# Cypress Semiconductor
# Product Qualification Report

**QTP# 93332/97316/99211 VERSION 1.0**
**March, 2000**

| MAX® EPLD, P20 Technology, Fab 2 | |
|---|---|
| CY7C346 | 128-Macrocell MAX EPLD |

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**CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:**

Ed Russell
Reliability Manager
(408)432-7069

| PRODUCT DESCRIPTION (for qualification) | | | |
|---|---|---|---|
| Qualification Purpose: Qualifies CY7C346 in P20 Technology, Fab2. | | | |
| Marketing Part #: | CY7C346 | | |
| Package: | 84pin Plastic Lleaded Chip Carriers (PLCC)<br>84pin Ceramic Windowed J-Leaded Chip Carriers (WLCC)<br>100pin Ceramic Windowed Pin Grid Arrays (WPGA) | | |
| Device Description: | 128-Macrocell MAX EPLD | | |
| Cypress Division: | Cypress Semiconductor Corporation – MPD Division | | |
| Overall Die (or Mask) REV Level (pre-requisite for qualification): | | Rev. A | |
| Die Size (stepping): | 335 mils x 289 mils | What ID markings on Die: | Z1031 |

| TECHNOLOGY/FAB PROCESS DESCRIPTION – P20 | | | |
|---|---|---|---|
| Number of Metal Layers: | 2 | Metal Composition: | Metal 1: 500 Ti/ 1200TiW6K Al/500Ti<br>Metal 2: 1minRF/1500Ti/9KAl |
| Passivation Type and Materials: | | Oxide | |
| Free Phosphorus contents in top glass layer(%): | | 0% | |
| Generic Process Technology/Design Rule (µ-drawn): | | CMOS, Double Metal /0.8 µm | |
| Gate Oxide Material/Thickness (MOS): | | $SiO_2$ / 195 Å | |
| Name/Location of Die Fab (prime) Facility: | | Cypress Semiconductor - Round Rock, TX (Fab2) | |
| Die Fab Line ID/Wafer Process ID: | | Fab2/P20 | |

| PLASTIC PACKAGE/ASSEMBLY DESCRIPTION | | | |
|---|---|---|---|
| Package Outline, Type, or Name: | 84pin Plastic Leaded Chip Carrier (PLCC) | | |
| Mold Compound Name/Manufacturer: | NITTO MP-8000CHV | | |
| Lead Frame material: | Copper | | |
| Lead Finish, composition: | Solder Plated, 85%Sn, 15%Pb | | |
| Die Attach Method: | Ag Epoxy | Die Attach Material: | 8361 Ablestick |
| Wire Bond Method: | Au Ball | Wire Material/Size: | Au / 1.3 mil |
| Thermal Resistance Theta JA | 27 | | |
| JESD22-A112 Moisture Sensitivity Level: | Level 5 | | |
| Name/Location of Assembly (prime) facility: | Cypress Thailand (ALPHA-X) | | |

| HERMETIC PACKAGE/ASSEMBLY DESCRIPTION | | | |
|---|---|---|---|
| Package Outline, Type, or Name: | 84pin Ceramic Windowed J-Leaded Chip Carrier (W LCC)<br>100pin Ceramic Windowed Pin Grid Arrays (WPGA) | | |
| Lead Frame material: | Kovar | | |
| Lead Finish, composition: | Nickle/Gold Plate | | |
| Die Attach Method: | Ag/Glass | Die Attach Material: | QMI 2419 |
| Wire Bond Method: | Wedge/Ultrasonic | Wire Material/Size: | Al / 1.25 mil |
| JESD22-A112 Moisture Sensitivity Level: | N/A | | |
| Name/Location of Assembly (prime) facility: | Cypress Bangkok, Thailand (Alpha-X) | | |

**RELIABILITY TESTS PERFORMED**

| Stress/Test | Test Condition (Temp/Bias) | Result P/F |
|---|---|---|
| High Temperature Operating Life Early Failure Rate | Dynamic Operating Condition Vcc= 125°C/140°C,5.75V | P |
| High Temperature Operating Life Latent Failure Rate | Dynamic Operating Condition, Vcc = 140°C/ 5.75V | P |
| High Accelerated Saturation Test (HAST) | 140°C, 5. 5V | P |
| Temperature Cycle | MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C | P |
| Data Bake Hermetic<br>Data Bake Plastic | Cypress Spec. 25-00060 (250°C, No Bias)<br>(165°C, No Bias) | P |
| Input/Output Capacitance | Cypress Spec. 01-00123 | P |
| Internal Water Vapor | MIL-STD-883, Method 1018 | P |
| Latch-up | Cypress Spec. 01-00081 | P<br>+/- 200mA |

**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] | 984 | 0 | N/A | N/A | 0 PPM |
| High Temperature Operating Life[2, 3] Long Term Failure Rate | 78,000 DHRs | 0 | 0.7 | 110 | 107 FIT |

[1] production burn-in of 12 Hrs at 150°C, 5.75V is required for Military products.
[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#: 93332/97316/99211[1]**

| EVAL # | DEVICE | ASSY-LOC | FABLOT# | ASSYLOT# | DURATION | S/S | REJ | FAIL MODE |
|---|---|---|---|---|---|---|---|---|
| STRESS: | DATA BAKE-HERMETIC (250C, NO BIAS) | | | | | | | |
| 93332 | CY7C346-HC | USA-G | 2330524 | 49304892 | 96 | 77 | 0 | |
| 93332 | CY7C346-HC | USA-G | 2330524 | 49304892 | 168 | 77 | 0 | |
| STRESS: | DATA BAKE-PLASTIC (165C, NO BIAS) | | | | | | | |
| 93332 | CY7C346-JC | KOREA-A | 2333798 | 49305964 | 168 | 76 | 0 | |
| 93332 | CY7C346-JC | KOREA-A | 2333798 | 49305964 | 552 | 75 | 0 | 1 ESD |
| STRESS: | HIGH ACCELERATED SATURATION TEST (140C/5.5V) | | | | | | | |
| 93332 | CY7C346-JC | KOREA-A | 2333798 | 49305964 | 128 | 46 | 0 | |
| STRESS: | HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (140C, 5.75V) | | | | | | | |
| 93332 | CY7C346-HC | USA-G | 2330524 | 49304748 | 120 | 78 | 0 | |
| 93332 | CY7C346-HC | USA-G | 2330524 | 49304748 | 1000 | 78 | 0 | |
| STRESS: | TC COND. C, -65 TO 150C, HERMETIC DEVICES | | | | | | | |
| 93332 | CY7C346-JC | KOREA-A | 2333798 | 49305964 | 300 | 46 | 1 | 1 TOPSIDE CRACKS |
| 93332 | CY7C346-HC | USA-G | 2330524 | 49304748 | 100 | 47 | 0 | |
| 93332 | CY7C346-HC | USA-G | 2330524 | 49304748 | 1000 | 47 | 0 | |
| STRESS: | HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (140C, 5.75V) | | | | | | | |
| 97316 | CY7C346-HMB | ALPHA-X | 2720543 | 219708428 | 72 | 132 | 0 | |
| 97316 | CY7C346-RMB | ALPHA-X | 2719344 | 219708446P | 72 | 178 | 0 | |
| 97316 | CY7C346-RMB | ALPHA-X | 2718201 | 219708195P | 72 | 185 | 0 | |
| STRESS: | HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.75V) | | | | | | | |
| 99211 | CY7C346-JC | ALPHA-X | 2910832 | 619920149 | 96 | 193 | 0 | |
| 99211 | CY7C346-JC | ALPHA-X | 2910382 | 619915399 | 96 | 296 | 0 | 1 EOS |

[1] **Combined Reliability Data**
**QTP #93332 (Product Qualification)**
**QTP #97316 (Military Burn-In reduction)**
**QTP #99211 (Commercial Burn-In elimination)**