

Cypress Semiconductor Product Qualification Report

QTP# 041804 VERSION 1.0
June 2004

4-Meg Cascade 1T Devices	
PSC 0.165um Technology, CML-RA (Autoline) Assembly	
CYK256K16SCCB	4-Mbit (256K x 16) Pseudo Static RAM
CYK256K16MCCB	4-Mbit (256K x 16) Pseudo Static RAM
CYK256K16SCCB-2XWI	4-Mbit (256K x 16) Pseudo Static RAM Die
WCMC4016V7B WCMC4016V9B	4-Mbit (256K x 16) Pseudo Static RAM
WCMC4016V1B	4-Mbit (256K x 16) Pseudo Static RAM Die

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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TECHNOLOGY QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
040504	New Device, 16-Meg, Super TSRAM using 0.165um Technology, Power Chip (Foundry), Chipmos-Taiwan Assembly	Jan 04
041804	New Device, 4Meg, Cascade 1T using 0.165um Technology, Cypress Philippines (Autoline) assembly	Jun 04

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify 4-Meg Cascade 1T device using 0.165um Technology at Cypress Phil. (CML-RA)	
Marketing Part #:	56K16SCCB, CY256K16MCCB, CYK256K16SCCB-2XWI, WCM4016V7B, WCM4016V9B, WCM04016V1B
Device Description:	2.7V– 3.3V, Industrial, available in 48-ball Fine Pitch Ball Grid Array (FBGA), and die wafer form
Cypress Division:	Cypress Semiconductor Corporation –Memory Product Division (MPD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	B
What ID markings on Die:	CHD416H8

TECHNOLOGY/FAB PROCESS DESCRIPTION – 0.165um			
Number of Metal Layers:	2	Metal Composition:	Metal 1: TiN/Ti (18/8.5nm) Metal 2: TiN/AlCu/Tin (23/800/28nm)
Passivation Type and Materials:	Si3N4 and Polyimide		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device	36 million		
Number of Gates in Device	1.5 million		
Generic Process Technology/Design Rule (μ-drawn):	0.165 μm		
Gate Oxide Material/Thickness (MOS):	SiO2, 7.2nm		
Name/Location of Die Fab (prime) Facility:	Power Chip (Foundry) - Taiwan		
Die Fab Line ID/Wafer Process ID:	BF023S1		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
48-ball FBGA	Cypress Phil (CML-RA), ASE-Taiwan (TAIWAN-G)

Note: Package Qualification details upon request

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BV48
Package Outline, Type, or Name:	48-ball Fine Pitch Ball Grid Array (FBGA)
Mold Compound Name/Manufacturer:	Plaskon SMT-B-1LS
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Substrate Material:	N/A
Lead Finish, Composition / Thickness:	Solder Ball, 62% Sn, 36% Pb, 2% Ag
Die Backside Preparation Method/Metallization:	Grinding
Die Separation Method:	Sawing 100%
Die Attach Supplier:	Dexter
Die Attach Material:	QMI506
Die Attach Method:	Silver Epoxy
Bond Diagram Designation:	10-05817
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 0.8um
Thermal Resistance Theta JA °C/W:	34.75 JA°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	11-20034
Name/Location of Assembly (prime) facility:	Cypress-Phil (CML-RA), ASE-Taiwan (TAIWN-G)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Chipmos - Taiwan
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	Dynamic Operating Condition, Vcc Max = 4.5V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max = 4.0V, 125°C	P
High Accelerated Saturation Test	130°C, 3.6V, 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 JESD22, Method A114-B	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,000V/2200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Machine Model (ESD-MM)	200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V/1000V Cypress Spec. 25-00020	P
Acoustic Microscopy, MSL 3	Cypress Spec. 25-00104	P
Dynamic Latch-up	125C, 5.5V	P
Static Latch-up	125C, 7.0V/10V, ± 300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	P
High Temperature Storage	150C, no bias	P
Thermal Shock	-55C to +125C Cypress Spec. 25-00014	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	3118	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	580,000 DHRs	0	0.7	55	29 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.

Reliability Test Data

QTP #: 040504

<i>Device</i>	<i>Lot #</i>	<i>Ass Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: ACOUSTIC-MSL3						
CYK001M16SCCAU (K001M6SCA)	BY97711101	TAIWN-GO	COMP	15	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	COMP	15	0	
CYK001M16SCCAU (K001M6SCA)	BZ05407102	TAIWN-GO	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 4.5V, Vcc Max						
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	72	684	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	72	315	0	
CYK001M16SCCAU (K001M6SCA)	BZ0531B1/2/30	TAIWN-GO	72	580	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 4.0V, Vcc Max						
CYK001M16SCCAU (K001M6SCA)	BY8803820	TAIWN-GO	168	77	0	
CYK001M16SCCAU (K001M6SCA)	BY8803820	TAIWN-GO	500	77	0	
CYK001M16SCCAU (K001M6SCA)	BY8803820	TAIWN-GO	1000	77	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	168	77	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	500	77	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	1000	77	0	
CYK001M16SCCAU (K001M6SCA)	BZ0531B10	TAIWN-GO	168	77	0	
CYK001M16SCCAU (K001M6SCA)	BZ0531B10	TAIWN-GO	500	77	0	
CYK001M16SCCAU (K001M6SCA)	BZ0531B10	TAIWN-GO	1000	77	0	
CYK001M16SCCAU (K001M6SCA)	BZ1280210	TAIWN-GO	168	116	0	
CYK001M16SCCAU (K001M6SCA)	BZ1280210	TAIWN-GO	500	116	0	
CYK001M16SCCAU (K001M6SCA)	BZ1280210	TAIWN-GO	1000	116	0	
CYK001M16SCCAU (K001M6SCA)	BZ2700110	TAIWN-GO	168	116	0	
CYK001M16SCCAU (K001M6SCA)	BZ2700110	TAIWN-GO	500	116	0	
CYK001M16SCCAU (K001M6SCA)	BZ2700110	TAIWN-GO	1000	116	0	
CYK001M16SCCAU (K001M6SCA)	BZ2690110	TAIWN-GO	168	117	0	
CYK001M16SCCAU (K001M6SCA)	BZ2690110	TAIWN-GO	500	117	0	
CYK001M16SCCAU (K001M6SCA)	BZ2690110	TAIWN-GO	1000	117	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,000V						
CYK001M16SCCAU (K001M6SCA)	BY8803280	TAIWN-GO	COMP	9	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	COMP	9	0	
CYK001M16SCCAU (K001M6SCA)	BZ0531B10	TAIWN-GO	COMP	9	0	

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STRESS: ESD-CHARGE DEVICE MODEL, 1000V						
CYK001M16SCCAU (K001M6SCA)	BY8803280	TAIWN-GO	COMP	9	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	COMP	9	0	
CYK001M16SCCAU (K001M6SCA)	BZ0531B10	TAIWN-GO	COMP	9	0	
STRESS: ESD-MACHINE MODEL, 200V						
CYK001M16SCCAU (K001M6SCA)	BY8803280	TAIWN-GO	COMP	9	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	COMP	9	0	
CYK001M16SCCAU (K001M6SCA)	BZ0531B10	TAIWN-GO	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 5.4V, ±150mA						
CYK001M16SCCAU (K001M6SCA)	BY8803280	TAIWN-GO	COMP	3	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	COMP	3	0	
STRESS: DYNAMIC LATCH-UP TESTING, 5.5V						
CYK001M16SCCAU (K001M6SCA)	BZ3630110	TAIWN-GO	COMP	3	0	
STRESS: HIGH TEMPERATURE STORAGE, 150C						
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	168	77	0	
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	500	77	0	
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	1000	77	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	100	77	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	500	77	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	1000	77	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	168	77	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	500	77	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	1000	77	0	
STRESS: THERMAL SHOCK						
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	100	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	200	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	100	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	200	45	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	100	45	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	200	45	0	

Reliability Test Data

QTP #: 040504

Device	Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.6V), PRE COND 192 HR 30C/60%RH, MSL3						
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	96	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	168	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	96	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	168	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ364011A2	TAIWN-GO	96	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ364011A2	TAIWN-GO	128	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ36301103	TAIWN-GO	96	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ36301103	TAIWN-GO	128	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ3630110	TAIWN-GO	96	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ3630110	TAIWN-GO	128	45	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30C/60%RH, MSL3						
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	96	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	168	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ3640110	TAIWN-GO	96	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ3640110	TAIWN-GO	168	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ364011A2	TAIWN-GO	96	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ364011A2	TAIWN-GO	168	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ36301103	TAIWN-GO	96	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ36301103	TAIWN-GO	168	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ3630110	TAIWN-GO	96	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ3630110	TAIWN-GO	168	45	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3						
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	100	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	200	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0540710	TAIWN-GO	500	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	100	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	200	45	0	
CYK001M16SCCAU (K001M6SCA)	BZ0530110	TAIWN-GO	500	45	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	100	45	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	500	45	0	
CYK001M16SCCAU (K001M6SCA)	BY9771110	TAIWN-GO	1000	45	0	

Reliability Test Data

QTP #: 041804

Device	Lot #	Fab Lot#	Ass Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: ESD-CHARGE DEVICE MODEL, 500V

CYK256K16DVVBU (K256K6C9B)	610424169N	9411916	CML-RA	COMP	9	0	
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STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 4.5V, Vcc Max

CYK256K16DVVBU (K256K6C9B)	610424169	9411916	CML-RA	96	3118	0	
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STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30C/60%RH, MSL3

CYK256K16DVVBU (K256K6C9B)	610424169	9411916	CML-RA	168	49	0	
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STRESS: STATIC LATCH-UP TESTING, 125C, 7.0V, ±300mA

CYK256K16DVVBU (K256K6C9B)	610424169N	9411916	CML-RA	COMP	3	0	
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STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3

CYK256K16DVVBU (K256K6C9B)	610424169	9411916	CML-RA	300	49	0	
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