Evaluation board with dual ST SCRs in ACEPACK SMIT package in TO240 module form factor

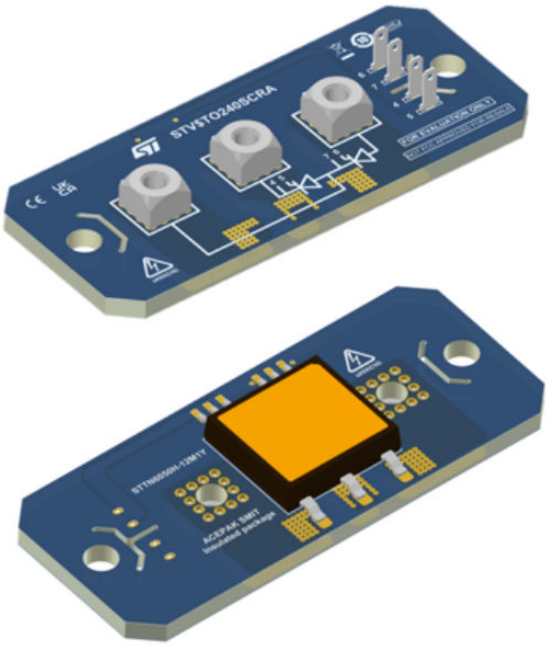
Introduction

STEVAL-TO240SCR is a ready-to-use interface board that features a 60 A dual thyristor. The evaluation board allows evaluating the ACEPACK SMIT package as an alternative to the TO240 module, using the same mounting points and a comparable heatsink.

The evaluation board includes four snap-on connectors so that it can directly use the driving wires used by TO240 modules.

The surface-mounted, top-side cooling ACEPACK SMIT package houses dual STTN6050H-12M1Y, automotive-qualified 60 A 1200 V thyristor, and achieves 600 A surge peak current and overvoltage robustness VDSM (DSM subscript) up to 1400 V. It also has an optimized tab-to-lead creepage distance of 4 mm, while the lead-to-lead creepage distance is 6.9 mm.

Figure 1. STEVAL-TO240SCR



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1 General features

- Ready to test the TO240 interface board
- Same pinout and mounting points as the TO240 module
- Same thermal impedance (junction to case) as TO240
- Thinner profile than TO240
- High current capability
- Surface mount package compatible with automatic assembly processes

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 no 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 How to use the board

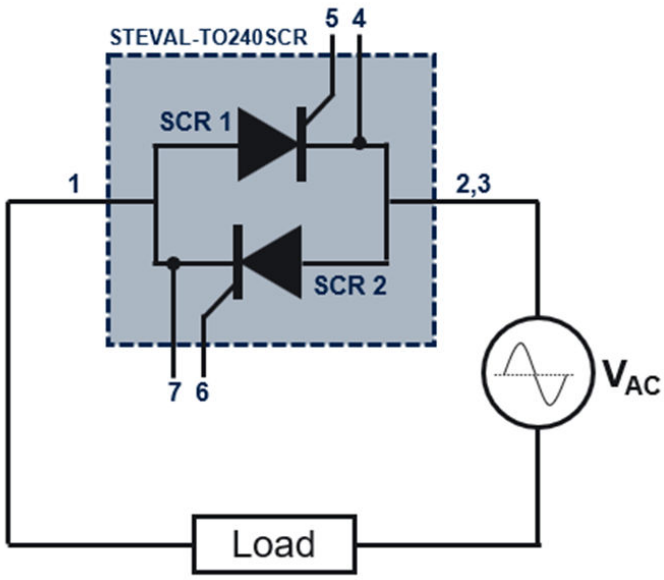
STEVAL-TO240SCR is a ready-to-use interface board for the TO240 package, applicable to solid state relay. It allows customer to evaluate the ACEPACK SMIT package in a standard TO240 application. For example, in order to obtain a bidirectional AC switch, the user must connect Pin 2 and Pin 3 together as illustrated in Figure 3.

Gate driver of SCR1 has to be connected to Pin 5 with reference connected to Pin 4.

Gate driver of SCR2 has to be connected to Pin 6 with reference connected to Pin 7.

The specification of the required gate drive current can be found on the STTN6050H-12M1Y datasheet (DS13748).

Figure 3. Connection synoptic diagram example



4 General specifications

4.1 Pinout and recommendation

Figure 4. **STEVAL-TO240SCR main components**

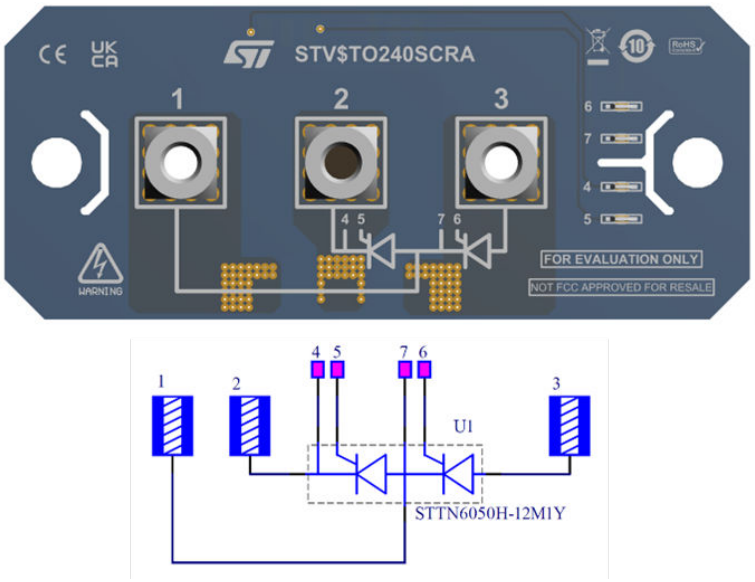


Table 1. **Pin assignment**

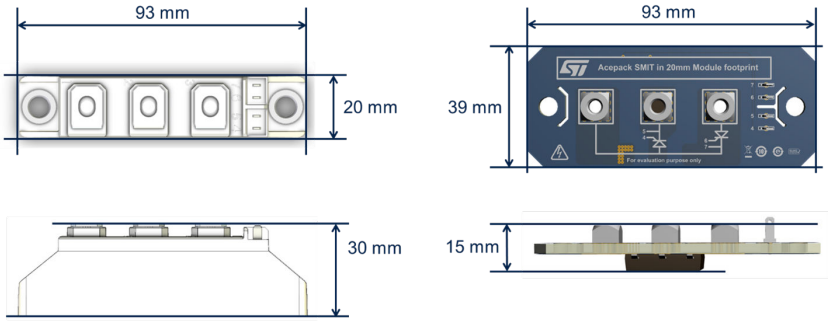
Pins number	Pins reference	Definition
1	A1-C2	Anode SCR1 - Cathode SCR2
2	C1	Cathode SCR1
3	A2	Anode SCR2
4	C1	Cathode SCR1
5	G1	Gate SCR1
6	G2	Gate SCR2
7	C2	Cathode SCR2

TO240 is an industry-standard power module (90 x 20 x 30 mm) using three screw connectors (M5) on top and four snap-on connectors to control the SCR. It is manually assembled using two screws to attach the base plate to the heatsink.

This interface board allows rapid evaluation of an alternative to the TO240 module, leveraging the thermal efficiency of the ACEPACK SMIT package housing dual ST 60 A SCRs. The ACEPACK SMIT surface mount top-side cooling package is also fully compatible with automatic assembly processes.

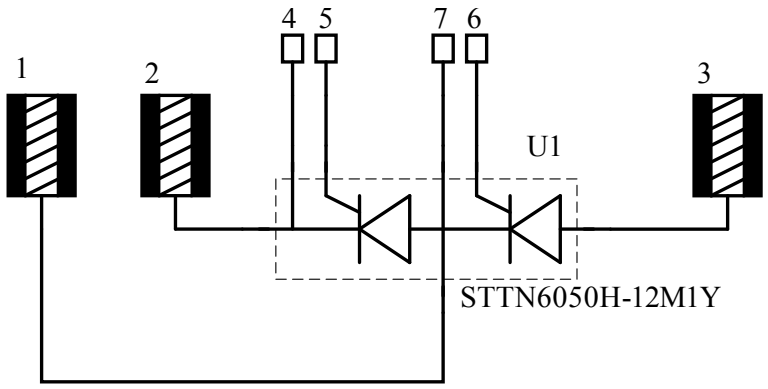
See the mechanical dimensions of the TO240 and STMicroelectronics interface board in the following section.

Figure 5. **Mechanical dimensions of TO240 and STMicroelectronics interface board**



4.2 Schematics

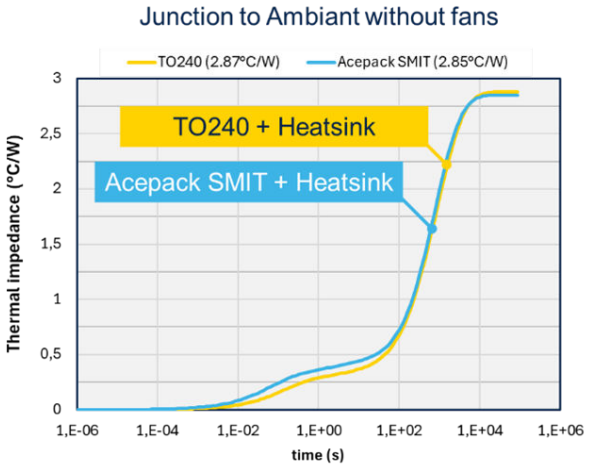
Figure 6. **STEVAL-TO240SCR schematic**



4.3 Thermal impedance

Thermal impedance measurements, according to JESD51-2A, have been made to compare TO240 and ACEPACK SMIT mounted on the same heatsink size (120 x 40 x 50 mm) without forced ventilation. As seen in the graph below, the setup resulted in the same 2.8 °C/W junction-to-ambient thermal impedance.

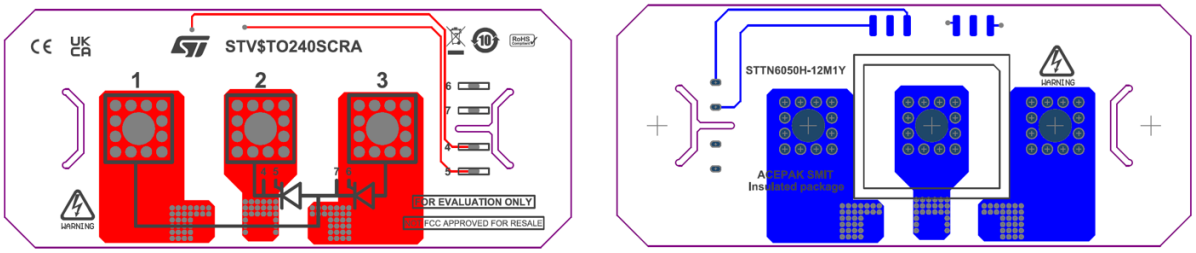
Figure 7. **Junction to ambient thermal impedance**



Heatsink 120 x 40 x 50 mm, Thermal grease 0.67 W/m.K, Torque 2,5 N.m, 5mm interposer between PCB and Heatsink

4.4 Layout

Figure 8. **STEVAL-TO240SCR layout**

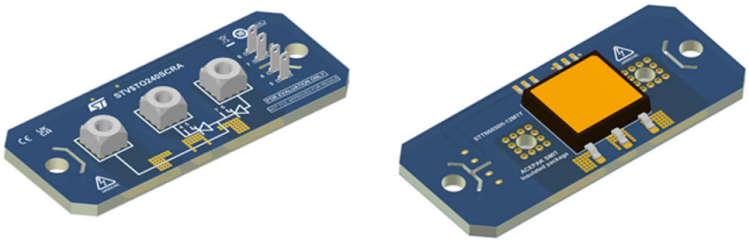


Top layer

Bottom layer

4.5 3D views

Figure 9. **STEVAL-TO240SCR 3D views**



5 Bill of materials

Table 2. **STEVAL-TO240SCR bill of materials**

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
1	3	1,2,3	Redcube Power connector	WP-BUCF REDCUBE PRESS-FIT with internal thread, L9W9H6mm, M5 x 6mm, 175A	Wurth Elektronik	7460408
2	4	4,5,6,7	Faston connector	faston 0.5 x 2.8 mm connector	RS pro	178-8405
3	1	U1	STTN6050H-12M1Y, ACEPACK SMIT	60 A 1200 V thyristor controlled bridge leg in ACEPACK SMIT module	ST	STTN6050H-12M1Y

6 Board versions

Table 3. **STEVAL-TO240SCR versions**

Finished good	Schematic diagrams	Bill of materials
STV$TO240SCRA (1)	STV$TO240SCRA schematic diagrams	STV$TO240SCRA bill of materials

1. *This code identifies the STEVAL-TO240SCR evaluation board first version.*

7 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 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 compliance with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (UK S.I. 2012 No. 3032).

Revision history

Table 4. **Document revision history**

Date	Revision	Changes
09-Oct-2025	1	Initial release.

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