Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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Solutions for Wind Energy Systems

Energy-efficient components and subsystems for high system reliability

www.infineon.com/windenergy

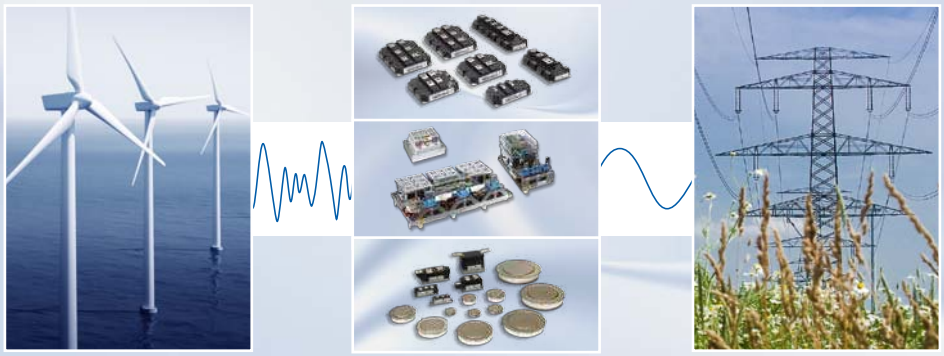
Contents

Introduction

Power semiconductors play a key role to produce energy from renewable sources. In wind turbines, power semiconductors are used to convert power and to couple the generator with the grid. They are also built into various auxiliary drives such as yaw drives, pitch drives, pumps and into protection circuits like crowbars.

Wind power converters control a number of vital functions and applications and therefore require power semiconductors of the highest quality standards. This applies in particular to offshore wind converters, which operate in exceptionally harsh environments exposed to salt, humidity etc. Rapid growth is projected for the offshore segment.

Wind energy turbines must also be designed to deliver maximum levels of availability in order to contribute to grid stability. This applies not only to the converter, but also to the various auxiliary drives mounted in different positions. Grid stability therefore depends on power semiconductor assemblies offering dynamic capabilities, outstanding functionality and superior reliability.

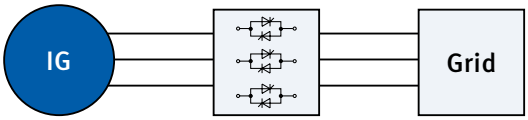


Power semiconductors:
From generator to grid

Topologies

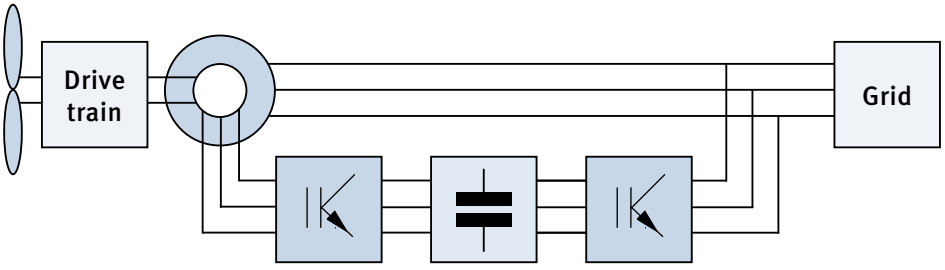
Fixed-speed generators

Fixed-speed designs are suited to generators up to 400 kW. New designs are usually based on semiconductor solutions to fulfill grid code requirements. Nevertheless, Infineon delivers the full range of grid coupling components, with thyristors and other bipolar semiconductors available as modules, discs and stacks.



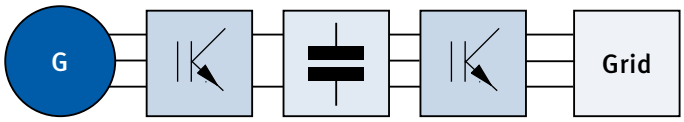
Doubly Fed Induction Generator (DFIG)

This speed-adjustable design is typically deployed in the power range between 400 kW and 2.500 kW. To control the full load only up to one third of the energy needs to be converted over power semiconductors in both directions. Infineon's IGBTs support optimum performance even at the limits of the operating range. High quality design, low voltage ride through (LVRT) capability and very low output frequencies meet high availability needs.



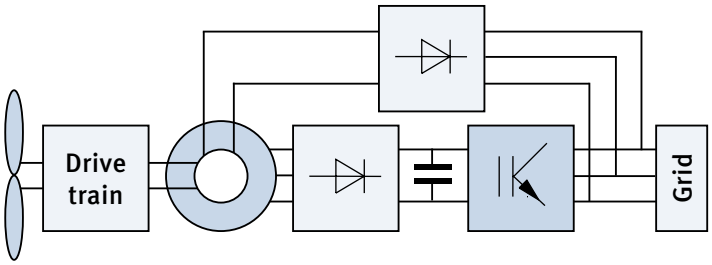
Permanent Magnet (PM) generators

Full converters for low-, medium- and high-speed generators provide maximum flexibility to meet LVRT and other grid stability requirements. High efficiency is mandatory and an active front-end inverter adapts variable power and frequency. This design reduces inductive component effort. Infineon's IGBTs enable modular and scalable system designs.



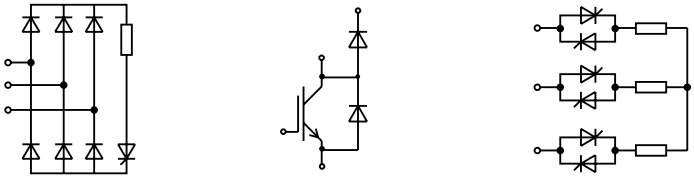
Electrical Excited (EE) generators

An EE generator feeds the inverter via a bipolar rectifier, with the generator voltage controlled by excitation. The grid inverter is controlled by an IGBT as the effect of excitation. This design is an established solution already successfully deployed in modern systems.



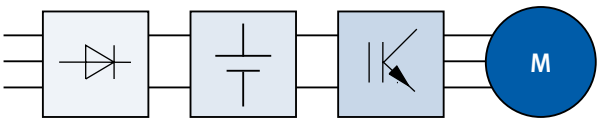
Protection circuits

Crowbars, choppers and active filters are important elements in wind turbine designs. Even though these components are not actively involved in feeding energy, they are needed to manage external impacts and fulfill grid stability requirements.



Auxiliary drives

Several drives are needed for a wind turbine design to function safely and properly. Yaw drives, pitch drives and pumps can be controlled by small inverters. An energy storage solution must be connected to the DC link in pitch control drives to enable emergency shutdown.



Overview of products supplied by Infineon

Inverter (p. 4/5)

Application	Stacks (p. 8)	IHM (p. 14)	PrimePACK™ (p. 12)	IHV (p. 16)	EconoDUAL™ 3 (p. 18)	EconoPACK™ + (p. 20)	Bipolar (p. 10)	Driver boards 2ED300C17 (p. 24)
PM (p. 5)	✔	✔	✔	✔	✔	✔	–	✔
DFIG (p. 4)	✔	✔	✔	✔	✔	✔	–	✔
EE (p. 5)	✔	✔	✔	✔	✔	✔	✔	✔

Protection circuits (p. 5)

Application	Stacks (p. 8)	IHM (p. 14)	Bipolar (p. 10)
Choppers	✔	✔	–
Crowbars	✔	–	✔

Auxiliary drives (p. 5)

Application	Low Power Econos (p. 22)	EconoDUAL™ 3 (p. 18)	Driver ICs 1ED020I12-B2 (p. 26)
Pitch control	✔	✔	✔
Yaw control	✔	✔	✔
Pump control	✔	✔	✔

Highest energy efficiency

Wide portfolio designed for the highest energy efficiency levels.
Our TRENCHSTOP™ IGBT with its trench gate and field stop concept has dramatically improved the static and dynamic losses of IGBT designs. This improved performance has made our power switches more efficient, increasing power density up to 50 percent. In addition, our zero defect strategy, coupled with the experience gained producing more than 1 million TRENCHSTOP™ IGBT wafers to date, is the best guarantee of lowest failure rates and highest reliability.

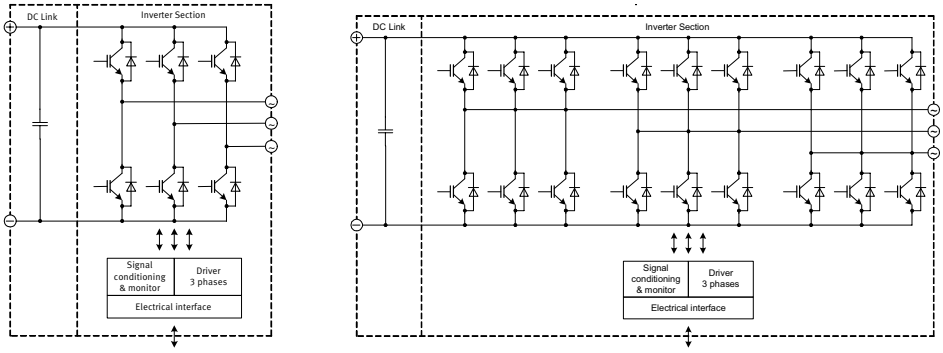
Key benefits:
- Industry-leading maximum operating junction temperature of 150°C
- Improved performance with lower electrical losses
- IGBT power modules offering highest quality and reliability

We have a global team of experienced application engineers providing advanced and cost-effective reference solutions and design support for our customers, thereby facilitating and shortening their time-to-market.

Environmental sustainability
- We have integrated environmental sustainability in our daily business and our strategy.
- We constantly reduce our environmental footprint.
- We enable energy-efficient end-products and applications.
- We enable a sustainable society by providing net environmental benefits.

Stacks

Our ModSTACK™ HD family is a complete power electronic switch assembly including our standard PrimePACK™ high-power IGBT half-bridge modules. The family supports nominal chip currents from 1000 A up to 3000 A at 1700 V.
The standard switch assemblies are equipped with the necessary components for current, voltage and temperature measurement. Features include monitoring functions for self-protection and liquid cooled heat sinks for thermal management with optimized performance. Vertically arranged AC power terminals are mechanically decoupled from the power terminals of the modules to give our customers maximum flexibility when connecting the power bus system.



Key benefits

- Highest power density with PrimePACK™ IGBT4 modules
- Wide product range supporting all applications
- Suited to standardized cabinet frame size
- High reliability and robust design
- Parallel operation possible
- Increased operating temperature T_{vjop} = 150°C with new IGBT4
- Low stray inductance
- Improved power cycling and thermal cycling capability
- Enlarged clearance and creepage distances
- Internal NTC sensor

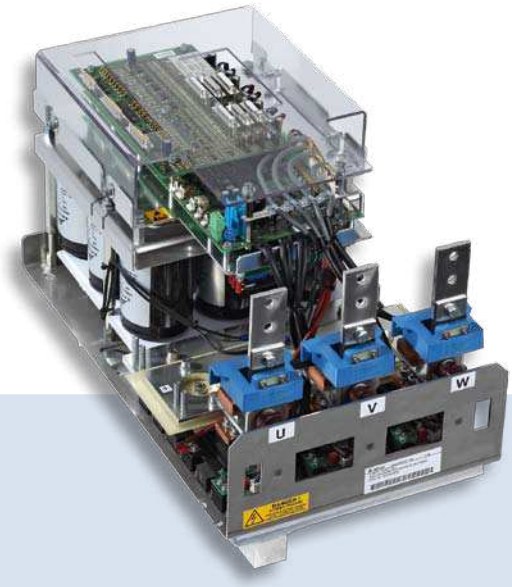
The ModSTACK™ HD stack works as a sub-assembly in a full converter system. The general control signals are supplied by a higher-level control unit provided by the customer. The ModSTACK™ HD family provides proven industry-standard electrical interfaces for regular operation and fault signal management.
The ModSTACK™ HD can work in stand-alone or parallel mode (master/slave configuration). Up to 8 MW is possible by paralleling up to 4 sub-assemblies. Symmetrical power layout and PWM control has to be provided by the end user.
Our ModSTACK™ HD family provides reliable and outstanding stack quality with optimized thermal management. The latest IGBT4 chip technology, combined with an in-built electronic controller and an optimized cooling concept, make this innovative solution ideal for a broad range of wind power systems.

IGBT4 1700 V_{CES}

V_{AC} = 690 V_{RMS} / V_{DC} = 1100 V

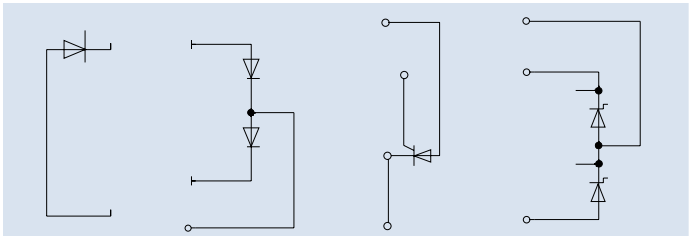
P_{max} [3] [kW]	I_{RMS} [1] [A]	f_{SW} [kHz]	f_{SWmax} [2] [kHz]	Stack type	Implemented IGBT4 modules	Topology	Case cooling	Width x depth x height [mm]
609	600	3	5	6MS10017E41W36460	3 x FF1000R17IE4	B6I	MS HD1 liquid (copper)	338 x 590 x 350
691	680	3	5	6MS10017E41W36775	3 x FF1000R17IE4	B6I	MS HD1 liquid (aluminum)	338 x 590 x 375
1219	1200	3	4	6MS20017E43W37032	6 x FF1000R17IE4	B6I	MS HD3 liquid (copper)	1090 x 596 x 342
1219	1200	3	4	6MS20017E43W38170[4]	6 x FF1000R17IE4	B6I	MS HD3 liquid (copper)	1090 x 596 x 342
1828	1800	3	3	6MS30017E43W35613	9 x FF1000R17IE4	B6I	MS HD3 liquid (copper)	1090 x 596 x 342
1828	1800	3	4	6MS30017E43W38169[4]	9 x FF1000R17IE4	B6I	MS HD3 liquid (copper)	1090 x 596 x 342
1828	1800	3	3	6MS30017E43W33015	9 x FF1000R17IE4	B6I	MS HD3 liquid (aluminum)	1090 x 596 x 342
2082	2050	3	3	6MS30017E43W34404	9 x FF1000R17IE4	B6I	MS HD3 liquid (aluminum)	1090 x 596 x 366
691 1382	680 1360	3 3	8 4	12MS20017E43W35155	3 x FF1000R17IE4 6 x FF1000R17IE4	B6I + B6I	MS HD3 liquid (aluminum)	1090 x 596 x 342

[1] Typical output current at V_{DC}=1100V, V_{AC}=690V, f_{SW}= 3 kHz, f_0=50Hz, cos(φ)=0.85, T_A=40°C, T_{vjmax}≤150°C.
[2] Current derating may be required
[3] P_{max} for 3-phase system similar to B6I types
[4] Optical interface included



Bipolar modules and discs

The availability and reliability of power semiconductors incorporated in wind power applications are key success factors for the overall design. Our bipolar modules and discs are ideal for these harsh environments with their rugged, highly reliable pressure contact technologies. In today's windmill systems, they are used as input thyristors and generator voltage rectifiers, in auxiliary power supplies and in protective crowbar applications. The low-maintenance design, high quality and exceptional reliability of our bipolar devices ensure profitable operation over a long lifetime.



Bipolar modules

Bipolar discs

Key benefits

- Short on fail
- High overload capability
- High reliability and long lifetime
- Lowest maintenance costs

Type	V_{RRM} [V]	I_{FSM} [A] @10 ms, $T_{vj\ max}$	∫i2dt [$A^2s \cdot 10^3$] @10 ms, $T_{vj\ max}$	I_{FAVM}/T_c [A] @180° el sin	$V_{(TO)}$ [V] $T_{vj\ max}$	r_T [mΩ] $T_{vj\ max}$	$R_{thjc\ max}$ [K/W] @180° el sin	R_{thch} [K/W] @180° el sin	$T_{vj\ max}$ [°C]
DZ 540 N26 K	2600	14000	980	540/100	0.78	0.31	0.078	0.02	150
DD 700 N22 K	2200	21000	2205	700/100	0.78	0.19	0.065	0.02	150
DZ 1070 N26 K	2600	35000	6125	1070/100	0.80	0.17	0.045	0.01	160

Type	V_{DRM}, V_{RRM} [V] $V_{DSM} = V_{DRM}$ $V_{RSM} = V_{RRM} + 100$ V	I_{TSM} [A] @10ms. $T_{vj\ max}$	∫i^2dt [$A^2s \cdot 10^3$] 10 ms. $T_{vj\ max}$	I_{TAVM}/T_c [A/°C] @180° el sin	$V_{(TO)}$ [V] @$T_{vj\ max}$	r_T [mΩ] @$T_{vj\ max}$	$(di/dt)_{cr}$ [A/µs] @DIN IEC 747-6	t_q [µs] typ.	$R_{thJC\ max}$ [K/W] @180° el sin	R_{thCK} [K/W] @180° el sin	$T_{vj\ max}$ [°C]
TZ 749 N22 KOF	2200	26500	3500	740/85	0.90	0.21	200	350	0.042	0.01	125
TZ 800 N18 KOF	1800	30000	4500	800/85	0.85	0.17	200	240	0.042	0.01	125
TT 425 N18 KOF	1800	12500	781	425/85	0.90	0.30	120	250	0.078	0.02	125
TT 430 N22 KOF	2200	12000	720	430/85	0.95	0.45	150	300	0.065	0.02	125
TT 500 N18 KOF	1800	14500	1051	500/85	0.90	0.27	200	250	0.065	0.02	125
TT 520 N22 KOF	2200	14500	1051	520/85	0.85	0.35	200	250	0.058	0.02	125

Type	V_{DRM}, V_{RRM} [V] $V_{DSM} = V_{DRM}$ $V_{RSM} = V_{RRM} + 100$ V	I_{TSM} [kA] @10 ms. $T_{vj\ max}$	∫i^2dt [$A^2s \cdot 10^3$] @10 ms. $T_{vj\ max}$	V_T/I_T [V/kA] $T_{vj\ max}$	I_{TAVM} [A] @180 ° el sin $T_c = 85$ °C	V(TO) [V] @$T_{vj\ max}$	rT [mΩ] @$T_{vj\ max}$	$(di/dt)_{cr}$ [A/µs] @DIN IEC 747-6	tq [µs] typ.	$R_{thJC\ max}$ [K/kW] @180 ° el sin	$T_{vj\ max}$ [°C]
T 1190 N18 TOF VT	1800	22.5	2530	2.05/5.4	1190	0.90	0.190	200	240	23.0	125
T 1500 N18 TOF VT	1800	33.5	5611	2.10/7.0	1500	0.90	0.150	200	240	18.4	125
T 2180 N18 TOF VT	1800	36.0	6480	2.05/8.0	2180	0.90	0.106	200	250	12.5	125
T 3160 N18 TOF VT	1800	57.0	16245	1.37/6.0	3160	0.85	0.082	200	250	8.5	125

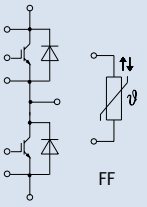
PrimePACK™

Our PrimePACK™ IGBT modules in half-bridge and chopper configurations (1200 V & 1700 V, 450 A to 1400 A) with internal NTC have been optimized for modern converters. Key highlights include improved thermal properties, low stray inductance and a wide range of operating temperatures up to 150°C.

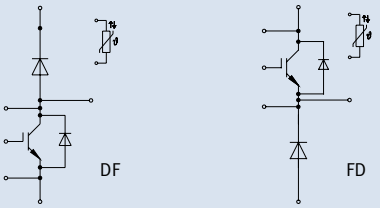
This family is designed to support inverter designs across a broad power range. The excellently placed DC terminal screw connections (all terminals are screw-connected) ensure high parallel design flexibility.

Two chopper variants (high side and low side) give design engineers even greater flexibility when choosing the inverter topology.

Many years of experience, a proven track record in driving innovation and a selection of the most recent chip generations optimized for high power applications mean that customers can always rely on us for the best converter solutions for wind applications.



Halfbridge with NTC



chopper modules with NTC

Our PrimePACK™ housing enjoys broad market acceptance and has established itself as an industry standard, used by all well-known manufacturers across countless applications worldwide.

Key benefits

- High power density for compact inverter designs
- Modular design optimized for paralleling
- Improved power cycling and thermal cycling capability
- Homogenous temperature distribution between the chips
- High clearance and creepage distance
- High reliability and robust module construction
- Standardized housing

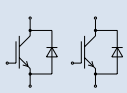
Type	V_{CES} V	I_C A	V_{CEsat} V T_{vj}= 25°C typ.	E_{on}/E_{off} mWs T_{vj}=125°C typ.	$R_{thjC\ max}$ K/W per arm
FF1000R17IE4	1700	1000	2	390/295	0.024
FF1000R17IE4D_B2	1700	1000	2	365/315	0.024
FF1400R17IP4	1700	1400	1.75	500/625	0.015
FD1000R17IE4	1700	1000	2	390/295	0.024
DF1000R17IE4	1700	1000	2	390/295	0.024
FD1000 R17IE4D_B2	1700	1000	2	365/315	0.024
DF1000 R17IE4D_B2	1700	1000	2	365/315	0.024

IHM

Our well-known IHM (IGBT High-power Modules) are extremely robust, operating with supreme reliability at temperatures from -40 to +150°C. These devices enjoy widespread market acceptance with more than 2 million IHMs deployed in different applications around the globe.

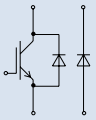
Highlights include superior power cycling with the latest IGBT technology and optimized switching losses. IHMs are available in 1200 V and 1700 V variants in half-bridge, single switch, chopper and diode topologies, covering a range from 400 A to 3600 A. This gives engineers the freedom to design high-power inverters of varying sizes. Electrical separation between the power and auxiliary terminals reduces the stray inductance influence on the sense contacts and makes these modules both easy to control and safe to use.

Backed by our global design support, our IHM solutions are the preferred choice for powerful, compact and modular converter designs. Customers can also rely on us to continually enhance IHM thermal properties and performance.

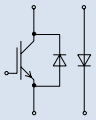


Half Bridge (FF)

Single Switches (FZ)



Chopper Modules (FD)



Chopper modules with inverted diode (FD ...-K)

Dual Diode (DD)

Key benefits

- Low V_{CEsat} and R_{thj-c}
- Superior power cycling with IGBT4
- Optimized switching losses combined with soft switching
- Widest product portfolio available in the market
  - Two housings: IHM A and IHM B
  - Two footprints: 190 x 140 mm, 130 x 140 mm
  - Two base-plate materials: AlSiC and Cu
  - I_{Cmax} from 400 A to 3600 A in voltage category 1200 V and 1700 V
  - Various topologies (half bridge-, single switch-, chopper- and diode modules)

Modul name	Green	Modul type	C-E-blocking-voltage	max. DC-rated current	Base plate	Housing
DD1200S17H4_B2	RoHS	Dual Diode	1700V	1200A	AlSiC	130 x 140 mm
DD800S17H4_B2	RoHS	Dual Diode	1700V	800A	AlSiC	130 x 140 mm
FD1200R17HP4-K_B2	RoHS	Chopper	1700V	1200A	AlSiC	130 x 140 mm
FD1600/1200R17HP4_B2	RoHS	Chopper	1700V	1600A	AlSiC	190 x 140 mm
FF800R17KP4_B2		Half bridge	1700V	800A	AlSiC	130 x 140 mm
FF1200R17KP4_B2		Half bridge	1700V	1200A	AlSiC	130 x 140 mm
FZ1200R12HP4		Single switch	1200V	1200A	Cu	130 x 140 mm
FZ1600R12HP4		Single switch	1200V	1600A	Cu	130 x 140 mm
FZ2400R12HP4		Single switch	1200V	2400A	Cu	130 x 140 mm
FZ3600R12HP4		Single switch	1200V	3600A	Cu	190 x 140 mm
FZ1200R17HP4		Single switch	1700V	1200A	Cu	130 x 140 mm
FZ1600R17HP4		Single switch	1700V	1600A	Cu	130 x 140 mm
FZ2400R17HP4		Single switch	1700V	2400A	Cu	130 x 140 mm
FZ2400R17HP4_B9		Single switch	1700V	2400A	Cu	190 x 140 mm
FZ3600R17HP4		Single switch	1700V	3600A	Cu	190 x 140 mm
FZ1600R17HP4_B2	RoHS	Single switch	1700V	1600A	AlSiC	130 x 140 mm
FZ1600R17HP4_B21	RoHS	Single switch	1700V	1600A	AlSiC	130 x 140 mm
FZ2400R17HP4_B2	RoHS	Single switch	1700V	2400A	AlSiC	130 x 140 mm
FZ2400R17HP4_B28	RoHS	Single switch	1700V	2400A	AlSiC	190 x 140 mm
FZ2400R17HP4_B29	RoHS	Single switch	1700V	2400A	AlSiC	190 x 140 mm
FZ3600R17HP4_B2	RoHS	Single switch	1700V	3600A	AlSiC	190 x 140 mm

IHV

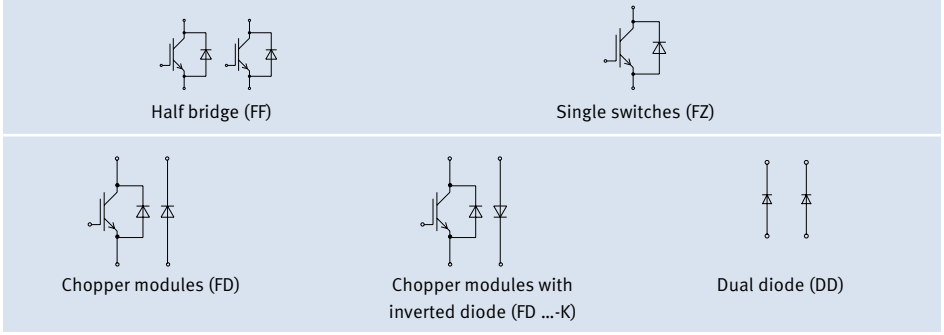
Our IHV (IGBT High-Voltage) modules are ideal for full inverter solutions in the power range above 2 MW. They enable significant cabling savings in turbine designs where the transformer is installed at the base of the tower. Our IHV devices offer blocking voltages of 3300 V, 4500 V or 6500 V. These devices have been successfully deployed in traction applications and industrial medium-voltage inverters for many years.

Our broad portfolio supports a wide range of nominal currents, topologies (chopper, diode) and designs. Multilevel inverters such as the popular NPC (Neutral Point Clamped) model can be built with good scalability. Internal isolation enables designs with grounded heat sinks, eliminating the need for deionized cooling fluids.

Our application support team provides assistance anywhere in the world, helping in particular to resolve your paralleling, Low Voltage Ride Through (LVRT) and lifetime challenges.

Key benefits

- Low V_{CEsat} and $R_{thj\text{-}c}$
- Good thermal cycling capability due to AlSiC baseplate
- Optimized switching losses
- Widest portfolio on the market
  - Two housings for different isolation requirements
  - Two footprints 190x140 mm² 130x140 mm²
  - I_{Cmax} from 200 A to 1500 A
  - Various topologies (half bridge-, single switch-, chopper- and diode modules)



Modul name	Green	Modul type	E-blocking-voltage	max. DC-rated current	Base plate	Housing
DD500S33HE3	RoHS	Dual diode	3300 V	500 A	AlSiC	130 x 140 mm
DD800S33K2C		Dual diode	3300 V	800 A	AlSiC	130 x 140 mm
DD1200S33K2C		Dual diode	3300 V	1200 A	AlSiC	130 x 140 mm
DD400S45KL3_B5		Dual diode	4500 V	400 A	AlSiC	130 x 140 mm
DD1200S45KL3_B5		Dual diode	4500 V	1200 A	AlSiC	130 x 140 mm
DD400S65K1		Dual diode	6500 V	400 A	AlSiC	130 x 140 mm
DD600S65K1		Dual diode	6500 V	600 A	AlSiC	130 x 140 mm
DD750S65K3		Dual diode	6500 V	750 A	AlSiC	130 x 140 mm
FF400R33KF2C		Half bridge	3300 V	400 A	AlSiC	130 x 160 mm
FZ800R33KF2C		Single switch	3300 V	800 A	AlSiC	130 x 140 mm
FZ1000R33HE3	RoHS	Single switch	3300 V	1000 A	AlSiC	130 x 140 mm
FZ1000R33HL3	RoHS	Single switch	3300 V	1000 A	AlSiC	130 x 140 mm
FZ1200R33HE3	RoHS	Single switch	3300 V	1200 A	AlSiC	190 x 140 mm
FZ1500R33HE3	RoHS	Single switch	3300 V	1500 A	AlSiC	190 x 140 mm
FZ1500R33HL3	RoHS	Single switch	3300 V	1500 A	AlSiC	190 x 140 mm
FZ800R45KL3_B5		Single switch	4500 V	800 A	AlSiC	130 x 140 mm
FZ1200R45KL3_B5		Single switch	4500 V	1200 A	AlSiC	190 x 140 mm
FZ400R65KF2		Single switch	6500 V	400A	AlSiC	130 x 140 mm
FZ600R65KE3		Single switch	6500 V	600A	AlSiC	190 x 140 mm
FZ750R65KE3		Single switch	6500 V	750A	AlSiC	190 x 140 mm

EconoDUAL™ 3

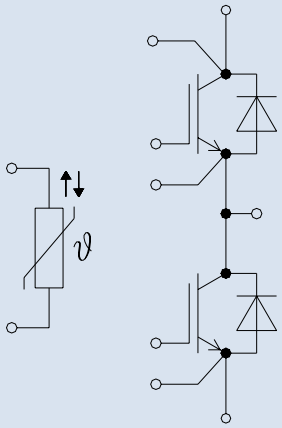
Our EconoDUAL™ 3 devices meet growing demands for compact inverter designs, flexibility and optimized electrical performance at highest reliability. These modules combine 17 mm housing with screw power terminals and easy assembly. The gate driver can be easily connected by placing it on top of the module. Low parasitic stray inductance and optimized thermal resistance to the heat sink contribute to excellent inverter designs.

All modules are available with our established PressFIT technology for reliable, solderless mounting. They are equipped with state-of-the-art IGBT4 technology up to T_{vjop} = 150°C for highest power densities and leading-edge power cycling capability – making these devices ideal for wind inverters. Symmetrical module design facilitates parallel operation, optimizing current sharing between IGBT half-bridges. This makes EconoDUAL™ 3 the compact solution of choice for 690 V drives.

The FF600R17ME4/_B11 is our new flagship product in the EconoDUAL™ 3 family. It was developed with a view to maximizing power density within a given footprint. Copper bonding technology and an improved DCB combine to increase the output power by more than 30 % compared with the 450 A 1700 V version.

Key benefits

- Compact modules measuring only 17 mm in height
- Easy and most reliable assembly: PressFIT controls pins and screw power terminals for completely solderless connections
- Easy separation of DC and AC link
- No plugs or cables required
- Optimized thermal resistance to heat sink
- Ideal for low inductive system designs
- Highest power density for compact inverter designs



IGBT4

Product type	Product status	Green	I_C	$V_{CE(sat)}$ (typ)	Configuration	Technology	Housing
FF600R17ME4	In production	RoHS	600.0 A	1.95 V	dual	IGBT4	EconoDUAL™ 3
FF600R17ME4_B11	In production	RoHS	600.0 A	1.95 V	dual	IGBT4	EconoDUAL™ 3
FF450R17ME4	In production	RoHS	450.0 A	1.95 V	dual	IGBT4	EconoDUAL™ 3
FF450R17ME4_B11	In production	RoHS	450.0 A	1.95 V	dual	IGBT4	EconoDUAL™ 3
FF300R17ME4	In production	RoHS	300.0 A	1.95 V	dual	IGBT4	EconoDUAL™ 3
FF300R17ME4_B11	In production	RoHS	300.0 A	1.95 V	dual	IGBT4	EconoDUAL™ 3
FF225R17ME4	In production	RoHS	225.0 A	1.95 V	dual	IGBT4	EconoDUAL™ 3
FF225R17ME4_B11	In production	RoHS	225.0 A	1.95 V	dual	IGBT4	EconoDUAL™ 3

EconoPACK™ +

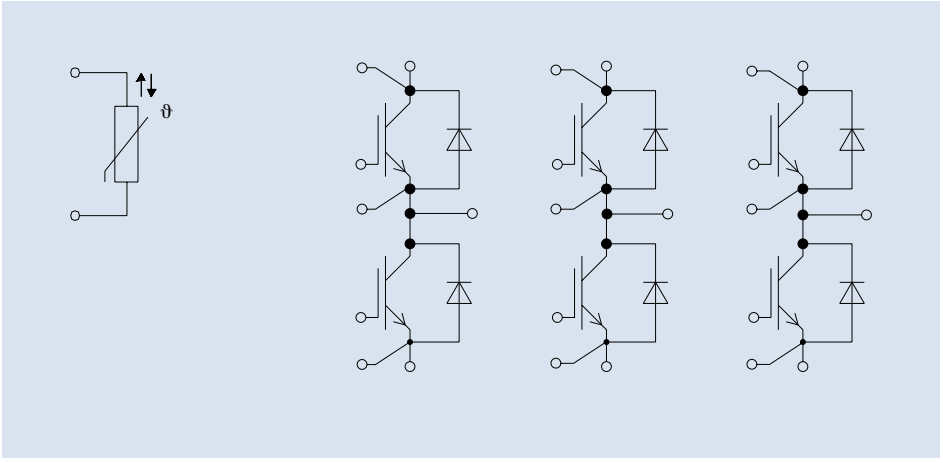
Our EconoPACK™ + D series meets growing market demands for compact inverter designs, flexibility and optimized electrical performance at highest reliability. These modules combine 17 mm housing with screw power terminals and easy assembly. The gate driver can be easily connected by placing it on top of the module. Low parasitic stray inductance and optimized thermal resistance to the heat sink contribute to excellent inverter designs.

All modules are available with our established PressFIT technology for reliable, solderless mounting. They are equipped with the state-of-the-art IGBT4 technology up to Tvjop = 150°C for highest power densities and leading-edge power cycling capability – making these devices ideal for wind inverters. Symmetrical module design facilitates parallel operation, optimizing current sharing between IGBT half-bridges. This makes EconoPACK™ + D the compact solution of choice for wind inverters.

The EconoPACK™ + D series is also available with our innovative pre-applied thermal interface material (TIM) solution. It fulfills the most stringent quality standards for power modules, offering the highest system reliability and output power.

Key benefits

- Compact modules measuring only 17 mm in height
- Easy and most reliable assembly: PressFIT controls pins and screw power terminals for completely solderless connections
- Easy separation of DC and AC link
- No plugs and cables required
- Optimized thermal resistance to heat sink
- Ideal for low inductive system designs
- Highest power density for compact inverter designs



IGBT4

Product type	Product status	Green	I_C	$V_{CE(sat)}$ (typ)	Configuration	Technology	Housing
FS500R17OE4D	In production	RoHS	500.0 A	1.95 V	sixpack	IGBT4	EconoPACK™ +
FS500R17OE4DP	In production	RoHS	500.0 A	1.95 V	sixpack	IGBT4	EconoPACK™ +
FS450R170E4	In production	RoHS	450.0 A	1.95 V	sixpack	IGBT4	EconoPACK™ +
FS300R170E4	In production	RoHS	300.0 A	1.95 V	sixpack	IGBT4	EconoPACK™ +
FS225R170E4	In production	RoHS	225.0 A	1.95 V	sixpack	IGBT4	EconoPACK™ +

EconoPACK™

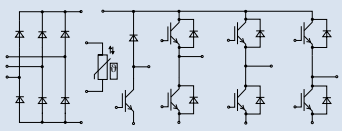
Our EconoPIM™/EconoPACK™ family was developed to give customers the option of cost-effective, compact designs with the added bonus of simplified, reliable mounting. This optimized family is targeted at low- and medium-power industrial drives used for pitch control in modern windmills.

The Econo family extends the power range from 15 A up to 200 A at 600 V/650 V/1200 V/1700 V. Devices are available in the well-known EconoPIM™ and EconoPACK™ packages. The Econo housing comes with a copper baseplate for optimized heat spread and greater reliability. It also includes a thermistor (NTC) for internal temperature measurement. Econo modules are available with solder or PressFIT pins.

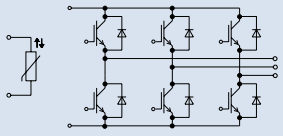
The Econo family features state-of-the-art IGBT4 650 V/1200 V/1700 V chip technology for low switching losses, low saturation voltage and high switching frequency. For ease of design, IGBTs with 10 µs short-circuit robustness are available in the same mechanical layouts for 650 V, 1200 V and 1700 V.

EconoBRIDGE™ 2 rectifier modules

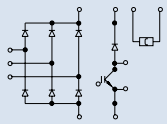
EconoBRIDGE™ 2 rectifier modules are available in the current range from 104 A to 180 A at 1600 V/1800 V. The available configurations are uncontrolled or half-controlled rectifier bridges including brake chopper IGBT and thermal resistor (NTC).



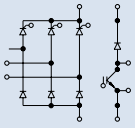
EconoPIM™



EconoPACK™



EconoBRIDGE™ 2 with Chopper IGBT and NTC



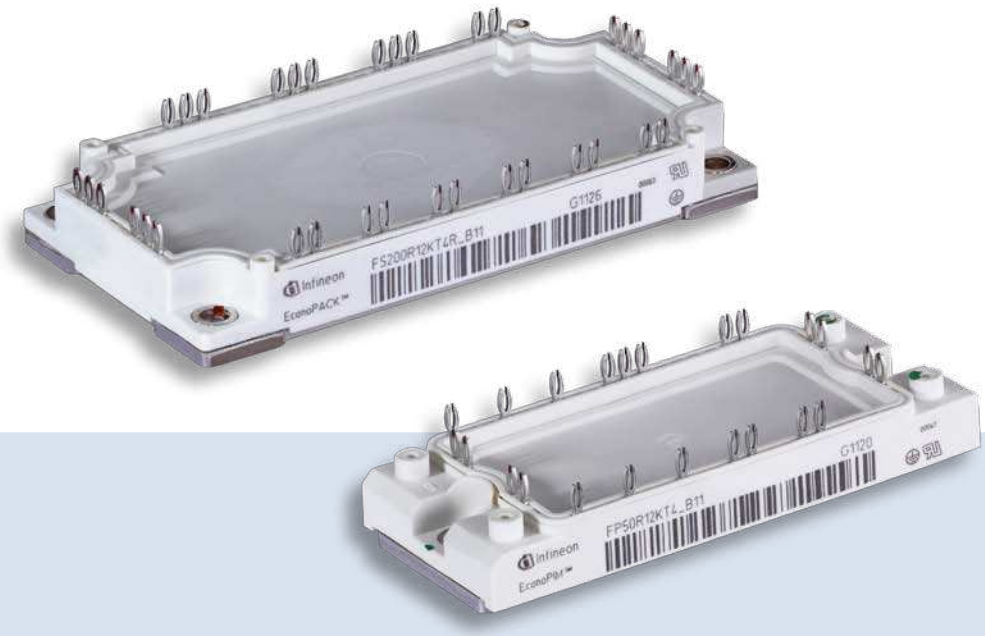
EconoBRIDGE™ 2, half-controlled with Chopper IGBT

Key Benefits

- Compact, well established module concept
- Optimized development cycle time and cost
- Configuration flexibility
- High power density
- Low stray inductance
- RoHS-compliant/UL recognized

	Article	IGBT inverter				Rectifier diodes				Brake chopper		
		V_{CE} [V]	I_C [A]	$R_{thJC\ max}$ [K/W]	V_{CEsat} T_{vj}= 25C° [V]	V_{RRM} [V]	I_d/T_c [A]/ [C°]	$R_{thJC\ max}$ [K/W]	V_F T_{vj}= 150C° [V]	V_{CES} [V]	$I_{c,IGBT}$ T_c= 80C° [A]	$R_{thJC\ max}$ [K/W]
EconoPACK™												
650V	FS75R07N2E4	650	75	0.60	1.55							
	FS100R07N2E4	650	100	0.45	1.55							
	FS150R07N3E4	650	150	0.35	1.55							
	FS200R07N3E4R	650	200	0.25	1.55							
1200V	FS75R12KT4_B15	1200	75	0.39	1.85							
	FS100R12KT4G	1200	100	0.29	1.75							
	FS150R12KT4	1200	150	0.20	1.75							
	FS200R12KT4R	1200	200	0.15	1.75							
1700V	FS100R17N3E4	1700	100	0.25	1.95							
	FS150R17N3E4	1700	150	0.18	1.95							
EconoPIM™												
650V	FP75R07N2E4	650	75	0.60	1.55	1600	80/80	0.65	1.00	650	50	0.80
	FP100R07N3E4	650	100	0.45	1.55	1600	100/80	0.50	1.10	650	75	0.60
	FP150R07N3E4	650	150	0.35	1.55	1600	150/80	0.40	1.10	650	100	0.45
1200V	FP75R12KT4	1200	75	0.39	1.85	1600	140/80	0.65	1.15	1200	50	0.54
	FP100R12KT4	1200	100	0.29	1.75	1600	150/80	0.40	1.00	1200	50	0.54
EconoBRIDGE™												
1600V	DDB6U104N16RR					1600	105/100	1.08	1.30	1200	50	0.38
	DDB6U134N16RR					1600	134/100	0.70	1.35	1200	70	0.25
	TDB6HK124N16RR					1600	125/85	0.63	1.35 (125C°)	1200	70	0.25
	TDB6HK180N16RR					1600	180/80	0.35	1.20	1200	100	0.29
1800V	DDB6U104N18RR					1800	105/100	1.08	1.30	1200	50	0.38

Extract from our Econo 2/3 product portfolio suitable for pitch-control drives. All modules also available in PressFIT technology (EconoBRIDGE™ ‹180A on request)

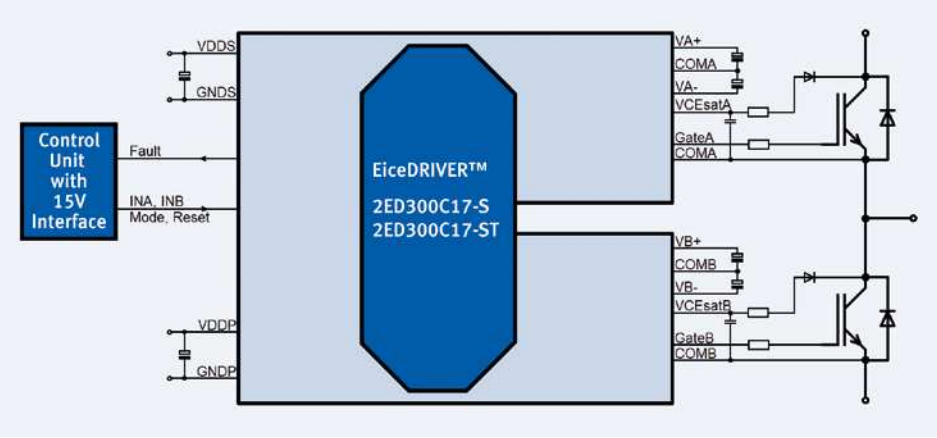


EiceDRIVER™ boards

Our EiceDRIVER™ board 2ED300C17-S/-ST is a dual-channel, high-voltage gate driver for all Infineon IGBT modules up to 1700 V. These boards are ideally equipped to meet the high safety and reliability demands of wind energy systems.

This driver offers outstanding protection features and integrated fault management functionality to ensure safe operation. Desaturation monitoring is used to detect short circuits. A soft shut-down function prevents high switching overvoltages . Undervoltage lock-out (UVLO) is avoids operation with gate voltages that are too low. Another important safety function is the reinforced isolation between the primary and secondary side.

Featuring two galvanically isolated channels, these devices can support two operating modes: direct mode and half-bridge mode. In half-bridge mode, an interlocking logic prevents cross-currents. In addition, the integrated isolated power supply allows simple paralleling of modules.



Key benefits

- Reinforced isolation according to EN 50178/ IEC 61800-5-1
- Reliable operation, also in harsh environments
- Patented paralleling of modules

EiceDRIVER™ Safe

Type	Channels	Control interface	IGBT max V_{CE} V	V_{ISO} kV	I_{GM} A	P_{OUT} W	T_{OP} °C	Size mm x mm	Mounting method	For modules
2ED300C17-S	2	15V CMOS logic	1700	5	±30	8	-25/85	60.5 x 72	Soldering	EconoPACK™+, 62 mm, IHM, EconoDUAL™, PrimePACK™
2ED300C17-ST	2	15V CMOS logic	1700	5	±30	8	-40/85	60.5 x 72	Soldering	EconoPACK™+, 62 mm, IHM, EconoDUAL™, PrimePACK™