Recap Clock & Timer

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Brun Roman

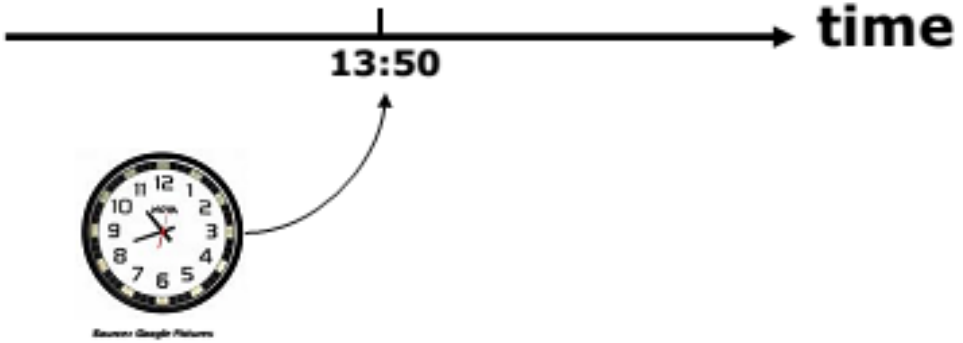
Clock

different clock sources in a microcontrollersystem

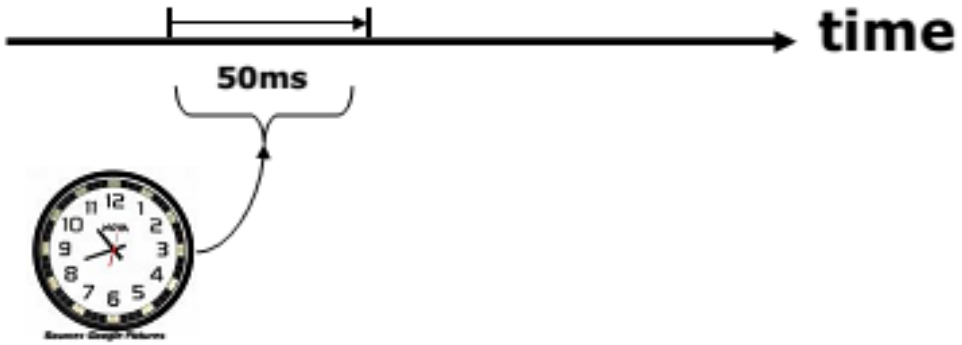
- System clock
- CPU clock
- Bus clock

Timeliness in Realtime Systems

- Categories
  - Absolute
  - Relative



- Need
  - Time base
  - Clock
  - Interrupt Synchronization



- Derived
  - Timer
  - Time

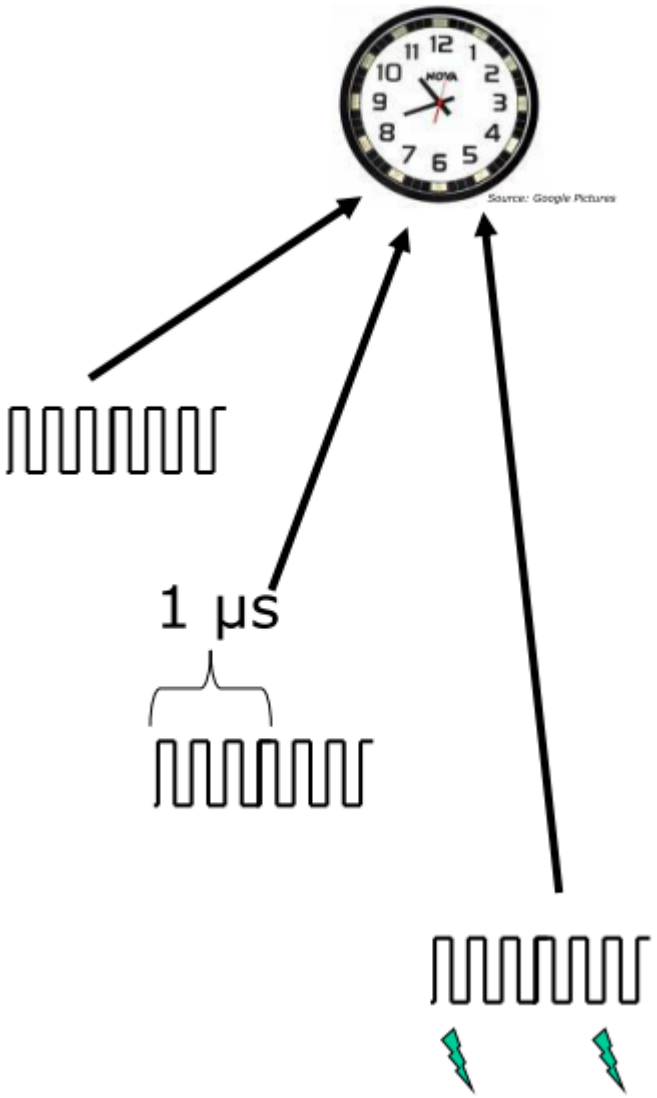
Possibilties

- Linkage to the real time
  - ns, µs, ms, s, h, …

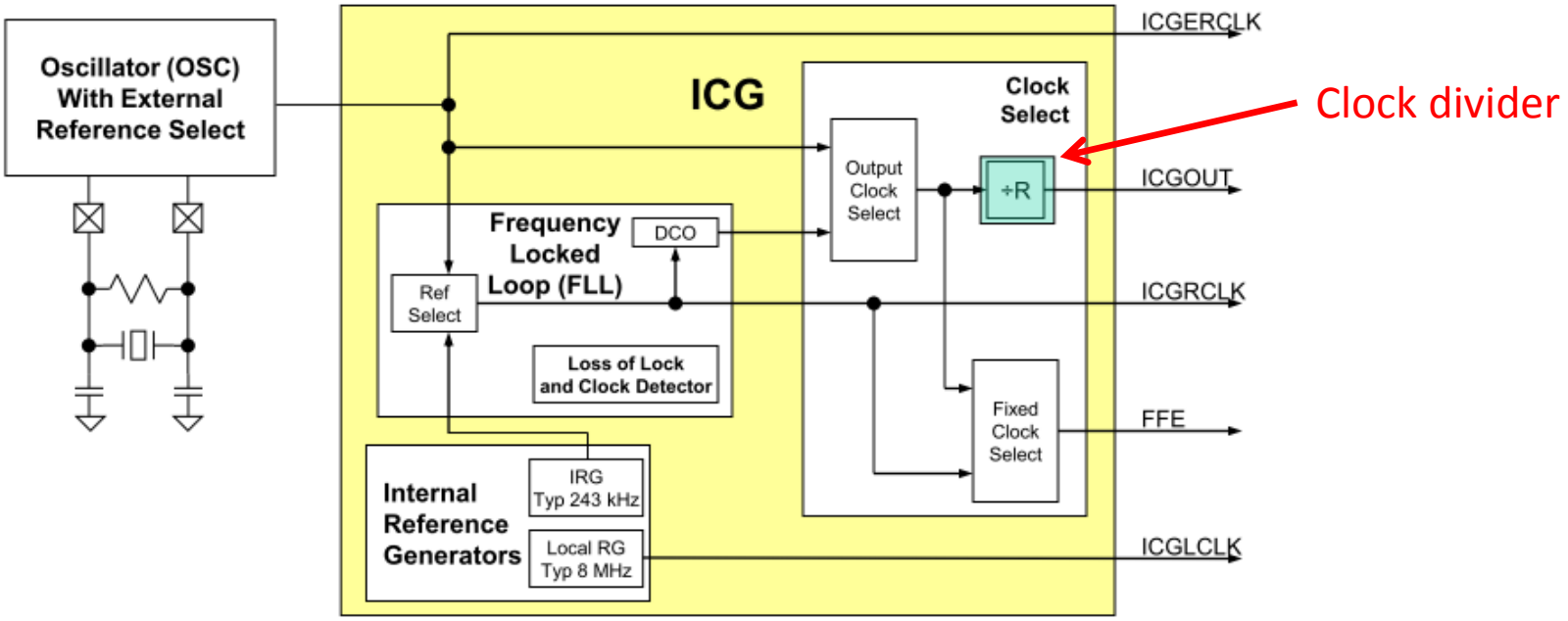
- Periodic Ticks
  - Known real time tick period
  - External or Internal source
  - System/CPU/Bus clock

- Operations
  - Counting ticks
  - Sum/Calculation: real time entity

- Synchronization with counter(s)
  - Events
  - Flags



Internal Clock Generator Block Diagram



- Reference Selection
  - Internal
  - External
- Prescalter Select
  - Multiplication Factor
  - Division Factor

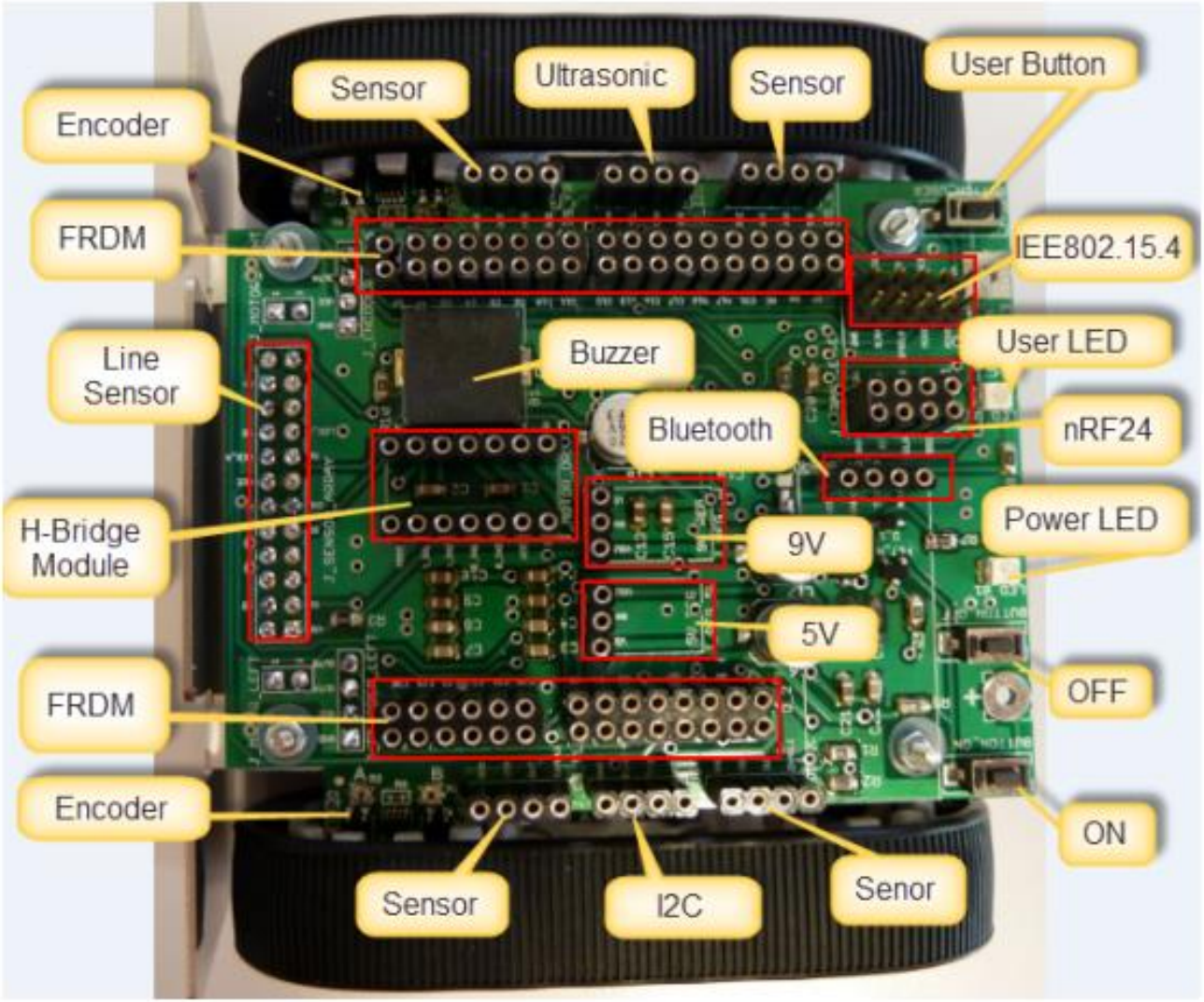
Timer Interface

Interface

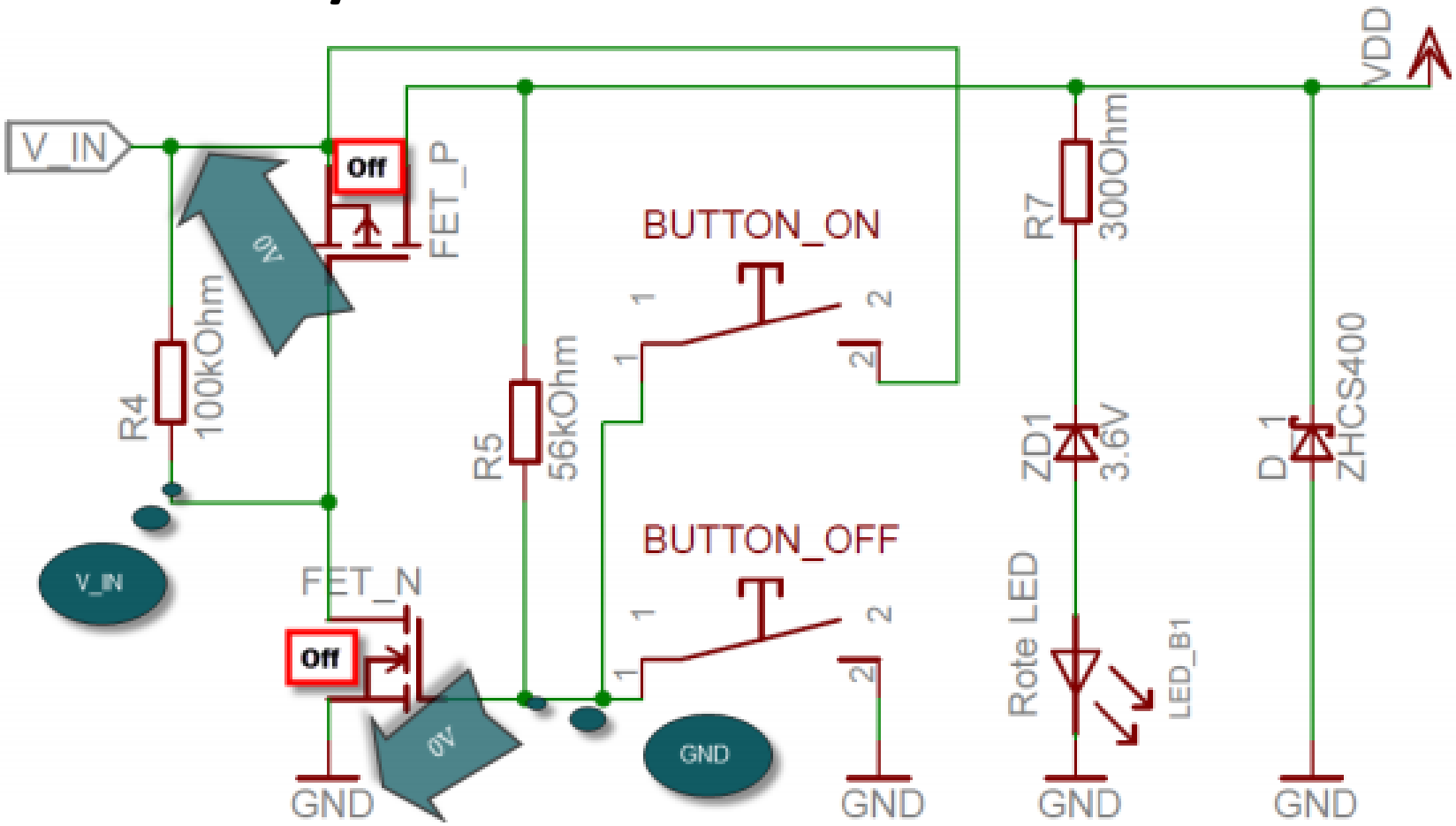
```
/* we get called every 10 ms */
#define TMR_TICK_MS 10

/*!
* \brief Function called from timer interrupt
* every TMR_TICK_MS.
*/
void TMR_On10ms(void);

/*! \brief Timer driver initialization */
void TMR_Init(void);
```

```
void TMR_On10ms(void) {
  /* timer interrupt is calling us every 10 ms */
#if PL_HAS_LED_HEARTBEAT /* we are using a timer
to do the heartbeat */
  static uint8_t cnt = 0; /* using static local variable */
  cnt++;
  if (cnt==1000/TMR_TICK_MS) { /* every second */
    EVNT_SetEvent(EVNT_LED_HEARTBEAT);
          /* using event method */
#endif
    cnt = 0; /* reset counter */
  }
}
```

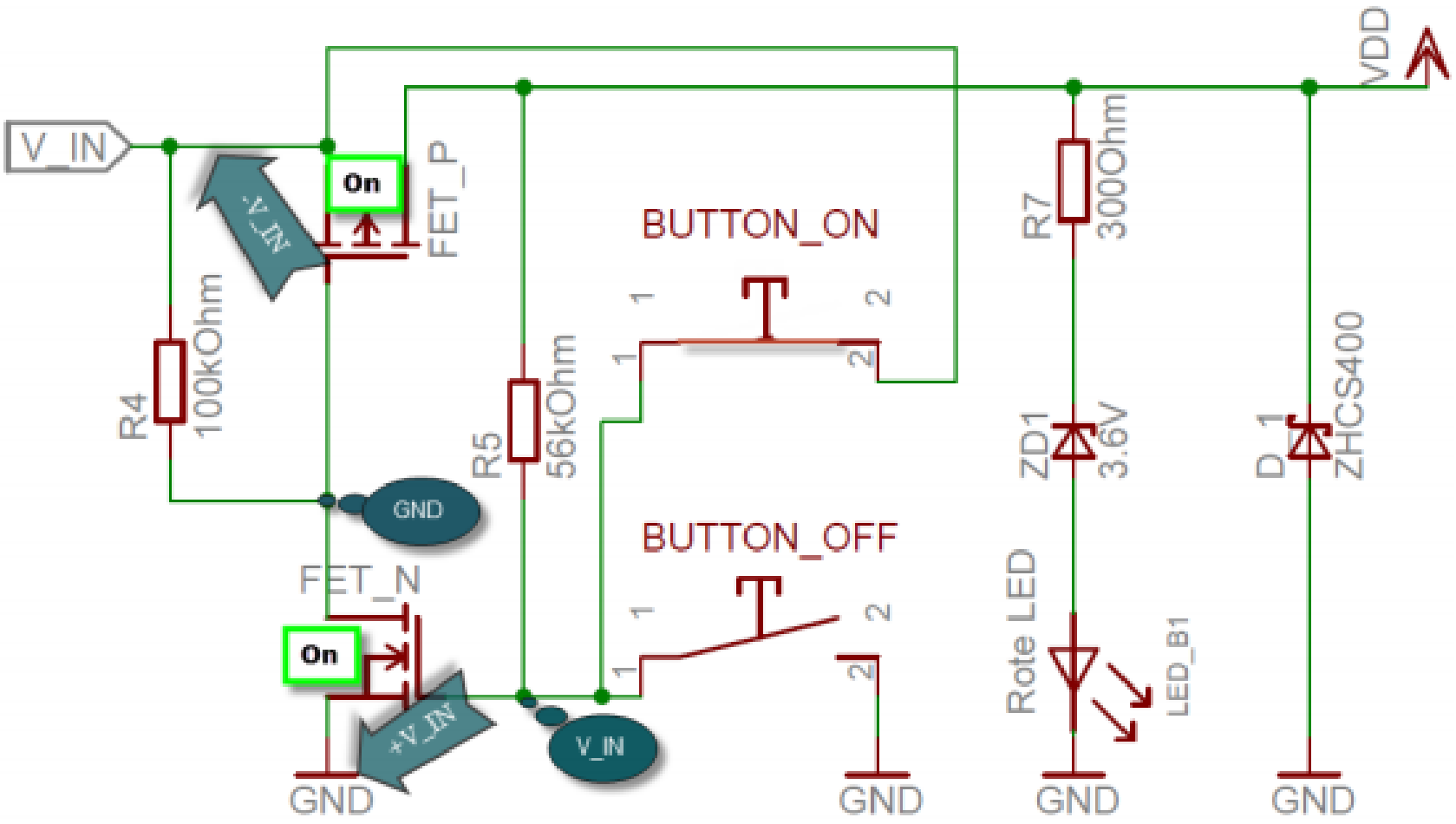
Hardware


Sensor
Ultrasonic
Sensor
User Button
Encoder
FRDM
IEE802.15.4
Line Sensor
Buzzer
User LED
Bluetooth
nRF24
H-Bridge Module
9V
Power LED
5V
FRDM
OFF
Encoder
ON
Sensor
I2C
Senor

Power ON/OFF


V_IN
Off
FET_P
0V
R4
100kOhm
R5
56kOhm
BUTTON_ON
1
2
1
2
R7
300Ohm
VDD
ZD1
3.6V
D_1
ZHCS400
V_IN
FET_N
Off
0V
BUTTON_OFF
1
2
1
2
Rote LED
LED_B1
GND
GND
GND
GND
GND

Power ON/OFF


V_IN
-V_IN
On
FET_P
R4
100kOhm
R5
56kOhm
BUTTON_ON
BUTTON_OFF
GND
FET_N
On
+V_IN
V_IN
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GND
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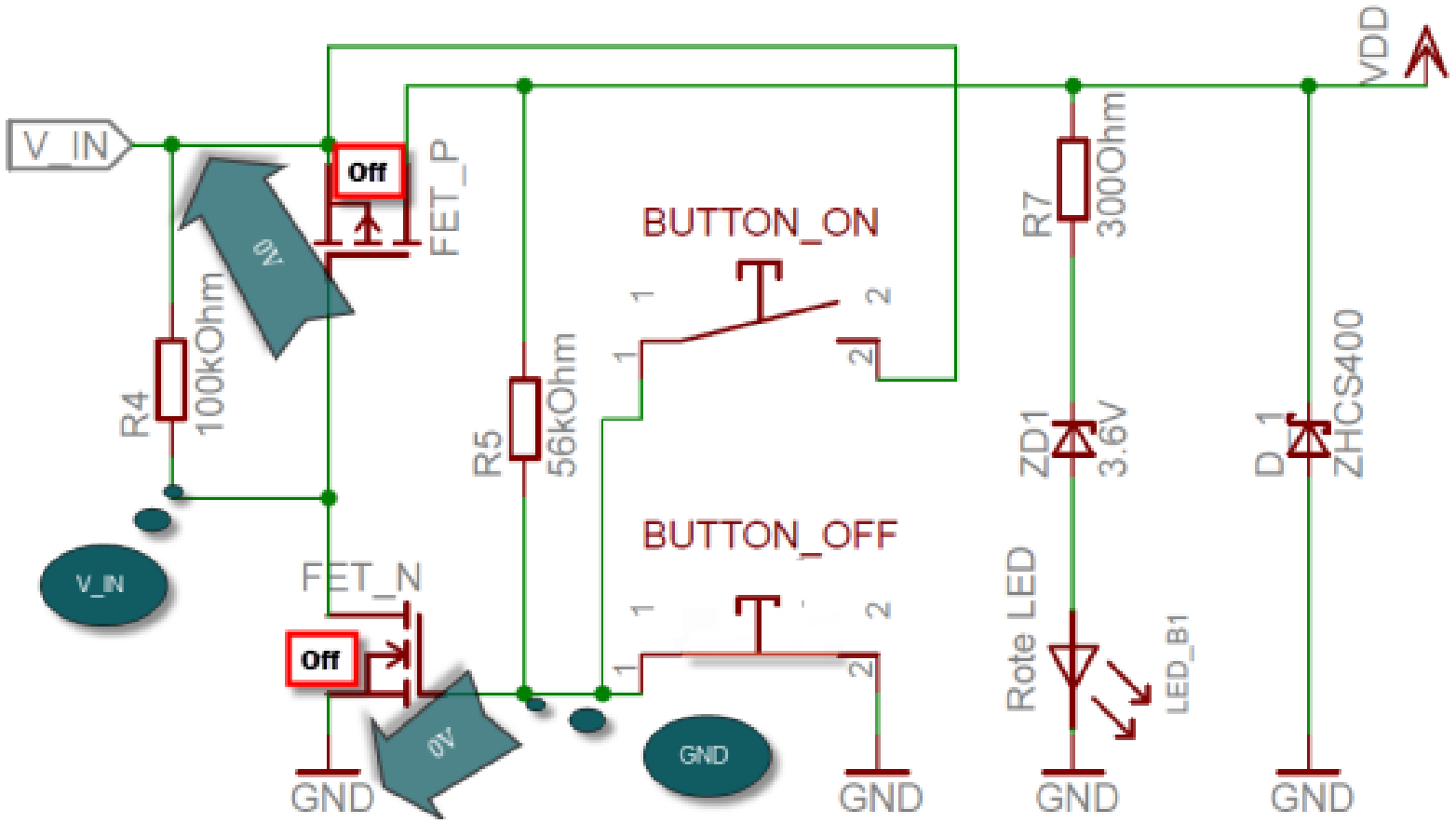
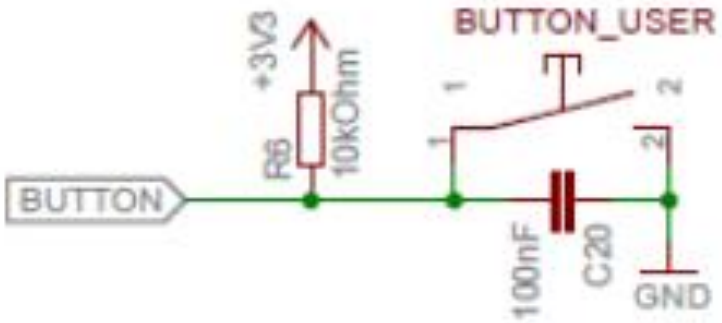
Power ON/OFF



Don‘t push together!!!

User Button

- Debouncing capacitor
- Pull-up resistor

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Questions

1. How are two different timelines categories called?

2. What are the three different clock sources?

3. Write three different types of clock down.

4. What needs a real-time System?

5. Which clock-soure is cheaper?

Anwers

1. absolute, relative

2. external crystal , external oscillator, internal clock

3. Bus clock, CPU clock, Bus clock

4. Time base, clock, interrupt synchronisation

5. Internal clock