9V, 5A Step-Down Voltage Regulator D36V50F9

Pololu item #: 4094
Brand: Pololu   supply outlook
Status: Active and Preferred
✓RoHS 3

Price break	Unit price (US$)
1	24.95
5	22.95
25	21.12
100	19.43

Quantity: 1   Add to cart
backorders *allowed*   Add to list

Output voltage	Typical max output current[1]	Input voltage range[2]
9 V	5 A	9.9 V – 50 V

Note 1: Typical continuous output current at 36 V in. Actual achievable continuous output current is a function of input voltage and is limited by thermal dissipation. See the output current graphs on the product pages for more information.
Note 2: Minimum input voltage is subject to dropout voltage considerations; see the dropout voltage section of product pages for more information.

Alternatives available with variations in these parameter(s): output voltage **Select variant…**

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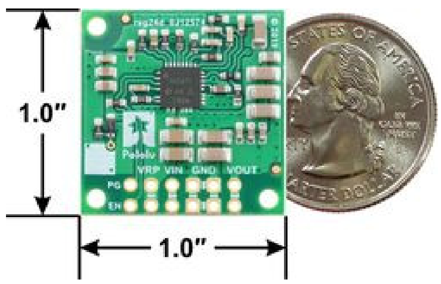
Description **Specs (11)** **Pictures (10)** **Resources (3)** FAQs (0) **On the blog (1)** **Distributors (32)**

Overview



The D36V50Fx family of buck (step-down) voltage regulators generates lower output voltages from input voltages as high as 50 V. They are switching regulators (also called switched-mode power supplies (SMPS) or DC-to-DC converters), which makes them much more efficient than linear voltage regulators, especially when the difference between the input and output voltage is large. These regulators can typically support continuous output currents between 2 A and 9 A, depending on the input voltage and output voltage (see the *Maximum continuous output current* section below). In general, the available output current is a little higher for the lower-voltage versions than it is for the higher-voltage versions, and it decreases as the input voltage increases.

This family includes six versions with fixed output voltages ranging from 3.3 V to 12 V:

- **D36V50F3: Fixed 3.3V output**
- **D36V50F5: Fixed 5V output**
- **D36V50F6: Fixed 6V output**
- **D36V50F7: Fixed 7.5V output**
- **D36V50F9: Fixed 9V output**
- **D36V50F12: Fixed 12V output**

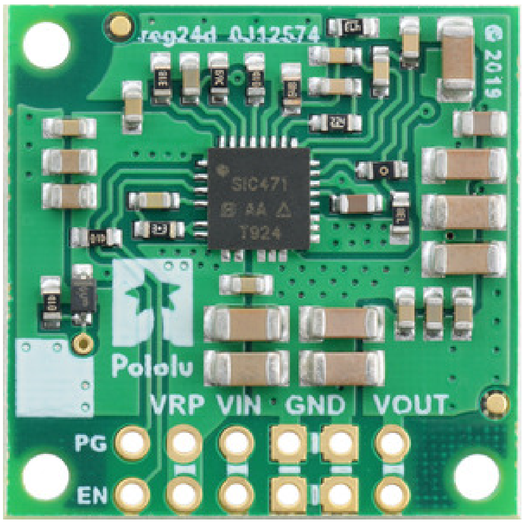
The regulators have input reverse voltage protection up to 40 V, output undervoltage and overvoltage protection, over-current protection, and short-circuit protection. A thermal shutdown feature also helps prevent damage from overheating and a soft-start feature limits the inrush current and gradually ramps the output voltage on startup.

If you do not need quite as much current, consider the very similar **D36V28Fx** or **D30V30Fx** families of step-down voltage regulators, which can deliver up to around 4 A in a wide range of output voltages.

> We manufacture these boards in-house at our Las Vegas facility, which gives us the flexibility to make these regulators with customized components to better meet the needs of your project. For example, if you have an application where the input voltage will always be below 20 V and efficiency is very important, we can make these regulators a bit more efficient at high loads by replacing the 40V reverse voltage protection MOSFET with a 20V one. We can also customize the output voltage. If you are interested in customization, please **contact us**.

Details for item #4094

9V, 5A Step-Down Voltage Regulator D36V50F9, top view.

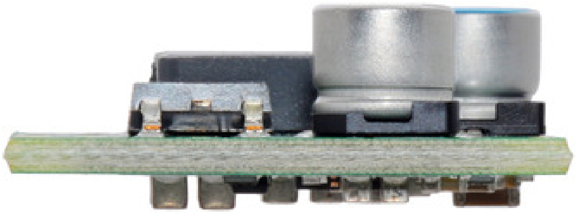


9V, 5A Step-Down Voltage Regulator D36V50F9, bottom view.

Features

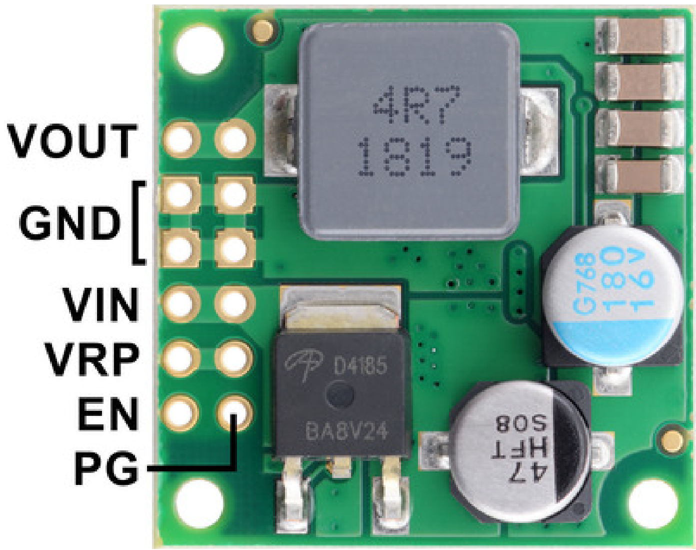
- Input voltage: 9.9 V to 50 V (minimum input subject to dropout voltage considerations; see the **dropout voltage section** for details)
- Output voltage: 9 V with 4% accuracy
- Typical maximum continuous output current: 2.7 A to 7 A (see the **maximum continuous output current graph** below)
- Typical efficiency of 85% to 95%, depending on input voltage, output voltage, and load (see the **efficiency graph** below)
- Switching frequency: ~500 kHz under heavy loads
- Power-save mode with ultrasonic operation that increases light load efficiency by reducing switching frequency, but keeps it above the audible range (20 kHz)
- 2 mA to 4 mA typical no-load quiescent current (see the **quiescent current graph** below)
- Enable input with precise cutoff threshold for disconnecting the load and putting the regulator into a low-power state that draws approximately 10 μA to 20 μA per volt on VIN
- “Power good” output indicates when the regulator cannot adequately maintain the output voltage
- Output undervoltage and overvoltage protection

- Soft-start feature limits inrush current and gradually ramps output voltage
- Integrated reverse-voltage protection up to 40 V, over-current and short-circuit protection, over-temperature shutoff
- Compact size: 1″ × 1″ × 0.375″ (25.4 mm × 25.4 mm × 9.5 mm)
- Three 0.086″ mounting holes for #2 or M2 **screws**



Step-Down Voltage Regulator D36V50Fx, side view.

Connections



This regulator has six connections, some of which are duplicated on multiple pins: power good (PG), enable (EN), input voltage (VIN), input voltage after reverse protection (VRP), output voltage (VOUT), and ground (GND).

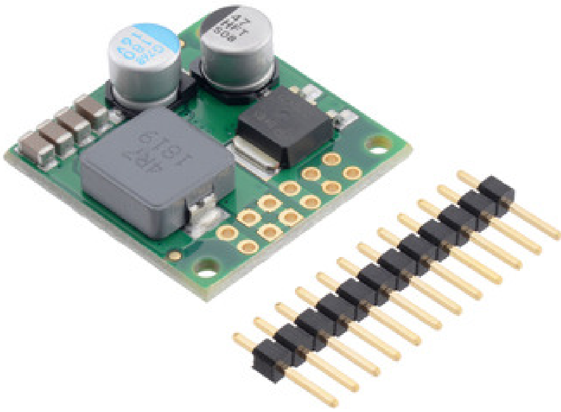
The “power good” indicator, **PG**, is an open-drain output that goes low when the regulator’s output voltage either rises more than 20% above or falls more than 10% below the nominal voltage (with hysteresis). An external pull-up resistor is required to use this pin.

The regulator, which is enabled by default, can be put into a low-power sleep state by reducing the voltage on the **EN** pin below 1.2 V, and it can be brought out of this state again by increasing the voltage on EN past 1.35 V. The quiescent current draw in this sleep mode is dominated by the current in the 100 kΩ pull-up resistor from ENABLE to VIN and in the reverse-voltage protection circuit, which altogether will be between 10 μA and 20 μA per volt on VIN. The tight tolerance of the enable input allows a precise low-VIN cutoff to be set, such as with the output of an external voltage divider powered by VIN, which is useful for battery powered applications where draining the battery below a particular voltage threshold could permanently damage it.

The input voltage, **VIN**, powers the regulator. Voltages between 4.5 V and 50 V can be applied to VIN, but generally 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 the dropout voltage** as a function of the load).

VRP provides access to the input voltage after reverse-voltage protection; this can be used as an output to power other devices, or the input voltage can be connected to VRP instead of VIN to bypass the reverse protection.

VOUT is the regulated output voltage.

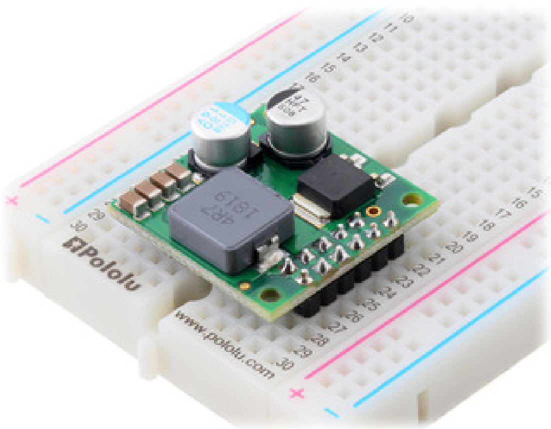


Step-Down Voltage Regulator D36V50Fx with included hardware.

All of the connections are arranged on a 0.1″ grid for compatibility with solderless **breadboards**, **connectors**, and other prototyping arrangements that use a 0.1″ grid. The PG connection is the only one not accessible along the edge of the board. A 1×12 or two 1×6 **straight male header strips** are included with the regulator.

The power connections (VIN, VRP, VOUT, and GND) are duplicated across both rows of through-holes, allowing two header pins to be used for each connection. Note that the EN and PG pins are not duplicated and are adjacent on different rows, so if you intend to use the regulator on a breadboard, be careful to avoid installing header pins in a way that shorts EN to PG. (In the picture below, note that the PG pin is omitted to avoid shorting it to EN.)

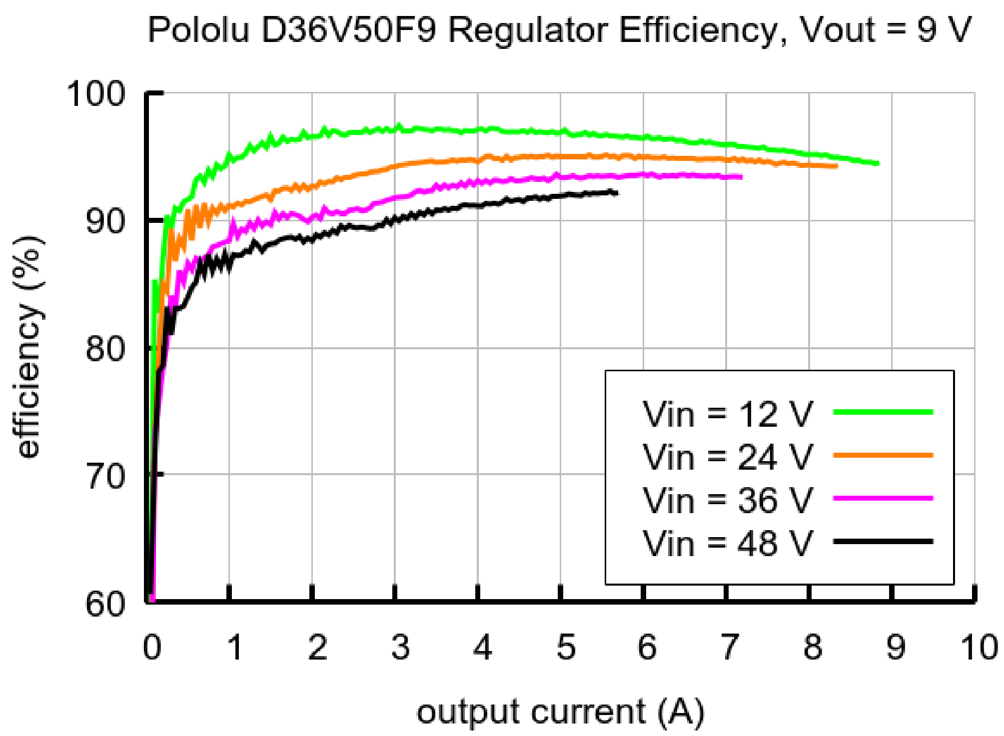
Each header pin is only rated for 3 A (6 A combined per pair), and solderless breadboards are usually not intended to handle more than a few amps, so for higher-power applications, thick wires should be soldered directly to the board.



Step-Down Voltage Regulator D36V50Fx, assembled on breadboard.

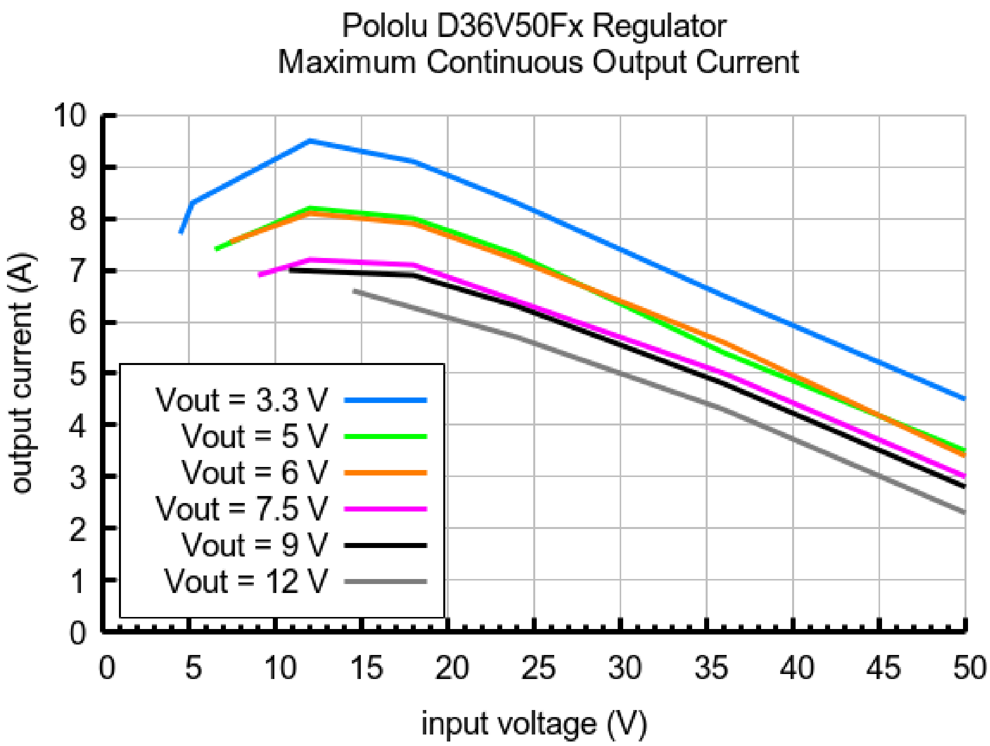
Typical efficiency

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.



Maximum continuous output current

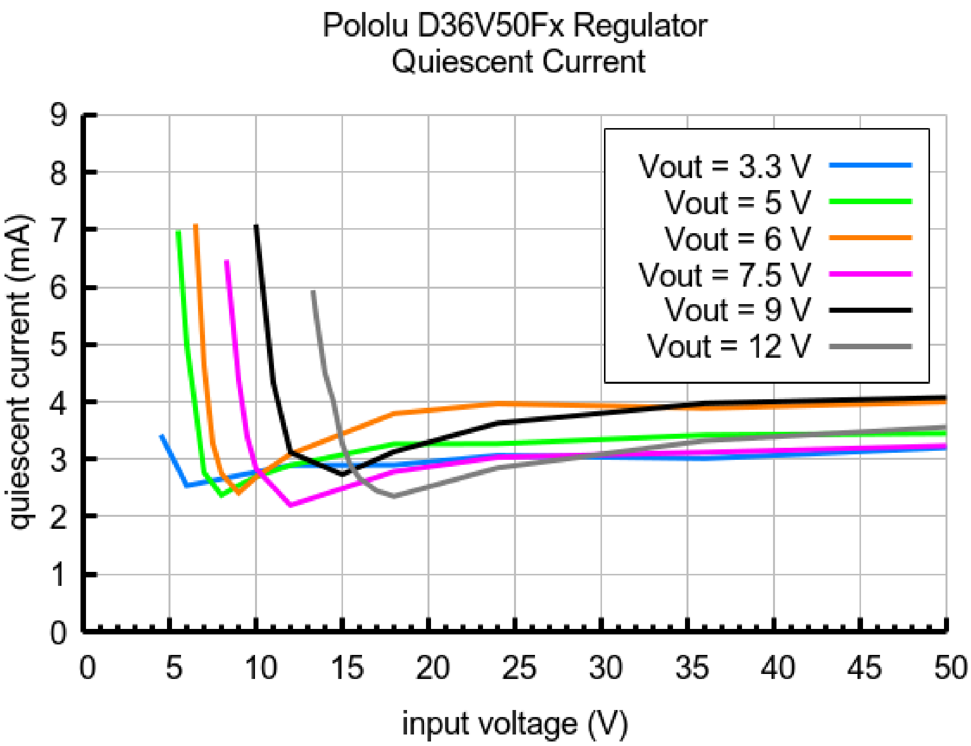
The maximum achievable output current of these regulators varies with the input voltage but also depends on other factors, including the ambient temperature, air flow, and heat sinking. The graph below shows maximum output currents that these regulators can deliver continuously at room temperature in still air and without additional heat sinking.



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

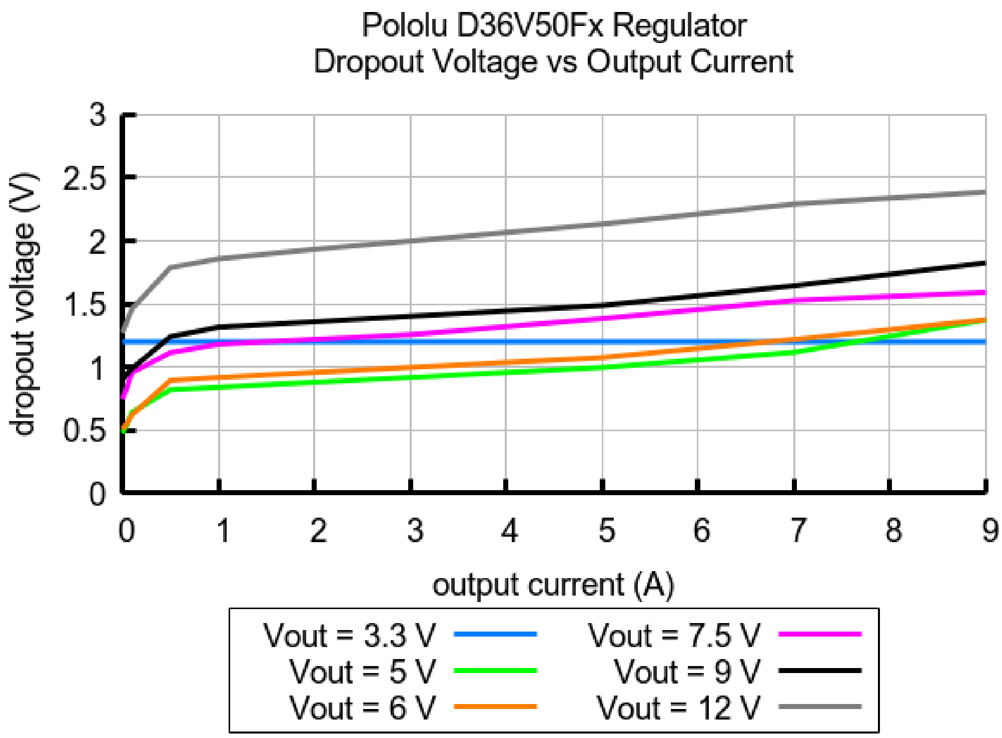
Quiescent current

The quiescent current is the current the regulator uses just to power itself, and the graph below shows this for the different regulator versions as a function of the input voltage. The module’s EN input can be driven low to put the board into a low-power state where it typically draws between 10 μA and 20 μA per volt on VIN.



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. The graph below shows the dropout voltages for the different members of this regulator family:



People often buy this product together with:

[3.3V, 6.5A Step-Down Voltage Regulator D36V50F3]

[5V, 5.5A Step-Down Voltage Regulator D36V50F5]

[6V, 5.5A Step-Down Voltage Regulator D36V50F6]