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Adaptation to Scientific and Technical Progress under Directive 2002/95/EC

Contract N° 07010401/2006/445990/ATA/G4

Final Report

- Final -

Freiburg, 22 October 2007

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5.9 "Lead in glass housing of high voltage diodes" (set 7, request no. 6, Vishay)

5.9.1 Requested exemption

Vishay Semiconductor (Austria) requests an exemption for GPR High Voltage diodes with zinc borat glass body which contains 2,5% lead in glass. This kind of diodes are mainly used for external power supplies being used in IT and telecommunication equipment and for automotive applications, too. The total number of GPR High Voltage diodes accounts for 20.000.000 pieces per year.

According to the applicant's argumentation, for the glass body of the diode an exemption exists. Upon request the applicant specified the existing exemption: "Lead in glass of cathode ray tubes, electronic components and fluorescent tubes" being applicable for the glass body of the diodes. However, an additional exemption is necessary for the use of lead in the plating layer of these diodes with a lead content <3000 ppm. This lead content is introduced unintentionally during the plating process, where the lead in the glass body contaminates the plating material.

5.9.2 Summary of justification for exemption

According to the applicant, lead in zinc borat glass is needed to reach similar extension as the touched metal pins. In addition, the change of the glass type is technically not possible, as the electrical loading of the glass type must be identical with the silicon-type being used (p-Si). Other materials than glass do furthermore not fulfil the specific surface conditions. These conditions are necessary in order to avoid flashover, as at a current of 1.800 Volt the distance between the Si-blocks only amounts to 180 µm. Furthermore, the expansion of all other materials like molybdenum is adjusted to this zinc borat glass. Only this kind of glass fulfils all of the technical/physical requirements.

Furthermore, the applicant argues that "According to all experiments and investigations with external institutes, it is not possible to avoid the contamination of galvanic fluid. During the galvanic process, the zinc borat glass body will be dissolved and the dissolved lead gather the plating material's pure tin." And: "To change the Glass material to a resist material against galvanic fluid is not possible. Electrically loading of Glass is a key factor, to keep the electrical parameter and performance."

Upon request, the applicant confirmed that theoretically the carryover of lead could be avoided if there was no contact of the galvanic fluid with the glass body. According to the applicant, several alternative techniques were discussed but none of them were very promising or led to unacceptable short life-time of the galvanic fluid.

5.9.3 Critical Review and final recommendation

A critical review of the documents made available by the applicant led to the following observations and conclusions:

- The requested exemption strongly relates to an existing exemption for lead in glass of …, electronic components and…"[9]. The arguments behind this existing exemption are comprehensible and valid.
- Theoretically there are two different approaches to avoid lead in the plating layer of these diodes:
  - Change the glass type being used.
  - Development of alternative techniques, which avoid the contact of the glass with the galvanic fluid.
- The applicant was able to substantiate that both approaches are technically not feasible or promising.

Against this background, we recommend to grant this request for exemption. In his written documents, the applicant did not provide a wording for this exemption. After consultation with the applicant, the wording was reconciled as follows:

Lead in the plating layer of high voltage diodes on the basis of a zinc borat glass body.

[9] Entry of RoHs Annex no. 5: "Lead in glass of cathode ray tubes, electronic components and fluorescent tubes."