

100 W LLC DC-DC Converter

Reference Guide

RD165-RGUIDE-01

TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION

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1. Introduction

This reference guide provides information on the specifications, use, and efficiency of the 100 W LLC DC-DC converter (hereafter referred to as this power supply). It can be used in industrial equipment connected to 24 V output AC-DC converters and various other applications. It provides various design information as a reference design, and contributes to labor saving in the process of designing in accordance with actual specifications.

2. Specifications

2.1. Power Supply Specifications

Table 2.1 lists the I/O characteristics of this power supply.

Table 2.1 Specifications of 100 W LLC DC-DC Converter

Parameter	Conditions	Minimum	Typical	Maximum	Unit
Input Characteristics					
Input Voltage		22.8	24	25.2	V
Input Current	$V_{in} = 22.8 \text{ V}, P_{out} = 100 \text{ W}$			4.4	A
Output Characteristics					
Output Voltage		11.4	12	12.6	V
Output Current				8.8	A
Output Power				100	W
Output Ripple Voltage			200		mV

2.2. External View of Power Supply

Fig. 2.1 shows the appearance of this power supply.

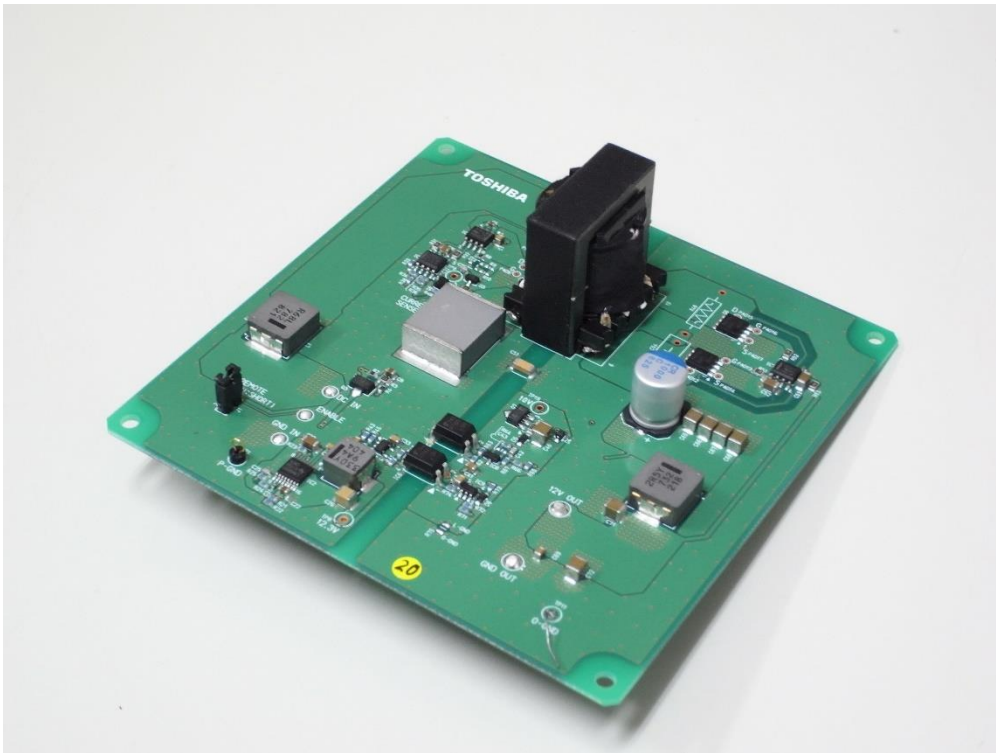


Fig. 2.1 External View of 100W LLC DC-DC Converter

External dimensions: 110 mm x 110 mm x 35 mm (excluding input/output terminals on the rear panel)

2.3. Block Diagram

Fig. 2.2 shows a block diagram of this power supply.

Refer to RD165-SCHEMATIC-01 for the actual schematic and to RD165-BOM-01 for the bill of materials.

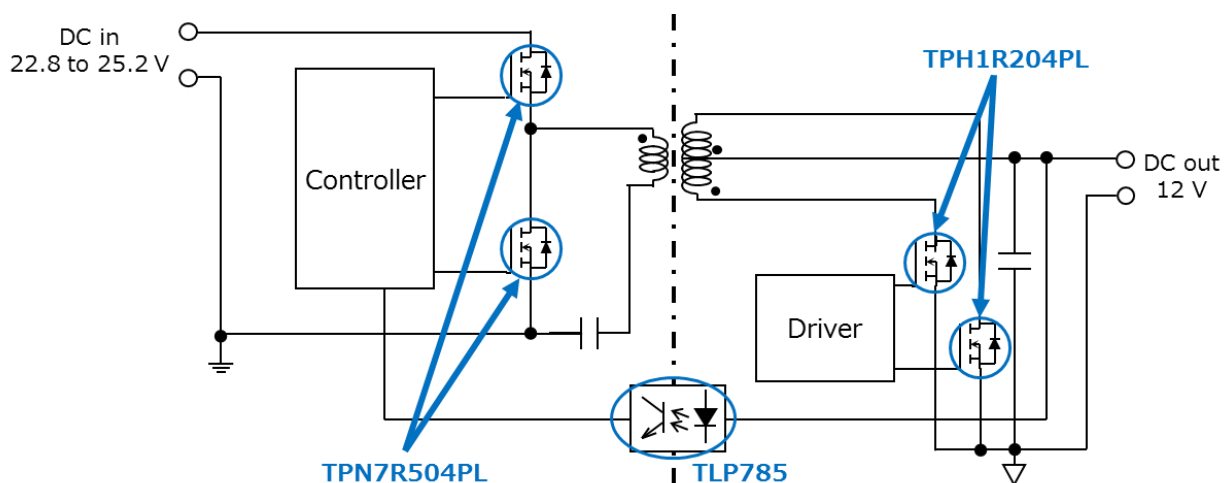


Fig. 2.2 Block Diagram

2.4. PCB Component Layout

Fig. 2.3 and Fig. 2.4 show the layout of components on the PCB of this power supply.

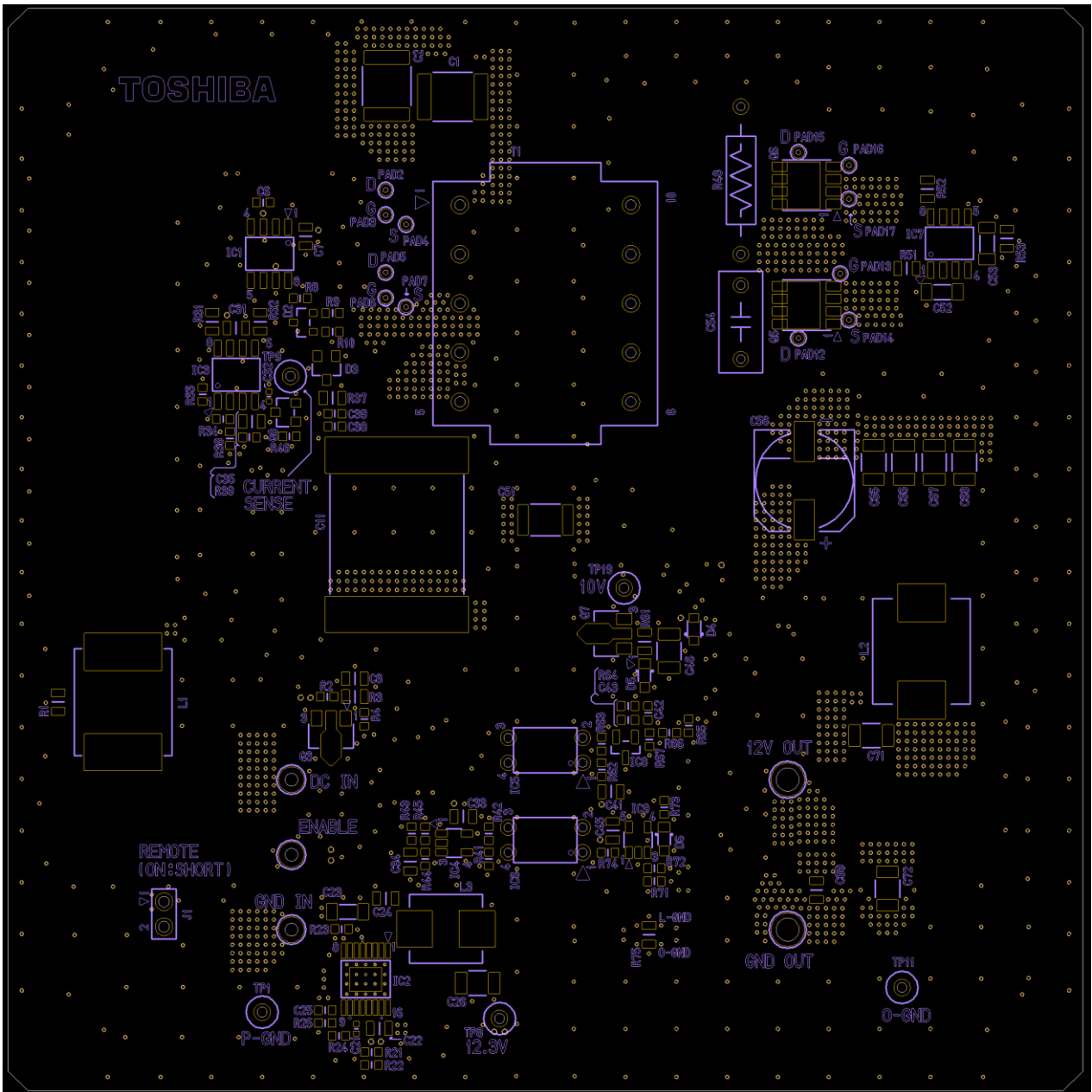


Fig. 2.3 PCB Component Layout (Front Side)

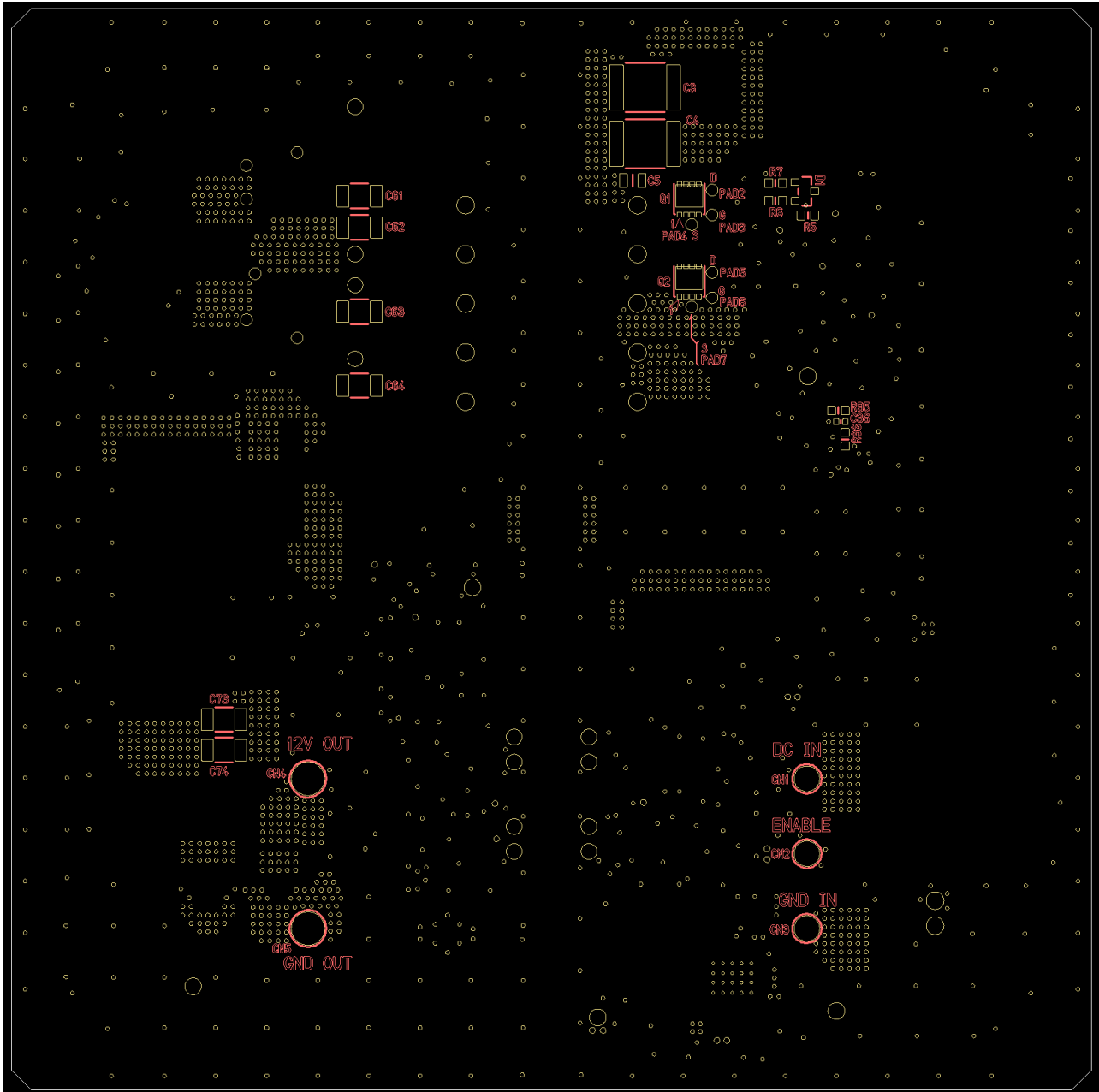


Fig. 2.4 PCB Component Layout (Back Side)

2.5. PCB Pattern

PCB-design data for this power supply compatible with various EDA (Electronic Design Automation) tools is provided in design files. Please refer to it for more information.

Fig. 2.5 shows Layer 1 of the PCB.

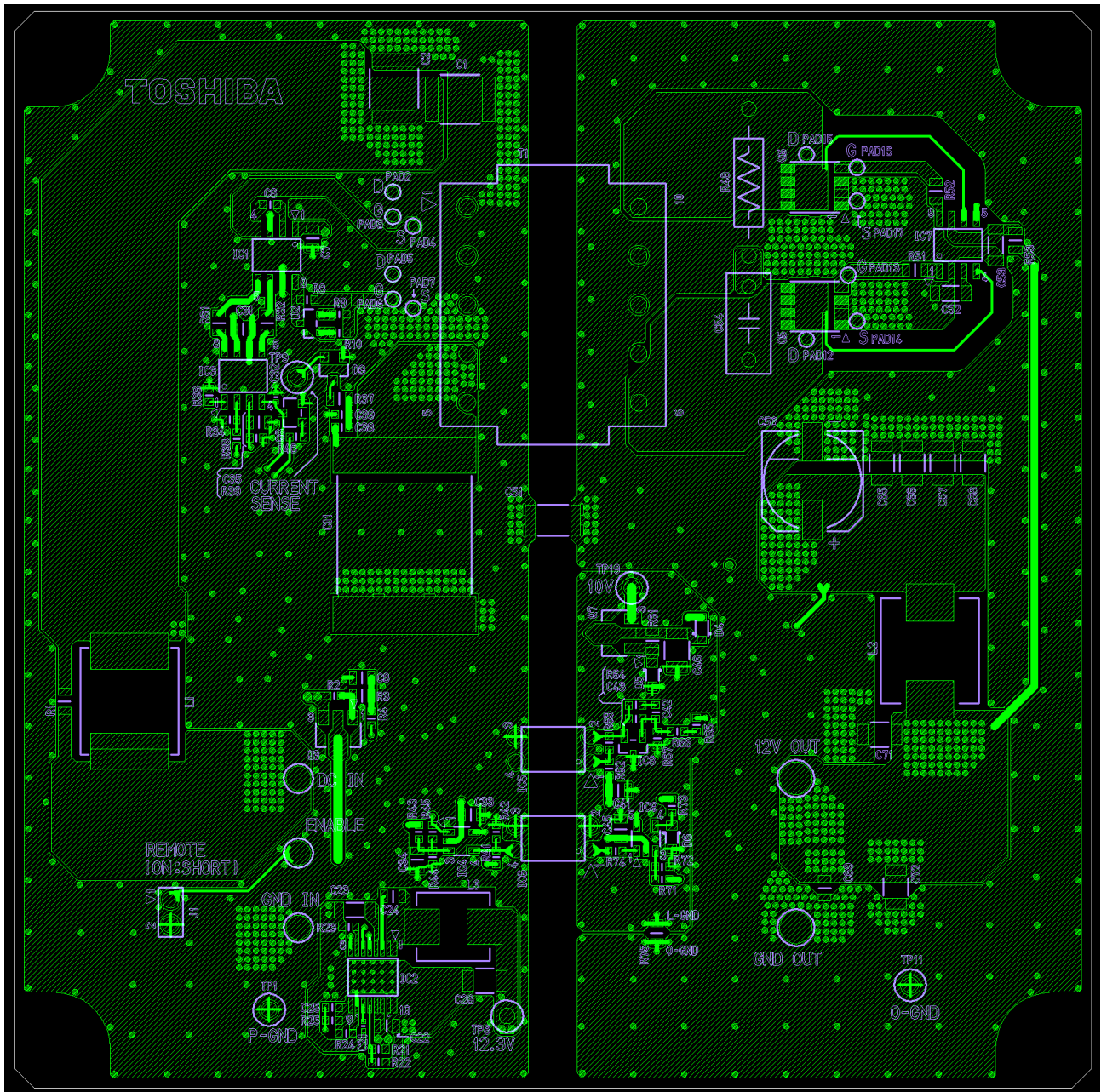


Fig. 2.5 Layer 1

Fig. 2.6 shows Layer 2 of the PCB.

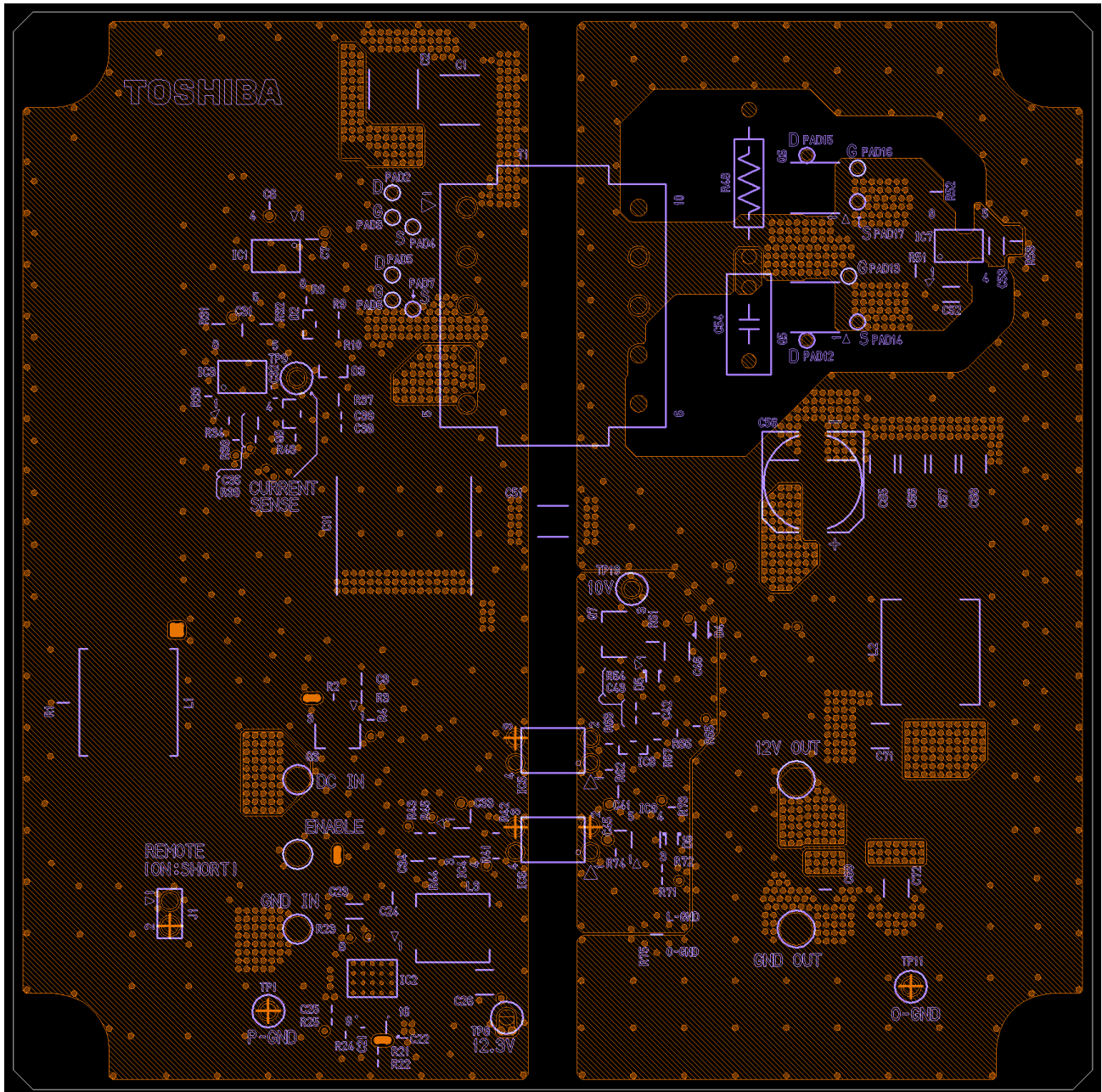


Fig. 2.6 Layer 2

Fig. 2.7 Layer 3

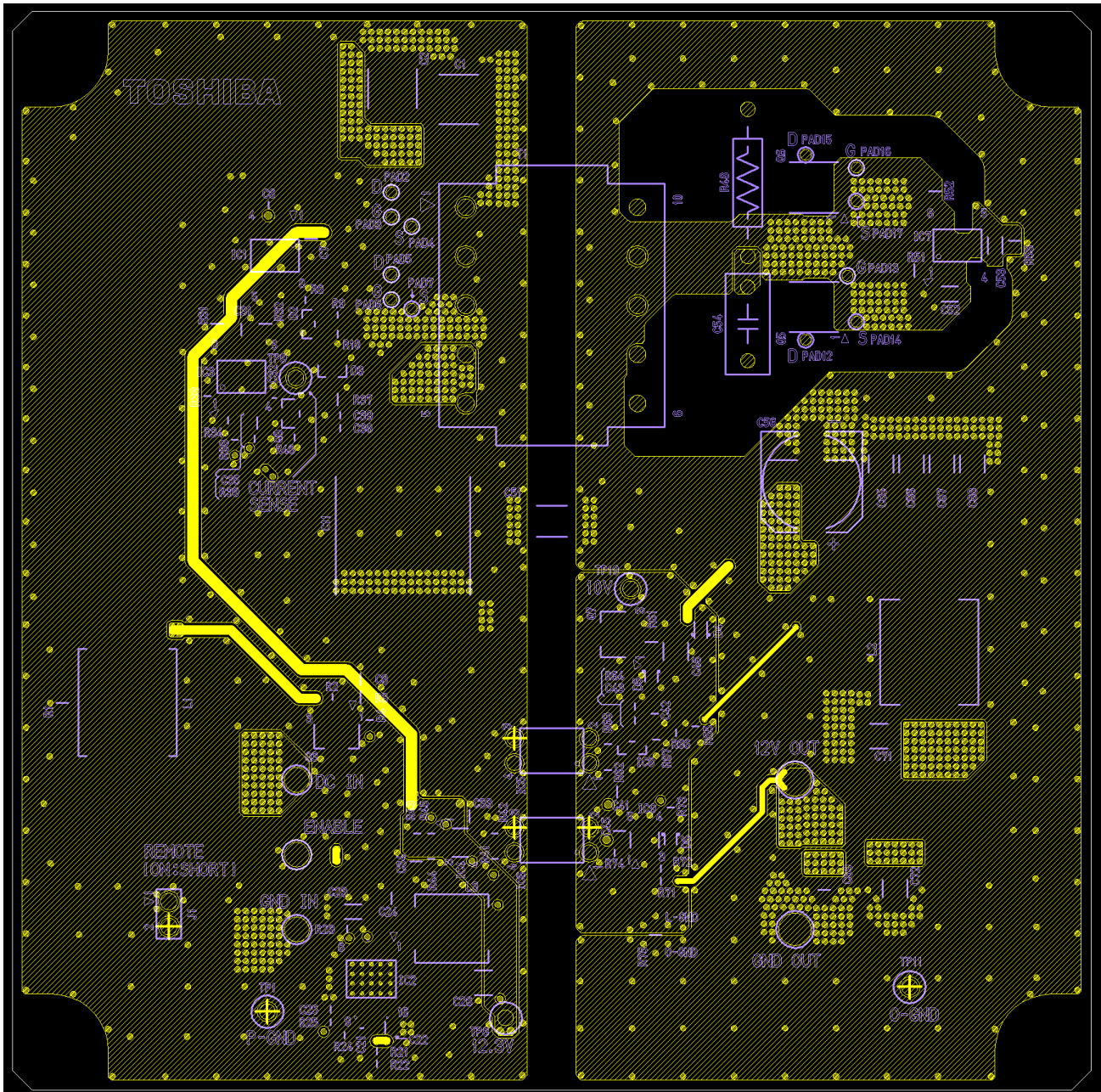


Fig. 2.7 Layer 3

Fig. 2.8 Layer 4

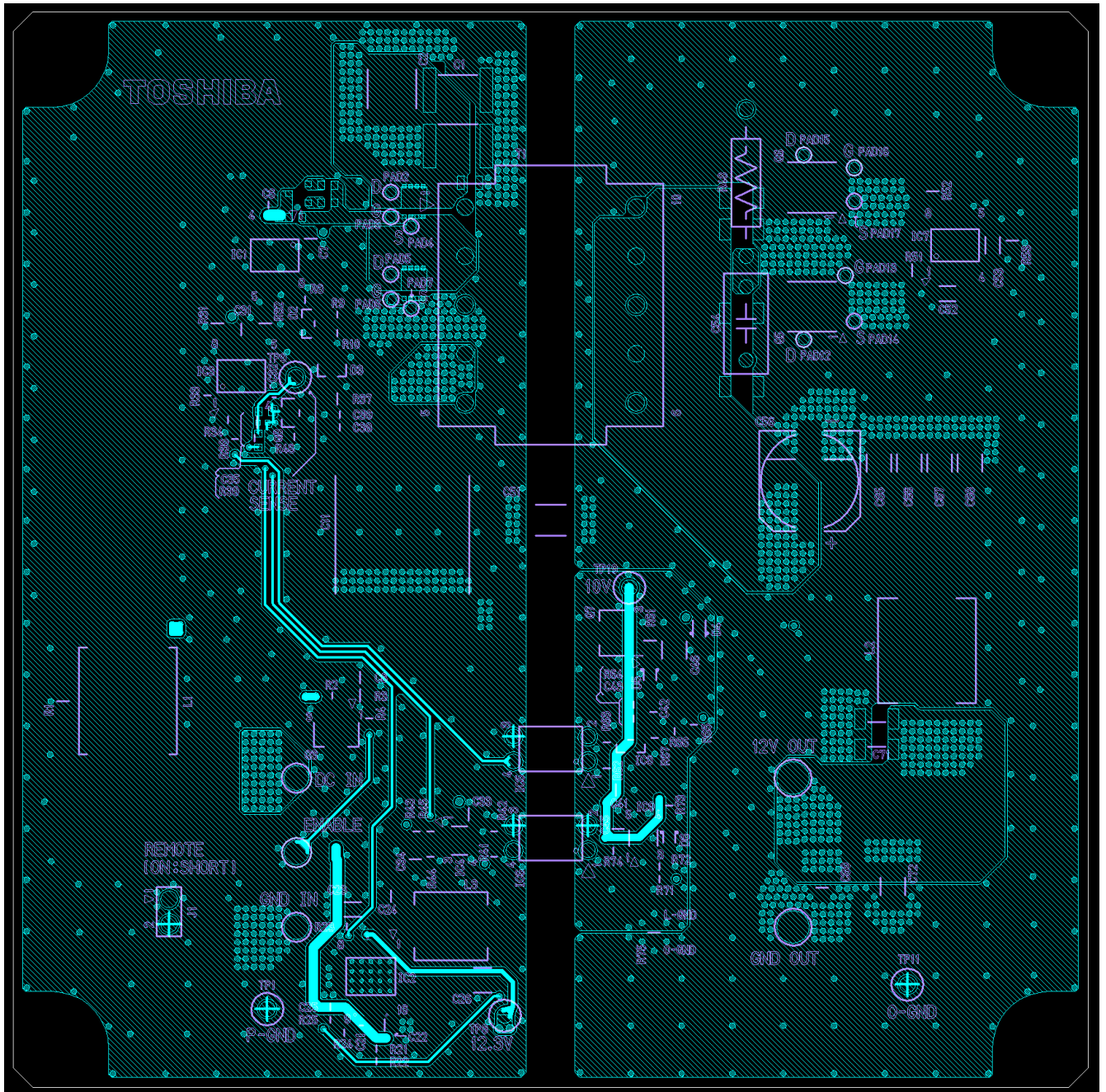


Fig. 2.8 Layer 4

3. Operating Procedure

This section explains the procedure for operating this power supply.

3.1. Connection to External Devices

Fig. 3. 1 External Connection Terminal

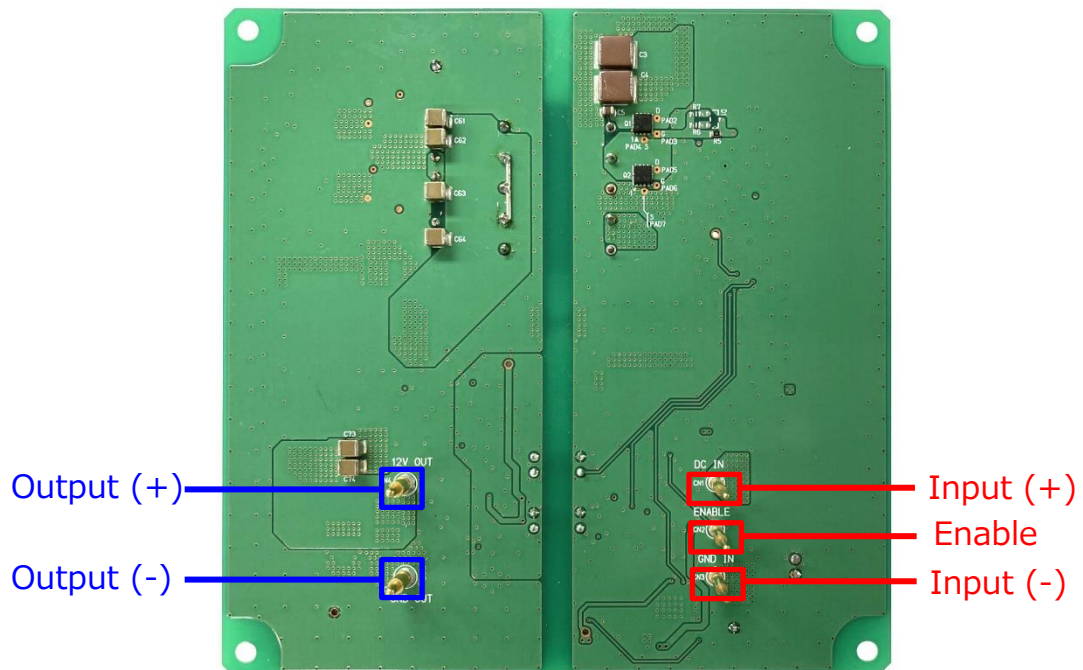


Fig. 3. 1 External Connection Terminals

3.2. Start and Stop Procedures

Before starting the power supply, check that all of the following terminal voltages are 0V.

Input(+) terminal, Input (-) terminal, Output (+) terminal, and Output (-) terminal.

Check that Enable terminal is open.

[Startup Procedure]

1. Turn on the input DC power.
2. Connect Enable terminal to ground.

[Stop Procedure]

1. Open Enable terminal.
2. Turn off the input DC power.

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

Fig. 3.2 Primary and Secondary Areas

In addition, semiconductors, transformer, etc. of this power supply generate heat according to the load current. Fig. 3.3 shows the components with large heat generation using a red broken line frame. This power supply is designed to work with forced air-cooling. Use an air-cooling device to ensure that the temperature of these components stay within the rated temperature range at high loads. Also, do not touch these components while the power supply is running, as there is a risk of burns. Fig. 3.3 Components with Large Heat

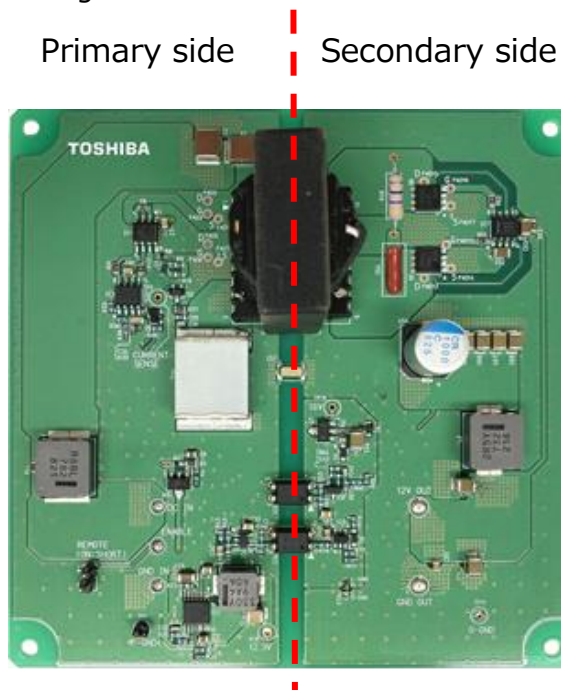


Fig. 3.2 Primary and Secondary Areas

Main transformer

MOSFET for Synchronous Rectification

Resistor for Snubber

Primary Side MOSFET

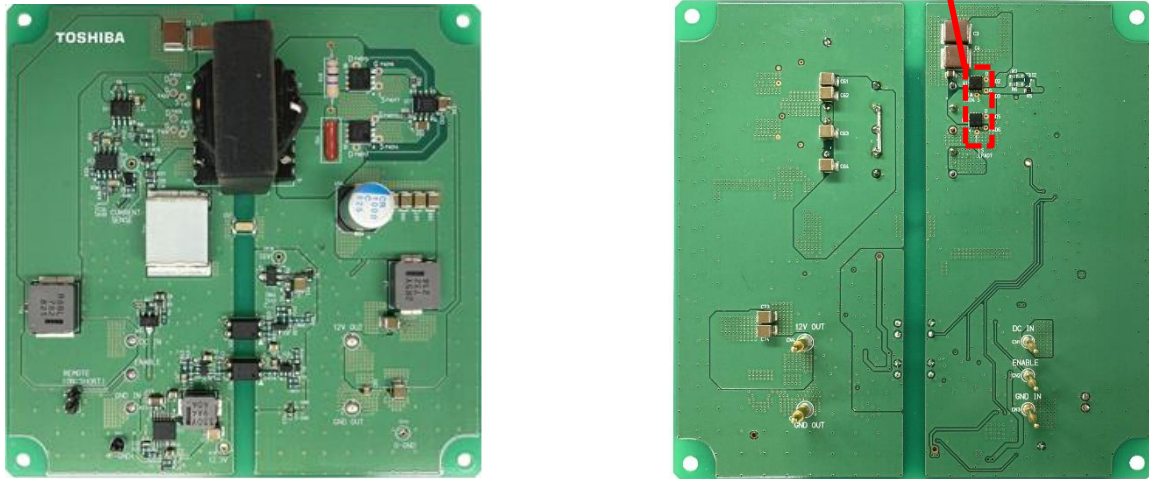


Fig. 3.3 Components with Large Heat Generation

4. Power Characteristics

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

4.1. Efficiency

Fig. 4.1 Efficiency Measurement Results

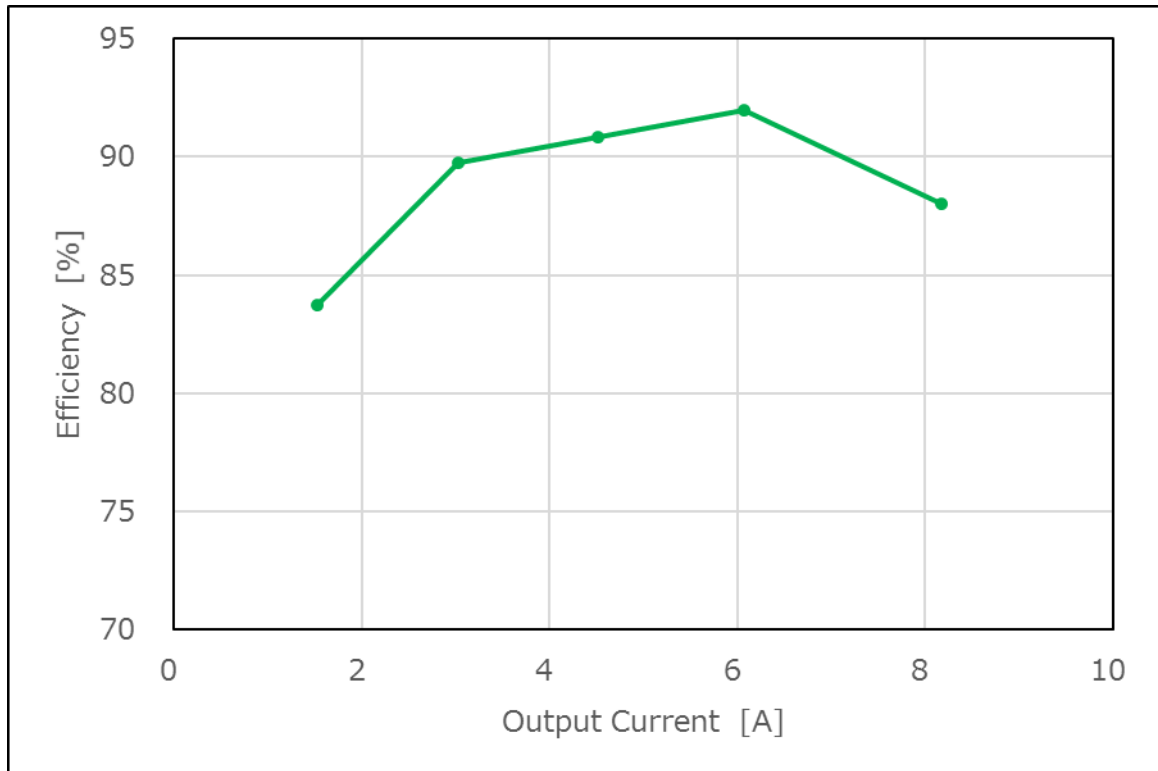


Fig. 4.1 Efficiency Measurement Results

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