COMPONENT SELECTION FOR USE BEYOND MANUFACTURER’S SPECIFICATIONS

Abstract

Products in many industries need electronic parts that can operate over wide temperature ranges. Electronic parts may not always be rated to meet the application requirements. The uprating process was developed in the late 1990s as a possible method to address this problem. Uprating is a process to assess the ability of a part to meet the functionality and performance requirements of the applications in which the part is used outside the manufacturers’ specification range. Uprating is built into the performance assessment step as part of the part selection and management process and requires validation through electrical testing. This process can be resource-intensive in terms of time and money, and the difficulties are higher with an increase in part complexity. Therefore, there is a need to preselect parts that have the potential to be uprated. This thesis developed an uprateability assessment process to facilitate this pre-selection. This process utilizes the thermal ratings information for the parts, including absolute maximum ratings and recommended operating conditions.

In this thesis, a quantitative analysis of 140 datasheets (representing over 500 part numbers) is performed for absolute maximum ratings, recommended operating conditions, assembly information, thermal resistances, and temperature dependence of electrical parameters. The analysis identifies the best practices of information sharing, along with inconsistencies and incompleteness in the information provided by the manufacturers. This thesis provides a methodology to establish recommended operating conditions and absolute maximum ratings when unavailable in the datasheets. It outlines the criteria necessary to verify a comprehensive rating section, assigning an information availability level to the thermal ratings to assess the quality of the information provided by the manufacturer, and recommends sources to obtain the missing information.

This thesis also provides an uprateability assessment methodology to identify the components that have the potential to be uprated out of an initial pool of components. This process evaluates and eliminates the parts that cannot be uprated, narrowing the potential candidates for uprating and reducing the cost of the selection process.