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Cypress Semiconductor Product Qualification Report

QTP# 091206 VERSION*B
January, 2015

| 16 Meg MoBL SRAM Family Technology R95LD-3R, HHGrace Fab 3 | |
|---|---------------------------------------|
| CY62167EV18 MoBL® | 16-Mb (1M x 16) Static RAM |
| CY62167EV30 MoBL® | 16-Mb (1M x 16) Static RAM |
| CY62168EV30 MoBL® | 16-Mbit (2M x 8) Static RAM |
| CY62167E MoBL® | 16-Mb (1M x 16) Static RAM |
| CY62165E MoBL® | 16-Mbit (1M x 16/2Mx8) Static RAM Die |

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT

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QUALIFICATION HISTORY

| QTP Number | Description of Qualification Purpose | Date Comp |
|---------------|---|--------------|
| 091206 | R95LD-3R Technology and 16M Micro Power Asynchronous SRAM Family Product Transfer from CMI to GPMC Qualification | Dec 2010 |

| PRODUCT DESCRIPTION (for qualification) | | |
|--|---|--------|
| Qualification Purpose: | R95LD-3R Technology and 16M Micro Power Asynchronous SRAM Family Product Qualification at HHGrace Fab 3 | |
| Marketing Part #: | CY62165E, CY62167ELL, CY62167EV30LL, CY62168EV30LL, CY62167EV18LL | |
| Device Description: | 1.8V, 3V, 5V 16 Meg MoBL SRAM | |
| Cypress Division: | Cypress Semiconductor Corporation –Memory Product Division | |
| Overall Die (or Mask) REV Level (pre-requisite for qualification): | | Rev. A |
| What ID markings on Die: | 7C62165F | |

| TECHNOLOGY/FAB PROCESS DESCRIPTION – LL65P-18R | | | |
|---|--------------------------------|--------------------|---|
| Number of Metal Layers: | 2 | Metal Composition: | Metal 1: Ti/TiN/Al/Ti/TiN: 150/250/3200/90/500 Å Metal2: TiN/Al/TiN: 500/6500/250Å |
| Passivation Type and Materials: | 1000A TEOS/ 9000A Nitride | | |
| Free Phosphorus contents in top glass layer(%): | 9% | | |
| Number of Transistors in Device | ~98 million | | |
| Number of Logic Gates in Device | ~19 million | | |
| Generic Process Technology/Design Rule (□-drawn): | CMOS, Double Metal, 0.09µm | | |
| Gate Oxide Material/Thickness (MOS): | SiO ₂ /28A | | |
| Name/Location of Die Fab (prime) Facility: | HHGrace Fab 3, Shanghai, China | | |
| Die Fab Line ID/Wafer Process ID: | HHGrace Fab 3/R95LD-3R | | |

PACKAGE AVAILABILITY

| PACKAGE | ASSEMBLY SITE FACILITY |
|-------------------------------|--------------------------|
| 48 lead TSOP1 48 Ball FBGA | OSE – Taiwan CML – RA |

Note: Package Qualification details upon request

| MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION | |
|--|--------------------|
| Package Designation: | BZ48A |
| Package Outline, Type, or Name: | 48 Ball FBGA |
| Mold Compound Name/Manufacturer: | KEG-2270 / Kyocera |
| Mold Compound Flammability Rating: | UL-94 V-0 |
| Substrate Material: | SUB2482B |
| Lead Finish, Composition / Thickness: | SnAgCu |
| Die Backside Preparation Method/Metallization: | Grinding |
| Die Separation Method: | Saw |
| Die Attach Supplier: | Henkel |
| Die Attach Material: | QMI-506 |
| Die Attach Method: | Epoxy |
| Bond Diagram Designation: | 001-46698 |
| Wire Bond Method: | Thermosonic |
| Wire Material/Size: | Au, 0.8 mil |
| Thermal Resistance Theta JA °C/W: | 26.49 °C/W |
| Package Cross Section Yes/No: | N/A |
| Assembly Process Flow: | 11-20034 |
| Name/Location of Assembly (prime) facility: | CML-RA |

| ELECTRICAL TEST / FINISH DESCRIPTION | |
|--------------------------------------|-------|
| Test Location: | CML-R |

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 = 1.85V, 125°C JESD22-A108 | P |
| High Temperature Operating Life Latent Failure Rate | Dynamic Operating Condition, Vcc Max = 1.85V, 125°C JESD22-A108 | P |
| Pre/Post LFR AC/DC Char | AC/DC Critical Parameter Char at LFR 168hrs & 1000hrs | 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) | JEDEC STD 22-A110: 110°C, 3.63V, 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 JEDEC EIA/JESD22-A114 | P |
| Electrostatic Discharge Charge Device Model (ESD-CDM) | 500V JESD22-C101 | P |
| Soft Error (Alpha Particle) | JESD89 | 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 Latchup | JESD78 | P |
| Static Latch Up | 125C, ± 140Ma 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 | 6,651 Devices | 1 | N/A | N/A | 150 PPM |
| High Temperature Operating Life ^{1,2} Long Term Failure Rate (125°C) | 1,196,000 DHRs | 1 | 0.7 | 55 | 31 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 #: 091206

| <i>Device</i> | <i>Fab Lot #</i> | <i>Assy Lot #</i> | <i>Ass Loc</i> | <i>Duration</i> | <i>Samp</i> | <i>Rej</i> | <i>Failure Mechanism</i> |
|---|------------------|-------------------|----------------|-----------------|-------------|------------|--------------------------|
| STRESS: ACOUSTIC, MSL3 | | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | COMP | 15 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | COMP | 15 | 0 | |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | COMP | 15 | 0 | |
| | 4035508 | | | | | | |
| STRESS: AGE BOND STRENGTH | | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | COMP | 3 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | COMP | 3 | 0 | |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | COMP | 3 | 0 | |
| | 4035508 | | | | | | |
| STRESS: DYNAMIC LATCH-UP, 8.6V | | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | COMP | 3 | 0 | |
| | 4019629 | | | | | | |
| STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V | | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | COMP | 8 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | COMP | 8 | 0 | |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | COMP | 8 | 0 | |
| | 4035508 | | | | | | |
| STRESS: ESD-CHARGE DEVICE MODEL, 500V | | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | COMP | 9 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | COMP | 9 | 0 | |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | COMP | 9 | 0 | |
| | 4035508 | | | | | | |



Reliability Test Data

QTP #: 091206

| Device | Fab Lot # | Assy Lot # | Ass Loc | Duration | Samp | Rej | Failure Mechanism |
|--|-----------|------------|---------|----------|------|-----|--|
| STRESS: HI-ACCEL SATURATION TEST, 110C, 85%RH, 3.63V, PRE COND 192 HR 30C/60%RH, MSL3 | | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | 264 | 75 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | 264 | 80 | 0 | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | 528 | 79 | 0 | |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | 264 | 79 | 0 | |
| | 4035508 | | | | | | |
| STRESS: HIGH TEMPERATURE STORAGE, PLASTIC, 150C | | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | 500 | 80 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | 1000 | 80 | 0 | |
| | 4019629 | | | | | | |
| STRESS: HIGH TEMP STEADY STATE LIFE TEST, 125C, 1.75V, Vcc Max | | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031803 | CML-RA | 168 | 80 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031803 | CML-RA | 336 | 80 | 0 | |
| | 4019629 | | | | | | |
| STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125°C, 1.85V, Vcc Max | | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | 96 | 3000 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | 96 | 1455 | 1 | ISB leakage 43Ua, TEM sample lost, FA#091206-2E1 |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | 96 | 2196 | 0 | |
| | 4035508 | | | | | | |
| STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125°C, 1.85V, Vcc Max | | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | 1000 | 406 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | 1000 | 394 | 1 | Metal1 defect, FA# 091206-2L2, CAR#201051002 |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | 1000 | 396 | 0 | |
| | 4035508 | | | | | | |

Reliability Test Data

QTP #: 091206

| Device | Fab Lot # | Assy Lot # | Ass Loc | Duration | Samp | Rej | Failure Mechanism |
|--------|-----------|------------|---------|----------|------|-----|-------------------|
|--------|-----------|------------|---------|----------|------|-----|-------------------|

STRESS: LOW TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, -30C, 2.0V Vcc

| | | | | | | | |
|--------------------------|----------|-----------|--------|-----|----|---|--|
| CY621675EV18 (7C621675F) | 4019849/ | 611031803 | CML-RA | 500 | 77 | 0 | |
| | 4019629 | | | | | | |

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

| | | | | | | | |
|--------------------------|----------|-----------|--------|-----|----|---|--|
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | 168 | 80 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | 168 | 80 | 0 | |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | 168 | 79 | 0 | |
| | 4035508 | | | | | | |

STRESS: Pre-/ Post HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE CHAR

| | | | | | | | |
|--------------------------|----------|-----------|--------|------|----|---|--|
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | COMP | 10 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | COMP | 10 | 0 | |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | COMP | 10 | 0 | |
| | 4035508 | | | | | | |

STRESS: STATIC LATCH-UP TESTING, 125C, 5.94V, +/-180Ma

| | | | | | | | |
|--------------------------|----------|-----------|--------|------|---|---|--|
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | COMP | 9 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | COMP | 9 | 0 | |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | COMP | 9 | 0 | |
| | 4035508 | | | | | | |

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

| | | | | | | | |
|--------------------------|----------|-----------|--------|------|----|---|--|
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | 500 | 80 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | 1000 | 80 | 0 | |
| | 4019629 | | | | | | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | 500 | 78 | 0 | |
| CY621675EV18 (7C621675F) | 4026715 | 611034391 | CML-RA | 1000 | 78 | 0 | |
| CY621675EV18 (7C621675F) | 4031243/ | 611047064 | CML-RA | 500 | 77 | 0 | |
| | 4035508 | | | | | | |



Reliability Test Data

QTP #: 091206

STRESS: SER – ALPHA PARTICLE, 3-TEPM, 3-VOLTAGE, @ 85C, Vcc Nom

| | | | | | | |
|--------------------------|----------|-----------|--------|------|---|---|
| CY621675EV18 (7C621675F) | 4019849/ | 611031802 | CML-RA | COMP | 3 | 0 |
| | 4019629 | | | | | |

Document History Page

Document Title: QTP 091206: 16 MEG MOBL SRAM FAMILY, R95LD-3R AT FAB5 GSMC QUALIFICATION REPORT
Document Number: 001-66101

| Rev. | ECN No. | Orig. of Change | Description of Change |
|------|---------|-----------------|--|
| ** | 3115592 | NSR | Initial spec release. |
| *A | 4241840 | JYF | Sunset Review: Deleted Version 1.0 and updated title of QA Engineering Director to Reliability Director in QTP title page; Updated division of the device from MID to MPD; Complete re-write of Reliability Tests Performed table for template alignment. |
| *B | 4621614 | JYF | Sunset review: Updated QTP title page for template alignment; Updated fab site name (from GSMC to HHGrace Fab 3) in page 1, Product Description and Technology/Fab Process Description tables. |

Distribution: WEB

Posting: None