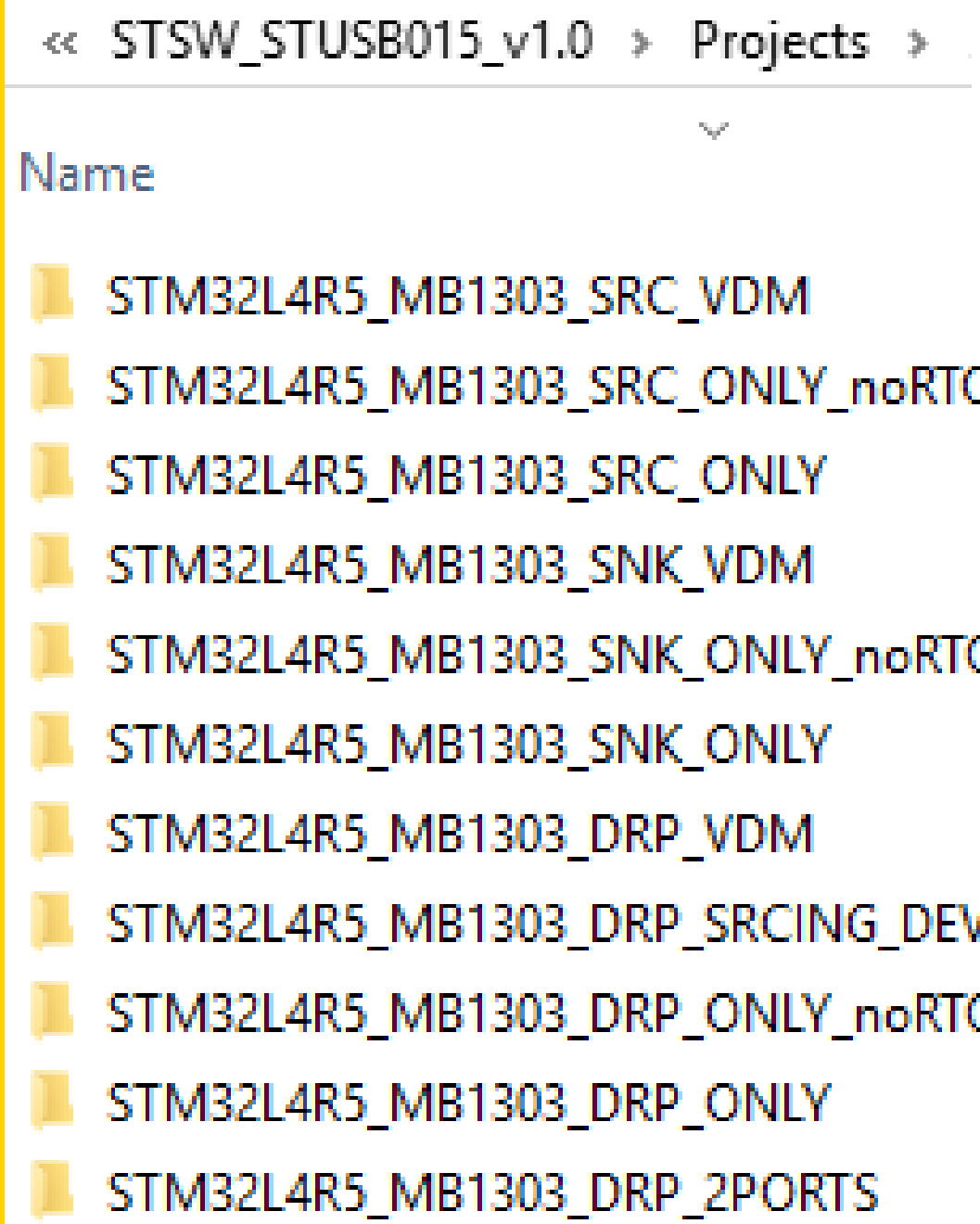

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STSW-STUSB015

Firmware package documentation

V1.0

STUSB

Table of Content

4 Folder view

5 Compiler

6 Project Type

7 Compilation switches

9 Shield MCU setup

10 _GPIO_FOR_SRC

11 _VVAR_FLASH

12 Projects Overview

Overview

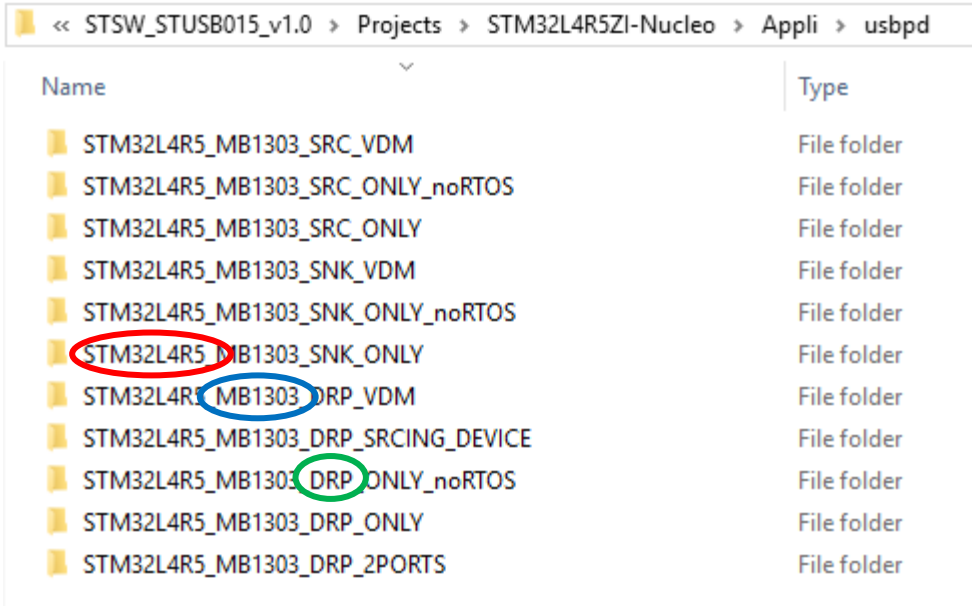
The software library includes 8 different software frameworks (+ 3 without RTOS) already optimized to address most common application scenario:

	Project	Typical Application
#1	STM32L4R5_MB1303_SRC_ONLY(*)	Provider / SOURCE (power management)
#2	STM32L4R5_MB1303_SRC_VDM	Provider / SOURCE (power management) + extended message support
#3	STM32L4R5_MB1303_SNK_ONLY(*)	Consumer / SINK (power management)
#4	STM32L4R5_MB1303_SNK_VDM	Consumer / SINK (power management) + extended message support + UFP support
#5	STM32L4R5_MB1303_DRP_ONLY (*)	Dual Role Port (power management) + dead battery mode
#6	STM32L4R5_MB1303_DRP_VDM	Dual Role Port (power management) + dead battery mode + extended message support + UFP support
#7	STM32L4R5_MB1303_DRP_2ports	2 x Dual Role Port (power management) + dead battery mode + extended message support + UFP support
#8	STM32L4R5_MB1303_DRP_SRCING_DEVICE	Dual Role Port requesting PR_swap when attached in Sink or DR_swap when attached in Source

- by default, all projects are packaged with RTOS support
- project annotated with a (*) are available with and without RTOS support

Folder view

- Projects folder provides different application examples in which each project name is prefix with MCU name: STM32F446 is example below

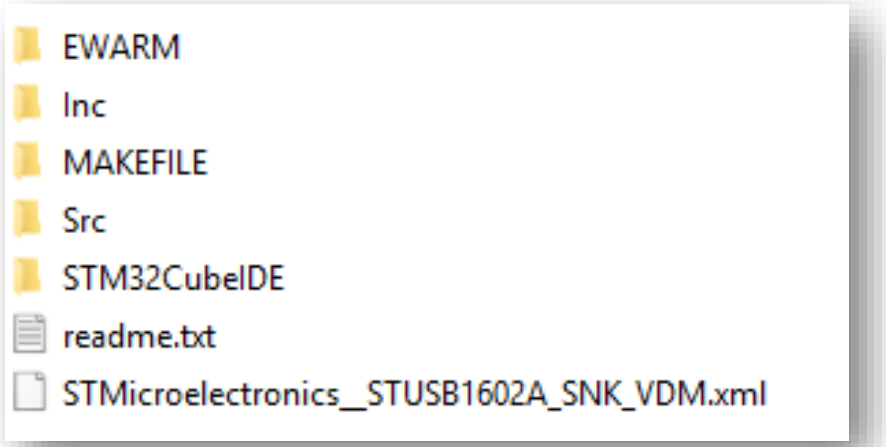


- Project name is build as: MCUname_shieldref_TypeCrole_type

Compiler

Projects can be compiled with either:

- IAR 8.x,
- GCC using GNU Arm Embedded Toolchain (version used: 9 2020-q2-update with GNU make-4.3),
- STM32CubeIDE (download here).



Project Type

Type = ONLY

- Those projects are simple ones. Only mandatory features are present, with RTOS

Type = ONLY_noRTOS

- Those projects are simple ones. Only mandatory features are present, without RTOS

Type = VDM

- Those projects are complex ones. Lot of optional features are present and could be disabled/enabled by compilation switch

Type = 2PORTS

- This project manages 2 STUSB1602 with single MCU

Type = SRCING_DEVICE

- This project is DRP sourcing device: application always try to achieve power role as source and data role as UFP

Compilation switches (1/2)

ONLY	ONLY_noRTOS	VDM	2PORTS	SRCING_DEVICE	Switch name	Comment
✓	✓	✓	✓	✓	**_TRACE**	Trace enabled for debug using UART
✓	✓	✓	✓	✓	**_ERROR_RECOVERY**	Enable error_recovery in lib stack. Mandatory for DRP compliance
✓	✓	✓	✓	✓	**_VCONN_SUPPORT**	Enabled in SRC and DRP project for cable messaging
X	X	✓	✓	✓	**_SRC_CAPA_EXT**	Enable source extended capability messages
X	X	✓	✓	✓	**_ADC_MONITORING**	Enable MCU ADC usage for voltage reporting.
X	X	✓	✓	✓	**_VDM**	Enable VDM messages possibility and needed for cable messages
☼	☼	☼	☼	☼	**SPI_ONE_LINE**	Disabled by default. Allow to merge MOSI and MISO pins
X	X	☼	☼	☼	**_MANU_INFO**	Disabled by default. Used to send/reply to manufacturer info messages
X	X	✓	✓	✓	**_ALERT**	Allow to send Alert messages
X	X	✓	✓	✓	**_STATUS**	Allow to send Status messages

Compilation switches (2/2)

ONLY	ONLY_no RTOS	VDM	2PORTS	SRCING_ DEVICE	Switch name	Comment
X	X	☼	☼	☼	**_BATTERY**	Disabled by default. Used to send/reply to battery messages
X	X	✓	✓	✓	**USBPD_DATA**	To setup and initialize USB IP in peripheral. Disabled by default on 'SRC' project
X	X	☼	✓	✓	**_CLASS_HID**	To configure descriptor class in HID
X	X	✓	☼	☼	**_CLASS_BB**	To configure descriptor class in BillBoard
X	X	☼	☼	✓	**SOURCING_DEVICE**	Application requests PR_swap when attached in Sink or DR_swap when attached in Source
X	X	✓	☼	☼	**UNCHUNKED_SUPPORT**	Allow support of unchunked messages
✓	X	✓	✓	✓	**USBPD_LED_SERVER**	To enable LED server for VBUS/CC/role toggling
☼	☼	☼	☼	☼	**_GPIO_FOR_SRC**	To drive 2 other voltages on top of 5V, in Source or DRP, using OpenDrain GPIOs (see here)
☼	☼	☼	☼	☼	**_VVAR_FLASH**	Allows to output DAC on ADD0 pin. DAC output value is always 1/10 of VBUS value

X Not supported and can't be enabled in current project

☼ Not supported by default but can be enabled in current project

✓ Supported by default (and can be disabled) in current project

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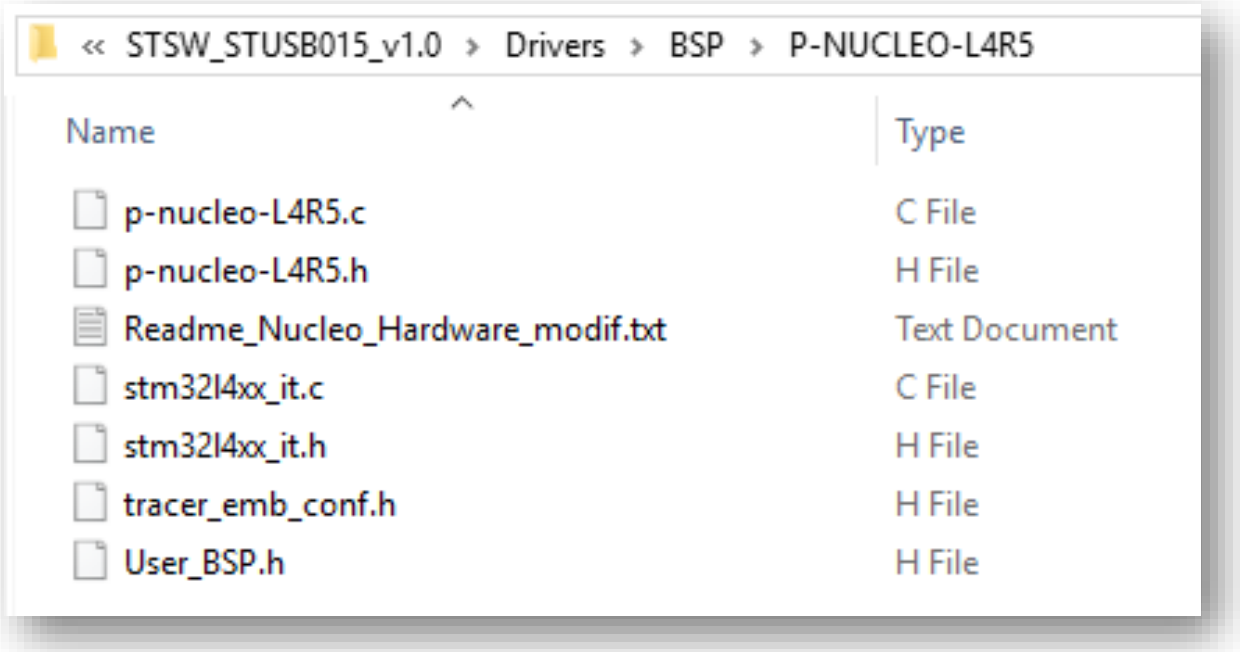
Shield-MCU setup

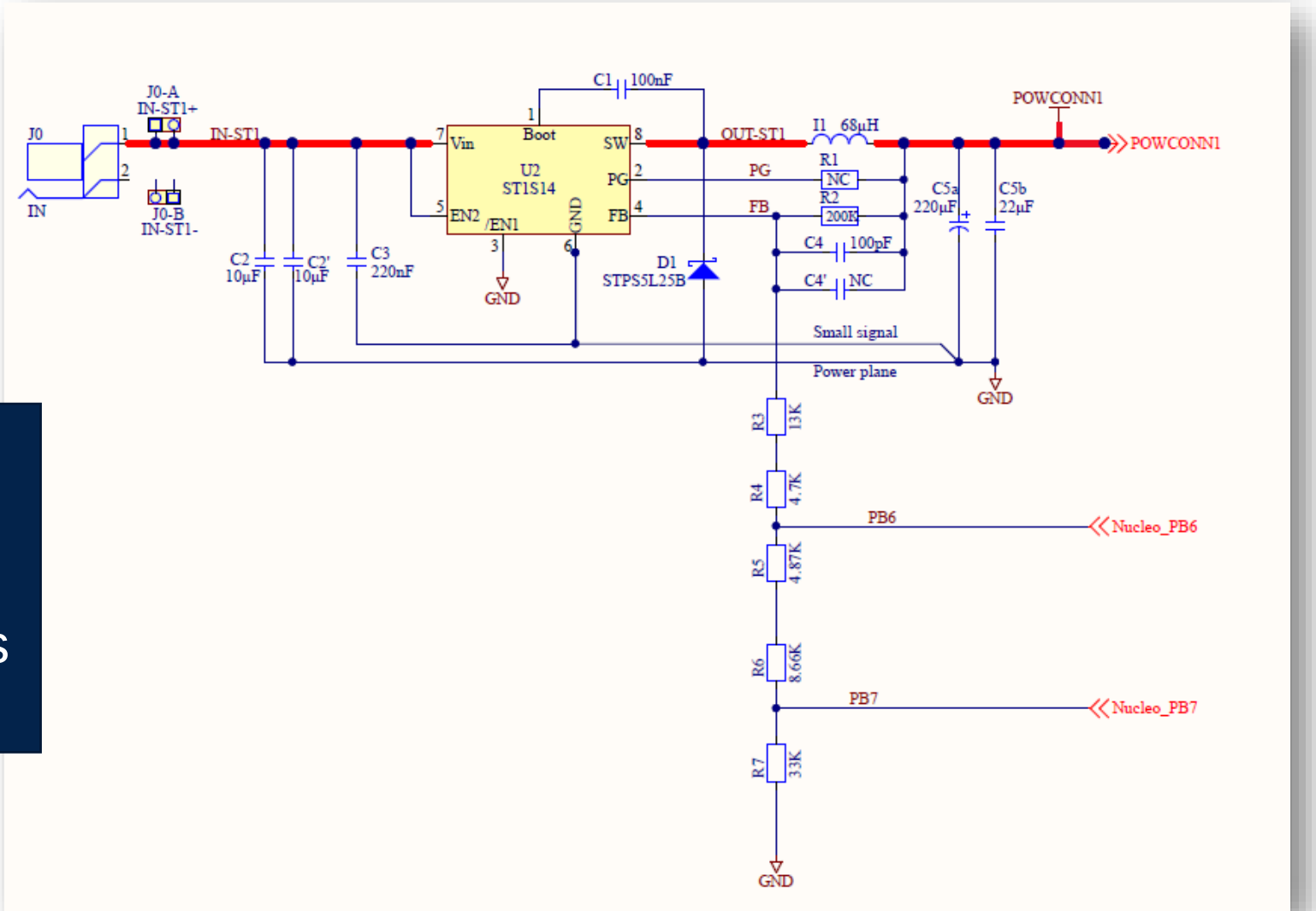
- MCU and board related settings are part of BSP folder. MCU name is found in folder name: see stm32L4R5 example below



- In BSP directory, Readme_Nucleo_Hardware_modif.txt file gives instructions about the Nucleo board modifications required to use it with MB1303 shield

_GPIO_FOR_SRC

Hardware implementation proposal using _GPIO_FOR_SRC switch.

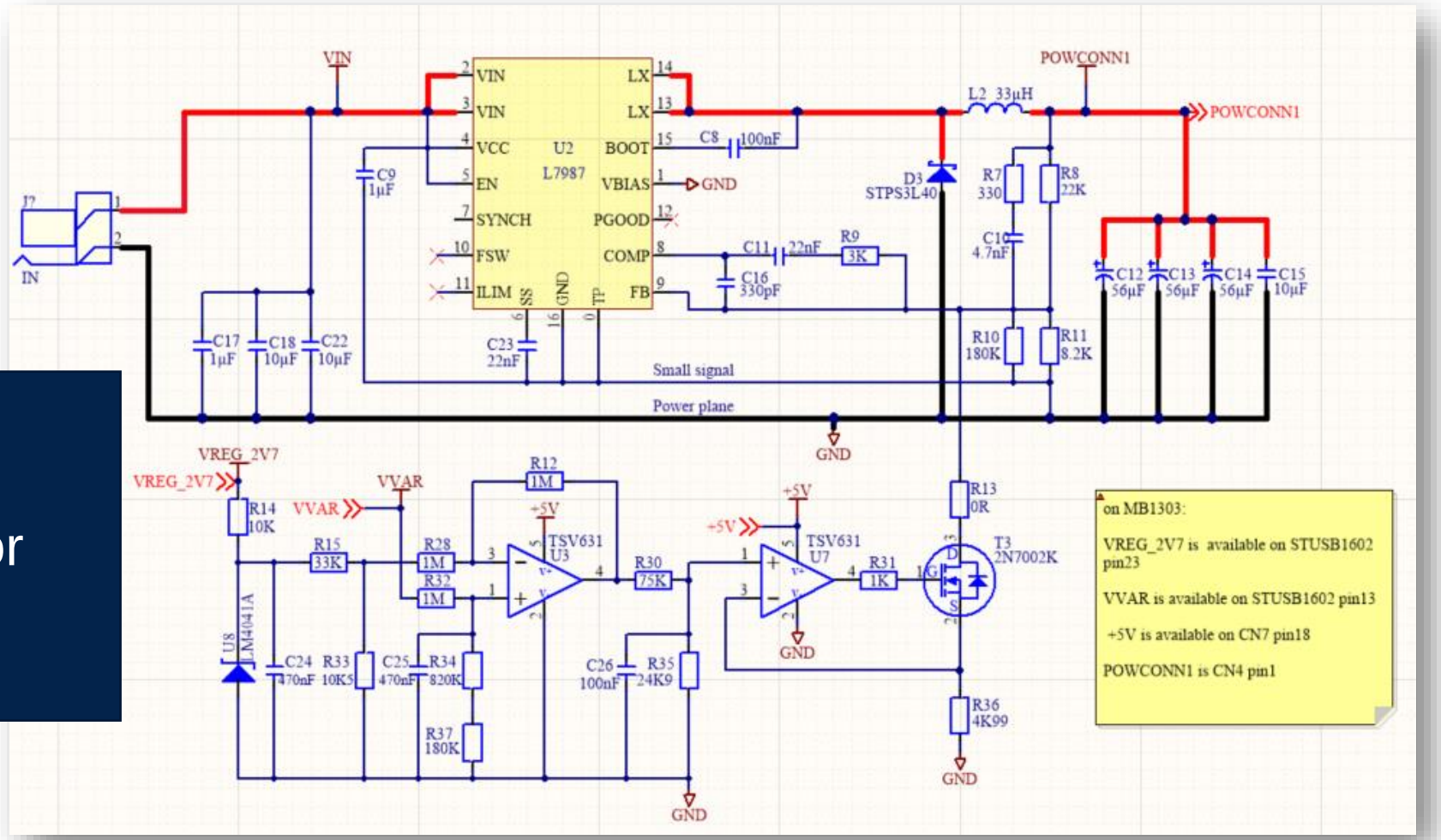


It proposes total 3 PDOs:
5V-9V-15V
toggling PB6 and PB7
defined as OpenDrain GPIOs
using Nucleo stm32F446ZE

_VVAR_FLASH

Hardware implementation proposal using _VVAR_FLASH switch.

Enabling this switch will allow to output 1/10th of PDO voltage selected for VBUS on VVAR-ADD0 STUSB1602 pin



#1 - MB1303_SRC_ONLY overview

- This is the typical framework for SOURCE only applications, implementing USB PD power negotiation.
- The code provided includes 1 PDO including EMCA support : when used with 3A only cables, maximum current advertised by the SOURCE is bounded to 3A for those PDO which normally support more than 3A.
- Default profiles is:
  - PDO1: 5V, 3A

NB:
Optional 9V and 12V profiles are available using _GPIO_FOR_SRC switch and appropriate hardware (see here)

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#2 - MB1303_SRC_VDM overview

- This is the typical framework for SOURCE only applications, implementing USB PD power negotiation and supporting optional extended messages.
- The code provided includes 1 PDO (including EMCA support), and is able to answer to the following messages:
  - Manufacturer info
  - Discover identity
  - Unchunked extended messages
- Defaults profiles is:
  - PDO1: 5V - 3A

NB:
Optional 9V and 12V profiles are available using _GPIO_FOR_SRC switch and appropriate hardware (see here)

#3 - MB1303_SNK_ONLY overview

- This is the typical framework for SINK only applications, implementing USB PD power negotiation.
- The code provided includes 2 PDOs (max power has priority),
- Defaults profiles are:
  - PDO1: 5V - 1.5A
  - PDO2: 9V - 1.5A

#4 - MB1303_SNK_VDM overview

- This is the typical framework for SINK only applications, implementing USB PD power negotiation and supporting optional extended messages. Project is defined as an Alternate Mode Adapter: it is able to enter alternate as a Display Port and enumerate as Billboard otherwise.
- The code provided includes 2 PDOs, and is able to answer:
  - Manufacturer info
  - Discover identity
  - Unchunked extended messages
- Defaults profiles are:
  - PDO1: 5V - 1.5A
  - PDO2: 9V - 1.5A

#5 - MB1303_DRP_ONLY overview

- This is the typical framework for Dual Role Port applications, such as Power bank applications.
- By default, the port connects as a SINK when application is not supplied (dead Battery mode), and supports both power and data role swap (PR_SWAP and DR_SWAP) and EMCA.
- Defaults profiles are:
  - Source:
    - PDO1: 5V - 3A
  - Sink:
    - PDO1: 5V - 1.5A
    - PDO2: 9V - 1.5A

NB:
Optional 9V and 12V SOURCE profiles are available using _GPIO_FOR_SRC switch and appropriate hardware (see here)

#6 - MB1303_DRP_VDM overview

- This is the typical framework for Dual Role Port supporting alternate mode in UFP.
- By default, the port connects as a SINK when application is not supplied (dead Battery mode), and supports both power and data role swaps (PR_SWAP and DR_SWAP). It implements USB PD power negotiation for both SOURCE (including EMCA support) and SINK, and supports optional PD3 features like:
  - Manufacturer info, Discover identity, Unchunked extended messages
  - Alternate mode:
    - Enters DP mode
    - Enumerate as Billboard if needed
- Defaults profiles are:
  - Source:
    - PDO1: 5V – 3A
  - Sink:
    - PDO1: 5V 1.5A
    - PDO2: 9V 1.5A

NB:
Optional 9V and 12V SOURCE profiles are available using _GPIO_FOR_SRC switch and appropriate hardware (see here)

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#7 - MB1303_DRP_2ports overview

- This is the typical framework for dual port applications with Dual Role Port capability supporting extended messages and UFP.
- It can be used typically for dual DRP applications, sourcing devices or sinking host
- By default, each port connects as a SINK when application is not supplied (dead Battery mode), and supports both power and data role swaps (PR_SWAP and DR_SWAP). It implements USB HID device for port #0, and USB PD power negotiation for both SOURCE (including EMCA support) and SINK, and supports optional PD3 features.
- Defaults profiles are:
  - Source:
    - PDO1: 5V – 3A
  - Sink:
    - PDO1: 5V 1.5A
    - PDO2: 9V 1.5A

NB:
Optional 9V and 12V SOURCE profiles are available using _GPIO_FOR_SRC switch and appropriate hardware (see here)

#8 - MB1303_DRP_SRCING_DEVICE overview

- This is the typical framework for single port application with Dual Role Port capability supporting extended messages and UFP.
- It can be used typically for applications acting as a power SOURCE and as a PERIPHERAL for USB data.
- At the connection, the port connects either as a SINK or as a SOURCE (depending on counterpart device role). When contract is established as a SINK (so by default UFP), it requests a POWER_SWAP to become a SOURCE/UFP (HID). At the opposite, when contract is established as a SOURCE (so by default DFP), it requests a DATA_SWAP to become a SOURCE/UFP (HID)
- Defaults profiles are:
  - Source:
    - PDO1: 5V – 3A
  - Sink:
    - PDO1: 5V 1.5A
    - PDO2: 9V 1.5A

NB:
Optional 9V and 12V SOURCE profiles are available using _GPIO_FOR_SRC switch and appropriate hardware (see here)

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