STM32H5

OPAMP

Hello, and welcome to this presentation of the STM32H5 embedded operational amplifier. It covers the features of this IP, which is widely used for conditioning analog signals.

- Features
  - 1x OPAMP in STM32H503
  - PGA gain 2,4,8,16
  - Offset calibration
  - High speed mode

SYMBOL	Parameter	Typical	Unit
VDDA	Analog supply voltage	2.0 ~ 3.6	V
CMIR	Common mode input range	0 ~ VDDA	V
Vos	Offset voltage	2.5 (max)	mV
Gain bandwidth (GBW)	Normal mode	7.3	MHz
SlewRate	High speed mode	24	V/µs
	Normal mode	3	V/µs
	Low power mode	0.25	V/µs
Output Current	Normal mode	500	uA
Power supply rejection Ratio (PSRR)	Normal mode	66	dB
WakeUp Time	Normal mode	3.2 (max)	µs
	High Speed mode	2.8 (max)	µs

2

The STM32H503 integrates one OPAMP module. This unit is not present in STM32H573.

It is general-purpose analog amplifiers, which reduce the need for an external stand-alone OPAMP.

As this OPAMP can be configured in stand-alone mode with all terminals available for the user, it is possible to use them as a voltage follower, non-inverting and inverting amplifiers, as well as analog filters such as low- or high-pass filters.

It can also act as a pre-amplifier for the ADC input.

The table shows performance parameters for the STM32H5's OPAMP.

The gain bandwidth is 7.3 MHz typical.

Note that the OPAMP module present in the STM32H503

supports a high speed mode, that is activated by setting a control bit.
In this mode, the slew rate characteristics are improved. By using an internal feedback resistor, the OPAMP can also be used as a Programmable Gain Amplifier, or PGA. To facilitate PCB design, a spice simulation model will be provided upon demand.

OPAMP input/output configuration

OPAMP	VINPx		VINMx		VOUTx	
	External	Internal	External	Internal	External	Internal
OPAMP1	PA0, PB0	dac1_out1	PC5, PB1	PGA feedback	PA7	ADC1_IN7

This table shows the internal and external connections of the OPAMP inputs and outputs.
OPAMP module has two inputs (inverting and non-inverting) and one output.
The non-inverting inputs can be connected to either a GPIO pad or internally to a DAC output.
The inverting input is used for feedback when PGA mode is selected or can be connected to a GPIO pad.
The output is connected to a GPIO pad then an ADC input.

Thank you

In addition to this presentation, you can refer to the following presentations for the peripherals connected to the STM32H5's operational amplifiers:
-Analog-to-digital converter (ADC) and Digital-to-analog converter (DAC).
-General purpose input output (GPIO).