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AMIS−30663 − Loss of 3.3 V Digital I/O Supply

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APPLICATION NOTE

INTRODUCTION

This document describes the behavior of the AMIS−30663 high speed CAN transceiver in case the supply for the digital I/O is lost.

PROBLEM DESCRIPTION

When the supply of the digital I/O is lost this will have influence on the communication between the CAN controller and the AMIS−30663 CAN transceiver and on the communication on the bus. Two cases can be distinguished:

- V33 (Pin 8) is interrupted for the transceiver only (still Tx transmission from the controller)
- The common 3.3 V supply for CAN controller and transceiver is lost (no communication from controller)

CASE STUDY

Measurement Set−Up

All measurements were done on the set−up illustrated in Figure 1.

V33 is Interrupted for Transceiver Only

When the I/O supply of the transceiver is interrupted and the CAN controller is still supplied, there will still be a TxD transmission possible. RxD is a constant low (or dominant).

As a consequence, communication from the controller to the bus is still possible but communication from CAN−bus to controller is blocked (RxD = 0). See oscilloscope plots below.

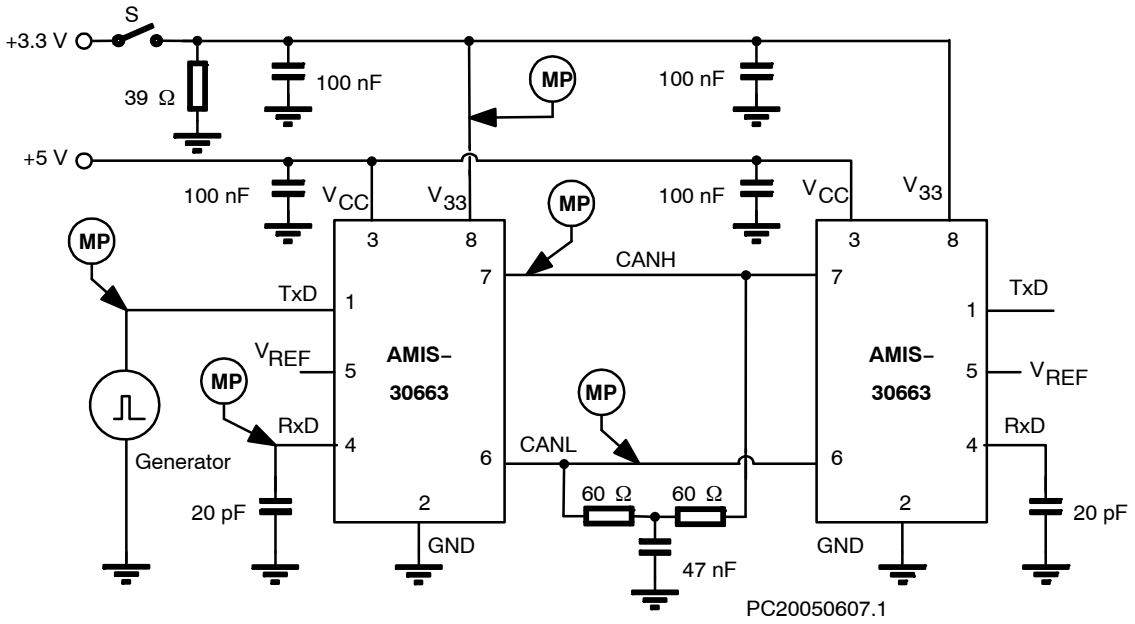
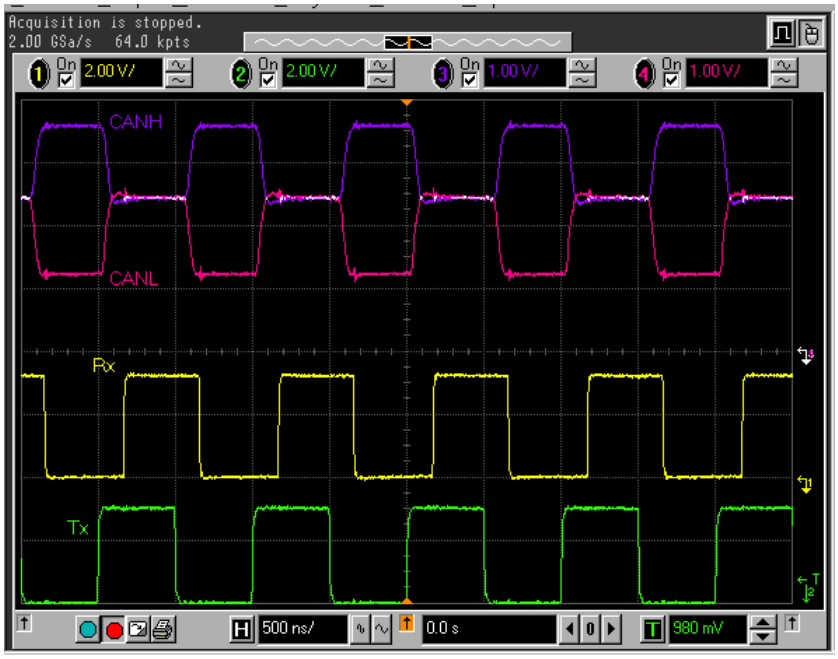
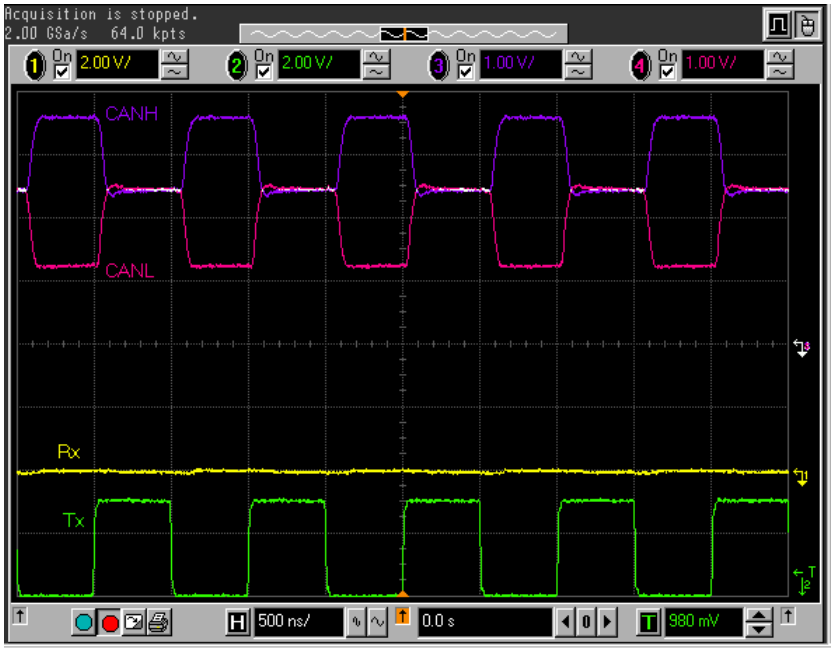


Figure 1. Measurement Set−Up



Freq: 1 MHz
Purple: CANH
Red: CANL
Yellow: RxD
Green: TxD

Figure 2. Normal Communication, S Closed V33 Present, Communication via TxD

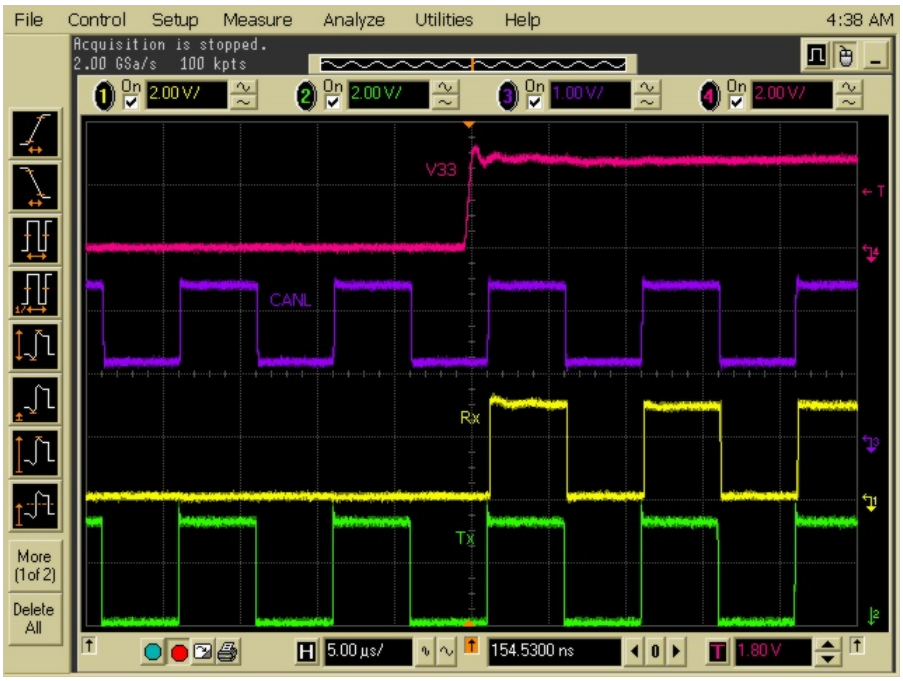


Freq: 1 MHz
Purple: CANH
Red: CANL
Yellow: RxD
Green: TxD

Figure 3. S is Open, V33 is Lost for Transceiver Only, Transmission is Still Possible

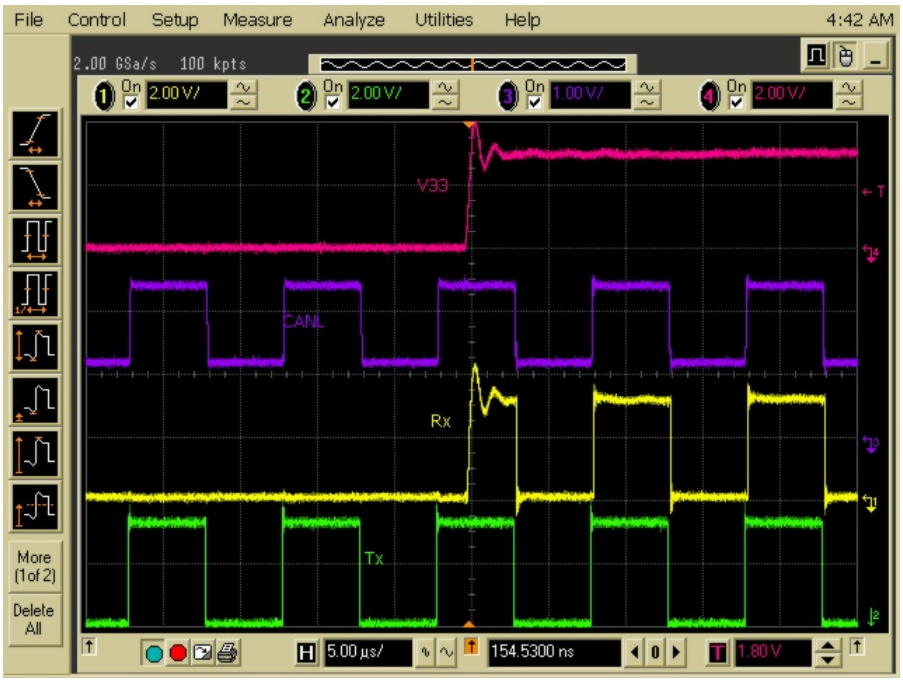
When the I/O supply of the transceiver is interrupted and the CAN controller is still supplied, there will still be a TxD transmission possible. Transients on the I/O supply will not have any influence on the communication on the bus, but enables the RxD driver.

The oscilloscope plots below show the effect when V33 is switched on during dominant (TxD = 0) or recessive (TxD = 1) state.



Freq: 1 MHz
Purple: CANL
Red: V33
Yellow: RxD
Green: TxD

Figure 4. S is Closed → V33 Transient at Dominant State (TxD = 0)

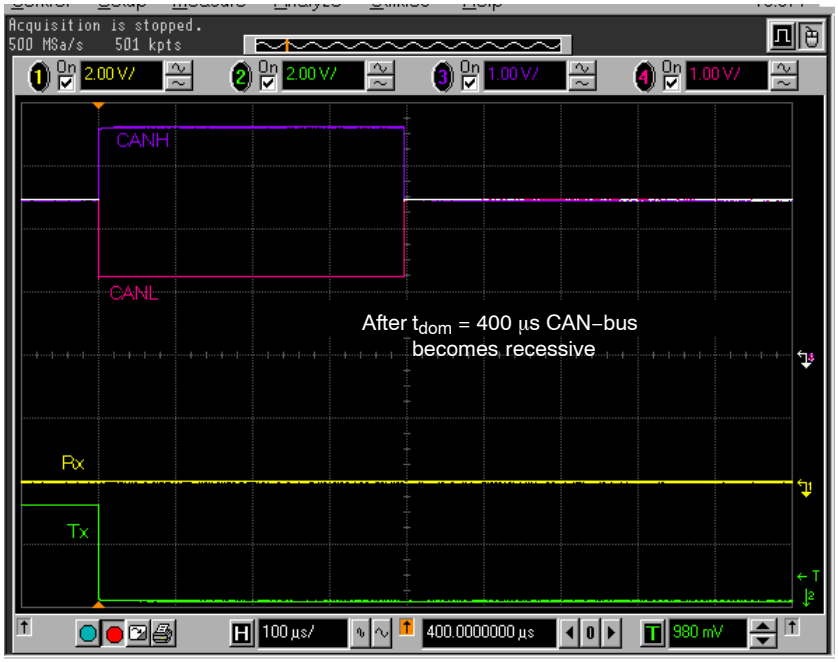


Freq: 1 MHz
Purple: CANL
Red: V33
Yellow: RxD
Green: TxD

Figure 5. S is Close → V33 Transient at Recessive State (TxD = 1)

V33 is Interrupted for Both Transceiver and CAN Controller

When the I/O supply of the transceiver is interrupted and the CAN controller is not supplied anymore, TxD transmission is possible. TxD will be 0 and the CAN bus becomes dominant. After the t_{dom} time−out (typically 450 µs) the CAN−bus becomes recessive. Further communication by other CAN nodes remains possible.



Purple: CANH
Red: CANL
Yellow: RxD
Green: TxD

Figure 6. S = Open, V33 is Lost for Both Transceivers as Controller, After the Dominant Time−Out the CAN−Bus Becomes Recessive

CONCLUSION

When V33 I/O supply is lost in the AMIS−30663 transceiver only, transmission is still possible. The receiver output signal cannot propagate through the digital interface of the chip: RxD = 0 constantly. The CAN controller will see that the RxD is constant dominant although it sends data on the CAN bus. This will lead to an error state of this node which will, after several re−trials as defined by the CAN protocol, put itself to the “bus−off” state and will stop the transmission attempts. The CAN bus itself will then not be affected and communication between other nodes on that bus will remain undisturbed.

When both V33 I/O supply of the AMIS−30663 and the 3.3 V CAN controller supply are lost, the CAN bus will be “decoupled” after a time−out of typically 450 µs (CAN bus becomes recessive after t_{dom}). Again the CAN bus itself will not be affected and communication between other nodes on that bus will remain undisturbed.

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