# Data Sheet
# 1SD312F2-MBN900D45A

## 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 1SD312F2-MBN900D45A is a compact single-channel intelligent gate driver designed for Hitachi's high-voltage IGBTs of type MBN900D45A. 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 12A
- Fiber-optic links
- Monitoring of supply voltage and fiber optics
- Switching frequency DC to max. 7.5kHz
- 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 1SD312F2 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: 187 x 63 mm.

Mounting Principle: Direct screw mount on IGBT.

| Interface | Remarks | Part type # |
|---|---|---|
| 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 |

| Power supply connector | Designator | Pin numbers |
|---|---|---|
| Ground | GND (Note 18) | 1, 2, 4, 5 |
| Supply voltage | $V_{DC}$ | 3 |

## 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 | +12 | A |
| Average supply current $I_{DC}$ | Note 3 | | 250 | mA |
| Output power gate driver | Notes 3,11 | | 3 | W |
| Switching frequency | Note 11 | | 7.5 | kHz |
| DC-link voltage | Note 5 | | 3000 | 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 (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 | | 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 | | 680 | | V |
| Response time | 3-level mode (Note 10) | | 8.5 | 9.2 | µs |
| Response time | 2-level mode (Note 6) | | 9.3 | 10.1 | 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 |

| **Gate output** | **Remarks** | **Min** | **Typ.** | **Max** | **Units** |
|---|---|---|---|---|---|
| Turn-on gate resistor $R_{g(on)}$ | Note 8 | | 2.2 | | Ω |
| Turn-off gate resistor $R_{g(off)}$ | Note 8 | | 4.1 | | Ω |

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## 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 1SD312F2 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.
17) The transmitter current at the gate driver is 30-35mA.
18) 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.

## 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.

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## Ordering Information

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

| Related IGBT | CONCEPT Driver Type # |
|---|---|
| Hitachi MBN900D45A | 1SD312F2-MBN900D45A |

## 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

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