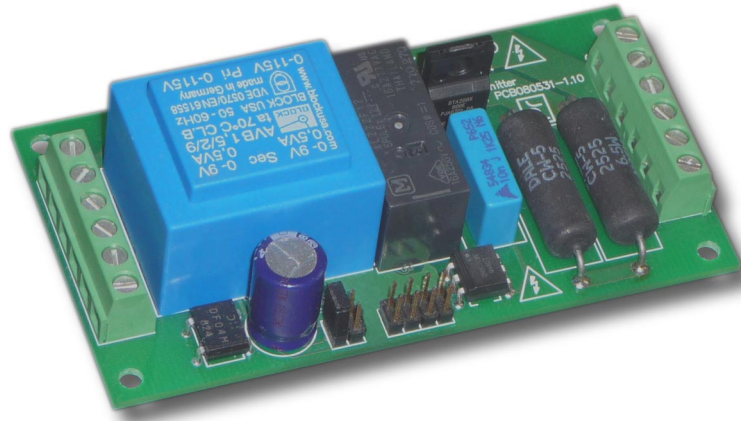


# IRCLIM10

## Universal AC Mains Inrush Current Limiter



### General Description

The IRCLIM10 is intended to limit the large transient current occurring when a mains transformer is first energized. The inrush current of the transformer is limited by means of a triac, switching an ohmic resistor in series with AC mains (“Softstart”) prior to switching full AC mains with a relay (“On”).

The IRCLIM10 is capable to switch multiple transformers up to a total switching power of 1500VA, the standby power consumption is below 1W.

A NTC thermistor optionally may be connected to the IRCLIM10 to ensure overtemperature shutdown, whereby the shutdown temperature is determined by the NTC specifications.

The IRCLIM10 is controlled by either a pushbutton or a switch (jumper selectable mode). LEDs may be connected to indicate the status “Standby”, “Softstart”, “On” and “Overtemperature”.

### Typical Applications

- Applications powered by large mains transformers

### Key Specifications

- AC Mains voltage: 115VAC or 230VAC (50Hz ... 60Hz)
- Switching power: 1500VA max.
- Standby power consumption: 1W max.
- Outline dimensions: 95 x 50 x 25mm (w x d x h)

### Main Features

- Softstart with zero-cross switching
- Controlled by either a pushbutton or a switch
- External LEDs for status indication
- External NTC for overtemperature shutdown (optional use)
- Customized designs available, contact Primelec for further information

## Block Diagram

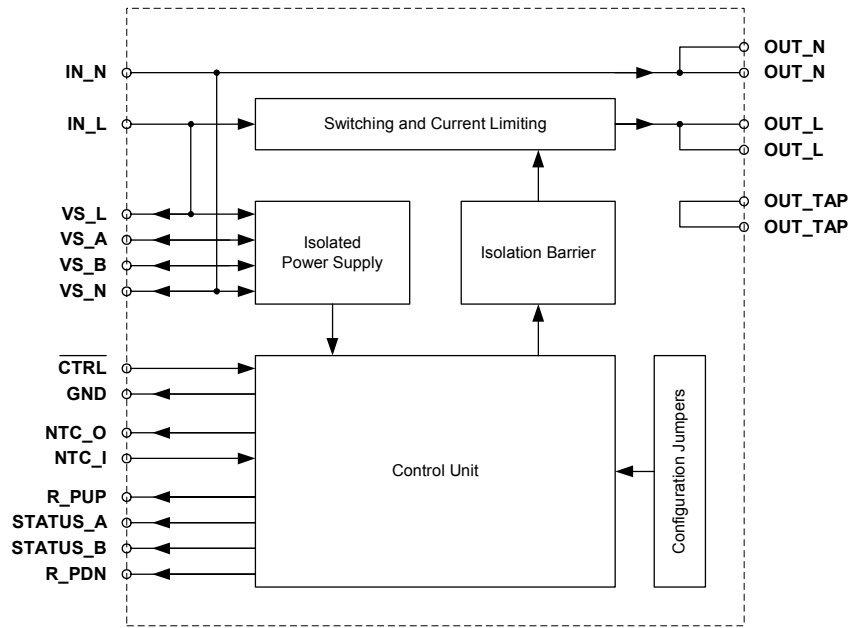


Figure 1: Block diagram

## Connection Diagram and Jumpers

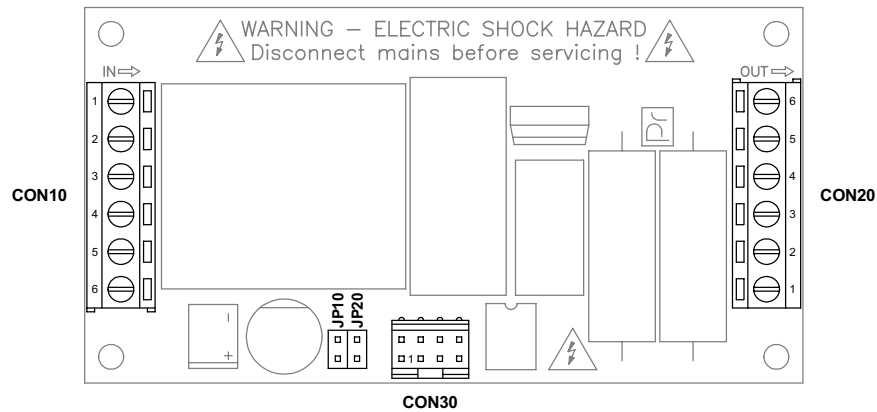


Figure 2: Connection diagram and jumpers



**CAUTION – HAZARDOUS VOLTAGE**  
 Incorrect wiring may result in serious injury or damage!  
 Disconnect mains before servicing!



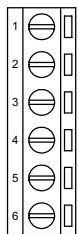
## Connector Descriptions

### CON10 (AC Mains In)

Type: Printed circuit terminal block, 6 positions

Specifications: Pitch 5mm, screw connection, conductor cross section 1.5mm<sup>2</sup> max.

Pinout:



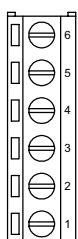
Pin	Signal	Function
1	IN_N	AC Mains input, neutral
2	IN_L	AC Mains input, line
3	VS_L	Voltage selector terminal for AC mains of the internal power supply
4	VS_A	Voltage selector terminal for AC mains of the internal power supply
5	VS_B	Voltage selector terminal for AC mains of the internal power supply
6	VS_N	Voltage selector terminal for AC mains of the internal power supply

### CON20 (AC Mains Out)

Type: Printed circuit terminal block, 6 positions

Specifications: Pitch 5mm, screw connection, conductor cross section 1.5mm<sup>2</sup> max.

Pinout:



Pin	Signal	Function
1	OUT_TAP	Transformer center tap terminal
2	OUT_TAP	Transformer center tap terminal
3	OUT_L	AC Mains output, line (switched and current limited)
4	OUT_L	AC Mains output, line (switched and current limited)
5	OUT_N	AC Mains output, neutral
6	OUT_N	AC Mains output, neutral

### CON30 (Low Level Signals)

Type: Rectangular shrouded header, 8 positions, male pins, 2 rows (FCI 69168-108HLF)

Specifications: Pitch 2.54mm, mates with rectangular housing FCI 69176-008LF and housings without polarizing key

Pinout:



Pin	Signal	Function
1	NTC_O	NTC output (internal pull-up resistor to +5V)
2	NTC_I	NTC input (internal pull-down resistor to GND)
3	GND	Ground terminal for the switch / pushbutton connection
4	CTRL	Control input switch / pushbutton (active low, internal pull-up to +5V)
5	STATUS_A	Status signal "A" output for LED connection
6	STATUS_B	Status signal "B" output for LED connection
7	R_PUP	Passive output for LED connection (internal pull-up resistor to +5V)
8	R_PDN	Passive output for LED connection (internal pull-down resistor to GND)

## Electrical Characteristics

### Absolute Maximum Ratings

Stresses above these ratings may cause permanent damage

Symbol	Parameter	Value	Unit
V <sub>ACMAINS</sub>	AC Mains Input Voltage on Pins IN_L and IN_N	250	V
f <sub>ACMAINS</sub>	AC Mains Input Frequency on Pins IN_L and IN_N	50 to 60	Hz
P <sub>SW</sub>	Switching Power	1500	VA
V <sub>CTRL</sub>	Input Voltage on Pin CTRL	-0.7 to 5.5	V
V <sub>NTC_I</sub>	Input Voltage on Pin NTC_I	0 to 5	V
T <sub>A</sub>	Ambient Temperature	10 to 60	°C

### Recommended Operating Conditions

Symbol	Parameter	Value	Unit
V <sub>ACMAINS</sub>	AC Mains Input Voltage on Pins IN_L and IN_N	115 or 230	V
f <sub>ACMAINS</sub>	AC Mains Input Frequency on Pins IN_L and IN_N	60 or 50	Hz

### Electrical Specifications

The following specifications apply for T<sub>A</sub> = 25°C, V<sub>ACMAINS</sub> = 230VAC (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>AC Mains</b>						
V <sub>ACMAINS</sub>	Input Voltage Range	Voltage Selector "115VAC" Voltage Selector "230VAC"	104 207	115 230	126 250	V
I <sub>SW</sub>	Switching Current	V <sub>ACMAINS</sub> = 115VAC / 60Hz typ. V <sub>ACMAINS</sub> = 230VAC / 50Hz typ.			10 6.3	A
P <sub>STDBY</sub>	Standby Power Consumption	V <sub>ACMAINS</sub> = 115VAC or 230 VAC			1	W
<b>Control Input</b>						
V <sub>CTRL_L</sub>	Low Level Input Voltage				0.8	V
V <sub>CTRL_H</sub>	High Level Input Voltage		2			V
I <sub>CTRL_PU</sub>	Pull-Up Current	Internal pulled-up to +5V		-500		μA
<b>NTC Output / Input</b>						
Z <sub>NTC_O</sub>	Output Impedance at Pin NTC_O	Internal pulled-up to +5V		220		Ω
Z <sub>NTC_I</sub>	Input Impedance at Pin NTC_I	Internal pulled-down to GND		4700		Ω
Z <sub>NTC_TH</sub>	Threshold Impedance for Shutdown	NTC at Pins NTC_O and NTC_I, Shutdown if Z <sub>NTC</sub> ≤ Z <sub>NTC_TH</sub>		1790		Ω
Z <sub>NTC_REL</sub>	Release Impedance after Shutdown	NTC at Pins NTC_O and NTC_I, Release if Z <sub>NTC</sub> > Z <sub>NTC_REL</sub>		2120		Ω
<b>Passive Outputs</b>						
Z <sub>PUP</sub>	Internal Resistor from Pin R_PUP to +5V			220		Ω
Z <sub>PDN</sub>	Internal Resistor from Pin R_PDN to GND			220		Ω
<b>Status Outputs</b>						
V <sub>ST_L</sub>	Low Level Output Voltage	I <sub>ST</sub> = 100μA I <sub>ST</sub> = 8mA	0.03 1.76		0.2 2.0	V
V <sub>ST_H</sub>	High Level Output Voltage	I <sub>ST</sub> = -100μA I <sub>ST</sub> = -8mA	4.6 2.8		5.23 3.49	V
Z <sub>ST</sub>	Output Impedance			220		Ω

## Application Information

### Electrical Safety Precautions

Carefully read this first before using the IRCLIM10:



- **Incorrect wiring of the IRCLIM10 may result in serious injury or damage**
- **Disconnected AC mains before working on the IRCLIM10**
- **Prevent accidental touching of the IRCLIM10, most parts contain hazardous voltages**
- **Use minimal 10mm spacers between the IRCLIM10 and the mounting plate**
- **Keep a minimum distance of 10mm around the IRCLIM10**
- **Do not expose the IRCLIM10 to rain or moisture**
- **Use an external fuse at the AC mains line input to reduce the risk of serious damage**

### Wiring Diagrams (230VAC Mains Voltage)

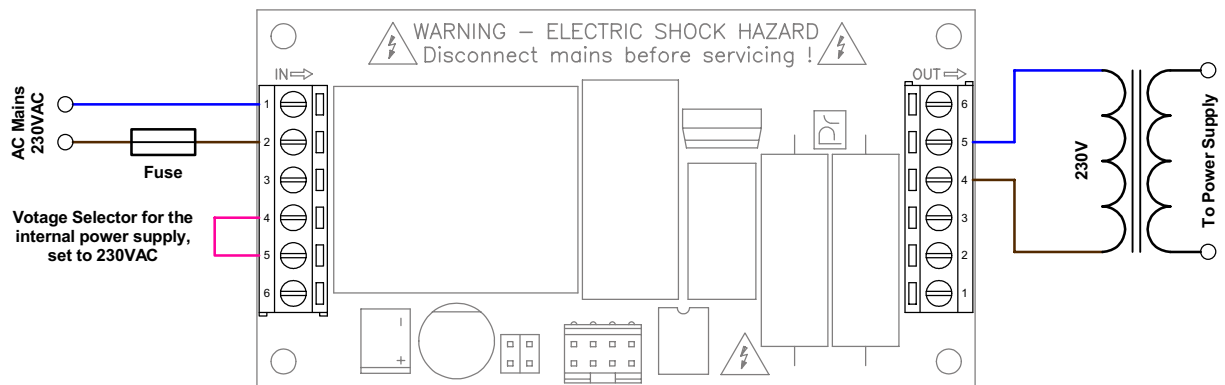


Figure 3: Wiring diagram, 230VAC mains voltage

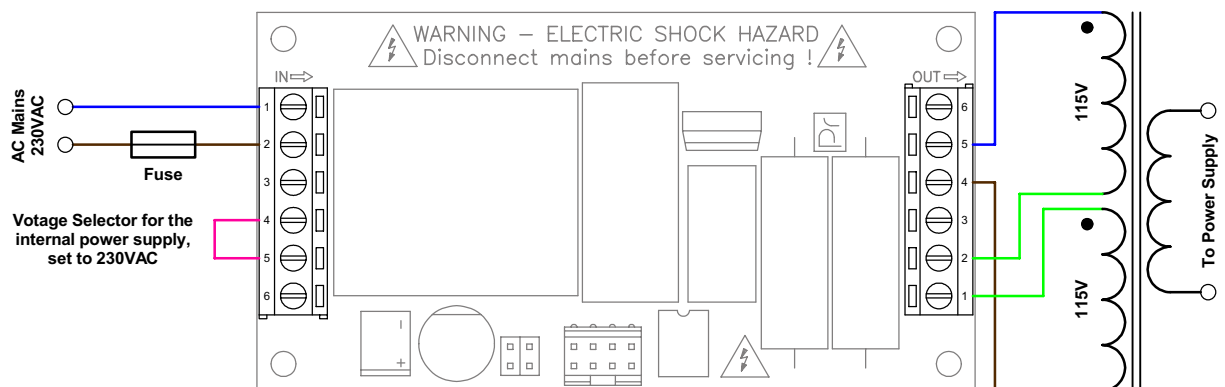


Figure 4: Wiring diagram, 230VAC mains voltage (transformer with 2 x 115V primary windings)

## Wiring Diagrams (115VAC Mains Voltage)

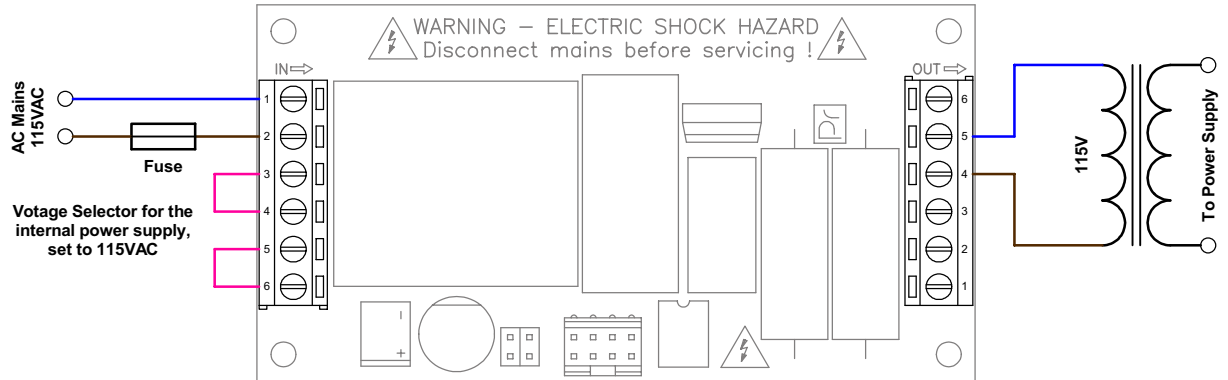


Figure 5: Wiring diagram, 115VAC mains voltage

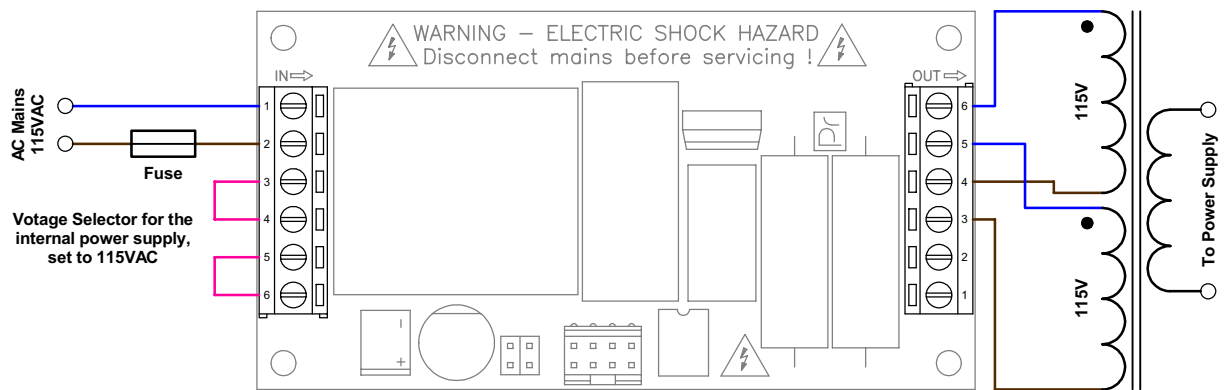


Figure 6: Wiring diagram, 115VAC mains voltage (transformer with 2 x 115V primary windings)

## Control Input

The IRCLIM10 is controlled by either a pushbutton or a switch, connected between the control input and GND. The control input is active-low and internal pulled-up to +5V, pulling the input below  $V_{CTRL\_L}$  activates the input.


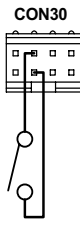



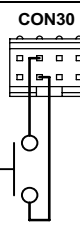


Mode	Jumper Setting	Wiring Diagram	Timing Diagram
Switch	<p>JP10 JP20</p>  <p>(JP10 set, JP20 removed)</p>		<p>CTRL </p> <p>Status <b>Standby</b> <b>Softstart</b> <b>On</b> <b>Standby</b></p> <p>MAINS OUT (simplified drawing) </p>
Pushbutton	<p>JP10 JP20</p>  <p>(JP10 removed, JP20 set)</p>		<p>CTRL </p> <p>Status <b>Standby</b> <b>Softstart</b> <b>On</b> <b>Standby</b></p> <p>MAINS OUT (simplified drawing) </p>

Table 1: Control input

## NTC Output / Input

Optionally a NTC thermistor may be connected to the IRCLIM10 to ensure overtemperature shutdown. If no temperature shutdown is required, leave the pins NTC\_O and NTC\_I unconnected, otherwise connect a NTC thermistor between the pins. If the impedance of the NTC falls below  $Z_{NTC\_TH}$ , the IRCLIM10 will turn off the AC mains output and enter shutdown mode. Once the impedance of the NTC rises above  $Z_{NTC\_REL}$ , the IRCLIM10 will enter standby mode.

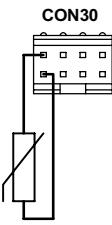
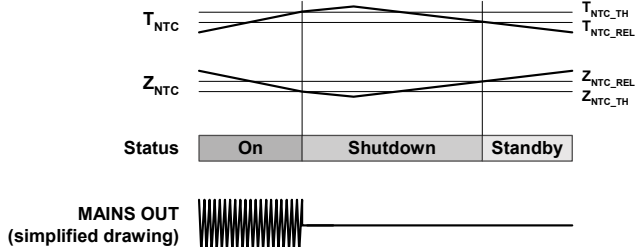
Wiring Diagram	Timing Diagram	NTC Examples
		<p>NTC: EPCOS B57891M0103J000,  <math>R_{25}</math> 10k<math>\Omega</math>  <math>R_{25\_100}</math> 3950K  <math>T_{TH}</math>: 70°C  <math>T_{REL}</math>: 65°C</p> <p>NTC: Murata NTSD1XR502FPB50,  <math>R_{25}</math> 5k<math>\Omega</math>  <math>R_{25\_50}</math> 3700K  <math>T_{TH}</math>: 53°C  <math>T_{REL}</math>: 48°C</p>

Table 2: NTC output / input

## Status Outputs

LEDs may be connected to the IRCLIM10 to indicate the status “Standby”, “Softstart”, “On” and “Overtemperature”. Various connection schemes are possible, see examples below.

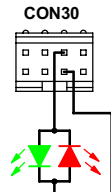
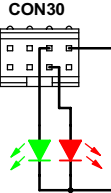
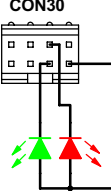
Wiring Diagram	Standby	Softstart	On	Overtemperature
	Red	Dimming from red to green	Green	Red blinking
	Red on, green off	Red dimming off, Green dimming on	Red off, green on	Red blinking, green off
	Red on, green off	Red dimming off, Green dimming on	Red off, green on	Red blinking, green off

Table 3: LEDs for status indication

## Ordering Information

**IRCLIM10** Universal AC mains inrush current limiter

## Physical Dimensions

All dimensions in mm, tolerance is  $\pm 0.2\text{mm}$  unless otherwise noted

