

# Cypress Semiconductor

## Product Qualification Report

QTP# 001605 VERSION 1.1  
December, 2002

<b>256K FAST ASYNCHRONOUS SRAM</b> <b>R42HDHA Technology, Fab 4</b>	
CY7C194/195	64K x 4 Static RAM
CY7C197	256K x 1 Static RAM
CY7C198/199	32K x 8 Static RAM

### 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>
98064	New Technology R42HD / 1Meg CY7C109and device family	Apr 98
98085	New R42HD Hot Aluminum / 1Meg CY7C109 and device family	May 98
98424	New Commercial 32K X 8 Static RAM, CY7C199 and device family	Dec 98
001605	New Military Product Qualification	Aug 00

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.

<b>PRODUCT DESCRIPTION (for qualification)</b>	
Qualification Purpose: Qualifies CY7C199 and its options in R42HDHA Technology, Fab4	
Marketing Part #:	CY7C194/CY7C195/ CY7C197/CY7C198/ CY7C199
Device Description:	5V, Military and Commercial available in 28-pin LCC and CerDIP Package.
Cypress Division:	Cypress Semiconductor Corporation – Memory Product Division (MPD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. G
What ID markings on Die:	7C1599C

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION - R42HDHA</b>			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500Å TiW/6000Å Al -5%Cu/1200Å TiW Metal 2: 500Å TiW/8000Å Al -5%Cu/300Å TiW
Passivation Type and Materials:	7000Å SiO <sub>2</sub> + 6000Å Si <sub>3</sub> N <sub>4</sub>		
Free Phosphorus contents in top glass layer(%):	0%		
Die Coating(s), if used:	N/A		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Double Metal /0.42 μm		
Gate Oxide Material/Thickness (MOS):	SiO <sub>2</sub> / 110Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/R42HDHA		

**PACKAGE AVAILABILITY**

<b>PACKAGE</b>	<b>ASSEMBLY FACILITY SITE</b>
<b>28-pin CerDIP</b>	<b>ALPHA-X</b>
<b>28-pin LCC</b>	<b>ALPHA-X</b>

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

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
<b>Package Designation:</b>	D283
<b>Package Outline, Type, or Name:</b>	28-pin Ceramic Dual-In-Line Packages (CerDIP)
<b>Lead Frame Material:</b>	Alloy 42
<b>Lead Finish, Composition / Thickness:</b>	Hot Solder Dip, 63%Sn, 37%Pb
<b>Die Backside Preparation Method/Metallization:</b>	N/A
<b>Die Separation Method:</b>	Wafer Saw
<b>Die Attach Supplier:</b>	QMI
<b>Die Attach Material:</b>	QMI2419
<b>Bond Diagram Designation</b>	10-03754
<b>Wire Bond Method:</b>	Wedge Ultrasonic
<b>Wire Material/Size:</b>	Al, 1.0 mil
<b>Package Cross Section Yes/No:</b>	N/A
<b>Assembly Process Flow:</b>	49-15079
<b>Name/Location of Assembly (prime) facility:</b>	ALPHA-X

ELECTRICAL TEST / FINISH DESCRIPTION	
<b>Test Location:</b>	ALPHA-X
<b>Fault Coverage:</b>	100%

**RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS**

	<b>Test Condition (Temp/Bias)</b>	<b>Result P/F</b>
High Temperature Operating Life Early Failure Rate	1) QTP #001605, QTP #98424, QTP #98085 Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
High Temperature Operating Life Latent Failure Rate	1) QTP #001605, QTP #98424, QTP #98085 Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
Military Life Test Group C	1) QTP #001605, QTP #98064 Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
Read and Record Life Test	1) QTP #98064 Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
High Temperature Steady State	1) QTP #98064 Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
High Accelerated Saturation Test (HAST)	1) QTP #98085 Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85°C/85%RH+3IR-Reflow, 220°C+5, 0°C 2) QTP #98064 Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 220°C+5, 0°C 140C, 85%RH, 5.5V MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C	P
Temperature Cycle	1) QTP #98424, QTP #98064 Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 220°C+5, 0°C 2) QTP #98085 Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85°C/85%RH+3IR-Reflow, 220°C+5, 0°C MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C	P
Temperature Cycle (Hermetic)	1) QTP #001605 MIL-STD-883, Method 1010, Condition C, -65°C to 150°C	P
Pressure Cooker	1) QTP #98424, QTP #98085 121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85°C/85%RH+3IR-Reflow, 220°C+5, 0°C	P

**RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS (Continuation)**

	<b>Test Condition (Temp/Bias)</b>	<b>Result P/F</b>
High Temperature Storage	1) QTP #98064 165C, no bias	P
Electrostatic Discharge Human Body Model (ESD-HBM)	1) QTP #001605, QTP #98424, QTP #98064 2) 2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP #001605, QTP #98424, QTP #98064 500V Cypress Spec. 25-00020	P
Internal Water Vapor	1) QTP #001605 ≤5K PPM H <sub>2</sub> O MIL-STD-883C, Method 1018	P
Input/Output Capacitance	1) QTP #001605 Cypress Spec. 01-00123	P
Current Density	1) QTP #98064 Cypress Spec. 22-00029	P
Age Bond Pull	1) QTP #98064 MIL-STD-883C, Method 2011	P
Cold Life Test	1) QTP #98064 -30°C, 6.5V	P
Latchup Sensitivity	1) QTP #001605, QTP #98424, QTP #98064 125C, 12V, ± 300mA 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 <sup>4</sup>	Failure Rate <sup>5</sup>
High Temperature Operating Life Early Failure Rate <sup>1</sup>	9,823	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>2,3</sup> Long Term Failure Rate	1,395,140 DHRs	0	0.7	170	4 FIT

<sup>1</sup> A production burn-in of 80 Hrs at 150°C, 5.75V is required for the product

<sup>2</sup> Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.

<sup>3</sup> Chi-squared 60% estimations used to calculate the failure rate.

<sup>4</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<sub>A</sub> = The Activation Energy of the defect mechanism.

k = Boltzmann's constant = 8.62x10<sup>-5</sup> eV/Kelvin.

T<sub>1</sub> is the junction temperature of the device under stress and T<sub>2</sub> is the junction temperature of the device at use conditions.

<sup>5</sup> Early Term Failure Rate based on QTP 98085, 98424 and QTP #001605.

<sup>5</sup> Long Term /Extended Dynamic Burn-in Failure Rate is based on QTP 98084, 98085 and 001605.

## Reliability Test Data

QTP #: 001605

<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: DATA ALPHA PARTICLE EMISSION</b>							
CY7C199-DMB	4004319	610013102	ALPHA-X	COMP	5	0	
<b>STRESS: INPUT/OUTPUT CAPACITANCE</b>							
CY7C199-DMB	4004319	610013102	ALPHA-X	COMP	3	0	
<b>STRESS: INTERNAL WATER VAPOR</b>							
CY7C199-DMB	4004319	610013102	ALPHA-X	COMP	25	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERTING LIFE - EARLY FAILURE RATE, 150C,5.75V, &gt; VCC MAX</b>							
CY7C199-DMB	4004320	610013101/102	ALPHA-X	48H	1269	0	
CY7C199-DMB	4004320	610013101/102	ALPHA-X	48H	1880	0	
<b>STRESS: ESD-CDM, 750V</b>							
CY7C199-DMB	4004319	610013102	ALPHA-X	COMP	3	0	
<b>STRESS: ESD-HBM, 3,300V</b>							
CY7C199-DMB	4004319	610013102	ALPHA-X	COMP	3	0	
<b>STRESS: STATIC LATCH-UP TESTING, 125C, 12V, +/-300mA</b>							
CY7C199-DMB	4004319	610013102	ALPHA-X	COMP	3	0	
<b>STRESS: MILITARY LIFE TEST GROUP C,, 150C, 5.75V (MILITARY)</b>							
CY7C199-DMB	4004319	610013102	ALPHA-X	184H	50	0	
CY7C199-DMB	4004320	610013101	ALPHA-X	184H	50	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERTING LIFE-LATENT FAILURE RATE, 150C, 5.75V, &gt;Vcc Max</b>							
CY7C199-DMB	4004320	610013101	ALPHA-X	80H	260	0	
CY7C199-DMB	4004320	610013101	ALPHA-X	500H	260	0	
<b>STRESS: TC CONDITION C, 150C TO -65C, HERMETIC DEVICE</b>							
CY7C199-DMB	4004320	610013101	ALPHA-X	100cy	48	0	
CY7C199-DMB	4004320	610013101	ALPHA-X	1000cy	48	0	



**RELIABILITY TEST DATA**

**QTP#: 98424**

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 5.75V</b>							
CY7C199-VC	CSPI-R	4822196	619808550	48	1012	0	
CY7C199-VC	CSPI-R	4822279	619809494	48	1008	0	
CY7C199-VC	CSPI-R	4828707	619812830	48	1000	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL, 1000V</b>							
CY7C199-VC	CSPI-R	4828707	619812830	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2200V</b>							
CY7C199-VC	CSPI-R	4828707	619812830	COMP	3	0	
<b>STRESS: STATIC LATCH-UP, 125, 11.43V, 300mA</b>							
CY7C199-VC	CSPI-R	4828707	619812830	COMP	3	0	
<b>STRESS: PRESSURE COOKER TEST, 121C, 100%RH</b>							
CY7C199-VC	CSPI-R	4828707	619812830	168	48	0	
<b>STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH, MSL 1</b>							
CY7C199-VC	CSPI-R	4828707	619812830	300	48	0	
CY7C199-VC	CSPI-R	4934352	619928997	1000	44	0	

**RELIABILITY TEST DATA**

**QTP#: 98085<sup>1</sup>**

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 5.75V</b>							
CY7C109-VC	INDNS-O	4802677	519802689/90	48	498	0	
CY7C109-VC	INDNS-O	4802677	519802689/90	48	1491	0	
CY7C109-VC	INDNS-O	4802677	519802689/90	48	1664	0	
<b>STRESS: HI-ACCEL SATURATION TEST, 140C, 5.5V, 85%RH, PRECOND. 168 HRS 85C/85%RH, MSL1</b>							
CY7C109-VC	INDNS-O	4802677	519802689/90	128	46	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 5.75V, MSL1</b>							
CY7C109-VC	INDNS-O	4802677	519802689/90	80	385	0	
CY7C109-VC	INDNS-O	4802677	519802689/90	500	383	0	
<b>STRESS: PRESSURE COOKER TEST, 121C, 100%RH</b>							
CY7C109-VC	INDNS-O	4802677	519802689/90	96	46	0	
CY7C109-VC	INDNS-O	4802677	519802689/90	168	46	0	
<b>STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH, MSL 1</b>							
CY7C109-VC	INDNS-O	4802677	519802689/90	300	46	0	
CY7C109-VC	INDNS-O	4802677	519802689/90	1000	46	0	

<sup>1</sup> QTP 98085 - 1 Meg SRAM, R42HD Hot Aluminum Technology.

**RELIABILITY TEST DATA**

**QTP#: 98064<sup>2</sup>**

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
<b>STRESS: ESD-CHARGE DEVICE MODEL, 1000V</b>							
CY7C109-VC	INDNS-O	4738602	519712560	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2200V</b>							
CY7C109-VC	INDNS-O	4738602	519712560	COMP	3	0	
<b>STRESS: HI-ACCEL SATURATION TEST (140C, 85%RH, 5.5V), PRECOND. 192 HRS 30C/60%RH</b>							
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	
<b>STRESS: HIGH TEMPERATURE STORAGE (165C, NO BIAS)</b>							
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	
<b>STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 5.75V)</b>							
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	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)</b>							
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	
<b>STRESS: MILITARY LIFE TEST GROUP C, (150C, 5.75V)</b>							
CY7C109-VC	INDNS-O	4739644	519714390	1000	527	0	
<b>STRESS: COLD LIFE TEST (-30C, 6.5V)</b>							
CY7C109-VC	INDNS-O	4738602	519712560	500	45	0	
CY7C109-VC	INDNS-O	4738602	519712560	1000	45	0	
<b>STRESS: READ &amp; RECORD LIFE TEST (150C, 5.75V)</b>							
CY7C109-VC	INDNS-O	4738602	519712560	48	10	0	
CY7C109-VC	INDNS-O	4738602	519712560	500	10	0	
<b>STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH</b>							
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	

<sup>2</sup> 1 Meg SRAM fabricated in Fab 4 with R42HD Technology.