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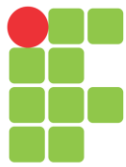
Projeto e Construção de Circuitos Eletrônicos

Fabricação e Montagem

Professor Ricardo Kerschbaumer

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<http://professor.luzerna.ifc.edu.br/ricardo-kerschbaumer/>

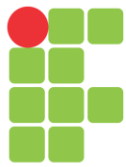


Soldagem e Práticas de Montagem

Soldagem e Práticas de Montagem

- Uso de fluxo (flux) e álcool isopropílico para limpeza.
- Diâmetro do fio de solda.
- Diferentes ligas de estanho (com ou sem chumbo),
 - Ligas Sn-Pb (chumbo-estanho)

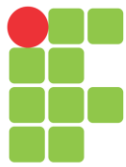




Soldagem e Práticas de Montagem

- Fitas de Kapton para proteger componentes sensíveis ao calor.

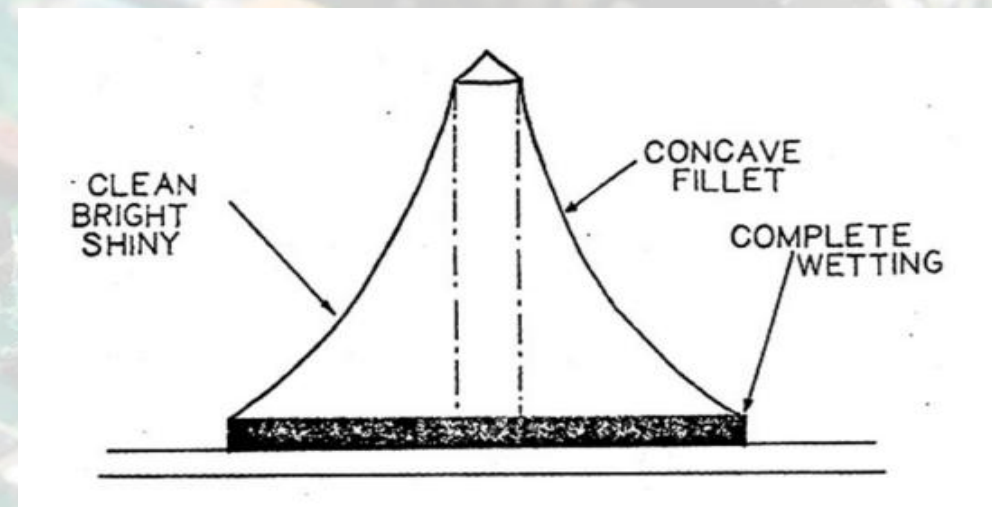




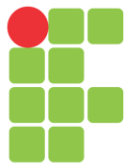
Soldagem e Práticas de Montagem

- Técnicas de soldagem: análise de exemplos de solda boa e ruim.

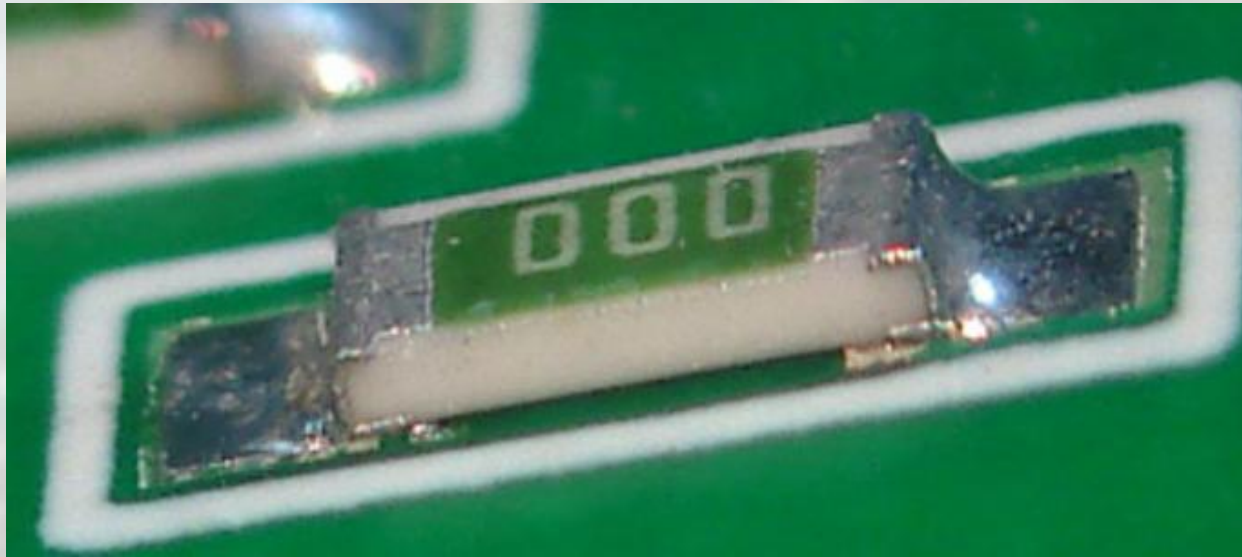
Solda ideal PTH



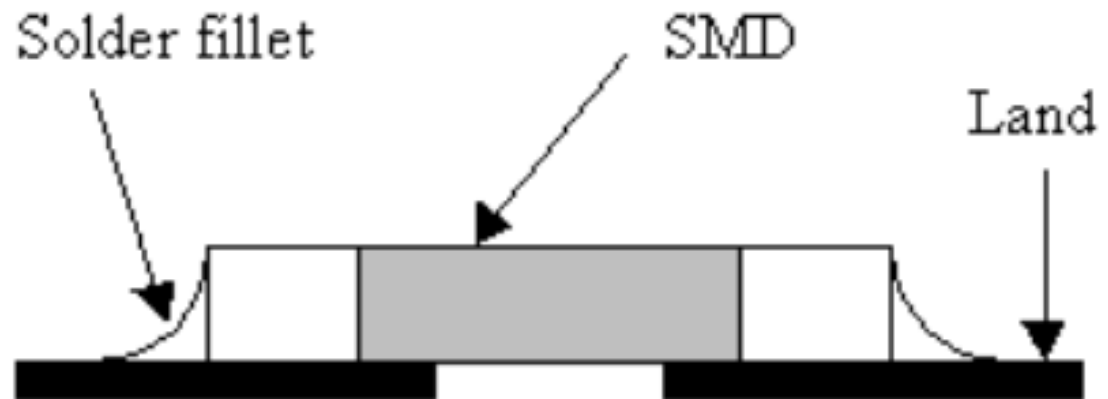
Fonte: <https://www.seeedstudio.com/blog/2021/06/18/13-common-pcb-soldering-problems-to-avoid/>



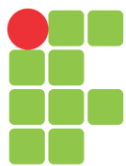
Soldagem e Práticas de Montagem



Solda ideal SMD

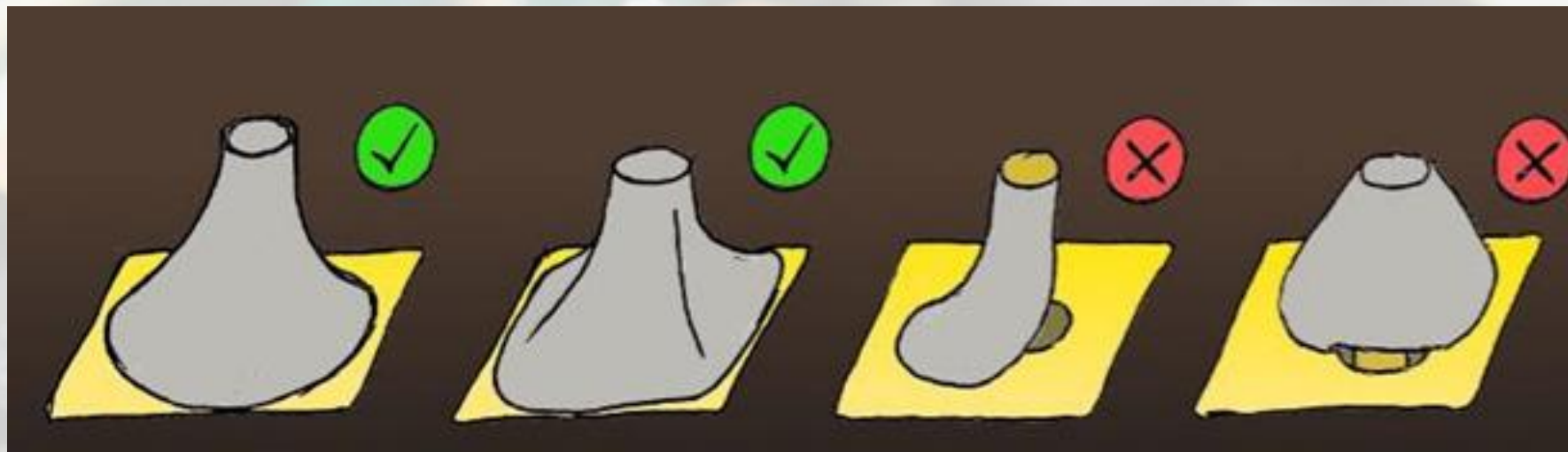


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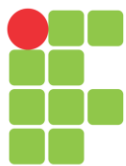


Soldagem e Práticas de Montagem

Problemas comuns

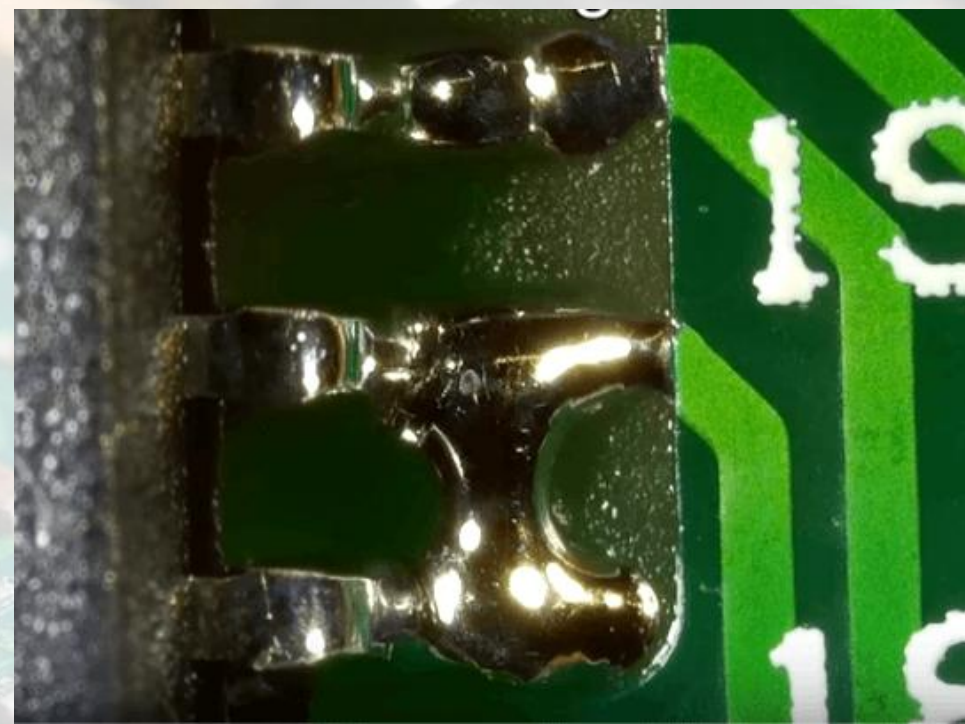
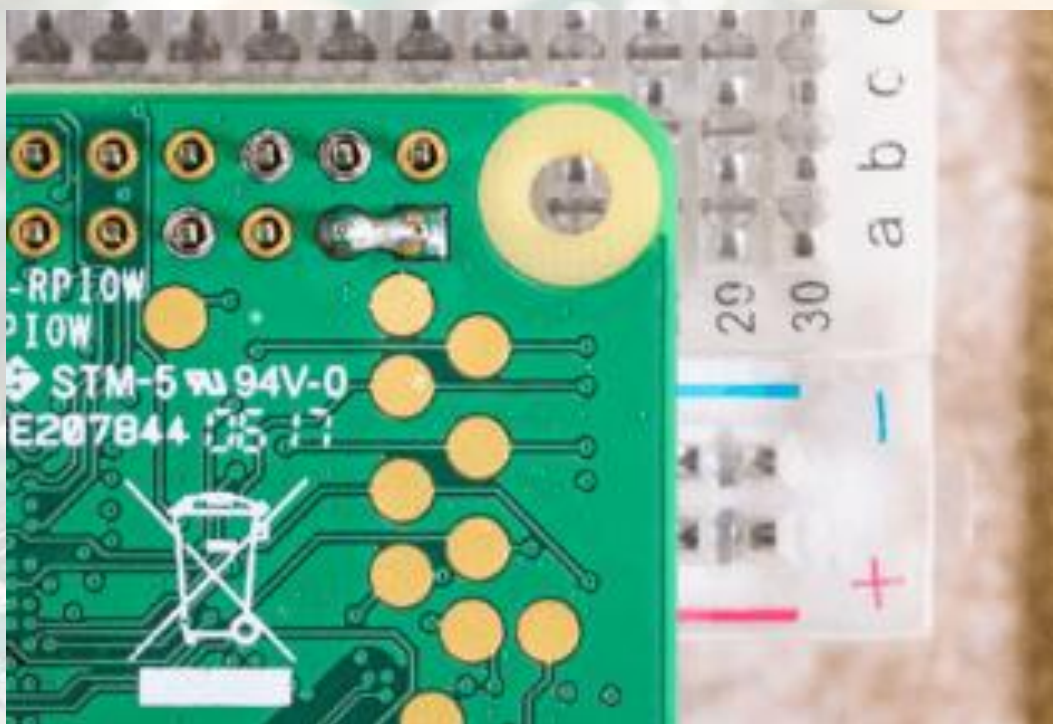


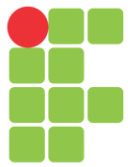
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Soldagem e Práticas de Montagem

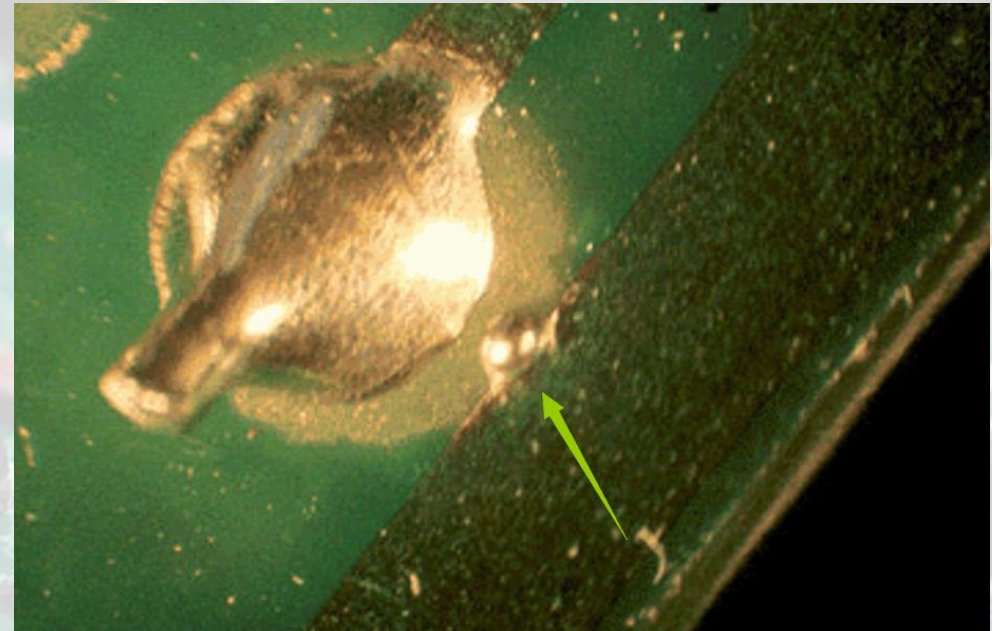
Problemas comuns

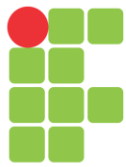




Soldagem e Práticas de Montagem

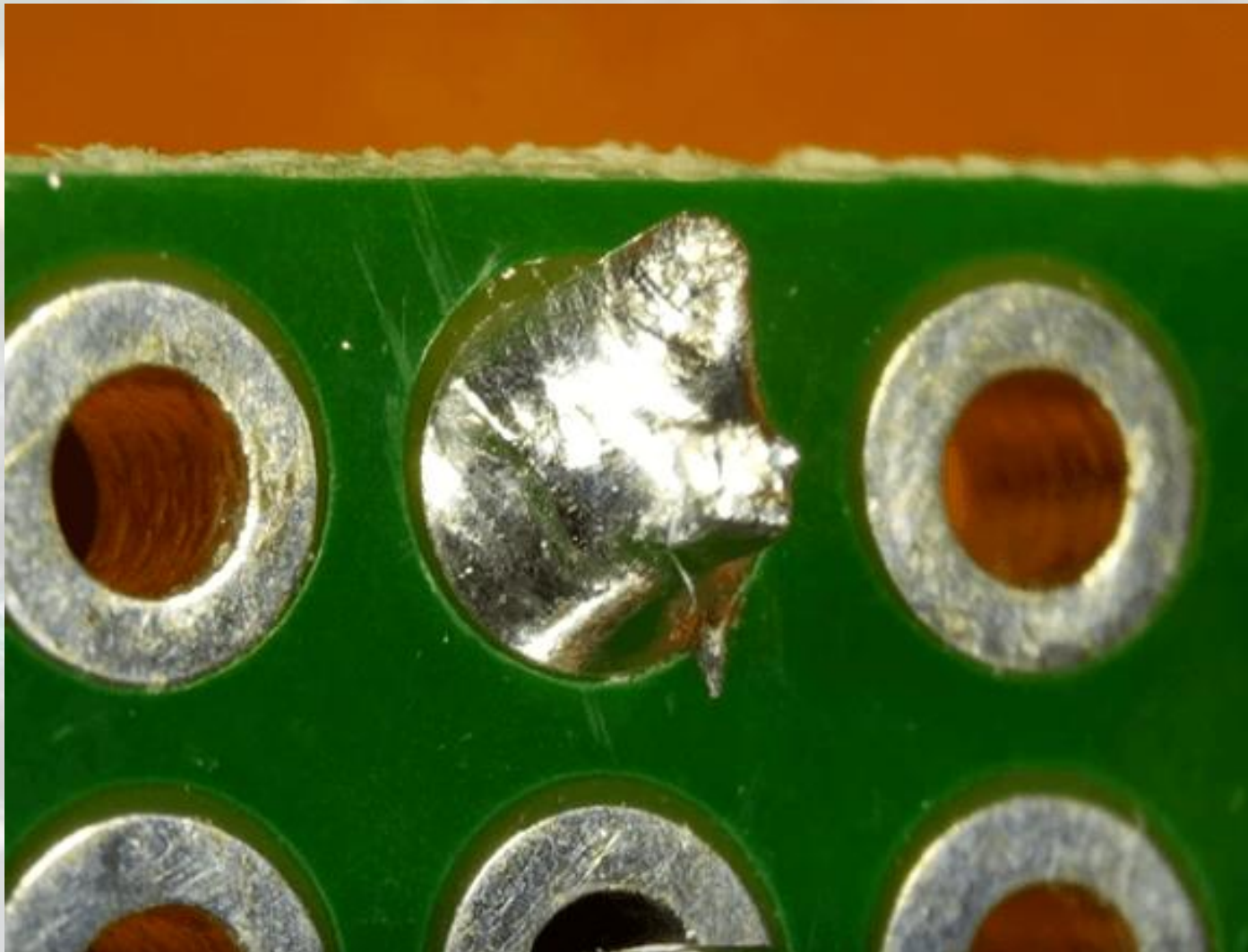
Problemas comuns, bolhas de solda



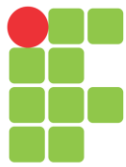


Soldagem e Práticas de Montagem

Problemas comuns – Solda fria

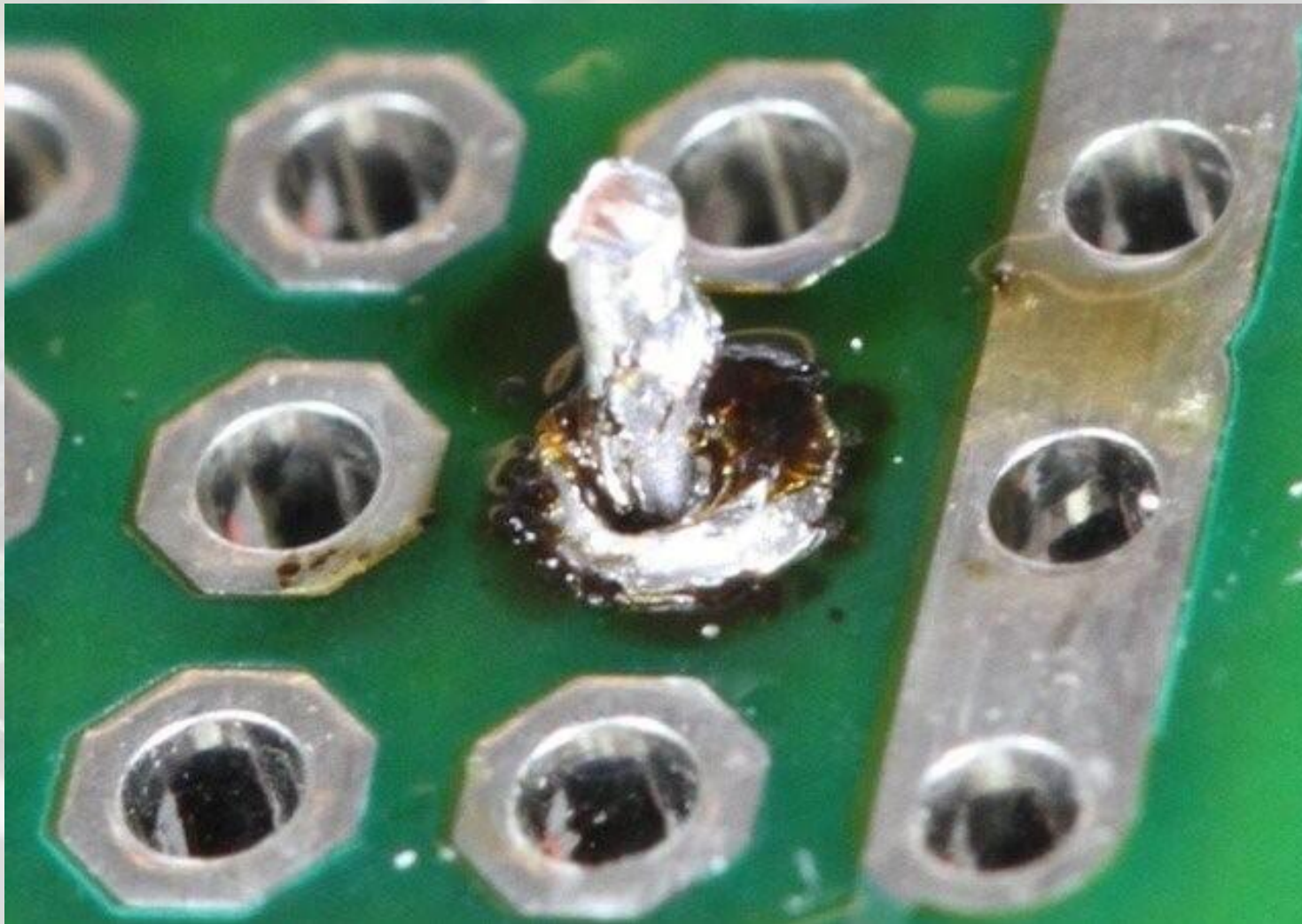


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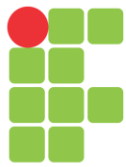


Soldagem e Práticas de Montagem

Problemas comuns – Superaquecimento



Fonte: <https://www.seeedstudio.com/blog/2021/06/18/13-common-pcb-soldering-problems-to-avoid/>

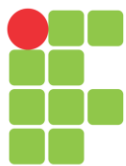


Soldagem e Práticas de Montagem

Tombstone



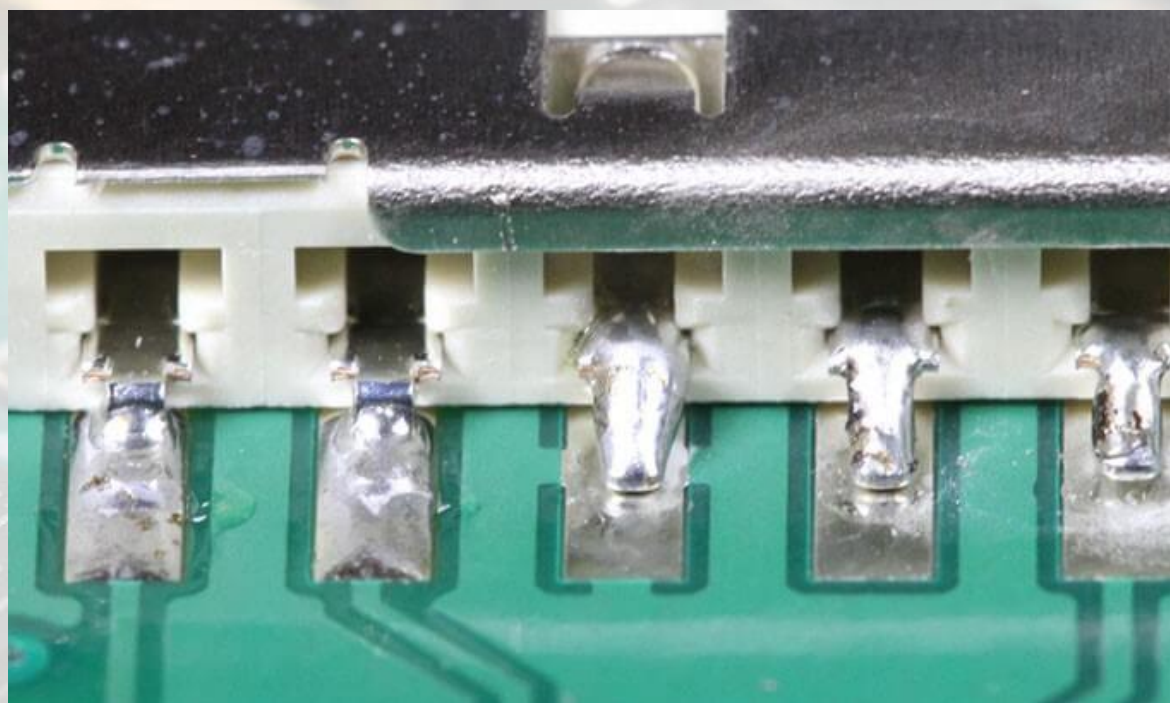
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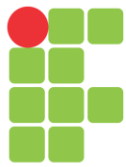
Soldagem e Práticas de Montagem



Pouca solda



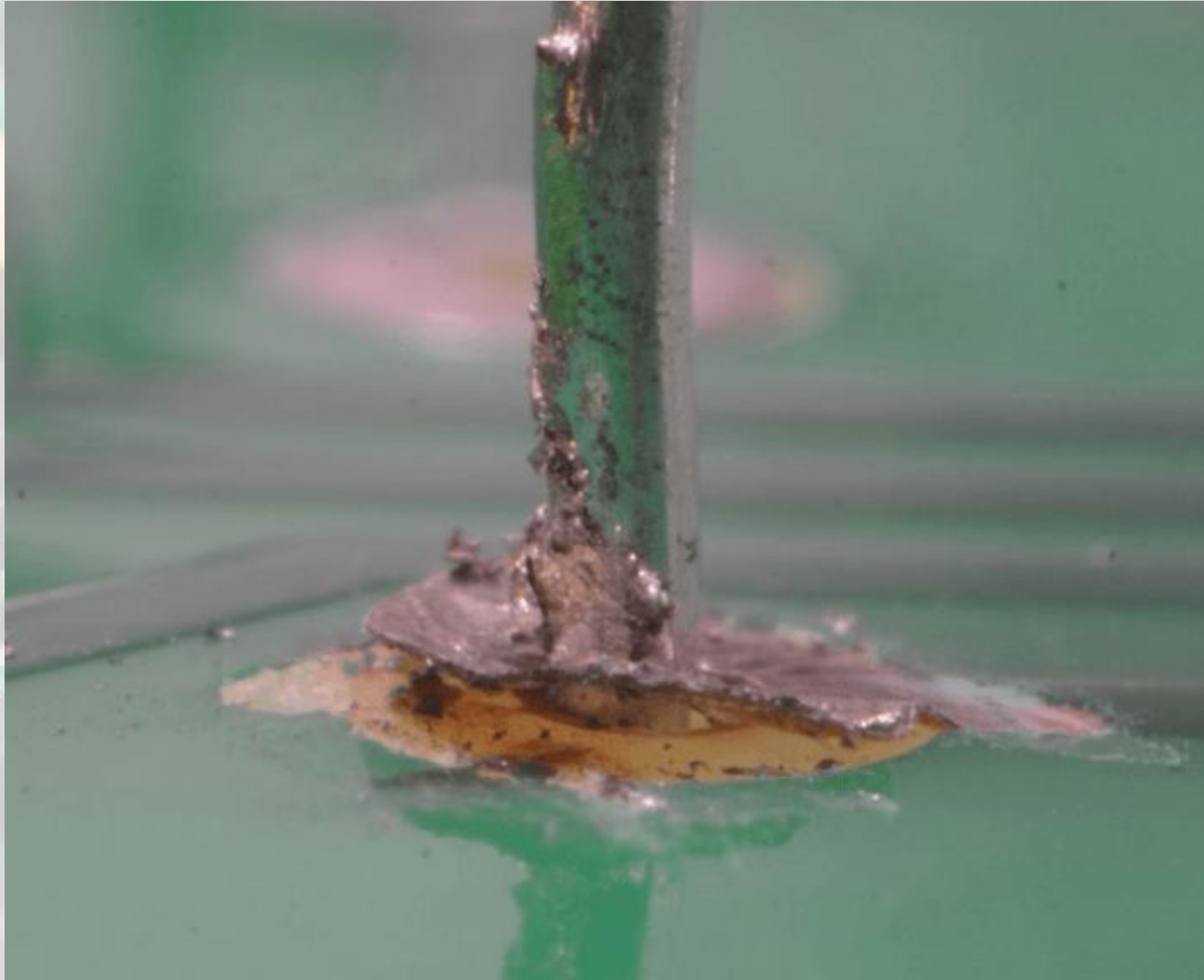
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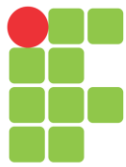
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Ilha Levantada

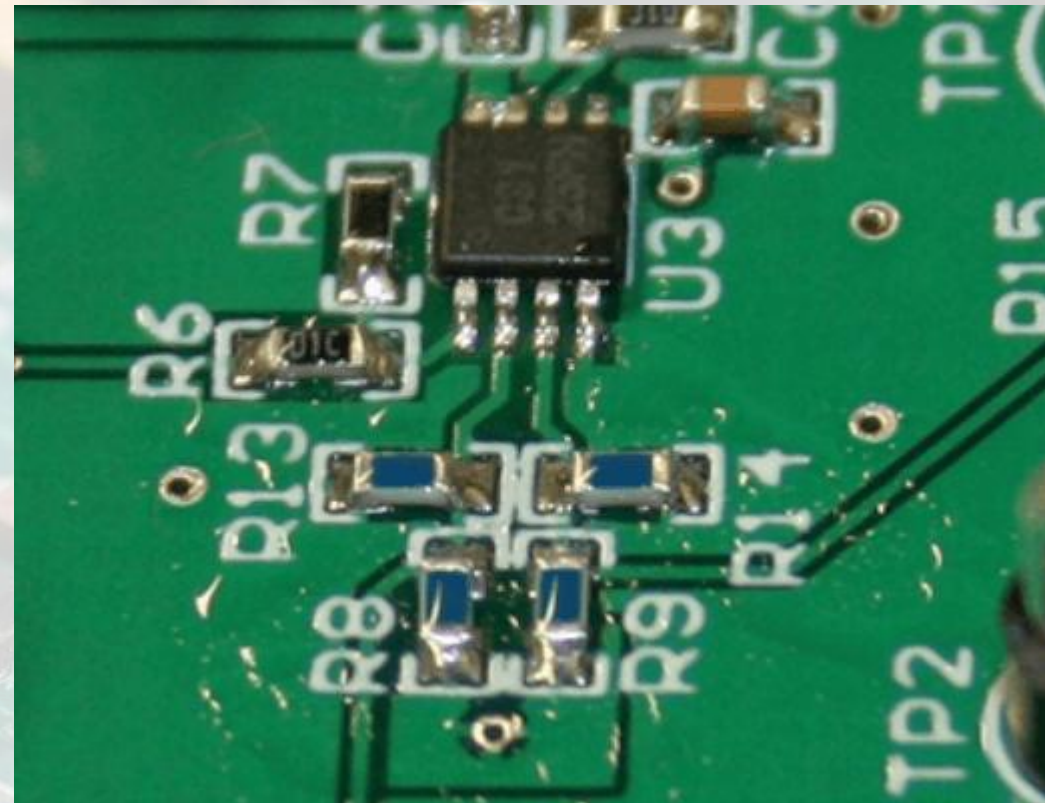
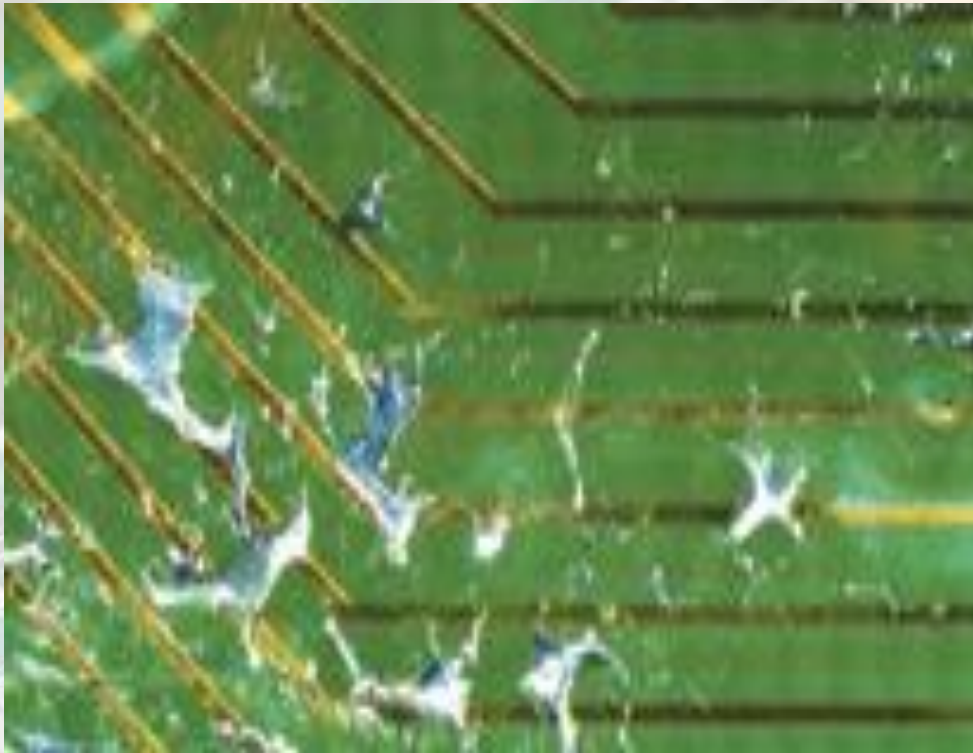


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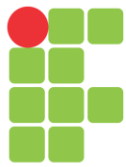


Soldagem e Práticas de Montagem

Respingos



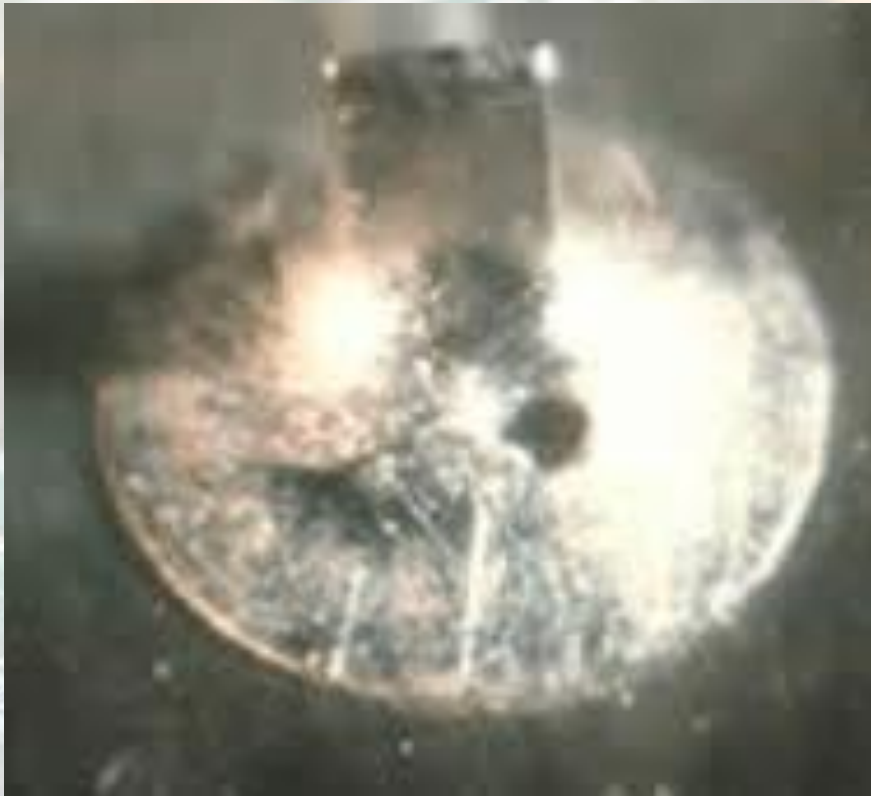
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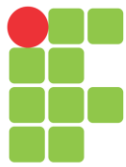
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Soldagem e Práticas de Montagem

Furos e bolhas

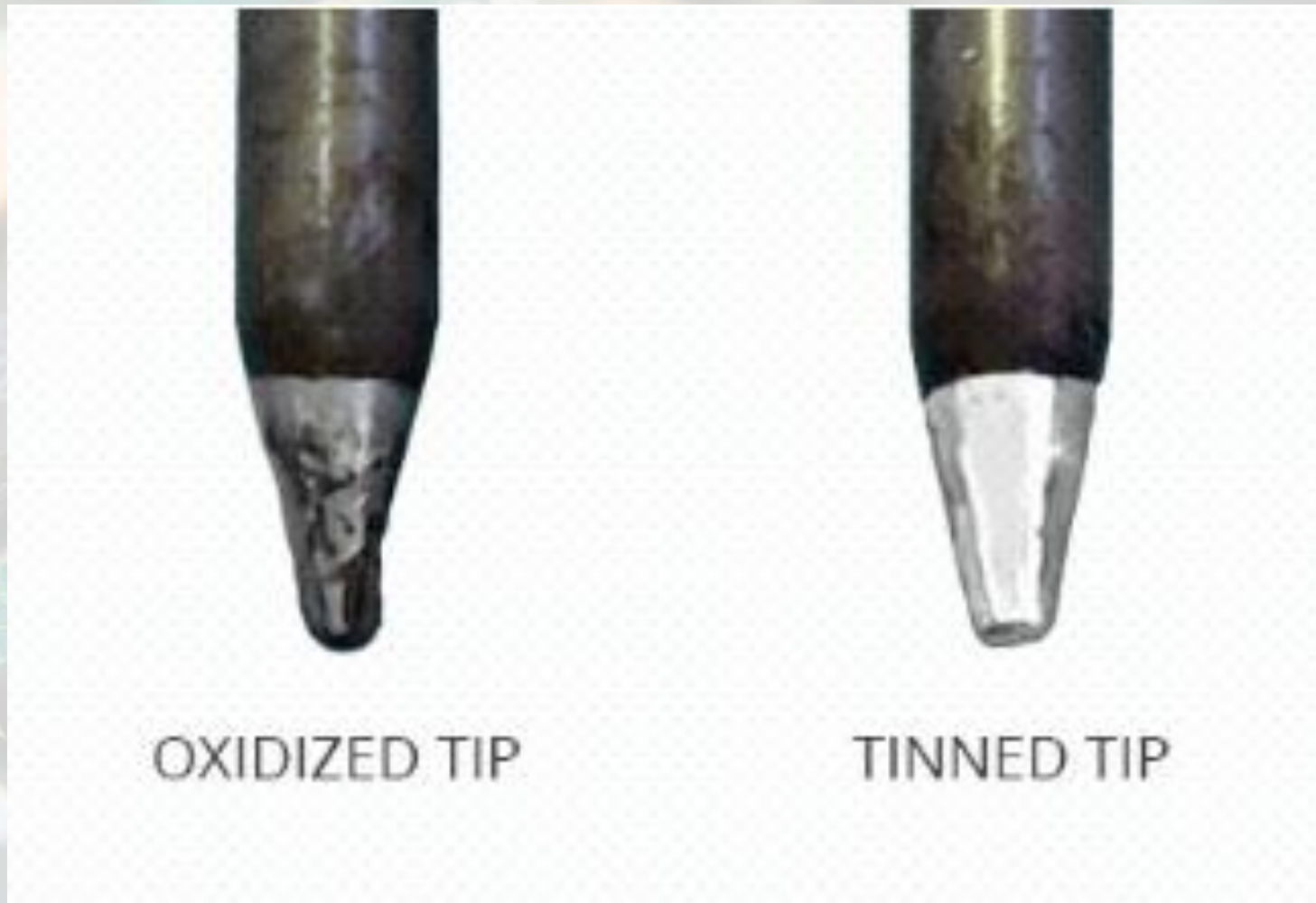


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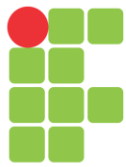


Soldagem e Práticas de Montagem

Limpeza e estanhagem da ponta do seu ferro de solda



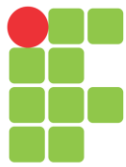
Fonte: <https://www.seeedstudio.com/blog/2021/06/18/13-common-pcb-soldering-problems-to-avoid/>



Remoção de componentes

- Estação de retrabalho (Ar quente)
- Adicionar solda nova.
- Usar bastante fluxo.
- Sugador de solda.



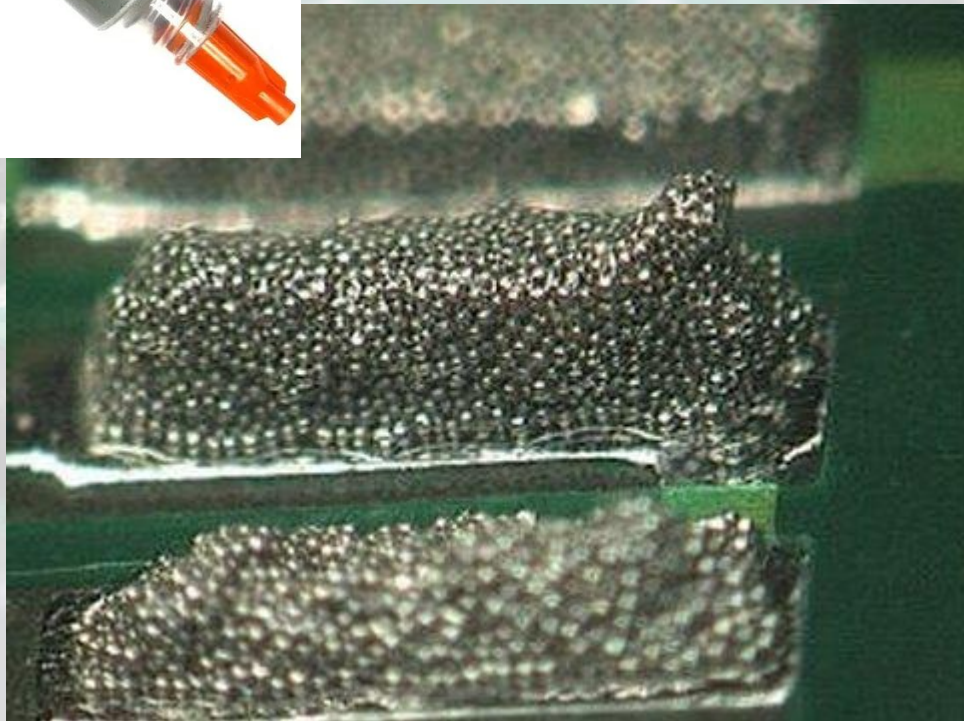


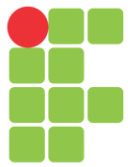
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Soldagem SMD



Pasta de solda

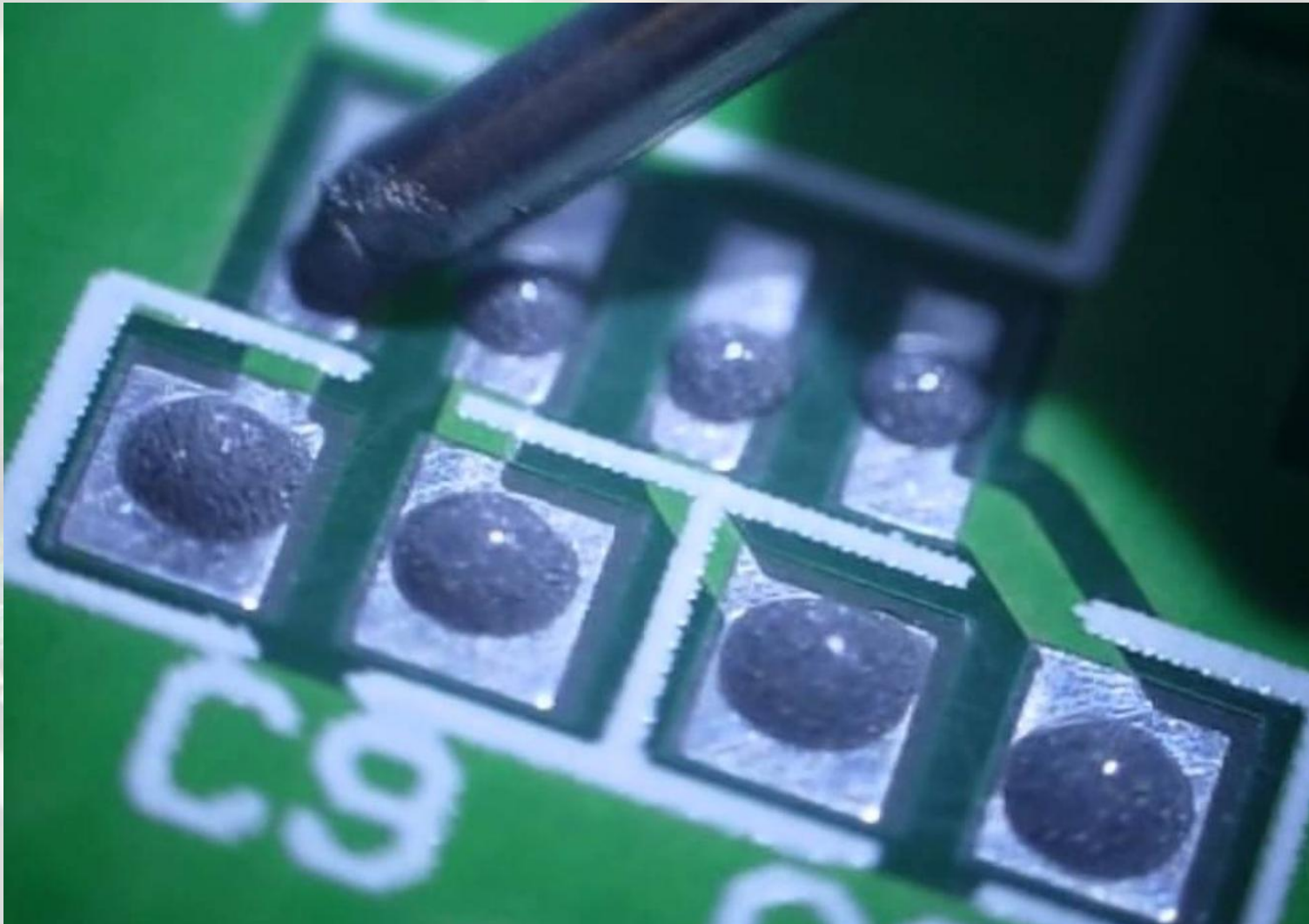


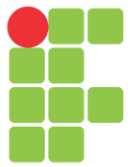


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Soldagem SMD

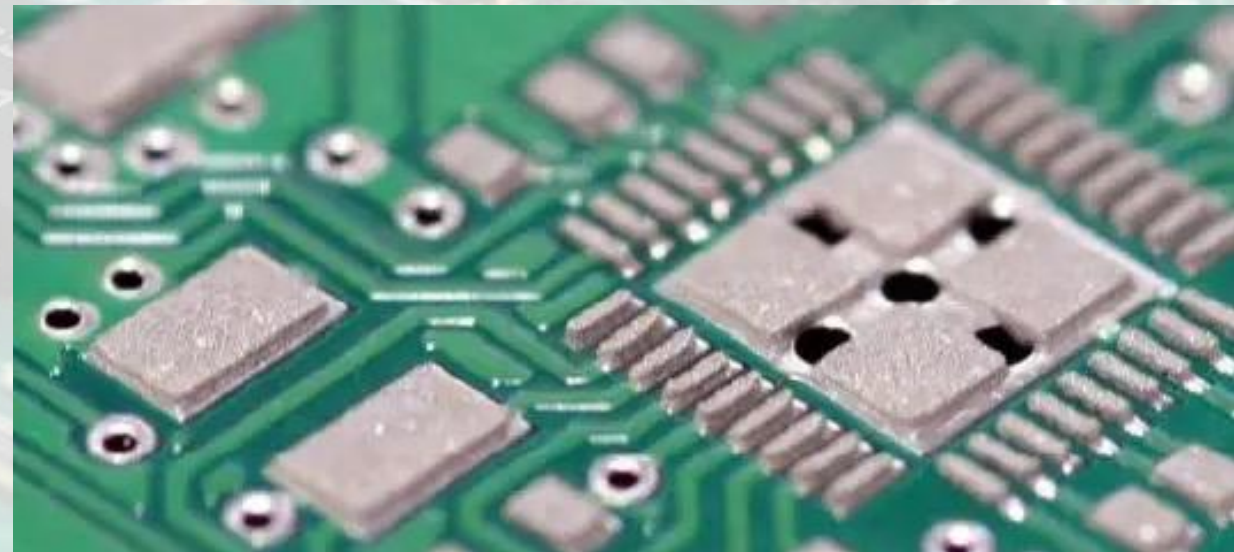
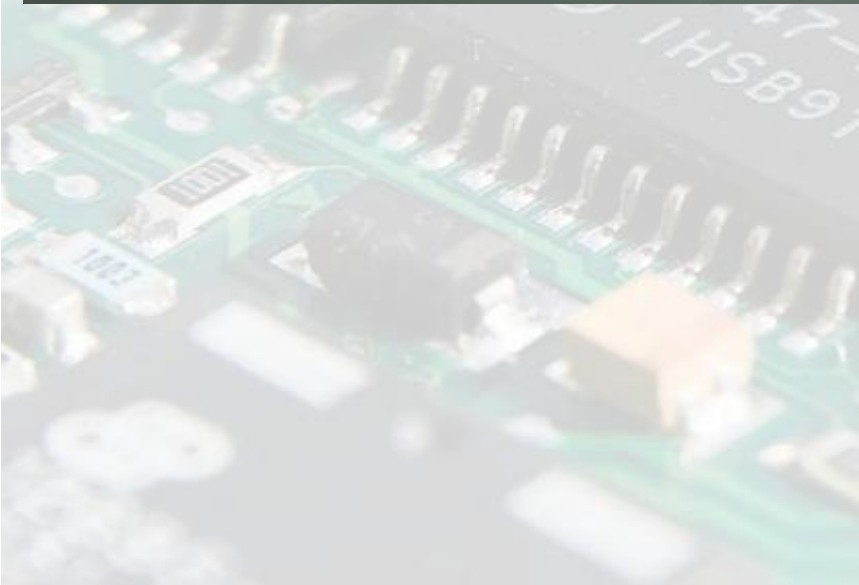
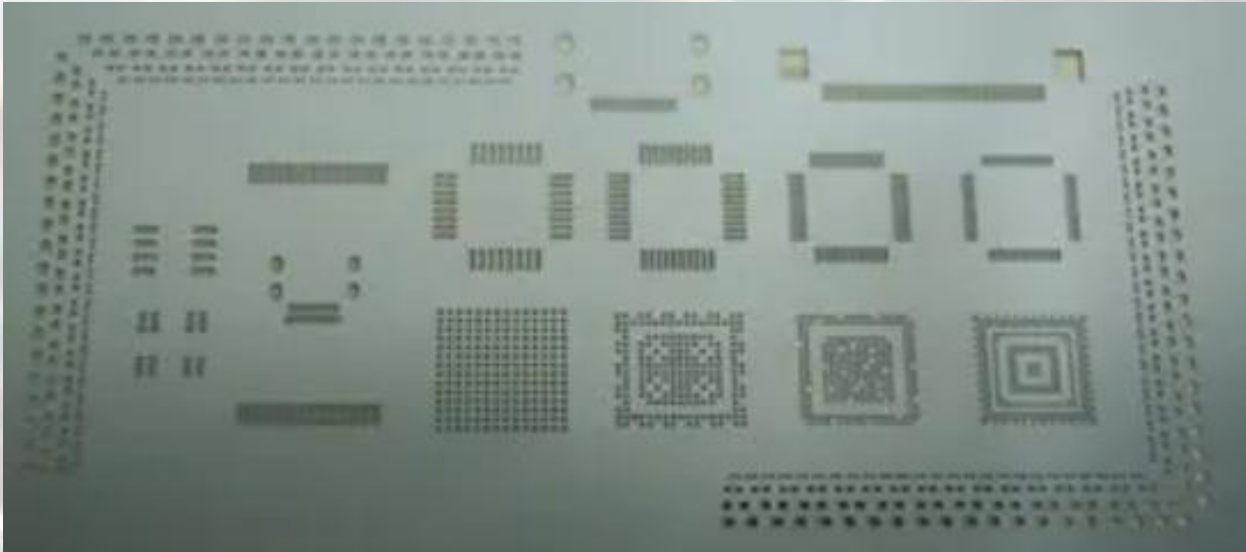
Aplicação manual de pasta de solda

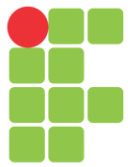




Soldagem SMD

Aplicação de pasta de solda com stencil

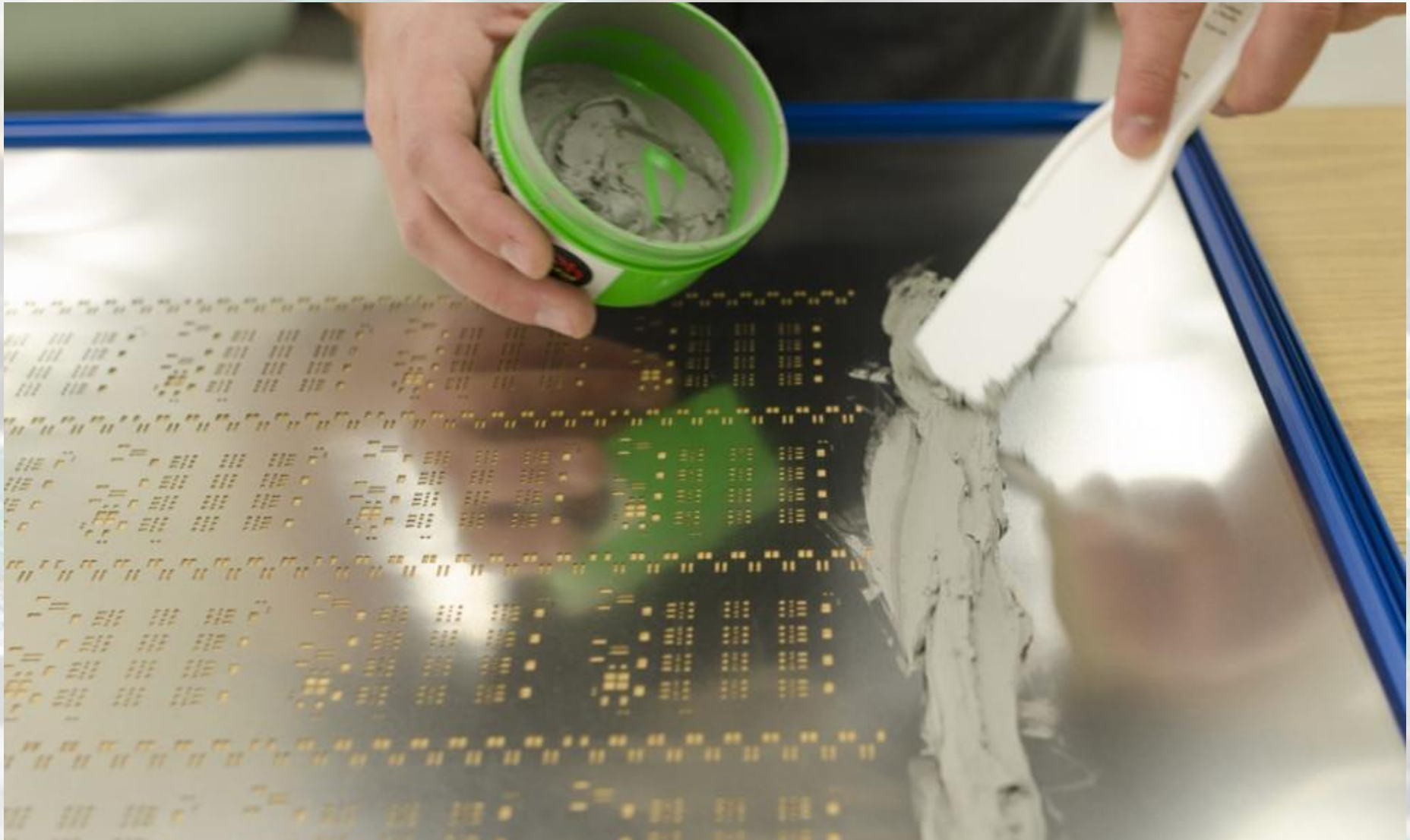




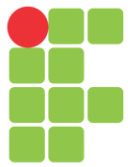
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Soldagem SMD

Aplicação de pasta de solda com stencil

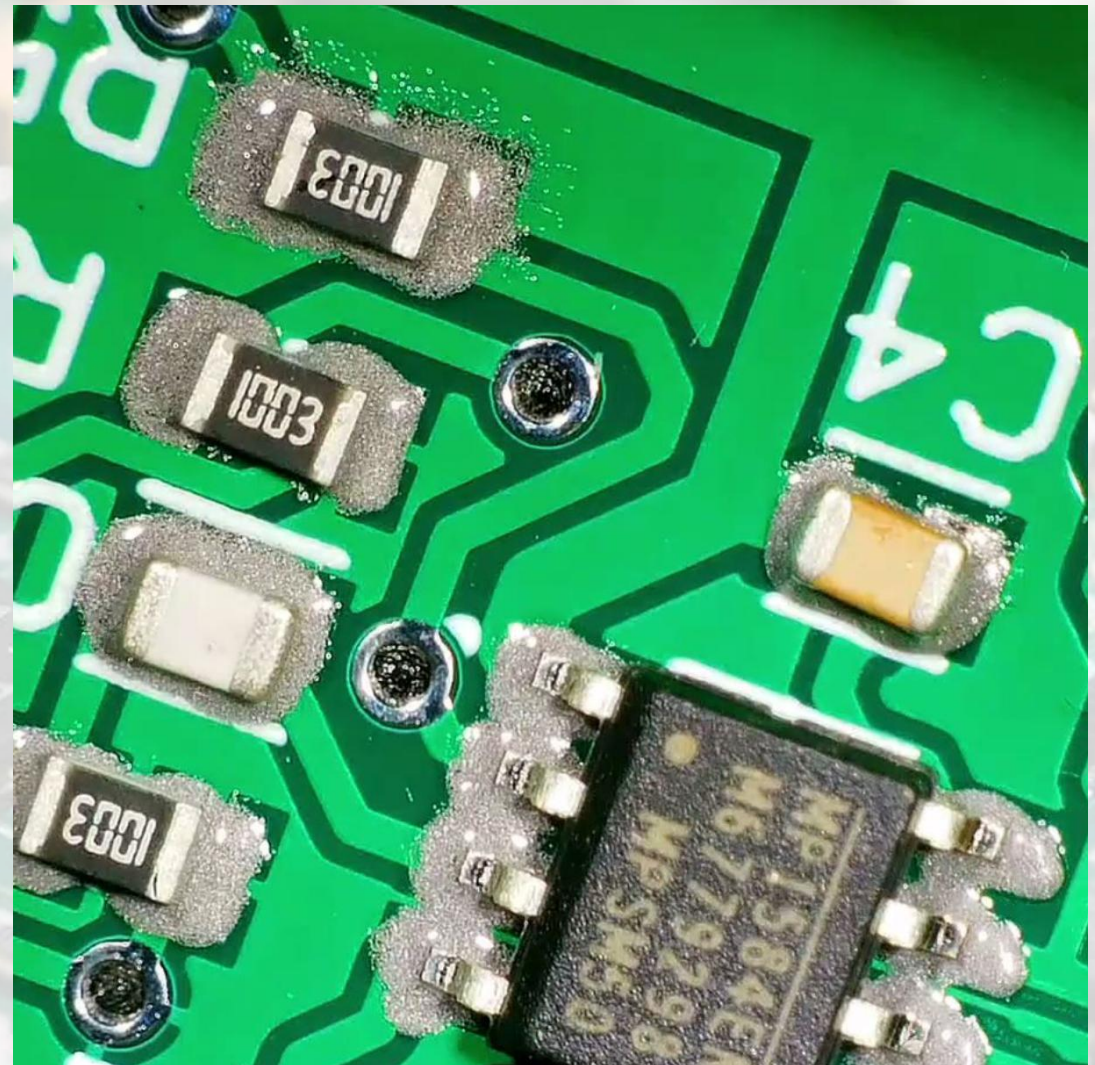


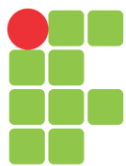
Professor Ricardo Kerschbaumer



Soldagem SMD

Posicionamento manual dos componentes

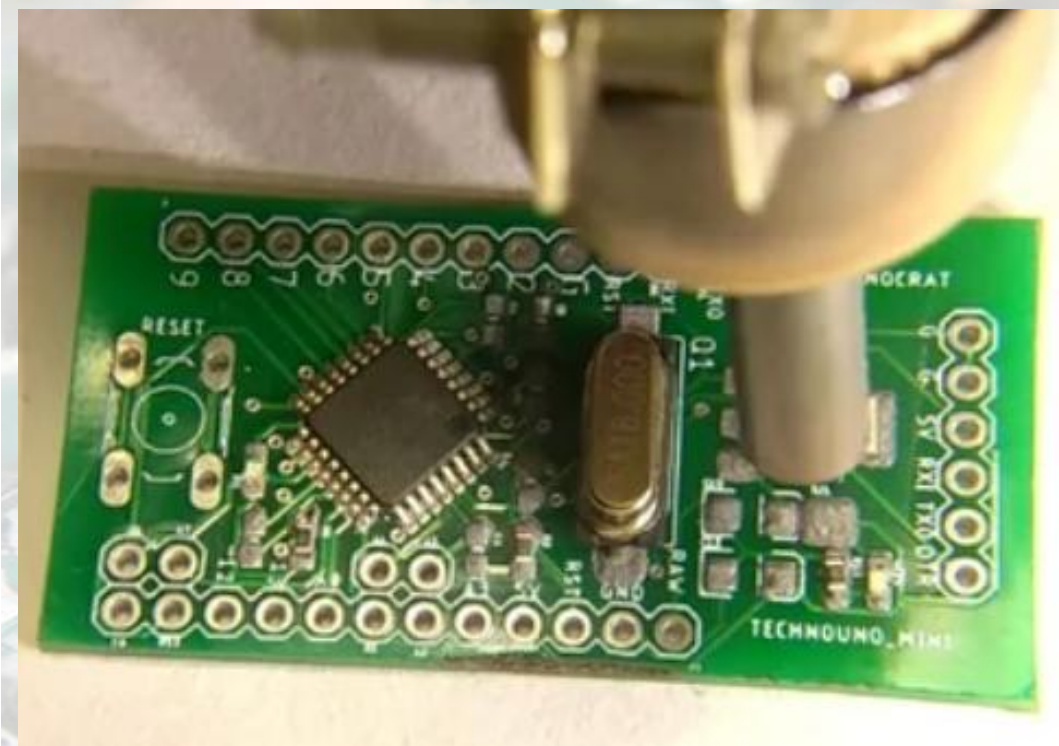


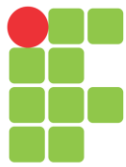


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Soldagem SMD

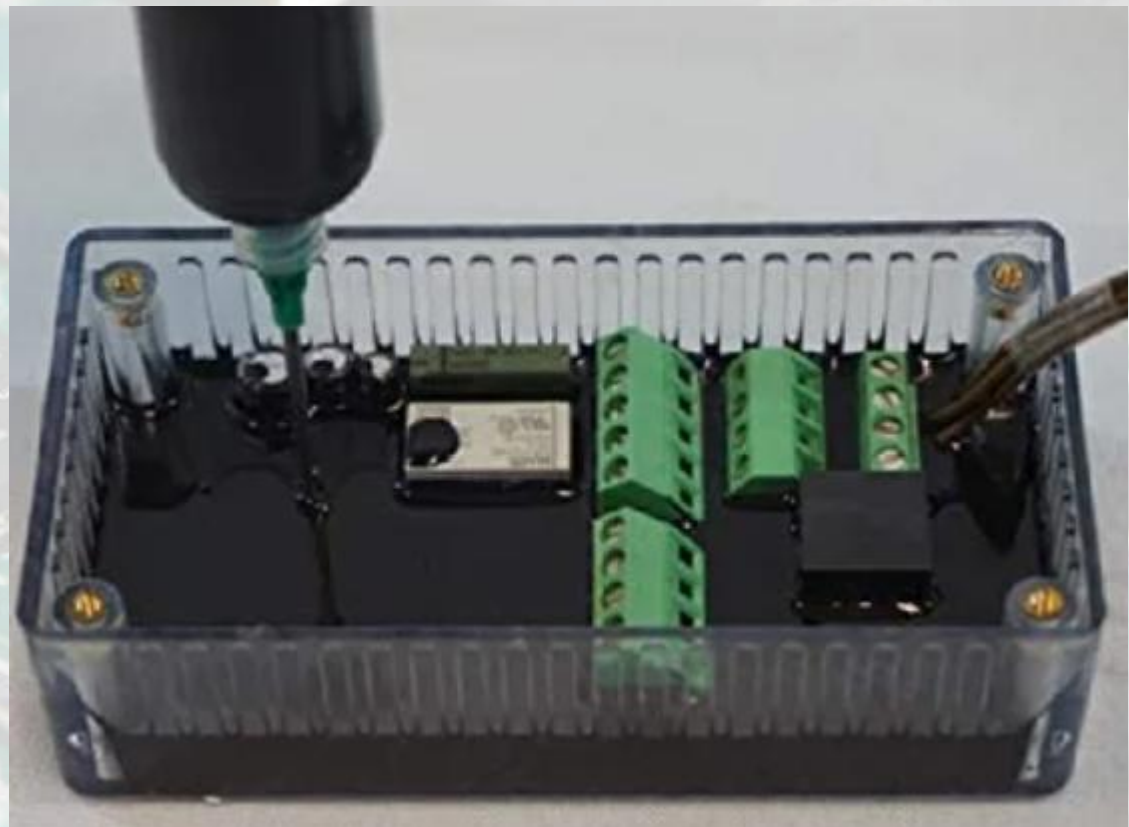
Solda manual

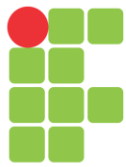




Tratamento e Proteção da PCB

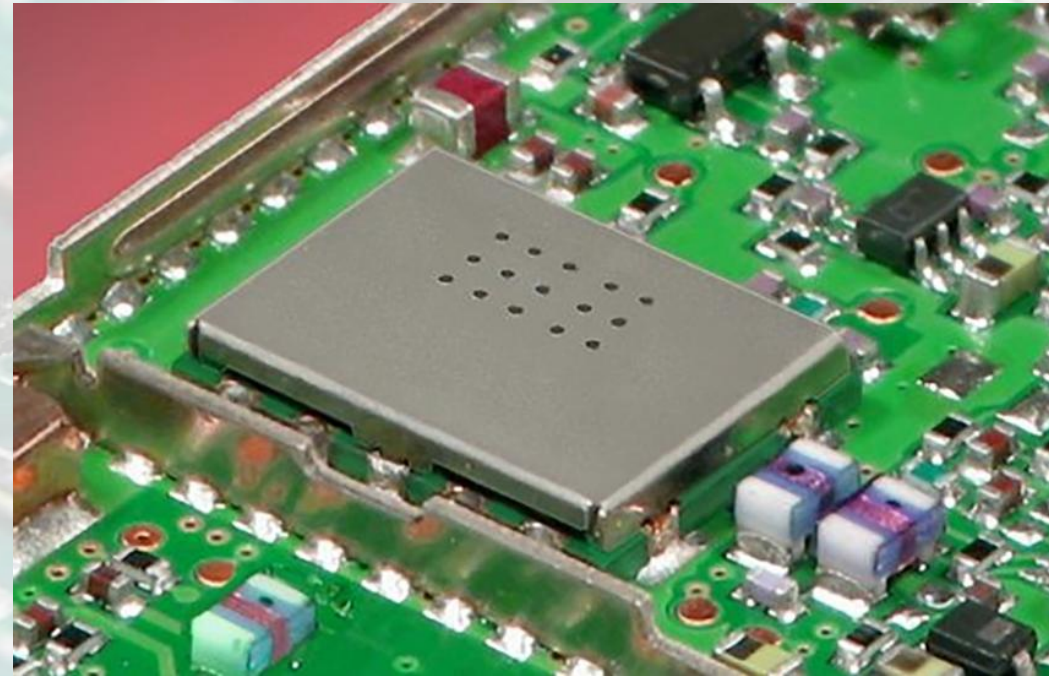
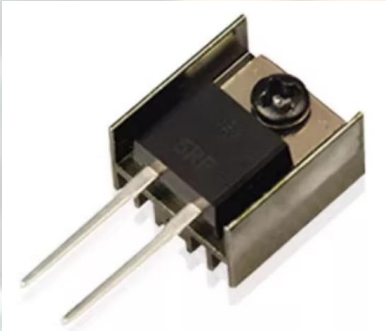
- Proteção contra umidade e poeira: verniz protetor (conformal coating) ou resinagem em casos extremos.





Tratamento e Proteção da PCB

- Isolador para dissipador: evitar contatos indevidos com a carcaça ou plano de terra.
- Escudos (shields) e blindagens para circuitos RF ou sensíveis.





Metodologia de Testes

- Uso de equipamentos de bancada: multímetro, osciloscópio, analisador lógico, medidor LCR.
- Ensaio de ruído (diferencial, modo comum) e compatibilidade eletromagnética (EMC).
- Calibração: ajuste de trimpots e trimmers, bem como ajuste de constantes de software.
- Aplicação da Giga de testes: se possível, gerar os sinais de entrada e verificar o funcionamento do circuito.



- Diagrama de conexões (cabos e conectores).
- Procedimento de calibração e ajuste do projeto em campo.
- Registro fotográfico: soldas, protótipos, pontos de teste, gráficos, tabelas, etc.
- Arquivos de projeto (fonte Kicad, bibliotecas, simulações).
- Documentação em PDF: esquemáticos e layout.
- Lista de materiais (BOM) com modelos, fabricantes, fornecedores e imagens.
- Versionamento final: “release” do hardware para produção.