# TMP61-Q1 Functional Safety FIT Rate and FMD

## 1 Overview

This document contains information for the TMP61-Q1 (X1SON, TO-92S and SOT-5X3 package) to aid in a functional safety system design. Information provided are:

- Functional Safety Failure In Time (FIT) rates of the semiconductor component estimated by the application of industry reliability standards
- Component failure modes and their distribution (FMD) based on the primary function of the device

The TMP61-Q1 was developed using a quality-managed development process, but was not developed in accordance with the IEC 61508 or ISO 26262 standards.

## 2 Functional Safety Failure In Time (FIT) Rates

This section provides Functional Safety Failure In Time (FIT) rates for TMP61-Q1 based on TI reliability testing.

**Table 1. Component Failure Rates**

| Category | Reference FIT Rate | Reference Virtual $T_J$ |
|---|---|---|
| Resistor, Si based thermistor linear PTC | 3 FIT | 40°C |

The Reference FIT Rate derived from HTOL, ELFR & HAST qualification testing results using 0.7eV activation energy with 90% confidence level.

The Reference Virtual $T_J$ (junction temperature) in Table 1 is based on the 40°C mean ambient temperatures from Siemens Norm SN 29500-4. Failure rates under operating conditions can be calculated from the reference failure rate and virtual junction temperature using conversion information in SN 29500-4 section 4.

## 3 Failure Mode Distribution (FMD)

The failure mode distribution estimation for TMP61-Q1 in Table 2 comes from the combination of common failure modes listed in standards such as IEC 61508 and IEC 61709 and from best engineering judgment.

The failure modes listed in this section reflect random failure events and do not include failures due to misuse or overstress.

**Table 2. Die Failure Modes and Distribution**

| Die Failure Modes | Failure Mode Distribution (%) |
|---|---|
| Resistor Short | 0% |
| Resistor Open | 100% |

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