FMEA Analysis Report
power_supply

Failure Mode and Effects Analysis
for Electronic Circuit Board

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Standard:	AIAG-VDA FMEA / IPC-A-610
Classification:	Quality Assurance Document

Executive Summary

This FMEA analysis evaluates the power_supply circuit design to identify potential failure modes and assess associated risks. The analysis examined 7 components across 0 subsystems.

Key Findings

Metric	Value	Status
Total Failure Modes Analyzed	25	✓ Good
Critical Risk Modes (RPN ≥ 300)	2	■ Attention
High Risk Modes (125 ≤ RPN < 300)	13	■ Attention
Average RPN Score	181.1	■ Attention

System Overview

Circuit analysis of power_supply.json

Subsystems

FMEA Analysis Table

ID	Component	Failure Mode	Effect	S	O	D	RPN	Risk
1	J1 - Barrel_Jack	Solder joint failure	Complete loss of connection, s	9	7	7	441	Critical
2	U1 - L7805	Thermal shutdown	System power loss, unexpected	8	7	6	336	Critical
3	U1 - L7805	Input overvoltage failure	Cascading component damage	9	4	7	252	High
4	C1 - C	ESR increase	Power supply instability, heat	6	6	7	252	High
5	C2 - C	ESR increase	Power supply instability, heat	6	6	7	252	High
6	U1 - L7805	Output voltage drift	Component malfunction, reduced	7	5	7	245	High
7	C1 - C	Capacitance degradation	Increased ripple, filtering in	5	7	7	245	High
8	C2 - C	Capacitance degradation	Increased ripple, filtering in	5	7	7	245	High
9	U1 - L7805	Dropout voltage increase	Component malfunction	6	5	8	240	High
10	D1 - 1N4007	Junction failure	Component malfunction	8	4	6	192	High
11	R1 - R	Resistance drift	Component malfunction	4	6	8	192	High
12	J1 - Barrel_Jack	Contact oxidation	Intermittent connection, data	5	6	6	180	High
13	D1 - 1N4007	Reverse leakage	Component malfunction	5	5	7	175	High
14	R1 - R	Thermal damage	Component malfunction	7	4	6	168	High
15	J1 - Barrel_Jack	Mechanical damage	Connection loss, physical dama	7	5	4	140	High
16	J1 - Barrel_Jack	Pin misalignment	Component malfunction	6	4	5	120	Medium
17	C1 - C	Short circuit	Power rail short, system damag	8	3	5	120	Medium
18	C2 - C	Short circuit	Power rail short, system damag	8	3	5	120	Medium
19	D1 - 1N4007	Short circuit	Component malfunction	8	3	5	120	Medium
20	C1 - C	Open circuit	Component malfunction	7	3	5	105	Medium
21	C2 - C	Open circuit	Component malfunction	7	3	5	105	Medium
22	R1 - R	Open circuit	Component malfunction	6	3	5	90	Medium
23	LED1 - LED	Luminosity degradation	Component malfunction	3	7	4	84	Medium
24	LED1 - LED	Color shift	Component malfunction	2	6	5	60	Medium
25	LED1 - LED	Burn out	Component malfunction	4	4	3	48	Low

Risk Assessment Matrix

Risk Level	RPN Range	Count	Action Required
Critical	≥ 300	2	Immediate action required
High	125-299	13	Action required before production
Medium	50-124	9	Monitor and improve if feasible
Low	< 50	1	Acceptable risk level

Recommendations

Priority Actions

• **J1 - Barrel_Jack** - Solder joint failure: CRITICAL: Add mechanical support, use thicker copper pours, implement strain relief

• **U1 - L7805** - Thermal shutdown: CRITICAL: Improve heatsinking, add thermal vias, consider higher-rated component

• **U1 - L7805** - Input overvoltage failure: CRITICAL: Review design and implement appropriate mitigation

• **C1 - C** - ESR increase: Important: Review design and implement appropriate mitigation

• **C2 - C** - ESR increase: Important: Review design and implement appropriate mitigation

General Recommendations

• Implement design review process with focus on high-RPN items

• Establish component derating guidelines (50-80% of maximum ratings)

• Add test points for critical signals to improve detection capability

• Implement thermal analysis and management for power components

• Establish incoming inspection procedures for critical components

• Document lessons learned and update FMEA regularly