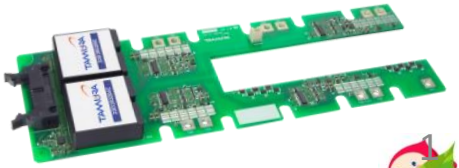
SIMPLIFY YOUR DRIVER

- Introduction for High capacity IGBT–

Issued on 1st Apr '22 Unit division HQ Japan





TAM-GDM-00006

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1. TAMURA Products History for Power Electronics

1-1. TAMURA General History

Since 1924

1924
RADIO

1930
Power Transformer

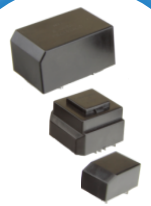
1939
Audio Transformer

1956
Power Supply

1994
Current Sensor
reactors

2007
ZERO watt standby
Power Supply

2011
Power Module



OPEN TYPE

L Series

CLOSED TYPE

S Series

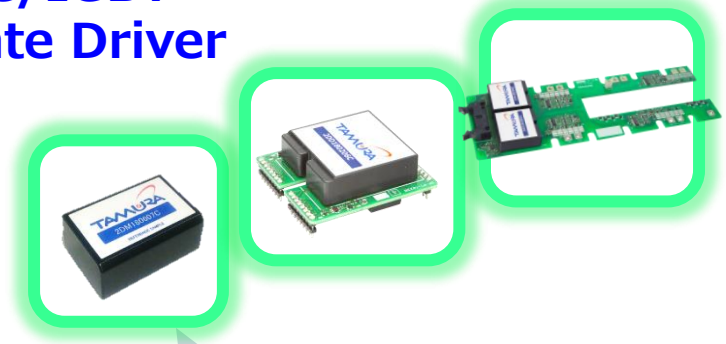
Fluxgate TYPE

F Series

ASIC TYPE

Large Current

2016～
SiC/IGBT Gate Driver



Further Expansion!!

2019

More Products

1. TAMURA Products History for Power Electronics

1-2. TAMURA Gate Driver History

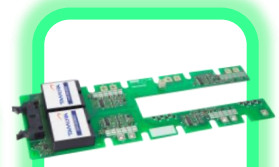
2018～

2PG-D

4DUx

2EG-C

FUJI (2in1) | Infineon (2in1)



2017

2CG for SiC/IGBT

2DD of
DC-DC convertor

2016

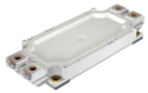
2DM/2DU for SiC

For NPC
For ANPC
For Parallel

High Power solution

2016 — 2017 — 2018 — 2019

ROHM (SiC)



Mitsubishi (2in1)

FUJI (2in1)

Infineon (2in1)

FUJI (4in1)

FUJI (2in1)

Infineon (2in1)

Mitsubishi (2in1)

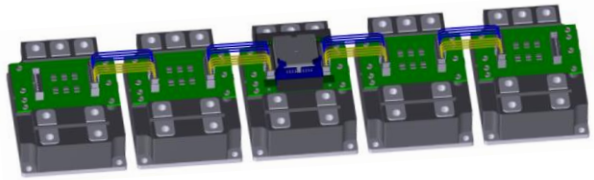
FUJI (2in1)

Infineon (2in1)

2019

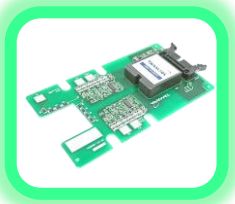
1-3. Future of TAMURA Gate Driver

2019～



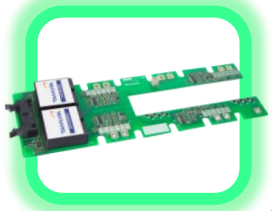
3～6 Parallel (Master and Slave)

2PG-D



ANPC/3combination

4DUx



2019

DC method
I-TYPE
3-Level

NPC method
T-TYPE
3-Level

ANPC method
I-TYPE
3-Level

Parallel method
×2,×3,×4・・

2020

2021

2022

Wind power generation

Renewable energy Products

Power conditioner

Solar power generation

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■ **SIMPLIFY YOUR DRIVER**
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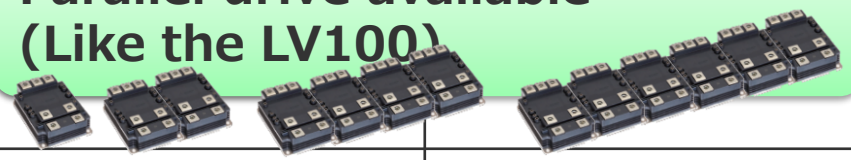
2. TAMURA Gate Driver Family Feature

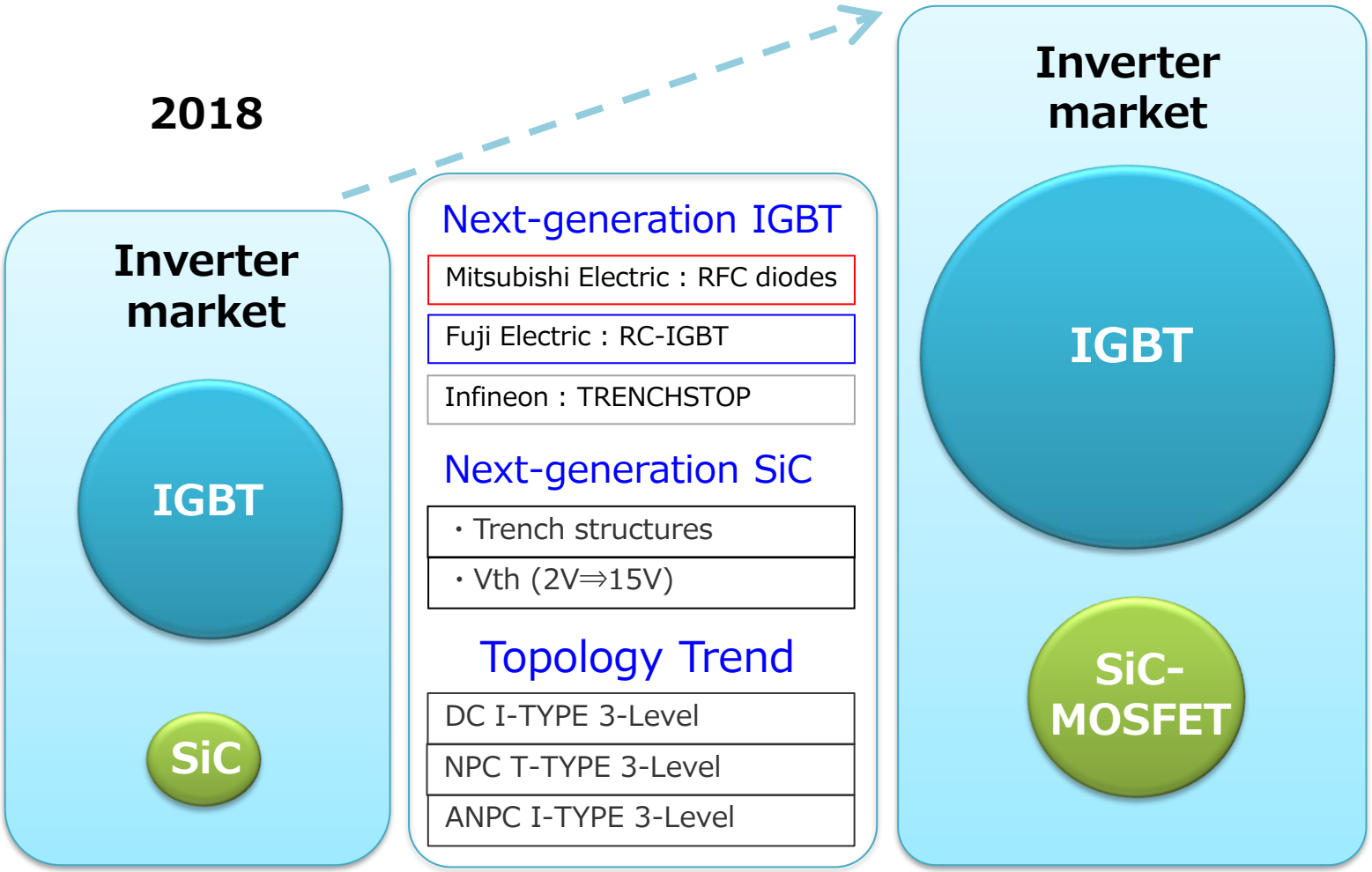
2-1. Pro and cons

Trans technology | Analog circuit technology | Digital circuit technology | EMC technology | Potting technology

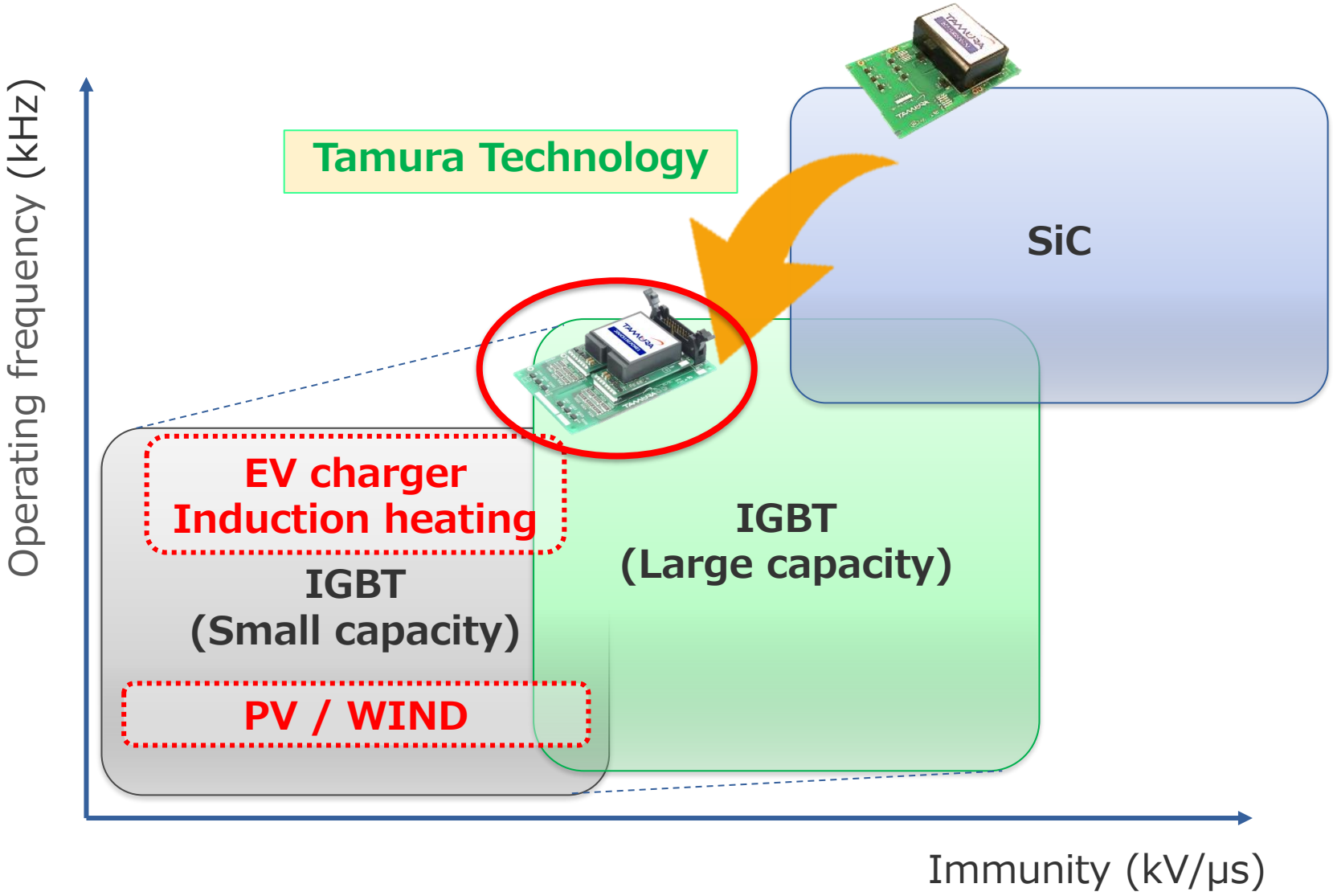
Item	Applied technology	Features	Compared with Competitors
Low stray capacity	■ ■ ■	Low noise at high frequencies	
Wider input voltage	■ ■ ■ ■	Supports 24V system Output high accuracy ⇒ Correspond to SiC	
High Power DC-DC converter	■ ■ ■	High Frequency & Large capacity	
High-speed response & accuracy	■ ■ ■	Parallel drive available (Like the LV100) 	
Various protections	■	Improved reliability	

2-2. Diffusion of Power Modules

Market growth
- PV, and Wind power
- Motor control inverter (general-purpose inverter)
- Automotive (HV, PHV, EV)



2-3. Market trend of IGBT



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3. Introduction of high capacity IGBT compatible Gate Driver

2018~

2PG-D

4DUx

2EG-C

FUJI (2in1)
Infineon (2in1)

2017

2CG for SiC/IGBT

2DD of
DC-DC convertor

2016

2DM/2DU for SiC

For NPC
For ANPC
For Parallel

High Power
solution

2016

2017

2018

2019

ROHM / SiC

Mitsubishi (2in1)
FUJI (2in1)
Infineon (2in1)

FUJI
(4in1)

FUJI (2in1)
Infineon (2in1)

Mitsubishi (2in1)
FUJI (2in1)
Infineon (2in1)

2019

More Products

3. Introduction of high capacity IGBT compatible Gate Driver

3-1. Product features

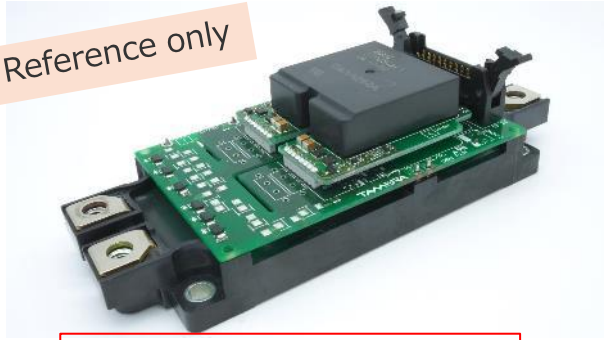
Reference only

Infineon Technologies
/ EconoDUAL™

Reference only

Fuji Electric
/ DualXT

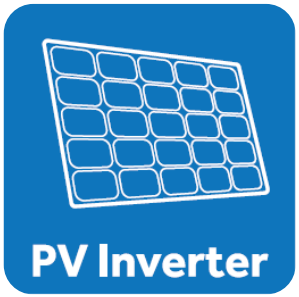
Reference only

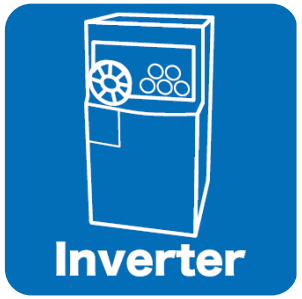


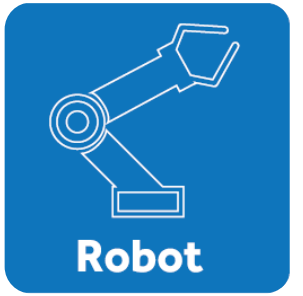
Mitsubishi Electric
/ NX type

4W per channel → **Frequency 200kHz (Max)** → **Peak Current 43A**

Suitable for various applications !





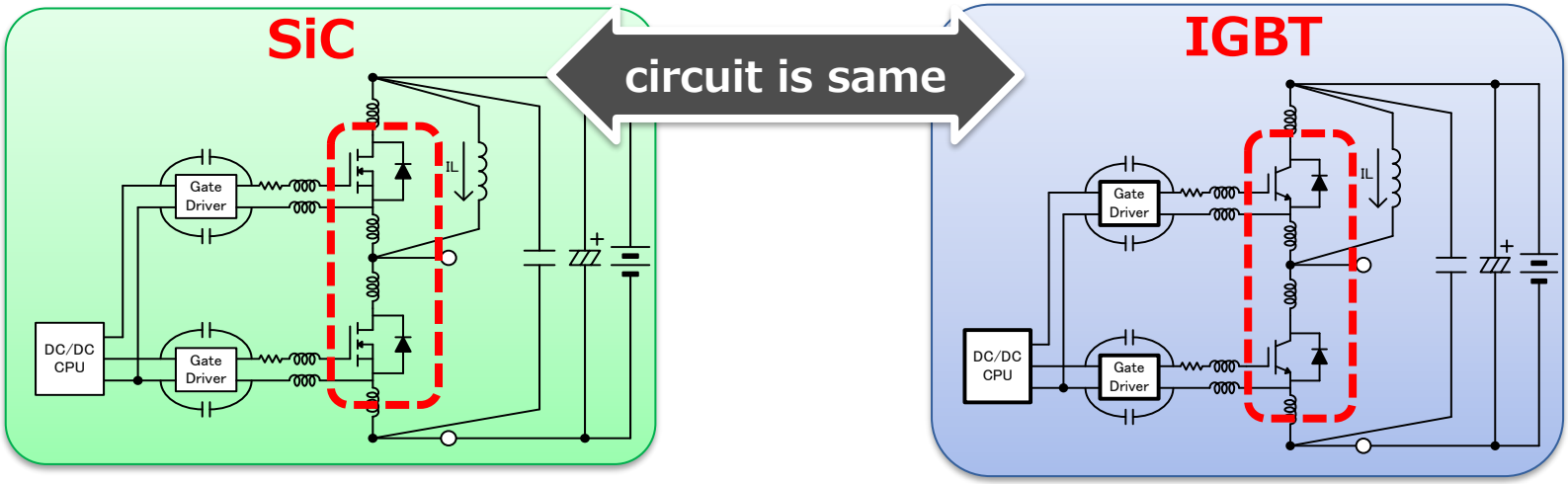


EconoDUAL™ is registered trademark of Infineon Technologies AG, Germany.

3-2. Gate Driver differences (SiC and IGBT)

Item	Condition (SiC-MOSFET)	Condition (IGBT)
Gate drive circuit	2 (Half bridge)	2 (Half bridge)
Gate voltage (H)/(L)	18V/-5V	15V/-10V
Protection function	DESAT, Miller clamp	DESAT, STO,ACL
Operating frequency	200kHz (MAX)	20kHz (MAX)
Stray capacity	12pF	30-40pF
Response	85nsec (TYP)	350nsec (TYP)

Cover with all items!



If the SiC-MOSFET can be driven, the IGBT can be driven easily!

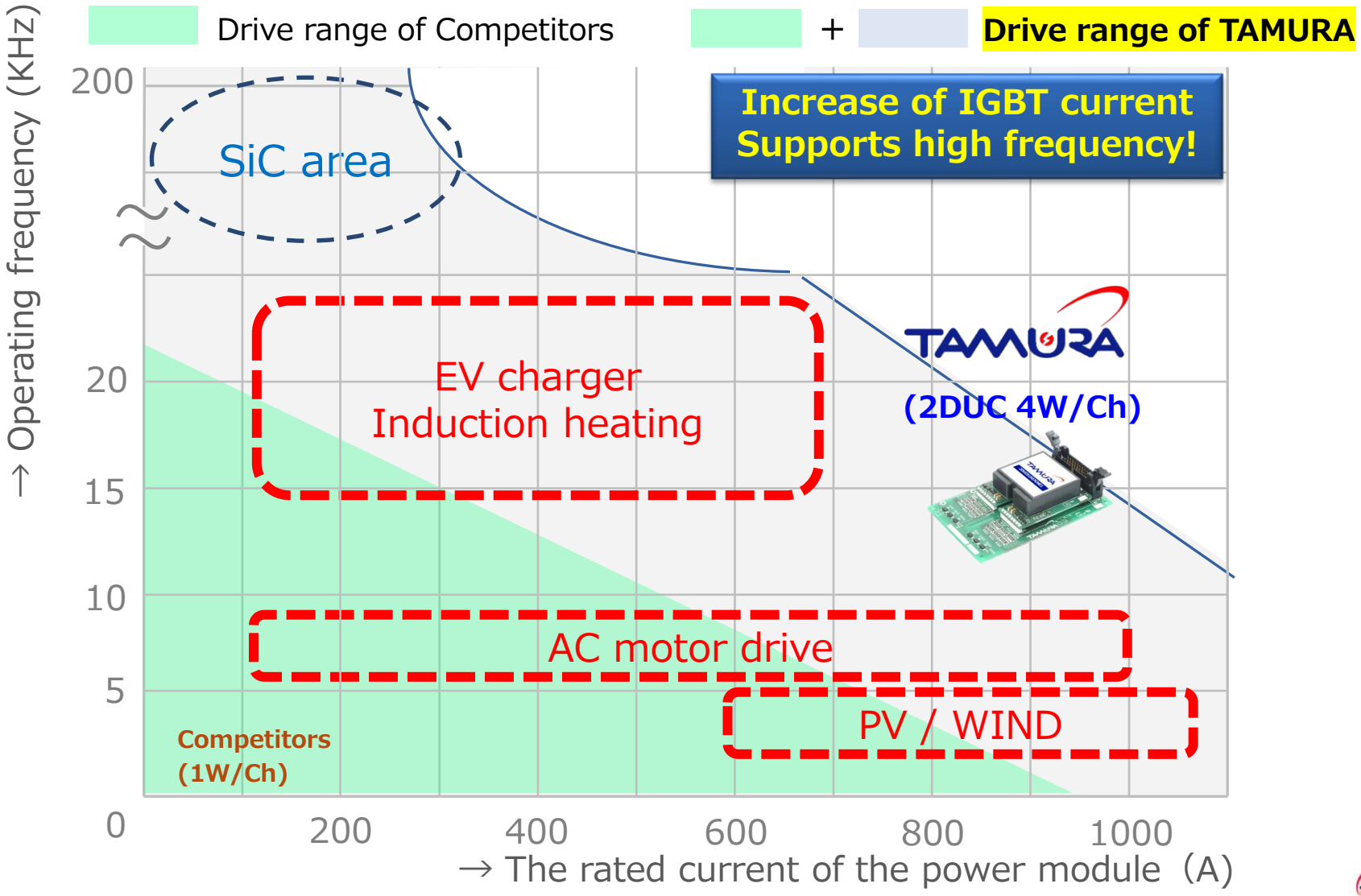
3-2. Performance comparison of other companies

Item	TAMURA	Company A
Power module	SiC-MOSFET/IGBT	IGBT
Input Voltage	13-28V	15V
Output Voltage	15V/-10V	15V/-10V
Output power	○ 4W	1W
Frequency	○ 200kHz (Max)	20kHz (Max)
Output Perk current	○ 43A	15A

Large drive capacity makes it ideal for large capacity IGBTs!

3-2. Performance comparison of other companies

Switching frequency range (image)



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3. New IGBT power module switching test data

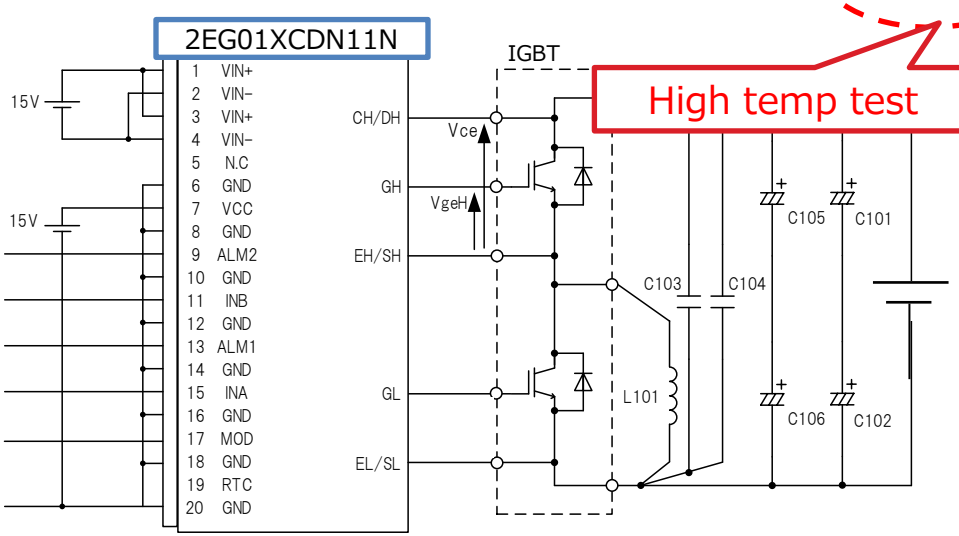
IGBT:FF900R12ME7_B11 (Infineon Technologies)

2EG01XCDN11N / Switching Test Data 1

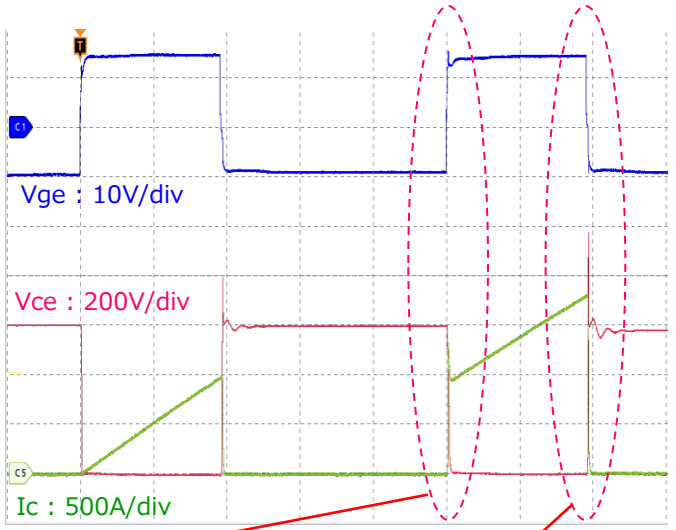
■ 2 Pulse Test

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

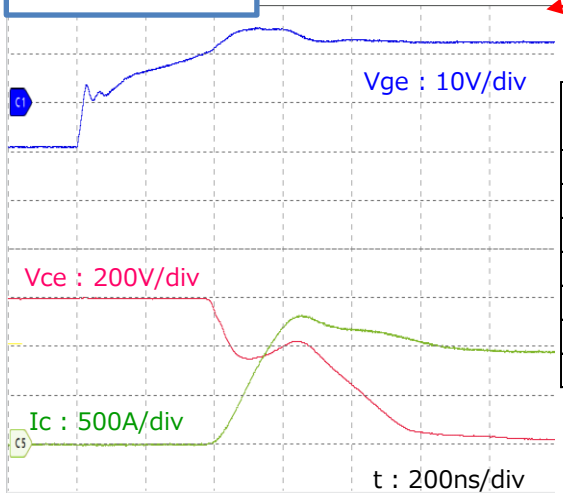
IGBT : FF900R12ME7_B11 (Infineon)



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

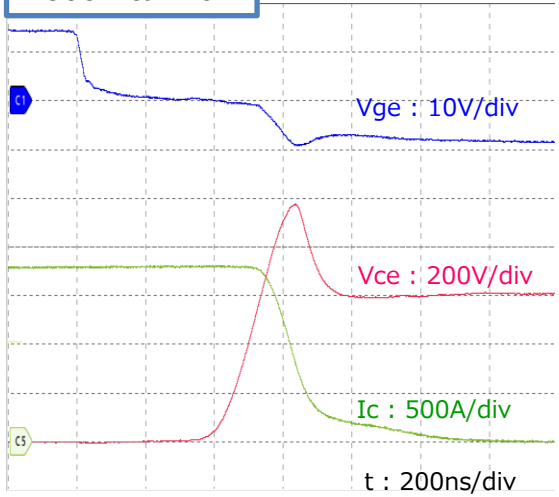


900A turn on



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

1800A turn off

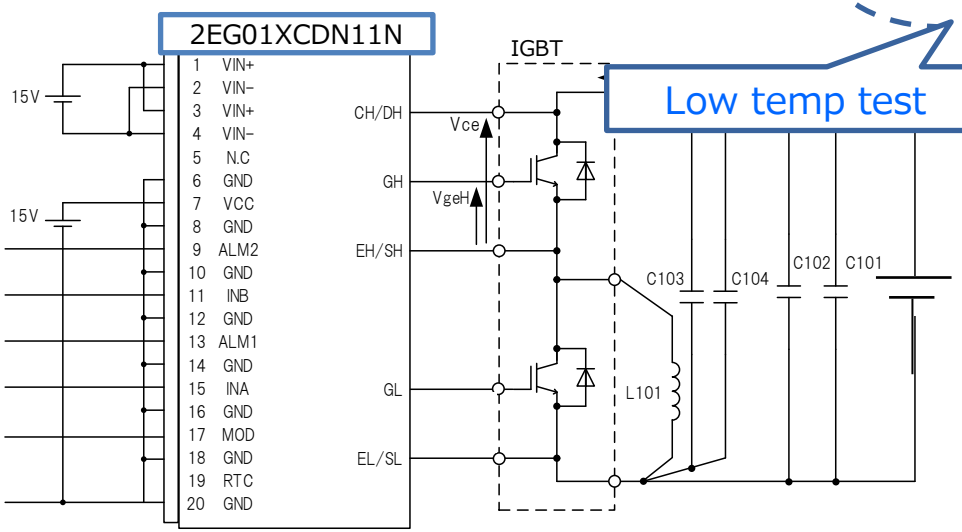


Item	Measurement value	
DC Link	600	V
Ic	1800	A
Vcep	973	V
dV/dt	5.2	kV/us
di/dt	12.4	kA/us
td(off)	0.56	us
tf	0.28	us
Eoff	240	mJ

2 Pulse Test

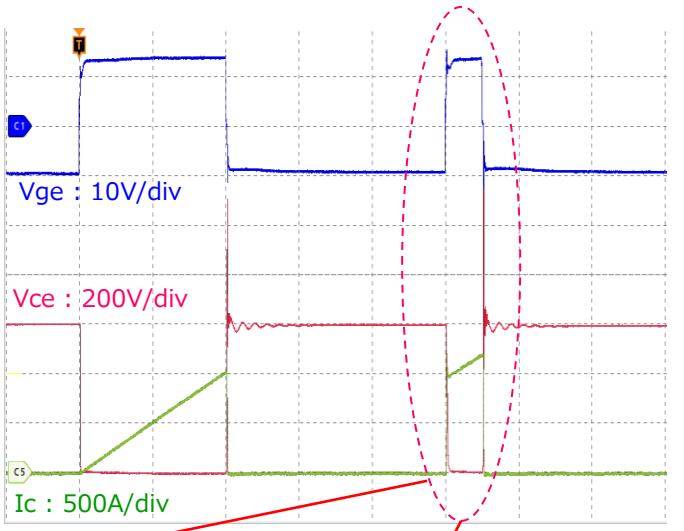
DC Link : 600V,　Ron=Roff : 0.51Ω,　Upper arm,　Tj=-40℃

IGBT : FF900R12ME7_B11 (Infineon)



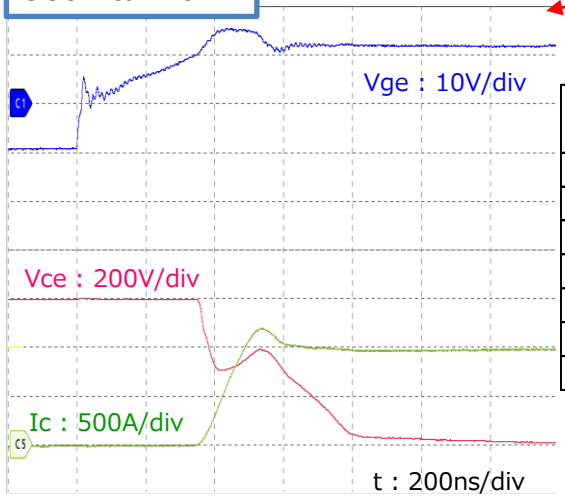
Low temp test

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



t : 20us/div

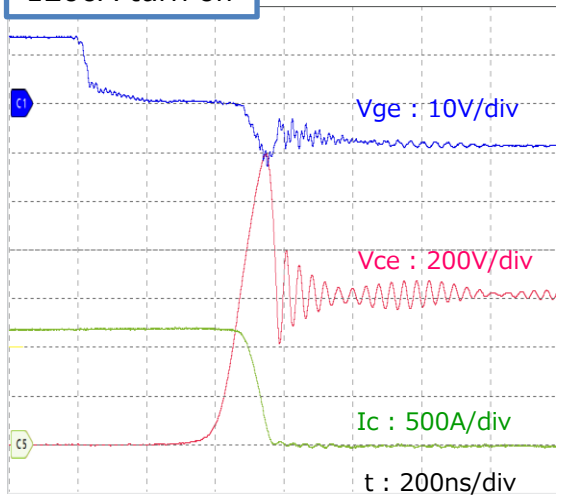
900A turn on



t : 200ns/div

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

1200A turn off



t : 200ns/div

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

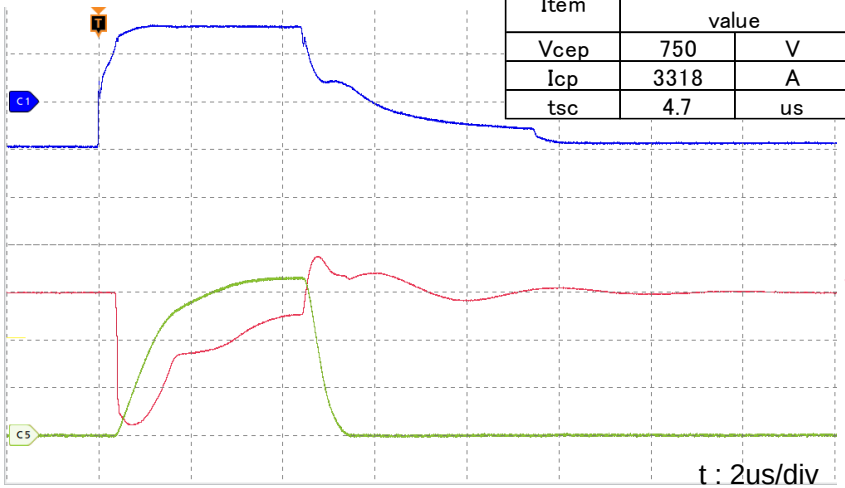
■ Desaturation Protection

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

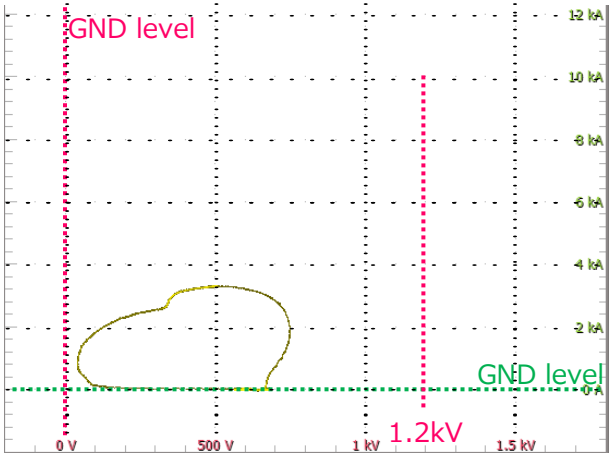
IGBT : FF900R12ME7_B11 (Infineon)

Load inductance : 170nH

Item	Measurement value	
Vcep	750	V
Icp	3318	A
tsc	4.7	us

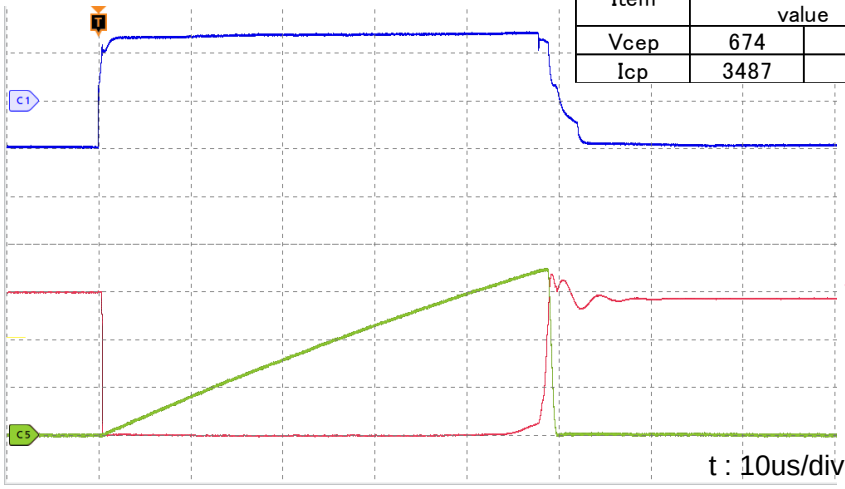


SOA

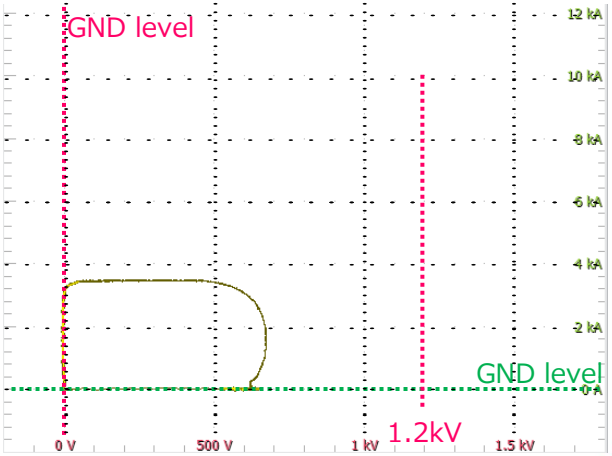


Load inductance : 7uH

Item	Measurement value	
Vcep	674	V
Icp	3487	A



SOA



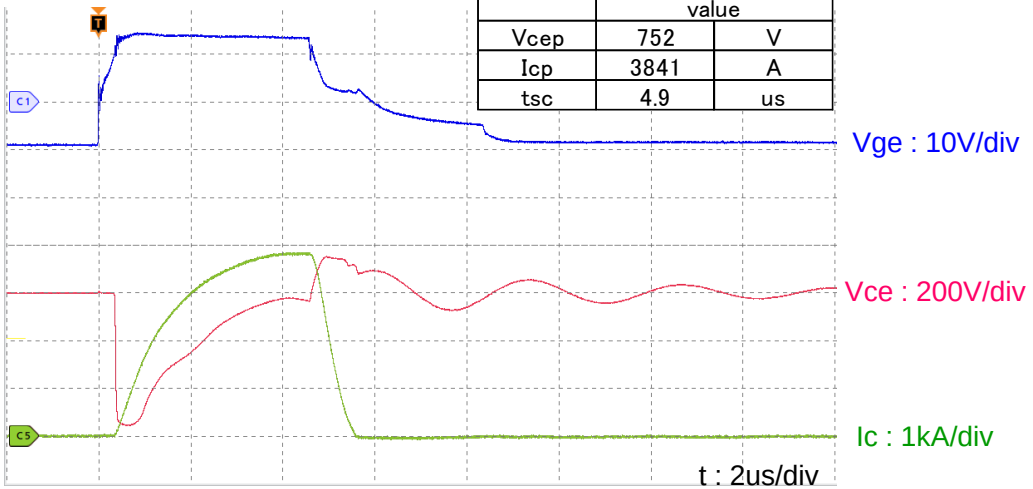
■ Desaturation Protection

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

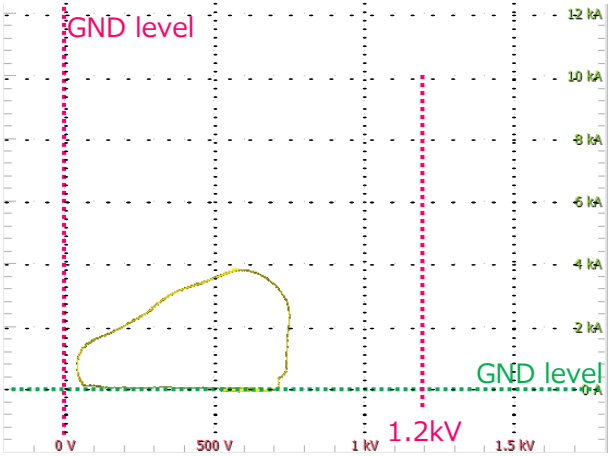
IGBT : FF900R12ME7_B11 (Infineon)

Load inductance : 170nH

Item	Measurement value	
Vcep	752	V
Icp	3841	A
tsc	4.9	us

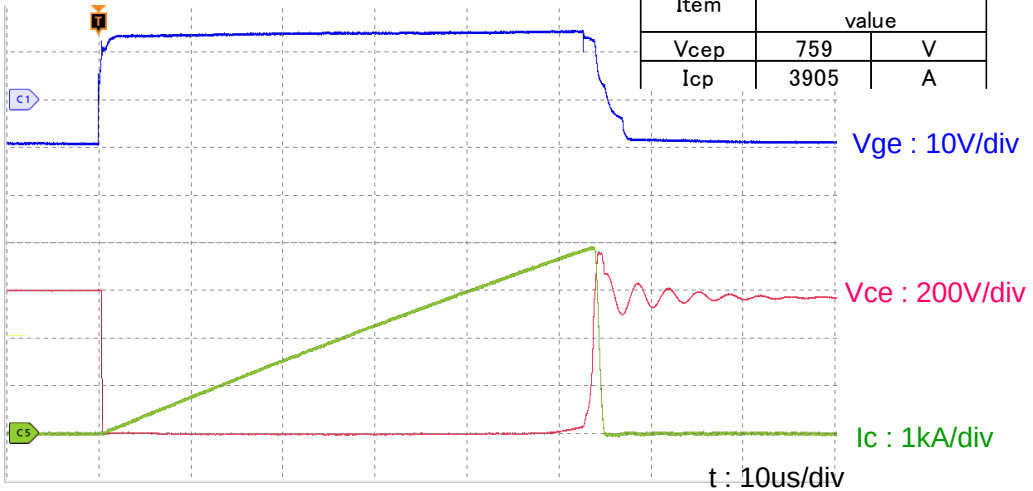


SOA

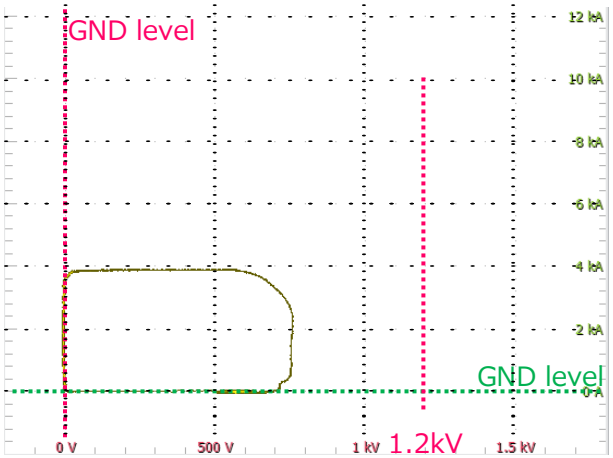


Load inductance : 7uH

Item	Measurement value	
Vcep	759	V
Icp	3905	A



SOA



3. New IGBT power module switching test data

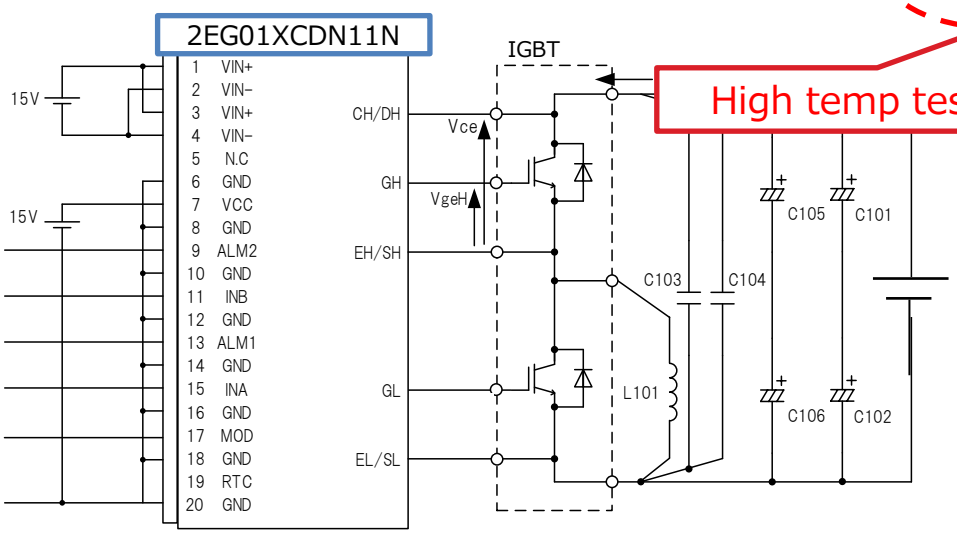
IGBT:CM800DX-24T1 (Mitsubishi Electric)

2EG01XCDN11N / Switching Test Data 1

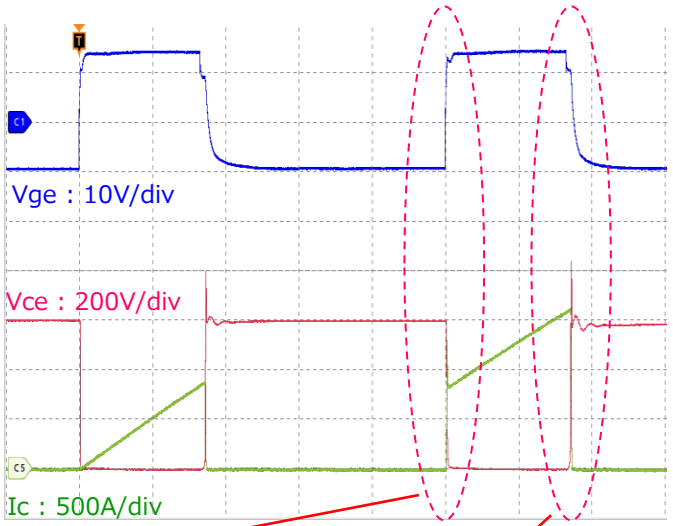
2 Pulse Test

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

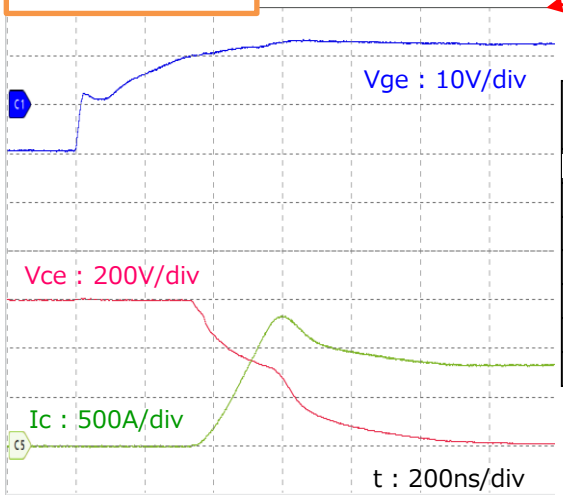
IGBT : CM800DX-24T1 (Mitsubishi)



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

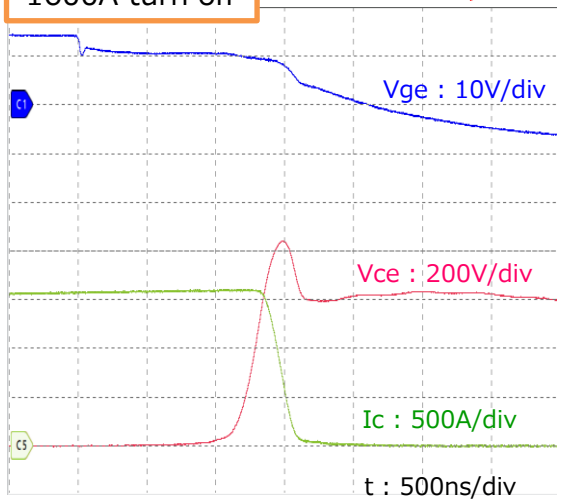


800A turn on



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

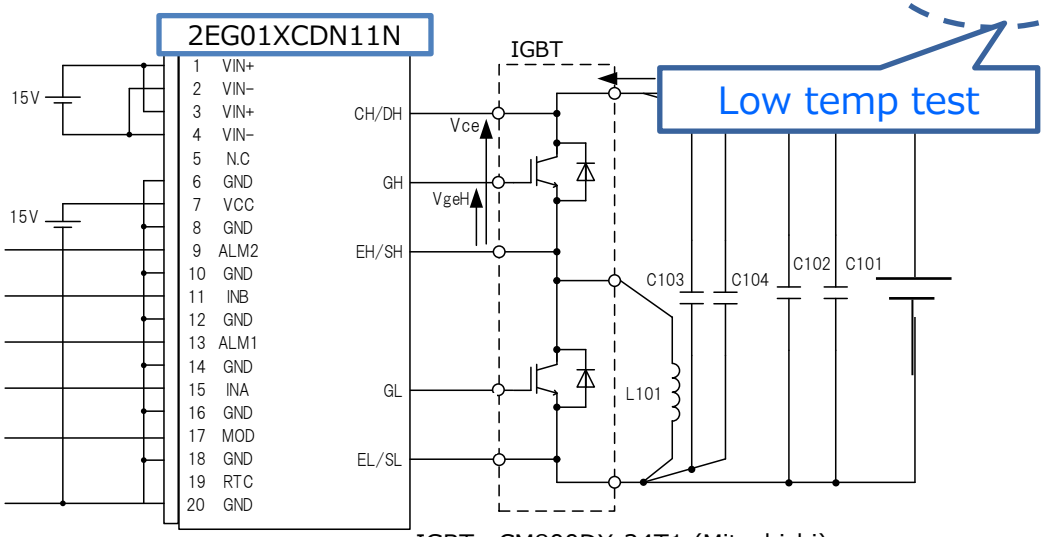


Item	Measurement value	
DC Link	600	V
Ic	1600	A
Vcep	838	V
dV/dt	3.4	kV/us
di/dt	8.4	kA/us
td(off)	1.38	us
tf	0.19	us
Eoff	261	mJ

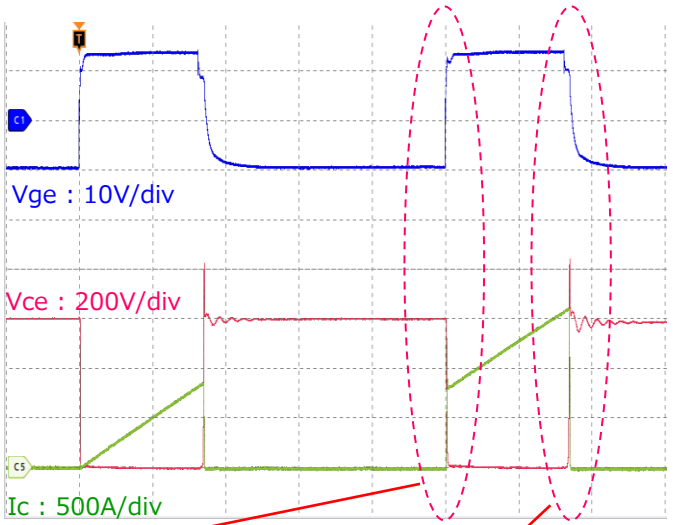
2 Pulse Test

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

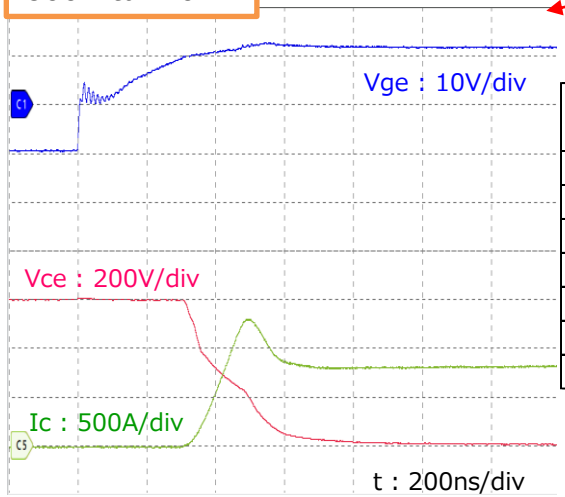
IGBT : CM800DX-24T1 (Mitsubishi)



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

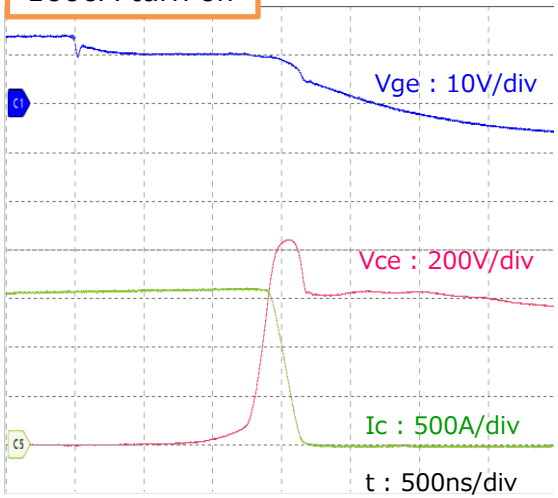


800A turn on



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

Desaturation Protection

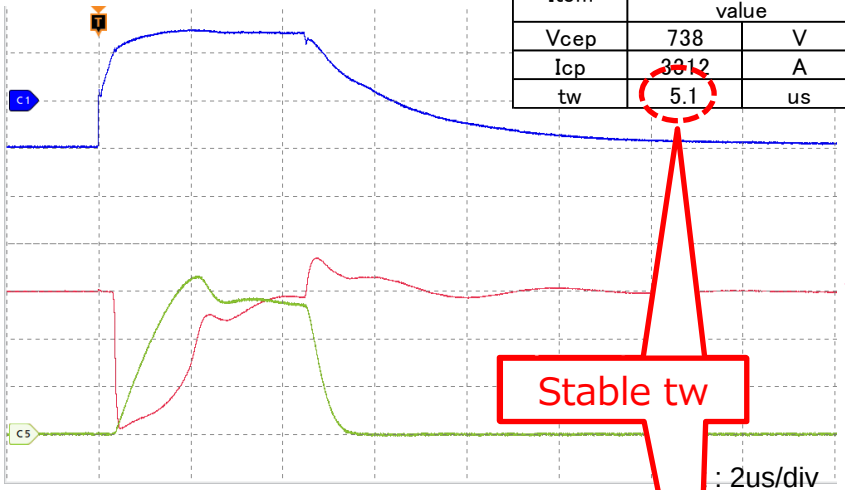
DC Link : 600V,　Ron : 1Ω,　Roff : 10Ω,　Upper arm,　Tj=150℃

IGBT : CM800DX-24T1 (Mitsubishi)

High temp test

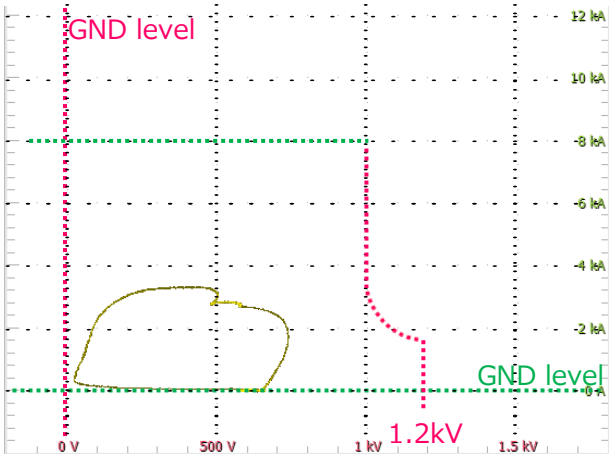
Load inductance : 170nH

Item	value	
Vcep	738	V
Icp	3312	A
tw	5.1	us



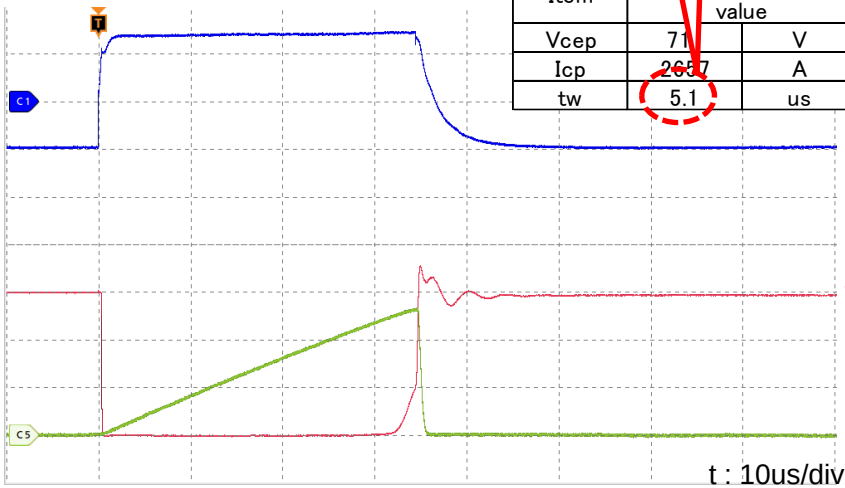
Stable tw

SOA

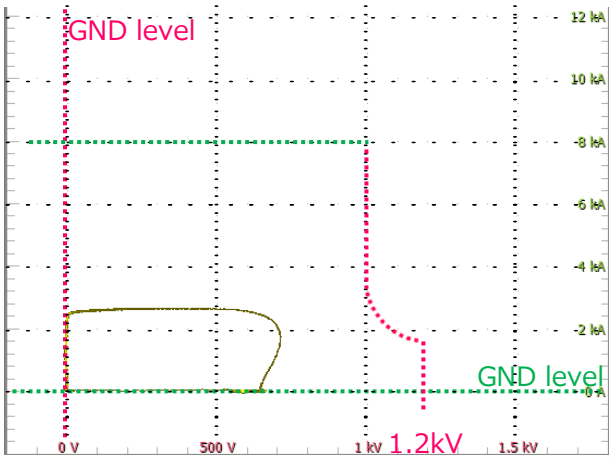


Load inductance : 7uH

Item	Measurement value	
Vcep	71	V
Icp	2657	A
tw	5.1	us



SOA



Desaturation Protection

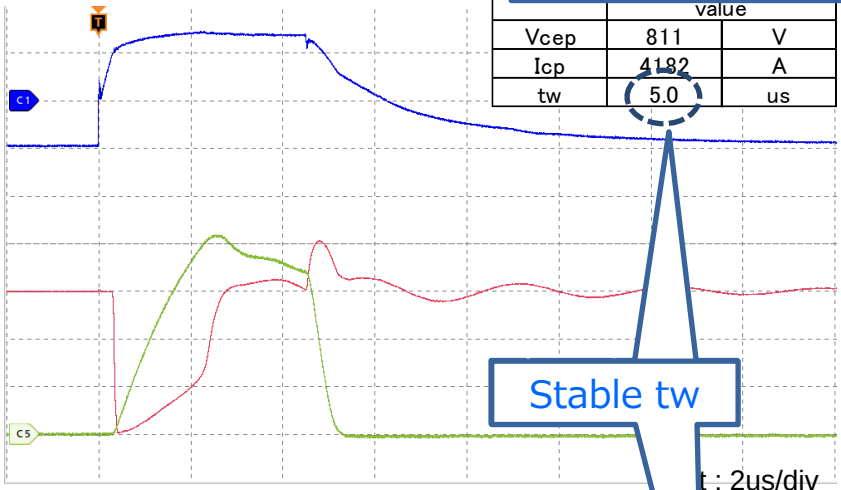
DC Link : 600V,　Ron : 1Ω,　Roff : 10Ω,　Upper arm,　Tj=-40℃

IGBT : CM800DX-24T1 (Mitsubishi)

Load inductance : 170nH

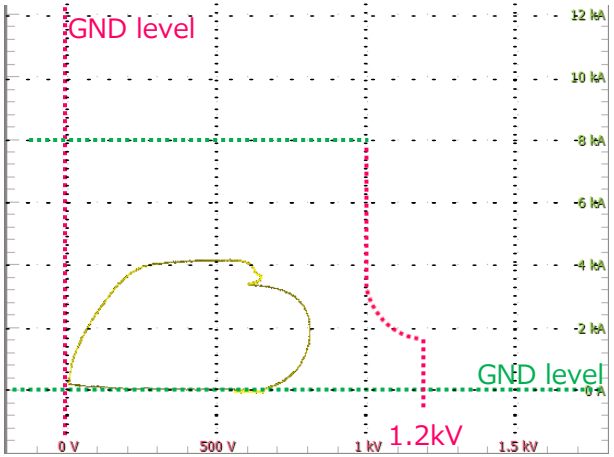
Low temp test

	Measurement value	
Vcep	811	V
Icp	4182	A
tw	5.0	us



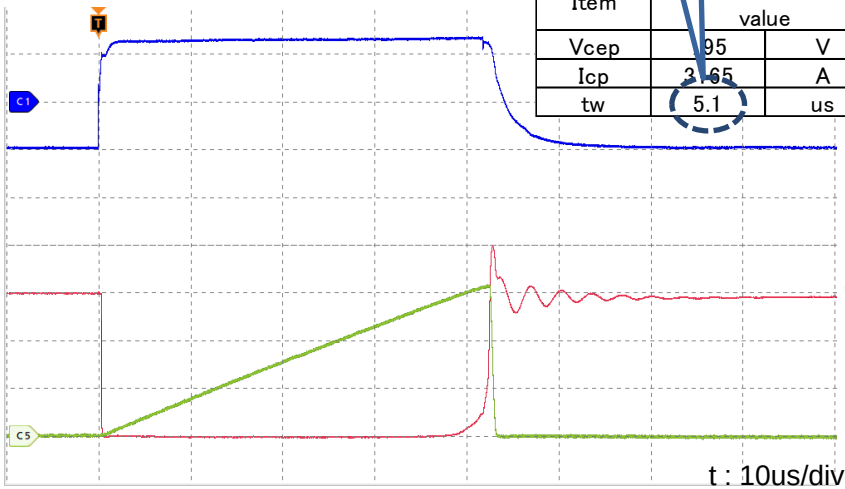
Stable tw

SOA

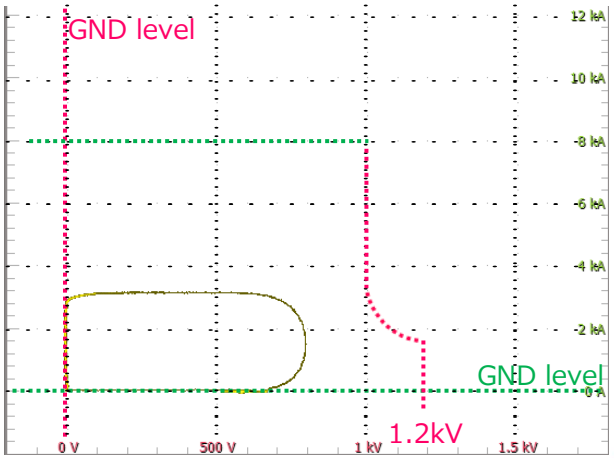


Load inductance : 7uH

Item	Measurement value	
Vcep	95	V
Icp	3165	A
tw	5.1	us



SOA



INDEX

■ **SIMPLIFY YOUR DRIVER**
- Introduction for High capacity IGBT–

5. Products Line-up

5-1. Product line-up for Infineon Technologies EconoDUAL™ 2in1 Type

Package	Output power (Ref.)	Ic	Part No	TAMURA Driver			
				2EG-C / D		2CG-B/2CG-D	2DD
		Vce = 1200V					
	20kW	150	FF150R12MS4G		2EG01XCCN11N *1 2EG01XCDN11N *1 2EG??zyxN11N - ?? *2	2CG010BBC11N (+15/-10V) Soft turn off ---------- 2CG010DBC11N (+15/-10V) Soft turn off +Active clamp 	2DD151008C (+15V/-10V) 
	30kW	225	FF225R12ME4				
			FF225R12MS4				
	50kW	300	FF300R12ME4				
			FF300R12MS4				
	100kW	450	FF450R12ME4				
	125kW	600	FF600R12ME4				
	150kW	900	FF900R12ME7				
		Vce = 1700V					
	TBC	225	FF225R17ME4		2EG01XCCN11N *1 2EG01XCDN11N *1 2EG??zyxN11N - ?? *2	2CG010BBC11N (+15/-10V) Soft turn off ---------- 2CG010DBC11N (+15/-10V) Soft turn off +Active clamp 	2DD151008C (+15V/-10V) 
		300	FF300R17ME4				
		450	FF450R17ME4				
		600	FF600R17ME4				
		750	T.B.D				
		900	T.B.D				

***1 Catalog products. Please confirm stock.**
***2 Not in stock due to optimization required. Please contact us.**

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: Gate resistors: "**X**" => Not mounted / "**0**" mounted
??: Semi-optimized code

 EconoDUAL™ is registered trademark of Infineon Technologies AG, Germany.

5. Products Line-up

5-2. Product line-up for Mitsubishi Electric NX 2in1 Type

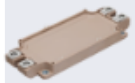
Package	Output power (Ref.)	Ic	Part No	TAMURA Driver 2EG-C / D		2CG-B/2CG-D	2DD
				Vce = 1200V			
	30kW	225	CM225DX-24T1		2EG01XCCN11N *1 2EG01XCDN11N *1 2EG??zyxN11N - ?? *2	2CG010BBC11N (+15/-10V) Soft turn off ---------- 2CG010DBC11N (+15/-10V) Soft turn off +Active clamp 	2DD151008C (+15V/-10V) 
			CM225DX-24T				
	50kW	300	CM300DX-24T1				
			CM300DX-24T				
	100kW	450	CM450DX-24T1				
			CM450DX-24T				
	125kW	600	CM600DX-24T1				
			CM600DX-24T				
	150kW	900	CM800DX-24T1				
				Vce = 1700V			
	TBC	225	CM225DX-34T		2EG01XCCN11N *1 2EG01XCDN11N *1 2EG??zyxN11N - ?? *2	2CG010BBC11N (+15/-10V) Soft turn off ---------- 2CG010DBC11N (+15/-10V) Soft turn off +Active clamp 	2DD151008C (+15V/-10V) 
		300	CM300DX-34T				
		450	CM450DX-34T				
		600	CM600DX-34T				

***1 Catalog products. Please confirm stock.**
***2 Not in stock due to optimization required. Please contact us.**

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: Gate resistors: "**X**" => Not mounted / "**0**" mounted
??: Semi-optimized code

5. Products Line-up

5-3. Product line-up for Fuji Electric DualXT 2in1 Type

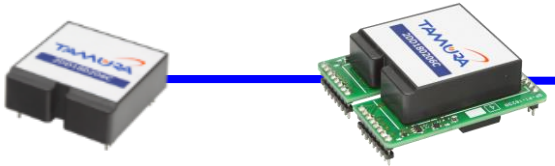
Package	Output power (Ref.)	Ic	Part No	TAMURA Driver 2EG-C / D		2CG-B/2CG-D	2DD
			Vce = 1200V				
	30kW	225	2MBI225XNA120-50		2EG01XCCN11N *1 2EG01XCDN11N *1 2EG??zyxN11N - ?? *2	2CG010BBC11N (+15/-10V) Soft turn off ---------- 2CG010DBC11N (+15/-10V) Soft turn off +Active clamp 	2DD151008C (+15V/-10V) 
	50kW	300	2MBI300XNA120-50				
			2MSI300VAN-120-53				
			2MSI300VWAN-120-53				
	100kW	450	2MBI450XNA120-50				
			2MSI450VAN-120-53				
	125kW	600	2MBI600XNG120-50				
			2MBI600XNE120-50				
			2MSI600VAN-120-53				
	150kW	800	2MBI800XNE120-50				
		1000	2MBI1000XRNE120-50				
			Vce = 1700V				
	TBC	225	2MBI225XNA170-50		2EG01XCCN11N *1 2EG01XCDN11N *1 2EG??zyxN11N - ?? *2	2CG010BBC11N (+15/-10V) Soft turn off ---------- 2CG010DBC11N (+15/-10V) Soft turn off +Active clamp 	2DD151008C (+15V/-10V) 
		300	2MBI300XNA170-50				
		450	2MBI450XNA170-50				
		550	2MSI550VAN-170-53				
		600	2MBI600XNG170-50				
			2MBI600XNE170-50				
		800	2MBI800XRNE170-50				

***1 Catalog products. Please confirm stock.**
***2 Not in stock due to optimization required. Please contact us.**

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: Gate resistors: "**X**" => Not mounted / "**0**" mounted
??: Semi-optimized code

5. Products Line-up

Gate Drivers Family Selection guide (All products)



DC-DC converter
2DD

Gate driver module
2CG-B/2CG-D

Infineon

Mitsubishi

FUJI

Gate driver Unit
2EG-C

16mm TYPE

Gate driver Unit
2PG-D

PrimePACK™

Gate driver Unit
2QG-D

PrimePACK™3+

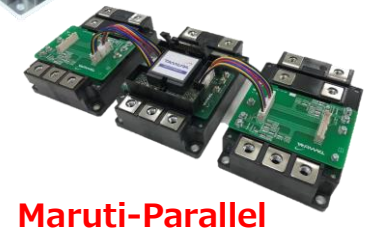
Gate driver Unit
4DUx

3Level

Gate driver Unit
2LG-D

LV100 (Industrial)

Gate driver Unit
2LG-D & 2LG-S

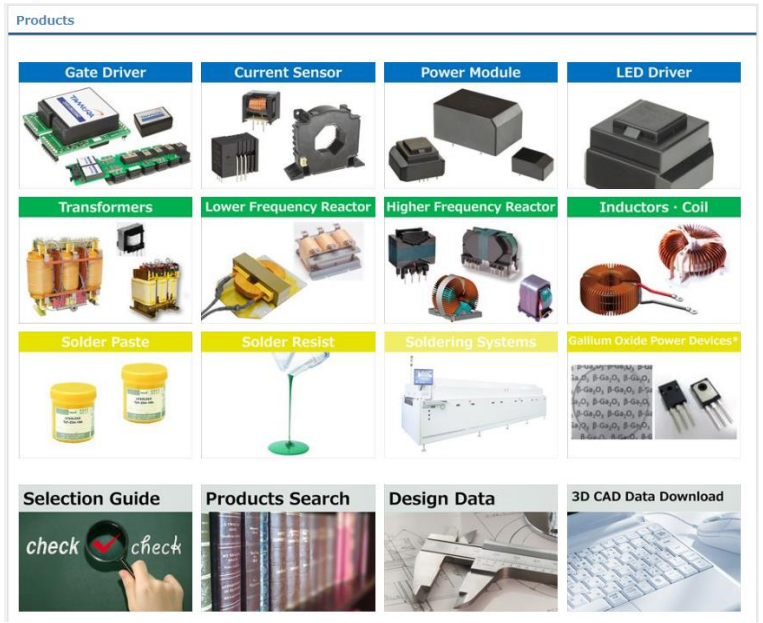


Maruti-Parallel

PrimePACK™ is registered trademark of Infineon Technologies AG, Germany.

Appendix) Information & Contact

Please visit our website!



WEB

Tamura Gate Driver

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