APEX MICROTECHNOLOGY CORPORATION
RELIABILITY PREDICTION
PA51M/883

by

Granger Scofield

Date of prediction: 15-Mar-01

This reliability prediction is based on MIL-HDBK-217F, December 2, 1991 including Notice 2, February 28, 1995.

Conditions of this prediction are as follows:

- Hybrid quality level is B
- Environment is Gf (Ground, Fixed)
- Case temperature is 40 °C
- Internal Power Dissipation = 25 W
- Supply voltage is +/- 28 V
- An AC signal is applied
- Product introduction date: 01-Aug-93

The results of this prediction are:

0.1 failures per million hours; or,
MTBF=10034 thousand hours.
Monolithic Bipolar and MOS Linear Devices:

\[ L_p = C_1 \cdot \pi T \]

IC1:  
- **Watts = 2.68**  
- **Tj = 200**  
- **#/Qs = 56**  

**Usage:**  
- **Watts = 0.1**  
- **Max Tj = 46.53**

<table>
<thead>
<tr>
<th>C1</th>
<th>PiT</th>
<th>Nc</th>
<th>Watts</th>
<th>Tj</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>0.550451</td>
<td>1</td>
<td>0.005505</td>
<td></td>
</tr>
</tbody>
</table>

Transistors, Low Frequency, Bipolar:

\[ L_p = L_b \cdot \pi T \cdot \pi R \cdot \pi S \]

Q2.5:  
- **Volts = 40**  
- **Watts = 1.2**  
- **Tj = 175**  
- **K/W = 125**

**Usage:**  
- **Vstress = 1**  
- **Vpwr = 1**  
- **Ic = 0.025**  
- **Vs = 0.025**  
- **Power = 0.025**

<table>
<thead>
<tr>
<th>Lb</th>
<th>PiT</th>
<th>PiR</th>
<th>PiS</th>
<th>Nc</th>
<th>Tj</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00074</td>
<td>1.501901</td>
<td>1.0698</td>
<td>0.048626</td>
<td>2</td>
<td>0.000116</td>
</tr>
</tbody>
</table>

Q3.4:  
- **Volts = 40**  
- **Watts = 1.2**  
- **Tj = 175**  
- **K/W = 125**

**Usage:**  
- **Vstress = 0.35**  
- **Vpwr = 0.35**  
- **Ic = 0.025**  
- **Vs = 0.025**  
- **Power = 0.0088**

<table>
<thead>
<tr>
<th>Lb</th>
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<th>PiR</th>
<th>PiS</th>
<th>Nc</th>
<th>Tj</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00074</td>
<td>1.438334</td>
<td>1.0698</td>
<td>0.046237</td>
<td>2</td>
<td>0.000105</td>
</tr>
</tbody>
</table>

Q1:  
- **Volts = 100**  
- **Watts = 145**  
- **Tj = 200**  
- **K/W = 1.2069**

**Usage:**  
- **Vstress = 53.5**  
- **Fraction Output Pwr = 1/1**

<table>
<thead>
<tr>
<th>Lb</th>
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<th>PiR</th>
<th>PiS</th>
<th>Nc</th>
<th>Tj</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00074</td>
<td>2.544136</td>
<td>6.3053</td>
<td>0.236314</td>
<td>2</td>
<td>0.00561</td>
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</tbody>
</table>

Capacitors, ceramic general purpose type CK:

\[ L_p = L_b \cdot \pi T \cdot \pi C \cdot \pi V \]

C6:  
- **Volts = 100**  
- **pF = 1000**

**Usage:**  
- **Vstress = 53.5**

<table>
<thead>
<tr>
<th>Lb</th>
<th>PiT</th>
<th>PiC</th>
<th>PiV</th>
<th>Nc</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00099</td>
<td>1.92167</td>
<td>0.288</td>
<td>1.7089</td>
<td>1</td>
<td>0.000938</td>
</tr>
</tbody>
</table>

**Sum of all components:** 0.012274

Hybrid microcircuit:

\[ L_p = \text{sumLc} \cdot (1 + 0.2 \cdot \pi E) \cdot \pi F \cdot \pi Q \cdot \pi L \]

Total failures per million hours = 0.099661

Mean time between failures = 1003403