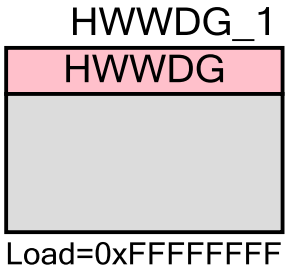
# Hardware Watchdog (PDL_HWWDG) 1.0




## Features

- Low-speed CR clock (CLKLC) used for a count clock

## General Description

The Peripheral Driver Library (PDL) Hardware Watchdog Timer (PDL_HWWDG) is a function to detect runaway of user program. If the watchdog timer is not cleared within the specified interval time, it judges that a user program is out of control and outputs either a system reset request or an interrupt request to CPU.

During watchdog timer operation, it is required to continually and periodically “feed” the watchdog before the specified interval time has elapsed. If an abnormal operation of the user program, such as hanging up, prevents it from being periodically reloaded, the timer continues counting down, underflows and outputs a watchdog interrupt request or a watchdog reset request.

The HWWDG timer is clocked by the built-in low-speed CR oscillator. Therefore, the HWWDG is active in low-power consumption modes that allow operation of the low-speed CR oscillator. These low power modes are described in the *Techincal Reference Manual (TRM)* “Low Power Consumption Mode” chapter.

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

### When to Use a PDL_HWWDG Component

Use the PDL_HWWDG component when you need to detect runaway condition in your firmware.

### Quick Start

1. Drag a PDL_HWWDG component from the Component Catalog FMx/System/Hardware Watchdog folder onto your schematic. The placed instance takes the name HWWDG_1.
2. Double-click to open the component’s Configure dialog.
3. On the **Basic** tab set the following parameters:
    - specify the load value
    - enable reset request if needed

- pfnHwwdgIrqCb - specify the interrupt callback function or clear it if not used

  **Note** The HWWDG interrupt fires whether the callback is declared or not. The interrupt is enabled when watchdog timer is started

4. 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 HWWDG_1 instance.
5. In the *main.c* file, initialize the peripheral and start the application:

```
(void)Hwwdg_Init(&HWWDG_1_Config);
(void)Hwwdg_Start();
Hwwdg_Feed(0x55, 0xAA);/* Call this function in the interrupt callback
function otherwise the reset request will be generated */
```

6. Build and program the device.

# Component Parameters

The PDL_HWWDG 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 basic peripheral initialization settings.

| Parameter Name | Description |
|---|---|
| bResetEnable | Enable/disable the hardware watchdog reset |
| u32LoadValue | Timer interval – number of CLKLC clock cycles before reset |
| pfnHwwdgIrqCb | Callback function for hardware watchdog. Note: this generates a declaration only - USER must implement the function |

# Component Usage

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

## Generated Data

The PDL_HWWDG 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. *HWWDG _1_config.c*). Each variable is also prefixed with the instance name of the component.

| Data Structure Type | Name | Description |
|---|---|---|
| stc_hwwdg_config_t | HWWDG_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 documentation 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

The PDL_SWWDG component always generates an interrupt on a timer underflow. The IRQ handler calls a callback function if it is defined. If the name of a callback function is specified in pfnHwwdgIrqCb the function definition will be generated. The user is required to write the definition (implementation). If an empty string is provided to pfnHwwdgIrqCb the callback declaration is not generated and the handler does not make a function call. The component generates the following function declarations.

| Function Callback | Description |
|---|---|
| HWWDG_1_ HwwdgIrqCb | Interrupt callback function. Note: this generates a declaration only - USER must implement the function. If you don't need to use callback function declared by the component, clear pfnHwwdgIrqCb parameter in the component's configuration dialog. |

### 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_HWWDG component uses the Hardware Watchdog (HWWDG) 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 | |