UL TEST REPORT AND PROCEDURE

Standard:	UL 60950-1, 2nd Edition, 2014-10-14 (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)
Product:	Switching Power Supply for building-in
Model:	LS150-X /YYYYYY, where X can be 3.3, 5, 7, 12, 15, 18, 24, 28, 36, 40, 48, or 56. And /YYYYYY can be /B, /BCO, /BCO2, /BCOL, /BCO2L, /BL, /BM, /BMCO, /BMCO2, /BMCOL, /BMCO2L, /BML, /CO, /COL, /CO2, /CO2L, /L or blank.
Rating:	Input: 100-120 V ac, 3.5 A, 50/60 Hz; Input: 200-240 V ac, 2.0 A, 50/60 Hz Output: LS150-3.3, 3.3 Vdc (3 - 3.6 Vdc), 30 A max.; LS150-5, 5 Vdc (4.75 - 5.5 Vdc), 26 A max.; LS150-7, 7 Vdc, 18.6 A; LS150-12, 12 Vdc (10.8 - 13.2 Vdc), 12.5 A max.; LS150-15, 15 Vdc (13.5 - 16.5 Vdc), 10 A max.; LS150-18, 18 Vdc, 8.3 A; LS150-24, 24 Vdc (22 - 27.2 Vdc), 6.5 A max.; LS150-28, 28 Vdc, 5.6 A; LS150-36, 36 Vdc (32 - 40 Vdc), 4.3 A max.; LS150-40, 40 Vdc, 3.9 A; LS150-48, 48 Vdc (42 - 54 Vdc), 3.3 A max.; LS150-56, 56 Vdc, 2.8 A.
Applicant Name and Address:	TDK-LAMBDA SINGAPORE PTE LTD #06-01/08 1008 TOA PAYOH NORTH SINGAPORE 318996 SINGAPORE

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: Maelyn Shi Reviewed by: CheeBeng Wai

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

Electronic components mounted on PWB.

Model Differences

All Models are similar to each other, except the following:-
a) Output rating;
b) Layout;
c) Transformer (T1) secondary winding;
d) Model designation (refer to Additional information more designation information);

LS150-X /YYYYYY, where X can be 3.3, 5, 7, 12, 15, 18, 24, 28, 36, 40, 48, or 56. And /YYYYYY can be /B, /BCO, /BCO2, /BCOL, /BCO2L, /BL, /BM, /BMCO, /BMCO2, /BMCOL, /BMCO2L, /BML, /CO, /COL, /CO2, /CO2L, /L or blank.

1) B => Input Connector (CN1) and Output connector (CN2) are from JST;
2) BM => Input Connector (CN1) and Output connector (CN2) are from Molex;
3) CO => PCB with one (1) side coating;
4) CO2 => PCB with two (2) sides coating;
5) L => Open frame (Cover removed);
6) blank => Input connector and output connector using terminal block TB1;

Terminal block TB1 can only be used with PWB type A; Input Connector CN1 can only be used with PWB type B.

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : for building-in
- Operating condition : continuous
- Access location : for building-in
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : +10%, -10% (manufacturer declared)

- 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
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : below 2000
- Altitude of test laboratory (m) : less than 2000 meters
- Mass of equipment (kg) : 0.70
- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: 40°C for model LS150-7; 50°C for model LS150-18, LS150-28, LS150-40, LS150-56., LS150-3.3 & LS150-5: Mounting A: 40°C for 100% load, 70°C for 50% load; Mounting B, C, D: 30°C for 100% load, 70°C for 40% load, LS150-12, LS150-15, LS150-24, LS150-36 & LS150-48: Mounting A: 50°C for 100% load, 70°C for 70% load; Mounting B, C: 40°C for 100% load, 70°C for 60% load; Mounting D: 40°C for 100% load, 70°C for 50% load.
- The product is intended for use on the following power systems: TN
- The product was investigated to the following additional standards: EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2:2013 (which includes all European national differences, including those specified in this test report).
- The following accessible locations (with circuit/schematic designation) are within a limited current circuit: Secondary side of C21
- The following were investigated as part of the protective earthing/bonding: Printed wiring board trace (PWB type A) Point A to Point B(refer to Enclosure 5-02 - Schematics + PWB for layouts),
- The following are available from the Applicant upon request: Installation (Safety) Instructions / Manual
- LEDs provided in the product are considered low power devices: Yes

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 following Production-Line tests are conducted for this product: Electric Strength, Earthing Continuity
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-SELV: 301Vrms, 584Vpk, Primary-Earthed Dead Metal: 239 Vrms, 351 Vpk,
- The following secondary output circuits are SELV: All secondary outputs.,
- The following secondary output circuits are at non-hazardous energy levels: All secondary outputs.,
- The following secondary output circuits are Limited Current Circuits: Secondary side of C21
- The following output terminals were referenced to earth during performance testing: T1 pin 9, 10, 11, 12,
- 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

- An investigation of the protective bonding terminals has: Been conducted
- The following input terminals/connectors must be connected to the end-product supply neutral: For model LS150-X, where input is terminal block TB1 (pin 2); For model LS150-X, where input is connector CN1 (pin 2),
- 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 F),
- The following end-product enclosures are required: Mechanical, Fire, Electrical
- The following LEDs operate within the exempt group per IEC 62471: All LEDs
- Power Supply Unit is evaluated at 4 different mounting positions. See enclosure 4-16 for details.

Additional Information

For CB report only, reissued no.4:
This report is reissued from E252373-A12-CB-3 due to the following:

1) Upgrade standard to IEC 60950-1 (2nd edition including amendment 1 + amendment 2): Information Technology Equipment - Safety - Part 1: General Requirements - Edition 2 - Revision Date: 2013/05/01;
2) Add mounting methods (B), (C), (D) as shown in enclosure 4-16 and add respective Tma (30°C for models LS150-3.3 and LS150-5 for mounting (B), (C), (D); 40°C for models LS150-12, LS150-15, LS150-24, LS150-36 and LS150-48 for mounting (B), (C), (D));
3) Add output derating (50% load at Tma 70°C for models LS150-3.3 and LS150-5 with mounting (A); 40% load at Tma 70°C for models LS150-3.3 and LS150-5 with mounting (B), (C), (D); 70% load at Tma 70°C for models LS150-12, LS150-15, LS150-24, LS150-36 and LS150-48 with mounting (A); 60% load at Tma 70°C for models LS150-12, LS150-15, LS150-24, LS150-36 and LS150-48 with mounting (B), (C); 50% load at Tma 70°C for models LS150-12, LS150-15, LS150-24, LS150-36 and LS150-48 with mounting (D));
4) Evaluate output voltage tolerance for LS150-3.3 (+/-9.1%), LS150-5 (-5%, +10%), LS150-12 (+/-10%), LS150-15 (+/-10%), LS150-24 (-8.3%, +13.3%), LS150-36 (+/-11.1%) and LS150-48 (+/-12.5%);
5) Add alternate components (Terminal block (TB1), Photocoupler (PC1, PC2), X-Capacitor (C1, C4), Y-Capacitor (C9, C22, C23), Varistor (SA1, SA2), Inductor (L1, L3), Insulation tubing for Q1;
6) Remove Terminal Block (TB1) type PMS 30 950 01 by Phoenix Mecano;
7) Remove Input Connector (CN1) type 5414 by Molex;
8) Part no. for Varistor changed from "SIOVS10K300E2 or S10K300E2" to "S10K300E2K1".

This report is reissued from CBTR Ref. No. E252373-A12-CB-3-Reissue, issued date 2013-03-12 with CB Test Certificate Ref. No. DK-31465-UL, issued date 2013-03-12.

Based on previously conducted testing and the review of product construction, only limited tests were deemed necessary.

Additional Standards

The product fulfills the requirements of: EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 + A2:2013

Markings and instructions

Clause Title	Marking or Instruction Details

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

Special Instructions to UL Representative

The output voltage range indicated in "( )" under "models and rating" represents output voltage tolerance that has been evaluated.

Production-Line Testing Requirements

Electric Strength Test Special Constructions - Refer to Generic Inspection Instructions, Part AC for further information.

Model	Component	Removable Parts	Test probe location	V rms	V dc	Test Time, s
--	--	--	--	--	--	--

Earthing Continuity Test Exemptions - This test is not required for the following models:

--

Electric Strength Test Exemptions - This test is not required for the following models:

--

Electric Strength Test Component Exemptions - The following solid-state components may disconnected from the remainder of the circuitry during the performance of this test:

--

Sample and Test Specifics for Follow-Up Tests at UL

Model	Component	Material	Test	Sample(s)	Test Specifics
--	--	--	--	--	--