1SP0335x2Mx-FZ750R65KE3
Target Data Sheet

Compact, high-performance, plug-and-play single-channel IGBT driver based on SCALE-2 technology for individual and parallel-connected modules in 2-level, 3-level and multilevel converter topologies

Abstract

The SCALE-2 plug-and-play driver 1SP0335x2Mx-FZ750R65KE3 is a compact single-channel intelligent gate driver designed for Infineon's HVI IGBTs FZ750R65KE3. The driver features a fiber-optic interface. 1SP0335x2Mx-FZ750R65KE3 (master) can be used together with 1SP0335D2Sx-FZ750R65KE3 (slave) to drive up to 3 parallel-connected IGBT modules FZ750R65KE3.

The DC/DC power supply must be purchased as a separate unit.

For drivers adapted to other types of high-power and high-voltage IGBT modules, refer to

www.IGBT-Driver.com/go/plug-and-play

Features

- ✓ Plug-and-play solution
- ✓ Allows parallel connection of IGBT modules
- ✓ For 2-level, 3-level and multilevel topologies
- ✓ Fiber-optic links
- ✓ Duty cycle 0... 100%
- ✓ Active clamping of V_{ce} at turn-off
- ✓ Dynamic IGBT short-circuit protection
- ✓ Monitoring of supply voltage
- ✓ Monitoring of gate voltage
- ✓ Extremely reliable; long service life
- ✓ Shortens application development time
- ✓ Suitable for FZ750R65KE3

Applications

- ✓ Traction
- ✓ Railroad power supplies
- ✓ Light rail vehicles
- ✓ HVDC
- ✓ Flexibel AC transmission systems (FACTS)
- ✓ Medium-voltage converters
- ✓ Industrial drives
- ✓ Wind-power converters
- ✓ Medical applications
- ✓ Research
- ✓ and many others

Target Data Sheet

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 electrostatic-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.

Important Product Documentation

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 & Application Manual for 1SP0335 SCALE-2 IGBT Drivers" on www.IGBT-Driver.com/go/1SP0335.

When applying SCALE-2 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-2 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 Dimensions

Dimensions: See the relevant "Description and Application Manual"

Mounting principle: Connected to IGBT module with screws

Fiber-Optic Interfaces

Interface	Remarks	Part type #
Drive signal input	1SP0335V, fiber-optic receiver (Notes 1, 2)	HFBR-2522
Drive signal input	1SP0335S, fiber-optic receiver (Notes 1, 2)	HFBR-2412Z
Status output	1SP0335V, fiber-optic transmitter (Notes 1, 3)	HFBR-1522
Status output	1SP0335S, fiber-optic transmitter (Notes 1, 3)	HFBR-1412Z

Electrical Connectors

Interface	Remarks	Part type #
Power supply connector X1	On-board connector (Note 4)	214012
Bus connectors X2 and X3	On-board connectors (Note 5)	214013

Absolute Maximum Ratings

Parameter	Remarks	Min	Max	Unit
Supply voltage V_{DC}	VDC to GND	0	30	V
Gate peak current I_{out}	Note 6	-35	+35	A
Average supply current I_{DC}	Without parallel connection (Note 7)		150	mA
Average supply current I_{DC}	Note 7		t.b.d.	mA
Gate output power	Ambient temperature <70°C (Note 8)		t.b.d.	W
	Ambient temperature 85°C (Note 8)		2	W
Switching frequency F			t.b.d.	kHz
DC-link voltage	Note 9		4400	V
Operating voltage	Collector-emitter voltage		6500	V_{peak}
Operating temperature	Note 10	-40	+70	°C
Storage temperature		-40	+90	°C

Recommended Operating Conditions

Power Supply	Remarks	Min	Typ	Max	Unit
Supply voltage V_{DC}	To GND	t.b.d.	25	t.b.d.	V

Electrical Characteristics

Power Supply	**Remarks**	**Min**	**Typ**	**Max**	**Unit**
Supply current I_{DC}	Without load, only 1SP0335x2Mx		45		mA
Supply current I_{DC}	Without load, per additional 1SP0335D2Sx		20		mA
Power Supply Monitoring	**Remarks**	**Min**	**Typ**	**Max**	**Unit**
Supply threshold V_{iso}-V_{ee}	Clear fault	12.1	12.6	13.1	V
	Set fault (Note 11)	11.5	12.0	12.5	V
Monitoring hysteresis	Set/clear fault	0.35			V
Supply threshold V_{ee}-V_{COM}	Clear fault	5	5.15	5.3	V
	Set fault (Note 11)	4.7	4.85	5	V
Monitoring hysteresis	Set/clear fault	0.15			V
Gate Monitoring	**Remarks**	**Min**	**Typ**	**Max**	**Unit**
Turn-on threshold $V_{GE,on,min}$	G_{mean} to E, set fault (Note 12)		12.9		V
Turn-off threshold $V_{GE,off,max}$	G_{mean} to COM, set fault (Note 12)		2.4		V
Filter delay	Turn-on		28		µs
	Turn-off		42		µs
Bus to 1SP0335D2Sx	**Remarks**	**Min**	**Typ**	**Max**	**Unit**
Supply voltage			VDC		V
Turn-on command	To COM		15		V
Turn-off command	To COM		0		V
Short-circuit Protection	**Remarks**	**Min**	**Typ**	**Max**	**Unit**
Static Vce-monitoring threshold	Between auxiliary terminals (Note 13)		275		V
Response time	DC-link voltage = 4400V (Note 14)		7.2		µs
	DC-link voltage = 3600V (Note 14)		9.4		µs
	DC-link voltage = 2800V (Note 14)		13.2		µs
Delay to IGBT turn-off	After the response time (Note 15)		2.4		µs
Timing Characteristics	**Remarks**	**Min**	**Typ**	**Max**	**Unit**
Turn-on delay $t_{d(on)}$	Note 16		215		ns
Turn-off delay $t_{d(off)}$	Note 16		230		ns
Output rise time $t_{r(out)}$	G to E (Note 17)		t.b.d.		ns
Output fall time $t_{f(out)}$	G to E (Note 17)		t.b.d.		ns

Timing Characteristics	Remarks	Min	Typ	Max	Unit
Transmission delay of fault state	Note 18		90		ns
Delay to clear fault state	Note 19		11		µs
Acknowledge delay time	Note 20		70		ns
Acknowledge pulse width	On host side		700	1050	ns

Gate output	Remarks	Min	Typ	Max	Unit
Turn-on gate resistor $R_{g(on)}$	Note 21		1		Ω
Turn-off gate resistor $R_{g(off)}$	Note 21		7.5		Ω
Auxiliary gate capacitor C_{ge}			not assembled		nF
Gate voltage at turn-on	Note 22		15		V
Gate-voltage at turn-off	Note 22		-10		V
Gate resistance to emitter			22		kΩ

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

Footnotes to the Key Data

1) The transceivers required on 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
2) The recommended transmitter current at the host controller is 20mA. A higher current may increase jitter or delay at turn-off.
3) The typical transmitter current at the gate driver is 18mA. In case of supply undervoltage, the minimum transmitter current at the gate driver is 12mA: this is suitable for adequate plastic optical.
4) The customer-side connector is not supplied with the gate driver, but via ERNI. Recommended cables: order code 839196 (length 450mm, connectors on both sides) or order code 839159 (length 200mm, connector on one side). Refer to www.IGBT-Driver.com/go/erni.
5) This connectors are to be used to connect 1SP0335x2Mx-xxx (master) to 1SP0335D2Sx-xxx (slaves) if parallel connection of IGBT modules is required. Recommended cable: order code 839076 (length 500mm, connectors on both sides). Refer to www.IGBT-Driver.com/go/erni.
6) The gate current is limited by the gate resistors located on the driver.
7) If the specified value is exceeded, this indicates a driver overload. It should be noted that the driver is not protected against overload.
8) If the specified value is exceeded, this indicates a driver overload. It should be noted that the driver is not protected against overload. From 70°C to 85°C, the maximum permissible output power can be linearly interpolated from the given data.
9) This limit is due to active clamping. Refer to "Description & Application Manual for 1SP0335 SCALE-2 IGBT Drivers". Note that a dynamic active clamping function will be implemented in later series. It will allow to increase slightly the max. DC-Link voltage when the IGBT is not switching (e.g. after emergency shut-down).
10) Only valid for ENG samples. The max. temperature will be increased to 85°C in later series.
11) Undervoltage monitoring of the supply voltage (Viso to Vee and Vee to COM which correspond with the approximate turn-on and turn-off gate-emitter voltages). If the corresponding voltage drops below this limit, all paralleled IGBTs (master and slaves) are switched off and a fault is transmitted to the status output.
12) The mean value $V_{GE,mean}$ of all gate voltages (master and all slaves) is filtered and compared to the given values at turn-on and turn-off. If the specified values are exceeded ($V_{GE,mean}<V_{GE,on,min}$ at turn-on resp. $V_{GE,mean}>V_{GE,off,max}$ at turn-off) the driver turns-off all parallel-connected IGBTs and a fault is transmitted to the status output.

13) A dynamic Vce protection is implemented on the driver. The maximum allowed Vce voltage at turn-on is dynamically adjusted in order to better fit to the IGBT characteristics at turn-on. At the end of the turn-on process the given static value applies.
14) The resulting pulse width of the direct output of the gate drive unit for short-circuit type I (excluding the delay of the gate resistors) is the sum of response time plus delay to IGBT turn-off.
15) The turn-off event of the IGBT is delayed by the specified time after the response time.
16) Including the delay of the 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).
17) Refers to the direct output of the gate drive unit (excluding the delay of the gate resistors).
18) Delay of external fiber-optic links. Measured from the driver secondary side (ASIC output) to the optical receiver on the host controller.
19) Measured on the host side. The fault status on the secondary side is automatically reset after the specified time.
20) Including the delay of the 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.
21) The gate resistors can be leaded or surface mounted. CONCEPT reserves the right to determine which type will be used. Typically, higher quantities will be produced with SMD resistors and small quantities with leaded resistors.
22) The driver supply voltage VDC is split into two distinct voltages on the driver. The first one is the turn-on voltage which is regulated at about 15V. The difference between VDC and the turn-on voltage is the turn-off voltage which is not regulated and mainly dependent on the driver input voltage VDC.

Legal Disclaimer

Ordering Information

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

Interface	CONCEPT Driver Type #	Related IGBT
Fiber-Optic Interface [1)]	1SP0335V2M0-FZ750R65KE3	FZ750R65KE3
Fiber-Optic Interface [2)]	1SP0335S2M0-FZ750R65KE3	FZ750R65KE3

1) Fiber-optic interface with versatile link (HFBR-2522 and HFBR-1522)
2) Fiber-optic interface with ST (HFBR-2412Z and HFBR-1412Z)
See "Description & Application Manual for 1SP0335 SCALE-2 IGBT Drivers"

Product home page: www.IGBT-Driver.com/go/1SP0335

Refer to www.IGBT-Driver.com/go/nomenclature for information on driver nomenclature

Information about Other Products

For other drivers, evaluation systems product documentation and application support

Please click: www.IGBT-Driver.com

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