Cypress Semiconductor
Product Qualification Report

QTP# 98434 VERSION 1.1
December, 2001

256K SRAM, R42H Technology, Hot Aluminum	
CY62256	32K x 8 Static RAM (5V Operation)

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
98064	New Technology R42HD / 1 Meg SRAM CY7C109/CY7C1009	Apr 98
98111	New Technology R42H Hot Aluminum / 4 Meg SRAM, CY62148	Aug 01
98434	New Low power Asynchronous SRAM CY62256	Dec 01

Note:
Based on using the same design rules and cells to establish a product family, as in JESD-47, Cypress qualifies devices within a product technology by using generic data from that product family to fill out the qualification requirements for those reliability stresses which test intrinsic reliability of the technology. Reliability stresses, such as ESD and Early Life, which are design sensitive are routinely performed in qualifications to ensure the specific design is reliable.

PRODUCT DESCRIPTION (for qualification)		
Qualification Purpose: Qualify 256K Slow Low Power SRAM CY62256 with Hot Al process in a qualified technology R42H		
Marketing Part #:	CY62256	
Device Description:	4.5.5V, Commercial and Industrial available in 28-lead SOIC, TSOP and PDIP package.	
Cypress Division:	Cypress Semiconductor Corporation– Memory Product Division (MPD)	
Overall Die (or Mask) REV Level (pre-requisite for qualification):		Rev. E
What ID markings on Die:	7C1256A	

TECHNOLOGY/FAB PROCESS DESCRIPTION - R42H			
Number of Metal Layers:	1	Metal Composition:	Metal 1: 500Å Cu-Ti/8000Å Al
Passivation Type and Materials:		3K Å Oxide + 6,000 Å Nitride (both with PECVD)	
Free Phosphorus contents in top glass layer(%):		0%	
Die Coating(s), if used:		None	
Number of Transistors in device:		1.72 million	
Number of Gates in Device:		1.72 million	
Generic Process Technology/Design Rule (μ-drawn):		CMOS, Single Metal /0.42 μm	
Gate Oxide Material/Thickness (MOS):		SiO_2 / 110Å	
Name/Location of Die Fab (prime) Facility:		Cypress Semiconductor - Bloomington, MN	
Die Fab Line ID/Wafer Process ID:		Fab4/R42H	

PACKAGE AVAILABILITY

	ASSEMBLY SITE FACILITY
28-pin TSOP / RTSOP	**CSPI-R / Anam Manila Philippines**
28-lead SNC	**OMEDATA / CSPI-R**
28-lead PDIP	**OMEDATA**

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	SN2833
Package Outline, Type, or Name:	28-lead Narrow SOIC (SN)
Mold Compound Name/Manufacturer:	Nitto MP8000H
Mold Compound Flammability Rating:	V-0
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plate 85%Sn, 15%Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	Ablestik 8361H
Die Attach Method:	Silver Epoxy
Bond Diagram Designation	10-03428
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0um
Thermal Resistance Theta JA °C/W:	60°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-70088
Name/Location of Assembly (prime) facility:	OMEDATA Indonesia (INDNS-O)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	OMEDATA Indonesia (INDNS-O)
Fault Coverage:	100%

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

RELIABILITY TESTS PERFORMED per SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	1) QTP #98434 Dynamic Operating Condition, Vcc = 6.5V, 125°C 2) QTP #98111 Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
High Temperature Operating Life Latent Failure Rate	1) QTP #98434 Dynamic Operating Condition, Vcc = 6.5V, 125°C 2) QTP #98111, QTP #98064 Dynamic Operating Condition, Vcc = 5.75V, 150C°	P
Extended Dynamic Burn-in	1) QTP #98064 Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
High Temperature Steady State Life	1) QTP #98064 Static Operating Condition, Vcc = 5.75V, 150°C	P
Read and Record Life Test	1) QTP #98064 Dynamic Operating Condition, Vcc = 5.75V, 150°	P
Temperature Cycle	1) QTP #98434 Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85°C/85%RH+3IR-Reflow, 220°C+5, -0°C 2) QTP #98111, QTP #98064 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 Test	1) QTP #98434 No bias, 121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85°C/85%RH+3IR-Reflow, 220°C+5, -0°C 2) QTP #98111 No bias, 121°C, 100%RH 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

RELIABILITY TESTS PERFORMED per SPECIFICATION REQUIREMENTS (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Accelerated Saturation Test (HAST)	1) QTP #98064 140C, 85%RH, 5.5V MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 220°C+5, -0°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	1) QTP #98434, QTP #98111, QTP #98064 2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP #98434, QTP #98111, QTP #98064 Cypress Spec. 25-00020	P
Cold Life Test	1) QTP #98064 -30C, 6.5V	P
High Temperature Storage	1) QTP #98064 165C	P
Age Bond Strength	1) QTP #98064 MIL-STD-883, Method 883-2011	P
Current Density	1) QTP #98064 Cypress Spec. 22-00029	P
Dynamic Latch-up	1) QTP #98064 7.3V	P
Static Latch-up Sensitivity	In accordance with JEDEC 17. Cypress Spec. 01-00081	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF[3]	Failure Rate[4]
High Temperature Operating Life Early Failure Rate	3,278	1	N/A	N/A	305 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	1,115,,080 DHRs	0	0.7	170	5 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.

[4]Long Term Failure Rate was based on QTP #98111, QTP 98064.
[4]Early Failure Rate was based on QTP #98434

RELIABILITY TEST DATA

QTP#: 98434

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 6.5V							
CY62256-SNC	INDNS-O	4830873	519812495	48	1172	0	
CY62256-SNC	INDNS-O	4830873	519812496	48	944	0	
CY62256-SNC	INDNS-O	4830873	519812497	48	1162	1	GATE OXIDE RELATED DEFECT
STRESS: ESD-CHARGE DEVICE MODEL, 1000V							
CY62256-SNC	INDNS-O	4827636	519809733/4/5	COMP	3	0	
CY62256-SNC	INDNS-O	4830873	519811363	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 4400V							
CY62256-SNC	INDNS-O	4830873	519811363	COMP	3	0	
STRESS: STATIC LATCH-UP, 125C, 9V							
CY62256-SNC	INDNS-O	4830873	519811363	COMP	3	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH MSL1							
CY62256-SNC	INDNS-O	4827636	519809733/4/5	168	51	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH, MSL 1							
CY62256-SNC	INDNS-O	4843203	519816512	300	60	0	

DEVICE RELATED RELIABILITY TEST DATA

QTP#: 98111[8]

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 5.75V							
CY62148-SC	TAIWN-G	4816753	619807424	96	1595	0	
STRESS: ESD-CHARGE DEVICE MODEL, 750V							
CY62148-SC	TAIWN-G	4816753	619807424	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 4,400V							
CY62148-SC	TAIWN-G	4816753	619807424	COMP	3	0	
STRESS: STATIC LATCH-UP 125C, 11V							
CY62148-SC	TAIWN-G	4816753	619807424	COMP	3	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 5.75V							
CY62148-SC	TAIWN-G	4816753	619807424	500	120	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRECOND. 192 HRS 30C/60%RH, MSL 3							
CY62148-SC	TAIWN-G	4816753	619807424	168	48	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH, MSL 3							
CY62148-SC	TAIWN-G	4816753	619807424	300	48	0	
CY62148-SC	TAIWN-G	4816753	619807424	1000	48	0	

DEVICE RELATED RELIABILITY TEST DATA

QTP#: 98064[10]

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: ESD-CHARGE DEVICE MODEL, 1000V							
CY7C109-VC	INDNS-O	4738602	519712560	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2200V							
CY7C109-VC	INDNS-O	4738602	519712560	COMP	3	0	
STRESS: STATIC LATCH-UP, 125C, 11V							
CY7C109-VC	INDNS-O	4738602	519712560	COMP	3	0	
STRESS: DYNAMIC LATCH-UP 7.3V							
CY7C109-VC	INDNS-O	4738602	519712560	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST (140C, 5.5V), PRECOND. 192 HRS 30C/60%RH							
CY7C109-VC	INDNS-O	4738602	519712560	128	46	0	
CY7C109-VC	INDNS-O	4738564	519712898	128	46	0	
CY7C109-VC	INDNS-O	4738564	519712898	256	46	0	
CY7C109-VC	INDNS-O	4739644	519714390	128	46	0	
STRESS: HIGH TEMPERATURE STORAGE, 165C, NO BIAS							
CY7C109-VC	INDNS-O	4738602	519712560	336	46	0	
CY7C109-VC	INDNS-O	4738602	519712560	500	46	0	
CY7C109-VC	INDNS-O	4738602	519712560	1000	46	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 5.75V							
CY7C109-VC	INDNS-O	4738602	519712560	80	78	0	
CY7C109-VC	INDNS-O	4738602	519712560	168	78	0	
CY7C109-VC	INDNS-O	4739644	519714390	80	78	0	
CY7C109-VC	INDNS-O	4739644	519714390	168	78	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 5.75V							
CY7C109-VC	INDNS-O	4739644	519714390	80	528	0	
CY7C109-VC	INDNS-O	4739644	519714390	500	527	0	
CY7C109-VC	INDNS-O	4745042	519800651L1	80	529	0	
CY7C109-VC	INDNS-O	4745042	519800651L1	500	529	0	
STRESS: EXTENDED DYNAMIC BURN-IN, 150C, 5.75V							
CY7C109-VC	INDNS-O	4739644	519714390	1000	527	0	
STRESS: COLD LIFE TEST, -30C, 6.5V							
CY7C109-VC	INDNS-O	4738602	519712560	500	45	0	
CY7C109-VC	INDNS-O	4738602	519712560	1000	45	0	
STRESS: READ & RECORD LIFE TEST, 150C, 5.75V							
CY7C109-VC	INDNS-O	4738602	519712560	48	10	0	
CY7C109-VC	INDNS-O	4738602	519712560	500	10	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH, MSL3							
CY7C109-VC	INDNS-O	4738602	519712560	300	46	0	
CY7C109-VC	INDNS-O	4738602	519712560	1000	46	0	
CY7C109-VC	INDNS-O	4738564	519712898	300	46	0	
CY7C109-VC	INDNS-O	4739644	519714390	300	46	0	