

How to connect non-5V tolerant IO to CAN transceiver?

**Questions:**

How to connect non-5V tolerant IOs to CAN transceiver?

**Answer:**

Most AT32 MCUs come with CAN feature. Some IOs supporting CAN are non-5V tolerant (see PA11 and PA12 in Table 1). In this case, users can select CAN transceiver and connect hardware according to the following two advices.

PA11	I/O	TC	TMR1_CH4 / I2C2_SCL / SPI2_CS / I2S2_WS / SPI4_MISO / USART1_CTS / USART6_TX / CAN1_RX / OTGFS1_D- / DVP_D2
PA12	I/O	TC	TMR1_EXT / I2C2_SDA / SPI2_MISO / USART1_RTS_DE / USART6_RX / CAN1_TX / OTGFS1_D+ / DVP_D3

Table 1

**I. Use 3.3V CAN transceiver IO**

Use 3.3V CAN transceiver IO or a CAN transceiver which is powered by a separate IO. Table 2 lists some general CAN transceivers for your reference.

Part number	Vendor	V <sub>CC</sub> (CAN bus power supply)	V <sub>IO</sub> (IO power supply)
SN65HVD230	TI	3V~3.6V	Powered by VCC, without separate IO supply
TJA1042T/3/1J	NXP	4.5V~5.5V	2.8V~5.5V
TJA1044GT/3Z	NXP	4.75V~5.25V	2.95V~5.25V
TJA1051T/3/1J	NXP	4.5V~5.5V	2.8V~5.5V
SIT1044T/3	SIT	4.75V~5.25V	2.95V~5.25V

Table 2

Here is an example of TJA1044GT/3Z. In this diagram, its VCC is 5V, but it provides 3.3V to V<sub>IO</sub> and MCU, so that the RXD of CAN transceiver TJA1044GT/3Z will be 3.3V high level that meets MCU's "non-5V IO" requirement.

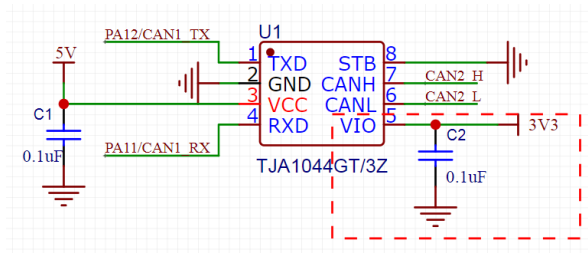


Figure 1

## II. A temporary fix when using 5V CAN transceiver IO to connect to a non-5V tolerant IO

If a CAN transceiver IO on a PCB is 5V and such PCB is to be used for testing purpose, in this case, there is no need of extra operation on its TXD for CAN to recognize signals. But its RXD deserves our attention. To avoid possible damage on MCU, you can add 1K resistor between CAN transceiver's RXD and MCU's CAN\_RX pin. However, when the RXD outputs high, the voltage on MCU IO will still exceed  $V_{DD}+0.3V$  even though the connected 1K resistor has withstood most voltage.

For MCU, the input voltage on its non-5V tolerant IOs should not be greater than  $V_{DD}+0.3V$ . Above this limit will trigger IO protective diode to be conducted (see figure below) and cause leakage inside IOs. The most direct phenomenon is that MCU's power consumption will become high, and even exceed its threshold especially in low-power mode. Because of this, this method can only be used as a temporary fix, but should not be applied to mass production scenario.

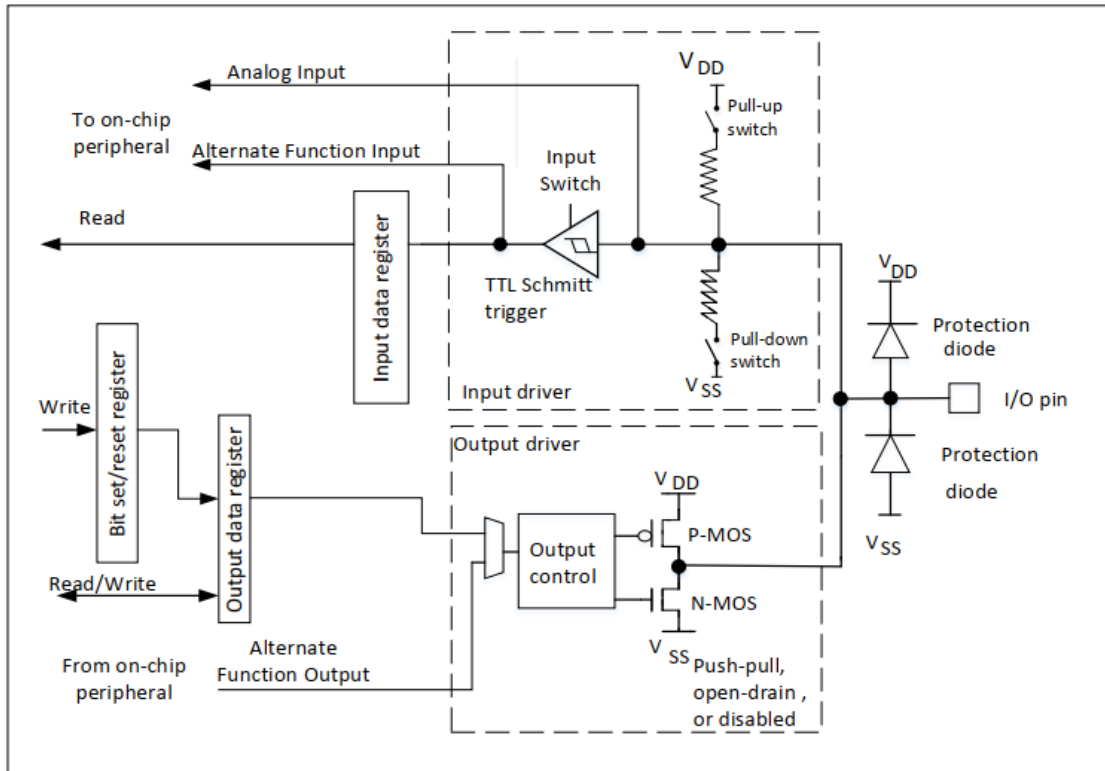


Figure 2 IO block diagram

**Type:** MCU application

**Applicable products:** AT32F4xx series

**Main function:** CAN

**Other function:** None

## Document revision history

Date	Revision	Changes
2022.3.25	2.0.0	Initial release

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