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Protection and Reliability in Electronic Systems

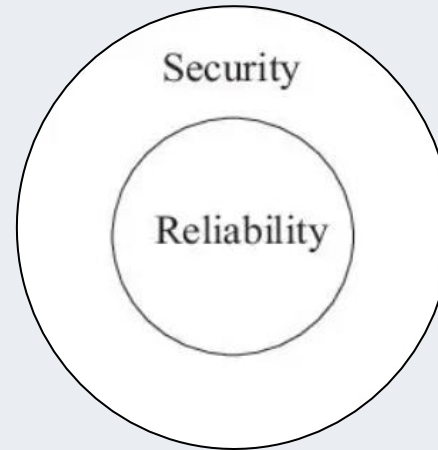
Presented by: Mr. Samkelo Nene
(ECST – Electrical Engineering Lecturer)



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1. Introduction

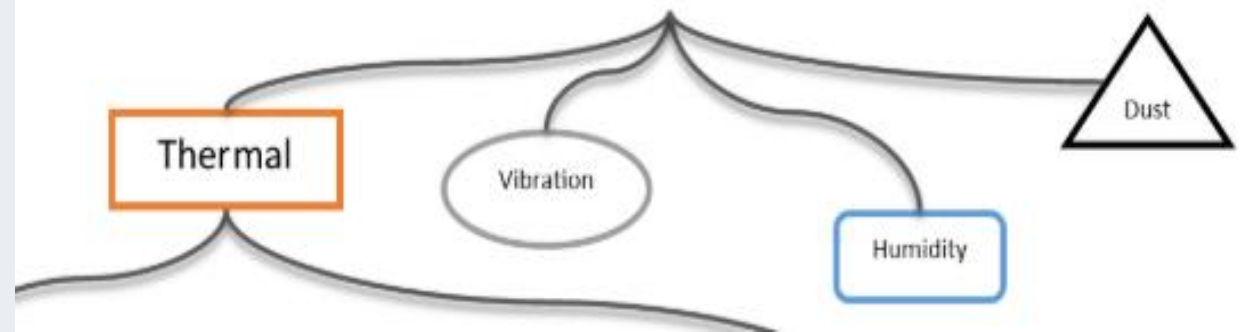


Prevents from Electrical Damages

PROTECTION DEVICES

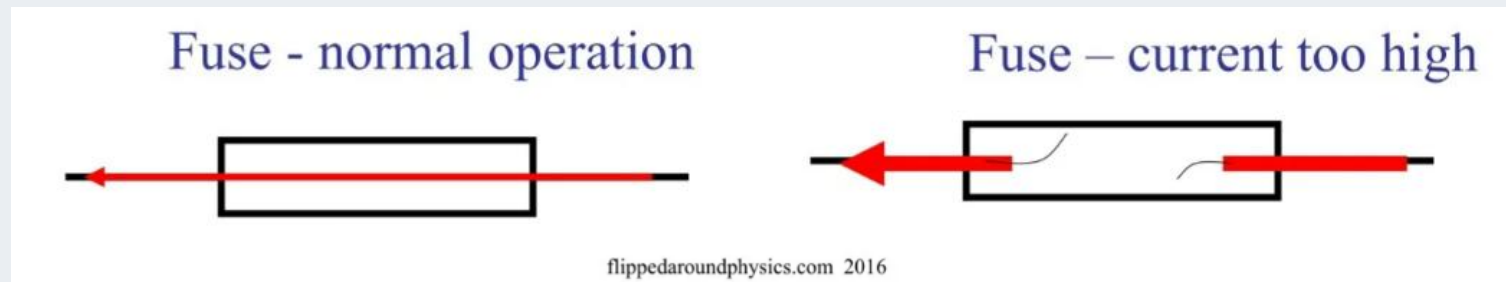
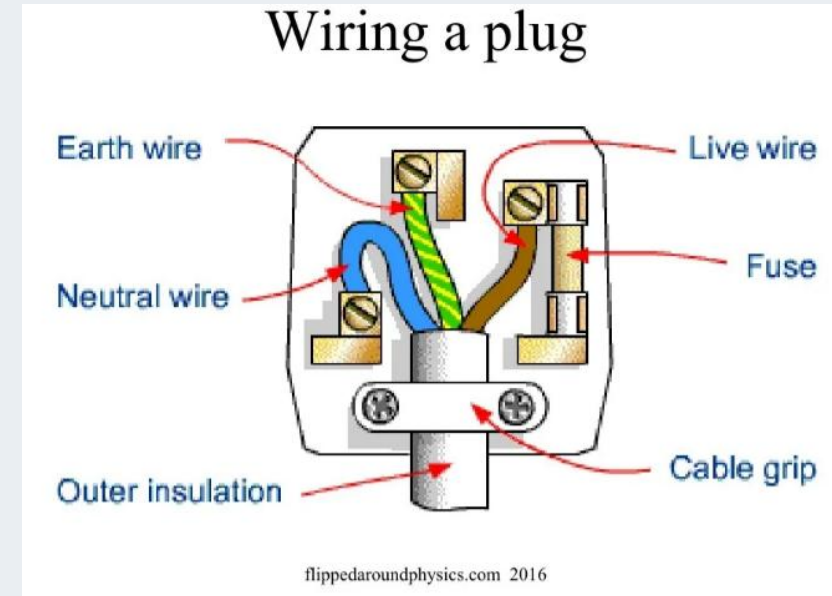


Electronics mechanical reliability issues



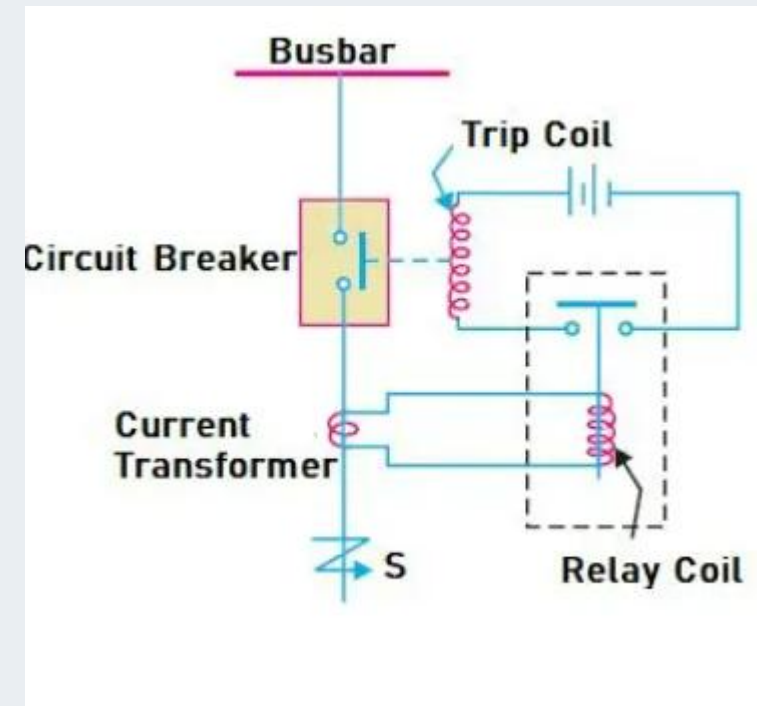
2. Traditional protection methods

A. Fuses



2. Traditional protection methods

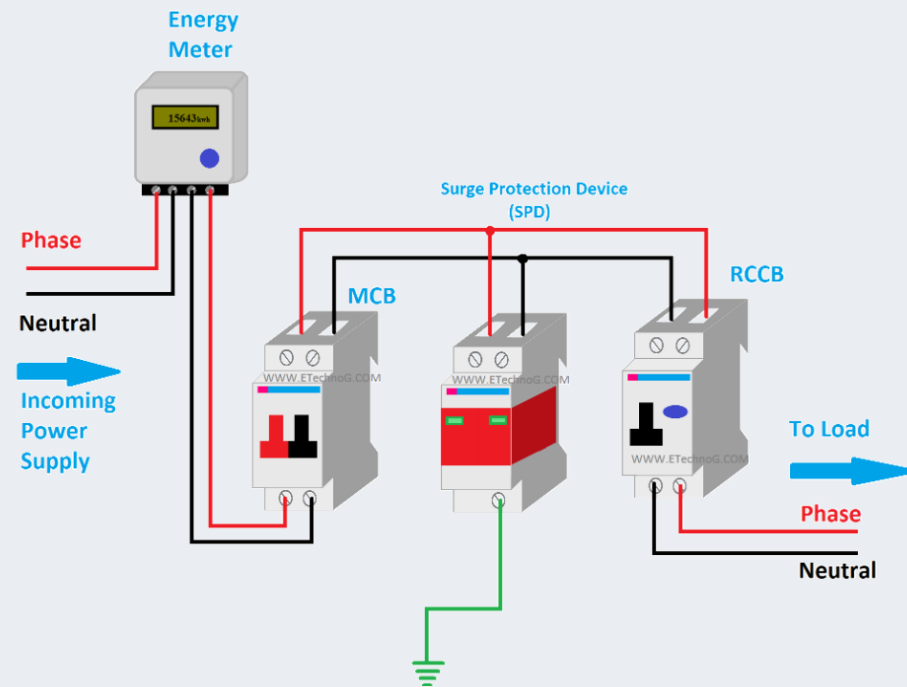
B. Circuit Breakers



“What the difference between a circuit breaker and an isolator?”

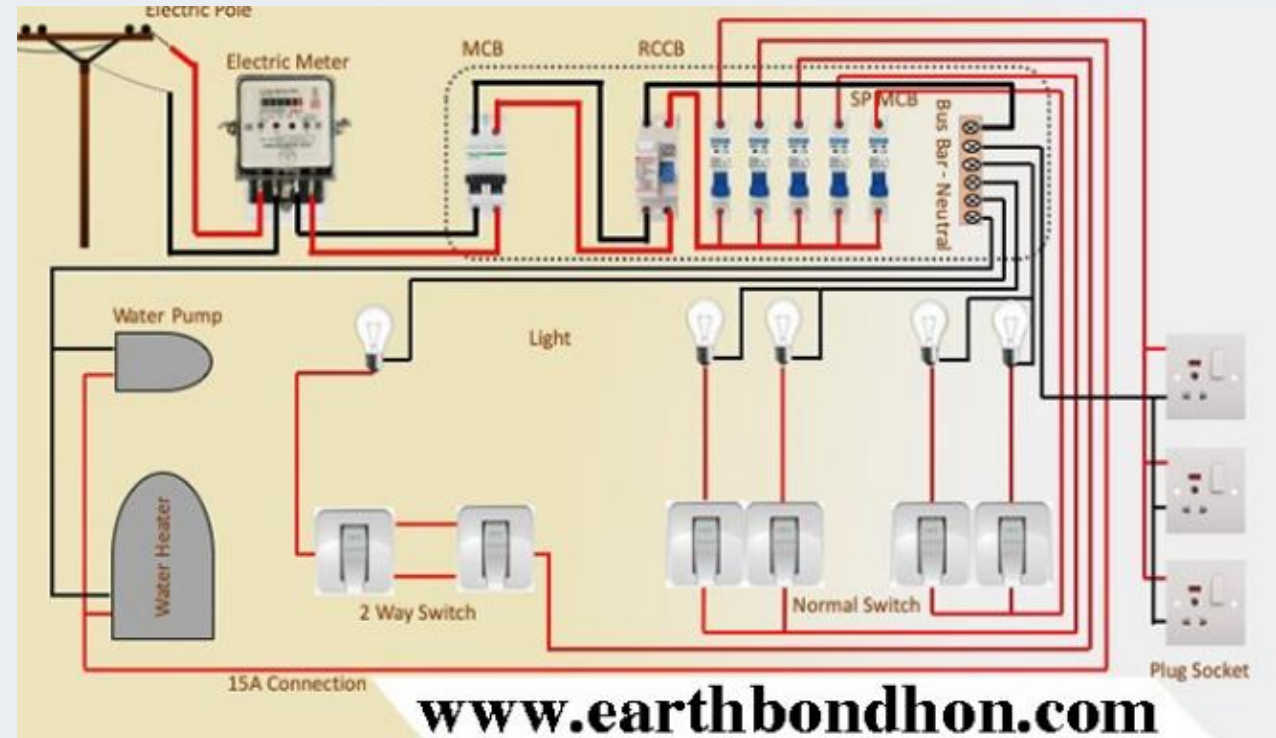
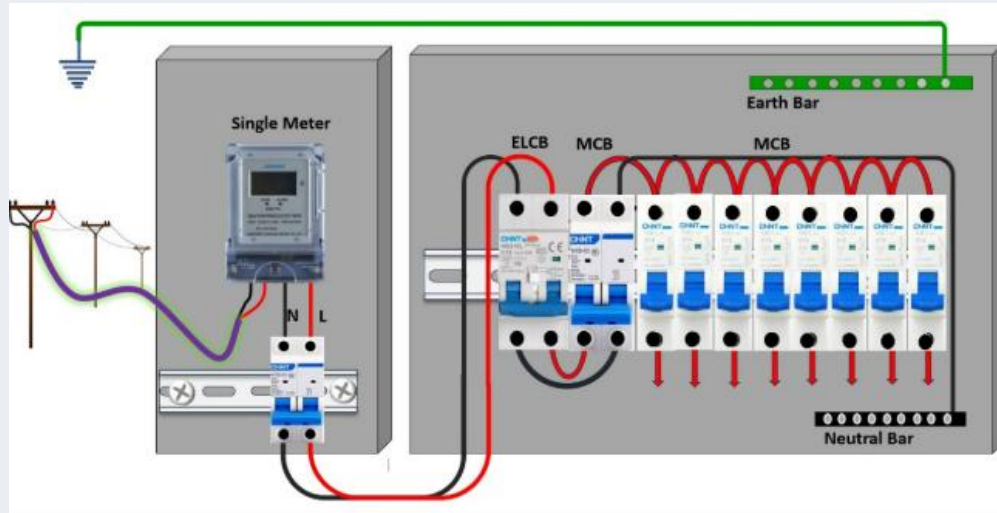
2. Traditional protection methods

C. Surge Protectors



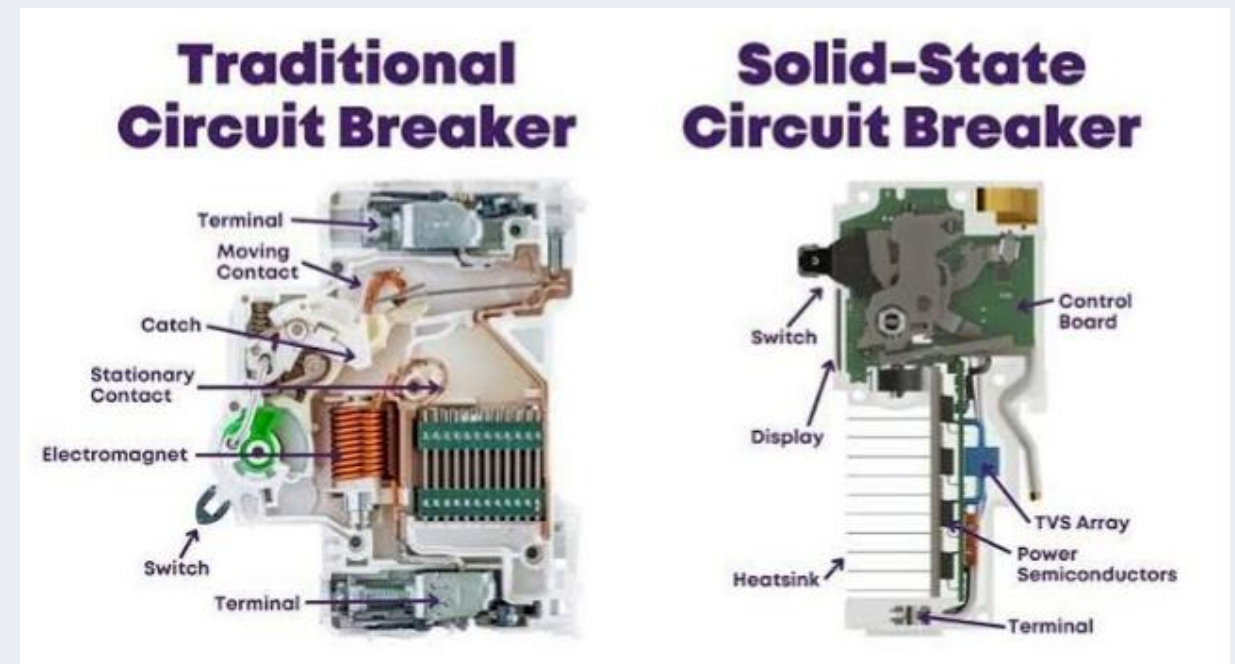
2. Traditional protection methods

D. In Application



3. Modern protection approaches

A. Solid-State Protection

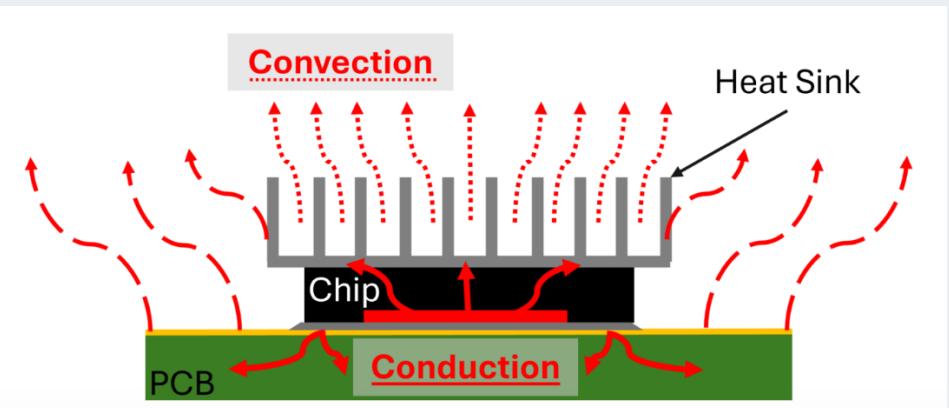
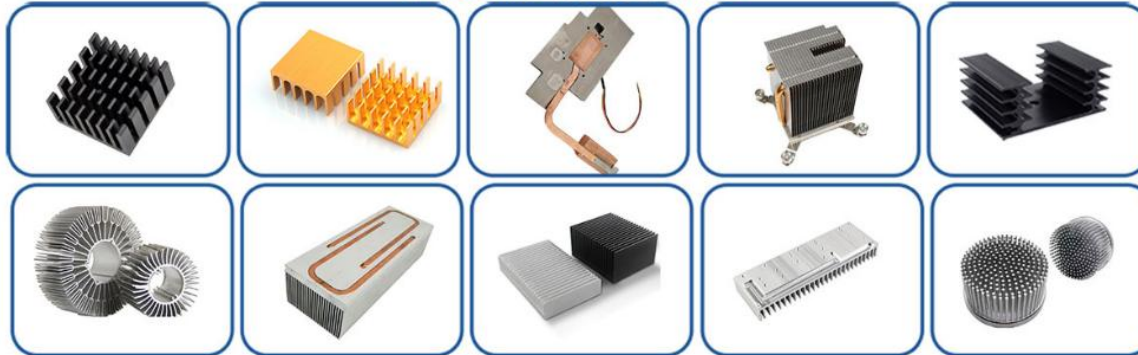


3. Modern protection approaches

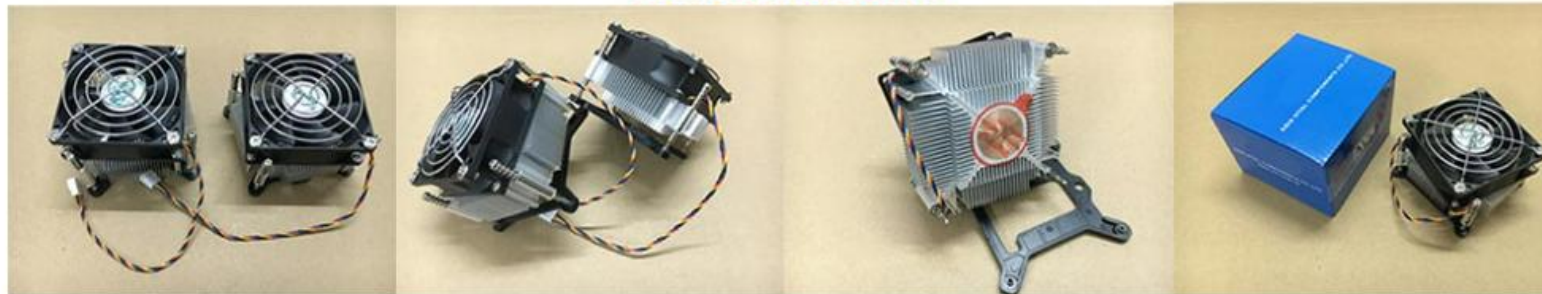
B. Thermal Management

Techniques:

Passive Heat Sinks



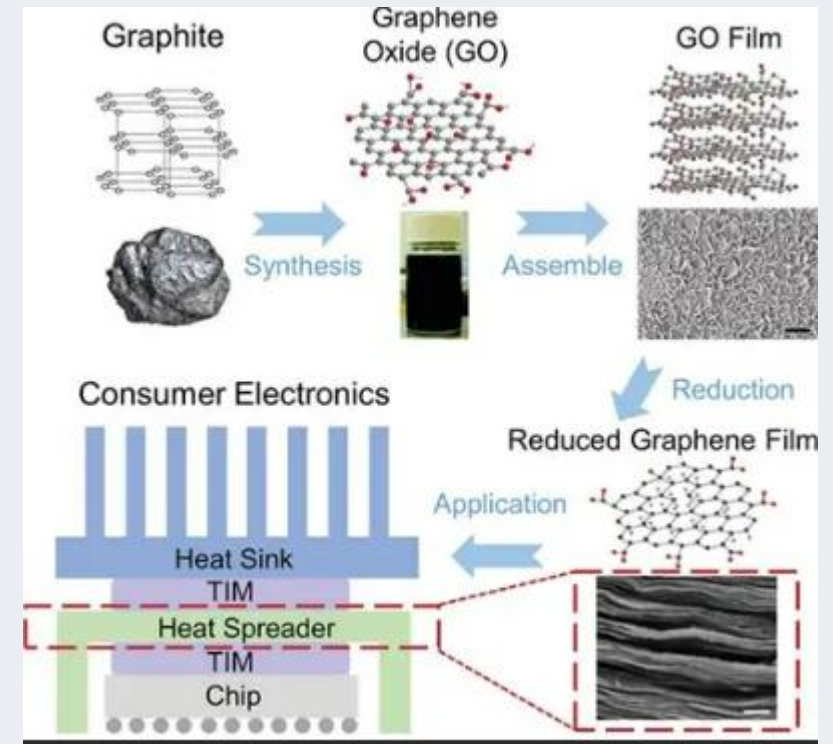
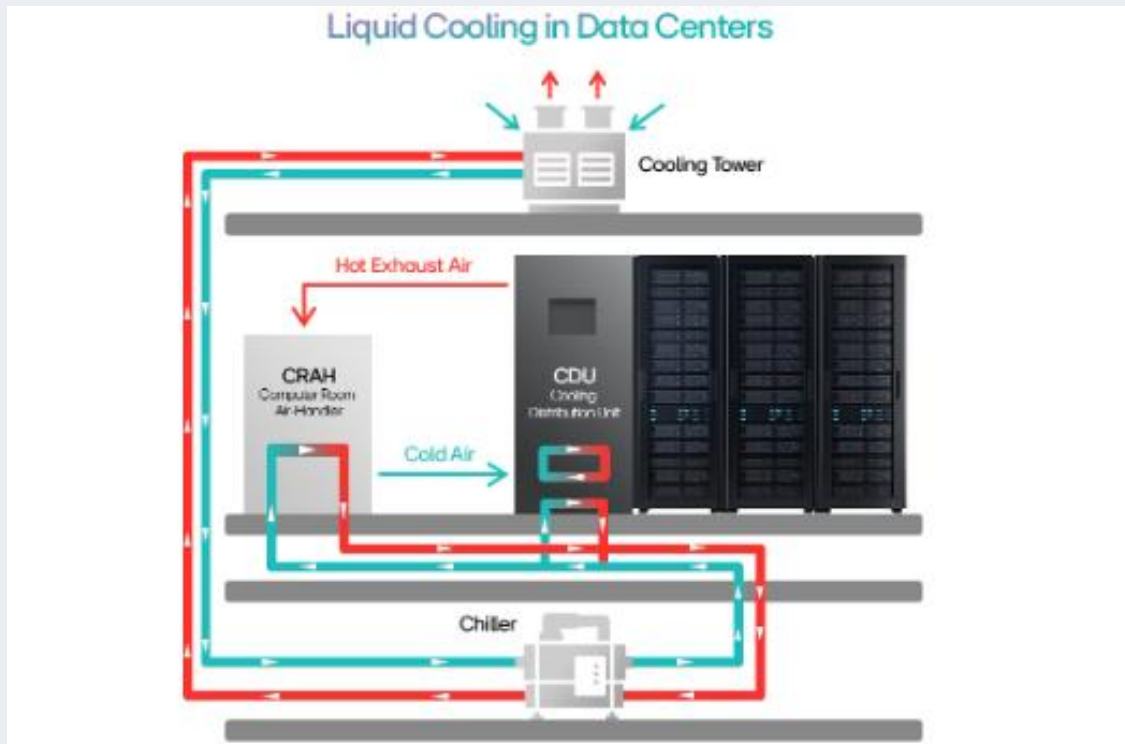
Active Heat Sink



3. Modern protection approaches

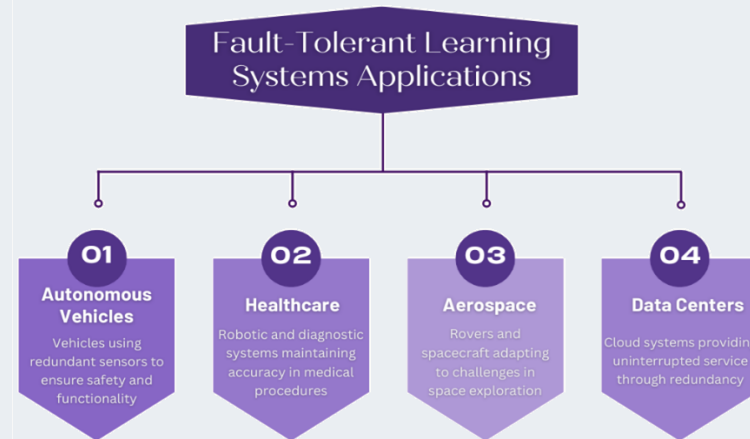
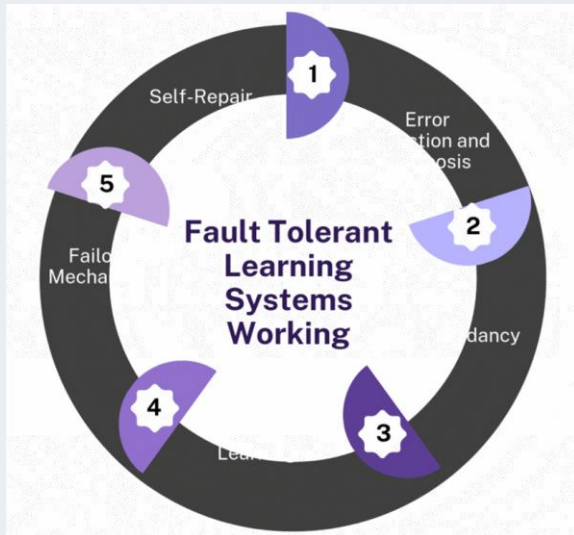
B. Thermal Management

Techniques:



3. Modern protection approaches

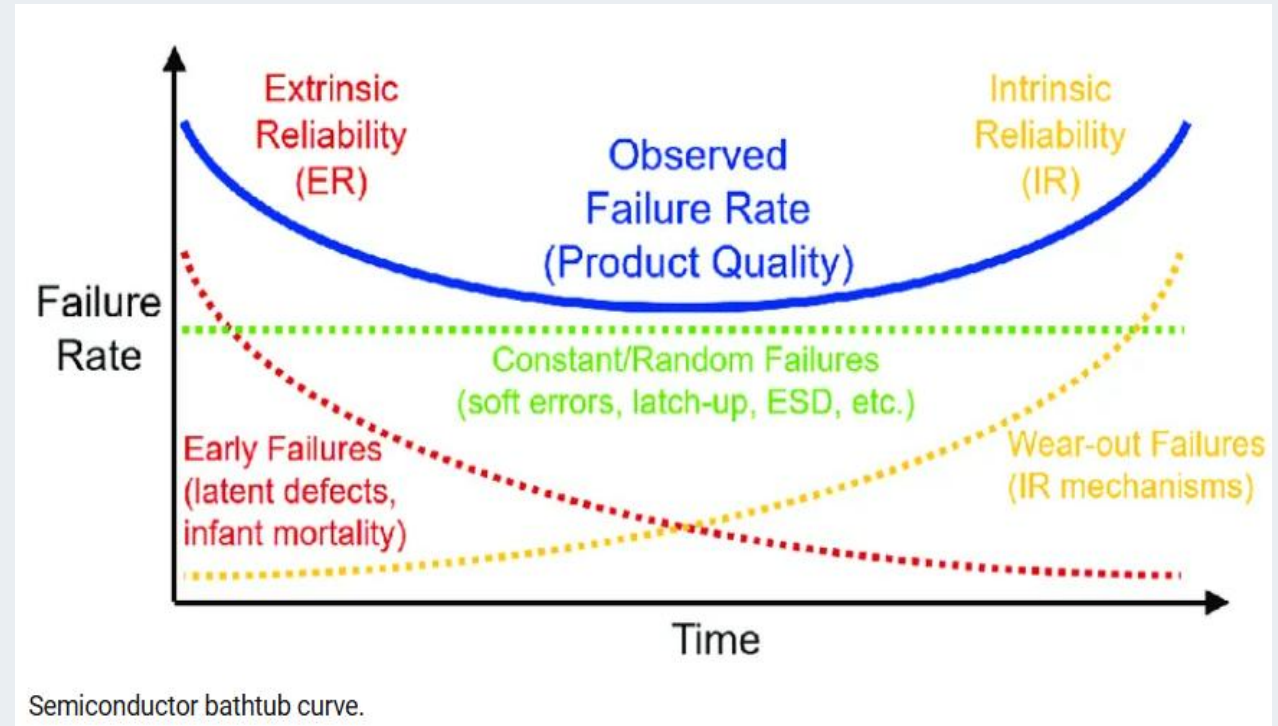
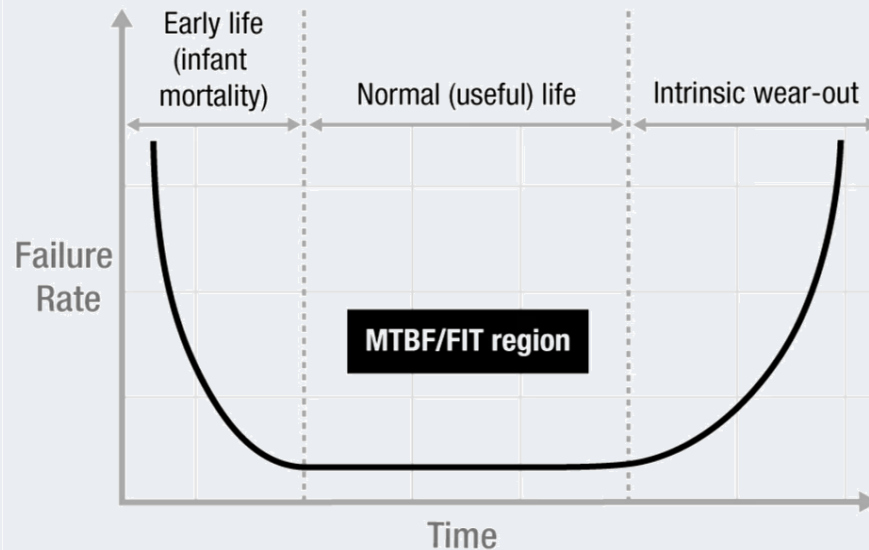
C. Fault-Tolerant Design



4. Reliability Engineering Concepts

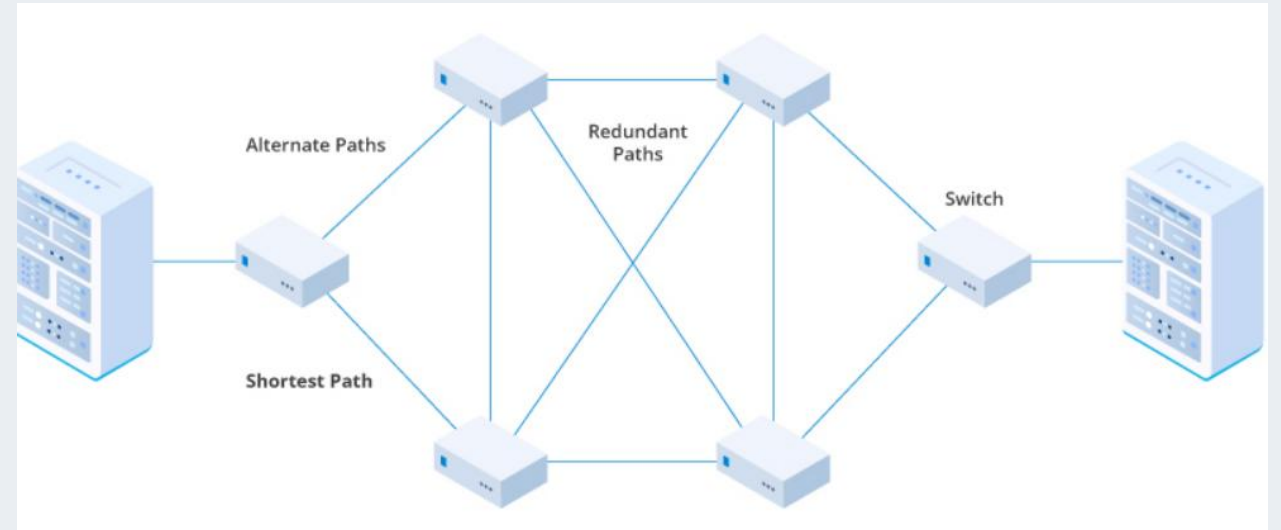
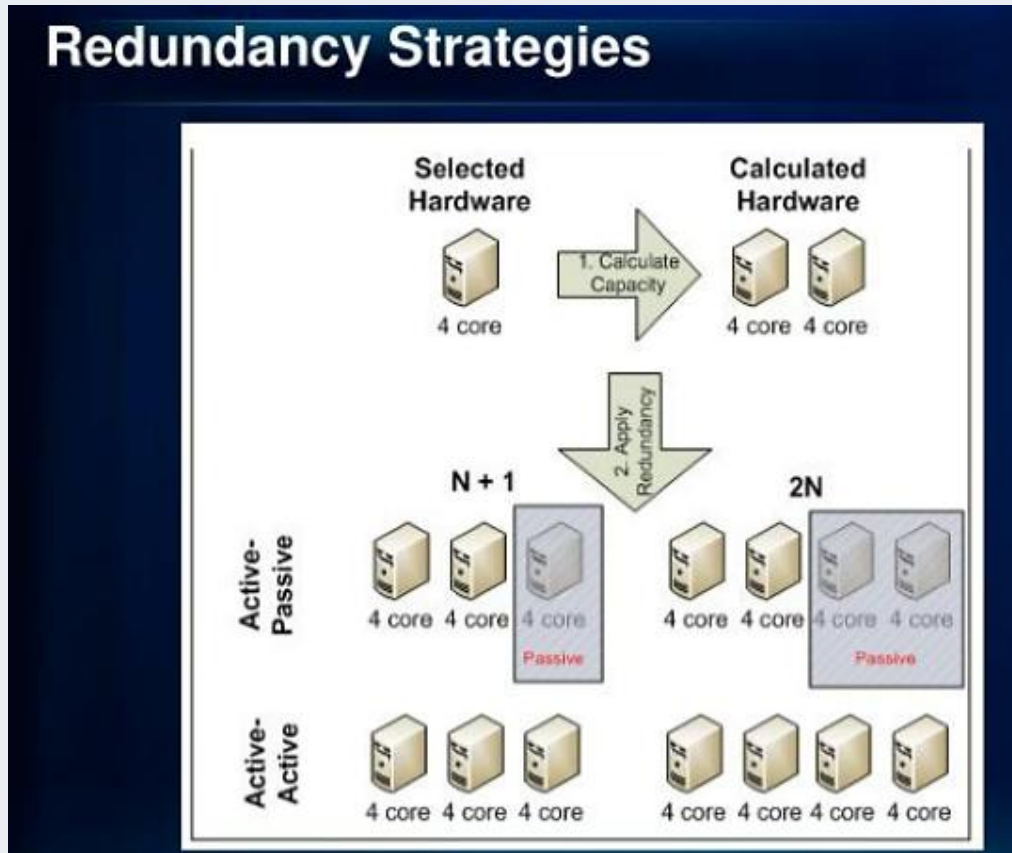
A. MTBF (Mean Time Between Failures)

$$MTBF = \frac{\text{Total Operational Time}}{\text{No. of Failures}}$$



4. Reliability Engineering Concepts

B. Redundancy Strategies



5. Comparative Analysis

A. Consumer Electronics: Cost-Driven Protection

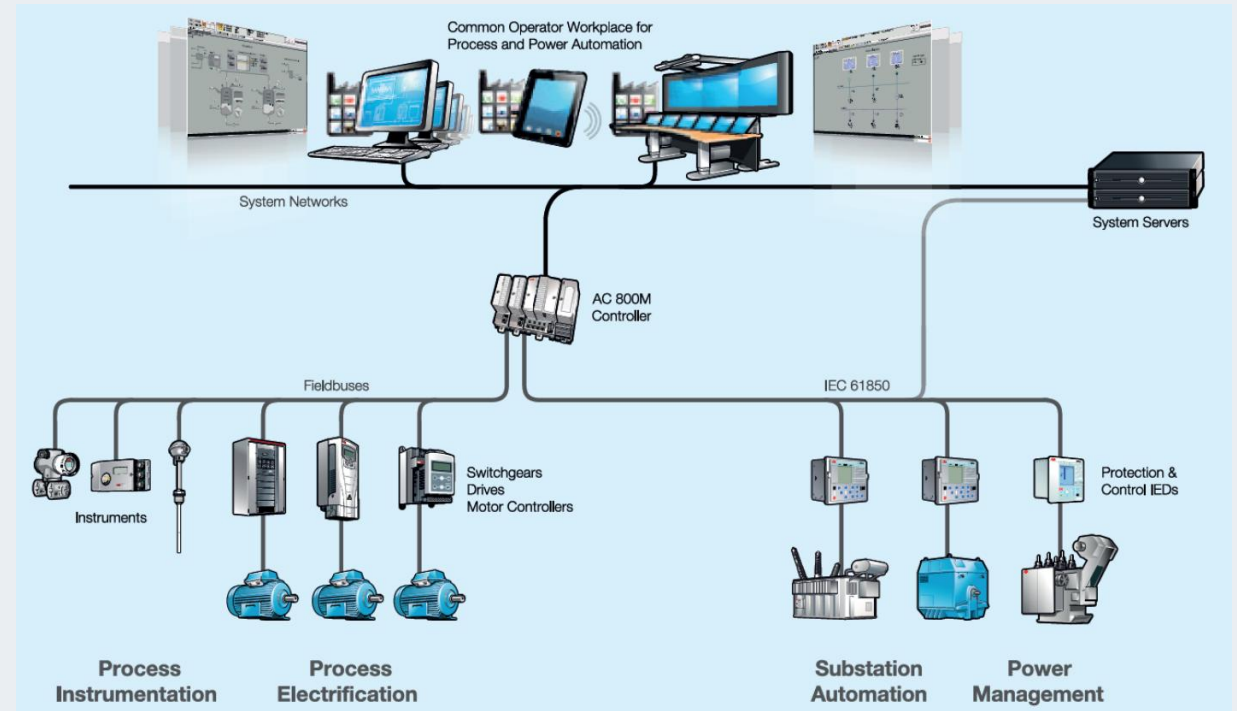
- Characteristics:
 - Compact, lightweight designs
 - Low-cost protection (fuses, surge protectors)
 - Focus on user safety and affordability



5. Comparative Analysis

B. Industrial Systems: Mission-Critical Reliability

- Characteristics:
 - Layered protection strategies (solid-state + mechanical + redundancy)
 - High MTBF requirements
 - Continuous uptime and fault tolerance



6. Conclusion & Key Takeaways

- Traditional and modern strategies ensure safe operation
- Reliability engineering enhances robustness and uptime
- Protection is essential across all domains of electronics



7. Engagement & Follow-Up

Which protection strategy will you explore further?

8. REFERENCES

1. [Types Of Protection Devices That Prevents From Electrical Damages](#)
2. [Electronics Reliability - It's getting hot in there! — Singularity Engineering LLC](#)
3. [Types of Fuses in Electrical System | Electrical Fuse Types](#)
4. [PPT - Wiring a plug PowerPoint Presentation, free download - ID:9429599](#)
5. [2nd-Featured-Image-2.jpeg \(1080×1080\)](#)
6. [Protective Relays: Function, Features & Operation - Power Systems](#)
7. [Difference between Isolator and Circuit breaker | Isolator Vs Circuit breaker – EEE Made Easy](#)
8. [Surge Protector Connection and Wiring Diagram.png \(1989×1769\)](#)
9. [Power Strip vs Surge Protector: Difference and Comparison](#)
10. [<https://www.youtube.com/watch?v=4s5FFSj6X6o>](#)
11. [First Class Single Phase Distribution Board Wiring Diagram House Outlet](#)
12. [\[https://media.licdn.com/dms/image/v2/D4D22AQE9qZx6jUYNTw/feedshare-shrink_2048_1536/B4DZTvZj1HwAs-/O/1739183242118?e=2147483647&v=beta&t=uEwZHyEH9ZVsZR69psEK_H5cgtIOMYMR8R-bzmT6bUU\]\(https://media.licdn.com/dms/image/v2/D4D22AQE9qZx6jUYNTw/feedshare-shrink_2048_1536/B4DZTvZj1HwAs-/O/1739183242118?e=2147483647&v=beta&t=uEwZHyEH9ZVsZR69psEK_H5cgtIOMYMR8R-bzmT6bUU\)](#)

8. REFERENCES

13. [Understanding Transistor Pinout for BJTs and MOSFETs](#)
14. [Choosing the Right Heat Sink for Your Application](#)
15. [EMAG Meets Thermal: A Beginner's Guide for Electrical Engineers with SIMULIA CST Suite](#)
16. [Heat-sink-cooling-fan-1024x682.jpg \(1024x682\)](#)
17. [Data Center Cooling: Air vs. Liquid - Which Way to the Future? | LG Global Business](#)
18. [https://tse3.mm.bing.net/th/id/OIP.WV2mEkqWM-Nym3ELtF6CWwHaGq?rs=1&pid=ImgDetMain&o=7&rm=3](#)
19. [What is Fault Tolerant Learning Systems?](#)
20. [BackToBasics: MTBF in Electronics - The Tech Blog](#)
21. [Semiconductor bathtub curve. | Download Scientific Diagram](#)
22. [PPT - Enterprise GIS Architecture Deployment PowerPoint Presentation, free download - ID:7009414](#)
23. [https://resource.fs.com/mall/generalImg/XNr0baJUWoRrPWxX2mhc9e8Hnlg.jpeg](#)
24. [vale-case-study.png \(1588x810\)](#)

Q&A

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