# Cypress Semiconductor
# Qualification Report

**QTP# 98081 VERSION 2.0**
**August, 1999**

| Synchronous 3.3V Cache RAM<br>R42D Technology w/ Hot Al, Fab 4 Qualification | |
|---|---|
| CY7C1325 | 256K x 18 Synchronous Cache RAM |
| CY7C1327 | 256K x 18 Synchronous Pipelined Cache RAM |
| CY7C1345 | 128K x 36 Synchronous Flow-Through Cache RAM |
| CY7C1347 | 128K x 36 Synchronous Pipelined Cache RAM |
| CY7C1338 | 128K x 32 Synchronous Flow-Through Cache RAM |
| CY7C1339 | 128k x 32 Synchronous Pipelined Cache RAM |

**CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:**

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| PRODUCT DESCRIPTION (for qualification) | |
|---|---|
| Qualification Purpose: Qualifies 256K x 18 Synchronous 3.3V Cache RAM, CY7C1325 and its options in R42D technology with Hot Al in Fab4. | |
| Marketing Part #: | CY7C1325 |
| Package: | 100-pin TQFP |
| Device Description: | 256K x 18 Synchronous Cache RAM |
| Cypress Division: | Cypress Semiconductor Corporation – MPD Division |
| Overall Die (or Mask) REV Level (pre-requisite for qualification): | Rev. A |
| What ID markings on Die: | 7C1325A |

| TECHNOLOGY/FAB PROCESS DESCRIPTION - R42D | | | |
|---|---|---|---|
| Number of Metal Layers: | 2 | Metal Composition: | Metal 1: TiW,AlCu,TiW/500Å,6000Å,1200Å<br>Metal 2: TiW,AlCu,TiW/500Å,8000Å,300Å |
| Passivation Type and Materials: | 3000Å $SiO_2$ + 6000Å $Si_3N_4$ | | |
| Free Phosphorus contents in top glass layer(%): | 0% | | |
| Die Coating(s), if used: | None | | |
| Generic Process Technology/Design Rule (µ-drawn): | CMOS, Double Metal /0.35 µm | | |
| Gate Oxide Material/Thickness (MOS): | $SiO_2$ / 70 Å | | |
| Name/Location of Die Fab (prime) Facility: | Cypress Semiconductor - Bloomington, MN | | |
| Die Fab Line ID/Wafer Process ID: | Fab4/R42D w/ Hot Al | | |

| PLASTIC PACKAGE/ASSEMBLY DESCRIPTION | | | |
|---|---|---|---|
| Package Outline, Type, or Name: | 100-pins TQFP | | |
| Mold Compound Name/Manufacturer: | Hitachi CEL9200 | | |
| Lead Frame material: | Copper | | |
| Lead Finish, composition: | Solder Plated, 90%Sn, 10%Pb | | |
| Die Attach Area Plating: | Silver Spot | | |
| Die Attach Method: | Epoxy | Die Attach Material: | Ablestik 8361H |
| Wire Bond Method: | Thermosonic | Wire Material/Size: | Gold / 1.0 mil |
| JESD22-A112 Moisture Sensitivity Level: | Level 3 | | |
| Name/Location of Assembly (prime) facility: | Cypress Philippines (CSPI-R) | | |

**Note:** Please contact a Cypress Representative for other packages availability.

## RELIABILITY TESTS PERFORMED

| Stress/Test | Test Condition (Temp/Bias) | Result P/F |
|---|---|---|
| High Temperature Operating Life Early Failure Rate | Dynamic Operating Condition, Vcc = 3.8 V, 150°C | P |
| High Temperature Operating Life Latent Failure Rate | Dynamic Operating Condition, Vcc = 3.8 V, 150°C | P |
| High Temperature Steady State Life | Static Operating Condition, Vcc = 3.63V, 150°C | P |
| High Accelerated Saturation Test (HAST) | 140°C, 3.65V<br>Precondition: JESD22 Moisture Sensitivity Level 3 (192 Hrs, 30/60% RH) | P |
| Temperature Cycle | MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C<br>Precondition: JESD22 Moisture Sensitivity Level 3 (192 Hrs, 30C/60%RH) | P |
| Electrostatic Discharge Human Body Model (ESD-HBM) | MIL-STD-883, Method 3015.7 | 4,400V |
| Electrostatic Discharge Charge Device Model (ESD-CDM) | Cypress Spec. 25-00020 | 500V |
| Latchup Sensitivity | In accordance with JEDEC 17. Cypress Spec. 01-00081 | 9.0V |
| Pressure Cooker Test | No bias, 121°C, 100%RH | 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] | 1722 | 0 | N/A | N/A | 0 PPM |
| High Temperature Operating Life[2,3] Long Term Failure Rate | 455,500 | 0 | 0.7 | 170 | 12 FIT |

[1] A production burn-in of 24 Hrs at 150°C, 4.3V 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#: 98081

| DEVICE | ASSY-LOC | FABLOT# | ASSYLOT# | DURATION | S/S | REJ | FAIL MODE |
|---|---|---|---|---|---|---|---|
| STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V) | | | | | | | |
| CY7C1325-AC | CSPI-R | 4812402 | 619805641 | 48 | 120 | 0 | |
| CY7C1325-AC | CSPI-R | 4816671 | 619806417 | 48 | 850 | 0 | |
| CY7C1325-AC | CSPI-R | 4819957 | 619807576 | 48 | 752 | 0 | 2 Electrical Overstress |
| STRESS: ESD-CHARGE DEVICE MODEL (500V) | | | | | | | |
| CY7C1325-AC | CSPI-R | 4816671 | 619806417 | COMP | 3 | 0 | |
| STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (4,400V) | | | | | | | |
| CY7C1325-AC | CSPI-R | 4816671 | 619806417 | COMP | 3 | 0 | |
| STRESS: HI-ACCEL SATURATION TEST (140C, 3.65V), PRECOND. 192 HRS 30C/60%RH | | | | | | | |
| CY7C1325-AC | CSPI-R | 4812402 | 619805641 | 128 | 47 | 0 | |
| STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 5.63V) | | | | | | | |
| CY7C1325-AC | CSPI-R | 4812402 | 619805641 | 80 | 78 | 0 | |
| CY7C1325-AC | CSPI-R | 4812402 | 619805641 | 168 | 78 | 0 | |
| STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V) | | | | | | | |
| CY7C1325-AC | CSPI-R | 4812402 | 619805641 | 80 | 120 | 0 | |
| CY7C1325-AC | CSPI-R | 4812402 | 619805641 | 500 | 120 | 0 | |
| CY7C1325-AC | CSPI-R | 4816671 | 619806417 | 80 | 396 | 0 | |
| CY7C1325-AC | CSPI-R | 4816671 | 619806417 | 500 | 396 | 0 | |
| CY7C1325-AC | CSPI-R | 4819957 | 619807576 | 80 | 396 | 0 | 1 Electrical Overstress |
| CY7C1325-AC | CSPI-R | 4819957 | 619807576 | 500 | 395 | 0 | |
| STRESS: PRESSURE COOKER TEST (121C, 100%RH) | | | | | | | |
| CY7C1325-AC | CSPI-R | 4816671 | 619806417 | 168 | 48 | 0 | (See Note 1) |
| STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH (MSL 3) | | | | | | | |
| CY7C1325-AC | CSPI-R | 4812402 | 619805641 | 300 | 48 | 0 | |
| CY7C1325-AC | CSPI-R | 4819957 | 619807575 | 300 | 48 | 0 | |
| CY7C1325-AC | CSPI-R | 4819957 | 619807576 | 300 | 48 | 0 | |
| STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH (MSL 1) | | | | | | | |
| CY7C1338-AC*** | CSPI-R | 4903616 | 619907235 | 300 | 333 | 0 | |
| CY7C1338-AC*** | CSPI-R | 4903616 | 619907235 | 500 | 333 | 2 | 2 Unknown cause |
| CY7C1338-AC*** | CSPI-R | 4903616 | 619907235 | 1000 | 331 | 0 | |

*** Reliability Monitor data, R992308.

Note1: 1 Topside defect due to mechanical damaged. The reject was not QTP related.