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Design for Manufacturability

The purposes of designing for Manufacturability are to improve quality, delivery, and cost. Proven DFM practices will ensure quality, reduce delivery lead-times and provide a reduction in the product cost by selecting the best materials and processes for the application.

Why DFM?

Many errors are systemic across different customers and industries. Some of the most common errors:

1. Missing or invalid manufacturing part numbers
2. Selection of components that are at the end of life or not available through distributors
3. No allowances for alternates on components
4. Selection of components that cannot withstand process temperatures (reflow)
5. The design requires unnecessary "extra" manual assembly effort
6. Distance between plated through hole parts (PTH) and surface mount technology (SMT) components is inadequate.
7. Connectors or other components too close or overhanging edge of board
8. Incorrect pad size for the part geometry
9. PCB specifications not adequately detailed (e.g. board material, thickness)
10. PCB layout provides poor access for testing
11. Via holes & board pad proximity too close
12. Pin spacing on PTH components wrong for machine placement, PTH holes incorrectly sized for part.

Bill of Material (BOM) creation and Component Selection

1. Select a manufacturing part number for each and every item on the BOM.
2. Review end of life, lead-times and availability of components selected. Select the best component that is not near its end-of-life, the component whose lead-time is within your delivery window and the component that is widely available in distribution. All too often it is only a*fter* the design is completed and implemented do you realize a difficult or long lead-time item has been unnecessarily designed in the product.
3. Select components with machine-place able features and packaging options. This will avoid driving additional cost by incurring additional manual handling of components.
4. When possible, list alternate components to allow us to find the best price/lead time part.
5. For specialized components or high dollar items, register the parts with the manufacturer and negotiate special pricing upfront. Once designed in, you will have

little control on pricing or delivery as the manufacturer knows they have you "locked in". Communicate pricing and the distributor to us.

6. Select components where the required Minimum Purchase Quantity best matches your annual demand.
7. On SMT assemblies, use headers that can be placed with automatic pick & place equipment. Many manufacturers do not offer pick caps for their SMT headers. Avoid selecting components that need to be hand placed as this increases costs and the opportunity for errors.
8. Select parts that can withstand the temperatures of the reflow ovens and wave/selective solder equipment. (RoHS) parts must be able to withstand 260 degrees Celsius max.
9. It is unadvisable for Ball Grid Arrays (BGA) RoHS components to undergo the traditional Tin-Lead process; however, they can be processed but with higher reflow oven temperatures.

10. Wires need to be specified for Gauge, Length, Color, and UL rating. Remember to include manufacturer's part number.

PCB Size and Mechanical Fit

1. PCB Size is defined by the equipment your EMS provider is using in production. The key is that size does matter and bigger is not always better. The larger the panel, typically the more difficult to process.
2. PCB Shape must have two parallel sides to process through automation.
3. 0.125" keep out area along board edges or rails/break off tabs required.
4. 0.250" rail/break off tab minimum size.
    - Let the EMS provider optimize for lowest cost by having flexibility on panelization
    - Panels become less stable as the array size increases. EMS providers will consider the lot size requirements when establishing the array size.
    - Include information about overhanging parts (outline & keep out areas)
5. V-Groove scoring is applied to both sides of the board. It is a "V" shaped groove leaving a 0.015" web of material to support the board. Components or other features should not be too close to the edge or damage may occur. Typically 0.035" – 0.050" should be allowed.
6. Routing & Perforated Tabs refer to IPC-700. Perforated tabs are made up of 3 holes 0.040" in diameter. Indent holes by 0.025" to avoid a manual operation after depanelization.
7. The location of the cut tab shall be specified, if critical as it may cause interference upon assembly into the application box or hardware.