



Hello, and welcome to this presentation of the STM32U0 analog comparators. It covers the main features of these ultra-low-power comparators.

Comp features

- 2 x COMP unit
- 3 speed modes
- Inputs:
 - GPIOs
 - Internal reference signals:
 - Vrefint submultiple: $x\frac{1}{4}$, $x\frac{1}{2}$, $x\frac{3}{4}$, $x1$
 - DAC output
 - Outputs:
 - GPIOs (alternate function)
 - Timers, Interrupt and many other peripheral triggers
- Programmable hysteresis
- Supports windowing mode
- Source for Wakeup from low power mode and Touch Sensing controller

Parameter	Condition	Typical	Unit
VDDA	-	1.62 ~ 3.6	V
VIN	-	0 ~ VDDA	V
Propagation delay	High-Speed mode	55	ns
	Medium mode	0.55	μ s
	Ultra-low-power mode	4	μ s
Consumption	High-Speed mode	70	μ A
	Medium mode	5	μ A
	Ultra-low-power mode	400	nA



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Two comparators inside the STM32U0 microcontrollers provide a binary output which indicates if the analog voltage on the positive input is larger than the voltage on the negative input.

They allow the microcontrollers to react when the analog signal crosses a predefined threshold.

The comparator continuously monitors voltage in contrast to an analog-to-digital converter which operates in sampled mode.

COMPx power consumption versus propagation delay can be adjusted to have the optimum trade-off for a given application, thanks to the three speed modes.

Input can be selectable from GPIOs, internal reference voltage as well as DAC output voltage.

Output can be routed to GPIO, and also timer or interrupt inputs through the peripheral interconnect matrix.

Hysteresis voltage is programmable and by combining the two comparators, it is possible to implement a window mode that monitors whether the analog voltage is within the voltage range defined by lower and upper thresholds.

Outputs can be used as wakeup source.

This is particularly interesting for the TSC peripheral, that has the possibility to use the COMP to achieve lower power consumption

COMP inputs/outputs configuration

COMP	INP	INM		OUT	
	External Pins	External Pins	Internal Signal	External Pins	Internal signal
COMP1	PA1, PA9, PB2,PC5,PC6	PA0,PA4, PA5,PB1,PC4	DAC1_OUT1 VREFINT ¼ VREFINT ½ VREFINT ¾ VREFINT	PA0,PA11 PA6,PB0,PB10 (AF6/AF12)	NVIC EXTI TIM1/2/3/15/16 LPTIM1/2/3
COMP2	PA3,PB4, PB6,PD10	PA2,PA4, PA5,PB3,PB7		PA2,PA7, PB5, PB11 (AF12)	



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This table shows the internal and external connections of the comparator inputs and outputs.

Each comparator has two analog inputs and one digital output.

The positive input is connected to a GPIO pad, while the negative input can be connected either to a GPIO pad or internally to DAC output or VREFINT with four divide ratios.

The output of the comparator can be inverted.

The state of the comparator can be connected to:

- GPIOs
- An Interrupt request
- EXTI module to generate a wakeup request or an event to the CPU

- Timer inputs.

It is possible to have the comparator output simultaneously redirected internally and externally.

Motor control loop is simplified by enabling a cooperation between the following units: comparators, timers, DACs and VREFINT.

Low-power modes

Mode	Description
Run	Active
Sleep	Active
Stop 0/1/2	Active
Standby	Powered-down ➤ The peripheral must be reinitialized after exiting Standby mode

The on-chip comparator remains active in the following modes: Run, Sleep, and Stop modes. In Standby mode, it is powered-down and must be reinitialized for use if returning to one of the higher-powered modes.

Thank you

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Thanks for attending this presentation.
You can refer to the following presentations for peripherals connected to the comparators:

- IMX Interconnect matrix
- GPIO General-purpose inputs and outputs.