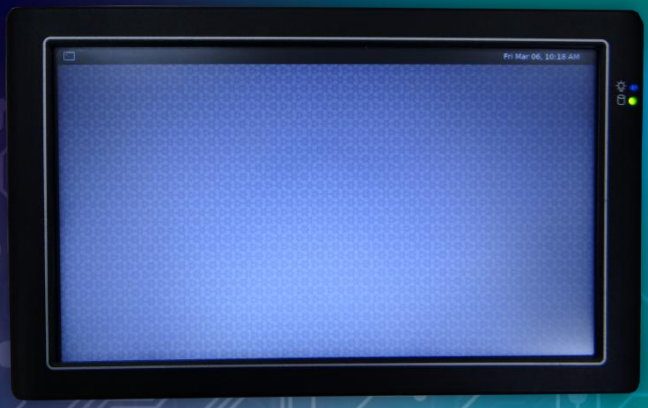
intelligent control on processor



PN8M Panel PC Series with 9” TFT LCD

■ Model:

PN8M-090T-5A-N4FM / PN8M-090T-8A-N4FM

PN8M-090T-5A-B4FM / PN8M-090T-8A-B4FM

PN8M-090T-5A-N4FS / PN8M-090T-8A-N4FS

PN8M-090T-5A-B4FS / PN8M-090T-8A-B4FS

PN8M-090T-5A-N5GM / PN8M-090T-8A-N5GM

PN8M-090T-5A-B5GM / PN8M-090T-8A-B5GM

PN8M-090T-5A-N5GS / PN8M-090T-8A-N5GS

PN8M-090T-5A-B5GS / PN8M-090T-8A-B5GS

User’s Manual

(Revision 1.1A)

CE FCC VCCI VIBRATION IP 65 TOUCH Wi-Fi FANLESS

Revision

Date	*Version*	*Description*
2020/07/24	Version 1.0A	Initial Release
2020/08/04	Version 1.1A	Correct section 2.5, System Status LED

Copyright

Manual No. IUMPN8M090-01 Ver.1.1A Aug, 2020

Trademarks Acknowledgment

Safety Information

- Read these Safety instructions carefully.
- Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
- Do not expose your Panel PC to rain or moisture, in order to prevent shock and fire hazard.
- Keep PN8M-090T away from humidity.
- Do not open the cabinet to avoid electrical shock. Refer to your nearest dealer for qualified personnel servicing.
- Never touch un-insulated terminals or wire unless your power adaptor is disconnected.
- Locate your 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 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.

DO NOT ATTEMPT TO OPEN OR TO DISASSEMBLE THE CHASSIS (ENCASING) OF THIS PRODUCT. PLEASE CONTACT YOUR DEALER FOR SERVICING FROM QUALIFIED TECHNICIAN.

Table of Contents

1.General Information

1.1 Product Description

PN8M-090T is an ultra-compact platform for the present demanding embedded and productive applications. It has NXP i.MX8M Mini Cortex-A53 ARM Quad Core which consumes only minimum power requirement when running at 1.6GHz, and up 4GB LPDDR4 memory provides faster data transfer rate. By using 9” TFT LCD, PN8M-090T becomes the perfect choice for a limited budget. In additional, the integrated Gigabit Ethernet port supplies the communication capability which makes PN8M-090T can be more widely used when running Yocto Linux, Win10 IoT Core environments to become the perfect solution for system integration.

1.2 Product Specification

Table 1-1 Product Specification

CPU Board Specifications	
CPU	i.MX8M Mini-1.6GHz Cortex-A53 ARM Quad-Core
Cache	L2: 512KB Cache
Memory	1GB/2GB/4GB LPDDR4 onboard
Watchdog Timer	Support 3 Watchdog Timer
LAN	Integrated Gigabit Ethernet
Audio	High Definition Audio
Internal Drives	8GB / 16GB / 32GB / 64GB of eMMC onboard Micro SD slot (Like a card reader only)
I/O	RS-232 x 1 USB port (Ver2.0) x 2 RJ-45 Port x 1 Line-Out x 1
Mechanical & Environment	
Power Requirement	Single Voltage +5VDC (5A) Multi Voltage +8~+35VDC (8A)
Power Consumption	8W (Typ.)
Operating Temperature	0 ~ +60℃ (32 ~ +140℉) / -20~+70℃ (-4 ~ +158℉) Optional (-I)
Storage Temp.	-30 ~ +70℃ (14 ~ +158℉)
Operating Humidity	0% ~ 90% relative humidity, non-condensing
Dimensions	236.6 x 146 x 35mm (9.31 x 5.75 x 1.38 inches)
Weight	840g

Front Panel Protection	IP 65
Certification **(Coming soon)**	CE / FCC / VCCI / Vibration / Shock
LCD Specifications	
Display Type	9” TFT LCD
Backlight Unit	LED
Display Resolution	1024(W) x 600(H)
Brightness (cd/m^2)	300 nits
Contrast Ratio	500 : 1
Display Color	262, 144
Active Area (mm)	196.61 (W) x 114.15 (H)
Viewing Angle	Vertical 120°, Horizontal 140°
Backlight Lifetime	20,000 hrs
Touchscreen	
Type	Analog Resistive
Resolution	Continuous
Transmittance	80%
Controller	USB interface
Software Driver	Linux
Durability	1 million

1.3 Inspection standard for TFT-LCD Panel

Table 1-2 Inspection Standard

<table>
<tr><th colspan="3">DEFECT TYPE</th><th colspan="6">LIMIT</th><th>Note</th></tr>
<tr><td rowspan="11">VISUAL DEFECT</td><td rowspan="11">INTER NAL</td><td rowspan="3">SPOT</td><td colspan="5">ϕ＜0.15mm</td><td>Ignore</td><td rowspan="3">Note1</td></tr>
<tr><td colspan="5">0.15mm≦ϕ≦0.5mm</td><td>N≦4</td></tr>
<tr><td colspan="5">0.5mm＜ϕ</td><td>N=0</td></tr>
<tr><td rowspan="2">FIBER</td><td colspan="5">0.03mm<W≦0.1mm, L≦ 5mm</td><td>N≦3</td><td rowspan="2">Note1</td></tr>
<tr><td colspan="5">1.0mm＜W, 1.5mm＜L</td><td>N=0</td></tr>
<tr><td rowspan="3">POLARIZER BUBBLE</td><td colspan="5">ϕ＜0.15mm</td><td>Ignore</td><td rowspan="3">Note1</td></tr>
<tr><td colspan="5">0.15mm≦ϕ≦0.5mm</td><td>N≦2</td></tr>
<tr><td colspan="5">0.5mm＜ϕ</td><td>N=0</td></tr>
<tr><td>Mura</td><td colspan="7">It’ OK if mura is slight visible through 6%ND filter</td><td></td></tr>
<tr><td rowspan="8">ELECTRICAL DEFECT</td><td colspan="2" rowspan="2">BRIGHT DOT</td><td colspan="3">A Grade</td><td colspan="3">B Grade</td><td rowspan="2">Note3</td></tr>
<tr><td>C Area</td><td>O Area</td><td>Total</td><td>C Area</td><td>O Area</td><td>Total</td></tr>
<tr><td colspan="2"></td><td>N≦0</td><td>N≦2</td><td>N≦2</td><td>N≦2</td><td>N≦3</td><td>N≦5</td><td>Note2</td></tr>
<tr><td colspan="2">DARK DOT</td><td>N≦2</td><td>N≦3</td><td>N≦3</td><td>N≦3</td><td>N≦5</td><td>N≦8</td><td></td></tr>
<tr><td colspan="2">TOTAL DOT</td><td colspan="3">N≦4</td><td>N≦5</td><td>N≦6</td><td>N≦8</td><td>Note2</td></tr>
<tr><td colspan="2">TWO ADJACENT DOT</td><td>N≦0</td><td>N≦1 pair</td><td>N≦1 pair</td><td>N≦1 pair</td><td>N≦1 pair</td><td>N≦1 pair</td><td>Note4</td></tr>
<tr><td colspan="2">THREE OR MORE ADJACENT DOT</td><td colspan="6">NOT ALLOWED</td><td></td></tr>
<tr><td colspan="2">LINE DEFECT</td><td colspan="6">NOT ALLOWED</td><td></td></tr>
</table>

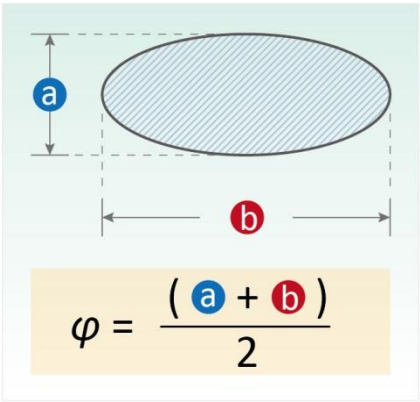
(1) One pixel consists of 3 sub-pixels, including R, G, and B dot.

(Sub-pixel = Dot)

(2) LITTLE BRIGHT DOT ACCEPTITABLE UNDER 6 % ND-Filter

(3) If require G0 grand (Total dot N≦0), please contact region sales.

[Note 1] W : Width[mm], L : Length[mm], N : Number, ϕ: Average Diameter.



1. White / Black Spot
2. Polarizer Bubble

Fig 1-1

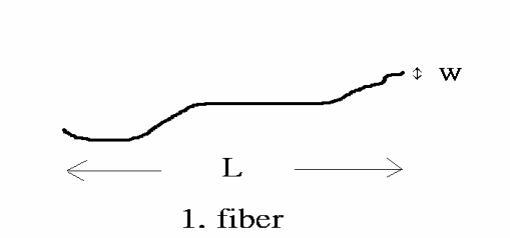


Fig 1-2

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

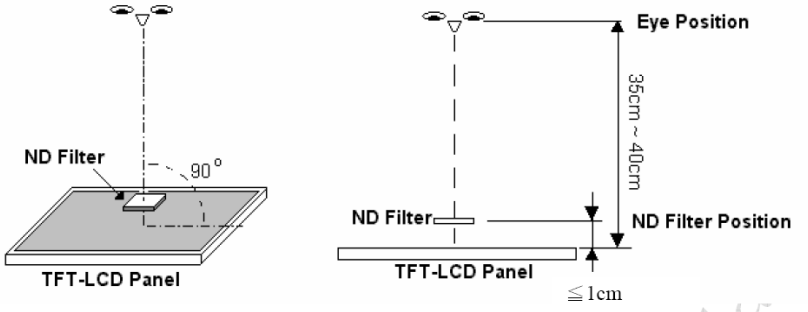
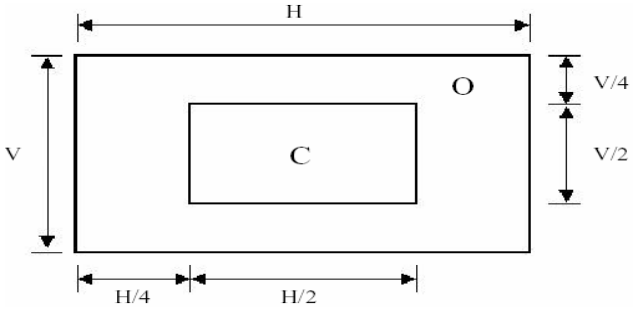


Fig 1-3

[Note 3]

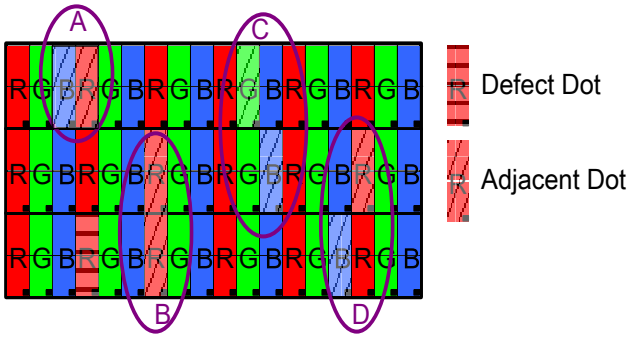


C Area: Center of display area

O Area: Outer of display area

[Note 4]

Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.



(1) 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.

[Note 5]

According to the technical information from LCD manufacturer, the image retention may happen on LCD display if the static image is kept for a period of time without any change. ICOP will suggest customers not to have static image on LCD for over 4 hours without any image movement and also enable screensaver to avoid image sticking issue if LCD displays need to be kept on for a long time.

Some Image retention issue will disappear when LCD display is turned off for a period of time, but some image retention may be not reversible when LCD encounters screen burn.

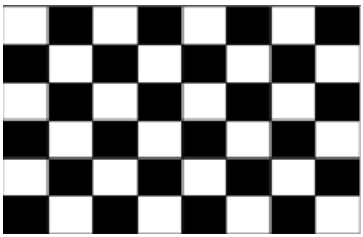
The following is LCD manufacturer's test result for customers' reference.

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	70℃ ;240hrs	
High Temperature Storage	80℃ ; 240hrs	
High Temperature High Humidity Operation	60℃ ; 90%RH ;240hrs	No condensation
Low Temperature Operation	-20℃ ; 240hrs	Backlight unit always turn on
Low Temperature Storage	-30℃ ; 240hrs	
Thermal Shock	–30℃(0.5hr) ~ 80℃(0.5hr) ; 200 Cycles	
Image Sticking	25℃ ; 4hrs	**Note 5-1**
MTBF	20,000Hrs	

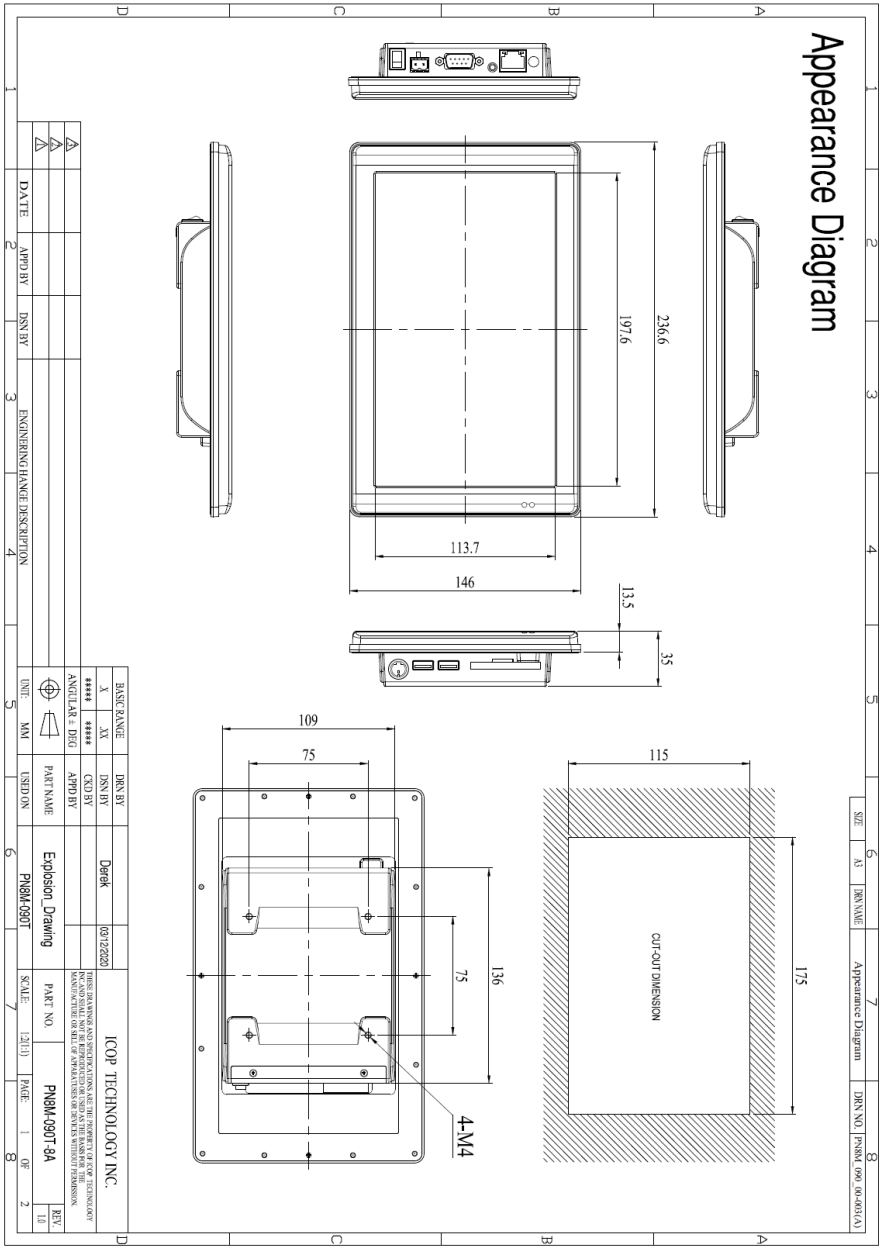
Note 5-1

1. Condition of Image Sticking test：25 ℃± 2 ℃.
2. Operation with test pattern sustained for 4 hrs, then change to gray pattern immediately.

3. After 5 mins, the mura must be disappeared completely.



1.4 Product Dimension



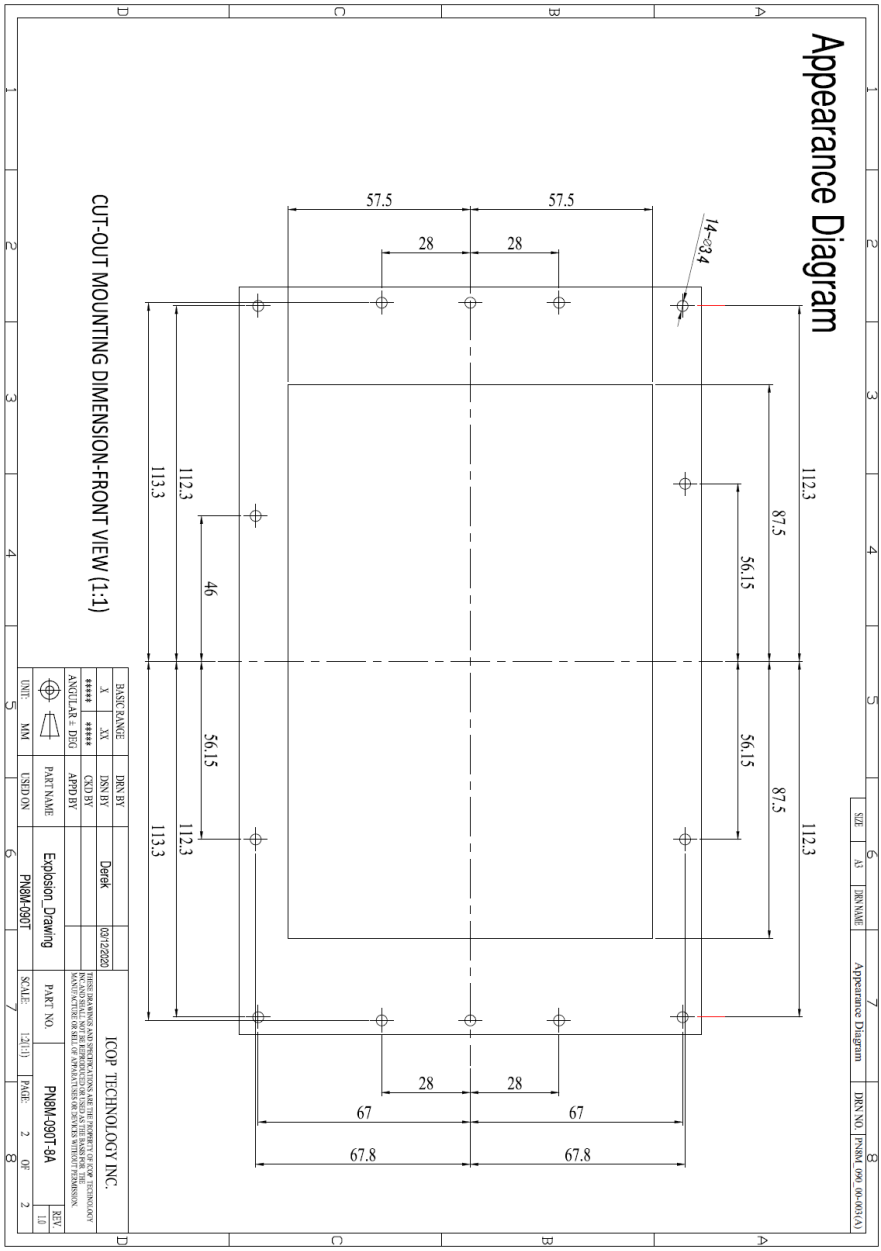
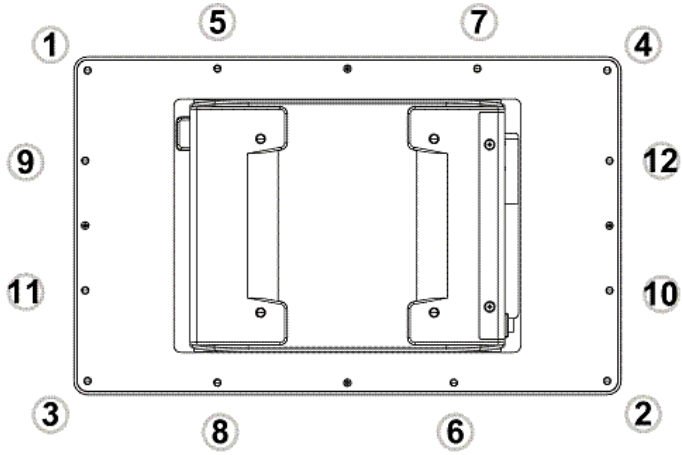
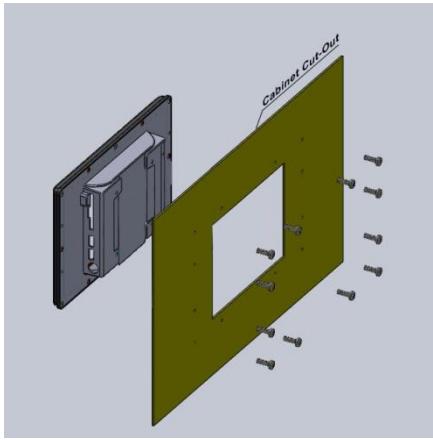


Fig 1-4 Product Dimension

1.5 Panel Mounting Instruction

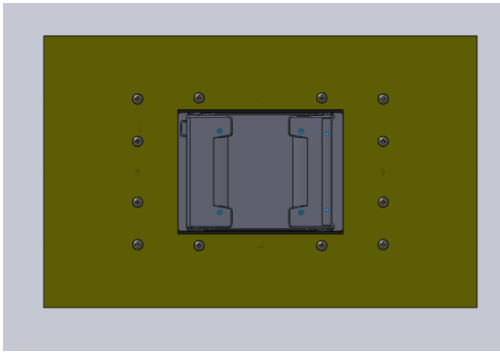
1. Cut a mounting hole in the panel. (Refer to PN8M-090T Dimensions on page 7) (Note 1)
2. Check and remove the twelve M3 screws in a diagonal pattern as image below if necessary.
3. Place PN8M-090T face-down on a clean, flat surface.
4. Slide the panel cutout around the back of PN8M-090T, until the panel rests directly on the gasket. Make sure the screw holes align with the screw holes on PN8M-090T.
5. The screw size is M3*L (L=wall thickness + 6.0mm) (Note 2)
6. Insert all twelve M3 screws into the screw holes. (Note 2)
7. Finger-tighten the M3 screws. Finish tightening the M3 screws in a diagonal pattern using an M3 screw driver (see the image as below); maximum torque 1.18Nm (12 kgf-cm).





Note 1:

It is strongly recommended that a professional machine shop cut the mounting hole in the panel.



Note 2:

The length for all twelve M3 screws will be according to the thickness of mounting panel. For example: The length of standard M3 screws for PN8M-090T is 6mm. If the thickness of your mounting panel is 3mm and washer thickness is 1mm, you have to use 10mm M3 screw.

1.6 Ordering Information

Product Code	LCD Size	DC-Input Type	BT&WLAN	DRAM	eMMC Capacity	eMMC Type	Wide Temp.
PN8M	090T	5A (DC5V) 8A (DC8~35V)	N (No BT&WLAN) B (With BT&WLAN)	4 (1GB) 5 (2GB) 6 (3BG)	F (8GB) G (16GB) H (32GB)	M (MLC) S (SLC)	I (Wide Temp.)

1. Product Code：Code 1~3。

PN8M：PN8M Series。

2. LCD Size：Code 4~7。

090T：9" LCD with touchscreen。

3. DC-Input Type：Code 8~9。

5A：Audio Line-out and Single DC5V Power Input。

8A：Audio Line-out and Support DC8~35V Power Input。

4. BT&WLAN：Code 10。

N：No BT&WLAN。

B：With BT&WLAN。

5. DRAM Onboard：Code 11。

4：1GB。

5：2GB。

6：4GB。**(Build to order)**

6. eMMC Capacity：Code 12。

F：8GB。

G：16GB。

H：32GB。**(Build to order)**

J：64GB。**(Build to order)**

7. eMMC Type：Code 13。

M：MLC。

S：SLC。

8. Wide Temp.：Code 14。

I：Support Wide Temp. -20~+70℃。**(Optional)**

(Standard version doesn't need to show this item.)

Table 1-3 Ordering Information

PART NUMBER	DESCRIPTION
PN8M-090T-8A-B5GM	PN8M-090T with i.MX8M Mini (Quad Core 1.6GHz), 2GB of LPDDR4, 16GB eMMC MLC, Wifi&BT and DC+8~35V
PN8M-090T-8A-N5GM	PN8M-090T with i.MX8M Mini (Quad Core 1.6GHz), 2GB of LPDDR4, 16GB eMMC MLC and DC+8~35V
PN8M-090T-8A-B5GS	PN8M-090T with i.MX8M Mini (Quad Core 1.6GHz), 2GB of LPDDR4, 16GB eMMC SLC, Wifi&BT and DC+8~35V
PN8M-090T-8A-N5GS	PN8M-090T with i.MX8M Mini (Quad Core 1.6GHz), 2GB of LPDDR4, 16GB eMMC SLC and DC+8~35V
PN8M-090T-8A-B4FM	PN8M-090T with i.MX8M Mini (Quad Core 1.6GHz), 1GB of LPDDR4, 8GB eMMC MLC, Wifi&BT and DC+8~35V
PN8M-090T-5A-N4FM	PN8M-090T with i.MX8M Mini (Quad Core 1.6GHz), 1GB of LPDDR4, 8GB eMMC MLC and DC+8~35V
PN8M-090T-5A-B5GM	PN8M-090T with i.MX8M Mini (Quad Core 1.6GHz), 2GB of LPDDR4, 16GB eMMC MLC, Wifi&BT and DC+5V
PN8M-090T-8A-N5GM	PN8M-090T with i.MX8M Mini (Quad Core 1.6GHz), 2GB of LPDDR4, 16GB eMMC MLC and DC+5V
PN8M-090T-8A-B5GS	PN8M-090T with i.MX8M Mini (Quad Core 1.6GHz), 2GB of LPDDR4, 16GB eMMC SLC, Wifi&BT and DC+5V
PN8M-090T-8A-N5GS	PN8M-090T with i.MX8M Mini (Quad Core 1.6GHz), 2GB of LPDDR4, 16GB eMMC SLC and DC+5V
CABLE-MINIDIN8P-30	Software Programming CABLE for Developer

1.7 Packing List

Table 1-4 Packing List

PART NUMBER	PACKAGE	
PN8M-090T-8A-B5GM	PN8M-090T-8A-B5GM	**WIRELESS-ANTENNA-157**
PN8M-090T-8A-N5GM	PN8M-090T-8A-N5GM	
PN8M-090T-8A-B5G**S**	PN8M-090T-8A-B5G**S**	**WIRELESS-ANTENNA-157**
PN8M-090T-8A-N5G**S**	PN8M-090T-8A-N5G**S**	
PN8M-090T-8A-B4FM	PN8M-090T-8A-B4FM	**WIRELESS-ANTENNA-157**
PN8M-090T-8A-N4FM	PN8M-090T-8A-N4FM	
PN8M-090T-5A-B5GM	PN8M-090T-5A-B5GM	**Power-20W-3PIN-X & PowerHead-US/EU** **WIRELESS-ANTENNA-157**
PN8M-090T-5A-N5GM	PN8M-090T-5A-N5GM	**Power-20W-3PIN-X & PowerHead-US/EU**
PN8M-090T-5A-B5G**S**	PN8M-090T-5A-B5G**S**	**Power-20W-3PIN-X & PowerHead-US/EU** **WIRELESS-ANTENNA-157**
PN8M-090T-5A-N5G**S**	PN8M-090T-5A-N5G**S**	**Power-20W-3PIN-X & PowerHead-US/EU**

2.System Installation

2.1 CPU Board Outline

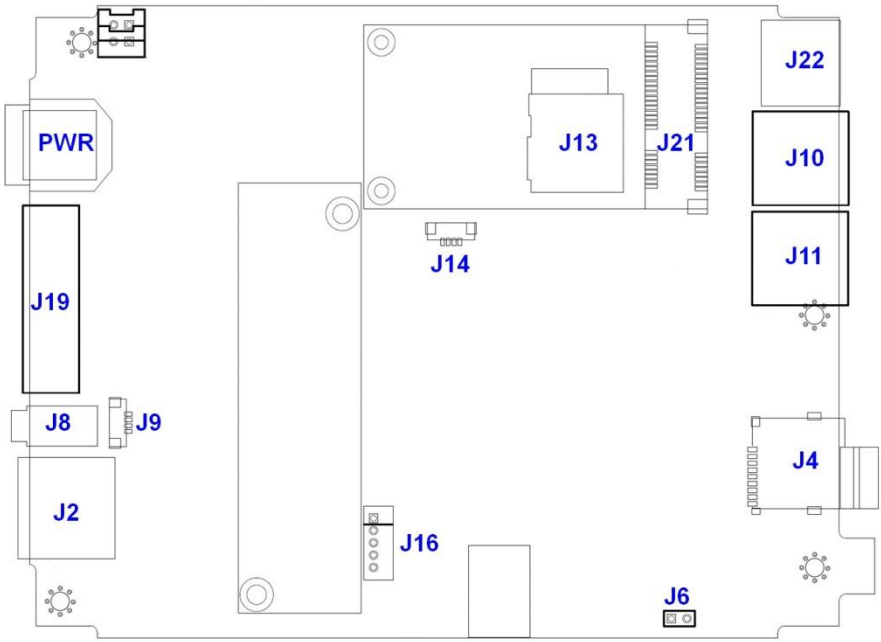


Fig 2-1 PN8M CPU Board

2.2 Connector Summary

Table 2-1 Summary Table

Nbr	Description	Type of Connections	Pin nbrs.
J2	Ethernet	External 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 **(Reserved)**	1.25mm 4-pin Wafer	4-pin
J10	USB 2.0	External USB 2.0 Connector	6-pin
J11	USB 2.0	External USB 2.0 Connector	6-pin
J13	Micro SIM Card Holder	Internal Micro SIM Card Holder	6-pin
J14	I2C (For External Gamma Firmware Programming)	1.25mm 4-pin wafer	4-pin
J16	USB 2.0 (For Touch Controller)	2.0mm 5-pin Wafer	5-pin
J19	COM1 (RS232/RS485)	External D-Sub Male Connector	9-pin
J21	Mini-PCIe	Internal Mini-PCIe Socket	52-pin
J22	Software Programming Port **(Reserved)**	External Mini DIN Socket	8-pin
PWR	Power Connector (5A)	External Mini DIN Socket	3-pin
PWR	Power Connector (8A)	External 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/RS482

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	AOL
3	AOR	4	AOR

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: I2C (For External Gamma Firmware Programming)

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

J16: USB 2.0 (For Touch Controller)

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		

J22: Software Programming Port **(Reserved)**

Pin #	Signal Name	Pin #	Signal Name
1	VCC	2	USBD1-
3	USBD1+	4	USBD1_ID
5	GND	6	GND
7	TXD2	8	RXD2

PWR: Power Connector (5A)

Pin #	Signal Name
1	+5V
2	GND
3	NC
4	GND

PWR: Power Connector (8A)

Pin #	Signal Name
1	+ 8 ~ 35V
2	GND

2.4 External I/O Overview

{ PN8M-090T-8A }

Fig 2-2 PN8M-090T-8A I/O overview

{ PN8M-090T-5A }

Fig 2-3 PN8M-090T-5A I/O overview

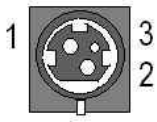
{Note}
1. WLAN is optional
2. COM1 can be RS232/RS485 signals by jumper, J6
3. MicroSD Socket likes a reader for data wrting/reading only

2.5 External I/O Pin Assignment

Power Switch

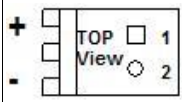
Pin #	Status
|	ON
O	OFF

Power Connector (5A)



Pin #	Signal Name
1	+5V
2	GND
3	NC

Power Connector (8A)

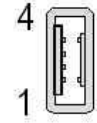


Pin #	Signal Name
1	+8 ~ 35V
2	GND

Audio Line-Out

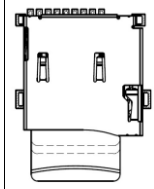
Pin #	Signal Name
1	GND
2	LOUTL
3	Open Touch
4	Open Touch
5	VREFOUT

USB 2.0 Port



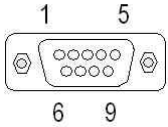
Pin #	Signal Name
1	VCC
2	USB0-
3	USB0+
4	GND
5	GGND
6	GGND

Micro SD Card Socket (Like Card Reader Only)



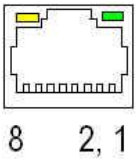
Pin #	Signal Name
1	DAT2
2	DAT3
3	CMD
4	VDD
5	CLK
6	VSS
7	DAT0
8	DAT1

COM1 RS232



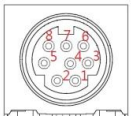
Pin #	Signal Name	Pin #	Signal Name
1	N/C	2	RXD1
3	TXD1	4	N/C or RS485+
5	GND	6	N/C or RS485-
7	RTS1	8	CTS1
9	N/C		

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-

Software Programming Port **(Reserved)**



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

Power LED

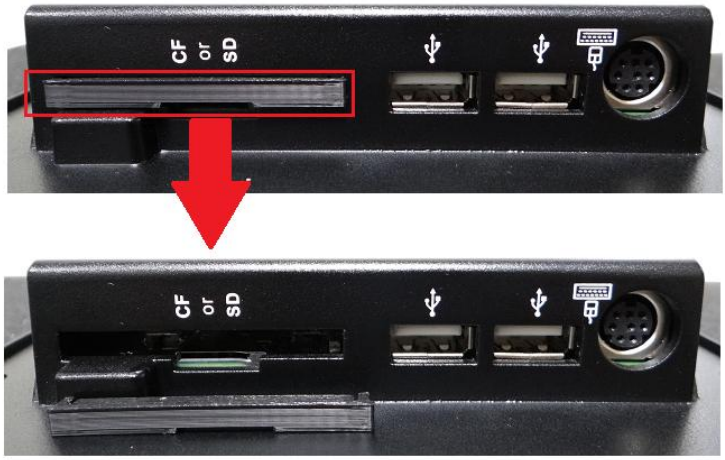
	LED Color	State
	Blue	Power On

System Status LED

	LED Color	State
	Green	System Status LED when system is active (LED on => System running) (LED off => System execute “poweroff”)

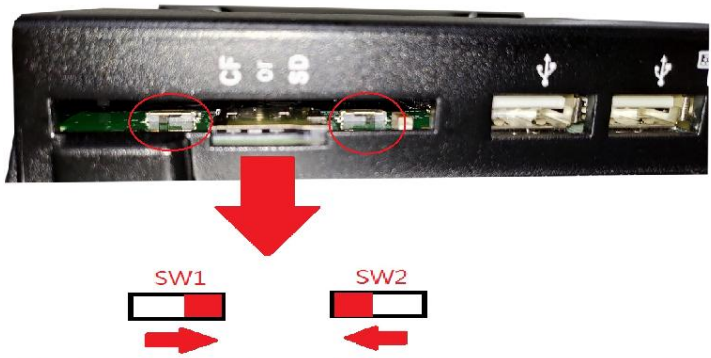
3.The Settings for Normal and Developer Modes

1. Remove the plastic cover.



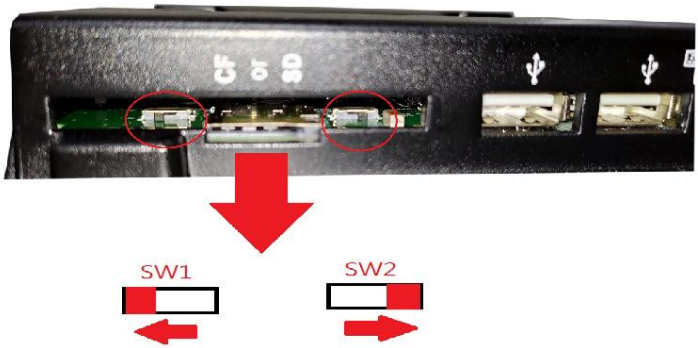
2. There are two modes, Normal and Develop Modes as below.

Two switches setting for Normal mode, internal flash booting.



Switch settings for Normal mode

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



Switch settings for developer mode

3. The Software Programming Cable for Developer Mode

Ordering Part Number: CABLE-MINIDIN8P-30

(1) Please order this cable from ICOP.

(2) Refer section 3.2 to set two switches to be developer mode.

(3) Plug 8-pin male terminal.

(4) Connect USB and serial console cables to your developer PC, and power on the system for system restore.

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.