

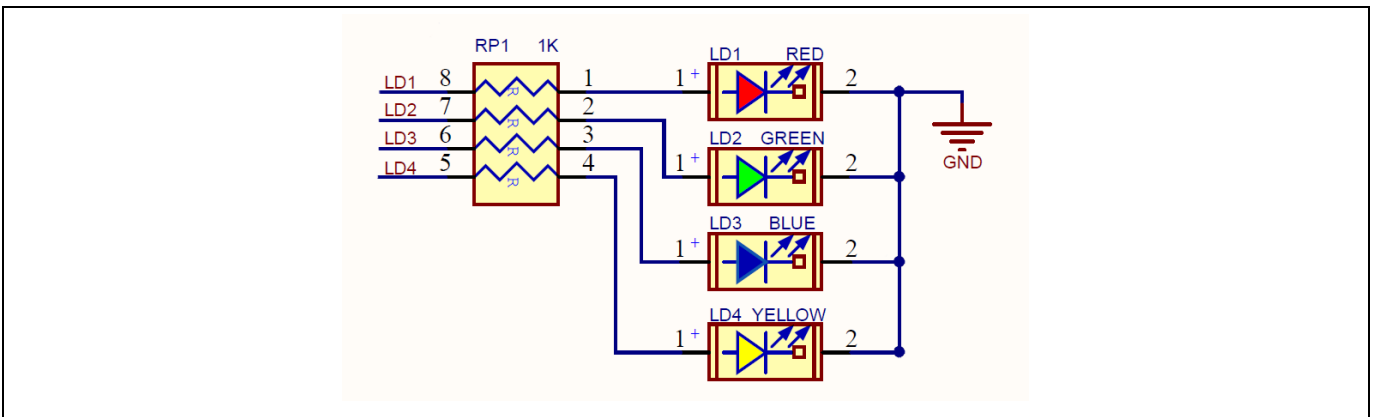
5V tolerant IO-induced current turns on LED

**Questions:**

5V-tolerant I/O-induced current during power on and NRST being low causes LED to be switched on

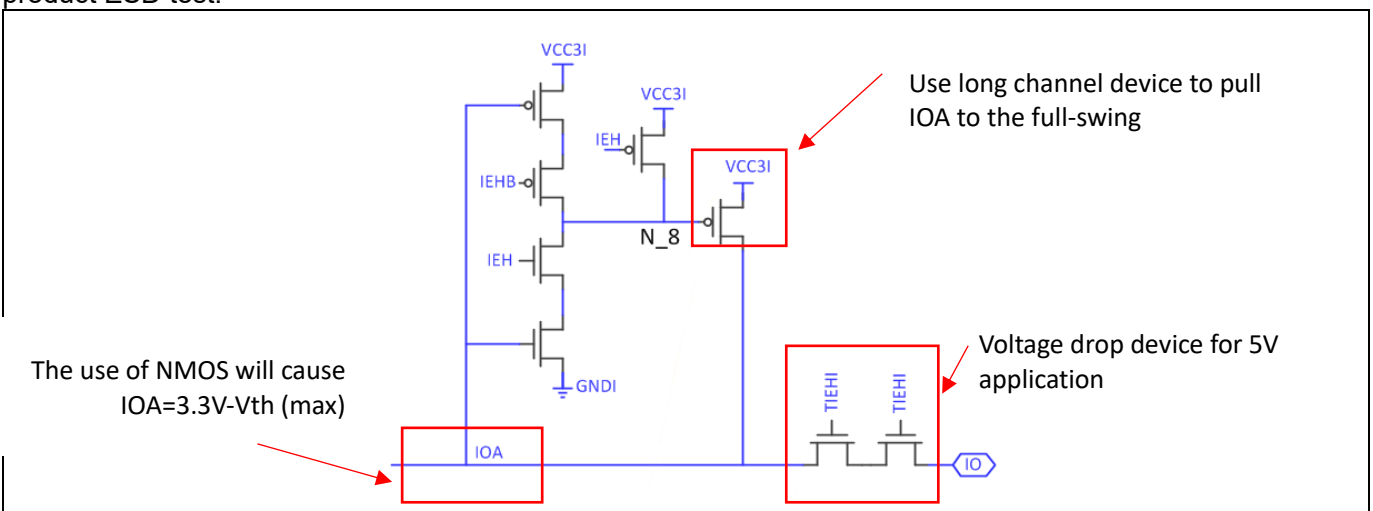
**Answer:**

The 5V-tolerant I/O of the AT32F4xx has a maximum of approximately 10uA current driving capability during reset or when it is in input floating mode. Therefore during MCU reset period or when IO remains in input floating mode because MCU program has yet to operate, the LED may be turned on by such small current. The figure below illustrates LED connection.



This behavior is associated with the design structure of 5V-tolerant I/O. During power up or reset period, the N\_8 (see figure below) is pulled low, and long channel device is switched on. In this case, if IO has resistive load to the ground, a circuit path where power flows from long channel device to I/O to resistive load and then to the ground will be formed. Such design produces uA-level current driving capability. But If the 5V-tolerant I/O has enough external pull-down resistor (like 100K), the above mentioned power path will be cut off automatically, eliminating the emergence of this current (max. 10uA) and of the possibility of LED being turned on by it when MCU resets or MCU I/O is in input floating mode.

This LED issue is due to 5V-tolerant I/O design structure. It is not viewed as current leakage, without affecting product ESD test.



Solution: it is recommended to enable LED by applying low level to 5V-tolerant I/O.

**Type:** MCU application

**Applicable products:** AT32 series

**Main function:** GPIO

**Minor function:** None

## Document revision history

Date	Revision	Changes
2022.2.16	2.0.0	Initial release

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