

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
Model:	LPS363-M-XXX, LPS364-M-XXX, LPS365-M-XXX, LPS368-M-XXX, LPS366-M-XXX (where -XXX can be any alphanumeric character, symbol or blank that represents customer identity that do not affect safety)
Rating:	Model LPS363-M-XXX: Input: 100-240Vac, 5.5A, 50/60Hz 120V(min) - 300V(max)dc, 5.5A DC Output: +12V, 30A max +12V fan, 1A max +5Vsb, 2A max Maximum Output Power: 200W Convection Cooling 360W Forced Air Cooling Model LPS364-M-XXX: Input: 100-240Vac, 5.5A, 50/60Hz 120V(min) - 300V(max)dc, 5.5A DC Output: +15V, 24A max +12V fan, 1A max +5Vsb, 2A max Maximum Output Power: 200W Convection Cooling 360W Forced Air Cooling Model LPS365-M-XXX: Input: 100-240Vac, 5.5A, 50/60Hz 120V(min) - 300V(max)dc, 5.5A DC Output: +24V, 15A max +12V fan, 1A max +5Vsb, 2A max Maximum Output Power: 200W Convection Cooling

360W Forced Air Cooling

Model LPS368-M-XXX:

Input:

100-240Vac, 5.5A, 50/60Hz

120V(min) - 300V(max)dc, 5.5A

DC Output:

+48V, 7.5A max

+12V fan, 1A max

+5Vsb, 2A max

Maximum Output Power:

200W Convection Cooling

360W Forced Air Cooling

Model LPS366-M-XXX:

Input:

100-240Vac, 5.5A, 50/60Hz

120V(min) - 300V(max)dc, 5.5A

DC Output:

+30.6 - +36V, 11.25A max

+12V fan, 1A max

+5Vsb, 2A max

Maximum Output Power:

200W Convection Cooling

360W Forced Air Cooling

Applicant Name and Address:

ASTEC INTERNATIONAL LTD

16TH FL

LU PLAZA

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KWUN TONG KOWLOON HONG KONG

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: Tony Yeung

Reviewed by: Brian Wong

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 an AC/DC switching power supply designed to deliver 200W rated output power during natural convection cooling and 360W rated output power during forced air cooling.

This equipment is intended for use in Class I or Class II application.

Reinforced insulation is provided between primary circuit to secondary circuit and basic insulation is provided on primary circuit to Earth and secondary circuit to earth. When this equipment is used as Class II equipment earth traces is considered dead metal.

Model Differences

LPS363-M-XXX identical to models LPS364-M-XXX, LPS365-M-XXX, LPS368-M-XXX, LPS366-M-XXX except for model designation, output voltage (main) rating and power transformer T4.

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : To be considered in the end system
- Operating condition : continuous
- Access location : To be considered in the end system
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : +10%, -10% for AC input; No tolerance declared for DC input
- Tested for IT power systems : No
- IT testing, phase-phase voltage (V) : N/A
- Class of equipment : Class I (earthed) / Class II (to be considered in the end system)
- 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) : 5000

- Altitude of test laboratory (m) : less than 2000 meters
- Mass of equipment (kg) : less than 1kg
- The Clearances and Creepage distances have additionally been assessed for suitability up to 5000 meters elevation. Clearance distance are calculated according to IEC60664-1 table A-2 multiplier factor is 1.48.
- This power supply is component level power supply intended for use in Class I or Class II application.
- This power supply maintains basic insulation between primary and PE trace, secondary and PE trace when used as Class II equipment. PE trace is considered dead metal.
- This equipment is not an electromedical equipment intended to be physically connected to a patient.
- The product was submitted and evaluated for use at the maximum ambient temperature (T_{ma}) permitted by the manufacturer's specification of: 50°C and up to 70°C at derated power. Output derates 2.5% per degree from 50°C to 70°C.
- The means of connection to the mains supply is: AC / DC Input Terminal
- 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 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.
- This equipment is not an electromedical equipment intended to be physically connected to a patient.

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 DC input voltage 120V(min) - 300V(max) is rectified from AC mains supply. Further evaluation must be considered if the unit is directly connected to DC mains supply.
- Earthing continuity test should be conducted in end system if the unit is considered as Class I construction.
- This equipment was not evaluated for system mounting. When installed in end system, proper evaluation should be considered.
- This equipment has a secondary output (+12V, +15V, +24V, +48V, +30.6 - +36V) exceeding 240VA. When installing into the end system, proper evaluation should be considered that all relevant standard must be fulfilled.
- For model LPS363-M-XXX: Additional evaluation has been considered on the +12V -0% / +15% output voltage adjustability limited to the following combined conditions: maximum 30A load current and 360W total output power. For model LPS364-M-XXX, additional evaluation has been considered on the +15V -5% /+10% output voltage adjustability limited to the following combined conditions: maximum 24A load current and 360W total output power. , For model LPS365-M-XXX, additional evaluation has been considered on the +24V -0% / +15% output voltage adjustability limited to the following combined conditions: maximum 15A load current and 360W total output power. , For model LPS368-M-XXX, additional evaluation has been considered on the +48V -5% / +10% output voltage adjustability limited to the following combined conditions: maximum 7.5A load current and 360W total

output power. ,

- Refer to General Product information 2 (additional information) for the maximum allowable output power, voltage and current.
- The following Production-Line tests are conducted for this product: Electric Strength
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: For LPS363-M-XXX, Primary-SELV: 425.2 Vrms, 592 Vpk, Primary-Earthed Dead Metal: 425.2 Vrms, 583 Vpk; For LPS364-M-XXX, Primary-SELV: 416.4 Vrms, 636 Vpk, Primary-Earthed Dead Metal: 416.4 Vrms, 636 Vpk; For LPS365-M-XXX, Primary-SELV: 416.8 Vrms, 619 Vpk, Primary-Earthed Dead Metal: 416.6 Vrms, 628 Vpk; For LPS368-M-XXX, Primary-SELV: 416.8 Vrms, 619 Vpk, Primary-Earthed Dead Metal: 416.6 Vrms, 619 Vpk, For LPS366-M-XXX, , Primary-SELV: 418.1 Vrms, 610 Vpk, Primary-Earthed Dead Metal: 418.6 Vrms, 610 Vpk;
- The following secondary output circuits are SELV: All output covered in this report
- The following secondary output circuits are at hazardous energy levels: +12V, +15V, +24V, +48V, +30.6 - +36V
- The following secondary output circuits are at non-hazardous energy levels: +12V fan, +5Vsb
- The following secondary output circuits are Limited Current Circuits: Secondary pin of Y1 capacitor
- 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: Not 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 (Class F) designated 155-10C; T1 (Class F) designated 155-10C
- The following end-product enclosures are required: Mechanical, Fire, Electrical
- The maximum continuous power supply output (Watts) relied on forced air cooling from: 400 LFM forced air cooling beyond 200W up to 360W maximum output power.
- The equipment is suitable for direct connection to: AC mains supply
- This equipment is not an electromedical equipment intended to be physically connected to the patient.

Additional Information

The corresponding UL report is E186249-A272.

Forced Air Cooling (derate each output at 2.5% per degree C from 50 to 70 degrees C)

360W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 50 degree C ambient

270W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 60 degree C ambient

180W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 70 degree C ambient

Forced Air Ventilation Set-up and Power Supply Orientation

Position 1: Fan blowing to Output

Position 2: Fan blowing to component L3

Position 3: Fan blowing to T4 (Power TRF)

Convection Cooling (derate each output at 2.5% per degree C from 50 to 70 degrees C)

200W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 50 degree C ambient

150W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 60 degree C ambient

100W Maximum output power at 100-240Vac input and 120(min)-300(max)Vdc input with 70 degree C ambient

Additional Convection Cooling Test Evaluation (derate each output at 2.5% per degree C from 50 to 70 degrees C)

220W Maximum output power at 100Vac(min) - 180Vac(max) input and 120Vdc input with 50 degree C ambient

165W Maximum output power at 100Vac(min) - 180Vac(max) input and 120Vdc input with 60 degree C ambient

110W Maximum output power at 100Vac(min) - 180Vac(max) input and 120Vdc input with 70 degree C ambient

240W Maximum output power at 200Vac(min) - 264Vac(max) input and 200Vdc(min)-300Vdc(max) input with 50 degree C ambient

180W Maximum output power at 200Vac(min) - 264Vac(max) input and 200Vdc(min)-300Vdc(max) input with 60 degree C ambient

120W Maximum output power at 200Vac(min) - 264Vac(max) input and 200Vdc(min)-300Vdc(max) input with 70 degree C ambient

The following are the output loading conditions used in the entire testing of model LPS364-M-XXX. For forced-air cooling: Load 1: +15.0V, 24.0A; +12V Fan 0A; +5Vsb, 0A (360W total output power). Load 2: +15.0V, 22.54A; +12V Fan 1A; +5Vsb, 2A (360W total output power). Load 3: +16.5V, 21.82A; +12V Fan, 0A; +5Vsb, 0A (360W total output power). Load 4: +16.5V, 20.48A; +12V Fan 1A; +5Vsb, 2A (360W total output power). Load 5: +14.25V, 24.0A; +12V Fan 0.67A; +5Vsb, 2A (360W total output power). For Natural convection cooling: Load 6: +16.5V, 11.46A; +12V Fan 0.5A; +5Vsb, 1A (200W total output power). Load 7: +16.5V, 12.67A; +12V Fan 0.5A; +5Vsb, 1A (220W total output power). Load 8: +16.5V, 13.88A; +12V Fan 0.5A; +5Vsb, 1A (240W total output power).

The following are the output loading conditions used in the entire testing of model LPS365-M-XXX. For forced-air cooling: Load 1: +24.0V, 15.0A; +12V Fan 0A; +5Vsb, 0A (360W total output power). Load 2: +24.0V, 14.1A; +12V Fan 1A; +5Vsb, 2A (360W total output power). Load 3: +27.6V, 13.05A; +12V Fan, 0A; +5Vsb, 0A (360W total output power). Load 4: +27.6V, 12.25A; +12V Fan 1A; +5Vsb, 2A (360W total output power). For Natural convection cooling: Load 5: +27.6V, 6.85A; +12V Fan 0.5A; +5Vsb, 1A (200W total output power). Load 6: +27.6V, 7.57A; +12V Fan 0.5A; +5Vsb, 1A (220W total output power). Load 7: +27.6V, 8.3A; +12V Fan 0.5A; +5Vsb, 1A (240W total output power).

The following are the output loading conditions used in the entire testing of model LPS368-M-XXX. For forced-air cooling: Load 1: +48.0V, 7.5A; +12V Fan 0A; +5Vsb, 0A (360W total output power). Load 2: +48.0V, 7.04A; +12V Fan 1A; +5Vsb, 2A (360W total output power). Load 3: +52.8V, 6.82A; +12V Fan, 0A; +5Vsb, 0A (360W total output power). Load 4: +52.8V, 6.40A; +12V Fan 1A; +5Vsb, 2A (360W total output power). Load 5: +45.6V, 7.5A; +12V Fan 0.67A; +5Vsb, 2A (360W total output power). Load 8: +52.8V, 4.8A; +12V Fan 0.75A; +5Vsb, 1.5A (270W total output power at 75% derated load). Load 9: +52.8V, 3.2A; +12V Fan 0.5A; +5Vsb, 1A (180W total output power at 50% derated load). For Natural convection cooling: Load 6: +52.8V, 3.96A; +12V Fan 0.5A; +5Vsb, 1A (220W total output power). Load 7: +52.8V, 4.34A; +12V Fan 0.5A; +5Vsb, 1A (240W total output power).

The following are the output loading conditions used in the entire testing of model LPS366-M-XXX. For forced-air cooling: Load 1: +36V, 10A; +12V Fan 0A; +5Vsb, 0A (360W total output power). Load 2: +36V,

9.39A; +12V Fan 1A; +5Vsb, 2A (360W total output power). Load 3: +36V, 7.05A; +12V Fan, 0.75A; +5Vsb, 1.5A (270W total output power). Load 4: +36V, 4.7A; +12V Fan 0.5A; +5Vsb, 1A (180W total output power). Load 7: +30.6V, 11.25A; +12V Fan 0A; +5Vsb, 0A (360W total output power). Load 8: +30.6V, 11.05A; +12V Fan 1A; +5Vsb, 2A (360W total output power). For Natural convection cooling: Load 5: +36V, 5.81A; +12V Fan 0.5A; +5Vsb, 1A (220W total output power). Load 6: +36V, 6.37A; +12V Fan 0.5A; +5Vsb, 1A (240W total output power).

Note: Loading conditions are the output load settings of the power supply during test. Loading conditions at the end system may vary however, it should not exceed the output ratings given (see cover page).

E186249-A276-CB-1-Amendment-1 (Project 4786516848)

- Addition of the new models LPS364M-XXX, LPS365M-XXX and LPS368M-XXX with new output ratings.

E186249-A276-CB-1-Amendment-2 (Project 4786550178)

- Revising the capacitances for the Y-Capacitors, C1, C2 to 1500 pF for the types: CD under TDK-EPC (E37861); AH under Walsin (E146544); KX under Murata (E37921).

E186249-A276-CB-1-Correction-1 (Project 476613929)

- Correcting the typo under the Table-Critical Components List by including the following items::

1. Power Transformer (T4) (For LPS364-M-XXX)
2. Power Transformer (T4) (For LPS365-M-XXX)
3. Power Transformer (T4) (For LPS368-M-XXX)
4. TIW (T4), types T-XX-A-01-T-XXX-1.5, T-AA-L-19/40-T-XXX-1.5, T-XX-A-01-T-XXX-1.5 under Rubadue Wire Co. Inc.
5. TIW (T1), type T-XX-A-01-T-XXX-1.5 under Rubadue Wire Co. Inc. and type WXXT1.5EXXTC1A under New England Wire Technologies.

The original report was modified on 2014-09-05 to include the following changes/additions:

This report is in conjunction to the CB report

1. E186249-A276-CB-1, dated on 2014-06-17, with the corresponding Certificate DK-39280-UL, dated on 2014-06-17;
2. E186249-A276-CB-1- Amendment-1 dated on 2014-08-08, with the corresponding Certificate DK-39280-A1-UL, dated on 2014-08-08.
3. E186249-A276-CB-1- Amendment-2 dated on 2014-09-05, with the corresponding Certificate DK-39280-A2-UL, dated on 2014-09-05.

This report is amended to E186249-A276-CB-1-Amendmenet-3 (Project 4786958932)

-employ alternate model LPS366-M-XXX

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

Markings and instructions

Clause Title	Marking or Instruction Details
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Special Instructions to UL Representative

N/A