

## Quarterly Reliability Monitoring Results

Quarters: Q1/2020 to Q4/2020

Based on structural similarity

| Supplier                  |  | User Part Number  |           |            |           |  |
|---------------------------|--|---|-----------|------------|-----------|--|
| Nexperia B.V.             |  | PBL56005D   |           |            |           |  |
| Name of Laboratory        |  | Part Description  |           |            |           |  |
| Assembly reliability labs |  | Nexperia DHAM<br>Small Signal Bipolar Transistor<br>SMD package |           |            |           |  |
| AEC-Q101 Test             | Test Conditions  | Duration  | # Lots    | # Quantity | # Rejects |  |
| # 1                       | <b>TEST</b><br>Pre- and Post-Stress<br>Electrical Test<br>Tamb = 25 °C   | N/A   | see below | all parts  | see below |  |
| # 2                       | <b>PC</b><br>Preconditioning<br>JESD22-A113<br>Bake Tamb = 125 °C<br>Soak Tamb = 85 °C, RH = 85%<br>Reflow soldering                             | 24 hours<br>168 hours<br>3 cycles                               | 679       | 48870      | 0         |  |
| # 5                       | <b>HTRB</b><br>High Temperature Reverse<br>Bias<br>MIL-STD-750-1<br>M1038 Method A<br>Tj = Tjmax, Vr = 100% of max. datasheet<br>reverse voltage | 1000 hours  | 156       | 12480      | 0         |  |
| # 7                       | <b>TC</b><br>Temperature Cycling<br>JESD22-A104<br>-65 °C to Tjmax, not to exceed 150°C  | 1000 cycles   | 144       | 11520      | 0         |  |
| # 8                       | <b>AC</b><br>Autoclave<br>JESD22-A102<br>Tamb = 121 °C, RH = 100 %<br>Pressure = 205 kPa (29.7 psia)   | 96 hours  | 144       | 11520      | 0         |  |
| # 9                       | <b>H3TRB</b><br>High Humidity High<br>Temperature Reverse Bias<br>JESD22-A101<br>Tamb = 85 °C, RH = 85%, VR > 80 % of<br>rated reverse voltage   | 1000 hours  | 140       | 11200      | 0         |  |
| # 10                      | <b>IOL</b><br>Intermittent Operating Life<br>MIL-STD-750 Method 1037<br>ton = toff, devices powered to insure ΔTj =<br>100 °C for 15000 cycles   | 1000 hours  | 142       | 11360      | 0         |  |
| # 20                      | <b>RSH</b><br>Resistance to Solder Heat<br>JESD22-A111<br>260 °C ± 5 °C  | 10 s  | 109       | 3270       | 0         |  |
| # 21                      | <b>SD</b><br>Solderability<br>J-STD-002<br>Test method B and D   |   | 264       | 2640       | 0         |  |

### Calculation of FIT and MTTF

Test considered for FIT calculation: High Temperature Reverse Bias (HTRB, AEC-Q101 Test # 5)

Confidence level 60%, derated to 55 °C, activation energy 0.7 eV, test time 168 to 1000 hours

| Wafer Fab        | Technology                         | Quantity | Rejects | Failure Rate (FIT) | MTTF (hrs) |
|------------------|------------------------------------|----------|---------|--------------------|------------|
| Nexperia<br>DHAM | Small Signal Bipolar<br>Transistor | 12480    | 0       | 0,34               | 2,94E+09   |

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