Infineon

Application Note
TLE9252V

Safety Recommendations

About this document

Scope and purpose

This document provides application information for the transceiver TLE9252V from Infineon Technologies AG as Physical Medium Attachment within a Controller Area Network (CAN).

This document contains information about:

• Safety recommendations for safety relevant applications using TLE35584 and TLE9252V

This document refers to the data sheet of the Infineon Technologies AG CAN Transceiver TLE9252V. TLE9252V has been developed as QM device.

Intended audience

This document is intended for engineers who develop applications.

Note: The following information is given as a hint for the implementation of our devices only and shall not be regarded as a description or warranty of a certain functionality, condition or quality of the device.

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1 Safety Recommendations

This chapter describes the function of NSTB and EN pin of TLE9252V in more detail in respect to safety.

1.1 Device Level Single Point Failure (SPF)

This chapter describes two different failures TLE9252V may cause on HS CAN bus:

• a permanent "dominant" state on HS CAN bus:

• a permanent "recessive" state on HS CAN bus:

Note: The relevance of a device failure for the system has to be judged by the system integrator.

1.1.1 Permanent "dominant" state on HS CAN bus

An internal failure of TLE9252V causing a permanent "dominant" state on HS CAN bus will block the complete bus communication and is a cricital failure for the network. In Normal-operating Mode the receiver is enabled and will indicate a permanent "dominant" state to the microcontroller. The microcontroller will detect this failure as the CAN protocol handler will start to increase the error counter and will go to "Bus off state". For FIT rate calculations please contact **Infineon Support**.

1.1.2 Permanent "recessive" state on HS CAN bus

An internal failure of TLE9252V causing a permanent "recessive" state on HS CAN bus will not block the bus communication and is not a cricital failure for the network. Nevertheless this failure will exclude the failing CAN node form the bus communication. For FIT rate calculations please contact **Infineon Support**.

1.2 Multi Point Failure (MPF)

In case the TLF35584 or microcontroller (e.g. Aurix^{TM}) detects a failure in the system, there is the requirement for safety relevant applications to disable the transmitter of TLE9252 in order to prevent the host microcontroller from sending corrupted messages to the CAN bus or to block the CAN bus communication.

The mode selection pins EN and NSTB can be used to disable the transmitter (see **Figure 1**). By changing the state of EN or NSTB pin in Normal-operating Mode (EN = NSTB = "high") the mode of operation is changed:

• set EN pin to "low": TLE9252V enters Receive-only Mode. In Receive-only Mode the internal transmitter output stage is turned off. The receiver is still enabled also during transition from Normal-operating Mode to Receive-only Mode. Communication on the bus will be indicated on the RxD output pin to the microcontroller. In this case the microcontroller will still be able to receive all messages on the HS CAN bus.

• set NSTB pin to "low": TLE9252V enters Sleep Mode. In Sleep Mode the transmitter an receiver are turned off. Only the low power receiver is enabled and indicates a wake-up if a valid Wake-up pattern or Local Wake-up event has been detected. In case a valid wake-up event has been detected the TLE9252V goes to Stand-by Mode. In Stand-by Mode and Sleep Mode the transmitter and receiver of TLE9252V is disabled.

In both cases the transmitter is disabled. For FIT rate calculations please contact **Infineon Support**. :
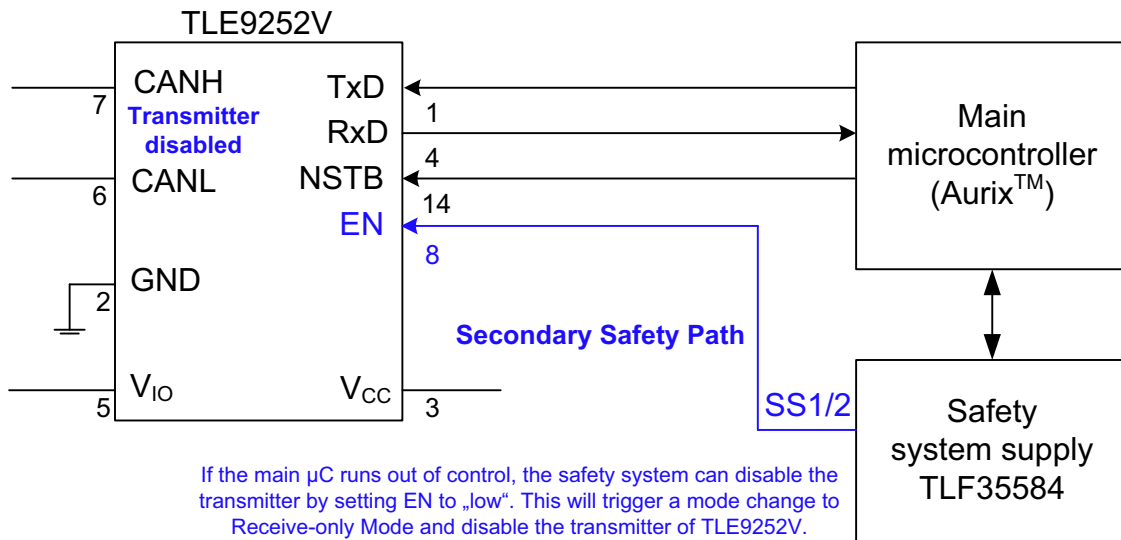
Safety Recommendations

Figure 1 Example 1: Application with Aurix^{TM} and safety system supply TLF35584 for Multi Point Failures

1.3 Common Cause Failure (CCF)

An overvoltage on QCO of TLF35584 can cause a damage of TLE9252V in case V_{CC} > 6.0V (Absolute Maximum Ratings). In this case the V_{CC} voltage has to be disconnected in order to protect TLE9252V. This can be implemented by an external MOSFET circuitry (see **Figure 2**).

As soon as there would be a potential critical situation leading to an absolute maximum rating violation on V_{CC} > 6.0V, the TLF35584 Safe State Output is able to stop driving the MOSFET in the V_{CC} supply line. This may be triggered by the monitoring functions of the TLF35584 itself or by state transition command from the microcontroller. Accordingly this disconnection switch is able to avoid a propagation of the overvoltage towards the TLE9252V V_{CC} rail.

Disconnecting the V_{CC} supply rail from TLE9252V also disables the transmitter. This also can be used in order to prevent the host microcontroller from sending corrupted messages to the CAN bus and to block the communication on the CAN bus.
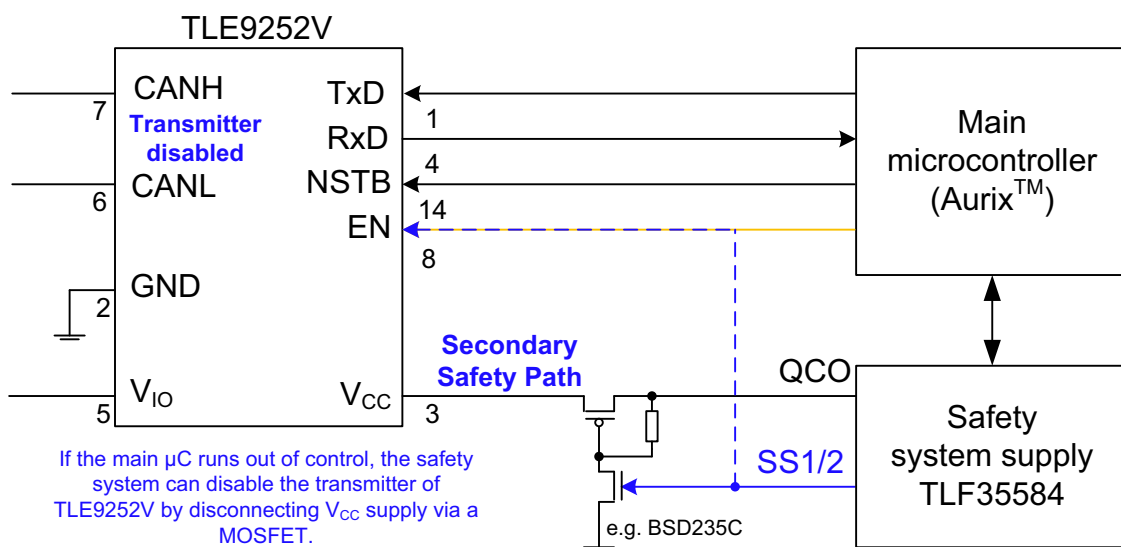

Figure 2 Example 2: Application with Aurix^{TM} and safety system supply TLF35584 for Common Cause and Multi Cause Failure

Terms and Abbreviations

Table 1   Terms and Abbreviations

CMC	Common mode choke
EMC	Electromagnetic compatibility
EME	Electromagnetic emission
EMI	Electromagnetic interference
EOS	Electrical overstress
ESD	Electrostatic discharge
ESR	Equivalent Series Resistance
"high"	logical high
"low"	logical low
WUP	Wake-up pattern

2   Revision History

Revision	Date	Changes
1.0	2017-12-12	Application Note created

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