PREDICTABLE DESIGNS

10 PCB DESIGN MISTAKES THAT DAMAGE PRODUCT RELIABILITY

MISTAKE #1

Thermal Mismanagement

[*] Spread out hot components
[*] Use wide copper pours & thermal vias under heat sources
[*] Avoid placing hot parts in corners/tight spaces
[*] Verify with a thermal camera (not fingers)
[*] Test at full load, extended periods, and in enclosures

MISTAKE #2

Inadequate Power Supply Design

[*] Size regulators for worst-case load & ambient temperature
[*] Account for peak current at startup/power events
[*] Provide thermal & current headroom
[*] Place a mix of low & high-value capacitors near ICs
[*] Validate under fast load, startup, and low battery conditions

MISTAKE #3

Poor Component Derating

[*] Rate capacitors at twice applied voltage
[*] Derate resistors to 50% of rated power
[*] Test switching devices under real-world waveforms & loads

MISTAKE #4

Weak Solder Joint Reliability

- [*] Use thermal reliefs on power/ground planes
- [*] Avoid via-in-pad unless filled/capped/plated
- [*] Reinforce heavy/connectors with brackets
- [*] Inspect solder quality early in production

MISTAKE #5

Ignoring Environmental Protection

- [*] Apply conformal coating in humid/moist environments
- [*] Respect creepage/clearance standards (esp. AC/high voltage)
- [*] Add ESD protection on external interfaces

MISTAKE #6

Poor Connector & Mechanical Design

- [*] Reinforce edge connectors with mounting points
- [*] Place connectors close to mounting holes
- [*] Add cable strain relief

MISTAKE #7

Battery Without Proper Protection

- [*] Use packs with built-in protection (preferred)
- [*] Add protection for overcharge, deep discharge, over-current, thermal runaway
- [*] Test protection circuitry under worst-case conditions

MISTAKE #8

Ignoring Vibration & Mechanical Stress

[*] Use standoffs & mounting holes for stability
[*] Support tall/heavy components mechanically
[*] Use thicker boards or stiffeners for long/narrow PCBs
[*] Test for drop, vibration, and flex

MISTAKE #9

Wrong Capacitor Types

[*] Use electrolytics/tantalums for bulk energy storage
[*] Use ceramics for high-frequency decoupling
[*] Combine cap types for stable rails
[*] Check effective capacitance under voltage

MISTAKE #10

Marginal PCB Materials

[*] Specify higher-Tg laminates for reliability
[*] Confirm exact PCB material (don't accept just "FR-4")
[*] For RF/high-voltage/high-temp: use specialty materials
[*] Ensure production doesn't downgrade materials

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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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