Cypress Semiconductor
Product Qualification Report

QTP# 99503VERSION 1.1
December, 2002

4 Meg Synchronous Cache RAM R52D-3 Technology at Fab 4	
CY7C1325B	256K x 18 Synchronous Flow-Through Cache RAM
CY7C1327B	256K x 18 Synchronous Pipelined Cache RAM
CY7C1345B	128K x 36 Synchronous Flow-Through Cache RAM
CY7C1347B	128K x 36 Synchronous Pipelined Cache RAM
CY7C1338B	128K x 32 Synchronous Flow-Through Cache RAM
CY7C1339B	128k x 32 Synchronous Pipelined Cache RAM

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
99311	New Technology R52D-3 / New Product, 2Meg SRAM, CY7C1329	Aug 99
99503	New Product, 4Meg Sync ,CY7C1325B	Jan 00

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualifies 4 Meg Synchronous Flow Through Cache RAM, CY7C1325B and its options in qualified R52D-3 Technology, Fab4.	
Marketing Part #:	CY7C1325B/CY7C1327B/CY7C1338B/ CY7C1339B/ CY7C1345B/ CY7C1347B
Device Description:	3.3V, Commercial, Industrial available in 100-pin TQFP package
Cypress Division:	Cypress Semiconductor Corporation – Memory Product Division (MPD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. B
What ID markings on Die:	7C1325A

TECHNOLOGY/FAB PROCESS DESCRIPTION - R52D-3			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500 Å TiW/6000 Å Al-.5%Cu/300 Å TiW Metal 2: 300Å CoTi/8000Å Al-.5%Cu/300Å TiW
Passivation Type and Materials:			1000Å Oxide + 9000Å Nitride
Free Phosphorus contents in top glass layer(%):			0%
Number of Transistors in Device			29,066,890
Number of Gates in Device			4.8 millions
Generic Process Technology/Design Rule (μ-drawn):			CMOS, Double Metal /0.25 μm
Gate Oxide Material/Thickness (MOS):			SiO_2 / 50 Å
Name/Location of Die Fab (prime) Facility:			Cypress Semiconductor -- Bloomington, MN
Die Fab Line ID/Wafer Process ID:			Fab4/R52D-3

PACKAGE AVAILABILITY

PACKAGE TYPE	ASSEMBLY SITE FACILITY
100-pin TQFP	CSPI-R

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	A100RF
Package Outline, Type, or Name:	100-pin Thin Quad Flat Pack (TQFP)
Mold Compound Name/Manufacturer:	Hitachi CEL9200
Mold Compound Flammability Rating:	V-O per UL 94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plated, 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
Bond Diagram Designation	10-03606
Wire Bond Method:	Thermosonic
Wire Material/Size:	1.0um
Thermal Resistance Theta JA °C/W:	51°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	11-20005
Name/Location of Assembly (prime) facility:	Cypress Philippines (CSPI-R)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Cypress Philippines (CSPI-R)
Fault Coverage:	100%

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	1) QTP #99503 Dynamic Operating Condition, Vcc = 3.8V, 150°C 2) QTP #99311 Dynamic Operating Condition, Vcc = 4.5V, 150°C	P
High Temperature Operating Life Latent Failure Rate	QTP #99311/99503 Dynamic Operating Condition, Vcc = 3.8 V, 150°C	P
High Temperature Steady State Life	1) QTP #99311 Dynamic Operating Condition, Vcc = 3.63V, 150°C	P
High Accelerated Saturation Test (HAST)	1) QTP #99503 130°C, 3.63V,85%RH 2) QTP #99311 140°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30/60% RH+3IR-Reflow, 220°C+5, -0°C	P
Temperature Cycle	1) QTP #99503, QTP #99311 MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, -0°C	P
Pressure Cooker	QTP #99503, QTP #99311 No bias, 121C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, -0°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	QTP #99503, QTP #99311 2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	QTP #99503, QTP #99311 500V Cypress Spec. 25-00020	P
Current Density	1) QTP #99311 Cypress Sec 22-00029	P
Age Bond Pull	1) QTP #99311 MIL-STD-883, Method 2011	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Acoustic Microscopy / C-SAM	1) QTP #99311 Cypress Spec. 25-00104 (99311)	P
Latchup Sensitivity	1) QTP #99503, QTP #99311 125°, 10V, ±300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	P

***LTOL: Done in QTP 99075, R52LD-3**

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF[4]	Failure Rate[5]
High Temperature Operating Life Early Failure Rate[1]	11,615	1	N/A	N/A	86 PPM
High Temperature Operating Life[2,3] Long Term Failure Rate	2,194,,320 DHRs	5	0.7	170	13FIT

[1] A production burn-in of 30 Hrs at 150°C, 4.5V is required for the product.
[2] Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.
[3] Chi-squared 60% estimations used to calculate the failure rate.
[4] 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.

[5] **EFR Failure Rate and LFR FIT Rate based on QTP #99503 and QTP #99311**.

RELIABILITY TEST DATA

QTP#: 99503

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 3.8V							
CY7C1338B-AC	CSPI-R	4932158	619934137/8/76	48	1500	0	
CY7C1325B-AC	CSPI-R	4931078	619927801	48	1798	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1325B-AC	CSPI-R	4906012	619907774	COMP	3	0	
CY7C1345B-AC	CSPI-R	4906012	619911173	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2200V							
CY7C1325B-AC	CSPI-R	4906012	619907774	COMP	3	0	
CY7C1345B-AC	CSPI-R	4906012	619911173	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST, 130C/85%RH/3.63V, PRECOND. 192 HRS 30C/60%RH							
CY7C1325B-AC	CSPI-R	4907111	619910139	128	47	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.8V							
CY7C1325B-AC	CSPI-R	4931078	619927801	80	400	0	
CY7C1325B-AC	CSPI-R	4931078	619927801	500	400	2	2-LOST UNITS
CY7C1338B-AC	CSPI-R	4932158	619934137/8/76	80	400	0	
CY7C1338B-AC	CSPI-R	4932158	619934137/8/76	500	399	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 192 HRS 30C/60%RH, MSL 3							
CY7C1325B-AC	CSPI-R	4906012	619907775	168	47	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH, MSL 3							
CY7C1325B-AC	CSPI-R	4906012	619907775	300	40	0	
CY7C1325B-AC	CSPI-R	4907111	619910139	300	47	0	
CY7C1325B-AC	CSPI-R	4907111	619910139	500	47	0	
CY7C1325B-AC	CSPI-R	4907111	619910139	1000	47	0	

RELIABILITY TEST DATA

QTP#: 99311

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 4.5V							
CY7C1329-AC	CSPI-R	4905886		48	2988	0	
CY7C1329-AC	CSPI-R	4905886	619909761	48	1205	0	
CY7C1329-AC	CSPI-R	4905886	619909776	48	871	0	
CY7C1329-AC	CSPI-R	4909345	619911324	48	1584	1	1 PARTICLE DEFECT
CY7C1329-AC	CSPI-R	4909345	619911327	48	1669	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1329-AC	CSPI-R	4853292	619902690	1000V	3	0	
CY7C1329-AC	CSPI-R	4901357	619903817	750V	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C1329-AC	CSPI-R	4853292	619902690	2200V	3	0	
CY7C1329-AC	CSPI-R	4901357	619903817	2200V	3	0	
STRESS: HI-ACCEL SATURATION TEST, 140C/85%RH/3.63V, PRECOND. 192 HRS 30C/60%RH, MSL3							
CY7C1329-AC	CSPI-R	4853292	619902690	128	48	0	
CY7C1329-AC	CSPI-R	4853292	619902690	256	48	0	
CY7C1329-AC	CSPI-R	4901357	619903817	128	48	0	
STRESS: HIGH TEMPERATURE STORAGE, 165C, NO BIAS							
CY7C1329-AC	CSPI-R	4842121	619815465	336	48	0	
CY7C1329-AC	CSPI-R	4843204	619815797	336	48	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 3.63V							
CY7C1329-AC	CSPI-R	4842121	619815465	80	80	0	
CY7C1329-AC	CSPI-R	4842121	619815465	168	80	0	
CY7C1329-AC	CSPI-R	4843204	619815797	80	80	0	
CY7C1329-AC	CSPI-R	4843204	619815797	168	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.8V							
CY7C1329-AC	CSPI-R	4905886	619909761	80	1196	0	
CY7C1329-AC	CSPI-R	4905886	619909761	500	799	0	
CY7C1329-AC	CSPI-R	4909345	619911324	80	1491	1	1 UNKNOWN CAUSE
CY7C1329-AC	CSPI-R	4909345	619911324	500	1199	1	1 UNKNOWN CAUSE
CY7C1329-AC	CSPI-R	4909345	619911327	80	1640	0	
CY7C1329-AC	CSPI-R	4909345	619911327	500	1451	1	1 UNKNOWN CAUSE

RELIABILITY TEST DATA

QTP#: 99311

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: PRESSURE COOKER TEST, 121C, 100%RH							
CY7C1329-AC	CSPI-R	4853292	619902690	168	48	0	
CY7C1329-AC	CSPI-R	4901357	619903817	168	46	0	
STRESS: STATIC LATCH-UP TESTING, +/-300mA							
CY7C1329-AC	CSPI-R	4853292	619902690	9.98V	3	0	
CY7C1329-AC	CSPI-R	4901357	619903817	9.96V	3	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH, MSL 3							
CY7C1329-AC	CSPI-R	4842121	619815465	300	48	0	
CY7C1329-AC	CSPI-R	4842121	619815465	1000	48	0	
CY7C1329-AC	CSPI-R	4843204	619815797	300	45	0	
CY7C1329-AC	CSPI-R	4843204	619815797	1000	45	0	