AND8364/D

AMIS-42665 Extended Voltage Range

ON Semiconductor®

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APPLICATION NOTE

Introduction

This document provides the results of the AMIS−42665 high speed low power CAN transceiver when used in an extended voltage range and answers whether or not the AMIS−42665 can operate at a voltage level of 5.5 V ± 0.1 V.

The AMIS−42665 can operate within the extended voltage range (5.4 V < V_{CC} < 5.6 V) without any risk or damage or reduced lifetime.

ON Semiconductor can not be hold responsible if the ISO 11898 standard is not met outside the normal operating range (4.75 V < V_{CC} < 5.25 V).

However, measurements on a limited set of samples at room temperature shows that at the extended voltage range all parameters are within the ISO 11898 standard.

General

The AMIS−42665 CAN transceiver is the interface between a controller area network (CAN) protocol controller and the physical bus. It may be used in both 12 V and 24 V systems. The transceiver provides differential transmit capability to the bus and differential receive capability to the CAN controller.

Perfect operation of the AMIS−42665 CAN transceiver is guaranteed if the supply voltage V_{CC} is between 4.75 V and 5.25 V (4.75 V < V_{CC} < 5.25 V). The absolute maximum supply voltage is 7 V. Permanent device failure is possible when going above this absolute maximum rating.

For more info about the AMIS−42665 CAN transceiver refer to the AMIS−42665 datasheet (http://www.onsemi.com/).

Extended Voltage Range Test

Being in line with the ISO 11898 standard is only guaranteed if the power supply V_{CC} is between 4.75 V and 5.25 V (normal operating voltage). To check the behavior of the AMIS−42665 outside this normal operating voltage, tests were done at higher supply voltage. The supply voltages used were 5 V, 5.25 V, 5.5 V, 5.75 V, and 6 V.

All tests were done on two devices. Each device was tested four times on every supply voltage V_{CC} with T_A = 25°C.

A resistor of 60 Ω (R_L) parallel with a capacitor of 100 pF (C_L) was placed between the CANH and CANL pin as bus termination. The transceiver was operating in normal mode.

Test Results

Dominant Bus Voltages

Figure 4 represents the voltages on the CANH and CANL bus in dominant state for the different supply voltages (V_{CC}). Also shown are the data sheet values. These are the maximum and minimum values that are guaranteed. However, this guarantee is only applicable when V_{CC} is between 4.75 V and 5.25 V (4.75 V < V_{CC} < 5.25 V).

Figure 4 shows that CANH will go above the maximum dominant CANH voltage (data sheet). Within the extended voltage range, however, the dominant CANH voltage stays below the maximum dominant CANH voltage (datasheet). Be aware, this was tested on only two samples (statistically not significant).

Figure 1 gives a better view on how V_{CANH} and V_{CANL} are measured.

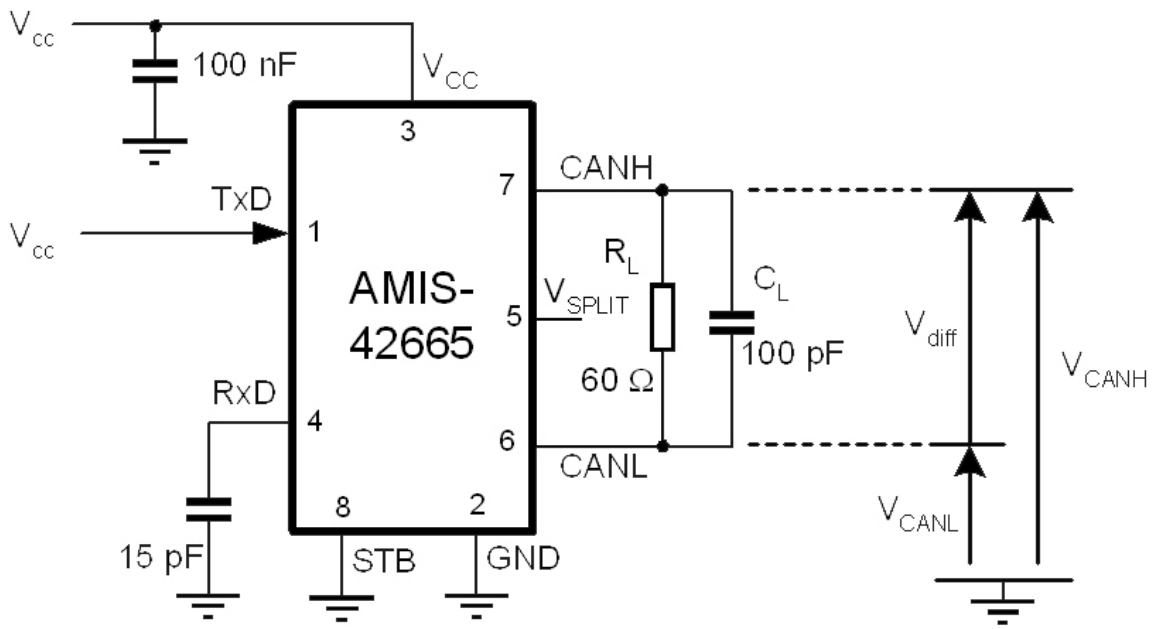

Figure 1. Set−up V_{CANH} and V_{CANL}

Differential Bus Output Voltages

Figure 5 represents the differential bus output voltage (V_{CANH} − V_{CANL}) in dominant state. Two different measurements are done, RL = 60 Ω and RL = 42.5 Ω. The chart also displays the minimum and maximum differential bus output voltage (data sheet). Be aware, this minimum and maximum is only guaranteed if the voltage supply V_{CC} is between 4.75 V and 5.25 V (4.75 V < V_{CC} < 5.25 V).

One can see that the differential bus output voltage, when R_L = 60 Ω, will go above 3 V. In the extended voltage range, however, this stays below the 3 V. Again, this was tested only on two samples (statistically not significant).

For this test, a similar set−up as in previous test was used (see Figure) with the exception that the test was also done with R_L = 42.50 Ω.

Differential Bus Receiver Thresholds

Figure 6 shows the differential receiver high threshold voltage for CMV = +12 V (V_{iDifHi_pos}) and for CMV = −5 V (V_{iDifHi_neg}).

V_{iDifHi_pos} is measured as:
V_{CANL} = 12 V, binary search V_{CANH} from 12.4 V to 13 V and look for change from ’1’ to ’0’ on pin RxD (see also Figure 2).

V_{iDifHi_neg} is measured like next:
V_{CANH} = −5 V, binary search V_{CANL} from –5.4 V to –6 V and look for change from ’1’ to ’0’ on pin RxD (see also Figure 3).

Figure 6 shows the minimum and maximum differential receiver high threshold voltage (datasheet). Again, this minimum and maximum is only guaranteed within a voltage range of 4.75 V and 5.25 V (4.75 V < V_{CC} < 5.25 V).

V_{iDifHi_pos} and V_{iDifHi_neg} will go higher than the maximum but this is outside the extended voltage range. Again, this was measured only on two samples (statistically not significant).

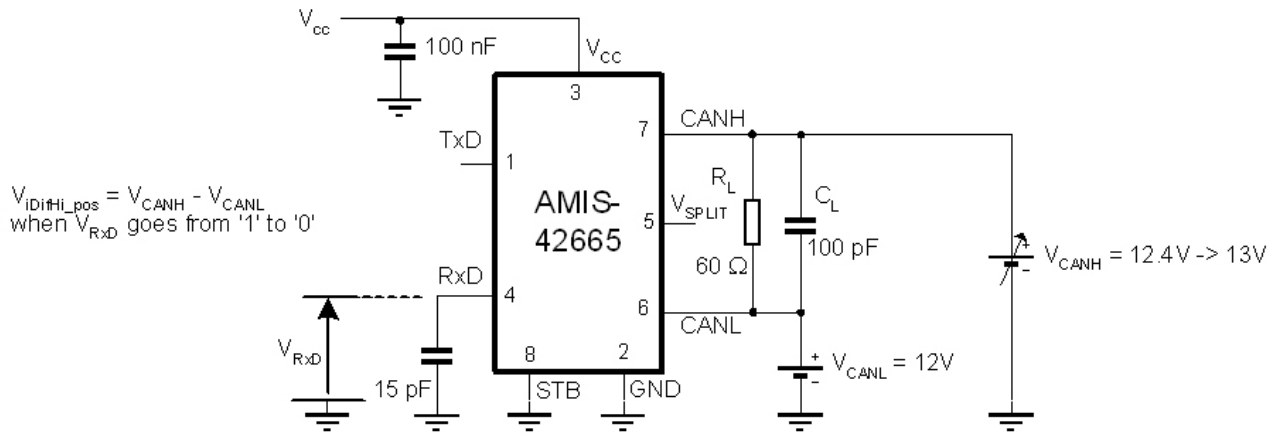

Figure 2. Differential Receiver High Threshold Voltage for CMV = +12 V

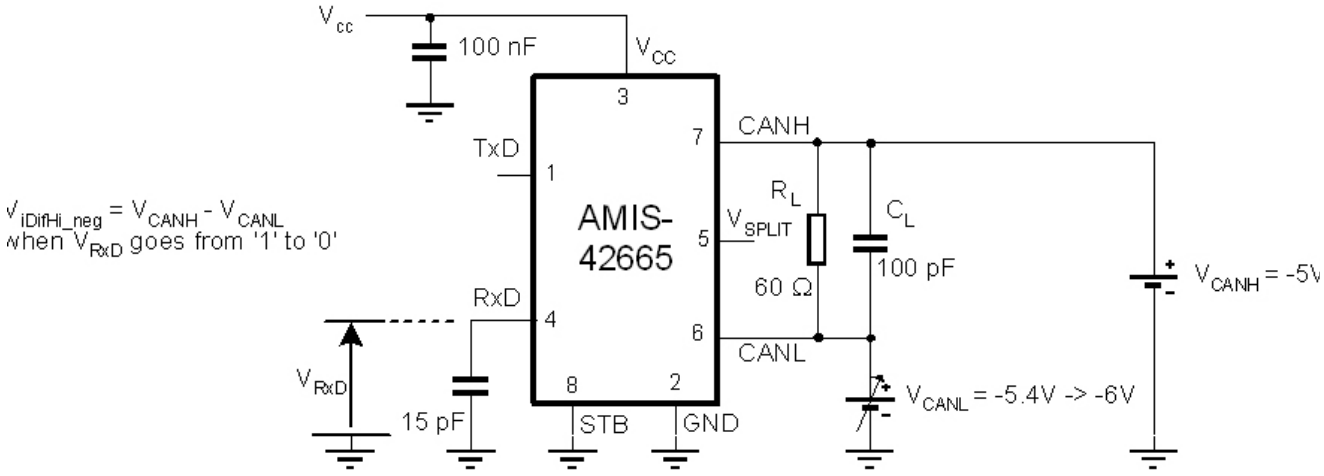

Figure 3. Differential Receiver High Threshold Voltage for CMV = −5 V

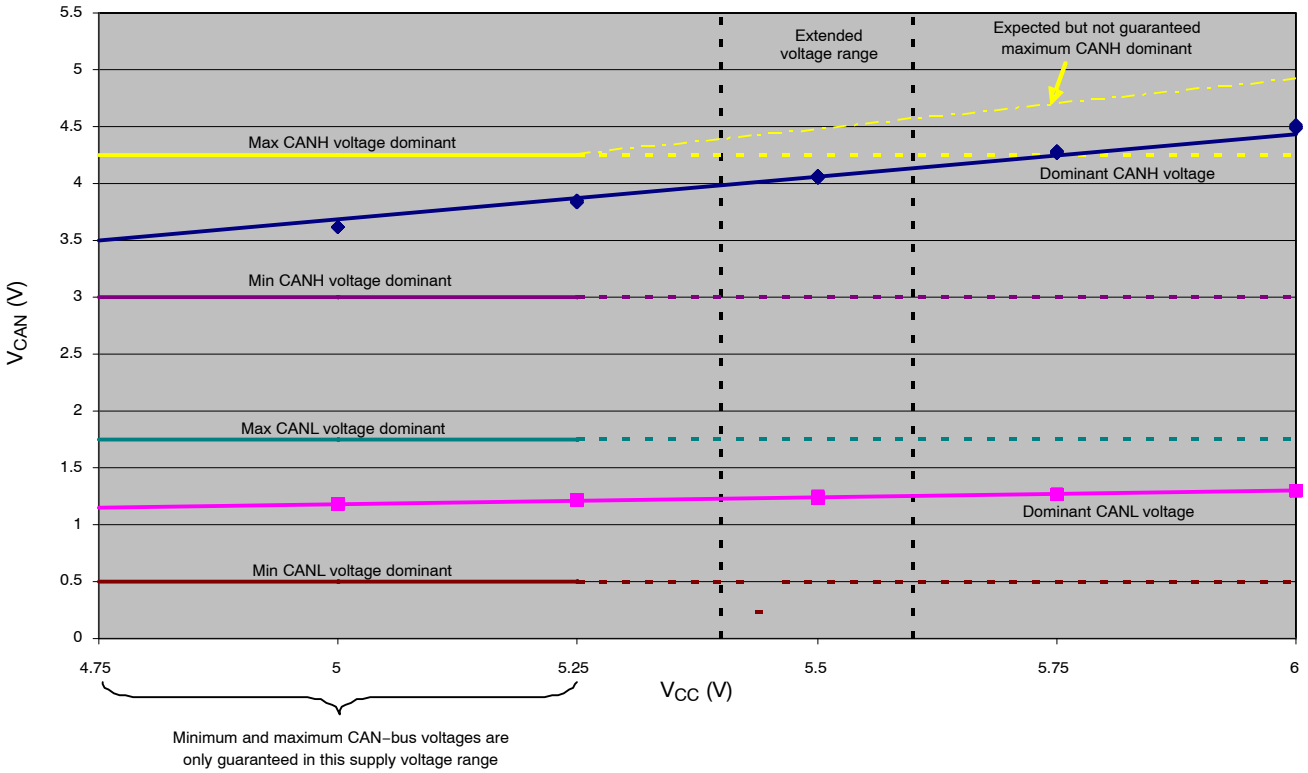

Figure 4. AMIS−42665 CAN−Bus Voltages

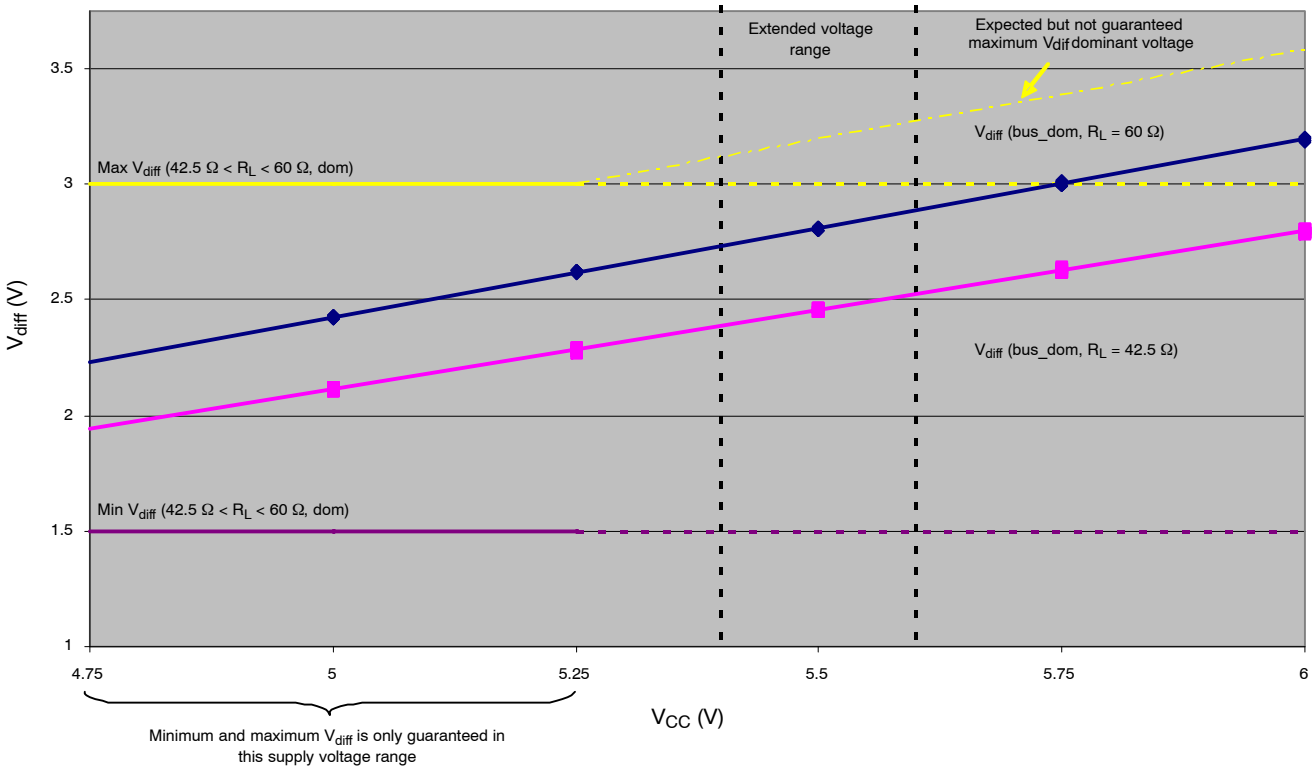

Figure 5. AMIS−42665 Dominant Differential Bus Output Voltage

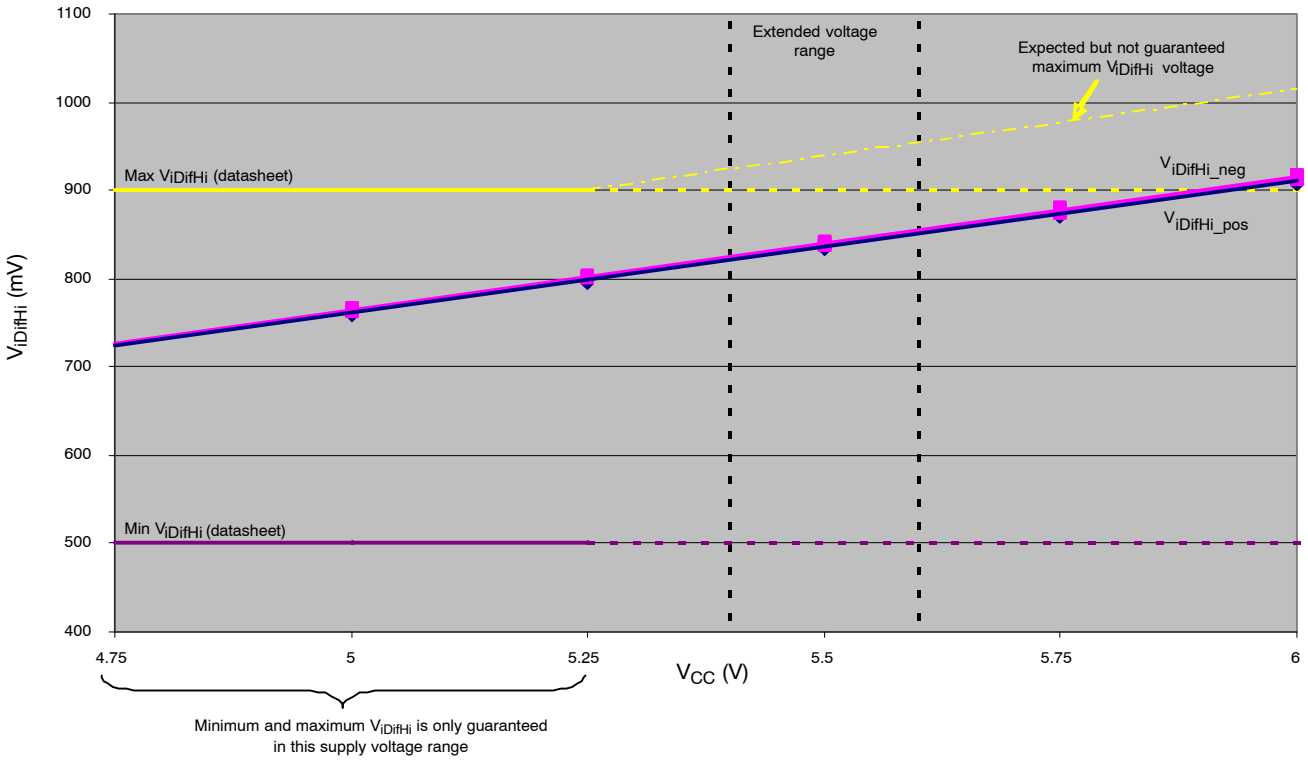

Figure 6. AMIS−42665 Differential Receiver High Threshold Voltage

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