



Manufacturing



How Boards Get Made

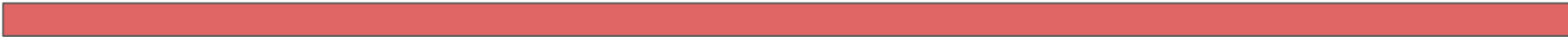
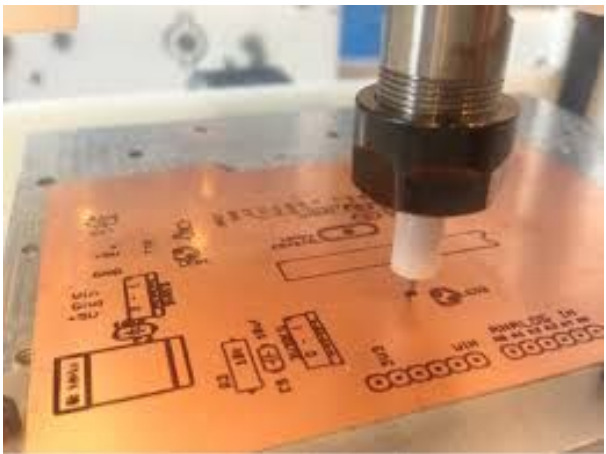
PCB Mills

Printing and chemically etching

Fab House

So cheap and fast you may as well

Can assemble as well





Cost

Number of **layers**

Size of board

Extent of **testing**

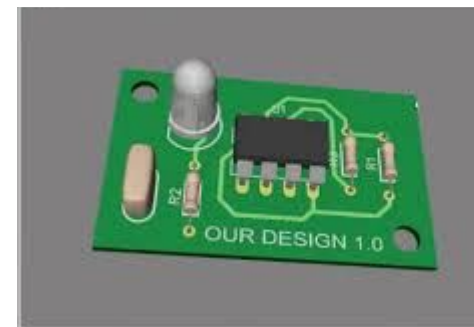
Assembly

of sides, # of **components**

Level of detail (min trace width, hole size)

Shipping

Number of **holes** (different sized holes)





In House Testing

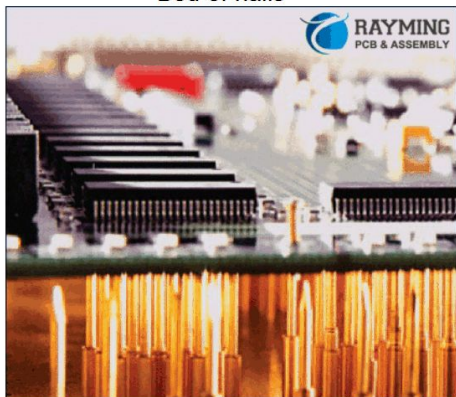
Flying probe - test for unwanted shorts, ensure proper connections

Can create custom testing for large-scale production

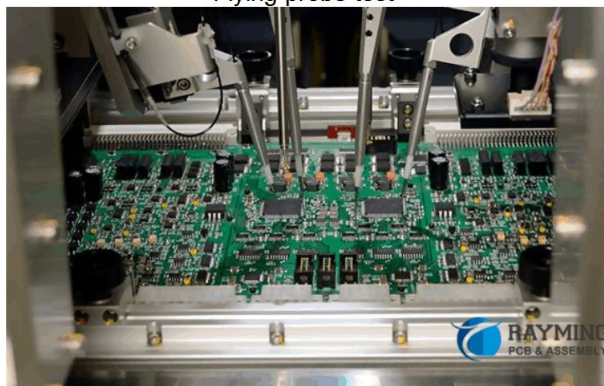
BON (Bed of Nails) - pins connected to designated test points to test connectedness, program

AOI - automated optical inspection

Bed of nails



Flying probe test





In House Assembly

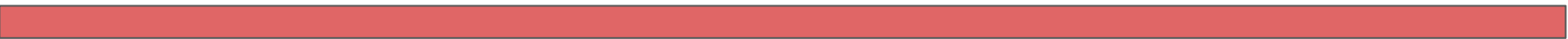
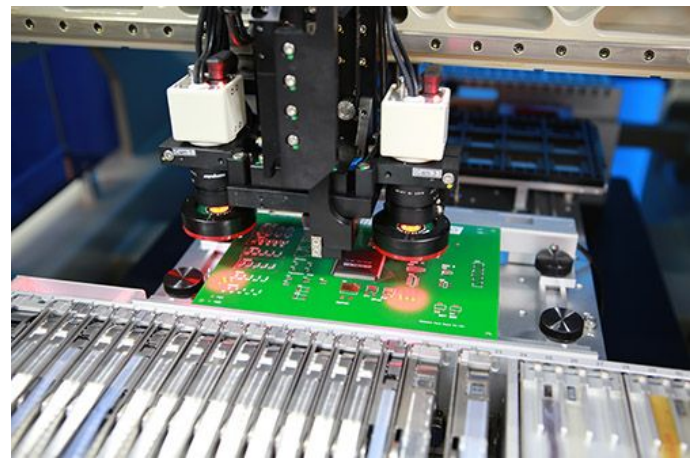
Thru hole vs smt - SMT easier

- Small scale thru hole done by hand sometimes, costly

Cheaper for one side

Pick & place machines - put components in correct spot on PCB from spools

Always need to send them extra for attrition





Process

Usually chemical etching used to define copper regions (traces, pads, planes, etc)

Holes drilled with CNC, through holes plated

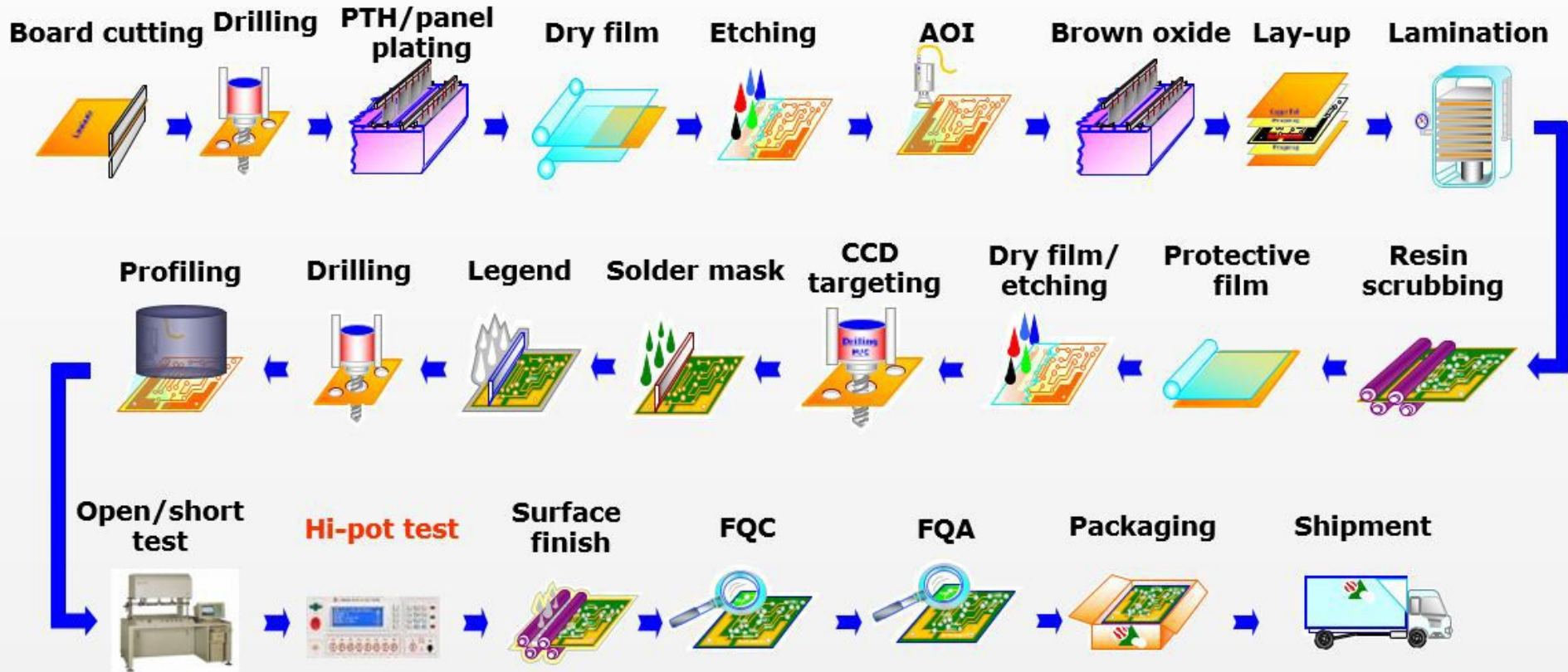
Solder mask applied to non-copper areas

Copper areas tinned if assembly to occur

Silk screen applied



PCB Manufacturing Process





Mass Manufacturing

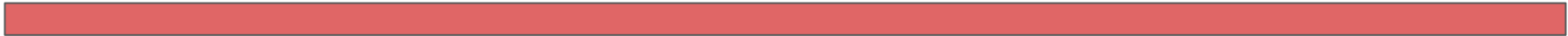
Very different design considerations

Cheaper per board

May want more thorough testing

Going to modify prototype to make smaller, cheaper

Source components directly from suppliers





BOM: Bill of Materials

When done with board, collect list of components

Associates designators with ordering components

Ensure it is complete enough for a stranger (manufacturer, future user) to order and place every component

| Designator | Manufacturer | MPN | Quantity | Description |
|----------------------------|------------------------|------------------------|----------|-------------------------------------|
| J26, J47 | Amphenol Commercial | LUSB-3193-00 | 2 | Amphenol Commercial Products |
| U19, U20, U21, U22, U23 | Texas Instruments | TPD2EUSB30ADRTR | 9 | ESD / Surge Solution for High Speed |
| TP2, TP3, TP4, TP5, TP6 | NA | TP | 8 | Mechanical Test Point |
| U31 | Texas Instruments | TPS79318DBVREP | 1 | Single Output Fast RF LDO, 200 mA, |
| J2, J3, J4, J8 | JST Sales America Inc. | SM06B-GHS-TB(LF)(SN) | 4 | CONN HEADER GH SIDE 6POS 1.25MM |
| J19 | rfdesign | MODEM-RFD900+ | 1 | RFD900 |
| U26 | Semtech Corporation | RCLAMPO508M | 1 | TVS DIODE 5VWM 25VC 10MSOP |
| J14, J15, J21 | JST Sales America Inc. | SM03B-GHS-TB(LF)(SN) | 3 | CONN HEADER GH TOP 3POS 1.25MM |
| J38 | Molex, LLC | 878312020 | 1 | 20 Positions Header |
| PSM1 | ProfiCNC | HX4-06006 | 1 | PCA, PSM, Assembly |
| J40 | Hirose | DF17(1.0H)-80DP-0.5V(5 | 1 | Connector, Header, 80Pos, .5MM, DI |
| J35, J36, J37 | Molex, LLC | 0878311241 | 3 | 12 Positions Header |
| J44 | Molex, LLC | 0878310442 | 1 | 4 Positions Header |
| SW1, SW2 | Wuerth Elektronik | 430451031836 | 2 | WS-TASV SMD Tact Switch 6X6 mm |
| J41, J43 | Molex, LLC | 0878310642 | 2 | 6 Positions Header |
| J46 | Molex, LLC | 0878312010 | 1 | 20 Positions Header |
| J45 | Molex | 0533980471 | 1 | CONN HEADER 4POS 1.25MM VERT |
| J50 | Samtec | SEAM-50-02.0-S-08-2 | 1 | TX2 400 Pin Module Interface Heade |
| U7, U8, U11, U12, U16, U17 | Diodes Incorporated | 2N7002K-7 | 12 | N-Channel 800V 1A (Tc) 45W (Tc) Si |
| J42 | Amphenol ICC (FCI) | 10029449-001RLF | 1 | Surface Mount Type A HDMI Recept |
| DS1, DS2, DS3 | Lite-On | LTST-C191KGTK | 3 | Chip LED, Green, 574 nm, 40 pF, -55 |
| J12 | JST Sales America Inc. | SM08B-GHS-TB(LF)(SN) | 1 | CONN HEADER GH SIDE 8POS 1.25MM |
| J48 | | | 1 | Header, 2-Pin |
| SW3 | C&K | OS202011MS2QS1 | 1 | Slide Switch DPDT Through Hole |
| U36 | Panasonic - BSC | CR-2032/F2N | 1 | BATTERY LITHIUM 3V COIN 20MM |
| J11, J13, J52 | Molex, LLC | 0705530001 | 3 | Header, 2-Pin |

