深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LMT043DEFFWA-NNA

LCD Module User Manual

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likeke		
Date: 2019-11-30	Date:	Date:

Rev.	Descriptions	Release Date
0.1	Preliminary	2019.11.30

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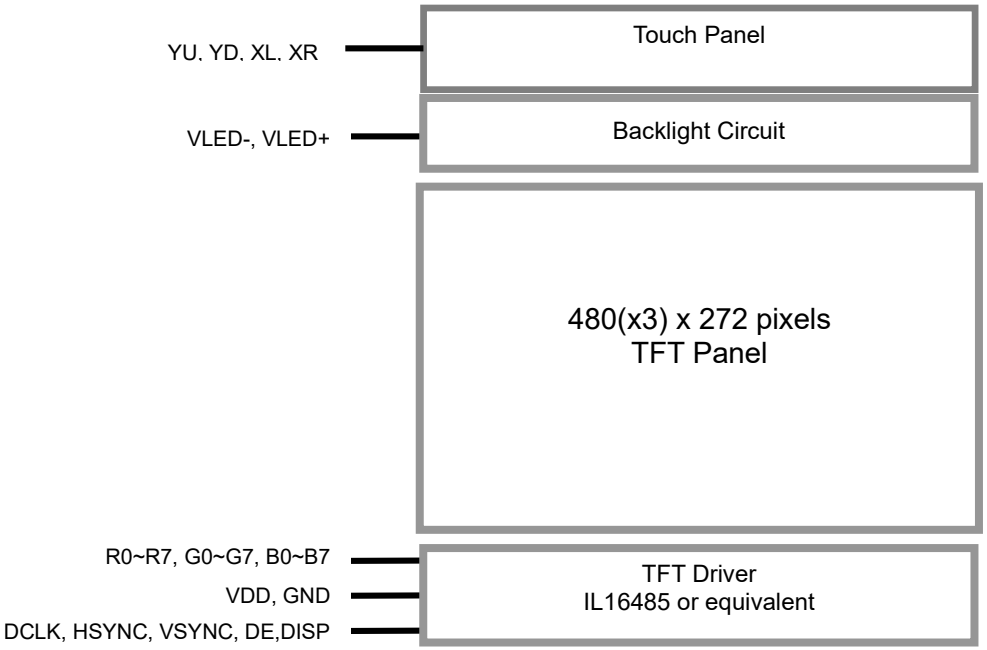
1. General Specification

Screen Size(Diagonal) :	4.3 inch
Resolution :	480(RGB) x 272
Signal Interface :	24bit parallel interface
Color Depth :	16.7M color (24bit) *1
Dot Pitch :	0.198 x 0.198 (mm)
Pixel Configuration :	Vertical Stripe
Display Mode :	Transmissive / Positive (normal white)
Surface Treatment :	Anti-Glare Treatment
Viewing Direction :	Full View
Outline Dimension :	105.5 x 67.2 x 2.9 (mm) (exclude FPC, see attached drawing for details)
Active Area :	95.04 x 53.86 (mm)
Backlight :	2x5 LEDs
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C

Note:
*1 Color tune may slightly changed by temperature and driving voltage.
*2 For saturated color display content (eg. pure-red, pure-green, pure-blue or pure-colors-combinations).
*3 For ”color scales” display content.

2. Block Diagram



3. Terminal Functions

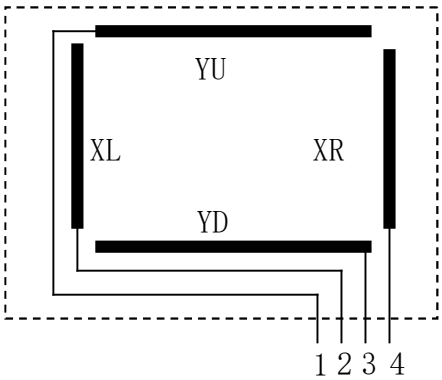
3.1 TFT Input Terminal

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	DCLK	I	Data clock signal input, rising edge trigger
31	DISP	I	Display on/of control (internally pull low) DISP=0: standby mode DISP=1: normal operation
32	HSYNC	I	Horizontal Sync signal input, active low (If not using, pull high)
33	VSYNC	I	Vertical Sync Signal Input, active low (If not using, pull high)
34	DE	I	Data Enable Signal Input, active high (If not using, pull low)
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:
The LMT043DEFFWA-NNA both supports DE mode and Sync mode timing.SYNC mode, DE pull-lo, HSYNC and VSYNC for timing control,DE mode, HSYNC and VSYNC pull-hi, DE for timing control

3.2 Touch Panel Terminal

Pin No.	Pin Name	I/O	Descriptions
1	YU	O	Up Side sense terminal
2	XL	O	Left Side sense terminal
3	YD	O	Down Side sense terminal
4	XR	O	Right Side sense terminal



Touch Panel Logic Details Scale =free

4. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage(TFT)	V_{DD}	-0.30	+4.00	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 (MCU terminal)

GND=0V, V_{DD} =3.3V, T_{OP} =25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Operating Voltage	V_{DD}	3.0	3.3	3.6	V	VDD
Input High Voltage	V_{IH}	0.7VDD	-	VDD	V	Input pins
Input Low Voltage	V_{IL}	GND	-	0.3VDD	V	Input pins
Frame Freq	F_{FRAME}	-	60	-	Hz	
Dot Data Clock	f_{DOTCLK}	-	9.0	15	MHz	
Operating Current (*1)	I_{DD}	-	21.0	-	mA	VDD
Standby Current (*2)	I_{DD}	-	15.2	-	uA	VDD

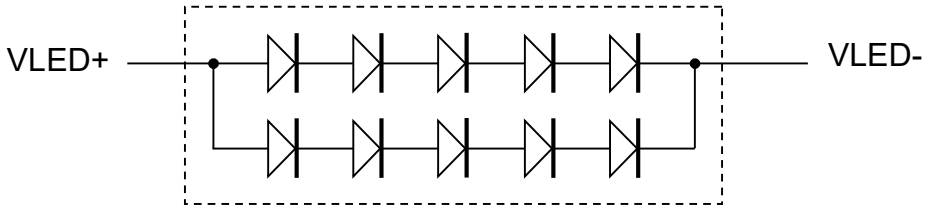
Note.
*1. test image is Black Mode, Frame Freq=60Hz
*2. DISP=0

5.2 LED Backlight Circuit Characteristics

If_{VLED+}=40mA, T_{OP}=25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward Voltage	Vf	-	16.0	-	V	
Forward Current	If_{VLED+}	-	40	50	mA	
Life Time	-	10,000	(20,000)	-	hr	

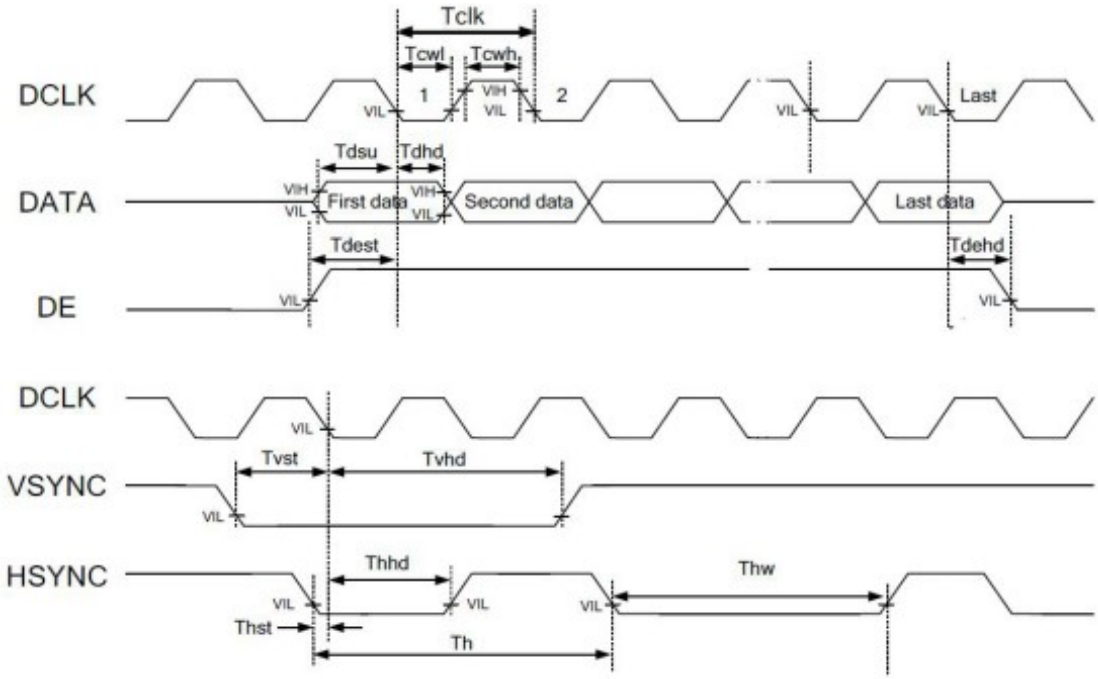
Cautions:
Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.



No. of LEDs = 2x5 pcs

5.3 AC Characteristics

5.3.1 Clock and Date Input Timing Diagram

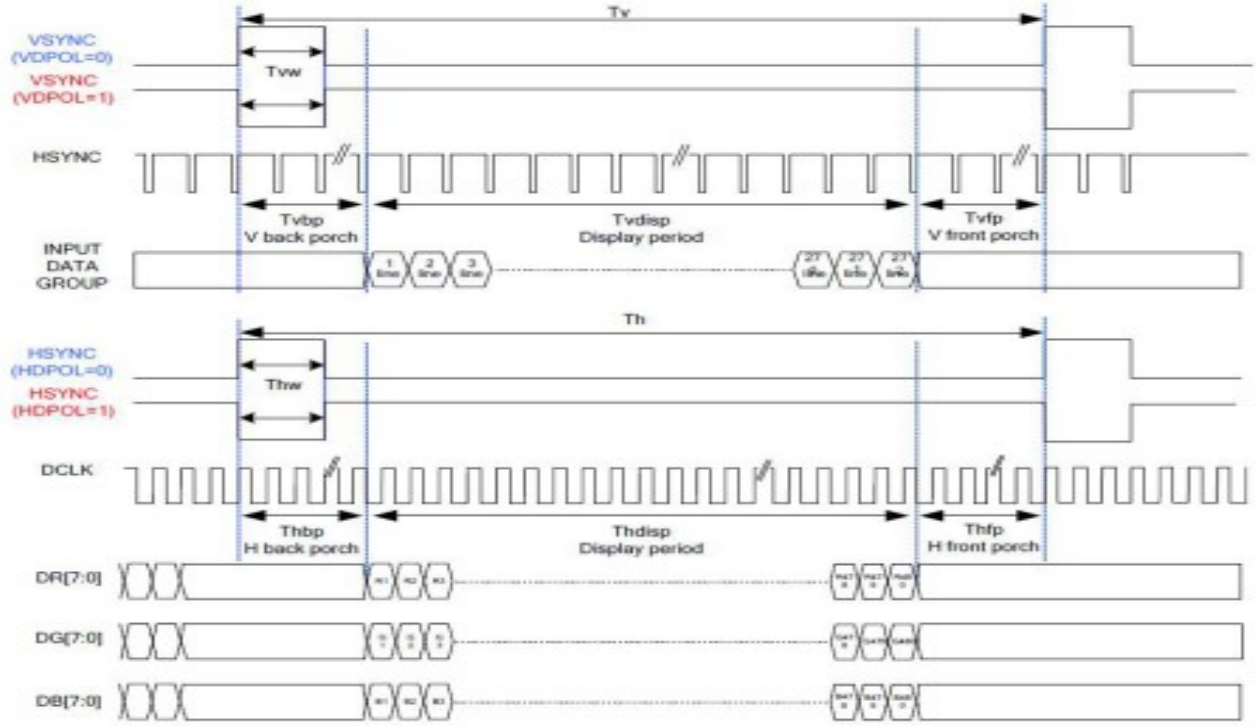


Timing Diagram

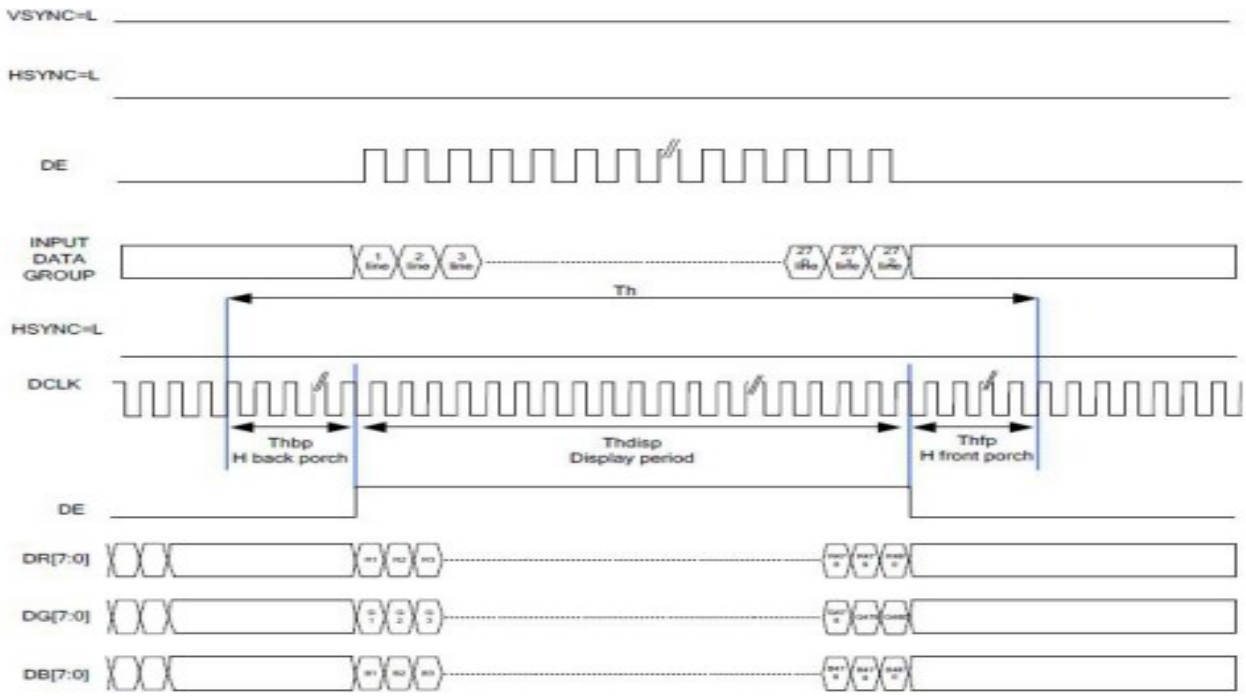
VDD=3.3V, GND=0V,T_{OP} =25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VCI power source slew time	TPOR	-	-	20	ms	From 0V to 99% VCI
RESX pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
Input/ Output timing						
CLK pulse duty	Tcw	40	50	60	%	
Hsync width	Thw	2	-	-	DCLK	
Hsync period	Th	55	60	65	us	
Vsync setup time	Tvst	12	-	-	ns	
Vsync hold time	Tvhd	12	-	-	ns	
Hsync setup time	Thst	12	-	-	ns	
Hsync hold time	Thhd	12	-	-	ns	
Data setup time	Tdsu	12	-	-	ns	
Data hold time	Tdhd	12	-	-	ns	
DE setup time	Tdest	10	-	-	ns	
DE setup time	Tdehd	10	-	-	ns	
SD output stable time	Tst	-	-	12	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD output rise and fall time	Tgst	-	-	6	ns	Output settled (5%~95%), Loading = 4.7k+29.8pF

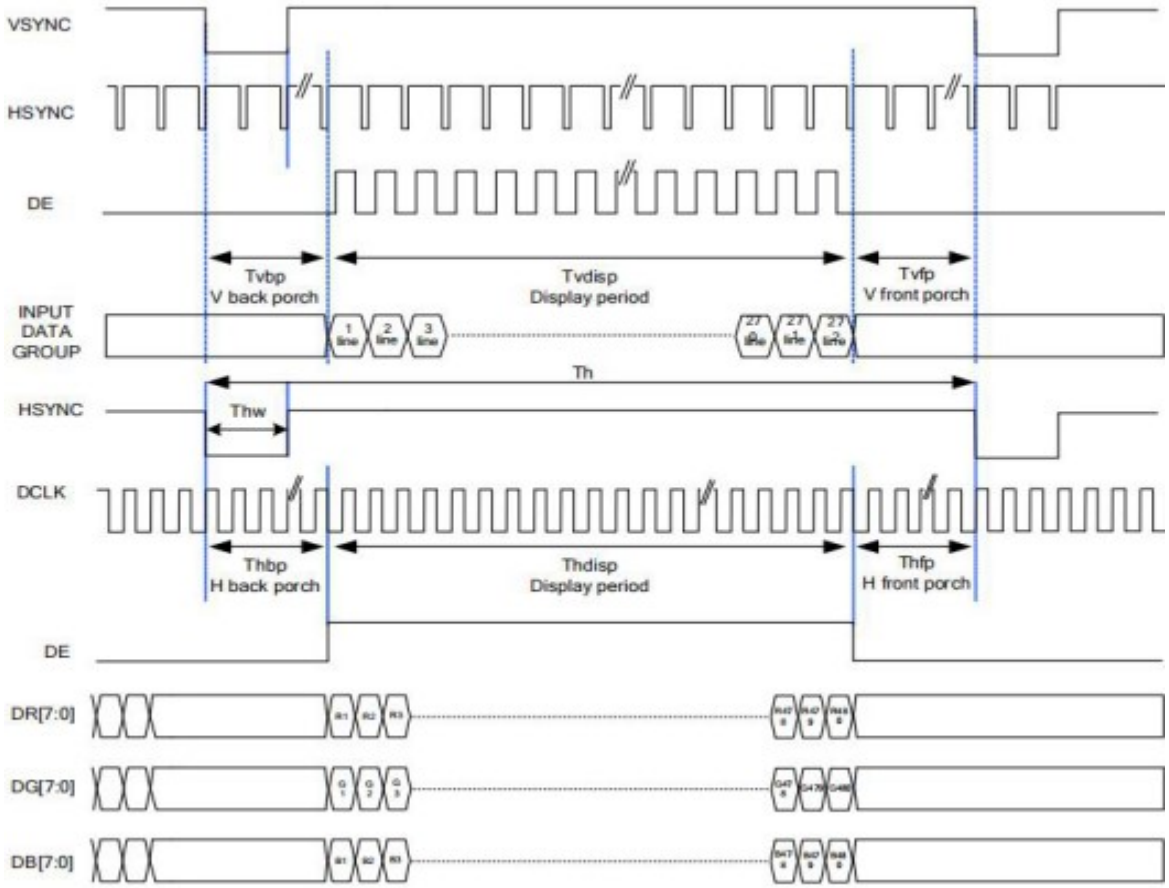
5.3.2 SYNC Mode Timing Diagram



5.3.3 DE Mode Timing Diagram



5.3.4 SYNC-DE Mode Timing Diagram



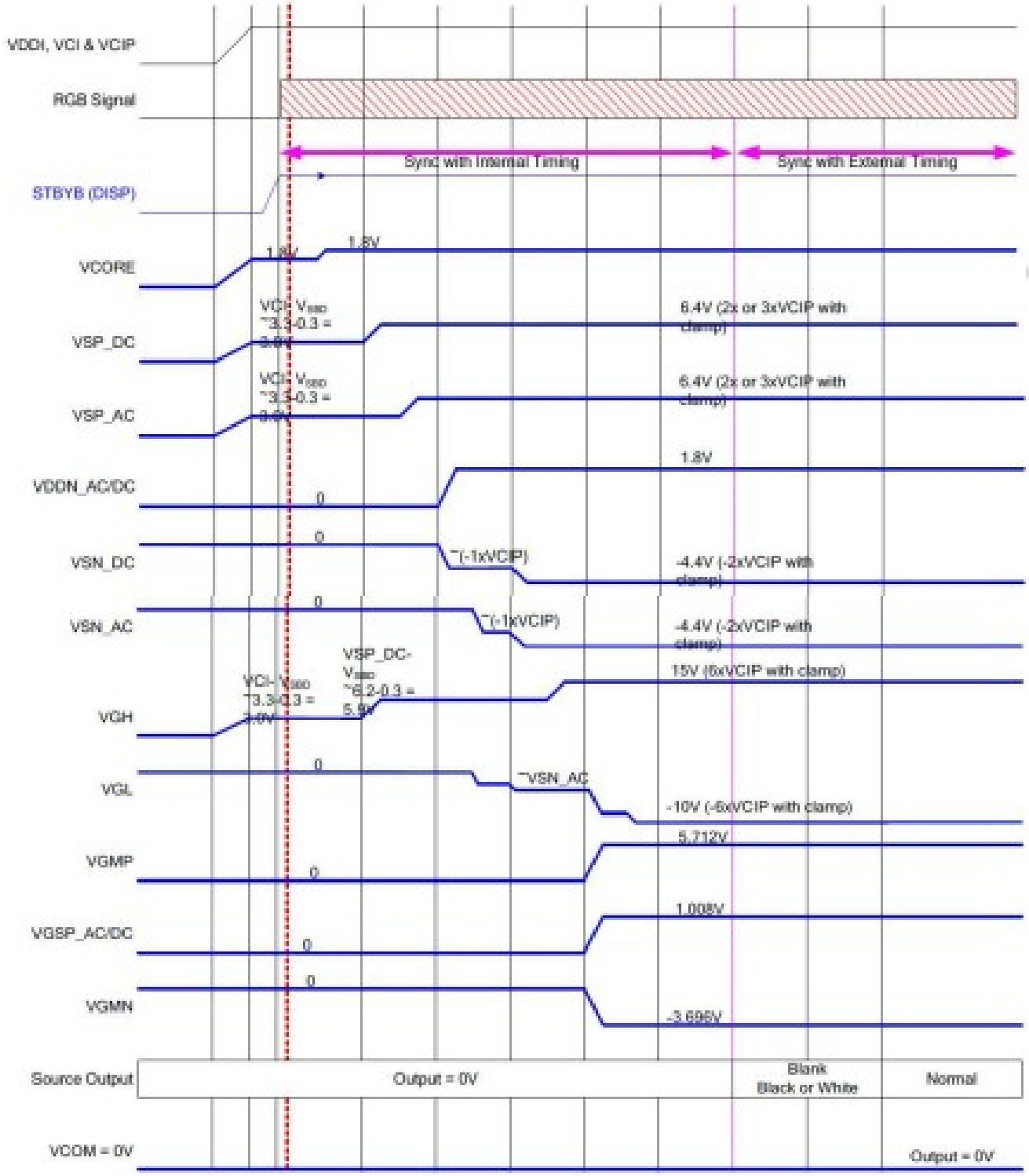
5.3.5 RGB Input Timing Table

480RGB X 272 Resolution Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	8	9	12	MHz	
DCLK Period		Tclk	125	111	83	ns	
HSYNC	Period Time	Th	487	531	598	DCLK	
	Display Period	Thdisp	-	480	-	DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_Blanking setting
	Front Porch	Thfp	4	8	75	DCLK	
	Pulse Width	Thw	2	4	75	DCLK	
VSYNC	Period Time	Tv	276	292	321	H	
	Display Period	Tvdisp	-	272	-	H	
	Back Porch	Tvbp	2	12	12	H	By V_Blanking setting
	Front Porch	Tvfp	2	8	37	H	
	Pulse Width	Tvw	2	4	37	H	

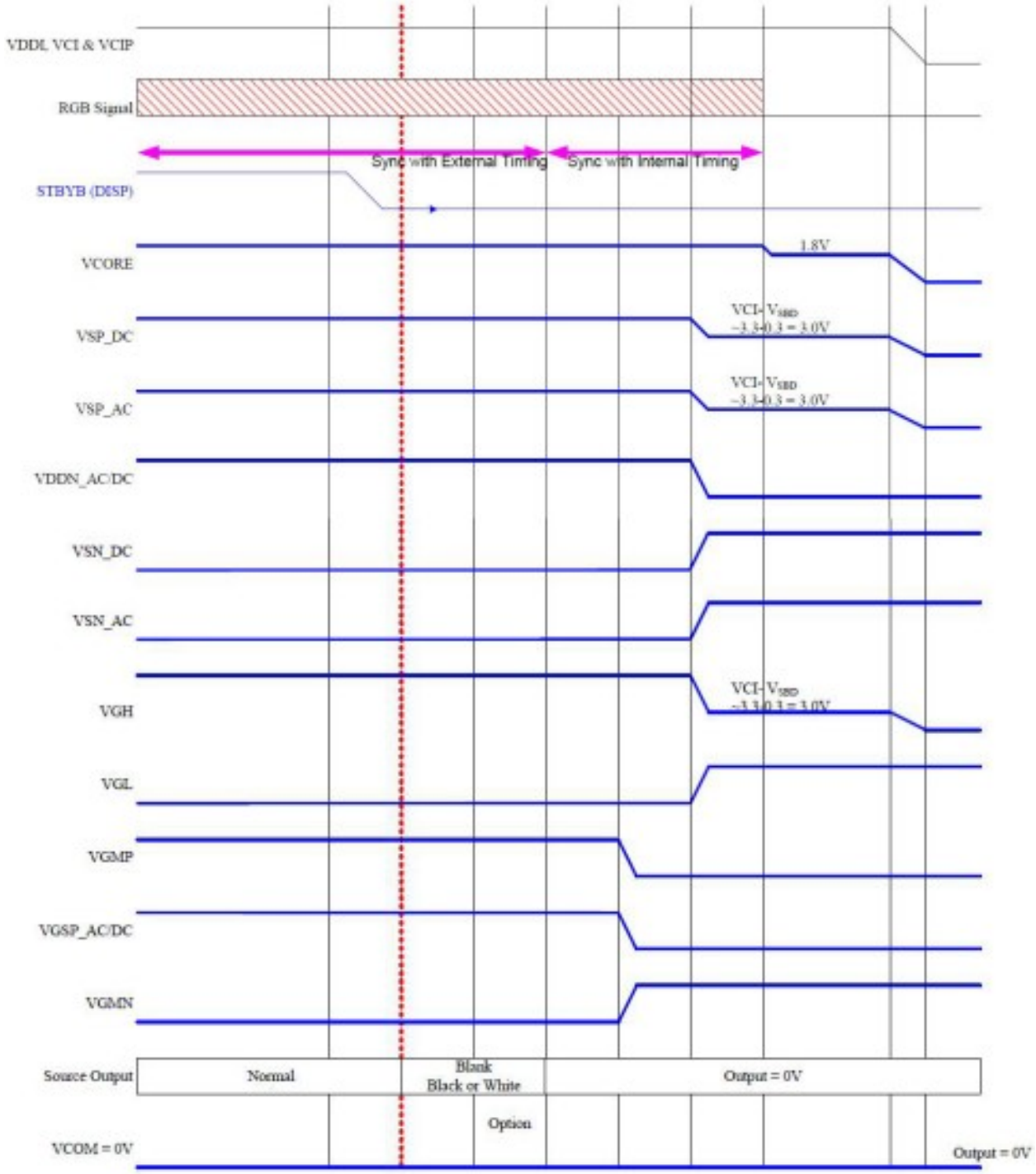
Note: 1.It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

2.Thbp+Thfp >=7

5.3.6 Power ON Sequence



5.3.7 Power Off Sequence



6. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	70	80	-	Degree	Note2,3
		θB		70	80	-		
		θL		70	80	-		
		θR		70	80	-		
Contrast Ratio		CR	θ = 0°	600	800	-		Note 3
Response Time		TON	25℃	-	20	30	ms	Note 4
		TOFF						
Chromaticity	**White**	x	Backlight is on	-	0.303	-		Note 1,5
		y		-	0.320	-		
	Red	x		-	0.588	-		Note 1,5
		y		-	0.354	-		
	Green	x		-	0.338	-		Note 1,5
		y		-	0.583	-		
	Blue	x		-	0.152	-		Note 1,5
		y		-	0.092	-		
Uniformity		U		75	80	-	%	Note 6
NTSC				45	50	-	%	Note 5
Luminance		L		280	320	-	cd/㎡	Note 7

Test Conditions:

1.IF= **40** mA, and the ambient temperature is 25℃. -

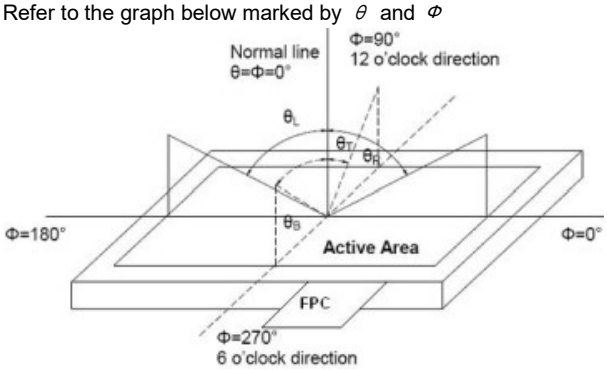
2. The test systems refer to Note 1 and Note 2.

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.

Measuring surroundings: Dark room

Measuring temperature: Ta=25℃.

Note 2: Definition of viewing angle range and measurement system.
The definition of viewing angle:
Refer to the graph below marked by θ and Φ

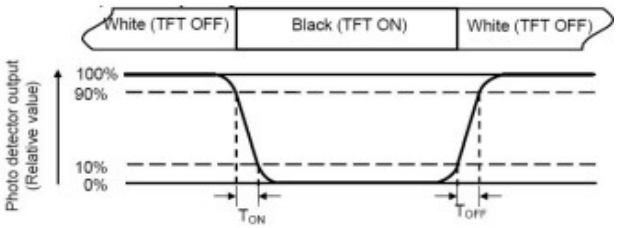


Note 3: Definition of contrast ratio
The definition of contrast ratio (Test LCM using SR-3A (1°)):

$$\text{Contrast Ratio(CR)} = \frac{\text{Luminance When LCD is at “White” state}}{\text{Luminance When LCD is at “Black” state}}$$

(Contrast Ratio is measured in optimum common electrode voltage)

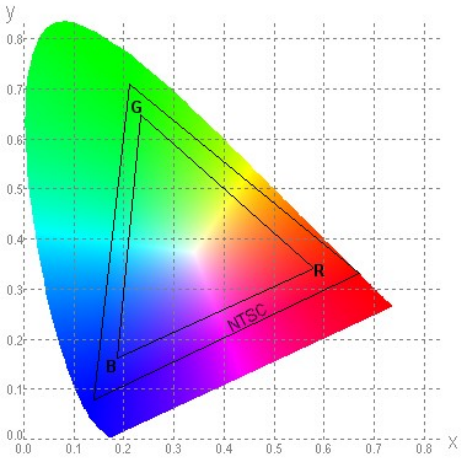
Note 4: Definition of Response time
Definition of Response time.
The response time is defined as the LCD optical switching time interval between “White” state and
“Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90%
to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10%
to 90%.



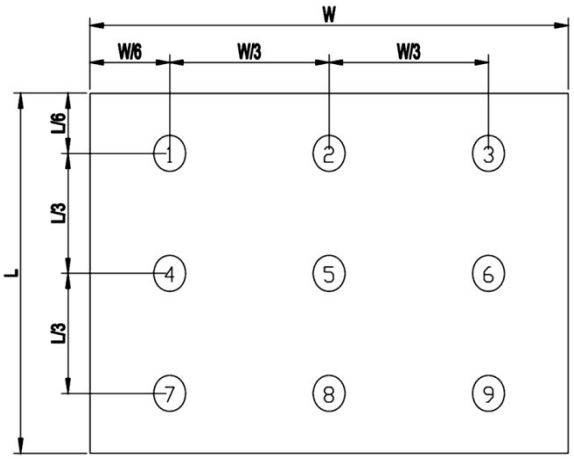
Note 5: Definition of color chromaticity (CIE1931)
Definition of Color of CIE1931 Coordinate and NTSC Ratio.

Color gamut:

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



Note 6: 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
Lmax: The measured Maximum luminance of all measurement position.
Lmin: The measured Minimum luminance of all measurement position.



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

7. Precautions of using LCD Modules

Mounting

- Mounting must use holes arranged in four corners or four sides.
- The mounting structure so provide even force on to LCD module. Uneven force (ex. Twisted stress) should not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- It is suggested to attach a transparent protective plate to the surface in order to protect the polarizer. It should have sufficient strength in order to the resist external force.
- The housing should adopt radiation structure to satisfy the temperature specification.
- 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.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. Never rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics deteriorate the polarizer.)
- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.

Operating

- The spike noise causes the mis-operation of circuits. It should be within the ±200mV level (Over and under shoot voltage)
- Response time depends on the temperature.(In lower temperature, it becomes longer.)
- Brightness depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
- 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.
- When fixed patterns are displayed for a long time, remnant image is likely to occur.
- 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 minimized the interference

Electrostatic Discharge Control

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.

Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

Storage

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

- Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

Protection Film

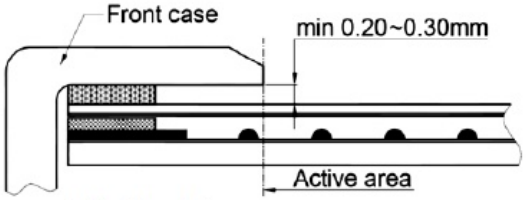
- When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
- The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt tore main on the polarizer. Please carefully peel off the protection film without rubbing it against the polarizer.
- When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

Transportation

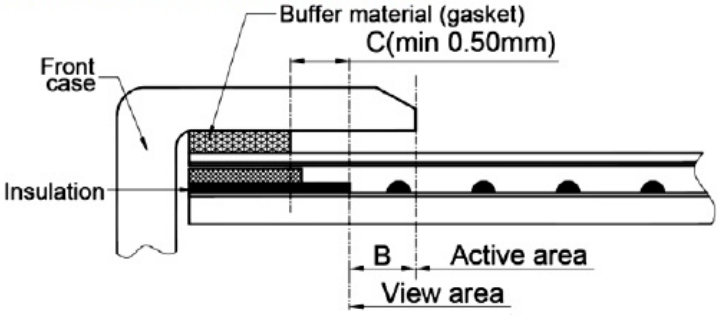
The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

TOPWAY Touch panel Design Precautions

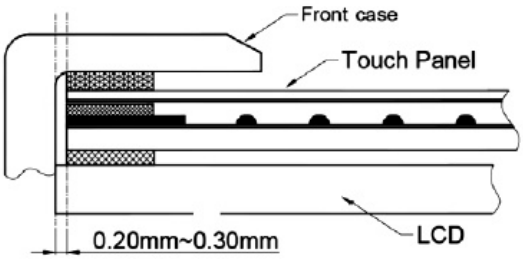
1. It should prevent front case touching the touch panel Active Area (A.A.) to prevent abnormal touch.
   It should left gab (e.g. 0.2~0.3mm) in between.



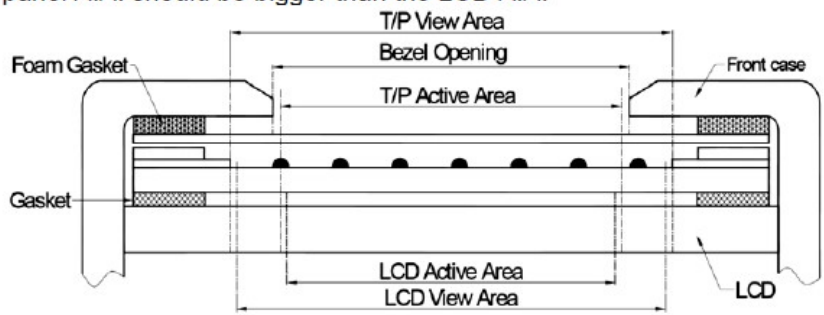
2. Outer case design should take care about the area outside the A.A.
   Those areas contain circuit wires which is having different thickness. Touching those areas could de-form the ITO film. As a result case the ITO cold be damaged and shorten its lifetime.
   It is suggested to protect those areas with gasket (between the front case and the touch panel).
   The suggested figures are B≥0.50mm; C≥0.50mm。

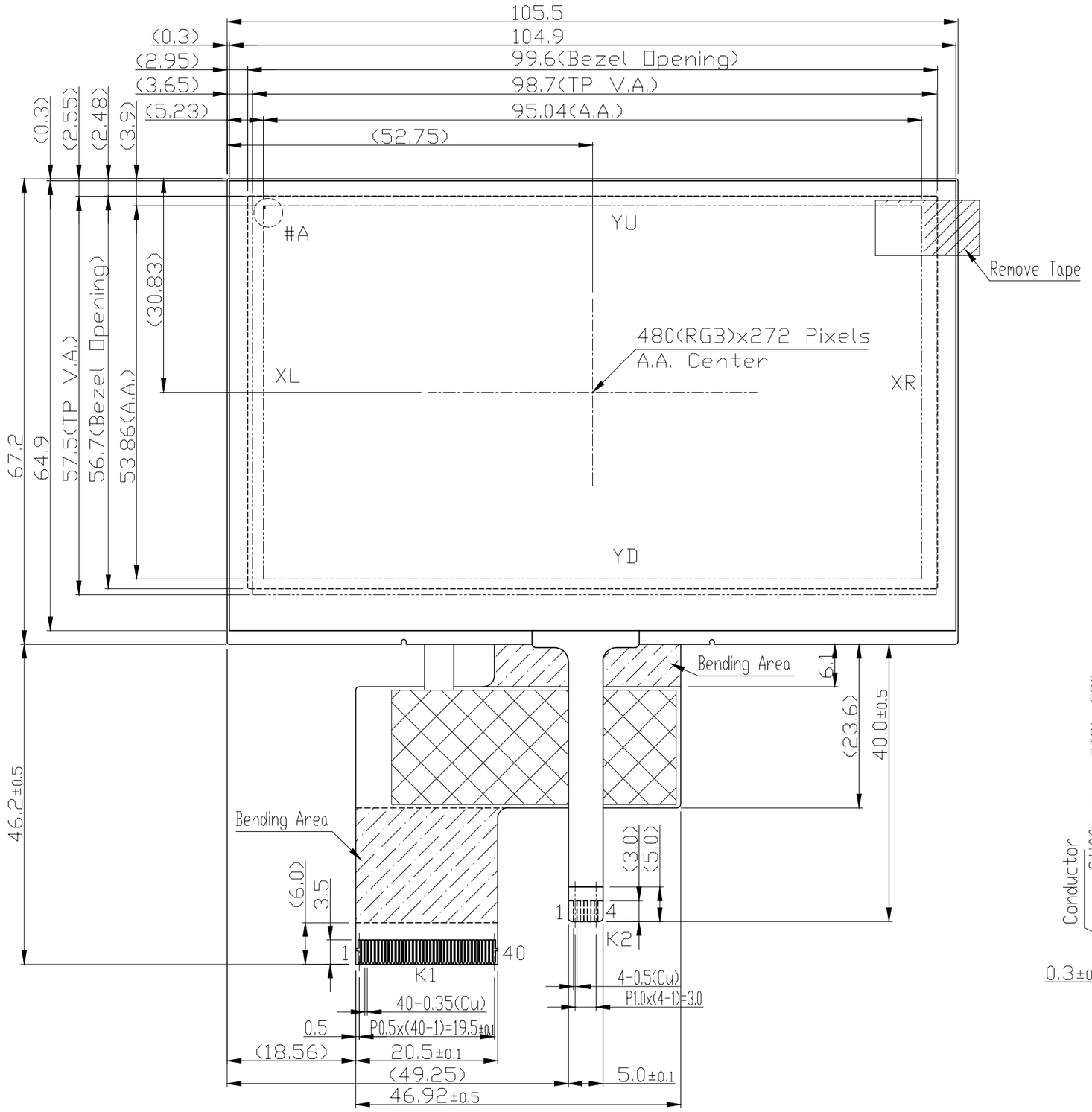


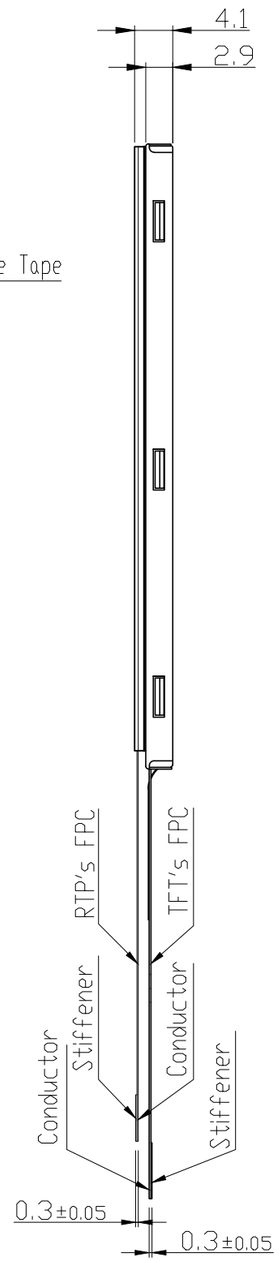
3. The front case side wall should keep space (e.g. 0.2 ~ 0.3mm) from the touch panel.

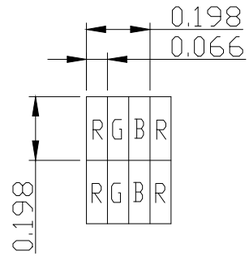


4. In general design,
   touch panel V.A. should be bigger than the LCD V.A.
   and touch panel A.A. should be bigger than the LCD A.A.

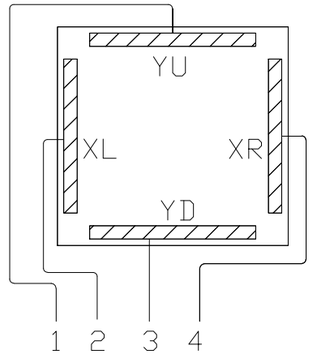








#A Details
Scale=50/1



Touch Panel Logic Details
Scale=free

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	DCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	NC
36	GND
37	NC
38	NC
39	NC
40	NC

K2 Terminal	
No	Pin Name
1	YU
2	XL
3	YD
4	XR

Note:
*1. LCD Display Type : TFT,Transmissive (Full View)
*2. Pixel Arrangment : RGB-STRIPE
*3. Signal Interface : RGB_24bits
*4. Color Depth : 16.7M Colors
*5. Operating Voltage : 3.3V
*6. Logic Voltage : 3.3V
*7. Backlight : White LEDs
*8. Backlight Supply : 40mA (Constant Current VF=16.0V, TYP)
*9. Touch Panel Type : Resistive Touch Panel
*10. Recommended Connector :
K1 : FH19SC-40S-0.5SH(HIROS) Or Equivalent
K2 : FH33-4S-1.0SH Or Equivalent
*11. Operating Temperature : -20°C~70°C
*12. Storage Temperature : -30°C~80°C
*13. Foam Gasket must be assemble outside RTP VA by 0.5mm

Rev	Note	Date
C		
B		
A		

Dwg Title: LMT043DEFFWA-NNA Outline Dwg

Dwg No.: MK-006753-1-1

Date: 2019-11-07

Scale: 3/2 | Tol.: ±0.3 | Unit: mm | Paper Size: A3

Approved | Checked | Drawn: Luo Lin

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