



深圳市拓普微科技开发有限公司
SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LMT050DNCFWU-3

LCD Module User Manual

Prepared by: Gong huimei Date: 2024-01-17	Checked by: Date:	Approved by: Date:
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Rev.	Descriptions	Edit	Release Date
0.1	Preliminary	Gong huimei	2024-01-17

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1. General Specification

Screen Size(Diagonal) :	5.0 ”
Active Area :	108 x 64.8 (mm)
Number of dots :	800(RGB) x 480
Pixel Pitch:	0.135 x 0.135 (mm)
Color Depth :	16.7M colors
Display Technology :	a-Si TFT active matrix
Display Mode :	Normal White, Transmissive
Display Interface :	RGB_24bit
Viewing Direction :	6H (*1) (gray scale inverse) 12H (*2)
Surface Treatment :	Anti-Glare
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C

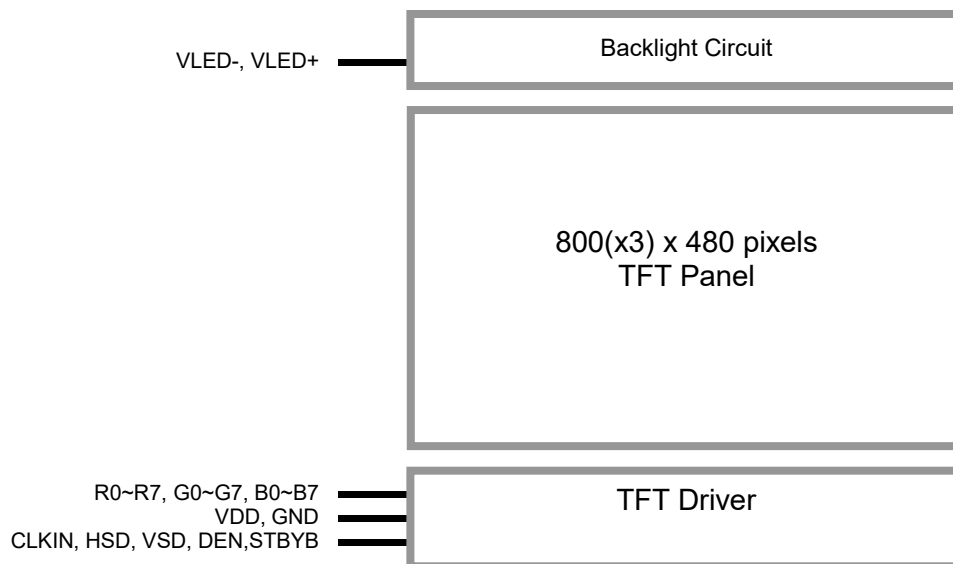
Note:

*1. For saturated color display content (eg. pure-red, pure-green, pure-blue, or pure-colors-combinations).

*2. For “color scales” display content.

*3. Color tone may slightly change by Temperature and Driving Condition.

2. Block Diagram



3. Terminal Functions

3.1 Interface

Pin No.	Pin Name	I/O	Descriptions
1	VLED-	P	Backlight LED Cathode supply
2	VLED+	P	Backlight LED Anode supply
3	GND	P	Power Ground (0V)
4	VDD	P	Positive Power Supply
5	R0	I	Red color data input
:	:		
12	R7		
13	G0	I	Green color data input
:	:		
20	G7		
21	B0	I	Blue color data input
:	:		
28	B7		
29	GND	P	Power Ground (0V)
30	CLKIN	I	Clock for input data. Data latched at falling edge of this signal.
31	STBYB	I	Standby mode. STBYB="1": Normally operation. STBYB="0": Standby mode .Timing controller, source driver will turn off, all output are High-Z.
32	HSD	I	Horizontal Sync signal input
33	VSD	I	Vertical Sync Signal Input
34	DEN	I	Data input enable. Effective only in DE mode.
35	NC	-	No connection, leave open
36	GND	P	Power Ground (0V)
37	NC	-	No connection, leave open
38	NC		
39	NC		
40	NC		

Note:

*1: I/O definition: I---Input, O---Output, P---Power/Ground

*2: Interface: HS, VS mode (default)

4. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V _{DD}	-0.5	+3.96	V	GND = 0V
Operating Temperature	T _{OP}	-20	+70	°C	No Condensation
Storage Temperature	T _{ST}	-30	+80	°C	No Condensation

Cautions:

Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

5. Electrical Characteristics

5.1 DC Characteristics

GND=0V, V_{DD} =3.3V, T_{OP} =25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Operating Voltage	V _{DD}	3.2	3.3	3.4	V	VDD
Input High Voltage	V _{IH}	0.7xV _{DD}	-	V _{DD}	V	Input pins
Input Low Voltage	V _{IL}	GND	-	0.3xV _{DD}	V	Input pins
Output Signal Low Voltage	V _{oH}	-	-	GND+0.4	V	
Output Signal High Voltage	V _{IL}	V _{DD} -0.4	-	-	V	
Operating Current (*1)	I _{DD}	-	90	-	mA	All black

Note.

*1. For different LCM, the value may have a bit of difference.

*2. To test the current dissipation, use "all Black Pattern".

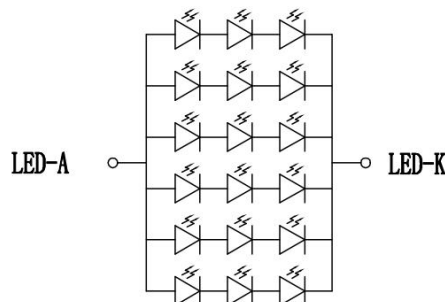
5.2 LED Backlight Circuit Characteristics

I_f=120mA, T_{OP}=25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward Voltage	V _f	-	9.0	9.9	V	
Forward Current	I _f	-	120	-	mA	
Life Time	-	-	40000	-	hr	

Cautions:

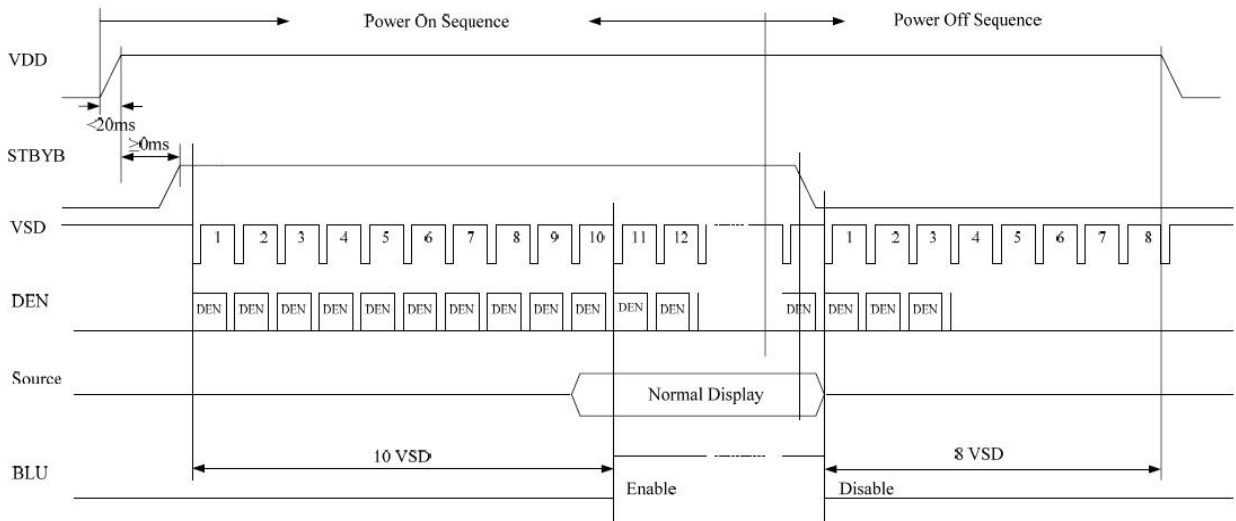
Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.



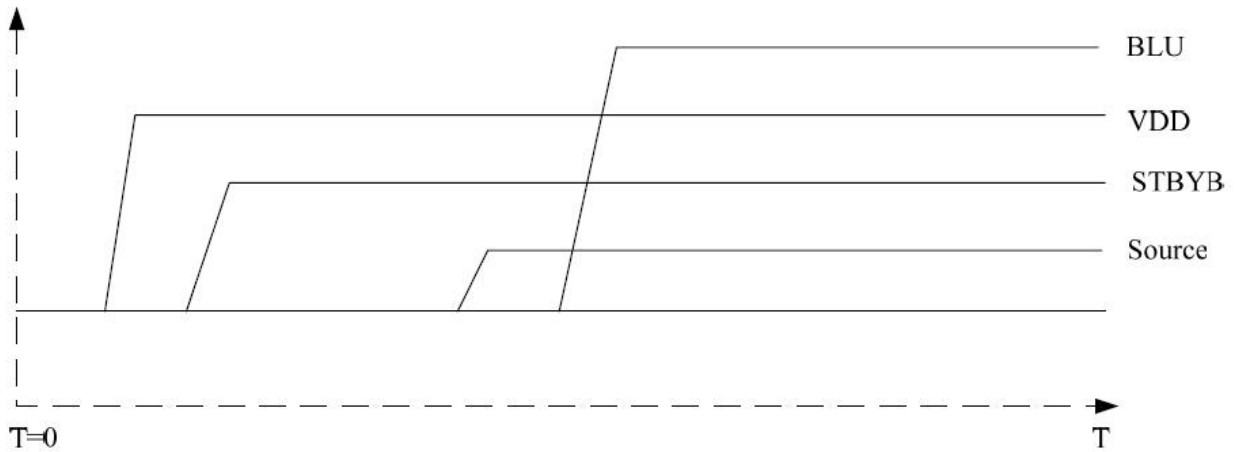
Backlight Circuit Diagram

No. of LEDs = 3x6 pcs

5.3 Power ON/OFF Sequence

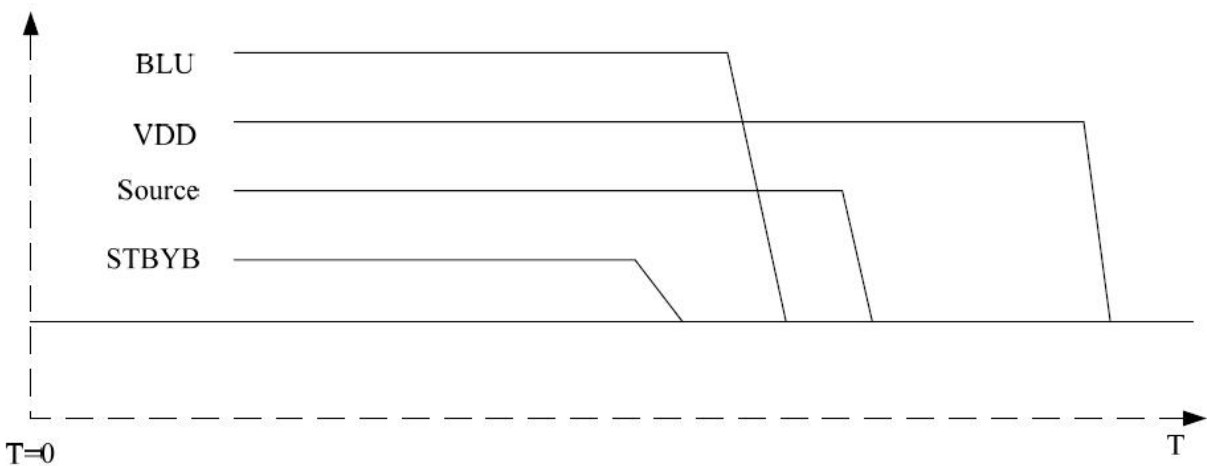


Power On/Off Sequence



VDD → Display on → Source → BLU

Power On Sequence



Display off → BLU → Source → VDD

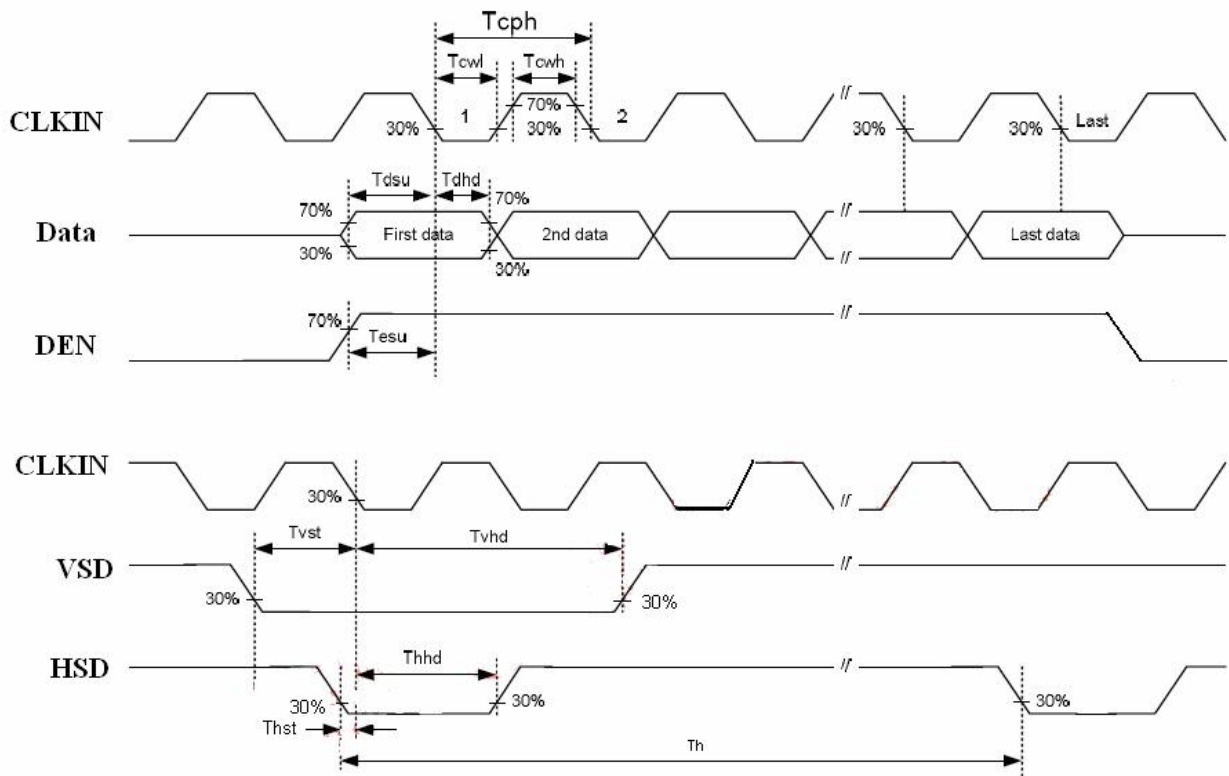
Power OFF Sequence

6. AC Characteristics

6.1 AC Timing

GND=0V, V_{DD} =3.3V, T_{OP} =25°C

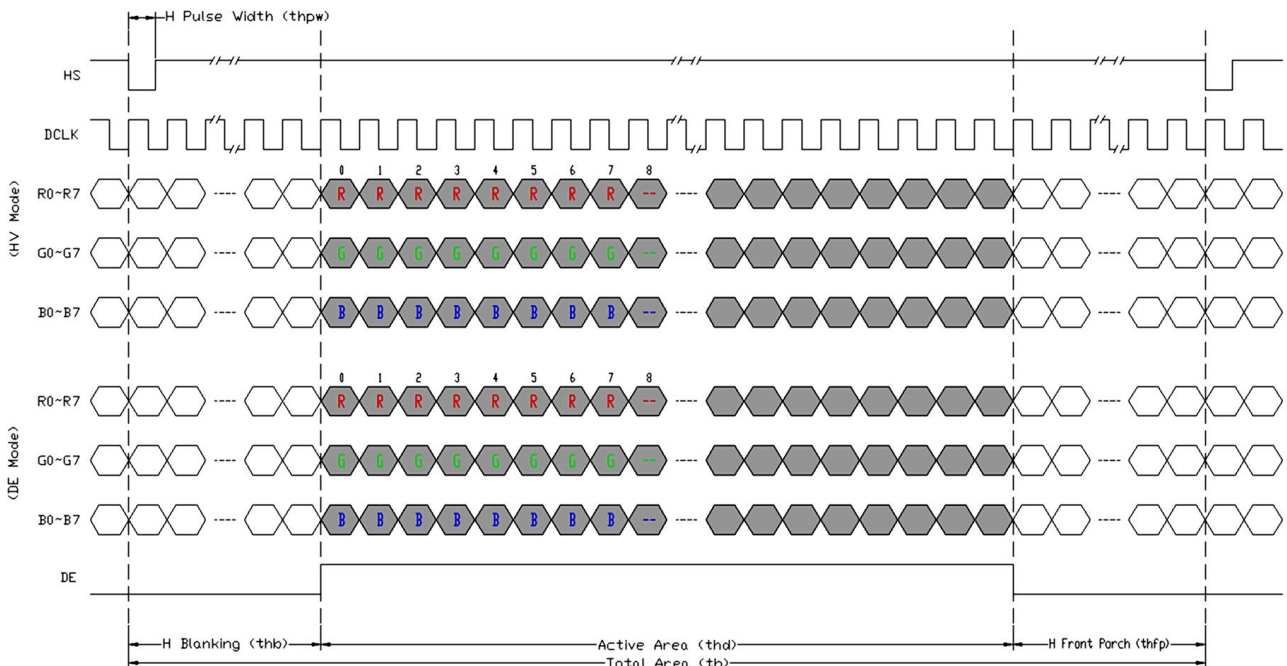
Item	Symbol	MIN.	TYP.	MAX.	Unit	Remark
HSD setup time	Thst	8	-	-	ns	
HSD hold time	Thhd	8	-	-	ns	
VSD setup time	Tvst	8	-	-	ns	
VSD hold time	Tvhd	8	-	-	ns	
Data setup time	Tdsu	8	-	-	ns	
Data hole time	Tdhd	8	-	-	ns	
DE setup time	Tesu	8	-	-	ns	
VDD Power On Slew rate	Tpor	-	-	20	ms	
CLKIN cycle time	Tcph	20	-	-	ns	
CLKIN pulse duty	Tcwh	40	50	60	%	



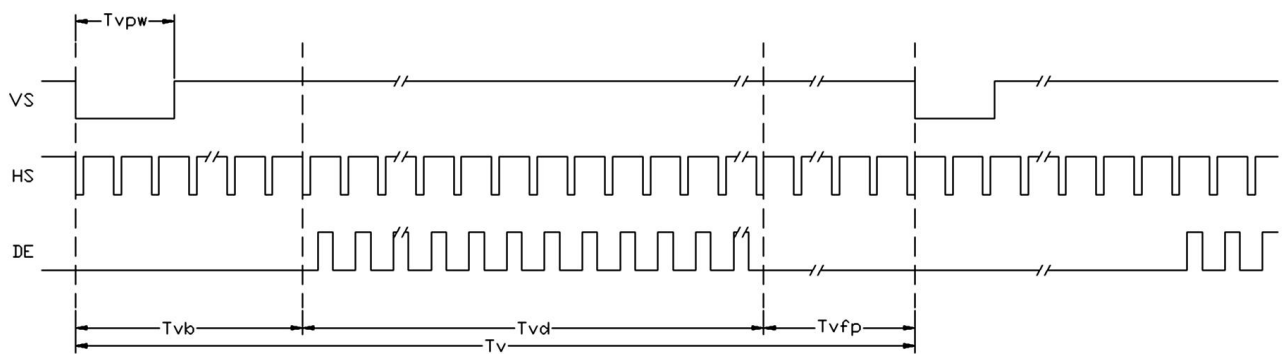
Input Clock and Data Timing Diagram

6.2 Data Input format

Item	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Horizontal Display Area	thd	800			DCLK	
CLKIN Frequency	fclk	-	30	50	MHz	
One Horizontal Line	th	889	928	1143	CLKIN	
HSD pulse width	thpw	1	48	255	CLKIN	
HSD Blanking	thb	88			CLKIN	
HSD Front Porch	thfp	1	40	255	CLKIN	
Vertical Display Area	tvd	480			TH	
VSD period time	tv	513	525	767	TH	
VSD pulse width	tvpw	3	3	255	TH	
VSD Blanking	tvb	32			TH	
VSD Front Porch	tvfp	1	13	255	TH	



Horizontal input timing diagram



Vertical input timing diagram

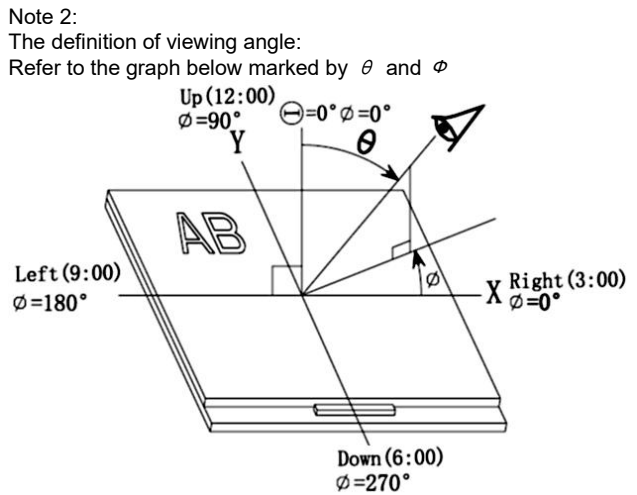
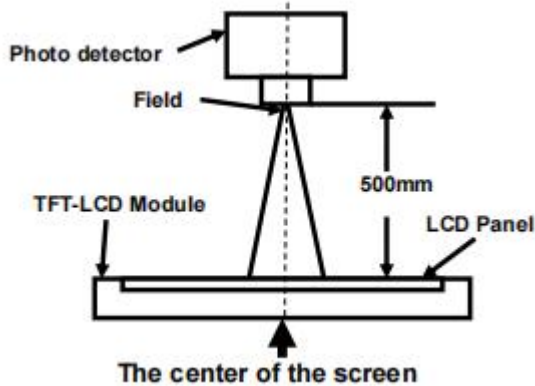
7. Optical Characteristics

Item	Symbol	Condition	MIN.	TYP.	MAX.	UNIT	Note.	
Viewing angle	θ_T	(CR \geq 10)	40	50	-	degree	Note 2,3	
	θ_B		60	70	-			
	θ_L		60	70	-			
	θ_R		60	70	-			
Contrast ratio	CR	$\theta=0^\circ$	500	600	-	-	Note 3	
Response Time	T _{on}	25°C	-	20	30	ms	Note 4	
	T _{off}							
Chromaticity	White	X	Backlight is on	0.275	0.325	0.375	-	Note 1,5
		Y		0.313	0.363	0.413		
	Red	X		0.556	0.616	0.656		
		Y		0.285	0.335	0.385		
	Green	X		0.256	0.306	0.356		
		Y		0.517	0.567	0.617		
	Blue	X		0.086	0.136	0.186		
		Y		0.108	0.158	0.208		
Luminance	L		-	1100	-	cd/m ²	Note 1,6	
NTSC			-	50		%	Note 5	
Luminance uniformity	U		80	85	-	%	Note 1,7	

Test Conditions:

1. If= 120mA, Vf=9.0V, and the ambient temperature is 25°C
2. The test systems refer to Note 1 and Note 2.

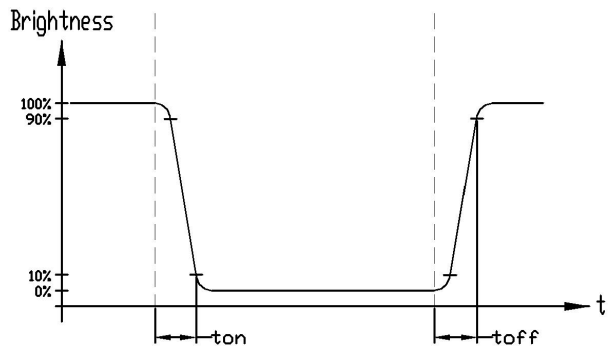
Note 1:
 Definition of optical measurement system.
 The optical characteristics should be measured in dark room.
 After 5 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.



Note 3:
 The definition of contrast ratio (Test LCM using SR-3A (1°)):

$$\text{Ratio(CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$
 (Contrast Ratio is measured in optimum common electrode voltage)

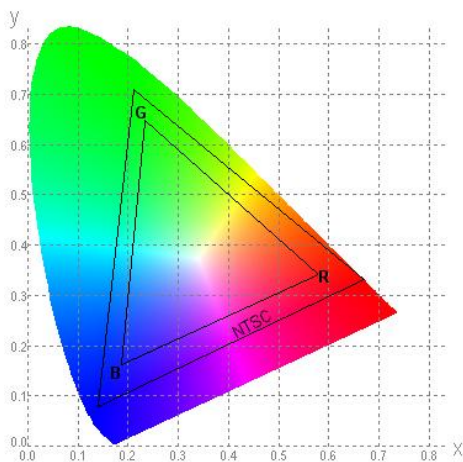
Note 4:
 Definition of Response time. (Test LCD using BM-7A(2°)):
 The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively.
 The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



Note 5:
 Definition of Color of CIE1931 Coordinate and NTSC Ratio.

Color gamut:

$$S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$

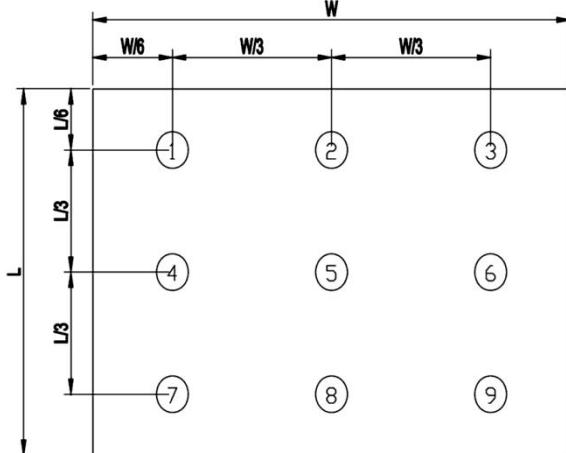


Note 6:
 The luminance uniformity is calculated by using following formula.

$$\Delta B_p = B_p (\text{Min.}) / B_p (\text{Max.}) \times 100 (\%)$$

$$B_p (\text{Max.}) = \text{Maximum brightness in 9 measured spots}$$

$$B_p (\text{Min.}) = \text{Minimum brightness in 9 measured spots.}$$

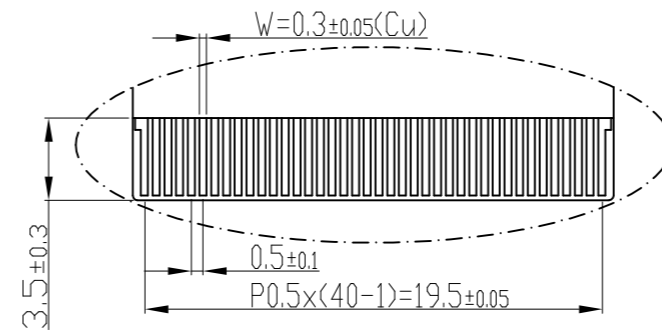
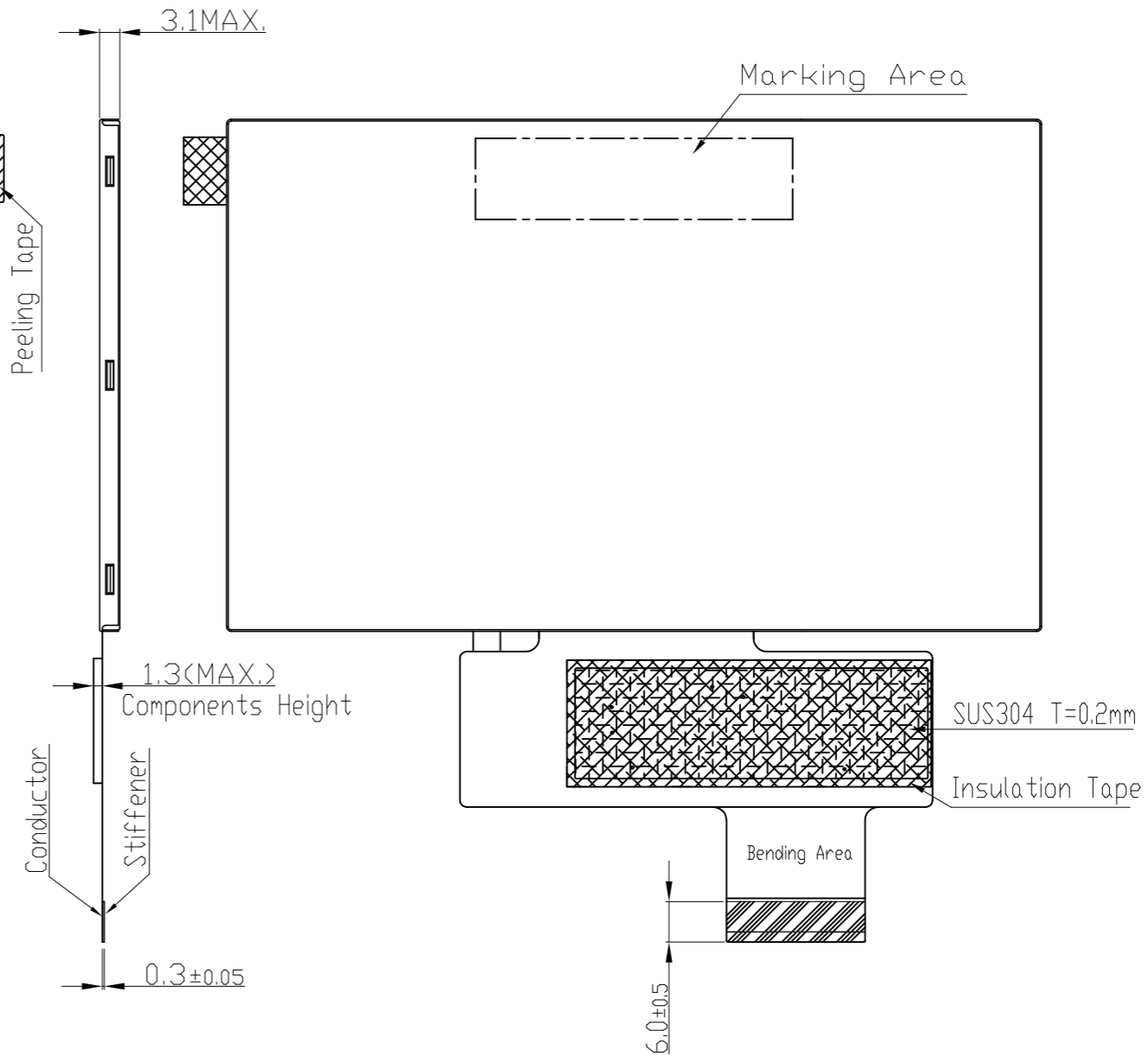
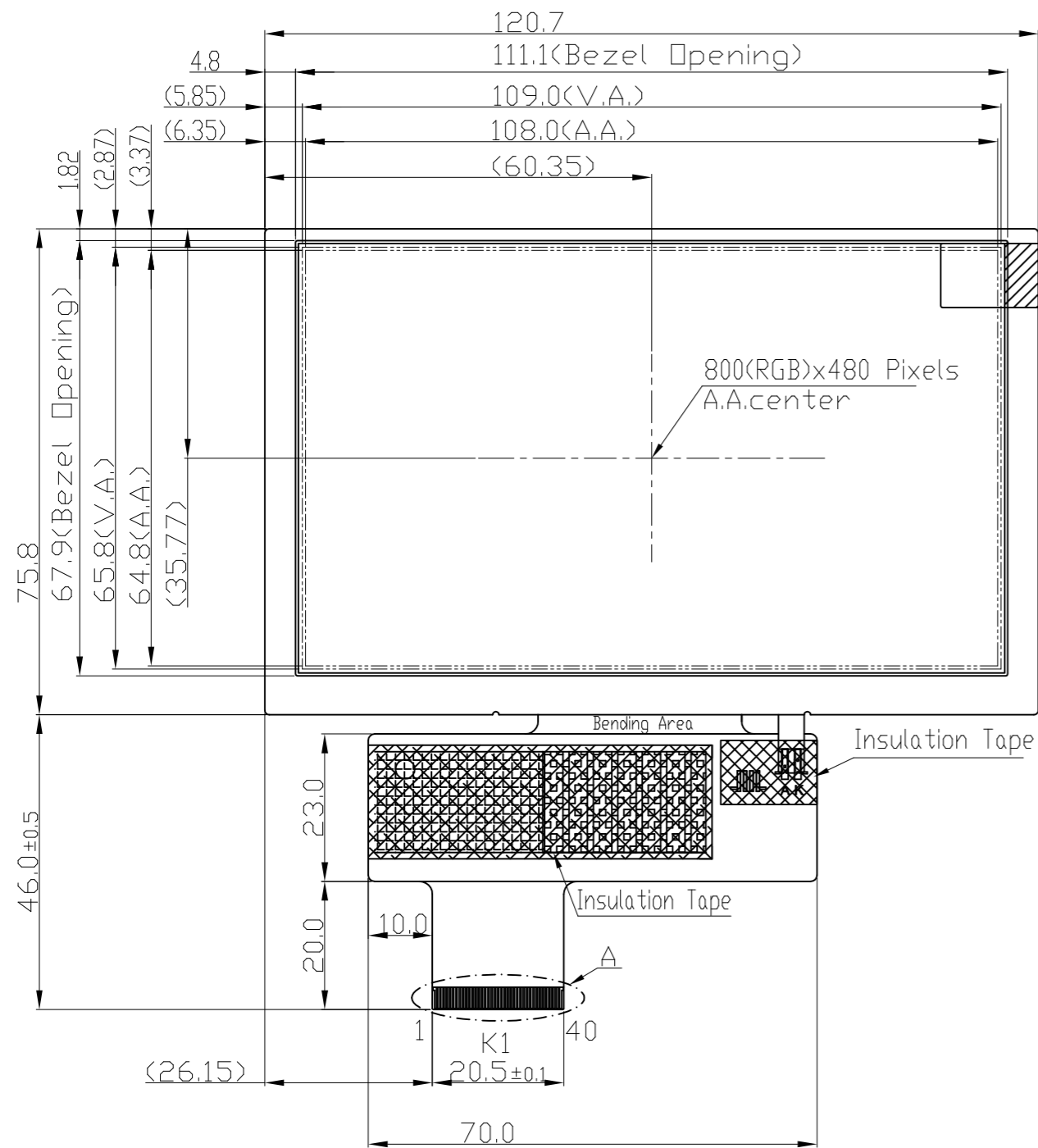


Note 7:
 Measured the luminance of white state at center point

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.



Detail A
Scale=3:1

K1 Terminal	
No	Pin Name
1	VLED-
2	VLED+
3	GND
4	VDD
5	R0
:	:
12	R7
13	G0
:	:
20	G7
21	B0
:	:
28	B7
29	GND
30	CLKIN
31	STBYB
32	HSD
33	VSD
34	DEN
35	NC
36	GND
37	NC
38	NC
39	NC
40	NC

Note:

- *1. LCD Display Type : TFT.Transmissive
- *2. Pixel Arrangement : RGB-STRIPE
- *3. Interface : RGB_24bit
- *4. Color Depth : 16.7M color
- *5. Operating Voltage : 3.3V
- *6. Backlight Supply : 120mA (Constant Current VF=9.0V typ.)
- *7. Backlight : White LED
- *8. Matched Connector: FH34SRJ-40S-0.5SH Or Equivalent
- *9. Operating Temperature : -20°C~70°C
- *10. Storage Temperature : -30°C~80°C
- *11. Unmarked Tolerance : ≤150,±0.3; >150,±0.5

C		
B		
A		
Rev	Note	Date
Dwg	Title	
	LMT050DNCFWU-3 outline Dwg	
Dwg No.	MK-008251-1-1	Date
		2023-12-12
Scale	Tol.	Unit
1/1		mm
Approved	Checked	Paper Size
		A3
		Drawn
		Zhangwenbo

TOPWAY