

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)
Complementary CCN:	QQJQ2, QQJQ8 (Power Supplies for Use in Audio/Video, Information and Communication Technology Equipment)
Product:	Power Supply
Model:	LCM300Q, LCM300U, LCM300L, LCM300W, LCM300N
Rating:	For LCM300Q: AC Input: 100-240V, 5.0A Max, 50/60Hz DC outputs: +24V, 14.5A Max, 350W Max; +5Vsb, 2.0A Max (optional) For LCM300U: AC Input: 100-240V, 5.0A Max, 50/60Hz DC outputs: +36V, 9.7A Max, 350W Max; +5Vsb, 2.0A Max (optional) For LCM300L: AC Input: 100-240V, 5.0A Max, 50/60Hz DC outputs: +12V, 25A Max, 300W Max; +5Vsb, 2.0A Max (optional) For LCM300W: AC Input: 100-240Vac, 5.0A Max, 50/60Hz DC outputs: +48V, 6.25A Max, 300W Max; +5.0Vsb, 2.0A Max (optional) For LCM300N: AC Input: 100-240Vac, 5.0A Max, 50/60Hz DC outputs: +15V, 20.0A Max, 300W Max; +5.0Vsb, 2.0A Max (optional)
Applicant Name and Address:	ASTEC INTERNATIONAL LIMITED 16TH FL LU PLAZA 2 WING YIP ST KWUN TONG KOWLOON HONG KONG

Issue Date: 2015-10-27
2018-02-01

Page 2 of 18

Report Reference #

E186249-A267-UL

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: Suki Kwong

Reviewed by: Patty Li / Paul Wan

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 equipment is switching power supply, intended for building in as a component used in information technology equipment which employs isolating transformers. Reinforced insulation is provided between primary and secondary. Basic insulation is provided between primary and PE (Protective Earth).

Model Differences

Model LCM300U is identical to model LCM300Q except the output ratings, power transformer (T4) and model designation.

Model LCM300L is identical to model LCM300Q except the output ratings, power transformer (T4), gate drive transformer (T2), PCB layout, and model designation.

Model LCM300W is identical to model LCM300Q except the output ratings, power transformer (T4), gate drive transformer (T2), maximum ambient temperature and model designation.

Model LCM300N is identical to model LCM300L except the output ratings, power transformer (T4), and model designation.

For LCM300Q, DC outputs: +24V, 14.5A Max, 350W Max; +5Vsb, 2.0A (optional)

For LCM300U, DC outputs: +36V, 9.7A Max, 350W Max; +5Vsb, 2.0A (optional)

For LCM300L, DC outputs: +12V, 25A Max, 300W Max; +5Vsb, 2.0A (optional)

For LCM300W, DC outputs: +48V, 6.25A Max, 300W Max; +5Vsb, 2.0A (optional)

For LCM300N, DC outputs: +15V, 20A Max, 300W Max; +5Vsb, 2.0A (optional)

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : to be considered in end system
- Operating condition : continuous
- Access location : operator accessible
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : +10%, -10%
- Tested for IT power systems : Yes (for Norway)
- IT testing, phase-phase voltage (V) : 230
- Class of equipment : Class I (earthed)
- Considered current rating of protective device as part of the building installation (A) : 20A
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : 5000 meters
- Altitude of test laboratory (m) : less than 2000 meters
- Mass of equipment (kg) : <18
- The product was submitted and evaluated for use at the maximum ambient temperature (T_{ma}) permitted by the manufacturer's specification of: 45°C at full load up to 350W (For LCM300Q and LCM300U) or 50°C at full load up to 300W up to 70°C at derated output power for the main output (50%).

- The means of connection to the mains supply is: Pluggable B (provided at end system)
- The product is intended for use on the following power systems: TN and IT
- The equipment disconnect device is considered to be: for consideration at end system
- 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), UL 62368-1, 2nd Edition: 2014, CSA C22.2 No.62368-1, 2nd Edition: 2014, IEC 62368-1, 2nd Edition: 2014, 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), UL 62368-1, 2nd Edition: 2014, CSA C22.2 No.62368-1, 2nd Edition: 2014, IEC 62368-1, 2nd Edition: 2014
- The following were investigated as part of the protective earthing/bonding: Printed wiring board trace
- The following are available from the Applicant upon request: Installation (Safety) Instructions / Manual
- The power supply in this equipment was: Investigated to IEC 60950-1. As part of the investigation of this product, the power supply and its test report were reviewed and found to comply with IEC 60950-1.
- The Clearances and Creepage distances have additionally been assessed for suitability up to 5000m elevation.
- For LCM300Q, Maximum ambient of 50°C at full load for +24V output at 300W Max; and maximum ambient of 45°C at full load for +24V output at 350W Max.
- For LCM300U, Maximum ambient of 50°C at full load for +36V output at 300W Max; and maximum ambient of 45°C at full load for +36V output at 350W Max.
- For LCM300L, Maximum ambient of 50°C at full load for +12V output at 300W Max.
- For LCM300W, Maximum ambient of 50°C at full load for +48V output at 300W Max.
- For LCM300N, Maximum ambient of 50°C at full load for +15V output at 300W Max.

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: 390 Vrms, 727 Vpk, Primary-Earthed Dead Metal: 390 Vrms, 712 Vpk
- The following secondary output circuits are SELV: +24V (for LCM300Q), +36V (for LCM300U), +12V (for LCM300L), +48V (for LCM300W), +5Vsb, +15V (for LCM300N)
- The following secondary output circuits are at hazardous energy levels: +24V (for LCM300Q), +36V (for LCM300U), +12V (for LCM300L), +48V (for LCM300W), +15V (for LCM300N)
- The following secondary output circuits are at non-hazardous energy levels: +5Vsb
- The power supply terminals and/or connectors are: Not investigated for field wiring
- 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 magnetic devices (e.g. transformers or inductor) are provided with an OBJ2 insulation

system with the indicated rating greater than Class A (105°C): T4, T1 and T2 (ClassF)

- The equipment is suitable for direct connection to: AC mains supply
- The secondary output connector has not been evaluated for field connections.
- The power supply has been evaluated for use in Class 1 equipment as defined in UL 60950-1 Second edition and CAN/CSA C22.2 No. 60950-1-07. An additional evaluation shall be made if the power supply is intended for use in other than Class 1 equipment.
- This equipment was not evaluated for end system mounting. When installed in the end system, the proper evaluation should be considered.
- Compliance to the temperature limits of user touchable parts and surfaces of the power supply shall be considered at the end system.
- For Model LCM300Q: Additional evaluations have been considered for the +24V +/- 20% output voltage adjustability limited to the following combined conditions: maximum allowed 12.5 A output current and 300W output power at 50°C ambient; and maximum allowed 14.5A output current and 350W output power at 45°C ambient. Additional evaluations have also been considered for Reversed Airflow condition with maximum output power of 300W at 50°C ambient.
- For Model LCM300U: Additional evaluations have been considered for the +36V +/- 20% output voltage adjustability limited to the following combined conditions: maximum allowed 8.35 A output current and 300W output power at 50°C ambient; and maximum allowed 9.7A output current and 350W output power at 45°C ambient.
- For Model LCM300L: Additional evaluations have been considered for the +12V +/- 20% output voltage adjustability limited to the following combined conditions: maximum allowed 25 A output current and 300W output power at 50°C ambient. Additional evaluations have also been considered for Reversed Airflow condition with maximum output power of 300 W at 50°C ambient.
- For Model LCM300W: Additional evaluations have been considered for the +48V +/- 20% output voltage adjustability limited to the following combined conditions: maximum allowed 6.25 A output current and 300W output power at 50°C ambient.
- For Model LCM300N: Additional evaluations have been considered for the +15V +/- 20% output voltage adjustability limited to the following combined conditions: maximum allowed 20.0 A output current and 300W output power at 50°C ambient.
- Only Nidec type U40G12BHA is allowed to be used for Reversed fan condition of LCM300Q.

Additional Information

Additional requirements:

1. Exposure to extreme temperatures, excessive dust, moisture or vibration; to flammable gases; to corrosive or explosive atmospheres:

This equipment is intended to operate in a "normal" environment (Offices and homes).

2. Electromedical equipment connected to the patient:

These equipment are not an electromedical equipment intended to be physically connected to a patient.

The label is a draft of an artwork for marking plate pending approval by National Certification Bodies and it shall not be affixed to products prior to such an approval.

For UL Report, refer to E186249-A232

Project 13CA05606:

- 1.) Added alternate fuse, Bel Fuse, Type 5HFP, Rated 250 V, 8 A.
- 2.) Corrected the typo error of the rating of Y-Cap (C7, C8) from 400 V to 250 V.
- 3.) Added Gate Drive Transformer (T2), Type 801-003585-0001
- 4.) Added Common Mode Choke (L10), Type 801-006154-0002

- 5.) Added Common Mode Choke (L2), Type 801-006703-0000
- 6.) Added Common Mode Choke (L3) Type 801-006170-0001 in the Critical Component List

Project 13CA22863:

- Change the testing condition for Humidity Test and Electric Strength Test after Humidity Test
- Update the name for the applicant and manufacturer

Project 13CA24852:

Update the Model number for Gate Drive Transformer (T2) due to typo error

Project 13CA43901:

- 1.) Added modified model LCM300U
- 2.) Added alternate power transformer (T4), type 801-006357-XXXX
- 3.) Corrected Auxiliary Transformer (T1) type from 801-006090-0001 to 801-006090-XXXX
- 4.) Corrected Gate Driver Transformer (T2) type from 801-003585-0001 to 801-003585-XXXX or 85266019861
- 5.) Corrected Common Mode Choke (L1) type from 801-006703-0000 to 801-006703-XXXX
- 6.) Corrected Common Mode Choke (L2) type from 801-006705-0000 or 801-006703-0000 to 801-006705-XXXX or 801-006703-XXXX
- 7.) Corrected Common Mode Choke (L3) type from 8801-006170-0001 to 801-006170-XXXX
- 8.) Corrected Common Mode Choke (L10) type from 801-006154-0002 to 801-006154-XXXX
- 9.) Corrected Output Choke (L601) type from 801-005212-0000 to 801-005212-XXXX
- 10.) Corrected Output Choke (L5) type from 801-000630-0000 to 801-000630-XXXX
- 11.) Added alternate Optocoupler (U104, U7, U8), Renesas type PS2561AL
- 12.) Added Output Terminal Block (optional) type E.I.Dupont type FR530
- 13.) Added alternate Fan Protechnic type MG(X)4012XB-(f)20, Protechnic type MG(X)4012HB-(f)20 and Sunonwealth type PSD1204PKB3-A
- 14.) Corrected enclosure material from Galvanized Steel to Steel
- 15.) Corrected cover material from Galvanized Steel to Steel
- 16.) Added alternate label format details see attachment ID7-03 to ID 7-07

Project 13CA43911:

- 1.) Corrected typo error of C7, C8 from 680pF to 1.0nF and 400V to 250V
- 2.) Corrected typo error of C136, C137 from 1.1nF to 2.2nF

Project: 4786102360:

- 1.) Revised the controlled component, Fuse, from F1 and F2 to F1 only
- 2.) Revised the manufacturer and type of the component, X and Y capacitors from being "controlled" to "interchangeable".
- 4.) Revised the rating of the Y-capacitor (C5,C6) from 220pF to 1.5nF
- 5.) Added alternate optocoupler, type TLP785F by Toshiba for U104, U7 and U8
- 6.) Increased the dimension of the base insulator from 152.4mm to 157.4 mm.

Reissue E186249-A267-CB (Project 4786333263)

This test report should be read in conjunction with the original report numbers:

- E186249-A232-CB-2 issued on 2013-04-24, E186249-A232-CB-2-Correction-1 issued on 2013-05-14, with CB Certificate No. (CB-DK-32314-UL), issued on 2013-04-24;
- E186249-A232-CB-2-Amendment-1 issued on 2013-08-15, E186249-A232-CB-2-Correction-2 issued on 2013-09-11, with CB Certificate No. (DK-32314-A1-UL) issued on 2013-08-15;
- E186249-A232-CB-2-Amendment-2 issued on 2013-11-12, with CB Certificate No. (DK-32314-A2-UL) issued on 2013-11-12.

Further information of this reissue:

1. Added modified model LCM300L

2. Added alternate power transformer (T4), type 801-006860-XXXX for LCM300L only
3. Added alternate Gate Drive Transformer (T2), type 801-006552-XXXX for LCM300L only
4. Added alternate fan, type Protechnic type MG(X)4012MB-(f)20 for LCM300L only;
5. Deleted fan, type Nidec type U40G12BHA5 for previous model LCM300Q and LCM300U; add fan, type Nidec type U40G12BHA5 for LCM300L only
6. Removed Output choke (L5) from critical components list
7. Increased the maximum value of Y-capacitor (C17, C18) to 1nF
8. Added alternate optocouplers by Everlight type EL1017
9. Added PWB layout for LCM300L
10. Amended varistor (Thinking, type TVR10471) PWB layout name form (X3) to (MOV3) for LCM300L
11. Added varistor by Epcos type S10K300 with PWB layout name (X3) for LCM300Q and LCM300U; (MOV3) for LCM300L
12. Added an insulator for capacitor C22. See attachment ID 7-06 for details.
13. Added an air deflector. See attachment ID 7-07 for details.
14. Upgrade standard from amendment 1 to amendment 2

E186249-A267-CB-1-Amendment-1 (under Project 478625068)

1. Employing additional Model LCM300W
2. Employing alternate Y-Capacitors (C5, C6), type CD by TDK, type AH by Walsin and type KX by Murata
3. Correcting typo error in Critical Component table

E186249-A267-CB-1-Amendment-2 (Project 4786444325)

- Add Alternate model LCM300N
- Revise the Rating of C17 to Max 220pF for model LCM300Q, LCM300U, LCM300W, LCM300N
- Add factories, "ASTEC ELECTRONICS COMPANY LIMITED", "ASTEC ELECTRONICS (LUODING) CO. LIMITED" and "ZHONGSHAN GENERAL CARTON BOX FACTORY CO LTD"

E186249-A267-CB-1-Amendment-3 (Project 4786492082)

- Add reversed air flow direction (From Input/Output terminals to Fan opening) for Model LCM300Q

Reissue: E186249-A267-CB-2 (Project 4787112301)

Some tests conducted under this investigation due to reissue of CB Test Report Ref. No E186249-A267-CB-1.

All required tests were carried out under the original investigation.

This report is a reissue of CBTR Ref. No.: E186249-A267-CB-1, issued on 2014-04-24 and CB Test Certificate Ref. No. DK-38373-UL, issued on 2014-04-25; Amendment 1: E186249-A267-CB-1, issued 2014-06-06 and CB Test Certificate Ref. No. DK-38373-A1-UL, issued on 2014-06-06; Amendment 2: E186249-A267-CB-1, issued 2014-06-16 and CB Test Certificate Ref. No. DK-38373-A2-UL, issued on 2014-06-16; and Amendment 3: E186249-A267-CB-1, issued 2014-07-16 and CB Test Certificate Ref. No. DK-38373-A3-UL, issued on 2014-07-16. Based on the previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, has been determined that the product continues to comply with the standard.

- 1) Include UL and C-UL Investigation in report E186249-A267;
- 2) Alternate reversed air flow direction (From Input/Output terminals to Fan opening) for Model LCM300L;
- 3) Delete the factory: ASTEC ELECTRONICS COMPANY LIMITED
1ST BUILDING EMERSON INDUSTRIAL PARK, FENG TANG ROAD,
FUYONG, BAO'AN DISTRICT, SHENZHEN, GUANGDONG PROVINCE,
PEOPLE'S REPUBLIC OF CHINA 518103 for CB investigation.

Revision: 3077620.832811

USR/CNR - Transfer the report E186249-A267-UL from Vol. X7 to Vol. X6 under the File E186249.

Revision: 4788198971

- Include the complementary CCN QQJQ2/8 of the followings:

1.) UL 62368-1 AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT - PART 1: SAFETY REQUIREMENTS- Edition 2 - Issue Date 2014/12/01.

2.) CSA C22.2 NO. 62368-1-14 AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT - PART 1: SAFETY REQUIREMENTS- Edition 2 - Issue Date 2014/12/01.

- Transfer the report E186249-A267-UL from Vol. X6 (for QGGQ2/8) to Vol. X9 (for QGGQ2/8 + QQJQ2/8) under the File E186249.

For CB report under IEC60950-1, please refer to E186249-A267-CB.

For CB report under IEC62368-1, please refer to E186249-A6001-CB.

Additional Standards

The product fulfills the requirements of: EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 +A2:2013; IEC 60950-1:2005 + A1:2009+A2:2013; UL 62368-1, 2nd Edition: 2014, CSA C22.2 No.62368-1, 2nd Edition: 2014, IEC 62368-1, 2nd Edition: 2014