

UL TEST REPORT AND PROCEDURE

Standard:	UL 60950-1, 2nd Edition, 2019-05-09 (Information Technology Equipment - Safety - Part 1: General Requirements) CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014-10 (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:	HWS80A-3(*), HWS80A-5(*), HWS80A-12(*), HWS80A-15(*), HWS80A-24(*), HWS80A-48(*) HWS100A-3(*), HWS100A-5(*), HWS100A-12(*), HWS100A-15(*), HWS100A-24(*), HWS100A-48(*). (*)-Maybe followed by suffix "abcdefg" (a is "/", b is "HD", c is "R", d is "A", "B" or "AB", e is "CO2", f is "FG", g is "DIN"; and "abcdefg" may be blank) HWS100A-5/E(**), HWS100A-12/E(**), HWS100A-15/E(**), HWS100A-24/E(**), HWS100A-48/E(**). (**)-Maybe followed by suffix "abcdefg" (a is "H" or "V", b is "HD", c is "R", d is "A", e is "CO2", f is "FG", g is "DIN"; and "bcdefg" may be blank)
Rating:	Input: AC100-240 V, 50-60 Hz 0.8A (for model HWS80A-3) 1.1A (for all HWS80A series except for HWS80A-3) 1.0 A (for model HWS100A-3) 1.4 A (for all HWS100A series except for HWS100A-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.

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Prepared By: Toshiyuki Suzuki / Project
Handler

Reviewed By: Masatomo Takiyama / Reviewer

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 V (2.97-3.96), maximum 16 A (maximum 52.8W) (for HWS80A-3),
5 V (4.0-6.0V), maximum 16 A (Maximum 80.0W) (for HWS80A-5),
12 V (9.6-14.4V), maximum 6.7 A (Maximum 80.4W) (for HWS80A-12),
15 V (12.0-18.0V), maximum 5.4 A (Maximum 81.0W) (for HWS80A-15),
24 V (19.2-28.8V), maximum 3.4 A (Maximum 81.6W) (for HWS80A-24),
48 V (38.4-52.8V), maximum 1.7 A (Maximum 81.6W) for HWS80A-48),
3.3 V (2.97V-3.96V), maximum 20 A (maximum 66W) (for HWS100A-3),
5 V (4.0V-6.0V), maximum 20 A (maximum 100W) (for HWS100A-5 and HWS100A-5/E),
12 V (9.6V-14.4V), maximum 8.5 A (maximum 102W) (for HWS100A-12 and HWS100A-12/E),
15 V (12.0V-18.0V), maximum 7.0 A (maximum 105W) (for HWS100A-15 and HWS100A-15/E),
24 V (19.2V-28.8V), maximum 4.5 A (maximum 108W) (for HWS100A-24 and HWS100A-24/E),
48 V (38.4V-52.8V), maximum 2.1 A (maximum 100.8W) (for HWS100A-48 and HWS100A-48/E)

Model Differences

HWS100A Series:

All models of HWS100A Series are identical, except for model designation, output rating, secondary winding and internal construction of Transformer (T2), and secondary components.

HWS100A Series maybe followed by suffix "abcdefg" (a is "/", b is "HD", c is "R", d is "A", "B" or "AB", e is "CO2", f is "FG", g is "DIN"; and "abcdefg" 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. CO2: Model with optional Thin Coating (QMJU2) on both component and solder side of PWB.
7. FG: Model with Low Leakage (the capacitances for Primary - FG reduced).
8. DIN: Model with DinRail Mounting Bracket.

Model HWS100A/E series are identical to Model HWS100A series, except for model designation, Terminal Block, PWB trace, component layout and secondary components, chassis and shape of insulation sheet located between PWB and Chassis.

HWS100A/E Series maybe followed by suffix "abcdefg" (a is "H" or "V", b is "HD" or blank, c is "R" or blank, d is "A" or blank, e is "CO2" or blank, f is "FG" or blank, g is "DIN" or 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. CO2: Model with optional Thin coating (QMJU2) on both component and solder side of PWB.
5. FG: Model with low leakage (capacitances between Primary - FG reduced).
6. DIN: Model with Din Rail Mounting Bracket.
7. EH: Model with European terminal block. Wire entry direction is horizontal.
8. EV: Model with European terminal block. Wire entry direction is vertical.

HSW80A Series:

HWS80A Series is identical to HWS100A series except for model designation, input current rating, output rating, temperature derating, inductors (L1, L2), Diode Bridge (D1) and FET (Q1).

All models of HWS80A Series are identical, except for model designation, output rating, secondary winding and internal construction of Transformer (T2), and secondary components.

HWS80A Series maybe followed by suffix "abcdefg" (a is /, b is HD, c is R, d is A, B or AB, e is CO2, f is FG, g is DIN; and "abcdefg" 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. CO2: Model with optional Thin Coating (QMJU2) on both component and solder side of PWB.
7. FG: Model with Low Leakage (the capacitances for Primary - FG reduced).
8. DIN: Model with DinRail Mounting Bracket.

Test Item Particulars	
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 0.47 kg

Technical Considerations

- 1.2 The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: See enclosure Ids. 7-01 and 7-03.
- 1.4 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:

- Line to Line Capacitor C1 has maximum 0.68 uF for capacitance. C1: 0.68uF was used in test. Therefore, consideration shall be given in conducting Discharge Test in the end product application with respect to the variation in C1.
- Lines to ground Capacitors C2, C3 have maximum 2200pF for capacitance. Primary to ground Capacitor C8 has maximum 2200pF for capacitance. C2, C3 and C8: 2200pF were used in test. Therefore, consideration shall be given in conducting Touch Current Test in the end product application with respect to the variation in C2, C3 and C8.
- Earth terminal provided on Terminal Block (TB1) 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) in the end product, Limited Short-Circuit Test per CSA C22.2 No.04 shall be conducted.
- Model HWS80A-3 was tested with output Voltage Range of 2.97 - 3.96 Vdc (maximum 52.8 W). , Model HWS80A-5 was tested with output Voltage Range of 4.0 - 6.0 Vdc (maximum 80 W). , , Model HWS80A-12 was tested with output Voltage Range of 9.6 - 14.4 Vdc (maximum 80.4 W). , Model HWS80A-15 was tested with output Voltage Range of 12.0 - 18.0 Vdc (maximum 81.0 W). , Model HWS80A-24 was tested with output Voltage Range of 19.2 - 28.8 Vdc (maximum 81.6 W). , Model HWS80A-48 was tested with output Voltage Range of 38.4 - 52.8 Vdc (maximum 81.6 W). , Model HWS100A-3 was tested with output Voltage Range of 2.97 - 3.96 Vdc (maximum 66 W). , Model HWS100A-5 was tested with output Voltage Range of 4.0 - 6.0 Vdc (maximum 100 W). , Model HWS100A-12 was tested with output Voltage Range of 9.6 - 14.4 Vdc (maximum 102 W). , Model HWS100A-15 was tested with output Voltage Range of 12.0 - 18.0 Vdc (maximum 105 W). , Model HWS100A-24 was tested with output Voltage Range of 19.2 - 28.8 Vdc (maximum 108 W). , Model HWS100A-48 was tested with output Voltage Range of 38.4 - 52.8 Vdc (maximum 100.8 W). , Adjustment was made via Variable Resistor (VR51).
- The following secondary output circuits are ES1: Output of all model except for Model HWS100A-48
- The following secondary output circuits are at PS3 energy level: Output of all models
- The following secondary output circuits are ES2: Output of Model HWS100A-48
- 1.3 The end-product Electric Strength Test is to be based upon a maximum working voltage of: [Model HWS80A-3] Primary - Secondary: 234Vrms, 458Vpk, Primary - Ground: 232Vrms, 454Vpk, [Model HWS80A-5] Primary - Secondary: 241Vrms, 446Vpk, Primary - Ground: 240Vrms, 442Vpk, [Model HWS80A-12] Primary - Secondary: 255Vrms, 456Vpk, Primary - Ground: 252Vrms, 454Vpk, [HWS80A-15] Primary - Secondary: 254Vrms, 456Vpk, Primary - Ground: 249Vrms, 456Vpk, [Model HWS80A-24] Primary - Secondary: 264Vrms, 480Vpk, Primary - Ground: 256Vrms, 470Vpk, [Model HWS80A-48] Primary - Secondary: 284Vrms, 612Vpk, Primary - Ground: 258Vrms, 456Vpk, [Model HWS100A-3] Primary - Secondary: 223Vrms, 412Vpk , Primary - Ground: 219Vrms, 428Vpk , [Model HWS100A-5] Primary - Secondary: 228Vrms, 428Vpk , Primary - Ground: 235Vrms, 432Vpk , [Model HWS100A-12] Primary - Secondary: 238Vrms, 448Vpk , Primary - Ground: 245Vrms, 432Vpk , [Model HWS100A-15] Primary - Secondary: 243Vrms, 412Vpk , Primary - Ground: 234Vrms, 436Vpk , [Model HWS100A-24] Primary - Secondary: 260Vrms, 500Vpk , Primary - Ground: 260Vrms, 434Vpk , [Model HWS100A-48] Primary - Secondary: 285Vrms, 620Vpk , Primary - Ground: 265Vrms, 464Vpk
- 1.5 The following secondary output circuits are SELV: Output of all models
- 1.7 The following secondary output circuits are at non-hazardous energy levels: Output of all models
- 1.11 The power supply terminals and/or connectors are: Suitable for factory wiring only
- 1.12 The maximum investigated branch circuit rating is: 20 A
- 1.13 The investigated Pollution Degree is: 2
- 1.15 Proper bonding to the end-product main protective earthing termination is: Required
- 1.18 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): T2 (Class 155 (F))
- 1.19 The following end-product enclosures are required: Electrical, Fire

Additional Information

The Clearances and Creepage Distances have additionally been assessed for suitability up to 4000 m elevation.

Additional Standards

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.