

고압 커패시터의 고장분석과 신뢰성 평가

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Reliability Evaluation and Failure Analysis for High Voltage Ceramic Capacitor

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Abstract

High voltage ceramic capacitors are widely applied in power electronic circuits, such as filters, snubbers, and resonant circuits, due to their excellent features of high voltage endurance and low aging. This paper presents a result of failure analysis and reliability evaluation for high voltage ceramic capacitors. The failure modes and failure mechanisms were identified in order to understand the failure physics in a component. The causes of failure mechanisms for zero resistance phenomena under withstanding voltage test in high voltage ceramic capacitors molded by epoxy resin were studied by establishing an effective closed-loop failure analysis. Also, the condition for dielectric breakdown was investigated. Particular emphasis was placed on breakdown phenomena at the ceramic-epoxy interface. The validity of the results in this study was confirmed by the results of accelerated testing. Thermal shock test as well as pressure cooker test for high voltage ceramic capacitor mounted on a magnetron were implemented. Delamination between ceramic and epoxy, which might cause electrical short in underlying circuitry, can occur during curing or thermal cycling. The results can be conveniently used to quickly identify defective lots, determine mean time to failure (MTTF) of each lot at the level of inspection, and detect major changes in the vendors processes.