DC-DC converter that bring out the performance of SiC gate drive

SUSTAINABLE DEVELOPMENT GOALS

Rev A

TAM-GDM-00059

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TAMURA
Your One and Only Company

DC-DC converter that bring out the performance of SiC gate drive

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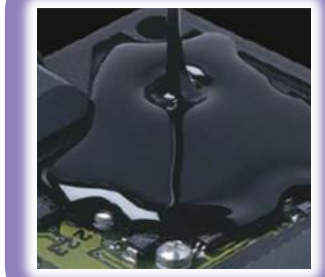
DC-DC converter that bring out the performance of SiC gate drive

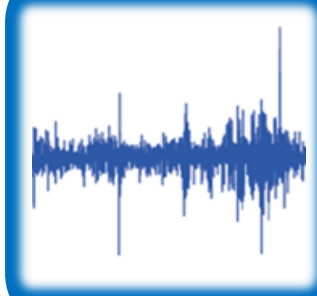
1-1. Why ??

Circuit design Technology

Transformer Technology



Potting Technology



EMI/EMC Solution

Market Awareness

DC-DC converter that bring out the performance of SiC gate drive

1-1. When ??

	2016	2017	2018	2019	2020	2021	2022	2023	2024
IGBT		2DD of DC-DC convertor	2CG-D for IGBT	2EG-C Mitsubishi (2in1) FUJI (2in1) Infineon (2in1)	2PG/2QG FUJI (2in1) Infineon (2in1)	2LG-C Mitsubishi (2in1)	2LG-C Parallel		For Traction Infrastructure Mitsubishi (LV100(HV))
SiC	2DM/2DU for SiC ROHM	2DD of DC-DC convertor	2CG-B for SiC	2CG-B + 2RB Infineon	2EG-B ROHM		2CG-B + 2RB Wolfspeed		Mitsubishi (LV100(HV))

DC-DC converter that bring out the performance of SiC gate drive

1-2. Application

Motor Controller

Inverter
GENERAL-PURPOSE INVERTER

PV
Photovoltaic Power Generation

Wind
Wind Power Generation

Robotics

Grid/SVG
Electric grid

Welding
Welding Machine

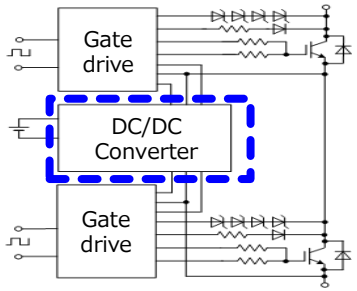
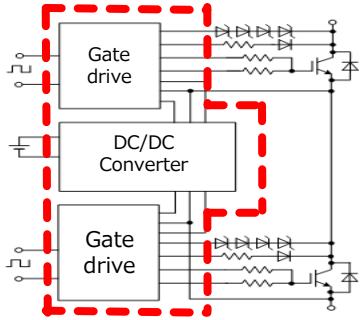
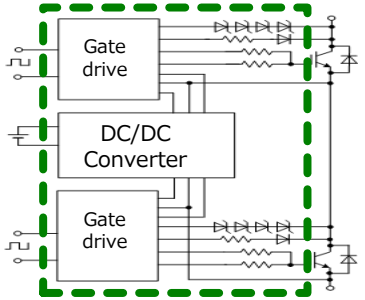
UPS
Uninterruptible Power Supply

EV Charger
EV Stand

ESS
Energy Storage System

DC-DC converter that bring out the performance of SiC gate drive

1-3. Product Configuration

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

DC-DC converter that bring out the performance of SiC gate drive

1-4. Features of DC-DC converter

Features of All-SiC Power Module

Feature① Short circuit tolerance is lower than Si

Feature② VGS(+) :On resistance does not decrease at 15V
VGS(−) :Low tolerance （Less than −5~4V)

Feature③ High frequency operation is possible

DC-DC converter solves all problems!

DC-DC converter that bring out the performance of SiC gate drive

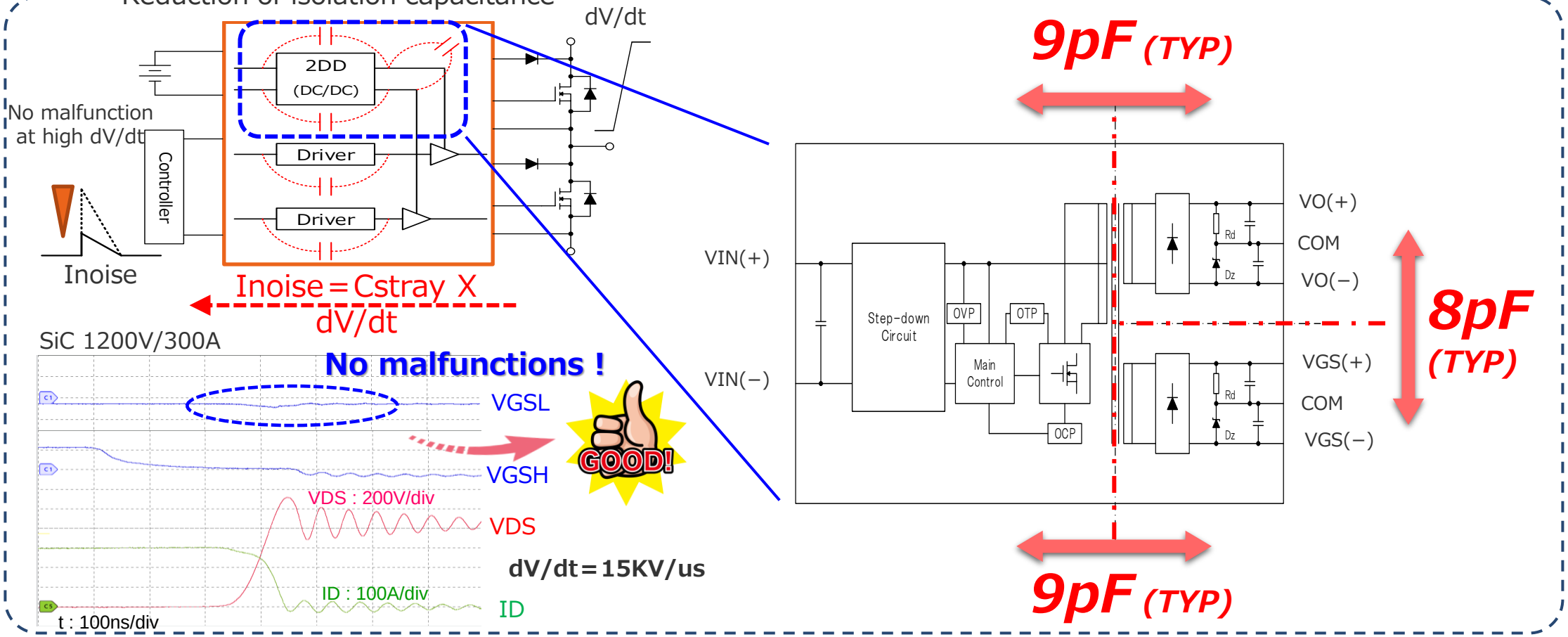
1-4. Features of DC-DC converter

Feature① Low threshold voltage VGS (th) (1V~3V)

--- IGBT is 6V~7V --- Beware of malfunctions from IGBT

Support with a DC-DC converter ・・・Reduction of isolation capacitance

Reduction of isolation capacitance



DC-DC converter that bring out the performance of SiC gate drive

1-4. Features of DC-DC converter

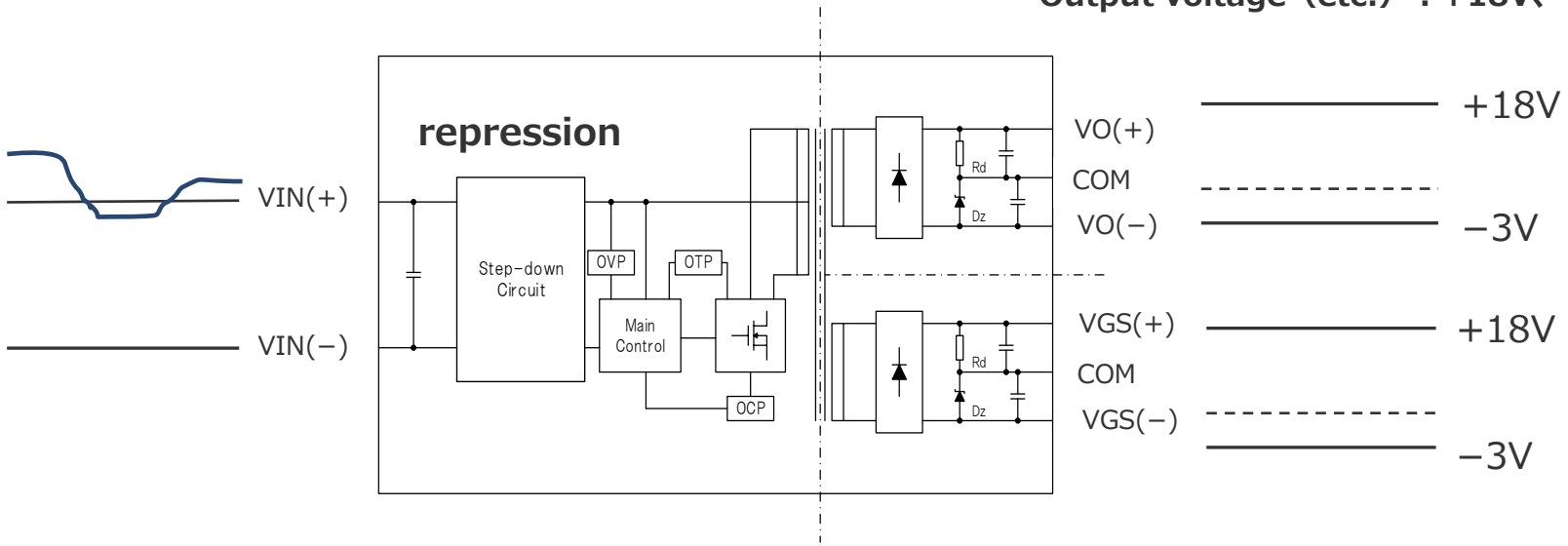
Feature② VGS(+) :On resistance does not decrease at 15V
VGS(−) :Low tolerance（Less than −5~4V）

--- IGBT's Gate driver cannot be used

Support with a DC-DC converter ･･･Constant voltage control of V_{GS}

Input voltage : 13V~28V

Output voltage（etc.）: +18V、−3V



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)

Improved SiC reliability
Low loss operation

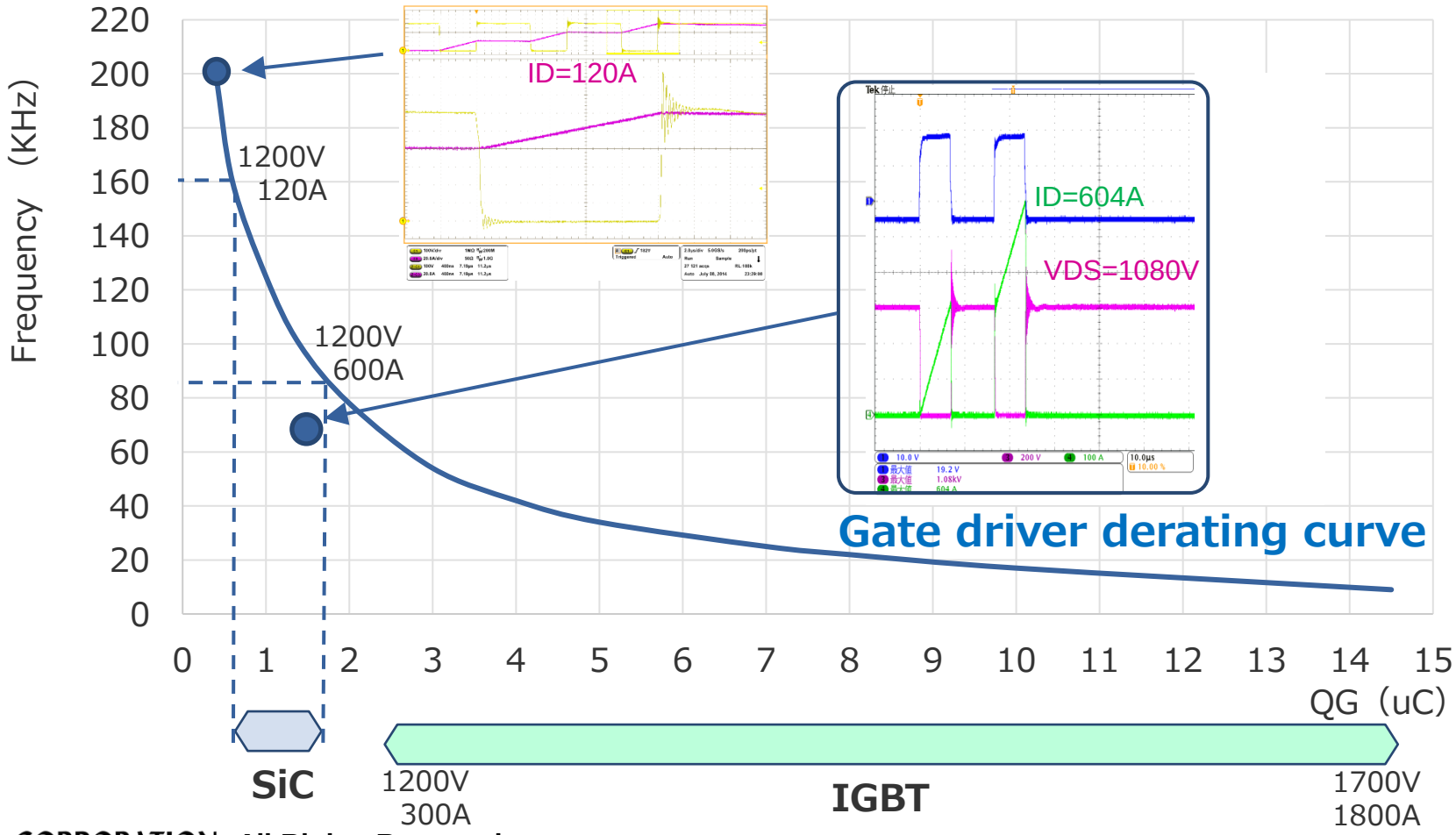
DC-DC converter that bring out the performance of SiC gate drive

1-4. Features of DC-DC converter

Feature③ High frequency operation is possible

Drive power needs to be increased

Support with a DC-DC converter ・・・Output capacity considering SiC power module



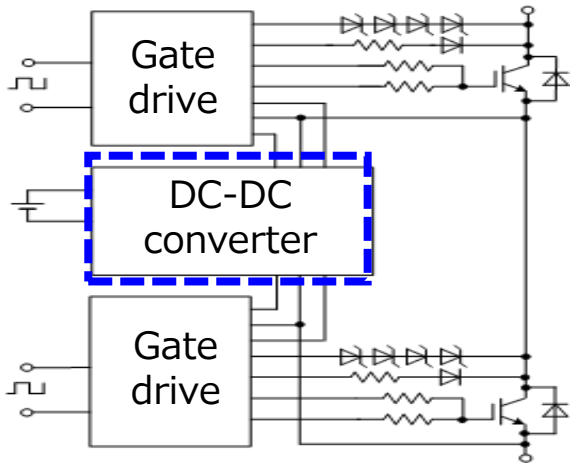
DC-DC converter that bring out the performance of SiC gate drive

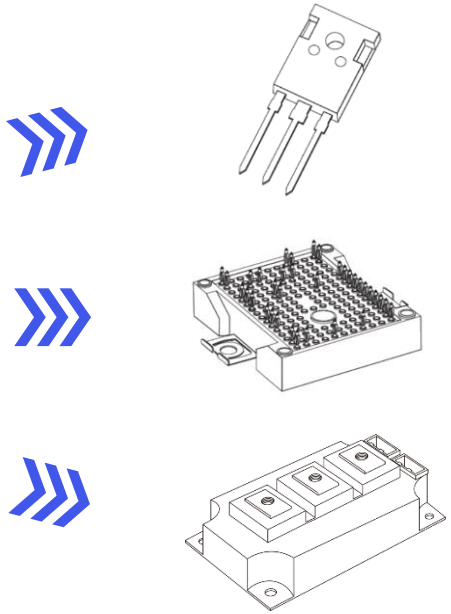
1-5. Comparison and expansion

Advantage of Tamura DC-DC converter for SiC gate drive (2DD)

Item	TAMURA	Company A	Advantages
Output power	**4W**	3W	O
Input Voltage	**13.5-26.4V Wide range**	5V / 12V / 24V each of ±5%	O
Isolation capacitance	**9pF**	10pF	O

DC-DC converter

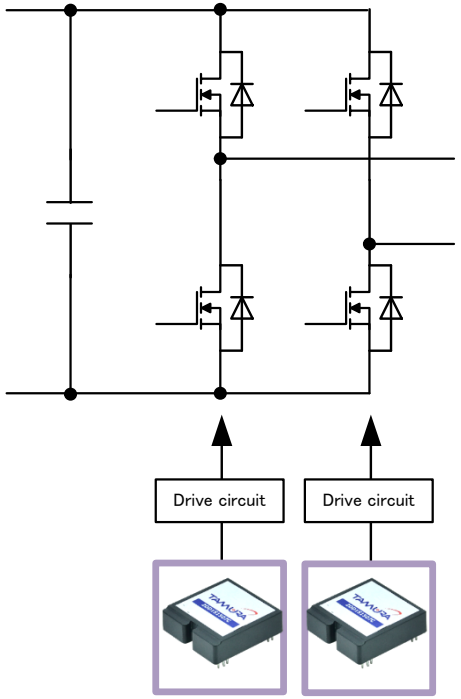




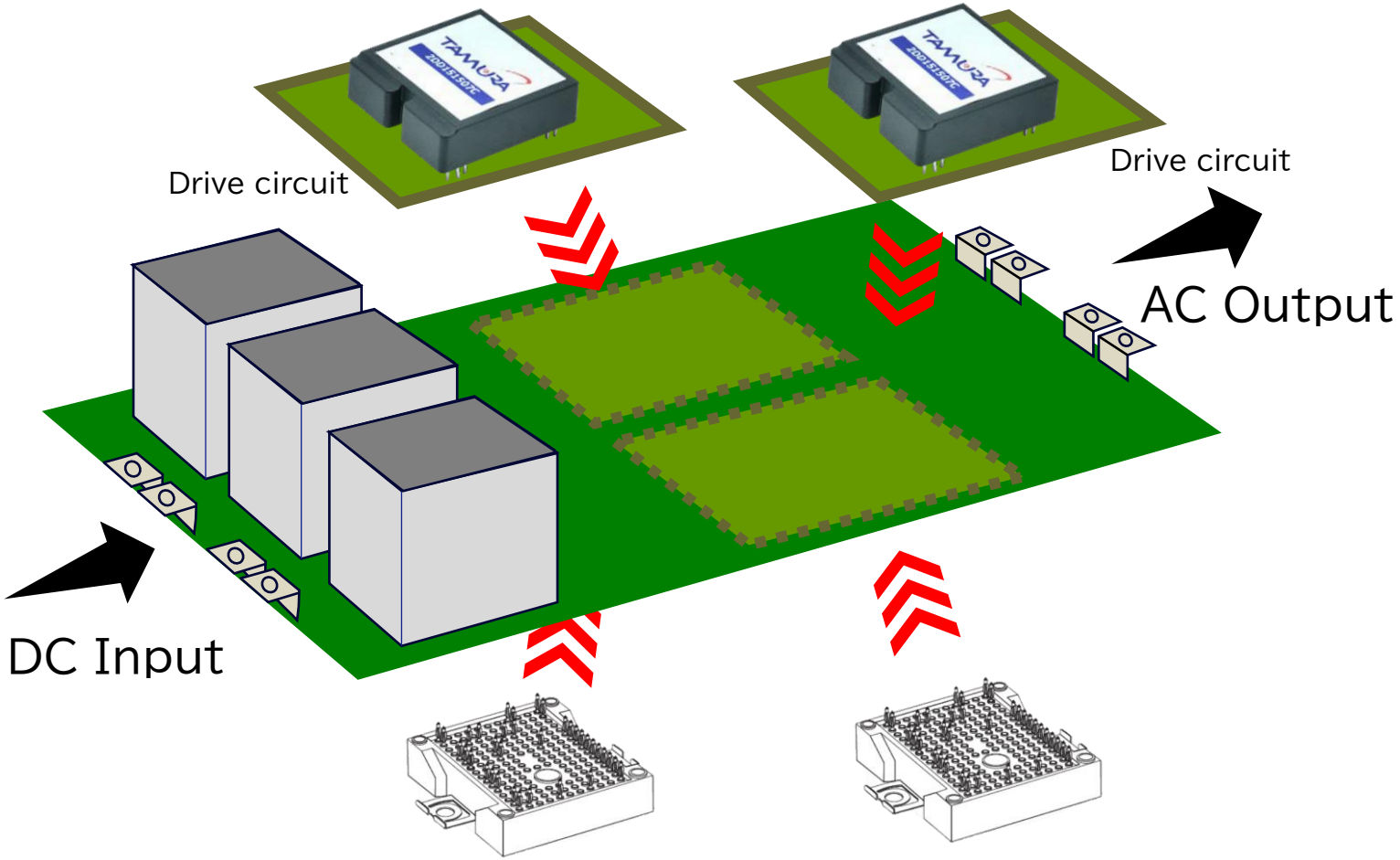
DC-DC converter that bring out the performance of SiC gate drive

1-5. Comparison and expansion

Deployment example of DC-DC converter for SiC gate drive (2DD)



EV Charger
(DC-AC section)



DC-DC converter that bring out the performance of SiC gate drive

1-6. Product line up

DC-DC converter 2DD series

		MODEL				
		2DD151008C	2DD151507C	2DD180407C	2DD180206C	2DD1504xxC
Output	Output voltage(+)	+15V	+15V	+18V	+18V	+15V
	Output voltage(-)	-10V	-15V	-4V	-2V	-4V
	Rated load	0.16A	0.11A	0.16A	0.16A	(0.16A)
	Output power	4.0W	3.3W	3.5W	3.2W	(3.0W)
	Number of output	2				
Input	Input voltage	DC13.5~26.4V				
Insulation	Withstand voltage	Primary to secondary AC5KV / Secondary to secondary AC4KV				
	Insulation resistance	DC500V 100mΩ min				
	Isolation capacitance	9pF (TYP)				
Protection	Over current protection	Auto recovery				
	Over temperature protection	Auto recovery				

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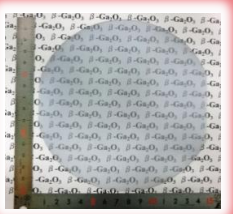
Introduction of One Tamura (General application)

Device technology

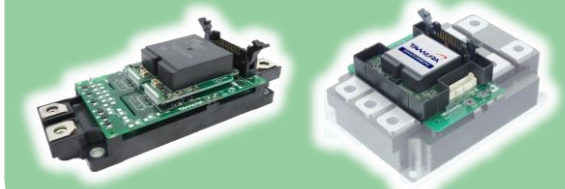
Ga_2O_3



Novel Crystal Technology, Inc.

Gate driver

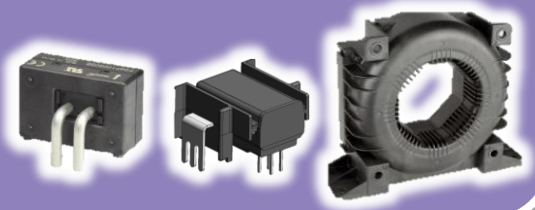
Circuit technology



Gate Driver Unit

Module technology

Current sensor



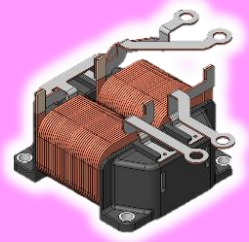
Power electronics technology and main products

Soldering technology

Electric Chemicals
Soldering material
Die attach material
TIM material

Reflow soldering system

Automotive reactor

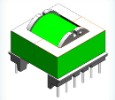


Reactor for PF
（2 in 1）

Passive components

Reactor Trans Coil
Large reactor/
transformer

Toroidal coil



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Tamura's mascot "Quenu"