ALLION®
Engineering Services

COMPLIANCE PROGRAM

TEST REPORT

USB 2.0 Test Report
For
Embedded Host Revision 2.0

Company Name:	NXP Semiconductors
VID (Dec or Hex):	0x1FC9 The VID for the company who apply the USB-IF logo.
Model Name:	LPC54608
Product Type:	Embedded Host
Report Date:	2018/10/10
Test Result:	**PASS**

Tester: **Kayla Seliner**

Legal Disclaimer

1. 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.

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Company Information:

Company

Company Name: NXP Semiconductors
Company Address: 411 E Plumeria Dr. San Jose, CA 95134

Technical Contact

Name: Dezheng Tang (Tom)
Phone Number: N/A
E-Mail: dezheng.tang@nxp.com
FAX Number: N/A

Marketing Contact

Name: N/A
Phone Number:
E-Mail:
FAX Number:

Product Information:

Information Obtained From Checklist or Vendor			
Input	**Type**	**Purpose**	**Checklist Ref**
Uses Micro-AB	☒	**Check this box for an EH which uses a Micro-AB receptacle instead of a Standard-A receptacle. It will be automatically selected for OTG devices.**	**P15a**
Supports Sessions	☐	**Check this box if the OTG A-UUT or EH with Micro-AB receptacle does not keep V BUS enabled all the time that the ID pin is held low. Check this box for an EH with Standard-A receptacle which does not keep V BUS high all the time it is powered up. In either case it is assumed that SRP or ADP is available to detect the presence of a device.**	**PI10**

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Input	Type	Purpose	Checklist Ref
SRP as A-device	☐	Check this box if the UUT, as an A-device, supports detecting, and acting on, an SRP pulse generated by a connected device.	PI13
HNP as A-device	☐	Check this box if the UUT, as an A-device, supports HNP to enable the connected B-device to become host if it so requires.	PI13
HNP Polling as A-device	☐	Check this box if the UUT, as an A-device, supports HNP polling. If it does it is allowed to remain as host, for as long as the other device does not set its Host Request Flag.	PI13
ADP as A-device	☐	Check this box if the UUT, as an A-device, supports ADP probing to detect the presence or otherwise of a connected device.	PI13
SRP as B-device	☐	Check this box if the UUT, as a B-device, supports generating an SRP pulse in order to start a session (cause the connected A-device to turn on V BUS).	PI20
HNP as B-device	☐	Check this box if the UUT, as an B-device, supports HNP to allow it to become host if it so requires.	PI20
ADP as B-device	☐	Check this box if the UUT, as an B-device, supports ADP sensing and probing to detect the presence or otherwise of a connected device.	PI20
FS Not Available	☐	Check this box if UUT does not fully support full-speed operation. This is not permitted for an OTG device, but may be for an Embedded Host.	PI11, PI18

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Input	Type	Purpose	Checklist Ref
$I_{A_VBUS_RATED}$	100 mA	The rated output current of an A-device in mA units.	PI8
bMaxPower	100 mA	bMaxPower (sic) is the highest current, in mA, declared in any of the device's Configuration Descriptors. This value ignores current drawn under the Battery Charging provisions.	PI17
TPWRUP_RDY	30 S	Maximum time, in seconds, specified by vendor from powering on the UUT until it is ready to perform USB functionality. By default this is set to 30 seconds, but a vendor is permitted to specify a longer time.	PI24
TA_WAIT_BCON max	30 S	The maximum time, in seconds, that V BUS is left on for by an A-device, in the absence of a B-device connecting. The default value is thirty seconds. A vendor is permitted to specify a longer time, but should be aware that this will have an impact on the time taken for, and therefore possibly the cost of, compliance testing.	PI10
Unknown Dev (No HNP)	VID: 1A0A PID: 0201	The test will use the VID/PID combination specified during tests for error messages, when an unknown B-device, not capable of HNP, is connected. A default value (1A0A/0201) is used, but any other device not on the UUT's TPL may be defined here.	-

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Input	Type	Purpose	Checklist Ref
Unknown Dev (HNP)	VID: 1A0A PID: 0202	The test will use the VID/PID combination specified during tests for error messages, when an unknown B-device, capable of HNP, is connected. A default value (1A0A/0202) is used, but any other device not on the UUT's TPL may be defined here.	-

Test Cable Information:

Information Obtained From Checklist or Vendor			
Input	**Type**	**Purpose**	
Cable A	175 mΩ	Test Cable A loop resistance in mΩ.	
Cable B	587 mΩ	Test Cable B loop resistance in mΩ.	

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High Speed & Basic Speed Compliance Tests

A4.4: Host High-speed Signal Quality

☒ Pass ☐ Fail ☐ N/A

These tests measure the ability of transmitters to do valid high speed signaling. High speed signal quality is measured on upstream ports. A high speed scope with differential probes is used. Signaling data is captured with the scope and then translated to an eye pattern. The signal quality eye patterns obtained from the measurements must agree with the transmit eye patterns in the USB 2.0 Specification.

Port	1
EL_2: Data Rate	Pass
EL_3: Eye Pattern	Pass
EL_6: Rise and Fall Time	Pass
EL_7: Monotonic	Pass

A4.5: Host Controller Packet Parameters

☒ Pass ☐ Fail ☐ N/A

This test measures the amount of time it takes hosts and devices to respond. It also verifies Host generated SYNCs and EOPs.

EL_21: (32bit)	32bit/32bit	☒ Pass	☐ Fail	☐ N/A
EL_25: (8bit)	8bit	☒ Pass	☐ Fail	☐ N/A
EL_23: (>=88bit and <=192bit)	95bit	☒ Pass	☐ Fail	☐ N/A
EL_22: (>=8bit and <=192bit)	135bit	☒ Pass	☐ Fail	☐ N/A
EL_55: (40bit)	40bit	☒ Pass	☐ Fail	☐ N/A

A4.7: Host CHIRP Timing

☒ Pass ☐ Fail ☐ N/A

This test examines the basic timings and voltages of both upstream ports during the speed detection protocol. (Device reset from Full Speed)

EL_33: (<=100us)	0.2870us	☒ Pass	☐ Fail	☐ N/A
EL_34: (>=40us and <=60us)	50.019us	☒ Pass	☐ Fail	☐ N/A
EL_35: (100us and <=500us)	308.77us	☒ Pass	☐ Fail	☐ N/A

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A4.8: Host Suspend/Resume/Reset timing ☒ Pass ☐ Fail ☐ N/A

This test verifies that a Host can be suspended and resumed while operating in high speed and also that the device can be reset from the suspended state.

EL_39:		☒ Pass	☐ Fail	☐ N/A
EL_41: (<=3ms)	107us	☒ Pass	☐ Fail	☐ N/A

A4.9: Host Test J/K, SE0_NAK (EL_9) ☒ Pass ☐ Fail ☐ N/A

The USB-IF no longer requires EL_8: Test_J and Test_K to be performed as a condition for USB Certification. Measurement of EL_9: Test_J, Test_K and SE0 is still a requirement for certification. EL_9 is defined in the USB 2.0 Test Specification and measures the data line voltage when not driven. For detail information please reference as below link:

EL_9

Port	1
SE0_NAK D+	-1.4
SE0_NAK D-	-1.4
Test J D-	1.9
Test K D+	1.9

(-10mV to 10mV)

Basic Speed Signal Quality Test Result ☒ Pass ☐ Fail ☐ N/A

Full Speed Downstream Signal Quality: ☒ Pass ☐ Fail ☐ N/A

Port 1
Pass

Low Speed Downstream Signal Quality: ☒ Pass ☐ Fail

Port 1
Pass

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Drop/ Droop Test Result ☒ Pass ☐ Fail

500mA

Port	1
$V_{non-load}$ (>=4.75V and <=5.25V)	5.02V
V_{load} (>=4.75V and <=5.25V)	4.82V
V_{drop} (<=500mV)	200mV
V_{droop} (<=330mV)	N/A

BC 1.2 Implemented Check: ☐ Support ☒ N/A

If any one of exposed ports has BC 1.2 capability, all items of BC 1.2 specific category(s) should be tested under this port(s) for USB-IF certification.

Port 1
N/A

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Embedded Host PET Automated Test (CH 6)

A-UUT

Test Item	Result
6.7.2 A-UUT Initial Power-up Test	Pass
6.7.4 A-UUT V_{BUS} Voltage and Current Measurements	Pass
6.7.5 A-UUT Bypass Capacitance	N/A
6.7.6 A-UUT SRP	N/A
6.7.8 A-UUT ADP	N/A
6.7.9 A-UUT Leakage	N/A
6.7.14 EH, Capable of ADP and SRP, State Transition Test (Standard-A)	N/A
6.7.15 EH, Capable of ADP but not SRP, State Transition Test (Standard-A)	N/A
6.7.16 EH, Capable of SRP but not ADP, State Transition Test (Standard-A)	N/A
6.7.17 EH with no Session Support State Transition Test (Standard-A)	N/A
6.7.18 EH, Capable of ADP and SRP, (Micro-AB) or OTG-A , Capable of ADP and SRP but not HNP, State Transition Test	N/A
6.7.19 EH, Capable of ADP but not SRP, (Micro-AB) or OTG-A , Capable of ADP but not SRP or HNP, State Transition Test	N/A
6.7.20 EH, Capable of SRP but not ADP, (Micro-AB) or OTG-A , Capable of SRP but not ADP or HNP, State Transition Test	N/A
6.7.21 EH with no Session Support State Transition Test (Micro-AB), or OTG-A with no Session or HNP Support	Pass
6.7.22 A-UUT “Device No Response” for connection timeout	Pass
6.7.23 A-UUT “Unsupported Device” Message	Pass
6.7.24 A-UUT “Device No Response” for HNP enable	N/A
6.7.25 EH using Micro-AB “Incorrect Connection”	Pass

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B-UUT

Only tested when Embedded Host B-Port is applied

Any B-device compliant with the documentation “On-The-Go and Embedded Host Supplement to the USB Revision 2.0 Specification, Revision 2.0 version 1.1a” shall verify the following B-UUT test items

Test Item	Result
6.8.1 B-UUT Initial Power-up Test	N/A
6.8.2 B-UUT V_{BUS} Voltage and Current Measurements	N/A
6.8.3 B-UUT Bypass Capacitance	N/A
6.8.4 B-UUT SRP	N/A
6.8.6 B-UUT ADP	N/A
6.8.7 B-UUT Leakage	N/A
6.8.13 ADP-Capable Peripheral Only B-device State Transition Test	N/A
6.8.14 SRP Only Capable Peripheral Only B-device State Transition Test	N/A
6.8.15 Peripheral Only B-device, Capable of No Protocols, State Transition Test	N/A
6.8.16 B-UUT “Device no response” for SRP	N/A

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Embedded Host Manual Interoperability Tests (CH 7)

This section will perform DUT interoperability with peripheral that on the vendor's Target Peripheral List.

Test Item	Result
7.3.1 A-UUT Functionality B-device	Pass
7.3.2 A-UUT Category Functionality B-device	Pass
7.3.3 A-UUT Boot test	Pass
7.3.4 A-UUT Legacy Speed test	N/A
7.3.5 A-UUT Concurrent and Independently test	N/A
7.3.6 A-UUT Unsupported device Message test	Pass
7.3.7 A-UUT Hub Error message test	Pass
7.3.8 A-UUT Hub Functionality test	N/A
7.3.9 A-UUT Hub maximum tier test	N/A
7.3.10 A-UUT Hub Concurrent and Independent test	N/A
7.3.11 A-UUT Bus powered hub power exceeded test	N/A
7.3.12 A-UUT Maximum concurrently device exceed message test	N/A
7.3.13 A-UUT Standby test	N/A
7.3.14 A-UUT Standby Disconnect test	N/A
7.3.15 A-UUT Standby Attach test	N/A
7.3.16 A-UUT Standby Topology Change test	N/A
7.3.17 A-UUT Standby Remote Wakeup test	N/A

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Battery Charging 1.2 Compliance Test

Dedicated Charging Port (DCP) ☐ Pass ☐ Fail ☒ N/A

Test Items \ Port	Port 1
DCP Overshoot and Undershoot Voltage Test	N/A
DCP Handshaking Test	N/A
DCP Resistance and Capacitance Tests	N/A
DCP Voltage and Current	N/A

Charging Downstream Port (CDP) ☐ Pass ☐ Fail ☒ N/A

Test Items \ Port	Port 1
CDP Overshoot and Undershoot Voltage Test	N/A
CDP Voltage and Current Test	N/A
CDP Handshaking Test	N/A
CDP Ground Offset Test – Full Speed	N/A
CDP Ground Offset Test – High Speed	N/A

Standard Downstream Port (SDP) ☐ Pass ☐ Fail ☒ N/A

Test Items \ Port	Port 1
SDP Handshaking Test	N/A

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Multiple Role Port (MRP) ☐ Pass ☐ Fail ☒ N/A

Test Items \ Port	Port 1
MRP Functional Test	N/A

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More Detail Test Result:

1. Low Speed Downstream Signal Quality: Pass

- Overall result: pass!
- Signal eye:
  eye passes
- EOP width: 1.31 us
  EOP width passes
- Measured signaling rate: 1.4999 MHz
  signal rate passes
- Edge Monotonicity: 113 mV
  Monotonic Edge passes
- Crossover voltage range: 1.40 V to 1.79 V, mean crossover 1.60 V
  (first crossover at 1.78 V, 24 other differential crossovers checked)
  crossover voltages pass
- Consecutive jitter range: -12.315 ns to 13.669 ns, RMS jitter 12.349 ns
- Paired JK jitter range: -0.818 ns to 0.625 ns, RMS jitter 0.495 ns
- Paired KJ jitter range: -1.313 ns to 1.355 ns, RMS jitter 0.723 ns
  jitter passes

Additional Information

- Rising Edge Rate: 14.20 V/us (Equivalent risetime = 185.96 ns)
- Falling Edge Rate: 15.87 V/us (Equivalent falltime = 166.37 ns)
- Edge Rate Match: 11.12% (limit +/-20%)

Signal Data and Eye

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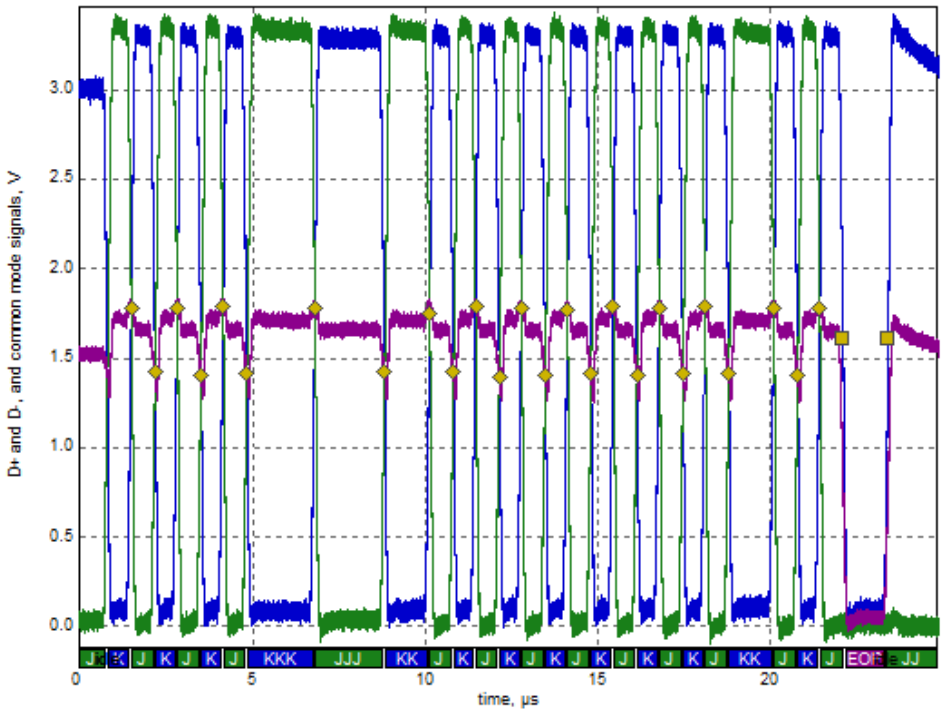

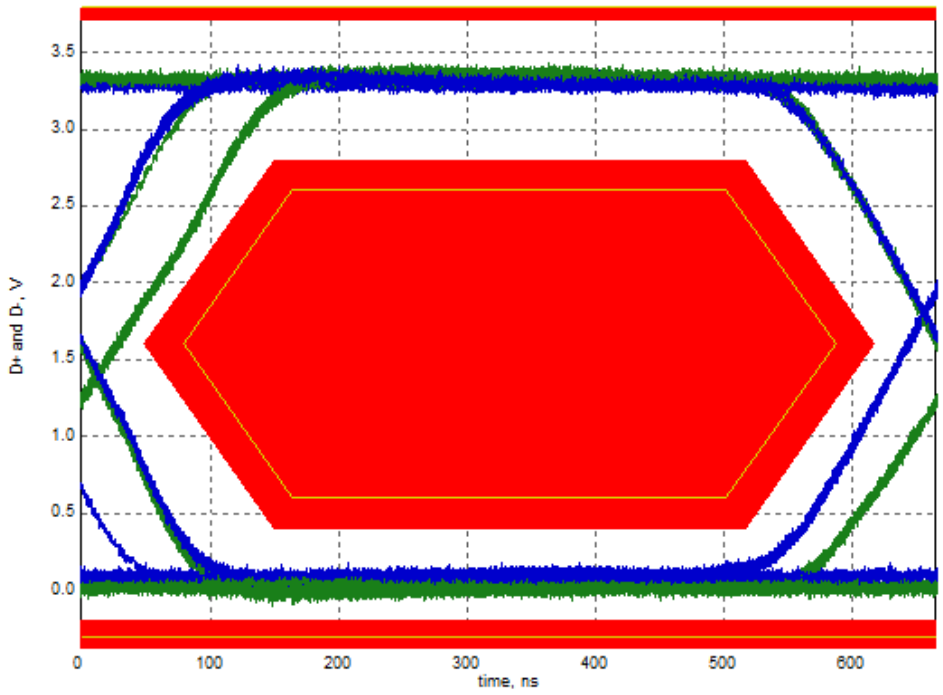

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2. Full Speed Downstream Signal Quality: Pass

- Overall result: pass!
- Signal eye:
  eye passes
- EOP width: 166.80 ns
  EOP width passes
- Measured signaling rate: 11.9988 MHz
  signal rate passes
- Edge Monotonicity: 57 mV
  Monotonic Edge passes
- Crossover voltage range: 1.52 V to 1.80 V, mean crossover 1.71 V
  (first crossover at 1.52 V, 17 other differential crossovers checked)
  crossover voltages pass
- Consecutive jitter range: -351.349 ps to 351.934 ps, RMS jitter 198.423 ps
- Paired JK jitter range: -230.114 ps to 389.441 ps, RMS jitter 183.164 ps
- Paired KJ jitter range: -283.478 ps to 250.851 ps, RMS jitter 179.478 ps
  jitter passes

Additional Information

- Rising Edge Rate: 135.20 V/us (Equivalent risetime = 19.53 ns)
- Falling Edge Rate: 142.80 V/us (Equivalent falltime = 18.49 ns)
- Edge Rate Match: 5.47% (limit +/-10%)

Signal Data and Eye

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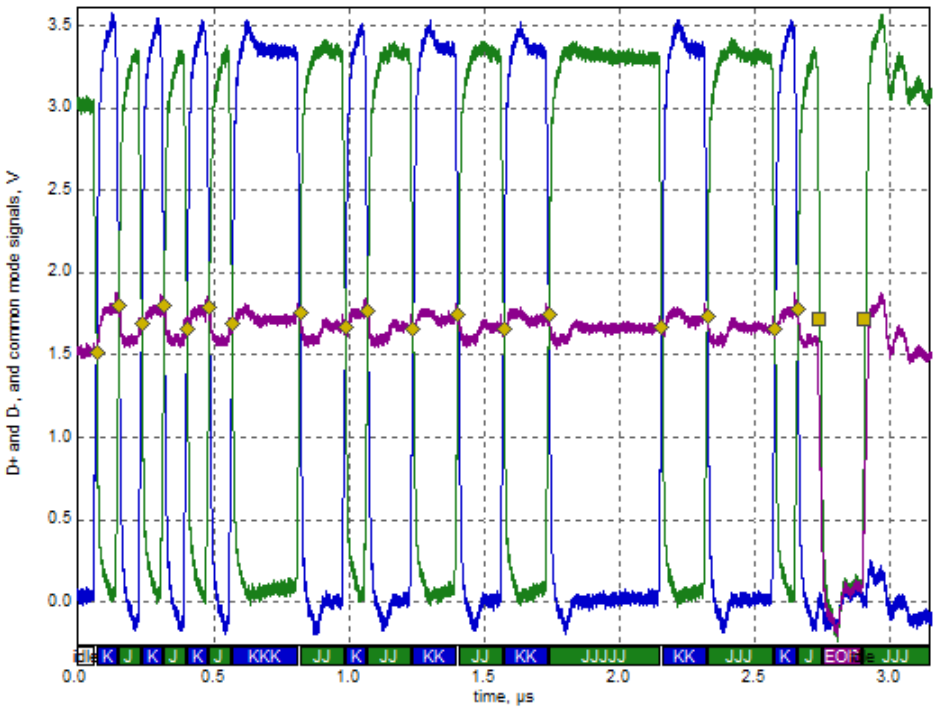

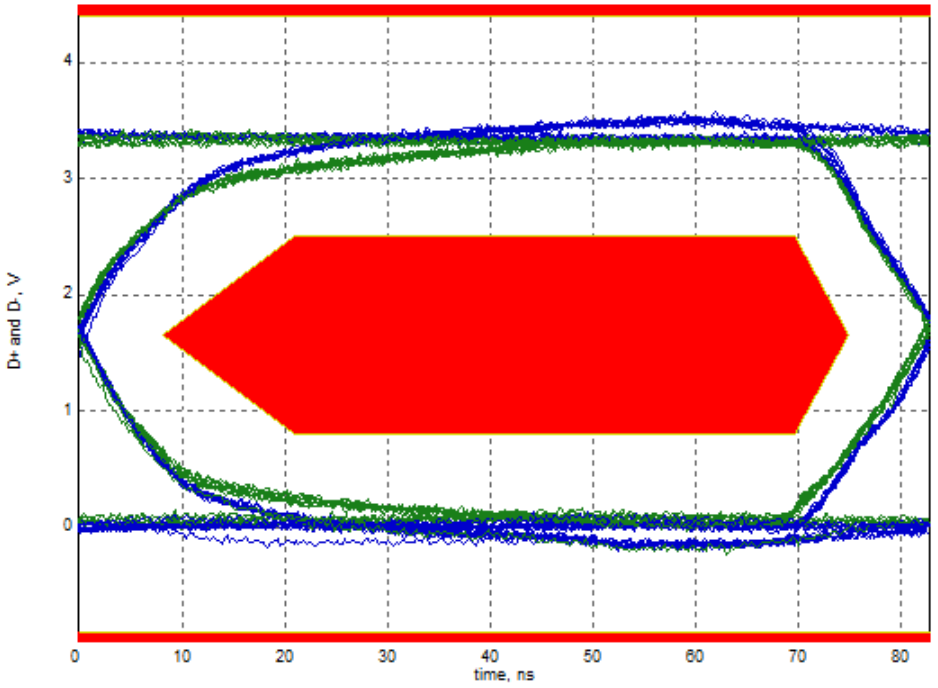

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3. High Speed Downstream Signal Quality: Pass

- Overall result: pass!
- Signal eye:
  eye passes
- EOP width: 7.95 bits
  EOP width passes
- Measured signaling rate: 480.0444 MHz
  signal rate passes
- Edge Monotonicity: 0 mV
  Monotonic Edge passes
- Rising Edge Rate: 1009.89 V/us (633.73 ps equivalent risetime)
  passes
- Falling Edge Rate: 1003.33 V/us (637.87 ps equivalent falltime)
  passes

Additional Information

- Consecutive jitter range: -96.194 ps to 76.145 ps, RMS jitter 40.335 ps
- Paired JK jitter range: -44.422 ps to 40.307 ps, RMS jitter 13.898 ps
- Paired KJ jitter range: -49.681 ps to 39.054 ps, RMS jitter 13.009 ps

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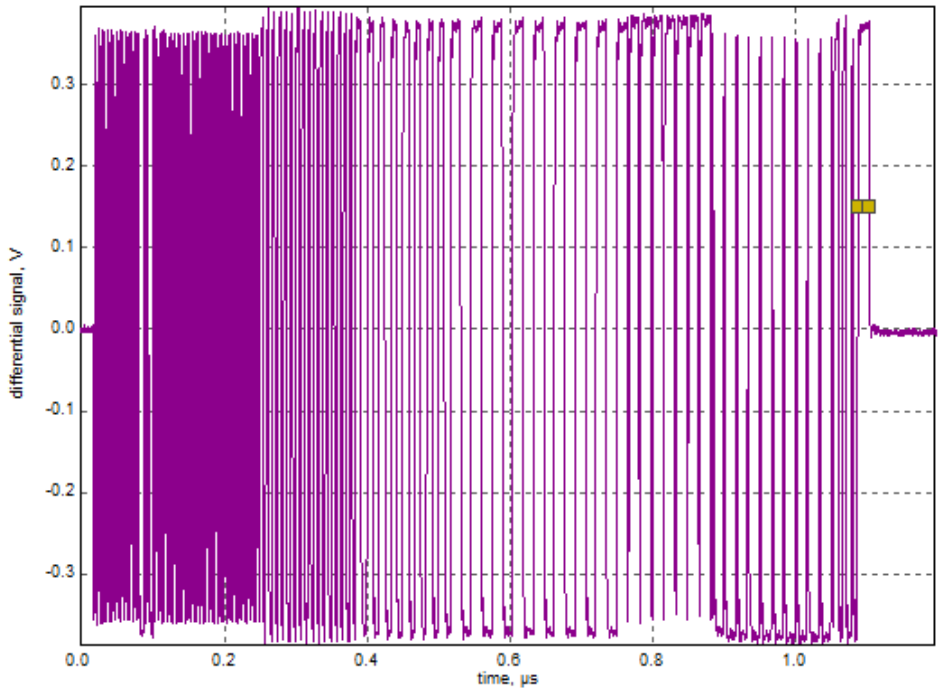

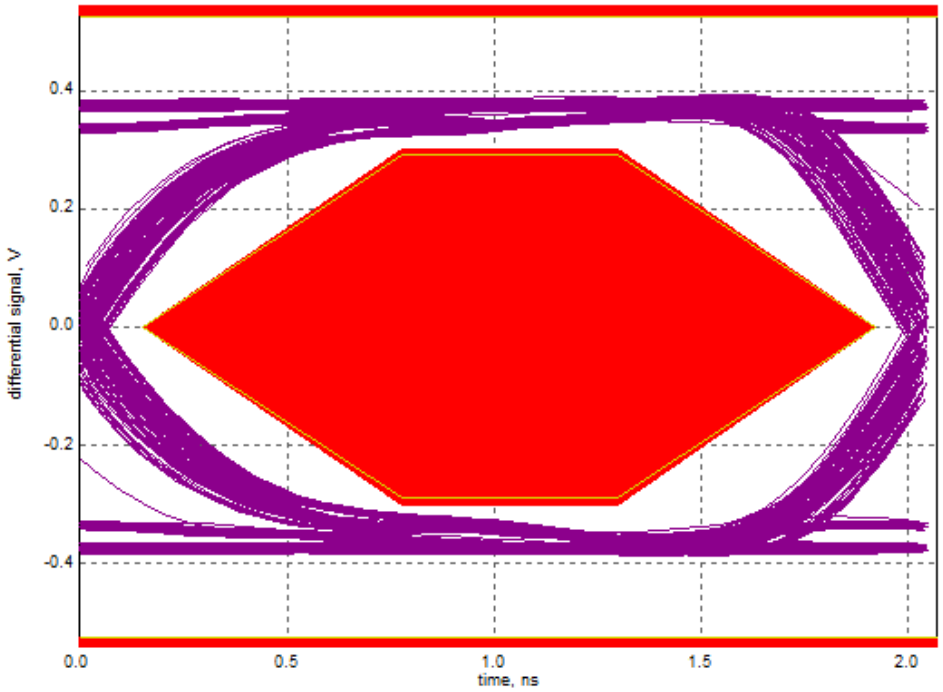

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Test Procedure Reference:

1. USB On-The-Go and Embedded Host Automated Compliance Plan for the On-The-Go & Embedded Host Supplement Revision 2.0, Version 1.2
2. Universal Serial Bus Implementers Forum High-speed System/Motherboard Compliance Test Procedure, Version: 1.4
3. Universal Serial Bus Implementers Forum Full and Low Speed Electrical and Interoperability Compliance Test Procedure, Version: 1.3
4. USB Battery Charging 1.2 Compliance Plan, Revision: 1.1

Notice: Test result is valid only to the original tested device model. The content of test report may not be copied or re-transmitted (except for the entire report) unless it is prior approved by Allion.

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