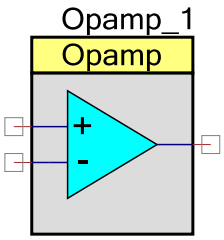
Operational Amplifier (Opamp)
1.10

Features



- 25 mA output current
- Follower or Opamp configuration
- Low resistance connection from output to pin

General Description

The Operational Amplifier (Opamp) component provides a simple follower or basic Opamp configuration. The inputs and output may be connected to internal routing nodes, directly to pins, or a combination of internal and external signals.

When to use an Opamp

The Opamp should be used anytime a voltage output needs to drive a load of less than 10K Ohms. These Opamps can also be used as stand-alone amplifiers. The Opamp may be used as a generic Opamp with external components.

Input/Output Connections

This section describes the various input and output connections for the Opamp. An asterisk (*) in the list of I/O's states that the I/O may be hidden on the symbol under the conditions listed in the description of that I/O.

Non-Inverting – Analog

When the Opamp is configured as a follower, this in the voltage input. If the Opamp is configured as an Opamp, it acts as the standard Opamp non-inverting input.

Inverting – Analog *

When the Opamp is configured for the follower mode, this pin is unavailable to the user. When the Opamp is configured as an Opamp, this pin is the standard Inverting pin of a basic Opamp.

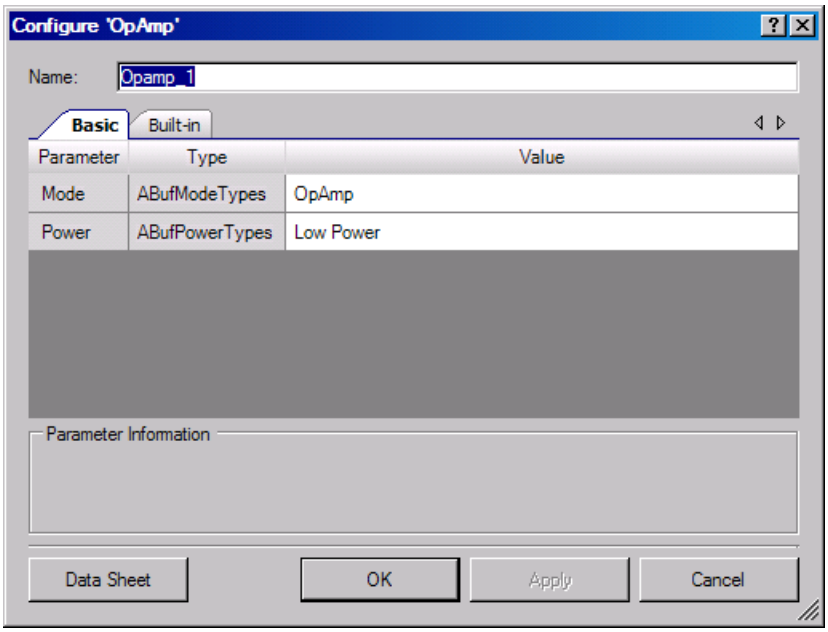
Vout – Analog

This is the standard Opamp output signal. It is directly connected to a pin and is capable of driving 25mA.

Parameters and Setup

Drag an Opamp component onto your design and double-click it to open the Configure dialog.

Figure 1 Configure Opamp Dialog

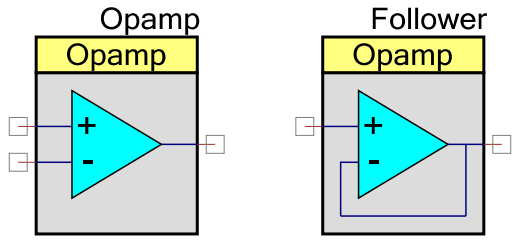


The Opamp has the following parameters:

Mode

This parameter allows you to select between two configurations: "Opamp" and "Follower". In Opamp mode, all three terminals are available for connection. In Follower mode, the inverting input is internally connected to the output to create a voltage follower. Opamp is the default configuration.

Figure 2 Configuration Options



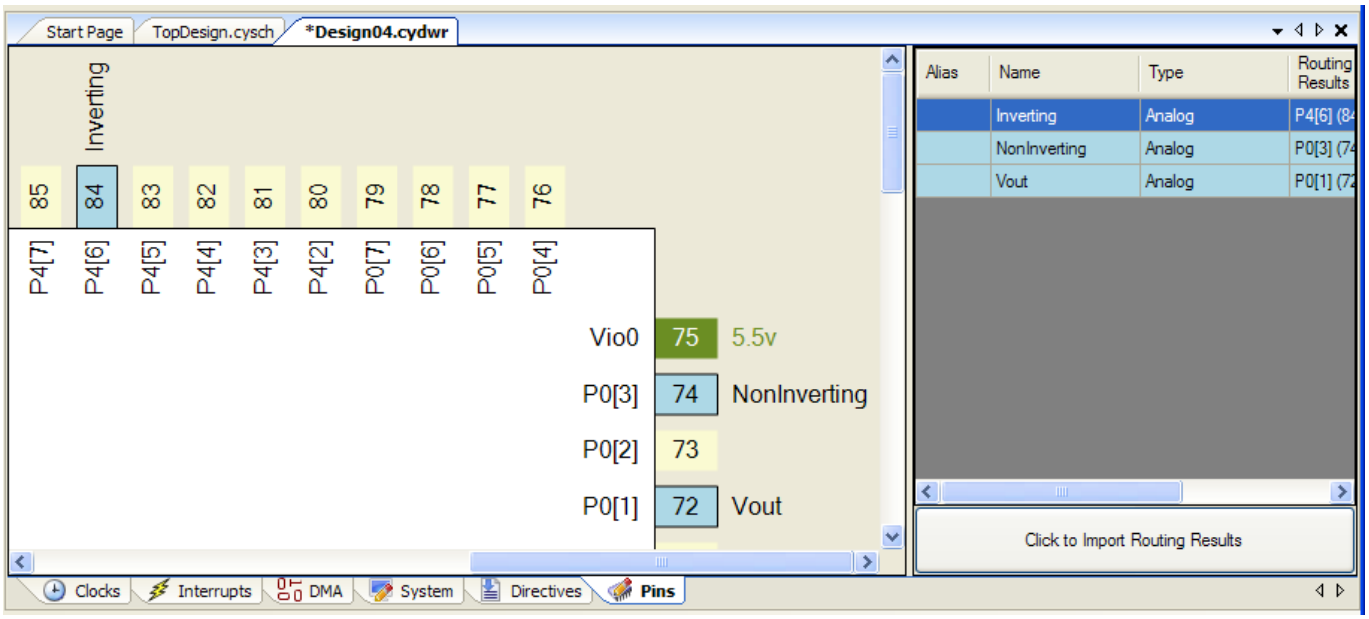
Power

This parameter allows you to select the power level of high, medium or low to adjust the Opamp to different external loads.

Placement

Each Opamp is directly associated with a set of GPIO pins. See the data sheet for the part being used for the specific pin connections. The following shows one example of how the Opamp may be connected using the Design-Wide Resources Pin Editor.

Figure 3 Example placement



Resources

The Opamp component uses one Opamp resource per instance. When used in the Opamp mode with external components (i.e., not routing the output through the analog globals), no routing resources are used.

Application Programming Interface

Application Programming Interface (API) routines allow you to configure the component using software. The following table lists and describes the interface to each function. The subsequent sections cover each function in more detail.

By default, PSoC Creator assigns the instance name "Opamp_1" to the first instance of a component in a given design. You can the rename it to any unique value that follows the syntactic rules for identifiers. The instance name becomes the prefix of every global function name, variable, and constant symbol. For readability, the instance name used in the following table is "Opamp".

Function	Description
void Opamp_Start(void)	Enable Opamp.
void Opamp_Stop(void)	Disable Opamp (power down)
void Opamp_SetPower(uint8 power)	Set the power level.

void Opamp_Start(void)

Description: Turns on the Opamp and sets the power level to the value chosen during the parameter selection.

Parameters: None

Return Value: None

Side Effects: None

void Opamp_Stop(void)

Description: Turn off the Opamp and enable its lowest power state.

Parameters: None

Return Value: None

Side Effects: None

void Opamp_SetPower(uint8 power)

Description: Sets the power level.

Parameters: (uint8) power: Sets the power level to one of three settings, Low, Medium, or High.

Power Setting	Notes
Opamp_LOWPOWER	Uses least amount of power
Opamp_MEDPOWER	
Opamp_HIGHPOWER	Uses most amount of power

Return Value: None

Side Effects: None

Sample Firmware Source Code

The following is a C language example demonstrating the basic functionality of the Opamp component. This example assumes the component has been placed in a design with the default name "Opamp_1."

Note If you rename your component you must also edit the example code as appropriate to match the component name you specify.

```
#include <device.h>

void main()
{
    Opamp_1_Start();

}
```

DC and AC Electrical Characteristics

DC Specifications

Parameter	Description	Conditions	Min	Typ	Max	Units
Vioff	Input offset voltage		-	-	2	mV
Vioff	Input offset voltage	T = 25 °C	-	0.5	-	mV
TCVos	Input offset voltage drift with temperature		-	12	-	µv/°C
Ge1	Gain error, unity gain buffer mode	Rload = 1 kΩ	-	-	0.1	%
	Quiescent current		-	900	-	µA
Vi	Input voltage range		Vssa	-	Vdda	mV
Vo	Output voltage range	Output load = 1 mA	Vssa + 50	-	Vdda - 50	mV
Iout	Output current	Output voltage is between Vssa +500 mV and Vdda - 500 mV, and Vdda > 2.7V	25	-	-	mA
Iout	Output current	Output voltage is between Vssa +500 mV and Vdda - 500 mV, and Vdda > 1.7V and Vdda < 2.7V	16	-	-	mA
CMRR	Common mode rejection ratio[8]		70	-	-	dB

AC Specifications

Parameter	Description	Conditions	Min	Typ	Max	Units
GBW	Gain BW[8]	100 mV pk-pk, load capacitance 200 pF	3	-	-	MHz
Tslew	Slew rate[8]	Load capacitance 200 pF	3	-	-	V/µs
	Input noise density[8]		-	38	-	nv/ sqrtHz

PRELIMINARY