voltage regulator XL4015

The DC-DC Step-down Module is a non-isolated buck converter based on the widely used LM2596 integrated circuit. It serves as a crucial power conditioning component, managing the transition from the high-power drive system to the sensitive control electronics.

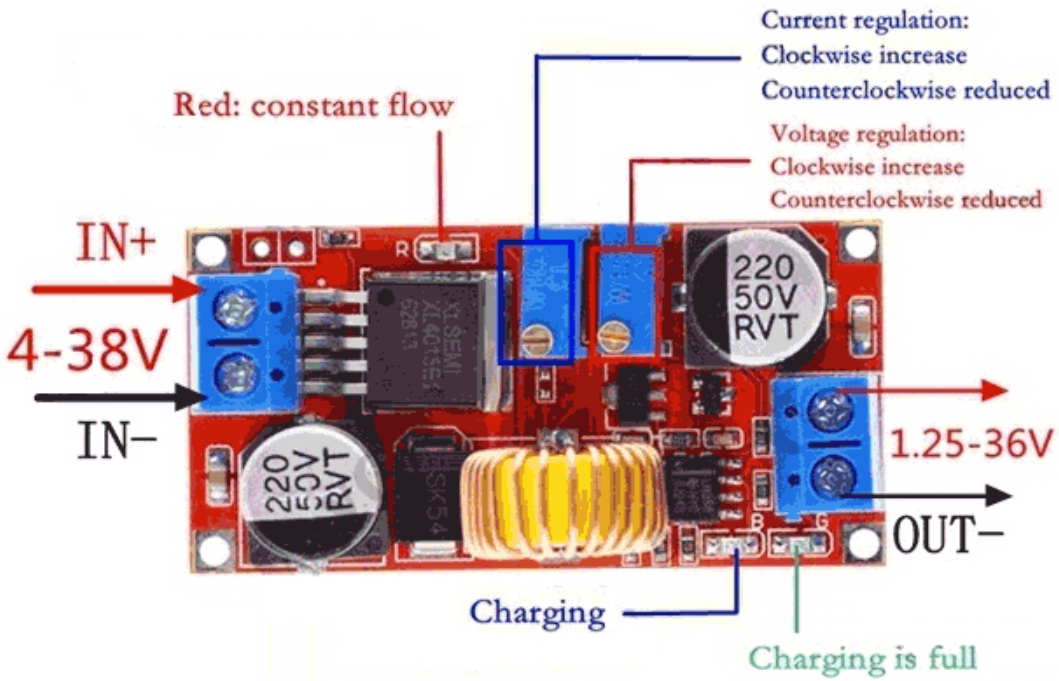
1. Power Regulation Necessity

The robot's propulsion system operates on a 9V battery supply, necessary for the DC drive motor. However, the sensitive low-voltage components—namely the Raspberry Pi 4 5V/3A minimum), the Servo Motor, and all digital Sensors—require a stable and lower operating voltage.

The primary function of this module is to safely and efficiently step-down the 9V input voltage to a regulated 5V output. This prevents potential damage to the control board and ensures power stability, which is vital for the reliable operation of the Raspberry Pi's CPU and GPIO communications.

2. Key Operational Data

The module accepts a wide input range 4.5V to 40V), easily accommodating the 12V battery output. It is manually tuned to provide a precise 5V output voltage and is rated for a continuous output current of approximately 3A, providing a sufficient power budget for all low-power electronics in the system. The high conversion efficiency (> 80\%) minimizes energy loss as heat, preserving battery life


Current regulation:
Clockwise increase
Counterclockwise reduced
Red: constant flow
Voltage regulation:
Clockwise increase
Counterclockwise reduced
IN+
4-38V
IN−
220
50V
RVT
1.25-36V
OUT−
Charging
Charging is full