

Cypress Semiconductor Technology Qualification Report

QTP# 020606 VERSION 1.0
July, 2003

32 MEG Synchronous SRAM S17 Technology, Promos Fab in Taiwan	
CY81U032X16A7A MoBL3™	32M (2M x 16) SRAM
CY81U032X16A9A MoBL3™	32M (2M x 16) SRAM

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TECHNOLOGY QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
020606	New Technology S17 / New Device, 32Meg, MoBL3 SRAM CYU0326A5/7/9AZ and family	Feb 03
031605	Fast Process Change for S17 Promos for 16Meg and 32Meg IT SRAM	May 03

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify New Technology S17, Promos Taiwan and 32M (2M x 16) SRAM/MoBL3 device and family.	
Marketing Part #:	CY81U032X16A9A MoBL3™
Device Description:	2.3V – 3.1V, Industrial available in 48-ball VFBGA package.
Cypress Division:	Cypress Semiconductor Corporation –Memory Product Division (MPD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A & B
What ID markings on Die:	U03265A

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: Al Cu (WL) Metal 2: Al Cu
Passivation Type and Materials:	1650Å TEOS / 4500Å Nitride		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device	35 million		
Number of Gates in Device	1.75 million		
Generic Process Technology/Design Rule (μ-drawn):	Promos S17/0.17 μm		
Gate Oxide Material/Thickness (MOS):	SiO ₂ , 62Å		
Name/Location of Die Fab (prime) Facility:	Promos (Taiwan)		
Die Fab Line ID/Wafer Process ID:	7C62177		

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Chipmos , Taiwan
Fault Coverage:	100%

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BV48
Package Outline, Type, or Name:	48-ball Very Thin Fine Pitch Ball Grid Array (VFBGA)
Mold Compound Name/Manufacturer:	KMC211VAA-EC
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:	10-04763
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0um
Thermal Resistance Theta JA °C/W:	80°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-41027
Name/Location of Assembly (prime) facility:	ASE Taiwan

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
48-ball VFBGA	CHIPMOS (Taiwan)

Note: Package Qualification details upon request

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc Max = 2.36V, 125°C Dynamic Operating Condition, Vcc Max = 2.9V, 125°C Dynamic Operating Condition, Vcc Max = 2.36V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max = 2.36V, 150°C	P
High Accelerated Saturation Test (HAST)	130°C, 2.2V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 235°C+5, 0°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL3 192 Hrs, 30C/60%RH+3IR-Reflow, 235°C+5, 0°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 235°C+5, 0°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P
Acoustic Microscopy, MSL 3	Cypress Spec. 25-00104	P
Static Latch-up	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 ⁴	Failure Rate
High Temperature Operating Life Early Failure Rate @125°C	6073	0	N/A	N/A	0 PPM
High Temperature Operating Life Early Failure Rate @150°C	999	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} , Long Term Failure Rate	408,720 DHRs	0	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 = 8.62x10⁻⁵ eV/Kelvin.

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

Reliability Test Data

QTP #: 020606

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC-MSL3							
U0326A9AZ	9239738	P5U00001.3	TAIWN-G	COMP	15	0	
U0326A9AZ	9239738	610245963	TAIWN-G	COMP	15	0	
7C62167	P5Q00004	P5Q00004.3D	TAIWN-G	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 2.9V, Vcc Max							
U0326A9AZ	9239738	610247536	TAIWN-G	96	500	0	
U0326A9AZ	9239738	610245963	TAIWN-G	96	2495	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 2.36V, Vcc Max							
7C62167	P5Q00004	P5Q00004.3D	TAIWN-G	48	999	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 2.36V, Vcc Max							
7C62167	P5Q00004	P5Q00004.3D	TAIWN-G	80	390	0	
7C62167	P5Q00004	P5Q00004.3D	TAIWN-G	500	390	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
U0326A9AZ	9239738	P5U00001.3	TAIWN-G	COMP	9	0	
U0326A9AZ	9239738	610247536	TAIWN-G	COMP	9	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
U0326A9AZ	9239738	P5U00001.3	TAIWN-G	COMP	9	0	
U0326A9AZ	9239738	610247536	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 6.5V, ±300Ma							
U0326A9AZ	9239738	P5U00001.3	TAIWN-G	COMP	3	0	
U0326A9AZ	9239738	610247536	TAIWN-G	COMP	3	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30C/60%RH, MSL3							
U0326A9AZ	9239738	610245963	TAIWN-G	168	46	0	
7C62167	P5Q00004	P5Q00004.3D	TAIWN-G	168	47	0	
7C62167	P5Q00006	P5Q00006.4C	TAIWN-G	168	45	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.41V, PRE COND 192 HR 30C/60%RH, MSL3							
U0326A9AZ	9239738	610245963	TAIWN-G	128	42	0	

Reliability Test Data

QTP #: 020606

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Ass Loc</i>	<i>Duration Samp</i>		<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3							
U0326A9AZ	9239738	610245963	TAIWN-G	300	47	0	
7C62167	P5Q00004	P5Q00004.3D	TAIWN-G	300	48	0	
7C62167	P5Q00004	P5Q00004.3D	TAIWN-G	500	47	0	
7C62167	P5Q00006	P5Q00006.4C	TAIWN-G	300	46	0	
7C62167	P5Q00006	P5Q00006.4C	TAIWN-G	500	46	0	
7C62167	P5Q00006	P5Q00006.4C	TAIWN-G	1000	46	0	

Reliability Test Data

QTP #: 031605

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Ass 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, 2.36V, Vcc Max							
U0166B9A	P5Q00014	P5Q00014	TAIWN-G	96	1217	0	
U0166B9A	9313753	610313329	TAIWN-G	96	1009	0	
U0166B9A	9313753	610314482	TAIWN-G	96	852	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 2.36V, Vcc Max							
U0166B9A	P5Q00014	P5Q00014	TAIWN-G	128	390	0	
U0166B9A	P5Q00014	P5Q00014	TAIWN-G	548	390	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
7C62167	P5Q00022	P5Q00022	TAIWN-G	COMP	9	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
7C62167	P5Q00022	P5Q00022	TAIWN-G	COMP	9	0	