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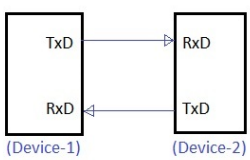
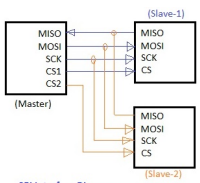
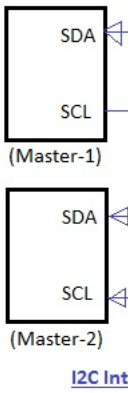
UART vs SPI vs I2C | Difference between UART,SPI and I2C

This page compares UART vs SPI vs I2C interfaces and mentions difference between UART, SPI and I2C in tabular format. It provides comparison between these interfaces based on various factors which include interface diagram, pin designations, data rate, distance, communication type, clock, hardware and software complexity, advantages, disadvanatages etc.

Features	UART	SPI	I2C
Full Form	Universal Asynchronous Receiver/Transmitter	Serial Peripheral Interface	Inter-Integ
Interface Diagram	 UART Interface Diagram	 SPI Interface Diagram	 I2C Int
Pin Designations	TxD: Transmit Data RxD: Receive Data	SCLK: Serial Clock	SDA: Seria SCL: Seria

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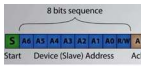
		MOSI: Master Output, Slave Input MISO: Master Input, Slave Output SS: Slave Select	
Data rate	As this is is asynchronous communication, data rate between two devices wanting to communicate should be set to equal value. Maximum data rate supported is about 230 Kbps to 460kbps.	Maximum data rate limit is not specified in SPI interface. Usually supports about 10 Mbps to 20 Mbps	I2C suppo kbps, 3.4 M also suppo Mbps.
Distance	Lower about 50 feet	highest	Higher
Type of communication	Asynchronous	Synchronous	Synchrono
Number of masters	Not Application	One	One or mo
Clock	No Common Clock signal is used. Both the devices will use there independent clocks.	There is one common serial clock signal between master and slave devices.	There is co between m multiple sla
Hardware complexity	lesser	less	more
Protocol	For 8 bits of data one start bit and one stop bit is used.	Each company or manufacturers have got their own specific protocols to communicate with peripherals. Hence one needs to read datasheet to know read/write protocol for SPI communication to be established. For example we would like SPI communication between microcontroller and EPROM. Here one need to go through read/write operational diagram in the EPROM data sheet.	It uses sta uses ACK data which data has b Figure dep communic 
Software	As this is one to one	Slave select	There will

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Software addressing	As this is one to one connection between two devices, addressing is not needed.	Slave select lines are used to address any particular slave connected with the master. There will be 'n' slave select lines on master device for 'n' slaves.	There will and multip masters ca all the slav devices ca connected I2C interfa
Advantages	• It is simple communication and most popular which is available due to UART support in almost all the devices with 9 pin connector. It is also referred as RS232 interface.	•It is simple protocol and hence so not require processing overheads. •Supports full duplex communication. •Due to separate use of CS lines, same kind of multiple chips can be used in the circuit design. •SPI uses push-pull and hence higher data rates and longer ranges are possible. •SPI uses less power compare to I2C	•Due to op limited slev achieved. •More tha be used in design. •Needs fe for commu •I2C addre which does lines used to add extr bus. •It uses op concept. H voltage flex interface b •Uses flow
Disadvantages	• They are suitable for communication between only two devices. • It supports fixed data rate agreed upon between devices initially before communication otherwise data will be garbled.	• As number of slave increases, number of CS lines increases, this results in hardware complexity as number of pins required will increase. • To add a device in SPI requires one to add extra CS line and changes in software for particular device addressing is concerned. •Master and slave relationship can not be changed as usually done in I2C interface. •No flow control available in SPI.	•Increases circuit whe and maste •I2C interf •Requires control the it needs sc overheads microcontr
Reference	RS232 Interface>>	SPI Interface>>	I2C Interfa

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what is difference between

difference between UART vs SPI vs I2C

Difference between 100Base-T1 and 1000Base-T1

CAN vs TTCAN

CAN vs TTP

RS232 vs RS422 vs RS485 interface

LIN vs CAN vs FlexRay vs MOST

Difference between MOST25,MOST50,MOST150

RF and Wireless Terminologies

SATELLITE RF Antenna Avionics Wireless LiFi vs WiFi MiFi vs WiFi BPSK vs QPSK BJT vs FET PDH vs SDH CS vs PS MS vs PS

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