

Cypress Semiconductor Qualification Report

QTP# 98086 VERSION 1.1
January, 1999

4 Meg SRAM, R42HD Technology, Hot Aluminum	
CY7C1049	512K x 8 SRAM (5V Operation)
CY7C1041	256K x 16 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 4 Meg SRAM, 5V operation with Hot Al process for the qualified R42HD technology.	
Marketing Part #:	CY7C1049
Package:	36-pin, 400-mil SOJ
Device Description:	512K x 8 Static RAM, R42HD Technology
Cypress Division:	Cypress Semiconductor Corporation
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	7C1549A

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 ₃ N 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:	36-pin, 400-mil SOJ		
Mold Compound Name/Manufacturer:	Hitachi-9200		
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 8361
Wire Bond Method:	Gold Ball bond	Wire Material/Size:	Gold / 1.3 mil
JESD22-A112 Moisture Sensitivity Level:	Level 3		
Name/Location of Assembly (prime) facility:	Anam-Seoul, Korea (KOREA-L)		

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 Temperature Steady State Life	Static Operating Condition, Vcc = 5.5V, 150°C	
High Accelerated Saturation Test (HAST)	140°C, 85%RH, 5.5V Precondition: JESD22 Moisture Sensitivity Level 3 (192 Hrs, 30C/60%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
Electrostatic Discharge Human Body Model (ESD-HBM)	MIL-STD-883, Method 3015.7	2,200V
Electrostatic Discharge Charge Device Model (ESD-CDM)	Cypress Spec. 25-00020	500V
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 ⁵
High Temperature Operating Life Early Failure Rate ¹	1686	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{2,3} Long Term Failure Rate	581,000 DHRs ⁵	2	0.7	170	31 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 = 8.62x10⁻⁵ eV/Kelvin.

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

⁵ Total device hours for 4 Meg SRAM, R42HD process, QTP 98248 (R42HD) and QTP 98086 (R42HD with hot Al)

RELIABILITY TEST DATA

QTP#: 98086¹

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)							
CY7C1049-VCB	KOREA-L	4803698	619803319	48	440	0	
CY7C1049-VCB	KOREA-L	4803698	619803319	48	490	0	
CY7C1049-VCB	KOREA-L	4803698	619803319	48	756	0	
STRESS: ESD-CHARGE DEVICE MODEL (500V)							
CY7C1049-VCB	KOREA-L	4803698	619803319	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY7C1049-VCB	KOREA-L	4803698	619803319	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST (140C, 5.5V), PRECOND. 192 HRS 30C/60%RH							
CY7C1049-VCB	KOREA-L	4803698	619803319	128	50	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 5.5V)							
CY7C1049-VCB	KOREA-L	4803698	619803319	80	80	0	
CY7C1049-VCB	KOREA-L	4803698	619803319	168	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)							
CY7C1049-VCB	KOREA-L	4803698	619803319	80	379	1	1 PARTICLE
CY7C1049-VCB	KOREA-L	4803698	619803319	200	378	0	
CY7C1049-VCB	KOREA-L	4803698	619803319	500	377	1	1 PARTICLE
STRESS: PRESSURE COOKER TEST (121C, 100%RH)							
CY7C1049-VCB	KOREA-L	4803698	619803319	168	48	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH (MSL 1)							
CY7C1049-VCB	KOREA-L	4803698	619803319	300	48	0	

¹ QTP 98086 - 4 Meg SRAM, R42HD Technology with hot Aluminum.

DEVICE RELATED RELIABILITY TEST DATA

QTP#: 98248²

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: ALPHA SENSITIVITY							
CY7C1049-VC	KOREA-L	4750331	619800740	DATA	5	0	
STRESS: STATIC LATCH-UP TESTING							
CY7C1049-VC	KOREA-L	4750331	619800740	DATA	3	0	
STRESS: DYNAMIC LATCH-UP TESTING (125C/11.22V)							
CY7C1049-VC	KOREA-L	4750331	619800740	DATA	3	0	
STRESS: ESD-CHARGE DEVICE MODEL (1000V)							
CY7C1049-VC	KOREA-L	4750331	619800740	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2200V)							
CY7C1049-VC	KOREA-L	4750331	619800740	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST (140C, 5.5V), PRECOND. 168 HRS 85C/85%RH							
CY7C1049-VC	KOREA-L	4750331	619800740	128	47	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 5.75V)							
CY7C1049-VC	KOREA-L	4750331	619800740	80	79	0	
CY7C1049-VC	KOREA-L	4750331	619800740	168	79	0	
CY7C1049-VCB	KOREA-L	4750364	619801747	80	80	0	
CY7C1049-VCB	KOREA-L	4750364	619801747	168	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)							
CY7C1049-VC	KOREA-L	4750331	619800740	80	385	0	
CY7C1049-VC	KOREA-L	4750331	619800740	500	385	0	
CY7C1049-VCB	KOREA-L	4750364	619801747	80	400	0	
CY7C1049-VCB	KOREA-L	4750364	619801747	500	400	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH (MSL 3)							
CY7C1049-VC	KOREA-L	4750331	619800740	300	47	0	
CY7C1049-VCB	KOREA-L	4750364	619801747	300	48	0	
CY7C1049-VCB	KOREA-L	4752513	619802812L1	300	47	0	

² QTP 98248 - 4 Meg SRAM, R42HD Technology