# Cypress Semiconductor
# Product Qualification Report

**QTP# 012801 VERSION 1.0**
**October 2004**

| 4 Meg SRAM Device<br>R7LD-1.8 Technology, Fab4 | |
|---|---|
| CY62146CV18 MoBL2™ | 256K x 16 Static RAM |
| CY62147CV18 MoBL2™ | 256K x 16 Static RAM |

**CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:**


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## TECHNOLOGY QUALIFICATION HISTORY

| Qual Report | Description of Qualification Purpose | Date Comp |
|---|---|---|
| 012411 | New Technology R7LD-1.8 / New Device, 8Meg, MoBL Static RAM CY62157CV18LL | Jun 01 |
| 012801 | New Device 4Meg MoBL Static RAM CY62146/7CV18, R7LD-1.8 Technology | Jul 01 |

| PRODUCT DESCRIPTION (for qualification) | | |
|---|---|---|
| Qualification Purpose: Qualify New Device CY62147CV18 and family R7LD-1.8, Fab 4 | | |
| Marketing Part #: | CY62146CV18, CY62147CV18 | |
| Device Description: | 1.65V – 1.95V, Industrial available in 48-ball FBGA package. | |
| Cypress Division: | Cypress Semiconductor Corporation –Memory Product Division (MPD) | |
| Overall Die (or Mask) REV Level (pre-requisite for qualification): | | Rev. C |
| What ID markings on Die: | 7C62345A | |

| TECHNOLOGY/FAB PROCESS DESCRIPTION – R7LD-1.8 | | | |
|---|---|---|---|
| Number of Metal Layers: | 2 | Metal Composition: | Metal 1: 150Å Ti / 4,200Å Al / 300Å TiW<br>Metal 2: 300Å Ti/8,000 Å Al / 300Å TiW |
| Passivation Type and Materials: | | | 1000Å TEOS / 9000Å Nitride |
| Free Phosphorus contents in top glass layer(%): | | | 0% |
| Number of Transistors in Device | | | 50 million |
| Number of Gates in Device | | | 3, 512 million |
| Generic Process Technology/Design Rule (µ-drawn): | | | CMOS, Double Metal /0.16 µm |
| Gate Oxide Material/Thickness (MOS): | | | $SiO_2$, 32Å |
| Name/Location of Die Fab (prime) Facility: | | | Cypress Semiconductor -- Bloomington, MN |
| Die Fab Line ID/Wafer Process ID: | | | Fab4/R7-1.8 |

## PACKAGE AVAILABILITY

| PACKAGE | ASSEMBLY SITE FACILITY |
|---|---|
| **48-ball FBGA** | **CML-R, TAIWN-G** |

**Note:** Package Qualification details upon request

| MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION | |
|---|---|
| **Package Designation:** | BA48 |
| **Package Outline, Type, or Name:** | 48-ball Fine Pitch Ball Grid Array (FBGA) |
| **Mold Compound Name/Manufacturer:** | PLASKON SMT-B-1 |
| **Mold Compound Flammability Rating:** | V-O per UL94 |
| **Oxygen Rating Index:** | >28% |
| **Substrate Material:** | BT Resin |
| **Lead Finish, Composition / Thickness:** | Solder Ball, 63%Sn, 37%Pb |
| **Die Backside Preparation Method/Metallization:** | N/A |
| **Die Separation Method:** | Wafer Saw |
| **Die Attach Supplier:** | Ablestik |
| **Die Attach Material:** | Ablestik 8355F |
| **Die Attach Method:** | Epoxy |
| **Bond Diagram Designation:** | 10-04099 |
| **Wire Bond Method:** | Thermosonic |
| **Wire Material/Size:** | Au, 1.0um |
| **Thermal Resistance Theta JA °C/W:** | 40°C/W |
| **Package Cross Section Yes/No:** | N/A |
| **Assembly Process Flow:** | 49-41020 |
| **Name/Location of Assembly (prime) facility:** | ASE Taiwan (TAIWN-G) |

| ELECTRICAL TEST / FINISH DESCRIPTION | |
|---|---|
| **Test Location:** | **TAIWN-G, CML-R** |
| **Fault Coverage:** | 100% |

## 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 = 2.75V, 125°C | P |
| High Temperature Operating Life Latent Failure Rate | Dynamic Operating Condition, Vcc Max=2.07V, 150°C | P |
| High Temperature Steady State Life | Static Operating Condition, Vcc Max=1.98V, 150°C | P |
| High Accelerated Saturation Test (HAST) | 130°C, 2.75V,85%RH<br>Precondition: JESD22 Moisture Sensitivity MSL 3<br>192 Hrs, 30C/60%RH+3IR-Reflow, 235°C+5, 0°C | P |
| Temperature Cycle | MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C<br>Precondition: JESD22 Moisture Sensitivity MSL3<br>192 Hrs, 30C/60%RH+3IR-Reflow, 235°C+5, 0°C | P |
| Pressure Cooker | 121°C, 100%RH<br>Precondition: JESD22 Moisture Sensitivity MSL 3<br>192 Hrs, 30C/60%RH+3IR-Reflow, 235°C+5, 0°C | P |
| High Temperature Storage | 150°C ± 5°C no bias | P |
| Electrostatic Discharge Human Body Model (ESD-HBM) | 2,200V<br>MIL-STD-883, Method 3015.7 | P |
| Electrostatic Discharge Charge Device Model (ESD-CDM) | 500V<br>Cypress Spec. 25-00020 | P |
| Age Bond Strength | 200C, 4HRS<br>MIL-STD-883, Method 883-2011 | P |
| SEM X-Section | MIL-STD-883, Method 883-2018-2 / Cypress Spec. 22-00009 | P |
| Low Temperature Operating Life | -30C, 3.25V, 8MHZ | P |
| Acoustic Microscopy, MSL 3 | Cypress Spec. 25-00104 | P |
| Static Latchup | 125C, 6.5V, ± 300mA<br>In accordance with JEDEC 17. Cypress Spec. 01-00081 | P |

## RELIABILITY FAILURE RATE SUMMARY

| Stress/Test | Device Tested/ Device Hours | # Fails | Activation Energy | Thermal AF[4] | Failure Rate |
|---|---|---|---|---|---|
| High Temperature Operating Life Early Failure Rate[1] | 1540 | 0 | N/A | N/A | 0 PPM |
| High Temperature Operating Life[1,2] Long Term Failure Rate | 488,288 DHRs | 1 | 0.7 | 170 | 24 FIT |

[1] A production burn-in of 12 Hrs at 125°C, 2.75V 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 = $8.62 \times 10^{-5}$ 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 #: 012411**

| Device | Fab Lot # | Assy Lot # | Ass Loc | Duration | Samp | Rej | Failure Mechanism |
|---|---|---|---|---|---|---|---|
| ***STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 2.75V, Vcc Max*** | | | | | | | |
| CY62157CV18LL (7C623571C) | 4108785 | *610112193* | CML-R | 96 | 1596 | 0 | |
| CY62157CV18LL (7C62357C) | 4110220 | *610114276L2* | CML-R | 96 | 1246 | 0 | |
| CY62157CV18LL (7C62357C) | 4039754 | *610100977L1* | CML-R | 96 | 791 | 0 | |
| ***STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 2.07V, Vcc Max*** | | | | | | | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112215* | CML-R | 96 | 390 | 0 | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112215* | CML-R | 500 | 389 | 1 | SINGLE BIT FAILURE |
| CY62157CV18LL (7C623571C) | 4108785 | *610112193* | CML-R | 96 | 389 | 0 | |
| CY62157CV18LL (7C623571C) | 4108785 | *610112193* | CML-R | 500 | 388 | 0 | |
| CY62157CV18LL (7C623571C) | 4048795 | *610103046* | CML-R | 96 | 200 | 0 | |
| CY62157CV18LL (7C623571C) | 4048795 | *610103046* | CML-R | 500 | 199 | 0 | |
| ***STRESS: ESD-CHARGE DEVICE MODEL, 500V*** | | | | | | | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112305* | CML-R | COMP | 9 | 0 | |
| CY62157CV18LL (7C623571C) | 4108785 | *610112193* | CML-R | COMP | 9 | 0 | |
| CY62157CV18LL (7C62357C) | 4028521 | *340000332* | CML-R | COMP | 9 | 0 | |
| ***STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V*** | | | | | | | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112305* | CML-R | COMP | 9 | 0 | |
| CY62157CV18LL (7C623571C) | 4108785 | *610112193* | CML-R | COMP | 9 | 0 | |
| CY62157CV18LL (7C62357C) | 4028521 | *340000332* | CML-R | COMP | 9 | 0 | |
| ***STRESS: STATIC LATCH-UP TESTING, 125C, 6.5V, +/300mA*** | | | | | | | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112305* | CML-R | COMP | 3 | 0 | |
| CY62157CV18LL (7C623571C) | 4108785 | *610112193* | CML-R | COMP | 3 | 0 | |
| CY62157CV18LL (7C62357C) | 4028521 | *340000332* | CML-R | COMP | 3 | 0 | |
| ***STRESS: ACOUSTIC-MSL3*** | | | | | | | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112460* | CML-R | COMP | 15 | 0 | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112461* | CML-R | COMP | 15 | 0 | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112462* | CML-R | COMP | 15 | 0 | |
| ***STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 1.98V, Vcc MAX*** | | | | | | | |
| CY62157CV18LL (7C62357C) | 4039638 | *610046995* | CML-R | 168 | 77 | 0 | |
| CY62157CV18LL (7C62357C) | 4039638 | *610046995* | CML-R | 336 | 76 | 1 | POLYSILICON PROTRUSION |
| ***STRESS: LOW TEMPERATURE OPERATING LIFE, -30C, 3.25V*** | | | | | | | |
| CY62157CV18LL (7C62357C) | 4039638 | *610046995* | CML-R | 500 | 44 | 1 | POLYSILICON PROTRUSION |

# Reliability Test Data

**QTP #: 012411**

| Device | Fab Lot # | Assy Lot # | Ass Loc | Duration | Samp | Rej | Failure Mechanism |
|---|---|---|---|---|---|---|---|
| ***STRESS: AGE BOND STRENGTH*** | | | | | | | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112215* | CML-R | COMP | 15 | 0 | |
| CY62157CV18LL (7C62357C) | 4111455 | *610114268* | CML-R | COMP | 15 | 0 | |
| CY62157CV18LL (7C62357C) | 4110220 | *610114276L2* | CML-R | COMP | 15 | 0 | |
| ***STRESS: HIGH TEMPERATURE STORAGE, PLASTIC, 150C*** | | | | | | | |
| CY62157CV18LL (7C62357C) | 4039638 | *610046995* | CML-R | 500 | 48 | 0 | |
| CY62157CV18LL (7C62357C) | 4039638 | *610046995* | CML-R | 1000 | 48 | 0 | |
| ***STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30C/60%RH, MSL3*** | | | | | | | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112305* | CML-R | 168 | 54 | 0 | |
| CY62157CV18LL (7C623571C) | 4108785 | *610112193* | CML-R | 168 | 47 | 0 | |
| CY62157CV18LL (7C62357C) | 4111455 | *610114268L4* | CML-R | 168 | 45 | 0 | |
| ***STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 1.98V), PRE COND 192 HR 30C/60%RH, MSL3*** | | | | | | | |
| CY62157CV18LL (7C62357C) | 4039638 | *610046995* | CML-R | 128 | 45 | 0 | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112215* | CML-R | 128 | 50 | 0 | |
| CY62157CV18LL (7C623571C) | 4108785 | *610112193* | CML-R | 128 | 50 | 0 | |
| ***STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3*** | | | | | | | |
| CY62157CV18LL (7C62357C) | 4039638 | *610046995* | CML-R | 300 | 46 | 0 | |
| CY62157CV18LL (7C623571C) | 4107546 | *610112215* | CML-R | 300 | 102 | 0 | |
| CY62157CV18LL (7C623571C) | 4108785 | *610112193* | CML-R | 300 | 47 | 0 | |

# Reliability Test Data

## QTP #: 012801

| Device | Fab Lot # | Assy Lot # | Ass Loc | Duration | Samp | Rej | Failure Mechanism |
|---|---|---|---|---|---|---|---|
| **STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 2.75V, Vcc Max** | | | | | | | |
| CY62147CV18LL (7C62347C) | 4115508 | *610120017* | CML-R | 96 | 1540 | 0 | |
| **STRESS: ESD-CHARGE DEVICE MODEL, 500V** | | | | | | | |
| CY62147CV18LL (7C62347C) | 4045021 | *610101961* | CML-R | COMP | 9 | 0 | |
| **STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V** | | | | | | | |
| CY62147CV18LL (7C62347C) | 4045021 | *610101961* | CML-R | COMP | 9 | 0 | |
| **STRESS: STATIC LATCH-UP TESTING, 125C, 6.5V, +/300mA** | | | | | | | |
| CY62147CV18LL (7C62347C) | 4045021 | *610101961* | CML-R | COMP | 9 | 0 | |
| **STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30C/60%RH, MSL3** | | | | | | | |
| CY62147CV18LL (7C62347C) | 4045021 | *610101961* | CML-R | 168 | 50 | 0 | |
| CY62147CV18LL (7C62347C) | 4113906 | *610117246* | CML-R | 168 | 49 | 0 | |
| **STRESS: TC COND. B -5C TO 125C, PRECONDITION 192 HRS 30C/60%RH, MSL3** | | | | | | | |
| CY62147CV18LL (7C62347C) | 4045021 | *610101961* | CML-R | 500 | 50 | 0 | |
| CY62147CV18LL (7C62347C) | 4045021 | *610101961* | CML-R | 1500 | 50 | 0 | |
| CY62147CV18LL (7C62347C) | 4045021 | *610101961* | CML-R | 2000 | 47 | 0 | |