# AN12468

## i.MX8MMINI Product Lifetime Usage

Rev. 0 — June 2019 Application Note

Contents



# 1 Introduction

This document describes the estimated product lifetimes for the i.MX8MMINI Application Processors based on the criteria used in the qualification process.

The product lifetimes described here are estimates and do not represent a guaranteed life time for a product.

The i.MX8MMINI series consist of several processors that deliver a wide range of processing and multimedia capabilities across various qualification levels. This document is intended to provide users with guidance on how to interpret the different i.MX8MMINI qualification levels in terms of the target operating frequency of the device, the maximum supported junction temperature (Tj) of the processor, and how it relates to the lifetime of the device.

# 2 Device qualification level and available PoH

Each qualification level supported (commercial and industrial) defines a number of Power-on Hours (PoH) available to the processor under a given set of conditions. For example,

- The target voltage for the application (commercial and industrial).
  - The lifetime is limited by the SOC operating voltage.
- The percentage of active use vs. suspend mode.
  - Active use means that the processor is running at an active performance mode.
    - For the Commercial tier,the maximum performance mode is 1.8 GHz.
    - For the Industrial tier, the maximum performance mode is 1.6 GHz.
  - In the suspend mode, the VDD_ARM and the VDD_SOC are lowered, reducing power consumption and junction temperature. In this mode, the voltage and temperature are set low enough so that the effect on the lifetime calculations is negligible and treated as if the device were powered off.
- The Tj of the processor.
  - The maximum junction temperature of the device is different for a given qualification level, for instance 105 C for Industrial Tier and 95 C for Commercial Tier.
  - Users must ensure that their device is appropriately thermally managed such that the maximum junction temperature is not exceeded.

All data provided within this document are estimates for PoH that are based on extensive qualification experience and testing with the i.MX8MMINI series. These statistically derived estimates should not be viewed as a limit on an individual device lifetime, nor should they be construed as a guarantee by NXP as to the actual lifetime of the device. Sales and warranty terms and conditions still apply.

## 2.1 Commercial lifetime estimates

Table 1. Commercial qualification lifetime estimates on page 2 provides the number of PoH for the typical use conditions for the commercial device.

**Table 1. Commercial qualification lifetime estimates**

| Operating voltage | Arm® core speed | PoH | SOC operating volatage | Arm core operating voltage | Tj |
|---|---|---|---|---|---|
| — | (MHz) | (Hrs) | (V) | (V) | (ºC) |
| Typical | 1800 | 63,602 | 0.85 | 1.0 | 95 |
| Maximum | 1800 | 29,137 | 0.9 | 1.05 | 95 |

Figure 1. on page 2 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 junction temperature at the maximum CPU frequency.

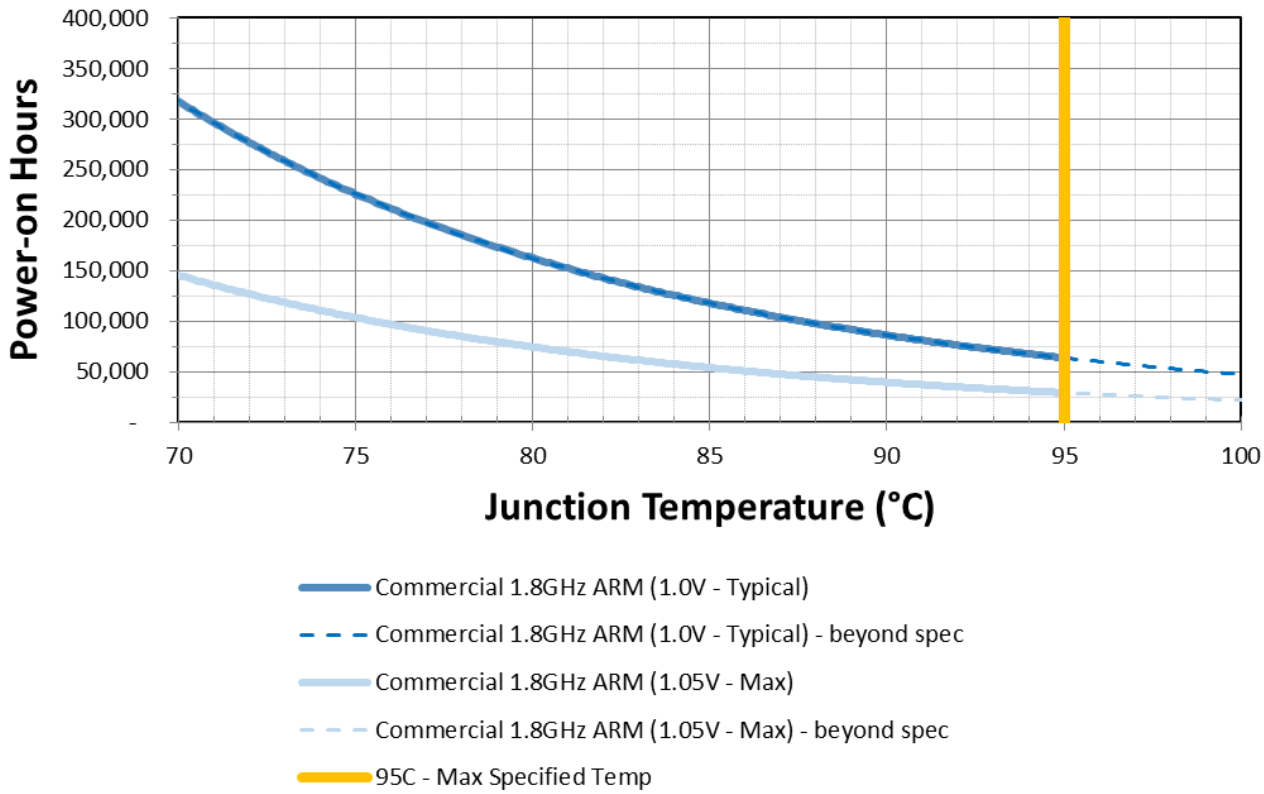


**Figure 1. Commercial qualification lifetime estimates**

## 2.2 Industrial qualification

Table 2. Industrial qualification lifetime estimates on page 3 provides the number of PoH for the typical use conditions for the industrial device.

**Table 2. Industrial qualification lifetime estimates**

| Operating voltage | Arm core speed | PoH | SOC operating volatage | Arm core operating voltage | Tj |
|---|---|---|---|---|---|
| — | (MHz) | (Hrs) | (V) | (V) | (ºC) |
| Typical | 1600 | 80,615 | 0.85 | 0.95 | 105 |
| Maximum | 1600 | 35,481 | 0.9 | 1.0 | 105 |

Figure 2. on page 3 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 junction temperature at the maximum CPU frequency.

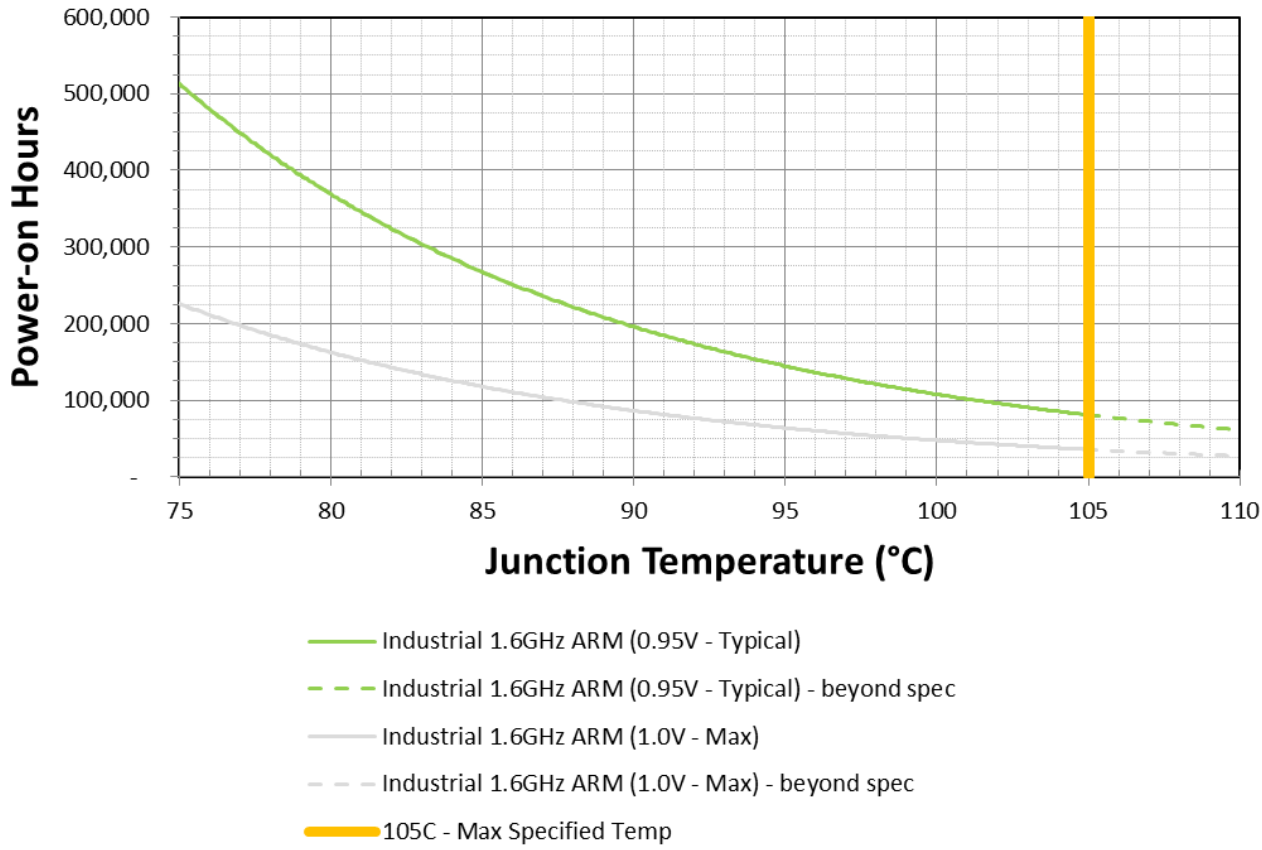


**Figure 2. Industrial qualification lifetime estimates**

# 3 Conclusion

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

Lowering the operating junction temperature in the application is the most effective means to increase the lifetime of the device without affecting the performance of the device. This can be accomplished by increasing the thermal dissipation capacity in the application. In cases where the thermal properties cannot be altered, a lower operating voltage can be used to increase the lifetime of the device. Lowering the voltage may result in lowered performance; the operating frequency may have to be adjusted lower to match the voltage as specified in the datasheet.

The data and examples provided in this application note help users determine the estimated lifetime for their particular application.

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