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STM32 – IR communication

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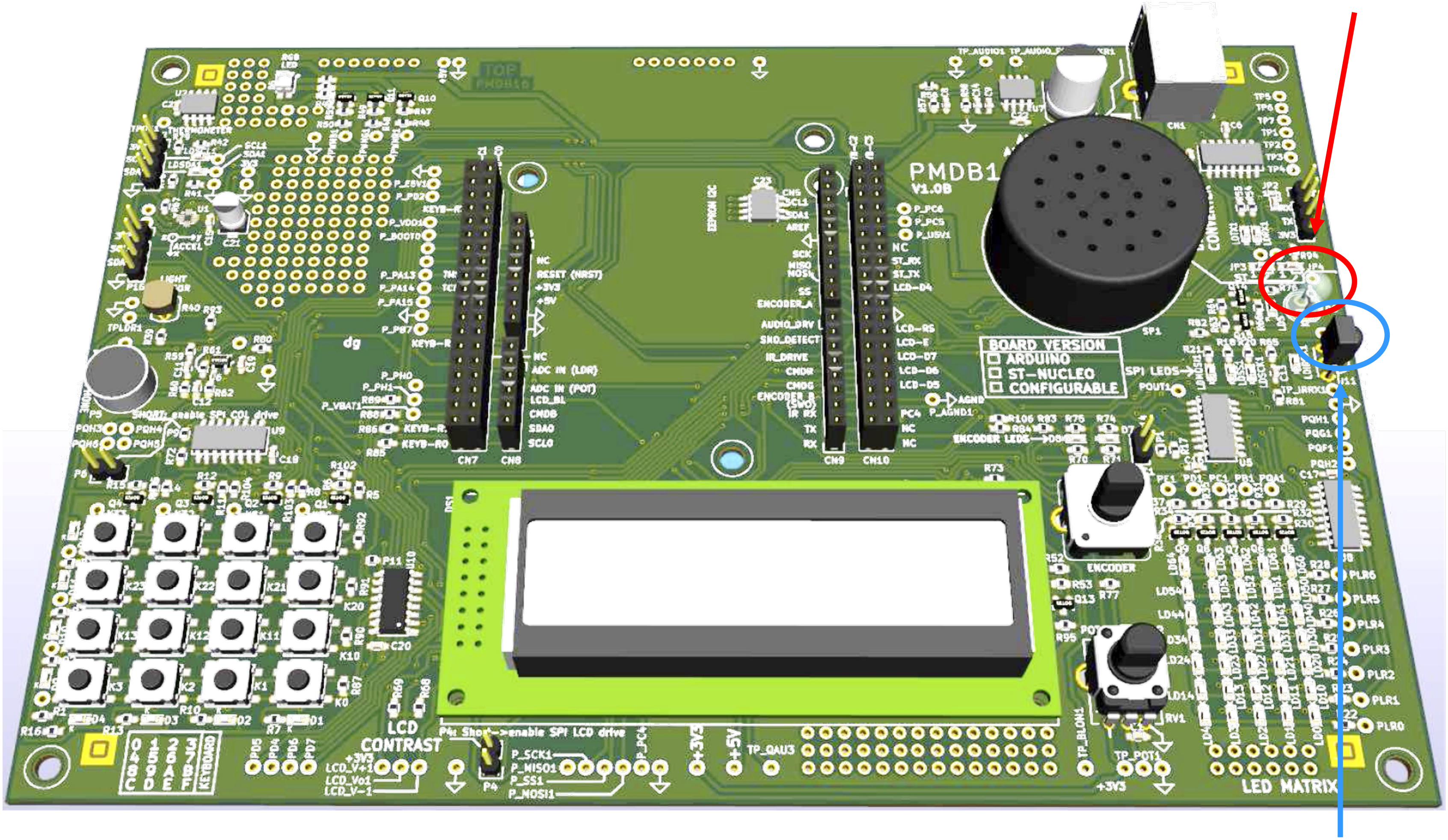
IR TX / RX – *Evaluation Board Components Overview*



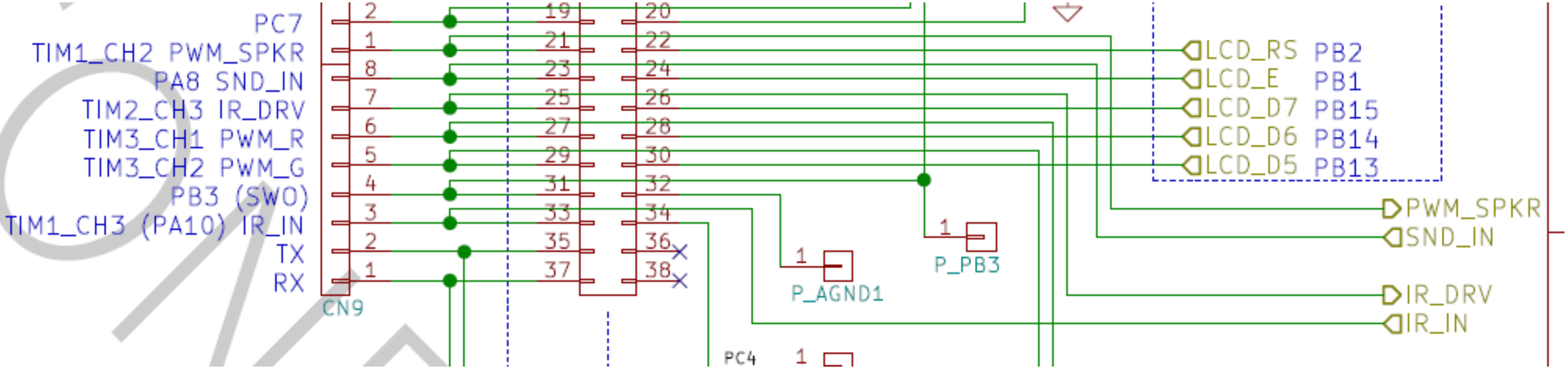
IR LED

IR RECEIVER

IR TX / RX – *PMDB16 details*

In our PMDB16 board:

- IR LED (IR_DRV) is connected to PB10 (TIM2_CH3)
- IR receiver (IR_IN) is connected to PA10 (TIM1_CH3 / USART1_RX)



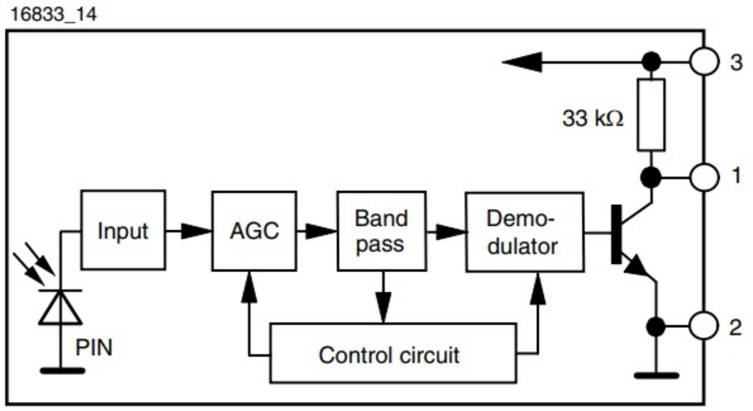
IR RX receiver – TSOP58238

Receiver consists of:

- Photodiode
- Amplifier with Automatic Gain Control (AGC)
- Bandpass filter and demodulator (38 kHz)
- Open-drain output with internal pull-up

Modulation allows to reject background light

Output goes **LOW** only when **MODULATED light is detected**



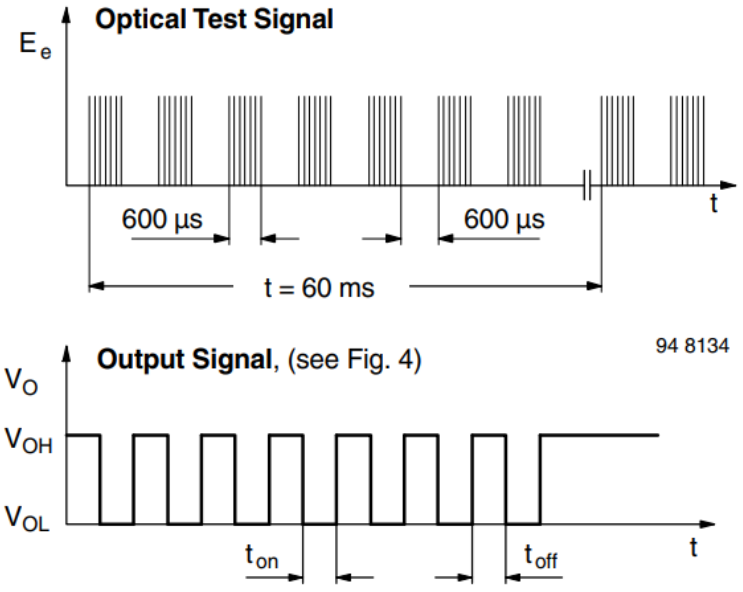


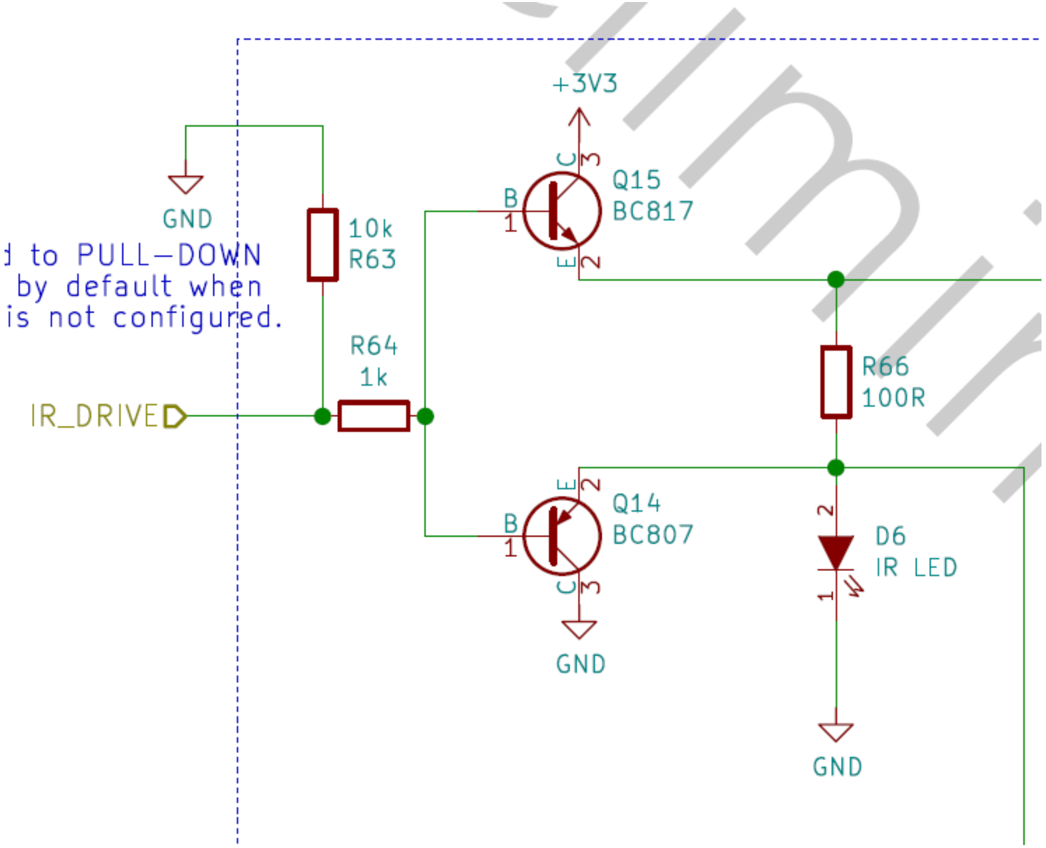
Fig. 3 - Output Function

IR TX LED

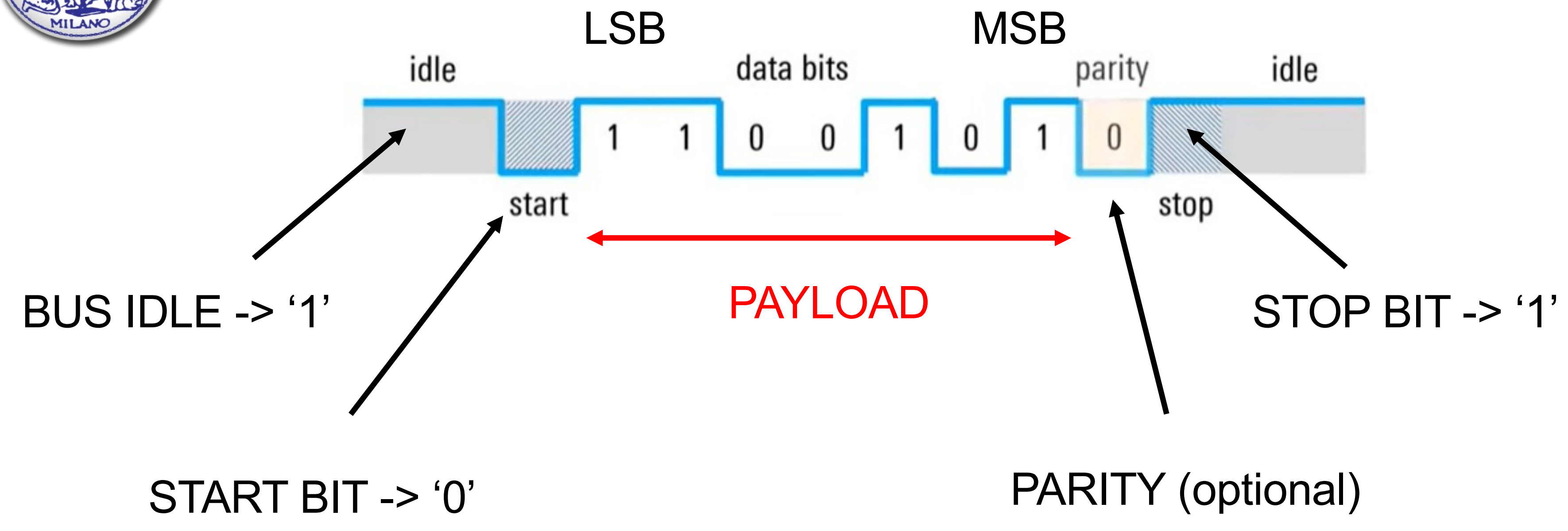
Transmitter:

- just a **simple LED**
- «Class B» amplifier to drive more current (~ 20 mA) than what the microcontroller pins allow (typ. 8 mA)

We can use **PWM** to drive the LED at 50% duty cycle, 38 kHz, to stimulate the receiver



UART protocol



This diagram is what we want to get at the receiver side:

- To transmit (receive) a '1' → LED stays OFF
- To transmit (receive) a '0' → LED pulses at 38 kHz
- Bit time = 1/(Baud rate)
  Suggested baud rate ≤ 2400 bps

IR - Project 1 - Preliminary

The group should split into
2 sub-groups:

Transmit and **Receive**

Objective of this project is to prepare the two boards to allow wireless communication between them

Transmit board – project 1

Step 1:

Create a function that **sends a byte via «Infrared UART»** at 2400 bps baud rate:

- Set up a timer (*TIMx*) to provide an interrupt every 1/2400 s
- When the function gets called, enable *TIMx* in interrupt mode
- Send the start bit by enabling TIM2_CH3 PWM at 38 kHz, until the *TIMx* interrupt
- Send the 8 bits, one at a time, enabling / disabling the PWM according to the bit to send
- Send the stop bit by disabling PWM

Step 2:

Create a function to **send strings** exploiting what made in step 1.

Receive board – project 1

Step 1:

Receive data via UART, using USART2 in **interrupt mode.**

Suggestion: receive 1 byte in interrupt mode. When byte is received, immediately restart receive mode, and store previously received byte.

React to received byte:

- Turn on green LED if you receive a ‘1’
- Turn off if you receive a ‘0’

You can debug by sending data via putty (just type in the window to send data).

Step 2:

Switch to receiving from the IR USART1, at 2400 bps baud rate.

Send the byte received with USART1 to the PC via USART2, using both in interrupt mode. **Help the other half group debug their sending code.**

Transmit - Project 2 - Objective

Objective

Communicate between boards

Project objective

Objective of the project for the Transmit board is:

- Scan the **pushbutton** matrix (as in M13 project 1b) and **send** the data corresponding to the pressed button via IR UART

Objective of the project for the Receive board is:

- **Receive** the IR UART data and **display** the corresponding character on the **LED matrix** (as in M11 project 1b)

OR

Just play around and make the boards do whatever you like, as long as wireless communication via IR is involved