Cypress Semiconductor
Product Qualification Report

QTP# 012005 VERSION 1.3
November, 2002

MoBL™ and Micrpower-Low Power Asynchronous SRAM Technology Derivative R7LD-3, Fab4	
CY62155CV CY62157CV25LL / CY62157CV30LL/ CY62157CV33LL	512K x 16 Static RAM
CY62158CV25LL / CY62158CV30LL/ CY62158CV33LL	1024K x 8 MoBL Static RAM

MoBL and More Battery Life are trademark of Cypress Semiconductor

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
014502	New Technology Derivative R7LD-3 / New 4Meg, Low power Asynchronous SRAM CY62147CV33LL and its bond option	Dec 01
012005	New 8Meg, Low power Asynchronous SRAM CY62155CV* and its bond option	Dec 01

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 new CY62155CV* device and its bond option in R7LD-3 technology Derivative, Fab 4		
Marketing Part #:	CY62155CV*, CY62157CV*, CY62158CV*	
Device Description:	2.2V – 3.6V, Industrial available in Wafer Die Sales and 48-ball FBGA package.	
Cypress Division:	Cypress Semiconductor Corporation –Memory Product Division (MPD)	
Overall Die (or Mask) REV Level (pre-requisite for qualification):		Rev. C
What ID markings on Die:	7C62155C	

TECHNOLOGY/FAB PROCESS DESCRIPTION – R7LD-3			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 100Å Ti / 300Å TiN / 6,000Å Al / 300Å TiW Metal 2: 8,000Å TiAl / 300Å TiN
Passivation Type and Materials:	1000Å TEOS / 9000Å Nitride		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device	50 million		
Number of Gates in Device	50 million		
Generic Process Technology/Design Rule (µ-drawn):	CMOS, Double Metal /0.16 µm		
Gate Oxide Material/Thickness (MOS):	SiO_2, 32Å / 70Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor -- Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/R7LD-3R		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
48-ball FBGA	**TAIWN-G, CSPI-R**

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:	Ablestik 8355F
Die Attach Method:	Epoxy
Bond Diagram Designation:	10-04355
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0mil
Thermal Resistance Theta JA °C/W:	64.33°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	11-20021
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 REQUIREMENT

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	1) QTP #012005 Dynamic Operating Condition, Vcc Max = 3.8V, 125°C 2) QTP #014502 Dynamic Operating Condition, Vcc Max=4.9V, 150°C	P
High Temperature Operating Life Latent Failure Rate	1) QTP #012005 Dynamic Operating Condition, Vcc Max = 3.8V, 125°C 1) QTP #014502 Dynamic Operating Condition, Vcc Max=4.9V, 150°C	P
High Temperature Steady State Life	1) QTP #012005, QTP #014502 Static Operating Condition, Vcc Max=3.63V, 150°C	P
High Accelerated Saturation Test (HAST)	1) QTP #012005, QTP #014502 130°C, 3.63V,85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
Temperature Cycle	1) QTP #012005, QTP #01402 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	1) QTP #012005, QTP #01402 121°C, 100%RH Precondition: JESD22 Moisture Sensitivity, MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
High Temperature Storage	1) QTP # QTP #012005, QTP #01402 150°C ± 5°C no bias	P
Current Density	1) QTP #014502 Cypress Spec 22-00029	P
Electrostatic Discharge Human Body Model (ESD-HBM)	1) QTP #012005, QTP #01402 2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP #012005, QTP #01402 500V Cypress Spec. 25-00020	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT

Stress/Test	Test Condition (Temp/Bias)	Result P/F
SEM X-Section	1) QTP #014502 MIL-STD-883, Method 883-2018-2 / Cypress Spec. 22-00009	P
Age Bond Strength	1) QTP #014502 200C, 4HRS 1) MIL-STD-883, Method 883-2011	P
Acoustic Microscopy, MSL 3	2) QTP #012005, QTP #014502 Cypress Spec. 25-00104	P
Dynamic Latchup	1) QTP #014502 6.2V In accordance with JEDEC 17. Cypress Spec. 01-00081	P
Static Latchup	1) QTP #012005, QTP #014502 125C, 6.5V, ± 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[3]	Failure Rate[4]
High Temperature Operating Life Early Failure Rate	10,379	1	N/A	N/A	96.3 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	620,620 DHRs	0	0.7	170	9 FIT

[1] Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.
[2] Chi-squared 60% estimations used to calculate the failure rate..
[3] 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 = 8.62×10^{-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.

[4] **FIT rate based on QTP #012005 and QTP #014502.**

Reliability Test Data

QTP #: 012005

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC-MSL3							
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	COMP	15	0	
CY62157CV33LL-BAI(7C62057C)	4129563	*610132904*	CSPI-R	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 3.8V, Vcc Max)							
CY62157CV33LL-BAI(7C62057C)	4139350	*610141885*	CSPI-R	84	1867	0	
CY62157CV30LL-BAI(7C62157C)	4139350	*610142505*	CSPI-R	84	1940	0	
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	90	468	0	
CY62157CV30LL-BAI(7C62157C)	4128563	*610134882*	CSPI-R	84	1408	0	
CY62157CV30LL-BAI(7C62157C)	4136914	*610138176*	CSPI-R	84	1752	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V, Vcc Max)							
CY62157CV33LL-BAI(7C62057C)	419512	*610132220*	CSPI-R	80	400	0	
CY62157CV33LL-BAI(7C62057C)	419512	*610132220*	CSPI-R	500	400	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	COMP	9	0	
CY62157CV30LL-BAI(7C62157C)	4129563	*610134882N*	CSPI-R	COMP	9	0	
CY62157CV33LL-BAI(7C62057C)	4136914	*610138176*	CSPI-R	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	COMP	9	0	
CY62157CV33LL-BAI(7C62057C)	4129563	*610132904*	CSPI-R	COMP	9	0	
CY62157CV33LL-BAI(7C62057C)	4136914	*610138176*	CSPI-R	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/300Ma							
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	COMP	3	0	
CY62157CV33LL-BAI(7C62057C)	4129563	*610132904*	CSPI-R	COMP	3	0	
CY62157CV33LL-BAI(7C62057C)	4136914	*610138176*	CSPI-R	COMP	3	0	
STRESS: HIGH TEMPERATURE STORAGE, PLASTIC, 150C							
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	500	50	0	
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	1000	49	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, Vcc MAX)							
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	80	80	0	
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	168	80	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 192 HR 30C/60%RH							
CY62157CV33LL-BAI(7C62057C)	4129563	*610132904*	CSPI-R	168	50	0	
CY62157CV30LL-BAI(7C62157C)	4129563	*610134882N*	CSPI-R	168	46	0	

Reliability Test Data

QTP #: 012005

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.63V), PRE COND 192 HR 30C/60%RH, MSL3							
CY62157CV33LL-BAI(7C62057C)	4129563	*610132904*	CSPI-R	128	50	0	
CY62157CV30LL-BAI(7C62157C)	4129563	*610134882N*	CSPI-R	128	41	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH (MSL3)							
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	300	50	0	
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	500	50	0	
CY62157CV33LL-BAI(7C62057C)	4129512	*610132220*	CSPI-R	1000	50	0	
CY62157CV33LL-BAI(7C62057C)	4129563	*610132904*	CSPI-R	300	50	0	
CY62157CV33LL-BAI(7C62057C)	4129563	*610132904*	CSPI-R	500	49	0	
CY62157CV33LL-BAI(7C62057C)	4129563	*610132904*	CSPI-R	1000	49	0	

Reliability Test Data

QTP #: 014502

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC-MSL3							
CY62147CV33LL-BAI(7C62047D)	4113951	*610116644*	TAIWN-G	COMP	15	0	
CY62147CV33LL-BAI(7C62047D)	4121877	*610126418*	TAIWN-G	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 4.9V, Vcc Max)							
CY62147CV33LL-BAI(7C62047D)	4121877	*610126418*	TAIWN-G	84	1486	0	
CY62147CV33LL-BAI(7C62047D)	4120575	*610128355*	TAIWN-G	84	1457	1	SEE FA REPORT 013007-3B14
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 4.9V, Vcc Max)							
CY62147CV33LL-BAI(7C62047D)	4121877	*610126418*	TAIWN-G	80	449	0	
CY62147CV33LL-BAI(7C62047D)	4121877	*610126418*	TAIWN-G	500	447	0	
CY62147CV33LL-BAI(7C62047D)	4120575	*610128355*	TAIWN-G	80	398	0	
CY62147CV33LL-BAI(7C62047D)	4120575	*610128355*	TAIWN-G	500	394	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY62147CV33LL-BAI(7C62047D)	4139353	*610142830*	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY62147CV33LL-BAI(7C62047D)	4139353	*610142830*	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/300mA							
CY62147CV33LL-BAI(7C62047D)	4113951	*610116644*	TAIWN-G	COMP	3	0	
CY62147CV33LL-BAI(7C62047D)	4121877	*610126418*	TAIWN-G	COMP	3	0	
CY62147CV33LL-BAI(7C62047D)	4120575	*610128355*	TAIWN-G	COMP	3	0	
STRESS: DYNAMIC LATCH-UP TESTING, 6.2V							
CY62147CV33LL-BAI(7C62047D)	4113951	*610116644*	TAIWN-G	COMP	3	0	
STRESS: AGE BOND STRENGTH							
CY62147CV33LL-BAI(7C62047D)	4113951	*610116644*	TAIWN-G	COMP	5	0	
CY62147CV33LL-BAI(7C62047D)	4121877	*610126418*	TAIWN-G	COMP	14	0	
STRESS: HIGH TEMPERATURE STORAGE, PLASTIC, 150C							
CY62147CV33LL-BAI(7C62047D)	4113951	*610116644*	TAIWN-G	500	47	0	
CY62147CV33LL-BAI(7C62047D)	4113951	*610116644*	TAIWN-G	1000	47	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 1.98V, Vcc MAX)							
CY62147CV33LL-BAI(7C62047D)	4113951	*610116644*	TAIWN-G	80	80	0	
CY62147CV33LL-BAI(7C62047D)	4113951	*610116644*	TAIWN-G	168	80	0	

Reliability Test Data

QTP #: 014502

Device	*Fab Lot #*	*Assy Lot #*	*Ass Loc*	*Duration*	*Samp*	*Rej*	*Failure Mechanism*
STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 192 HR 30C/60%RH							
CY62147CV33LL-BAI(7C62047D)	4121877	*610126418*	TAIWN-G	168	50	0	
CY62147CV33LL-BAI(7C62047D)	4120575	*610128355*	TAIWN-G	168	48	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.63V), PRE COND 192 HR 30C/60%RH, MSL3							
CY62147CV33LL-BAI(7C62047D)	4121877	*610126418*	TAIWN-G	128	50	0	
CY62147CV33LL-BAI(7C62047D)	4120575	*610128355*	TAIWN-G	128	50	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH (MSL3)							
CY62147CV33LL-BAI(7C62047D)	4113951	*610116644*	TAIWN-G	300	48	0	
CY62147CV33LL-BAI(7C62047D)	4113951	*610116644*	TAIWN-G	500	48	0	
CY62147CV33LL-BAI(7C62047D)	4121877	*610126418*	TAIWN-G	300	48	0	