ARM Microcontroller Course

May 20, 2015

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Timers

Timers can be used for:

- Counting

Timers
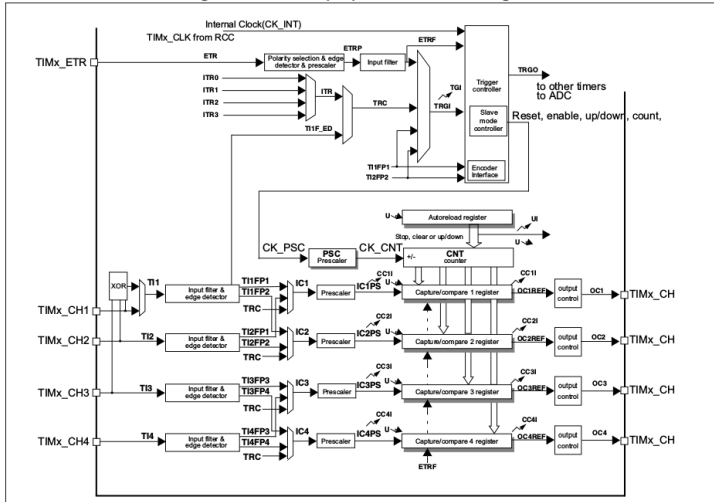
Timers can be used for:

- Counting
- PWM

Timers

Timers can be used for:

- Counting
- PWM
- Keeping time

Timer internals

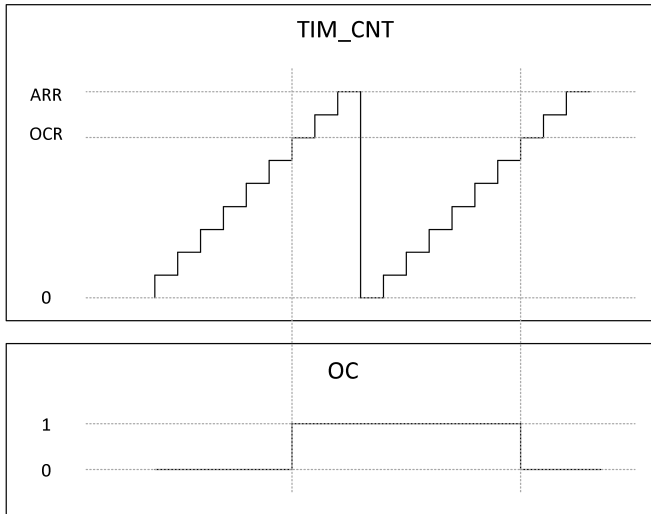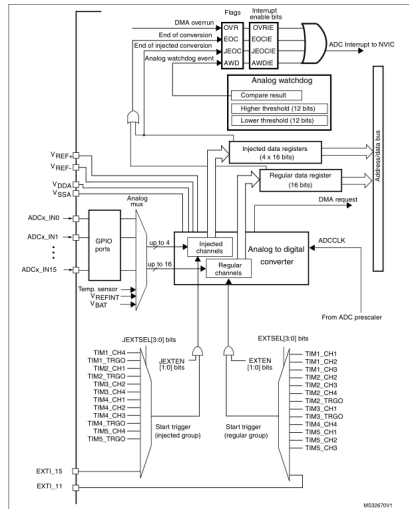Figure 87. General-purpose timer block diagram

Timer function

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Analog Peripherals

- ADC
- Comparator
- Opamp
- Temperature Sensor

ADC internals

To use ADC:

- Turn on clock for ADC
- Turn on clock for GPIO of potentiometer pin
- Initialize the ADC
- Configure potentiometer pin
- Optional: turn on NVIC for ADC
- Turn on ADC

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HAL
Hardware Abstraction Layer

- API for peripherals

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Hardware Abstraction Layer

- API for peripherals
- Handles: PPP_HandleTypeDef
- Shared and system peripherals: GPIO, SYSTICK, NVIC, PWR, RCC and FLASH

HAL Examples

```
HAL_StatusTypeDef HAL_GPIO_Init (GPIO_TypeDef* GPIOx,
    GPIO_InitTypeDef *Init)
{
// GPIO initialization
}

//example of handle
UART_HandleTypeDef uarthandle;
uarthandle.Instance = UART1;
HAL_UART_Init(&uarthandle);
```
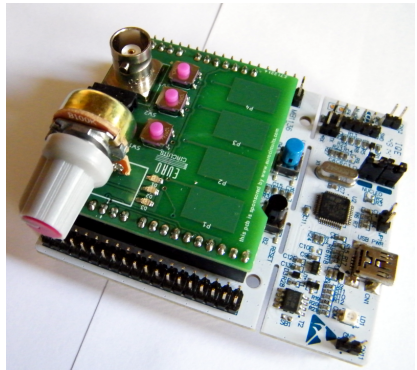
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Shield

- Potentiometer
- DAC over SPI
- 3 Buttons
- 3 LEDs
- 4 Captouch buttons
- Jack and BNC

Material

You can find all material on
http://www.scintilla.utwente.nl/docs/cursus
Make sure you download:

- The Updated Manual (0520)

- The Usermanual of the Nucleo-F411RE

- The Reference Manual of the STM32F411RE

Optional:

- HAL document

- Programming Guide