1.6 kW T-Type 3-Level PFC Power Supply

Reference Guide

RD172-RGUIDE-01

TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION

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1. Introduction

This reference guide (hereinafter referred to as "this guide") is a document that describes the specifications, usage method, and characteristics of 1.6 kW T-Type 3-Level PFC Power Supply (hereinafter referred to as "this power supply").

2. Specifications

2.1. Power Supply Specifications

Table 2.1 lists the main specifications of this power supply.

Table 2.1 Specifications of 1.6 kW T-Type 3-Level PFC Power Supply

Item	Specification	Remark
AC Input Voltage Range	90 to 264 V	
AC Input Frequency Range	47 to 53 Hz, 57 to 63 Hz	Considering the fundamental frequency is 50 Hz / 60 Hz.
DC Output Rated Voltage	380 V	
Control Power Supply Voltage	DC 24 V	
Gate Voltage	DC 15 V	
DC Output Maximum Current	4.2 A	
Power Rating	1.6 kW @ AC 180 to 264 V 800 W @ AC 90 to 115 V	Between AC 115 V and 180 V with fixed DC output voltage of 380 V the outputs power changes according to the input AC voltage.
Switching Frequency	100 kHz	
Sensor Input	・AC input voltage ・AC input current ・DC output voltage ・DC midpoint voltage	The DC midpoint voltage is the voltage between two series capacitors and the DC output N terminal.

2.2. Block Diagram

Fig. 2.1 shows the block diagram of this power supply. This reference consists of a main circuit board and a control board.

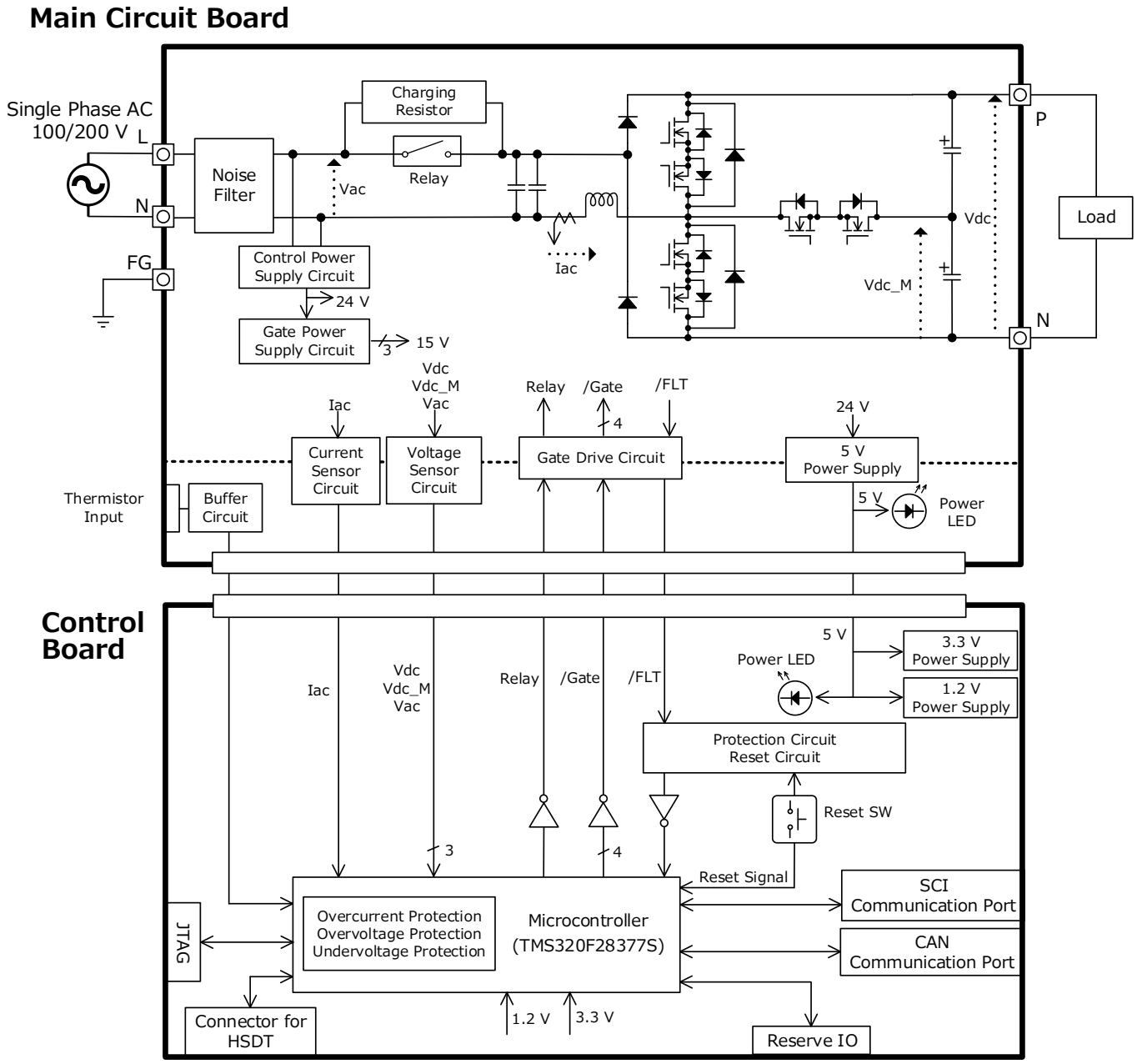


Fig. 2.1 Block Diagram

2.3. External View

Fig. 2.2 and Fig. 2.3 show the appearance of this power supply.

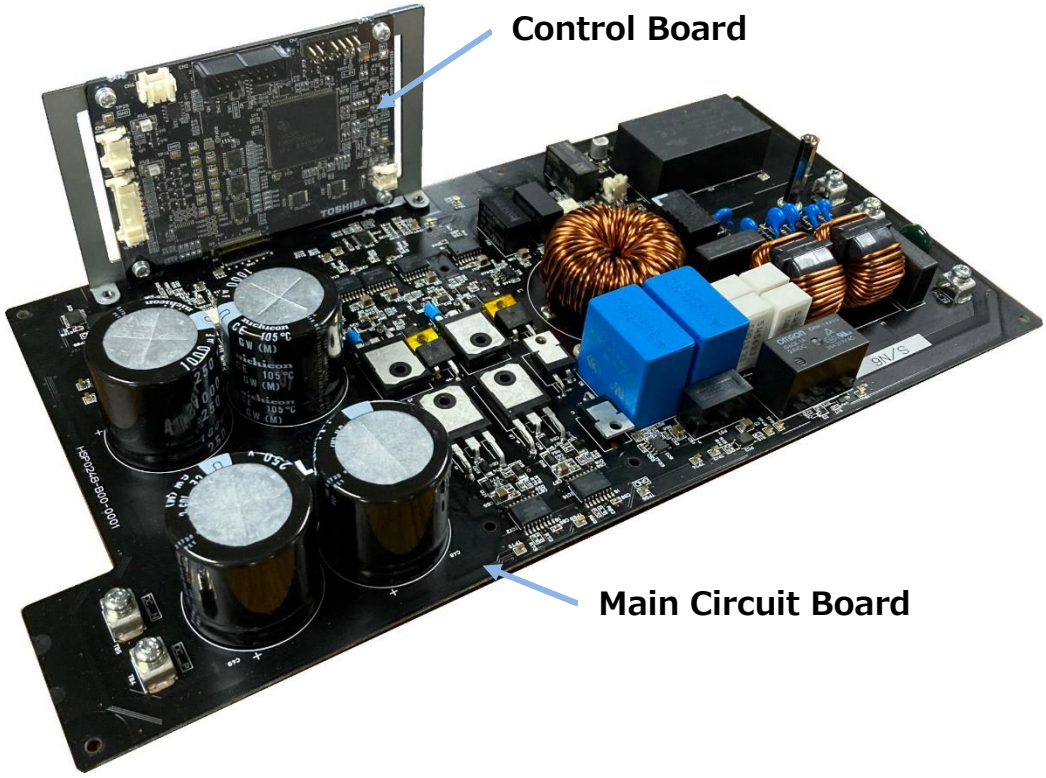


Fig. 2.2 Side View of 1.6 kW T-Type 3-Level PFC Power Supply

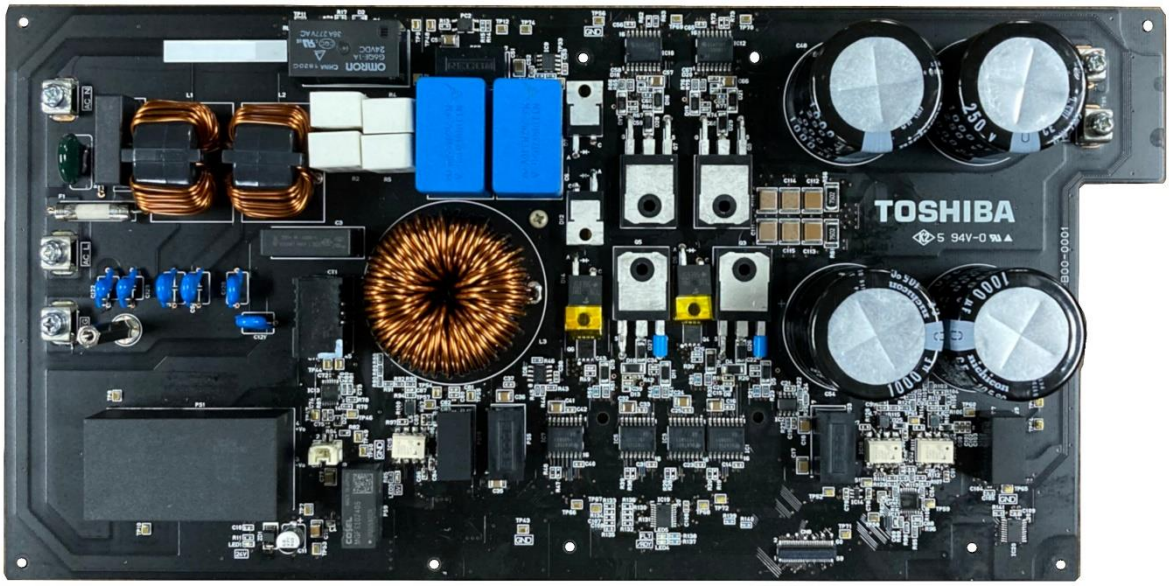
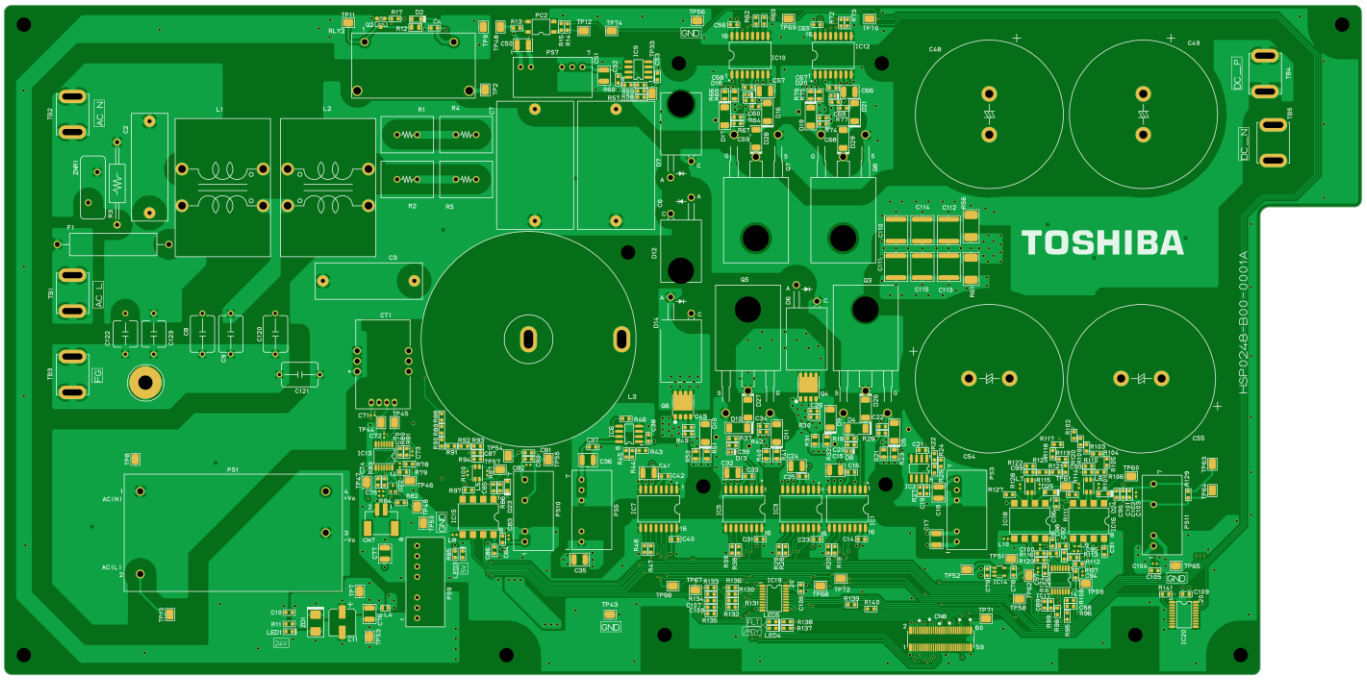


Fig. 2.3 Top view of 1.6 kW T-Type 3-Level PFC Power Supply (Main Circuit Board)

2.4. PCB Component Layout

Fig. 2.4 shows the component layout of the main circuit board of this power supply.



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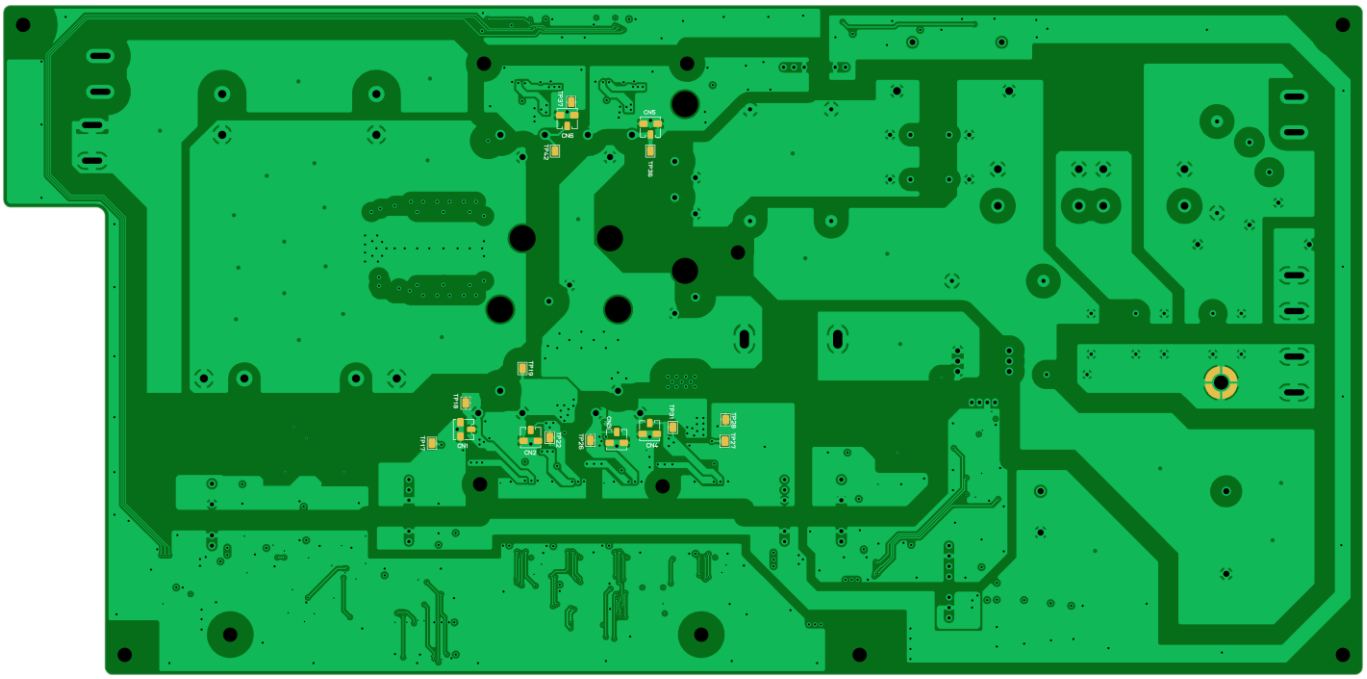


<Back>

Fig. 2.4 Component Layout of 1.6 kW T-Type 3-Level PFC Power Supply (Main Circuit Board)

3. Circuit Diagram, Bill of Material, and PCB Pattern Diagram

3.1 Circuit Diagram

Refer to the following files for the circuit diagram of this power supply.

Main circuit board	RD172-SCHEMATIC-xx.pdf
Control board	RD044-SCHEMATIC2-xx.pdf

(xx is the revision number)

3.2. Bill of Material

Refer to the following files for the Bill of Material (BOM) for this power supply.

Main circuit board	RD172-BOM-xx.pdf
Control board	RD044-BOM2-xx.pdf

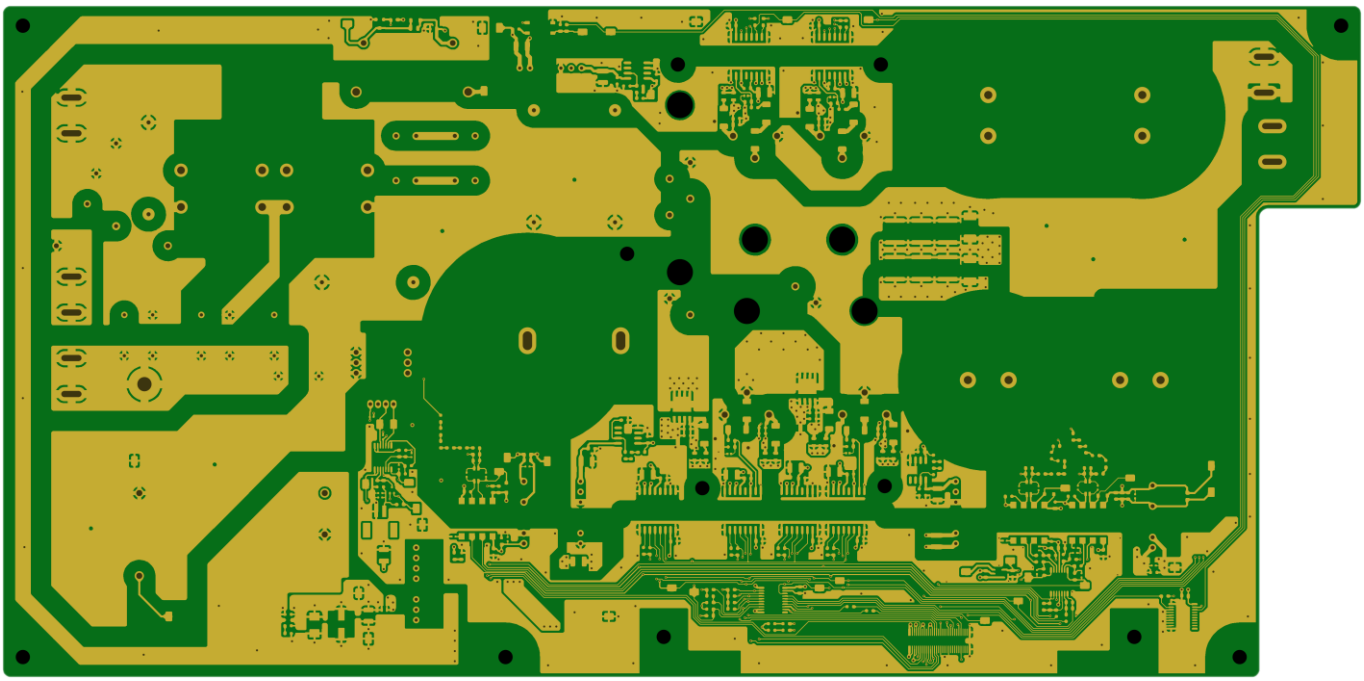
(xx is the revision number)

3.3. PCB Pattern Diagram

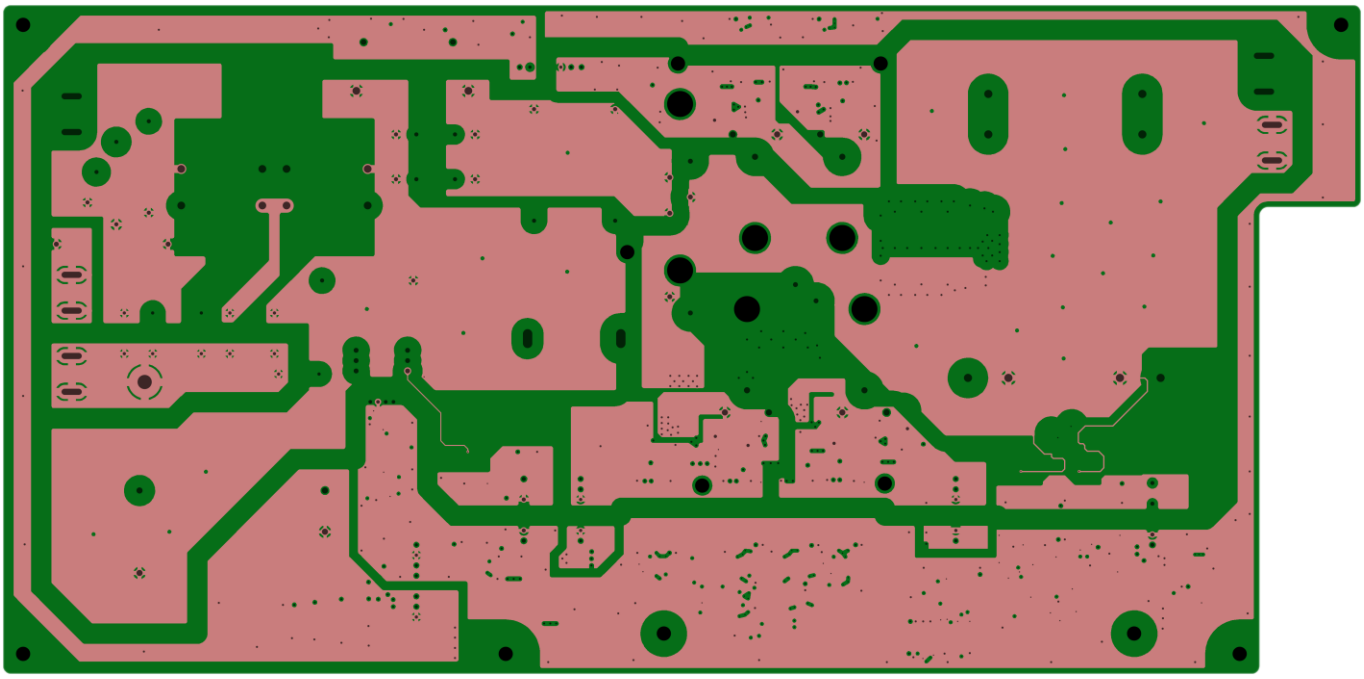
Fig. 3.1 shows the pattern diagram of the main circuit board of this power supply. It is also available in following files:

Main circuit board	RD172-LAYER-xx.pdf
Control board	RD044-LAYER2-xx.pdf

(xx is the revision number)



<Layer1 Front side, Front View>



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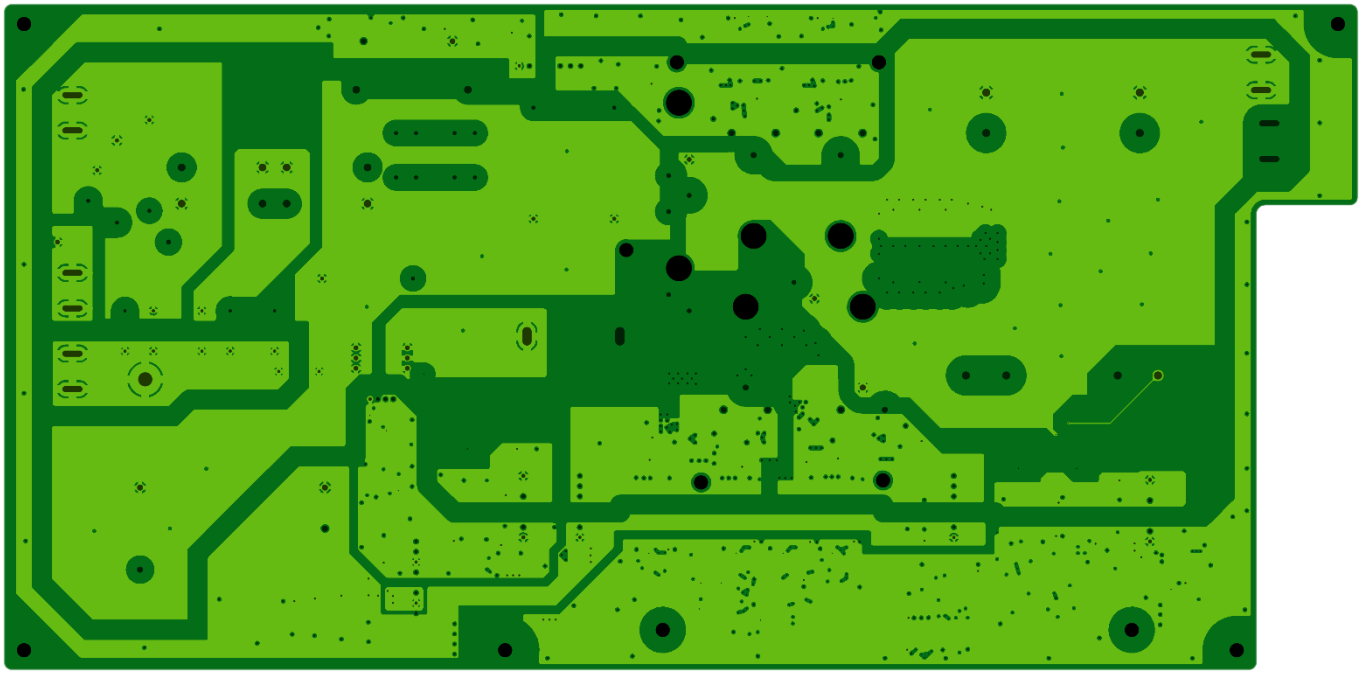
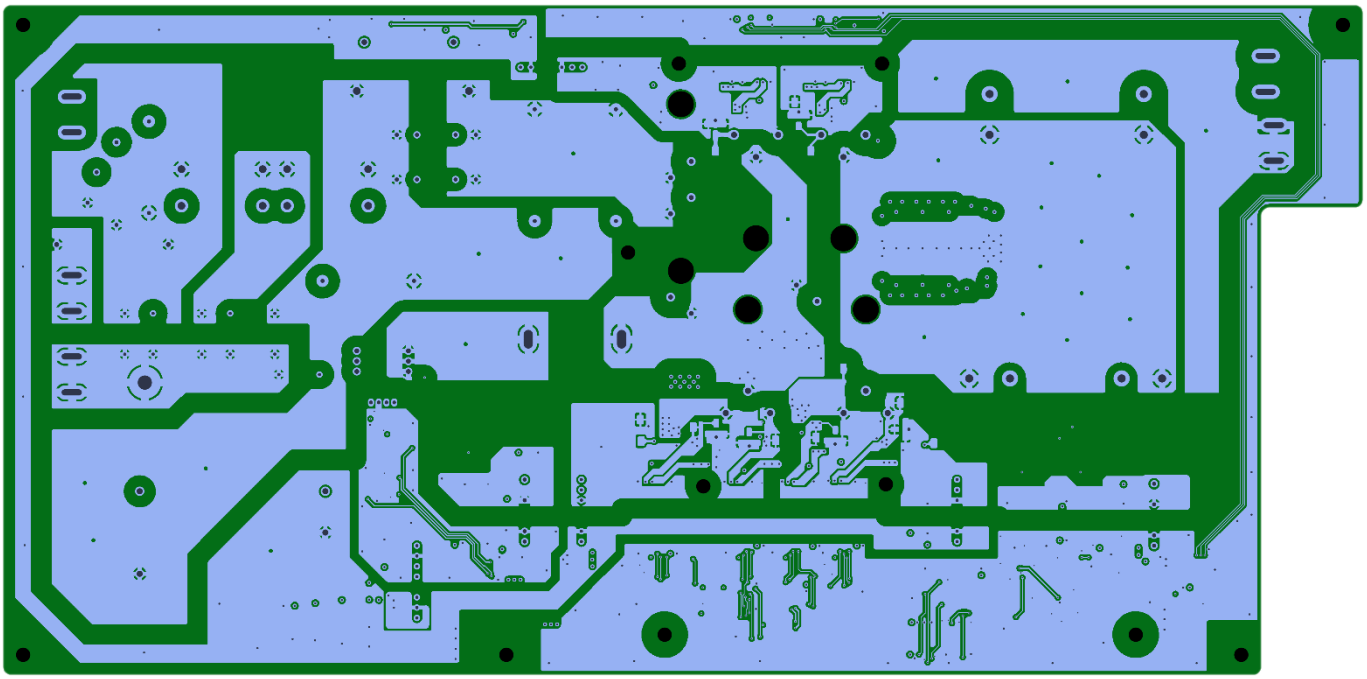


<Layer3、Front View>



<Layer4 Back side, Front View>

Fig. 3.1 Pattern Diagram of 1.6 kW T-Type 3-Level PFC Power Supply (Main Circuit Board)

4. Operating Procedure

4.1. Connections

Connect this power supply as follows.

・Properly ground the FG terminal (TB3).

・Connect the positive side of the load to the P terminal (TB4) and the negative side of the load to the N terminal (TB5).

・Connect a single-phase AC power supply to the L terminal (TB1) and N terminal (TB2).

4.2. Start and Stop Procedures

Before starting up the power supply, check that all input terminals (L terminal, N terminal) and output terminals (P terminal, N terminal) are 0 V.

[Startup Procedure]

1. Turn on the input power supply (L terminal and N terminal).

[Stop Procedure]

1. Turn off the input power supply (L terminal and N terminal).

4.3. Evaluation Precautions (To Prevent Electric Shock, Burn Injury, etc.)

Be careful of electric shock when connecting the power supply. Do not touch any component of the power supply directly while the power is on. Be very careful when observing the waveforms. Even after this power supply is stopped, there is a risk of electric shock due to the residual charge of various capacitors. Do not touch the board before confirming that the voltage of each component has decreased sufficiently.

In addition, the semiconductor devices and inductor of this power supply generates heat according to the load current. Do not touch any component of the power supply while the power supply is in operation, as this can cause burns.

5. Power Characteristics

The efficiency measurement result of this power supply is described below.

5.1. Efficiency

Fig. 4.1 shows the efficiency measurement result of this power supply. The efficiency is 97.3 % at an input voltage of 230 V and an output of 1600 W.

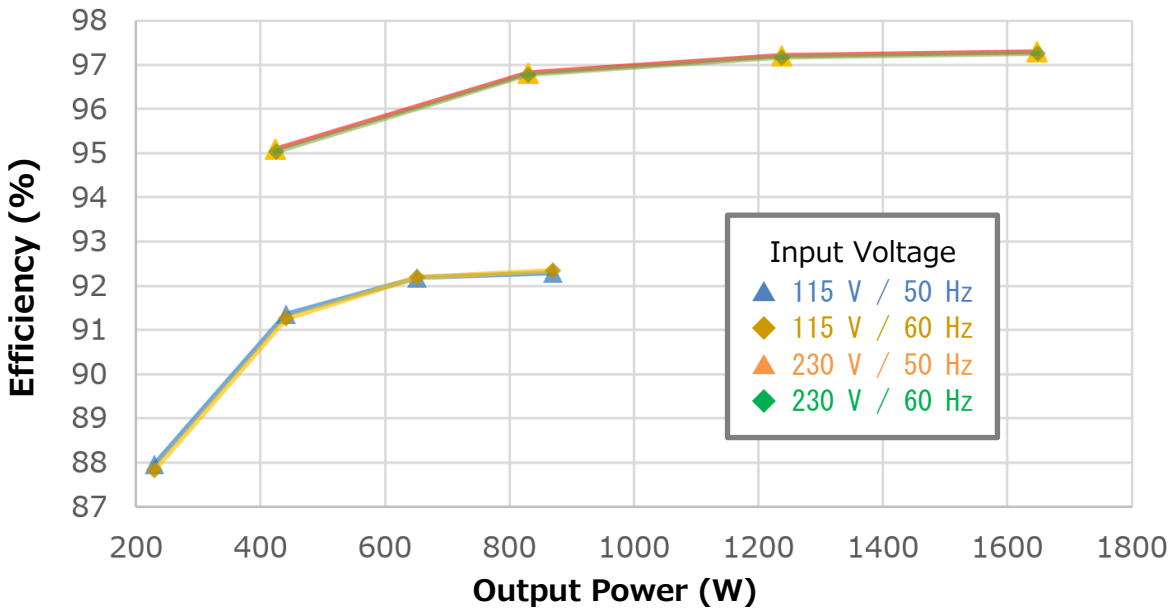


Fig. 4.1 Efficiency Measurement Result

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