Protect Nano – Adjustable Power Protection Module for 3.3, 5 and 12 V DC for Over/under Voltage, Overcurrent, Reverse Current and Polarity

1. Features

- Active over/under voltage detection with auto-recovery
- Suitable for systems operating at 3.3, 5, 12 V at currents of up to 5 A continuous
- Reverse polarity (to -12 V) and reverse current blocking (ideal diode) feature
- Latch-off overcurrent protection at adjustable levels of 1, 3 or 6 A.
- Electrical or Mechanical reset option
- Digital interface featuring Power Good and Reset signals.
- Breadboard compatible with header pins, SMT compatible or can be used with included terminal blocks (footprint included)

2. Applications

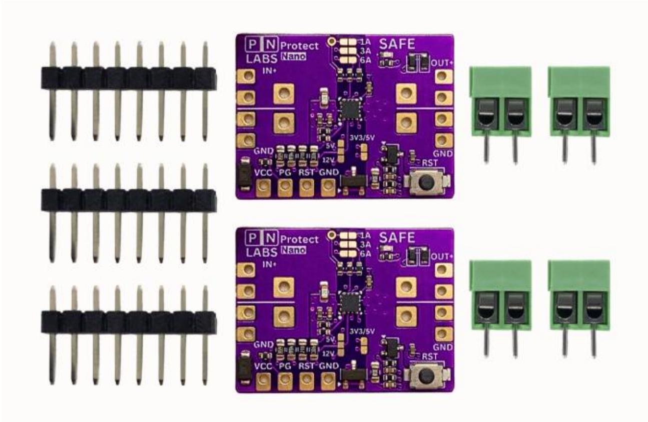
- Power supply protection for Arduino, ESP32, and other MCUs that operate at 5 or 3.3 V.
- Power ORing or Power Multiplexing applications.
- Protection from Adjustable PSUs being set incorrectly
- High-side load switch operated via the Reset pin.

3. Description

The Protect Nano is your essential safeguard for preventing accidental applications of DC power from destroying your electronics. It sits between your power source and load, continuously monitoring power conditions and disconnecting the load if the input voltage falls outside the allowable window, or the overcurrent threshold is exceeded. It can safely block applied voltages up to 14 V (3.3 V mode) and 25 V (5 and 12 V modes) with auto-recovery, while also featuring reverse polarity protection to -12 V.

In addition to adding a reliable level of protection to any electronics project, the Protect Nano's ideal diode and reset functionality can also be used to parallel multiple supplies in a power ORing or power multiplexing configuration. This makes it an excellent choice for configuring your projects to work from multiple power supplies for redundancy, to extend battery life, or to prioritize power from an external source instead of an onboard battery.

Product Photo



4. Revision History

- October 2025 – Released
- January 2026 – Updated Safety information

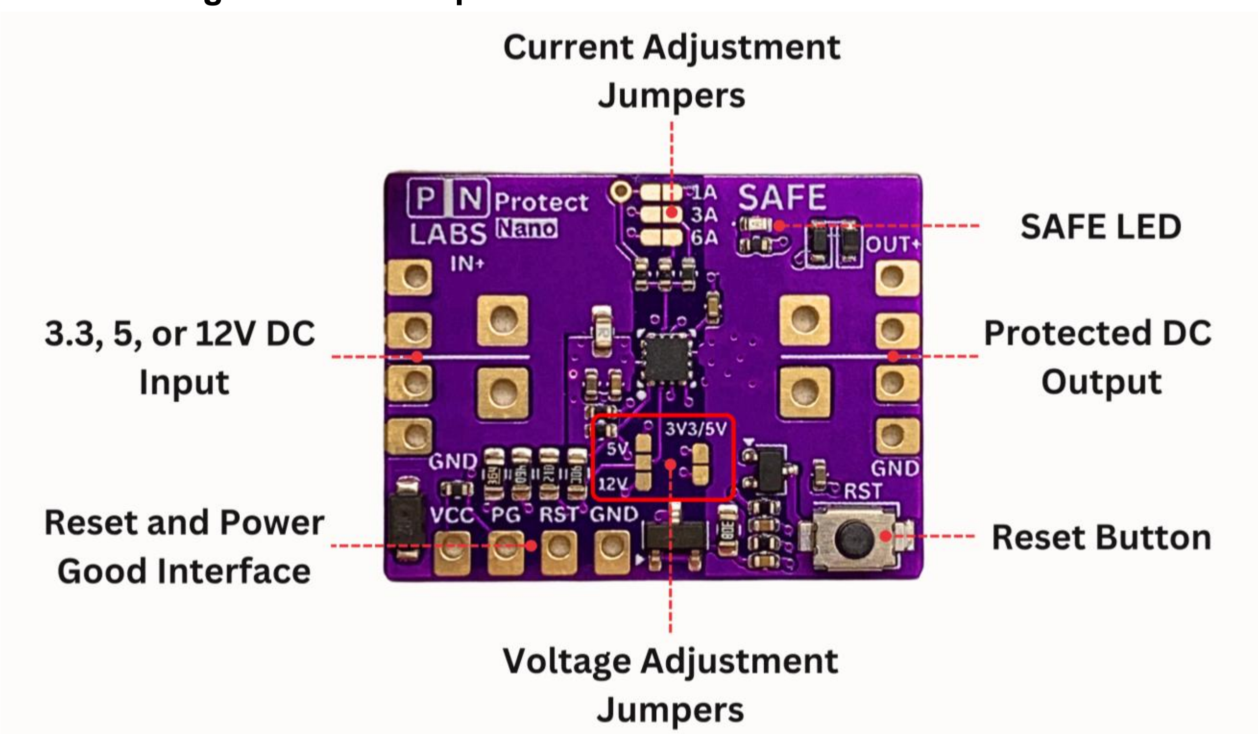
5. Safety Disclaimer

During normal operation at high currents, this product gets hot enough to burn you. Take care when handling this product or other components connected to it.

Not warranted for use in safety-critical systems. Understand the limitations of solid-state protection modules on our website and in **Section 6.6** before use.

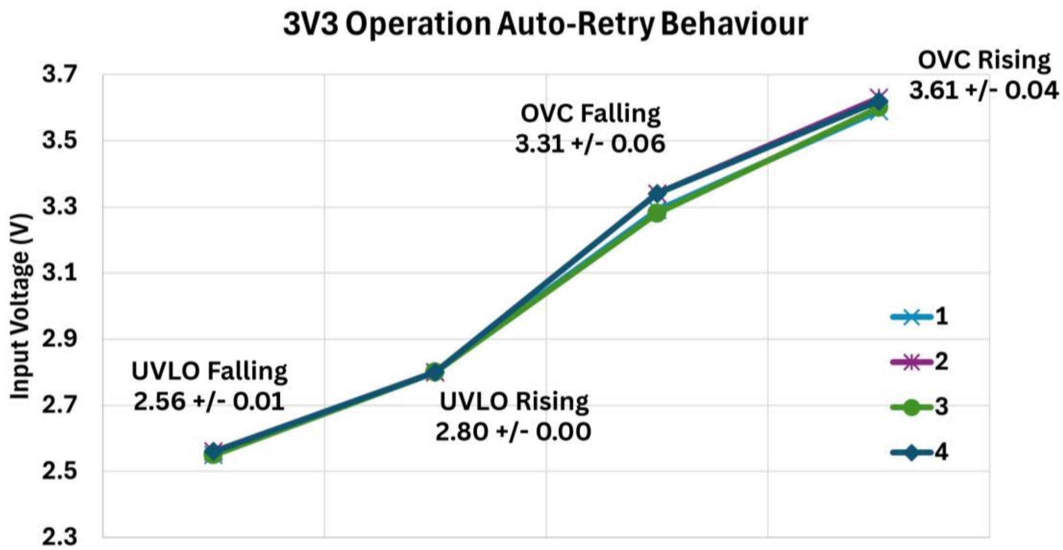
Not respecting the maximum ratings and guides outlined in this data sheet may result in damage to the product and/or your circuit.

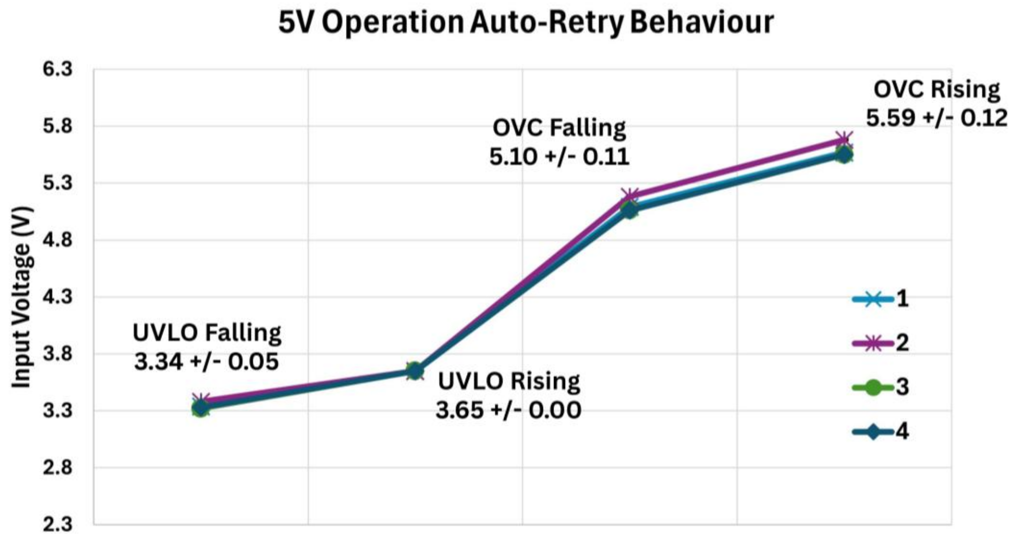
6. Board Diagram and Set-up Guide

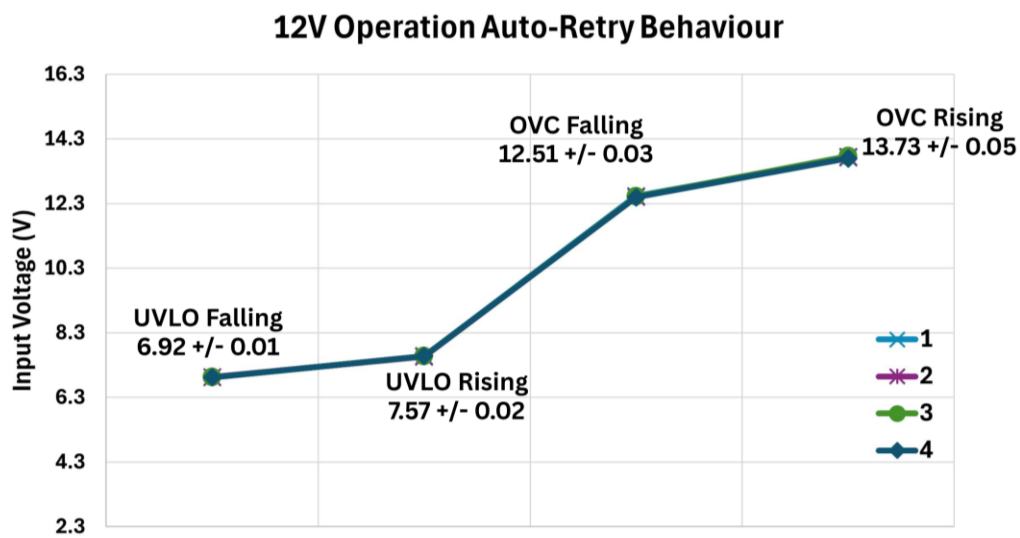


To set up the Protect Nano module for **protection operation**, do the following:

1. View the 3 selectable voltage windows shown below and determine which of the 3.3, 5 or 12 V settings is most appropriate for your application. Also consider which current setting to solder, as **the board will not work without this jumper connected**.







2. Solder the selected current and voltage jumpers, the configurations which are shown below:

Voltage Adjustment Jumpers

Current Selection Jumpers

Only one jumper should be connected.

3. Solder the header pins or screw terminal connectors to the board. For pin headers, we recommend using a breadboard to hold them in place while you solder them.

Overcurrent Response Behavior:

The overcurrent threshold is defined solely by soldering the corresponding solder jumper.

- If downstream loads attempt to exceed the set current limit, the device will actively regulate the input voltage in an attempt to not exceed the limit. If enough heat is dissipated in the device that its over-temperature feature activates, it will latch off.
- If the overcurrent event is severe enough that it exceeds double the set current limit, the device will skip current limiting and immediately shut down, latching off.

6. Specifications

Stresses beyond those listed under Section 6.1 may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Section 6.2. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

6.1 Absolute Maximum ratings

At 25 °C ambient temperature.

	MIN	NOM	MAX	UNIT
Input Voltage (3V3 Mode)	-	-	15	V
Input Voltage (5 V and 12 V Mode)	-	-	25	V

Vcc	-	-	20	V
Output Current	-	-	5.5	A

6.2 Recommended Operating Conditions

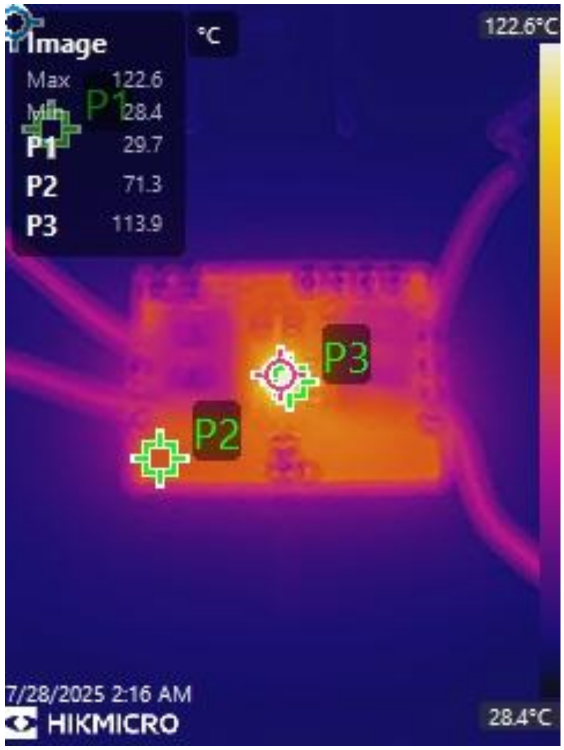
At 25 °C ambient temperature.

	MIN	NOM	MAX	UNIT
Input Voltage (3V3 Mode)	2.8*	3.3	14	V
Input Voltage (5 V Mode)	3.65*	5	23	V
Input Voltage (12 V Mode)	7.57*	12	23	V
Vcc	3	-	15	V
Continuous Output Current	0	-	5	A

**Given by UVLO (Rising) – See previous plots*

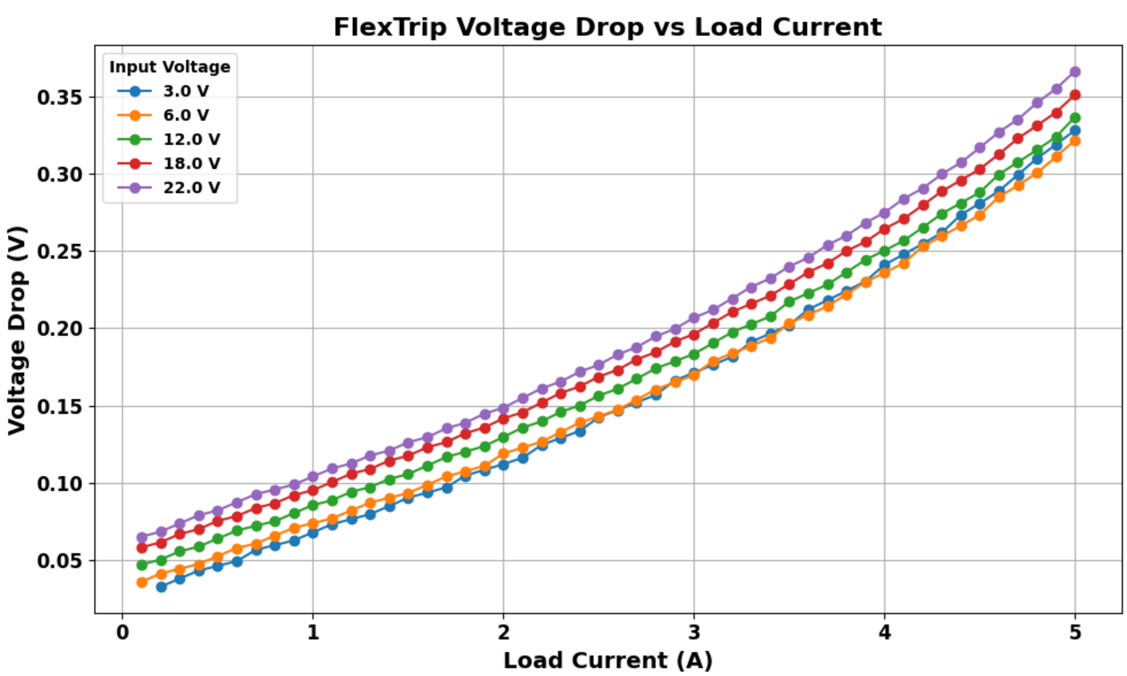
6.3 Thermal Information

Shown below is the thermal profile of the Protect Nano running 5 A continuously for about 8 minutes at about 5 V input voltage.



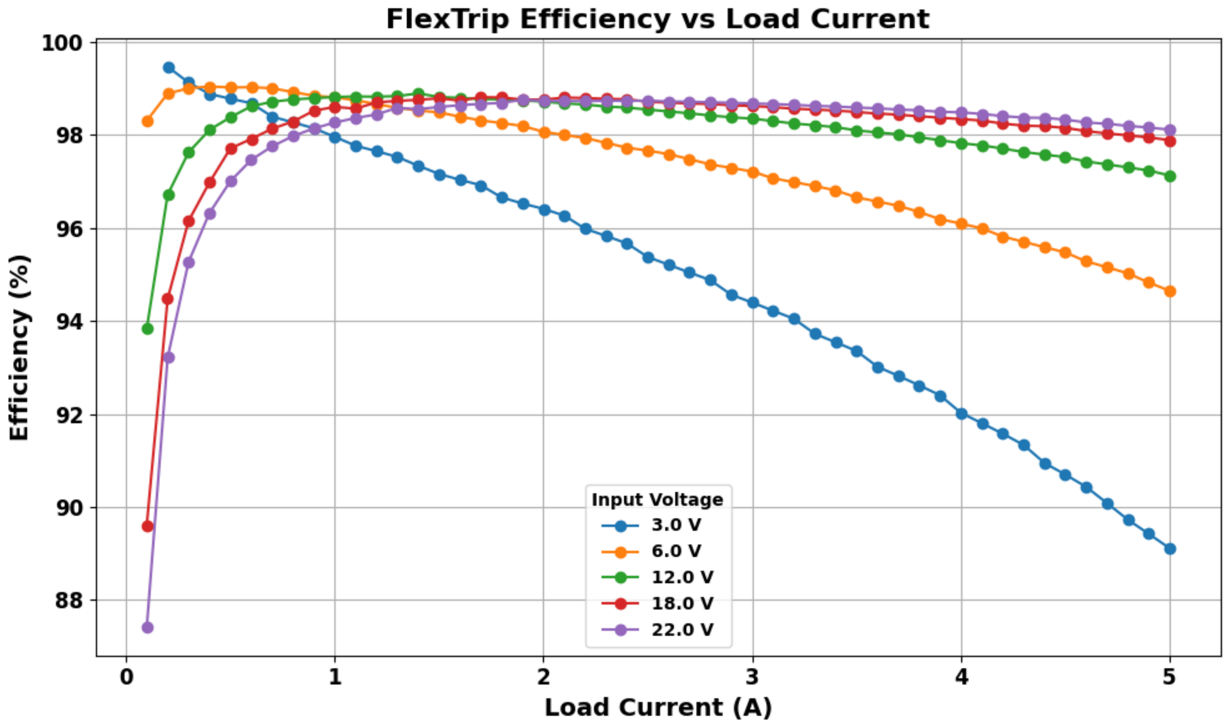
6.4 Inline Voltage Drop and Efficiency vs Load Current Characteristics

The total voltage drop was measured using a programmable electronic load and power supply for a similar product, FlexTrip, which is equivalent to the Protect Nano with its voltage cutoffs removed:



For the Protect Nano, the curves of interest would be the 3, 6, 12 V operating curves corresponding similarly to the 3.3, 5 and 12 V modes of operation.

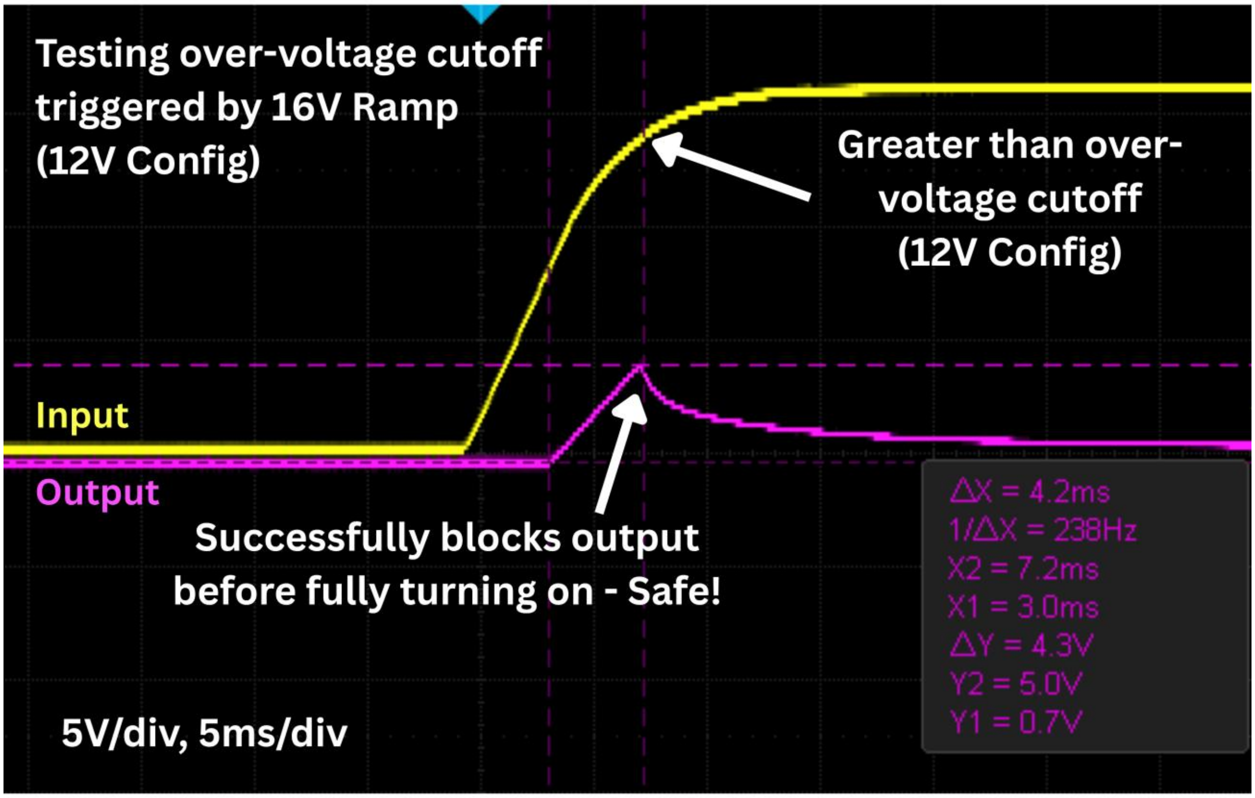
The efficiency was also similarly measured and is shown below:



The efficiency was measured as a standard DC:DC converter. A 4-wire measurement of the output voltage on the electronic load was made, and the output of the power supply was compensated to account for the voltage drop in the wires going to the device.

6.5 Soft-start Behavior on Start-up

Upon start-up, the Protect Nano will ramp the output at approximately 1 V/ms after the under-voltage condition is exceeded until the output reaches its final value. During this ramp, the Protect Nano is checking the input voltage to see if it ever exceeds the OVC limit defined by its operating mode, shown previously, and will pause the turn-on process if the input voltage ever exceeds the threshold, as shown below:



As can be seen, when the 13.5 V OVC threshold is exceeded in 12 V mode, the turn-on processed is paused and the voltage falls from its peak value at 5.0 V, so the downstream devices never see this 16 V setting that otherwise would have been applied!

Note that the voltage cutoffs operate with auto-retry behavior, it is only the over-current response that is latch-off. i.e. if the voltage falls back down to within normal limits, the Protect Nano will turn back on.

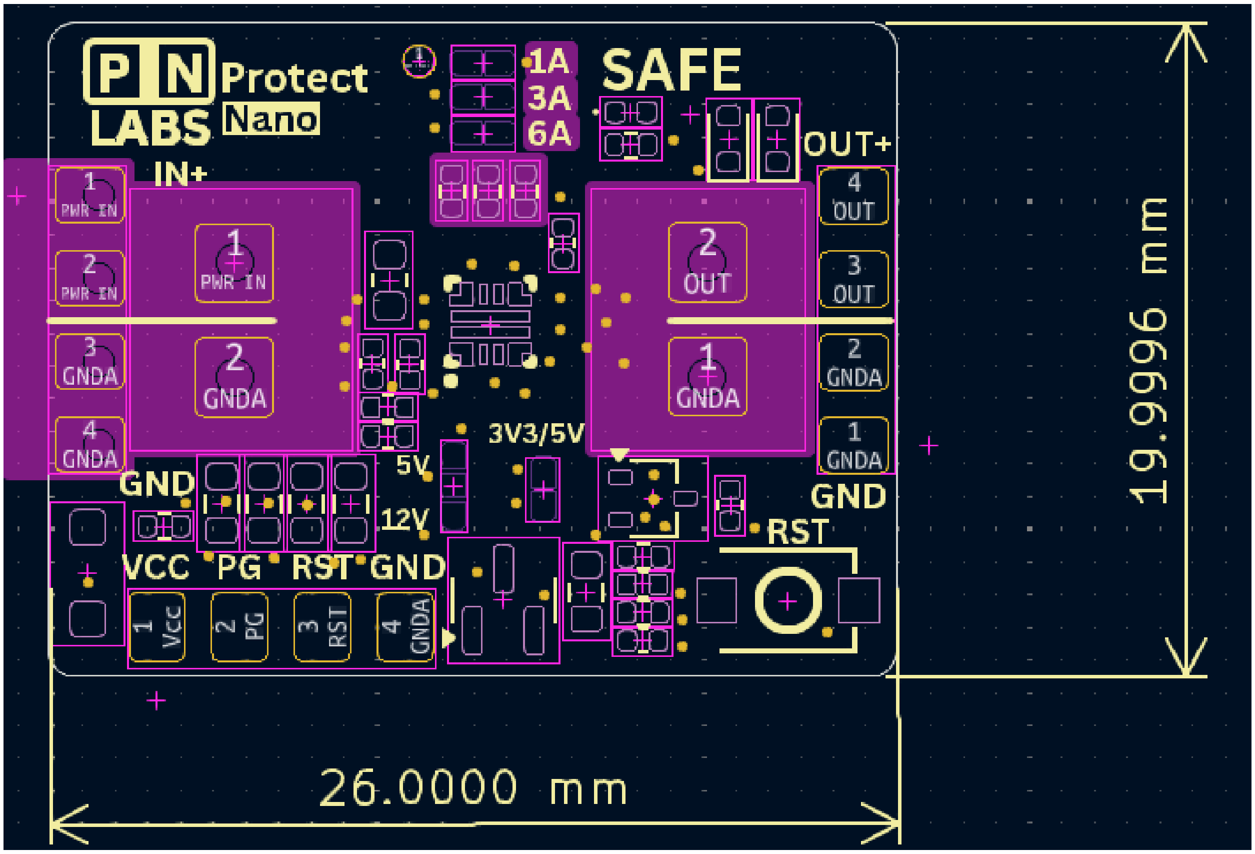
6.6 Typical Failure Mode

As with many semiconductors, MOSFETs fail short when overstressed by excessive voltage or high current. This means that the module will not protect against voltages higher than the maximum rated value in this datasheet and will let current through uninterrupted if the ratings are not respected.

This specific class of module uses MOSFETs for their speed and ability to create a true OVP system upon start-up. If you want a circuit with a higher isolation voltage, we recommend looking into conventional relay-based protection solutions.

7. Mechanical Dimensions

Download the STEP file from our website for integration into your favorite CAD software!



Further questions? Spotted a mistake and want clarification?

Reach out to us at support@pnlabs.ca!