AN14004

i.MX 8XLite Product Lifetime Usage Estimates

Rev. 1.1 — 28 September 2023 **Application note**

Document information

Information	Content
Keywords	AN14004, i.MX 8XLite application processor, product lifetime estimates, device qualification level, Power-on Hours (PoH)
Abstract	This document describes the estimated product lifetimes for the i.MX 8XLite application processor based on the criteria used in the qualification process.

1 Introduction

This document describes the estimated product lifetimes for the i.MX 8XLite application processor based on the criteria used in the qualification process.

Note: *The product lifetimes described in this document are estimates and do not represent a guaranteed life time for a product.*

2 Device qualification level and available PoH

Each qualification level supported (automotive and industrial) defines a number of Power-on Hours (PoH) available to the processor under a given set of conditions such as:

- The target voltage for the application (automotive and industrial).
  - The input voltage to the core complex of the processor (VDD_A35) determines the target frequency.
- The percentage of active use versus the Low-power mode.
  - Active use means that the processor is running in an active performance mode.
    - For the automotive tier of 8XLite, there are two performance modes available: 1.2 GHz and 900 MHz.
    - For the industrial tier of 8XLite, the maximum performance mode is 1.2 GHz.
  - In the Low power (KS1) mode, the datasheet defines lower operating conditions for the VDD_A35, reducing power consumption and junction temperature. In this mode, the voltage and temperature are set low. Thereby, the effect on the lifetime calculations is negligible and it is treated as if the device was powered off.
- The junction temperature of the processor (Tj).
  - The maximum junction temperature of the device is 125 °C.
    CAUTION: *It is important to note that while the automotive and industrial devices are guaranteed to operate at 125 °C, operating the devices at 125 °C for an extended time period results in the lowest estimated PoH range for the device.*
  - Ensure that your device is appropriately thermally managed and that the maximum junction temperature is not exceeded.

Note:

- *The data presented in this document is provided for your convenience. However, it does not represent all potential failing mechanisms and has limited usefulness as an accurate representation of how the device may behave in different mission profiles or applications.*
- *The data is based on a single activation energy and voltage acceleration parameter, using the Arrhenius equation for temperature acceleration and Power Law for voltage acceleration, along with the data collected during High Temperature Operating Life (HTOL), to demonstrate how temperature could impact the life of the product.*
- *If you have an application that deviates from the electrical, thermal, mechanical, and lifetime parameters as specified in NXP's datasheet and qualification reports, it is recommended to contact NXP for a more accurate assessment of your mission profile.*

Note: *The industrial and automotive PoH curves are different due to their specific mission profile requirements and conditions.*

2.1 Automotive lifetime estimates

Figure 1 establishes guidelines for estimating PoH as a function of junction temperature. PoH can be read directly from the curves below to determine the necessary trade-offs to the junction temperature at the maximum CPU frequency. The PoH values assume that the product is powered on and active for 100% of the time (100% duty cycle).

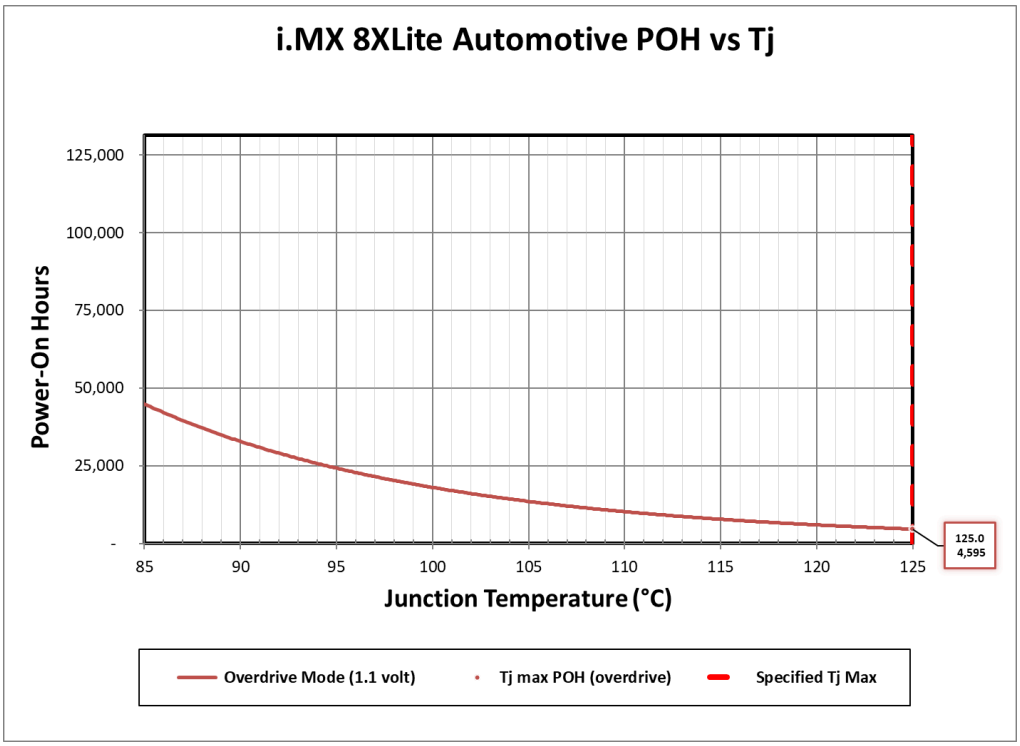

Figure 1. i.MX 8XLite automotive lifetime estimates

2.2 Industrial qualification

Figure 2 provides the number of PoH for the use conditions for the industrial device. The PoH values assume that the product is powered on and active for 100% of the time (100% duty cycle). The curve establishes guidelines for estimating PoH as a function of junction temperature at the maximum voltage and frequency. The PoH can be read directly from the curve to determine the necessary trade-offs to the junction temperature at the maximum CPU frequency.

Note: *The maximum junction temperature specification is 125 °C. Operating at this temperature results in the lowest estimated PoH range for the device.*

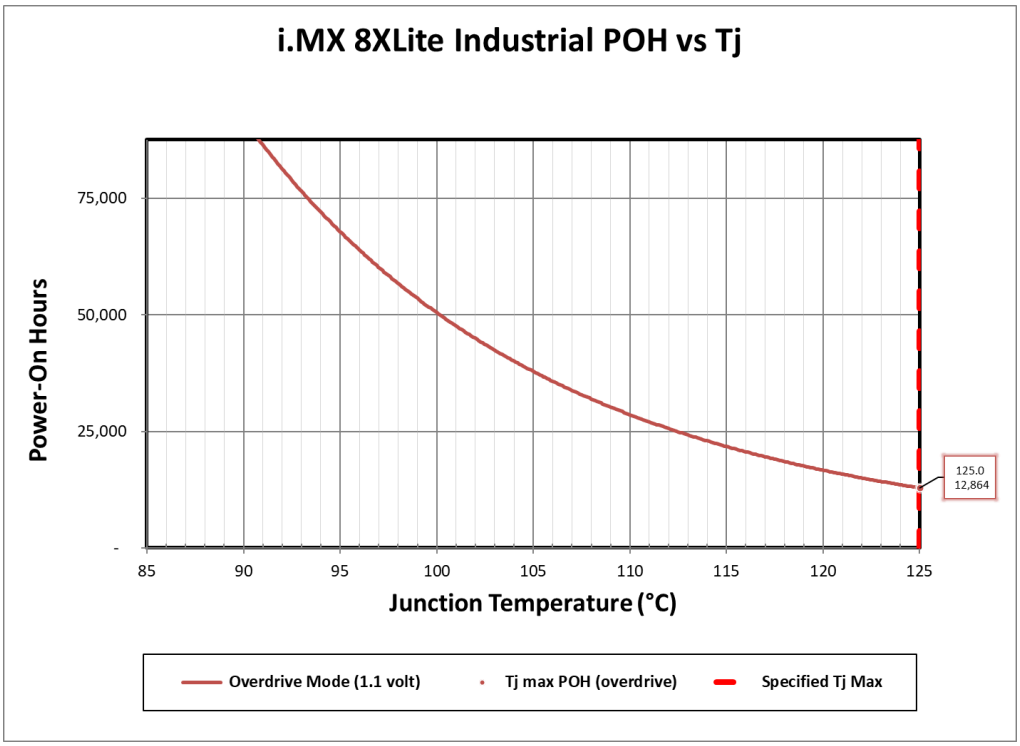

Figure 2. i.MX 8XLite industrial lifetime estimates in overdrive mode

3 Conclusion

Selecting the optimal operating performance point and thermal envelope is critical to meet the application lifetime targets. Trade-offs between the target operating voltage/frequency of the device and the operating junction temperature (Tj) of the processor can greatly improve the lifetime of the device.

The data and examples provided in this application note are a reference to support the customer in their application development.

4 Related documentation

Refer to the below documents for more information:

- *i.MX 8XLite Industrial Data Sheet (IMX8XLB0IEC).*
- *i.MX 8XLite Automotive Data Sheet (IMX8XLB0AEC).*

For more references, refer to *i.MX 8XLite Documentation page*.

5 Revision history

Table 1 below summarizes the revisions to this document.

Table 1. Document revision history

Revision	Date	Description
1.1	28 September 2023	Removed a disclaimer note
1	7 September 2023	Initial public release

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Date of release: 28 September 2023
Document identifier: AN14004