UL TEST REPORT AND PROCEDURE

Standard:	ANSI/AAMI ES60601-1 (2005/(R)2012 + A1:2012, C1:2009/(R)2012 + A2:2010/(R)2012) - Amendment 1 - Revision Date 2012/08/21 CAN/CSA-C22.2 No. 60601-1:14 - Edition 3 - Revision Date 2014/03
Certification Type:	Component Recognition
CCN:	QQHM2, QQHM8 (Power Supplies, Medical and Dental)
Product:	Medical Power Supply
Model:	Models LPT52-M, LPT53-M, LPT51-M, LPT54-M
Rating:	AC Input: 100-240 V, 50/60 Hz, 2 A Model LPT52-M: Rated Output: 5 Vdc, 8 A; 12 Vdc, 3 A; -12 Vdc, 0.5 A Total Max. Output Power: 55 W Model LPT53-M: Rated Output: 5 Vdc, 8 A; 15 Vdc, 2.4 A; -15 Vdc, 0.5 A Total Max. Output Power: 55 W Model LPT51-M: Rated Output: 5 Vdc, 3 A; 12 Vdc, 0.5 A; +3.3 Vdc, 8 A Total Max. Output Power: 47.4 W Model LPT54-M: Rated Output: 5 Vdc, 8 A; +12 Vdc, 0.5 A; +24 Vdc, 1.5 A Total Max. Output Power: 55 W
Applicant Name and Address:	ASTEC INTERNATIONAL LTD - PHILIPPINE BRANCH 16TH FL LU PLAZA 2 WING YIP ST 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: Ricky Wang / Clare He Reviewed by: David Shih

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

Switching Mode Power Supply, where the electronic components are mounted on PWB with no enclosure, without RM evaluation in this investigation.

Model Differences

Model LPT53-M is identical to LPT52-M except for the followings:
1. Model Designation;
2. Rated DC Output;
3. T1 secondary winding;
4. Components: D5 and D6

Model LPT51-M is identical to LPT52-M except for the followings:
1. Model Designation:
2. Rated DC Output;
3. T1 Primary and secondary winding
4. Employing alternate choke L1, types 85272000090 and 85272000100 and L2, type 85272000090

Model LPT54-M is identical to LPT51-M except for the followings:
1. Model Designation:
2. Rated DC Output;
3. T1 Primary and secondary winding;
4. Employing alternate choke L2, type 85272000380
5. Add a Gap pad on transformer (T1)

Technical Considerations

- Classification of installation and use : For built-in
- Device type (component/sub-assembly/ equipment/ system) : Component
- Intended use (Including type of patient, application location) : Component – to be evaluated in end product
- Mode of operation : Continuous
- Supply connection : Component – to be evaluated in end product
- Accessories and detachable parts included : None
- Other options include : None
- The product was investigated to the following additional standards: AAMI ES60601-1 AMD 1 MEDICAL ELECTRICAL EQUIPMENT - PART 1: GENERAL REQUIREMENTS FOR BASIC SAFETY AND ESSENTIAL PERFORMANCE, AMENDMENTS - Edition 1 - Issue Date 2012/08/20 CSA C22.2 NO. 60601-1:14 MEDICAL ELECTRICAL EQUIPMENT. PT. 1, GENERAL REQUIREMENTS FOR BASIC SAFETY AND ESSENTIAL PERFORMANCE - Edition 3 - Issue Date 2014/01/01
- The product was not investigated to the following standards or clauses: Biocompatibility (ISO 10993-1), Clause 14, Programmable Electronic Systems, Electromagnetic Compatibility (IEC 60601-1-2)
- The degree of protection against harmful ingress of water is:: Ordinary
- The product is suitable for use in the presence of a flammable anesthetics mixture with air or oxygen or with nitrous oxide:: No

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:

- 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 equipment has not been evaluated for use in or likely to be used in the patient vicinity. , -The secondary output circuit is SELV and are not at hazardous energy levels. , -Instructions and equipment marking shall be provided in a language, which is acceptable in the country in which the equipment is to be installed. , -Additional marking shall be provided per the end product application. , -The magnetic device (T1) is provided with an Class F(OBJY2) insulation system. , -Protective earthing connection shall be investigated in the end-product. Earthing and Potential Equalization Test need to be repeat in end-product. , -A suitable Enclosures or Protective Covers should be provided in end system.
- This power supply has been judged on the basis of the required creepage and clearances in the First Edition of the Standard for Medical Electrical Equipment, ANSI/AAMI ES 60601-1, Sub clause 8.9.
- This power supply has not been evaluated for patient connected applications.
- This power supply is type of built-in device as parts of medical equipment. The date of manufacture need to be evaluated in the end-product.
- Pollution Degree IIIb
- Overvoltage Category II
- This unit is intended to be used at 3000m high altitude.
- The reference voltage for Dielectric Voltage Test in End Product: 277.9rms /513Vpk for T1(Pri to sec)
- This power supply was tested on a 20A branch circuit. If used on a branch circuit greater than this, additional testing may be necessary.
- The power supply was evaluated as 2 MOOP between Primary to Secondary and 1 MOOP from Primary to Earth see insulation diagram for details.
- This power supply shall be installed in compliance with the enclosure, mounting, spacing, casualty, markings and segregation requirements of the end use application.
- No test data recorded in this upgrade report, all tests(Leakage current test, Temperature test, marking test, and working voltage and earth impedance required can be refer to E182560-A122 3.0 edition report.
- End product Risk Management Process to consider the need for different orientations of installation during testing.
- End product to determine the acceptability of risk in conjunction to insulation to resistance to heat, moisture, and dielectric strength.
- End product to determine the acceptability of risk in conjunction to the movement of components and conductors as part of the power supply.
- End product to determine the acceptability of risk in conjunction to the routing of wires away from moving parts and sharp edges as part of the power supply.
- Temperature Test was conducted without Test Corner. End product to determine the acceptability of risk in conjunction to temperature testing without test corner as part of the power supply.
- End product to determine the acceptability of risk in conjunction to the Cleaning and Disinfection Methods as part of the power supply.
- End product to determine the acceptability of risk in conjunction to the Leakage of Liquids as part of the power supply.
- End product to determine the acceptability of risk in conjunction to the Arrangement of Indicators as part of the power supply.
- End product to determine the acceptability of risk in conjunction to the results of Mechanical Testing conducted as part of the power supply.

- End product to determine the acceptability of risk in conjunction to the selection of components as it pertains to the intended use, essential performance, transport, storage conditions as part of the power supply.
- The end-product evaluation shall ensure that the requirements related to Accompanying Documents, Clause 7.9 are met.

Additional Information

All models information and test results were derived from original report E182560-A122: upgrade standard to 3.1 version of ANSI/AAMI ES60601-1 (2005 + C1:09 + A2:10 + A1:12) and CAN/CSA-C22.2 No. 60601-1 (2014). The risk management requirements of the standard were not addressed.
The product was previously certified by ANSI/AAMI ES60601-1: 2005 and CAN/CSA-C22.2 No.60601-1:08, 2nd Edition, All the test records and tests data can be referred to original report of E182560-X2-A122.

The risk management requirements of the standard were not addressed.

Additional Standards

The product fulfills the requirements of: N/A

Markings and instructions

Clause Title	Marking or Instruction Details
Company identification	Classified or Recognized company's name, Trade name, Trademark or File
Model	Model number
Supply Connection	Voltage range, ac/dc, phases if more than single phase
Supply Frequency	Rated frequency range in hertz
Alternating current	
Power Input	Amps, VA, or Watts
Output	Rated output voltage, power
Fuses	Ratings(current and voltage) and type. (located adjacent to fuse OR as a diagram inside enclosure)
Protective earth ground	

Special Instructions to UL Representative

N/A

Production-Line Testing Requirements

Test Exemptions - The following models are exempt from the indicated test

Model	Grounding Continuity	Dielectric Voltage Withstand	Patient Circuit Dielectric Voltage Withstand
All models	Required	Required	Exempted

Solid-State Component Test Exemptions - The following solid-state components may be disconnected from the remainder of the circuitry during either Dielectric Voltage Withstand Test:

Component
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Sample and Test Specifics for Follow-Up Tests at UL

The following tests shall be conducted in accordance with the Generic Inspection Instructions

Plastic Enclosure or Part	Test	Sample(s)	Test Specifics
N/A	--	--	--

TABLE: List of Critical Components

Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN /Standard	Marks of Conformity
Marking Label	3M	7815	150°C, for application to metal.	PGJI2, PGDQ2	UL
PWB	Various	Various	94V0 or Better, 130°C	ZPMV2/8	UL
Input Connector (SK1)	Molex Inc.	41791	7A, 250Vac	ECBT2	UL
Output Connector (SK2)	Various	Various	6 pins provided. Plastic minimum rated V-2 or better.	QMFZ2	UL
Fuse (F1, F2)	Wickmann-Werke	392	T2.5 A, 250 Vac. Marked "F1 T2.5AL 250V" and "F2 T2.5AL 250V" on PWB respectively by silk-screened.	JDYX2, JDYX8	UL
Fuse (F1, F2) - Alternate	Various	Various	Listed, 2.5 A, 250 Vac ac. Marked "F1 T2.5AL 250V" and "F2 T2.5AL 250V" on PWB by silk-screened.	JDYX	UL
X-Cap. (C1)	Various	Various	Min. 250 Vac, Max. 0.33 µF, Class X1 or Class X2, also comply with IEC 60384-14	FOKY2, FOWX2	UL
Y-Cap. (C2, C3)	Various	Various	Min. 250 Vac, Max. 1500 pF. Class Y1 or Class Y2, also comply with IEC 60384-14	FOKY2, FOWX2	UL
Electrolytic Capacitor (C12, C42)	Various	Various	Max. 82 µF, min. 400 V, min. 105 °C, provided with pressure relief.	-	-
Bridging capacitor (C22)	Various	Various	Max. 1000 pF, Min. 250 Vac, Class Y1, also comply with IEC 60384-14	FOKY2 FOWX2	UL
Thermistor (TH1)	Various	Various	10 ohm, 3A at 25°C	-	-
Bridge Diode (DB1)	Various	Various	Min. 800 V, Min. 4 A.	-	-
Transistor (Q3)	Various	Various	Min. 650 V, Min. 11A.	-	-
Discharging resistor (R1, R2)	Various	Various	Max. 470 kohm, Min. 1/4 W respectively.	-	-
Opto-coupler (IC4, IC5)	Lite-On Technology Corp.	LTV817	Double Protection, Viso; 5000 V ac.	FPQU2, FPQU8	UL/CN
Opto-coupler (IC4, IC5) - Alternate	Vishay Infrared Components	System code H or J	Double Protection, Viso; 4420 Vac.	FPQU2, FPQU8	UL/CN
Transformer (T1) - For Model LPT52-M only	Astec	Part No. 852-72000340	(OBJY2), Astec, designated 155-10B (E94225). This magnetic component is controlled by file E127000. See enclosure attachment for T1 spec.	-	UL
Transformer (T1) - For	Astec	Part No. 852-	(OBJY2), Astec, designated155-10B (E94225).	-	UL

Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN /Standard	Marks of Conformity
Model LPT53-M only		72000350	This magnetic component is controlled by file E127000. See enclosure attachment for T1 spec.		
Transformer (T1) - For Model LPT51-M only	Astec	Part No. 852-72000330	(OBJY2), Astec, designated155-10B (E94225). This magnetic component is controlled by file E127000. See enclosure attachment for T1 spec.	-	UL
Transformer (T1) - For Model LPT54-M only	Astec	Part No. 852-72000360	(OBJY2), Astec, designated155-10B (E94225). This magnetic component is controlled by file E127000. See enclosure attachment for T1 spec.	-	UL
Output Choke (T2)	Astec	Part No. 852-72000410	Consists of (OBMW2), copper magnet wire are separated by 1 layer of Zytel bobbin, (QMFZ2), E I Dupont, Type FR50, V-0, min. 0.75 mm thick, 130°C Secured on PWB by soldering.	-	-
Common Mode Choke (L1) - For Models LPT51-M, LPT52-M, LPT53-M only	Astec	Part No. 852-72000380	Consists of (OBMW2), copper magnet wire wound toroidal ferrite core and bobbin, (QMFZ2), Chang Chun Plastic, Type T375J, V-0, min. 0.79 mm thick, 150°C Secured on PWB by soldering.	-	-
Alternate-Common Mode Choke (L1) - For Models LPT51-M, LPT54-M only	Astec	Part No. 852-72000090	Consists of (OBMW2), copper magnet wire wound toroidal ferrite core and bobbin, (QMFZ2), Chang Chun Plastic, Type T375J, V-0, min. 0.79 mm thick, 150°C Secured on PWB by soldering.	-	-
Alternate-Common Mode Choke (L1) - For Models LPT51-M, LPT54-M only	Astec	Part No. 852-72000100	Consists of (OBMW2), copper magnet wire wound toroidal ferrite core and bobbin, (QMFZ2), Chang Chun Plastic, Type T375J, V-0, min. 0.79 mm thick, 150°C Secured on PWB by soldering.	-	-
Common Mode Choke (L2) For Models LPT51-M, LPT52-M, LPT53-M, LPT54-M only	Astec	Part No. 852-72000100	Consists of (OBMW2), copper magnet wire wound toroidal ferrite core and bobbin, (QMFZ2), Chang Chun Plastic, Type T375J, V-0, min. 0.79 mm thick, 150°C Secured on PWB by soldering.	-	-
Altenate -Common Mode Choke (L2) - For Models LPT51-M, LPT54-M only	Astec	Part No. 852-72000090	Consists of (OBMW2), copper magnet wire wound toroidal ferrite core and bobbin, (QMFZ2), Chang Chun Plastic, Type T375J, V-0, min. 0.79 mm thick, 150°C Secured on PWB by soldering.	-	-
Altenate -Common Mode Choke (L2) - For Model	Astec	Part No. 852-72000380	Consists of (OBMW2), copper magnet wire wound toroidal ferrite core and bobbin, (QMFZ2), Chang	-	-

Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN /Standard	Marks of Conformity
LPT54-M only			Chun Plastic, Type T375J, V-0, min. 0.79 mm thick, 150°C Secured on PWB by soldering.		
Primary heatsink (Q3)	Various	Various	Metal, L-shaped, overall approximately 33 by 8 by 27 mm, 2 mm thick	-	-
Secondary heatsink (D5)	Various	Various	Metal, L-shaped, overall approximately 41 by 7.5 by 26 mm, 2 mm thick.	-	-
Secondary heatsink (D6)	Various	Various	Metal, top part is polygon, approximately 37 by 33 mm, 1 corner trim off with a quarter of circle, C23 and C30 are visible on the top through this trimming. Bottom part is still L-shaped, overall approximately 40 mm by 9 mm by 25 mm, 2 mm thick.	-	-
Gap pad on Transformer T1 for Model LPT54-M only	Bergquist Co (E59150)	GAP pad 1500	Rated V-0, 150°C, polygon, overall 32.0 by 20.0 by 23 mm	QMFZ2	UL

Enclosures

Type	Supplement Id	Description
Photographs	Fig.3-01	NAMEPLATE-VIEW
Photographs	Fig.3-02	PCB-VIEW
Photographs	Fig.3-03	TOP-VIEW
Photographs	Fig.3-04	TRACE-VIEW1
Photographs	Fig.3-05	TRACE-VIEW2
Diagrams	ILL.4-01	CHK-COM-T16X9-6-3
Diagrams	ILL.4-02	CHK-COM-T16X9X8
Diagrams	ILL.4-03	CHK-COM-T16X9X8-LPT52
Diagrams	ILL.4-04	TRF-CUR-T6X3X2-LPT51
Diagrams	ILL.4-05	TRF-PWR-RM10-47W-LPT51-M
Diagrams	ILL.4-06	TRF-PWR-RM10-55W-LPT52-M-Specs
Diagrams	ILL.4-07	TRF-PWR-RM10-55W-LPT53-M-SPECS
Diagrams	ILL.4-08	TRF-PWR-RM10-55W-LPT54-M
Schematics + PWB	ILL.5-01	PWB-layout-01
Schematics + PWB	ILL.5-02	PWB-layout-02
Manuals	ILL.6-01	LPT51-M-MANUAL
Manuals	ILL.6-02	LPT52-M-MANUAL
Manuals	ILL.6-03	LPT53-M-MANUAL
Manuals	ILL.6-04	LPT54-M-MANUAL
Miscellaneous	ILL.7-01	NAMEPLATE-RATING-LABEL3
Miscellaneous	ILL.7-02	NAMEPLATE-RATING-LABEL1
Miscellaneous	ILL.7-03	NAMEPLATE-RATING-LABEL2
Miscellaneous	ILL.7-04	NAMEPLATE-RATING-LABEL3
Miscellaneous	ILL.7-05	Client Declaration letter