

| <b>ESP32-S2FN4R2 系列产品内置 flash 更新</b><br><b>Upgrade In-package Flash of ESP32-S2FN4R2 Series Products</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                |                                                                             |               |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
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| <b>PCN 编号</b><br><b>PCN No.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | PCN202501201                                                                                                                   | <b>提出日期</b><br><b>Issue Date of PCN</b>                                     | 2026/06/04    |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| <b>变更日期</b><br><b>Proposed Date of Change</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2026/07/04                                                                                                                     | <b>预计变更后产品首次出货日期</b><br><b>Proposed Date of First Shipment After Change</b> | 2026/08/05    |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| <b>PCN 类型</b><br><b>PCN Category</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <input type="checkbox"/> 客户需要批准/ Customer Approval Required<br><input checked="" type="checkbox"/> 客户通知/ Customer Notification |                                                                             |               |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| <b>1. 影响物料编码/ Affected Part Number</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                |                                                                             |               |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th style="width: 15%;">产品类型<br/><b>Product Type</b></th><th style="width: 25%;">产品名称<br/><b>Product Name</b></th><th style="width: 25%;">物料编码<br/><b>Part Number</b></th><th style="width: 35%;">Chip on Board</th></tr></thead><tbody><tr><td>Chip</td><td>ESP32-S2FN4R2</td><td>ESP32-S2FN4R2</td><td>/</td></tr><tr><td>Module</td><td>ESP32-S2-MINI-1</td><td>ESP32-S2-MINI-1-N4R2</td><td>ESP32-S2FN4R2</td></tr><tr><td>Module</td><td>ESP32-S2-MINI-1U</td><td>ESP32-S2-MINI-1U-N4R2</td><td>ESP32-S2FN4R2</td></tr><tr><td>Module</td><td>ESP32-S2-MINI-2</td><td>ESP32-S2-MINI-2-N4R2</td><td>ESP32-S2FN4R2</td></tr><tr><td>Module</td><td>ESP32-S2-MINI-2U</td><td>ESP32-S2-MINI-2U-N4R2</td><td>ESP32-S2FN4R2</td></tr></tbody></table> |                                                                                                                                |                                                                             |               | 产品类型<br><b>Product Type</b> | 产品名称<br><b>Product Name</b> | 物料编码<br><b>Part Number</b> | Chip on Board | Chip | ESP32-S2FN4R2 | ESP32-S2FN4R2 | / | Module | ESP32-S2-MINI-1 | ESP32-S2-MINI-1-N4R2 | ESP32-S2FN4R2 | Module | ESP32-S2-MINI-1U | ESP32-S2-MINI-1U-N4R2 | ESP32-S2FN4R2 | Module | ESP32-S2-MINI-2 | ESP32-S2-MINI-2-N4R2 | ESP32-S2FN4R2 | Module | ESP32-S2-MINI-2U | ESP32-S2-MINI-2U-N4R2 | ESP32-S2FN4R2 |
| 产品类型<br><b>Product Type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 产品名称<br><b>Product Name</b>                                                                                                    | 物料编码<br><b>Part Number</b>                                                  | Chip on Board |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| Chip                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ESP32-S2FN4R2                                                                                                                  | ESP32-S2FN4R2                                                               | /             |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ESP32-S2-MINI-1                                                                                                                | ESP32-S2-MINI-1-N4R2                                                        | ESP32-S2FN4R2 |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ESP32-S2-MINI-1U                                                                                                               | ESP32-S2-MINI-1U-N4R2                                                       | ESP32-S2FN4R2 |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ESP32-S2-MINI-2                                                                                                                | ESP32-S2-MINI-2-N4R2                                                        | ESP32-S2FN4R2 |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ESP32-S2-MINI-2U                                                                                                               | ESP32-S2-MINI-2U-N4R2                                                       | ESP32-S2FN4R2 |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| <b>2. 变更原因/ Reason for Change</b> <p>ESP32-S2FN4R2 中原内置的 flash 产品计划停产。为提高供应稳定性, 乐鑫已完成同一供应商升级版本 flash 在 ESP32-S2FN4R2 的物料验证测试, 测试通过, 因此决定导入该升级版本 flash 作为段落 1 列出产品的 flash 物料。</p> <p>The in-package flash on ESP32-S2FN4R2 will reach the end of its life. To ensure a robust and diversified product supply, Espressif has qualified the upgraded flash from the same manufacturer on ESP32-S2FN4R2 series products. Therefore, the upgraded flash will be introduced as the new source for the products listed in Para 1.</p>                                                                                                                                                                                                                                                                                                    |                                                                                                                                |                                                                             |               |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| <b>3. 变更描述/ Description of Change</b> <p>ESP32-S2FN4R2 系列产品内置 flash 物料更新。</p> <p>The in-package flash on ESP32-S2FN4R2 series products will be updated.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                |                                                                             |               |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| <b>4. 变更对比/ Change Comparison</b> <p>请见附录 I: 变更对比。</p> <p>Please refer to Appendix I: Change Comparison.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                |                                                                             |               |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |
| <b>5. 变更影响/ Impact of Change</b> <p>1) 品质和性能/ Quality &amp; Performance:</p> <p>新 flash 已经通过了物料验证测试, 乐鑫确认其品质和性能满足乐鑫的要求。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                |                                                                             |               |                             |                             |                            |               |      |               |               |   |        |                 |                      |               |        |                  |                       |               |        |                 |                      |               |        |                  |                       |               |

The new flash has passed the material validation test, and Espressif confirms that its quality and performance meet Espressif's requirements.

2) 交期/ Delivery: 无影响/ No impact

3) 物料编码/ Part Number: 无影响/ No impact

4) 软件/ Software:

基于通用 ESP-IDF 使用, 无影响。如使用第三方 SDK 或自定义 SPI flash 驱动, 请联系[乐鑫](#)。

There is no impact to the updated product when used with the standard ESP-IDF. If the use of a third-party SDK, a custom SPI flash driver, please contact [Espressif](#).

5) 认证/ Certification: 无影响/ No impact

6) 技术规格书/ Datasheet: 无影响且无需更新/ No impact and need no change

## 6. 变更前后产品处理/ How to Deal with Products

FIFO

## 7. 相关报告/ Related Report(s)

☒Material Qualification Report

| 编号<br>No. | 测试项目<br>Test Item                               | 测试结果<br>Test Result |
|-----------|-------------------------------------------------|---------------------|
| 1         | 运行模式测试<br>Operation Mode Test                   | Pass                |
| 2         | Deep-sleep 唤醒测试<br>Wake up from Deep-sleep Test | Pass                |
| 3         | 掉电测试<br>Powerdown Test                          | Pass                |
| 4         | Wi-Fi OTA 测试<br>Wi-Fi OTA Test                  | Pass                |
| 5         | 高低温读写测试<br>High-Low Temp. Read/Write            | Pass                |
| 6         | 高温批量读写测试<br>High Temp. Read/Write (Batch)       | Pass                |

## Appendix I 变更对比/ Change Comparison

| 项目 / Item                                                   | 变更前 / Before Change                                                                                  | 变更后 / After Change         |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------|
| In-package Flash                                            | flash A                                                                                              | flash B                    |
| Part Number<br>(No Changes)                                 | See Product List in Para 1                                                                           | See Product List in Para 1 |
| Flash Operating Voltage<br>(No Changes)                     | 2.3 V ~ 3.6 V                                                                                        | 2.3 V ~ 3.6 V              |
|                                                             | All the affected products should work at 3.0 V ~ 3.6 V, so all types of flash meet the requirements. |                            |
| Chip/Module Typical Power<br>Supply Voltage<br>(No Changes) | 3.3 V                                                                                                | 3.3 V                      |
| Flash Capacity<br>(No Changes)                              | 4 MB                                                                                                 | 4 MB                       |
| Flash Page Program Time<br>(Typ. / Max)                     | 0.5 ms / 5 ms                                                                                        | 0.25 ms / 2 ms             |
| Flash Sector Erase Time (4KB)<br>(Typ. / Max)               | 50 ms / 500 ms                                                                                       | 25 ms / 300 ms             |
| Flash Block Erase Time (32KB)<br>(Typ. / Max)               | 0.15 s / 1.4 s                                                                                       | 0.1 s / 0.8 s              |
| Flash Block Erase Time (64KB)<br>(Typ. / Max)               | 0.3 s / 1.8 s                                                                                        | 0.15 s / 1 s               |
| Flash Chip Erase Time<br>(Typ. / Max)                       | 20 s / 60 s                                                                                          | 5 s / 50 s                 |

**邮件订阅****Espressif Email Notifications**

乐鑫为注册用户提供电子邮件通知服务，用户可通过[乐鑫订阅系统](#)接收技术文档更新、新闻通讯、PCN 等邮件通知。

Espressif sends email notifications of technical documentation changes, along with newsletters, PCNs and other valuable information, to subscribed customers only. If you wish to stay updated on our products and services, please subscribe [here](#).

**客户响应要求****Customer Response Requirements****需客户批准的变更/ Change Requiring Customer Approval:**

- a) 客户须在乐鑫发出 PCN 后的 30 天内告知乐鑫已收到 PCN。如客户未在接收到 PCN 后的 30 天内告知已收到，则视为客户收到变更。

Customers are requested to acknowledge receipt of the PCN within 30 calendar days from the date of issue of the PCN. Customers would be considered as notified 30 calendar days after issue of the PCN if no acknowledgement is received.

- b) 自发布 PCN 之日起 90 天内，客户没有任何其他反馈，则表示客户接受该 PCN。

The lack of any additional responses from customers within 90 calendar days from the date of issue of the PCN constitutes acceptance of the proposed changes.

**客户通知/ Customer Notification:**

- a) 客户需在乐鑫发出 PCN 后 14 天内通知乐鑫收到该 PCN。如客户未在接收到 PCN 14 日反馈乐鑫，则视为客户确认该 PCN。

Customers are requested to acknowledge receipt of the PCN within 14 calendar days from the date of issue of the PCN. Customers would be considered as having acknowledged the PCN if no response is received after 14 calendar days.

请反馈至 [pcn@espressif.com](mailto:pcn@espressif.com)。

Please send feedback to [pcn@espressif.com](mailto:pcn@espressif.com).

**客户批准/确认信息****Customer Approval / Acknowledgement and Remarks**

客户公司全称:

Customer's Company Name:

PCN 评审结果  
PCN Review Result

- ☐ 批准/确认 Accepted / Acknowledged  
☐ 不批准 Rejected  
☐ 需要分析 Further Analysis Required

客户意见/ Comment:

公司代表人姓名  
Representative's Name

公司代表人职责  
Representative's Job  
Title

公司代表人签名  
Representative's  
Signature

日期  
Date