

# Cypress Semiconductor Product Qualification Report

QTP# 042702 VERSION 6.0  
October 2006

<b>Automotive PSoC™ Mixed Signal Array Family</b> S4AD-5CTI Technology, Fab 2	
<b>CY8C27243</b> <b>CY8C27443</b> <b>CY8C27643</b>	<b>Mixed Signal Array with On-Chip Controller</b>

## 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>
042702	Automotive PSoC 8C27243/443/643 Rev B Device Product Family on S4AD-5CTI Technology, Fab2	Nov 04

<b>PRODUCT DESCRIPTION (for qualification)</b>	
Qualification Purpose: Qualify CY8C27xxx product family in Technology S4D-5CTI in Fab 2	
Marketing Part #:	CY8C27243, CY8C27443, CY8C27643
Device Description:	5V, Industrial, available in 20/28/48-Lead SSOP
Cypress Division:	Cypress Semiconductor – Consumer and Computation Division
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. B
What ID markings on Die:	8C27002

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION</b>		<b>S4AD-5CTI</b>	
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A Ti/6000A Al 0.5% Cu /1200A TiW Metal 2: 500A Ti/8000A Al 0.5% Cu/300A TiW
Passivation Type and Materials:	3,000A TeOs / 6000A Si <sub>3</sub> N <sub>4</sub>		
Free Phosphorus contents in top glass layer (%):	0%		
Number of Transistors in Device:	600,000		
Number of Gates in Device	100,000		
Generic Process Technology/Design Rule (□-drawn):	Single Poly, Double Metal, 0.35 □m		
Gate Oxide Material/Thickness (MOS):	SiO <sub>2</sub> / 110A		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Round Rock, TX		
Die Fab Line ID/Wafer Process ID:	Fab2, S4AD-5CTI SONOS		

**PACKAGE AVAILABILITY**

<b>PACKAGE</b>	<b>ASSEMBLY SITE FACILITY</b>
<b>20/28-Lead SSOP</b>	<b>OSE-Taiwan (TAIWN-T), Cypress-Phil (CML-R)</b>
<b>28-Lead PDIP</b>	<b>Omedata-Indonesia (INDNS-O)</b>
<b>40-Lead QFN</b>	<b>Amkor-Korea (SEOUL-L)</b>
<b>48-Lead SSOP</b>	<b>Cypress-Phil (CML-R)</b>

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

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
<b>Package Designation:</b>	SP28
<b>Package Outline, Type, or Name:</b>	28-Lead Shrunk Small Outline Packages (SSOP)
<b>Mold Compound Name/Manufacturer:</b>	Hitachi CEL9220HF
<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>	Pure Sn
<b>Die Backside Preparation Method/Metallization:</b>	N/A
<b>Die Separation Method:</b>	Sawing 100%
<b>Die Attach Supplier:</b>	Ablestik
<b>Die Attach Material:</b>	8340
<b>Die Attach Method:</b>	Epoxy (Conductive)
<b>Bond Diagram Designation:</b>	10-05762
<b>Wire Bond Method:</b>	Thermosonic
<b>Wire Material/Size:</b>	Au, 1.0mil
<b>Thermal Resistance Theta JA °C/W:</b>	95° C/W
<b>Package Cross Section Yes/No:</b>	N/A
<b>Assembly Process Flow:</b>	49-35026
<b>Name/Location of Assembly (prime) facility:</b>	OSE-Taiwan

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
<b>Test Location:</b>	CML-R

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

**RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT**

<b>Stress/Test</b>	<b>Test Condition (Temp/Bias)</b>	<b>Result P/F</b>
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
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
High Accelerated Saturation Test (HAST)	130°C, 5.5V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	500V/1000V/1500V/2000V JESD22, Method A114-B	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	250V/500V/750V (corner pins only) Cypress Spec. 25-00020	P
High Temperature Storage	150°C ± 5°C, no bias	P
Acoustic Microscopy	Cypress Spec. 25-00104	P
Ball Shear	Cypress Spec 24-00018	P
Bond Pull	Cypress Spec 24-00002	P
Data Retention	150°C ± 5°C no bias	P
Electrical Distribution	AEC-Q100-009	P
Endurance Test	AEC-Q100-005	P
External Visual	Cypress Spec 25-00038	P
Physical Dimensions	Cypress Spec. 25-00031	P
Solderability	Cypress Spec. 25-00018	P
Static Latchup Sensitivity	125°C, ± 300mA 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
High Temperature Operating Life Early Failure Rate @125C	2,543 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>1,2</sup> Long Term Failure Rate	232,000 DHRs	0	0.7	55	71 FITs *

<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.

\* Based on Automotive qual samples size not Commercial qual sample size.

## Reliability Test Data

**QTP #: 042702**

<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>							
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	COMP	15	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	COMP	15	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	15	0	
<b>STRESS: BALL SHEAR</b>							
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	5	0	
<b>STRESS: BOND PULL</b>							
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	5	0	
<b>STRESS: DATA RETENTION</b>							
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	1000	94	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	1000	94	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	1000	92	0	
<b>STRESS: ELECTRICAL DISTRIBUTION</b>							
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	COMP	30	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	COMP	30	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	30	0	
<b>STRESS: ENDURANCE (DATA RETENTION)</b>							
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	COMP	94	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	COMP	94	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	1000	92	0	
<b>STRESS: EXTERNAL VISUAL</b>							
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	COMP	1317	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	COMP	1223	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	1400	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL, 250V</b>							
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	3	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL, 500V</b>							
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	3	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL, 750V (Corner pins only)</b>							
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	6	0	

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<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 500V</b>							
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 1,000V</b>							
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 1,500V</b>							
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2,000V</b>							
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	3	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 5.5V, Vcc Max</b>							
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	48	848	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	48	848	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	48	847	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 5.5V, Vcc Max</b>							
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	1000	78	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	1000	81	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	1000	73	0	
<b>STRESS: ENDURANCE (LIFE TEST)</b>							
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	1000	81	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	1000	84	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	1000	84	0	
<b>STRESS: HIGH TEMPERATURE STORAGE, 150C</b>							
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	1000	50	0	
<b>STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 5.5V, PRE COND 168 HR 85C/85%RH, MSL1</b>							
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	96	85	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	96	84	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	96	85	0	
<b>STRESS: PHYSICAL DIMENSIONS</b>							
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	COMP	10	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	COMP	10	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	10	0	



## Reliability Test Data

**QTP #: 042702**

<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>
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**STRESS: STATIC LATCH-UP TESTING, 125C, 9V, ±300mA**

CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	3	0	
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**STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 168 HR 85C/85%RH, MSL1**

CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	96	85	0	
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	168	85	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	96	85	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	168	85	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	96	85	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	168	85	0	

**STRESS: TC COND. C -65C TO 150C, PRE COND 168 HRS 85C/85%RH, MSL1**

CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	500	85	0	
CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	1000	84	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	500	85	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	1000	82	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	500	85	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	1000	80	0	

**STRESS: SOLDERABILITY**

CY8C27443 (8C27443B)	2414285	610438918	TAIWN-T	COMP	15	0	
CY8C27443 (8C27443B)	2405478	610438920	TAIWN-T	COMP	15	0	
CY8C27443 (8C27443B)	2403330	610438921	TAIWN-T	COMP	15	0	