PRODUCT RELIABILITY REPORT
FOR

DS18S20, Rev C4

Maxim Integrated Products

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

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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.

\[ \text{AfT} = \exp\left(\frac{E_a}{k} \left(\frac{1}{T_u} - \frac{1}{T_s}\right)\right) = \frac{t_u}{t_s} \]

**AfT** = Acceleration factor due to Temperature

\( t_u = \) Time at use temperature (e.g. 55°C)

\( t_s = \) Time at stress temperature (e.g. 125°C)

\( k = \) Boltzmann’s Constant (8.617 x 10^-5 eV/°K)

\( T_u = \) Temperature at Use (°K)

\( T_s = \) Temperature at Stress (°K)

\( E_a = \) 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.

\[ \text{AfV} = \exp(B(V_s - V_u)) \]

**AfV** = Acceleration factor due to Voltage

\( V_s = \) Stress Voltage (e.g. 7.0 volts)

\( V_u = \) 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:

\[ Fr = \frac{X}{(t_s * \text{AfV} * \text{AfT} * N * 2)} \]

\( X = \) Chi-Sq statistical upper limit

\( N = \) Life test sample size

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The calculated failure rate for this device/process is:

MTTF = 1/Fr

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this device/process is:

<table>
<thead>
<tr>
<th>FAILURE RATE:</th>
<th>MTTF (YRS):</th>
<th>FITS:</th>
<th>DEVICE HOURS:</th>
<th>FAILS:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>51730</td>
<td>2.2</td>
<td>916418895</td>
<td>1</td>
</tr>
</tbody>
</table>

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. Product Number denotes specific product data.

**Device Information:**
- Process: SA E6W, 0.6um BiCMOS, 2 Poly, 2 Metal, EEPROM, 8 inch wafer
- Passivation: TEOS Oxide-Nitride Passivation
- Die Size: 78 x 54
- Number of Transistors: 8503
- Interconnect: Aluminum / 0.5% Copper
- Gate Oxide Thickness: 150 Å

**ELECTRICAL CHARACTERIZATION**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>DATE CODE/PRODUCT/LOT</th>
<th>CONDITION</th>
<th>READPOIN</th>
<th>QTY</th>
<th>FAILS</th>
<th>FA#</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESD SENSITIVITY</td>
<td>0539 DS1820B</td>
<td>EOS/ESD S5.1 HBM 500 VOLTS</td>
<td>1</td>
<td>PUL’S</td>
<td>3</td>
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<tr>
<td>ESD SENSITIVITY</td>
<td>0539 DS1820B</td>
<td>EOS/ESD S5.1 HBM 1000 VOLTS</td>
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<td>PUL’S</td>
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<td>ESD SENSITIVITY</td>
<td>0539 DS1820B</td>
<td>EOS/ESD S5.1 HBM 2000 VOLTS</td>
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<td>PUL’S</td>
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<td>ESD SENSITIVITY</td>
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<td>EOS/ESD S5.1 HBM 3000 VOLTS</td>
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<td>PUL’S</td>
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<td>ESD SENSITIVITY</td>
<td>0539 DS1820B</td>
<td>EOS/ESD S5.1 HBM 4000 VOLTS</td>
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<td>PUL’S</td>
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<tr>
<td>LATCH-UP</td>
<td>0539 DS1820B</td>
<td>JESD78, I-TEST 125C</td>
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<tr>
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<td>JESD78, V-SUPPLY TEST 125C</td>
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**OPERATING LIFE**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>DATE CODE/PRODUCT/LOT</th>
<th>CONDITION</th>
<th>READPOIN</th>
<th>QTY</th>
<th>FAILS</th>
<th>FA#</th>
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</thead>
<tbody>
<tr>
<td>HIGH TEMP OP LIFE</td>
<td>0720 DS1851</td>
<td>QK707606BB 125C, 5.5 VOLTS</td>
<td>192 HRS</td>
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<table>
<thead>
<tr>
<th>HIGH TEMP OP LIFE</th>
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<th>MTTF (YRS)</th>
<th>FITS:</th>
<th>DEVICE HOURS:</th>
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<tbody>
<tr>
<td>0948 DS1856</td>
<td>WM049367A 125C, 5.5 VOLTS</td>
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<tr>
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<td>WM158219A 125C, 5.5 VOLTS</td>
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<tr>
<td>1050 DS1856</td>
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<tr>
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<td>FJ162135DB 125C, 5.5 VOLTS</td>
<td>1000 HRS 77</td>
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<td>1103 DS18S20</td>
<td>FD162367AC 125C, 5.5 VOLTS</td>
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<td>1000 HRS 80</td>
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</tbody>
</table>

Total: 1

FAILURE RATE: 2.2
MTTF (YRS): 51730
FITS: 2.2
DEVICE HOURS: 916418895
FAILS: 1

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