

High Power Density SiC Module HSDIP20: 3-Phase Inverter Evaluation Board (BST70T2P4K01-EVK-001) Quick Start Guide

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<High Voltage Safety Precautions>

◇ Read all safety precautions before use

Please note that this document covers only the **HSDIP20 3-phase Inverter** evaluation board (**BST70T2P4K01-EVK-001**) 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.

High Power Density SiC Module HSDIP20: 3-Phase Inverter Evaluation Board (BST70T2P4K01-EVK-001) Quick Start Guide

This document can be used as the simplified manual for the test environment creation and operating procedure of the 3-phase inverter evaluation board (BST70T2P4K01-EVK-001) consisting of the high-density power module HSDIP20 (6-in-1 type). Be careful that this is not a 4-in-1 type module evaluation board.

To use the board safely, be sure to observe the precautions in this document even though the board is designed to allow customers to easily create their own evaluation environments.

This evaluation board does not have a short circuit protection function for the evaluation device. Therefore, even with the normal evaluation method, if the usage deviates from the electrical specifications (maximum current etc.) of the evaluation device selected by the customer, the device may be severely damaged and may emit a popping sound. Therefore, never use the evaluation board in a way that deviates from the specifications of the evaluation device. Also, take precautions to prevent fragments from scattering and wear protective equipment in case severe damage occurs.

To evaluate the operation conditions of a SiC module and its effects on applications, it is necessary to create an evaluation environment. However, this is not an easy task. To solve this problem, we have prepared an evaluation board that allows you to easily create an evaluation environment for the HSDIP20, so that you can efficiently conduct an evaluation. Furthermore, the board is designed in a modular manner in which functions are divided and arranged to improve the usefulness of evaluation testing. This allows you to change the constants of the driver circuits without breaking the wiring environment of the main circuit.

0. Summary

This evaluation board is configured with three modules: the main board equipped with the power device and peripherals, gate driver boards operating the power device, and sensing boards obtaining the voltages and currents applied to devices.

Figure A shows the appearance and functions of the evaluation board (main board), Figure B shows the appearance of the gate driver board, and Figure C shows a diagram of the system configuration. Note that no sensing boards are included. However, the main board can obtain analog signals, so connect any sensing board prepared by yourself.

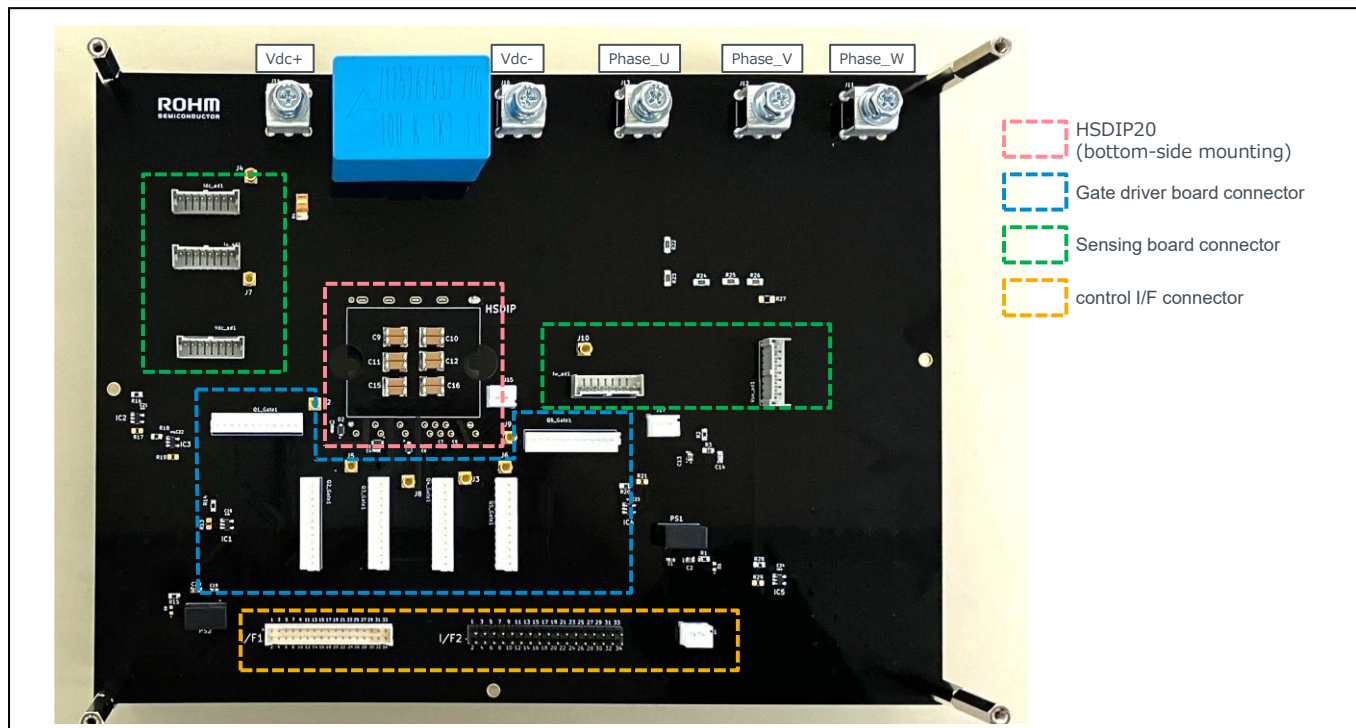


Figure A. Appearance and functions of the evaluation board

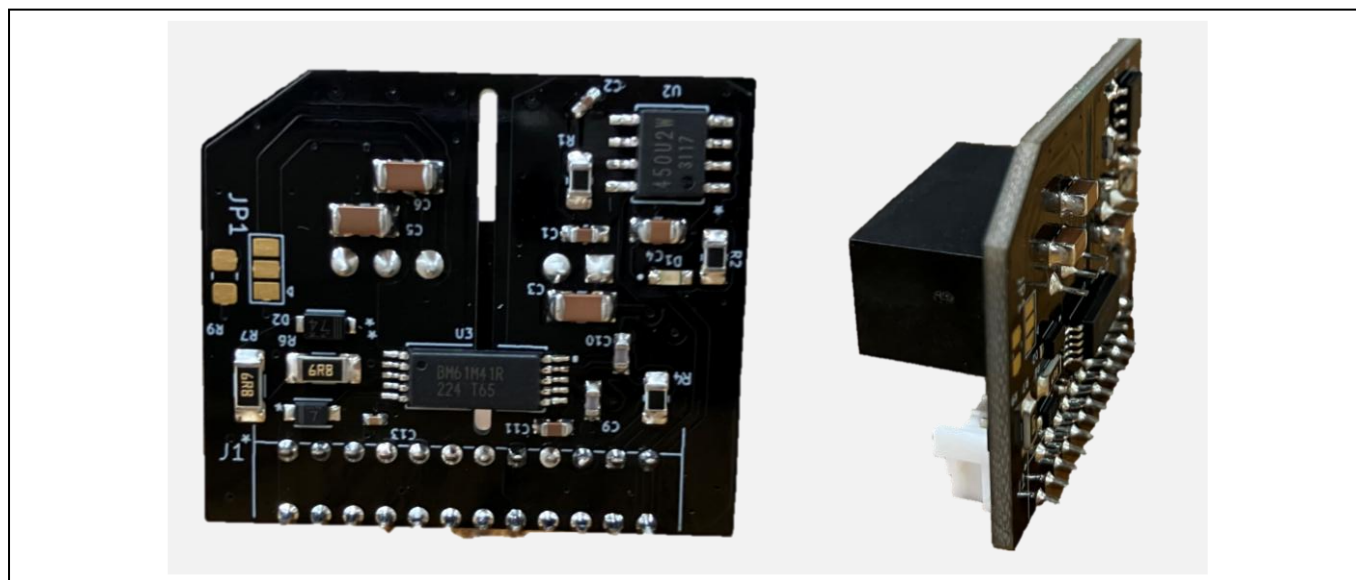


Figure B. Appearance of the gate driver board

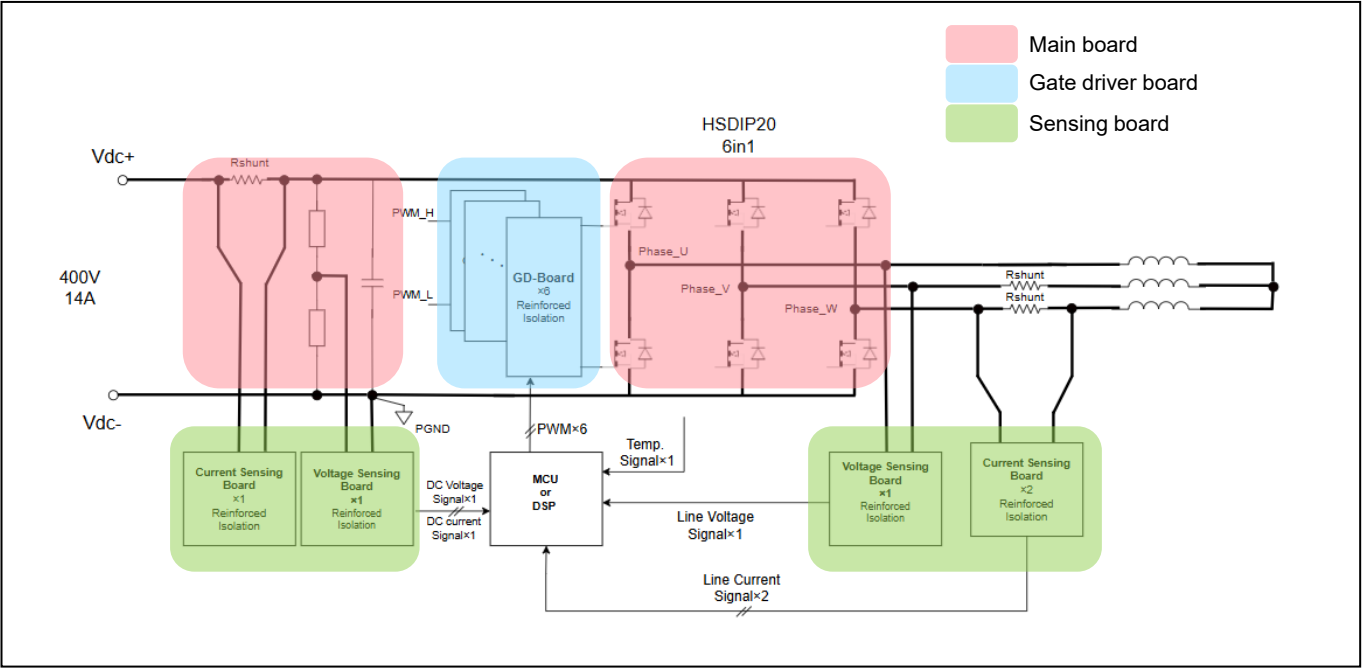


Figure C. Diagram of the system configuration. Sensing boards shall output analog signals only.

List of core parts

Table A. Core parts

Product	Model	Feature	Data sheet
Power module	BST70T2P4K01-VC	Small and low-loss SiC MOSFET, 6-in-1, Rthj-c 0.28°C/W, built-in thermistor	URL
Gate driver IC	BM61M41RFV-C	Breakdown voltage of 3750 Vrms, I/O delay time of 65 ns, and minimum input pulse width of 60 ns.	URL
Chip resistor for current sensing	PSR100KTQFH1L00	6432 (2512) size, 8W, 1mΩ, High Power Type Metal Plate Shunt Resistor	URL
Op-amp	LMR1802G-LB	High precision, low noise, low input offset, low input bias current	URL

1. Introduction

Since this board has multiple voltage and signal sources supplied from external sources, be sure to follow the on/off sequence specified below to avoid problems, such as destruction.

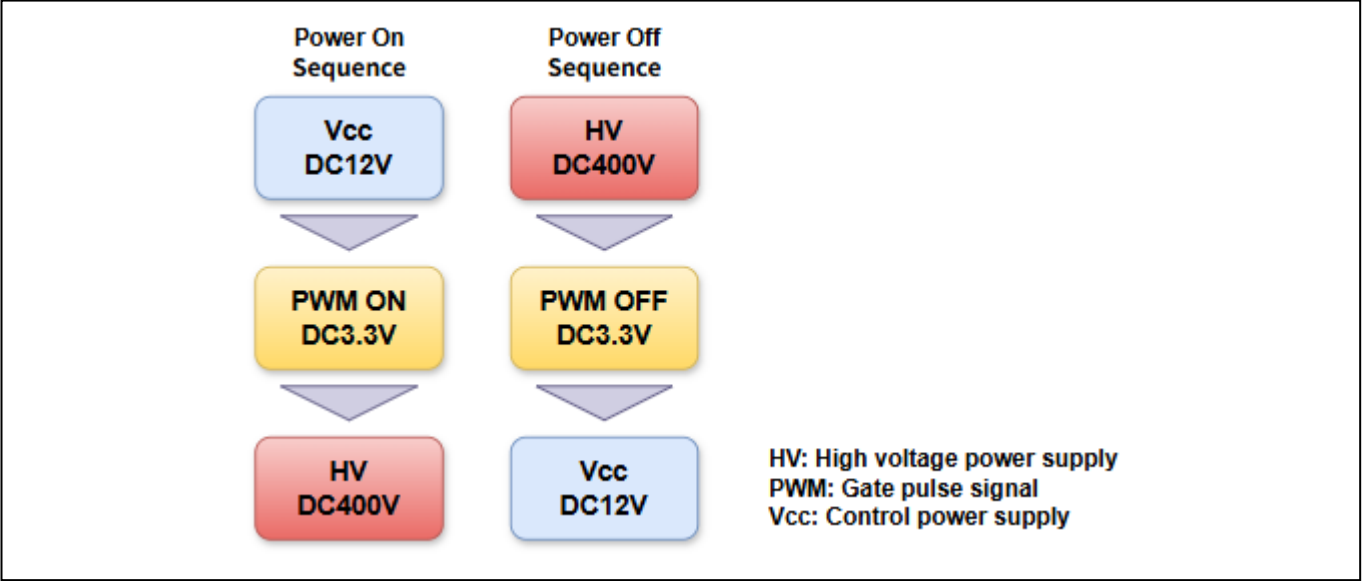


Figure 1-1. On/Off sequence

2. LED Display

The board is equipped with LEDs showing the status of the control power supply. These LEDs are mounted above the control power supply terminal J1 and on the gate driver boards. The detailed locations of the LEDs are shown in Figures 2-1 and 2-2, and their details are shown in Table 2-1.

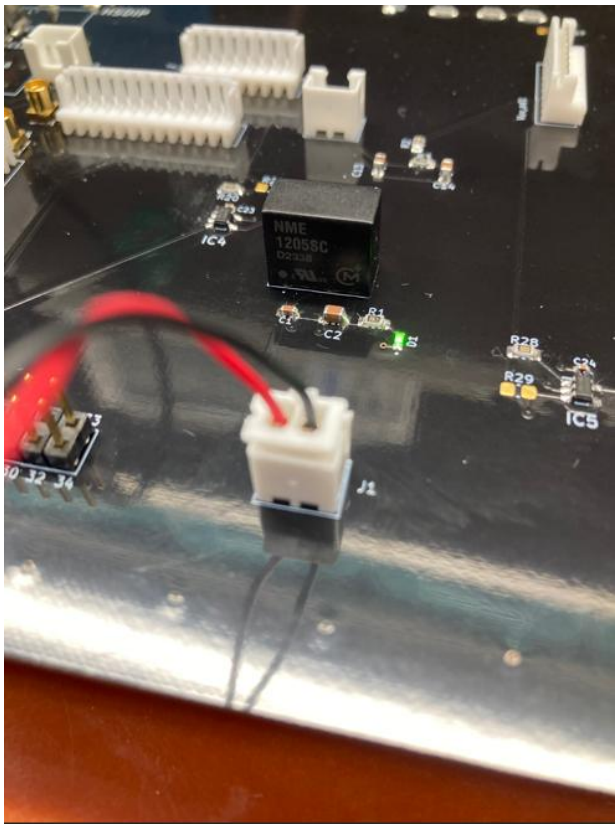


Figure 2-1. Control power supply LED

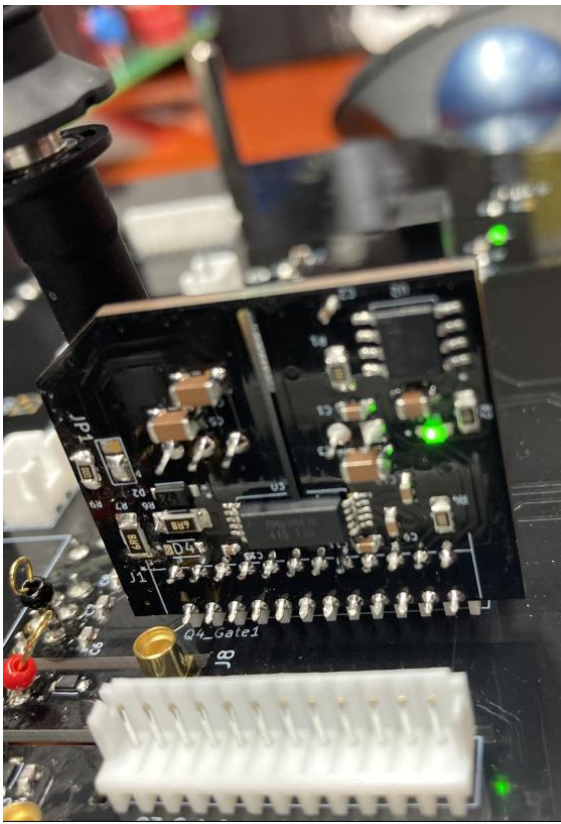


Figure 2-2. Gate driver power supply LED

Table 2-1. LED lights and their meanings

Designator	Color	Lighting status	Details
D1	Green	On	Normal operation (DC 10.8 V to 13.2 V). Testing can be performed.
		Off	Error condition. Please verify that the control power supply is within the normal operating range.
D8	Green	On	Normal operation (DC 10.8 V to 13.2 V). Testing can be performed.
		Off	Error condition. Please verify that the control power supply is within the normal operating range.
D1 (GD)*	Green	On	Normal operation (DC 10.8 V to 13.2 V). Testing can be performed.
		Off	Interrupt the control power supply, insert the gate driver board again, and apply the control power supply again.

*An LED on a gate driver board.

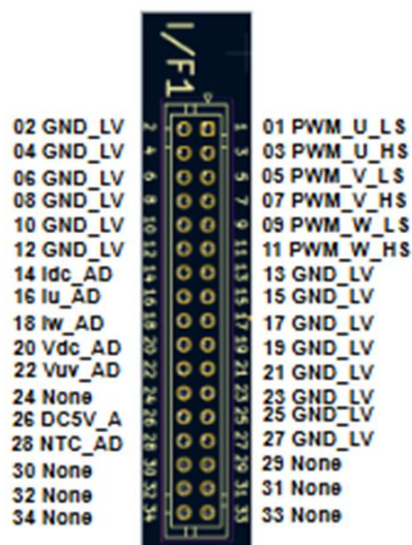
3. Connector pin assignment

The pin assignment of the control power supply input connector (J1) and the control signal interface connectors (I/F1, I/F2) are shown in Figure 3-1. Use one of the control signal interface connectors. In addition, the definitions of the power supply pins and signals are shown in Tables 3-1 and 3-2.

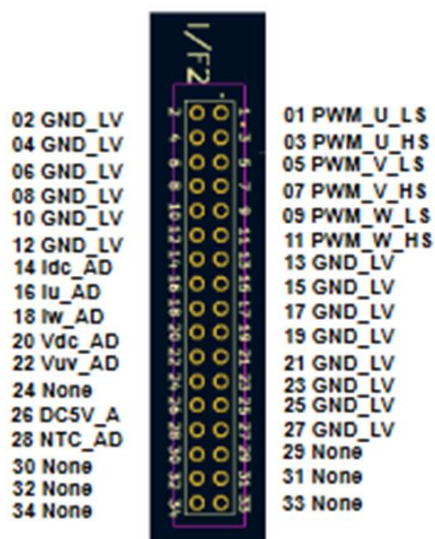
1) J1 Control power supply connector (Part Number : XH_B2B)



2) I/F1 Control signal I/O connector (Part Number : B34B-PHDSS)



3) I/F2 Control signal I/O connector (Part Number : 2.54mm pitch Pin header)



4) J15 Built-in thermistor connector (Part Number : XH_B2B)



Figure 3-1. Connector pin assignment (top view)

Table 3-1. Definitions of power supply pins

Designator	Signal	Description
J14	HV_P	Connect it to the P side of inverter DC voltage (M5 screws included).
J16	HV_N	Connect it to the N side of inverter DC voltage (M5 screws included). This is separated from GND of the control circuit.
J13	HV_U	Connect it to the U-phase of the 3-phase load (M5 screws included).
J12	HV_V	Connect it to the V-phase of the 3-phase load (M5 screws included).
J11	HV_W	Connect it to the W-phase of the 3-phase load (M5 screws included).

Table 3-2. Definitions of control signals

Signal name	I/O	Description
PWM_U_LS	I	Gate signal of the inverter U-phase low-side (3.3 to 5.0 V). Turns on the power element at the "H" level. Pull it down when open.
PWM_U_HS	I	Gate signal of the inverter U-phase high-side (3.3 to 5.0 V). Turns on the power element at the "H" level. Pull it down when open.
PWM_V_LS	I	Gate signal of the inverter V-phase low-side (3.3 to 5.0 V). Turns on the power element at the "H" level. Pull it down when open.
PWM_V_HS	I	Gate signal of the inverter V-phase high-side (3.3 to 5.0 V). Turns on the power element at the "H" level. Pull it down when open.
PWM_W_LS	I	Gate signal of the inverter W-phase low-side (3.3 to 5.0 V). Turns on the power element at the "H" level. Pull it down when open.
PWM_W_HS	I	Gate signal of the inverter W-phase high-side (3.3 to 5.0 V). Turns on the power element at the "H" level. Pull it down when open.
Idc_AD	O	Analog signals can be acquired. When not in use, leave it in an open (floating) state.
Iu_AD	O	Analog signals can be acquired. When not in use, leave it in an open (floating) state.
Iw_AD	O	Analog signals can be acquired. When not in use, leave it in an open (floating) state.
Vdc_AD	O	Analog signals can be acquired. When not in use, leave it in an open (floating) state.
Vuv_AD	O	Analog signals can be acquired. When not in use, leave it in an open (floating) state.
DC5V_A	O	5 V power supply for externally additional contacts and other purposes. Use it with a load current of 80 mA or less.
NTC_AD	O	Thermistor signal can be acquired. When not in use, leave it in an open (floating) state.

4. Experiment procedure

4.1. Procedure for powering up

Step (1): Wire the main circuit part as shown in the examples of Figures 4-1. and 4-2. The screw size of the terminals on the main circuit part is M5.

For safety, use ring terminals with an inner diameter of M5. In addition, be sure to tighten a screw completely.

For the details of signal pins, see Chapter 3. For the mounting method of a continuous conduction heat sink, see the User's Manual.

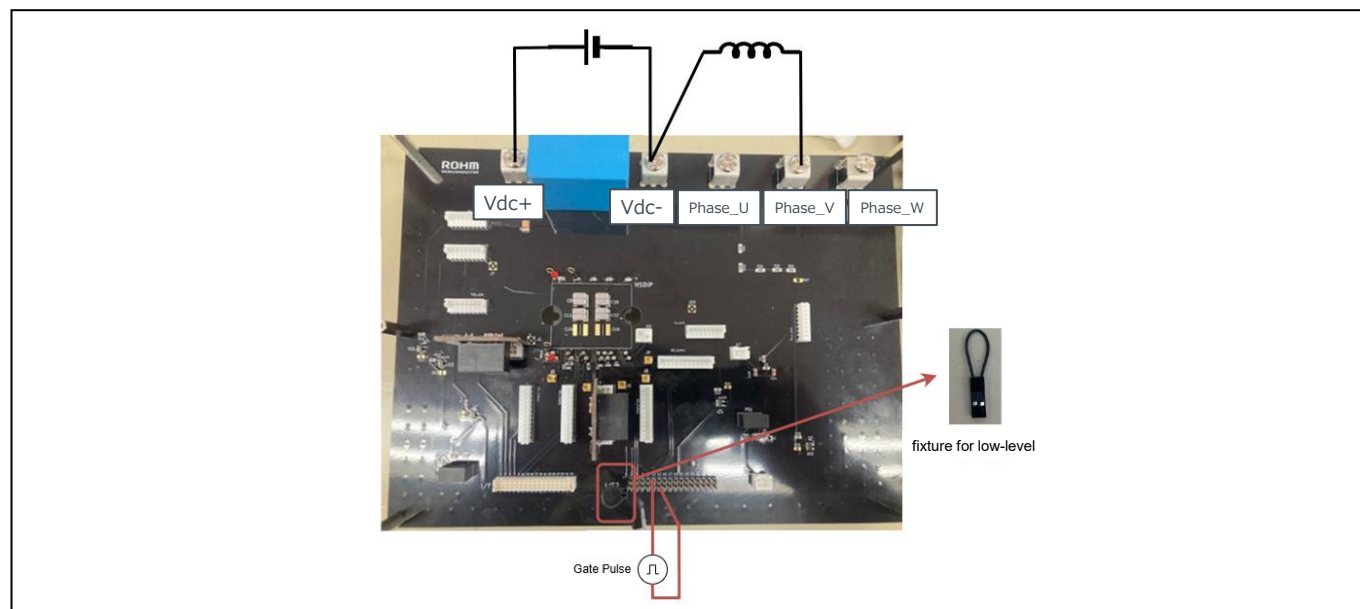


Figure 4-1. Example of main circuit wiring for DPT testing

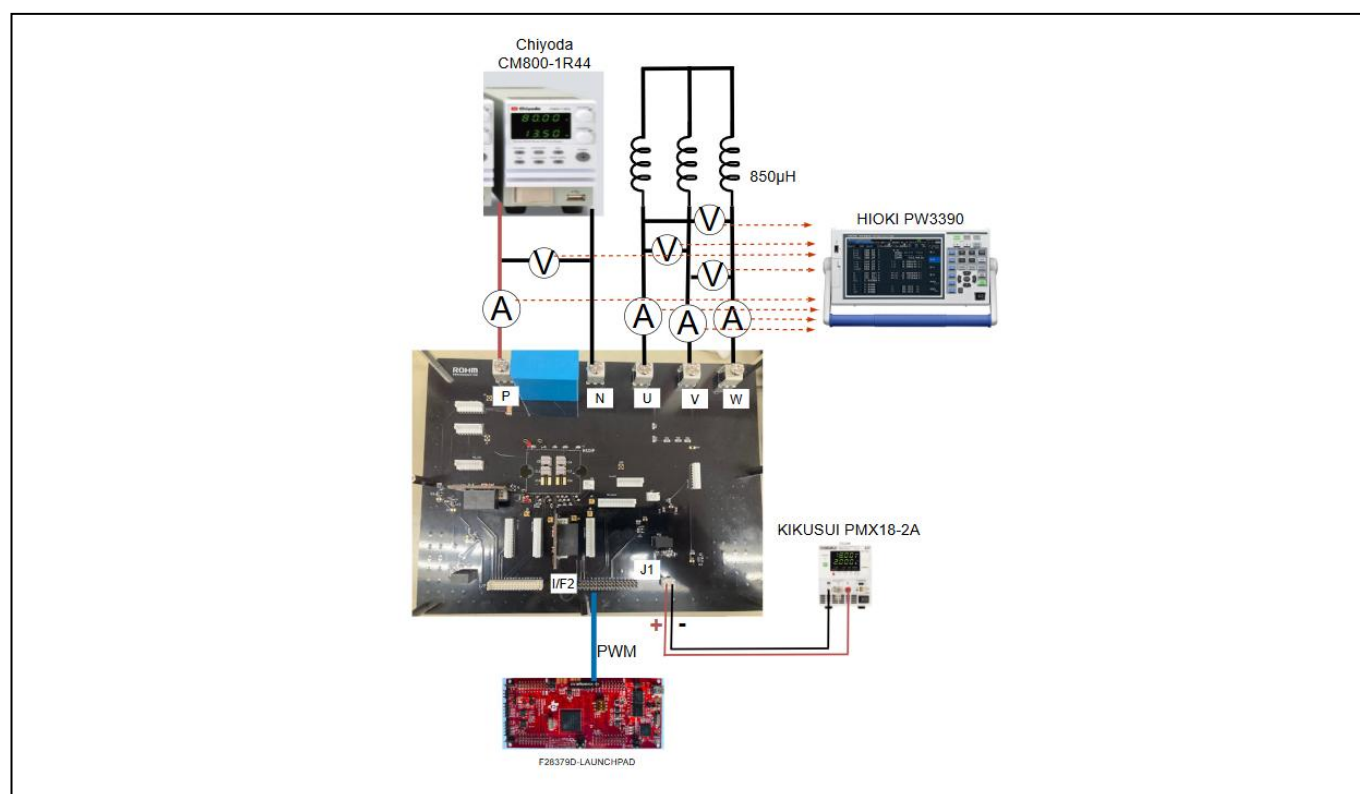


Figure 4-2. Example of main circuit wiring for continuous conduction

Step (2): Insert a gate driver board with any gate resistor mounted straight into the specified connector until it is locked.
The insertion direction and positions are shown in Figures 4-3. and 4-4., respectively.

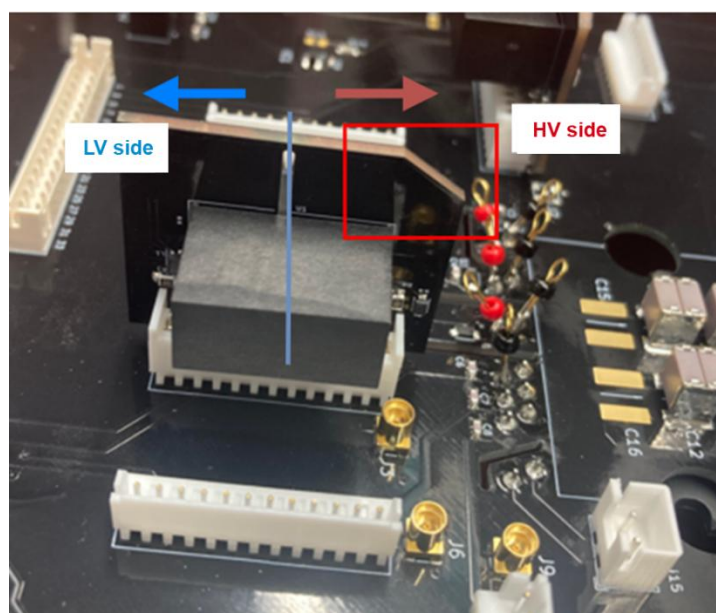


Figure 4-3. Direction of the gate driver board (the chamfer framed in red is to be placed on the HV side)

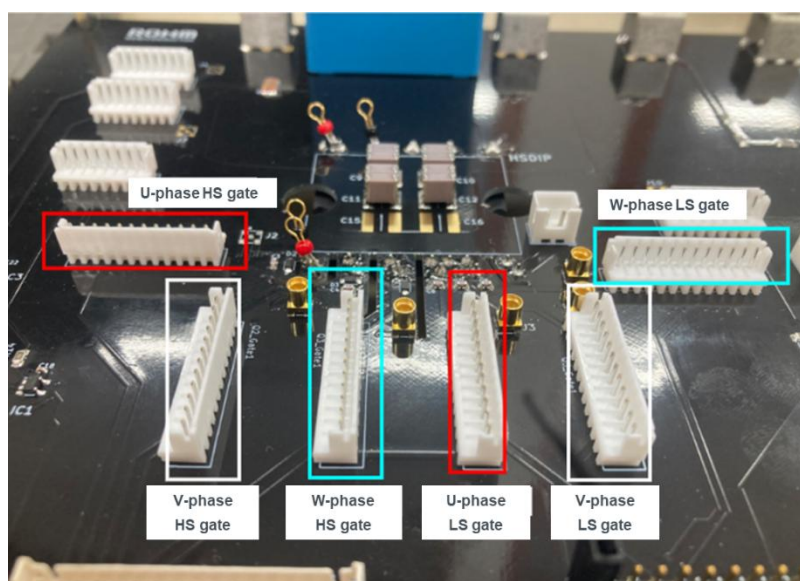


Figure 4-4. Arrangement of gate driver board connectors

Step (3): After checking wiring and the inserted module boards, apply the control power supply (10.8 to 13.2 V DC) and check that all the LEDs on the boards are normally lit. For the details of LED positions, see chapter 2.

Step (4): Start up the high-voltage power supply and slowly apply a voltage until it reaches the test voltage. The design voltage of the board is 400 Vdc.

Step (5): Make the MCU connected to I/F1 or I/F2 output PWM and other signals and conduct the measurement.

4.2. Procedure for powering down

Step (1): Set the output of the high-voltage source to “0” and wait for about two seconds. Be sure to check that residual electric charges in the power supply connected to the film condenser of the main circuit and other components are completely consumed by loads.

Step (2): Stop PWM signals output from the MCU.

Step (3): Turn off the control power supply and then check that all the LEDs on the boards are turned off.

Step (4): Disassemble measurement lines and the main circuit wiring if necessary.

4.3 Procedure for changing gate resistors during testing

Step (1): Set the output of the high-voltage source to “0” and wait for about two seconds. Be sure to check that residual electric charges in the power supply connected to the film condenser of the main circuit and other components are completely consumed by loads.

Step (2): Stop PWM signals output from the MCU.

Step (3): Turn off the control power supply and then check that all the LEDs on the boards are turned off.

Step (4): Pull out a gate driver module straight and change gate resistors. For the positions of gate resistors, see chapter 5 of the User's Manual.

Step (5): Return the gate driver module and resume the experiment from Step (3) of “Procedure for powering up.”

Revision history

Version	Date	Description
1.0	2026/1/20	Originally issued.
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