Gate driver module that brings out the performance of All-SiC power modules
Index

■ Tamura Corporation Gate Driver Product Overview

■ Functions to bring out the features and performance of All-SiC power modules

■ Introducing the line-up of gate drivers for All-SiC power modules

Appendix) Contact person
- What is required of a gate driver?
  1. Bring out the performance of power modules
  2. Increase reliability of both power modules and applications.
  3. Providing efficient development

Power Module
SiC MOSFET
IGBT

Applications
- Wind power generation
- PV Inverter
- UPS
- Energy Storage
- Welding machine
- Motor control unit
- Automotive

Role of gate driver
<table>
<thead>
<tr>
<th>Product</th>
<th>Function</th>
<th>Block diagram</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC/DC Converter</td>
<td>2in1 PM designated DC/DC Converter</td>
<td></td>
<td>2DD series</td>
</tr>
<tr>
<td>Gate Driver Module</td>
<td>DC/DC Converter + Gate drive</td>
<td></td>
<td>2CG series</td>
</tr>
<tr>
<td>Gate Driver Unit</td>
<td>Gate Driver Module + Gate resistors Protective function</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Gate Driver Module 2CG-B series

## Gate Driver Unit 2EG-B series

<table>
<thead>
<tr>
<th>Output</th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2CG010BBC11N</td>
<td>2CG010BBC12N</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Output voltage(+)</td>
<td>+15V</td>
</tr>
<tr>
<td>Output voltage(-)</td>
<td>-10V</td>
</tr>
<tr>
<td>Output power/1ch</td>
<td>3.8W</td>
</tr>
<tr>
<td>Number of output</td>
<td>2</td>
</tr>
<tr>
<td>Peak output current</td>
<td>±43A</td>
</tr>
</tbody>
</table>

## Input

<table>
<thead>
<tr>
<th></th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>DC13~28V</td>
</tr>
<tr>
<td>Logic input voltage</td>
<td>DC3.3~5V</td>
</tr>
</tbody>
</table>

## Insulation

<table>
<thead>
<tr>
<th></th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withstand voltage</td>
<td>Primary to secondary AC5kV / Secondary to secondary AC4kV</td>
</tr>
<tr>
<td>Partial discharge extinction voltage</td>
<td>1768V peak</td>
</tr>
</tbody>
</table>

## Function

<table>
<thead>
<tr>
<th></th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode select</td>
<td>Direct mode / Half bridge mode</td>
</tr>
<tr>
<td>DESAT protection</td>
<td>Yes</td>
</tr>
<tr>
<td>Soft turn off</td>
<td>Yes</td>
</tr>
<tr>
<td>Active clamp</td>
<td>No</td>
</tr>
<tr>
<td>Miller clamp</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* Under development
Functions to bring out the features and performance of All-SiC power modules

Features of All-SiC Power Module

Feature① Short circuit tolerance is lower than Si

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

Feature③ $V_{GS}(+)$: On resistance does not decrease at 15V
$V_{GS}(-)$: Low tolerance (Less than −5V)

Feature④ $dV/dt$ can be set high

Feature⑤ High frequency operation is possible
Functions to bring out the features and performance of All-SiC power modules

Feature ① Short circuit tolerance is lower than Si

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

Optimal value of SiC : 1.0~3.0us
Optimal value of IGBT : 3.0~7.0us

Adjustable with external capacitor capacity

Small chip area ・ Wide band gap ・ High breakdown voltage ・ High temperature operation
Functions to bring out the features and performance of All-SiC power modules

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

Support with a gate driver...

- Reduction of parasitic capacitance
- Miller clamp circuit

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

Reduction of parasitic capacitance and Miller clamp circuit

Inoise = Cstray X dV/dt

No malfunctions at high dV/dt

Inoise = Cstray X dV/dt

Controllers

Driver

Driver

Timing control block

2DMBxxxxxCC

VCC

VEE

VGS

VDS

VDS

No malfunctions}

Rev A

Functions to bring out the features and performance of All-SiC power modules
Functions to bring out the features and performance of All-SiC power modules

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

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
Functions to bring out the features and performance of All-SiC power modules

**Feature**

④ 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**

Operates when short-circuited

**Active clamp (Option)**

Support with a gate driver... Ability to suppress surge voltage with high dV/dt (Soft turn-off, Active clamp)
Functions to bring out the features and performance of All-SiC power modules

- **Feature**: High frequency operation is possible
- **Support with a gate driver**: Output capacity considering SiC power module

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- Drive power needs to be increased

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**Gate driver derating curve**

- **SiC**
  - 1200V
  - 120A
- **IGBT**
  - 1700V
  - 300A
  - 1600V
  - 600A

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**Parameters**

- **QG (μC)**
- **ID (A)**
- **VDS (V)**

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### Gate Driver Line-up for SiC power module

<table>
<thead>
<tr>
<th>Package</th>
<th>Ic</th>
<th>Part No</th>
<th>TAMURA Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>2EG-B</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>2CG-B</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>2DD</strong></td>
</tr>
</tbody>
</table>

**Vce = 1200V**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>C type</td>
<td>80</td>
<td>BSM080D12P2C008</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>BSM120D12P2C005</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>180</td>
<td>BSM180D12P3C007</td>
<td>-</td>
</tr>
<tr>
<td>E type</td>
<td>180</td>
<td>BSM180D12P2E002</td>
<td>2EG01XBxN13N  *1</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>BSM300D12P2E001</td>
<td>2EG01XBxN13N  *1</td>
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<tr>
<td></td>
<td>300</td>
<td>BSM300D12P3E005</td>
<td>2EG01XBxN14N  *1</td>
</tr>
<tr>
<td>G type</td>
<td>400</td>
<td>BSM400D12P2G003</td>
<td>2EG01XBxN13N  *1</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>BSM400D12P3G002</td>
<td>2EG01XBxN14N  *1</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>BSM600D12P3G001</td>
<td>2EG01XBxN14N  *1</td>
</tr>
</tbody>
</table>

**Vce = 1700V**

<p>| | | | |</p>
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E type</td>
<td>250</td>
<td>BSM250D17P2E004</td>
<td>2EG01XBxN13N  *1</td>
</tr>
</tbody>
</table>

*1 Not in stock due to optimization required. Please contact us.

**x:** Signal input voltage selectable “C” => 3.3~15V “D” => 15V
Extensive line-up of SiC and IGBT gate drivers

- **EconoDUAL™ TYPE**
  - Gate driver Unit 2EG-B/C/D
  - Gate driver Unit 2PG-C/D
  - Gate driver Unit 2QG-D
  - Gate driver Unit 4DUx-P
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit Under development

- **PrimePACK™**
  - Gate driver Unit 2PG-C/D
  - Gate driver Unit 2QG-D
  - Gate driver Unit 4DUx-P
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit Under development

- **PrimePACK™ 3+**
  - Gate driver Unit 2PG-C/D
  - Gate driver Unit 2QG-D
  - Gate driver Unit 4DUx-P
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit Under development

- **3Level**
  - Gate driver Unit 2QG-D
  - Gate driver Unit 4DUx-P
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit Under development

- **Maruti-Parallel**
  - Gate driver Unit 2QG-D
  - Gate driver Unit 4DUx-P
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit Under development

- **IHM B**
  - Gate driver Unit 2QG-D
  - Gate driver Unit 4DUx-P
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit Under development

- **Under development**
  - Gate driver Unit 2QG-D
  - Gate driver Unit 4DUx-P
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit 2LG-C/D
  - Gate driver Unit Under development

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- **Infineon**
- **Mitsubishi**
- **FUJI**

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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! ↓

https://www.tamuracorp.com/electronics/en/contact/