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STM32U5

Analog Comparators
(Comp)

ST Restricted

Hello, and welcome to this presentation of the STM32U5 analog comparators. It covers the main features of these ultra-low-power comparators.

Comp features

- 2 x COMP
- 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 trigger
- Programmable hysteresis
- Support windowing mode
- Offset calibration
- Source for Wakeup from low power mode

Parameter	Condition	U5 Typical	L5 Typical	Unit
VDDA	-	1.58 ~ 3.6	1.62 ~ 3.6	V
VIN	-	0 ~ VDDA	0 ~ VDDA	V
Propagation delay	High-Speed	40	55	ns
	Medium Speed	0.5	0.55	us
	Low-Speed	2	5	us
Consumption	High-Speed	48	70	μ A
	Medium Speed	3	5	μ A
	Low-Speed	300	400	nA



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Two comparators inside the STM32U5 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.

Each comparator has 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 if the analog voltage is within the voltage range defined by lower and upper thresholds. There is also an integrated mechanism to calibrate the offset.

Outputs can often be used as wakeup source.

Compared to the STM32L5, the comparator of the STM32U5 features a lower propagation delay.

COMP inputs/outputs configuration

COMP	INP	INM		OUT	
	External Pins	External Pins	Internal Signal	External Pins	Internal signal
COMP1	PA2, PC5, PB2	PB1, PC4	DAC1_OUT1 DAC1_OUT2	PB0, PB10 (AF12)	NVIC EXTI
COMP2	PB4, PB6	PB3, PB7	VREFINT ¼ Vrefint ½ Vrefint ¾ Vrefint	PB5, PB11 (AF12)	TIM1/2/3/4/5/ 8/15/16/17 LPTIM1/2/3/4 I2C1/2/3/4/5/6 USART1/2/3/6 UART4/5 LPUART1 SPI1/2/3 GPDMA LPDMA

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 outputs 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

- Triggers for communication peripherals
- Triggers to GPDMA/LPDMA.

These two last possibilities are new with respect to the STM32L5.

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.

Thank you

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Refer to the following presentations for peripherals connected to the comparators:

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