Test Report issued under the responsibility of:

Eurofins Electrical and Electronic Testing NA, Inc.

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

Report Number..... :	US-2558-MET EN 126343 M0A0
Date of issue ..... :	2023-Dec-19
Total number of pages ..... :	120
Name of Testing Laboratory preparing the Report ..... :	Eurofins Electrical and Electronic Testing NA, Inc.
Applicant's name..... :	Texas Instruments Incorporated
Address ..... :	12500 TI Boulevard Dallas, Texas 75243 USA
Test specification:	
Standard ..... :	IEC 62368-1:2018
Test procedure..... :	CB Scheme
Non-standard test method..... :	N/A
TRF template used ..... :	IECEE OD-2020-F1:2020, Ed.1.3
Test Report Form No. ..... :	IEC62368_1E
Test Report Form(s) Originator.... :	UL(US)
Master TRF ..... :	Dated 2021-02-04

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

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.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description .....:	Current-Limited, Power-Distribution Switch
Trade Mark(s) .....:	Texas Instruments
Manufacturer.....:	Texas Instruments Incorporated
Model/Type reference .....:	TPS2000E, TPS2001E, TPS2069E, TPS2068E, TPS2051B, TPS2065, TPS2052B. May be followed by other characters after the model number designate the type of integrated circuit package, integrated circuit lead types, or other features that are considered not to affect the functionality of the device.
Ratings .....:	**Input:** 2.7 to 5.5 VDC **Output Continuous Rating:** TPS2051B and TPS2052B: 0.5A TPS2065: 1.0A TPS2068E and TPS2069E: 1.5A TPS2000E and TPS2001E: 2.0A **Output Current Limit (typical):** TPS2051B and TPS2052B: 1A TPS2065: 1.55A TPS2068E and TPS2069E: 2.13A TPS2000E and TPS2001E: 2.8A **Maximum Operational Temperature:** 85°C

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**CB Testing Laboratory:**	Eurofins Electrical and Electronic Testing NA, Inc.	
Testing location/ address ..... :		13501 McCallen Pass Austin, Texas 78753 USA	
Tested by (name, function, signature) ..... :		Kacy Stanfill *(Project Handler)*	Kacy Stanfill
Approved by (name, function, signature) .. :		Harold Raab *(Project Reviewer)*	Harold Raab

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

Attachment 1 – National Differences (45 pages)

Attachment 2 – Photographs and Illustrations (18 pages)

Summary of testing:

Tests performed (name of test and test clause):		**Testing location:**
Normal operating conditions temperature measurement	B.2.6, 5.4.1.4, 6.3, 9.3, B.1.5	Eurofins Electrical and Electronic Testing NA, Inc.
Simulated single fault conditions	B.4	13501 McCallen Pass
IC Current Limiters	G.9	Austin, Texas 78753
		USA

Summary of compliance with National Differences (List of countries addressed):

This report includes the following National Differences:

US / CA, EU Group Differences, SA, AU / NZ and JP.

Explanation of abbreviation country codes:

AU=Australia, DK=Denmark, FI=Finland, IE=Ireland, IT=Italy, NO=Norway, NZ=New Zealand, JP=Japan, SA=Saudi Arabia, SE=Sweden, SG=Singapore, US=United States, CA=Canada.

☒ **The product fulfils the requirements of IEC 62368-1:2018, CSA/UL 62368-1:2019, EN IEC 62368-1:2020+A11:2020, SASO-IEC 62368-1:2020, AS/NZS 62368.1:2022 and J62368-1(2023).**

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

☒ **Statement not required by the standard used for type testing**

(Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)

Statements of conformity to specifications (Pass/Fail) and/or reported test result values are presented in datasheets and reports without taking measurement uncertainty into account; except in cases where required by a standard, or where a customer has made a specific request, in writing. Therefore, statements of conformity will be made utilizing the following "Simple Acceptance" Decision Rules except when one of the above conditions is present (see Appendix 1). Pass – Results within the specified limits; Fail – Results outside the specified limits

Documents referenced by this report (available on request):		
Document Name or No.	**Document's description**	**Page No.**
SLVUCO9=1=TI PDF=en-us_final	EVM User's Guide: TPS2068E TPS2069E TPS2000E TPS2001E	--
SLVS514N	TPS20xxB Current-Limited, Power-Distribution Switches	--

Summary of testing:	
Clause	**Comment**
See "Tests performed" Section	--
Test Report History: This report may consist of more than one report and is only valid with additional or previous issued reports:	
Report Ref. No.	Item
None	--

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.

Note: The above markings are the minimum requirements required by the safety lab. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.

Test item particulars:	
Product group .....:	☐ end product ☒ built-in component
Classification of use by .....:	☒ Ordinary person ☐ Children likely present ☐ Instructed person ☐ Skilled person
Supply connection.....:	☐ AC mains ☐ DC mains ☒ 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 ☐ pluggable equipment type B - ☐ non-detachable supply cord ☐ appliance coupler ☐ permanent connection ☐ mating connector ☒ other: N/A
Considered current rating of protective device.....:	☐ A; Location: ☐ building ☐ equipment ☒ N/A
Equipment mobility .....:	☐ movable ☐ hand-held ☐ transportable ☐ direct plug-in ☐ stationary ☒ for building-in ☐ wall/ceiling-mounted ☐ SRME/rack-mounted ☐ other:
Overvoltage category (OVC) .....:	☒ OVC I ☐ OVC II ☐ OVC III ☐ OVC IV ☐ other:
Class of equipment .....:	☐ Class I ☐ Class II ☒ Class III ☐ Not classified ☐
Special installation location .....:	☒ N/A ☐ restricted access area ☐ outdoor location ☐
Pollution degree (PD) .....:	☐ PD 1 ☒ PD 2 ☐ PD 3
Manufacturer's specified T_{ma}.....:	85 °C ☐ Outdoor: minimum °C
IP protection class .....:	☒ IPX0 ☐ IP___
Power systems .....:	☐ TN ☐ TT ☐ IT - V_{L-L} ☒ not AC mains
Altitude during operation (m) .....:	☒ 2000 m or less ☐ m
Altitude of test laboratory (m) .....:	☒ 2000 m or less ☐ m
Mass of equipment (kg) .....:	<0.1 kg kg

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 .....:	2023-May-22
Date (s) of performance of tests.....:	2023-Jun-02 to 2023-Dec-08

General remarks:

"(See Enclosure #)" 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) ..... :	Texas Instruments Semiconductor Manufacturing (Chengdu) Co., Ltd., No.8-8 & No. 8-10, Kexin Road West Zone of Chengdu Hi-Tech Industrial Development Zone Chengdu Sichuan 611731 China TI (PHILIPPINES) INC, Baguio City, PEZA, Loakan Road 2600, Philippines, Baguio Texas Instruments Malaysia Sdn Bhd, 1 Lorong Enggang 33 AMPANG/ULU KLANG 54200, Kuala Lumpur, Malaysia Tongfu Microelectronics Co Ltd., NO 288 CHONGCHUAN RD CHONGCHUAN DEVELOPMENT ZONE, Nantong Jiangsu 226006, China

General product information and other remarks:

The component power distribution switch (IC Current Limiter) limits the output current to within the specified output ratings. These devices provide current limiting and short-circuit protection when supplied by a power source (e.g., 250 VA) in accordance with those specified for LPS outputs. These devices are for use in SELV circuits only.

Technical Considerations

- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: 85°C.

Engineering Conditions of Acceptability

When installed in an end-product, consideration must be given to the following:

- These devices are integrated circuits and electrical spacings within the device are not specified.
- These devices are entirely electronic in nature and have no means for manual operation or reset.
- The terminals of these devices are for factory wiring only and are intended to be mounted on printed wiring board.
- These devices have only been evaluated for supplementary overcurrent protection of secondary circuits supplied by the load side of a transformer or battery, and have not been evaluated for branch-circuit protection.
- These devices have been subjected to environmental conditionings with respect to the following conditions (per UL 2367):
    - Shipping and Storage: -30°C to 70°C
    - Thermal Cycling: 0°C to +49˚C
    - Endurance
    - Abnormal
- These devices limit currents to values less than the overcurrent protection rating of 2 amperes.
- These devices have not been subjected to Tests for Telecom applications and their suitability for connection to telecommunication networks with outside plant connections should be determined in the end-use.
- These devices were evaluated with respect to continuous current operation at the current levels shown in the electrical ratings section of this report.

MARKING: The Recognized Company, trade name (Texas Instruments), trademark, catalog number, and Recognized Component Mark on the smallest package or reel. Electrical ratings, including voltage range, maximum continuous current, protective current and operating temperatures shall be provided on the manufacturer's device specific datasheet. Electrical ratings are optional. The datasheet maybe web-based provided it is publicly accessible on the internet.

The Marking Label provided is considered representative of all models. Refer Marking Plate as reference. Model marking code is silkscreen printed in the product.

OVERVIEW OF ENERGY SOURCES AND SAFEGUARDS				
Clause	**Possible Hazard**			
5	Electrically-caused injury			
Class and Energy Source (e.g. ES3: Primary circuit)	Body Part (e.g. Ordinary)	Safeguards		
		B	S	R
N/A	N/A	N/A	N/A	N/A
6	Electrically-caused fire			
Class and Energy Source (e.g. PS2: 100 Watt circuit)	Material part (e.g. Printed board)	Safeguards		
		B	1st S	2nd S
N/A	N/A	N/A	N/A	N/A
7	Injury caused by hazardous substances			
Class and Energy Source (e.g. Ozone)	Body Part (e.g., Skilled)	Safeguards		
		B	S	R
N/A	N/A	N/A	N/A	N/A
8	Mechanically-caused injury			
Class and Energy Source (e.g. MS3: Plastic fan blades)	Body Part (e.g. Ordinary)	Safeguards		
		B	S	R
N/A	N/A	N/A	N/A	N/A
9	Thermal burn			
Class and Energy Source (e.g. TS1: Keyboard caps)	Body Part (e.g., Ordinary)	Safeguards		
		B	S	R
N/A	N/A	N/A	N/A	N/A
10	Radiation			
Class and Energy Source (e.g. RS1: PMP sound output)	Body Part (e.g., Ordinary)	Safeguards		
		B	S	R
N/A	N/A	N/A	N/A	N/A
Supplementary Information: "B" – Basic Safeguard; "S" – Supplementary Safeguard; "R" – Reinforced Safeguard				

ENERGY SOURCE DIAGRAM
Optional. Manufacturers are to provide the energy sources diagram identify declared energy sources and identifying the demarcations are between power sources. Recommend diagram be provided included in power supply and multipart systems. Insert diagram below. Example diagram designs are; Block diagrams; image(s) with layered data; mechanical drawings
☐ **ES** ☐ **PS** ☐ **MS** ☐ **TS** ☐ **RS** ☒ **N/A**

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Clause	Requirement + Test	Result - Remark	Verdict
4	**GENERAL REQUIREMENTS**		**P**
4.1.1	Acceptance of materials, components and subassemblies	Approved materials used.	P
4.1.2	Use of components		P
4.1.3	Equipment design and construction		P
4.1.4	Specified ambient temperature for outdoor use (°C) .....:		N/A
4.1.5	Constructions and components not specifically covered		N/A
4.1.8	Liquids and liquid filled components (LFC)		N/A
4.1.15	Markings and instructions		P
4.4.3	Safeguard robustness		N/A
4.4.3.1	General		N/A
4.4.3.2	Steady force tests		N/A
4.4.3.3	Drop tests		N/A
4.4.3.4	Impact tests		N/A
4.4.3.5	Internal accessible safeguard tests		N/A
4.4.3.6	Glass impact tests		N/A
4.4.3.7	Glass fixation tests		N/A
	Glass impact test (1J)		N/A
	Push/pull test (10 N)		N/A
4.4.3.8	Thermoplastic material tests	No such construction.	N/A
4.4.3.9	Air comprising a safeguard	No such construction.	N/A
4.4.3.10	Accessibility, glass, safeguard effectiveness	No such construction.	N/A
4.4.4	Displacement of a safeguard by an insulating liquid	No liquids.	N/A
4.4.5	Safety interlocks		N/A
4.5	**Explosion**		**N/A**
4.5.1	General	No likelihood of explosion.	N/A
4.5.2	No explosion during normal/abnormal operating condition	No likelihood of explosion.	N/A
	No harm by explosion during single fault conditions		N/A
4.6	**Fixing of conductors**	No conductors.	**N/A**
	Fix conductors not to defeat a safeguard		N/A
	Compliance is checked by test..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
4.7	**Equipment for direct insertion into mains socket–outlets**		**N/A**
4.7.2	Mains plug part complies with relevant standard .. :	Not for direct insertion into mains socket-outlets.	N/A
4.7.3	Torque (Nm) ..... :		N/A
4.8	**Equipment containing coin/button cell batteries**		**N/A**
4.8.1	General	No batteries.	N/A
4.8.2	Instructional safeguard ..... :		N/A
4.8.3	Battery compartment door/cover construction		N/A
	Open torque test		N/A
4.8.4.2	Stress relief test		N/A
4.8.4.3	Battery replacement test		N/A
4.8.4.4	Drop test		N/A
4.8.4.5	Impact test		N/A
4.8.4.6	Crush test		N/A
4.8.5	Compliance		N/A
	30N force test with test probe		N/A
	20N force test with test hook		N/A
4.9	**Likelihood of fire or shock due to entry of conductive object**		**N/A**
4.10	**Component requirements**		**N/A**
4.10.1	Disconnect Device	EUT is a built-in component.	N/A
4.10.2	Switches and relays		N/A

5	**ELECTRICALLY-CAUSED INJURY**		**P**
5.2	**Classification and limits of electrical energy sources**		**P**
5.2.2	ES1, ES2 and ES3 limits	EUT is ES1.	P
5.2.2.2	Steady-state voltage and current limits.....:	5.5 VDC max, 2A max.	N/A
5.2.2.3	Capacitance limits.....:	Capacitor is not energy source.	N/A
5.2.2.4	Single pulse limits .....:	Single pulse is not energy source.	N/A
5.2.2.5	Limits for repetitive pulses .....:	Pulses is not energy source.	N/A
5.2.2.6	Ringing signals	No ringing signals.	N/A
5.2.2.7	Audio signals	No audio signals.	N/A
5.3	**Protection against electrical energy sources**		**N/A**

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Clause	Requirement + Test	Result - Remark	Verdict
5.3.1	General Requirements for accessible parts to ordinary, instructed and skilled persons	EUT is ES1 and is a built-in component.	N/A
5.3.1 a)	Accessible ES1/ES2 derived from ES2/ES3 circuits		N/A
5.3.1 b)	Skilled persons not unintentional contact ES3 bare conductors		N/A
5.3.2.1	Accessibility to electrical energy sources and safeguards		N/A
	Accessibility to outdoor equipment bare parts		N/A
5.3.2.2	Contact requirements		N/A
	Test with test probe from Annex V		—
5.3.2.2 a)	Air gap – electric strength test potential (V) .....:		N/A
5.3.2.2 b)	Air gap – distance (mm) .....:		N/A
5.3.2.3	Compliance		N/A
5.3.2.4	Terminals for connecting stripped wire		N/A
5.4	**Insulation materials and requirements**		**P**
5.4.1.2	Properties of insulating material	Refer to Clause 5.4.1.4	P
5.4.1.3	Material is non-hygroscopic		N/A
5.4.1.4	Maximum operating temperature for insulating materials.....:	(See appended table)	P
5.4.1.5	Pollution degrees .....:		N/A
5.4.1.5.2	Test for pollution degree 1 environment and for an insulating compound		N/A
5.4.1.5.3	Thermal cycling test		N/A
5.4.1.6	Insulation in transformers with varying dimensions		N/A
5.4.1.7	Insulation in circuits generating starting pulses		N/A
5.4.1.8	Determination of working voltage .....:	(See appended table 5.4.1.8)	N/A
5.4.1.9	Insulating surfaces		N/A
5.4.1.10	Thermoplastic parts on which conductive metallic parts are directly mounted		N/A
5.4.1.10.2	Vicat test.....:	(See appended table 5.4.1.10.2)	N/A
5.4.1.10.3	Ball pressure test .....:	(See appended table 5.4.1.10.3)	N/A
5.4.2	Clearances	EUT is ES1 and is a built-in component.	N/A
5.4.2.1	General requirements		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Clearances in circuits connected to AC Mains, Alternative method		N/A
5.4.2.2	Procedure 1 for determining clearance	N/A	N/A
	Temporary overvoltage .....:	N/A	—
5.4.2.3	Procedure 2 for determining clearance		N/A
5.4.2.3.2.2	a.c. mains transient voltage.....:	N/A	—
5.4.2.3.2.3	d.c. mains transient voltage .....:	N/A	—
5.4.2.3.2.4	External circuit transient voltage.....:	N/A	—
5.4.2.3.2.5	Transient voltage determined by measurement .....:	N/A	—
5.4.2.4	Determining the adequacy of a clearance using an electric strength test .....:		N/A
5.4.2.5	Multiplication factors for clearances and test voltages .....:		N/A
5.4.2.6	Clearance measurement .....:		N/A
5.4.3	Creepage distances		N/A
5.4.3.1	General		N/A
5.4.3.3	Material group .....:	N/A	—
5.4.3.4	Creepage distances measurement .....:		N/A
5.4.4	Solid insulation		N/A
5.4.4.1	General requirements		N/A
5.4.4.2	Minimum distance through insulation .....:		N/A
5.4.4.3	Insulating compound forming solid insulation		N/A
5.4.4.4	Solid insulation in semiconductor devices		N/A
5.4.4.5	Insulating compound forming cemented joints		N/A
5.4.4.6	Thin sheet material		N/A
5.4.4.6.1	General requirements		N/A
5.4.4.6.2	Separable thin sheet material		N/A
	Number of layers (pcs) .....:		N/A
5.4.4.6.3	Non-separable thin sheet material		N/A
	Number of layers (pcs) .....:		N/A
5.4.4.6.4	Standard test procedure for non-separable thin sheet material .....:		N/A
5.4.4.6.5	Mandrel test		N/A
5.4.4.7	Solid insulation in wound components		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.4.4.9	Solid insulation at frequencies >30 kHz, E_P, K_R, d, V_{PW} (V) ..... :		N/A
	Alternative by electric strength test, tested voltage (V), K_R ..... :		N/A
5.4.5	Antenna terminal insulation	No antennas.	N/A
5.4.5.1	General		N/A
5.4.5.2	Voltage surge test		N/A
5.4.5.3	Insulation resistance (MΩ)..... :		N/A
	Electric strength test .....:		N/A
5.4.6	Insulation of internal wire as part of supplementary safeguard	EUT is built-in component. No such construction.	N/A
5.4.7	Tests for semiconductor components and for cemented joints	EUT is built-in component. No such construction.	N/A
5.4.8	Humidity conditioning	EUT is PD2.	N/A
	Relative humidity (%), temperature (°C), duration (h) ..... :	N/A	—
5.4.9	Electric strength test	EUT is ES1 and is a built-in component.	N/A
5.4.9.1	Test procedure for type test of solid insulation.....:		N/A
5.4.9.2	Test procedure for routine test		N/A
5.4.10	Safeguards against transient voltages from external circuits	EUT is not connected to external circuits.	N/A
5.4.10.1	Parts and circuits separated from external circuits		N/A
5.4.10.2	Test methods		N/A
5.4.10.2.1	General		N/A
5.4.10.2.2	Impulse test ..... :		N/A
5.4.10.2.3	Steady-state test..... :		N/A
5.4.10.3	Verification for insulation breakdown for impulse test ..... :		N/A
5.4.11	Separation between external circuits and earth	EUT is not connected to external circuits.	N/A
5.4.11.1	Exceptions to separation between external circuits and earth		N/A
5.4.11.2	Requirements		N/A
	SPDs bridge separation between external circuit and earth		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Rated operating voltage U_{op} (V) ..... :	N/A	—
	Nominal voltage U_{peak} (V) ..... :	N/A	—
	Max increase due to variation ΔU_{sp} ..... :	N/A	—
	Max increase due to ageing ΔU_{sa} ..... :	N/A	—
5.4.11.3	Test method and compliance ..... :		N/A
5.4.12	Insulating liquid	No liquids.	N/A
5.4.12.1	General requirements		N/A
5.4.12.2	Electric strength of an insulating liquid ..... :		N/A
5.4.12.3	Compatibility of an insulating liquid ..... :		N/A
5.4.12.4	Container for insulating liquid ..... :		N/A
5.5	**Components as safeguards**		**N/A**
5.5.1	General	No components used as safeguard.	N/A
5.5.2	Capacitors and RC units	No components used as safeguard.	N/A
5.5.2.1	General requirement		N/A
5.5.2.2	Safeguards against capacitor discharge after disconnection of a connector ..... :		N/A
5.5.3	Transformers	No components used as safeguard.	N/A
5.5.4	Optocouplers	No components used as safeguard.	N/A
5.5.5	Relays	No components used as safeguard.	N/A
5.5.6	Resistors	No components used as safeguard.	N/A
5.5.7	SPDs	No components used as safeguard.	N/A
5.5.8	Insulation between the mains and an external circuit consisting of a coaxial cable ..... :	No coax.	N/A
5.5.9	Safeguards for socket-outlets in outdoor equipment	Not outdoor equipment.	N/A
	RCD rated residual operating current (mA) ..... :	N/A	—
5.6	**Protective conductor**		**N/A**
5.6.2	Requirement for protective conductors	EUT is ES1 and is a built-in component.	N/A
5.6.2.1	General requirements		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.6.2.2	Colour of insulation		N/A
5.6.3	Requirement for protective earthing conductors		N/A
	Protective earthing conductor size (mm^2) ..... :	N/A	—
	Protective earthing conductor serving as a reinforced safeguard		N/A
	Protective earthing conductor serving as a double safeguard		N/A
5.6.4	Requirements for protective bonding conductors	EUT is ES1 and is a built-in component.	N/A
5.6.4.1	Protective bonding conductors		N/A
	Protective bonding conductor size (mm^2). ..... :	N/A	—
5.6.4.2	Protective current rating (A)..... :		N/A
5.6.5	Terminals for protective conductors	EUT is ES1 and is a built-in component.	N/A
5.6.5.1	Terminal size for connecting protective earthing conductors (mm)..... :		N/A
	Terminal size for connecting protective bonding conductors (mm) .....:		N/A
5.6.5.2	Corrosion		N/A
5.6.6	Resistance of the protective bonding system	EUT is ES1 and is a built-in component.	N/A
5.6.6.1	Requirements		N/A
5.6.6.2	Test Method..... :	(See appended table 5.6.6)	N/A
5.6.6.3	Resistance (Ω) or voltage drop..... :	(See appended table 5.6.6)	N/A
5.6.7	Reliable connection of a protective earthing conductor	EUT is ES1 and is a built-in component.	N/A
5.6.8	Functional earthing	EUT is ES1 and is a built-in component.	N/A
	Conductor size (mm^2)..... :		N/A
	Class II with functional earthing marking ..... :		N/A
	Appliance inlet cl & cr (mm)..... :		N/A
5.7	**Prospective touch voltage, touch current and protective conductor current**		**N/A**
5.7.2	Measuring devices and networks		N/A
5.7.2.1	Measurement of touch current	EUT is ES1 and is a built-in component.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.7.2.2	Measurement of voltage	EUT is ES1 and is a built-in component.	N/A
5.7.3	Equipment set-up, supply connections and earth connections	EUT is ES1 and is a built-in component.	N/A
5.7.4	Unearthed accessible parts ..... :	EUT is ES1 and is a built-in component.	N/A
5.7.5	Earthed accessible conductive parts ..... :	EUT is ES1 and is a built-in component.	N/A
5.7.6	Requirements when touch current exceeds ES2 limits	EUT is ES1 and is a built-in component.	N/A
	Protective conductor current (mA) ..... :		N/A
	Instructional Safeguard ..... :		N/A
5.7.7	Prospective touch voltage and touch current associated with external circuits	EUT is ES1 and is a built-in component.	N/A
5.7.7.1	Touch current from coaxial cables		N/A
5.7.7.2	Prospective touch voltage and touch current associated with paired conductor cables		N/A
5.7.8	Summation of touch currents from external circuits	EUT is ES1 and is a built-in component.	N/A
	a) Equipment connected to earthed external circuits, current (mA) ..... :		N/A
	b) Equipment connected to unearthed external circuits, current (mA) ..... :		N/A
5.8	**Backfeed safeguard in battery backed up supplies**		**N/A**
	Mains terminal ES ..... :	Not a battery backed up supply.	N/A
	Air gap (mm) ..... :		N/A

6	**ELECTRICALLY- CAUSED FIRE**		**P**
6.2	**Classification of PS and PIS**		**N/A**
6.2.2	Power source circuit classifications ..... :		N/A
6.2.3	Classification of potential ignition sources		N/A
6.2.3.1	Arcing PIS ..... :		N/A
6.2.3.2	Resistive PIS ..... :		N/A
6.3	**Safeguards against fire under normal operating and abnormal operating conditions**		**P**

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Clause	Requirement + Test	Result - Remark	Verdict
6.3.1	No ignition and attainable temperature value less than 90 % defined by ISO 871 or less than 300 °C for unknown materials ..... :	(See appended table B.1.5 and B.3)	P
	Combustible materials outside fire enclosure .....:	EUT is built-in component.	N/A
6.4	**Safeguards against fire under single fault conditions**		**N/A**
6.4.1	Safeguard method	EUT is PS1 and is a built-in component.	N/A
6.4.2	Reduction of the likelihood of ignition under single fault conditions in PS1 circuits		N/A
6.4.3	Reduction of the likelihood of ignition under single fault conditions in PS2 and PS3 circuits		N/A
6.4.3.1	Supplementary safeguards		N/A
6.4.3.2	Single Fault Conditions ..... :		N/A
	Special conditions for temperature limited by fuse		N/A
6.4.4	Control of fire spread in PS1 circuits		N/A
6.4.5	Control of fire spread in PS2 circuits		N/A
6.4.5.2	Supplementary safeguards		N/A
6.4.6	Control of fire spread in PS3 circuits		N/A
6.4.7	Separation of combustible materials from a PIS		N/A
6.4.7.2	Separation by distance		N/A
6.4.7.3	Separation by a fire barrier		N/A
6.4.8	Fire enclosures and fire barriers		N/A
6.4.8.2	Fire enclosure and fire barrier material properties		N/A
6.4.8.2.1	Requirements for a fire barrier		N/A
6.4.8.2.2	Requirements for a fire enclosure		N/A
6.4.8.3	Constructional requirements for a fire enclosure and a fire barrier		N/A
6.4.8.3.1	Fire enclosure and fire barrier openings		N/A
6.4.8.3.2	Fire barrier dimensions		N/A
6.4.8.3.3	Top openings and properties		N/A
	Openings dimensions (mm)..... :		N/A
6.4.8.3.4	Bottom openings and properties		N/A
	Openings dimensions (mm)..... :		N/A
	Flammability tests for the bottom of a fire enclosure	(See Clause S.3)	N/A
	Instructional Safeguard.....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6.4.8.3.5	Side openings and properties		N/A
	Openings dimensions (mm)..... :		N/A
6.4.8.3.6	Integrity of a fire enclosure, condition met: a), b) or c)..... :		N/A
6.4.8.4	Separation of a PIS from a fire enclosure and a fire barrier distance (mm) or flammability rating ..... :		N/A
6.4.9	Flammability of insulating liquid.....:		N/A
6.5	**Internal and external wiring**		**N/A**
6.5.1	General requirements	No internal or external wiring.	N/A
6.5.2	Requirements for interconnection to building wiring ..... :		N/A
6.5.3	Internal wiring size (mm^2) for socket-outlets..... :		N/A
6.6	**Safeguards against fire due to the connection to additional equipment**		**N/A**
7	**INJURY CAUSED BY HAZARDOUS SUBSTANCES**		**N/A**
7.2	**Reduction of exposure to hazardous substances**		**N/A**
7.3	**Ozone exposure**		**N/A**
7.4	**Use of personal safeguards or personal protective equipment (PPE)**		**N/A**
	Personal safeguards and instructions ..... :	No hazardous substances,	—
7.5	**Use of instructional safeguards and instructions**		**N/A**
	Instructional safeguard (ISO 7010) ..... :	No hazardous substances,	—
7.6	**Batteries and their protection circuits**		**N/A**
8	**MECHANICALLY-CAUSED INJURY**		**N/A**
8.2	**Mechanical energy source classifications**		**N/A**
8.3	**Safeguards against mechanical energy sources**		**N/A**
8.4	**Safeguards against parts with sharp edges and corners**		**N/A**
8.4.1	Safeguards	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Instructional Safeguard.....:		N/A
8.4.2	Sharp edges or corners		N/A
8.5	**Safeguards against moving parts**		**N/A**
8.5.1	Fingers, jewellery, clothing, hair, etc., contact with MS2 or MS3 parts	No moving parts.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	MS2 or MS3 part required to be accessible for the function of the equipment		N/A
	Moving MS3 parts only accessible to skilled person		N/A
8.5.2	Instructional safeguard .....:	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
8.5.4	Special categories of equipment containing moving parts	No moving parts.	N/A
8.5.4.1	General		N/A
8.5.4.2	Equipment containing work cells with MS3 parts		N/A
8.5.4.2.1	Protection of persons in the work cell		N/A
8.5.4.2.2	Access protection override		N/A
8.5.4.2.2.1	Override system		N/A
8.5.4.2.2.2	Visual indicator		N/A
8.5.4.2.3	Emergency stop system		N/A
	Maximum stopping distance from the point of activation (m).....:		N/A
	Space between end point and nearest fixed mechanical part (mm) .....:		N/A
8.5.4.2.4	Endurance requirements		N/A
	Mechanical system subjected to 100 000 cycles of operation		N/A
	- Mechanical function check and visual inspection		N/A
	- Cable assembly .....:		N/A
8.5.4.3	Equipment having electromechanical device for destruction of media		N/A
8.5.4.3.1	Equipment safeguards		N/A
8.5.4.3.2	Instructional safeguards against moving parts .....:		N/A
8.5.4.3.3	Disconnection from the supply		N/A
8.5.4.3.4	Cut type and test force (N).....:		N/A
8.5.4.3.5	Compliance		N/A
8.5.5	High pressure lamps	No lamps.	N/A
	Explosion test.....:		N/A
8.5.5.3	Glass particles dimensions (mm) .....:		N/A
8.6	**Stability of equipment**		**N/A**

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Clause	Requirement + Test	Result - Remark	Verdict
8.6.1	General	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Instructional safeguard .....:		N/A
8.6.2	Static stability		N/A
8.6.2.2	Static stability test .....:		N/A
8.6.2.3	Downward force test		N/A
8.6.3	Relocation stability		N/A
	Wheels diameter (mm) .....:	N/A	—
	Tilt test		N/A
8.6.4	Glass slide test		N/A
8.6.5	Horizontal force test.....:		N/A
8.7	**Equipment mounted to wall, ceiling or other structure**		**N/A**
8.7.1	Mount means type .....:	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
8.7.2	Test methods		N/A
	Test 1, additional downwards force (N).....:		N/A
	Test 2, number of attachment points and test force (N).....:		N/A
	Test 3 Nominal diameter (mm) and applied torque (Nm).....:		N/A
8.8	**Handles strength**		**N/A**
8.8.1	General	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
8.8.2	Handle strength test		N/A
	Number of handles.....:		—
	Force applied (N) .....:		—
8.9	**Wheels or casters attachment requirements**		**N/A**
8.9.2	Pull test	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
8.10	**Carts, stands and similar carriers**		**N/A**
8.10.1	General	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
8.10.2	Marking and instructions.....:		N/A
8.10.3	Cart, stand or carrier loading test		N/A
	Loading force applied (N) .....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.10.4	Cart, stand or carrier impact test		N/A
8.10.5	Mechanical stability		N/A
	Force applied (N) .....:		—
8.10.6	Thermoplastic temperature stability		N/A
8.11	**Mounting means for slide-rail mounted equipment (SRME)**		**N/A**
8.11.1	General	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
8.11.2	Requirements for slide rails		N/A
	Instructional Safeguard.....:		N/A
8.11.3	Mechanical strength test		N/A
8.11.3.1	Downward force test, force (N) applied.....:		N/A
8.11.3.2	Lateral push force test		N/A
8.11.3.3	Integrity of slide rail end stops		N/A
8.11.4	Compliance		N/A
8.12	**Telescoping or rod antennas**		**N/A**
	Button/ball diameter (mm) .....:	No antennas.	—

9	**THERMAL BURN INJURY**		**N/A**
9.2	**Thermal energy source classifications**		**N/A**
9.3	**Touch temperature limits**		**N/A**
9.3.1	Touch temperatures of accessible parts.....:	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
9.3.2	Test method and compliance		N/A
9.4	**Safeguards against thermal energy sources**		**N/A**
9.5	**Requirements for safeguards**		**N/A**
9.5.1	Equipment safeguard	None required. EUT is an ES1/PS1 board-mounted, built-in component.	N/A
9.5.2	Instructional safeguard .....:		N/A
9.6	**Requirements for wireless power transmitters**		**N/A**
9.6.1	General	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
9.6.2	Specification of the foreign objects		N/A
9.6.3	Test method and compliance .....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

10	**RADIATION**		**N/A**
10.2	**Radiation energy source classification**		**N/A**
10.2.1	General classification	No radiation sources.	N/A
	Lasers ..... :	N/A	—
	Lamps and lamp systems ..... :	N/A	—
	Image projectors ..... :	N/A	—
	X-Ray ..... :	N/A	—
	Personal music player ..... :	N/A	—
10.3	**Safeguards against laser radiation**		**N/A**
	The standard(s) equipment containing laser(s) comply ..... :	No radiation sources.	N/A
10.4	**Safeguards against optical radiation from lamps and lamp systems (including LED types)**		**N/A**
10.4.1	General requirements	No radiation sources.	N/A
	Instructional safeguard provided for accessible radiation level needs to exceed		N/A
	Risk group marking and location ..... :		N/A
	Information for safe operation and installation		N/A
10.4.2	Requirements for enclosures		N/A
	UV radiation exposure ..... :		N/A
10.4.3	Instructional safeguard ..... :		N/A
10.5	**Safeguards against X-radiation**		**N/A**
10.5.1	Requirements	No radiation sources.	N/A
	Instructional safeguard for skilled persons ..... :	N/A	—
10.5.3	Maximum radiation (pA/kg) ..... :	N/A	—
10.6	**Safeguards against acoustic energy sources**		**N/A**
10.6.1	General	No acoustic energy sources.	N/A
10.6.2	Classification		N/A
	Acoustic output $L_{Aeq,T}$, dB(A) ..... :		N/A
	Unweighted RMS output voltage (mV) ..... :		N/A
	Digital output signal (dBFS) ..... :		N/A
10.6.3	Requirements for dose-based systems		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
10.6.3.1	General requirements		N/A
10.6.3.2	Dose-based warning and automatic decrease		N/A
10.6.3.3	Exposure-based warning and requirements		N/A
	30 s integrated exposure level (MEL30) .....:		N/A
	Warning for MEL ≥ 100 dB(A) .....:		N/A
10.6.4	Measurement methods		N/A
10.6.5	Protection of persons		N/A
	Instructional safeguards ..... :		N/A
10.6.6	Requirements for listening devices (headphones, earphones, etc.)		N/A
10.6.6.1	Corded listening devices with analogue input		N/A
	Listening device input voltage (mV) ..... :		N/A
10.6.6.2	Corded listening devices with digital input		N/A
	Max. acoustic output $L_{Aeq,T}$, dB(A).....:		N/A
10.6.6.3	Cordless listening devices		N/A
	Max. acoustic output $L_{Aeq,T}$, dB(A).....:		N/A

B	**NORMAL OPERATING CONDITION TESTS, ABNORMAL OPERATING CONDITION TESTS AND SINGLE FAULT CONDITION TESTS**		**P**
B.1	**General**		**P**
B.1.5	Temperature measurement conditions	(See appended table B.1.5)	P
B.2	**Normal operating conditions**		**N/A**
B.2.1	General requirements..... :		N/A
	Audio Amplifiers and equipment with audio amplifiers ..... :		N/A
B.2.3	Supply voltage and tolerances		N/A
B.2.5	Input test..... :		N/A
B.3	**Simulated abnormal operating conditions**		**N/A**
B.3.1	General		N/A
B.3.2	Covering of ventilation openings		N/A
	Instructional safeguard ..... :		N/A
B.3.3	DC mains polarity test		N/A
B.3.4	Setting of voltage selector		N/A
B.3.5	Maximum load at output terminals		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
B.3.6	Reverse battery polarity		N/A
B.3.7	Audio amplifier abnormal operating conditions		N/A
B.3.8	Safeguards functional during and after abnormal operating conditions ..... :		N/A
B.4	**Simulated single fault conditions**		**P**
B.4.1	General		P
B.4.2	Temperature controlling device	Not a temperature controlling device.	N/A
B.4.3	Blocked motor test	No motors.	N/A
B.4.4	Functional insulation	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
B.4.4.1	Short circuit of clearances for functional insulation		N/A
B.4.4.2	Short circuit of creepage distances for functional insulation		N/A
B.4.4.3	Short circuit of functional insulation on coated printed boards		N/A
B.4.5	Short-circuit and interruption of electrodes in tubes and semiconductors	No such components.	N/A
B.4.6	Short circuit or disconnection of passive components	No such components.	N/A
B.4.7	Continuous operation of components	No such components.	N/A
B.4.8	Compliance during and after single fault conditions ..... :		P
B.4.9	Battery charging and discharging under single fault conditions		N/A
C	**UV RADIATION**		**N/A**
C.1	**Protection of materials in equipment from UV radiation**		**N/A**
C.1.2	Requirements	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
C.1.3	Test method		N/A
C.2	**UV light conditioning test**		**N/A**
C.2.1	Test apparatus..... :	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
C.2.2	Mounting of test samples		N/A
C.2.3	Carbon-arc light-exposure test		N/A
C.2.4	Xenon-arc light-exposure test		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
D	**TEST GENERATORS**		**N/A**
D.1	**Impulse test generators**		**N/A**
D.2	**Antenna interface test generator**		**N/A**
D.3	**Electronic pulse generator**		**N/A**
E	**TEST CONDITIONS FOR EQUIPMENT CONTAINING AUDIO AMPLIFIERS**		**N/A**
E.1	**Electrical energy source classification for audio signals**		**N/A**
	Maximum non-clipped output power (W)..... :	No amplifiers.	—
	Rated load impedance (Ω) ..... :	N/A	—
	Open-circuit output voltage (V)..... :	N/A	—
	Instructional safeguard ..... :	N/A	—
E.2	**Audio amplifier normal operating conditions**		N/A
	Audio signal source type ..... :	No amplifiers.	—
	Audio output power (W)..... :	N/A	—
	Audio output voltage (V) ..... :	N/A	—
	Rated load impedance (Ω) ..... :	N/A	—
	Requirements for temperature measurement		N/A
E.3	Audio amplifier abnormal operating conditions	No amplifiers.	N/A
F	**EQUIPMENT MARKINGS, INSTRUCTIONS, AND INSTRUCTIONAL SAFEGUARDS**		**P**
F.1	**General**		**N/A**
	Language ..... :	EUT is an ES1/PS1 board-mounted, built-in component.	—
F.2	**Letter symbols and graphical symbols**		**N/A**
F.2.1	Letter symbols according to IEC60027-1	No letter symbols. EUT is an ES1/PS1 board-mounted, built-in component.	N/A
F.2.2	Graphic symbols according to IEC, ISO or manufacturer specific	No graphic symbols. EUT is an ES1/PS1 board-mounted, built-in component.	N/A
F.3	**Equipment markings**		**P**
F.3.1	Equipment marking locations	EUT is marked accordingly.	P
F.3.2	Equipment identification markings	See below.	P
F.3.2.1	Manufacturer identification ..... :	See “Models and Ratings”.	P
F.3.2.2	Model identification ..... :	See “Models and Ratings”.	P

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Clause	Requirement + Test	Result - Remark	Verdict
F.3.3	Equipment rating markings		N/A
F.3.3.1	Equipment with direct connection to mains		N/A
F.3.3.2	Equipment without direct connection to mains		N/A
F.3.3.3	Nature of the supply voltage ..... :		N/A
F.3.3.4	Rated voltage ..... :		N/A
F.3.3.5	Rated frequency ..... :		N/A
F.3.3.6	Rated current or rated power ..... :		N/A
F.3.3.7	Equipment with multiple supply connections		N/A
F.3.4	Voltage setting device		N/A
F.3.5	Terminals and operating devices		N/A
F.3.5.1	Mains appliance outlet and socket-outlet markings ..... :		N/A
F.3.5.2	Switch position identification marking..... :		N/A
F.3.5.3	Replacement fuse identification and rating markings ..... :		N/A
	Instructional safeguards for neutral fuse ..... :		N/A
F.3.5.4	Replacement battery identification marking ..... :		N/A
F.3.5.5	Neutral conductor terminal		N/A
F.3.5.6	Terminal marking location		N/A
F.3.6	Equipment markings related to equipment classification		N/A
F.3.6.1	Class I equipment		N/A
F.3.6.1.1	Protective earthing conductor terminal..... :		N/A
F.3.6.1.2	Protective bonding conductor terminals ..... :		N/A
F.3.6.2	Equipment class marking ..... :		N/A
F.3.6.3	Functional earthing terminal marking ..... :		N/A
F.3.7	Equipment IP rating marking ..... :		N/A
F.3.8	External power supply output marking ..... :		N/A
F.3.9	Durability, legibility and permanence of marking		N/A
F.3.10	Test for permanence of markings		N/A
F.4	**Instructions**		**N/A**
	Information prior to installation and initial use		N/A
	Equipment for use in locations where children not likely to be present		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Instructions for installation and interconnection		N/A
	Equipment intended for use only in restricted access area		N/A
	Equipment intended to be fastened in place		N/A
	Instructions for audio equipment terminals		N/A
	Protective earthing used as a safeguard		N/A
	Protective conductor current exceeding ES2 limits		N/A
	Graphic symbols used on equipment		N/A
	Permanently connected equipment not provided with all-pole mains switch		N/A
	Replaceable components or modules providing safeguard function		N/A
	Equipment containing insulating liquid		N/A
	Installation instructions for outdoor equipment		N/A
F.5	Instructional safeguards		**N/A**
G	**COMPONENTS**		**P**
G.1	**Switches**		**N/A**
G.1.1	General	No switches.	N/A
G.1.2	Ratings, endurance, spacing, maximum load		N/A
G.1.3	Test method and compliance		N/A
G.2	**Relays**		**N/A**
G.2.1	Requirements	No relays.	N/A
G.2.2	Overload test		N/A
G.2.3	Relay controlling connectors supplying power to other equipment		N/A
G.2.4	Test method and compliance		N/A
G.3	**Protective devices**		**N/A**
G.3.1	Thermal cut-offs	No thermal cut-offs.	N/A
	Thermal cut-outs separately approved according to IEC 60730 with conditions indicated in a) & b)		N/A
	Thermal cut-outs tested as part of the equipment as indicated in c)		N/A
G.3.1.2	Test method and compliance		N/A
G.3.2	Thermal links	No thermal links.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.3.2.1	a) Thermal links tested separately according to IEC 60691 with specifics		N/A
	b) Thermal links tested as part of the equipment		N/A
G.3.2.2	Test method and compliance		N/A
G.3.3	PTC thermistors	No PTC thermistors.	N/A
G.3.4	Overcurrent protection devices	No overcurrent protection devices.	N/A
G.3.5	Safeguards components not mentioned in G.3.1 to G.3.4	No such components.	N/A
G.3.5.1	Non-resettable devices suitably rated and marking provided		N/A
G.3.5.2	Single faults conditions..... :		N/A
G.4	**Connectors**		**N/A**
G.4.1	Spacings	No connectors.	N/A
G.4.2	Mains connector configuration ..... :		N/A
G.4.3	Plug is shaped that insertion into mains socket-outlets or appliance coupler is unlikely		N/A
G.5	**Wound components**		**N/A**
G.5.1	Wire insulation in wound components	No wound components.	N/A
G.5.1.2	Protection against mechanical stress		N/A
G.5.2	Endurance test	No wound components.	N/A
G.5.2.1	General test requirements		N/A
G.5.2.2	Heat run test		N/A
	Test time (days per cycle) ..... :	N/A	—
	Test temperature (°C)..... :	N/A	—
G.5.2.3	Wound components supplied from the mains		N/A
G.5.2.4	No insulation breakdown		N/A
G.5.3	Transformers	No wound components.	N/A
G.5.3.1	Compliance method..... :		N/A
	Position..... :		N/A
	Method of protection..... :		N/A
G.5.3.2	Insulation		N/A
	Protection from displacement of windings..... :	N/A	—
G.5.3.3	Transformer overload tests		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.5.3.3.1	Test conditions		N/A
G.5.3.3.2	Winding temperatures		N/A
G.5.3.3.3	Winding temperatures - alternative test method		N/A
G.5.3.4	Transformers using FIW	No wound components.	N/A
G.5.3.4.1	General		N/A
	FIW wire nominal diameter..... :	N/A	—
G.5.3.4.2	Transformers with basic insulation only		N/A
G.5.3.4.3	Transformers with double insulation or reinforced insulation..... :		N/A
G.5.3.4.4	Transformers with FIW wound on metal or ferrite core		N/A
G.5.3.4.5	Thermal cycling test and compliance		N/A
G.5.3.4.6	Partial discharge test		N/A
G.5.3.4.7	Routine test		N/A
G.5.4	Motors	No motors.	N/A
G.5.4.1	General requirements		N/A
G.5.4.2	Motor overload test conditions		N/A
G.5.4.3	Running overload test		N/A
G.5.4.4.2	Locked-rotor overload test		N/A
	Test duration (days) ..... :	N/A	—
G.5.4.5	Running overload test for DC motors		N/A
G.5.4.5.2	Tested in the unit		N/A
G.5.4.5.3	Alternative method		N/A
G.5.4.6	Locked-rotor overload test for DC motors		N/A
G.5.4.6.2	Tested in the unit		N/A
	Maximum Temperature ..... :		N/A
G.5.4.6.3	Alternative method		N/A
G.5.4.7	Motors with capacitors	No motors.	N/A
G.5.4.8	Three-phase motors	No motors.	N/A
G.5.4.9	Series motors	No motors.	N/A
	Operating voltage ..... :	N/A	—
G.6	**Wire Insulation**		**N/A**
G.6.1	General	No wiring.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.6.2	Enamelled winding wire insulation		N/A
G.7	**Mains supply cords**		**N/A**
G.7.1	General requirements	Not mains connected. EUT is a board-mounted, built in component.	N/A
	Type..... :	N/A	—
G.7.2	Cross sectional area (mm^2 or AWG) ..... :		N/A
G.7.3	Cord anchorages and strain relief for non-detachable power supply cords		N/A
G.7.3.2	Cord strain relief		N/A
G.7.3.2.1	Requirements		N/A
	Strain relief test force (N)..... :		N/A
G.7.3.2.2	Strain relief mechanism failure		N/A
G.7.3.2.3	Cord sheath or jacket position, distance (mm)..... :		N/A
G.7.3.2.4	Strain relief and cord anchorage material		N/A
G.7.4	Cord Entry		N/A
G.7.5	Non-detachable cord bend protection		N/A
G.7.5.1	Requirements		N/A
G.7.5.2	Test method and compliance		N/A
	Overall diameter or minor overall dimension, *D* (mm) ..... :	N/A	—
	Radius of curvature after test (mm)..... :	N/A	—
G.7.6	Supply wiring space		N/A
G.7.6.1	General requirements		N/A
G.7.6.2	Stranded wire		N/A
G.7.6.2.1	Requirements		N/A
G.7.6.2.2	Test with 8 mm strand		N/A
G.8	**Varistors**		N/A
G.8.1	General requirements	No varistors.	N/A
G.8.2	Safeguards against fire		N/A
G.8.2.1	General		N/A
G.8.2.2	Varistor overload test		N/A
G.8.2.3	Temporary overvoltage test		N/A
G.9	**Integrated circuit (IC) current limiters**		**P**

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Clause	Requirement + Test	Result - Remark	Verdict
G.9.1	Requirements		P
	IC limiter output current (max. 5A) ..... :	2A	—
	Manufacturers' defined drift ..... :	See "Models and Ratings".	—
G.9.2	Test Program	Tested per G.9	P
G.9.3	Compliance		P
G.10	**Resistors**		**N/A**
G.10.1	General	No resistors.	N/A
G.10.2	Conditioning		N/A
G.10.3	Resistor test		N/A
G.10.4	Voltage surge test		N/A
G.10.5	Impulse test		N/A
G.10.6	Overload test		N/A
G.11	**Capacitors and RC units**		**N/A**
G.11.1	General requirements	No capacitors or RC units.	N/A
G.11.2	Conditioning of capacitors and RC units		N/A
G.11.3	Rules for selecting capacitors		N/A
G.12	**Optocouplers**		**N/A**
	Optocouplers comply with IEC 60747-5-5 with specifics	No optocouplers.	N/A
	Type test voltage $V_{ini,a}$ ..... :	N/A	—
	Routine test voltage, $V_{ini,b}$ ..... :	N/A	—
G.13	**Printed boards**		**N/A**
G.13.1	General requirements	Not a PCB.	N/A
G.13.2	Uncoated printed boards		N/A
G.13.3	Coated printed boards		N/A
G.13.4	Insulation between conductors on the same inner surface		N/A
G.13.5	Insulation between conductors on different surfaces		N/A
	Distance through insulation ..... :		N/A
	Number of insulation layers (pcs) ..... :	N/A	—
G.13.6	Tests on coated printed boards		N/A
G.13.6.1	Sample preparation and preliminary inspection		N/A
G.13.6.2	Test method and compliance		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.14	**Coating on components terminals**		**N/A**
G.14.1	Requirements ..... :	No terminals.	N/A
G.15	**Pressurized liquid filled components**		**N/A**
G.15.1	Requirements	No liquid filled components.	N/A
G.15.2	Test methods and compliance		N/A
G.15.2.1	Hydrostatic pressure test		N/A
G.15.2.2	Creep resistance test		N/A
G.15.2.3	Tubing and fittings compatibility test		N/A
G.15.2.4	Vibration test		N/A
G.15.2.5	Thermal cycling test		N/A
G.15.2.6	Force test		N/A
G.15.3	Compliance		N/A
G.16	**IC including capacitor discharge function (ICX)**		**N/A**
G.16.1	Condition for fault tested is not required	No capacitors.	N/A
	ICX with associated circuitry tested in equipment		N/A
	ICX tested separately		N/A
G.16.2	Tests		N/A
	Smallest capacitance and smallest resistance specified by ICX manufacturer for impulse test..... :	N/A	—
	Mains voltage that impulses to be superimposed on ..... :	N/A	—
	Largest capacitance and smallest resistance for ICX tested by itself for 10000 cycles test ..... :	N/A	—
G.16.3	Capacitor discharge test..... :		N/A
H	**CRITERIA FOR TELEPHONE RINGING SIGNALS**		**N/A**
H.1	**General**		**N/A**
H.2	**Method A**		**N/A**
H.3	**Method B**		**N/A**
H.3.1	Ringing signal	No ringing signals.	N/A
H.3.1.1	Frequency (Hz) ..... :	N/A	—
H.3.1.2	Voltage (V) ..... :	N/A	—
H.3.1.3	Cadence; time (s) and voltage (V) ..... :	N/A	—
H.3.1.4	Single fault current (mA):..... :	N/A	—

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Clause	Requirement + Test	Result - Remark	Verdict
H.3.2	Tripping device and monitoring voltage		N/A
H.3.2.1	Conditions for use of a tripping device or a monitoring voltage		N/A
H.3.2.2	Tripping device		N/A
H.3.2.3	Monitoring voltage (V) ..... :		N/A
J	**INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION**		**N/A**
J.1	**General**		**N/A**
	Winding wire insulation..... :	No such construction.	—
	Solid round winding wire, diameter (mm)..... :		N/A
	Solid square and rectangular (flatwise bending) winding wire, cross-sectional area (mm^2)..... :		N/A
J.2/J.3	Tests and Manufacturing	N/A	—
K	**SAFETY INTERLOCKS**		**N/A**
K.1	**General requirements**		**N/A**
	Instructional safeguard ..... :	No interlocks.	N/A
K.2	**Components of safety interlock safeguard mechanism**		**N/A**
K.3	**Inadvertent change of operating mode**		**N/A**
K.4	**Interlock safeguard override**		**N/A**
K.5	**Fail-safe**		**N/A**
K.5.1	Under single fault condition		N/A
K.6	**Mechanically operated safety interlocks**		**N/A**
K.6.1	Endurance requirement	No interlocks.	N/A
K.6.2	Test method and compliance ..... :	No interlocks.	N/A
K.7	**Interlock circuit isolation**		**N/A**
K.7.1	Separation distance for contact gaps & interlock circuit elements	No interlocks.	N/A
	In circuit connected to mains, separation distance for contact gaps (mm)..... :		N/A
	In circuit isolated from mains, separation distance for contact gaps (mm)..... :		N/A
	Electric strength test before and after the test of K.7.2 ..... :		N/A
K.7.2	Overload test, Current (A) ..... :	No interlocks.	N/A
K.7.3	Endurance test	No interlocks.	N/A
K.7.4	Electric strength test	No interlocks.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
L	**DISCONNECT DEVICES**		**N/A**
L.1	**General requirements**	No disconnect devices. EUT is a board-mounted, built in component.	**N/A**
L.2	**Permanently connected equipment**	EUT is a board-mounted, built in component.	**N/A**
L.3	**Parts that remain energized**	EUT is a board-mounted, built in component.	**N/A**
L.4	**Single-phase equipment**	EUT is a board-mounted, built in component.	**N/A**
L.5	**Three-phase equipment**	EUT is a board-mounted, built in component.	**N/A**
L.6	**Switches as disconnect devices**	No disconnect devices. EUT is a board-mounted, built in component.	**N/A**
L.7	**Plugs as disconnect devices**	No disconnect devices. EUT is a board-mounted, built in component.	**N/A**
L.8	**Multiple power sources**	EUT is a board-mounted, built in component.	**N/A**
	Instructional safeguard ..... :	EUT is a board-mounted, built in component.	N/A
M	**EQUIPMENT CONTAINING BATTERIES AND THEIR PROTECTION CIRCUITS**		**N/A**
M.1	**General requirements**		**N/A**
M.2	**Safety of batteries and their cells**		**N/A**
M.2.1	Batteries and their cells comply with relevant IEC standards ..... :	No batteries.	N/A
M.3	**Protection circuits for batteries provided within the equipment**		**N/A**
M.3.1	Requirements	No batteries.	N/A
M.3.2	Test method	No batteries.	N/A
	Overcharging of a rechargeable battery		N/A
	Excessive discharging		N/A
	Unintentional charging of a non-rechargeable battery		N/A
	Reverse charging of a rechargeable battery		N/A
M.3.3	Compliance	No batteries.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.4	**Additional safeguards for equipment containing a portable secondary lithium battery**		**N/A**
M.4.1	General	No batteries.	N/A
M.4.2	Charging safeguards	No batteries.	N/A
M.4.2.1	Requirements		N/A
M.4.2.2	Compliance..... :		N/A
M.4.3	Fire enclosure..... :	No batteries.	N/A
M.4.4	Drop test of equipment containing a secondary lithium battery	No batteries.	N/A
M.4.4.2	Preparation and procedure for the drop test		N/A
M.4.4.3	Drop, Voltage on reference and dropped batteries (V); voltage difference during 24 h period (%): ..... :		N/A
M.4.4.4	Check of the charge/discharge function		N/A
M.4.4.5	Charge / discharge cycle test		N/A
M.4.4.6	Compliance		N/A
M.5	**Risk of burn due to short-circuit during carrying**		**N/A**
M.5.1	Requirement	No batteries.	N/A
M.5.2	Test method and compliance	No batteries.	N/A
M.6	**Safeguards against short-circuits**		N/A
M.6.1	External and internal faults	No batteries.	N/A
M.6.2	Compliance	No batteries.	N/A
M.7	**Risk of explosion from lead acid and NiCd batteries**		**N/A**
M.7.1	Ventilation preventing explosive gas concentration	No batteries.	N/A
	Calculated hydrogen generation rate ..... :		N/A
M.7.2	Test method and compliance		N/A
	Minimum air flow rate, Q (m^3/h)..... :		N/A
M.7.3	Ventilation tests	No batteries.	N/A
M.7.3.1	General		N/A
M.7.3.2	Ventilation test – alternative 1		N/A
	Hydrogen gas concentration (%)..... :		N/A
M.7.3.3	Ventilation test – alternative 2		N/A
	Obtained hydrogen generation rate..... :		N/A
M.7.3.4	Ventilation test – alternative 3		N/A
	Hydrogen gas concentration (%)..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.7.4	Marking ..... :	No batteries.	N/A
M.8	**Protection against internal ignition from external spark sources of batteries with aqueous electrolyte**		**N/A**
M.8.1	General	No batteries.	N/A
M.8.2	Test method		N/A
M.8.2.1	General		N/A
M.8.2.2	Estimation of hypothetical volume V_Z (m^3/s) ..... :	N/A	—
M.8.2.3	Correction factors ..... :	N/A	—
M.8.2.4	Calculation of distance *d* (mm) ..... :	N/A	—
M.9	**Preventing electrolyte spillage**		**N/A**
M.9.1	Protection from electrolyte spillage	No batteries.	N/A
M.9.2	Tray for preventing electrolyte spillage	No batteries.	N/A
M.10	Instructions to prevent reasonably foreseeable misuse	No batteries.	**N/A**
	Instructional safeguard ..... :		N/A
N	**ELECTROCHEMICAL POTENTIALS**		**N/A**
	Material(s) used ..... :	None.	—
O	**MEASUREMENT OF CREEPAGE DISTANCES AND CLEARANCES**		**N/A**
	Value of *X* (mm) ..... :	EUT is a board-mounted, built in component.	—
P	**SAFEGUARDS AGAINST CONDUCTIVE OBJECTS**		**N/A**
P.1	**General**	EUT is a board-mounted, built in component.	**N/A**
P.2	**Safeguards against entry or consequences of entry of a foreign object**		**N/A**
P.2.1	General	EUT is a board-mounted, built in component.	N/A
P.2.2	Safeguards against entry of a foreign object	EUT is a board-mounted, built in component.	N/A
	Location and Dimensions (mm) ..... :	N/A	—
P.2.3	Safeguards against the consequences of entry of a foreign object	EUT is a board-mounted, built in component.	N/A
P.2.3.1	Safeguard requirements		N/A
	The ES3 and PS3 keep-out volume in Figure P.3 not applicable to transportable equipment		N/A
	Transportable equipment with metalized plastic parts ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
P.2.3.2	Consequence of entry test..... :		N/A
P.3	**Safeguards against spillage of internal liquids**		**N/A**
P.3.1	General	No liquids.	N/A
P.3.2	Determination of spillage consequences	No liquids.	N/A
P.3.3	Spillage safeguards	No liquids.	N/A
P.3.4	Compliance	No liquids.	N/A
P.4	**Metallized coatings and adhesives securing parts**		**N/A**
P.4.1	General	No such construction.	N/A
P.4.2	Tests		N/A
	Conditioning, T_C (°C) ..... :	N/A	—
	Duration (weeks) ..... :	N/A	—
Q	**CIRCUITS INTENDED FOR INTERCONNECTION WITH BUILDING WIRING**		**N/A**
Q.1	**Limited power sources**	EUT is a board-mounted, built in component.	**N/A**
Q.1.1	Requirements		N/A
	a) Inherently limited output		N/A
	b) Impedance limited output		N/A
	c) Regulating network limited output		N/A
	d) Overcurrent protective device limited output		N/A
	e) IC current limiter complying with G.9		N/A
Q.1.2	Test method and compliance ..... :		N/A
	Current rating of overcurrent protective device (A) ..... :		N/A
Q.2	**Test for external circuits – paired conductor cable**	EUT is a board-mounted, built in component.	**N/A**
	Maximum output current (A) ..... :		N/A
	Current limiting method ..... :	N/A	—
R	**LIMITED SHORT CIRCUIT TEST**		**N/A**
R.1	**General**	EUT is a board-mounted, built in component.	**N/A**
R.2	**Test setup**	EUT is a board-mounted, built in component.	**N/A**
	Overcurrent protective device for test ..... :	N/A	—

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Clause	Requirement + Test	Result - Remark	Verdict
R.3	**Test method**	EUT is a board-mounted, built in component.	**N/A**
	Cord/cable used for test ..... :	N/A	—
R.4	**Compliance**	EUT is a board-mounted, built in component.	**N/A**
S	**TESTS FOR RESISTANCE TO HEAT AND FIRE**		**N/A**
S.1	**Flammability test for fire enclosures and fire barrier materials of equipment where the steady state power does not exceed 4 000 W**		**N/A**
	Samples, material..... :	EUT is a board-mounted, built in component.	—
	Wall thickness (mm) ..... :	N/A	—
	Conditioning (°C) ..... :	N/A	—
	Test flame according to IEC 60695-11-5 with conditions as set out		N/A
	- Material not consumed completely		N/A
	- Material extinguishes within 30s		N/A
	- No burning of layer or wrapping tissue		N/A
S.2	**Flammability test for fire enclosure and fire barrier integrity**		**N/A**
	Samples, material..... :	EUT is a board-mounted, built in component.	—
	Wall thickness (mm) ..... :	N/A	—
	Conditioning (°C) ..... :	N/A	—
S.3	**Flammability test for the bottom of a fire enclosure**		**N/A**
S.3.1	Mounting of samples	EUT is a board-mounted, built in component.	N/A
S.3.2	Test method and compliance	EUT is a board-mounted, built in component.	N/A
	Mounting of samples ..... :	N/A	—
	Wall thickness (mm) ..... :	N/A	—
S.4	**Flammability classification of materials**	EUT is a board-mounted, built in component.	**N/A**
S.5	**Flammability test for fire enclosure materials of equipment with a steady state power exceeding 4 000 W**	EUT is a board-mounted, built in component.	**N/A**
	Samples, material..... :	N/A	—
	Wall thickness (mm) ..... :	N/A	—

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Clause	Requirement + Test	Result - Remark	Verdict
	Conditioning (°C) ..... :	N/A	—
T	**MECHANICAL STRENGTH TESTS**		**N/A**
T.1	**General**		**N/A**
T.2	**Steady force test, 10 N ..... :**	EUT is a board-mounted, built in component.	**N/A**
T.3	**Steady force test, 30 N ..... :**	EUT is a board-mounted, built in component.	**N/A**
T.4	**Steady force test, 100 N ..... :**	EUT is a board-mounted, built in component.	**N/A**
T.5	**Steady force test, 250 N ..... :**	EUT is a board-mounted, built in component.	**N/A**
T.6	**Enclosure impact test**	EUT is a board-mounted, built in component.	**N/A**
	Fall test		N/A
	Swing test		N/A
T.7	**Drop test ..... :**	EUT is a board-mounted, built in component.	**N/A**
T.8	**Stress relief test..... :**	EUT is a board-mounted, built in component.	**N/A**
T.9	**Glass Impact Test ..... :**	No glass. EUT is a board-mounted, built in component.	**N/A**
T.10	**Glass fragmentation test**		**N/A**
	Number of particles counted..... :	No glass. EUT is a board-mounted, built in component.	N/A
T.11	**Test for telescoping or rod antennas**		**N/A**
	Torque value (Nm) ..... :	No antennas. EUT is a board-mounted, built in component.	N/A
U	**MECHANICAL STRENGTH OF CATHODE RAY TUBES (CRT) AND PROTECTION AGAINST THE EFFECTS OF IMPLOSION**		**N/A**
U.1	**General**		**N/A**
	Instructional safeguard **:**	No CRTs.	N/A
U.2	**Test method and compliance for non-intrinsically protected CRTs**		**N/A**
U.3	**Protective screen**		**N/A**

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Clause	Requirement + Test	Result - Remark	Verdict
V	**DETERMINATION OF ACCESSIBLE PARTS**		**N/A**
V.1	**Accessible parts of equipment**		**N/A**
V.1.1	General	EUT is a board-mounted, built in component.	N/A
V.1.2	Surfaces and openings tested with jointed test probes	EUT is a board-mounted, built in component.	N/A
V.1.3	Openings tested with straight unjointed test probes	EUT is a board-mounted, built in component.	N/A
V.1.4	Plugs, jacks, connectors tested with blunt probe	EUT is a board-mounted, built in component.	N/A
V.1.5	Slot openings tested with wedge probe	EUT is a board-mounted, built in component.	N/A
V.1.6	Terminals tested with rigid test wire	EUT is a board-mounted, built in component.	N/A
V.2	**Accessible part criterion**		**N/A**
X	**ALTERNATIVE METHOD FOR DETERMINING CLEARANCES FOR INSULATION IN CIRCUITS CONNECTED TO AN AC MAINS NOT EXCEEDING 420 V PEAK (300 V RMS)**		**N/A**
	Clearance .....:	EUT is a board-mounted, built in component.	N/A
Y	**CONSTRUCTION REQUIREMENTS FOR OUTDOOR ENCLOSURES**		**N/A**
Y.1	**General**	EUT is a board-mounted, built in component.	**N/A**
Y.2	**Resistance to UV radiation**	EUT is a board-mounted, built in component.	**N/A**
Y.3	**Resistance to corrosion**		**N/A**
Y.3.1	Metallic parts of outdoor enclosures are resistant to effects of water-borne contaminants by ..... :	EUT is a board-mounted, built in component.	N/A
Y.3.2	Test apparatus		N/A
Y.3.3	Water – saturated sulphur dioxide atmosphere		N/A
Y.3.4	Test procedure ..... :		N/A
Y.3.5	Compliance		N/A
Y.4	**Gaskets**	No gaskets. EUT is a board-mounted, built in component.	**N/A**
Y.4.1	General		N/A
Y.4.2	Gasket tests		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Y.4.3	Tensile strength and elongation tests		N/A
	Alternative test methods ..... :		N/A
Y.4.4	Compression test		N/A
Y.4.5	Oil resistance		N/A
Y.4.6	Securing means		N/A
Y.5	**Protection of equipment within an outdoor enclosure**		**N/A**
Y.5.1	General	EUT is a board-mounted, built in component.	N/A
Y.5.2	Protection from moisture		N/A
	Relevant tests of IEC 60529 or Y.5.3 ..... :		N/A
Y.5.3	Water spray test		N/A
Y.5.4	Protection from plants and vermin		N/A
Y.5.5	Protection from excessive dust		N/A
Y.5.5.1	General		N/A
Y.5.5.2	IP5X equipment		N/A
Y.5.5.3	IP6X equipment		N/A
Y.6	**Mechanical strength of enclosures**	EUT is a board-mounted, built in component.	**N/A**
Y.6.1	General		N/A
Y.6.2	Impact test ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

5.2	**TABLE: Classification of electrical energy sources**						**N/A**
Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters				ES Class
			U (V)	I (mA)	Type[1)]	Additional Info [2)]	
Supplementary information:							
1) Type: Steady state (SS), Capacitance (CP), Single pulse (SP), Repetitive pulses (RP), etc.							
2) Additional Info: Frequency, Pulse duration, Pulse off time, Capacitance value, etc.							

5.4.1.8	**TABLE: Working voltage measurement**			**N/A**
Location	RMS voltage (V)	Peak voltage (V)	Frequency (Hz)	Comments
Supplementary information:				

5.4.1.10.2	**TABLE: Vicat softening temperature of thermoplastics**		**N/A**
Method.....:	ISO 306 / B50		—
Object/ Part No./Material	Manufacturer/trademark	Thickness (mm)	T softening (°C)
Supplementary information:			

5.4.1.10.3	**TABLE: Ball pressure test of thermoplastics**			**N/A**
Allowed impression diameter (mm).....:	≤ 2 mm			—
Object/Part No./Material	Manufacturer/trademark	Thickness (mm)	Test temperature (°C)	Impression diameter (mm)
Supplementary information:				

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Clause	Requirement + Test	Result - Remark	Verdict

5.4.2, 5.4.3	**TABLE: Minimum Clearances/Creepage distance**							**N/A**
Clearance (cl) and creepage distance (cr) at/of/between:	U_p (V)	U_{rms} (V)	Freq [1] (Hz)	Required cl (mm)	cl (mm)	E.S. [2] (V)	Required cr (mm)	cr (mm)
Supplementary information:								
1) Only for frequency above 30 kHz 2) Complete Electric Strength voltage (E.S. (V) when 5.4.2.4 applied)								

5.4.4.2	**TABLE: Minimum distance through insulation**			**N/A**
Distance through insulation (DTI) at/of	Peak voltage (V)	Insulation	Required DTI (mm)	Measured DTI (mm)
Supplementary information:				

5.4.4.9	**TABLE: Solid insulation at frequencies >30 kHz**					**N/A**
Insulation material	E_P	Frequency (kHz)	K_R	Thickness d (mm)	Insulation	V_{PW} (Vpk)
Supplementary information:						

5.4.9	**TABLE: Electric strength tests**			**N/A**
Test voltage applied between:	Voltage shape (Surge, Impulse, AC, DC, etc.)	Test voltage (V)	Breakdown Yes / No	
Supplementary information:				

5.5.2.2	**TABLE: Stored discharge on capacitors**	**N/A**

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Clause	Requirement + Test	Result - Remark	Verdict

Location	Supply voltage (V)	Operating and fault condition [1)]	Switch position	Measured voltage (Vpk)	ES Class
Supplementary information:					
X-capacitors installed for testing: [ ] bleeding resistor rating: [ ] ICX: 1) Normal operating condition (e.g., normal operation, or open fuse), SC= short circuit, OC= open circuit					

5.6.6	**TABLE: Resistance of protective conductors and terminations**			**N/A**
Location	Test current (A)	Duration (min)	Voltage drop (V)	Resistance (Ω)
Supplementary information:				

5.7.4	**TABLE: Unearthed accessible parts**					**N/A**
Location	Operating and fault conditions	Supply Voltage (V)	Parameters			ES class
			Voltage (V_{rms} or V_{pk})	Current (A_{rms} or A_{pk})	Freq. (Hz)	
Supplementary information:						
Abbreviation: SC= short circuit; OC= open circuit						

5.7.5	**TABLE: Earthed accessible conductive part**			**N/A**
Supply voltage (V) ..... :				—
Phase(s) ..... :	[ ] Single Phase; [ ] Three Phase: [ ] Delta [ ] Wye			
Power Distribution System ..... :	[ ] TN [ ]TT [ ] IT			
Location	Fault Condition No in IEC 60990 clause 6.2.2	Touch current (mA)	Comment	
Supplementary Information:				

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Clause	Requirement + Test	Result - Remark	Verdict

5.8	**TABLE: Backfeed safeguard in battery backed up supplies**					**N/A**
Location	Supply voltage (V)	Operating and fault condition	Time (s)	Open-circuit voltage (V)	Touch current (A)	ES Class
Supplementary information:						
Abbreviation: SC= short circuit, OC= open circuit						

6.2.2	**TABLE: Power source circuit classifications**					**N/A**
Location	Operating and fault condition	Voltage (V)	Current (A)	Max. Power[1)] (W)	Time (S)	PS class
Supplementary information:						
Abbreviation: SC= short circuit; OC= open circuit 1) Measured after 3 s for PS1 and measured after 5 s for PS2 and PS3.						

6.2.3.1	**TABLE: Determination of Arcing PIS**			**N/A**
Location	Open circuit voltage after 3 s (Vpk)	Measured r.m.s current (A)	Calculated value	Arcing PIS? Yes / No
Supplementary information:				

6.2.3.2	**TABLE: Determination of resistive PIS**		**N/A**
Location	Operating and fault condition	Dissipate power (W)	Arcing PIS? Yes / No
Supplementary information:			
Abbreviation: SC= short circuit; OC= open circuit			

8.5.5	**TABLE: High pressure lamp**			**N/A**
Lamp manufacturer	Lamp type	Explosion method	Longest axis of glass particle	Particle found beyond 1 m

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Clause	Requirement + Test	Result - Remark	Verdict

			(mm)	Yes / No
Supplementary information:				

9.6	**TABLE: Temperature measurements for wireless power transmitters**								**N/A**
Supply voltage (V)..... :									—
Max. transmit power of transmitter (W)..... :									—
	w/o receiver and direct contact		with receiver and direct contact		with receiver and at distance of 2 mm		with receiver and at distance of 5 mm		
Foreign objects	Object (°C)	Ambient (°C)	Object (°C)	Ambient (°C)	Object (°C)	Ambient (°C)	Object (°C)	Ambient (°C)	
Supplementary information:									

5.4.1.4, 9.3, B.1.5, B.2.6	**TABLE: Temperature measurements**					**P**
Supply voltage (V)..... :	2.7 Vdc	2.7 Vdc	5.5 Vdc	5.5 Vdc		—
Ambient temperature during test T_{amb} (°C) .... :	T_{amb1}	T_{amb2}	T_{amb1}	T_{amb2}		—
Maximum measured temperature *T* of part/at:	*T* (°C)					Allowed T_{max} (°C)
Ambient	Room Amb	Adjusted	Room Amb	Adjusted		130°C
Model TPS2001E – Top of Unit	--	--	25.0	42.7		130°C
Temperature T of winding:	t_1 (°C)	R_1 (Ω)	t_2 (°C)	R_2 (Ω)	T (°C)	Allowed T_{max} (°C)	Insulation class
--	--	--	--	--	--	--	--
Supplementary information:							
T_{amb} = The thermal steady state temperature measurement of the ambient air. • Columns with T_{amb1} are the temperature measurements of the ambient air.							

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Clause	Requirement + Test	Result - Remark	Verdict

- Columns with T_{amb2} are the temperature measurements of the ambient air extrapolated to the desired ambient rating of 85°C.

T = The thermal steady state temperature measurement.

T_{max} = The limit of the thermal steady state temperature measurement.

Tests ran at 5.5 VDC, as this was considered worst case during measurement.

Date: 2023-Jun-21

Equipment Used: 1, 2, 3, 4

Ambient Conditions: 21.05°C, 54.4 %RH, 998.02 kpa

B.2.5	**TABLE: Input test**							**N/A**
U (V)	Hz	I (A)	I rated (A)	P (W)	P rated (W)	Fuse No	I fuse (A)	Condition/status
Supplementary information:								

B.3, B.4	**TABLE: Abnormal operating and fault condition tests**					**P**
Ambient temperature T_{amb} (°C)..... :				** Refer to conditions below.		—
Power source for EUT: Manufacturer, model/type, outputrating .. :				** Refer to test equipment list.		—
Component No.	Condition	Supply voltage (V)	Test time	Fuse no.	Fuse current (A)	Observation
1. Model TPS2001E - Start up	Enable pin – cycle. Device Condition Temp: 25°C for 3 hours before test. Output Load: 2A	5.5 Vdc	10,000 cycles	--	--	10,000 cycles completed. No risk of fire or shock.
2. Model TPS2001E - Start up	Enable pin – cycle: Power On with Output Short-Circuited, Enable Pin Off. Device Condition Temp: 70°C for 3 hours before test. Output Load: 2A	5.5 Vdc	50 cycles	--	--	50 cycles completed. No risk of fire or shock.

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Clause	Requirement + Test	Result - Remark	Verdict

3. Model TPS2001E - Start up	Enable pin – cycle: Power On with Output Short-Circuited, Enable Pin Off Device Condition Temp: -30°C for 3 hours before test. Output Load: 2A	5.5 Vdc	50 cycles	--	--	50 cycles completed. No risk of fire or shock.
4. Model TPS2001E - Start up	Input power pin – cycle: Output Short-Circuit, Power to Circuit Off to Power On Device Condition Temp: -30°C for 3 hours before test. Output Load: 2A	5.5 Vdc	50 cycles	--	--	50 cycles completed. No risk of fire or shock.
5. Model TPS2001E - Start up	Input power pin – cycle: Output Short-Circuit, Power to Circuit Off to Power On. Device Condition Temp: -30°C for 3 hours before test. Output Load: 2A	5.5 Vdc	50 cycles	--	--	50 cycles completed. No risk of fire or shock.
6. Model TPS2001E - Short Circuit	Input power pin – cycle. Power On with Output Open Circuit to Short Output. Device Condition Temp: 70°C for 3 hours before test. Output Load: Open to 0 Ω (open to short)	5.5 Vdc	50 cycles	--	--	50 cycles completed. No risk of fire or shock.
7. Model TPS2001E - Overload	Enable pin – cycle: Power On with Output Short-Circuited, Enable Pin Off. Device Condition Temp: 25°C for 3 hours before test. Output Load: 150% max. Max. rated: 2A; 150% = 3A	5.5 Vdc	50 cycles	--	--	50 cycles completed. No risk of fire or shock.

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Clause	Requirement + Test	Result - Remark	Verdict

8. Model TPS2001E - Overload	Input power pin – cycle: Output Short-Circuit, Power to Circuit Off To Power On Off Device Condition Temp: 25°C for 3 hours before test. Output Load: 150% max. Max. rated: 2A; 150% = 3A	5.5 Vdc	50 cycles	--	--	50 cycles completed. No risk of fire or shock.

Supplementary information:

Date: 2023-Jun-21

Equipment Used: 5, 6, 7, 8, 9, 10, 11

Ambient Conditions: 23.4°C, 50.5 %RH, 998.78 kpa

M.3	**TABLE: Protection circuits for batteries provided within the equipment**							**N/A**
Is it possible to install the battery in a reverse polarity position? ..... :								—
Equipment Specification	Charging							
	Voltage (V)				Current (A)			
Manufacturer/type	Battery specification							
	Non-rechargeable batteries		Rechargeable batteries					
	Discharging current (A)	Unintentional charging current (A)	Charging			Discharging current (A)	Reverse charging current (A)	
			Voltage (V)		Current (A)			
Note: The tests of M.3.2 are applicable only when above appropriate data is not available.								
Specified battery temperature (°C) ..... :								

Component No.	Fault condition	Charge/ discharge mode	Test time	Temp. (°C)	Current (A)	Voltage (V)	Observation

Supplementary information:

Abbreviation: SC= short circuit; OC= open circuit NL= no chemical leakage; NS= no spillage of liquid; NE= no explosion; NF= no emission of flame or expulsion of molten metal.

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Clause	Requirement + Test	Result - Remark	Verdict

M.4.2	**TABLE: Charging safeguards for equipment containing a secondary lithium battery**				**N/A**
Maximum specified charging voltage (V) ..... :					—
Maximum specified charging current (A) ..... :					—
Highest specified charging temperature (°C) ..... :					
Lowest specified charging temperature (°C) ..... :					
Battery manufacturer/type	Operating and fault condition	Measurement			Observation
		Charging voltage (V)	Charging current (A)	Temp. (°C)	
Supplementary information:					
Abbreviation: SC= short circuit; OC= open circuit; MSCV= maximum specified charging voltage; MSCC= maximum specified charging current; HSCT= highest specified charging temperature; LSCT= lowest specified charging temperature					

Q.1	**TABLE: Circuits intended for interconnection with building wiring (LPS)**						**N/A**
Output Circuit	Condition	U_{oc} (V)	Time (s)	I_{sc} (A)		S (VA)	
				Meas.	Limit	Meas.	Limit
Supplementary Information:							

T.2, T.3, T.4, T.5	**TABLE: Steady force test**					**N/A**
Location/Part	Material	Thickness (mm)	Probe	Force (N)	Test Duration (s)	Observation
Supplementary information:						

T.6, T.9	**TABLE: Impact test**	**N/A**

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Clause	Requirement + Test	Result - Remark	Verdict

Location/Part	Material	Thickness (mm)	Height (mm)	Observation
Supplementary information:				

T.7	**TABLE: Drop test**			**N/A**
Location/Part	Material	Thickness (mm)	Height (mm)	Observation
Supplementary information:				

T.8	**TABLE: Stress relief test**				**N/A**
Location/Part	Material	Thickness (mm)	Oven Temperature (°C)	Duration (h)	Observation
Supplementary information:					

X	**TABLE: Alternative method for determining minimum clearances distances**		**N/A**
Clearance distanced between:	Peak of working voltage (V)	Required cl (mm)	Measured cl (mm)
Supplementary information:			

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Clause	Requirement + Test	Result - Remark	Verdict

4.1.2	**TABLE: Critical components information**				**P**
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity[1)]
TPS2000E TPS2001E TPS2052B TPS2068E (DGK, DGN, D package)	Sumitomo	EME-G633C	130℃	UL 746C+	UL, --
TPS2000E TPS2001E TPS2051B TPS2065 TPS2068E TPS2069E (DBV package)	Sumitomo	EME-G700LTD	130℃	UL 746C+	UL, --
TPS2001E (DGK package)	Sumitomo	EME-G700QB	130℃	UL 746C+	UL, --
Supplementary information:					
1) Provided evidence ensures the agreed level of compliance. See OD-CB2039. 2) Description line content is optional. Main line description needs to clearly detail the component used for testing 3) The CBTL has verified the component information + Indicates UL standard has requirements that meet or exceed the relevant requirements in IEC standard column.					

List of test equipment used:

A completed list of used test equipment shall be provided in the Test Reports when a Customer's Testing Facility according to CTF stage 1 or CTF stage 2 procedure has been used.
Note: This page may be removed when CTF stage 1 or CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

Item No.	Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
1	B.2.5, B.3, B.4, 5.4.1.4	Ambient Logger	Pressure, Humidity and Temperature Data Logger (3A3377)	--	2022-Oct-14	2023-Oct-14
2	B.2.5, B.3, B.4, 5.4.1.4	Power Supply	PROGRAMMABLE DC POWER SUPPLY (3A3104)	--	FVBU	FVBU
3	B.2.5, B.3, B.4, 5.4.1.4	Voltage / Current	Digital Multimeter (3A3168)	--	2023-Jan-24	2024-Jan-24
4	B.2.5, B.3, B.4, 5.4.1.4	Data Logger	LXI Data Acquisition Unit (3A3403)	--	2022-Nov-04	2023-Nov-04
5	G.11	Humidity	Humidity System (3A3118)	--	2022-Nov-30	2023-Nov-30
6	G.11	Power Source	A/C Power Source (1A1051)	--	2022-Oct-06	2023-Oct-06
7	G.11	Interface	PC Interface (1A1052)	--	2022-Oct-06	2023-Oct-06
8	G.11	Voltage	Multi Meter (3A3402)	--	2022-Oct-07	2023-Oct-07
9	G.11	Voltage / Current / Power	Digital Power Analyzer (3A3028)	--	2022-Oct-13	2023-Oct-13
10	G.11	Power Source	80V-60A-300W SINGLE CHANNEL (3A3113)	--	2022-Sept-08	2023-Sept-08
11	G.11	Environmental	Temperature and Humidity Chamber (3A3399)	--	2023-May-16	2024-May-16

12	G.11	Data Loger	LXI Data Acquisition Unit (3A3403)	--	11/04/2022	11/04/2023

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	Result - Remark	Verdict	

ATTACHMENT TO TEST REPORT

IEC 62368-1
U.S.A. AND CANADA NATIONAL DIFFERENCES
(AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT – PART 1: SAFETY REQUIREMENTS)

Differences according to.....:	CSA/UL 62368-1:2019
TRF template used: .....:	IECEE OD-2020-F3, Ed. 1.1
Attachment Form No.....:	US_CA_ND_IEC62368_1E
Attachment Originator .....:	UL(US)
Master Attachment.....:	Dated 2022-03-04

IEC 62368-1 - US and Canadian National Differences
Special National Conditions based on Regulations and Other National Differences

1 (1DV.1) (1.3)	All equipment is to be designed to allow installation in accordance with the National Electrical Code (NEC), ANSI/NFPA 70, the Canadian Electrical Code (CEC), Part 1, CAN/CSA C22.1, and when applicable, the National Electrical Safety Code, IEEE C2. Also, for such equipment marked or otherwise identified, installation is allowed per the Standard for the Protection of Information Technology Equipment, ANSI/NFPA 75.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
1 (1DV.2.1)	This standard includes additional requirements for equipment used for entertainment purposes intended for installation in general patient care areas of health care facilities. See Annex DVB.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
1 (1DV.2.2)	This standard includes additional requirements for equipment intended for mounting under cabinets. See Annex DVC.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
1 (1DV.2.3)	IEC 62368-3 clause 5 for DC power transfer at ES1 or ES2 voltage levels is considered informative. IEC 62368-3 clause 6 for remote power feeding telecommunication (RFT) circuits is considered normative (see ITU K.50). Alternatively, equipment with RFT circuits are given in either UL 2391 or CSA/UL 60950-21. RFT-C circuits are not permitted unless the RFT-C circuit complies with RFT-V limits (≤ 200V per conductor to earth).	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

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	Result - Remark	Verdict	

1 (1DV.3)	For protection against direct lightning strikes, reference is made to NFPA 780 and CAN/CSA-B72 for additional requirements.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
1 (DV.5)	Additional requirements apply to some forms of power distribution equipment, including sub-assemblies.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
4.1 (4.1.17)	*For lengths exceeding 3.05 m, external interconnecting cable assemblies are required to be a suitable cable type (e.g., DP, CL2) specified in the NEC.*	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	For lengths 3.05 m or less, external interconnecting cable assemblies that are not types specified in the NEC generally are required to have special construction features and identification markings.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
4.6 (4.6.2)	Wire-wrap terminals have special construction and performance requirements.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
4.8 (4.8.3, 4.8.4.5, 4.8.5)	Coin / button cell batteries have modified special construction and performance requirements.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.4.2.3.2 (5.4.2.3.2.1)	*Surge Arrestors and Transient Voltage Surge Suppressors installed external to the equipment are required to comply with the appropriate NEC and CEC requirements.*	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.5.9	Receptacles, rated 125-V, single phase, 15- or 20-A accessible to either ordinary, instructed, or skilled persons are required to be provided with GFCI Protection for Personnel if the equipment containing the receptacles is installed outdoors. The protection devices are required to comply with UL 943, and CAN/CSA C22.2 No.144.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

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	Result - Remark	Verdict	

5.6.3	Protective earthing conductors comply with the minimum conductor sizes in Table G.7, except as required by Table G.7ADV.1 for cord connected equipment, or Annex DVH for permanently connected equipment.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.7.8 (5.7.8.1)	Equipment intended to receive telecommunication ringing signals is required to comply with a special touch current measurement tests.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
6.5.1	PS3 wiring outside a fire enclosure is required to comply with single fault testing in B.4, or be current limited per one of the permitted methods.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex F (F.3.3.9)	Output terminals provided for supply of other equipment, except mains supply, are required to be marked with a maximum rating or reference to equipment permitted to be connected.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex F (F.3.7)	Outdoor Enclosures are required to be classified and marked in accordance with UL 50 or 50E, or CAN/CSA C22.2 No. 94.1 or 94.2.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex G (G.7)	Permanent connection of equipment to the mains supply by a power supply cord is not permitted, except for certain equipment, such as ATMs.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Power supply cords are required to have attachment plugs rated not less than 125 percent of the rated current of the equipment.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Flexible power supply cords are required to be compatible with Article 400 of the NEC, and Tables 11 and 12 of the CEC.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Minimum cord length is required to be 1.5 m, with certain constructions such as external power supplies allowed to consider both input and output cord lengths into the requirement. Power supply cords are required to be no longer than 4.5 m in length if used in ITE Rooms.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Power supply cords for outdoor equipment are required to be suitable outdoor use type as required by Section 400.4 of the NEC and Rule 4-012 of the CEC, i.e., marked “W.”	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex H.2	Continuous ringing signals under normal operating conditions up to 16 mA only are permitted if the equipment is subjected to special installation and performance restrictions.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex H.4	For circuits with other than ringing signals and with voltages exceeding 42.4 Vpeak or 60 Vd.c., the maximum acceptable current through a 2000 ohm resistor (or greater) connected across the voltage source with other loads disconnected is 7.1 mA peak or 30 mA d.c. under normal operating conditions.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

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	Result - Remark	Verdict	

Annex Q (Q.3)	Equipment with paired conductor and/or coax communications cables/wiring connected to building wiring are required to have special voltage, current, power and marking requirements.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (1)	Equipment that is designed such that it may be powered from a separate electrical service, is required to meet applicable requirements for service equipment for control and protection of services and their installation and complies with Article 230 of the National Electrical Code (NEC), NFPA 70 and Section 6 of the Canadian Electrical Code, Part I, CSA C22.1.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Equipment intended for use in spaces used for environmental air (plenums) are subjected to special flammability requirements for heat and visible smoke release.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	For ITE room applications, automated information storage systems with combustible media greater than 0.76 m^3 (27 cu ft) are required to have a provision for connection of either automatic sprinklers or a gaseous agent extinguishing system with an extended discharge.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Consumer products designed or intended primarily for children 12 years of age or younger are subject to additional requirements in accordance with U.S. and Canadian Regulations.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Baby monitors are required to additionally comply with ASTM F2951, Consumer Safety Specification for Baby Monitors.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Storage batteries and battery management equipment, other than associated with lead-acid batteries, and including battery backup systems that are not an integral part of stationary AV and ICT equipment, such as provided in separate cabinets, are required to be certified (listed) to the appropriate standard(s) for such storage batteries and equipment.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (5.6)	For Pluggable Equipment Type A, the protection in the installation is assumed to be 20A.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (6.3)	The maximum quantity of flammable liquid stored in equipment is required to comply with NFPA 30.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

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	Result - Remark	Verdict	

Annex DVA (6.4.8)	For ITE room applications, enclosures with combustible material measuring greater than 0.9 m^2 (10 sq ft) or a single dimension greater than 1.8 m (6 ft) are required to have a flame spread rating of 50 or less. For equipment with the same dimensions for other applications, an external surface that is not a fire enclosure requires a minimum flammability classification of V-1.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (10.3)	Equipment with lasers is required to meet the U.S. Code of Federal Regulations 21 CFR 1040 (and the Canadian Radiation Emitting Devices Act, REDR C1370).	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (10.5)	Equipment that produces ionizing radiation is required to comply with the U.S. Code of Federal Regulations, 21 CFR 1020 (and the Canadian Radiation Emitting Devices Act, REDR C1370).	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (F.3.3.4)	Equipment for use on a.c. mains supply systems with a neutral and more than one phase conductor (e.g. 120/240 V, 3-wire) require a special marking format for electrical ratings. Additional considerations apply for voltage ratings that exceed the attachment cap rating or that are lower than the “Normal Operating Condition” in Table 2 of CAN/CSA C22.2 No. 235.”	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (F.3.3.6)	Equipment identified for ITE (computer) room installation is required to be marked with the rated current.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (G.1)	Vertically-mounted disconnect switches and circuit breakers are required to have the "on" position indicated by the handle in the up position, where mounted in an enclosure, vertically mounted **disconnect switches** and **circuit breakers** with vertical operating means extending outside the enclosure are required to indicate in a location visible when accessing the external operating means whether the switch or circuit breaker is in the open (off) or closed (on) position.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (G.3.4)	Suitable NEC/CEC branch circuit protection rated at the maximum circuit rating is required for all standard supply outlets and receptacles (such as supplied in power distribution units) if the supply branch circuit protection is not suitable.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Where a fuse is used to provide Class 2 or Class 3 current limiting, it is not operator-accessible unless it is non- interchangeable.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

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Annex DVA (G.4.2)	Equipment with isolated ground (earthing) receptacles is required to comply with NEC 250.146(D) and CEC 10-400 and 10-612.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (G.4.3)	Interconnection of units by conductors supplied by a limited power source, or a Class 2 circuit defined in the NEC/CEC may have field wiring connections other than specified in DVH.3, such as wire-wrap and crimp-on types, if the limited power source and Class 2 circuits are separated from all other circuits by barriers, routing or fixing.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (G.5.3)	Power distribution transformers distributing power at 100 volts or more, and rated 10 kVA or more, require special transformer overcurrent protection.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (G.5.4)	Motor control devices are required for cord-connected equipment with a mains-connected motor if the equipment is rated more than 12 A, or if the equipment has a nominal voltage rating greater than 120 V, or if the motor is rated more than 1/3 hp (locked rotor current over 43 A).	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (G.7)	Flexible cords used outdoors are required to have the suffix “W” marked on the flexible cord.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (M)	For ITE room applications, equipment with battery systems capable of supplying 750 VA for five minutes are required to have a battery disconnect means that may be connected to the ITE room remote power-off circuit.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVA (Q)	If applicable per NEC 725.121(C), some limited power sources supplied from AV/ICT equipment are required to have a label indicating the maximum voltage and rated current output for per conductor for each connection point. Where multiple connection points have the same rating, a single label is permitted to be used.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Wiring terminals intended to supply Class 2 outputs in accordance with the NEC or CEC Part 1are required to be marked with the voltage rating and “Class 2” or equivalent. The marking is located adjacent to the terminals and visible during wiring.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Applicable parts of Chapter 8 of the NEC, and Rules 54 and 60 of the CEC, may be applicable to ITE installed outdoors with connections to communication systems.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

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Annex DVB (1)	Additional requirements apply for equipment used for entertainment purposes intended for installation in general patient care areas of health care facilities.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVC (1)	Additional requirements apply for equipment intended for mounting under kitchen cabinets.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVE (4.1.1)	Some equipment, components, sub-assemblies and materials associated with the risk of fire, electric shock, or personal injury are required to have component or material ratings in accordance with the applicable national (U.S. and Canadian) component or material requirements. These equipment and components include: appliance couplers, attachment plugs, battery backup systems, circuit breakers, communication circuit accessories, connectors (used for current interruption of non-LPS circuits), direct plug-in equipment, electrochemical capacitor modules (energy storage modules with ultracapacitors), enclosures (outdoor), flexible cords and cables, fuses (branch circuit), ground-fault current interrupters, interconnecting cables, modular data centres, power supply cords, some power distribution equipment, printed wiring, protectors for communications circuits, receptacles, surge protective devices, vehicle battery adapters, wire connectors, and wire and cables.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH	Equipment for permanent connection to the mains supply is subjected to additional requirements.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.1)	Wiring methods (terminals, leads, etc.) used for the connection of the equipment to the mains are required to be in accordance with the NEC/CEC.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.2.1)	For safe and reliable connection to a mains, permanently connected equipment is to be provided.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.2.2)	Additional considerations for D.C. mains.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.3.2.1)	Terminals for permanent wiring, including protective earthing terminals, are required to be suitable for U.S./Canadian wire gauge sizes, rated 125 percent of the equipment rating, and be specially marked when specified.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.3.2.3)	Wire binding screws are not permitted to attach conductors larger than 10 AWG (5.3 mm^2).	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

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Annex DVH (DVH.3.2.4)	All associated mains supply terminals are located in proximity to each other and to the main protective earthing terminal, if any.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.3.2.5)	Terminals are located, guarded or insulated so that, should a strand of a conductor escape when the conductor is fitted, there is no likelihood of accidental contact between such a strand and accessible conductive parts or unearthed conductive parts separated from accessible conductive parts by supplementary insulation only.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.3.3)	When field connection to an external circuit is via wires (example, free conductors), the wires are not smaller than 18 AWG (0.82 mm^2) and the free length of the wire inside an outlet box or wiring compartment is 150 mm or more.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.3.4)	Size of protective earthing conductors and terminals	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.4)	Permanently connected equipment is required to have a suitable wiring compartment and wire bending space.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.4.1)	Wire bending space	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.4.2)	Volume of wiring compartment	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.4.3)	Separation of circuits	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.5)	Equipment markings and instructional safeguards	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.5.1)	Identification of protective earthing terminal	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.5.2)	Identification of terminal for earthed conductor (neutral)	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.5.3)	Identification of terminals for aluminium conductors	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH.5.4)	Wire temperature ratings	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVH (DVH 5.5)	Equipment connected to a centralized d.c. power system, and having one pole of the DC mains input terminal connected to the main protective earthing terminal in the equipment, is required to comply with special earthing, wiring, marking and installation instruction requirements.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex DVI (6.7)	Equipment intended for connection to telecommunication network outside plant cable is required to be protected against overvoltage from power line crosses.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

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Annex DVJ (10.6.1)	Equipment connected to a telecommunication and cable distribution networks and supplied with an earphone intended to be held against, or in the ear is required to comply with special acoustic pressure requirements.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

IEC62368_1E - ATTACHMENT		
ATTACHMENT TO TEST REPORT **IEC 62368-1** **EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES** (Audio/video, information and communication technology equipment - Part 1: Safety requirements)		
Differences according to ..... : EN IEC 62368-1:2020+A11:2020		
Attachment Form No. ..... : EU_GD_IEC62368_1E **Attachment Originator.....** : UL(Demko) **Master Attachment** ..... : 2021-02-04		
	CENELEC COMMON MODIFICATIONS (EN)	**N/A**
	Clause numbers in the cells that are shaded light grey are clause references in EN IEC 62368-1:2020+A11:2020. All other clause numbers in that column, except for those in the paragraph below, refers to IEC 62368-1:2018. Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 62368-1:2018 are prefixed "Z".	N/A
	Add the following annexes: Annex ZA (normative) Normative references to international publications with their corresponding European publications Annex ZB (normative) Special national conditions Annex ZC (informative) A-deviations Annex ZD (informative) IEC and CENELEC code designations for flexible cords	N/A
1	Modification to Clause 3 .	N/A
3.3.19	Sound exposure *Replace 3.3.19 of IEC 62368-1 with the following definitions:*	N/A

3.3.19.1	momentary exposure level, MEL metric for estimating 1 s sound exposure level from the HD 483-1 S2 test signal applied to both channels, based on EN 50332-1:2013, 4.2. Note 1 to entry: MEL is measured as A-weighted levels in dB. Note 2 to entry: See B.3 of EN 50332-3:2017 for additional information.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
3.3.19.3	sound exposure, ***E*** A-weighted sound pressure (p) squared and integrated over a stated period of time, T Note 1 to entry: The SI unit is Pa^2 s. $$E = \int_0^T p(t)^2 \, \mathrm{d}t$$	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
3.3.19.4	sound exposure level, ***SEL*** logarithmic measure of sound exposure relative to a reference value, E_0, typically the 1 kHz threshold of hearing in humans. Note 1 to entry: *SEL* is measured as A-weighted levels in dB. $$SEL = 10 \lg \left(\frac{E}{E_0} \right) \mathrm{dB}$$ Note 2 to entry: See B.4 of EN 50332-3:2017 for additional information.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
3.3.19.5	digital signal level relative to full scale, dBFS levels reported in dBFS are always r.m.s. Full scale level, 0 dBFS, is the level of a dc-free 997-Hz sine wave whose undithered positive peak value is positive digital full scale, leaving the code corresponding to negative digital full scale unused Note 1 to entry: It is invalid to use dBFS for non-r.m.s. levels. Because the definition of full scale is based on a sine wave, the level of signals with a crest factor lower than that of a sine wave may exceed 0 dBFS. In particular, square wave signals may reach +3,01 dBFS.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
2	**Modification to Clause 10**		N/A
10.6	**Safeguards against acoustic energy sources** Replace 10.6 of IEC 62368-1 with the following:		N/A
10.6.1.1	**Introduction** Safeguard requirements for protection against long-term exposure to excessive sound pressure levels from personal music players closely coupled to the ear are specified below. Requirements for earphones and headphones intended for use with personal music players are also covered.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

	A personal music player is a portable equipment intended for use by an ordinary person, that: – is designed to allow the user to listen to audio or audiovisual content / material; and – uses a listening device, such as headphones or earphones that can be worn in or on or around the ears; and – has a player that can be body worn (of a size suitable to be carried in a clothing pocket) and is intended for the user to walk around with while in continuous use (for example, on a street, in a subway, at an airport, etc.). EXAMPLES Portable CD players, MP3 audio players, mobile phones with MP3 type features, PDAs or similar equipment. Personal music players shall comply with the requirements of either 10.6.2 or 10.6.3. NOTE 1 Protection against acoustic energy sources from telecom applications is referenced to ITU-T P.360. NOTE 2 It is the intention of the Committee to allow the alternative methods for now, but to only use the dose measurement method as given in 10.6.5 in future. Therefore, manufacturers are encouraged to implement 10.6.5 as soon as possible. Listening devices sold separately shall comply with the requirements of 10.6.6. These requirements are valid for music or video mode only. The requirements do not apply to: – professional equipment; NOTE 3 Professional equipment is equipment sold through special sales channels. All products sold through normal electronics stores are considered not to be professional equipment. – hearing aid equipment and other devices for assistive listening; – the following type of analogue personal music players: · long distance radio receiver (for example, a multiband radio receiver or world band radio receiver, an AM radio receiver), and · cassette player/recorder; NOTE 4 This exemption has been allowed because this technology is falling out of use and it is expected that within a few years it will no longer exist. This exemption will not be extended to other technologies. – a player while connected to an external amplifier that does not allow the user to walk around while in use. For equipment that is clearly designed or intended primarily for use by children, the limits of the relevant toy standards may apply. The relevant requirements are given in EN 71-1:2011, 4.20 and the related tests methods and measurement distances apply.		

N/A10.6.1.2	Non-ionizing radiation from radio frequencies in the range 0 to 300 GHz The amount of non-ionizing radiation is regulated by European Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz). For intentional radiators, ICNIRP guidelines should be taken into account for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz). For hand-held and body mounted devices, attention is drawn to EN 50360 and EN 50566.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.2	Classification of devices without the capacity to estimate sound dose		N/A
10.6.2.1	General This standard is transitioning from short-term based (30 s) requirements to long-term based (40 hour) requirements. These clauses remain in effect only for devices that do not comply with sound dose estimation as stipulated in EN 50332-3. For classifying the acoustic output $L_{Aeq,T}$, measurements are based on the A-weighted equivalent sound pressure level over a 30 s period. For music where the average sound pressure (long term $L_{Aeq,T}$) measured over the duration of the song is lower than the average produced by the programme simulation noise, measurements may be done over the duration of the complete song. In this case, T becomes the duration of the song. NOTE Classical music, acoustic music and broadcast typically has an average sound pressure (long term $L_{Aeq,T}$) which is much lower than the average programme simulation noise. Therefore, if the player is capable to analyse the content and compare it with the programme simulation noise, the warning does not need to be given as long as the average sound pressure of the song does not exceed the required limit. For example, if the player is set with the programme simulation noise to 85 dB, but the average music level of the song is only 65 dB, there is no need to give a warning or ask an acknowledgement as long as the average sound level of the song is not above the basic limit of 85 dB.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.2.2	RS1 limits (to be superseded, see 10.6.3.2) RS1 is a class 1 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or where the combination of player and listening device is known by other means such as setting or automatic detection, the $L_{Aeq,T}$ acoustic output shall be ≤ 85 dB when playing the fixed "programme simulation noise" described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

	allows connection to a listening device for general use, the unweighted r.m.s. output voltage shall be ≤ 27 mV (analogue interface) or -25 dBFS (digital interface) when playing the fixed “programme simulation noise” described in EN 50332-1. – The RS1 limits will be updated for all devices as per 10.6.3.2.		
10.6.2.3	RS2 limits (to be superseded, see 10.6.3.3) RS2 is a class 2 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or when the combination of player and listening device is known by other means such as setting or automatic 130 detection, the $L_{Aeq,T}$ acoustic output shall be ≤ 100 dB(A) when playing the fixed “programme simulation noise” as described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output voltage shall be ≤ 150 mV (analogue interface) or -10 dBFS (digital interface) when playing the fixed “programme simulation noise” as described in EN 50332-1.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.2.4	RS3 limits RS3 is a class 3 acoustic energy source that exceeds RS2 limits.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.3	Classification of devices (new)		N/A
10.6.3.1	General Previous limits (10.6.2) created abundant false negative and false positive PMP sound level warnings. New limits, compliant with The Commission Decision of 23 June 2009, are given below.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.3.2	RS1 limits (new) RS1 is a class 1 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or where the combination of player and listening device is known by other means such as setting or automatic detection, the $L_{Aeq,T}$ acoustic output shall be ≤ 80 dB when playing the fixed “programme simulation noise” described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output voltage shall be ≤ 15 mV (analogue interface) or -30 dBFS (digital interface) when playing the fixed “programme simulation noise” described in EN 50332-1.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

10.6.3.3	RS2 limits (new) RS2 is a class 2 acoustic energy source that does not exceed the following: – for equipment provided as a package (player with its listening device), and with a proprietary connector between the player and its listening device, or where the combination of player and listening device is known by other means such as setting or automatic detection, the weekly sound exposure level, as described in EN 50332-3, shall be ≤ 80 dB when playing the fixed "programme simulation noise" described in EN 50332-1. – for equipment provided with a standardized connector (for example, a 3,5 phone jack) that allows connection to a listening device for general use, the unweighted r.m.s. output level, integrated over one week, as described in EN50332-3, shall be ≤ 15 mV (analogue interface) or -30 dBFS (digital interface) when playing the fixed "programme simulation noise" described in EN 50332-1.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.4	Requirements for maximum sound exposure		N/A
10.6.4.1	Measurement methods All volume controls shall be turned to maximum during tests. Measurements shall be made in accordance with EN 50332-1 or EN 50332-2 as applicable.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.4.2	Protection of persons Except as given below, protection requirements for parts accessible to ordinary persons, instructed persons and skilled persons are given in 4.3. NOTE 1 Volume control is not considered a safeguard. Between RS2 and an ordinary person, the basic safeguard may be replaced by an instructional safeguard in accordance with Clause F.5, except that the instructional safeguard shall be placed on the equipment, or on the packaging, or in the instruction manual. Alternatively, the instructional safeguard may be given through the equipment display during use. The elements of the instructional safeguard shall be as follows: – element 1a: the symbol  , IEC 60417-6044 (2011-01) – element 2: "High sound pressure" or equivalent wording – element 3: "Hearing damage risk" or equivalent wording – element 4: "Do not listen at high volume levels for long periods." or equivalent wording	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

	An equipment safeguard shall prevent exposure of an ordinary person to an RS2 source without intentional physical action from the ordinary person and shall automatically return to an output level not exceeding what is specified for an RS1 source when the power is switched off. The equipment shall provide a means to actively inform the user of the increased sound level when the equipment is operated with an output exceeding RS1. Any means used shall be acknowledged by the user before activating a mode of operation which allows for an output exceeding RS1. The acknowledgement does not need to be repeated more than once every 20 h of cumulative listening time. NOTE 2 Examples of means include visual or audible signals. Action from the user is always needed. NOTE 3 The 20 h listening time is the accumulative listening time, independent of how often and how long the personal music player has been switched off. A skilled person shall not be unintentionally exposed to RS3.		
10.6.5	Requirements for dose-based systems		N/A
10.6.5.1	General requirements Personal music players shall give the warnings as provided below when tested according to EN 50332-3, using the limits from this clause. The manufacturer may offer optional settings to allow the users to modify when and how they wish to receive the notifications and warnings to promote a better user experience without defeating the safeguards. This allows the users to be informed in a method that best meets their physical capabilities and device usage needs. If such optional settings are offered, an administrator (for example, parental restrictions, business/educational administrators, etc.) shall be able to lock any optional settings into a specific configuration. The personal music player shall be supplied with easy to understand explanation to the user of the dose management system, the risks involved, and how to use the system safely. The user shall be made aware that other sources may significantly contribute to their sound exposure, for example work, transportation, concerts, clubs, cinema, car races, etc.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.5.2	Dose-based warning and requirements When a dose of 100 % *CSD* is reached, and at least at every 100 % further increase of *CSD*, the device shall warn the user and require an acknowledgement. In case the user does not	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

	acknowledge, the output level shall automatically decrease to compliance with class RS1. The warning shall at least clearly indicate that listening above 100 % *CSD* leads to the risk of hearing damage or loss.		
10.6.5.3	Exposure-based requirements With only dose-based requirements, cause and effect could be far separated in time, defying the purpose of educating users about safe listening practice. In addition to dose-based requirements, a PMP shall therefore also put a limit to the short-term sound level a user can listen at. The exposure-based limiter (EL) shall automatically reduce the sound level not to exceed 100 dB(A) or 150 mV integrated over the past 180 s, based on methodology defined in EN 50332-3. The EL settling time (time from starting level reduction to reaching target output) shall be 10 s or faster. Test of EL functionality is conducted according to EN 50332-3, using the limits from this clause. For equipment provided as a package (player with its listening device), the level integrated over 180 s shall be 100 dB or lower. For equipment provided with a standardized connector, the unweighted level integrated over 180 s shall be no more than 150 mV for an analogue interface and no more than -10 dBFS for a digital interface. NOTE In case the source is known not to be music (or test signal), the EL may be disabled.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

10.6.6	Requirements for listening devices (headphones, earphones, etc.)		N/A
10.6.6.1	Corded listening devices with analogue input With 94 dB L_{Aeq} acoustic pressure output of the listening device, and with the volume and sound settings in the listening device (for example, built-in volume level control, additional sound features like equalization, etc.) set to the combination of positions that maximize the measured acoustic output, the input voltage of the listening device when playing the fixed "programme simulation noise" as described in EN 50332-1 shall be ≥ 75 mV. NOTE The values of 94 dB and 75 mV correspond with 85 dB and 27 mV or 100 dB and 150 mV.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.6.2	Corded listening devices with digital input With any playing device playing the fixed "programme simulation noise" described in EN 50332-1, and with the volume and sound settings in the listening device (for example, built-in volume level control, additional sound features like equalization, etc.) set to the combination of positions that maximize the measured acoustic output, the $L_{Aeq,T}$ acoustic output of the listening device shall be ≤ 100 dB with an input signal of -10 dBFS.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.6.3	Cordless listening devices In cordless mode, – with any playing and transmitting device playing the fixed programme simulation noise described in EN 50332-1; and – respecting the cordless transmission standards, where an air interface standard exists that specifies the equivalent acoustic level; and – with volume and sound settings in the receiving device (for example, built-in volume level control, additional sound features like equalization, etc.) set to the combination of positions that maximize the measured acoustic output for the above mentioned programme simulation noise, the $L_{Aeq,T}$ acoustic output of the listening device shall be ≤ 100 dB with an input signal of -10 dBFS.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
10.6.6.4	Measurement method *Measurements shall be made in accordance with EN 50332-2 as applicable.*	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
3	Modification to the whole document		N/A

	Delete all the “country” notes in the reference document according to the following list: 0.2.1 Note 1 and 2 | 1 Note 4 and 5 | 3.3.8.1 Note 2 3.3.8.3 Note 1 | 4.1.15 Note | 4.7.3 Note 1 and 2 5.2.2.2 Note | 5.4.2.3.2.2 Table 12 Note c | 5.4.2.3.2.4 Note 1 and 3 5.4.2.3.2.4 Table 13 Note 2 | 5.4.2.5 Note 2 | 5.4.5.1 Note 5.4.10.2.1 Note | 5.4.10.2.2 Note | 5.4.10.2.3 Note 5.5.2.1 Note | 5.5.6 Note | 5.6.4.2.1 Note 2 and 3 and 4 5.6.8 Note 2 | 5.7.6 Note | 5.7.7.1 Note 1 and Note 2 8.5.4.2.3 Note | 10.2.1 Table 39 Note 3 and 4 and 5 | 10.5.3 Note 2 ~~10.6.1~~ Note 3 | F.3.3.6 Note 3 | Y.4.1 Note Y.4.5 Note	
4	Modification to Clause 1		N/A
1	***Add*** *the following note:* *NOTE Z1 The use of certain substances in electrical and electronic equipment is restricted within the EU: see Directive 2011/65/EU.*	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

5	**Modification to 4.Z1**		N/A
4.Z1	***Add*** *the following new subclause after 4.9:* To protect against excessive current, short-circuits and earth faults in circuits connected to an a.c. mains, protective devices shall be included either as integral parts of the equipment or as parts of the building installation, subject to the following, a), b) and c): a) except as detailed in b) and c), protective devices necessary to comply with the requirements of B.3.1 and B.4 shall be included as parts of the equipment; b) for components in series with the mains input to the equipment such as the supply cord, appliance coupler, r.f.i. filter and switch, short-circuit and earth fault protection may be provided by protective devices in the building installation; c) it is permitted for pluggable equipment type B or permanently connected equipment, to rely on dedicated overcurrent and short-circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instructions. If reliance is placed on protection in the building installation, the installation instructions shall so state, except that for pluggable equipment type A the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
6	**Modification to 5.4.2.3.2.4**		N/A
5.4.2.3.2.4	***Add*** *the following to the end of this subclause:* The requirement for interconnection with **external circuit** is in addition given in EN 50491-3:2009.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
7	**Modification to 10.2.1**		N/A
10.2.1	Add the following to [c)] and [d)] in table 39: For additional requirements, see 10.5.1.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

8	**Modification to 10.5.1**		N/A
10. 5. 1	***Add*** *the following after the first paragraph:* For RS 1 compliance is checked by measurement under the following conditions: In addition to the normal operating conditions, all controls adjustable from the outside by hand, by any object such as a tool or a coin, and those internal adjustments or pre-sets which are not locked in a reliable manner, are adjusted so as to give maximum radiation whilst maintaining an intelligible picture for 1 h, at the end of which the measurement is made. NOTE Z1 Soldered joints and paint lockings are examples of adequate locking. The dose-rate is determined by means of a radiation monitor with an effective area of 10 cm^2, at any point 10 cm from the outer surface of the apparatus. Moreover, the measurement shall be made under fault conditions causing an increase of the high voltage, provided an intelligible picture is maintained for 1 h, at the end of which the measurement is made. For RS1, the dose-rate shall not exceed 1 µSv/h taking account of the background level. NOTE Z2 These values appear in Directive 96/29/Euratom of 13 May 1996.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
9	**Modification to G.7.1**		N/A
G. 7. 1	***Add*** *the following note:* NOTE Z1 The harmonized code designations corresponding to the IEC cord types are given in Annex ZD.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

10	Modification to **Bibliography**		N/A
	Add the following notes for the standards indicated: IEC 60130-9 NOTE Harmonized as EN 60130-9. IEC 60269-2 NOTE Harmonized as HD 60269-2. IEC 60309-1 NOTE Harmonized as EN 60309-1. IEC 60364 NOTE some parts harmonized in HD 384/HD 60364 series. IEC 60601-2-4 NOTE Harmonized as EN 60601-2-4. IEC 60664-5 NOTE Harmonized as EN 60664-5. IEC 61032:1997 NOTE Harmonized as EN 61032:1998 (not modified). IEC 61508-1 NOTE Harmonized as EN 61508-1. IEC 61558-2-1 NOTE Harmonized as EN 61558-2-1. IEC 61558-2-4 NOTE Harmonized as EN 61558-2-4. IEC 61558-2-6 NOTE Harmonized as EN 61558-2-6. IEC 61643-1 NOTE Harmonized as EN 61643-1. IEC 61643-21 NOTE Harmonized as EN 61643-21. IEC 61643-311 NOTE Harmonized as EN 61643-311. IEC 61643-321 NOTE Harmonized as EN 61643-321. IEC 61643-331 NOTE Harmonized as EN 61643-331.		N/A
11	**ADDITION OF ANNEXES**		N/A
ZB	**ANNEX ZB, SPECIAL NATIONAL CONDITIONS (EN)**		N/A
4.1.15	Denmark, Finland, Norway and Sweden To the end of the subclause the following is added: Class I pluggable equipment type A intended for connection to other equipment or a network shall, if safety relies on connection to reliable earthing or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment shall be connected to an earthed mains socket-outlet. The marking text in the applicable countries shall be as follows: In Denmark: “Apparatets stikprop skal tilsluttes en stikkontakt med jord som giver forbindelse til stikproppens jord.” In Finland: "Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan" In Norway: “Apparatet må tilkoples jordet stikkontakt” In Sweden: “Apparaten skall anslutas till jordat uttag”	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

4.7.3	United Kingdom To the end of the subclause the following is added: The torque test is performed using a socket-outlet complying with BS 1363, and the plug part shall be assessed to the relevant clauses of BS 1363. Also see Annex G.4.2 of this annex	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.2.2.2	**Denmark** After the 2nd paragraph add the following: A warning (marking safeguard) for high touch current is required if the touch current exceeds the limits of 3,5 mA a.c. or 10 mA d.c.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.4.11.1 and Annex G	Finland and Sweden To the end of the subclause the following is added: For separation of the telecommunication network from earth the following is applicable: If this insulation is solid, including insulation forming part of a component, it shall at least consist of either · two layers of thin sheet material, each of which shall pass the electric strength test below, or · one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. If this insulation forms part of a semiconductor component (e.g. an optocoupler), there is no distance through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that clearances and creepage distances do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition · passes the tests and inspection criteria of 5.4.8 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 5.4.9 shall be performed using 1,5 kV), and · is subject to routine testing for electric strength during manufacturing, using a test voltage of 1,5 kV. It is permitted to bridge this insulation with a capacitor complying with EN 60384-14:2005, subclass Y2. A capacitor classified Y3 according to EN 60384-14:2005, may bridge this insulation under the following conditions:	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

	· the insulation requirements are satisfied by having a capacitor classified Y3 as defined by EN 60384-14, which in addition to the Y3 testing, is tested with an impulse test of 2,5 kV defined in 5.4.11; • the additional testing shall be performed on all the test specimens as described in EN 60384-14; the impulse test of 2,5 kV is to be performed before the endurance test in EN 60384-14, in the sequence of tests as described in EN 60384-14.		
5.5.2.1	Norway After the 3rd paragraph the following is added: Due to the IT power system used, capacitors are required to be rated for the applicable line-to-line voltage (230 V).	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.5.6	Finland, Norway and Sweden To the end of the subclause the following is added: Resistors used as basic safeguard or bridging basic insulation in class I pluggable equipment type A shall comply with G.10.1 and the test of G.10.2.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.6.1	Denmark Add to the end of the subclause Due to many existing installations where the socket-outlets can be protected with fuses with higher rating than the rating of the socket-outlets the protection for pluggable equipment type A shall be an integral part of the equipment. *Justification:* In Denmark an existing 13 A socket outlet can be protected by a 20 A fuse.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.6.4.2.1	Ireland and United Kingdom After the indent for pluggable equipment type A, the following is added: – the protective current rating is taken to be 13 A, this being the largest rating of fuse used in the mains plug.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.6.4.2.1	France After the indent for pluggable equipment type A, the following is added: – in certain cases, the protective current rating of the circuit supplied from the mains is taken as 20 A instead of 16 A.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.6.5.1	To the second paragraph the following is added: The range of conductor sizes of flexible cords to be accepted by terminals for equipment with a rated current over 10 A and up to and including 13 A is: 1,25 mm^2 to 1,5 mm^2 in cross-sectional area.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

5.6.8	Norway To the end of the subclause the following is added: Equipment connected with an earthed mains plug is classified as **class I equipment**. See the Norway marking requirement in 4.1.15. The symbol IEC 60417-6092, as specified in F.3.6.2, is accepted.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.7.6	Denmark To the end of the subclause the following is added: The installation instruction shall be affixed to the equipment if the protective conductor current exceeds the limits of 3,5 mA a.c. or 10 mA d.c.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

5.7.6.2	Denmark To the end of the subclause the following is added: The warning (marking safeguard) for high touch current is required if the touch current or the protective current exceed the limits of 3,5 mA .	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
5.7.7.1	Norway and Sweden To the end of the subclause the following is added: The screen of the television distribution system is normally not earthed at the entrance of the building and there is normally no equipotential bonding system within the building. Therefore the protective earthing of the building installation needs to be isolated from the screen of a cable distribution system. It is however accepted to provide the insulation external to the equipment by an adapter or an interconnection cable with galvanic isolator, which may be provided by a retailer, for example. The user manual shall then have the following or similar information in Norwegian and Swedish language respectively, depending on in what country the equipment is intended to be used in: “Apparatus connected to the protective earthing of the building installation through the mains connection or through other apparatus with a connection to protective earthing – and to a television distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a television distribution system therefore has to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11)” NOTE In Norway, due to regulation for CATV-installations, and in Sweden, a galvanic isolator shall provide electrical insulation below 5 MHz. The insulation shall withstand a dielectric strength of 1,5 kV r.m.s., 50 Hz or 60 Hz, for 1 min. Translation to Norwegian (the Swedish text will also be accepted in Norway): “Apparater som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplet utstyr – og er tilkoplet et koaksialbasert kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkopling av apparater til kabel-TV nett installeres en galvanisk isolator mellom apparatet og kabel-TV nettet.” Translation to Swedish: ”Apparater som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medföra risk för brand. För att undvika detta skall vid anslutning av apparaten till kabel-TV nät	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

	galvanisk isolator finnas mellan apparaten och kabel-TV nätet.”.		
8.5.4.2.3	United Kingdom Add the following after the 2nd dash bullet in 3rd paragraph: An emergency stop system complying with the requirements of IEC 60204-1 and ISO 13850 is required where there is a risk of personal injury.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
B.3.1 and B.4	Ireland and United Kingdom The following is applicable: To protect against excessive currents and short-circuits in the primary circuit of direct plug-in equipment, tests according to Annexes B.3.1 and B.4 shall be conducted using an external miniature circuit breaker complying with EN 60898-1, Type B, rated 32A. If the equipment does not pass these tests, suitable protective devices shall be included as an integral part of the direct plug-in equipment, until the requirements of Annexes B.3.1 and B.4 are met	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

G.4.2	Denmark To the end of the subclause the following is added: Supply cords of single phase appliances having a rated current not exceeding 13 A shall be provided with a plug according to DS 60884-2-D1:2011. CLASS I EQUIPMENT provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with standard sheet DK 2-1a or DK 2-5a. If a single-phase equipment having a RATED CURRENT exceeding 13 A or if a polyphase equipment is provided with a supply cord with a plug, this plug shall be in accordance with the standard sheets DK 6-1a in DS 60884-2-D1 or EN 60309-2. Mains socket outlets intended for providing power to Class II apparatus with a rated current of 2,5 A shall be in accordance DS 60884-2-D1:2011 standard sheet DKA 1-4a. Other current rating socket outlets shall be in compliance with Standard Sheet DKA 1-3a or DKA 1-1c. Mains socket-outlets with earth shall be in compliance with DS 60884-2-D1:2011 Standard Sheet DK 1-3a, DK 1-1c, DK1-1d, DK 1-5a or DK 1-7a *Justification:* Heavy Current Regulations, Section 6c	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
G.4.2	United Kingdom To the end of the subclause the following is added: The plug part of direct plug-in equipment shall be assessed to BS 1363: Part 1, 12.1, 12.2, 12.3, 12.9, 12.11, 12.12, 12.13, 12.16, and 12.17, except that the test of 12.17 is performed at not less than 125 °C. Where the metal earth pin is replaced by an Insulated Shutter Opening Device (ISOD), the requirements of clauses 22.2 and 23 also apply.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

G.7.1	United Kingdom To the first paragraph the following is added: Equipment which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS 1363 by means of that flexible cable or cord shall be fitted with a 'standard plug' in accordance with the Plugs and Sockets etc. (Safety) Regulations 1994, Statutory Instrument 1994 No. 1768, unless exempted by those regulations. NOTE "Standard plug" is defined in SI 1768:1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
G.7.1	Ireland To the first paragraph the following is added: Apparatus which is fitted with a flexible cable or cord shall be provided with a plug in accordance with Statutory Instrument 525: 1997, "13 A Plugs and Conversion Adapters for Domestic Use Regulations: 1997. S.I. 525 provides for the recognition of a standard of another Member State which is equivalent to the relevant Irish Standard	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
G.7.2	Ireland and United Kingdom To the first paragraph the following is added: A power supply cord with a conductor of 1,25 mm^2 is allowed for equipment which is rated over 10 A and up to and including 13 A.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

ZC	**ANNEX ZC, NATIONAL DEVIATIONS (EN)**		N/A
10.5.2	Germany The following requirement applies: For the operation of any cathode ray tube intended for the display of visual images operating at an acceleration voltage exceeding 40 kV, authorization is required, or application of type approval (Bauartzulassung) and marking. *Justification*: German ministerial decree against ionizing radiation (Röntgenverordnung), in force since 2002-07-01, implementing the European Directive 96/29/EURATOM. **NOTE** Contact address: Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig, Tel.: Int+49-531-592-6320, Internet: http://www.ptb.de	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

ZD	IEC and CENELEC CODE DESIGNATIONS FOR FLEXIBLE CORDS (EN)	N/A

Type of flexible cord	Code designations	
	IEC	CENELEC
PVC insulated cords		
Flat twin tinsel cord	60227 IEC 41	H03VH-Y
Light polyvinyl chloride sheathed flexible cord	60227 IEC 52	H03VV-F H03VVH2-F
Ordinary polyvinyl chloride sheathed flexible cord	60227 IEC 53	H05VV-F H05VVH2-F
Rubber insulated cords		
Braided cord	60245 IEC 51	H03RT-F
Ordinary tough rubber sheathed flexible cord	60245 IEC 53	H05RR-F
Ordinary polychloroprene sheathed flexible cord	60245 IEC 57	H05RN-F
Heavy polychloroprene sheathed flexible cord	60245 IEC 66	H07RN-F
Cords having high flexibility		
Rubber insulated and sheathed cord	60245 IEC 86	H03RR-H
Rubber insulated, crosslinked PVC sheathed cord	60245 IEC 87	H03RV4-H
Crosslinked PVC insulated and sheathed cord	60245 IEC 88	H03V4V4-H
Cords insulated and sheathed with halogen-free thermoplastic compounds		
Light halogen-free thermoplastic insulated and sheathed flexible cords		H03Z1Z1-F H03Z1Z1H2-F
Ordinary halogen-free thermoplastic insulated and sheathed flexible cords		H05Z1Z1-F H05Z1Z1H2-F

ATTACHMENT TO TEST REPORT

IEC 62368-1:2018

SAUDI ARABIA NATIONAL DIFFERENCES
(Audio/video, information and communication technology equipment Part 1: Safety requirements)

Differences according to..... :	National standard SASO-IEC 62368-1:2020
TRF template used:..... :	IECEE OD-2020-F3, Ed. 1.1
Attachment Form No. ..... :	SA_ND_IEC62368_1E
Attachment Originator..... :	SASO
Master Attachment ..... :	2022-12-22

	National Differences		N/A
			N/A
	Plugs used for pluggable equipment comply with standard SASO-2203.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
--	**Frequency (Hz)**	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	60 Hz	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
--	**Rated voltage (V)**	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
	Single phase 230 V Three phase 400 V	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT IEC 62368-1 (AUSTRALIA / NEW ZEALAND) NATIONAL DIFFERENCES (**Audio/video, information and communication technology equipment**)			
Differences according to ..... :	AS/NZS 62368.1:2022		
TRF template used: ..... :	IECEE OD-2020-F3, Ed. 1.1		
Attachment Form No. ..... : **Attachment Originator.....** : **Master Attachment** ..... :	AU_NZ_ND_IEC62368_1E JAS-ANZ 2022-07-01		
Copyright © 2020 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved.			
	National Differences		**N/A**
Appendix ZZ	Variations to IEC 62368-1:2018 (ED. 3.0) for Australia and New Zealand		**N/A**
ZZ1 Scope	This Appendix lists the normative variations to IEC 62368-1:2018 (ED. 3.0)		**N/A**
ZZ2 Variations	The following modifications are required for Australian/New Zealand conditions:		**N/A**
2	After the first paragraph, *add* the following: The Australian or Australian/New Zealand Standards listed below are modified adoptions of, or not equivalent to, the IEC normative references and are required for the application of this Standard. All references in the source text to those IEC normative references shall be replaced by references to the corresponding Australian or Australian/New Zealand Standards. Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably -AS/NZS 3112, *Approval and test specification—Plugs and socket-outlets* -AS/NZS 3123, *Approval and test specification—Plugs, socket-outlets and couplers for general industrial application* -AS/NZS 3191, *Electric flexible cords* *-AS/NZS 60884.1.Plugs and socket-outlets for household and similar purposes, Part 1: General requirements* *-IEC 60086-2 Primary batteries — Part 2: Physical and electrical specifications* -AS/NZS 60065, *Audio, video and similar electronic apparatus—Safety requirements (IEC 60065:2015 (ED.8.0) MOD)* -AS/NZS 60320.1, *Appliance couplers for household and similar general purposes, Part 1: General requirements (IEC 60320-1, Ed.2.1 (2007) MOD)* -AS/NZS 60320.2.2, *Appliance couplers for household and similar general purposes Part 2.2: Interconnection couplers for household and similar equipment (IEC 60320-2-*	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	2, Ed.2.0 (1998) MOD) -AS/NZS 60695.2.11*, Fire hazard testing, Part 2.11: Glowing/hot wire based test methods—Glow-wire flammability test method for end-products* -AS/NZS 60695.11.5, *Fire hazard testing, Part 11.5: Test flames—Needle-flame test method—Apparatus, confirmatory test arrangement and guidance* -AS/NZS 60695.11.10, *Fire hazard testing, Part 11.10: Test flames—50 W horizontal and vertical flame test methods* -AS/NZS 60884.1, *Plugs and socket-outlets for household and similar purposes, Part 1: General requirements* -AS/NZS 60950.1, *Information technology equipment—Safety*, Part 1: *General requirements (IEC 60950-1, Ed.2.2 (2013), MOD)* IEC 61032:1997, *Protection of persons and equipment by enclosures—Probes for verification* -AS/NZS 61558.1, *Safety of Power Transformers, Power Supplies, Reactors and Similar Products, Part 1: General requirements and tests (IEC 61558-1 Ed 3, MOD)* -AS/NZS 61558.2.16, *Safety of transformers, reactors, power supply units and similar products for voltages up to 1 100 V, Part 2.16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units.*		
4.7.2	**Requirements** *Delete* the text of the second paragraph and *replace* with the following: Equipment with a plug portion, suitable for insertion into a 10 A 3-pin flat-pin socket-outlet conforming to AS/NZS 3112, shall conform to the requirements in AS/NZS 3112 for equipment with integral pins for insertion into socket-outlets. Conformity is checked by inspection and, if necessary, by the tests in AS/NZS 3112. NOTE: Equipment with plug portions for use in countries other than Australia and New Zealand will need to conform to other countries' requirements Note Additional AS/NZS 3112 Appendix J,TRF is appended to end of this TRF.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
4.7.3	**Compliance Criteria** *Delete* this clause	Considered.	Info
4.8.1	**General** After second list, *add* the following: NOTE: Refer to the Consumer Goods (Products Containing Button/Coin Batteries) Safety Standard 2020 and Consumer Goods (Products Containing Button/Coin Batteries) Information Standard 2020 for more information on button cell batteries in Australia..	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

<table>
<tr><td colspan="4">IEC 62368_1E ATTACHMENT</td></tr>
<tr><td>Clause</td><td>Requirement + Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td>5.4.10.2.1</td><td>General
Delete the first paragraph and replace with the following:
In Australia, the separation is checked by the test given in both Clause 5.4.10.2.2 and Clause 5.4.10.2.3.
In New Zealand, the separation is checked by the test given in either 5.4.10.2.2 or 5.4.10.2.3..</td><td>EUT is an ES1/PS1 board-mounted, built-in component.</td><td>N/A</td></tr>
<tr><td>Table 28</td><td colspan="2">Delete Table 28 and replace with the following:</td><td></td></tr>
<tr><td colspan="4">
<table>
<tr><td rowspan="2">Parts</td><td colspan="2">Impulse test</td><td colspan="2">Steady state test</td></tr>
<tr><td>New Zealand</td><td>Australia</td><td>New Zealand</td><td>Australia</td></tr>
<tr><td>Parts indicated in Clause 5.4.10.1 a) [a]</td><td>2.5 kV</td><td>7.0 kV for hand-held telephones and headsets, 2.5 kV for other equipment.</td><td>1.5 kV</td><td>3 kV</td></tr>
<tr><td>Parts indicated in Clause 5.4.10.1 b) and c) [b]</td><td colspan="2">1.5 kV [c]</td><td>1.0 kV</td><td>1.5 kV</td></tr>
<tr><td colspan="5">[a] Surge suppressors shall not be removed.
[b] Surge suppressors may be removed, provided that such devices pass the impulse test of Clause 5.4.10.2.2 when tested as components outside the equipment.
[c] During this test, it is allowed for a surge suppressor to operate and for a sparkover to occur in a GDT.</td></tr>
</table>
</td></tr>
<tr><td>5.4.10.2.2</td><td>Delete “NOTE” and replace with “NOTE 1”.
After NOTE 1, add the following:
NOTE 2: For Australia, the 7 kV impulse simulates lightning surges on typical rural and semi-rural network lines.
NOTE 3: For Australia, the value of 2.5 kV for Clause 5.4.10.1 a) was chosen to ensure the adequacy of the insulation concerned and does not necessarily simulate likely overvoltages.</td><td>EUT is an ES1/PS1 board-mounted, built-in component.</td><td>N/A</td></tr>
<tr><td>5.4.10.2.3</td><td>Delete “NOTE” and replace with “NOTE 1”.
After NOTE 1, add the following:
NOTE 2: For Australia, where there are capacitors across the insulation under test, it is recommended that d.c. test voltages are used.
NOTE 3: The 3 kV and 1.5 kV values for Australia have been determined considering the low frequency induced voltages from the power supply distribution system.</td><td>EUT is an ES1/PS1 board-mounted, built-in component.</td><td>N/A</td></tr>
<tr><td>6</td><td>Electrically-caused fire</td><td></td><td>N/A</td></tr>
<tr><td>6.6</td><td colspan="2">After Clause 6.6, add the new Clauses 6.201 as follows:
6.201 External power supplies, docking stations and other similar devices
(see special national conditions)</td><td>N/A</td></tr>
<tr><td>8.6</td><td colspan="2">Stability of equipment</td><td></td></tr>
<tr><td>Table 36</td><td>Footnote [a], after first sentence, add the following:
Equipment having displays with moving images shall include “television sets and display devices”.</td><td>EUT is an ES1/PS1 board-mounted, built-in component.</td><td>N/A</td></tr>
</table>

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
8.6.1	After Clause 8.6.1 *add* the following new clauses: **8.6.201 Restraining Device fixing point** (see special national conditions) **8.6.202 Restraining device** (see special national conditions)	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex F **Paragraph F.3.3.4**	**Rated Voltage** *Delete* "NOTE" and *replace* with NOTE1" After NOTE 1, *add* the following Equipment that is intended for connection to the supply mains in Australia and New Zealand shall be marked with: (a) A rated voltage of: • 230 V for single phase equipment • 400 V for poly phase equipment Or (b) A rated voltage range that includes: • 230 V for single phase equipment • 400 V for poly phase equipment NOTE 2: equipment that is not rated as above is not suitable for direct connection to the supply mains in Australia or new Zealand.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex F.3.3.5	After the list, *add* the following Equipment that is intended for connection to supply mains in Australia or New Zealand shall be marked with a rated frequency of 50 Hz or a rated frequency range or nominal value which includes 50Hz	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex F.3.8	After "The DC output of an external power supply", insert "or docking stations and other similar external devices"	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex G **Paragraph G.4.2**	**Mains connectors** 1 After "IEC 60320", insert "or AS/NZS 60320 series". 2 After "IEC 60906-1", insert"or AS/NZS 3123" 3 *After* first paragraph *add* the following: 10 A or 15 A 250 V flat pin plugs for the connection of equipment to mains-powered socket-outlets for household or similar general use shall comply with AS/NZS 3112 or AS/NZS 60884.1.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Paragraph G.5.3.1	**Transformers, General** 1 Third dashed point *replace* 'IEC 61558-1 and the relevant parts of IEC 61558-2' with 'AS/NZS 61558-1 and the relevant parts of AS/NZS 61558.2' 2 Fourth dashed point *replace* 'IEC 61558-2-16' with 'AS/NZS 61558.2.16'.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex G.7.1	**Mains supply cords, General** Fourth dashed paragraph, *replace* 'IEC 60320-1' with 'AS/NZS 60320.1'	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
Table G.7	**Sizes of conductors** 1 First column, second row, *delete* "6" and *replace* with "7.5" 2 Second column, second row, *delete* '0,75' and *replace* with '0.75[b] 3 *Delete* NOTE 1. 4 *Replace* 'NOTE 2' with 'NOTE:'. 5 *Delete* 'Footnote b' and *replace* with the following: [b] This nominal cross-sectional area is only allowed for Class II appliances if the length of the power supply cord, measured between the point where the cord, or cord guard, enters the appliance, and the entry to the plug does not exceed 2 m (0.5 mm^2 three-core supply flexible cords are not permitted; see AS/NZS 3191). 6 Footnote c *replace* 'IEC 60320-1' with 'AS/NZS 60320.1' 7 Footnote d *replace* 'IEC 60320-1' with 'AS/NZS 60320.1'	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex M **M 2.1**	*Add* "IEC 60086-2" to the list	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
Annex M **Paragraph M.3.2**	**Test method** Delete"NOTE" and replace with "NOTE 1" After NOTE 1 *add* the following: NOTE 2: In cases where the voltage source is provided by power from an unassociated power source, consideration should be given to the effects of possible single fault conditions in the unassociated equipment. If the power source is unknown then it should be assumed that the maximum limit of ES1 may be applied to the source input under assumed single fault conditions in the source when assessing the charging circuit in the equipment under test.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
			N/A
	Special national conditions (if any)		N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
6.201	**External power supplies, docking stations and other similar devices** For external power supplies, docking stations and other similar devices, during and after abnormal operating conditions and during single fault conditions the output voltage— (a) at all ES1 outlets or connectors shall not increase by more than 10 % of the output rated voltage under normal operating conditions, measured after 3 s of introducing a singlefault condition and after 3 s of introducing abnormal operating conditions; and (b) of a USB outlet or connector shall not increase by more than 3 V or 10 % of the output rated voltage under normal operating conditions, whichever is higher, measured after3 seconds of introducing a single fault condition and after 3 s of introducing abnormal operating conditions For equipment with multiple rated voltages at the output, the requirements apply with the equipment configured for each output rated voltage in turn NOTE: This is intended to reduce the possibility of battery fire or explosion in attached equipment or accessories when charging secondary lithium batteries. The 3 s measurement delay is based on IEC document 108/742/INF, *TC 108, Standards Interpretation Panel Question 15 — Output voltage*, in relation to similar requirements in IEC 62368-3:2017. Conformity shall be checked by measurement, taking into account the abnormal operating conditions of Annex B.3 and the simulated single fault conditions of Annex B.4.	EUT is an ES1/PS1 board-mounted, built-in component.	N/A
8.6.201	**Restraining device fixing point** Freestanding-capable MS2 and MS3 television sets and display devices shall be provided with a fixing point to facilitate the anchoring of the equipment from toppling The fixing point shall conform to Clause 8.7 where the fixing point uses a wall, ceiling or other structure mount. Alternatively, the fixing point shall be capable of withstanding a pull equal to the mass of the equipment in all directions without damage Instructions for installation or instructions for use shall be provided to specify correct use of the fixing point	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

IEC 62368_1E ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
8.6.202	**Restraining device** MS2 and MS3 television sets and display devices shall be provided with a restraining device and associated hardware to attach to the television set or display device. The restraining device shall be capable of withstanding a pull equal to the mass of the equipment in all directions. Instructions for installation or instructions for use shall be provided to specify correct use of the fixing point .	EUT is an ES1/PS1 board-mounted, built-in component.	N/A

ATTACHMENT to TRF IEC62368_1E			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT **IEC 62368-1:2018** **JAPAN NATIONAL DIFFERENCES** AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT – PART 1: SAFETY REQUIREMENTS			
Differences according to..... : J62368-1(2023)			
TRF template used: ..... : IECEE OD-2020-F3:2022, Ed. 1.2			
Attachment Form No. ..... : JP_ND_IEC62368_1E **Attachment Originator.....** : UL Solutions (JP) **Master Attachment** ..... : Dated 2023-05-12			
	National Differences		N/A
4.1.2	Where the component, or a characteristic of a component, is a safeguard or a part of a safeguard, components shall comply with the requirements of this document or, where specified in a requirements clause, with the safety aspects of the relevant JIS component standards or IEC component standards, or components shall have properties equivalent to or better than these.	EUT is ES1 and is a built-in component.	N/A
5.6.1	Mains socket-outlet and interconnection coupler shall comply with Clause G.4.2A if they are incorporated as part of the equipment.	EUT is ES1 and is a built-in component.	N/A
5.6.2.1	Connection for protective conductor of class 0I equipment provided with instructional safeguard in accordance with Clause F.3.6.1A is considered to make earlier and break later than supply connection. Mains plug having a lead wire for protective earthing connection of class 0I equipment shall comply with all of the following: – Not to be used for equipment having a rated voltage of 150 V or more – Clip is not used for the earthing connection of the lead wire. – The lead wire for earthing is at least 10 cm long If class 0I equipment provides an independent main protective earthing terminal and is intended to be installed by ordinary person, earthing wire shall be provided in the package of the equipment.	EUT is ES1 and is a built-in component.	N/A

ATTACHMENT to TRF IEC62368_1E			
Clause	Requirement + Test	Result - Remark	Verdict
5.6.2.2	Internal earthing conductor of the cord set that is covered by the sheath of mains cord and is formed together with mains plug and appliance connector need not be green-and-yellow.	EUT is ES1 and is a built-in component.	N/A
5.6.3	In case of class 0I equipment using power supply cord having two conductors (no earthing conductor), the conductor of protective earthing lead wire shall comply with either of the following: – use of annealed copper wire with 1.6 mm diameter or corrosion-inhibiting metal wire having size and strength that are equivalent to or more than the above copper wire – single core cord or single core cab tire cable with 1.25 mm^2 or more cross-sectional area	EUT is ES1 and is a built-in component.	N/A
5.7.3	For class 0I equipment that is provided with mains socket-outlet in the configuration as specified in JIS C 8282 series, JIS C 8300 or JIS C 8303, or that is provided with mains appliance outlet as specified in JIS C 8283 series for the purpose of interconnection, the measurement is conducted on the system of the interconnected equipment having a single connection to the mains.	EUT is ES1 and is a built-in component.	N/A
5.7.5	In case of class 0I equipment, touch current shall not exceed 1.41 mA peak or for sinusoidal wave, 1.0 mA r.m.s. when measured using the network specified in Figure 4 of IEC 60990:2016.	EUT is ES1 and is a built-in component.	N/A
6.4.3.2	A fuse complying with JIC C 6575 series or a fuse having equivalent characteristics shall open within 1 s. A fuse having time/current characteristics other than those specified in IEC 60127 shall be tested with the characteristics taken into account. In case of Class A fuse of JIS C 6575, replace “2.1 times” by “1.35 times” and in case of Class B fuse of JIS C 6575, replace “2.1 times” by “1.6 times”.	EUT is ES1 and is a built-in component.	N/A
8.5.4.3.1	Only three-phase stationary equipment rated more than AC 200 V can be considered as being for use in locations where children are not likely to be present, when complying with Clause F.4.	EUT is ES1 and is a built-in component.	N/A
8.5.4.3.2	For equipment installed where children may be present, an instructional safeguard shall be provided by easily understandable wording in accordance with Clause F.5, except that element 3 is optional.	EUT is ES1 and is a built-in component.	N/A
8.5.4.3.4	The media destruction device is tested according to Clause V.1.2 with applicable jointed test probes to the opening. And then the wedge probe per Figure V.4 shall not contact any moving part.	EUT is ES1 and is a built-in component.	N/A

ATTACHMENT to TRF IEC62368_1E			
Clause	Requirement + Test	Result - Remark	Verdict
8.5.4.3.5	The wedge probe of Figure V.4 and applicable jointed test probes specified in Clause V.1.2 shall not contact any moving part. Instructional safeguard shall not be used instead of equipment safeguard for preventing access to hazardous moving parts.	EUT is ES1 and is a built-in component.	N/A
F.3.5.1	When the mains socket-outlet is configured in accordance with JIS C 8282 series, JIS C 8300 or JIS C 8303, the assigned current or power shall be marked. If the voltage of the socket-outlet is the same as the mains voltage, the voltage need not be marked. Instructional safeguard of Class 0I equipment shall be provided with an instructional safeguard in accordance with Clause F.5 when a mains socket-outlet as specified in JIS C 8282 series, JIS C 8300 or JIS C 8303 to which class I equipment can be connected is provided in accordance with Clause G.4.2A except for the cases where the socket-outlet is accessible only to skilled persons.	EUT is ES1 and is a built-in component.	N/A
F.3.5.3	If the fuse is necessary for the safeguard function, the symbols indicating pre-arcing time-current characteristic shall be included.	EUT is ES1 and is a built-in component.	N/A
F.3.6.1A	Marking for class 0I equipment The requirements of Clauses F.3.6.1.1 and F.3.6.1.2 shall be applied to class 0I equipment. For class 0I equipment, a marking of instructions shall be provided regarding the earthing connection. In addition to the above, for class 0I equipment, an instruction to connect earthing before and disconnect earthing after the connection of supply conductors shall be marked on the visible place of the main body or shall be in the text of an accompanying document.	EUT is ES1 and is a built-in component.	N/A
F.3.6.2	Symbols, IEC 60417-5172 (2003-02) or IEC 60417-6092 (2011-10), shall not be used for class I equipment or class 0I equipment.	EUT is ES1 and is a built-in component.	N/A
F.3.8A	Attention marking for aging deterioration of CRT television Year of manufacture, standard usage period by design according to JIS C 9921-5 and cautionary statement for possible risks of aging deterioration when used beyond the specified period shall be marked on CRT television except for industrial use CRT television.	EUT is ES1 and is a built-in component.	N/A

ATTACHMENT to TRF IEC62368_1E			
Clause	Requirement + Test	Result - Remark	Verdict
F.4	For audio equipment with terminals classified as ES3 in accordance with Table E.1, and for other equipment with terminals marked in accordance with F.3.6.1 and F.3.6.1A, the instructions shall require that the external wiring connected to these terminals shall be installed by a skilled person, or shall be connected by means of ready-made leads or cords that are constructed in a way that would prevent contact with any ES3 circuit. For class 0I equipment provided with independent main protective earthing terminal, where the cord for the protective earthing connection is not provided in the package of the equipment, if the protective earthing connection is made by instructed person or skilled person, the suitable installation instruction for the protective earthing connection shall be provided.	EUT is ES1 and is a built-in component.	N/A
G.3.2.1	The thermal link when tested as a separate component, shall comply with the requirements of JIS C 6691 or have properties equivalent to or better than that.	EUT is ES1 and is a built-in component.	N/A
G.3.4	Except for devices covered by Clause G.3.5, overcurrent protective devices used as a safeguard shall comply with the applicable JIS or IEC standard in accordance with 4.1.2 or shall have equivalent or better properties. Such a protective device shall have adequate breaking (rupturing) capacity to interrupt the maximum fault current (including short-circuit current) that can flow.	EUT is ES1 and is a built-in component.	N/A
G.4.1	This requirement does not apply to connectors covered in Clauses G.4.2 and G.4.2A.	EUT is ES1 and is a built-in component.	N/A

ATTACHMENT to TRF IEC62368_1E			
Clause	Requirement + Test	Result - Remark	Verdict
G.4.2	Mains connectors, mains plugs and socket-outlets shall comply with JIS C 8283 series, JIS C 8285, IEC 60309 series, JIS C 8282 series, JIS C 8300, JIS C 8303, or have equivalent or better properties. A power supply cord set provided with appliance connector that can fit appliance inlet complying with JIS C 8283-1 shall comply with JIS C 8286. Construction shall prevent mechanical stress not to transmit to the soldering part of appliance inlet terminal. When an equipment is rated not more than 125 V and all of the following are met, Type C14 and C18 appliance inlet complying with JIS C 8283-3 can be considered as rated 15 A. – The temperature of appliance inlet does not exceed the value specified in JIS C 8283-1 under the most unfavourable normal operating condition as specified in Clause B.2.1. – "Use only designated cord set attached in this equipment" or equivalent text is described in the operating instruction. If the cord set is not provided in the package of the equipment, suitable information regarding to the cord set is described in the operating instruction.	EUT is ES1 and is a built-in component.	N/A
G.4.2A	Mains socket-outlet and interconnection coupler provided with the class II, class I and class 0I equipment respectively	EUT is ES1 and is a built-in component.	N/A
G.7.1	A mains supply cord need not include the protective earthing conductor for class 0I equipment provided with independent protective earthing conductor.	EUT is ES1 and is a built-in component.	N/A
G.7.2 Table G.7	Cross-sectional area of equipment rated up to and including 3 A shall be 0.75 mm^2.	EUT is ES1 and is a built-in component.	N/A
G.7.6.1 Table G.9	The cross-sectional area of mains cords according to JIS C 3010 may comply with relevant Japanese wiring regulation. For cables other than those complying with JIS C 3662 series or JIS C 3663 series, the terminals shall be suitable for the size of the intended cables.	EUT is ES1 and is a built-in component.	N/A

Photographs and Illustrations – ATTACHMENT 2

Figure 1 – TPS2051BEVM (Top) and TPS2052BEVM (Bottom)

Photographs and Illustrations – ATTACHMENT 2

Figure 2 – TPS20xxB EVM Data Sheet (cont.)

Ordering & quality | Technical documentation | Design & development | Support & training

TEXAS INSTRUMENTS

TPS2041B, TPS2042B, TPS2043B, TPS2044B
TPS2051B, TPS2052B, TPS2053B, TPS2054B
SLVS514N – JUNE 2010 – REVISED JULY 2023

TPS20xxB Current-Limited, Power-Distribution Switches

1 Features

- 70-mΩ High-Side MOSFET
- 500-mA Continuous Current
- Thermal and Short-Circuit Protection
- Accurate Current Limit (0.75 A Minimum, 1.25 A Maximum)
- Operating Range: 2.7 V to 5.5 V
- 0.6-ms Typical Rise Time
- Undervoltage Lockout
- Deglitched Fault Report ($\overline{OC}$)
- No $\overline{OC}$ Glitch During Power Up
- Maximum Standby Supply Current: 1-µA (Single, Dual) or 2-µA (Triple, Quad)
- Ambient Temperature Range: –40°C to 85°C
- UL Recognized, File Number E169910
- Additional UL Recognition for TPS2042B and TPS2052B for Ganged Configuration

2 Applications

- Heavy Capacitive Loads
- Short-Circuit Protections

3 Description

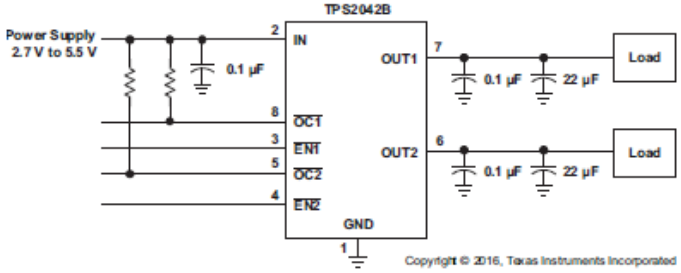
The TPS20xxB power-distribution switches are intended for applications where heavy capacitive loads and short circuits are likely to be encountered. These devices incorporates 70-mΩ N-channel MOSFET power switches for power-distribution systems that require multiple power switches in a single package. Each switch is controlled by a logic enable input. Gate drive is provided by an internal charge pump designed to control the power-switch rise times and fall times to minimize current surges during switching. The charge pump requires no external components and allows operation from supplies as low as 2.7 V.

When the output load exceeds the current-limit threshold or a short is present, the device limits the output current to a safe level by switching into a constant-current mode, pulling the overcurrent ($\overline{OCx}$) logic output low. When continuous heavy overloads and short circuits increase the power dissipation in the switch, causing the junction temperature to rise, a thermal protection circuit shuts off the switch to prevent damage. Recovery from a thermal shutdown is automatic once the device has cooled sufficiently. Internal circuitry ensures that the switch remains off until valid input voltage is present. This power-distribution switch is designed to set current limit at 1 A (typical).

Device Information

PART NUMBER	PACKAGE(1)	BODY SIZE (NOM)
TPS20xxB	SOIC (8)	4.90 mm × 3.91 mm
	SOIC (16)	9.90 mm × 3.91 mm
	SOT-23 (5)	2.90 mm × 1.60 mm
	HVSSOP (8)	3.00 mm × 3.00 mm
	SON (8)	3.00 mm × 3.00 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.



Typical Application Schematic

An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.

Photographs and Illustrations – ATTACHMENT 2

Figure 3 – TPS20xxB EVM Data Sheet (cont.)

Table of Contents

4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision M (June 2016) to Revision N (July 2023)	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document	1
• Update TPS2051BDBV and TPS2052BD electrical characteristics, including overcurrent trip threshold, high-level output supply current and undervoltage lockout	7
• Updated TPS2051BDBV and TPS2052BD Typical Characteristics	14
• Moved overcurrent description from Application and Implementation section to Detailed Description section	22
• Added TPS2051BDBV and TPS2052BD overcurrent description	22

Changes from Revision L (June 2011) to Revision M (June 2016)	Page
• Added *ESD Ratings* table, *Feature Description* section, *Device Functional Modes*, *Application and Implementation* section, *Power Supply Recommendations* section, *Layout* section, *Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section	6

Photographs and Illustrations – ATTACHMENT 2

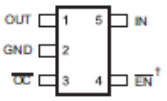
Figure 4 – TPS20xxB EVM Data Sheet (cont.)

5 General Switch Catalog

GENERAL SWITCH CATALOG

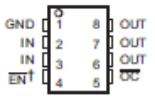
33 mΩ, Single	80 mΩ, Single	80 mΩ, Dual	80 mΩ, Dual	80 mΩ, Triple	80 mΩ, Quad	80 mΩ, Quad
TPS201xA 0.2 A to 2 A TPS202x 0.2 A to 2 A TPS203x 0.2 A to 2 A	TPS2014 600 mA TPS2015 1 A TPS2041B 500 mA TPS2051B 500 mA TPS2045A 250 mA TPS2049 100 mA TPS2055A 250 mA TPS2061 1 A TPS2065 1 A TPS2068 1.5 A TPS2069 1.5 A	TPS2042B 500 mA TPS2052B 500 mA TPS2046B 250 mA TPS2056 250 mA TPS2062 1 A TPS2066 1 A TPS2060 1.5 A TPS2064 1.5 A	TPS2080 500 mA TPS2081 500 mA TPS2082 500 mA TPS2090 250 mA TPS2091 250 mA TPS2092 250 mA	TPS2043B 500 mA TPS2053B 500 mA TPS2047B 250 mA TPS2057A 250 mA TPS2063 1 A TPS2067 1 A	TPS2044B 500 mA TPS2054B 500 mA TPS2048A 250 mA TPS2058 250 mA	TPS2065 500 mA TPS2066 500 mA TPS2067 500 mA TPS2095 250 mA TPS2096 250 mA TPS2097 250 mA

6 Pin Configuration and Functions



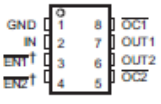
† All enable outputs are active high for the TPS205xB series.

Figure 6-1. TPS2041B and TPS2051B: DBV Package 5-Pin SOT-23 Top View



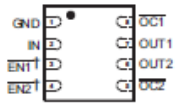
† All enable outputs are active high for the TPS205xB series.

Figure 6-2. TPS2041B and TPS2051B: D and DGN Packages 8-Pin SOIC and HVSSOP Top View



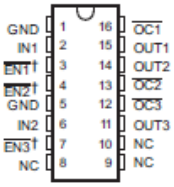
† All enable outputs are active high for the TPS205xB series.

Figure 6-3. TPS2042B and TPS2052B: D and DGN Packages 8-Pin SOIC and HVSSOP Top View



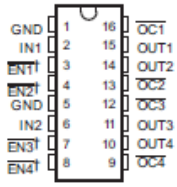
† All enable outputs are active high for the TPS205xB series.

Figure 6-4. TPS2042B and TPS2052B: DRB Package 8-Pin SON Top View



† All enable outputs are active high for the TPS205xB series.

Figure 6-5. TPS2043B and TPS2053B: D Package 16-Pin SOIC Top View



† All enable outputs are active high for the TPS205xB series.

Figure 6-6. TPS2044B and TPS2054B: D Package 16-Pin SOIC Top View

Table 6-1. Pin Functions (TPS2041B and TPS2051B)

NAME	PIN				I/O	DESCRIPTION
	TPS2041B	TPS2051B	TPS2041B	TPS2051B		
	SOIC AND DGN		SOT-23			
$\overline{EN}$	4	—	4	—	I	Enable input, logic low turns on power switch
EN	—	4	—	4	I	Enable input, logic high turns on power switch
GND	1	1	2	2	—	Ground
IN	2, 3	2, 3	5	5	I	Input voltage
$\overline{OC}$	5	5	3	3	O	Overcurrent open-drain output, active-low
OUT	6, 7, 8	6, 7, 8	1	1	O	Power-switch output

Figure 5 – TPS20xxB EVM Data Sheet (cont.)

Table 6-2. Pin Functions (TPS2042B and TPS2052B)

NAME	PIN		I/O	DESCRIPTION
	TPS2042B	TPS2052B		
	SOIC, HVSSOP, SON			
$\overline{EN1}$	3	—	I	Enable input, logic low turns on power switch IN-OUT1
$\overline{EN2}$	4	—	I	Enable input, logic low turns on power switch IN-OUT2
EN1	—	3	I	Enable input, logic high turns on power switch IN-OUT1
EN2	—	4	I	Enable input, logic high turns on power switch IN-OUT2
GND	1	1	—	Ground
IN	2	2	I	Input voltage
$\overline{OC1}$	8	8	O	Overcurrent, open-drain output, active low, IN-OUT1
$\overline{OC2}$	5	5	O	Overcurrent, open-drain output, active low, IN-OUT2
OUT1	7	7	O	Power-switch output, IN-OUT1
OUT2	6	6	O	Power-switch output, IN-OUT2
PowerPAD ™	—	—	—	Internally connected to GND; used to heat-sink the part to the circuit board traces. Should be connected to GND pin.

Table 6-3. Pin Functions (TPS2043B and TPS2053B)

NAME	PIN		I/O	DESCRIPTION
	TPS2043B	TPS2053B		
	SOIC	SOIC		
$\overline{EN1}$	3	—	I	Enable input, logic low turns on power switch IN1-OUT1
$\overline{EN2}$	4	—	I	Enable input, logic low turns on power switch IN1-OUT2
$\overline{EN3}$	7	—	I	Enable input, logic low turns on power switch IN2-OUT3
EN1	—	3	I	Enable input, logic high turns on power switch IN1-OUT1
EN2	—	4	I	Enable input, logic high turns on power switch IN1-OUT2
EN3	—	7	I	Enable input, logic high turns on power switch IN2-OUT3
GND	1, 5	1, 5	—	Ground
IN1	2	2	I	Input voltage for OUT1 and OUT2
IN2	6	6	I	Input voltage for OUT3
NC	8, 9, 10	8, 9, 10	—	No connection
$\overline{OC1}$	16	16	O	Overcurrent, open-drain output, active low, IN1-OUT1
$\overline{OC2}$	13	13	O	Overcurrent, open-drain output, active low, IN1-OUT2
$\overline{OC3}$	12	12	O	Overcurrent, open-drain output, active low, IN2-OUT3
OUT1	15	15	O	Power-switch output, IN1-OUT1
OUT2	14	14	O	Power-switch output, IN1-OUT2
OUT3	11	11	O	Power-switch output, IN2-OUT3

Table 6-4. Pin Functions (TPS2044B and TPS2054B)

NAME	PIN		I/O	DESCRIPTION
	TPS2044B	TPS2054B		
	SOIC	SOIC		
$\overline{EN1}$	3	—	I	Enable input, logic low turns on power switch IN1-OUT1
$\overline{EN2}$	4	—	I	Enable input, logic low turns on power switch IN1-OUT2
$\overline{EN3}$	7	—	I	Enable input, logic low turns on power switch IN2-OUT3
$\overline{EN4}$	8	—	I	Enable input, logic low turns on power switch IN2-OUT4
EN1	—	3	I	Enable input, logic high turns on power switch IN1-OUT1
EN2	—	4	I	Enable input, logic high turns on power switch IN1-OUT2

Figure 5 – TPS20xxB EVM Data Sheet (cont.)

Table 6-4. Pin Functions (TPS2044B and TPS2054B) (continued)

PIN			I/O	DESCRIPTION
NAME	TPS2044B	TPS2054B		
	SOIC	SOIC		
EN3	—	7	I	Enable input, logic high turns on power switch IN2-OUT3
EN4	—	8	I	Enable input, logic high turns on power switch IN2-OUT4
GND	1, 5	1, 5	—	Ground
IN1	2	2	I	Input voltage for OUT1 and OUT2
IN2	6	6	I	Input voltage for OUT3 and OUT4
$\overline{OC1}$	16	16	O	Overcurrent, open-drain output, active low, IN1-OUT1
$\overline{OC2}$	13	13	O	Overcurrent, open-drain output, active low, IN1-OUT2
$\overline{OC3}$	12	12	O	Overcurrent, open-drain output, active low, IN2-OUT3
$\overline{OC4}$	9	9	O	Overcurrent, open-drain output, active low, IN2-OUT4
OUT1	15	15	O	Power-switch output, IN1-OUT1
OUT2	14	14	O	Power-switch output, IN1-OUT2
OUT3	11	11	O	Power-switch output, IN2-OUT3
OUT4	10	10	O	Power-switch output, IN2-OUT4

Figure 5 – TPS20xxB EVM Data Sheet (cont.)

7 Specifications

7.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) (1)

		MIN	MAX	UNIT
$V_{I(IN)}$, $V_{I(INx)}$	Input voltage (2)	–0.3	6	V
$V_{O(OUT)}$, $V_{O(OUTx)}$ (2)	Output voltage	–0.3	6	V
$V_{I(\overline{EN})}$, $V_{I(\overline{ENx})}$, $V_{I(EN)}$, $V_{I(ENx)}$	Input voltage	–0.3	6	V
$V_{I(\overline{OC})}$, $V_{I(\overline{OCx})}$	Voltage range	–0.3	6	V
$I_{O(OUT)}$, $I_{O(OUTx)}$	Continuous output current	Internally limited		
	Continuous total power dissipation	See *Dissipation Ratings*		
T_J	Operating virtual junction temperature	–40	125	°C
T_{stg}	Storage temperature	–65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) All voltages are with respect to GND.

7.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins(1)	±2000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins(2)	±500	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

7.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

		MIN	NOM	MAX	UNIT
$V_{I(IN)}$, $V_{I(INx)}$	Input voltage	2.7		5.5	V
$V_{I(\overline{EN})}$, $V_{I(\overline{ENx})}$, $V_{I(EN)}$, $V_{I(ENx)}$	Input voltage	0		5.5	V
$I_{O(OUT)}$, $I_{O(OUTx)}$	Continuous output current	0		500	mA
T_J	Operating virtual junction temperature	–40		125	°C

7.4 Thermal Information

THERMAL METRIC(1)		TPS2042xx and TPS2053xx					UNIT
		D (SOIC)		DBV (SOT-23)	DGN (HVSSOP)	DRB (SON)	
		8 PINS	16 PINS	5 PINS	8 PINS	8 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	119.3	81.6	208.6	53.6	47.5	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	67.6	42.7	122.9	58.7	53	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	59.6	39.1	37.8	35.5	14.2	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	20.3	10.4	14.6	2.7	1.2	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	59.1	38.8	36.9	35.3	14.2	°C/W

Photographs and Illustrations – ATTACHMENT 2

Figure 6 – TPS20xxB EVM Data Sheet (cont.)

7.4 Thermal Information (continued)

THERMAL METRIC(1)		TPS2042xx and TPS2053xx					UNIT
		D (SOIC)		DBV (SOT-23)	DGN (HVSSOP)	DRB (SON)	
		8 PINS	16 PINS	5 PINS	8 PINS	8 PINS	
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	6.7	7.3	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report.

7.5 Electrical Characteristics

over recommended operating junction temperature range, $V_{I(IN)}$ = 5.5 V, I_O = 0.5 A, $V_{I(ENx)}$ = 0 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS(1)			MIN	TYP	MAX	UNIT
POWER SWITCH								
$r_{DS(on)}$	Static drain-source on-state resistance, 5-V operation and 3.3-V operation	$V_{I(IN)}$ = 5 V or 3.3 V, I_O = 0.5 A, –40°C ≤ T_J ≤ 125°C		D and DGN packages		70	135	mΩ
				DBV package only		95	140	
	Static drain-source on-state resistance, 2.7-V operation	$V_{I(IN)}$ = 2.7 V, I_O = 0.5 A, –40°C ≤ T_J ≤ 125°C		D and DGN packages		75	150	mΩ
	Static drain-source on-state resistance, 5-V operation	$V_{I(IN)}$ = 5 V, I_O = 1 A, OUT1 and OUT2 connected, 0°C ≤ T_J ≤ 70°C		DGN package, TPS2042B/52B			49	mΩ
t_r	Rise time, output	$V_{I(IN)}$ = 5.5 V	C_L = 1 µF, R_L = 10 Ω	T_J = 25°C		0.6	1.5	ms
		$V_{I(IN)}$ = 2.7 V				0.4	1	
t_f	Fall time, output	$V_{I(IN)}$ = 5.5 V			0.05		0.5	
		$V_{I(IN)}$ = 2.7 V			0.05		0.5	
ENABLE INPUT $\overline{EN}$ AND $\overline{ENx}$								
V_{IH}	High-level input voltage	2.7 V ≤ $V_{I(IN)}$ ≤ 5.5 V			2			V
V_{IL}	Low-level input voltage	2.7 V ≤ $V_{I(IN)}$ ≤ 5.5 V					0.8	V
I_I	Input current	$V_{I(\overline{ENx})}$ = 0 V or 5.5 V			–0.5		0.5	µA
t_{on}	Turnon time	C_L = 100 µF, R_L = 10 Ω					3	ms
t_{off}	Turnoff time	C_L = 100 µF, R_L = 10 Ω					10	ms
CURRENT LIMIT								
I_{OS}	Short-circuit output current	$V_{I(IN)}$ = 5 V, OUT connected to GND, device enabled into short-circuit		T_J = 25°C	0.75	1	1.25	A
				–40°C ≤ T_J ≤ 125°C	0.7	1	1.3	
		$V_{I(IN)}$ = 5 V, OUT1 and OUT2 connected to GND, device enabled into short-circuit, measure at IN		0°C ≤ T_J ≤ 70°C TPS2042B/52B	1.5			
I_{OC} (2)	Overcurrent trip threshold	V_{IN} = 5 V, 100 A/s	TPS2041B TPS2051B (D and DGN packages only)		I_{OS}	1.5	1.9	A
			TPS2042B TPS2052B (DGN package only)		I_{OS}	1.55	2	
SUPPLY CURRENT (TPS2041B, TPS2051B)								
Supply current, low-level output		No load on OUT, $V_{I(\overline{ENx})}$ = 5.5 V, or $V_{I(ENx)}$ = 0 V		T_J = 25°C		0.5	1	µA
				-40°°C ≤ T_J ≤ 125°C		0.5	5	

Photographs and Illustrations – ATTACHMENT 2

Figure 7 – TPS20xxB EVM Data Sheet (cont.)

7.5 Electrical Characteristics (continued)

over recommended operating junction temperature range, $V_{I(IN)}$ = 5.5 V, I_O = 0.5 A, $V_{I/(ENx)}$ = 0 V (unless otherwise noted)

PARAMETER	TEST CONDITIONS[1]			MIN	TYP	MAX	UNIT
Supply current, high-level output	No load on OUT, $V_{I(\overline{ENx})}$ = 0 V, or $V_{I(ENx)}$ = 5.5 V	TPS2041B TPS2051B (D and DGN packages only)	T_J = 25°C		43	60	µA
			–40°C ≤ T_J ≤ 125°C		43	70	
		TPS2051BDBV	T_J = 25°C		75	95	
			–40°C ≤ T_J ≤ 125°C		75	95	
Leakage current	OUT connected to ground, $V_{I(\overline{ENx})}$ = 5.5 V, or $V_{I(ENx)}$ = 0 V		–40°C ≤ T_J ≤ 125°C		1		µA
Reverse leakage current	$V_{I(OUTx)}$ = 5.5 V, IN = ground		T_J = 25°C		0		µA
SUPPLY CURRENT (TPS2042B, TPS2052B)							
Supply current, low-level output	No load on OUT, $V_{I(\overline{ENx})}$ = 5.5 V		T_J = 25°C		0.5	1	µA
			–40°C ≤ T_J ≤ 125°C		0.5	5	
Supply current, high-level output	No load on OUT, $V_{I(\overline{ENx})}$ = 0 V	TPS2042B TPS2052B (DGN package only)	T_J = 25°C		50	70	µA
			–40°C ≤ T_J ≤ 125°C		50	90	
		TPS2052BD	T_J = 25°C		95	120	uA
			–40°C ≤ T_J ≤ 125°C		95	120	
Leakage current	OUT connected to ground, $V_{I(\overline{ENx})}$ = 5.5 V		–40°C ≤ T_J ≤ 125°C		1		µA
Reverse leakage current	$V_{I(OUTx)}$ = 5.5 V, IN = ground		T_J = 25°C		0.2		µA
SUPPLY CURRENT (TPS2043B, TPS2053B)							
Supply current, low-level output	No load on OUT, $V_{I(ENx)}$ = 0 V		T_J = 25°C		0.5	2	µA
			–40°C ≤ T_J ≤ 125°C		0.5	10	
Supply current, high-level output	No load on OUT, $V_{I(ENx)}$ = 5.5 V		T_J = 25°C		65	90	µA
			–40°C ≤ T_J ≤ 125°C		65	110	
Leakage current	OUT connected to ground, $V_{I(ENx)}$ = 0 V		–40°C≤ T_J ≤ 125°C		1		µA
Reverse leakage current	$V_{I(OUTx)}$ = 5.5 V, INx = ground		T_J = 25°C		0.2		µA
SUPPLY CURRENT (TPS2044B, TPS2054B)							
Supply current, low-level output	No load on OUT, $V_{I(\overline{ENx})}$ = 5.5 V, or $V_{I(ENx)}$ = 0 V		T_J = 25°C		0.5	2	µA
			–40°C ≤ T_J ≤ 125°C		0.5	10	
Supply current, high-level output	No load on OUT, $V_{I(\overline{ENx})}$ = 0 V, or $V_{I(ENx)}$ = 5.5 V		T_J = 25°C		75	110	µA
			–40°C ≤ T_J ≤ 125°C		75	140	
Leakage current	OUT connected to ground, $V_{I(\overline{ENx})}$ = 5.5 V, or $V_{I(ENx)}$ = 0 V		–40°C≤ T_J ≤ 125°C		1		µA
Reverse leakage current	$V_{I(OUTx)}$ = 5.5 V, INx = ground		T_J = 25°C		0.2		µA
UNDERVOLTAGE LOCKOUT (All Devices excluding TPS2051BDBV and TPS2052BD)							
Low-level input voltage, IN, INx				2		2.5	V
Hysteresis, IN, INx	T_J = 25°C				75		mV
UNDERVOLTAGE LOCKOUT (TPS2051BDBV and TPS2052BD)							
Low-level input voltage, IN, INx				2		2.6	V
Hysteresis, IN, INx	T_J = 25°C				75		mV
OVERCURRENT $\overline{OC}$ and $\overline{OCx}$							
Output low voltage, $V_{OL(\overline{OCx})}$	$I_{O(\overline{OCx})}$ = 5 mA					0.4	V
Off-state current	$V_{O(\overline{OCx})}$ = 5 V or 3.3 V					1	µA
$\overline{OC}$ deglitch	$\overline{OCx}$ assertion or deassertion			4	8	15	ms
THERMAL SHUTDOWN[3]							
Thermal shutdown threshold				135			°C

Figure 8 – TPS20xxB EVM Data Sheet (cont.)

7.5 Electrical Characteristics (continued)

over recommended operating junction temperature range, $V_{I(IN)}$ = 5.5 V, I_O = 0.5 A, $V_{I/ENx)}$ = 0 V (unless otherwise noted)

PARAMETER	TEST CONDITIONS(1)	MIN	TYP	MAX	UNIT
Recovery from thermal shutdown		125			°C
Hysteresis			10		°C

(1) Pulse-testing techniques maintain junction temperature close to ambient temperature; thermal effects must be taken into account separately.
(2) TPS2051BDBV and TPS2052BD don't have overcurrent trip threshold. Current will be limited to I_{OS} under different test conditon. Check Section 9.3.7 for more details.
(3) The thermal shutdown only reacts under overcurrent conditions.

7.6 Dissipation Ratings

PACKAGE	THERMAL RESISTANCE, θ_{JA}	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE T_A = 25°C	T_A = 70°C POWER RATING	T_A = 85°C POWER RATING
DGN-8		1712.3 mW	17.123 mW/°C	941.78 mW	684.93 mW
D-8		585.82 mW	5.8582 mW/°C	322.20 mW	234.32 mW
D-16		898.47 mW	8.9847 mW/°C	494.15 mW	359.38 mW
DBV-5		285 mW	2.85 mW/°C	155 mW	114 mW
DRB-8 (Low-K)(1)	270 °C/W	370 mW	3.71 mW/°C	203 mW	148 mW
DRB-8 (High-K)(2)	60 °C/W	1600 mW	16.67 mW/°C	916 mW	866 mW

(1) Soldered PowerPAD on a standard 2-layer PCB without vias for thermal pad. See TI application note SLMA002 for further details.
(2) Soldered PowerPAD on a standard 4-layer PCB with vias for thermal pad. See TI application note SLMA002 for further details.

7.7 Typical Characteristics (All Devices Excluding TPS2051BDBV and TPS2052BD)

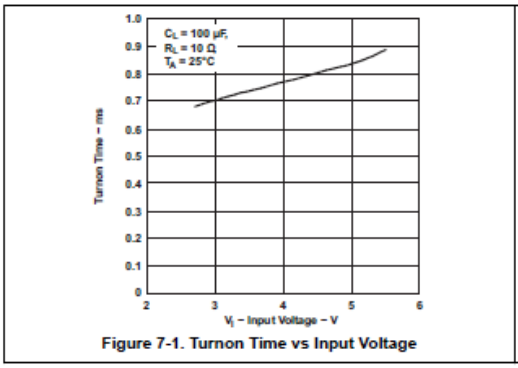


Figure 7-1. Turnon Time vs Input Voltage

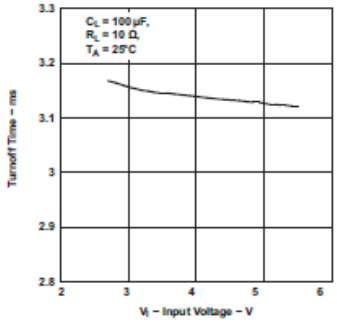


Figure 7-2. Turnoff Time vs Input Voltage

Figure 9 – TPS20xxE EVM Data Sheet

EVM User's Guide: TPS2068E TPS2069E TPS2000E TPS2001E

Single-Channel, Power-Distribution Switch Evaluation Module

TEXAS INSTRUMENTS

Description

TPS2001EEVM-247 evaluation module (EVM) is a simple, easy to use, maximum 2A operating current power switch module with enable switch and fault indication. The default mounted device is TPS2001E, and the EVM is also for TPS2068E, TPS2069E, TPS2000E to evaluate. The EVM operates from 2.7V to 5.5V and supports maximum 2A operating current.

Features

- 2.7 V to 5.5 V input and output voltage range
- 2 A maximum operating current with current limit
- Multiple package support for SOT23-5, MSOP-8 with thermal pad and MSOP-8 without thermal pad

Applications

- PC & notebooks
- TV
- Set-top box and streaming media
- Short-circuit protection

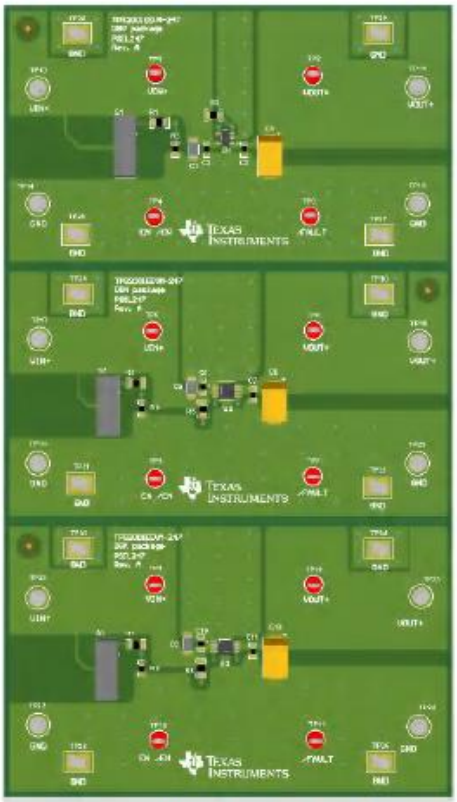


Figure 1-1. TPS2001EEVM-247 Hardware Image (Top View)

Figure 10 – TPS20xxE EVM Data Sheet (cont.)

1 Evaluation Module Overview

This user's guide describes the TPS2001EEVM-247 evaluation modules (EVM). The default mounted device is TPS2001E, and the EVM is also for TPS2068E, TPS2069E, TPS2000E as well. This guide contains the EVM schematics, bill of materials, assembly drawings, and top and bottom board layouts.

1.1 Introduction

The TPS2001EEVM-247 is the evaluation module (EVM) for the Texas Instruments family of single-channel, current-limited, power distribution switches. The EVM operates over a 2.7 V to 5.5 V range and provides a continuous output current of up to 2 A (see Table 3-1). Test points provide convenient access to all critical node voltages.

The TPS2001EEVM-247 accepts an SOT23-5 packaged switch, and MSOP-8 packaged switches with or without a thermal pad. These switches have an enable input, fault status output, and overtemperature shutdown.

1.2 Kit Contents

Table 1-1. TPS2001EEVM-247 Kit Contents

Item	Description	Quantity
TPS2001EEVM-247	PCB	1

1.3 Device Information

The EVM is for TPS2001EDBV(SOT23-5), TPS2001EDGN(MSOP-8 with thermal pad), and TPS2001EDGK(MSOP-8 without thermal pad). And in view of the pin-to-pin device TPS2068E, TPS2069E, TPS2000E, the EVM is also available for these devices. The devices are in the USB power switch family for 1.5A or 2.0A operation current.The device family also has the current limit and thermal shutdown feature to help protect the main power path.

1.4 Specification

The TPS2001EEVM-247 has the following features:

- Multiple package support
- Easy to use and flexible evaluation

The EVM consists of three parts based on different packages (SOT23-5, MSOP-8 with thermal pad, MSOP-8 without thermal pad). The three parts can be separated from each other to do the evaluation for the different chip packages, respectively. For each package, the device has different enable logic (high enable or low enable). Thus, a switch is used to control the logic of enable. Based on this design, there are 12 devices (TPS2068E, TPS2069E, TPS2000E and TPS2001E; each part number has three different packages) that can be evaluated with this EVM.

2 EVM Setup

2.1 Recommended Test Equipment

The following test equipment is recommended:

- Two-channel storage oscilloscope
- Current probe
- Voltage probe
- 5 V at 5-A power supply
- Volt-ohm meter
- A passive or active load

2.2 Measuring Current Limit

The user is advised to read the applicable data sheet (SLVSGZ7) before using the EVM.

Figure 2-1 shows the EVM test setup for measuring current limit. The power distribution switch is enabled into a short circuit for this measurement.

Photographs and Illustrations – ATTACHMENT 2

Figure 11 – TPS20xxE EVM Data Sheet (cont.)

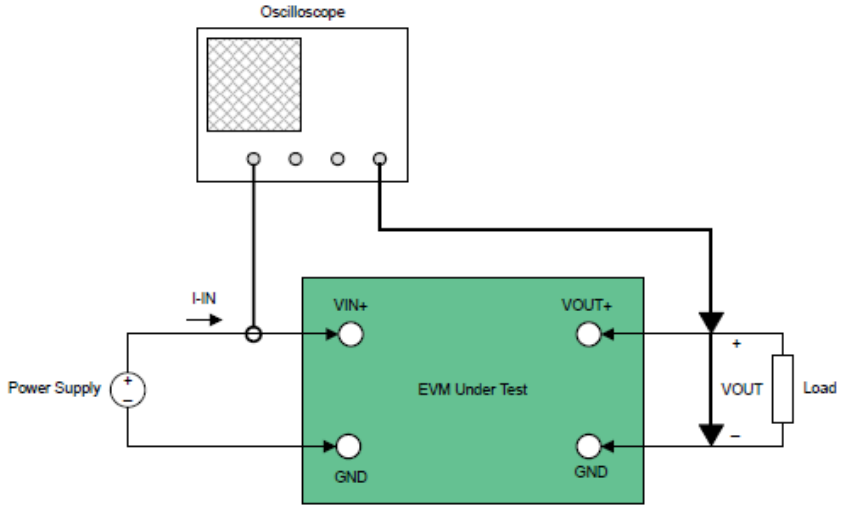


Figure 2-1. EVM Setup For Measuring Current Limit

Figure 12 – TPS20xxE EVM Data Sheet (cont.)

3 Hardware Design Files

3.1 EVM Options

Table 3-1. TPS2001EEVM-247 Options

Device	Continuous Output Current (A)	Enable Method	Package
TPS2068EDBV	1.5	Low enable	SOT23-5
TPS2068EDBN			MSOP-8, thermal pad
TPS2068EDGK			MSOP-8, no thermal pad
TPS2069EDBV		High enable	SOT23-5
TPS2069EDGN			MSOP-8, thermal pad
TPS2069EDGK			MSOP-8, no thermal pad
TPS2000EDBV	2	Low enable	SOT23-5
TPS2000EDGN			MSOP-8, thermal pad
TPS2000EDGK			MSOP-8, no thermal pad
TPS2001EDBV		High enable	SOT23-5
TPS2001EDGN			MSOP-8, thermal pad
TPS2001EDGK			MSOP-8, no thermal pad

3.2 Board Layout

This section contains three views of the TPS2001EEVM-247 evaluation boards as well as some layout considerations.

3.2.1 TPS2001EEVM-247 Board

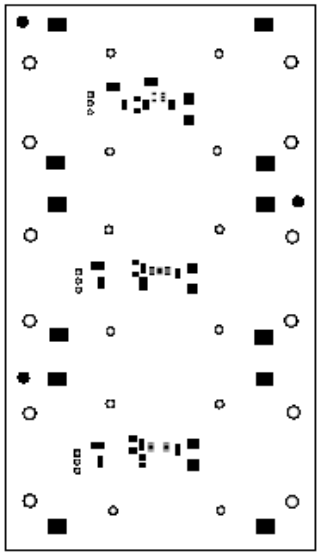


Figure 3-1. TPS2001EEVM-247 Component Placement

Figure 13 – TPS20xxE EVM Data Sheet (cont.)

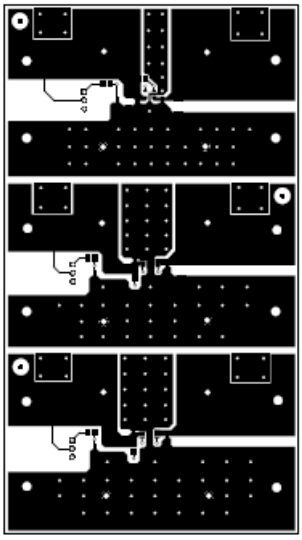


Figure 3-2. TPS2001EEVM-247 Top-Side Layout

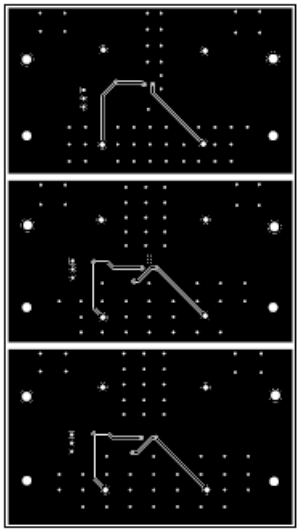


Figure 3-3. TPS2001EEVM-247 Bottom-Side Layout

3.2.2 Layout Considerations

The IN and OUT pins of U1, U2 or U3 can carry significant current, so traces to these pins must be of acceptable length and width to minimize the voltage drop to the load. Locate the 0.1-µF bypass capacitors close to the IN and OUT pins of U1, U2 or U3.

Photographs and Illustrations – ATTACHMENT 2

Figure 14 – TPS20xxE EVM Data Sheet (cont.)

3.3 Schematics

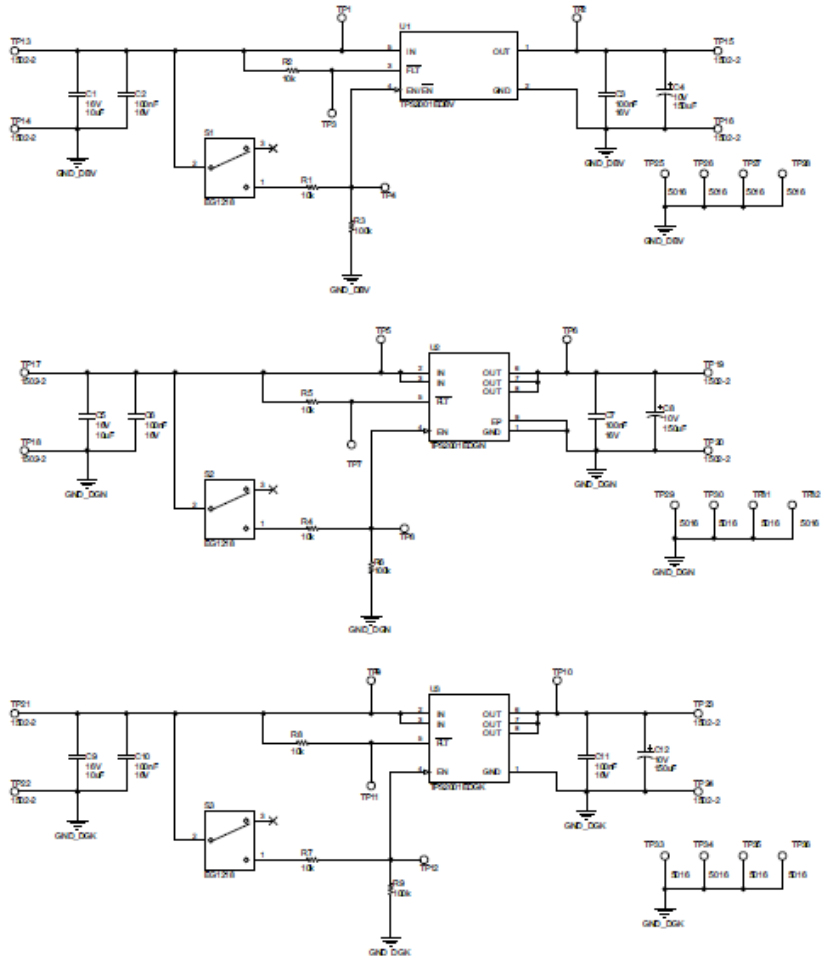


Figure 3-4. TPS2001EEVM-247 Schematic

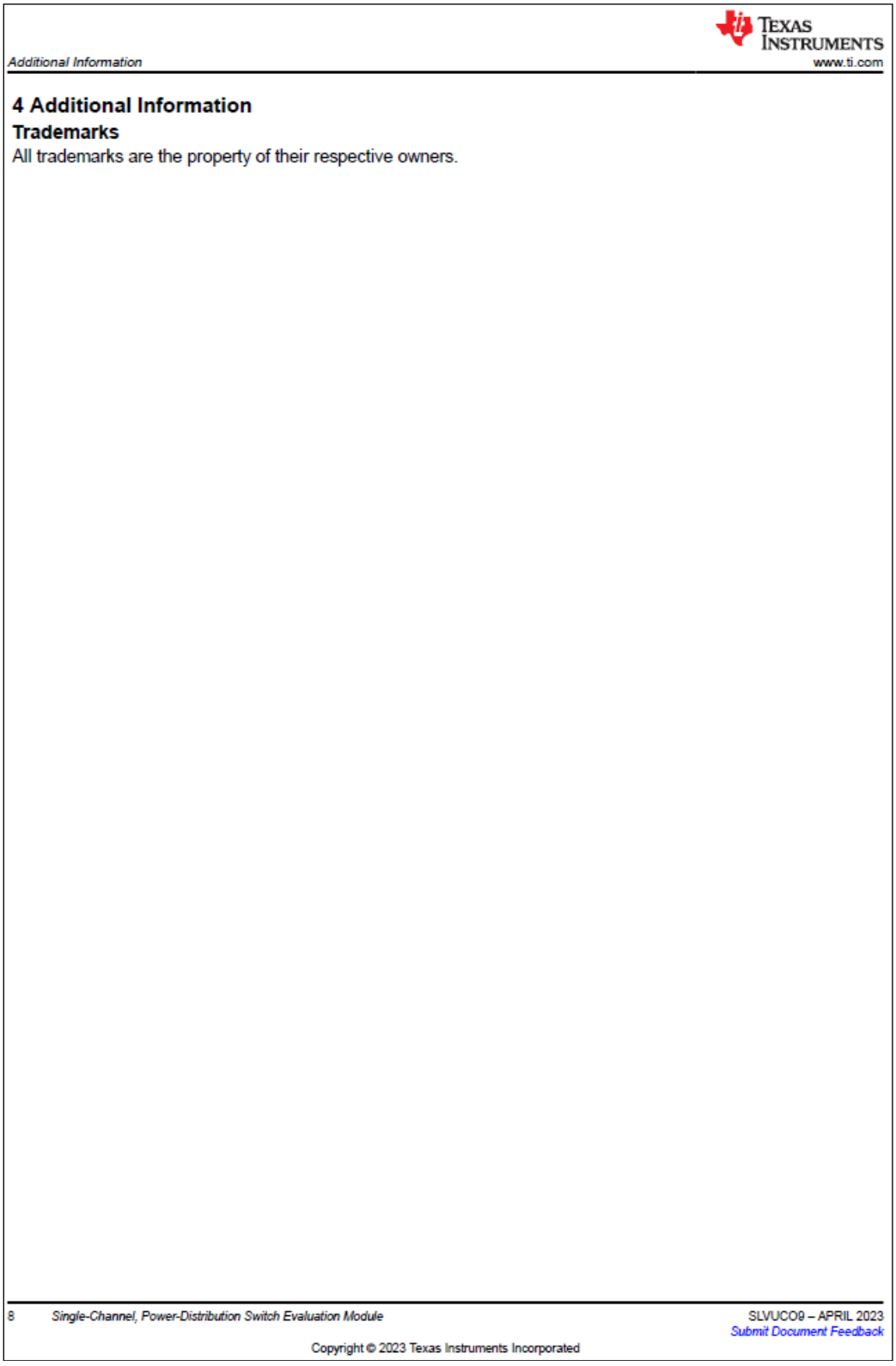
Figure 15 – TPS20xxE EVM Data Sheet (cont.)

3.4 Bill of Materials

Table 3-2. TPS2001EEVM-247 Bill of Materials

Count	RefDes	Value	Description	Size	Part Number	MFR
3	C1, C5, C9	10 µF	CAP, CERM, 10 uF, 16 V, +/- 10%, X7R, 1206	1206	GRM31CR71C106KAC7L	MuRata
6	C2, C3, C6, C7, C10, C11	0.1 µF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0603	0603	CL10B104KO8NNNC	Samsung Electro-Mechanics
3	C4, C8, C12	150 µF	CAP, TA, 150 uF, 10 V, +/- 10%, 0.1 ohm, SMD	7343-31	T495D157K010ATE100	Kemet
6	R1, R2, R4, R5, R7, R8	10k	RES, 10 k, 5%, 0.125 W, 0805	0805	CRCW080510K0JNEA	Vishay-Dale
3	R3, R6, R9	100k	RES, 100 k, 5%, 0.1 W, 0603	0603	CRCW0603100KJNEA	Vishay-Dale
3	S1, S2, S3	-	Switch, SPDT, Slide, On-On, 2 Pos, TH	4x11.6mm	EG1218	E-Switch
12	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12	-	Test Point, Compact, Red, TH	Red Compact Testpoint	5005	Keystone
12	TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP21, TP22, TP23, TP24	-	Terminal, Turret, TH, Double	Keystone1502-2	1502-2	Keystone
12	TP25, TP26, TP27, TP28, TP29, TP30, TP31, TP32, TP33, TP34, TP35, TP36	-	Test Point, Compact, SMT	Testpoint_Keystone_Compact	5016	Keystone
1	U1	-	Current Limited, Power-Distribution Switch	SOT23-5	TPS2001EDBV	Texas Instruments
1	U2	-	Current Limited, Power-Distribution Switch	HVSSOP8	TPS2001EDGN	Texas Instruments
1	U3	-	Current Limited, Power-Distribution Switch	VSSOP8	TPS2001EDGK	Texas Instruments

Figure 16 – TPS20xxE EVM Data Sheet (cont.)



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4 Additional Information

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8 Single-Channel, Power-Distribution Switch Evaluation Module

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Figure 17 – TPS20xxE EVM Data Sheet (cont.)

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