

AMIS-42665 Extended Voltage Range



ON Semiconductor®

<http://onsemi.com>

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 $5.5\text{ V} \pm 0.1\text{ V}$.

The AMIS-42665 can operate within the extended voltage range ($5.4\text{ V} < V_{CC} < 5.6\text{ V}$) 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 ($4.75\text{ V} < V_{CC} < 5.25\text{ V}$).

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 ($4.75\text{ V} < V_{CC} < 5.25\text{ V}$). 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 $T_A = 25^\circ\text{C}$.

A resistor of $60\ \Omega$ (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 ($4.75\text{ V} < V_{CC} < 5.25\text{ V}$).

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.

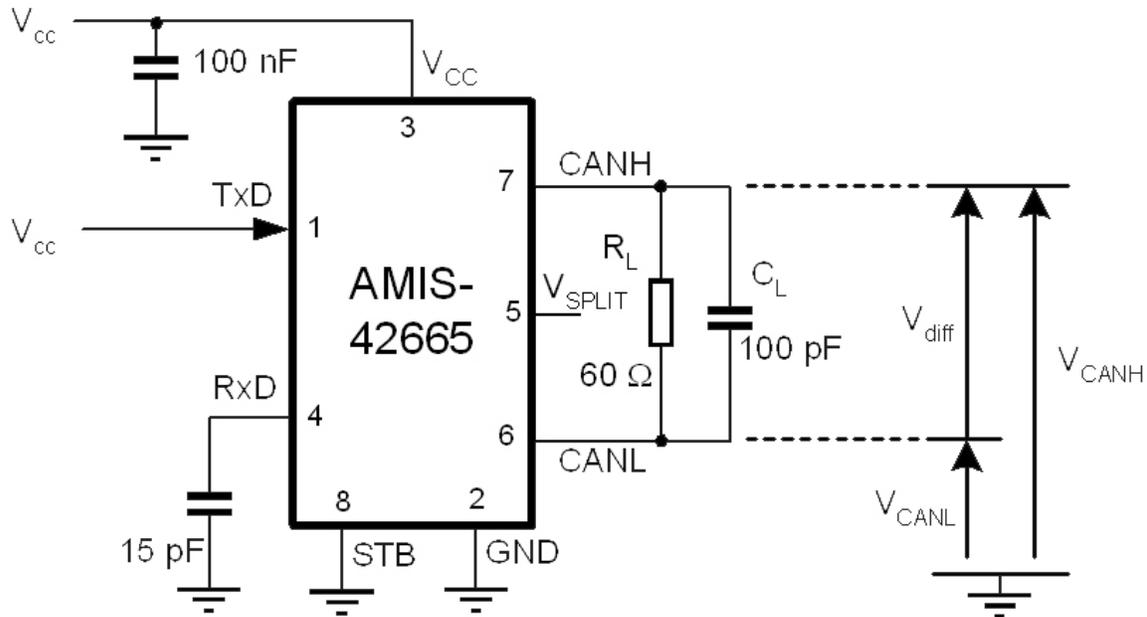


Figure 1. Set-up V_{CANH} and V_{CANL}

Differential Bus Output Voltages

Figure 5 represents the differential bus output voltage ($V_{CANH} - V_{CANL}$) in dominant state. Two different measurements are done, $R_L = 60 \Omega$ and $R_L = 42.5 \Omega$. 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 $R_L = 60 \Omega$, 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 $R_L = 42.50 \Omega$.

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).

AND8364/D

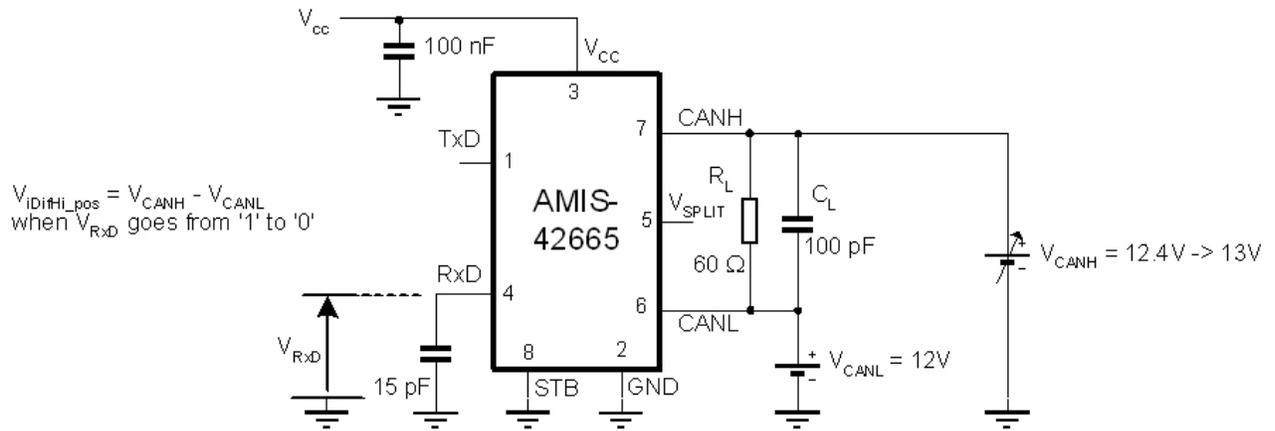


Figure 2. Differential Receiver High Threshold Voltage for CMV = +12 V

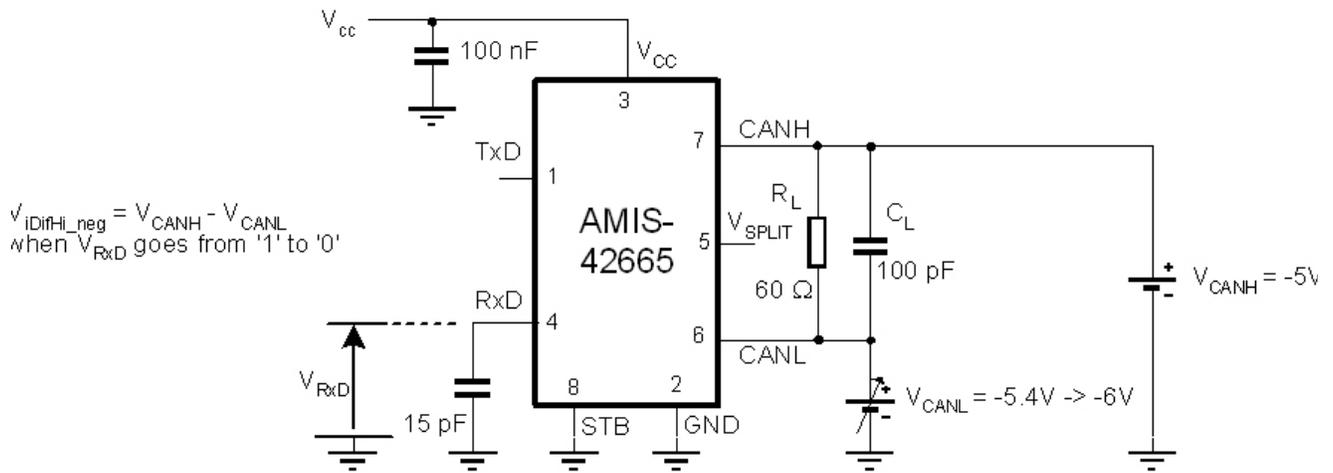


Figure 3. Differential Receiver High Threshold Voltage for CMV = -5 V

AND8364/D

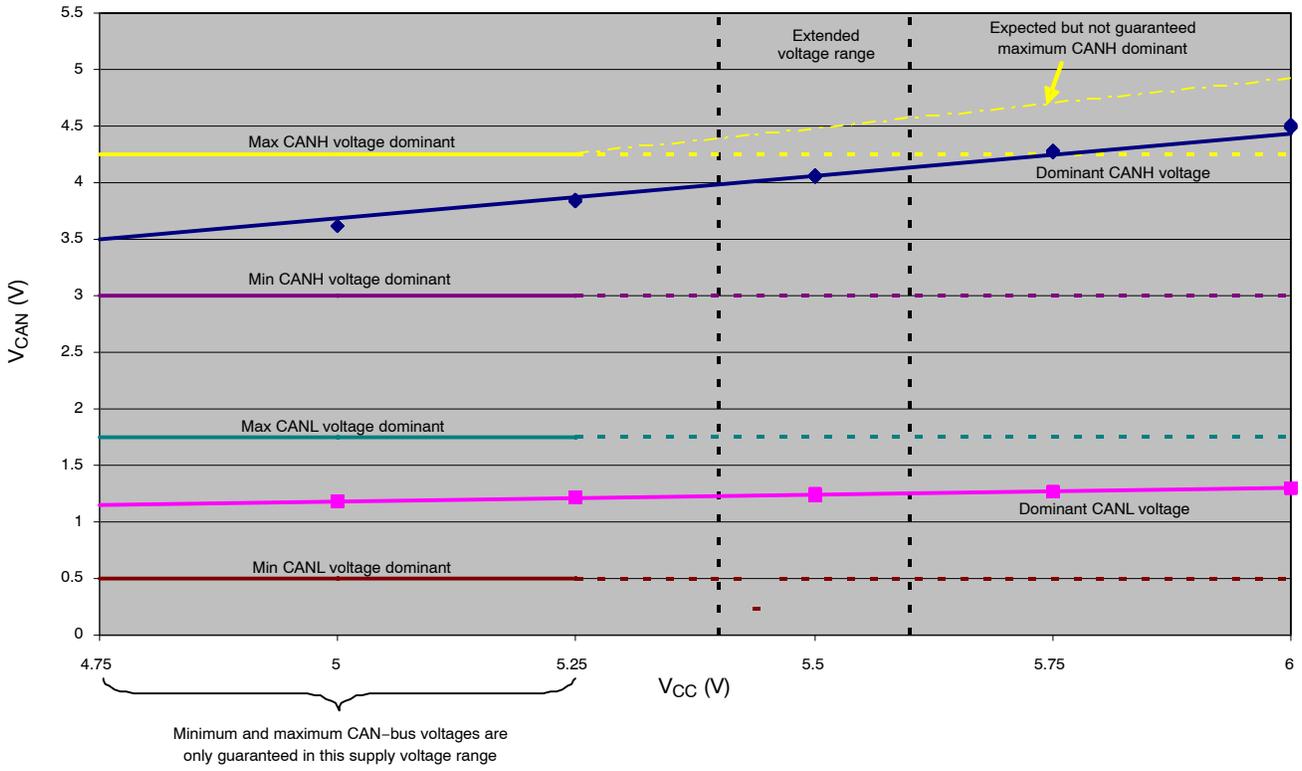


Figure 4. AMIS-42665 CAN-Bus Voltages

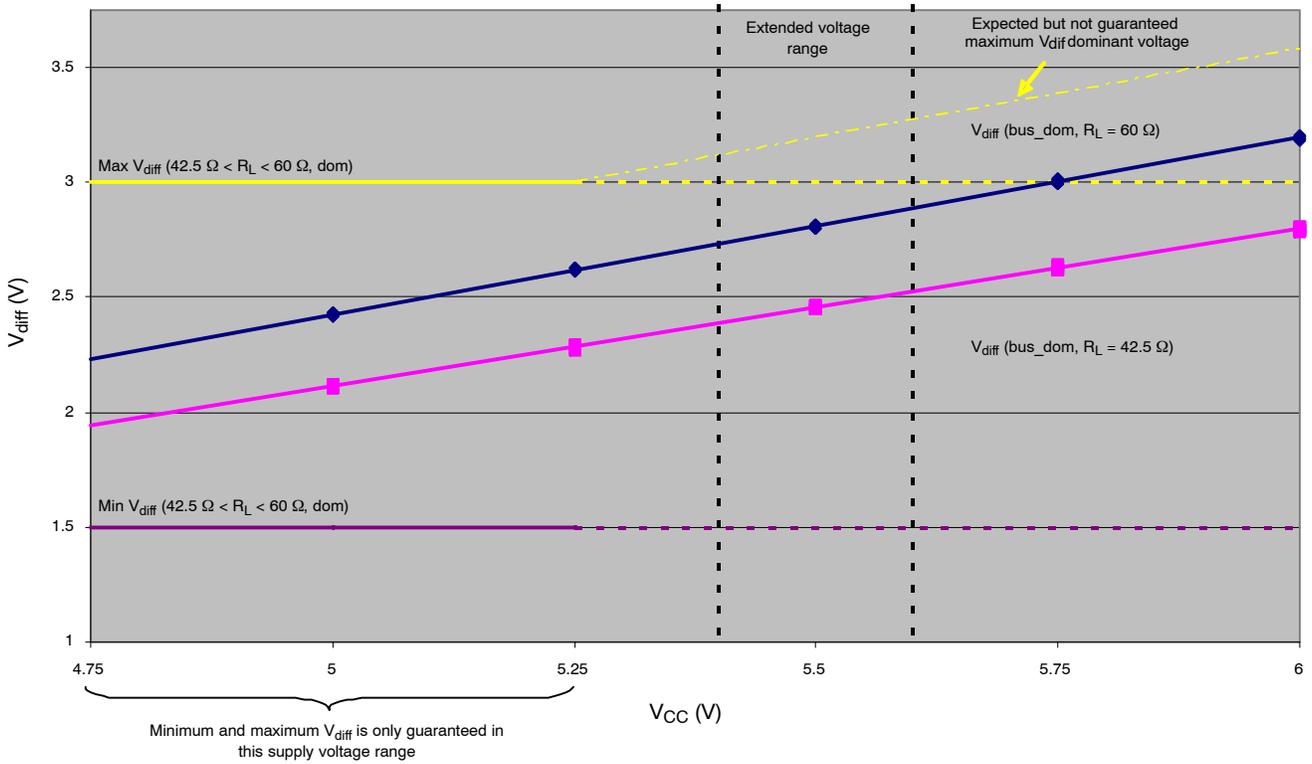


Figure 5. AMIS-42665 Dominant Differential Bus Output Voltage

AND8364/D

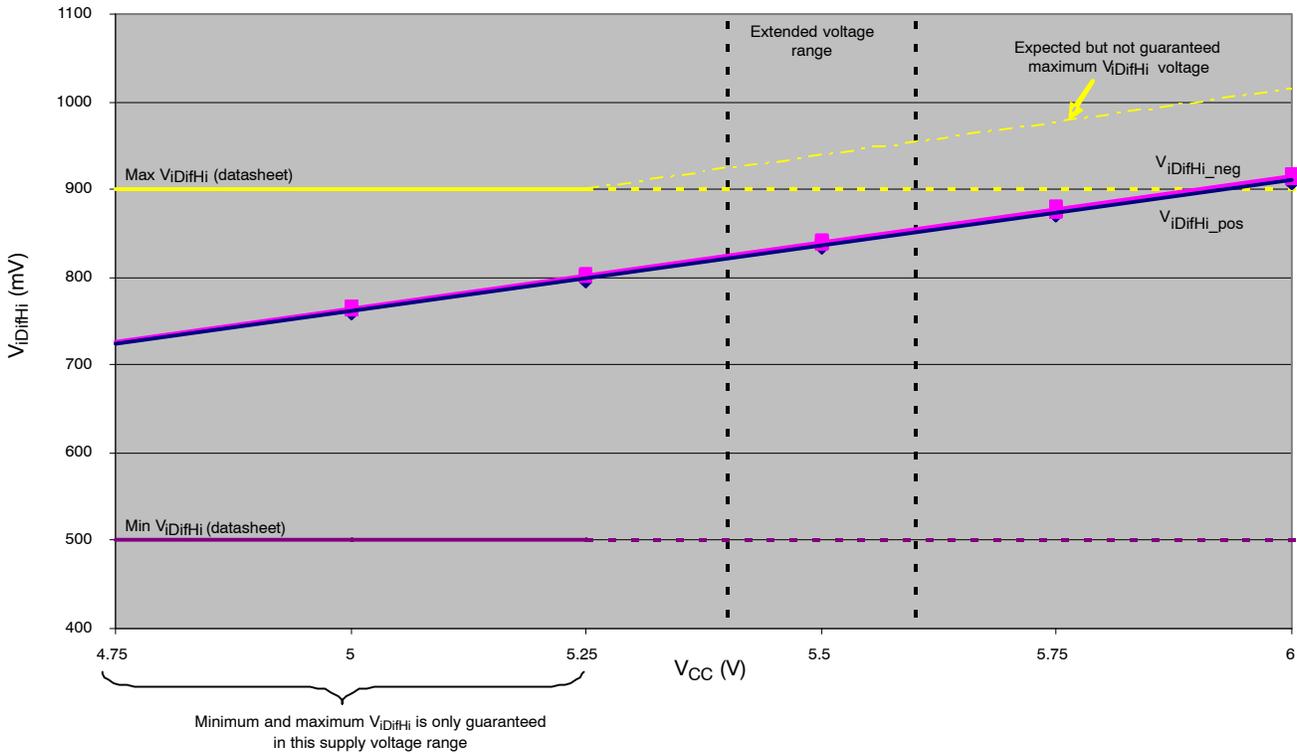


Figure 6. AMIS-42665 Differential Receiver High Threshold Voltage

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5773-3850

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local Sales Representative