

Introduction of Gate Driver Units for High capacity IGBT



SUSTAINABLE
DEVELOPMENT
GOALS



TAMURA

Your One and Only Company

Rev F

TAM-GDM-00006

Issued on 1st Mar '23 Unit division HQ Japan

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Introduction of Gate Driver Units for High capacity IGBT

1) Introduction of TAMURA Gate Driver Units

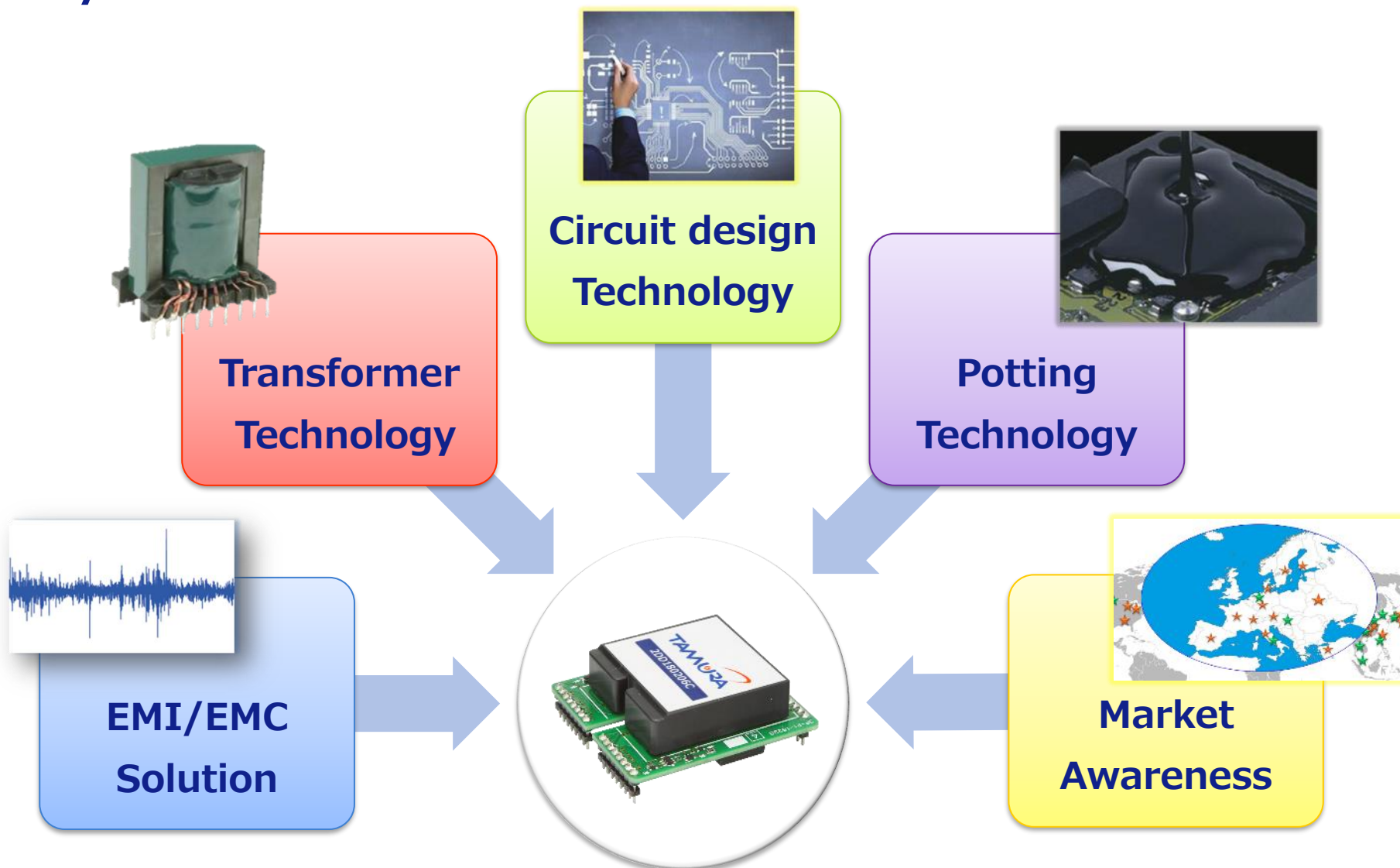
- 1-1. When, Why, we started development gate drivers
- 1-2. Application
- 1-3. Product configuration
- 1-4. Features of Gate Driver Units
- 1-5. Gate drive waveform of High capacity IGBT
- 1-6. Comparison
- 1-7. Line up / Specification
- 1-8. Power module correspondence table

2) Introduction of One Tamura

Appendix) Contact person

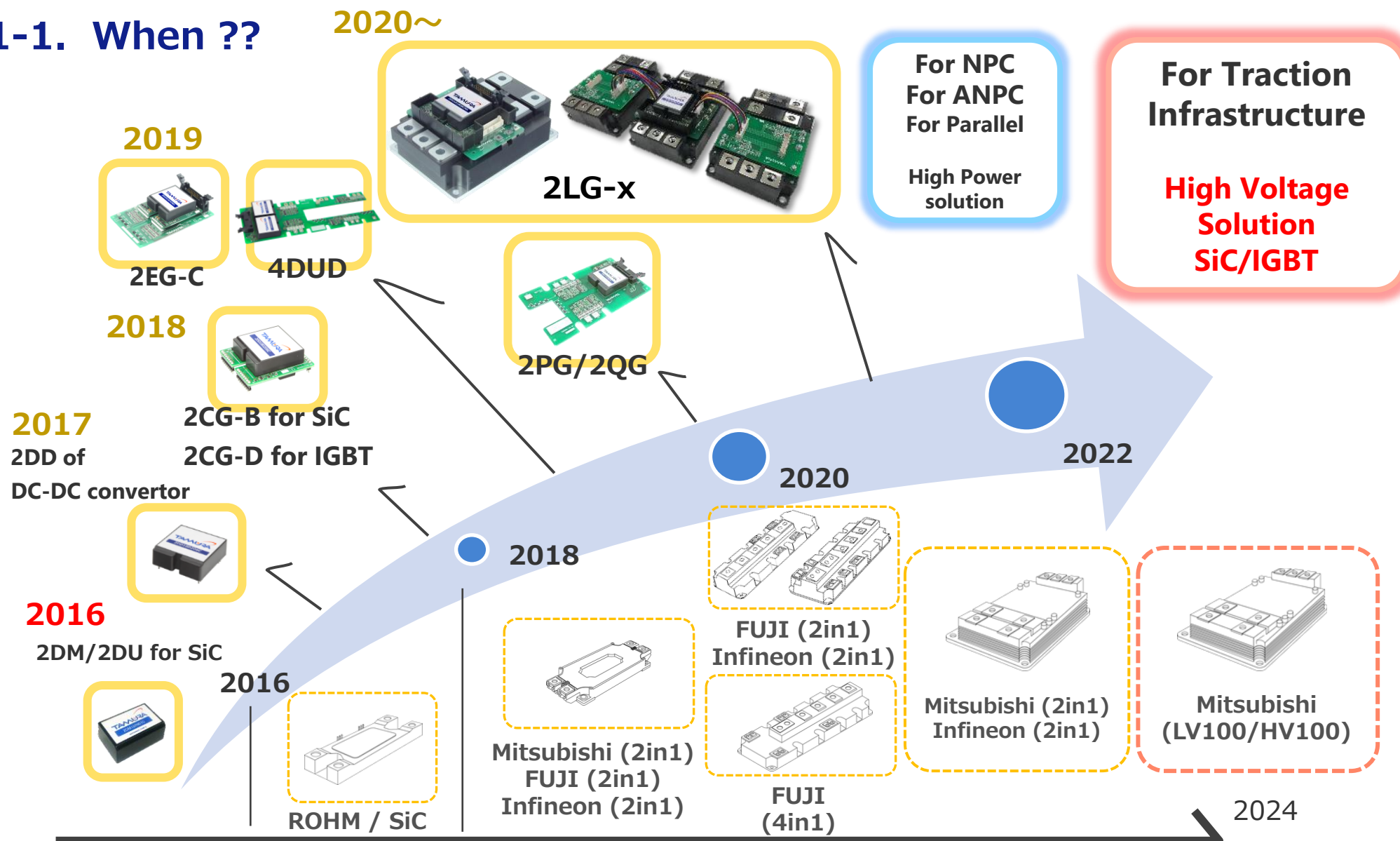
1) Introduction of TAMURA Gate Driver Units

1-1. Why ??



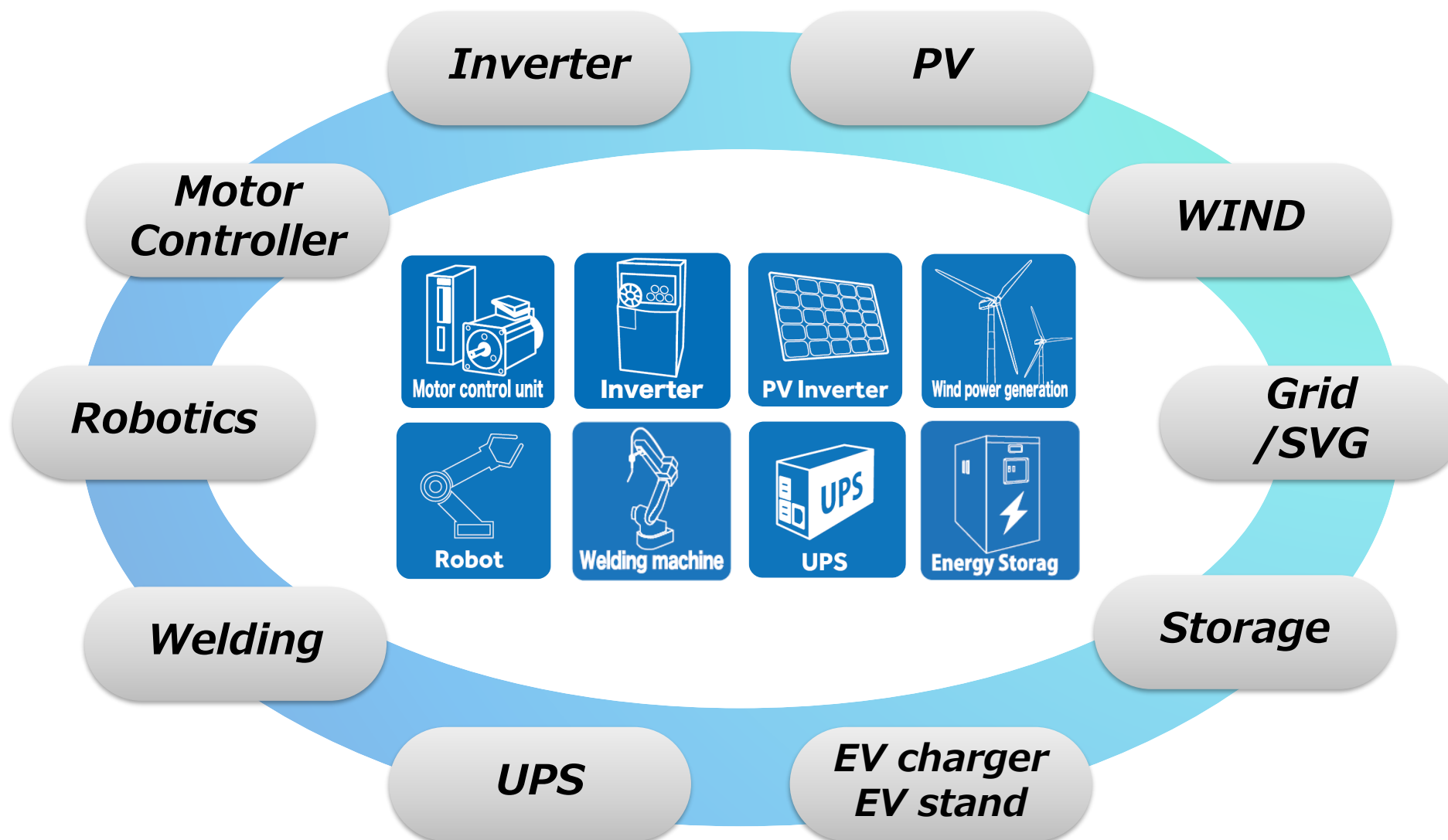
1) Introduction of TAMURA Gate Driver Units

1-1. When ??



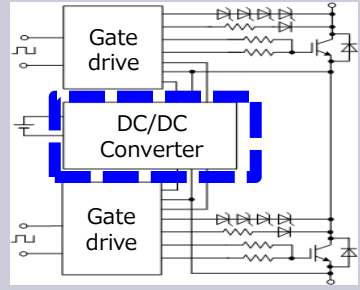
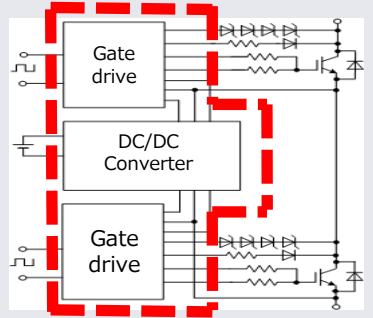
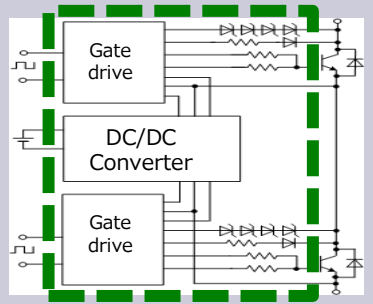
1) Introduction of TAMURA Gate Driver Units

1-2. Application



1) Introduction of TAMURA Gate Driver Units

1-3. Product Configuration.

Product	Function	Block diagram	Appearance
DC/DC Converter	2 in1 PM designated DC/DC Converter		2DD series 
Gate Driver Module	DC/DC Converter + Gate drive		2CG-B/D series 
Gate Driver Unit	Gate Driver Module + Gate resistors Protective function		2EG-C series 

1) Introduction of TAMURA Gate Driver Units

1-4. Features of Gate Driver Units



Infineon Technologies
/ EconoDUAL™



Fuji Electric
/ DualXT



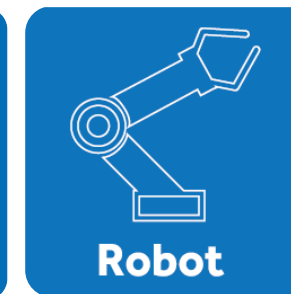
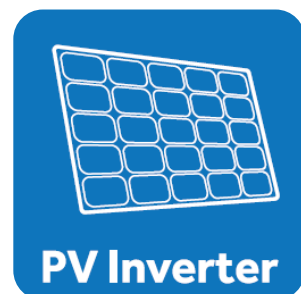
Mitsubishi Electric
/ NX type

4W per channel

Frequency
100kHz (Max)

Peak Current
±43A

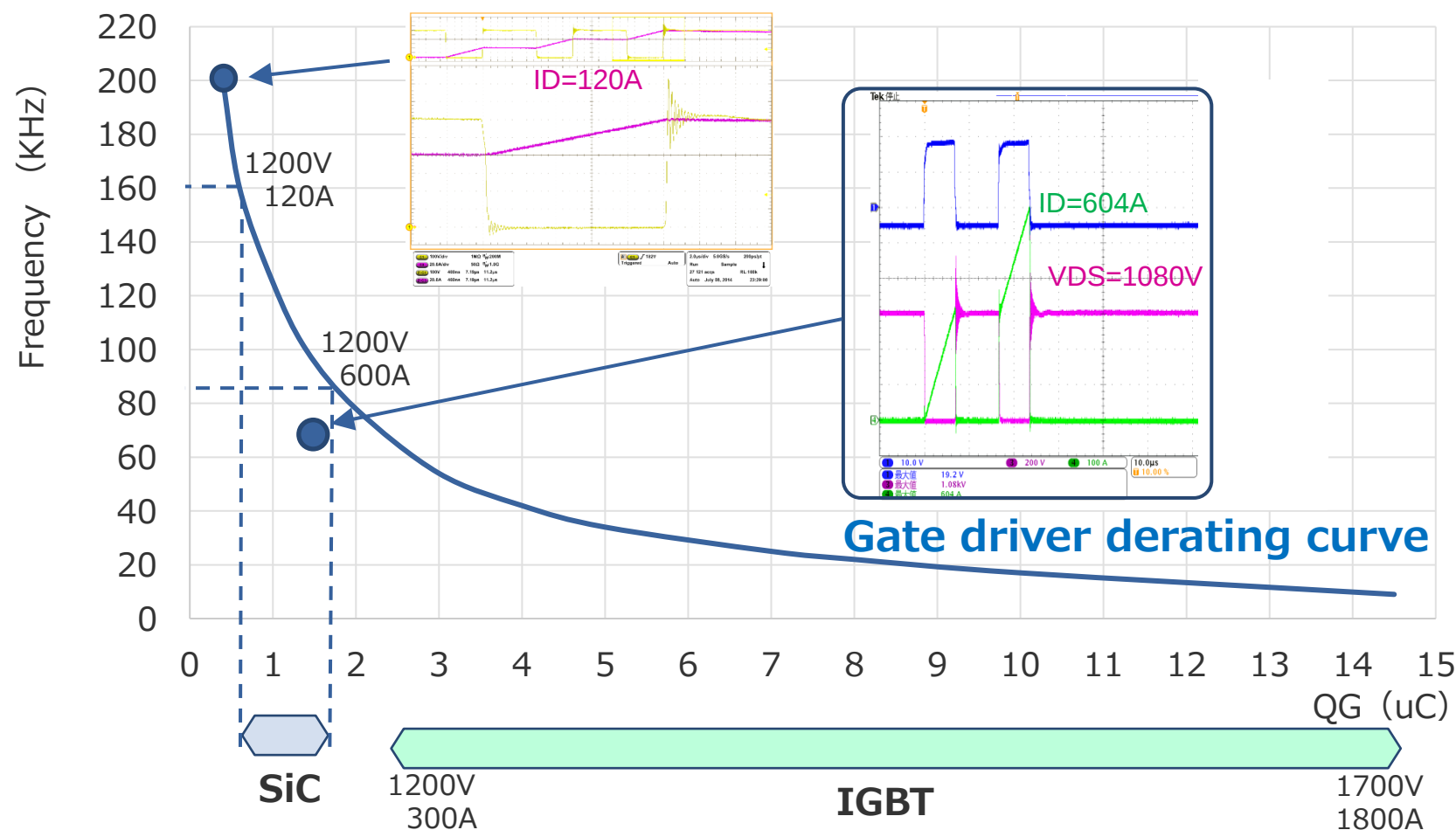
Suitable for various applications !



1) Introduction of TAMURA Gate Driver Units

1-4. Features of Gate Driver Units

Easy to drive of large Qg device !



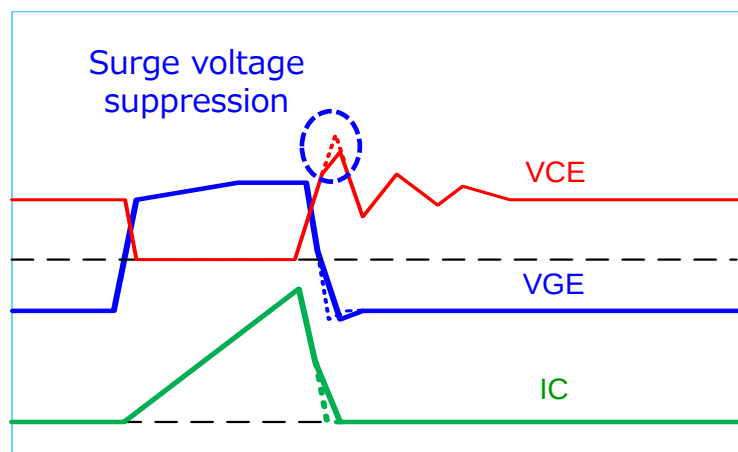
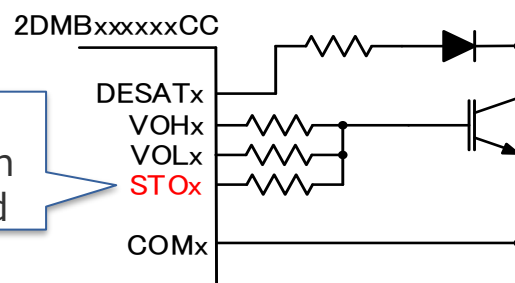
1) Introduction of TAMURA Gate Driver Units

1-4. Features of Gate Driver Units

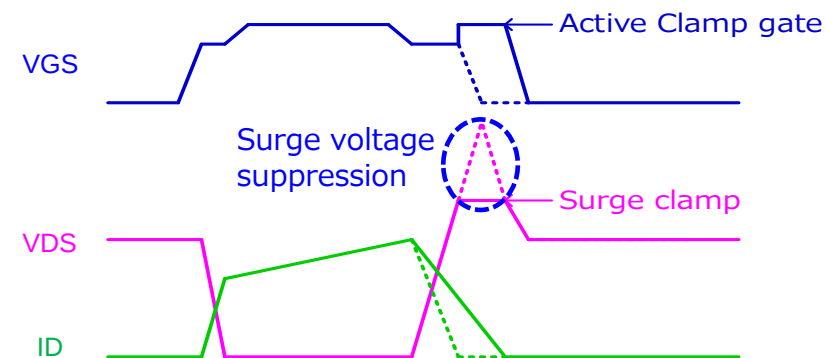
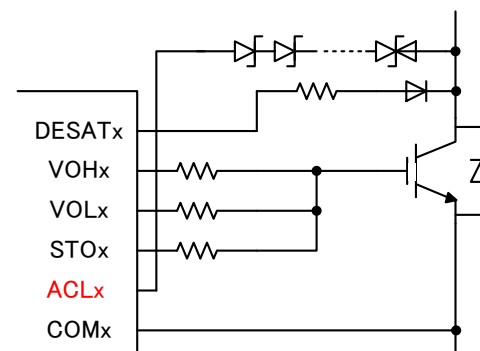
Easy to protect to power module !

Soft turn-off

Soft turn-off
Operates when
short-circuited



Active clamp (Option)



1) Introduction of TAMURA Gate Driver Units

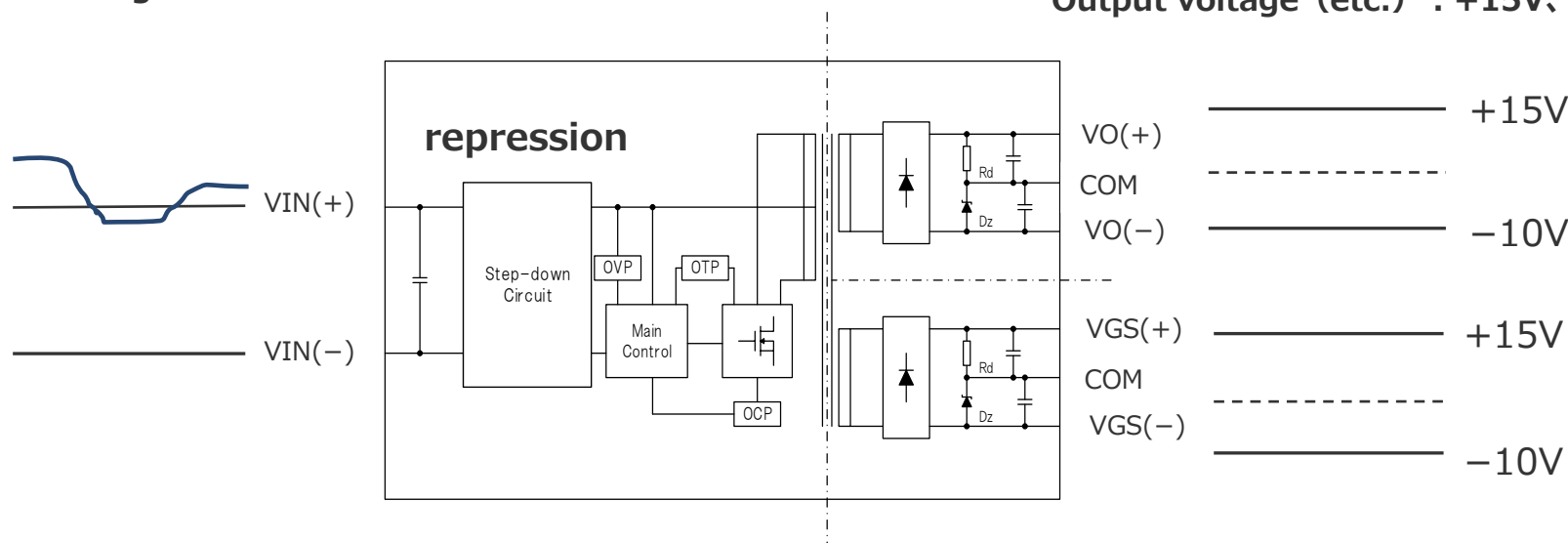
1-4. Features of Gate Driver Units

Easy to control of V_{GS} !

Support with a gate driver ... Constant voltage control of V_{GS}

Input voltage : 13V~28V

Output voltage (etc.) : +15V、-10V



Controls the gate voltage to be constant even for input fluctuations
The gate voltage is constant even for output fluctuations
(SW frequency, QG of power module)

1) Introduction of TAMURA Gate Driver Units

1-5. Gate drive waveform of High capacity IGBT

IGBT:CM800DX-24T1 (Mitsubishi Electric)

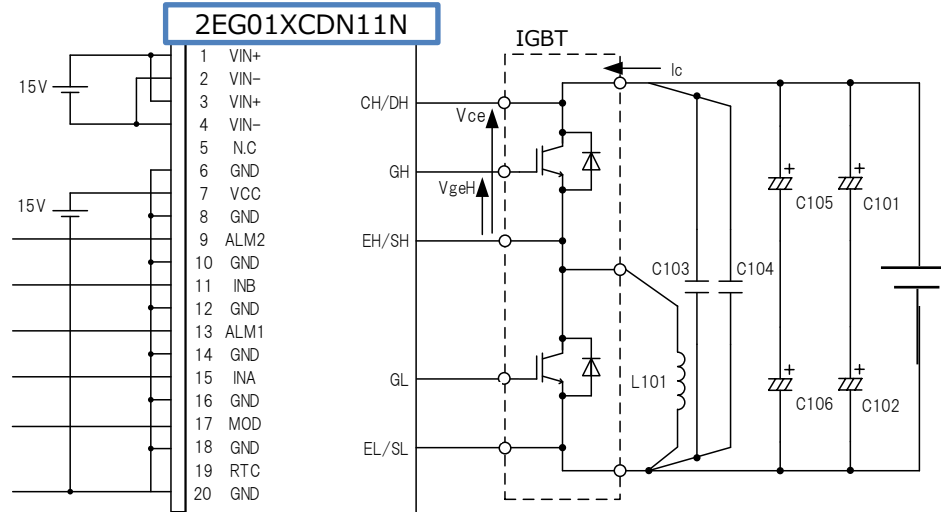
2EG01XCDN11N Switching Test Data



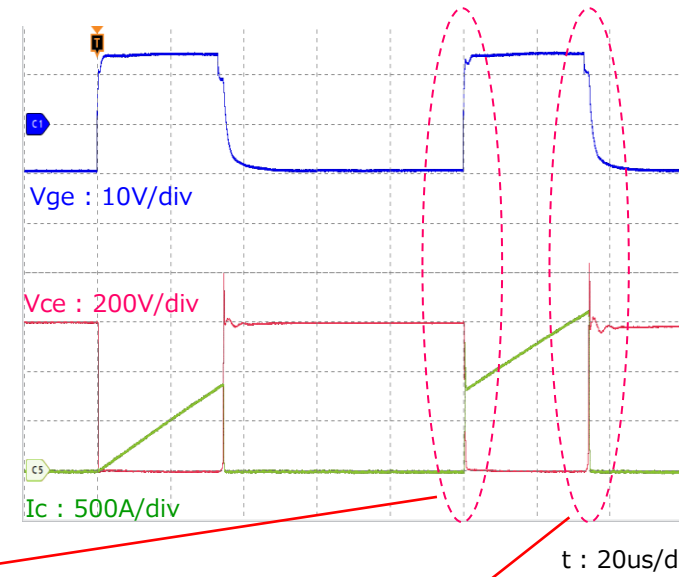
1) Introduction of TAMURA Gate Driver Units

Single drive solution /2 Pulse test

DC Link : 600V, Ron : 1Ω, Roff : 10Ω, Upper arm, Tj=150°C

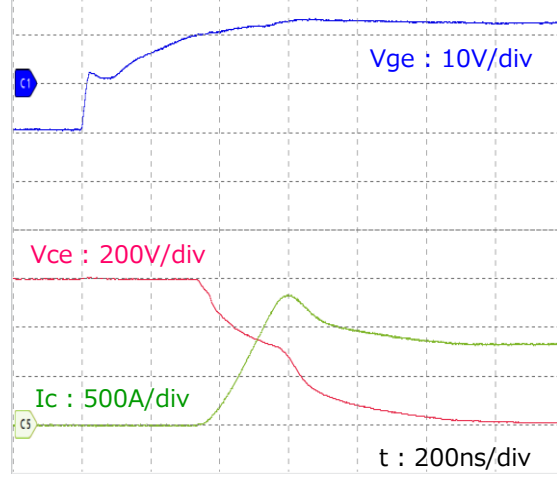


IGBT : CM800DX-24T1 (Mitsubishi)
C101,102,105,106 : 2700uF (Ls : 20nH)
C103,104: 4.7uF (Ls : 20nH)
L101: 22uH



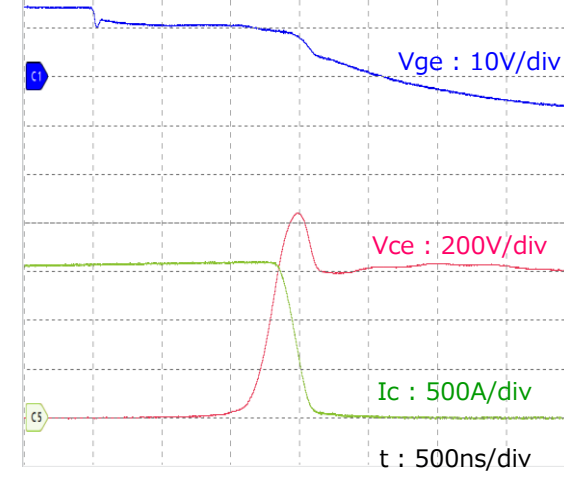
High temp test

800A turn on



Item	Measurement value	
DC Link	600	V
Ic	800	A
dV/dt	2.2	kV/us
di/dt	7.2	kA/us
td(on)	0.37	us
tr	0.14	us
Eon	99	mJ

1600A turn off

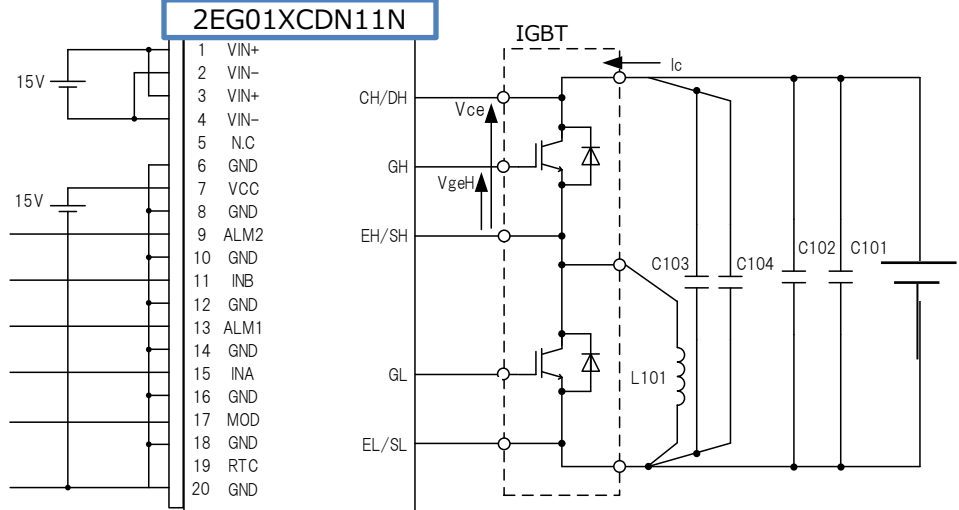


Item	Measurement value	
DC Link	600	V
Ic	1600	A
Vcep	838	V
dV/dt	3.4	kV/us
di/dt	8.4	kA/us
td(off)	1.38	us
tf	0.19	us
Eoff	261	mJ

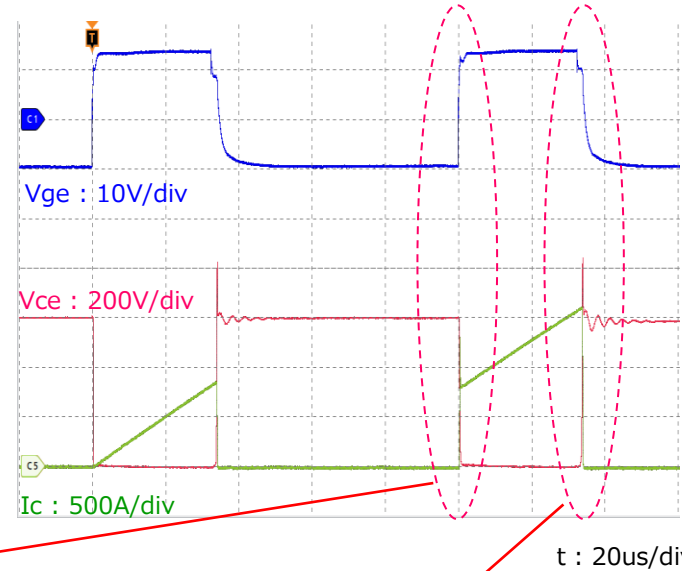
1) Introduction of TAMURA Gate Driver Units

Single drive solution /2 Pulse test

DC Link : 600V, Ron : 1Ω, Roff : 10Ω, Upper arm, Tj=-40℃

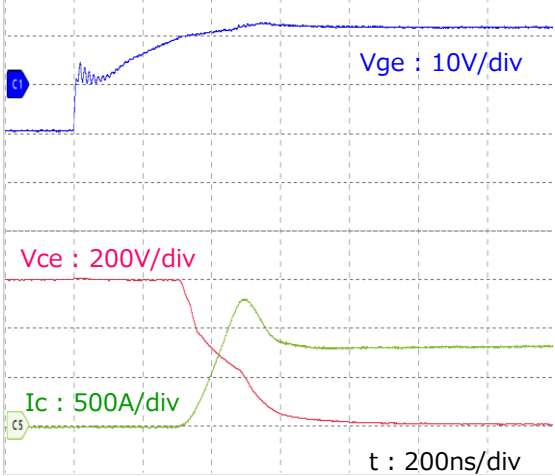


IGBT : CM800DX-24T1 (Mitsubishi)
C101,102 : 1500uF(Ls : 50nH)
C103,104 : 4.7uF (Ls : 20nH)
L101: 22uH



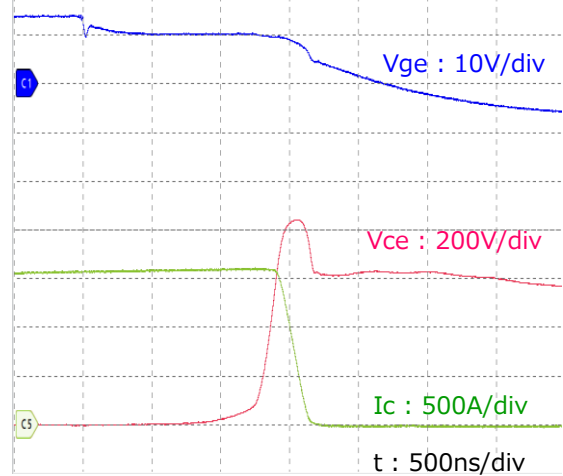
Low temp test

800A turn on



Item	Measurement value	
DC Link	600	V
Ic	800	A
dV/dt	3.2	kV/us
di/dt	8.9	kA/us
td(on)	0.33	us
tr	0.08	us
Eon	46	mJ

1600A turn off



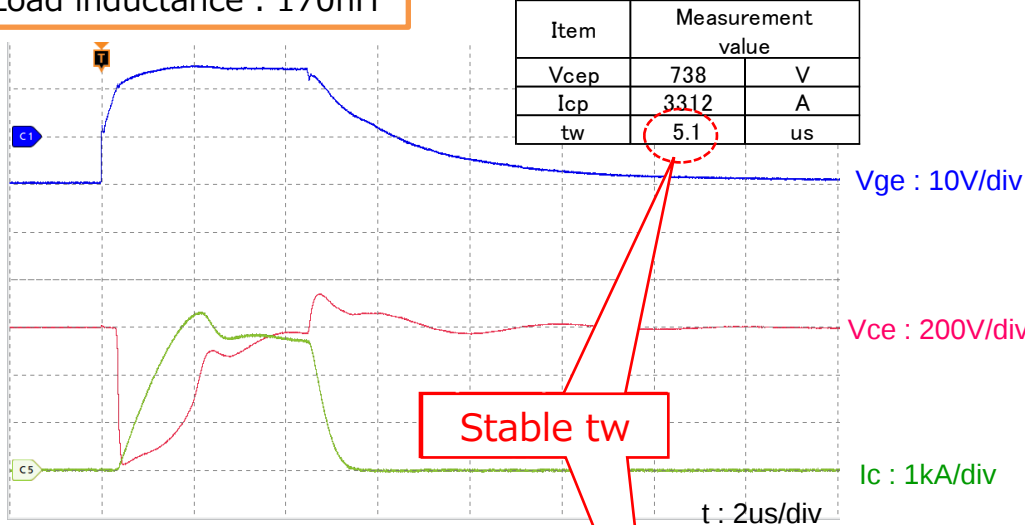
Item	Measurement value	
DC Link	600	V
Ic	1600	A
Vcep	840	V
dV/dt	4.3	kV/us
di/dt	8.0	kA/us
td(off)	1.45	us
tf	0.18	us
Eoff	236	mJ

1) Introduction of TAMURA Gate Driver Units

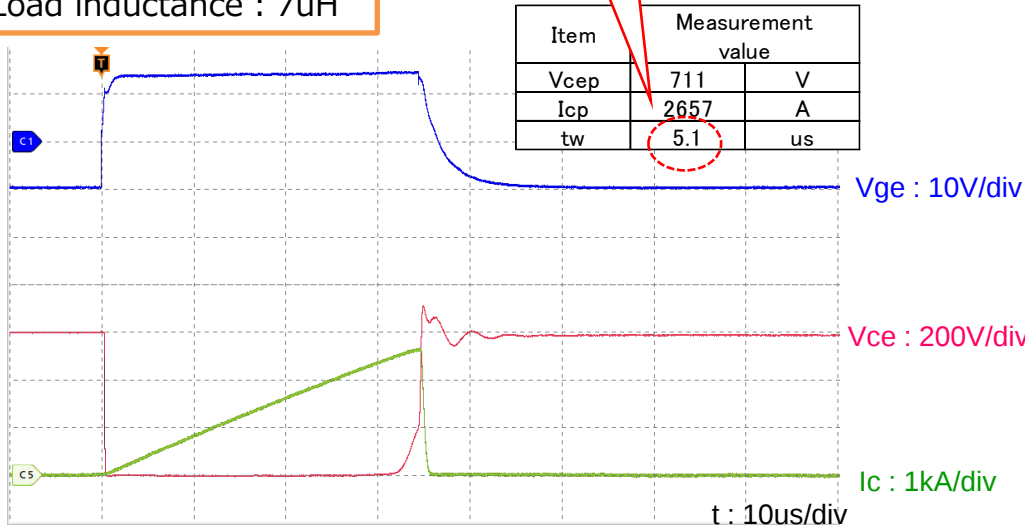
Single drive solution/Arm short circuit

DC Link : 600V, Ron : 1Ω, Roff : 10Ω, Upper arm, Tj=150℃

Load inductance : 170nH

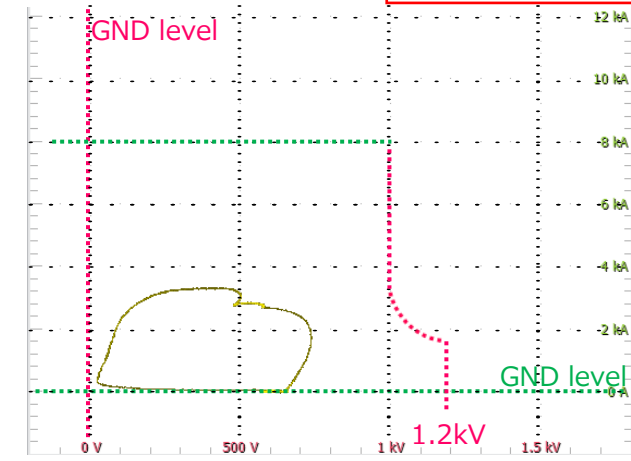


Load inductance : 7uH

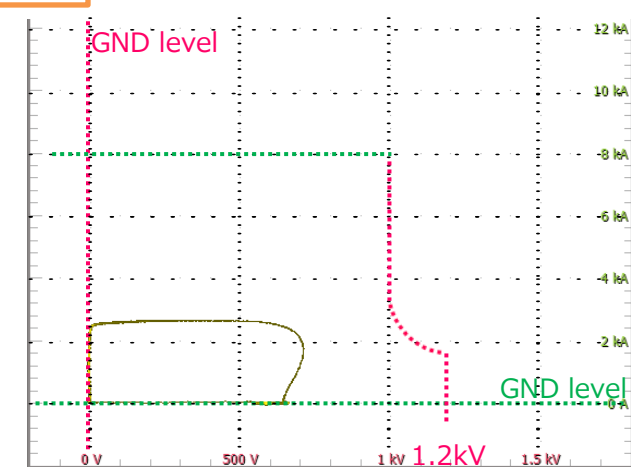


SOA

High temp test



SOA

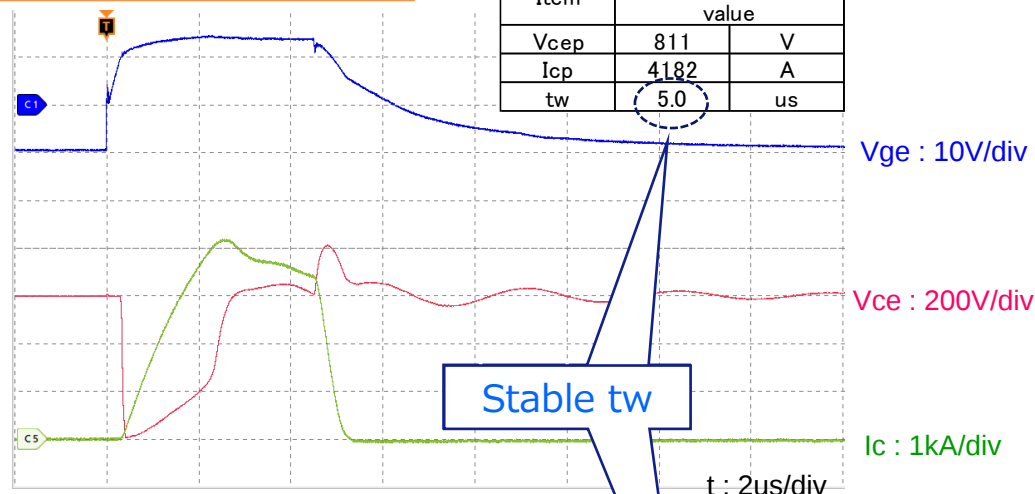


1) Introduction of TAMURA Gate Driver Units

Single drive solution/Arm short circuit

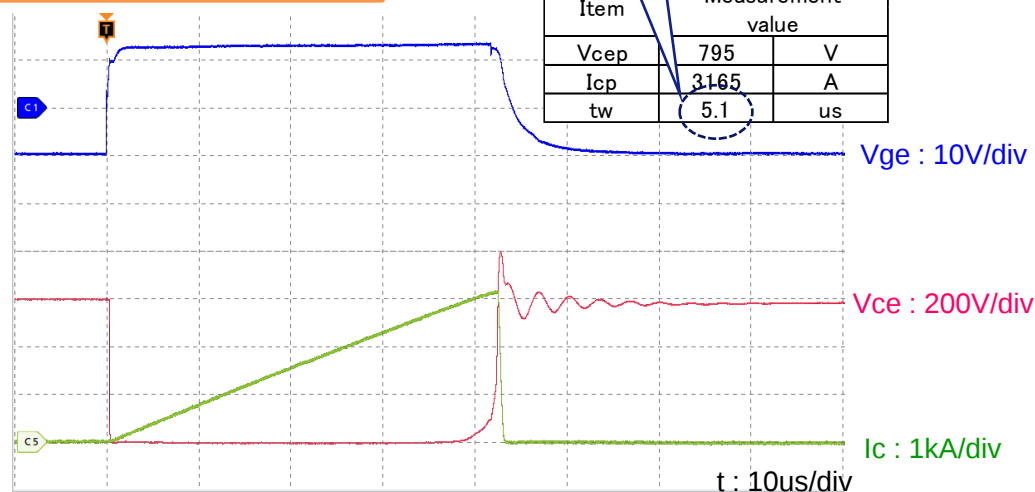
DC Link : 600V, Ron : 1Ω, Roff : 10Ω, Upper arm, Tj = -40°C

Load inductance : 170nH

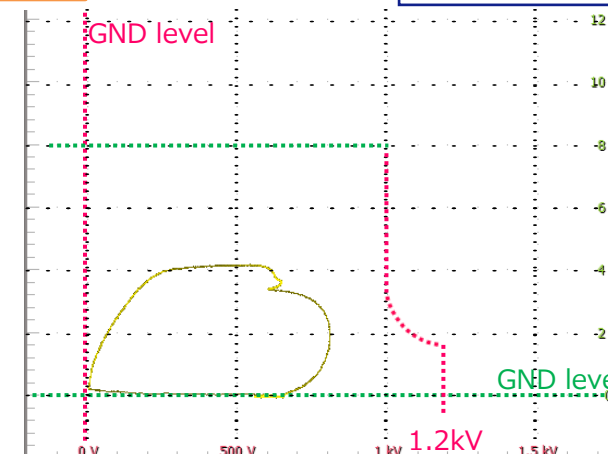


Stable tw

Load inductance : 7uH

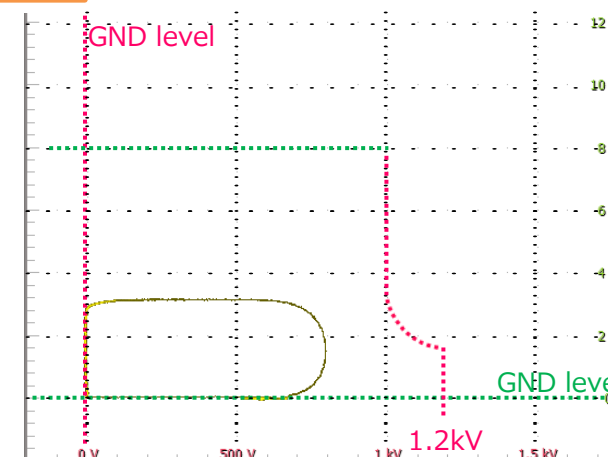


SOA



Low temp test

SOA



1) Introduction of TAMURA Gate Driver Units

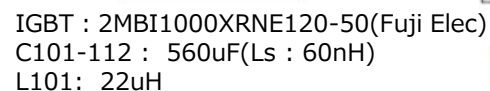
1-5. Gate drive waveform of High capacity IGBT

IGBT: 2MBI1000XRNE120-50 (FUJI Electric)

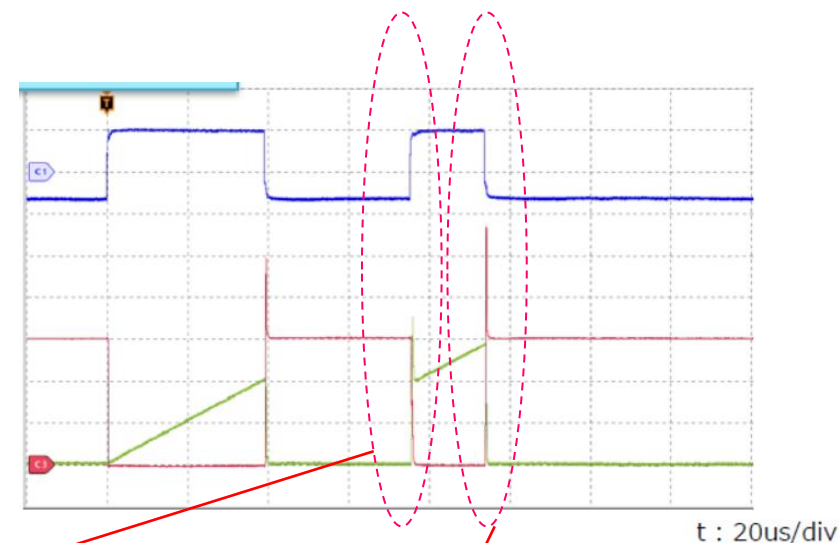
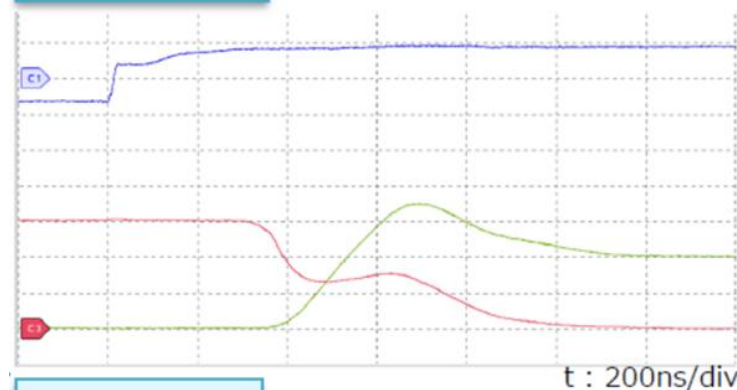
2EG01XCDN11N Switching Test Data



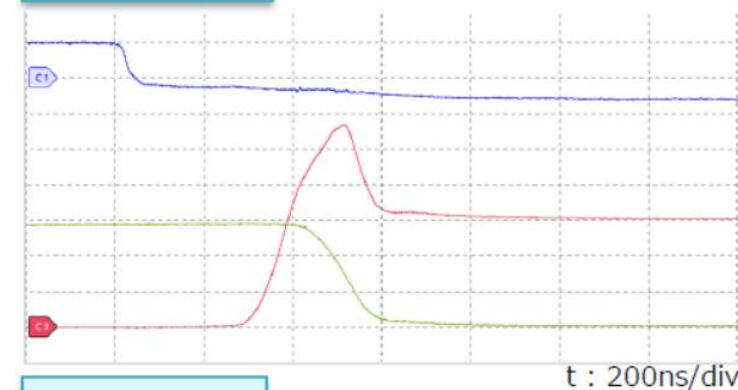
DC Link : 600V, Ron=Roff : 0.47Ω, Upper arm, Tj=150°C



V_{ce}, I_c, V_{geH}



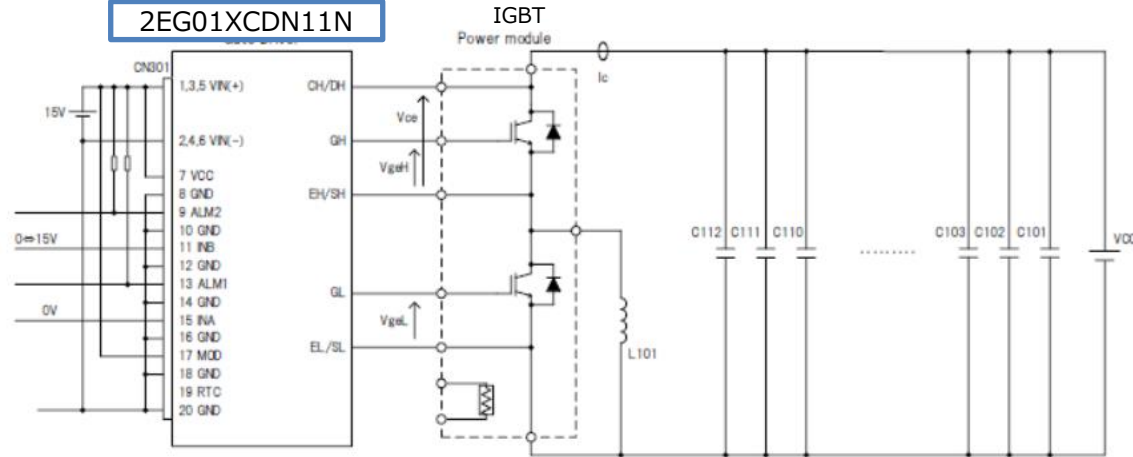
Vce,Ic,VgeH



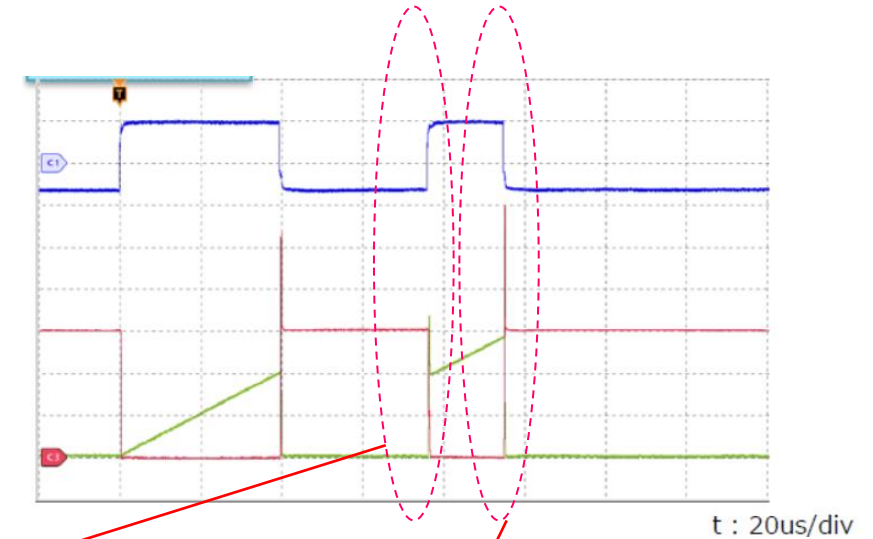
1) Introduction of TAMURA Gate Driver Units

Single drive solution /2 Pulse test

DC Link : 600V, Ron=Roff : 0.47Ω, Upper arm, Tj=25°C

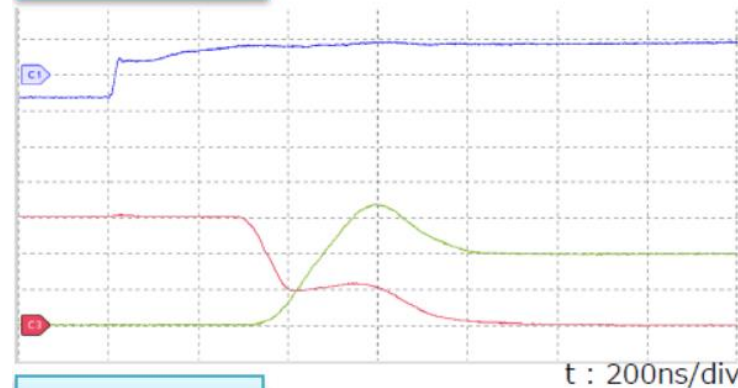


IGBT : 2MBI1000XRNE120-50(Fuji Elec)
C101-112 : 560uF(Ls : 60nH)
L101: 22uH



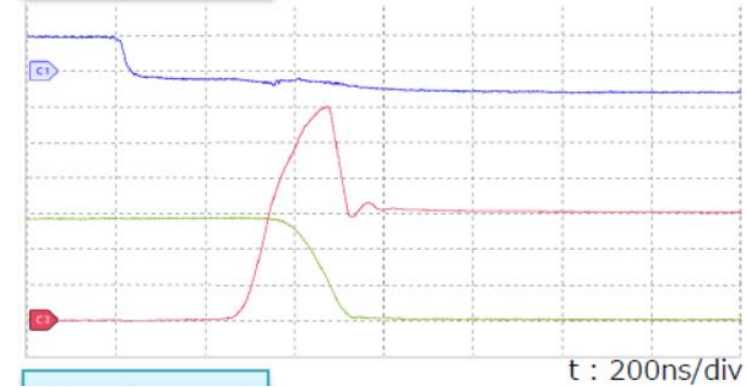
Turn ON / Ic =1000A

Vce,Ic,VgeH



Turn OFF / Ic =1400A

Vce,Ic,VgeH

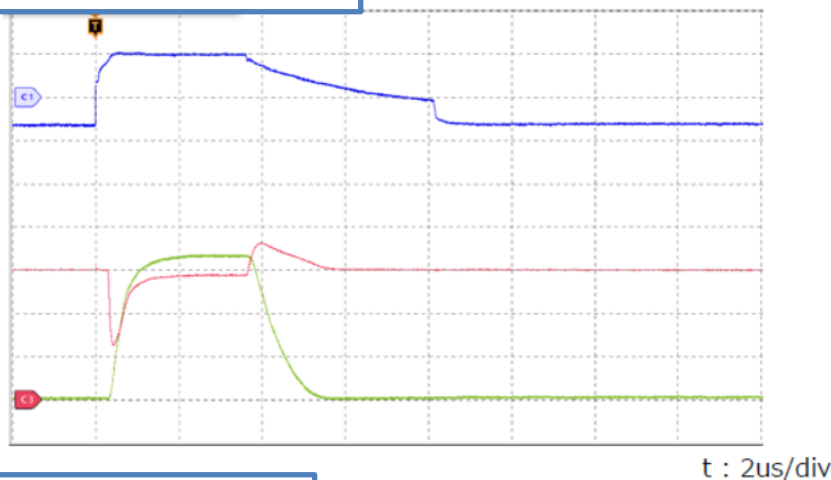


1) Introduction of TAMURA Gate Driver Units

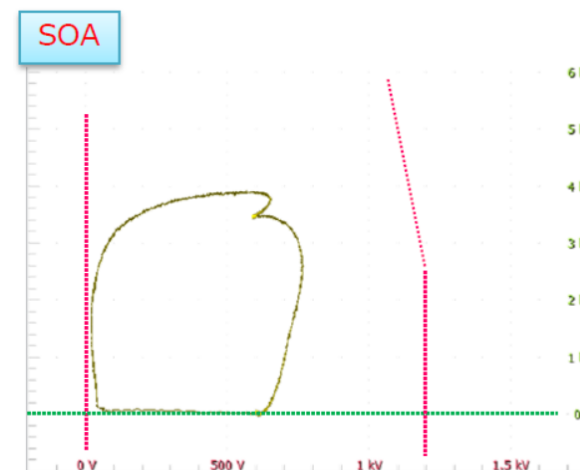
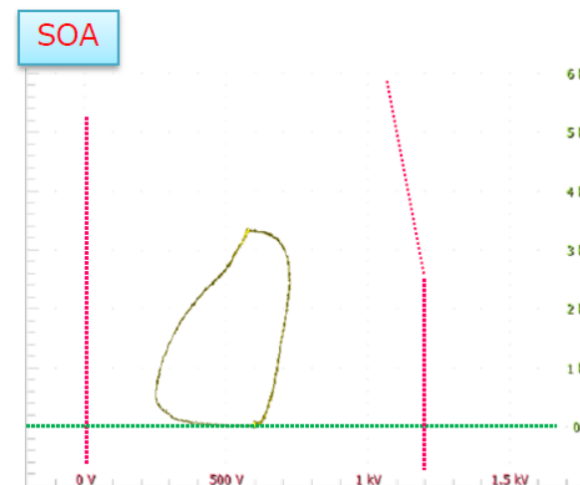
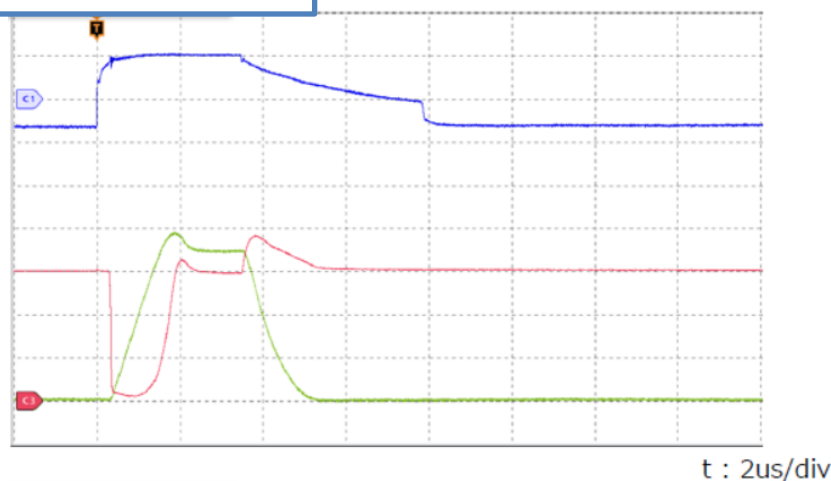
Single drive solution/Arm short circuit

DC Link : 600V, Ron=Roff : 0.47Ω, Upper arm, Tj=150°C

Load inductance : Arm short



Load inductance : 170nH

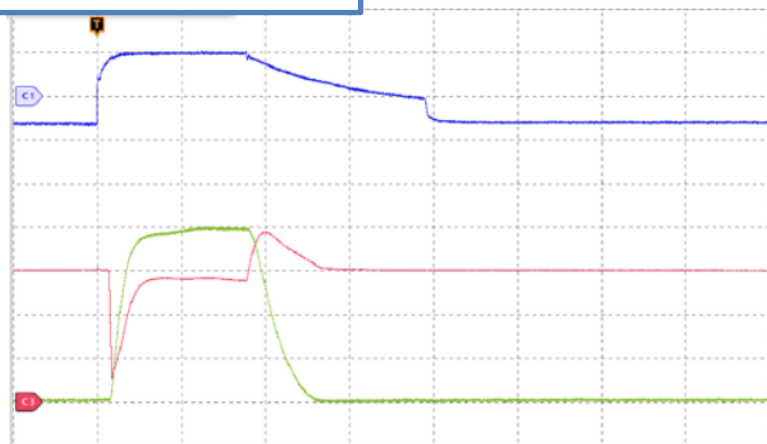


1) Introduction of TAMURA Gate Driver Units

Single drive solution/Arm short circuit

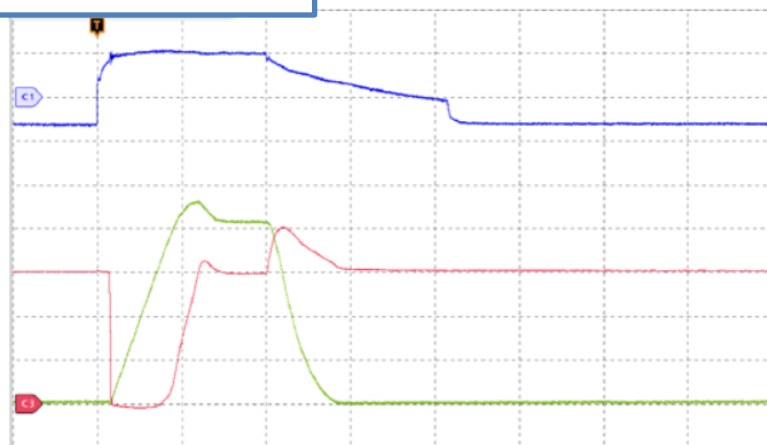
DC Link : 600V, Ron=Roff : 0.47Ω, Upper arm, Tj=25°C

Load inductance : Arm short

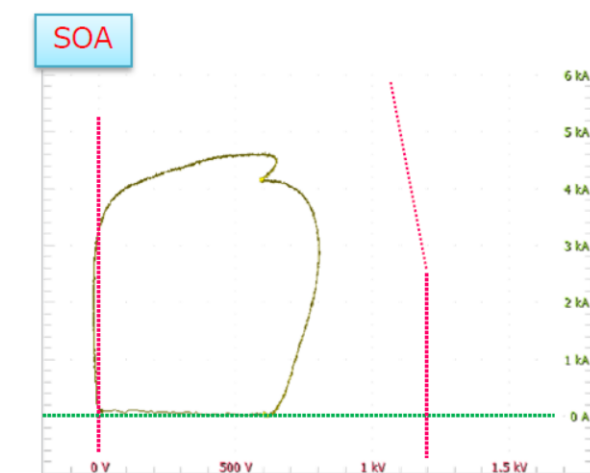
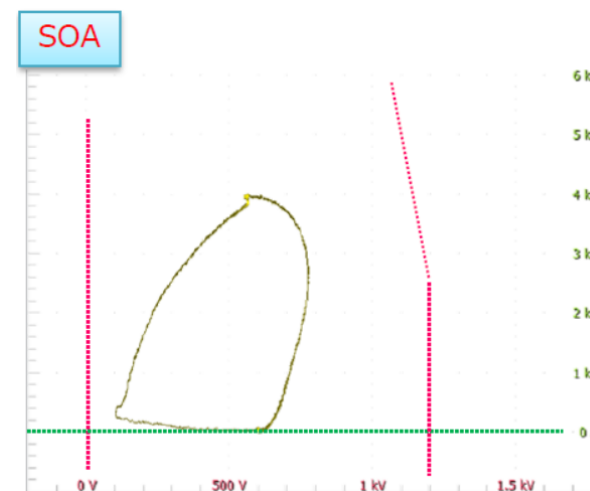


t : 2us/div

Load inductance : 170nH



t : 2us/div



1) Introduction of TAMURA Gate Driver Units

1-5. Gate drive waveform of High capacity IGBT

IGBT:FF900R12ME7_B11 (Infineon Technologies)

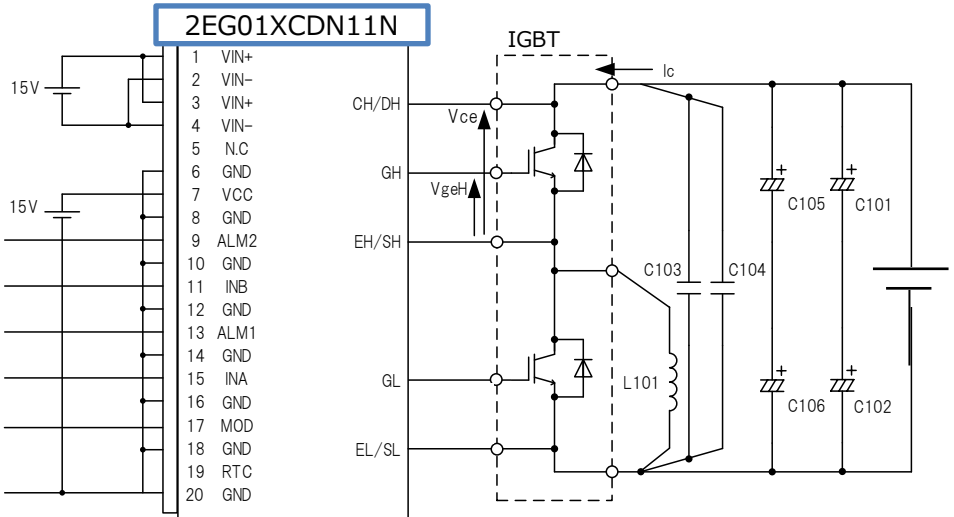
2EG01XCDN11N Switching Test Data



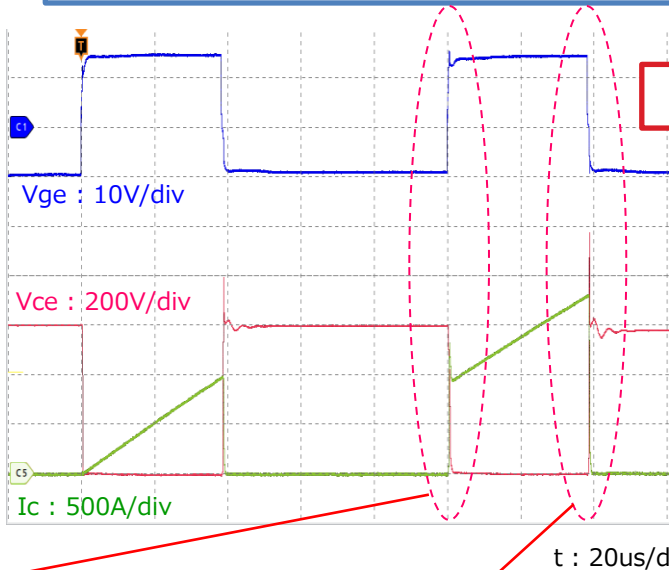
1) Introduction of TAMURA Gate Driver Units

Single drive solution / 2 Pulse test

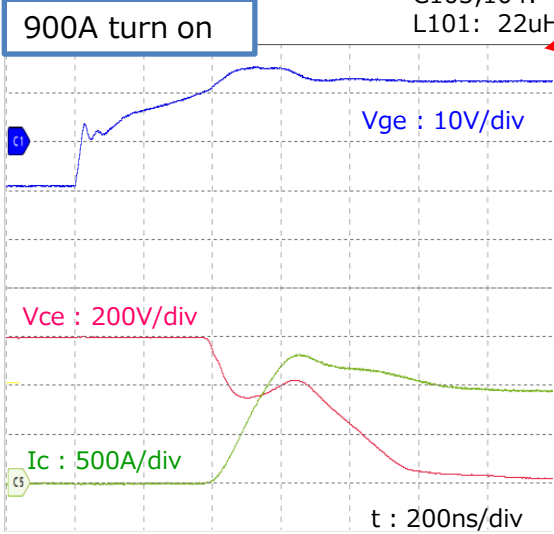
DC Link : 600V, Ron=Roff : 0.51Ω, Upper arm, Tj=150°C



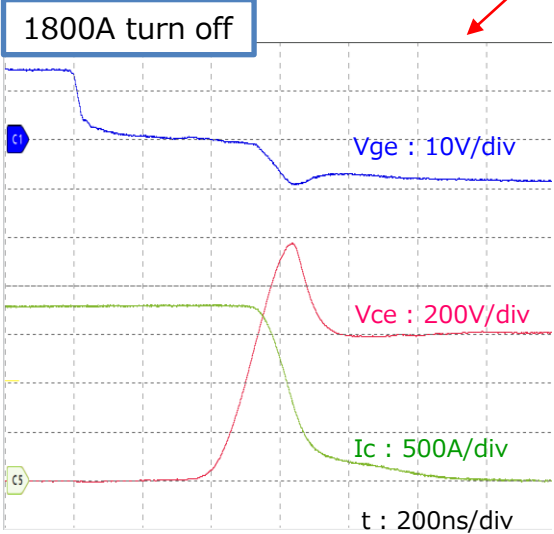
IGBT : FF900R12ME7_B11 (Infineon)
C101,102,105,106 : 2700uF (Ls : 20nH)
C103,104: 4.7uF (Ls : 20nH)
L101: 22uH



High temp test



Item	Measurement value	
DC Link	600	V
Ic	900	A
dV/dt	2.7	kV/us
di/dt	7.5	kA/us
td(on)	0.40	us
tr	0.12	us
Eon	172	mJ

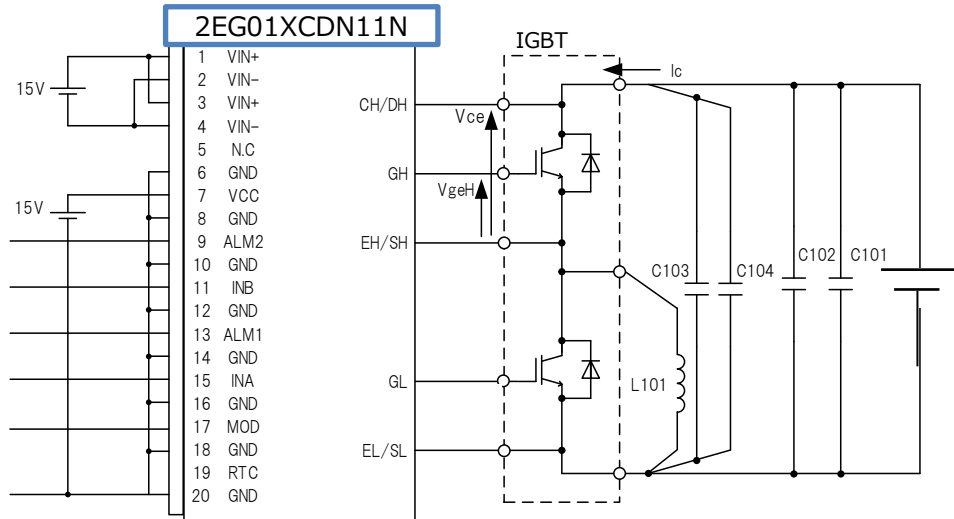


Item	Measurement value	
DC Link	600	V
Ic	1800	A
Vcep	973	V
dV/dt	5.2	kV/us
di/dt	12.4	kA/us
td(off)	0.56	us
tf	0.28	us
Eoff	240	mJ

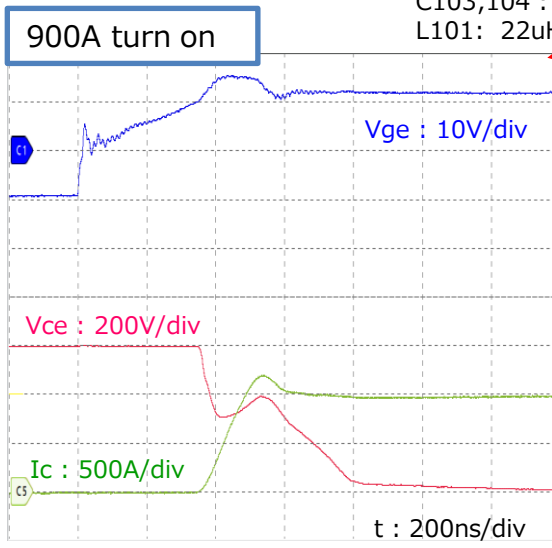
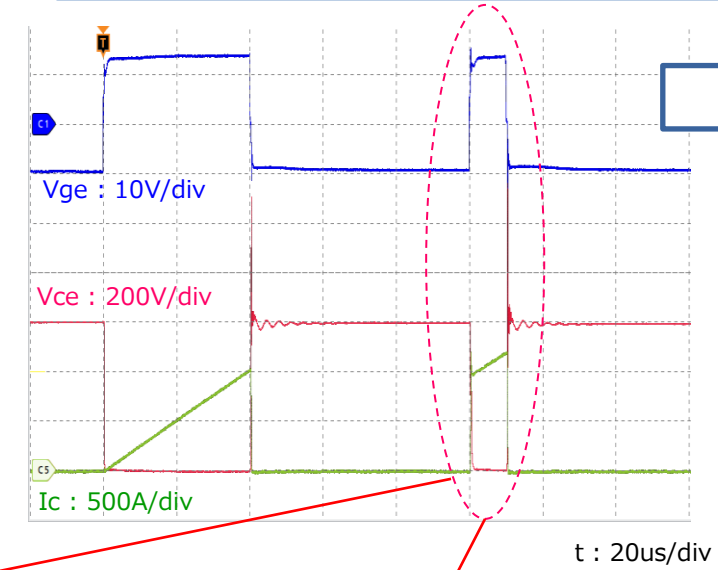
1) Introduction of TAMURA Gate Driver Units

Single drive solution /2 Pulse test

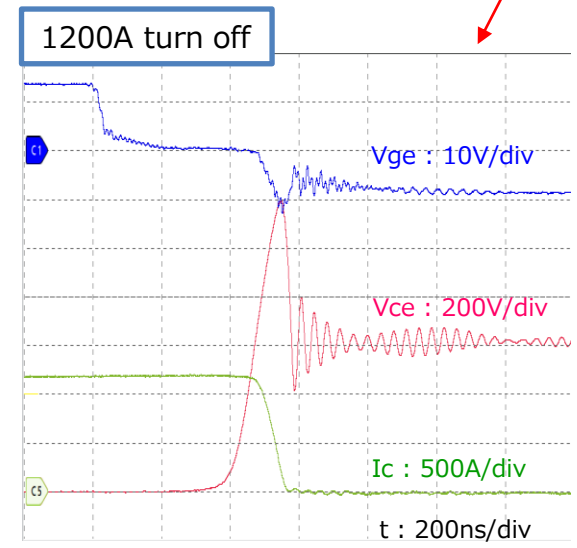
DC Link : 600V, Ron=Roff : 0.51Ω, Upper arm, Tj=-40℃



IGBT : FF900R12ME7_B11 (Infineon)
C101,102 : 1500uF (Ls : 50nH)
C103,104 : 4.7uF (Ls : 20nH)
L101: 22uH



Item	Measurement value	
DC Link	600	V
Ic	900	A
dV/dt	4.2	kV/us
di/dt	9.2	kA/us
td(on)	0.36	us
tr	0.10	us
Eon	108	mJ



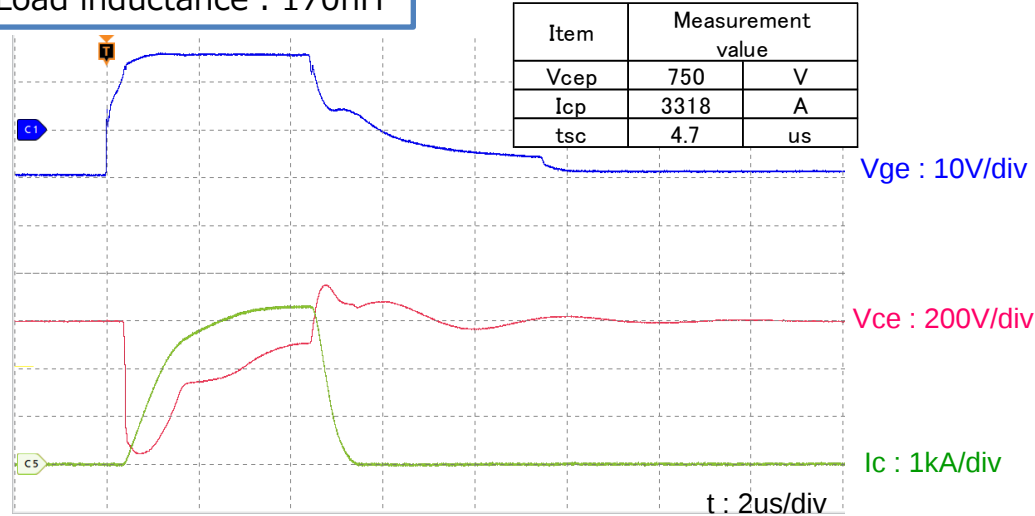
Item	Measurement value	
DC Link	600	V
Ic	1200	A
Vcep	1197	V
dV/dt	8.0	kV/us
di/dt	16.3	kA/us
td(off)	0.47	us
tf	0.07	us
Eoff	82	mJ

1) Introduction of TAMURA Gate Driver Units

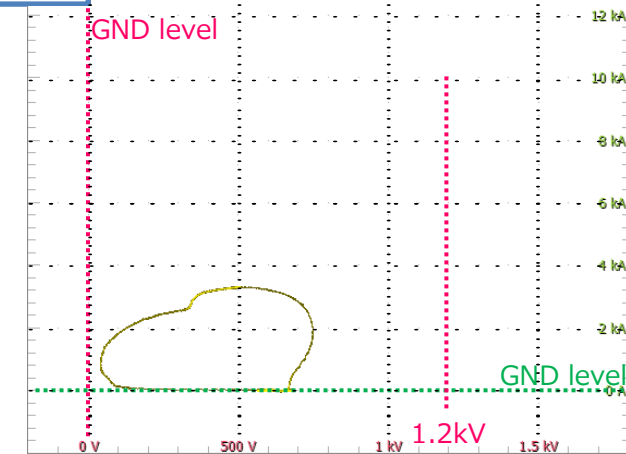
Single drive solution/Arm short circuit

DC Link : 600V, Ron=Roff : 0.51Ω, Upper arm, Tj=150°C

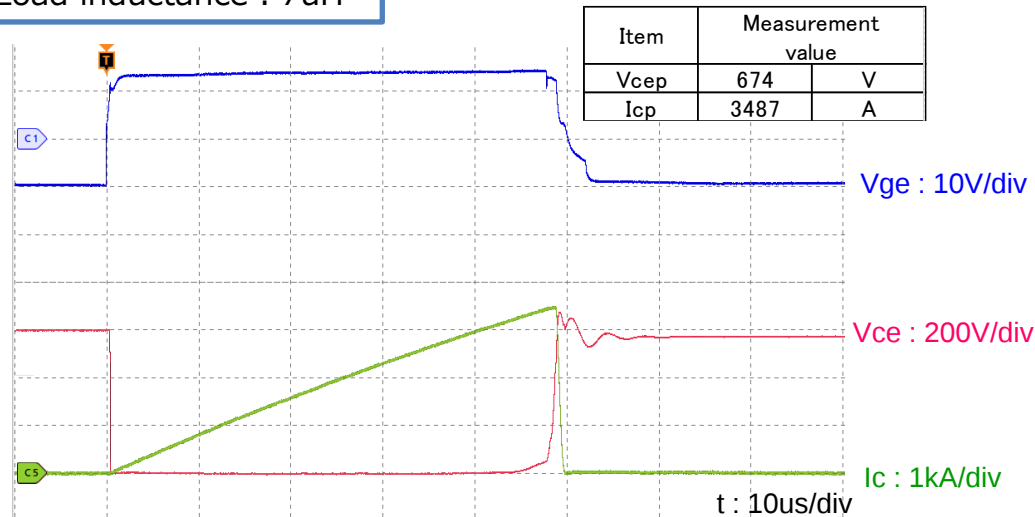
Load inductance : 170nH



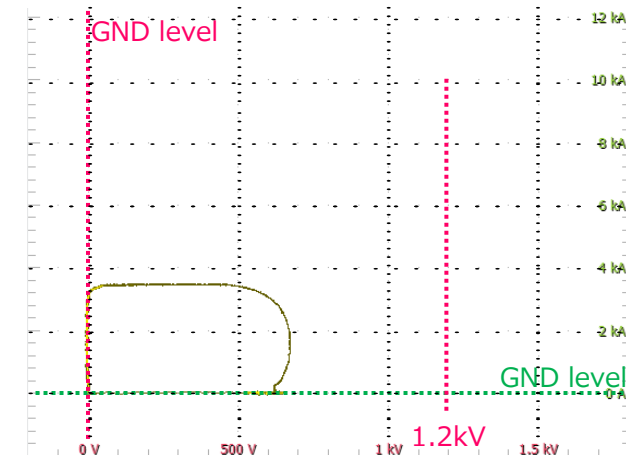
SOA



Load inductance : 7uH



SOA

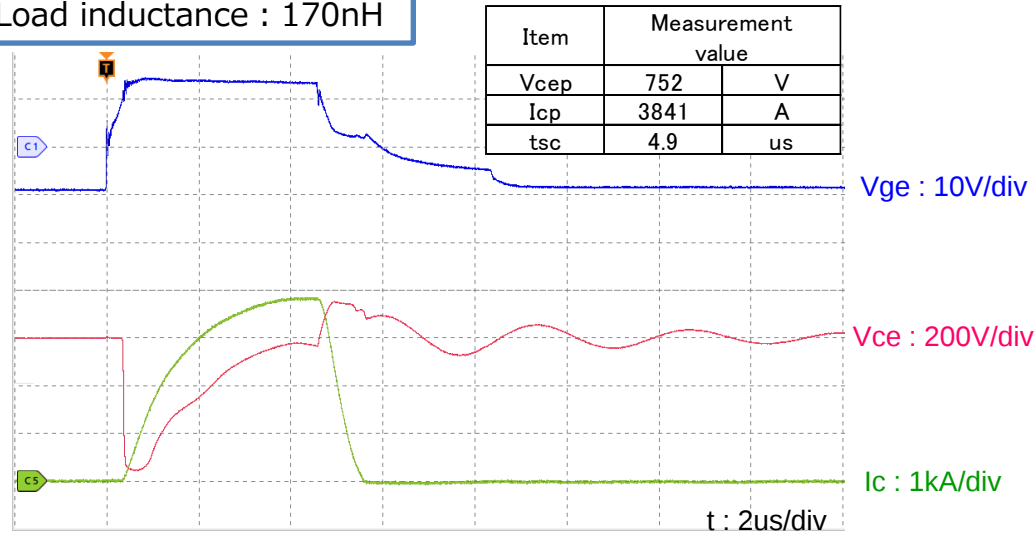


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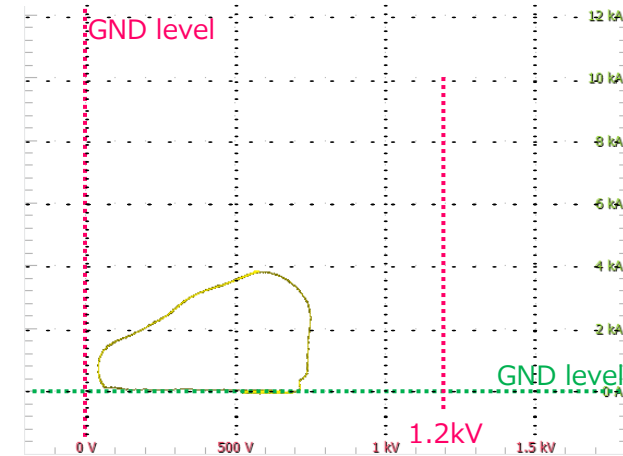
Single drive solution/Arm short circuit

DC Link : 600V, Ron=Roff : 0.51Ω, Upper arm, Tj=-40℃

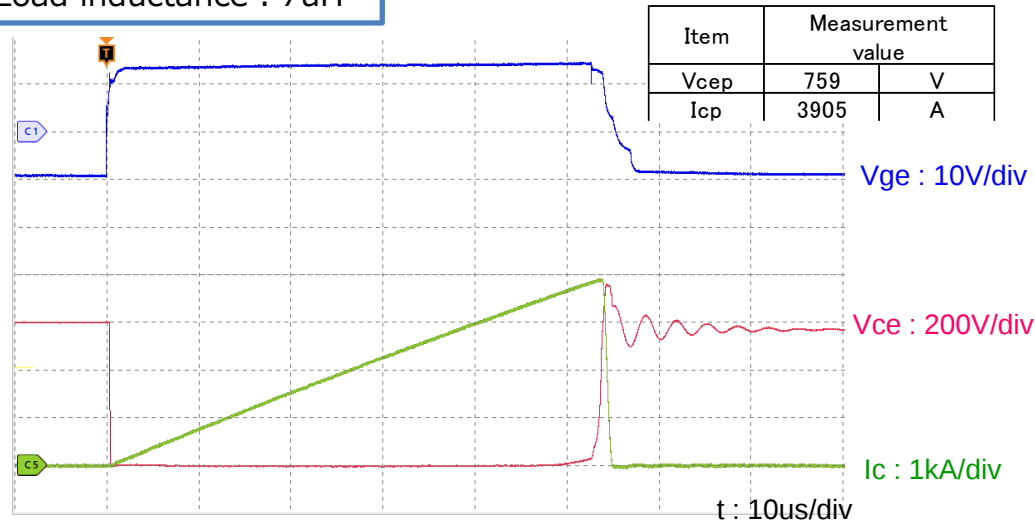
Load inductance : 170nH



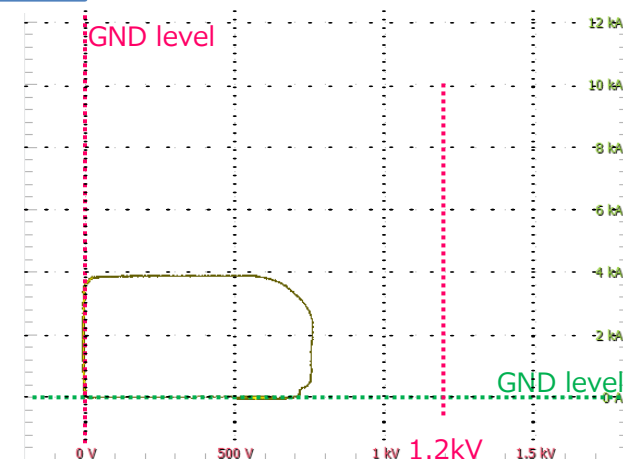
SOA



Load inductance : 7uH



SOA



1) Introduction of TAMURA Gate Driver Units



1-6. Comparison

Advantage of Tamura Gate driver modules (2EG-C)

Item	TAMURA	Company A	Advantages
Input Voltage	13.5-26.4V	14.5-15.5V	○
Output Power	4W	1W	○
Peak output current	±43A	+15A/-8A	○
Frequency	100kHz (Max)	Not defined	○
Isolation capacitance	12pF(TYP)	22pF	○
CMTI	70kV/us	50kV/us	○
Protection	Soft turn off Active Clamp *	Active Clamp	○

* Active clamp is option.

Large drive capacity makes it ideal for large capacity IGBTs!

1) Introduction of TAMURA Gate Driver Units

1-7. Line up / Specification

Item		Model	
		2EG01XCDN11N	2EG01XCCN11N
Application		IGBT	
Input	Input Voltage Range (VIN, VCC)	DC13V~28V	
	Logic Input Voltage (INA, INB)	DC13~18V	DC3.3~18V
Output	Number of Output	2	
	Gate Voltage (ON)	+14V~+16V	
	Gate Voltage (OFF)	-9V~-11V	
	Maximum Switching Frequency	100kHz	
	Permissible Switching Frequency	15.6kHz (Qg=7uC)	
Insulation	Withstand Voltage	Primary to secondary : AC5000V	
	Delay Time	±130ns(TYP)	
	Minimum Clearance Distance	Primary to secondary : 14mm *As for Gate driver PCB	
	Minimum Creepage Distance	Primary to secondary : 16mm *As for Gate driver PCB	
Function	Mode select	Direct mode / Half bridge mode can be switched	
	Desaturation Protection	Yes	
	Soft Turn Off	Yes	
	Miller Clamp	None	
	Active Clamp	None	
	Protection Release Condition	Auto Recovery, Interval: 110 ms(TYP)	
	Gate resistor	No mounting / Lead resistor can be mounted.	
Environment	Ambient Temperature (Operating)	-40~+85℃ (Input Voltage : DC13V~18V)	
		-40~+75℃ (Input Voltage : DC18V~28V)	
	Ambient Humidity (Operating)	20~95%RH (Nil condensation)	
	Ambient Temperature (Storage)	-40~+90℃	
	Ambient Humidity (Storage)	5~95%RH (Nil condensation)	

Electrical Specification (Ta=25℃)

1) Introduction of TAMURA Gate Driver Units

1-8. Power module correspondence table

Semiconductors Manufacturer	Tamura P/N	Appearance	Signal input voltage	Protection circuits *1	Status	Stock
Mitsubishi NX type Fuji DualXT Infineon EconoDUAL™ Any others	2EG01XCCN11N 2EG01XCDN11N		DC3.3~15V	DESAT protection Soft turn off	Active	Yes
			DC15V	DESAT protection Soft turn off	Active	Yes

*1 Active clamp is option.

Gate Driver Family Selection Guide



▶ Click here to search applicable power modules!

Gate Driver that bring out the performance of SiC gate drive

1) Introduction of TAMURA Gate Driver Modules

1-1. When, Why, we started development gate drivers

1-2. Application

1-3. Product configuration

1-4. Features of Gate Driver Modules

1-5. Gate drive waveform of SiC power module

1-6. Comparison

1-7. Line up

1-8. Product Line-up (power module correspondence table)

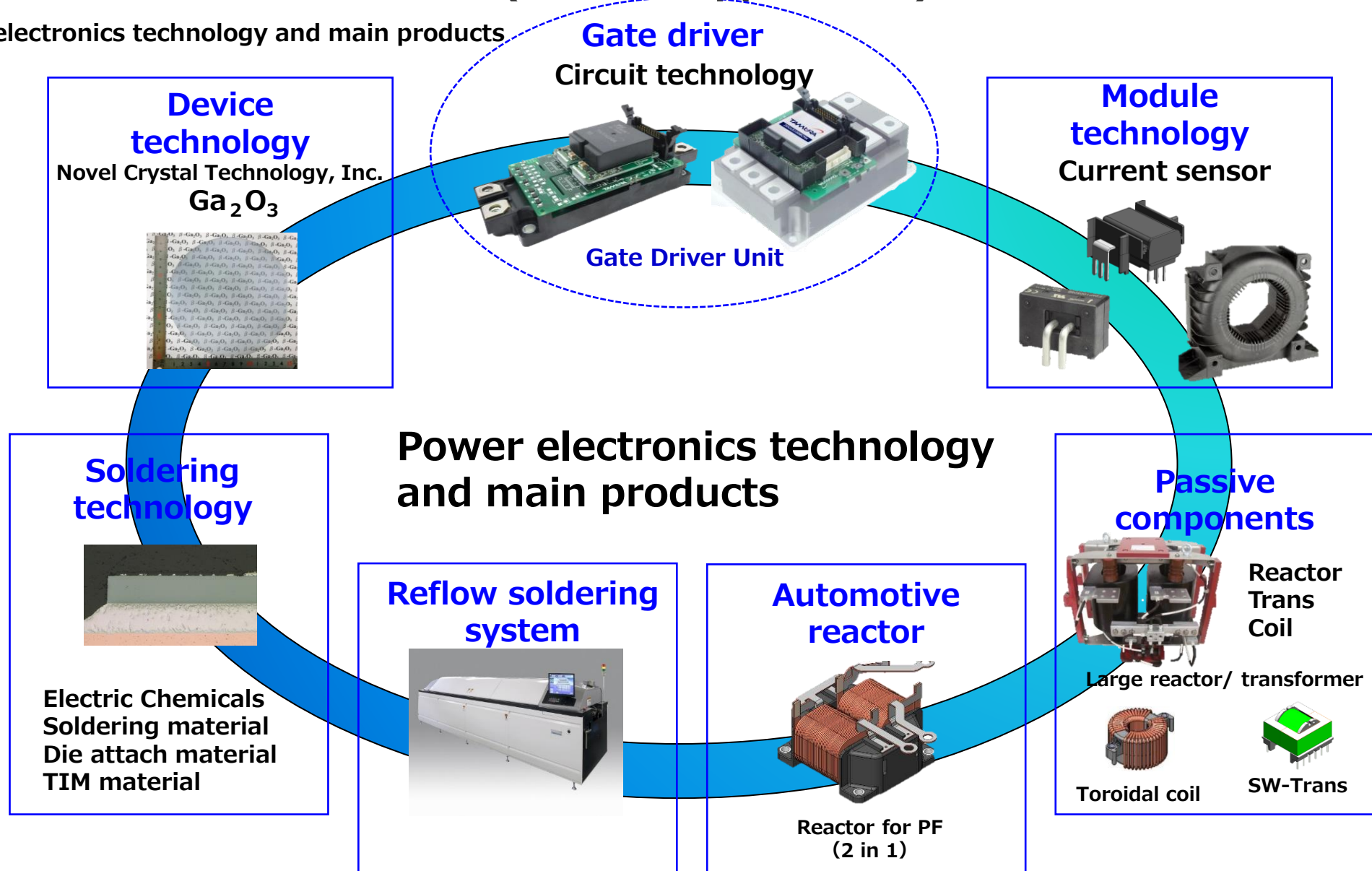
ROHM / Infineon / Mitsubishi

2) Introduction of One Tamura

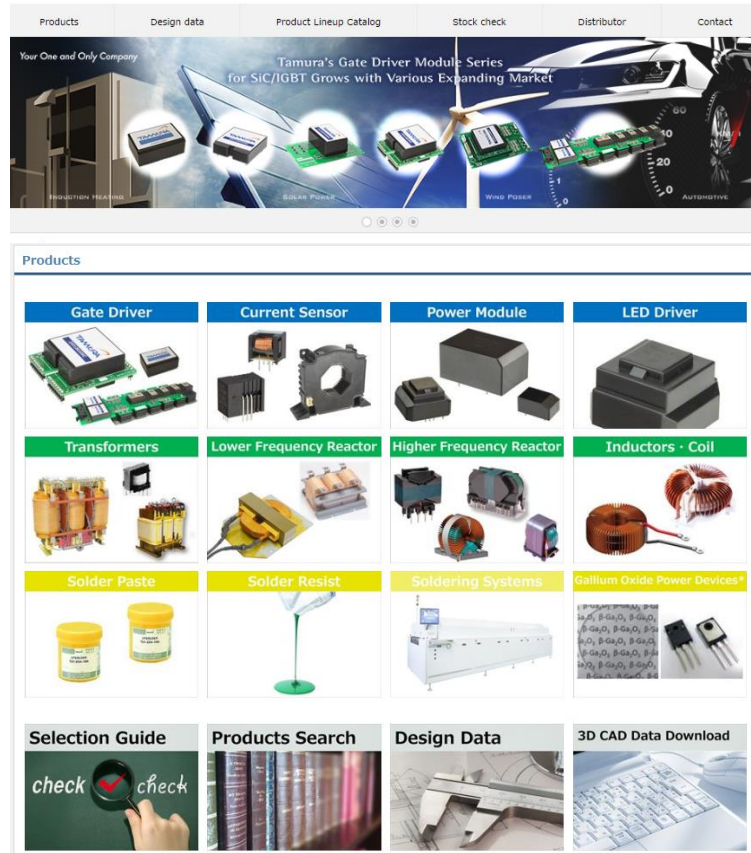
Appendix) Contact person

2. Introduction of One Tamura (General application)

Power electronics technology and main products



Please visit our website!



WEB



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! ↓

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