

**Westpac Electronics Limited**  
威柏電子有限公司



威柏电子提供风电变流核心功率器件



富士电机的功率半导体

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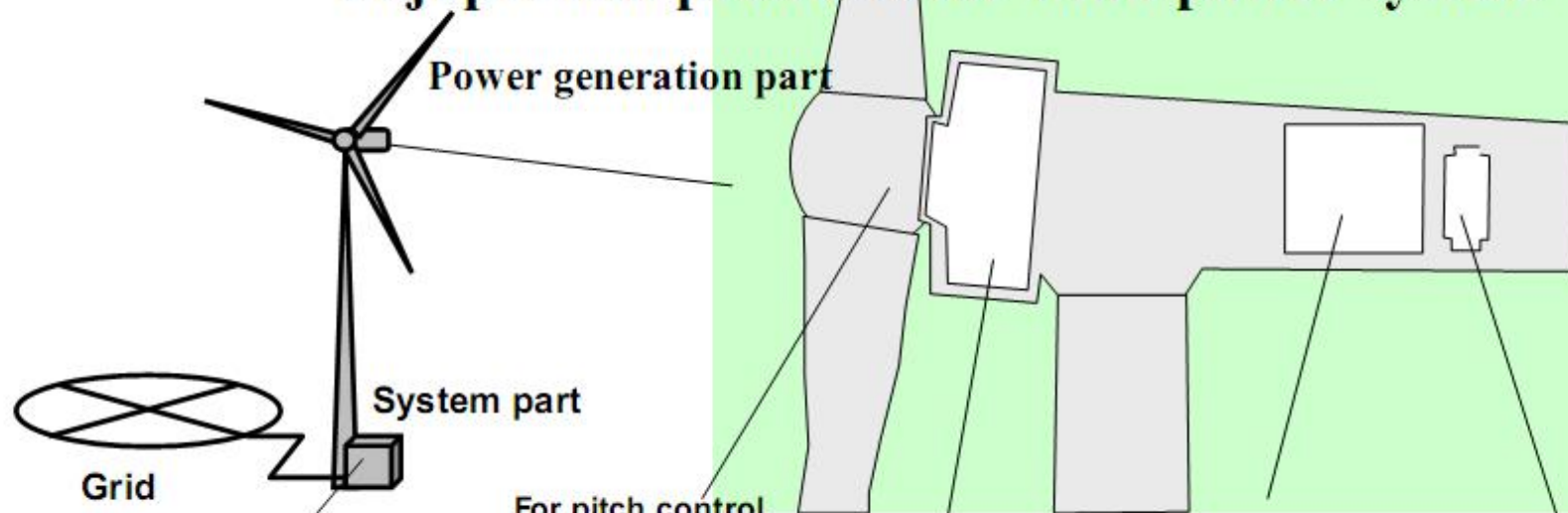
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## Fuji present products for wind power system

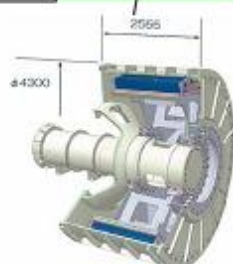


Stabilization device

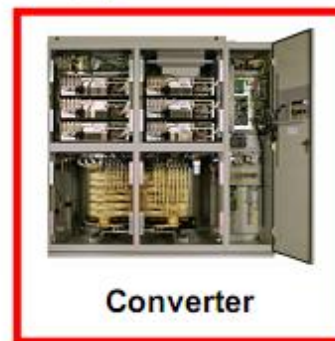
For pitch control



Servo system



PM dynamo



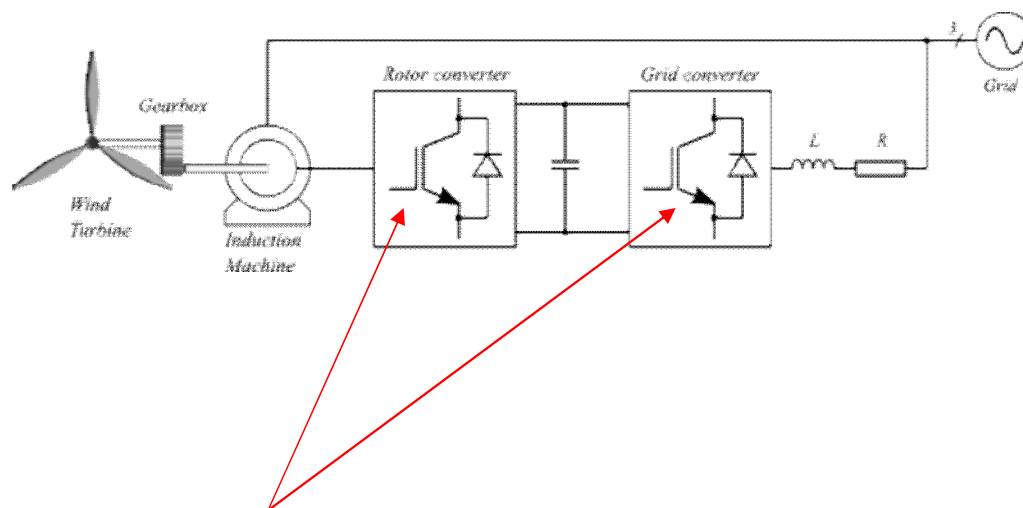
Converter



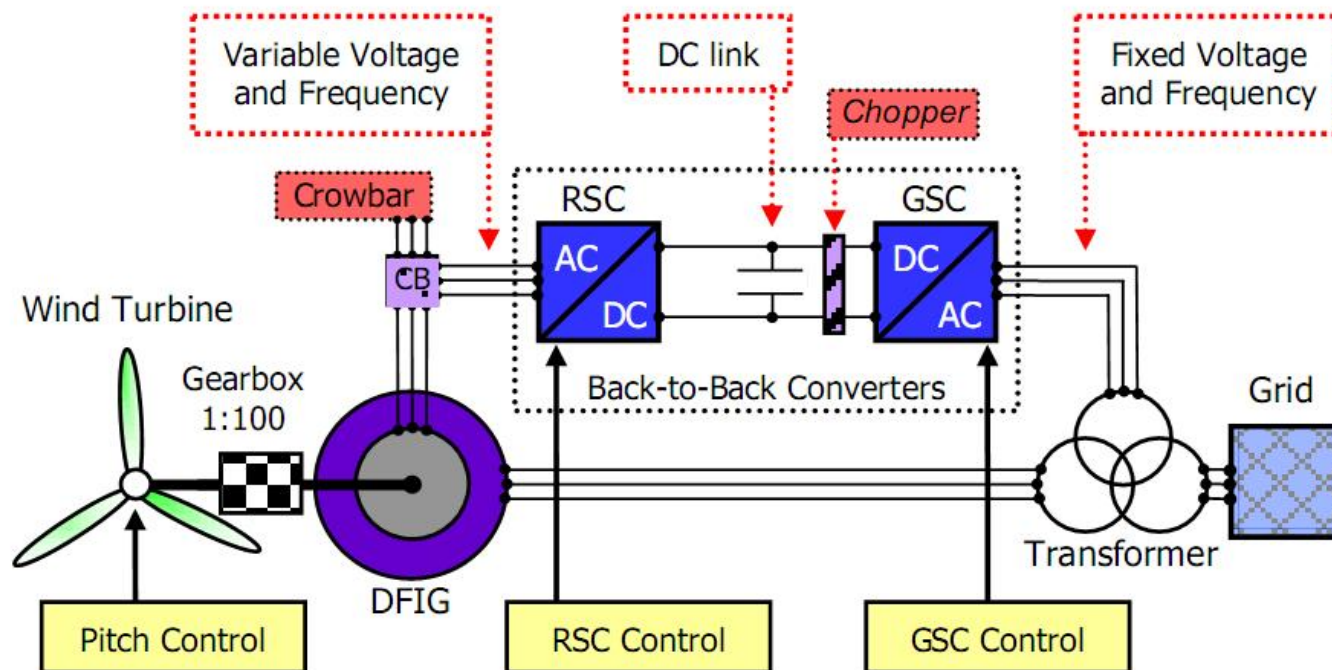
Transformer



## 威柏电子提供风电变流核心功率器件









# 2MBI450U4N-170-50

IGBT Modules

**IGBT MODULE (U series)**  
**1700V / 450A / 2 in one package**

## ■ Features

- High speed switching
- Voltage drive
- Low Inductance module structure

## ■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Industrial machines, such as Welding machines





# 6MBI450U-170



**IGBT Module U-Series** 1700V / 450A 6 in one-package

## ■ Features

- Compact Package
- P.C.Board Mount
- LOW  $V_{CE(sat)}$

## ■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Industrial machines, such as welding machines











In production with U4-silicon

Type name	Ic rating	VCES	Package	Base Plate	Isolation
1MBI1200U4C-120	1200A	1200V	M151 : size 130 x 140 x 38mm 	Copper (Cu)	Silicone Nitride (Si3N4)
1MBI1600U4C-120	1600A				
1MBI1200U4C-170	1200A	1700V			
1MBI1600U4C-170	1600A				
1MBI2400U4D-120	2400A	1200V	M152 : size 190 x 140 x 38mm 	Copper (Cu)	Silicone Nitride (Si3N4)
1MBI3600U4D-120	3600A				
1MBI2400U4D-170	2400A	1700V			
1MBI3600U4D-170	3600A				






In production with U4-silicon

Type name	Ic rating	VCES	Package	Base Plate	Isolation
2MBI600U4G-120	600A	1200V	M256 : size 130 x 140 x 38mm 	Copper (Cu)	Silicone Nitride (Si3N4)
2MBI800U4G-120	800A				
2MBI1200U4G-120	1200A				
2MBI600U4G-170	600A	1700V			
2MBI800U4G-170	800A				
2MBI1200U4G-170	1200A				






### FY 2010 MP

	Voltage	Curret	Package No.	MP	Feature	Package
2in1	1200V	600A , 900A	M271	Nov.-2010	General industrial use V-Series(Trench gate and Field-Stop) Cu base , Al2O3 DCB CTI>600 Package regin RoHS , Viso 4.0kV	
		1400A	M272			
	1700V	650A	M271			
		1000A	M272			

### FY 2011 MP

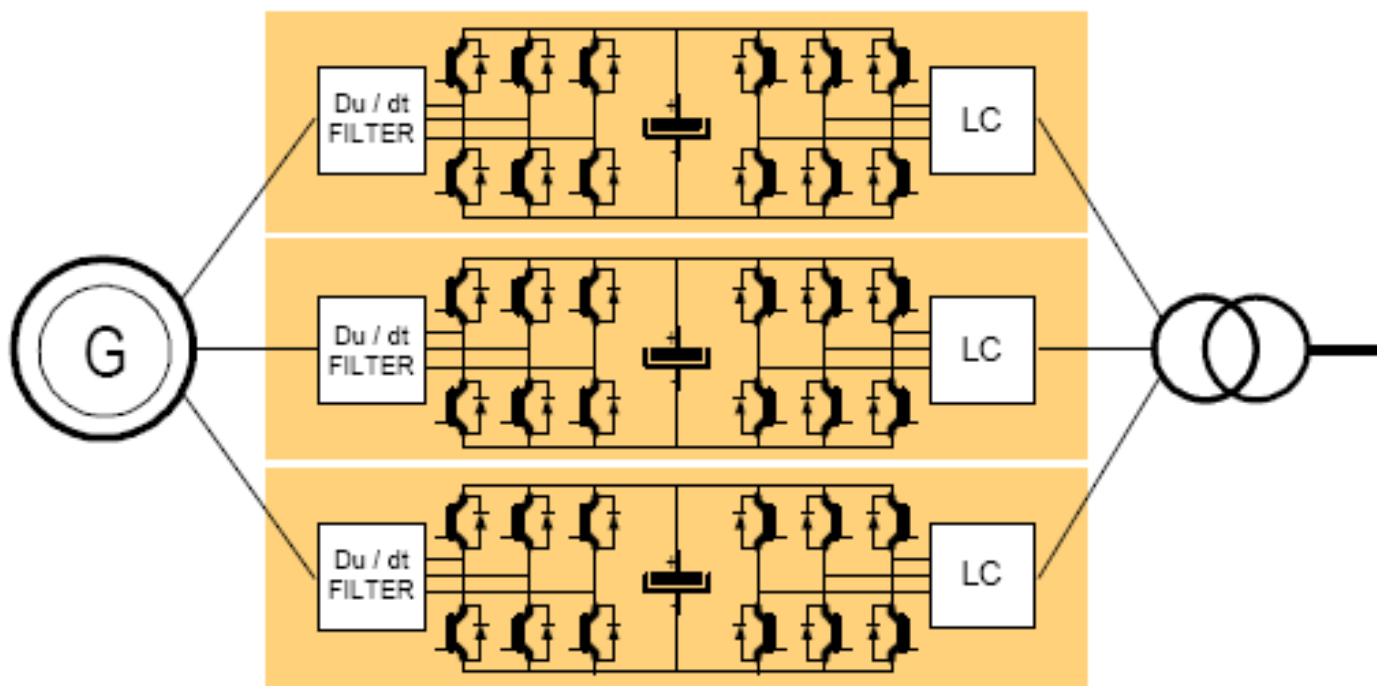
	Voltage	Curret	Package No.	MP	Feature	Package
2in1	1700V	1400A	M272	Jun.-2011	General industrial use V-Series(Trench gate and Field-Stop) Cu base , Al2O3 DCB CTI>600 Package regin RoHS , Viso 4.0kV	
Chopper	1200V	600A , 900A	M271			
		1400A	M272			
	1700V	650A	M271			
1000A		M272				





威柏电子提供风电变流IPM功率套件

## 变流器的模块化设计





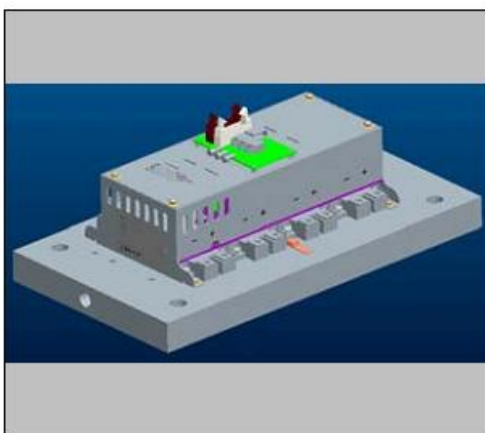
威柏电子提供风电变流IPM功率套件



特许专业代理商

WESTPAC ELECTRONICS LIMITED 威柏电子

### 2MBI1800U4N-170-50-4P



2-pack-integrated intelligent Power System

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
<b>System</b>				
$V_{CC}$	Operating DC link voltage		1200	V
$V_{isol}$	AC sinus 50Hz, t=1min		4000	V
$I_{t(RMS)}$	per AC terminal, rms, $T_s=25^\circ C$		450	A
$f_{out}$	fundamental output frequency		10	kHZ
$T_{stg}$	storage temperature		-40..+85	$^\circ C$
$T_{op}$	operating temperature		-40..+125	$^\circ C$
<b>IGBT</b>				
$V_{CES}$			1700	V
$I_C$	$T_j=150^\circ C$	$T_s=25^\circ C$	2400	A
		$T_s=80^\circ C$	1842	A
$I_{onom}$			1800	A
$T_j$			-40..+150	$^\circ C$



直流电容附件外形图

DC Capacitor addition  
Power stack outline



CT感应器

DC capacitor BOX  
直流电压连接电容



IPM part





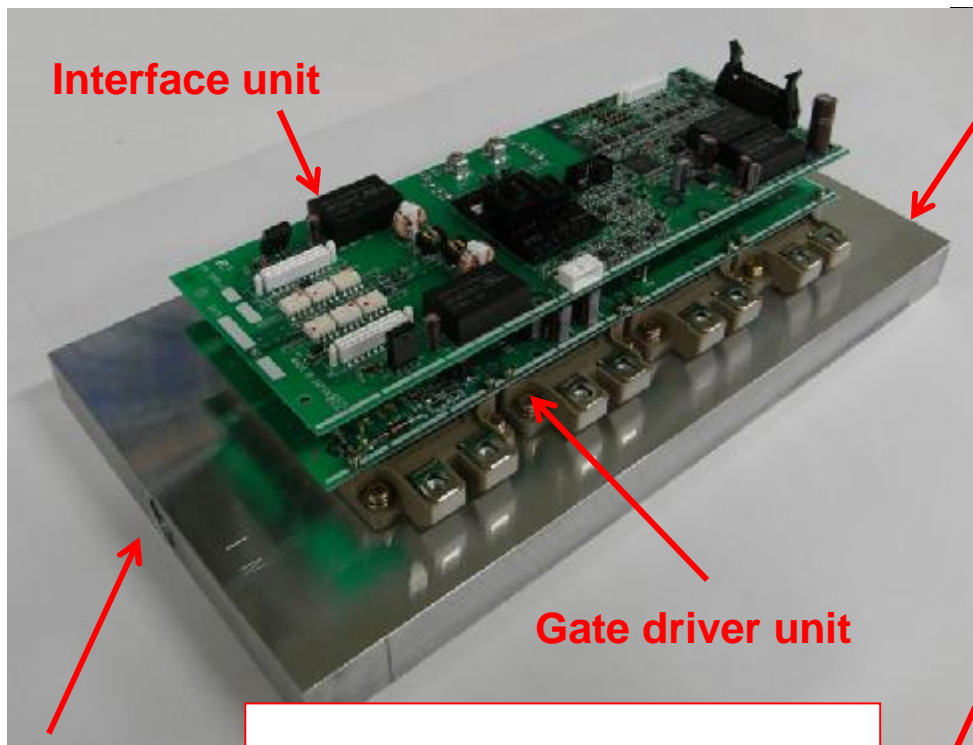


## IPM type

水冷散热器

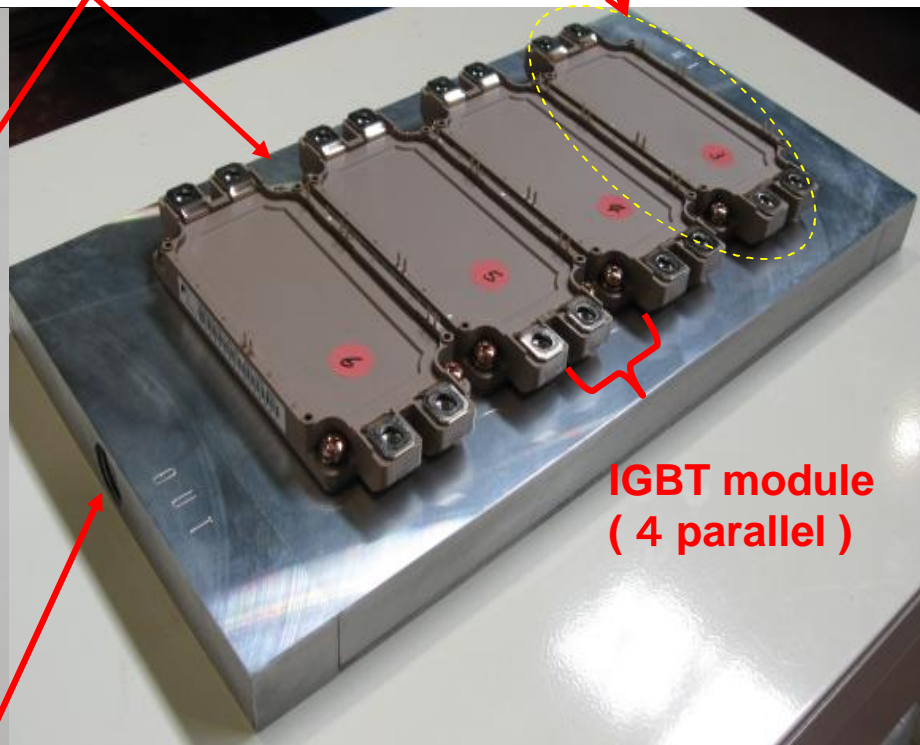
Heat sink of water cooling

IGBT模块



Interface unit

Gate driver unit



IGBT module  
( 4 parallel )

进水口

W:360 D:190 H:92 (mm)

出水口

Inflow side of water

Overflow

功率组件外观图片



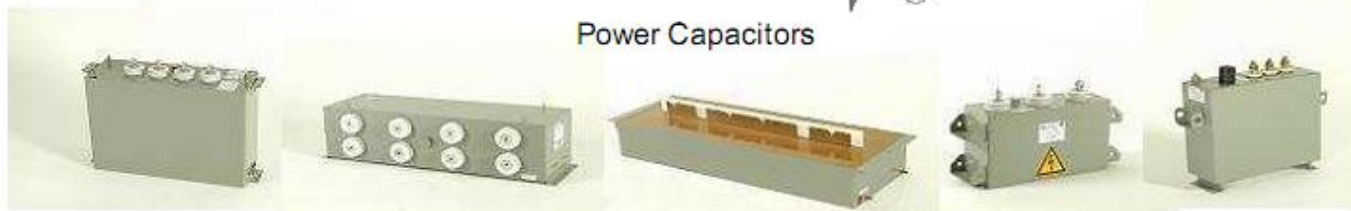
## 威柏提供风电变流无源器件

- Long Life, High Reliability
- High Power Density
- Safety Approvals
- Custom Design

Snap-in & screw terminal  
Electrolytic Capacitors



Power Capacitors



Discharge and Chopper  
Resistors

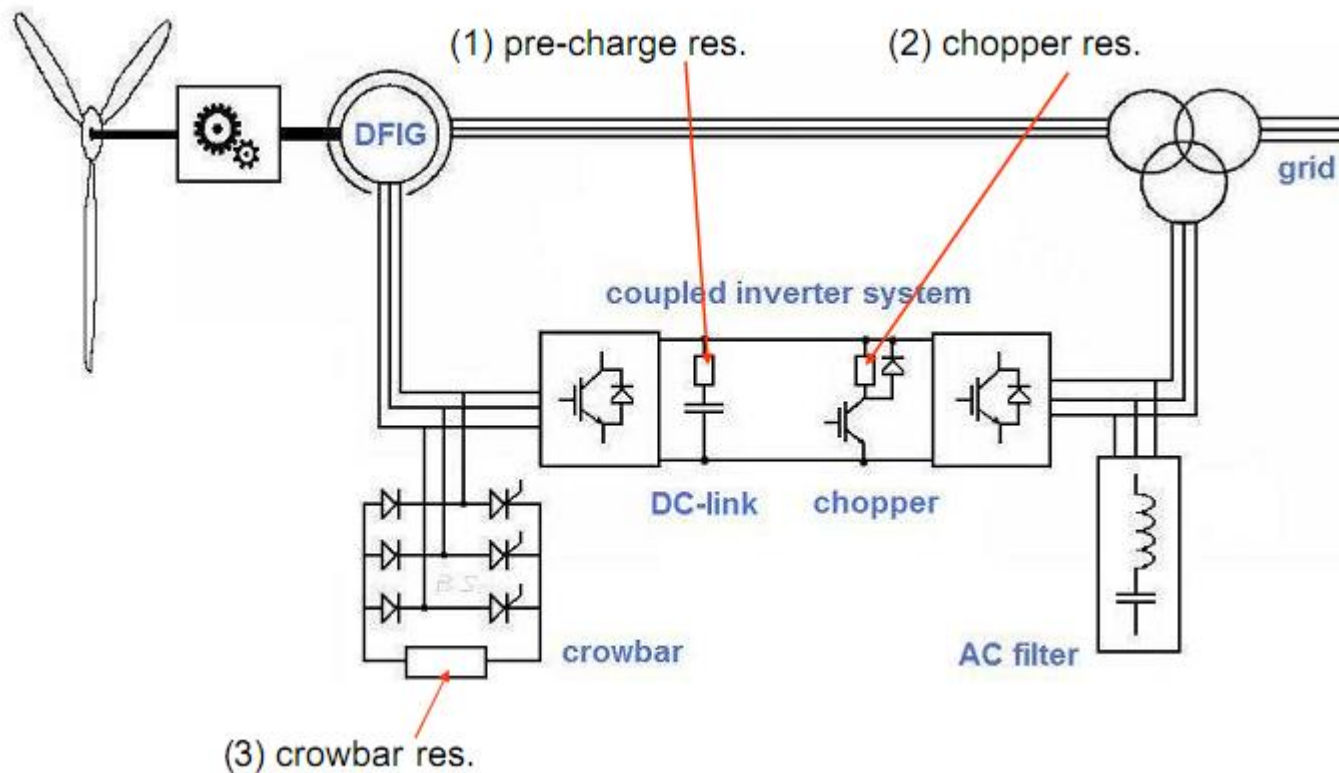


Crowbar Resistors





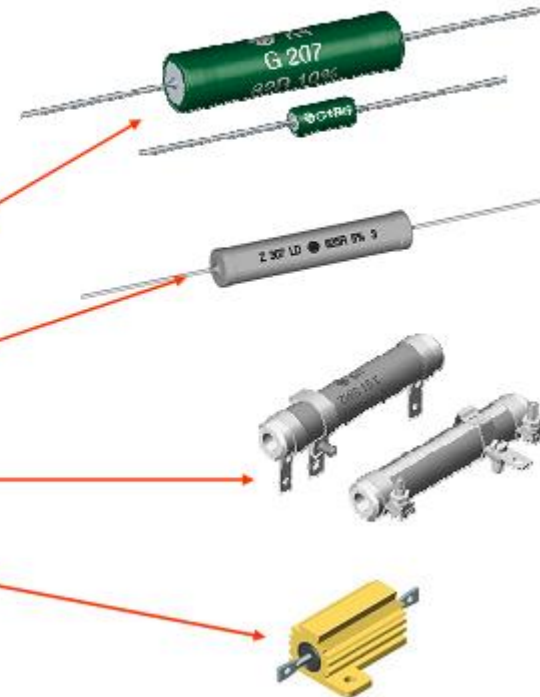
## 威柏电子提供风电变流功率电阻







- **Function:**
  - limit inrush current into DC-link cap. at initial switch-on
- **Typical requirements:**
  - high single pulse energy capability
  - $E = \frac{1}{2} C U^2$
  - $C = 10 \mu\text{F}$  and  $U = 690\text{V} \rightarrow E = 5 \text{ J}$
  - small size and therefore high energy density
  - high voltage capability
- **Suitable Vishay resistor series:**
  - G200 enameled wirewound
  - Z300 cemented wirewound
  - ZWS cemented wirewound
  - RH Al-housed wirewound





- **Function:**
  - DC-voltage control
- **Typical requirements:**
  - high continuous power (=repetitive pulse energy) capability
  - small size (i.e. high energy density)
  - low inductance (i.e. high switching frequency)
  - high voltage capability
  - mounting on heat sink →
- **Suitable Vishay resistor series:**
  - LPS300, 300 W
  - LPS600, 600 W
  - LPS800, 800 W





- **Function:**
  - AC-Filter and DC-voltage control
- **Typical requirements:**
  - high continuous power (= repetitive pulse energy) capability
  - Corrugated ribbon construction aids rapid cooling
  - Complete vitreous coating for perfect humidity protection
  - small size (i.e. high energy density)
  - high voltage capability
- **Suitable Vishay resistor series:**
  - GBS60/370 - True Power of up to 1000 W
  - GBS45/370 - True 750 W

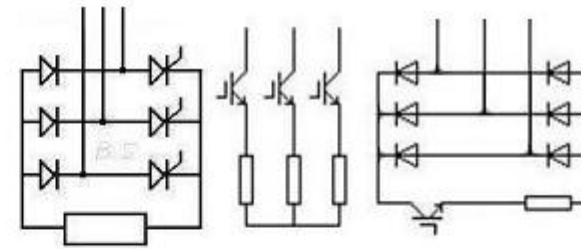






## CROW-BAR电阻

- **Function:**
  - current and voltage limitation  
e.g. in case of high voltage ride through
- **Typical requirements:**
  - $I = 10 \text{ kA} - 20 \text{ kA}$
  - $R = 10 \text{ m}\Omega - 50 \text{ m}\Omega$
  - $P = R \times I^2 = 1 \text{ MW} - 20 \text{ MW}$
  - $dt = 200 \text{ ms}$
  - $E = P \times dt = 4 \text{ MJ}$



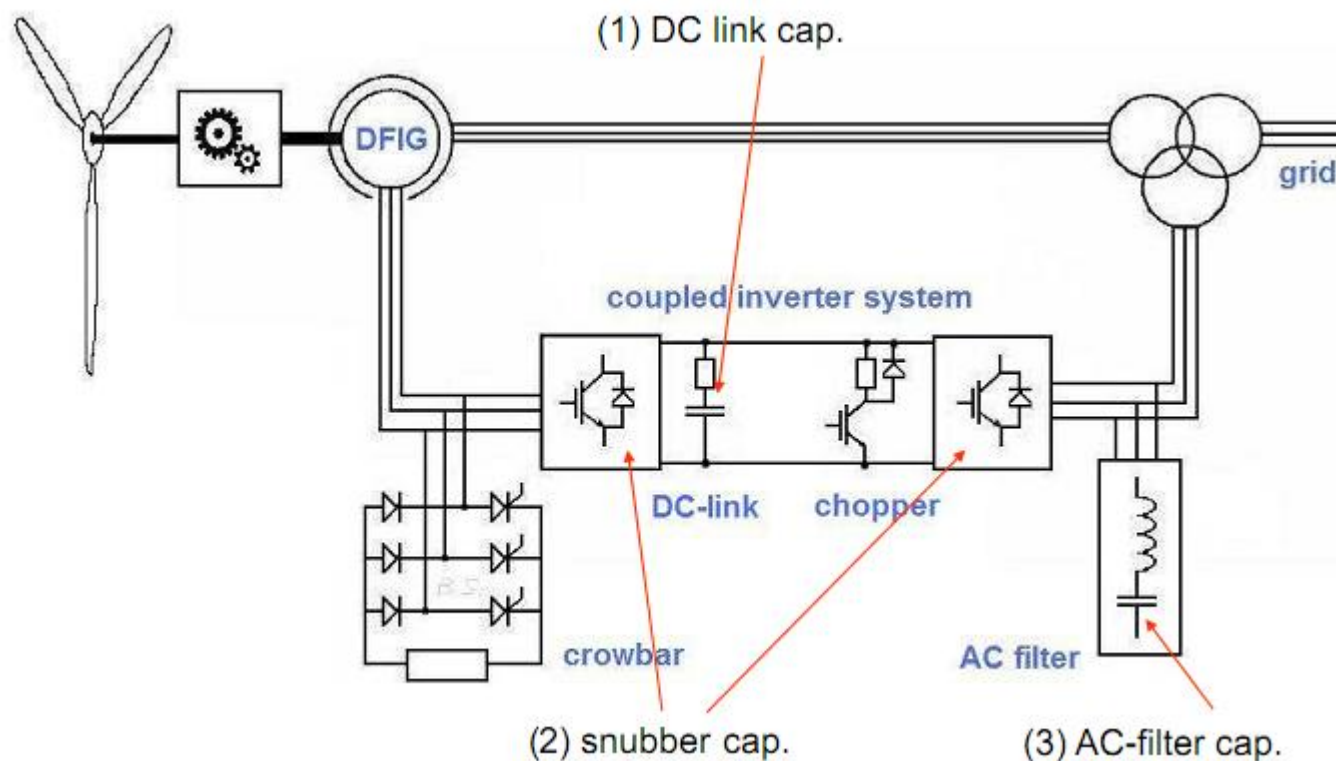
crowbar topologies

- **Suitable Vishay resistor series: ULDCR** →
- **Thick laser-cut steel steel plates**
  - very robust and reliable design
  - extremely high single pulse energy capability
  - small size and therefore high energy density
  - high voltage capability
  - high temperature rating of  $375^\circ\text{C}$





## 威柏电子提供风电变流功率电容





- **Function:**
  - stabilizing DC-link voltage
- **Typical requirements:**
  - C = 3300 to 4700 uF and U = 690V !!!
- **Suitable Vishay film capacitor series:**
  - MKP 1848 DC-Link and customized MKP 1849







## IGBT吸收电容

- **Function:**
  - reduce voltage and current spikes (limit  $dU/dt$  and  $dI/dt$ ) in power semiconductor switching applications in order to protect semiconductors, reduce total losses and EMI
- **Typical requirements:**
  - $C < 1 \mu\text{F}$  and  $U = 1200\text{V}$   
because  $C \approx 1 / (U^2 \times f)$
- **Suitable Vishay film capacitor series:**
  - MMKP 386





## 交流滤波电容

- **Function:**
  - reduce higher harmonics of line frequency
- **Typical requirements and suitable Vishay ESTA caps:**
  - U up to 760V and power up to 50 kVAR: PhMKDg
  - U up to 1400V and power up to 350 kVAR: PhMKPg
  - U up to 24 kV and power up to 800 kVAR: Pha...
- **Vishay-ESTA also provides power caps. for HVDC power lines → next page**





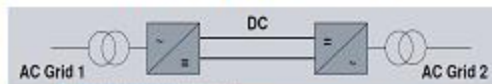
off-shore windpark



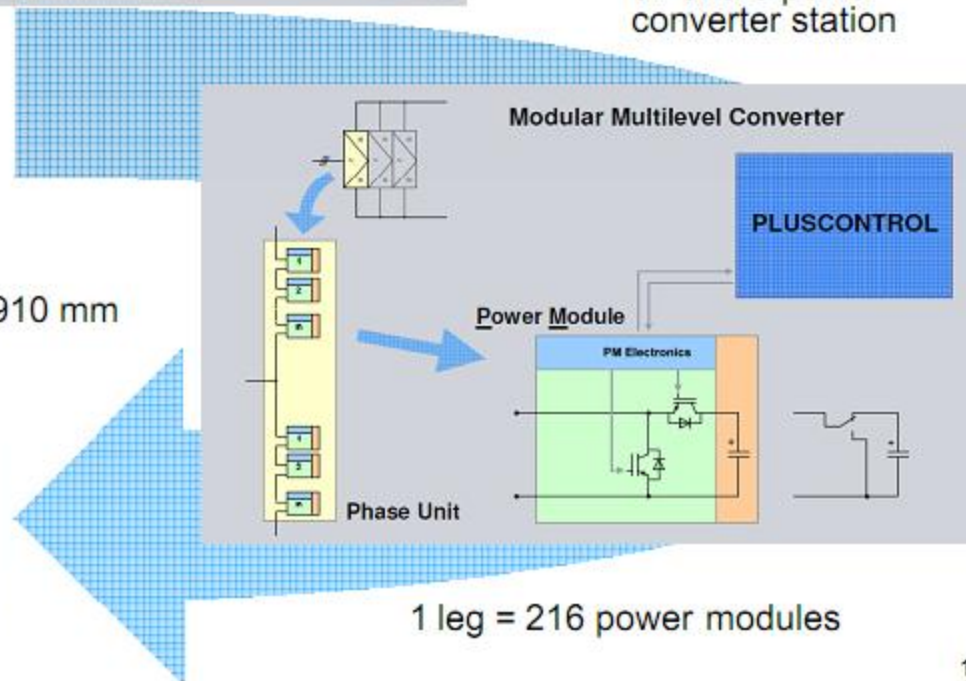
- ESTA Capacitor  
DCMKP 2.65 / 4.4 mF  
U = 2650 VDC  
C = 4400  $\mu$ F  
LxWxH = 340 x 175 x 910 mm  
weight = 70kg



HVDC power line



on-shore power  
converter station



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- **Vishay offers special DC Power capacitors for:**
  - HVDC-Transmission Off-Shore
  - SVC (Static VAR compensation)
  - FACTS (Flexible AC Transmission Systems)
- **ESTA DC-Capacitors are key-components for modern IGBT-Converter Technologies**



Source: Global Wind Energy Council Report

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