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Reference : Exemption 24 "Lead in solders for the soldering to machined through hole discoidal and planar array ceramic multilayer capacitors"

Syfer Technology Ltd support the continuation of exemption 24 unchanged, as the technical issues relating to the use of lead free solders in this application are unchanged.

Background

Through hole machined ceramic capacitors, multilayer discoidal or planar array capacitors which have a hole drilled through the ceramic body, are susceptible to cracking due the contraction of the solder inside the bore of the through drilled hole during the cooling cycle of the soldering operation.
This effect is normally prevented by the use of In/Pb or high% Pb solder alloys which have inherent ductility from the metal formulations. This ductility does not exist in Pb free alloys, hence the exemption on technical grounds.

Market changes since the original exemption application

There has been little change to the finished component design and we would not change the information previously supplied of typically 5mg of lead per solder joint equating to approximately 0.75% of the total filter weight. Market growth has increased the total lead used solder joints at Syfer to an estimated 5.2kg in 2007 (previously estimated at 4kg in 2003).

There has been an increased interest in the possibility of using spring clip contacts to replace the inner solder joints, but technical difficulties remain (see below).

It has become more apparent that some of our customers are tending towards using higher lead alloys (typically 95% lead rather than 50% lead) to overcome the limitations of the RoHS directive. This was one option Syfer discussed in the original application, but considered to represent a negative environmental impact due to :-

i) Increased lead in the final component.

ii) Increased energy usage to reflow the high lead solder, which demands a higher solder reflow temperature.

Where customers have been considering high lead solders, Syfer have actively encouraged switching the lower lead content In/Pb solder alloys allowed by exemption 24. (Note however that some specific applications demand the use of higher melting point solders on technical grounds).

Active development plans

1) Spring Clips

As mentioned above, there has been increased interest in the possibilities of replacing the solder joints with spring contacts. As this seems to represent the best opportunity for lead reduction, the main impetus of development has been towards this.

Spring clips reduce the available capacitance / voltage rating of a part by imposing limitations on the hole dimensions that are achievable. Historically this has limited their use to certain applications where this is

not important. Syfer have been discussing options with several clip manufacturers to try and reduce the clip size to make this a more attractive option. By working with customers at an earlier stage in the design cycle, we have also been able to promote the use of clips over solder.

One significant disadvantage of clips identified by our customers has been the increased contact resistance between the capacitor and the contact pin compared to a solder joint. This has proved unacceptable in some applications. Again, work to change the architecture of the ceramic capacitor has been investigated, but so far has not proved suitable to all applications.

Summary – spring clips offer a possibility to reduce the total lead usage, but are not suitable for all applications and have technical constraints. Solder is still the preferred method of jointing the capacitor to the surrounding metalwork.

2) Solder Alloys.

Syfer maintain a close relationship with solder manufacturers and will evaluate any lead free solder that is claimed to contain the ductility required.

The latest advice we have is that ductile lead free solder alloys are being considered for development, but that the small potential market for these alloys results in other development plans taking precedence.

3) Conductive Epoxies.

No conductive epoxy with the appropriate flow characteristics to flow into the space where the joint is to be made has been identified. Syfer will continue to monitor the market and trial any epoxies that claim to be suitable.

Work to eliminate the use of lead based solders is continuing but it is clear that solder is the only connection method that fulfils all the technical requirements and until a new solder alloy can be developed offering the critical ductility there is no lead free alternative for this application.

We therefore support the continuation of exemption 24 unchanged whilst development work continues.

Reference : Exemption 7a "Lead in high melting temperature type solders (i.e. lead-based alloys containing 85 % by weight or more lead)"

As mentioned above, ceramic capacitors are also extensively soldered using high temperature, high lead containing alloys (examples 95Pb/5In, 93.5Pb/5Sn/1.5Ag) for situations where post assembly soldering, for example Pb reflow into bulkhead) or high temperature operation is important.

Syfer will watch the progress of the development programs to investigate high temperature lead free alloys, and when they come available evaluate them for the required ductility for these applications.