




TEST REPORT IEC 60950-1 Information technology equipment – Safety – Part 1: General requirements	
Report Number	306525
Date of issue	2016-04-26
Total number of pages	Refer to page 4
Applicant's name	Aplustek Integrated Circuits Corp.
Address	7F, NO11, Park Ave.2, Hsinchu Science Based Industrial Park, Hsinchu City, 30075, Taiwan
Test specification:	
Standard	IEC 60950-1:2005 (Second Edition) + Am 1:2009 + Am 2:2013 with CTL Decision, DSH 1080
Test procedure	CB Scheme
Non-standard test method	N/A
Test Report Form No.	IEC60950_1F
Test Report Form(s) Originator	SGS Fimko Ltd
Master TRF	Dated 2014-02
Copyright © 2014 Worldwide System for Conformity Testing and Certification of Electrotechnical Equipment and Components (IECEE), Geneva, Switzerland. All rights reserved. This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. 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	ICX
Trade Mark	
Manufacturer	Same as applicant.
Model/Type reference	AT6002 series, AT1688 series; AT6001 series
Ratings	230V AC (Tested for 85~265V AC) 50/60 Hz (Tested for 47~63Hz)

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	Nemko Shanghai Ltd. Shenzhen Branch
Testing location/ address		Unit C & D, Floor 10, Tower 2, Kefa Road #8 Hi-Technology Park Nanshan District 518057 Shenzhen CHINA
<input type="checkbox"/>	Associated CB Testing Laboratory:	
Testing location/ address		
Tested by (name, function, signature)..... :		Ada Yan (Project Handler) <i>Ada Yan</i>
Approved by (name, function, signature)... :		Jane Sun (Verifier) <i>Jane Sun</i>
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address		
Tested by (name, function, signature)..... :		
Approved by (name, function, signature)... :		
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature)... :		
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	
Testing location/ address		
Tested by (name, function, signature)..... :		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature)... :		
Supervised by (name, function, signature) :		

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

1. Main Test report (53 pages)
2. Photos (4 pages)
3. European Group differences and National differences (19 pages)
4. CTL Decision, DSH 1080 (2 pages)
5. Specification for model AT6002 series (9 pages)
6. Specification for model AT1688 / AT6001 series (7 pages)
7. Schematics of demo board used during testing (2 pages)

Summary of testing:

This report covers only tests applicable for IC including capacitor discharge function (ICX). Requirements for such components are covered by CTL Decision, DSH 1080, refer attachment.

The following clauses are not applicable for such components in this report:

1.5, 1.6, 1.7 (except for 1.7.1 and 1.7.11), 2.1 (except for 2.1.1.7), 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9 (except for 2.9.2), 2.10, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 5.1, 5.2, 5.3 (except 5.3.7 and 5.3.9) and all Annexes.

However, all relevant clauses must be considered for end products using this ICX.

The following tests were performed as per DSH 1080:

- The IC is connected with below capacitor and resistor provided by manufacturer.
- Humidity treatment for 120 h at a temperature of $(40 \pm 2)^{\circ}\text{C}$ and a relative humidity of $(93 \pm 3)\%$.

Humidity treatment performed on both the AT6002 series and AT1688 series, refer also clause 2.9.2 in this report.

- 100 positive impulses and 100 negative impulses between line and neutral using a capacitor with the largest capacitance and a resistor with the smallest resistance specified by the manufacturer of the ICX; and repeated with a capacitor with the smallest capacitance and the resistor with the largest resistance. The time between any two impulses shall not be less than 1 s. The impulse shall be as specified in circuit 2 of Table N.1 (60950-1) / 1.2/50 μs in Table K.1 (60065), with U_c equal to the transient voltage.

Impulse tests as described performed both the AT6002 series and AT1688 series. $U_c = 2500V_{\text{peak}}$. Tested in the following conditions with regard to resistance and capacitance (based on manufacturer request):

Resistor=15 – 40Kohm.

X-capacitor=3.0 μF – 0.1 μF .

- Application of an a.c. voltage that is 110% of the rated voltage for 2.5 minutes.

A voltage of 265V AC applied for 2.5 minutes on both the AT6002 series and AT1688 series. 265V AC was used based on the maximum voltage declared by the manufacturer.

- 10 000 cycles of power on and off using a capacitor with the smallest capacitance and a resistor with the largest resistance as specified by the manufacturer of ICX. The power on and off cycles time shall not be less than 1 s.

10 000 cycles of power on and off (cycle time is 1 s) performed on both the AT6002 series and AT1688 series. Tests performed at both 85V AC and 265V AC input voltage. Tested in the following conditions with regard to resistance and capacitance (based on manufacturer request):

Resistor=40Kohm.

X-capacitor=0.1 μF .

If any of the associated circuitry components other than those critical for the discharge function fails, it may be replaced with a new component.

No components critical to the discharge function did fail during the above tests.

During testing the ICX was mounted on a demo board. Refer attached photos and schematics showing the demo board and the location of the ICX. Values of the X-capacitor and discharge resistors are as per recommendation from the manufacturer.

Summary of testing (Cont.):

Compliance criteria:

Compliance is checked by evaluation of the available data or by conducting the above tests. The capacitor discharge test is conducted after above tests, ensuring the ICX or the EUT provided with the ICX continues to provide the safeguard function.

NOTE: Evaluation of available data should include information of failure of any associated circuitry components keeps the discharge modes in the on/stay mode.

After above tests the capacitor discharge tests were performed according to clause 2.1.1.7. The circuit tested continue to comply with 2.1.1.7, refer 2.1.1.7 for details. Note that compliance with 2.1.1.7 must also be checked when the ICX forms part of an end product.

In addition to above tests, evaluation of available data from the manufacturer have been made to prove that the discharge function of the ICX remains the same also during single fault conditions. Refer general product information and clause 5.3.7 for details.

Note that DSH 1080 only covers Installation Category II (2.5kV transients), and end products using the ICX covered by this report must follow the same Installation Category.

Tests performed (name of test and test clause):

Clause	Test(s)
1.7	Durability of Marking Test
2.1	Protection from electric shock and energy hazards
2.9	Humidity Conditioning test

Test based on CTL decision sheet, DSH 1080.

Operation condition:

Tested for 85~265V AC, 47~63Hz required by manufacturer.

Testing location:

See page 3

Radio and television interference suppression compliance with the EMC directive is necessary for achieving type certification. The appliance shall comply with the relevant EMC standards, depending on the equipment in question.

The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, has not been tested for EMC, the end product must be tested with this integrated circuit (IC) installed.

1.7.2.1
Language of safety markings/instructions.

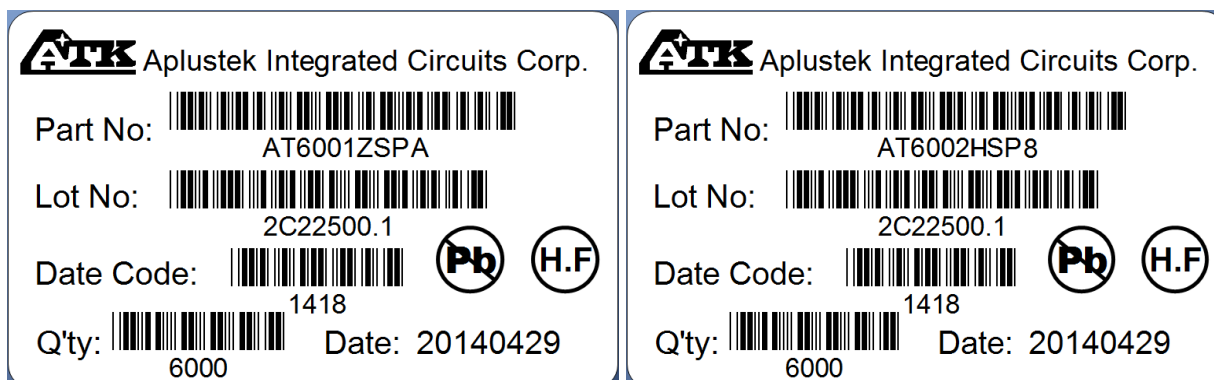
Instructions and equipment marking related to safety is applied in the language that is acceptable in the country in which the equipment is to be sold.

Summary of compliance with National Differences

The sample(s) tested compliance with the requirements of IEC 60950-1: 2005 (2nd Edition); Am1: 2009; Am2: 2013 and all CENELEC members as listed in EN 60950-1: 2006 +A11: 2009+A1: 2010+A12: 2011+A2: 2013, and CTL Decision, DSH 1080.

Copy of marking plates:

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.



Calibration:	<p>All instruments used in the tests given in this test report are calibrated and traceable to national or international standards.</p> <p>Further information about traceability will be given on request.</p>
Measurement uncertainty:	<p>Measurement uncertainties are calculated for all instruments and instrument set-ups given in this report. Calculations are based on the principles given in the standard EA-4/02 (Dec. 1999), IEC Guide 115:2007, Nemko routine L227 and other relevant internal Nemko-procedures.</p> <p>Further information about measurement uncertainties will be given on request.</p>
Evaluation of results:	<p>If not explicitly stated otherwise in the standard, the test is passed if the measured value is equal to or below (above) the limit line, regardless of the measurement uncertainty. If the measured value is above (below) the limit line, the test is not passed – ref IEC Guide 115:2007, and Nemko routine L220.</p> <p>The instrumentation accuracy is within limits agreed by IECEE-CTL (ref. Nemko routine L227).</p>

Test item particulars :	
Equipment mobility	<input type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> transportable <input type="checkbox"/> stationary <input checked="" type="checkbox"/> for building-in <input type="checkbox"/> direct plug-in
Connection to the mains	<input type="checkbox"/> pluggable equipment <input type="checkbox"/> type A <input type="checkbox"/> type B <input type="checkbox"/> permanent connection <input type="checkbox"/> detachable power supply cord <input type="checkbox"/> non-detachable power supply cord <input checked="" type="checkbox"/> not directly connected to the mains
Operating condition.....	<input checked="" type="checkbox"/> continuous <input type="checkbox"/> rated operating / resting time:
Access location	<input checked="" type="checkbox"/> operator accessible <input type="checkbox"/> restricted access location
Over voltage category (OVC)	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV <input type="checkbox"/> other:
Mains supply tolerance (%) or absolute mains supply values	Tested for 85~265V AC, 47~63Hz required by manufacturer. (110% voltage based on CTL decision sheet, DSH 1080)
Tested for IT power systems	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
IT testing, phase-phase voltage (V)	230
Class of equipment	<input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input checked="" type="checkbox"/> Not classified
Considered current rating of protective device as part of the building installation (A)	N/A
Pollution degree (PD)	<input type="checkbox"/> PD 1 <input checked="" type="checkbox"/> PD 2 <input type="checkbox"/> PD 3
IP protection class	IP20
Altitude during operation (m)	Up to 5000m:
Altitude of test laboratory (m)	< 2000m:
Mass of equipment (kg)	Weight Approx.: <10g Dimension Approx. (mm): For model AT6002 series: 4.8 x 6.0 x 1.6 mm For model AT1688 series; AT6001 series: 4.9 x 6.0 x 1.6 mm
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	2016-04-05
Date(s) of performance of tests	2016-04-05 to 2016-04-22

General remarks:

"(see attachment #)" refers to additional information appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 6.2.5 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) : Aplustek Integrated Circuits Corp.
7F, NO11, Park Ave.2, Hsinchu Science Based Industrial Park, Hsinchu City, 30075, Taiwan.

General product information:

The equipment under tests are controller IC including discharge function (ICX). It is used to cope with environmental issues, as it limits the power consumption in standby conditions. The ICX blocks current through X-capacitor discharge resistor when AC voltage is connected, and it automatically discharges X capacitor through discharge resistors when AC is disconnected.

Model AT6002 series and AT1688 series are different:

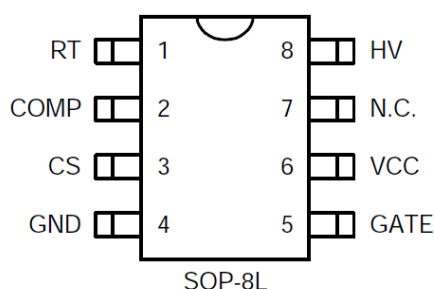
AT6002 series: 8 pins.

AT1688 series: 10 pins.

Model AT1688 series and AT6001 series are same except for model name.

The Pin Configuration are as follows:

Pin Configuration: AT6002 series



Function Pin Description

Pin No.	Pin Name	Description
1	RT	Temperature Detection. An internal current source allows the direct connection of an NTC for over temperature detection.
2	COMP	Voltage Feedback. This pin connecting an opto-coupler to monitor output for regulation control loop.
3	CS	Current Sense. This pin sense primary MOSFET current.
4	GND	Ground.
5	GATE	PWM Signal Output. This pin output to drive the external power MOSFET.
6	VCC	Power Supply.
7	N.C.	No Connection.
8	HV	High Voltage. This pin connects to X-cap capacitor via resistors to be a high voltage start-up current source, and to implement X-cap discharge and Brown in/out detection.

AT6002 is a highly integrated current mode PWM control for flyback converter, optimized for high performance, low standby power consumption and cost effective offline flyback converter applications.

The AT6002 built-in multiple protection with VCC under voltage lockout (UVLO), VCC over voltage protection (OVP), VCC clamp, GATE clamp, cycle-by-cycle current limiting (OCP), over load protection (OLP), RT Low Level Protection(RTLP), RT High Level Protection(RTHP), and leading-edge blanking (LEB) of the current sensing to prevent circuit damage occurred under abnormal conditions.

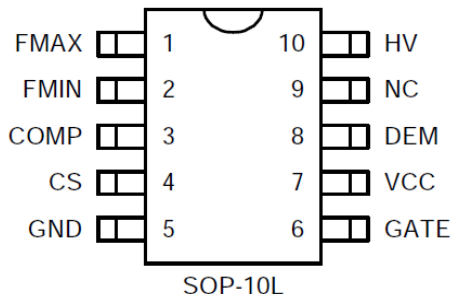
The AT6002 also has an X-cap discharge function to discharge the X-cap when the input is unplugged and Brownout protection function.

The AT6002 is available in an SOP-8L package and require very few external devices for operation.

General product information (Cont.):

Configuration are as follows:

Pin Configuration: AT1688 series and AT6001 series



Function Pin Description

Pin No.	Pin Name	Description
1	FMAX	Maximum frequency programming pin. This pin connecting an resistors to ground for setting maximum switching frequency.
2	FMIN	Minimum frequency programming pin. This pin connecting an resistors to ground for setting minimum switching frequency.
3	COMP	Voltage Feedback pin. This pin connecting an opto-coupler to monitor output for regulation control loop.
4	CS	Current Sense pin. This pin sense primary MOSFET current.
5	GND	Ground.
6	GATE	PWM Signal Output pin. This pin output to drive the external power MOSFET.
7	VCC	Power Supply.
8	DEM	This pin is for valley switching detector of the auxiliary winding signal and also used for output over voltage protection.
9	NC	Unconnected pin.
10	HV	High Voltage pin. This pin connecting to X-cap capacitor via resistors to be a high voltage start-up current source, and to implement X-cap discharge and Brown in/out detection .

AT1688 is a highly integrated quasi-resonant (QR) mode PWM control for flyback converter, optimized for high performance, low standby power consumption and cost effective offline flyback converter applications.

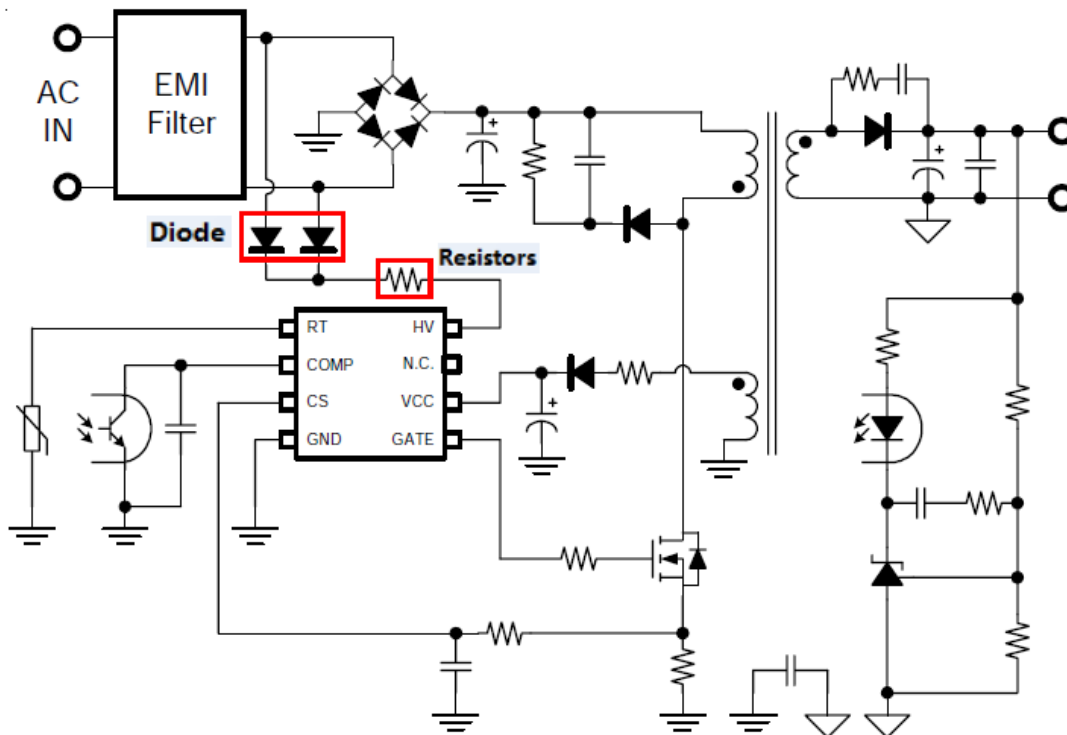
The AT1688 internal valley detector ensures minimum drain voltage switching at QR operation. At low line and heavy loading, it operates in critical conduction mode(CCM) via an external resistor sets minimum fixed frequency. At high line and normal loading, it operates in QR mode. When light load, it operates in pulse frequency modulation (PFM) mode. When the output power falls below a given level, it enters the burst mode.

The AT1688 built-in multiple protection with VCC under voltage lockout (UVLO), VCC over voltage protection (OVP), VCC clamp, GATE clamp, internal over temperature protection (OTP), Output over voltage protection, DEM high level protection, cycle-by-cycle current limiting (OCP), over load protection (OLP), X-cap discharge, brown in/out protection, and leading-edge blanking (LEB) of the current sensing to prevent circuit damage occurred under abnormal conditions.

The AT1688 is available in an SOP-10L package and require very few external devices for operation.

General product information (Cont.):

Figure below shows a typical configuration using the ICX for model AT6002 series:



The mains input signals L and N are connected via HV diodes and resistance to the HV pin of the ICX.

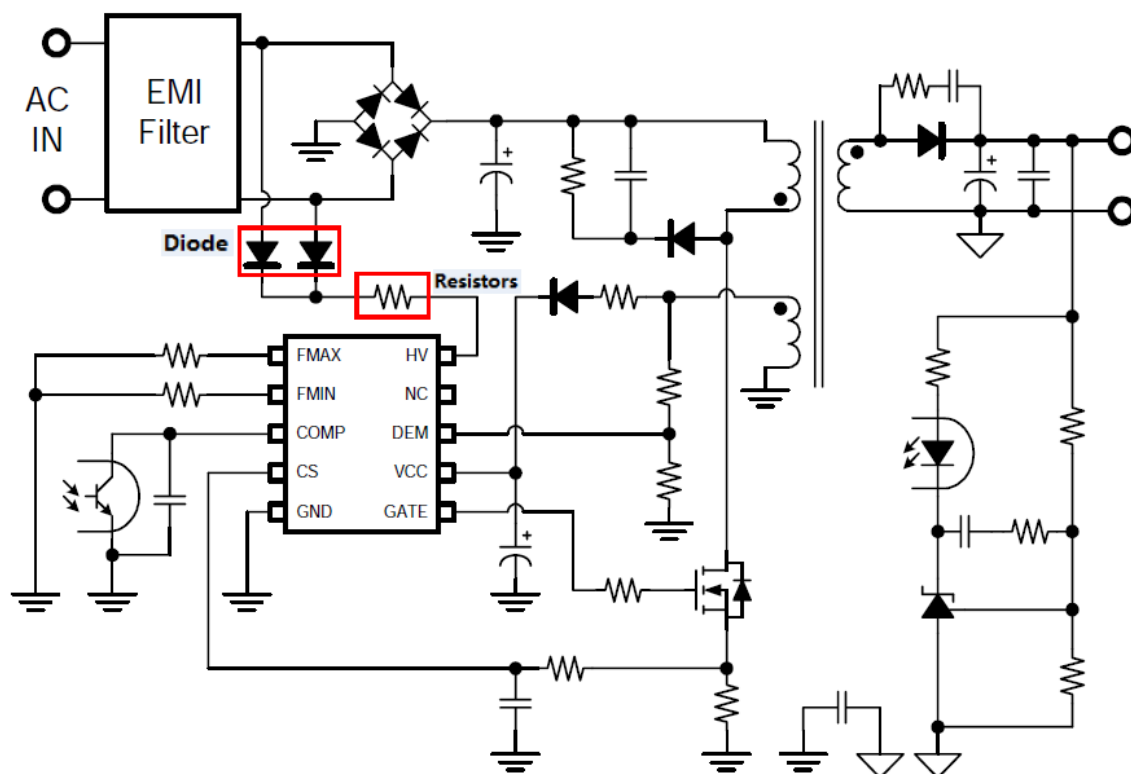
The HV pins is responsible for the X-cap discharge function.

Select total resistance of R1 and R2 according to table below.

PN	X Capacitance	Total Series Resistance
AT6002 series	0.1uF	40 K ohm
	3.0µF	15 K ohm

Diode and Resistors with red rectangle remarked must be used within the range which list in table 1.5.1 in end product.

Figure below shows a typical configuration using the ICX for model AT1688 series and AT6001 series:



Select total resistance of R1 and R2 according to table below.

PN	X Capacitance	Total Series Resistance
AT1688 series	0.1uF	40 K ohm
AT6001 series	3.0μF	15 K ohm

Diode and Resistors with red rectangle remarked must be used within the range which list in table 1.5.1 in end product.

General product information (Cont.):

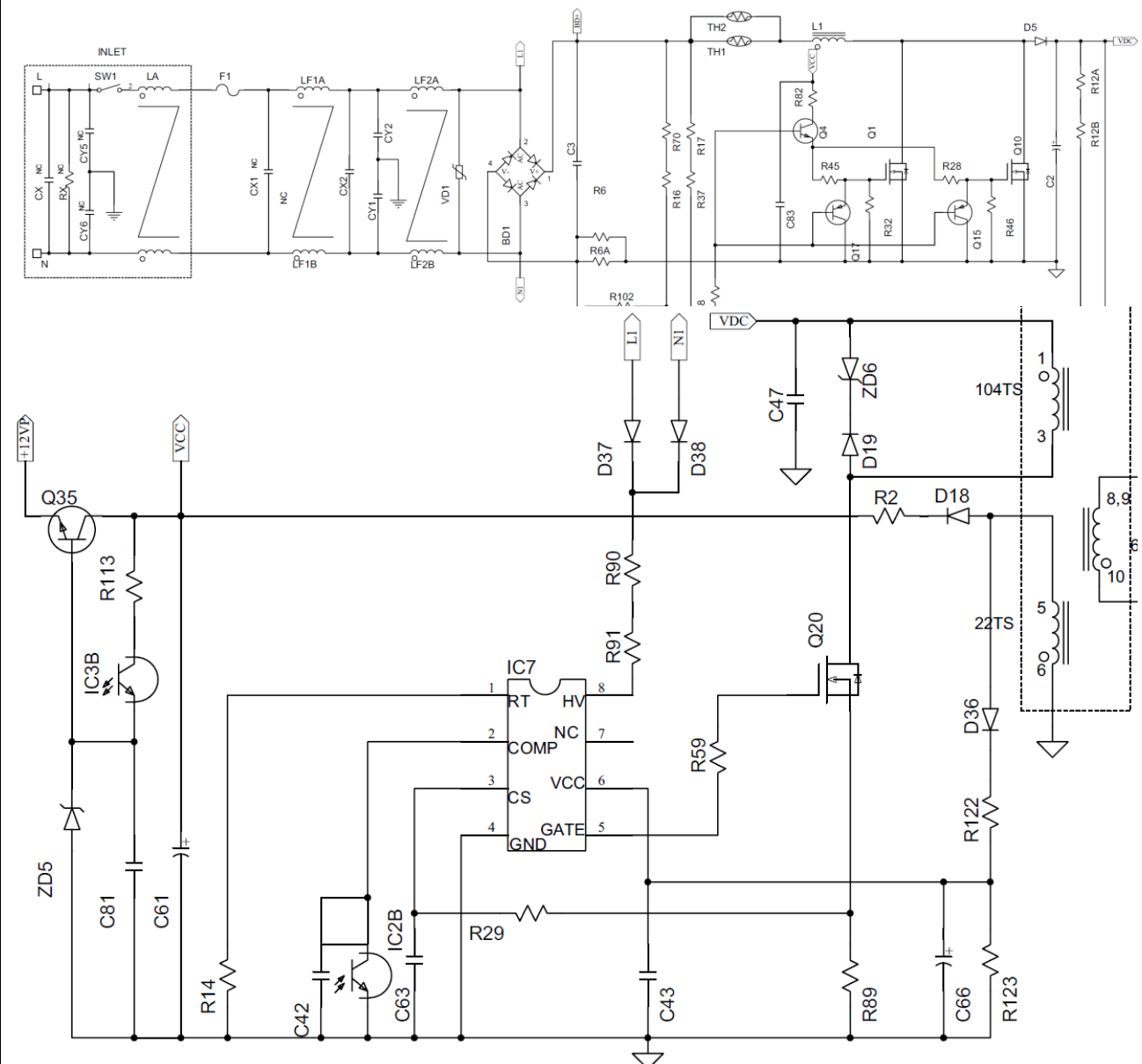
Discharge Circuit diagram for Demo board for ICX model AT6002 series as below:

- Impulse tests some components are not connected, which impact the tests, detail as below:

Open circuit: D38.

Short circuit: D37, BD1 Pin (1-2), BD1 Pin (3-4)

Smallest capacitance with largest resistance:	Largest capacitance with smallest resistance:
CX2=0.1uF, R90=R91=20K ohm, total 40K ohm.	CX2=3.0uF, R90=R91=7.5K ohm, total 15K ohm.



General product information (Cont.):

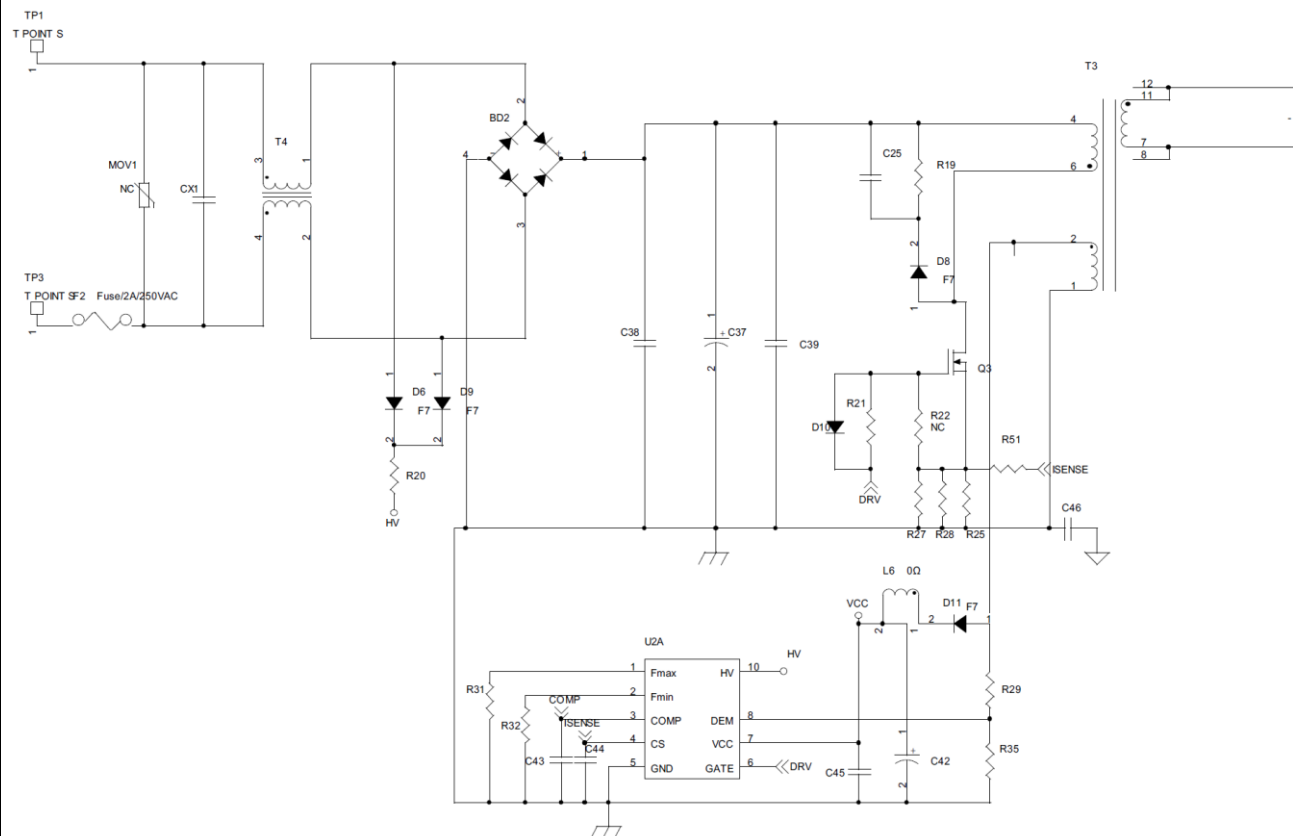
Discharge Circuit diagram for Demo board for ICX model AT1688 series and AT6001 series as below:

- Impulse tests some components are not connected, which impact the tests, detail as below:

Open circuit: MOV1, D9.

Short circuit: D6, BD2 Pin (1-2), BD2 Pin (3-4)

Smallest capacitance with largest resistance:	Largest capacitance with smallest resistance:
CX1=0.1uF, R20=40K ohm	CX1=3.0uF, R20=15K ohm.



General product information:

Testing	Observation
1. Humidity treatment for 120hr	No damage found on IC
2. 100 Positive and Negative Impulse	No damage found on IC
3. 265V (based on client request voltage) is applied to L and N for 2.5 minutes.	No damage found on IC
4. 10000 cycles power on and off	No damage found on IC
Result:	
Checking for the function of ICX	The value of resistors and capacitors keeps the same before all the tests, and the IC works as normal. In conclusion, the ICX provided safeguard function according to this set of values of capacitor and resistor.

1.1.2 - Additional requirements:

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

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

Electromedical equipment connected to the patient:

This equipment is not an electromedical equipment intended to be physically connected to a patient.

Equipment used in vehicles, ships or aircrafts, in tropical countries, or at elevations > 2000m:

This equipment is intended to operate in a "normal" environment (Offices and homes) and is intended to be operated under altitude up to 5000m, so the clearance is multiplied by the altitude correction factor (1.48 linear interpolation used), specified in table A.2 of IEC 60664-1.

Abbreviations used in the report:

- normal conditions	N.C.	- single fault conditions	S.F.C
- functional insulation	OP	- basic insulation	BI
- double insulation	DI	- supplementary insulation SI	
- between parts of opposite polarity	BOP	- reinforced insulation	RI

Indicate used abbreviations (if any)

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

1	GENERAL		—
---	---------	--	---

1.5	Components		
1.5.1	General		P
	Comply with IEC 60950-1 or relevant component standard	(see appended tables 1.5.1)	P
1.5.2	Evaluation and testing of components	<p>Certified components are used in accordance with their ratings, certifications and they comply with applicable parts of this standard.</p> <p>Components not certified are used in accordance with their ratings and they comply with applicable parts of IEC 60950-1 and the relevant component standard.</p> <p>Components, for which no relevant IEC-standard exists, have been tested under the conditions occurring in the equipment, using applicable parts of IEC 60950-1.</p>	P
1.5.3	Thermal controls	No thermal controls.	N/A
1.5.4	Transformers	No isolating transformer in the equipment.	N/A
1.5.5	Interconnecting cables	No interconnecting cables.	N/A
1.5.6	Capacitors bridging insulation	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
1.5.7	Resistors bridging insulation	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
1.5.7.1	Resistors bridging functional, basic or supplementary insulation		—
1.5.7.2	Resistors bridging double or reinforced insulation between a.c. mains and other circuits		—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.5.7.3	Resistors bridging double or reinforced insulation between a.c. mains and antenna or coaxial cable		—
1.5.8	Components in equipment for IT power systems	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
1.5.9	Surge suppressors	1.5.9.1-1.5.9.5: The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
1.5.9.1	General		—
1.5.9.2	Protection of VDRs		—
1.5.9.3	Bridging of functional insulation by a VDR		—
1.5.9.4	Bridging of basic insulation by a VDR		—
1.5.9.5	Bridging of supplementary, double or reinforced insulation by a VDR		—
1.6	Power interface		N/A
1.6.1	AC power distribution systems	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
1.6.2	Input current		N/A
1.6.3	Voltage limit of hand-held equipment		N/A
1.6.4	Neutral conductor		N/A
1.7	Marking and instructions		
1.7.1	Power rating and identification markings	The required marking is located on the outside surface of the equipment and the packaging.	P
1.7.1.1	Power rating marking	See below	P
	Multiple mains supply connections.....:	Only one mains supply connections.	N/A
	Rated voltage(s) or voltage range(s) (V)	230V~	P
	Symbol for nature of supply, for d.c. only	The equipment is for a.c. supply.	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Rated frequency or rated frequency range (Hz):	50/60Hz	—
	Rated current (mA or A)	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	—
1.7.1.2	Identification markings	See below.	P
	Manufacturer's name or trade-mark or identification mark	See Copy of marking plates.	P
	Model identification or type reference :	See Copy of marking plates.	—
	Symbol for Class II equipment only	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
	Other markings and symbols	The additional marking does not give rise to misunderstandings.	P
1.7.2	Safety instructions and marking	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
1.7.2.1	General		—
1.7.2.2	Disconnect devices		—
1.7.2.3	Overcurrent protective device		—
1.7.2.4	IT power distribution systems		—
1.7.2.5	Operator access with a tool		—
1.7.2.6	Ozone		—
1.7.3	Short duty cycles	The equipment is intended for continuous operation.	N/A
1.7.4	Supply voltage adjustment	No voltage selector.	N/A
	Methods and means of adjustment; reference to installation instructions		—
1.7.5	Power outlets on the equipment	No standard power outlet.	N/A
1.7.6	Fuse identification (marking, special fusing characteristics, cross-reference)	No fuse.	N/A
1.7.7	Wiring terminals	Must be checked in the end product.	—
1.7.7.1	Protective earthing and bonding terminals		—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.7.2	Terminals for a.c. mains supply conductors		—
1.7.7.3	Terminals for d.c. mains supply conductors		—
1.7.8	Controls and indicators	Refer below.	—
1.7.8.1	Identification, location and marking	No control.	N/A
1.7.8.2	Colours	No indicators with colours where safety is involved.	N/A
1.7.8.3	Symbols according to IEC 60417	There are no switches in the equipment.	N/A
1.7.8.4	Markings using figures	No controls.	N/A
1.7.9	Isolation of multiple power sources	Only one connection supplying hazardous voltages and energy levels to the equipment.	N/A
1.7.10	Thermostats and other regulating devices	No thermostats or other regulating devices.	N/A
1.7.11	Durability	The marking withstands required tests.	P
1.7.12	Removable parts	No marking is placed on removable parts.	N/A
1.7.13	Replaceable batteries	No replaceable batteries in the equipment.	N/A
	Language(s)		—
1.7.14	Equipment for restricted access locations.....	Equipment not intended for installation in RAL.	N/A

2	PROTECTION FROM HAZARDS		
2.1	Protection from electric shock and energy hazards		—
2.1.1	Protection in operator access areas	Refer below:	—
2.1.1.1	Access to energized parts	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
	Test by inspection		—
	Test with test finger (Figure 2A)		—
	Test with test pin (Figure 2B)		—
	Test with test probe (Figure 2C)		—
2.1.1.2	Battery compartments	No battery and TNV circuits in the equipment.	N/A
2.1.1.3	Access to ELV wiring	No internal wiring at ELV accessible to the operator.	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Working voltage (V _{peak} or V _{rms}); minimum distance through insulation (mm)		—
2.1.1.4	Access to hazardous voltage circuit wiring	Must be checked in the end product.	N/A
2.1.1.5	Energy hazards	Must be checked in the end product.	N/A
2.1.1.6	Manual controls	No shafts of knobs etc. at ELV or hazardous voltage or TNV.	N/A
2.1.1.7	Discharge of capacitors in equipment	The capacitance of the input circuit is > 0.1µF. The measurements were performed after treatment of humidity based on CTL decision sheet, DSH 1080 and following conditions.	P
	Measured voltage (V); time-constant (s)	<ul style="list-style-type: none"> - humidity treatment for 120h at temperature of 40°C and a relative humidity of 95%, then - 100 positive impulses and 100 negative impulses between line and neutral with U_c=2500V using a capacitor with the largest capacitance (3.0µF) and a resistor with the smallest resistance (total 15KΩ) specified by the manufacturer of the ICX; and repeated with a capacitor with the smallest capacitance (0.1µF) and the resistor with the largest resistance (total 40KΩ), then, 	—
		<ul style="list-style-type: none"> - Application of an a.c. voltage 85V and 265V (required by manufacturer) for 2.5 minutes, then - 10000 cycles of power on and off using a capacitor with the smallest capacitance (0.1µF) and a resistor with the largest resistance (total 40KΩ) as specified by the manufacturer of ICX. - Condition is: no load, and with following conditions: <p>Time constant refer to table 2.1.1.7.</p>	
	Measured voltage (V); time-constant (s)		—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.1.1.8	Energy hazards – d.c. mains supply	Not connected to DC mains supply.	N/A
	a) Capacitor connected to the d.c. mains supply ...:		N/A
	b) Internal battery connected to the d.c. mains supply		N/A
2.1.1.9	Audio amplifiers	No audio amplifier.	N/A
2.1.2	Protection in service access areas	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
2.1.3	Protection in restricted access locations	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A

2.2	SELV circuits		N/A
2.2.1	General requirements	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
2.2.2	Voltages under normal conditions (V)		N/A
2.2.3	Voltages under fault conditions (V)		N/A
2.2.4	Connection of SELV circuits to other circuits		N/A

2.3	TNV circuits		N/A
2.3.1	Limits	No TNV circuits.	N/A
	Type of TNV circuits		—
2.3.2	Separation from other circuits and from accessible parts		N/A
2.3.2.1	General requirements		N/A
2.3.2.2	Protection by basic insulation		N/A
2.3.2.3	Protection by earthing		N/A
2.3.2.4	Protection by other constructions		N/A
2.3.3	Separation from hazardous voltages		N/A
	Insulation employed.....		—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.3.4	Connection of TNV circuits to other circuits		N/A
	Insulation employed.....:		—
2.3.5	Test for operating voltages generated externally		N/A
2.4	Limited current circuits		N/A
2.4.1	General requirements	2.4.1-2.4.3: No limited current circuits	N/A
2.4.2	Limit values		N/A
	Frequency (Hz).....:		—
	Measured current (mA)		—
	Measured voltage (V)		—
	Measured circuit capacitance (nF or μ F).....:		—
2.4.3	Connection of limited current circuits to other circuits		N/A
2.5	Limited power sources		N/A
	a) Inherently limited output	No limited power sources.	N/A
	b) Impedance limited output		N/A
	c) Regulating network or IC current limiter, limits output under normal operating and single fault condition		N/A
	Use of integrated circuit (IC) current limiters		N/A
	d) Overcurrent protective device limited output		—
	Max. output voltage (V), max. output current (A), max. apparent power (VA) :		—
	Current rating of overcurrent protective device (A) .:		N/A
2.6	Provisions for earthing and bonding		N/A
2.6.1	Protective earthing	2.6.1 – 2.6.5.8: The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
2.6.2	Functional earthing		N/A
2.6.3	Protective earthing and protective bonding conductors		—
2.6.3.1	General		—
2.6.3.2	Size of protective earthing conductors		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Rated current (A), cross-sectional area (mm ²), AWG.....:		—
2.6.3.3	Size of protective bonding conductors		—
	Rated current (A), cross-sectional area (mm ²), AWG.....:		—
	Protective current rating (A), cross-sectional area (mm ²), AWG.....:		—
2.6.3.4	Resistance of earthing conductors and their terminations; resistance (Ω), voltage drop (V), test current (A), duration (min)		N/A
2.6.3.5	Colour of insulation.....:		N/A
2.6.4	Terminals		—
2.6.4.1	General		—
2.6.4.2	Protective earthing and bonding terminals		N/A
	Rated current (A), type, nominal thread diameter (mm).....:		—
2.6.4.3	Separation of the protective earthing conductor from protective bonding conductors		N/A
2.6.5	Integrity of protective earthing		N/A
2.6.5.1	Interconnection of equipment		N/A
2.6.5.2	Components in protective earthing conductors and protective bonding conductors		N/A
2.6.5.3	Disconnection of protective earth		N/A
2.6.5.4	Parts that can be removed by an operator		N/A
2.6.5.5	Parts removed during servicing		N/A
2.6.5.6	Corrosion resistance		N/A
2.6.5.7	Screws for protective bonding		N/A
2.6.5.8	Reliance on telecommunication network or cable distribution system		N/A

2.7	Overcurrent and earth fault protection in primary circuits		N/A
2.7.1	Basic requirements	2.7.1 – 2.7.6: The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
	Instructions when protection relies on building installation		N/A
2.7.2	Faults not simulated in 5.3.7		N/A
2.7.3	Short-circuit backup protection		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.7.4	Number and location of protective devices		N/A
2.7.5	Protection by several devices		N/A
2.7.6	Warning to service personnel.....		N/A
2.8	Safety interlocks		N/A
2.8.1	General principles	No safety interlocks.	N/A
2.8.2	Protection requirements		N/A
2.8.3	Inadvertent reactivation		N/A
2.8.4	Fail-safe operation		N/A
	Protection against extreme hazard		N/A
2.8.5	Moving parts		N/A
2.8.6	Overriding		N/A
2.8.7	Switches, relays and their related circuits		N/A
2.8.7.1	Separation distances for contact gaps and their related circuits (mm)		N/A
2.8.7.2	Overload test		N/A
2.8.7.3	Endurance test		N/A
2.8.7.4	Electric strength test		N/A
2.8.8	Mechanical actuators		N/A
2.9	Electrical insulation		
2.9.1	Properties of insulating materials	Neither natural rubber, materials containing asbestos nor hygroscopic materials are used as insulation. No driving belts or couplings used.	N/A
2.9.2	Humidity conditioning	Humidity treatment performed for 120 hrs.	P
	Relative humidity (%), temperature (°C)	95%, 40°C.	—
2.9.3	Grade of insulation	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
2.9.4	Separation from hazardous voltages	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Method(s) used		—
2.10	Clearances, creepage distances and distances through insulation		N/A
2.10.1	General	2.10.1 – 2.10.12: The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
2.10.1.1	Frequency		N/A
2.10.1.2	Pollution degrees		N/A
2.10.1.3	Reduced values for functional insulation		N/A
2.10.1.4	Intervening unconnected conductive parts		N/A
2.10.1.5	Insulation with varying dimensions		N/A
2.10.1.6	Special separation requirements		N/A
2.10.1.7	Insulation in circuits generating starting pulses		N/A
2.10.2	Determination of working voltage		N/A
2.10.2.1	General		N/A
2.10.2.2	RMS working voltage		N/A
2.10.2.3	Peak working voltage		N/A
2.10.3	Clearances		N/A
2.10.3.1	General		N/A
2.10.3.2	Mains transient voltages		N/A
	a) AC mains supply		N/A
	b) Earthed d.c. mains supplies		N/A
	c) Unearthed d.c. mains supplies		N/A
	d) Battery operation		N/A
2.10.3.3	Clearances in primary circuits		N/A
2.10.3.4	Clearances in secondary circuits		N/A
2.10.3.5	Clearances in circuits having starting pulses		N/A
2.10.3.6	Transients from a.c. mains supply		N/A
2.10.3.7	Transients from d.c. mains supply		N/A
2.10.3.8	Transients from telecommunication networks and cable distribution systems		N/A
2.10.3.9	Measurement of transient voltage levels		—
	a) Transients from a mains supply		N/A
	For an a.c. mains supply		N/A
	For a d.c. mains supply		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) Transients from a telecommunication network :		N/A
2.10.4	Creepage distances		N/A
2.10.4.1	General		N/A
2.10.4.2	Material group and comparative tracking index		N/A
	CTI tests		—
2.10.4.3	Minimum creepage distances		N/A
2.10.5	Solid insulation		N/A
2.10.5.1	General		N/A
2.10.5.2	Distances through insulation		N/A
2.10.5.3	Insulating compound as solid insulation		N/A
2.10.5.4	Semiconductor devices		N/A
2.10.5.5	Cemented joints		N/A
2.10.5.6	Thin sheet material – General		N/A
2.10.5.7	Separable thin sheet material		N/A
	Number of layers (pcs)		—
2.10.5.8	Non-separable thin sheet material		N/A
2.10.5.9	Thin sheet material – standard test procedure		N/A
	Electric strength test		—
2.10.5.10	Thin sheet material – alternative test procedure		N/A
	Electric strength test		N/A
2.10.5.11	Insulation in wound components		N/A
2.10.5.12	Wire in wound components		N/A
	Working voltage		N/A
	a) Basic insulation not under stress		N/A
	b) Basic, supplementary, reinforced insulation		N/A
	c) Compliance with Annex U		N/A
	Two wires in contact inside wound component; angle between 45° and 90°		N/A
2.10.5.13	Wire with solvent-based enamel in wound components		N/A
	Electric strength test		N/A
	Routine test		N/A
2.10.5.14	Additional insulation in wound components		N/A
	Working voltage		N/A
	- Basic insulation not under stress		N/A
	- Supplementary, reinforced insulation		N/A
2.10.6	Construction of printed boards		N/A
2.10.6.1	Uncoated printed boards		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.10.6.2	Coated printed boards		N/A
2.10.6.3	Insulation between conductors on the same inner surface of a printed board		N/A
2.10.6.4	Insulation between conductors on different layers of a printed board		N/A
	Distance through insulation		N/A
	Number of insulation layers (pcs).....:		N/A
2.10.7	Component external terminations		N/A
2.10.8	Tests on coated printed boards and coated components		N/A
2.10.8.1	Sample preparation and preliminary inspection		N/A
2.10.8.2	Thermal conditioning		N/A
2.10.8.3	Electric strength test		N/A
2.10.8.4	Abrasion resistance test		N/A
2.10.9	Thermal cycling		N/A
2.10.10	Test for Pollution Degree 1 environment and insulating compound		N/A
2.10.11	Tests for semiconductor devices and cemented joints		N/A
2.10.12	Enclosed and sealed parts		N/A

3	WIRING, CONNECTIONS AND SUPPLY		N/A
3.1	General		N/A
3.1.1	Current rating and overcurrent protection	3.1.1 – 3.1.10: The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
3.1.2	Protection against mechanical damage		N/A
3.1.3	Securing of internal wiring		N/A
3.1.4	Insulation of conductors		N/A
3.1.5	Beads and ceramic insulators		N/A
3.1.6	Screws for electrical contact pressure		N/A
3.1.7	Insulating materials in electrical connections		N/A
3.1.8	Self-tapping and spaced thread screws		N/A
3.1.9	Termination of conductors		N/A
	10 N pull test		N/A
3.1.10	Sleeving on wiring		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

3.2	Connection to a mains supply		N/A
3.2.1	Means of connection	3.2.1-3.2.9: The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
3.2.1.1	Connection to an a.c. mains supply		N/A
3.2.1.2	Connection to a d.c. mains supply		N/A
3.2.2	Multiple supply connections		N/A
3.2.3	Permanently connected equipment		N/A
	Number of conductors, diameter of cable and conduits (mm)		—
3.2.4	Appliance inlets		N/A
3.2.5	Power supply cords		N/A
3.2.5.1	AC power supply cords		N/A
	Type		—
	Rated current (A), cross-sectional area (mm ²), AWG		—
3.2.5.2	DC power supply cords		N/A
3.2.6	Cord anchorages and strain relief		N/A
	Mass of equipment (kg), pull (N)		—
	Longitudinal displacement (mm)		—
3.2.7	Protection against mechanical damage		N/A
3.2.8	Cord guards		N/A
	Diameter or minor dimension D (mm); test mass (g)		—
	Radius of curvature of cord (mm).....		—
3.2.9	Supply wiring space		N/A

3.3	Wiring terminals for connection of external conductors		N/A
3.3.1	Wiring terminals	3.3.1 – 3.3.8; The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
3.3.2	Connection of non-detachable power supply cords		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
3.3.3	Screw terminals		N/A
3.3.4	Conductor sizes to be connected		N/A
	Rated current (A), cord/cable type, cross-sectional area (mm ²)		—
3.3.5	Wiring terminal sizes		N/A
	Rated current (A), type, nominal thread diameter (mm)		—
3.3.6	Wiring terminal design		N/A
3.3.7	Grouping of wiring terminals		N/A
3.3.8	Stranded wire		N/A

3.4	Disconnection from the mains supply		N/A
3.4.1	General requirement	3.4.1 – 3.4.11 The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
3.4.2	Disconnect devices		N/A
3.4.3	Permanently connected equipment		N/A
3.4.4	Parts which remain energized		N/A
3.4.5	Switches in flexible cords		N/A
3.4.6	Number of poles - single-phase and d.c. equipment		N/A
3.4.7	Number of poles - three-phase equipment		N/A
3.4.8	Switches as disconnect devices		N/A
3.4.9	Plugs as disconnect devices		N/A
3.4.10	Interconnected equipment		N/A
3.4.11	Multiple power sources		N/A

3.5	Interconnection of equipment		N/A
3.5.1	General requirements	3.5.1 - 3.5.4 The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
3.5.2	Types of interconnection circuits		N/A
3.5.3	ELV circuits as interconnection circuits		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

3.5.4	Data ports for additional equipment		N/A
-------	-------------------------------------	--	-----

4	PHYSICAL REQUIREMENTS		N/A
4.1	Stability		N/A
	Angle of 10°	Mass < 7kg	N/A
	Test force (N):	The unit is not floor-standing.	N/A

4.2	Mechanical strength		N/A
4.2.1	General	4.2.1 – 4.2.10 The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	NA
	Rack-mounted equipment.		N/A
4.2.2	Steady force test, 10 N		N/A
4.2.3	Steady force test, 30 N		N/A
4.2.4	Steady force test, 250 N		N/A
4.2.5	Impact test		N/A
	Fall test		N/A
	Swing test		N/A
4.2.6	Drop test; height (mm):		N/A
4.2.7	Stress relief test		N/A
4.2.8	Cathode ray tubes		N/A
	Picture tube separately certified:		N/A
4.2.9	High pressure lamps		N/A
4.2.10	Wall or ceiling mounted equipment; force (N):		N/A

4.3	Design and construction		
4.3.1	Edges and corners	All edges and corners are rounded and/or smoothed.	P
4.3.2	Handles and manual controls; force (N):	No knobs, grips, handles, lever etc.	N/A
4.3.3	Adjustable controls	No hazardous adjustable controls.	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.3.4	Securing of parts	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
4.3.5	Connection by plugs and sockets	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
4.3.6	Direct plug-in equipment	Not intended to plug directly into a wall socket-outlet.	N/A
	Torque		—
	Compliance with the relevant mains plug standard :		—
4.3.7	Heating elements in earthed equipment	No heating elements provided.	N/A
4.3.8	Batteries	No batteries.	N/A
	- Overcharging of a rechargeable battery		N/A
	- Unintentional charging of a non-rechargeable battery		N/A
	- Reverse charging of a rechargeable battery		N/A
	- Excessive discharging rate for any battery		N/A
4.3.9	Oil and grease	Insulation is not exposed to oil, grease etc.	N/A
4.3.10	Dust, powders, liquids and gases	The equipment does not generate ionizing radiation or use a laser, and does not contain flammable liquids or gases.	N/A
4.3.11	Containers for liquids or gases	No containers for liquids or gases in the equipment.	N/A
4.3.12	Flammable liquids	The equipment does not contain flammable liquid.	N/A
	Quantity of liquid (l)		N/A
	Flash point (°C)		N/A
4.3.13	Radiation	Refer below:	—
4.3.13.1	General	Refer below:	—
4.3.13.2	Ionizing radiation	The equipment does not generate ionizing radiation.	N/A
	Measured radiation (pA/kg)		—
	Measured high-voltage (kV)		—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Measured focus voltage (kV)		—
	CRT markings		—
4.3.13.3	Effect of ultraviolet (UV) radiation on materials	The equipment does not produce significant UV radiation.	N/A
	Part, property, retention after test, flammability classification		N/A
4.3.13.4	Human exposure to ultraviolet (UV) radiation	The equipment does not produce significant UV radiation.	N/A
4.3.13.5	Lasers (including laser diodes) and LEDs	No Laser product used.	N/A
4.3.13.5.1	Lasers (including laser diodes)	No laser.	N/A
	Laser class		—
4.3.13.5.2	Light emitting diodes (LEDs)		—
4.3.13.6	Other types	The equipment does not generate other types of radiation.	N/A

4.4	Protection against hazardous moving parts		
4.4.1	General	No moving parts.	N/A
4.4.2	Protection in operator access areas	No moving parts.	N/A
	Household and home/office document/media shredders	Not intended for installation in RAL.	N/A
4.4.3	Protection in restricted access locations	Unintentional contact is not likely in service access areas.	N/A
4.4.4	Protection in service access areas	No moving parts.	N/A
4.4.5	Protection against moving fan blades		N/A
4.4.5.1	General		N/A
	Not considered to cause pain or injury. a).....		N/A
	Is considered to cause pain, not injury. b)		N/A
	Considered to cause injury. c)		N/A
4.4.5.2	Protection for users		N/A
	Use of symbol or warning		N/A
4.4.5.3	Protection for service persons		N/A
	Use of symbol or warning		N/A

4.5	Thermal requirements	N/A
------------	-----------------------------	-----

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.5.1	General	4.5.1-4.5.5 The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
4.5.2	Temperature tests		N/A
	Normal load condition per Annex L:		N/A
4.5.3	Temperature limits for materials		N/A
4.5.4	Touch temperature limits		N/A
4.5.5	Resistance to abnormal heat:		N/A

4.6	Openings in enclosures		
4.6.1	Top and side openings	4.6.1 - 4.6.5 The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
	Dimensions (mm):		—
4.6.2	Bottoms of fire enclosures		N/A
	Construction of the bottom, dimensions (mm):		—
4.6.3	Doors or covers in fire enclosures		N/A
4.6.4	Openings in transportable equipment		N/A
4.6.4.1	Constructional design measures		N/A
	Dimensions (mm):		—
4.6.4.2	Evaluation measures for larger openings		N/A
4.6.4.3	Use of metallized parts		N/A
4.6.5	Adhesives for constructional purposes	No barrier secured by adhesive inside enclosure.	N/A
	Conditioning temperature (°C), time (weeks):		—

4.7	Resistance to fire		
4.7.1	Reducing the risk of ignition and spread of flame	Refer below.	N/A
	Method 1, selection and application of components wiring and materials	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Method 2, application of all of simulated fault condition tests		N/A
4.7.2	Conditions for a fire enclosure	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	—
4.7.2.1	Parts requiring a fire enclosure		N/A
4.7.2.2	Parts not requiring a fire enclosure		N/A
4.7.3	Materials		—
4.7.3.1	General	Integrated circuit material is flame class V-2.	P
4.7.3.2	Materials for fire enclosures	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	—
4.7.3.3	Materials for components and other parts outside fire enclosures	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	—
4.7.3.4	Materials for components and other parts inside fire enclosures	Integrated circuit material is flame class V-2.	P
4.7.3.5	Materials for air filter assemblies	No air filters in the equipment.	N/A
4.7.3.6	Materials used in high-voltage components	No parts exceeding 4kV.	N/A

5	ELECTRICAL REQUIREMENTS AND SIMULATED ABNORMAL CONDITIONS		
5.1	Touch current and protective conductor current		N/A
5.1.1	General	5.1.1 – 5.1.8 The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
5.1.2	Configuration of equipment under test (EUT)		—
5.1.2.1	Single connection to an a.c. mains supply		N/A
5.1.2.2	Redundant multiple connections to an a.c. mains supply		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.2.3	Simultaneous multiple connections to an a.c. mains supply		N/A
5.1.3	Test circuit		N/A
5.1.4	Application of measuring instrument		N/A
5.1.5	Test procedure		—
5.1.6	Test measurements		—
	Supply voltage (V)		—
	Measured touch current (mA)		—
	Max. allowed touch current (mA)		—
	Measured protective conductor current (mA)		—
	Max. allowed protective conductor current (mA) ...		—
5.1.7	Equipment with touch current exceeding 3,5 mA		N/A
5.1.7.1	General		—
5.1.7.2	Simultaneous multiple connections to the supply		N/A
5.1.8	Touch currents to telecommunication networks and cable distribution systems and from telecommunication networks		N/A
5.1.8.1	Limitation of the touch current to a telecommunication network or to a cable distribution system		N/A
	Supply voltage (V)		—
	Measured touch current (mA)		—
	Max. allowed touch current (mA)		—
5.1.8.2	Summation of touch currents from telecommunication networks		N/A
	a) EUT with earthed telecommunication ports		—
	b) EUT whose telecommunication ports have no reference to protective earth		—
5.2	Electric strength		N/A
5.2.1	General	5.2.1 – 5.2.2 The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
5.2.2	Test procedure		N/A
5.3	Abnormal operating and fault conditions		

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.3.1	Protection against overload and abnormal operation	Based on CTL enquiry form, tracking no. 1080, The ICX was following the test listed in General Product Information.	P
5.3.2	Motors	No motors.	N/A
5.3.3	Transformers	No isolating transformer in the equipment.	N/A
5.3.4	Functional insulation.....:	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
5.3.5	Electromechanical components	No electromechanical components in secondary circuits.	N/A
5.3.6	Audio amplifiers in ITE:	No audio amplifiers inside equipment.	N/A
5.3.7	Simulation of faults	In the case of a single fault condition the active X-cap discharge is always operating except when the HV pin is left open. Open circuit of the HV pin of the controller IC is considered unlikely. Also, compliance with 2.1.1.7 does not involve open circuit of discharge resistor(s).	P
5.3.8	Unattended equipment	No thermostats, temperature limiters or thermal cut-outs.	N/A
5.3.9	Compliance criteria for abnormal operating and fault conditions	See Cl. 5.3.7	P
5.3.9.1	During the tests	No fire or molten metal occurred and no deformation of enclosure during the tests.	P
5.3.9.2	After the tests		P

6	CONNECTION TO TELECOMMUNICATION NETWORKS		
6.1	Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment		—
6.1.1	Protection from hazardous voltages		—
6.1.2	Separation of the telecommunication network from earth		—
6.1.2.1	Requirements	No TNV circuit.	N/A
	Supply voltage (V):		—
	Current in the test circuit (mA):		—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

6.1.2.2	Exclusions		N/A
---------	------------------	--	-----

6.2	Protection of equipment users from overvoltages on telecommunication networks		
6.2.1	Separation requirements		N/A
6.2.2	Electric strength test procedure		N/A
6.2.2.1	Impulse test		N/A
6.2.2.2	Steady-state test		N/A
6.2.2.3	Compliance criteria		N/A

6.3	Protection of the telecommunication wiring system from overheating		N/A
	Max. output current (A)		—
	Current limiting method		—

7	CONNECTION TO CABLE DISTRIBUTION SYSTEMS		N/A
7.1	General	Not connected to Cable Distribution System.	N/A
7.2	Protection of cable distribution system service persons, and users of other equipment connected to the system, from hazardous voltages in the equipment		N/A
7.3	Protection of equipment users from overvoltages on the cable distribution system		N/A
7.4	Insulation between primary circuits and cable distribution systems		N/A
7.4.1	General		N/A
7.4.2	Voltage surge test		N/A
7.4.3	Impulse test		N/A

A	ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE		N/A
A.1	Flammability test for fire enclosures of movable equipment having a total mass exceeding 18 kg, and of stationary equipment (see 4.7.3.2)		N/A
A.1.1	Samples		—
	Wall thickness (mm).....		—
A.1.2	Conditioning of samples; temperature (°C)		N/A
A.1.3	Mounting of samples		N/A
A.1.4	Test flame (see IEC 60695-11-3)		N/A
	Flame A, B, C or D		—
A.1.5	Test procedure		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
A.1.6	Compliance criteria		N/A
	Sample 1 burning time (s)		—
	Sample 2 burning time (s)		—
	Sample 3 burning time (s)		—
A.2	Flammability test for fire enclosures of movable equipment having a total mass not exceeding 18 kg, and for material and components located inside fire enclosures (see 4.7.3.2 and 4.7.3.4)		N/A
A.2.1	Samples, material.....		—
	Wall thickness (mm).....		—
A.2.2	Conditioning of samples; temperature (°C)		N/A
A.2.3	Mounting of samples		N/A
A.2.4	Test flame (see IEC 60695-11-4)		N/A
	Flame A, B or C		—
A.2.5	Test procedure		N/A
A.2.6	Compliance criteria		N/A
	Sample 1 burning time (s)		—
	Sample 2 burning time (s)		—
	Sample 3 burning time (s)		—
A.2.7	Alternative test acc. to IEC 60695-11-5, cl. 5 and 9		N/A
	Sample 1 burning time (s)		—
	Sample 2 burning time (s)		—
	Sample 3 burning time (s)		—
A.3	Hot flaming oil test (see 4.6.2)		N/A
A.3.1	Mounting of samples		N/A
A.3.2	Test procedure		N/A
A.3.3	Compliance criterion		N/A
B	ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS (see 4.7.2.2 and 5.3.2)		N/A
B.1	General requirements	No motor used.	N/A
	Position		—
	Manufacturer		—
	Type		—
	Rated values		—
B.2	Test conditions		N/A
B.3	Maximum temperatures		N/A
B.4	Running overload test		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
B.5	Locked-rotor overload test		N/A
	Test duration (days)		—
	Electric strength test: test voltage (V)		—
B.6	Running overload test for d.c. motors in secondary circuits		N/A
B.6.1	General		N/A
B.6.2	Test procedure		N/A
B.6.3	Alternative test procedure		N/A
B.6.4	Electric strength test; test voltage (V)		N/A
B.7	Locked-rotor overload test for d.c. motors in secondary circuits		N/A
B.7.1	General		N/A
B.7.2	Test procedure		N/A
B.7.3	Alternative test procedure		N/A
B.7.4	Electric strength test; test voltage (V)		N/A
B.8	Test for motors with capacitors		N/A
B.9	Test for three-phase motors		N/A
B.10	Test for series motors		N/A
	Operating voltage (V)		—

C	ANNEX C, TRANSFORMERS (see 1.5.4 and 5.3.3)		N/A
	Position	No isolating transformer in the equipment.	—
	Manufacturer		—
	Type		—
	Rated values		—
	Method of protection		—
C.1	Overload test		N/A
C.2	Insulation		N/A
	Protection from displacement of windings		N/A

D	ANNEX D, MEASURING INSTRUMENTS FOR TOUCH-CURRENT TESTS (see 5.1.4)		N/A
D.1	Measuring instrument	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
D.2	Alternative measuring instrument		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

E	ANNEX E, TEMPERATURE RISE OF A WINDING (see 1.4.13)		N/A
----------	--	--	-----

F	ANNEX F, MEASUREMENT OF CLEARANCES AND CREEPAGE DISTANCES (see 2.10 and Annex G)		N/A
----------	---	--	-----

G	ANNEX G, ALTERNATIVE METHOD FOR DETERMINING MINIMUM CLEARANCES		N/A
G.1	Clearances		N/A
G.1.1	General		N/A
G.1.2	Summary of the procedure for determining minimum clearances		N/A
G.2	Determination of mains transient voltage (V)		N/A
G.2.1	AC mains supply		N/A
G.2.2	Earthed d.c. mains supplies		N/A
G.2.3	Unearthed d.c. mains supplies		N/A
G.2.4	Battery operation		N/A
G.3	Determination of telecommunication network transient voltage (V)		N/A
G.4	Determination of required withstand voltage (V)		N/A
G.4.1	Mains transients and internal repetitive peaks		N/A
G.4.2	Transients from telecommunication networks		N/A
G.4.3	Combination of transients		N/A
G.4.4	Transients from cable distribution systems		N/A
G.5	Measurement of transient voltages (V)		N/A
	a) Transients from a mains supply		N/A
	For an a.c. mains supply		N/A
	For a d.c. mains supply		N/A
	b) Transients from a telecommunication network		N/A
G.6	Determination of minimum clearances		N/A

H	ANNEX H, IONIZING RADIATION (see 4.3.13)		N/A
----------	---	--	-----

J	ANNEX J, TABLE OF ELECTROCHEMICAL POTENTIALS (see 2.6.5.6)		N/A
	Metal(s) used		—

K	ANNEX K, THERMAL CONTROLS (see 1.5.3 and 5.3.8)		N/A
K.1	Making and breaking capacity		N/A
K.2	Thermostat reliability; operating voltage (V)		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
K.3	Thermostat endurance test; operating voltage (V)		N/A
K.4	Temperature limiter endurance; operating voltage (V)		N/A
K.5	Thermal cut-out reliability		N/A
K.6	Stability of operation		N/A
L	ANNEX L, NORMAL LOAD CONDITIONS FOR SOME TYPES OF ELECTRICAL BUSINESS EQUIPMENT (see 1.2.2.1 and 4.5.2)		N/A
L.1	Typewriters		N/A
L.2	Adding machines and cash registers		N/A
L.3	Erasers		N/A
L.4	Pencil sharpeners		N/A
L.5	Duplicators and copy machines		N/A
L.6	Motor-operated files		N/A
L.7	Other business equipment		N/A
M	ANNEX M, CRITERIA FOR TELEPHONE RINGING SIGNALS (see 2.3.1)		N/A
M.1	Introduction		N/A
M.2	Method A		N/A
M.3	Method B		N/A
M.3.1	Ringling signal		N/A
M.3.1.1	Frequency (Hz)		—
M.3.1.2	Voltage (V)		—
M.3.1.3	Cadence; time (s), voltage (V)		—
M.3.1.4	Single fault current (mA)		—
M.3.2	Tripping device and monitoring voltage		N/A
M.3.2.1	Conditions for use of a tripping device or a monitoring voltage		N/A
M.3.2.2	Tripping device		N/A
M.3.2.3	Monitoring voltage (V)		N/A
N	ANNEX N, IMPULSE TEST GENERATORS (see 1.5.7.2, 1.5.7.3, 2.10.3.9, 6.2.2.1, 7.3.2, 7.4.3 and Clause G.5)		N/A
N.1	ITU-T impulse test generators		N/A
N.2	IEC 60065 impulse test generator		N/A
P	ANNEX P, NORMATIVE REFERENCES		—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
Q	ANNEX Q, Voltage dependent resistors (VDRs) (see 1.5.9.1)		N/A
	- Preferred climatic categories		N/A
	- Maximum continuous voltage		N/A
	- Combination pulse current		N/A
	Body of the VDR Test according to IEC60695-11-5.....		N/A
	Body of the VDR. Flammability class of material (min V-1).....		N/A
R	ANNEX R, EXAMPLES OF REQUIREMENTS FOR QUALITY CONTROL PROGRAMMES		N/A
R.1	Minimum separation distances for unpopulated coated printed boards (see 2.10.6.2)		N/A
R.2	Reduced clearances (see 2.10.3)		N/A
S	ANNEX S, PROCEDURE FOR IMPULSE TESTING (see 6.2.2.3)		N/A
S.1	Test equipment		N/A
S.2	Test procedure		N/A
S.3	Examples of waveforms during impulse testing		N/A
T	ANNEX T, GUIDANCE ON PROTECTION AGAINST INGRESS OF WATER (see 1.1.2)		N/A
			—
U	ANNEX U, INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION (see 2.10.5.4)		N/A
			—
V	ANNEX V, AC POWER DISTRIBUTION SYSTEMS (see 1.6.1)		N/A
V.1	Introduction		N/A
V.2	TN power distribution systems		N/A
W	ANNEX W, SUMMATION OF TOUCH CURRENTS		N/A
W.1	Touch current from electronic circuits		N/A
W.1.1	Floating circuits		N/A
W.1.2	Earthed circuits		N/A
W.2	Interconnection of several equipments		N/A
W.2.1	Isolation		N/A
W.2.2	Common return, isolated from earth		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
W.2.3	Common return, connected to protective earth		N/A
X	ANNEX X, MAXIMUM HEATING EFFECT IN TRANSFORMER TESTS (see clause C.1)		N/A
X.1	Determination of maximum input current		N/A
X.2	Overload test procedure		N/A
Y	ANNEX Y, ULTRAVIOLET LIGHT CONDITIONING TEST (see 4.3.13.3)		N/A
Y.1	Test apparatus		N/A
Y.2	Mounting of test samples		N/A
Y.3	Carbon-arc light-exposure apparatus		N/A
Y.4	Xenon-arc light exposure apparatus		N/A
Z	ANNEX Z, OVERVOLTAGE CATEGORIES (see 2.10.3.2 and Clause G.2)		N/A
AA	ANNEX AA, MANDREL TEST (see 2.10.5.8)		N/A
BB	ANNEX BB, CHANGES IN THE SECOND EDITION		—
CC	ANNEX CC, Evaluation of integrated circuit (IC) current limiters		N/A
CC.1	General		N/A
CC.2	Test program 1.....		N/A
CC.3	Test program 2.....		N/A
CC.4	Test program 3.....		N/A
CC.5	Compliance.....		N/A
DD	ANNEX DD, Requirements for the mounting means of rack-mounted equipment		N/A
DD.1	General		N/A
DD.2	Mechanical strength test, variable N.....		N/A
DD.3	Mechanical strength test, 250N, including end stops.....		N/A
DD.4	Compliance.....		N/A
EE	ANNEX EE, Household and home/office document/media shredders		N/A
EE.1	General		N/A
EE.2	Markings and instructions		N/A
	Use of markings or symbols.....		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Information of user instructions, maintenance and/or servicing instructions.....:		N/A
EE.3	Inadvertent reactivation test.....:		N/A
EE.4	Disconnection of power to hazardous moving parts:		N/A
	Use of markings or symbols.....:		N/A
EE.5	Protection against hazardous moving parts		N/A
	Test with test finger (Figure 2A)		N/A
	Test with wedge probe (Figure EE1 and EE2)		N/A

1.5.1	TABLE: Opto Electronic Devices	N/A
Manufacturer		
Type		
Separately tested		
Bridging insulation		
External creepage distance.....		
Internal creepage distance.....		
Distance through insulation.....		
Tested under the following conditions.....		
Input		
Output		
supplementary information		

1.6.2	TABLE: electrical data (in normal conditions)					N/A
fuse #	I _{rated} (A)	U (V / Hz)	P (W)	I (A)	I _{fuse} (A)	condition/status
Supplementary information:						

2.1.1.5 c1)	TABLE: max. V, A, VA test				N/A
Voltage (rated) (V)	Current (rated) (A)	Voltage (max.) (V)	Current (max.) (A)	VA (max.) (VA)	
supplementary information:					

2.1.1.7	Capacitance discharge test		P
Condition	τ measured (s)	Comments	
For model AT6002 series, set 1			
Vin=85V	172ms	Vp=120 V, 37%Vp=44.4V	
Vin=265V	404ms	Vp=380 V, 37%Vp=140.6V	
For model AT6002 series, set 2			
Vin=85V	168ms	Vp=120 V, 37%Vp=44.4V	
Vin=265V	410ms	Vp=380 V, 37%Vp=140.6V	
For model AT6002 series, set 3			
Vin=85V	177ms	Vp=120 V, 37%Vp=44.4V	
Vin=265V	408ms	Vp=380 V, 37%Vp=140.6V	
Test without load, total capacitance=3.0μF, total resistance=15Kohm. 4V after 2 sec. for all sets.			

2.1.1.7	Capacitance discharge test	P
Condition	τ measured (s)	Comments
For model AT6002 series, set 1		
Vin=85V	88ms	Vp=120 V, 37%Vp=44.4V
Vin=265V	90ms	Vp=380 V, 37%Vp=140.6V
For model AT6002 series, set 2		
Vin=85V	90ms	Vp=120 V, 37%Vp=44.4V
Vin=265V	92ms	Vp=380 V, 37%Vp=140.6V
For model AT6002 series, set 3		
Vin=85V	89ms	Vp=120 V, 37%Vp=44.4V
Vin=265V	93ms	Vp=380 V, 37%Vp=140.6V
Test without load, total capacitance=0.1 μ F, total resistance=40Kohm. 0V after 2 sec. for all sets.		

2.1.1.7	Capacitance discharge test	P
Condition	τ measured (s)	Comments
For model AT1688 series; AT6001 series, set 1		
Vin=85V	192ms	Vp=120 V, 37%Vp=44.4V
Vin=265V	440ms	Vp=380 V, 37%Vp=140.6V
For model AT1688 series; AT6001 series, set 2		
Vin=85V	195ms	Vp=120 V, 37%Vp=44.4V
Vin=265V	436ms	Vp=380 V, 37%Vp=140.6V
For model AT1688 series; AT6001 series, set 3		
Vin=85V	199ms	Vp=120 V, 37%Vp=44.4V
0in=265V	444ms	Vp=380 V, 37%Vp=140.6V
Test without load, total capacitance=3.0 μ F, total resistance=15Kohm. 4V after 2 sec. for all sets.		

2.1.1.7	Capacitance discharge test		P
Condition	τ measured (s)	Comments	
For model AT1688 series; AT6001 series, set 1			
Vin=85V	104ms	Vp=120 V, 37%Vp=44.4V	
Vin=265V	100ms	Vp=380 V, 37%Vp=140.6V	
For model AT1688 series; AT6001 series, set 2			
Vin=85V	110ms	Vp=120 V, 37%Vp=44.4V	
Vin=265V	103ms	Vp=380 V, 37%Vp=140.6V	
For model AT1688 series; AT6001 series, set 3			
Vin=85V	98ms	Vp=120 V, 37%Vp=44.4V	
Vin=265V	103ms	Vp=380 V, 37%Vp=140.6V	
Test without load, total capacitance=0.1μF, total resistance=40Kohm. 4V after 2 sec. for all sets.			

2.2	TABLE: evaluation of voltage limiting components in SELV circuits			N/A
Component (measured between)		max. voltage (V) (normal operation)		Voltage Limiting Components
		V peak	V d.c.	
Fault test performed on voltage limiting components		Voltage measured (V) in SELV circuits (V peak or V d.c.)		
supplementary information: s-c=short circuit.				

2.4.2	TABLE: limited current circuit measurement			N/A
Location	Voltage (V)	Current (mA)	Freq. (KHz)	Limit (mA)
supplementary information:				

2.5	TABLE: limited power sources	N/A
Circuit output tested:		
Measured Uoc (V) with all load circuits disconnected:		See below
	I _{sc} (A)	
	Meas.	Limit
	VA	
	Meas.	Limit
supplementary information:		

2.10.2	Table: working voltage measurement			N/A
Location		Peak voltage (V)	RMS voltage (V)	Comments
Supplementary information:				

2.10.3 and 2.10.4	TABLE: Clearance and creepage distance measurements						N/A
Clearance (cl) and creepage distance (cr) at/of/between:		U peak (V)	U r.m.s. (V)	Required cl (mm) *)	cl (mm)	Required cr (mm)	cr (mm)
Supplementary information:							

2.10.5	TABLE: distance through insulation measurements				N/A
distance through insulation di at/of:		Up (V)	test voltage (V)	required di (mm)	di (mm)
Supplementary information:					

4.5	TABLE: maximum temperatures					N/A
	test voltage (V) :					—
maximum temperature T of part/at:		T (°C)				allowed Tmax (°C)
supplementary information:						

4.5.5	TABLE: Ball pressure test of thermoplastic parts			N/A
	Allowed impression diameter (mm) : ≤ 2 mm			—
Part			Test temperature (°C)	Impression diameter (mm)
Supplementary information:				

4.7	TABLE: Resistance to fire					N/A
Part	Manufacturer of material	Type of material	Thickness (mm)	Flammability class	Evidence	
Supplementary information:						

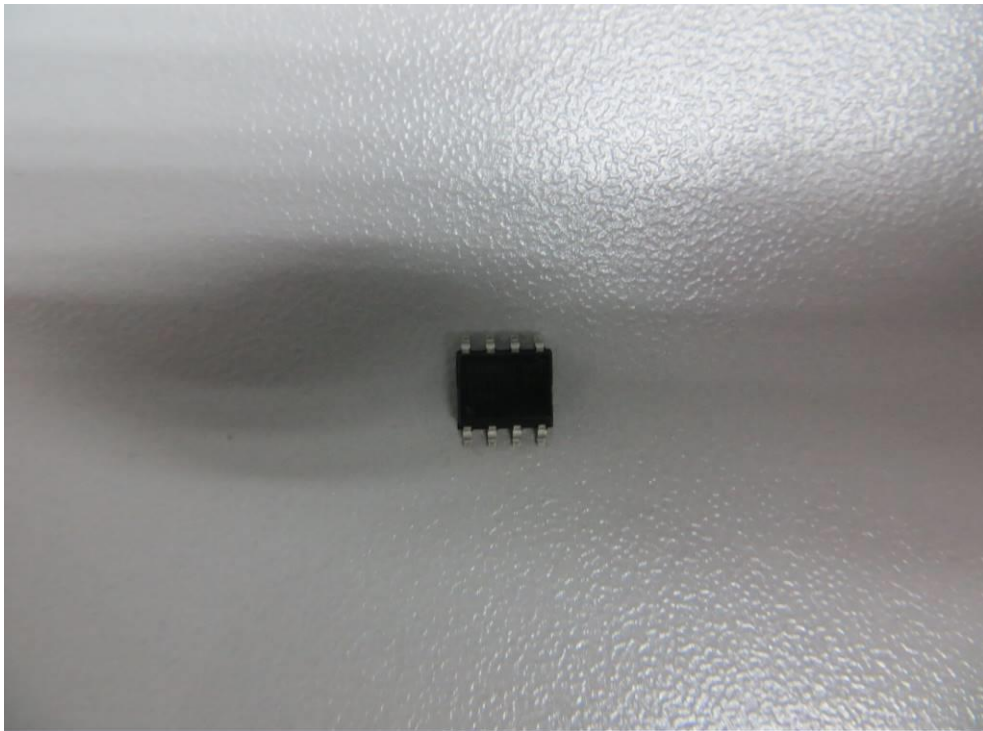
5.1	TABLE: touch current measurement			N/A
Measured between:		Measured (mA)	Limit (mA)	Comments/conditions
supplementary information:				

5.2	TABLE: Electric strength tests, impulse tests and voltage surge tests			N/A
Test voltage applied between:		Voltage shape (AC, DC, impulse, surge)	Test voltage (V)	Breakdown Yes / No
Supplementary information:				

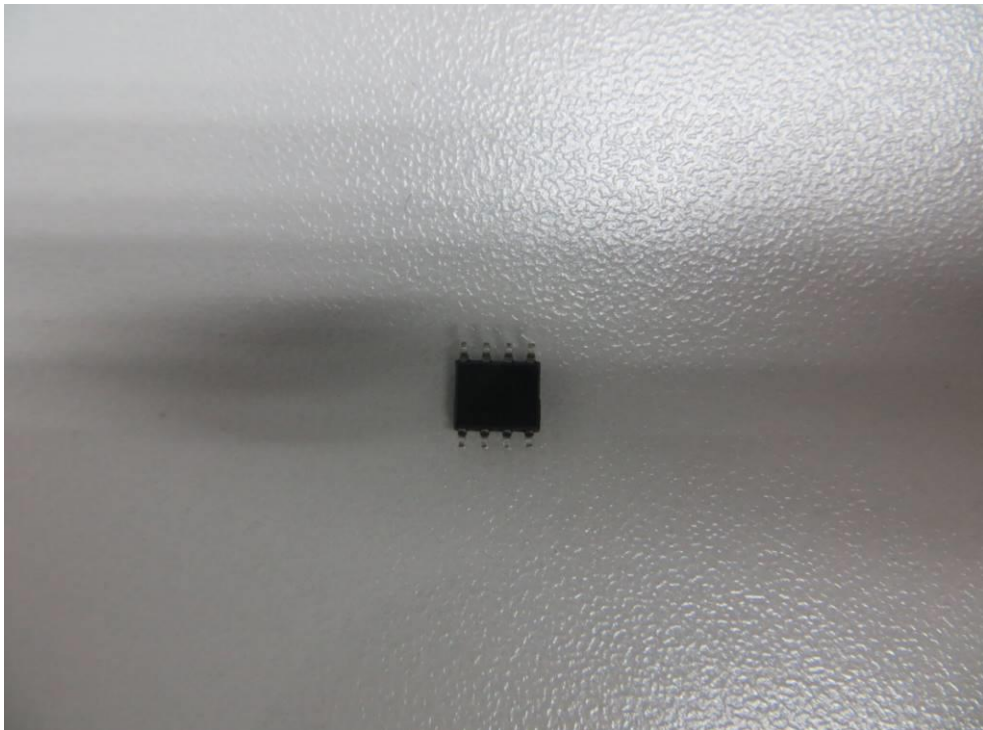
5.3	TABLE: Fault condition tests					P
	Ambient temperature (°C) :					—
	Power source for EUT: Manufacturer, model/type, output rating :					—
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
Supplementary information:						
Refer to clause 5.3.7.						

C.2		TABLE: transformer						N/A	
Loc.	Tested insulation	Working voltage peak / V (2.10.2)	Working voltage rms / V (2.10.2)	Required electric strength (5.2)	Required clearance / mm (2.10.3)	Required creepage distance / mm (2.10.4)	Required distance thr. insul. (2.10.5)		
Loc.	Tested insulation			Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers		
supplementary information:									

Photos

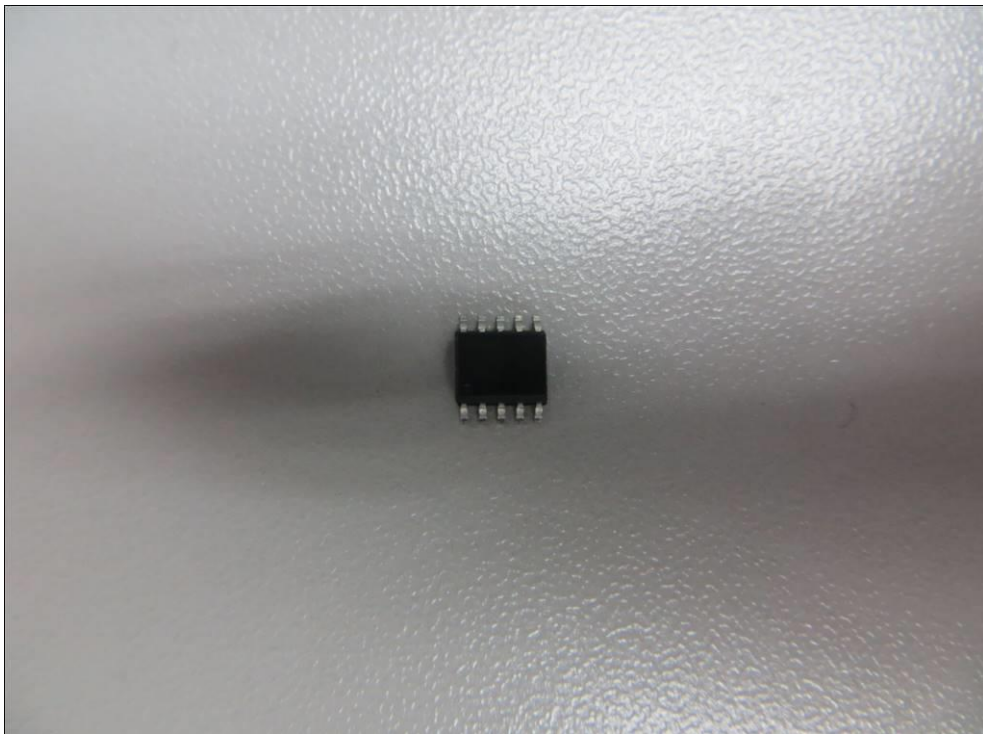


AT6002 series

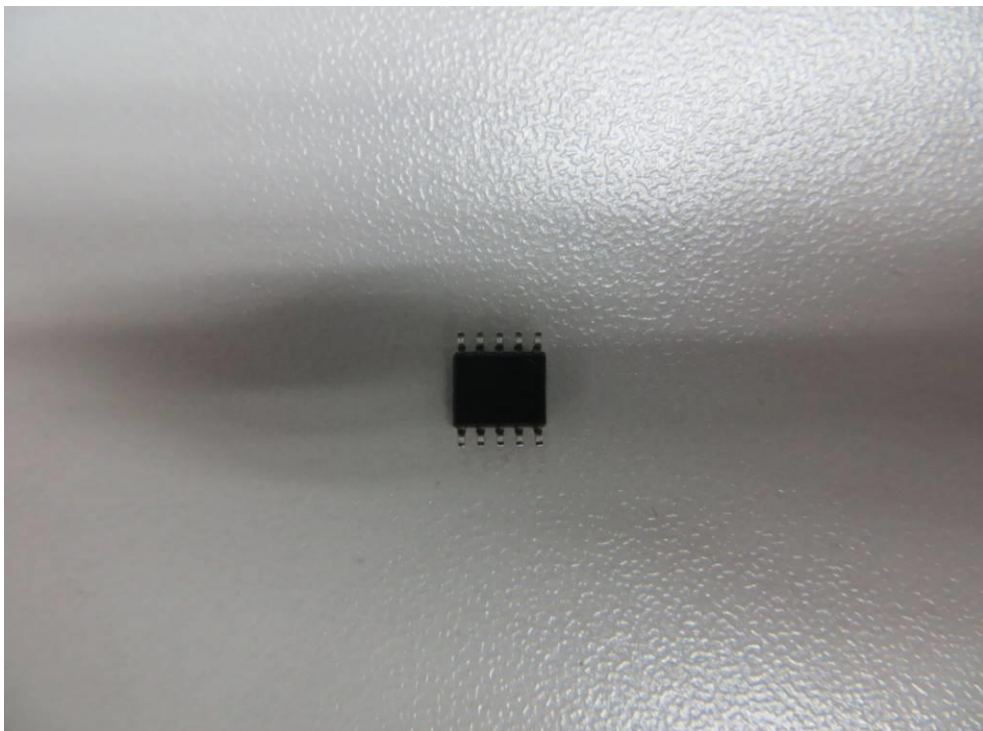


AT6002 series

Photos

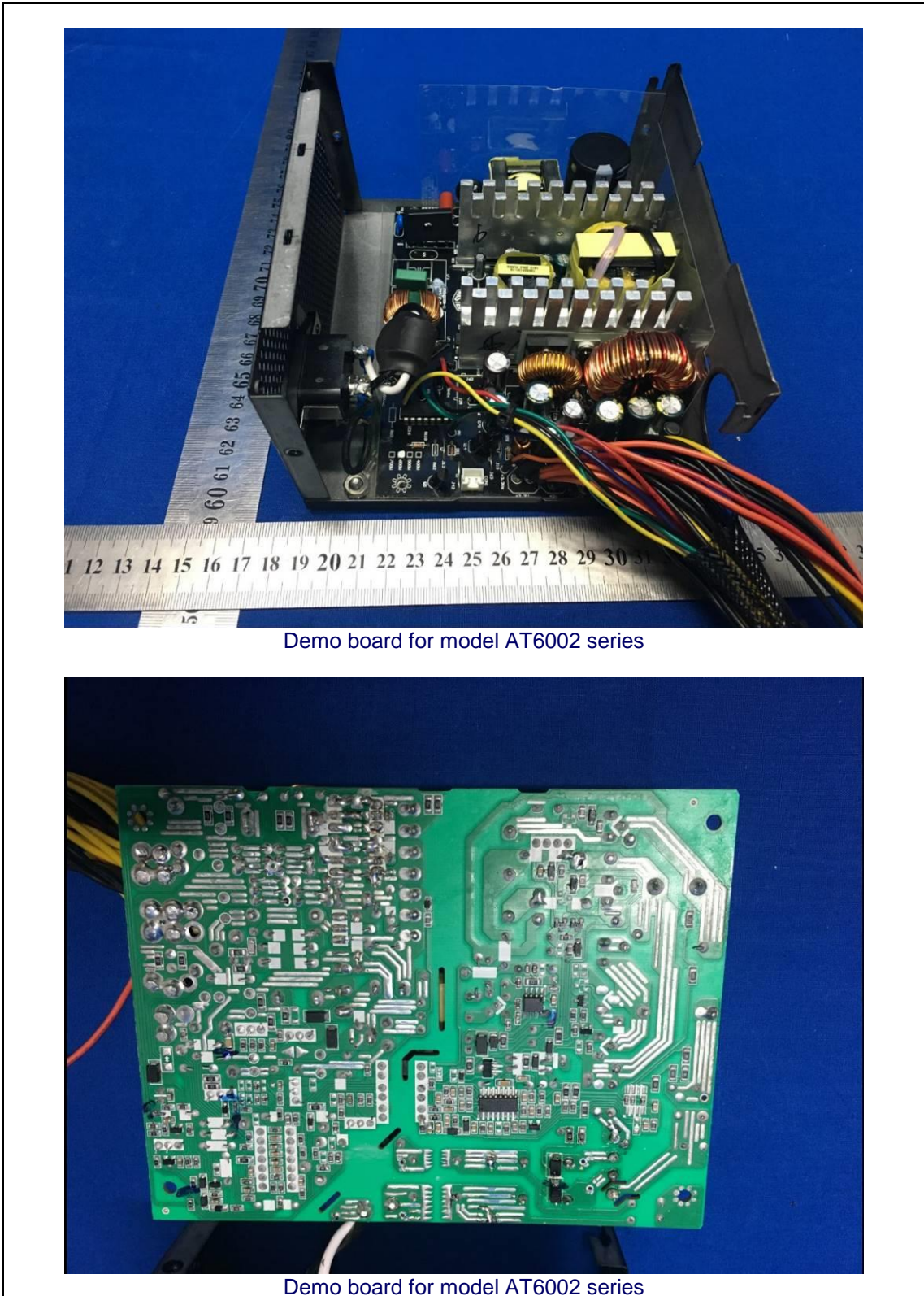


AT1688 series; AT6001 series

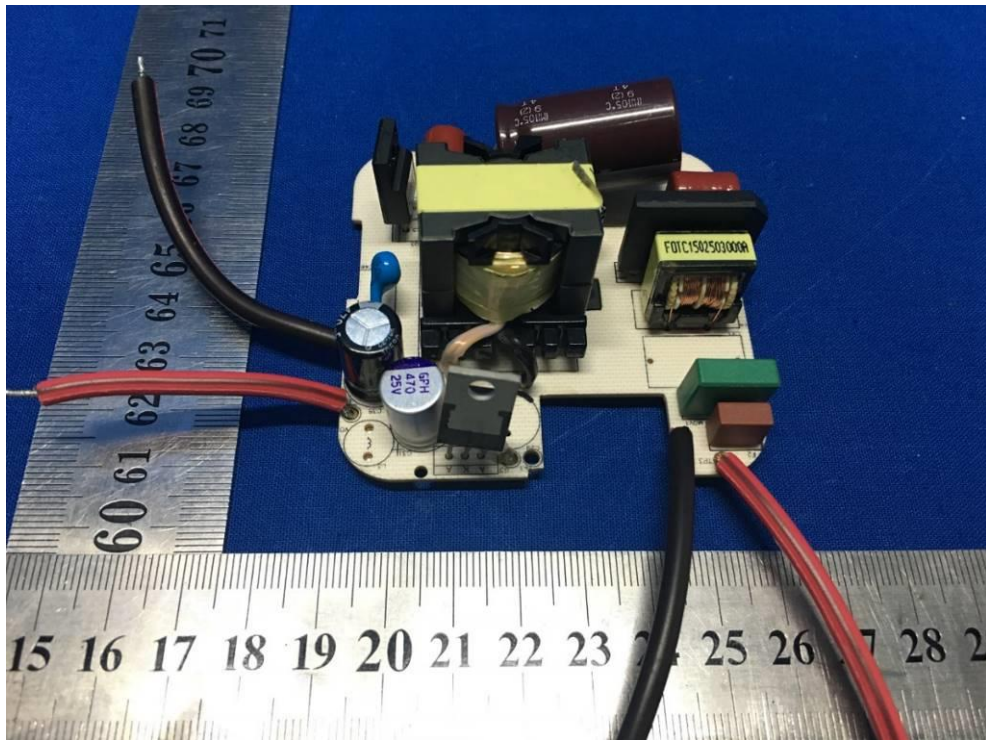


AT1688 series; AT6001 series

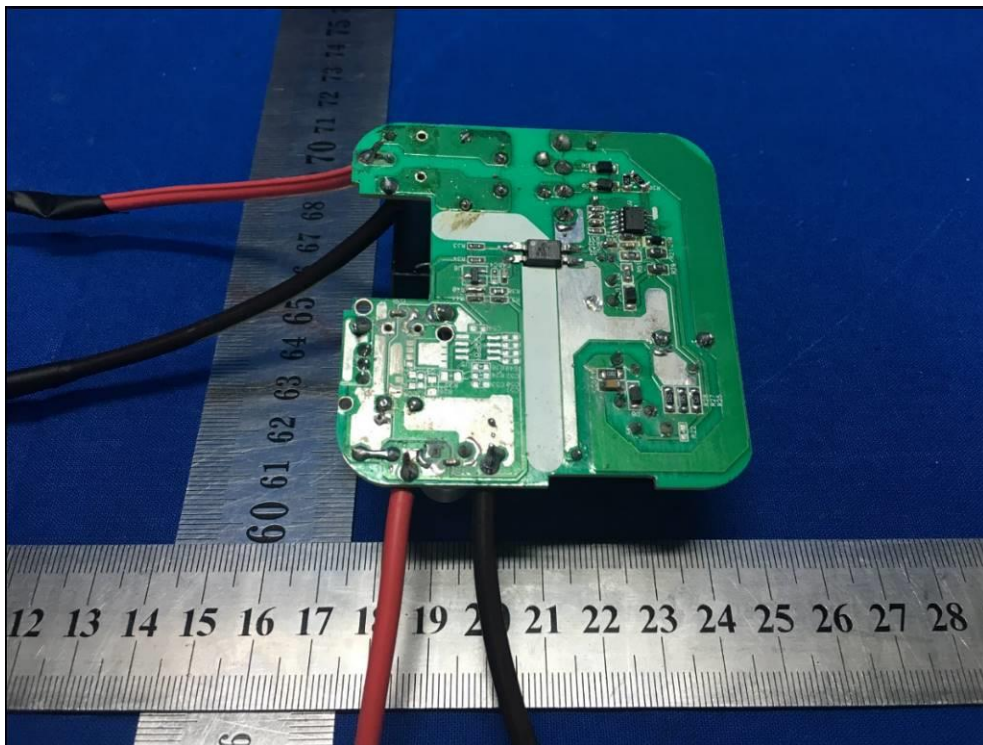
Photos



Photos



Demo board for model AT1688 series; AT6001 series



Demo board for model AT1688 series; AT6001 series

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

<p align="center">ATTACHMENT TO TEST REPORT IEC 60950-1 EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES Information technology equipment – Safety –</p>			
PART 1: GENERAL REQUIREMENTS			
Differences according to: EN 60950-1:2006/A11:2009/A1:2010/A12:2011/A2:2013			
Attachment Form No.: EU_GD_IEC60950_1E			
Attachment Originator: SGS Fimko Ltd			
Master Attachment: Date 2014-02			
Copyright © 2014 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved.			

EN 60950-1:2006/A11:2009/A1:2010/A12:2011/A2:2013 – CENELEC COMMON MODIFICATIONS


IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	Clauses, subclauses, notes, tables and figures which are additional to those in IEC60950-1 and it's amendmets are prefixed "Z"		
Contents	Add the following annexes:		P
	Annex ZA (normative) Normative references to international publications with their corresponding European publications		
(A2:2013)	Annex ZB (normative) Special national conditions		
	Annex ZD (informative) IEC and CENELEC code designations for flexible cords		
General	Delete all the "country" notes in the reference document (IEC 60950-1:2005) according to the following list:		P
	1.4.8 Note 2 1.5.1 Note 2 & 3 1.5.7.1 Note 1.5.8 Note 2 1.5.9.4 Note 1.7.2.1 Note 4, 5 & 6 2.2.3 Note 2.2.4 Note 2.3.2 Note 2.3.2.1 Note 2 2.3.4 Note 2 2.6.3.3 Note 2 & 3 2.7.1 Note 2.10.3.2 Note 2 2.10.5.13 Note 3 3.2.1.1 Note 3.2.4 Note 3. 2.5.1 Note 2 4.3.6 Note 1 & 2 4.7 Note 4 4.7.2.2 Note 4.7.3.1 Note 2 5.1.7.1 Note 3 & 4 5.3.7 Note 1 6 Note 2 & 5 6.1.2.1 Note 2 6.1.2.2 Note 6.2.2 Note 6.2.2.1 Note 2 6.2.2.2 Note 7.1 Note 3 7.2 Note 7.3 Note 1 & 2 G.2.1 Note 2 Annex H Note 2		
General (A1:2010)	Delete all the "country" notes in the reference document (IEC 60950-1:2005/A1:2010) according to the following list:		P
	1.5.7.1 Note 6.1.2.1 Note 2 6.2.2.1 Note 2 EE.3 Note		
General (A2:2013)	Delete all the "country" notes in the reference document (IEC 60950-1:2005/A2:2013) according to the following list:		
	2.7.1 Note * 2.10.3.1 Note 2 6.2.2. Note		
* Note of secretary: Text of Common Modification remains unchanged.			

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
1.3.Z1	<p>Add the following subclause:</p> <p>1.3.Z1 Exposure to excessive sound pressure</p> <p>The apparatus shall be so designed and constructed as to present no danger when used for its intended purpose, either in normal operating conditions or under fault conditions, particularly providing protection against exposure to excessive sound pressures from headphones or earphones.</p> <p>NOTE Z1 A new method of measurement is described in EN 50332-1, Sound system equipment: Headphones and earphones associated with portable audio equipment - Maximum sound pressure level measurement methodology and limit considerations - Part 1: General method for "one package equipment", and in EN 50332-2, Sound system equipment: Headphones and earphones associated with portable audio equipment - Maximum sound pressure level measurement methodology and limit considerations - Part 2: Guidelines to associate sets with headphones coming from different manufacturers.</p>	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
(A12:2011)	<p>In EN 60950-1:2006/A12:2011</p> <p>Delete the addition of 1.3.Z1 / EN 60950-1:2006</p> <p>Delete the definition 1.2.3.Z1 / EN 60950-1:2006 /A1:2010</p>		N/A
1.5.1 (Added info*)	<p>Add the following NOTE:</p> <p>NOTE Z1 The use of certain substances in electrical and electronic equipment is restricted within the EU: see Directive 2002/95/EC.</p> <p>New Directive 2011/65/11 *</p>	Considered.	P
1.7.2.1 (A1:2010)	In addition, for a PORTABLE SOUND SYSTEM, the instructions shall include a warning that excessive sound pressure from earphones and headphones can cause hearing loss.	Not a portable sound system.	N/A
1.7.2.1 (A12.2011)	<p>In EN 60950-1:2006/A12:2011</p> <p>Delete NOTE Z1 and the addition for Portable Sound System.</p> <p>Add the following clause and annex to the existing standard and amendments.</p>	Not a portable sound system.	N/A
	Zx Protection against excessive sound pressure from personal music players		N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Zx.1 General</p> <p>This sub-clause specifies requirements for protection against excessive sound pressure from personal music players that are closely coupled to the ear. It also specifies requirements for earphones and headphones intended for use with personal music players.</p> <p>A personal music player is a portable equipment for personal use, that:</p> <ul style="list-style-type: none"> – is designed to allow the user to listen to recorded or broadcast sound or video; and – primarily uses headphones or earphones that can be worn in or on or around the ears; and – allows the user to walk around while in use. <p>NOTE 1 Examples are hand-held or body-worn portable CD players, MP3 audio players, mobile phones with MP3 type features, PDA's or similar equipment.</p> <p>A personal music player and earphones or headphones intended to be used with personal music players shall comply with the requirements of this sub-clause.</p> <p>The requirements in this sub-clause are valid for music or video mode only.</p> <p>The requirements do not apply:</p> <ul style="list-style-type: none"> – while the personal music player is connected to an external amplifier; or – while the headphones or earphones are not used. <p>NOTE 2 An external amplifier is an amplifier which is not part of the personal music player or the listening device, but which is intended to play the music as a standalone music player.</p> <p>The requirements do not apply to:</p> <ul style="list-style-type: none"> – hearing aid equipment and professional equipment; <p>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.</p>		N/A
	<ul style="list-style-type: none"> – analogue personal music players (personal music players without any kind of digital processing of the sound signal) that are brought to the market before the end of 2015. <p>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.</p> <p>For equipment which is clearly designed or intended for use by young children, the limits of EN 71-1 apply.</p>		N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Zx.2 Equipment requirements</p> <p>No safety provision is required for equipment that complies with the following:</p> <ul style="list-style-type: none"> – equipment provided as a package (personal music player with its listening device), where the acoustic output $L_{Aeq,T}$ is ≤ 85 dBA measured while playing the fixed “programme simulation noise” as described in EN 50332-1; and – a personal music player provided with an analogue electrical output socket for a listening device, where the electrical output is ≤ 27 mV measured as described in EN 50332-2, while playing the fixed “programme simulation noise” as described in EN 50332-1. <p>NOTE 1 Wherever the term acoustic output is used in this clause, the 30 s A-weighted equivalent sound pressure level $L_{Aeq,T}$ is meant. See also Zx.5 and Annex Zx.</p> <p>All other equipment shall:</p> <ul style="list-style-type: none"> a) protect the user from unintentional acoustic outputs exceeding those mentioned above; and b) have a standard acoustic output level not exceeding those mentioned above, and automatically return to an output level not exceeding those mentioned above when the power is switched off; and 		N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>c) provide a means to actively inform the user of the increased sound pressure when the equipment is operated with an acoustic output exceeding those mentioned above. Any means used shall be acknowledged by the user before activating a mode of operation which allows for an acoustic output exceeding those mentioned above. The acknowledgement does not need to be repeated more than once every 20 h of cumulative listening time; and</p> <p>NOTE 2 Examples of means include visual or audible signals. Action from the user is always required.</p> <p>NOTE 3 The 20 h listening time is the accumulative listening time, independent how often and how long the personal music player has been switched off.</p> <p>d) have a warning as specified in Zx.3; and</p> <p>e) not exceed the following:</p> <ol style="list-style-type: none"> 1) equipment provided as a package (player with its listening device), the acoustic output shall be ≤ 100 dBA measured while playing the fixed "programme simulation noise" described in EN 50332-1; and 2) a personal music player provided with an analogue electrical output socket for a listening device, the electrical output shall be ≤ 150 mV measured as described in EN 50332-2, while playing the fixed "programme simulation noise" described in EN 50332-1. <p>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, the warning does not need to be given as long as the average sound pressure of the song is below the basic limit of 85 dBA. In this case T becomes the duration of the song.</p> <p>NOTE 4 Classical music 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 song 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 is below the basic limit of 85 dBA.</p> <p>For example, if the player is set with the programme simulation noise to 85 dBA, but the average music level of the song is only 65 dBA, 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 dBA.</p>		N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Zx.3 Warning</p> <p>The warning shall be placed on the equipment, or on the packaging, or in the instruction manual and shall consist of the following:</p> <ul style="list-style-type: none"> – the symbol of Figure 1 with a minimum height of 5 mm; and – the following wording, or similar: <p>“To prevent possible hearing damage, do not listen at high volume levels for long periods.”</p>  <p>Figure 1 – Warning label (IEC 60417-6044)</p> <p>Alternatively, the entire warning may be given through the equipment display during use, when the user is asked to acknowledge activation of the higher level.</p>		N/A
	Zx.4 Requirements for listening devices (headphones and earphones)		
	<p>Zx.4.1 Wired listening devices with analogue input</p> <p>With 94 dBA sound pressure output $L_{Aeq,T}$, the input voltage of the fixed “programme simulation noise” described in EN 50332-2 shall be ≥ 75 mV.</p> <p>This requirement is applicable in any mode where the headphones can operate (active or passive), including any available setting (for example built-in volume level control).</p> <p>NOTE The values of 94 dBA – 75 mV correspond with 85dBA – 27 mV and 100 dBA – 150 mV.</p>		N/A
	<p>Zx.4.2 Wired listening devices with digital input</p> <p>With any playing device playing the fixed “programme simulation noise” described in EN 50332-1 (and respecting the digital interface standards, where a digital interface standard exists that specifies the equivalent acoustic level), the acoustic output $L_{Aeq,T}$ of the listening device shall be ≤ 100 dBA.</p> <p>This requirement is applicable in any mode where the headphones can operate, including any available setting (for example built-in volume level control, additional sound feature like equalization, etc.).</p> <p>NOTE An example of a wired listening device with digital input is a USB headphone.</p>		N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Zx.4.3 Wireless listening devices</p> <p>In wireless mode:</p> <ul style="list-style-type: none"> – with any playing and transmitting device playing the fixed programme simulation noise described in EN 50332-1; and – respecting the wireless transmission standards, where an air interface standard exists that specifies the equivalent acoustic level; and – with volume and sound settings in the listening device (for example built-in volume level control, additional sound feature like equalization, etc.) set to the combination of positions that maximize the measured acoustic output for the abovementioned programme simulation noise, the acoustic output $L_{Aeq,T}$ of the listening device shall be ≤ 100 dBA. <p>NOTE An example of a wireless listening device is a Bluetooth headphone.</p>		N/A
	<p>Zx.5 Measurement methods</p> <p>Measurements shall be made in accordance with EN 50332-1 or EN 50332-2 as applicable. Unless stated otherwise, the time interval T shall be 30 s.</p> <p>NOTE Test method for wireless equipment provided without listening device should be defined.</p>	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A
2.7.1	<p>Replace the subclause as follows:</p> <p>Basic requirements</p> <p>To protect against excessive current, short-circuits and earth faults in PRIMARY CIRCUITS, 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):</p> <p>a) except as detailed in b) and c), protective devices necessary to comply with the requirements of 5.3 shall be included as parts of the equipment;</p> <p>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;</p>	The equipment is an integrated circuit (IC) including a capacitor discharge function for building-in, must be considered when installed in the end product.	N/A

IEC60950_1F - ATTACHMENT									
Clause	Requirement + Test	Result - Remark	Verdict						
	<p>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.</p> <p>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.</p>		N/A						
2.7.2	This subclause has been declared 'void'.	Must be considered when installed in the end product.	N/A						
3.2.3	Delete the NOTE in Table 3A, and delete also in this table the conduit sizes in parentheses.	The equipment is not intended for permanent connection to the mains.	N/A						
3.2.5.1	<p>Replace "60245 IEC 53" by "H05 RR-F"; "60227 IEC 52" by "H03 VV-F or H03 VVH2-F"; "60227 IEC 53" by "H05 VV-F or H05 VVH2-F2".</p> <p>In Table 3B, replace the first four lines by the following:</p> <table><tr><td>Up to and including 6 </td><td>0,75 ^{a)} </td></tr><tr><td>Over 6 up to and including 10 (0,75) ^{b)}</td><td>1,0 </td></tr><tr><td>Over 10 up to and including 16 (1,0) ^{c)}</td><td>1,5 </td></tr></table> <p>In the conditions applicable to Table 3B delete the words "in some countries" in condition ^{a)}.</p> <p>In NOTE 1, applicable to Table 3B, delete the second sentence.</p>	Up to and including 6	0,75 ^{a)}	Over 6 up to and including 10 (0,75) ^{b)}	1,0	Over 10 up to and including 16 (1,0) ^{c)}	1,5	Must be considered when installed in the end product.	N/A
Up to and including 6	0,75 ^{a)}								
Over 6 up to and including 10 (0,75) ^{b)}	1,0								
Over 10 up to and including 16 (1,0) ^{c)}	1,5								
3.2.5.1 (A2:2013)	NOTE Z1 The harmonised code designations corresponding to the IEC cord types are given in Annex ZD		N/A						
3.3.4	<p>In Table 3D, delete the fourth line: conductor sizes for 10 to 13 A, and replace with the following:</p> <table><tr><td>Over 10 up to and including 16 </td><td>1,5 to 2,5 </td><td>1,5 to 4 </td></tr></table> <p>Delete the fifth line: conductor sizes for 13 to 16 A</p>	Over 10 up to and including 16	1,5 to 2,5	1,5 to 4	Must be considered when installed in the end product.	N/A			
Over 10 up to and including 16	1,5 to 2,5	1,5 to 4							
4.3.13.6 (A1:2010)	<p>Replace the existing NOTE by the following:</p> <p>NOTE Z1 Attention is drawn to:</p> <p>1999/519/EC: Council Recommendation on the limitation of exposure of the general public to electromagnetic fields 0 Hz to 300 GHz, and</p> <p>2006/25/EC: Directive on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation).</p>	Not applicable.	N/A						

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	Standards taking into account mentioned Recommendation and Directive which demonstrate compliance with the applicable EU Directive are indicated in the OJEC.		N/A
Annex H	<p>Replace the last paragraph of this annex by:</p> <p>At any point 10 cm from the surface of the OPERATOR ACCESS AREA, the dose rate shall not exceed 1 μSv/h (0,1 mR/h) (see NOTE). Account is taken of the background level.</p> <p>Replace the notes as follows:</p> <p>NOTE These values appear in Directive 96/29/Euratom.</p> <p>Delete NOTE 2.</p>	The unit does not emit X-ray radiation.	N/A
Bibliography	Additional EN standards.		—
ZA	NORMATIVE REFERENCES TO INTERNATIONAL PUBLICATIONS WITH THEIR CORRESPONDING EUROPEAN PUBLICATIONS		—

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ZB ANNEX (normative) SPECIAL NATIONAL CONDITIONS (EN)			
Clause	Requirement + Test	Result - Remark	Verdict
1.2.4.1	In Denmark , certain types of Class I appliances (see 3.2.1.1) may be provided with a plug not establishing earthing conditions when inserted into Danish socket-outlets.	Must be considered when installed in the end product.	N/A
1.2.13.14 (A11:2009)	In Norway and Sweden , for requirements see 1.7.2.1 and 7.3 of this annex.	Not connected to cable distribution system.	N/A
1.5.7.1 (A11:2009)	In Finland , Norway and Sweden , resistors bridging BASIC INSULATION in CLASS I PLUGGABLE EQUIPMENT TYPE A must comply with the requirements in 1.5.7.1. In addition when a single resistor is used, the resistor must withstand the resistor test in 1.5.7.2.	No such parts.	N/A
1.5.8	In Norway , due to the IT power system used (see annex V, Figure V.7), capacitors are required to be rated for the applicable line-to-line voltage (230 V).	No such parts	N/A
1.5.9.4	In Finland , Norway and Sweden , the third dashed sentence is applicable only to equipment as defined in 6.1.2.2 of this annex.	No such VDR used.	N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ZB ANNEX (normative) SPECIAL NATIONAL CONDITIONS (EN)			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.2.1	<p>In Finland, Norway and Sweden, CLASS I PLUGGABLE EQUIPMENT TYPE A intended for connection to other equipment or a network shall, if safety relies on connection to protective earth or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment must be connected to an earthed mains socket-outlet.</p> <p>The marking text in the applicable countries shall be as follows:</p> <p>In Finland: "Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan"</p> <p>In Norway: "Apparatet må tilkoples jordet stikkontakt"</p> <p>In Sweden: "Apparaten skall anslutas till jordat uttag"</p>	Must be considered when installed in the end product.	N/A
1.7.2.1 (A11:2009)	<p>In Norway and Sweden, the screen of the cable 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 need to be isolated from the screen of a cable distribution system.</p> <p>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 e.g. a retailer.</p> <p>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:</p> <p>"Equipment connected to the protective earthing of the building installation through the mains connection or through other equipment with a connection to protective earthing – and to a cable distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a cable distribution system has therefore to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11)."</p>		

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ZB ANNEX (normative) SPECIAL NATIONAL CONDITIONS (EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>NOTE In Norway, due to regulation for installations of cable distribution systems, 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.</p> <p>Translation to Norwegian (the Swedish text will also be accepted in Norway):</p> <p>“Utstyr som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplet utstyr – og er tilkoplet et kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkopling av utstyret til kabel-TV nettet installeres en galvanisk isolator mellom utstyret og kabel- TV nettet.”</p> <p>Translation to Swedish:</p> <p>”Utrustning 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 utrustningen till kabel-TV nät galvanisk isolator finnas mellan utrustningen och kabel-TV nätet.”</p>		
1.7.2.1 (A2:2013)	<p>In Denmark, CLASS I PLUGGABLE EQUIPMENT TYPE A intended for connection to other equipment or a network shall, if safety relies on connection to protective earth or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment must be connected to an earthed mains socket-outlet.</p> <p>The marking text in Denmark shall be as follows: In Denmark: “Apparatets stikprop skal tilsluttes en stikkontakt med jord, som giver forbindelse til stikproppens jord.”</p>		N/A
1.7.5	<p>In Denmark, socket-outlets for providing power to other equipment shall be in accordance with the Heavy Current Regulations, Section 107-2-D1, Standard Sheet DK 1-3a, DK 1-5a or DK 1-7a, when used on Class I equipment. For STATIONARY EQUIPMENT the socket-outlet shall be in accordance with Standard Sheet DK 1-1b or DK 1-5a.</p>	No socket-outlets provided.	N/A
1.7.5 (A11:2009)	<p>For CLASS II EQUIPMENT the socket outlet shall be in accordance with Standard Sheet DKA 1-4a.</p>		

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ZB ANNEX (normative) SPECIAL NATIONAL CONDITIONS (EN)			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.5 (A2:2013)	<p>In Denmark, socket-outlets for providing power to other equipment shall be in accordance with the DS 60884-2-D1:2011.</p> <p>For class I equipment the following Standard Sheets are applicable: DK 1-3a, DK 1-1c, DK 1-1d, DK 1-5a or DK 1-7a, with the exception for STATIONARY EQUIPMENT where the socket-outlets shall be in accordance with Standard Sheet DK 1-1b, DK 1-1c, DK 1-1d or DK 1-5a.</p> <p>Socket outlets intended for providing power to Class II apparatus with a rated current of 2,5 A shall be in accordance with DS 60884-2-D1 standard sheet DKA 1-4a. Other current rating socket outlets shall be in compliance with by DS 60884-2-D1 Standard Sheet DKA 1-3a or DKA 1-3b.</p> <p>Justification the Heavy Current Regulations, 6c</p>		N/A
2.2.4	In Norway , for requirements see 1.7.2.1, 6.1.2.1 and 6.1.2.2 of this annex.	No TNV circuits.	N/A
2.3.2	In Finland , Norway and Sweden there are additional requirements for the insulation. See 6.1.2.1 and 6.1.2.2 of this annex.	No TNV circuits.	N/A
2.3.4	In Norway , for requirements see 1.7.2.1, 6.1.2.1 and 6.1.2.2 of this annex.	No TNV circuits.	N/A
2.6.3.3	In the United Kingdom , the current rating of the circuit shall be taken as 13 A, not 16 A.	Must be considered when installed in the end product.	N/A
2.7.1	In the United Kingdom , to protect against excessive currents and short-circuits in the PRIMARY CIRCUIT of DIRECT PLUG-IN EQUIPMENT, tests according to 5.3 shall be conducted, using an external protective device rated 30 A or 32 A. If these tests fail, suitable protective devices shall be included as integral parts of the DIRECT PLUG-IN EQUIPMENT, so that the requirements of 5.3 are met.	Must be considered when installed in the end product.	N/A
2.10.5.13	In Finland , Norway and Sweden , there are additional requirements for the insulation, see 6.1.2.1 and 6.1.2.2 of this annex.	No TNV circuits.	N/A
3.2.1.1	<p>In Switzerland, supply cords of equipment having a RATED CURRENT not exceeding 10 A shall be provided with a plug complying with SEV 1011 or IEC 60884-1 and one of the following dimension sheets:</p> <p>SEV 6532-2.1991 Plug Type 15 3P+N+PE 250/400 V, 10 A</p>	Must be considered when installed in the end product.	N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ZB ANNEX (normative) SPECIAL NATIONAL CONDITIONS (EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>SEV 6533-2.1991 Plug Type 11 L+N 250 V, 10 A</p> <p>SEV 6534-2.1991 Plug Type 12 L+N+PE 250 V, 10 A</p> <p>In general, EN 60309 applies for plugs for currents exceeding 10 A. However, a 16 A plug and socket-outlet system is being introduced in Switzerland, the plugs of which are according to the following dimension sheets, published in February 1998: SEV 5932-2.1998: Plug Type 25 , 3L+N+PE 230/400 V, 16 A</p> <p>SEV 5933-2.1998: Plug Type 21, L+N, 250 V, 16A</p> <p>SEV 5934-2.1998: Plug Type 23, L+N+PE 250 V, 16 A</p>	Must be considered when installed in the end product.	N/A
3.2.1.1 (A2:2013)	<p>In Denmark, supply cords of single-phase equipment having a rated current not exceeding 13 A shall be provided with a plug according to DS 60884-2-D1.</p> <p>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.</p> <p>If a single-phase equipment having a RATED CURRENT exceeding 13 A or if a poly-phase 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.</p> <p>Justification the Heavy Current Regulations, 6c</p>	Must be considered when installed in the end product.	N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ZB ANNEX (normative) SPECIAL NATIONAL CONDITIONS (EN)			
Clause	Requirement + Test	Result - Remark	Verdict
3.2.1.1	<p>In Spain, supply cords of single-phase equipment having a rated current not exceeding 10 A shall be provided with a plug according to UNE 20315:1994.</p> <p>Supply cords of single-phase equipment having a rated current not exceeding 2,5 A shall be provided with a plug according to UNE-EN 50075:1993.</p> <p>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 UNE 20315:1994.</p> <p>If poly-phase equipment is provided with a supply cord with a plug, this plug shall be in accordance with UNE-EN 60309-2.</p>	Must be considered when installed in the end product.	N/A
3.2.1.1	<p>In the United Kingdom, apparatus 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 and plug, shall be fitted with a 'standard plug' in accordance with Statutory Instrument 1768:1994 - The Plugs and Sockets etc. (Safety) Regulations 1994, unless exempted by those regulations.</p> <p>NOTE 'Standard plug' is defined in SI 1768:1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.</p>	Must be considered when installed in the end product.	N/A
3.2.1.1	<p>In Ireland, apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to I.S. 411 by means of that flexible cable or cord and plug, shall be fitted with a 13 A plug in accordance with Statutory Instrument 525:1997 - National Standards Authority of Ireland (section 28) (13 A Plugs and Conversion Adaptors for Domestic Use) Regulations 1997.</p>	Must be considered when installed in the end product.	N/A
3.2.4	<p>In Switzerland, for requirements see 3.2.1.1 of this annex.</p>	Must be considered when installed in the end product.	N/A
3.2.5.1	<p>In the United Kingdom, a power supply cord with conductor of 1,25 mm² is allowed for equipment with a rated current over 10 A and up to and including 13 A.</p>	Must be considered when installed in the end product.	N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ZB ANNEX (normative) SPECIAL NATIONAL CONDITIONS (EN)			
Clause	Requirement + Test	Result - Remark	Verdict
3.3.4	<p>In the United Kingdom, the range of conductor sizes of flexible cords to be accepted by terminals for equipment with a RATED CURRENT of over 10 A up to and including 13 A is:</p> <ul style="list-style-type: none"> • 1,25 mm² to 1,5 mm² nominal cross-sectional area. 	Must be considered when installed in the end product.	N/A
4.3.6	<p>In the United Kingdom, the torque test is performed using a socket outlet complying with BS 1363 part 1:1995, including Amendment 1:1997 and Amendment 2:2003 and 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.</p>	Must be considered when installed in the end product.	N/A
4.3.6	<p>In Ireland, DIRECT PLUG-IN EQUIPMENT is known as plug similar devices. Such devices shall comply with Statutory Instrument 526:1997 - National Standards Authority of Ireland (Section 28) (Electrical plugs, plug similar devices and sockets for domestic use) Regulations, 1997.</p>	Must be considered when installed in the end product.	N/A
5.1.7.1	<p>In Finland, Norway and Sweden TOUCH CURRENT measurement results exceeding 3,5 mA r.m.s. are permitted only for the following equipment:</p> <ul style="list-style-type: none"> • STATIONARY PLUGGABLE EQUIPMENT TYPE A that <ul style="list-style-type: none"> is intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, for example, in a telecommunication centre; and has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR; and is provided with instructions for the installation of that conductor by a SERVICE PERSON; • STATIONARY PLUGGABLE EQUIPMENT TYPE B; • STATIONARY PERMANENTLY CONNECTED EQUIPMENT. 	Not applicable.	N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ZB ANNEX (normative) SPECIAL NATIONAL CONDITIONS (EN)			
Clause	Requirement + Test	Result - Remark	Verdict
6.1.2.1 (A1:2010)	<p>In Finland, Norway and Sweden, add the following text between the first and second paragraph of the compliance clause:</p> <p>If this insulation is solid, including insulation forming part of a component, it shall at least consist of either</p> <ul style="list-style-type: none"> - 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. <p>Alternatively for components, there is no distance through insulation requirements 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</p> <ul style="list-style-type: none"> - passes the tests and inspection criteria of 2.10.11 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 2.10.10 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. 	No TNV circuits.	N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ZB ANNEX (normative) SPECIAL NATIONAL CONDITIONS (EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>It is permitted to bridge this insulation with an optocoupler complying with 2.10.5.4 b).</p> <p>It is permitted to bridge this insulation with a capacitor complying with EN 60384-14:2005, subclass Y2.</p> <p>A capacitor classified Y3 according to EN 60384-14:2005, may bridge this insulation under the following conditions:</p> <ul style="list-style-type: none"> - 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 EN 60950-1:2006, 6.2.2.1; - 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. 	No TNV circuits.	N/A
6.1.2.2	<p>In Finland, Norway and Sweden, the exclusions are applicable for PERMANENTLY CONNECTED EQUIPMENT, PLUGGABLE EQUIPMENT TYPE B and equipment intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, e.g. in a telecommunication centre, and which has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR and is provided with instructions for the installation of that conductor by a SERVICE PERSON.</p>	No TNV circuits.	N/A
7.2	<p>In Finland, Norway and Sweden, for requirements see 6.1.2.1 and 6.1.2.2 of this annex.</p> <p>The term TELECOMMUNICATION NETWORK in 6.1.2 being replaced by the term CABLE DISTRIBUTION SYSTEM.</p>	Must be considered when installed in the end product.	N/A
7.3 (A11:2009)	<p>In Norway and Sweden, for requirements see 1.2.13.14 and 1.7.2.1 of this annex.</p>	Must be considered when installed in the end product.	N/A

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

Annex ZD (informative)

IEC and CENELEC code designations for flexible cords

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	60277 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

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

CTL Decision, DSH 1080



**IEC System for Conformity Testing and Certification
of Electrotechnical equipment and Components**

CTL DECISION SHEET (DSH)

Standard(s) (incl. year)	Subclause(s)	No.	Year
IEC 60950-1:2005 + A1:2009 (ed. 2.1) IEC 60065:2001 + A1:2005 + A2:2010 (ed. 7.2)	2.1.1.7 9.1.6	DSH 1080	2013
Category			
OFF, TRON			
Subject	Keywords	Developed by	Approved at
Zero loss automatic X cap discharge	IC including capacitor discharge function (ICX) IC, capacitor discharge, Zero loss	ETF2	2013 CTL Plenary Meeting
Question			
How should an equipment with IC including a capacitor discharge function be tested?			
Decision			
<p><u>Requirements</u></p> <p>An ICX and any associated components critical to the discharge function of a capacitor to an accessible part (such as the mains capacitor) are not fault tested if one of the following conditions is met:</p> <ul style="list-style-type: none"> – the ICX with the associated circuitry as provided in the equipment complies with the tests below. Any impulse attenuating components (such as varistors and GDT's) that attenuate the impulse to the ICX and the associated circuitry are disconnected. If discharge components external to the ICX are necessary, they shall not fail during the tests; or – the ICX tested separately complies with the requirements and tests below. If discharge components external to the ICX are necessary: <ul style="list-style-type: none"> • they shall be included in the test; and • they shall not fail during the tests; and • the discharge components used in the equipment shall be within the range tested <p><u>Tests</u></p> <p>Where the ICX is tested by itself, the test set up shall be as recommended by the ICX manufacturer.</p> <ul style="list-style-type: none"> – humidity treatment for 120 h at a temperature of (40±2)°C and a relative humidity of (93±3)% – 100 positive impulses and 100 negative impulses between line and neutral using a capacitor with the largest capacitance and a resistor with the smallest resistance specified by the manufacturer of the ICX; and repeated with a capacitor with the smallest capacitance and the resistor with the largest resistance. The time between any two impulses shall not be less than 1 s. The impulse shall be as specified in circuit 2 of Table N.1 (60950-1) / 1,2/50 µs in Table K.1 (60065), with U_c equal to the transient voltage. – Application of an a.c. voltage that is 110 % of the rated voltage for 2,5 minutes. 			

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict



IEC System for Conformity Testing and Certification of Electrotechnical equipment and Components

- 10 000 cycles of power on and off using a capacitor with the smallest capacitance and a resistor with the largest resistance as specified by the manufacturer of ICX. The power on and off cycles time shall not be less than 1 s.

If any of the associated circuitry components other than those critical for the discharge function fails, it may be replaced with a new component

Compliance criteria

Compliance is checked by evaluation of the available data or by conducting the above tests. The capacitor discharge test is conducted after the above tests, ensuring the ICX or the EUT provided with the ICX continues to provide the **safeguard** function.

NOTE: Evaluation of available data should include information of failure of any associated circuitry components keeps the discharge mode in the on/stay mode

Explanatory notes

An ICX is introduced to cope with environmental issues. It limits power consumption in standby conditions.

Product Highlights of ICX

- Blocks current through X-cap discharge resistor when AC voltage is connected
- Automatically discharges X-cap through discharge resistors when AC is disconnected

Single fault condition (open circuit conditions) of the IC and associated circuitry components critical for the discharge function is the concern related to safety, when AC power is disconnected. If the capacitance of X-capacitors connected in the equipment is above a certain value, it would result in a noncompliance with the requirements for plug discharge in IEC 60950-1 Clause 2.1.1.7 / IEC 60065 Clause 9.1.6.

IEC TC108 HBSDT agreed to include requirements for IC including capacitor discharge function (ICX) to the FDIS for IEC 62368-1 ed2.0. The Decision above is in accordance with this.

Amd.2 to IEC 60950-1 ed2.0 and IEC 60065 ed8.0 (assumed to be the last updates to these std.) do not include these requirements. IEC TC108 MT1/MT2 has therefore been asked to confirm this CTL proposal.

Recommendation by IEC TC108 MT1/MT2, 10 May 2013

The TC108 management discussed the issue and feels that the approach to use the requirements from the latest draft IEC 62368-1, edition 2 is very reasonable. It is also in line with the statements in the drafts of IEC 60065 and IEC 60950-1 that allow components and subassemblies to be used that are evaluated according to IEC 62368-1.

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

Specification for model AT6002 series

High Voltage PWM Controller

General Description

AT6002 is a highly integrated current mode PWM control for flyback converter, optimized for high performance, low standby power consumption and cost effective offline flyback converter applications.

The AT6002 built-in multiple protection with VCC under voltage lockout (UVLO), VCC over voltage protection (OVP), VCC clamp, GATE clamp, cycle-by-cycle current limiting (OCP), over load protection (OLP), RT Low Level Protection(RTLP), RT High Level Protection(RTHP), and leading-edge blanking (LEB) of the current sensing to prevent circuit damage occurred under abnormal conditions.

The AT6002 also has an X-cap discharge function to discharge the X-cap when the input is unplugged and Brown-out protection function.

The AT6002 is available in an SOP-8L package and require very few external devices for operation.

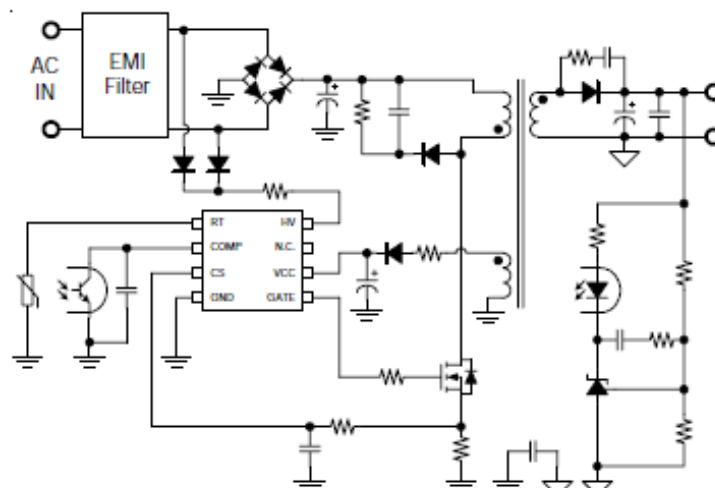
Features

- High Voltage Startup Circuit
- VCC Under Voltage Lockout (UVLO)
- VCC Over voltage Protection (OVP)
- Cycle-by-Cycle Current Limiting (OCP)
- Over Load Protection (OLP)
- Connection of an NTC for Over Temperature Protection (OTP)
- Leading Edge Blanking (LEB)
- X-CAP Discharge Function
- Brown-out Protection
- VCC & Gate Voltage Clamp
- 500mA Source/500mA Sink Gate Driver
- 100kHz/65kHz Switching Frequency with Frequency Hopping for Reducing EMI
- SOP-8 Package

Applications

- AC/DC Switching Power Adaptor
- Battery Charger
- Open Frame Switching Power Supply

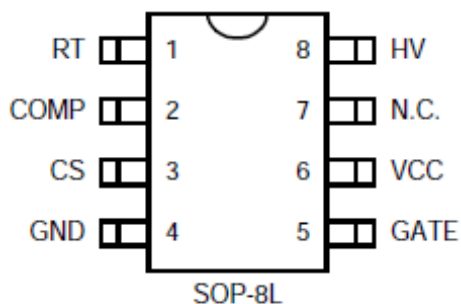
Typical Application Circuit



IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Pin Configuration



Function Pin Description

Pin No.	Pin Name	Description
1	RT	Temperature Detection. An internal current source allows the direct connection of an NTC for over temperature detection.
2	COMP	Voltage Feedback. This pin connecting an opto-coupler to monitor output for regulation control loop.
3	CS	Current Sense. This pin sense primary MOSFET current.
4	GND	Ground.
5	GATE	PWM Signal Output. This pin output to drive the external power MOSFET.
6	VCC	Power Supply.
7	N.C.	No Connection.
8	HV	High Voltage. This pin connecting to X-cap capacitor via resistors to be a high voltage start-up current source, and to implement X-cap discharge and Brown in/out detection.

Protection Mode

Part Number	Switching Frequency	OLP	VCC OVP	RTLP	RTHP	Int. TSD
AT6002H	100kHz	Auto	Latch	Auto	Latch	Auto
AT6002Z	65kHz	Auto	Latch	Latch	Latch	Auto
AT6002A	65kHz	Auto	Auto	Auto	Auto	Auto
AT6002L	65kHz	Auto	Latch	Latch	Latch	Auto

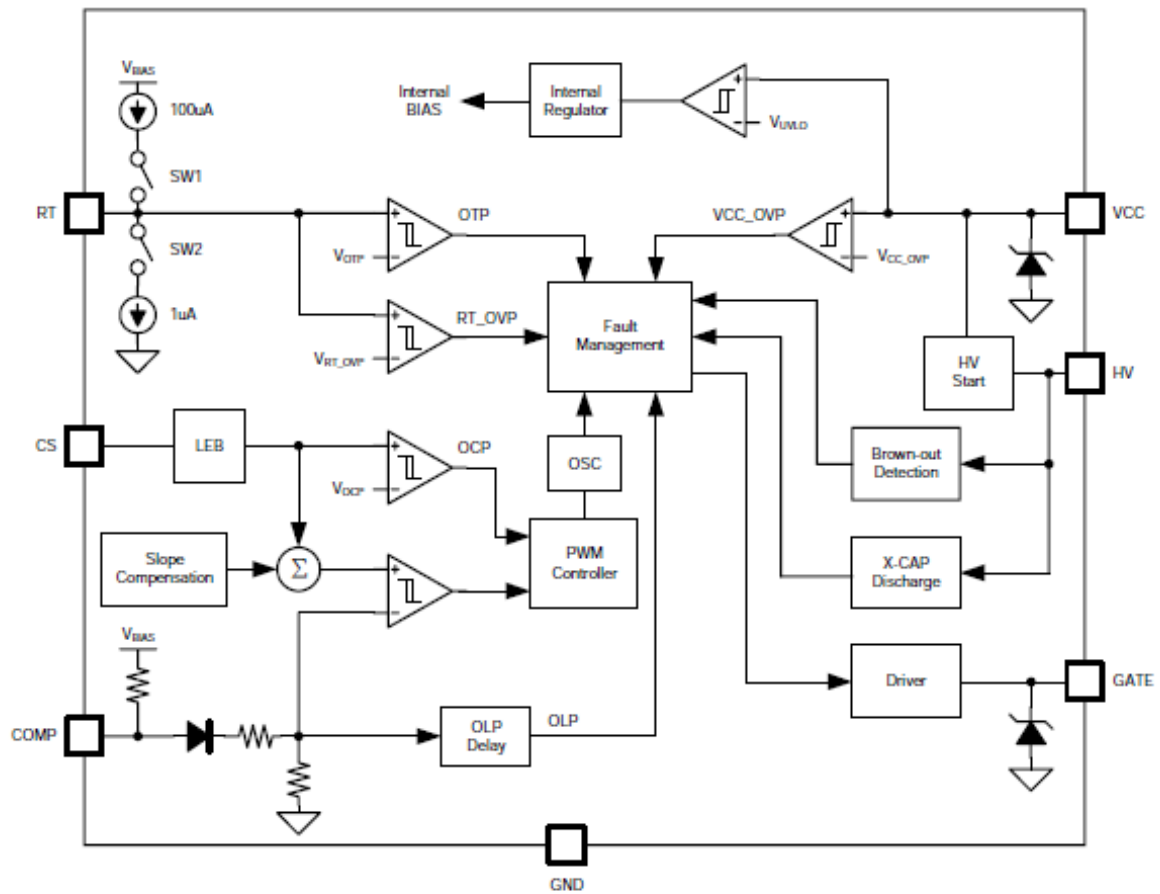
Ordering and Marking Information

Order Number	Package	Top Marking
AT6002HSP8	SOP-8L	AT6002H
AT6002ZSP8	SOP-8L	AT6002Z
AT6002ASP8	SOP-8L	AT6002A
AT6002LSP8	SOP-8L	AT6002L

IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Function Blocks



IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Absolute Maximum Ratings

(Note1)

Supply Input Voltage, VCC	-0.3V to +32V
High-Voltage Pin, HV	-0.3V to +600V
RT, COMP, CS	-0.3V to +7V
GATE	-0.3V to +20V
Storage Temperature Range	-65°C to +150°C
Junction Temperature	-40°C to +150°C
Lead Temperature Range(Soldering 10sec)	260°C

ESD Rating (Note2)

HBM(Human Body Mode, Except HV Pin)	4KV
HBM(Human Body Mode, HV Pin)	1.5KV
MM(Mechine Mode)	400V

Thermal Characteristics

Package Thermal Resistance (Note3)

SOP-8L θ_{JA}	250°C/W
SOP-8L θ_{JC}	140°C/W

Power Dissipation, PD @ TA = 25°C

SOP-8L	400mW
--------	-------

Electrical Characteristics

(V_{CC} = 12V, T_A = +25°C unless otherwise specified.)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Input Section						
Operating Voltage			8	--	27	V
Power On Voltage	VCC_on		13.5	14	14.5	V
Holdup Voltage	VCC_hold	I _{HV} > 1mA	8	8.5	9	V
Power Off Voltage	VCC_off		7	7.5	8	V
Reset Voltage	VCC_rst		6	6.5	7	V
Over Voltage Protection Voltage	VCC_ovp		27	28.5	30	V
Internal Zener Clamp	VCC_clamp	I _{CC} > 2*I _{CC_op}	--	31	--	V
Startup Current	I _{CC_start}		200	270	350	uA
Normal Operating Current	I _{CC_op}	C _L = 1nF	--	1.3	--	mA
Burst Mode Operating Current	I _{CC_bs}	V _{CMOP} < V _{CMOP_bs}	--	0.35	--	mA
COMP Pin Section						
COMP Pull High Impedance	ZCOMP		--	20	--	kΩ
Open Loop Voltage	VCOMP_o	COMP Open	--	5	--	V
Over Load Protection Voltage	VCOMP_olp		--	4.4	--	V
Over Load Protection Debounce Time	Tdeb_olp		--	65	--	ms

IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
High Voltage Section						
High-Voltage Current	IHV_on	VCC>1V	2.5	3	3.5	mA
Initial High-Voltage Current	IHV0_on	VCC=0V	--	0.67	--	mA
High-Voltage Off Current	IHV_off	VHV=600V,VCC>VCC_on	--	--	20	uA
Brown In Threshold			101	106	111	V
Brown In Delay Time			--	200	--	us
Brown Out Threshold			94	99	104	V
Brown Out Delay Time			--	90	--	ms
Xcap Discharge Current			--	2	--	mA
Xcap Debounce Time			--	90	--	ms
Xcap Discharge Time			--	500	--	ms
HV Resister Range			--	20	40	kΩ
Oscillation Section						
Nominal Frequency	Fosc_n1	VCOMP>VCOMP_f	94	100	106	kHz
Nominal Frequency	Fosc_n2	VCOMP>VCOMP_f	61	65	69	kHz
Green Frequency	Fosc_gr	VCOMP_bs<VCOMP<VCOMP_gr	--	24	--	kHz
COMP Threshold for Frequency Reduction	VCOMP_f	Fosc<Fosc_n	--	2.2	--	V
COMP Voltage for Green Frequency	VCOMP_gr	Fosc=Fosc_gr	--	2	--	V
COMP Threshold for Zero Duty	VCOMP_bs		--	1.6	--	V
Frequency Hopping Range		Fosc=Fosc_n	--	+5	--	%
Current Sense Section						
Delay to Output			--	--	100	ns
Leading Edge Blanking Time	t_leb	VCS>1.1V	--	350	--	ns
Minimum On Time	ton_min		--	710	--	ns
CS Threshold at Max Duty	VCS_max	Fosc=Fosc_n	0.885	0.9	0.915	V
Input Impedance	ZCS		1	--	--	MΩ
Soft Start Time	tss		--	0.5	--	ms
GATE Section						
Maximum Duty Cycle	Dmax	Max Frequency	71	80	89	%
Output Voltage Low	Vol	VCC=15V, I _o =20mA Sinking	--	0.12	0.25	V
Output Voltage High	Voh	VCC=15V, I _o =20mA Sourcing	9	11	--	V
Rising Time	tr	CL=1nF,Vgate from 2V to 6V	--	88	--	ns
Falling Time	tf	CL=1nF,Vgate from 6V to 2V	--	10	--	ns
Gate Voltage Clamping	Vgate_clamp	VCC=27V	12	14	16	V

IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
RT Pin Section						
Floating Voltage of RT	VRT_o	RT Open	2.1	2.3	2.5	V
RT Sourcing Current	IRT	RT < 1.5V	95	100	105	uA
RT High Level Protection	VRTHP		3.325	3.5	3.675	V
RT Low Level Protection	VRTTLP		0.95	1	1.05	V
RT Low Protection Blanking Time after Brown In	tbk_rtlp		--	5.12	--	ms
TSD Section						
Internal Thermal Protection			--	140	--	°C
Fault Section						
Fault Recycle Time	tcyc_fault		--	1	--	s
Fault Debounce Time (Exclude OLP)	tdeb_fault		--	75	--	us

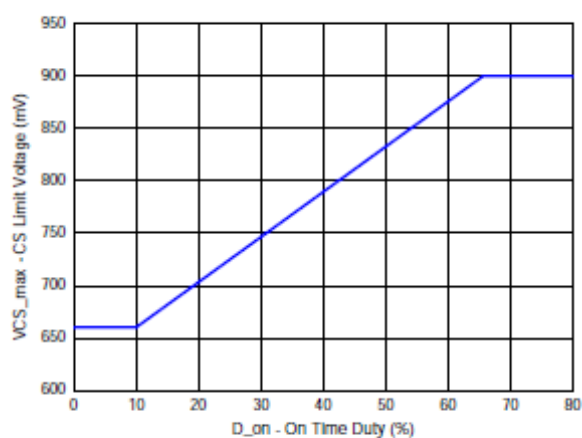
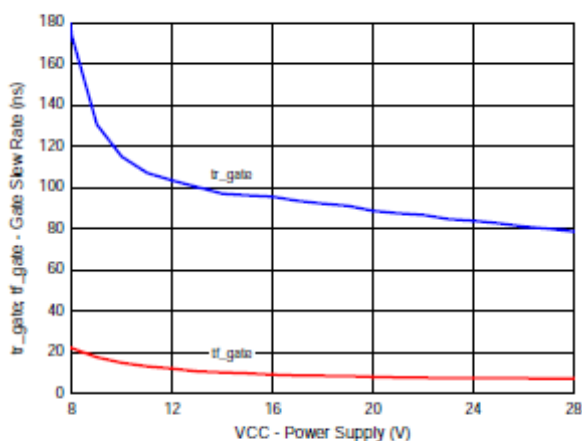
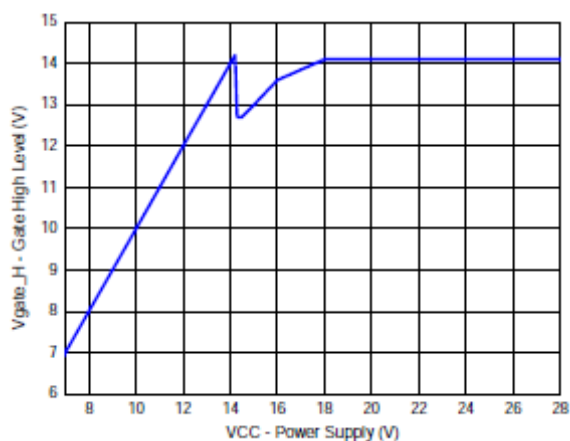
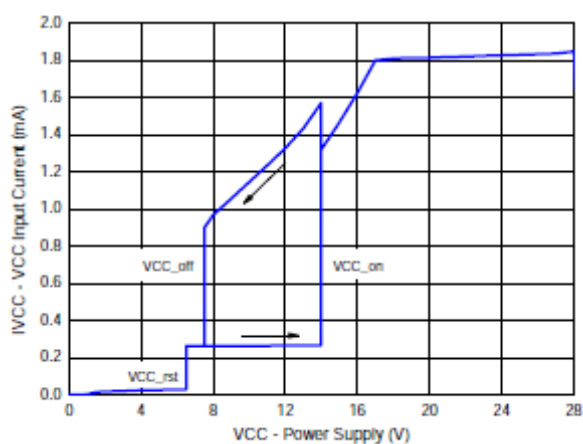
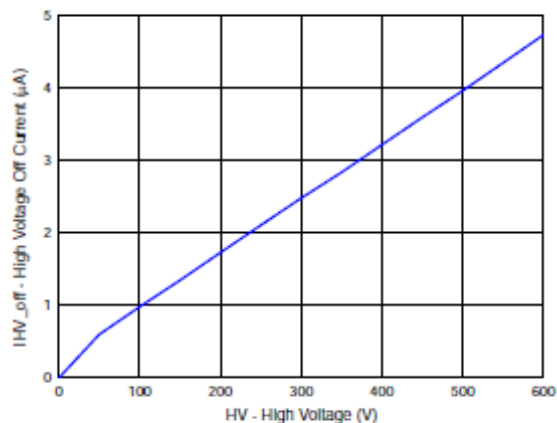
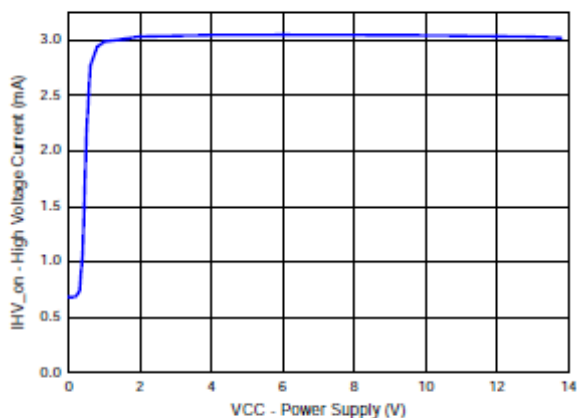
Note 1. Exceeding these limits may impair the life of the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.

Note 2. θ_{JA} is measured with the component mounted on a high effective thermal conductivity test board in free air. The exposed pad of the package is soldered directly on the PCB.

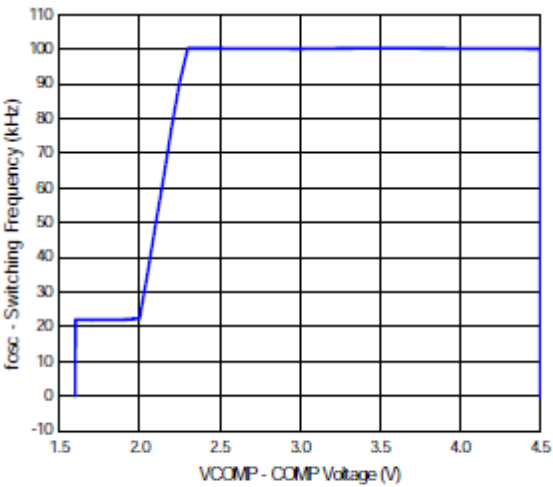
IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Typical Characteristics



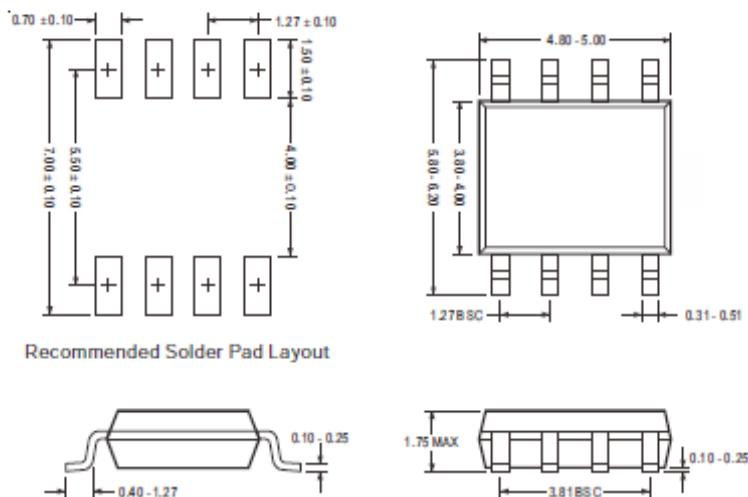
IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict



IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

Package Information

SOP-8L



Note

1. Package Outline Unit Description:

BSC: Basic. Represents theoretical exact dimension .

MAX: Maximum dimension specified.

MIN: Minimum dimension specified.

REF: Represents dimension for reference use only. The value is not the device specification.

TYP: Represents as a typical value. The value is not the device specification.

2. All linear dimensions are in Millimeters.

IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

Specification for model AT1688 series; AT6001 series

High Voltage Quasi-Resonant PWM Controller

General Description

AT1688Z is a highly integrated quasi-resonant (QR) mode PWM control for flyback converter, optimized for high performance, low standby power consumption and cost effective offline flyback converter applications.

The AT1688Z internal valley detector ensures minimum drain voltage switching at QR operation. At low line and heavy loading, it operates in critical conduction mode (CCM) via an external resistor sets minimum fixed frequency. At high line and normal loading, it operates in QR mode. When light load, it operates in pulse frequency modulation (PFM) mode. When the output power falls below a given level, it enters the burst mode.

The AT1688Z built-in multiple protection with VCC under voltage lockout (UVLO), VCC over voltage protection (OVP), VCC clamp, GATE clamp, internal over temperature protection (OTP), Output over voltage protection, DEM high level protection, cycle-by-cycle current limiting (OCP), over load protection (OLP), X-cap discharge, brown in/out protection, and leading-edge blanking (LEB) of the current sensing to prevent circuit damage occurred under abnormal conditions.

The AT1688Z is available in an SOP-10L package and require very few external devices for operation.

< Patent Pending >

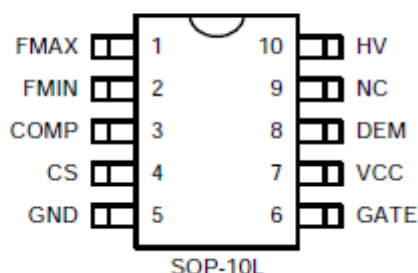
Features

- High Voltage Startup Circuit
- VCC Under Voltage Lockout (UVLO)
- VCC Over Voltage Protection (VCC OVP)
- Output Over Voltage Protection by DEM (DEM OVP)
- DEM High Level Protection (DEMHP)
- Cycle-by-Cycle Current Limiting (OCP)
- Over Load Protection (OLP)
- Internal Over Temperature Protection (OTP)
- Leading Edge Blanking (LEB)
- X-CAP Discharge Function
- Brown In/Out Protection
- VCC & Gate Voltage Clamped
- 500mA Source/500mA Sink Gate Driver
- Frequency Hopping for Reducing EMI
- SOP-10L Package

Applications

- AC/DC Switching Power Adaptor
- Battery Charger
- Open Frame Switching Power Supply

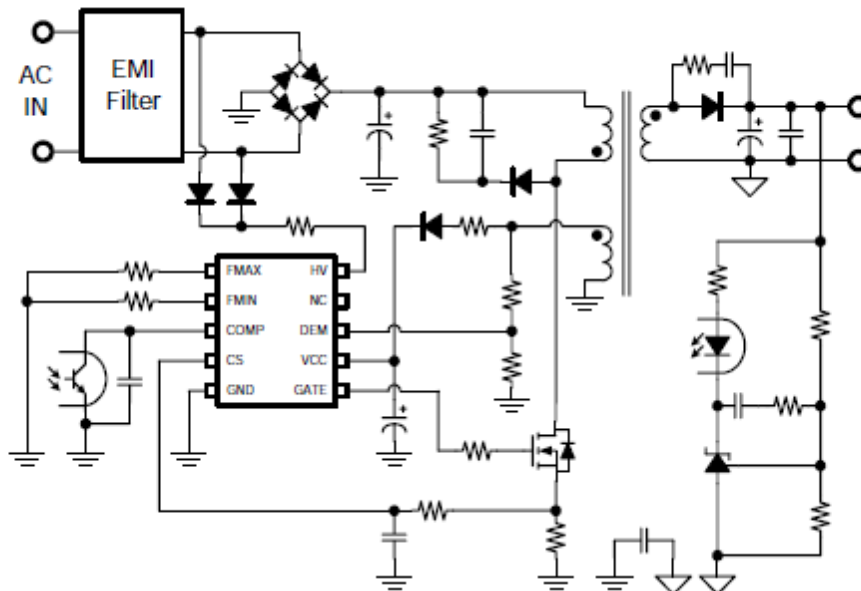
Pin Configuration



IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Typical Application Circuit



Function Pin Description

Pin No.	Pin Name	Description
1	FMAX	Maximum frequency programming pin. This pin connecting an resistors to ground for setting maximum switching frequency.
2	FMIN	Minimum frequency programming pin. This pin connecting an resistors to ground for setting minimum switching frequency.
3	COMP	Voltage Feedback pin. This pin connecting an opto-coupler to monitor output for regulation control loop.
4	CS	Current Sense pin. This pin sense primary MOSFET current.
5	GND	Ground.
6	GATE	PWM Signal Output pin. This pin output to drive the external power MOSFET.
7	VCC	Power Supply.
8	DEM	This pin is for valley switching detector of the auxiliary winding signal and also used for output over voltage protection.
9	NC	Unconnected pin.
10	HV	High Voltage pin. This pin connecting to X-cap capacitor via resistors to be a high voltage start-up current source, and to implement X-cap discharge and Brown in/out detection .

Ordering and Marking Information

Order Number	Package	Top Marking
AT1688ZSPA	SOP-10L	AT1688Z

Note: Aplustek products are compatible with the current IPC/JEDEC J-STD-020 requirement. They are halogen-free, RoHS compliant and 100% matte tin (Sn) plating that are suitable for use in SnPb or Pb-free soldering processes.

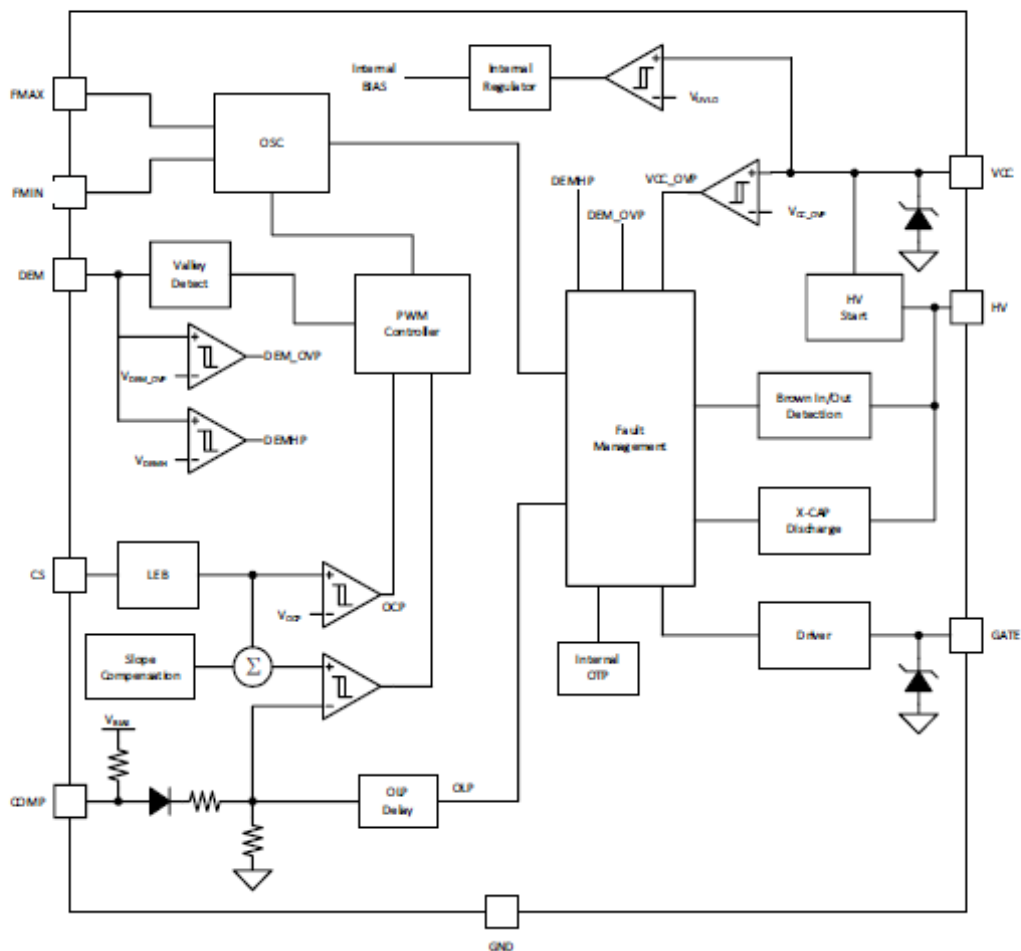
IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Protection Mode

Part Number	OLP	VCC OVP	DEMOVP	DEMHP	Int. TSD
AT1688Z	Auto	Latch	Latch	Latch	Auto

Function Blocks



IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Absolute Maximum Ratings

(Note1)

Supply Input Voltage, VCC	-0.3V to +32V
High-Voltage Pin, HV	-0.3V to +600V
FMAX, FMIN, COMP, CS, DEM	-0.3V to +7V
GATE	-0.3V to +20V
Storage Temperature Range	-65°C to +150°C
Junction Temperature	-40°C to +150°C
Lead Temperature Range(Soldering 10sec)	260°C

ESD Rating (Note2)

HBM(Human Body Mode, Except HV Pin)	4KV
HBM(Human Body Mode, HV Pin)	1.5KV
MM(Mechine Mode)	400V

Thermal Characteristics

Package Thermal Resistance (Note3)

SOP-10L θ_{JA}	120°C/W
SOP-10L θ_{JC}	45°C/W

Power Dissipation, PD @ TA = 25°C

SOP-10L	1W
---------	----

Electrical Characteristics

(V_{CC} = 12V, T_A = +25°C unless otherwise specified.)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Input Section						
Operating Voltage			8	--	27	V
Power On Voltage	VCC_on		13.5	14	14.5	V
Holdup Voltage	VCC_hold	I _{HV} > 1mA	8	8.5	9	V
Power Off Voltage	VCC_off		7	7.5	8	V
Reset Voltage	VCC_rst		6	6.5	7	V
Over Voltage Protection Voltage	VCC_ovp		27	28.5	30	V
Internal Zener Clamp	VCC_clamp	ICC > 2*ICC_op	--	31	--	V
Startup Current	ICC_start		200	270	350	uA
Normal Operating Current	ICC_op	C _L = 1nF	--	1.3	--	mA
Burst Mode Operating Current	ICC_bs	VCMOP < VCMOP_bs	--	0.35	--	mA
COMP Pin Section						
COMP Pull High Impedance	ZCOMP		--	40	--	kΩ
Open Loop Voltage	VCOMP_o	COMP Open	--	5	--	V
Over Load Protection Voltage	VCOMP_olp		--	4.4	--	V
Over Load Protection Debounce Time	Tdeb_olp		--	65	--	ms

IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
High Voltage Section						
High-Voltage Current	IHV_on	VCC>1V	2.5	3	3.5	mA
Initial High-Voltage Current	IHV0_on	VCC=0V	--	0.67	--	mA
High-Voltage Off Current	IHV_off	VHV=600V,VCC>VCC_on	--	--	20	uA
Brown In Threshold	VHV_brown_in		101	106	111	V
Brown In Debounce Time	Tdeb_brown_in		--	200	--	us
Brown Out Threshold	VHV_brown_out		94	99	104	V
Brown Out Debounce Time	Tdeb_brown_out		--	90	--	ms
Xcap Discharge Current	Idis_xcap		--	2	--	mA
Xcap Debounce Time	Tdeb_xcap		--	90	--	ms
Xcap Discharge Time	Tdis_cap		--	500	--	ms
HV Resistor Range			--	20	40	kΩ
Oscillation Section						
Minimum Frequency	Fosc_min	Fmin=100kΩ to GND	61	65	69	kHz
Maximum Frequency	Fosc_max	Fmax=75kΩ to GND	81.5	87	92.5	kHz
Fmin; Fmax Resistor Range			39	--	150	kΩ
Nominal Voltage of Fmin/Fmax			1.2	1.25	1.3	V
Green Frequency	Fosc_gr	VCOMP_bs<VCOMP<VCOMP_gr	--	24	--	kHz
COMP Threshold for Frequency Reduction	VCOMP_f	Fosc<Fosc_min	--	2.2	--	V
COMP Voltage for Green Frequency	VCOMP_gr	Fosc=Fosc_gr	--	2	--	V
COMP Threshold for Zero Duty	VCOMP_bs		--	1.6	--	V
Frequency Hopping Range		Fosc=Fosc_min	--	+5	--	%
Current Sense Section						
Delay to Output			--	--	100	ns
Leading Edge Blanking Time	t_leb	VCS>1.1V	--	350	--	ns
Minimum On Time	ton_min		--	710	--	ns
CS Threshold at Max Duty	VCS_max	Fosc=Fosc_min	0.885	0.9	0.915	V
Input Impedance	ZCS		1	--	--	MΩ
Soft Start Time	tss		--	0.5	--	ms
GATE Section						
Maximum Duty Cycle	Dmax	Max Frequency	79	85	91	%
Output Voltage Low	Vol	VCC=15V, I _b =20mA Sinking	--	0.12	0.25	V
Output Voltage High	Voh	VCC=15V, I _b =20mA Sourcing	9	11	--	V
Rising Time	tr	CL=1nF,Vgate from 2V to 6V	--	88	--	ns

IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Falling Time	tf	CL=1nF,Vgate from 6V to 2V	--	10	--	ns
Gate Voltage Clamping	Vgate_clamp	VCC=27V	12	14	16	V
DEM Pin Section						
Negative Clamp Voltage		Source Current=100uA	--	-0.5	--	V
Positive Clamp Voltage		Sink Current=100uA	--	5.15	--	V
Valley Detection Voltage	Vvalley		--	0.1	--	V
DEM OVP (sampling detection)	VDEMOVP		3.135	3.3	3.465	V
DEM High Level Protection Voltage(continuous detection)	VDEMHP		3.325	3.5	3.675	V
Blanking Time for DEM OVP Sense after GATE off	tbk_demovp		--	2.5	--	us
TSD Section						
Internal Thermal Protection	TSD_int		--	140	--	°C
Fault Section						
Fault Recycle Time	tcyc_fault		--	1	--	s
Fault Debounce Time (Exclude OLP & Output OVP)	tdeb_fault		--	75	--	us

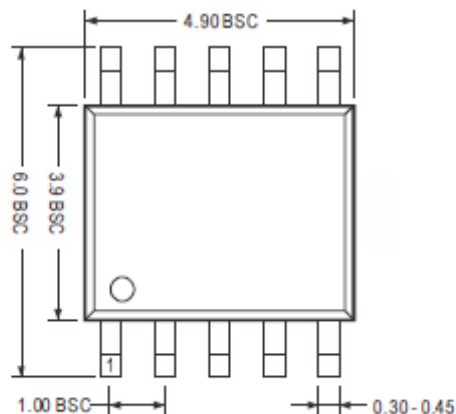
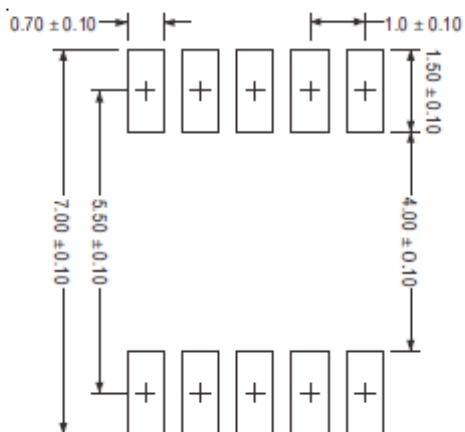
Note 1. Exceeding these limits may impair the life of the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.

Note 2. θ_{JA} is measured with the component mounted on a high effective thermal conductivity test board in free air. The exposed pad of the package is soldered directly on the PCB.

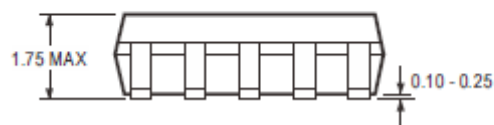
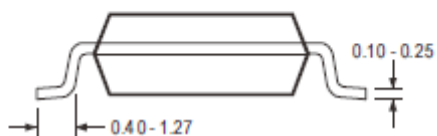
IEC60950_1F - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

Package Information

SOP-10L



Recommended Solder Pad Layout



Note

1.Package Outline Unit Description:

BSC: Basic. Represents theoretical exact dimension .

MAX: Maximum dimension specified.

MIN: Minimum dimension specified.

REF: Represents dimension for reference use only. The value is not the device specification.

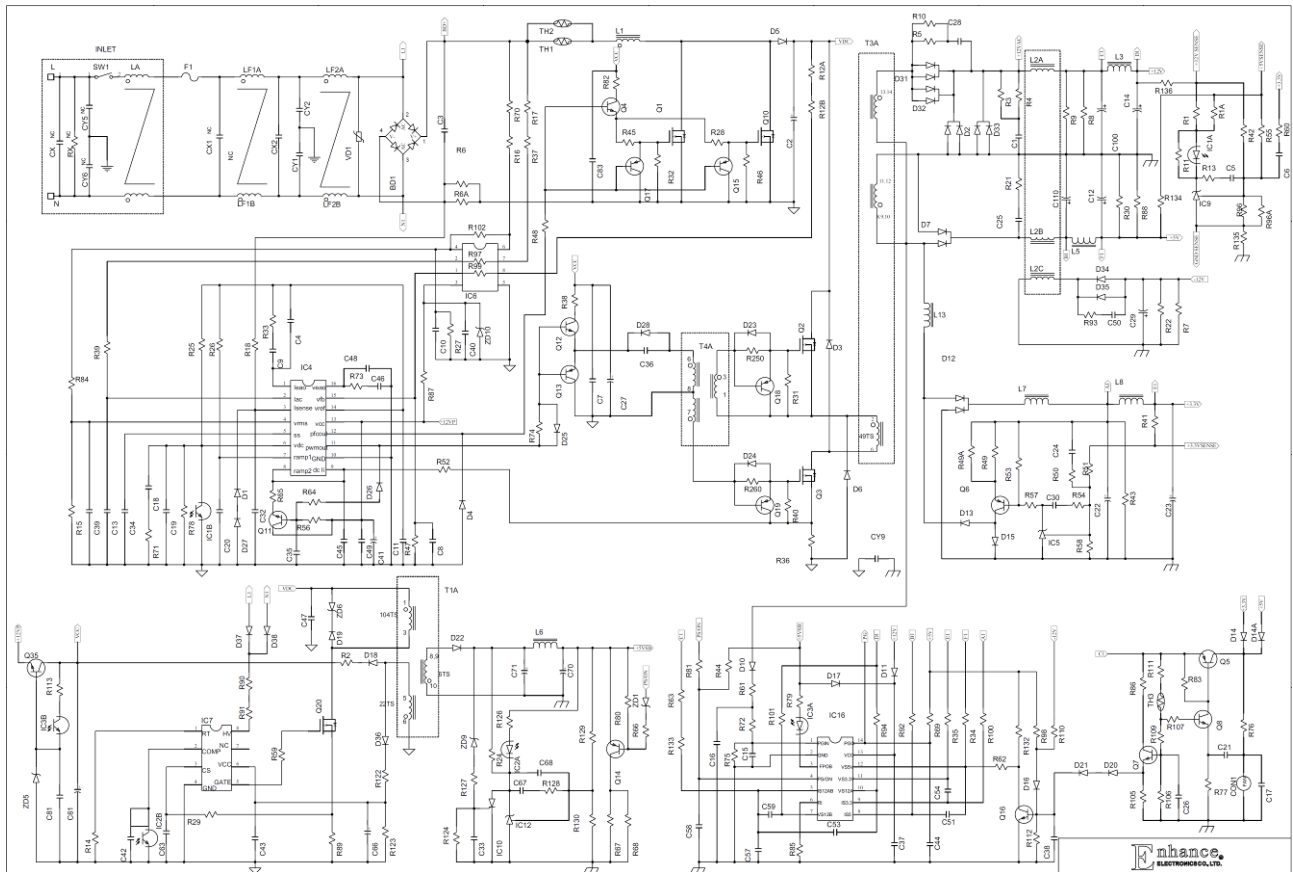
TYP: Represents as a typical value. The value is not the device specification.

2.All linear dimensions are in Millimeters.

IEC60950_1F - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
--------	--------------------	-----------------	---------

Schematics of demo board for model AT6002 series



Schematics of demo board for model AT1688 / AT6001 series

