ASUS IoT

# Tinker Board

## AIoT를 위한 최선의 엣지 단말기


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# Contents

- Tinker 소개
- Tinker 비교 가이드
- 산업 활용 예시
- 악세서리 소개


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# Product Roadmap

Product MP

Next Gen new

| Q3'22 | Q4'22 | Q1'23 | Q2 '23 |
|---|---|---|---|
| **Tinker Edge T**<br>4 x Cortex-A53 @ 1.5GHz, edge TPU<br>1GB LPDDR4, 8GB eMMc | | | |
| **Tinker Edge R**<br>2 x Cortex-A72 @ 1.8GHz +<br>4 x Cortex-A53 @ 1.4GHz, NPU<br>2+1/4+2GB LPDDR, 16GB eMMc | | | |
| **Tinker Board 2S**<br>2 x Cortex-A72 @ 2.0GHz +<br>4 x Cortex-A53 @ 1.5GHz<br>2GB/4GB LPDDR4, 16GB eMMC | | | |
| **Tinker Board 2**<br>2 x Cortex-A72 @ 2.0GHz +<br>4 x Cortex-A53 @ 1.5GHz<br>2GB/4GB LPDDR4 | | | |
| **Tinker Board S R2.0**<br>4 x Arm® Cortex®-A17 @ 1.8 GHz<br>2GB LPDDR3, 16/32GB eMMC | | | |
| **Tinker Board R2.0**<br>4 x Arm® Cortex®-A17 @ 1.8 GHz<br>2GB LPDDR3 | | | |
| **Tinker System 2**<br>RK3399, Fanless,<br>2GB/4GB LPDDR4, 16/32GB eMMC<br>Certified with RF Regulation | | | |

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# Tinker Board Series 소개

## TINKER BOARD 2S

## TINKER BOARD S R2.0


## TINKER BOARD 3N Series

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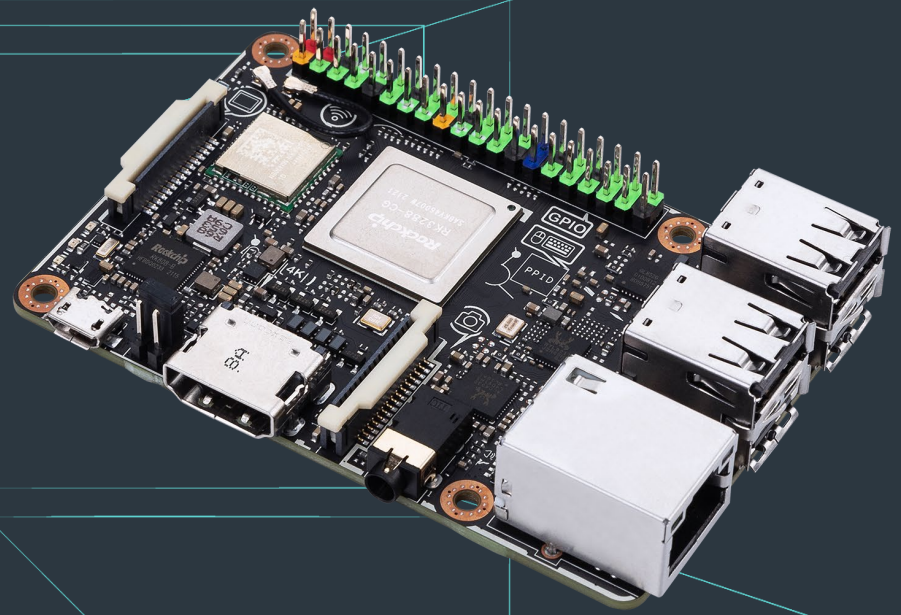
# Tinker Board R2.0 series - 사양

| | TINKER BOARD R2.0 / TINKER BOARD S R2.0 |
|---|---|
| SoC | Rockchip RK3288-CG.W (32bit) |
| CPU | Quad-core ARM Cortex-A17 @ up to 1.8 GHz |
| GPU | ARM Mali™-T764 MP4 @ 650MHz |
| Memory Size | Dual-CH LPDDR4 2GB/4GB |
| Storage | 1 x Onboard 16GB eMMC*<br>1 x Micro SD card slot |
| Display | 1 x HDMI (up to 4K/30Hz & CEC HW Ready)<br>1 x 15-pins MIPI DSI (2 lane) (HD) |
| Camera | 1 x 15-pins MIPI CSI-2 (2 lane) |
| Connectivity | 1 x RJ-45 GbE LAN<br>1 x Wi-Fi 802.11ac & BT 4.2 (2T2R, swappable antenna) |
| USB | 4 x USB 2.0 Type-A |
| AUDIO | 1 x HDMI audio out<br>Realtek ALC4030U Codec with 1 x |
| Internal Headers | - 40-pin connector for GPIO (I2C, PWM, UART, SPI, I2S, etc)<br>- DC fan header<br>- RTC battery header<br>- Power-On/Reset/Recovery/Debug headers |
| Power Connector | 5V/2.5~3A Micro USB |
| OS Support | Debian 10 (32bit)/ Android 11 10 (32bit) |
| Dimension | 85 x 56 mm |

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# SPEC 비교 – Tinker Board R2.0 vs RPi 3B/3B+

| Model | Tinker Board R2.0 Series | 3B | 3B+ |
|---|---|---|---|
| Core Processor (SoC) | Rockchip RK3288-CG.W<br>Quad-Core A17 1.8GHz | Broadcom BCM2837<br>Quad-Core A53 1.2GHz | Broadcom BCM2837B0<br>Quad-Core A53 1.4GHz |
| GPU | ARM Mali-T760 MP4 600MHz | Broadcom VideoCore IV 300MHz | Broadcom VideoCore IV 400MHz |
| RAM | 2GB | 1GB | 1GB |
| Display Output Resolution | 1 x HDMI@4K | 1 x HDMI@1080P | 1 x HDMI@1080P |
| 4K Video Playback | Yes | No | No |
| System Storage | eMMC (S only) + SDIO 3.0 | SDIO 2.0 | SDIO 2.0 |
| NIC | Gb LAN | 100M LAN | Gb LAN (shared with USB 2) |
| Audio SPEC | 1 x audio jack (with microphone)<br>1 x S/PDIF contact pin for extension<br>192K/24bit sampling rate | 1 x audio jack<br>(with Composite Video output) | 1 x audio jack<br>(with Composite Video output) |
| Wi-Fi | 802.11 b/g/n | 802.11 b/g/n | Dual-band 802.11 b/g/n/ac |
| Bluetooth | Yes, 4.2 | Yes | Yes |
| Swappable Antenna for Better Signal | Yes, w/ swappable antenna | No | No |
| USB | 4 x USB 2.0 | 4 x USB 2.0 (shared with LAN) | 4 x USB 2.0 (shared with LAN) |
| Official Supported OS | Linux – Debian & Android 11 | Linux – Debian | Linux – Debian |

**Key Summary**

1.확실히 더 나은 CPU/GPU 성능
2.더 빠른 시스템 저장소 I/O 성능
3.4K 출력 및 4K 재생 가능
4.더 나은 오디오 퀄리티
5.변경 가능한 안테나를 통한 더 나은 무선 신호
6.엄청난 기술적, 기업적 지원

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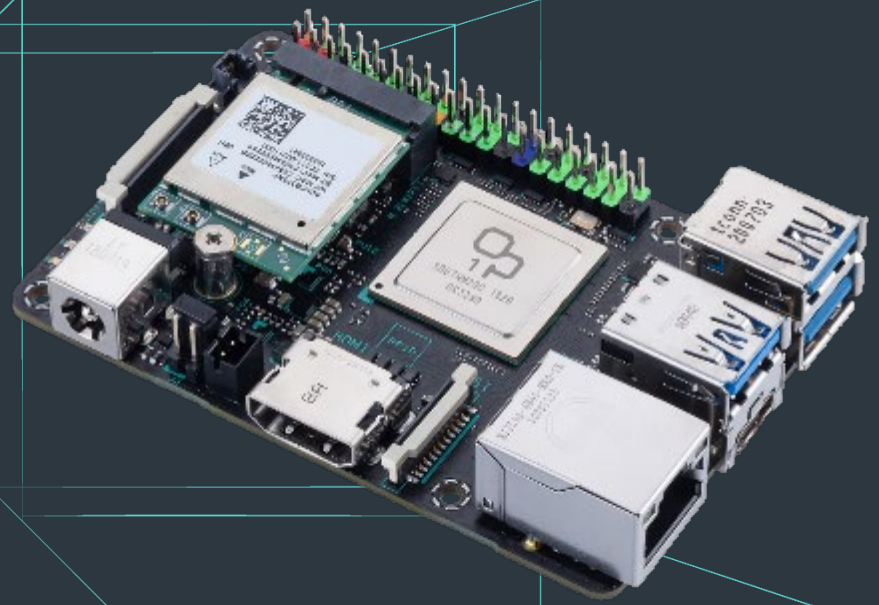
# Tinker Board 2 series - 사양

| | TINKER BOARD 2 / TINKER BOARD 2S |
|---|---|
| SoC | Rockchip RK3399 (64-bit) |
| CPU | Dual-core ARM Cortex-A72 @ 2.0GHz +<br>Quad-core ARM Cortex-A53 @ 1.5GHz |
| GPU | ARM Mali-T860 MP4 @ 800MHz |
| Memory Size | Dual-CH LPDDR4 2GB/4GB |
| Storage | 1 x Onboard 16GB eMMC*<br>1 x Micro SD card slot |
| Display | 1 x HDMI 2.0 (up to 4K/60Hz & CEC HW Ready)<br>1 x Type-C (DP 1.2 Alt Mode)<br>1 x 22-pins MIPI DSI (4 lanes) |
| Camera | 1 x 15-pins MIPI CSI-2 (2 lane) |
| Connectivity | 1 x RJ-45 GbE LAN<br>1 x Wi-Fi 802.11ac & BT 5.0 (2T2R, swappable antenna) |
| USB | 3 x USB 3.2 Gen1 Type-A<br>1 x USB 3.2 Gen1 Type-C OTG |
| Internal Headers | - 40-pin connector for GPIO (I2C, PWM, UART, SPI, I2S, etc)<br>- DC fan header<br>- RTC battery header<br>- Power-On/Reset/Recovery/Debug headers |
| Power Connector | 12V~19V DC-in (Barrel jack 5.5Ø/2.5Ø) |
| OS Support | Debian 10 / Android 11 |
| Dimension | 85 x 56 mm |



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# SPEC 비교 – Tinker Board 2 vs RPi 4

| Model | Tinker Board 2 Series | Rxxxberry Pi 4 Model B |
|---|---|---|
| Core Processor (SoC) | Rockchip RK3399 (64-bit)<br>Dual-core ARM Cortex-A72 @ 2.0GHz +<br>Quad-core ARM Cortex-A53 @ 1.5GHz | Broadcom BCM2711<br>Quad-core ARM Cortex-A72 1.5GHz |
| GPU | ARM Mali-T860 MP4 @ 800MHz | Broadcom VideoCore VI 500MHz |
| RAM | Dual-CH LPDDR4 2GB/4GB | Single-CH LPDDR4 2GB / 4GB / 8GB |
| Display | 1 x HDMI 2.0 (up to 4K/60Hz & CEC HW Ready)<br>1 x Type-C (DP 1.2 Alt Mode)<br>1 x 22-pins MIPI DSI (4 lane)<br>1 x 15-pin MIPI CSI-2 (2 lane) | 2 x Micro HDMI (up to 4K/60Hz)<br>1 x 15-pins MIPI DSI display port (2-lane)<br>1 x 15-pin MIPI CSI camera port (2-lane) |
| System Storage | 1 x Onboard 16GB eMMC (S only)<br>1 x Micro SD card slot | 1 x Micro SD card slot |
| Internal Headers | 40-pin connector for GPIO (I2C, PWM, UART, SPI, I2S, etc)<br>DC fan header<br>RTC battery header<br>Power-On/Reset/Recovery/Debug headers | 40-pin GPIO header |
| Wi-Fi | 1 x Wi-Fi 802.11 a/b/g/n/ac & BT 5.0 (2T2R) | 1 x Wi-Fi 802.11b/g/n/ac & BT 5.0 (1T1R) |
| Swappable Antenna for Better Signal | Yes, w/ swappable antenna | No |
| USB | 3 x USB 3.2 Gen1 Type-A<br>1 x USB 3.2 Gen1 Type-C OTG | 2 x USB 3.0 ports<br>2 x USB 2.0 ports |
| Official Supported OS | Debian 11 / Android 11 | Linux – Debian 10 |

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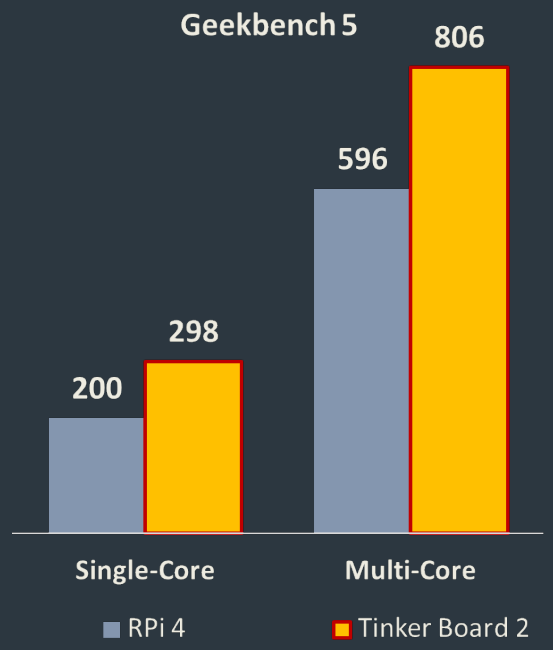
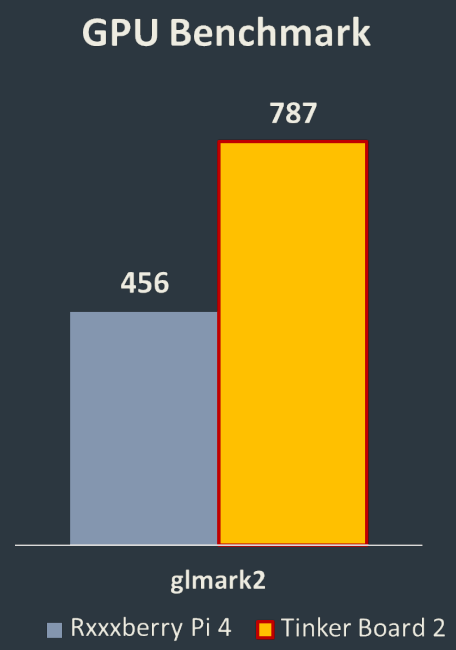
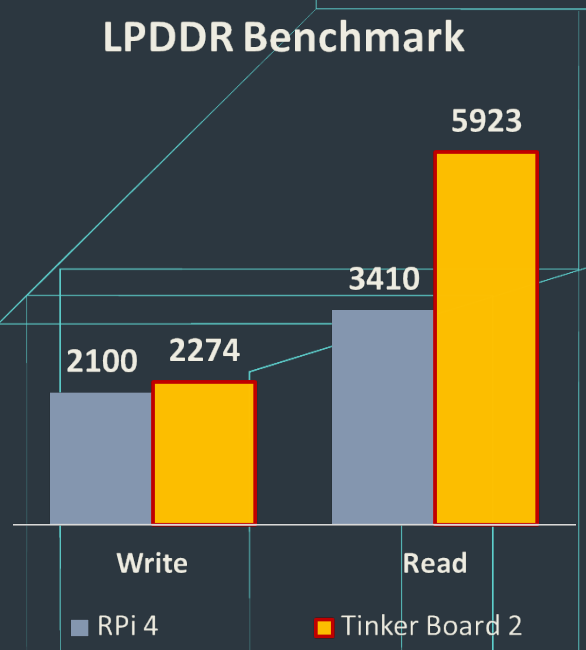
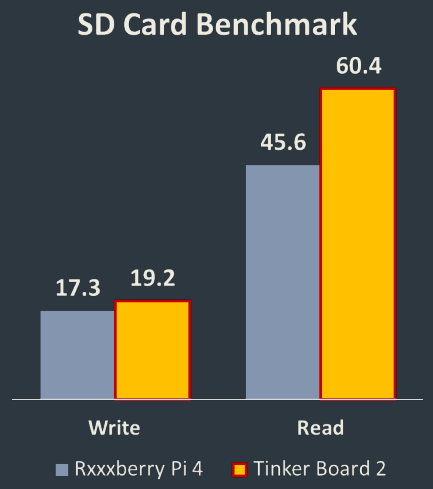
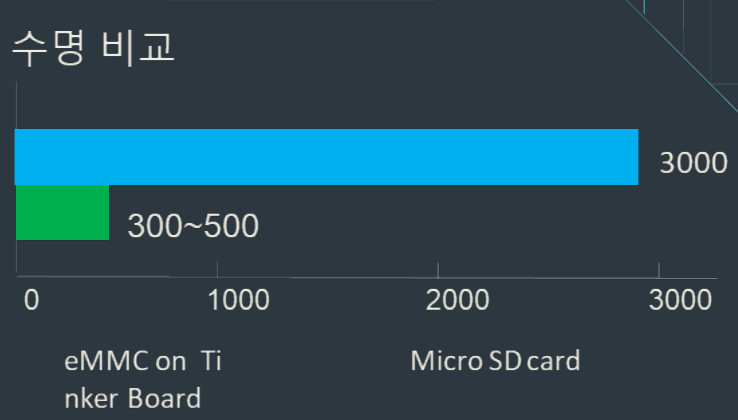
# Benchmark 비교 – Tinker Board 2 vs RPi 4



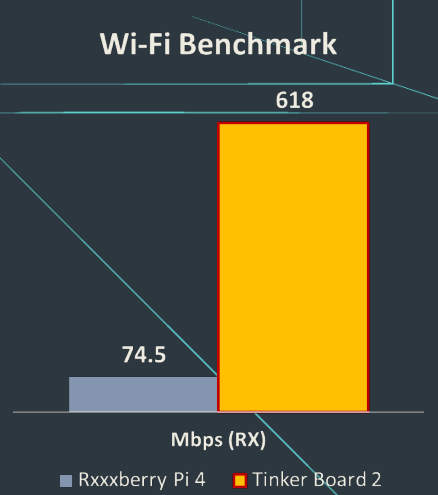




P/E(쓰기-읽기) 사이클은 플래시 메모리 장치의 수명을 결정하며, 예상케 하는 하나의 척도입니다.

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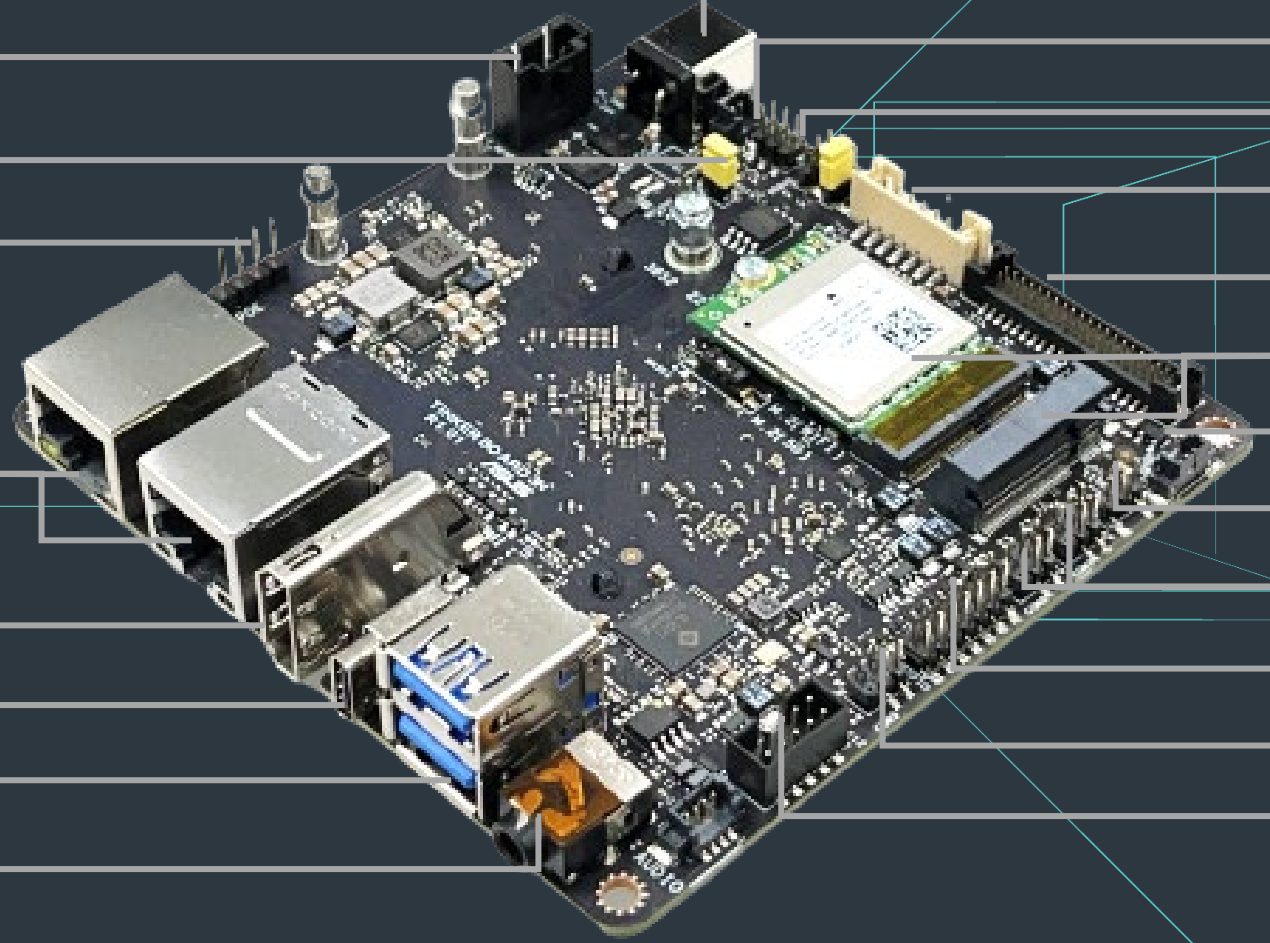
# Tinker Board 3N series – 9월 런칭



DC Header
Recover Header
PoE Convert Header
Gbit Ethernet support PoE
HDMI 2.0 support 4K@60
USB 3.2 Gen1 Type C
USB 3.2 Gen1
Audio Phone Jack

DC Input
Power/Reset
Debug
LCD Backlight Panel
LVDS/eDP
M.2 B-Key & E-Key
CAN Bus
IR Headers
COM Ports *2
12-pin GPIO
COM Port
USB 2.0 pin headers

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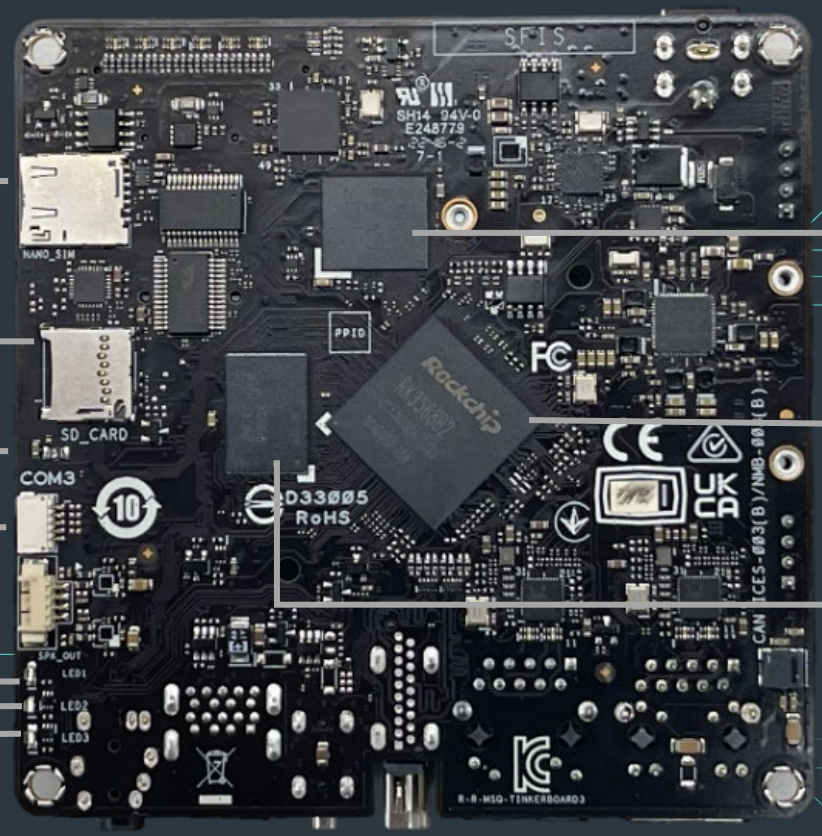
# Tinker Board 3N series – Overview

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# SKU and Naming Rule

| Type | Details |
|---|---|
| TINKER BOARD 3N PLUS | Wide Temp. Full Spec |
| TINKER BOARD 3N | Standard Temp. Full Spec |
| TINKER BOARD 3N LITE | Standard Temp. Lite Spec |

| Ram size |
|---|
| /2G |
| /4G |
| /8G |

| eMMC size |
|---|
| /32G |
| /64G |
| |

e.g.

TINKER BOARD 3N PLUS/4G/32G

TINKER BOARD 3N PLUS/4G

TINKER BOARD 3N/4G/32G

TINKER BOARD 3N/4G

TINKER BOARD 3N LITE/4G/32G

TINKER BOARD 3N LITE/4G

| Optional Spec | SPI Flash | LAN | M.2 B-Key | CAN | COM 232 (w/ Flow Ctrl.) |
|---|---|---|---|---|---|
| Full | 16MB | 2 | 1 | 1 | 2 |
| Lite | n/a | 1 | n/a | n/a | 1 |

# Tinker Board 3N PLUS Specification

| | |
|---|---|
| **SoC** | Rockchip RK3568 |
| **CPU** | Quad-core Arm® Cortex®-A55 |
| **GPU** | Arm® Mali™-G52 |
| **Display** | 1 x HDMI™ with CEC hardware ready , up to 4096 x 2160 @ 60 Hz<br>1 x LVDS (Dual-link) up to 1920 x 1080 @60 Hz + eDP up to 2560 x 1600 @ 60 H |
| **Memory Size** | Dual-CH LPDDR4/LPDDR4X 2GB / 4GB |
| **Storage** | none / 32GB / 64GB eMMC |
| | Micro SD(TF) card slot (push/pull) |
| | SPI Flash 16MB |
| **Ethernet** | 2 x RTL8211 GbE LAN |
| **POE Power-In** | x1 (one LAN support POE via module card, 802.3at 25W) |
| **M.2 E-Key 2032** | x1 for Wi-Fi / BT module* (PCIe 2.0x1, USB 2.0) |
| **M.2 B-Key 3042/3052** | x1 for 4G / 5G / SSD module (PCIe 3.0x1, USB 3.0, USB 2.0, SIM) |
| **Audio** | 1 x 3.5 Phone Jack (w/ Mic)<br>1 x Speaker Out, Stereo Pin Header (4ohm, 3W each) |
| **USB** | 1 x USB 3.2 Gen1 Type-C® OTG port<br>2 x USB 3.2 Gen1 Type-A ports<br>2 x USB 2.0 Pin header |
| **CAN Bus** | x1 Pin Header |
| **COM 232** | x2 Pin Header with flow control |
| **COM 232/422/485** | x1 Pin Header |
| **Internal Headers** | 1 x 40-pin LVDS + eDP connector<br>1 x 5V Panel Backlight & Control header<br>1 x 12-pin GPIO headers includes (up to 4 x PWM, up to 1 x SPDIF, up to 1 x SPI with 2 CS, 1 I2C, 1 UART, 1 GND, 2 ADC 8bit) |
| **Power Connector 12~24V** | 1 x DC Barrel Power Input Jack (5.5/2.5 mm)<br>1 x 4-Pin Power In Header (also for POE module) |
| **Operating Temperature** | -40˚C ~ 85°C |
| **OS Support** | Debian 11 / Android 12/ Yocto |
| **Dimension** | 4 x 4 inches / 100 x 100 mm |

# Tinker Board 3N Specification

| | |
|---|---|
| **SoC** | Rockchip RK3568 |
| **CPU** | Quad-core Arm® Cortex®-A55 |
| **GPU** | Arm® Mali™-G52 |
| **Display** | 1 x HDMI™ with CEC hardware ready , up to 4096 x 2160 @ 60 Hz<br>1 x LVDS (Dual-link) up to 1920 x 1080 @60 Hz + eDP up to 2560 x 1600 @ 60 H |
| **Memory Size** | Dual-CH LPDDR4/LPDDR4X 2GB / 4GB / 8GB |
| **Storage** | none / 32GB / 64GB eMMC<br>Micro SD(TF) card slot (push/pull)<br>SPI Flash 16MB |
| **Ethernet** | 2 x RTL8211 GbE LAN |
| **POE Power-In** | x1 (one LAN support POE via module card, 802.3at 25W) |
| **M.2 E-Key 2032** | x1 for Wi-Fi / BT module* (PCIe 2.0x1, USB 2.0) |
| **M.2 B-Key 3042/3052** | x1 for 4G / 5G / SSD module (PCIe 3.0x1, USB 3.0, USB 2.0, SIM) |
| **Audio** | 1 x 3.5 Phone Jack (w/ Mic)<br>1 x Speaker Out, Stereo Pin Header (4ohm, 3W each) |
| **USB** | 1 x USB 3.2 Gen1 Type-C® OTG port<br>2 x USB 3.2 Gen1 Type-A ports<br>2 x USB 2.0 Pin header |
| **CAN Bus** | x1 Pin Header |
| **COM 232** | x2 Pin Header with flow control |
| **COM 232/422/485** | x1 Pin Header |
| **Internal Headers** | 1 x 40-pin LVDS + eDP connector<br>1 x 5V Panel Backlight & Control header<br>1 x 12-pin GPIO headers includes (up to 4 x PWM, up to 1 x SPDIF, up to 1 x SPI with 2 CS, 1 I2C, 1 UART, 1 GND, 2 ADC 8bit) |
| **Power Connector 12~24V** | 1 x DC Barrel Power Input Jack (5.5/2.5 mm)<br>1 x 4-Pin Power In Header (also for POE module) |
| **Operating Temperature** | 0˚C ~ 60°C |
| **OS Support** | Debian 11 / Android 12/ Yocto |
| **Dimension** | 4 x 4 inches / 100 x 100 mm |

# Tinker Board 3N LITE Specification

| | |
|---|---|
| **SoC** | Rockchip RK3568 |
| **CPU** | Quad-core Arm® Cortex®-A55 |
| **GPU** | Arm® Mali™-G52 |
| **Display** | 1 x HDMI™ with CEC hardware ready , up to 4096 x 2160 @ 60 Hz<br>1 x LVDS (Dual-link) up to 1920 x 1080 @60 Hz + eDP up to 2560 x 1600 @ 60 H |
| **Memory Size** | Dual-CH LPDDR4/LPDDR4X 2GB / 4GB / 8GB |
| **Storage** | none / 32GB / 64GB eMMC<br>Micro SD(TF) card slot (push/pull) |
| **Ethernet** | 1 or 2 x RTL8211 GbE LAN (optional) |
| **M.2 E-Key 2032** | x1 for Wi-Fi / BT module* (PCIe 2.0x1, USB 2.0) |
| **Audio** | 1 x 3.5 Phone Jack (w/ Mic)<br>1 x Speaker Out, Stereo Pin Header (4ohm, 3W each) |
| **USB** | 1 x USB 3.2 Gen1 Type-C® OTG port<br>2 x USB 3.2 Gen1 Type-A ports<br>2 x USB 2.0 Pin header |
| **COM 232/422/485** | x1 Pin Header |
| **Internal Headers** | 1 x 4-pin Power-on & Reset header<br>1 x 2-pin Maskrom (eMMC recovery) header<br>1 x IR Receiver header / 1 x 3-pin Debug UART header<br>1 x 4-pin DC Fan header / 1 x 2-pin RTC Battery header |
| **Power Connector 12~24V** | 1 x DC Barrel Power Input Jack (5.5/2.5 mm)<br>1 x 4-Pin Power In Header (also for POE module) |
| **OS Support** | Debian 11 / Android 12/ Yocto |
| **Dimension** | 4 x 4 inches / 100 x 100 mm |

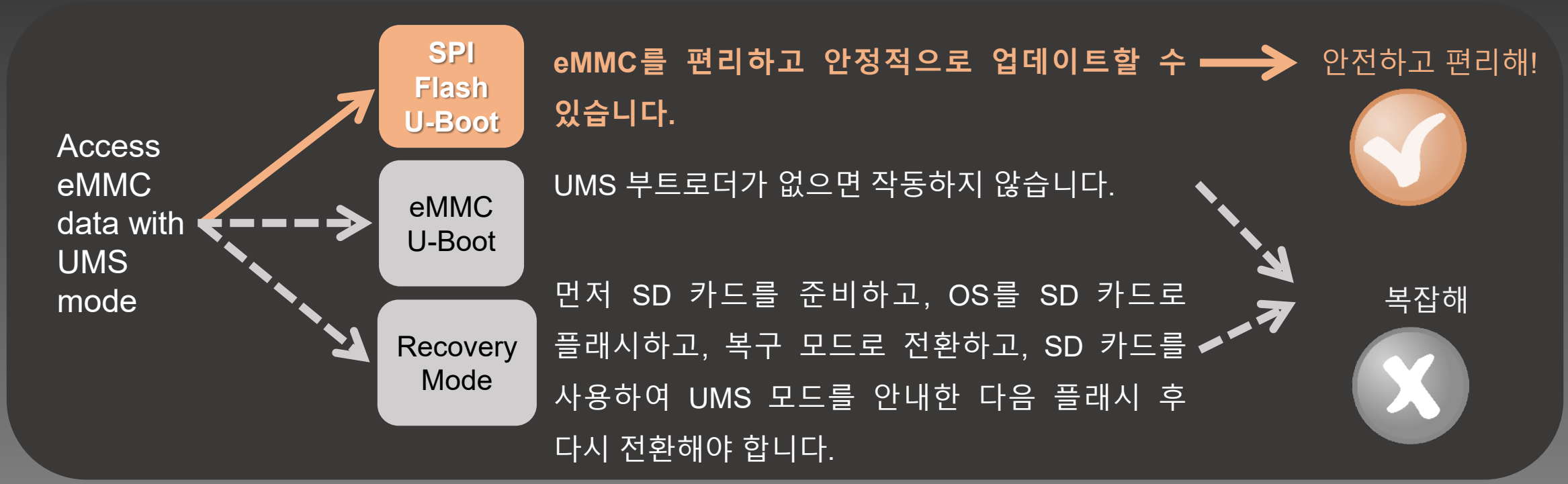
# Tinker Board 3N Series 차이점

| SKU Type | | 3N PLUS | 3N | 3N LITE |
|---|---|---|---|---|
| Memory | Size* | 2GB / 4GB | 2GB / 4GB / 8GB | |
| Storage | eMMC* | none / 32GB / 64GB | | |
| | SPI Flash | 16MB | | n/a |
| Ethernet | Controller | 2 x Realtek RTL8211 | | 1 x Realtek RTL8211 |
| | POE PD | 1 x one LAN support POE via module card | | n/a |
| Expansion | M.2 B key 3042/3052 | 1 x for 4G/5G/SSD (PCIe 3.0 x1, USB 3.0, USB 2.0, SIM) | | n/a |
| Serial Interface | CAN Bus 2.0B FD | 1 x 3-Pin header | | n/a |
| | COM RS232 (w/ flow control) | 2 x 5-Pin header | | n/a |
| Internal Header | Maskrom (SPI Flash) | 1 x 2-pin header | | n/a |
| Environment | Operating Temperature | -40 ~ 85°C | 0 ~ 60°C | |

# SPI Flash U-Boot를 이용한 CrashFree UMS 모드

UMS 모드*는 온보드 eMMC에 직접 OS를 편리하게 배포할 수 있지만 UMS 부트로더가 없으면 사용할 수 없으므로 OS 설치 프로세스가 다시 복잡해집니다. CrashFree UMS 모드는 온보드 eMMC와 독립적으로 작동하며, UMS 부트로더가 손상되는 경우가 드물지만 OS 복구의 필요성을 완화하면서 동일한 수준의 편의성을 제공합니다.

**UMS (USB Mass Storage) 모드는 PC 연결을 기기의 메모리를 USB 메모리처럼 인식하게 합니다.

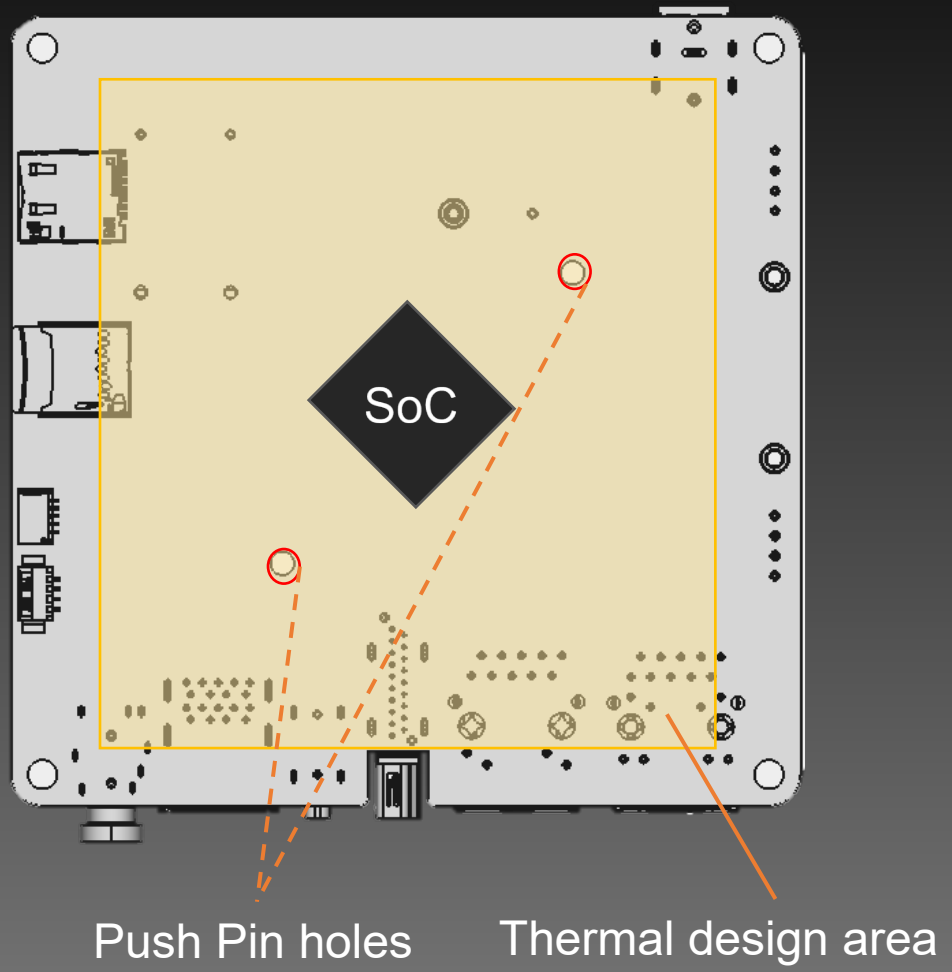


# Stable Thermal Design

- LP 타입의 푸쉬핀 방열판
- 뒷면에 SoC를 배치하여 유연성을 제공

  시스템 통합을 위한 열 설계 옵션
- 더 넓은 온도 지원을 가능케 함
- 다양한 도전적인 환경에 적합:
  - Down to -40℃.
  - Factory or environment with high temp

    temperature under 85℃.



# 다중 디스플레이 솔루션

- 메인스트림 패널 사양에 적합한 듀얼 채널을 통한 풀 HD 출력이 가능한 LVDS 온보드
- 패널 백라이트 전원 핀을 제공하여 패널을 쉽게 통합

| All Configs | | 1st Display | |
|---|---|---|---|
| | | HDMI 4096x2160@60 | eDP 2560x1600@60 |
| 2nd Display | HDMI 1920x1080@60 | - | V |
| | eDP 1920x1080@60 | V | - |
| | LVDS 1920x1080@60 | V | - |

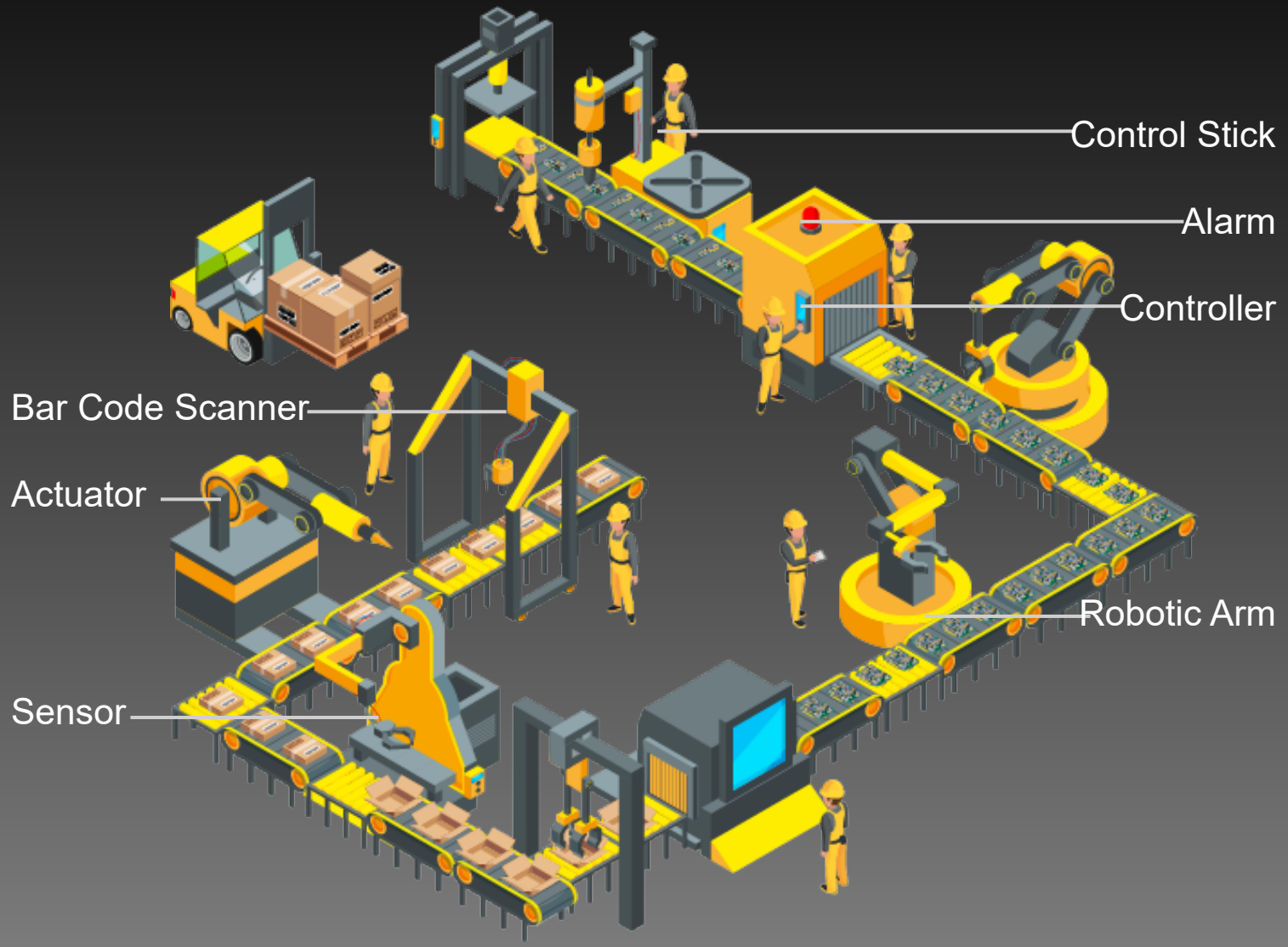
Suitable for multiple display use in various embedded design.

# 산업용 솔루션을 위한 확장성

COM headers 와 CAN Bus는

다양한 어플리케이션에 적합함

- COM RS-232  x2 Pin Header.
- COM RS-232/422/485  x1 Pin Header.
- CAN Bus  x1 Pin Header.



# 산업용 솔루션을 위한 확장성

다른 장치 및 네트워크와의

안정적인 통신

- M.2 E-Key 2032는 Wi-Fi / BT

  확장을 가능케 함.

- M.2 B-Key 3042/3052는 4G / 5G

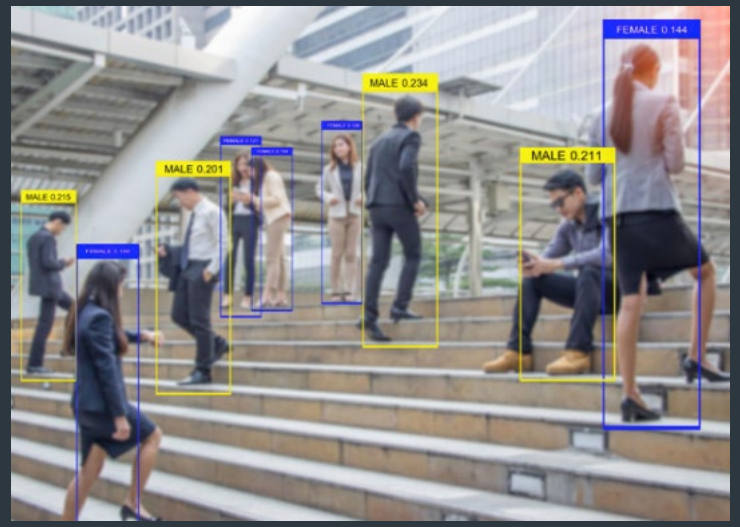
  modules 및 SSD 기능을 가능케 함.

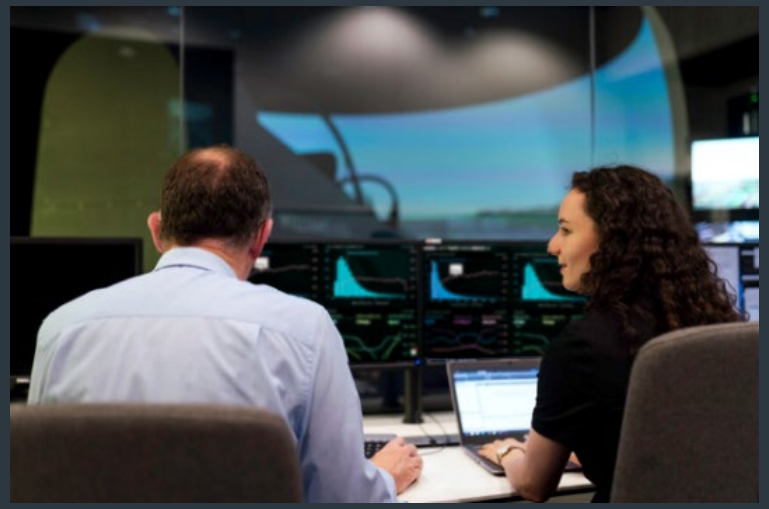
# Supportive OS assistance

Tinker Board 3N provides a variety of the latest and mainstream operating system platforms to use in different area. With official OS supports, ASUS would keep maintain and midgrade to latest mainstream OS version based on the SoC vender roadmap, in product life cycle.



# Industry Application - Smart Cities



## 스마트 시티

- 차량 보행자 감지
- 인구 밀도/흐름 모니터링 및 분석
- 공기 질 모니터링 및 분석
- 인프라 데이터 관제 센터

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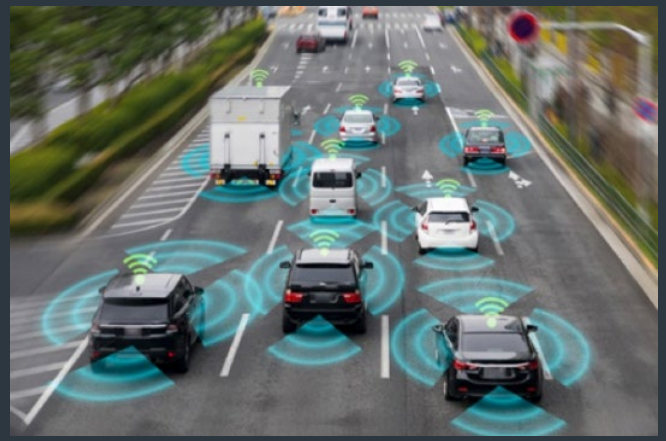
# Industry Application - TRANSPORT & LOGISTICS



## 교통 & 물류

- 교통 흐름 데이터 분석
- 교통 운행 관리
- 재고 컨트롤
- 배송 패키지 추적

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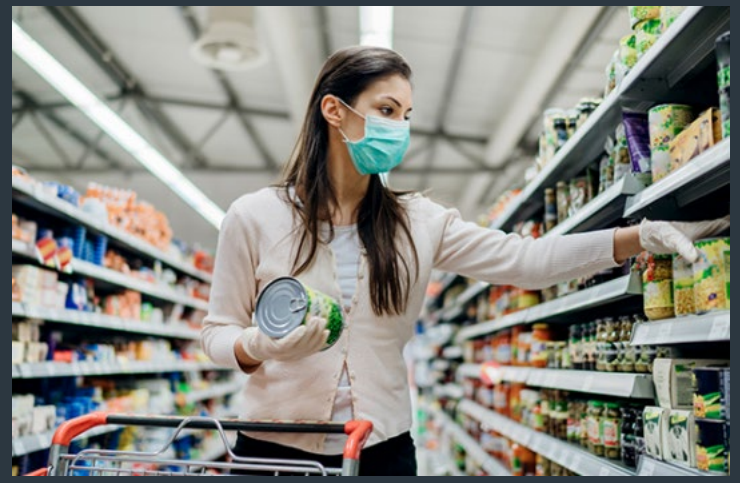
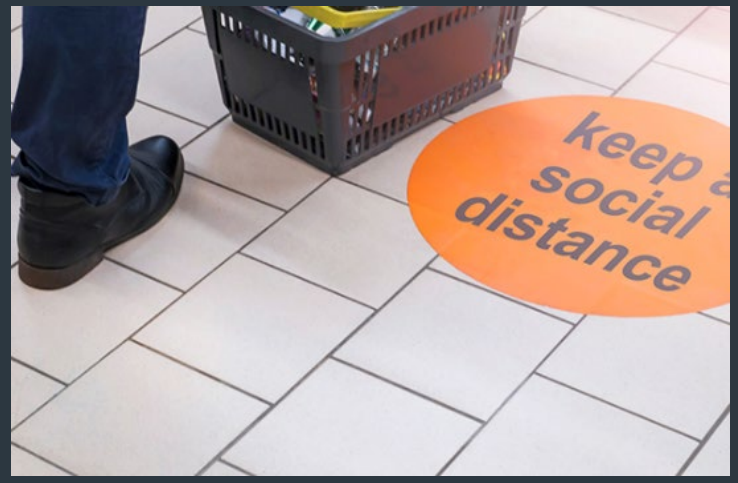
# Industry Application - RETAIL






## 소매업

- 진열대/입구에서의 고객 안면 인식
- 고객들 사이에 사회적 거리두기 인식
- 물체 인식을 통한 무인 계산
- ASUS IoT Cyber Security

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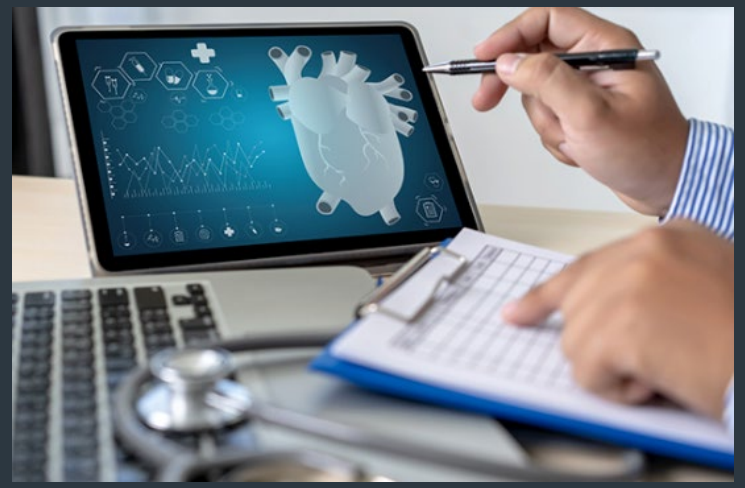
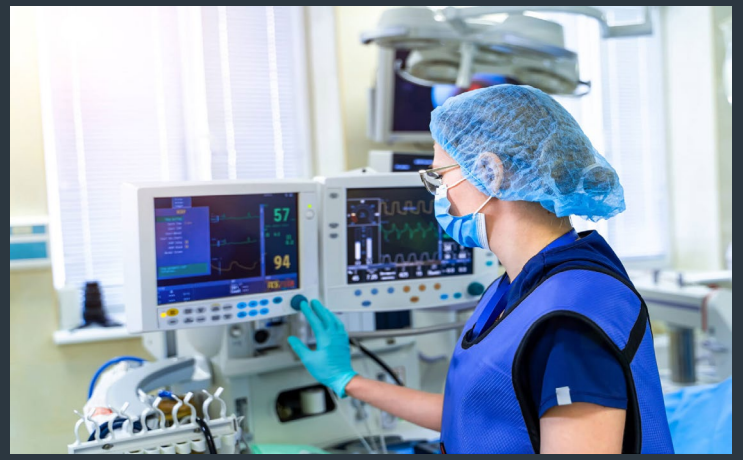
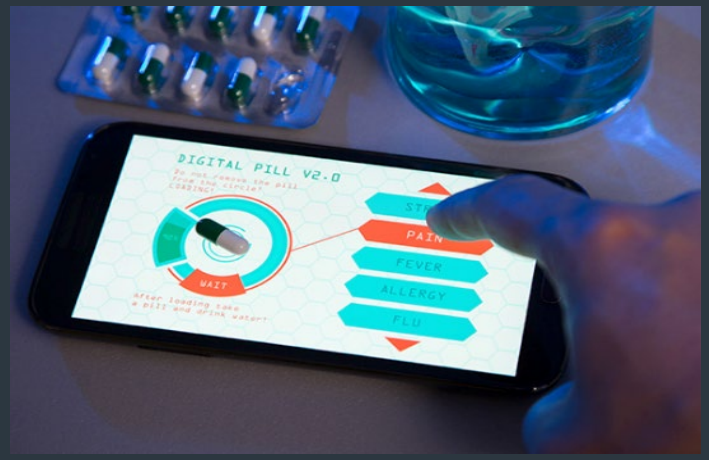
# Industry Application - HEALTHCARE






## 헬스케어

- 환자 질병 데이터 모니터링
- 패턴 분석을 통한 질병 인지 및 예측
- 의약품 보조 케어
- 약물 원격 처방/구매

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# Case Sharing – Tinker Board S -> 주차 정산기


## 왜 팅커를 써야할까?

- 낮은 비용으로 고성능의 키오스크 제작 가능
- X86기반 시스템에 비해 낮은 전력소모
- 컴팩트한 클라우드 기반 솔루션

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# More accessories

- Adapter


- 65W DC (5.5/2.5) adapter

*Picture for reference only, may depending on region or specs.

- Backlight Module


- Backlight module for LVDS

- PoE Module

- Power over Ethernet module