Automotive Grade X7R MLCC with Soft Termination – AS series

High reliability, superior quality for automotive applications

Yageo, the global passive component leader, extended its range of automotive grade (AC-Series) with soft termination (AS-Series) multilayer ceramic capacitors (MLCCs). The new AS ranges are class II X7R up to 4.7 micro farad capacitance with case sizes (inch) 0603 to 1210. This AS series, with continuous quality improvements and assurances, can further solve the cracking issue caused by excessive mechanical stress and thermal fatigue. A typical bending crack is shown in the example below.

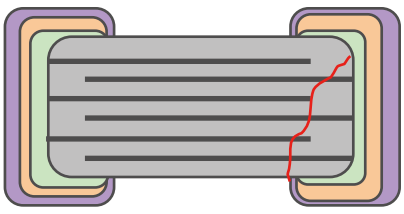


Fig. 1 Typical Bending and Temperature Cycling Crack

The soft termination capacitors are designed with the insertion of a layer of conductive polymer-Ag into the normal termination structure in order to provide extra elasticity and effectively absorb external stress, thus improving the ability to resist cracking and resulting in overall product reliability.

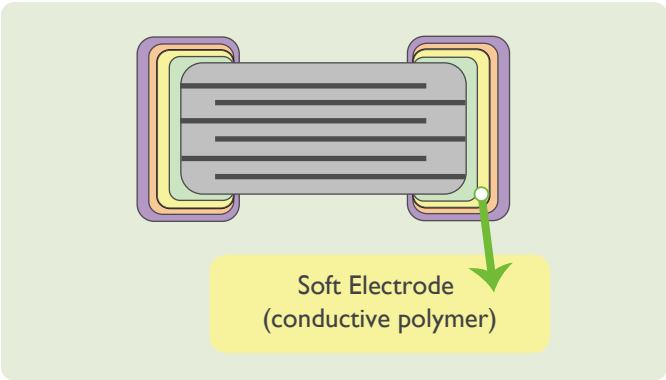


Fig. 2 Structure of Termination with Polymer Ag

Yageo treats AEC-Q200 criteria as the basic quality requirements for the AS series MLCCs. To reach even higher quality level, longer life, and more superior reliability, approaches adopted include high quality raw materials, special construction design, a comprehensive SPC (Statistical Process Control) and a dedicated production line. In addition tightened processing control and entire in-line & outgoing automatic checks are adopted on top of the existing production standards.

Let's look at high reliability MLCCs from two different viewpoints, (1) Macro-structure and (2) Micro-structure. To be more robust, the internal construction design for the AS has been evaluated. For example, some low capacitance items may apply different inner electrode structure and modified dimensions of cover plate and margins, as shown in Fig.3, to enhance mechanical and electrical performance.

In contrast with the macro-structure mentioned above, a good micro-structure requires more effort in material design and processing control. Simply speaking, a good micro-structure for high reliability MLCC should be uniform in both grain size and core-shell structure as shown in Fig.4.

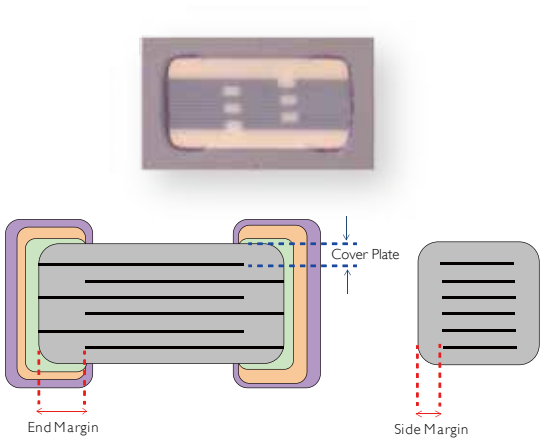
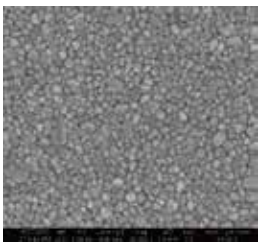
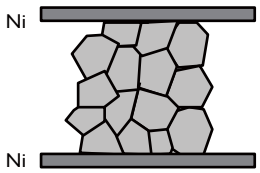


Fig. 3 Special Design for Construction





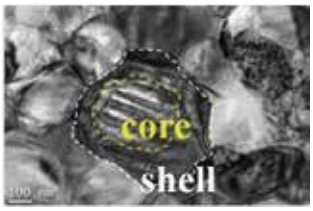


Fig. 4 Balanced Core-Shell Structure

To achieve high reliability Automotive grade MLCCs, the whole MLCC processing, starting from material design to the final product testing, has to be carefully studied and controlled. For example, the particle size distribution of the powder used for the AS series production is narrower than that used for commodity grade. With smaller deviations in all MLCC processing stages, better quality can be realized. (Fig. 5)

Comprehensive and continuous Statistical Process Control has been installed in Yageo's MLCC production lines. This production data provides an effective and instantaneous response in production status, and modifications can then be made immediately to ensure the quality. (Fig. 7)

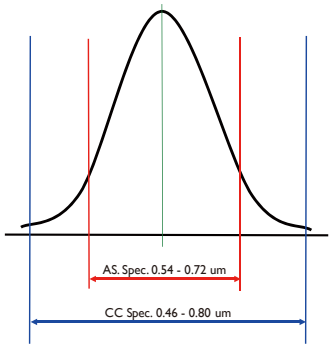


Fig. 5 Powder X7R D50 Spec.

After all these types of approaches have been applied to the AS series MLCC, high reliability performance can be reached as shown in the attached plot. This reliability level is much higher than that required by AEC-Q200 which is indicated by the red line in the plot. (Fig. 6)

Production part approval process (PPAP) documents are ready for all the AS series items. As with all other Yageo's MLCC series, the AS series is also RoHS compliant and has improved thermal and mechanical robustness. This offers customers a wider variety of choices and solutions in order to meet various application demands and requirements.

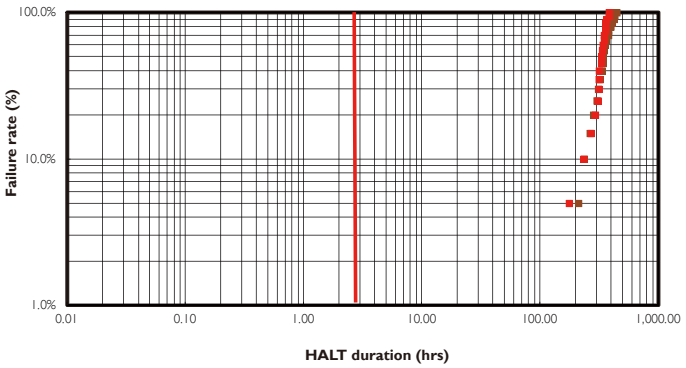


Fig. 6 High Reliability Performance

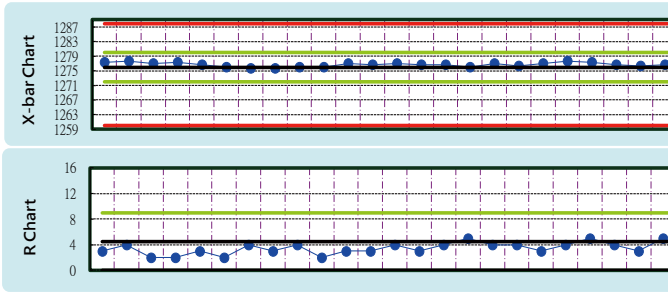


Fig. 7 Example: Sintering SPC chart - Thermal Ring Temp.

Automotive Grade X7R MLCC with Soft Termination – AS series

Features

- With or over AEC-Q200 requirements
- PPAP level 3 available
- High reliability with life test outgoing monitor
- Superior quality with 100% AOI & SPC monitor
- Factory QMS : IATF 16949 certified
- RoHS compliant

Applications

- Audio and video systems
- Comfort
- Infotainment
- Telematics
- Navigation
- Remote vehicle control
- Connectivity
- Lighting
- Head Up Display
- Security

Yageo's AS Series Application Map

Get More info. > Click here
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