Cypress Semiconductor Qualification Report

QTP# 98085 VERSION 1.0
June, 1998

1 Meg SRAM, R42HD Technology, Hot Aluminum	
CY7C109/CY7C1009	128K x 8 SRAM (5V Operation)

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT DESCRIPTION (for qualification)	
Information provided in this document is intended for generic qualification and technically describes the Cypress part supplied: qualify 1 Meg SRAM, 5V operation with Hot Al process for qualified technology R42HD	
Marketing Part #:	CY7C109/CY7C1009
Package:	32-pin, 400-mil SOJ
Device Description:	128K x 8 Static RAM, R42HD Technology
Cypress Division:	Cypress Semiconductor Corporation
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. H
What ID markings on Die:	7C109A

TECHNOLOGY/FAB PROCESS DESCRIPTION - R42HD			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500Å TiW/6000Å Al -5%Cu/1200Å TiW Metal 2: 500Å TiW/8000Å Al -5%Cu/300Å TiW
Passivation Type and Materials:	7000Å SiO_2 + 6000Å Si_3N_4		
Free Phosphorus contents in top glass layer(%):	0%		
Die Coating(s), if used:	N/A		
Generic Process Technology/Design Rule (µ-drawn):	CMOS, Double Metal /0.42 µm		
Gate Oxide Material/Thickness (MOS):	SiO_2 / 110Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/R4HD		

PLASTIC PACKAGE/ASSEMBLY DESCRIPTION			
Package Outline, Type, or Name:	32-pin, 400-mil SOJ		
Mold Compound Name/Manufacturer:	Nitto MP-8000CHV		
Lead Frame material:	Copper Alloy 194		
Lead Finish, composition:	Solder Plated, 90%Sn, 10%Pb		
Die Attach Area Plating:	Silver Spot		
Die Attach Method:	Epoxy	Die Attach Material:	Ablestik 84-1LMISR4
Wire Bond Method:	Thermosonic	Wire Material/Size:	Gold / 1.3 mil
JESD22-A112 Moisture Sensitivity Level:	Level 3		
Name/Location of Assembly (prime) facility:	Omedata, Indonesia (INDNS-O)		

Note: Please contact a Cypress Representative for other packages availability.

RELIABILITY TESTS PERFORMED

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
High Accelerated Saturation Test (HAST)	140°C, 85%RH, 5.5V Precondition: JESD22 Moisture Sensitivity Level 1 (168 Hrs, 85C/85%RH)	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity Level 1 (168 Hrs, 85C/85%RH)	P
Pressure Cooker Test	No bias, 121°C, 100%RH	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[1]	3653	0	N/A	N/A	0 PPM
High Temperature Operating Life[2,3] Long Term Failure Rate	983,000 DHRs[5]	0	0.7	170	5 FIT

[1] A production burn-in of 48 Hrs at 150°C, 6.5V 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 = 8.62×10^{-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.

[5] Total device hours for 1 Meg SRAM, R42HD process, QTP 98064 (R42HD) and QTP 98085 (R42HD with hot Al)

RELIABILITY TEST DATA

QTP#: 98085[1]

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)							
CY7C109-VC	INDNS-O	4802677	519802689/90	48	498	0	
CY7C109-VC	INDNS-O	4802677	519802689/90	48	1491	0	
CY7C109-VC	INDNS-O	4802677	519802689/90	48	1664	0	
STRESS: HI-ACCEL SATURATION TEST (140C, 5.5V), PRECOND. 168 HRS 85C/85%RH							
CY7C109-VC	INDNS-O	4802677	519802689/90	128	46	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)							
CY7C109-VC	INDNS-O	4802677	519802689/90	80	385	0	
CY7C109-VC	INDNS-O	4802677	519802689/90	500	383	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH)							
CY7C109-VC	INDNS-O	4802677	519802689/90	96	46	0	
CY7C109-VC	INDNS-O	4802677	519802689/90	168	46	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH (MSL 1)							
CY7C109-VC	INDNS-O	4802677	519802689/90	300	46	0	
CY7C109-VC	INDNS-O	4802677	519802689/90	1000	46	0	

[1] QTP 98085 - 1 Meg SRAM, R42HD Technology with hot Aluminum.

DEVICE RELATED RELIABILITY TEST DATA

QTP#: 98064[2]

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: ESD-CHARGE DEVICE MODEL, 1000V							
CY7C109-VC	INDNS-O	4738602	519712560	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2200V							
CY7C109-VC	INDNS-O	4738602	519712560	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST (140C, 5.5V), PRECOND. 192 HRS 30C/60%RH							
CY7C109-VC	INDNS-O	4738602	519712560	128	46	0	
CY7C109-VC	INDNS-O	4738564	519712898	128	46	0	
CY7C109-VC	INDNS-O	4738564	519712898	256	46	0	
CY7C109-VC	INDNS-O	4739644	519714390	128	46	0	
STRESS: HIGH TEMPERATURE STORAGE (165C, NO BIAS)							
CY7C109-VC	INDNS-O	4738602	519712560	336	46	0	
CY7C109-VC	INDNS-O	4738602	519712560	500	46	0	
CY7C109-VC	INDNS-O	4738602	519712560	1000	46	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 5.75V)							
CY7C109-VC	INDNS-O	4738602	519712560	80	78	0	
CY7C109-VC	INDNS-O	4738602	519712560	168	78	0	
CY7C109-VC	INDNS-O	4739644	519714390	80	78	0	
CY7C109-VC	INDNS-O	4739644	519714390	168	78	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)							
CY7C109-VC	INDNS-O	4739644	519714390	80	528	0	
CY7C109-VC	INDNS-O	4739644	519714390	500	527	0	
CY7C109-VC	INDNS-O	4745042	519800651L1	80	529	0	
CY7C109-VC	INDNS-O	4745042	519800651L1	500	529	0	
STRESS: EXTENDED DYNAMIC BURN-IN (150C, 5.75V)							
CY7C109-VC	INDNS-O	4739644	519714390	1000	527	0	
STRESS: COLD LIFE TEST (-30C, 6.5V)							
CY7C109-VC	INDNS-O	4738602	519712560	500	45	0	
CY7C109-VC	INDNS-O	4738602	519712560	1000	45	0	
STRESS: READ & RECORD LIFE TEST (150C, 5.75V)							
CY7C109-VC	INDNS-O	4738602	519712560	48	10	0	
CY7C109-VC	INDNS-O	4738602	519712560	500	10	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH							
CY7C109-VC	INDNS-O	4738602	519712560	300	46	0	
CY7C109-VC	INDNS-O	4738602	519712560	1000	46	0	
CY7C109-VC	INDNS-O	4738564	519712898	300	46	0	
CY7C109-VC	INDNS-O	4739644	519714390	300	46	0	

[2] QTP 98064 – 1 Meg SRAM, R42HD Technology