



晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-640480WTZQW-00H
APPROVED BY	
DATE	

☐ Preliminary Specification

☒ Formal Specification

Distributed by:



Approved by	Checked by	Organized by
Kokai	Jessica	Simon

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2024/01/08	--	New Release.	Simon
2024/01/15	18	Current Mechanical Dimensions	Simon

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1 General Description and Features

3.5 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 3.5" TFT-LCD panel, a driver circuit and backlight unit.

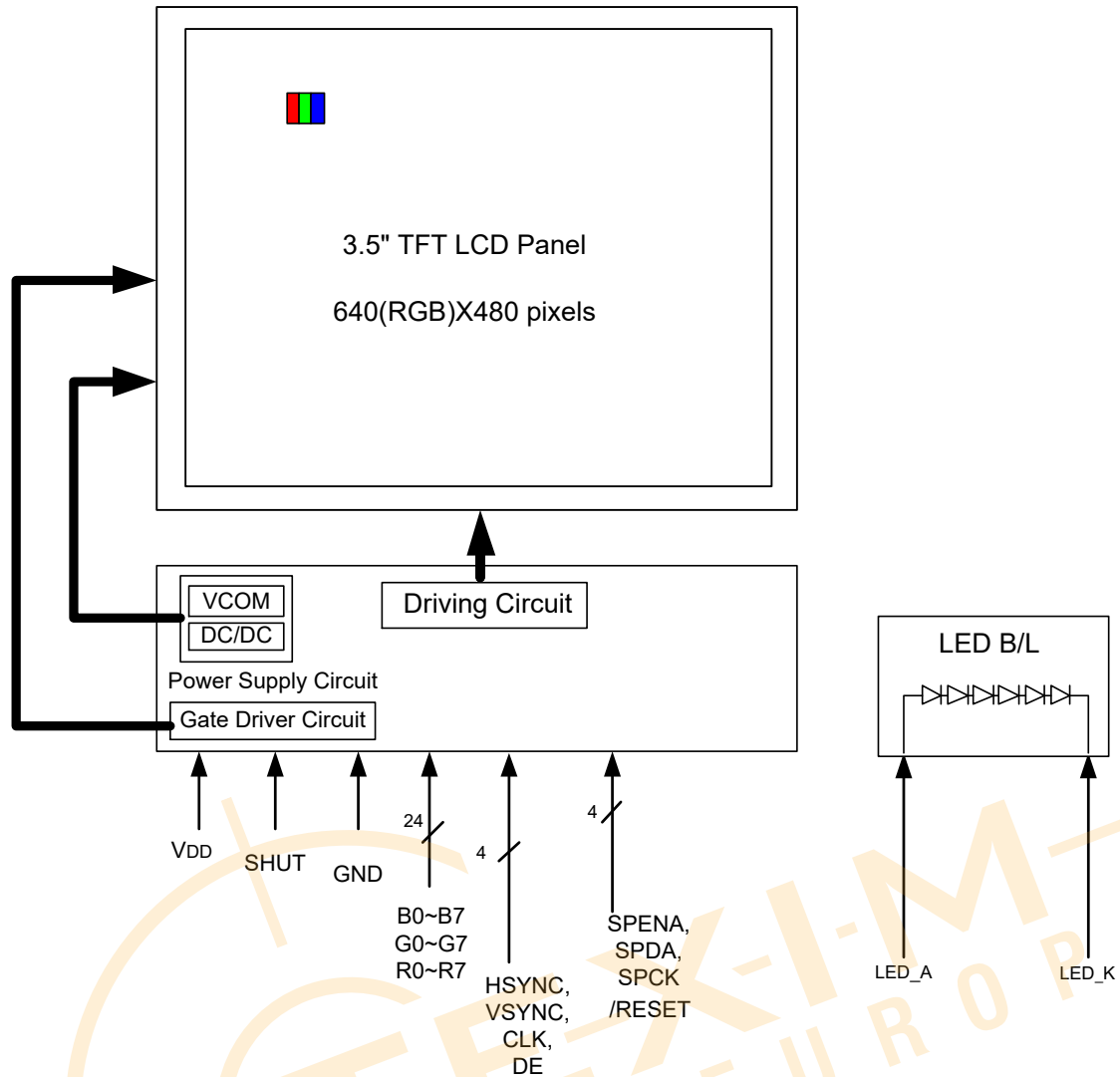
- 1.1 Construction: 3.5" IPS TFT-LCD, White LED Backlight.
- 1.2 Resolution (pixel): 640(R.G.B) X480.
- 1.3 Number of the Colors: 16.7M Dithering (R, G, B 8 bit digital each).
- 1.4 LCD type: Transmissive Color TFT LCD
- 1.5 24Bit RGB Interface/
- 1.6 Interface: 54 pin.

2 Physical specifications

Item	Specifications	unit
Display Resolution	640(RGB)(W) x 480(H)	dot
Active area	70.08 x 52.56	mm
Screen size	3.5(Diagonal)	inch
Pixel pitch	0.1095 (W) x 0.1095 (H)	mm
Color configuration	R.G.B – Vertical stripe	
Overall Dimension	76.9(W) x 63.9(H) x 3.2(T)	mm
Input interface	digital 24-bits RGB	
Backlight unit	White LED	
Display Mode	Normally Black	
Surface Treatment	Anti-Glare	

Note 1: Requirements on Environmental Protection: RoHS

3 Functional Block Diagram



4 Electrical Specifications

TFT LCD Panel FPC Descriptions

Pin no	Symbol	I/O	Description	Remark
1	LED_K	P	LED backlight Cathode	
2	LED_K	P	LED backlight Cathode	
3	LED_A	P	LED backlight Anode	
4	LED_A	P	LED backlight Anode	
5	NC	--	No Connect	
6	NC	--	No Connect	
7	NC	--	No Connect	
8	NC	--	No Connect	
9	NC	--	No Connect	
10	NC	--	No Connect	
11	NC	--	No Connect	
12.	B0	I	Blue Data Bit 0	
13.	B1	I	Blue Data Bit 1	
14.	B2	I	Blue Data Bit 2	
15.	B3	I	Blue Data Bit 3	
16.	B4	I	Blue Data Bit 4	
17.	B5	I	Blue Data Bit 5	
18.	B6	I	Blue Data Bit 6	
19.	B7	I	Blue Data Bit 7	
20.	G0	I	Green Data Bit 0	
21.	G1	I	Green Data Bit 1	
22.	G2	I	Green Data Bit 2	
23.	G3	I	Green Data Bit 3	
24.	G4	I	Green Data Bit 4	
25.	G5	I	Green Data Bit 5	
26.	G6	I	Green Data Bit 6	
27.	G7	I	Green Data Bit 7	
28.	R0	I	Red Data Bit 0	
29.	R1	I	Red Data Bit 1	
30.	R2	I	Red Data Bit 2	
31.	R3	I	Red Data Bit 3	
32.	R4	I	Red Data Bit 4	
33.	R5	I	Red Data Bit 5	
34.	R6	I	Red Data Bit 6	
35.	R7	I	Red Data Bit 7	

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36.	HSYNC	I	Horizontal Synchronous Signal	
37.	VSYNC	I	Vertical Synchronous Signal	
38.	CLK	I	Data Clock	
39.	NC	--	No Connect	
40	NC	--	No Connect	
41	VDDIO	P	Logic I/O power supply	
42	VDD	P	Power supply (3.3V)	
43	NC	--	Must keep floating.	
44	NC	--		
45	NC	--		
46	NC	--		
47	NC	--	No Connect	
48	NC	--	No Connect	
49	NC	--	No Connect	
50	NC	--	No Connect	
51	NC	--	No Connect	
52	DE	I	Data Enable Input	
53	GND	P	Ground	
54	GND	P	Ground	

Note 2-1:

I/O definition: I – Input O – Output P – Power/Ground

5 Basic Display Color and Gray Scale

	Display	MSB				LSB				MSB				LSB				MSB				LSB				Gray scale Level
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:				:				:				:				:				:				L3...L251
		H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
		H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L2
		:				:				:				:				:				:				L3...L251
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L252
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L253
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L254
	Green	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Green L255
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
		:				:				:				:				:				:				L3...L251
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L252
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L254
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255

6 Absolute Maximum Ratings

(The following are maximum values which, if exceeded, may cause operation or damage to the unit.)

Item	Symbol	Min	Max	Unit	Note
Power Supply Voltage	VDD	-0.3	3.6	V	
Power Supply Voltage	VDDIO	-0.3	3.6	V	
Operating Temperature	T _{OP}	-20	70	°C	
Storage Temperature	T _{ST}	-30	80	°C	

Note:

*1. Non-condensation.

*2. Temp. ≤ 60°C, 90%RH Max.

Temp. > 60°C, Absolute humidity shall be less than 90%RH.



7 Electrical Characteristics

7.1 DC Electrical characteristic of the LCD

Typical operating conditions (GND=0V, Ta=25°C)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VDD	2.65	2.8	3.6	V	
Logic Signal Input supply		VDDIO	1.65	1.8	3.6		
Input Voltage for logic	H Level	V _{IH}	0.7*VDD	-	VDD	V	
	L Level	V _{IL}	0	-	0.3*VDD	V	

7.2 Electrical characteristic of LED Back-light

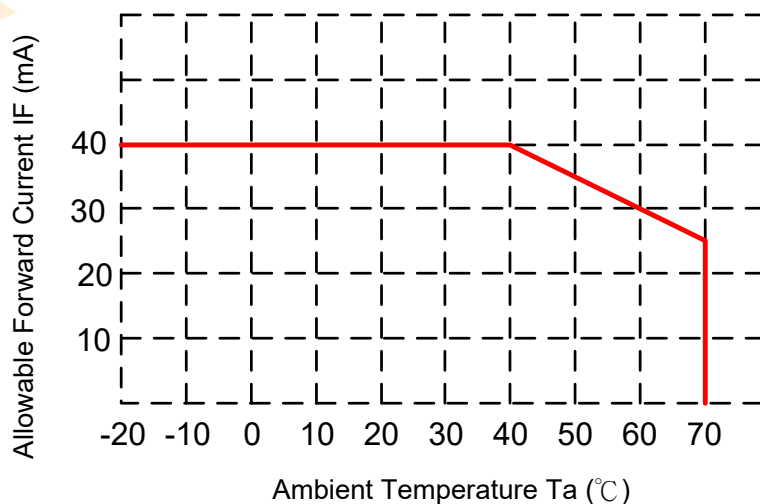
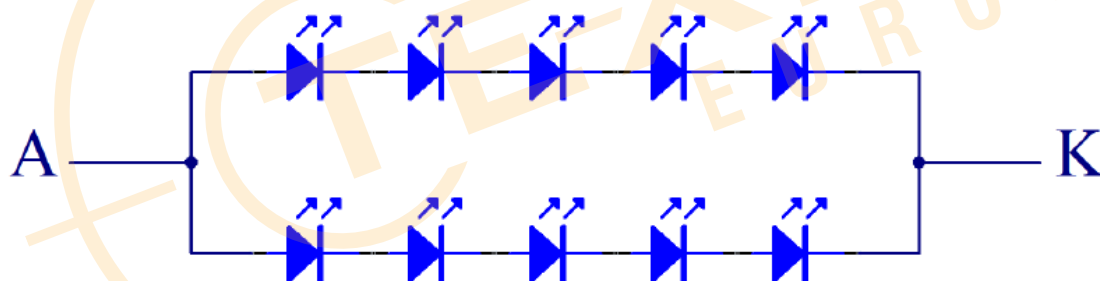
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward current	IF	-	40	--	mA	
Forward voltage	VF	-	17.5		V	
Operating Life time		50	--		kHrs	Ta=25°C

Note1: The figure below shows the connection of backlight LED.

Note2: Optical performance should be evaluated at Ta=25°C only.

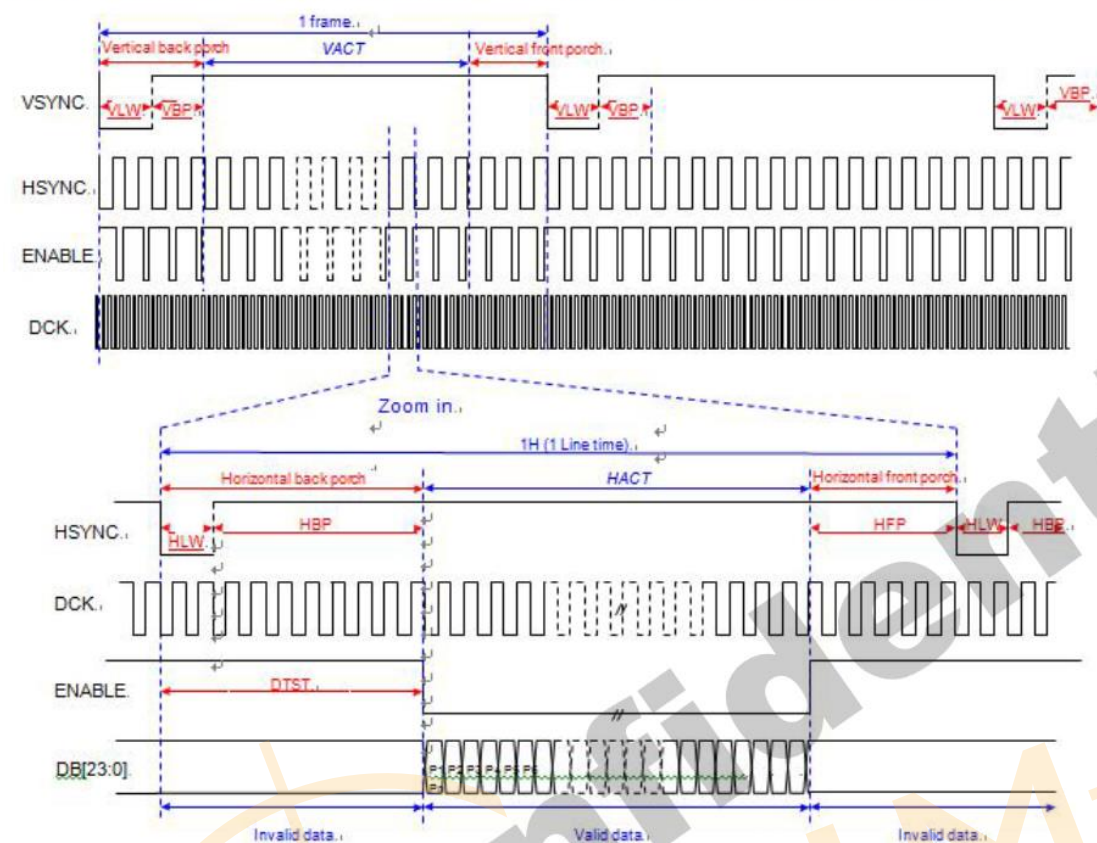
Note3: IF LED is driven by high current, high ambient temperature & humidity condition, the life time of LED will be reduced.

Note4: Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



8 DPI interface Timing

The timing chart of 24-/18-/16-bit DPI (RGB) interface mode is illustrated in Figure 10.



VLW : VSYNC Low pulse Width
 HLW : HSYNC Low pulse Width
 DTST : Data Transfer Startup Time
 Pn : pixel 1, pixel 2..., pixel n

Parameter	Symbols	Condition	Min.	Typ.	Max.	Units
Frame Rate	FR		54		66	fps
Horizontal Low Pulse width	HLW		1		-	DOTCLK
Horizontal Back Porch	HBP		2		126	DOTCLK
Horizontal Address	HACT					DOTCLK
Horizontal Front Porch	HFP		2		-	DOTCLK
Vertical Low Pulse width	VLW		1		126	Line
Vertical Back Porch	VBP		1		126	Line
Vertical Address	VACT				1440	Line
Vertical Front Porch	VFP		1		255	Line
Data Clock	DCLK		16.6		50	MHz

Figure 10 DPI Interface Timing diagram

Note1. $HLW+HBP+HFP \geq 4.5us$.

Note2. $VSPL=0'$, $HSPL=0'$, $DPL=0'$ and $EPL=0'$ of "(Interface Mode Control 21h of the Page 1)" command.

8.1 Power On/Off Sequence

T.B.D



9 Optical specification

9.1 Optical characteristic of the LCD

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\Theta=0$ Normal viewing angle	900	1200	—		(1)(2)
Response time		T_R+T_F		—	25	35	msec	(1)(3)
White luminance (Center)		Y_L		700	800	—	cd/m ²	(1)(4)
Color chromaticity (CIE1931)	White	W_x		-0.05	0.290	+0.05		(1)(4)
		W_y			0.310			
	Red	R_x			--			
		R_y			--			
	Green	G_x			--			
		G_y			--			
	Blue	B_x			--			
		B_y			--			
Viewing angle	Hor.	Θ_L	CR>10	75	85	—		
		Θ_R		75	85	—		
	Ver.	Θ_U		75	85	—		
		Θ_D		75	85	—		

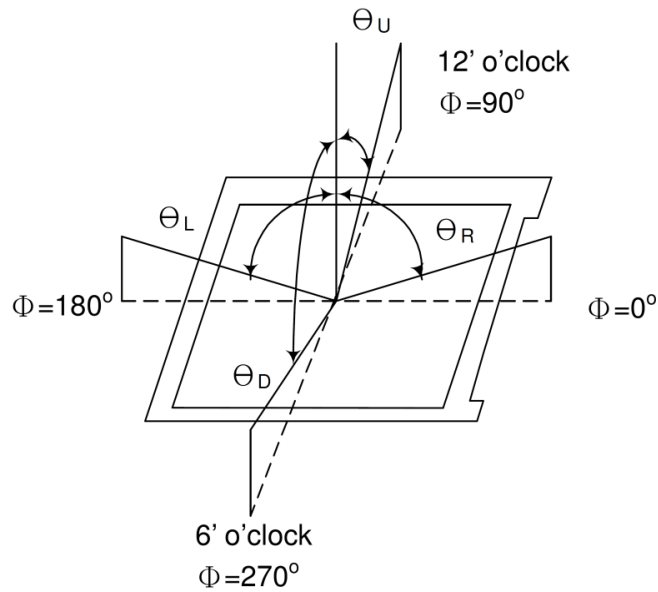
Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : 25±2°C
- 15min. warm-up time.

Measuring Equipment

Measuring Equipment is BM-7

Note 1 Definition of viewing angle

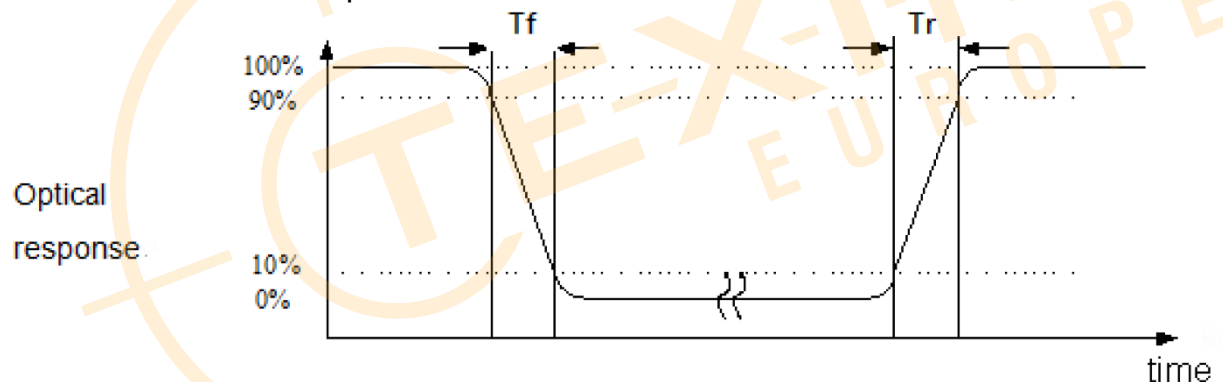


Note 2: Definition of contrast ratio (CR)

Measured at the center point of panel

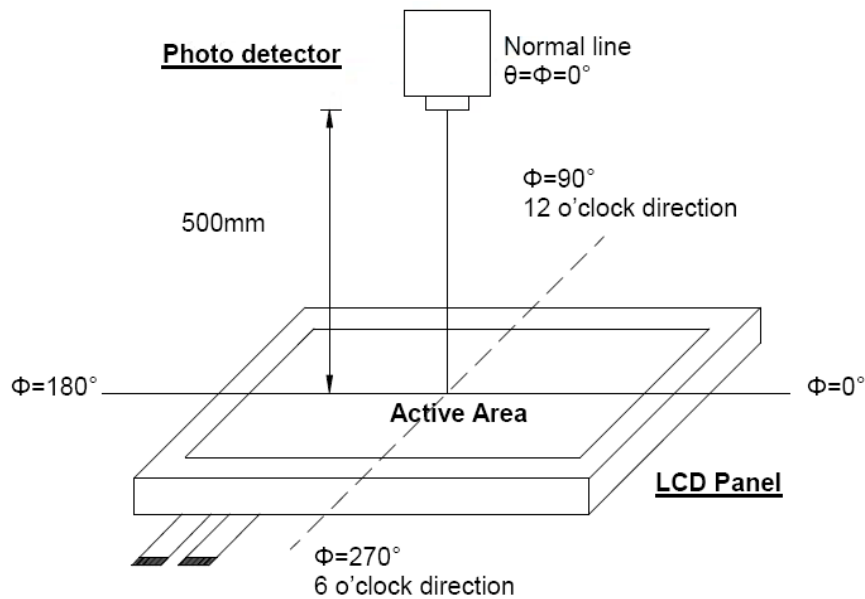
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note 3: Definition of response time: Sum of T_R and T_F



Note 4: Definition of optical measurement setup

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° / Height: 500mm.)



10 Reliability Test

The reliability test items and its conditions are shown below.

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=240 hrs	
Low Temperature Operation	-20±3°C , t=240 hrs	
High Temperature Storage	80±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=240 hrs	1,2
Storage at High Temperature and Humidity	60°C, 90% RH , 240 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10~55~10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axes Duration : 30 min/each axis	2

Note 1: Condensation of water is not permitted on the module.

Note 2: The module should be inspected after 1 hour storage in normal conditions (15-35°C, 45-65%RH).

Note 3: The module shouldn't be tested more than one condition, and all the test conditions are independent.

Note 4: All the reliability tests should be done without protective film on the module.

11 USE PRECAUTIONS

11.1 Handling Precautions

- 11.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 11.1.2. 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.
- 11.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- 11.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 11.1.5. 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 alcoholSolvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- 11.1.6. Do not attempt to disassemble the LCD Module.
- 11.1.7. If the logic circuit power is off, do not apply the input signals.
- 11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - 11.1.8.1. Be sure to ground the body when handling the LCD Modules.
 - 11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.
 - 11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - 11.1.8.4. 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.

11.2 Storage Precautions

- 11.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- 11.2.2. 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°C ~ 40°C Relatively humidity: ≤80%
- 11.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

11.3 Transportation Precautions

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

11.4 Other

- 11.4.1. AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.
- 11.4.2. Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.



Date: 2024/01/15



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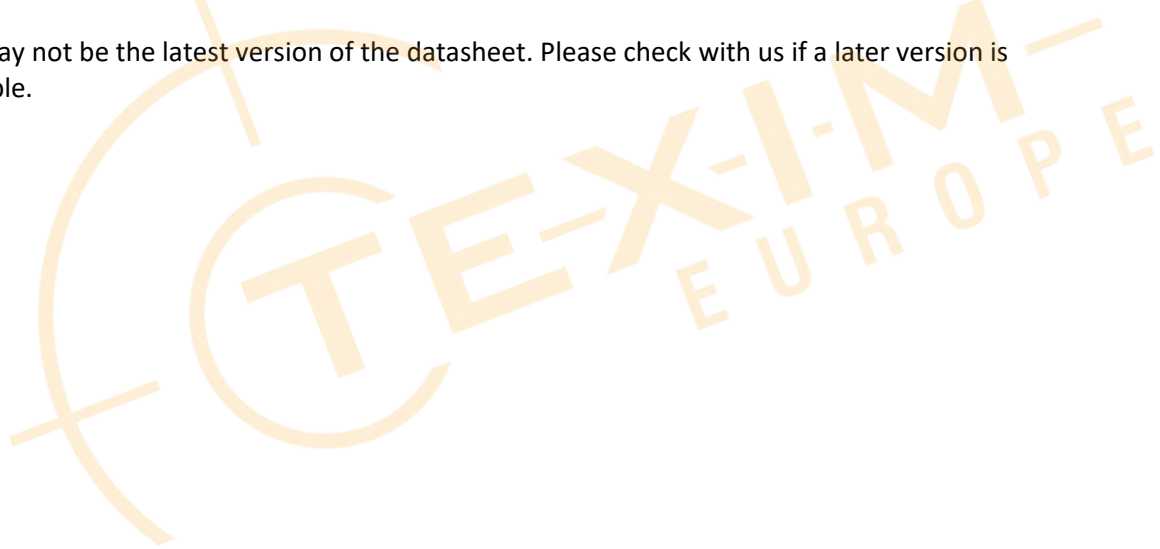
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Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time.

All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts.

Please contact us if you have any questions about the contents of the datasheet.

This may not be the latest version of the datasheet. Please check with us if a later version is available.





Headquarters & Warehouse

Elektrostraat 17
NL-7483 PG Haaksbergen
The Netherlands

T: +31 (0)53 573 33 33
E: info@texim-europe.com
Homepage: www.texim-europe.com



The Netherlands

Elektrostraat 17
NL-7483 PG Haaksbergen

T: +31 (0)53 573 33 33
E: nl@texim-europe.com



Belgium

Zuiderlaan 14, box 10
B-1731 Zellik

T: +32 (0)2 462 01 00
E: belgium@texim-europe.com



UK & Ireland

St Mary's House, Church Lane
Carlton Le Moorland
Lincoln LN5 9HS

T: +44 (0)1522 789 555
E: uk@texim-europe.com



Germany

Bahnhofstrasse 92
D-25451 Quickborn

T: +49 (0)4106 627 07-0
E: germany@texim-europe.com



Germany

Martin-Kollar-Strasse 9
D-81829 München

T: +49 (0)89 436 086-0
E: muenchen@texim-europe.com



Austria

Warwitzstrasse 9
A-5020 Salzburg

T: +43 (0)662 216 026
E: austria@texim-europe.com



Nordic

Stockholmsgade 45
2100 Copenhagen

T: +45 88 20 26 30
E: nordic@texim-europe.com



Italy

Martin-Kollar-Strasse 9
D-81829 München

T: +49 (0)89 436 086-0
E: italy@texim-europe.com