

Cypress Semiconductor Product Qualification Report

QTP# 002303 VERSION 1.2
December 2002

2 Meg FCP MoBL™ SRAM Family	
R52LD-3 Technology, Fab 4	
CY62135V	128K x 16 Static RAM
CY62136V/CY62137V	

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
99075	New Technology R52LD-3 /New 2Meg Micropower device, CY62137V	Apr 99
002303	New 2Meg FCP MoBL Device CY62137VLL (different pad layout from CY62137V)	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.

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify CY62135VLL/CY62136VLL/CY62137VLL, 2Meg FCP MoBL™, R52LD-3 Technology, Fab4	
Marketing Part #:	CY62135VLL/CY62136VLL/CY62137VLL
Device Description:	2.7V-3.6V, Commercial available via die sale, 48-ball FBGA and 44-pin 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:	7C62136/7V

TECHNOLOGY/FAB PROCESS DESCRIPTION - R52LD-3			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500Å TiW/6000 Å 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 ₂ N ₄		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device:	12.7 million		
Number of Gates in Device:	4.1 million		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Double Metal /0.25 μm/0.3 FETS		
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 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

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

Note: Package Qualification details upon request

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BA48
Package Outline, Type, or Name:	48-ball Fine Pitch Ball Grid Array (FBGA)
Mold Compound Name/Manufacturer:	Plaskon SMT-B-1
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	> 28%
Substrate Material:	BT Resin
Lead Finish, Composition / Thickness:	Solder Ball, 63%Sn, 37%Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	8355F
Bond Diagram Designation	10-03495
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0ml
Thermal Resistance Theta JA °C/W:	54.9°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-41010
Name/Location of Assembly (prime) facility:	ASE Taiwan (TAIWN-G)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	ASE Taiwan (TAIWN-G)
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 #002303 Dynamic Operating Condition, Vcc = 4.2V, 125C 2) 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 Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°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 Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, -0°C	P
Pressure Cooker Test	1) QTP 002303, 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
Electrostatic Discharge Human Body Model (ESD-HBM)	1) QTP #002303, QTP #99075 2,200V MIL-STD-883, Method 3015.7	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP #002303, QTP #99075 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 25-00104	P
Latchup Sensitivity	1) QTP #99075, QTP #002303 In accordance with JEDEC 17, Cypress Spec. 01-00081 (6.5V, ±300mA)	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	5,982	1	N/A	N/A	167 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 8 Hrs at 125°C, 4.2V 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 Failure Rate based on QTP 002303 and #99075.

⁵ LFR Fit Rate based on QTP #99075

Reliability Test Data

QTP #: 002303

<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>
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 4.2V, Vcc Max)							
CY62137V-BAIB	4942425	619938313	TAIWN-G	48	989	0	
CY62137V-BAIB	4942485	610001024	TAIWN-G	48	999	0	
CY62137V-BAIB	4945842	610001080	TAIWN-G	48	985	0	
STRESS: ESD-CHARGE DEVICE MODEL (1,000V)							
CY62137V-BAIB	4942425	619938313	TAIWN-G	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY62137V-BAIB	4005488	610010218	TAIWN-G	COMP	3	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 192 HR 30C/60%RH							
CY62137V-BAIB	4942485	610001024	TAIWN-G	168	50	0	
STRESS: STATIC LATCH-UP TESTING (125C, 7.5V, +/-300mA)							
CY62137V-BAIB	4005488	610010218	TAIWN-G	COMP	3	0	
STRESS: TC JEDDEC22 CONDITION B. -55C TO 125C, PRECOND. 192 HRS 30C/60%RH							
CY62137V-BAIB	4942425	619938313	TAIWN-G	500	50	0	
CY62137V-BAIB	4942425	619938313	TAIWN-G	1500	50	0	
CY62137V-BAIB	4942425	619938313	TAIWN-G	2000	50	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	
