

# New Gate Drivers optimized for Mitsubishi Electric New IGBT Module LV100 series parallel operation

Application reference : Wind Power 2MW 2 level Single phase Power Stack.



Supported by Mitsubishi Electric Corporation  
Joint Development for Power Stack : NTUT



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### B) Power Stack application reference

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# 1) Tamura Gate Driver 7 key points

Space saving / 100% on the IGBT

High-speed response & accuracy

Suitable for parallel drive



High Power DC-DC converter

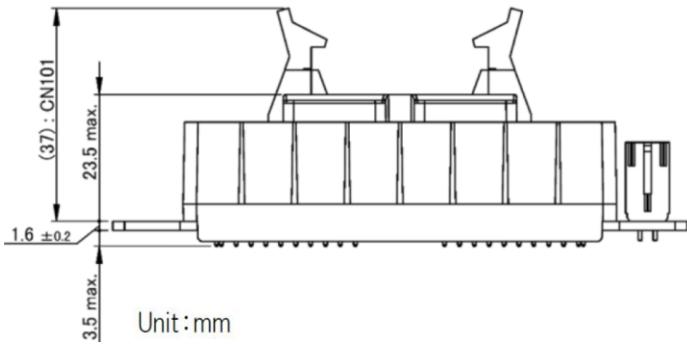
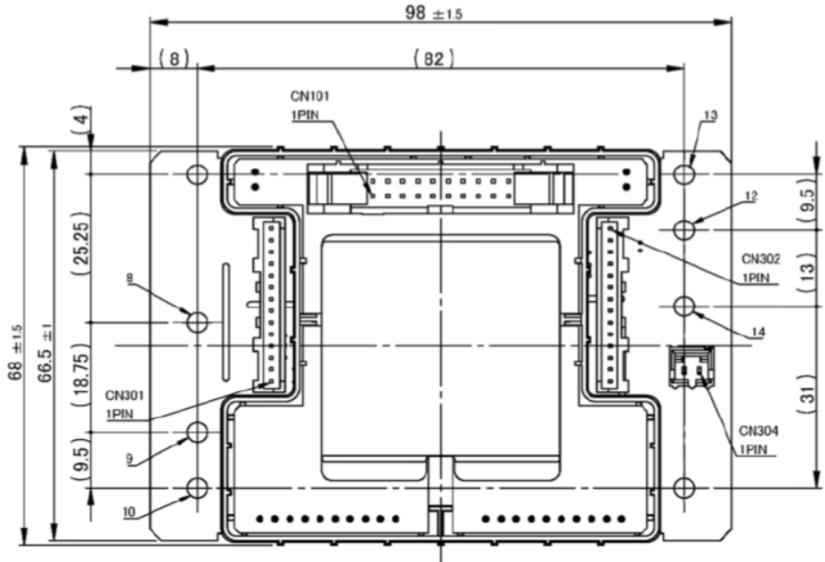
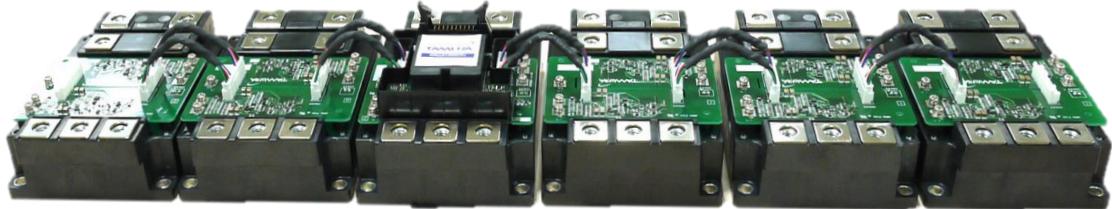
Low stray capacity



Wider input voltage

Various protections

## 2) Appearance



Unit : mm

Note :1.The dimensional tolerance without directions is  $\pm 0.5\text{mm}$ .

\* Specifications may be changed.

### 3) Specification

Package	Vce	Ic	Part No	Master /Slave	Model	Frequency (kHz)	Maximum parallel number	
	800	CM800DW-24T	Master	Slave	2LG02zyxC11M (2DUy51008xML4)	TBD	TBD	
					2LG02zyZC11S (2DSC51008-ML4)			
	1200	CM1200DW-24T	Master	Slave	2LG02zyxC11M (2DUy51008xML3)	9kHz (max)/units	3units (frequency 2.5kHz or less)	
					2LG02zyZC11S (2DSC51008-ML3)			
	800	CM800DW-34T CM800DW-34TA	Master	Slave	2LG01zyxC11M (2DUy51008xML2)	13.5kHz (max)/units	5units (frequency 2.5kHz or less)	
					2LG01zyZC11S (2DSC51008-ML2)			
	1700	1200	CM1200DW-34T	Master	Slave	2LG01zyxC11M (2DUy51008xML1)	9kHz (max)/units	3units (frequency 2.5kHz or less)

Model: ( ) Old Products number

**x:** Signal input voltage selectable "C" => 3.3~15V "D" => 15V

**y:** Protection circuits "C"=>Soft turn off / "D"=>Soft turn off + Active clamp

**z:** Thermistor Isolated Amplifiers "A"=>Yes / "0"=>None



## 4) Insulation performance corresponding to each safety standard

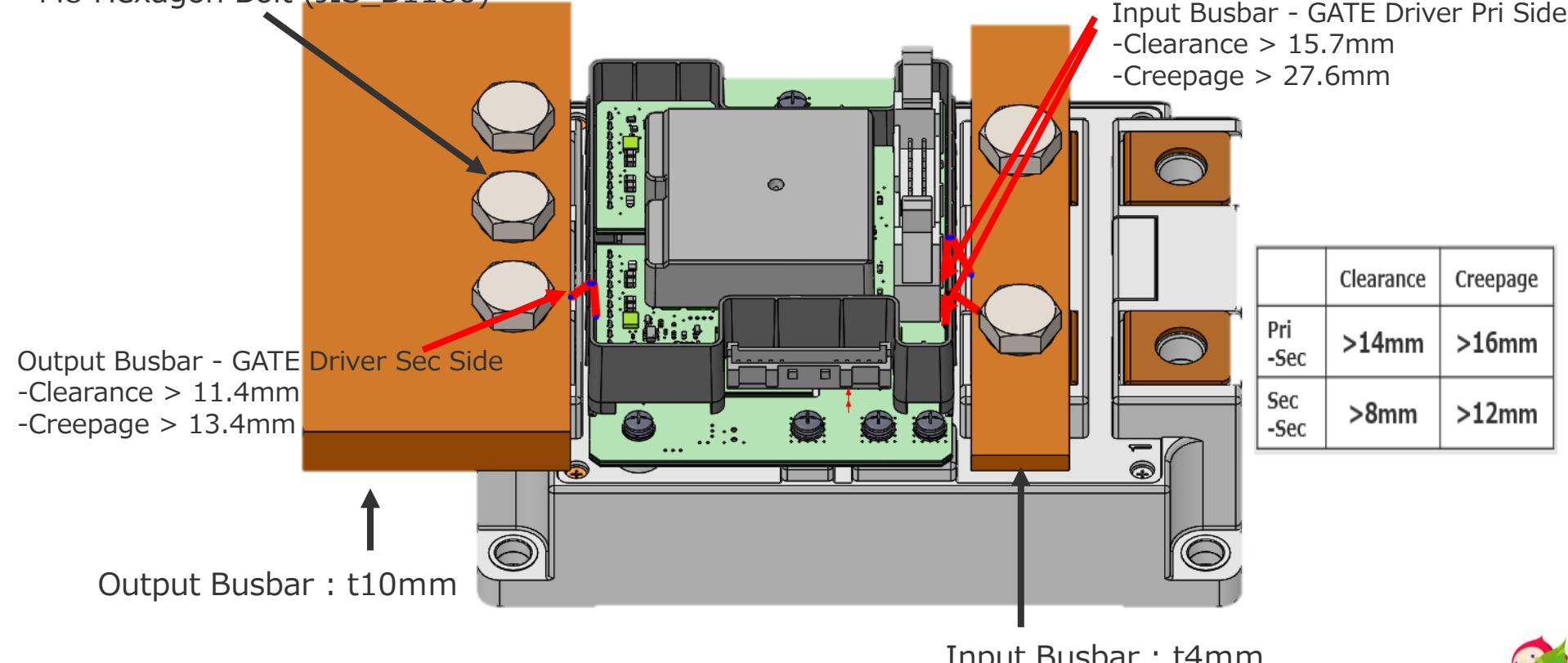
### ■ Compliant Safety Standards

- IEC62109-1 (photovoltaic generation standard)  
and IEC62477-1 (semi-conductor power conversion system/wind power generation standard)

- Basic isolation: Systems voltage  $\leq$ 1000Vrms (1500Vdc), Operating voltage  $\leq$ 1600Vrms, OVCIII, PD2, 4000m
- Enhanced isolation: Systems voltage  $\leq$ 1000Vrms (1500Vdc), Operating voltage  $\leq$ 1250Vrms, OVCIII, PD2, 2000m

### ■ Busbar - Gate Driver

M8 Hexagon Bolt (JIS\_B1180)



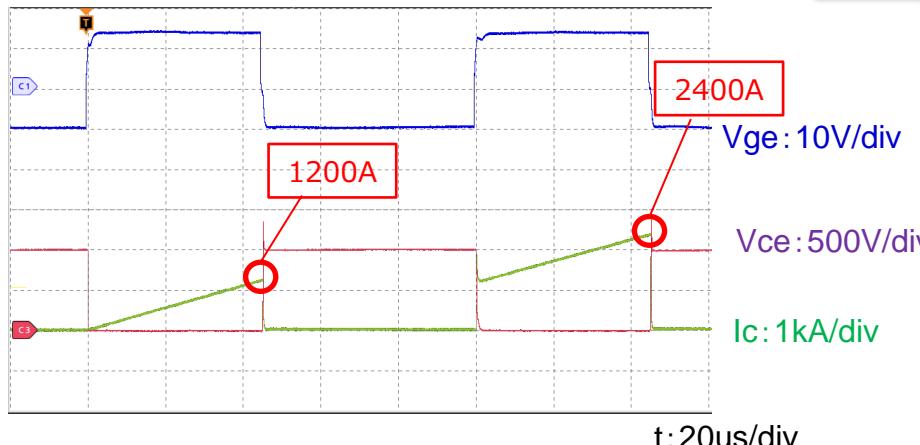
## 5) Single Operation Matching Data

**2 pulse test**

**N-side**

**Vce,Ic,Vge**

T<sub>j</sub>=25°C, **Vcc=1000V**



**【Turn on\_1200A】**

**CM1200DW-34T**

SW side gate (turn ON)  
No ringing and no overshoot

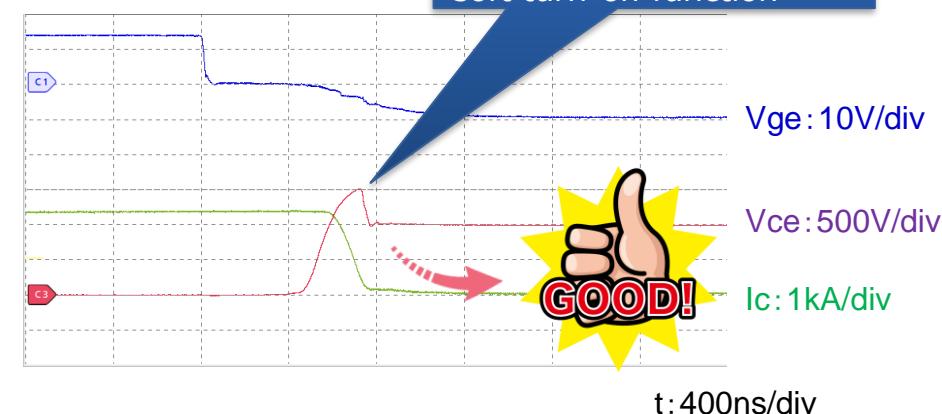


**【Measured value】**

Vce(peak)		1501	V
Turn on _1200A	dV/dt(max)	7	kV/us
	dI/dt(max)	11	kA/us
	Eon	241	mJ
Turn off _2400A	dV/dt(max)	10	kV/us
	dI/dt(max)	16	kA/us
	Eoff	448	mJ

**【Turn off\_2400A】**

Vce peak reduction with  
soft turn-off function



## 5) Single Operation Matching Data

### Short circuit test

N-side

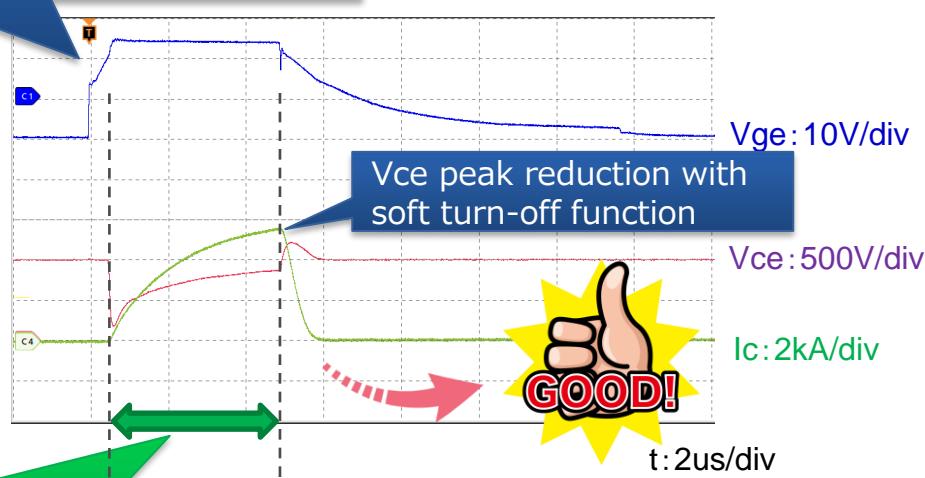
$T_j=25^\circ\text{C}$ ,  $V_{cc}=1000\text{V}$ , Load inductance : 170nH

#### 【Measured value】

- $V_{ce}(\text{peak})$  : 1213V
- $I_c(\text{peak})$  : 5659A
- $t_w$  : 5.3us

$V_{ce}, I_c, V_{ge}$

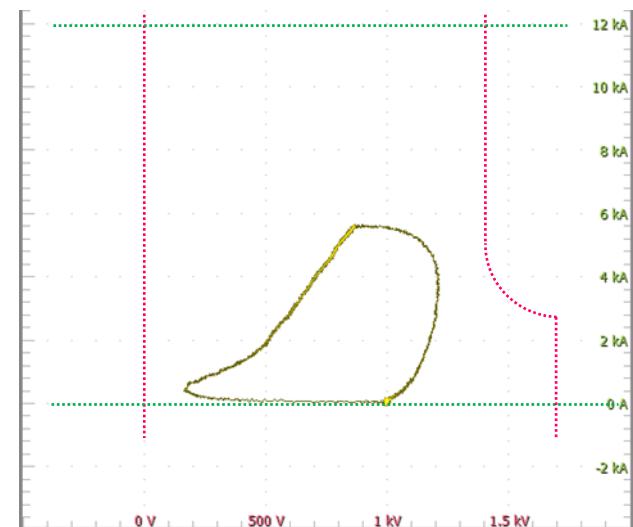
SW side gate (turn ON)  
No ringing and no overshoot



CM1200DW-34T

This driver suppresses the  $V_{ce}$  peak voltage in the short circuit by our original circuit technology, and can control the mask time to prevent false short circuit detection.  
(Patent pending)

SOA



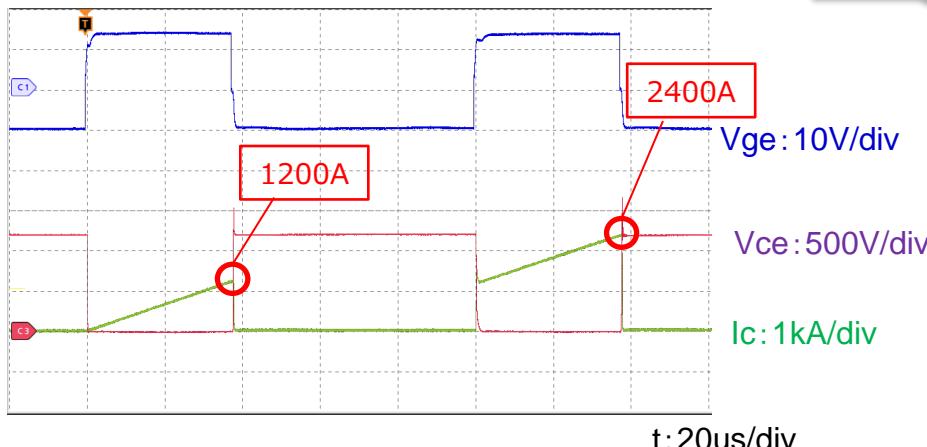
## 5) Single Operation Matching Data

**2 pulse test**

**N-side**

**Vce, Ic, Vge**

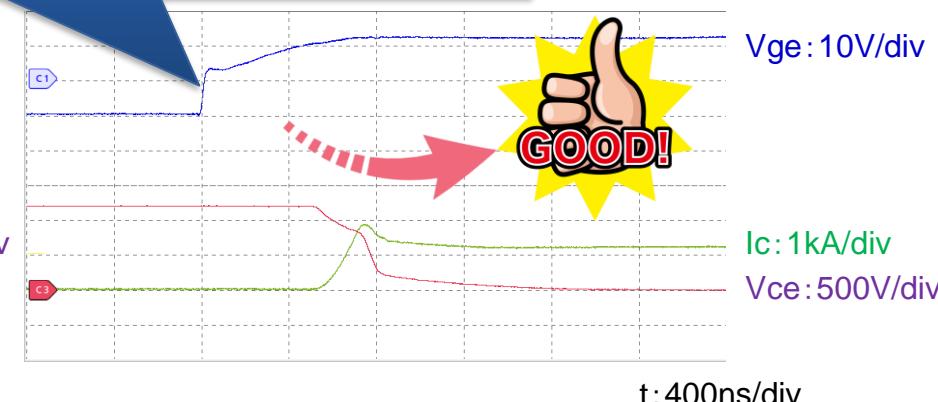
T<sub>j</sub>=25°C, **Vcc=1200V**



**【Turn on\_1200A】**

SW side gate (turn ON)  
No ringing and no overshoot

**CM1200DW-34T**

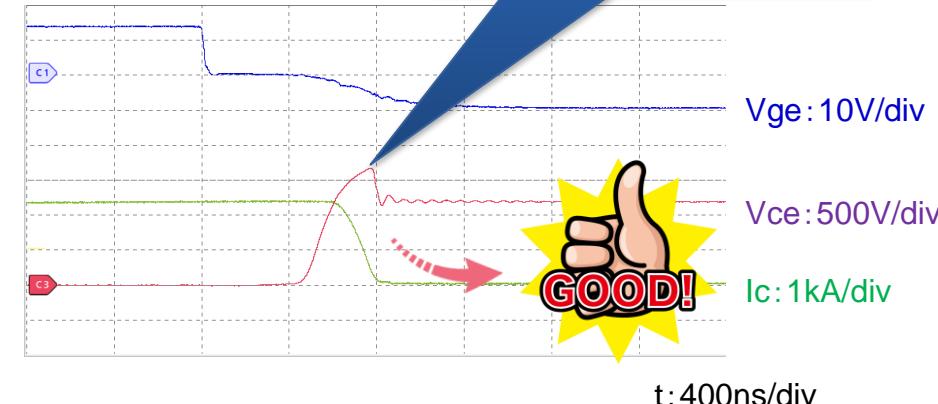


**【Measured value】**

Vce(peak)		1664	V
Turn on _1200A	dV/dt(max)	8	kV/us
	dI/dt(max)	11	kA/us
	Eon	300	mJ
Turn off _2400A	dV/dt(max)	10	kV/us
	dI/dt(max)	15	kA/us
	Eoff	591	mJ

**【Turn off\_2400A】**

Vce peak reduction with  
soft turn-off function



## 5) Single Operation Matching Data

### Short circuit test

N-side

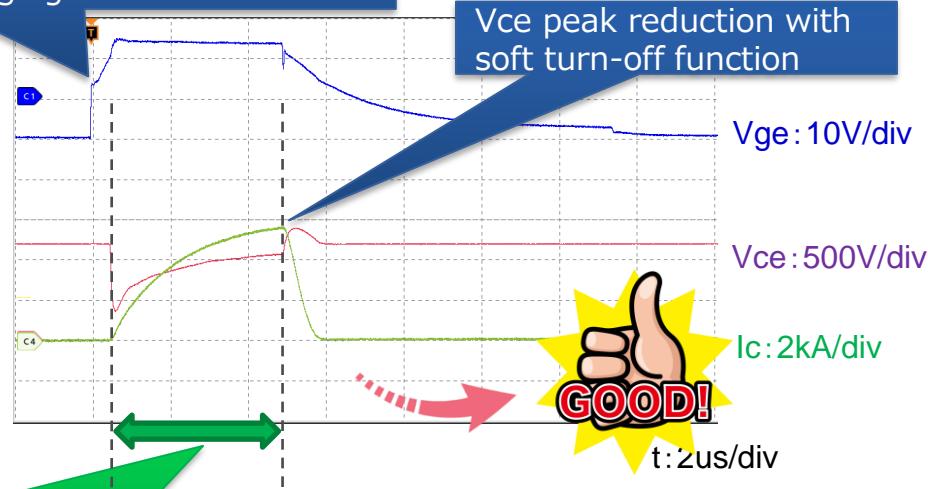
$T_j=25^\circ\text{C}$ ,  $V_{cc}=1200\text{V}$ , Load inductance : 170nH

[Measured value]

- $V_{ce}(\text{peak})$  : 1395V
- $I_c(\text{peak})$  : 5718A
- $t_w$  : 5.3us

$V_{ce}, I_c, V_{ge}$

SW side gate (turn ON)  
No ringing and no overshoot

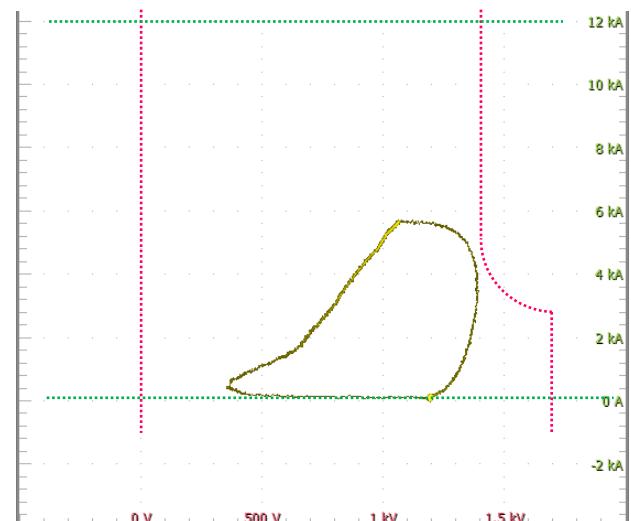


Constant control of mask time to prevent false short circuit detection regardless of short circuit conditions

CM1200DW-34T

This driver suppresses the  $V_{ce}$  peak voltage in the short circuit by our original circuit technology, and can control the mask time to prevent false short circuit detection.  
(Patent pending)

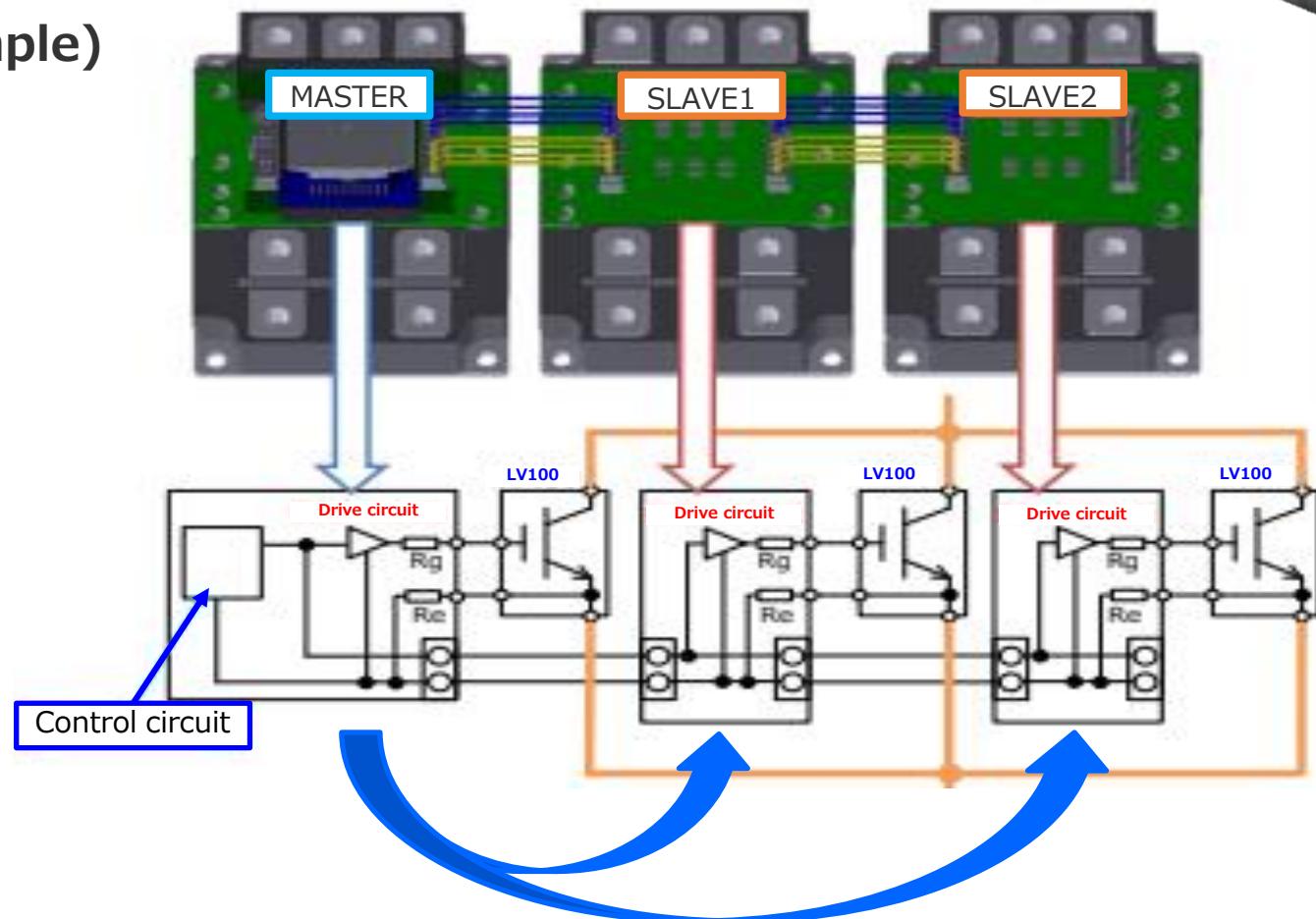
SOA



## 6) Parallel drive configuration

### Master and Slave Functions

Example)



★Master board can be placed anywhere!  
Please refer to page 21 current balance data.

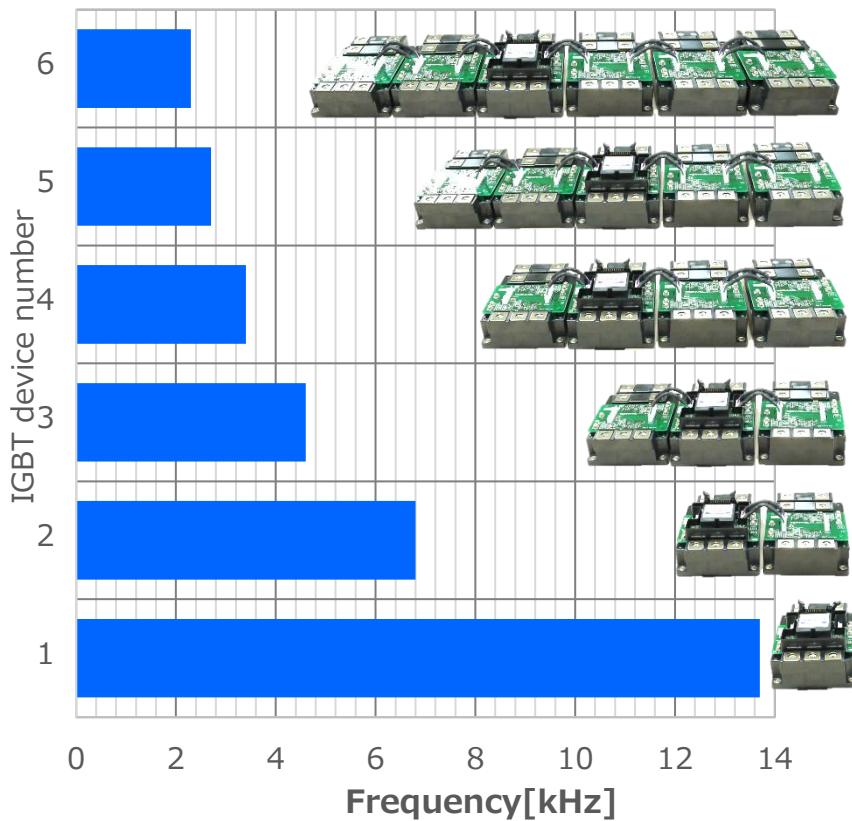


## 6) Parallel drive configuration (reference only)

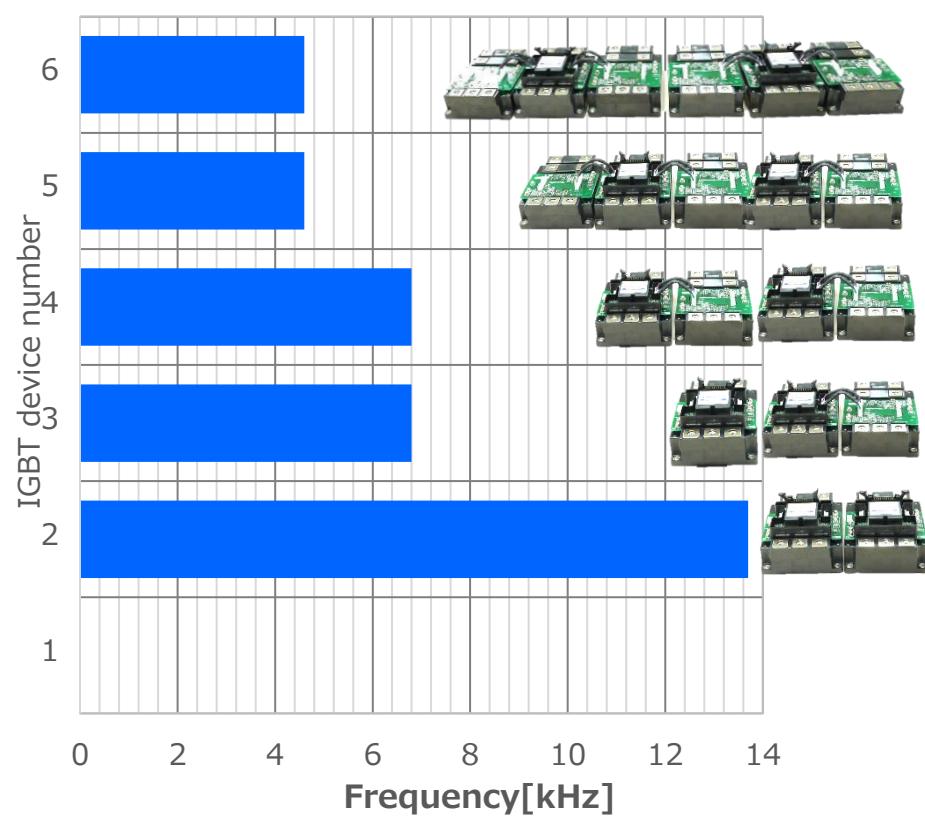
Frequency vs Gate driver parallel number (+15V / -10V)

- CM800DW-34T/CM800DW-34TA

1) Master PCB: 1set



2) Master PCB: 2set

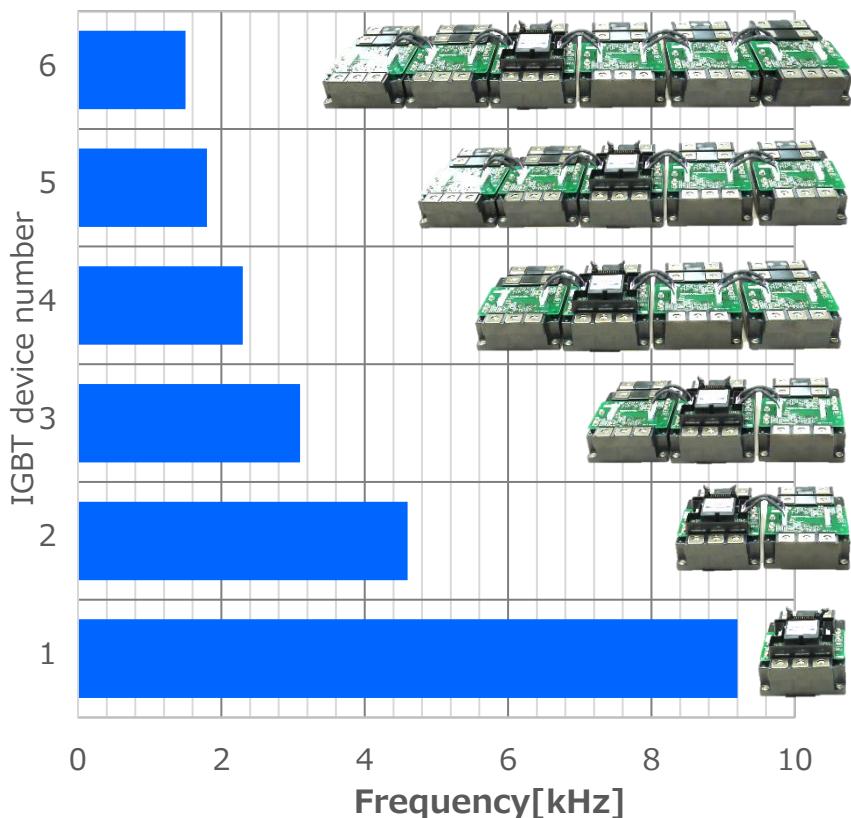


## 6) Parallel drive configuration (reference only)

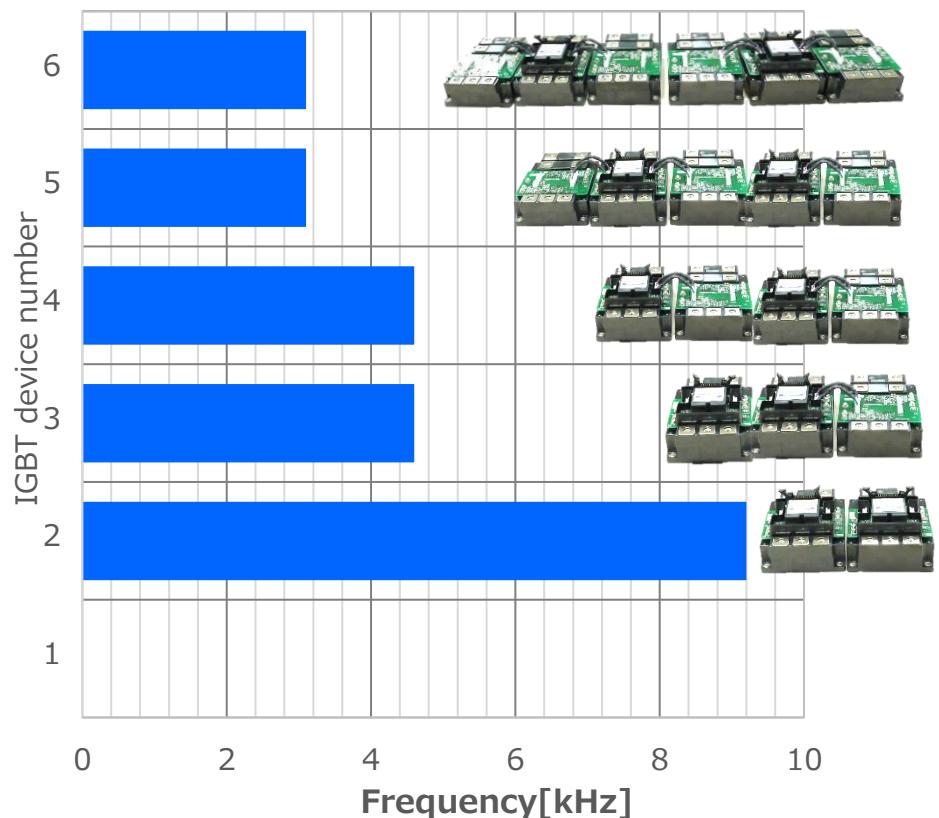
Frequency vs Gate driver parallel number (+15V / -10V)

- CM1200DW-34T/CM1200DW-24T

1) Master PCB: 1set

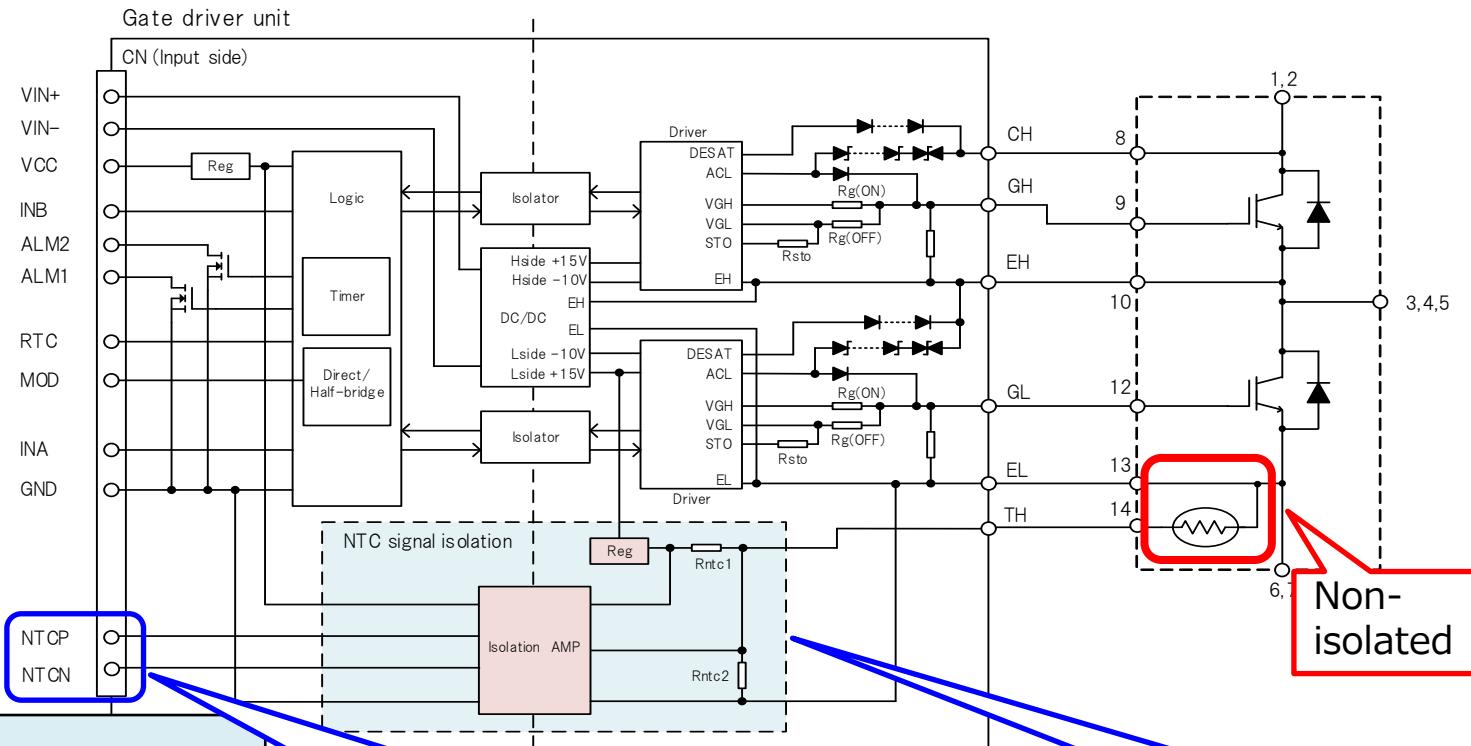


2) Master PCB: 2set

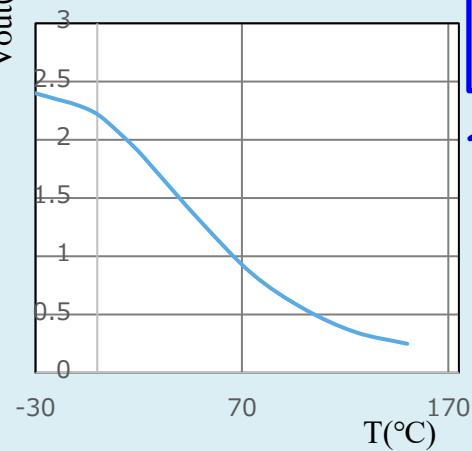


# 7) Isolated temperature sensing

Optional function

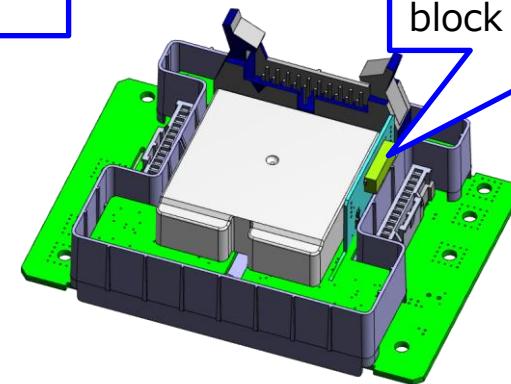


V<sub>out</sub>(V)



V<sub>out</sub> VS TJ

NTC information output from input CN



NTC isolation processing block

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## B) Power Stack application reference

- 1) Power Stack Information
- 2) Power Stack specification reference
- 3) Power Stack operation reference data (2 pulse / Short circuit)

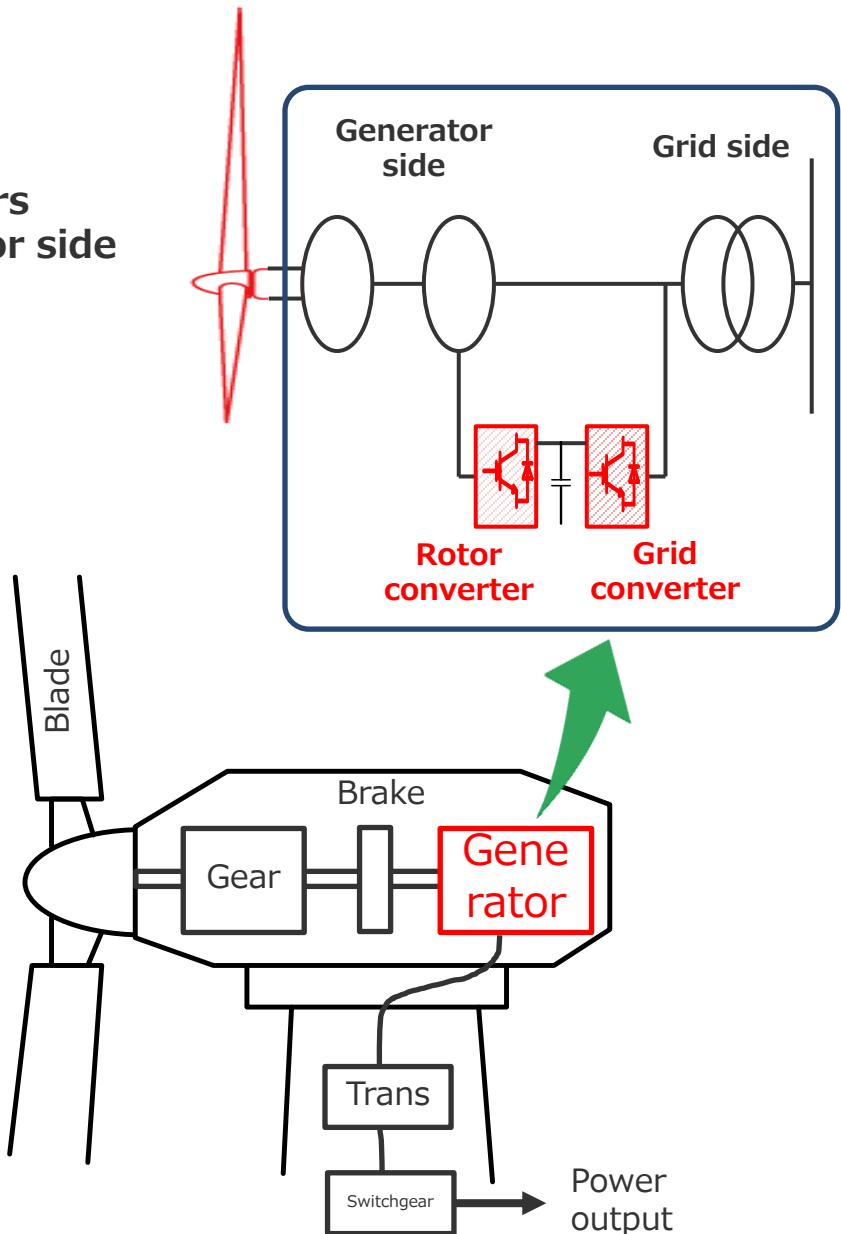
## C) Introduction of One Tamura

### Appendix) Contact person

# 1) Power Stack Information

## Reference information

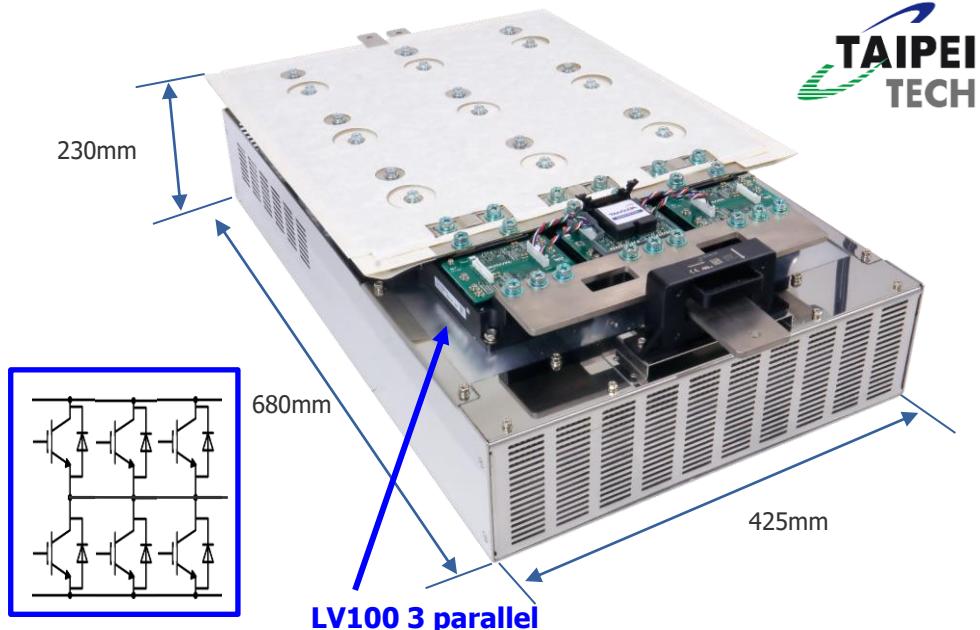
Reference application : Wind Power converters  
for Grid side and Rotor side  
Install type : Onshore  
Circuit solution : 2 Level



## 2) Power Stack specification reference

Joint Development of National TAIPEI University of Technology - Tamura

Cooperated by Mitsubishi Electric



Slave PCB1  
(2LG01ADZC11S)

Master PCB  
(2LG01ADDC11M)

Slave PCB2  
(2LG01ADZC11S)

### Specification

- The half-bridge 3-parallel
- Max Power 2.0MW
- Rated Current 1900Arms\*
- Bus-bar stray inductance 10nH

\* Vdc-link 1050V Vac = 690Vrms

**Power Module**    “CM1200DW-34T” (Mitsubishi Electric)  
Rated current 1200A  
Rated voltage 1700V

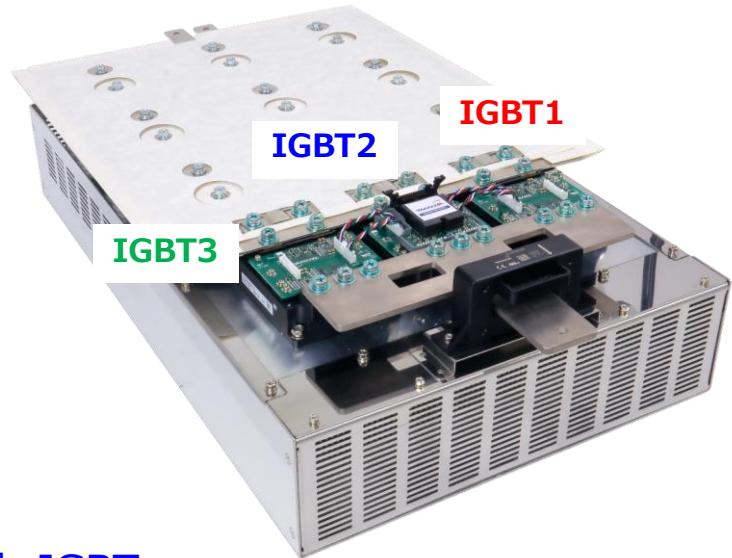
**Gate Driver**    “2LG01ADDC11M” (TAMURA)  
“2LG01ADZC11S” (TAMURA)  
**Current Sensor**    “L51S2T5D15” (TAMURA)



### 3) Power Stack operation reference data

#### 2 pulse test (reference only)

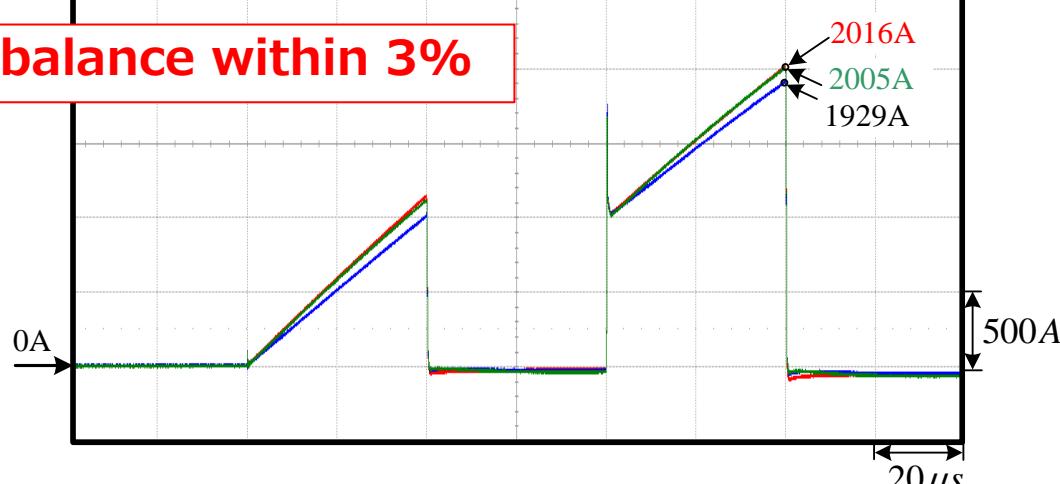
Item	Description
IGBT device	CM1200DW-34T
Gate driver	2LG01ADDC11M
Gate voltage	+15V/-10V
Gate resistor	+0.47Ω/-0.47Ω
DC-link voltage (VCC)	1000V
Load inductance	11uH
Junction temperature	25°C



Current waveform of each IGBT

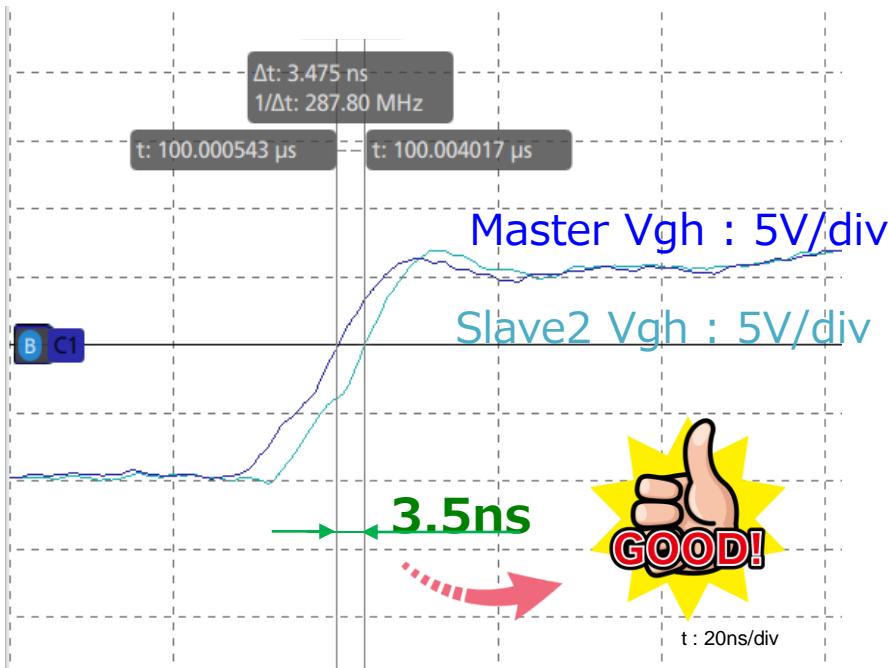
	IGBT1	IGBT2	IGBT3	Avg.	
Value(A)	2016	1929	2005	1983.33	
Var(%)	1.65	2.74	1.09		

Current balance within 3%

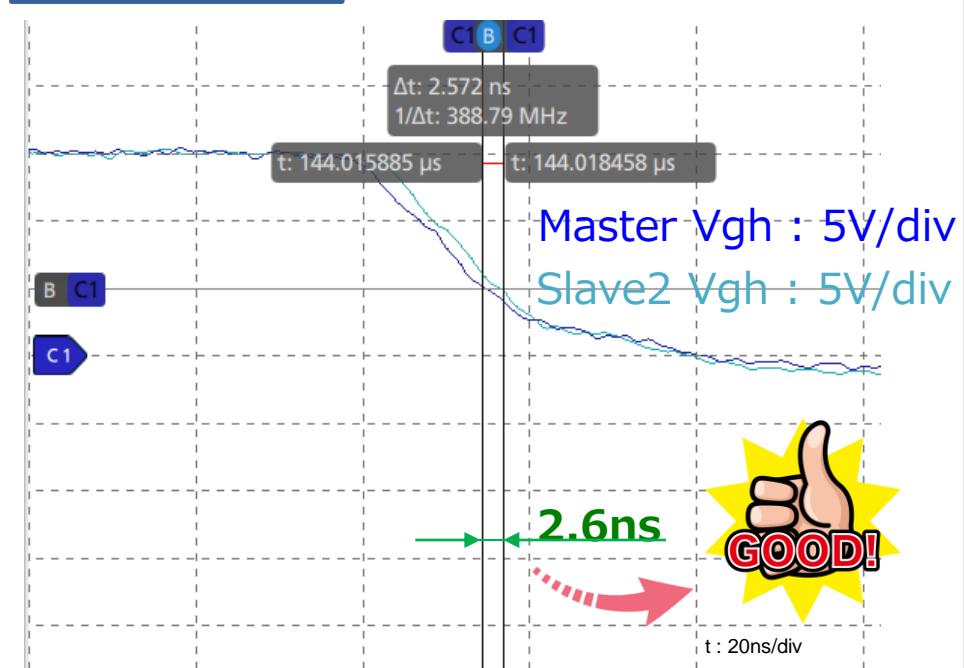


## Gate signal balance

Turn ON



Turn OFF

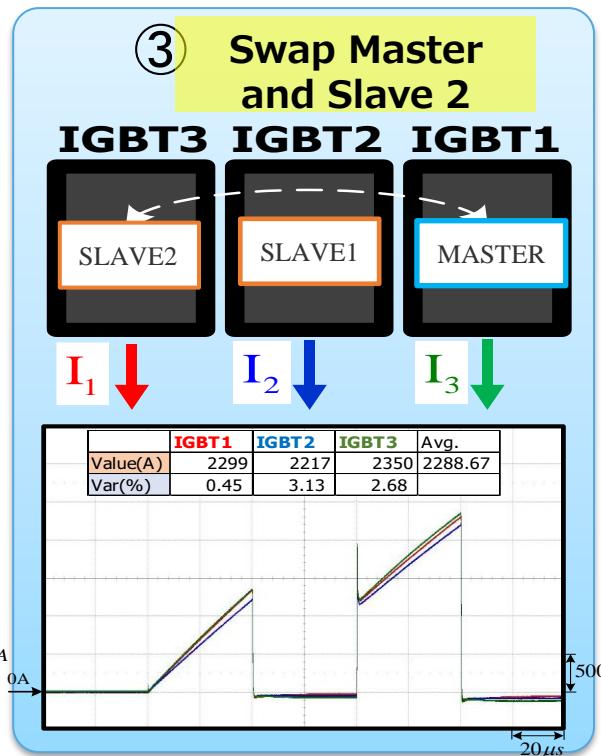
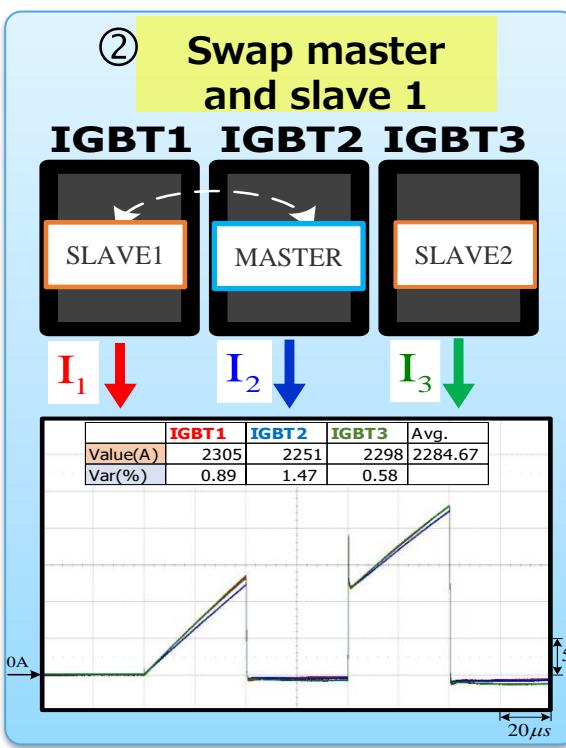
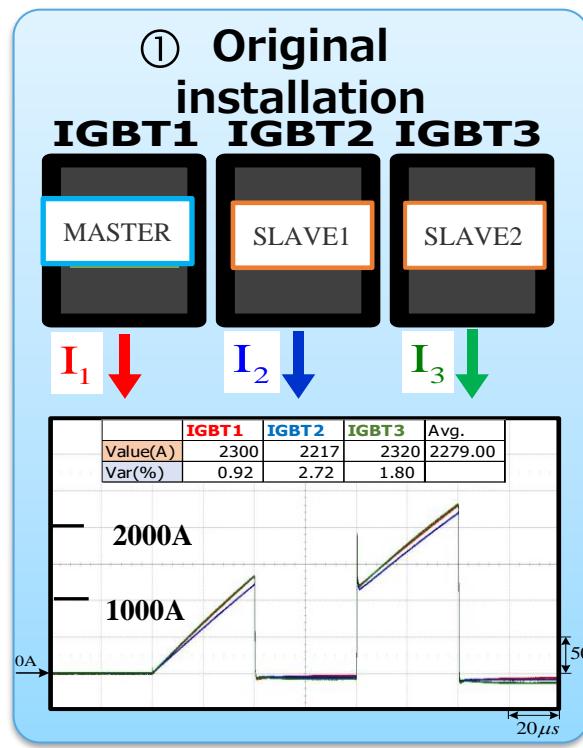


**Slave drive signal delay is very small.**



### 3) Power Stack operation reference data

#### Current balance



The current balance does not change even when the position of the gate driver is changed.

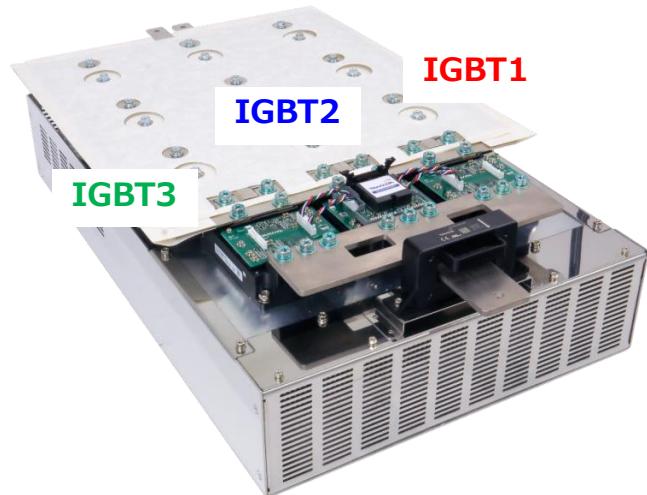
= Do not worsen the current balance in the gate driver



### 3) Power Stack operation reference data

#### Short circuit test (Load short / reference only)

Item	Description
IGBT device	CM1200DW-34T
Gate driver	2LG01ADDC11M
Gate voltage	+15V/-10V
Gate resistor	+0.47Ω/-0.47Ω
DC-link voltage (VCC)	1000V
Load inductance	170nH (L101, 102, 103)
Junction temperature	25°C



SW side gate (turn ON)  
No ringing and no overshoot

Vce peak reduction with  
soft turn-off function

Constant control of mask time to prevent  
false short circuit detection regardless of  
short circuit conditions

Vg (IGBT1) : 15V/div

Vg (IGBT3) : 15V/div

Vce : 400V/div

Ic (IGBT1) : 1kA/div

Ic (IGBT2) : 1kA/div

Ic (IGBT3) : 1kA/div



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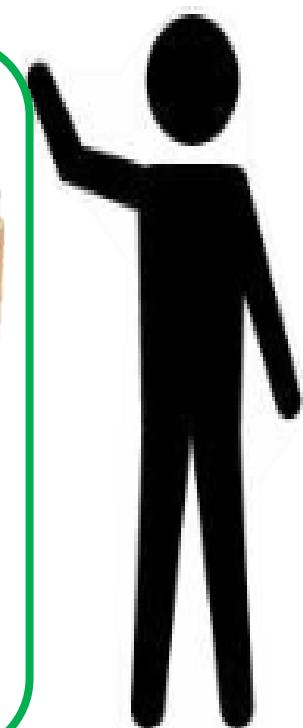
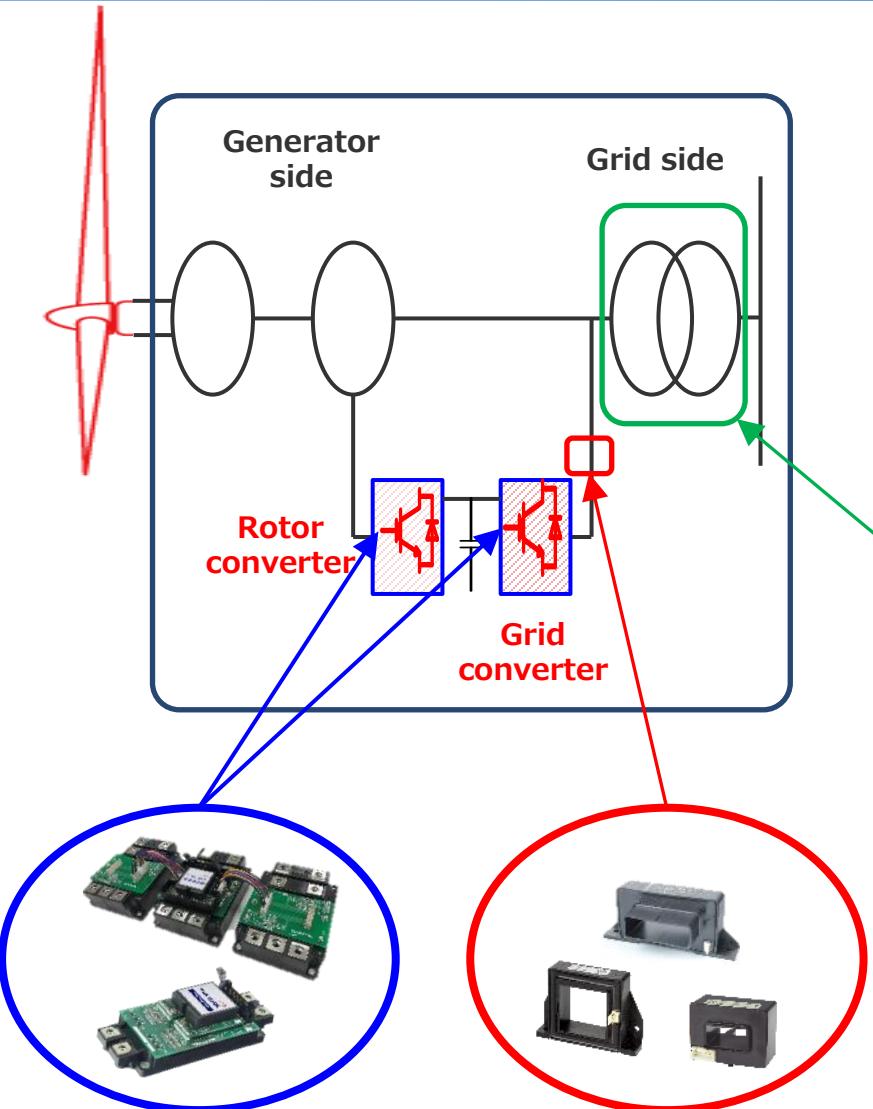
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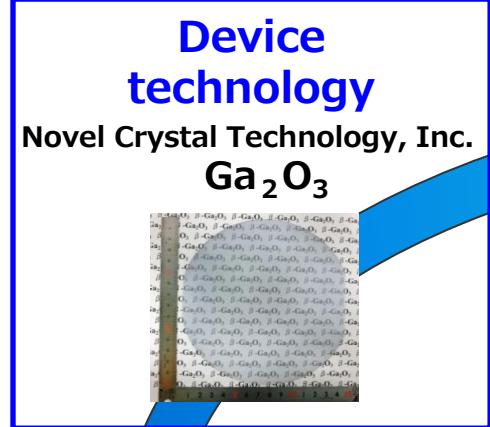
### C) Introduction of One Tamura (Wind Power converters)



Dimension ratio 1/25

# C) Introduction of One Tamura (General application)

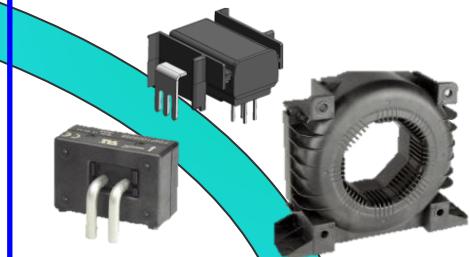
Power electronics technology and main products



**Gate driver**  
Circuit technology



**Module technology**  
Current sensor



**Soldering technology**



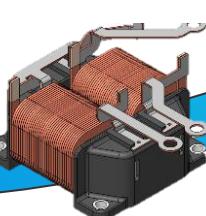
Electric Chemicals  
Soldering material  
Die attach material  
TIM material

**Power electronics technology and main products**

**Reflow soldering system**

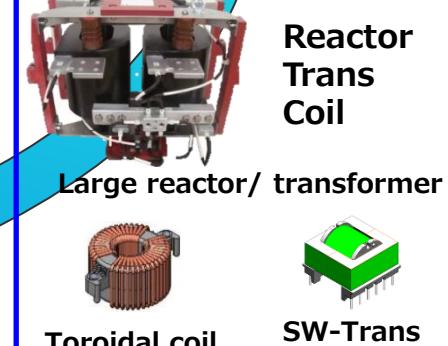


**Automotive reactor**



Reactor for PF  
(2 in 1)

**Passive components**



# Appendix) Information & Contact



Please visit our website!

The screenshot shows the TAMURA website's main page. At the top, there are navigation links: Products, Design data, Product Lineup Catalog, Stock check, Distributor, and Contact. Below this, a banner features the text "Your One and Only Company" and "Tamura's Gate Driver Module Series for SiC/IGBT Grows with Various Expanding Market". It includes images of various power electronic components and applications like Production Heating, Solar Power, Wind Power, and Automotive. The main content area is titled "Products" and displays a grid of product categories with images: Gate Driver, Current Sensor, Power Module, LED Driver, Transformers, Lower Frequency Reactor, Higher Frequency Reactor, Inductors • Coil, Solder Paste, Solder Resist, Soldering Systems, and Gallium Oxide Power Devices\*. At the bottom, there are links for Selection Guide, Products Search, Design Data, and 3D CAD Data Download.



Tamura Gate Driver



- Let's know more TAMURA products  
Special movie  
Presentation of conference
- Easy Get the essential  
Matching data with power module  
3D data to design!
- One-click to purchase  
from the check stock!

Feel free to inquire! ↓

<https://www.tamuracorp.com/electronics/en/contact/>