

# ISO5125I Preliminary Data Sheet

High-Voltage Insulated DC/DC Power Supply for SCALE-2 Gate Drivers for 3.3kV, 4.5kV and 6.5kV IGBT Modules

## Abstract

The ISO5125I is a single-channel insulated DC/DC converter suitable as a power supply for IGBT drivers up to 6.5kV. Its output power of 5W enables switching frequencies up to 5kHz for 6.5kV/750A IGBTs. The ISO5125I complements the 1SP0335 high-voltage IGBT drivers.

For drivers adapted to various types of high-power and high-voltage IGBT modules, refer to [www.IGBT-Driver.com/go/plug-and-play](http://www.IGBT-Driver.com/go/plug-and-play)



Fig. 1 Power Supply ISO5125I

## Features

- ✓ Electrical insulation up to 18kV<sub>AC</sub>
- ✓ Creepage distance 60mm
- ✓ Output power 5W
- ✓ No electrolytic capacitors
- ✓ Extremely reliable; long service life
- ✓ Shortens application development time
- ✓ Outstanding coupling capacitance 4pF

## Applications

- ✓ Traction
- ✓ Railroad power supplies
- ✓ Light rail vehicles
- ✓ Industrial drives
- ✓ HVDC
- ✓ Flexible AC transmission systems (FACTS)
- ✓ Medium-voltage converters

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**Safety Notice!**

The data contained in this data sheet is intended exclusively for technically trained staff. Handling all high-voltage equipment involves risk to life. Strict compliance with the respective safety regulations is mandatory!

Any handling of electronic devices is subject to the general specifications for protecting electrostatically sensitive devices according to international standard IEC 60747-1, Chapter IX or European standard EN 100015 (i.e. the workplace, tools, etc. must comply with these standards). Otherwise, this product may be damaged.

**Mechanical Dimensions**

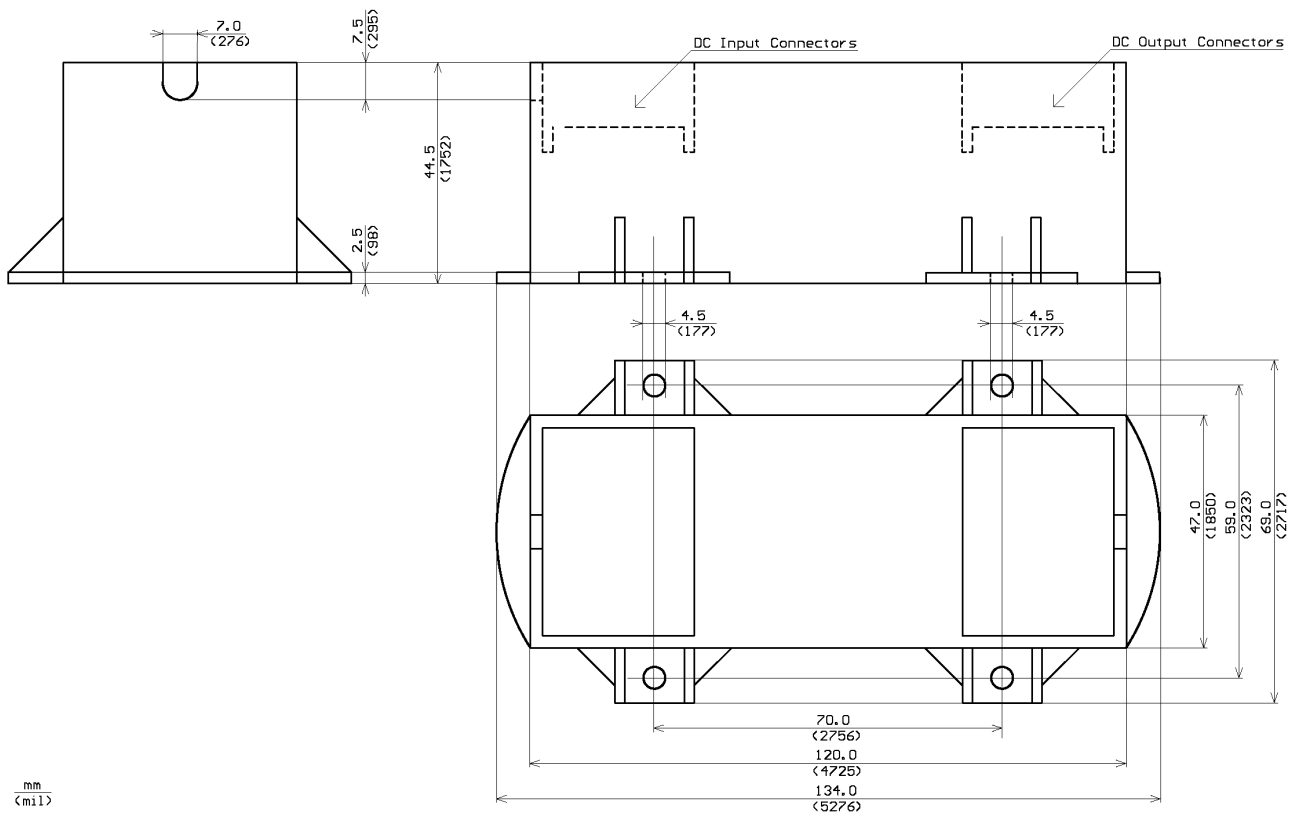


Fig. 2 Mechanical Drawing ISO5125I

## Input and Output Connectors

### DC Input

Two DC input connectors X0 and X0S are available (see Fig. 3 below):

#### X0

1 = GND-IN  
3 = GND-IN

2 =  $V_{IN}$  (+15V referred to GND-IN)

Manufacturer: ERNI, order code 284696. Link: [www.IGBT-Driver.com/go/ext\\_erni](http://www.IGBT-Driver.com/go/ext_erni)

#### X0S

1 = GND-IN

2 =  $V_{IN}$  (+15V referred to GND-IN)

Manufacturer: SAURO, order code MSB02005. Link: [www.IGBT-Driver.com/go/ext\\_sauro](http://www.IGBT-Driver.com/go/ext_sauro)

### DC Output

Two DC output connectors X1 and X1S are available (see Fig. 3 below):

#### X1

1 = GND-OUT  
3 =  $V_{OUT}$  (+25V referred to GND-OUT)

2 =  $V_{OUT}$  (+25V referred to GND-OUT)  
4 = GND-OUT

Manufacturer: ERNI, order code 284697. Link: [www.IGBT-Driver.com/go/ext\\_erni](http://www.IGBT-Driver.com/go/ext_erni)

#### X1S

1 = GND-OUT

2 =  $V_{OUT}$  (+25V referred to GND-OUT)

Manufacturer: SAURO, order code MSB02005. Link: [www.IGBT-Driver.com/go/ext\\_sauro](http://www.IGBT-Driver.com/go/ext_sauro)

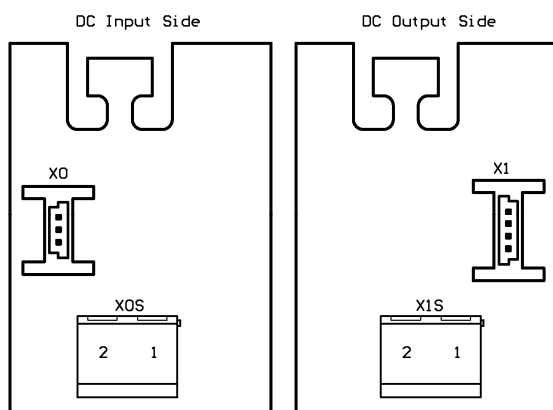


Fig. 3 View of the DC input and output connector sides

Pin 1 and designators IN and OUT are labeled on the PCB.

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### Recommended Cables and PCB Connectors

The following cables and PCB connectors for the X0 and X1 interfaces are recommended and may be ordered from CONCEPT:

| Accessories           | Interface | Length/Type | CONCEPT Ordering Number |
|-----------------------|-----------|-------------|-------------------------|
| Cable (Input, 3-pin)  | X0        | 100cm       | MBC31-100-0             |
| Cable (Output, 4-pin) | X1        | 35cm        | MBC41-035-0             |
| Cable (Output, 4-pin) | X1        | 45cm        | MBC41-045-0             |
| Cable (Output, 4-pin) | X1        | 70cm        | MBC41-070-0             |
| Cable (Output, 4-pin) | X1        | 110cm       | MBC41-110-0             |
| PCB connector (3-pin) | X0        | Right angle | MBCON-3-1-0             |
| PCB connector (3-pin) | X0        | Vertical    | MBCON-3-2-0             |
| PCB connector (4-pin) | X1        | Right angle | MBCON-4-1-0             |
| PCB connector (4-pin) | X1        | Vertical    | MBCON-4-2-0             |

Refer to [www.igbt-driver.com/go/ext\\_erni](http://www.igbt-driver.com/go/ext_erni) for more information

All cables are delivered with straight plugs on both sides.

The PCB connectors can be ordered as "right angle" types (the cable is plugged in parallel to the PCB) or as "vertical" types (the cable is plugged vertically to the PCB).

**Please note that the interface cable X1 carries high potential. The voltage rating of the recommended cables is only 300V. They must therefore be isolated. The user is fully responsible for providing adequate isolation to the delivered cables.**

### Absolute Maximum Ratings

| Parameter                     | Remarks                       | Min | Max  | Unit              |
|-------------------------------|-------------------------------|-----|------|-------------------|
| Input voltage                 | $V_{IN}$ to GND-IN (Note 1)   | 0   | 16   | V                 |
| Average output current        | Note 2                        |     | 200  | mA                |
| Average input current         | Note 3                        |     | 500  | mA                |
| Output power                  | Note 2                        |     | 5    | W                 |
| External blocking capacitance | Between $V_{OUT}$ and GND-OUT |     | 330  | $\mu$ F           |
| Dielectric test voltage       | 50Hz/1min                     |     |      |                   |
| for ISO5125I-45               |                               |     | 7.4  | kV <sub>RMS</sub> |
| for ISO5125I-65               |                               |     | 10.2 | kV <sub>RMS</sub> |
| for ISO5125I-100              |                               |     | 15.2 | kV <sub>RMS</sub> |
| for ISO5125I-120              |                               |     | 18.0 | kV <sub>RMS</sub> |
| Operating temperature         |                               | -40 | +85  | °C                |
| Storage temperature           |                               | -40 | +90  | °C                |

### Recommended Operating Conditions

| Power Supply            | Remarks            | Min  | Typ | Max  | Unit |
|-------------------------|--------------------|------|-----|------|------|
| Supply voltage $V_{IN}$ | To GND-IN (Note 1) | 14.5 | 15  | 15.5 | V    |

### Electrical Characteristics

All data refer to +25°C and an input voltage of  $V_{IN}=15V$ , unless otherwise specified.

| Input Characteristics         | Remarks                       | Min | Typ  | Max | Unit     |
|-------------------------------|-------------------------------|-----|------|-----|----------|
| Input current                 | Without load (Note 4)         | 30  | 55   | 130 | mA       |
|                               | Load 50mA                     |     | 142  |     | mA       |
|                               | Load 100mA                    |     | 230  |     | mA       |
|                               | Load 200mA                    |     | 395  |     | mA       |
| Turn-on threshold             | Note 5                        |     | 11.9 |     | V        |
| Turn-off threshold            | Note 5                        |     | 11.7 |     | V        |
| Output Characteristics        | Remarks                       | Min | Typ  | Max | Unit     |
| Output voltage                | No load (Note 1)              |     | 32.0 |     | V        |
|                               | Load 50mA (Note 1)            |     | 26.4 |     | V        |
|                               | Load 100mA (Note 1)           |     | 26   |     | V        |
|                               | Load 200mA (Note 1)           |     | 24.8 |     | V        |
| Output resistance             | Notes 1, 2, 6                 |     | 10.5 |     | $\Omega$ |
| Internal blocking capacitance | Between $V_{OUT}$ and GND-OUT |     | 23   |     | $\mu$ F  |

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| Electrical Insulation               | Remarks                                      | Min | Typ | Max  | Unit               |
|-------------------------------------|--|-----|-----|------|--------------------|
| ISO5125I-45:                        |  |     |     |      |                    |
| Operating voltage                   | Note 7                                       |     |     | 4.5  | kV <sub>peak</sub> |
| Dielectric test voltage (50Hz/1min) | Note 8                                       |     |     | 7.4  | kV <sub>RMS</sub>  |
| Partial discharge ext. voltage      | Note 9                                       | 3.6 |     |      | kV <sub>RMS</sub>  |
| ISO5125I-65:                        |  |     |     |      |                    |
| Operating voltage                   | Note 7                                       |     |     | 6.5  | kV <sub>peak</sub> |
| Dielectric test voltage (50Hz/1min) | Note 8                                       |     |     | 10.2 | kV <sub>RMS</sub>  |
| Partial discharge ext. voltage      | Note 9                                       | 5.1 |     |      | kV <sub>RMS</sub>  |
| ISO5125I-100:                       |  |     |     |      |                    |
| Operating voltage                   | Note 7                                       |     |     | 10.0 | kV <sub>peak</sub> |
| Dielectric test voltage (50Hz/1min) | Note 8                                       |     |     | 15.2 | kV <sub>RMS</sub>  |
| Partial discharge ext. voltage      | Note 9                                       | 7.8 |     |      | kV <sub>RMS</sub>  |
| ISO5125I-120:                       |  |     |     |      |                    |
| Operating voltage                   | Note 7                                       |     |     | 12.0 | kV <sub>peak</sub> |
| Dielectric test voltage (50Hz/1min) | Note 8                                       |     |     | 18.0 | kV <sub>RMS</sub>  |
| Partial discharge ext. voltage      | Note 9                                       | 9.4 |     |      | kV <sub>RMS</sub>  |
| Creepage distance                   | Note 10                                      | 60  |     |      | mm                 |
| Clearance distance                  | Note 10                                      | 52  |     |      | mm                 |
| Coupling capacitance                | Between V <sub>IN</sub> and V <sub>OUT</sub> |     | 4   |      | pF                 |

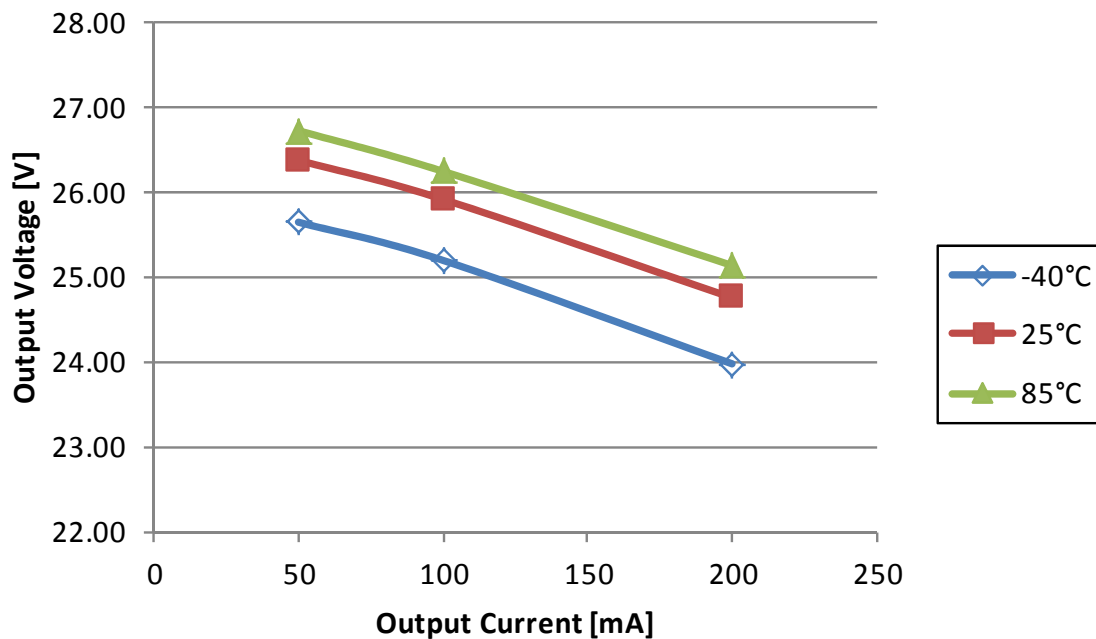


Fig. 4 Output Characteristics with V<sub>IN</sub>=15V

**Footnotes to the key data**

- 1) The output voltage is not regulated and tracks the input voltage. Input voltages higher than those specified can lead to destruction of the DC/DC converter or the gate driver.
- 2) The output voltage is not regulated and decreases with increasing load current. The DC/DC converter is not protected against overload.
- 3) Refers to the static case. The input current increases with decreasing temperature. The maximum value refers to an operating temperature of -40°C.
- 4) Refers to the static case without load. The input current increases with decreasing temperature. The maximum value refers to an operating temperature of -40°C.
- 5) Under-voltage monitoring of the input voltage. For a voltage lower than this limit, the DC/DC converter is switched off.
- 6) For an output current in the range of 50mA to 200mA. (For SCALE-2 high-voltage IGBT driver 1SP0335, the standby supply current is 45mA.)
- 7) Maximum continuous or repeatedly applied DC voltage or peak value of the repeatedly applied AC voltage between input and output or between input or output and the mounting plane.
- 8) The dielectric test voltage may be applied only once during one minute. It should be noted that with this (strictly speaking obsolete) test method, some (minor) damage occurs to the insulation layers due to the partial discharge. Consequently, this test is not performed at CONCEPT as a series test. In the case of repeated insulation tests (e.g. module test, equipment test, system test), the subsequent tests should be performed with a lower test voltage: the test voltage is reduced by 10% for each additional test. The more modern if more elaborate partial-discharge measurement is better suited than such test methods as it is almost entirely non-destructive.
- 9) Every production sample shipped to customers has undergone 100% testing at the given value or higher.
- 10) Distance between input and output or between input or output and the mounting plane. Mounting screws have not been considered.

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## Preliminary Data Sheet

### **The Information Source: SCALE-2 Driver Data Sheets**

CONCEPT offers the widest selection of gate drivers for power MOSFETs and IGBTs for almost any application needs. The largest website on gate-drive circuitry anywhere contains all data sheets, application notes and manuals, technical information and support sections: [www.IGBT-Driver.com](http://www.IGBT-Driver.com)

### **Quite Special: Customized SCALE-2 Drivers**

If you need an IGBT driver that is not included in the delivery range, please don't hesitate to contact CONCEPT or your CONCEPT sales partner.

CONCEPT has more than 20 years experience in the development and manufacture of intelligent gate drivers for power MOSFETs and IGBTs and has already implemented a large number of customized solutions.

### **Technical Support**

CONCEPT provides expert help with your questions and problems:

[www.IGBT-Driver.com/go/support](http://www.IGBT-Driver.com/go/support)

### **Quality**

The obligation to high quality is one of the central features laid down in the mission statement of CT-Concept Technologie AG. The quality management system covers all stages of product development and production up to delivery. The drivers of the SCALE-2 series are manufactured to the ISO9001:2000 quality standard.

### **Legal Disclaimer**

This data sheet specifies devices but cannot promise to deliver any specific characteristics. No warranty or guarantee is given – either expressly or implicitly – regarding delivery, performance or suitability.

CT-Concept Technologie AG reserves the right to make modifications to its technical data and product specifications at any time without prior notice. The general terms and conditions of delivery of CT-Concept Technologie AG apply.



### Ordering Information

The general terms and conditions of delivery of CT-Concept Technologie AG apply.

| IGBT voltage class | DC/DC converter type # |
|--------------------|------------------------|
| 3300V/4500V        | ISO5125I-45            |
| 6500V              | ISO5125I-65            |
| 6500V Multilevel   | ISO5125I-100           |
| 6500V Multilevel   | ISO5125I-120           |

### Information about Other Products

#### For drivers adapted to high-voltage or high-power IGBT modules

Direct link: [www.IGBT-Driver.com/go/plug-and-play](http://www.IGBT-Driver.com/go/plug-and-play)

#### For other drivers and evaluation systems

Please click: [www.IGBT-Driver.com](http://www.IGBT-Driver.com)

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## Power Integrations:

[ISO5125I-100](#) [ISO5125I-120](#) [ISO5125I-65](#) [ISO5125I-45](#)



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