

# **Cypress Semiconductor Product Qualification Report**

**QTP# 021405 VERSION 1.1  
May, 2003**

**CY23020\* Twenty Output Zero-Delay Buffer**

**R42LDHA, Fab 4**

## **CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:**

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### PRODUCT QUALIFICATION HISTORY

<b>Qual Report</b>	<b>Description of Qualification Purpose</b>	<b>Date Comp</b>
98357	R42 with Hot Aluminum / 4 Meg, 128K x 36 Pipelined SRAM CY1350	Sep 98
021011	Twenty Output Zero-Delay Buffer CY23020*	Apr 02
021405	Functionality Enhancement	May 02

Cypress products are manufactured using qualified processes. The technology qualification for this product is referenced above and must be considered to get a complete and thorough evaluation of the reliability of the product.

<b>PRODUCT DESCRIPTION (for qualification)</b>	
Qualification Purpose: Qualify CY23020* in R42LDHA, Fab 4	
Marketing Part #:	CY23020*
Device Description:	3.3V, Commercial, available in 48-lead TSSOP/QFN package
Cypress Division:	Cypress Semiconductor Corporation – Timing Technology Division (TTD) WA
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	7C80200A

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION - R42LDHA</b>			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500Å TiW/6000Å Al/.5%Cu/1200Å TiW Metal 2: 500Å TiW/8000Å Al/.5%Cu/300Å TiW
Passivation Type and Materials:	3,000 TEOS + 6,000Å Si <sub>3</sub> N <sub>4</sub>		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device:	20,000		
Number of Gates in Device	5,000		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Double Metal /0.35 μm		
Gate Oxide Material/Thickness (MOS):	SiO <sub>2</sub> / 70Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/R42LDHA		

**PACKAGE AVAILABILITY**

<b>PACKAGE</b>	<b>ASSEMBLY SITE FACILITY</b>
48-lead QFN	Seoul Korea (SEOL-L)
48-lead TSSOP	Cypress Philippines (CML-R)

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
<b>Package Designation:</b>	Z4824
<b>Package Outline, Type, or Name:</b>	48-lead TSSOP
<b>Mold Compound Name/Manufacturer:</b>	Hitachi CEL 9200
<b>Mold Compound Flammability Rating:</b>	V-O per UL94
<b>Oxygen Rating Index:</b>	>28%
<b>Lead Frame Material:</b>	Copper
<b>Lead Finish, Composition / Thickness:</b>	Solder Plated 85%Pb / 15Sn
<b>Die Backside Preparation Method/Metallization:</b>	Backgrind
<b>Die Separation Method:</b>	Wafer Saw
<b>Die Attach Supplier:</b>	Dexter
<b>Die Attach Material:</b>	QMI 509
<b>Die Attach Method:</b>	Epoxy
<b>Bond Diagram Designation:</b>	10-04073
<b>Wire Bond Method:</b>	Thermosonic
<b>Wire Material/Size:</b>	Au, 1.0mil
<b>Thermal Resistance Theta JA °C/W:</b>	91°C/W
<b>Package Cross Section Yes/No:</b>	N/A
<b>Assembly Process Flow:</b>	11-20007
<b>Name/Location of Assembly (prime) facility:</b>	Cypress Philippines (CML)

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
<b>Test Location:</b>	Cypress Philippines (CML)
<b>Fault Coverage:</b>	100%

**RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT**

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc Max=3.8V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=3.8V, 150°C	P
High Accelerated Saturation Test (HAST)	130°C, 3.63V,85%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C  Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+5, -0°C	P
Temperature Cycle	Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C  Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+5, -0°C  MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C	P
Pressure Cooker	Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C  Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+5, -0°C 121°C, 100%RH	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V 2,000V MIL-STD-883, Method 3015.7	P
Acoustic Microscopy	MSL3 Cypress Spec. 25-00104	P
Latchup Sensitivity	125C, 10V, ± 300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	P

**RELIABILITY FAILURE RATE SUMMARY**

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal <sup>3</sup> A.F	Failure Rate <sup>4</sup>
High Temperature Operating Life Early Failure Rate <sup>1</sup>	4,498	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>1,2</sup> Long Term Failure Rate	517,435 DHRs @150C	1	0.7	170	23 FIT

<sup>1</sup> Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.

<sup>2</sup> Chi-squared 60% estimations used to calculate the failure rate.

<sup>3</sup> 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.

<sup>4</sup> EFR failure rate based on QTP# 021405, QTP# 021011, QTP #98357.

<sup>4</sup> LFR failure rate based on QTP# 021011 and QTP #98357.

**RELIABILITY TEST DATA**

**QTP#: 98357**

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: ACOUSTIC, MSL3							
CY7C1350-AC	CSPI-R	4815594	619807192	COMP	15	0	
CY7C1352-AC	CSPI-R	4812385	619805289	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 3.8V							
CY7C1350-AC	CSPI-R	4812418	619805770	48	750	0	
CY7C1350-AC	CSPI-R	4815594	619807192	48	684	0	
CY7C1352-AC	CSPI-R	4824383	619809153	48	66	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1352-AC	CSPI-R	4824383	619809153	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 4,400V							
CY7C1352-AC	CSPI-R	4824383	619809153	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/-300mA							
CY7C1352-AC	CSPI-R	4824383	619809153	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 3.63V), PRECOND. 192 HRS 30C/60%RH, MSL3							
CY7C1350-AC	CSPI-R	4816713	619808643	128	48	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.8V							
CY7C1350-AC	CSPI-R	4812418	619805770	80	392	1	1 UNKNOWN CAUSE
CY7C1350-AC	CSPI-R	4812418	619805770	500	390	0	
CY7C1350-AC	CSPI-R	4815594	619807192	80	396	0	
CY7C1350-AC	CSPI-R	4815594	619807192	548	396	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, MSL3							
CY7C1352-AC	CSPI-R	4816713	619808642	168	45	0	
CY7C1352-AC	CSPI-R	4816713	619808642	288	45	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH, MSL3							
CY7C1350-AC	CSPI-R	4812418	619805769	300	45	0	
CY7C1350-AC	CSPI-R	4812418	619805770	300	45	0	
CY7C1350-AC	CSPI-R	4815594	619807192	300	45	0	

## Reliability Test Data

QTP #: 021011

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
<b>STRESS: ACOUSTIC,-MSL1</b>							
CY23020ZC (7C80200A)	4143167	61042994	CSPI-R	COMP	15	0	
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	COMP	15	0	
CY23020ZC (7C80200A)	4145640	610211800/01/02	CSPI-R	COMP	15	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 3.8V, Vcc Max</b>							
CY23020ZC (7C80200A)	4143167	61042994	CSPI-R	96	998	0	
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	96	999	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 3.8V, Vcc Max</b>							
CY23020ZC (7C80200A)	4143167	61042994	CSPI-R	168	235	0	
CY23020ZC (7C80200A)	4143167	61042994	CSPI-R	1000	231	0	
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	396	239	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL, 500V</b>							
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	COMP	9	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200</b>							
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	COMP	9	0	
<b>STRESS: STATIC LATCH-UP TESTING, 125C, 10V, ±300mA</b>							
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	COMP	3	0	
<b>STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 168 HR 85C/85%RH, MSL1</b>							
CY23020ZC (7C80200A)	4143167	61042994	CSPI-R	128	100	0	
<b>STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 168 HR 85C/85%RH, MSL1</b>							
CY23020ZC (7C80200A)	4143167	61042994	CSPI-R	168	50	0	



## Reliability Test Data

QTP #: 021011

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
<b>STRESS: TC COND. C -65C TO 150C, PRECONDITION 168 HRS 85C/85%RH, MSL1</b>							
CY23020ZC (7C80200A)	4143167	61042994	CSPI-R	300	48	0	
CY23020ZC (7C80200A)	4143167	61042994	CSPI-R	500	48	0	
CY23020ZC (7C80200A)	4143167	61042994	CSPI-R	1000	48	0	
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	300	47	0	
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	500	47	0	
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	1000	47	0	
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	300	45	0	
CY23020ZC (7C80200A)	4145640	610208291/2/3	CSPI-R	500	45	0	

## Reliability Test Data

QTP #: 021405

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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**STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 3.8V, Vcc Max**

CY23020ZC-1 (7C80200A)	4215642	610217468/9/70	CSPI-R	96	1001	0	
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**STRESS: ESD-CHARGE DEVICE MODEL, 500V**

CY23020ZC-1 (7C80200A)	4215642	610217468/9/70	CSPI-R	COMP	9	0	
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**STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V**

CY23020ZC-1 (7C80200A)	4215642	610217468/9/70	CSPI-R	COMP	9	0	
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**STRESS: STATIC LATCH-UP TESTING, 125C, 10V, ±300mA**

CY23020ZC-1 (7C80200A)	4215642	610217468/9/70	CSPI-R	COMP	3	0	
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**STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 168 HR 85C/85%RH, MSL1**

CY23020ZC-1 (7C80200A)	4143167	61042994	CSPI-R	168	50	0	
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**STRESS: TC COND. C -65C TO 150C, PRECONDITION 168 HRS 85C/85%RH, MSL1**

CY23020ZC-1 (7C80200A)	4145640	610208291/2/3	CSPI-R	300	47	0	
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CY23020ZC-1 (7C80200A)	4145640	610208291/2/3	CSPI-R	500	47	0	
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CY23020ZC-1 (7C80200A)	4145640	610208291/2/3	CSPI-R	1000	47	0	
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