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		Richard Chiu	01/24/07

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## 1.0 INTRODUCTION

### 1.1 SCOPE

This document describes the functional and test requirements for the PCI Express™ card-edge connector. The connector is designed to meet the requirements of the PCI Express Card Electromechanical Specification and certain customer specifications not covered by the PCI-SIG document.

### 1.2 APPLICABLE DOCUMENTS


- 1.2.1 Solderability : BUS-19-002/A
- 1.2.2 PCI Express Card Electromechanical Specification
- 1.2.3 EIA-364-09,17,20,21,28,31,32,65,70,90,101,108,638.  
EIA-364-1000.01 test groups 1,2,3 and 4.
- 1.2.4 PCI Express Connector High Speed Electrical Test Procedure.
- 1.2.5 FCI drawing, PCI Express connector, inspection & customer copy.

### 1.3 DRAWING PRECEDENCE

In the event of conflict between this document and product prints, the product prints shall take precedence.

## 2.0 GENERAL REQUIREMENTS

- 2.1 The connector has the following characteristics:  
1.00m(0.040") pitch, X1, X4, X8 sizes, surface mount configuration, rectangular outline, plastic peg or two holdowns requiring solder pad on PCB.
- 2.2 Visual examination, unless otherwise specified, shall be made at 7X.
- 2.3 Silicone compounds (mold releases, lubricants, etc.) May not be used in the manufacturing processes.
- 2.4 Flammability to be rated UL 94V-0.
- 2.5 Unless otherwise specified, tests that require the use of a pc edge card shall use the following
  - 2.5.1 Card material: FR-4 glass epoxy.
  - 2.5.2 Thickness: 1.57 +/- 0.13 (0.062 +/- 0.005 inch)
  - 2.5.3 Trace material: 0.035 (0.0014 inches), copper.
  - 2.5.4 Trace plating: 0.76 micrometers (30 microinches) minimum gold over 1.27 micrometers (50 microinches) minimum unbrushed nickel
  - 2.5.5 Pad and trace design: pad and trace design shall follow PCI Express standard as depicted in customer drawing.

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## 2.6 SOLDERTAIL TERMINATION

Tests requiring termination of the soldertails to a PC board shall be prepared as follows:

- 2.6.1 A 1.6 mm minimum thick FR-4 glass epoxy board having no internal ground planes with plated pads in the pattern specified in FCI customer drawing, shall be used.
- 2.6.2 For soldering soldertails, 0.09 mm minimum thickness solder paste should be used on PC board pads.

## 3.0 MECHANICAL REQUIREMENTS

### 3.1 EXAMINATION OF PRODUCT

Samples must comply to applicable FCI product prints.

### 3.2 INSERTION / WITHDRAWAL FORCE- ADD IN CARD PER EIA-364-13

Mating cycle is with maximum/minimum thickness gauge at a rate of 25.4 mm/minute.


3.2.1 Maximum insertion force is 1.15 N max. per contact pair when measured with a 1.70 +0.00/-0.01 (0.067 +0.000/-0.004 inches) thick hardened steel card made to the dimensions shown for the PCI Express expansion board in the FCI customer drawing. The card has a R0.05 min., R0.10 max. (sharp edge) and the surface roughness in connector area to be 0.10 micrometers (4 microinches) maximum.

3.2.2 Withdrawal force is 0.15N minimum per contact pair when measured with a 1.44 +0.01/-0.00 (0.067 +0.004/-0.000 inches) thick hardened steel card made to the dimensions shown for the PCI Express expansion board in the FCI customer drawing. The card has a R0.05 min., R0.10 max (sharp edge) and the surface roughness in the connector area to be 0.10 micrometers (4 microinches) maximum.

### 3.3 CONTACT RETENTION

Minimum retention force of terminals in the connector housing to be 5N each. Pull rate to be 1.27 mm/min.

### 3.4 SOLDERABILITY

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Per EIA -364-52

- a. steam age for 1 hour
- b. 220°C for 5 seconds (Tin/Lead plating); 245°C for 5 seconds (Tin plating)
- c. contact areas evaluated shall meet 95% minimum coverage.


#### 4.0 ELECTRICAL REQUIREMENTS

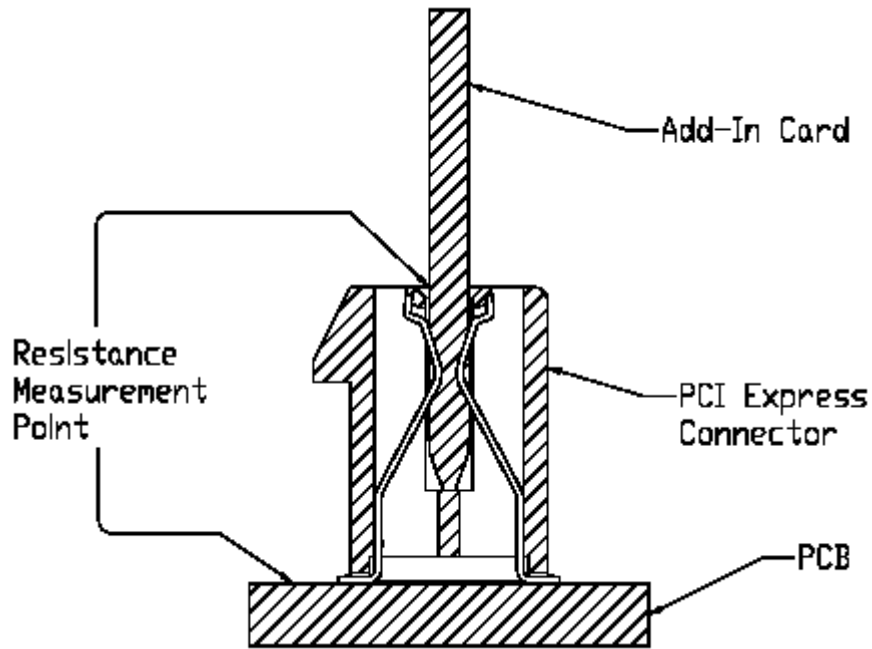
Unless otherwise specified, all measurements should be performed in the following ambients:

relative humidity: 50% or less  
temperature: 25°C +/- 5°C  
barometric pressure: 711 to 812 mm mercury (at sea level)

##### 4.1 LOW LEVEL CONTACT RESISTANCE EIA-364-23

- 4.1.1 Solder connector to pc board per section 2.6 and insert card per section 2.5
- 4.1.2 Resistance measurements should be made from the underside of the pc board to the PTH in the add-in card above the contact pad. The test current shall be 100 milliamperes d.c. max. with a maximum open circuit voltage of 20 millivolts D.C. See figure 1.0 for attachment of current and voltage leads.
- 4.1.3 Requirement is 30 milliohms maximum initial, with change of 10 milliohms maximum after exposure testing.

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CONTACT RESISTANCE TEST SET UP  
SMT TYPE  
FIGURE 1.0

#### 4.2 INSULATION RESISTANCE

Requirement is 1000 megohm minimum at 100 + / - 10% vdc when tested to EIA-364-21 per spec. The connector shall not be mated during insulation resistance measurement.


#### 4.3 DIELECTRIC WITHSTANDING

Per EIA-364-20 method B per spec. Test potential to be 300 VAC RMS, 60 HZ, and applied for 1 minute. No breakdown should occur. Test is performed with connector unmated.

#### 4.4 CONTACT CURRENT RATING

1.1 amp per contact minimum per EIA-364-70, method 2 and *PCI Express Connector High Speed Electrical Test Procedure*. The temperature rise shall not exceed 30 degree C. Ambient condition is still air at 25°C.

#### 4.5 INSERTION LOSS

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Per EIA-364-101 and PCI Express Connector High Speed Electrical Test Procedure.

Requirements:

- Less than or equal to 1dB up to 1.25 GHz
- Less than or equal to  $1.6 \times (F-1.25)+1$  db between 1.25GHz and 3.75GHz.
- Less than or equal to 5 dB at 3.75 GHz

#### 4.6 RETURN LOSS

Per EIA-364-108 and *PCI Express Connector High Speed Electrical Test Procedure.*

Requirements:

- Less than or equal to -12dB up to 1.3 GHz
- Less than or equal to -7dB up to 2.0 GHz
- Less than or equal to -4dB up to 3.75 GHz

#### 4.7 CROSSTALK: NEXT

Per EIA-90 and *PCI Express Connector High Speed Electrical Test Procedure.*

Requirements:

- Less than or equal to -32 dB max up to 1.25 GHz
- Less than or equal to  $-(32 - 2.4 \times (F-1.25))$  db between 1.25 GHz and 3.75GHz.
- Less than or equal to -26 dB max up to 3.75 GHz

#### 4.8 JITTER:

10 ps maximum. By design; measurement not required.

#### 4.9 INTRA-PAIR SKEW:

5 ps maximum. By design; measurement not required.


### **5.0 ENVIRONMENTAL REQUIREMENTS (Per EIA-364-1000.01)**

#### 5.1 THERMAL SHOCK

Per EIA-364-32, test condition I. Cycle the connector -55 to +85 Degree C . Dwell time of 30 minutes at extreme temperature. Transfer time 5 minutes Max. No damage after 10 cycles.

#### 5.2 CYCLIC TEMPERATURE AND HUMIDITY

Per EIA-364-31. Cycle the connector between  $25 \pm 3$  at 90% RH and  $65 \pm 3$  at 95% RH. Ramp times should be 2 hours and dwell times should be 2 hours. Dwell times start when the temperature

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and humidity have stabilized within the specified levels. Perform 24 such cycles.

### 5.3 TEMPERATURE LIFE (Pre-conditioning)

Per EIA-364-17, method A, 92 hours at 105°C

### 5.4 TEMPERATURE LIFE

Per EIA-364-17, method A, 168 hours at 105°C

### 5.5 VIBRATION

Per EIA-364-28, test condition VII, test condition letter D.1 hour in each of three mutually perpendicular directions.  
Requirements: no evidence of physical damage

### 5.6 DURABILITY (Pre-conditioning)

CYCLE RATE : 500 MATING / HOUR  
Per EIA-364-09, 20 cycles

### 5.7 DURABILITY

CYCLE RATE : 500 MATING / HOUR  
Per EIA-364-09, 50 cycles

### 5.8 MIXED FLOWING GAS


Per EIA-364-65, class IIA, 10 days exposure. Expose connectors unmated for 2/3 of the total duration. Mate each connector to the same add-in card that it was mated to in temperature life (preconditioning) and expose for the remainder of the test duration.

### 5.9 RESEATING

Manually plug/unplug the connector with add-in card, 3 cycles.

### 5.10 RESISTANCE TO SOLDERING HEAT

Per EIA-364-56 procedure 3, test condition C.  
260°±5°C 10±2 seconds  
Requirements: no evidence of physical damage


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**6.0 Test Matrix for 1X,4X,8X**

**TABLE 1 - QUALIFICATION TESTING MATRIX**


		TEST GROUP	TEST GROUP	TEST GROUP	TEST GROUP	TEST GROUP	TEST GROUP	TEST GROUP	TEST GROUP	TEST GROUP
		1	2	3	4	5	6	7	8	9
TEST	PARA	TEST SEQUENCE								
Examination of Product Insertion/Withdrawal Force - Add In Card	3.1	1	1	1	1	1	1	1	1	1
Contact Retention	3.3					4				
Solderability	3.4					3				
Low Level Contact Resistance	4.1	2, 5, 7	2, 5, 8, 10	2, 5, 7	2, 5, 7, 9, 11			3, 5		
Insulation Resistance	4.2		7							
DWV	4.3							2, 6		
Contact Current Rating	4.4								2	
Insertion Loss	4.5						2			
Return Loss	4.6						3			
Crosstalk	4.7						4			
Thermal Shock	5.1		4		8					
Cyclic Temp and Humidity	5.2		6							
Temperature Life (pre-conditioning)	5.3			4	4					
Temperature Life	5.4	4								
Vibration	5.5			6						
Durability (pre-conditioning)	5.6	3	3	3	3					
Durability	5.7							4		
Mixed Flowing Gas	5.8				6					
Reseating	5.9	6	9		10					
Resistance to soldering heat	5.10									2
Sample Quantity / Group		16X-5 <sup>(1)</sup>	16X-5	16X-5	16X-5 <sup>(2)</sup>	16X-5, 4X-5, 1X-5 <sup>(1)</sup>	4X-3	16X-5 <sup>(3)</sup>	8X-4 <sup>(4)</sup>	16X-5 8X-5



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Notes:

1. samples for test groups 1,2,3,4,5 & 9 have metal hold downs, phos bronze contacts and 0.076 micrometers (3 u") gold plate, and black housings.
2. samples for test group 4:
  - a. 5 samples, same as above except with 0.076 micrometers (3u") gold plate.
3. samples for test group 7:
  - a. 5 samples, same as above except with 0.076 micrometers (3U") gold plate.
4. samples for test group 8:
  - a. 2 samples, as note above except with 0.076 micrometers (3U") gold plate.

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