

Gate driver module that bring out the performance of Mitsubishi Electric **Full-SiC Power Module**



SUSTAINABLE
DEVELOPMENT
GOALS



TAMURA

Your One and Only Company

Rev D

TAM-GDM-00031

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Index

1) Solution Guide for Full SiC Power Module

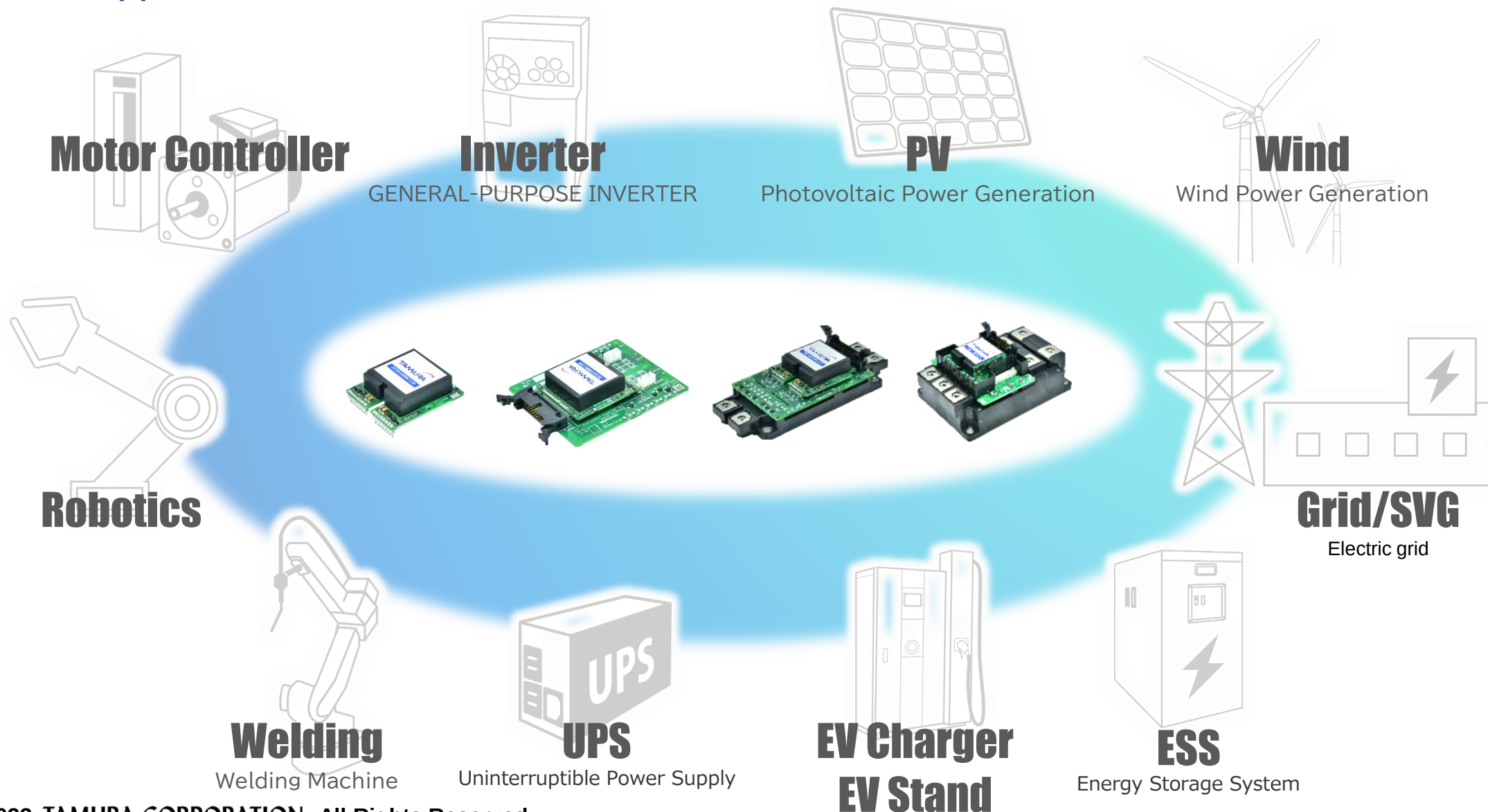
- 1-1 Application
- 1-2 Features of Gate Drivers (especially for SiC power module)
- 1-3 Product line-up
- 1-4 Evaluation board

2) Introduction of One Tamura

Appendix) Contact person

1. Solution Guide for Full-SiC Power Module

1-1. Application



1. Solution Guide for Full-SiC Power Module

1-2. Features of Gate Driver (especially for SiC power module)

Features of Full-SiC Power Module

Feature① Short circuit tolerance is lower than Si

Feature② Low threshold voltage $V_{GS(th)}$ (1V~3V)

Feature③ $V_{GS(-)}$:Low tolerance (Less than -8V)

Feature④ dV/dt can be set high

Feature⑤ High frequency operation is possible

Gate
Driver
solves all
problems!

1. Solution Guide for Full-SiC Power Module

1-2. Features of Gate Driver (especially for SiC power module)

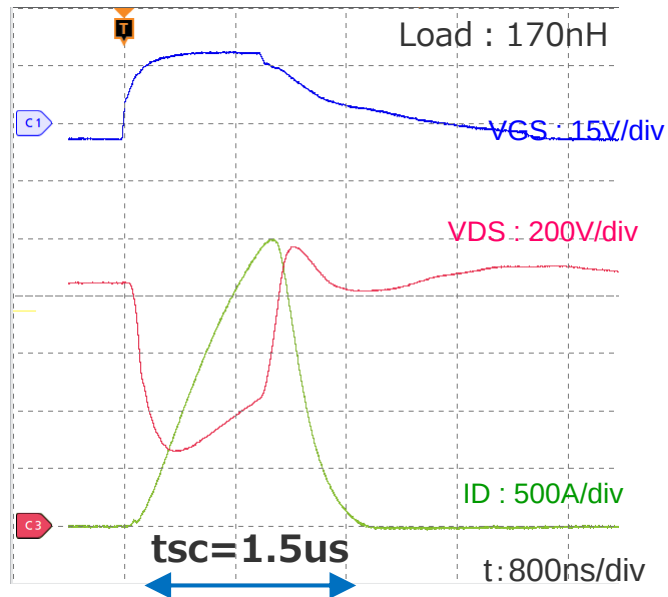
Feature ① Short circuit tolerance is lower than Si

----- Small chip area -----

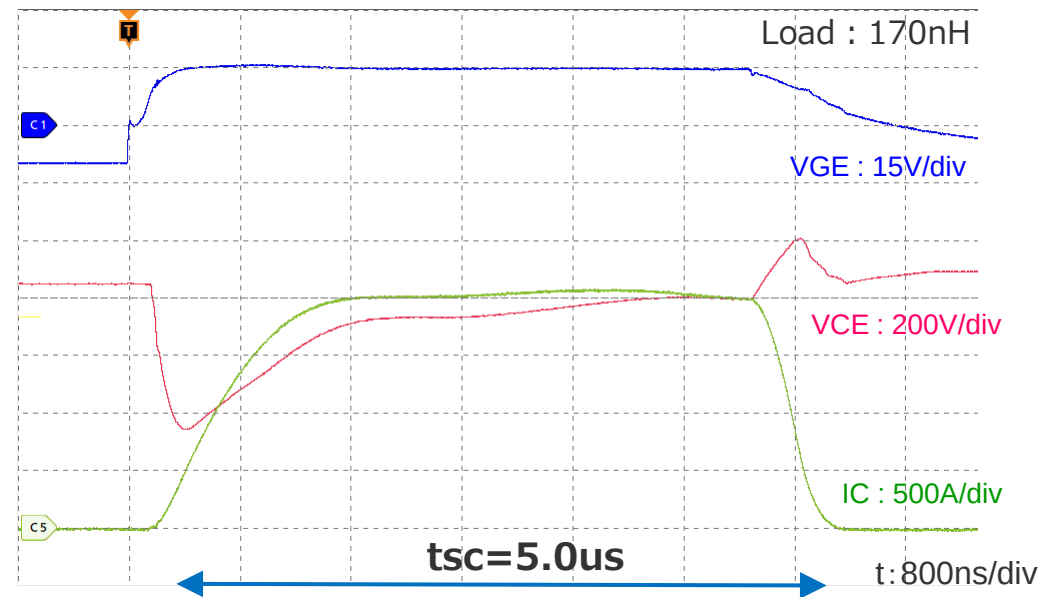
- Wide band gap
- High breakdown voltage
- High temperature operation

Support with a gate driver ... Short-circuit mask time (tsc) adjustment function

SiC power module (1200V 300A)
Waveform with shorted load



IGBT power module (1200V 300A)
Waveform with shorted load



Adjustable with external capacitor capacity

Optimal value of SiC : 1.0~3.0us

Optimal value of IGBT : 3.0~7.0us

1. Solution Guide for Full-SiC Power Module

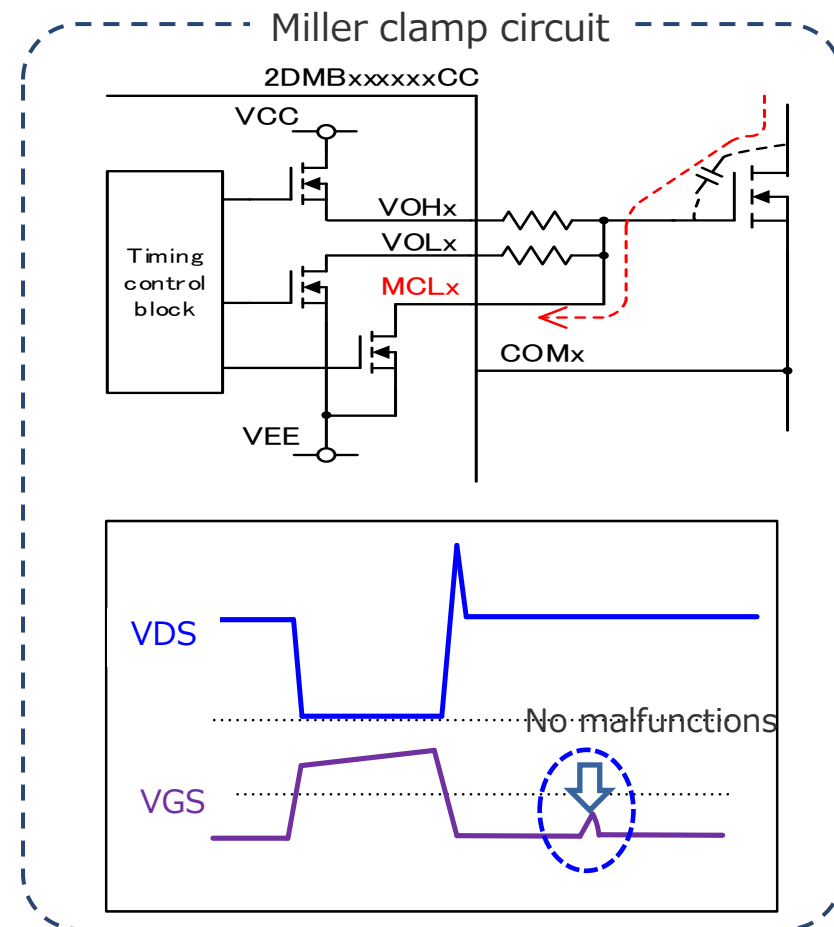
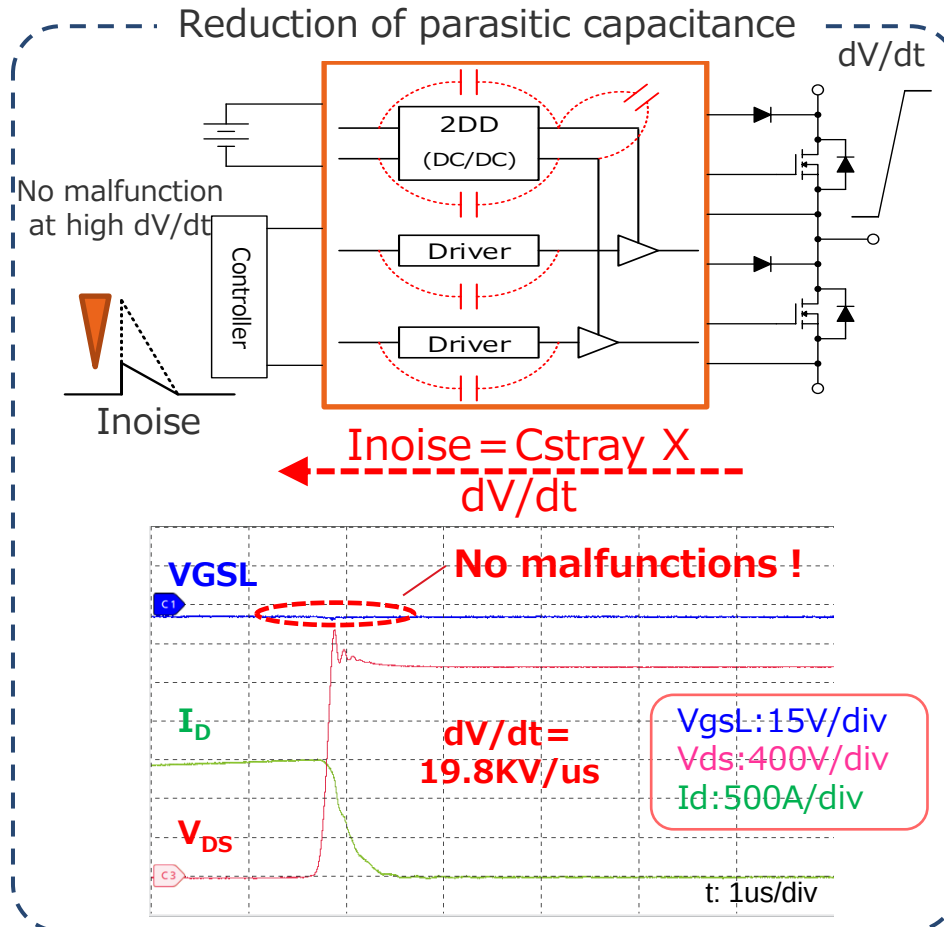
1-2. Features of Gate Driver (especially for SiC power module)

Feature② Low threshold voltage VGS (th)
(1V~3V)

--- IGBT is 6V~7V

--- Beware of malfunctions from IGBT

Support with a gate driver ... Reduction of parasitic capacitance and Miller clamp circuit



1. Solution Guide for Full-SiC Power Module

1-2. Features of Gate Driver (especially for SiC power module)

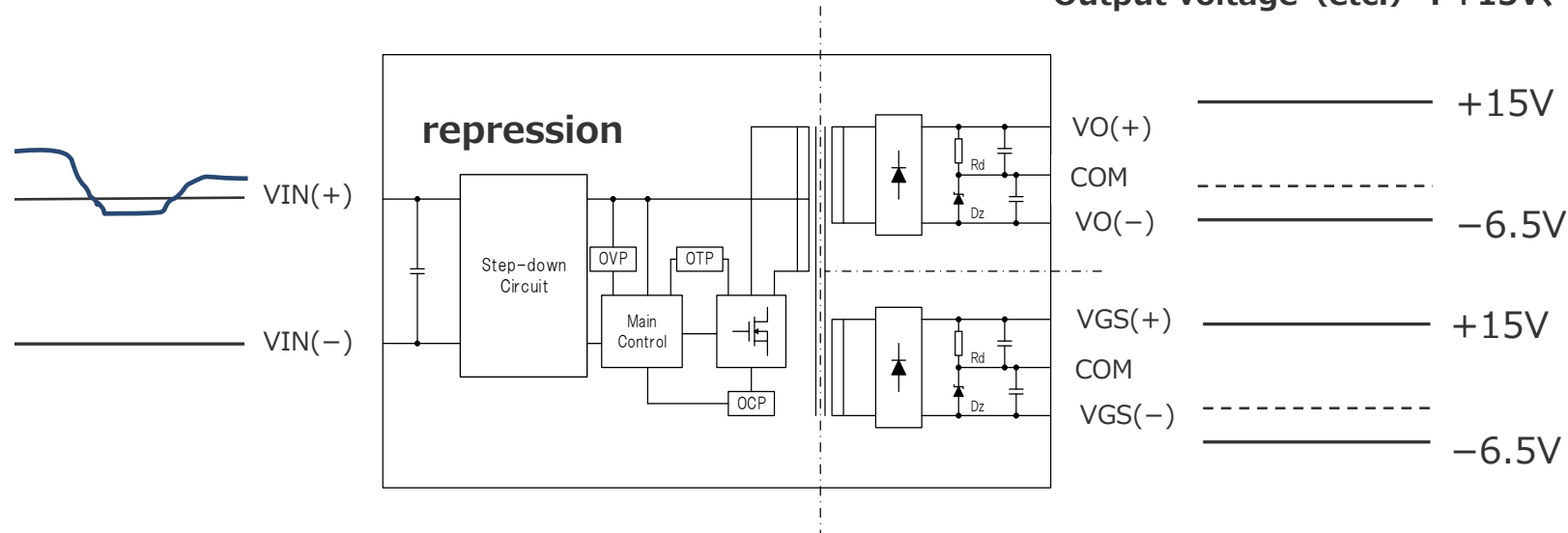
Feature③ VGS(−) :Low tolerance (Less than −8V)

--- IGBT's Gate driver cannot be used

Support with a gate driver ···Constant voltage control of VGS

Input voltage : 13V~28V

Output voltage (etc.) : +15V、−7V



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**

1. Solution Guide for Full-SiC Power Module

1-2. Features of Gate Driver (especially for SiC power module)

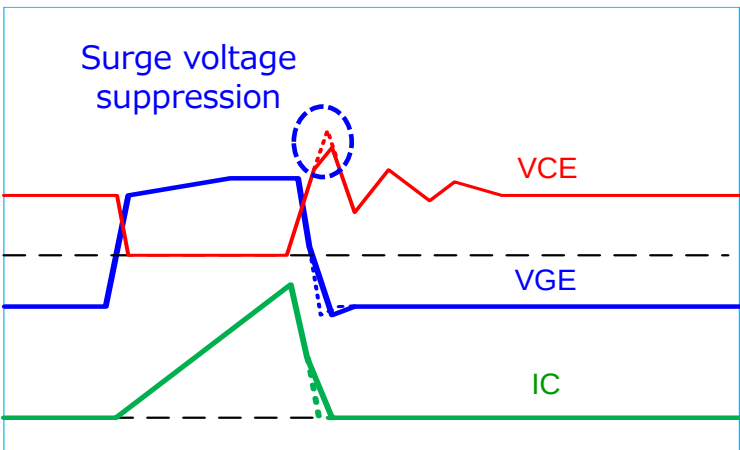
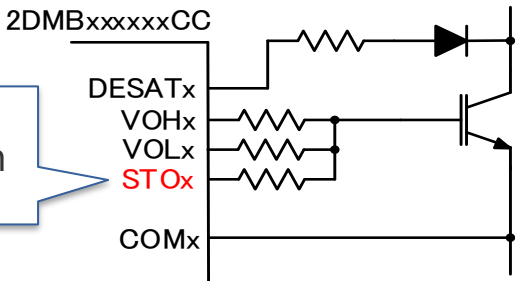
Feature④ dV/dt can be set high

----- Turn-on: Recovery current is small
Turn-off: No tail current

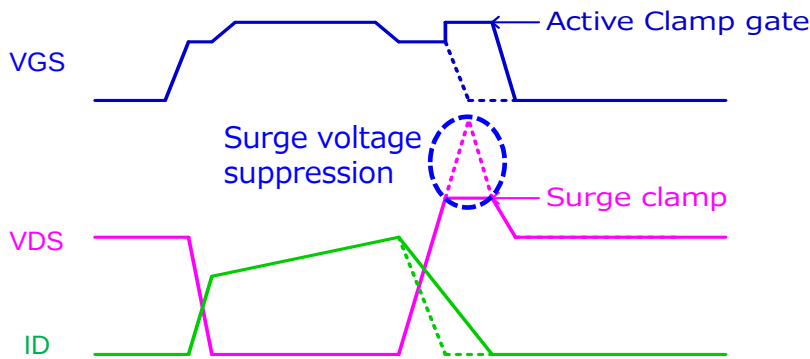
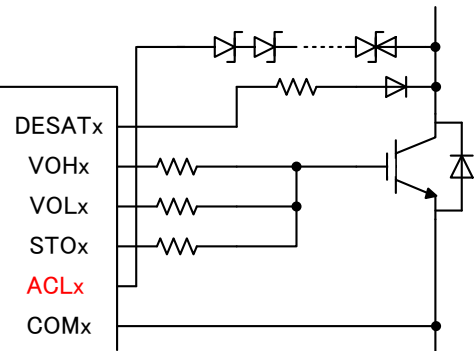
Support with a gate driver ... Ability to suppress surge voltage with high dV/dt
(Soft turn-off, Active clamp)

Soft turn-off

Soft turn-off
Operates when
short-circuited



Active clamp (Option)



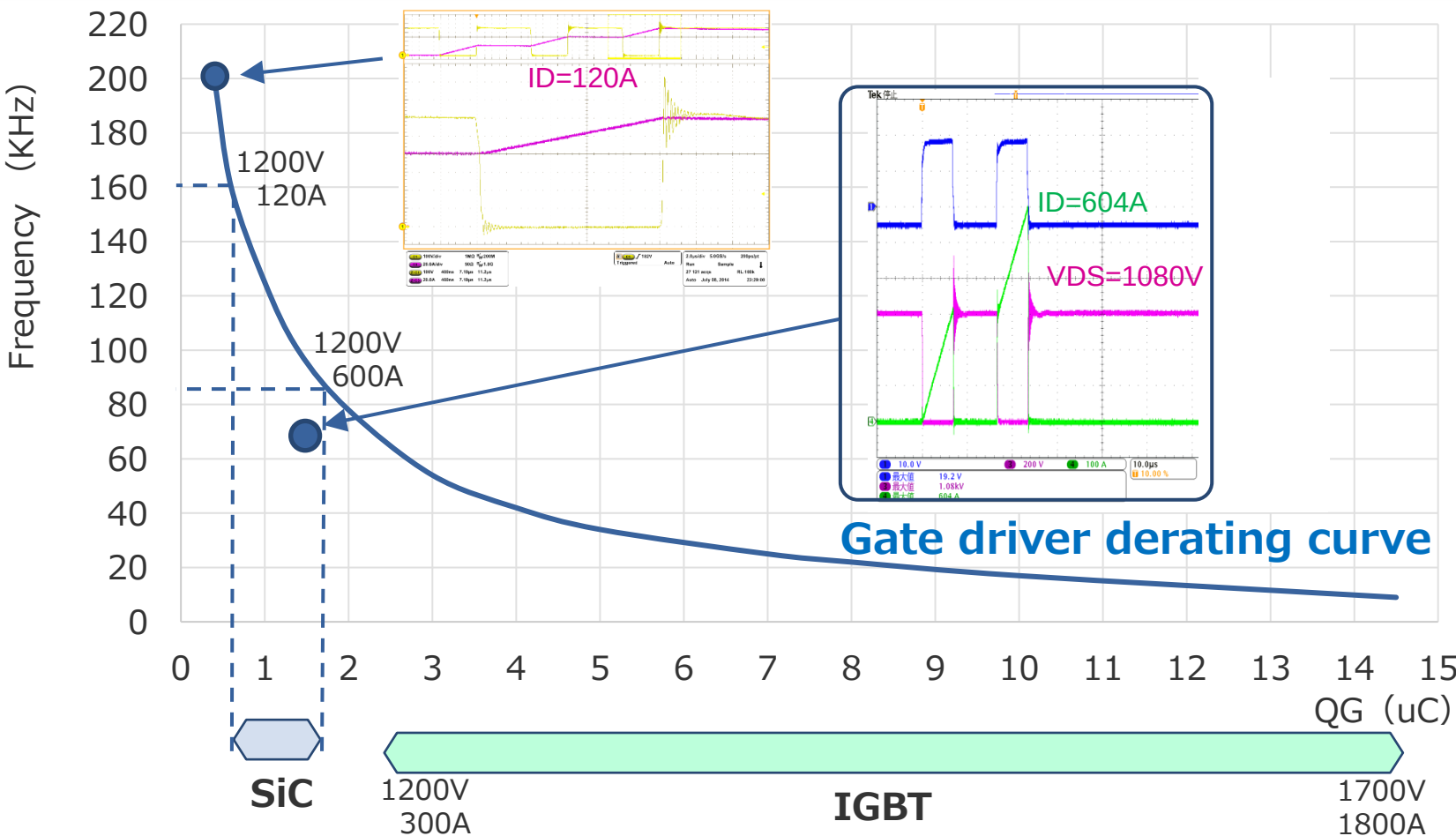
1. Solution Guide for Full-SiC Power Module

1-2. Features of Gate Driver (especially for SiC power module)

Feature⑤ High frequency operation is possible

----- Drive power needs to be increased

Support with a gate driver ... Output capacity considering SiC power module



1. Solution Guide for Full-SiC Power Module

1-3. Product Line-up

Product

DC/DC Converter

Gate Driver Module

Gate Driver Unit

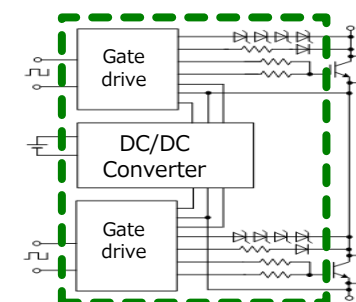
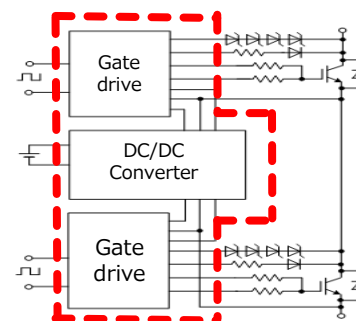
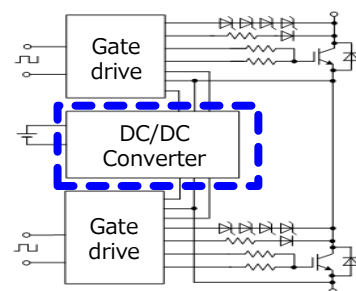
Function

**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



1. Solution Guide for Full-SiC Power Module

1-3. Product Line-up

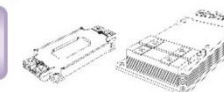
GDM Leading sector (For **Mitsubishi Electric**)

Gate Driver Family Selection Guide

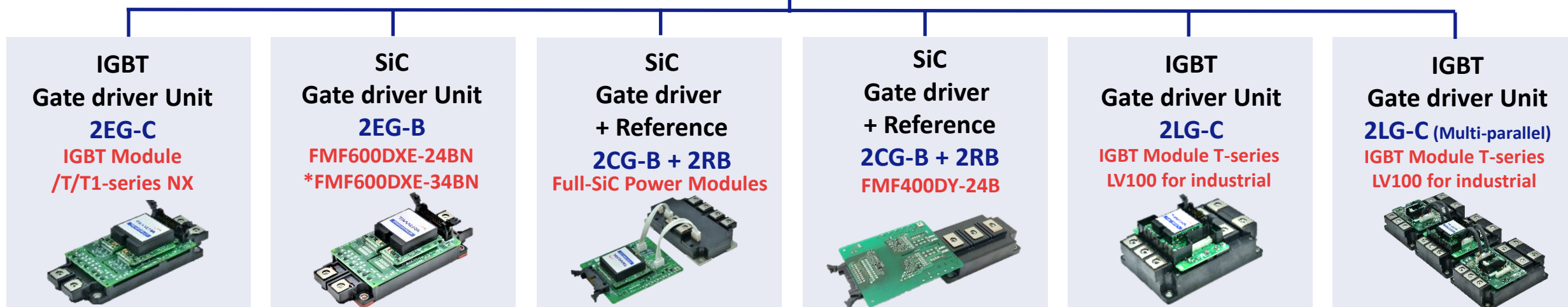
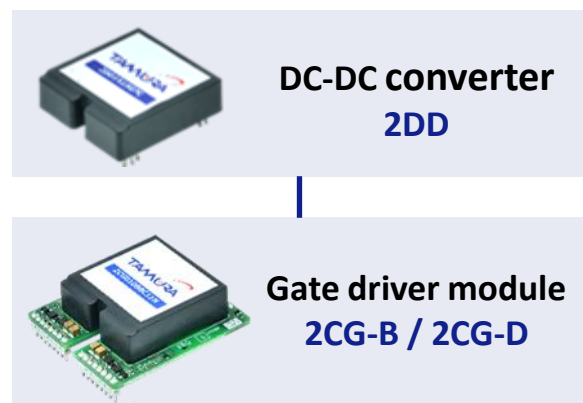
 Products Selection Guide

Click here to search applicable power modules!

[Go to selection guide !](#)



 Click here !



1. Solution Guide for Full-SiC Power Module

1-3. Product Line-up

Mass production board is available

Output Voltage +15V / -7V

Can be mounted directly !

Model: 2EG01XBxN18N



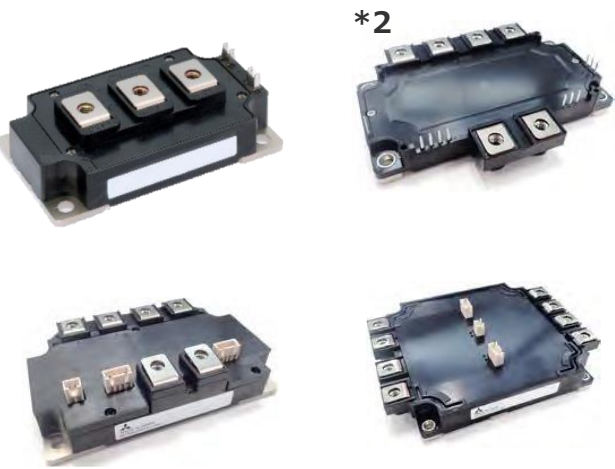
Product line-up

Power module Part No	Series		
	Gate driver unit (Plug & Play)/2EG-B	Driver Core/2CG-B	DC-DC converter/2DD
FMF600DXE-24BN	$V_{DS} = 1200V$		
	2EG01XBCN18N (Signal 3.3~15V)	2CG010BBC**N (+15/-7V) 	2DD1507**C (+15V/-7V) 
	2EG01XBDN18N (Signal 15V)		

★ Please contact us on gate drivers for FMF600DXE-34BN

1. Solution Guide for Full-SiC Power Module

1-4 Evaluation board

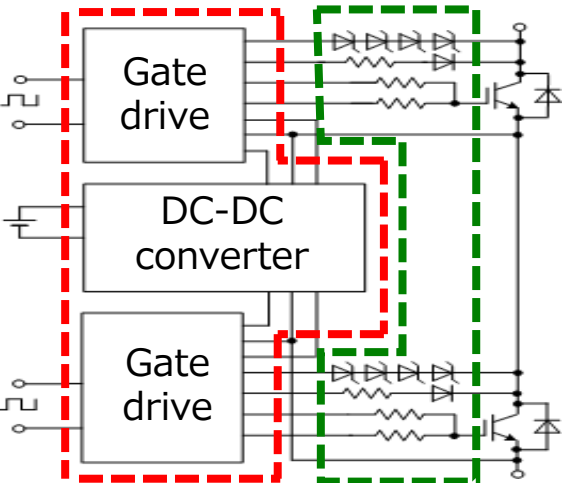


I _D	Part No	Evaluation board	Gate Driver Module	DC-DC
	V _{DS} =1200V			
300	FMF300BXZ-24B	*1 *4	2CG010BBC11N 2CG010BBC12N 	2DD151008C 2DD151507C 
	FMF400BX-24B	*2		
400	FMF400BXZ-24B	*1 *4		
	FMF400DY-24B	Can be connected directly		
600	FMF600DXZA-24B	*3 *4		
800	FMF800DX-24B	*2		
	FMF800DXZA-24B	*3 *4		
1200	FMF1200DXZ-24B			
	V _{DS} =1700V			
300	FMF300DXZ-34B	*3 *4	2CG010BBC11N 2CG010BBC12N	2DD151008C 2DD151507C

- *1: It is necessary to branch the lead wire of the gate signal from the evaluation board.
- *2: A connection board with the SiC power module is required.
- *3: A lead wire with a connector is required.
- *4: SC terminal is not supported. However, we can propose external circuit for SC terminal.



Gate Driver Module



Evaluation board
2RB020BB



Index

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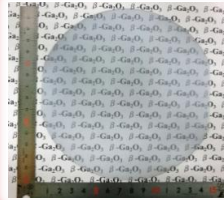
2) Introduction of One Tamura

Appendix) Contact person

2. Introduction of One Tamura

Device technology

Ga_2O_3



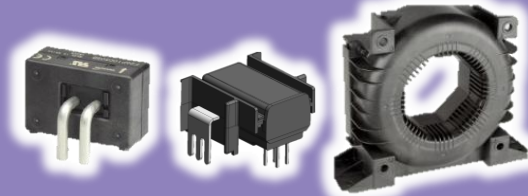
Novel Crystal Technology, Inc.

Gate driver Circuit technology

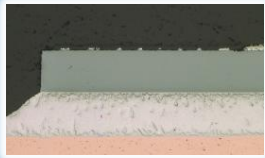


Gate Driver Unit

Module technology Current sensor



Soldering technology



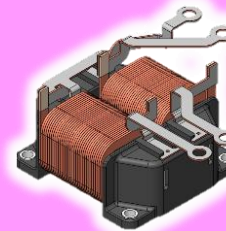
Electric Chemicals
Soldering material
Die attach material
TIM material

Power electronics technology and main products

Reflow soldering system



Automotive reactor



Reactor for PF
(2 in 1)

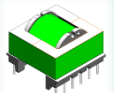
Passive components



Reactor Trans Coil
Large reactor/
transformer



Toroidal coil



SW-Trans

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Energize the Future 100th

CORPORATE GOVERNANCE REPORT



Tamura's mascot "Quenu"