

Functional Safety Information

LM51772-Q1 and LM251772-Q1

Functional Safety FIT Rate and FMD



Table of Contents

1 Overview.....2

2 Functional Safety Failure In Time (FIT) Rates.....3

3 Failure Mode Distribution (FMD).....4

4 Revision History.....4

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1 Overview

This document contains information for the LM51772-Q1 and LM251772-Q1 (VQFN 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 distribution (FMD) based on the primary function of the device

Figure 1-1 shows the device functional block diagram for reference.

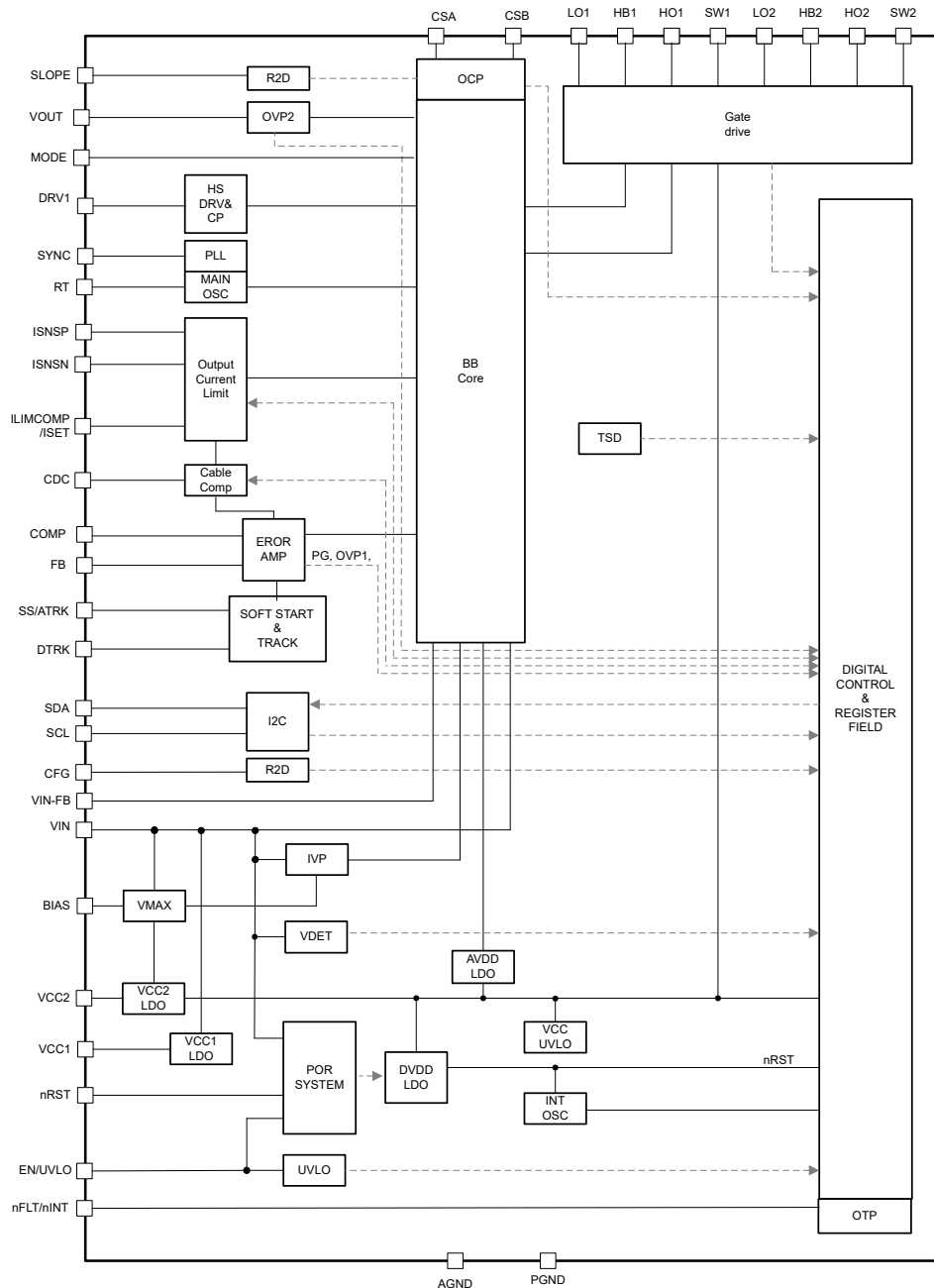


Figure 1-1. Functional Block Diagram of the LM51772-Q1

The LM51772-Q1 and LM251772-Q1 were developed using a quality-managed development process, but were 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 the LM51772-Q1 based on two different industry-wide used reliability standards:

- [Table 2-1](#) provides FIT rates based on IEC TR 62380 / ISO 26262 part 11
- [Table 2-2](#) provides FIT rates based on the Siemens Norm SN 29500-2

Table 2-1. Component Failure Rates per IEC TR 62380 / ISO 26262 Part 11

FIT IEC TR 62380 / ISO 26262	FIT (Failures Per 10 ⁹ Hours)
Total component FIT rate	30
Die FIT rate	5
Package FIT rate	25

The failure rate and mission profile information in [Table 2-1](#) comes from the reliability data handbook IEC TR 62380 / ISO 26262 part 11:

- Mission profile: Motor control from table 11 or figure 16
- Power dissipation: 1400mW
- Climate type: World-wide table 8 or figure 13
- Package factor (λ_3): Table 17b or figure 15
- Substrate material: FR4
- EOS FIT rate assumed: 0 FIT

Table 2-2. Component Failure Rates per Siemens Norm SN 29500-2

Table	Category	Reference FIT Rate	Reference Virtual T _J
5	CMOS, BICMOS ASICs analog and mixed HV >50V supply	N/A	75°C

The reference FIT rate and reference virtual T_J (junction temperature) in [Table 2-2](#) come from the Siemens Norm SN 29500-2 tables 1 through 5. Failure rates under operating conditions are calculated from the reference failure rate and virtual junction temperature using conversion information in SN 29500-2 section 4.

3 Failure Mode Distribution (FMD)

The failure mode distribution estimation for the LM51772-Q1 and LM251772-Q1 in [Table 3-1](#) comes from the combination of common failure modes listed in standards such as IEC 61508 and ISO 26262, the ratio of sub-circuit function size and complexity, and from best engineering judgment.

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

Table 3-1. Die Failure Modes and Distribution

Die Failure Modes	Failure Mode Distribution (%)
HO1 and HO2 or LO1 and LO2 gate drivers are stuck on	10
HO1 and HO2 or LO1 and LO2 gate drivers are stuck off	20
HO1 and HO2 or LO1 and LO2 gate drivers are Hi-Z	3
VCC1 and VCC2 LDO output voltage out of specification	10
DRV1 or nFLT false switching	3
VOUT voltage out of specification	30
Average current out of specifications	14
Digital control malfunctions or electrical parameters are out of specification	10

4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
May 2025	*	Initial Release

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