UL TEST REPORT AND PROCEDURE

Standard:	UL 60950-1, 2nd Edition, 2011-12-19 (Information Technology Equipment - Safety - Part 1: General Requirements) CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2011-12 (Information Technology Equipment - Safety - Part 1: General Requirements)
Certification Type:	Component Recognition
CCN:	QQGQ2, QQGQ8 (Power Supplies for Information Technology Equipment Including Electrical Business Equipment)
Complementary CCN:	QQJQ2, QQJQ8 (Power Supplies for Use in Audio/Video, Information and Communication Technology Equipment)
Product:	Switching Power Supply
Model:	HWS50A-3, HWS50A-5, HWS50A-12, HWS50A-15, HWS50A-24, and HWS50A-48 Maybe followed by suffix "abcde" (a is /, b is HD, c is R, d is A, B, AB, e is FG, DIN; and "abcde" may be blank)
Rating:	Input: 100-240 Vac, 50-60 Hz, 0.5 A (for Model HWS50A-3) and 0.7 A (for all models except for Model HWS50A-3)
Applicant Name and Address:	TDK-LAMBDA CORP NAGAOKA TECHNICAL CENTER R&D DIV 2704-1 SETTAYA-MACHI NAGAOKA-SHI NIIGATA 940-1195 JAPAN

This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of UL LLC ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

The applicant is authorized to reproduce the referenced Test Report provided it is reproduced in its entirety.

UL authorizes the applicant to reproduce the latest pages of the referenced Test Report consisting of the first page of the Specific Technical Criteria through to the end of the Conditions of Acceptability.

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Prepared by: Ippei Fukuda Reviewed by: Ikuro Kinno

Supporting Documentation

The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:

A. Authorization - The Authorization page may include additional Factory Identification Code markings.

B. Generic Inspection Instructions -

i. Part AC details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.

ii. Part AE details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.

iii. Part AF details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.

Product Description

The product covered in this report is building-in type switching power supply having a single output circuit.

Output:
3.3 Vdc (2.97-3.96 Vdc), maximum 10 A (maximum 33 W) (for HWS50A-3),
5 Vdc (4.0-6.0 Vdc), maximum 10 A (maximum 50 W) (for HWS50A-5),
12 Vdc (9.6-14.4 Vdc), maximum 4.3 A (maximum 51.6 W) (for HWS50A-12),
15 Vdc (12.0-18.0 Vdc), maximum 3.5 A (maximum 52.5 W) (for HWS50A-15),
24 Vdc (19.2-28.8 Vdc), maximum 2.2 A (maximum 52.8 W) (for HWS50A-24),
48 Vdc (38.4-52.8 Vdc), maximum 1.1 A (maximum 52.8 W) (for HWS50A-48)

Model Differences

All models are identical, except for model designation, output rating, secondary winding and internal construction of Transformer (T1), and secondary components.

HWS50A Series maybe followed by suffix "abcde" (a is /, b is HD, c is R, d is A, B, AB, e is FG, DIN; and "abcde" may be blank)
1. HD: Model with optional Thin Coating (QMJU2) on both component and solder side of PWB and maximum operating temperature is 71°C.
2. R: Model with optional ON/OFF control function.
3. A: Model with Metal Cover.
4. B: Model with optional Input Connector instead of Terminal Block.
5. AB: Model with Metal Cover and optional Input Connector instead of Terminal Block.
6. FG: Model with low leakage (capacitances for Primary - FG reduced).
7. DIN: Model with Din Rail Mounting Bracket.

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : N/A
- Operating condition : continuous
- Access location : N/A (for building-in)
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : +10%, -10%
- Tested for IT power systems : No
- IT testing, phase-phase voltage (V) : N/A
- Class of equipment : Class I (earthed)
- Considered current rating of protective device as part of the building installation (A) : 20 A

- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : up to 4000 m
- Altitude of test laboratory (m) : approximately 10 to 20 m
- Mass of equipment (kg) : approximately 0.3 kg
- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: See Enclosure Id. 7-01 for details.
- The product is intended for use on the following power systems: TN

Engineering Conditions of Acceptability

For use only in or with complete equipment where the acceptability of the combination is determined by UL LLC. When installed in an end-product, consideration must be given to the following:

- The end-product Electric Strength Test is to be based upon a maximum working voltage of: [Model HWS50A-3] Primary - Secondary: 380 Vrms / 530 Vpk , Primary - Ground: 380 Vrms / 530 Vpk , [Model HWS50A-5] Primary - Secondary: 375 Vrms / 510 Vpk , Primary - Ground: 375 Vrms / 510 Vpk , [Model HWS50A-12] Primary - Secondary: 392 Vrms / 522 Vpk , Primary - Ground: 392 Vrms / 522 Vpk , [Model HWS50A-15] Primary - Secondary: 394 Vrms / 526 Vpk , Primary - Ground: 394 Vrms / 526 Vpk , [Model HWS50A-24] Primary - Secondary: 395 Vrms / 550 Vpk , Primary - Ground: 395 Vrms / 550 Vpk , [Model HWS50A-48] Primary - Secondary: 399 Vrms / 742 Vpk , Primary - Ground: 399 Vrms / 742 Vpk
- The following secondary output circuits are SELV: Output of all models
- The following secondary output circuits are at non-hazardous energy levels: Output of all models
- The power supply terminals and/or connectors are: Suitable for factory wiring only
- The maximum investigated branch circuit rating is: 20 A
- The investigated Pollution Degree is: 2
- Proper bonding to the end-product main protective earthing termination is: Required
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY2 insulation system with the indicated rating greater than Class A (105°C): T1 (Class 155 (F))
- The following end-product enclosures are required: Electrical / Fire
- Line to Line Capacitor (C1) rated maximum 0.33 µF for capacitance. Line to Line Capacitor (C4) rated maximum 0.1 µF for capacitance. C1: 0.33 µF and C4: 0.1 µF were used in test. Therefore, consideration shall be given in conducting Capacitance Discharge Test in the end product with respect to the variation in C1 and C4.
- Line to Ground Capacitors (C2, C3) rated maximum 2200 pF for capacitance. Primary to Ground Capacitor (C7) rated maximum 2200pF for capacitance. C2, C3, and C7: 2200 pF were used in test. Therefore, consideration shall be given in conducting Touch Current Measurement Test in the end product with respect to the variation in C2, C3, and C7.
- Earth terminal provided on Terminal Block (TB1) and Input Connector (CN1) has not been evaluated as protective earthing terminal. This component is intended to be connected to a protective earth via earthed parts of end-product. If protective earthing conductor is connected to the earth terminal on Terminal Block (TB1) or Input Connector (CN1) in the end-product, Limited Short-Circuit Test in accordance with CSA C22.2 No.04 shall be conducted.
- Model HWS50A-3 was tested with output Voltage Range of 2.97 - 3.96 Vdc (maximum 33 W). , Model HWS50A-5 was tested with output Voltage Range of 4.0 - 6.0 Vdc (maximum 50 W). , Model HWS50A-12 was tested with output Voltage Range of 9.6 - 14.4 Vdc (maximum 51.6 W). , Model HWS50A-15 was tested with output Voltage Range of 12.0 - 18.0 Vdc (maximum 52.5 W). , Model HWS50A-24 was tested with output Voltage Range of 19.2 - 28.8 Vdc (maximum 52.8 W). , Model HWS50A-48 was tested with output Voltage Range of 38.4 - 52.8 Vdc (maximum 52.8 W). , Adjustment was made via Variable Resistor (VR51).
- The following secondary output circuits are ES1: Output of all models

- The following secondary output circuits are at PS2 energy level: Output of all models

Additional Information

The clearances and creepage distances were assessed for suitability up to 4000 m elevation.

Additional Standards

The product fulfills the requirements of: The product fulfills the requirements of: UL 62368-1, 2nd Edition, 2014-12-01, CAN/CSA C22.2 No. 62368-1-14, 2nd Edition, 2014-12-01.

Markings and instructions

Clause Title	Marking or Instruction Details
1.7.1 Power rating - Ratings	Ratings (voltage, frequency/dc, current)
1.7.1 Power rating - Company identification	Listee's or Recognized company's name, Trade Name, Trademark or File Number
1.7.1 Power rating - Model	Model Number
1.7.6 Fuses - Rating	Rated current and voltage and type located on or adjacent to fuse or fuseholder.