PARTS COUNT RELIABILITY PREDICTION

TBolt E DOCXO

Prepared for:

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Parts Count Reliability Prediction

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TBolt E DOCXO

Part Number PWA # 60333-50

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Reference Documents

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<td>Telcordia Technologies</td>
<td>SR-332</td>
<td>Issue 2</td>
<td>Sept 2006</td>
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1. Parts Count Reliability Prediction

1.1. **Scope**

This reliability prediction for the Trimble Navigation Tbolt E DOCXO printed wiring assembly PWA # 60333-50 was calculated using the parts count method per Telcordia Technologies special report SR-332, Issue 2, September 2006; Reliability Prediction Procedure for Electronic Equipment.

1.2. **Assumptions**

- Parts quality level = II. The parts used in the Tbolt E DOCXO PWA are high quality commercial parts made by reputable manufacturers, and only procured directly from the manufacturer or through manufacturers authorized distributors. Trimble Navigation maintains an Approved Manufacturers parts List (AML) for each Trimble part number on the Tbolt E DOCXO BoM.
- Operating Environment = Ground, Fixed, Controlled (Ge). The Tbolt E DOCXO Assembly will be in an environmentally controlled central office or base station. Environmental stresses are nearly zero, with optimum maintenance.
- Parts local ambient temperature = 40°C.
- Parts stress ratio = 50%.
- Failure of any one part will cause the failure of the PWA. The conservative reliability model.
- The failure rate Q3, Q9, Q7, and Q11 is from ON Semiconductor’s laboratory test data.
- The failure rate of D15, U11, U13, U16, U18, U2, U22, U28, U3, U34, U36, U5, U6, and U8 is from Texas Instrument’s laboratory test data.
- The failure rate of U17 is from Maxim’s laboratory test data.
- The failure rate of L10, L4, and L11 is from Coilcraft’s laboratory test data.
- The failure rate of U10 is from Xilinx’s laboratory test data.
- The failure rate of U23 and U27 is from Linear Technologies’ laboratory test data.
- For the failure rate of U4, the Colossus RF ASIC; it was assumed to be composed of 1 VCO @ 60 FITs; 5 analog amplifiers with 20 transistors each, 1 charge pump with 20 transistors, 3 mixers with 20 transistors each, 1 quad divider with 20 transistors, and 1 phase detector with 20 transistors, for a total of 220 transistors which equal 52 FITs; plus 6 digital gates which equal 10 FITs; for a grand total of 122 FITs.
1.3. Mean Time Between Failure

The mean time between failures (MTBF) of the TBolt E DOCXO was calculated to be 2,215,281 hours.