



Open Networking Consortium

Open Network Systems Interoperability Test Report

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Enclosed are the results from the Open Network Systems Interoperability Plugfest performed on:

Module or Cable Assembly Under Test (MUT/CUT):

Vendor and Device Type	GoodOptics QSFP28 SR4 100G Module
Part Number	GOODOPTICS100

Host Under Test (HUT):

Host System 1 Composition	
Network Operating System	SWITCHY-NOS
OS Version	
Bare Metal Switch	Switchy
Part Number	SWITCHY-5000
ONIE Version	2014.08

This testing pertains to the Open Network Systems Interoperability Test Plan, which outlines a series of tests performed on a variety of optical transceivers and cables with bare-metal open switches running Network Operating Systems from multiple vendors. The focus of these tests was basic interoperability which aims to validate the operation of open network systems.

As always, we welcome any comments regarding this Test Suite. If you have any questions about the test procedures or results, please feel free to contact me via e-mail at david@iol.unh.edu or by phone at +1-603-862-0090.

Regards,
David Woolf

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In section 2, the following equipment was used:

Test System Hardware	
EEPROM Reader	Avago Aport USB-MDIO/TWI Interface Controller

In section 3, the following equipment was used:

Test System Hardware	
Network Analyzer	Agilent E5071C

In section 4, the following equipment was used:

Test System Hardware	
Wide Bandwidth Oscilloscope	Agilent DCA-X 86100D
Waveform Analyzer	Agilent 86105C
50GHz Waveform Analyzer	Agilent DCA-86108B
Clock Recovery Module	Agilent 83496A
High Performance Serial BERT	Agilent N4903B
Signal Quality Analyzer	Anritsu MP1800A with MU181020B 14Gbps PPG* Modules
De-Emphasis Signal Converter	Agilent N4916B

*Two modules used during testing

In section 6, an Ixia XM12 was used to generate test traffic:

Test System Hardware	
Ethernet Traffic Generator	Ixia XM12
Software Version	IxOS 8.10 EA
Port Types	QSFP28

The following table contains possible results and their meanings.

Result	Interpretation
PASS	The Device Under Test (DUT) was observed to exhibit conformant behavior.
PASS W/ Comments	The specified behavior is demonstrated by the DUT, however this result indicates that either changes were made to the standard test procedure or results other than the expected results were observed.
FAIL	The DUT was observed to exhibit non-compliant behavior.
INFO	This Test is designed for informational purposes only. While the results may help ensure the interoperability of the DUT, a PASS/FAIL is not given for this test.
WARN	The DUT was observed to exhibit behavior that is not recommended.
N/A	Not Applicable. This test is not applicable for the DUT.
N/S	Not Supported. This test was not run due to features not implemented on the DUT.
N/T	Not tested. This test was not run.

Summary of Results- Conformance	
Test	Result
Test 1.1: ONIE Compliance Environment	N/A
Test 1.2: Installing and uninstalling a NOS through ONIE via HTTP server	PASS
Test 4.1.1: Calibration for 100G QSFP28 Module and AOC Testing	PASS
Test 4.1.2: 100G QSFP28 Golden Module Verification	PASS
Test 4.2.1: Transmitter Eye Mask for 100G QSFP28 (Modules Only)	PASS
Test 4.2.2: Output Eye Mask for 100G QSFP28	PASS
Test 5.1.1: Output Rise and Fall Times for 100G Host	PASS
Test 5.1.2: Transmitter Eye Mask for 100G Host	PASS
Test 5.1.3: Total Jitter for 100G Host	PASS
Test 5.1.4: Input and Output Return Loss on 100G Host	PASS

Summary of Results - Interoperability	
Test	Result
Test 2.1: Physical Compatibility with Supporting Devices	PASS
Test 2.2: Host Management of Module or Cable Assembly	PASS
Test 2.3: Diagnostic Optical Monitor Support	PASS
Test 6.1: Establish Baseline Performance Analysis	PASS
Test 6.2: Link Detection on Power Up	PASS
Test 6.3: Packet Error Rate Estimation	PASS
Test 6.4: Packet Loss/Stress Test	PASS

Notes

Conformance Test Results	
Test Information	Test Result
<p>Test 1.1: ONIE Compliance Environment</p> <p><i>Purpose:</i> To verify that a host can pass a random sampling of ONIE Compliance Environment tests.</p>	N/A
Comments on Test Procedure	
The random sampling of tests from the ONIE Compliance Environment was not used.	
Comments on Test Results	
Additional Comments	
This test is only applicable to Hosts which have not performed ONIE compliance testing previously.	
Test Information	Test Result
<p>Test 1.2: Installing and uninstalling a NOS through ONIE via HTTP server</p> <p><i>Purpose:</i> To verify that a NOS can be successfully installed through ONIE.</p>	PASS
Comments on Test Procedure	
This test was completed using the standard procedure as written in the Test Plan. The random sampling of tests from the ONIE Compliance Environment was not used.	
Comments on Test Results	
<p>Part A: The DUT was able to install the NOS via ONIE. Part B: The DUT was able to uninstall the NOS via ONIE.</p>	
Additional Comments	

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Test Information	Test Result
<p>Test 4.1.1: Calibration for 100G QSFP28 Module and AOC Testing</p> <p><i>Purpose:</i> To establish Electrical input baseline of the SFP+ optical modules.</p>	<p>PASS</p>
<p>Comments on Test Procedure</p>	
<p>This test was completed using the standard procedure.</p>	
<p>Comments on Test Results</p>	
<p>The signal at point TP1 was calibrated to meet SFF-8431 requirements for Module Electrical Input Signals.</p>	
<p>Additional Comments</p>	

Test Information	Test Result
<p>Test 4.1.2: 100G QSFP28 Golden Module Verification</p> <p><i>Purpose:</i> To record the optical output eye mask margin of the Golden Optical Unit. This unit will be used to test SFP+ Modules at TP4.</p>	<p>PASS</p>
<p>Comments on Test Procedure</p>	
<p>This test was completed using the standard procedure.</p>	
<p>Comments on Test Results</p>	
<p>Using the input signal calibrated during 4.1.1, a Golden Module was selected that was compliant to IEEE Std. 802.3-2012 for a 10G signal at TP2.</p>	
<p>Additional Comments</p>	

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Test Information	Test Result
<p>Test 4.2.1: Transmitter Eye Mask for 100G QSFP28</p> <p><i>Purpose:</i> To verify that the device (Module or Cable Assembly) under test (DUT) demonstrates electrical output characteristics that meets the specified requirements.</p>	PASS
Comments on Test Procedure	
This test was completed using the standard procedure.	
Comments on Test Results	
The hit ratio did not exceed 5×10^{-5} . The Mask Margin was greater than 0.	
Additional Comments	

Test Information	Test Result
<p>Test 4.2.2: Output eye mask for 100G QSFP28</p> <p><i>Purpose:</i> To verify that the device (Module or Cable Assembly) under test (DUT) demonstrates electrical output characteristics that meets the specified requirements.</p>	PASS
Comments on Test Procedure	
This test was completed using the standard procedure.	
Comments on Test Results	
The hit ratio did not exceed 5×10^{-5} . The Mask Margin was greater than 0.	
Additional Comments	

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Test Information	Test Result
<p>Test 5.1.1: Output Rise and Fall Times for 100G Host</p> <p><i>Purpose:</i> To verify that the Eye Mask Hit Ratio is within the conformance limits.</p>	PASS
Comments on Test Procedure	
The test was completed with the standard procedure.	
Comments on Test Results	
The device under test exhibited the expected behavior.	
Additional Comments	

Test Information	Test Result
<p>Test 5.1.2: Transmitter Eye Mask on 100G Host</p> <p><i>Purpose:</i> To verify that the Eye Mask Hit Ratio is within the conformance limits.</p>	PASS
Comments on Test Procedure	
The test was completed with the standard procedure.	
Comments on Test Results	
The device under test exhibited the expected behavior.	
Additional Comments	

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Test Information	Test Result
<p>Test 5.1.3: Total Jitter for 100G Host</p> <p><i>Purpose:</i> To verify that the Total Jitter (TJ) is within the conformance limit.</p>	PASS
Comments on Test Procedure	
The test was completed with the standard procedure.	
Comments on Test Results	
The device under test exhibited the expected behavior.	
Additional Comments	

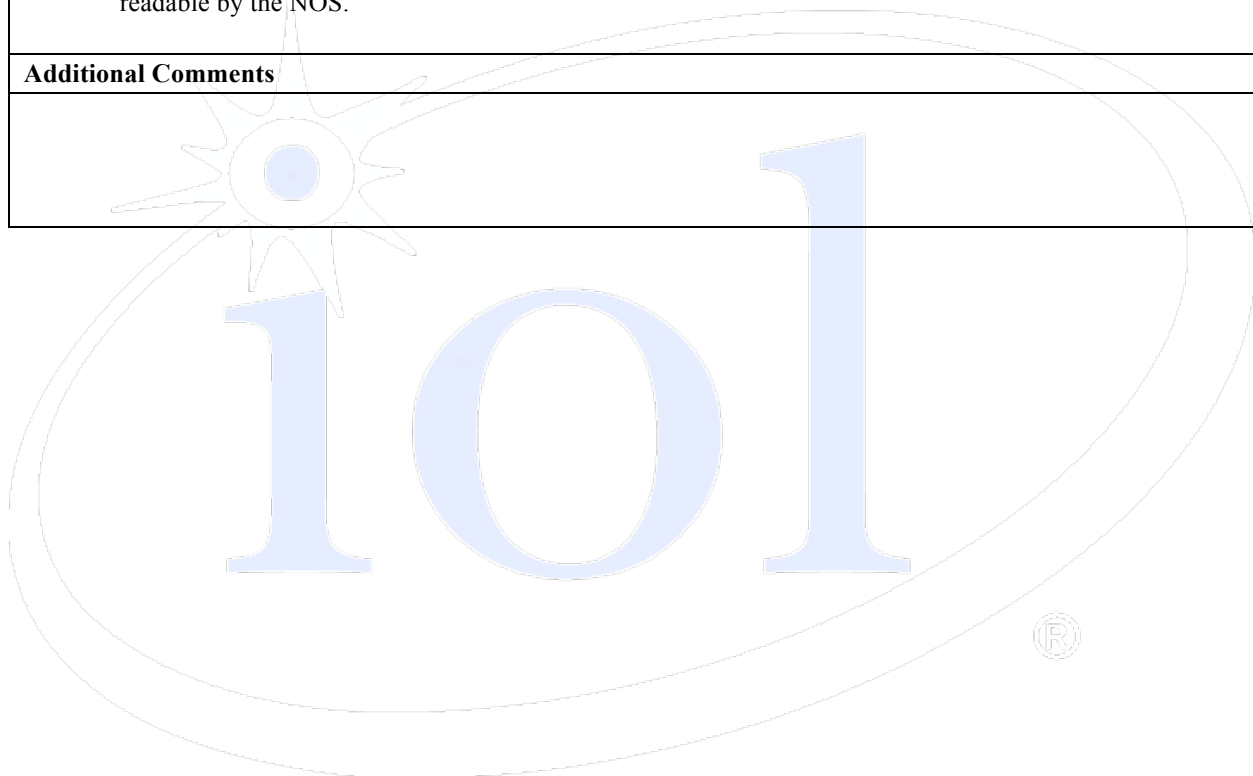
Test Information	Test Result
<p>Test 5.1.4: Input and Output Return Loss on 100G Host</p> <p><i>Purpose:</i> To verify that the differential input and output return loss of the DUT is within conformance limits.</p>	PASS
Comments on Test Procedure	
The test was completed with the standard procedure.	
Comments on Test Results	
The device under test exhibited the expected behavior.	
Additional Comments	
See Appendix B	

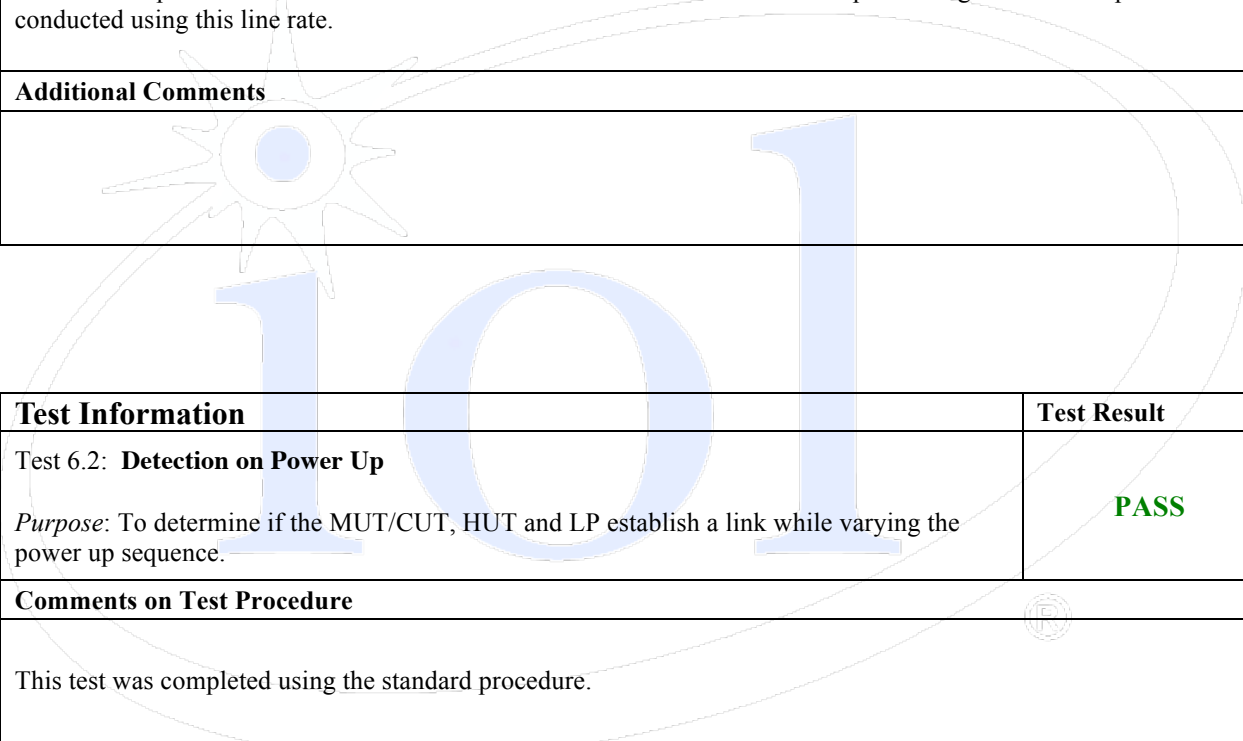
Interoperability Test Results	
Test Information	Test Result
<p>Test 2.1: Physical Compatibility with Supporting Devices</p> <p><i>Purpose:</i> To verify that the mechanical form factor is compatible with devices for interoperability purposes.</p>	PASS
Comments on Test Procedure	
The test was completed with the standard procedure.	
Comments on Test Results	
<p>Part A: The MUT/CUT was able to be inserted into the Host. Part B: This test is not applicable to Cable Assemblies. Part C: The MUT/CUT was able to be removed from the Host.</p>	
Additional Comments	

Test Information	Test Result
<p>Test 2.2: Host Management of Module or Cable Assembly</p> <p><i>Purpose:</i> To verify that the MUT/CUT is manageable via the Host complex.</p>	PASS
Comments on Test Procedure	
The test was completed with the standard procedure.	
Comments on Test Results	
<p>Part B: The EEPROM data of the MUT/CUT was readable. The serial number and vendor information extracted from the EEPROM data matches the serial number and vendor information of the part.</p>	
Additional Comments	

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Test Information	Test Result
Test 2.3: Diagnostic Optical Monitor Support <i>Purpose:</i> To verify that the MUT/CUT (active optical cable only) supports diagnostic functions via the Host complex.	PASS
Comments on Test Procedure	
The test was completed with the standard procedure.	
Comments on Test Results	
Part A: The MUT/CUT supports diagnostic monitoring and the diagnostic information from the EEPROM was readable by the NOS.	
Additional Comments	



Test Information	Test Result
<p>Test 6.1: Establish Baseline Performance Analysis</p> <p><i>Purpose:</i> To establish a baseline performance analysis of the HUT.</p>	PASS
Comments on Test Procedure	
<p>This test was completed using a modified procedure. Because of a lack of 40G Golden Modules, the Host was baselined using each 40G MUT/CUT.</p>	
Comments on Test Results	
<p>The baseline performance of the Host was determined to be 90% line rate. All proceeding tests in Group 6 were conducted using this line rate.</p>	
Additional Comments	
	

Test Information	Test Result
<p>Test 6.2: Detection on Power Up</p> <p><i>Purpose:</i> To determine if the MUT/CUT, HUT and LP establish a link while varying the power up sequence.</p>	PASS
Comments on Test Procedure	
<p>This test was completed using the standard procedure.</p>	
Comments on Test Results	
<p>Part A: The Host and Link Partner were able to establish a valid link with this MUT/CUT while fully powered and operational.</p> <p>Part B: The Host and Link Partner were able to establish a valid link with this MUT/CUT when the Link Partner was powered on after the Host.</p> <p>Part C: The Host and Link Partner were able to establish a valid link with this MUT/CUT when the Host was powered on after the Link Partner.</p>	
Additional Comments	

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Test Information	Test Result
<p>Test 6.3: Packet Error Rate Estimation</p> <p><i>Purpose:</i> To determine if a Host can exchange packets with a Module or Cable Assembly such that a bit error rate of 10^{-12} is achieved</p>	PASS
Comments on Test Procedure	
This test was completed using the standard procedure.	
Comments on Test Results	
<p>Part A: All 247,000,000 frames transmitted by TS1 were received by TS2. Part B: All 10,506,539,320 frames transmitted by TS1 were received by TS2.</p>	
Additional Comments	

Test Information	Test Result
<p>Test 6.4: Packet Loss/Stress Test</p> <p><i>Purpose:</i> To verify that no obvious buffer management problems occur when directing a large volume of traffic at the Host and Module/Cable Assembly combination.</p>	PASS
Comments on Test Procedure	
This test was completed using the standard procedure.	
Comments on Test Results	
<p>Parts A-D: All 1,000,000,000 64-byte frames transmitted by TS1 were received by TS2. All 1,000,000,000 1518-byte frames transmitted by TS1 were received by TS2.</p>	
Additional Comments	

Appendix A: EEPROM Data

GOODOPTICS CORP QSFP28 module
Part Number: GOODOPTICS100 Serial Number: CU2003T
GOODOPTICS_CU2003T_____EEPROMdecode_20160802155646.txt

SERIAL_ID Keys:

BR_NOMINAL: 25750
CONNECTOR: 12
CU_ATTENUATE_2_5: 0
CU_ATTENUATE_5_0: 0
DEVICE_TECH: 0x0
ENCODING: 5
EXTENDED_MODULE: 0x0
EXT_IDENTIFIER: 204
EXT_RATE_COMPLY: 0
IDENTIFIER: 17
LENGTH_OM1_62_5UM: 0
LENGTH_OM2_50UM: 0
LENGTH_OM3_50UM: 70
LENGTH_OM4_OR_CU: 100
LENGTH_SMF_KM: 0
MAX_CASE_TEMP: 0
SPEC_COMPLIANCE: 0x80 0x0 0x0 0x0 0x0 0x0 0x0 0x0
VENDOR_NAME: GOODOPTICS CORP
VENDOR_OUI: 0x0 0x90 0x65
VENDOR_PN: GOODOPTICS100
VENDOR_REV: A0
WAVELENGTH: 850.0
WAVELEN_TOLERANCE: 10.0

Vendor Specific: 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0
0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0
0x0 0x0

I2C Address A0h, bytes 0-127, in hex

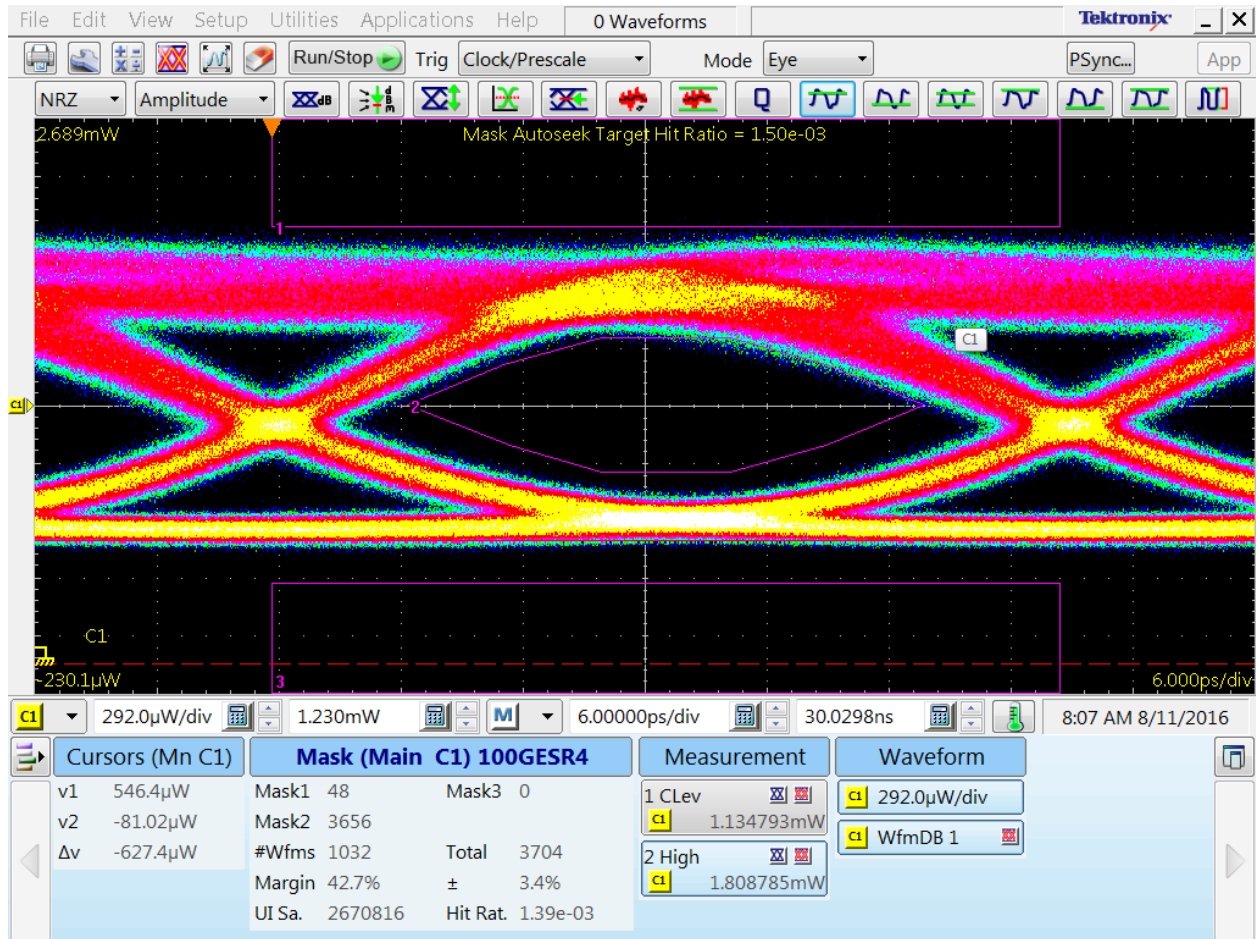
0000x: 1107020f 000f0000 00555555 55000000
0010x: 00000000 0000111e 00008116 00000000
0020x: 00000015 00170028 0034000c 00000007
0030x: 00001d57 19ae125e 19bd0000 00000000
0040x: 00000000 00000000 00000000 00000000
0050x: 00000000 00000001 cc000000 00000000
0060x: 0000ff00 00000000 00000000 00000000
0070x: 00000000 00000000 00000000 00000000

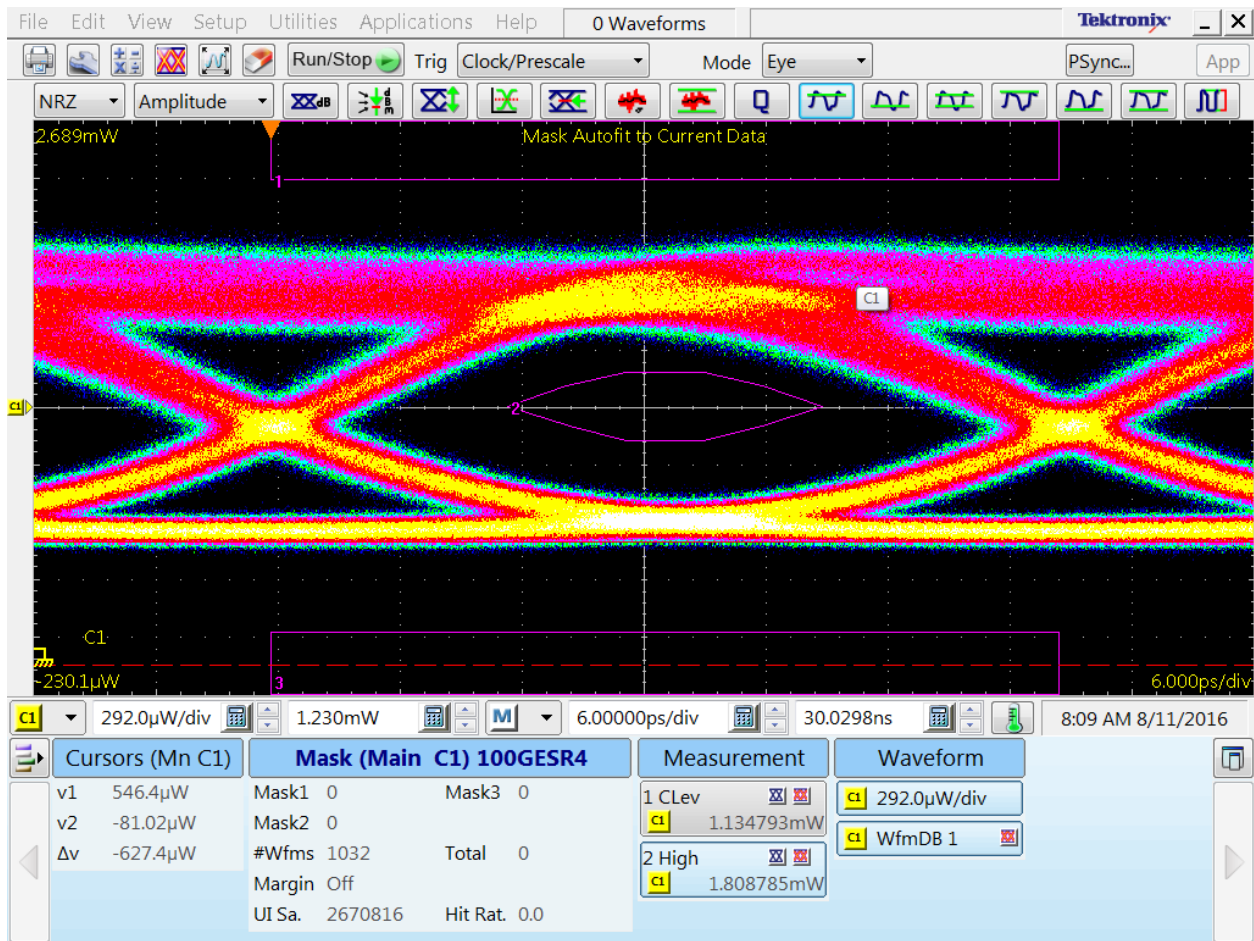
I2C Address A0h, page 0, bytes 128-255, in hex

0000x: 11cc0c80 00000000 00000005 ff000023
0010x: 00003200 46494e49 53415220 434f5250
0020x: 20202020 00009065 46544c43 39353531
0030x: 5245504d 20202020 41304268 07d0003a
0040x: 0207ffde 43553230 30335420 20202020

```
0050x: 20202020 31353037 31312020 0c1067a9
0060x: 00000000 00000000 00000000 00000000
0070x: 00000000 00000000 00000000 00000000
```

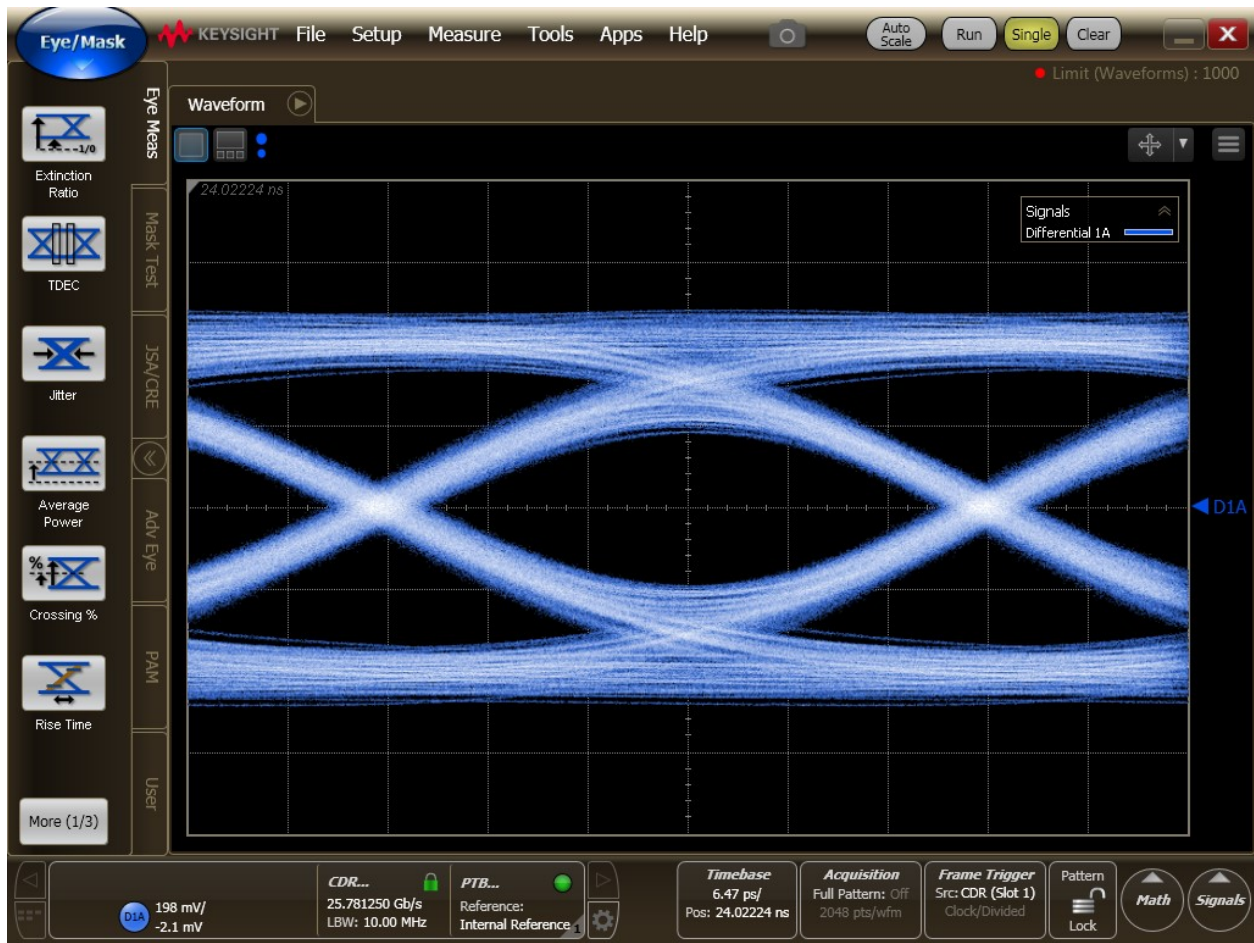
Appendix B: Pluggable Module / Cable Electrical Data





Appendix C: Host Electrical Data

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