

Cypress Semiconductor Product Qualification Report

QTP# 99262 VERSION 1.1
July, 2001

MoBL™ SRAM	
R52LD Technology, Fab 4 Qualification	
CY62136V/CY62137V	128K x 16 Static RAM
CY62138V	256K x 8 Static RAM

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
99075	New R52LD-3 Technology/New MoBL SRAM, CY62137V	Apr 99
99262	4 layer mask change (Poly, MI, VIA and M2) to enhance functionality	Aug 99

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: 3 layer mask change to CY62137V R52LD-3 Technology, Fab 4	
Marketing Part #:	CY62136VLL/62137VLL/62138VLL
Device Description:	2.8V - 3.3V, Commercial and Industrial available in 48-ball FBGA and 44-pin TSOP type II
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:	7C62136/7A

TECHNOLOGY/FAB PROCESS DESCRIPTION – R52LD-3			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500Å TiW/6000Å Al-Cu/300Å TiW Metal 2: 300Å CoTi/8000Å Al-Cu/300Å TiW
Passivation Type and Materials:	1K Å PECVD + 9K Å PECVD SiN ₄		
Die Coating(s), if used:	N/A		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Double Metal /0.25 μm/0.3 FETs		
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 70Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/R52LD-3		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
48-Ball FBGA	TAIWAN-G / CSPI-R/ TAIWN-GF/ TAIWN-T
44-pin TSOP II	CSPI-R

Major Package Information Used in This Qualification	
Package Designation:	ZS444
Package Outline, Type, or Name:	44-pin Thin Small outline Package (TSOP II)
Mold Compound Name/Manufacturer:	Hitachi CEL 9200
Mold Compound Flammability Rating:	V-O per UL 94
Oxygen Rating Index:	> 28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plated, 90%Sn, 10%Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	8361H
Bond Diagram Designation	10-03496
Wire Bond Method:	Thermosonic
Wire Material/Size:	Gold, 1.0mil
Thermal Resistance Theta JA °C/W:	66.5°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	11-20007
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 #99075 Dynamic Operating Condition, Vcc = 3.8V, 125°C	P
High Temperature Operating Life Latent Failure Rate	1) 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 #99075 140°C, 85%RH, 3.63V Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 235°C+5, -0°C	P
Temperature Cycle	1) 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, 235°C+5, -0°C	P
Pressure Cooker Test	1) QTP #99075 No bias, 121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 235°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
Electrostatic Discharge Human Body Model (ESD-HBM)	1) QTP #99262, QTP #99075 2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP #99262, QTP #99075 500V Cypress Spec. 25-00020	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Current Density	Cypress Spec 22-00029	P
Age Bond Pull	MIL-STD-883, Method 2011	P
Acoustic Microscopy/C-SAM	25-00104	P
Latchup Sensitivity	1) QTP #99262, QTP #99075 6.5V, \pm 200mA 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 ⁴	Failure Rate ⁵
High Temperature Operating Life Early Failure Rate ¹	3109	1	N/A	N/A	332 PPM
High Temperature Operating Life ^{2,3} Long Term Failure Rate	602,500 DHRs	1	0.7	170	20 FIT

¹ A production burn-in of 12 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 = 8.62x10⁻⁵ eV/Kelvin.

T₁ is the junction temperature of the device under stress and T₂ is the junction temperature of the device at use conditions.

⁵ EFR and LFR are based on QTP 99075.

RELIABILITY TEST DATA

QTP#: 99262

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
=====							
STRESS: ESD-CHARGE DEVICE MODEL (500V)							
CY62137VL-ZSIB	CSPI-R	4920726	619919067	COMP	3	0	

STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2200V)							
CY62137VL-ZSIB	CSPI-R	4920726	619919067	COMP	3	0	

STRESS: LATCH-UP SENSITIVITY (7.5V, ±300mA)							
CY62137VL-ZSIB	CSPI-R	4920726	619919067	COMP	3	0	

RELIABILITY TEST DATA

QTP#: 99075

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V)							
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)
STRESS: ESD-CHARGE DEVICE MODEL (500V)							
CY62137V-ZSIB	CSPI-R	4852210	619903364	COMP	3	0	
CY62138V-ZSC	CSPI-R	4851023	619907600	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2200V)							
CY62137V-ZSIB	CSPI-R	4852210	619903364	COMP	3	0	
CY62138V-ZSC	CSPI-R	4851023	619907600	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST (140C,85%RH,3.63V), PRECOND. 192 HRS 30C/60%RH							
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	
STRESS: HIGH TEMPERATURE STORAGE (165C, NO BIAS)							
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	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 3.63V)							
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	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V)							
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	
STRESS: EXTENDED DYNAMIC BURN-IN (150C, 3.8V)							
CY62137V-ZSIB	CSPI-R	4852210	619903364	1000	404	0	
STRESS: LOW TEMPERATURE OPERATING LIFE (-30C, 3.8V, 8 MHZ)							
CY62137V-ZSIB	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
STRESS: PRESSURE COOKER TEST (121C, 100%RH)							
CY62137V-ZSIB	CSPI-R	4852210	619903364	168	48	0	
CY62137V-ZSIB	CSPI-R	4902501	619905577	168	48	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH (MSL 3)							
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	