



LMT121EAGFWA-NND

LCD Module User Manual

Prepared by: Chenzhonghua Date: 2024-05-16	Checked by: Date:	Approved by: Date:
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Rev.	Descriptions	Edit	Release Date
0.1	Preliminary release	Chenzhonghua	2024-05-16

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1. General Specifications

Feature		Spec
Display Spec.	Size	12.1 inch
	Resolution	1024(RGB) x 768
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel Pitch (mm)	0.240 (H) × 0.240 (V)
	Display Mode	Transmissive, Normally Black
	Surface Treatment(Up Polarizer)	HC
	Viewing Direction	Full
Mechanical Characteristics	LCM (W x H x D) (mm)	260.5x203.0x11.9
	Active Area(mm)	245.76*184.32
	With /Without TSP	With Capacitive Touch Panel
	Matching Connection Type	FI-SEB20P-HFE
Electrical Characteristics	Interface	1port LVDS 8bit / 6-bit
	Color Depth	16.7M&262K

Note 1 : Requirements on Environmental Protection: Q/S0002

Note 2: LCM weight tolerance: +/-5%

2. Input/Output Terminals

2.1 K1 TFT LCD Panel (JAE FI-SEB20P-HFE)

Pin No.	Symbol	Signal	Input data signal: 8-bit		Input data signal: 6-bit	Remarks
			MAP A	MAP B		
1	A	D3+	Pixel data	R0-R1,G0-G1,B0-B1	R6-R7,G6-G7,B6-B7	-
	B	GND	Ground	-		Ground
2	A	D3-	Pixel data	R0-R1,G0-G1,B0-B1	R6-R7,G6-G7,B6-B7	-
	B	GND	Ground	-		Ground
3	DPS	Selection of scan direction	High : Normal scan Low or Open : Reverse scan			
4	FRC	Selection of the number of colors	High		Low or Open	
5	GND	Ground	Ground			
6	CLK+	Pixel clock	Pixel clock			
7	CLK-					
8	GND	Ground	Ground			
9	D2+	Pixel data	B4-B7,DE	B2-B5,DE		
10	D2-					
11	GND	Ground	Ground			
12	D1+	Pixel data	G3-G7,B2-B3	G1-G5,B0-B1		
13	D1-					
14	GND	Ground	Ground			
15	D0+	Pixel data	R2-R7,G2	R0-R5,G0		
16	D0-					
17	GND	Ground	Ground			
18	MSL	Selection of LVDS input map	Low(Note1)	High or Open	Low(Note2)	
19	VCC	Power supply	Power supply			
20	VCC					

Note1: FRC is high

Note2: FRC is low

Note3: Detail can refer to Page 12~13

2.2 K2 Backlight (SM10B-SHLS-TF(LF))

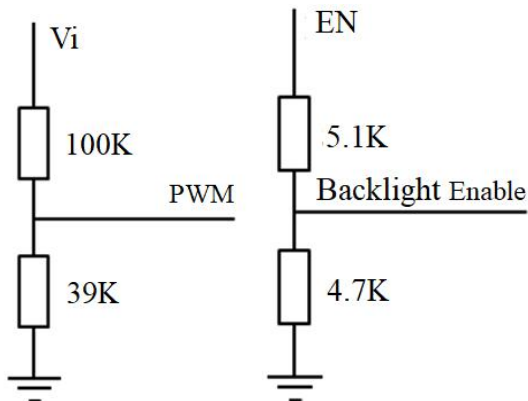
No	Symbol	I/O	Description	Remarks
1	Vi	P	Converter input voltage	
2	Vi	P	Converter input voltage	
3	Vi	P	Converter input voltage	
4	Vi	P	Converter input voltage	
5	V _{GND}	P	Converter ground	
6	V _{GND}	P	Converter ground	
7	V _{GND}	P	Converter ground	
8	V _{GND}	P	Converter ground	
9	EN	I	Enable pin	Default L(Note1)
10	PWM	I	Backlight Adjust	Default H(Note2)

I/O definition:

I----Input O----Output I/O----Input/Output P----Power/Ground N—No Connect

Note1: The circuit diagram of PWM on LCM is as follows

Note2: The circuit diagram of EN on LCM is as follows



PWM circuit on LCM

EN circuit on LCM

2.3 K3 Capacitive Touch Panel Terminal(FFC Socket)

Pin No.	Pin Name	IO	Descriptions
1	NC	-	No connection
2	NC	-	No connection
3	NC	-	No connection
4	NC	-	No connection
5	NC	-	No connection
6	NC	-	No connection
7	GND	Power	Power Supply GND (0V)
8	D+	I/O	USB D+ Signal
9	D-	I/O	USB D- Signal
10	VBUS	Power	Positive Power Supply(5.0V)

2.4 K4 Capacitive Touch Panel Terminal(USB Type-A)

Pin No.	Pin Name	IO	Descriptions
1	VBUS	Power	Positive Power Supply(5.0V)
2	D-	I/O	USB D- Signal
3	D+	I/O	USB D+ Signal
4	GND	Power	Power Supply GND (0V)

3. Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit	Remarks	
Power supply voltage	LCD panel signal processing board	VCC	-0.5 to +5.0	V	Ta=25°C	
	LED driver	Vi	9V to 28V			
Input voltage for signals	Logic Input Voltage	Low level	VIL	0 to 0.3VCC		V
		High level	ViH	0.7VCC to VCC		V
	LED driver	PWM	TBD to +(5.5)	V		
		EN	TBD to(12)			
Inrush current		Irush	-	A		
Storage temperature		Tst	-40 to +90	°C		-
Operating temperature	Front surface	TopF	-30 to +80	°C		Note1
	Rear surface	TopR	-30 to +80	°C		Note2
Relative humidity Note4		RH	≤ 95	%	Ta ≤ 40°C	
			≤ 85	%	40°C < Ta ≤ 50°C	
			≤ 55	%	50°C < Ta ≤ 60°C	
			≤ 36	%	60 < Ta ≤ 70°C	
			≤ 24	%	70 < Ta ≤ 80°C	
Absolute humidity Note3		AH	≤ 70 Note4	g/m ³	Ta = 80°C	

Note1: Measured at LCD panel surface (including self-heat)

Note2: Measured at LCD module's rear shield surface (including self-heat)

Note3: No condensation

Note4: Water amount at Ta= 80°C and RH= 24%

4. Electrical Characteristics

4.1 Driving TFT LCD Panel

(Ta= 25°C)

Parameter	Symbol	min.	typ.	max.	Unit	Remarks
Power supply voltage	VCC	(3.2)	3.3	(3.4)	V	-
Power supply current	ICC	-	(TBD) Note1	(TBD) Note2	mA	at VCC= 3.3V
Permissible ripple voltage	VRPC	-	-	100	mVp-p	for VCC
Differential input threshold voltage	High	VTH	-	-	(+100)	mV at VCM= 1.2 V Note3
	Low	VTL	(-100)	-	-	
Input voltage for DPS,FRC and MSL signal	High	VFH1	(0.7VCC)	-	(VCC)	V CMOS level
	Low	VFL1	0	-	0.3VCC	
Input current for DPS,FRC and MSL signal	High	IFH1	-	-	(-300)	μA -
	Low	IFL1	(-300)	-	-	

Note1: Checkered flag pattern [by IEC 61747-6]

Note2: Pattern for maximum current

Note3: Common mode voltage for LVDS receiver

4.2 Driving Backlight

(Ta= 25°C)

Parameter	Symbol	min.	typ.	max.	Unit	Remarks	
Power supply voltage	Vi	(11.2)	12.0	(12.8)	V	Note1	
Power supply current Note2	Ii	-	192 (TBD)	(TBD) Note3	mA	Note4	
Permissible ripple voltage	VRPD	-	-	200	mVp-p	for VDD	
Input voltage for PWM signal	High	VDFH1	(1.2)	-	(5.5)	V	-
	Low	VDFL1	0	-	(0.35)	V	
Input voltage for EN signal	High	VDFH2	5	(12)	12.5	V	-
	Low	VDFL2	0	-	(0.8)	V	
PWM frequency	f _{PWM}	(200)	-	(10K)	Hz	Note5, Note6	
PWM duty ratio	DR _{PWM}	(5%)	-	(100)	%	Note7	
PWM pulse width	t _{PWH}	TBD	-	-	μs		
LED Life Time	LT	-	50000	-	Hrs	Note8	

Note1:When designing of the power supply, take the measures for the prevention of surge voltage.

Note2:The power supply lines (Vi and GND) may have ripple voltage during luminance control of LED. There is the possibility that the ripple voltage produces acoustic noise and signal wave noise in audio circuit and so on. Put a capacitor between the power supply lines (Vi and GND) to reduce the noise if necessary.

Note3: This value excludes peak current such as overshoot current.

Note4: At the maximum luminance control

Note5: A recommended f_{PWM} value is as follows.

$$f_{PWM} = \frac{2n - 1}{4} \times f_v$$

(n = integer, f_v = frame frequency of LCD module)

Note6: Depending on the frequency used, some noise may appear on the screen, Please Conduct a thorough evaluation.

Note7: The recommended PWM frequency is 200Hz to 10kHz, but the LED current cannot be 100% proportional to duty cycle, especially for high frequency and low duty ratio.

While the EN signal is high, do not set the tPWH (PWM pulse width) is less than 0.1us. It may cause abnormal working of the backlight. In this case, turn the backlight off and then on again by EN signal.

Note8: Optical performance should be evaluated at $T_a=25^\circ\text{C}$ Only.

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

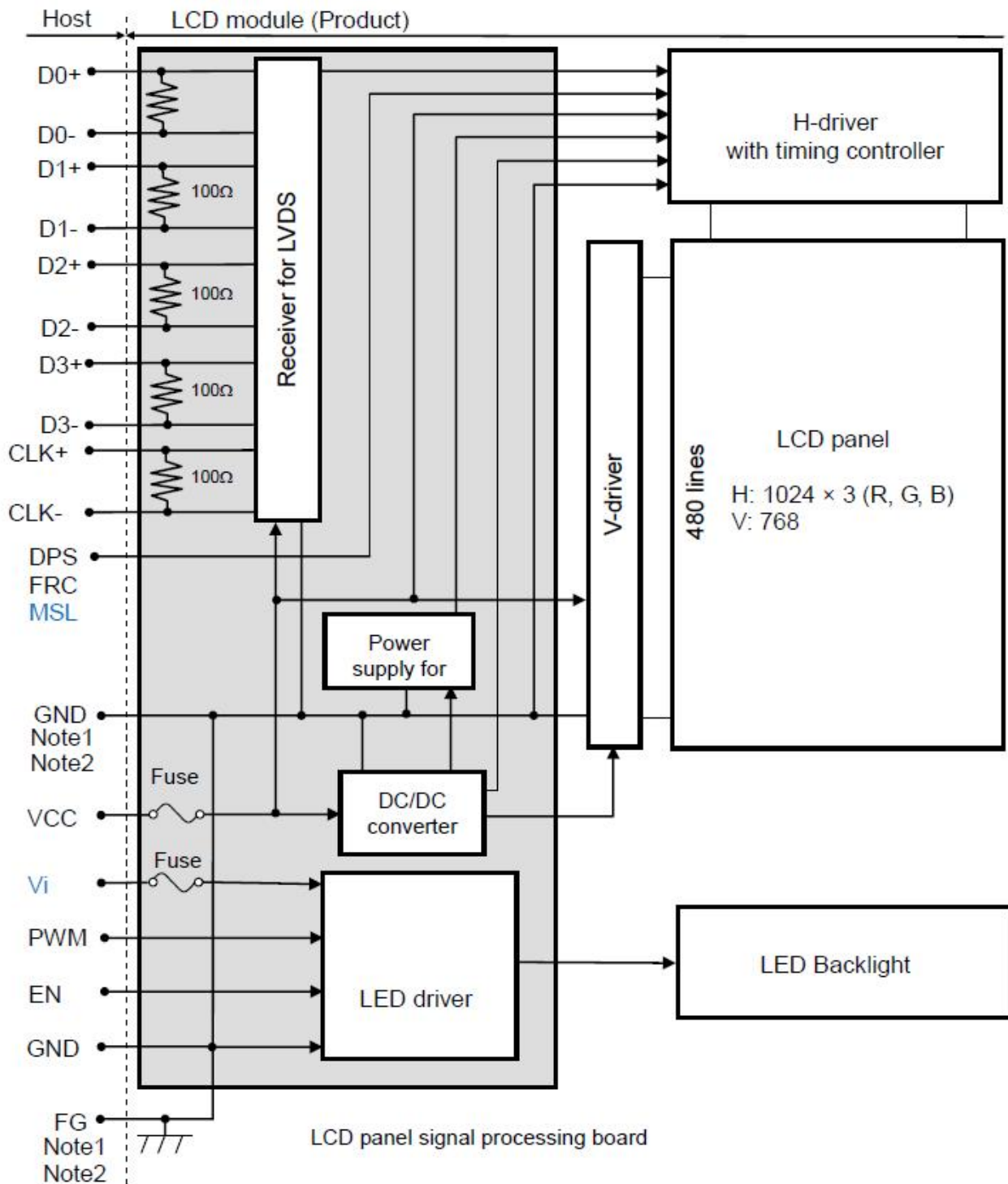
Operating life means brightness goes down to 50% of initial brightness.

Typical operating life time is estimated data.

4.3 CTP recommended Operating Condition

Parameter	Symbol	min.	typ.	max.	Unit	Remarks
Power supply voltage	V _{BUS}	4.5	5.0	5.5	V	
Power supply current	I _{_VBUS}	-	25	-	mA	

4.4 Block Diagram



Note1:GND (Signal ground)is connected to FG (Frame ground) in the LCD module
 Note2:GND and FG must be connected to customer equipment's ground, and it is recommended that these grounds to be connected together in customer equipment.

5. Timing Chart

5.1 Timing Characteristics

Parameter		Symbol	min.	typ.	max.	Unit	Remarks	
CLK	Frequency	1/tc	(50.34)	50.66	(65.34)	MHz	19.739ns (typ.)	
DE	Horizontal	Cycle	th	-	21.477	-	μs	46.561 kHz (typ.)
				1084	1,088	1214	CLK	
		Display period	thd	1024			CLK	-
	Vertical (One frame)	Cycle	tv	-	16.666	-	ms	60.0Hz (typ.)
			774	776	897	H		
	Display period	tvd	768			H	-	

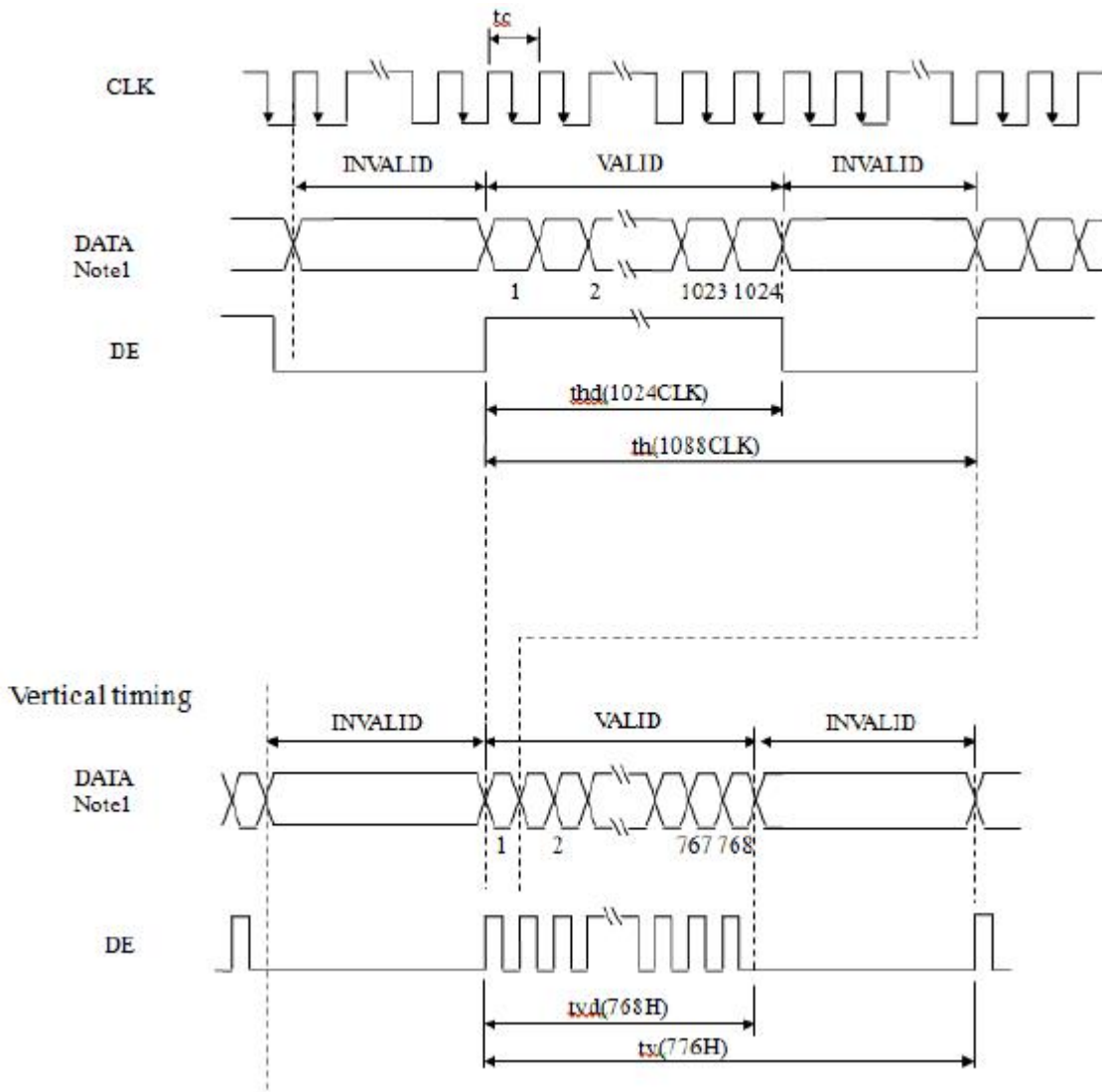
Note1: Definition of parameters is as follows.

$$t_c = 1\text{CLK}, t_h = 1\text{H}$$

Note2: See the data sheet of LVDS transmitter.

Note3: Vertical cycle (tv) should be specified in integral multiple of Horizontal cycle (th).

5.2 Input signal timing chart



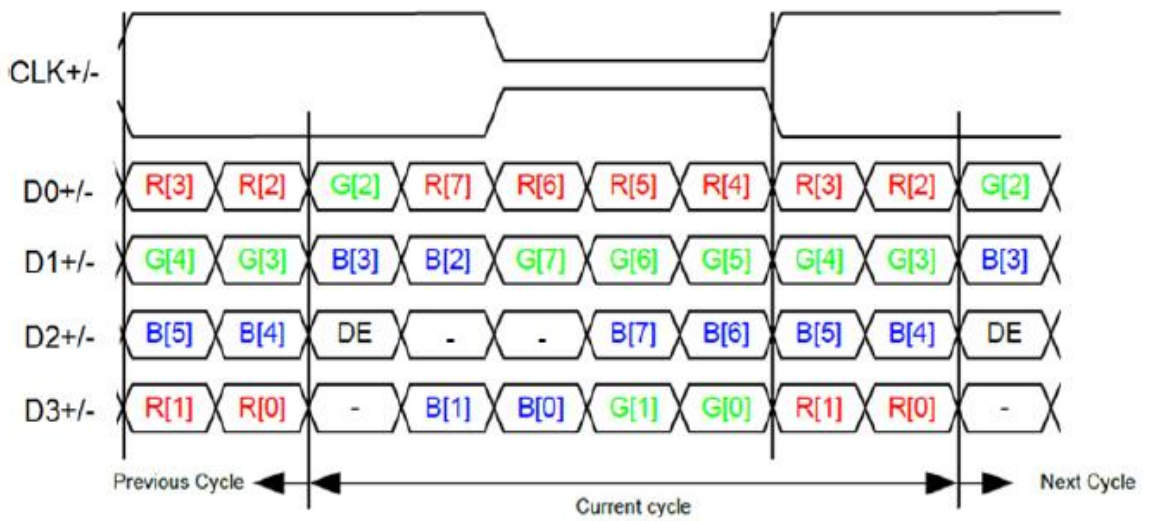
Note1: DATA = R0-R7, G0-G7, B0-B7

5.3 LVDS data input format

Input data signal: 8-bit



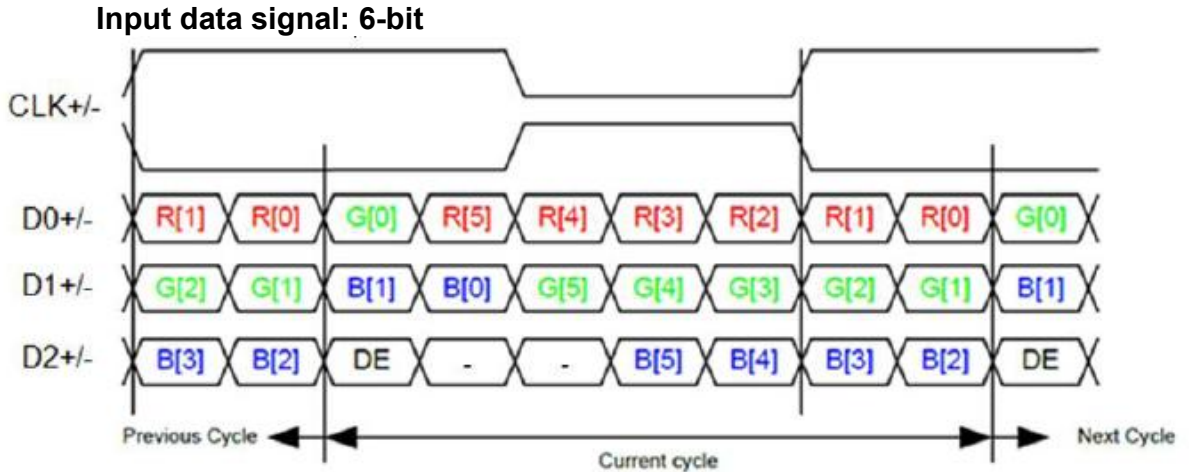
VESA (MAP B)format



JEIDA (MAP A)format

Note1:LSB (Least Significant Bit) – R0, G0, B0; MSB (Most Significant Bit) – R7, G7, B7

Note2:Twist pair wires with 100R(Characteristic impedance) should be used between LCD panel signal processing board and LVDS transmitter.

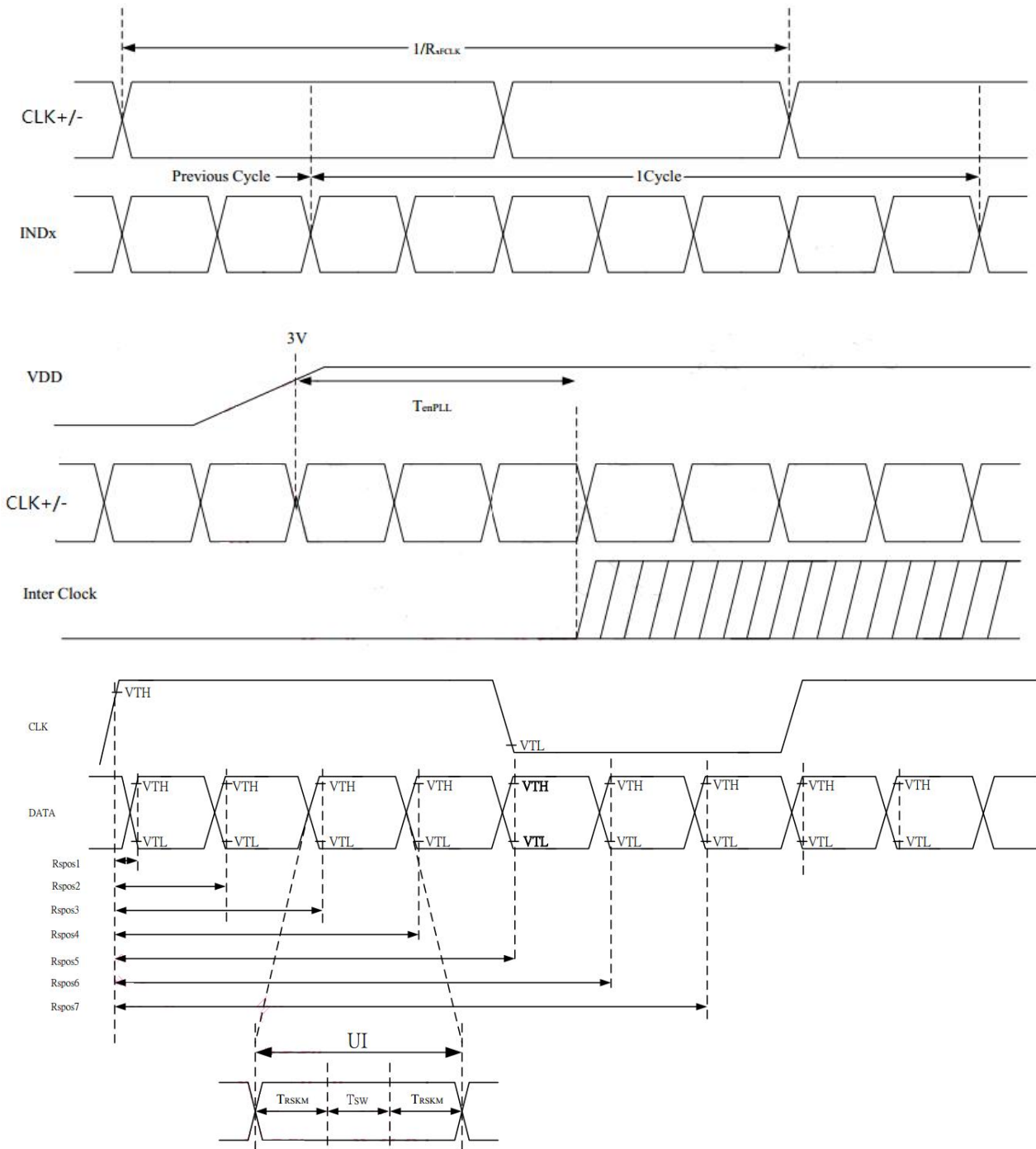


Note1:LSB (Least Significant Bit) - R0, G0, B0 MSB (Most Significant Bit) - R7, G7, B7

Note2:Twist pair wires with 100R(Characteristic impedance) should be used between LCD panel signal processing board and LVDS transmitter.

5.4 LVDS Rx AC SPEC

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	RXFCLK	10	-	110	MHz	
1 data bit time	UI	1/7	1/RXFCLK			
Position 1	Rspos1	-0.2	0	0.2	UI	
Position 2	Rspos2	0.8	1	1.2	UI	
Position 3	Rspos3	1.8	2	2.2	UI	
Position 4	Rspos4	2.8	3	3.2	UI	
Position 5	Rspos5	8	4	4.2	UI	
Position 6	Rspos6	4.8	5	5.2	UI	
Position 7	Rspos7	5.8	6	6.2	UI	
Input data skew margin	TRSKM	-	-	0.2	UI	VID =100mV RXVCM=1.2V RXFCLK=75MHz
Clock high time	TLVCH	-	4/(7*RXFCLK)	-	ns	
Clock low time	TLVCL	-	3/(7*RXFCLK)	-	ns	
PLL wake-up time	TenPLL	-	-	150	us	



Ideal TX Pulse Position

Ideal TX Pulse Position

TRSKM: Receiver strobe margin
 Tsw : Strobe width (internal data sampling window)
 $V_{TH}=R_{xvcm}+|VID|/2$, $V_{TL}=R_{xvcm}-|VID|/2$

5.5 Display Colors and Input Data Signals

5.5.1 16,777,216colors

This product can display equivalent of 16,777,216colors with 256 gray scales(FRC:High). Also the relation between display colors and input data signals is as follows.

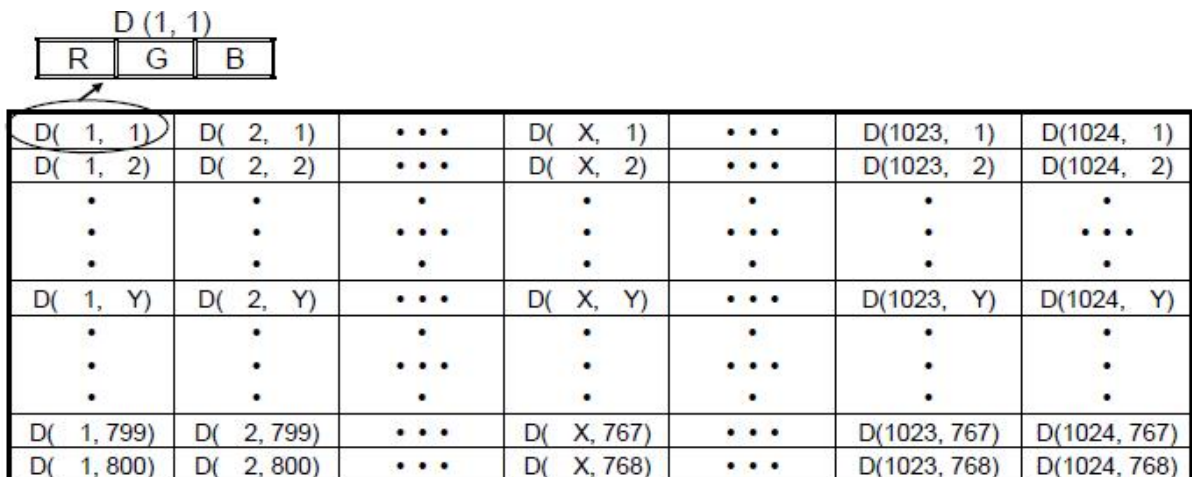
Display colors		Data signal (0: Low level, 1: High level)																							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red gray scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	dark	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑				:																				
	↓				:																				
bright	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green gray scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	↑				:																				
	↓				:																				
bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	
Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	
Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
Blue gray scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	↑				:																				
	↓				:																				
bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	
Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	
Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	

5.5.2 262,144colors

This product can display equivalent of 262,144colors with 64gray scales(FRC:Low). Also the relation between display colors and input data signals is as follows.

Display colors		Data signal (0: Low level, 1: High level)																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	a	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Cyan	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	Yellow White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red gray scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	dark	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	↑																		
	↓																		
	bright	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Red	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green gray scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	dark	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	↑																		
	↓																		
	bright	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
Green	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	
Blue gray scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	↑																		
	↓																		
	bright	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	
Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	

5.6 Display Positions



5.7 Scanning Direction

The following figures are seen from a front view.

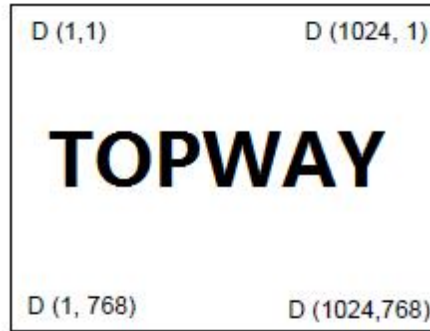


Figure1. Normal scan (DPS:High)

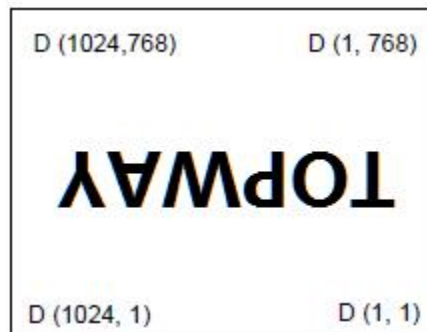
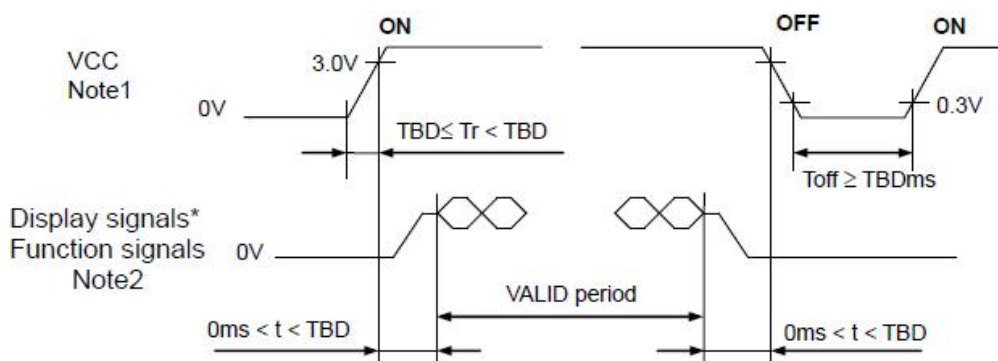


Figure2. Reverse scan (DPS:Low)

5.8 POWER SUPPLY VOLTAGE SEQUENCE

5.8.1 LCD panel signal processing board



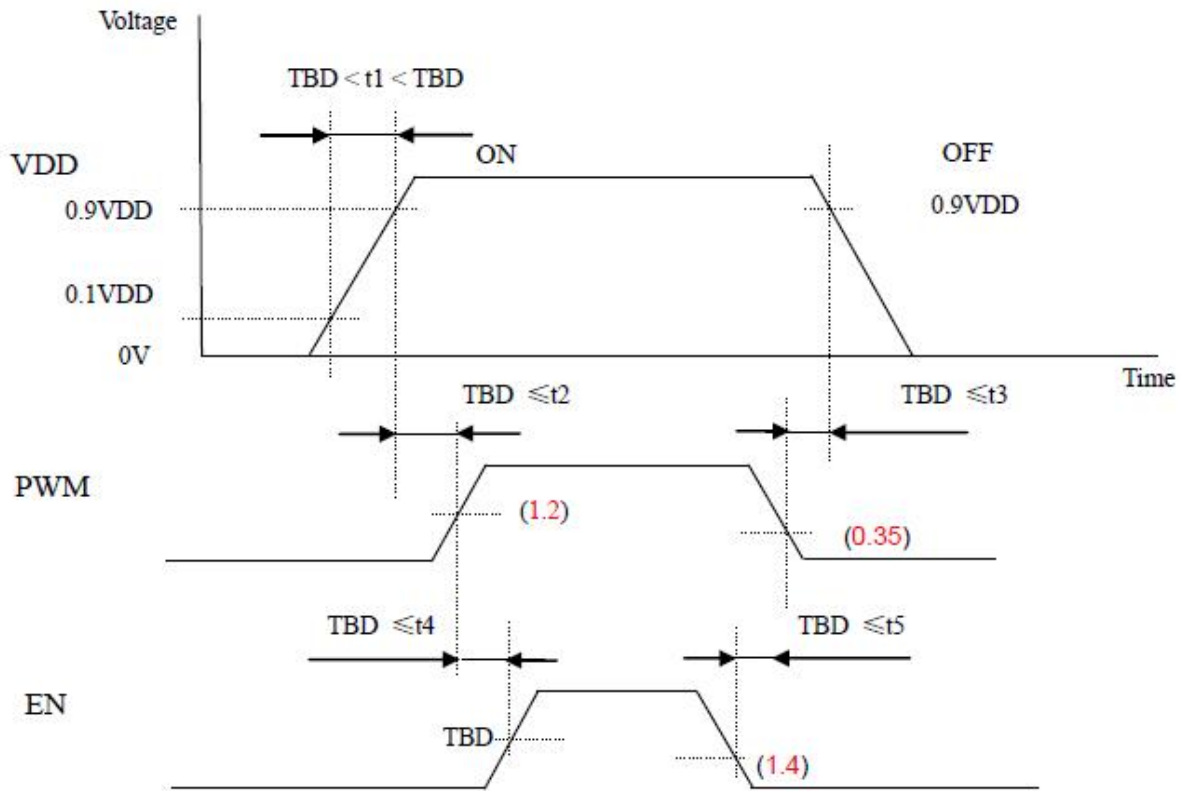
* These signals should be measured at the terminal of 100R resistance.

Note1: If there is a voltage variation (voltage drop) at the rising edge of VCC below 3.0V, there is a possibility that a product does not work due to a protection circuit.

Note2: Display signals (D0+/-, D1+/-, D2+/- and CLK+/-) and function signals (DPS) must be set to Low or High-impedance, except the VALID period (See above sequence diagram), in order to avoid the circuitry damage.

If some of display and function signals of this product are cut while this product is working, even if the signal input to it once again, it might not work normally. If a customer stops the display and function signals, VCC also must be shut down.

5.8.2 LED Driver



6. Optical Characteristics

6.1 Optical Specification

Ta=25°C

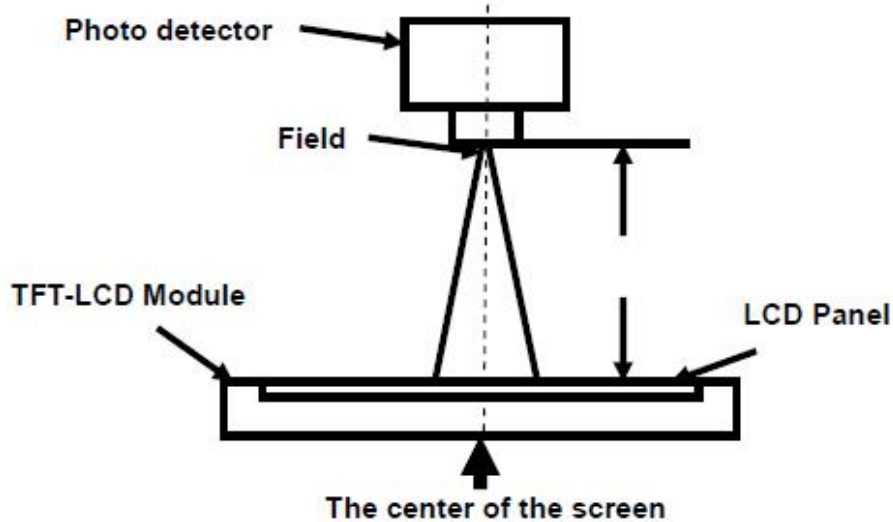
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	
View Angles	θT	CR ≥ 10	70	88	-	Degree	Note 2	
	θB		70	88	-			
	θL		70	88	-			
	θR		70	88	-			
Contrast Ratio	CR	θ=0°	800	1000	-	-	Note1 Note3	
Response Time	T _{ON}	25°C	-	25	35	ms	Note1 Note4	
	T _{OFF}							
Chromaticity	White	Backlight is on	x	-	TBD	-	-	Note5 Note1
			y	-	TBD	-		
	Red		x	-	TBD	-		
			y	-	TBD	-		
	Green		x	-	TBD	-		
			y	-	TBD	-		
	Blue		x	-	TBD	-		
			y	-	TBD	-		
Uniformity	U	-	75	80	-	%	Note1 Note6	
NTSC	-	-	65	72	-	%	Note5	
Luminance	L	-	-	400	-	cd/m ²	Note1	

Test Conditions:

1. 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.

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.



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).

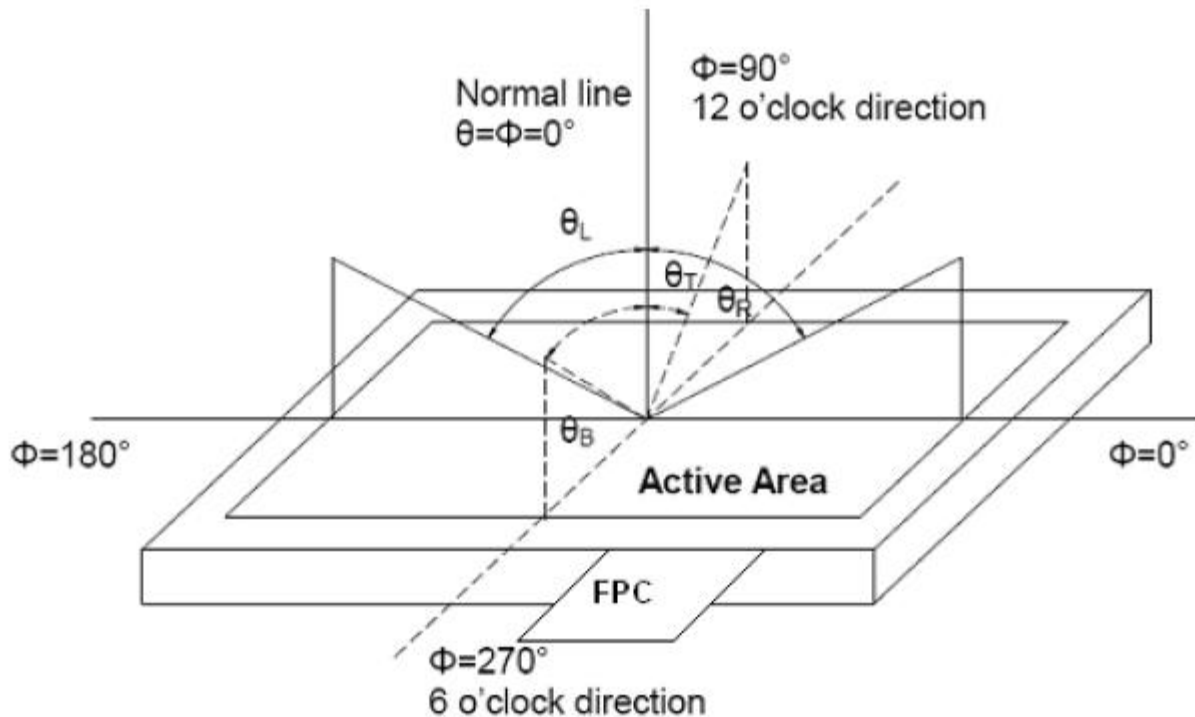


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

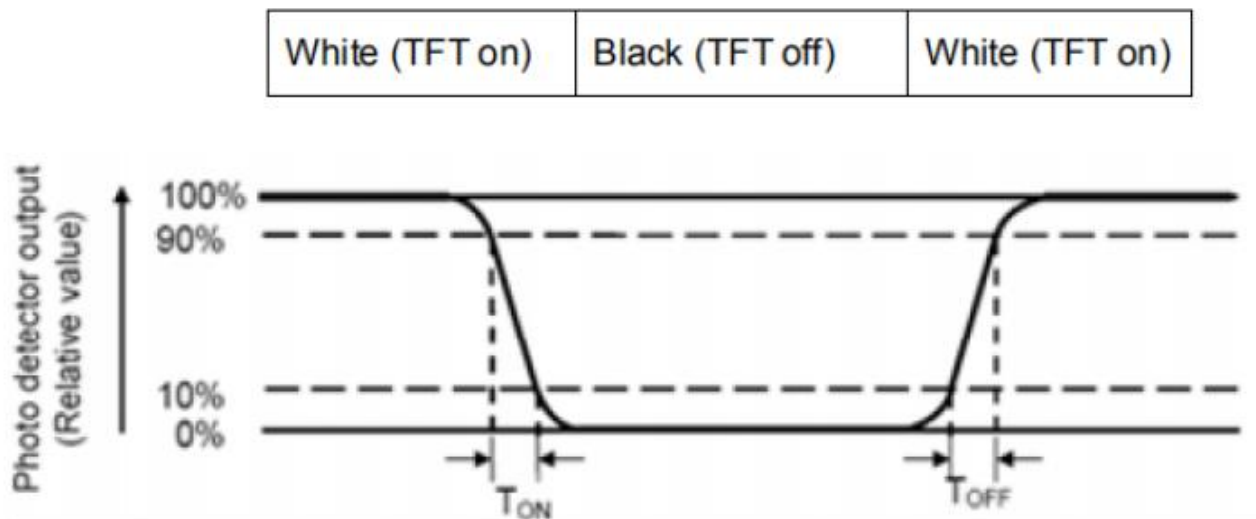
“White state “:The state is that the LCD should driven by Vwhite.

“Black state”: The state is that the LCD should 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) = L_{min} / L_{max}

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

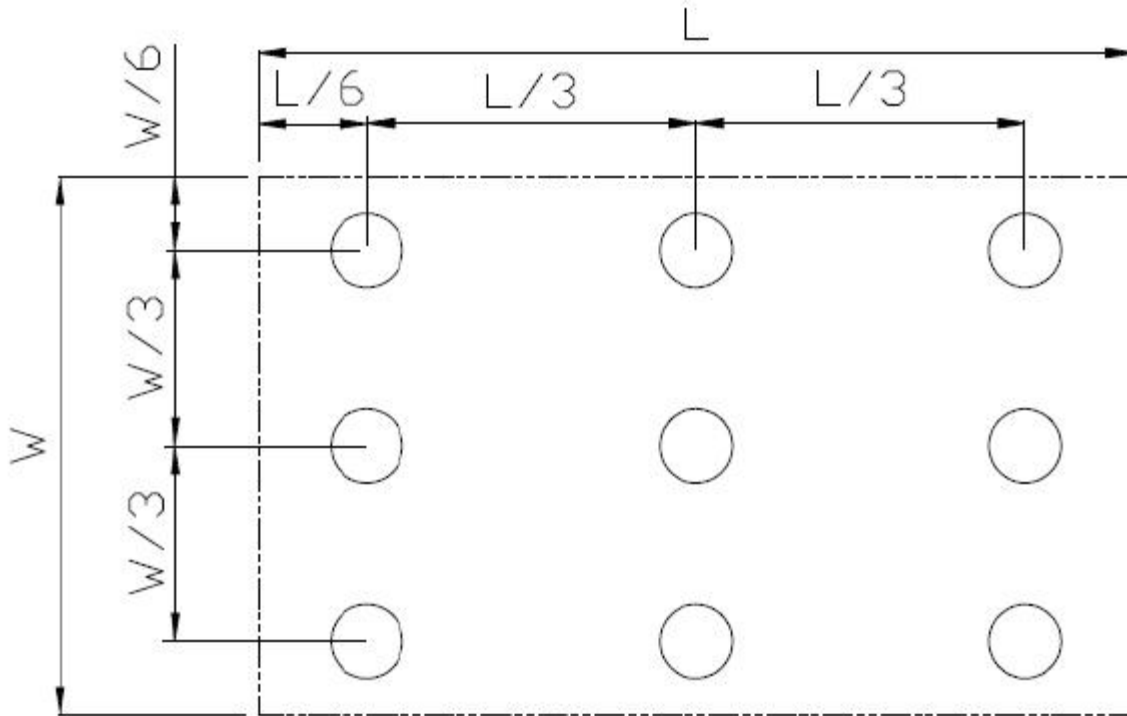


Fig. 2 Definition of uniformity

L_{max} : The measured maximum luminance of all measurement position.

L_{min} : 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	Remark
1	High Temperature Operation	Ta= +80℃,240hours	IEC60068-2-1 GB2423.2
2	Low Temperature Operation	Ta = -30℃, 240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +90℃, 240 hours	IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta = -40℃, 240 hours	IEC60068-2-1 GB2423.1
5	High Temperature & High Humidity Operation	Ta = +60℃, 90% RH max,240 hours	IEC60068-2-78 GB/T2423.3
6	ThermalShock (non-operation)	-30℃30 min~+80℃30 min, Change time:5min, 100 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22
7	ESD	C=150pF,R=330Ω,9point/panel Air:±15Kv,5times; Contact:±8Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
8	Vibration Test(Non Op)	5~100HZ, 19.60m/s ² 1min/cycle 120times Per X\Y\Z	IEC60068-2-6 GB/T17626.6
9	Mechanical Shock (Non Op)	539m/s ² , 11ms 5times ±X、±Y、±Z	IEC60068-2-27 GB/T2423.5

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

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

8. Precautions for Use of LCD Modules

8.1 Handling Precautions

- 8.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 8.1.2 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.
- 8.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- 8.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 8.1.5 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
- 8.1.6 Do not attempt to disassemble the LCD Module.
- 8.1.7 If the logic circuit power is off, do not apply the input signals.
- 8.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - 8.1.8.1 Be sure to ground the body when handling the LCD Modules.
 - 8.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.
 - 8.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - 8.1.8.4 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.

8.2 Storage Precautions

- 8.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- 8.2.2 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%
- 8.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

8.3 Transportation Precautions

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

<p>9. LCD Module Design and Handling Precautions</p>	<p>9. 液晶显示模块设计和使用须知</p>
<ul style="list-style-type: none"> - Please ensure V0, VCOM is adjustable, to enable LCD module get the best contrast ratio under different temperatures, view angles and positions. - Normally display quality should be judged under the best contrast ratio within viewable area. Unexpected display pattern may com out under abnormal contrast ratio. - Never operate the LCD module exceed the absolute maximum ratings. - Never apply signal to the LCD module without power supply. - Keep signal line as short as possible to reduce external noise interference. - IC chip (e.g. TAB or COG) is sensitive to light. Strong light might cause malfunction. Light sealing structure casing is recommended. - Make sure there is enough space (with cushion) between case and LCD panel, to prevent external force passed on to the panel; otherwise that may cause damage to the LCD and degrade its display result. - Avoid showing a display pattern on screen for a long time (continuous ON segment). - LCD module reliability may be reduced by temperature shock. - When storing and operating LCD module, avoids exposure to direct sunlight, high humidity, high or low temperature. They may damage or degrade the LCD module. - Never leave LCD module in extreme condition (max./min storage/operate temperature) for more than 48hr. - Recommend LCD module storage conditions is 0 C~40 C <80%RH. - LCD module should be stored in the room without acid, alkali and harmful gas. - Avoid dropping & violent shocking during transportation, and no excessive pressure press, moisture and sunlight. - LCD module can be easily damaged by static electricity. Please maintain an optimum anti-static working environment to protect the LCD module. (eg. ground the soldering irons properly) - Be sure to ground the body when handling LCD module. - Only hold LCD module by its sides. Never hold LCD module by applying force on the heat seal or TAB. - When soldering, control the temperature and duration avoid damaging the backlight guide or diffuser which might degrade the display result such as uneven display. 	<ul style="list-style-type: none"> - 请注意 V0, VCOM 的设定, 以确保液晶显示模块在不同的使用温度下以及在不同的视角和位置观察模块显示, 均能达到最佳对比度, 请务必将应用电路上设置为对比度可调。 - 请注意液晶显示模块的显示品质判定是指在正常对比度下以及视窗(V. A)范围内进行的, 非正常对比度下液晶可能会出现非预期的显示不良, 应注意区分。 - 请勿在最大额定值以外使用液晶显示模块。 - 请勿在没有接通电源的条件下, 给液晶显示模块输送信号。 - 请尽可能缩短信号线的连接, 以避免对液晶显示模块的信号干扰。 - 集成电路因 IC 芯片(如 TAB 或 COG)对紫外线极为敏感, 强光环境下可能会引起液晶显示模块功能失效, 故应采用不透光的外壳。 - 请在液晶显示模块与外壳之间保留足够的空间(可使用衬垫), 以缓冲外力对液晶显示模块的损坏或因受力不均而产生的显示不匀等异常现象。 - 避免液晶显示屏在某一画面下长时间点亮, 否则有出现残影的风险; 请通过软件每隔一段时间改变一次画面。 - 液晶显示模块的可靠性可能因温度冲击而降低。 - 请勿在阳光直射、高湿、高温或低温下储存和使用液晶显示模块, 这将造成液晶显示模块的损坏或失效。 - 请勿在极限环境(最大/最小存储/工作温度)下使用或放置液晶显示模块超过 48 小时以上。 - 液晶显示模块建议存储条件为: 0 C~40 C <80%RH。 - 请勿让液晶显示模块存储于带有酸性, 碱性, 有害气体环境之中。 - 在运输过程中, 请勿让液晶显示模块跌落与猛烈震动, 同时避免异常挤压, 高湿度, 与阳光照射。 - 液晶显示模块极易受静电损坏, 请务必保证液晶显示模块在防静电的工作环境中使用或保存。(如: 烙铁正确接地, 等) - 拿取液晶显示模块时需注意操作人员的接地情况。 - 请手持液晶显示模块的边沿取放模块, 防止热压纸或 TAB 部位受力。 - 焊接液晶模块时, 请注意控制烙铁的温度、焊接时间, 以免烫坏导光板或偏光片, 导致显示不匀等不良现象发生。 - 请勿使用洗板水等腐蚀性液体接触液晶模块, 以免腐蚀导光板或模块电路。 - 仅可使用柔软的干布, 异丙醇或乙醇清洁液晶屏表面, 其他任何溶剂(如: 水)都有可能损坏液晶模块。 - 请勿挤压液晶显示模块上的元器件, 以避免

<ul style="list-style-type: none"> - Never let LCD module contact with corrosive liquids, which might cause damage to the backlight guide or the electric circuit of LCD module. - Only clean LCD with a soft dry cloth, Isopropyl Alcohol or Ethyl Alcohol. Other solvents (e.g. water) may damage the LCD. - Never add force to components of LCD module. It may cause invisible damage or degrade the module's reliability. - When mounting LCD module, please make sure it is free from twisting, warping and bending. - Do not add excessive force on surface of LCD, which may cause the display color change abnormally. - LCD panel is made with glass. Any mechanical shock (e.g. dropping from high place) will damage the LCD module. 	<ul style="list-style-type: none"> - 产生潜在的损坏或失效而影响产品可靠性。 - 装配液晶显示模块时，请务必注意避免液晶显示模块的扭曲或变形。 - 请勿挤压液晶显示屏表面，这将导致显示颜色的异常。 - 液晶屏由玻璃制作而成，任何机械碰撞（如从高处跌落）均有可能损坏液晶显示模块。
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<ul style="list-style-type: none"> - Protective film is attached on LCD screen. Be careful when peeling off this protective film, since static electricity may be generated. - Polarizer on LCD gets scratched easily. If possible, do not remove LCD protective film until the last step of installation. - When peeling off protective film from LCD, static charge may cause abnormal display pattern. The symptom is normal, and it will turn back to normal in a short while. - LCD panel has sharp edges, please handle with care. - Never attempt to disassemble or rework LCD module. - If display panel is damaged and liquid crystal substance 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. 	<ul style="list-style-type: none"> - 液晶屏表面带有保护膜，揭除保护膜时需要注意可能产生的静电。 - 因液晶显示屏表面的偏光片极易划伤，安装完成之前请尽量不要揭下保护膜。 - 请缓慢揭除保护膜，在此过程中液晶显示屏上可能会产生静电，此为正常情况，可在短时间内消失。 - 请注意避免被液晶显示屏的边缘割伤。 - 请不要试图拆卸或改造液晶显示模块。 - 当液晶显示屏出现破裂，内部液晶液体可能流出；相关液体不可吞吃，绝对不可接触嘴巴，如接触到皮肤或衣服，请使用肥皂与清水彻底清洗。
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10. CTP Mounting Instructions

10.1 Bezel Mounting (Figure 1)

- The bezel window should be bigger than the CTP active area. It should be $\geq 0.5\text{mm}$ each side.
- Gasket should be installed between the bezel and the CTP surface. The final gap should be about $0.5\sim 1.0\text{mm}$.
- It is recommended to provide an additional support bracket for backside support when necessary (e.g. slim type TFT module without mounding structure). They should only provide appropriate support and keep the module in place.
- The mounting structure should be strong enough to prevent external uneven force or twist act onto the module.

10. 电容触摸屏安装指导

10.1 面框安装（附图 1）

- 客户面框窗口应大于 CTP 动作区域，各边离动作区应 $\geq 0.5\text{mm}$ 。
- 面框与 CTP 面板间应垫有胶垫，其最终间隙约为 $0.5\sim 1.0\text{mm}$ 。
- 建议必要时在背面提供附加支架（例如无安装结构的薄型 TFT 模块），应仅利用适当支撑以保持模块位置。
- 安装结构应具有足够的强度，以防止外部不均匀力或扭曲力作用到模块上。

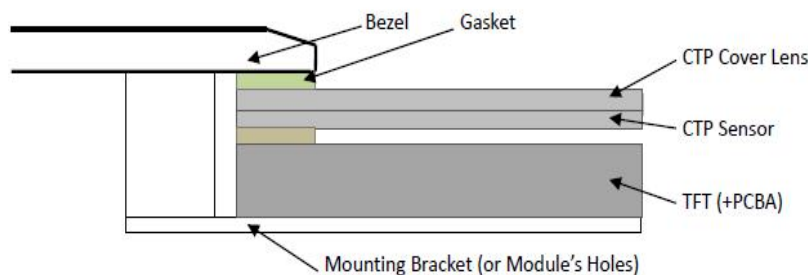


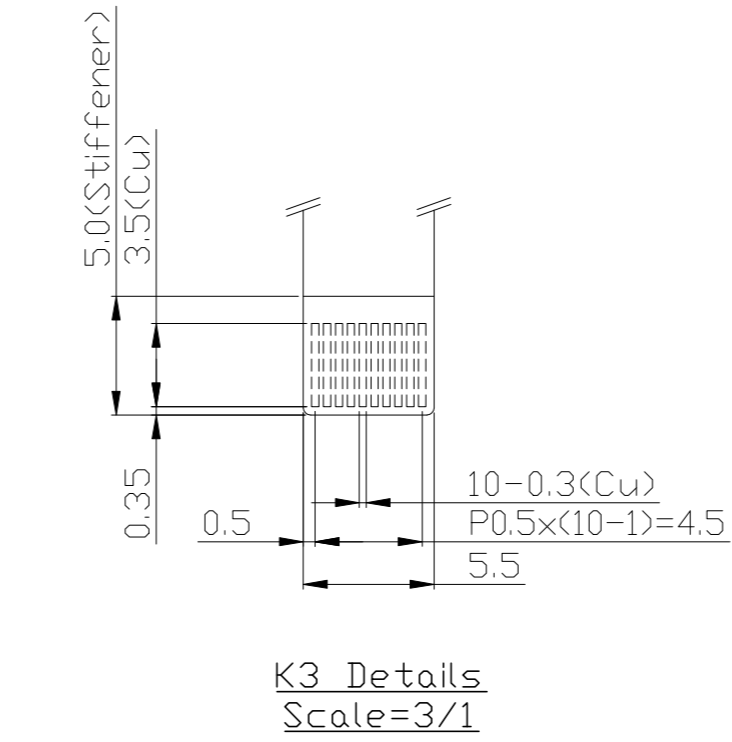
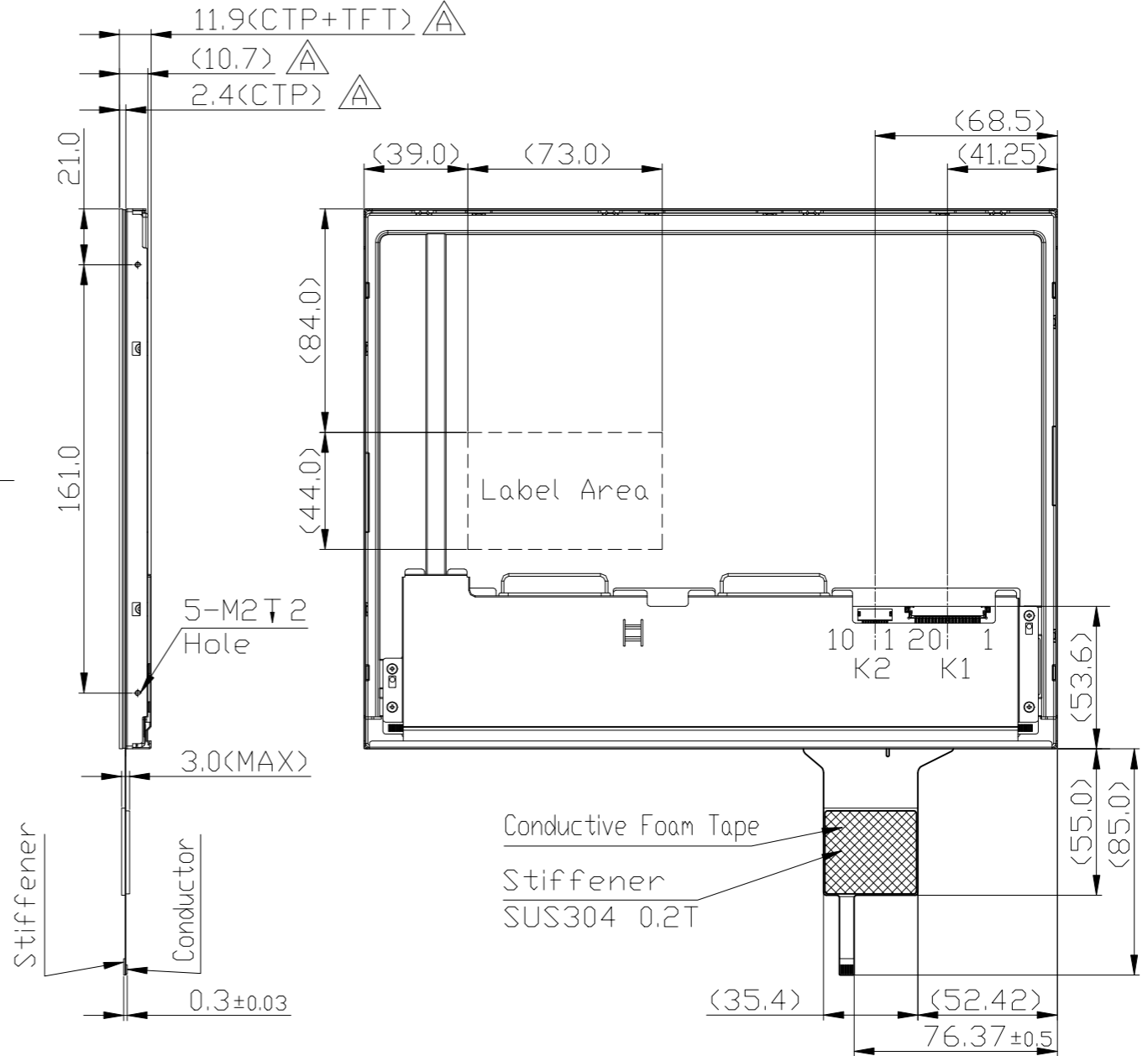
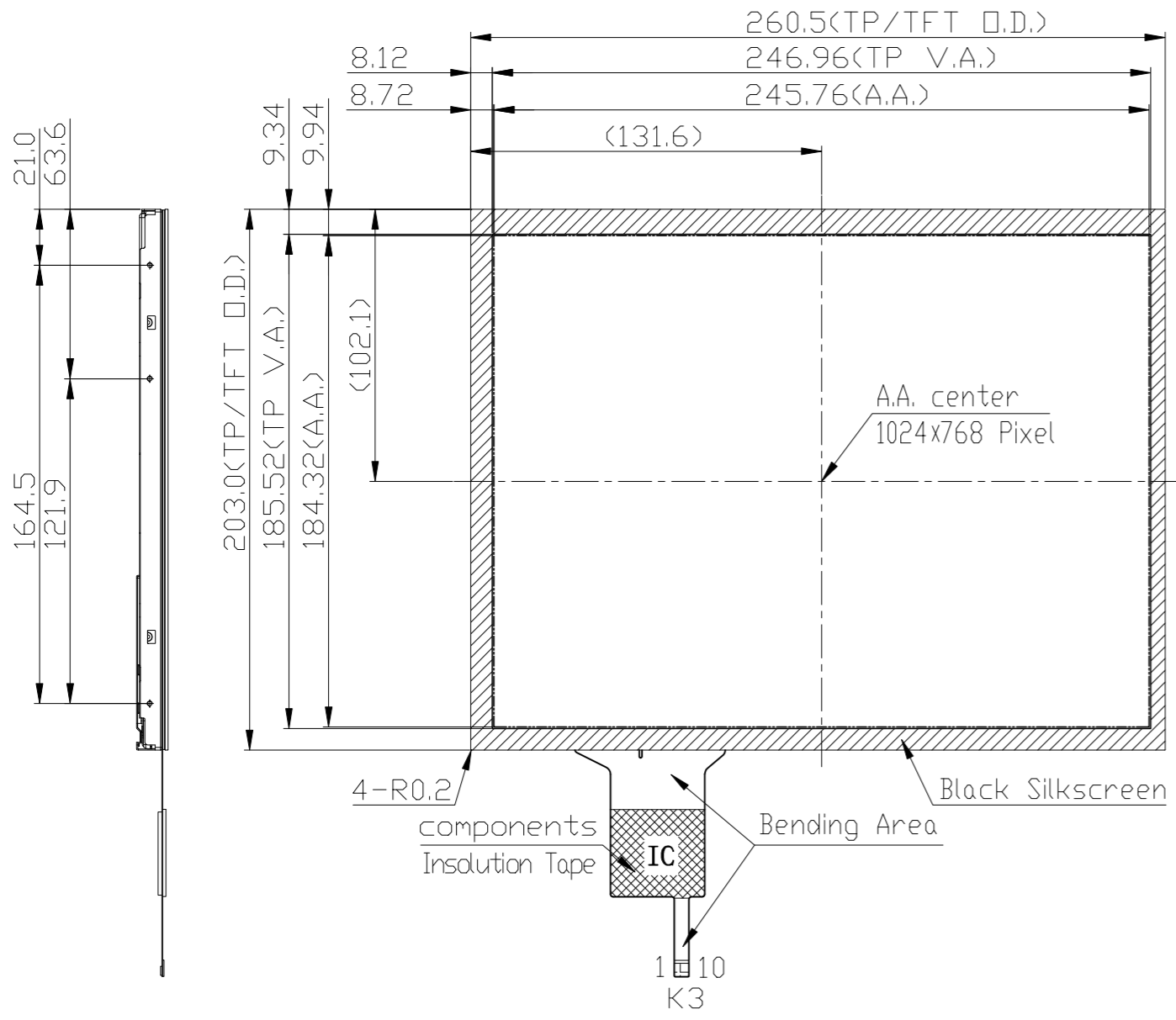
Figure 1

11. Warranty

This product has been manufactured to our company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

- We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.
- We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
- We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed our company's acceptance inspection procedures.
- When the product is in CCFL models, CCFL service life and brightness will vary according to the performance of the inverter used, leaks, etc. We cannot accept responsibility for product performance, reliability, or defect, which may arise.

We cannot accept responsibility for intellectual property of a third part, which may arise through the application of our product to our assembly with exception to those issues relating directly to the structure or method of manufacturing of our product.



K1 Terminal	
No	Pin Name
1	RX3+
2	RX3-
3	DPS
4	FRC
5	GND
6	RXCLK+
7	RXCLK-
8	GND
9	RX2+
10	RX2-
11	GND
12	RX1+
13	RX1-
14	GND
15	RX0+
16	RX0-
17	GND
18	MSL
19	VCC
20	VCC

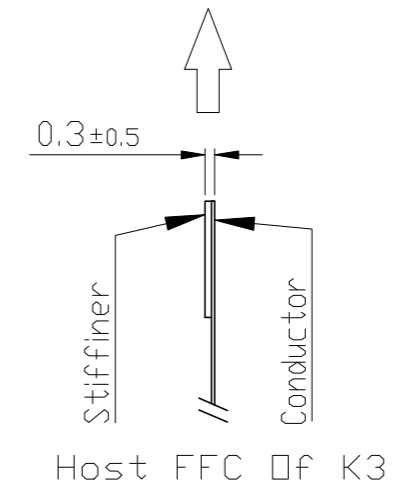
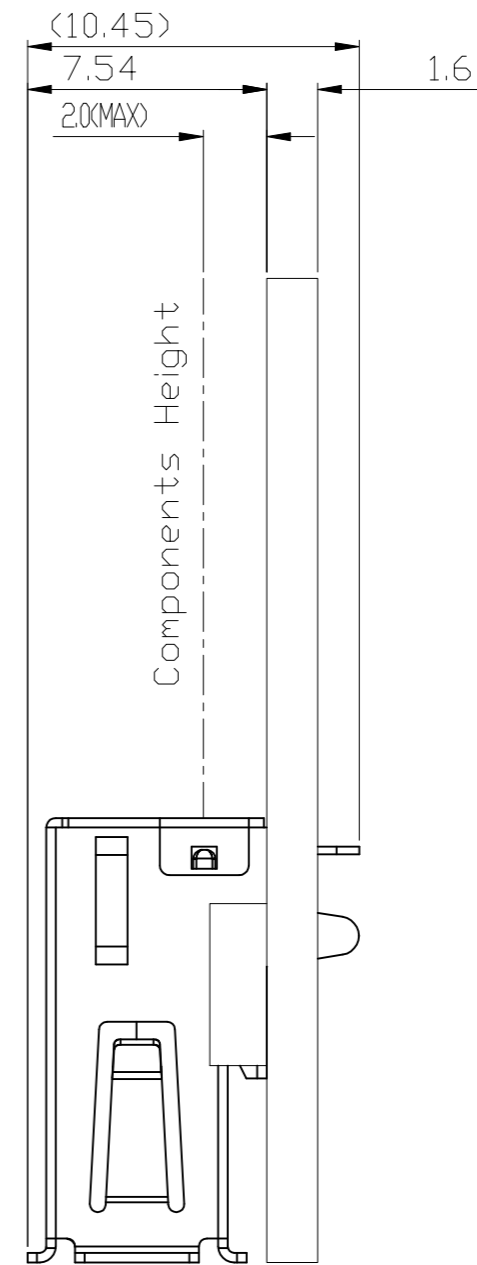
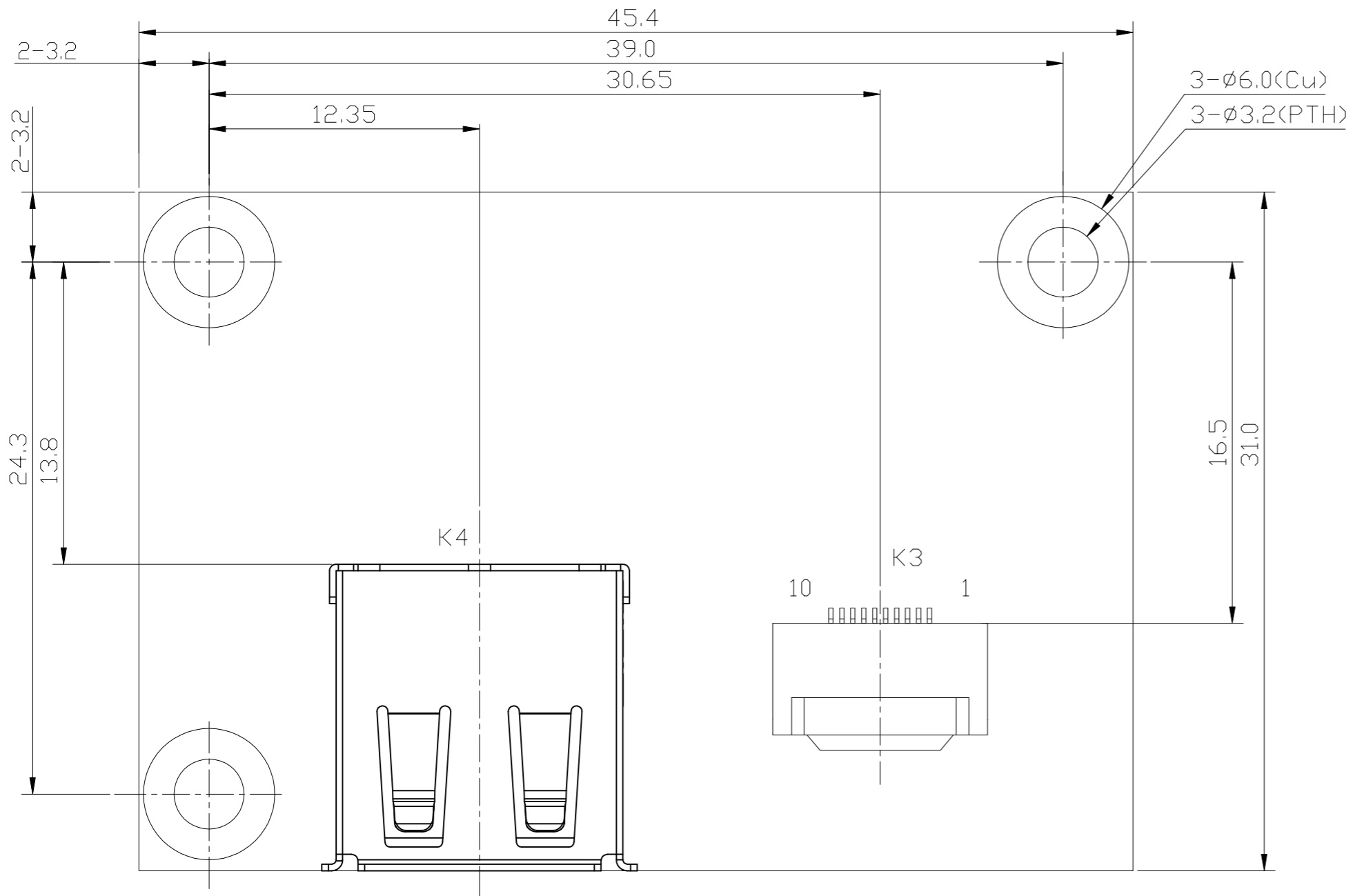
K2 Terminal	
No	Pin Name
1	Vi
2	Vi
3	Vi
4	Vi
5	VGND
6	VGND
7	VGND
8	VGND
9	EN
10	PWM

K3 Terminal			
No	Pin Name	No	Pin Name
1	NC	6	NC
2	NC	7	GND
3	NC	8	D+
4	NC	9	D-
5	NC	10	VDD(5V)

B	Correcting Connector Information	BiChangLiu 2024-05-16
A	Increase CTP Thickness	BiChangLiu 2023-11-20
Rev	Note	Date
Dwg Title LMT121EAGFWA-NND Outline Dwg		
Dwg No.	MK-008221b-1-1	Date 2023-10-28
Scale 2/5	Tol.	Unit mm
Approved	Checked	Paper Size A3
		Drawn BiChangLiu



- Note:
- *1. LCD Display Type: TFT.Transmissive (Full View)
 - *2. Pixel Arrangement: RGB-STRIPE
 - *3. Color Depth : 16.7M & 262K Colors
 - *4. Operating Voltage(TFT) : 3.3V
 - *5. Backlight: White LED
 - *6. Backlight Supply: 12.0V
 - *7. Interface: LVDS 24bits(JEIDA/VESA)/18bits(JEIDA/VESA)
 - *8. Terminal:
 - K1: P1.25x20P JAE FI-SEB20P-HFE
 - K2: P1.0x10Pin JST SM10B-SHLS-TF
 - K3: Matched connection(P1.0x10pin FFC Socket or equivalent)
 - *9. Operating Temperature : -30°C~80°C
 - *10. Storage Temperature : -35°C~85°C
 - *11. Touch Panel Type : Capacitive Touch Panel
 - *12. Unmarked Tolerance : ≤150,±0.3; >150,±0.5



K3 Terminal	
No	Pin Name
1	NC
2	NC
3	NC
4	NC
5	NC
6	NC
7	GND
8	D+
9	D-
10	VDD<5V>

Note:

- *1. Operating Voltage : 5.0V
- *2. Terminal :
K3: P1.0x10pin FFC Socket or equivalent
K4: 4Pin USB_Type A
- *3. Operating Temperature : -20°C~70°C
- *4. Storage Temperature : -30°C~80°C
- *5. Unmarked Tolerance ≤150,±0.3; >150,±0.5

A				
Rev	Note			Date
Dwg	Title	LMT121EAGFWA-NND PCB Outline Dwg		
Dwg No.	MK-008270-1-1	Date	2023-11-30	
Scale	4/1	Tol.	Unit mm	Paper Size A3
Approved	Checked	Drawn BiChangLiu		

