

# TOTAL POWER SOLUTION

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**PRODUCT CATALOG**

2023

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2023 **Print.**

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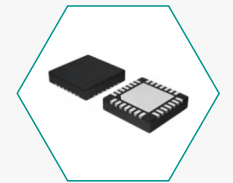
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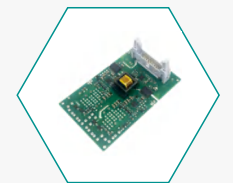
# TOTAL POWER SOLUTION

## About Us

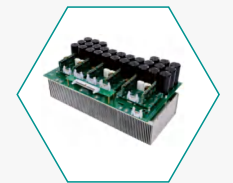
Hangzhou Firstack Technology Co., Ltd. was established in 2011, focusing on bringing customers total power solution with high reliability, high power density and intelligence. Firstack specializes in the R&D, production and sales of IGBT intelligent gate drivers, power stack, power semiconductor equipment and data services. The products of Firstack have been widely used in renewable energy power generation and energy storage, new energy vehicles, rail, power grids and so on, and have reached cooperation with many leading enterprises in the industry.



Driver IC



Gate driver



Power stack



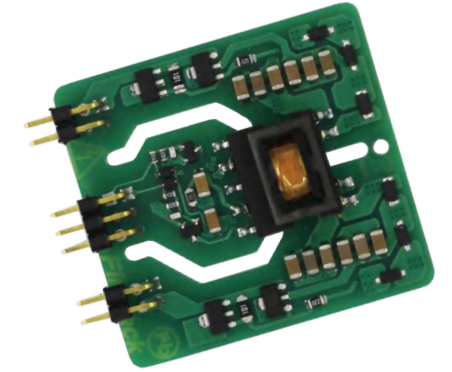
Testing equipment

# Gate Driver Cores

Product Photo	Part number	Output power per channel/ Gate peak current	Rated voltage	Commonly used power modules that match to the gate driver
	2FSC0110T12SA1	1W/10A	1200V	F3L300R07PE4, F3L150R07W2E3_B11 GD300MLT60C2S, SKM300MLI066TAT
	2FSC0210L-db	2W/10A	1200V	F3L300R07PE4, F3L150R07W2E3_B11GD300MLT60C2S SKM300MLI066TAT
	2FSC0210H-db	2W/10A	1700V	FF300R17KE4, CM300DX-34T, SKM300GB17E4
	2FHC0215	2W/15A	1200V	FF500R17KE4, FF800R12KE7 CM300DX-34T, TG600HF17M1-S300 SKM300GB17E4
	2FSC0435+	4W/35A	1700V	FF1400R17IP4, 2MBI600NXE-170-50 CM600DX-34T, GD600HFL170C6S SKM1400GB17R8, TG600HF17M1-S300
	2FSC0410-SiC	4W/10A	1700V	CAS300M17M2, FF3MR12KM1, WAB300M12BM3 BSM250D17P2E004, BSM600D12P3G001

# 2FSC0110T12SA1

2FSC0110T12SA1 is an easy-to-use gate driver core for small and medium power inverters, which is suitable for 2-level, NPC T and NPC I-type 3-level, and supports up to a maximum voltage of 1200V applications.



## Applications

- APF/SVG
- PV string inverter
- ESS PCS
- Induction heating power supply

## Key Features

- Dual-channel, suitable for 1200V IGBT
- Gate peak output current is 10A
- +15V(stable voltage)/-8V gate drive voltage
- 2×1W(2FSC0110T12SA1)

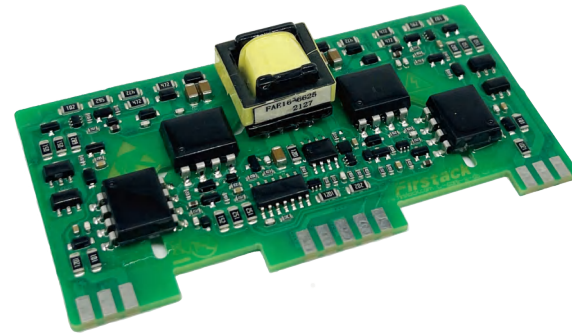
## Key Data Overview

Parameter	2FSC0110T12SA1	2FSC0210T12SA1
Power supply	12V	12V
Output power(85℃)	1W	2W
Gate peak current	10A	10A
Gate voltage	+15V/-8V	+15V/-8V
Dielectric test voltage	5kV <sub>RMS</sub>	5kV <sub>RMS</sub>
Operating temperature	-40℃~105℃	-40℃~105℃

## 2FSC0210L-db/2FSC0210H-db

**2FSC0210L-db and 2FSC0210H-db** are cost-effective small and medium power gate driver cores from Firstack.

**2FSC0210L-db** is suitable for 1200V IGBT,  
**2FSC0210H-db** is suitable for 1700V IGBT.



### Applications

- APF/SVG
- UPS
- PV string inverter
- ESS PCS
- Industrial drives
- Induction heating power supply

### Key Features

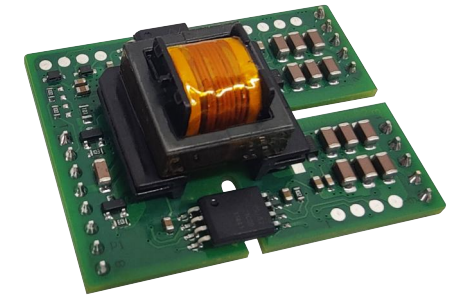
- Dual-channel, suitable for 1200V or 1700V IGBT
- Gate peak output current is 10A
- +15V (stable voltage)/-8V gate drive voltage
- 2×2 W
- IGBT short-circuit protection function
- Power supply undervoltage protection function
- Soft shut down

### Key Data Overview

Parameter	2FSC0210L-db	2FSC0210H-db
Nominal supply voltage	15V	15V
Output power(85℃)	2*2W(dual channel)	2*2W(dual channel)
Gate peak current	10A/-10A	10A/-10A
Gate voltage	15V/-8V	15V/-8V
Dielectric test voltage	4kV <sub>RMS</sub>	5kV <sub>RMS</sub>
Operating temperature	-40℃~85℃	-40℃~85℃
Undervoltage protection	Yes	Yes

## 2FHC0215

**2FHC0215** is a high-performance, dual-channel gate driver core developed independently by Firstack based on smart chip technology, supporting IGBT modules up to 1700V.



### Applications

- APF/SVG
- ESS PCS
- UPS
- Welding machine
- Industrial drives

### Key Features

- Dual-channel, suitable for 1700V IGBT
- 2W/15A
- IGBT short-circuit protection function
- Switching frequency up to 30kHz
- Soft shut down

### Key Data Overview

Parameter	2FHC0215
Output power per channel/Gate peak current	2W/15A
Type	Digital gate driver
PWM transmission method	Capacitor coupler
Soft shut down	Yes
Intelligent fault communication	Yes

## 2FSC0435+

2FSC0435+ is Firstack's digital gate driver core that integrates "intelligent fault management system" and "highly robust DC/DC", which solves the problems of gate driver reliability and adaptability in harsh electromagnetic field environment.



### Applications

- Wind power and PV
- Industrial power supply
- Rail
- High voltage SVG
- Variable-frequency drive
- UPS

### Key Features

- Dual-channel, suitable for 1700V IGBT
- Gate peak output current is 35A
- IGBT short-circuit protection function
- Switching frequency up to 20kHz
- Power supply undervoltage protection function
- Soft shut down
- Digitally controlled active clamping
- Intelligent fault management

### Key Data Overview

Parameter	2FSC0435+
Output power per channel/Gate peak current	4W/35A
Parallel connection	3×PrimePACK™
	6×EconoDUAL™
Type	Digital gate driver
Misoperation handling	Digital algorithm
Power supply reliability	Highly robust DC/DC
PWM transmission method	Optical coupler
Soft shut down	Yes
Intelligent fault communication	Yes
NPC 3-level timing management	Yes
Active clamping	Digitally controlled active clamping

## 2FSC0410-SiC

2FSC0410 is a highly reliable, flexible and intelligent digital SiC-MOSFET gate driver core of Firstack based on digital technology.



### Applications

- Smart grid
- Special power supply
- Rail
- Electronic transformer

### Key Features

- Dual-channel, suitable for 1700V IGBT
- Gate peak output current is 10A
- 2×4W
- Switching frequency up to 130kHz
- IGBT short-circuit protection function
- Power supply undervoltage protection function
- Soft shut down
- Intelligent fault management
- Miller clamping function







### Key Data Overview

Parameter	2FSC0410-SiC
Nominal supply voltage	12~15V
Output power per channel(85℃)	4W
Gate peak current	10A/-10A
Dielectric test voltage	5kV <sub>RMS</sub>
Operating temperature	-40℃~105℃
Protection function	Short-circuit, undervoltage, overvoltage
Intelligent fault communication	Yes
Miller clamping	Yes

## Plug-and-Play Gate Driver

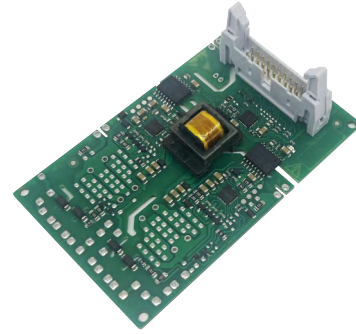
Product Photo	Product Mode	Output power per channel/ Gate peak current	Isolation voltage	Commonly used power modules that match to the gate driver
	2FHD0115	1.2W/20A	5kV <sub>RMS</sub>	FF600R17ME4, 2MBI600VN-170P-50, DIM600M1HS17-PA500, SEMiX603GB12E4p, TG600HF12M1-S3A00, 2MBI800XNE120-50
	2FSD0320T+	4W/35A	5kV <sub>RMS</sub>	FF1400R17IP4, 2MBI1400VXB-170E-50 SKM1400GB17R8, TG1000HF17H1-S300
	PM0538N	3W/38A	5kV <sub>RMS</sub>	FF1400R17IP4, 2MBI1400VXB-170E-50 SKM1400GB17R8, TG1000HF17H1-S300
	2FSD0410-62C	4W/10A	5kV <sub>RMS</sub>	FF1400R17IP4, 2MBI1400VXB-170E-50 SKM1400GB17R8, TG1000HF17H1-S300
	2FSD0420-EDC	4W/10A	5kV <sub>RMS</sub>	FF1400R17IP4, 2MBI1400VXB-170E-50 SKM1400GB17R8, TG1000HF17H1-S300
	2FSS0435	4W/35A	5kV <sub>RMS</sub>	2MBI600VN-170P-50, 2MBI600XNG-170-50 DIM600M1HS17-PA500 2MB1450VN-170-50
	HP1-39J-A	1W/5A	2.5kV <sub>RMS</sub>	FS400R07A1E3, TG400FF08S2-S3A00 GD400FFX65P3S, SGM400PB7B1TFM
	PM0438IP5-245G	4W/35A	5kV <sub>RMS</sub>	FF1800R17IP5 FF1800R12IE5
	PM140	7W/38A	5kV <sub>RMS</sub>	FF1000R17IE4, 2MBI1400VXB-120P-54 FF1800R17IP5, SKM1000GB17R8
	PM110TRP	8W/38A	5kV <sub>RMS</sub>	FF1000R17IE4, 2MBI1400VXB-120P-54, SKM1000GB17R8

## Plug-and-Play Gate Driver

Product Photo	Product Mode	Output power per channel/ Gate peak current	Isolation voltage	Commonly used power modules that match to the gate driver
	1FSD08110	8W/110A	6kV <sub>RMS</sub>	FZ1500R33HE3, 1MBI2400VD-170E CM1200HC-66H, TIM1500ESM33-PSA012 5SNA 1500E330305, GD1500SGL330A4S
	1FSD215	8W/110A	6kV <sub>RMS</sub>	FZ2400R17HE4, CM1500HC-66R CM800HC-66H, 5SNA1500E330305 5SNA1200E330100
	2FSD0338	3W/38A	6kV <sub>RMS</sub>	TIM500GDM33-PSA011, 5SND 0500N330300, TIM1000ECM33-PSA011
	SK08110	8W/110A	10.5kV <sub>RMS</sub>	TG3000SW45ZC-P200, ST1500GXH24
	HV1027P	8W/27A	15kV <sub>RMS</sub>	FZ1200R45KL3_B5, MBN1200H45E2-H CM1200HG-90R, 5SNA1200G450350 YMIF1200-45, TIM1200ASM45
	HMV10126	10W/126A	10.5kV <sub>RMS</sub>	FZ1500R33HL3, 5SNA 1200E330100 CM1200HG-90R, TG3000SW45ZC-P200

## 2FHD0115

**2FHD0115** is a high-performance, dual-channel, plug-and-play gate driver developed independently by Firstack based on intelligent chip technology for IGBT modules up to 1700V in the EconoDUAL™ package.



### Applications

- Industrial drives
- APF/SVG
- Industrial drives
- UPS
- ESS PCS

### Key Features

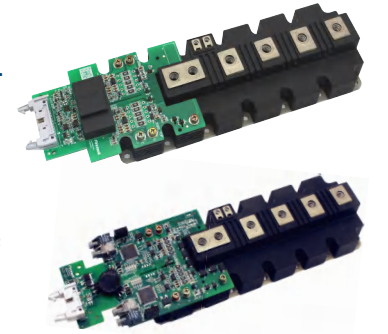
- Dual-channel, suitable for 1200V IGBT
- 2x2W
- IGBT short-circuit protection function
- Switching frequency up to 20kHz
- Power supply undervoltage protection function
- Soft shut down
- Highly robust DC/DC

### Key Data Overview

Parameter	2FHD0115
Output power per channel(85 °C)	1.5W
Gate peak current	15A
Soft shut down	Yes
PMW transmission	Optical coupler
Short-circuit protection	Diode detection
Operating temperature	-40 °C~85 °C
Intelligent fault communication	Yes

## PM0538N/2FSD0320T+

**PM0538-N and 2FSD0320T+** series gate drivers are designed for use with PrimePACK™ packaged IGBT modules and compatible modules.



**2FSD0320T+** is Firstack's plug-and-play gate driver based on the 2FSC0435+ core, which is pin-compatible with existing product sizes in the market. The gate driver is based on a digitally controlled chip, providing different protection strategies to optimise the system application according to different applications.

### Applications

- Industrial drives
- Industrial servo
- Industrial power supply
- UPS
- Energy storage

### Key Features

- Dual-channel, suitable for 1700V IGBT
- Gate peak output current is 35A
- Switching frequency up to 20kHz
- Power supply undervoltage protection function
- Soft shut down
- Intelligent fault management
- Highly robust DC/DC

### Key Data Overview

Parameter	2FSD0320T+	PM0538-N
Output power per channel	4W	3W
Soft shut down	Yes	Yes
PWM transmission	Optical coupler	Optical fiber
Operating temperature	-40° C~85 °C	40° C~85 °C
Short-circuit protection	Diode detection	Diode detection
Intelligent fault communication	Yes	Optional



## 2FSD0410-62C/2FSD0420-EDC

The two are plug-and-play gate drivers developed by Firstack based on the 2FSC0410-SiC digital gate driver core for 62mm and EconoDUAL™ package SiC-MOSFET, respectively



### Applications

- Smart grid
- Special power supply
- Rail
- Electronic transformer

### Key Features

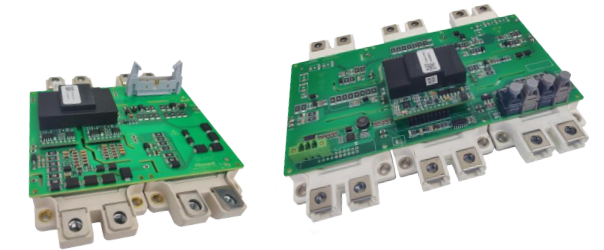
- Dual-channel, suitable for 1700V SiC MOSFET
- Gate peak output current is 10A/20A
- Switching frequency up to 130kHz
- Power supply undervoltage and overvoltage protection
- Short-circuit protection
- Soft shut down
- Intelligent fault management
- Temperature data acquisition

### Key Data Overview

Parameter	2FSD0410-62C	2FSD0420-EDC
Nominal supply voltage	12~15V	12~15V
	12~15V	12~15V
Output power per channel(85 °C)	4W	4W
Gate peak current	10A/-10A	20A/-15A
Clearance distance(primary to secondary side)	8mm	8mm
Creepage distance(primary to secondary side)	10.5mm	10.5mm
Dielectric test voltage	5kV <sub>RMS</sub>	5kV <sub>RMS</sub>
Operating temperature	40 °C~85 °C	-40 °C~85 °C

## 2FSS0435

2FSS0435 is a gate driver solution based on Firstack's digital intelligent gate driver core 2FSC0435, and developed for EconoDUAL™ package modules, 2 in parallel and 3 in parallel.



### Applications

- Power quality
- Industrial drives
- Industrial power supply
- Energy storage

### Key Features

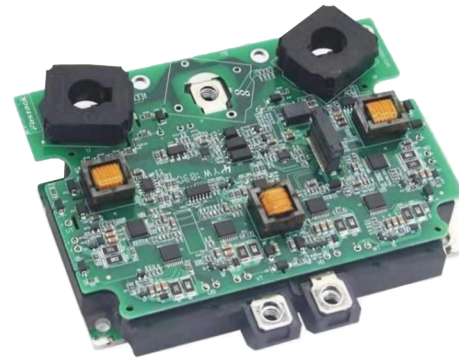
- Dual-channel, suitable for 1700V IGBT
- Gate peak output current is 35A
- IGBT short-circuit protection function
- Switching frequency up to 20kHz
- Power supply undervoltage protection function
- Soft shut down
- Digitally controlled active clamping
- Intelligent fault management

### Key Data Overview

Parameter	2FSS0435
Output power per channel	4W
Gate peak current	35A
Gate voltage	+15.5V/-8V
Operating temperature	-40 °C~105 °C
Protection function	Short-circuit, undervoltage, active clamping
Intelligent fault communication	Yes

## HP1-39J-A

**HP1-39J-A** is Firstack's plug-and-play IGBT gate driver for new energy vehicles based on the HybridPACK™ and HybridPACK™-DC6 package modules. HP1-39J-A adopts board-to-board plug-and-play connectors to save wiring harness space and cost; adopts 0V reliable turn-off to reduce drive power consumption; integrates high-precision bus voltage and NTC temperature isolation sampling, and meets the applications of high power density and high reliability of electric vehicles.



### Applications

- New energy vehicles

### Key Features

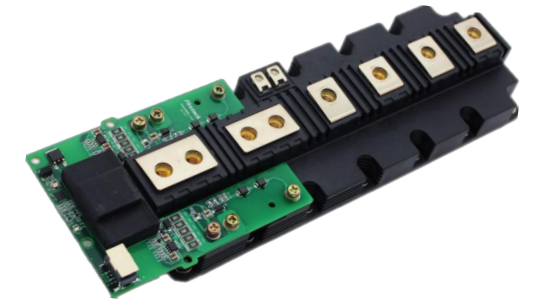
- Board-to-board plugging saves wiring harnesses and connectors
- Plug-and-play, compatible with HP1 modules
- 0V reliable turn-off, lower drive power consumption, fewer devices
- Short-circuit protection/undervoltage protection/Soft shut down
- Built-in NTC temperature sampling, ±1 °C
- Built-in bus voltage sampling, ±1%
- Operating temperature range: -40 °C~105 °C

### Key Data Overview

Parameter	Min	Typ	Max	Unit
Nominal supply voltage	6.5	7	7.5	V
Output power per channel	-	-	1	W
Gate peak current	-	-	5	A
Gate voltage	-	15/0	-	V
Clearance distance(primary to secondary side)	4	-	-	mm
Creepage distance(primary to secondary side)	5.5	-	-	mm
Dielectric test voltage	-	-	2500	V <sub>RMS</sub>
Operating temperature	-40	-	105	°C

## PM0438IP5-245G

**PM0438IP5-245G** is a plug-and-play digital gate driver for PrimePACK™3+ power modules. It can support 1700V modules and is mainly used in new energy buses, mining trucks and construction machinery.



### Applications

- Motorized mining trucks
- Construction machinery
- Industrial drives
- Industrial servo
- Industrial power supply
- Energy storage

### Key Features

- Compact, highly reliable
- Support 1700V PrimPACK™ package module
- 4W@85° C
- Short-circuit protection/undervoltage protection/soft shut down
- Built-in NTC temperature sampling, ±1 °C
- PWM interlocking function
- Highly robust DC/DC

### Key Data Overview

Parameter	PM0438IP5-245G
Nominal supply voltage	15V
Output power per channel(85 °C)	4W
Gate peak current	38A
Gate voltage	14.5V-15.5V/-7.8V-7.1V
Clearance distance(primary to secondary side)	-
Creepage distance(primary to secondary side)	-
Dielectric test voltage	5kV <sub>RMS</sub>
Operating temperature	-40 °C -100 °C

## PM140/PM110TRP

**PM140** is a 2-in-parallel plug-and-play gate driver for the PrimePACK™ module based on Firstack digital intelligent IGBT gate driver.

**PM110TRP** is a 3-in-parallel plug-and-play integrated gate driver for PrimePACK™ modules based on the Firstack digital intelligent IGBT gate driver.



### Applications

- Wind power
- Photovoltaic energy storage system
- Industrial drives
- Smart grid

### Key Features

#### PM140 Key Features

- Support PP3 module 2 in parallel
- Gate peak current is 38A
- 2×7W
- Short-circuit protection, undervoltage protection
- Overheating protection
- Highly robust DC/DC

#### PM110TRP Key Features

- Support PP3 module 3 in parallel
- Gate peak current is 38A
- 2×8W
- Short-circuit protection, undervoltage protection
- Overheating protection
- Highly robust DC/DC

### Key Data Overview

Parameter	PM140	PM110TRP
Nominal supply voltage	15V	24V
Output power per channel	7W	8W
Gate peak current	38A	38A
Gate voltage	15V/-15V	15V/-15V
Clearance distance(primary to secondary side)	9mm	9mm
Creepage distance(primary to secondary side)	15mm	14mm
Operating temperature	-40 °C~85 °C	-40 °C~85 °C
PWM connector	Optical interface	Optical interface
Parallel connection number	2 in parallel	3 in parallel

## 1FSD08110

**1FSD08110** is an "enhanced reliable, extremely flexible and highly intelligent" digital driver based on Firstack's leading digital gate driver technology and powerful hardware design capability, which is suitable for 2-level and multi-level converter. Digitally control can optimize the IGBT switching performance. It integrates the "intelligent fault management system", which provides optimal protection for the IGBT. Its good EMC characteristics is suitable for harsh electromagnetic field environment.



### Applications

- Medium voltage industrial drives
- Rail
- Wind power
- HVDC
- High pressure dust removal
- FACTS

### Key Features

- Highly robust DC/DC, withstand GE short-circuit for any time
- Powerful drive capability: 8W/110A
- double short-circuit protection: di/dt+V<sub>CE</sub> desaturation
- Integrate digitally controlled active clamping and multi-level turn-off
- Support intelligent fault management

### Key Data Overview

Parameter	1FSD08110
Nominal supply voltage	15V
Output power per channel	8W
Gate peak current	110A
Gate voltage	15V/-10V
Clearance distance(primary to secondary side)	22mm
Creepage distance(primary to secondary side)	22mm
Operating temperature	-40 °C~85 °C

# 1FSD215

**1FSD215** is a 2-in-parallel plug-and-play gate driver developed for IHM package modules with high functionality and reliability for various applications such as ship propulsion, industrial drives, rail and smart grid.



## Applications

- Ship propulsion
- Industrial drives
- Smart grid
- Rail

## Key Features

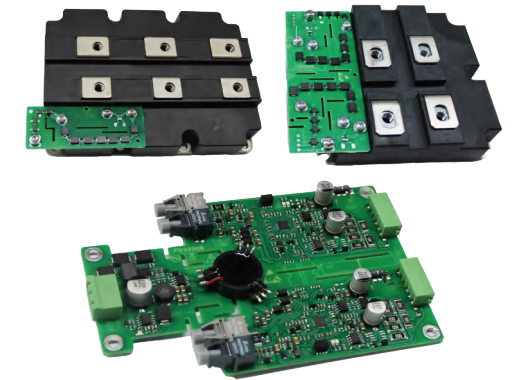
- Highly robust DC/DC
- Current sharing unbalance <5%
- Vce short-circuit protection
- Soft shut down

## Key Data Overview

Parameter	1FSD215
Nominal supply voltage	15V
Output power per channel	8W
Gate peak current	110A
Gate voltage	15V/-10V
Clearance distance(primary to secondary side)	19mm
Creepage distance(primary to secondary side)	19.5mm
Operating temperature	-40 °C~85 °C

# 2FSD0338

**2FSD0338** is a cost-effective optical port gate driver solution for dual-channel 3300V IGBT.



## Applications

- Rail
- Mine drive
- Industrial drives

## Key Features

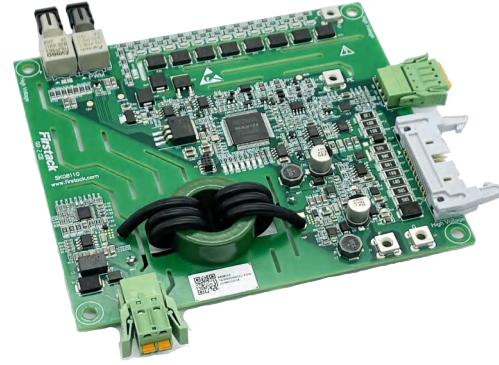
- Highly robust DC/DC
- Adaptation of various package modules
- Multi-level turn-off

## Key Data Overview

Parameter	2FSD0338
Nominal supply voltage	15V
Output power per channel	3W
Gate peak current	38A
Gate voltage	15V/-8V
Clearance distance(primary to secondary side)	18mm
Creepage distance(primary to secondary side)	22mm
Dielectric test voltage	6kV <sub>RMS</sub>
Operating temperature	-40 °C~85 °C

# SK08110

SK08110 is a digital gate driver developed for crimping modules. It integrates highly robust DC/DC, multi-level turn-off, digitally controlled active clamping, and other technologies.



## Applications

- Smart grid
- Offshore wind power
- Rail
- Industrial drives
- HVDC

## Key Features

- Highly robust DC/DC
- Multi-level turn-off
- Digitally controlled active clamping
- Intelligent fault management

## Key Data Overview

Parameter	SK08110
Nominal supply voltage	15V
Output power per channel	8W
Gate peak current	110A
Gate voltage	15V/-10V
Clearance distance(primary to secondary side)	32mm
Creepage distance(primary to secondary side)	66mm
Dielectric test voltage	10.5kV <sub>RMS</sub>
Operating temperature	-40 °C~85 °C

# HV1027P+FPS08-15K

HV1027P driver is a high-performance digital gate driver developed by Firstack for modules in IHV and the same package. It is suitable for 2-level and multi-level converter, digitally control can optimize the IGBT switching performance, and integrated with "intelligent fault management system" to provide optimal protection for IGBT. Its good EMC characteristics is suitable for harsh electromagnetic field environment. Additionally, it has double short-circuit protection with di/dt and V<sub>CE</sub> desaturation detection.



## Applications

- HVDC
- Offshore wind power
- Rail
- High voltage industrial drives

## Key Features

- Highly robust DC/DC, withstand GE short-circuit for any time
- Intelligent fault management system, "big data" management of field converters
- Wide power supply operating range: 14V-25V
- Double short-circuit protection: di/dt+V<sub>CE</sub> desaturation
- Integrate multi-level turn-on and turn-off technology

## Key Data Overview

Parameter	HV1027P	Parameter	FPS08-15K
Nominal supply voltage	15V/-10V	Input voltage	15V/24V
Output power per channel	8W	Power supply output power(≤65 °C)	8W
Gate peak current	27A/-30A	+15V output voltage	15V
Gate voltage	15V/-10V	-10V output voltage	-10V
Clearance distance(primary to secondary side)		Clearance distance(primary to secondary side)	50mm
Creepage distance(primary to secondary side)		Creepage distance(primary to secondary side)	60mm
Dielectric test voltage		Dielectric test voltage	15kV <sub>RMS</sub>
Operating temperature	-40 °C~85 °C	Operating temperature	-40 °C~85 °C

# HMV10126

HMV10126 is suitable for 3300V/4500V/6500V common modules and crimped modules. 10W/126A hardware configuration makes it easy to support up to 3 modules in parallel ( $f \leq 2\text{kHz}$  according to different module part numbers), which further expands the capacity of the converter. HMV10126 is based on Firstack's leading digital gate driver technology, integrated with "intelligent fault management system", with good EMC characteristics, suitable for harsh electromagnetic field environment, and has been widely used in various fields such as rail and smart grid.



## Applications

- Rail
- Industrial drives
- Smart grid

## Key Features

- Highly robust DC/DC, withstand GE short-circuit for any time
- Intelligent fault management system, "big data" management of field converters
- Integrate multi-level turn-on and turn-off technology
- Integrate overcurrent and di/dt protection
- Support IHM 3 in parallel

## Key Data Overview

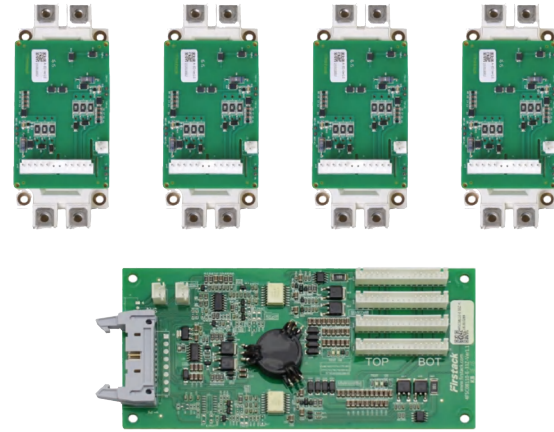
Parameter	HMV10126
Nominal supply voltage	15V/24V
Output power per channel	10W
Gate peak current	126A
Gate voltage	15V/-10V
Clearance distance(primary to secondary side)	42mm
Creepage distance(primary to secondary side)	65mm
Operating temperature	-40 °C~85 °C

# Application Specific Gate Driver Solutions

Product Photo	Part number	Output power per channel/ Gate peak current	Isolation voltage	Commonly used power modules that match to the gate driver
	4FSC08110	110A/6W	5kV <sub>RMS</sub>	FF600R12ME4, 2MBI800U4G-120 CM450DX-24T1, SEMiX603GB12E4Ip
	6FSC08110	110A/8W	5kV <sub>RMS</sub>	FF450R12ME4, 2MBI600VN-170-50 FF1000R17IE4, 2MBI1400VXB-170E-50 FF1800R17IP5
	ED - WP - CA series	108A/4W	5.7kV <sub>RMS</sub>	FF600R12ME4, FF600R17ME4, FF450R17ME4, FF1800R17IP5, FF1400R17IP4, FF1000R17IE4
	9FSC0210T17A2C	10A/2W	5kV <sub>RMS</sub>	FF600R12ME4, FF600R17ME4, FF450R17ME4, FF1800R17IP5, FF1400R17IP4, FF1000R17IE4

## 4FSC08110

**4FSC08110** is an IGBT gate driver developed for EconoDUAL™, which supports 2~4 in parallel. It adopts the gate driver core + adaptor board scheme, the IGBT parallel space can be matched arbitrarily, and the uneven flow is <5%. At the same time, the driver adopts the driver core + adapter board scheme, the IGBT parallel spacing can be matched arbitrarily, and the current sharing unbalance is <5%.



### Applications

- PV
- Energy storage
- High power industrial drives

### Key Features

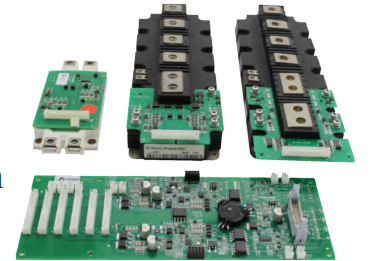
- Dual-channel, low-cost gate driver
- Gate peak current is 110A
- 2x6W
- IGBT short-circuit protection, undervoltage protection
- Soft shut down
- Support EconDual™ 2-4 in parallel

### Key Data Overview

Parameter	4FSC08110
Nominal supply voltage	15V
Output power per channel	6W
Gate peak current	110A
Gate voltage	15V/-15V
Clearance distance(primary to secondary side)	8.5mm
Creepage distance(primary to secondary side)	8.5mm
Dielectric test voltage	5kV <sub>RMS</sub>
Operating temperature	-40 °C~85 °C

## 6FSC08110

**6FSC08110** is an adaptor board based on Firstack digital intelligent IGBT gate driver, and developed for EconoDUAL™ and PrimePACK™ package modules. It needs to be used with the corresponding A-ED, A-PM and A-PM-IP5. The digital gate driver core board can provide 8W output power per channel and 110A gate peak current, and can support EconoDUAL™ modules 2 to 6 in parallel, and PrimePACK™ modules 2 to 3 in parallel. It is compatible with fibre-optic/electrical interface and integrates six isolated NTC temperature sampling and protection, which allows real-time monitoring of the operating temperature of the parallel modules.



### Applications

- Wind power
- Photovoltaic energy storage system
- Industrial drives
- Smart grid

### Key Features

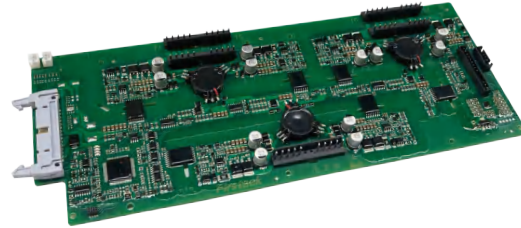
- Dual-channel, suitable for 1200V-1700V IGBT
- Gate peak current is 110A
- 2x8W
- IGBT short-circuit protection, undervoltage protection
- Soft shut down
- Integrate 6-channel temperature sampling
- Support EconDual™ 2-6 in parallel

### Key Data Overview

Parameter	6FSC08110
Nominal supply voltage	15V
Output power per channel	8W
Gate peak current	110A
Gate voltage	15V/-15V
Clearance distance(primary to secondary side)	9mm
Creepage distance(primary to secondary side)	10.5mm
Operating temperature	-40 °C~85 °C
IGBT module voltage	1200V/1700V

## ED - WP - CA series

ED-WP-CA series is a high-performance digital gate driver developed for I-type 3-level topology, which integrates the functions of 3-level timing management, multi-level turn-off, intelligent fault location, and multi-channel temperature sampling.



### Applications

- PV
- Wind power
- PV string inverter
- Energy feedback
- Industrial drive

### Key Features

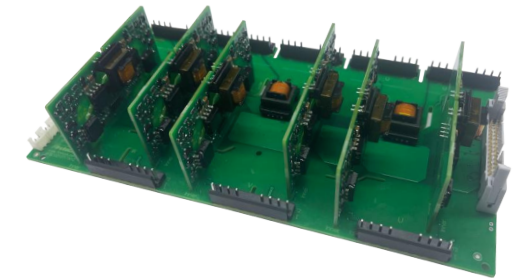
- Compatible with NPC and ANPC topology
- Multi-level turn-off
- 3-level timing management
- Multi-channel isolated temperature sampling

### Key Data Overview

Parameter	ED-WP-CA
Nominal supply voltage	15V
Output power per channel(85℃)	4W
Gate peak current	108A
Gate voltage	15V/-8V
Clearance distance(primary to secondary side)	14.5mm
Creepage distance(primary to secondary side)	15mm
Dielectric test voltage	5.7kV <sub>RMS</sub>
Operating temperature	-40℃~85℃

## 9FSC0210T17A2C

9FSC0210T17A2C is an IGBT gate driver developed specially for 1140Vac 3-level inverters. It is an NPC I-type three-phase gate driver solution specially developed with the 2FSC0210H-db driver core.



### Applications

- APF/SVG
- Energy storage inverter
- Mine drive
- Charging pile
- Metro energy feedback

### Key Features

- 9-channel NTC sampling, isolated output
- Suitable for up to 1700 EconoDUAL™ or 62 mm module
- Short-circuit protection(soft shut down)undervoltage protection
- IGBT short-circuit protection, undervoltage protection
- Timing protection
- Optical coupler isolation, stable EMC characteristics

### Key Data Overview

Parameter	9FSC0210T17A2C
Nominal supply voltage	15V
Output power per channel	2W
Gate peak current	10A
Gate voltage	15V/-7V
Clearance distance(primary to secondary side)	9mm
Creepage distance(primary to secondary side)	10mm
Dielectric test voltage	5kV <sub>RMS</sub>
Operating temperature	-40℃~85℃



# Power Stack

## 380V/150A Single-Phase Power Stack-FPI-2FSC0210L-db-B3

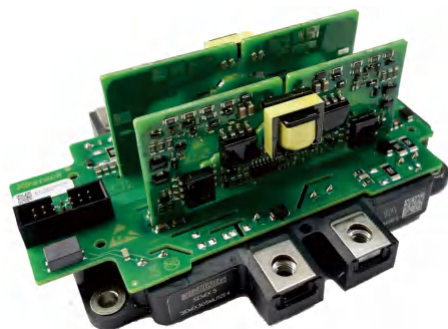


Two IGBTs in parallel installation unevenness <50um

Parameter	
Power rating	100kVA
Rated voltage/current	380V/150A
DC voltage	800V
Typical switching frequency	20kHz
Topology	Single phase/NPC I-type 3-level
Power stack component	Integrated IGBT, absorption capacitor
Gate driver protection function	Short-circuit soft shut down/ power supply undervoltage protection/ fault timing protection/ GE short-circuit protection
Current or NTC sampling	Dual-channel NTC sampling, maximum temperature output/ temperature difference protection
DC capacitance*	External DC capacitor board
Dimensions	140*108*54mm <sup>3</sup>
Applications	Energy storage/APF/SVG/ power supply/charging pile

\*Note: Firststack provides DC capacitor board design reference

## 690V/150A Single-Phase Power Stack-FPI-2FSC0210L-db-A5



Systematic cost reduction 50%\*

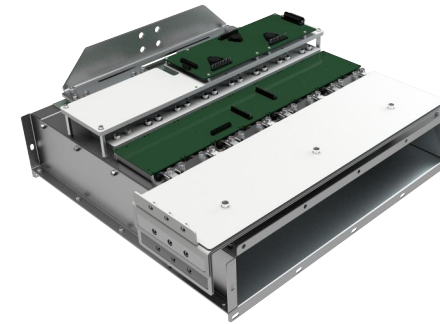
\*Compared based on Firststack power schemes and sample product power schemes

Parameter	
Power rating	180kVA
Rated voltage/current	690V/150A
DC voltage	1600V
Typical switching frequency	20kHz
Topology	Single phase/NPC I-type 3-level
Power stack component	Integrated IGBT
Gate driver protection function	Short-circuit soft shut down/ power supply undervoltage protection/fault timing
Current or NTC sampling	NTC terminals lead directly to the connector
DC capacitance*	External DC capacitor board
Dimensions	140*104*60mm <sup>3</sup>
Applications	Energy storage/APF/SVG/power supply/charging pile

\*Note: Firststack provides DC capacitor board design reference

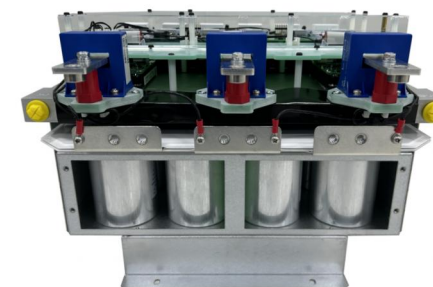
# Power Stack

## MW Level Energy Storage PCS Power Stack-FPS150HA124TA002



Parameter	
Power rating	1.725MW
Cooling method	Air cooling
Rated voltage/current	690V/1442A
DC voltage	1500VDC
DC voltage	1500VDC
Switching frequency	3.5 kHz
IGBT package/topology	EconoDUAL™ package/NPC I-type 3-level 4 in parallel
NTC sampling	Integrated 12-channel NTC sampling, isolated output
Gate driver protection function	Short-circuit soft shut down/ power supply undervoltage protection/ intelligent timing management/multi-level turn-off/ intelligent fault communication/ encrypted communication protocol
Power stack component	IGBT, radiator, gate driver board, DC busbar, AC copper busbar
Dimensions	621.5*538*222mm <sup>3</sup>
Applications	Energy storage/high power supply / inverters

## 750V/350A Three-Phase Power Stack-FPS036TA121XWP001



Parameter	
Power rating	450kW
Cooling method	Liquid cooling
Rated voltage/current	750V/350A
DC voltage	1600V <sub>DC</sub>
Switching frequency	3.5 kHz
IGBT package/topology	EconoDUAL™ package/3-phase 3-level ANPC
NTC sampling	Integrated 9-channel NTC sampling, isolated output
Gate driver protection function	Short-circuit soft shut down/ power supply undervoltage protection/ intelligent timing management/ multi-level turn-off/ intelligent fault communication
Power stack component	IGBT, radiator, gate driver board, DC busbar, AC copper busbar
Dimensions	424*324.5*451mm <sup>3</sup>
Applications	Energy storage system converter

# ME300D-Laboratory dynamic testing equipment

## Wide-range, multi-function laboratory dynamic testing solution



- Highlights**
- Wide testing range**  
 Voltage range up to 6000V, current range up to 10000A, covering multi packaged power devices
  - Specially designed power supply system**  
 Adaptive voltage-balancing technology, supporting dynamic test for 3-level topology
  - Intelligent testing software**  
 Automatic testing and report generation
  - Optional automation fixtures**  
 Supporting automatic testing for power module with multiple devices

# ME300D Technical Specifications

Device under test	IGBT, SiC MOSFET, Power Stack
Test items	Single pulse, double pulse, RBSOA, SCSOA, parallel current sharing, narrow pulse, dead time and stray inductance calculation, device comparison
Testing range	Voltage range from 20V to 6000V; Current range from 50A to 10000A
Software functions	Automatic report generation, $V_{CEmax}$ risk prediction, data management and analysis, IGBT datasheet library
Load inductor	10/20/50/100/200/500μH(optional automatic switching device)
Heat platform	Room temperature ~ 200°C
Equipment stray inductor	Busbar stray inductance 15 ~ 25nH; TO-247 fixture stray inductance <10nH
Automation fixture	Automatic test of six devices in three-phase power module
Testing fixture clip	TO-247 package (adjustable gate voltage: negative voltage - 15-0V, positive voltage 10-25V, voltage accuracy 0.1V, stray inductance <10nH, supporting optical isolated probe and shunt resistor testing)
	Multi-functional driver board (driving core + adapter board, adjustable $V_{GE}$ : -22 ~ +25V, adjustable switching resistance, compatible packages including EconoDual™3, HP Drive, 34mm, 62mm, EconoDual™3, HiPak, Hp1, etc.)
	HPD-SiC driver board (CMTI ≥ 100KV / us, $V_{GS}$ : -4 ~ +20V, short-circuit protection time 1.6us)

Parameters	Testing range	Parameters	Testing range
$t_{don}$	1-10000ns	$I_c$ (actual)	50-10000A
$t_r$	1-10000ns	$V_{CE}$ (actual)	20-6000V
$t_{doff}$	1-10000ns	$I_{RM}$	20-8000A
$t_f$	1-10000ns	$V_{RM}$	20-6000V
$t_{on}$	1-10000ns	$-d_{rr}/d_t$	10-50000A/us
$t_{off}$	1-10000ns	$V_{GEmax}$	0-30V
$t_{rr}$	1-10000ns	di/dt(Diode)	10- 50000A/us
$E_{on}$	1-10000mJ	dv/dt(Diode)	10- 50000A/us
$E_{off}$	1-10000mJ	$t_{SC}$	1-100μs
$E_{rec}$	1-10000mJ	$E_{SC}$	0-100J
$E_{tot}$	1-10000mJ	$Q_G$	10-1000000nC
$V_{CEmax}$	20-7000V	$I_{SC}$	10-12000A
di/dt(on)	10- 50000A/us	$a_{static}$	0-100%
dv/dt(on)	10- 50000V/us	$a_{on}$	0-100%
di/dt(off)	10- 50000A/us	$a_{off}$	0-100%
dv/dt(off)	10- 50000V/us	$t_{D Tmin}$	0-30μs

# ME300D-SE-Laboratory dynamic equipment

Cost-effective laboratory solution for dynamic characteristics testing



### Highlights

#### DPowerTEST test software

- Support user-defined test items, test conditions and test standards
- Support multi - brand oscilloscope

#### Standard TO-247 fixture

- Stray inductance < 10nH
- Current detection compatible with shunt resistor and Rogowski coil

#### High-performance SiC driver

- CMTI ≥ 100KV/us,  $V_{GS}$ : -4~+20V, short circuit protection time < 2us

# ME300D-SE- Technical Specifications

Device under test	IGBT, SiC MOSFET
Test items	Single pulse, double pulse, SCSOA
Testing range	Voltage range from 20V to 1200V; Current range from 5A to 4000A, short-circuit current(maximum) 12000A
Software functions	User-defined test flow, freely callable subsystem (high voltage source, signal generator, heating table, load inductance, etc.), user-defined test standards, compatible with grand oscilloscope
Load inductor	10/20/50/100/200/500μH (Manual switching)
Temperature platform	Room temperature ~ 200°C
Testing fixture clip	TO-247 package (adjustable gate voltage adjustable: negative voltage - 15-0V, positive voltage 10-25V, voltage accuracy 0.1V, stray inductance < 10nH, supporting optical isolated probe and shunt resistor testing)
	Multi-functional driver board (driving core + adapter board, adjustable $V_{GE}$ : -22 ~ +25V, adjustable switching resistance, compatible packages including EconoDual™3, HP Drive, 34mm, 62mm, EconoDual™3, HiPak, Hp1, etc.)  HPD-SiC driver board (CMTI ≥ 100KV / us, $V_{GS}$ : -4 ~ +20V, short-circuit protection time 1.6us)

Parameters	Testing range	Parameters	Testing range
$t_{don}$	1-10000ns	$I_c$ (actual)	5-4000A
$t_r$	1-10000ns	$V_{CE}$ (actual)	20-1200V
$t_{doff}$	1-10000ns	$I_{RM}$	5-8000A
$t_f$	1-10000ns	$V_{RM}$	20-2000V
$t_{on}$	1-10000ns	$-d_{if}/d_t$	10-50000A/us
$t_{off}$	1-10000ns	$V_{GEmax}$	0-30V
$t_{rr}$	1-10000ns	di/dt(Diode)	10- 50000A/us
$E_{on}$	1-10000mJ	dv/dt(Diode)	10- 50000A/us
$E_{off}$	1-10000mJ	$t_{SC}$	1-100μs
$E_{rec}$	1-10000mJ	$E_{SC}$	0-100J
$E_{tot}$	1-10000mJ	$Q_G$	10-1000000nC
$V_{CEmax}$	20-2000V	$I_{SC}$	10-12000A
di/dt(on)	10- 50000A/us	$\alpha_{static}$	0-100%
dv/dt(on)	10- 50000V/us	$\alpha_{on}$	0-100%
di/dt(off)	10- 50000A/us	$\alpha_{off}$	0-100%
dv/dt(off)	10- 50000V/us	$t_{DTmin}$	0-30μs

# ME100DS-PIM-Dynamic and Static Equipment for production

# ME100DS-PIM- Technical Specifications

## Dynamic and Static ATE Test Solution for new power device



Based on the AccoTEST STS 8200 platform, with high efficiency and stability

Quantity of platform : 3000+  
Operating life: 10 years +

Dynamic and static Integrated machine, with two stations for parallel testing.

Dynamic: voltage: 1200V, current: 4000A  
Static: voltage: 2000V, current: 1000A/2000A

### Highlights

Specialized short circuit protection device, expanding the measurement range and rapidly protecting the test device and equipment.

Short circuit current(maximum): 12000A  
Short circuit protection time: <2us  
Stray inductance: ≤15nH

Device under test	IGBT, SiC MOSFET, GaN HEMT, IPM
Test items	Single pulse, double pulses, multi- pulses, diode dynamic characteristic, RBSOA, SCSOA Leakage current, breakdown voltage, on - state resistance voltage, forward voltage, Transconductance, NTC resistor
Testing range	Static: voltage: 2000V, current: 2000A Dynamic: voltage: 1200V, current: 4000A Short circuit current(maximum): 12000A
Software functions	Editable test conditions, visual waveform comparison, real-time production monitoring, automatic self-check and self-calibration, overcurrent protection
Load inductor	10/20/50/100μH(Customizable )
Heating range	Room temperature to 200°C
UPH	300UPH(Single-phase module test speed)
Stray inductance	≤15nH
Gate driver	Voltage: -30V~30V (up to 35V, ±0.10V) Q <sub>G</sub> : 1mA ~ 150mA
Gate resistance	Software control, multiple resistance (customizable)
Sampling equipment	Virtual oscilloscope(PICO): 200MHz, sampling rate(customizable), vertical resolution: 12-bit

Dc Parameters	Testing range	AC Parameters	Testing range
I <sub>GES</sub>	V <sub>GE</sub> -100V~100V I <sub>GE</sub> -10A~10A	IGBT Switching Test I <sub>CE</sub> , I <sub>CE_PEAK</sub> , V <sub>CE_PEAK</sub> , t <sub>on</sub> , t <sub>off</sub> , t <sub>don</sub> , t <sub>doff</sub> , T <sub>FI</sub> , T <sub>RI</sub> , T <sub>FV</sub> , T <sub>RV</sub>	Up To 1200V Up To 4000A
V <sub>th</sub>	V <sub>GE</sub> -100V~100V I <sub>GE</sub> -10A~10A	Diode Switching Test T <sub>rr</sub> , Q <sub>rr</sub> , E <sub>rr</sub> , I <sub>rr</sub> , di/dt <sub>(on)</sub> , di/dt <sub>(off)</sub> , dv/dt <sub>(on)</sub> , dv/dt <sub>(off)</sub>	Up To 1200V Up To 4000A
BV <sub>CES</sub>	V <sub>CE</sub> -2000V~2000V(Can upgrade to ±3000V) I <sub>CE</sub> -20mA~20mA	Short-Circuit Curre (SCSOA) T <sub>SC</sub> , I <sub>SC</sub> , V <sub>CE_PEAK</sub> , I <sub>CE_PEAK</sub>	Up To 1200V Up To 12000A
I <sub>CES</sub>	V <sub>CE</sub> -2000V~2000V(Can upgrade to ±3000V) I <sub>CE</sub> -20mA~20mA	I <sub>Latch</sub> I <sub>CE</sub> , V <sub>CE</sub> , V <sub>CE_PEAK</sub> , T <sub>FI</sub> , T <sub>FV</sub> , di/dt <sub>(on)</sub> , di/dt <sub>(off)</sub> , dv/dt <sub>(on)</sub> , dv/dt <sub>(off)</sub>	Up To 1200V Up To 4000A
V <sub>CEsat</sub>	V <sub>GE</sub> -100V~100V I <sub>GE</sub> -10A~10A V <sub>CE</sub> -100V~100V I <sub>CE</sub> 0~2000A	Q <sub>G</sub>	Up To 1200V Up To 4000A
V <sub>F</sub>	V <sub>GE</sub> -100V~100V I <sub>GE</sub> -10A~10A V <sub>CE</sub> -100V~100V I <sub>CE</sub> 0~2000A	RBSOA	Up To 1200V Up To 4000A
GFS	V <sub>GE</sub> 0~20V I <sub>CE</sub> 0~2000A V <sub>CE</sub> 0~30V		
NTC	V <sub>NTC</sub> -100V~100V I <sub>NTC</sub> -10A~10A		