

SMD's solderen

- Algemene soldeertips + vb's
- Wat is doel van flux gebruiken bij solderen
- Soorten solderen
- Foutjes bij smd componenten
- Soorten smd componenten
- Praktische demonstratie solderen smd componenten

Algemene soldeertips

- De te solderen materialen moeten voldoende warm, minstens 30 tot 50 °C warmer dan smeltemp van soldeersel
- Soldeertijd beperken tot max 10 sec
- Temperatuur beneden 300°C houden

Slechte soldering

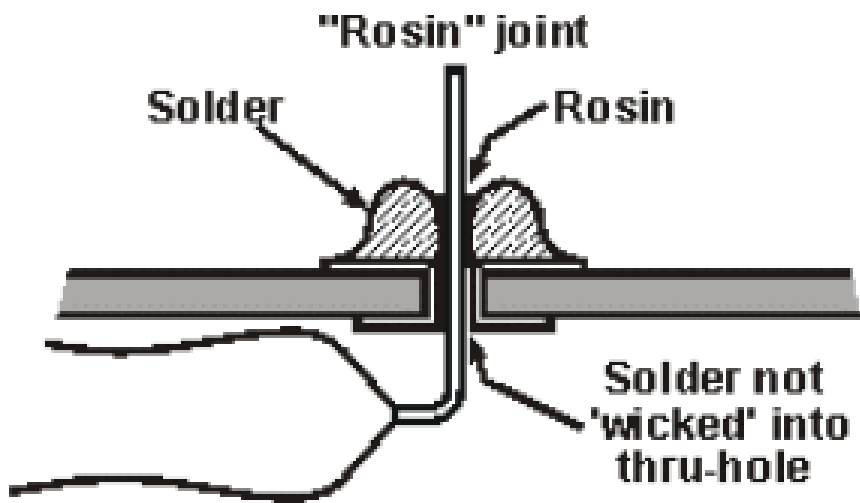
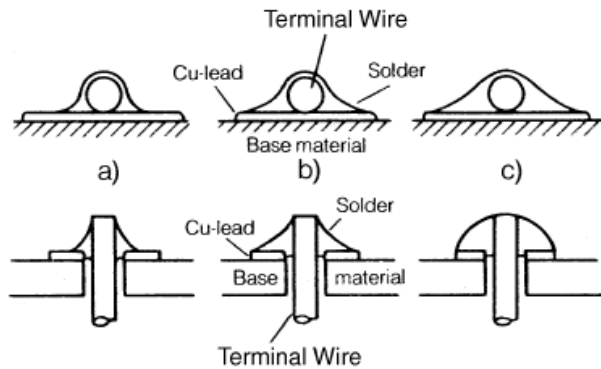


Figure 9

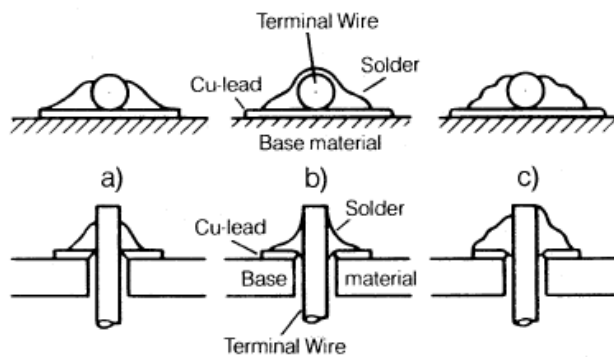
Right Amount of Solder

- a) Minimum amount of solder
- b) Optimal
- c) Excessive solder



Solderability

- a) Bad solderability of terminal wire
- b) Bad soldering of PCB
- c) Bad soldering of terminal wire and PCB



Doel van flux bij solderen

- Oxidatie van te solderen metaaloppervlakten en soldeersel verwijderen
- Voorkomen dat materialen oxideren
- Vloeien van soldeersel verbeteren door uitkuisen opp. => betere adhesie
- Helpt warmte beter geleiden

Soorten flux

- Rosin
- RMA (Rosin Mildly Activated)
- No-clean flux ~ RMA, maar minder actieve stof
- RA (Activation flux)
- A (composite resin strong activation flux)
- Water-Washable (Soluble)

Rosin

- Organische flux gemaakt van pijnboom sap/hars
- Opgelost in een organische solvent
- Vloeibaar bij hogere temperaturen zoals soldeertemperatuur
- In vaste vorm niet-reagerend niet-corrosief en niet-geleidend

No-clean flux

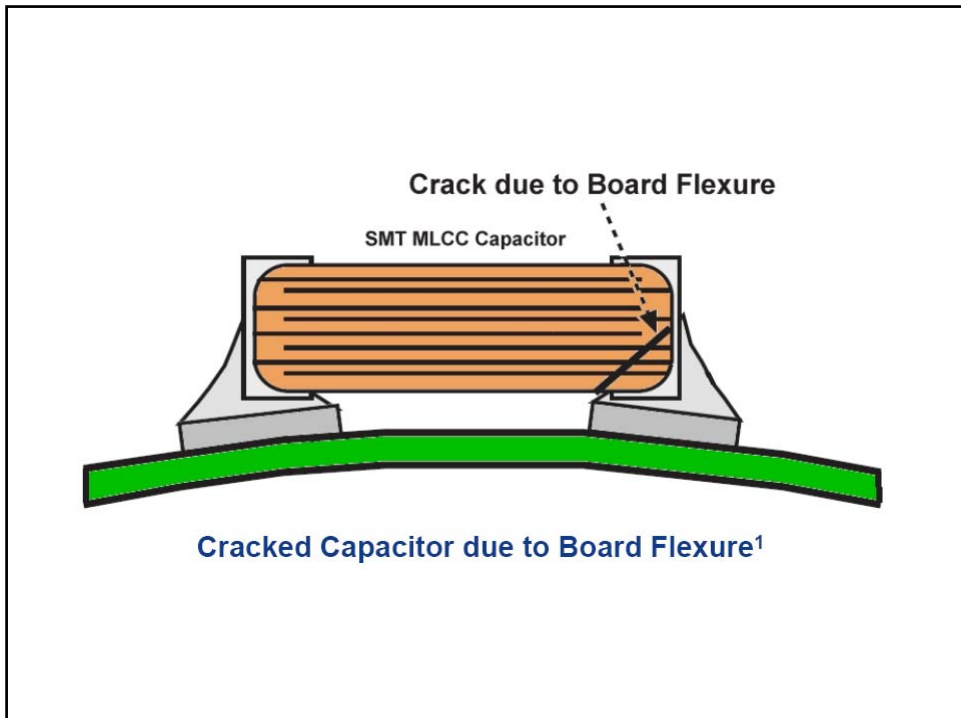
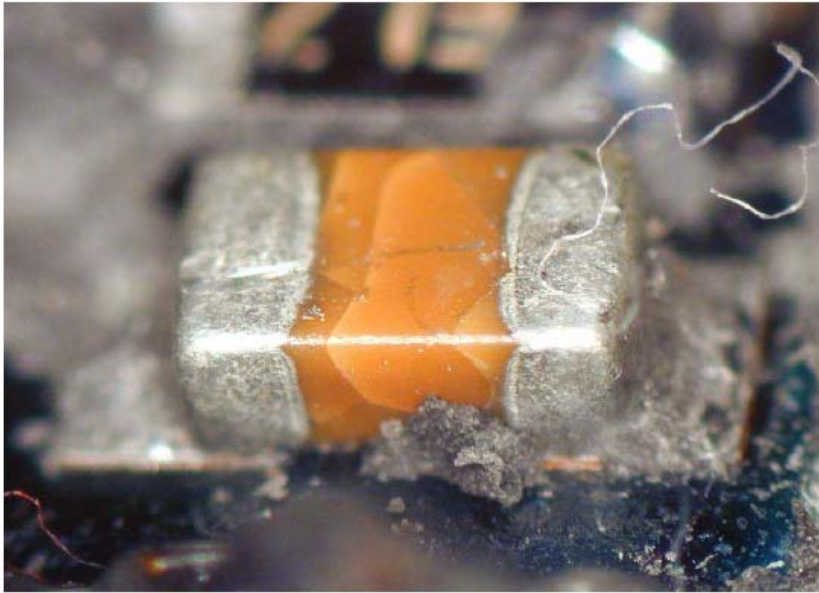
- Mild actieve fluxen bedoeld voor smd
- Residu na solderen is niet-geleidend en niet-corrosief
- Moet dus niet verwijderd worden na solderen

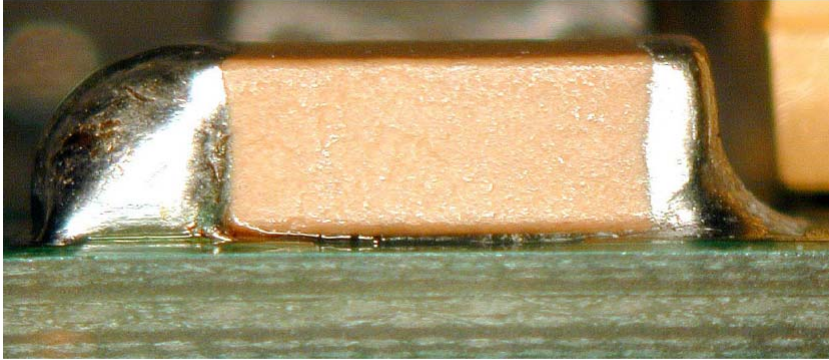
RMA

- Rosin Mild Activated
- Voorbode van no-clean
- Residu na solderen is soms nog geleidend en/of corrosief
- Best verwijderen na solderen

Water-Washable flux

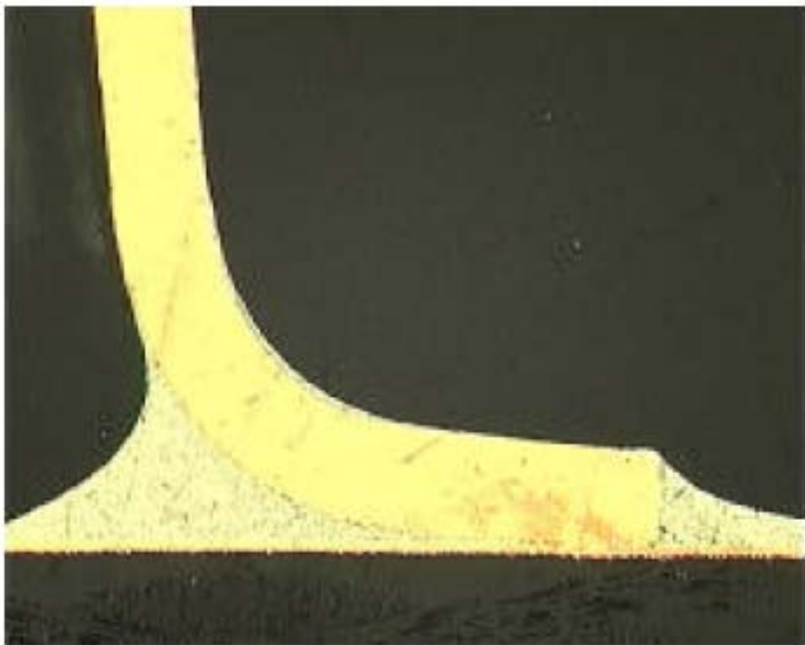
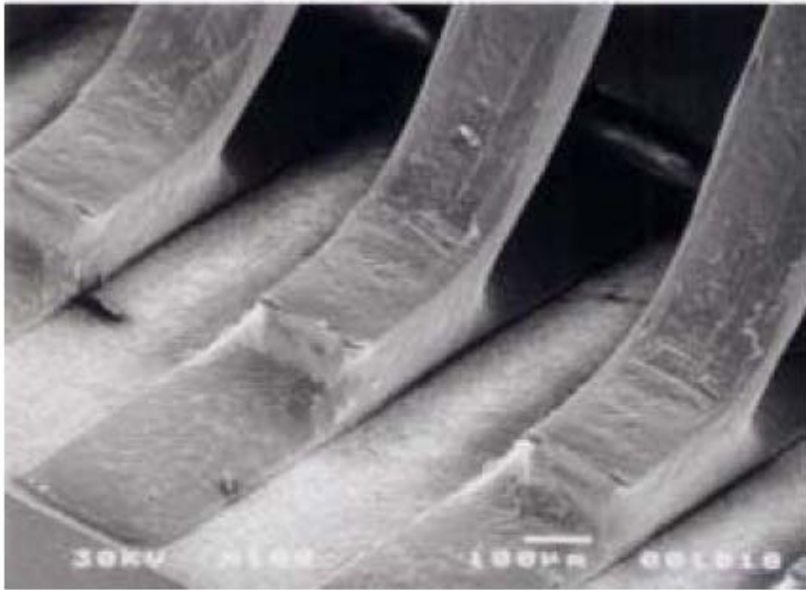
- Agressievere flux dan voorgaande
- Ontworpen om verwijderd te worden met water
- Residu's na solderen zijn geleidend en sterk corrosief

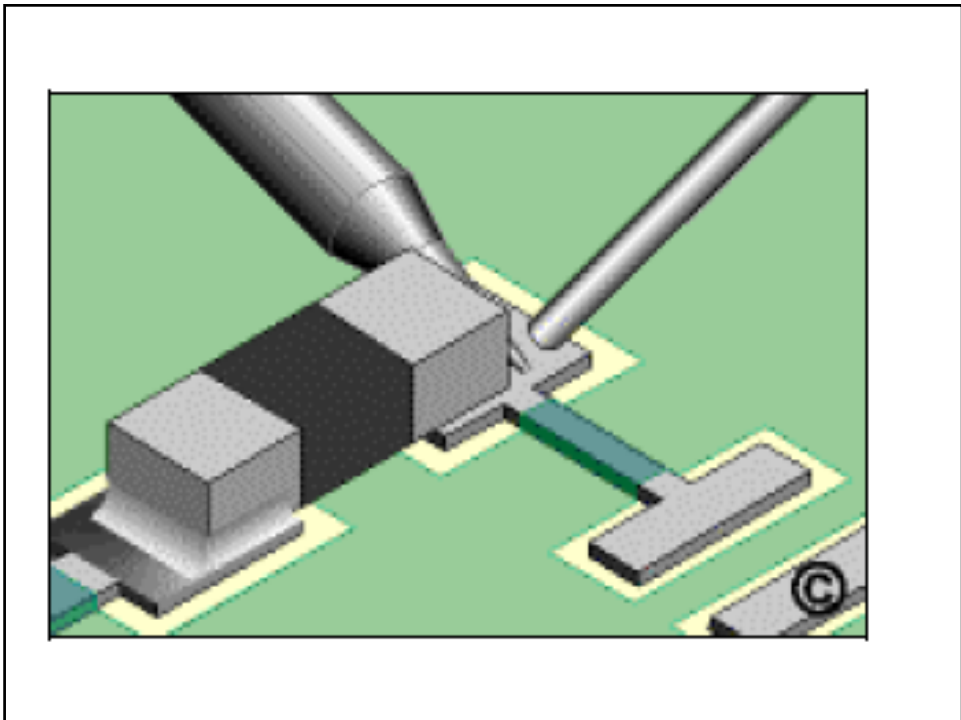




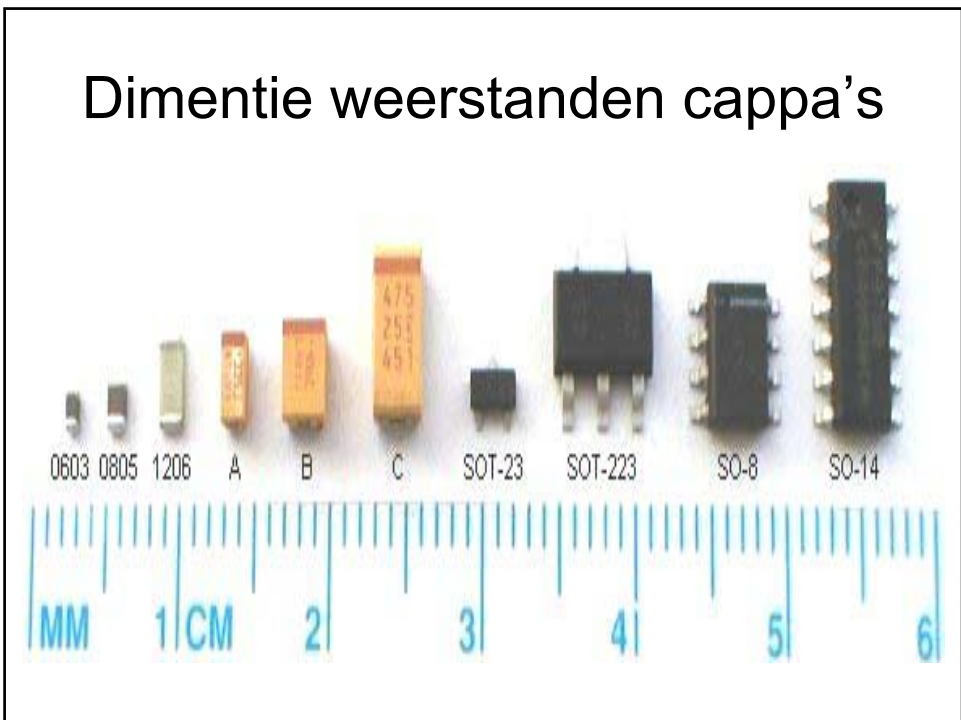
Excessive Solder vs. Adequate Solder







Dimentie weerstanden cappa's



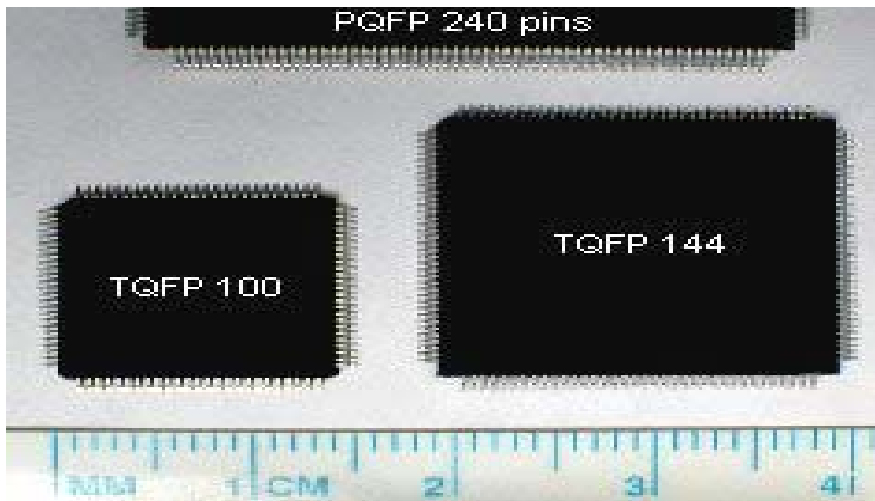
Uitleg afmetingen r's en c's

0603: means 0.06"x0.03", or 60x30 mils, or 1.6x0.8mm

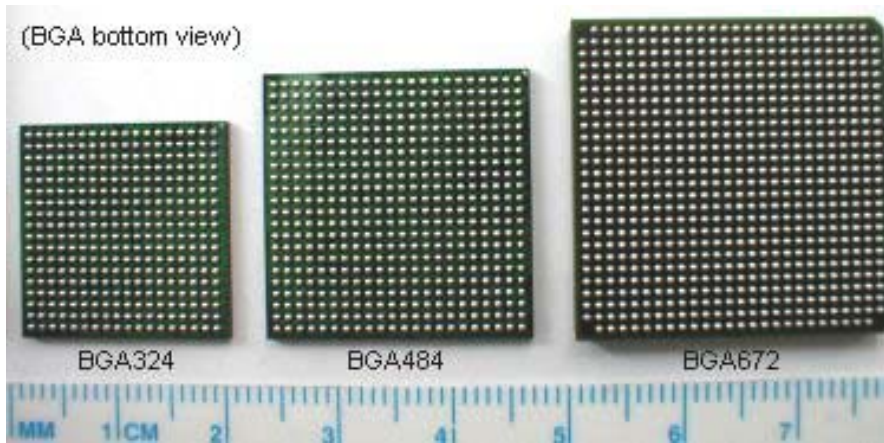
0805: means 0.08"x0.05"

1206: means 0.12"x0.06"

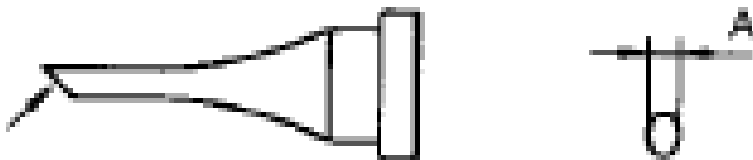
Quad flat packs



Ball Grid Array's



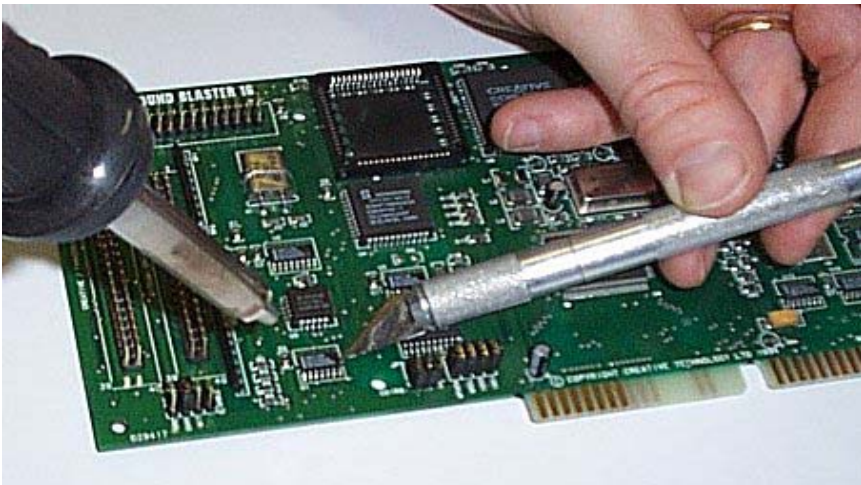
SMT soldeerpunt











SMT soldeerpunt in gebruik



Hetelucht bout om te desolderen



Soldeerpunten om te desolderen

Configuration	Cat No	Component Style	Component design	Component Size (L x W x H)
	SMT 0504A	Chips 	0405	040" x 050" x 040"
	SMT 0504A		0504	050" x 040" x 040"
	SMT 0504A		0505	050" x 040" x 040"
	SMT 0805B		0705	070" x 050" x 040"
	SMT 0805B		0805	080" x 050" x 050"
	SMT 1005C		1005	100" x 050" x 050"
	SMT 1205D		1205	120" x 060" x 060"
	SMT 1205D		1210	120" x 100" x 065"
	SMT 1505E		1505	150" x 050" x 065"
	SMT 1808F		1805	180" x 050" x 065"
	SMT 1808F		1808	180" x 080" x 065"
	SMT 1808F		1812	180" x 120" x 065"
	SMT 1825G		1825	180" x 250" x 065"
SMT 1825G	2225	220" x 250" x 070"		
	SMT 80H	Meif 	SOD80	138" x 063" DIA.
	SMT 80H	Small	SOD87	138" x 081" DIA.
	SMT 89J	Outline 	SOT23	118" x 098" x 043"
	SMT 89J	Transistor 	SOT89	181" x 167" x 063"
	SMT 8K	Small	SOT143	118" x 098" x 043"
	SMT 8K	Outline	SO8	197" x 157" x 066"
	SMT 8K	I C 	SO14	344" x 157" x 066"
	SMTA	For EC2100/		
	SMT 7	For TCP irons		

RoHS

- Wat the fuck is da??
- Waarom is da nou van doen??
- Gevolgen voor solderende hobbyisten

RoHS

- Restriction of Certain Hazardous Substances
- Europese richtlijn in werking vannaf juli 2006
- Lood 1 van de 6 stoffen die in elektronicaïndustrie worden verboden
- Loodhoudende produkten worden zoveel mogelijk vervangen

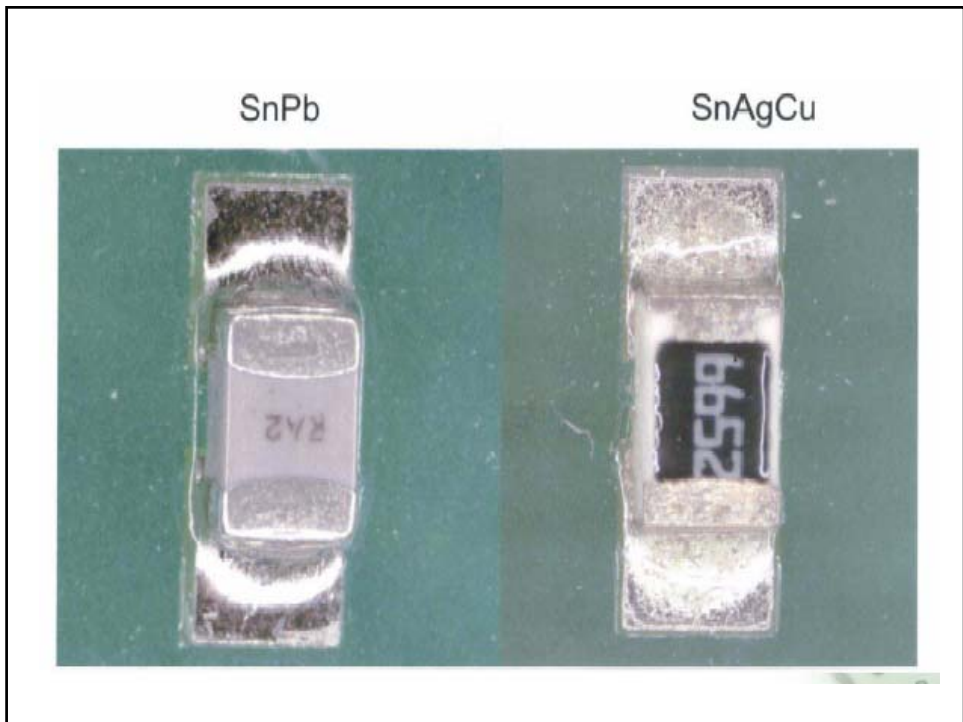
- RoHS legislation bans six substances from products destined for shipment to EU countries – effective July 1, 2006
 - Cadmium (Cd)
 - Hexavalent Chromium (Cr6+)
 - Mercury (Hg)
 - Lead (Pb)
 - Polybrominated biphenyl (PBB)
 - Polybrominated diphenyl ether (PBDE)
- *The law exempts the use of lead in solder, on high end storage and telecom equipment – but most customers intend to ship lead-free products in advance of the 2006 date*

Waarom geen lood ??

- Lood is giftig veroorzaakt veranderingen in het bloed en beschadigd zenuwstelsel
- Elektronica is bron van grondwatervervuiling

Gevolgen

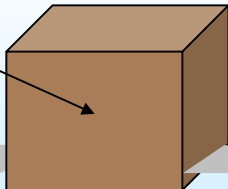
- Temperatuur gemiddeld 40°C hoger
- Visueel moeilijker goede slechte verbinding op te sporen
- Duurder
- Met den enen draad-componenten verdwijnen



Compliance

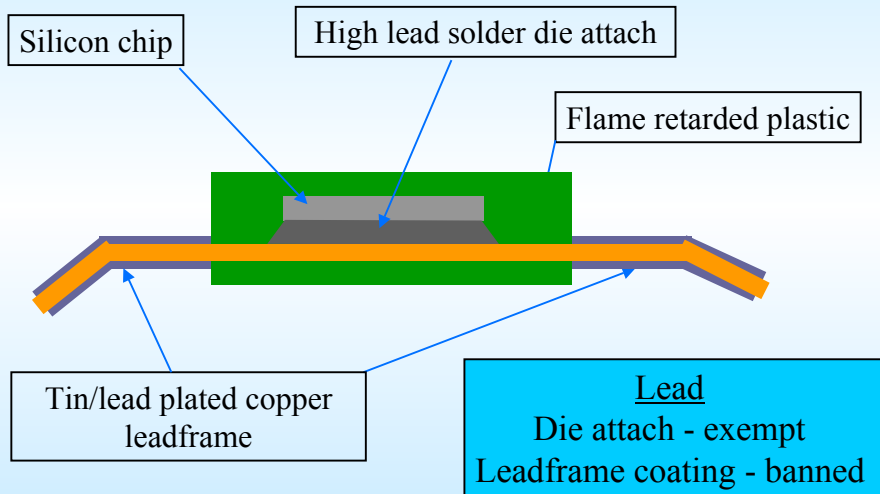
- Example of component weighing 10 grams. This has a termination coating with Sn 5%Pb, total weight of lead is likely to be $<1 \mu\text{g}$ ($<0.0001\%$)

May have lead impurity at $<0.1\%$



Lead-free and RoHS compliant may not be the same

Compliance - power semiconductor



◆ Die attach

☞ AuSi eutectic

- ☞ Not applicable to large die because it's brittle
- ☞ Tends to crack large silicon dies

☞ AuSn eutectic

- ☞ Melts at 180
- ☞ Definition of new materials
- ☞ For new molding compounds

☞ New compounds need to meet high-temp requirements

☞ Compounds should meet WEEE halogen free requirements

☞ Organic can use Ag-filled epoxy

Overzicht afkortingskes

SAC	Sn / Ag / Cu	Tin Silver Copper alloy
SAB	Sn / Ag / Bi	Tin Silver Bismuth alloy
SABC	Sn / Ag / Bi / Cu	Tin Silver Bismuth Copper alloy
SAC408	Sn / Ag 4% / 0.8% Cu	Alloy mix percentiles
SAC385	Sn / Ag 3.8% / 0.5% Cu	Alloy mix percentiles
SAC305	Sn / Ag 3.0% / 0.5% Cu	Alloy mix percentiles

ALLOYS USED	MELTING RANGE (°C)	INDUSTRY SERVED	COMPANY
SnAg	221 - 226	Automotive	Visteon (Ford)
SnAgBi	206 - 213	Military/Aerospace	Panasonic
		Consumer	Hitachi
SnAgBiCu		Military/Aerospace	Panasonic (FA Controller?)
SnAgBiCuGe		Consumer	Sony
SnAgBiX	206 - 213	Consumer	Panasonic
SnAgCu	217	Automotive	Panasonic
		Telecommunications	Nokia
			Nortel
			Panasonic
		Toshiba	
SnBi	138	Consumer	Panasonic
SnCu	227	Consumer	Panasonic
		Telecommunications	Nortel
SnZn	198.5	Consumer	NEC
			Panasonic
			Toshiba

◆ SnAgCu

- ☞ **Appears to be most popular candidate - with or without the addition of a 4th element**
- ☞ **Chosen as benchmark for testing - SnPb is the baseline**
- ☞ **Concerns**
 - ⌚ Higher processing temperatures
 - ⌚ Higher temperatures leads to more energy used - added cost
 - ⌚ Compatibility with some lead bearing finishes
 - ⌚ Toxicity of Ag

◆ SnCu

- ☞ **Low-cost alternative for wave soldering**
- ☞ **Compatible with most lead bearing finishes**
- ☞ **Concerns**
 - ⌚ Higher processing temperatures than most SnAgCu alloys

◆ SnAgBi

- ☞ **Candidate for SMT applications**
- ☞ **NCMS study showed better thermal cycle reliability for certain SMT than SnAgCu**
- ☞ **Concerns**
 - ⌚ Toxicity of Bi and Ag
 - ⌚ Fillet lifting

◆ SnZn

- ☞ **Low melting temperature**
- ☞ **Long-term data needed**
- ☞ **Concerns**
 - ⌚ Zn oxidation
 - ⌚ Long-term corrosion of solder joint
 - ⌚ Requires special flux chemistries
 - ⌚ Wetting characteristics not as good as SnAgCu

◆ SnAg

- ☞ **Long history of usage**
- ☞ **Extensive data - attractive to most companies**
- ☞ **Concerns**
 - ⌚ Higher melting temperatures than SnAgCu
 - ⌚ Toxicity of Ag

Finish	Manufacturing Experience	Concerns
NiPd	Yes	Material cost (Process is cheaper; must switch 100%)
NiPdAu	Yes	Material cost
SnBi	No	The assembly must be totally Pb free.
Sn	Yes	Tin whiskers
SnCu	Yes	Tin whiskers

Tin Whiskers

Whisker Failure Modes

Electrical Short Circuits

- Permanent (if current < 10's of mA)
- Intermittent (if current > 10's of mA) *Whisker Melts*



Debris/Contamination

- Interfere with Sensitive Optics or MEMS
- Shorts in Areas REMOTE From Whisker Origins (*Zinc Whiskers on raised flooring are a PRIME Example*)



METAL VAPOR ARC

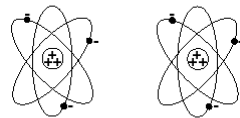
- Under Some Electrical/Atmospheric Conditions, Whisker Shorts May Vaporize into Conductive PLASMA of Metal Ions
- Plasma Forms Arc Capable of Carrying **HUNDREDS OF AMPS!** *With Resulting CATASTROPHIC DAMAGE*



Electrostatic Discharge

- Electrostatistische lading meestal opgebouwd dmv triboelectric charging
- Elektrisch potentiaalverschil tussen 2 punten
- Ontlading schadelijk voor halfgeleiders

Triboelectric Charge

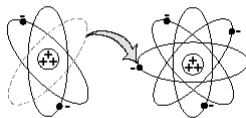


Material "A"
-3
+3
Net = 0

Material "B"
-3
+3
Net = 0

Charge, Materials Make Intimate Contact

Triboelectric Charge



Material "A"
-2
+3
Net = +1

Material "B"
-4
+3
Net = -1

e Triboelectric Charge - Separation

Table 2
Examples of Static Generation
Typical Voltage Levels

Means of Generation	10-25% RH	65-90% RH
Walking across carpet	35,000V	1,500V
Walking across vinyl tile	12,000V	250V
Worker at bench	6,000V	100V
Poly bag picked up from bench	20,000V	1,200V
Chair with urethane foam	18,000V	1,500V

Typical Triboelectric Series

Rabbit fur	P o s i t i v e		
Glass			
Mica			
Human Hair			
Nylon			
Wool			
Fur			
Lead			
Silk			
Aluminum			
Paper		N e g a t i v e	
COTTON			
Steel			
Wood			
Amber			
Sealing Wax			
Nickel, copper Brass, silver			
Gold, platinum			
Sulfur			
Acetate rayon			
Polyester			
Celluloid			
Silicon			
Teflon			

