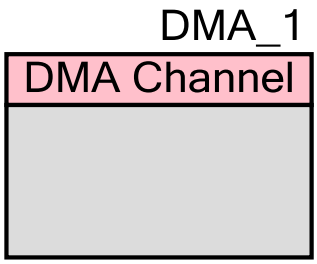
DMA Channel (PDL_DMA) 1.0



Features

- Software-Block Transfer & Burst Transfer
- Hardware-Demand Transfer
- Hardware-Block Transfer & Burst Transfer
- Channel Priority Control

General Description

The Peripheral Driver Library (PDL) Direct Memory Access (DMA) Channel (PDL_DMA) component provides user access to the DMA Controller, which is a function block that transfers data at high speed without CPU intervention. Using DMA improves system performance.

This component uses a firmware driver from the PDL DMA module, which is automatically added to your project after a successful build.

When to Use a PDL_DMA Component

Use the PDL_DMA component when you need a function block that transfers data at high speed without CPU intervention.

Quick Start

1. Drag a PDL_DMA component from the Component Catalog FMx/System/ folder onto your schematic. The placed instance takes the name DMA_1.
2. Double-click to open the component's Configure dialog. See Component Parameters.
3. On the **Basic** tab, set the following parameters:
    - width and mode of the transfer
    - count of the transfer
4. On the **Interrupts** tab, initialize needed interrupts and their callback functions.
5. Build the project to verify the correctness of your design. This will add the required PDL modules to the Workspace Explorer and generate configuration data for the DMA_1 instance.

6. In the *main.c* file, initialize the peripheral and start the application

```
/* Before initialize the PDL_DMA component set the source and destination
addresses*/
DMA_1_Config.u32SourceAddress = &source;
DMA_1_Config.u32DestinationAddress = &destination
Dma_InitChannel(0u, &DMA_1_Config); /* Initialize DMA channel 0 */
Dma_Enable();/* Overall enable of DMA */
Dma_SetChannel(0u, TRUE, FALSE, TRUE); /* Enable channel and software
trigger */
```

7. Build and program the device.

Component Parameters

The PDL_DMA component Configure dialog allows you to edit the configuration parameters for the component instance.

Basic Tab

This tab contains the component parameters used in the general peripheral initialization settings.

Parameter Name	Description
bFixedDestination	Fix destination address or increment on each transfer
bReloadDestination	Control whether the destination address is reloaded
bEnableBitMask	If false, clear EB (bEnable) bit on completion (mandatory for transfer end!)
bReloadCount	Control whether count is reloaded
enDmaIdrq	The trigger signal for DMA transactions (see the DMA #define values in the triggering component generated source)
enTransferMode	DMA transfer mode
enTransferWidth	DMA transfer data width
u16TransferCount	Transfer counter
u8BlockCount	Block count
bFixedSource	Fix source address or increment on each transfer
bReloadSource	Control whether the source address is reloaded

Interrupts Tab

This tab contains the Interrupt configuration settings.

Parameter Name	Description
bTouchNvic	Install interrupts in NVIC
bErrorIrq	DMA error interrupt
pfnErrorIrqCb	DMA error interrupt callback. Note: this generates a declaration only - USER must implement the function
bCompleteIrq	DMA transfer completion interrupt
pfnCompletionIrqCb	DMA transfer completion interrupt callback. Note: this generates a declaration only - USER must implement the function

Component Usage

After a successful build, a firmware driver from the PDL DMA module is added to your project in the pdl/drivers/dma folder. Pass the generated data structures to the associated PDL functions in your application initialization code to configure the peripheral.

Generated Data

The PDL_DMA component populates the following peripheral initialization data structure(s). The generated code is placed in C source and header files that are named after the instance of the component (e.g., *DMA_1_config.c*). Each variable is also prefixed with the instance name of the component.

Data Structure Type	Name	Description
stc_dma_irq_en_t	DMA_1_IrqEn	Interrupt enable structure
stc_dma_irq_cb_t	DMA_1_IrqCb	Interrupt callback functions structure
stc_dma_config_t	DMA_1_Config	Configuration structure

Once the component is initialized, the application code should use the peripheral functions provided in the referenced PDL files. Refer to the PDL API Reference Manual for the list of provided API functions. To access this document, right-click on the component symbol on the schematic and choose **Open API Documentation…** in the drop-down menu.

Data in RAM

The generated data may be placed in flash memory (const) or RAM. The former is the more memory-efficient choice if you do not wish to modify the configuration data at run-time. Under the **Built-In** tab of the Configure dialog, set the parameter CONST_CONFIG to make your selection. The default option is to place the data in flash.

Interrupt Support

If the PDL_DMA component is specified to trigger interrupts, it will generate the callback function declaration that will be called from the DMA ISR. The user is then required to provide the actual callback code. If a null string is provided the struct is populated with zeroes and the callback declaration is not generated. In that case it is the user's responsibility to modify the struct in firmware.

The component generates the following function declarations.

Function Callback	Description
DMA_1_CompleteIrqCb	Transfer completion interrupt callback function. . Note: this generates a declaration only - USER must implement the function
DMA_1_ErrorIrqCb	Transfer error interrupt callback function. . Note: this generates a declaration only - USER must implement the function

Code Examples and Application Notes

There are numerous code examples that include schematics and example code available online at the Cypress Code Examples web page.

Cypress also provides a number of application notes describing how FMx devices can be integrated into your design. You can access the Cypress Application Notes search web page at www.cypress.com/appnotes.

Resources

The PDL_DMA component uses the DMA Controller peripheral block.

References

- FM0+ Family of 32-bit ARM® Cortex®-M0+ Microcontrollers Peripheral Manuals
- Cypress FM0+ Family of 32-bit ARM® Cortex®-M0+ Microcontrollers

Component Changes

This section lists the major changes in the component from the previous version.

Version	Description of Changes	Reason for Changes / Impact
1.0	Initial Version	

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