

Topic 10

Case Study : Acuity brand

Acuity Driver × De-Facto Model Analysis

1. Acuity Driver Lifetime Summary

- LED drivers are the determining factor for fixture lifetime, more critical than LED sources or mechanical components.
- Standard reference: Design Lights Consortium (DLC) requires 50,000 hours (~5.7 years continuous operation).
- Example: eldoLED SOLOdrive 360A → Lifetime of 50,000 h at Case Temperature (T_c) = 85 °C.
 - If $T_c = 75$ °C → ~100,000 h.
 - If $T_c = 65$ °C → ~200,000 h.
- Key insight: A driver rated 50,000 h @ 85 °C is significantly more robust than one rated 50,000 h @ 65 °C.
- Selecting higher T_c -rated drivers provides more margin for high-temperature field applications.

2. De-Facto Reliability Model

Industry-wide assumption:

- Failure rate $\lambda \approx 0.2\%$ per 1,000 h $\approx 2 \times 10^{-6}$ /h at $T_c = 50$ °C.
- Arrhenius rule: For every +10 °C increase in T_c , lifetime is reduced by ~50% (failure rate doubles).

3. Case Temperature vs Ambient Temperature

Assuming case temperature (T_c) \approx ambient temperature (T_a) + 25–35 °C, the following table shows estimated lifetimes using the de-facto model:

Case Temp (T_c , °C)	Ambient Temp (T_a , °C)	Estimated Lifetime	Relative Failure Rate
65 °C	30–40 °C	~200,000 h ($\times 4$ baseline)	$\lambda \approx 0.5 \times$
75 °C	40–50 °C	~100,000 h ($\times 2$ baseline)	$\lambda \approx 1 \times$
85 °C	50–60 °C	50,000 h (DLC reference)	$\lambda \approx 2 \times$
105 °C	70–80 °C	~1,600 h ($\div 32$ baseline)	$\lambda \approx 32 \times$

4. Conclusion

- Acuity's definition (50,000 h @ $T_c = 85\text{ °C}$) is stricter and more reliable than drivers rated only at 65 °C .
- In real-world high-temperature environments (e.g., paper mills, steel plants) with ambient $T_a = 75\text{--}85\text{ °C}$, driver case temperatures may approach or exceed 105 °C , reducing lifetime to the scale of thousands of hours (months).
- The de-facto failure rate model quantifies this risk, providing fire departments and insurers with a clear basis for evaluation.

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Reference _ <https://www.acuitybrands.com/>