

PRODUCT MANUAL

Product Name: A10-3588

Product Model: NA10011E

REVISION RECORDS

Revision	Description	Prepared by	Checked by	Date
V1.0	Basic Version	Frank Wang		

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Scope of Application

This product specification applies to the Namtso Technology Co., Ltd. A10-3588 industrial single board computer.

Product Description

1. **Product Category:** Industrial Single Board Computer
2. **Product Name:** A10-3588
3. **Product Model:** NA10011E
4. **Specifications**
 - a) Rated Input: 12V/2A (wide range 9~20V)
 - b) Operating temperature: -20°C~80°C (Industrial version supports -40°C~85°C)
 - c) Network: 10/100/1000M Ethernet
5. **Industrial Applications**
 - a) Industrial computing. The A10-3588 can be used as the core central control unit of an industrial computer, when combined with an expansion board and a three-proof structure design. It can also be made into a compact industrial computer without the use of expansion boards.
 - b) Self-service terminal. The A10-3588 can be used as the core control unit of a self-service terminal. It can be combined with a touch screen and industrial design to create an intelligent self-service terminal with client-side computing power.
 - c) AIOT. The A10-3588 can be used as the edge computing terminal of the AIOT chain, or as the data processing center or AI routing of the AIOT chain.
 - d) Other use cases. Based upon the versatility of the A10-3588's interfaces, high CPU performance, and compactness of the product, it can be used as the computing core for most commercial electronic products and has a universal applicability.

Product Feature

1. Product Architecture

One industrial computer to meet the needs of all customers. Through a cross-architecture, cross-platform and cross-system design, we provide customers with a plethora of options and adaptations.

- a) Cross-architecture: Supports x86 and ARM architectures, and will also support RISC-V and newer architectures in the future.
- b) Cross-platform: Supports Intel and Rockchip platforms, and will also support MediaTek, Nvidia and newer platforms in the future.
- c) Cross-system: Supports Windows, Android, Ubuntu and other Linux systems.

Design Highlights:

- a) Project evaluation stage: Provide customers with a plethora of options to improve

project evaluation and development efficiency.

- b) Late project stages: It is designed to be convenient for customers to upgrade, iterate or replace the core industrial single board computer without having to also change the peripheral equipment.
- c) Highly compatible, reducing the need to adapt accessories, thus improving reusability of the core industrial single board computer.

2. Compact Size and Exquisite Design

Mission: Combine practicality and artistry, to pursue the ultimate user/customer experience

- a) The positions of port interfaces and mounting holes are standardized to improve compatibility and reduce costs of iteration.
- b) On the premise of improving flexibility of functionality, control the size of the core unit as much as possible, and provide sufficient options for expansion and scaling.
- c) Unique gold-trim design, highly recognizable.
- d) Unique layout design that is both practical and artistic whilst ensuring reliability and stability.
- e) Two sets of mounting holes are available to increase compatibility and flexibility of mounting options for our customers.

3. NAMTSO Link



- a) Definition: NAMTSO Link is a self-developed high-performance connector with up to 122 PINs (118 interface pins, 4 power pins).
- b) High Reliability: 120 hours of salt spray test and standard stress tests, resulted in no rust nor deformation, ensuring long-term connection stability in harsh environments.
- c) High performance: The general I/O performance speed reaches the PCIe 5.0 standard, which meets the performance requirements of most protocols and interfaces, and provides sufficient effective bandwidth.
- d) Bi-directional high current power supply: 10A high current capacity, supports bi-directional power supply, and meets the power supply needs of various scenarios.

4. High Reliability/Stability

- a) Life cycle: 8 years of service life, 10 year life cycle. Regularly iterate and improve. Ensure long product life and stable long-term supply.
- b) Rigorous reliability testing: 120 hour salt spray test, long-term high and low temperature alternation testing and other rigorous and complete reliability tests to ensure that the product can adapt to harsh industrial environments.
- c) Wide operating temperature: The working temperature of the commercial version is -20 to 85°C, which is much wider than the 0 to 65°C of conventional commercial electronic products, and can adapt to more harsh environments. The industrial version operates between -40 to 85°C, complying with industrial operating temperature regulations.
- d) High strength PCB: The PCB thickness is 1.6mm, which can endure higher stresses and thus operate in more environments. It is equipped with a high-strength metal middle frame to ensure long-term stable operation in environments with intense vibration and/or high pressure.

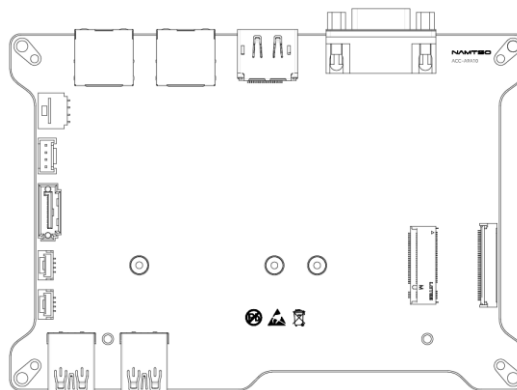
- e) Industrial-grade temperature rise control: The heat dissipation kit can ensure that the temperature rise is controlled within 30°C, complying with strict industrial-grade temperature control requirements.
- f) Strict material selection: All components are suited to the operating temperature ranges and strict reliability testing requirements. Most components use high-quality materials from major manufacturers.

5. High Scalability

- a) Large number of expansion ports (low-speed interface): Two rows of header expansion interfaces, that include communications interfaces such as UART and I2C to audio interfaces such as MIC, as well as RTC battery holders, etc., greatly improve scalability.
- b) NAMTSO Link (high-speed interface): includes display interfaces, a large number of PCIe interfaces, and low-speed interfaces such as USB and I2C. NAMTSO Link thus can be used as a bridge connector between the A10-3588 and expansion boards.



- c) M.2 (high-speed interface): includes PCIe, USB and other interfaces, supports Wi-Fi6, and other wireless communication modules through customization.
- d) ACC-A9A10 expansion board: This expansion board is connected to the A10-3588 via NAMTSO Link. It can thus add a large number of display interfaces, USB, 2.5G LAN port with PoE, and storage expansion interfaces including M.2 and SATA.



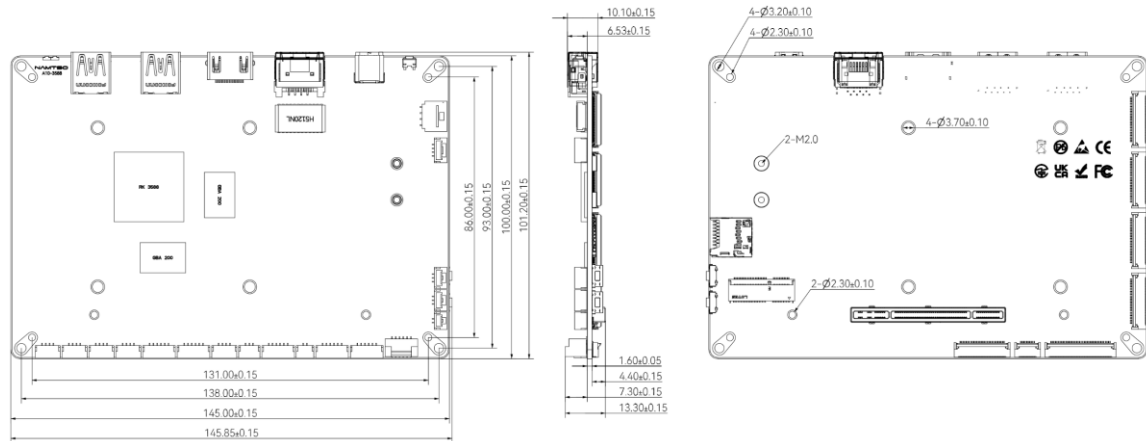
6. Developer Friendly (Open Source)

- a) Hardware: Provide open source schematic diagrams, bitmaps, and the NAMTSO Link power supply layout reference design.
- b) Software: Open-source code, friendly, highly readable and easy-to-use SDK, and mirrorable through Github.
- c) Structure: 2D drawings of the A10-3588 PCBA, heat dissipation kit, middle frame and other structural accessories are all open sourced.
- d) Complete peripheral accessories: LCD, Camera, Wi-Fi module and other peripheral accessories are complete, which facilitates quick verification and implementation of the project.

Product Appearance & Interfaces

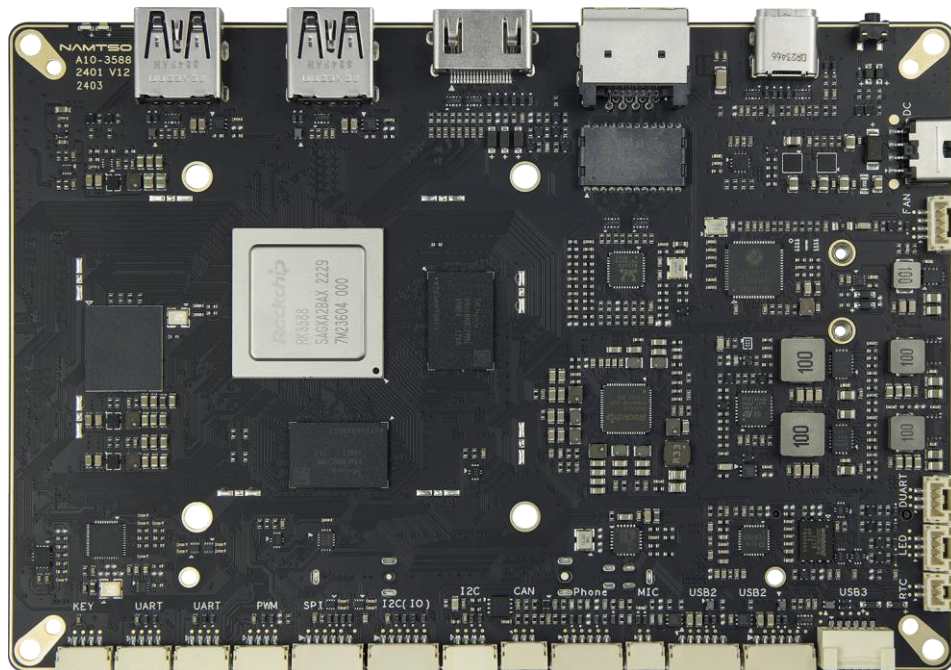
1. Appearance

- a) Dimensions: 145.8mm(L) x 101.2mm(W) x 13.3mm(H)

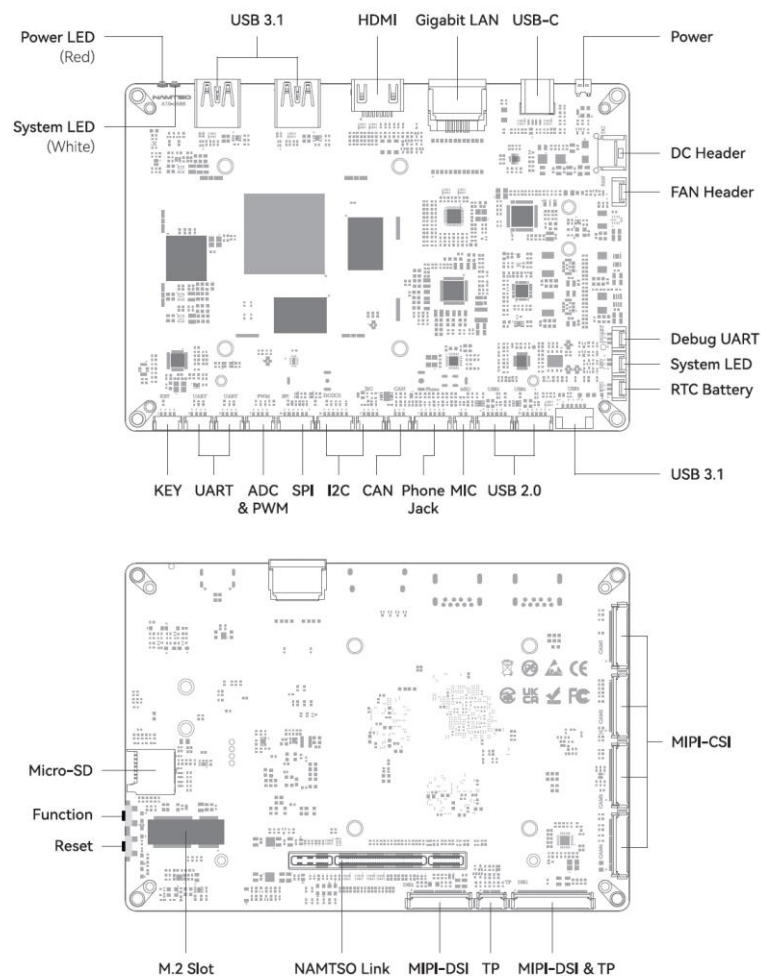


- b) Weight: 86.2g

- c) Color: black PCBA with gold trimming, gold trim thickness 0.4mm



2. Interface Description



Technical Specifications

A10-3588	
Processor	
CPU	Rockchip RK3588
Cores	8 Cores, Quad Core ARM Cortex-A76 + Quad Core ARM Cortex-A55
Frequency	Cortex-A76 up to 2.4GHz, Cortex-A55 up to 1.8GHz
Graphics	ARM Mali-G610 MP4, up to 1GHz
Video Codec	8K@60fps H.265, 4K@60fps AV1 Decoding 8K@30fps H.264/H.265 Encoding
NPU	Build-in 6 TOPS

SPI Flash	32MB
MCU	STM32G031K6
Memory	
Technology[1]	64-bit LPDDR4X 2112 MHz
Capacity[2]	8GB/16GB
Storage[3]	
eMMC	32/64GB
SD Card	Molex Slot, Spec Version 2.x/3.x/4.x(SDSC/SDHC/SDXC), UHS-III
Display	
HDMI	Type-A Female, 8K@60fps HDMI2.1, Dynamic HDR, CEC, DSC 1.2a and HDCP 2.3
DP	USB Type-C Female, 8K@30fps
MIPI Display	x1 30-pin 0.5mm FPC Connector 4-lane MIPI-DSI Interface, Resolution up to 4K@60Hz
Touch Display	x1 40-pin 0.5mm FPC Connector 4-lane MIPI-DSI Interface, Resolution up to 4K@60Hz I2C and GPIO for Touch Panel
Multiple Displays[4]	4 (HDMI + DP + MIPI Display+ Touch Display)
Network	
LAN	x1 RJ45, 1.0 Gigabit Ethernet
Wireless Communication[5]	Expansion E-KEY M.2 Slot Wi-Fi 6 Support, IEEE 802.11 ax/ac/a/b/g/n
Audio	
Chipset	Everest ES8316, Low Power Audio Codec, Line-in, Line-out
Interfaces	x1 6-pin 1.27mm Header, Headphone Jack x1 2-pin 1.27mm Header, DMic
Interfaces	
USB	x2 Type-A Female, USB 3.1 Gen1 x1 Type-C Female, USB 3.1 Gen1 + PD +DP x2 USB2.0, 6-pin 1.27mm Header x1 USB 3.1 Gen1, 12-pin 1.27mm Header
LED	x2 LEDs, Power LED(Red) + System LED(White)
Buttons	x3 Buttons, Reset + Func + Power
Sensor	TDK ICM-42670-P, 6-axis Digital Accelerometer

I2C	x2 I2C, 4-pin 1.27mm Header + 6-pin 1.27mm Header(x2 Normal GPIO)
SPI	x1 SPI, 6-pin 1.27mm Header
UART	x2 UART, 4-pin 1.27mm Header x1 Debug UART, 3-pin 1.27mm Header
ADC/PWM	x2 ADC + x2 PWM, 4-pin 1.27mm Header
KEY	x1 PWR KEY, 4-pin 1.27mm Header
FAN	x1 4-pin 1.27mm Header
CAN	x1 2-pin 1.27mm Header
Expansion	
NAMTSO Link[6]	x1 4-lane + x2 1-lane PCIe x1 USB 3.1 + x1 USB 2.0 x1 HDMI + x1 eDP x1 I2C + x2 UART + x1 Debug UART
M.2 Slot	x1 E-KEY M.2 Slot, Wi-Fi 6 Module Support x1 1-lane PCIe + x1 USB 2.0 + x1 UART
Power	
USB-C PD Input	9V ~ 20V
DC Power Input	12V ~ 24V, 4-pin 2.54mm Header
NAMTSO Link	Power Input: 12V ~ 24V Power Output: 12V ~ 24V
Priority[7]	NAMTSO Link > DC Power Input > USB-C PD Input
Environment	
Operational Temperature	-20°C ~ 80°C, 95% RH Non-Condensing
Non-Operational Temperature	-40°C ~ 85°C, 95% RH Non-Condensing
Physical	
Dimension	145.8mm x 101.2mm x 13.3mm
Weight	86.2g
Mounting Holes	x4 Size M2 + x4 Size M3
Operating System	
Linux	Ubuntu 22.04 / Yocto
Android	Android 13
Certification	CE, FCC, UCKA, TELEC, RoHS

[1] RK3588 compatible JEDEC standards LPDDR4/LPDDR4X/LPDDR5.

[2] RK3588 has up to 32GB of addressable space.

[3] SSD and SATA can be accessed through NAMTSO Link.

[4] HDMI and eDP is not available through NAMTSO Link.

[5] The officially supported WiFi module is Ampak AP6275P(2T2R).

[6] NAMTSO Link: NAMTSO self-developed high speed connector.

[7] Power supply switching after power-on will cause the A10-3588 to reboot.

Supported Accessory List

A10-3588		
Expansion Board	A9A10 Expansion Board	Y
	A3121 AP6275P Wi-Fi Board	Y
Adapter	B1200 30W USB-C Adapter	Y
	B1300 65W USB-C Adapter	Y
Cables	C13A0 Header to Header Cables[1]	Y
	C13B0 Header to Jump Wire Cables[1]	Y
	C13C0 Header to USB Cables[2]	Y
	C13E0 Header to PhoneJack Cables	Y
	C13F0 Header to DC Cables	Y
Cooling Kit	D1130 Cooling Kit[3]	Y
Camera	E1080C Camera[4]	Y
	E1080A Camera	Y
Screen	F1050T Touch Screen	Y
	F1101T Touch Screen	Y
Frame	G0A10 Frame	Y

[1] These cables contain different specifications: 2/3/4/5/6pins.

[2] These cables contains different specifications: 6-pins for USB 2.x, 12-pins for USB3.x.

[3] D1130 can support a maximum heat dissipation load of 45W.

[4] E1080C supports IR-Cut.

Performance Data

IOPS(Input/Output Per Second) Performance

Function	eMMC	SDIO	PCIe[1]	SATA	USB3.0	USB2.0
Write	203.8MB/s	55.8MB/s	2866MB/s	188.5MB/s	367.9MB/s	31.7MB/s
Read	271.0MB/s	63.0MB/s	3118MB/s	192.6MB/s	360.2MB/s	34.0MB/s
Function	Eth0	Eth1[1]	Eth2[1]	Wi-Fi 6[2][3]	Wi-Fi 2.4G[2][3]	
Upload	926Mbps/s	1.83Gbits/s	2.13Gbits/s	458Mbps/s	100Mbps/s	
Download	945Mbps/s	2.19Gbits/s	2.32Gbits/s	630Mbps/s	131Mbps/s	

[1] Connect the expansion board ACC-A9A10 using NAMTSO Link.

[2] Connect the ACC-A3121Wi-Fi accessory to A10-3588 using the M.2 slot.

[3] Distance:5 meters between the A10-3588 and the testing router.

Performance Benchmarks

Antutu Test Conditions	With Cooling Kit	Without Cooling Kit
CPU	198620	171534
CPU Mathematical Score	25318	21394
CPU Common Use Score	37325	33449
CPU Multi-Core Score	135977	116691
GPU	165132	144999
Seasons - Vulkan	83363	73762
Coastline2 - Vulkan	81769	71237
UX	158936	139266
Data Security Score	19130	16155
Data Processing Score	16739	14002
Image Processing Score	14213	14052
User Experience Score	30742	25232

MEM	103149	108241
RAM	52553	32352
ROM Score	4051	4473
Scores	625837	564040

Antutu Version: V10.1.9

Geekbench Test Conditions	With Cooling Kit	Without Cooling Kit
Single-Core Score	635	544
Multi-Core Score	2483	2197
Vulkan Score	3882	3416
Scores	7000	6157

Geekbench Version: V5

Product Certifications

Certifications	CE	UKCA	RoHS	KC	FCC	TELEC	CCC
Status	√	√	√	x	√	√	x

Note: " x " means that the design is certifiable but has not yet attained certification.

User Guide

1. Indicator Light Description

Status	System	Power	Color
Power-Input	-	Solid On	Red
Boot-Up	Solid On	-	White
Normal Operation	Flashing	-	White
Burning Mode	-	Flash 3 Times	Red

2. Power Supply Instructions

- USB-C power supply: It is recommended to use 20V/2A PD power input, 9~20V wide input voltage range is also supported.
- DC power supply: supports 12V ~ 24V input.
- NAMTSO Link power supply: supports 12V ~ 24V input and 12V ~ 24V output.
- Power supply priority: NAMTSO Link > DC Power Input > USB-C PD Input.
- Switching input sources: The power input source can be switched when the A10-3588 is powered off. The system will reboot when switching power input sources after powering on.

User Precautions

1. Power-on protection: Power-on protection is ON by default, thus you need to press the POWER button to turn the A10-3588 on. Power-on protection can be turned OFF through software, thus allowing the A10-3588 to power-on automatically when electrical power is available.
2. NAMTSO Link power supply: Based on equipment security considerations, the default state of the NAMTSO Link two-way power supply is OFF, and can be changed to ON through software.
3. Wi-Fi interface default state: The PCIe used for the Wi-Fi function on the motherboard's M.2 interface and the PCIe on the NAMTSO Link are multiplexed. The default setting is for NAMTSO Link, that is the Wi-Fi is turned OFF by default. This PCIe channel can be configured to the Wi-Fi interface through software.

Manufacturer Information

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