500 W Server Power Supply

Reference Guide

RD049-RGUIDE-01

TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION

Contents

1. Introduction

This reference guide describes the specifications, usage, and various characteristics of the 500 W server power supply (this power supply). This power supply can provide 500 W of power at the outgoing DC 12 V. Input AC power (90 V to 264 V) and output DC 12 V through CCM PFC circuitry and isolated half-bridge LLC circuitry. N+1 redundant operation can be performed with ORing circuitry of the output section. Since small components are selected, they can be applied to a variety of sizes and applications, including general-purpose 1U server power supplies. Our power MOSFET, which enables high-speed switching, are used for switching elements, realizing high-efficiency.

2. Specifications

2.1. Power Supply Specifications

Table 2.1 shows the input and output specification of this power supply.

Table 2.1 500 W Server Power Supply Specification

Parameter	Condition	Min	Typ.	Max	Unit
Input Characteristics					
AC input voltage (rms)		90		264	V
AC input frequency		47		63	Hz
CCM PFC circuit output characteristics (internal characteristics)					
Output voltage			390		V
Switching frequency			78		kHz
Output characteristics (LLC circuit)					
Output voltage		11.4	12.0	12.6	V
Output current				42	A
Maximum output power				500	W
Output ripple voltage	Ta = 25 ℃			200	mV

2.2. Outline

Fig. 2.1 shows this power supply.

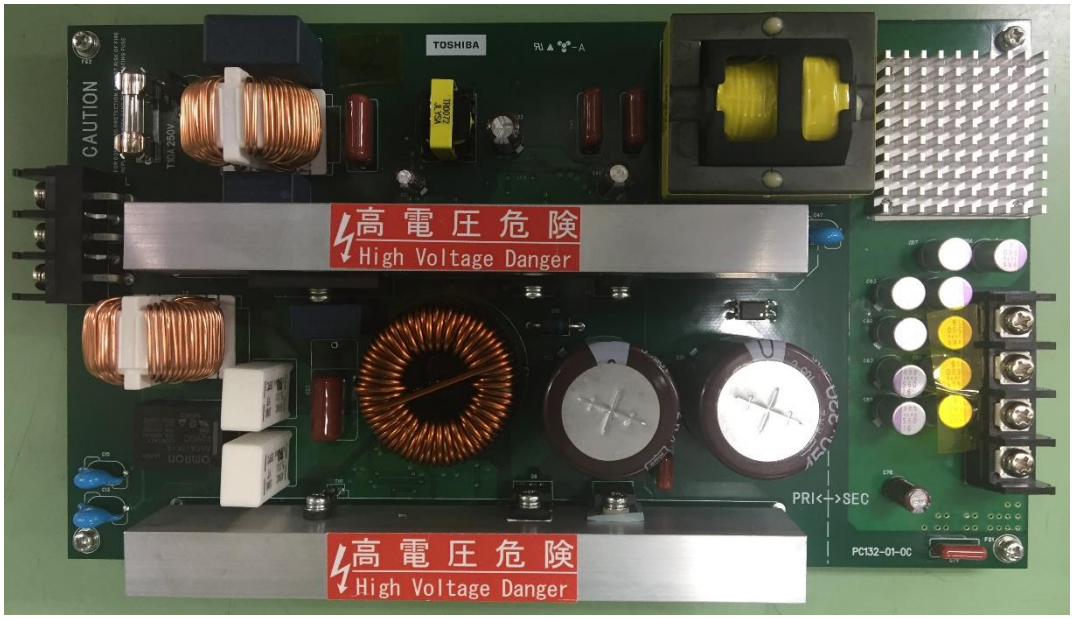

Fig. 2.1 500 W Server Power Supply

Oulline size : 240 mm x 135 mm x 40 mm

2.3. Block Diagram

Fig. 2.2 shows a simplified block diagram to understand the function and operation of this power supply. Fig. 2.2 Refer to RD049-SCHEMATIC-01 for actual schematics and to RD049-BOM-01_E for bill of materials.

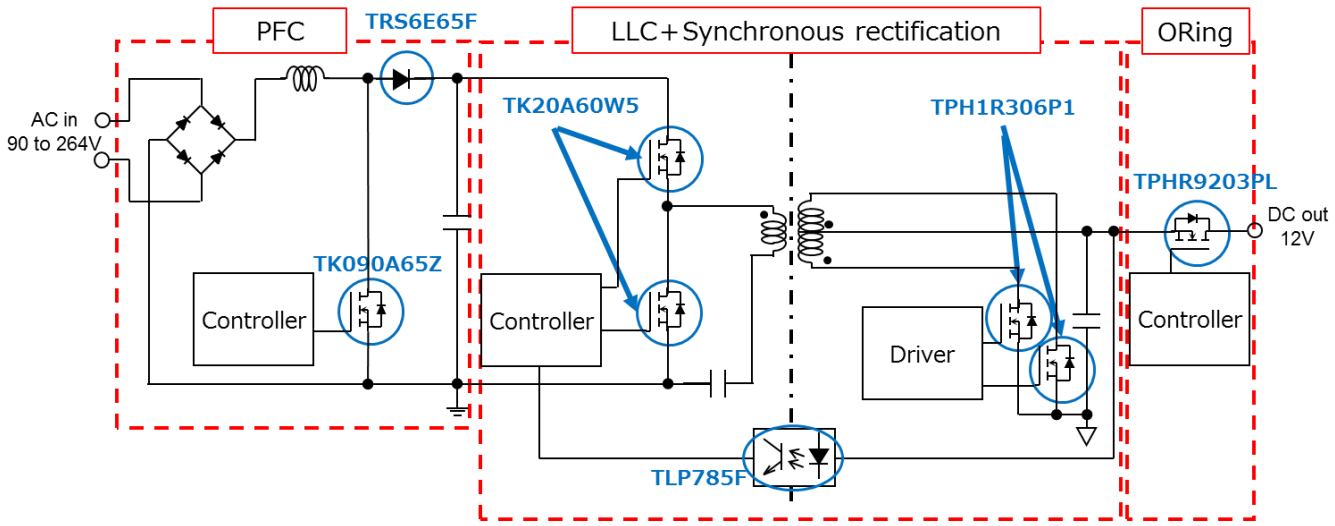

Fig. 2.2 Block Diagram

2.4. Component Arrangement

Fig. 2.3 shows the components layout on the PCB (top side).

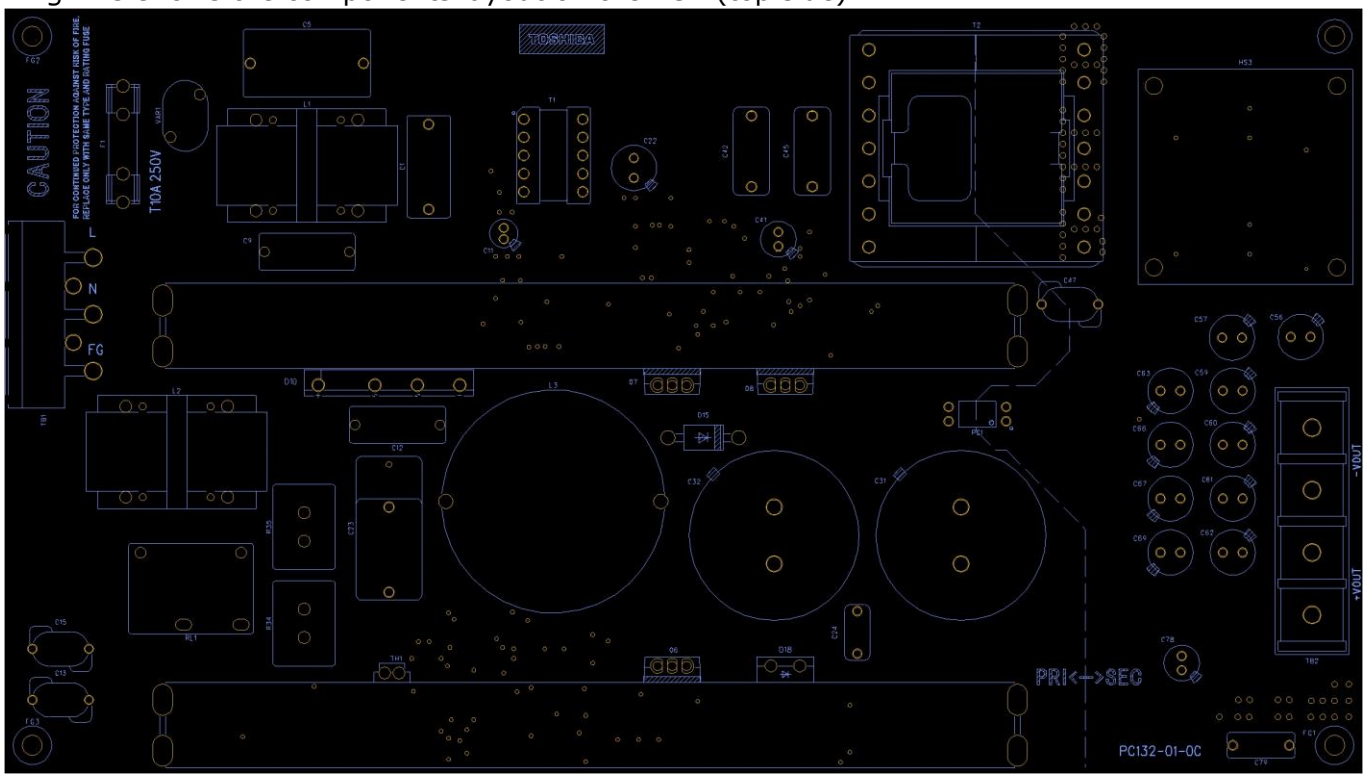

Fig. 2.3 Components Layout on the PCB (top side)

Fig. 2.4 shows the components layout on the PCB (back side).

Fig. 2.4 Components Layout on the PCB (back side)

2.5. PCB Pattern

Fig. 2.5 shows Layer1 of the PCB.

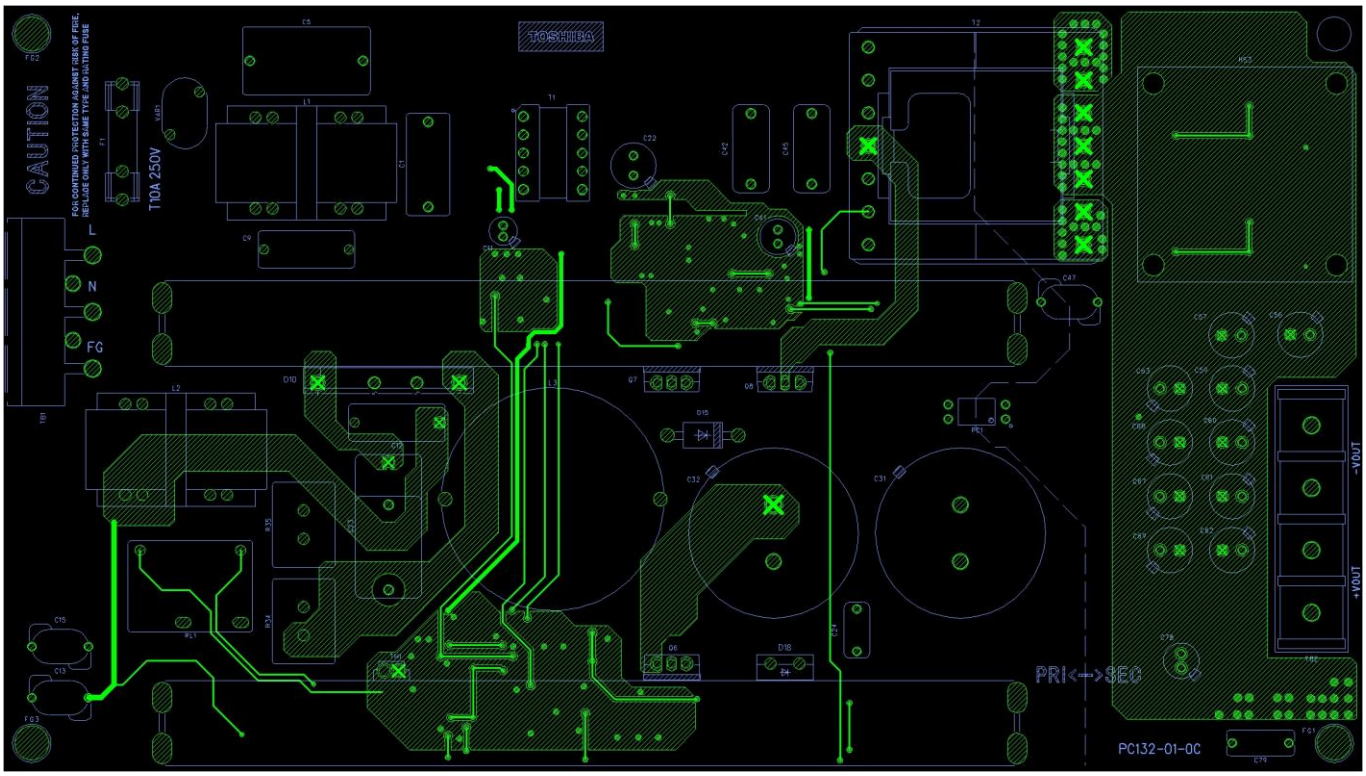

Fig. 2.5 Layer1

Fig. 2.6 shows Layer2 of the PCB.

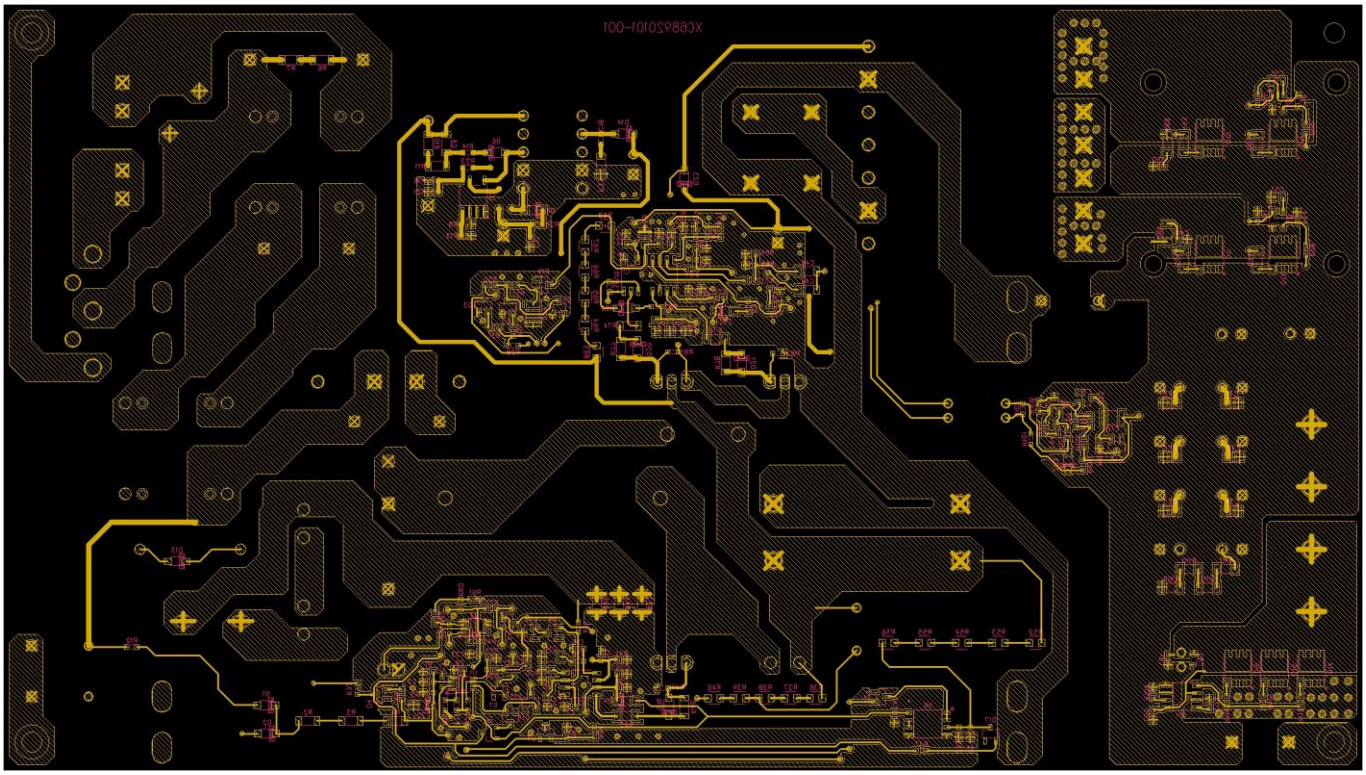

Fig. 2.6 Layer2

3. Operating Procedure

This section describes the operating procedure of this power supply.

3.1. Connection with External Equipment

Fig. 3.1 shows the connections of this power supply with external equipment. Red rectangles indicate terminals connected to an external power supply. Connect an AC stabilized power supply to the Input (Live) and Input (Neutral) terminals. Choose appropriate power supplies, cables, lead wires, and connectors that meet the Power Supply Specifications shown on the Table 2.1. Blue rectangles indicate 12 V output terminals. Connect a load unit to the Output (+) and Output (-) terminals. Chose appropriate load units, cables, and connectors that meet the Power Supply Specifications shown on the Table 2.1.Fig. 3.12.1Power Supply Specifications2.1Power Supply Specifications

Fig. 3.1 Terminals for External Equipment

3.2. Power-Up and Power-Off Procedures

Make sure all of the following terminal voltages are 0 V, before power-up.
Input (+) terminal, Input (-) terminal, Output (+) terminal, and Output (-) terminal

[Power-Up Procedure]
Turn on the AC stabilized power supply

[Power-Off Procedure]
Turn off the AC stabilized power supply

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

You can receive an electric shock if you touch the primary side while AC stabilized power is being applied to this power supply. Don't touch any portion on the primary side while the AC power is being applied to this power supply. Fig. 3.2 shows the boundary between the primary and secondary sides. Be very careful when measuring the waveform. You can also receive an electric shock even after power-off because electric charge remains in some capacitors. Make sure that the voltage at each portion of the PCB is low enough before you touch it.
In addition, semiconductor devices, transformers, and other components on the PCB can heat up while this power supply is on. The portions highlighted by red dashed lines in Fig. 3.3 dissipate much heat. Don't touch these areas while the power supply is on, as there is a risk of burns.

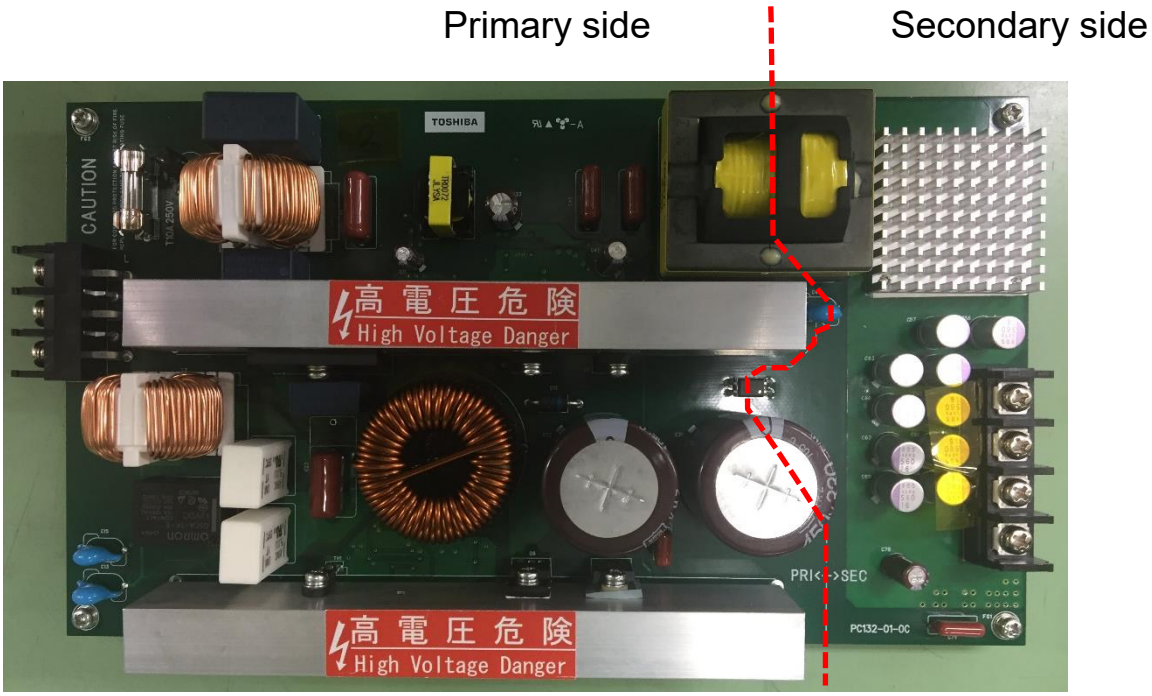

Fig. 3.2 Primary Side Area / Secondary Side

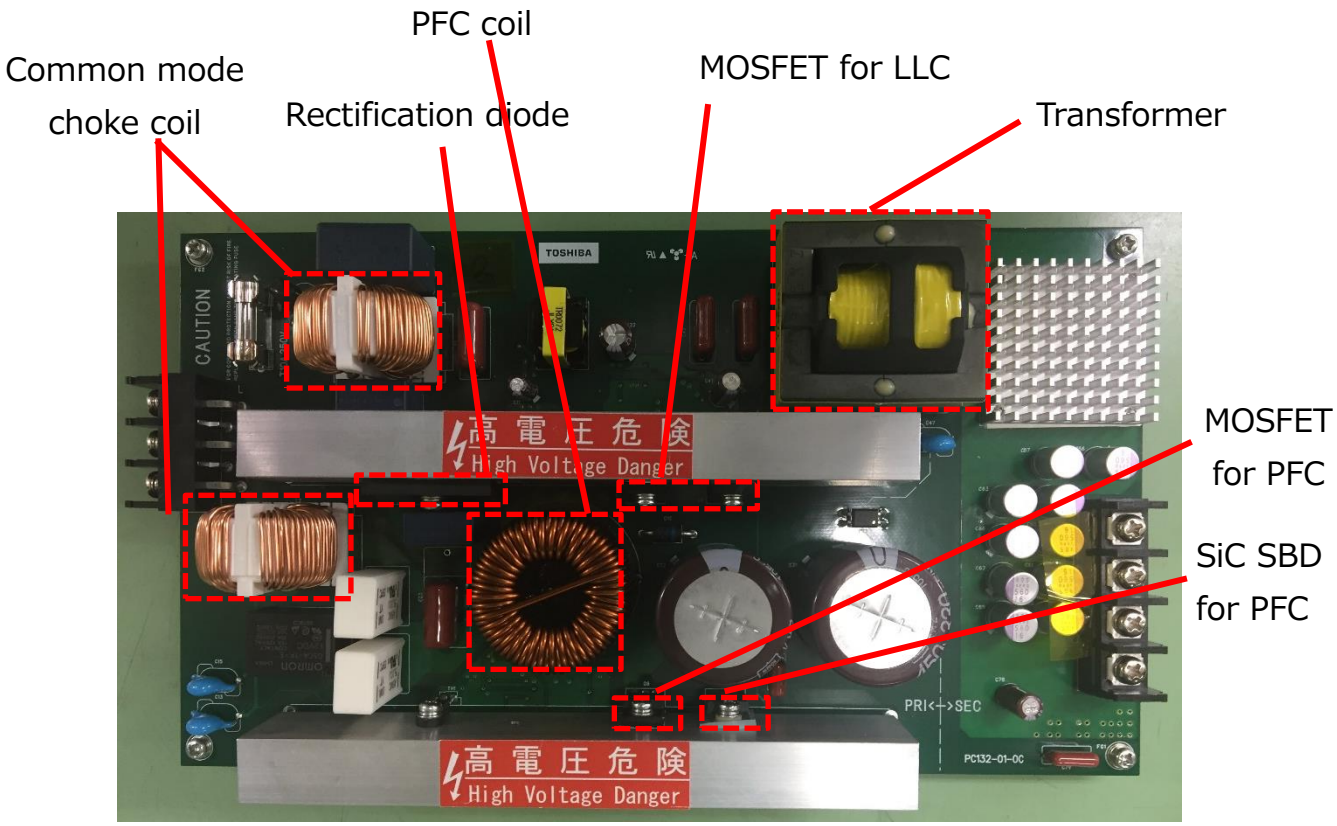

Fig. 3.3 Components Subject to High Temperature

4. Performance

This section describes the efficiency of this power supply.

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 115 V or 230 V for measurement. The efficiency at the 100 % load is 91.3 % for 115 V input and 93.1 % for 230V input, achieving high efficiency. This power supply is equipped with ORing circuitry in the output section. When ORing circuitry is deleted, the power supply efficiency of this power supply will be improved.

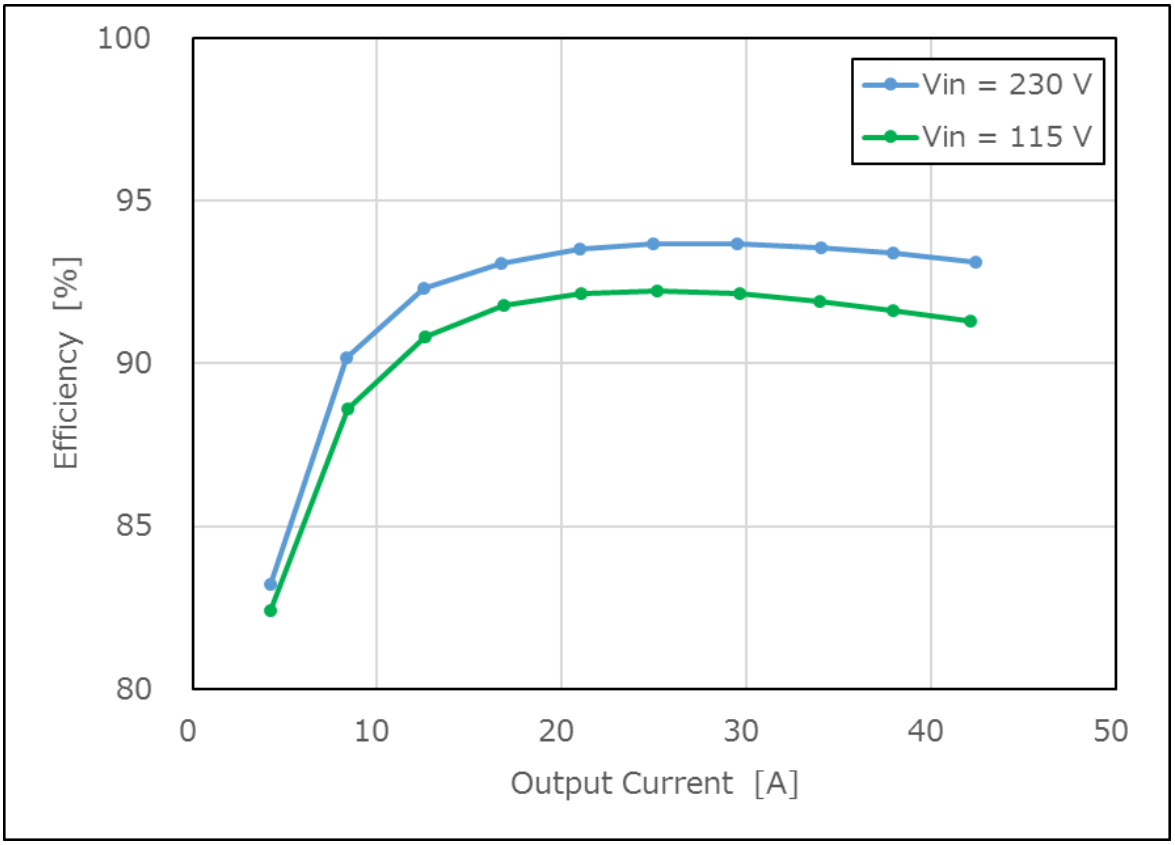

Fig. 4.1 Efficiency Result (Vin = 115 V, Vin = 230 V)

For reference, Fig. 4.2 to Fig. 4.5 show the measured power-efficiency of this power supply and the standard of 80 PLUS. The 80 PLUS standards in the chart are as of November 2020. The specification value may be updated. Please check it every time. This power supply is not certified for 80 PLUS. It is necessary to measure the power supply efficiency using the equipment that will be the final product and acquire the certification.

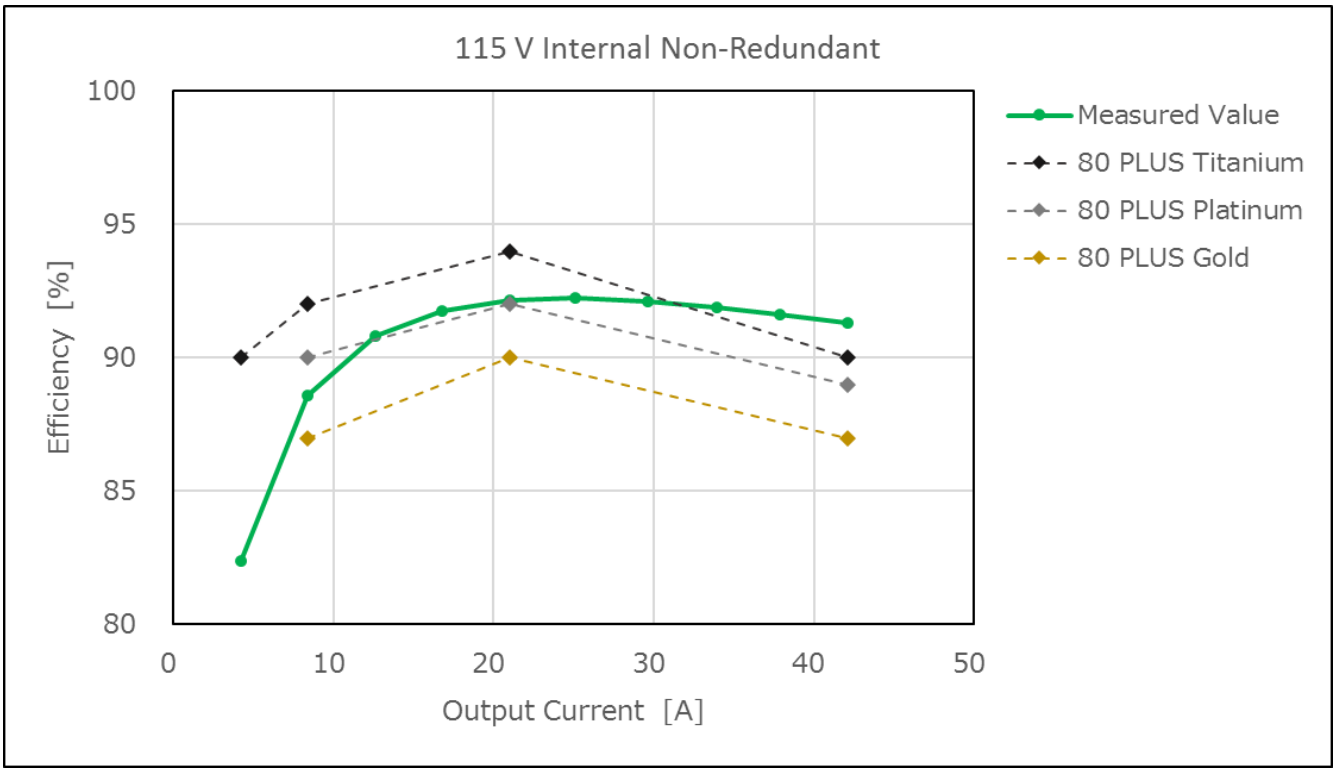

Fig. 4.2 Efficiency Result (80 PLUS : 115 V Internal Non-Redundant)

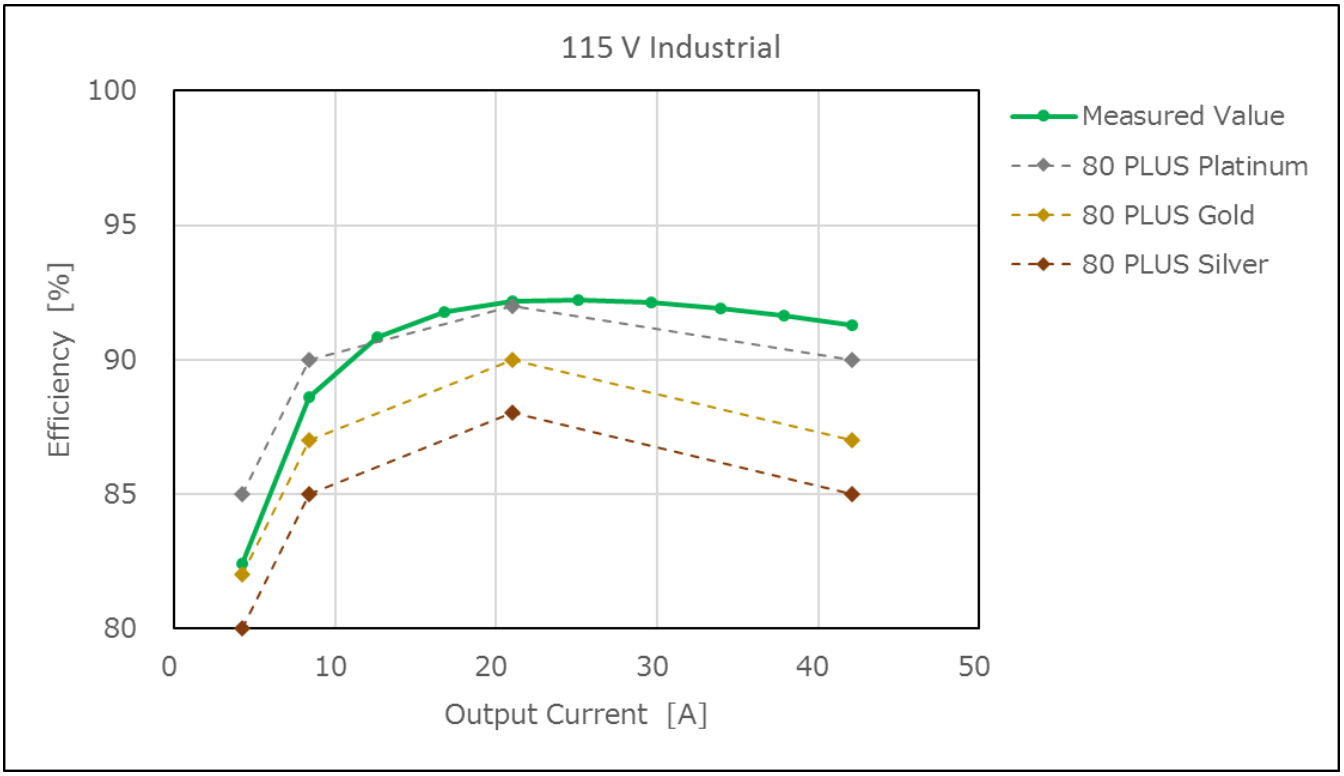

Fig. 4.3 Efficiency Result (80 PLUS : 115 V Industrial)

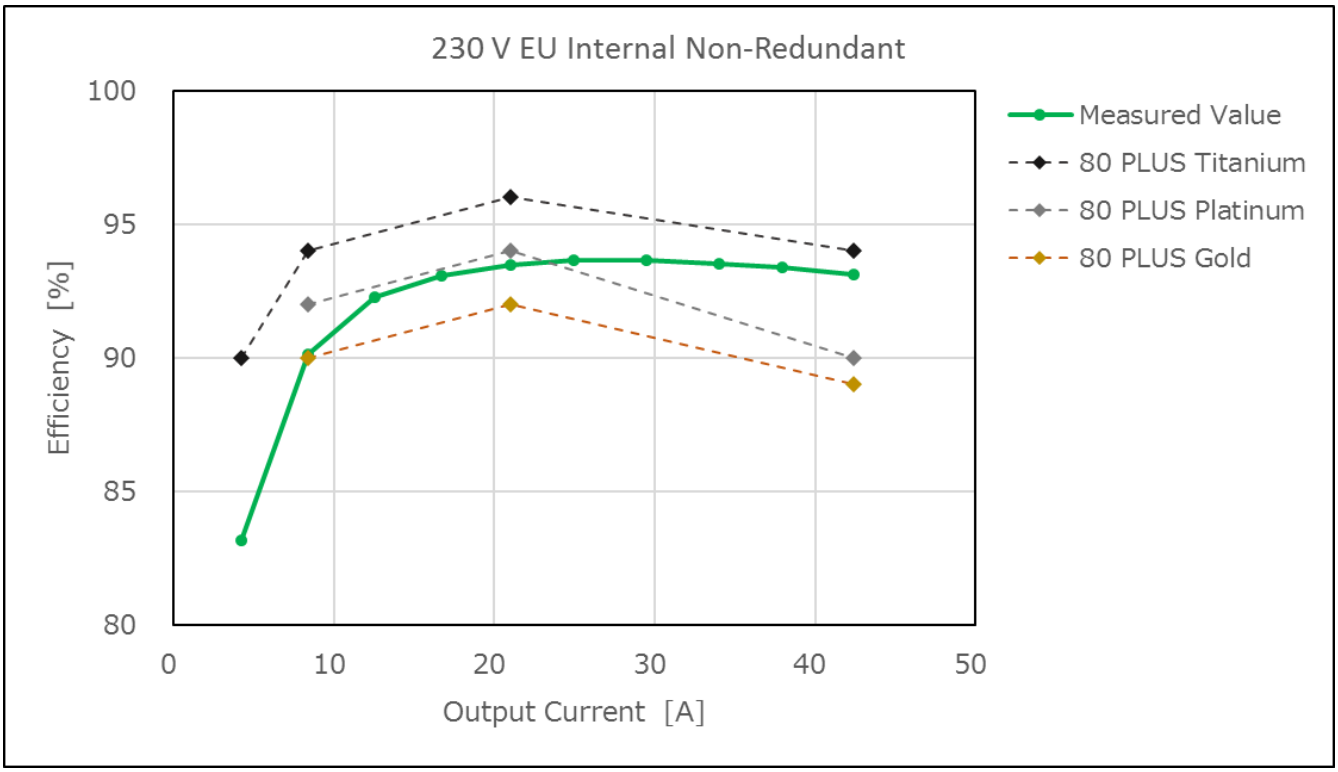

Fig. 4.4 Efficiency Result (80 PLUS : 230 V EU Internal Non-Redundant)

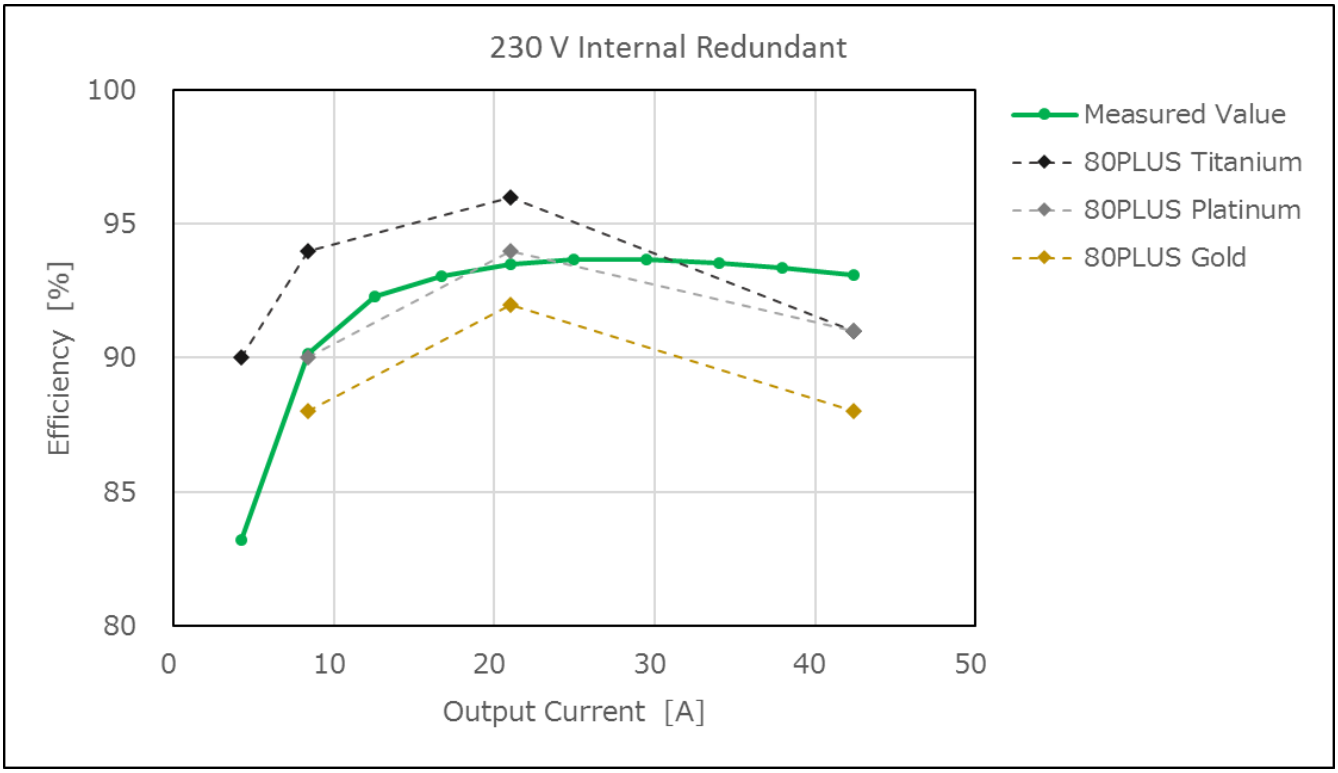

Fig. 4.5 Efficiency Result (80 PLUS : 230 V Internal Redundant)

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