Application Advisory

<table>
<thead>
<tr>
<th>Title</th>
<th>Optimization of eFuse Programming for ESP32 / ESP32-C3 / ESP32-S2 / ESP32-S3 Series of Chips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue date</td>
<td>2022/09/22</td>
</tr>
<tr>
<td>Advisory Number</td>
<td>AR2022-006</td>
</tr>
<tr>
<td>Serial Number</td>
<td>NA</td>
</tr>
<tr>
<td>Version</td>
<td>v1.0</td>
</tr>
</tbody>
</table>

**Issue Summary**

If secure boot v1, secure boot v2, and/or flash encryption are used, and there are no corresponding keys burned in eFuse, the bootloader will generate the key and burn it to the corresponding eFuse BLOCK. It was identified that there is a very small probability of failure in some cases where eFuse bits might not be burned from 0 to 1.

For secure boot v1 and secure boot v2, if the eFuse key is not correct, the verification of bootloader will fail, and the system will not be started up normally.

For the IDF versions older than v4.4.2, v4.3.3, v4.2.4, there is no eFuse data validation after burning in bootloader.

The issue has been investigated. Due to the use of different programming environments, the following possible causes have been identified of eFuse bits not being flashed correctly:

1. The power-up and power-down time of eFuse time settings is not configured appropriately.
2. Some eFuse bits are not easily fused by a single program action.

In order to decrease the failure rate, the following updates have been introduced in ESP-IDF:

1. Updated the eFuse time settings configuration for power-up and power-down.
2. Introduced the option to validate the eFuse data after burning and re-burning.

**Fixed/Patched Versions for ESP-IDF**

The above-mentioned updates have been included in the ESP-IDF v5.0-beta1, v4.4.2, v4.3.3, v4.2.4 releases and will be present in the newer versions.

The detailed commits in the ESP-IDF branches are as follows:
**Recommendations for Espressif Users**

If your application uses secure boot v1, secure boot v2 or flash encryption as well as uses the bootloader to generate the key and burn it to the corresponding eFuse BLOCK, it is recommended that you update to the latest stable IDF release version that includes the above-mentioned updates.

Although, very few reports regarding the issue in question have been received from ESP32 ECO. V3 customers, it is still recommended that you use the latest stable IDF release version with other ESP32 series of chips, e.g. ESP32-C3, ESP32-S2 and ESP32-S3.