

## Data Sheet

# SCALE High Voltage IGBT Driver 1SD210FI-FX200R65KF1

Plug-and-play, compact, high performance, single channel driver for two-level converters

### Abstract

The SCALE HVI 1SD210FI-FX200R65KF1 is a compact single-channel intelligent gate driver designed for EUPEC's high-voltage IGBTs type FD200R65KF1-K and FZ200R65KF1. The driver features a fiber optic interface and a short-circuit protection.

For drivers adapted to other types of high-power and high-voltage IGBT modules refer to [www.Igbt-Driver.com/HVI](http://www.Igbt-Driver.com/HVI)

### Product Highlights

- ✓ Plug-and play solution
- ✓ Protects the IGBT from short-circuit failure
- ✓ Active clamping of Vce at turn-off
- ✓ Extremely reliable; long service life
- ✓ No electrolytic capacitors
- ✓ Gate current up to -6A/+10A
- ✓ Fiber-optic links
- ✓ Monitoring of supply voltage and fiber optics
- ✓ Switching frequency DC to max. 6kHz
- ✓ Duty cycle 0... 100%
- ✓ Suitable DC/DC power supply as separate unit
- ✓ Shorten application's development time

### Applications

- ✓ Two-level converters
- ✓ Medium-voltage converters
- ✓ High-voltage applications
- ✓ Industrial drives
- ✓ Traction
- ✓ Railroad power supplies
- ✓ Wind-power converters
- ✓ Radiology and laser technology
- ✓ Research
- ✓ Almost all other conceivable

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**Important: Please Refer to the Related Manuals!**

This data sheet contains only product-specific data. For a detailed description, must-read application notes, and common data that apply to the whole series, please refer to "Description and Application Manual for 1SD210FI SCALE High Voltage IGBT Drivers".

**Quality Standard**

Manufacturing ISO9001 certified.

**Mechanical and Electrical Interfaces**

Dimensions: 150 x 74 mm.

Mounting Principle: Direct screw mount on FD200R65KF1-K. (Note 20)

| <b>Interface</b>       | <b>Remarks</b>                         | <b>Part type #</b> |
|------------------------|--|--------------------|
| Drive signal input     | Fiber optic receiver (Notes 14, 16)    | HFBR-2522          |
| Status output          | Fiber optic transmitter (Notes 14, 17) | HFBR-1522          |
| Power supply connector | On board connector (Note 15)           | 77315-101-05       |

| <b>Power supply connector</b> | <b>Designator</b> | <b>Pin numbers</b> |
|-------------------------------|-------------------|--------------------|
| Ground                        | GND (Note 19)     | 1, 2, 4, 5         |
| Supply voltage                | $V_{DC}$          | 3                  |

**Absolute Maximum Ratings**

| <b>Parameter</b>                | <b>Remarks</b>      | <b>min max</b> | <b>Unit</b> |
|---------------------------------|---------------------|----------------|-------------|
| Supply voltage $V_{DC}$         | VDC to GND (Note 1) | 0 17.3         | V           |
| Gate peak current $I_{out}$     | Note 8              | -6 +10         | A           |
| Average supply current $I_{DC}$ | Note 3              | 190            | mA          |
| Output power gate driver        | Notes 3, 11         | 2              | W           |
| Switching frequency             | Note 11             | 6              | kHz         |
| DC link voltage                 | Note 5              | 4400           | V           |
| Operating temperature           | Note 11             | -40 +85        | °C          |
| Storage temperature             |                     | -40 +90        | °C          |

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### Electrical Characteristics

All data refer to +25°C and  $V_{DC} = 16.4V$  unless otherwise specified

| <b>Power supply</b>                 | <b>Remarks</b>             | <b>min</b> | <b>typ</b> | <b>max</b> | <b>units</b> |
|-------------------------------------|----------------------------|------------|------------|------------|--------------|
| Nominal supply voltage $V_{DC}$     | VDC to GND (Note 1)        | 15.5       | 16.4       | 16.8       | V            |
| Supply current $I_{DC}$             | Without load (Note 2)      |            | 80         |            | mA           |
| Turn-on threshold $V_{th}$          | Note 4                     |            | 13.7       |            | V            |
| Hysteresis on-/off                  | Note 4                     |            | 1.0        |            | V            |
| <b>Short-circuit protection</b>     | <b>Remarks</b>             | <b>min</b> | <b>typ</b> | <b>max</b> | <b>units</b> |
| Vce-monitoring threshold            | Between aux. terminals     |            | 750        |            | V            |
| Response time                       | Notes 6, 18                |            | 10.0       | 11.0       | ms           |
| Blocking time                       | Note 7                     |            | 1          |            | s            |
| <b>Timing characteristics</b>       | <b>Remarks</b>             | <b>min</b> | <b>typ</b> | <b>max</b> | <b>units</b> |
| Turn-on delay $t_{pd(on)}$          | Note 12                    |            | 430        |            | ns           |
| Turn-off delay $t_{pd(off)}$        | Note 12                    |            | 520        |            | ns           |
| Output rise time $t_{r(out)}$       | Note 9                     |            | 100        |            | ns           |
| Output fall time $t_{f(out)}$       | Note 9                     |            | 100        |            | ns           |
| Acknowledge delay time              | At status output (Note 13) |            | 450        |            | ns           |
| Acknowledge pulse width             | At status output           | 0.7        |            | 1.8        | ms           |
| <b>Gate Output</b>                  | <b>Remarks</b>             | <b>min</b> | <b>typ</b> | <b>max</b> | <b>units</b> |
| Turn-on gate resistor $R_{g(on)}$   | Note 8                     |            | 13.2       |            | W            |
| Turn-off gate resistor $R_{g(off)}$ | Note 8                     |            | 75         |            | W            |
| Aux. gate capacitor $C_{ge}$        |                            |            | 22         |            | nF           |

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### Footnotes to the key data

- 1) Supply voltages higher than specified can lead to the destruction of the driver and protection circuits on the output side. The gate-emitter voltage tracks with the supply voltage. (Not regulated by the gate drive unit.) The recommended DC/DC power supply ISO3116I with high voltage isolation capability is a suitable separate unit.
- 2) Static power consumption of the gate driver.
- 3) If the specified power consumption of the gate driver is exceeded at average, this indicates an overload of the gate driver and the external DC/DC power supply ISO3116I.
- 4) Under-voltage monitoring of supply voltage of the gate driver. For a voltage lower than that limit, the power modules are switched off.
- 5) This limit is due to active clamping. Refer to "Description and Application Manual for 1SD210FI SCALE High Voltage IGBT Drivers".
- 6) Pulswidth of the direct output of the gate drive unit. (Not covering the delay of the gate resistors.)
- 7) Duration of blocking the command input (keeping the gate driver and the IGBT in off-state) after fault detection, i.e. short circuit detection or power supply undervoltage lock out.
- 8) The gate current is limited by on-board gate resistors.
- 9) Refers to the direct output of the gate drive unit. (Not covering the delay of the gate resistors.)
- 10)
- 11) Application-specific self-heating of gate drivers and IGBT modules, especially at high switching frequency, must be taken into account. Commonly, the switching frequency is limited due to switching losses of the IGBT modules. Because CONCEPT cannot predict how the drivers will be incorporated in the user's application, no binding recommended value for self-heating and thus for the maximum useable output power can be made. So, it is recommended to check the gate driver's ambient temperature within the system.
- 12) Including the delay of external fiber optic links. Measured from the transition of turn-on or turn-off command at the host controller side optical transmitter to direct output of the gate drive unit. (Not covering the delay of the gate resistors.)
- 13) Including the delay of external fiber optic links. Measured from the transition of turn-on or turn-off command at the host controller side optical transmitter to the transition of acknowledge signal at the host controller side optical receiver.
- 14) The transceivers required at the host controller side are not delivered with the gate driver. It is recommended to use the same types as used in the gate driver. For product information refer to [www.semiconductor.agilent.com](http://www.semiconductor.agilent.com)
- 15) Connector and cable to the DC/DC power supply are not delivered with the gate driver, but via FCI inc. Recommended crimp contact housing: order code 65039-032; recommended crimp contacts: 5 pcs, order code 48236-002. Refer to [www.fciconnect.com](http://www.fciconnect.com)
- 16) The recommended transmitter current at the host controller is 30-35mA, suitable for plastic optic fiber with a length of less than 2.5 meters. Higher current may increase jitter or delay at turn-off.
- 17) The transmitter current at the gate driver is 30-35mA.
- 18) The delay from turn-on transition at direct output of the gate drive unit to the turn-on of the IGBT amounts to about 2ms (due to gate resistors). But turn-off at short-circuit happens without delay; so the real short-circuit time is 2ms less than the response time.
- 19) GND of power supply is not the same electrical potential as the aux. emitter terminal of the IGBT and they must never be connected together.
- 20) Since the IGBT FZ200R65KF1 has other mechanical dimensions, the driver cannot be direct screw mounted on the module. The driver must be mounted at about electrical emitter potential and connected via short wires to the aux. terminals of the module.

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**Exclusion Clause**

CONCEPT 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 Technology Ltd. apply.

**Technical Support**

CONCEPT offers you expert help for your questions and problems:

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**Quite Special: Customized SCALE HVI Drivers**

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

CONCEPT engineers have more than 15 years experience in the development and manufacture of intelligent drivers for power MOSFETs and IGBTs and have already implemented a large number of customized solutions.

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## Ordering Information

**Related IGBT****CONCEPT Driver Type #**

EUPEC FD200R65KF1-K  
EUPEC FZ200R65KF1

1SD210FI- FX200R65KF1  
1SD210FI- FX200R65KF1

## Information about Other Products

**For drivers adapted to other high-voltage IGBT modules**

Direct link: [www.IGBT-Driver.com/HVI](http://www.IGBT-Driver.com/HVI)

**Other drivers and evaluation boards**

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

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