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Cypress Semiconductor Product Qualification Report

**QTP# 081704 VERSION*A
DECEMBER 2015**

Zero Delay Buffer L28 Technology, TSMC-2A	
CY2309 CY2305	Low-Cost 3.3V Zero Delay Buffer
CY2304 CY2308	3.3V Zero Delay Buffer
CY2300 CY2303	Phase-Aligned Clock Multiplier

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

QTP Number	Description of Qualification Purpose	Date
99285	To qualify L28-TSMC Technology in TMSC-2A	May 2003
081704	CY230X L28 Process Transfer from CTI Fab2 to TSMC-2A	Aug 2008

PRODUCT DESCRIPTION (for qualification)	
Purpose: CY230X L28 Process Transfer from CTI Fab2 to TSMC	
Marketing Part #:	CY2304, CY2305, CY2308, CY2309, CY2300, CY2303
Device Description:	3.3V Zero Delay Buffer available in 8/16-Lead SOIC
Cypress Division:	Cypress Semiconductor Corporation –Memory Product Division (MPD)

TECHNOLOGY/FAB PROCESS DESCRIPTION – R9T-3R			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 400Å Ti / 1,000Å TiN/ 4,700Å AlSiCu / 375Å TiN Metal 2: 1,500 Å Ti / 8,000Å AlSiCu / 375Å TiN
Passivation Type and Materials:	3,000Å SiN / 3,150Å SOG, 1,200Å SiN		
Generic Process Technology/Design Rule (□ - drawn):	CMOS, Single Poly, Double Metal/0.65um		
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 125 Å		
Name/Location of Die Fab (prime) Facility:	TSMC-2A, Taiwan		
Die Fab Line ID/Wafer Process ID:	TSMC-2A/L28 TSMC		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
8-Lead SOIC	PHIL-M, CML-RA
16 Lead SOIC	PHIL-M, CML-RA, TAIWAN-T

Note: **Package Qualification details upon request.**

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	SZ165
Package Outline, Type, or Name:	16-Lead Small Outline IC (SOIC)
Mold Compound Name/Manufacturer:	Sumitomo 6600H
Mold Compound Flammability Rating:	V-O per UL94
Mold Compound Alpha Emission Rate	N/A
Oxygen Rating Index:	None
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Pure Sn
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	8290
Die Attach Method:	Eutectic
Bond Diagram Designation:	001-16776
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au 1.0mil
Thermal Resistance Theta JA °C/W:	124.86°C/W
Package Cross Section Yes/No:	No
Assembly Process Flow:	49-24026
Name/Location of Assembly (prime) facility:	Amkor Philippines (Phil-M)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CML-R
Fault Coverage:	100%

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
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc = 3.8V, 150°C JESD22-A108	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 3.8V, 150°C JESD22-A108	P
Temperature Cycle	-65°C to 150°C, MIL-STD-883, Method 1010, (99285), JESD22-A-104, , (081704) Precondition: JESD22 Moisture Sensitivity Level 1 (168 hrs, 85C/85%RH)	P
High Accelerated Saturation Test (HAST)	JEDEC STD 22-A110: 130C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 1 (168 Hrs, 85C/85%RH)	P
High Temperature Steady Life Test	JESD22-A108: VCC=150°C/3.63V	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.7 (99285), JESD22-A114E , (081704)	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V JESD22-C101	P
Electrostatic Discharge Machine Model (ESD-MM)	200V JESD22-A115-A	P
Low Temperature Operating Life	JESD22-A108 (-30C)	P
Pressure Cooker	JESD22-A102: 121°C, 100%RH Precondition: JESD22 Moisture Sensitivity Level 1 (168 Hrs, 85C/85%RH)	P
Data Retention	150 C, non-biased JESD22-A117 and JESD22-A103	P
Latch-up Sensitivity	± 200mA In accordance with JEDEC 17 (99285), JESD-78A (081704), 125°C, ± 200mA	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Acceleration Factor ³	Failure Rate
High Temperature Operating Life Early Failure Rate	1671	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1, 2} Long Term Failure Rate	181,660HRs	0	0.7	170	30FIT*

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.

* Fit rate data based from the Technology Qual



Reliability Test Data

QTP #: 99285

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: DATA RETENTION, PLASTIC, 150C

CY2280-OC	2937109	619927291/2/3	CSPI-R	500	85	0	
CY2280-OC	2937109	619927291	CSPI-R	500	85	0	
CY2280-OC	2937109	619927291	CSPI-R	1000	85	0	
CY2280-OC	2937190	619928659	CSPI-R	500	50	0	
CY2280-OC	2937190	619928659	CSPI-R	1000	50	0	
CY2280-OC	2942829	619933793	CSPI-R	500	50	0	
CY2280-OC	2942829	619933793	CSPI-R	1000	50	0	

STRESS: ESD-CHARGE DEVICE MODEL, (1000V)

CY2280-OC	2937109	619927291/2/3	CSPI-R	COMP	3	0	
CY2280-OC	2937190	619928659/60/61	CSPI-R	COMP	3	0	

STRESS: ESD-HUMAN BODY CIRCUIT PER PER MIL STD 883, METHOD 3015 (2,200V)

CY2280-OC	2937109	619927291/2/3	CSPI-R	COMP	3	0	
CY2280-OC	2937190	619928659/60/61	CSPI-R	COMP	3	0	

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V, Vcc Max)

CY2280-OC	2937109	619927291/2/3	CSPI-R	48	335	0	
CY2280-OC	2937190	619928659/60/61	CSPI-R	48	234	0	
CY2280-OC	2937190	619928659/60/61	CSPI-R	48	101	0	
CY2280-OC	2942829	619933793/4/5	CSPI-R	48	349	0	

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V, Vcc Max)

CY2280-OC	2937109	619927291/2/3	CSPI-R	80	120	0	
CY2280-OC	2937109	619927291/2/3	CSPI-R	500	120	0	
CY2280-OC	2937190	619928659/60/61	CSPI-R	80	120	0	
CY2280-OC	2937190	619928659/60/61	CSPI-R	500	120	0	
CY2280-OC	2942829	619933793/4/5	CSPI-R	80	125	0	
CY2280-OC	2942829	619933793/4/5	CSPI-R	500	123	0	

STRESS: HI-ACCEL SATURATION TEST (140C/85%RH/3.63V), PRECOND. 168 HRS 85C/85%RH

CY2280-OC	2937109	619927291/2/3	CSPI-R	128	50	0	
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Reliability Test Data

QTP #: 99285

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 3.63V)

CY2280-OC	2937109	619927291/2/3	CSPI-R	80	77	0	
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CY2280-OC	2937109	619927291/2/3	CSPI-R	168	77	0	
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STRESS: LOW TEMPERATURE OPERATING LIFE (-30C/8MHZ)

CY2280-OC	2937190	619928659/60/61	CSPI-R	500	50	0	
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STRESS: PRESSURE COOKER TEST, MSL 1 (121C, 100%RH)

CY2280-OC	2937109	619927291/2/3	CSPI-R	168	53	0	
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STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH (MSL 1))

CY2280-OC	2937109	619927291/2/3	CSPI-R	300	50	0	
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Reliability Test Data

QTP #: 081704

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 (150C, 3.8V, Vcc Max)

CY2309ESXI (7C80727B)	8823000	610828970	M-PHIL	48	504	0	
CY2309ESXI (7C80727B)	8823000	610831567	M-PHIL	48	663	0	
CY2309ESXC (7C80727B)	8823000	610831048	RA-CML	48	504	0	

STRESS: ESD-CHARGE DEVICE MODEL, (500V)

CY2309ESXI (7C80727B)	8823000	610828970	M-PHIL	COMP	9	0	
CY2300ESXC (7C80731B)	8823000	610828961	M-PHIL	COMP	9	0	
CY2305ESXI (7C80723B)	8823000	610828969	M-PHIL	COMP	9	0	
CY2309EZSI (7C80727B)	8823000	610831054	M-PHIL	COMP	9	0	

STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-E, (2,200V)

CY2308ESXI (7C80725B)	8823000	610828966	M-PHIL	COMP	8	0	
CY2309ESXI (7C80727B)	8823000	610828970	M-PHIL	COMP	8	0	
CY2300ESXC (7C80731B)	8823000	610828961	M-PHIL	COMP	8	0	
CY2309ESX1 (7C80721B)	8823000	610831772	M-PHIL	COMP	8	0	

STRESS: ESD-MACHINE MODEL, 110V

CY2309SXI (7C80727B)	4825485	610831567	RA-CML	COMP	3	0	
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STRESS: ESD-MACHINE MODEL, 160V

CY2309SXI (7C80727B)	4825485	610831567	RA-CML	COMP	3	0	
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STRESS: ESD-MACHINE MODEL, 200V

CY2309SXI (7C80727B)	4825485	610831567	RA-CML	COMP	3	0	
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STRESS: ESD-MACHINE MODEL, 250V

CY2309SXI (7C80727B)	4825485	610831567	RA-CML	COMP	3	0	
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STRESS: ESD-MACHINE MODEL, 300V

CY2309SXI (7C80727B)	4825485	610831567	RA-CML	COMP	3	0	
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STRESS: STATIC LATCH-UP TESTING PER JEDEC17 (125C, ±200mA, 5.4V)

CY2308ESXI (7C80725B)	8823000	610828966	M-PHIL	COMP	6	0	
CY2309ESXI (7C80727B)	8823000	610828970	M-PHIL	COMP	6	0	
CY2309ESX1 (7C80721B)	8823000	610831772	M-PHIL	COMP	6	0	
CY2309ESX1 (7C80721B)	8823000	610831772	M-PHIL	COMP	6	0	



Reliability Test Data

QTP #: 081704

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: STATIC LATCH-UP TESTING PER JESD78 (125C, $\pm 200\text{mA}$, 5.4V)

CY2308ESXI (7C80725B)	8823000	610828966	M-PHIL	COMP	6	0	
CY2309ESXI (7C80727B)	8823000	610828970	M-PHIL	COMP	6	0	
CY2300ESXC (7C80731B)	8823000	610828961	M-PHIL	COMP	6	0	

STRESS: ETEST DATA

CY2308ESXI (7C80725B)	8823000				COMPARABLE		
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STRESS: SORT YIELD

CY2308ESXI (7C80725B)	8823000				COMPARABLE		
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Document History Page

Document Title: QTP 081704: ZERO DELAY BUFFER (CY230X), L28 TECHNOLOGY, TSMC-2A
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Rev.	ECN No.	Orig. of Change	Description of Change
**	3810582	NSR	Initial Spec Release.
*A	5033738	JYF MEL	Sunset review: Updated QTP title page for template alignment. Removed "Distribution: WEB" and "Posting: NONE" from the document history page.