

产 品 规 格 书

Product Specification

Model Name (产品名称)		TFT-LCD Module	
Part Number (产品型号)		JT428FHI51R3L01	
Item (项目)	Prepared (拟制)	Checked (审核)	Approved (批准)
Signature (签名)	赖依	林勇	
Date (日期)	2023-06-29	2023-06-29	
Note (备注)			
Customer: (客户)		Signature (签名)	
		Date (日期)	

Revision Record

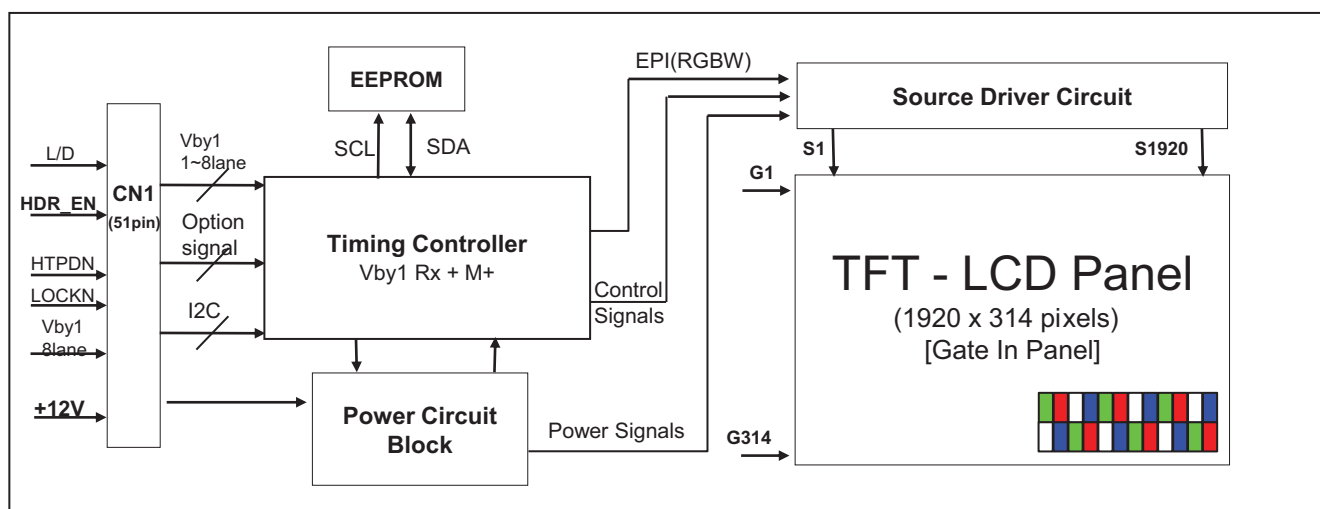
Version	Issued Date	Page	Old Description	New Description
01	2023-06-29	\	Initial release	\

CONTENTS

Number	ITEM	Page
	CONTENTS	2
	GENERAL DESCRIPTION	3
	ABSOLUTE MAXIMUM RATINGS	4
1	ELECTRICAL SPECIFICATIONS	5
2 3-1	ELECTRICAL CHARACTERISTICS	5
3 3-2	INTERFACE CONNECTIONS	6
3-3	SIGNAL TIMING SPECIFICATIONS	7
3-4	V by One Input Characteristics	8
3-5	INTARA INTERFACE SIGNAL SPECIFICATION	10
3-6	COLOR DATA REFERENCE	11
3-7	POWER SEQUENCE	12
3-8	Backlight Specification	13
4	OPTICAL SPECIFICATIONS	15
5	MECHANICAL CHARACTERISTICS	19
6	MECHANICAL DIMENSION	20
7	RELIABILITY	21
8	INTERNATIONAL STANDARDS	22
8-1	SAFETY	22
8-2	ENVIRONMENT	22
9	PACKING	23
10	PRECAUTIONS	24
10-1	HANDLING PRECAUTIONS	24
10-2	OPERATING PRECAUTIONS	24
10-3	PROTECTION FILM	25
10-4	STORAGE PRECAUTIONS	25
10-5	PACKING PRECAUTIONS	25

1. General Description

This is a Color Active Matrix Liquid Crystal Display with an integral the Source PCB and Gate implanted on Panel (GIP). The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally black mode. It has a 42.8 inch diagonally measured active display area with QWUXGA resolution (314 vertical by 1920 horizontal pixel array). Sub-pixels are constructed with Red, Green, Blue and White. Each pixel is divided into RGB or WRG or BWR or GBW or dots which are arranged in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 10-bit gray scale signal for each dot. Therefore, it can present a palette of more than 1.07Billion colors. It has been designed to apply the 10-bit 8 Lane V by One interface. It is intended to support LCD TV, PCTV where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.



General Features

Items	Specification	Unit	Note
Active Screen Size	42.8	inch	
Number of Pixels	1920 X 314	Pixel	
Display Area	1073.78 (H) x 175(V)	mm	
Bezel Opening	1078.5(H) x 179.6(V)	mm	
Outline Dimension	1104.5(H) x 205.6(V) x 21(D)	mm	
Luminance, White	300 (Center 1 point, Typ.)	cd/m ²	
Power Supply Input Voltage	12 (Typ)	V	Backlight
Power Supply Voltage	12.0 (Typ)	V	OC
Power Consumption	Total = 43.4 (Typ.)	W	LCD Open Cell = 12.4 W(Typ.) Backlight = 31 W(Typ.)
Contrast Ratio	1100 : 1	--	
Response time	6 (Typ.)(G to G)	ms	
Color temperature	8297	K	
Weight	4.35(Typ)	Kg	
Operating Temperature	0 ~ 50	°C	
Storage Temperature	-20 ~ 65	°C	

2. Absolute Maximum Ratings

The following items are maximum values which, if exceeded, may cause faulty operation or permanent damage to the LCD module.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Value		Unit	Note
			Min	Max		
Power Input Voltage	LCD Circuit	V _{LCD}	-0.3	+14.0	V _{DC}	1
T-Con Option Selection Voltage		V _{LOGIC}	-0.3	+4.0	V _{DC}	
Operating Temperature		T _{OP}	0	+50	°C	2,3
Storage Temperature (without packing)		T _{ST}	-20	+60	°C	
Panel Front Temperature		T _{SUR}	-	+68	°C	4
Operating Ambient Humidity		H _{OP}	10	90	%RH	2,3
Storage Humidity		H _{ST}	5	90	%RH	

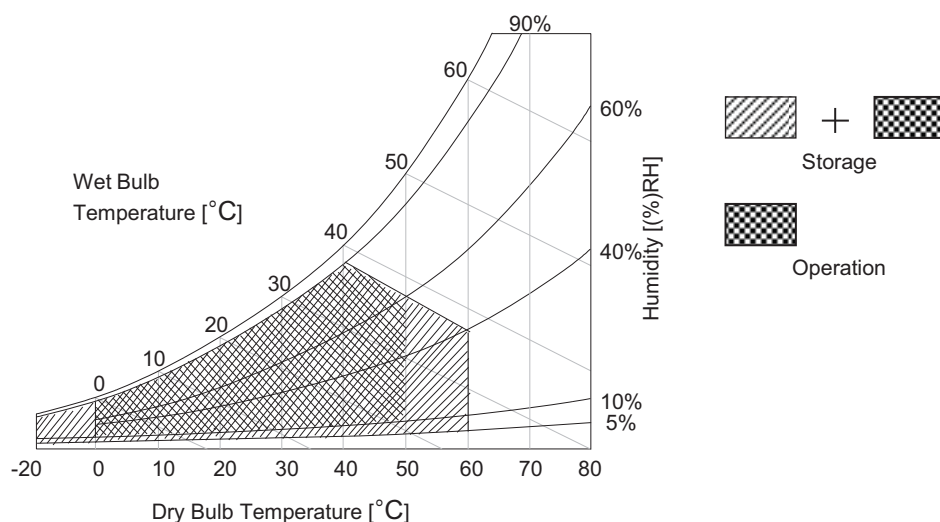
Note1. Ambient temperature condition ($T_a = 25 \pm 2 \text{ }^\circ\text{C}$)

2. Temperature and relative humidity range are shown in the figure below.

Wet bulb temperature should be Max 39°C, and no condensation of water.

3. Gravity mura can be guaranteed below 40°C condition.

4. The maximum operating temperatures is based on the test condition that the surface temperature of display area is less than or equal to 68°C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 68°C. The range of operating temperature may be degraded in case of improper thermal management in final product design.



3. Electrical Specifications

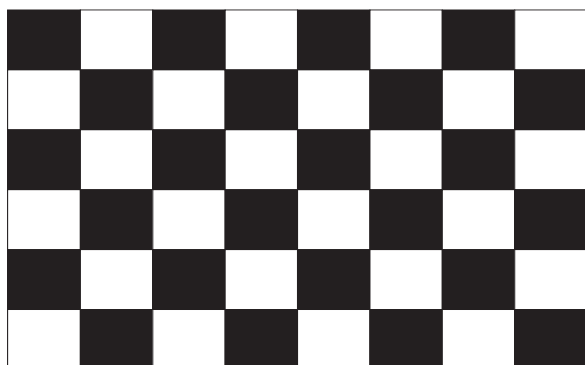
3-1. Electrical Characteristics

Table 2. ELECTRICAL CHARACTERISTICS

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Circuit :							
Power Input Voltage		V _{LCD}	10.8	12.0	13.2	V _{DC}	
Power Input Current		I _{LCD}	-	1030	1340	mA	1
			-	1755	2280	mA	2
T-CON Option Selection Voltage	Input High Voltage	V _{IH}	2.7	-	3.6	V _{DC}	
	Input Low Voltage	V _{IL}	0	-	0.7	V _{DC}	
Power Consumption		P _{LCD}	-	12.4	16.1	Watt	1
Rush current		I _{RUSH}	-	-	5	A	3

- Note
1. The specified current and power consumption are under the V_{LCD}=12.0V, Ta=25 ± 2°C, f_V=60Hz condition, and mosaic pattern(8 x 6) is displayed and f_V is the frame frequency.
 2. The current is specified at the maximum current pattern.
 3. The duration of rush current is about 2ms and rising time of power input is 0.5ms (min.).
 4. Ripple voltage level is recommended under ±5% of typical voltage

White : 1023Gray, Black : 0 Gray



Mosaic Pattern(8 x 6)

Magenta
R : 1023Gray, G : 0Gray, B : 1023Gray



Max Current Pattern

3-2. Interface Connections

This LCD module employs one kind of interface connection, 51-pin connector is used for the module electronics.

3-2-1. LCD Module

- LCD Connector(CN1): FI-RE51S-HF(manufactured by JAE) or GT05P-51S-H38(manufactured by LSM) or IS050-C51B-C39(manufactured by UJU)
- Mating Connector : FI-R51HL(manufactured by JAE) or compatible

Table 3. MODULE CONNECTOR(CN1) PIN CONFIGURATION

No	Symbol	Description	No	Symbol	Description
1	VLCD	Power Supply +12.0V	27	GND	Ground
2	VLCD	Power Supply +12.0V	28	Rx0n	V-by-One HS Data Lane 0
3	VLCD	Power Supply +12.0V	29	Rx0p	V-by-One HS Data Lane 0
4	VLCD	Power Supply +12.0V	30	GND	Ground
5	VLCD	Power Supply +12.0V	31	Rx1n	V-by-One HS Data Lane 1
6	VLCD	Power Supply +12.0V	32	Rx1p	V-by-One HS Data Lane 1
7	VLCD	Power Supply +12.0V	33	GND	Ground
8	VLCD	Power Supply +12.0V	34	Rx2n	V-by-One HS Data Lane 2
9	NC	NO CONNECTION	35	Rx2p	V-by-One HS Data Lane 2
10	GND	Ground	36	GND	Ground
11	GND	Ground	37	Rx3n	V-by-One HS Data Lane 3
12	GND	Ground	38	Rx3p	V-by-One HS Data Lane 3
13	GND	Ground	39	GND	Ground
14	PWM TIN	External VBR (From System)	40	Rx4n	V-by-One HS Data Lane 4
15	PWM TOUT	External VBR (For System)	41	Rx4p	V-by-One HS Data Lane 4
16	Mplus Mode 0	Input Data Format [1:0]	42	GND	Ground
17	Mplus Mode 1	'00':Low Power, '01':High Luminance '10':High Luminance II, '11':HDR Mode ※ Available Mode HDR_EN : L → '00, 01, 10' HDR_EN : H → '11'	43	Rx5n	V-by-One HS Data Lane 5
18	SDA	SDA (For I2C)	44	Rx5p	V-by-One HS Data Lane 5
19	SCL	SCL (For I2C)	45	GND	Ground
20	NC	NO CONNECTION	46	Rx6n	V-by-One HS Data Lane 6
21	HDR_EN	'H' : On, 'L' or NC: : Off	47	Rx6p	V-by-One HS Data Lane 6
22	L/D	Local Dimming Enable 'H' : On, 'L' or NC: : Off	48	GND	Ground
23	AGP or NSB & M+ Bypass	'H' : AGP, M+ bypass 'L' or NC: : NSB (No signal Black), M+	49	Rx7n	V-by-One HS Data Lane 7
24	MSE	'L' : off, 'H' on	50	Rx7p	V-by-One HS Data Lane 7
25	HTPDN	Hot plug detect	51	GND	Ground
26	LOCKN	Lock detect	-	-	-

Note

1. All GND (ground) pins should be connected together to the LCD module's metal frame.
2. All Input levels of V-by-One signals are based on the V-by-One-HS Standard Version 1.4
3. #9 & #20 NC(No Connection) : These pins are used only for LGD (Do not connect)
4. About specific pin(#16,#17, #21) of HDR Function, please see the Appendix V.
5. Specific pin No. #23 is used for "No signal detection" of system signal interface.
It should be GND or NC for NSB (No Signal Black) while the system interface signal is not.
If this pin is "H", LCD Module displays AGP (Auto Generation Pattern).

3-3. Signal Timing Specifications

Table 4 shows the signal timing required at the input of the Vx1 transmitter. All of the interface signal timings should be satisfied with the following specification for normal operation.

Table 4. TIMING TABLE (DE Only Mode)

ITEM		Symbol	Min	Typ	Max	Unit	Note
Horizontal	Display Period	t_{HV}	480	480	480	t_{CLK}	3840/8
	Blank	t_{HB}	60	70	120	t_{CLK}	1
	Total	t_{HP}	540	550	600	t_{CLK}	
Vertical	Display Period	t_{VV}	2160	2160	2160	Lines	
	Blank	t_{VB}	40	90	600	Lines	1
	Total	t_{VP}	2200	2250	2760	Lines	

ITEM		Symbol	Min	Typ	Max	Unit	Note
Frequency	DCLK	f_{CLK}	60	74.25	78.00	MHz	594/8
	Horizontal	f_H	121.8	135	140	KHz	2
	Vertical	f_V	47	60	63	Hz	2

notes: 1. The input of HSYNC & VSYNC signal does not have an effect on normal operation (DE Only Mode).
If you use spread spectrum of EMI, add some additional clock to minimum value for clock margin.

2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate and the horizontal frequency.

3. Spread Spectrum Rate (SSR) is limited to $\pm 0.5\%$ center spread at 30KHz.

※. Timing should be set based on clock frequency.

3-4. V by One input signal Characteristics

3-4-1. V by One Input Signal Timing Diagram

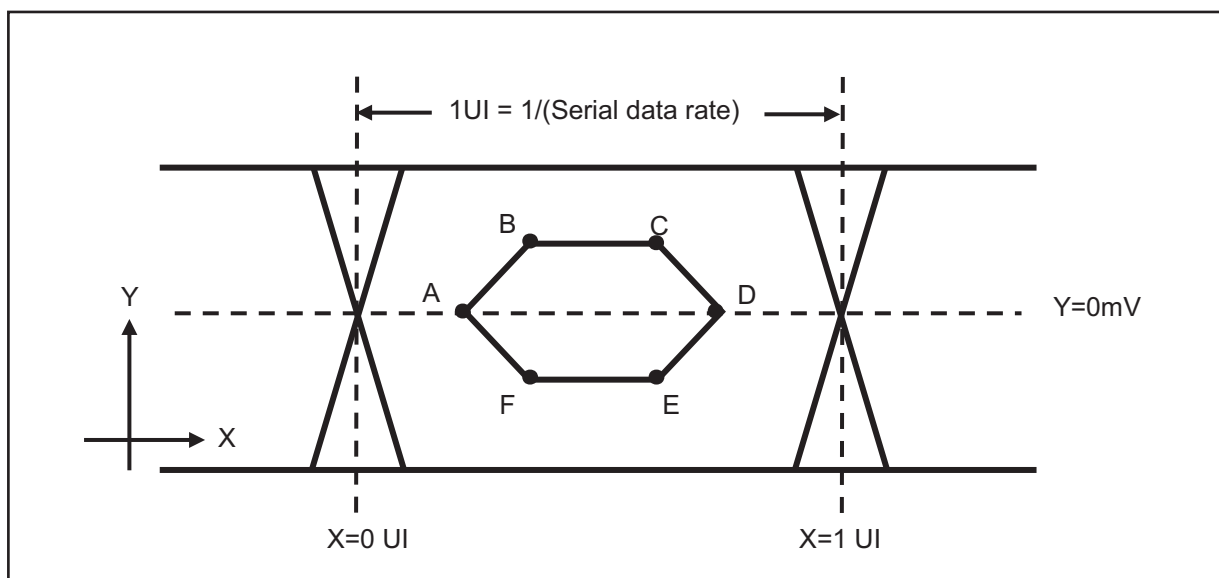


Table5. Eye Mask Specification

	X[UI]	Note	Y[mV]	Note
A	0.25 (max)	2	0	-
B	0.3 (max)	2	50	3
C	0.7(min)	3	50	3
D	0.75(min)	3	0	-
E	0.7(min)	3	I -50 I	3
F	0.3(max)	2	I -50 I	3

notes 1. All Input levels of V by One signals are based on the V by One HS Standard Ver. 1.4

2. This is allowable maximum value.

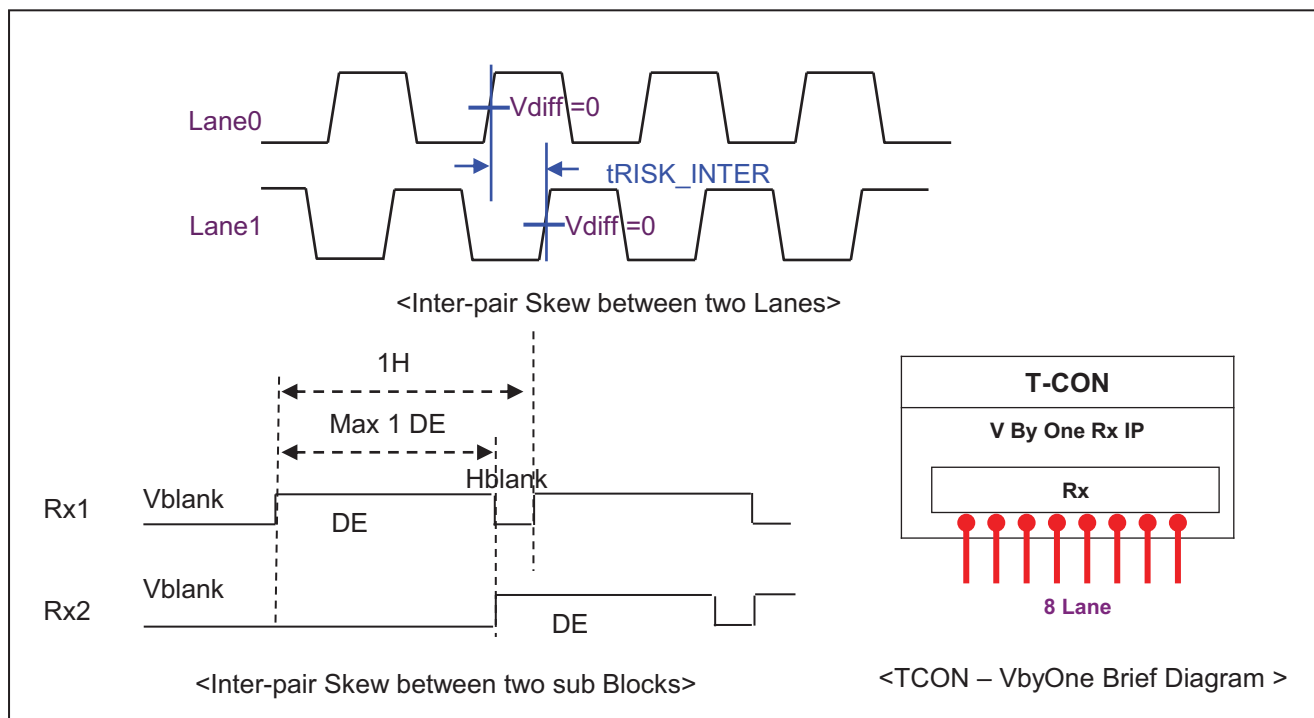
3. This is allowable minimum value.

4. The eye diagram is measured by the oscilloscope and receiver CDR characteristic must be emulated.

- PLL bandwidth : 15Mhz

- Damping Factor : 1.5

3-4-2. V by One Input Signal Characteristics



Description	Symbol	Min	Max	Unit	notes
Allowable inter-pair skew between lanes	t_{RISK_INTER}	-	5	UI	1,2

Notes 1. $1UI = 1/\text{serial data rate}$

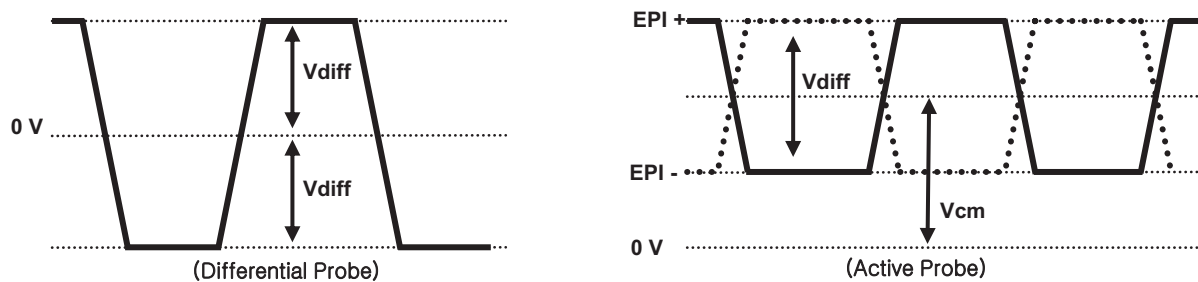
2. it is the time difference of the differential voltage between any two lanes in one sub block.

3-5. Intra interface Signal Specification

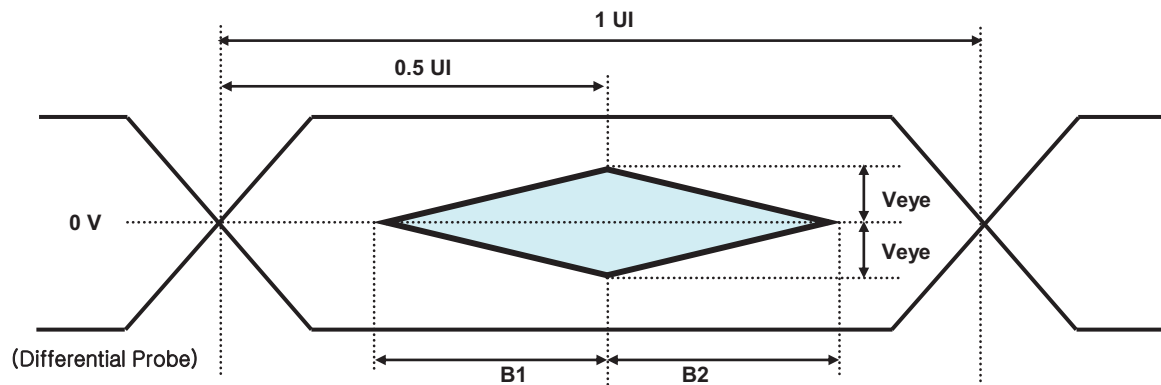
3-5-1. EPI Signal Specification

Table 6. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	Unit	notes
Logic & EPI Power Voltage	VCC	-	1.62	1.8	1.98	V _{DC}	
EPI input common voltage	VCM	CML Type	0.8	-	1.2-V _{diff} /2	V	
EPI input differential voltage	V _{diff}	-	150	-	500	mV	
EPI Input eye diagram	V _{eye}	-	90	-	-	mV	
Effective Veye width time	B1&B2		0.25	-	-	UI	



EPI Differential signal characteristics



Eye Pattern of EPI Input

*Source PCB

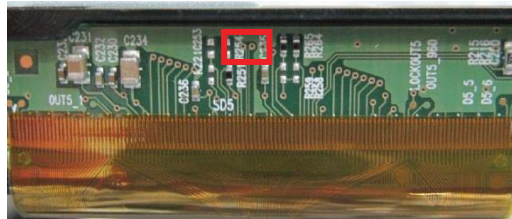


FIG. 3 Measure point

3-6. Color Data Reference

The brightness of each primary color (red, green, blue) is based on the 10bit gray scale data input for the color. The higher binary input, the brighter the color. Table 7 provides a reference for color versus data input.

Table 7. COLOR DATA REFERENCE

Packer input & Unpacker output		30bpp RGB (10bit)
Byte0	D[0]	R[2]
	D[1]	R[3]
	D[2]	R[4]
	D[3]	R[5]
	D[4]	R[6]
	D[5]	R[7]
	D[6]	R[8]
	D[7]	R[9]
Byte1	D[8]	G[2]
	D[9]	G[3]
	D[10]	G[4]
	D[11]	G[5]
	D[12]	G[6]
	D[13]	G[7]
	D[14]	G[8]
	D[15]	G[9]
Byte2	D[16]	B[2]
	D[17]	B[3]
	D[18]	B[4]
	D[19]	B[5]
	D[20]	B[6]
	D[21]	B[7]
	D[22]	B[8]
	D[23]	B[9]
Byte3	D[24]	Don't care
	D[25]	Don't care
	D[26]	B[0]
	D[27]	B[1]
	D[28]	G[0]
	D[29]	G[1]
	D[30]	R[0]
	D[31]	R[1]

3-7. Power Sequence

3-7-1. LCD Driving circuit

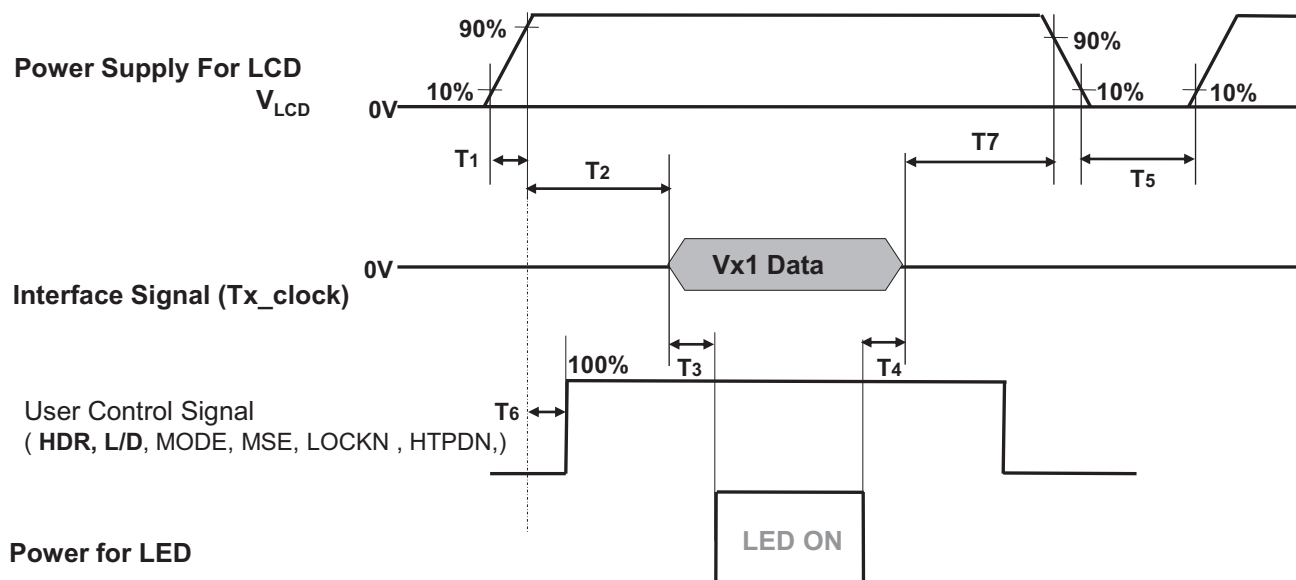


Table 8. POWER SEQUENCE

Parameter	Value			Unit	Note
	Min	Typ	Max		
T1	0.5	-	20	ms	1
T2	0	-	-	ms	2
T3	400	-	-	ms	3
T4	100	-	-	ms	3
T5	1.0	-	-	s	4
T6	0	-	T2	ms	5
T7	0	-	-	ms	6

- Note :**
1. Even though T1 is over the specified value, there is no problem if I2T spec of fuse is satisfied.
 2. If T2 is satisfied with specification after removing LVDS Cable, there is no problem.
 3. The T3 / T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.
 4. T5 should be measured after the Module has been fully discharged between power off and on period.
 5. If the on time of signals (Interface signal and user control signals) precedes the on time of Power (V_{LCD}), it will be happened abnormal display. When T6 is NC status, T6 doesn't need to be measured.
 6. It is recommendation specification that T7 has to be 0ms as a minimum value.
- ※ Please avoid floating state of interface signal at invalid period.
- ※ When the power supply for LCD (V_{LCD}) is off, be sure to pull down the valid and invalid data to 0V.

3-8 Backlight Unit

Parameter	Symbol	Values			Unit	notes
		Min	Typ	Max		
LED Driver :						
Power Supply Input Voltage	VBL	10.8	12.0	12.5	Vdc	1
Power Supply Input Current	IBL	-	2.58	2.80	A	1
Power Supply Input Current (In-Rush)	In-rush	-	-	(TBD)	A	VBL = 12.0V ExtV _{BR-B} = 100% 3
Power Consumption	PBL	-	31.0	35.0	W	1
LED :						
Life Time		30,000	50,000		Hrs	2

notes :

1. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 60 minutes at $25\pm 2^{\circ}\text{C}$. The specified current and power consumption are under the typical supply Input voltage 24V and VBR (ExtV_{BR-B} : 100%), it is total power consumption.
2. The life time (MTTF) is determined as the time which luminance of the LED is 50% compared to that of initial value at the typical LED current (ExtV_{BR-B} : 100%) on condition of continuous operating in LCM state at $25\pm 2^{\circ}\text{C}$.
3. The duration of rush current is about 200ms. This duration is applied to LED on time.

3-8-1 Specification of LED driver Board

(1) Dimension of P.C.B. : L 95mm、W 42mm、H 10mm

Unit : mm Tolerance : $\pm 0.5\text{mm}$

图 1-1 PCB Dimension

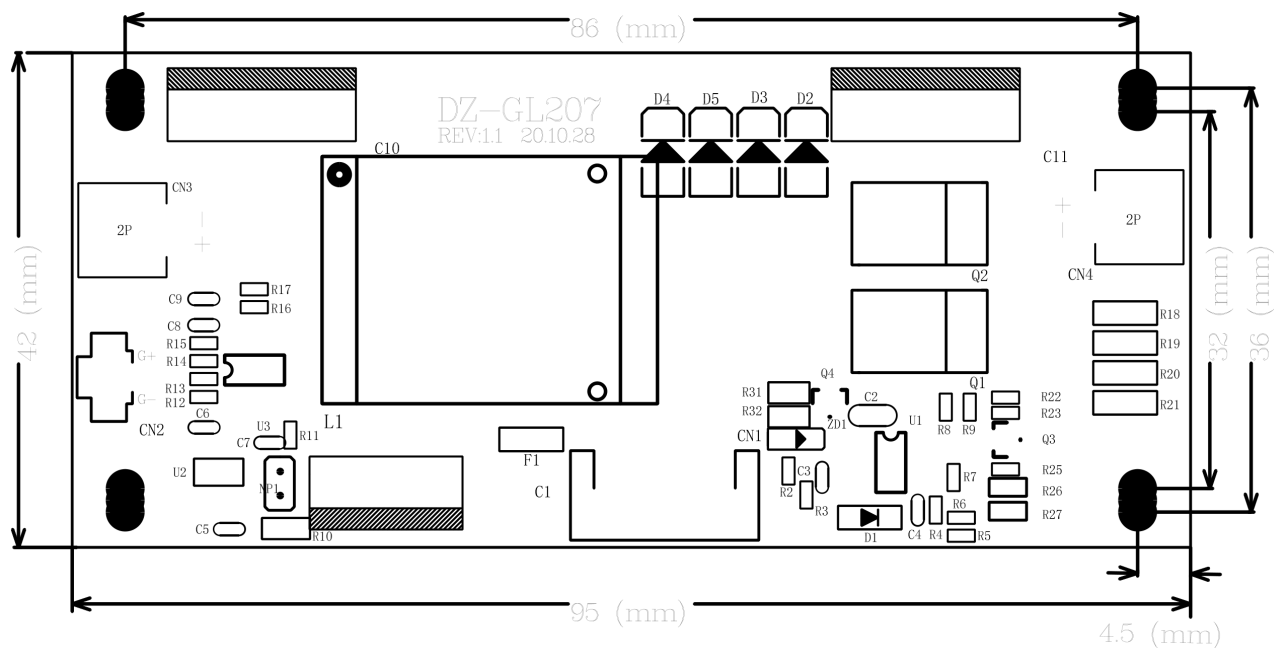
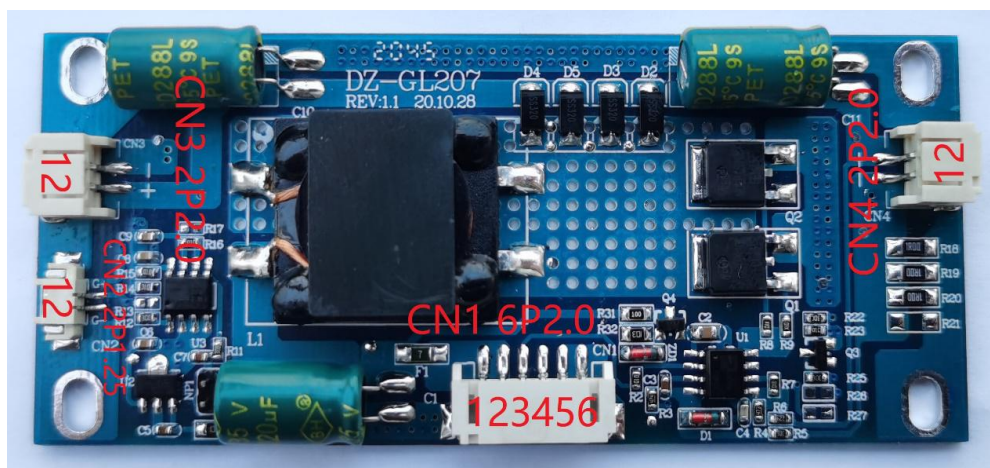


图 1-2 General view



CN1(6P2.0:Power input port) Are defined follows:

1-2	Mains input+12V
5-6	Mains input-12V(GND)
3	ON/OFF on-off control (+3.3V)
4	PWM/DIM brilliance control

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at $25 \pm 2^\circ\text{C}$. The values are specified at distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0° . FIG. 1 shows additional information concerning the measurement equipment and method.

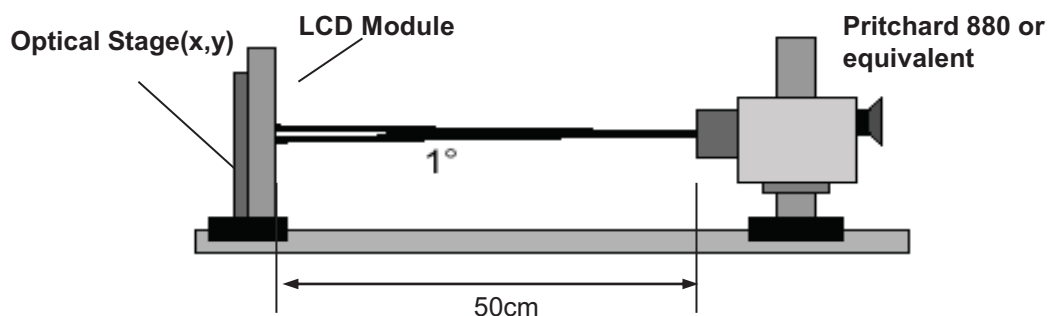


FIG. 1 Optical Characteristic Measurement Equipment and Method

$T_a = 25 \pm 2^\circ\text{C}$, $V_{\text{LCD}} = 12.0\text{V}$, $f_v = 60\text{Hz}$, $D_{\text{clk}} = 74.25\text{MHz}$,
Light Source : D65 Standard

Table 9. OPTICAL CHARACTERISTICS

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Contrast Ratio		CR	800	1100	-		1
Response Time	Variation	G to G _σ		6	9		3
	Gray to Gray (BW)	G to G BW		9	13	ms	2
Transmittance		T	6.16	6.85		%	4
Color Coordinates [CIE1931]	RED	R _x	Typ -0.03	0.660	Typ +0.03		5
		R _y		0.325			
	GREEN	G _x		0.288			
		G _y		0.570			
	BLUE	B _x		0.136			
		B _y		0.132			
Viewing Angle (CR>10)							
	x axis, right(φ=0°)	θ _r	89	-	-	degree	6
	x axis, left (φ=180°)	θ _l	89	-	-		
	y axis, up (φ=90°)	θ _u	89	-	-		
	y axis, down (φ=270°)	θ _d	89	-	-		
Gray Scale			-	-	-		7
Brightness			270	300	-	cd/m ²	

Product Specification

Note : 1. . 1. Contrast Ratio(CR) is defined mathematically as :

CR(Contrast Ratio) = Maximum CRn (n=1, 2, 3, 4, 5)

$$CRn = \frac{\text{Surface Luminance at position n with all white pixels}}{\text{Surface Luminance at position n with all black pixels}}$$

n = the Position number(1, 2, 3, 4, 5). For more information, see FIG 2.

The contrast ratio is valued with operating condition of LGD's standard BLU.

2. Response time is the time required for the display to transit from any gray to white (Rise Time, Tr_R) and from any gray to black (Decay time, Tr_D). For additional information see the FIG. 3.

※ G to G_{BW} Spec stands for average value of all measured points.

Photo Detector : RD-80S / Field : 2 °

The response time is valued with operating condition of LGD's standard BLU

3. G to G_σ is Variation of Gray to Gray response time composing a picture

G to $G(\sigma)$ =

$$\sqrt{\frac{\sum(Xi - u)^2}{N}}$$

Xi = Individual Data

u = Data average

N : The number of Data

4. The value of transmittance should be extracted using the standard light source of D65

It is measured with FIG 2

5. The value of color coordinates should be extracted using the standard light source of D65

6. Viewing angle is the angle at which the contrast ratio is greater than 10. 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 module surface. For more information, see the FIG. 4.

7. Gray scale specification

Gamma Value is approximately 2.2. For more information, see the Table 10.

Table 10. GRAY SCALE SPECIFICATION

Gray Level	Luminance [%] (Typ)
L0	0.091
L63	0.27
L127	1.04
L191	2.49
L255	4.68
L319	7.66
L383	11.5
L447	16.1
L511	21.6
L575	28.1
L639	35.4
L703	43.7
L767	53.0
L831	63.2
L895	74.5
L959	86.7
L1023	100

Measuring point for Contrast Ratio

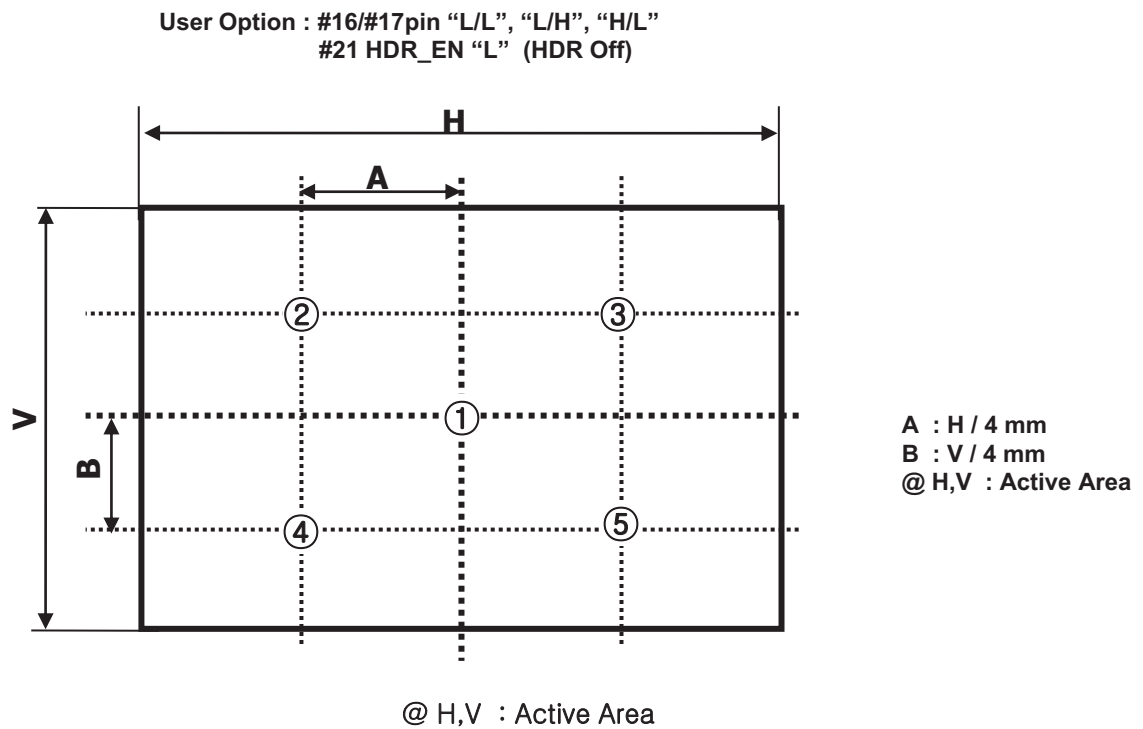


FIG. 2 PTN & Point for Contrast Ratio & Transmittance Measure

Response time is defined as the following figure and shall be measured by switching the input signal for "Gray(N)" and "Black or White".

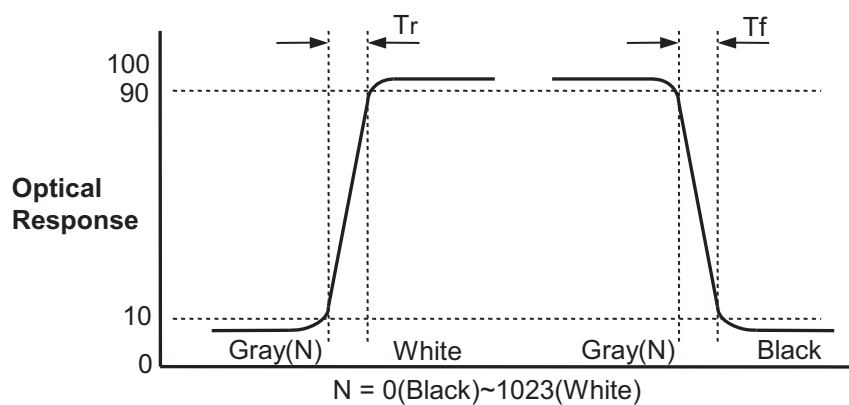


FIG. 3 Response Time

Dimension of viewing angle range

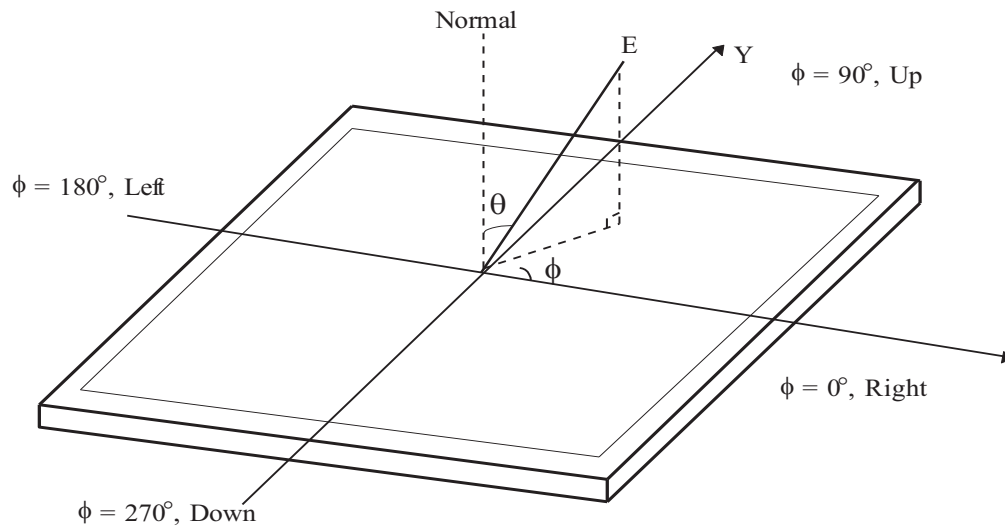


FIG. 4 Viewing Angle

5. Mechanical Characteristics

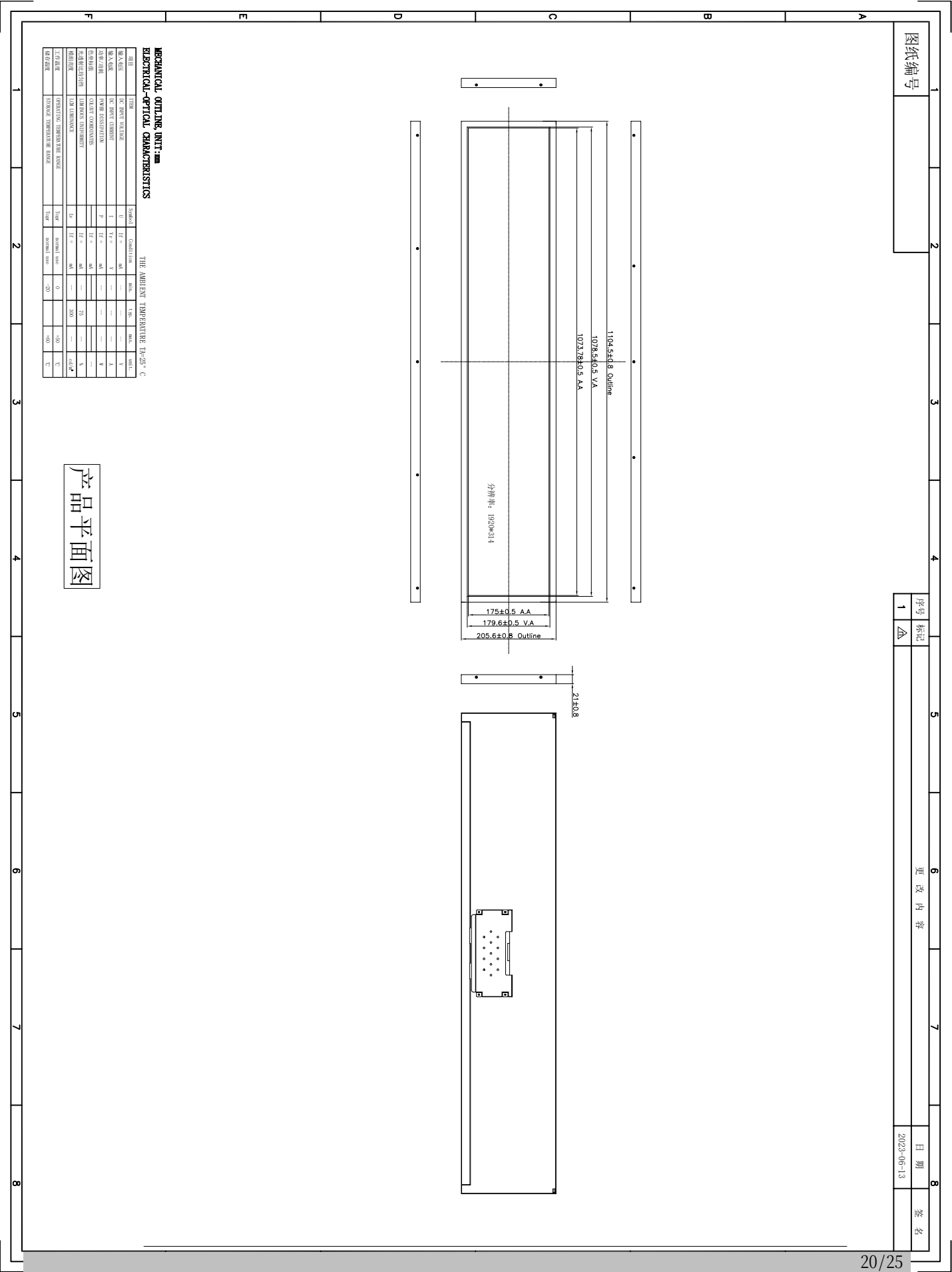
Table 11 provides general mechanical characteristics.

Table 11. MECHANICAL CHARACTERISTICS

Item	Value	
Outline Dimension	Horizontal	1104.5mm
	Vertical	205.6mm
	Depth	21mm
Active Display Area	Horizontal	1073.78 mm
	Vertical	175 mm
Weight	4.35 Kg (Typ.)	
Surface Treatment	Hard coating(2H), Anti-glare low reflection treatment of the front polarizer (Haze 3%(Typ.))	

Note : Please refer to a mechanic drawing in terms of tolerance at the next page.

6. Mechanical Dimension (倒显)



7. Reliability

Table 12. ENVIRONMENT TEST CONDITION

No.	Test Item	Condition
1	High temperature storage test	Ta= 60°C 90% 240h
2	Low temperature storage test	Ta= -20°C 240h
3	High temperature operation test	Ta= 50°C 50%RH 500h
4	Low temperature operation test	Ta= 0°C 500h
5	Humidity condition Operation	Ta= 40 °C ,90%RH
6	Altitude operating storage / shipment	0 - 16,400 ft 0 - 40,000 ft

Note : Before and after Reliability test, LCM should be operated with normal function.

8. International Standards

8-1. Safety

- a) UL 60065, Underwriters Laboratories Inc.
Audio, Video and Similar Electronic Apparatus - Safety Requirements.
- b) CAN/CSA C22.2 No.60065:03, Canadian Standards Association.
Audio, Video and Similar Electronic Apparatus - Safety Requirements.
- c) IEC 60065, The International Electrotechnical Commission (IEC).
Audio, Video and Similar Electronic Apparatus - Safety Requirements.

8-2. Environment

- a) RoHS, Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011

9. Packing

TBD

10. Precautions

Please pay attention to the followings when you use this TFT LCD module.

10-1. Handling Precautions

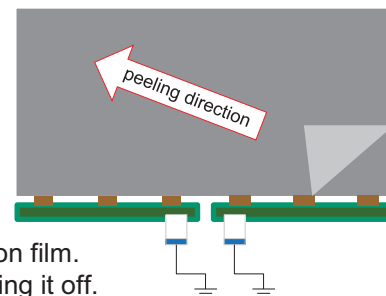
- (1) Please attach the surface transparent protective film to the surface in order to protect the polarizer.
Transparent protective plate should have sufficient strength in order to resist external force.
- (2) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- (3) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
- (4) After removing the protective film, when the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaked with petroleum benzene.
Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
- (5) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (6) Since a module is composed of electronic circuits, it is not strong to electrostatic discharge.
Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly. Panel ground path should be connected to metal ground.
- (7) Please make sure to avoid external forces applied to the Source PCB and D-IC during the process of handling or assembling the TV set. If not, it causes panel damage or malfunction.
- (8) Panel and BLU should be protected from the static electricity. If not, it causes IC damage.
- (9) Do not pull or fold the source D-IC which connect the source PCB and the panel.
- (10) Panel(board ass'y) should be put on the BLU structure precisely to avoid mechanical impact.
- (11) FFC Cable should be connected between System board and Source PCB correctly.
- (12) Mechanical structure for backlight system should be designed for sustaining board ass'y safely.
- (13) Surface temperature of the Component on PCB should be controlled under 100°C (D-IC : 110°C) with TV Set status.
If not, problems such as IC damage or decrease of lifetime could occur.

10-2. Operating Precautions

- (1) Response time depends on the temperature. (In lower temperature, it becomes longer.)
- (2) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, Stable time (required time that brightness is stable after turned on) becomes longer
- (3) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (5) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

10-3. Protection Film

- (1) Please keep attaching the protection film before assembly.
- (2) Please peel off the protection film slowly.
- (3) Please peel off the protection film just like shown in the Fig.1
- (4) Ionized air should be blown over during the peeling.
- (5) Source PCB should be connected to the ground when peel off the protection film.
- (6) The protection film should not be contacted to the source D-IC during peeling it off.

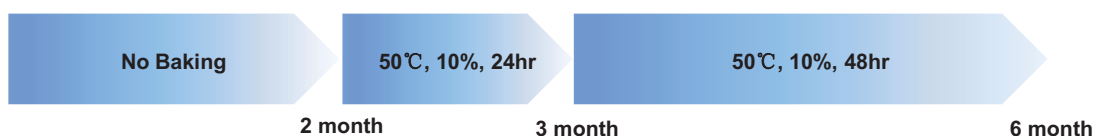


< Fig. 1 >

10-4. Storage Precautions

When storing modules as spares for a long time, the following precautions are necessary.

- (1) Temperature : 5 ~ 40 °C
- (2) Humidity : 35 ~ 75 %RH
- (3) Period : 6 months
- (4) Control of ventilation and temperature is necessary.
- (5) Please make sure to protect the product from strong light exposure, water or moisture. Be careful for condensation.
- (6) Please keep the modules at a circumstance shown below Fig. 2



< Fig. 2 >

10-5. Packing Precautions

Product assembled into module should be stored in the Al-bag(cover case).