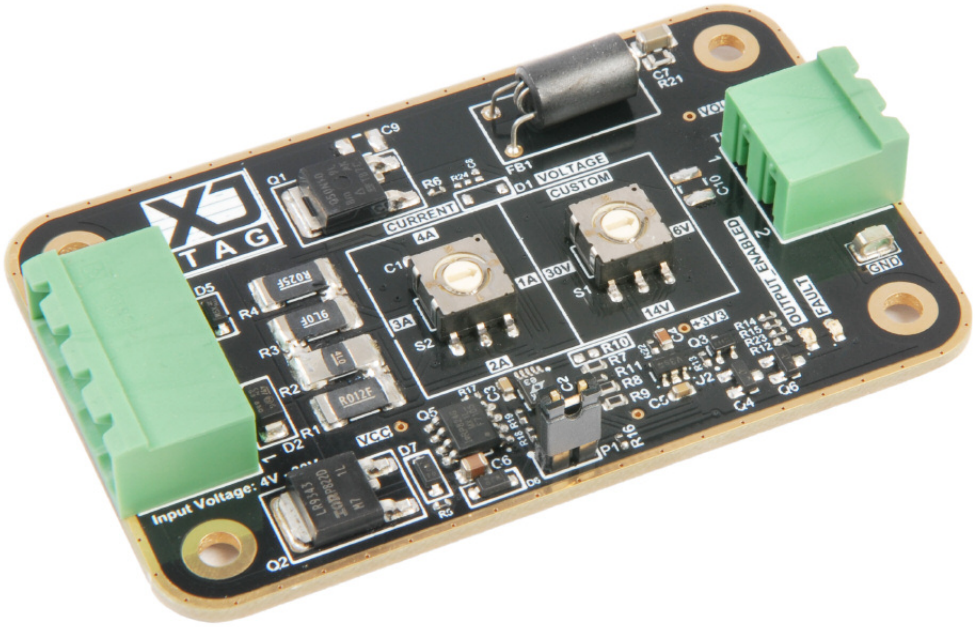
XJTAG®

Surge Protection Board

User Guide

Version 1.1



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1. Introduction

This board provides power supply reverse polarity protection, and limits the inrush current at switch-on to the user-selected setting. Over-current and over-voltage events are constantly monitored and will trip the power output during fault conditions.

2. Features

- Based around the Analog Devices LT4356 Surge Stopper
- Input voltage range of +4 V to +30 V
- Over-voltage limit configurable via a switch to 6 V, 14 V or 30 V
- A custom over-voltage range that can be set by fitting a single resistor
- Inrush current limits settable via a switch to 1 A, 2 A, 3 A or 4 A
- External power-on signal can be used to control the power from an external source
- Small form factor and easily mountable
- Simple installation

3. Electrical and Operational Specification

Outer dimensions (including connectors)	64 mm (L) x 46.12 mm (W) x 14.16 mm (H)
Input Voltage	4-30 V
Operating current	6 mA
Terminal Block connector TB1	4-pin, single row, 5.04 mm pitch
Terminal Block connector TB2	2-pin, single row, 5.04 mm pitch

4. Connector Pin Assignments

TB1

Pin	Signal Name	I/O	Description
1	PWR_IN (Input)	INPUT	Input power for DUT
2	GND		Ground
3	GND		Ground
4	CONTROL (Input)	INPUT	Control signal for external control (optional)

TB2

Pin	Signal Name	I/O	Description
1	VOUT (Input)	OUTPUT	Output power to DUT
2	GND	OUTPUT	Ground

5. Configuration

The over-voltage and current limit settings can be set by adjusting the switches S1 and S2.

Current Limit Switch (S1)

Changing the position of S1 selects the current limit of the device in 1A steps.

S1 Position	Current Limit
0	1A ± 5 %
1	2A ± 5 %
2	3A ± 5 %
3	4A ± 5 %

The time in which it takes for an over-current transient to cause an switch-off event is determined by the voltage across the Surge Protection Board and the capacitance of C2(C_{TMR}) (on the Surge Protection Board, this value is 47 nF). This over-current fault time (t_{OC}) can be calculated by the following formula:

$$t_{OC} = \frac{C_{TMR} \times 850\,000}{(3.22 \times (V_{CC} - 0.5)) + 2}$$

Equation 1

Figure 1 is a graphical representation of *Equation 1* across the Surge Protection Board's operating range to provide a guide to calculate the time that an over-current transient causes a switch-off event.

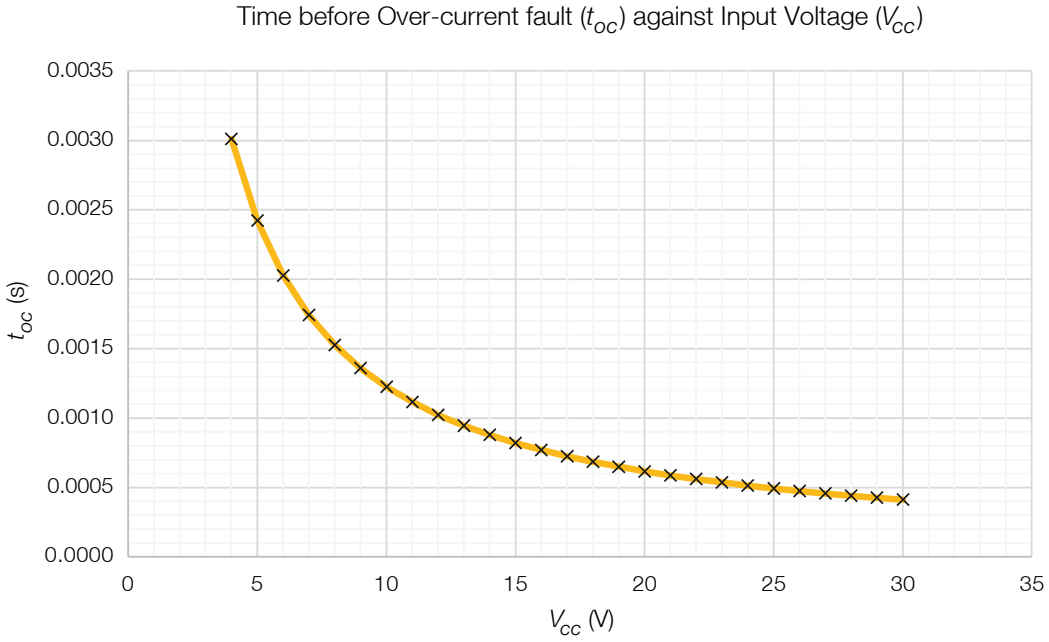

Figure 1

Over-Voltage Switch (S2)

Changing the position of S2 will change the over-voltage trip limit. There are three pre-set options on positions 0, 1 and 2, but position 3 of S2 is configurable by fitting the resistor R10.

S2 Position	Over-Voltage Limit
0	6 V
1	14 V
2	30 V
3	Custom

The custom limit can be configured by fitting R10 calculated by the formula:

$$R_{custom} = 4000\ (V_{trip} - 1.25) \quad \text{(value in } \Omega\text{)}$$

Equation 2

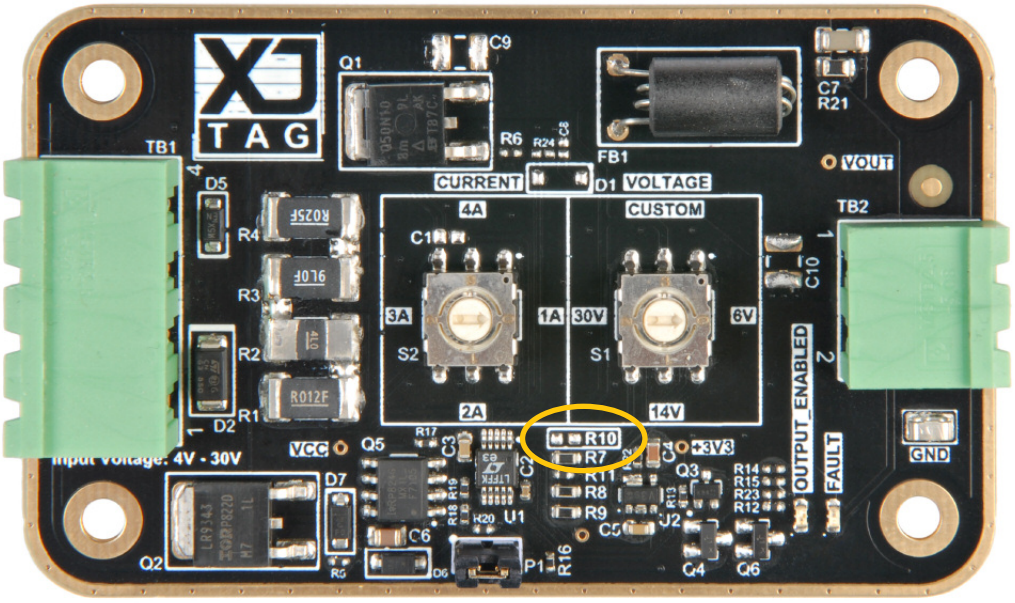

Figure 2

The over-voltage trip time depends on the voltage (V_{OV}) applied. The time (in seconds) it takes from the voltage first exceeding the limit set with switch S2 to the output being disabled (t_{OV}) can be calculated using the following formula:

$$t_{OV} = \left(\frac{C_{TMR} \times 750\,000}{(V_{OV} \times 0.644) + 2} \right) + 0.001$$

Equation 3

where C_{TMR} is the timer capacitor C2, that has a value of 47 nF (±10 %).

Figure 3 is a graphical representation of Equation 3 across the Surface Protection Board's operating range to provide a guide to calculate the time that an over-voltage transient causes a switch-off event.

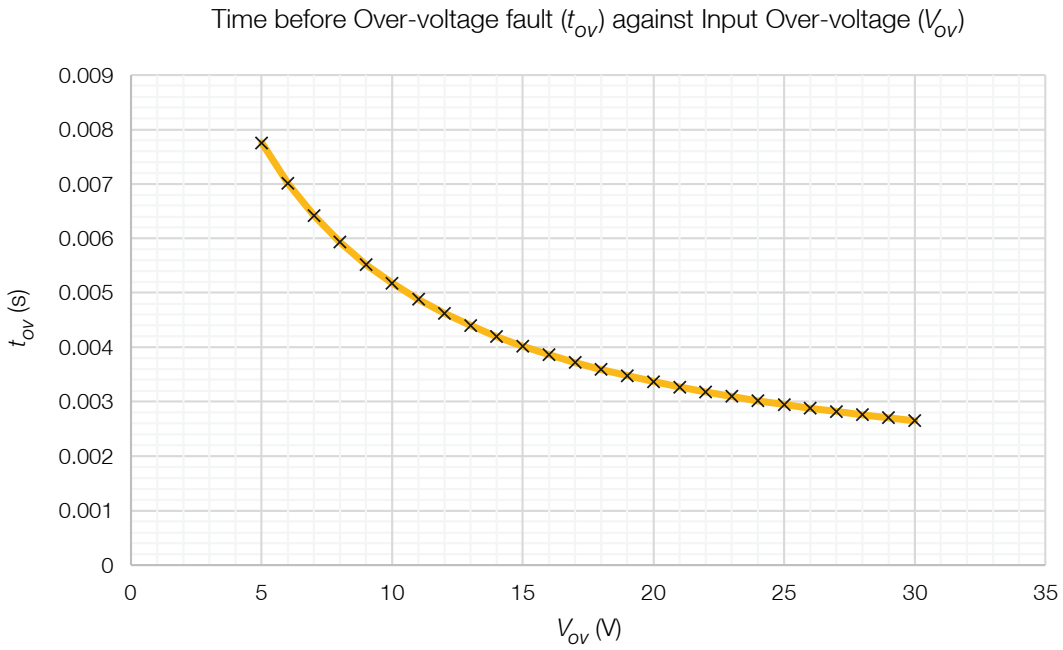

Figure 3

7. Operating Instructions

Quick Start Instructions

1. Switch S1 to select the desired current limit for the DUT.
2. Switch S2 to select the desired over-voltage limit for the DUT.
3. Connect the input power to TB1 using the screw in terminal blocks*.
   a. If you are using the CONTROL pin to enable power to the DUT, this will need to be plugged into TB1.4, and the jumper on P1 removed.
   b. If you require to have the board permanently enabled, fit the jumper on P1.
4. Connect the DUT to the XJTAG Surface Protection Board via TB2.
5. Turn on the power to the Surface Protection Board at the desired voltage.
6. The green OUTPUT_ENABLED LED should be lit.
7. The FAULT LED will illuminate if the inrush surge current or voltage is too high for the time period which is determined by C2 (see Current Limit Switch).
8. Fault conditions are cleared by power cycling the board.

*if the input power is connected through relays, the *output* of the relays should be connected to the *input* side of the Surface Protection Board.

Detailed Description

Before installation, the Surge Protection Board should be configured. This is done by changing the switches S1 and S2 to the relevant positions as described above.

S1 is required to set the current limit. The current limit corresponds to the maximum current that the board takes as the capacitors on the DUT charge up. The time it takes for before the output is disabled during an over-current condition is described in the Configuration section. Once an over-current fault has occurred, the FAULT LED is illuminated. The board will stay in this FAULT state until the Surge Protection Board's input power is cycled.

S2 is required to set the over-voltage trip limit. This is the voltage at which the board will disable the output, at which point the FAULT LED will be illuminated. If a fault condition occurs, the input voltage will need to be power cycled and drop below 3 V in order to clear the fault.

The Surge Protection Board is designed to be directly connect to the DUT. Any switches or relays must be placed on the power input side of the Surge Protection Board.

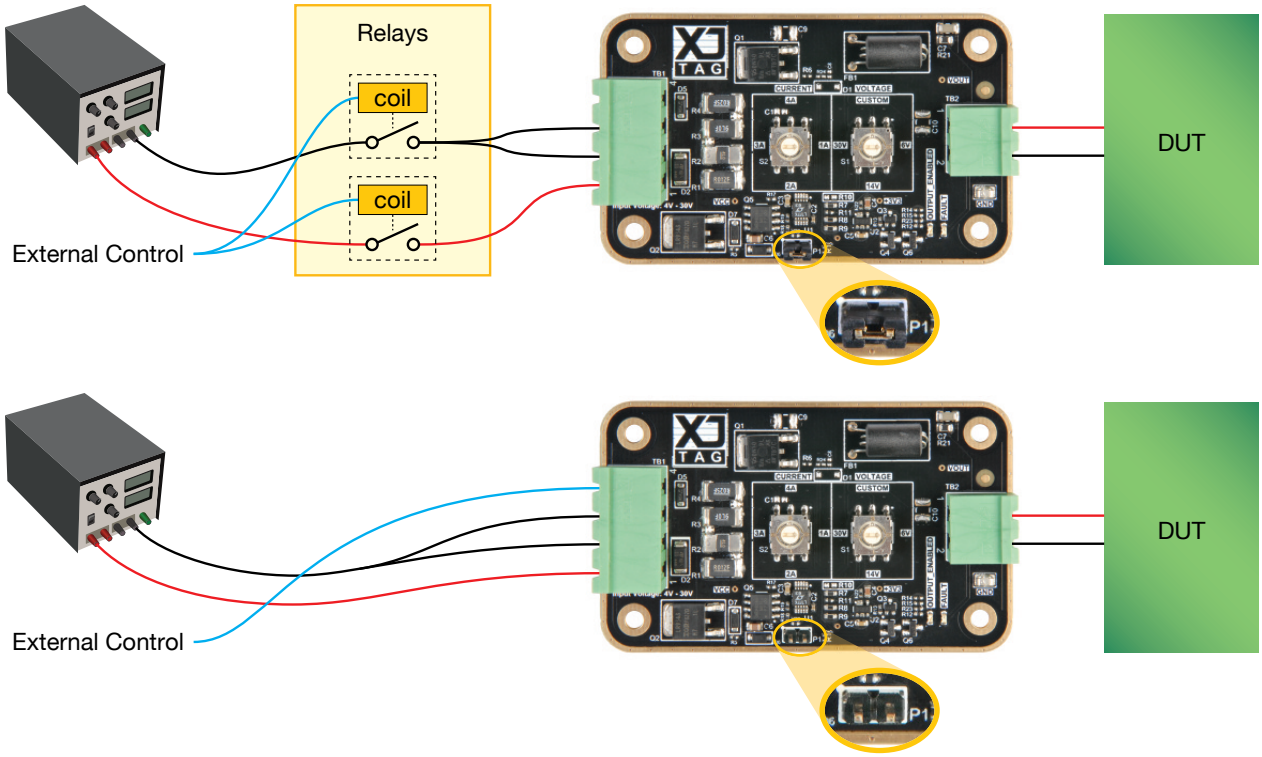

Figure 4

If the DUT is to be controlled via an external signal, e.g. an XJLink2, this control signal must be connected to pin 4 of TB1. The jumper on P1 will also need to be removed in order for the CONTROL signal to have any effect.