

# USB-IF COMPLIANCE PROGRAM

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## USB 3.0 Test Report for High Speed Device

TM

Company Name: Silicon Motion, Inc.

Model Name: SM324

Product Type: Mass Storage

Product Receive Date: \_\_\_\_\_

Test Start Date: 02/06/2018

Report Date: 02/08/2018

Test Result: **PASS**

Notice: Test result is valid only to the original tested device model. Allion reserves the right to prohibit others to distort, isolate, falsify, copied and/or by any process to change the content of this test report unless it is prior approved by Allion.

Project ID : REM-SIN-USB-018 1



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## Company

Company Name: Silicon Motion, Inc.  
Company Address: No.20-1,Taiyuan St.,Jhubei City HsinChu County 302,Taiwan  
VID (Dec) 2316 The VID for the company who apply the USB-IF logo.

## Technical Contact

Name: Johnson Liu  
Phone Number: 02-22196688#3708  
E-Mail: Johnson.Liu@siliconmotion.com.tw  
FAX Number: 02-22196868

## Marketing Contact

Name: Kevin Yeh  
Phone Number: 02-22196688#3502  
E-Mail: Kevin.Yeh@siliconmotion.com.tw  
FAX Number: 02-22196868

## Product Information:

Silicon Model Name: SM324 TID (If you know): \_\_\_\_\_

\*\*\* This is a required field, the test project will be held until the information provided. \*\*\*

☐ Retail Device ☒ Device and Silicon ☐ Silicon Only  
☒ Hi Power ☐ Low Power  
☒ Bus Powered ☐ Self Powered  
☐ Untethered B ☒ Tethered

Highest capacity tested for Mass Storage Device: \_\_\_\_\_

Device Category: \_\_\_\_\_ Device Description: \_\_\_\_\_

VID: 090C PID: 5000

Tested OS: ☐ Win 2000 ☒ Win XP (Standard test fee will cover 1 OS only.)

Tester: Sam Chen

Authorized Signature: James Ou

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## Legacy USB Compliance Tests

**Frameworks Test Result:** ☒ Pass ☐ Fail

### Chapter 9:

High Speed Mode: ☒ Pass ☐ Fail

Full Speed Mode: ☒ Pass ☐ Fail

Interface: 1 MAX Power: 200 mA Remote Wakeup: N/A

MSC Test: ☐ N/A

High Speed Mode: ☒ Pass ☐ Fail

Full Speed Mode: ☒ Pass ☐ Fail

UVC Test: ☒ N/A

High Speed Mode: ☐ Pass ☐ Fail

Full Speed Mode: ☐ Pass ☐ Fail

**Power Current Test Result:** ☒ Pass ☐ Fail

### High Speed Mode:

Operating Power: 123.2 mA

(≤ Max Power ≤ 100mA for Low Power)

(≤ Max Power ≤ 100mA for Self Power)

(≤ Max Power ≤ 500mA for High Power)

Unconfiguration Power: 52.4 mA (<100mA)

(≤Max Power ≤ 100mA)

Configuration Power: 52.5 mA

(≤ Max Power ≤ 100mA for Low Power)

(≤ Max Power ≤ 500mA for High Power)

Suspend Mode Power: 377 uA

(≤ 2500uA for High Power /w Remote Wake Up)

(≤ 500uA for others)

### Full Speed Mode:

Operating Power: 82 mA

(≤ Max Power ≤ 100mA for Low Power)

(≤ Max Power ≤ 100mA for Self Power)

(≤ Max Power ≤ 500mA for High Power)

Unconfiguration Power: 31.4 mA (<100mA)

(≤Max Power ≤ 100mA)

Configuration Power: 31.4 mA

(≤ Max Power ≤ 100mA for Low Power)

(≤ Max Power ≤ 500mA for High Power)

Suspend Mode Power: 378 uA

(≤ 2500uA for High Power /w Remote Wake Up)

(≤ 500uA for others)

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**Interoperability Test Overall Result:** ☒ Pass ☐ Fail OS: ☐ W2k ☒ XP

## **EHCI Controller: (Intel D865GLC Motherboard)**

- |                                           |                                          |                               |                                         |
|-------------------------------------------|------------------------------------------|-------------------------------|-----------------------------------------|
| 1. Enumeration and Driver installation:   | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |
| 2. Operation with Default Driver:         | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |
| 3. Update Driver:                         | <input type="checkbox"/> Pass            | <input type="checkbox"/> Fail | <input checked="" type="checkbox"/> N/A |
| 4. Install Additional Software:           | <input type="checkbox"/> Pass            | <input type="checkbox"/> Fail | <input checked="" type="checkbox"/> N/A |
| 5. DUT Demonstrates Operation:            | <input type="checkbox"/> Pass            | <input type="checkbox"/> Fail | <input checked="" type="checkbox"/> N/A |
| 6. DUT Operation Speed:                   | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |
| 7. Interoperability – Operate all device: | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |
| 8. Hot Detach & Reattach:                 | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |
| 9. Topology Change:                       | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |
| 10. Warm Boot:                            | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |
| 11. Cold Boot:                            | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |
| 12. Active S1 Suspend and Resume:         | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |
| 13. Inactive S1 Suspend and Resume:       | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |
| 14. Active S3 Suspend and Resume:         | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |                                         |

## **UHCI Controller: (Intel D865GLC Motherboard)**

- |                                           |                                          |                               |
|-------------------------------------------|------------------------------------------|-------------------------------|
| 1. Enumeration and Driver installation:   | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 2. Interoperability – Operate all device: | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 3. Hot Detach & Reattach:                 | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 4. Topology Change:                       | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 5. Warm Boot:                             | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 6. Cold Boot:                             | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 7. Active S1 Suspend and Resume:          | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 8. Inactive S1 Suspend and Resume:        | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 9. Active S3 Suspend and Resume:          | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |

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## OHCI Controller: (PCI Adapter)

- |                                           |                                          |                               |
|-------------------------------------------|------------------------------------------|-------------------------------|
| 1. Enumeration and Driver installation:   | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 2. Interoperability – Operate all device: | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 3. Hot Detach & Reattach:                 | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 4. Topology Change:                       | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 5. Warm Boot:                             | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 6. Cold Boot:                             | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 7. Active S1 Suspend and Resume:          | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 8. Inactive S1 Suspend and Resume:        | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 9. Active S3 Suspend and Resume:          | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |

## EHCI Controller: (PCI Adapter)

- |                                           |                                          |                               |
|-------------------------------------------|------------------------------------------|-------------------------------|
| 1. Enumeration and Driver installation:   | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 2. Interoperability – Operate all device: | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| 3. Active S3 Suspend and Resume:          | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |

**Signal Quality Test Result:** ☒ Pass ☐ Fail

Full Speed UP Stream Signal Quality: ☒ Pass ☐ Fail

Inrush Current Test: ☒ Pass ☐ Fail

**Back Voltage Test Result:** (Enumerate before/after) ☒ Pass ☐ Fail

D+: 0 mV / 0 mV

D- : 0 mV / 0 mV

V<sub>Bus</sub>: 0 mV / 0 mV

(All values <= 400mV)

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## High Speed USB Compliance Tests

### A4.4 Device High-speed Signal Quality

☒ Pass ☐ Fail

EL\_2: Transmitter Data Rate:

☒ Pass ☐ Fail

EL\_4: Eye Pattern (Template 1):

☐ Pass ☐ Fail ☒ N/A

EL\_5: Eye Pattern (Template 2):

☒ Pass ☐ Fail ☐ N/A

EL\_6: Rising and Falling Time:

☒ Pass ☐ Fail

EL\_7: Monotonic Data Transition:

☒ Pass ☐ Fail

\*\*\* USB 2.0 HS driver must have 10% to 90% differential rise and fall times of greater than 500 ps. Reference documents: USB 2.0 Specification, Section 7.1.2.2 \*\*\*

### A4.5 Device Packet Parameters

☒ Pass ☐ Fail

EL\_21: 32 bit, EL\_22 Step1: 123 bit, Step2: 125 bit, EL\_25: 8 bit

(EL\_21: 32Bit)

EL\_22: 8 to 192 bit

EL\_25: 8Bit)

### A4.6 Device CHIRP Timing

☒ Pass ☐ Fail

EL\_28: 451.2us,

(EL\_28: 2.5us to 6ms)

EL\_29: 1.667ms,

EL\_29: 1ms to 7ms

EL\_31: 2.8us

EL\_31: 500us)

### A4.7 Device Suspend/Resume/Reset timing

☒ Pass ☐ Fail

EL\_38: 3.02ms,

(EL\_38: 3ms to 3.125ms)

EL\_39: YES,

EL\_40: YES

EL\_27: 3.4ms,

(EL\_27: 3.1ms to 6ms)

EL\_28: 454us

EL\_28: 2.5us to 6ms)

### A4.8 Device Test J/K, SE0\_NAK

☒ Pass ☐ Fail

EL\_8

| Test | D+ Voltage (mV) | D- Voltage (mV) |
|------|-----------------|-----------------|
| J    | 422             | 1               |
| K    | 1               | 422             |

(360mV to 440mV)

EL\_9

|    | Voltage (mV) |
|----|--------------|
| D- | 0.6          |
| D+ | 0.6          |

(-10mV to 10mV)

### A4.9 Device Receiver Sensitivity

☒ Pass ☐ Fail

EL\_18: YES, EL\_17: +144, -144 mV, EL\_16: +136, -136 mV

(EL\_17: <= +200mV and >= -200mV EL\_16: >= +100mV and <= -100mV)

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## More Detail Test Result:

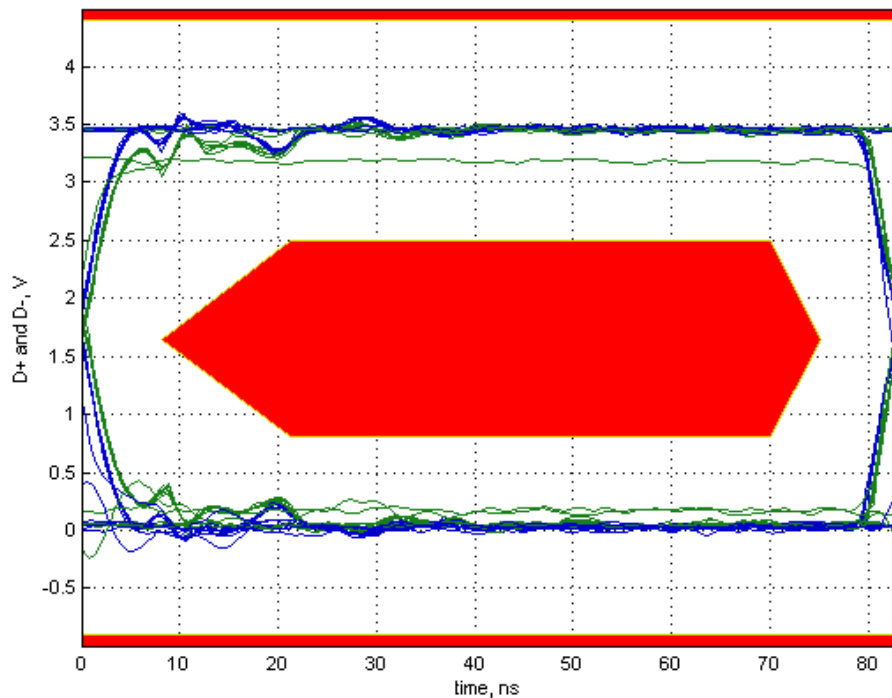
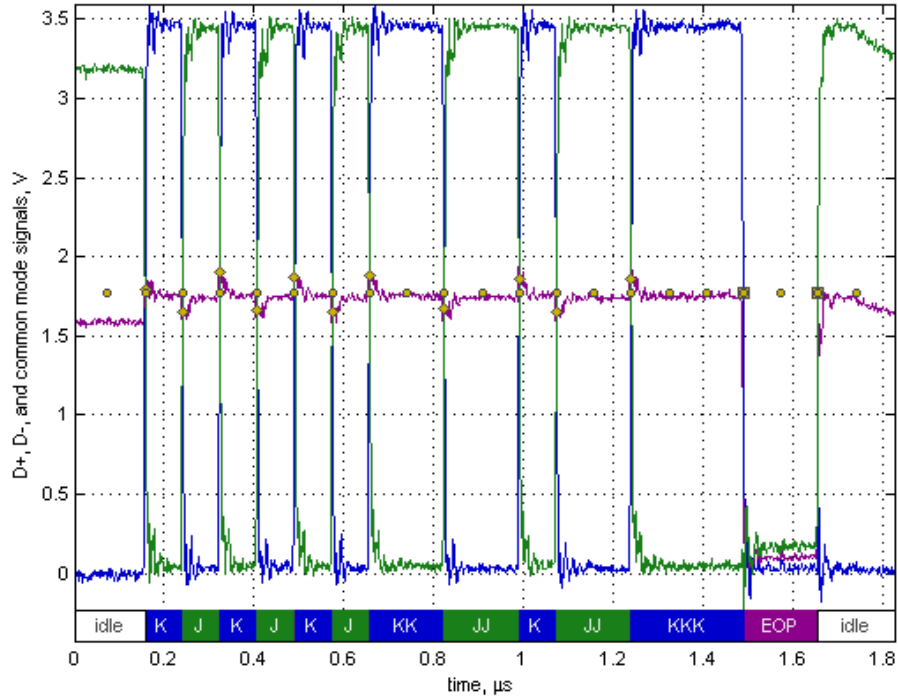
### 1. Full Speed Upstream Signal Quality: Pass

- Overall result: pass!
- Signal eye:  
eye passes
- EOP width: 167.21ns  
EOP width passes
- Receivers: reliable operation on tier 6  
receivers pass
- Measured signaling rate: 11.9980MHz  
signal rate passes
- Crossover voltage range: 1.65V to 1.90V, mean crossover 1.77V  
(first crossover at 1.80V, 10 other differential crossovers checked)  
crossover voltages pass
- Consecutive jitter range: -0.1ns to 0.1ns, RMS jitter 0.1ns  
Paired JK jitter range: -0.2ns to 0.1ns, RMS jitter 0.1ns  
Paired KJ jitter range: -0.1ns to 0.1ns, RMS jitter 0.1ns  
jitter passes

### [Signal Data and Eye](#)

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## 2. High Speed Upstream Signal Quality: Pass

- Overall result: pass!
- Signal eye:  
eye passes
- EOP width: 8.00 bits  
EOP width passes
- Measured signaling rate: 480.0147MHz  
signal rate passes

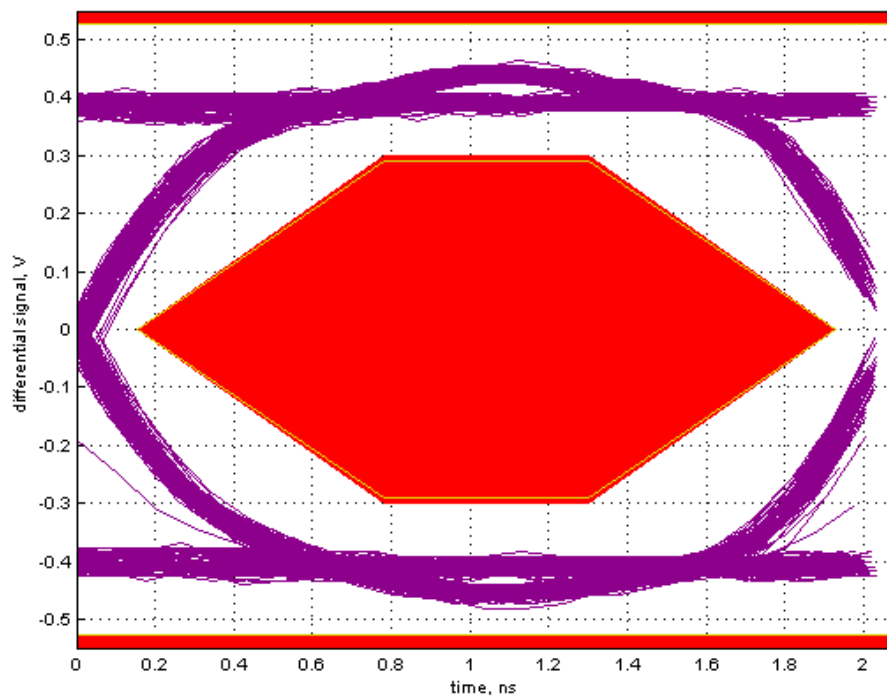
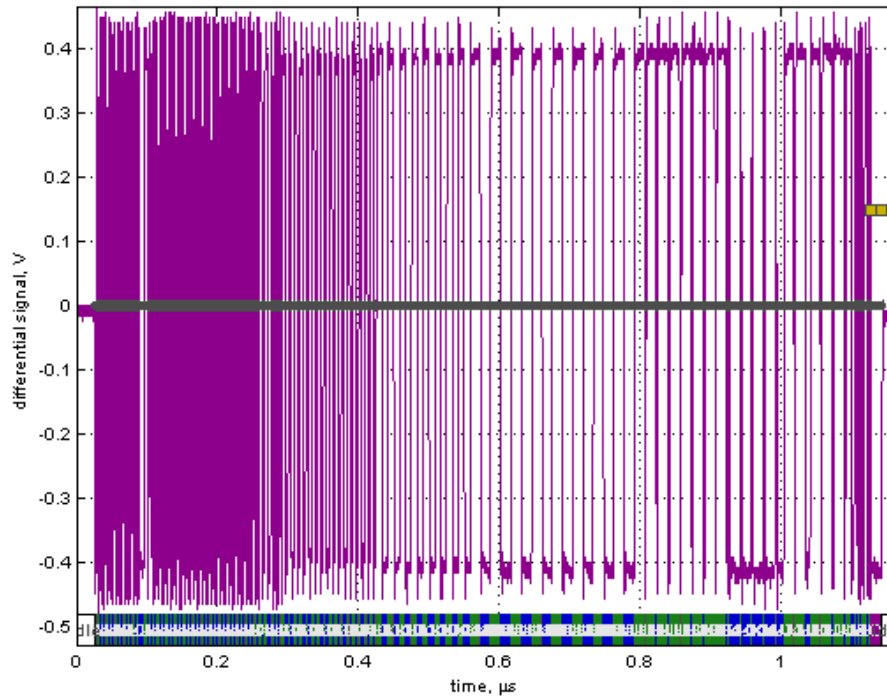
### Additional Information

- Consecutive jitter range: -53.573ps to 74.300ps, RMS jitter 21.501ps  
Paired JK jitter range: -70.191ps to 56.536ps, RMS jitter 25.840ps  
Paired KJ jitter range: -81.440ps to 51.095ps, RMS jitter 26.475ps

### Signal Data and Eye

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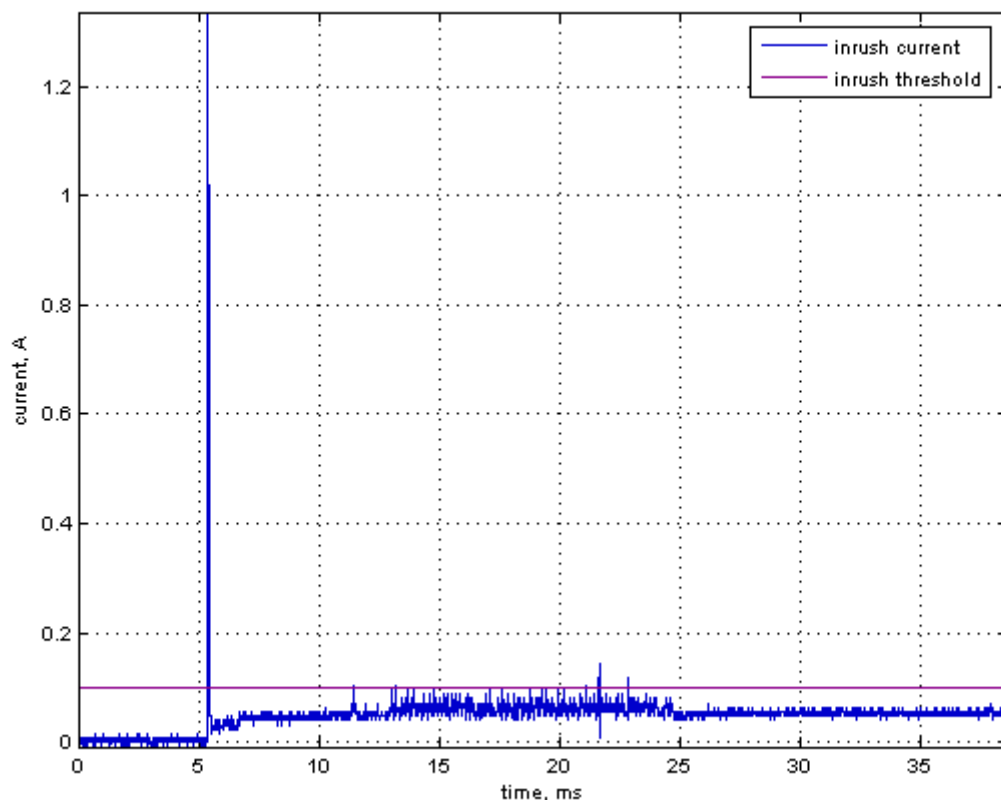
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## 3. Inrush Current: Pass

- Overall result: pass!
- Inrush at 5.150V: 42.98 $\mu$ C  
inrush passes

### Hot Plug (Attach) Current Draw



#### Test Procedure Reference:

1. Universal Serial Bus Implementers Forum Full and Low Speed Electrical and Interoperability Compliance Test Procedure, version: 1.3
2. Universal Serial Bus Implementers Forum Device High-speed Electrical Test Procedure For Agilent Infiniium, version: 1.0
3. Universal Serial Bus Implementers Forum Device High-speed Electrical Test Procedure, version: 1.0

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