



# User's Manual

## VOX-090-TS-N8M

NXP i.MX 8M Mini

Open Frame Panel PC with 9" TFT LCD and Touch Panels

(Revision V1.0)

# REVISION

| DATE       | VERSION     | DESCRIPTION |
|------------|-------------|-------------|
| 2024/08/01 | Version 1.0 | New Release |

ICOP TECHNOLOGY INC.

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Manual # IUMVOX-090-TS-N8M Ver. 1.0 Aug, 2024

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This Manual is for the VOX-090-TS-N8M.

## SAFETY INFORMATION

- Read these Safety instructions carefully.
- Please carry the unit with both hands, handle carefully.
- Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
- Do not expose your Open Frame Panel PC to rain or moisture in order to prevent shock and fire hazard.
- Input voltage rated +12 ~ 36 VDC
- Operating temperature between 0~60°C / -20~+70°C (Option).
- Keep VOX-090-TS-N8M away from humidity.
- Never touch un-insulated terminals or wire unless your power adaptor is disconnected.
- Locate your Open Frame Panel PC as close as possible to the socket outline for easy access and to avoid force caused by entangling of your arms with surrounding cables from the Open Frame Panel PC.
- USB connectors are not supplied with Limited Power Sources.
- If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.

### **WARNING!**



*DO NOT ATTEMPT TO DISASSEMBLE THE CPU Module or CHASSIS (ENCASING) OF THIS PRODUCT. PLEASE CONTACT YOUR DEALER FOR SERVICING FROM QUALIFIED TECHNICIAN.*

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# Ch. 1

## General Information

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[1.2 Product Specifications](#)

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# 1.1 Product Description

ICOP Technology Inc. is proudly going to release a brand new open frame Panel PC, which offers fanless design and low power consumption. The VOX-090-TS-N8M is powered by NXP i.MX 8M Mini, the Quad-Core Cortex-A53 of ARM based processor, and 2GB/4GB LPDDR4 chipset that handles processing more efficiently and provides faster performance. The high LED backlight TFT LCD increases operation convenience and visibility in outdoor environments. The ultra-compact and thin exterior design is perfect for the present demanding embedded and productive applications.

The new VOX-090-TS-N8M includes the versatile I/O ports, Gigabit Ethernet, and support WLAN, etc. can fulfill fundamental functions. Our consistent advantages feature stable performance, extended working temperature support, low power consumption and fanless design. The expandable customize I/O ports by MiniPCIe slot can be accommodated connectivity requirements to industrial machine platforms and industrial automation equipment's needs.

The VOX-090-TS-N8M supports Yocto Linux and Anroid to meet ready-to-market demand and provide competitive advantages for customer.

## 1.2 Product Specifications

### CPU BOARD SPECIFICATIONS

|                 |                                                                                                                                        |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------|
| CPU             | NXP i.MX 8M Mini-1.6GHz Cortex-A53 Quad Core                                                                                           |
| Cache           | L2: 512KB Cache                                                                                                                        |
| Memory          | 2GB / 4GB LPDDR4 onboard                                                                                                               |
| Watchdog Timer  | Support 3 Watchdog Timer                                                                                                               |
| LAN             | Integrated Gigabit Ethernet                                                                                                            |
| Audio           | High Definition Audio                                                                                                                  |
| Internal Drives | 16GB / 64GB of eMMC onboard<br>Micro SD slot (Like a card reader only)                                                                 |
| Expansion       | MiniPCle Slot with Micro SIM Card Holder                                                                                               |
| I/O             | USB2.0 x2<br>COM x1 (RS232/RS485)<br>RJ-45 Port x1<br>Audio Line-out x1<br>WLAN & BT x1 <b>(Option)</b><br>Software Programing Port x1 |

### MECHANICAL & ENVIRONMENT

|                       |                                            |
|-----------------------|--------------------------------------------|
| Power Requirement     | +12 ~ 36VDC Input                          |
| Power Consumption     | 8Watt (Typical)                            |
| Operating Temperature | 0~60°C / -20~+70°C <b>(Option)</b>         |
| Storage Temperature   | -30~+80°C                                  |
| Operating Humidity    | 0% ~ 90% Relative Humidity, Non-Condensing |
| Dimensions            | 186 x 121.05 x 38.15mm                     |



|        |      |
|--------|------|
| Weight | 530g |
|--------|------|

## LCD SPECIFICATIONS

|                                 |                                |
|---------------------------------|--------------------------------|
| Display Type                    | 9" WVGA TFT LCD                |
| Backlight Unit                  | LED                            |
| Display Resolution              | 1024(W) x 600(H)               |
| Brightness (cd/m <sup>2</sup> ) | 300 nits                       |
| Contrast Ratio                  | 500 : 1                        |
| Display Color                   | 16.2M                          |
| Active Area (mm)                | 196.61 (W) x 114.15 (H)        |
| Viewing Angle                   | Vertical 120°, Horizontal 140° |
| Backlight Lifetime              | 20,000 hrs                     |

## 1.3 Inspection standard for TFT-LCD Panel

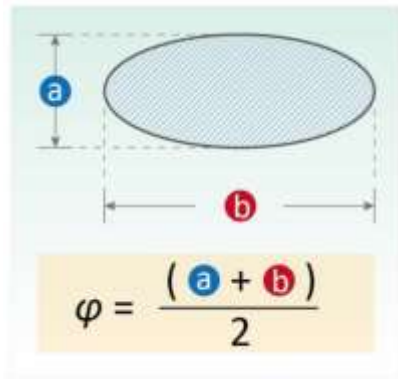
| DEFECT TYPE       |                            |                  | LIMIT                                                    |                         |                         |                         |                         | Note                    |       |
|-------------------|----------------------------|------------------|----------------------------------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------|
| VISUAL DEFECT     | INTERNAL                   | SPOT             | $\varphi < 0.15\text{mm}$                                |                         |                         | Ignore                  |                         | Note1                   |       |
|                   |                            |                  | $0.15\text{mm} \leq \varphi \leq 0.5\text{mm}$           |                         |                         | $N \leq 4$              |                         |                         |       |
|                   |                            |                  | $0.5\text{mm} < \varphi$                                 |                         |                         | $N=0$                   |                         |                         |       |
|                   |                            | FIBER            | $0.03\text{mm} < W \leq 0.1\text{mm}, L \leq 5\text{mm}$ |                         |                         | $N \leq 3$              |                         | Note1                   |       |
|                   |                            |                  | $1.0\text{mm} < W, 1.5\text{mm} < L$                     |                         |                         | $N=0$                   |                         |                         |       |
|                   |                            | POLARIZER BUBBLE | $\varphi < 0.15\text{mm}$                                |                         |                         | Ignore                  |                         | Note1                   |       |
|                   |                            |                  | $0.15\text{mm} \leq \varphi \leq 0.5\text{mm}$           |                         |                         | $N \leq 2$              |                         |                         |       |
|                   |                            |                  | $0.5\text{mm} < \varphi$                                 |                         |                         | $N=0$                   |                         |                         |       |
|                   |                            | Mura             | It' OK if mura is slight visible through 6%ND filter     |                         |                         |                         |                         |                         |       |
| ELECTRICAL DEFECT | BRIGHT DOT                 |                  | A Grade                                                  |                         |                         | B Grade                 |                         |                         |       |
|                   |                            |                  | C Area                                                   | O Area                  | Total                   | C Area                  | O Area                  | Total                   | Note3 |
|                   |                            |                  | $N \leq 0$                                               | $N \leq 2$              | $N \leq 2$              | $N \leq 2$              | $N \leq 3$              | $N \leq 5$              | Note2 |
|                   | DARK DOT                   |                  | $N \leq 2$                                               | $N \leq 3$              | $N \leq 3$              | $N \leq 3$              | $N \leq 5$              | $N \leq 8$              |       |
|                   | TOTAL DOT                  |                  | $N \leq 4$                                               |                         |                         | $N \leq 5$              | $N \leq 6$              | $N \leq 8$              | Note2 |
|                   | TWO ADJACENT DOT           |                  | $N \leq 0$                                               | $N \leq 1 \text{ pair}$ | $N \leq 1 \text{ pair}$ | $N \leq 1 \text{ pair}$ | $N \leq 1 \text{ pair}$ | $N \leq 1 \text{ pair}$ | Note4 |
|                   | THREE OR MORE ADJACENT DOT |                  | NOT ALLOWED                                              |                         |                         |                         |                         |                         |       |
|                   | LINE DEFECT                |                  | NOT ALLOWED                                              |                         |                         |                         |                         |                         |       |

(1) One pixel consists of 3 sub-pixels, including R, G, and B dot. (Sub-pixel = Dot)

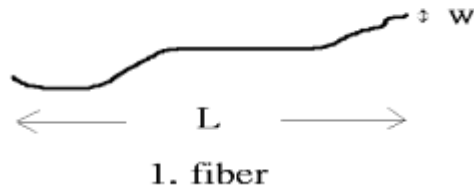
(2) Little bright Dot acceptable under 6% ND-Filter.

**(3) If require G0 grand (Total dot  $N \leq 0$ ), please contact region sales.**

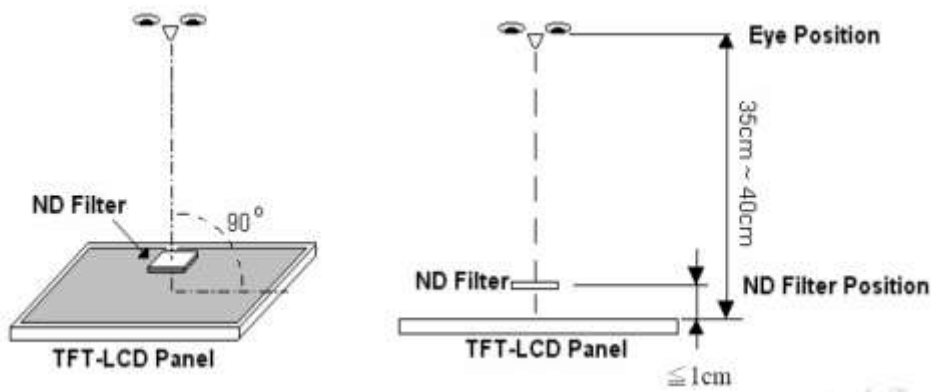
[ **Note 1** ] W: Width[mm]; L: Length[mm]; N: Number;  $\phi$ : Average Diameter.



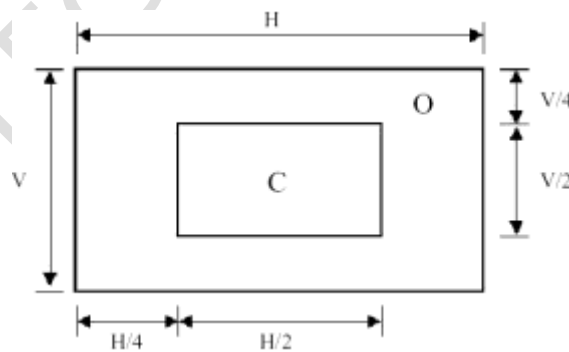
(a) White / Black Spot    (b) Polarizer Bubble



[ **Note 2** ] Bright dot is defined through 6% transmission ND Filter as following.

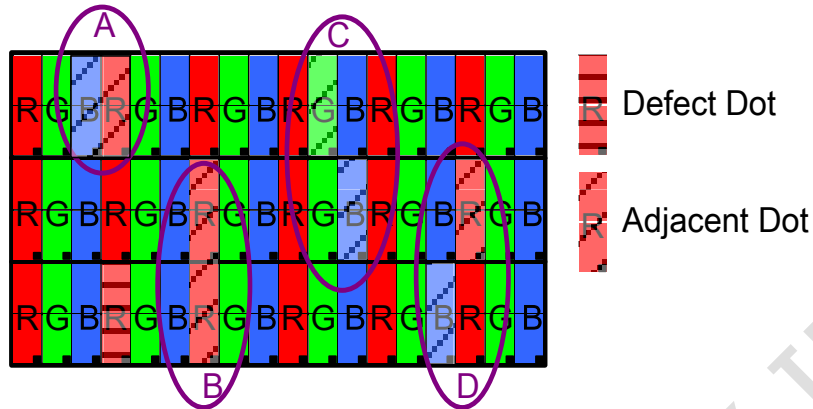


[ **Note 3** ] Display area



**C Area:** Center of display area    **O Area:** Outer of display area

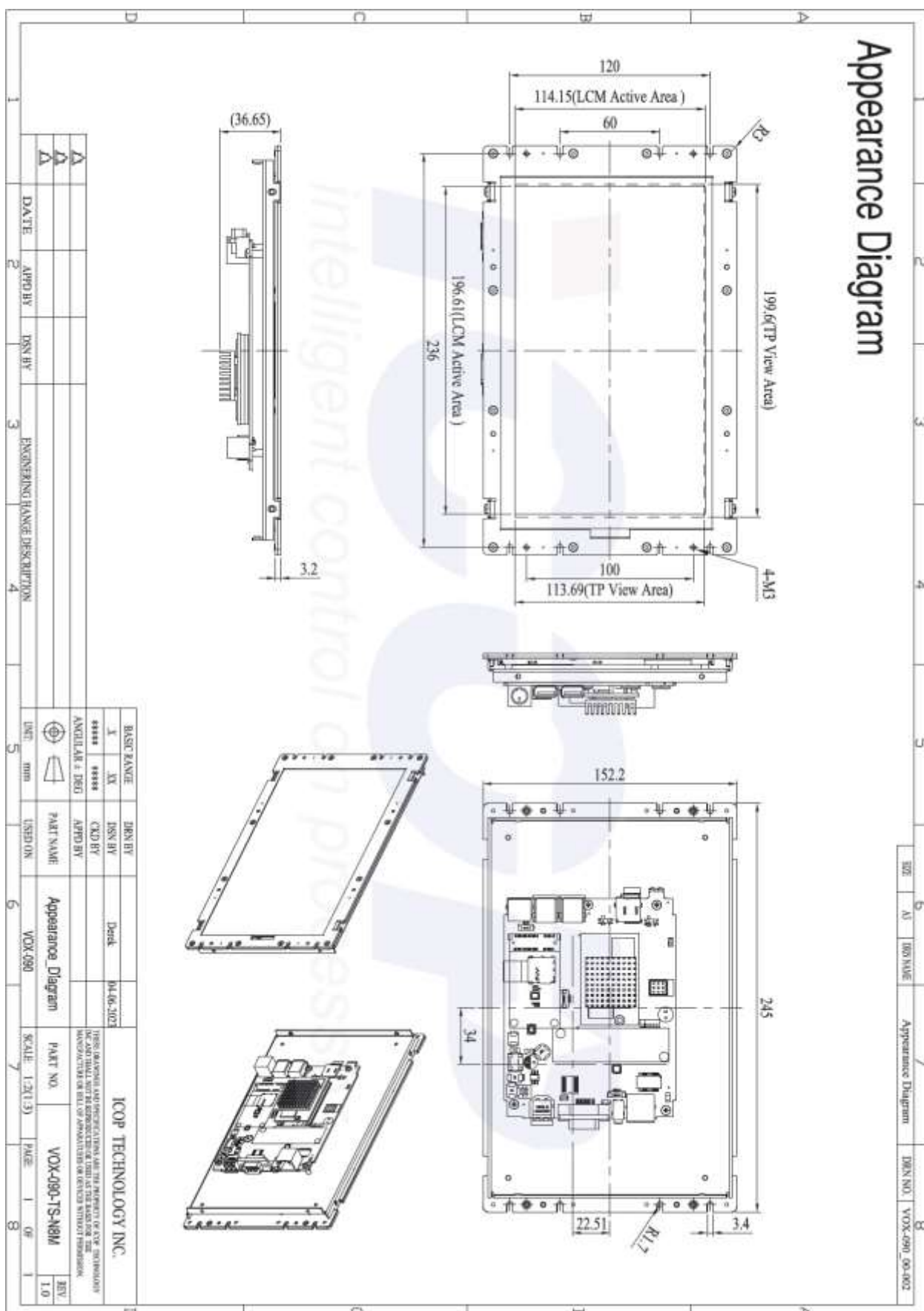
**[ Note 4 ]** Judge the defect dot and the adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dark adjacent dot. And they will be counted 2 defect dots in total quantity.



The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

## 1.4 Product Dimensions



## 1.5 Ordering Information

| PART NUMBER                                            | DESCRIPTION                                                                                                                                                                |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>VOX-090-TS-N8M-N5GM</b>                             | 9" OP w/iMX8M Mini /2GB DRAM /16GB eMMC<br>Onboard /2U /1S /GLAN /MiniPCle /MicroSD<br>/Line-out /+12~36V Input                                                            |
| <b>VOX-090-TS-N8M-B5GM</b>                             | 9" OP w/iMX8M Mini /2GB DRAM /16GB eMMC<br>Onboard /2U /1S /GLAN /MiniPCle /MicroSD<br>/Line-out / <b>WLAN&amp;BT</b> /+12~36V Input                                       |
| <b>VOX-090-TS-N8M-N5GMI</b>                            | 9" OP w/iMX8M Mini /2GB DRAM /16GB eMMC<br>Onboard /2U /1S /GLAN /MiniPCle /MicroSD<br>/Line-out /+12~36V Input <b>-20°C to +70°C</b>                                      |
| <b>VOX-090-TS-N8M-B5GMI</b>                            | 9" OP w/iMX8M Mini /2GB DRAM /16GB eMMC<br>Onboard /2U /1S /GLAN /MiniPCle /MicroSD<br>/Line-out / <b>WLAN&amp;BT</b> /+12~36V Input <b>-20°C to +70°C</b>                 |
| <b>VOX-090-TS-N8M-N6HM</b><br><b>(Build To Order)</b>  | 9" OP w/iMX8M Mini / <b>4GB</b> DRAM / <b>64GB</b> eMMC<br>Onboard /2U /1S /GLAN /MiniPCle /MicroSD<br>/Line-out /+12~36V Input                                            |
| <b>VOX-090-TS-N8M-B6HM</b><br><b>(Build To Order)</b>  | 9" OP w/iMX8M Mini / <b>4GB</b> DRAM / <b>64GB</b> eMMC<br>Onboard /2U /1S /GLAN /MiniPCle /MicroSD<br>/Line-out / <b>WLAN&amp;BT</b> /+12~36V Input                       |
| <b>VOX-090-TS-N8M-N6HMI</b><br><b>(Build To Order)</b> | 9" OP w/iMX8M Mini / <b>4GB</b> DRAM / <b>64GB</b> eMMC<br>Onboard /2U /1S /GLAN /MiniPCle /MicroSD<br>/Line-out /+12~36V Input <b>-20°C to +70°C</b>                      |
| <b>VOX-090-TS-N8M-B6HMI</b><br><b>(Build To Order)</b> | 9" OP w/iMX8M Mini / <b>4GB</b> DRAM / <b>64GB</b> eMMC<br>Onboard /2U /1S /GLAN /MiniPCle /MicroSD<br>/Line-out / <b>WLAN&amp;BT</b> /+12~36V Input <b>-20°C to +70°C</b> |
| <b>CABLE-MINIDIN8P-30</b>                              | Software Programming Cable<br><br>for VOX-090-TS-N8M Series                                                                                                                |

# Ch. 2

## System Installation

[2.1 CPU Board Outline](#)

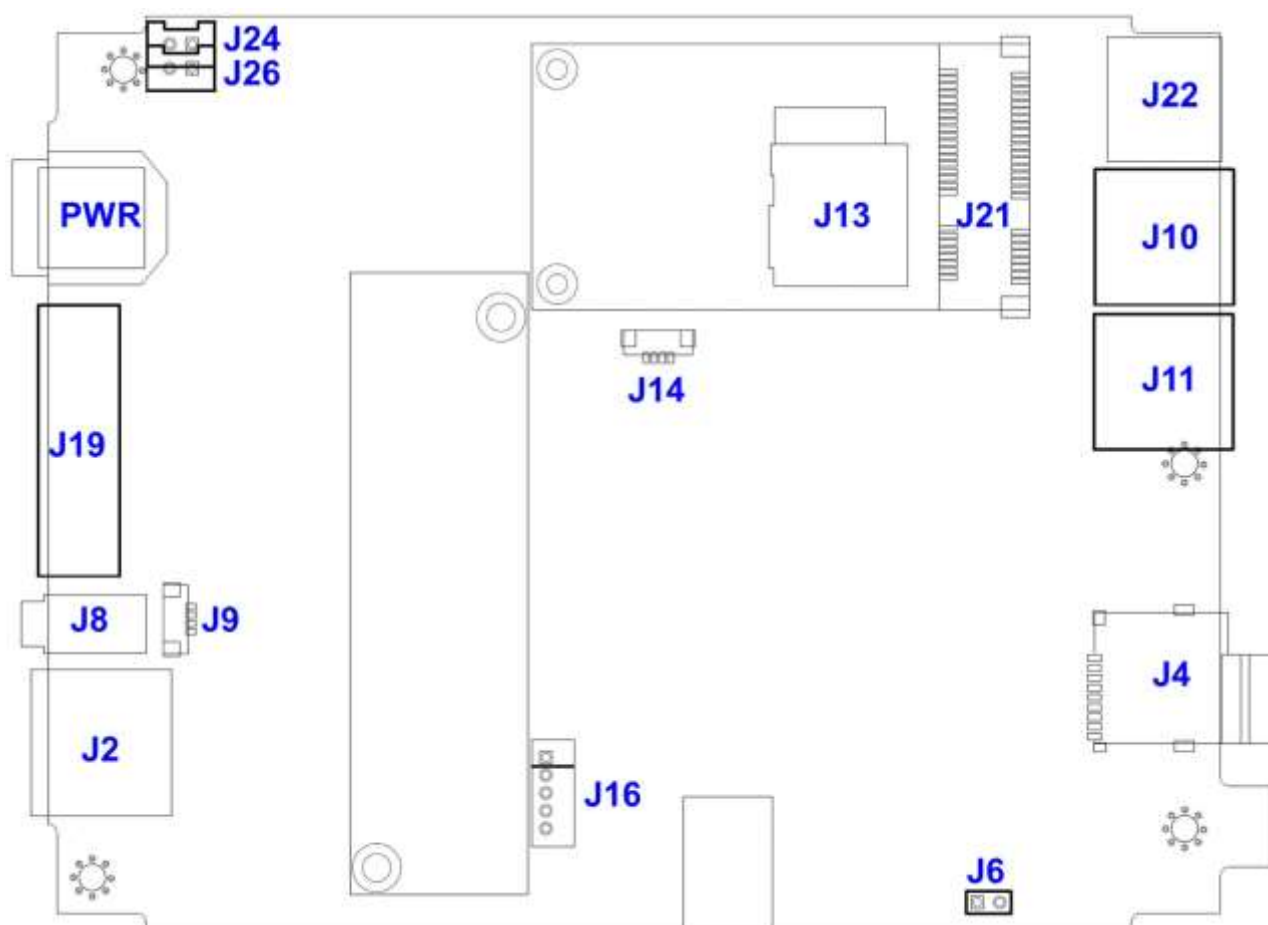
[2.2 Connector Summary](#)

[2.3 Connector Pin Assignments](#)

[2.4 Boot Mode And Pin Mux Settings](#)

[2.5 External I/O Overview](#)

## 2.1 CPU Board Outline



CPU Board



## 2.2 Connector Summary

| No. | Description                                                  | Type of Connections   | Pin #  |
|-----|--------------------------------------------------------------|-----------------------|--------|
| J2  | Ethernet                                                     | RJ45 Connector        | 8-pin  |
| J4  | Micro SD Card Socket                                         | Micro SD Socket       | 9-pin  |
| J6  | Enable RS232/RS485                                           | 2.54mm 2-pin header   | 2-pin  |
| J8  | Audio Line-out                                               | 1.25mm Phone Jack     | 5-pin  |
| J9  | Audio Mic-in <b>(Reserved)</b>                               | 1.25mm 4-pin wafer    | 4-pin  |
| J10 | USB 2.0                                                      | USB 2.0 Connector     | 6-pin  |
| J11 | USB 2.0                                                      | USB 2.0 Connector     | 6-pin  |
| J13 | Micro SIM Card Holder                                        | Micro SIM Card Holder | 4-pin  |
| J14 | I2C<br><b>(For External Gamma Firmware Programming Only)</b> | 1.25mm 4-pin wafer    | 4-pin  |
| J16 | USB 2.0<br><b>(For USB Touch Controller or Reserved)</b>     | 2.00mm 5-pin wafer    | 5-pin  |
| J19 | COM1 (RS232/RS485)                                           | D-Sub Male Connector  | 9-pin  |
| J21 | Mini-PCle                                                    | Mini-PCle Socket      | 52-pin |
| J22 | Software Programming Port<br><b>(Reserved)</b>               | Mini DIN Socket       | 8-pin  |
| J24 | SW1 Power Switch (8A)                                        | 2.54mm 2-pin wafer    | 2-pin  |
| J26 | SW2 Power Switch (5A)                                        | 2.54mm 2-pin wafer    | 2-pin  |
| PWR | Power Connector (5A)                                         | Mini DIN Socket       | 3-pin  |
| PWR | Power Connector (8A)                                         | Power Plug            | 2-pin  |

## 2.3 Connector Pin Assignments

### J2: RJ45

| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | BI-DA+      | 2     | BI_DA-      |
| 3     | BI_DB+      | 4     | BI_DC+      |
| 5     | BI_DC-      | 6     | BI_DB-      |
| 7     | BI_DD+      | 8     | BI_DD-      |

### J4: Micro SD Card Socket

| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | DAT2        | 2     | DAT3-       |
| 3     | CMD         | 4     | VDD         |
| 5     | CLK         | 6     | VSS         |
| 7     | DAT0        | 8     | DAT1        |

### J6: Enable RS232 / RS485

| Pin #     | Signal Name |
|-----------|-------------|
| 1-2 Open  | COM1 RS232  |
| 1-2 Close | COM1 RS485  |

### J8: Audio Line-out

| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | AMUTE       | 2     | AOR         |
| 3     | AOL         | 4     | AOL         |

### J9: Audio Mic-in (Reserved)

| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | MIC_IN      | 2     | GND_AUD     |
| 3     | GND_AUD     | 4     | MIC_IN      |

### J10: USB 2.0

| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | VCC         | 2     | USBD3-      |
| 3     | USBD3+      | 4     | GND         |
| 5     | FGND        | 6     | FGND        |

### J11: USB 2.0

| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | VCC         | 2     | USBD4-      |
| 3     | USBD4+      | 4     | GND         |
| 5     | FGND        | 6     | FGND        |

### J13: Micro SIM Card Holder

| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | SIM-VCC     | 2     | SIM-RST     |
| 3     | SIM-CLK     | 4     | GND         |
| 5     | SIM-VPP     | 6     | SIM-IO      |

### J14: I<sup>2</sup>C (For External Gamma Firmware Programming Only.)

| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | VCC         | 2     | GND         |
| 3     | I2C_SCL     | 4     | I2C_SDA     |

### J16: USB2.0 (For USB Touch Controller or Reserved)

| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | VCC         | 2     | USBD6-      |
| 3     | USBD6+      | 4     | GND         |
| 5     | FGND        |       |             |

### J19: COM1 (RS232 / RS485)

| Pin # | Signal Name | Pin # | Signal Name   |
|-------|-------------|-------|---------------|
| 1     | N/C         | 2     | RXD1          |
| 3     | TXD1        | 4     | N/C or RS485+ |
| 5     | GND         | 6     | N/C or RS485+ |
| 7     | RTS1        | 8     | CTS1          |
| 9     | N/C         |       |               |

### J21: Mini-PCle

| Pin #          | Signal Name     | Pin # | Signal Name    |
|----------------|-----------------|-------|----------------|
| 1              | PCIE_nWAKE      | 2     | +3.3V          |
| 3              | N/C             | 4     | GND            |
| 5              | N/C             | 6     | +1.5V          |
| 7              | N/C             | 8     | <b>SIM-VCC</b> |
| 9              | GND             | 10    | <b>SIM-IO</b>  |
| 11             | <b>PE0_CLK-</b> | 12    | <b>SIM-CLK</b> |
| 13             | <b>PE0_CLK+</b> | 14    | <b>SIM-RST</b> |
| 15             | GND             | 16    | <b>SIM-VPP</b> |
| Mechanical Key |                 |       |                |
| 17             | N/C             | 18    | GND            |
| 19             | N/C             | 20    | W_DISABLE      |
| 21             | GND             | 22    | PE0_RST        |
| 23             | <b>PE0_RX-</b>  | 24    | +3.3V          |
| 25             | <b>PE0_RX+</b>  | 26    | GND            |
| 27             | GND             | 28    | +1.5V          |
| 29             | GND             | 30    | N/C            |
| 31             | <b>PE0_TX-</b>  | 32    | N/C            |
| 33             | <b>PE0_TX+</b>  | 34    | GND            |
| 35             | GND             | 36    | PE0_USB-       |
| 37             | GND             | 38    | PE0_USB+       |
| 39             | +3.3V           | 40    | GND            |
| 41             | +3.3V           | 42    | LED_WWAN#      |
| 43             | GND             | 44    | N/C            |
| 45             | N/C             | 46    | N/C            |
| 47             | N/C             | 48    | VCC1.5         |
| 49             | N/C             | 50    | GND            |
| 51             | N/C             | 52    | +3.3V          |

### J22: Software Programming Port

**(Reserved)**

| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | VCC         | 2     | USBD1--     |
| 3     | USBD1+      | 4     | USBD_ID     |
| 5     | GND         | 6     | GND         |
| 7     | TXD2        | 8     | RXD2        |

### SW1: SW1 Power Switch (8A)

| Pin #     | Signal Name |
|-----------|-------------|
| 1-2 Open  | Power Off   |
| 1-2 Close | Power On    |

### SW2: SW2 Power Switch (5A)

| Pin #     | Signal Name |
|-----------|-------------|
| 1-2 Open  | Power Off   |
| 1-2 Close | Power On    |

### PWR: Power Connector (5A)

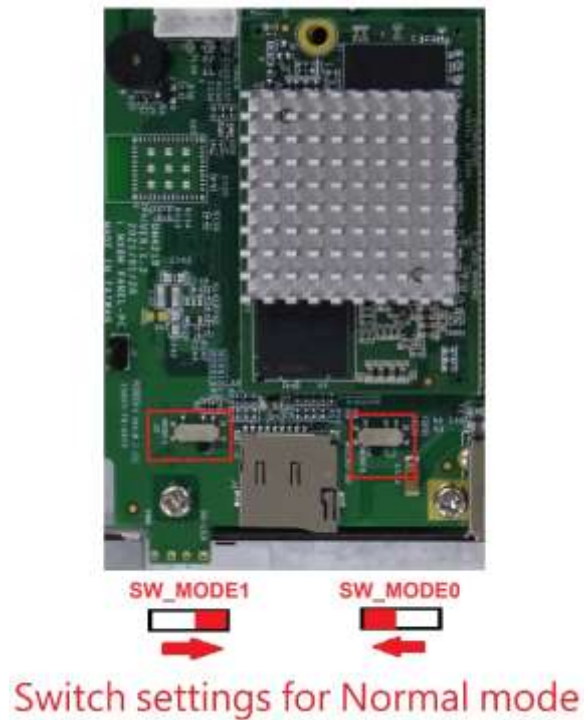
| Pin # | Signal Name |
|-------|-------------|
| 1     | +5V         |
| 2     | GND         |
| 3     | N/C         |
| 4     | GND         |

### PWR: Power Connector (8A)

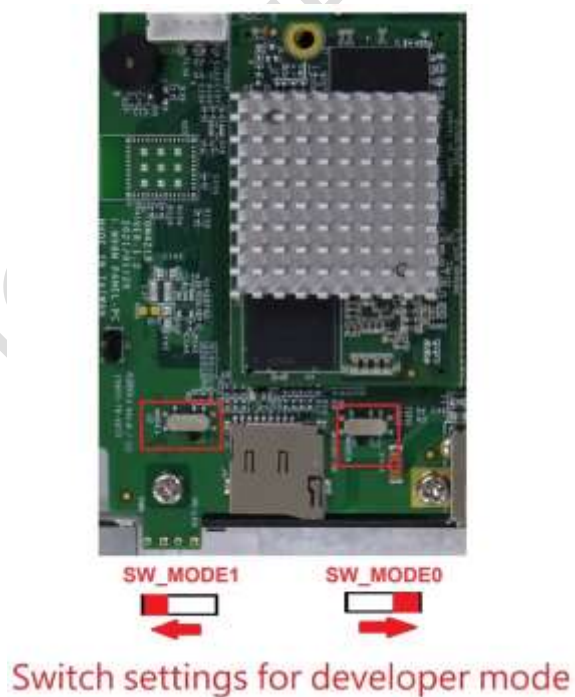
| Pin # | Signal Name      |
|-------|------------------|
| 1     | <b>+12 ~ 36V</b> |
| 2     | GND              |

## 2.4 Boot Mode Settings

Two switches setting for Normal mode, internal flash booting.



Two switches setting for Developer mode, which allow user to write the image in the eMMC.



## 2.5 External I/O Overview



### NOTE

1. MiniPCle Socket supports PCIe and USB signals.
2. Micro SIM Card Holder is only for MiniPCI slot.
3. The RS232/485 function of COM1 is selected by J6 headers.  
(Please refer the section 2.2 and 2.3.)

# Ch. 3

## Software Resource

[3.1 ICOP Wiki](#)

ICOP TECHNOLOGY INC.

## 3.1 ICOP Wiki

ICOP Technology has a wiki site which provides all of the software support for VOX-090-TS-N8m such as demo image, recipe, and testing method as

Please check the following link:

<https://wiki.icop.com.tw/product/index.php/IMX8MMINI-PPC>

**(PN8M-090T-N8M's Mainboard is the same with VOX-090-TS-N8M.)**

Please contact [info@icop.com.tw](mailto:info@icop.com.tw) or your ICOP sales representative.

# Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster. Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, originality to use this product. Vendor will not be liable for any claim made by any other related party. Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

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