TitanSBC-8Mmini Datasheet and Pinout

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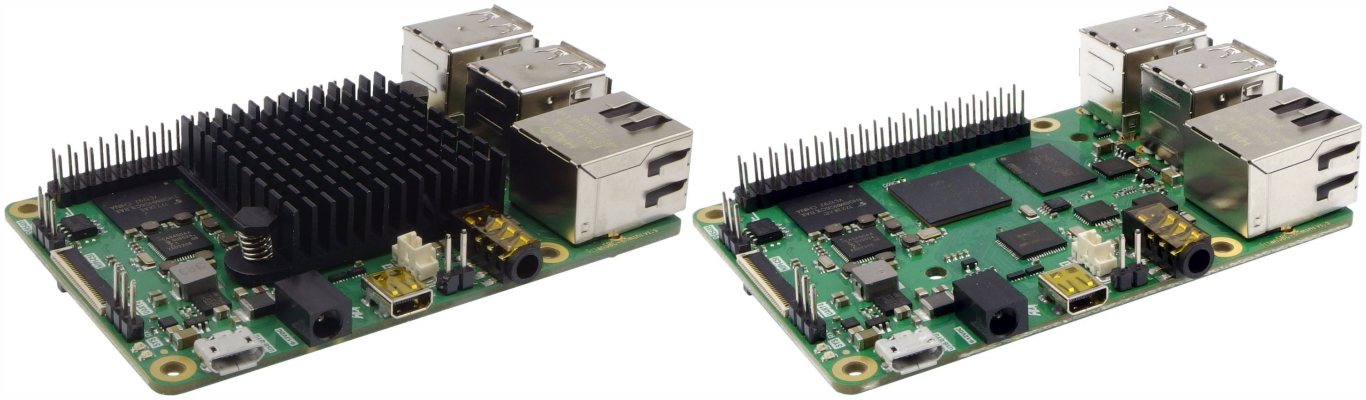
TitanSBC-8Mmini Datasheet and Pinout

General description



The TitanSBC-8Mmini (SLC5) is a new generation single board computer (SBC), based on energy efficient and fast 64-bit quad core industrial, heterogenous MPU NXP i.MX8Mmini, equipped with Cortex-A53 cores.
The main MPU of TitanSBC-8Mmini is equippped with real-time Cortex-M4 core, Gigabit Ethernet interface, video codec (H.265, H.264, VP8, VP9), PCIe 2.0 interface and another communication peripherals often used in industrial applications. Internal GPU offers up to 1080p60 resolution on HDMI interfaces with independent 2D (GC320) and 3D (Vivante GCNano Ultra) GPU engines. The MPU cores run at 1.8GHz without thermal throttling using the stock heat sink allowing a robust and quiet computer. The low-power LPDDR4 RAM memory used by default in TitanSBC-8Mmini computer additionally helps save energy.
The TitanSBC-8Mmini is equipped with on-board 1Gb/s Ethernet interface, half-duplex RS-485 interface, on-board RTC with external battery connector, audio codec (with headphone and microphone Jack connector and external speakers outputs), HDMI, 4 x USB 2.0 host connectors, 1 x USB-OTG connector, MIPI-CSI camera connector, PCIe 2.0 FPC connector (dedicated M.2 adapter available: SL-ADP-PCIe-M2), MicroSD card connector, DC/DC converter adapted to 12V external power supply. Additionally the TitanSBC-8Mmini SBC is equipped with easy to use 2×20 pin connectors with 28 GPIOs for any use in user application.
The StarSBC-6ULL supports industrial grade embedded applications.

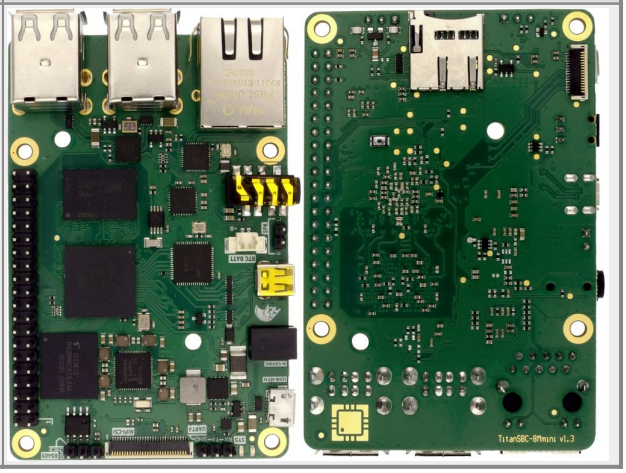
Applications

- Multimedia Interfaces
- Home Control Panels
- Industrial HMI
- Industrial Controls
- Home Security and Surveillance
- Edge Computing
- IoT Sensor Hubs
- Home Appliances
- Home Automation – Smart Home
- Robotic Appliance
- Transport Ticketing
- Smart Lighting
- Point-of-sales (POS) terminals
- Cash Register
- Smart grid infrastructure
- Outdoor equipment

Features

- Powered by quad-core heterogenous NXP i.MX8Mmini (Cortex-A53 + Cortex-M4) application processor
- Core clock up to 1.8GHz
- Up to 4GB LPDDR4
- Up to 32GB eMMC
- HDMI video output (3D + 2D GPUs, full HD resolution)
- Single MIPI-CSI camera input
- Half-duplex RS-485 interface on-board
- 10/100/1000 Ethernet PHY on-board
- 4 x USB 2.0 (host) + USB-OTG interfaces
- PCIe 2.0 connector (FPC, 16 pin, 0.5 mm)
- Stereo audio codec (headphone, microphone and speakres connectors)
- Power-efficient and cost-optimized solution
- Ideal for industrial IoT and embedded applications
- Integrated security features

Pictures of SBC versions

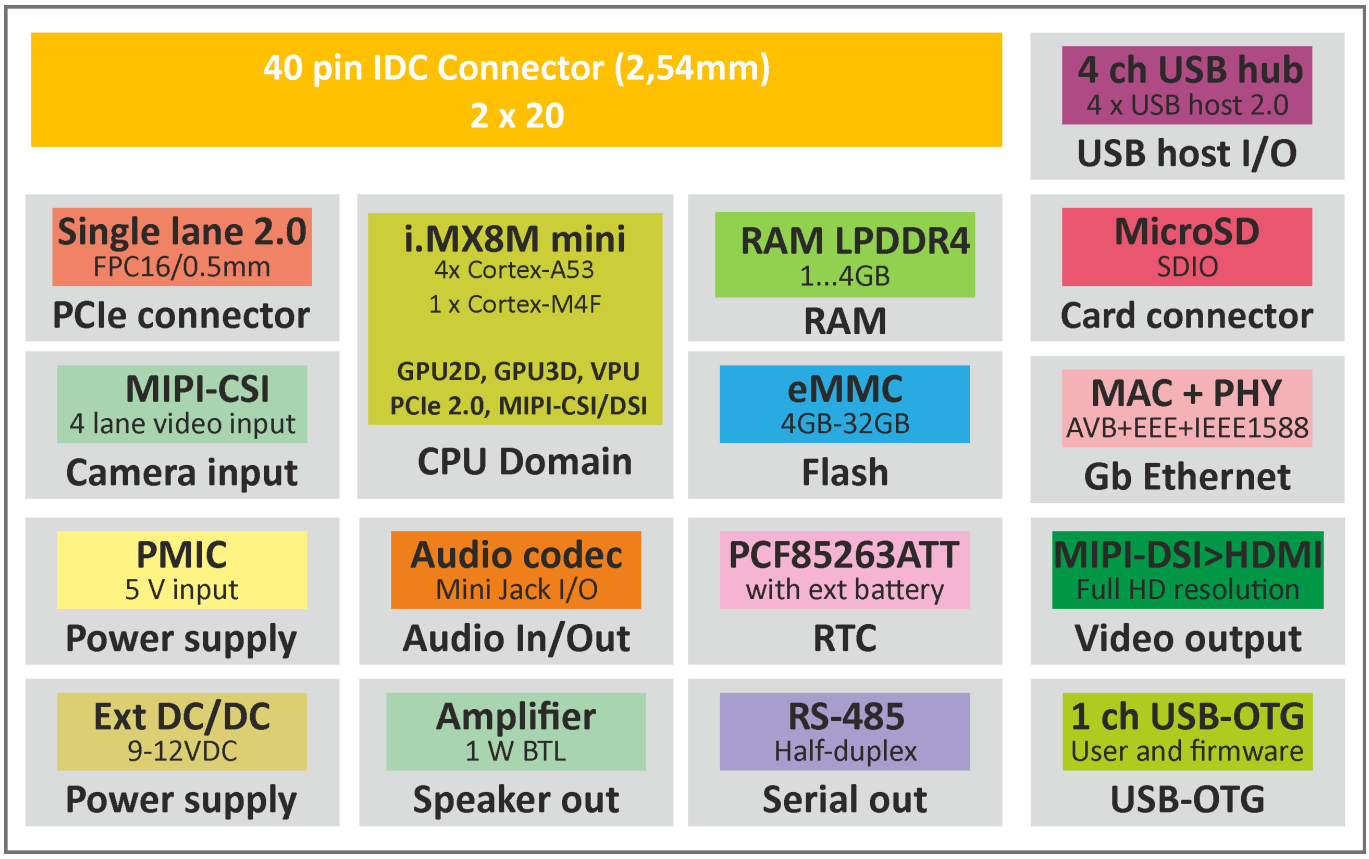
Version	Photo
eMMC	

Ordering info

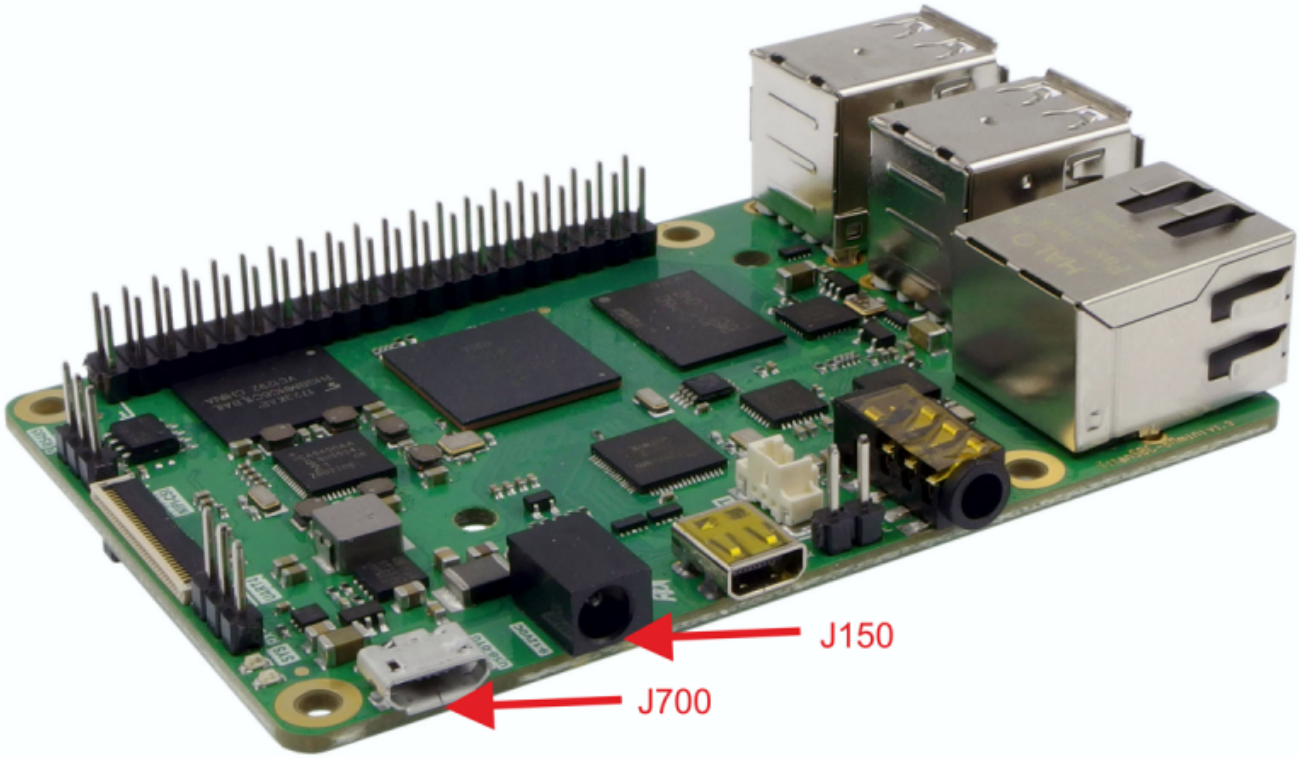
SLCNX8MMCpuType_Clock_RamSize_FlashSize_SF_TEMP

SLC	Product type SLC - Single Board Computer
N	Form factor 5 - TitanSBC
X8MM	CPU Family X8MM - NXP i.MX8Mmini
CpuType	CPU Type QC - Fully featured: 4 x Cortex-A53, 1 x Cortex-M4, GPU3D, video codec
Clock	CPU Clock Speed 1600C - 1.6GHz 1800C - 1.8GHz
RamSize	LPDDR4 RAM Size 01GR - 1GB 02GR - 2GB 04GR - 4GB
FlashSize	Flash Size Type and Density 04GE - 4GB eMMC 08GE - 8GB eMMC 16GE - 16GB eMMC 32GE - 32GB eMMC
SF	Special Features 0SF - Fully equipped
TEMP	Operating Temperature C - Consumer: 0 to +70 C E - Extended: -25 to +70 C I - Industrial: -40 to +85 C

Block Diagram



Operating ranges



Parameter	Value	Unit	Comment
USB Power Supply	5	V	Connected to J700[1]
External Power Supply	12	V	Connected to J150[2]
GPIO voltage	3.3	V	-
Environment temperature[4]	-40...+85	°C	Industrial range
	-25...+70		Extended range
	0...+70		Consumer range

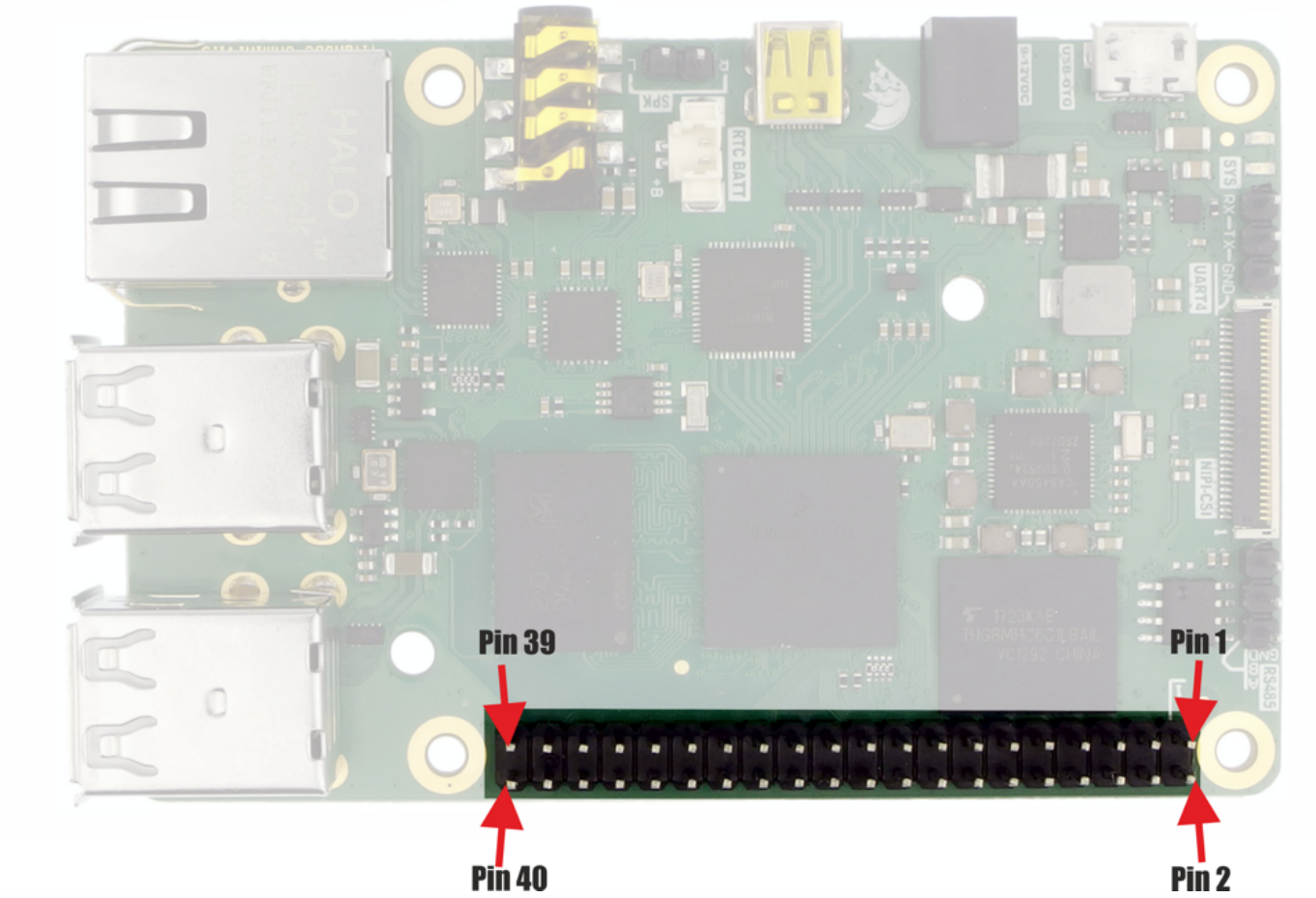
Note:
1. MicroUSB-OTG connector.
2. Power-jack connector compatible with Wuerth Elektronik 694103304002 (1.35 mm).
3. Only one power source can be active at the time (connected to J700 or to J150).
4. Maximum MPU junction temperature is +105°C (industrial version) or +95°C (consumer version).

Electrical parameters

SBC signal name	Parameter	Value			Units
		Min.	Typ.	Max.	
EXT PWR	SBC external supply voltage[1]	9	12	14	V
USB PWR	SBC supply USB-OTG voltage[2]	-	5	-	V
VGPIO	GPIO Input Voltage	0	-	3.6[3]	V
VDD-3V3	Aux power source	3.2	3.3	3.35	V
VDD-5V0	Aux power source	4.65	4.85	5.0	V
I_{3V3}	Max load of aux power source	0	-	100	mA
I_{5V0}	Max load of aux power source	0	-	100	mA
I_{EXT}	Total Supply Current	TBD	TBD	TBD	mA
I_{+5V}	Total Supply Current	TBD	TBD	TBD	mA
V_{BATT}	RTC/SNVS Backup Battery Supply	2.66	-	3.6	V

Notes:
1. The external voltage connected to J150 connector.
2. The external voltage connected to J700 connector.
3. Applying the maximum voltage 3.6V results in shorten lifetime. Recommended value is smaller than 3.5V.

External GPIOs



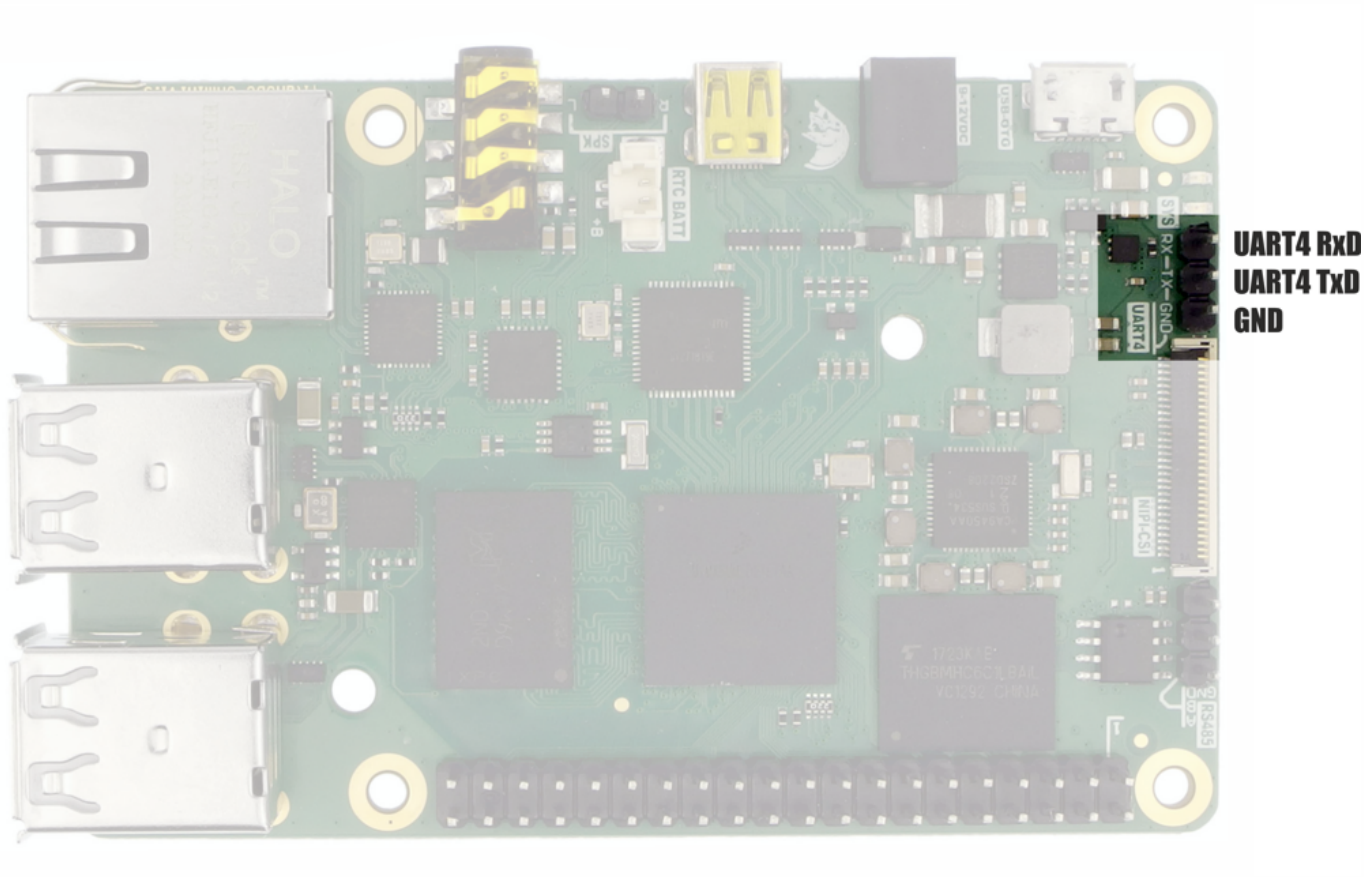
Connector pin number	Default SBC function	Default pin name	GPIO	MPU ball number	Notes
1	VDD-3V3	-	-	-	Power source for external devices (up to 100 mA)
2	VDD-5V0	-	-	-	Power source for external devices (totally up to 100 mA on both VDD-5V0)
3	I2C4-SDA	I2C4-SDA	GPIO5-IO21	E13	Internally pull-uped with 4.7k connected to 3.3V
4	VDD-5V0	-	-	-	Power source for external devices (totally up to 100 mA on both VDD-5V0)
5	I2C4-SCL	I2C4-SCL	GPIO5-IO20	D13	Internally pull-uped with 4.7k connected to 3.3V
6	GND	-	-	-	-
7	GPIO4-IO13	SAI-TXD1	GPIO4-IO13	AF20	-
8	UART2-TXD	UART2-TXD	GPIO5-IO24	F15	-
9	GND	-	-	-	-
10	UART2-RXD	UART2-RXD	GPIO5-IO25	E15	-
11	GPIO4-IO12	SAI1-TXD0	GPIO4-IO12	AG20	-

12	PWM2	SPDIF-RX	GPIO5-IO04	AG9	-
13	GPIO4-IO09	SAI1-RXD7	GPIO4-IO09	AF19	-
14	GND	-	-	-	-
15	GPIO4-IO08	SAI1-RXD6	GPIO4-IO08	AG19	-
16	UART1-RXD	SAI1-RXFS	GPIO4-IO21	AC19	-
17	VDD-3V3	-	-	-	-
18	UART1-TXD	SAI2-RXC	GPIO4-IO22	AB22	-
19	ECSPI2-MOSI	ECSPI2-MOSI	GPIO5-IO11	B8	-
20	GND	-	-	-	-
21	ECSPI2-MISO	ECSPI2-MISO	GPIO5-IO12	A8	-
22	GPIO4-IO7	SAI1-RXD5	GPIO4-IO07	AF18	-
23	ECSPI2-SCLK	ECSPI2-SCLK	GPIO5-IO10	E6	-
24	ECSPI2-SS0	ECSPI2-SS0	GPIO5-IO13	A6	-
25	GND	-	-	-	-
26	GPIO4-IO06	SAI1-RXD4	GPIO4-IO06	AG18	-
27	I2C3-SDA	I2C3-SDA	GPIO5-IO19	F10	Internally pull-uped with 4.7k connected to 3.3V
28	I2C3-SCL	I2C3-SCL	GPIO5-IO18	E10	Internally pull-uped with 4.7k connected to 3.3V
29	UART1-CTS	SAI2-RXD	GPIO4-IO23	AC24	-
30	GND	-	-	-	-
31	UART1-RTS	SAI2-TXFS	GPIO4-IO24	AD23	-
32	GPIO4-IO05	SAI1-RXD3	GPIO4-IO05	AF17	-
33	PWM1	SPDIF-EXT-CLK	GPIO5-IO05	AF8	-
34	GND	-	-	-	-
35	GPIO4-IO01	SAI1-RXC	GPIO4-IO01	AF16	-
36	GPIO4-IO04	SAI1-RXD2	GPIO4-IO04	AG17	-
37	GPIO4-IO02	SAI1-RXD0	GPIO4-IO02	AG15	-
38	GPIO4-IO00	SAI1-RXFS	GPIO4-IO00	AG16	-
39	GND	-	-	-	-
40	GPIO4-IO03	SAI1-RXD1	GPIO4-IO03	AF15	-

Note:
1. GPIOs are compatible with TTL-LV/CMOS33 voltage levels.
2. Use of internal MPU pull-up resistors is not recommended (ERR050080, Mask Set Errata for Mask 0N87W, Rev. 2, 6/2022).

Serial terminal interface (UART4)

By default the UART4 is used as Linux terminal interface. Both communication lines (TxD and RxD) are compatible with TTL-LV or CMOS33 levels.



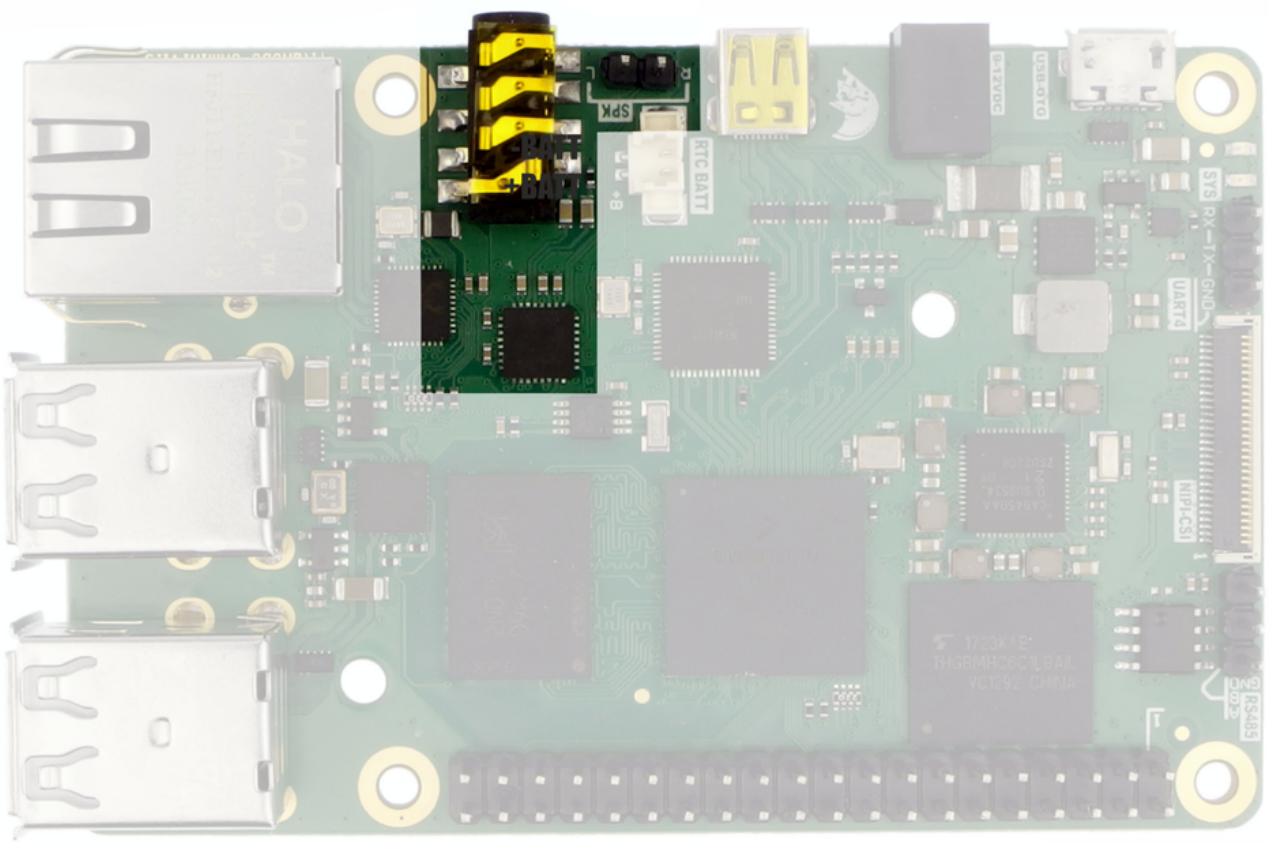
Internal GPIO connections

Default SBC function	Default pin name	GPIO	MPU ball number	Description
I2C-18-SCL	I2C2-SCL	GPIO5-IO16	D10	PMIC, DSI-HDMI converter, internally pull-uped with 4.7k
I2C-18-SDA	I2C2-SDA	GPIO5-IO17	D9	PMIC, DSI-HDMI converter, internally pull-uped with 4.7k
SYS-LED	SD1-DATA0	GPIO2-IO02	Y27	System LED (heartbeat)
UART3-TXEN	SAI1-TXD4	GPIO4-IO16	AG22	RS485 (DE in MAX3485)
UART3-RXD	UART3-RXD	GPIO5-IO26	E18	RS485
UART3-TXD	UART3-TXD	GPIO5-IO27	D18	RS485
CAM-GPIO0	SD1-CLK	GPIO2-IO00	V26	MIPI-CSI (camera input) auxiliary line
CAM-GPIO1	SD1-CMD	GPIO2-IO01	V27	MIPI-CSI (camera input) auxiliary line
UART4-RXD	UART4-RXD	GPIO5-IO28	F19	Console UART
UART4-TXD	UART4-TXD	GPIO5-IO29	F18	Console UART
PMIC-INT	GPIO1-IO01	GPIO1-IO01	AF14	PMIC interrupt
WDOG-B	GPIO1-IO02	GPIO1-IO02	AG13	System watchdog input
HDMI-DETECT	GPIO1-IO06	GPIO1-IO06	AG11	HDMI detect input
M2H-INT	GPIO1-IO07	GPIO1-IO07	AF11	HDMI interrupt
M2H-RESET	GPIO1-IO09	GPIO1-IO09	AF10	HDMI converter reset
SPDIF-TX	SPDIF-TX	GPIO5-IO03	AF9	HDMI audio output
USB1-VBUS-EN	GPIO1-IO12	GPIO1-IO12	AB10	USB control line
USB1-VBUS-OC	GPIO1-IO13	GPIO1-IO13	AD9	USB control line
USB2-VBUS-EN	GPIO1-IO14	GPIO1-IO14	AC9	USB control line
USB2-VBUS-OC	GPIO1-IO15	GPIO1-IO15	AB9	USB control line
USB-RESET	SAI3-RXFS	GPIO4-IO28	AG8	USB hub reset
RTC-INT	SAI3-RXC	GPIO4-IO29	AG7	RTC interrupt
I2C-33-SCL	I2C1-SCL	GPIO5-IO14	E9	RTC, audio codec, HDMI-DDC, PCIe, MIPI-CSI
I2C-33-SDA	I2C1-SDA	GPIO5-IO15	F9	RTC, audio codec, HDMI-DDC, PCIe, MIPI-CSI
SAI3-MCLK	SAI3-MCLK	GPIO4-IO02	AD6	Audio codec MCLK line
SAI3-TXC	SAI3-TXC	GPIO5-IO00	AG6	Audio codec BCLK line
SAI3-TXFS	SAI3-TXFS	GPIO4-IO31	AC6	Audio codec FS line
SAI3-TXD	SAI3-TXD	GPIO5-IO01	AF6	Audio codec DACIN line
SAI3-RXD	SAI3-RXD	GPIO4-IO30	AF7	Audio codec ADCOUT line
ENET-INT	ECSPI1-SCLK	GPIO5-IO06	D6	Ethernet PHY interrput
ENET-PHY-RESET	SAI1-TXD2	GPIO4-IO14	AG21	Ethernet PHY reset
ENET1-RXC	ENET1-RXC	GPIO1-IO25	AE26	Ethernet PHY
ENET1-RX-CTL	ENET1-RX-CTL	GPIO1-IO24	AF27	Ethernet PHY
ENET1-RXD3	ENET1-RXD3	GPIO1-IO29	AC26	Ethernet PHY
ENET1-RXD2	ENET1-RXD2	GPIO1-IO28	AD26	Ethernet PHY
ENET1-RXD1	ENET1-RXD1	GPIO1-IO27	AD27	Ethernet PHY
ENET1-RXD0	ENET1-RXD0	GPIO1-IO26	AE27	Ethernet PHY
ENET1-TXC	ENET1-TXC	GPIO1-IO23	AG24	Ethernet PHY
ENET1-TXD3	ENET1-TXD3	GPIO1-IO18	AF25	Ethernet PHY
ENET1-TXD2	ENET1-TXD2	GPIO1-IO19	AG25	Ethernet PHY
ENET1-TXD1	ENET1-TXD1	GPIO1-IO20	AF26	Ethernet PHY

ENET1-TXD0	ENET1-TXD0	GPIO1-IO21	AG26	Ethernet PHY
ENET1-TX-CTL	ENET1-TX-CTL	GPIO1-IO22	AF24	Ethernet PHY
ENET1-MDC	ENET1-MDC	GPIO1-IO16	AC27	Ethernet PHY
ENET1-MDIO	ENET1-MDIO	GPIO1-IO17	AB27	Ethernet PHY
SDIO-VSELECT	GPIO1-IO04	GPIO1-IO04	AG12	MicroSD card - NVCC-SD2 voltage selector 1.8/3.3V
SD2-CLK	SD2-CLK	GPIO2-IO13	W23	MicroSD card
SD2-CMD	SD2-CMD	GPIO2-IO14	W24	MicroSD card
SD2-DATA0	SD2-DATA0	GPIO2-IO15	AB23	MicroSD card
SD2-DATA1	SD2-DATA1	GPIO2-IO16	AB24	MicroSD card
SD2-DATA2	SD2-DATA2	GPIO2-IO17	V24	MicroSD card
SD2-DATA3	SD2-DATA3	GPIO2-IO18	V23	MicroSD card
SD2-CD	SD2-CD	GPIO2-IO12	AA26	MicroSD card

Audio codec and amplifiers

The TitanSBC-8Mmini is equipped with 24-bit audio codec (NAU88C22YG). The NAU88C22YG includes drivers for speaker, headphone, and differential or stereo line outputs, and integrates preamps for stereo differential microphones, significantly reducing external component requirements.

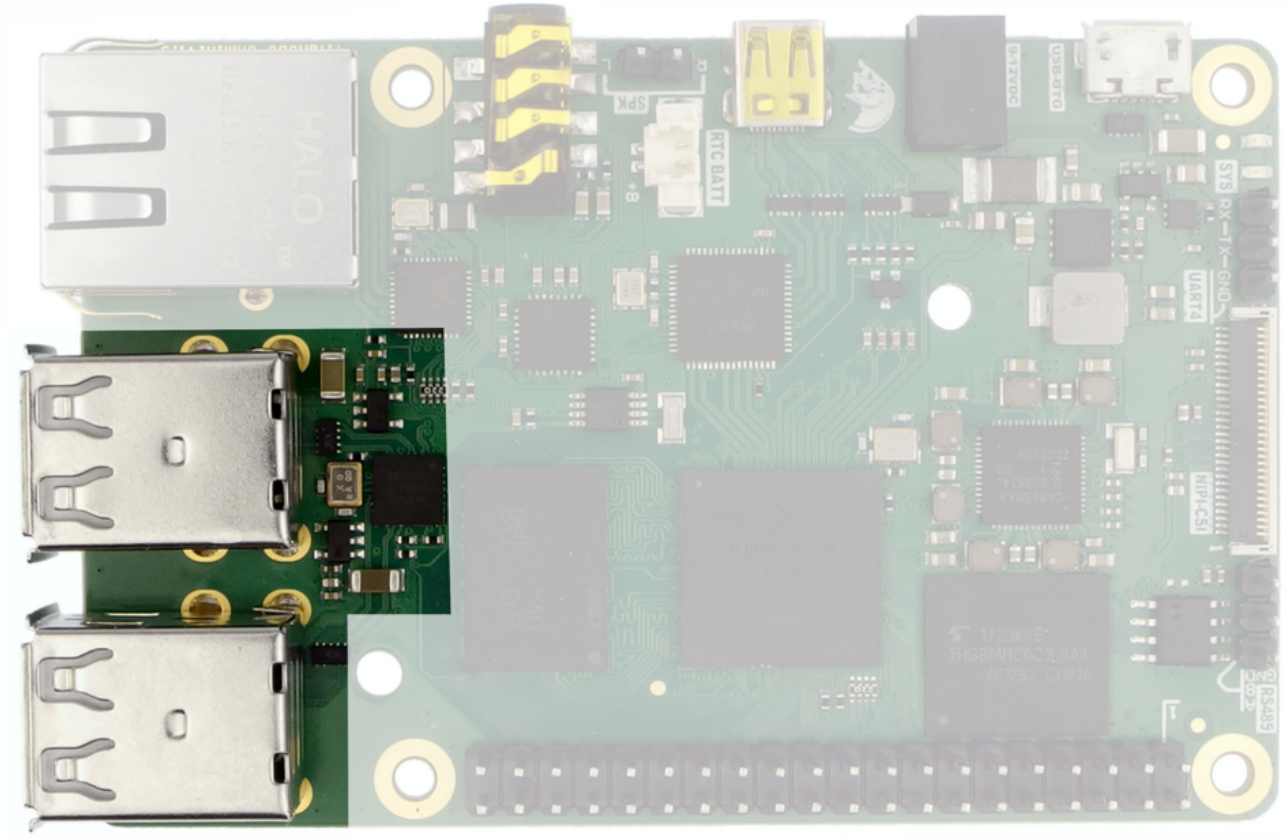


Default SBC function	Default pin name	GPIO	MPU ball number	Description
SAI3-MCLK	SAI3-MCLK	GPIO4-IO02	AD6	Audio codec MCLK line
SAI3-TXC	SAI3-TXC	GPIO5-IO00	AG6	Audio codec BCLK line
SAI3-TXFS	SAI3-TXFS	GPIO4-IO31	AC6	Audio codec FS line
SAI3-TXD	SAI3-TXD	GPIO5-IO01	AF6	Audio codec DACIN line
SAI3-RXD	SAI3-RXD	GPIO4-IO30	AF7	Audio codec ADCOUT line

Note:
1. Codec is configured with I2C1 MPU interface.

Hub USB

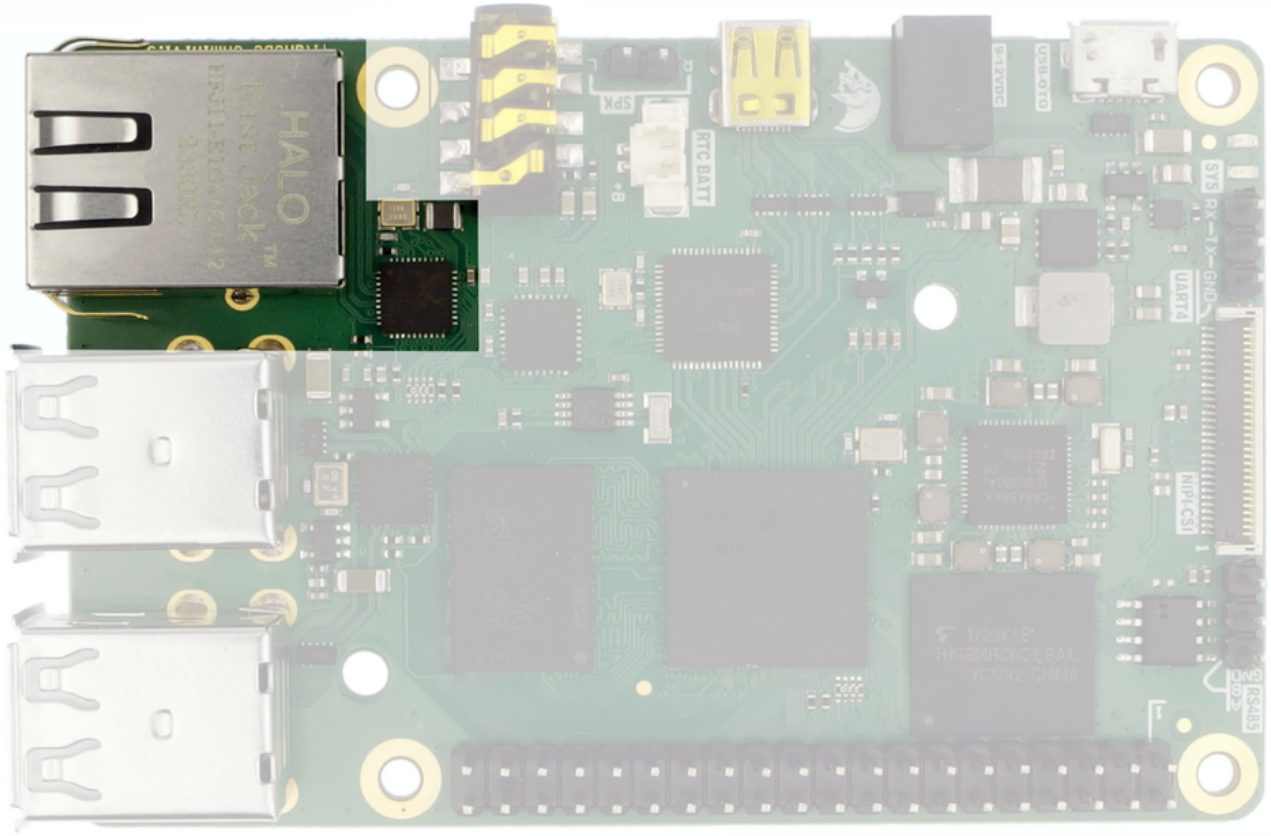
The TitanSBC-8Mmini is equipped with on-board 4 channel USB hub, based on GL852G MTT controller.



Default SBC function	Default pin name	GPIO	MPU ball number	Description
USB2-VBUS-EN	GPIO1-IO14	GPIO1-IO14	AC9	USB control line
USB2-VBUS-OC	GPIO1-IO15	GPIO1-IO15	AB9	USB control line
USB-RESET	SAI3-RXFS	GPIO4-IO28	AG8	USB hub reset

Ethernet interface

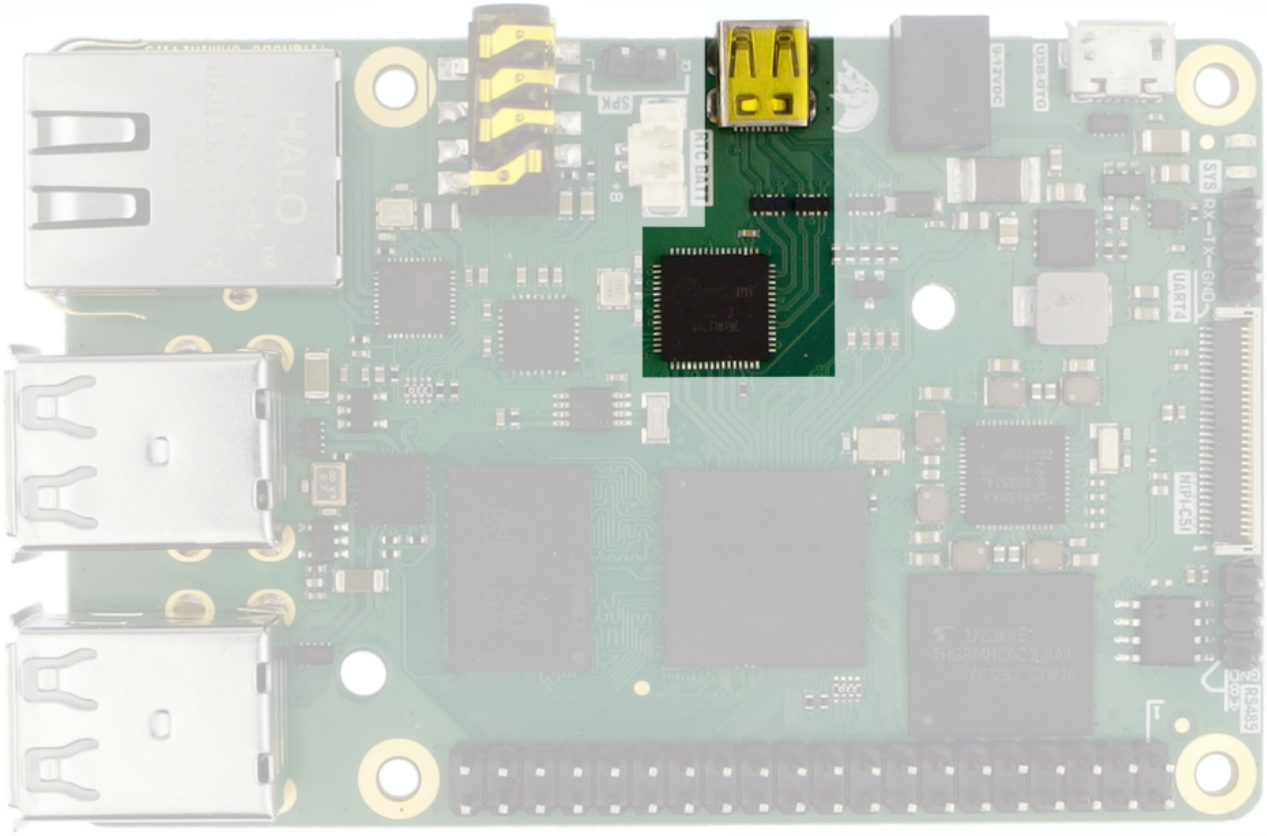
The TitanSBC-8Mmini is equipped with on-board 10/100/1000Mb/s Ethernet interface.



Default SBC function	Default pin name	GPIO	MPU ball number	Description
ENET-INT	ECSPI1-SCLK	GPIO5-IO06	D6	Ethernet PHY interrput
ENET-PHY-RESET	SAI1-TXD2	GPIO4-IO14	AG21	Ethernet PHY reset
ENET1-RXC	ENET1-RXC	GPIO1-IO25	AE26	Ethernet PHY
ENET1-RX-CTL	ENET1-RX-CTL	GPIO1-IO24	AF27	Ethernet PHY
ENET1-RXD3	ENET1-RXD3	GPIO1-IO29	AC26	Ethernet PHY
ENET1-RXD2	ENET1-RXD2	GPIO1-IO28	AD26	Ethernet PHY
ENET1-RXD1	ENET1-RXD1	GPIO1-IO27	AD27	Ethernet PHY
ENET1-RXD0	ENET1-RXD0	GPIO1-IO26	AE27	Ethernet PHY
ENET1-TXC	ENET1-TXC	GPIO1-IO23	AG24	Ethernet PHY
ENET1-TXD3	ENET1-TXD3	GPIO1-IO18	AF25	Ethernet PHY
ENET1-TXD2	ENET1-TXD2	GPIO1-IO19	AG25	Ethernet PHY
ENET1-TXD1	ENET1-TXD1	GPIO1-IO20	AF26	Ethernet PHY
ENET1-TXD0	ENET1-TXD0	GPIO1-IO21	AG26	Ethernet PHY
ENET1-TX-CTL	ENET1-TX-CTL	GPIO1-IO22	AF24	Ethernet PHY
ENET1-MDC	ENET1-MDC	GPIO1-IO16	AC27	Ethernet PHY
ENET1-MDIO	ENET1-MDIO	GPIO1-IO17	AB27	Ethernet PHY

HDMI output

The TitanSBC-8Mmini is equipped with on-board MIPI-DSI to HDMI converter.

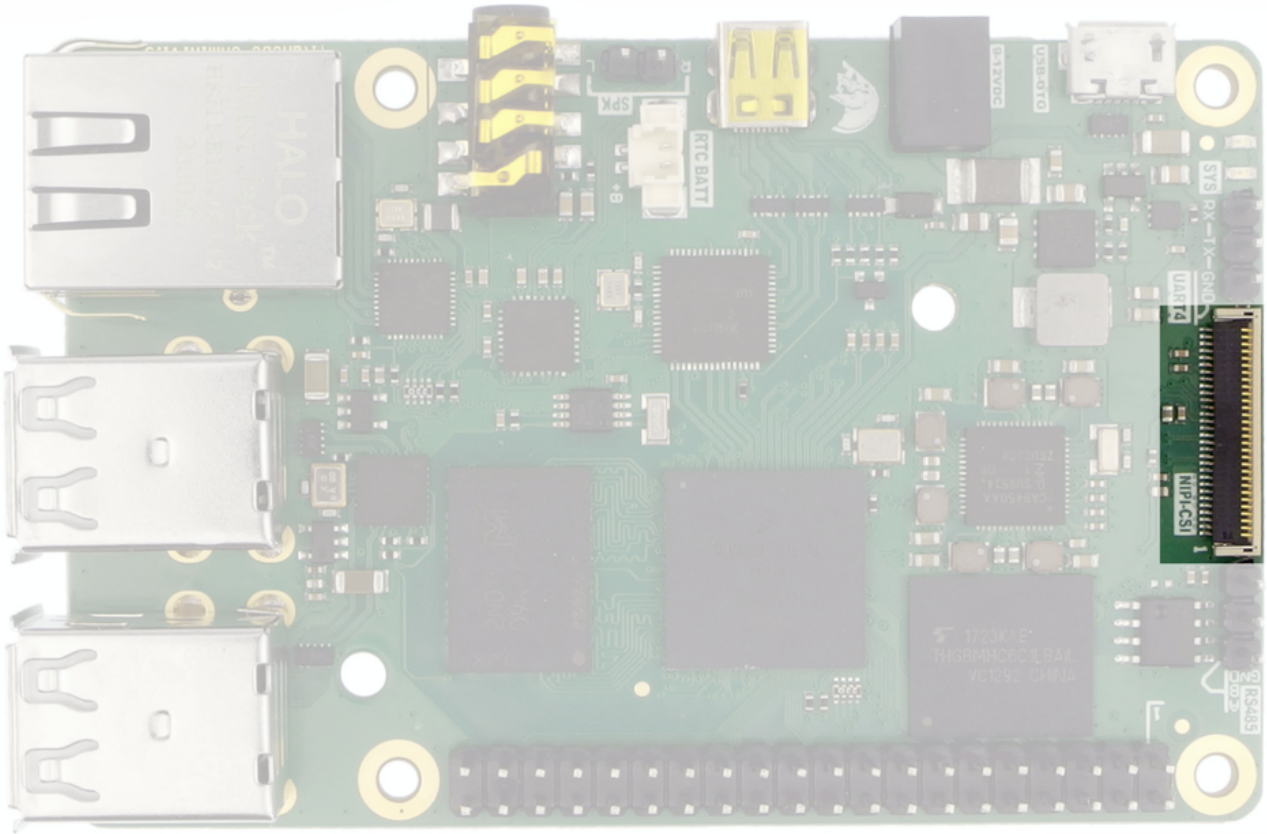


Default SBC function	Default pin name	GPIO	MPU ball number	Description
HDMI-DETECT	GPIO1-IO06	GPIO1-IO06	AG11	HDMI detect input
M2H-INT	GPIO1-IO07	GPIO1-IO07	AF11	HDMI interrupt
M2H-RESET	GPIO1-IO09	GPIO1-IO09	AF10	HDMI converter reset
SPDIF-TX	SPDIF-TX	GPIO5-IO03	AF9	HDMI audio output

Note:
1. HDMI converter (LT8912B) is configured with I2C1 MPU interface.

Camera input

The TitanSBC-8Mmini is equipped with on-board MIPI-CSI camera input. The MIPI-CSI connector is FPC30 type and is fully compatible with SL-MIPI-CSI-OV5640 SoMLabs camera module.



Default SBC function	Default pin name	GPIO	MPU ball number	Description
CAM-GPIO0	SD1-CLK	GPIO2-IO00	V26	MIPI-CSI auxiliary line
CAM-GPIO1	SD1-CMD	GPIO2-IO01	V27	MIPI-CSI auxiliary line

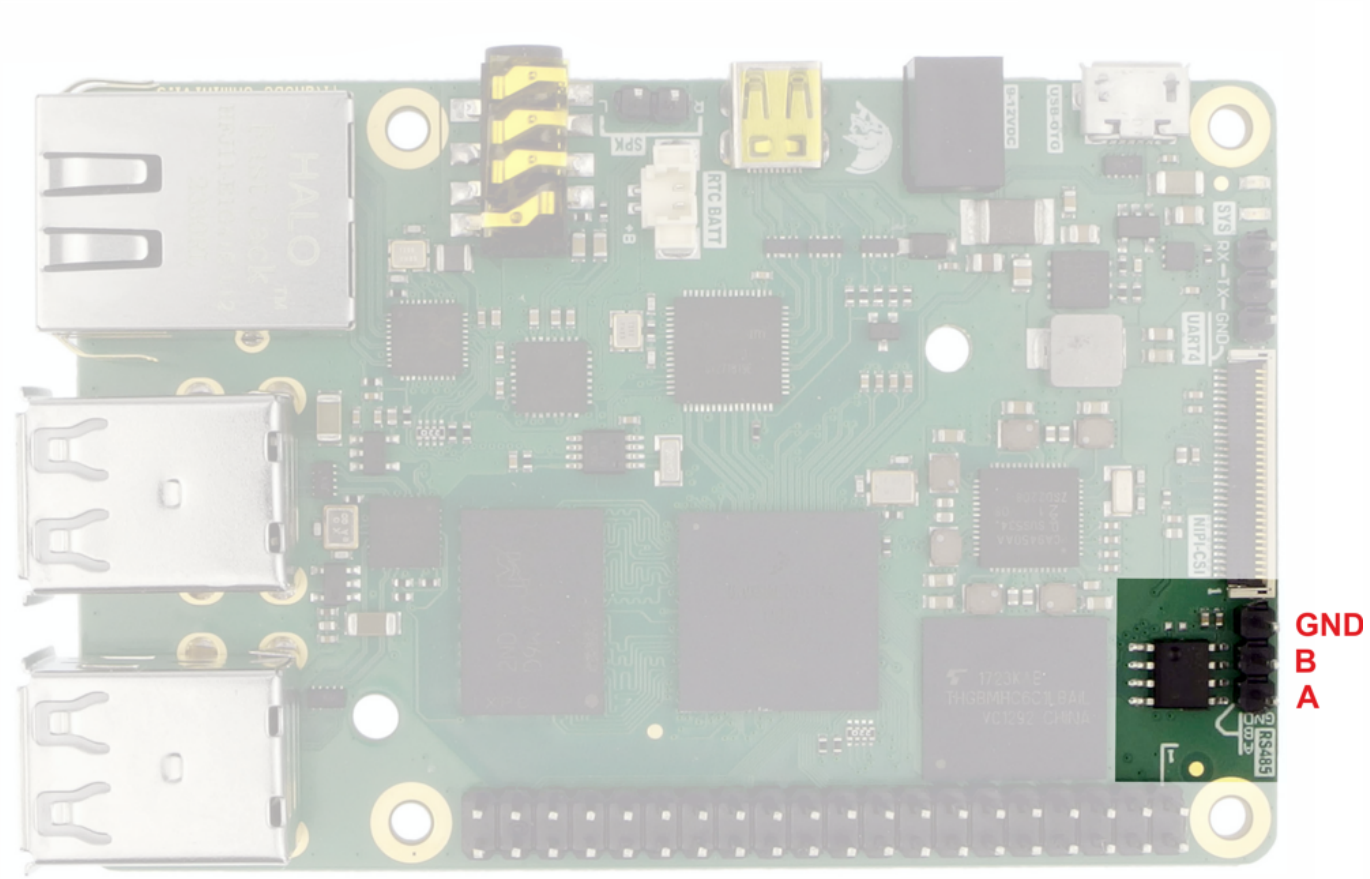
Connector pin number	Function
1	GND
2	CSI-CLK_p
3	CSI-CLK_n
4	GND
5	CSI-DATA0_p
6	CSI-DATA0_n
7	GND
8	CSI-DATA1_p
9	CSI-DATA1_n
10	GND
11	CSI-DATA2_p
12	CSI-DATA2_n

13	GND
14	CSI-DATA3_p
15	CSI-DATA3_n
16	GND
17	I2C-33-SCL (I2C1)
18	I2C-33-SDA (I2C1)
19	GND
20	CAM-GPIO0
21	CAM-GPIO1
22	-
23	GND
24	3.3V
25	3.3V
26	5.0V
27	5.0V
28	-
29	-
30	GND

Note:
1. External camera module is configured with I2C1 MPU interface.
2. MIPI-CSI data and clock lines are swapped (P/N).This must be reflected in driver. MIPI-CSI PHY supports data/clock lane polarity swap via register settings.

RS-485 interface

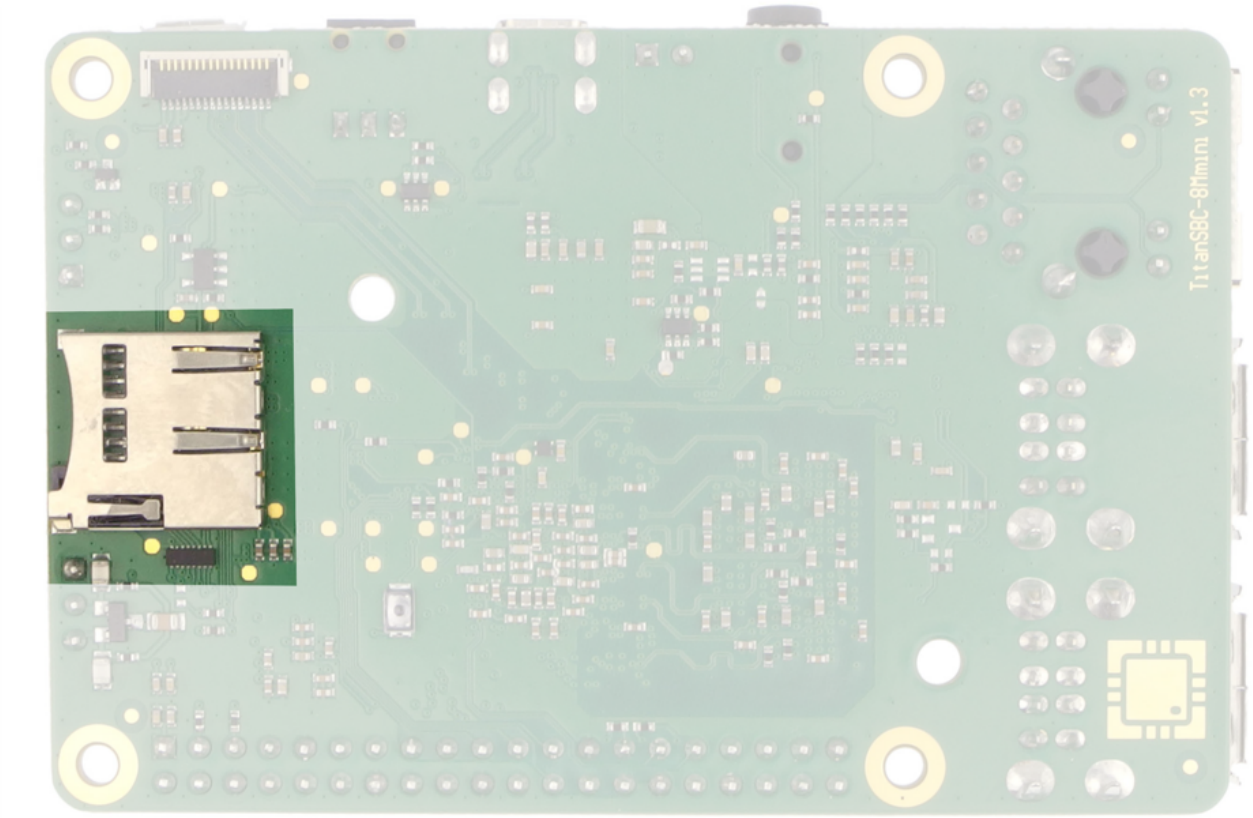
The TitanSBC-8Mmini is equipped with RS-485 half-duplex transceiver (MAX3485CSA or compatible).



Default SBC function	Default pin name	GPIO	MPU ball number	Description
UART3-TXEN	SAI1-TXD4	GPIO4-IO16	AG22	RS485 (DE in MAX3485)
UART3-RXD	UART3-RXD	GPIO5-IO26	E18	RS485
UART3-TXD	UART3-TXD	GPIO5-IO27	D18	RS485

MicroSD card connector

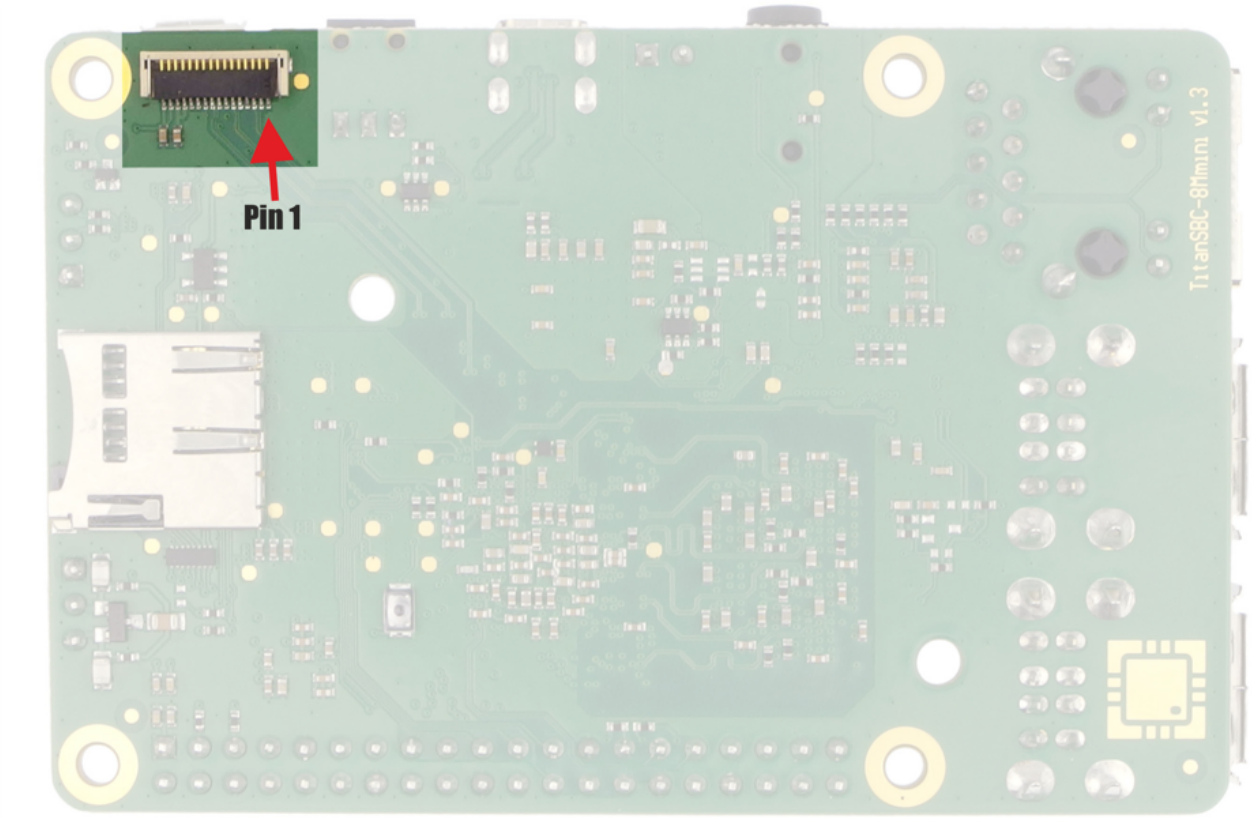
The TitanSBC-8Mmini is equipped with MicroSD card connector (mounted on the bottom side of the board), connected to SDHC2 channel of MPU.
The power supply voltage of MicroSD card can be selected: 1.8V or 3.3V with SDIO-VSELECT line.



Default SBC function	Default pin name	GPIO	MPU ball number	Description
SDIO-VSELECT	GPIO1-IO04	GPIO1-IO04	AG12	MicroSD card - NVCC-SD2 voltage selector 1.8/3.3V
SD2-CLK	SD2-CLK	GPIO2-IO13	W23	MicroSD card
SD2-CMD	SD2-CMD	GPIO2-IO14	W24	MicroSD card
SD2-DATA0	SD2-DATA0	GPIO2-IO15	AB23	MicroSD card
SD2-DATA1	SD2-DATA1	GPIO2-IO16	AB24	MicroSD card
SD2-DATA2	SD2-DATA2	GPIO2-IO17	V24	MicroSD card
SD2-DATA3	SD2-DATA3	GPIO2-IO18	V23	MicroSD card
SD2-CD	SD2-CD	GPIO2-IO12	AA26	MicroSD card

PCIe connector

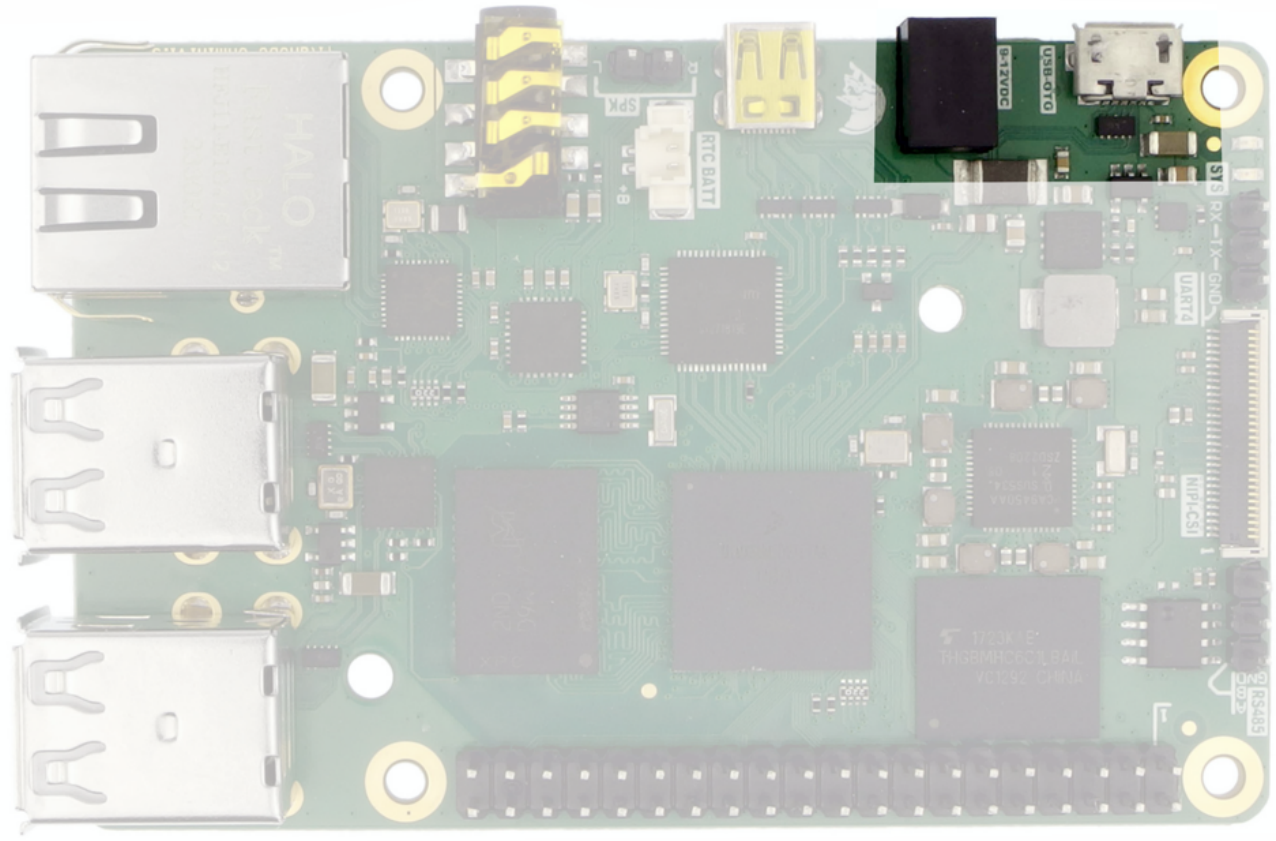
The TitanSBC-8Mmini is equipped with PCIe connector (mounted on the bottom side of the board). The connector is FPC16 type, compatible with SoMLabs SL-ADP-PCIe-M2 adapter (M.2 key M to PCIe adapter compatible with 2242, 2260 and 2280 modules equipped with single lane interface).



Connector pin number	Function
1	GND
2	PCIE-RXN_p
3	PCIE-RXN_n
4	GND
5	PCIE-TXN_p
6	PCIE-TXN_n
7	GND
8	PCIE-CLK_p
9	PCIE-CLK_n
10	GND
11	I2C-33-SCL (I2C1)
12	I2C-33-SDA (I2C1)
13	3.3V
14	3.3V
15	5.0V
16	5.0V

Note:
1. PCIe module can be configured with I2C1 (I2C-33-SDA/-SCL) MPU interface.
2. Lines PCIE-CLK_n/_p and PCIE-TXN_n/_p are separated on-board with 100nF capacitors.
3. Lines of I2C1 interface are pull-uped with 4.7k resistors.

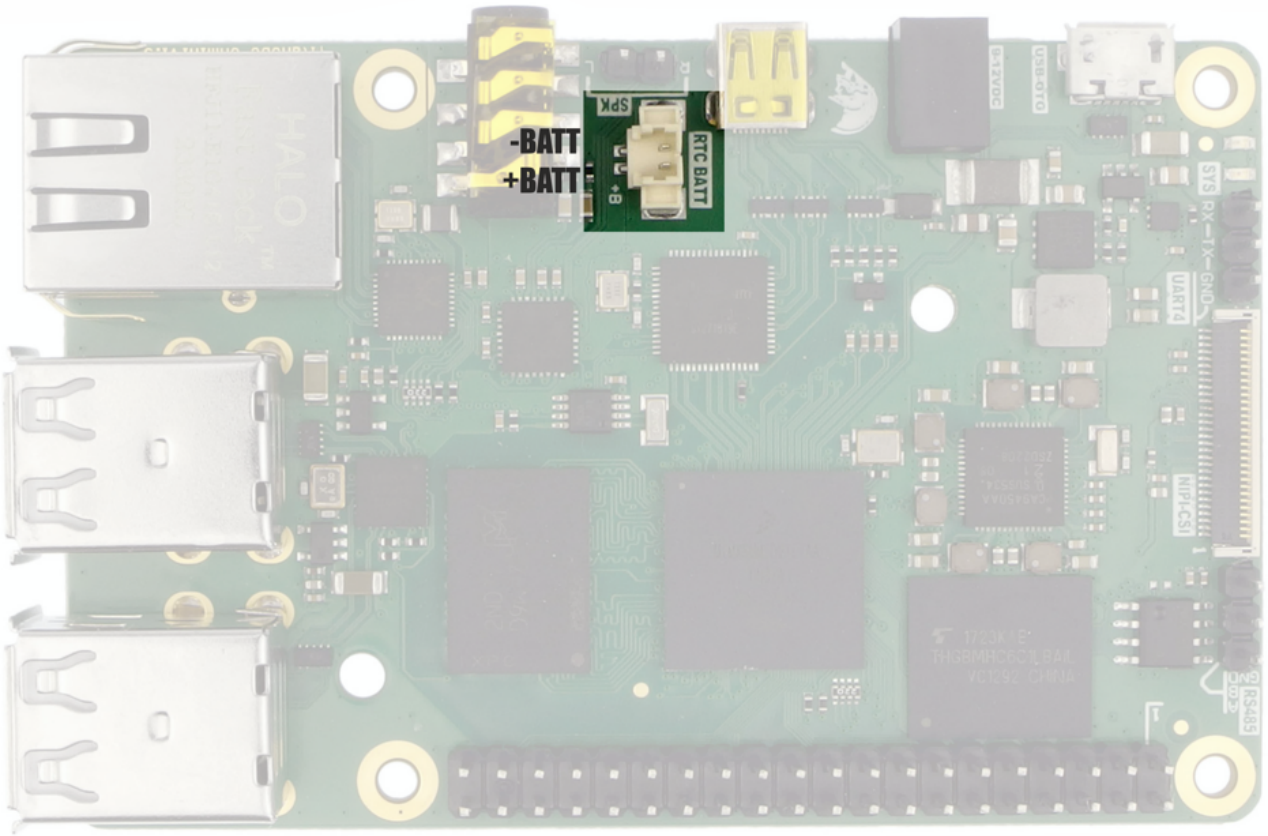
Power supply



The TitanSBC-8Mmini has two alternative power supply ports: 9-12VDC (power-jack connector, Wuerth Elektronik 694103304002, 1.35 mm) or 5VDC (USB-OTG).

RTC and external battery connection

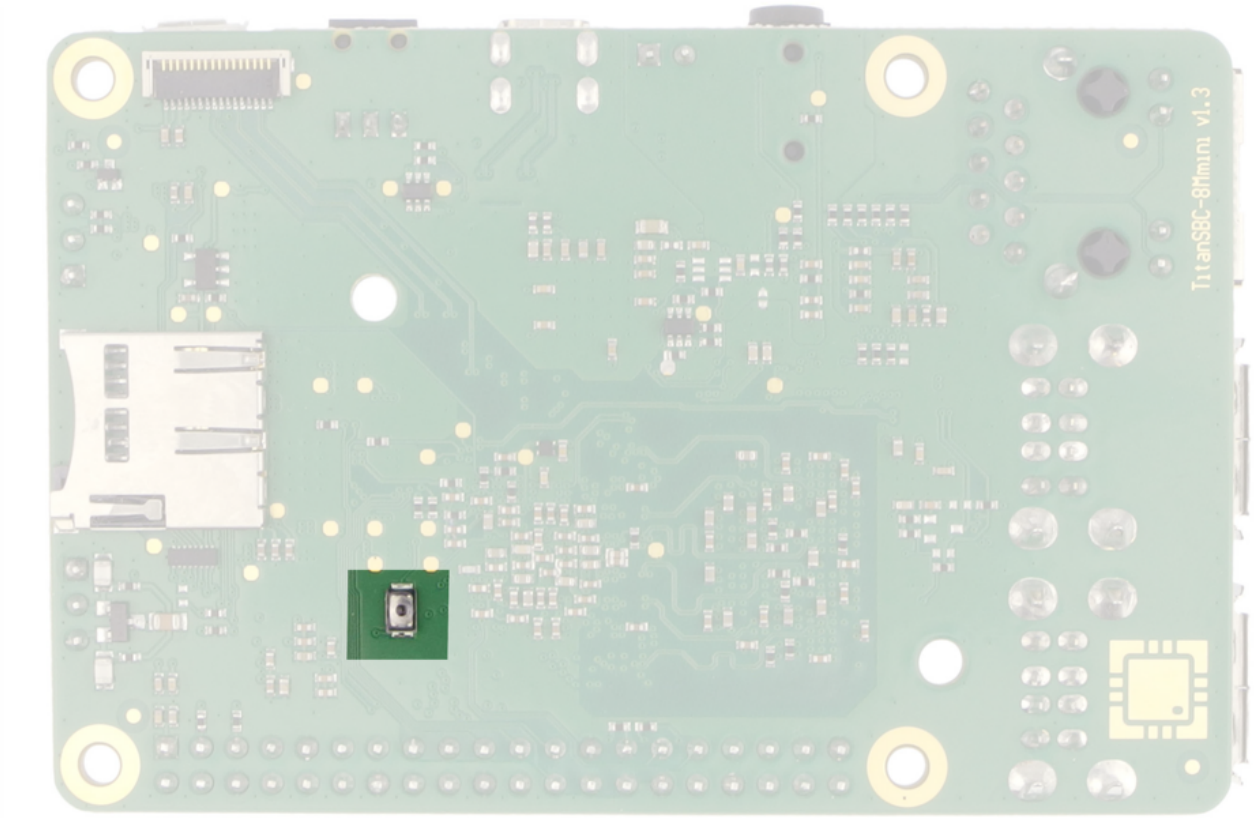
The TitanSBC-8Mmini is equipped with RTC (PCF85263ATT) connected to I2C1 MPU interface (I2C-33-SCL/-SDA).
The value of the V_{BATT} voltage should be in range 2.66-3.6V.



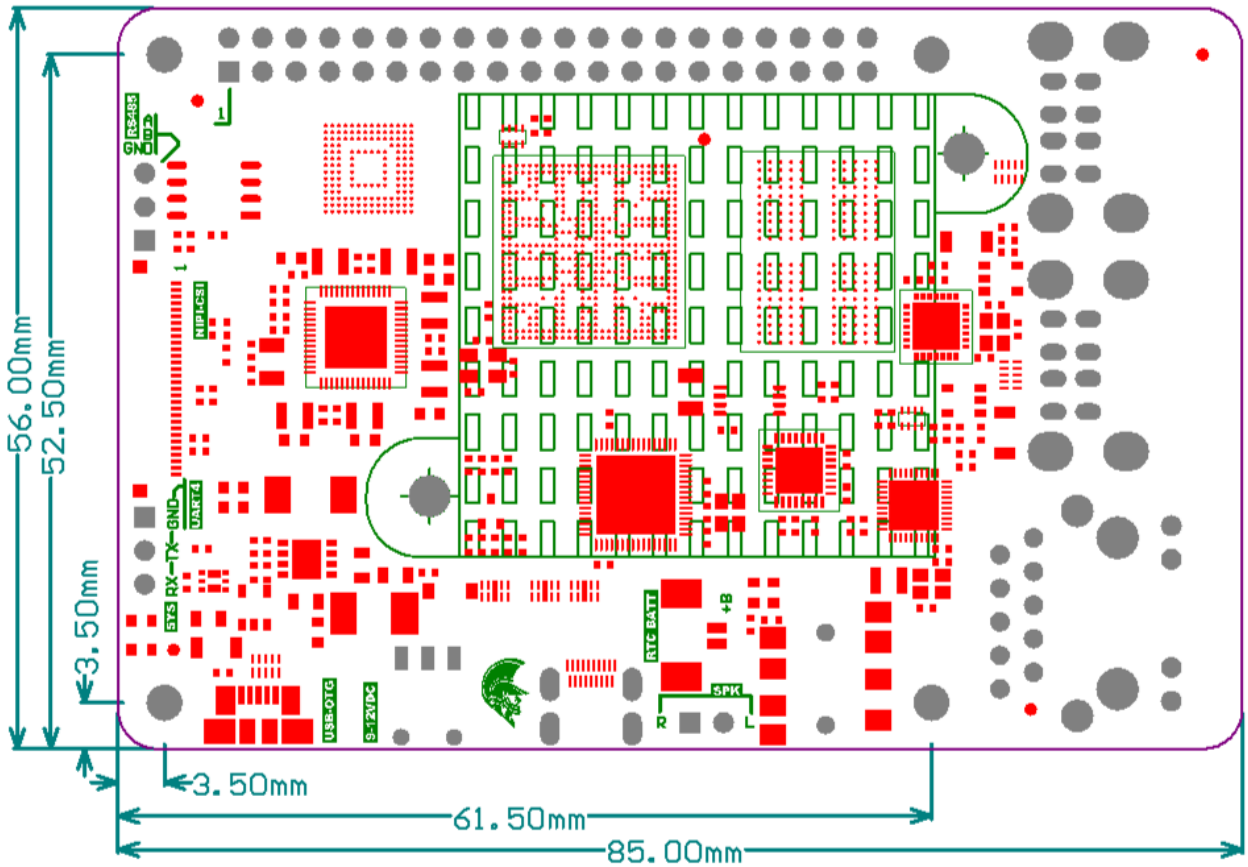
Default SBC function	Default pin name	GPIO	MPU ball number	Description
RTC-INT	SAI3-RXC	GPIO4-IO29	AG7	RTC interrupt
I2C-33-SCL	I2C1-SCL	GPIO5-IO14	E9	RTC, audio codec, HDMI-DDC, PCIe, MIPI-CSI
I2C-33-SDA	I2C1-SDA	GPIO5-IO15	F9	RTC, audio codec, HDMI-DDC, PCIe, MIPI-CSI

RECOVERY pushbutton

The TitanSBC-8Mmini is equipped with pushbutton that forces the system to start procedure of downloading the image to the Flash memory mode after system reset.



Dimensions



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