

Component list with descriptions

Power supply circuit

1.1 DC/DC Stepdown converter (36 → 7.4V)

Description:

A DC/DC stepdown converter which is able to reduce a wide array of input voltage levels (7-36 volts) down to a wide array of output voltages (2.5 to 12.6 volts). The DC/DC stepdown converter can in addition deliver up to 6 A worth of power, dependent on the output load in the circuit.

Purpose in circuit:

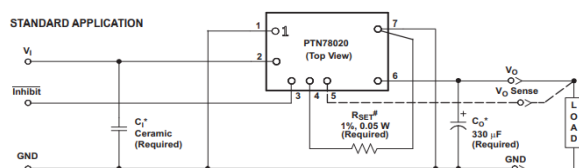
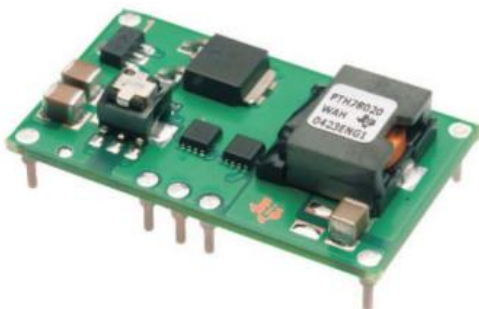
1. Reduces the input voltage from 36 volts down to 7.4 volts to accommodate a potential servomotor while being able to deliver enough power to run it (3.5 Ampere).
2. Helps with noise reduction by completing the voltage reduction in two steps rather than one.
3. NB! The component was chosen due to it being used in the previous iteration and it was therefore easy to implement which saved some time designing a new circuit. It is however rather expensive and could with some redesign to the circuit be swapped out for a cheaper option, if necessary, when the complete robot is to be built.

Producer: Texas Instruments

Supplier: Texas Instruments

Texas instrument item description: TEXAS INSTRUMENTS - PTN78020WAD - IC, ISR 6A ADJ O/P, 78020 Cost: kr 296,-

Hyperlink: [Texas Instruments, PTN78020WAD Step-Down Switching Regulator, 1-Channel 6A 7-Pin, DIP Module | RS Components \(rs-online.com\)](#)



In addition, the following components are necessary to enable the IC:

Resistor:

- **Purpose:** A resistance is needed to decide the output voltage of the DC/DC converter. This resistance is placed in the position Rset shown in the circuit above. For more information on which resistance values provides which output voltages, check the datasheet for the converter.
- Supplier: LCSC Electronics
- LCSC item description: 7.5k Ω \pm 1% 1/16W \pm 100ppm/ $^{\circ}$ C 0402 Chip Resistor - Surface Mount RoHS
- Amount: 1
- Resistance value: 7.5kohm
- Resulting output voltage: 7.405 V

Ceramic Capacitor:

- **Purpose:** Decoupling capacitor for input voltage
- Supplier: LCSC Electronics
- LCSC item description: 2.2uF \pm 10% 50V X7R 1206 Multilayer Ceramic Capacitors MLCC - SMD/SMT RoHS
- Amount: 1
- Capacitance: 2.2 uF

Electrolyte capacitor:

- **Purpose:** Decoupling capacitor for output voltage (Chosen for its ability to handle ripple current, needs to at least be able to handle 250 mArms)
- Supplier: LCSC Electronics
- LCSC item description: 330uF \pm 20% 16V 20m Ω @ 100kHz~300kHz 2.8A @ 100kHz 2.5mm Radial,6.3x8mm Solid Polymer Electrolytic Capacitor RoHS
- Amount: 1
- Capacitance: 330 uF

1.2 LDO DC/DC converter, LP38690DT-5.0/NOPB**Description:**

A low dropout DC/DC voltage converter with a fixed output voltage of 5 volts and the ability to deliver 1 ampere of power.

Purpose in circuit:

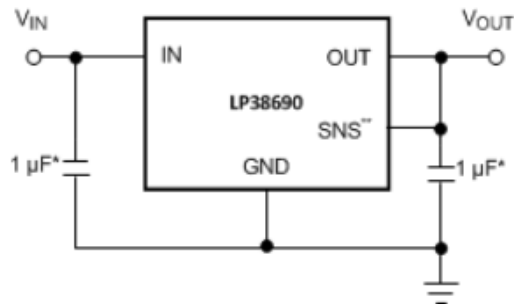
1. Reducing the voltage further from 7.4 volts down to 5 volts to accommodate the sensors excitation voltage aswell as the instrument amplifiers gain.
2. Helps reduce noise in the circuit by completing the step down in two steps instead of one (The first DC/DC converter works as step one).

Producer: Texas Instruments

Supplier: Texas Instruments

Mouser Itemnr: 595-PTN78020WAD

Texas instruments item description: TEXAS INSTRUMENTS - 1-A, 10-V, low-dropout voltage regulator
Cost: kr 12,-



In addition, the following components are necessary to enable the IC:

Ceramic capacitor:

- **Purpose:** Decoupling capacitor for input and output voltage
- Supplier: LCSC Electronics
- LCSC item description: 1uF $\pm 10\%$ 16V X5R 0402 Multilayer Ceramic Capacitors MLCC - SMD/SMT RoHS
- Amount: 2
- Capacitance: 1 uF

Microcontroller

2.1 Adafruit Feather M4 CAN Express with ATSAME51

Description:

A small and compact microcontroller with many digital and analog input/output pins as well as being CAN-buss compatible. Perfect for use in a robot due to its small size.

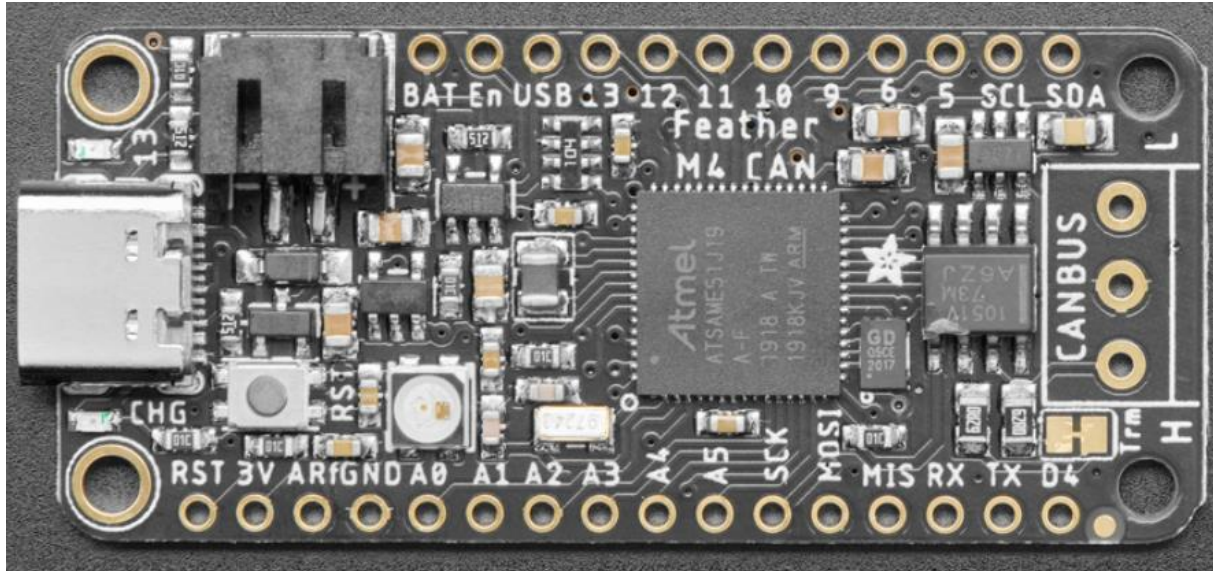
Purpose in system:

In the system the microcontroller is used for two things, providing analog to digital conversion and running the digital potentiometers. By being able to run the potentiometers from the microcontroller instead of using regular analog potentiometers the system becomes way easier to calibrate.

Producer: Adafruit

Supplier: Adafruit

Hyperlink: [Adafruit Feather M4 CAN Express with ATSAME51 : ID 4759 : \\$24.95 : Adafruit Industries, Unique & fun DIY electronics and kits](#)



Amplifier circuit

3.1 INA122UA, Single Supply, Micropower Instrumentation Amplifier

Description:

The INA122 is a precision instrumentation amplifier for accurate, low noise differential signal acquisition. Its two-op-amp design provides excellent performance with very low quiescent current and is ideal for portable instrumentation and data acquisition systems.

Purpose in circuit:

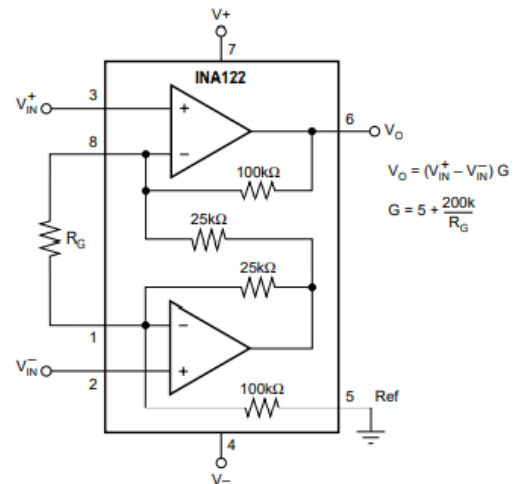
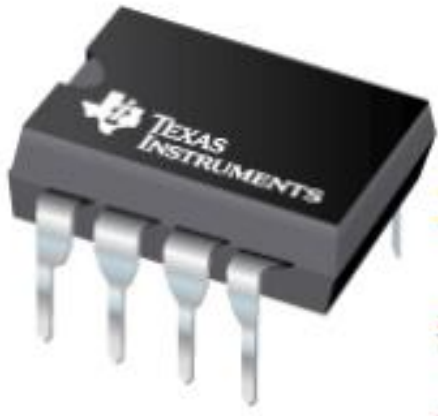
Receive and amplify the signals coming from the sensor and suppress any occurring noise through its CMMR capabilities. Should the system run in single supply mode the INA122 is also tasked with receiving and setting the applied signal offset.

Producer: Texas Instruments

Supplier: LCSC Electronics

Texas instrument item description: TEXAS INSTRUMENTS - INA122UA/2K5 - Cost: kr 33,-

Hyperlink: [INA122UA/2K5](#) | [Buy TI parts](#) | [TI.com](#)



In addition, the following components are necessary to enable the IC:

TPL0501:

- **Purpose:** Connecting to the two gain pins (1 and 8), enabling gain control.
- Supplier: LCSC Electronics
- LCSC item description: SOT-23-8 Digital Potentiometer ICs RoHS
- Amount: 1
- Resistance: 0-100KΩ

3.2 TPL0501 256-Taps, Single-Channel, Digital Potentiometer With SPI Interface

Description:

The TPL0501 device is a single-channel, linear-taper, digital potentiometer with 256 wiper positions. This device can be used as a three-terminal potentiometer or as a two-terminal rheostat.

Purpose in circuit:

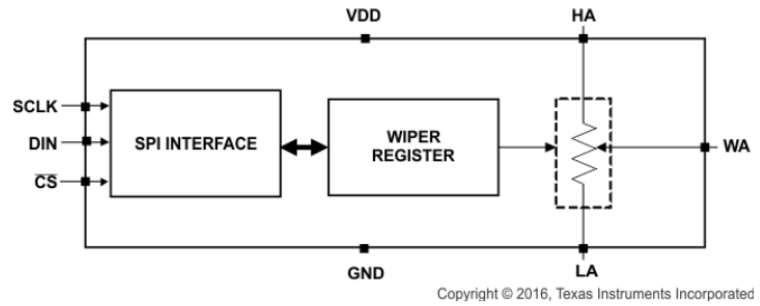
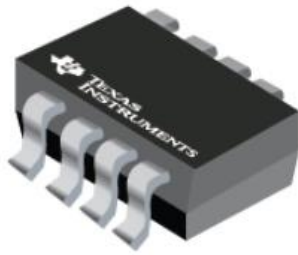
Responsible for setting and controlling the resistance between the two gain pins (1 and 8) on the INA122. Giving the TPL0501 the sole task of regulating the gain on the system.

Producer: Texas Instruments

Supplier: LCSC Electronics

Texas instrument item description: TEXAS INSTRUMENTS - INA122UA/2K5 - Cost: kr 5,1,-

Hyperlink: [TPL0501 256-Taps, Single-Channel, Digital Potentiometer With SPI Interface datasheet \(Rev. C\)](#)



In addition, the following components are necessary to enable the IC:

Adafruit Feather M4:

- **Purpose:** Allowing control over the digital wiper
- Supplier: Adafruit
- Adafruit item description: Adafruit Feather M4 CAN Express with ATSAME51
- Amount: 1