4.14 Exemption no. 8a – stakeholder proposal part C (v)

"Lead in solders for electrical connection between semiconductor die and carrier within integrated circuit Flip Chip packages"

This exemption is currently listed as exemption no. 15 in the Annex of the RoHS Directive. It has been reviewed during the 2008/2009 review of the RoHS Annex. It was recommended to be continued until 2014 with the following wording (Gensch et al. 2009):

Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages.

Flip chip packages under this exemption are used in EES in vehicles as well. Texas Instruments provides some examples (Texas Instruments 2009):

- electronic stability control systems;
- advanced emergency braking systems;
- distance control;
- lane departure warning systems;
- frontal projection systems;
- pedestrian protection
  tire pressure monitoring systems to reduce rolling resistance and noise emissions;
- hydrogen and hybrid cars;
- car radio;
- vision systems;
- car-infotainment;
- traffic sign recognition;
- navigation;
- telematics;
- head-up displays.

The exemption was thoroughly assessed and reviewed during the RoHS Annex review in 2008 and 2009. For details see page 175 ff in the Final Review Report (Gensch et al. 2009). The stakeholders submitted the same information for this review of exemption 8a in the ELV Directive like for the previous review of the RoHS Annex (ESIA 2009).

There is no new evidence that the use of lead in this technology could be avoidable. As flip chip packages are used in EES in vehicles as well, the exemption is recommended to be transferred to Annex II of the ELV Directive. There is no reason to assume that, contrary to

applications in RoHS equipment, lead could be avoided in automotive EES in this flip chip technology. Art. 4 (2) (b) (ii) therefore would justify an exemption.

It is recommended to grant the requested exemption with the same wording as in the Annex of the RoHS Directive:

> *Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages; review in 2014.*

The review date in 2014 is recommended to enable a parallel assessment of the exemption in the ELV and the RoHS Directive in order to maintain the congruence of the exemption as far as possible.

4.15 Exemption no. 8a – stakeholder proposal part D

"Lead in terminals of Aluminium-Capacitors (Electrolyte Capacitors)"

The stakeholders had proposed part D of exemption 8 for "Lead in terminals of aluminium capacitors (electrolyte capacitors)" with expiry in 2016 for new type approved vehicles (ACEA et al. 2009b).

4.15.2 Description of exemption

The standard use of Aluminium Capacitors is buffering and stabilising of the supply voltage from the vehicles board net. Also they are required to filter the electromagnetic "noise" on the ECU input terminals. Their high capacity and reliability is also needed in high power applications to reduce the outgoing power peaks from the ECU to avoid negative impact on other automotive electronic systems (ACEA et al. 2009b).

In airbag ECU and sensors, aluminium-capacitors (electrolyte capacitors) are used as energy buffer to assure functionality (Airbag deployment) even during an accident when battery and generator are already destroyed. Energy buffering is also needed to provide the short high power pulses for electromagnetic valves as required in fuel saving gasoline and diesel common rail systems (ACEA et al. 2009b).

All Al-capacitors need to be soldered to electronic circuit boards. Therefore the terminals of the component must have a solderable surface. As the inner structure of the Aluminium capacitor is required to be solely of aluminium, an interface between the solderable terminal and the aluminium (paddle-tab) is required. As industry standard this joint is done by welding (ACEA et al. 2009b).