Cypress Semiconductor
Product Qualification Report

QTP# 072105 VERSION 1.0
August 2009

EZ-Color™ Device Family S4AD-5 Technology, GSMC	
CY8CLED04	EZ-Color™ HB LED Controller

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date Comp
060605		Qualify GSMC using PSoC Device Product Family on S4AD-5 Technology		Aug 06
072105		Qualify CY8CLED04 Device on S4AD-5 Technology, GSMC		May 07

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: CY8CLED04 Device Qualification on S4AD-5 Technology in GSMC	
Marketing Part #:	CY8CLED04
Device Description:	EZ-Color Controller
Cypress Division:	Cypress Semiconductor - Consumer and Computation Division

TECHNOLOGY/FAB PROCESS DESCRIPTION S4AD-5			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 250A TiN/5,800A Al/700A TiN Metal 2: 500A TiN/8,000A Al/250A TiN
Passivation Type and Materials:	7,000A TeOs /6,000A Si_3N_4		
Generic Process Technology/Design Rule (µ-drawn):	Single Poly, Double Metal, 0.35 µm		
Gate Oxide Material/Thickness (MOS):	SiO_2 / 110A		
Name/Location of Die Fab (prime) Facility:	GSMC/Shanghai-China		
Die Fab Line ID/Wafer Process ID:	S4AD-5		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
28-Lead SSOP	**PHIL-M, TAIWN-T**
56-Lead MLF	**SEOL-L**
68-Lead MLF	**SEOL-L, CML-RA**

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION FOR THIS QUALIFICATION	
Package Designation:	SP28
Package Outline, Type, or Name:	28-Lead Shrunk Small Outline Package (SSOP)
Mold Compound Name/Manufacturer:	G600
Mold Compound Flammability Rating:	V-0 PER UL-94
Oxygen Rating Index:	>28%
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:	Ablebond 8290
Die Attach Method:	Epoxy
Bond Diagram Designation:	10-06565
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au. 1.0mil
Thermal Resistance Theta JA °C/W:	90.0°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-41999
Name/Location of Assembly (prime) facility:	Amkor-Phil
MSL Level	1
Reflow Profile	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CML-R, CML-RA

Note: Please contact a Cypress Representative for other packages availability.

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=5.5V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=5.5V, 125°C	P
High Temperature Steady State life	125°C, 5.5V, Vcc Max	P
Low Temperature Operating Life	-30°C, 5.5V	P
High Accelerated Saturation Test (HAST)	130°C, 5.25V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, **260°C**+0, -5°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, **260°C**+0, -5°C	P
Pressure Cooker	121°C, 100%RH, 15 Psig Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow**, 260°C**+0, -5°C	P
Acoustic Microscopy	Spec. 25-00104	P
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Data Retention	150°C ± 5°C No Bias	P
Dynamic Latch-up	125C, 8.5V	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V JESD22, Method A114-B	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P
Endurance Test	MIL-STD-883, Method 883-1033	P
Static Latch-up	125C, ± 200mA Cypress Spec. 01-00081	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal[3] A.F	Failure Rate
High Temperature Operating Life Early Failure Rate[1]	3,057 Devices	1	N/A	N/A	327 PPM
High Temperature Operating Life[1, 2] Long Term Failure Rate	720,000DHRs	0	0 .7	55	23 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.

Reliability Test Data

QTP #: 072105

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL1							
CY8CLED04	9621713	610632687	PHIL-M	COMP	15	0	
CY8CLED04	9623715	610635580	PHIL-M	COMP	15	0	
CY8CLED04	9623716	610639767	PHIL-M	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CY8CLED04	9621713	610632687	PHIL-M	COMP	10	0	
CY8CLED04	9623715	610635580	PHIL-M	COMP	10	0	
CY8CLED04	9623716	610639767	PHIL-M	COMP	10	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8CLED04	9621713	610632687	PHIL-M	336	256	0	
CY8CLED04	9621713	610632687	PHIL-M	1000	256	0	
CY8CLED04	9621713	610632687	PHIL-M	1500	256	0	
CY8CLED04	9623715	610635580	PHIL-M	336	256	0	
CY8CLED04	9623715	610635580	PHIL-M	1000	256	0	
CY8CLED04	9623716	610639767	PHIL-M	336	256	0	
STRESS: ENDURANCE							
CY8CLED04	9621713	610632687A	PHIL-M	COMP	47	0	
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8CLED04	9621713	610632687	PHIL-M	COMP	9	0	
CY8CLED04	9623715	610635580	PHIL-M	COMP	9	0	
CY8CLED04	9623716	610639767	PHIL-M	COMP	9	0	
CY8CLED04	9623715	610635880	PHIL-M	COMP	9	0	
CY8CLED04	9623716	610639349	SEOL-L	COMP	9	0	
CY8CLED04	9623716	610639350	SEOL-L	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8CLED04	9621713	610632687	PHIL-M	COMP	9	0	
CY8CLED04	9623716	610639767	PHIL-M	COMP	9	0	
CY8CLED04	9623715	610635880	PHIL-M	COMP	9	0	
CY8CLED04	9623716	610639350	SEOL-L	COMP	9	0	

Reliability Test Data

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Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, (2,200V)							
CY8CLED04	9621713	*610632687*	PHIL-M	COMP	3	0	
CY8CLED04	9623716	*610639767*	PHIL-M	COMP	3	0	
CY8CLED04	9623715	*610635880*	PHIL-M	COMP	3	0	
CY8CLED04	9623716	*610639350*	SEOL-L	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, +/-200mA)							
CY8CLED04	9623716	*610639767*	PHIL-M	COMP	3	0	
CY8CLED04	9621713		C-USA	COMP	3	0	
CY8CLED04	9623715	*610638054*	SEOL-L	COMP	3	0	
CY8CLED04	9623716	*610639350*	SEOL-L	COMP	3	0	
STRESS: DYNAMIC LATCH-UP (125C, 8.5V)							
CY8CLED04	9621713	*610632687*	PHIL-M	COMP	2	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8CLED04	9621713	*610632687*	PHIL-M	96	1005	0	
CY8CLED04	9623715	*610635580*	PHIL-M	96	1144	0	
CY8CLED04	9623716	*610639767*	PHIL-M	96	908	1	CAPACITOR DEFECT
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8CLED04	9621713	*610632687*	PHIL-M	168	180	0	
CY8CLED04	9621713	*610632687*	PHIL-M	1000	1800		
CY8CLED04	9623715	*610635580*	PHIL-M	168	180	0	
CY8CLED04	9623715	*610635580*	PHIL-M	1000	180	0	
CY8CLED04	9623716	*610639767*	PHIL-M	168	180	0	
CY8CLED04	9623716	*610639767*	PHIL-M	1000	180	0	
CY8CLED04	9623716	*610639767A*	PHIL-M	1000	180	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (125C, 5.5V)							
CY8CLED04	9621713	*610632687*	PHIL-M	168	80	0	
CY8CLED04	9621713	*610632687*	PHIL-M	336	80	0	
STRESS: LOW TEMPERATURE DYNAMIC OPERATING LIFE, -30C, 5.5V							
CY8CLED04	9621713	*610632687*	PHIL-M	500	45	0	

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Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.25V), PRE COND 168 HR 85C/85%RH (MSL1)							
CY8CLED04	9621713	*610632687*	PHIL-M	128	49	0	
CY8CLED04	9623715	*610635580*	PHIL-M	128	49	0	
CY8CLED04	9623716	*610639767*	PHIL-M	128	49	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 168 HR 85C/85%RH (MSL1)							
CY8CLED04	9621713	*610632687*	PHIL-M	168	50	0	
CY8CLED04	9621713	*610632687*	PHIL-M	288	50	0	
CY8CLED04	9621713	*610632687*	PHIL-M	500	47	0	
CY8CLED04	9623715	*610635580*	PHIL-M	168	50	0	
CY8CLED04	9623716	*610639767*	PHIL-M	168	50	0	
CY8CLED04	9623716	*610639767*	PHIL-M	288	50	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 168 HRS 85C/85%RH (MSL1)							
CY8CLED04	9621713	*610632687*	PHIL-M	300	50	0	
CY8CLED04	9621713	*610632687*	PHIL-M	500	50	0	
CY8CLED04	9621713	*610632687*	PHIL-M	1000	50	0	
CY8CLED04	9623715	*610635580*	PHIL-M	300	50	0	
CY8CLED04	9623715	*610635580*	PHIL-M	500	49	0	
CY8CLED04	9623715	*610635580*	PHIL-M	1000	49	0	
CY8CLED04	9623716	*610639767*	PHIL-M	300	50	0	
CY8CLED04	9623716	*610639767*	PHIL-M	500	49	0	