



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 34590.11-2022

**Road vehicles - Functional safety - Part 11: Guidelines on
applications to semiconductors**

Issued on: December 30, 2022

Implemented on: July 1, 2023

Issued by: SAMR; SAC

Table of Contents

Foreword...	3
Introduction...	5
1 Scope...	9
2 Normative references...	10
3 Terms and definitions...	10
4 A semiconductor component and its partitioning...	10
4.1 How to consider semiconductor components...	10
4.2 Dividing a semiconductor component in parts...	11
4.3 About hardware faults, errors and failure modes...	11
4.4 About adapting a semiconductor component safety analysis to system level...	14
4.5 Intellectual Property (IP)...	15
4.6 Base failure rate for semiconductors...	27
4.7 Semiconductor dependent failure analysis...	57
4.8 Fault injection...	71
4.9 Production and Operation...	75
4.10 Interfaces within distributed developments...	76
4.11 Confirmation measures...	77
4.12 Clarification on hardware integration and verification...	77
5 Specific semiconductor technologies and use cases...	79
5.1 Digital components and memories...	79
5.2 Analogue/mixed signal components...	103
5.3 Programmable logic devices...	126
5.4 Multi-core components...	144
5.5 Sensors and transducers...	147

Foreword

This document was drafted in accordance with the rules provided in GB/T 1.1-2020
Directives

for Standardization - Part 1.Rules for the Structure and Drafting of Standardizing
Documents.

This document is Part 11 of GB/T 34590 Road Vehicles - Functional Safety. GB/T 34590

has

issued the following parts.

- Part 1.Vocabulary;
- Part 2.Management of Functional Safety;
- Part 3.Concept Phase;
- Part 4.Product Development at the System Level;
- Part 5.Product Development at the Hardware Level;
- Part 6.Product Development at the Software Level;
- Part 7.Production, Operation, Service and Decommissioning;
- Part 8.Supporting Processes;
- Part 9.Automotive Safety Integrity Level (ASIL)-oriented and Safety-oriented Analyses;
- Part 10.Guideline;
- Part 11.Guidelines on Applications to Semiconductors;
- Part 12.Adaptation for Motorcycles.

The revision of this document adopts ISO 26262-11:2018 "Road vehicles - Functional safety -

Part 11.Guidelines on applications of ISO 26262 to semiconductors".

The technical differences between this document and ISO 26262-11:2018 and their reasons are

as follows.

- Replace ISO 26262-1 with the normative reference GB/T 34590.1-2022 to adapt to the technical conditions of China.

The following editorial changes are made to this document.

- Delete the number of "4.1.1";
- Change the sub-clause numbers 4.3, 4.6.2.1.1, 4.6.2.1.2, 5.5.2, A.1.3 to make the structure more complete.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The issuing authority shall not be held responsible for identifying any

or all such patent rights.

This document was proposed by the Ministry of Industry and Information Technology of the People's Republic of China.

This document shall be under the jurisdiction of National Technical Committee 114 on Auto of

Standardization Administration of China (SAC/TC 114).

The drafting organizations of this document. China Automotive Technology and Research Center Co., Ltd., Infineon Technologies (China) Co., Ltd., Beijing Horizon Robot Technology Research and Development Co., Ltd., Valeo Automotive Internal Control (Shenzhen) Co., Ltd.,

Amou Technology (China) Co., Ltd., Huawei Technologies Co., Ltd. Company, Bosch Auto Parts (Suzhou) Co., Ltd., Zhuzhou CRRC Times Electric Co., Ltd., Beijing National New Energy Vehicle Technology Innovation Center Co., Ltd., SAIC Volkswagen Co., Ltd., Great Wall Motor Co., Ltd., Shanghai Shuimu Bluewhale Semiconductor Technology Co., Ltd.

Company, BYD Auto Industry Co., Ltd., Schaeffler (China) Co., Ltd., Beijing Baowo Automobile Co., Ltd., Shanghai Jinmai Electronic Technology Co., Ltd., China FAW Group Co., Ltd., Beijing Baidu Zhixing Technology Co., Ltd., CRRC Times Electric Vehicle Co., Ltd.,

Ningde Times New Energy Technology Co., Ltd., Hubei Yikatong Technology Co., Ltd., Youmuyu Information Technology (Shanghai) Co., Ltd., SAIC Maxus Automobile Co., Ltd., ALWAYS Automobile (Shanghai) Co., Ltd., Beijing Jingwei Hengrun Technology Co., Ltd., Nanjing Xinchu Semiconductor Technology Co., Ltd., Weilai Automobile (Anhui) Co., Ltd., Zhixing Automobile Technology (Suzhou) Co., Ltd., Honeycomb Energy Technology Co., Ltd.,

Suzhou Inovance United Power System Co., Ltd., Pan Asia Automotive Technology Center Co.,

Ltd., BAIC Motor Co., Ltd., Shanghai Hella Electronics Co., Ltd., ZF Automotive Technology (Shanghai) Co., Ltd., Vitesco Technology Investment (China) Co., Ltd.

1 Scope

This document is intended to be applied to safety-related systems that include one or more

electrical and/or electronic (E/E) systems and that are installed in series production road vehicles, excluding mopeds.

2 Normative references

The following referenced documents are indispensable for the application of this document.
For

dated references, only the edition cited applies. For undated references, the latest edition of the

referenced document (including any amendments) applies.

GB/T 34590.1-2022, Road vehicles - Functional safety - Part 1.Vocabulary (ISO 26262-1:2018, MOD)

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 34590.1-2022 apply.

4 A semiconductor component and its partitioning

Random hardware faults and failure modes of an integrated circuit are linked together as shown

in Figure 3 below.

A failure mode is described at a level of detail commensurate with the safety concept and the

related safety mechanism.

5 Specific semiconductor technologies and use cases

Memory fault models can vary depending on the memory architecture and memory technology.

Typical fault models of semiconductor memories are shown in Table 29.The listing is not exhaustive and can be adjusted based on additional known faults or depending on the application.

One of the key aspects for the safety analysis of analogue elements is the proper identification