DESCRIPTION OF SPI

Serial Peripheral Interface (SPI) is a synchronous serial communication interface. It is used for short-distance communication in an emended system. It is commonly used for exchanging data between components in an embedded system such as, an instruction sets from microcontroller and peripherals. The peripherals may include shift registers, memory and sensors which the system needs to perform a set task/purpose. SPI is a collection of unidirectional bus lines which can transfer data at the same time.

SPI operated in full duplex mode, which means that it used a separate clock and bus lines, along with a select line to choose which peripheral the central processing unit (CPU) wants to exchange data with. The interface is simple to implementation and is capable for high-speed data transfer. For this reason, it is used in various application from connecting sensors to the microcontrollers, communication and storing data on memory storage device.

SPI used a master and slave configuration for communication with, a common master switch between one or more slave devices. The master generates a clock signal and the data transferred between the master and the slave is synchronised to the clock generated (the speed of the data transfer depends on the clock frequency). Both master and slave can send data at the same time, where the master using MOSI-Master Output Salve Input line and the salve using MISO-Master Input Slave Output line respectively. The MOSI line is also used to send data to any peripherals connected to the SPI, such as sensors and cameras. The interface allows the user to choose to shift and sample the data at a rising or falling edge of the clock. Additionally, the user can choose the order to shift and sample the data whether, it may be in Most Significant Bit (MSB) first or, Least Significant Bit (LSB) first. This can be configured in the SPI settings on most SPI microcontrollers.

Depending on the SPI microcontroller or setting configuration data can be transferred in parallel or serial form. In a parallel configuration, the bites of data are sent at the same time, each bite sent through its dedicated select line. In the serial configuration, the bites are sent along a single line one at a time at the frequency of the clock. The frequency of the master is communicated to the salve via separate line so the data can be reconstructed at the other side. In a serial configuration, the SPI uses a multiplexer to serialise the data and slave uses a demultiplexer to parallelise the data.

The use of SPI allows for a continues transfer and receiving of data without interrupts as it doesn’t have to check for start and stop bits in the signal. However, as it docent check for interrupts there is not acknowledgment that the data have been successfully sent and received.