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Cypress Semiconductor

Product Qualification Report

QTP# 033302
February 2013

18 Meg Synchronous SRAM Family Technology R9T-3R, Fab4	
CY7C1370D CY7C1372D	18-Mbit (512K x 36/1M x 18) Pipelined SRAM with NoBL™ Architecture
CY7C1370DV25 CY7C1372DV25	18-Mbit (512K x 36/1M x 18) Pipelined SRAM with NoBL™ Architecture
CY7C1371D CY7C1373D	18-Mbit (512K x 36/1M x 18) Flow-Through SRAM with NoBL™ Architecture
CY7C1371DV25 CY7C1373DV25	18-Mbit (512K x 36/1M x 18) Flow-Through SRAM with NoBL™ Architecture
CY7C1371DV33	18-Mbit (512 K X 36) Flow-Through SRAM with NoBL™ Architecture
CY7C1380D, CY7C1380F CY7C1382D, CY7C1382F	18-Mbit (512K x 36/1M x 18) Pipelined SRAM
CY7C1380DV25 CY7C1382DV25 CY7C1380DV33	18-Mbit (512K x 36/1M x 18) Pipelined SRAM
CY7C1381D, CY7C1381F CY7C1383D, CY7C1383F	18-Mbit (512K x 36/1M x 18) Flow-Through SRAM
CY7C1381DV25 CY7C1383DV25	18-Mbit (512K x 36/1M x 18) Flow-Through SRAM
CY7C1386D CY7C1387D	18-Mbit (512K x 36/1M x 18) Pipelined DCD Sync SRAM
CY7C1386DV25 CY7C1387DV25	18-Mbit (512K x 36/1M x 18) Pipelined DCD Sync SRAM
CY7C1384D	18M 3.3V Sync 512x32 Pipeline
CY7C1385D	18M 3.3V Sync 512x32 Flowthrough

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date Comp
033302		New Technology R9T-3R, Fab 4, and New Device CY7C137*/138*E (18Meg) Synchronous product family		Sep 04
042205		New Device CY7C1360C, (9 Meg) Synchronous Product Family in R9T-3R Technology, Fab 4		Sep 04
053405		CY7C1360CC, 9Meg Synchronous Product Family in R9T-3R Technology, GOOBI		Sep 05

Cypress products are manufactured using qualified processes. The technology qualification for this product is referenced above and must be considered to get a complete and thorough evaluation of the reliability of the product.

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify CY7C1360C Synchronous Product Family in qualified Technology R9T-3R, Fab 4	
Marketing Part #:	CY7C1354C, CY7C1355C, CY7C1356C, CY7C1357C, CY7C1354CV25, CY7C1356CV25, CY7C1360C, CY7C1361C, CY7C1362C, CY7C1363C, CY7C1364C, CYC71365C, CY7C1366C, CYC71367C, CY7C1368C, CYC71378C, CY7C1379C, CY7C1371DV33, CY7C1380DV33
Device Description:	2.5V, 3.3V, Commercial and Industrial
Cypress Division:	Cypress Semiconductor Corporation –Memory & Image Division (MID)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. C
What ID markings on Die:	7C1360C

TECHNOLOGY/FAB PROCESS DESCRIPTION – R9T-3R			
Number of Metal Layers:	3	Metal Composition:	Metal 1: 100 ^a CoTi, 3200 ^a Al, 300 ^a TiW Metal 2: 150 ^Å Ti / 6000 ^Å Al / 300 ^Å TiW Metal 3: 150 ^Å Ti / 8000 ^Å Al / 300 ^Å TiW
Passivation Type and Materials:	1000 ^Å Oxide TEOS / 9000 ^Å Nitride		
Free Phosphorus contents in top glass layer (%):	0%		
Number of Transistors in Device	~5.8.E+07		
Number of Logic Gates in Device	~1.2.E+06		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Triple Metal, 90 nm		
Gate Oxide Material/Thickness (MOS):	Nitridized SiO ₂ , 23 ^Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor – Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/R9T-3R		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
100-Lead TQFP	CML-R
119/165-Ball BGA	TAIWN-G

Note: Package Qualification details upon request

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION		
Package Designation:	BG119	BY119
Package Outline, Type, or Name:	119-Ball BGA	
Mold Compound Name/Manufacturer:	G770-J	
Mold Compound Flammability Rating:	V-O per UL94	
Oxygen Rating Index:	NA	
Lead Frame Material:	BT Resin (Substrate)	
Lead Finish, Composition / Thickness:	SnPb	SnAgCu
Die Backside Preparation Method/Metallization:	Backgrind	
Die Separation Method:	100% Sawing	
Die Attach Supplier:	Ablebond	
Die Attach Material:	2100A	
Die Attach Method:	Epoxy Dispense	
Bond Diagram Designation:		
Wire Bond Method:	Thermosonic	
Wire Material/Size:	Au. 1.0mil	
Thermal Resistance Theta JA °C/W:	18.6°C/W	
Package Cross Section Yes/No:	N/A	
Assembly Process Flow:	49-41046	
Name/Location of Assembly (prime) facility:	Taiwan-G	
MSL Level	3	3
Reflow Profile	220C	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Cypress Philippines (CML-R),

Note: Please contact a Cypress Representative for other packages availability

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	A100
Package Outline, Type, or Name:	100-Thin Quad Flat Pack (TQFP)
Mold Compound Name/Manufacturer:	Hitachi CEL9200HF9-Uv80
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Ni-Pd-Au
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Dexter
Die Attach Material:	QMI 509
Die Attach Method:	Epoxy
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au. 1.0mil
Thermal Resistance Theta JA °C/W:	28.66°C/W
Package Cross Section Yes/No:	N/A
Name/Location of Assembly (prime) facility:	Cypress Philippines (CML-R)
MSL Level	3
Reflow Profile	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Cypress Philippines (CML-R)

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 = 2.25V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=2.25V, 150°C	P
High Temperature Steady State Life	Static Operating Condition, Vcc Max=2.25V, 150°C	P
Low Temperature Operating Life	Dynamic Operating Condition, Vcc = 6.50V, -30°C	P
High Accelerated Saturation Test (HAST)	130°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 260°C +0, -5°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 260°C +0, -5°C	P
Pressure Cooker	121°C, 100%RH, 15 Psig Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 260°C +0, -5°C	P
High Temperature Storage	150°C, no bias	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V JEDEC EIA/JESD22-A114-B	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V JESD22-C101	P
Current Density	Meets the Technology Device Level Reliability Specifications	P
Age Bond Strength	200°C, 4HRS MIL-STD-883, Method 883-2011	P
Acoustic Microscopy	J-STD-020	P
Dynamic Latchup	JESD78	P
Static Latchup	125C, ± 300mA JESD78	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF ³	Failure Rate
High Temperature Operating Life Early Failure Rate	3,772 Devices	1	N/A	N/A	265 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	485,000 DHRs	0	0.7	170	11 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 #: 033302

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: ACOUSTIC-MSL3							
CY7C1470V33 (7C1470A)	4330156	610417279	CML-R	COMP	15	0	
CY7C1470V33 (7C1470A)	4321389	610417280	CML-R	COMP	15	0	
CY7C1470V33 (7C1470A)	4323794	610348235	TAIWN-G	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CY7C1370DV33 (7C1370E)	4421235	610447674	CML-R	COMP	5	0	
CY7C1370DV33 (7C1370E)	4406200	610435906	CML-R	COMP	5	0	
CY7C1370DV33 (7C1370E)	4410258	610437891	CML-R	COMP	5	0	
STRESS: BALL SHEAR							
CY7C1470V33 (7C1470A)	4321389	610417278	CML-R	COMP	10	0	
STRESS: BOND PULL							
CY7C1470V33 (7C1470A)	4321389	610417278	CML-R	COMP	10	0	
STRESS: DYNAMIC LATCH-UP							
CY7C1470V33 (7C1470A)	4321389	610417278	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C1470V33 (7C1470A)	4352888	610425832	TAIWN-G	COMP	3	0	
CY7C1470V33 (7C1470A)	4401980	610425833	TAIWN-G	COMP	3	0	
CY7C1370DV33 (7C1370E)	4345377	610417723	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V							
CY7C1470V33 (7C1470A)	4352888	610425832	TAIWN-G	COMP	9	0	
CY7C1470V33 (7C1470A)	4401980	610425833	TAIWN-G	COMP	9	0	
CY7C1370DV33 (7C1370E)	4421235	610446833	CML-R	COMP	9	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1470V33 (7C1470A)	4352888	610425832	TAIWN-G	COMP	9	0	
CY7C1470V33 (7C1470A)	4401980	610425833	TAIWN-G	COMP	9	0	
CY7C1370DV33 (7C1370E)	4345377	610417723	CML-R	COMP	9	0	
STRESS: HIGH TEMPERATURE STORAGE, PLASTIC, 150C							
CY7C1470V33 (7C1470A)	4323794	610348234	TAIWN-G	500	47	0	
CY7C1470V33 (7C1470A)	4323794	610348234	TAIWN-G	1000	47	0	

Reliability Test Data

QTP #: 033302

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 2.25V, Vcc Max (Core)

CY7C1370DV33 (7C1370E)	4345377	610424939	CML-R	48	193	0	
CY7C1370DV33 (7C1370E)	4345377	610422227	CML-R	48	951	0	
CY7C1370DV33 (7C1370E)	4406200	610435906	CML-R	48	1246	0	
CY7C1370DV33 (7C1370E)	4410258	610437891	CML-R	48	1382	1	Non-Visual

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 2.25V, Vcc Max (Core)

CY7C1370DV33 (7C1370E)	4345377	610424939	CML-R	500	170	0	
CY7C1370DV33 (7C1370E)	4406200	610435906	CML-R	500	400	0	
CY7C1370DV33 (7C1370E)	4410258	610437891	CML-R	500	400	0	

STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 2.25V, Vcc Max

CY7C1470V33 (7C1470A)	4405088	610418824	TAIWN-G	80	85	0	
CY7C1470V33 (7C1470A)	4405088	610418824	TAIWN-G	168	85	0	

STRESS: INTERNAL VISUAL

CY7C1470V33 (7C1470A)	4321389	610417278	CML-R	COMP	5	0	
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STRESS: LOW TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, -30C, 6.50V, Vcc

CY7C1470V33 (7C1470A)	4333765	610349455	CML-R	500	45	0	
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STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3

CY7C1370DV33 (7C1370E)	4345377	610422227	CML-R	168	50	0	
CY7C1370DV33 (7C1370E)	4406200	610435906	CML-R	168	50	0	
CY7C1470V33 (7C1470A)	4321389	610417278	CML-R	168	43	0	

STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 192 HR 30C/60%RH, MSL3

CY7C1370DV33 (7C1370E)	4406200	610435906	CML-R	128	50	0	
CY7C1470V33 (7C1470A)	4321389	610417278	CML-R	128	47	0	
CY7C1470V33 (7C1470A)	4330156	610417279	CML-R	128	44	0	

STRESS: STATIC LATCH-UP TESTING, 125C, 7.5V, +/-300mA

CY7C1470V33 (7C1470A)	4352888	610425832	TAIWN-G	COMP	3	0	
CY7C1470V33 (7C1470A)	4401980	610425833	TAIWN-G	COMP	3	0	
CY7C1370DV33 (7C1370E)	4345377	610417723	CML-R	COMP	3	0	



Reliability Test Data
QTP #: 033302

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CY7C1370DV33 (7C1370E)	4345377	610422227	CML-R	300	50	0	
CY7C1370DV33 (7C1370E)	4345377	610422227	CML-R	500	49	0	
CY7C1370DV33 (7C1370E)	4345377	610422227	CML-R	1000	49	0	
CY7C1470V33 (7C1470A)	4330156	610417279	CML-R	300	43	0	
CY7C1470V33 (7C1470A)	4330156	610417279	CML-R	500	43	0	
CY7C1470V33 (7C1470A)	4330156	610417279	CML-R	1000	42	0	
CY7C1470V33 (7C1470A)	4321389	610417280	CML-R	300	34	0	
CY7C1470V33 (7C1470A)	4321389	610417280	CML-R	500	33	0	
CY7C1470V33 (7C1470A)	4321389	610417280	CML-R	1000	33	0	
STRESS: THERMAL SHOCK							
CY7C1470V33 (7C1470A)	4321389	610417278	CML-R	100	46	0	
CY7C1470V33 (7C1470A)	4321389	610417278	CML-R	200	46	0	
STRESS: X-RAY							
CY7C1470V33 (7C1470A)	4321389	610417278	CML-R	COMP	15	0	



Reliability Test Data

QTP #: 071009

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Results</i>
<i>STRESS: CLASS YIELD</i>					
CY7C1370DV33 (7C1370E)	4533948	VARIOUS	CML-R	COMP	COMPARABLE
<i>STRESS: SORT YIELD</i>					
CY7C1370DV33 (7C1370E)	4533948	VARIOUS	CML-R	COMP	COMPARABLE

Document History Page

Document Title: QTP 033302: 18 MEG SYNCHRONOUS SRAM FAMILY, TECHNOLOGY R9T-3R, FAB4
Document Number: 001-76177

Rev.	ECN No.	Orig. of Change	Description of Change
**	3527621	NSR	Initial spec release. Previous Qual report revision is posted in memo HGA-462. Added CY7C1371DV33 and CY7C1380DV33 devices in the title page.
*A	3631220	NSR	Added Marketing Part Numbers CY7C1384D and CY7C1385D in the title page as per memo GRW-382. Removed Version 8.2 in the title page.
*B	3906564	NSR	Removed obsolete Cypress specs 10-06814, 49-41025, 10-05376, 11-20046 and 001-00293. Removed reference Cypress specs in the reliability tests performed table and replaced with reference industry standard.

Distribution: WEB

Posting: None