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# Cypress Semiconductor Automotive Product Qualification Report

## QTP# 080803 VERSION*A
## February 2015

| Zero Delay Clock Buffer HiREL Technology R52T-3, Fab4 | |
|---|---|
| **CY2305C** | **Low Cost 3.3V Zero Delay Clock Buffer** |

**FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT**
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## PRODUCT QUALIFICATION HISTORY

| QTP Number | Description of Qualification Purpose | Date |
|---|---|---|
| 080803 | Zero Delay Clock Buffer HiREL Technology Qual using 7C823C15AC, R52T-3, Fab4 | Jun 08 |

| PRODUCT DESCRIPTION (for qualification) | |
|---|---|
| Qualification Purpose: | To qualify 7C823C15AC Zero Delay Clock Buffer for automotive application on R52T-3, Fab4 |
| Marketing Part #: | CY2305C* |
| Device Description: | 3.3V, Zero Delay Clock Buffer |
| Cypress Division: | Cypress Semiconductor Corporation – Programmable Systems Division (PSD) |

| TECHNOLOGY/FAB PROCESS DESCRIPTION | | | |
|---|---|---|---|
| Number of Metal Layers: | 3 | Metal Composition: | Metal 1: 500Å TiW, 6000Å Al /500Å TiW<br>Metal 2: 500Å TiW, 6000Å Al /500Å TiW<br>Metal 3: 300Å Ti, 8000Å Al /300Å TiW |
| Passivation Type and Materials: | | | 1000Å TEOS + 9000Å Si3N4 |
| Number of Transistors in device | | | 13,741 |
| Number of Gates in device | | | 3,435 |
| Generic Process Technology/Design Rule (µ-drawn): | | | CMOS, Triple Metal, 0.25um |
| Gate Oxide Material/Thickness (MOS): | | | SiO2/55A |
| Name/Location of Die Fab (prime) Facility: | | | Cypress Semiconductor -- Bloomington, MN |
| Die Fab Line ID/Wafer Process ID: | | | Fab 4, R52T-3 |

## PACKAGE AVAILABILITY

| PACKAGE | ASSEMBLY FACILITY SITE |
|---|---|
| **8-Lead SOIC** | **PHIL-M** |

| MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION | |
|---|---|
| **Package Designation:** | SZ8 |
| **Package Outline, Type, or Name:** | 8-Lead Small Outline Integrated Circuit (SOIC) |
| **Mold Compound Name/Manufacturer:** | 6600H/Sumitomo |
| **Mold Compound Flammability Rating:** | UL 94 V0 |
| **Mold Compound Alpha Emission Rate :** | N/A |
| **Oxygen Rating Index:** | N/A |
| **Lead Frame Material:** | Copper |
| **Lead Finish, Composition / Thickness:** | Pure Sn |
| **Die Backside Preparation Method/Metallization:** | Backgrind |
| **Die Separation Method:** | 100% Saw |
| **Die Attach Supplier:** | Ablestik |
| **Die Attach Material:** | 8290 |
| **Die Attach Method:** | Epoxy dispensing |
| **Bond Diagram Designation** | 001-17468 |
| **Wire Bond Method:** | Thermosonic |
| **Wire Material/Size:** | Au/1.0mil |
| **Thermal Resistance Theta JA °C/W:** | 136.73 |
| **Package Cross Section Yes/No:** | N/A |
| **Assembly Process Flow:** | 49-24026 |
| **Name/Location of Assembly (prime) facility:** | PHIL-M |
| **MSL Level** | 3 |
| **Reflow Profile** | 260C |

| ELECTRICAL TEST / FINISH DESCRIPTION | |
|---|---|
| Test Location: | CML-R |

**Note:** Please contact a Cypress Representative for other package availability.

# RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

| Stress/Test | Test Condition (Temp/Bias) | Result P/F |
|---|---|---|
| Bond Shear | AEC-Q100-001 | P |
| Bond Pull | Mil-Std 883, Method 2011 | P |
| Final Visual Inspection | JESD22B101 | P |
| Electrostatic Discharge<br>Charge Device Model (ESD-CDM) | 250V/500V/750V (Corner Pins)<br>AEC-Q100-003 | P |
| Electrical Distributions | AEC-Q100-009 | P |
| Electrostatic Discharge<br>Human Body Model (ESD-HBM) | 500V/1000V/1500V/2000V<br>AEC-Q100-002 | P |
| Electro Thermally-Induced Gate Leakage | AEC-Q100-006 | P |
| Electrostatic Discharge<br>Machine Model (ESD-MM) | 100V/200V/400V/800V<br>AEC- Q100-003 | P |
| High Accelerated Saturation Test (HAST) | JESD22-A110, 130°C, 3.63V,85%RH<br>Precondition: JESD22-A113 Moisture Sensitivity MSL 3<br>192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C | P |
| High Temperature Operating Life<br>Early Failure Rate | AEC-Q100-008 and JESD22-A108, 150°C<br>Dynamic Operating Condition, Vcc = 3.80V, 150°C | P |
| High Temperature Operating Life<br>Latent Failure Rate | JESD22-A108, 150°C<br>Dynamic Operating Condition, Vcc Max = 3.80V, 150°C | P |
| High Temperature Storage (HTS) | JESD22-A103, 150°C | P |
| Static Latch-up | AEC-Q100-004, 125C, 6.50V+/-240mA<br>AEC-Q100-004, 125C, 5.4V+/-200mA | P |
| Physical Dimensions | JESD22B100 and B108 | P |
| Post Temperature Cycle Wirebond Pull | Mil-Std 883, Method 2011 | P |
| Pressure Cooker | JESD22-A102, 121°C, 100%RH, 15PSIG<br>Precondition: JESD22-A113 Moisture Sensitivity MSL 3<br>192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C | P |
| Solderability | JESD22-B102 | P |
| Temperature Cycle | JESD22-A104, -65°C to 150°C<br>Precondition: JESD22-A113 Moisture Sensitivity MSL 3<br>192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C | P |

## RELIABILITY FAILURE RATE SUMMARY

| Stress/Test | Device Tested/ Device Hours | # Fail | Activation | Thermal | Failure Rate |
|---|---|---|---|---|---|
| High Temperature Operating Life Early Failure Rate | 11,467 Devices | 0 | N/A | N/A | 0 PPM |
| High Temperature Operating Life[1,2] Long Term Failure Rate | 110,160 DHRs | 0 | 0.7 | 170 | FIT ** |

[1] Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.
[2] Chi-squared 60% estimations used to calculate the failure rate.
[3] Thermal Acceleration Factor is calculated from the Arrhenius equation

$$AF = \exp\left[\frac{E_A}{k}\left[\frac{1}{T_2} - \frac{1}{T_1}\right]\right]$$

where:

$E_A$ =The Activation Energy of the defect mechanism.
K = Boltzmann's constant = $8.62 \times 10^{-5}$ eV/Kelvin.
$T_1$ is the junction temperature of the device under stress and $T_2$ is the junction temperature of the device at use conditions.

**Insufficient samples to calculate FIT Rate.
**Based on Automotive qual samples size not Commercial qual sample size.

# Reliability Test Data

## QTP #: 080803

| Device | Fab Lot # | Assy Lot # | Ass Loc | Duration | Samp | Rej | Failure Mechanism |
|---|---|---|---|---|---|---|---|
| ***STRESS: BALL SHEAR*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 30 | 0 | |
| ***STRESS: BOND PULL*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 30 | 0 | |
| ***STRESS: POST TEMP CYCLE BOND PULL*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 6 | 0 | |
| ***STRESS: ELECTRICAL DISTRIBUTIONS*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 30 | 0 | |
| CY2305CSXI (7C823C15AC) | 4706115 | 610719512 | PHIL-M | COMP | 30 | 0 | |
| CY2305CSXI (7C823C15AC) | 4707473 | 610725547 | PHIL-M | COMP | 30 | 0 | |
| ***STRESS: ESD-CHARGE DEVICE MODEL, 250V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-CHARGE DEVICE MODEL, 500V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-CHARGE DEVICE MODEL, 750V (corner pins)*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-HUMAN BODY CIRCUIT, 500V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-HUMAN BODY CIRCUIT, 1000V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-HUMAN BODY CIRCUIT, 1500V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-HUMAN BODY CIRCUIT, 2000V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-HUMAN BODY CIRCUIT, 4000V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-HUMAN BODY CIRCUIT, 6000V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |

# Reliability Test Data

## QTP #: 080803

| Device | Fab Lot # | Assy Lot # | Ass Loc | Duration | Samp | Rej | Failure Mechanism |
|---|---|---|---|---|---|---|---|
| ***STRESS: ESD-HUMAN BODY CIRCUIT, 8000V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-MACHINE MODEL, 100V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| CY2305CSXA (7A823C15AC) | 4744883 | 610809340 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-MACHINE MODEL, 200V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| CY2305CSXA (7A823C15AC) | 4744883 | 610809340 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-MACHINE MODEL, 400V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| CY2305CSXA (7A823C15AC) | 4744883 | 610809340 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: ESD-MACHINE MODEL, 800V*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| CY2305CSXA (7A823C15AC) | 4744883 | 610809340 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 192 HR 30C/60%RH, MSL3*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | 96 | 80 | 0 | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | 128 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4706115 | 610719512 | PHIL-M | 96 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4706115 | 610719512 | PHIL-M | 128 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4707473 | 610725547 | PHIL-M | 96 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4707473 | 610725547 | PHIL-M | 128 | 80 | 0 | |
| ***STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 3.80V, Vcc Max*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | 24 | 3597 | 0 | |
| CY2305CSXI (7C823C15AC) | 4740068 | 610813512 | PHIL-M | 24 | 1936 | 0 | |
| CY2305CSXI (7C823C15AC) | 4740068 | 610813686 | PHIL-M | 24 | 1934 | 0 | |
| CY2305CSXA (7A823C15AC) | 4744883 | 610809340 | PHIL-M | 24 | 4000 | 0 | |

# Reliability Test Data

## QTP #: 080803

| Device | Fab Lot # | Assy Lot # | Ass Loc | Duration | Samp | Rej | Failure Mechanism |
|---|---|---|---|---|---|---|---|
| ***STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.80V, Vcc Max*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | 408 | 90 | 0 | |
| CY2305CSXI (7C823C15AC) | 4706115 | 610719512 | PHIL-M | 408 | 90 | 0 | |
| CY2305CSXI (7C823C15AC) | 4707473 | 610725547 | PHIL-M | 408 | 90 | 0 | |
| ***STRESS: HIGH TEMPERATURE STORAGE, 150ºC*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | 1000 | 80 | 0 | |
| ***STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30C/60%RH, MSL3*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | 96 | 80 | 0 | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | 168 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4706115 | 610719512 | PHIL-M | 96 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4706115 | 610719512 | PHIL-M | 168 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4707473 | 610725547 | PHIL-M | 96 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4707473 | 610725547 | PHIL-M | 168 | 80 | 0 | |
| ***STRESS: PHYSICAL DIMENSIONS*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 10 | 0 | |
| CY2305CSXI (7C823C15AC) | 4706115 | 610719512 | PHIL-M | COMP | 10 | 0 | |
| CY2305CSXI (7C823C15AC) | 4707473 | 610725547 | PHIL-M | COMP | 10 | 0 | |
| ***STRESS: SOLDERABILITY*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 15 | 0 | |
| CY2305CSXI (7C823C15AC) | 4706115 | 610719512 | PHIL-M | COMP | 15 | 0 | |
| CY2305CSXI (7C823C15AC) | 4707473 | 610725547 | PHIL-M | COMP | 15 | 0 | |
| ***STRESS: STATIC LATCH-UP TESTING, 125C, 5.4 V, +/-200mA*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |
| ***STRESS: STATIC LATCH-UP TESTING, 125C, 6.50 V, +/-240mA*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | COMP | 3 | 0 | |

# Reliability Test Data

## QTP #: 080803

| Device | Fab Lot # | Assy Lot # | Ass Loc | Duration | Samp | Rej | Failure Mechanism |
|---|---|---|---|---|---|---|---|
| ***STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3*** | | | | | | | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | 500 | 85 | 0 | |
| CY2305CSXI (7A823C15AC) | 4723984 | 610756045 | PHIL-M | 1000 | 75 | 0 | |
| CY2305CSXI (7C823C15AC) | 4706115 | 610719512 | PHIL-M | 500 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4706115 | 610719512 | PHIL-M | 1000 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4707473 | 610725547 | PHIL-M | 500 | 80 | 0 | |
| CY2305CSXI (7C823C15AC) | 4707473 | 610725547 | PHIL-M | 1000 | 80 | 0 | |

# Document History Page

Document Title: QTP 080803: ZERO DELAY CLOCK BUFFER HIREL TECHNOLOGY R52T-3, FAB4
Document Number: 001-85727

| Rev. | ECN No. | Orig. of Change | Description of Change |
|---|---|---|---|
| ** | 3873657 | NSR | Initial Spec Release |
| *A | 4645745 | HSTO | Align qualification report based on the new template in the front page |

Distribution: WEB

Posting: None