Pololu 5V, 5A Step-Down Voltage Regulator D24V50F5

Pololu item #: 2851 **573** in stock

Price break	Unit price (US$)
1	14.95
5	13.45
25	11.95
100	10.45

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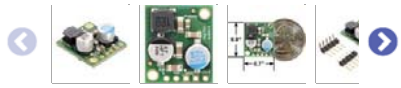

This small synchronous switching step-down (or buck) regulator takes an input voltage of up to 38 V and efficiently reduces it to **5 V**. The board measures only 0.7″ × 0.8″, but it allows a typical continuous output current of up to **5 A**. Typical efficiencies of 85% to 95% make this regulator well suited for high-power applications like powering motors or servos. High efficiencies are maintained at light loads by dynamically changing the switching frequency, and an optional shutdown pin enables a low-power state with a current draw of a few hundred microamps.

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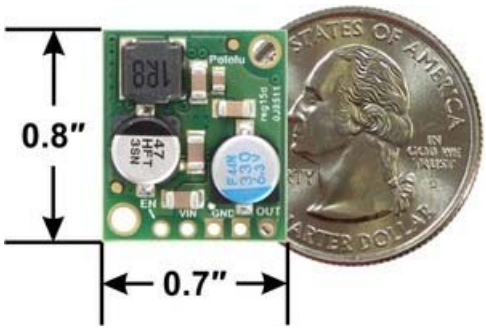
Description **Specs (10)** **Pictures (10)** **Resources (1)** FAQs (0) **On the blog (1)**

Overview

The D24V50Fx family of step-down voltage regulators generates lower output voltages from input voltages as high as 38 V. They are switching regulators (also called switched-mode power supplies (SMPS) or DC-to-DC converters) with typical efficiencies between 85% and 95%, which is much more efficient than linear voltage regulators, especially when the difference between the input and output voltage is large. The available output current is a function of the input voltage and efficiency (see the *Typical Efficiency and Output Current* section below), but the output current can typically be as high as 5 A.



At light loads, the switching frequency automatically changes to maintain high efficiencies. These regulators have a typical quiescent (no load) current draw of less than 1 mA, and the ENABLE pin can be used to put the boards in a low-power state that reduces the quiescent current to approximately 10 µA to 20 µA per volt on VIN.

The modules have built-in reverse-voltage protection, short-circuit protection, a thermal shutdown feature that helps prevent damage from overheating, a soft-start feature that reduces inrush current, and an under-voltage lockout.

Several different fixed output voltages are available:

Select options: 5 V Go ▶

The different voltage versions of this regulator all look very similar, so you should consider adding your own distinguishing

marks or labels if you will be working simultaneously with multiple versions. This product page applies to all versions of the D24V50Fx family.

For lower-power applications, please consider our **D24V25Fx family of step-down voltage regulators**; these are slightly smaller, pin-compatible versions of this regulator with typical maximum output current of 2.5 A.

Side-by-side comparison of the 2.5A D24V25Fx (left) and 5A D24V50Fx (right) step-down voltage regulators.

Two larger, higher-power, 5 V versions of this regulator are also available: one with a **typical maximum output current of 6 A**, and the other with a **typical maximum output current of 9 A**. The higher-power versions also have a few additional features, like a “power good” signal and the ability to lower their output voltage, and they include optional terminal blocks for easy removable connections.

Features

- Input voltage:
  - 4.5 V to 38 V for the version that outputs 3.3 V
  - [*output voltage* + *dropout voltage*] to 38 V for output voltages of 5 V and higher (see below for more information on dropout voltage)
- Fixed 3.3 V or 5 V (depending on regulator version) with 4% accuracy
- Typical maximum continuous output current: 5 A
- Integrated reverse-voltage protection, over-current protection, over-temperature shutoff, soft-start, and under-voltage lockout
- Typical efficiency of 85% to 95%, depending on input voltage and load; the switching frequency automatically changes at light loads to maintain high efficiencies
- Typical no-load quiescent current under 1 mA; can be reduced to 10 µA to 20 µA per volt on VIN by disabling the board* Compact size: 0.7″ × 0.8″ × 0.35″ (17.8 mm × 20.3 mm × 8.8 mm)
- Two 0.086″ mounting holes for #2 or M2 **screws**

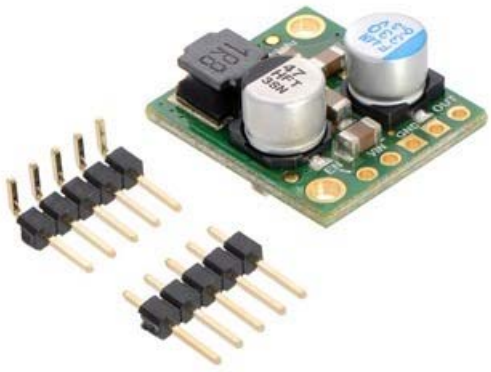
Connections

This buck regulator has five connection points for four different connections: enable (EN), input voltage (VIN), 2x ground (GND), and output voltage (VOUT).

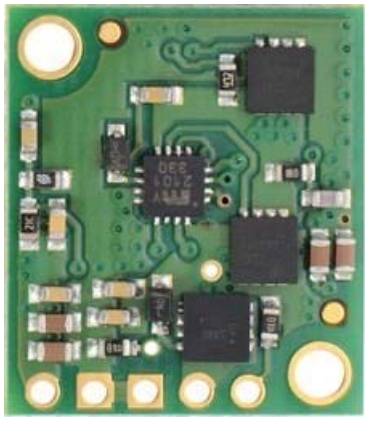
The input voltage, **VIN**, powers the regulator. Voltages between 4.5 V and 38 V can be applied to VIN, but for versions of the regulator that have an output voltage higher than 4.5 V, the effective lower limit of VIN is VOUT plus the regulator's dropout voltage, which varies approximately linearly with the load (see below for graphs of dropout voltages as a function of the load).

The output voltage, **VOUT**, is fixed and depends on the regulator version: the D24V50F3 version outputs 3.3 V and the D24V50F5 version outputs 5 V.

The regulator is enabled by default: a 100 kΩ pull-up resistor on the board connects the **ENABLE** pin to reverse-protected VIN. The ENABLE pin can be driven low (under 0.6 V) to put the board into a low-power state. The quiescent current draw in this sleep mode is dominated by the current in the pull-up resistor from ENABLE to VIN and by the reverse-voltage protection circuit, which will draw between 10 µA and 20 µA per volt on VIN when ENABLE is held low. If you do not need this feature, you should leave the ENABLE pin disconnected.

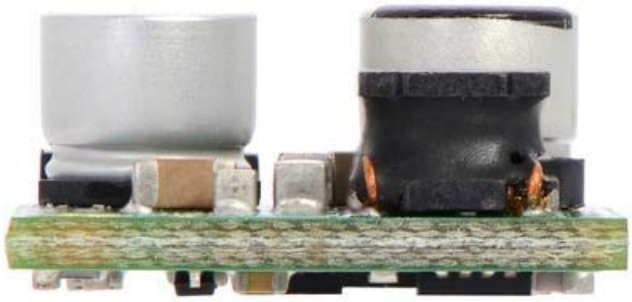


Pololu 5A Step-Down Voltage Regulator D24V50Fx with included hardware.



Pololu 5A Step-Down Voltage Regulator D24V50Fx, bottom view.

The five connection points are labeled on the top of the PCB and are arranged with a 0.1″ spacing for compatibility with solderless **breadboards**, **connectors**, and other prototyping arrangements that use a 0.1″ grid. Either the included 5×1 **straight male header strip** or the 5×1 **right angle male header strip** can be soldered into these holes. For the most compact installation, you can solder wires directly to the board.



Pololu 5A Step-Down Voltage Regulator D24V50Fx, side view.

The board has two 0.086″ mounting holes intended for #2 or M2 **screws**. The mounting holes are at opposite corners of the board and are separated by 0.53″ horizontally and 0.63″ vertically.

Typical efficiency and output current

The efficiency of a voltage regulator, defined as (Power out)/(Power in), is an important measure of its performance, especially when battery life or heat are concerns. This family of switching regulators typically has an efficiency of 85% to 95%, though the actual efficiency in a given system depends on input voltage, output voltage, and output current. See the efficiency graph near the bottom of this page for more information.

The maximum achievable output current is typically around 5 A, but this depends on many factors, including the ambient temperature, air flow, heat sinking, and the input and output voltage.

Typical dropout voltage

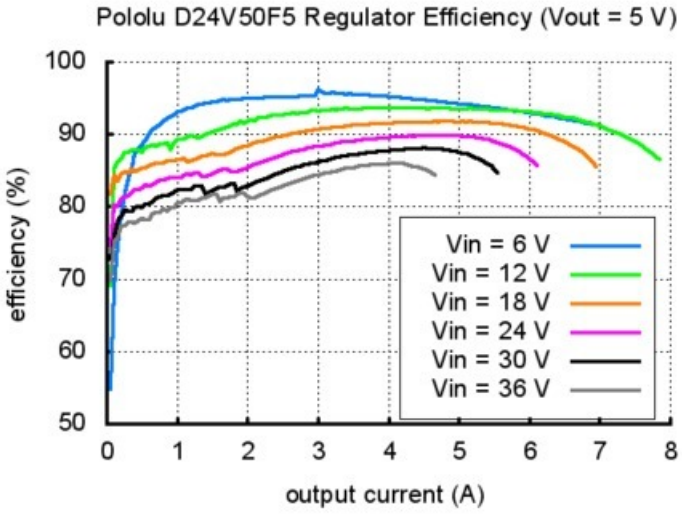
The dropout voltage of a step-down regulator is the minimum amount by which the input voltage must exceed the regulator's target output voltage in order to ensure the target output can be achieved. For example, if a 5 V regulator has a 1 V dropout voltage, the input must be at least 6 V to ensure the output is the full 5 V. Generally speaking, the dropout voltage increases as the output current increases. See the "Details" section below for more information on the dropout voltage for this specific regulator version.

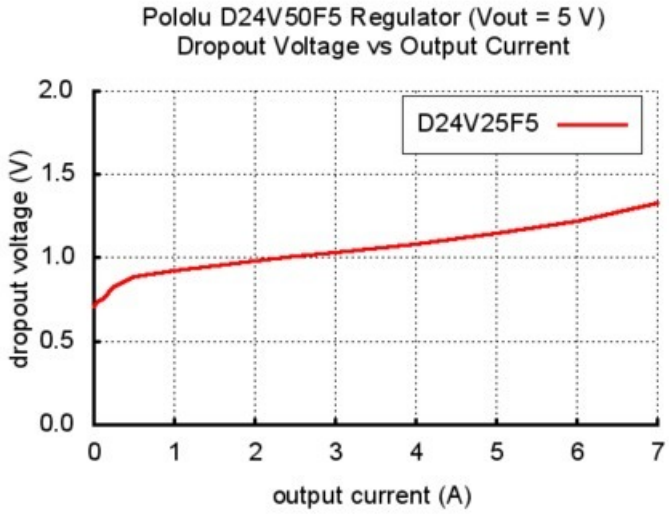
Switching frequency and behavior under light loads

The regulator generally operates at a switching frequency of around 600 kHz, but the frequency drops when encountering a light load to improve efficiency. This could make it harder to filter out noise on the output caused by switching.

Details for item #2851

The graphs below show the typical efficiency and dropout voltage of the 5 V D24V50F5 regulator as a function of the output current:





During normal operation, this product can get hot enough to burn you. Take care when handling this product or other components connected to it.

The over-current limit of the regulator operates on a combination of current and temperature: the current threshold decreases as the regulator temperature goes up. However, there might be some operating points at low input voltages and high output currents (well over 5 A) where the current is just under the limit and the regulator might not shut off before damage occurs. If you are using this regulator in an application where the input voltage is near the lower limit and the load could exceed 5A for sustained periods (more than five seconds), consider using additional protective components such as fuses or circuit breakers.

People often buy this product together with:

Pololu 5V, 2.5A Step-Down Voltage Regulator D24V25F5