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instruments

analog::blocks

OpAmp Boards and Modules

User Manual

Rev. 1.0

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1) General Description

The analog::blocks OpAmp platform uses a pre-routed amplifier circuit that can be populated for different operational-amplifier applications. The same circuit concept is used for prototype boards and for ready-to-use Function Modules.

Configurable resistor positions provide access to the inverting and non-inverting OpAmp inputs, the application-defined REF input and the analog outputs.

The OpAmp supply can be selected for ± 5 V or ± 12 V operation. Dedicated through-hole pads at -OPAMP and OUT-OPAMP provide convenient access for feedback components, avoiding repeated rework of the 0805 SMD positions during experiments.

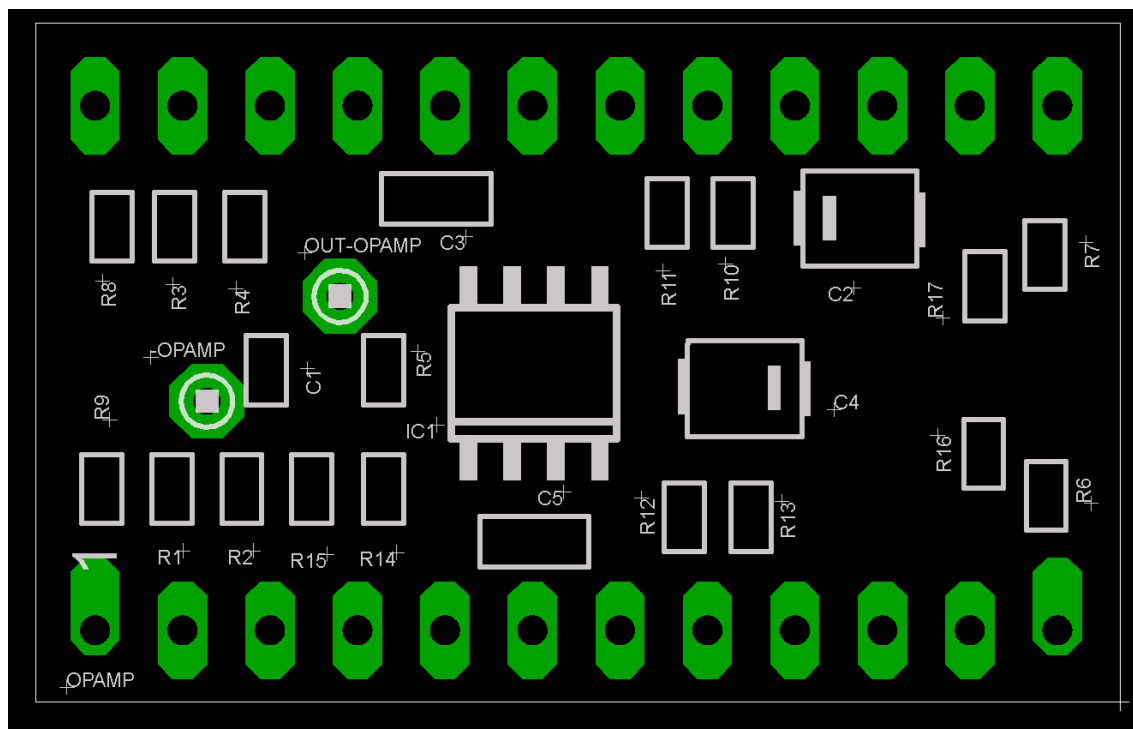


Figure 1. Common SO-8 OpAmp Board layout

2) Common Circuit

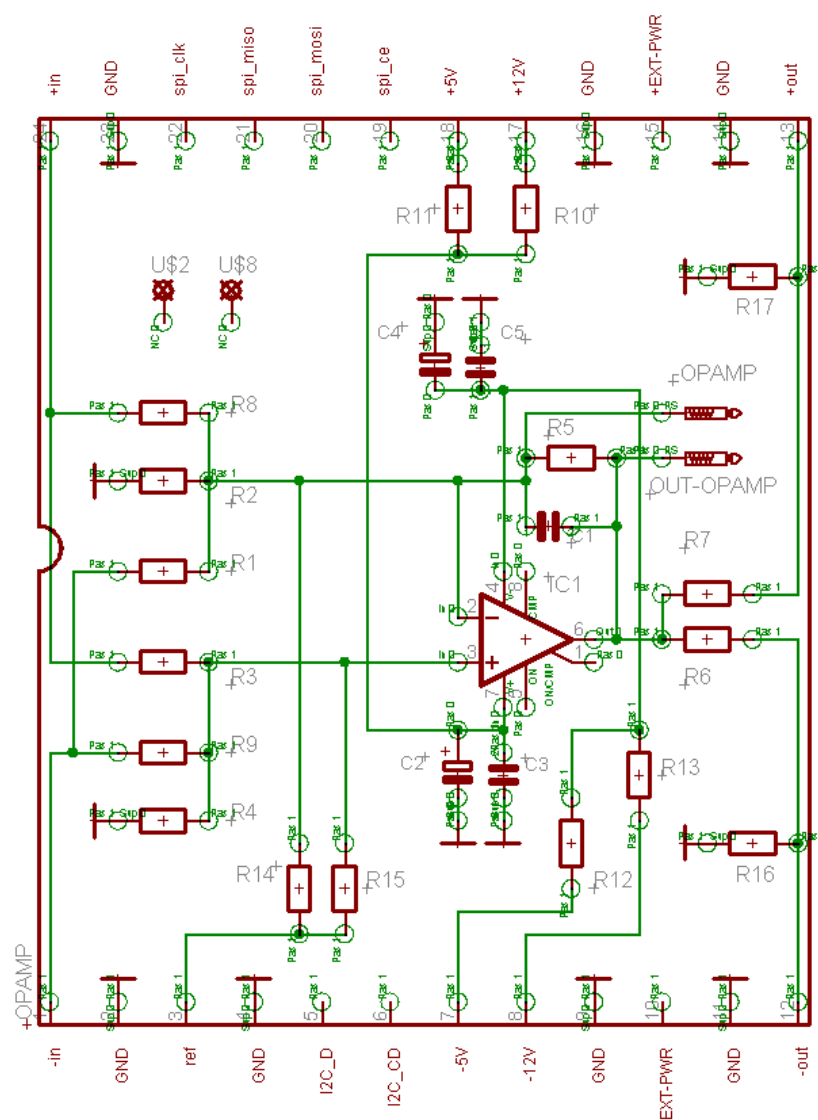


Figure 2. Common OpAmp circuit.

Components / pads	Function
R1 / R2 / R8	Configuration of the inverting (-) OpAmp input
R3 / R4 / R9	Configuration of the non-inverting (+) OpAmp input
R5 / C1	OpAmp Feedback configuration
R14 / R15	Connection to the application-defined REF input
-OPAMP / OUT-OPAMP	Through-hole pads for external feedback components
R6 / R16, R7 / R17	Output routing
R10 / R11	Positive supply selection: +5 V or +12 V
R12 / R13	Negative supply selection: -5 V or -12 V

3) Configuration Notes

The PCB supports non-inverting, inverting, differential and transimpedance amplifier configurations by changing the resistor population.

Non-inverting amplifier: The input signal is applied to the non-inverting input. R2 and the feedback resistor R5 determine the voltage gain.

Inverting amplifier: The input signal is applied to the inverting input through R1 or R8. The non-inverting input is normally connected to GND through R4.

Differential amplifier: Both analog inputs are used. The resistor ratios determine the differential gain and should be matched accordingly.

Transimpedance amplifier: The input current is applied to the inverting input. R5 determines the transimpedance gain, while C1 can be used for frequency compensation and stability.

The REF input provides an application-defined reference potential for the amplifier circuit. It can be used to shift the signal reference from ground to another voltage, for example to establish a virtual ground in single-supply applications or to add a defined DC offset to the output signal. R14 and R15 allow the REF input to be connected to the appropriate nodes of the amplifier circuit.

External feedback components may be connected between the –OPAMP and OUT-OPAMP through-hole pads, either in addition to or instead of R5 / C1.

Configuration	Populated components
Non-inverting, IN-	R2 / R9 / R5 / C1 (if required)
Non-inverting, IN+	R2 / R3 / R5 / C1 (if required)
Inverting, IN-	R4 / R1 / R5 / C1 (if required)
Inverting, IN+	R4 / R8 / R5 / C1 (if required)
Differential (IN+) - (IN-)	R4 / R3 / R1 / R5 / C1 (if required)
Differential (IN-) - (IN+)	R4 / R9 / R8 / R5 / C1 (if required)
Transimpedance, IN-	R4 / R1: 0 Ω / R5 / C1 (if required)
Transimpedance, IN+	R4 / R8: 0 Ω / R5 / C1 (if required)
Configuration Output	Populated components
out+	R7
out-	R6
Configuration Power	Populated components
± 12 V	R10 / R13 / C2 / C3 / C4 / C5
± 5 V	R11 / R12 / C2 / C3 / C4 / C5
+12 V / -5 V	R10 / R12 / C2 / C3 / C4 / C5
+5 V / -12 V	R11 / R13 / C2 / C3 / C4 / C5
+12 V / GND	R10 / C4 / C5 / C3: 0 Ω
+5 V / GND	R11 / C4 / C5 / C3: 0 Ω
-5 V / GND	R12 / C2 / C3 / C4: 0 Ω
-12 V / GND	R13 / C2 / C3 / C4: 0 Ω
Configuration Reference	Populated components
REF	R14 or R15

4.1) SO-8 OpAmp Prototype Board

Pre-routed board for standard SO-8 operational amplifiers. The resistor and feedback positions allow application-specific amplifier configurations to be implemented without designing a dedicated PCB.

Ordering Information: ABL-PAO-11-U1-S08

4.2) DIL-8 OpAmp Prototype Board

Pre-routed board for standard DIL-8 operational amplifiers. A socket can be used for quick exchange and comparison of different devices

Ordering Information: ABL-PAO-11-U1-D08

5) Populated Function Modules

The populated Function Modules use the same configurable circuit as the Prototype Boards. Their factory configuration can therefore be modified by changing the corresponding resistor and capacitor positions.

Operating Limits:	Refer to the datasheet of the installed OpAmp.
Common population:	C2 / C4: 10 μ F / 16 V tantalum
	C3 / C5: 0.1 μ F / 1206, X7R

5.1) SO-8 General Purpose OpAmp Module

Configuration:	Voltage amplifier: +IN, +OUT
OpAmp:	IC1: OP07
Resistors:	R3: 10 k Ω / R2: 10 k Ω / R5: 91 k Ω / R7: 100 Ω
Gain:	10 $\pm$ 5%
Bandwidth:	40 kHz (-3 dB)
Supply:	$\pm$ 12 V / R13: 18 Ω / R10: 18 Ω
Ordering Information:	ABL-MAO-11-U1-S08-OP07-G10

5.2) SO-8 Wideband OpAmp Module

Configuration:	Wideband voltage amplifier: +IN, +OUT
OpAmp	IC1: AD8055
Resistors:	R3: 1.0 k Ω / R2: 1.0 k Ω / R5: 9.1 k Ω / R7: 51 Ω
Gain:	10 $\pm$ 5%
Bandwidth:	22 MHz (-3 dB)
Supply:	$\pm$ 5 V / R12: 18 Ω / R11: 18 Ω
Ordering Information:	ABL-MAO-11-W1-S08-AD8055-G10

5.3) SO-8 Transimpedance OpAmp Module

Configuration:	Transimpedance amplifier: +IN, +OUT
OpAmp:	IC1: TL081
Resistors:	R4: 0 Ω / R8: 0 Ω / R5: 1 M Ω / C1: 2.2 pF / R7: 100 Ω
Transimpedance gain:	1 V/ μ A $\pm$ 5%
Bandwidth:	70 kHz (-3 dB)
Supply:	$\pm$ 12 V / R13: 18 Ω / R10: 18 Ω
Ordering Information:	ABL-MAO-11-T1-S08-TL081-T1E6

6) Module Interface and Pin Assignment

The module interface consists of 24 contacts. The four corner contacts are the principal analog signal connections. The signal names IN and OUT describe their usual purpose; an individual module may use these analog contacts in the opposite direction.

Pinout

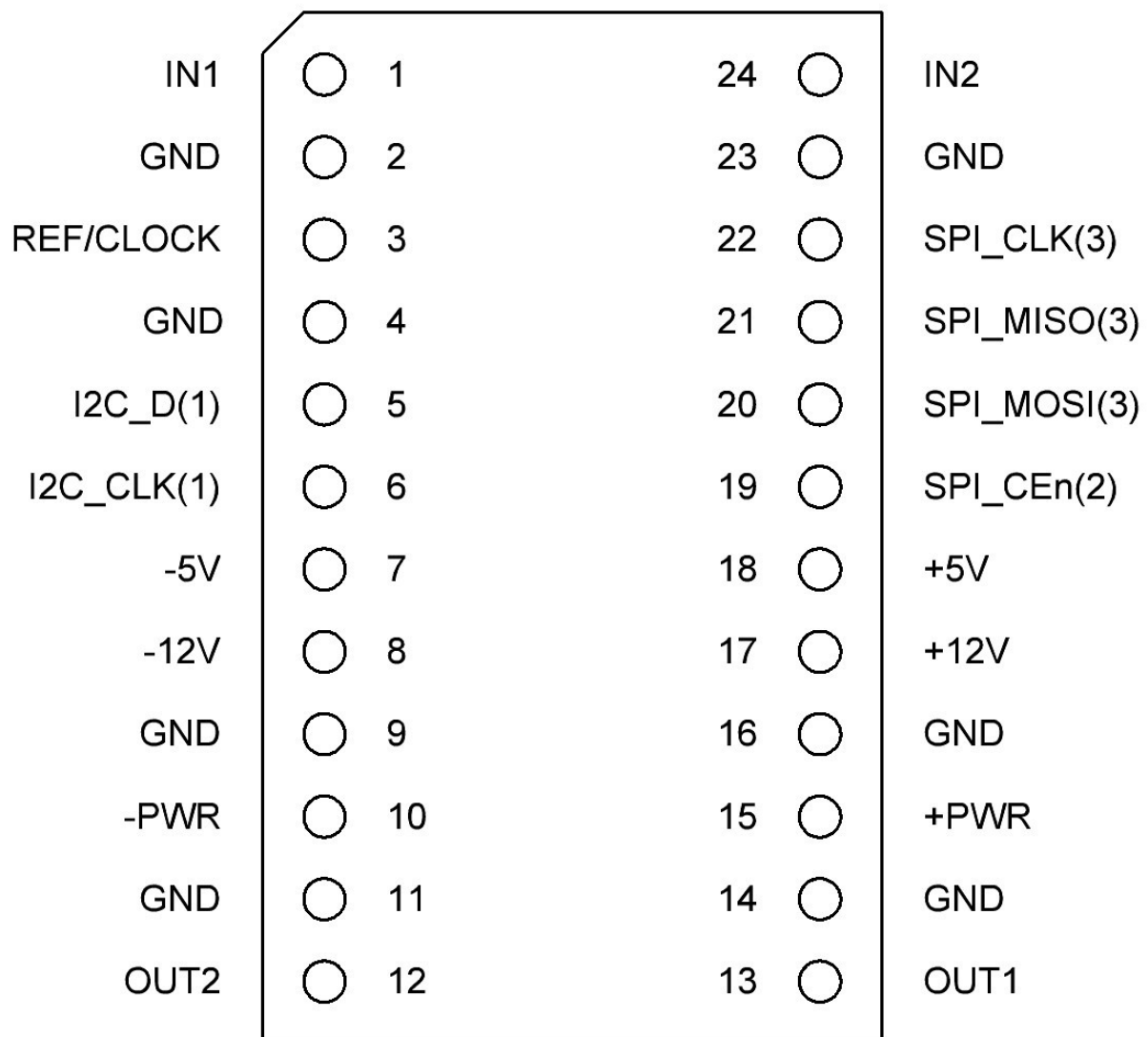


Figure 3: 24-pin analog::blocks module interface, top view.

History:

Revision	date yy/mm/dd	Changes
1.0	26/09/21	Initial.