

1 Subject

Affected Products	conga-B7XD
Subject	MTBF values of conga-B7XD (Telcordia 3)
Confidential/Public	Confidential
Date (yyyy.mm.dd)	2019.05.17
Author	SPA

2 Affected Article Numbers

2.1 Product Data

Affected Number(s)	Product
047500	conga-B7XD/X-D1577
047501	conga-B7XD/X-D1567
047502	conga-B7XD/X-D1548
047503	conga-B7XD/X-D1527
047504	conga-B7XD/P-D1509
047505	conga-B7XD/P-D1508
047520	conga-B7XD/i-X-D1559
047521	conga-B7XD/i-X-D1539
047522	conga-B7XD/i-X-D1529
047523	conga-B7XD/i-P-D1519

3 Introduction

This CTN explains how congatec calculates the MTBF rates in general and provides the MTBF rates of conga-B7XD. It also explains how MTBF rates can be further improved in section 5.

3.1 MTBF Definition

The mean time between failures (MTBF) rate predicts the average time between system failures. A higher MTBF rate means more time between failures and therefore a better reliability. Each MTBF rate is only valid for a specific use case. The MTBF rate neither describes the early failure rate nor the lifetime of the product.

Note

MTBF rates are dramatically affected by the use case. Each embedded computer manufacturer may make different assumptions about the use case. Therefore, the use case must be taken into consideration when comparing the reliability of similar products from different manufacturers. Do not make judgments about the reliability of similar products from different manufacturers before considering the use case.

3.2 MTBF Calculation

To calculate MTBF rates, congatec measures the temperature of the components in a controlled environment and uses the temperature to derive the failure in time (FIT) rate. The FIT rate of the components provides the FIT rate of the product and is converted to the MTBF rate.

Except for the System on Chip (SoC), the FIT rate of each component is derived from the Telcordia (Issue 3 of SR-332) database. The FIT rate of the SoC is provided by the manufacturer.

3.3 Telcordia Use Cases

Telcordia 3 defines three use cases:

Ground fixed, uncontrolled: The System is in a rough environment (strong temperature changes and vibrations).

Ground benign, controlled: The System is mounted in a non-mobile application (no vibration and nearly constant temperature).

Ground Mobile: The System is used in a mobile application (strong temperature changes, vibration and even condensation can occur).

3.4 Test Conditions

To calculate MTBF rates, congatec measures the temperature of the components in a controlled test environment:

- **high end variant** of the product (conga-B7XD/X-D1577, 16 cores, 1.3GHz, 45W TDP)
- 23°C ambient temperature
- 100% SoC workload
- Standard congatec cooling solution

The following temperatures were measured:

Component	Temperature
SoC	55°C
All other components	40°C
All capacitors and resistors	48°C

 Note

The FIT value for the SoC is based on a Communication Infrastructure Commercial Temperature environment use case condition defined by Intel.

4 MTBF Rates

This section provides the MTBF rates for the conga- B7XD.

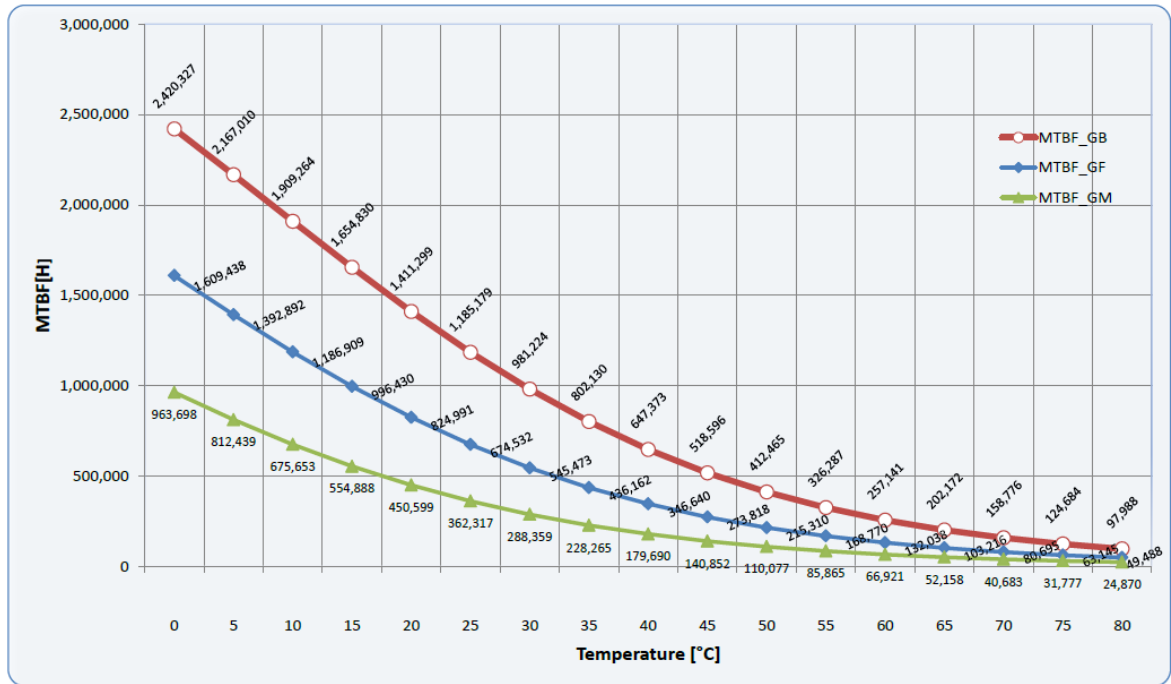
Ambient temperature: 23°C

	Ground Fixed, uncontrolled	Ground Benign, controlled	Ground Mobile
Failure Rate [FIT]	1,365.859	785.429	2,526.718
MTBF [H]	732,140	1,273,189	395,770
MTBF [a]	83	145	45

 Note

The failure rates for the main components were obtained and added together. The inverse value of the total failure rates provides the MTBF in hours (MTBF [H]). The MTBF in years (MTBF [a]) was calculated by dividing MTBF [H] by 8760 and rounding the result down.

Temperature Graph:



5 Improving MTBF Rates

5.1 SoC Variant

As described in section 3.4 “Test Conditions”, the MTBF rates are calculated with the **high end product variant**. Less powerful product variants produce less heat and therefore have a better MTBF rate.

5.2 Workload

As described in section 3.4 “Test Conditions”, the MTBF rates are calculated with **100% SoC workload**. Less workload results in lower temperature and therefore a better MTBF rate.

5.3 FIT Rates

As described in section 3.2 “MTBF Calculation”, the MTBF rate is calculated based on the Telcordia Issue 3 FIT rates of the components.

Component manufacturers usually specify better FIT rates than Telcordia. Using more FIT rates from manufacturers can improve the overall MTBF rate.

Telcordia also allows FIT rates from actual field experience. Using actual field FIT rates can improve the overall MTBF rate.

5.4 Voltage Levels

The FIT rates of most components were calculated with estimated voltage levels. Depending on the use case, actual voltage levels can be lower, improving the component’s FIT rate. Using actual voltage levels can improve the overall MTBF rate.

6 Summary

MTBF rates are dramatically affected by the temperature. Using SoC variants with lower TDP and/or less workload will improve the MTBF rate. Additionally, the MTBF rate is based on assumptions like FIT rates from Telcordia Issue 3 and on estimated voltage levels for the components. Using actual values can also improve the overall MTBF rate.

7 Revision History

Revision	Date (yyyy.mm.dd)	Author	Changes
1.0	2019.05.17	SPA	Initial release
