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 Supplies
Model:	ZWS150BAF-abcdefghij a = 3, 5, 12, 15, 24 or 48 b = "/" or blank c = "R" or blank d = "A", "L" or blank e = "CO2" or blank f = "FG" or blank g = "FV" or blank h = "FGM" or blank i = "SN" or blank j = "N" or blank ZWS150BAF-24/FU
Rating:	Input: Model ZWS150BAF-3bcdefghij: 100-240 Vac, 50/60 Hz, 1.4A Models ZWS150BAF-5bcdefghij, -12bcdefghij, -15bcdefghij, -24bcdefghij, -48bcdefghij and ZWS150BAF-24/FU 100-240 Vac, 50/60 Hz, 2.0A Output: 3.3 Vdc, 30A: ZWS150BAF-3bcdefghij (DC 2.64 - 3.63 V, max 30A, max 99.0W) 5 Vdc, 30A: ZWS150BAF-5bcdefghij (DC 4.0 - 5.5 V, max 30A, max 150W) 12 Vdc, 12.5A: ZWS150BAF-12bcdefghij (DC 9.6 - 13.2 V, max 12.5A, max 150W)

	15 Vdc, 10A: ZWS150BAF-15bcdefghij (DC 12.0 - 16.5 V, max 10A, max 150W) 24 Vdc, 6.3A: ZWS150BAF-24bcdefghij and ZWS150BAF-24/FU (DC 19.2 - 26.4 V, max 6.3A, max 151.2W) 48 Vdc, 3.2A: ZWS150BAF-48bcdefghij (DC 38.4 - 52.8 V, max 3.2A, max 153.6W)
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:	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 is a switching power supply intended for building in to an ITE end product.

Model Differences

All models are identical except for input rating of Model ZWS150BAF-3, output ratings, and the following suffixes:

ZWS150BAF-abcdefghij

(a = 3, 5, 12, 15, 24, or 48. b = "/" or blank. c = "R" or blank. d = "A", "L" or blank. e = "CO2" or blank. f = "FG" or blank. g = "FV" or blank. h = "FGM" or blank. i = "SN" or blank, j = "N" or blank)

a: output voltage as above

b: (separator)

c: R = remote ON/OFF control function.

d: A = L shaped metal chassis and cover.

L = L shaped metal chassis mounted solder side of unit.

e: CO2 = coating on both side of PCB. (not for reduce required spacing)

f: FG = low leakage current.

g: FV = fixed output voltage without adjustable volume.

h: FGM = low leakage current, with or without coating on both side of PCB. (coating is not for reduce required spacing)

i: SN = for the specific customer (Model ZWS150BAF-12 only)

j: N = model not using RK73H2BT+2203F and RMC1/8K224F+ for Bleeder resistor/ R101, R102, R103

ZWS150BAF-24/FU:

Model of long hold-up time for specific customer.

(employing electrolytic capacitor (C6, C7) with higher capacitance)

Test Item Particulars

Mass of equipment (kg)	0.4 kg approx., 0.6 kg approx. for models with suffix /A, 0.56 kg approx. for models with suffix /L
Equipment mobility	for building-in
Connection to the mains	not directly connected to mains
Operating condition	continuous
Access location	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)	-
Class of equipment	Not classified
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)	3000 m.
Altitude of test laboratory (m)	< 1000 m

Technical Considerations

- Secondary Circuits (SELV) are separated from primary by double/ reinforced insulation.
- Primary circuits are separated from Bonding/Grounding points by at least Basic insulation.
- 1.2 The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: For Model Series ZWS150BAF with all suffixes except /A:
- 100% load @ 50°C ambient for Mounting position A, B with convection cooling;
- 100% load @ 40°C ambient for Mounting positions C, E with convection cooling; 100% load @ 30°C ambient for Mounting positions D, F with convection cooling;
- See Enclosure Miscellaneous ID 7-01 for complete Output Derating Curves.
- Repeat of Heating test should be performed in the end product application.
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- For Model Series ZWS150BAFwith suffix /A
- 100% load @ 40°C ambient for Mounting position A, B with convection cooling;
- 100% load @ 30°C ambient for Mounting positions C, E with convection cooling;
- 100% load @ 20°C ambient for Mounting positions D, F with convection cooling;
- See Enclosure Miscellaneous ID 7-03 for complete Output Derating Curves.
- Repeat of Heating test should be performed in the end product application.

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:

- Heating Tests shall be repeated in the end product evaluation.
- 1.5 The following secondary output circuits are SELV: All
- 1.7 The following secondary output circuits are at non-hazardous energy levels: All
- 1.11 The power supply terminals and/or connectors are: Not investigated for field wiring
- 1.12 The maximum investigated branch circuit rating is: 20 A
- 1.13 The investigated Pollution Degree is: 2
- 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 F Insulation System - Reinforced Insulation); L1, L2, L3, T1 (130°C materials, Functional Insulation), PWB (130°C)
- 1.19 The following end-product enclosures are required: Electrical
  Fire
  Mechanical
- The following secondary output circuits are ES1: Output of all models
- The following secondary output circuits are at PS3: Output of all models
- Proper bonding to the end-product main protective earthing termination is: Required (via Cover/Chassis)
- Line to Line Capacitor C1 and C4 may have variations in capacitance to 0.47 uF. Therefore, consideration shall be given in controlling the capacitance value in the end product application with respect to capacitance discharge issue.
- Primary to Ground capacitor C2, C3 may have variations in capacitance up to 2200 pF. Therefore, consideration shall be given in controlling the capacitance value in the end product application with respect to touch current issue.
- Humidity conditioning has been conducted by tropical condition.
- This component has been evaluated in ‘control of fire spread’ method assuming appropriate fire enclosure is provided in end product. Unless the fire enclosure is made of non-combustible or V-0 material, the separation from the PIS shall be considered.
- Classification of PIS has not been conducted. Therefore, all electrical components and conductors including printed wirings were assumed to be arcing/resistive PIS.

Additional Information

N/A

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.

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.