

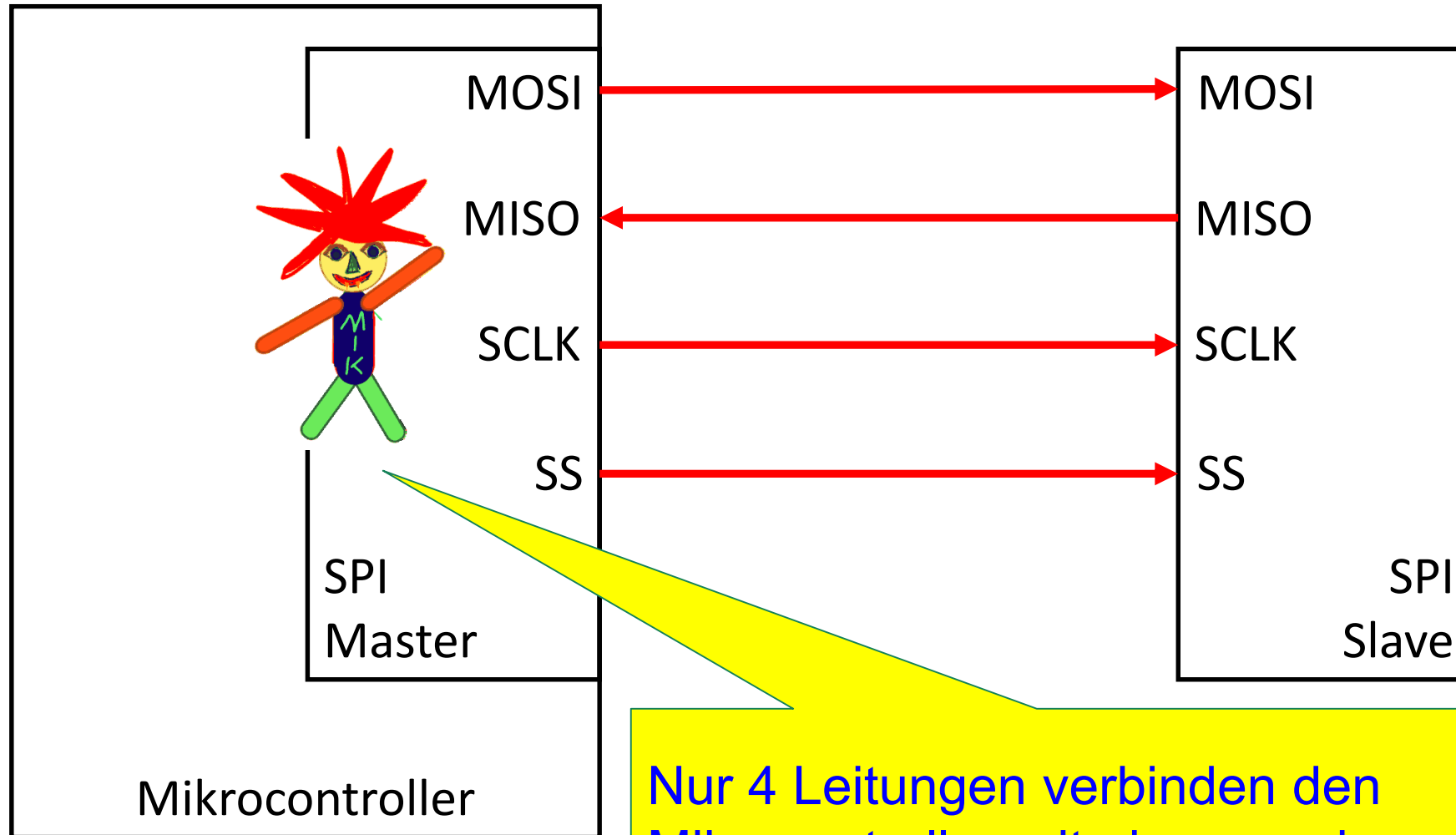
# SPI Serial Peripheral Interface



Smalltalk auf der  
Leiterplatte



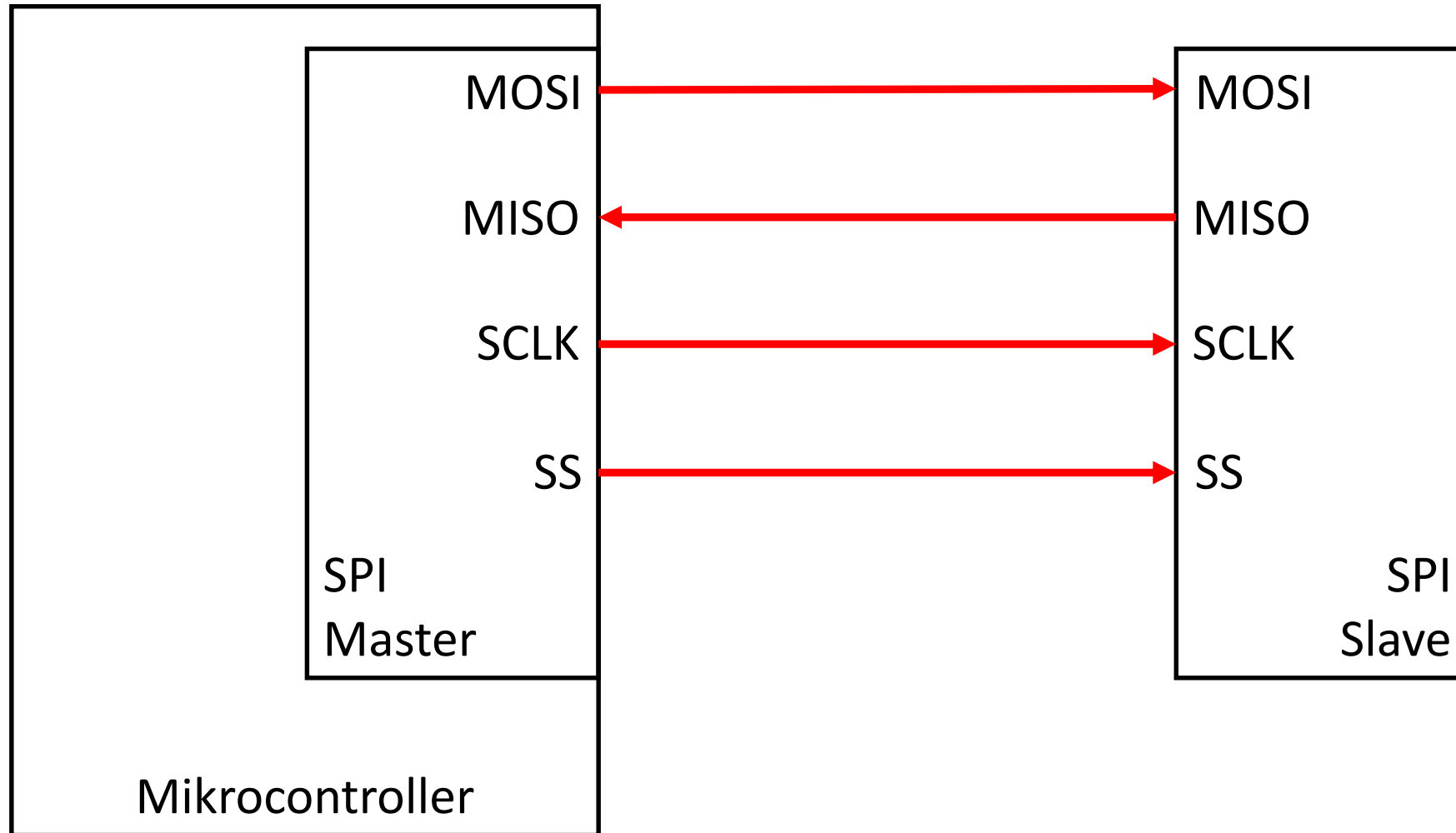
# SPI Serial Peripheral Interface



Nur 4 Leitungen verbinden den Mikrocontroller mit einem anderen „Modul“ auf der Leiterplatte



# SPI Serial Peripheral Interface

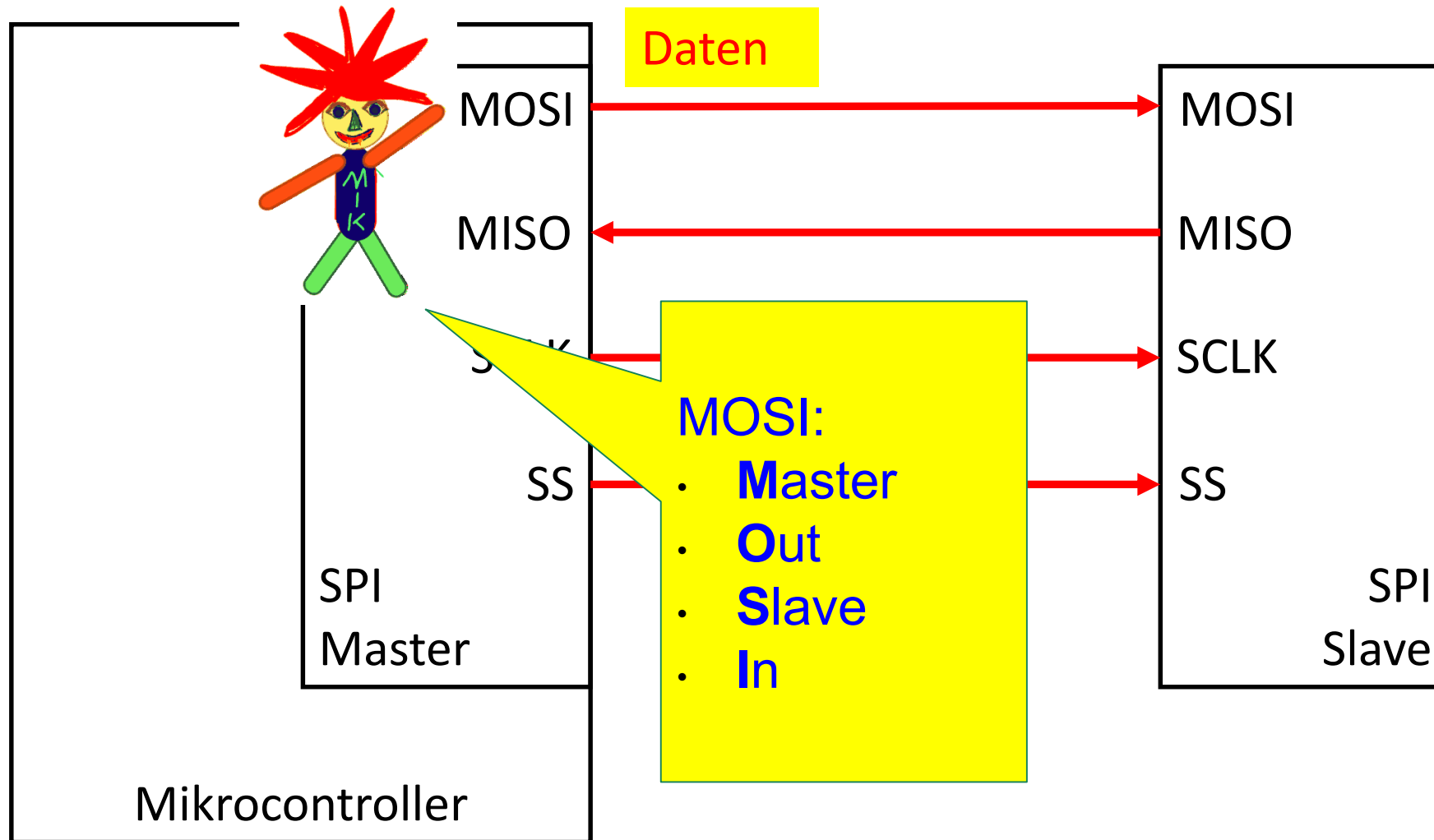


Z.B.

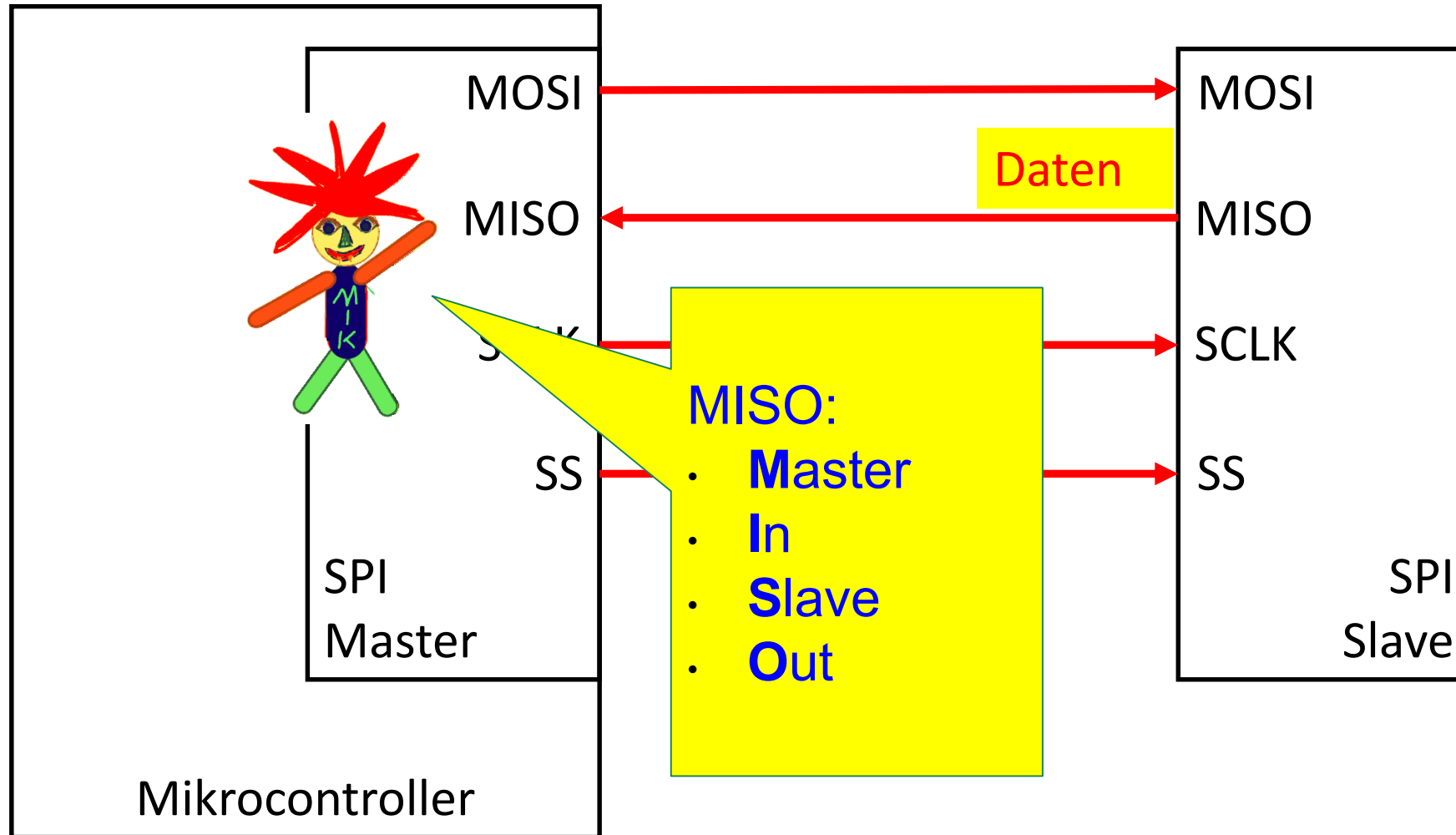
- Display
- LAN-Modul
- E/A-Baugruppe



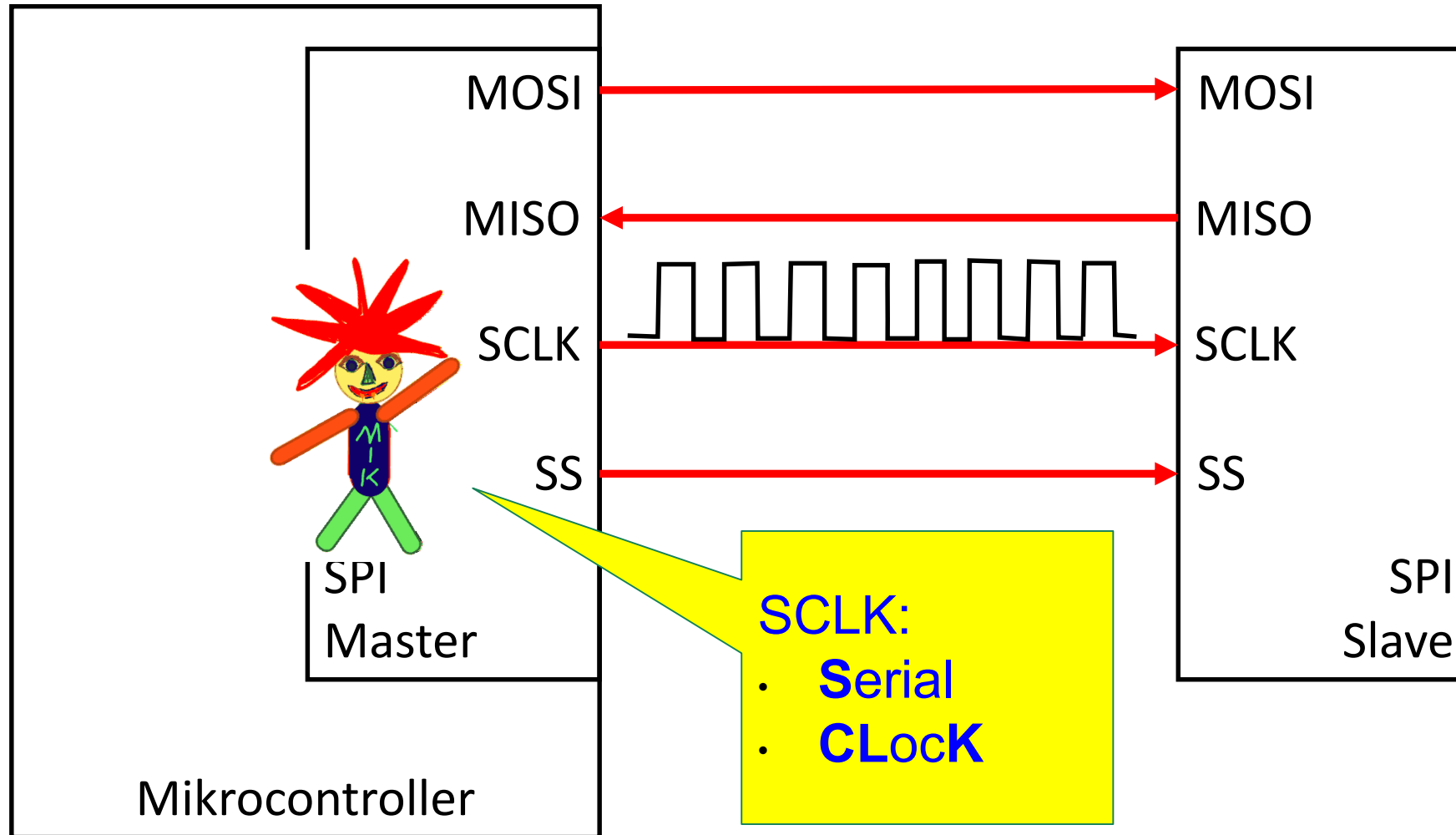
# SPI Serial Peripheral Interface



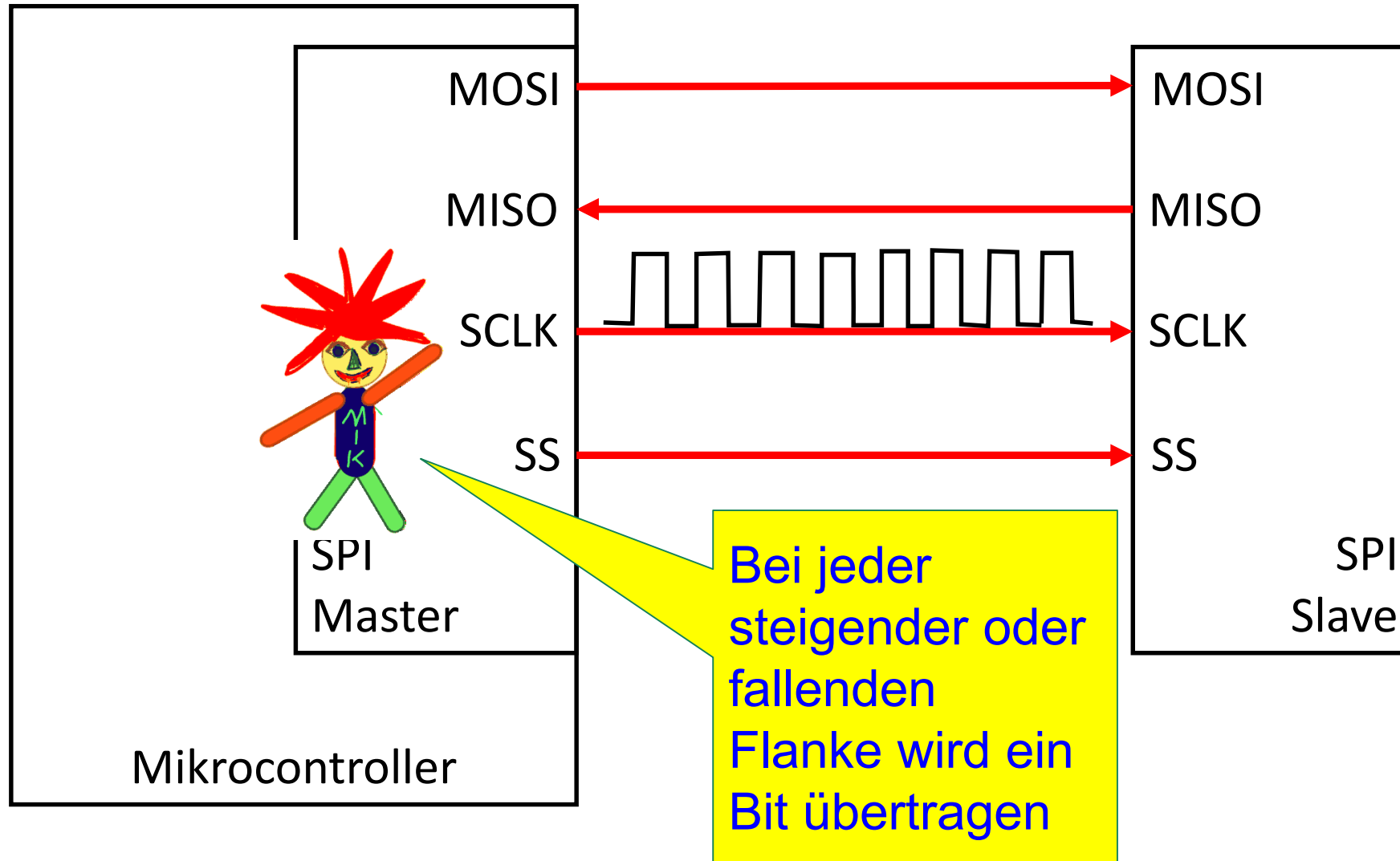
# SPI Serial Peripheral Interface



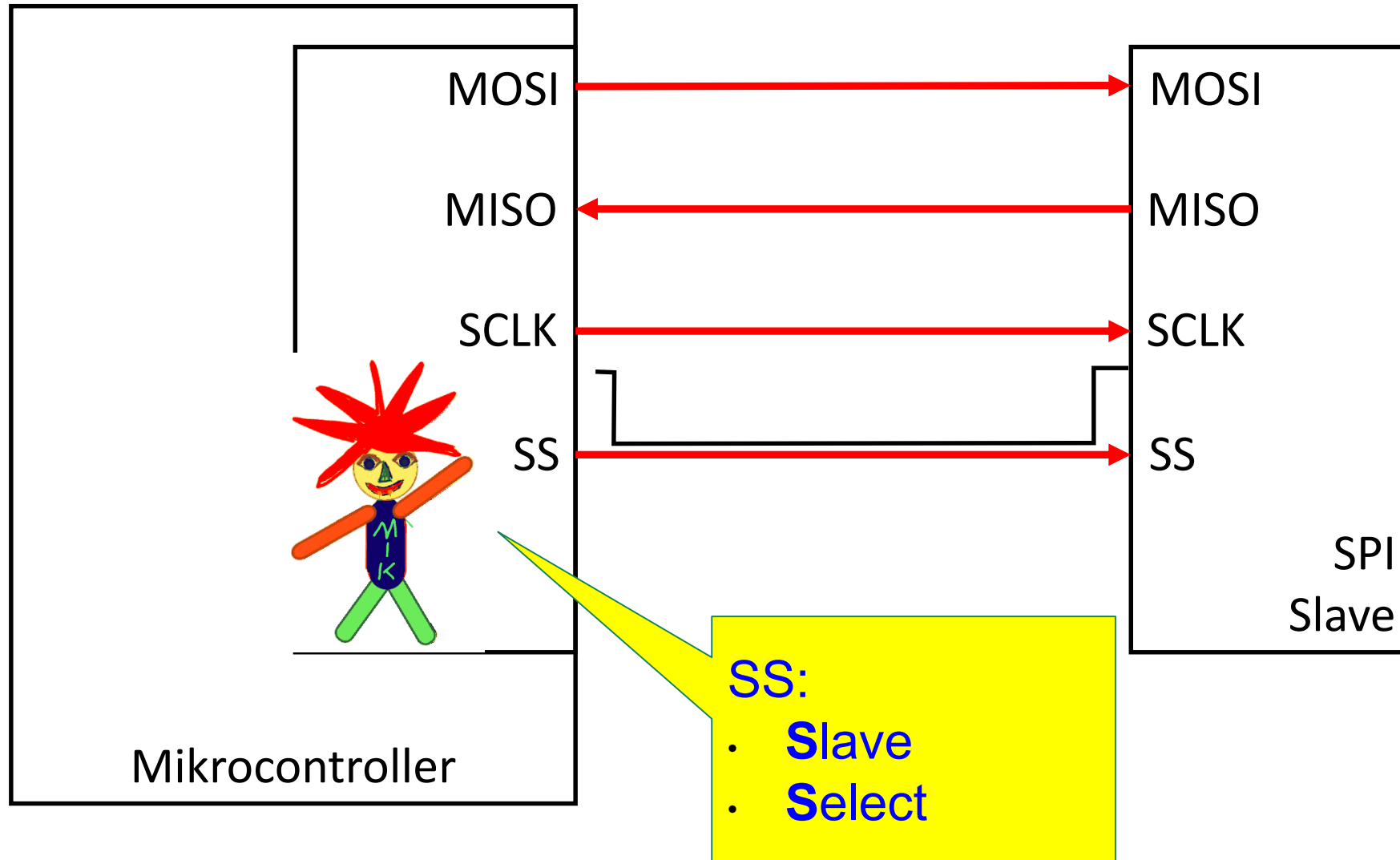
# SPI Serial Peripheral Interface



# SPI Serial Peripheral Interface

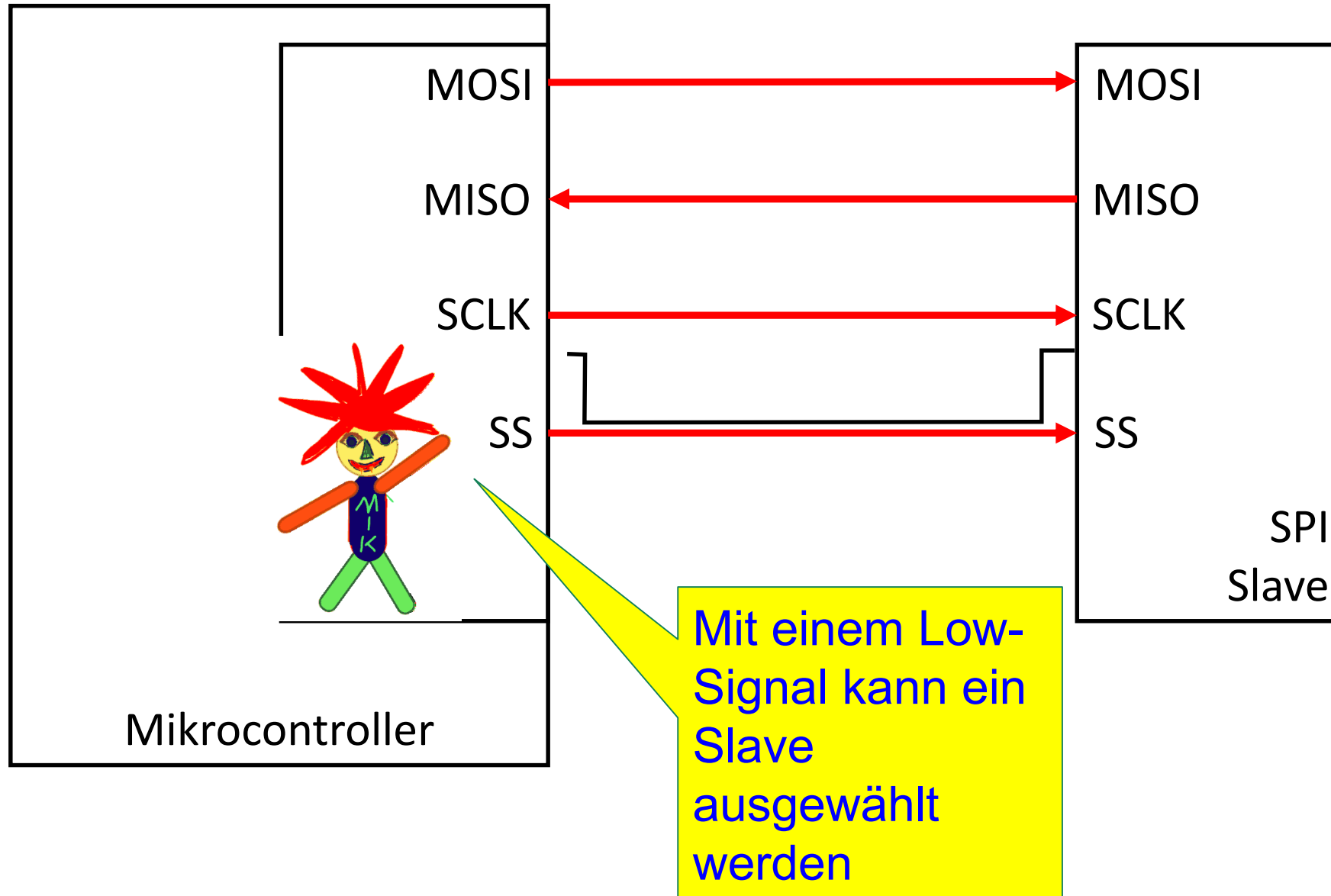


# SPI Serial Peripheral Interface

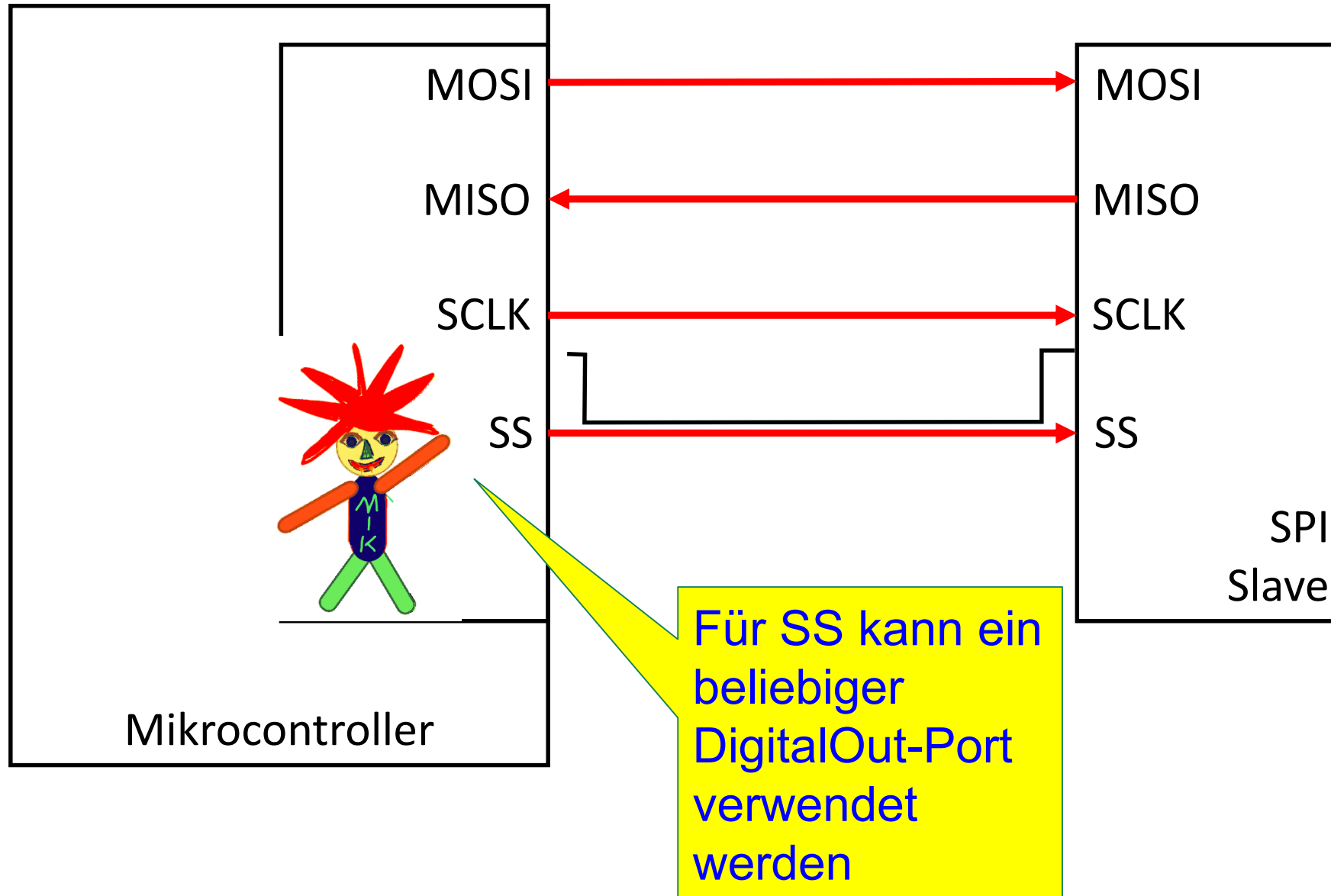




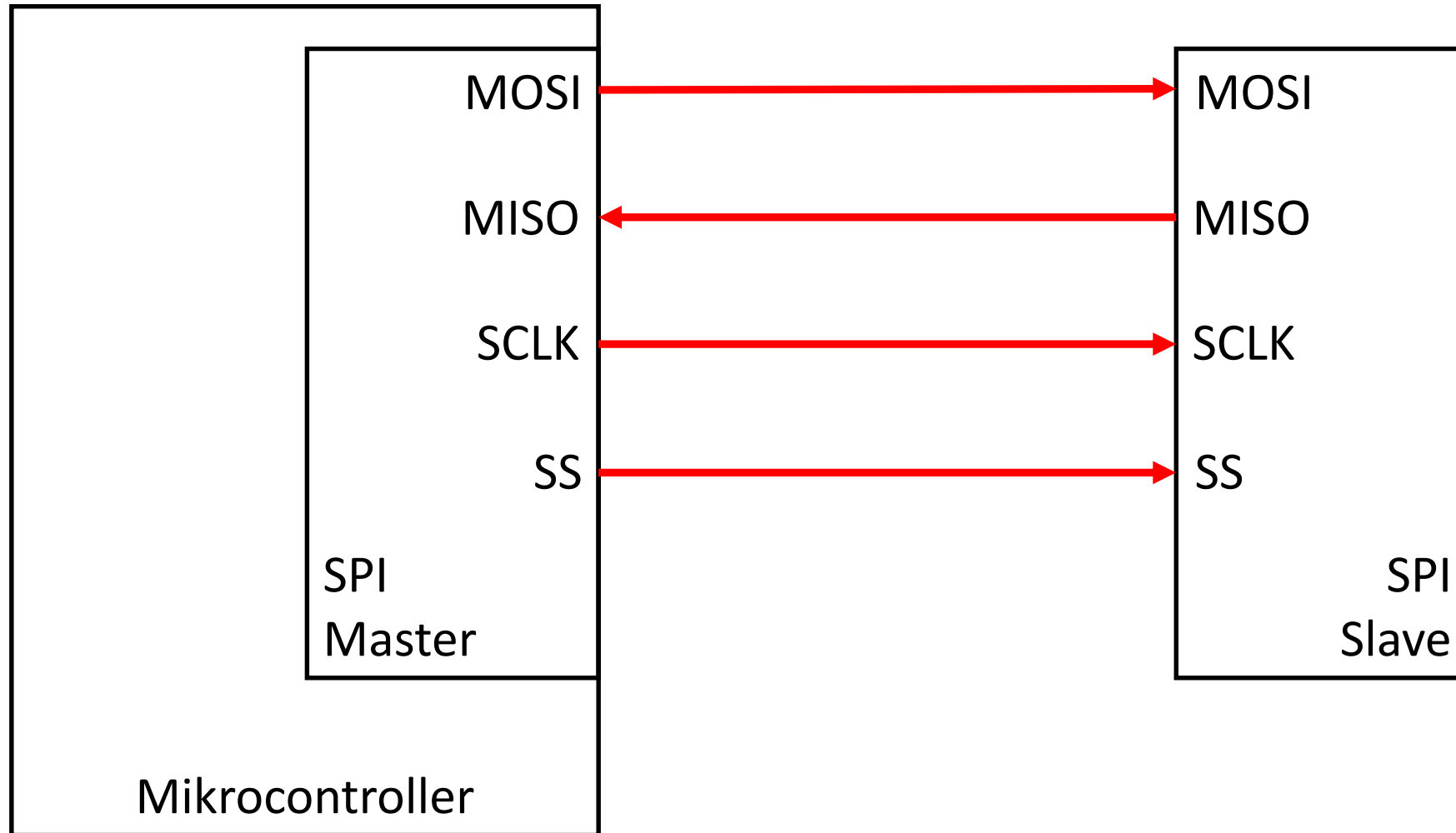
# SPI Serial Peripheral Interface



# SPI Serial Peripheral Interface



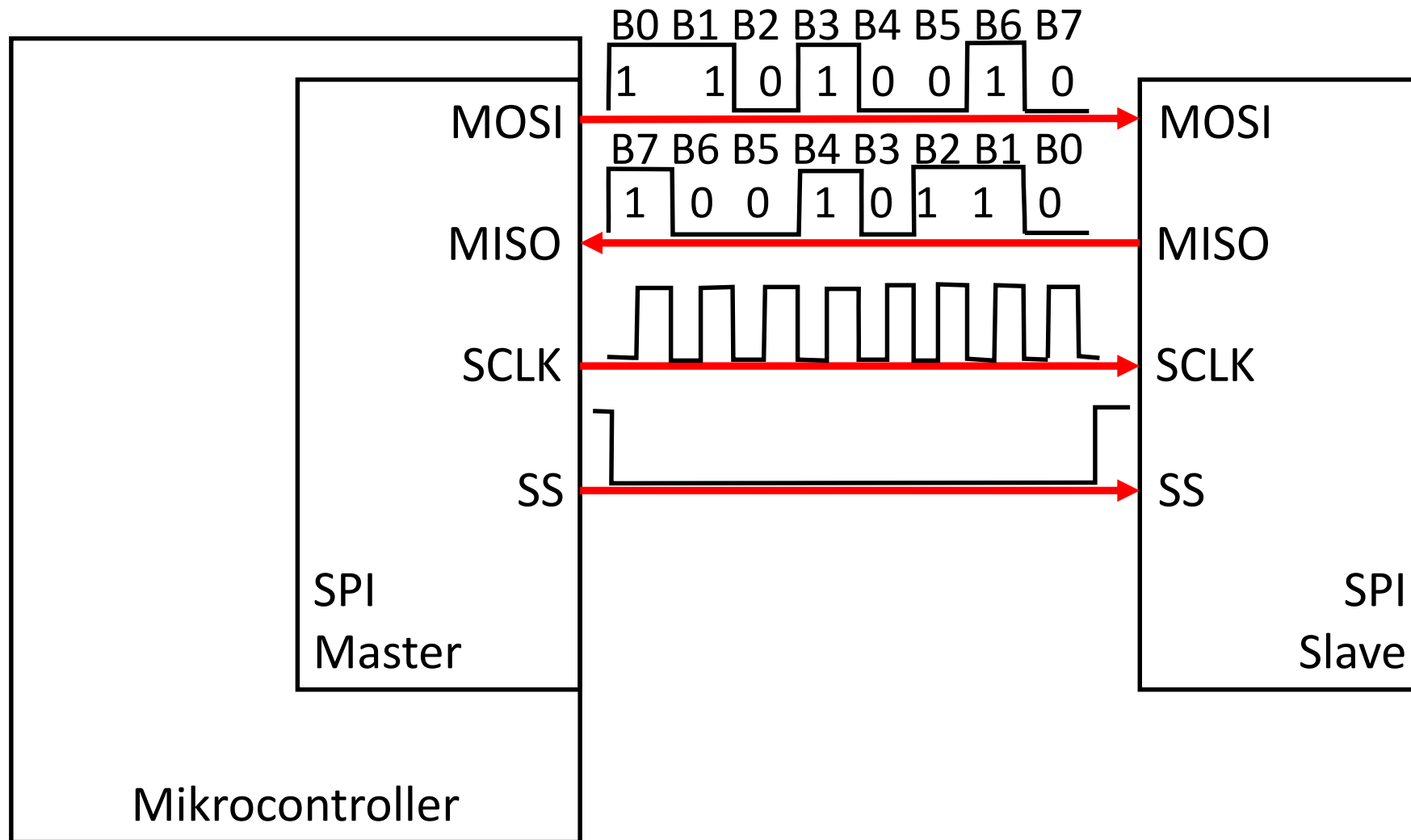
# SPI Serial Peripheral Interface



Wie können umfangreiche Daten über nur 4 Verbindungen übertragen werden?



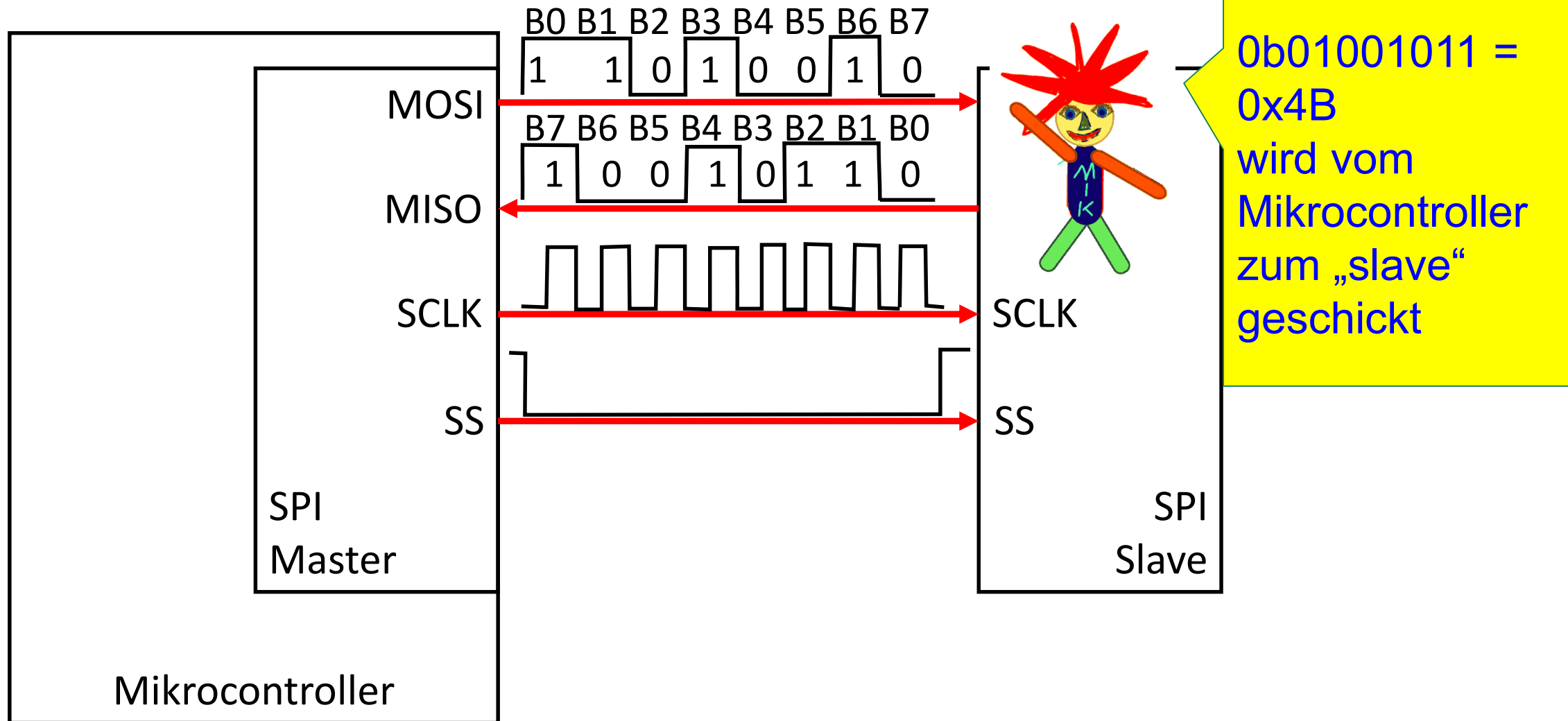
# SPI Serial Peripheral Interface



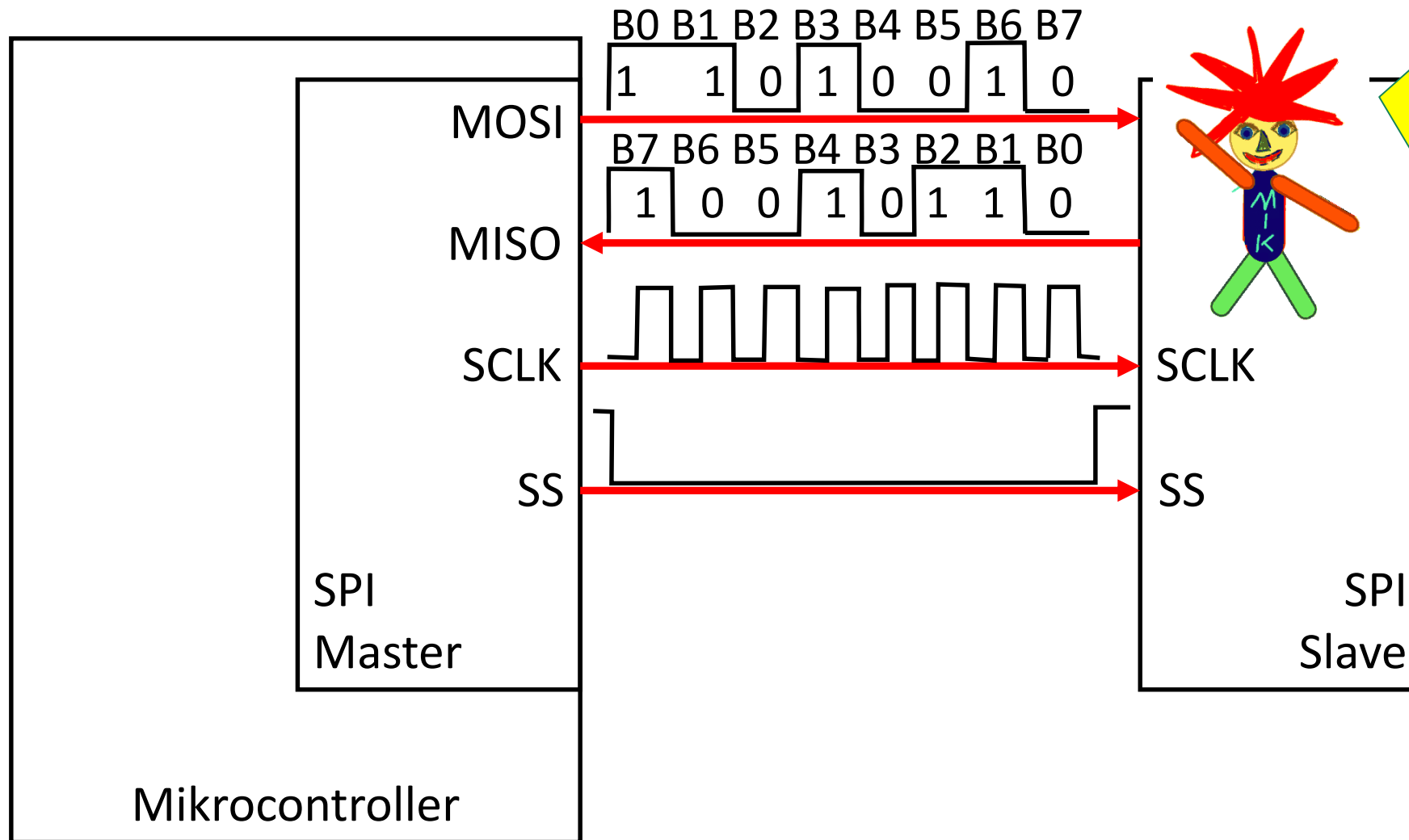
Bit für Bit  
nacheinander  
=  
seriell



# SPI Serial Peripheral Interface



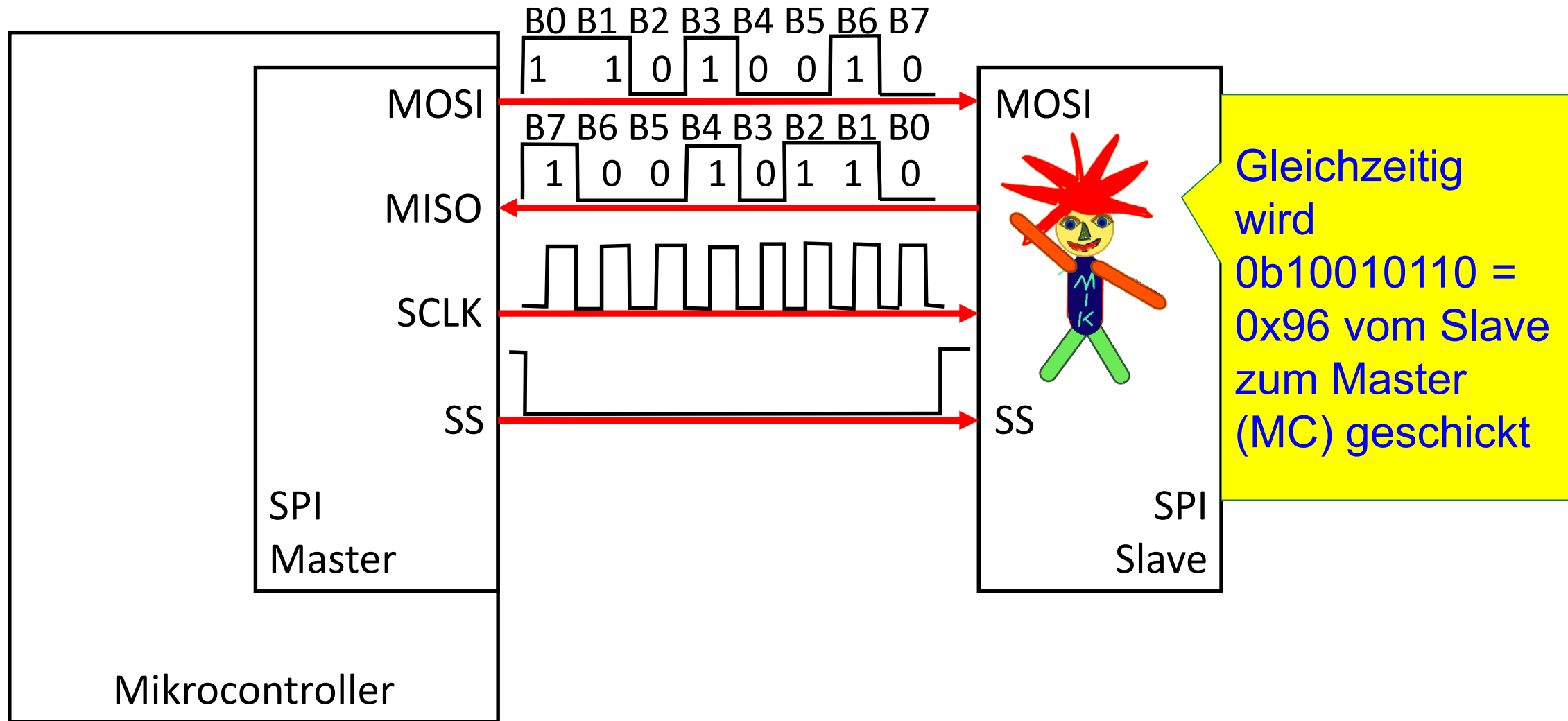
# SPI Serial Peripheral Interface



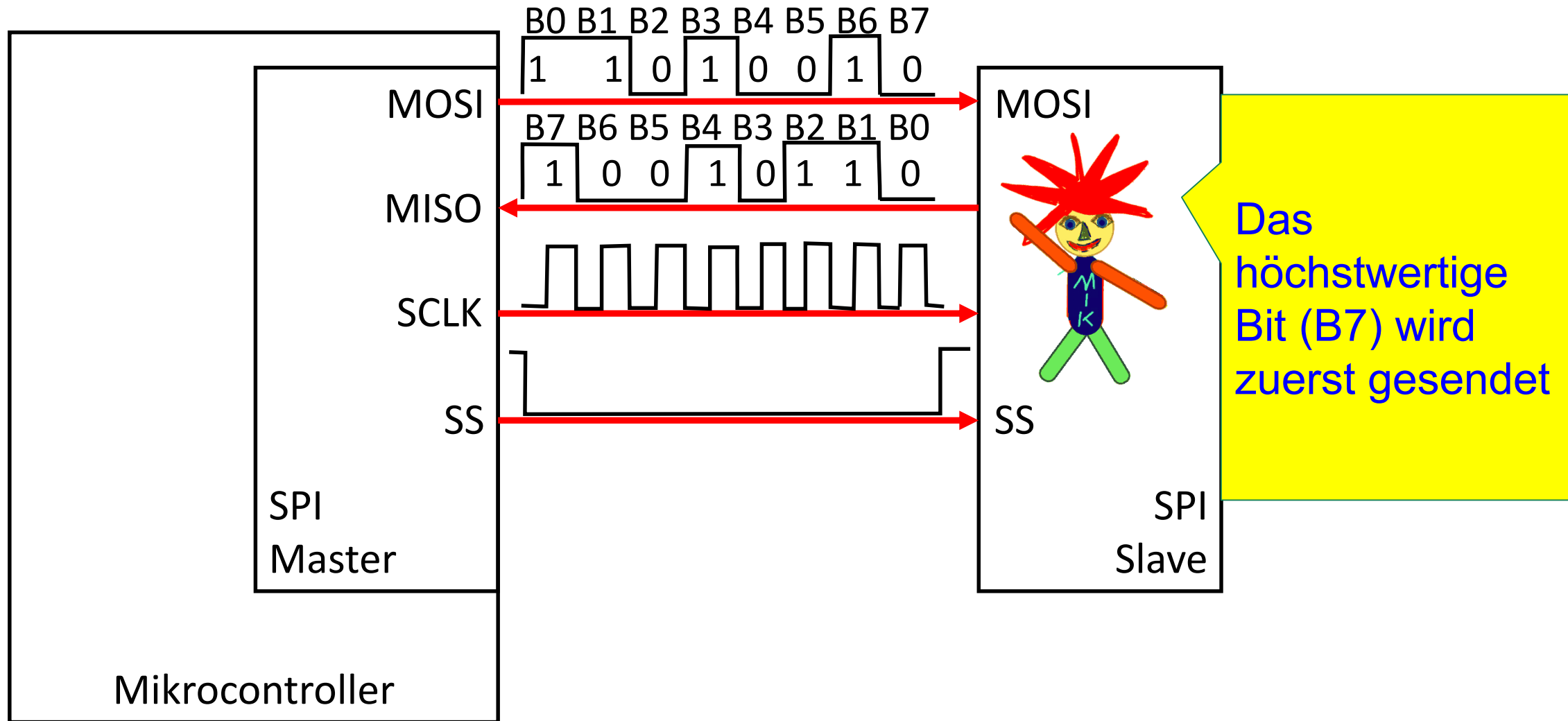
Das  
höchstwertige  
Bit (B7) wird  
zuerst gesendet



# SPI Serial Peripheral Interface

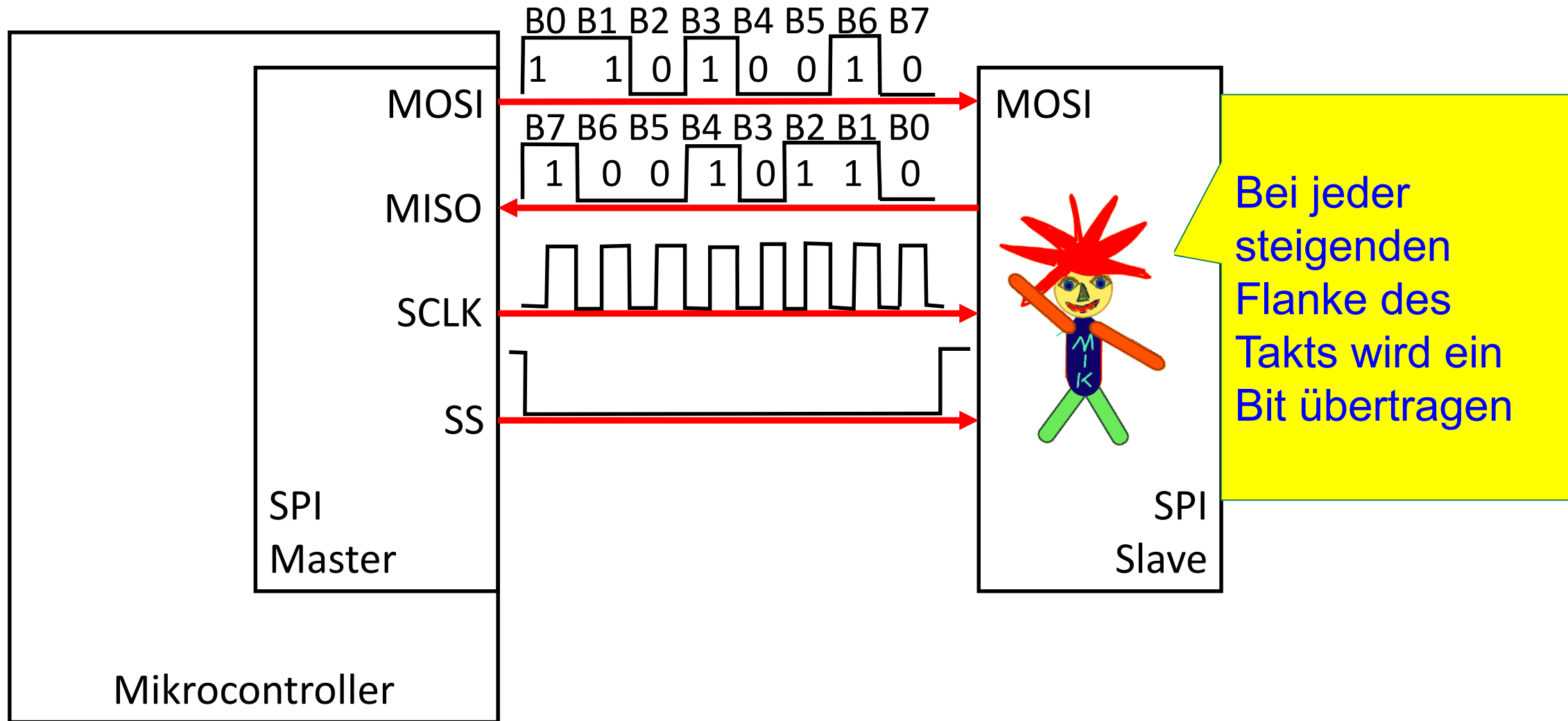


# SPI Serial Peripheral Interface

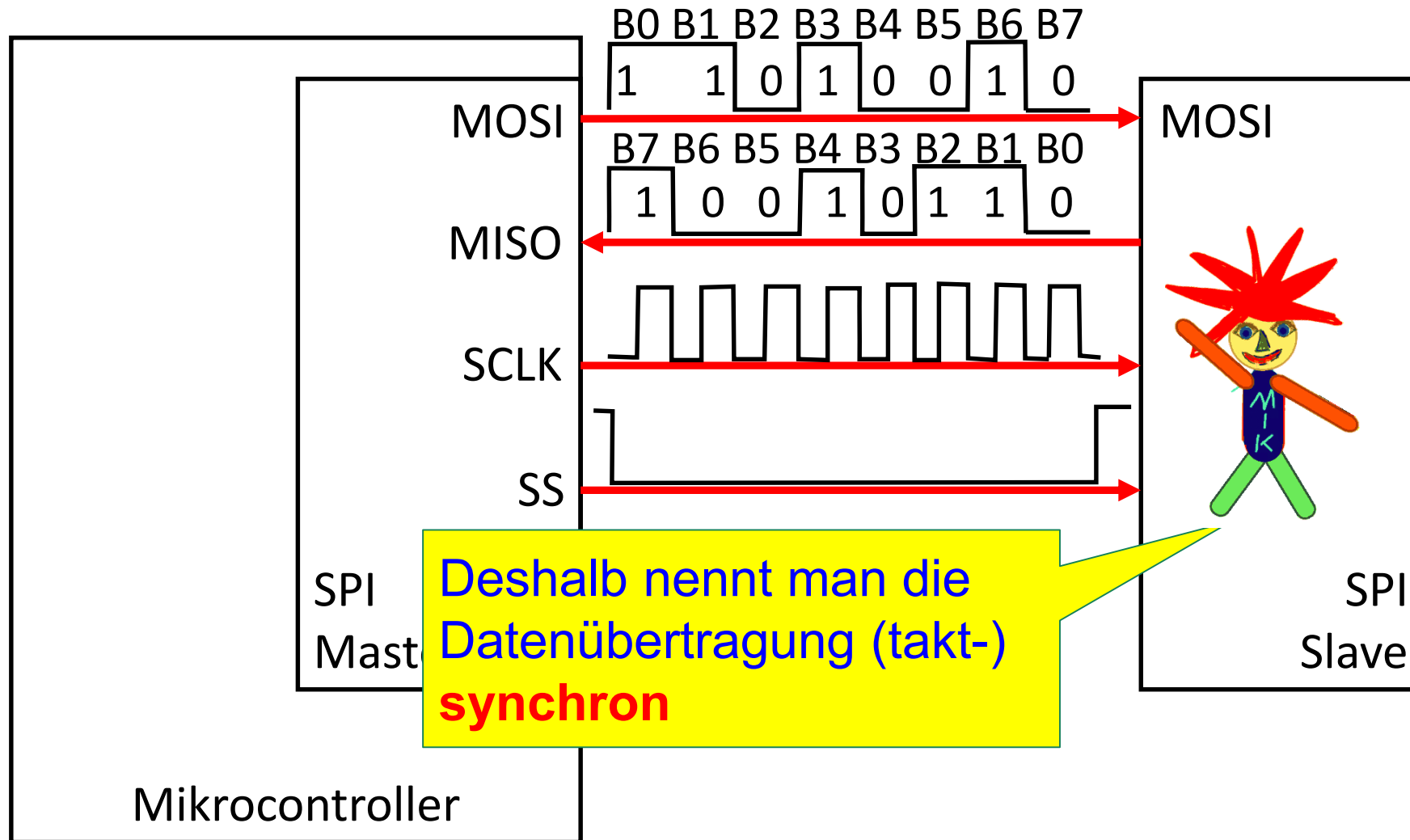




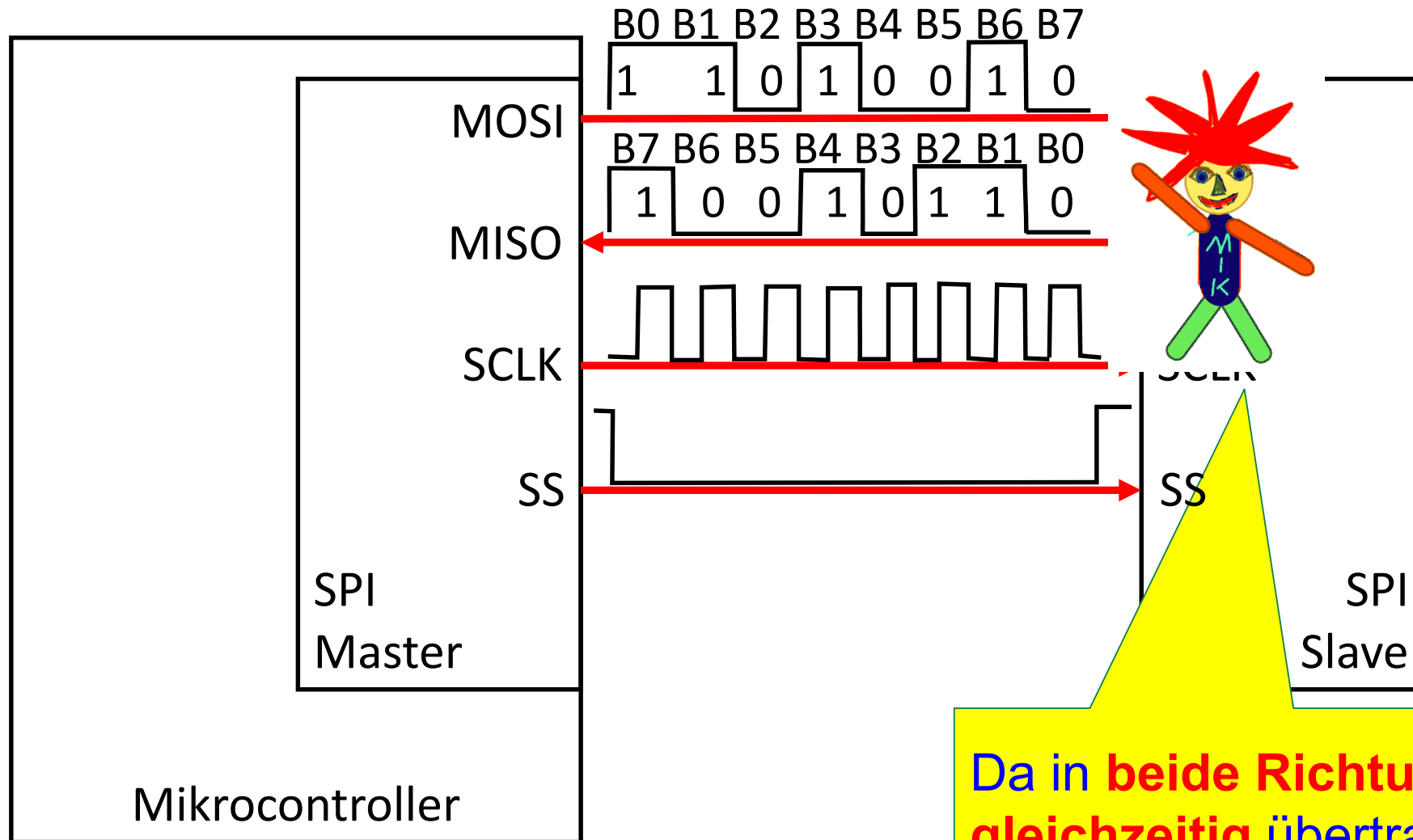
# SPI Serial Peripheral Interface



# SPI Serial Peripheral Interface



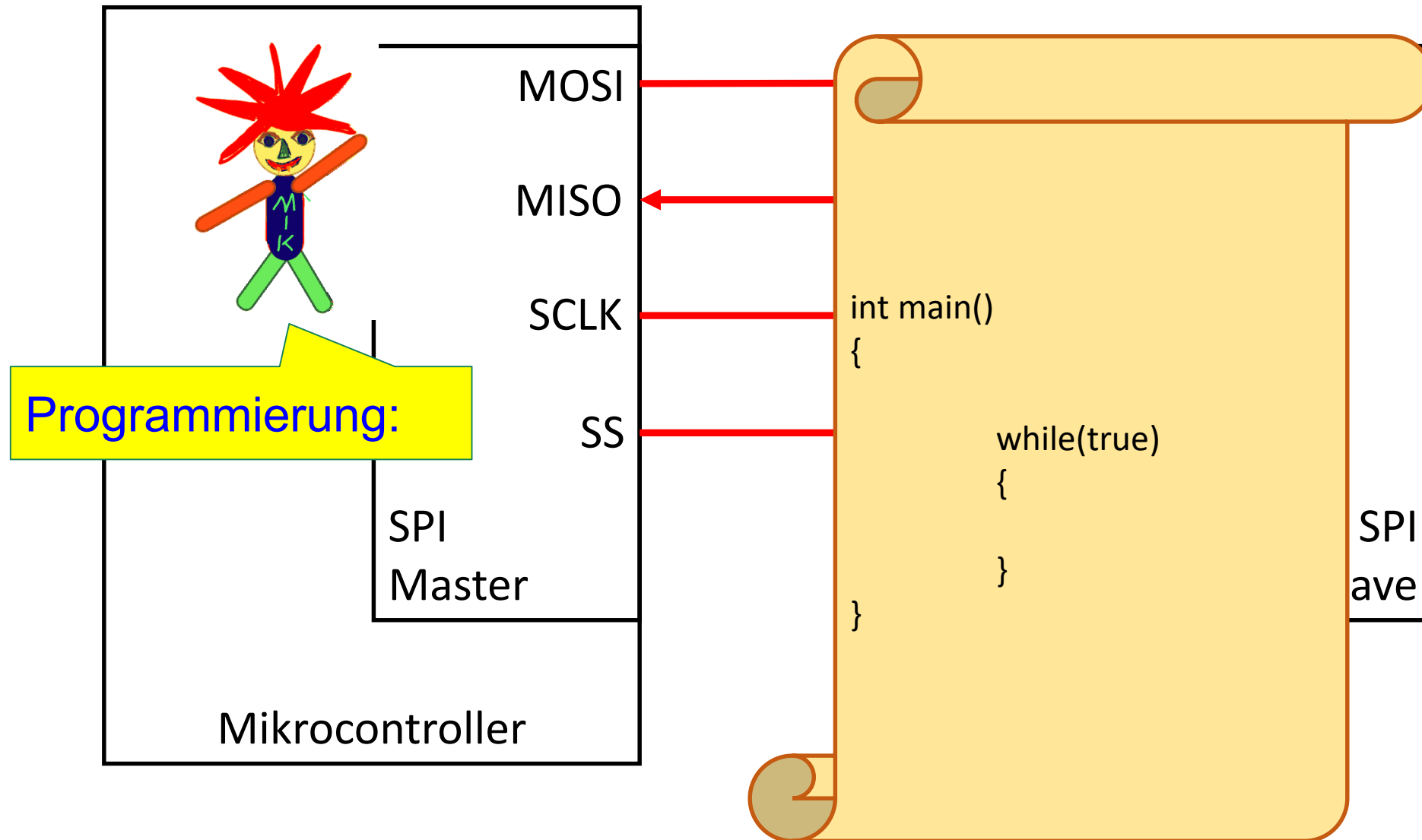
# SPI Serial Peripheral Interface



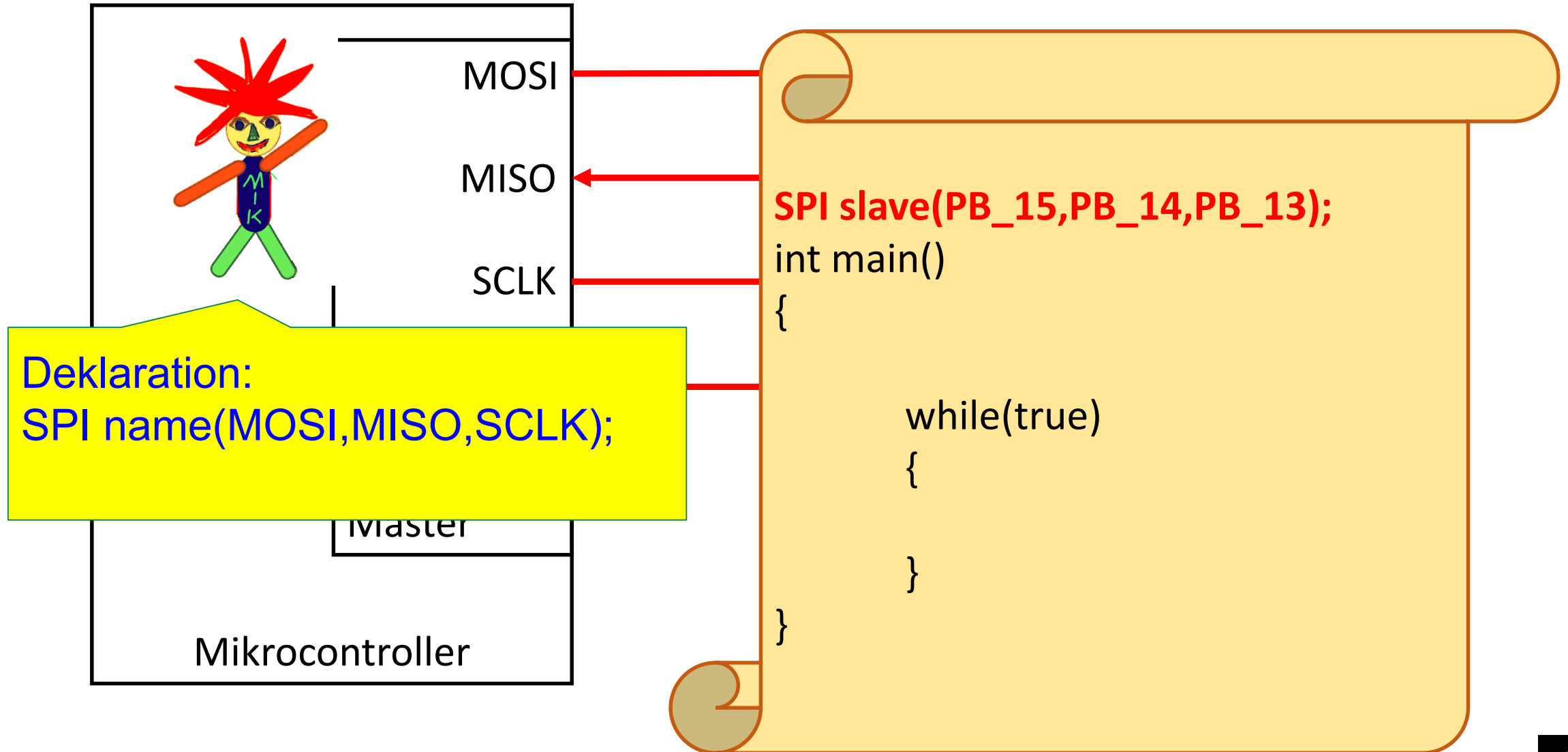
Da in beide Richtungen gleichzeitig übertragen wird, spricht man von: **Vollduplex**



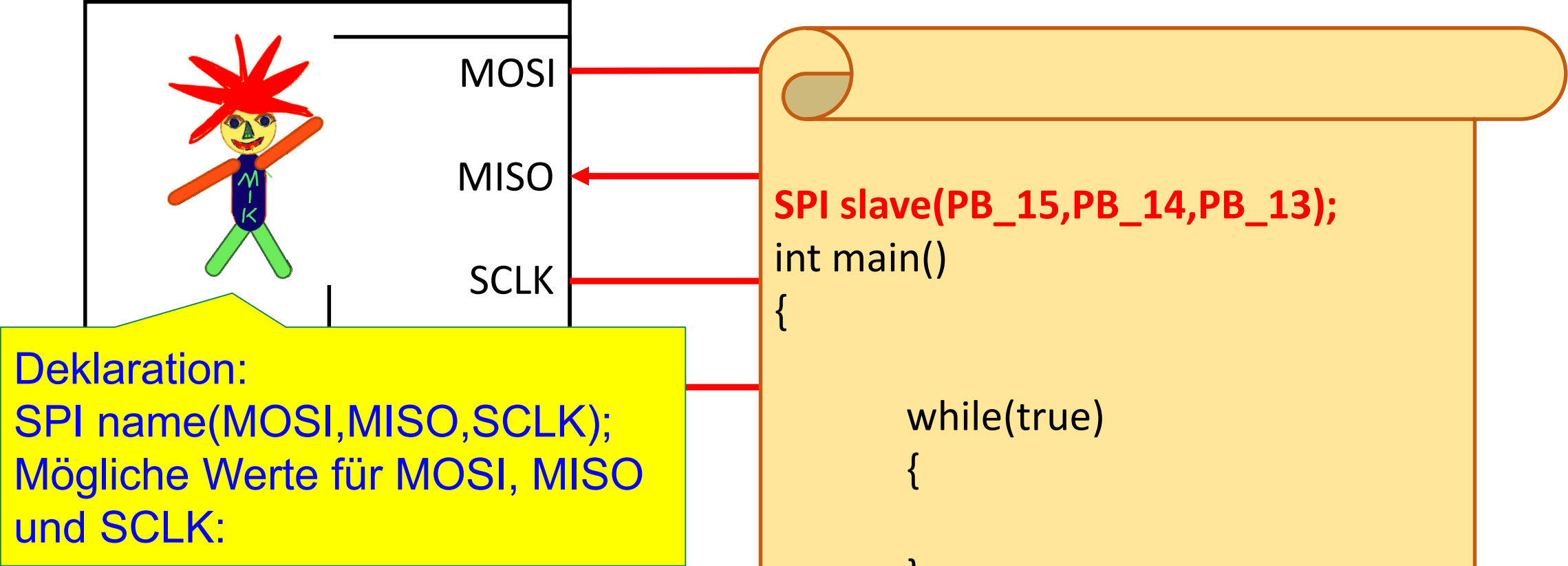
# SPI Serial Peripheral Interface



# SPI Serial Peripheral Interface



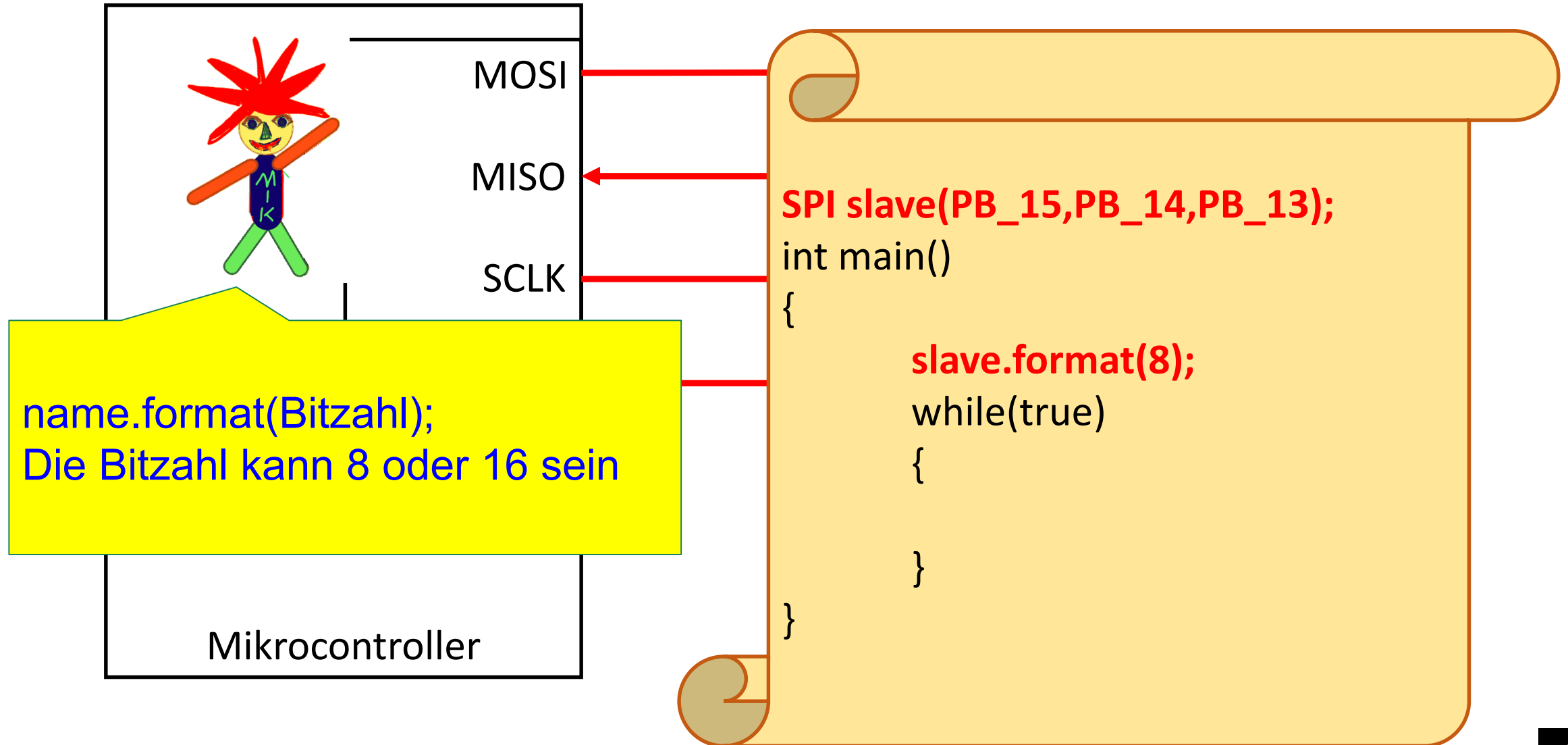
# SPI Serial Peripheral Interface



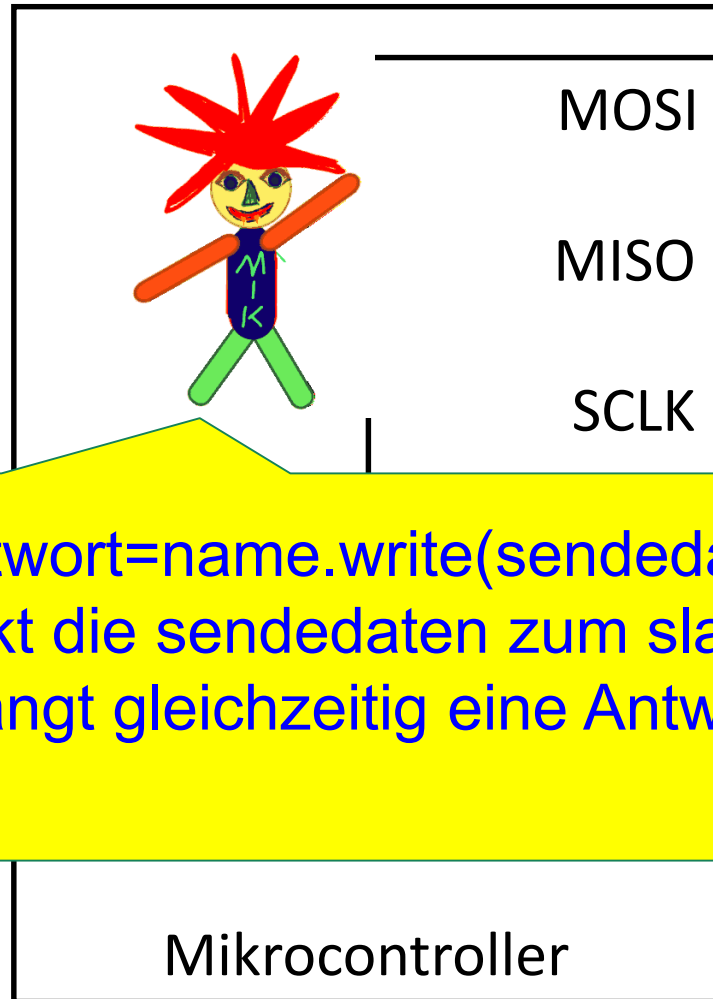
Mikrocontr		MOSI	MISO	SCLK
	SPI2	PB_15	PB_14	PB_13
	SPI1	PB_5 (D4)	PB_4 (D5)	PB_3 (D3)
	SPI1	PA_7 (D11)	PA_6 (D12)	PA_5 (D13)



# SPI Serial Peripheral Interface



# SPI Serial Peripheral Interface



`int antwort=name.write(sendedaten);`  
Schickt die sendedaten zum slave und empfängt gleichzeitig eine Antwort vom Slave.

```
SPI slave(PB_15,PB_14,PB_13);
```

```
int main()
```

```
{ int antwort,sendedaten;
```

```
    slave.format(8);
```

```
    while(true)
```

```
    {
```

```
        sendedaten=0x4B;
```

```
        antwort=slave.write(sendedaten);
```

```
    }
```

```
}
```





# SPI Serial Peripheral Interface



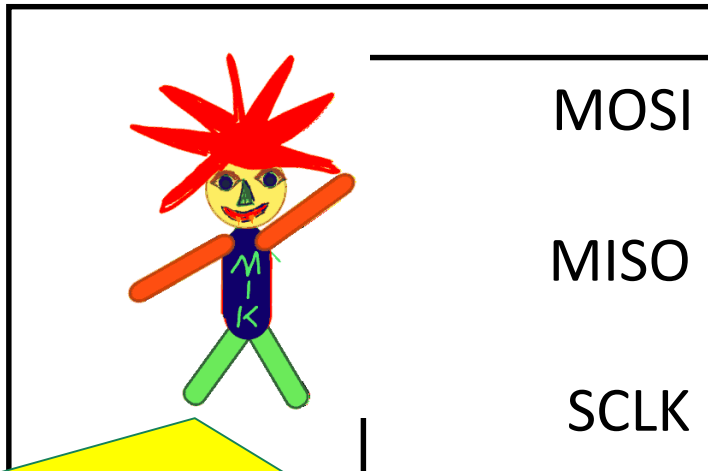
Ein DigitalOut für den Slave-Select

```
SPI slave(PB_15,PB_14,PB_13);  
DigitalOut SS(PB_12);
```

```
int main()  
{ int antwort,sendedaten;  
  slave.format(8);  
  while(true)  
  {  
    sendedaten=0x4B;  
    antwort=slave.write(sendedaten);  
  }  
}
```



# SPI Serial Peripheral Interface



Vorher SS auf 0,  
Nachher SS auf 1

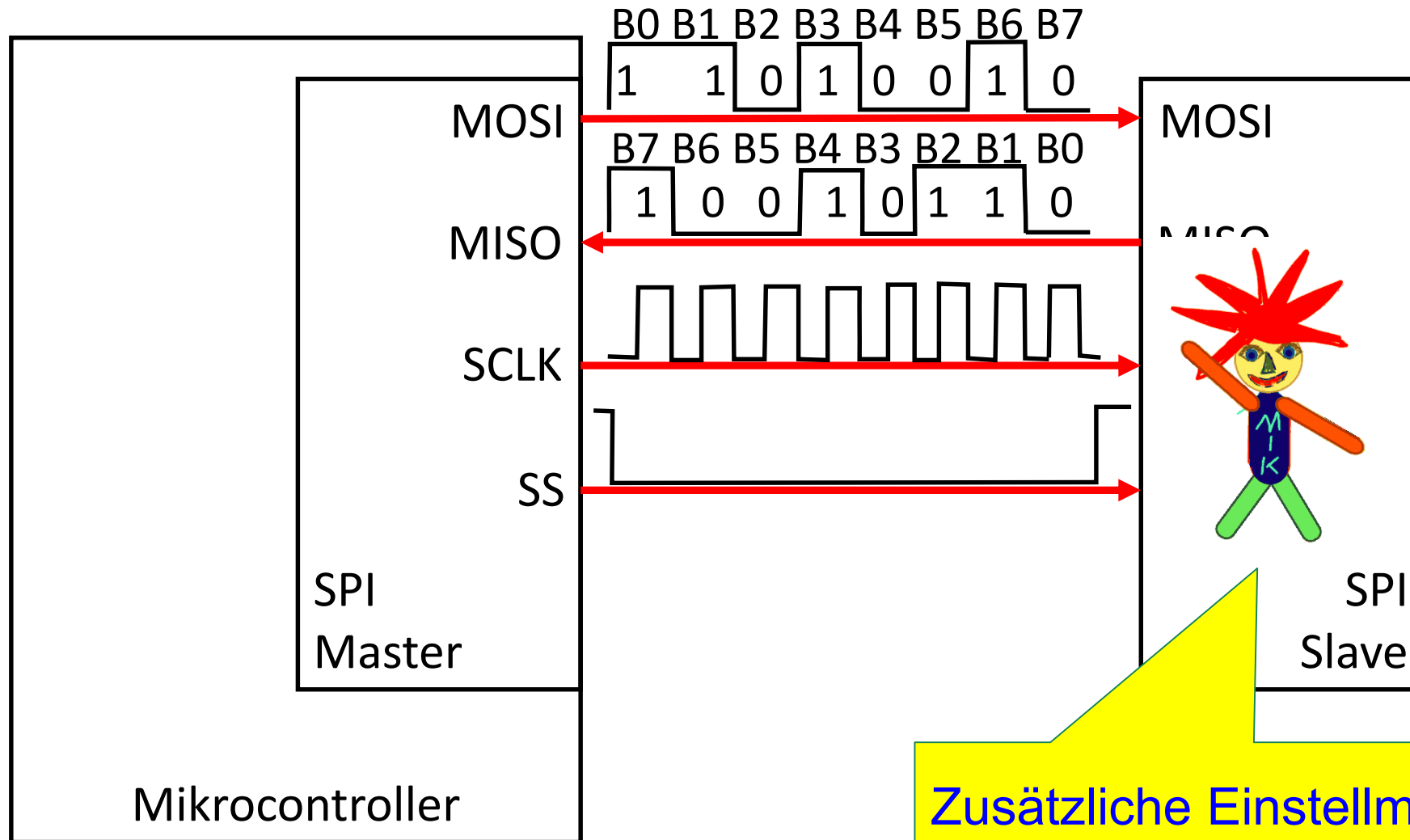
Mikrocontroller

```
SPI slave(PB_15,PB_14,PB_13);  
DigitalOut SS(PB_12);
```

```
int main()  
{ int antwort,sendedaten;  
  slave.format(8);  
  while(true)  
  {  
    sendedaten=0x4B;  
    SS=0;  
    antwort=slave.write(sendedaten);  
    SS=1;  
  }  
}
```



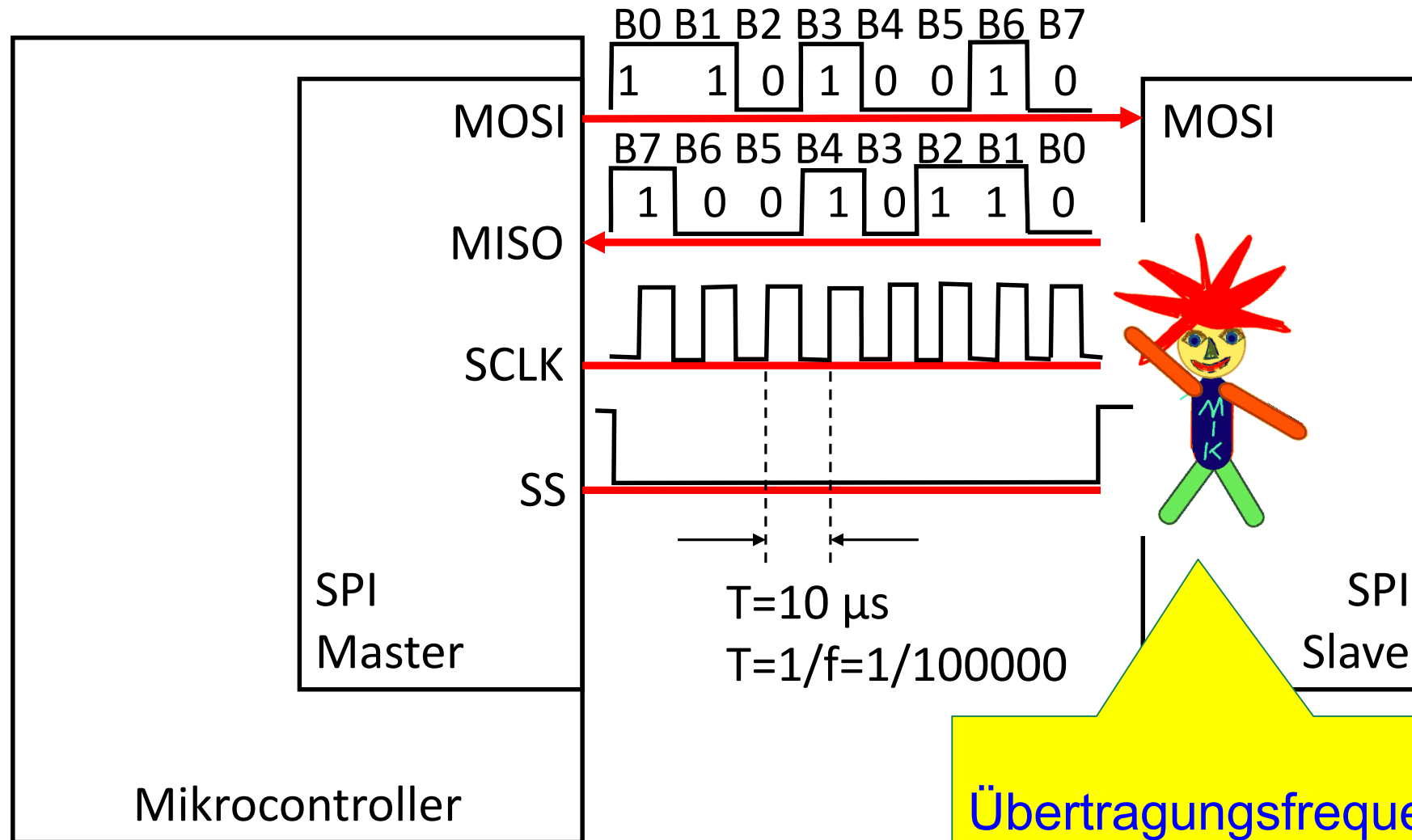
# SPI Serial Peripheral Interface



Zusätzliche Einstellmöglichkeiten  
entsprechend der Spezifikation  
des Slaves



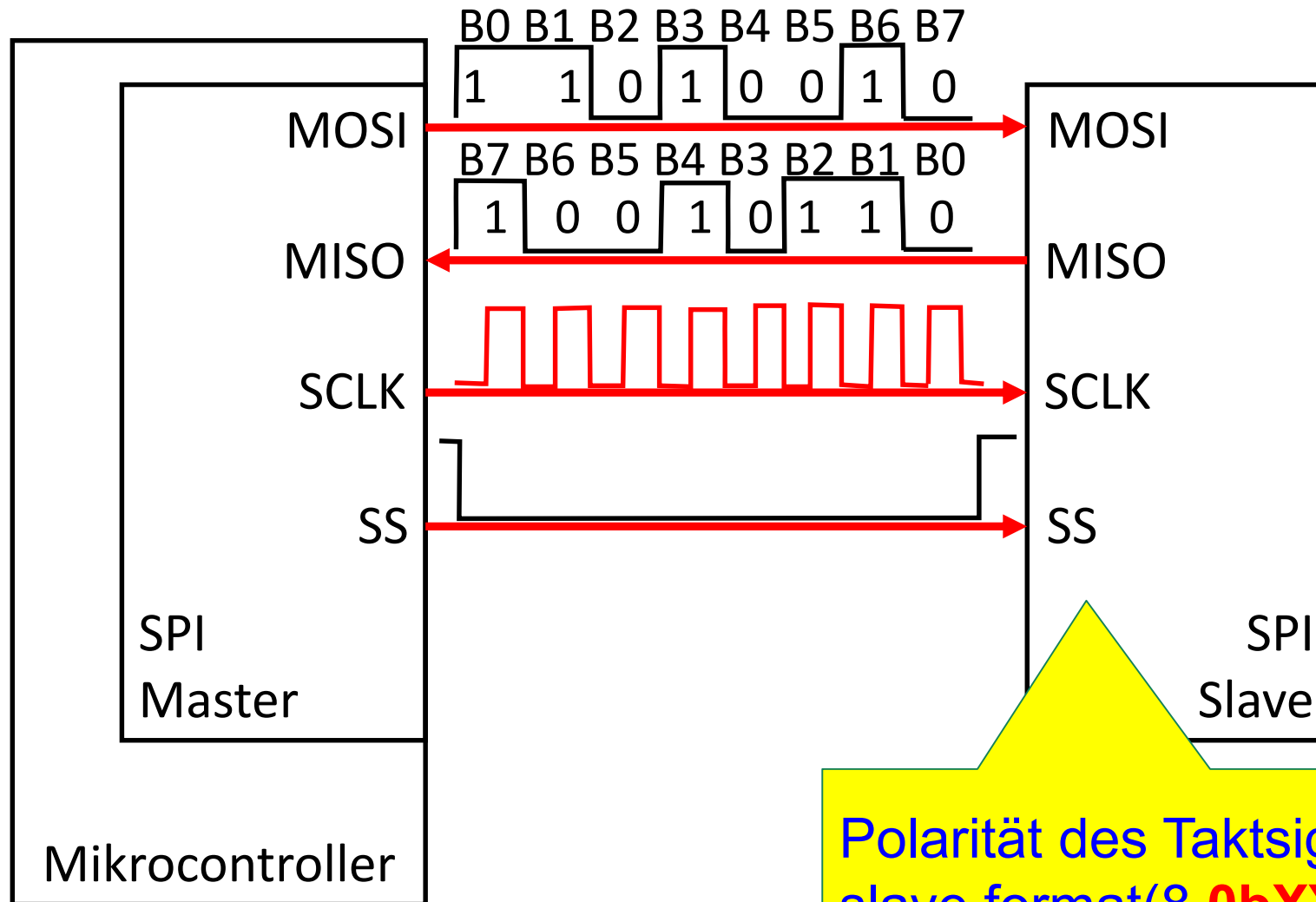
# SPI Serial Peripheral Interface



Übertragungsfrequenz:  
`slave.frequency(100000); //f in Hz`



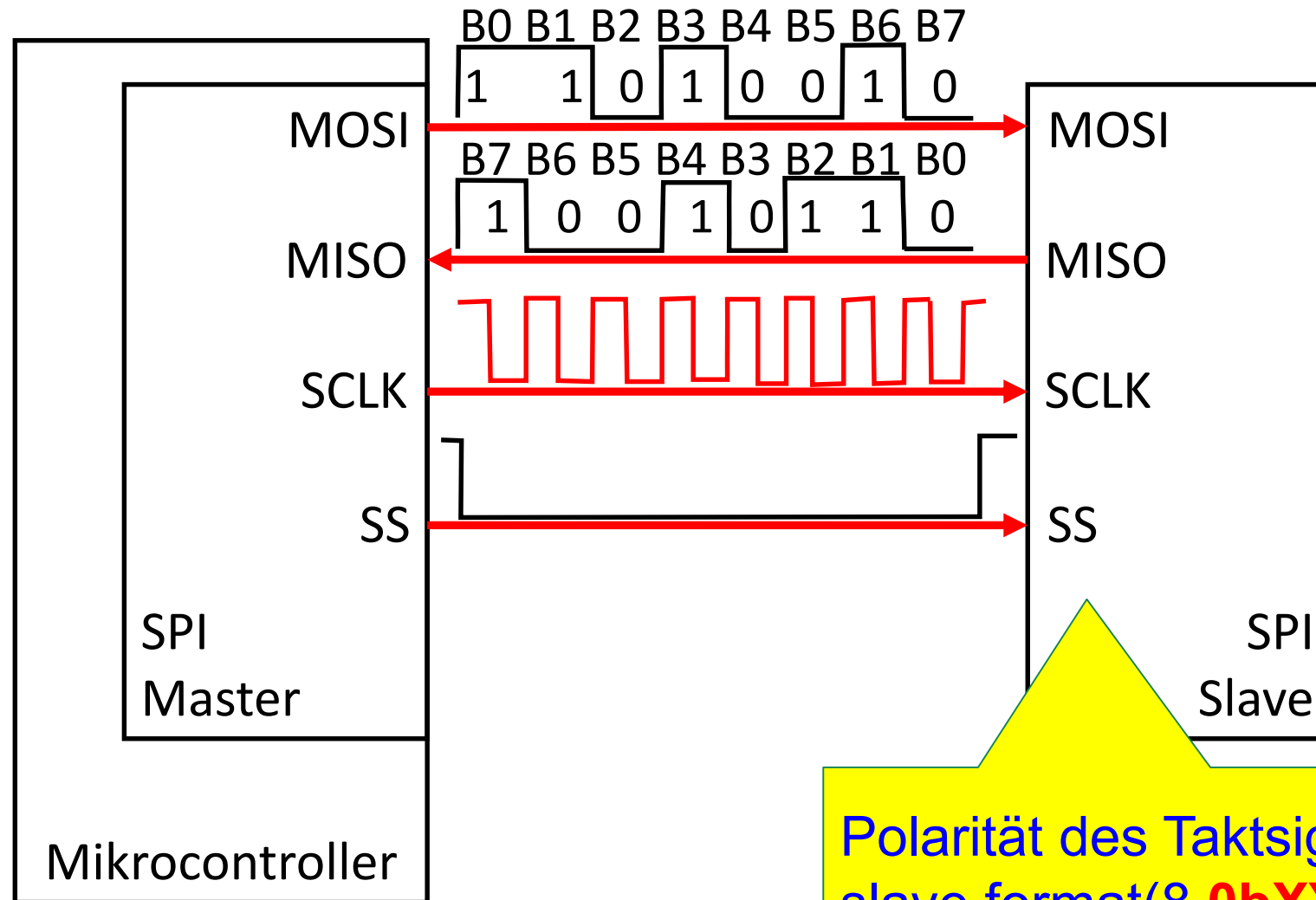
# SPI Serial Peripheral Interface



Polarität des Taktsignals:  
`slave.format(8,0bXY);`  
Mit **X=0** Polarität Highaktiv



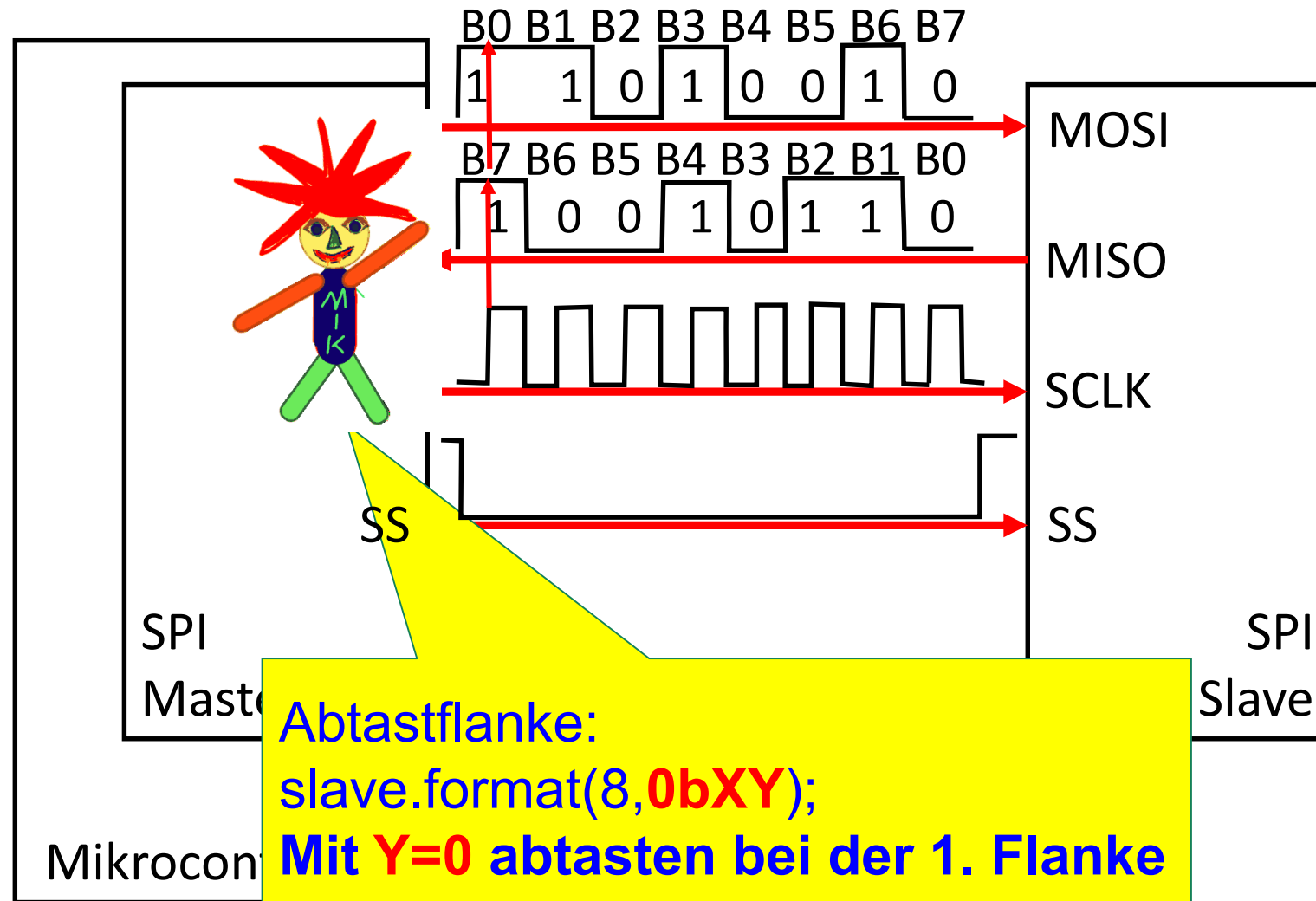
# SPI Serial Peripheral Interface



Polarität des Taktsignals:  
`slave.format(8,0bXY);`  
Mit **X=1** Polarität Lowaktiv



# SPI Serial Peripheral Interface



Abtastflanke:

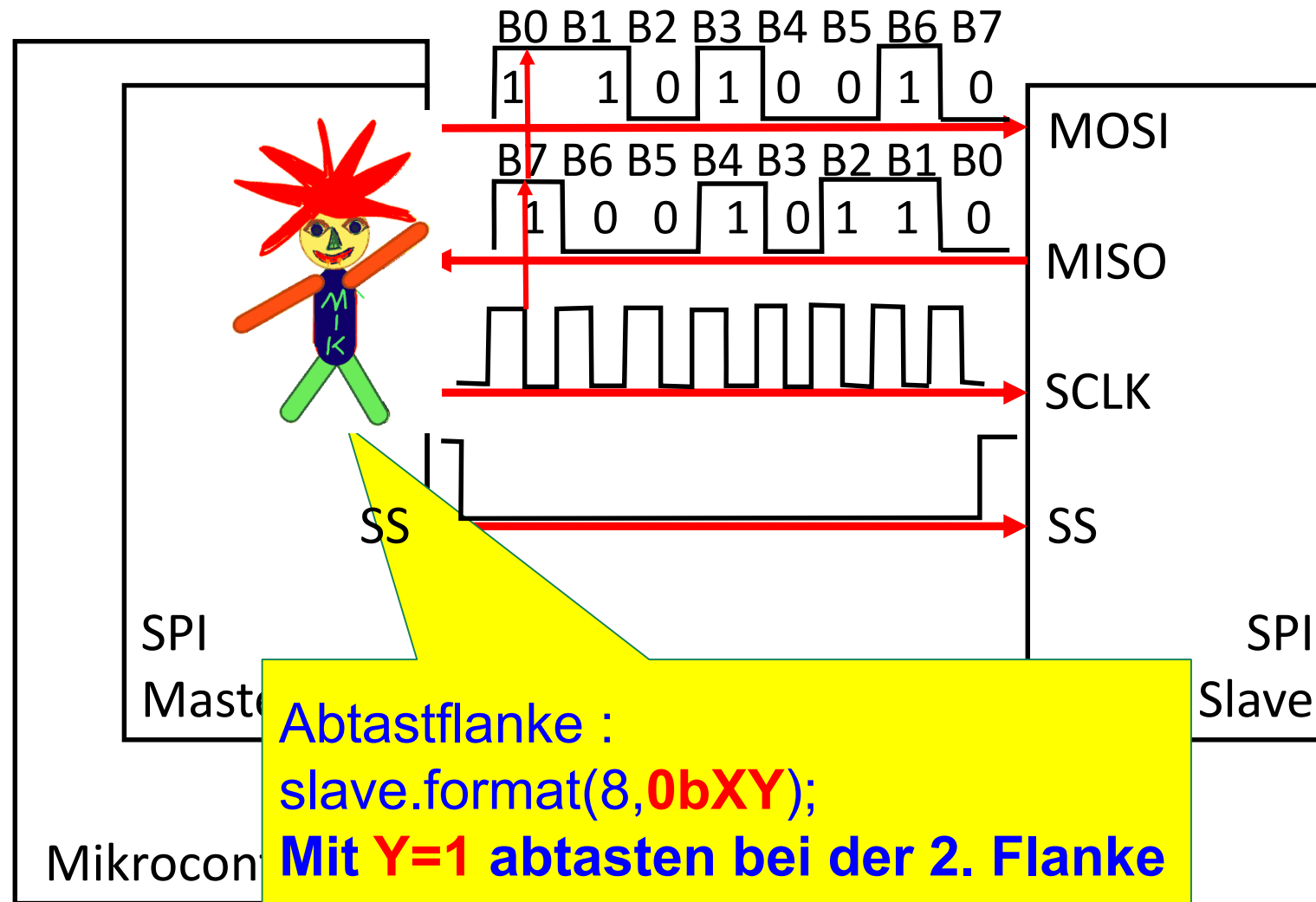
`slave.format(8,0bXY);`

**Mit Y=0 abtasten bei der 1. Flanke**

Es muss immer in Bitmitte  
abgetastet werden



# SPI Serial Peripheral Interface



Abtastflanke :

`slave.format(8,0bXY);`

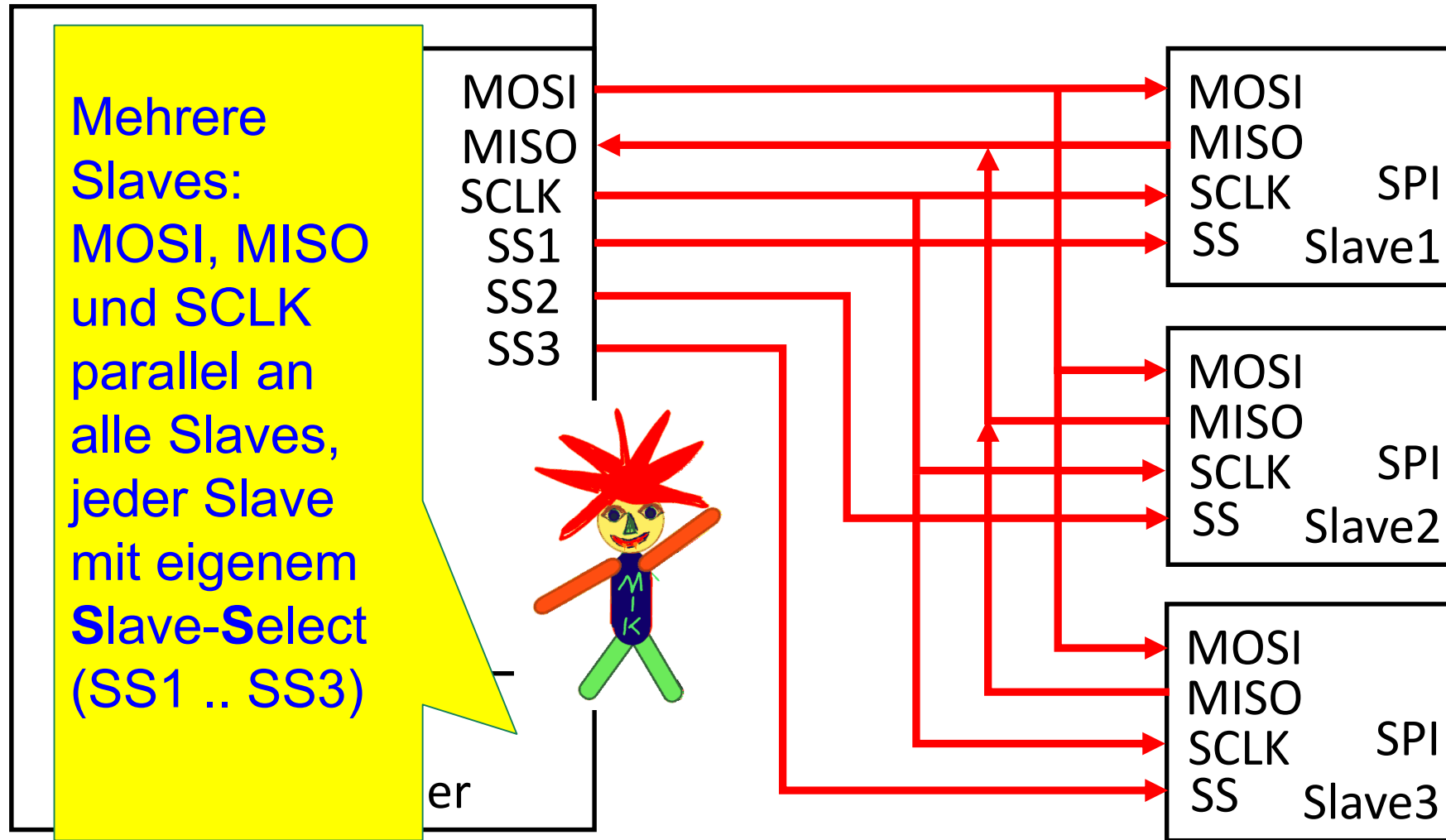
**Mit Y=1 abtasten bei der 2. Flanke**

Es muss immer in Bitmitte  
abgetastet werden

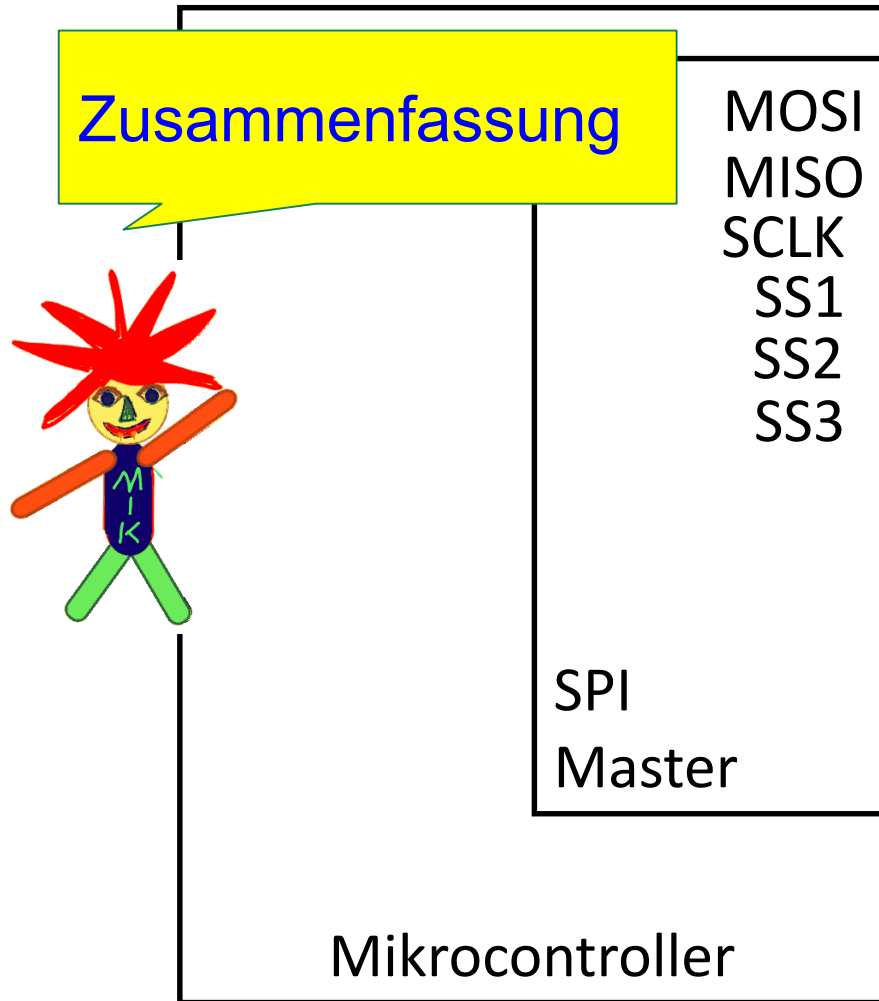




# SPI Serial Peripheral Interface



# SPI Serial Peripheral Interface



- 4-Leiter-Bus
  - MOSI: Daten senden
  - MISO: Daten empfangen
  - SCLK: Takt
  - SS: Slave Select
- Vollduplex
- Master-Slave
- (Takt-)Synchron
- Standard-Taktfrequenz: 1MHz (einstellbar)
- High- oder Lowaktiver Takt einstellbar
- 1. oder 2. Taktflanke einstellbar

