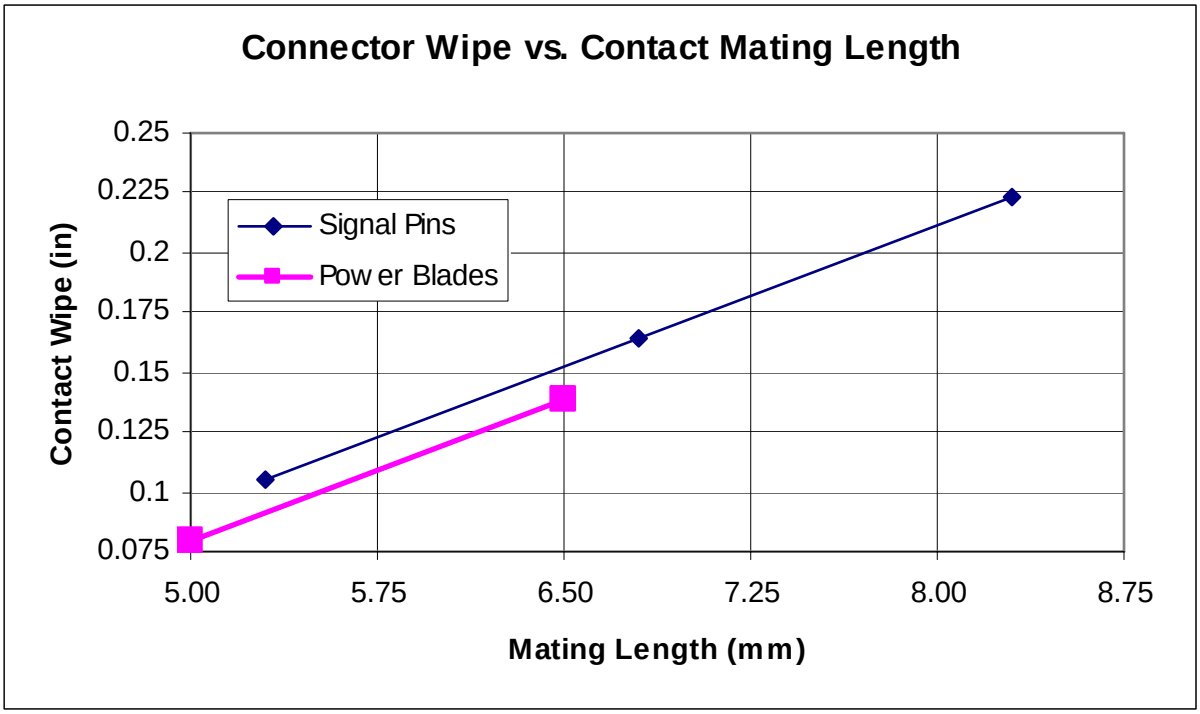
Note: For more detail see the module specific tech sheet. Board thickness of plus or minus 10% of the shown nominal is acceptable. Socket board thickness greater than those called out above are possible but require special notching and or chamfering (see section 4.2.A).

4.3 UHM Style D Connector System (section view of core product) with Power and Guidance



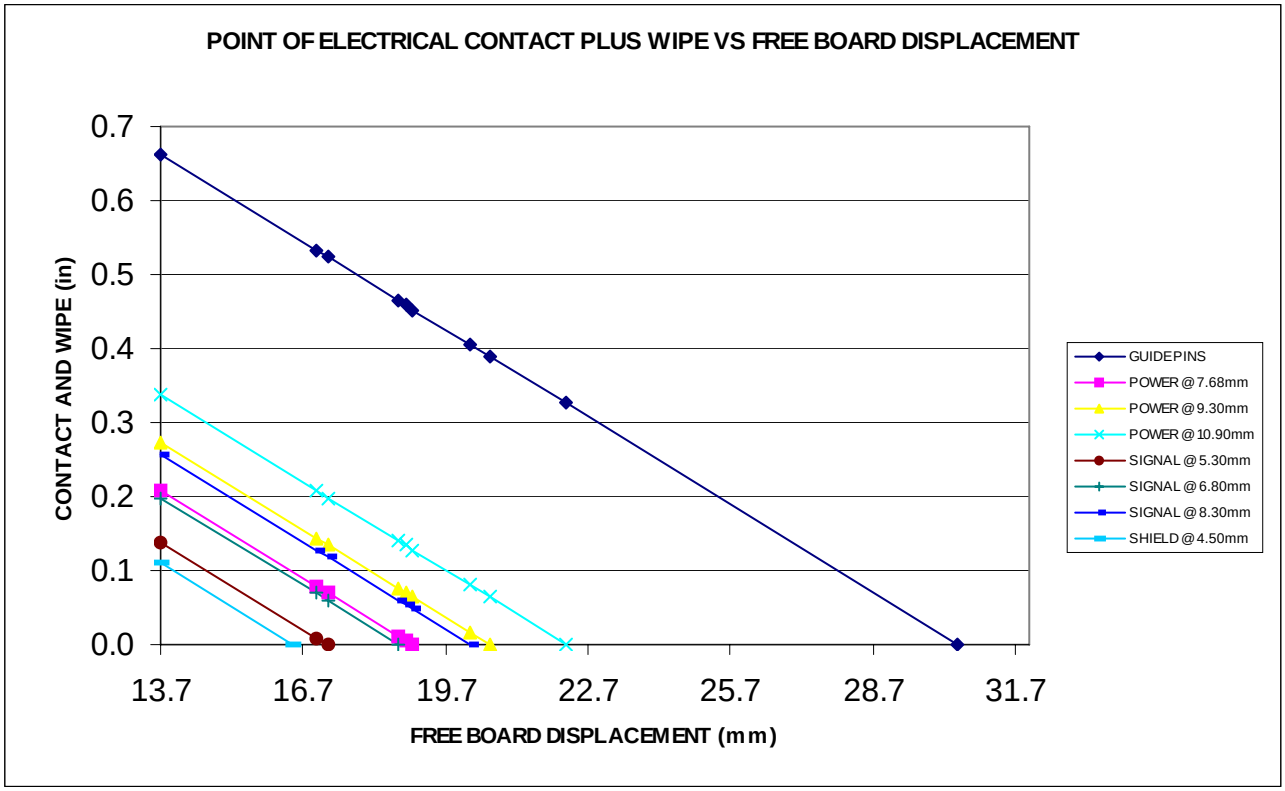
Note: For more detail see the module specific tech sheet. Board thickness of plus or minus 10% of the shown nominal is acceptable. Socket board thickness greater than those called out above are possible but require special notching and or chamfering (see section 4.2.A). PCB thickness guidelines for an “E” style module are applicable.

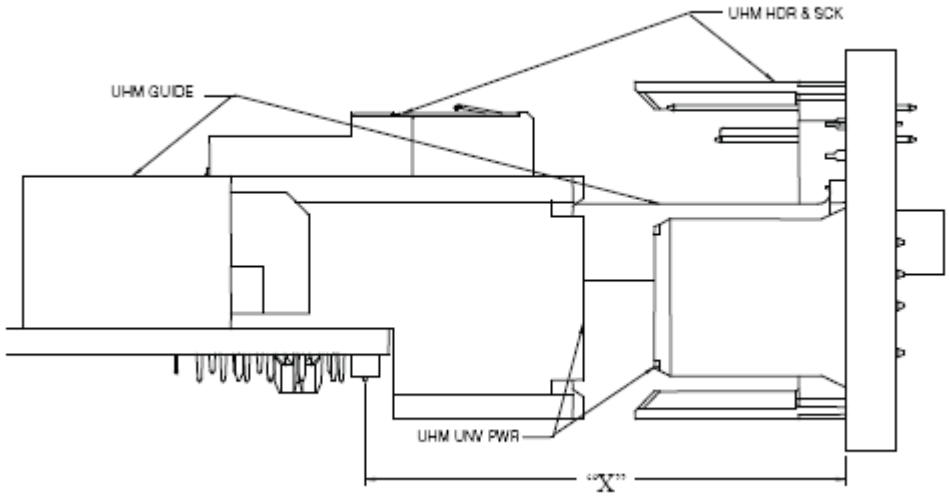
4.4 Connector Wipe



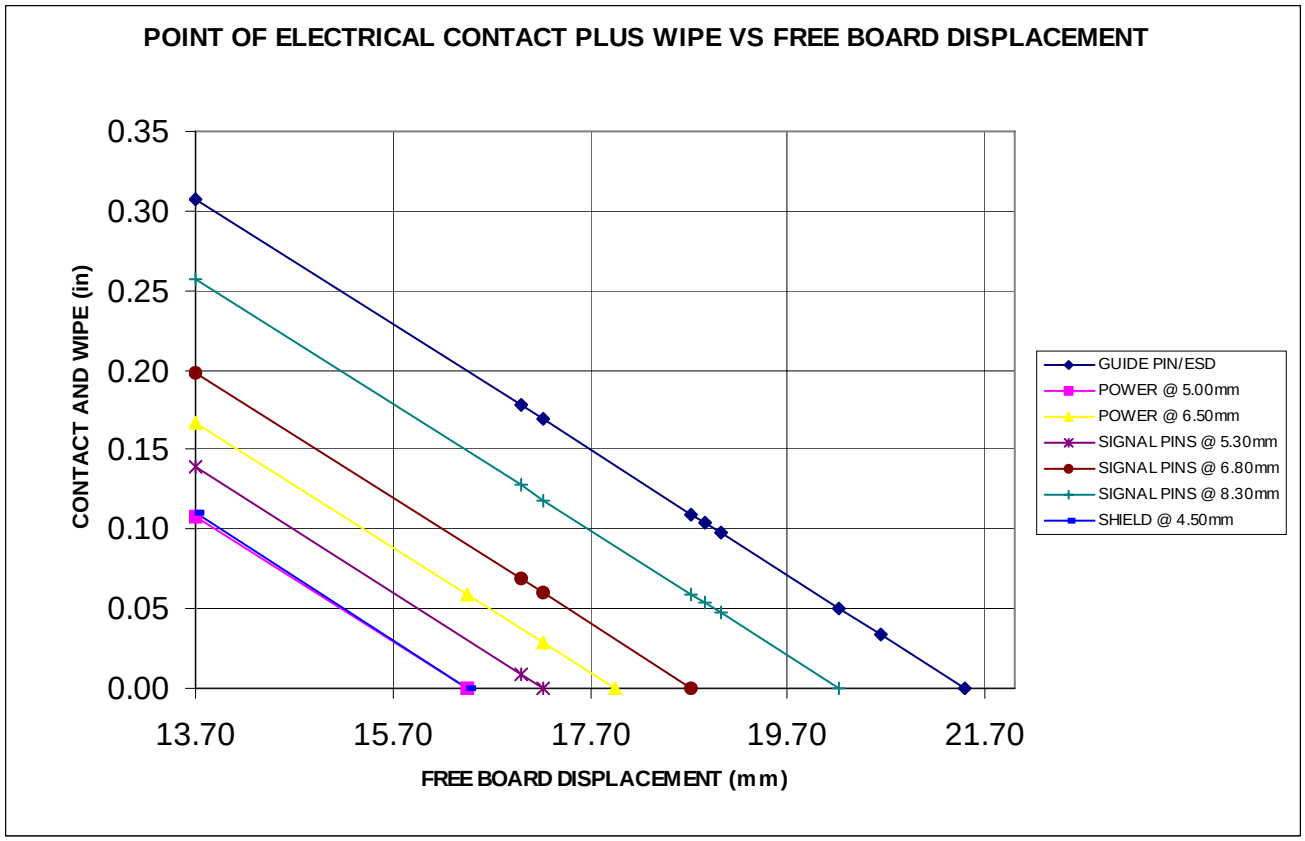
Note: Shield mate length and wipe are constant, 4.50mm (0.177”) 1.60mm (0.063”) respectively.

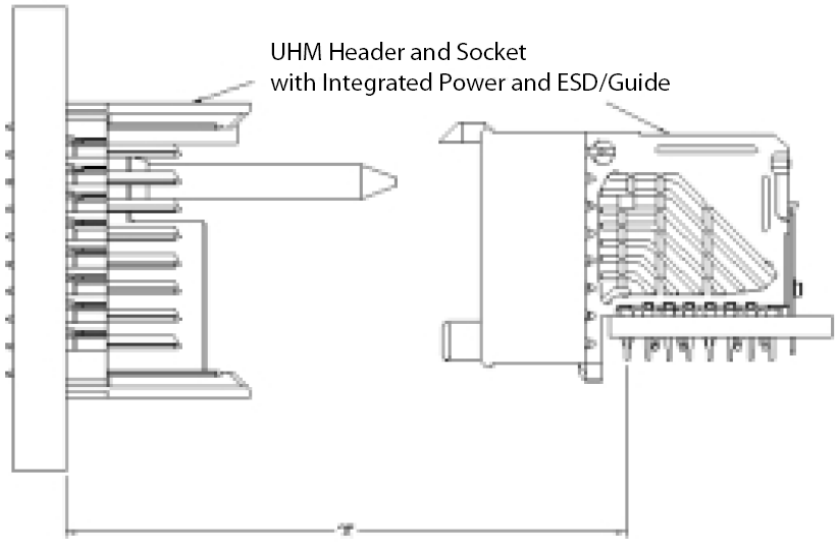
4.5 Point of Electrical Contact Plus Wipe versus Free Board Displacement (Universal power and stand alone guide pins)





4.6 Point of Electrical Contact Plus Wipe versus Free Board Displacement (Style D with power and ESD / Guide)





5.0 ELECTRICAL CHARACTERISTICS

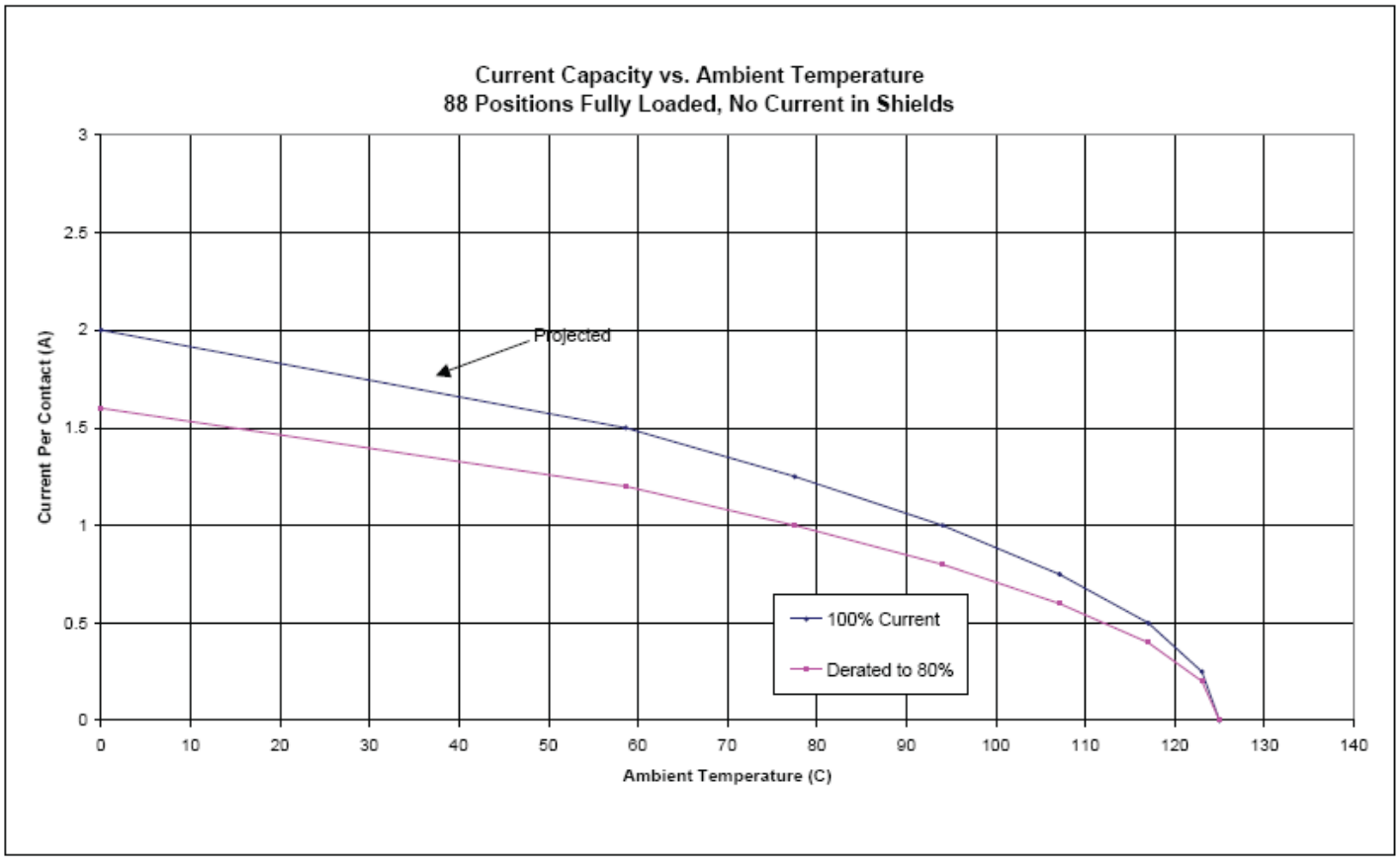
5.1 Examination of Product

A. Signal socket/header modules meet drawing specifications

5.2 Current / Temperature Rating

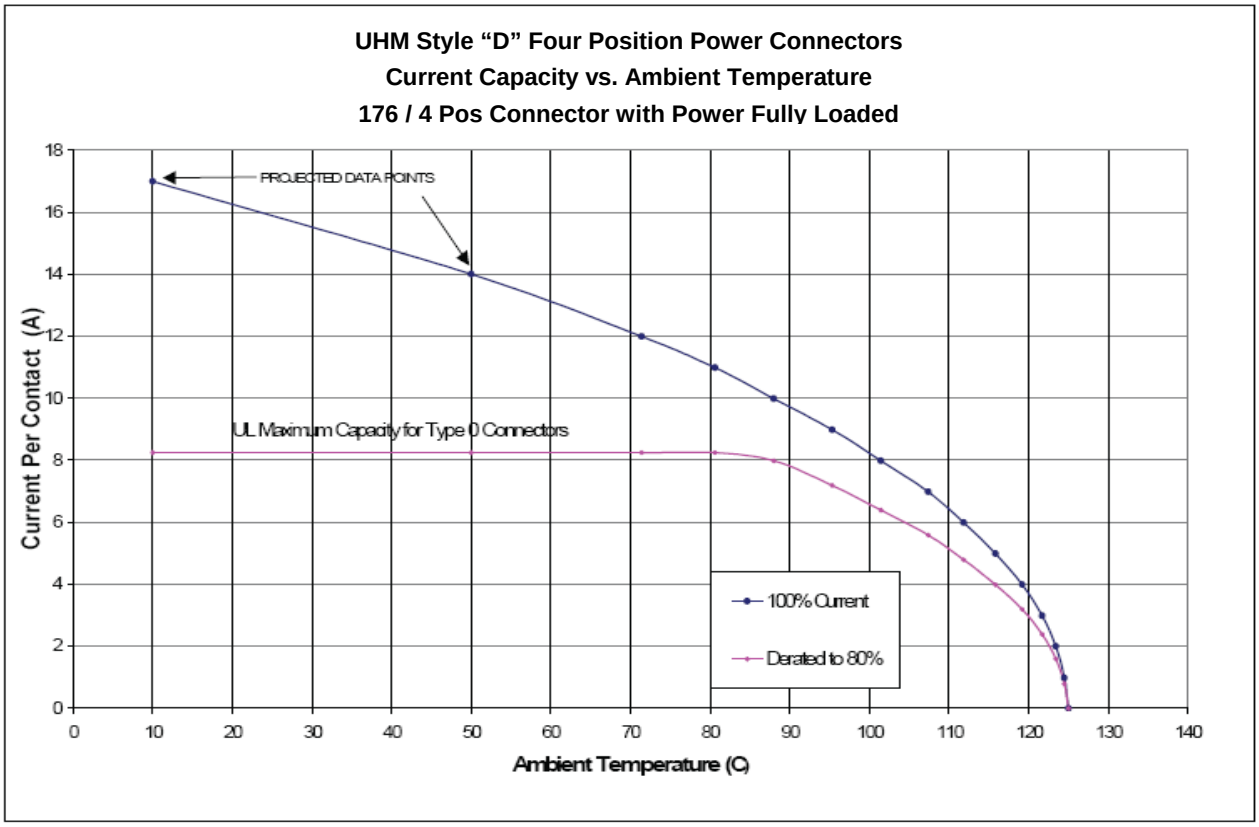
A. 1.00 A at 70°C Ambient per fully loaded, signal socket/header contact

Note: All curves include a 20% de-rating factor or factor of safety. Curves are based on all circuits loaded and center circuit temperature rise measured for signal connectors.



B. 8.25 A at 70°C Ambient per fully loaded, style “D” power socket/header contact

Note: All curves include a 20% de-rating factor or factor of safety. Curves are based on all circuits loaded and center circuit temperature rise measured for signal connectors.



5.3 Total Resistance for Mated Contacts
(socket and header contacts fully mated)
(total resistance = bulk resistance + interface resistance)

UHM **SINGLE ENDED (SE)**	Mated Signal Contacts (pre testing values)
Row A	20 mΩ max.
Row B	20 mΩ max.
Row C	20 mΩ max.
Row D	20 mΩ max.
Row E	20 mΩ max.
Row F	20 mΩ max.
Row G	20 mΩ max.
Row H	20 mΩ max.

5.4 Insulation Resistance

A. 10,000 MΩ contact to contact
B. 10,000 MΩ contact to shield

5.5 Withstanding Voltage

A. 750 Vrms per signal socket module
B. 750 Vrms per signal header module

5.6 Crosstalk

See the 3M UHM Signal Integrity Report 2009May12, 78-9100-9527-8.

5.7 Characteristic Impedance

See the 3M UHM Signal Integrity Report 2009May12, 78-9100-9527-8.

6.0 SUMMARY OF ELECTRICAL TEST REQUIREMENTS AND PROCEDURES

Electrical Test Summary		
Test Description	**Requirement**	**Procedure**
Examination of Product Reference Test: First Article Inspections Product and Part Prints	Meets requirements of product drawings and has no defects which would impair normal operation (5.1)	Visual, dimensional and functional inspection in accordance with IEC 61076-4-101, IEC-60512-2 (test 1a and 1b), IEC-60512-7 (test 13e)
Current/Temperature Rating Reference Test: IR6095, IR6159	The current/temperature rating shall be as earlier noted (5.2)	Steady state current and temperatures are used to create capacity curves and are rated in accordance with IEC 61076-4-101, IEC 60512-3 (test 5b)
Transient Current for a Single Line (Duration and Magnitude)	TBD	TBD
Bulk and Interface Resistance Reference Test: RN-00-023, IR5886	The bulk and interface resistance shall be as earlier noted (5.4)	Install contacts in a test circuit and measure voltage drop. Calculate resistance in accordance with IEC 61076-4-101, IEC-60512-2 (test 2a)

Electrical Test Summary		
Test Description	**Requirement**	**Procedure**
Insulation Resistance Reference Test: RN-00-023, IR6137	The insulation resistance shall be as earlier noted (5.5)	Voltage is applied across the insulative housing to measure the resistance in accordance with IEC 61076-4-101, IEC-60512-3 (test 3a)
Withstanding Voltage Reference Test: RN-00-023, RN-01-010, IR6137	The withstanding voltage shall be as earlier noted (5.6)	A.C. voltage is applied to adjacent contacts until arcing is observed in accordance with IEC 61076-4-101, IEC-60512-2 (test 4a)
Propagation Delay Reference Test: RN- 5000334	The propagation delay shall be as earlier noted (5.9)	No standard has yet been established for the measurement of this electrical property. See RN 5000334 for procedure utilized.
Skew Reference Test: RN- 5000334	The skew shall be as earlier noted (5.10)	No standard has yet been established for the measurement of this electrical property. See RN 5000334 for procedure utilized.
Crosstalk Reference Test: RN- 5000334	The crosstalk shall be as earlier noted (5.11)	No standard has yet been established for the measurement of this electrical property. See RN 5000334 for procedure utilized.
Characteristic Impedance Reference Test: RN- 5000334	The characteristic impedance shall be as earlier noted (5.12)	No standard has yet been established for the measurement of this electrical property. See RN 5000334 for procedure utilized.

Note: SPICE models for UHM connectors are available, contact local sales representative

7.0 MECHANICAL CHARACTERISTICS

7.1 Contact Retention to Thermoplastic Housing

A. Average 14.60 N (3.30 lbf) per signal header contact (male contacts)
B. Average 54.70 N (12.3 lbf) per signal shield strip (male contacts)
C. Average 4.50 N (1 lbf) wafer to cap per signal socket contact (female contacts)

7.2 Individual Contact Engagement Force

A. Average 0.32 N (33 g) per signal socket contact (header contacts lubricated)
B. Average 0.22 N (22 g) per signal shield contact (header contacts lubricated)
C. Average 0.08 N (8 g) per ground shield contact (header contacts lubricated)
D. Average 1.42 N (145 g) per power contact (contacts are lubricated)

7.3 Individual Contact Separation Force

A. Average 0.20 N (20 g) per signal socket contact (header contacts lubricated)
B. Average 0.20 N (20 g) per signal shield contact (header contacts lubricated)
C. Average 0.05 N (5 g) per ground shield contact (header contacts lubricated)
A. Average 0.89 N (91 g) per power contact (contacts are lubricated)

7.4 Normal Force

A. Average 0.57 N (58 g) per signal beam (2X)
B. Average 0.74 N (75 g) per signal shield beam (1X)
C. Average 0.41 N (42 g) per ground shield beam (1X)
D. Average 0.98 N (100 g) per power beam (2X)

7.5 Module Mating Force

A. Average Force = number of contacts per module X individual Engagement force

7.6 Module Unmating Force

A. Average Force = number of contacts per module X individual Separation force

7.7 Physical Shock

A. Maximum 1.0 microsecond discontinuities per mated pair of signal contacts

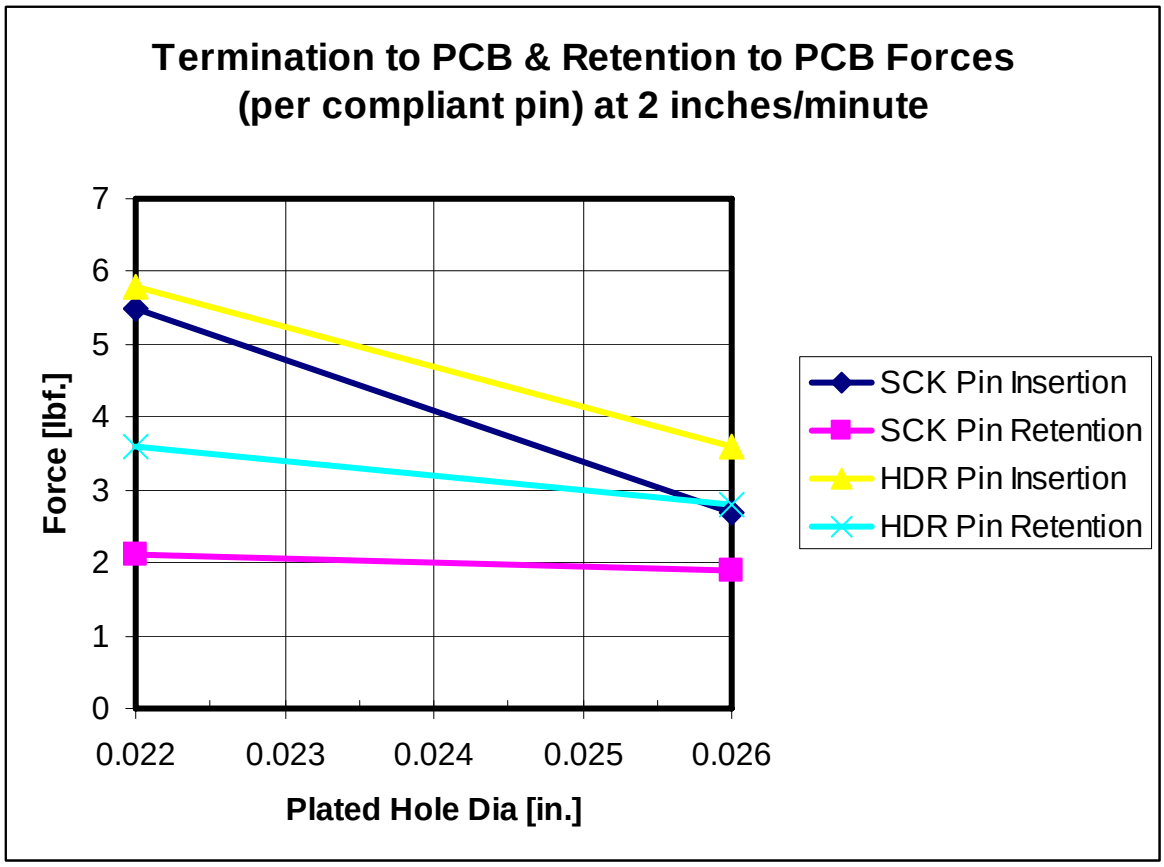
7.8 Random Vibration

A. Maximum 1.0 microsecond discontinuities per mated pair of signal contacts

7.9 Compliant Sections

A. For plated through hole specifications, see 3M UHM PCB Fabrication Guidelines, 78-9100-9520-3.

7.10 Average Single Compliant Pin Insertion & Retention Forces



8.0 SUMMARY OF MECHANICAL TEST REQUIREMENTS AND PROCEDURES

Mechanical Test Summary		
Test Description	Requirement	Procedure
Contact Retention Reference Test: RN-99-010, RN-00-023	No loosening of the contact when a positive or negative axial force is applied to the contact axis	Axial forces are applied in two directions and retention is measured in accordance with IEC 61076-4-101, IEC 60512-8 (test 15a)
Individual Contact Insertion Force Reference Test: RN-00-023, IR6095	The magnitude of the mating force shall be as earlier noted (7.2)	A pin is inserted into the contact and the force is measured in accordance with IEC 60512-8 (16e)
Individual Contact Withdrawal Force Reference Test: RN-00-023, IR6095	The magnitude of the withdrawal force shall be as earlier noted (7.3)	A pin is withdrawn from the contact and the force is measured in accordance with IEC 60512-8 (16e)
Normal Force Reference Test: RN-00-004	The magnitude of the normal force shall be as earlier noted (7.4)	A load is applied to the contact and displacement is measured. The normal force and permanent set are then measured in accordance with EIA-364-04

MECHANICAL TEST SUMMARY		
Test Description	Requirement	Procedure
Module Mating Force Reference Test: RN-00-023	The magnitude of the mating force shall be as earlier noted (7.5)	A mating force is applied to the module until mating occurs in accordance with IEC 61076-4-101, IEC 60512-7 (test 13a)
Module Unmating Force Reference Test: RN-00-023	The magnitude of the unmating force shall be as earlier noted (7.6)	An unmating force is applied to the module until unmating occurs in accordance with IEC 61076-4-101, IEC 60512-7 (test 13b)
Physical Shock Reference Test: RN-00-023	No measurable discontinuities utilizing a detector sensitive to 1 microsecond (7.7)	Mated connectors are subjected to mechanical shocks. Shocks in each direction applied along 3 mutually perpendicular planes in accordance with IEC 61076-4-101, IEC-60512-4 (test 6c)
Random Vibration Reference Test: RN-00-023, IR5886	No measurable discontinuities utilizing a detector sensitive to 1 microsecond (7.8)	Mated connectors are subjected to sinusoidal displacements in accordance with IEC 61076-4-101, IEC-60512-4 (test 6d)
Durability Reference Test: RN-00-023	Meets visual requirements, no wear through of the noble metals detectable (7.9)	Connector assemblies are mated and unmated in accordance with IEC 61076-4-101, IEC-60512-5 (test 9a)
Compliant Sections Reference Test: RN-00-023, IR5886	Meets termination and retention requirements or is qualified through supplemental testing (7.10)	Individual contacts are pressed into and out of printed circuit boards in accordance with IEC 61076-4-101 and IEC-60512-8 (test 16f)

10.0 ENVIRONMENTAL CHARACTERISTICS

10.1 Performance Levels

Performance Level	Climatic Category	Category Temperature		Damp Heat, Steady State
		Lower °C	Upper °C	Days
1	55/125/56	-55	125	56
2	55/125/21	-55	125	21
3	55/125/00	-55	125	0

9.2 Thermal Shock

A. No degradation or physical damage to the mated signal modules that would impair normal operation

9.3 Humidity-Temperature Cycling

A. No degradation or physical damage to the mated signal modules that would impair normal operation

9.4 Mixed Flowing Gas

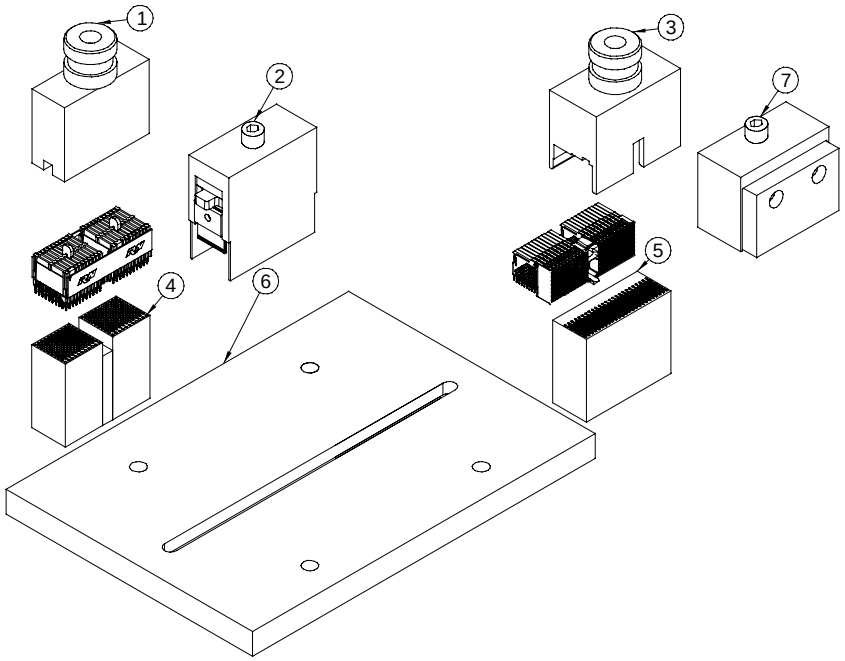
A. No degradation or physical damage to the mated signal modules that would impair normal operation

10. ENVIRONMENTAL TEST SUMMARY

ENVIRONMENTAL TEST SUMMARY		
Test Description	Requirements	Procedure
Thermal Shock Reference Test: RN-00-023, IR5886	No physical damage and shall meet the standards of the following tests: Examination of Product, Bulk and Interface Resistance, Withstanding Voltage, Insulator Resistance, Random Vibration, Physical Shock, Module Mating and Unmating Force, Contact Retention force, and Humidity-Temperature Cycling	Mated connectors are subjected to thermal cycling in accordance with IEC 61076-4-101, IEC-60512-6 (test 11d)
Humidity-Temperature Cycling Reference Test: RN-00-023, IR5886	Same as previous requirements	Mated connectors are subjected to varying temperature and relative humidity cycles in accordance with IEC 61076-4-101 and IEC-60512-6 (test 11m)
Mixed Flowing Gas Reference Test: RN-00-023, IR5886	No physical damage and shall meet the standards of the following tests: Examination of Product, Bulk and Interface Resistance, Withstanding Voltage, Insulator Resistance, Module Mating and Unmating Force	Mated connectors are subjected to corrosive gases in accordance with IEC 61076-4-101 and IEC 60512-6 (test11g)

11.0 GENERAL APPLICATION TOOLING OVERVIEW

11.1 Termination/Repair Tooling for UHM connectors



1 – Header push block
2 – Header puller
3 – Socket push block
4 – Header receiver block
5 – Socket receiver block
6 – Support Plate
7 – Socket puller

Note: For more detail, see the 3M Product Catalog, specific tech sheet, and HSHM/HM Application Tooling Specification 78-8133-3961-1. Specific tool descriptions, usage matrices, and compatible presses are detailed in specification 78-8133-3961-1. For specific press-fit instructions for UHM-S110Bx-5AP1-xxxx socket connectors, see the UHM Press-fit Application Instructions Document, 78-9100-9523-7.