WS281x

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1.1 Required .ioc configuration (timer)

Make sure you have these set in your .ioc file:

- In project manager tick *Generate peripheral initialization as pair of '.c/.h' files per peripheral*
- Choose timer and channel which can use DMA
- Timer must be in mode *PWM Generation CHx* where x is number of chosen channel
- Set frequency to 800kHz (1.25 μs period) on your timer using *Counter Period*. It's not recommended to have prescaler active.
- Add DMA request in DMA settings, choose direction to *Memory to Peripheral*, make sure data width is *Half Word* in Peripheral and Memory. Mode should be *Normal*
- if you use inverting logic level shifter, switch *CH Polarity* to Low

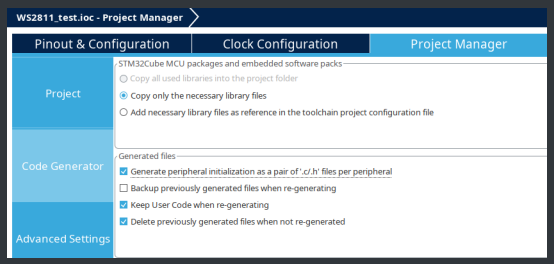

Figure 1: How to generate separated files

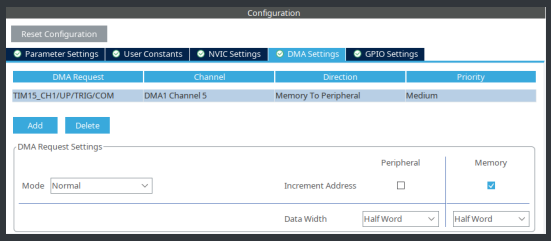

Figure 2: Sample DMA configuration

1.2 Required .ioc configuration (SPI)

Make sure you have these set in your .ioc file:

- In project manager tick *Generate peripheral initialization as pair of '.c/.h' files per peripheral*
- Choose your SPI and then mode: *Half-Duplex Master*
- Set *Data Size* to 6 Bits (if not possible then set 8 Bits), MSB First
- Set your *Prescaler* to value which gives *6-7MBits/s Baud Rate*, you may need to switch clock configuration

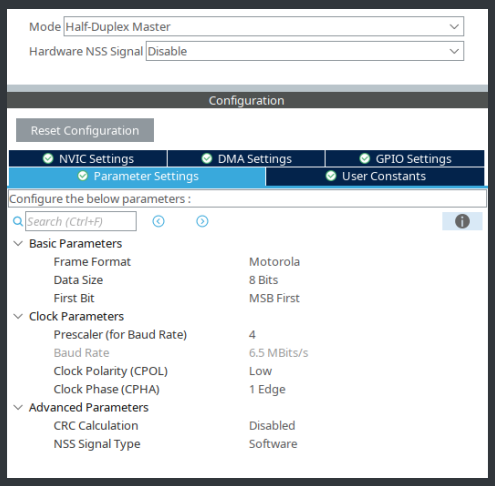

Figure 3: SPI configuration

1.3 Adding library

Just follow these steps:

1. In command line (can be git bash or linux terminal) type:

```
git init
git submodule add https://github.com/MaciejZb66/ws281x.git
```

2. Refresh project by clicking F5
3. Add library path to build
   3.1. Left click on project and choose properties
   3.2. On left side choose *C/C++ General*, then *Paths and Symbols* and *includes*
   3.3. Click on add button and find folder **ws281x**
   3.4. In *Source Location* (still *C/C++ General* and *Paths and Symbols*) add folder **ws281x**
4. In file *main.h* add this line:

```
#include "led.h"
```

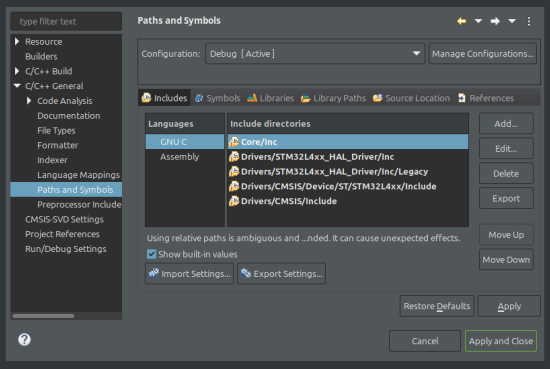

Figure 4: Add path to folder in includes

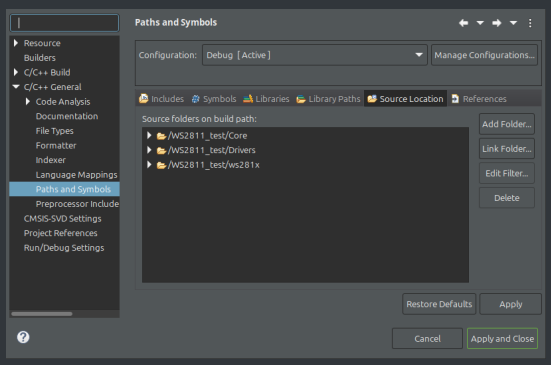

Figure 5: Add to source location

1.4 Configuration file

This library is default configured in *sample_ config.h* where we have:

```
#define STM_FAMILY_L4
#define WS_TIM_15
#define WS_CHANNEL_1
#define user_leds 24
```

To redefine configuration create your own configuration file. There must be defined:

- using timer or SPI (can be both)
- STM family
- number of outputs
- maximum number of LEDs (WS drivers connected to LEDs)
- `#define WS_CONFIG //required to exclude sample_config.h`

1.5 Initialization

To initialize your chosen timer use function:

```
void WS281x_init_TIM(WS281x_data* led, TIM_HandleTypeDef* htim, uint32_t t_channel, uint16_t led_number
```

To initialize your chosen SPI use function:

```
void WS281x_init_SPI(WS281x_data* led, SPI_HandleTypeDef* hspi, uint16_t led_number)
```

and give all required info. `WS281x_data` is named LED and it's created as you define number of outputs. In both cases it's required to initialize once per output.

2 Code description

to be described later