

TPS7B84-Q1 Functional Safety FIT Rate and FMD

1 Overview

This document contains information for TPS7B84-Q1 (DFN-6 and SOT223-4 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

Figure 1 shows the device functional block diagram for reference.

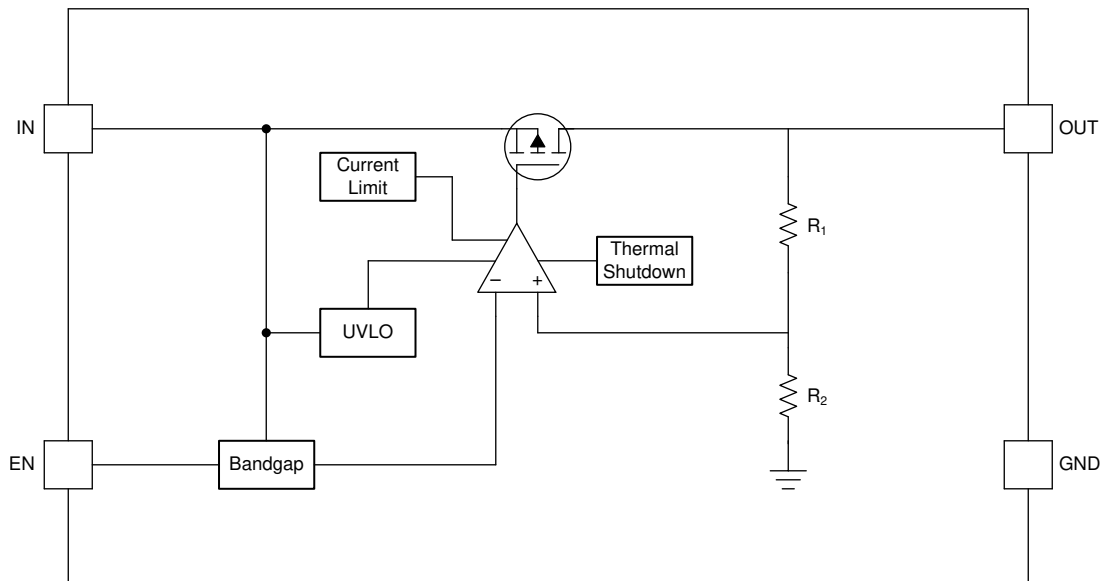


Figure 1. Functional Block Diagram

TPS7B84-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

2.1 DFN-6 Package

This section provides Functional Safety Failure In Time (FIT) rates for the DFN-6 package of TPS7B84-Q1 based on two different industry-wide used reliability standards:

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

Table 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	10
Die FIT Rate	6
Package FIT Rate	4

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

- Mission Profile: Motor Control from Table 11
- Power dissipation: 500 mW
- Climate type: World-wide Table 8
- Package factor (lambda 3): Table 17b
- Substrate Material: FR4
- EOS FIT rate assumed: 0 FIT

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

Table	Category	Reference FIT Rate	Reference Virtual T _J
5	CMOS, BICMOS ASICs Analog & Mixed ≤ 50 V supply	25 FIT	55°C

The Reference FIT Rate and Reference Virtual T_J (junction temperature) in [Table 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.

2.2 SOT223-4 Package

This section provides Functional Safety Failure In Time (FIT) rates for the SOT223-4 package of TPS7B84-Q1 based on two different industry-wide used reliability standards:

- [Table 3](#) provides FIT rates based on IEC TR 62380 / ISO 26262 part 11
- [Table 4](#) provides FIT rates based on the Siemens Norm SN 29500-2

Table 3. 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	14
Die FIT Rate	6
Package FIT Rate	8

The failure rate and mission profile information in [Table 3](#) comes from the Reliability data handbook IEC TR 62380 / ISO 26262 part 11:

- Mission Profile: Motor Control from Table 11
- Power dissipation: 500 mW
- Climate type: World-wide Table 8
- Package factor (λ_3): Table 17b
- Substrate Material: FR4
- EOS FIT rate assumed: 0 FIT

Table 4. Component Failure Rates per Siemens Norm SN 29500-2

Table	Category	Reference FIT Rate	Reference Virtual T _J
5	CMOS, BICMOS ASICs Analog & Mixed ≤ 50 V supply	25 FIT	55°C

The Reference FIT Rate and Reference Virtual T_J (junction temperature) in [Table 4](#) 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 TPS7B84-Q1 in [Table 5](#) 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 due to misuse or overstress.

Table 5. Die Failure Modes and Distribution

Die Failure Modes	Failure Mode Distribution (%)
V_{OUT} high (following V_{IN})	15%
V_{OUT} not in specification - voltage or timing	60%
V_{OUT} low (no output)	25%

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