Connections

These buck regulators have five main connection points for five different electrical nodes: power good (PG), enable (EN), input voltage (VIN), ground (GND), and output voltage (VOUT). The board also features a second ground connection point off the main row of connections that might be convenient for applications where you are soldering wires directly to the board rather than using it in a breadboard.

The input voltage, **VIN**, powers the regulator. Voltages between 4 V and 36 V can be applied to VIN, but for versions of the regulator that have an output voltage higher than 4 V, the effective lower limit of VIN is VOUT pluse the regulator’s dropout voltage, which varies approximately linearly with the load (see below for a graph of dropout voltages as a function of the load).

The output voltage, **VOUT**, is fixed and depends on the regulator version: the D24V22F3 version outputs 3.3 V, the D24V22F5 version outputs 5 V, the D24V22F6 version outputs 6 V, the D24V22F7 version outputs 7.5 V, the D24V22F9 version outputs 9 V, and the D24V22F12 version outputs 12 V.

The regulator is enabled by default: a 270 kΩ pull-up resistor on the board connects the **EN** pin to reverse-protected VIN. The EN pin can be driven low (under 1 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 EN to VIN and by the reverse-voltage protection circuit, which altogether will draw between 5 µA and 10 µA per volt on VIN when EN is held low. If you do not need this feature, you should leave the EN pin disconnected.

The “power good” indicator, **PG**, is an open-drain output that goes low when the regulator’s output voltage falls below around 85% of the nominal voltage and becomes high-impedance when the output voltage rises above around 90%. An external pull-up resistor is required to use this pin.

The five main 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.

The board has two 0.086″ (2.18 mm) diameter mounting holes intended for #2 or M2 screws. The mounting holes are at opposite corners of the board and are separated by 0.52″ (13.21 mm) both horizontally and vertically. For all the board dimensions, see the dimension diagram (204k pdf).

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 over 2 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.