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Book Reviews

Surface Mount Technology Materials, Processes, and Equipment, by Carmen Capillo, McGraw-Hill, Inc., 347 pages, 1990, $46.95.

REVIEWED BY A. J. RAFANELLI[1]

Upon first inspection of its Table of Contents, Carmen Capillo's book, *Surface Mount Technology Materials, Processes, and Equipment*, appears all inclusive covering design, manufacturing, and test.The twelve chapters are grouped into five parts each of which is preceded by a synopsis describing the background/objective for each part.

Chapter 1 presents a history of surface mount technology (SMT). Included is a nice summary of the advantages and disadvantages of SMT. A decision model for selecting SMT (as opposed to other technologies), while a good idea, appears to be ambiguous in that it does not really answer the question of whether SMT is desirable for high speed, high frequency, reduced weight, and reduced noise conditions.

In Chapter 2, passive and discrete surface mount components are discussed. Yet, definitions/descriptions of passive versus discrete components are not clearly illustrated which could be disadvantageous to the non-electronic/electrical engineer. However, the chapter represents a nice summary of surface mount components types, and, in this regard would be a good reference for practicing engineers.

Chapter 3 provides a very adequate dissertation of the comparison of the J-lead versus the gull-wing lead configurations. Further along, coverage of active components, while lacking somewhat in a clear definition, does provide a good overview of various device configurations and constructions. SMT interconnections are addressed, very well, in Chapter 4.

Chapter 5 is especially interesting and worthy of note. The opening paragraph relates a very timely and critical message; "...a good designer should understand, as much as possible, the manufacturing assembly and PCB fabrication processes and communicate with the manufacturing engineers who will eventually inherit the designer's foundation of work." With regard to this remark, the author provides a very suitable, comprehensive list of guidelines that the designer should consider, e.g., concern for zero defects/high yield, process optimization, materials/process compatibility, test, etc. The guidelines addressing material compatibility probably should be expanded to account for present restrictions on CFC-free solvents. In general, Chapter 5 is a very good compendium in design basics.

Chapter 6 provides detailed design guidelines addressing such aspects as substrate materials, panel and tooling holes, land geometrics, and design for testability.

Chapter 7, 8, and 9 deal with assembly. Chapter 7 does an adequate job in presenting manufacturing controls and incoming inspection. Chapter 8 is concerned with manufacturing materials and application techniques. In particular, one noteworthy comment is the explanation of the rheological aspects of solder, i.e., in paste form. Also, the author makes a good point that viscosity testing must be standardized in terms of test equipment procedure. From this reviewers's experience, these "variables" are dependent on user applications and should be agreed upon between user and supplier. Further along in Chapter 8, the author (in future editions) may want to include a definition of "resin" in order to better distinguish between "rosin-based fluxes" and fluxes with "synthetic resins and small amounts of rosins." The author is complemented for including a sub-section that classifies adhesives into structural, non-structural, and sealing functions. The subsequent explanations provide some helpful insight especially to a designer in deciding the true purpose of the adhesive. The overview of assembly techniques is very adequate. There is an abundance of clear, concise figures and graphics. Chapter 9 does a good job addressing Surface Mount Device (SMD) placement, rework, and workmanship.

Chapters 10 and 11 address soldering and cleaning, respectively. The latter chapter is commendable in describing the "theory of cleaning" in terms of the physical and chemical bonds of contamination. Moreover, the section dealing with the "mechanisms of removing contaminants" is very graphic. Furthermore, the author is complemented for including a section explaining current initiatives in reduction/elimination of CFC-based solvents, vis-a-vis Montreal Protocol. In short, Chapter 11 may be the best written chapter of the entire book. Chapter 12 is very comprehensive concerning testing of surface mount assemblies.

In summary, Carmen Capillo has produced a fine product. The book would prove to be a very useful reference for a practicing engineer in the electronic packaging and surface mount industry.

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