SOPARK
TOTAL ELECTRONICS SOLUTION
Minority Woman-Owned Business

CIRCUIT NEWS 2.4

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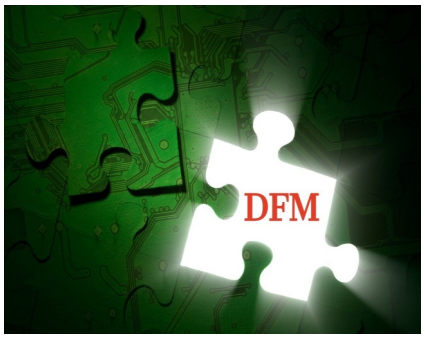

Design for Manufacturability (DFM)

Printed circuit board designs continue to drive towards smaller footprints with ever more complexity. The balance between functionality and manufacturability is like a complex puzzle where the pieces need to fit together properly to ultimately achieve both objectives. DFM can be the key piece to help solve the puzzle when used at the start of the design and development focusing on the five key elements of process, design, materials, environment and testing. The cost of doing DFM early is significantly less than at a later date when the design is qualified and in full production.

Why DFM? Here are some helpful considerations...

- ***Design Basics*** - Use of fewer components, standardized components, thermal management, proper spacing between elements and circuit board edges are all key design considerations to understand. Is the space signature for all the components in the CAD design file the correct size?
- ***Quality and Reliability*** - DFM techniques can greatly improve these areas which ultimately increase throughput and reduces cost.
- ***Know the Manufacturing Process Being Utilized*** - Surface Mount Technology (SMT) equipment is supplied by many different manufacturers, each with its own capability and limitation set. Through hole or hand operations can offer more design flexibility, but at a significantly higher cost to manufacture. Your contract manufacturer can provide the necessary requirements of their equipment.

Yield Losses to Consider:

- **Functional Yield Loss** - still the most dominant factor is caused by equipment related problems, systematic defects or entirely random defects.
- **Parametric Design Marginalities** - high performance designs may be more susceptible due to very slight fluctuations in voltage and/or temperature during assembly making spacing even more critical.
- **Testing Yield Loss** - is the testing system or process performing correctly?

DFM Organizations and Resources - here are few helpful resources...

- *https://www.ipc.org (offers many PCB DFM courses and materials)*
- *https://www.twi-global.com (offers several PCB DFM courses and documents)*
- *https://www.ame.org/sites/default/files/target_articles/96q1a2.pdf (AME DFM article John Ingalls 1996)*

Examples of DFM Success

Many articles have reported on the impact of DFM on the quality as well as efficiency. Gains such as 40 percent less time and 25 percent less labor to produce a product have been achieved with DFM services.
In a survey of 250 manufacturers with sales of $10M to $500M, over 64% of these companies were using DFM. A variable frequency (AC) motor drive company used DFM starting with their circuit board design (60% of the cost of the motor) and proceeding with the other components. The results were significant:

- Total part count dropped by 64%
- Screw connections reduced 43%
- Control wire reduction of 74%
- Assembly labor reduction 74%
- Overall motor cost reduction 41%

Source: ame.org article: John Ingalls.

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