Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
IEC 62368-1
Audio/video, information and communication technology equipment
Part 1: Safety requirements

Report Number ..... :	**60378829 001**
Date of issue ..... :	2020-06-19
Total number of pages ..... :	150 (excluding attachments, refer to page 3)
Applicant's name..... :	**TDK-Lambda (China) Electronics Co., Ltd.**
Address ..... :	No. 95, Zhujiang Road, Xinwu District, Wuxi 214028 Jiangsu, P.R. China
Test specification:	
Standard..... :	IEC 62368-1:2014 (Second Edition)
Test procedure ..... :	CB Scheme
Non-standard test method..... :	N/A
Test Report Form No..... :	IEC62368_1B
Test Report Form(s) Originator .. :	UL(US)
Master TRF ..... :	2014-03

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test Item description ..... :	Switching Power Supply
Trade Mark ..... :	TDK·Lambda
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	CUS200LD-zzxxxxxxx; CUS200LJ-zzxxxxxxx (zz = 3, 4, 5, 7R5, 12, 15, 18, 24, 28, 32, 36 or 48; xxxxxxx = M, J, U, B, CO, CO2, L, RTB, other alphanumeric character, symbol or blank) Refer to page 11 for definition of variables
Ratings ..... :	See the model list on page 10 for details

Testing procedure and testing location:			
☒	CB Testing Laboratory:	TÜV Rheinland Shanghai Co., Ltd.	
Testing location/ address .....:		No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China	
☐	Associated CB Testing Laboratory:		
Testing location/ address .....:			
Tested by (name + signature) ..... :		Tim Song / Technical Expert	
Approved by (name + signature)..... :		Sunny Sun / Technical Reviewer	
☐	Testing procedure: TMP/CTF Stage 1		
Testing location/ address .....:			
Tested by (name + signature) .....:			
Approved by (name + signature).....:			
☐	Testing procedure: WMT/CTF Stage 2		
Testing location/ address .....:			
Tested by (name + signature) .....:			
Witnessed by (name + signature) .....:			
Approved by (name + signature).....:			
☐	Testing procedure: SMT/CTF Stage 3 or 4		
Testing location/ address .....:			
Tested by (name + signature) .....:			
Approved by (name + signature).....:			
Supervised by (name + signature) .....:			

List of Attachments (including a total number of pages in each attachment):

- ATTACHMENT – Measurement Section (8 pages)
- ATTACHMENT – National Differences (35 pages)
- ATTACHMENT – Photo documentation (7 pages)

Note: Total number of pages in each attachment is indicated in individual attachment.

Summary of testing:

Tests performed (name of test and test clause):

This report is based on original CB report 50100188 001, 50100188 002 with certificate ref. no. JPTUV-084130, JPTUV-084130-A1 with following changes:

1. Change Applicant and Manufacturer from TDK-Lambda Corp. Nagaoka Technical Center to TDK-Lambda (China) Electronics Co., Ltd.
2. Add additional new factory TDK-Lambda (China) Electronics Co., Ltd.
3. Update test standard from IEC 60950-1 to IEC 62368-1.

All applicable tests as described in Test Case and Tables were performed.

The maximum specified operation ambient temperature is 70°C. Specified ambient temperature for operation is according to manufacturer's specification. (see chart of convection cooling and force air cooling on following)

Unless otherwise specified, throughout this report, all tests were performed on models CUS200LD-5, CUS200LD-7R5, CUS200LD-12, CUS200LD-48 and perform construction check on model CUS200LD-48 to represent other similar models.

The load conditions used during testing: Maximum normal load according to clause B.2.5 for this equipment is the operation with the maximum specified DC-load with maximum power condition according to the manufacturer specified.

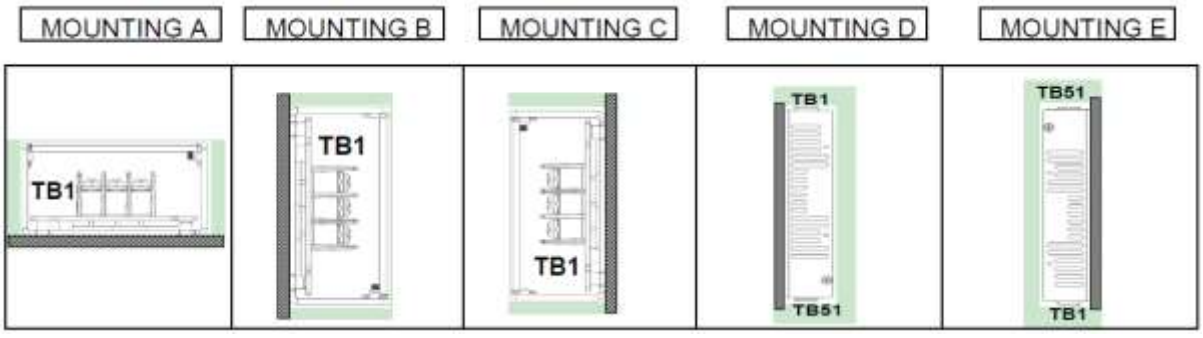
The equipment is operated up to 5000m above sea level as declared by manufacturer. Clearances have been evaluated according to IEC 60664-1 table A.2 with a multiplication factor of 1.48 throughout this report.

The test samples are pre-production without serial numbers.

Testing location:

TÜV Rheinland Shanghai Co. Ltd.
No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

Mounting position:



Derating Curve:

OUTPUT DERATING VERSUS OPERATING AMBIENT TEMPERATURE (Ta)

1. CONDUCTION COOLING

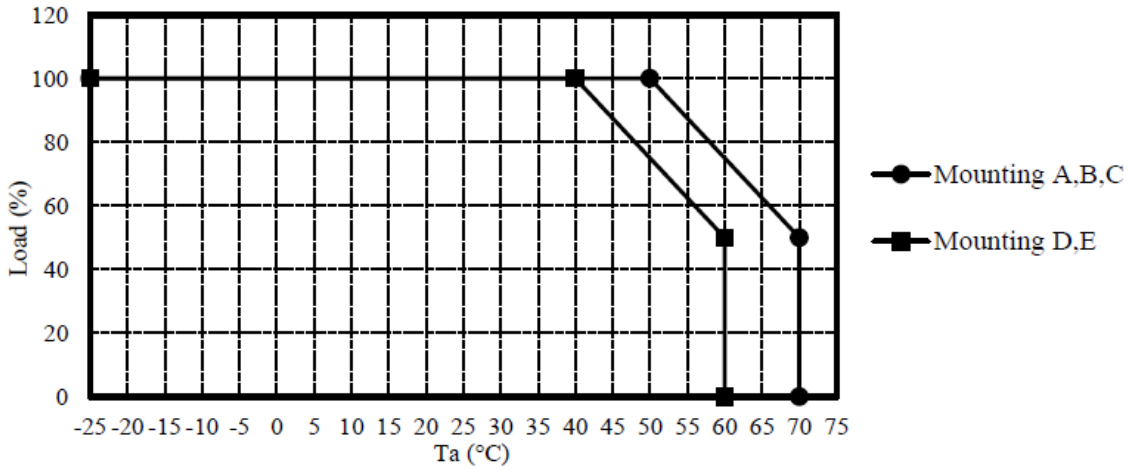
Maximum output power and output current derating

Mounting A,B,C

Ta (°C)	Load (%)
-25 - +50	100
+70	50

Mounting D,E

Ta (°C)	Load (%)
-25 - +40	100
+60	50



2. CONVECTION COOLING

Maximum output power and output current derating

Mounting A

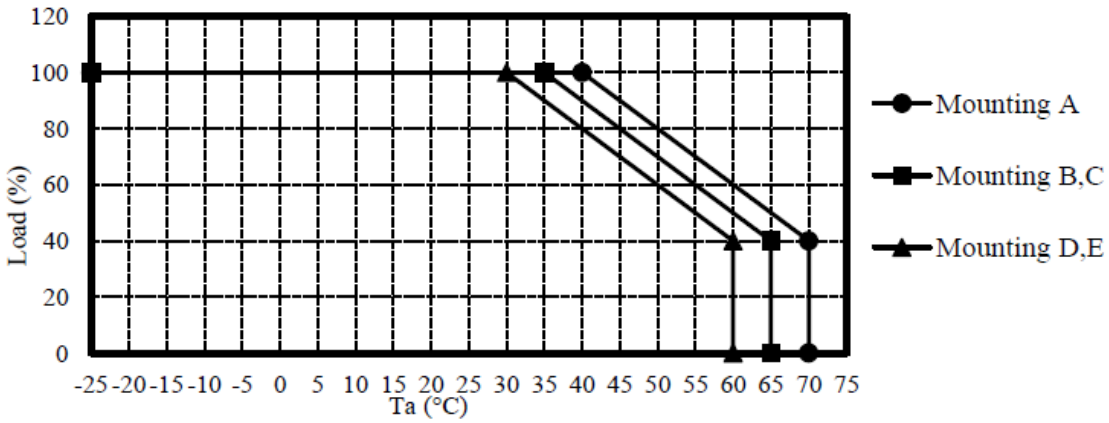
Ta (°C)	Load (%)
-25 - +40	100
+70	40

Mounting B,C

Ta (°C)	Load (%)
-25 - +35	100
+65	40

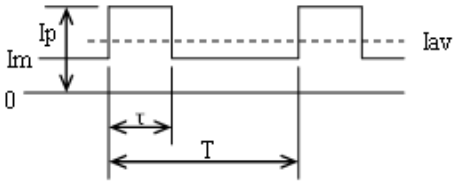
Mounting D,E

Ta (°C)	Load (%)
-25 - +30	100
+60	40



Specification for dynamic load during thermal test as below:

Dynamic load for Conduction cooling: Peak current period 10 seconds, low current period 18.571 seconds, peak current duty 35%.
Dynamic load for Convection cooling: Peak current period 5 seconds, low current period 9.286 seconds, peak current duty 35%.



Ip : Peak output current (A)
Im : Minimum output current (A)
Iav : Average output current (A)
D : Duty cycle, τ/T (%)

Iav =Ip x D + Im x (1-D)

Conduction cooling:

		Ip (A)	Im (A)	Iav (A)	τ (s)	T (s)	T-τ (s)	D (%)
3.3V/4.2V/5V	100%	40.000	24.615	30.000	10.000	28.571	18.571	35%
	50%	20.000	12.308	15.000	10.000	28.571	18.571	35%
7.5V	100%	26.600	16.446	20.000	10.000	28.571	18.571	35%
	50%	13.300	8.223	10.000	10.000	28.571	18.571	35%
12V	100%	16.700	10.238	12.500	10.000	28.571	18.571	35%
	50%	8.350	5.119	6.250	10.000	28.571	18.571	35%
15V	100%	13.400	8.169	10.000	10.000	28.571	18.571	35%
	50%	6.700	4.085	5.000	10.000	28.571	18.571	35%
18V	100%	11.200	6.892	8.400	10.000	28.571	18.571	35%
	50%	5.600	3.446	4.200	10.000	28.571	18.571	35%
24V	100%	8.400	5.169	6.300	10.000	28.571	18.571	35%
	50%	4.200	2.585	3.150	10.000	28.571	18.571	35%
28V	100%	7.200	4.431	5.400	10.000	28.571	18.571	35%
	50%	3.600	2.215	2.700	10.000	28.571	18.571	35%
32V	100%	6.300	3.838	4.700	10.000	28.571	18.571	35%
	50%	3.150	1.919	2.350	10.000	28.571	18.571	35%
36V	100%	5.600	3.446	4.200	10.000	28.571	18.571	35%
	50%	2.800	1.723	2.100	10.000	28.571	18.571	35%
48V	100%	4.300	2.608	3.200	10.000	28.571	18.571	35%
	50%	2.150	1.304	1.600	10.000	28.571	18.571	35%

Convection cooling:

		Ip (A)	Im (A)	Iav (A)	τ (s)	T (s)	T-τ (s)	D (%)
3.3V/4.2V/5V	100%	40.000	15.385	24.000	5.000	14.286	9.286	35%
	40%	16.000	6.154	9.600	5.000	14.286	9.286	35%
7.5V	100%	26.600	10.292	16.000	5.000	14.286	9.286	35%
	40%	10.640	4.117	6.400	5.000	14.286	9.286	35%
12V	100%	16.700	6.392	10.000	5.000	14.286	9.286	35%
	40%	6.680	2.557	4.000	5.000	14.286	9.286	35%
15V	100%	13.400	5.092	8.000	5.000	14.286	9.286	35%
	40%	5.360	2.037	3.200	5.000	14.286	9.286	35%
18V	100%	11.200	4.277	6.700	5.000	14.286	9.286	35%
	40%	4.480	1.711	2.680	5.000	14.286	9.286	35%
24V	100%	8.400	3.169	5.000	5.000	14.286	9.286	35%
	40%	3.360	1.268	2.000	5.000	14.286	9.286	35%
28V	100%	7.200	2.738	4.300	5.000	14.286	9.286	35%
	40%	2.880	1.095	1.720	5.000	14.286	9.286	35%
32V	100%	6.300	2.377	3.750	5.000	14.286	9.286	35%
	40%	2.520	0.951	1.500	5.000	14.286	9.286	35%
36V	100%	5.600	2.138	3.350	5.000	14.286	9.286	35%
	40%	2.240	0.855	1.340	5.000	14.286	9.286	35%
48V	100%	4.300	1.685	2.600	5.000	14.286	9.286	35%
	40%	1.720	0.674	1.040	5.000	14.286	9.286	35%

Summary of compliance with National Differences:

List of countries addressed

EU Group Differences, EU Special National Conditions, AU, CA, DK, JP, NZ, US

Explanation of used codes:

AU = Australia; CA = Canada; DK = Denmark; JP = Japan; NZ = New Zealand; US = United States of America

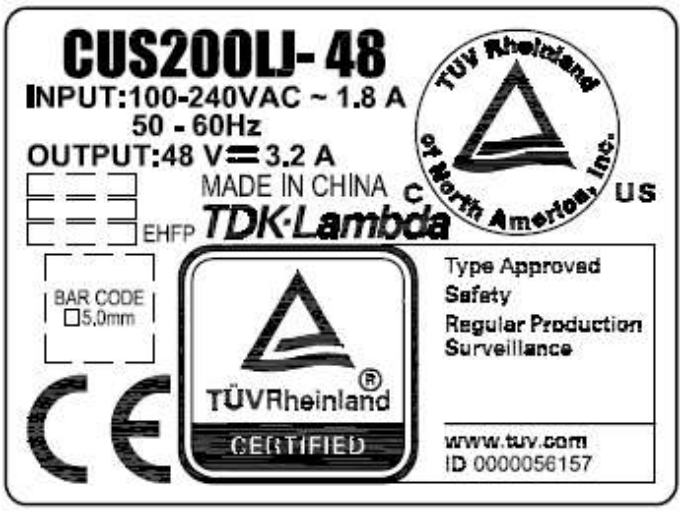
☒ **The product fulfils the requirements of**

IEC 62368-1:2014 (Second Edition),
EN 62368-1:2014+A11:2017 and
CSA/UL 62368-1:2014

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

<Representative>



Note: The rating labels of all models have the same design as above except for the model designation and output ratings.

TEST ITEM PARTICULARS:	
Classification of use by..... :	☒ Ordinary person ☒ Instructed person ☒ Skilled person ☐ Children likely to be present
Supply Connection ..... :	☒ AC Mains ☐ DC Mains ☐ External Circuit - not Mains connected - ☐ ES1 ☐ ES2 ☐ ES3
Supply % Tolerance ..... :	☒ +10%/-10% ☐ +20%/-15% ☐ None
Supply Connection – Type ..... :	☒ pluggable equipment type A - ☐ non-detachable supply cord ☐ appliance coupler ☐ direct plug-in ☒ mating connector ☐ pluggable equipment type B - ☐ non-detachable supply cord ☐ appliance coupler ☒ permanent connection ☐ mating connector ☒ other:Terminal block
Considered current rating of protective device as part of building or equipment installation.....:	16 A or 20 A (for US/CSA) Installation location: ☒ building; ☐ equipment
Equipment mobility.....:	☐ movable ☐ hand-held ☐ transportable ☐ stationary ☒ for building-in ☐ direct plug-in ☐ rack-mounting ☐ wall-mounted
Over voltage category (OVC) .....:	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV ☐ other: _____
Class of equipment .....:	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Access location .....:	☒ restricted access location ☐ N/A
Pollution degree (PD) .....:	☐ PD 1 ☒ PD 2 ☐ PD 3
Manufacturer's specified maxium operating ambient .....:	70 °C
IP protection class .....:	☒ IPX0 ☐ IP___
Power Systems .....:	☒ TN ☐ TT ☒ IT - 230 V $_{L-L}$
Altitude during operation (m) .....:	☐ 2000 m or less ☒ up to 5000 m
Altitude of test laboratory (m) .....:	☒ 2000 m or less ☐ _____ m
Mass of equipment (kg) .....:	≅0.38kg

POSSIBLE TEST CASE VERDICTS:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object does not meet the requirement .....:	F (Fail)
TESTING:	
Date of receipt of test item .....:	2017-05-22(50100188 001) 2020-05-19 (this report)
Date (s) of performance of tests .....:	2017-05-27 to 2017-09-18(50100188 001) 2020-05-19 to 2020-06-01 (this report)
GENERAL REMARKS:	
"(See Enclosure #)" refers to additional information appended to the report. **"(See ATTACHMENT #)" refers to additional information appended to the report.** **"(See appended table)" refers to a table appended to the report.** **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided .....:	☒ **Yes** ☐ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies).....:	1. TDK-Lambda (China) Electronics Co., Ltd. No. 95, Zhujiang Road, Xinwu District, Wuxi 214028 Jiangsu, P.R. China 2. Zhangjiagang Hua Yang Electronics Co., Ltd. Zhao Feng Industrial Zone, Leyu Town Zhangjiagang, 215622 Jiangsu, P.R. China 3. Sendan Electronics Mfg. Co., Ltd. 1010 Habushin Nanto-shi, Toyama 939-1756 Japan 4. ALPS Logistics Facilities Co., Ltd. 593-1 Nishi-Ohashi, Tsukuba-shi, Ibaraki, 305- 0831 Japan 5. TDK-Lambda Corp. Nagaoka Technical Center 2704-1 Settaya-machi, Nagaoka-shi, Niigata 940-1195 Japan

GENERAL PRODUCT INFORMATION:

General product information:

The EUT is a component type switching mode power supplies intended for the class I construction of information technology equipment.

Model CUS200LJ-zzxxxxxxx is identical to model CUS200LD-zzxxxxxxx except for model name.

All models are identical, except of the optional chassis, cover, turns of Transformer and the rating of some components which results in different output ratings. See Model List below for details.

For rating differences between the models see below tables:

Model Name	I/p voltage (Vac)	Freq (Hz)	I/p current (A)	Minimal output (V d.c / A)	Rated output (V d.c / A)	Maximum output (V d.c / A)
Convection cooling						
CUS200LD-3 CUS200LJ-3	100-240	50-60	1.1	2.64	3.3	3.96
				24	24	20
CUS200LD-4 CUS200LJ-4	100-240	50-60	1.3	3.36	4.2	5.04
				24	24	20
CUS200LD-5 CUS200LJ-5	100-240	50-60	1.5	4	5	6
				24	24	20
CUS200LD-7R5 CUS200LJ-7R5	100-240	50-60	1.5	6	7.5	9
				16	16	13.33
CUS200LD-12 CUS200LJ-12	100-240	50-60	1.5	9.6	12	14.4
				10	10	8.33
CUS200LD-15 CUS200LJ-15	100-240	50-60	1.5	12	15	18
				8	8	6.67
CUS200LD-18 CUS200LJ-18	100-240	50-60	1.5	14.4	18	21.6
				6.7	6.7	5.58
CUS200LD-24 CUS200LJ-24	100-240	50-60	1.5	19.2	24	28.8
				5	5	4.17
CUS200LD-28 CUS200LJ-28	100-240	50-60	1.5	22.4	28	33.6
				4.3	4.3	3.58
CUS200LD-32 CUS200LJ-32	100-240	50-60	1.5	25.6	32	38.4
				3.75	3.75	3.13
CUS200LD-36 CUS200LJ-36	100-240	50-60	1.5	28.8	36	43.2
				3.35	3.35	2.79
CUS200LD-48 CUS200LJ-48	100-240	50-60	1.5	38.4	48	57.6
				2.6	2.6	2.17
Conduction cooling						
CUS200LD-3 CUS200LJ-3	100-240	50-60	1.3	2.64	3.3	3.96
				30	30	25
CUS200LD-4 CUS200LJ-4	100-240	50-60	1.6	3.36	4.2	5.04
				30	30	25
	100-240	50-60	1.8	4	5	6

CUS200LD-5 CUS200LJ-5				30	30	25
CUS200LD-7R5 CUS200LJ-7R5	100-240	50-60	1.8	6	7.5	9
				20	20	16.67
CUS200LD-12 CUS200LJ-12	100-240	50-60	1.8	9.6	12	14.4
				12.5	12.5	10.42
CUS200LD-15 CUS200LJ-15	100-240	50-60	1.8	12	15	18
				10	10	8.33
CUS200LD-18 CUS200LJ-18	100-240	50-60	1.8	14.4	18	21.6
				8.4	8.4	7
CUS200LD-24 CUS200LJ-24	100-240	50-60	1.8	19.2	24	28.8
				6.3	6.3	5.25
CUS200LD-28 CUS200LJ-28	100-240	50-60	1.8	22.4	28	33.6
				5.4	5.4	4.5
CUS200LD-32 CUS200LJ-32	100-240	50-60	1.8	25.6	32	38.4
				4.7	4.7	3.92
CUS200LD-36 CUS200LJ-36	100-240	50-60	1.8	28.8	36	43.2
				4.2	4.2	3.5
CUS200LD-48 CUS200LJ-48	100-240	50-60	1.8	38.4	48	57.6
				3.2	3.2	2.67
Remark: Operating temp.: up to +70ºC (operating temperature depending on equipment's load, mounting position, for details refer to instruction manual).						

Additional Information:

- The product is a component type switching power supply, the overall compliance shall be investigated in the complete end system/equipment, in particular as:
  - Fire enclosure
  - Mechanical enclosure
  - Electrical enclosure
- Some components are **pre-certified**, which have been evaluated according to the relevant requirements of IEC 62368-1, are employed in this product. Their suitability of use has been checked according to clauses 4.1.1 and 4.1.2.
- The product is to be operated up to 5000 m above sea level, the minimum clearances were multiplied by the factor given in Table A.2 of IEC 60664-1: 1.48.
- The label is draft of artwork for marking plates pending approval by National Certification Bodies and it shall not be affixed to products prior to such an approval.

Markings and Instructions

- The installation instruction contains instructions for connection to an IT power distribution system.
- Fuse Identification: F1: T3.15A 250Vac

The product also marked with:

CAUTION: FOR CONTINUED PROTECTION AGAINST RISK OF FIRE, REPLACE ONLY WITH SAME TYPE AND RATING OF FUSE.

Definition of variable(s):

CUS200LD-zzxxxxxxx; CUS200LJ-zzxxxxxxx
(zz = 3, 4, 5, 7R5, 12, 15, 18, 24, 28, 32, 36 or 48; xxxxxxx = M, J, U, B, CO, CO2, L, RTB, other alphanumeric character, symbol or blank)

Note: Suffix options would be used shown below or used together.		
Variable:	Range of variable:	Content:
zz	3, 4, 5, 7R5, 12, 15, 18, 24, 28, 32, 36 or 48	Denotes for output voltage
xxxxxxx	M	Denotes for Molex connector
	J	Denotes for JST connector
	U	Denotes for U shape chassis
	B	Denotes for Base plate
	CO	Denotes for solder side PWB coating
	CO2	Denotes for double side PWB coating
	L	Denotes for L shape chassis
	RTB	Denotes for right angle terminal block
	other alphanumeric character, symbol or blank	For market purposes, no construction differences and no safety impact.

Additional application considerations – (Considerations used to test a component or sub-assembly) –

The equipment is a component intended for incorporation in IT equipment, the overall compliance shall be investigated in the complete end system.

The power supply cord set was not evaluated together with the equipment. The suitable certified power supply cord set has to be provided in the country where the equipment is sold.

ENERGY SOURCE IDENTIFICATION AND CLASSIFICATION TABLE:	
(Note 1: Identify the following six (6) energy source forms based on the origin of the energy.) (Note 2: The identified classification e.g., ES2, TS1, should be with respect to its ability to cause pain or injury on the body or its ability to ignite a combustible material. Any energy source can be declared Class 3 as a worse case classification e.g. PS3, ES3.	
Electrically-caused injury (Clause 5): (Note: Identify type of source, list sub-assembly or circuit designation and corresponding energy source classification) Example: +5 V dc input ES1	
Source of electrical energy	**Corresponding classification (ES)**
Primary circuits	ES3
DC output terminal	ES1
Electrically-caused fire (Clause 6): (Note: List sub-assembly or circuit designation and corresponding energy source classification) Example: Battery pack (maximum 85 watts): PS2	
Source of power or PIS	**Corresponding classification (PS)**
Primary circuits	PS3
DC output	PS3
Injury caused by hazardous substances (Clause 7) (Note: Specify hazardous chemicals, whether produces ozone or other chemical construction not addressed as part of the component evaluation.) Example: Liquid in filled component Glycol	
Source of hazardous substances	**Corresponding chemical**
N/A	N/A
Mechanically-caused injury (Clause 8) (Note: List moving part(s), fan, special installations, etc. & corresponding MS classification based on Table 35.) Example: Wall mount unit MS2	
Source of kinetic/mechanical energy	**Corresponding classification (MS)**
Sharp edges and corners	MS1
Equipment mass – mass < 7 kg	MS1
Thermal burn injury (Clause 9) (Note: Identify the surface or support, and corresponding energy source classification based on type of part, location, operating temperature and contact time in Table 38.) Example: Hand-held scanner – thermoplastic enclosure TS1	
Source of thermal energy	**Corresponding classification (TS)**
Metal chassis	The evaluation shall be made during the final system approval
Radiation (Clause 10) (Note: List the types of radiation present in the product and the corresponding energy source classification.) Example: DVD – Class 1 Laser Product RS1	
Type of radiation	**Corresponding classification (RS)**
N/A	N/A

ENERGY SOURCE DIAGRAM
Indicate which energy sources are included in the energy source diagram. Insert diagram below
See “ENERGY SOURCE IDENTIFICATION AND CLASSIFICATION TABLE” ☒ **ES** ☒ **PS** ☒ **MS** ☐ **TS** ☐ **RS**

OVERVIEW OF EMPLOYED SAFEGUARDS				
Clause	**Possible Hazard**			
5.1	Electrically-caused injury			
Body Part (e.g. Ordinary)	Energy Source (ES3: Primary Filter circuit)	Safeguards		
		Basic	Supplementary	Reinforced
Ordinary (output circuit assumed to be accessible by ordinary person in end product)	ES3: Primary circuits	--	--	Isolating Transformers, Optocouplers
Ordinary (metal chassis assumed to be direct or indirect accessible by ordinary person in end product)	ES3: Primary circuits	Certified Y-Capacitor	Protectively bonding chassis	N/A
Ordinary	ES1: Output	N/A	N/A	N/A
6.1	Electrically-caused fire			
Material part (e.g. mouse enclosure)	Energy Source (PS2: 100 Watt circuit)	Safeguards		
		Basic	Supplementary	Reinforced
Combustible materials	PS3: > 100 Watt circuit (Primary circuits and Secondary circuits)	Equipment safeguards (no ignition occurs and no such temp. attained specified in 6.3.1 a)	Equipment safeguards (e.g. rated V-0 PCB, combustible material rated V-2 min., metal fire barrier or enclosure; see 6.4.5 and 6.4.6)	N/A
7.1	Injury caused by hazardous substances			
Body Part (e.g., skilled)	Energy Source (hazardous material)	Safeguards		
		Basic	Supplementary	Reinforced
N/A	N/A	N/A	N/A	N/A
8.1	Mechanically-caused injury			
Body Part (e.g. Ordinary)	Energy Source (MS3:High Pressure Lamp)	Safeguards		
		Basic	Supplementary	Reinforced
Ordinary	MS1: Sharp edge and corners	Rounded edge and corners	N/A	N/A
Ordinary	MS1: Equipment mass – mass < 7 kg	≅0.38kg	N/A	N/A
9.1	Thermal Burn			
Body Part (e.g., Ordinary)	Energy Source (TS2)	Safeguards		
		Basic	Supplementary	Reinforced
N/A	N/A	N/A	N/A	N/A
10.1	Radiation			
Body Part (e.g., Ordinary)	Energy Source (Output from audio port)	Safeguards		
		Basic	Supplementary	Reinforced

N/A	N/A	N/A	N/A	N/A
Supplementary Information: (1) See attached energy source diagram for additional details. (2) “N” – Normal Condition; “A” – Abnormal Condition; “S” Single Fault				