FMEA Analysis Report
motor_driver

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 motor_driver circuit design to identify potential failure modes and assess associated risks. The analysis examined 11 components across 0 subsystems.

Key Findings

Metric	Value	Status
Total Failure Modes Analyzed	28	✓ Good
Critical Risk Modes (RPN ≥ 300)	2	■ Attention
High Risk Modes (125 ≤ RPN < 300)	16	■ Attention
Average RPN Score	184.1	■ Attention

System Overview

Circuit analysis of motor_driver.json

Subsystems

FMEA Analysis Table

ID	Component	Failure Mode	Effect	S	O	D	RPN	Risk
1	J1 - Screw_Terminal_	Solder joint failure	Complete loss of connection, s	9	7	7	441	Critical
2	J2 - Screw_Terminal_	Solder joint failure	Complete loss of connection, s	9	7	7	441	Critical
3	C1 - C	ESR increase	Power supply instability, heat	6	6	7	252	High
4	C2 - CP	ESR increase	Power supply instability, heat	6	6	7	252	High
5	C1 - C	Capacitance degradation	Increased ripple, filtering in	5	7	7	245	High
6	C2 - CP	Capacitance degradation	Increased ripple, filtering in	5	7	7	245	High
7	D1 - 1N4148	Junction failure	Component malfunction	8	4	6	192	High
8	D2 - 1N4148	Junction failure	Component malfunction	8	4	6	192	High
9	D3 - 1N4148	Junction failure	Component malfunction	8	4	6	192	High
10	D4 - 1N4148	Junction failure	Component malfunction	8	4	6	192	High
11	J1 - Screw_Terminal_	Contact oxidation	Intermittent connection, data	5	6	6	180	High
12	J2 - Screw_Terminal_	Contact oxidation	Intermittent connection, data	5	6	6	180	High
13	D1 - 1N4148	Reverse leakage	Component malfunction	5	5	7	175	High
14	D2 - 1N4148	Reverse leakage	Component malfunction	5	5	7	175	High
15	D3 - 1N4148	Reverse leakage	Component malfunction	5	5	7	175	High
16	D4 - 1N4148	Reverse leakage	Component malfunction	5	5	7	175	High
17	J1 - Screw_Terminal_	Mechanical damage	Connection loss, physical dama	7	5	4	140	High
18	J2 - Screw_Terminal_	Mechanical damage	Connection loss, physical dama	7	5	4	140	High
19	D1 - 1N4148	Short circuit	Component malfunction	8	3	5	120	Medium
20	D2 - 1N4148	Short circuit	Component malfunction	8	3	5	120	Medium
21	D3 - 1N4148	Short circuit	Component malfunction	8	3	5	120	Medium
22	D4 - 1N4148	Short circuit	Component malfunction	8	3	5	120	Medium
23	C1 - C	Short circuit	Power rail short, system damag	8	3	5	120	Medium
24	C2 - CP	Short circuit	Power rail short, system damag	8	3	5	120	Medium
25	J1 - Screw_Terminal_	Pin misalignment	Component malfunction	6	4	5	120	Medium
26	J2 - Screw_Terminal_	Pin misalignment	Component malfunction	6	4	5	120	Medium
27	C1 - C	Open circuit	Component malfunction	7	3	5	105	Medium
28	C2 - CP	Open circuit	Component malfunction	7	3	5	105	Medium

Risk Assessment Matrix

Risk Level	RPN Range	Count	Action Required
Critical	≥ 300	2	Immediate action required
High	125-299	16	Action required before production
Medium	50-124	10	Monitor and improve if feasible
Low	< 50	0	Acceptable risk level

Recommendations

Priority Actions

• **J1 - Screw_Terminal_01x02** - Solder joint failure: CRITICAL: Add mechanical support, use thicker copper pours, implement strain relief

• **J2 - Screw_Terminal_01x02** - Solder joint failure: CRITICAL: Add mechanical support, use thicker copper pours, implement strain relief

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

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

• **C1 - C** - Capacitance degradation: Use higher-grade capacitors, derate voltage, add redundancy

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