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AMIS−30660 Minimum Communication Speed

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APPLICATION NOTE

Introduction

The AMIS−30660 is designed for high speed CAN transmission. This means that communication up to 1 Mbps is guaranteed. The minimum speed is defined by the TxD dominant time−out and the used symbol length in the protocol. The CAN protocol ensures, that no more than 5 identical consecutive bits occur in an error−free bit stream. However, in a situation when an error shall be flagged on the bus, up to 12 consecutive dominants (logical 0's) can be encountered. If the symbol length is 12 bits, the minimum speed is 48 kbps.

Measurement Setup

Figure 1 shows the measurement setup used to determine the minimum speed of operation:

- A high speed AMIS−30660 CAN transceiver is connected through a terminated CAN network to a second AMIS−30663 CAN transceiver.
- A generator is sending a square wave signal with 5 V amplitude and varying frequency in the TxD pin of the first CAN transceiver.
- With a four−channel oscilloscope TxD, CANH, CANL, and RxD of the second transceiver is monitored.

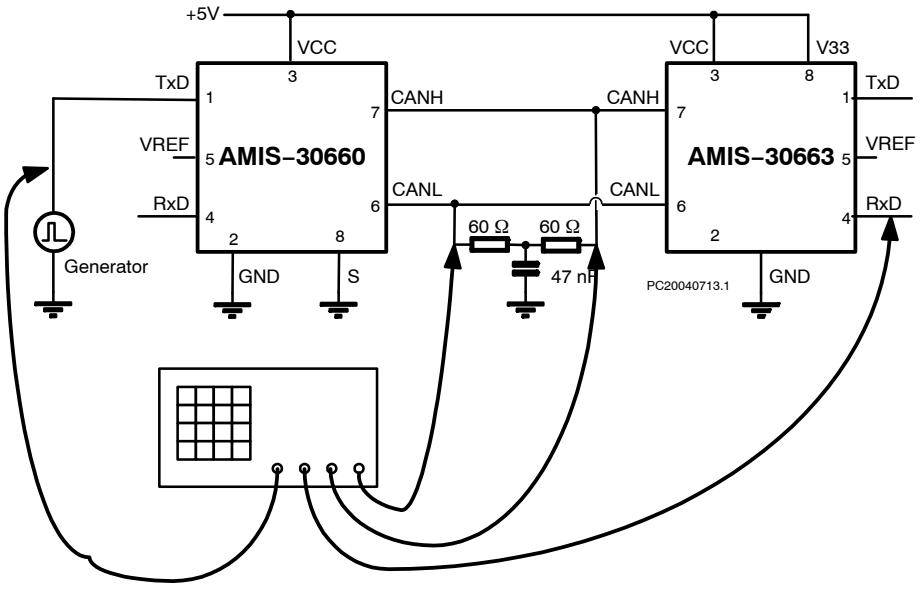

Figure 1. Measurement Setup

Observation

When the frequency of the square wave signal at the TxD pin is gradually decreased, the signal at the RxD of the second transceiver is also lowered in frequency. Below a certain frequency the duty cycle starts to be effected. The transmission of the dominant level (CANH = high and CANL = low) is ceased after a time−out period. This time−out is the maximum low time at the RxD pin. As illustrated below the measured maximum (RxD) dominant time is 391 μs.

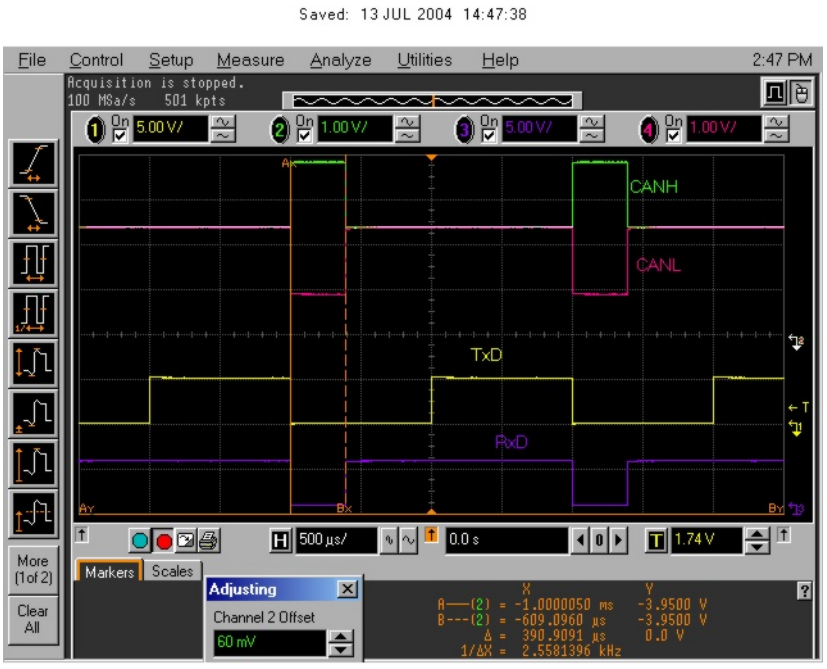

Figure 2. Measurement Result

Explanation

In Table 1, taken from the AMIS−30660 data sheet, there is a time−out for dominant TxD signaling. This prevents the bus−lines being driven to a permanent dominant state blocking all network communication.

Table 1. TIMING CHARACTERISTICS; AMIS−30660 DATA SHEET, PAGE 9

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
TIMING CHARACTERISTICS (see Figures 6 and 7)						
$t_{dom(TXD)}$	TXD dominant time for time out	V_{TXD} = 0 V	250	450	750	µs

The typical value indicated in the datasheet is 450 µs. To calculate the minimum transmission speed the minimum value (250 µs) needs to be taken. This yields in:

$$f_{TxD,min} = \frac{1}{t_{dom,min}} = \frac{1}{250\ \mu s} = 4\ kHz$$

This means that the minimum theoretical bit−rate is 4 kbps provided that no more than 1 dominant (logical 0) is transmitted in a row.

The practically usable baud rate is defined as the theoretical minimum bit−rate multiplied by the maximum symbol length.

If the symbol length was 1 bit, which means that the maximum dominant state length is one bit−time, the minimum speed would be 4 kbps. If 12 consecutive zero's are allowed – as it's the case for the CAN protocol, or the symbol length is 12 bit, than the minimum speed is 4 x 12 = 48 kbps.

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