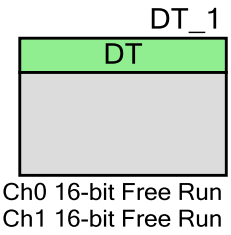
Dual Timer (PDL_DT)

1.0



Features

- Programmable 32/16-bit down counter
- Three operating modes
  - Free-Running
  - Periodic
  - One-Shot

General Description

The Peripheral Driver Library (PDL) Dual Timer (PDL_DT) component allows you to configure the Dual Timer peripheral block, which contains a pair of programmable 32/16-bit down counters that generate an interrupt when the counter reaches zero.

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

When to Use a PDL_DT Component

Use this to implement different timeouts, timing delays, system ticks, software timers and other timed activities.

Quick Start

Follow this quick start steps below to configure and start a Dual Timer.

1. Drag a PDL_DT component from the Component Catalog FMx/Digital folder onto your schematic. The placed instance takes the name DT_1.
2. Double-click to open the component's Configure dialog. See Components Parameters.
3. On the **Basic** tab, to meet your timing requirements set the following parameters:
   - timer mode
   - counter size
   - clock prescaler
4. 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 DT_1 instance.
6. In the *main.c* file, initialize the peripheral and start the application.

```
Dt_Init(&DT_1_Chn_Config, DT_1_CHANNELn);
Dt_WriteLoadVal(val, DT_1_CHANNELn);
Dt_EnableCount(DT_1_CHANNELn);
n = 0,1 – timer channel number.
```

7. Build and program the device.

Component Parameters

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

Timer Tab

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

Parameter Name	Description
u8Ch*n*Mode	Configures the DT to one of the following modes: ▪ Free Run: The counter operates continuously and wraps around to its maximum value each time that it reaches zero. ▪ Periodic: The counter is reloaded from Load Register and operates continuously each time that it reaches zero. ▪ One Shot: Writing to the Load Register (TimerXLoad) loads the counter with a new value. The counter halts until it is reprogrammed when the counter reaches zero. *n*- number of the channel to configure.
u8Ch*n*CounterSize	Sets the counter size to 16 or 32 bits, where *n* – is the number of the channel to configure.
u8Ch*n*PrescalerDiv	Sets the clock prescaler to divide the timer source (PCLK) by 1, 16 or 256, where *n* – is the number of the channel to configure

Interrupt Tab

This tab contains the Interrupt configuration settings.

Parameter Name	Description
bCh*n*IrqEnable	Enables Dual Timer interrupt, where *n* – is the number of the channel to configure.
pfnCh*n*IrqCb	Callback function for Dual Timer interrupt, where *n* – is the number of the channel to configure. This generates a declaration only. The user is required to provide the callback handler.

Parameter Name	Description
bCh*n*TouchNvic	Updates the NVIC with the timer channel interrupt, where *n* – is the number of the channel to configure.

Component Usage

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

Generated Data

The PDL_DT 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. *DT_1_config.c*). Each variable is also prefixed with the instance name of the component.

Data Structure Type	Name	Description
stc_dt_channel_config_t	DT_1_Ch*n*_Config	The configuration structure to initialize the DT, where *n* – is the number of the channel. This should be passed to Dt_Init().

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 DT component is specified to trigger interrupts, it will generate the callback function declaration that will be called from the DT 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. Thus, it is the user's responsibility to modify the struct in firmware.

The component generates the following function declarations.

Function Callback	Description
DT_1_Ch*n*_IrqCb	This will be called from the DT ISR, triggered when the counter reaches zero, where *n* – is the number of the channel intended to call the callback. 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_DT component uses the one channel of the Dual Timer 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 Errata

This section lists known problems with the component.

Cypress ID	Component Version	Problem	Workaround
251737	1.0	The PDL dual timer driver does not configure Channel 1 correctly. This limits the dual timer peripheral usage to Channel 0 only	None. The problem will be corrected in the next PDL release.

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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