

Application Note AN-116

Failure Mode and Effect Analysis

IML204DG Backlight Controller

Device and Test Platform Information

All FMEA test items were performed on the 1CV4CC test board which is designed for PC monitor applications with output power loading conditions: 5 V / 1.2 A, LED 45 V / 400 mA. The flyback controller IC used is InnoMux2 IMX2065C, and the four-channel LED backlight controller IC is IML204DG. The device was tested under room temperature during 90 VAC and 265 VAC line voltages and, standby and nominal load. Results fall under all these test conditions unless otherwise specified.

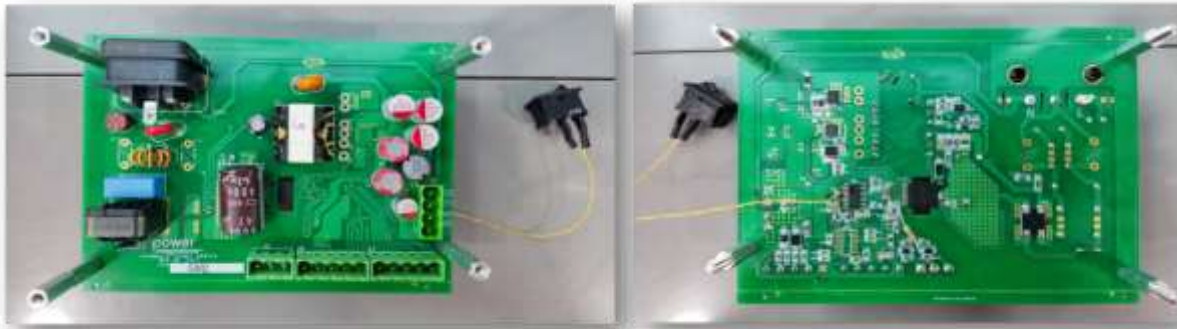


Figure 1. FMEA Test Vehicle.

List of Equipment used:

- Keysight 6812C AC Power Source/Analyzer
- Programmable DC Electronic Load 6310 Series
- Yokogawa WT310 Digital Power Meter

Pin test with No Failure will result to either a normal operation, auto-restart or latch-off of the converter. Pin test with Safe Failure will result to a converter with either the controller or other system component damage, or both.

Refer to Figure 2 for the pin assignments. Please refer to the IML204DG datasheet for the package information.

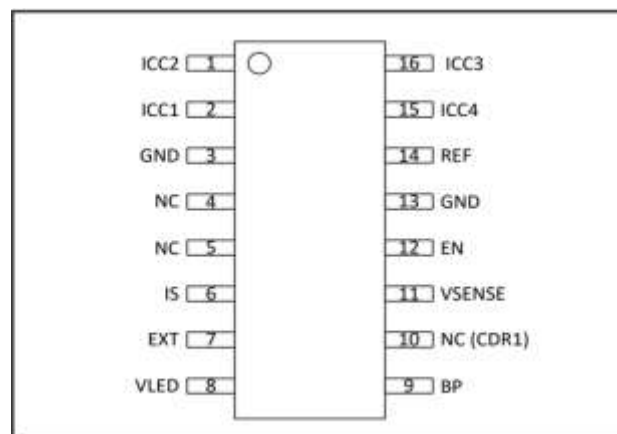


Figure 2. Part Under Test.

Test Results Summary

Pin-to-Pin Short Test

Fault Mode	Operation Condition		Operation Behavior Notes	
	Start-up	Steady State	Start-up	Steady State
ICC2 to ICC1	No failure	No failure	Normal operation	Normal operation
ICC1 to GND	No failure	No failure	Auto-restart	Auto-restart
GND to NC (pin 4)	No failure	No failure	Normal operation	Normal operation
NC (pin 4) to NC (pin 5)	No failure	No failure	Normal operation	Normal operation
NC (pin 5) to ISENSE	No failure	No failure	Normal operation	Normal operation
ISENSE to EXT	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
EXT to VLED	No failure	No failure	Normal CV1 operation with 1 LED string disabled	Normal operation
BPS to NC (pin 10)	No failure	No failure	Normal operation	Normal operation
NC (pin 10) to VSENSE	No failure	No failure	Normal operation	Normal operation
VSENSE to EN	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
EN to GND	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
GND to REF	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
REF to ICC4	No failure	No failure	Normal CV1 operation with ICC4 string current at 30% of $I_{LED,max}^1$	Normal CV1 operation with ICC4 string current at 30% of $I_{LED,max}^1$
ICC4 to ICC3	No failure	No failure	Normal operation	Normal operation

Note:

- $I_{LED,max}$ is the maximum current on a single ICCx LED string.

Pin Open Test

Fault Mode	Operation Condition		Operation Behavior Notes	
	Start-up	Steady State	Start-up	Steady State
ICC2 open	No failure	No failure	Normal CV1 operation with ICC2 string disabled	Normal CV1 operation with ICC2 string disabled
ICC1 open	No failure	No failure	Normal CV1 operation with ICC1 string disabled	Normal CV1 operation with ICC1 string disabled
GND open (pin 3)	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
ISENSE open	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
EXT open	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
VLED open	No failure	No failure	Normal operation	Normal operation
BP open	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
VSENSE open	No failure	No failure	Auto-restart	Normal CV1 operation with IML204DG auto-restart
EN open	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
GND open (pin 13)	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
REF open	No failure	No failure	Normal CV1 operation with unregulated LED current	Normal CV1 operation with unregulated LED current
ICC4 open	No failure	No failure	Normal CV1 operation with LED ICC4 string disabled	Normal CV1 operation with ICC4 string disabled
ICC3 open	No failure	No failure	Normal CV1 operation with ICC3 string disabled	Normal CV1 operation with ICC3 string disabled

Pin to Ground Short Test

Fault Mode	Operation Condition		Operation Behavior Notes	
	Start-up	Steady State	Start-up	Steady State
ICC2 to GND	No failure	No failure	Auto-restart	Auto-restart
ICC1 to GND	No failure	No failure	Auto-restart	Auto-restart
NC (pin 4) to GND	No failure	No failure	Normal operation	Normal operation
NC (pin 5) to GND	No failure	No failure	Normal operation	Normal operation
ISENSE to GND	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
EXT to GND	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled ¹
VLED to GND	No failure	No failure	Normal operation	Normal operation
BP to GND	No failure	No failure	Auto-restart	Auto-restart
NC (pin 10) to GND	No failure	No failure	Normal operation	Normal operation
VSENSE to GND	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled ²
EN to GND	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
REF to GND	No failure	No failure	Normal CV1 operation with LED disabled	Normal CV1 operation with LED disabled
ICC4 to GND	No failure	No failure	Auto-restart	Auto-restart
ICC3 to GND	No failure	No failure	Auto-restart	Auto-restart

Notes:

- EXT to GND fault: Result on the table taken at 90 VAC. At 265 VAC: No Failure, IML204DG enters auto-restart.
- VSENSE to GND fault: Result on the table taken at 90 VAC. At 265 VAC: No Failure, IML204DG enters auto-restart.

Revision	Notes	Date
A	Initial Release.	01/25

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