

# Cypress Semiconductor Product Qualification Report

QTP# 002603 VERSION 1.2  
December, 2002

**4 Meg FCP MoBL™ SRAM Family**  
**R52LD-3 Technology, Fab 4**

<b>CY62145V</b>	<b>256K x 16 Static RAM</b>
<b>CY62146V/ CY62147V</b>	

## CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

Ed Russell  
Reliability Director  
(408) 432-7069

Kim-Ngan Nguyen  
Staff Reliability Engineer  
(408) 943-2136

### PRODUCT QUALIFICATION HISTORY

<b>Qual Report</b>	<b>Description of Qualification Purpose</b>	<b>Date Comp</b>
99075	New Technology R52LD-3 /New SRAM MoBL, CY62137V	Apr 99
002603	New Product, 4Meg, Synchronous SRAM, CY62146V, R52LD-3	Jun 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 CY62145V/CY62146V/CY62147V FCP MoBL™ in qualified, R52LD-3 Technology , Fab4	
Marketing Part #:	CY62145V/CY62146V/CY62147V FCP MoBL™
Device Description:	2.7V-3.6V, Industrial available via die sale and 48-ball FBGA and 44-lead TSOP II package.
Cypress Division:	Cypress Semiconductor Corporation – Memory Product Division (MPD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	7C62145/6/7V

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION - R52LD-3</b>			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500Å TiW/6000Å Al-0.5%Cu/300Å TiW Metal 2: 300Å CoTi/8,000Å Al-0.5%Cu/300Å TiW
Passivation Type and Materials:	1000Å PECVD Oxide + 9000Å PECVD Si <sub>2</sub> N <sub>4</sub>		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device:	25.2 million		
Number of Gates in Device:	8.4 million		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Double Metal /0.25 μm/0.3 FETS		
Gate Oxide Material/Thickness (MOS):	SiO <sub>2</sub> / 70 Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor -- Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/R52LD-3		

**PACKAGE AVAILABILITY**

<b>PACKAGE</b>	<b>ASSEMBLY FACILITY SITE</b>
<b>44-lead TSOP II</b>	<b>CSPI-R</b>
<b>48-Ball FBGA</b>	<b>ASE TAIWAN / CSPI-R</b>

**Note:** Package Qualification details upon request

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
<b>Package Designation:</b>	BA48
<b>Package Outline, Type, or Name:</b>	48-ball Fine Ball Grid Array (FBGA)
<b>Mold Compound Name/Manufacturer:</b>	Plaskon SMT-B-1
<b>Mold Compound Flammability Rating:</b>	V O per UL 94
<b>Oxygen Rating Index:</b>	>28%
<b>Lead Frame Material:</b>	BT Resin
<b>Lead Finish, Composition / Thickness:</b>	Solder Ball, 63%Sn, 37%Pb
<b>Die Backside Preparation Method/Metallization:</b>	N/A
<b>Die Separation Method:</b>	Wafer Saw
<b>Die Attach Method:</b>	Epoxy
<b>Die Attach Supplier:</b>	Ablestik
<b>Die Attach Material:</b>	Ablestik 8355F
<b>Bond Diagram Designation</b>	10-03667
<b>Wire Bond Method:</b>	Thermosonic
<b>Wire Material/Size:</b>	Gold 1.0mil
<b>Thermal Resistance Theta JA °C/W:</b>	63.9°C/W
<b>Package Cross Section Yes/No:</b>	N/A
<b>Assembly Process Flow:</b>	49-41010
<b>Name/Location of Assembly (prime) facility:</b>	ASE Taiwan (TAIWN-G)

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
<b>Test Location:</b>	ASE Taiwan (TAIWN-G)
<b>Fault Coverage:</b>	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 #002603 Dynamic Operating Condition, Vcc = 4.2V, 125°C 2) QTP #99075 Dynamic Operating Condition, Vcc = 3.8V, 125°C	P
High Temperature Operating Life Latent Failure Rate	1) QTP #002603 Dynamic Operating Condition, Vcc = 4.2V, 125°C 2) QTP #99075 Dynamic Operating Condition, Vcc = 3.8V, 150°C	P
Extended Dynamic Burn-in	1) QTP #99075 Dynamic Operating Condition, Vcc = 3.8V, 150°C	P
High Temperature Steady State Life	1) QTP #99075 Static Operating Condition, Vcc = 3.63V, 150°C	P
High Accelerated Saturation Test (HAST)	1) QTP #002603 130°C, 85%RH, 3.63V 2) QTP #99075 140°C, 3.3V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, -0°C	P
Temperature Cycle	1) QTP #002603, QTP #99075 MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, -0°C	P
Pressure Cooker Test	1) QTP #002603, QTP #99075 No bias, 121°C, 100%RH Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, -0°C	P
High Temp Storage	1) QTP #99075 165°C, no bias	P
Low Temperature Operating Life	1) QTP #99075 -30C, 3.8V, 8MHz	P

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

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Electrostatic Discharge Human Body Model (ESD-HBM)	1) QTP #002603, QTP #99075 2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP #002603 500V Cypress Spec. 25-00020	P
Current Density	1) QTP #99075 Cypress Spec 22-00029	P
Age Bond Pull	1) QTP #99075 MIL-STD-883, Method 2011	P
Acoustic Microscopy/C-SAM	1) QTP #99075 Cypress Spec 25-00104	P
Latchup Sensitivity	1) QTP #002603, QTP #99075 $\pm 200\text{mA}$ 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>	4,990	1	N/A	N/A	200 PPM
High Temperature Operating Life <sup>2,3</sup> Long Term Failure Rate	1,014,500 DHRs	1	0.7	155-170	7 FIT

<sup>1</sup> A production burn-in of 6 Hrs at 125°C, 4.2V 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:

$E_A$  = 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.

<sup>5</sup> EFR Failure Rate and LFR FIT Rate based on QTP #99075 and 002603.

## Reliability Test Data

QTP #: 002603

<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: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 4.2V, &gt;Vcc Max)</b>							
CY62146V-BAI (7C621456A)	4936664	619933213	TAIWN-G	48	1009	0	
CY62146V-BAIB (7C621456A)	4950506	340000033	TAIWN-G	48	972	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL (1,000V)</b>							
CY62146V-BAI (7C621456A)	4935565	619930675	TAIWN-G	COMP	5	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (3,000V)</b>							
CY62146V-BAI (7C621456A)	4006723	610013537	TAIWN-G	COMP	3	0	
<b>STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.3V), PRE COND 192 HR 30C/60%RH</b>							
CY62146V-BAI (7C621456A)	4935565	619930675	TAIWN-G	100	65	0	
CY62146V-BAI (7C621456A)	4935565	619930675	TAIWN-G	128	65	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C,4.2V, &gt;Vcc Max)</b>							
CY62146V-BAI (7C621456A)	4936664	619933213	TAIWN-G	168	210	0	
CY62146V-BAI (7C621456A)	4936664	619933213	TAIWN-G	500	210	0	
CY62146V-BAI (7C621456A)	4936664	619933213	TAIWN-G	1000	210	0	
<b>STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 192 HR 30C/60%RH</b>							
CY62146V-BAI (7C621456A)	4935565	619930675	TAIWN-G	168	47	0	
<b>STRESS: ALPHA PARTICLE SENSITIVE</b>							
CY62137V-BAIB (7C621456A)	4942485	610001024	TAIWN-G	COMP	5	0	
<b>STRESS: STATIC LATCH-UP TESTING (125C, 9.0V, +/-200mA)</b>							
CY62146V-BAI (7C621456A)	4935565	619930675	TAIWN-G	COMP	3	0	
<b>STRESS: TC JEDDEC22 CONDITION B. -55C TO 125C, PRECOND. 192 HRS 30C/60%RH</b>							
CY62146V-BAI (7C621456A)	4935565	619930675	TAIWN-G	300	50	0	
CY62146V-BAI (7C621456A)	4935565	619930675	TAIWN-G	500	50	0	
CY62146V-BAI (7C621456A)	4935565	619930675	TAIWN-G	1000	50	0	
CY62146V-BAI (7C621456A)	4935565	619930675	TAIWN-G	1500	50	0	



**RELIABILITY TEST DATA**

**QTP#: 99075**

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V)</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	48	1505	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4902501	619905577	48	1504	1	1 Marginal to TOH (See note 1)
<b>STRESS: ESD-CHARGE DEVICE MODEL (500V)</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	COMP	3	0	
CY62138V-ZSC (7C62137A)	CSPI-R	4851023	619907600	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2200V)</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	COMP	3	0	
CY62138V-ZSC (7C62137A)	CSPI-R	4851023	619907600	COMP	3	0	
<b>STRESS: STATIC LATCH-UP TESTING (125C, 6.5V, ± 200mA)</b>							
CY62137V-ZSI (7C62137A)	CSPI-R	4852210	619903364	COMP	3	0	
CY62138V-ZSC (7C62137A)	CSPI-R	4851023	619907600	COMP	3	0	
<b>STRESS: HI-ACCEL SATURATION TEST (140C, 85%RH, 3.63V), PRECOND. 192 HRS 30C/60%RH</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	128	48	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	256	48	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4902501	619905577	128	48	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4902501	619905577	256	48	0	
CY62137V-RZIB (7C62137A)	CSPI-R	4903568	619907944	128	48	0	
<b>STRESS: HIGH TEMPERATURE STORAGE (165C, NO BIAS)</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	336	47	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	1000	47	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4902501	619905577	336	48	0	
<b>STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 3.63V)</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	80	71	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	80	9	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	168	80	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V)</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	80	405	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	500	405	1	1 UNKNOWN
CY62137V-ZSIB (7C62137A)	CSPI-R	4902501	619905577	80	396	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4902501	619905577	500	396	0	
<b>STRESS: EXTENDED DYNAMIC BURN-IN (150C, 3.8V)</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	1000	404	0	
<b>STRESS: LOW TEMPERATURE OPERATING LIFE (-30C, 3.8V, 8 MHZ)</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	500	45	0	

**NOTE 1:** The failure unit was marginal to TOH (1 Ns). Corrective action was assigned, CAR C991604Q. Permanent corrective action was implemented in WW9912 to tight TOHA limit at Class test to 12 ns + Guard band to screen out marginal TOHA rejects.

**RELIABILITY TEST DATA**

**QTP#: 99075**

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
<b>STRESS: PRESSURE COOKER TEST (121C, 100%RH)</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	168	48	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4902501	619905577	168	48	0	
<b>STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH (MSL 3)</b>							
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	300	48	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4852210	619903364	1000	48	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4902501	619905577	300	48	0	
CY62137V-ZSIB (7C62137A)	CSPI-R	4902501	619905577	1000	48	0	