

LCD MODULE SPECIFICATION

Customer:	

Module No.: XY020QVV15F-H1184B

Date: <u>2023-06-07</u>

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For Customer's Acceptance:

Approved by	Comment

Approved by	Checked by	Prepared by



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Record of Revision

Rev.	Date	Description	Editor
1.0	2023-06-07	First release	ping.Yang



1 General Specifications

No.	Item	Specification	Remark
1	LCD Size	2.0 inch (Diagonal)	
2	Driver Element	a-Si TFT active matrix	
3	Resolution	240 (RGB) ×320	
4	Display Mode	Normally Black, Transmissive	
5	Pixel Pitch	0.0425 (H) × 0.1275 (V)	
6	Display Colors	65K	
7	Surface Treatment	urface Treatment With Sunlight film	
8	Color Arrangement	RGB-Stripe	
9	Interface	MCU 8Bit	
10	Viewing Direction	ALL	
11	Gray Scale Inversion Direction	/	Note 1
12	Outline Dimension (mm)	37.68(W) ×51.32 (H) × 2.41(T)	
13	Active Area (mm)	30.6 (W) ×40.8 (H)	
14	Touch Screen	/	
15	Display Driver IC	ST7789	
16	Touch Driver IC	/	

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180° shift. Note 2: RoHS compliant.



2 Pin Assignment

2.1 LCD Pin assignment

Match connector: FH26-25S-0.3SHW(Hirose)or equivalent.

PIN	Symbol	I/O	Description	Remark
1	LEDK	Р	LED Cathode.	
2	LEDA	Р	LED Anode.	
3	GND	Р	Power Ground.	
4	VCC	Р	LCM Power Supply .	
5	IOVCC	Р	LCD I/O power supply.	
6		0	Tearing effect signal is used to synchronize	
0	5 FMARK 0 MCU to		MCU to frame memory	
7	/CS	I	LCM Chip selection signal	
8	RESET	I	LCM Reset pin	
9	RS	I	MCU Data or Instruction select input pin.	
10	/WR	I	MCU Write strobe signal input pin.	
11	/RD	I	MCU Read enable in parallel interface.	
12~19	DB7~DB0	I	8Bit MCU Parallel Date bus.	
20	GND	Р	Power Ground.	
21	GND	Р	Power Ground.	
22	GND	Р	Power Ground.	
23	GND	Р	Power Ground.	
24	GND	Р	Power Ground.	
25	GND	Р	Power Ground.	

I---Input, O---Output, P--- Power/Ground

3 Absolute Maximum Ratings

					Ta = 25℃
Item	Symbol	Min.	Max.	Unit	Remark
	VCC	-0.30	+4.2	V	
Power Voltage	IOVCC	-0.30	+4.0	V	
Operating Temperature	Тор	-20.0	70.0	°C	
Storage Temperature	T _{st}	-30.0	80.0	°C	
Operating and Storage Humidity	H _{stg}	10%	90%	%(RH)	

4. Electrical Characteristics

4.1 Recommended Operating Condition

				VCC=3.3V, GND=0V, Ta = 25° C			
Ite	m	Symbol	Min.	Тур.	Max.	Unit	Remark
Power sup	ply	VCC	2.8	3.0	3.3	V	
Digital supp	ly Voltage	IOVCC	1.65	1.8	3.3	V	
Input Signal	Low Level	V _{IL}	0	-	0.3 x IOVCC	V	
Voltage	High Level	VIH	0.7 x IOVCC	-	IOVCC	V	
Current of Power supply		I _{Vcc}	-	-	25	mA	VCC=3.3V, color bar pattern
Current of digital supply voltage		l _{iovcc}	-	-	15	mA	

4.2 Backlight Unit Driving Condition

Item	Symbol	Min.	Тур.	Max.	Unit	Remark
Forward Current	I _F	-	60	75	mA	3pcs Dual-core
Forward Current Voltage	VF	-	6.4	6.8	V	LED
Backlight Power Consumption	W _{BL}	-	384	510	mW	(1 LED Serial, 3LED Parallel)
Operating Life Time		30000			hrs	Note 2, Note 3

Note1: The LED driving condition is defined for each module (1 LED Serial, 3 LED Parallel).

Note2: When LCM is operated, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: Optical performance should be evaluated at Ta= 25° C When LED is driven at high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

Note4: The LED driving condition is defined for each LED module.



5 Timing Chart

5.1 Parallel 8/ bit Interface Characteristics.



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Signal	Symbol	Parameter	Min	Max	Unit	Description
DICX	T _{AST}	Address setup time	0		ns	
DICX	T _{AHT}	Address hold time (Write/Read)	10		ns	-
	T _{CHW}	Chip select "H" pulse width	0		ns	
	T _{cs}	Chip select setup time (Write)	15		ns	
COX	T _{RCS}	Chip select setup time (Read ID)	45		ns	
CSA	TRCSFM	Chip select setup time (Read FM)	355		ns	-
	T _{CSF}	Chip select wait time (Write/Read)	10		ns	
	T _{CSH}	Chip select hold time	10		ns	
	T _{WC}	Write cycle	66		ns	
WRX	TWRH	Control pulse "H" duration	<mark>15</mark>		ns	
	TWRL	Control pulse "L" duration	15		ns	
	T _{RC}	Read cycle (ID)	160		ns	
RDX (ID)	T _{RDH}	Control pulse "H" duration (ID)	90		ns	When read ID data
	T _{RDL}	Control pulse "L" duration (ID)	45		ns	
DDY	T _{RCFM}	Read cycle (FM)	450		ns	M/hon road from
	T _{RDHFM}	Control pulse "H" duration (FM)	90		ns	frame memory
	T _{RDLFM}	Control pulse "L" duration (FM)	355		ns	frame memory
D[17:0]	T _{DST}	Data setup time	10		ns	For CL=30pF
	T _{DHT}	Data hold time	10		ns	
	T _{RAT}	Read access time (ID)		40	ns	
	T _{RATFM}	Read access time (FM)		340	ns	
	TODH	Output disable time	20	80	ns	



5.2 Reset timing



Symbol	vmbol Parameter		Min.	Max.	Unit
t _{RW}	Reset pulse width ⁽²⁾	RESX	10	-	μs
t _{RT}	Reset complete time ⁽³⁾	121	121	5	ms
	Reset complete time	923	-	120	ms



5.3 Power ON/OFF Timing (VCC=VCI; IOVCC= VDDI)





6 Optical Characteristics

Ta=25℃

Item		Symbol	Condition	Min.	Тур.	Max.	Unit	Remark
View Angles		θт	CR≧10	-	80	-	- Degree	Note 2
		θВ		-	80	-		
		θL		-	80	-		
		θR		-	80	-		
Contrast Ratio		CR	θ=0°	640	800	-		Note1 Note3
Response Time		T _{ON}	25 ℃	_	30	40	ms	Noto1
		T _{OFF}						Note1 Note4
Chromaticity	White	x	Backlight is on	0.266	0.296	0.326		
		У		0.295	0.325	0.355		Note1
	Red	x		0.617	0.647	0.677		
		У		0.299	0.329	0.359		
	Green	x		0.249	0.279	0.309		Note5
		У		0.530	0.550	0.580		
	Blue	x		0.104	0.134	0.164		
		У		0.093	0.123	0.153		
Uniformity		U		80	85	-	%	Note1 Note6
NTSC				54	60	-	%	Note 5
Luminance		L		-	750	-	cd/m ²	Note1 Note7

Test Conditions:

- 1. I_F = 60 mA, V_F =6.4 V and the ambient temperature is 25±2 °C .humidity is 65±7%
- 2. The test systems refer to Note 1 and Note 2.



Note 1: Definition of optical measurement system.

Properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

Viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80) $_{\circ}$



Note 3: Definition of contrast ratio

 $Contrast ratio (CR) = \frac{Luminance measured when LCD is on the "White" state}{Luminance measured when LCD is on the "Black" state}$

"White state ": The state is that the LCD should drive by Vwhite.

"Black state": The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of response time



The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of luminance uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

L-----Active area length W----- Active area width



Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

Note 7: Definition of luminance:

Measure the luminance of white state at center point.



7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours	No abnormalities in functions
2	Low Temperature Operation	Ta = -20℃, 240 hours	No abnormalities in functions
3	High Temperature Storage	Ta = +80℃, 240 hours	No abnormalities in functions
4	Low Temperature Storage	Ta = -30℃, 240 hours	No abnormalities in functions
5	Storage at High Temperature and Humidity	Ta = +60 $^\circ \!\!\!\!\mathrm{C}$, 90% RH max,240hours	No abnormalities in functions
6	Thermal Shock (non-operating)	-30°C 30 min~ +70°C 30 min, Change time: 0.5 hour \leftarrow 5 min \rightarrow 0.5 hour.10 Cycle	Start with cold temperature, End with high temperature,
7	ESD	C=150pF, R=330Ω,5point/panel Air: ±8Kv, 5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	No abnormalities in functions

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of samples.



8 Mechanical Drawing





9 Precautions for Use of LCD Modules

Handling Precautions

9.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

9.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

9.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

9.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

9.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

Isopropyl alcohol

Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

9.1.6 Do not attempt to disassemble the LCD Module.

9.1.7 If the logic circuit power is off, do not apply the input signals.

9.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

9.1.8.1 Be sure to ground the body when handling the LCD Modules.

9.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

9.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

9.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

Storage Precautions

9.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

9.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is: Temperature : $0^{\circ}C \sim 40^{\circ}C$ Relatively humidity: $\leq 80\%$

9.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

Transportation Precautions

9.3.1 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.