

## UL TEST REPORT AND PROCEDURE

<b>Standard:</b>	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)
<b>Certification Type:</b>	Component Recognition
<b>CCN:</b>	QQGQ2, QQGQ8 (Power Supplies for Information Technology Equipment Including Electrical Business Equipment)
<b>Product:</b>	Switching Power Supply for building-in
<b>Model:</b>	LS100-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, /BM, /BMCO, /BMCO2, /BMCOL, /BMCO2L, /BL, /BML, /CO, /CO2, /COL, /CO2L, /L or blank.
<b>Rating:</b>	Input: 100-240 V ac, 2.2 A, 50/60 Hz  Output: LS100-3.3, 3.3 V dc (+3 - +3.6 Vdc), 20 Amax; LS100-5, 5 V dc (+4.75 - + 5.5 Vdc), 16 Amax; LS100-7, 7 V dc, 11.4 A; LS100-12, 12 V dc (+10.8 - +13.2 Vdc), 8.5 Amax; LS100-15, 15 V dc (+13.5 - + 16.5 Vdc), 7 Amax; LS100-18, 18 V dc, 5.8 A; LS100-24, 24 V dc (+22 - +27.2 Vdc), 4.5 Amax; LS100-28, 28 V dc, 3.9 A; LS100-36, 36 V dc (+32 - +40 Vdc), 3 Amax; LS100-40, 40 V dc, 2.7 A; LS100-48, 48 V dc (+42 - +54 Vdc), 2.3 Amax; LS100-56, 56 V dc, 2 A;
<b>Applicant Name and Address:</b>	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.

Issue Date: 2008-07-17  
2016-07-05

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Report Reference #

E252373-A11-UL

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: Chiang Shiau Hui / Project Handler      Reviewed by: CheeBeng Wai / 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

Electronic components mounted on PWB and housed with metal enclosure.

### 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);

LS100-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, /BM, /BMCO, /BMCO2, /BMCOL, /BMCO2L, /BL, /BML, /CO, /CO2, /COL, /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 : not directly connected to the mains
- Operating condition : continuous
- Access location : N/A
- 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 2000m
- Altitude of test laboratory (m) : less than 2000 meters
- Mass of equipment (kg) : 0.60kg
- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: Model LS100-7: 45 °C; Models LS100-18, LS100-28, LS100-40 and LS100-56: 50 °C; Models LS100-3.3 and LS100-5; 40 °C for 100 % load, Mounting Position C and D; 45 °C for 100 % load, Mounting Position A and B; 70 °C for 60 % load (output derating), Mounting Position A and B; 70 °C for 50 % load (output derating), Mounting

Position C and D; , Models LS100-12, LS100-15, LS100-24, LS100-36 and LS100-48; 45 °C for 100 % load, Mounting Position C and D; 50 °C for 100 % load, Mounting Position A and B; 70 °C for 60 % load (output derating), Mounting Position A and B; 70 °C for 50 % load (output derating), Mounting Position C and D.

- 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 C43
- The following were investigated as part of the protective earthing/bonding: Printed wiring board trace point A to Point B (refer to Enclosure 3-05)
- 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: Earthing Continuity, Electric Strength
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-SELV: 341.667 Vrms, 741.667 Vpk, Primary-Earthed Dead Metal: 236 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 C43.
- 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 LS100-X, where input is terminal block TB1 (pin 2); For model LS100-X, where input is connector CN1 (pin 2)
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJ2 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
- LS100-3.3, LS100-5, LS100-7, LS100-12, LS100-15, LS100-18, LS100-24, LS100-28, LS100-36, LS100-40, LS100-48, LS100-56 are evaluated at a derated load at 81.5% of maximum normal load at  $V_{in} = 90V_{ac}$ ; And evaluated at 100% of maximum normal load at  $V_{in} = 115V_{ac}$  to  $264V_{ac}$ .
- Models LS100-3.3, LS100-5, LS100-12, LS100-15, LS100-24, LS100-36 and LS100-48 are evaluated to 4 mounting positions. Other Models only evaluated at Mounting Position A for all test. Refer to enclosure 4-28 for details.

### Additional Information

For CB report only, reissued no. 4:

This report is reissued from original report E252373-A11-CB-3 due to the following:

- 1) Upgrade standard to IEC 60950-1 2ND EDITION + AMD 1 + AMD 2 INFORMATION TECHNOLOGY EQUIPMENT - SAFETY - PART 1: GENERAL REQUIREMENTS - Edition 2 - Revision Date 2013/05/01;
- 2) Add alternate Terminal block, TB1 Mfr: Tianli Electrical Machinery, Type: T950;
- 3) Add alternate Y-capacitor, C1, C2, C4, C5, C8 Mfr: Walsin Technology Corp, Type: AC series;
- 4) Add alternate X-capacitor, C3, C6, C7 Mfr: Eurotronics, Type: MPX 2 series;
- 5) Add alternate Line Choke, L1 Mfr: TDK, Type: PA57915;
- 6) Add alternate optocoupler, PC1, PC2 Mfr: Everlight, Type: EL816;
- 7) Add alternate insulation sleeving at Q2 Mfr: Pioneer Material Precision Tech, Type: PMP-P-100;
- 8) Removed of Terminal block, TB1 Mfr: Phoenix Mecano, Type: PMS 30 950 01;
- 9) Evaluate voltage range as identified by manufacturer for LS100-3.3 (+/- 9.09%), LS100-5 (+10%, -5%), LS100-12 (+/- 10%), LS100-15 (+/- 10%), LS100-24 (+13.33%, -8.33%), LS100-36 (+/- 11.11%) and LS100-48 (+/- 12.5%);
- 10) Add mounting methods (B), (C) and (D);
- 11) Add output derating as follow:  
For Models LS100-3.3, LS100-5, LS100-12, LS100-15, LS100-24, LS100-36 and LS100-48:  
70 °C for 60 % load (Condition C and D), Mounting Position A and B;  
70 °C for 50 % load (Condition E and F), Mounting Position C and D.
- 12) Minor PCB changes to improve clearance creepage distances;
- 13) Additional transformer, T1 winding;
- 14) Additional varistor, SA1 Mfr: Epcos, Type: SNF14K350E2K and alternate Mfr: Thinking Electronic Industrial, Type: TVR14561-M;
- 15) Change of factory name from TRIO ENGINEERING CO LTD to PANYU TRIO MICROTRONICS CO LTD and factory address from SHIJI INDUSTRIAL ESTATE, DONGYONG, PANYU, GUANGZHOU GUANGDONG CHINA to SHIJI INDUSTRIAL ESTATE DONGYONG NANSHA GUANGZHOU GUANGDONG 511453 CHINA.

This report is a reissue of the following CBTRs:

- 1) CBTR Ref. No. E252373-A11-CB-3-Reissue, issued date 2013-02-11 with CB Test Certificate Ref. No. DK-31001-UL, issued date 2013-02-11;
- 2) CBTR Ref. No. E252373-A11-CB-3-Amendment-1, issued date 2013-08-15 with CB Test Certificate Ref. No. DK-31001-A1-UL, issued date 2013-08-15.

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

- 1.2.2.1 - GUIDE INFORMATION PAGE - MAXIMUM OUTPUT VOLTAGE, CURRENT, AND VOLT-AMPERE MEASUREMENT TEST;
- 1.6.2 - INPUT TEST: SINGLE-PHASE;
- 2.1.1.5, 2.1.2, 1.2.8.10 - ENERGY HAZARD MEASUREMENTS;
- 2.2.2, 2.2.3, 2.2.4, PART 22 6.1 - SELV RELIABILITY TEST INCLUDING HAZARDOUS VOLTAGE MEASUREMENTS;
- 2.9.1, 2.9.2, 5.2.2 - HUMIDITY TEST;
- 2.10.2 - DETERMINATION OF WORKING VOLTAGE - WORKING VOLTAGE MEASUREMENT TEST;
- 4.5.1, 1.4.12, 1.4.13 - HEATING TEST;
- 4.5.5, 4.5 - BALL PRESSURE TEST;
- 5.2.2 - ELECTRIC STRENGTH TEST;
- 5.3.1, 5.3.4, 5.3.7 - COMPONENT FAILURE TEST;
- 5.3.1 - 5.3.9 - ABNORMAL OPERATION TESTS;
- 5.3.3, 5.3.7B, ANNEX C.1 - TRANSFORMER ABNORMAL OPERATION TEST;

5.3.7 - POWER SUPPLY OUTPUT SHORT-CIRCUIT/OVERLOAD TEST.

**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.
Fuses - Operator caution statement	"CAUTION: For continued protection against risk of fire, replace only with same type and rating of fuse".

**Special Instructions to UL Representative**

N/A