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Cypress Semiconductor Product Qualification Report

QTP# 062206 VERSION*C
February 2019

2 Meg MoBL SRAM Family Technology R95LD-3R, Fab 4	
CY62137FV18 MoBL®	2-Mbit (128K x 16) Static RAM
CY62136FV30 MoBL®	2-Mbit (128K x 16) Static RAM
CY62137FV30 MoBL®	2-Mbit (128K x 16) Static RAM
CY62138F MoBL®	2-Mbit (256K x 8) Static RAM
CY62138FV30 MoBL®	2-Mbit (256K x 8) Static RAM
CY62135 MoBL®	2-Mbit Static RAM Die

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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PRODUCT QUALIFICATION HISTORY

QTP Number	Description of Qualification Purpose	Date Comp
054302	New Technology R95LD-3R, Fab 4, and New Device CY7C62xxx (4Meg) MoBL Product Family.	Dec. 05
062206	Qualify 2Meg Device Family, R95LD-3R Technology, Fab4	Feb. 07
070905	MM1 (450B) Mask Change on R95 2Meg Device Family, Fab4	Mar. 07
134511	Qualify polyimide mask to qualified Industrial 2 Meg MoBL SRAM, R95LD-3R Technology at Fab 4	Nov. 13

PRODUCT DESCRIPTION (for qualification)	
Purpose: Qualify 2Meg CY7C6xxx MoBL product family in qualified technology R95LD-3R, Fab 4	
Marketing Part #:	CY62135, CY62136/7/8FV30, CY62137FV18, CY62138F
Device Description:	1.8V, 3V, 2Meg MoBL SRAM
Cypress Division:	Cypress Semiconductor Corporation –Memory Product Division (MPD)

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	Proprietary	Metal Composition:	Proprietary
Passivation Type and Materials:	Proprietary		
Generic Process Technology/Design Rule (μ -drawn):	Proprietary		
Gate Oxide Material/Thickness (MOS):	Proprietary		
Name/Location of Die Fab (prime) Facility:	SkyWater, Minnesota		
Die Fab Line ID/Wafer Process ID:	R95LD-3R		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
36-Ball VFBGA	TAIWAN-G
48-Ball VFBGA	TAIWAN –G
32-Lead TSOP II/STSOP II	TAIWAN-T, CML-R
32-Lead SOIC	CML-R
44-Lead TSOP II	CML-R

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BZ48
Package Outline, Type, or Name:	48-Ball BGA
Mold Compound Name/Manufacturer:	KE-G2270
Mold Compound Flammability Rating:	NA
Oxygen Rating Index:	NA
Lead Frame Material:	BT Resin
Lead Finish, Composition / Thickness:	SnAgCu
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	Sawing 100%
Die Attach Supplier:	Ablestik
Die Attach Material:	Alebond 2025D
Die Attach Method:	Epoxy
Bond Diagram Designation:	001-08357
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0mil
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	001-04693
Name/Location of Assembly (prime) facility:	Taiwan-G
MSL Level	3
Reflow Profile	260C

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

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

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc Max = 1.85V, 125°C JESD22-A108	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max = 1.85V, 125°C /150°C JESD22-A108	P
Long Life Verification	Dynamic Operating Condition, Vcc = 1.85V, 150°C JESD22-A108	P
High Temperature Steady State Life	Static Operating Condition, Vcc Max = 1.75V, 125°C JESD22-A108	P
Low Temperature Operating Life	Dynamic Operating Condition, Vcc = 2.0V, -30°C JESD22-A108	P
High Accelerated Saturation Test (HAST)	JESD22-A110: 130°C, 3.63V/5.5V, 85%RH; 110°C, 1.85V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+ Reflow, 260°C+0, -5°C	P
Temperature Cycle	MIL-STD-883, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+ Reflow, 260°C+0, -5°C	P
Pressure Cooker	JESD22-A102: 121°C, 100%RH, 15 Psig Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+ Reflow, 260°C+0, -5°C	P
High Temperature Storage	JESD22-A103: 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	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 Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+ Reflow, 260°C+0, -5°C	P
Dynamic Latch Up	In accordance with JEDEC 17	P
Static Latch Up	125C, ± 200/ 300mA In accordance with JEDEC 17	P

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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	1,519 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	676,000 DHRs	1	0.7	170	19 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 #: 054302

<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							
CY62147EV30LL (7C62147F)	4438656	610461414	CML-RA	COMP	15	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	COMP	15	0	
CY62147EV30LL (7C62147F)	4447261	610506302N	CML-R	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CY62147EV30LL (7C62147F)	4514985	610527600	CML-R	COMP	10	0	
CY62136EV30LL (7C62136F)	4516742	610537839	CML-R	COMP	10	0	
CY62147EV30LL (7C62147F)	4516646	610527599	CML-R	COMP	10	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 1.85V, Vcc Max							
CY62147EV30LL (7C62147F)	4438656	610461414	CML-RA	96	679	0	
CY62147EV30LL (7C62147F)	4527847	610558767	CML-R	96	4031	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	96	1711	0	
CY62147EV30LL (7C62147F)	4447261	610506302N	CML-R	96	917	1	Single Bit (Non-visual)
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 1.85V, Vcc Max							
CY62147EV30LL (7C62147F)	4438656	610461414	CML-RA	80	400	0	
CY62147EV30LL (7C62147F)	4438656	610461414	CML-RA	500	400	1	Blocked contact at Poly
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	80	400	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	500	400	0	
CY62147EV30LL (7C62147F)	4447261	610506302N	CML-R	80	400	0	
CY62147EV30LL (7C62147F)	4447261	610506302N	CML-R	500	400	0	
STRESS: LONG LIFE VERIFICATION, 150C, 1.85V, Vcc Max							
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	1000	393	0	
STRESS: HIGH TEMPERATURE STEADY STATE LIFE, 125C, 1.75V, Vcc Max							
CY62147EV30LL (7C62147F)	4438656	610461414	CML-RA	168	76	0	
CY62147EV30LL (7C62147F)	4438656	610461414	CML-RA	336	75	0	
STRESS: LOW TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, -30C, 2.0V, Vcc							
CY62147EV30LL (7C62147F)	4447261	610506302N	CML-R	500	45	0	
STRESS: HIGH TEMPERATURE STORAGE							
CY62147EV30LL (7C62147F)	4438656	610461414	CML-RA	500	45	0	
CY62147EV30LL (7C62147F)	4438656	610461414	CML-RA	1000	45	0	

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Reliability Test Data

QTP #: 054302

<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: ESD-CHARGE DEVICE MODEL, 500V

CY62147EV30LL (7C62147F)	4527847	610548767	CML-R	COMP	9	0	
CY62148EV30LL (7C62148F)	4527847	610548491	TAIWN-G	COMP	9	0	
CY62148EV30LL (7C62148F)	4527847	610550592	CML-RA	COMP	9	0	
CY62147EV30LL (7C62147F)	4516646	610527599	CML-R	COMP	9	0	
CY62147EV30LL (7C62147F)	4514985	610527600	CML-R	COMP	9	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	COMP	9	0	

STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114, 2,200V

CY62147EV30LL (7C62147F)	4527847	610548767	CML-R	COMP	9	0	
CY62148EV30LL (7C62148F)	4527847	610548491	TAIWN-G	COMP	9	0	
CY62148EV30LL (7C62148F)	4527847	610551587	CML-R	COMP	9	0	
CY62148EV30LL (7C62148F)	4527847	610550592	CML-RA	COMP	9	0	
CY62147EV30LL (7C62147F)	4516646	610527599	CML-R	COMP	9	0	
CY62147EV30LL (7C62147F)	4514985	610527600	CML-R	COMP	9	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	COMP	9	0	

STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V

CY62147EV30LL (7C62147F)	4527847	610548767	CML-R	COMP	3	0	
CY62148EV30LL (7C62148F)	4527847	610548491	TAIWN-G	COMP	3	0	
CY62148EV30LL (7C62148F)	4527847	610551587	CML-R	COMP	3	0	
CY62148EV30LL (7C62148F)	4527847	610550592	CML-RA	COMP	3	0	
CY62147EV30LL (7C62147F)	4516646	610527599	CML-R	COMP	3	0	
CY62147EV30LL (7C62147F)	4514985	610527600	CML-R	COMP	3	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	COMP	3	0	

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

CY62137EV30LL (7C62137F)	4516742	610539321	CML-R	128	45	0	
CY62137EV30LL (7C62137F)	4516742	610539321	CML-R	256	45	0	
CY62137EV30LL (7C62137F)	4516742	610539321	CML-R	128	54	0	

STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 5.5V, PRE COND 192 HR 30C/60%RH, MSL3

CY62147EV30LL (7C62147F)	4527847	610558767	CML-R	128	45	0	
CY62147EV30LL (7C62147F)	4527847	610558767	CML-R	264	45	0	

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Reliability Test Data

QTP #: 054302

<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: DYNAMIC LATCH-UP TESTING, 9.0V							
CY62147EV30LL (7C62147F)	4438656	610461414	TAIWN-G	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 6.5V, +/-300mA							
CY62147EV30LL (7C62147F)	4514985	610527600	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/-300mA							
CY62147EV30LL (7C62147F)	4527847	610548767	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 9.5V, +/-300mA							
CY62147EV30LL (7C62147F)	4516646	610527599	CML-R	COMP	3	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 8.5V, +/-200mA							
CY62148EV30LL (7C62148F)	4527847	610548491	TAIWN-G	COMP	3	0	
CY62148EV30LL (7C62148F)	4527847	610551587	CML-R	COMP	3	0	
CY62148EV30LL (7C62148F)	4527847	610550592	CML-RA	COMP	3	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 P_{sig}, PRE COND 192 HR 30C/60%RH, MSL3							
CY62147EV30LL (7C62147F)	4516742	610537714	CML-R	168	50	0	
CY62147EV30LL (7C62147F)	4516742	610537714	CML-R	288	50	0	
CY62147EV30LL (7C62147F)	4516646	610537739	CML-R	168	50	0	
CY62147EV30LL (7C62147F)	4516646	610537739	CML-R	288	50	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	168	50	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CY62147EV30LL (7C62147F)	4438656	610461414	CML-RA	300	42	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	300	49	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	500	48	0	
CY62147EV30LL (7C62147F)	4519690	610533058	CML-RA	1000	46	0	
CY62147EV30LL (7C62147F)	4447261	610506302N	CML-R	300	45	0	
CY62147EV30LL (7C62147F)	4447261	610506302N	CML-R	500	44	0	
CY62147EV30LL (7C62147F)	4447261	610506302N	CML-R	1000	44	0	



Reliability Test Data QTP #: 062206

<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, 125C, 1.85V, Vcc Max							
CY62137FV18LL (7C62137G)	4624056	610651979	TAIWN-G	96	1519	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY62137FV18LL (7C62137G)	4624056	610651979	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114, 2,200V							
CY62137FV18LL (7C62137G)	4624056	610651979	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY62137FV18LL (7C62137G)	4624056	610651979	TAIWN-G	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 6.5V, +/-200mA							
CY62137FV18LL (7C62137G)	4624056	610651979	TAIWN-G	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 8.5V, +/-200mA							
CY62137FV18LL (7C62137G)	4624056	610651979	TAIWN-G	COMP	3	0	



Reliability Test Data
QTP #: 070905

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Result
STRESS: SORT YIELD					
7C62135GC	4640977			COMP	COMPARABLE



Reliability Test Data

QTP #: 134511

<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: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 1.85V, Vcc Max (Core)

CY62157EV30LL (7C62157F)	4229219	611238363	CML-RA	168	76	0	
CY62157EV30LL (7C62157F)	4229219	611238363	CML-RA	1000	76	0	

STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3

CY62157EV30LL (7C62157F)	4229219	611238363	CML-RA	500	77	0	
CY62157EV30LL (7C62157F)	4229219	611238363	CML-RA	1000	76	0	

STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3

CY62157EV30LL (7C62157F)	4229219	611238363	CML-RA	96	76	0	
CY62157EV30LL (7C62157F)	4229219	611238363	CML-RA	168	65	0	

STRESS: HI-ACCEL SATURATION TEST, 110C, 85%RH, 1.85V, PRE COND 192 HR 30C/60%RH, MSL3

CY62157EV30LL (7C62157F)	4229219	611238363	CML-RA	128	77	0	
CY62157EV30LL (7C62157F)	4229219	611238363	CML-RA	264	77	0	

STRESS: HIGH TEMPERATURE STORAGE

CY62157EV30LL (7C62157F)	4229219	611238363	CML-RA	1000	77	0	
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STRESS: INTERNAL VISUAL

CY62157EV30LL (7C62157F)	4229219	611238363	CML-RA	COMP	5	0	
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STRESS: SORT YIELD

7C62155FC	VARIOUS	NA	NA	COMP	EQUIVALENT		
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STRESS: E-TEST YIELD

7C62155FC	VARIOUS	NA	NA	COMP	EQUIVALENT		
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Document History Page

Document Title: QTP 062206: 2 MEG MOBL SRAM FAMILY, TECHNOLOGY R95LD-3R, SKYWATER
 Document Number: 001-84624

Rev.	ECN No.	Orig. of Change	Description of Change
**	3810634	NSR	Initial Spec Release.
*A	4185355	JYF	Template alignment and addition of polyimide qualification data.
*B	4577861	JYF	Sunset review: Updated QTP title page for template alignment.
*C	6494696	JYF	1) Update on CY logo (recent) and Rel Contact person 2) Updated Technology/Fab Process Description Table: - Deleted most of the information and replaced with "Proprietary" - Changed Fab 4 to SkyWater 3) Updated Major Package Information Table: - Deleted Thermal Resistance Data 4) Reliability Tests Performed Table: - Added other HAST condition (130C/5.5V) and (110C/1.85V,85%RH)
		FRA	Deleted Distribution and Posting in document history page.