

UNECE WP 6 MARS meeting

Hidden costs of counterfeited products

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Introduction

- 1. Counterfeited products not only may be dangerous to users, but**
- 2. They may also induce economic loss to manufactures who's products have been counterfeited.**
- 3. Ultimately these incidents may damage the reputation of the plagued manufacturer even putting him out of business...**

The unsafe toaster

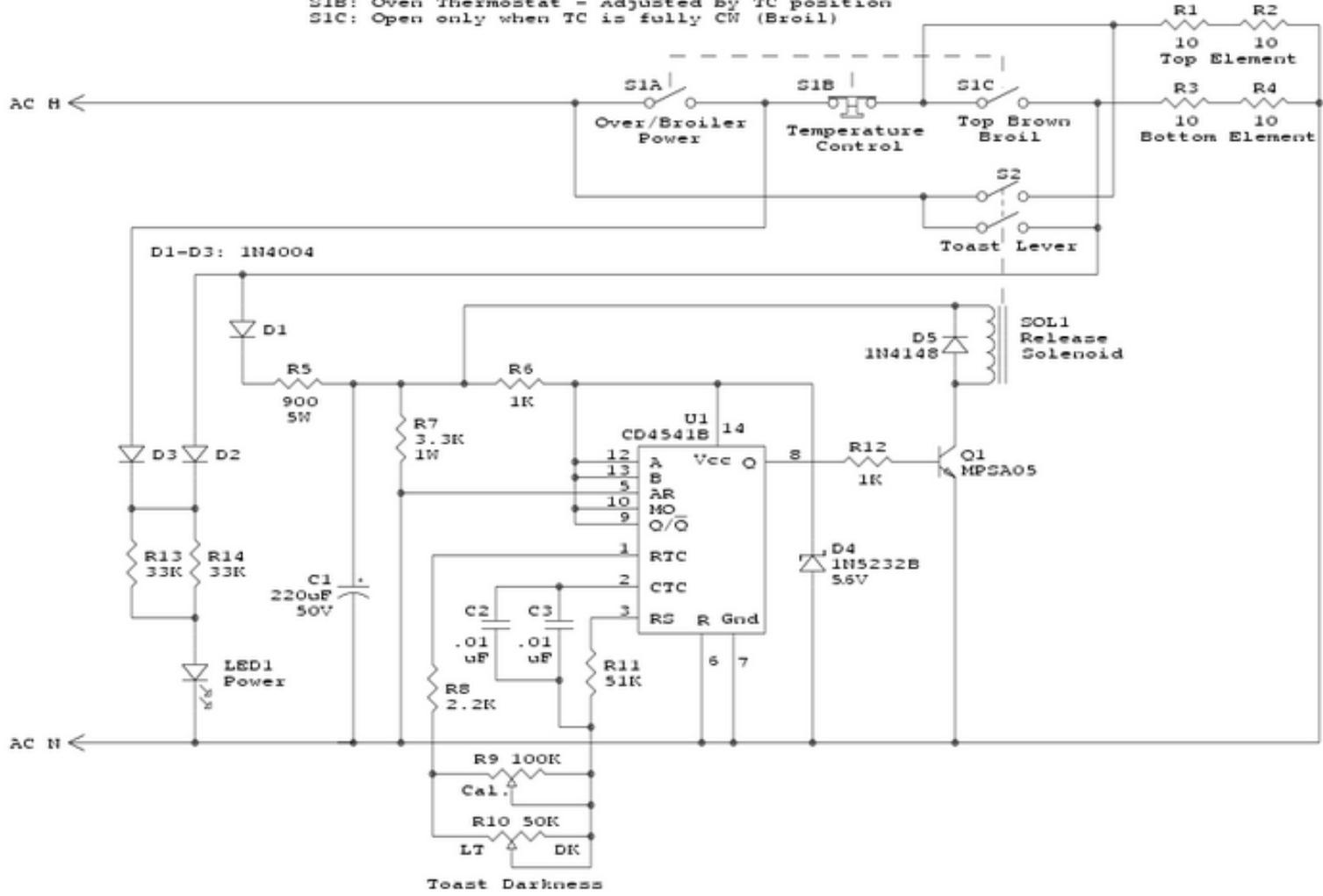
A defective toaster may cause fire in the house



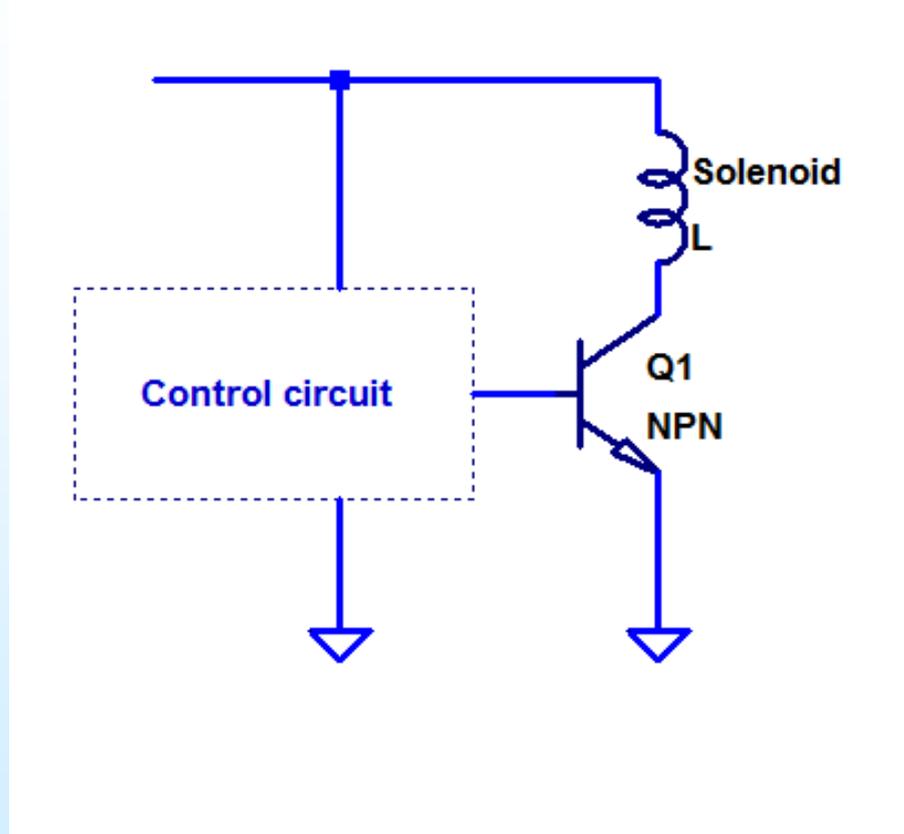
Toaster schematic

S1A,B,C are all part of Temperature Control (TC)

- S1A: Closed except when TC is fully CCW (OFF)
- S1B: Oven Thermostat - Adjusted by TC position
- S1C: Open only when TC is fully CW (Broil)



Toaster schematics simplified



The temperature control in the schematic is bypassed when the relay is engaged: the heating elements remain heating because Q1 is short-circuited (= simulated fault: defect through surge).

Toaster safety standard

The latest IEC 60335-2-9 safety standard includes EMC testing for the electronic circuit which operates the release mechanism

EUROPEAN STANDARD

EN 60335-2-9

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2003

ICS 13.120; 97.040.50

Supersedes EN 60335-2-9:1995 + A1:1998 + A2:2000 + A11:2000 + A12:2002 + A13:2002

English version

**Household and similar electrical appliances –
Safety
Part 2-9: Particular requirements for grills, toasters
and similar portable cooking appliances
(IEC 60335-2-9:2002, modified)**

Toaster testing



EN 60335-2-9:2003

Cl. 19 Abnormal operation

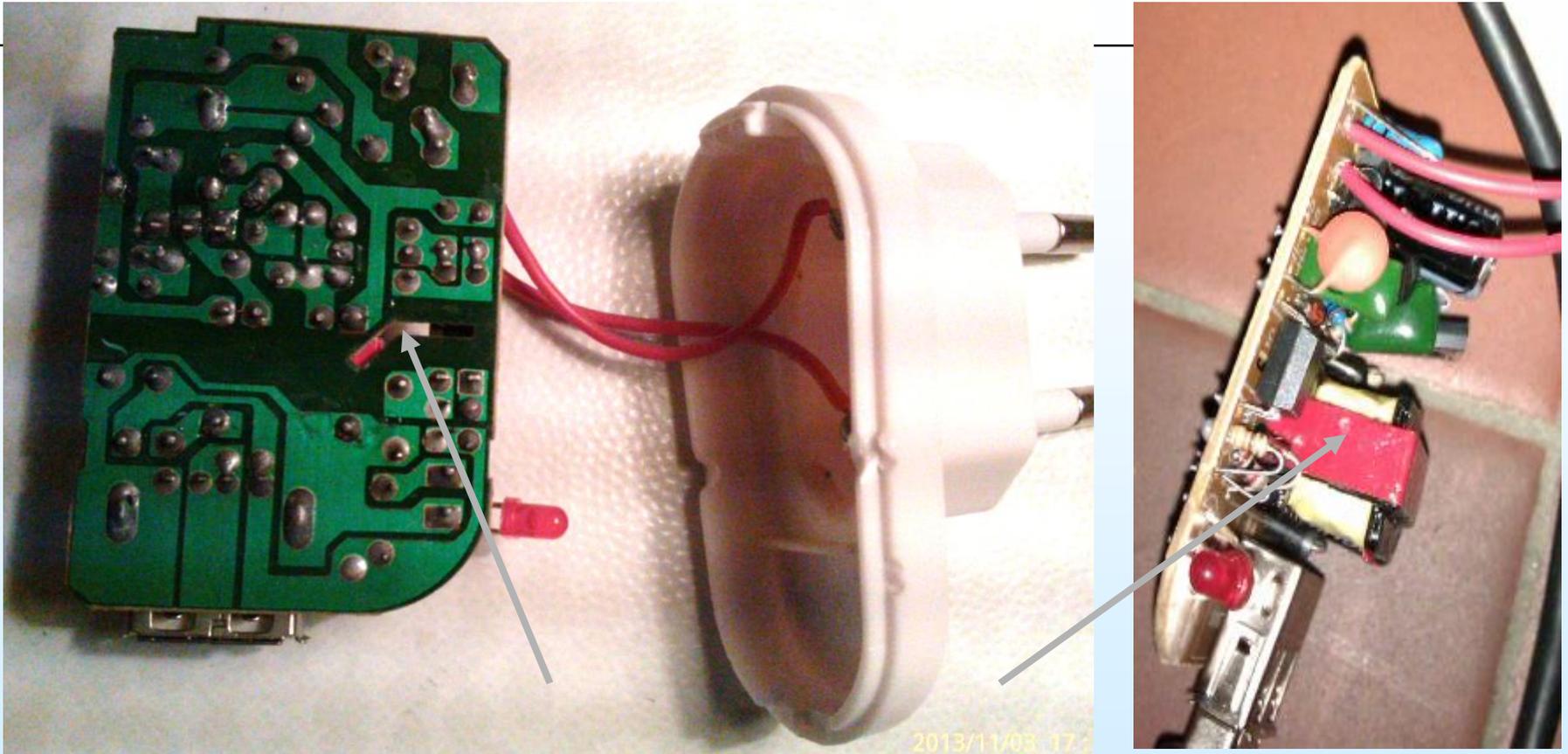
Clause 19.102 Toasters, loaded with the bread specified for normal operation, are operated at rated power input. The ejector mechanism is prevented from releasing and the supply is maintained to the heating elements after the timer has completed its cycle. The test is terminated after any fire has extinguished, after which any residual bread is removed from the toaster.

The unsafe toaster

Apparently, the design of the counterfeited product was removed from protective devices like transzorbs or other safety devices, making it cheaper and... dangerous in use.



I-phone like charger



The cell phone charger, see above, broke down at 1800V ac, while it should withstand 3000V. The slot on the PCB was made in order to increase creepage distance between the pins of the transformer (visible as a red patch through the slot). Nowadays good chargers may have flying secondary contacts - loose wires, rather than fixed to the PCB, in order to increase the distance. Cl. 5.2 of IEC 60950-1

2. I-phone like charger: schematics

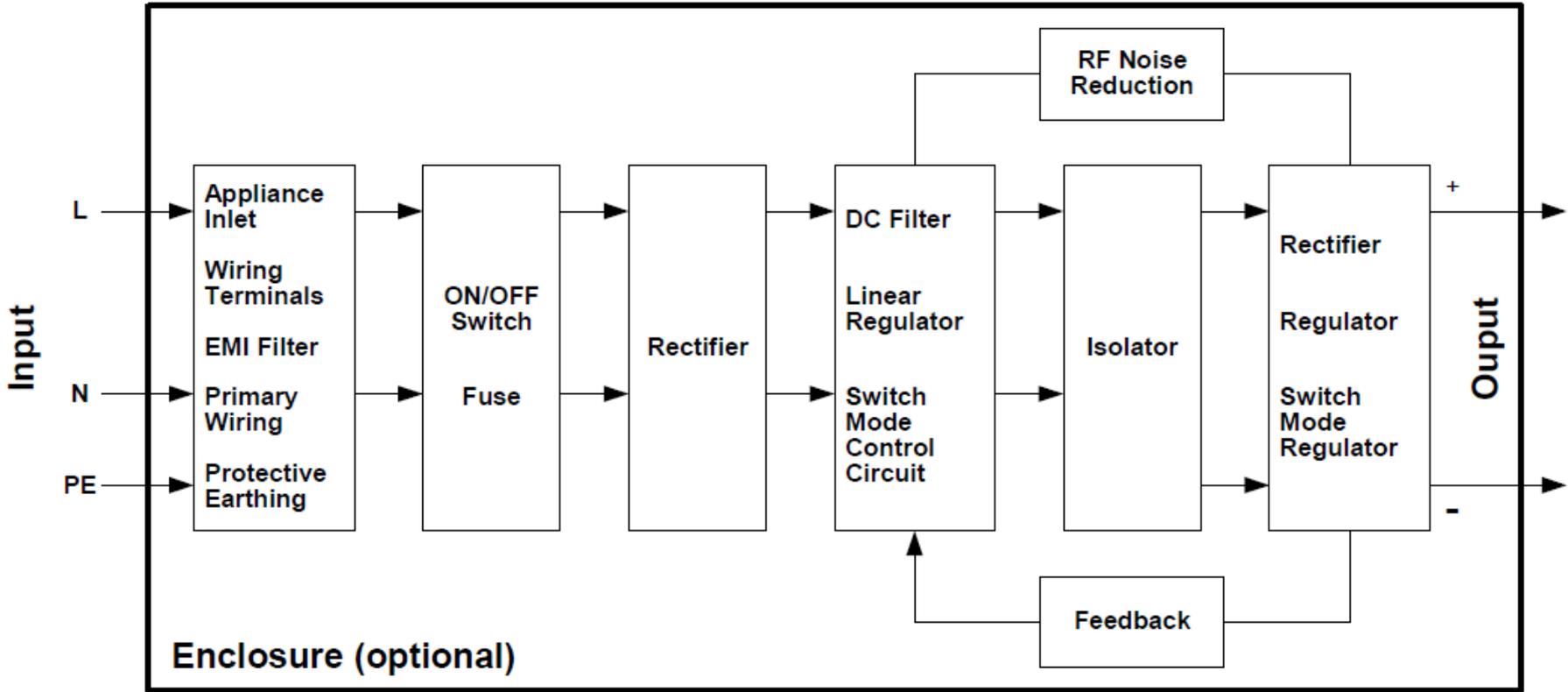


Fig. A typical bloc diagram of a power supply

I-phone like charger: transformer construction

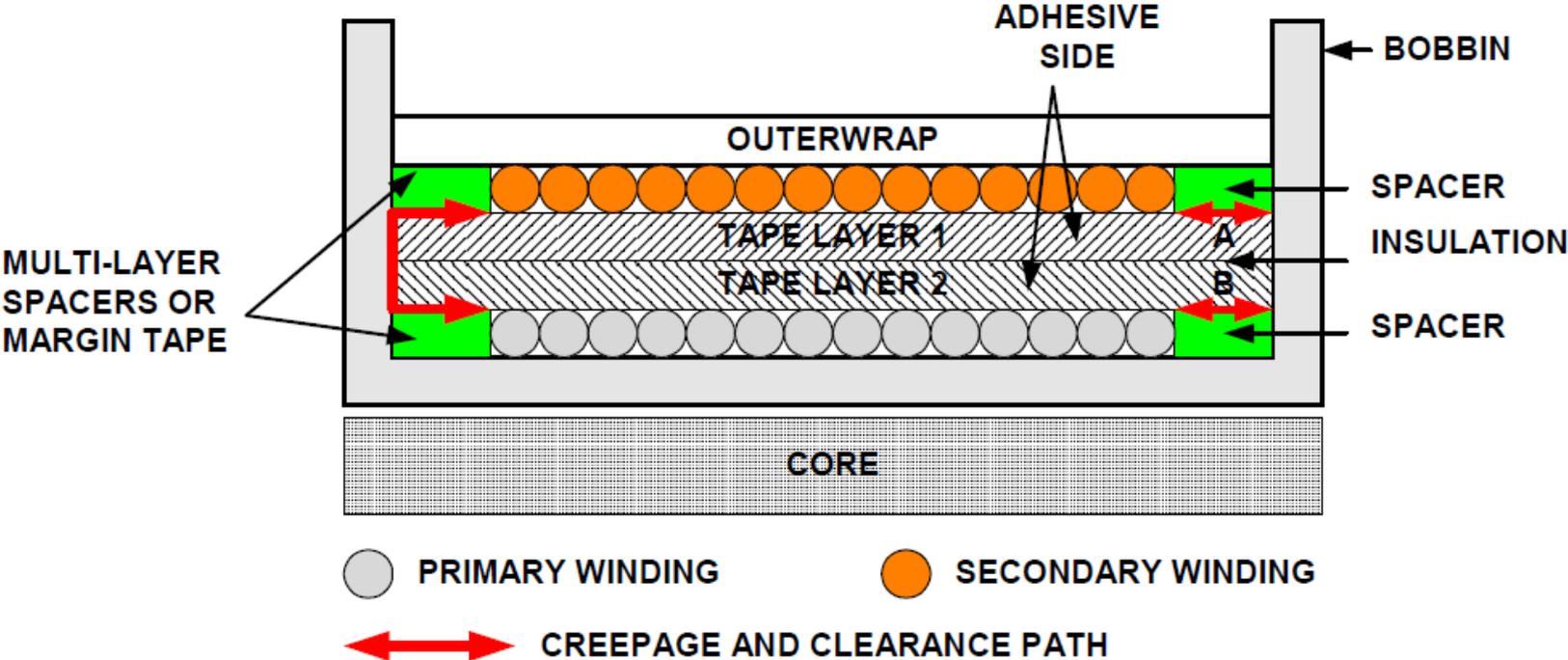
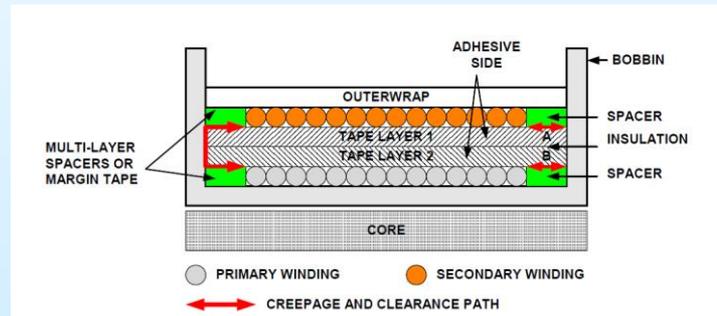


Fig. Decrease of insulating distances in an isolating transformer

I-phone like charger

Again an example that omitting or reducing essential insulation in critical places, may render the product cheaper but also dangerous in use.



Deep fat fryer schematics

Both temp. controllers
are in same phase

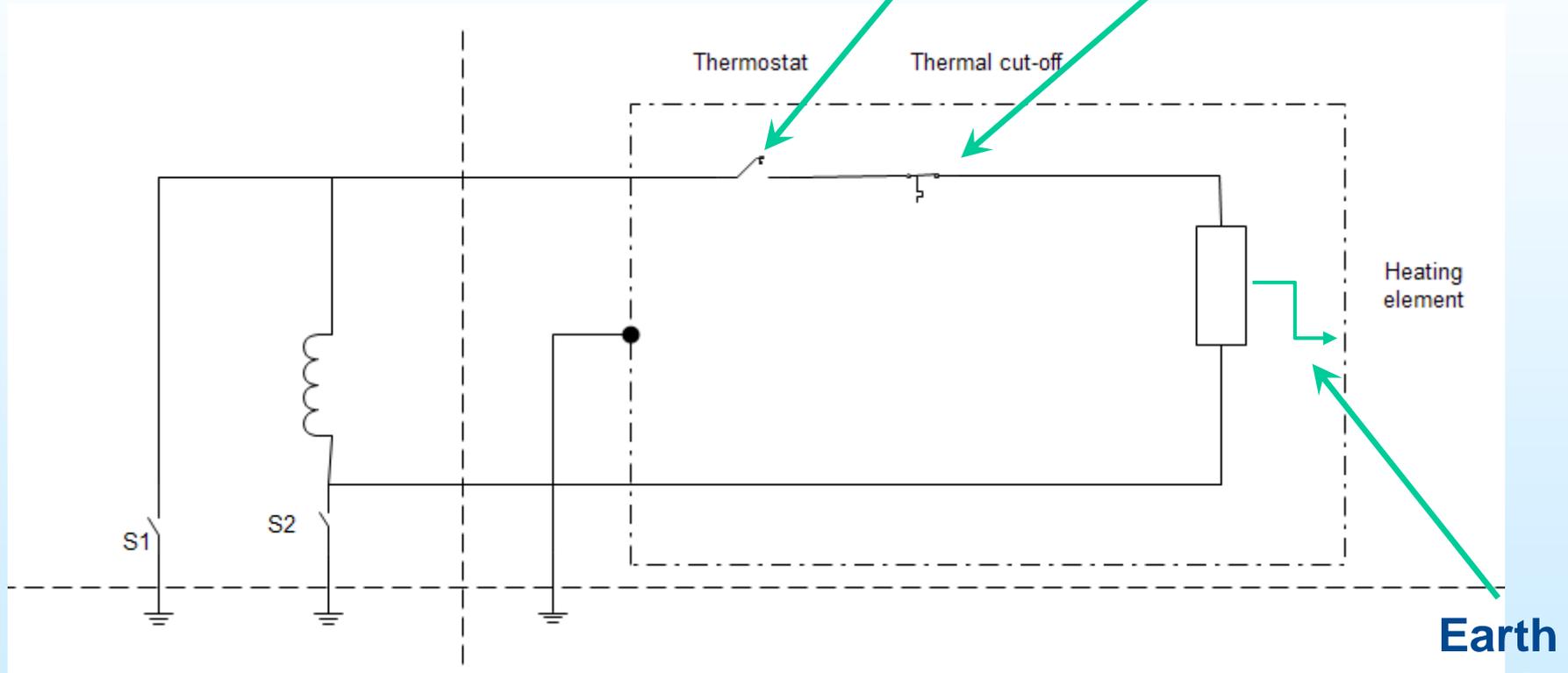
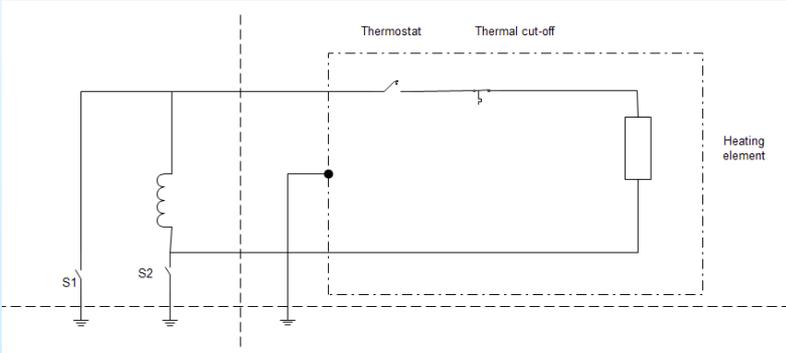


Fig. A bloc diagram of a potentially unsafe deep fat fryer, depending polarity of the mains (S1 or S2 closed)

Cl. 19 of IEC 60335-2-13

Unclear deep fat fryer instructions

In this example unclear or missing user instructions, may render the product dangerous in use (i.e. How to connect the equipment to the mains in case of non-polarised mains connection)



Faulty electrolytic capacitors

The weakest link in power supply is usually one of the electrolytic capacitors. Usually electronics repair people need to replace electrolytic capacitors more in repair actions, because it has a limited life span. This occurs because the electrolyte in the element eventually dissipates heat. Since electrolytic capacitors are not hermetically sealed, the electrolyte in these capacitor eventually evaporates causing increased ESR which causes increased heating, which causes the safety seal on the capacitor to pop, because if it does not pop, the capacitor explodes.

Faulty electrolytic capacitors



A counterfeit issue in Asia caused damage in a large number of power supplies of computers already on the market in 2002. After a few hours of operation of the counterfeited capacitor, the electrolyte would leak hydrogen gas, before bursting the metal body of the capacitor. The electrolyte would then leak its brownish filling and could cause a fire.

(e.g. Dell computer case)

Faulty electrolytic capacitors

Ripple current effect on lifetime

Electrolytic has larger Tan delta, so internal resistance ESR is higher meaning increased heating inside the capacitor.

Power dissipation by the ripple current:

$$W = I_R^2 \cdot R + V \cdot I_L$$

Where W = Internal power dissipation in capacitor

I_R = Ripple current

R = Internal resistance (equivalent series resistance ESR)

V = Applied voltage

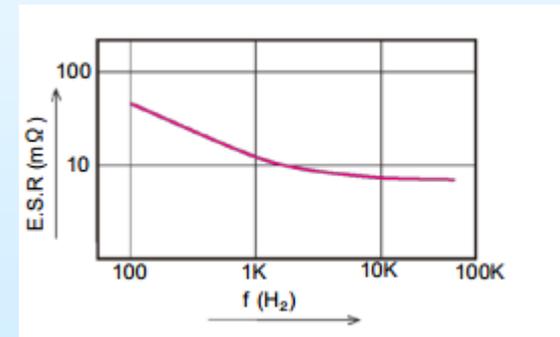
I_L = Leakage current

(Cl. 10 of IEC 60950-1)

Counterfeited plug-in card (tantalum capacitor)

Safety issue: ESR versus frequency

Tantalum capacitors have an equivalent series resistance (ESR) ten times smaller than the ESR of aluminium electrolytic capacitors, which allows for larger currents to pass through the capacitor with less heat generated



Just replacing a tantalum by an electrolytic capacitor, may lead to excessive heating, eventually to a fire in the equipment.

Counterfeited plug-in card



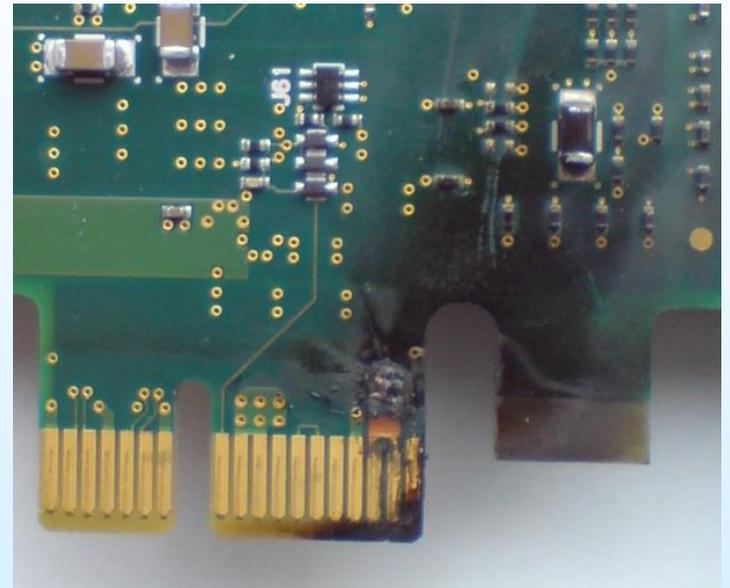
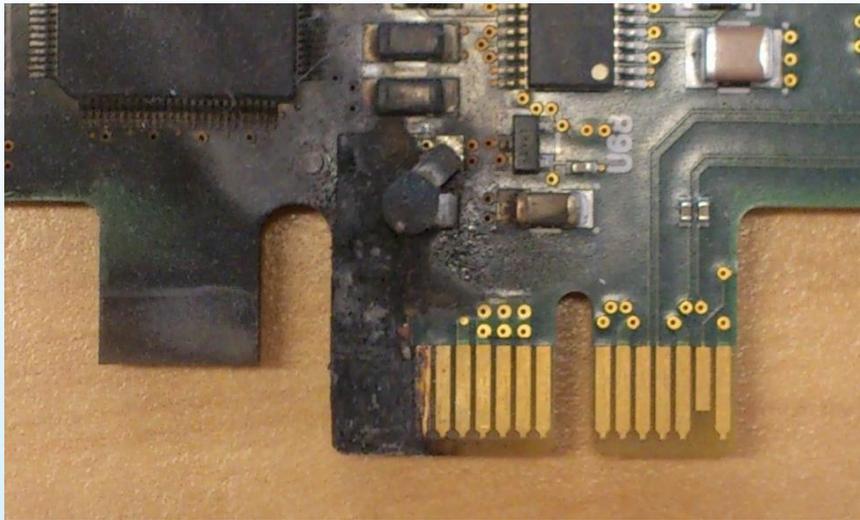
- 1. Product: plug-in video card in a PC**
- 2. Original design by a manufacturer in Belgium since 2006.**
- 3. 2011: counterfeited plug-in card found in a metro station control unit in Mexico which causes a fire in the metro installation, considerable damage to the installation**
- 4. Because the card has been copied fully including software, software key and marking details (manufacturer name and model No, incl. serial No) the Belgian manufacturer is sued by the Metro company**

Counterfeited plug-in card

- 5. Judge in Mexico requires that the Belgian company puts the conditions back into order in Mexico as before the fire: to pay the damage costs but also to install new equipment and to make it operational.**
- 6. Company in Belgium goes into appeal to the Court decision but this is not easy due to differing legal systems.**
- 7. Case is still not ended (as of April 2014)**

Likely effects: economic loss, eventually “bad” name of conform product manufacturer.

Counterfeited plug-in card



Photos of counterfeited plug-in card product fire issue