ESP8266 HSPI Host Multi-device API

Version 1.0

Espressif Systems IOT Team

http://bbs.espressif.com/

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1. Function Overview

ESP8266 encapsulates two SPI (Serial Peripheral Interfaces) bus segments, shortly named SPI and HSPI. SPI bus is especially used to read CPU programming code from the external Flash, while HSPI bus is used for SPI device communication.

When ESP8266 is working as a host, HSPI bus can operate with three user devices, besides, it also supports one external Flash writing operation. User devices are supported through selection with CS lines. To be more specific,

Mode	Device Name
HSPI Default IO	User device 1
SPI OVERLAP and CS1	User device 2
SPI OVERLAP and CS2	User device 3
SPI OVERLAP and CS0	Flash

In above-mentioned ways of connection, SPI bus shares the same external Flash with HSPI bus. Apart from the memory occupied by programs and related configurations, the rest Flash memory can all be used for reading and writing of user programs.

To simplify operations between several different user devices, this document mainly introduces how to operate multi user devices via HSPI host, how to connect, as well as details on API functions.

Users can refer to documentation “8N-ESP8266__SPI_Communication_User_Guide__CN_v0.1” and “8O-ESP8266__SPI_Overlap_&_Display_Application_Guide__CN_v0.1” on how to config.

> ⚠ ***Note:***
>
> - Operation with devices via HSPI host implemented by software programming is not supported in the API functions.
> - When downloading user programs, the clock frequency of SPI bus used for reading Flash data should be set at 80 MHz. SPI clock frequency should be specified as 80 MHz at SPI OVERLAP and CS1 mode or SPI OVERLAP and CS2 mode.

2. Hardware Connection

Generally speaking, SPI slave devices specify four logic signals: SCLK, MOSI, MISO, and CS.

HSPI bus can operate with three different user devices, the ways of connection are explained below:

Mode	Pin Name of Host ESP8266	SPI bus Signal Line
HSPI Default IO	MTDO	CLK
	MTCK	MOSI
	MTDI	MISO
	MTMS	CS
SPI OVERLAP and CS1	U0TXD	CS
	SD_CLK	SCLK
	SD_DATA0	MISO
	SD_DATA1	MOSI
SPI OVERLAP and CS2	GPIO0	CS
	SD_CLK	SCLK
	SD_DATA0	MISO
	SD_DATA1	MOSI

Remark:

The pins used when HSPI operates with the Flash in OVERLAP mode is completely the same with that of SPI communication.

3. API Descriptions

Names of the connection modes supported by the system are defined by macro definitions in \app\include \driver\spi_overlap.h.

- HSPI_CS_DEV (HSPI default IO)
- SPI_CS1_DEV (SPI OVERLAP and CS1)
- SPI_CS2_DEV (SPI OVERLAP and CS2)

Operation with the Flash is defined as SPI_CS0_FLASH. If HSPI operates with two user devices, the API function is shown as below:

void hspi_master_dev_init(uint8 dev_no,uint8 clk_polar,uint8 clk_div)

Function	This function is used to initialize connection of HSPI host. Altogether four user devices can be operated. If multi devices communicate with the host using SPI communication mode, the function should be called each time when that certain device is operated.
Location	Defined in directory \app\include\driver\spi_overlap.h, implemented in directory \app\driver \spi_overlap.c.
Paramaters	• uint8 dev_no: only HSPI_CS_DEV, SPI_CS1_DEV, SPI_CS2_DEV, and SPI_CS0_FLASH are supported, the corresponding values of these four parameters are 0, 1, 2, and 3 respectively. If the parameter should be other values, ERROR will be printed and the function will be returned. • uint8 clk_polar: clock polarity. - If the clock polarity is 0, data are captured on the clock's rising edge, and are propagated on a falling edge. - If the clock polarity is 1, data are captured on the clock's falling edge, and are propagated on a rising edge. - If the clock polarity should be other values, ERROR will be printed and the function will be returned. • uint8 clk_div: clock frequency division. 40 MHz is reference frequency, the number of division is clk_div+1. To be more specific, 0 stands for reference frequency, 1 stands for 20 MHz, while 2 stands for 40/3MHz, and so forth. - ***Note:*** ONLY when the clock frequency of SPI bus used for reading Flash data is set at 80 MHz. If the device is defined by SPI_CS1_DEV and SPI_CS2_DEV via SPI OVERLAP, the clock frequency of host SPI is unadjustable, and should be 80 MHz.

void hspi_dev_sel(uint8 dev_no)

Function	Convert and select host communication devices.
Location	Defined in directory \app\include\driver\spi_overlap.h, implemented in directory \app \driver\spi_overlap.c.
Paramaters	uint8 dev_no: only HSPI_CS_DEV, SPI_CS1_DEV, SPI_CS2_DEV, and SPI_CS0_FLASH are supported, the corresponding values of these four parameters are 0, 1, 2, and 3 respectively. If the device has not been initialized, ERROR will be printed and the function will be returned. If it the parameter should be other values, ERROR will be printed and the function will be returned.