



# AN3332

## Application note

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### Generating PWM signals using STM8S-DISCOVERY

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#### Application overview

This application user manual provides a short description of how to use the Timer 2 peripheral (TIM2) to generate three PWM signals.

Even though the STM8S-DISCOVERY is built around an STM8S105C6T6, it allows evaluation of the main features of all the STM8S MCUs.

#### Reference documents

- STM8S-DISCOVERY evaluation board user manual (UM0817).
- Developing and debugging STM8S-DISCOVERY application user manual (UM0834).

# 1 Application description

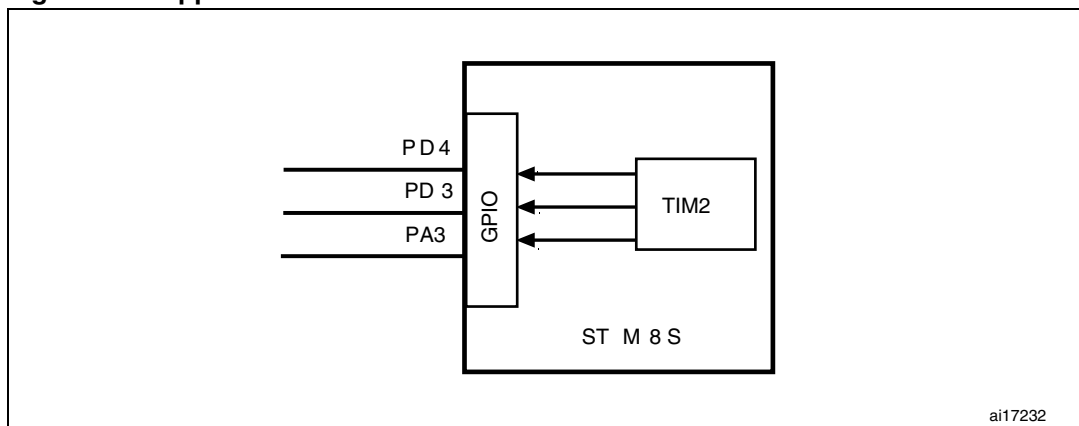
## 1.1 Hardware requirement

No additional hardware is required on the STM8S-DISCOVERY board.

An oscilloscope is needed as an external resource.

## 1.2 Application schematics

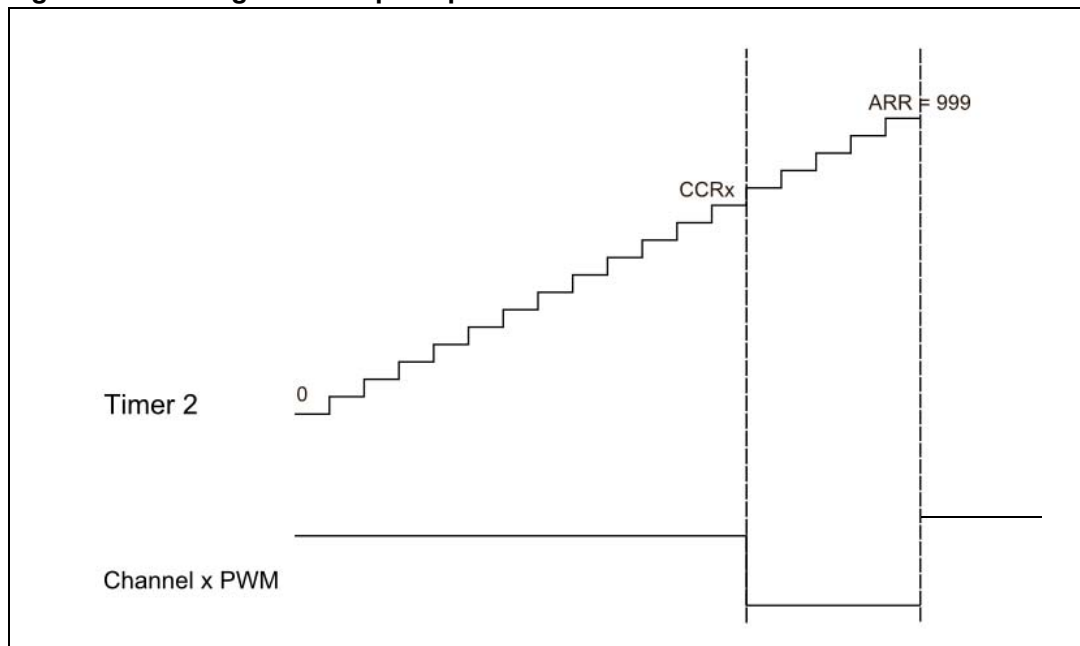
Figure 1. Application schematics



## 1.3 Application principle

This application is based on the use of the STM8S TIM2 in PWM (pulse width modulation) mode to generate 3 PWM signals.

The generation process is presented in [Figure 2](#).

**Figure 2. PWM generation principle**

TIM2 counts up from 0 to the Auto-reload register value (TIM2\_ARR) according to the TIM2 counter clock.

- When the counter value equals the Compare/Capture register (TIM2\_CCRxx) value channel x signal is set to 0.
- When the counter value reaches the TIM2\_ARR value the counter is reset and channel x signal is set to 1.

By configuring the TIM2\_CCRxx and TIM2\_ARR registers you can easily modify the duty cycle and frequency of the PWM signals generated (see [Section 2: Software description](#)).

By default the application provides the 3 PWM signals as specified in [Table 1](#).

*Note:* It is possible to configure the AFR option byte to get channel 3 on PD2 also.

**Table 1. Default PWM signals**

Signal	Duty cycle	Frequency	I/O pin	Header connector
Channel 1 PWM	50%	2 KHz	PD4	CN4.9
Channel 2 PWM	25%	2 KHz	PD3	CN4.8
Channel 3 PWM	75%	2 KHz	PA3	CN1.9

## 2 Software description

This example uses the STM8S standard firmware library to control the general purpose functions.

To generate the PWM signals the TIM2 peripheral must be configured as follows:

- Output state enabled for each channel
- Output compare active low for each channel
- Preload register enabled for each channel
- PWM output signal frequency = 2 KHz:
  - The timer source clock frequency is 2 MHz ( $f_{CPU}$  by default) and the prescaler is set to 1 to obtain a TIM2 counter clock of 2 MHz.
  - PWM output signal frequency can be set according to the following equation:  
**PWM output signal frequency = TIM2 counter clock/(TIM2\_ARR + 1)**  
(in our case TIM2\_ARR = 999, so PWM output signal frequency is 2 KHz)
- PWM mode for each channel. To obtain a different PWM duty cycle value on each channel the TIM2\_CCRxx register must be set according to this equation:  
**Channel x duty cycle = [TIM2\_CCRxx/(TIM2\_ARR + 1)] \* 100**  
By default we have:
  - Channel 1: TIM2\_CCR1x register value is 500, so channel 1 of TIM2 generates a PWM signal with a frequency of 2 KHz and a duty cycle of 50%.
  - Channel 2: TIM2\_CCR2x register value is 750, so channel 2 of TIM2 generates a PWM signal with a frequency of 2 KHz and a duty cycle of 75%.
  - Channel 3: TIM2\_CCR3x register value is 250, so channel 3 of TIM2 generates a PWM signal with a frequency of 2 KHz and a duty cycle of 25%.

### 2.1 STM8S standard firmware library configuration

The *stm8s\_conf.h* file of the STM8S standard firmware library is used to configure the library by enabling the peripheral functions used by the application.

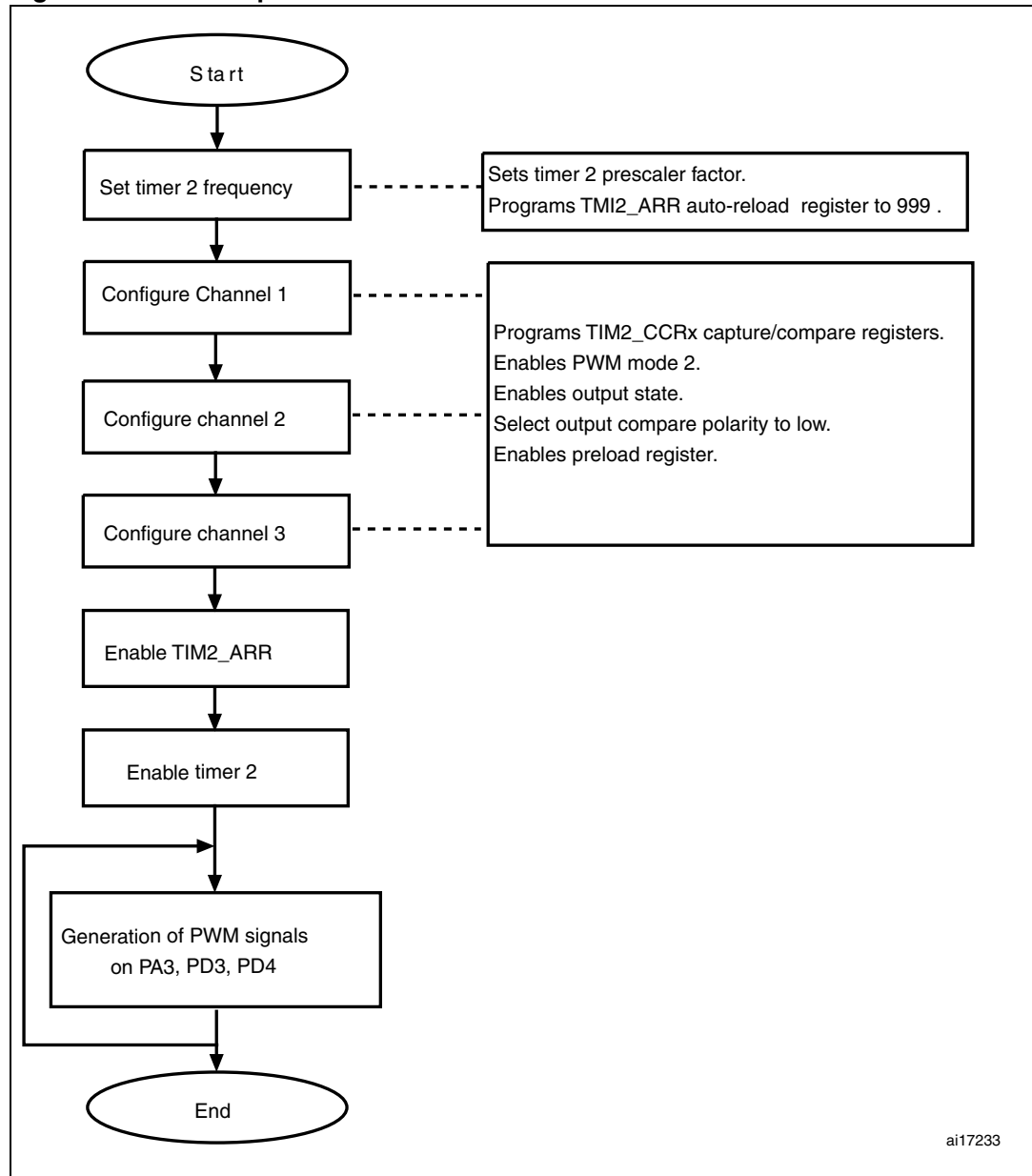
The following `define` statements must be present:

- `#define _GPIO 1` enables the GPIOs
- `#define _TIM2 1` enables the TIM2

## 2.2 Application software flowcharts

### 2.2.1 Main loop flowchart

Figure 3. Main loop flowchart



### 3 Revision history

**Table 2. Document revision history**

Date	Revision	Changes
15-Jan-2011	1	Initial release. This document replaces UM0856.

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