Cypress Semiconductor
Process Qualification Report

QTP# 063003 VERSION 1.0
June 2007

Nitride Seal Mask (NSM) Qualification S4AD-5 Technology, Fab 2
All S4 Devices

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

QUAL REPORT	DESCRIPTION OF QUALIFICATION PURPOSE	DATE COMP.
010702	New Technology S4AD-5/ New Product, Programmable Clock Generator, CY2414ZC, its product family and bond option.	Apr 01
063002	S4AD Technology Nitride Seal Mask (NSM) Process Implementation in Fab2 using MXP Equipment	Oct 06
063003	S4AD Technology Nitride Seal Mask (NSM) Process Implementation in Fab2 using Drytek	Apr 07

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.

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose:	Qualify S4AD Technology, Nitride Seal Mask Process at Fab 2 using Drytek
Marketing Part #:	All S4AD Devices
Device Description:	2.5V/3.3V, Commercial and Industrial
Cypress Division:	Cypress Semiconductor Corporation – Consumer and Computation Division

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A Ti/6,000A Al 0.5% Cu /1,200A TiW Metal 2: 500A Ti/8,000A A1 0.5% Cu/300A TiW
Passivation Type and Materials:			3000A 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:			Cypress Semiconductor – Round Rock, TX
Die Fab Line ID/Wafer Process ID:			Fab2, S4AD-5

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
All	All Qualified Assembly Sites

Note: Package Qualification details available upon request.

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 Max = 3.3V, 125°C Dynamic Operating Condition, Vcc Max = 5.5V, 125°C Dynamic Operating Condition, Vcc Max = 5.75, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max= 5.5V, 125°C Dynamic Operating Condition, Vcc Max= 3.8V, 150°C	P
High Accelerated Saturation Test (HAST)	130°C, 5.25V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL1 168 Hrs, 85°C/85%RH+3IR-Reflow, **260°C**+0, -5°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, **260°C**+0, -5°C	P
Pressure Cooker Test	121°C, 100%RH, 15 Psig Precondition: JESD22 Moisture Sensitivity MSL1 168 Hrs, 85°C/85%RH+3IR-Reflow, **260°C**+0, -5°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%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 MSL1 168 Hrs, 85°C/85%RH+3IR-Reflow, **260°C**+0, -5°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, **260°C**+0, -5°C	P
Acoustic Microscopy Test	Cypress Spec.25-00104	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V JEDEC EIA/JESD22-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
Age Bond	MIL-STD-883, Method 2011	P
Ball Shear	Cypress Spec.24-00018	P
Wire Pull	Cypress Spec. 12-00292	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF3	Failure Rate
High Temperature Operating Life Early Failure Rate	10,897 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	180,000 DHRs	0	0.7	170	30 FITs**

[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.

**** FITs Rate calculation based on the Technology Qual.**

Reliability Test Data

QTP #: 010702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V, Vcc Max)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	80	120	0	
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	500	120	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	80	120	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	500	120	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	80	120	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	500	120	0	

Reliability Test Data

QTP #: 063002

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	COMP	15	0	
CY8C26432A (8C24423D)	2616122	610641117	TAIWAN-T	COMP	15	0	
CY7C53120E (7C531200C)	2615980	610642185	CML-R	COMP	15	0	
STRESS: AGE BOND							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	COMP	3	0	
CY7C53120E (7C531200C)	2615980	610642185	CML-R	COMP	3	0	
STRESS: BALL SHEAR							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	COMP	10	0	
CY7C53120E (7C531200C)	2615980	610642185	CML-R	COMP	10	0	
STRESS: BOND PULL							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	COMP	10	0	
CY7C53120E (7C531200C)	2615980	610642185	CML-R	COMP	10	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	COMP	3	0	
CY7C53120E (7C531200C)	2615980	610642185	CML-R	COMP	9	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C,5.75V, Vcc Max							
CY7C53120E (7C531200C)	2615980	610642185	CML-R	48	1122	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C,3.3V, Vcc Max							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	96	999	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C,5.5V, Vcc Max							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	168	179	0	
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	1000	179	0	

Reliability Test Data

QTP #: 063002

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HI-ACCEL STURATION TEST, 130C, 85%RH, 5.25V, PRE COND 168 HR 85C/85%RH, MSL1							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	128	45	0	
CY8C26432A (8C24423D)	2616122	610641117	TAIWAN-T	128	47	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	168	50	0	
CY7C53120E (7C531200C)	2615980	610642185	CML-R	168	50	0	
CY7C53120E (7C531200C)	2615980	610642185	CML-R	288	45	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 168 HR 85C/85%RH, MSL1							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	300	47	0	
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	500	47	0	
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	1000	47	0	
CY8C26432A (8C24423D)	2616122	610641117	TAIWAN-T	300	50	0	
CY8C26432A (8C24423D)	2616122	610641117	TAIWAN-T	500	50	0	
CY8C26432A (8C24423D)	2616122	610641117	TAIWAN-T	1000	50	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C53120E (7C531200C)	2615980	610642185	CML-R	300	50	0	
CY7C53120E (7C531200C)	2615980	610642185	CML-R	500	50	0	
CY7C53120E (7C531200C)	2615980	610642185	CML-R	1000	50	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, ±200mA)							
CY8C26443A (8C26443D)	2616122	610641118	TAIWAN-T	COMP	3	0	

Reliability Test Data

QTP #: 063003

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC							
CY8C26443A (8C26443D)	2617283	610647907	TAIWAN-T	COMP	15	0	
CY8C26423A (8C26443D)	2618433	610647908	TAIWAN-T	COMP	15	0	
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	COMP	15	0	
STRESS: AGE BOND							
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	COMP	3	0	
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	COMP	3	0	
STRESS: BALL SHEAR							
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	COMP	10	0	
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	COMP	10	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 5.75V, Vcc Max							
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	48	990	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 5.5V, Vcc Max							
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	96	998	0	
CY8C24423A (8C24423B)	2618433	610667112	TAIWAN-T	96	1693	0	
CY8C24423A (8C24423B)	2618433	610667774	TAIWAN-T	96	1396	0	
CY8C24423A (8C24423B)	2646385	610704648	TAIWAN-T	96	1798	0	
CY8C24423A (8C24423B)	2646385	610704649	TAIWAN-T	96	3997	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C,5.5V, Vcc Max							
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	168	180	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 3.5V, Vcc Max							
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	168	180	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V							
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	COMP	9	0	
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	COMP	9	0	

Reliability Test Data

QTP #: 063003

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HI-ACCEL STURATION TEST, 130C, 85%RH, 5.25V, PRE COND 192 HR 30C/60%RH, MSL3							
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	128	46	0	
CY8C26443A (8C26443D)	2617283	610647907	TAIWAN-T	128	49	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 168 HR 85C/85%RH, MSL1							
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	168	50	0	
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	288	45	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	168	50	0	
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	288	45	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 168 HR 85C/85%RH, MSL1							
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	300	50	0	
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	500	50	0	
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	1000	50	0	
CY8C26443A (8C26443D)	2617283	610647907	TAIWAN-T	300	50	0	
CY8C26443A (8C26443D)	2617283	610647907	TAIWAN-T	500	50	0	
CY8C26443A (8C26443D)	2617283	610647907	TAIWAN-T	1000	50	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	300	50	0	
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	500	50	0	
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	1000	50	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, ±200mA)							
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	COMP	3	0	
STRESS: WIRE PULL							
CY7C53120E4 (7C531200C)	2616077	610648063	TAIWAN-T	COMP	10	0	
CY8C24423A (8C24423B)	2618433	610647908	TAIWAN-T	COMP	10	0	