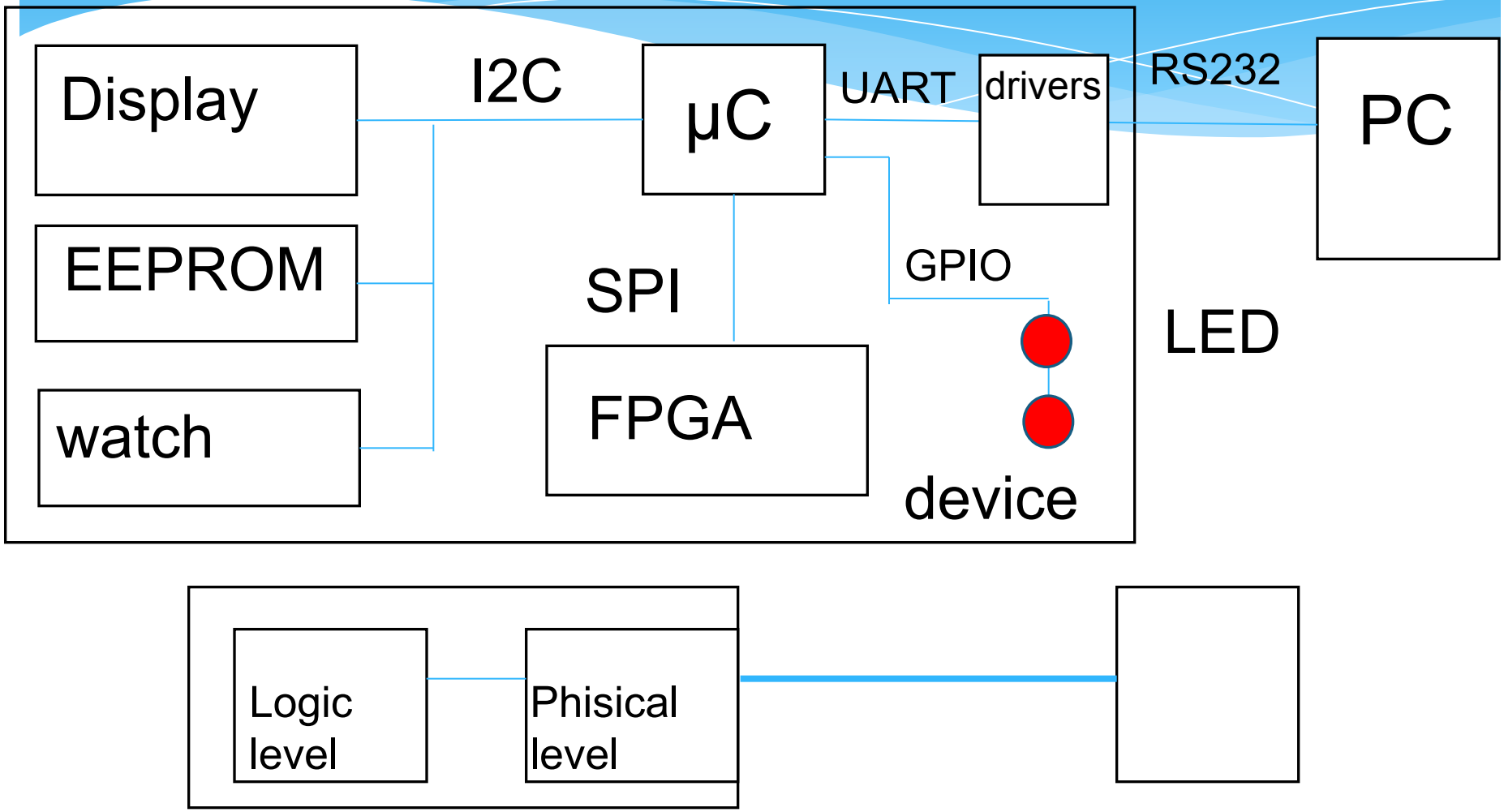
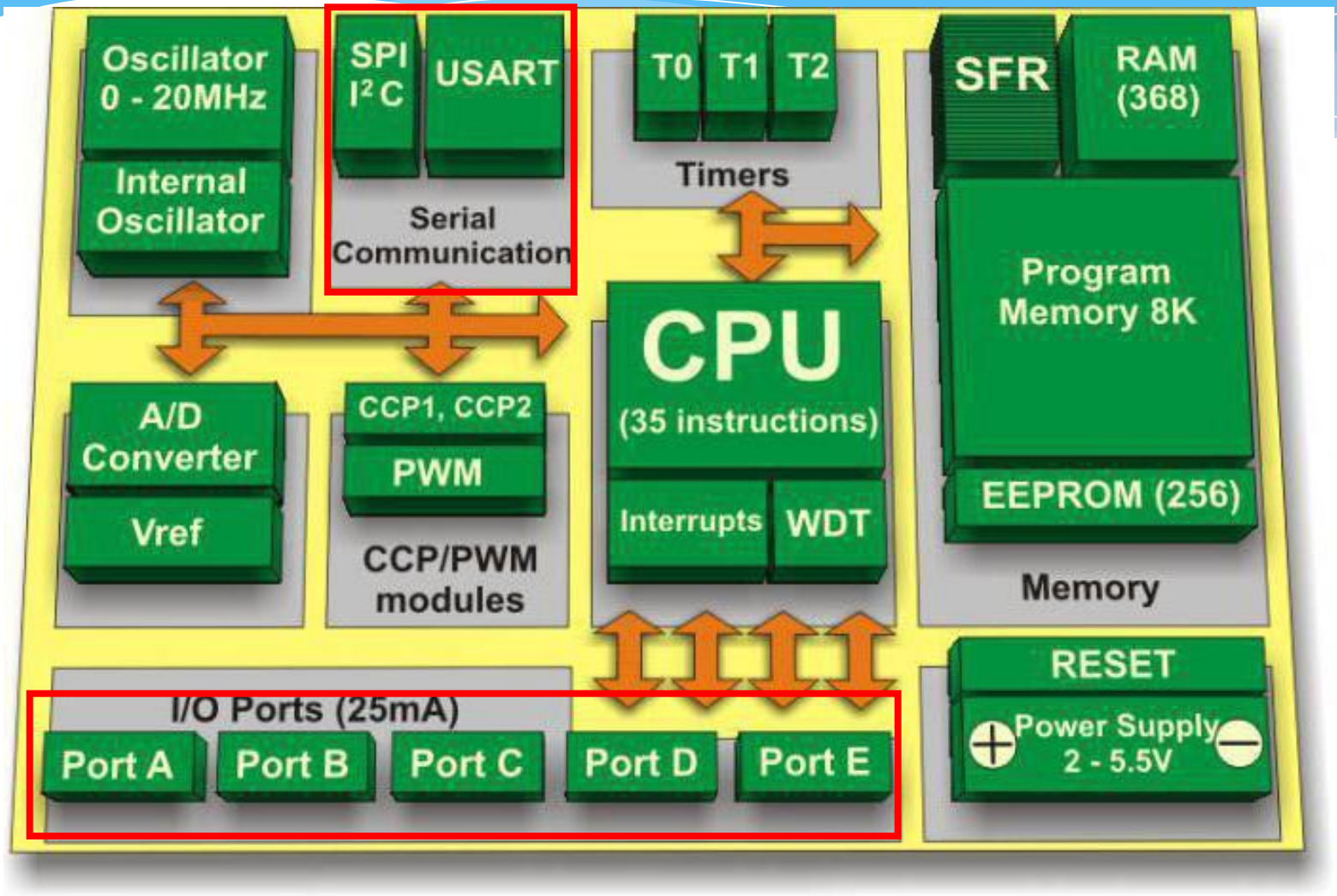
INTERFACES OF THE MICROCONTROLLERS

Lecture 2

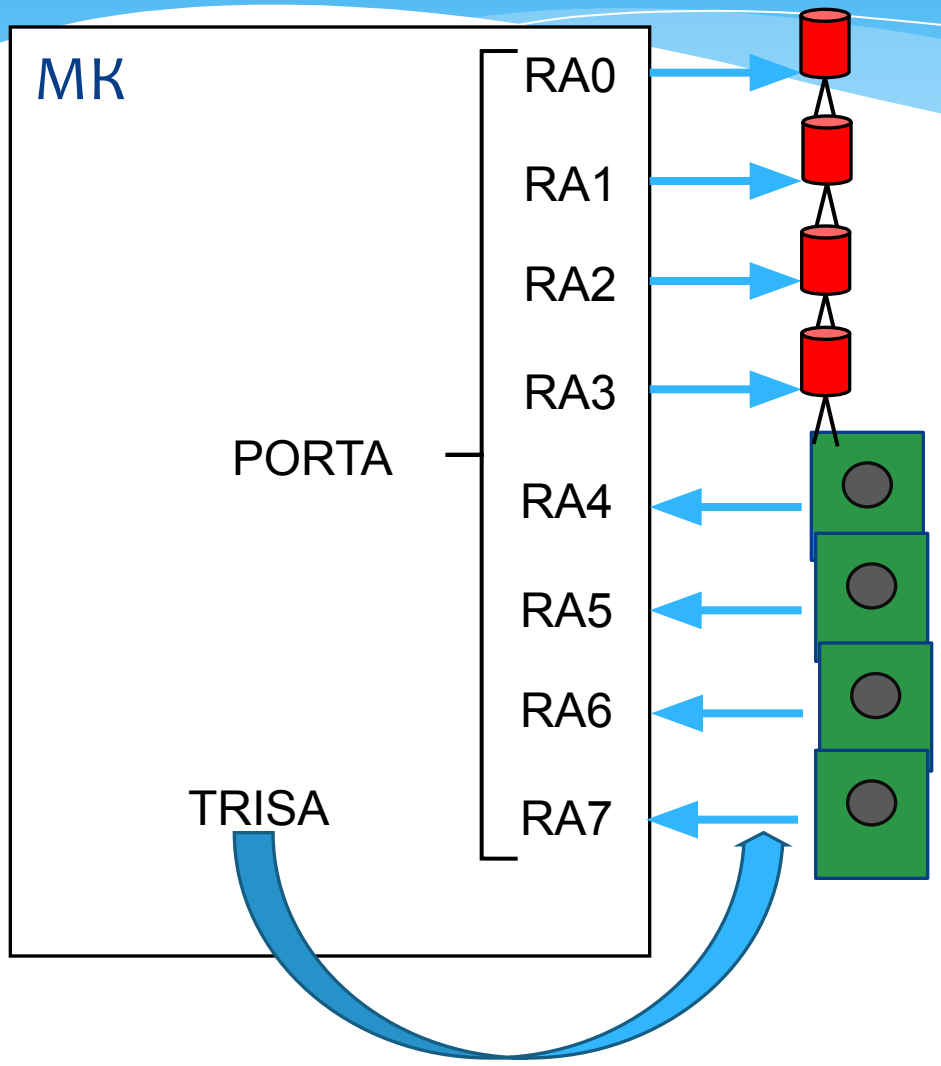
Applications

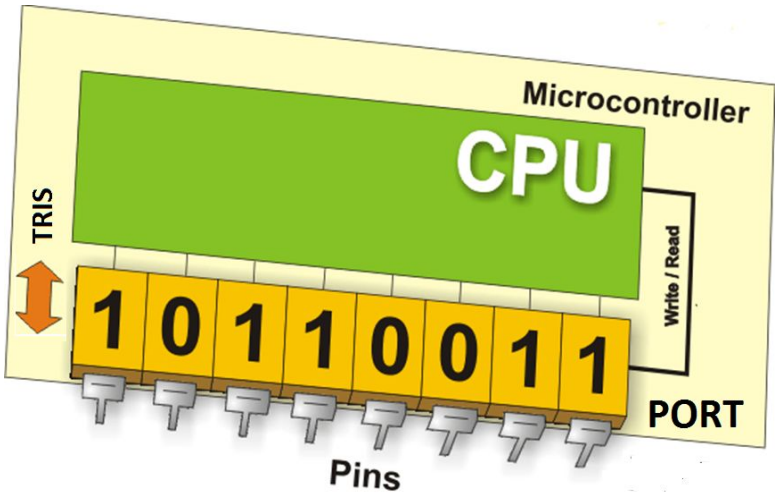


INTERFACES ON BLOCK DIAGRAM

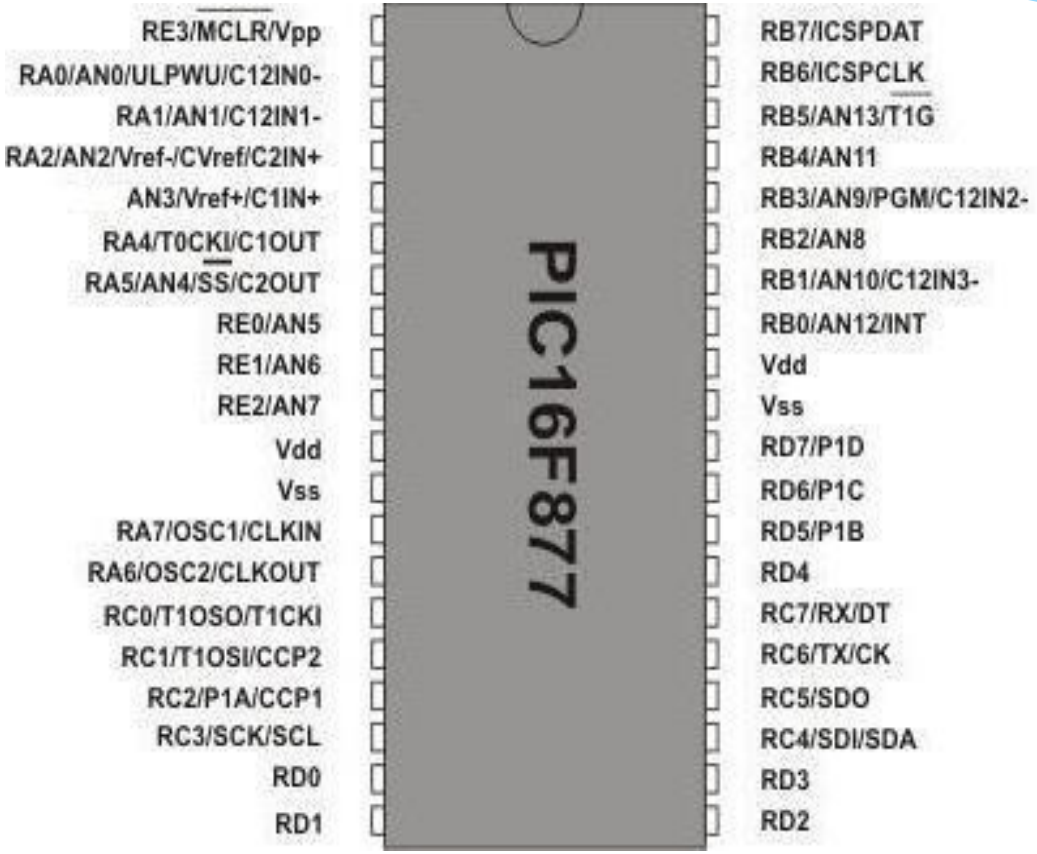


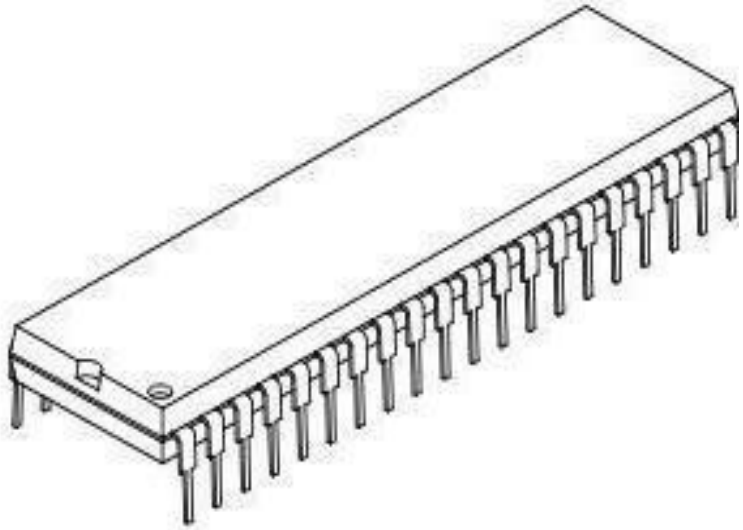
GPIO: General Port Input Output



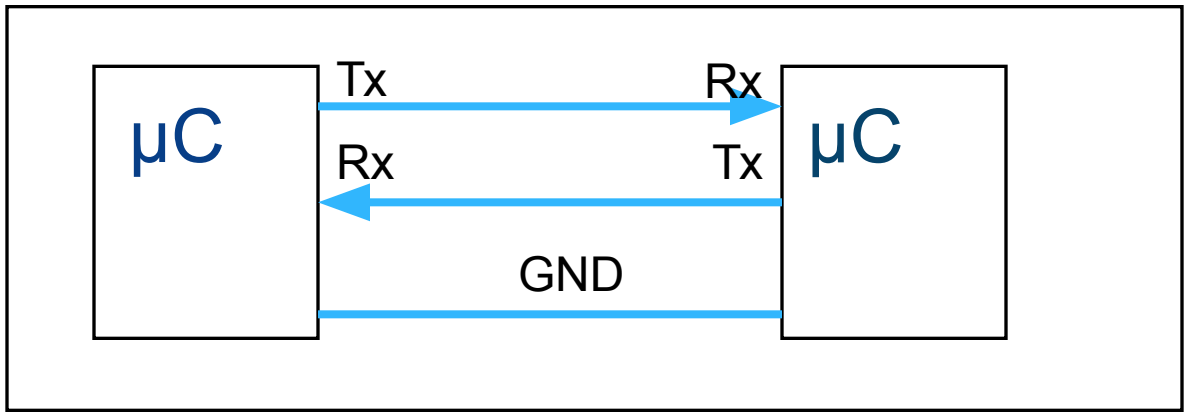


Pins interfaces

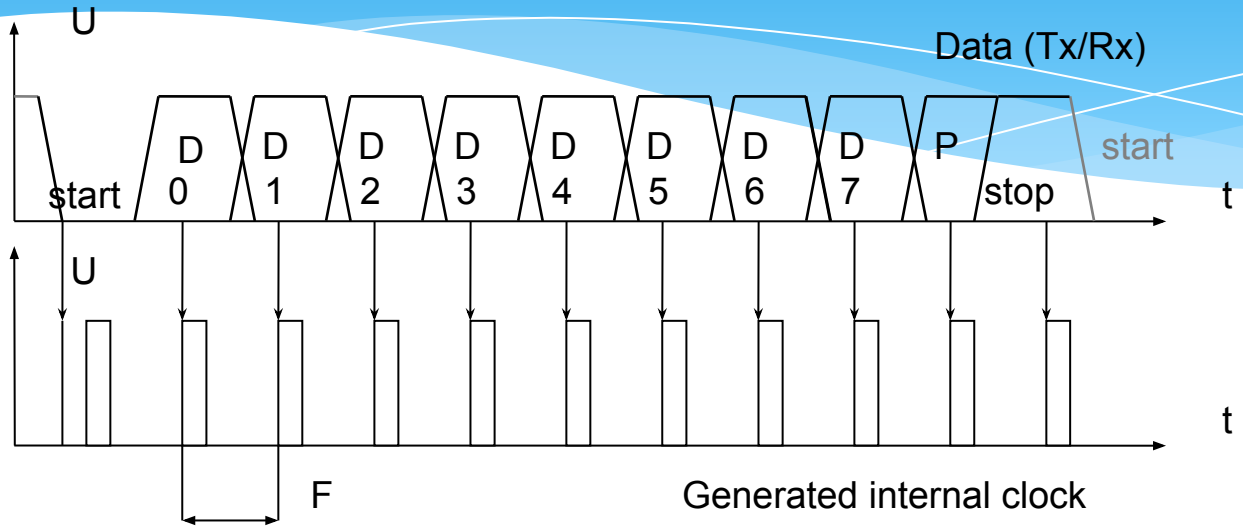




UART (USATR)

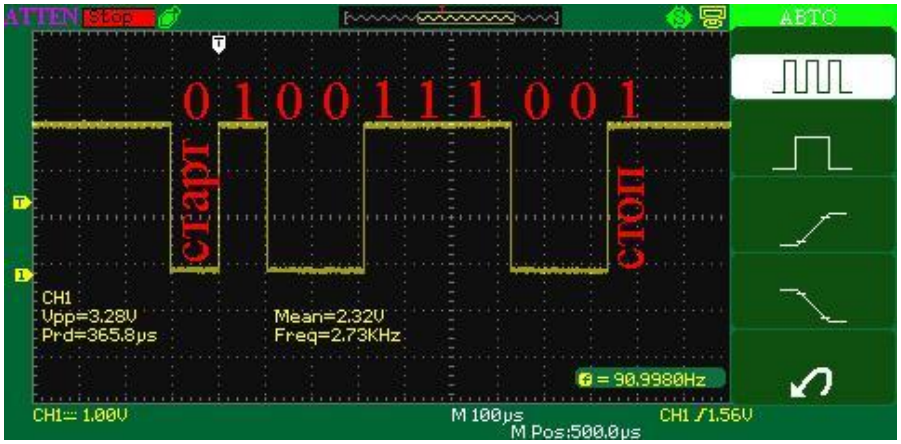


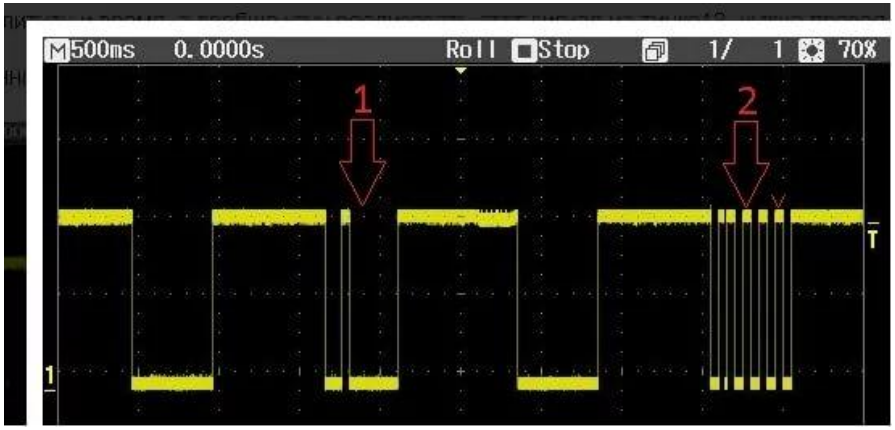
UART interface



P – parity
D0-D7- data

what period of the clock on speed 9600 bits / sec ?

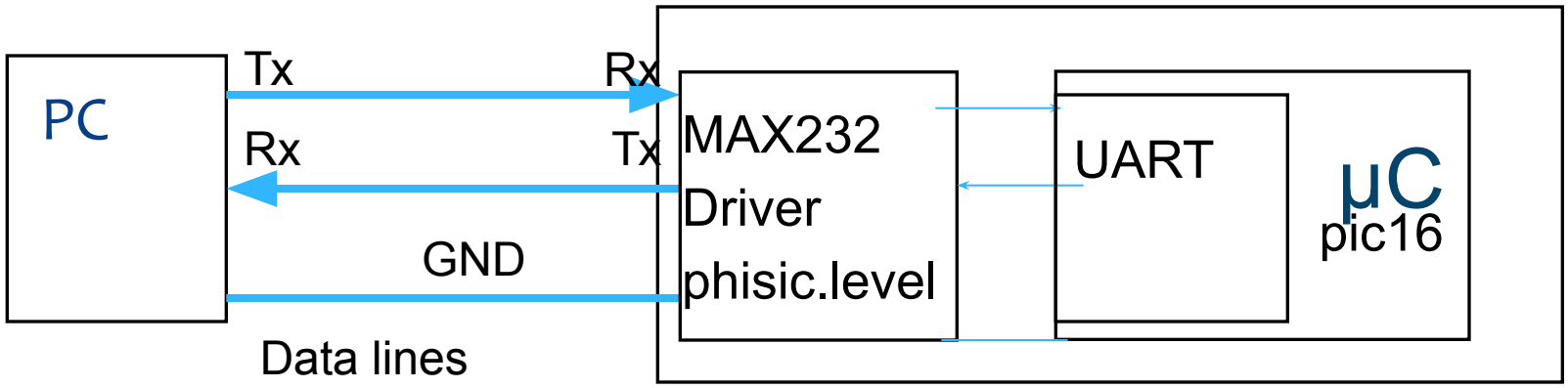




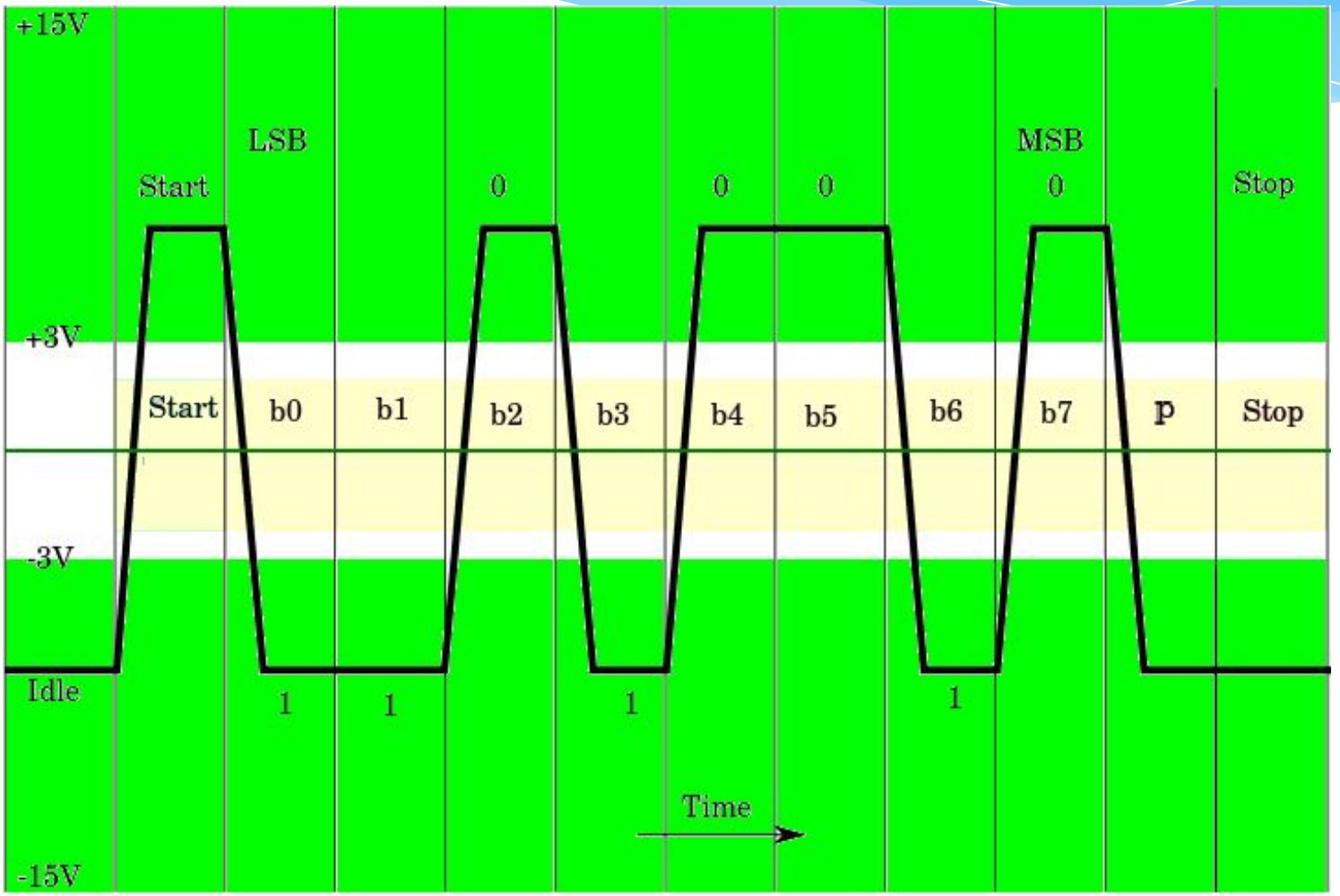
UART interface

```
void WriteCom(unsigned char value)
{
        while(TXIF == 0)
                ;
        TXREG = value;
}



……..
……..
……..
……..
……..
WriteCom(25);
……..
```

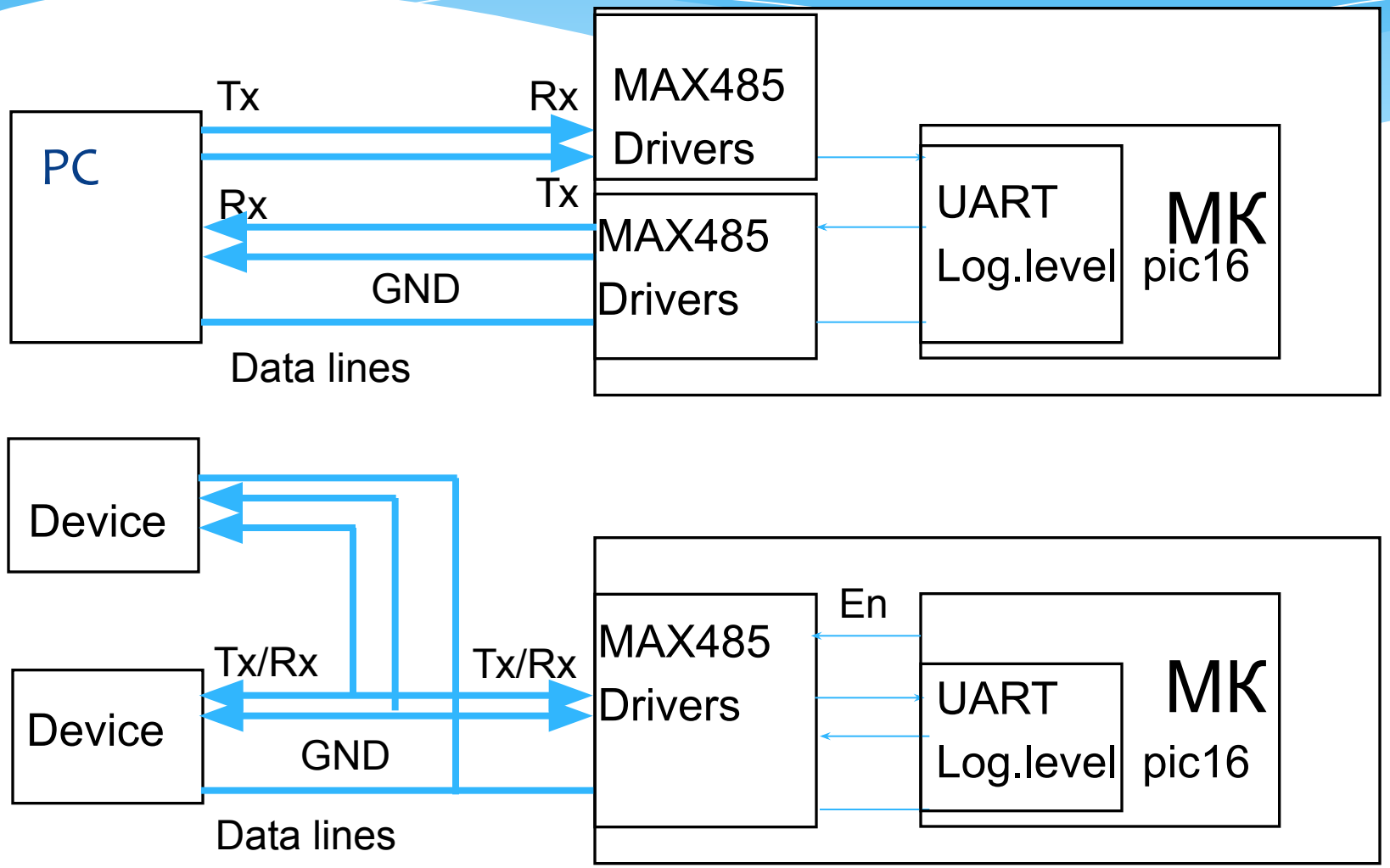
UART + driver RS232



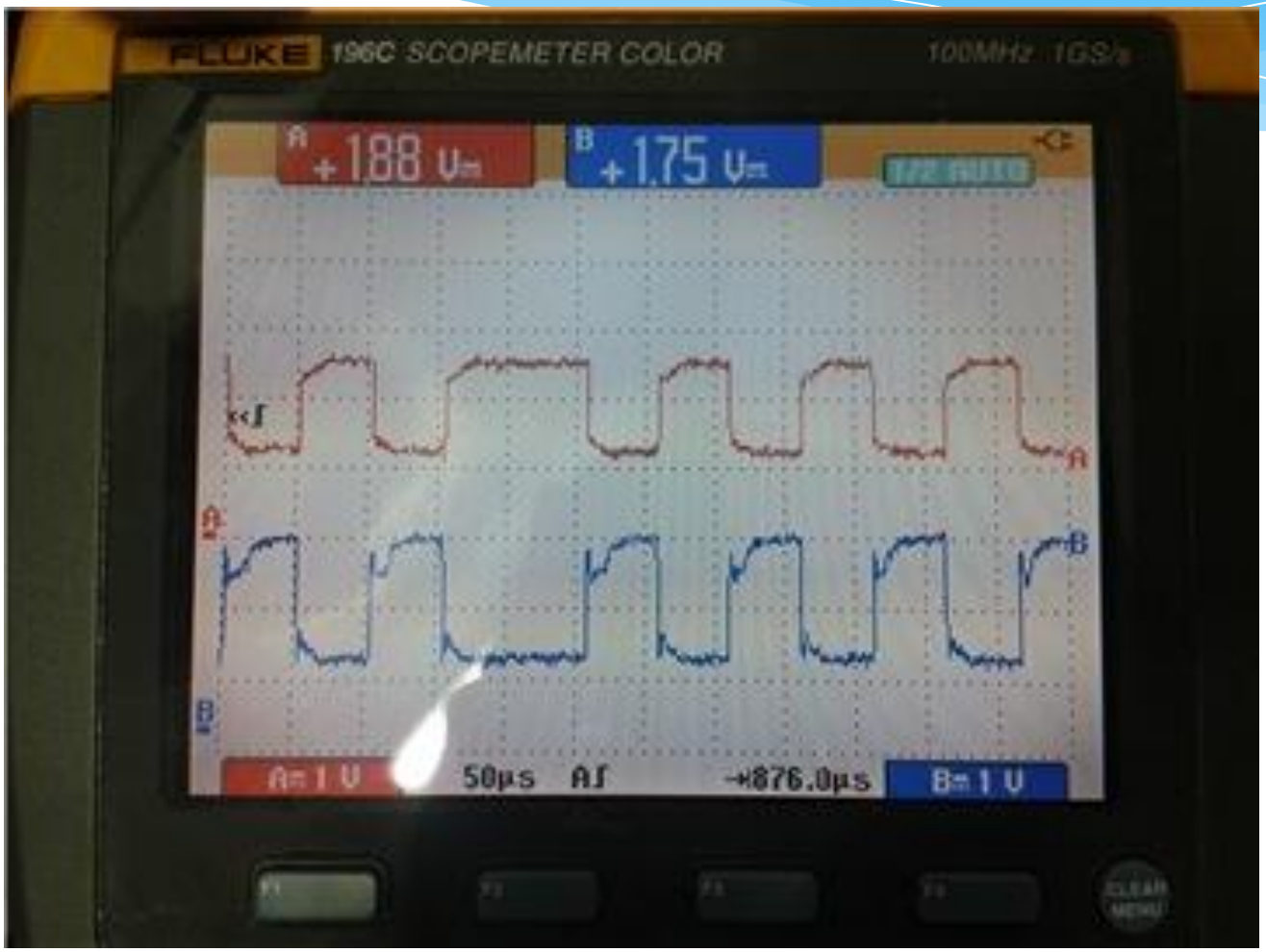
UART + RS232 (level diagram)



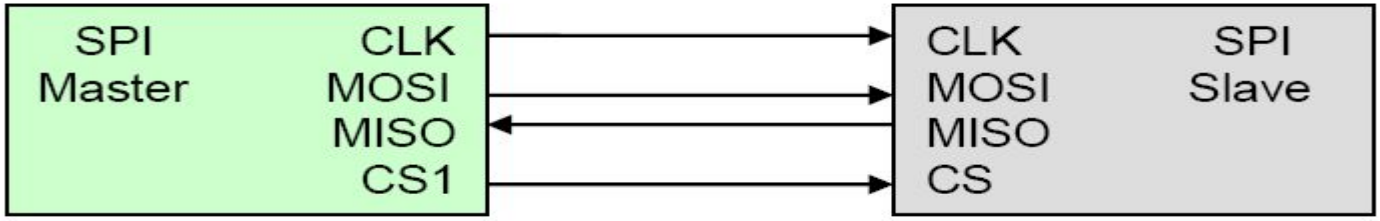
UART + RS485

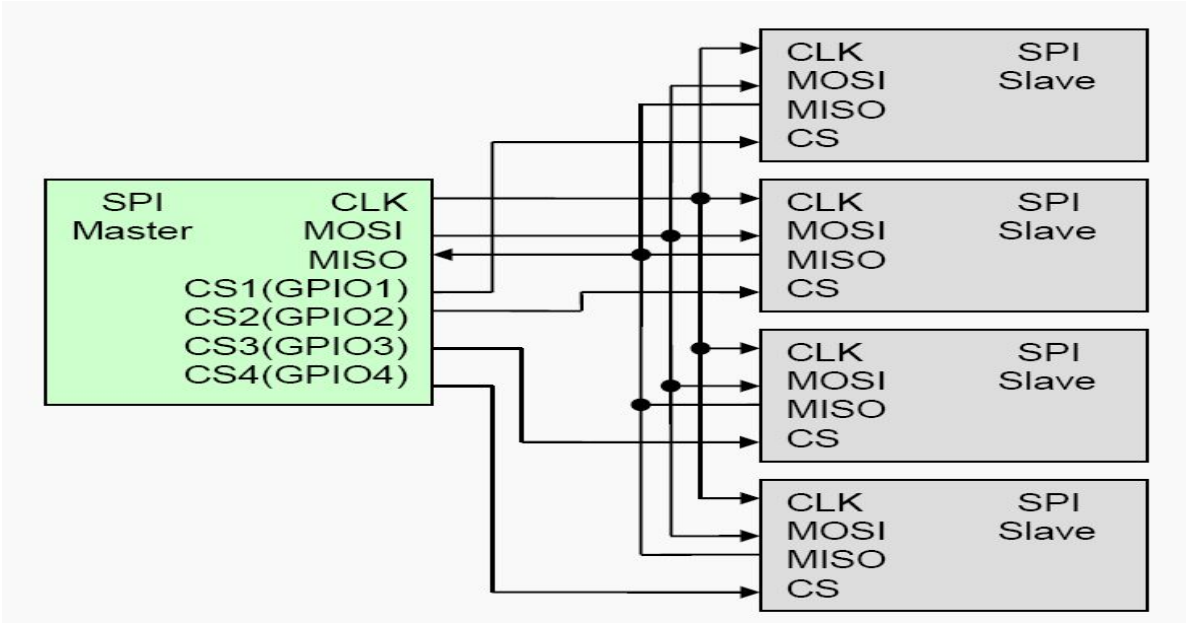

PC
Tx
Rx
Rx
Tx
GND
Data lines
MAX485
Drivers
MAX485
Drivers
UART
Log.level
MK
pic16
Device
Device
Tx/Rx
Tx/Rx
GND
Data lines
En
MAX485
Drivers
UART
Log.level
MK
pic16

UART + RS485(level diagram)



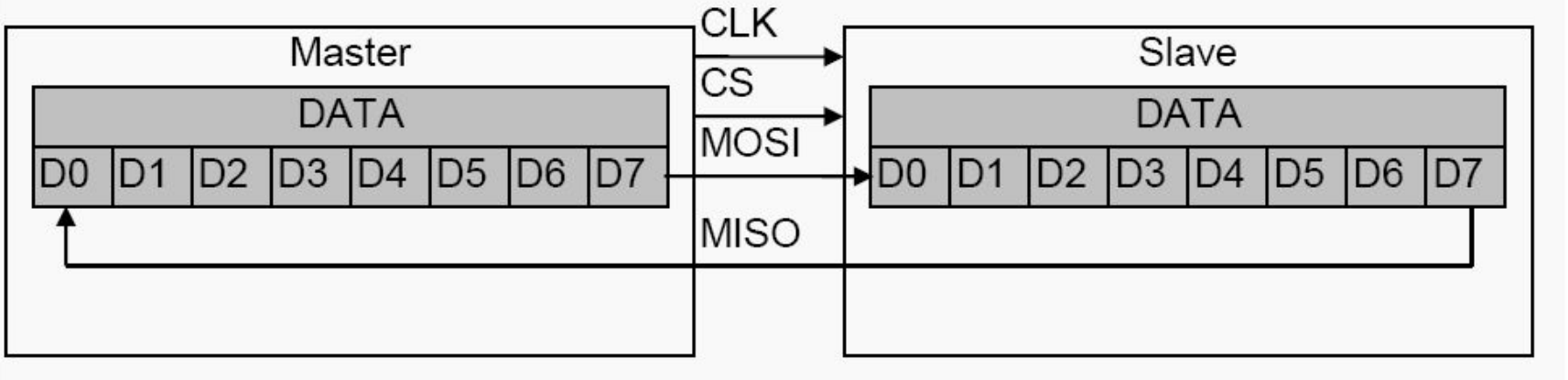
SPI interface





SCLK : Serial Clock (output from master).
MOSI : Master Output, Slave Input (output from master).
MISO : Master Input, Slave Output (output from slave).
SS : Slave Select (active low, output from master).

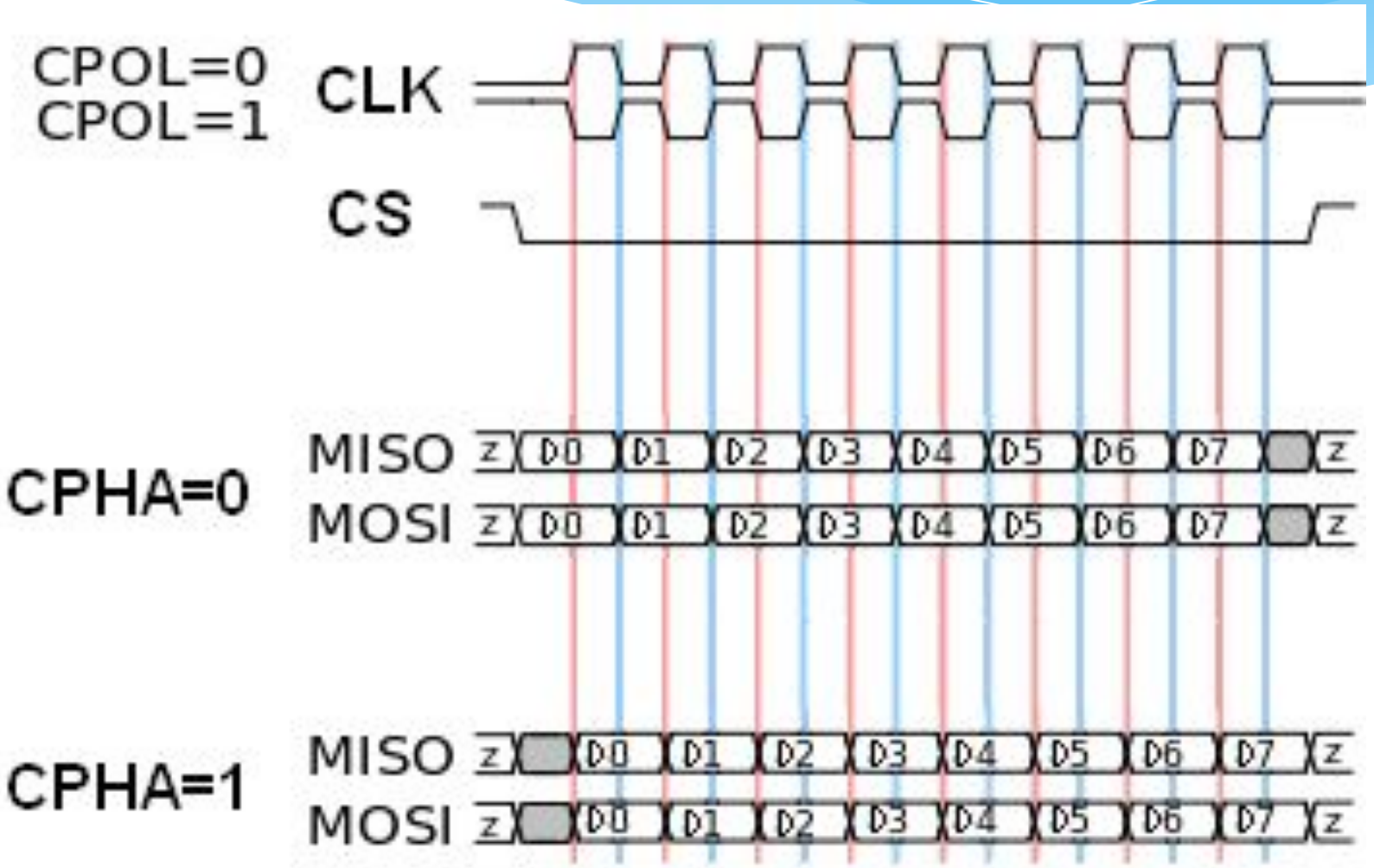
SPI interface



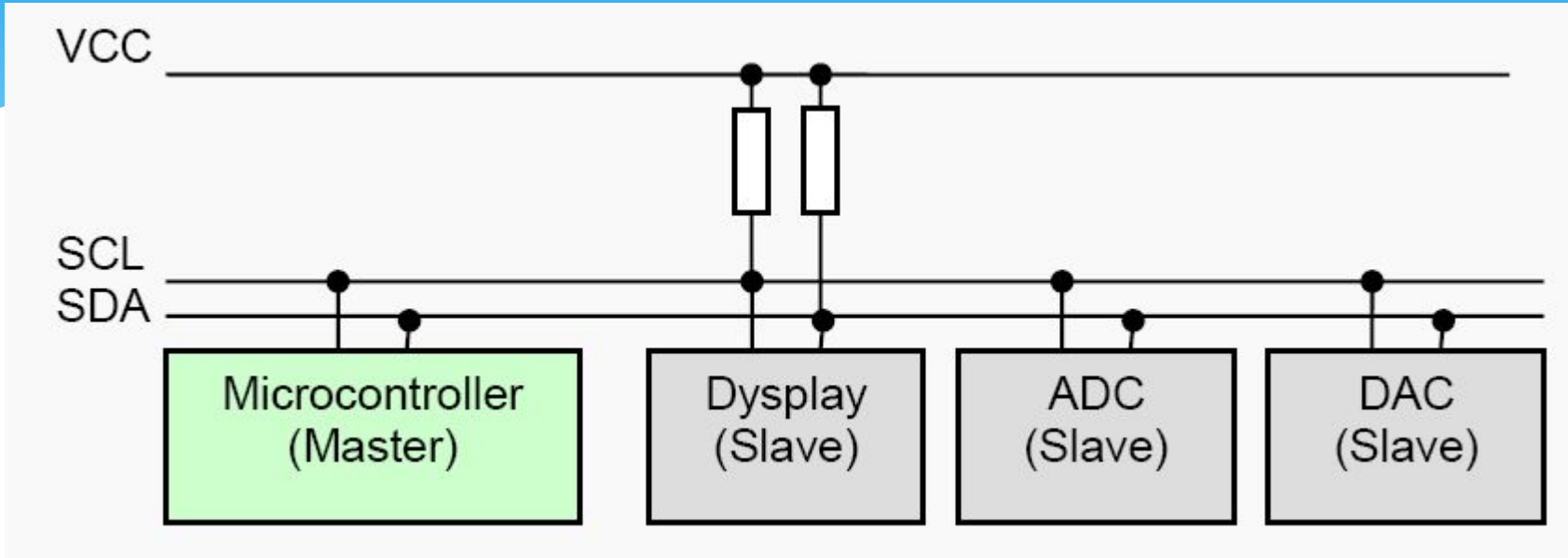
SCLK : Serial Clock (output from master).
MOSI : Master Output, Slave Input (output from master).
MISO : Master Input, Slave Output (output from slave).
SS : Slave Select (active low, output from master).

-only 4 wires
-numbers devices limited numbers pins μC
-speed 4 MBit (1МБ, 10МБ)
-Simultaneous data transfer

SPI signal diagram



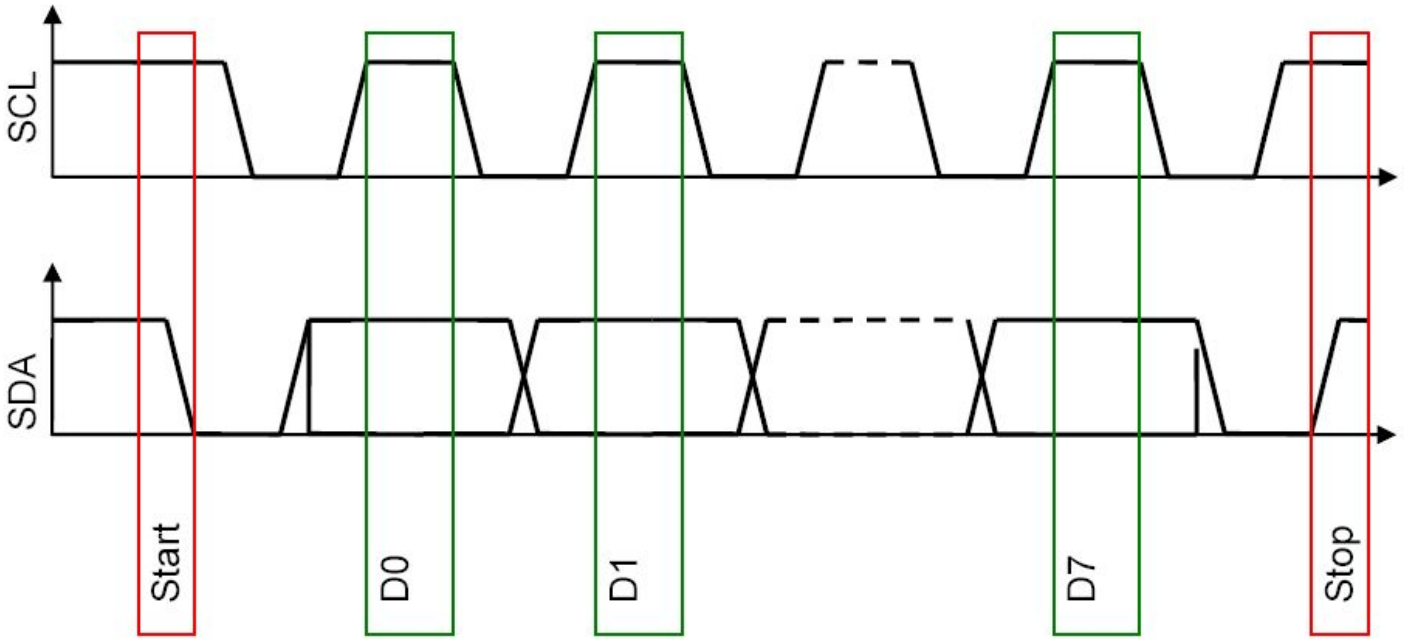
I2C interface



SCL : Serial Clock (output from master).
SDA : Serial Data

-2 wires
-lot devices
-speed 400кБит (100кБ, 1000кБ)
-Alternate exchange data

I2C diagram



I2C example of the program

Parts 1

```
void I2C_start (void)
{
BCLIF=0;
SSPIF = 0; // сняли флаг
SEN = 1; // запустили стартовую последовательность
while(!SSPIF); // ждём установки флага
SSPIF = 0; // сняли флаг
}


void I2C_stop (void)
{
BCLIF=0;
SSPIF = 0; // сняли флаг
PEN = 1; // запустили стартовую последовательность
while(!SSPIF); // ждём установки флага
SSPIF = 0; // сняли флаг
}
```

I2C example of the program

Parts 2

```
void send_byte(unsigned char word)
{
SSPIF = 0; // сняли флаг
SSPBUF = word;  // отправляем адрес/ данные
while(!SSPIF); // ждём установки флага
SSPIF = 0; // сняли флаг
BCLIF=0;
}

void read_byte(void)
{
        BCLIF=0;
        SSPIF=0;
        RCEN=1;
        while (!SSPIF && !BCLIF);
        ACKDT=1;
        BCLIF=0;
        SSPIF=0;
        ACKEN=1;
          RCEN = 0;
        while (!SSPIF && !BCLIF);
}
```

checking task

Symbol	Function
++	?
--	?
~	?
-	?
+	?
&	?
&&	?
|	?
||	?
==	?
=	?
!=	?

Symbol	Function
<<	?
>>	?
<	?
>	?
%	?

15 minutes on execution

bin	dec	hex
0b01010101	?	?
?	-1	?
?	?	3FF
?	99	?