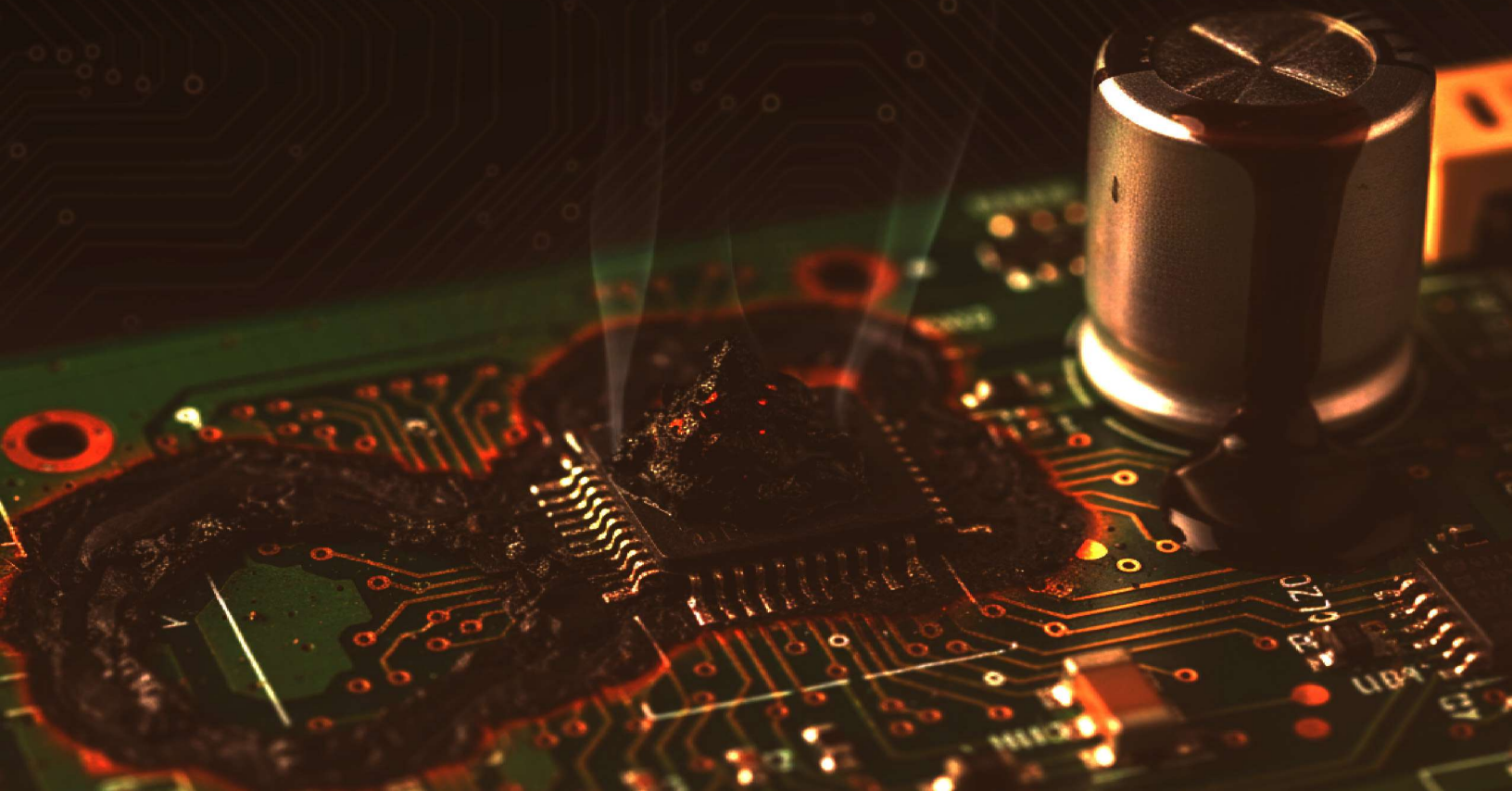
PREDICTABLE DESIGNS

10 PCB DESIGN MISTAKES THAT CAUSE THERMAL FAILURES



MISTAKE #1

Undersized Copper Traces for High Current

- Calculate worst-case current
- Use IPC-2221 or updated trace width calculators
- Increase trace width if borderline
- Use thicker copper
- Add copper pours
- Verify temp rise inside enclosure

MISTAKE #2

Poor Thermal Via Design

- Add multiple thermal vias
- Prefer filled and plated via-in-pad
- Use 0.2-0.3 mm vias
- Connect vias to internal planes
- Add pours around thermal pad
- Don't rely only on air cooling

MISTAKE #3

No Thermal Relief on Pads

- Ensure thermal relief spokes
- Verify solderability
- Adjust spoke width/number
- Disable solid connections only when needed
- Confirm with assembly house

MISTAKE #4

Concentrating Heat Sources Together

- Identify hot components
- Avoid grouping power components
- Spread heat sources
- Separate from RF/analog
- Check airflow paths

MISTAKE #5

Inadequate Copper Pour or Planes

- Add wide copper pours
- Connect thermal pads to copper areas
- Use via stitching
- Include solid planes
- Balance thermal vs EMI
- Increase copper thickness

MISTAKE #6

Ignoring Component Thermal Specs

- Read datasheet pad requirements
- Check QJA and QJC
- Review derating curves
- Confirm power dissipation at real temps
- Follow exposed pad guidelines
- Don’t assume nominal current ratings

MISTAKE #7

No Consideration of Airflow

- Evaluate airflow in enclosure
- Align heat sinks vertically
- Avoid blocking airflow
- Create air channels
- Remove heat pockets
- Ensure fans have clear paths

MISTAKE #8

Overlooking Board Thickness and Layers

- Consider 4+ layers
- Use internal planes
- Increase copper thickness
- Avoid thin PCBs for high-wattage
- Check cost vs thermal needs
- Prototype before reducing layers

MISTAKE #9

Ignoring Component Thermal Specs

- Identify sensitive parts
- Keep away from regulators/MOSFETs
- Place in cool areas
- Check capacitor lifetime ratings
- Avoid sensor heat exposure
- Use barriers if needed

MISTAKE #10

Skipping Thermal Testing

- Test under worst-case load
- Seal enclosure during test
- Use thermal camera
- Run extended tests
- Identify hotspots
- Iterate layout

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without costly mistakes!

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Meet your guide: John Teel

Hey there, I'm a former microchip design engineer at Texas Instruments and founder of a hardware startup that sold products in hundreds of retail stores. My chip designs are in devices from Apple, Intel, and more.

Now, my full-time focus is helping people like you bring new electronic products to life, without wasting time, money, or risking everything.

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