1.6 kW T-Type 3-Level PFC Power Supply

Reference Guide

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>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Input Voltage Range</td>
<td>90 to 264 V</td>
<td></td>
</tr>
<tr>
<td>AC Input Frequency Range</td>
<td>47 to 53 Hz, 57 to 63 Hz</td>
<td>Considering the fundamental frequency is 50 Hz / 60 Hz.</td>
</tr>
<tr>
<td>DC Output Rated Voltage</td>
<td>380 V</td>
<td></td>
</tr>
<tr>
<td>Control Power Supply Voltage</td>
<td>DC 24 V</td>
<td></td>
</tr>
<tr>
<td>Gate Voltage</td>
<td>DC 15 V</td>
<td></td>
</tr>
<tr>
<td>DC Output Maximum Current</td>
<td>4.2 A</td>
<td></td>
</tr>
<tr>
<td>Power Rating</td>
<td>1.6 kW @ AC 180 to 264 V</td>
<td>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.</td>
</tr>
<tr>
<td>Switching Frequency</td>
<td>100 kHz</td>
<td></td>
</tr>
<tr>
<td>Sensor Input</td>
<td>• AC input voltage</td>
<td>The DC midpoint voltage is the voltage between two series capacitors and the DC output N terminal.</td>
</tr>
<tr>
<td></td>
<td>• AC input current</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• DC output voltage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• DC midpoint voltage</td>
<td></td>
</tr>
</tbody>
</table>
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.

**Main Circuit Board**

**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.

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)
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.

![Efficiency Measurement Result](image)

**Fig. 4.1 Efficiency Measurement Result**
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