



How to configure the STM8A microcontroller clocks

Introduction

The STM8A microcontroller has a very flexible clock controller (CLK) that allows the clocks to be reconfigured at any time to suit different requirements or functional modes in the application.

There are four clock sources that can be used.

- 1-24 MHz high speed external crystal (HSE)
- Up to 24 MHz high speed user-external clock (HSE user-ext)
- 16 MHz high speed internal RC oscillator (HSI)
- 128 kHz low speed internal RC (LSI)

This application note provides practical examples of how to program the STM8A CLK registers. The source code of the examples is included in the STM8 firmware library.

For further information and a hardware description of the STM8A CLK, please refer to the section on 'Clock control (CLK)' in the STM8A microcontroller family reference manual (RM0009). Please contact STMicroelectronics for information on the STM8 firmware library.

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1 Example 1: Clock security system (CSS) capability

1.1 Overview

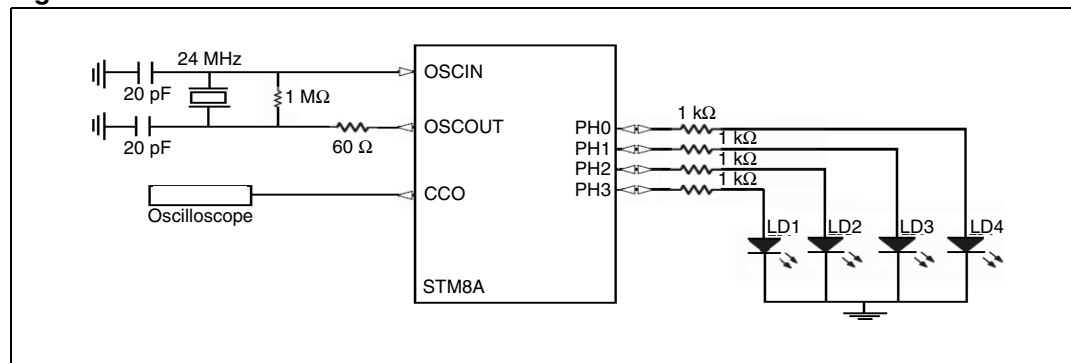
This example shows how to use the CSS capability. Enabling the CSS, is a way of making the application more reliable, by ensuring the microcontroller keeps running even if the main clock, (HSE) fails.

The example is provided as CLK example 1 in the STM8 firmware library. It uses most of the features of the CLK driver provided in the library.

1.2 Hardware description

Figure 1 shows the main hardware connections needed to run the CSS.

Figure 1. STM8A CLK interface



1.3 Firmware description

The STM8 firmware library includes the CLK driver which supports all CLK features through a set of functions.

The current example shows how to configure the CLK to detect a failure on the HSE.

When the 24 MHz HSE clock is used as the system clock, the four LEDs (LD1, LD2, LD3, and LD4) connected to pins PH3, PH2, PH1 and PH0 respectively are toggled with a fast frequency derived from the system clock.

The CSS is enabled, so that when the HSE clock disappears (when it is broken or the external crystal is disconnected), the following clock recovery sequence is performed automatically:

- The HSE clock is disabled and the system clock switches to the HSI backup clock.
- The CPU continues processing operations but the frequency is changed to HSI/8 (CSS default clock).
- LED1, 2, 3, 4 toggle at a slower frequency.
- The clock switchover can be monitored by connecting an oscilloscope to the CCO pin (PE0).

2 Example 2: Automatic clock switching

2.1 Overview

The purpose of this example is to demonstrate the automatic clock switching feature available in the STM8A. It provides an easy to use, fast and secure way for the application to switch from one master clock source to another using very few instructions.

This example is provided as CLK example 2 in the STM8 firmware library.

2.2 Hardware description

The STM8/128-EVAL evaluation board is used for this example. The main hardware connections are shown in [Figure 1](#).

2.3 Firmware description

The user can change the clock selection at any time, by pressing the joystick in the desired direction according to [Table 1](#).

Table 1. Joystick control

Joystick movement	Clock source to switch to
Up	HSE clock
Down	LSI clock
Right	HSI clock

The current clock selection is displayed on the LCD.

Each clock source is associated with a LED as shown in [Table 2](#).

Table 2. Status of LEDs display

LED	Master clock source
LD1	HSE clock
LD2	LSI clock
LD3	HSI clock

The LED blinking frequency depends on the clock speed. Clock switching can also be monitored by connecting an oscilloscope to the CCO pin (PE0).

3 Example 3: Manual clock switching

3.1 Overview

This example demonstrates how to manually switch the STM8A master clock from one clock source to another. Manual switching requires more instructions than automatic switching (described in [Section 2](#)) but it gives the application precise control of the switch event time.

This example is provided as CLK example 3 in the STM8 firmware library.

3.2 Hardware description

The STM8/128-EVAL evaluation board is used for this example. The main hardware connections are shown in [Figure 1](#).

3.3 Firmware description

When this example is running on the evaluation board, the user can select a new clock source using the joystick (see [Table 1](#)).

Each time a clock source is selected, LEDs 1 to 3 blink for a short period. Clock switching can also be monitored by connecting an oscilloscope to the CCO pin (PE0).

4 Example 4: Configuring clocks for maximum speed

4.1 Overview

This example shows how to configure the STM8A microcontroller to run at its highest or second highest frequency using the external or internal clock sources (HSE or HSI respectively).

Such configurations make the CPU run at the frequency provided by the CLK without any prescaler or division factors.

This example is provided as CLK example 4 in the STM8 firmware library.

4.2 Hardware description

The STM8/128-EVAL evaluation board is used for this example. The main hardware connections are shown in [Figure 1](#).

4.3 Firmware description

The CLK registers are configured so that the CPU runs at exactly 24 MHz (HSE clock frequency).

Pressing the 'KEY' button on the evaluation board makes the CPU run at 16 MHz (HSI clock frequency).

This example can be used as a tutorial exercise or as starting point that can be easily modified for use in different applications.

5 Revision history

Table 3. Document revision history

Date	Revision	Changes
07-Apr-2008	1	Initial release
25-Sep-2008	2	<p><i>Section 2.2:</i> Removed <i>Figure 2: USART and HyperTerminal interface</i> and associated text.</p> <p><i>Section 2.3:</i> Simplified and removed text. Added <i>Table 1: Joystick control</i> which was previously in <i>Section 3.3</i>.</p> <p><i>Section 3.3:</i> Removed <i>Table 2: Joystick control</i> and added it to <i>Section 2.3</i>.</p>

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