PRODUCTION SPECIFICATION
OF LCD MODULE

MODULE NO.:XY024HQV8636ANT

Customer Name:		
Customer Part Number:		
Approved By:		Date:

Prepared By	Checked By	Approved By
Ray	Jacky	Meter

Table of Contents

Revision History

Rev	Issued Date	Description	Page	Editor
1.0	May 29.2023	First release	All	

1 General Specifications

Feature		Specifications
Display Spec.	LCD type	2.4 inch
	Resolution（H∗V）	240（RGB）×320
	Technology Type	a-Si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	Transmissive／Normally Black
	Viewing Direction	ALL
	Gray Scale Inversion Direction	ALL
Mechanical Characteristics	OutlineDimensions（W x H x T）（mm）	42.72∗60.26∗2.2
	Active Area（mm）	36.72∗48.96
	With／Without Touch screen	Without
	Match Connector Type	OK-14GM024-04
	Backlight Type	White LED
	Weight（g）	TBD
Electrical Characteristics	Interface	MCU8bit
	Number of color	65K
	Driver IC	ST7789V

Note 1： Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

2　Pin Assignment

NO.	PIN NAME	I/O	Description
1	LEDK	I	LED Cathode
2	LEDA	I	LED Anode
3	GND	I	Power Ground
4	VCI	I	Power Supply 2.8V Voltage
5	IOVCC	I	Power Supply 1.8V Voltage
6	fmark	O	Tearing effect signal is used to synchronize MCU to frame memory
7	CS	I	Input pin for chip selection signal
8	RESET	I	LCM Reset input signal
9	RS	I	Register select signal
10	WR	I	Write strobe signal input pin
11	RD	I	Read strobe signal input pin
12~19	DB7-DB0	I/O	Display Data I/O
20~24	GND	I	Power Ground

Note1：I/O definition：I-----Input　　O---Output　　P----Power/Ground

3 Absolute Maximum Ratings

GND=0V, Ta= 25℃

Item	Symbol	Value	Unit
Power supply voltage for logic	V_{DD}	1.6~3.3	V
Input voltage	Vin	V_{DD}+0.3	V
Operating temperature	Topr	−20 to 70	C
Storage temperature	Tstg	−30 to 80	C

4 Electrical Characteristics

4.1 DC Characteristics（VDD=2.8V,Ta=25℃）

Item	Symbol	Min	Type	Max	Unit	Test condition
Operating voltage	V_{DD}	2.6	2.8	3.3	V	–
Supply current	I_{DD}	–	–	25	mA	V_{DD}=2.8V,Ta=25 C
Input voltage	V_{IH}	0.8VDD	–	VDD	V	–
	V_{IL}	0	–	0.2VDD	V	
Input leakage current	I_{IL}	−1.0	–	1.0	A	V_{IN}=V_{DD} or V_{SS}

Note：Voltage greater than above may damage the module.

All voltages are specified relative to VSS=0V.

4.2 Driving Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	––	80	90	mA	
Forward Voltage	V_F	–	3.2	–	V	
Connection mode	P	––	4 Parallel	––		
LED number	/		4		pcs	
LED life time		20000			hours	

Note1: Optical performance should be evaluated at Ta=25℃ only .If LED is driven by 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.
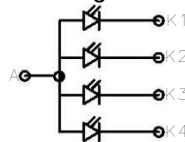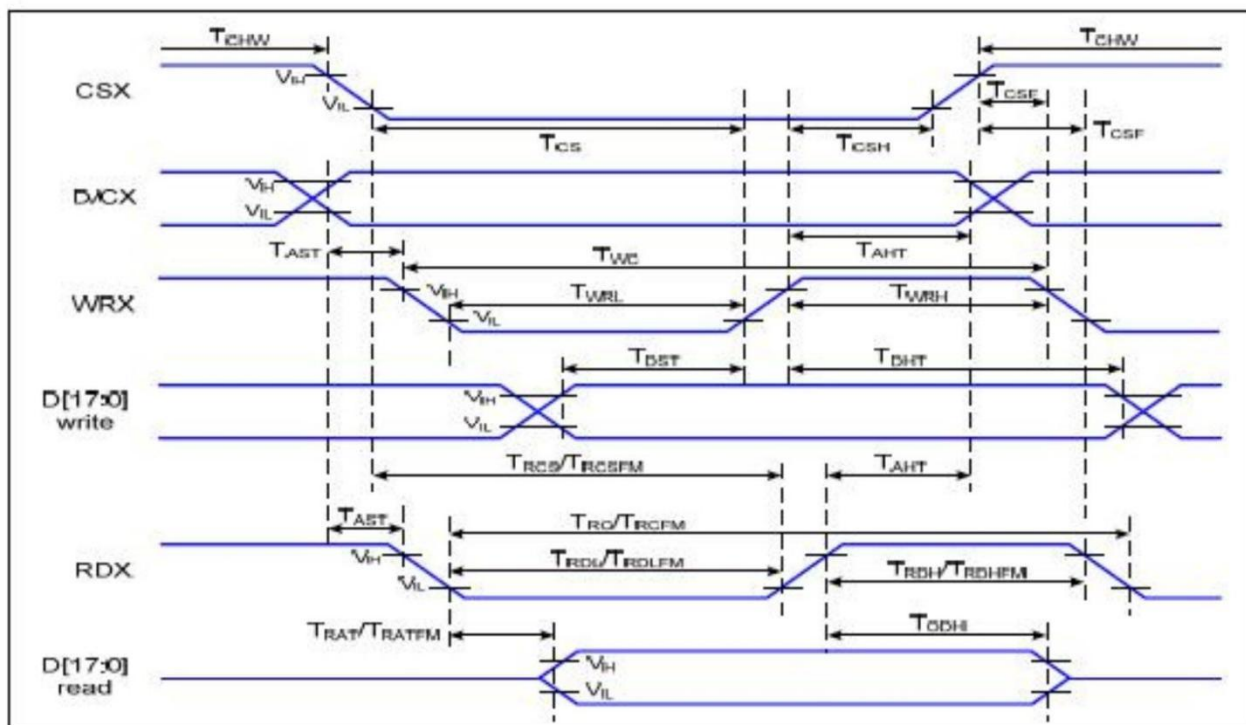

Vled=3.2±1.2V Iled=80mA

4.3   Block Diagram

RESET
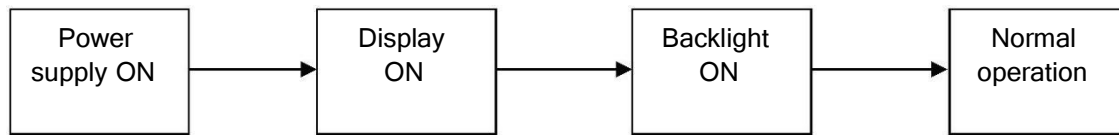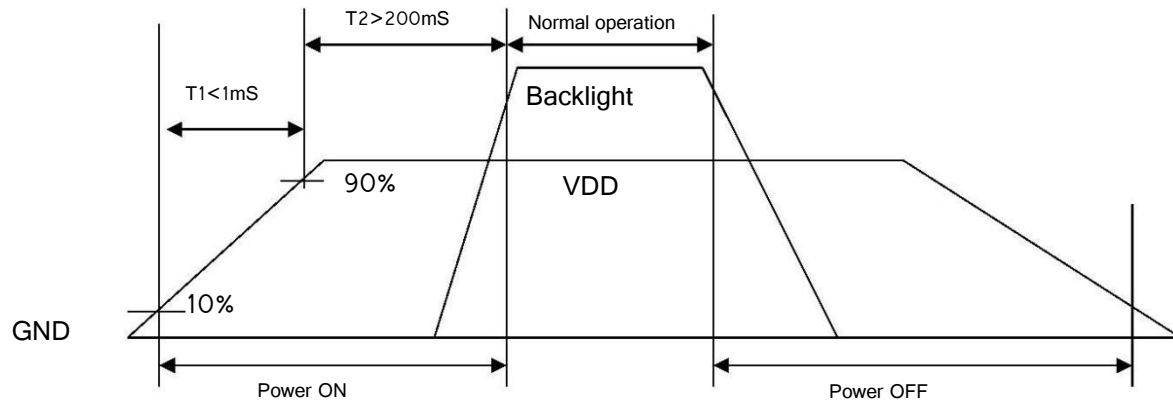
CS

RS

WR

RD

VCC

DB0-DB7

GND

A,K

BL
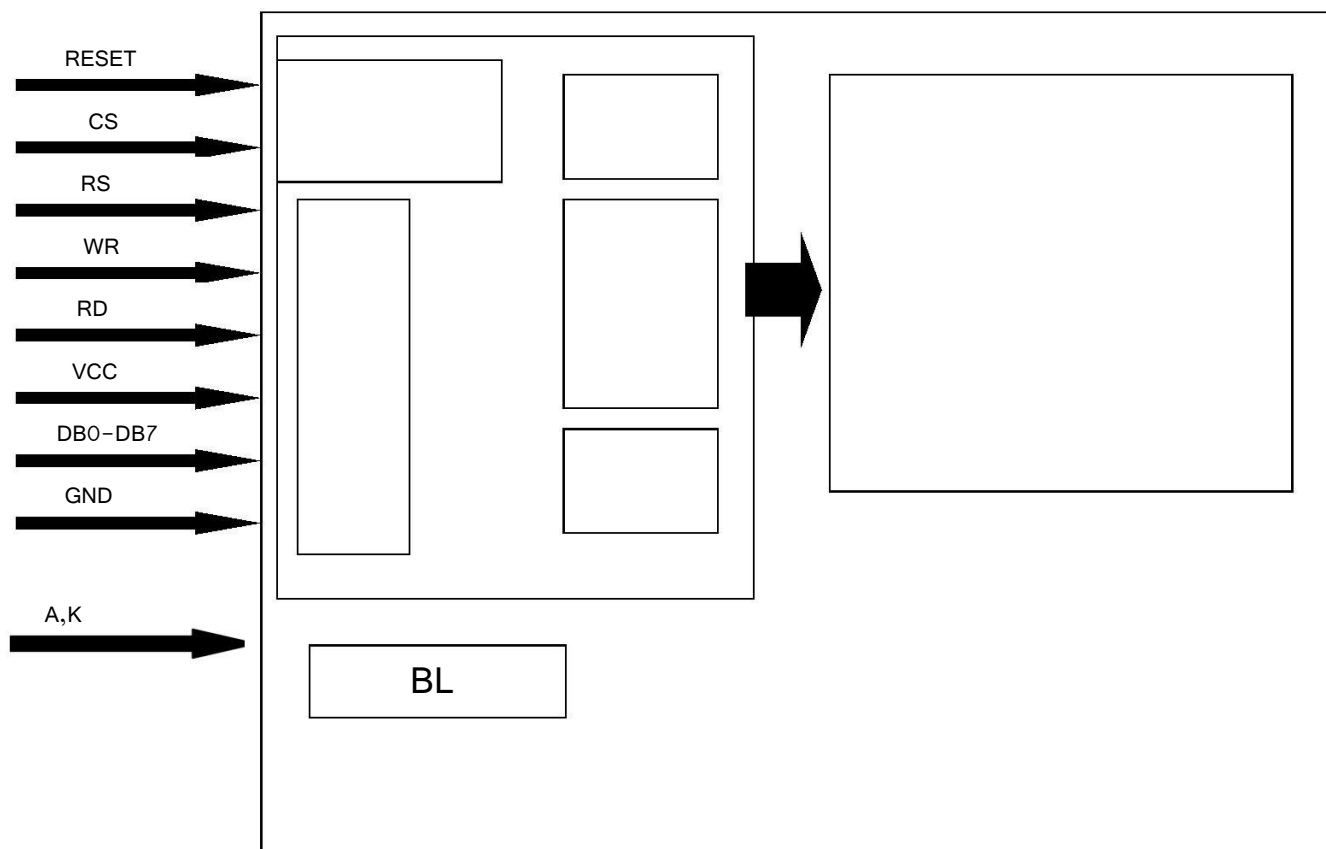
5 INTERFACE TIMING

5.1 MCU interface

Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	T_{AST}	Address setup time	0		ns	-
	T_{AHT}	Address hold time (Write/Read)	10		ns	
CSX	T_{CHW}	Chip select "H" pulse width	0		ns	-
	T_{CS}	Chip select setup time (Write)	15		ns	
	T_{RCS}	Chip select setup time (Read ID)	45		ns	
	T_{RCSFM}	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	
WRX	T_{WC}	Write cycle	66		ns	
	T_{WRH}	Control pulse "H" duration	15		ns	
	T_{WRL}	Control pulse "L" duration	15		ns	
RDX (ID)	T_{RC}	Read cycle (ID)	160		ns	When read ID data
	T_{RDH}	Control pulse "H" duration (ID)	90		ns	
	T_{RDL}	Control pulse "L" duration (ID)	45		ns	
RDX (FM)	T_{RCFM}	Read cycle (FM)	450		ns	When read from frame memory
	T_{RDHFM}	Control pulse "H" duration (FM)	90		ns	
	T_{RDLFM}	Control pulse "L" duration (FM)	355		ns	
D[17:0]	T_{DST}	Data setup time	10		ns	For CL=30pF

5.2

T2>200mS

Normal operation

T1<1mS

Backlight

90%

VDD

10%

GND

Power ON

Power OFF

| Power supply ON | → | Display ON | → | Backlight ON | → | Normal operation |

Power ON sequence

| Normal operation | → | Backlight OFF | → | Display OFF | → | Power supply OFF |
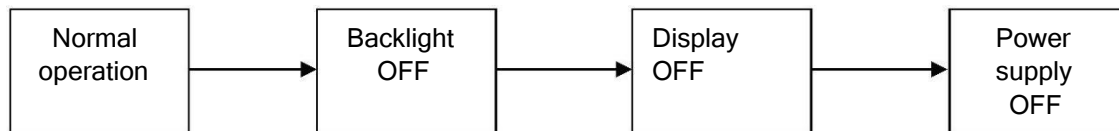
Power OFF sequence

6 Optical Characteristics

Ta=25℃

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	θT	CR≧10	70	80	–	Degree	Note 2
	θB		70	80	–		
	θL		70	80	–		
	θR		70	80	–		
Contrast Ratio	CR	θ=0°	450	500	–	–	Note1 Note3
Response Time	I ON / I OFF	25℃	–	15	–	ms	Note1 Note4
Uniformity	U	–	70	80	–	%	Note1 Note6
NTSC	–	–	–	50	–	%	Note 5
Luminance	L		250	280	–	cd/m²	Note1 Note7

Test Conditions：

1. V_F=3.2V, I_F=80mA, the ambient temperature is 25℃.

2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical 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.

Photo detector

Field

TFT-LCD Module

500 mm

LCD Panel

The center of the screen
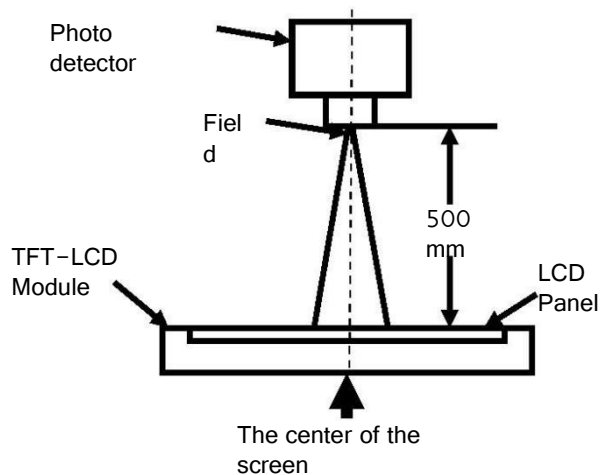
Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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

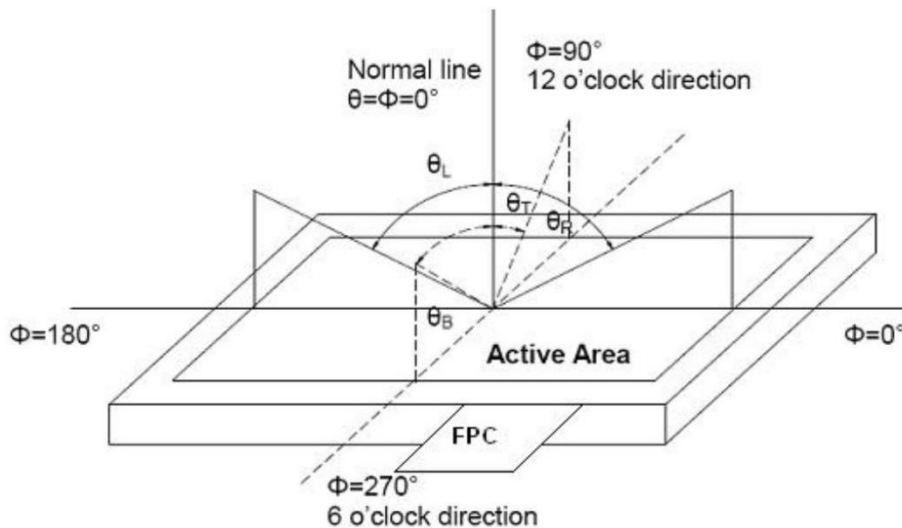viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。

Fig. 1 Definition of viewing angle

Note 3：Definition of contrast ratio

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

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

"Black state": The state is that the LCD should be driven 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（TON）is the time between photo detector output intensity changed from 90% to 10%. And fall time（TOFF）is the time between photo detector output intensity changed from 10% to 90%.
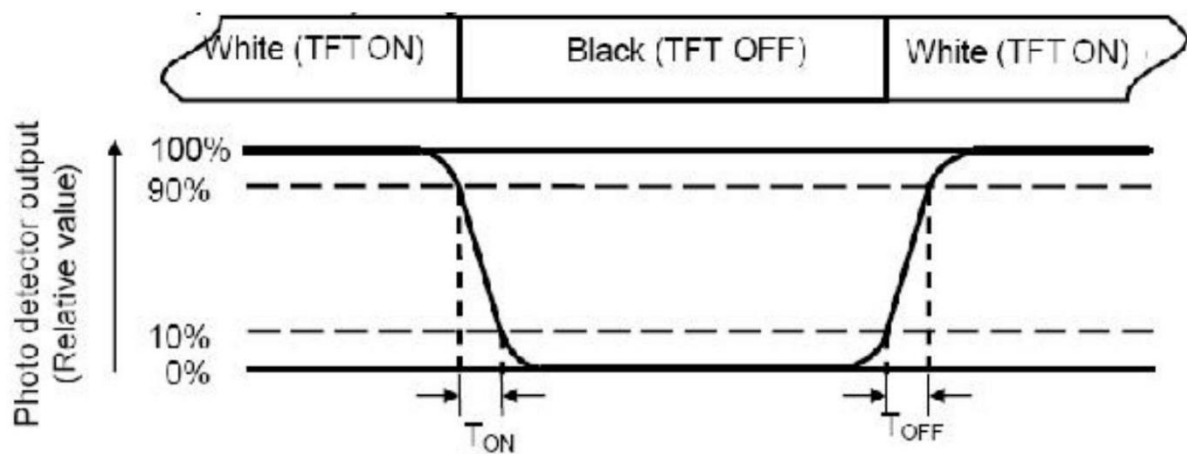
Note 5：Definition of color chromaticity（CIE1931）

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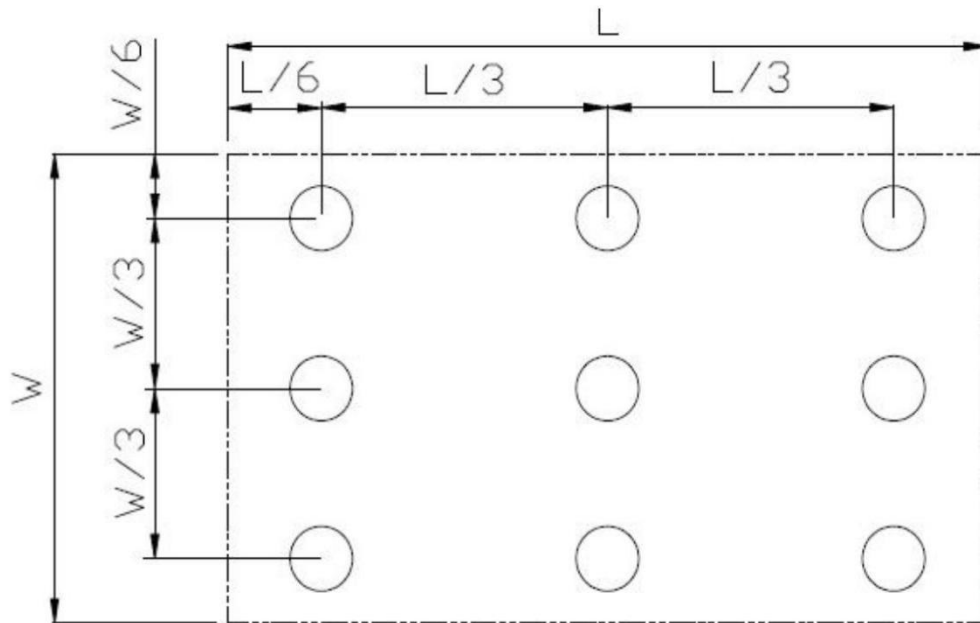
L－－－－－－－Active area length W－－－－－ Active area width

Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance:

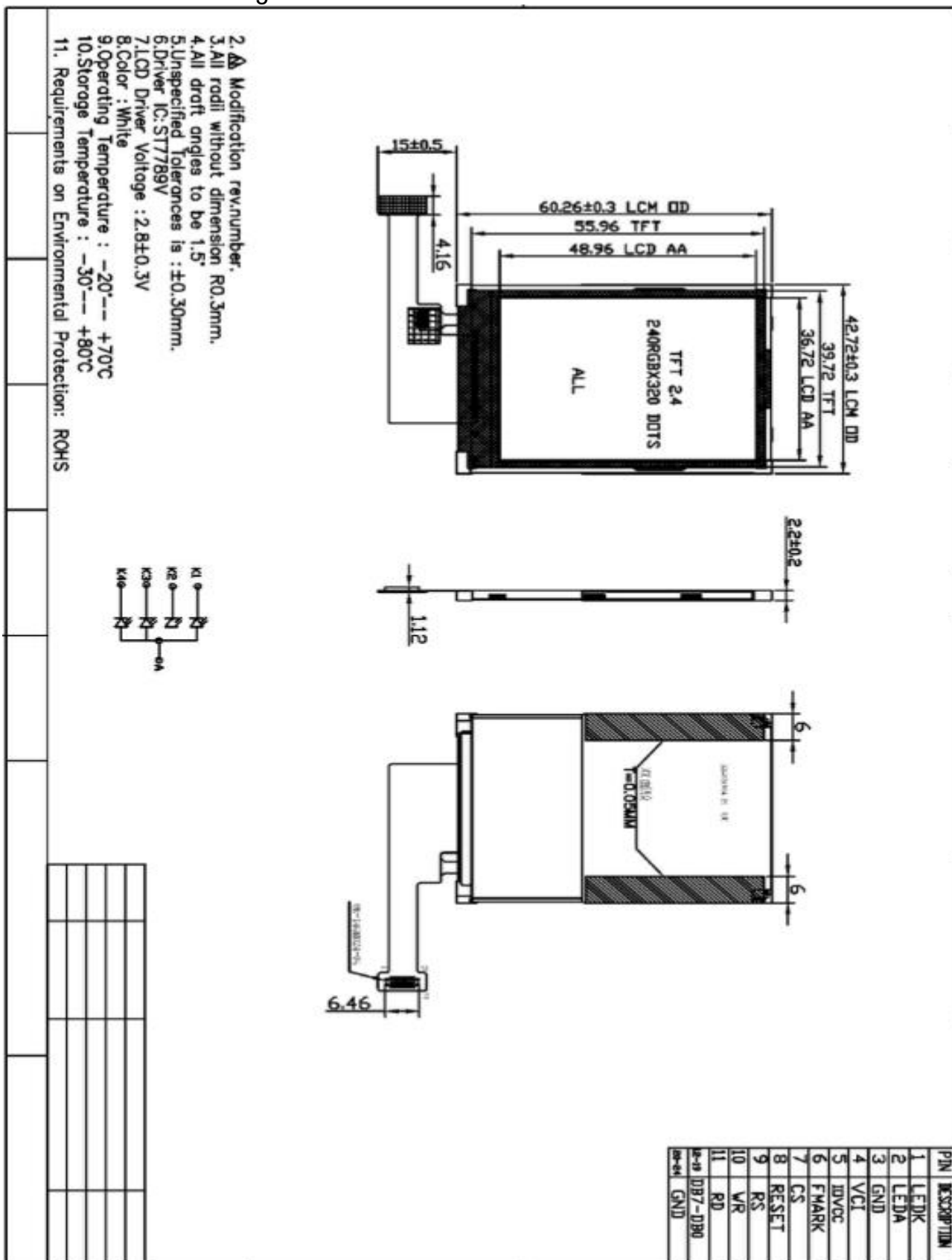Measure the luminance of white state at center point.

7   Environmental／Reliability Test

Item	Condition	Time（hrs）	Assessment
High temp. Storage	80 C	120	No abnormalities in functions and appearance
High temp. Operating	70 C	120	
Low temp. Storage	-30 C	120	
Low temp. Operating	-20 C	120	
Humidity	40 C／90%RH	120	
Thermal Shock（Non-operation）	-20 C　25 C　70 C （0.5 hour　5 min　0.5 hour）	10cycles	

Remark：

1.The test samples should be applied to only one test item.

2.Sample size for each test item is 1~10pcs.

3.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

8   Mechanical Drawing

2. ⚠ Modification rev.number.
3. All radii without dimension R0.3mm.
4. All draft angles to be 1.5°
5. Unspecified Tolerances is :±0.30mm.
6. Driver IC:ST7789V
7. LCD Driver Voltage :2.8±0.3V
8. Color : White
9. Operating Temperature : -20°-- +70°C
10. Storage Temperature : -30°-- +80°C
11. Requirements on Environmental Protection: ROHS

PIN	DESCRIPTION
1	LEDK
2	LEDA
3	GND
4	VCI
5	IOVCC
6	FMARK
7	CS
8	RESET
9	RS
10	VR
11	RD
12-19	DB7-DB0
20-24	GND

9   Precautions For Use of LCD Modules

9.1   Handling Precautions

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

9.1.1.2 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.

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

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

9.1.1.5 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

9.1.1.6 Do not attempt to disassemble the LCD Module.

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

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

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

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

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

9.1.1.12   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.

9.1.1.13   Storage precautions

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

9.1.1.15   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:

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

9.2   Transportation Precautions

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