

3-Phase AC 400 V Input PFC Converter

Reference Guide

RD044-RGUIDE-01

TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION

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1. Introduction

This reference guide describes the specifications, usage, and characteristics of the 3-phase AC 400 V input-compatible PFC power supply (this power supply). This power supply can provide 4 kW at the outgoing DC 750 V. Three-phase AC power supply (312 V to 528 V) is input, and DC 750 V is output in a 3-phase totem pole configuration employing a 1200 V SiC MOSFET. It can be applied to various industrial equipment with 3-phase AC power input, such as charging stations for electric vehicles.

2. Specifications

2.1. Power Supply Specifications

Table 2.1 lists the input and output characteristics of this power supply.

Table 2.1 3-Phase AC 400 V Input PFC Power Supply Specifications

| Parameters | Conditions | Minimum | Typical | Maximum | Unit |
|--|------------|---------|---------|---------|------|
| Input Characteristics | | | | | |
| AC input voltage (line-to-line rms) | | 312 | | 528 | V |
| AC Input frequency | | 49.8 | | 60.3 | Hz |
| AC input current (rms) | | | | 6.2 | A |
| | | | | | |
| Output characteristics | | | | | |
| Output voltage | | 742 | 750 | 758 | V |
| Output current | | | | 42 | A |
| Output power | | | | 4000 | W |
| Switching frequency | | | 50 | | kHz |

2.2. External View of This Power Supply

Fig. 2.1 shows the appearance of this power supply.

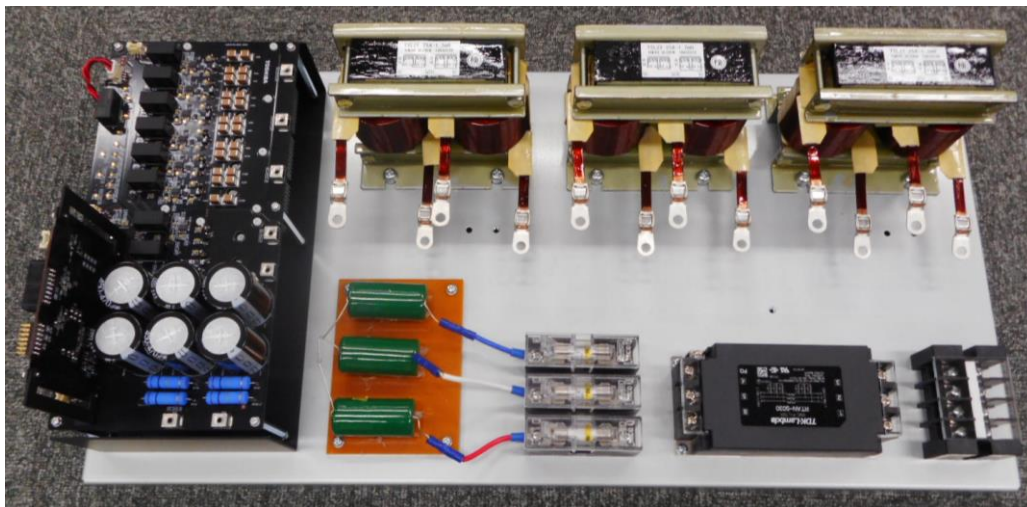


Fig. 2.1 External View of This Power Supply

External Dimensions : 500 mm x 320 mm x 160 mm

2.3. Block Diagram

Fig. 2.2 shows a block diagram to understand the function operation. Fig. 2.2 Block Diagram For actual circuit diagrams, refer to RD044-SCHEMATIC1-01 (main circuit board), RD044-SCHEMATIC2-01 (control board), RD044-BOM1-01_E (main circuit board) and RD044-BOM2-01_E (control board).

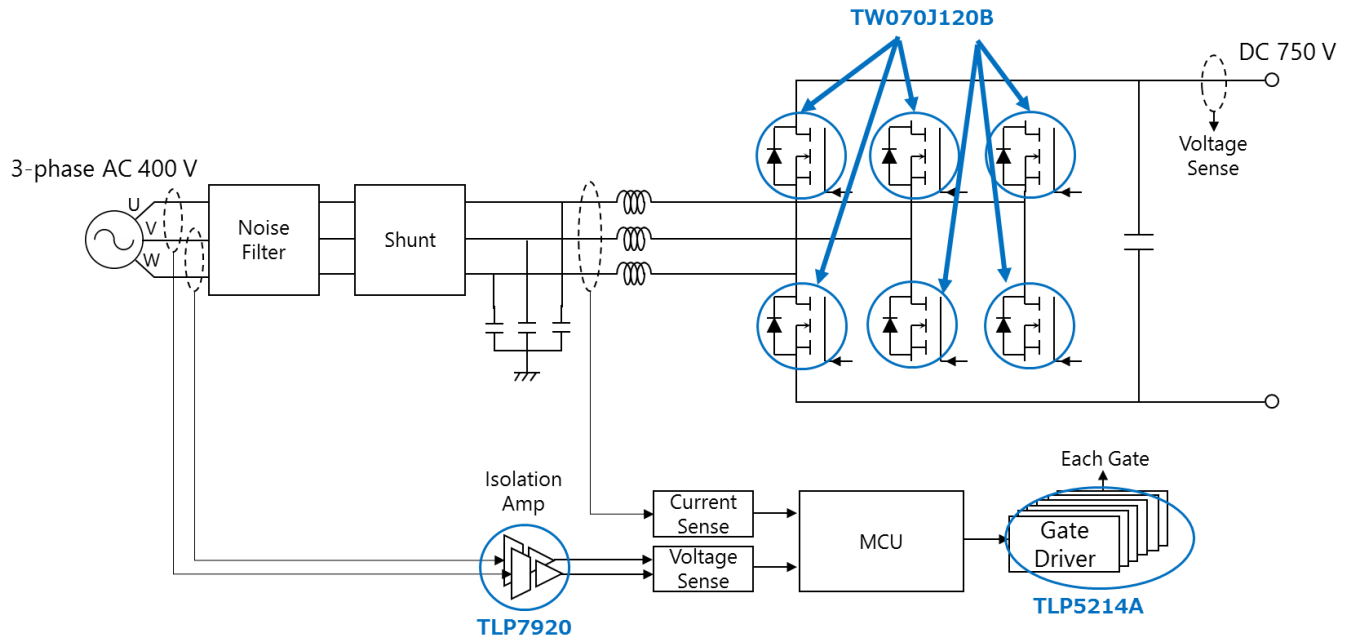


Fig. 2.2 Block Diagram

3. Operating Procedure

3.1. Wiring Connection

Prepare the wiring connections for each part of the power supply according to the connection diagram shown in Fig. 3.1.

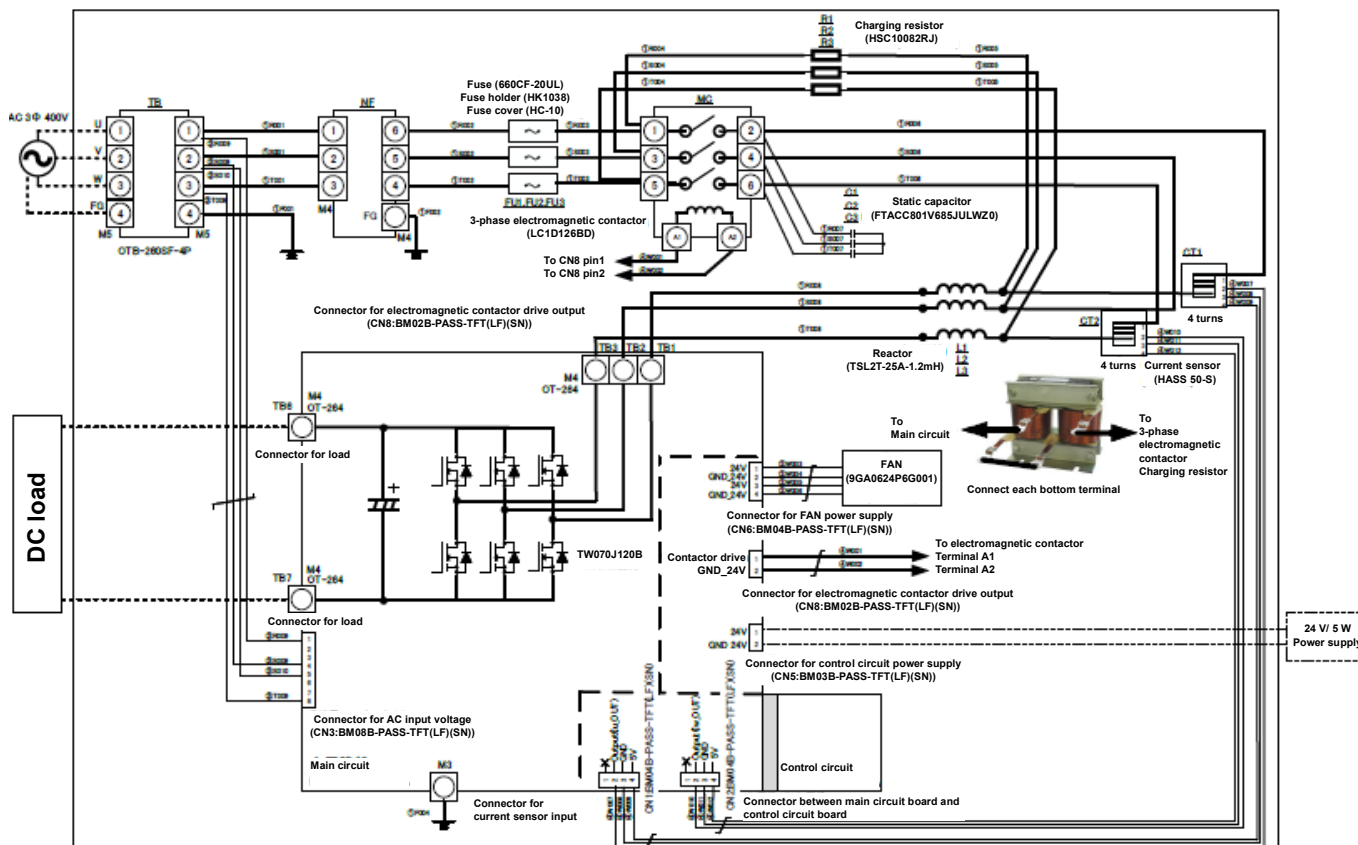


Fig. 3.1 Wiring Connection Diagram

3.2. Connecting to an External Device

Connect a stabilized power supply that outputs 3-phase AC to the input terminal of this power supply and a load unit to the output terminal. Also, connect the 24 V power supply for the control circuit to the control board.

3.3. Start and Stop Procedures

Before starting the power supply, check that the input and output pin voltages are all 0 V.

[Power-up Procedure]

1. Turn on the 24 V power supply for the control circuit.
2. Turn on the stabilized power supply.

[Power-off Procedure]

1. Shut down the stabilized power supply.
2. Stop the 24 V power supply for the control circuit.

3.4. Evaluation Precautions (Electric Shock, Burn Injury, etc.)

Be careful of electric shock when connecting a stabilized power supply. Do not touch each part of the power supply directly while the power is on. Be very careful when observing the waveform. Even after this power supply is stopped, there is a risk of electric shock due to the remained charge of various capacitors. Confirm that the voltage of each part has decreased sufficiently before touching the board.

In addition, the semiconductor or inductor of this power supply generates heat according to the load current. Do not touch each part of the power supply while the power supply is in operation, as there is a risk of burns.

4. Power Characteristics

The power supply efficiency measurement results of this power supply are described below.

4.1. Efficiency

Fig. 4.1 shows the power supply efficiency measurement results of this power supply. The output voltage of the AC stabilized power supply is set to 400 V and measured. The efficiency is as high as 97.3% when the load power is 100%.

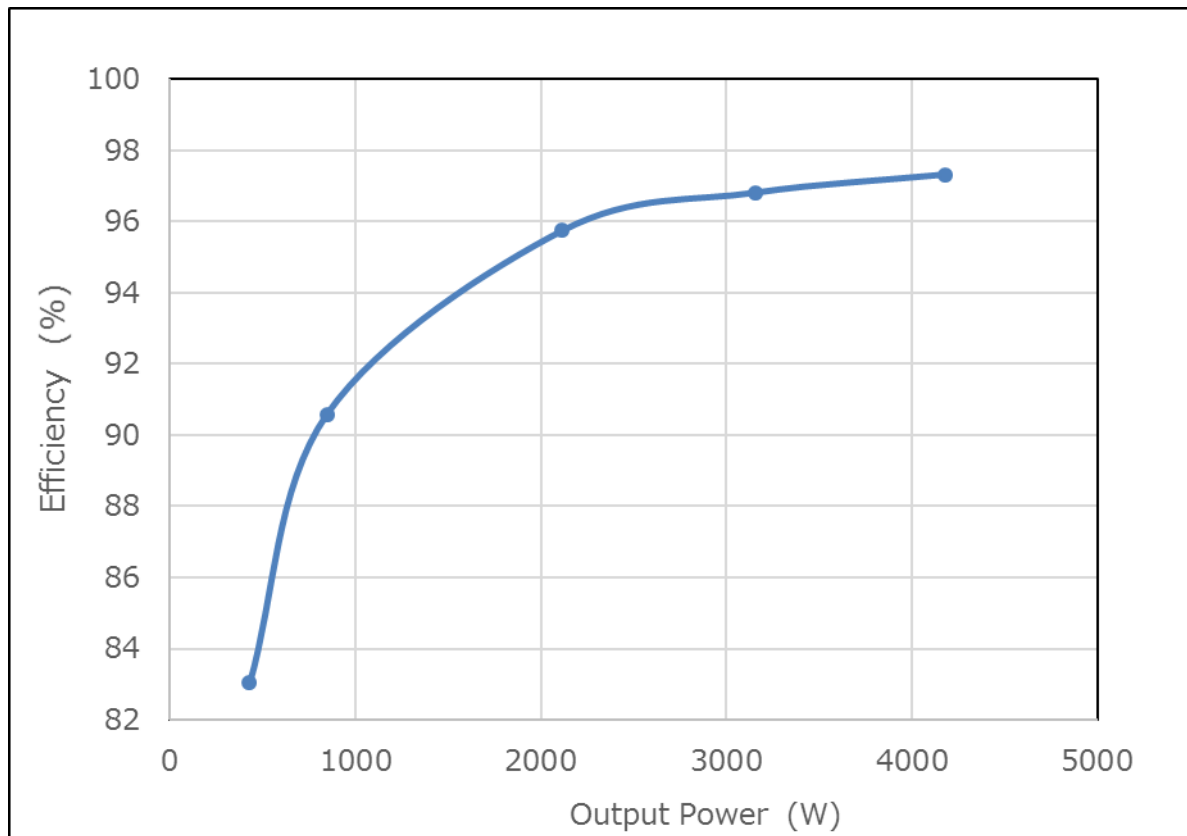


Fig. 4.1 Efficiency Measurement Results ($V_{in} = 400\text{ V}$)

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