



2/9/2017

**PRODUCT RELIABILITY REPORT
FOR**

DS1624

Maxim Integrated

**160 Rio Robles
San Jose, CA 95134**

Approved by:

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Conclusion:

The following qualification successfully meets the quality and reliability standards required of all Maxim products:

DS1624

In addition, Maxim's continuous reliability monitor program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards. The current status of the reliability monitor program can be viewed at <http://www.maxim-ic.com/TechSupport/dsreliability.html>.

Device Description:

A description of this device can be found in the product data sheet. You can find the product data sheet at http://dbserv.maxim-ic.com/l_datasheet3.cfm.

Reliability Derating:

The Arrhenius model will be used to determine the acceleration factor for failure mechanisms that are temperature accelerated.

$$AfT = \exp((Ea/k) * (1/Tu - 1/Ts)) = tu/ts$$

AfT = Acceleration factor due to Temperature
tu = Time at use temperature (e.g. 55°C)
ts = Time at stress temperature (e.g. 125°C)
k = Boltzmann's Constant (8.617 x 10⁻⁵ eV/°K)
Tu = Temperature at Use (°K)
Ts = Temperature at Stress (°K)
Ea = Activation Energy (e.g. 0.7 ev)

The activation energy of the failure mechanism is derived from either internal studies or industry accepted standards, or activation energy of 0.7ev will be used whenever actual failure mechanisms or their activation energies are unknown. All deratings will be done from the stress ambient temperature to the use ambient temperature.

An exponential model will be used to determine the acceleration factor for failure mechanisms, which are voltage accelerated.

$$AfV = \exp(B * (Vs - Vu))$$

AfV = Acceleration factor due to Voltage
Vs = Stress Voltage (e.g. 7.0 volts)
Vu = Maximum Operating Voltage (e.g. 5.5 volts)
B = Constant related to failure mechanism type (e.g. 1.0, 2.4, 2.7, etc.)

The Constant, B, related to the failure mechanism is derived from either internal studies or industry accepted standards, or a B of 1.0 will be used whenever actual failure mechanisms or their B are unknown. All deratings will be done from the stress voltage to the maximum operating voltage. Failure rate data from the operating life test is reported using a Chi-Squared statistical model at the 60% or 90% confidence level (Cf).

The failure rate, Fr, is related to the acceleration during life test by:

$$Fr = X / (ts * AfV * AfT * N * 2)$$

X = Chi-Sq statistical upper limit
N = Life test sample size

Failure Rates are reported in FITs (Failures in Time) or MTTF (Mean Time To Failure). The FIT rate is related to MTTF by:

$$MTTF = 1/Fr$$

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this device/process is:

FAILURE RATE: **MTTF (YRS):** **112374** **FITS:** **1.0**
DEVICE HOURS: **901990573** **FAILS:** **0**

Only data from Operating Life or similar stresses are used for this calculation.

The parameters used to calculate this failure rate are as follows:

Cf: 60% **Ea: 0.7** **B: 0** **Tu: 25** °C **Vu: 5.5** Volts

The reliability data follows. At the start of this data is the device information. The next section is the detailed reliability data for each stress. The reliability data section includes the latest data available and may contain some generic data. **Bold** Product Number denotes specific product data.

Device Information:

Process: SA E35W-0.5um, 5V CMOS with embedded Array EEPROM, embedded RSE EEPROM, 18V CMOS, VNP, P2-P1 Cap, LVMOSCAP, HVMOSCAP, Varactor Cap, NTC poly R's, 3LM, M3 Laser Fuses
 Passivation: TEOS Oxide-Nitride Passivation
 Die Size: 68 x 80
 Number of Transistors: 20125
 Interconnect: Aluminum / 0.5% Copper
 Gate Oxide Thickness: 120 Å

ESD HBM

| DESCRIPTION | DATE CODE/PRODUCT/LOT | CONDITION | READPOIN | QTY | FAILS | FA# |
|-----------------|------------------------------|----------------------------|----------|-----|----------|-----|
| ESD SENSITIVITY | 1009 DS1624 WJ048844B | JESD22-A114 HBM 500 VOLTS | 1 PUL'S | 3 | 0 | |
| ESD SENSITIVITY | 1009 DS1624 WJ048844B | JESD22-A114 HBM 1000 VOLTS | 1 PUL'S | 3 | 0 | |
| ESD SENSITIVITY | 1009 DS1624 WJ048844B | JESD22-A114 HBM 2000 VOLTS | 1 PUL'S | 3 | 0 | |
| ESD SENSITIVITY | 1009 DS1624 WJ048844B | JESD22-A114 HBM 3000 VOLTS | 1 PUL'S | 3 | 0 | |
| ESD SENSITIVITY | 1009 DS1624 WJ048844B | JESD22-A114 HBM 4000 VOLTS | 1 PUL'S | 3 | 0 | |
| Total: | | | | | 0 | |

LATCH-UP

| DESCRIPTION | DATE CODE/PRODUCT/LOT | CONDITION | READPOIN | QTY | FAILS | FA# |
|---------------|------------------------------|-----------------------------|----------|-----|----------|-----|
| LATCH-UP I | 1009 DS1624 WJ048844B | JESD78A, I-TEST 125C | | 6 | 0 | |
| LATCH-UP V | 1009 DS1624 WJ048844B | JESD78A, V-SUPPLY TEST 125C | | 6 | 0 | |
| Total: | | | | | 0 | |

OPERATING LIFE

| DESCRIPTION | DATE CODE/PRODUCT/LOT | CONDITION | READPOIN | QTY | FAILS | FA# |
|-------------------|-----------------------|---|---------------|-----|----------|-----|
| HIGH TEMP OP LIFE | 0839 DS2784 | WJ942986T 125C, 4.6 V (PSA) & 15.0 V (PSB) | 1000 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 0843 DS2784 | WJ941766O 125C, 4.6 V (PSA) & 15.0 V (PSB) | 1000 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 0848 DS2784 | WJ943239LC 125C, 4.6 V (PSA) & 15.0 V (PSB) | 1000 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 0914 DS2780 | WJ944804A 125C, 5.5 VOLTS | 1000 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 0916 DS2784 | WJ943240IC 125C, 5.5 V (PSA) & 15.0 V (PSB) | 1000 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 0916 DS2784 | WJ945481A 125C, 5.5 V (PSA) & 15.0 V (PSB) | 1000 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 0922 DS36A92 | WJ946542A 125C, 3.6 VOLTS | 192 HRS | 45 | 0 | |
| HIGH TEMP OP LIFE | 0932 MAX17043 | WJ946441P 125C, 4.5V (PSA) & 9.2V (PSB) | 192 HRS | 45 | 0 | |
| HIGH TEMP OP LIFE | 0933 DS1873 | QJ917612BC 125C, 4.2 VOLTS | 192 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 0937 DS2784 | WJ046898JC 125C, 5.5 V (PSA) & 15.0 V (PSB) | 1000 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 0940 DS2784 | WJ048759A 125C, 5.5 V (PSA) & 15.0 V (PSB) | 1000 HRS | 80 | 0 | |
| HIGH TEMP OP LIFE | 0946 DS1876 | WJ048840A 125C, 4.2 VOLTS | 192 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 0948 DS1091L | WJ946344E 150C, 3.6 VOLTS | 408 HRS | 45 | 0 | |
| HIGH TEMP OP LIFE | 0948 DS1091L | WJ946344E 150C, 3.6 VOLTS | 408 HRS | 45 | 0 | |
| HIGH TEMP OP LIFE | 0951 DS2784 | WJ049559A 125C, 5.5 V (PSA) & 15.0 V (PSB) | 1000 HRS | 80 | 0 | |
| HIGH TEMP OP LIFE | 0951 DS1877 | WJ048842A 125C, 4.2 VOLTS | 192 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 0951 DS2430A | WH048838A 125C, 5.25 VOLTS | 192 HRS | 50 | 0 | |
| HIGH TEMP OP LIFE | 1004 DS3644 | WS046549D 125C, 3.6V (PSA) & 3.3V (PSB) | 192 HRS | 45 | 0 | |
| HIGH TEMP OP LIFE | 1009 DS1624 | WJ048844B 125C, 5.5 VOLTS | 192 HRS | 77 | 0 | |
| HIGH TEMP OP LIFE | 1013 DS2784 | WJ050375A 125C, 5.5 V (PSA) & 15.0 V (PSB) | 500 HRS | 80 | 0 | |
| | | | Total: | | 0 | |

W/E ENDURANCE AND DATA RET'N

| DESCRIPTION | DATE CODE/PRODUCT/LOT | CONDITION | READPOIN | QTY | FAILS | FA# |
|---------------------------|-----------------------|--|----------|-----|-------|-----|
| WRITE CYCLE STRESS (KCYS) | 0839 DS2784 | WJ942986T 50 C, 4.6 V (PSA) & 15.0 V (PSB) | 50 KCYS | 77 | 0 | |
| STORAGE LIFE | 0839 DS2784 | WJ942986T 150C | 1000 HRS | 77 | 0 | |
| WRITE CYCLE STRESS (KCYS) | 0843 DS2784 | WJ941766O 50 C, 4.6 V (PSA) & 15.0 V (PSB) | 50 KCYS | 77 | 0 | |

| | | | | | | | | |
|------------------------------|------|---------------|------------|-------------------------------------|------|------|----|---|
| STORAGE LIFE | 0843 | DS2784 | WJ941766O | 150C | 1000 | HRS | 77 | 0 |
| WRITE CYCLE STRESS (KCYS) | 0848 | DS2784 | WJ943239LC | 50 C, 4.6 V (PSA) & 15.0 V (PSB) | 50 | KCYS | 77 | 0 |
| STORAGE LIFE | 0848 | DS2784 | WJ943239LC | 150C | 1000 | HRS | 77 | 0 |
| WRITE CYCLE STRESS (KCYS) | 0916 | DS2784 | WJ943240IC | 50 C, 5.5 V (PSA) & 15.0 V (PSB) | 50 | KCYS | 77 | 0 |
| STORAGE LIFE | 0916 | DS2784 | WJ943240IC | 150C | 1000 | HRS | 77 | 0 |
| WRITE CYCLE STRESS (KCYS) | 0916 | DS2784 | WJ945481A | 50 C, 5.5 V (PSA) & 15.0 V (PSB) | 50 | KCYS | 77 | 0 |
| STORAGE LIFE | 0916 | DS2784 | WJ945481A | 150C | 1000 | HRS | 77 | 0 |
| WRITE CYCLE STRESS (KCYS) | 0940 | DS3882 | WJ946345A | 85 C, 5.25 VOLTS | 30 | KCYS | 77 | 0 |
| STORAGE LIFE | 0940 | DS3882 | WJ946345A | 150C | 1000 | HRS | 77 | 0 |
| WRITE CYCLE STRESS (KCYS) | 0951 | DS2430A | WH048838A | 25 C, 5.25 VOLTS | 200 | KCYS | 77 | 0 |
| STORAGE LIFE | 0951 | DS2430A | WH048838A | 150C | 96 | HRS | 77 | 0 |
| WRITE CYCLE STRESS (KCYS) | 1009 | DS1624 | WJ048844B | 85 C, 5.5 VOLTS | 25 | KCYS | 77 | 0 |
| STORAGE LIFE | 1009 | DS1624 | WJ048844B | 150C | 96 | HRS | 77 | 0 |

Total: 0

FAILURE RATE: MTTF (YRS): 112374 FITS: 1.0
DEVICE HOURS: 901990573 FAILS: 0