**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**CalypsoAIC Low Speed**

**Signal Integrity Test Report**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

cid:image004.jpg@01D24199.C8B12520

|  |  |
| --- | --- |
| Project name | CalypsoAIC Low Speed SI test |
| Part Number | 303-587-000A-00 |
| Tested Platforms | PowerEdge740 |
| Software Environment | DDOS 3.2-594610 |
| Main Qual Scope | Low Speed Signal Integrity Test for Clock/NOR Flash/I2C/Reset |
| Overall Test Result | Pass |
| JIRAFIX | N/A |
| Contact engineer | Curry Yan |
| Date | 10/11/2018 |

**TABLE OF CONTENTS**

[1 Executive Summary 3](#_Toc533689629)

[2 Test Issues 3](#_Toc533689630)

[3 Clock Test 3](#_Toc533689631)

[3.1 Test Equipment 3](#_Toc533689632)

[3.2 Test Purpose and Test Scope 3](#_Toc533689633)

[3.3 Test Configuration 4](#_Toc533689634)

[3.4 Test Procedure 4](#_Toc533689635)

[3.5 Pass/Fail Criteria 4](#_Toc533689636)

[3.6 Summary of Test results 5](#_Toc533689637)

[3.7 DETAILED RESULTS 5](#_Toc533689638)

[4 NOR Flash Test 6](#_Toc533689639)

[4.1 Test Equipment 6](#_Toc533689640)

[4.2 Test Purpose and Test Scope 7](#_Toc533689641)

[4.3 Test Configuration 7](#_Toc533689642)

[4.4 Test Procedure 7](#_Toc533689643)

[4.5 Pass/Fail Criteria 8](#_Toc533689644)

[4.6 Summary of Test results 8](#_Toc533689645)

[4.7 DETAILED RESULTS 9](#_Toc533689646)

[5 I2C Test 12](#_Toc533689647)

[5.1 Test Equipment 12](#_Toc533689648)

[5.2 Test Purpose and Test Scope 13](#_Toc533689649)

[5.3 Test Configuration 13](#_Toc533689650)

[5.4 Test Procedure 13](#_Toc533689651)

[5.5 Pass/Fail Criteria 13](#_Toc533689652)

[5.6 Summary of Test results 14](#_Toc533689653)

[5.7 DETAILED RESULTS 15](#_Toc533689654)

[6 Reset Test 21](#_Toc533689655)

[6.1 Test Equipment 21](#_Toc533689656)

[6.2 Test Purpose and Test Scope 21](#_Toc533689657)

[6.3 Test Configuration 21](#_Toc533689658)

[6.4 Test Procedure 21](#_Toc533689659)

[6.5 Pass/Fail Criteria 22](#_Toc533689660)

[6.6 Summary of Test results 22](#_Toc533689661)

[6.7 DETAILED RESULTS 22](#_Toc533689662)

[7 Conclusion 23](#_Toc533689663)

[8 Reference Documents 24](#_Toc533689664)

[9 APPENDIX 24](#_Toc533689665)

# I2C Test

## Test Equipment

* PLATFORM: PowerEdge R740 Server
* CalypsoAIC cDVT Sample
* Oscilloscope: Tektronix DPO 4104B 1GHz 5GS/s
* Probe:
* Tektronix TPP1000 X 2 1GHz

## Test Purpose and Test Scope

• Verify I2C bus signal basic electrics parameters can meet I2C specification electrical requirement.

* + Avoid logic error on I2C bus.
  + Avoid communication error between different FRUs.

## Test Configuration

|  |  |
| --- | --- |
| Test Platform: | PowerEdge740 & PowerEdge940 |
| Platform FW info: | BIOS 91.37 |
| CalypsoAIC S/N: | CF2SZ183000002/CF2SZ183000003 |
| CalypsoAIC FW info: | Flash:082718; SSD:082118; CPLD:v7; Fuel Gauge:01 |
| Test Environment: | Room Temp |

## Test Procedure

1. Select one I2C device (as resume address: **A8**) on SLIC to be tested.
2. Probe at SCL/SDA test points/pins of resume with passive probes on scope, select Bus B1 as I2C.
3. Define inputs in Bus B1.
4. Preset measured signals threshold to TTL (1.4V) in Bus B1.
5. Include R/W in address.
6. Set Trigger Type as ‘Bus’, Source Bus’B1’, Trigger on ’Address’, Address ’**A8**h’,  Mode ‘Normal’.
7. Let scope capture the write data to address A8, it shows ‘A [W]: **A8**’ in B1 after decoding.
8. Measure SCL frequency, save screen image.
9. Measure SCL/SDA high/low level input voltage, save screen image.
10. Measure SCL/SDA overshoot/undershoot, save screen image.
11. Measure SCL/SDA Rise time; observe rising edges monotonic, save screen image.
12. Measure SCL/SDA Fall time; observe falling edges monotonic, save screen image.
13. User cursor manual placement measure SDA setup time, save screen image.
14. User cursor manual placement measure SDA hold time, save screen image.
15. Repeat step#1-14 for other devices on I2C bus.

## Pass/Fail Criteria

* Octeon pass/fail criteria

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test item | Spec | | | |
| Min. | Typ. | Max. | Unit |
| VIH | 1.4 |  | - | V |
| VIL | - |  | 0.66 | V |
| Overshoot |  |  | - | V |
| Undershoot | - |  |  | V |
| Rise Time |  |  | 1000 | ns |
| Fall Time |  |  | 300 | ns |
| Setup Time(tSU:dat) | 250 |  |  | ns |
| Hold Time (tHD:DAT) | 0 |  | 3.45 | μs |

* DS75 pass/fail criteria

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test item | Spec | | | |
| Min. | Typ. | Max. | Unit |
| VIH | 2.31 (0.7 x VDD) |  | 3.8 | V |
| VIL | -0.5 |  | 0.99 (0.3 x VDD) | V |
| Overshoot |  |  | 3.8 | V |
| Undershoot | -0.5 |  |  | V |
| Rise Time |  |  | 1000 | ns |
| Fall Time |  |  | 300 | ns |
| Setup Time(tSU:dat) | 100 |  |  | ns |
| Hold Time (tHD:DAT) | 0 |  | 3.45 | μs |

* bq27510-G3 pass/fail criteria

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test item | Spec | | | |
| Min. | Typ. | Max. | Unit |
| VIH | 1.2 |  | 6 | V |
| VIL | -0.3 |  | 0.6 | V |
| Overshoot |  |  | 6 | V |
| Undershoot | -0.3 |  |  | V |
| Rise Time |  |  | 1000 | ns |
| Fall Time |  |  | 300 | ns |
| Setup Time(tSU:dat) | 250 |  |  | ns |
| Hold Time (tHD:DAT) | 0(Rx mode)  0.3(Tx mode) |  |  | μs |

* DIMM pass/fail criteria

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test item | Spec | | | |
| Min. | Typ. | Max. | Unit |
| VIH | 1.75 |  | 3 | V |
| VIL | -0.5 |  | 0.75 | V |
| Overshoot |  |  | 3 | V |
| Undershoot | 0.75 |  |  | V |
| Rise Time |  |  | 1000 | ns |
| Fall Time |  |  | 300 | ns |
| Setup Time (tSU:dat) | 50 |  |  | ns |
| Hold Time (tHD:DAT) | 0 |  |  | us |

## Summary of Test results

| **Test Case** | **Result**  **(Pass/Fail)** |
| --- | --- |
| I2C device:DS75 | PASS |
| I2C device: bq27510-G3 | PASS |
| I2C device: DIMM | PASS |

## DETAILED RESULTS

### Octeon write to bq27510-G3(Address@AA)

|  |  |  |
| --- | --- | --- |
| Signal name | Probe location | Note |
| I2C1\_SDA | R601.2 | Vcc = 3.3V  Vss = 0 |
| I2C1\_SCL | R600.1 |

#### Test data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test item | Measured value | | Spec | | | |
| SDA | SCL | Min. | Typ. | Max. | Unit |
| VIH | 3.16 | 3.18 | 1.2 |  | 6 | V |
| VIL | 0 | 0.02 | -0.3 |  | 0.6 | V |
| Overshoot | 3.32 | 3.34 |  |  | 6 | V |
| Undershoot | -0.24 | -0.26 | -0.3 |  |  | V |
| Rise Time | 230.4 | 214.1 |  |  | 1000 | ns |
| Fall Time | 9.944 | 10.16 |  |  | 300 | ns |
| Setup Time(tSU:dat) | 2900 | | 250 |  |  | ns |
| Hold Time (tHD:DAT) | 1.996 | | 0 |  |  | μs |

|  |  |
| --- | --- |
| C:\Users\yanc8\Desktop\CalypsoAIC\LowSpeedSI_Test\I2C\2018-12-25\Battery\Write\tek00005.png | C:\Users\yanc8\Desktop\CalypsoAIC\LowSpeedSI_Test\I2C\2018-12-25\Battery\Write\tek00006.png |
| C:\Users\yanc8\Desktop\CalypsoAIC\LowSpeedSI_Test\I2C\2018-12-25\Battery\Write\tek00007.png | C:\Users\yanc8\Desktop\CalypsoAIC\LowSpeedSI_Test\I2C\2018-12-25\Battery\Write\tek00008.png |

### Octeon read from bq27510-G3(Address@AB)

|  |  |  |
| --- | --- | --- |
| Signal name | Probe location | Note |
| OCT\_I2C1\_SDA | R203.1 | VDD = 3.3V  Vss = 0 |
| OCT\_I2C1\_SCL | R202.1 |

#### Test data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test item | Measured value | | Spec | | | |
| SDA | SCL | Min. | Typ. | Max. | Unit |
| VIH | 3.12 | 3.18 | 1.4 |  | - | V |
| VIL | -0.04 | -0.02 | - |  | 0.66 | V |
| Overshoot | 3.32 | 3.34 |  |  | - | V |
| Undershoot | -0.24 | -0.22 | - |  |  | V |
| Rise Time | 227.1 | 212.0 |  |  | 1000 | ns |
| Fall Time | 9.287 | 9.77 |  |  | 300 | ns |
| Setup Time(tSU:dat) | 4163.6 | | 250 |  |  | ns |
| Hold Time (tHD:DAT) | 0.729 | | 0 |  | 3.45 | μs |

|  |  |
| --- | --- |
| C:\Users\yanc8\Desktop\CalypsoAIC\LowSpeedSI_Test\I2C\2018-12-25\Battery\Read\tek00001.png | C:\Users\yanc8\Desktop\CalypsoAIC\LowSpeedSI_Test\I2C\2018-12-25\Battery\Read\tek00002.png |
| C:\Users\yanc8\Desktop\CalypsoAIC\LowSpeedSI_Test\I2C\2018-12-25\Battery\Read\tek00003.png | C:\Users\yanc8\Desktop\CalypsoAIC\LowSpeedSI_Test\I2C\2018-12-25\Battery\Read\tek00004.png |