

Low level buses

RS232

Standard für serielle Schnittstelle bei Computern Vorgänger von USB

heutige Verwendung:

- Service- und Konfigurationsschnittstelle für Router, Switches und Speichersysteme
- POS Terminals (Terminal zum bargeldlosen bezahlen)

eine Datenleitung für beide Übertragungsrichtungen (seriell)

Übertragung in word (bis zu 9bit) ASCII codiert

Datenübertragung asynchron

Geschwindigkeit:

- Abhängig von UART Hardware
- mind. 1,5 Mbps

Kabellänge:

- bis 15m Standard
- bei Verwendung von low capacity Kabeln bis 30m

I²C

Type:

- serial computer bus

Used in:

- lower-speed peripherals ICs to processors and microcontrollers in short-distance, intra-board communication

Data signal:

- Open-drain

Protocol:

- Serial, half-duplex

Bitrate:

- 0.1 / 0.4 / 1.0 / 3.4 / 5.0 Mbit/s

Applications:

- Reading configuration data from SPD EEPROMs on DIMM memory sticks
- Accessing NVRAM chip that keeps user settings
- Accessing low speed DACs and ADCs
- Changing sound volume in intelligent speakers
- Controlling OLED/LCD displays, like in a cellphone
- Reading real-time clocks
- Turning on and off the power supply of system components.

Operation system support:

- AmigaOS
- Arduino (Wire library)
- Maximite
- PICAXE
- eCos
- ChibiOS/RT
- FreeBSD/NetBSD/OpenBSD
- Linux with specific device driver
- Max OS X
- Microsoft Windows
- Unison OS
- Windows CE
- RISC OS

Design:

- 7-bit or 10-bit address space
- 100 kbit/s standard mode speed
- 10 kbit/s low-speed mode
- 400 kbit/s Fast mode
- 1 Mbit/s Fast mode plus
- 3.4 High speed mode

Pair-Communication same group: (Slava)

- Inventor Phillips
- two lines, one for data (USDA) one for clock (USCL)
- Voltage 5V and 3.3V
- Length restricted to few meters
- Always master and slave

SPI

Serial peripheral interface for synchronous serial communication Used for short distances and mostly used in embedded systems Standard from Motorola.

Master-Slave architecture, full-duplex communication using four wires.

- SCLK: Serial Clock (output from master).
- MOSI: Master Output Slave Input, or Master Out Slave In (data output from master)
- MISO: Master Input Slave Output, or Master In Slave Out (data output from slave).
- SS: Slave Select (often active low, output from master).

Master configures the clock which must be supported from the slave device. The master then selects the slave device with a logic level 0 on the select line. If a waiting period is required, such as for an analog-to-digital conversion, the master must wait for at least that period of time before issuing clock cycles. Frequency up to a few MHz, limiting also the wire length. Connection of more devices possible.

SPI is used to talk to a variety of peripherals, such as:

- Sensors
 - temperature, pressure, ADC, touchscreens, video game controllers
- Control devices
 - audio codecs, digital potentiometers, DAC
- Camera lenses
 - Canon EF lens mount
- Communications
 - Ethernet, USB, USART, CAN, IEEE 802.15.4, IEEE 802.11, handheld video games
- Memory
 - flash and EEPROM
- Real-time clocks
- LCD, sometimes even for managing image data
- Any MMC or SD card

Onewire:

- similar concept to I2C
- lower data rates and longer range
- Feature: only use two wires: Data and Ground
- 75 devices can be found per second
- Examples: Java Ring (iButton), Apple MacSafe
- Master can be a PC or microcontroller
- Data include power supply model, wattage, serial number, commands to send full power and illuminate the connector
- Used for communication small inexpensive devices (e.g. digital thermometers/weather instruments)
- also called MicroLAN
- Maximum Cable Length: 750 Meters
- Different forms (linear, stubbed, star topology)
- Master/Slaves[= 1-Wire-Devices]
- Slaves no longer stubs than three meters in linear topology
- In stubbed topology longer than three meters are possible
- Bus-topology up to 300 meters
- Star topology - any length (max 750 meter)
- 220Ohm Pullup resistor for the master
- Slaves are connected to the net
- 150Ohm resistor for the slaves which are connected to the net (reduction of reflections on the line)
- 15 microsec and 54 microsec/data package
- Protocol used: CMOS/TTL
- Supply voltage of 2.8V to 6V
- Sequential data flow in either direction
- serial and bidirectional

- ONLY one direction at a TIME! (half duplex)
- Data read and written = least significant bit first
- 16.3kBit/sec
- Home Automation classic use case