

Project Schedule for Electronic Appliances

Concept/feasibility

- Form, Fit, and Function
- Can it operate at maximum tolerances
- Does it violate any patents
- Are there any similar products to use in design
- What Agency approvals will be needed
- Estimate volume and price targets
- Are custom parts needed and obtainable
 - Displays, Membrane switches, Transformers, Sensors, Housings, etc.
- Finalize functional specifications

Capture Schematic

- Consult AVL (Approved Vender List)
- Create any new parts, symbols and footprints
- Make BOM
- Get pricing based on volume

Lay out PCB

- Get current capacity for ground and output traces
- Establish mechanical keep-aways
- Estimate overall size
- Make sure inputs are sufficiently isolated from noise sources
- Make development boards with no solder mask
- Submit to ICT and function test Engineers (preliminary)

Make CAD drawings of mechanical parts

- Locate displays and input buttons (see Marketing)
- Locate mechanical stress points and strengthen them
- Mounting scheme and brackets
- Specify assembly procedure.
 - any special tools or precautions

Contact Agency approval offices

- Get pricing and open new project
- Get critical test requirements
- Will it be necessary to visit facility for testing (UL, FCC)
 - If so, which facility, how much does it cost, what's their lead time

Order Parts

- Enough for 5 -10 boards for development
- Get pricing and lead time for expected volume for rare components
- Make sure no parts are expected to become obsolete soon
- Identify alternative parts for critical components,
 - output transistors, relays, buzzers, buttons, connectors, displays, transformers, op-amps
 - PCB should accommodate all alternate parts
- Submit drawings to vendors for quote of custom items
 - Displays, Membrane switches, Transformers, Housings, Plastic retainers, etc

Start ICT and Function test Engineers designing for boards

- Theory of Operation for how it functions
 - Sequence of button pushes, inputs needed, outputs expected, how it will be programmed
- Test points, pass/fail requirements, test code

Notify Manufacturing of product

- BOM
- Assembly procedure
- Special handling of vulnerable components
- Testing procedure
- Packaging requirements

Notify purchasing to prepare for Pilot Run

- BOM, Prints for custom parts, expected date of Pilot Run

Start Documentation

- Verification test procedure
 - How to tell it is functioning, exercise all components
- Validation test plan
 - Component temperatures, Hi line, low line, Hi temp, low temp, FCC compliance, relay and transformer qualification tests, Then destructive test such as FMEA table, Surge testing, Vibration and drop tests
- Software Check out plan
 - Are there any unexpected states or state changes
- Theory of Operations
 - Used by Diag + Repair, Test Engineering
- Worse Case Analysis
 - Make sure no components ever operate outside the tolerances listed in their datasheets (calculations in theory)
- Diagnostics and Repair Manual
- User Guide

Develop prototype units

- Populate prototype boards (no solder mask)
- Use to develop hardware and software
 - Identify and fix any software bugs
 - Does software handle sensors, buttons, displays, and outputs
 - Confirm that it operates under maximum load
 - Identify hot components, get bigger resistors or transistors
 - Identify noisy circuits that may need shielding
 - Does transformer need TCO
 - Do preliminary validation tests for worst case load, component temperatures, hi-line, low-line, FCC, hi-temp, low-temp, injected noise, surge testing
 - Check for physical fit in end product
- Assemble final product, Identify any difficulties
- Make sure custom parts operate correctly and fit as designed

Preparation for Pilot run

- When satisfied with development, finalize schematic, BOM, PCB layout, prints for custom parts and any assembly drawings for production.
- Notify Test Engineers of final layout so they can finish ICT and Function testers
- Notify Manufacturing of final assembly drawings to prepare for Pilot run
- Notify Purchasing of final changes to BOM and drawings

Pilot run of production

- Construct assembly line and stock parts
- Post instructions and train personnel
- Take notes on any difficulties and change prints if necessary
- Confirm QC testing meets expectations

Finish Validation testing

- Use Pilot units to complete in depth Validation test plan
- Confirm preliminary Validation, UL, FCC testing results
- Do destructive tests, drop, vibration, temp cycling, FMEA
- Do any field testing

Release to Production

- Finish Documentation
 - Validation test plan
 - Agency approvals (FCC, FCC, etc.)
 - Mechanical Prints
 - Hardware Specification
 - Theory of Operation
 - Worse Case Analysis
 - Diagnostic + Repair manual
 - User Guide
 - Incoming Inspection Instructions
- Notify Packaging Engineer
 - Identify any special electronic or mechanical concerns
- Initiate final ECR to release

Be available for any quality issues that may occur in manufacturing or returns from the field.