1 Subject

Affected Products	conga-TR3
Subject	MTBF values of conga-TR3 (Telcordia 3)
Confidential/Public	Confidential
Date (yyyy.mm.dd)	2018.10.29
Author	SPA

2 Affected Article Numbers

2.1 Product Data

Affected Number(s)	Product
041300	conga-TR3/RX-421BD
041301	conga-TR3/RX-418GD
041302	conga-TR3/RX-216GD
041310	conga-TR3/i-RX-416GD
041320	conga-TR3/GX-217GI

3 Introduction

This CTN explains how congatec calculates the MTBF in general and provides the MTBF values of conga-TR3. 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.

All FIT rates of the components are derived from the Telcordia (Issue 3 of SR-332).

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-TR3/RX-421BD, 4 cores, 2.1 GHz, 12W TDP)
- 25°C ambient temperature
- 100% SoC workload
- Standard congatec cooling solution

The following temperatures were measured:

Component	Temperature
SoC	45°C
Hot area components	57°C
All other components	45°C

4 MTBF Rates

This section provides the MTBF rates for the conga- TR3.

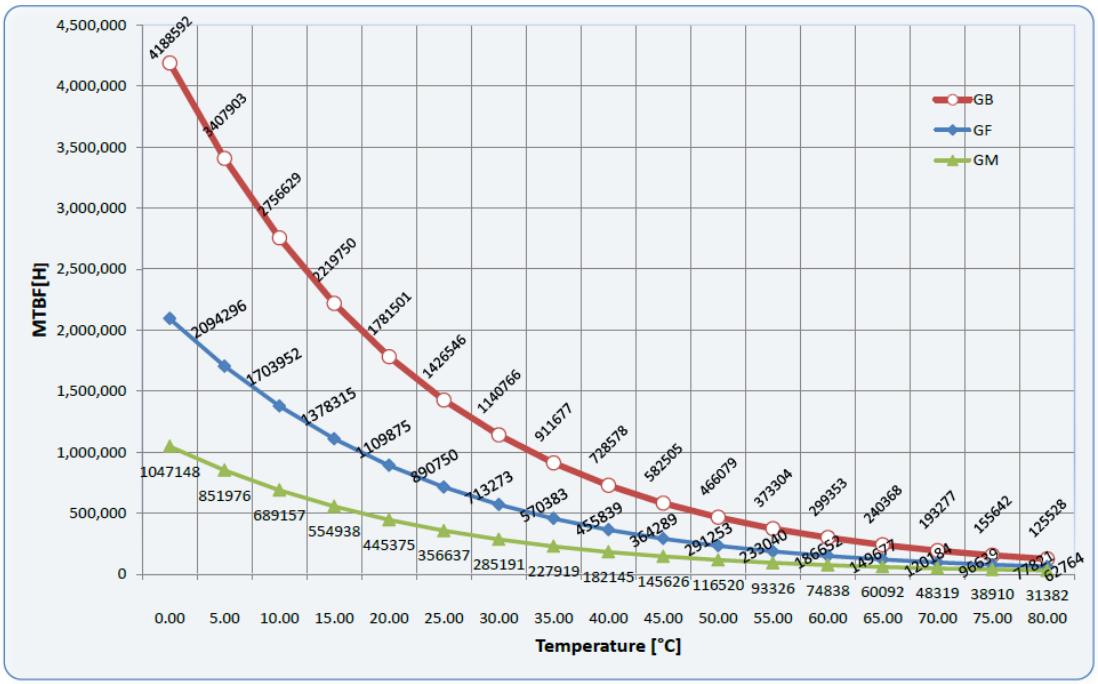
Ambient temperature: 25°C

	Ground Fixed, uncontrolled	Ground Benign, controlled	Ground Mobile
Failure Rate [FIT]	1,401.988	700.994	2,803.975
MTBF [H]	713,273	1,426,546	356,637
MTBF [a]	81	162	40

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	2018.10.29	SPA	Initial release
1.1	2018.10.29	SPA/SDA	Corrected MTBF values (Section 4)