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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 Metal 2: 500Å TiW, 6000Å Al /500Å TiW 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 Charge Device Model (ESD-CDM)	250V/500V/750V (Corner Pins) AEC-Q100-003	P
Electrical Distributions	AEC-Q100-009	P
Electrostatic Discharge Human Body Model (ESD-HBM)	500V/1000V/1500V/2000V AEC-Q100-002	P
Electro Thermally-Induced Gate Leakage	AEC-Q100-006	P
Electrostatic Discharge Machine Model (ESD-MM)	100V/200V/400V/800V AEC- Q100-003	P
High Accelerated Saturation Test (HAST)	JESD22-A110, 130°C, 3.63V,85%RH Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
High Temperature Operating Life Early Failure Rate	AEC-Q100-008 and JESD22-A108, 150°C Dynamic Operating Condition, Vcc = 3.80V, 150°C	P
High Temperature Operating Life Latent Failure Rate	JESD22-A108, 150°C 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 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 Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 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 Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 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 = 8.62×10^{-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

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