

Cypress Semiconductor Automotive Product Qualification Report

**QTP# 163308 VERSION **
August, 2016**

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|--|-------------------------------|
| Microcontroller, 180nm Technology Product Family, Denso-Iwate | |
| MB96900 Series (MB96F903, MB96F905) | 16-bit Microcontroller |

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

| QTP Number | Description of Qualification Purpose | Date |
|-------------------|---|--------------|
| 163308 | Qualification of 180nm Technology Product Family at Denso-Iwate | August, 2016 |
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| PRODUCT DESCRIPTION (for qualification) | |
|--|---|
| Qualification Purpose: Qualify 180nm technology product at Denso-Iwate | |
| Marketing Part #: | MB96F348 (Represent MB96900 Series)* |
| Device Description: | 16-bit general purpose single-chip products with Flash |
| Cypress Division: | Cypress Semiconductor Corporation - Programmable Systems Division |

(*) MB96900 is 'Custom-made-Part#')

PACKAGE AVAILABILITY

| PACKAGE | ASSEMBLY FACILITY SITE |
|----------------|-------------------------------|
| LQFP100 | FIM* in Japan |

(*) FIM : Fujitsu Integrated Microelectronics

| MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION | |
|---|--------------|
| Package Designation: | LQI100 |
| Package Outline, Type, or Name: | 100-LQFP |
| Lead Finish : Thickness | Pure-Sn |
| Name/Location of Assembly facility: | FIM in Japan |
| MSL Level | 3 |
| Reflow Profile | 260c |

| ELECTRICAL TEST / FINISH DESCRIPTION | |
|---|--------------|
| Test Location: | FIM in Japan |

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

| Stress/Test | Test Condition (Temp/Bias) | Result P/F |
|--|---|---------------|
| High Temperature Operating Life Latent Failure Rate | Dynamic Operating Condition, Max. rating Voltage, 125 degreeC, JESD22-A108 | P |
| Temperature Humidity Bias Life Test | 85 degreeC, 85%RH, Max. Rating Voltage, Precondition: JESD22 Moisture Sensitivity Level3 JEDEC STD 22-A101 | P |
| High Accelerated Saturation Test (HAST) | 130 degreeC, 85%RH, Max. Rating Voltage, Precondition: JESD22 Moisture Sensitivity Level3 JEDEC STD 22-A110 | P |
| Unbiased High Accelerated Saturation Test (UHST) | 130 degreeC, 85%RH, Precondition: JESD22 Moisture Sensitivity Level3 JEDEC STD 22-A118: | P |
| Temperature Cycle | JESD22-A104, Condition C, -60 to 150 degreeC | P |
| High Temperature Storage | JESD22-A103: 150 degreeC, | P |
| Electrostatic Discharge Human Body Model (ESD-HBM) | JEDEC EIA/JESD22-A114-B | P |
| Electrostatic Discharge Charge Device Model (ESD-CDM) | JESD22-C101 | P |
| Static Latch up | 125 degreeC, 140mA | P |
| Endurance + Data Retention Bake | JESD22-A117, Cycling temp : 105 degreeC Bake Temperature : 150 degreeC | P |

RELIABILITY FAILURE RATE SUMMARY

| Stress/Test | Device Tsted/ Device Hours | # Fails | Activation Energy | Thermal A.F (3) | Failure Rate |
|--|-------------------------------|------------|----------------------|--------------------|-----------------|
| High Temperature Operating Life Early Failure Rate | 4,800 Devices | 0 | N/A | N.A | 0 PPM (1) |
| High Temperature Operating Life Latent Failure Rate | 1,382,000DHRs | 0 | 0.7 | 78 | 8.5FIT (2) |

- 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 #: 163308

| Device | Fab Lot # | Assy Lot # | Assy Loc | Duration | Samp | Rej | Failure Mechanism |
|--|-----------|------------|-----------|----------|------|-----|-------------------|
| STRESS : High Temperature Operating Life | | | | | | | |
| MB96F348 | - | - | FIM | 1000 | 88 | 0 | |
| MB96F348 | - | - | FIM | 1000 | 88 | 0 | |
| MB96F348 | - | - | FIM | 1000 | 88 | 0 | |
| MB91F467 | - | - | J-Devices | 1000 | 77 | 0 | |
| MB91F467 | - | - | J-Devices | 1000 | 77 | 0 | |
| MB91F467 | - | - | J-Devices | 1000 | 77 | 0 | |
| STRESS : High Accelerated Saturation Test | | | | | | | |
| MB96F348 | - | - | FIM | 96 | 88 | 0 | |
| MB96F348 | - | - | FIM | 96 | 88 | 0 | |
| MB96F348 | - | - | FIM | 96 | 88 | 0 | |
| MB91F467 | - | - | J-Devices | 96 | 33 | 0 | |
| MB91F467 | - | - | J-Devices | 96 | 33 | 0 | |
| MB91F467 | - | - | J-Devices | 96 | 33 | 0 | |
| STRESS : Unbiased Accelerated Saturation Test | | | | | | | |
| MB96F348 | - | - | FIM | 96 | 88 | 0 | |
| MB96F348 | - | - | FIM | 96 | 88 | 0 | |
| MB96F348 | - | - | FIM | 96 | 88 | 0 | |
| MB91F467 | - | - | J-Devices | 96 | 77 | 0 | |
| MB91F467 | - | - | J-Devices | 96 | 77 | 0 | |
| MB91F467 | - | - | J-Devices | 96 | 77 | 0 | |
| STRESS ; Temperature Cycle | | | | | | | |
| MB96F348 | - | - | FIM | 500 | 88 | 0 | |
| MB96F348 | - | - | FIM | 500 | 88 | 0 | |
| MB96F348 | - | - | FIM | 500 | 88 | 0 | |
| MB91F467 | - | - | J-Devices | 500 | 77 | 0 | |
| MB91F467 | - | - | J-Devices | 500 | 77 | 0 | |
| MB91F467 | - | - | J-Devices | 500 | 77 | 0 | |



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

STRESS ; High Temperature Storage

| | | | | | | | |
|----------|---|---|-----------|------|----|---|--|
| MB96F348 | - | - | FIM | 1000 | 45 | 0 | |
| MB91F467 | - | - | J-Devices | 1000 | 77 | 0 | |
| MB91F467 | - | - | J-Devices | 1000 | 77 | 0 | |
| MB91F467 | - | - | J-Devices | 1000 | 77 | 0 | |

STRESS ; Endurance (10Kcycling) + Data Retention Test

| | | | | | | | |
|----------|---|---|-----|------|----|---|--|
| MB91F467 | - | - | FIM | 1344 | 77 | 0 | |
| MB91F467 | - | - | FIM | 1344 | 77 | 0 | |
| MB91F467 | - | - | FIM | 1344 | 77 | 0 | |

STRESS ; ESD (HBM)

| | | | | | | | |
|----------|---|---|-----|------|----|---|--|
| MB96F348 | - | - | FIM | COMP | 21 | 0 | |
|----------|---|---|-----|------|----|---|--|

STRESS ; ESD-CDM

| | | | | | | | |
|----------|---|---|-----|------|----|---|--|
| MB96F348 | - | - | FIM | COMP | 21 | 0 | |
|----------|---|---|-----|------|----|---|--|

STRESS ; Latch-up Test

| | | | | | | | |
|----------|---|---|-----|------|----|---|--|
| MB96F348 | - | - | FIM | COMP | 21 | 0 | |
|----------|---|---|-----|------|----|---|--|



Document History Page

Document Title: QTP#163308_Microcontrollers, 180nm Technology Product Family, Denso-Iwate
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| Rev. | ECN No. | Orig. of Change | Description of Change |
|------|---------|-----------------|------------------------|
| ** | 5410825 | KUMI | Initial spec. release. |