How to realize V$_{BAT}$ power supply on AT32F421 series?

Questions:
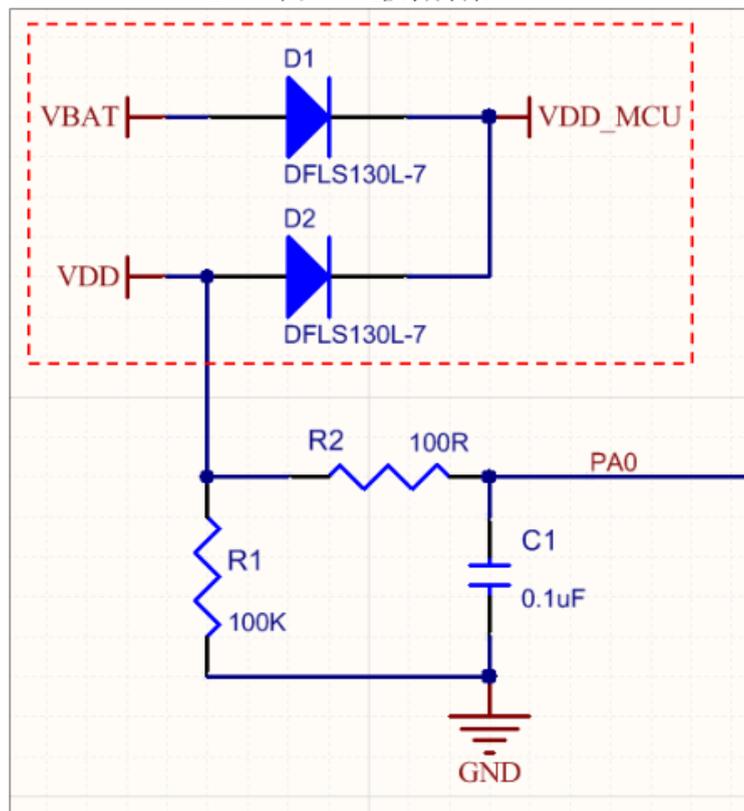
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Answer：

There is no seperate V$_{BAT}$ pin on AT32F421. To use V$_{BAT}$ for Standby function, an external power supply switch circuit should be designed.

Circuit principle is shown in *Figure 1*. VDD_MCU is connected to MCU power pin V$_{DD}$, VDD to the main power, and VBAT to the battery.

Figure 1. Using diode solution

Principle description:

1. When both VDD and VBAT are powered at the same time, VDD voltage is higher than that of VBAT, D2 is turned on, D1 is turned off, and VDD supplies MCU. When VDD is powered off, D1 is turned on, then VBAT starts to supply MCU, and D2 prevents VBAT from leaking to VDD.

Note: VDD voltage must be higher than VBAT, otherwise, VBAT will have priority over VDD when supplying MCU, which will shorten the battery life. D1 and D2 must be low-drop diodes to minimize the voltage difference between VDD_MCU and VDD.

2. PA0 is used to monitor whether VDD is powered off. If VDD powered off, PA0 input becomes low, and MCU will enter low-power mode after detecting PA0 status in order to save VBAT battery consumption; When VDD is restored, MCU is woken up through PA0 WKUP, which needs to be done by software. In *Figure 1*, C1 and R2 can be used, depending on your hardware environment, to eliminate glitches or noise on the power line. After VDD is powered off, R1 pulls PA0 level to a stable low level, which can also be done through PA0 internal pull-down resistor.

3. If VBAT is higher than VDD in your application environment, the circuit marked in red in *Figure 1* needs to be replaced with *Figure 2*. VBAT is allowed to be slightly higher than VDD, but must not exceed Vgs voltage of Q1, otherwise, Q1 is turned on, and VBAT will have priority over than VDD_MCU; However, VDD_MCU should not be too much higher than VBAT (depending on the Drain-Source parasitic diode of Q1), else, VDD_MCU will leak to VBAT reversely.

Figure 2. Using MOS solution
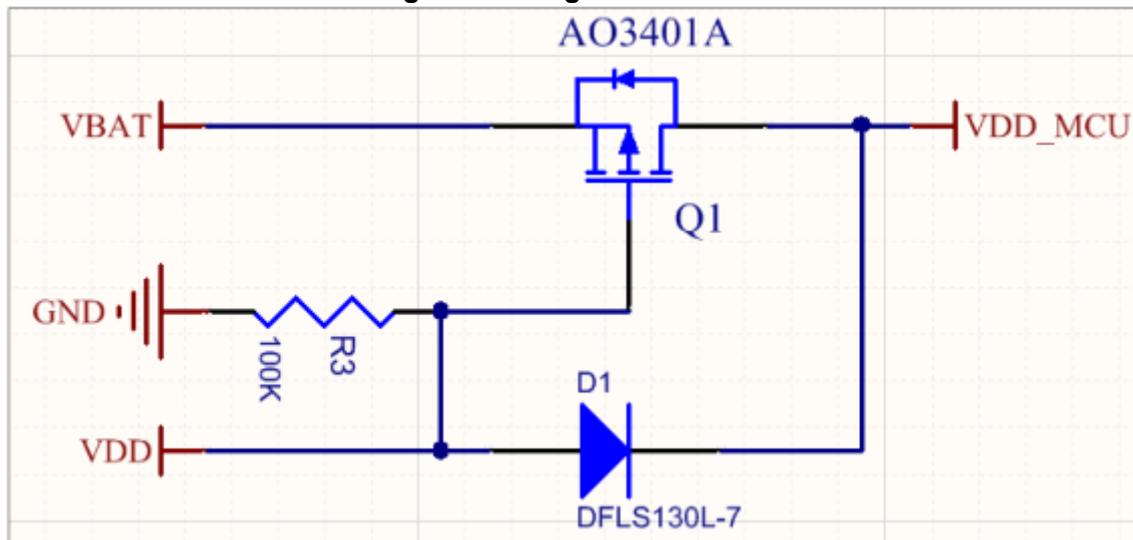
Type: MCU
Applicable products: AT32F421
Main function: Power
Minor function: V_{BAT}

Document revision history

Date	Revision	Changes
2022.2.21	2.0.0	Initial release

IMPORTANT NOTICE – PLEASE READ CAREFULLY