

Inrush current limiter for active AC-DC bridge rectifier



Features

- Two **TN1605H-6T** 16 A - 600 V Hi Tj SCRs in a TO-220 package, used to bypass the inrush resistor
- Compact solution: 43.6 x 28.5 mm (≈ 1.8 sq in)
- Compatible with AC-DC converters with or without PFC in all modes: CCM, CRM, and DCM
- Enable signal (EN = 3.3 V to 15 V) versus GND_DC (DC or PWM signal)
- Suitable for applications from 50 W up to 1000 W ($230 V_{RMS}$, $T_{AMB} = 60^{\circ}C$)
- Compliant with AC or DC input voltage: 90-265 V_{AC} , 50/60 Hz, 4.3 A_{RMS} or 120-400 V_{DC} , 2 A
- Robust, immune (2 kV IEC 61000-4-5, 4 kV IEC 61000-4-4)
- Low EMI noise (EN55014 and EN55022) solution

Description

The **STEVAL-SCR002V1** introduces a simple and innovative AC-DC front-end circuit that allows the designer to perform an inrush current limitation in any converter with input rectifier bridge topologies.

Based on a discrete control circuit made of one **Z0110MN** SMD triac and two **STTH110A** diodes, it offers a compact and non-insulated high voltage driver for the mains SCR. The drive circuit synchronizes the SCR gate signals with the AC line polarity and powers directly the SCR gate from the mains. This operation does not generate reverse losses in the SCRs.

This **STEVAL-SCR002V1** solid-state solution provides a high reliability, a long service lifetime, an electromagnetic interference reduction, and a faster response compared to electromechanical solutions.

This solution is also compatible with an inrush current limitation performed either in the NTC/PTC bypass mode or in the MCU phase-control mode.

The enable control pin of the SCR driver is referenced to GND_DC. Therefore, an uninsulated power supply or a direct control by the MCU can be used.

With five wires to connect, the **STEVAL-SCR002V1** is designed for an easy implementation on existing AC-DC converters for plug-and-play tests.

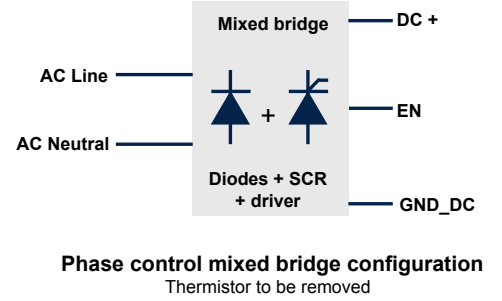
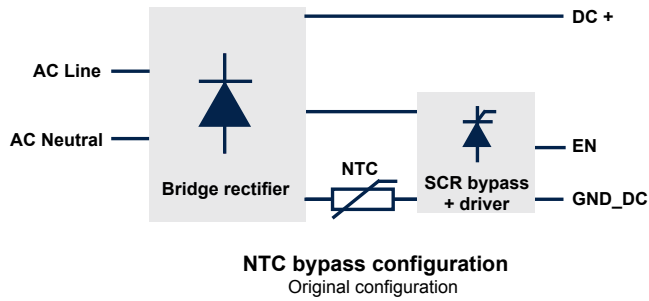
It is suitable for applications with an RMS current up to 4.3 A (at an ambient temperature of $60^{\circ}C$).

Product summary

Inrush current limiter for active AC-DC bridge rectifier	STEVAL-SCR002V1
600 V, 16 A high temperature SCR	TN1605H-6T
600 V, 1 A standard Triac	Z0107MN 5AA4
1000 V, 1 A ultrafast diode	STTH110A
Applications	AC-DC Converters

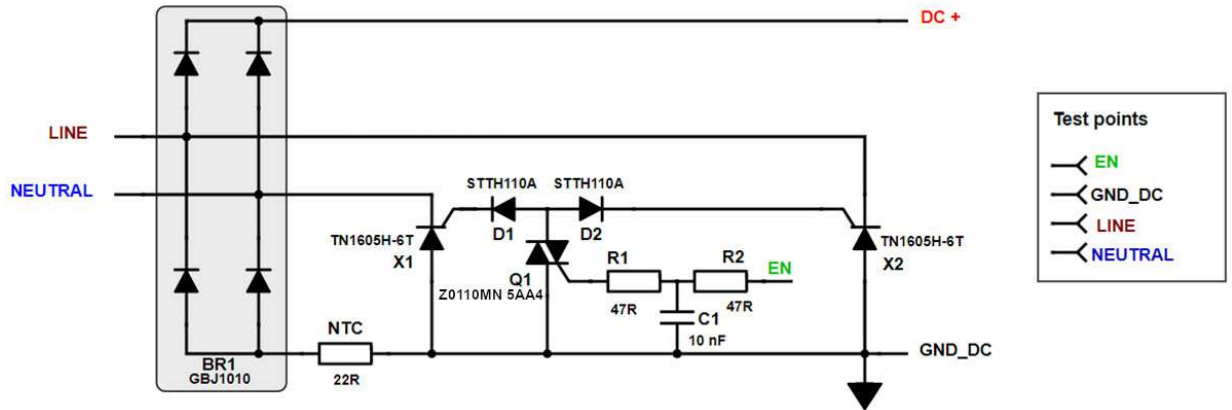
1 Configurations

Figure 1. STEVAL- SRC002V1 circuit configurations



2 Schematic diagrams

Figure 2. STEVAL-SCR002V1 circuit schematic



A T-filter (R1-C1-R2) is placed on top of the Z0110MN gate to maximize the EFT immunity of the low side ICL driver. Refer to AN5649 for further information.

3 Board versions

Table 1. STEVAL-SCR002V1 versions

PCB version	Schematic diagrams	Bill of materials
STEVAL\$SCR002V1A ⁽¹⁾	STEVAL\$SCR002V1A schematic diagrams	STEVAL\$SCR002V1A bill of materials

1. This code identifies the STEVAL-SRC002V1 evaluation board first version. It is printed on the board PCB.

Revision history

Table 2. Document revision history

Date	Revision	Changes
04-Jul-2022	1	Initial release.
18-Jul-2022	2	Updated cover page image.
03-Nov-2022	3	Updated cover page features.

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