

# Cypress Semiconductor Product Qualification Report

QTP# 000307 VERSION 1.2  
December, 2002

<b>4 Meg MoBL™ SRAM Family</b>	
CY62146V	256K x 16 Static RAM
CY62147V	256K x 16 Static RAM
CY62148V	512K 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>
99075	New Technology R52LD-3 / 2Meg MoBL SRAM, CY62137VLL	Apr 99
000307	New Product, 4Meg MoBL SRAM CY62146VLL, CY62147VLL, CY62148VLL	Jun 00

<b>PRODUCT DESCRIPTION (for qualification)</b>	
Qualification Purpose: Qualifies CY62146VLL / CY62147VLL/CY62148VLL, R52LD-3 Technology , Fab4	
Marketing Part #:	CY62146VLL / CY62147VLL / CY62148VLL
Device Description:	2.7V-3.6V256/512 x 16/8 Mobil SRAM available in 36/48-ball FBGA, 32/44-lead TSOP II, 32-lead SOIC respectively.
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:	7C62146/7V 7C62148V/7C11484

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION - R52LD-3</b>			
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 PECVD Oxide + 9000Å PECVD Si <sub>2</sub> N <sub>4</sub>		
Free Phosphorus contents in top glass layer(%):	0%		
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 SITE FACILITY</b>
<b>44pin TSOP</b>	<b>CSPI-R, ASE TAIWAN, KOREA-H</b>
<b>48-Ball FBGA</b>	<b>CSPI-R, ASE TAIWAN</b>
<b>32 pin SOIC</b>	<b>CSPI-R, ASE TAIWAN</b>

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
<b>Package Designation:</b>	ZS324
<b>Package Outline, Type, or Name:</b>	32-lead Thin Small Outline package type II (TSSOP II)
<b>Mold Compound Name/Manufacturer:</b>	Sumitomo EME 7351LS
<b>Mold Compound Flammability Rating:</b>	V-O per UL94
<b>Oxygen Rating Index:</b>	> 28 %
<b>Lead Frame Material:</b>	Copper
<b>Lead Finish, Composition / Thickness:</b>	Solder Plated 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 8361H
<b>Bond Diagram Designation</b>	10-03536
<b>Wire Bond Method:</b>	Thermosonic
<b>Wire Material/Size:</b>	Au, 1.0um
<b>Thermal Resistance Theta JA °C/W:</b>	73.6°C/W
<b>Package Cross Section Yes/No:</b>	N/A
<b>Assembly Process Flow:</b>	49-20023
<b>Name/Location of Assembly (prime) facility:</b>	Hyundai Korea (KOREA-H)

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
<b>Test Location:</b>	Hyundai Korea (KOREA-H)
<b>Fault Coverage:</b>	100 %

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
<b>Package Designation:</b>	ZS444
<b>Package Outline, Type, or Name:</b>	44-lead Thin Small Outline Package (TSSOP II)
<b>Mold Compound Name/Manufacturer:</b>	Hitachi CEL 9200
<b>Mold Compound Flammability Rating:</b>	V-O per UL94
<b>Oxygen Rating Index:</b>	> 28 %
<b>Lead Frame Material:</b>	Copper
<b>Lead Finish, Composition / Thickness:</b>	Solder Plated 85%Sn, 15%Pb
<b>Die Backside Preparation Method/Metallization:</b>	N/A
<b>Die Separation Method:</b>	Wafer Saw
<b>Die Attach Method:</b>	Silver Epoxy
<b>Die Attach Supplier:</b>	Ablestik
<b>Die Attach Material:</b>	Ablestik 8361H
<b>Bond Diagram Designation</b>	10-03533
<b>Wire Bond Method:</b>	Thermosonic
<b>Wire Material/Size:</b>	Au, 1.0um
<b>Thermal Resistance Theta JA °C/W:</b>	74.21°C/W
<b>Package Cross Section Yes/No:</b>	N/A
<b>Assembly Process Flow:</b>	11-20007
<b>Name/Location of Assembly (prime) facility:</b>	Cypress Philippines (CSPI-R)

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

<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) 7mm x 8.5mm
<b>Mold Compound Name/Manufacturer:</b>	Plaskon SMT-B-1
<b>Mold Compound Flammability Rating:</b>	V-O per UL94
<b>Oxygen Rating Index:</b>	> 28%
<b>Substrate 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 Supplier:</b>	Ablestik
<b>Die Attach Material:</b>	Ablestik 8355F
<b>Bond Diagram Designation</b>	10-03532
<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 REQUIREMENT**

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	1) QTP #000307, QTP 99075 Dynamic Operating Condition, Vcc Max = 3.8V, 150°C	P
High Temperature Operating Life Latent Failure Rate	1) QTP #000307, QTP 99075 Dynamic Operating Condition, Vcc Max = 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 #000307, 130°C, 3.63V, 85%RH 2) QTP 99075 140°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
Temperature Cycle	1) QTP #000307 MIL-STD-883C, Method 1010, Condition B, -55°C to 125°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
Temperature Cycle	1) QTP #000307, QTP 99075 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 Test	1) QTP #000307, QTP 99075 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	P
Electrostatic Discharge Human Body Model (ESD-HBM)	1) QTP #000307, QTP 99075 2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP #000307, QTP 99075 500V Cypress Spec. 25-00020	P

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

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Current Density	1) QTP #99075 Cypress Spec. 22-00029	P
High Temperature Storage	165°C, No bias	P
Age Bond Strength	MIL-STD-883, Method 2011	P
SEM X-Section	1) QTP 99075 MIL-STD-883, Method 883-2018-2	P
Acoustic Microscopy, MSL 3	2) QTP #000307, QTP 99075 Cypress Spec. 25-00104	P
Latchup Sensitivity	1) QTP #000307 125°C, 9V, +-300mA 2) QTP 99075 125°C, 10V, +-200mA	P



**RELIABILITY FAILURE RATE SUMMARY**

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF <sup>4</sup>	Failure Rate
High Temperature Operating Life Early Failure Rate <sup>1</sup>	7,514	1	N/A	N/A	133 PPM
High Temperature Operating Life <sup>2,3</sup> Long Term Failure Rate	525,500 DHRs	1	0.7	170	23FIT

<sup>1</sup> A production burn-in of 24 Hrs at 150°C, 4.5V 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.

## Reliability Test Data

QTP #: 000307

<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: ACOUSTIC, MSL 3</b>							
CY62148VLL-ZSC	4924164	619924019L1	KOREA-H	COMP	15	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V, Vcc Max)</b>							
CY62147VLL-BAI	4005556	610013509Q1	TAIWN-G	48	3000	0	
CY62147VLL-BAI	4925824	610009202	TAIWN-G	48	1505	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V, Vcc Max)</b>							
CY62148VLL-ZSC	4924164	619924019L1	KOREA-H	80	250	0	
CY62148VLL-ZSC	4924164	619924019L1	KOREA-H	500	250	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL (750V)</b>							
CY62146VLL-ZSIB	4911505	619915334	CSPI-R	COMP	3	0	
CY62148VLL-ZSC	4924164	619924019L1	KOREA-H	COMP	3	0	
CY62147VLL-BAI	4942448	610000369	TAIWN-G	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V/3,300V)</b>							
CY62146VLL-ZSIB	4911505	619915334	CSPI-R	COMP	3	0	
CY62148VLL-ZSC	4924164	619924019L1	KOREA-H	COMP	3	0	
CY62147VLL-BAI	4929800	619931709S1	TAIWN-G	COMP	3	0	
CY62147VLL-BAI	4929800	619931709S1	TAIWN-G	COMP	3	0	
<b>STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.63V), PRE COND 192 HR 30C/60%RH, MSL3</b>							
CY62146VLL-BAIB	4925255	619925644	TAIWN-G	128	54	0	
<b>STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 192 HR 30C/60%RH, MSL3</b>							
CY62147VLL-BAI	4942448	610000369	TAIWN-G	168	48	0	
<b>STRESS: STATIC LATCH-UP TESTING (125C, 9V, +/-300 mA)</b>							
CY62146VLL-ZSIB	4911505	619915334	CSPI-R	COMP	3	0	
CY62148VLL-ZSC	4924164	619924019L1	KOREA-H	COMP	3	0	
CY62147VLL-BAI	4942448	610000369	TAIWN-G	COMP	3	0	

## Reliability Test Data

QTP #: 000307

<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: TC JEDDEC22 CONDITION B. -55C TO 125C, PRECOND. 192 HRS 30C/60%RH, MSL3</b>							
CY62146VLL-BAIB	4925255	619925642	TAIWN-G	500	48	0	
CY62146VLL-BAIB	4925255	619925642	TAIWN-G	1000	48	0	
CY62146VLL-BAIB	4925255	619925642	TAIWN-G	1500	47	0	
<b>STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3</b>							
CY62148VLL-ZSCB	4932144	619935711	KOREA-H	300	49	1	1 Unknown Cause
CY62148VLL-ZSCB	4932144	619935711	KOREA-H	500	49	0	
CY62148VLL-ZSC	4932144	619935711	KOREA-H	1000	49	0	

RELIABILITY TEST DATA

QTP#: 99075<sup>1</sup>

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
<b>STRESS: ACOUSTIC</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	COMP	15	0	
CY62137V-ZSIB	CSPI-R	4902501	619905577	COMP	15	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V)</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	48	1505	0	
CY62137V-ZSIB	CSPI-R	4902501	619905577	48	1504	1	1 Marginal to TOH (See note 1)
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V)</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	80	405	0	
CY62137V-ZSIB	CSPI-R	4852210	619903364	500	405	1	1 UNKNOWN
CY62137V-ZSIB	CSPI-R	4902501	619905577	80	396	0	
CY62137V-ZSIB	CSPI-R	4902501	619905577	500	396	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL (500V)</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	COMP	3	0	
CY62138V-ZSC	CSPI-R	4851023	619907600	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2200V)</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	COMP	3	0	
CY62138V-ZSC	CSPI-R	4851023	619907600	COMP	3	0	
<b>STRESS: STATIC LATCH-UP (125C, 10V, +/- 200mA)</b>							
CY62138V-ZSC	CSPI-R	4851023	619907600	COMP	3	0	
<b>STRESS: AGE BOND STRENGTH</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	COMP	3	0	
CY62137V-ZSIB	CSPI-R	4902501	619905577	COMP	3	0	
<b>STRESS: HI-ACCEL SATURATION TEST (140C, 3.63V), PRECOND. 192 HRS 30C/60%RH</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	128	48	0	
CY62137V-ZSIB	CSPI-R	4852210	619903364	256	48	0	
CY62137V-ZSIB	CSPI-R	4902501	619905577	128	48	0	
CY62137V-ZSIB	CSPI-R	4902501	619905577	256	48	0	
CY62137V-RZIB	CSPI-R	4903568	619907944	128	48	0	
<b>STRESS: HIGH TEMPERATURE STORAGE (165C, NO BIAS)</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	336	47	0	
CY62137V-ZSIB	CSPI-R	4852210	619903364	1000	47	0	
CY62137V-ZSIB	CSPI-R	4902501	619905577	336	48	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.

<sup>1</sup> Qtp 99075, 2 Meg SRAM, R52LD-3 Technology, Fab 4 qualification

RELIABILITY TEST DATA

QTP#: 99075

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
<b>STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 3.63V)</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	80	71	0	
CY62137V-ZSIB	CSPI-R	4852210	619903364	80	9	0	
CY62137V-ZSIB	CSPI-R	4852210	619903364	168	80	0	
<b>STRESS: EXTENDED DYNAMIC BURN-IN (150C, 3.8V)</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	1000	404	0	
<b>STRESS: LOW TEMPERATURE OPERATING LIFE (-30C, 3.8V, 8 MHZ)</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	500	45	0	
<b>STRESS: PRESSURE COOKER TEST (121C, 100%RH)</b>							
CY62137V-ZSIB	CSPI-R	4852210	619903364	168	48	0	
CY62137V-ZSIB	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	CSPI-R	4852210	619903364	300	48	0	
CY62137V-ZSIB	CSPI-R	4852210	619903364	1000	48	0	
CY62137V-ZSIB	CSPI-R	4902501	619905577	300	48	0	
CY62137V-ZSIB	CSPI-R	4902501	619905577	1000	48	0	