



HMI MODULE SPECIFICATION

P/N: BDH043IWVC-01T201

This module is ROHS compliant

For Customer's Acceptance:

Customer	
Approved by	
Comment	

	Revision	1.1
	Engineering	
	Date	2025-06-03
	Our Reference	

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1. REVISION RECORD

[illegible]

2. GENERAL INFORMATION

Item	Specification	Unit
LCD Type	IPS TFT / Transmissive / Normally Black	/
Size	4.3	Inch
Viewing Direction	Full Viewing Angle	O'clock
LCM (W × H × D)	107.10 × 68.60 × 4.50	mm ³
Active Area (W × H)	95.04 × 53.86	mm ²
Resolution	800 (RGB) × 480	dots
Color Depth	16.7M	/
Soc	ITE9866	/
CPU	Dual ARM9, 800M Hz+400M Hz	/
RAM	64 MB	/
Flash	128 MB NAND FLASH	/
Interface	RS232, RS485, CAN, USB, AUDIO	/
ETHERNET	10/100 M	/
Wireless	Wi-Fi(reserved)	/
With / Without TSP	With CTP; Controller IC Atmel mXT336u	/
Touch Points	Default single point; can be adjust to mutual	/
Total Weight	124	g

3. MODULE DRAWING

4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Max.	Unit
Power Supply Voltage	VDD	4.5	12	V
Operating Temperature	T _{OP}	-20	70	°C
Storage Temperature	T _{ST}	-30	80	°C

5. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power Supply Voltage	VDD	4.5	5.0	12	V
Supply Current for VDD	IDD	-	315	-	mA
Input High-Level Voltage	VIH	2.0	-	3.3	V
Input Low-Level Voltage	VIL	0	-	0.8	V

6. BACKLIGHT ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Unit
Forward Voltage	V _f	16.8	18.0	19.2	V
Forward Current	I _f	-	40	-	mA
Power Consumption	W _{BL}	-	720	-	mW
Operating Life Time	VIL	30000	50000	-	hours

Notes:

- (1) Condition: T_a=25±2°C, Humidity 60%±5%RH
- (2) Operating life time means brightness goes down to 50% initial brightness. The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions. Typical operating life time is an estimated data.

7. Display ELECTRO-OPTICAL CHARACTERISTICS

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Notes
Response Time		Tr + Tf	$\theta=0^\circ$	-	30	40	ms	4
Contrast Ratio		Cr		640	800	-	---	1
Luminance Uniformity		δ White		75	80	-	%	3
Surface Luminance		Lv		-	460	-	cd/m ²	2
Viewing Angle Range		θ	$\varnothing = 90^\circ$	-	80	-	Deg.	1, 6
			$\varnothing = 270^\circ$	-	80	-	Deg.	
			$\varnothing = 0^\circ$	-	80	-	Deg.	
			$\varnothing = 180^\circ$	-	80	-	Deg.	
CIE (x, y) Chromaticity	White	x	$\theta=0^\circ$	0.274	0.324	0.374	---	5
		y		0.322	0.372	0.422		
	Red	x		0.579	0.629	0.679		
		y		0.276	0.326	0.376		
	Green	x		0.287	0.337	0.387		
		y		0.496	0.546	0.596		
	Blue	x		0.086	0.136	0.186		
		y		0.093	0.143	0.193		
NTSC	-	-	-	-	51	-	%	-

Note 1. Contrast Ratio (CR) is defined by following formula. For more information see FIG 3.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P3, P4, P5)}}$$

Note 2. Surface luminance is the LCD surface luminance with all pixels displaying white state. For more information see FIG 3.

Lv = Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)

Note 3. The uniformity in surface luminance (δ White) is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 3.

$$\delta \text{ White} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

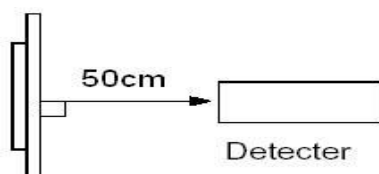
Note 4. Response time is the time required for the display to transition from white to black (Rise Time, Tr) and from black to white (Fall Time, Tf). For additional information see FIG 2.

Note 5. CIE (x,y) chromaticity, color coordinates measured at center point of LCD.

Note 6. Viewing angle is the angle at which the contrast ratio is greater than a specific value. For TFT module, the specific value of contrast ratio is 10. For monochrome module, the specific value of contrast ratio is 2. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 4.

FIG 1. The setup of optical measurement.

The optical characteristics should be measured in a stable, windless, and



dark room.

FIG 2. The Definition of Response Time

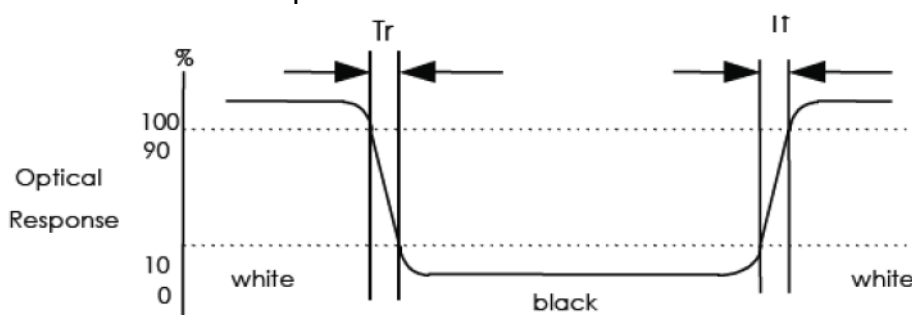
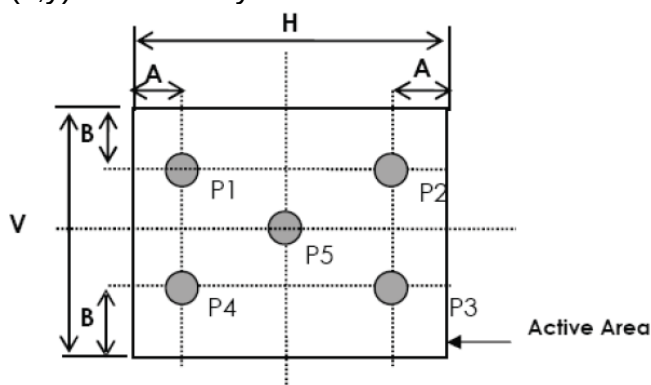


FIG 3. Measuring method for contrast ratio, surface luminance, Luminance uniformity, CIE (x,y) chromaticity.



A: $H/6$

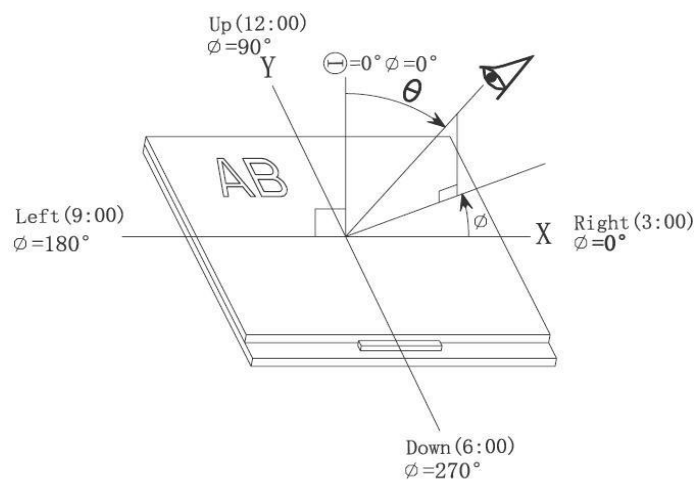
B: $V/6$

H, V: Active Area

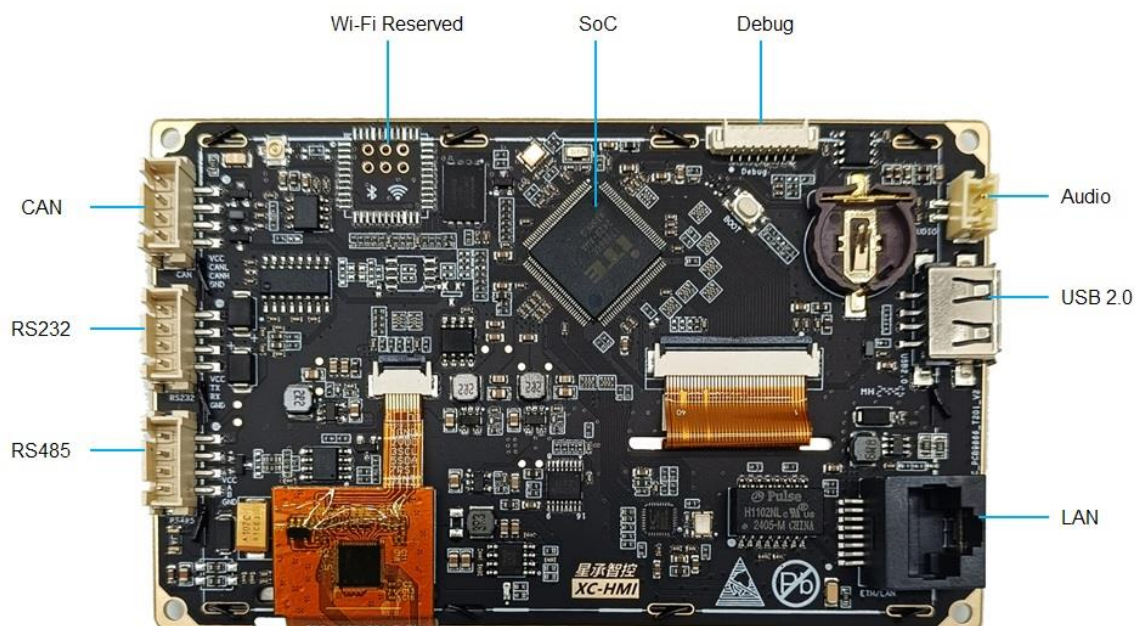
Light spot size $\varnothing = 7\text{mm}$, 500mm distance from the LCD surface to detector lens.

Measurement instrument is TOPCON's luminance meter BM-7.

FIG 4. The definition of viewing angle

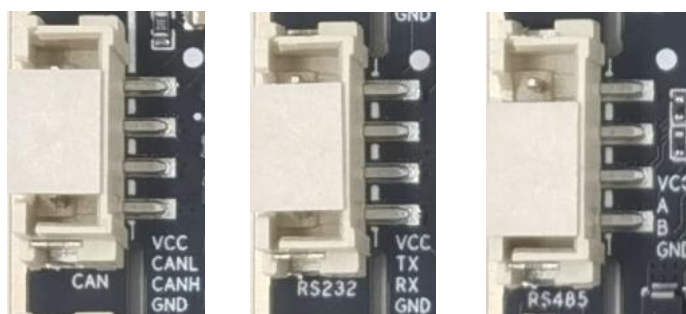


8. BOARD INTERFACE AND CONNECTORS



8.1 POWER INPUT CONNECTOR

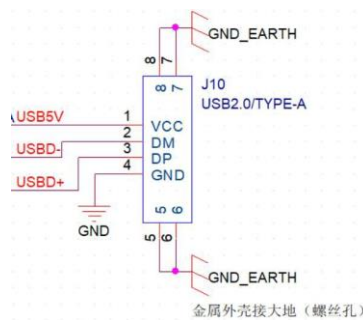
The VCC power supply is integrated with RS232/RS485/CAN, end user can select any one of the three interfaces as the power supply. The 2.54mm 4-pin connectors as shown below:



Symbol	DESCRIPTION
VCC	Power supply input; 4.5~12.0V
GND	Ground-

8.2 USB

The connector printed USB2.0 is the USB interface as shown below:

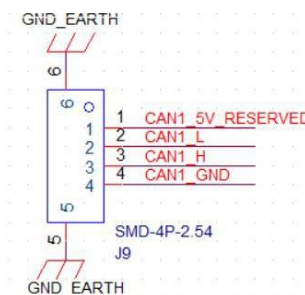


Symbol	DESCRIPTION
VCC	Power supply
DM	USB data+
DP	USB data-
GND	Ground

Note: Customer can use the FAT32 U-disk to update the firmware from USB interface.

8.3 CAN

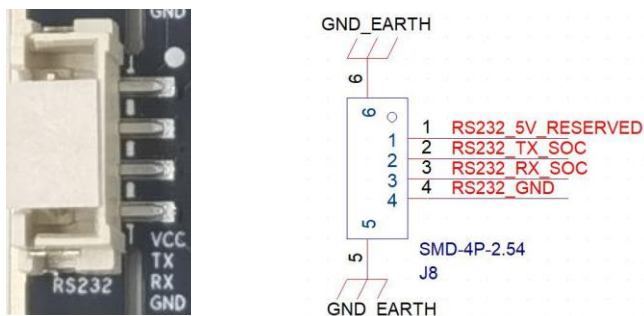
The 2.54mm 4-pin connector printed CAN is CAN interface as shown below:



Symbol	DESCRIPTION
VCC	Power supply input; 4.5~12V
CANL	CAN Low-Level Voltage
CANH	CAN High-Level Voltage
GND	Ground

8.4 RS232

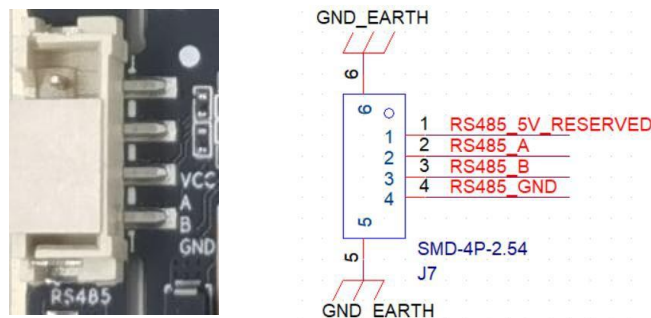
The 2.54mm 4-pin connector printed RS232 is RS232 interface as shown below:



Symbol	DESCRIPTION
VCC	Power supply input; 4.5~12V
TX	Transmit Data
RX	Receive Data
GND	Ground

8.5 RS485

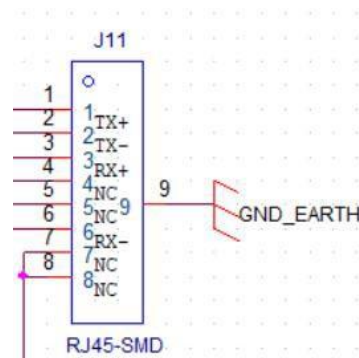
The 2.54mm 4-pin connector printed RS485 is RS485 interface as shown below:



Symbol	DESCRIPTION
VCC	Power supply input; 4.5~12V
A	Non-inverting receiver input and non-inverting driver output
B	Inverting receiver input and inverting driver output
GND	Ground

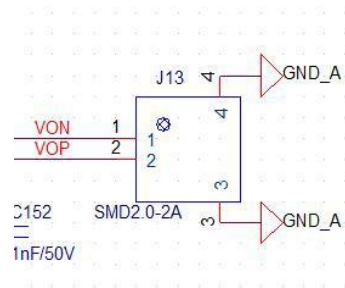
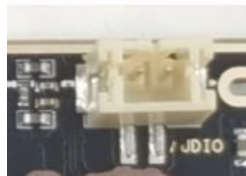
8.6 ETHERNET/LAN

The connector printed ETH/LAN is the Ethernet / LAN interface as shown below:



8.7 AUDIO

The 2.0mm 2-pin connector printed AUDIO is the AUDIO interface as shown below:



8.8 WIFI ANTENNA

The Wi-Fi module is reserved.

9. INSPECTION CRITERION

This specification is made to be used as the standard acceptance/rejection criteria for HMI module.

9.1 Sample Plan

- (1) Lot size: Quantity per shipment lot per model
- (2) Sampling type: Normal inspection, Single sampling
- (3) Inspection level: II
- (4) Sampling table: MIL-STD-105D
- (5) Acceptable quality level(AQL)
 - Major defect: AQL=0.65
 - Minor defect: AQL=1.50

9.2 Inspection condition

(1) Ambient conditions

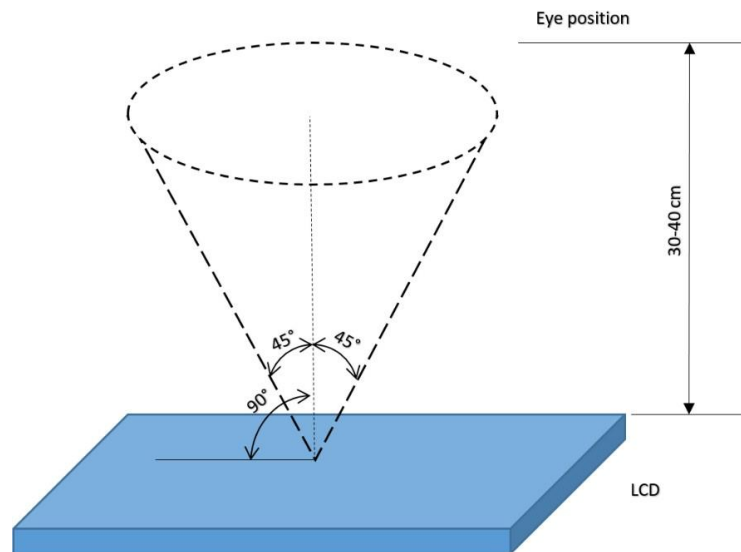
- Temperature: Room temperature $25 \pm 5^{\circ}\text{C}$
- Humidity: $(60 \pm 10)\% \text{RH}$
- Illumination: Single fluorescent lamp non-directive (400 to 800 Lux)

(2) View distance

The distance between the LCD and the inspector's eye shall be at least $35 \pm 5\text{cm}$.

(3) View angle

U/D: 45° / 45° , L/R: 45° / 45°



9.3 Inspection Standard

(1) For PCBA: IPC-A-610.

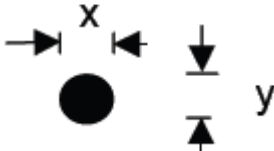
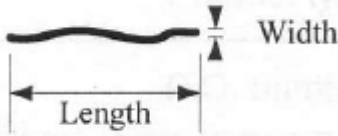
(2) For TFT module:

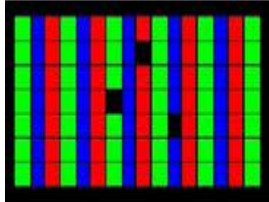
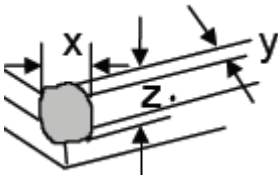
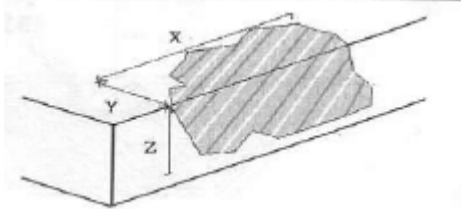
Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

a. Major defect

Item No.	Items To Be Inspected	Inspection Standard
1	All Functional Defects	1) No display 2) Display abnormally 3) Short circuit 4) Line defect 5) Excess power consumption 6) No touch function
2	Missing	Missing function component
3	Crack	Glass crack

b. Minor defect

Item No.	Items To Be Inspected	Inspection Standard	
1	Spot Defect Including Black spot White spot Pinhole Foreign particle Polarizer dirt	For dark / white spot is defined $\varphi = (x + y) / 2$ 	
		Size φ (mm)	Acceptable Quantity
		$\varphi \leq 0.15$ 2mm(min) apart	Ignore
		$0.15 < \varphi \leq 0.25$ 5mm(min) apart	3
		$0.25 < \varphi$	Not allowed
2	Line Defect Including Black line White line Scratch	Defined 	
		Width (mm) Length (mm)	Acceptable Quantity
		$W \leq 0.05$ and $L \leq 10$	Ignore
		$0.05 < W \leq 0.08$ and $L \leq 10$ 3mm(min) apart	3
		$0.08 < W \leq 0.10$ and $L \leq 5$ 3mm(min) apart	1
		$0.10 < W$ or $10 < L$	Not allowed
3	Polarizer Dent / Bubble	Size φ (mm)	Acceptable Quantity
		$\varphi \leq 0.25$	Ignore
		Nonvisible area	Ignore

		$0.25 < \varphi \leq 0.50$ 5mm(min) apart	3
		$0.50 < \varphi$	Not allowed
4	Electrical Dot Defect	Bright and black dot define:	
		 and 	
		Inspection pattern: Full white, Full black, Red, Green and Blue screens	
		Item	Acceptable Quantity
		Black dot defect	2
		Bright dot defect	0
		Total Dot	2
5	Touch Panel Chips	1. Corner chips:	
			
		Size (mm)	Acceptable Quantity
		$X \leq 3\text{mm}$ $Y \leq 3\text{mm}$ $Z \leq T$	Ignore T: Glass thickness X: Length Y: Width Z: Thickness
		2. Side chips:	
			
		Size (mm)	Acceptable Quantity

		$X \leq 5\text{mm}$ $Y \leq 3\text{mm}$ $Z \leq T$	Ignore T: Glass thickness X: Length Y: Width Z: Thickness
6	Touch Panel Newton Ring	Compare with limit sample	

Note:

(1) Mura is checked by 6% ND filter.

(2) Foreign particles on the surface of the module should be ignore.

10. RELIABILITY TEST

No.	Test Item	Test Condition	Remark
1	High Temperature Storage Test	80°C ± 2°C / 240Hrs.	IEC60068-2-2
2	Low Temperature Storage Test	-30°C ± 2°C / 240Hrs.	IEC60068-2-1
3	High Temperature Operating Test	70°C ± 2°C / 240Hrs.	IEC60068-2-2
4	Low Temperature Operating Test	-20°C ± 2°C / 240Hrs.	IEC60068-2-1
5	High Temperature and High Humidity Operation Test	60 ± 5°C, 90%RH 240Hrs.	IEC60068-2-3
6	Thermal Shock Test (Non-operating)	-30 ± 2°C (30Min.) ~ 25 ± 2°C (5Min.) ~70 ± 2°C (30Min.) 20Cycles	IEC60068-2-14
7	Vibration Test (Non-operating)	Frequency: 10~55Hz Amplitude: 1.5mm Sweep Time: 11Mins Test Period: 6 Cycles for Each Direction of X, Y, Z (Packing Condition)	IEC60068-2-6
8	Electrostatic Discharge Test	R: 330Ω, C:150pF, 5points/panel Air: ±8KV, 5times; Contact: ±4KV, 5times; (Environment: 15°C~35°C, 30%~60%, 86Kpa~106Kpa)	IEC61000-4-2