

Isolated thyristors driver in AC solid-state-relay

Description

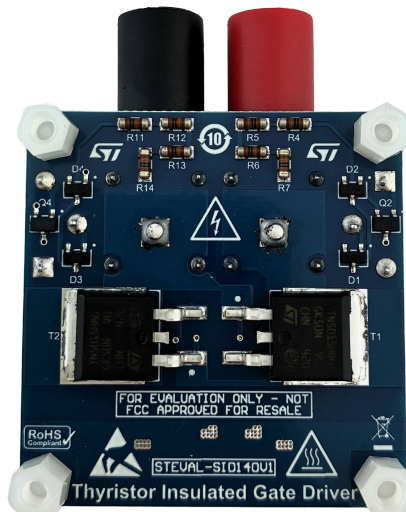
The **STEVAL-SID140V1** allows to evaluate insulated control of thyristors SCRs with the **STSID140-12** driver.

The **STSID140-12** driver has a 40 mA of output current capability to drive SCR gate easily without any additional power supply in high voltage.

The galvanic-insulated inductive barrier allows a 1250 V rms rating-insulated voltage, compliant for the application of functional insulation, and with a high creepage distance at 3.9 mm.

Based on two **TN5015H-8G** SCR in back-to-back, this evaluation board is able to drive AC load connected on line up 4 Amps.

Figure 1. STEVAL-SID140V1



Notice: For dedicated assistance, submit a request through our online support portal at www.st.com/support.

1 Features

- Isolated thyristor driver STSID140-12
 - 1250 V RMS of insulation barrier (V_{ISO})
 - 40 mA output current for thyristor gate
 - Power transfer from low voltage
 - Direct MCU driving with I/O at 3.3 V
- Compact AC solid state-relay
 - Up to 4 Amps AC load driving
 - TN5015H-8G high temperature 50 Amps 800 V
 - SCRs in back-to-back
 - Compact D2PAK SMD package
- AC main zeros cross-triggering option
- 5-pins LV connectors for MCU control
- Two HV connectors for load and line connection

2 Safety instructions

Figure 2. Pictograms



Danger: Use the board only after applying a fire-resistant cover. The cover is not included in the board package.
 There is a danger of serious personal injury, property damage, or death due to electrical shock and burn hazards if the kit or components are improperly used or installed incorrectly.

Warning: The kit is not electrically isolated from the high-voltage supply AC-DC input. The evaluation board is directly linked to the mains voltage. No insulation is ensured between the accessible parts and the high voltage. All measurement equipment must be isolated from the mains before powering the board.
 When using an oscilloscope with the evaluation board, it must be isolated from the AC line. This prevents shock from occurring as a result of touching any single point in the circuit, but does not prevent shock when touching two or more points in the circuit.

Caution: During assembly, testing, and operation, the evaluation board poses several inherent hazards, including bare wires, moving or rotating parts and hot surfaces. All operations involving transportation, installation, use, and maintenance must be performed by skilled technical personnel who are familiar with the installation, use, and maintenance of power electronic systems.
 The board has to be connected directly on the mains. Non-isolated parts at high-voltage levels are present on both sides of the PCB.
 The high current flowing through the two SCRs generates heat: the board temperature can reach up to 150 °C at full power. Be aware that, due to the thermal inertia, the board could remain hot even after the current flow.

- **Workarea safety :**
 - The work area must be clean and tidy
 - Do not work alone when boards are powered
 - Protect the area against any unauthorized access by putting suitable barriers and signs
 - A system architecture that supplies power to the evaluation board must be equipped with additional control and protective devices in accordance with the applicable safety requirements (that is, compliance with technical equipment and accident prevention rules).
- **Electrical safety:**
 - Remove the power supply from the evaluation board and electrical loads before performing any electrical measurement
 - Arrange measurement setup, wiring, and configuration, paying attention to the high voltage section

Once the setup is complete, power the board. Fuse protection is not included with this evaluation board.

Danger: Do not touch the evaluation board when it is powered or immediately after it has been disconnected from the voltage supply as several parts and power terminals containing potentially energized capacitors need time to discharge, and heat-sink and transformers may still be very hot.

Personal safety:

- Always wear suitable personal protective equipment, such as insulating gloves and safety glasses
- Take adequate precautions and install the board to prevent accidental touch
- Use protective shields, such as an insulating box with interlocks

3 Block diagram

Figure 3. Block diagram

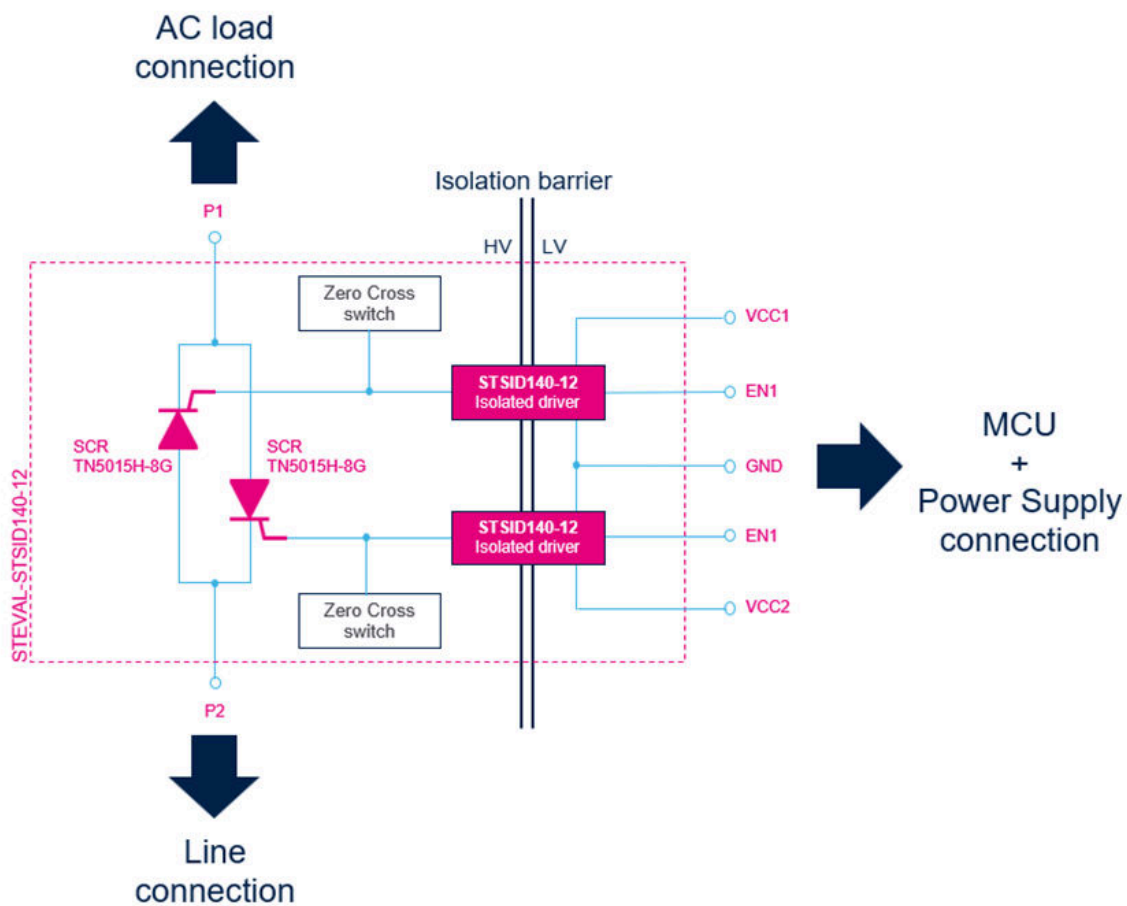


Figure 4. Cross switch

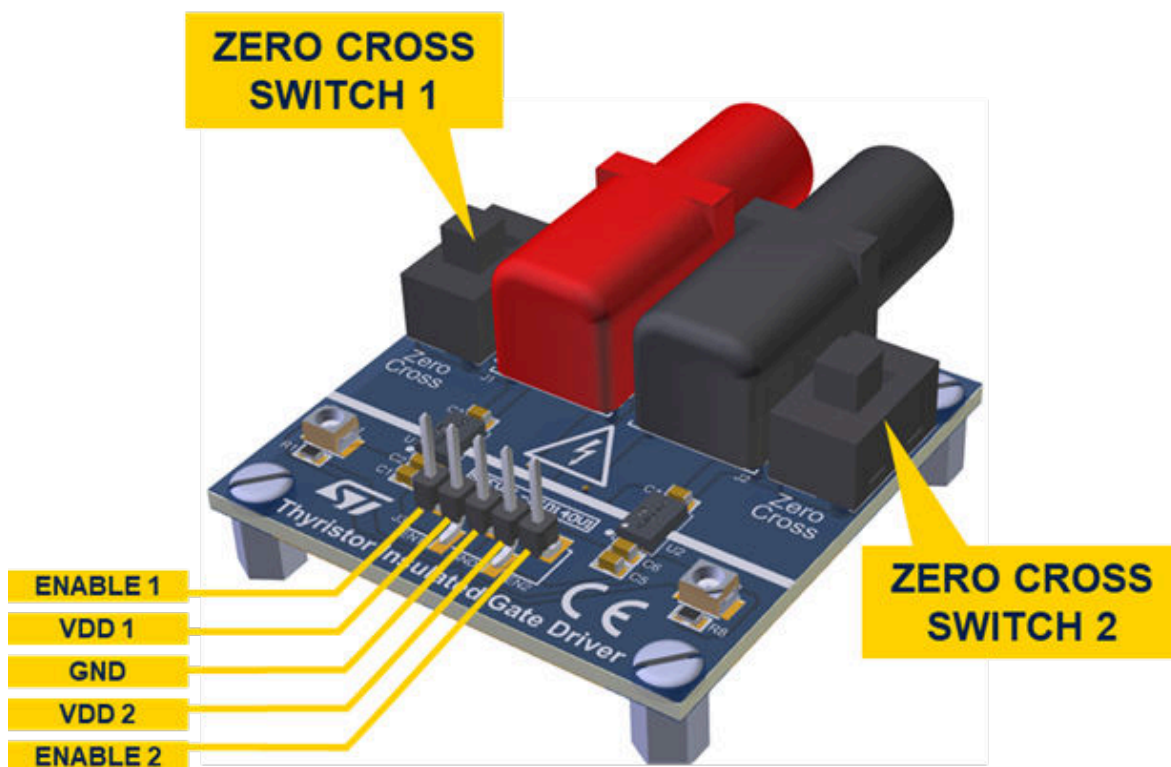
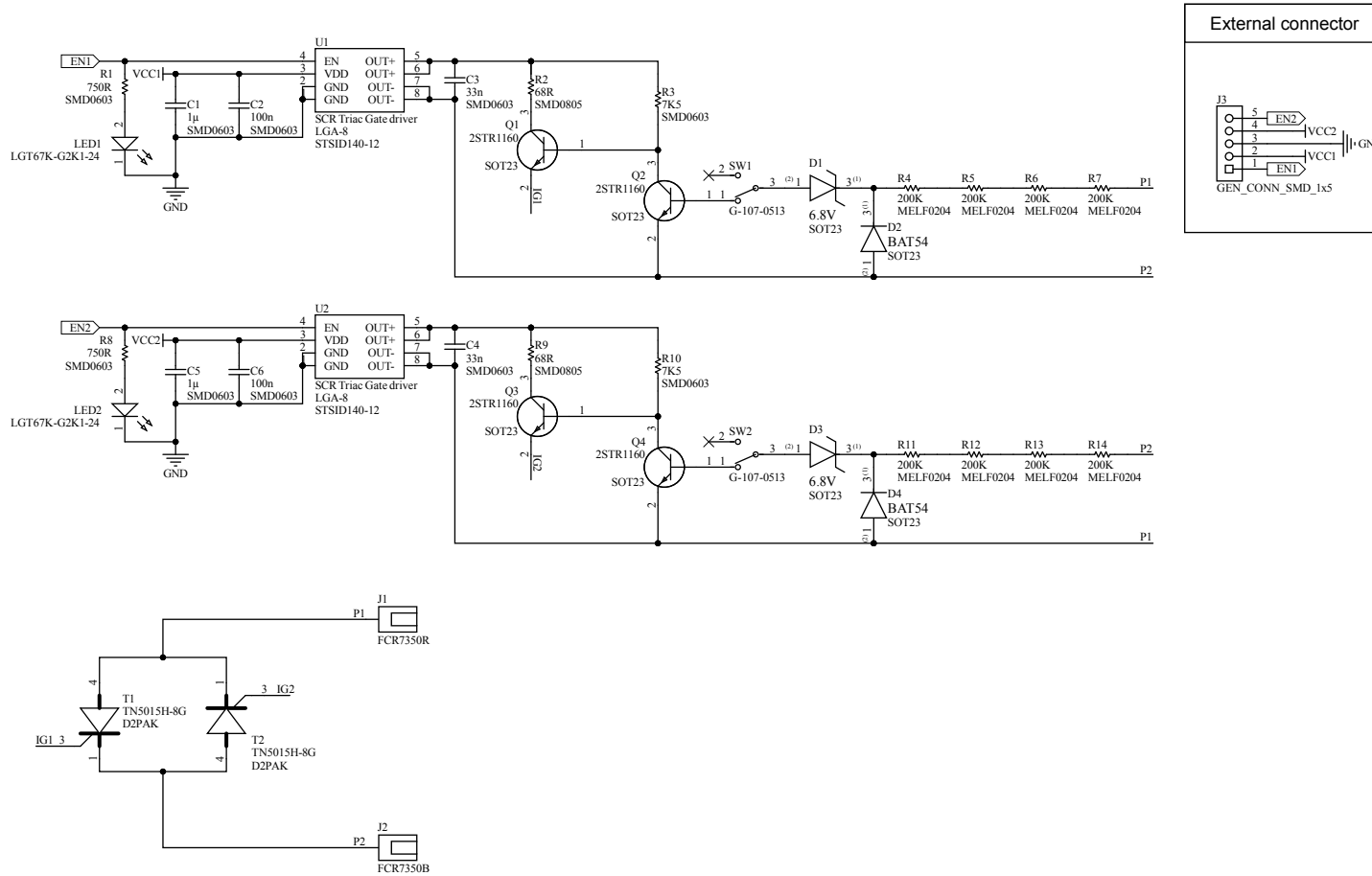


Figure 5. STEVAL-SID140V1 circuit schematic



5 Bill of materials

Table 1. STEVAL-SID140V1 bill of materials

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
1	2	C1, C5	1μ	CONDENSATE UR_CMS_0603	Any	Any
2	2	C2, C6	100n	CONDENSATE UR_CMS_0603	Any	Any
3	2	C3, C4	33n	CONDENSATE UR_CMS_0603	Any	Any
4	2	D1, D3	6.8V	6.8V	Any	Any
5	2	D2, D4	BAT54, SOT23	BAT54	ST	BAT54
6	1	J1		FCR7350R	Cliff	FCR7350R
7	1	J2		FCR7350B	Cliff	FCR7350R
8	1	J3		GEN_CONN_C MS_1x5	Molex	
9	2	LED1, LED2		LGT67K- G2K1-24	Osram	LGT67K-G2K1-24
10	4	Q1, Q2, Q3, Q4	2STR1160, SOT23	2STR1160	ST	2STR1160
11	2	R1, R8	750R	RESISTANCE_ CMS_0603	Any	Any
12	2	R2, R9	68R	RESISTANCE_ CMS_0805	Any	Any
13	2	R3, R10	7K5	RESISTANCE_ CMS_0603	Any	Any
14	8	R4, R5, R6, R7, R11, R12, R13, R14	200K	RESISTANCE_ MELF_0204	Any	Any
15	2	SW1, SW2		G-107-0513	CW Industries	G-107-0513
16	2	T1, T2	TN5015H-8G, D2PAK	TN5015H-8G	ST	TN5015H-8G
17	2	U1, U2	STSID140-2, LGA-8	SCR Triac Gate driver	ST	STSID140-2
18	4	N/A		Standoffs	Keystone Electronics	25508
19	4	N/A		Screws	Keystone Electronics	29341

6 Board versions

Table 2. STEVAL-SID140V1 versions

Finished good	Schematic diagrams	Bill of materials
STV\$SID140V1A ⁽¹⁾	STV\$SID140V1A schematic diagrams	STV\$SID140V1A bill of materials

1. This code identifies the STEVAL-SID140V1 evaluation board first version.

7 PCB stack-up

Table 3. Stack

Stack up		Layer stack			
Layer	Board layer stack	Name	Material	Thickness	Constant
1		Top overlay		0 mm	
2		Top solder	Solder resist	0.01016 mm	3.5
3		Top layer		0.07 mm	
4		Dielectric 1	FR-4	0.32004 mm	4.8
5		Bottom layer		0.07 mm	
6		Bottom solder	Solder resist	0.01016 mm	
7		Soder overlay		0 mm	

8 Zero cross option

The STEVAL-SID140V1 has two slider switches that allow the user to select how to switch the load.

When RANDOM is selected, the load is activated synchronously with the ENABLE signal.

When ZERO CROSS is selected, the load will be activated when the AC line voltage crosses zero volt.

ZERO CROSS switching allows to activate the load softly as the current will slowly increase through the load following the AC line cycle.

As the AC switch is composed of two back-to-back semiconductors controlled rectifier (SCR) a slider switch is provided for both SCR and will allow the user to select the switching mode for both positive and negative polarities of the line cycle.

Figure 6. Zero cross

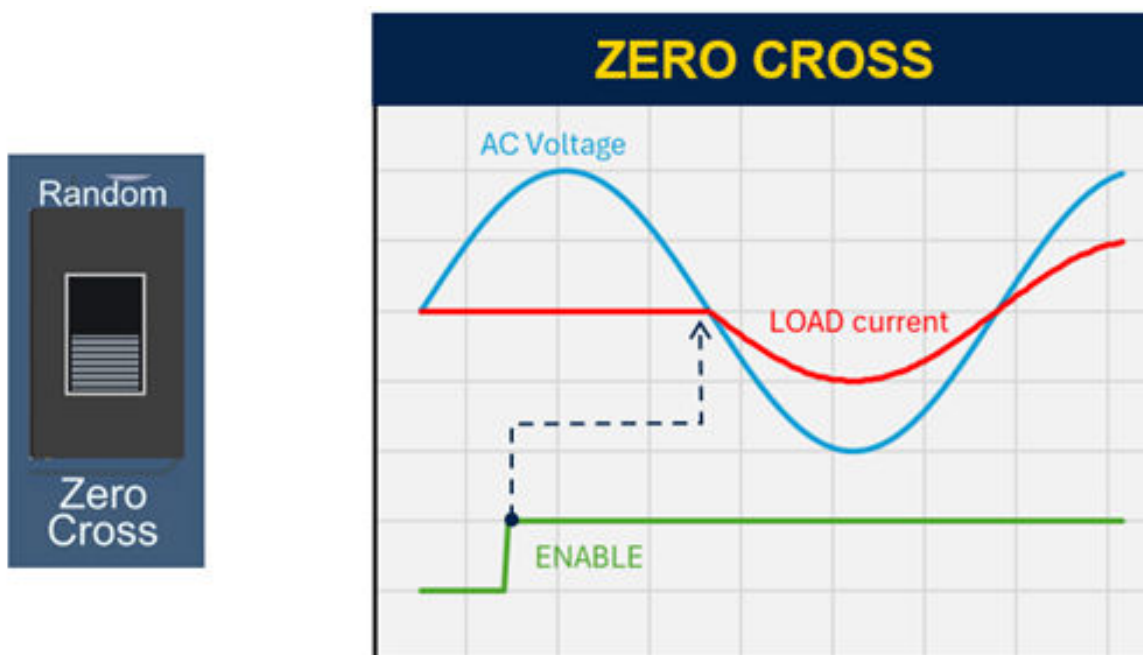
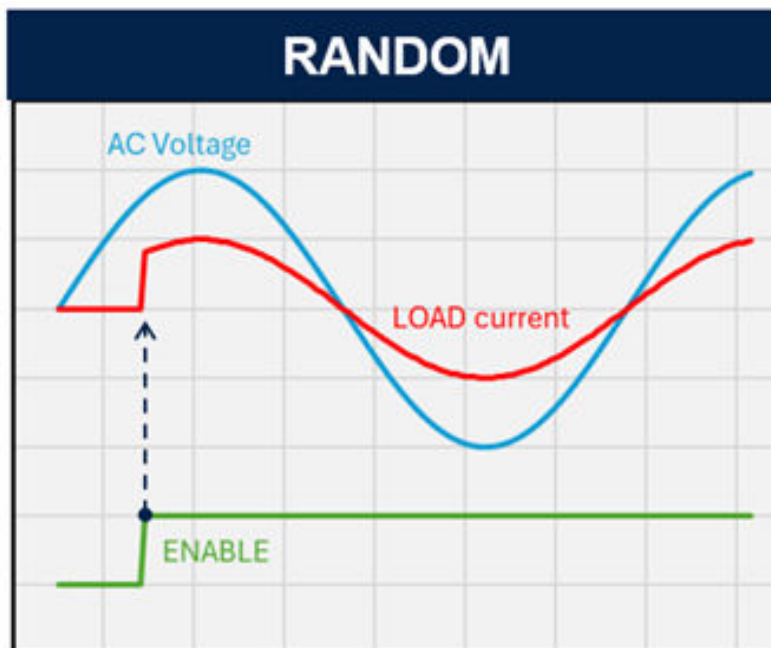


Figure 7. Random



9 Regulatory compliance information

Notice for US Federal Communication Commission (FCC)

For evaluation only; not FCC approved for resale

FCC NOTICE - This kit is designed to allow:

(1) Product developers to evaluate electronic components, circuitry, or software associated with the kit to determine

whether to incorporate such items in a finished product and

(2) Software developers to write software applications for use with the end product.

This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter 3.1.2.

Notice for Innovation, Science and Economic Development Canada (ISED)

For evaluation purposes only. This kit generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to Industry Canada (IC) rules.

À des fins d'évaluation uniquement. Ce kit génère, utilise et peut émettre de l'énergie radiofréquence et n'a pas été testé pour sa conformité aux limites des appareils informatiques conformément aux règles d'Industrie Canada (IC).

Notice for the European Union

This device is in conformity with the essential requirements of the Directive 2014/30/EU (EMC), of the Directive 2014/35/EU (LV) and of the Directive 2011/65/EU (RoHS II), including subsequent revisions and additions, as well as amended by the Delegated Directive 2015/863/EU (RoHS III).

Notice for the United Kingdom

This device is in conformity with the relevant provisions of the following EU legislation recognized by the United Kingdom:

- Electromagnetic Compatibility Regulations 2016 (S.I. 2016/1091) implementing Directive 2014/30/EU (EMC)
- Electrical Equipment (Safety) Regulations 2016 (S.I. 2016/1101) implementing Directive 2014/35/EU (LVD)
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (RoHS) (S.I. 2012/3032) implementing Directive 2011/65/EU (RoHS II), including subsequent revisions and additions, as well as amended by the Delegated Directive 2015/863/EU (RoHS III).

Revision history

Table 4. Document revision history

Date	Revision	Changes
20-Jul-2026	1	Initial release.

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