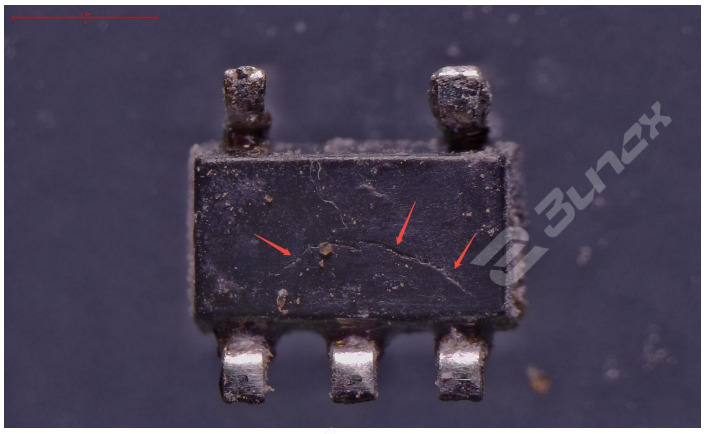
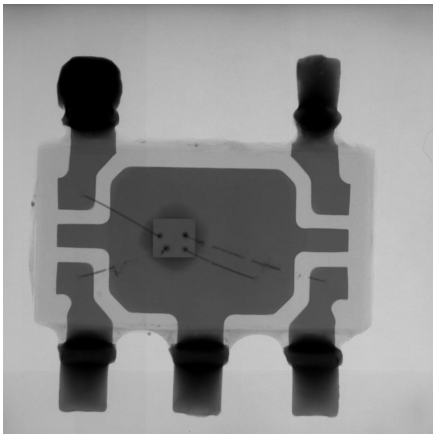
Failure Analysis Case

Linear Regulator (LDO) – Internal Short-Circuit Failure Analysis

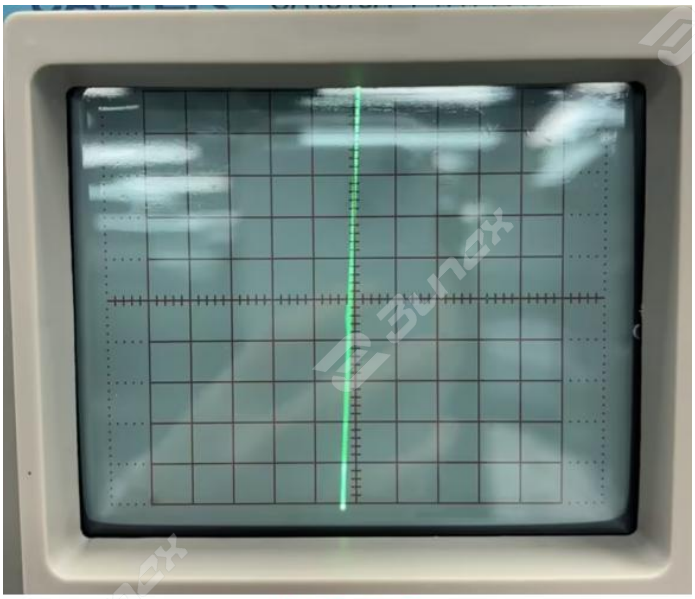
1.**Case Background:**The LP5907MFX-3.3 sample exhibited an internal short-circuit failure with no output.
2.**Failure Mode:**Functional failure.
3.**Failure Cause:**Fusing of bonding wires.
4.**Analysis Conclusion:**An excessive input voltage at PIN1 caused the chip to break down, resulting in high current flow, excessive power dissipation, and a sharp temperature rise. This led to fused bonding wires, burn damage on the die, cracking of the IC body, and a short circuit at PIN5, ultimately causing abnormal output and functional failure.
5.**Analysis Process:**

a)**Visual Inspection:**Visual inspection of the failed IC revealed no obvious anomalies to the naked eye. Under a stereomicroscope, however, cracking was observed on the backside of the IC body.





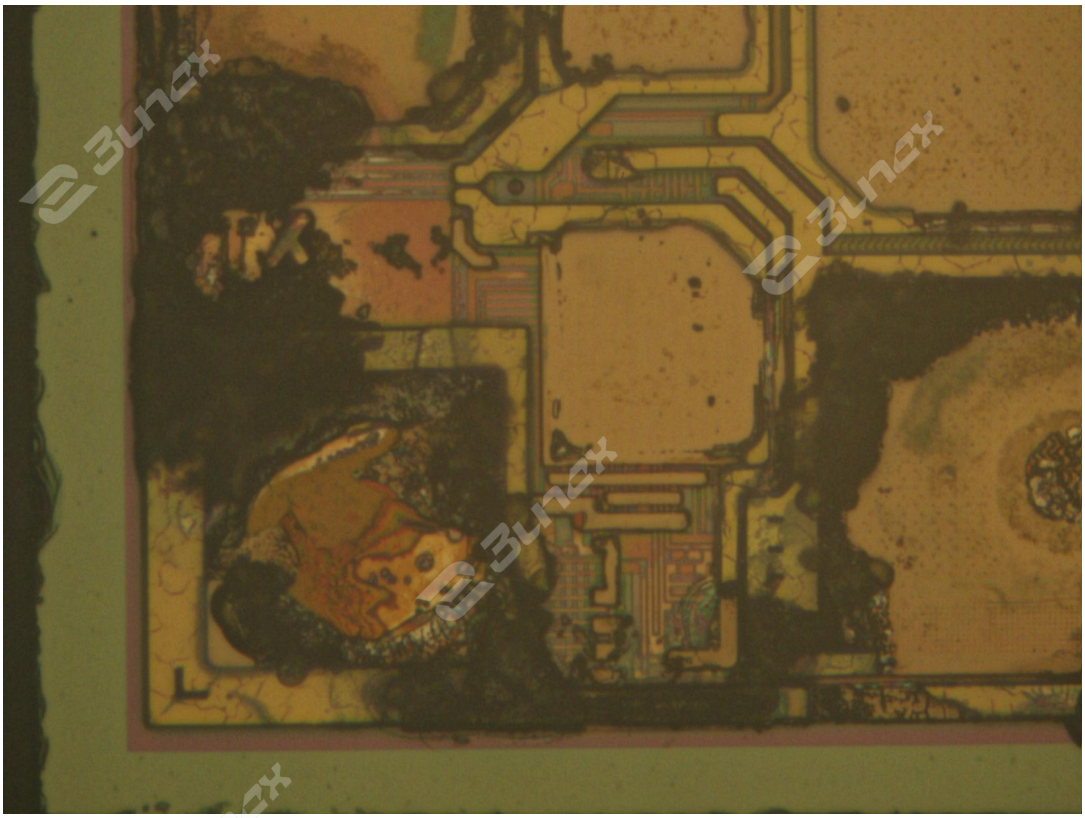
b)**Non-Destructive Inspection:**To further confirm the structural failure mode, X-ray imaging was performed on the NG sample. The X-ray images showed that the bonding wires at PIN1 through PIN3 were all fused.



Pin2 To Pin5

c)**Electrical Parameter Testing:**To further characterize the failure mode and locate the failure site, I-V characteristic measurements were performed on each pin. Comparing the test results of the NG sample with those of a known-good (OK) unit, it was found that pin 5 of the NG sample exhibited a short-circuit characteristic, whereas the OK sample displayed normal PN junction I-V behavior.

d)**Decapsulation Analysis:**The NG sample was subjected to decap analysis. Examination using a metallographic microscope revealed breakdown burn marks and carbonization on the die surface, with the damage concentrated in the area of PIN1.



Conclusion

Based on all the experimental results above, it is preliminarily determined that an excessive input voltage at PIN1 triggered a chip breakdown, leading to a high current, excessive power, and a sudden temperature surge. This caused the bonding wires to fuse, the die to suffer burn damage, the IC body to crack, and a short to appear at PIN5, which resulted in abnormal output and device failure.

Recommendations

Keep the input voltage within the specified operating range and avoid pushing the device to its extreme limits. Alternatively, connect a Zener diode at the input to provide a stable voltage to the chip and protect the circuit from damage caused by overvoltage or transient disturbances, thereby improving overall system reliability and service life.