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

LMT050DNCFWU-NNA

LCD Module User Manual

Prepared by:	Checked by:	Approved by:
Lin Li		
Date: 2018-10-18	Date:	Date:

Rev.	Descriptions	Release Date
0.1	Preliminary New release	2013-11-18
0.2	Refine Section 3 Terminal Descriptions	2014-05-08
0.3	Typing correction	2016-4-5
0.4	Update section 1 and section 6	2018-10-18

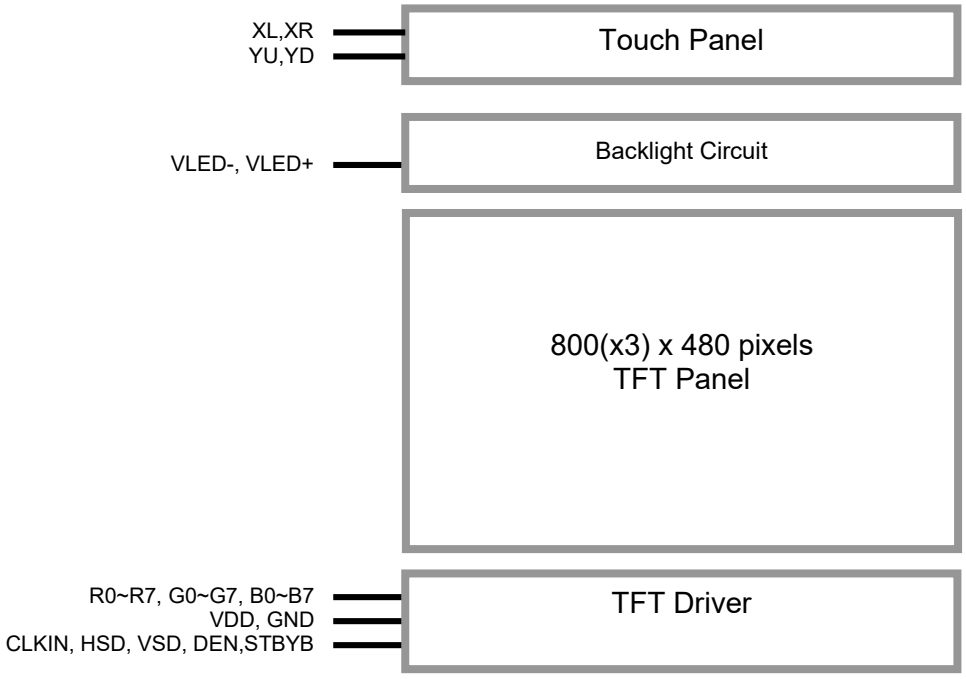
Table of Content

1. General Specification

Screen Size(Diagonal) :	5.0 inch
Resolution :	800 x 480
Signal Interface :	24bit parallel interface
Color Depth :	16.7M color (24bit)
Pixel Pitch :	0.135 x 0.135 (mm)
Pixel Configuration :	RGB Stripe
Display Mode :	Transmissive / normal white
Surface Treatment :	Anti-Glare Treatment
Viewing Direction :	6H (*1) (gray scale inverse) 12H (*2)
Outline Dimension :	120.7 x 75.8 x 4.1 (mm) (exclude FPC, see attached drawing for details)
Active Area :	108 x 64.8 (mm)
Backlight :	2x7 LEDs
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.

1.1 Block Diagram



2. Terminal Functions

2.1 Interface

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

Note:
Interface : HS, VS mode (default)

3. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V_{DD}	-0.3	+4.0	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.

4. Electrical Characteristics

4.1 DC Characteristics (MCU terminal)

GND=0V, V_{DD} =3.3V, T_{OP} =25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Operating Voltage	VDD	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
Output Signal Low Voltage	V_{oH}	-	-	GND+0.4	V	
Output Signal High Voltage	V_{IL}	VDD-0.4	-	-	V	
Operating Current (*1)	I_{DD}	-	TBD	-	mA	All black

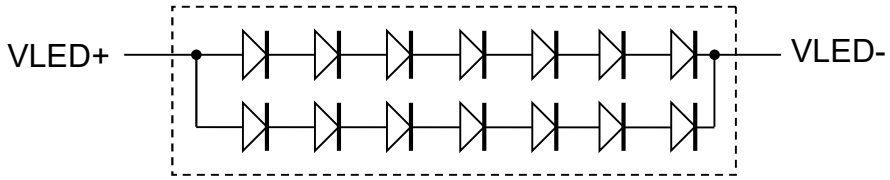
Note.
*1. For different LCM, the value may have a bit of difference.
*2. To test the current dissipation, use “all Black Pattern”.

4.2 LED Backlight Circuit Characteristics

If_{VLED+}=40mA, T_{OP}=25°C

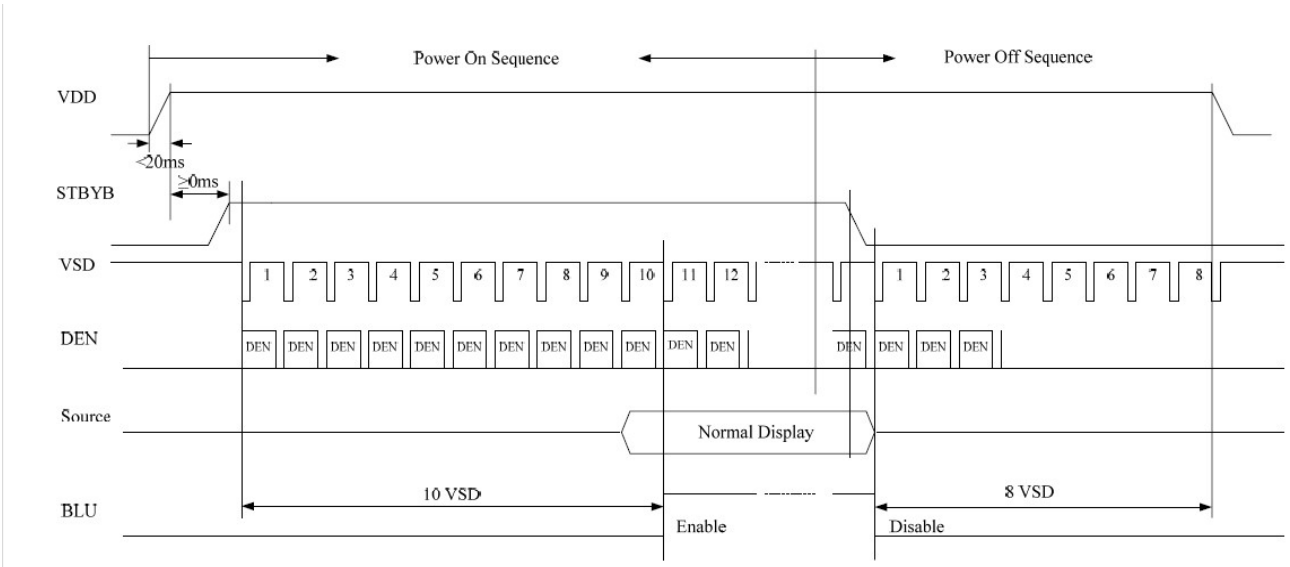
Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward Voltage	Vf	-	21.7	-	V	
Forward Current	If_{VLED+}	-	40	50	mA	
Life Time	-	10,000	(20,000)	-	hr	

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

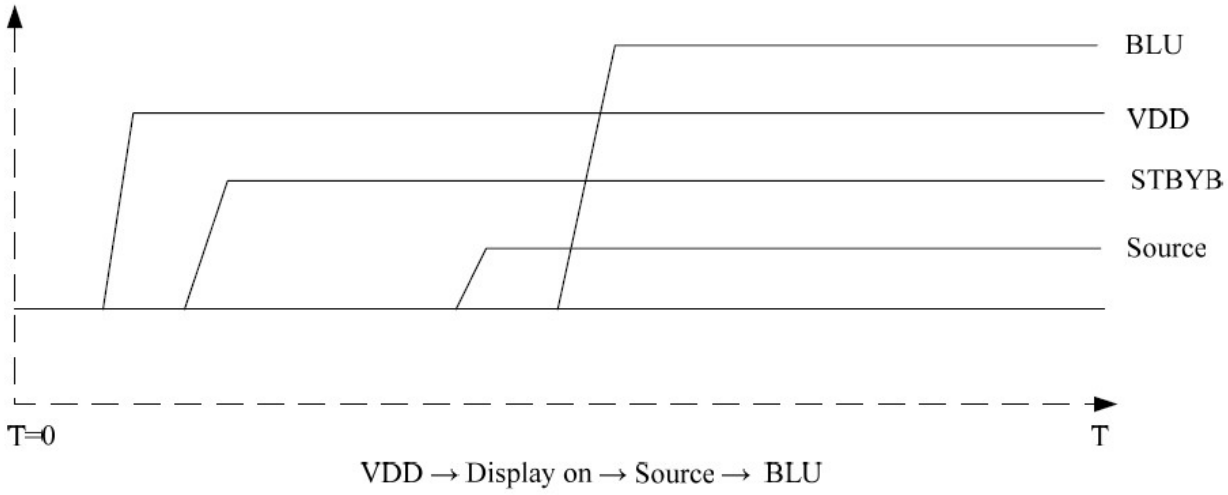


No. of LEDs = 2x7 pcs

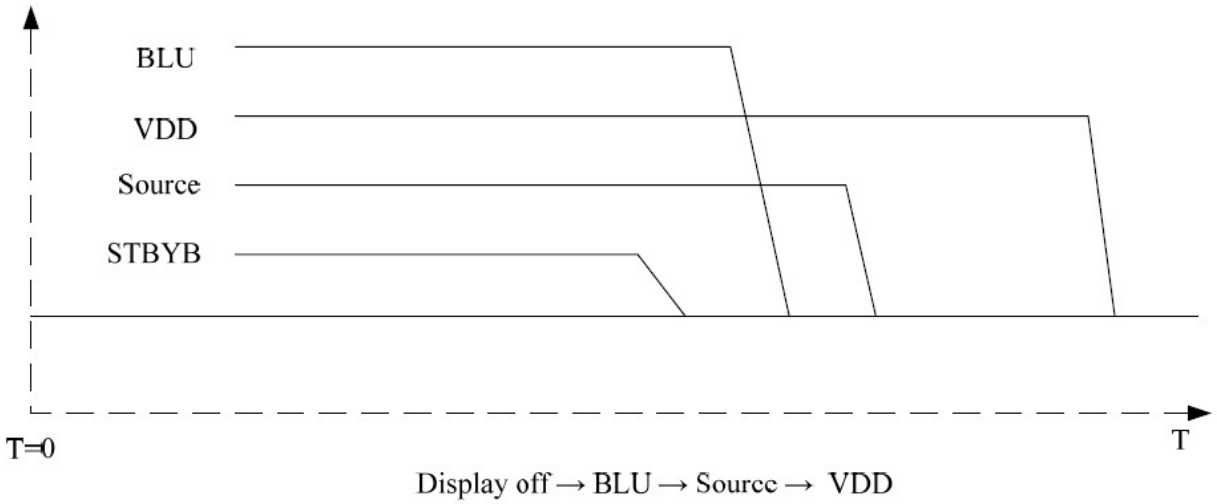
4.3 Power ON/OFF Sequence



Power On/Off Sequence



Power On Sequence



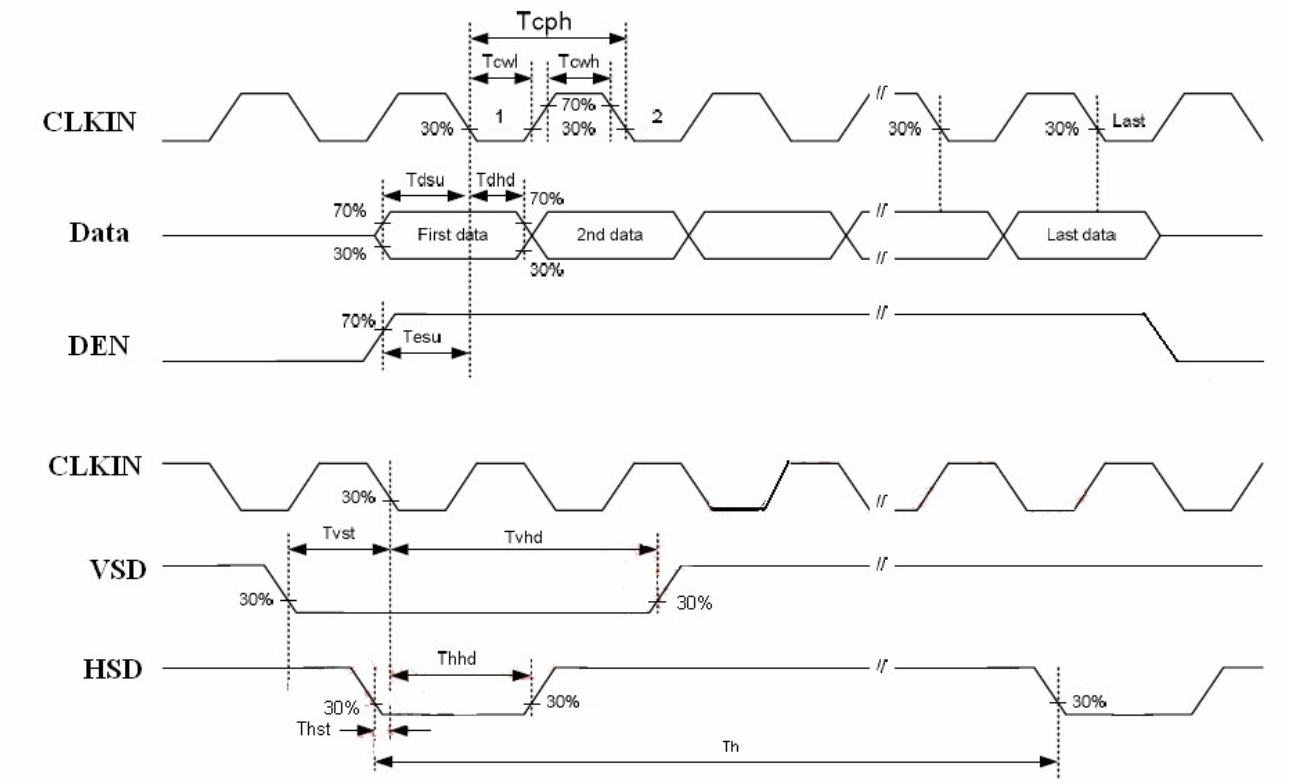
Power OFF Sequence

5. AC Characteristics

5.1 AC Timing

GND=0V, V_{DD} =3.3V, T_{OP} =25°C

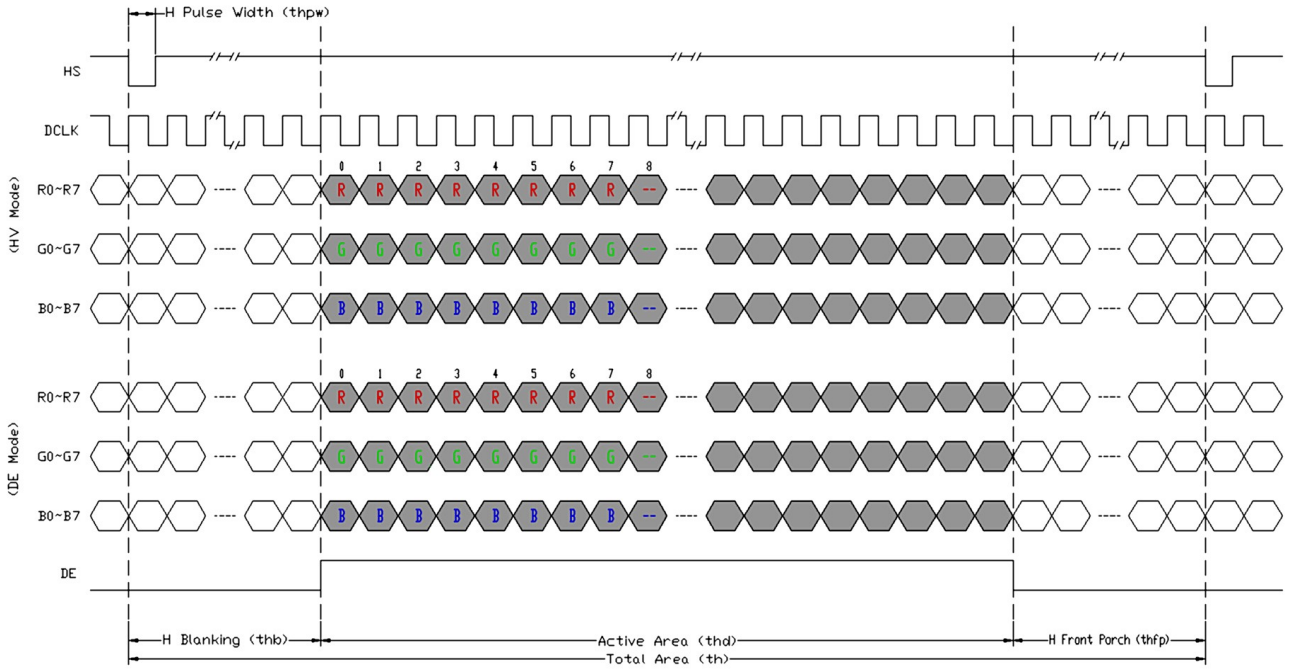
Item	Symbol	MIN.	TYP.	MAX.	Unit	Remark
HS setup time	Thst	8	-	-	ns	
HS hold time	Thhd	8	-	-	ns	
VS setup time	Tvst	8	-	-	ns	
VS hold time	Tvhd	8	-	-	ns	
Data setup time	Tdsu	8	-	-	ns	
Data hole time	Tdhd	8	-	-	ns	
DE setup time	Tesu	8	-	-	ns	
DVDD Power On Slew rate	Tpor	-	-	20	ms	
CLKIN cycle time	Tcph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



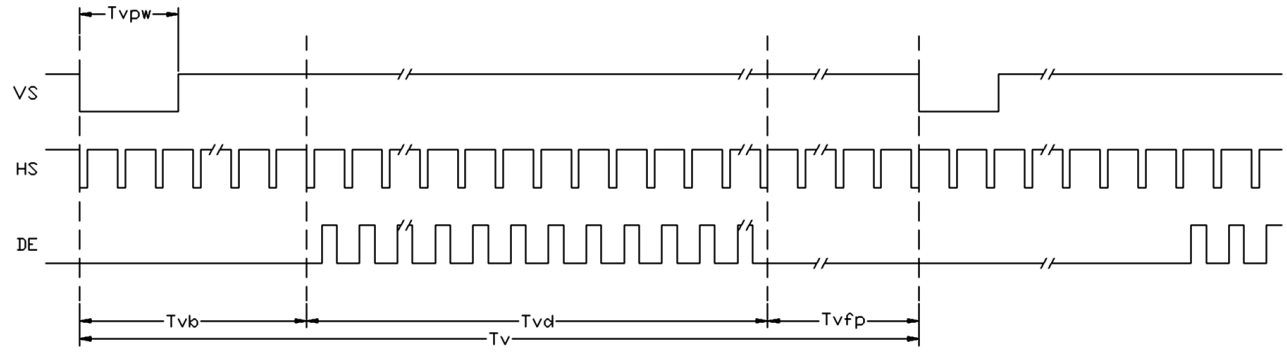
Input Clock and Data Timing Diagram

5.2 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

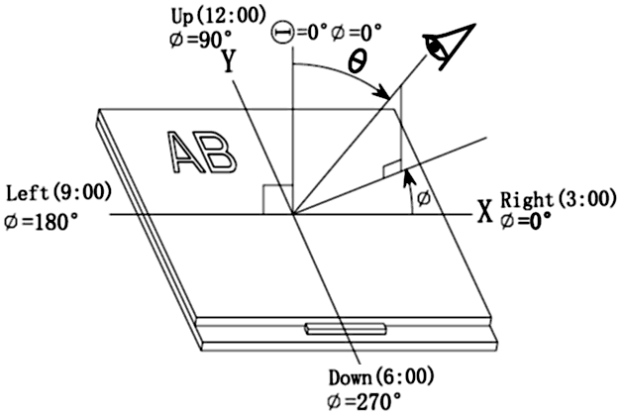
6. Optical Characteristics

Item		Symbol	Condition	MIN.	TYP.	MAX.	UNIT	Note.
Viewing angle		θ_T	(CR≥10)	40	50	-	degree	Note 2
		θ_B		60	70	-		
		θ_L		60	70	-		
		θ_R		60	70	-		
Contrast ratio		CR	θ=0°	500	600	-	-	Note 1,3
Response Time		T_{on}	25℃	-	20	30	msec	Note 1,4
		T_{off}					msec	
Chromaticlty	White	X	Backlight is on	0.260	0.310	0.360		Note 1,5
		Y		0.280	0.330	0.380		
	Red	X		0.540	0.590	0.640		
		Y		0.300	0.350	0.400		
	Green	X		0.298	0.348	0.398		
		Y		0.520	0.570	0.620		
	Blue	X		0.095	0.145	0.195		
		Y		0.060	0.110	0.160		
Luminance		L		-	200	-	cd/m^2	Note 1,6
NTSC				-	50		%	Note 5
Luminance uniformity		U		75	80	-	%	Note 1,7

Test Conditions:
1. IF= 40mA, VF=21.7V, and the ambient temperature is 25. ℃
2. The test systems refer to Note 1 and Note 2.

Note 1:
The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment SR-3A (1°)
Measuring condition:
- Measuring surroundings: Dark room
- Measuring temperature: Ta=25℃.
- Adjust operating voltage to get optimum contrast at the center of the display.

Note 2:
The definition of viewing angle:
Refer to the graph below marked by θ and Φ

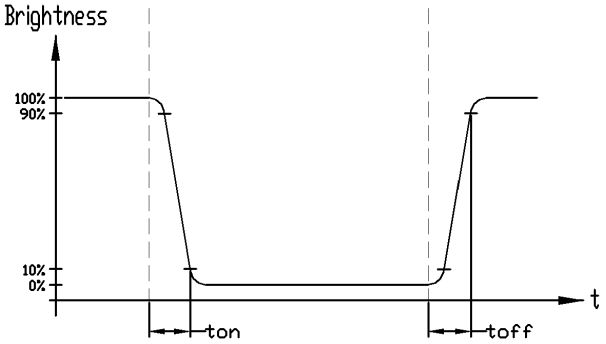


Note 3:
The definition of contrast ratio (Test LCM using SR-3A (1°)):

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

(Contrast Ratio is measured in optimum common electrode voltage)

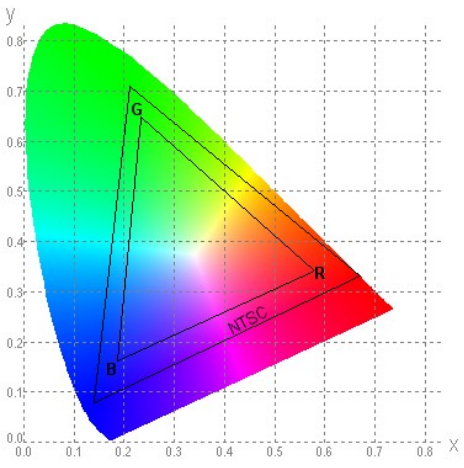
Note 4:
Definition of Response time. (Test LCD using BM-7A(2°)):
The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between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



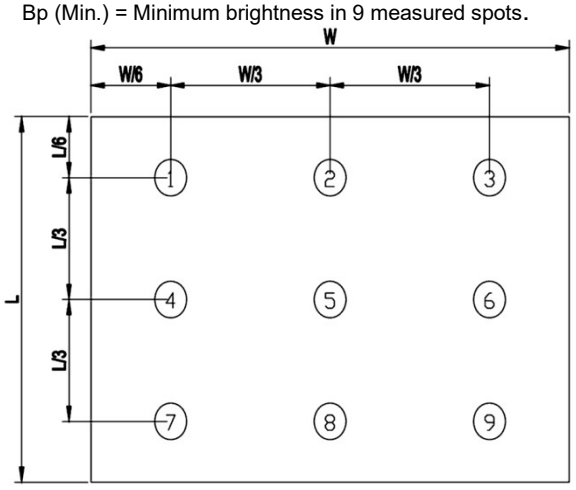
Note 5:
Definition of Color of CIE1931 Coordinate and NTSC Ratio.

Color gamut:

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



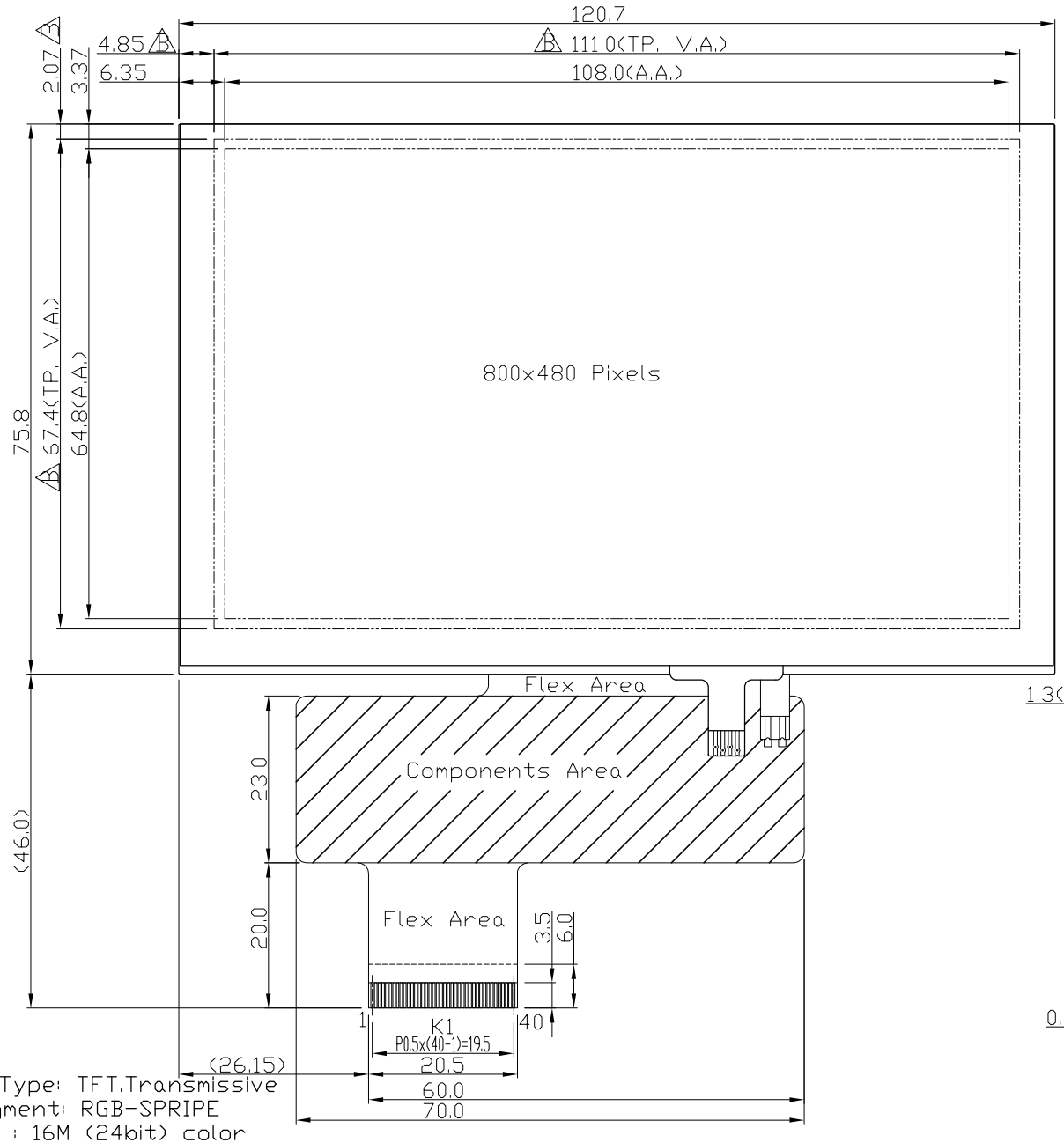
Note 6:
The luminance uniformity is calculated by using following formula.
△ Bp = Bp (Min.) / Bp (Max.)×100 (%)
Bp (Max.) = Maximum brightness in 9 measured spots
Bp (Min.) = Minimum brightness in 9 measured spots.

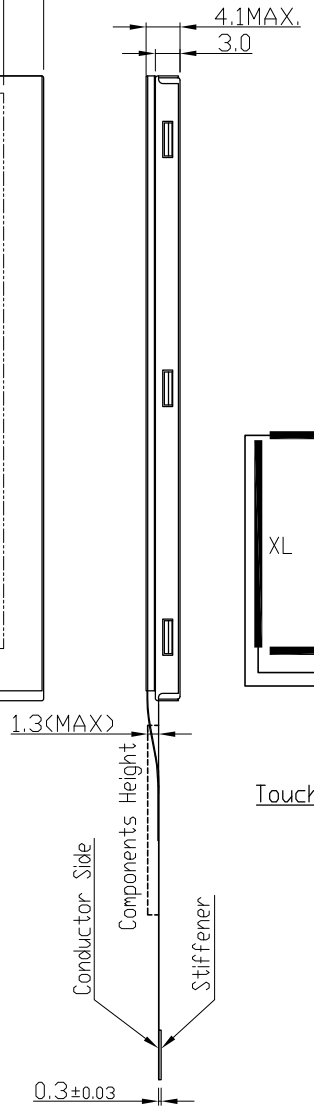


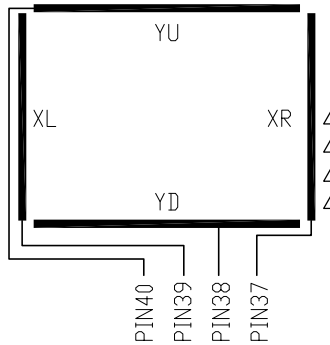
Note 7:
Measured the luminance of white state at center point

7. Precautions of using LCD Modules

Please refer to "LCD-Module-Design-Handling-Precaution.pdf".







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	CLKIN
31	STBYB
32	HSD
33	VSD
34	DEN
35	NC
36	GND
37	XR
38	YD
39	XL
40	YU

Note:
*1. LCD Display Type: TFT,Transmissive
*2. Pixel Arrangment: RGB-SPRIPE
*3. Color Depth : 16M (24bit) color
*4. Operating Voltage : 3.3V
*5. Backlight Supply : 40mA (21.7V TYP)
*6. Backlight : LEDs
*7. Touch Panel Type : Resistive Touch Panel
*8. Foam Gasket must be assemble outside TP VA by 0.5mm
*9. Operating Temperature : -20°C~70°C
*10. Storage Temperature : -30°C~80°C

Rev	Note	Date
C		
B	-Revise Outline	Jin liang 2015-09-09
A	-Revise K1 Terminal	Deng Junjie 2014-05-08

Dwg Title	LMT050DNCFWU-NNA Outline Dwg		
Dwg No.	MK-004637b-1-1		Date 2013-11-18
Scale 3/2	Tol. ±0.5	Unit mm	Paper Size A3
Approved	Checked	Drawn Deng Junjie	

TOPWAY