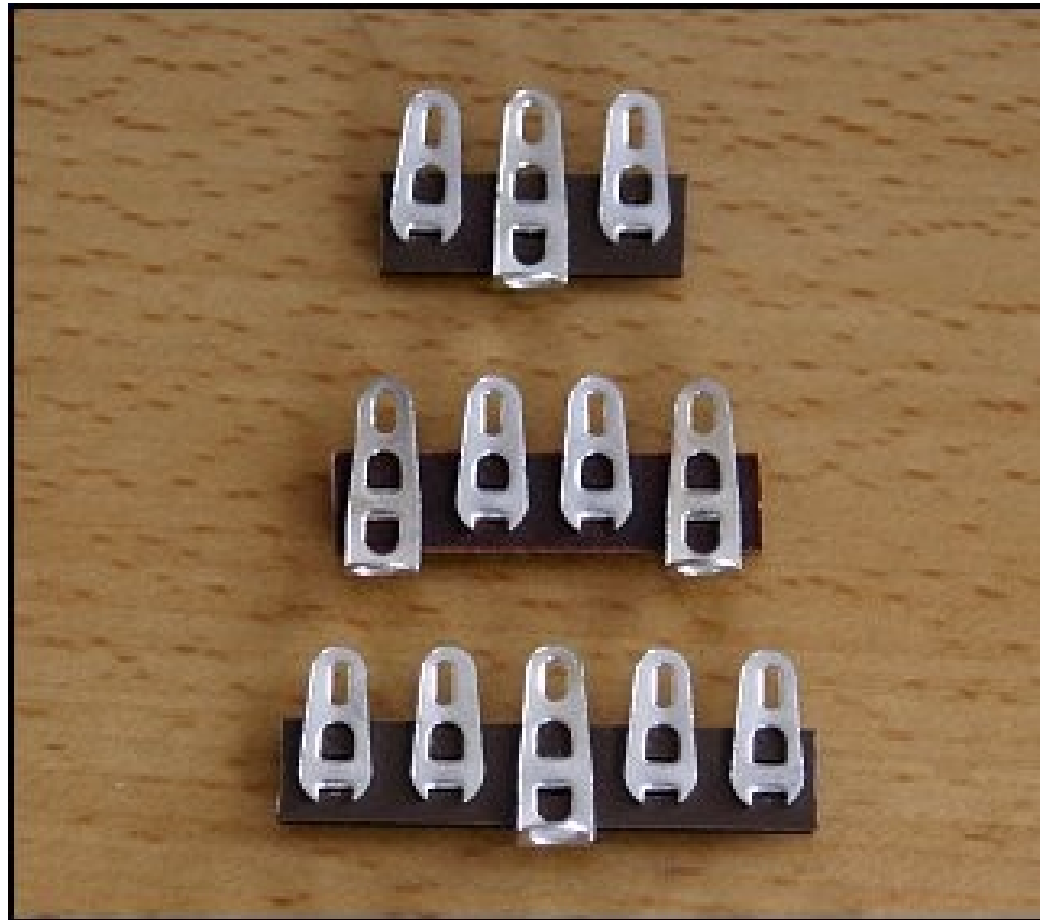


# Surface Mount

- Understand the technology and
- Soldering with practical.
- Graham Crossley VK2GRA

# Valves

Point to point wiring / tag strips





# Cold War & Space Race

- Transistors
- Hybrid Circuits
- Field Effect Transistors (FETs)
- ICs
- RTL > TTL>ECL>MOS/CMOS>SSI>MSI>LSI>
- Micro computers>Micro controllers
- Programmable logic (ROM>PAL>GAL>FPGA)
- Both Analog and Digital electronics get better.

# Technology Drivers

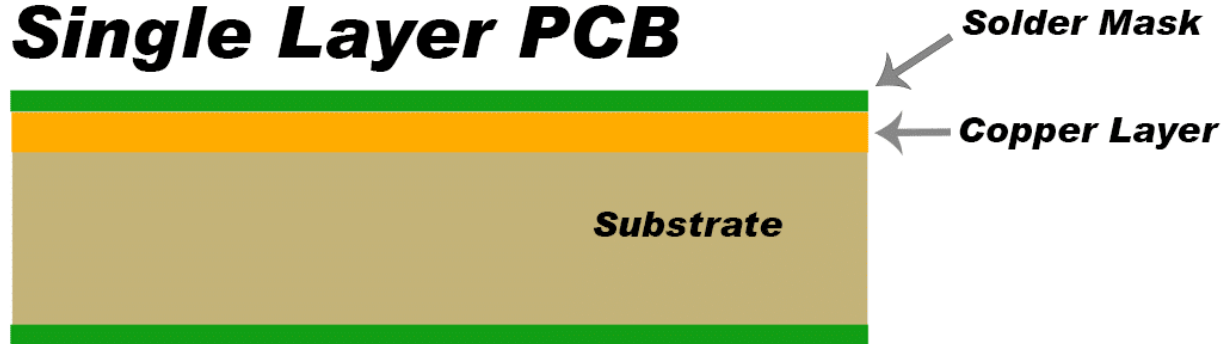
- Smaller, Lighter, Faster
- Less power used - Less heat
- Functionality - more / new & automation of functions
- Vibration and G-force resistance
- Higher reliability
- Less EMI generated / less susceptible to RFI
- Automation – design, build, test.
- Cheaper

# PCB Evolutions

- Single Sided (Bakelite then fiberglass)
- Double sided
- Multi layer
- Through hole
- Surface Mount
- Mixed – Surface mount and Through Hole
- Transmission Line Techniques as digital speed increases or for RF

# PCBs

## **Single Layer PCB**

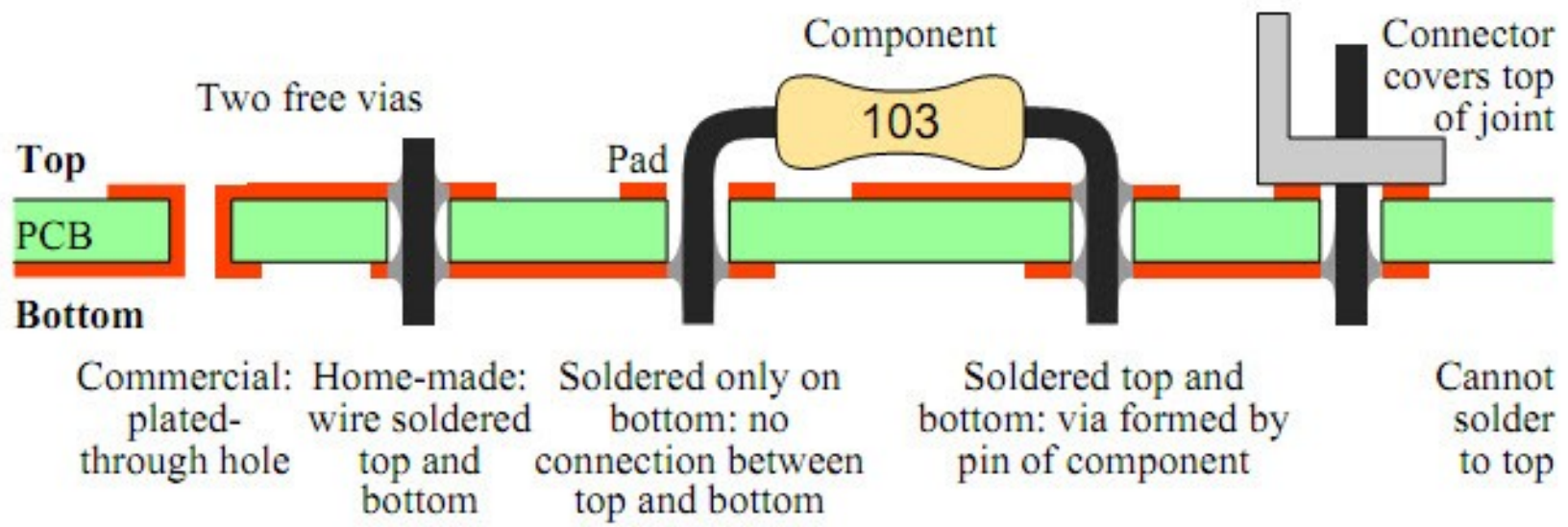


[www.allpcb.com](http://www.allpcb.com)

## **Double Layer PCB**

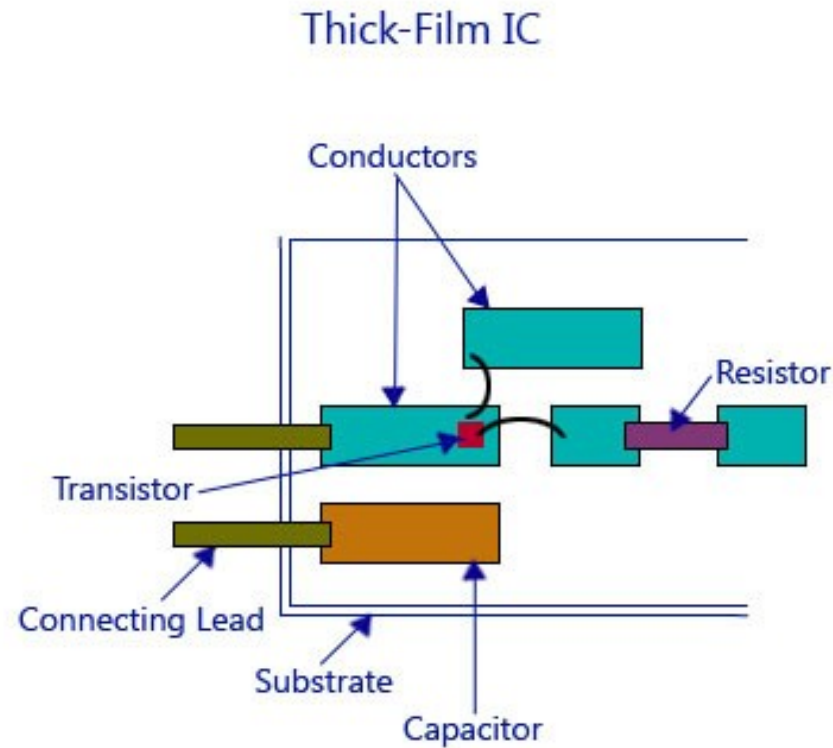


# PCBs – connecting the layers.

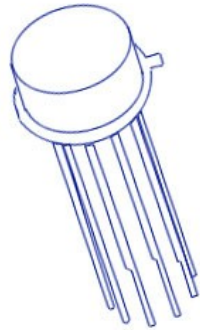




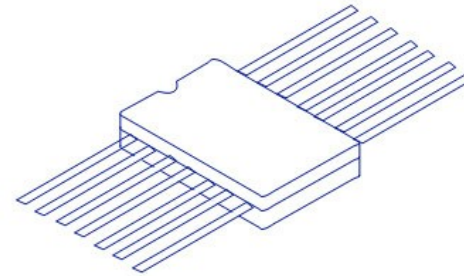
# Thick Film – Early integration



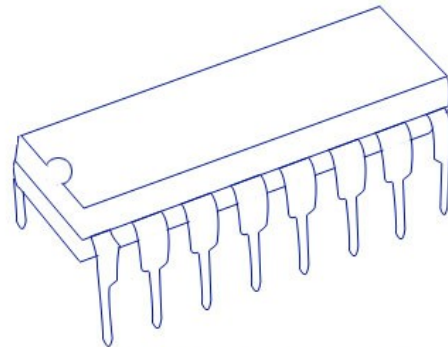
# ICs – Early Packages



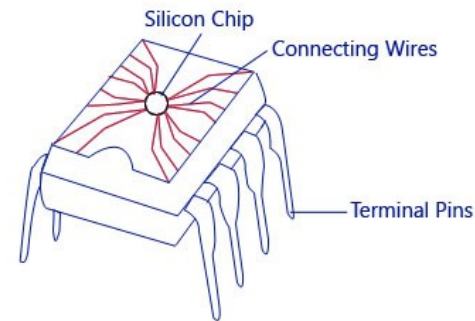
Metal Can IC



Ceramic Flat Pack IC



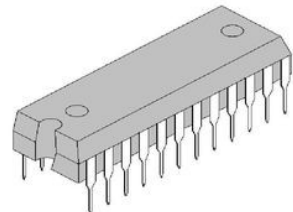
14 Pin Dual In-line Package (DIP)



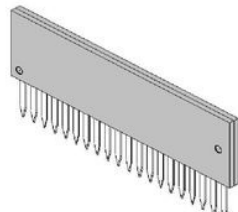
8 Pin Dual In-line Package (DIP) Plastic

# ICs – Later Packages

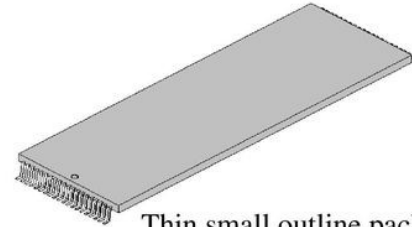
## Typical IC Packages



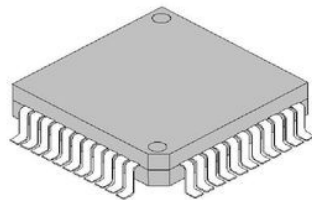
Dual in-line package  
(DIP)



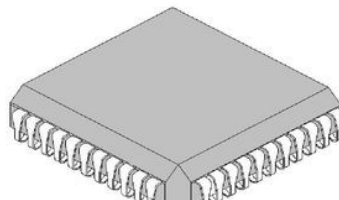
Single in-line package  
(SIP)



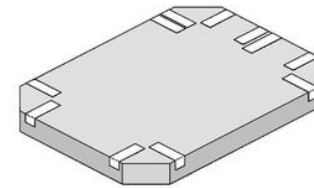
Thin small outline package  
(TSOP)



Quad flat pack  
(QFP)



Plastic leaded chip carrier  
(PLCC)



Leadless chip carrier  
(LCC)

# Some Definitions

- SMD – Surface Mount Device
- SMT – Surface Mount Technology
- SMC – Surface Mount Components
- SME – Surface Mount Equipment
  
- SMD is most commonly used abbreviation.

# Disadvantages

- Not suitable for high power / high voltages
- Not suitable for heavy components unless extra support.
- Not suitable for multiple use connectors unless mechanically supported.
- Harder to prototype
- Harder to identify components – device codes or no codes at all.
- Joint failures increase at ultra high densities
- Rework can be difficult

# Package Sizes

Package		Approximate dimensions, length × width		Typical resistor power rating (W)
Metric	Imperial			
0201	008004	0.25 mm × 0.125 mm	0.010 in × 0.005 in	
03015	009005	0.3 mm × 0.15 mm	0.012 in × 0.006 in	0.02 <sup>[17]</sup>
0402	01005	0.4 mm × 0.2 mm	0.016 in × 0.008 in	0.031 <sup>[18]</sup>
0603	0201	0.6 mm × 0.3 mm	0.02 in × 0.01 in	0.05 <sup>[18]</sup>
1005	0402	1.0 mm × 0.5 mm	0.04 in × 0.02 in	0.062 <sup>[19]</sup> -0.1 <sup>[18]</sup>
1608	0603	1.6 mm × 0.8 mm	0.06 in × 0.03 in	0.1 <sup>[18]</sup>
2012	0805	2.0 mm × 1.25 mm	0.08 in × 0.05 in	0.125 <sup>[18]</sup>
2520	1008	2.5 mm × 2.0 mm	0.10 in × 0.08 in	
3216	1206	3.2 mm × 1.6 mm	0.125 in × 0.06 in	0.25 <sup>[18]</sup>
3225	1210	3.2 mm × 2.5 mm	0.125 in × 0.10 in	0.5 <sup>[18]</sup>
4516	1806	4.5 mm × 1.6 mm	0.18 in × 0.06 in <sup>[20]</sup>	
4532	1812	4.5 mm × 3.2 mm	0.18 in × 0.125 in	0.75 <sup>[18]</sup>
4564	1825	4.5 mm × 6.4 mm	0.18 in × 0.25 in	0.75 <sup>[18]</sup>
5025	2010	5.0 mm × 2.5 mm	0.20 in × 0.10 in	0.75 <sup>[18]</sup>
6332	2512	6.3 mm × 3.2 mm	0.25 in × 0.125 in	1 <sup>[18]</sup>
7451	2920	7.4 mm × 5.1 mm	0.29 in × 0.20 in <sup>[21]</sup>	

# Soldering

- Lead / Tin alloy
- Removal Of Hazardous Substances (ROHS)
- ROHS – No lead based solder
- ROHS – Uses tin
- ROHS – Hotter
- ROHS – Tin dendrites affect reliability
- ROHS can be repaired using normal solder
- I will teach Lead / Tin soldering

# Solder Phase Diagram

