

Gate driver module and Evaluation board that bring out the performance of Infineon Technologies AG SiC Power Module



Supported by Infineon Technologies AG



Index

1) Solution Guide for SiC Power Module

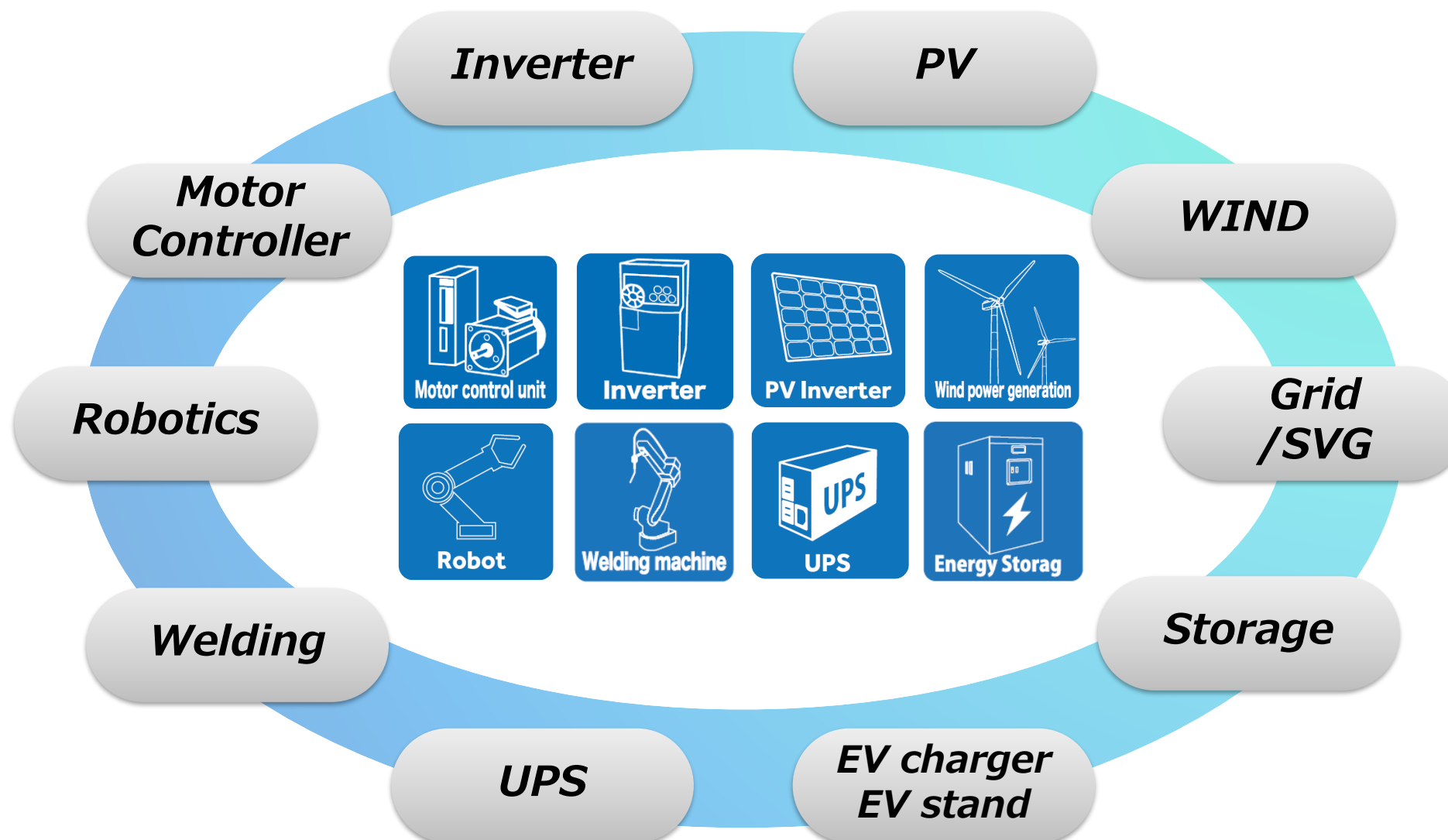
- 1-1 Application
- 1-2 Features of Gate driver module.
- 1-3 Waveform of 2 pulse test / Short circuit test
(SiC Power Module : FF3MR12KM1)
- 1-4 Product line-up
- 1-5 Reference board

2) Introduction of One Tamura

Appendix) Contact person

1. Solution Guide for SiC Power Module

1-1. Application



1. Solution Guide for SiC Power Module

1-2. Features of Gate driver module.

Features of All-SiC Power Module

Feature① Short circuit tolerance is lower than Si

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

Feature③ VGS(+) :On resistance does not decrease at 15V
VGS(−) :Low tolerance (Less than −5~4V)

Feature④ dV/dt can be set high

Feature⑤ High frequency operation is possible

**Gate Driver
Module
solves all
problems!**

1. Solution Guide for SiC Power Module

1-2. Features of Gate driver module.

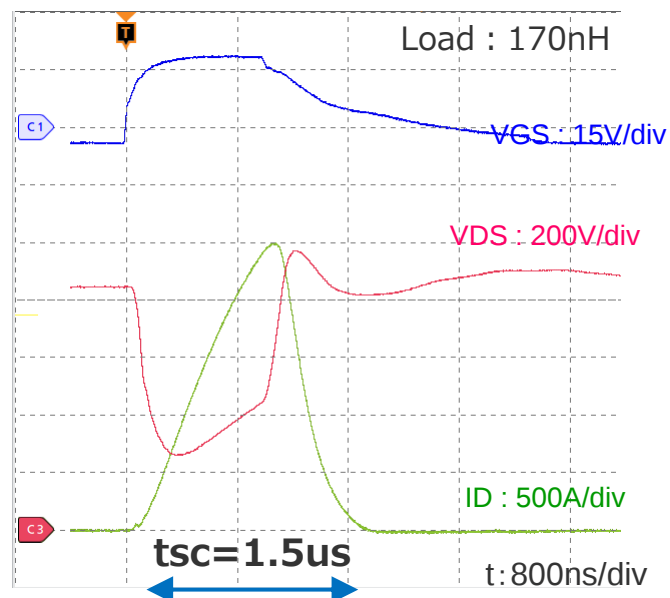
Feature ① Short circuit tolerance is lower than Si

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

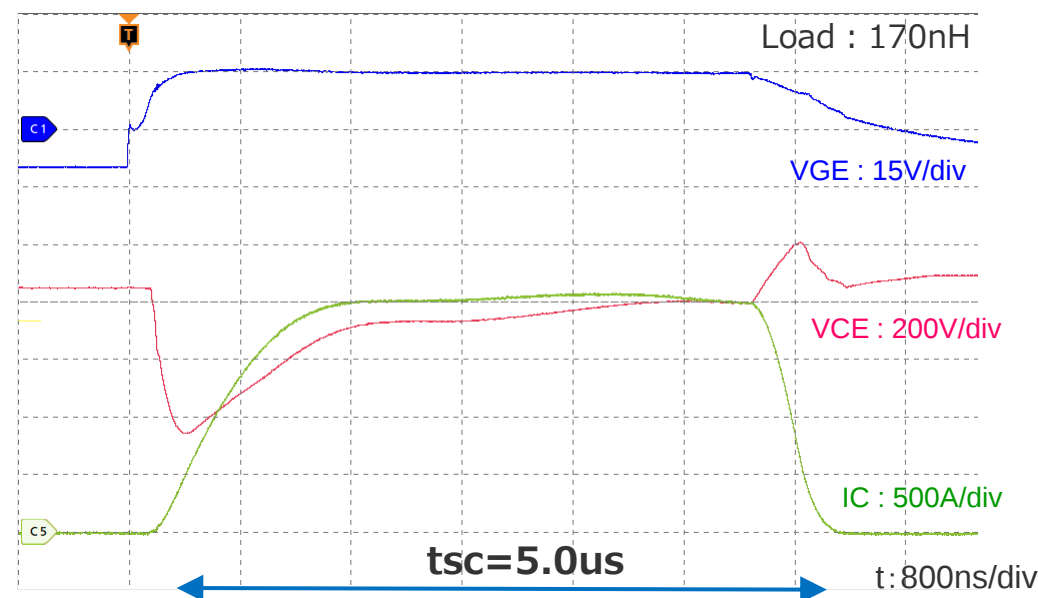
- Wide band gap
- High breakdown voltage
- High temperature operation

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

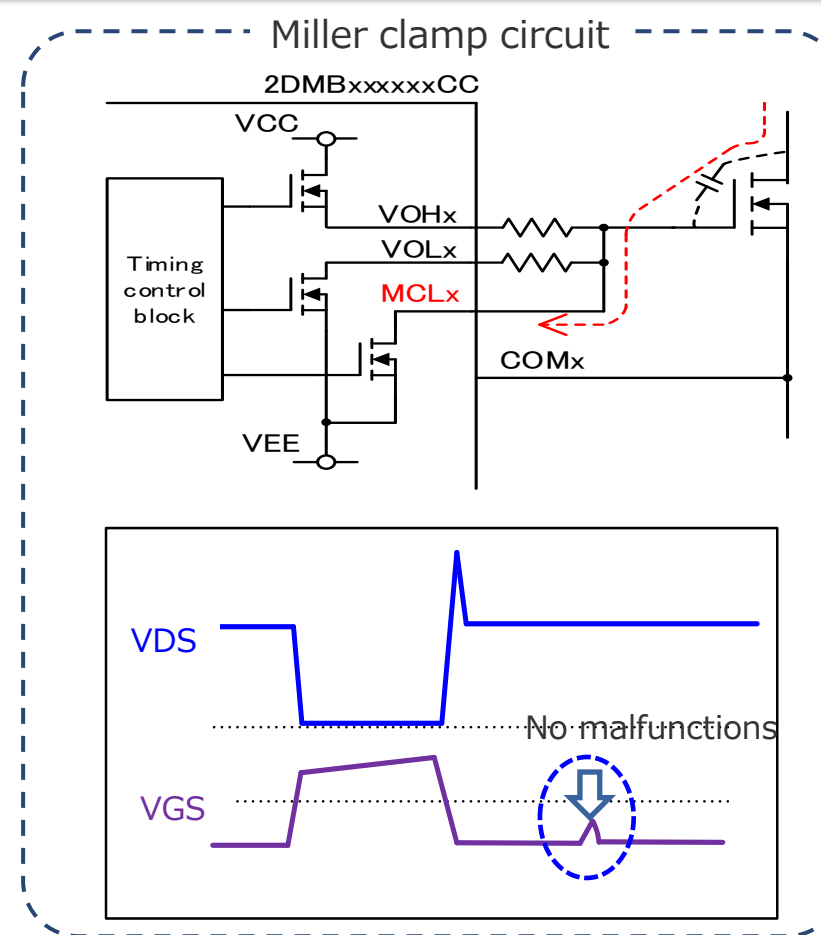
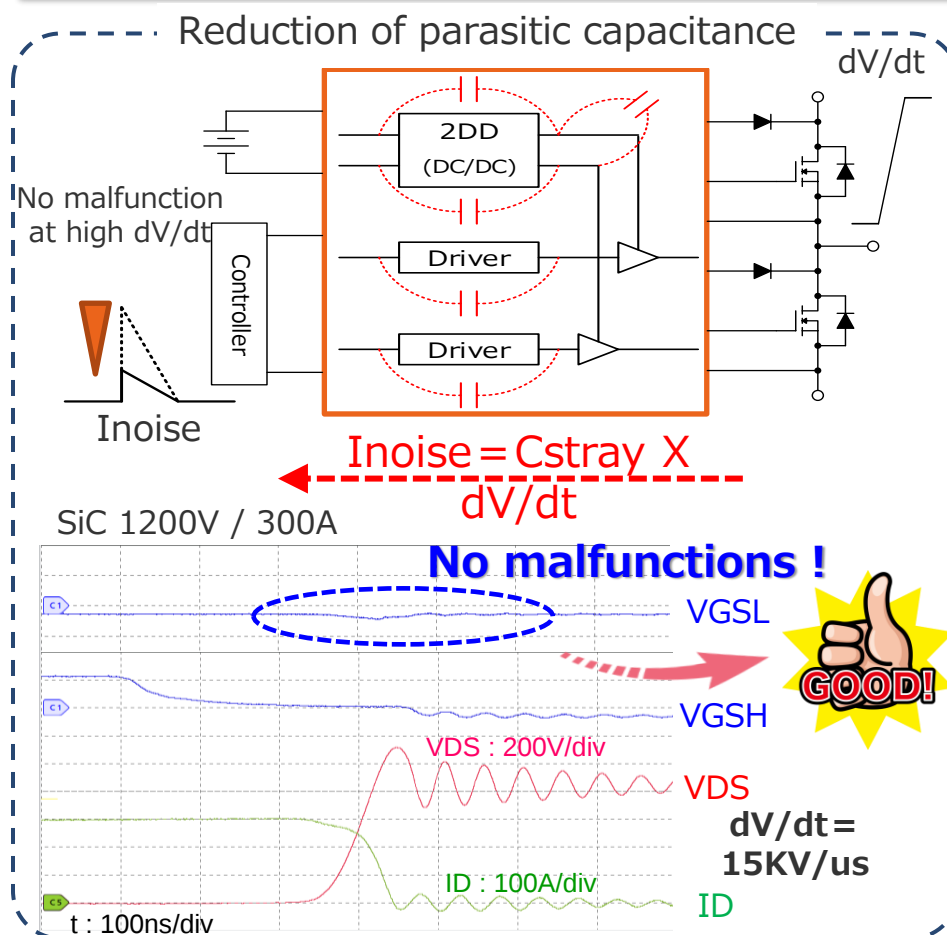
1. Solution Guide for SiC Power Module

1-2. Features of Gate driver 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 SiC Power Module

1-2. Features of Gate driver module.

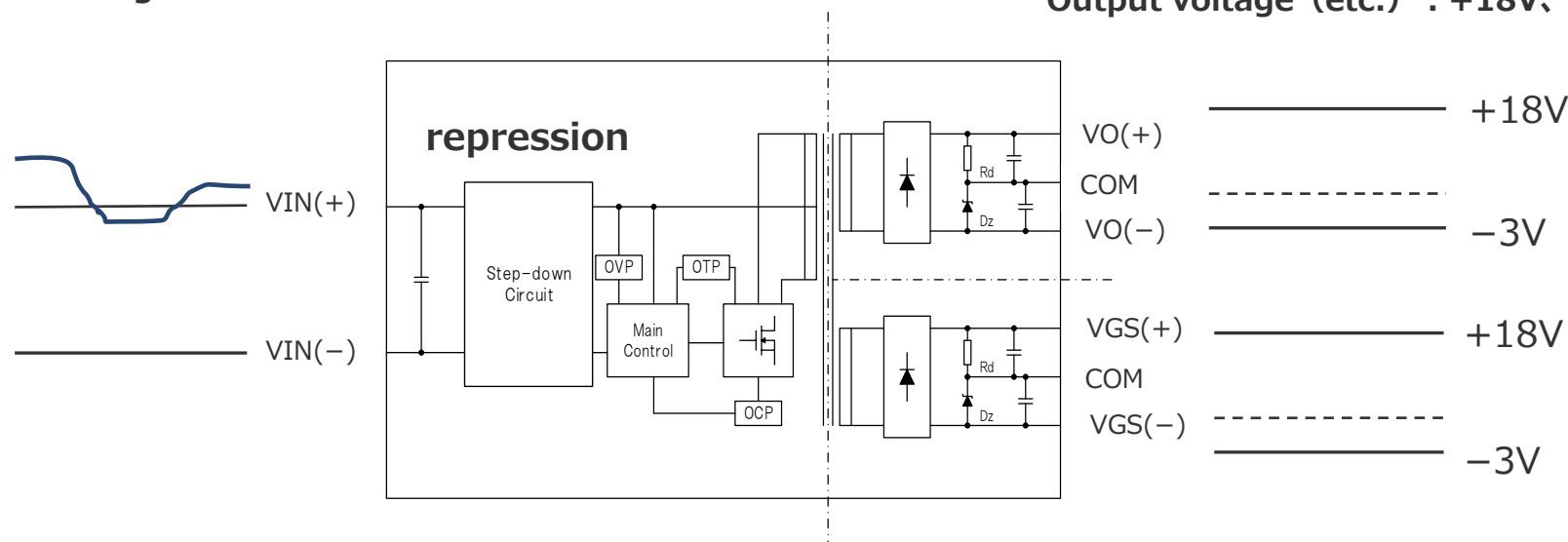
Feature③ VGS(+) :On resistance does not decrease at 15V
VGS(-) :Low tolerance (Less than -5~4V)

--- IGBT's Gate driver cannot be used

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

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**

1. Solution Guide for SiC Power Module

1-2. Features of Gate driver module.

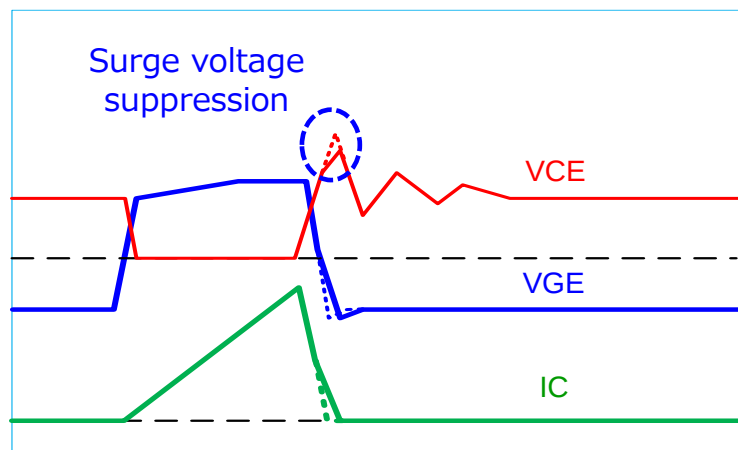
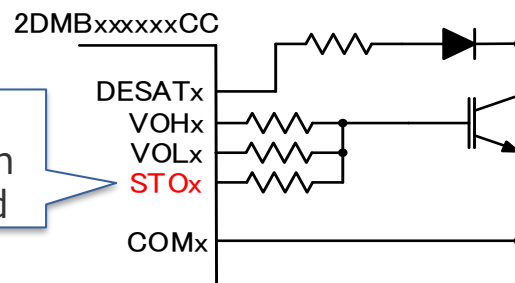
Feature④ dV/dt can be set high

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

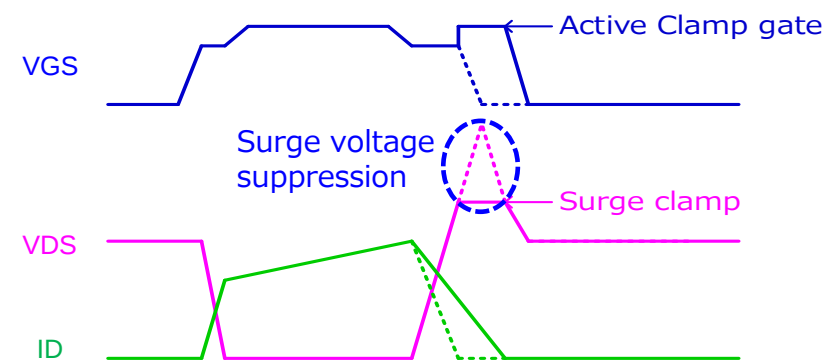
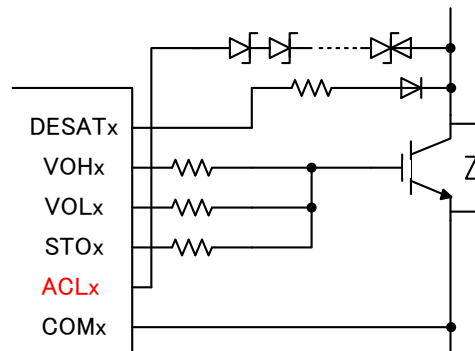
Support with a gate driver ... Ability to suppress surge voltage with high dV/dt
(Soft turn-off, Active clamp)

Soft turn-off

Soft turn-off
Operates when
short-circuited



Active clamp (Option)



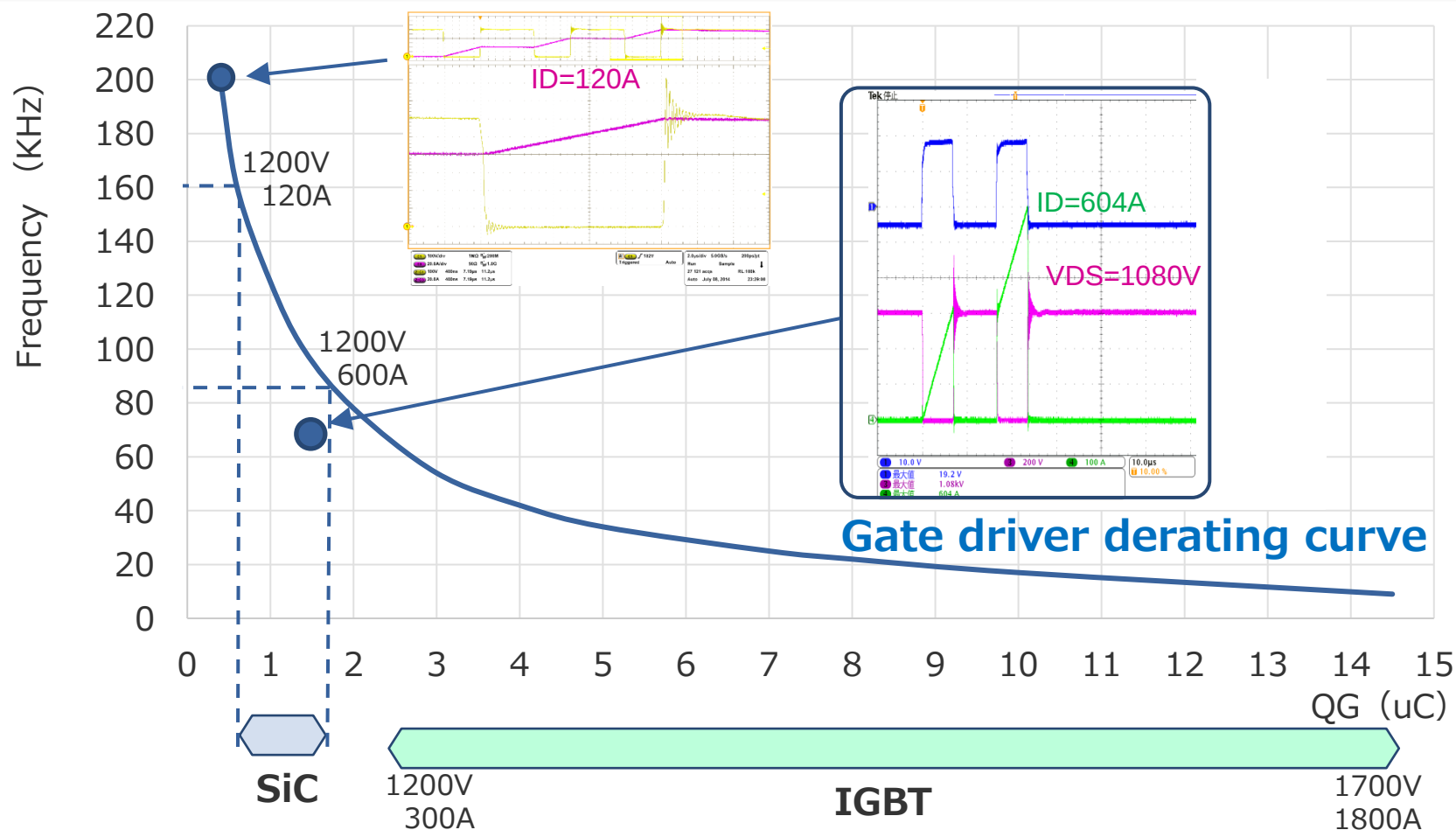
1. Solution Guide for SiC Power Module

1-2. Features of Gate driver 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 SiC Power Module

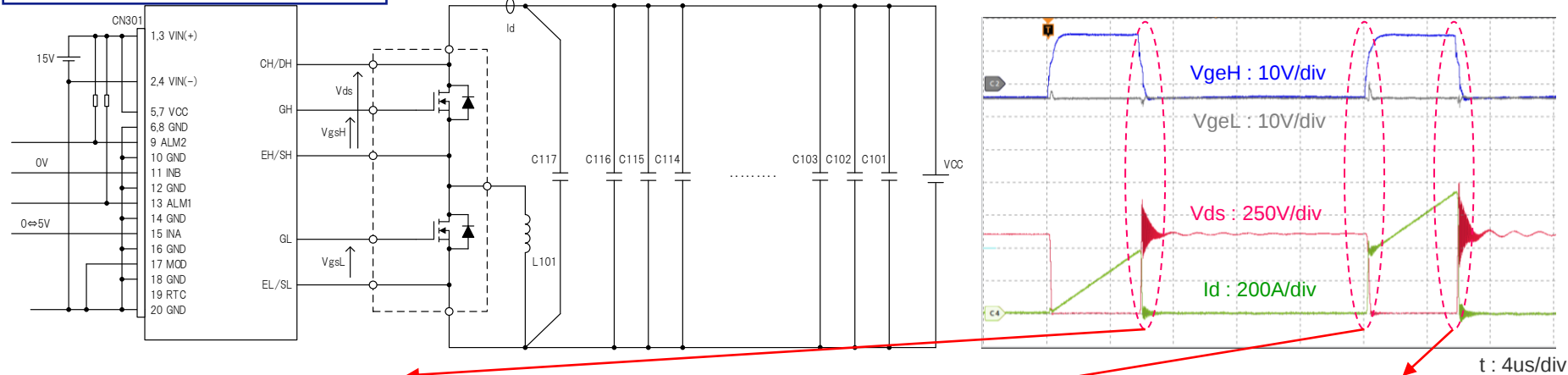
1-3. Waveform of Tamura gate driver (2 Pulse test)

SiC MOSFET : FF3MR12KM1

DC Link : 600V, Ron : 4.3Ω, Roff : 3.6Ω, Upper arm, Tj=25°C

2CG010BBC15N+ Evaluation board

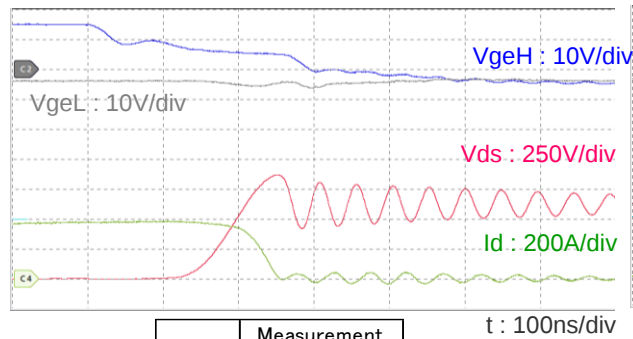
C101-116 : 560uF(Ls : 60nH)
C117 : 1uF(Ls : 20nH)



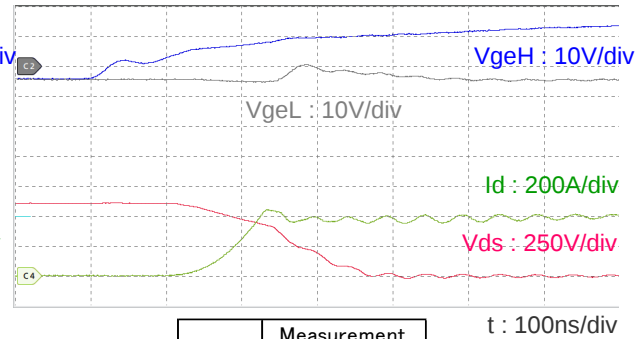
Turn OFF / Ic =375A

Turn ON / Ic =375A

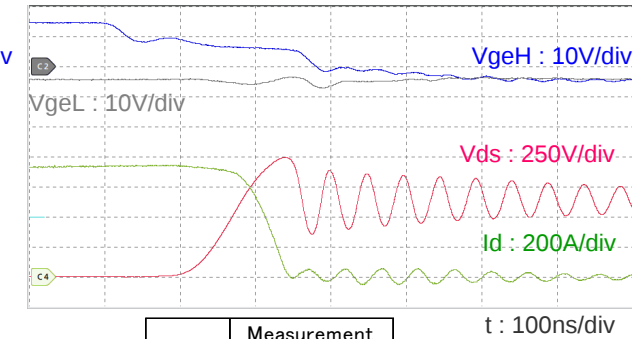
Turn OFF / Ic =750A



Item	Measurement value	
Vdsp	866	V
dV/dt	8.8	kV/us
di/dt	6.2	kA/us
Eoff	13	mJ



Item	Measurement value	
dV/dt	4.6	kV/us
di/dt	5.0	kA/us
Eon	19	mJ



Item	Measurement value	
Vdsp	992	V
dV/dt	9.2	kV/us
di/dt	10.3	kA/us
Eoff	33	mJ



1. Solution Guide for SiC Power Module

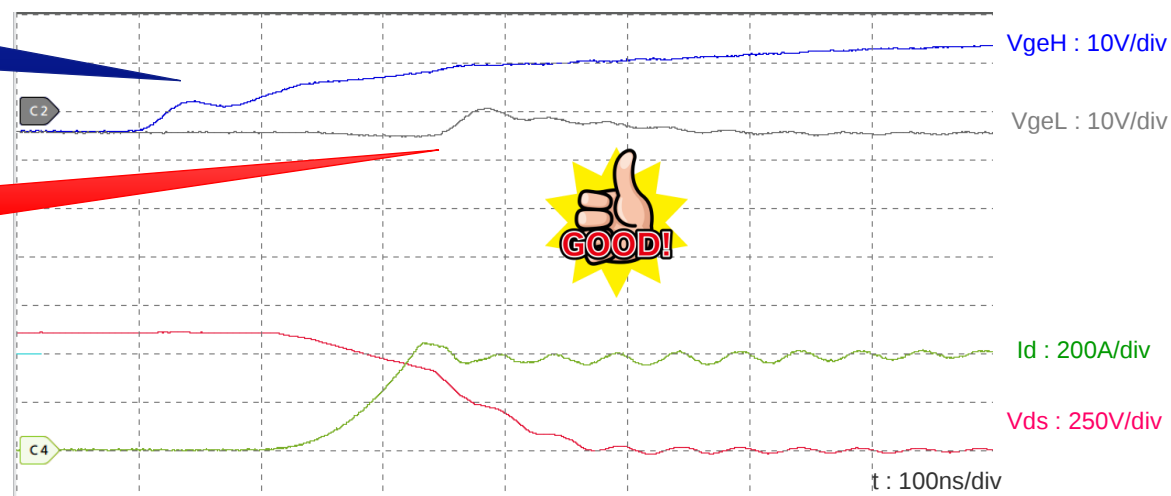
1-3. 2 Pulse test (Enlarged waveform)

SiC MOSFET : FF3MR12KM1

Turn ON / $I_c = 375A$

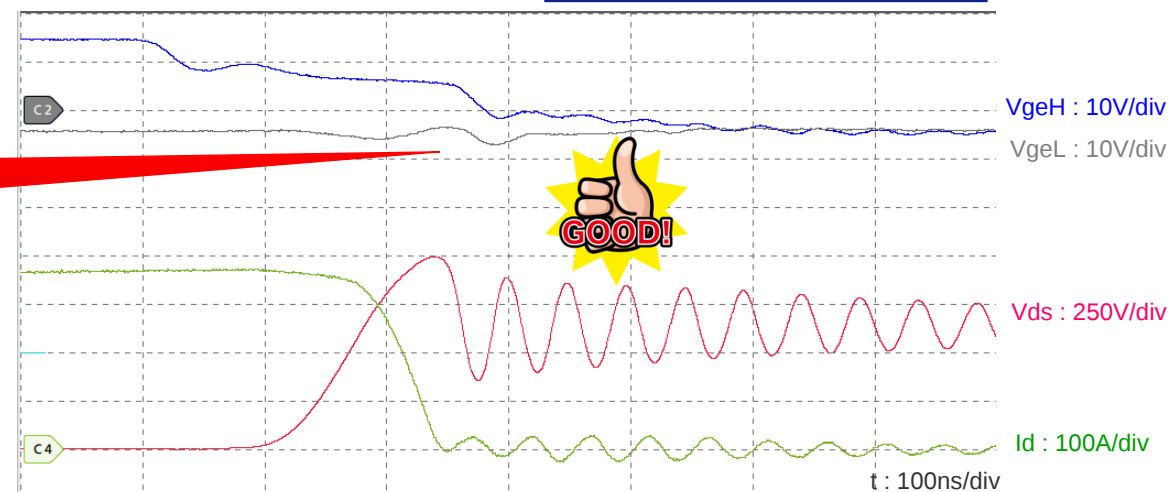
SW side gate (turn ON)
No ringing and no overshoot

OFF side gate
Stable L state without malfunction



Turn OFF / $I_c = 750A$

OFF side gate
Stable L state without malfunction

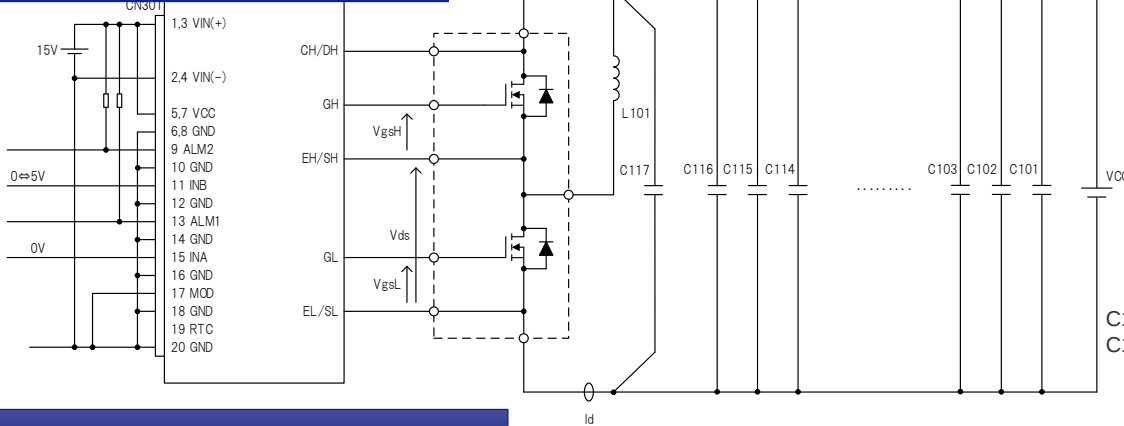


1. Solution Guide for SiC Power Module

1-3 Waveform of Tamura gate driver (Short circuit test)

DC Link : 600V, Ron : 4.3Ω, Roff : 3.6Ω, Lower arm, Tj=25°C

2CG010BBC15N+ Evaluation board



SiC MOSFET : FF3MR12KM1

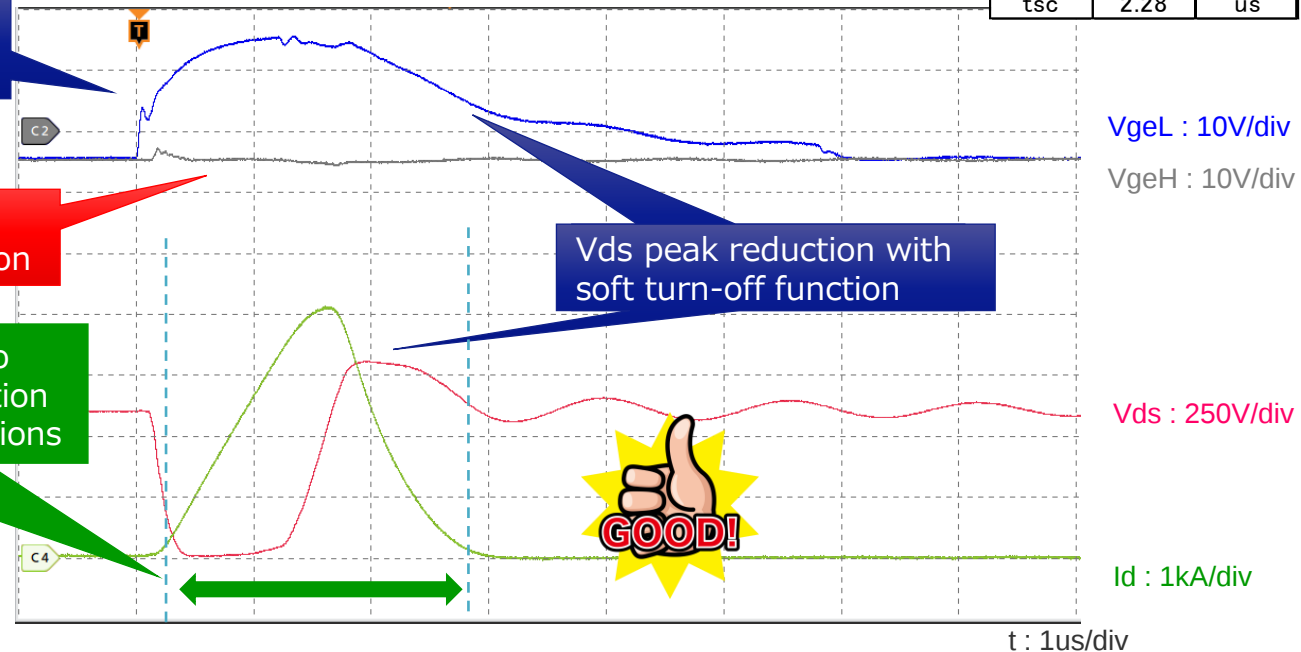
This driver suppresses the Vds peak voltage in the short circuit by our original circuit technology, and can control the mask time to prevent false short circuit detection. (Patent pending)

Item	Measurement value	
Vdsp	806	V
Idp	4124	A
tsc	2.28	us

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

OFF side gate
Stable L state without malfunction

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



1. Solution Guide for SiC Power Module

1-4. Product Line-up



Gate Driver Module 2CG-B series

		MODEL				
		2CG010BBC11N	2CG010BBC12N	2CG010BBC13N	2CG010BBC14N	2CG010BBC15N
Output	Output voltage(+)	+15V	+15V	+18V	+18V	+15V
	Output voltage(-)	-10V	-15V	-4V	-2V	-4V
	Output power/1ch	3.8W	3.3W	3.5W	3.2W	T.B.D
	Number of output	2				
	Peak output current	±43A				
Input	Input voltage	DC13~28V				
	Logic input voltage	DC3.3~5V				
Insulation	Withstand voltage	Primary to secondary AC5KV / Secondary to secondary AC4KV				
	Partial discharge extinction voltage	1768V peak				
Function	Mode select	Direct mode / Half bridge mode				
	DESAT protection	Yes				
	Soft turn off	Yes				
	Active clamp	No				
	Miller clamp	Yes				

1. Solution Guide for SiC Power Module

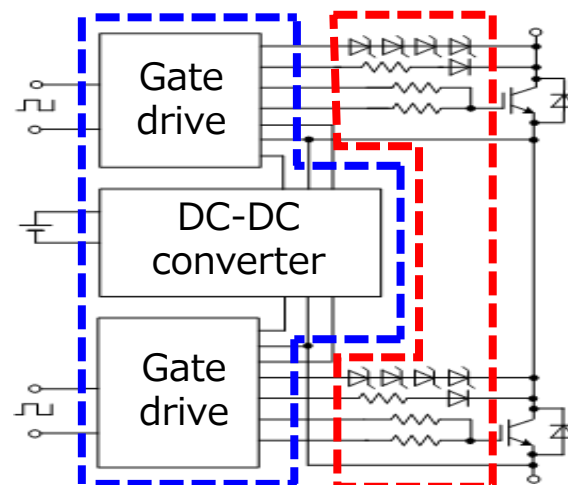
1-4. Evaluation board (2RB020BB)

Help your evaluation !

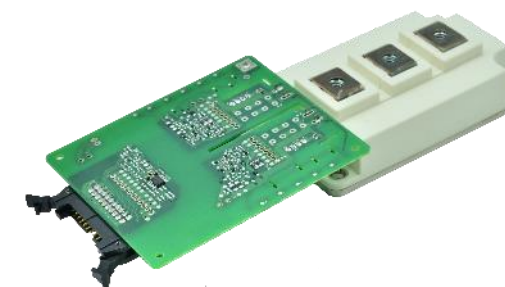
Package	ID	Part No	TAMURA Driver			
			Evaluation board	2CG-B	2DD	
	V _{D-S} = 1200V					
	250	FF6MR12KM1		2RB020BB	2CG010BBC15N (+15/-4V) 	2DD1504xxC (+15V/-4V) 
		FF6MR12KM1P				
	375	FF3MR12KM1				
		FF3MR12KM1P				
	500	FF2MR12KM1				
		FF2MR12KM1P				
	V _{D-S} = 2000V					
	250	FF6MR20KM1H		2RB020BB	2CG010BBC13N (+18/-4V) 	2DD180407C (+18V/-4V) 
		FF6MR20KM1HP				
	375	FF4MR20KM1H				
		FF4MR20KM1HP				
	500	FF3MR20KM1H				
		FF3MR20KM1HP				



Gate Driver Module
(2CG-B series)



Evaluation board
(2RB series)



Can be connected directly !

Index

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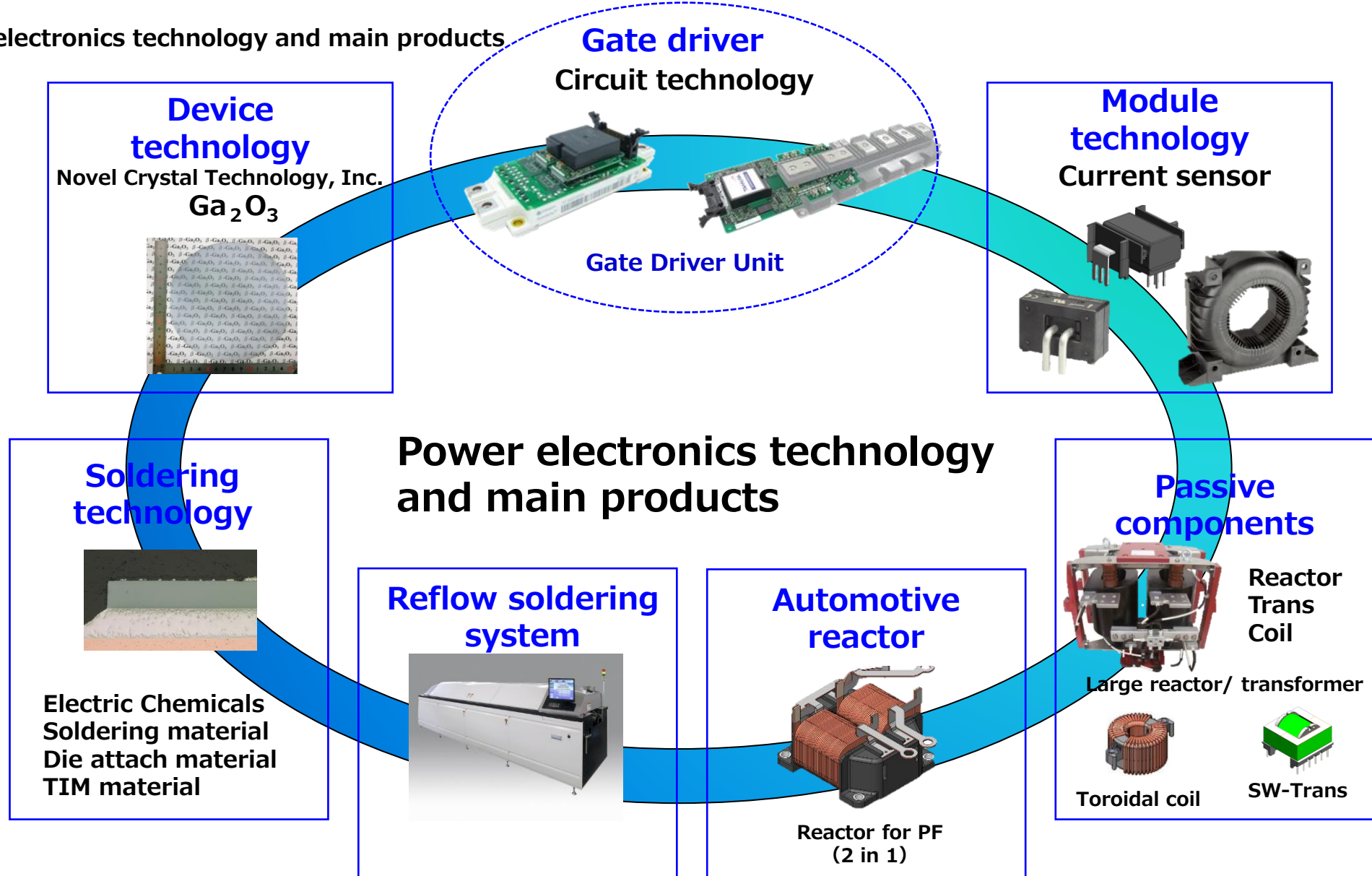
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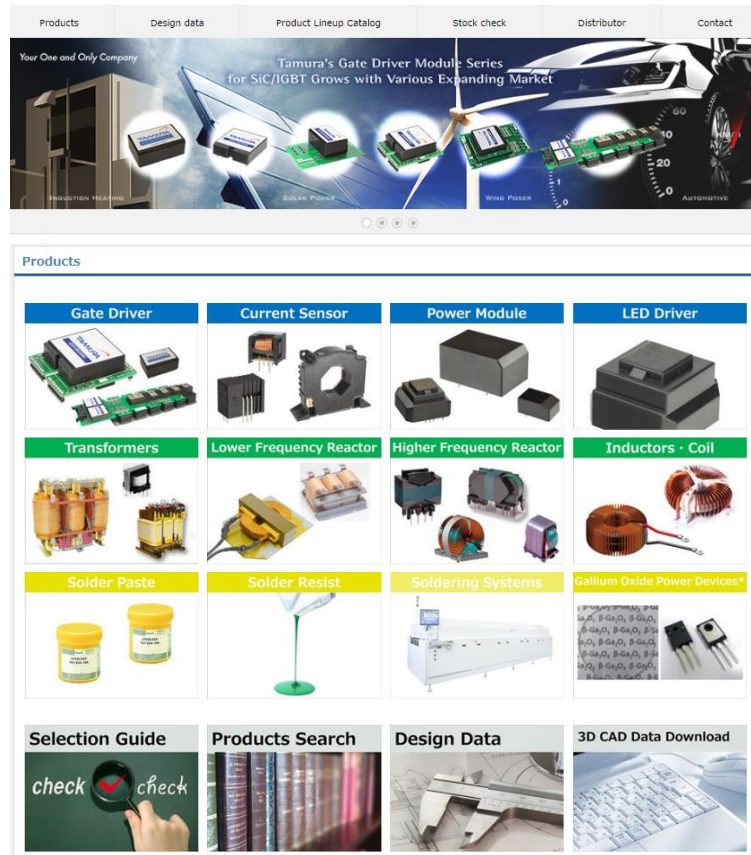
2) Introduction of One Tamura (General application)

Power electronics technology and main products



Appendix) Information & Contact

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! ↓

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