

Data Sheet

1SD210F2-FX200R65KF2

Single-Channel SCALE Plug-and-Play IGBT Driver

Ultra-compact, high-performance driver for 2-level, 3-level and multilevel converters

Abstract

The SCALE plug-and-play driver 1SD210F2-FX200R65KF2 is a compact single-channel intelligent gate driver designed for Infineon's high-voltage IGBTs of type FD200R65KF2-K and FZ200R65KF2. The driver features a fiber-optic interface and a selectable operation mode via a jumper.

For drivers adapted to other types of high-power and high-voltage IGBT modules, refer to www.IGBT-Driver.com/go/plug-and-play

Product Highlights

- ✓ Plug-and-play solution
- ✓ Protects the IGBT from short-circuit failure
- ✓ Active clamping of V_{ce} 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. 10kHz
- ✓ Duty cycle 0... 100%
- ✓ Suitable DC/DC power supply as separate unit
- ✓ Shortens application development time

Applications

- ✓ Three/multi-level converters
- ✓ 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 applications

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Important Notes

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 the "Description and Application Manual for 1SD210F2 SCALE High-Voltage IGBT Drivers".

When applying SCALE plug-and-play drivers, please note that these drivers are specifically adapted to a particular type of IGBT module. Therefore, the type designation of SCALE plug-and-play drivers also includes the type designation of the corresponding IGBT module. **These drivers are not valid for IGBT modules other than those specified. Incorrect use may result in failure.**

Mechanical and Electrical Interfaces

Dimensions: 156 x 79.5 mm.

Mounting Principle: see Note 22.

| Interface | Remarks | Part type # |
|-------------------------------|---------------------------------------|--------------|
| Drive signal input (Standard) | Fiber-optic receiver (Notes 14,16) | HFBR-2522 |
| Drive signal input (Opt. 01) | Fiber-optic receiver (Notes 14,16) | HFBR-2522 |
| Drive signal input (Opt. 02) | Fiber-optic receiver (Notes 14,20) | HFBR-2412T |
| Status output (Standard) | Fiber-optic transmitter (Notes 14,17) | HFBR-1522 |
| Status output (Opt. 01) | Fiber-optic transmitter (Notes 14,17) | HFBR-1522 |
| Status output (Opt. 02) | Fiber-optic transmitter (Notes 14,21) | HFBR-1412T |
| Power supply connector | On-board connector (Note 15) | 77315-101-05 |

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

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Absolute Maximum Ratings

| Parameter | Remarks | Min | Max | Units |
|---------------------------------|------------------------------|-----|------|-------|
| 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} | Standard and Opt. 1 (Note 3) | | 190 | mA |
| | Opt. 2 (Note 3) | | 225 | mA |
| Output power gate driver | Notes 3,11 | | 2 | W |
| Switching frequency | Note 11 | | 10 | kHz |
| DC-link voltage | Note 5 | | 4400 | V |
| Operating temperature | Note 11 | -40 | +85 | °C |
| Storage temperature | | -40 | +90 | °C |

Electrical Characteristics

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

| Power supply | Remarks | Min | Typ. | Max | Units |
|---------------------------------|----------------------------|------|------|------|-------|
| Nominal supply voltage V_{DC} | VDC to GND (Notes 1,22,23) | 15.5 | 16.4 | 16.8 | V |
| Supply current I_{DC} | Without load (Note 2) | | 80 | | mA |
| | Standard and Opt. 1 | | 115 | | mA |
| Turn-on threshold V_{th} | Note 4 | | 14 | | V |
| Hysteresis on/off | Note 4 | | 1.0 | | V |

| Short-circuit protection | Remarks | Min | Typ. | Max | Units |
|--------------------------------|----------------------------|-----|------|------|-------|
| V_{ce} -monitoring threshold | Between aux. terminals | | 1200 | | V |
| Response time | 3-level mode (Notes 10,18) | | 10.8 | 11.5 | µs |
| Response time | 2-level mode (Notes 6,18) | | 11.6 | 12.4 | µs |
| Blocking time | 2-level mode (Note 7) | | 1 | | s |

| Timing characteristics | Remarks | Min | Typ. | Max | Units |
|------------------------------|----------------------------|-----|------|-----|-------|
| 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 | µs |

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| Gate output | Remarks | Min | Typ. | Max | Units |
|-------------------------------------|---------|-----|------|-----|----------|
| Turn-on gate resistor $R_{g(on)}$ | | | 13.6 | | Ω |
| Turn-off gate resistor $R_{g(off)}$ | | | 91 | | Ω |
| Aux. gate capacitor C_{ge} | | | 22 | | nF |

Footnotes to the key data

- 1) Supply voltages higher than those specified can lead to the destruction of the driver and protection circuits on the output side. The gate-emitter voltage tracks the supply voltage. (Not regulated by the gate drive unit.) The recommended DC/DC power supply ISO3116I with high-voltage insulation 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 on 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 this limit, the power modules are switched off.
- 5) This limit is due to active clamping. Refer to the "Description and Application Manual for 1SD210F2 SCALE High-Voltage IGBT Drivers".
- 6) Pulse width of the direct output of the gate drive unit. (Excluding the delay of the gate resistors.)
- 7) Duration of blocking the command input (keeping the gate driver and the IGBT in the off-state) after fault detection, i.e. power supply under-voltage lock out, or – only in 2-level mode – short-circuit detection. (For three/multilevel mode, turn-off under the short-circuit condition is managed by the host controller.)
- 8) The gate current is limited by on-board gate resistors.
- 9) Refers to the direct output of the gate drive unit. (Excluding the delay of the gate resistors.)
- 10) Including the delay of external fiber-optic links. Measured from the turn-on transition at direct output of the gate drive unit (excluding the delay of the gate resistors) to the transition of the status signal at the optical receiver on the host controller side.
- 11) Application-specific self-heating of gate drivers and IGBT modules, especially at high switching frequency, must be taken into account. The switching frequency is usually limited due to the 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 given. It is therefore 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 the turn-on or turn-off command at the optical transmitter on the host controller side to the direct output of the gate drive unit. (Excluding the delay of the gate resistors.)
- 13) Including the delay of external fiber-optic links. Measured from the transition of the turn-on or turn-off command at the optical transmitter on the host controller side to the transition of the acknowledge signal at the optical receiver on the host controller side.
- 14) The transceivers required at the host controller side are not supplied with the gate driver. It is recommended to use the same types as used in the gate driver. For product information refer to www.IGBT-Driver.com/go/fiberoptics
- 15) The connector and cable to the DC/DC power supply are not supplied 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.IGBT-Driver.com/go/fci
- 16) The recommended transmitter current at the host controller is 30-35mA, suitable for plastic optic fibers with a length of less than 2.5 meters. A higher current may increase jitter or delay at turn-off.

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- 17) The transmitter current at the gate driver is 30-35mA.
- 18) The delay from the turn-on transition at direct output of the gate drive unit to the turn-on of the IGBT amounts to about 2 μ s (due to gate resistors). But turn-off at short circuit takes place without delay; so the real short-circuit time is 2 μ s shorter than the response time.
- 19) GND of the power supply is not at the same electrical potential as the auxiliary emitter terminal of the IGBT. They should never be connected together.
- 20) The recommended transmitter current at the host controller is 60mA.
- 21) The transmitter current at the gate driver is about 65mA.
- 22) Since the IGBT FZ200R65KF2 has different dimensions, the driver cannot be screw-mounted directly onto the module. The driver must be mounted at electrical emitter potential and connected to the auxiliary terminals of the module via short leads.
- 23) In order not to violate the short-circuit SOA of the IGBT module the supply voltage should not exceed 16.5V.

Important Notice

The data contained in this product 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 electrostatic-sensitive devices according to international standard IEC 747-1, Chapter IX or European standard EN 100015 (i.e. the workplace, tools, etc. must comply with these standards). Otherwise, this product may be damaged.

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.

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Ordering Information

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

Related IGBT**CONCEPT Driver Type #**

| | |
|--------------------------------|------------------------------|
| Infineon (eupec) FD200R65KF2-K | 1SD210F2-FX200R65KF2 |
| Infineon (eupec) FZ200R65KF2 | 1SD210F2-FX200R65KF2 |
| Infineon (eupec) FD200R65KF2-K | 1SD210F2-FX200R65KF2 Opt. 01 |
| Infineon (eupec) FZ200R65KF2 | 1SD210F2-FX200R65KF2 Opt. 01 |
| Infineon (eupec) FD200R65KF2-K | 1SD210F2-FX200R65KF2 Opt. 02 |
| Infineon (eupec) FZ200R65KF2 | 1SD210F2-FX200R65KF2 Opt. 02 |

Opt. 01: Lateral fiber-optic interface (HFBR-2522 and HFBR-1522), see "Description and Application Manual for 1SD210F2 SCALE High-Voltage IGBT Drivers".

Opt. 02: Lateral fiber-optic interface with threaded port (HFBR-2412T and HFBR-1412T), see "Description and Application Manual for 1SD210F2 SCALE High-Voltage IGBT Drivers".

Information about Other Products**For drivers adapted to other high-voltage IGBT modules**

Direct link: www.IGBT-Driver.com/go/plug-and-play

For other drivers and evaluation systems

Please click: www.IGBT-Driver.com

Manufacturer

CT-Concept Technologie AG
Intelligent Power Electronics
Renferstrasse 15
CH-2504 Biel-Bienne
Switzerland

Tel. +41 - 32 - 344 47 47
Fax +41 - 32 - 344 47 40

E-mail Info@IGBT-Driver.com
Internet www.IGBT-Driver.com

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