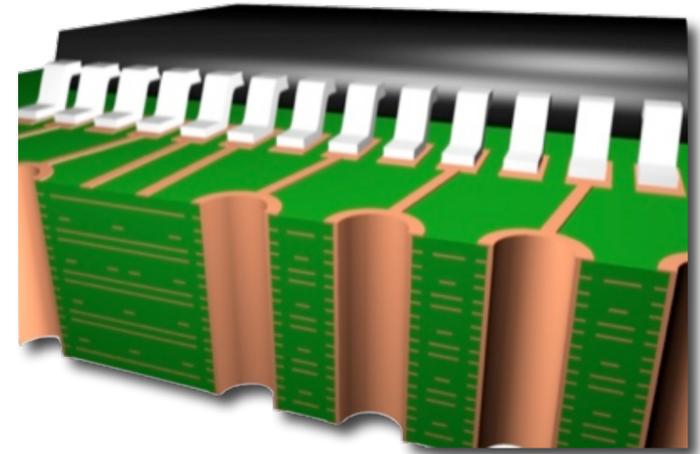
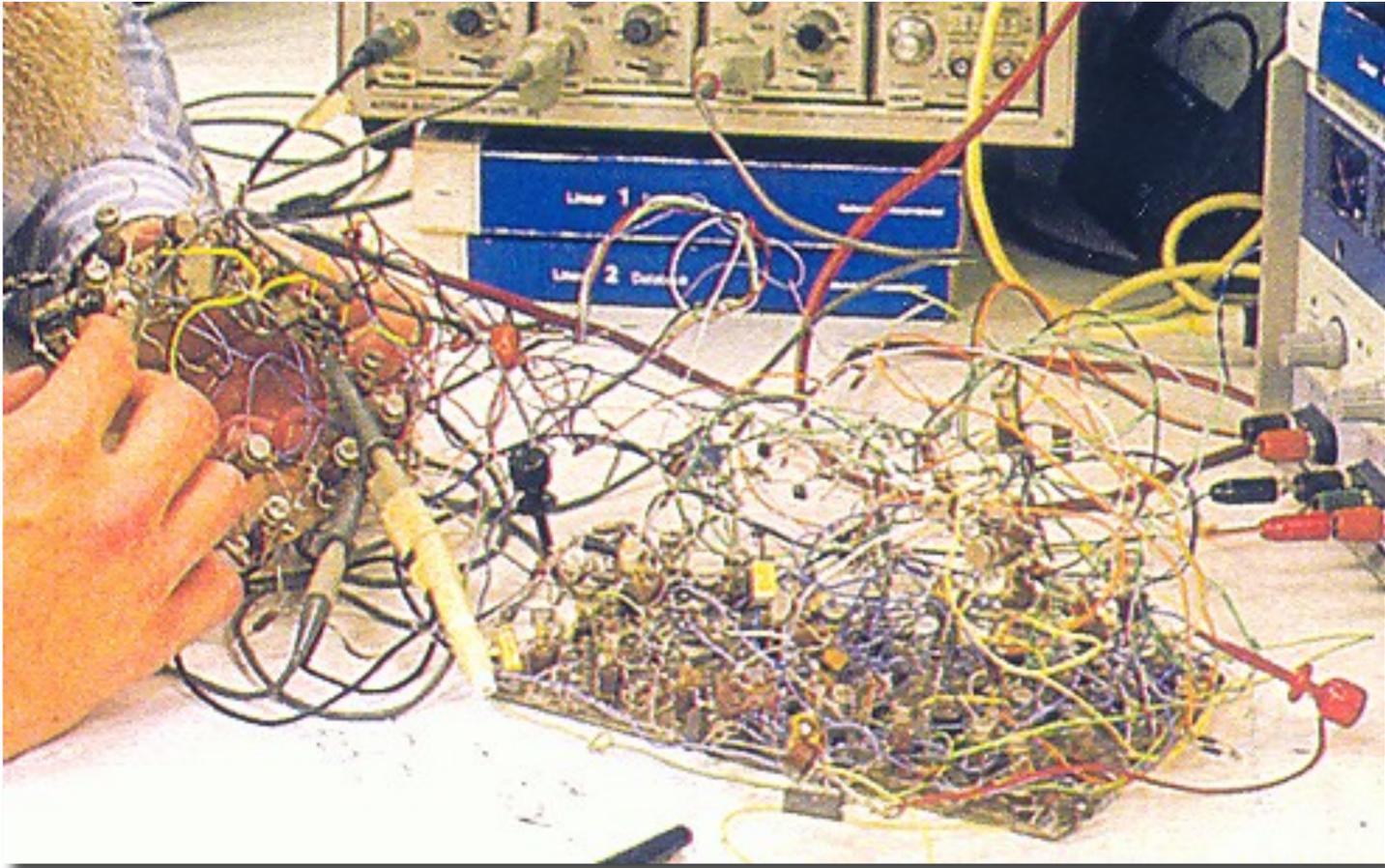


PCB（印刷电路板）基本概念

构成电路板的主要元素

PCB的功能

将不同的元器件放置在上面，并能够将这些元器件进行电气连接

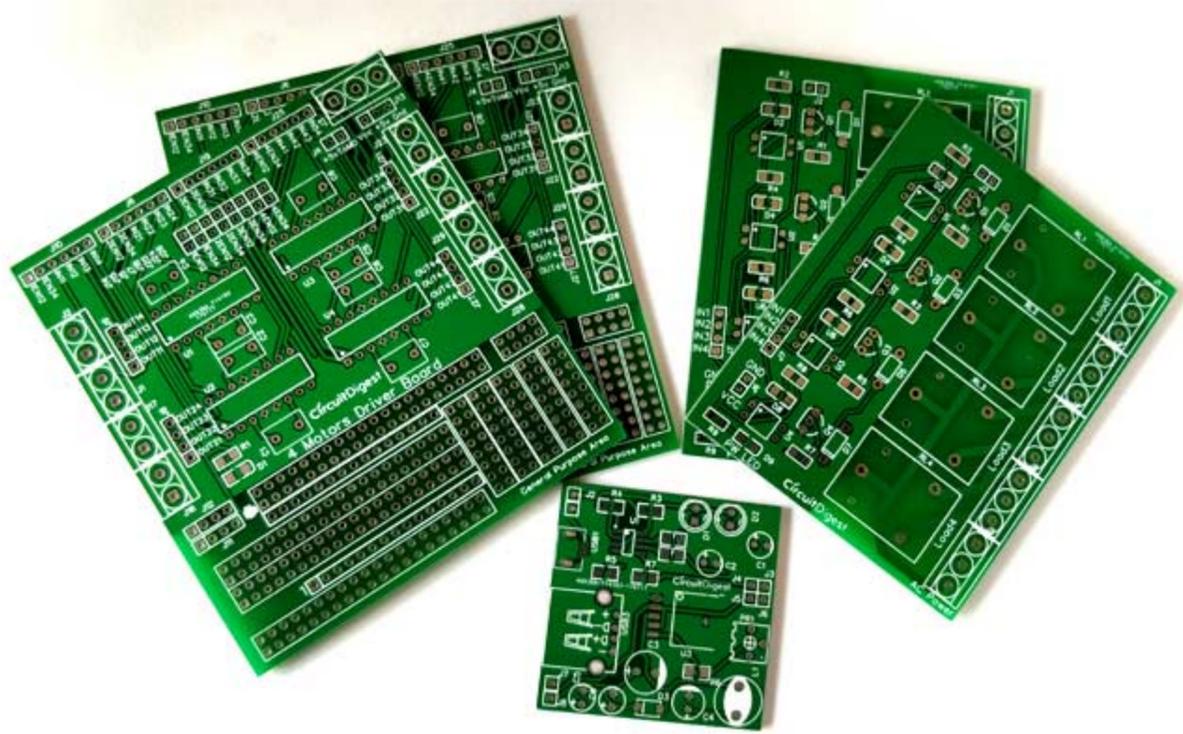


PCB & PCBA

PCB



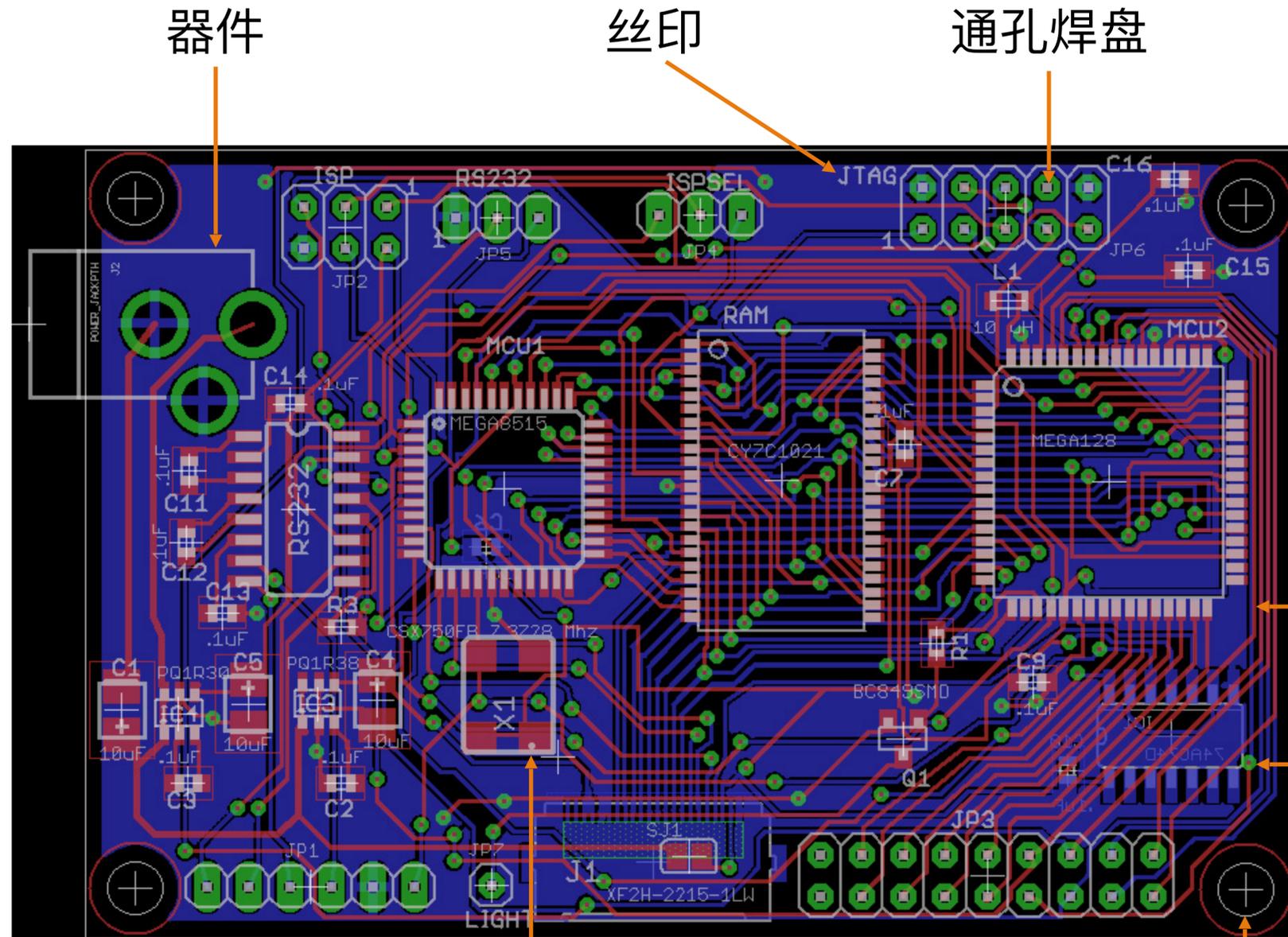
PCBA - PCB Assembly



嘉立创、捷多帮、金百泽、兴森快捷

汉普、金百泽、易德龙

PCB - 印刷电路板

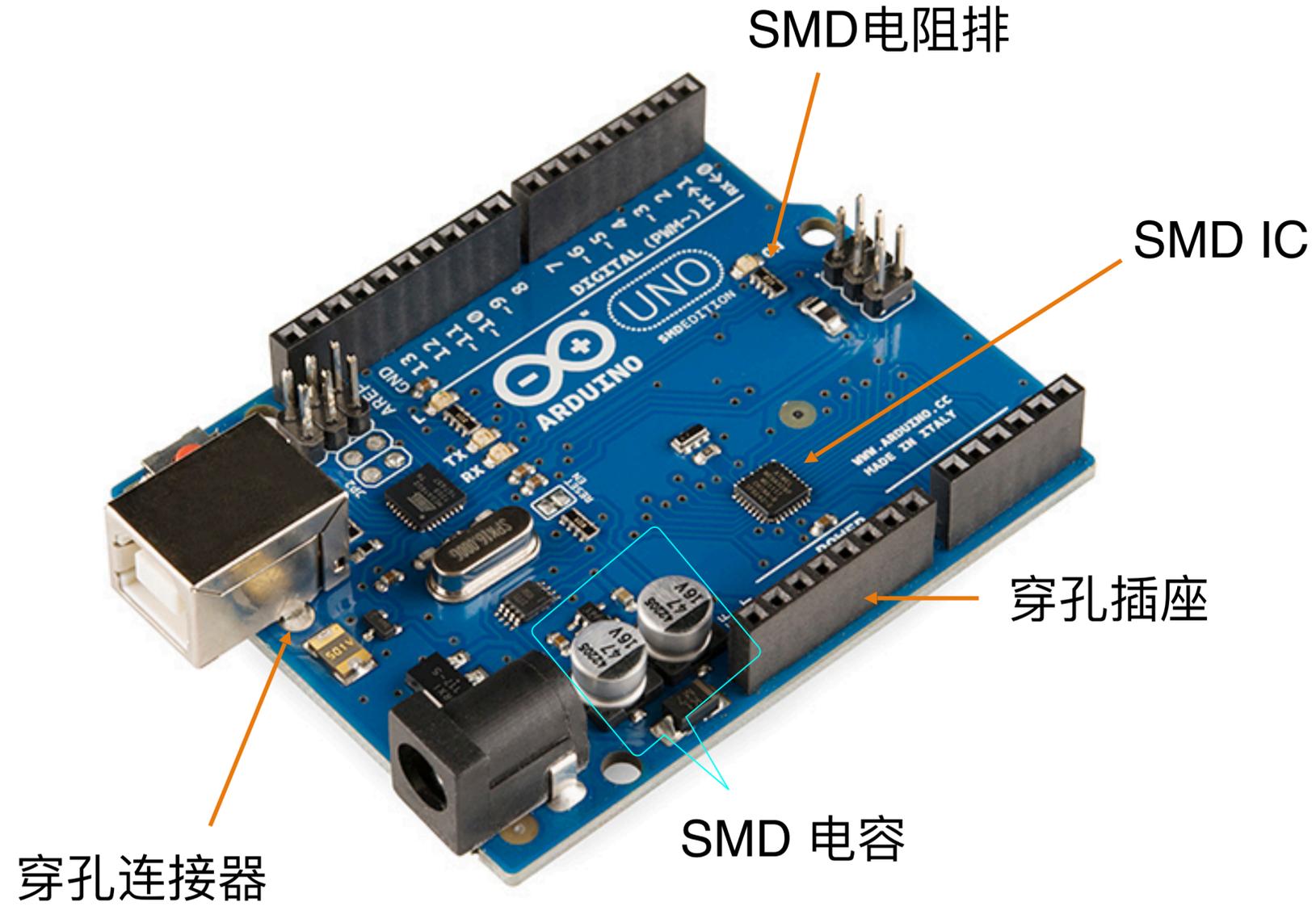


- 器件 - Part
- 焊盘 - Pad
- 走线 - Track(Trace)
- 过孔 - Via
- 层 - Layer
- 丝印 - Silk screen(overlay)
- 阻焊层 - Solder mask
- 定位孔 - Mounting hole

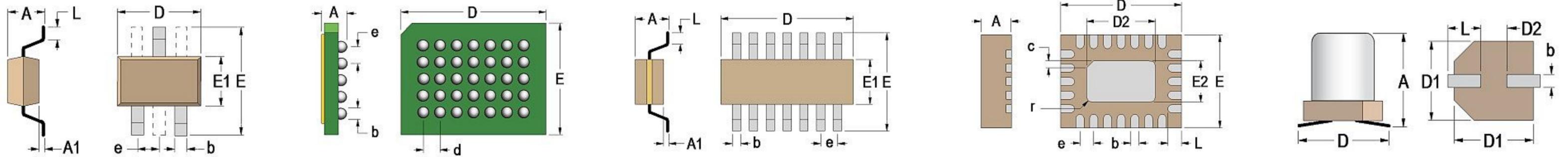
表面贴装焊盘

定位孔

器件(Part) - 穿孔和表面贴装器件



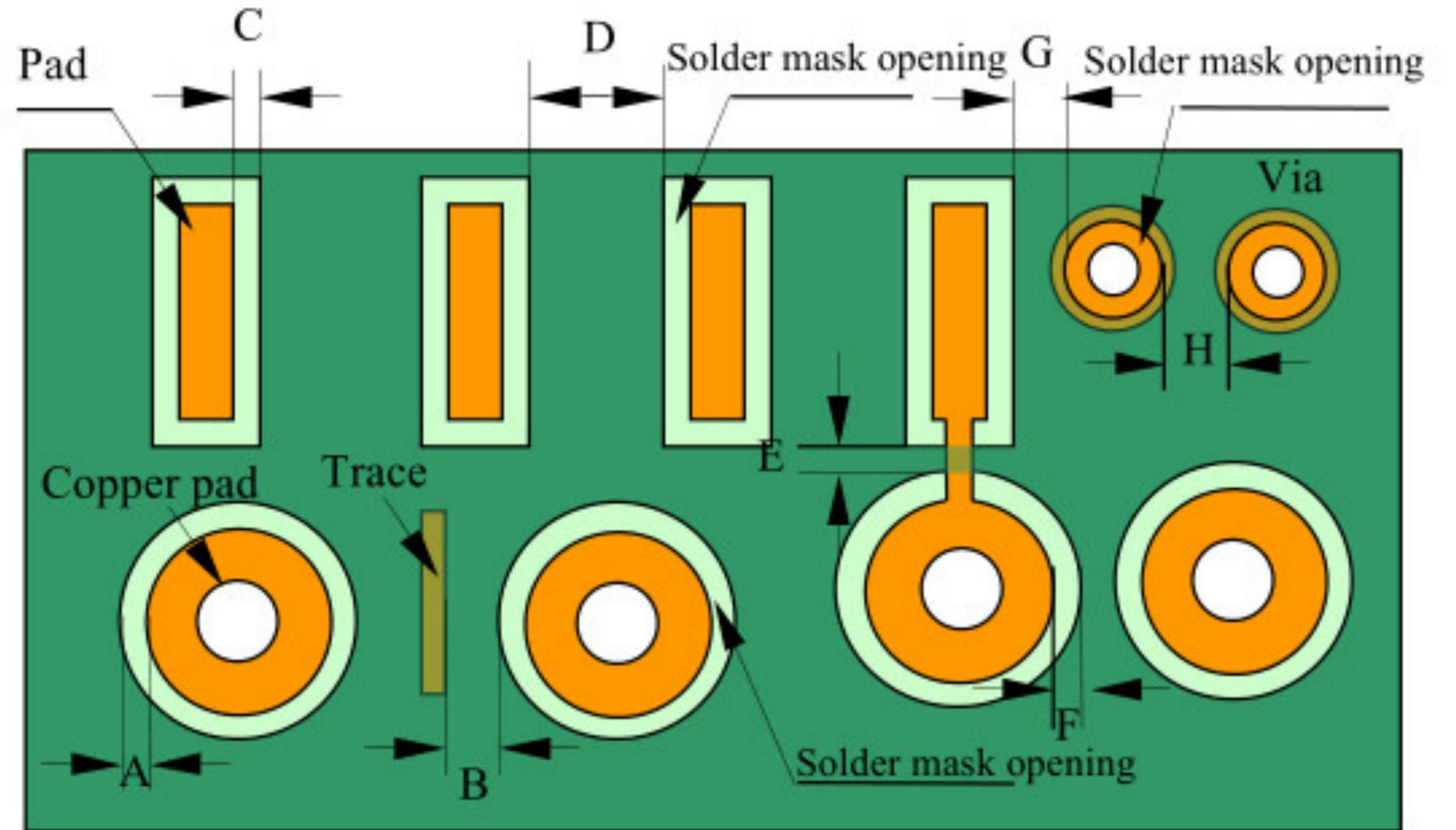
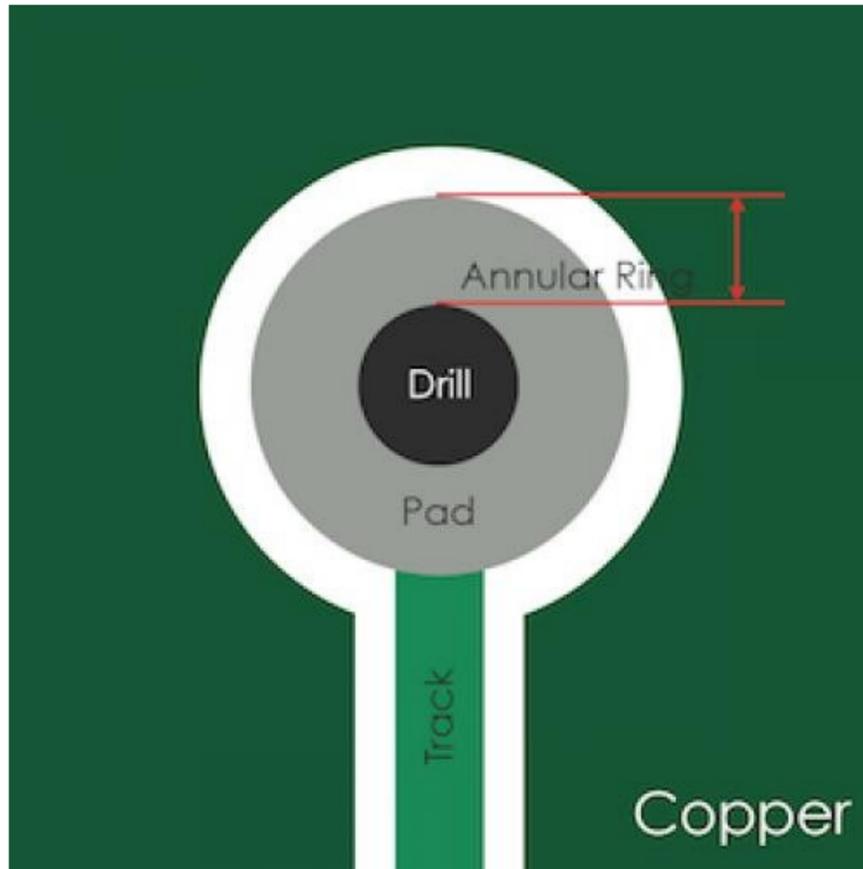
SMD器件的使用



- 单面分布器件的引脚和焊盘 - 可以是双面都分别放置
- 体积小巧、便宜、电路板加工生产比较容易，电路板密度可以更高
- 文字标注要随元件所在面放置
- 器件的起始脚（第一脚）需要定义清楚，有时采用不同形状的焊盘来表示

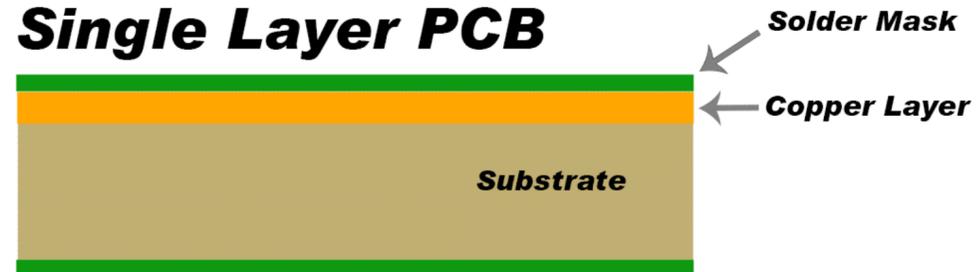
焊盘 - PAD

通过焊盘将元器件焊接到电路板上



PCB分层 - Layer

Single Layer PCB



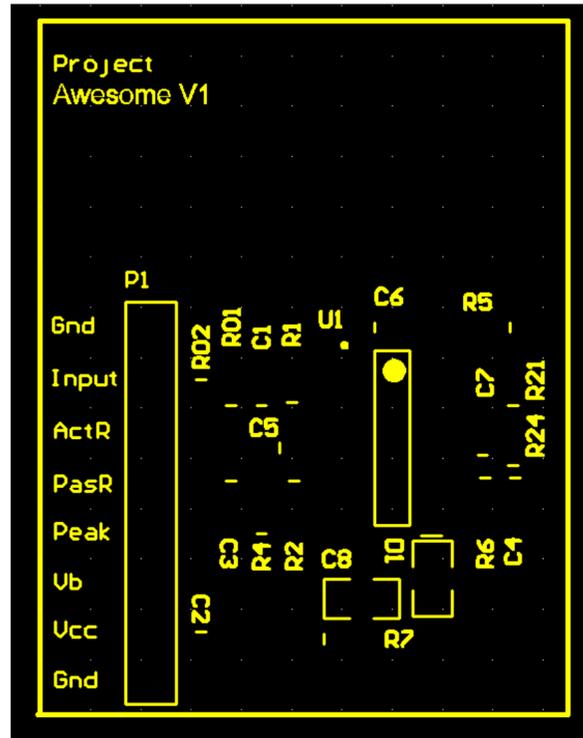
Double Layer PCB



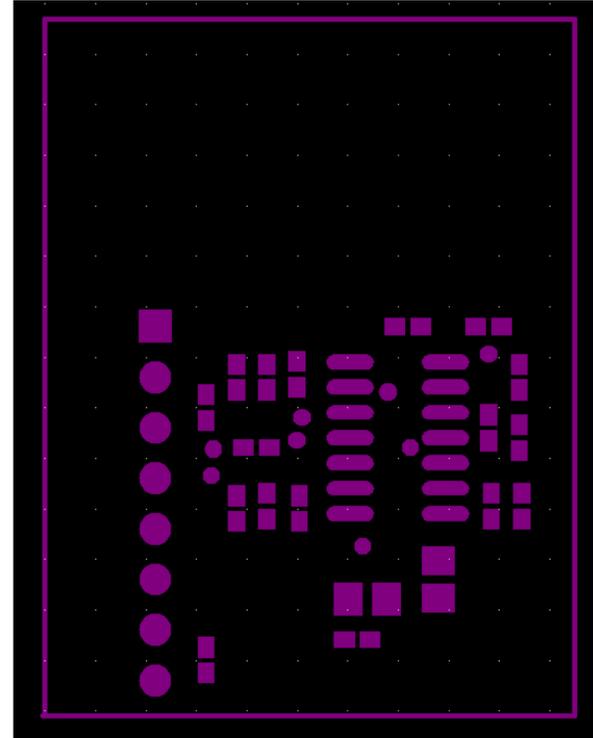
- Mechanical: 机械层 - 定义了板的外观
- Keepout layer: 禁止布线层 - 电气布线的边界
- Top overlay: 顶层丝印层
- Bottom overlay: 底层丝印层
- Top paste: 顶层焊盘层
- Bottom paste: 底层焊盘层
- Top solder: 顶层阻焊层
- Bottom solder: 底层阻焊层
- Drill guide: 过孔引导层
- Drill drawing: 过孔钻孔层
- Signal layer: 信号层
- Internal plane layer: 内部电源/接地层
- Solder mask layer: 阻焊层
- Paste mask layer - 锡膏保护层, SMD贴片层



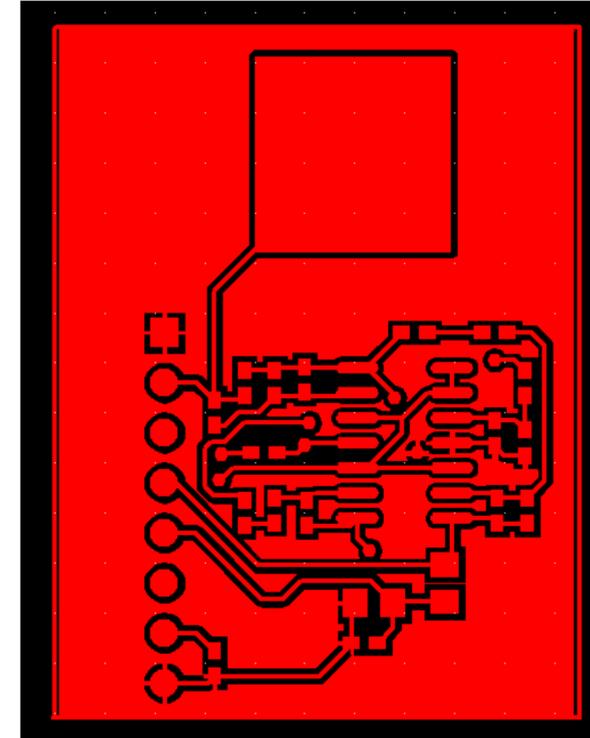
Top Silkscreen



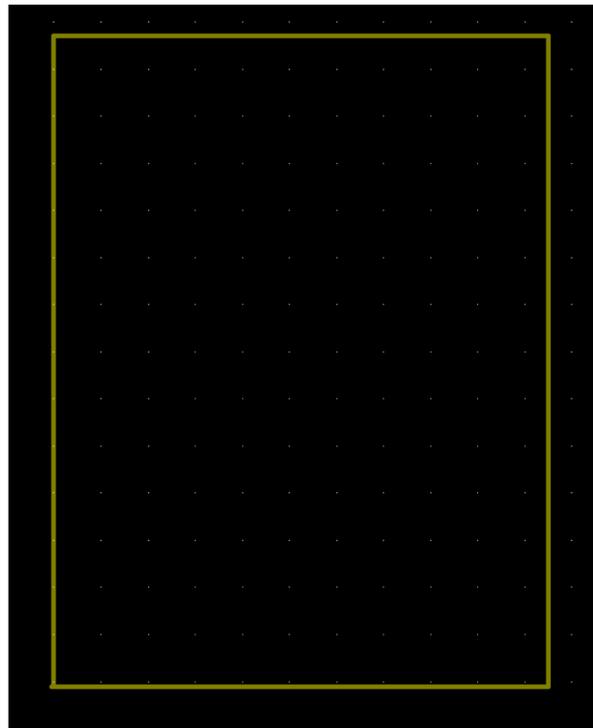
Top Solder mask



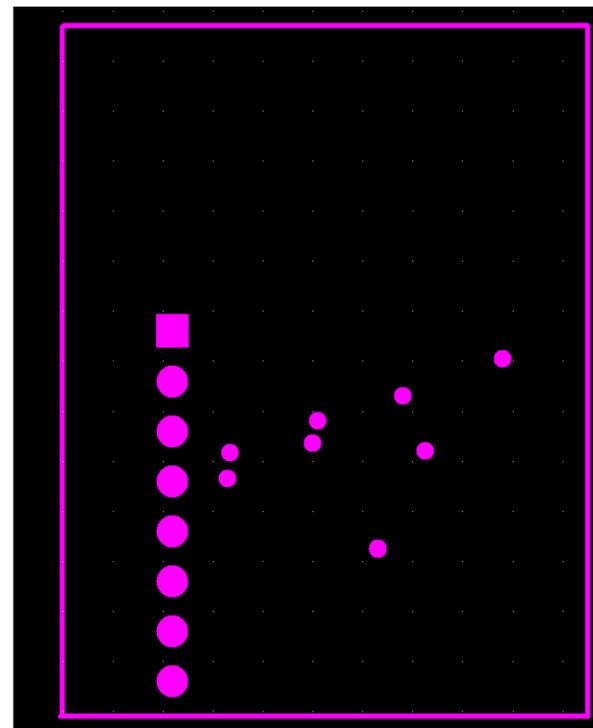
Top Copper



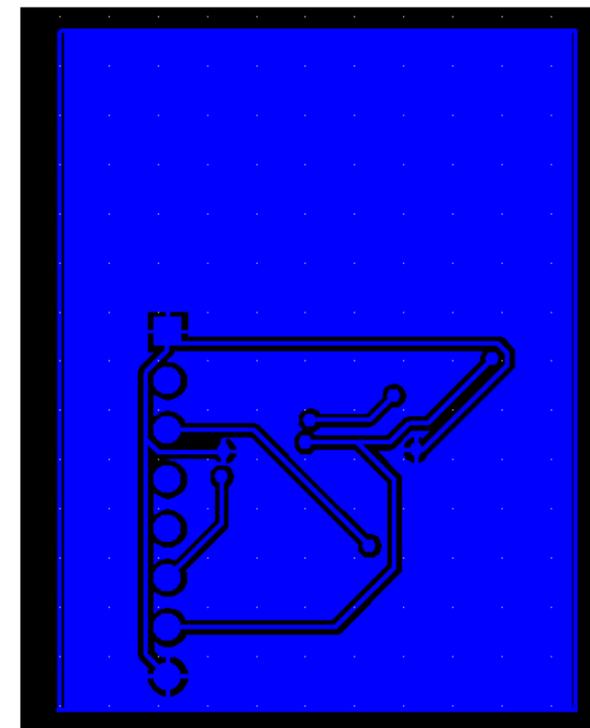
Bottom Silkscreen



Bottom Solder mask

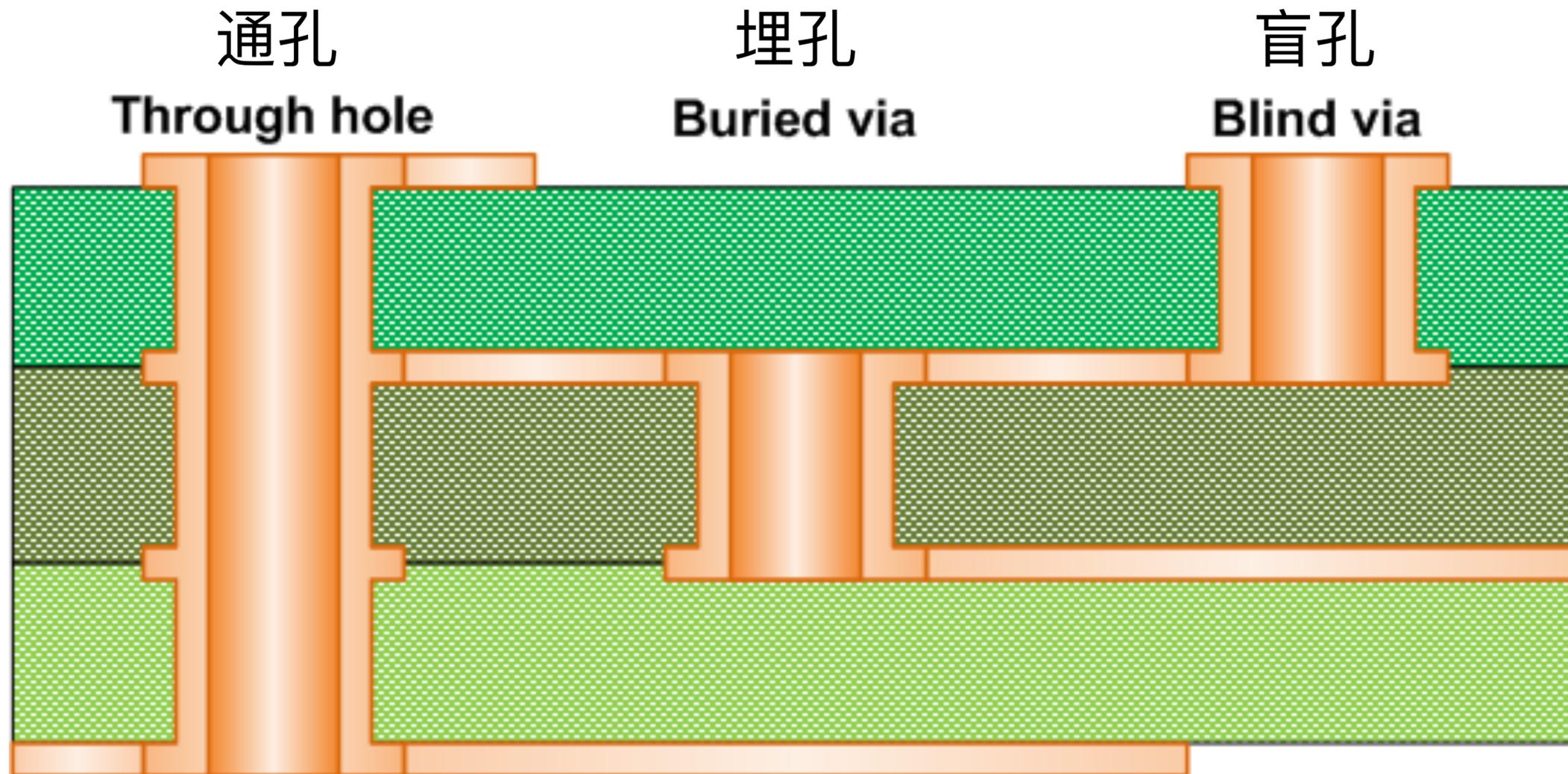


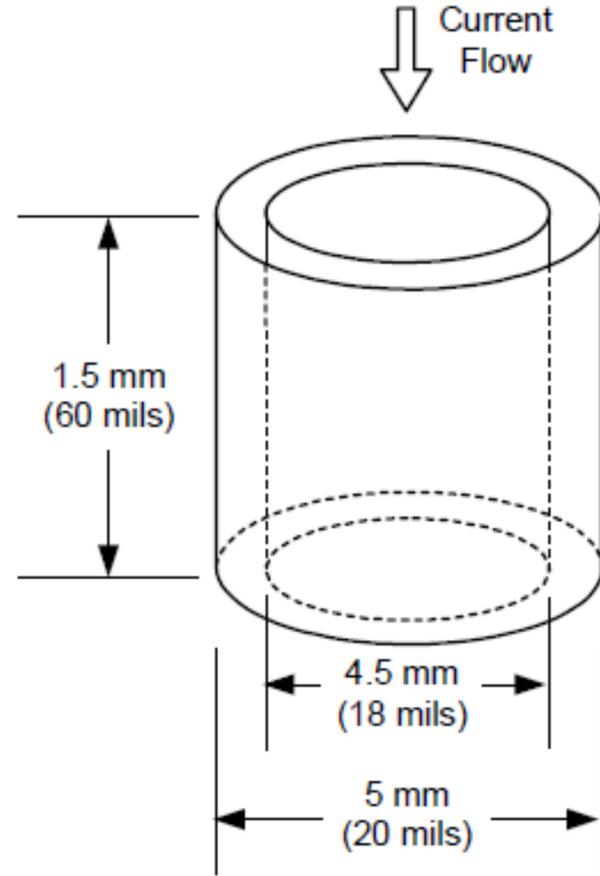
Bottom Copper



过孔 - Via

能够让电流通过的圆孔，可以将不同层的走线进行连接





$$R = \frac{\rho l}{A}$$

$$R = \frac{\rho l}{\pi(r_o^2 - r_i^2)}$$

$$R = \frac{2.36 \times 10^{-6} \times 0.06}{\pi(0.01^2 - 0.009^2)} = 2.4 \text{ m}\Omega$$

Fig. 3. Vias have resistance too!

PCB Via Calculator March 12, 2006

This Javascript web calculator calculates the resistance, voltage drop, and power loss of printed circuit board vias. Note that vias are made out of plated copper which typically has a resistivity of 1.7E-6 to 2.2E-6 Ohm-cm. The calculator has an input box for the resistivity which defaults to 1.9E-6 Ohm-cm.

Updates:

May 22, 2006 – Added thermal resistance calculation.

January 19, 2007 – Minor Clarifications.

March 28, 2007 – Updated resistivity. See comment 12.

June 21, 2007 – Added estimated ampacity. See comment 17.

Inputs:

Finished Hole Dia	18	mil
Plating Thickness	1	mil
Via Length	60	mil

Optional Inputs:

Applied Current	1	Amps
Plating Resistivity	1.9E-6	Ohm-cm

Electrical Results:

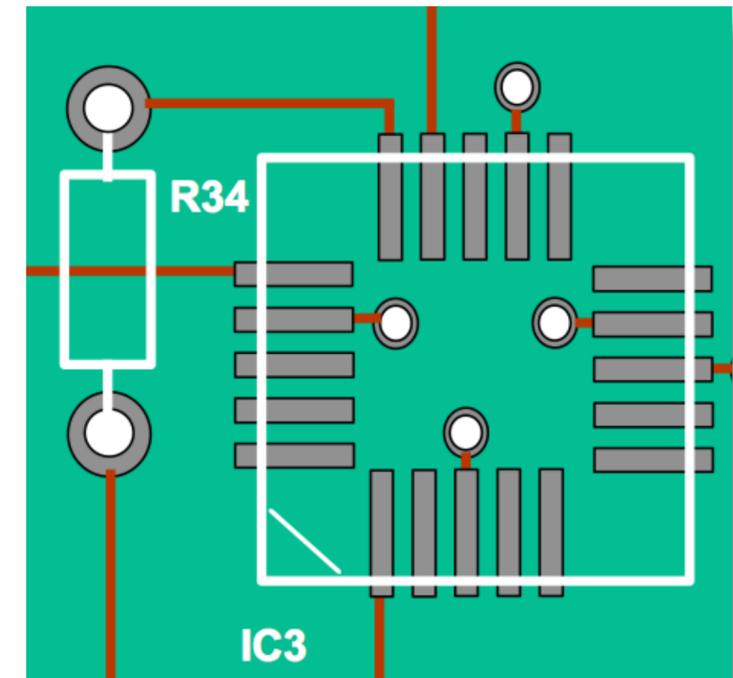
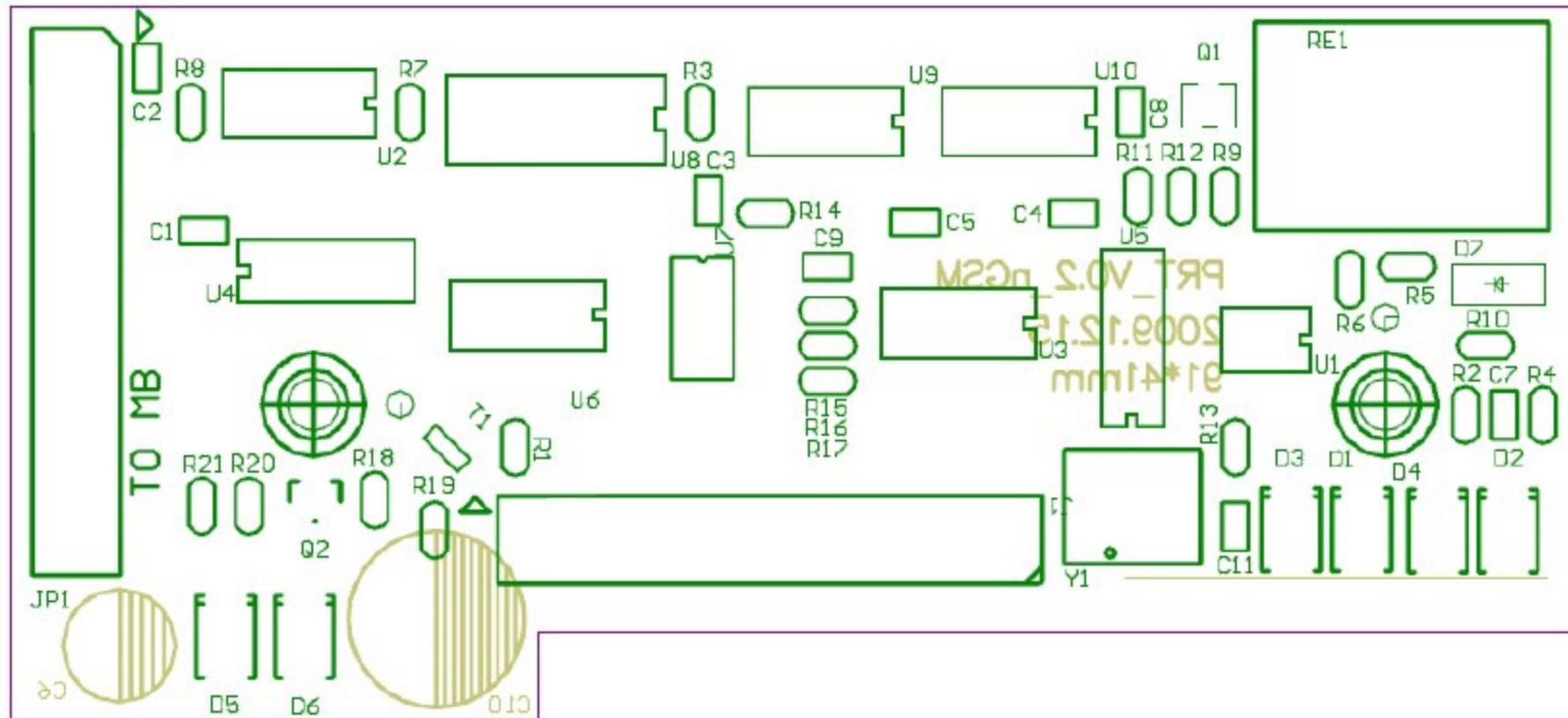
Resistance	0.000752	Ohms
Voltage Drop	0.000752	Volts
Power Loss	0.000752	Watts
Estimated Ampacity	2.56	Amps

Thermal Results:

Thermal Resistance	98.5	Deg. C/Watt
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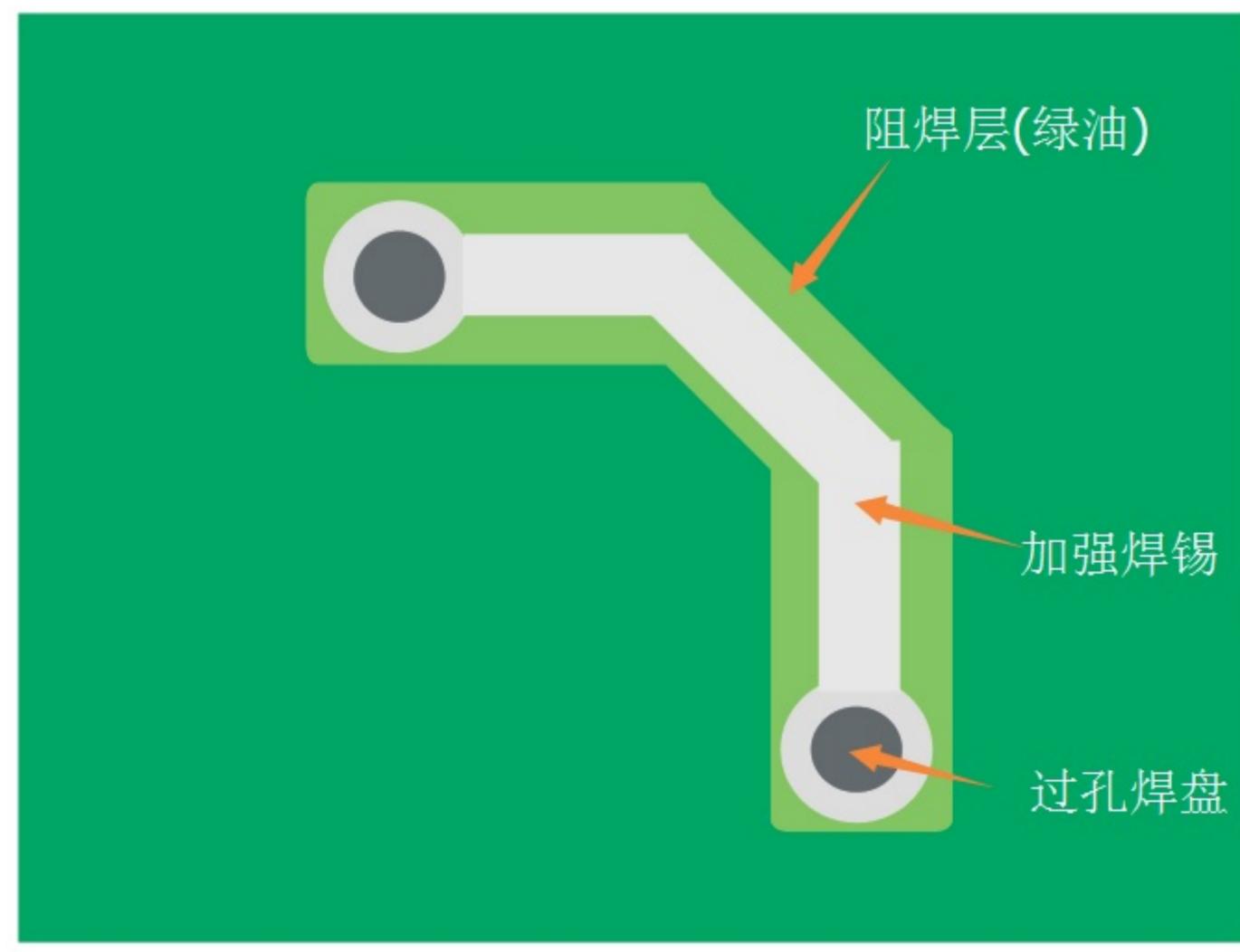
丝印 - Silk Screen

- 元器件轮廓、方向、编号、备注信息，方便辨识
- 一般在Top overlay层和Bottom overlay层
- 字体大小适中，不要放置在焊盘或过孔上导致阅读困难



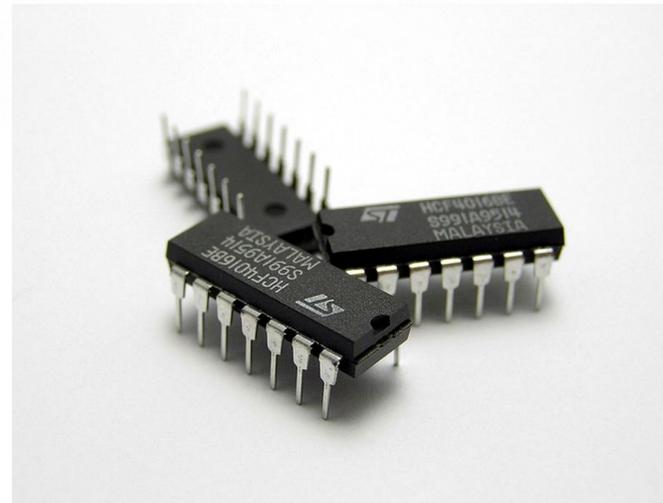
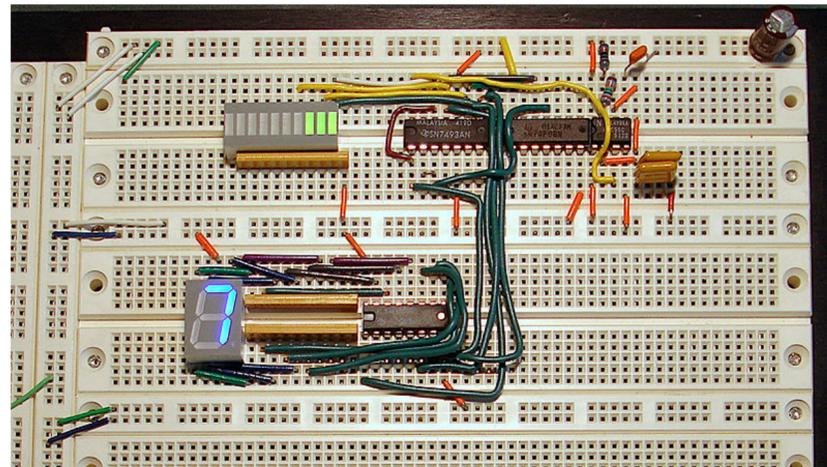
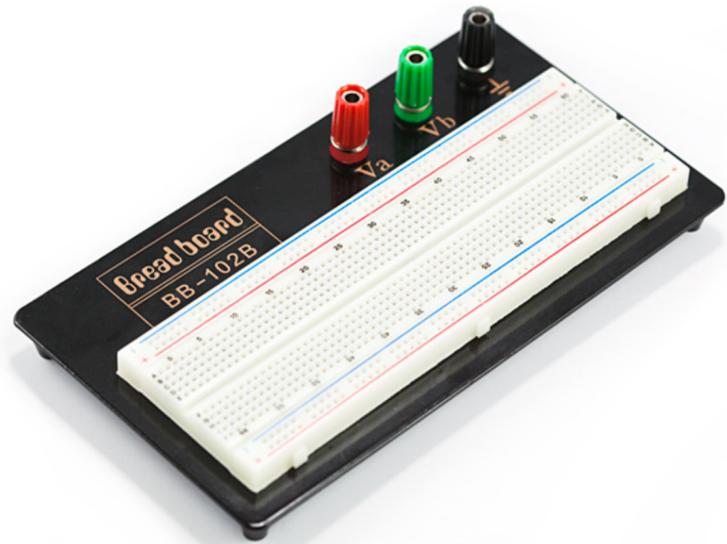
阻焊 - Solder Mask (Stop Mask)

在上下两层没有焊盘的地方上的一层用于绝缘的绿油层，防止焊锡将不同Net的两个连线短路



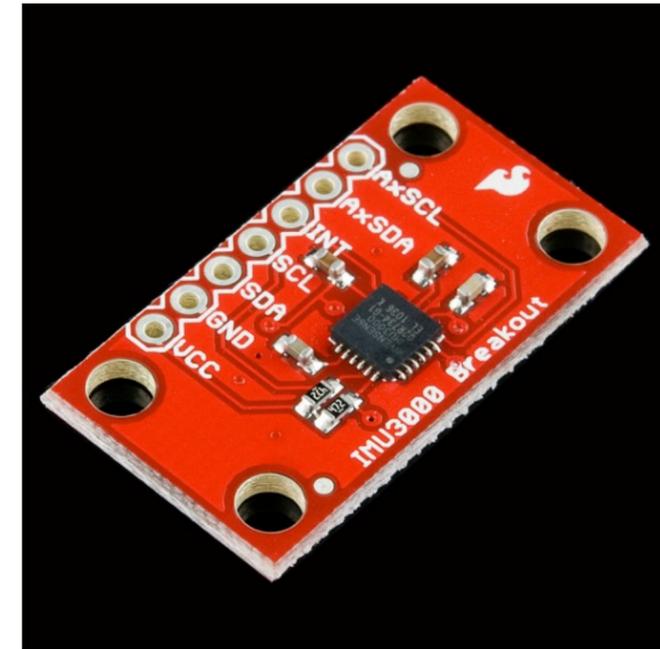
测试电路构成

面包板 + 穿孔的元器件 + 突破板, SMD到穿孔转换板 + 连线

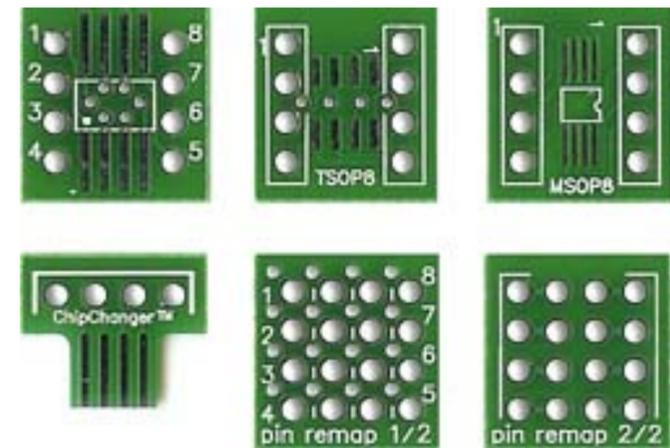


双列直插封装器件

突破板 (Breakout boards)

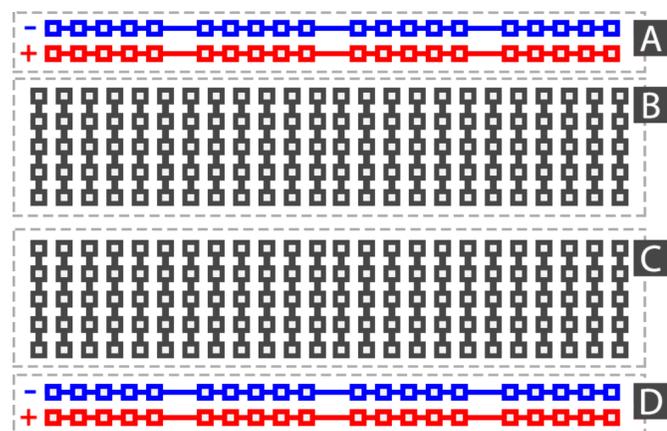
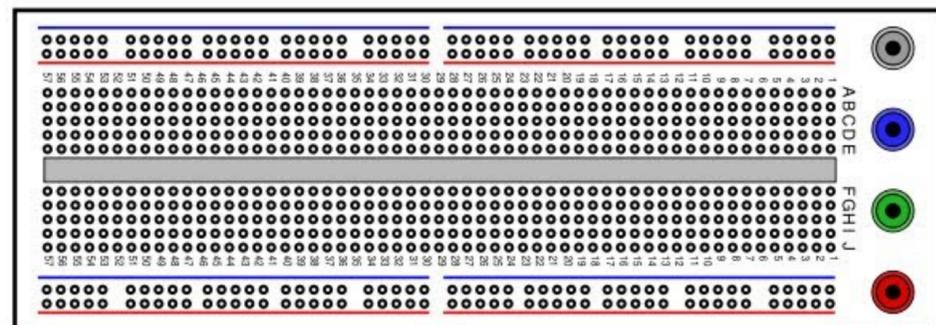


SMD器件到穿孔器件转换板

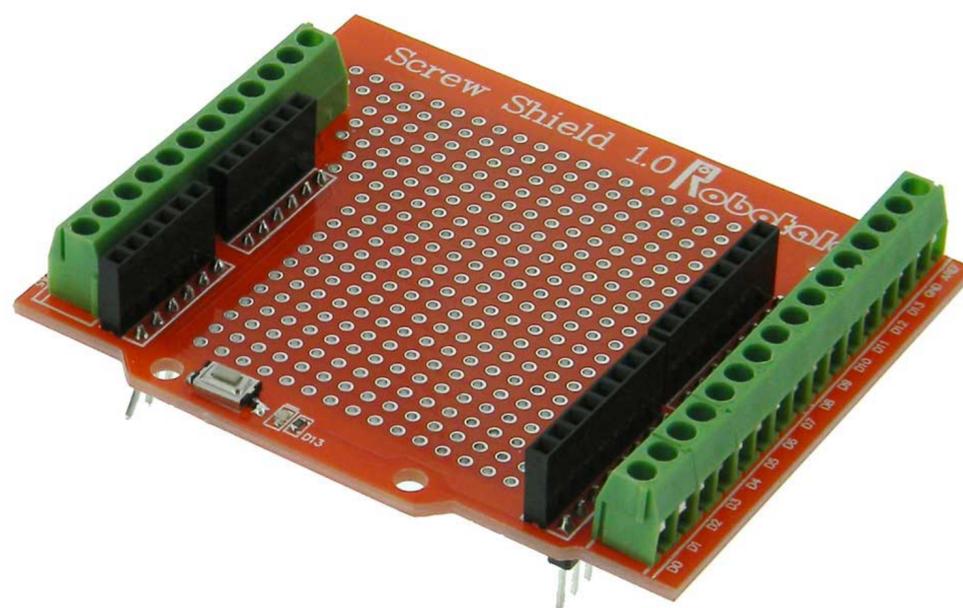


原型板 - 简单原理验证

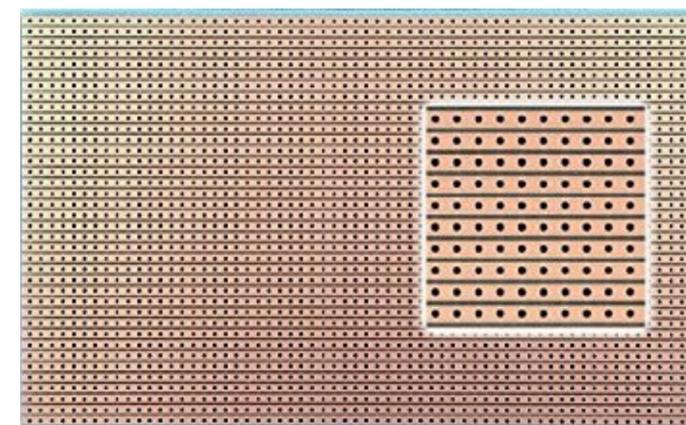
面包板 - 不需要焊接



多孔板 - 不带焊盘/带焊盘



铜箔板



开发板 - 为电路设计和元器件选型提供参考

有时，如果你只是小批量的“生产”，可以利用现有的开发板你，在此基础上连接你自己设计的扩展板，成本更低、时间更快。

