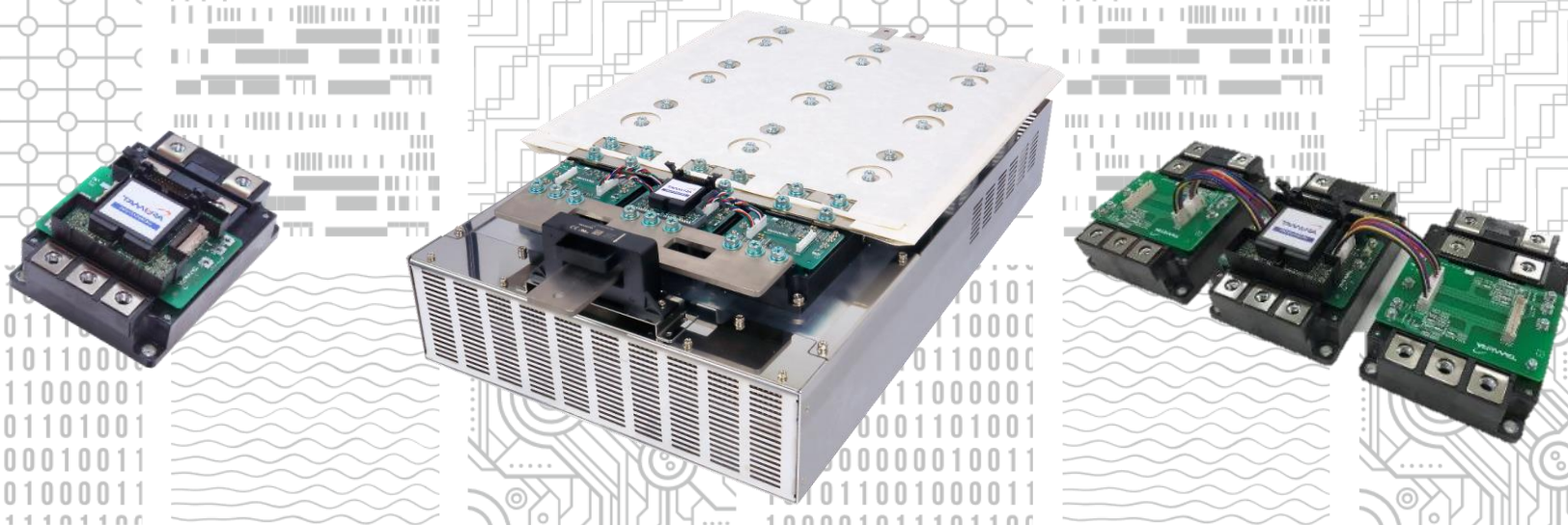


New Gate Drivers optimized for Mitsubishi Electric New IGBT Module LV100 series parallel operation

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



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



Index

A) Introduction of Gate Driver for LV100

- 1) Tamura Gate Driver 7 key points
- 2) Appearance
- 3) Specification
- 4) Insulation performance corresponding to each safety standard
- 5) Single operation matching data (2 pulse / Short circuit)
- 6) Parallel drive configuration
- 7) Isolated temperature sensing

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

Index

A) Introduction of Gate Driver for LV100

- 1) Tamura Gate Driver 7 key points
- 2) Appearance
- 3) Specification
- 4) Insulation performance corresponding to each safety standard
- 5) Single operation matching data (2 pulse / Short circuit)
- 6) Parallel drive configuration
- 7) Isolated temperature sensing

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

Space saving / 100% on the IGBT

High-speed response & accuracy

Suitable for parallel drive

High Power DC-DC converter

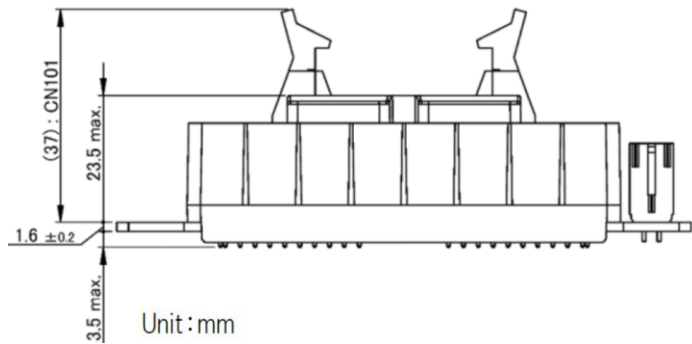
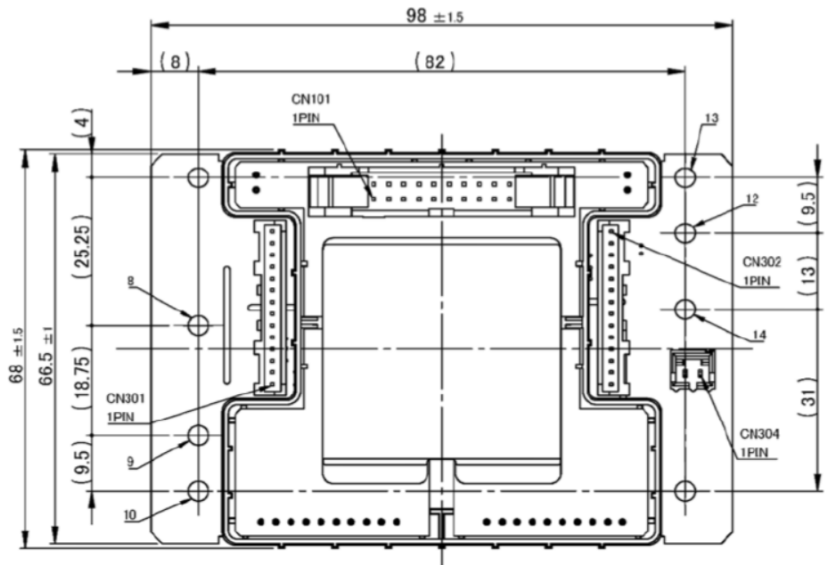
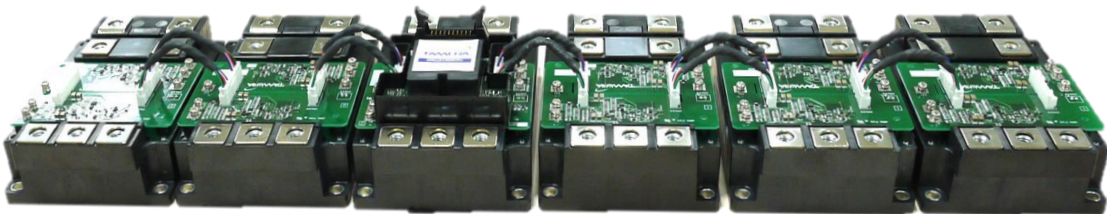
Low stray capacity

Wider input voltage

Various protections



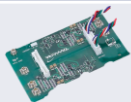
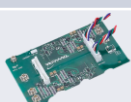
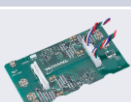
2) Appearance



Unit: mm

Note: 1. The dimensional tolerance without directions is ± 0.5 mm.

3) Specification

Package	Vce	Ic	Part No	Master /Slave	Model	Frequency (kHz)	Maximum parallel number
	1200	800	CM800DW-24T	Master 	2LG02zyxC11M (2DUy51008xML4)	TBD	TBD
				Slave 	2LG02zyZC11S (2DSC51008-ML4)		
		1200	CM1200DW-24T	Master 	2LG02zyxC11M (2DUy51008xML3)	9kHz (max) /units	3units (frequency 2.5kHz or less)
				Slave 	2LG02zyZC11S (2DSC51008-ML3)		
	1700	800	CM800DW-34T CM800DW-34TA	Master 	2LG01zyxC11M (2DUy51008xML2)	13.5kHz (max) /units	5units (frequency 2.5kHz or less)
				Slave 	2LG01zyZC11S (2DSC51008-ML2)		
		1200	CM1200DW-34T	Master 	2LG01zyxC11M (2DUy51008xML1)	9kHz (max) /units	3units (frequency 2.5kHz or less)
				Slave 	2LG01zyZC11S (2DSC51008-ML1)		

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

■ Compliant Safety Standards

- IEC62109-1 (photovoltaic generation standard)
and IEC62477-1 (semi-conductor power conversion system/wind power generation standard)
- Basic isolation: Systems voltage $\leq 1000\text{Vrms}$ (1500Vdc), Operating voltage $\leq 1600\text{Vrms}$, OVCI, PD2, 4000m
- Enhanced isolation: Systems voltage $\leq 1000\text{Vrms}$ (1500Vdc), Operating voltage $\leq 1250\text{Vrms}$, OVCI, PD2, 2000m

■ Busbar - Gate Driver

M8 Hexagon Bolt (JIS_B1180)

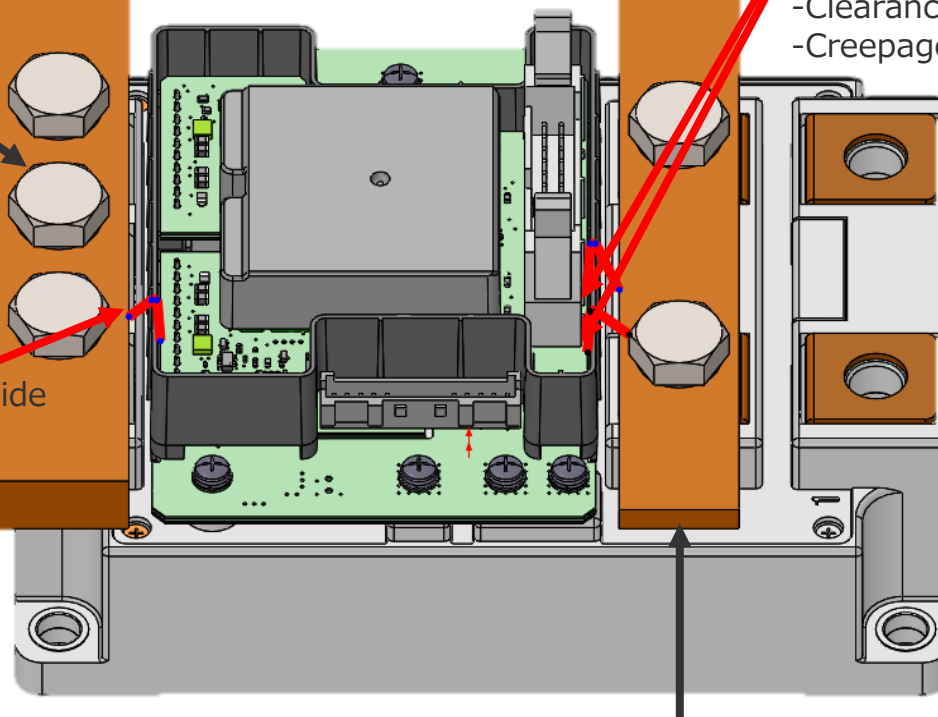
Input Busbar - GATE Driver Pri Side
-Clearance > 15.7mm
-Creepage > 27.6mm

	Clearance	Creepage
Pri -Sec	>14mm	>16mm
Sec -Sec	>8mm	>12mm

Output Busbar - GATE Driver Sec Side
-Clearance > 11.4mm
-Creepage > 13.4mm

Output Busbar : t10mm

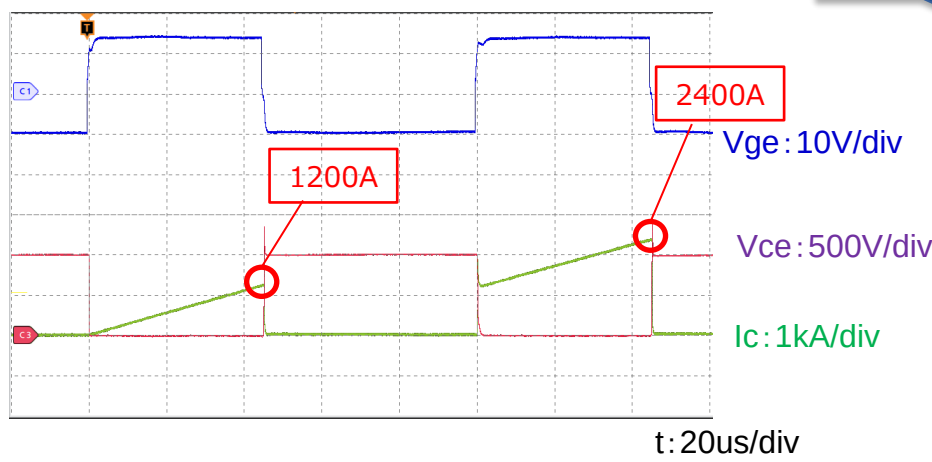
Input Busbar : t4mm



5) Single Operation Matching Data

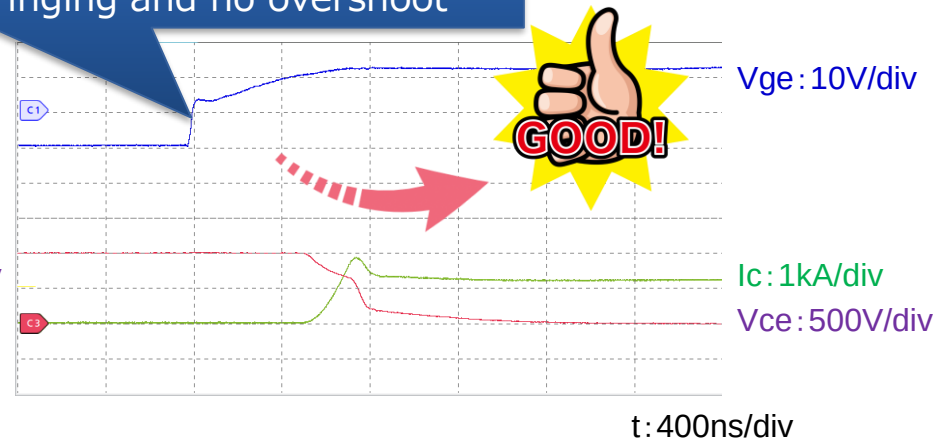
2 pulse test N-side

Vce,Ic,Vge Tj=25°C, Vcc=1000V



【Turn on_1200A】 CM1200DW-34T

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

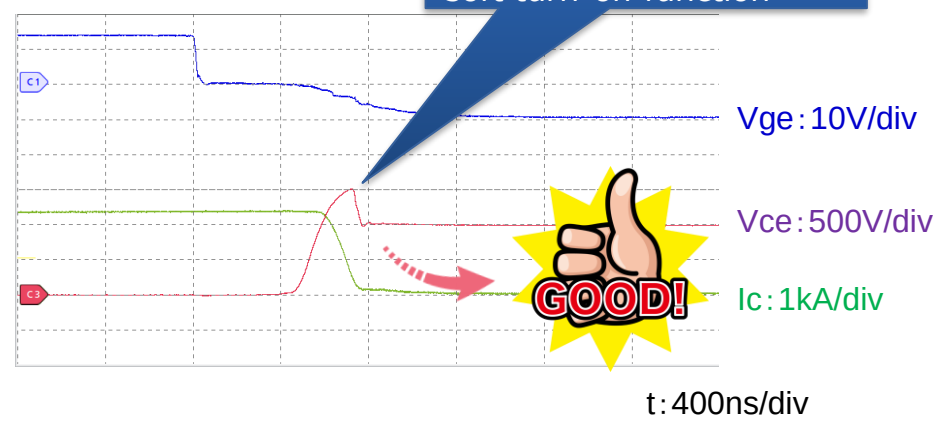


【Measured value】

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

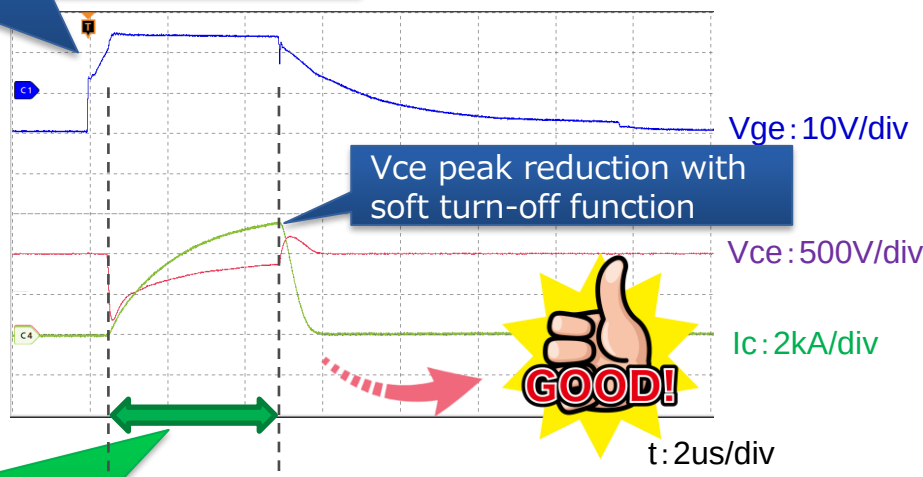
$T_j=25^{\circ}\text{C}$, $V_{cc}=1000\text{V}$, Load inductance : 170nH

【Measured value】

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

V_{ce}, I_c, V_{ge}

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

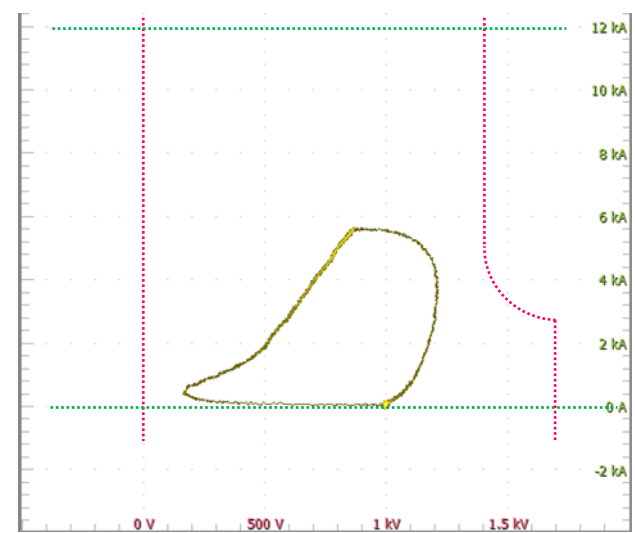


Constant control of mask time to prevent false short circuit detection regardless of short circuit conditions

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



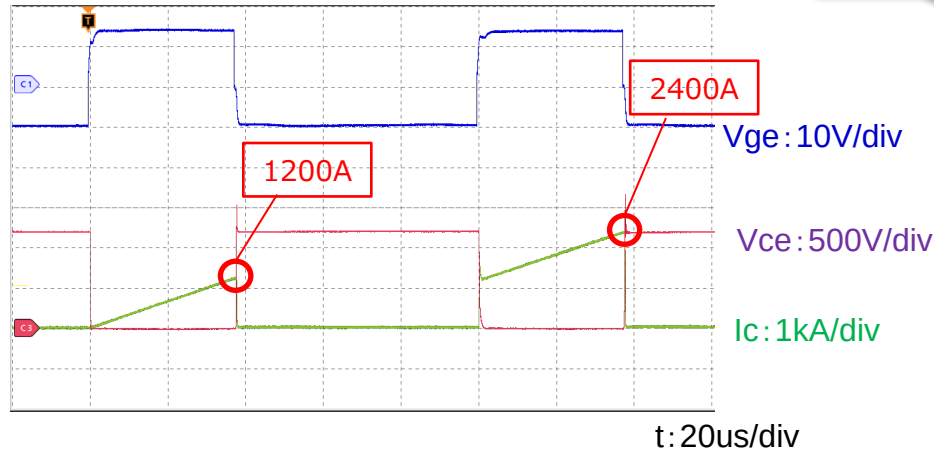
5) Single Operation Matching Data

2 pulse test

N-side

Vce, Ic, Vge

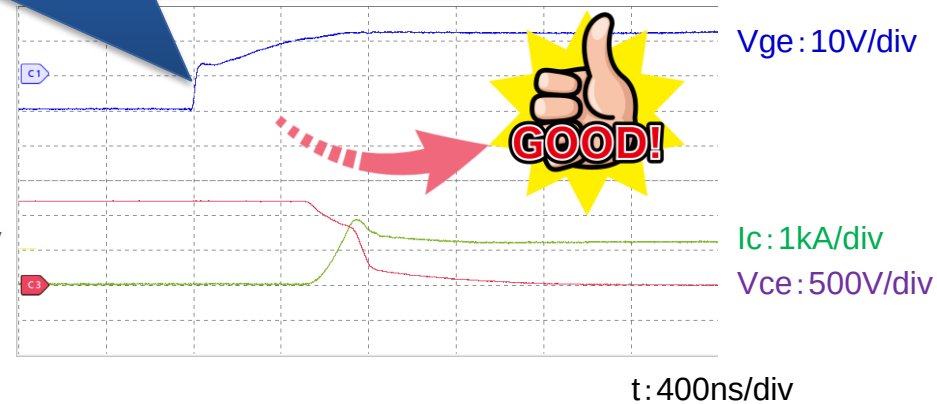
Tj=25°C, Vcc=1200V



【Turn on_1200A】

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

CM1200DW-34T

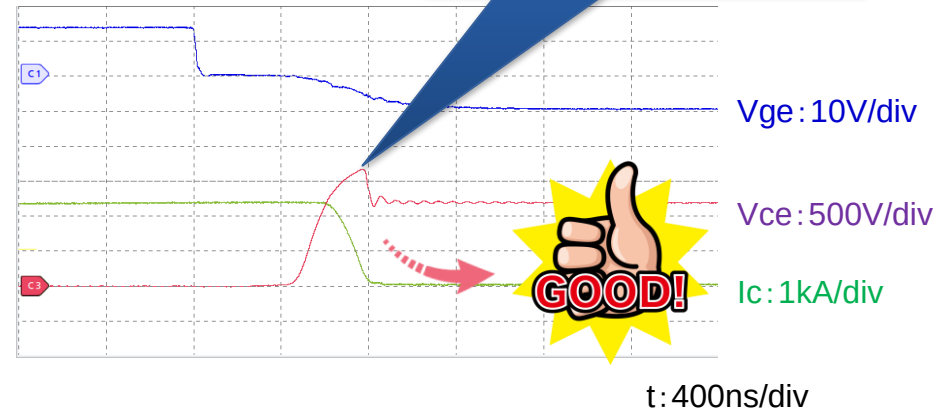


【Measured value】

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

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

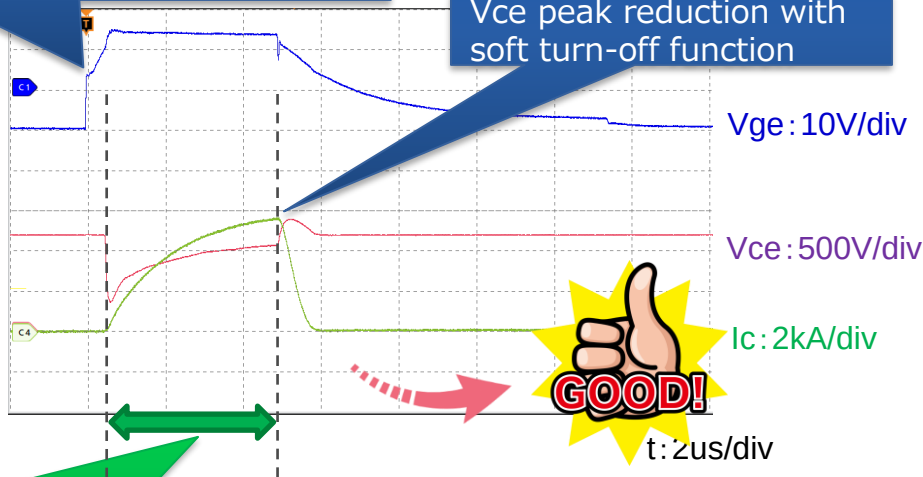
【Measured value】

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

V_{ce}, I_c, V_{ge}

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

V_{ce} peak reduction with
soft turn-off function

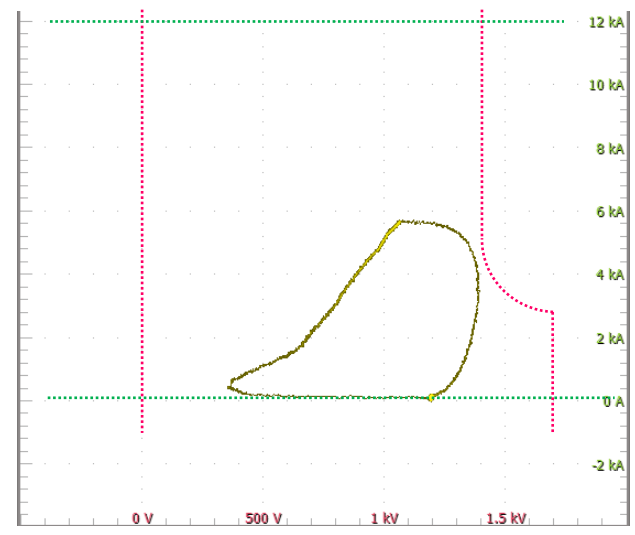


Constant control of mask time to prevent
false short circuit detection regardless of
short circuit conditions

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

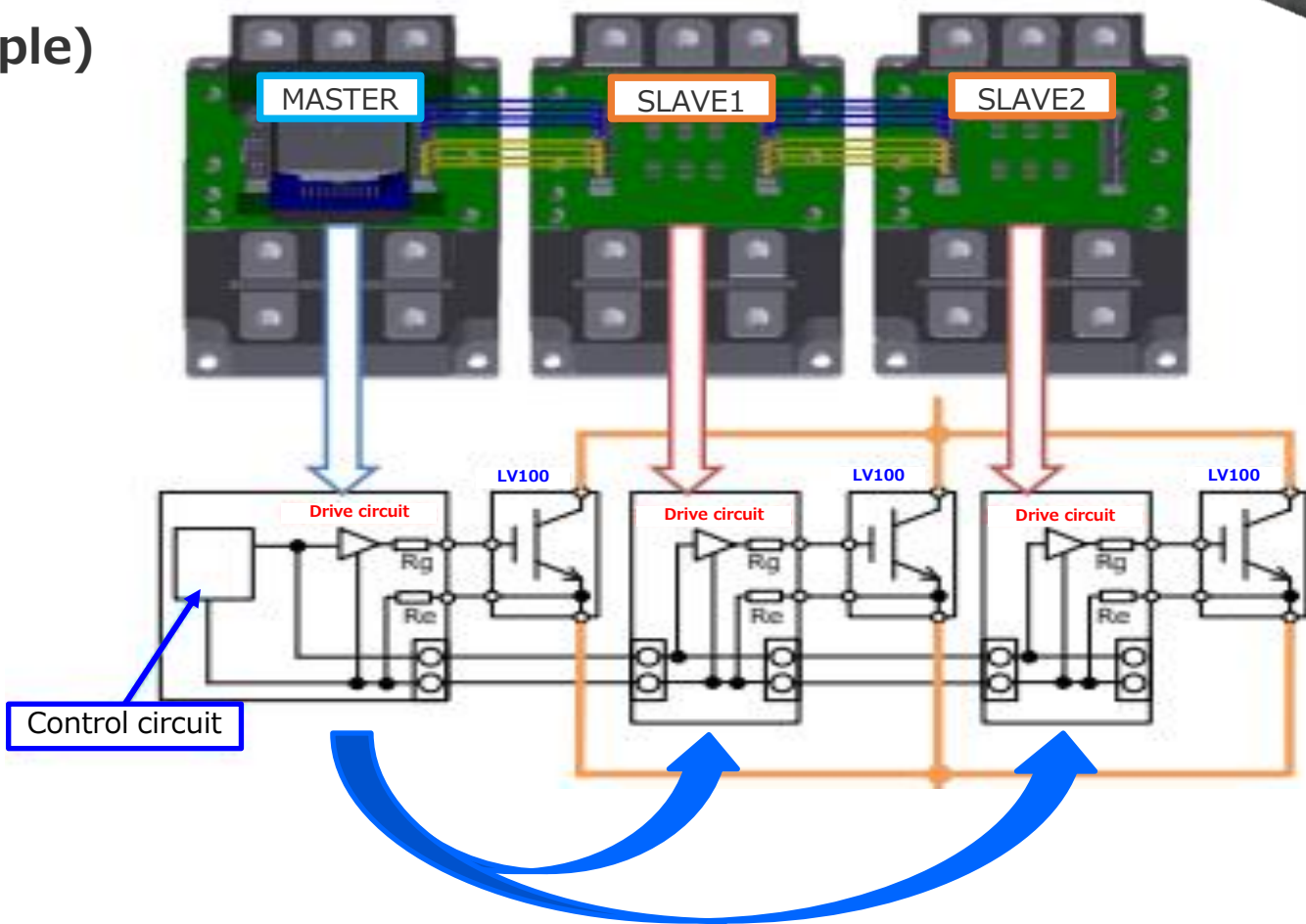


6) Parallel drive configuration

Master and Slave Functions



Example)



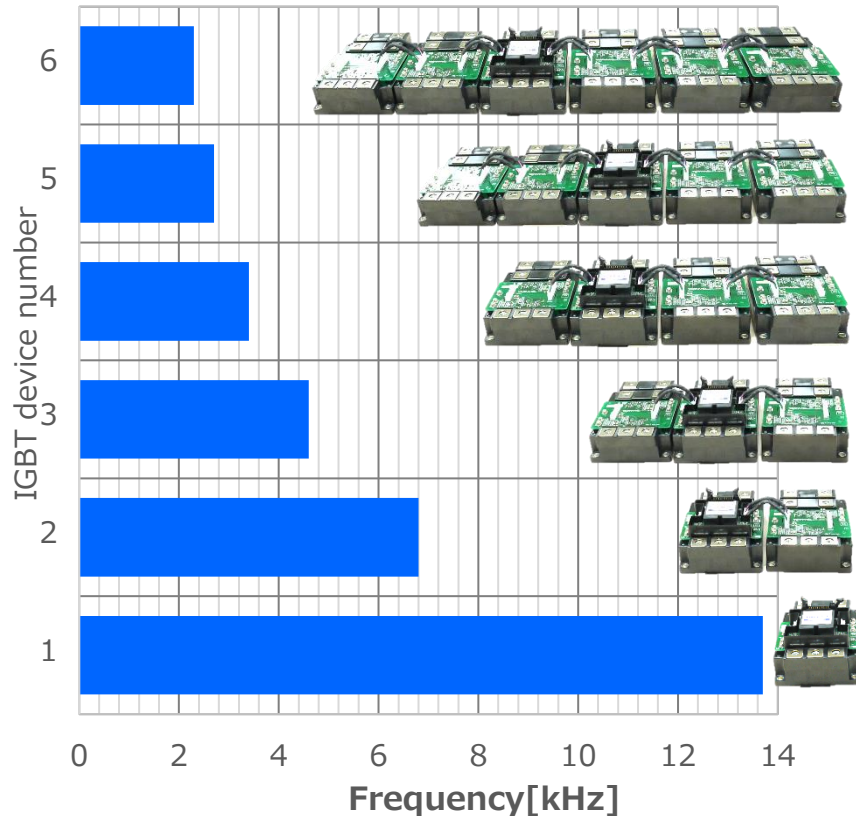
★ Master board can be placed anywhere!
Please refer to page 21 current balance data.

6) Parallel drive configuration (reference only)

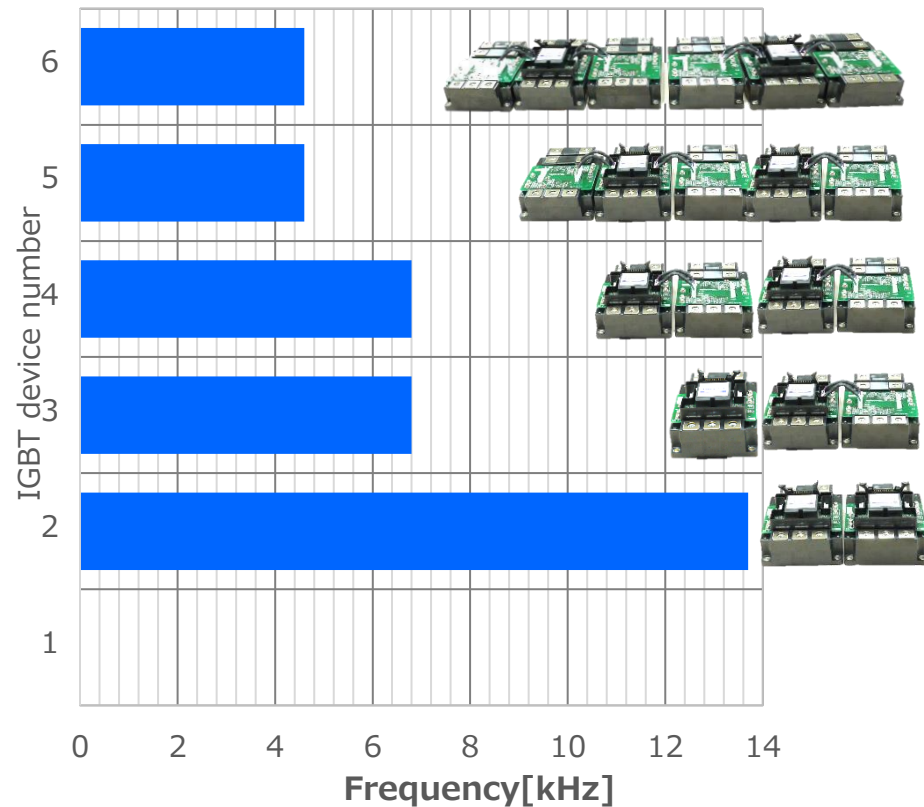
Frequency vs Gate driver parallel number (+15V / -10V)

• CM800DW-34T/CM800DW-34TA

1) Master PCB: 1set



2) Master PCB: 2set

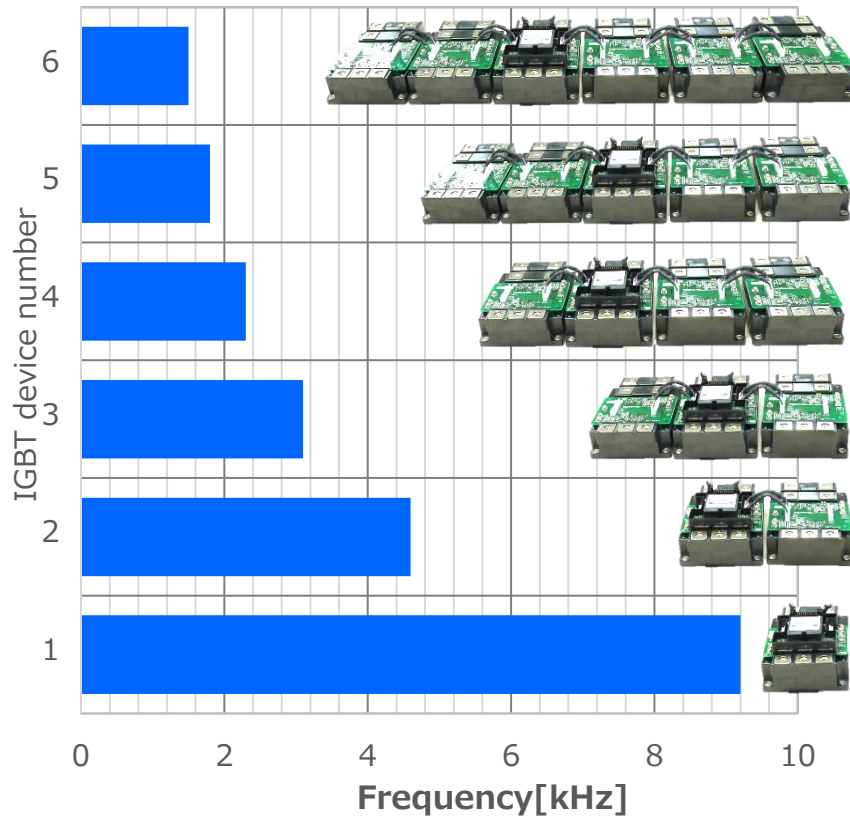


6) Parallel drive configuration (reference only)

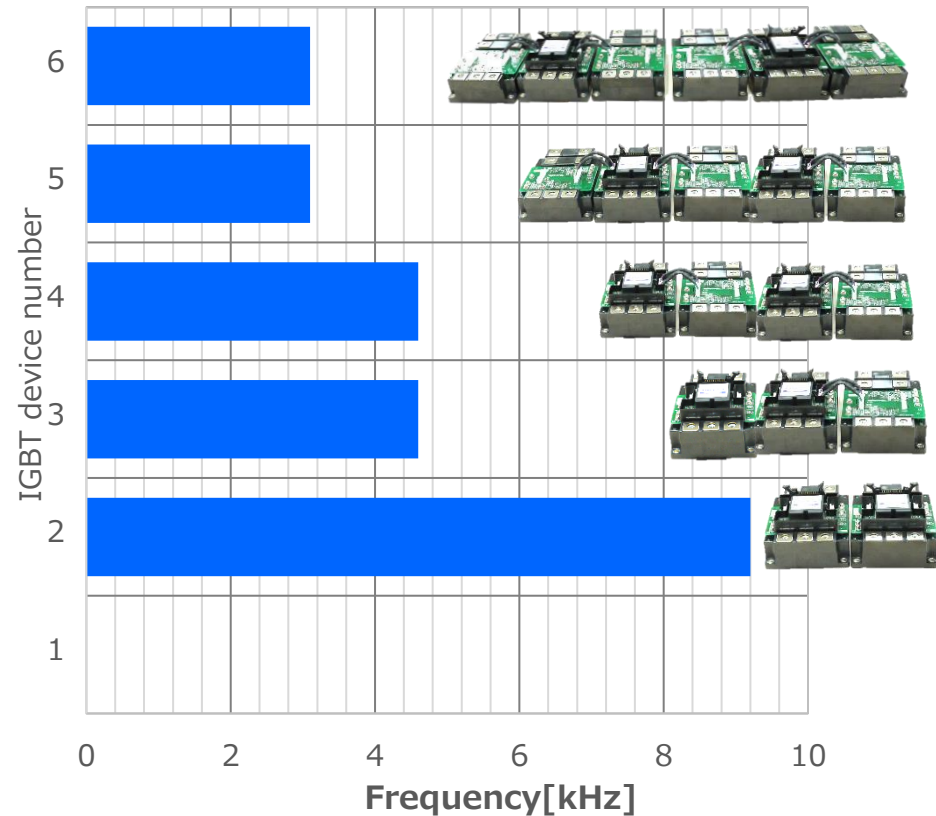
Frequency vs Gate driver parallel number (+15V / -10V)

• CM1200DW-34T/CM1200DW-24T

1) Master PCB: 1set

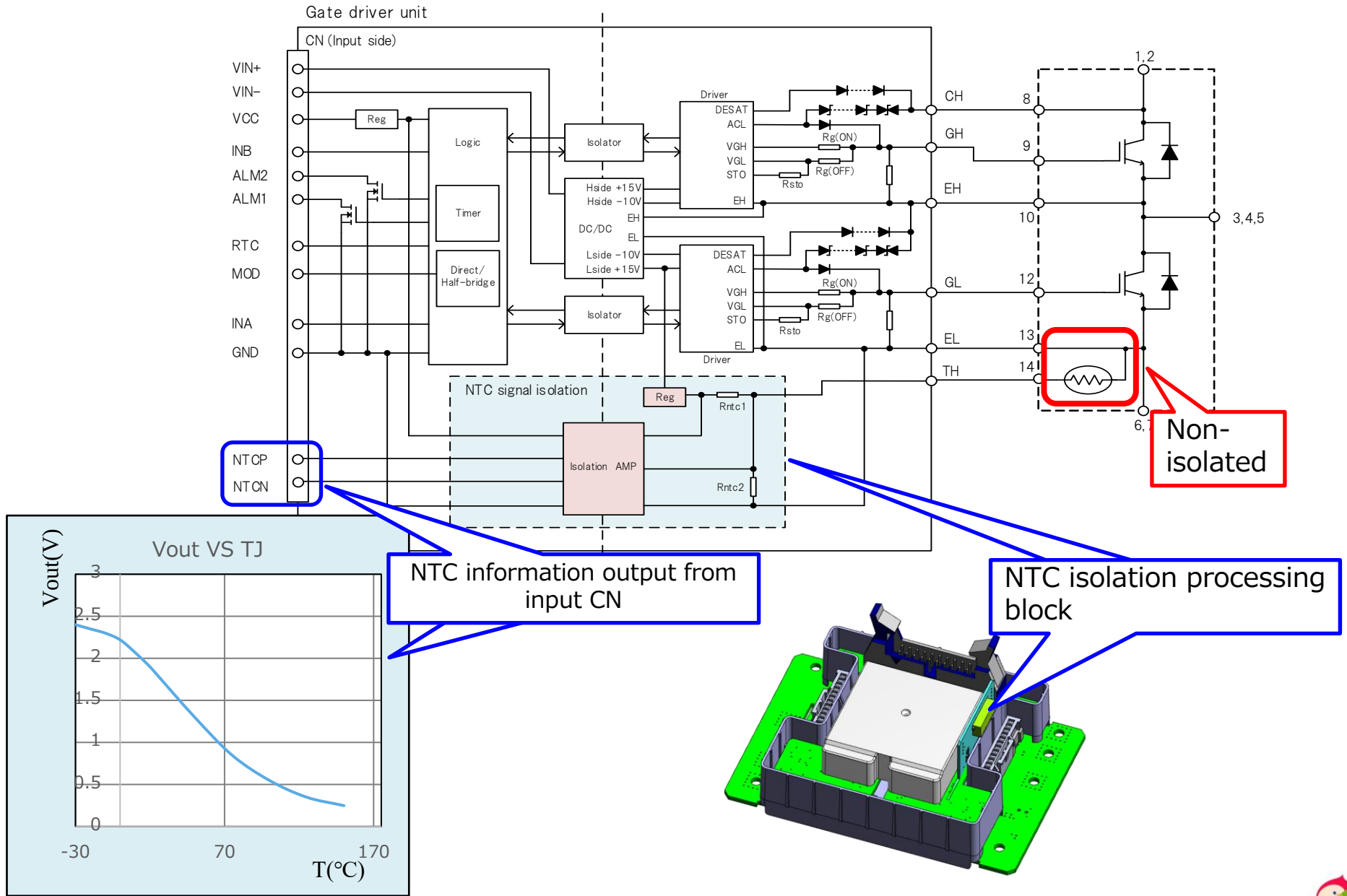


2) Master PCB: 2set



7) Isolated temperature sensing

Optional function



Index

A) Introduction of Gate Driver for LV100

- 1) Tamura Gate Driver 7 key points
- 2) Appearance
- 3) Specification
- 4) Insulation performance corresponding to each safety standard
- 5) Single operation matching data (2 pulse / Short circuit)
- 6) Parallel drive configuration
- 7) Isolated temperature sensing

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

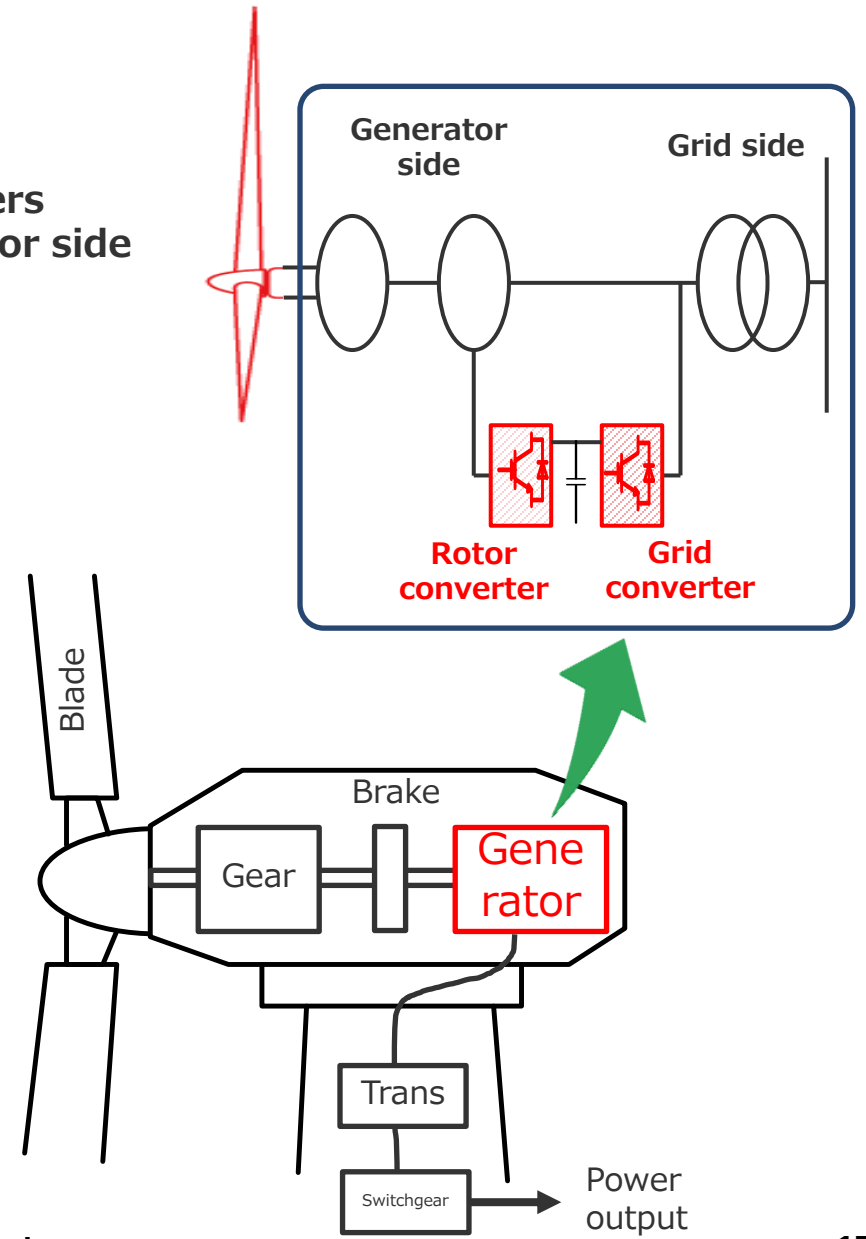
1) Power Stack Information

Reference information

Reference application : Wind Power converters
for Grid side and Rotor side

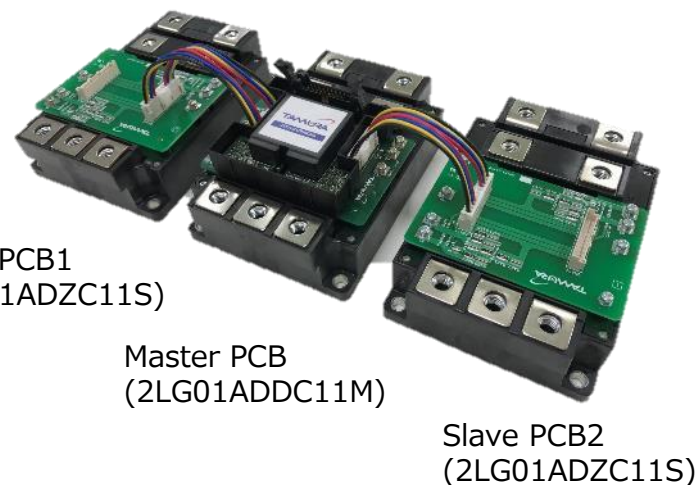
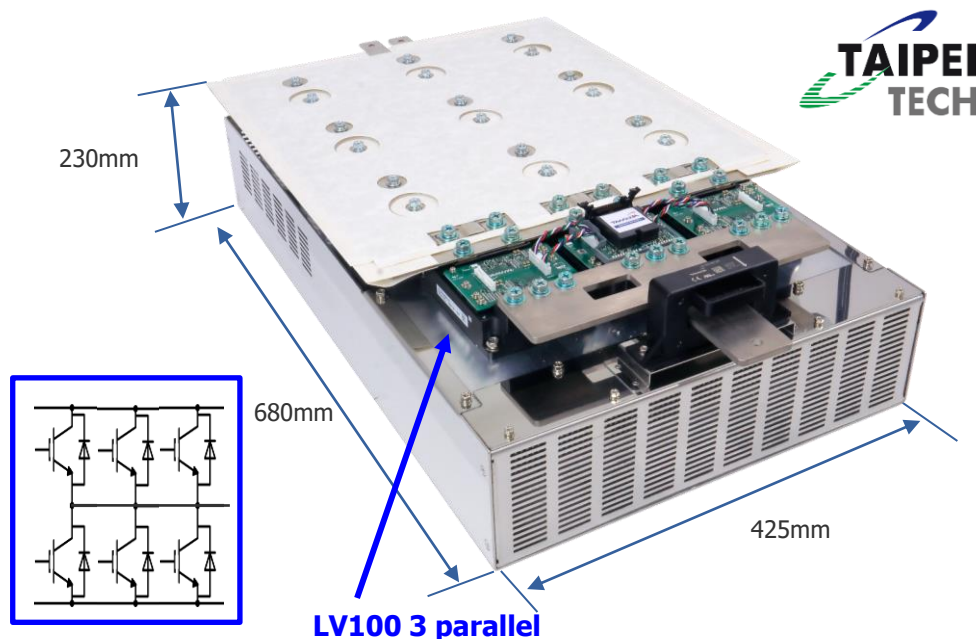
Install type : Onshore

Circuit solution : 2 Level



Joint Development of National TAIPEI University of Technology - Tamura

Cooperated by Mitsubishi Electric



Specification

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

* Vdc-link 1050V Vac = 690Vrms

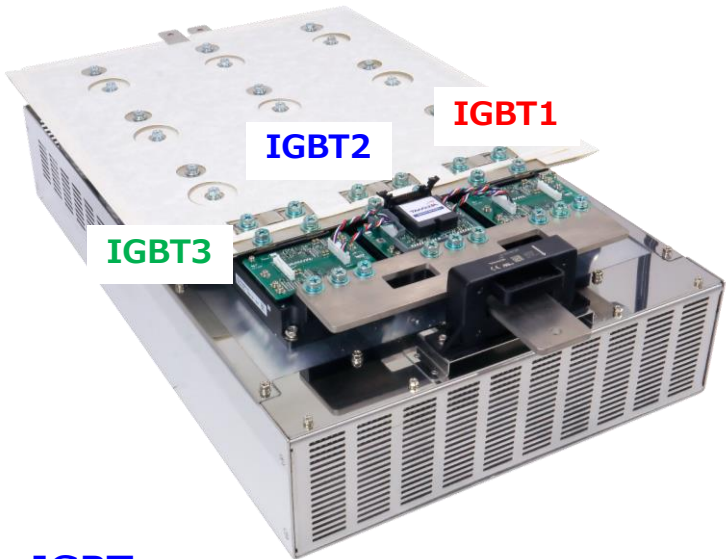
Power Module "CM1200DW-34T" (Mitsubishi Electric)
Rated current 1200A
Rated voltage 1700V

Gate Driver "2LG01ADDC11M" (TAMURA)
"2LG01ADZC11S" (TAMURA)

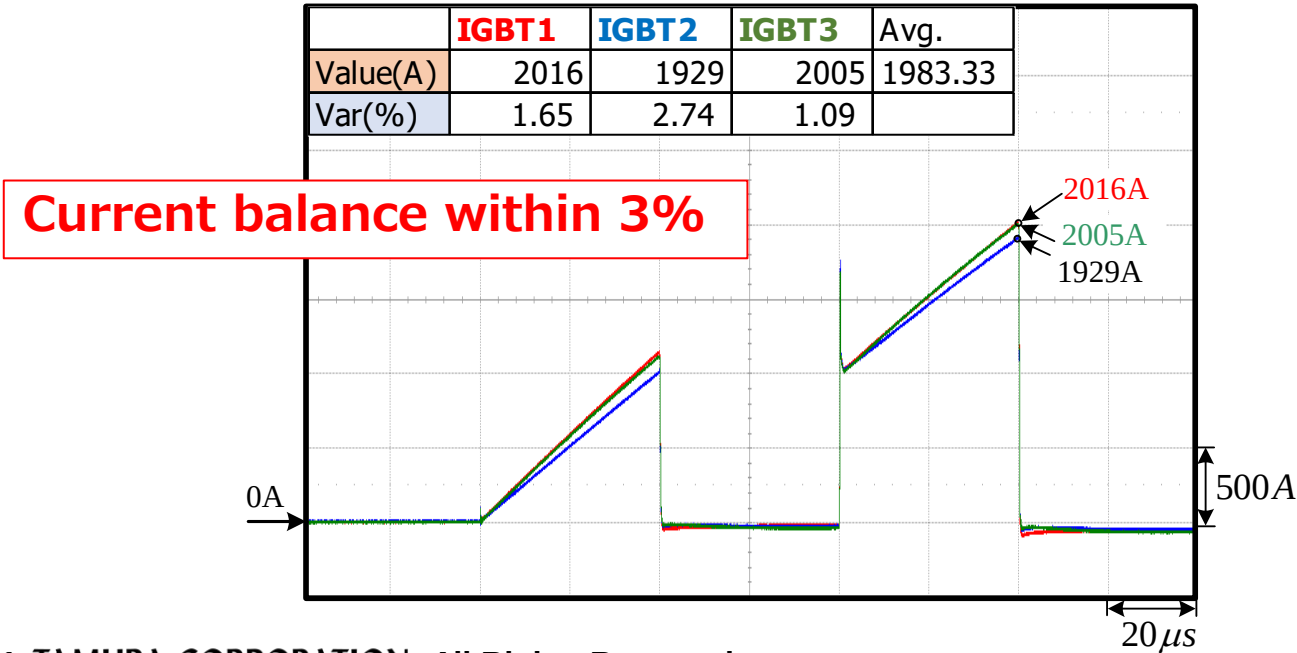
Current Sensor "L51S2T5D15" (TAMURA)

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℃



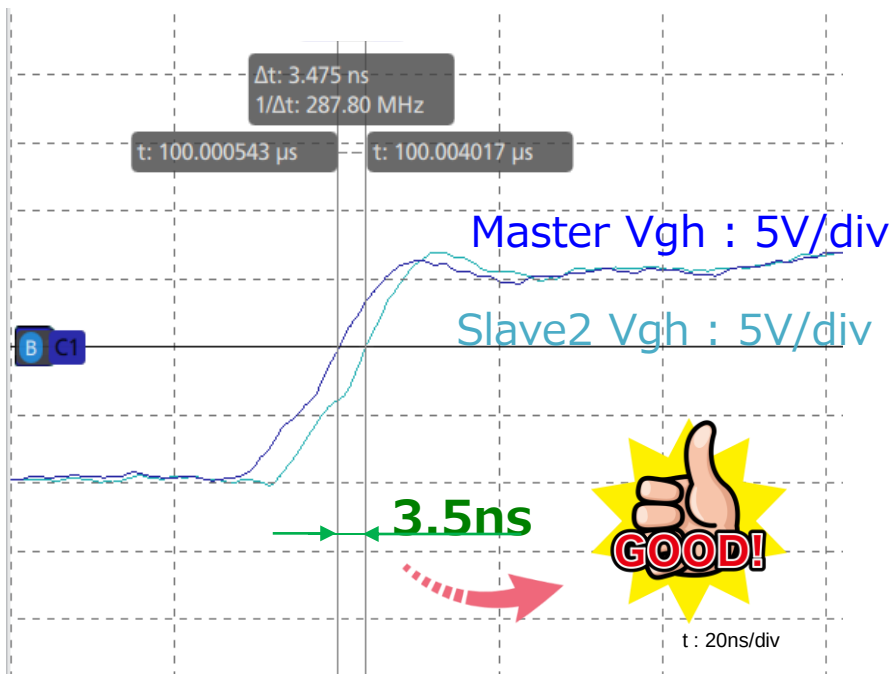
Current waveform of each IGBT



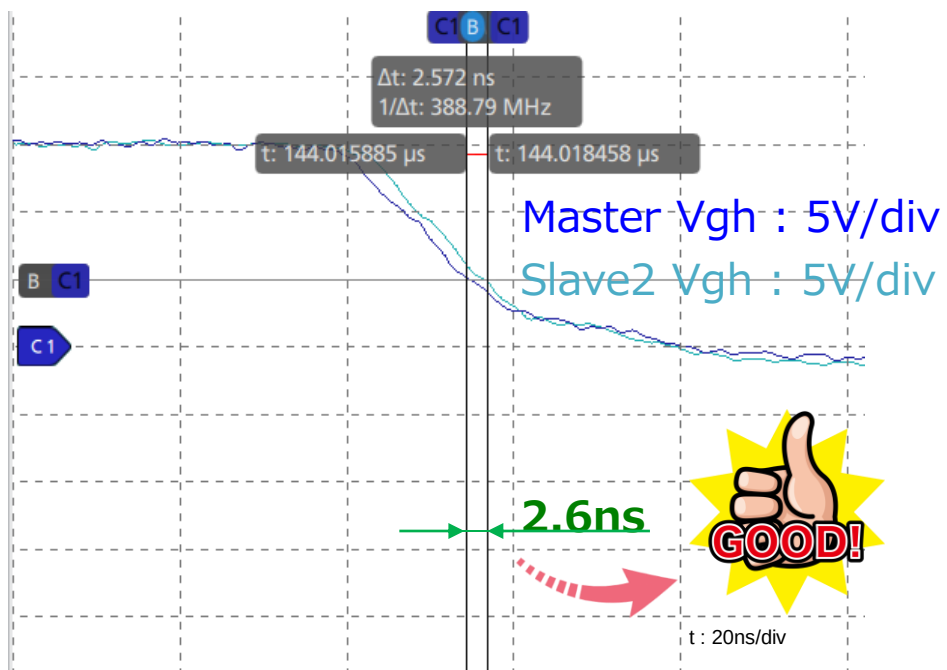
Gate signal balance

@V_{DC}1kV

Turn ON

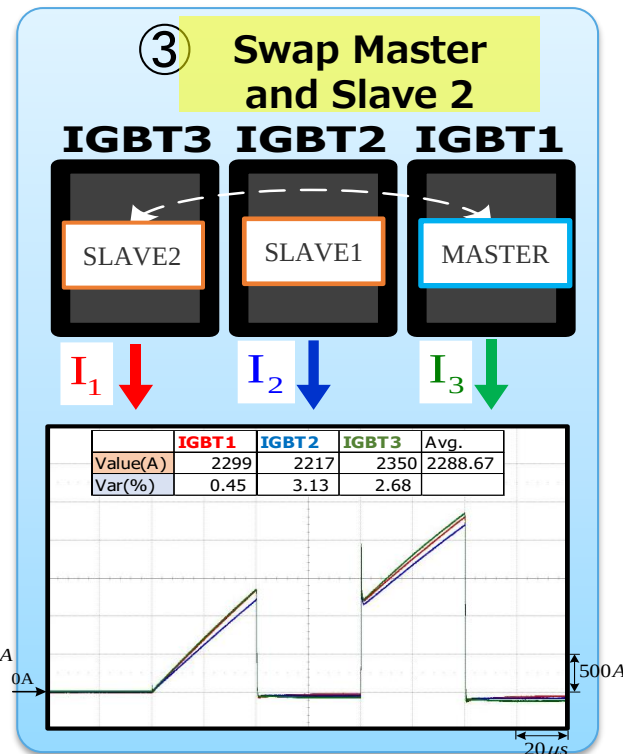
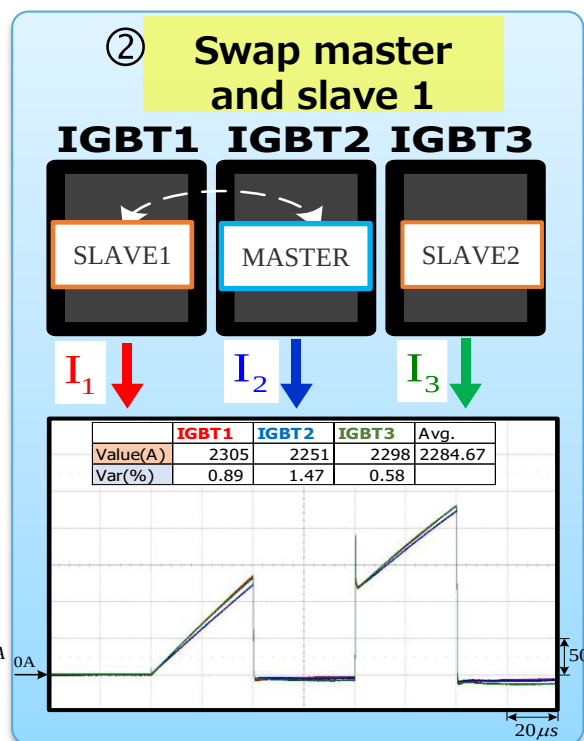
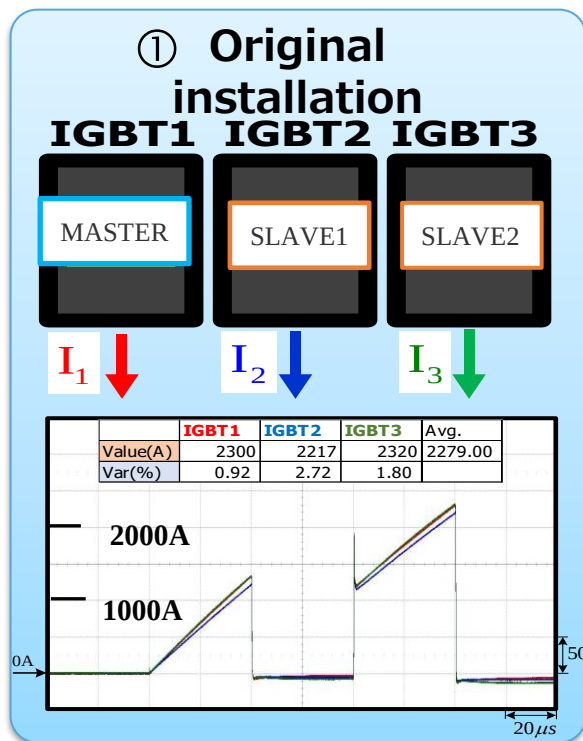


Turn OFF



Slave drive signal delay is very small.

Current balance

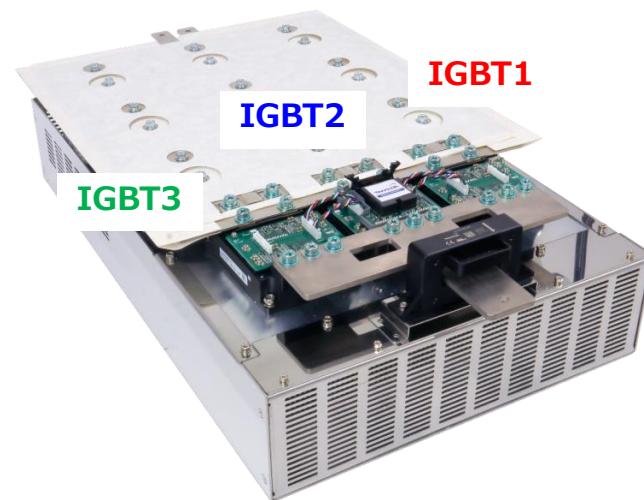


The current balance does not change even when the position of the gate driver is changed.
 = Do not worsen the current balance in the gate driver

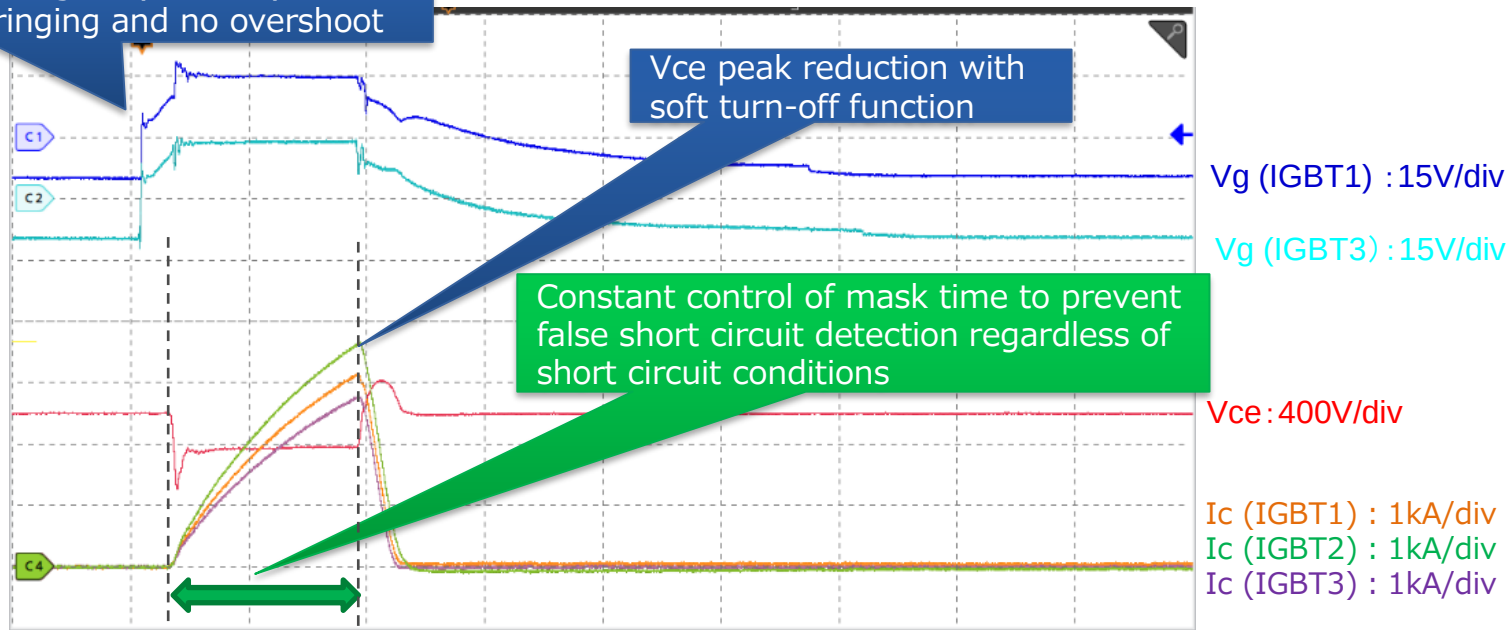


Short circuit test (Load short / reference only)

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



Index

A) Introduction of Gate Driver for LV100

- 1) Tamura Gate Driver 7 key points
- 2) Appearance
- 3) Specification
- 4) Insulation performance corresponding to each safety standard
- 5) Single operation matching data (2 pulse / Short circuit)
- 6) Parallel drive configuration
- 7) Isolated temperature sensing

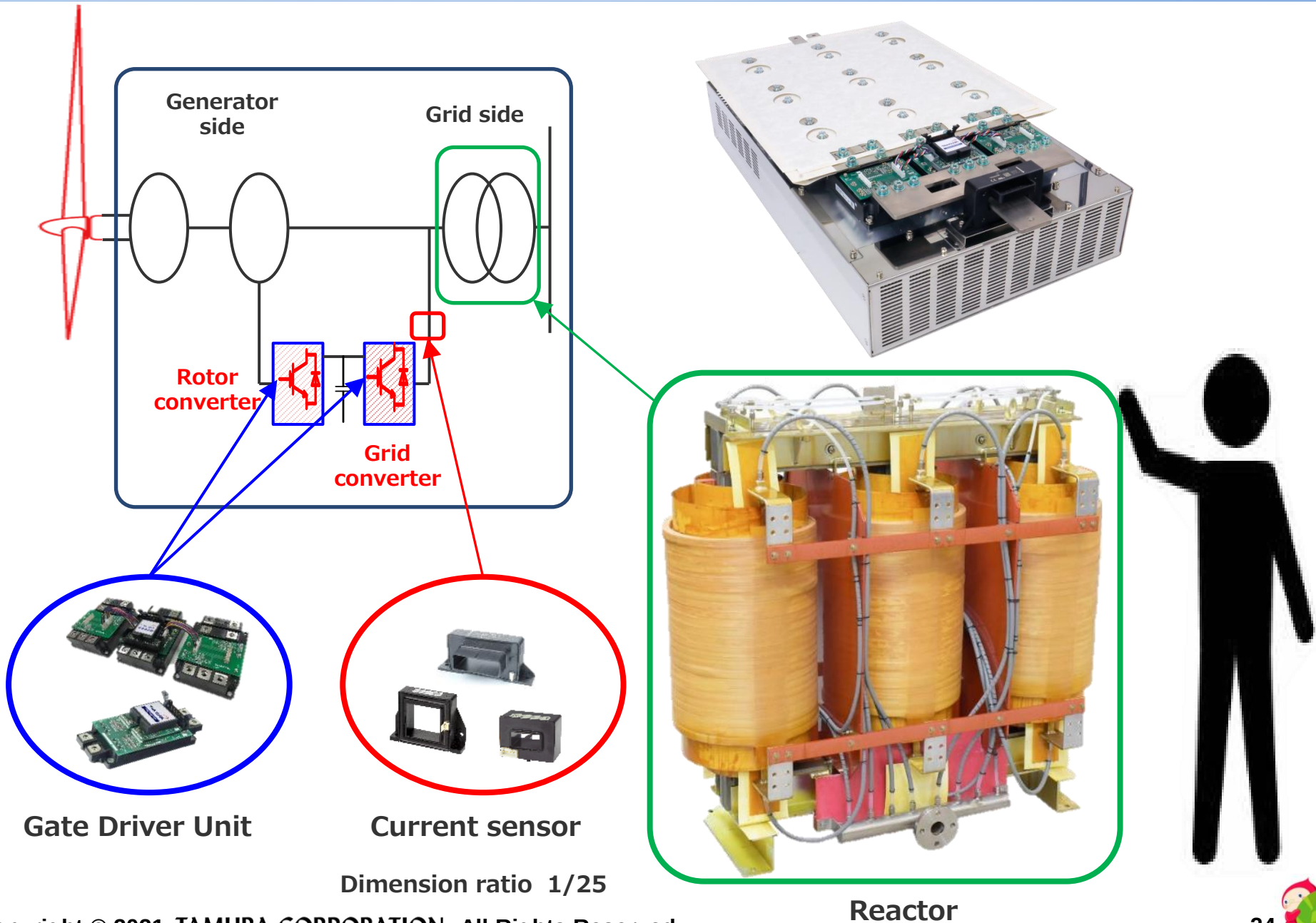
B) Power Stack application reference

- 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

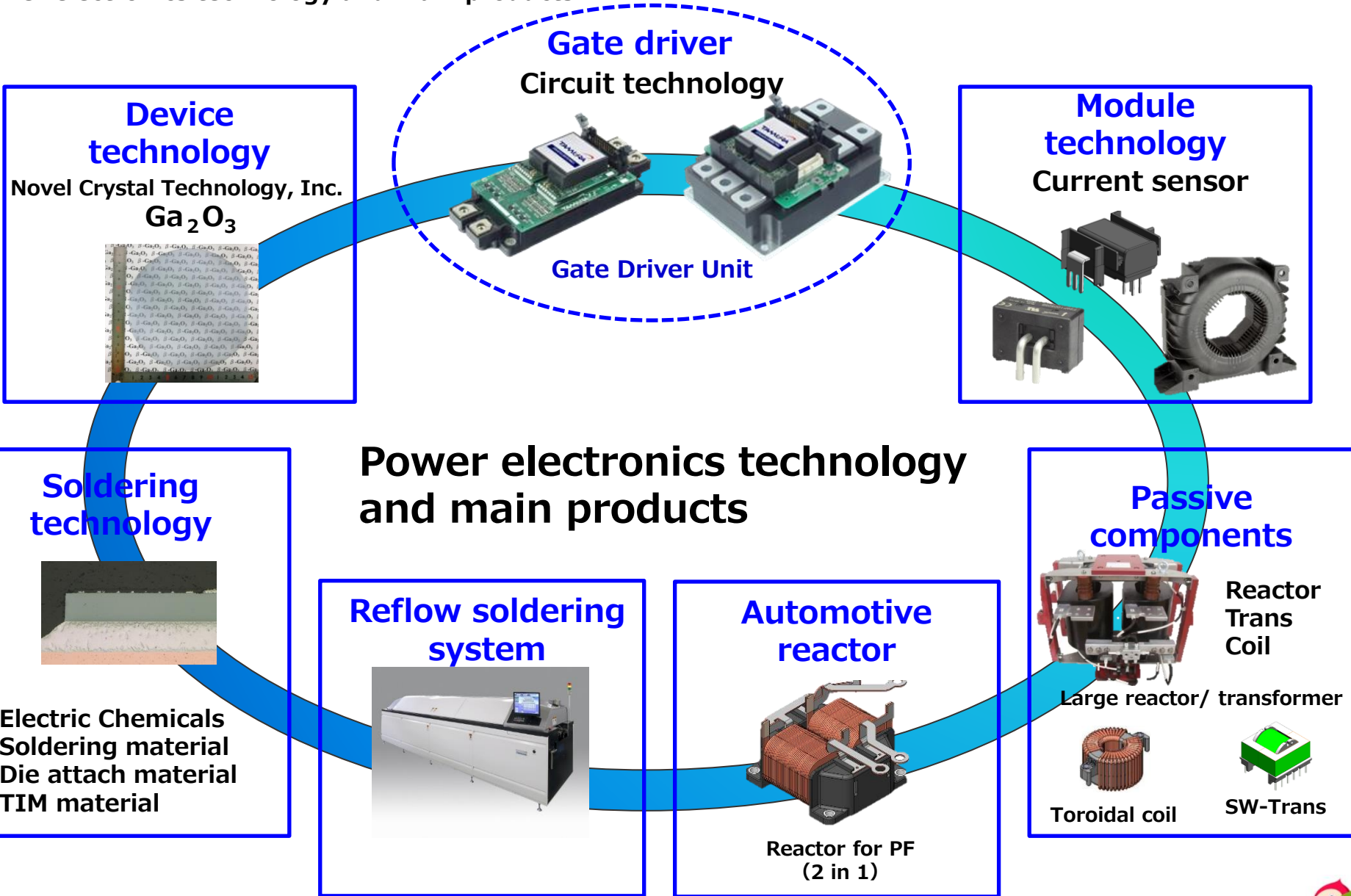
C) Introduction of One Tamura (Wind Power converters)



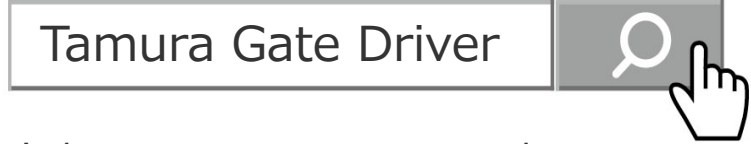
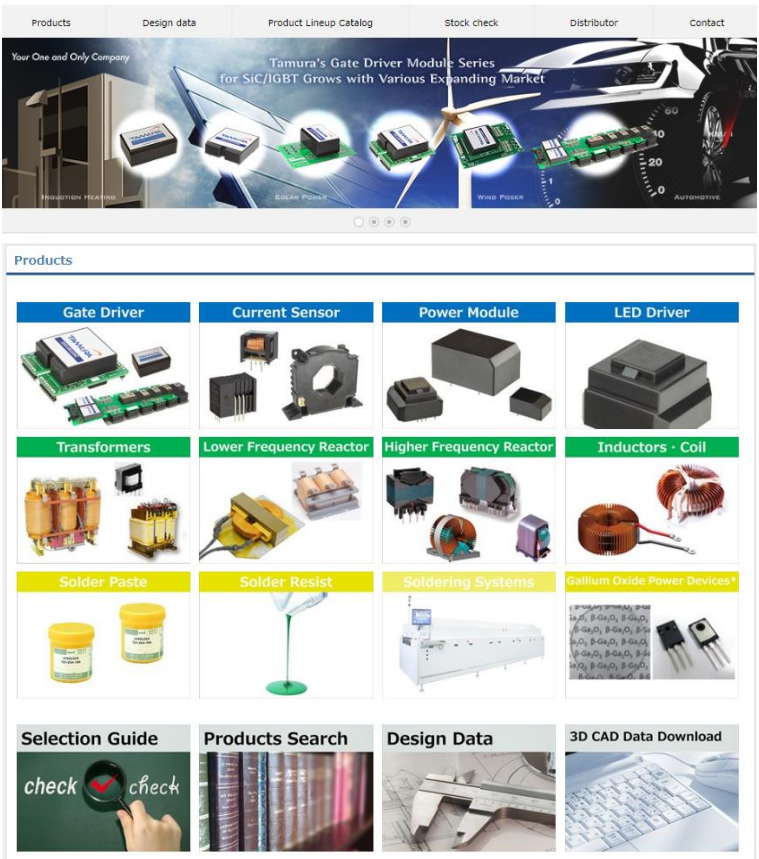
C) Introduction of One Tamura (General application)



Power electronics technology and main products



Please visit our website!



- 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/>