

Cypress Semiconductor Product Qualification Report

QTP# 044201 VERSION 6.2
May 2008

36 Meg QDR Synchronous SRAM Family	
R9Q-3R Technology, Fab4	
CY7C1410AV18 CY7C1412AV18 CY7C1414AV18 CY7C1425AV18	36-Mbit QDR-II™ SRAM 2-Word Burst Architecture
CY7C1411AV18 CY7C1413AV18 CY7C1415AV18 CY7C1426AV18	36-Mbit QDR-II™ SRAM 4-Word Burst Architecture
CY7C1416AV18 CY7C1418AV18 CY7C1420AV18 CY7C1427AV18	36-Mbit DDR-II SRAM 2-Word Burst Architecture
CY7C1417AV18 CY7C1419AV18 CY7C1421AV18 CY7C1428AV18	36-Mbit DDR-II SRAM 4-Word Burst Architecture
CY7C1422AV18 CY7C1423AV18 CY7C1424AV18 CY7C1429AV18	36-Mbit DDR-II SIO SRAM 2-Word Burst Architecture

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, 18 Meg Synchronous product family	Sep 04
051207	R9 18 Meg QDR, 7C1313D 4 Metal Layer Process	Mar 05
051901	New Device CY7C151*/7C152* AC (72Meg QDR/DDR/LW) device family, R9Q-3R Technology fabricated at Fab4	May 05
044201	R9 36 Meg QDR, 7C1414B 4 Metal Layer Process	May 05
071004	R9 36 Meg QDR II New Metal Mask Process (MM1)	Mar 07

PRODUCT DESCRIPTION (for qualification)	
Purpose: Qualify CY7C1414B, 36Meg QDR Synchronous product family in qualified technology R9Q-3R, Fab 4	
Marketing Part #:	CY7C1410/2/4/25AV18, CY7C1411/3/5/26AV18, CY7C1416/8/20/27AV18, CY7C1417/9/21/28AV18, CY7C1422/3/4/9AV18
Device Description:	1.8V / 2.5V, Commercial and Industrial available in 165-Ball FBGA
Cypress Division:	Cypress Semiconductor Corporation –Memory & Image Division (MID)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. B
What ID markings on Die:	7C1412B

TECHNOLOGY/FAB PROCESS DESCRIPTION R9Q-3R			
Number of Metal Layers:	4	Metal Composition:	Metal 1: 150Å Ti / 3200Å Al / 300Å TiW Metal 2: 150Å Ti / 6000Å Al / 300Å TiW Metal 3: 150Å Ti / 6000Å Al / 300Å TiW Metal 4: 150Å Ti / 8000Å Al / 300Å TiW
Passivation Type and Materials:	1000Å Oxide TEOS / 9000Å Nitride		
Free Phosphorus contents in top glass layer (%):	N/A		
Number of Transistors in Device	~252M		
Number of Logic Gates in Device	~36M		
Generic Process Technology/Design Rule (-drawn):	CMOS, Quad Metal, 90 nm		
Gate Oxide Material/Thickness (MOS):	Nitridized SiO ₂ , Thin GOX 20A, Thick GOX, 58A		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/R9Q-3R		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
165-Ball FBGA	TAIWAN-G

Note: Package Qualification details upon request

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BB165
Package Outline, Type, or Name:	165-Ball Thin Ball Grid Array (FBGA)
Mold Compound Name/Manufacturer:	KE-G2270 / Kyocera
Mold Compound Flammability Rating:	VO UL-94
Oxygen Rating Index:	N/A
Lead Frame Material:	Substrate, BT
Lead Finish, Composition / Thickness:	Sn63%, Pb37%
Die Backside Preparation Method/Metallization:	Grinding
Die Separation Method:	Sawing
Die Attach Supplier:	Ablestik
Die Attach Material:	2025D
Die Attach Method:	Epoxy
Bond Diagram Designation:	10-06582
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0 mil
Thermal Resistance Theta JA °C/W:	17.2°C/W
Package Cross Section Yes/No:	No
Assembly Process Flow:	49-41041
Name/Location of Assembly (prime) facility:	ASE-Taiwan
MSL Level	3
Reflow Profile	220C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	ChipMOS-Taiwan (GO)

Note: Please contact a Cypress Representative for other packages availability

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 (Core) = 2.25V, 150°C Dynamic Operating Condition, Vcc Max (Core) = 2.25V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max (Core)= 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, 220°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, 220°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, 220°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 Cypress Spec. 25-00020	P
Current Density	Cypress Spec 22-00029	P
Age Bond Strength	200°C, 4HRS MIL-STD-883, Method 883-2011	P
Acoustic Microscopy	Cypress Spec. 25-00104	P
Dynamic Latch up	Cypress Spec. 01-00081	P
Static Latch up	125C, ± 300mA Cypress Spec. 01-00081	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	1,235 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	834,849 DHRs	0	0.7	170	7 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

<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: 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	
STRESS: LOW TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, -30C, 6.50V, Vcc							
CY7C1470V33 (7C1470A)	4333765	610349455	CML-R	500	45	0	
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, +I300mA							
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

<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>
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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	
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Reliability Test Data

QTP #: 051207

<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: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1314BV18 (7C1314D)	4444085	610507866	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V							
CY7C1314BV18 (7C1314D)	4444085	610507866	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C1314BV18 (7C1314D)	4444085	610507866	TAIWN-G	COMP	3	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 2.25V, Vcc Max (Core)							
CY7C1312BV18 (7C1312D)	4440030	610465503	TAIWN-G	96	1803	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 2.25V, Vcc Max (Core)							
CY7C1312BV18 (7C1312D)	4440030	610465503	TAIWN-G	168	1395	0	
CY7C1312BV18 (7C1312D)	4440030	610465503	TAIWN-G	500	359	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1313BV18 (7C1313D)	4436152	610459993	TAIWN-G	168	50	0	
CY7C1313BV18 (7C1313D)	4436152	610459993	TAIWN-G	288	50	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 4.5V, +/-300mA							
CY7C1314BV18 (7C1314D)	4444085	610507866	TAIWN-G	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CY7C1313BV18 (7C1313D)	4436152	610459993	TAIWN-G	300	50	0	
CY7C1313BV18 (7C1313D)	4436152	610459993	TAIWN-G	500	50	0	
CY7C1313BV18 (7C1313D)	4436152	610459993	TAIWN-G	1000	50	0	

Reliability Test Data

QTP #: 051901

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1514V18 (7C1514A)	4412759	610452856	TAIWN-G	COMP	9	0	
CY7C1515V18 (7C1515A)	4347629	610436891	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C1512V18 (7C15121A)	4406161	610437889	TAIWN-G	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V							
CY7C1512V18 (7C15121A)	4406161	610437889	TAIWN-G	COMP	9	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 2.25V, Vcc Max (Core)							
CY7C1512V18 (7C15121A)	4451052	610510951	TAIWN-G	96	1613	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 2.25V, Vcc Max (Core)							
CY7C1512V18 (7C15121A)	4425371	610459092	TAIWN-G	168	862	0	
CY7C1512V18 (7C15121A)	4425371	610459092	TAIWN-G	500	612	0	
CY7C1512V18 (7C15121A)	4422351	610459094	TAIWN-G	168	696	0	
CY7C1512V18 (7C15121A)	4422351	610459094	TAIWN-G	500	696	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1512V18 (7C15121A)	4413923	610445193	TAIWN-G	168	48	0	
CY7C1512V18 (7C15121A)	4413923	610445193	TAIWN-G	288	48	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 5.0V, +/-300mA							
CY7C1512V18 (7C15121A)	4406161	610437889	TAIWN-G	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CY7C1512V18 (7C15121A)	4413923	610445193	TAIWN-G	300	48	0	
CY7C1512V18 (7C15121A)	4413923	610445193	TAIWN-G	500	48	0	
CY7C1512V18 (7C15121A)	4413923	610445193	TAIWN-G	1000	48	0	

Reliability Test Data

QTP #: 044201

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1415AV18 (7C1415B)	4448196	610507735	TAIWN-G	COMP	15	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V							
CY7C1414AV18 (7C1414B)	4447043	610505881	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C1414AV18 (7C1414B)	4447043	610505881	TAIWN-G	COMP	3	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 2.25V, Vcc Max (Core)							
CY7C1413AV18 (7C1413B)	4453505	610516129	TAIWN-G	96	265	0	
CY7C1413AV18 (7C1413B)	4452210	610513131	TAIWN-G	96	970	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1414AV18 (7C1414B)	4447043	610505881	TAIWN-G	168	48	0	
CY7C1414AV18 (7C1414B)	4447043	610505881	TAIWN-G	288	48	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 6.0V, +300mA							
CY7C1414AV18 (7C1414B)	4447043	610505881	TAIWN-G	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CY7C1414AV18 (7C1414B)	4447043	610505881	TAIWN-G	300	48	0	
CY7C1414AV18 (7C1414B)	4447043	610505881	TAIWN-G	500	48	0	
CY7C1414AV18 (7C1414B)	4447043	610505881	TAIWN-G	1000	48	0	

Reliability Test Data

QTP #: 071004

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Result
STRESS: E-TEST YIELD					
7C1412B	4703824			COMP	COMPARABLE
STRESS: SORT YIELD					
7C1412B	4703824			COMP	COMPARABLE