



**Gate Driver**  
**BM61M22BFJ-C Evaluation Board**  
**BM61M22BFJ-EVK002**

**User's Guide**

## <High Voltage Safety Precautions>

◇ Read all safety precautions before use

Please note that this document covers only the BM61M22BFJ-C evaluation board (BM61M22BFJ-EVK002) and its functions. For additional information, please refer to the datasheet.

**To ensure safe operation, please carefully read all precautions before handling the evaluation board**



Depending on the configuration of the board and voltages used,

**Potentially lethal voltages may be generated.**

Therefore, please make sure to read and observe all safety precautions described in the red box below.

### Before Use

- [1] Verify that the parts/components are not damaged or missing (i.e. due to the drops).
- [2] Check that there are no conductive foreign objects on the board.
- [3] Be careful when performing soldering on the module and/or evaluation board to ensure that solder splash does not occur.
- [4] Check that there is no condensation or water droplets on the circuit board.

### During Use

- [5] Be careful to not allow conductive objects to come into contact with the board.
- [6] **Brief accidental contact or even bringing your hand close to the board may result in discharge and lead to severe injury or death.**

**Therefore, DO NOT touch the board with your bare hands or bring them too close to the board.** In addition, as mentioned above please exercise extreme caution when using conductive tools such as tweezers and screwdrivers.

- [7] If used under conditions beyond its rated voltage, it may cause defects such as short-circuit or, depending on the circumstances, explosion or other permanent damages.
- [8] Be sure to wear insulated gloves when handling is required during operation.

### After Use

- [9] The ROHM Evaluation Board contains the circuits which store the high voltage. Since it stores the charges even after the connected power circuits are cut, please discharge the electricity after using it, and please deal with it after confirming such electric discharge.
- [10] Protect against electric shocks by wearing insulated gloves when handling.

This evaluation board is intended for use only in research and development facilities and should be handled **only by qualified personnel familiar with all safety and operating procedures.**

We recommend carrying out operation in a safe environment that includes the use of high voltage signage at all entrances, safety interlocks, and protective glasses.

## Isolated Gate Driver

# BM61M22BFJ-C Evaluation Board

## BM61M22BFJ-EVK002

The BM61M22BFJ-EVK002 board can be driving two MOSFET and IGBT Power Devices such as for High-side and Low-side on Half-Bridge application. The Input-side power supply voltage is from 4.5 to 5.5 V. The output-side power supply is from 9 to 24 V. The BM61M22BFJ-C has Power Supply protections which are the Under-Voltage Lockout (UVLO) function at Input-side and Output-side. The BM61M22BFJ-EVK002 allows designers to evaluate Rohm's Gate Driver family for various applications.

### Application

MOSFET Gate Drive

IGBT Gate Drive

### Electric Characteristics

Features and electric characteristics are complied with BM61M22BFJ-C. The BM61M22BFJ-C datasheet can be referenced to help facilitate designs.

### Operating Range

| Parameter                  | Symbol                   | Min | Max  | Units |
|----------------------------|--------------------------|-----|------|-------|
| Input-side Supply Voltage  | VCC1 <sup>(Note 1)</sup> | 4.5 | 5.5  | V     |
| Output-side Supply Voltage | VCC2 <sup>(Note 2)</sup> | 9   | 24   | V     |
| Operating Temperature      | Topr                     | -40 | +125 | °C    |

<sup>(Note 1)</sup>: Relative to GND1

<sup>(Note 2)</sup>: Relative to GND2

### Absolute Maximum Ratings

| Parameter                  | Symbol           | Limits  | Units |
|----------------------------|------------------|---|-------|
| Input-side Supply Voltage  | VCC1             | -0.3 to +7.0 <sup>(Note 3)</sup>              | V     |
| Output-side Supply Voltage | VCC2             | -0.3 to +30.0 <sup>(Note 4)</sup>             | V     |
| INA Pin Input Voltage      | V <sub>INA</sub> | -0.3 to +VCC1+0.3 or +7.0 <sup>(Note 3)</sup> | V     |
| INB Pin Input Voltage      | V <sub>INB</sub> | -0.3 to +VCC1+0.3 or +7.0 <sup>(Note 3)</sup> | V     |

<sup>(Note 3)</sup>: Relative to GND1

<sup>(Note 4)</sup>: Relative to GND2

Terminal Descriptions

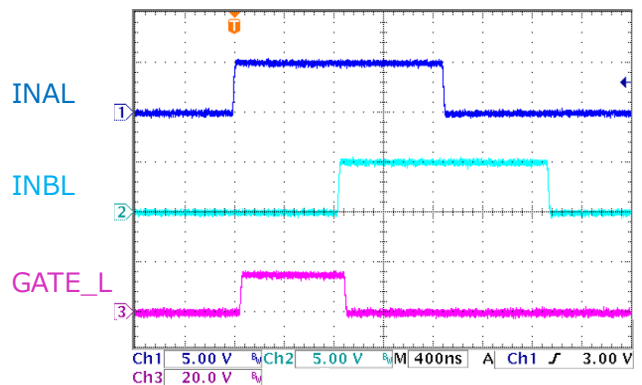
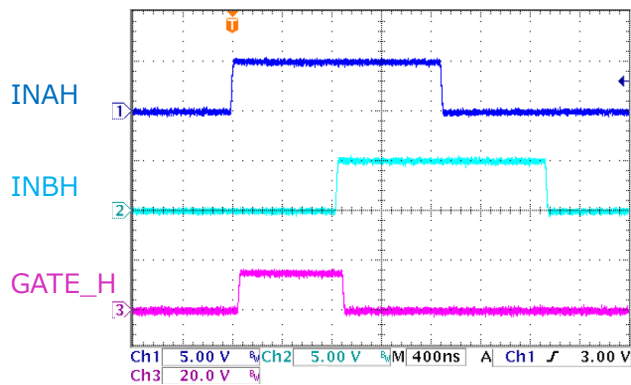
| Pin name | Description                           |
|----------|---------------------------------------|
| VCC1     | Input-side Power Supply               |
| INAH     | Input-side Control A on High-side     |
| INBH     | Input-side Control B on High-side     |
| INAL     | Input-side Control A on Low-side      |
| INBL     | Input-side Control B on Low-side      |
| GND1     | Input-side Ground                     |
| GND2L    | Output-side Ground on Low-side        |
| GATE_L   | Output-side Gate Control on Low-side  |
| VCC2L    | Output-side Power Supply on Low-side  |
| GND2H    | Output-side Ground on High-side       |
| GATE_H   | Output-side Gate Control on High side |
| VCC2H    | Output-side Power Supply on High side |

Input / output terminal Control

| INAH (Input) | INBH (Input) | GATE_H (Output) |
|--------------|--------------|-----------------|
| L            | H            | L               |
| H            | H            | L               |
| L            | L            | L               |
| H            | L            | H               |

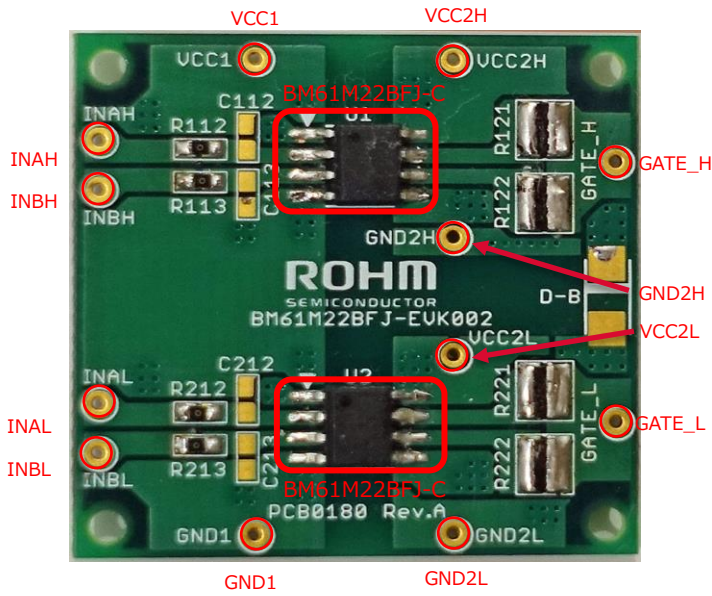
| INAL (Input) | INBL (Input) | GATE_L (Output) |
|--------------|--------------|-----------------|
| L            | H            | L               |
| H            | H            | L               |
| L            | L            | L               |
| H            | L            | H               |

Waveform

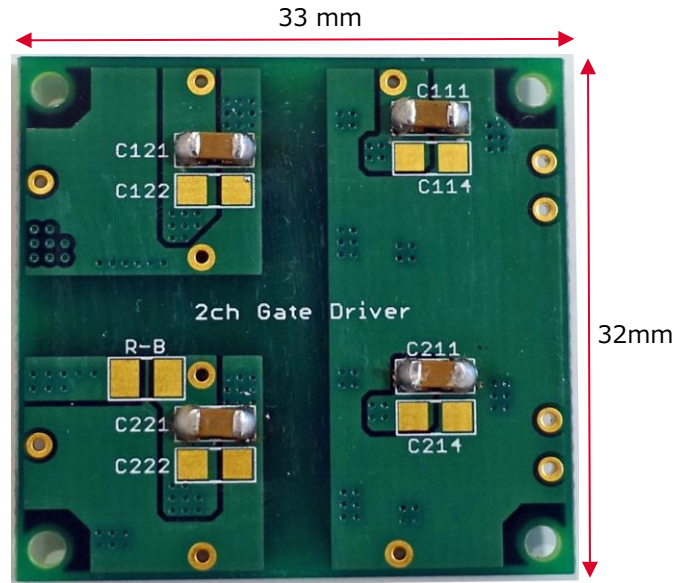


Evaluation Board

Front

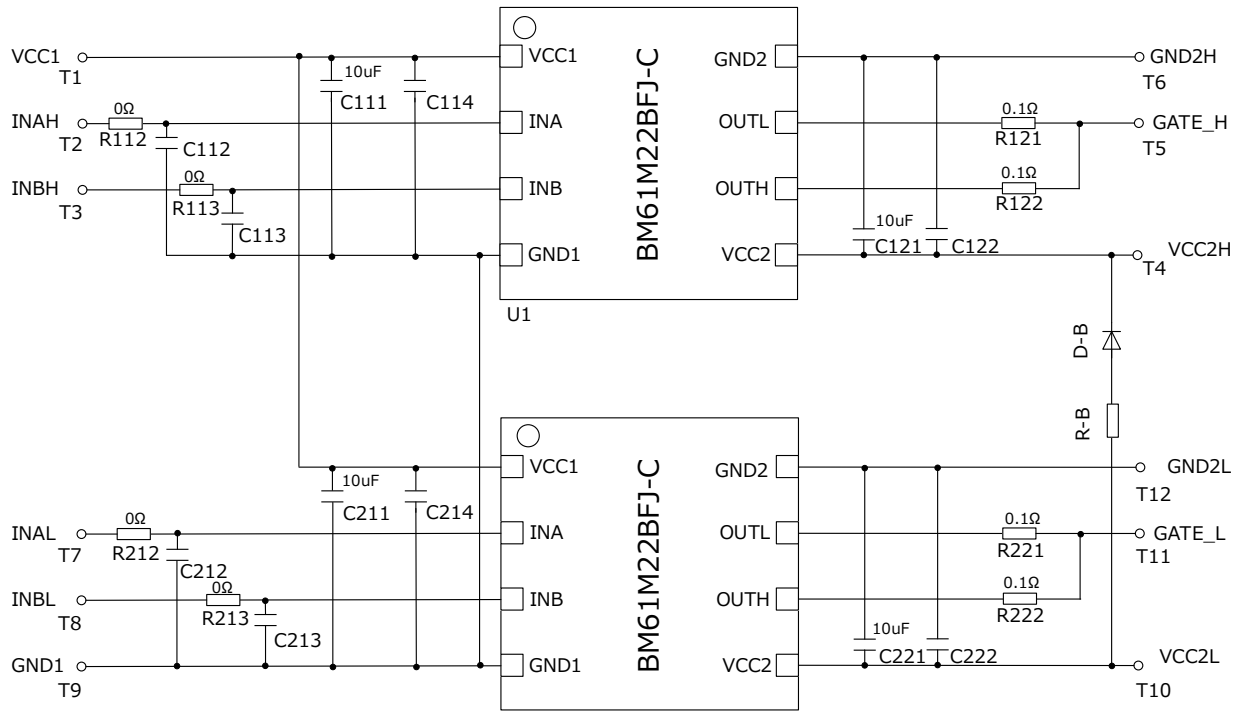


Back



Schematics

R112, R113, R121, R122, R212, R213, R221, and R222 are implemented interim resistors for shipment check. Please replace each resistor which can work with Power Device or input device appropriately.



Bill of Materials

| Device              | Parts No.  | Description          | Manufacturer   | Parts name         | Qty. |
|---------------------|--|----------------------|----------------|--------------------|------|
| Gate Driver         | U1, U2   | 1ch, 9-24V           | ROHM           | BM61M22BFJ-C       | 2    |
| Input Capacitor     | C111, C211   | 10uF, 50V, X7R, 3216 | TDK            | CGA5L1X7R1H106K160 | 2    |
|                     | C114, C214   | (no stuff)           |                |                    | 0    |
| Input signal filter | R112, R113, R212, R213                                     | 0 ohm, 1608          | ROHM           | MCR03EZPJ000       | 4    |
|                     | C112, C113, C212, C213                                     | (no stuff)           |                |                    | 0    |
| Output Capacitor    | C121, C221   | 10uF, 50V, X7R, 3216 | TDK            | CGA5L1X7R1H106K160 | 2    |
|                     | C122, C222   | (no stuff)           |                |                    | 0    |
| Gate                | R121, R221   | 0.1 ohm, 3216        | ROHM           | LTR18EZPJLR10      | 2    |
|                     | R122, R222   | 0.1 ohm, 3216        | ROHM           | LTR18EZPJLR10      | 2    |
| Bootstrap           | D-B  | (no stuff)           |                |                    | 0    |
|                     | R-B  | (no stuff)           |                |                    | 0    |
| Test pin            | T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12 (Option) | (no stuff)           | Hirosugi-Keiki | HT-0710-3          | 12   |
| Spacer              | (Option)   | M2, 10mm             | Hirosugi-Keiki | BSN2010            | 4    |
| Nut                 | (Option)   | M2                   | Hirosugi-Keiki | NNT-00             | 4    |

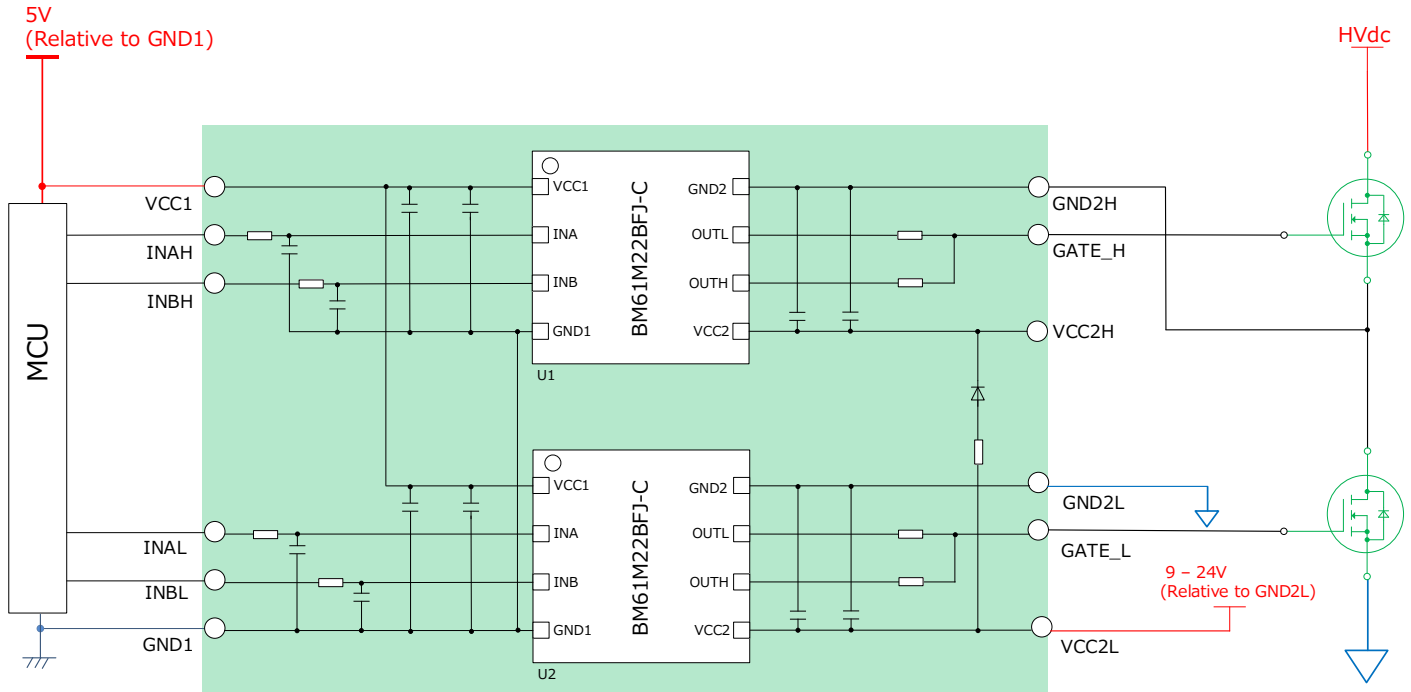
Materials may be changed without notice.

### Application and Operation procedure

Following figure is shown the example application. Power Devices and microcontroller [MCU] are connected to the board via terminals. VCC2H power can be supplied from VCC2L by using bootstrap circuit. Please place appropriate components on the EVK for bootstrap. Please make sure to replace the appropriate value for each resistor and capacitor on the board depends on your applications.

The numerous application notes can be referenced to help facilitate designs. Useful power device application notes for design and evaluation are listed on page 9.

#### Example Application



#### Additional Components for Bootstrapping

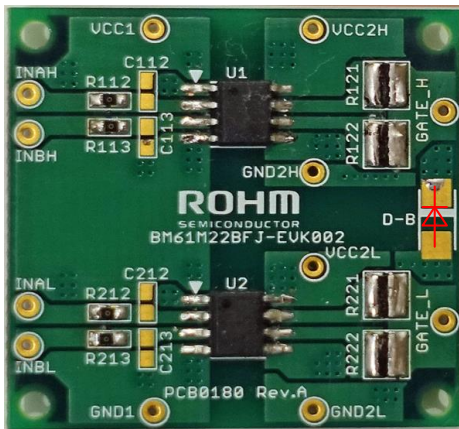
R-B and D-B parts are for bootstrapping. Place appropriate components depends on your applications.

Examples:

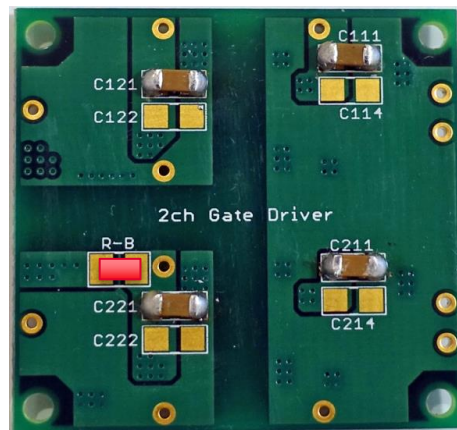
D-B: ROHM RFN2LAM6STF [Reverse voltage: 600V, Current: 1.5A, Package: PMDTM]

R-B: ROHM ESR18 series resistor [Package size: 3216mm]

Front



Back



Equipment

- DC Power Supply: 5 V for control signal [5 VDC], 9 to 24 V for Power Device [9 to 24 VDC]
- Microcontroller [MCU]: Input signal for controlling GATE output
- Power Device: MOSFET

We have many power devices which can work with Evaluation Board. You can get applicable product information from our web site. Some products are shown on page 8.

Instructions

Before start to connect, make sure to turn off all equipment for your safety.

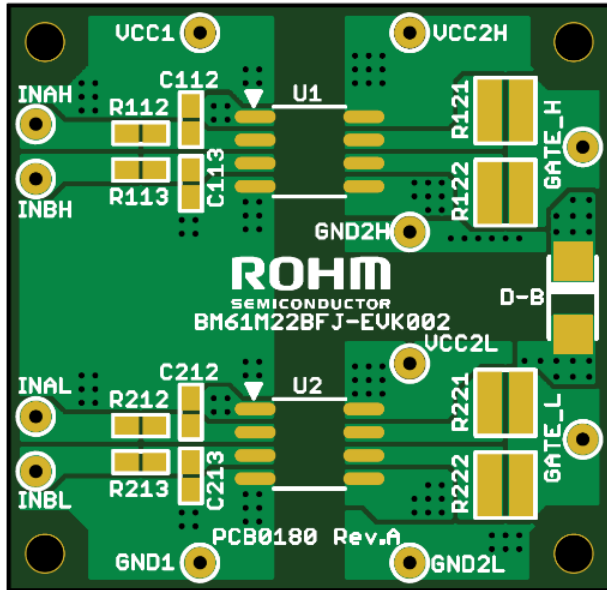
1. Connect 5 VDC to VCC1–GND1 terminal on board.  
Stay turn off the power supply.
2. Connect 9 to 24 VDC to VCC2L-GND2L terminal on board.  
Stay turn off the power supply.
3. Connect MCU to the INAH, INBH, INAL, and INBL terminal on board.  
Refer to the Input / Output terminal Control description on page 2.
4. Connect GATE\_H and GATE\_L terminal on board to each gate terminal on power devices.
5. Turn on the 5 VDC and MCU.
6. Turn on the 9 to 24 VDC.

**PCB Layout**

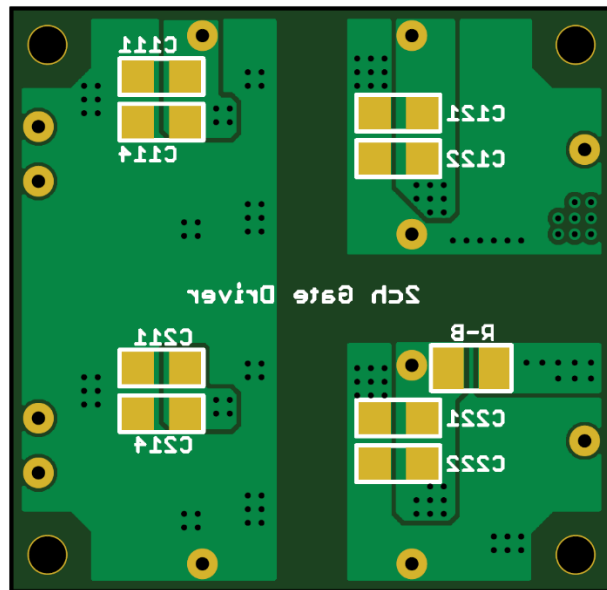
Board size: 33 x 32 mm, Material:FR-4, 4-layer.

Input-side capacitors and output capacitors [C111, C114, C121, C122, C211, C214, C221, and C222] are placed on bottom side in order to reduce board size. When you design your PCB layout, we recommend to place them to the same side and near the gate driver as close as possible.

Top Layer with Pad and Silkscreen (Top View)

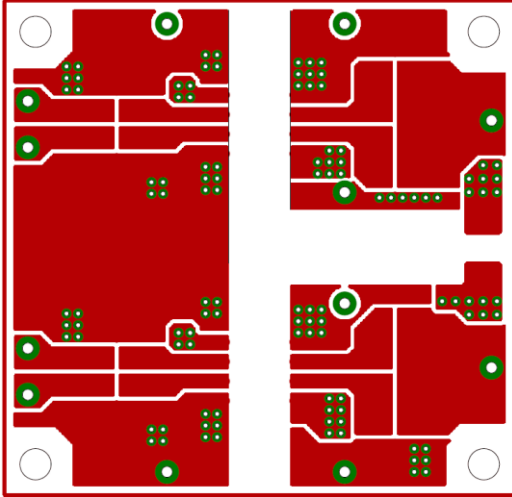


Bottom Layer with Pad and Silkscreen (Top View)

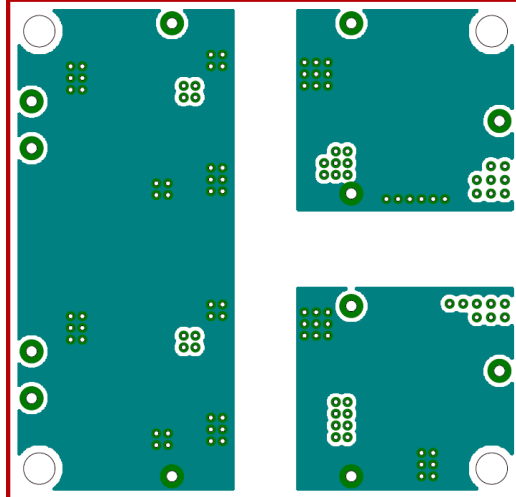




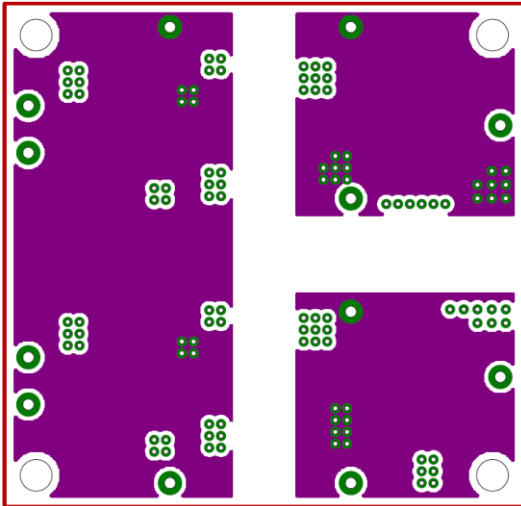
Top Layer (Top View)



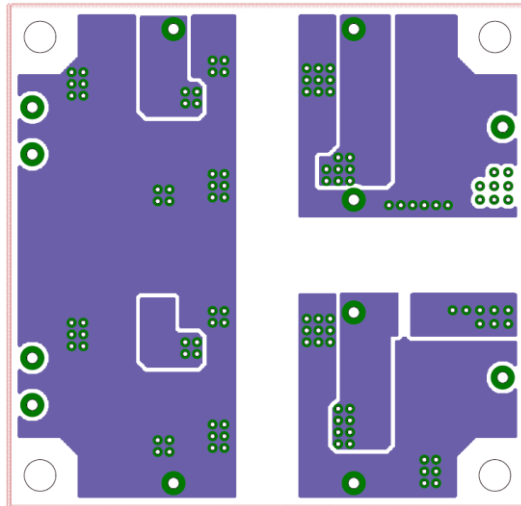
2<sup>nd</sup> Layer (Top View)



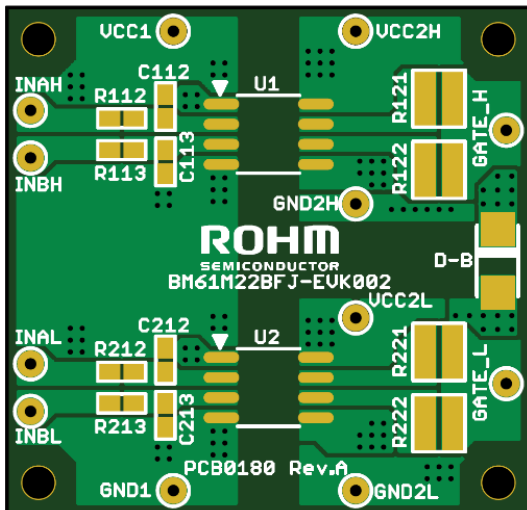
3<sup>rd</sup> Layer (Top View)



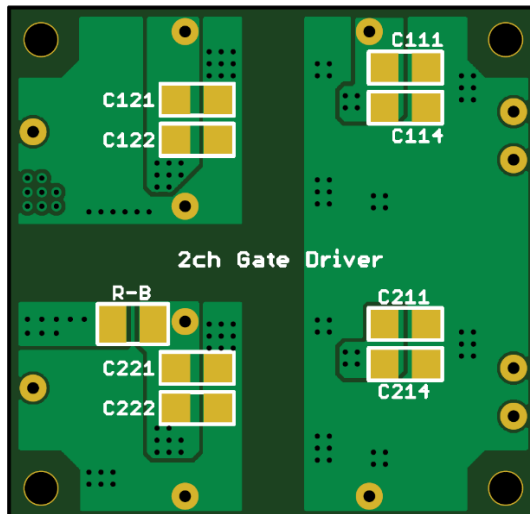
Bottom Layer (Top View)



Silkscreen (Top)



Silkscreen (Bottom)



We have numerous power devices which are suitable for your requests.

For the MOSFET, please visit our web site below:

<https://www.rohm.com/products/transistors/mosfets>

Following examples are MOSFET for high-speed switching specifications.

[Drive voltage = 10V]

| Products  | Drain-Source Voltage VDSS[V] | Polarity | Drain Current [A] | RDS(on)[Ohm] (Typ.)<br>Drive Voltage = 10V | Package           |
|-----------|------------------------------|----------|-------------------|--|-------------------|
| R6504KNJ  | 650                          | Nch      | 4                 | 0.955                                      | TO-263<br>(D2PAK) |
| R6507KNJ  |                              |          | 7                 | 0.605                                      |                   |
| R6509KNJ  |                              |          | 9                 | 0.53                                       |                   |
| R6511KNJ  |                              |          | 11                | 0.36                                       |                   |
| R6515KNJ  |                              |          | 15                | 0.28                                       |                   |
| R6520KNJ  |                              |          | 20                | 0.185                                      |                   |
| R6524KNJ  |                              |          | 24                | 0.16                                       |                   |
| R6504KNX  |                              |          | 4                 | 0.955                                      | TO-220FM          |
| R6507KNX  |                              |          | 7                 | 0.605                                      |                   |
| R6509KNX  |                              |          | 9                 | 0.53                                       |                   |
| R6511KNX  |                              |          | 11                | 0.36                                       |                   |
| R6515KNX  |                              |          | 15                | 0.28                                       |                   |
| R6520KNX  |                              |          | 20                | 0.185                                      |                   |
| R6524KNX  |                              |          | 24                | 0.16                                       |                   |
| R6530KNX  |                              |          | 30                | 0.125                                      | TO-247AD          |
| R6520KNZ4 |                              |          | 20                | 0.185                                      |                   |
| R6524KNZ4 |                              |          | 24                | 0.16                                       |                   |
| R6530KNZ4 |                              |          | 30                | 0.125                                      |                   |
| R6535KNZ4 |                              |          | 35                | 0.098                                      |                   |
| R6547KNZ4 |                              |          | 47                | 0.07                                       | TO-3PF            |
| R6576KNZ4 |                              |          | 76                | 0.04                                       |                   |
| R6515KNZ  |                              |          | 15                | 0.28                                       |                   |
| R6520KNZ  |                              |          | 20                | 0.185                                      |                   |
| R6524KNZ  |                              |          | 24                | 0.16                                       |                   |
| R6530KNZ  | 30                           | 0.125    |                   |  |                   |
| R6535KNZ  | 35                           | 0.098    |                   |  |                   |

As of June, 2020.

For more details and latest information, please visit our web site.

For the IGBT, please visit our web site below:  
<https://www.rohm.com/products/igbt>

Following examples are IGBT for high speed fast switching with fast recovery diode.

| Products   | V <sub>CEs</sub> [V] | I <sub>c</sub> [A]<br>(100°C) | V <sub>CE(SAT)</sub><br>(Typ.)[V] | t <sub>f</sub> (Typ.)<br>[ns] | Diode | Package |
|------------|----------------------|-------------------------------|-----------------------------------|-------------------------------|-------|---------|
| RGW40TS65D | 650                  | 20                            | 1.5                               | 63                            | FRD   | TO-247N |
| RGW50TS65D |                      | 25                            |                                   | 53                            |       |         |
| RGW60TS65D |                      | 30                            |                                   | 35                            |       |         |
| RGW80TS65D |                      | 40                            |                                   | 34                            |       |         |
| RGW00TS65D |                      | 50                            |                                   | 33                            |       |         |
| RGWX5TS65D |                      | 75                            |                                   | 31                            |       |         |
| RGW40TK65D |                      | 16                            |                                   | 63                            |       | TO-3PFM |
| RGW50TK65D |                      | 18                            |                                   | 53                            |       |         |
| RGW60TK65D |                      | 20                            |                                   | 35                            |       |         |
| RGW80TK65D |                      | 23                            |                                   | 34                            |       |         |
| RGW80TK65E |                      | 23                            |                                   | 34                            |       |         |
| RGW00TK65D |                      | 26                            |                                   | 33                            |       |         |

As of June, 2020.

For more details and latest information, please visit our web site.

We also offer useful power device application notes for design and evaluation.

Please visit our web site below:

<https://www.rohm.com/search/application-notes>

1. Gate-source voltage behavior in a bridge configuration, No.60AN135E
2. Gate-Source Voltage Surge Suppression Methods, No.62AN010E
3. Snubber circuits design method for SiC MOSFET, No.62AN037E
4. Improvement of switching loss by driver source , No.62AN040E
5. Precautions during gate-source voltage measurement, 62AN085E

**Revision History**

| Date   | Revision Number | Description |
|--------|-----------------|-------------|
| 2020.6 | 001             | New Release |

## Notes

- 1) The information contained herein is subject to change without notice.
- 2) Before you use our Products, please contact our sales representative and verify the latest specifications :
- 3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.  
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- 4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.
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