

## 125 kbps with AMIS-4168x



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### APPLICATION NOTE

#### Introduction

##### Question

“Is it possible to drive 125kB with the AMIS-41682?” Please consider all possible CAN bit timings (TSEG1, TSEG2, SJW), a capacitive load at each can pin about 300 pF and  $l = 20\text{m}$  line (5 ns/m) length. Please investigate different communication scenarios (e.g. arbitration).

##### Conclusion

The maximum propagation delay measured at 125 kB is 1.555  $\mu\text{s}$ . This is for 270 pF capacitive load and a bus length of 20m. When using the AMIS-41682, the user has to

program the CAN-controller in such a way that the propagation segment of a bit time accounts for two maximum propagation delays to ensure correct function of the bus during arbitration and acknowledgment. In our example, the propagation segment shall be at least 3.11  $\mu\text{s}$  long.

If for instance the bit time is divided in 16 time quanta ( $t_q$ ),  $t_q$  will be 0.5  $\mu\text{s}$  and the Prop\_Seg has to be set to  $7 t_q = 3.5 \mu\text{s}$ . By applying this CAN-controller setting, it's ensured that the bus signal will be sampled correctly in all situations.

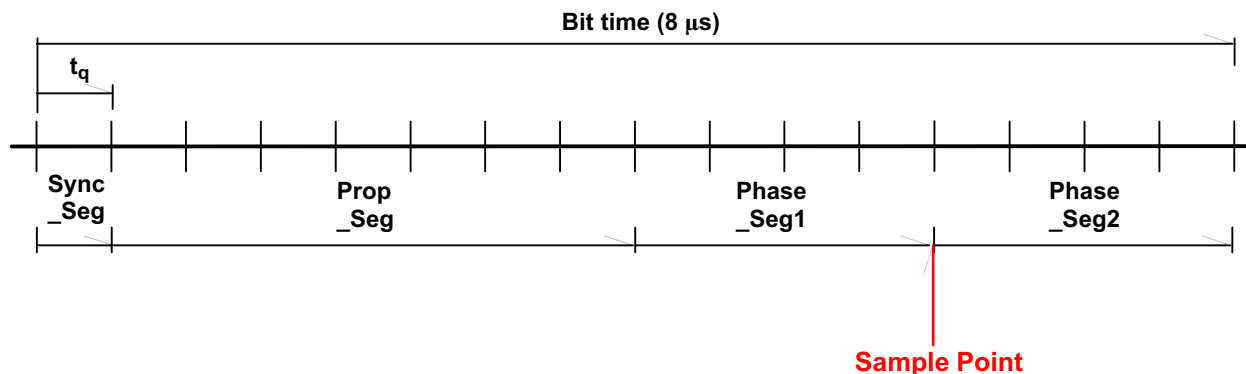


Figure 1. Example of CAN-Controller Setting Suitable for 125kB Operation with AMIS-4168x

Overall, it is not a problem to drive 125 kB with the AMIS-41682.

#### Performed Measurements

Propagation delay between Tx\_1 and Rx\_1 (transceiver 1) and Tx\_1 and Rx\_2 (receive transceiver 2) for different cable length, and CANL/CANH termination of 220  $\Omega$ .

Used equipment:

- Oscillator type: Hewlett-Packard 3310A Function Generator; frequency 62.5 kHz ( $t_{\text{bit}} = 8 \mu\text{s}$ )

- Oscilloscope type: Agilent Infiniium 600 MHz, 4 GSa/s
- Power supply: Thurlby Thandar Instruments PL310QMD
- Cable: Alcatel TIA/EIA 568-B.2 Category 5e; 100  $\Omega$ ; propagation delay: 570 ns/100m at 1 MHz

The circuit shown in was Figure 2 used for the measurement.

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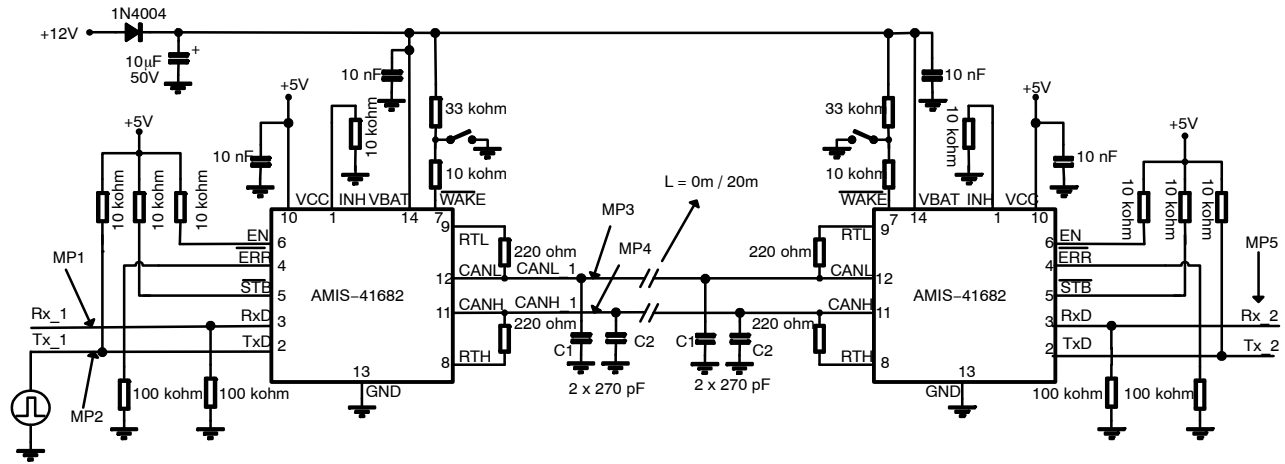


Figure 2. Measurement Set-Up

## Measurements Results

Propagation delay (see data sheet) L → H and H → L for different bus configurations.

$T_{bit} = 8 \mu s$

$T_{amb} = 25^\circ C$

Table 1. MEASURED PROPAGATION DELAYS

Symbol	Parameter	Condition	Value	Comment
$t_{PD(H)}$	Propagation delay Tx_1 to Rx_1 high	$C_1 = C_2 = 270 \text{ pF}$ $L = 0m$	1.041 $\mu s$	See Figure 3
$t_{PD(L)}$	Propagation delay Tx_1 to Rx_1 low	$C_1 = C_2 = 270 \text{ pF}$ $L = 0m$	1.107 $\mu s$	See Figure 4
$t_{PD(H)}$	Propagation delay Tx_1 to Rx_2 high	$C_1 = C_2 = 270 \text{ pF}$ $L = 0m$	1.051 $\mu s$	See Figure 5
$t_{PD(L)}$	Propagation delay Tx_1 to Rx_2 low	$C_1 = C_2 = 270 \text{ pF}$ $L = 0m$	1.110 $\mu s$	See Figure 6
$t_{PD(H)}$	Propagation delay Tx_1 to Rx_1 high	$C_1 = C_2 = 270 \text{ pF}$ $L = 20m$	1.536 $\mu s$	See Figure 7
$t_{PD(L)}$	Propagation delay Tx_1 to Rx_1 low	$C_1 = C_2 = 270 \text{ pF}$ $L = 20m$	1.176 $\mu s$	See Figure 8
$t_{PD(H)}$	Propagation delay Tx_1 to Rx_2 high	$C_1 = C_2 = 270 \text{ pF}$ $L = 20m$	1.555 $\mu s$	See Figure 9
$t_{PD(L)}$	Propagation delay Tx_1 to Rx_2 low	$C_1 = C_2 = 270 \text{ pF}$ $L = 20m$	1.244 $\mu s$	See Figure 10

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## Measurements Cable Length 0m

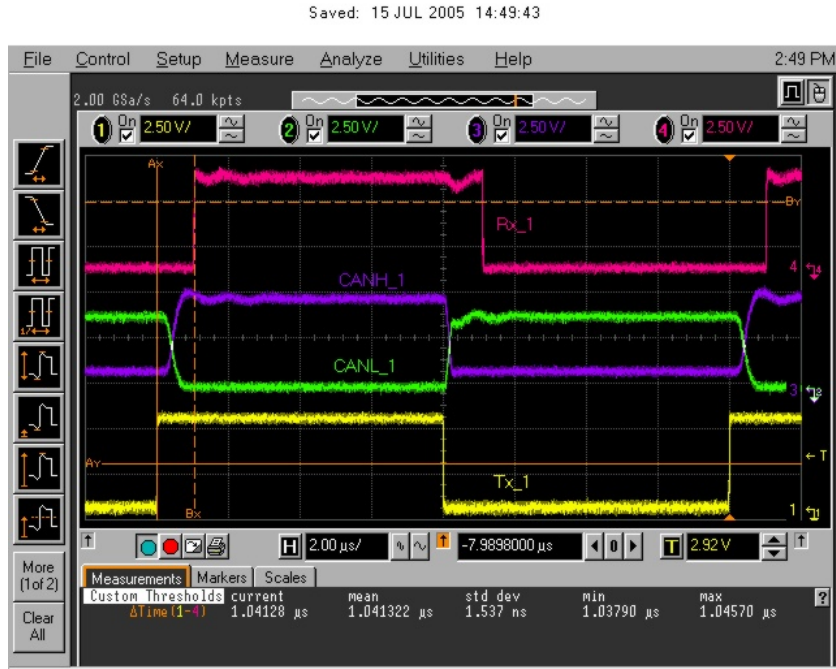


Figure 3. Propagation Delay  $t_{PD(H)}$  Between Tx\_1 and Rx\_1 at 125kB and Cable Length 0m = 1.041 μs

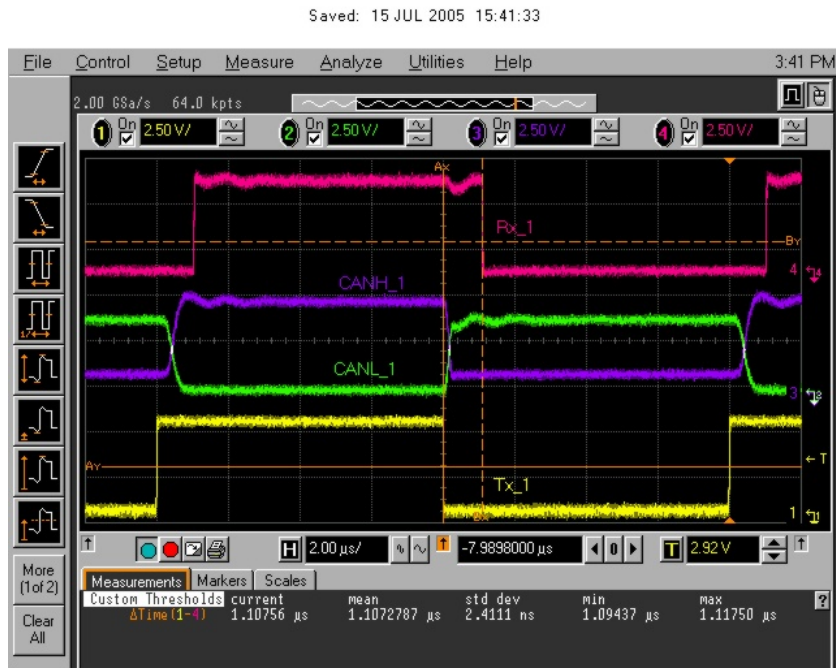


Figure 4. Propagation Delay  $t_{PD(L)}$  Between Tx\_1 and Rx\_1 at 125kB and Cable Length 0m = 1.107 μs

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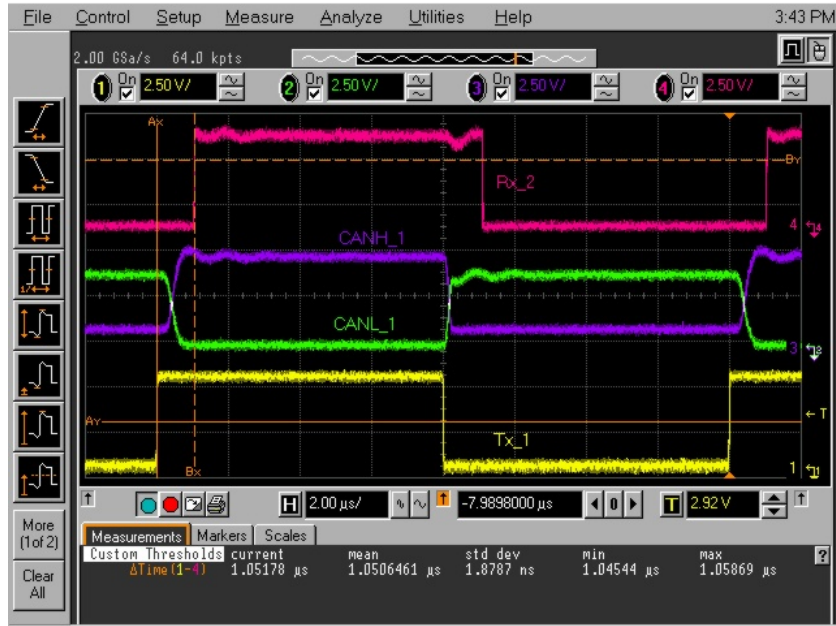


Figure 5. Propagation Delay  $t_{PD(H)}$  Between Tx\_1 and Rx\_2 at 125kB and Cable Length 0m = 1.051 μs

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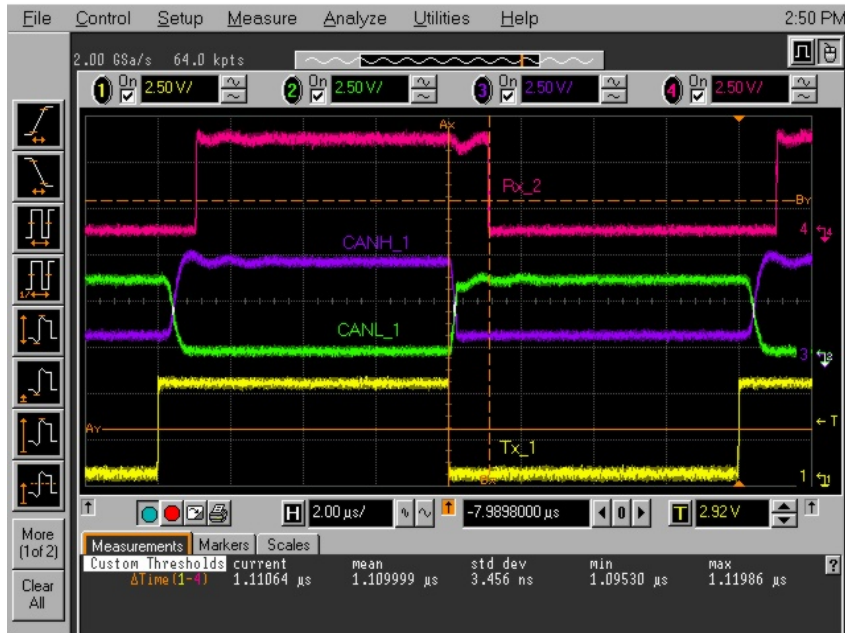


Figure 6. Propagation Delay  $t_{PD(L)}$  Between Tx\_1 and Rx\_2 at 125kB and Cable Length 0m = 1.110 μs

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## Measurements Cable Length 20m

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Figure 7. Propagation Delay  $t_{PD(H)}$  Between Tx\_1 and Rx\_1 at 125kB and Cable Length 20m = 1.536  $\mu$ s

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Figure 8. Propagation Delay  $t_{PD(L)}$  Between Tx\_1 and Rx\_1 at 125kB and Cable Length 20m = 1.176  $\mu$ s



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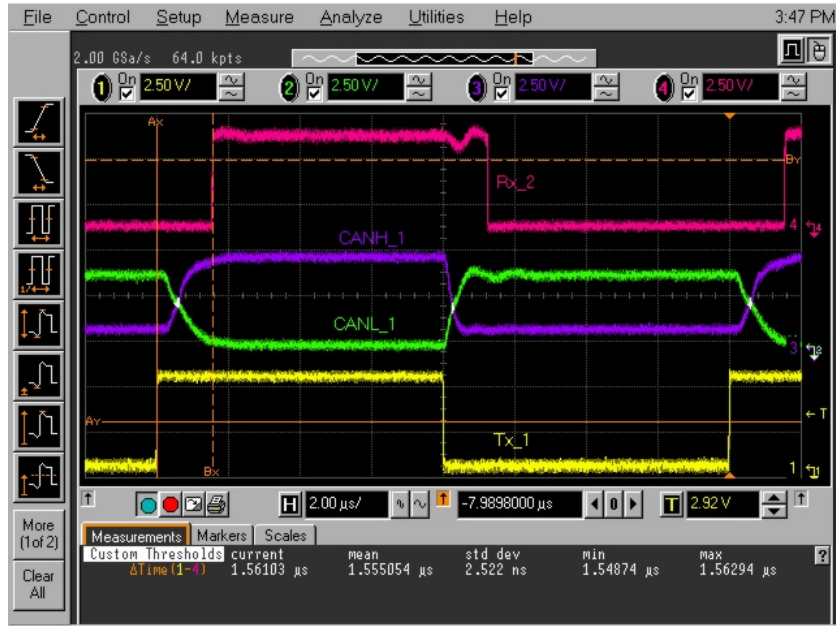


Figure 9. Propagation Delay  $t_{PD(H)}$  Between Tx\_1 and Rx\_2 at 125kB and Cable Length 20m = 1.555  $\mu$ s

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Figure 10. Propagation Delay  $t_{PD(L)}$  Between Tx\_1 and Rx\_2 at 125kB and Cable Length 20m = 1.244  $\mu$ s

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