Cypress Semiconductor
Product Qualification Report

QTP# 003906 VERSION 1.2
December, 2002

4 Meg MoBL2™ SRAM	
R52D-3 Technology, Fab 4	
CY62146BV18 CY62147BV18	256K x 16 Static RAM

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date Comp
99311		New Technology R52D-3 , 2Meg CY7C1329		Aug 99
99245		New Device , 4Meg Sync with MoBL Architecture CY7C1350B, R52D-3		Apr 00
003906		New Device , 4Meg, MoBL2™ CY62147BV18, R52D-3		May 01

Note:
Based on using the same design rules and cells to establish a product family, as in JESD-47, Cypress qualifies devices within a product technology by using generic data from that product family to fill out the qualification requirements for those reliability stresses which test intrinsic reliability of the technology. Reliability stresses, such as ESD and Early Life, which are design sensitive are routinely performed in qualifications to ensure the specific design is reliable.

PRODUCT DESCRIPTION (for qualification)		
Qualification Purpose: Qualify CY62147BV18 and its options in qualified .R52D-3 Technology, Fab 4.		
Marketing Part #:	CY62147BV18	
Device Description:	1.65V – 1.95V,Industrial available in 48-ball FBGA package.	
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:	7C62345/6/7V	

TECHNOLOGY/FAB PROCESS DESCRIPTION – R52D-3			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500Å TiW/6,000Å Al -0.5% Cu/300Å TiW Metal 2: 300Å CoTi/8,000A Al -0.5% Cu /300 TiW
Passivation Type and Materials:			1000Å Oxide + 9000Å Nitride
Free Phosphorus contents in top glass layer(%):			0%
Number of Transistors in Device			25,2 million
Number of Gates in Device			4.8 million
Gate Oxide Material/Thickness (MOS):			SiO_2 / 55 Å
Generic Process Technology/Design Rule (µ-drawn):			CMOS, Double Metal /0.25 µm
Name/Location of Die Fab (prime) Facility:			Cypress Semiconductor - Bloomington, MN
Die Fab Line ID/Wafer Process ID:			Fab4/R52D-3

PACKAGE AVAILABILITY

PACKAGE TYPE	ASSEMBLY SITE FACILITY
48-ball FBGA	**ASE TAIWAN**

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)7mm x 8.5mm
Mold Compound Name/Manufacturer:	Plaskon SMT-B-1
Mold Compound Flammability Rating:	V-O per UL 94
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
Bond Diagram Designation	10-03668
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0um
Thermal Resistance Theta JA °C/W:	120°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 REQUIREMENT

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	1) QTP #003906 Dynamic Operating Condition, Vcc = 2.9V, 125°C, Vcc Max (Note 1) 2) QTP #99245 Dynamic Operating Condition, Vcc = 3.8V, 150°C, Vcc Max 3) QTP #99311 Dynamic Operating Condition, Vcc = 4.5V, 150°C, Vcc Max	P
High Temperature Operating Life Latent Failure Rate	1) QTP #003906 Dynamic Operating Condition, Vcc = 2.9 V, 125°C, Vcc Max (Note 1) 2) QTP #99311 Dynamic Operating Condition, Vcc = 3.8 V, 150°C, Vcc Max	P
High Temperature Steady State Life	1) QTP #99311 Dynamic Operating Condition, Vcc = 3.63 V, 150°C, Vcc Max	
Temperature Cycle	1) QTP #003906, QTP #99245, QTP #99311 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
High Accelerated Saturation Test (HAST)	1) QTP #99311 140°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30/60% RH+3IR-Reflow, 220°C+5, -0°C	P
Pressure Cooker	1) QTP #003906, QTP #99245, QTP #99311 121°C/100%RH Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30/60% RH+3IR-Reflow, 220°C+5, -0°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	1) QTP# 003906, QTP #99245, QTP #99311 2,200V MIL-STD-883, Method 3015.7	P

Note 1: This device is a 2M MoBL2 FCP device with a Vcc operating range of 1.65 - 2.5V. 115% Vcc max (115% of 2.5V = 2.9V) is used for EFR and LFR

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP# 003906, QTP #99245, QTP #99311 500V Cypress Spec. 25-00020	P
Age Bond Pull	1) QTP #99311 MIL-STD-883, Method 2011	P
High Temperature Storage	1) QTP #99311 165C, no bias	P
Current Density	1) QTP #99311 Cypress Spec. 22-00029	P
Acoustic Microscope/C-SAM	1) QTP #99311 Cypress Spec. 25-00104	P
Latchup Sensitivity	1) QTP #003906, QTP #99245 125°C, 6.5V, ±300mA 2) QTP #99311 125°C, 10V, ±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[3]	Failure Rate[4]
High Temperature Operating Life Early Failure Rate[4]	13,255	2	N/A	N/A	151 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	1,924,740 DHRs	3	0.7	170	13 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] EFR Failure Rate based on QTP #003906, QTP #99245 and QTP #99311.
[4] LFR Fit Rate based on QTP #003906, and QTP #99311.

Reliability Test Data

QTP #: 003906

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 2.9V, Vcc Max							
CY62146BV18-BAI (7C62346B)	4042339	*610048320*	TAIWN-G	96	1696	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 2.9V, Vcc Max							
CY62146BV18-BAI (7C62346B)	4042339	*610048320*	TAIWN-G	168	260	0	
CY62146BV18-BAI (7C62346B)	4042339	*610048320*	TAIWN-G	1000	260	0	
STRESS: ESD-CDM DONE, 500V							
CY62146BV18-BAI (7C62346B)	4042339	*610048320*	TAIWN-G	COMP	9	0	
CY62146BV18-BAI (7C62346B)	4043501	*610049930*	TAIWN-G	COMP	9	0	
STRESS: ESD-HBM DONE, 2,200V							
CY62146BV18-(7C62346B)	4042339	*610048320*	TAIWN-G	COMP	9	0	
CY62146BV18-BAI (7C62346B)	4043501	*610049930*	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 6.5V, +/-300mA							
CY62146BV18-BAI (7C62346B)	4043501	*610049930*	TAIWN-G	COMP	3	0	
CY62146BV18-BAI (7C62346B)	4042339	*610048320*	TAIWN-G	COMP	3	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH), PRE COND 192HRS 30C/60%RH							
CY62146BV18-BAI (7C62346B)	4043501	*610049930*	TAIWN-G	168	45	0	
STRESS: TC CONDITION C,-65C TO 150C, PRE COND. 192 HRS 30C/60%RH, MSL3							
CY62146BV18-BAI (7C62346B)	4042339	*610048320*	TAIWN-G	300	48	0	

Reliability Test Data

QTP #: 99245

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: PRESSURE TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 3.8V, 150C, Vcc Max							
CY7C1350B-ACB (7C1350B)	4942447	*610006467/6508*	CSPI-R	48	250	0	
CY7C1350B-ACB (7C1350B)	4942447	*610006467/6508*	CSPI-R	48	1248	0	
CY7C1350B-ACB (7C1350B)	4943615	*610009589*	CSPI-R	48	244	0	
CY7C1350B-ACB (7C1350B)	4943615	*610009589*	CSPI-R	48	1500	0	
STRESS: ESD-CHARGE DEVICE MODEL, 750V							
CY7C1350B-ACB (7C1350B)	4942447	*610006467/6508*	CSPI-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C1350B-ACB (7C1350B)	4942447	*610006467/6508*	CSPI-R	COMP	3	0	
STRESS: PRESSURE COOKER TEST, (121C, 100%RH), PRE COND 192 HR 30C/60%RH							
CY7C1350B-ACB (7C1350B)	4942447	*610006467/6508*	CSPI-R	168	50	0	
STRESS: STATIC LATCH-UP TESTING, +/-300mA							
CY7C1350B-ACB (7C1350B)	4942447	*610006467/6508*	CSPI-R	COMP	6	0	
CY7C1350B-ACB (7C1350B)	4942447	*610006467/6508*	CSPI-R	COMP	6	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3							
CY7C1350B-ACB (7C1350B)	4942447	*610006467/6508*	CSPI-R	300	50	0	
CY7C1350B-ACB (7C1350B)	4942447	*610006467/6508*	CSPI-R	500	50	0	
CY7C1350B-ACB (7C1350B)	4942447	*610006467/6508*	CSPI-R	1000	50	0	

RELIABILITY TEST DATA

QTP#: 99311[3]

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 4.5V)							
CY7C1329-AC(7C1329D)	CSPI-R	4905886		48	2988	0	
CY7C1329-AC(7C1329D)	CSPI-R	4905886	619909761	48	1205	0	
CY7C1329-AC(7C1329D)	CSPI-R	4905886	619909776	48	871	0	
CY7C1329-AC(7C1329D)	CSPI-R	4909345	619911324	48	1584	1	1 PARTICLE DEFECT
CY7C1329-AC(7C1329D)	CSPI-R	4909345	619911327	48	1669	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CY7C1329-AC(7C1329D)	CSPI-R	4853292	619902690	1000V	3	0	
CY7C1329-AC(7C1329D)	CSPI-R	4901357	619903817	750V	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015							
CY7C1329-AC(7C1329D)	CSPI-R	4853292	619902690	2200V	3	0	
CY7C1329-AC(7C1329D)	CSPI-R	4901357	619903817	2200V	3	0	
STRESS: HI-ACCEL SATURATION TEST (140C/85%RH/3.63V), PRECOND. 192 HRS 30C/60%RH							
CY7C1329-AC(7C1329D)	CSPI-R	4853292	619902690	128	48	0	
CY7C1329-AC	CSPI-R	4853292	619902690	256	48	0	
CY7C1329-AC(7C1329D)	CSPI-R	4901357	619903817	128	48	0	
STRESS: HIGH TEMPERATURE STORAGE (165C, NO BIAS)							
CY7C1329-AC(7C1329D)	CSPI-R	4842121	619815465	336	48	0	
CY7C1329-AC(7C1329D)	CSPI-R	4843204	619815797	336	48	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 3.63V)							
CY7C1329-AC(7C1329D)	CSPI-R	4842121	619815465	80	80	0	
CY7C1329-AC(7C1329D)	CSPI-R	4842121	619815465	168	80	0	
CY7C1329-AC(7C1329D)	CSPI-R	4843204	619815797	80	80	0	
CY7C1329-AC(7C1329D)	CSPI-R	4843204	619815797	168	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V)							
CY7C1329-AC(7C1329D)	CSPI-R	4905886	619909761	80	1196	0	
CY7C1329-AC(7C1329D)	CSPI-R	4905886	619909761	500	799	0	
CY7C1329-AC(7C1329D)	CSPI-R	4909345	619911324	80	1491	1	1 UNKNOWN CAUSE
CY7C1329-AC(7C1329D)	CSPI-R	4909345	619911324	500	1199	1	1 UNKNOWN CAUSE
CY7C1329-AC(7C1329D)	CSPI-R	4909345	619911327	80	1640	0	
CY7C1329-AC(7C1329D)	CSPI-R	4909345	619911327	500	1451	1	1 UNKNOWN CAUSE
STRESS: PRESSURE COOKER TEST (121C, 100%RH)							
CY7C1329-AC(7C1329D)	CSPI-R	4853292	619902690	168	48	0	
CY7C1329-AC(7C1329D)	CSPI-R	4901357	619903817	168	46	0	

[3] **QTP 99311, 2Meg, R52D-3 Technology Qualification.**

RELIABILITY TEST DATA

QTP#: 99311

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: STATIC LATCH-UP TESTING (+/-200 mA)							
CY7C1329-AC(7C1329D)	CSPI-R	4853292	619902690	9.98V	3	0	
CY7C1329-AC(7C1329D)	CSPI-R	4901357	619903817	9.96V	3	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH (MSL 3)							
CY7C1329-AC(7C1329D)	CSPI-R	4842121	619815465	300	48	0	
CY7C1329-AC(7C1329D)	CSPI-R	4842121	619815465	1000	48	0	
CY7C1329-AC(7C1329D)	CSPI-R	4843204	619815797	300	45	0	
CY7C1329-AC(7C1329D)	CSPI-R	4843204	619815797	1000	45	0	