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

TOPWAY LMT050ENCFWU LCD Module User Manual

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LMT050ENCFWU

LCD Module User Manual

Prepared by: **Gonghuimei** Date: 2021-07-26	Checked by: Date:	Approved by: Date:

Rev.	Descriptions	Release Date
0.1	Preliminary release	2021-07-26

Contents

General Specification

Screen Size(Diagonal) :	5.0” Active Area : 108.0 x 64.8 (mm)
Number of dots :	800 (RGB) x 480
Pixel Pitch :	0.135x 0.135 (mm)
Color Depth :	16.7M colors
Display Technology :	a-Si TFT active matrix
Display Mode :	Normal White, Transmissive
Display Interface :	RGB
Viewing Direction :	6 o’clock(Gray scale Inversion) (*1) 12 o’clock (*2)
Surface Treatment :	Anti-Glare Treatment
Operating Temperature :	-30 ~ +85°C
Storage Temperature :	-40 ~ +90°C

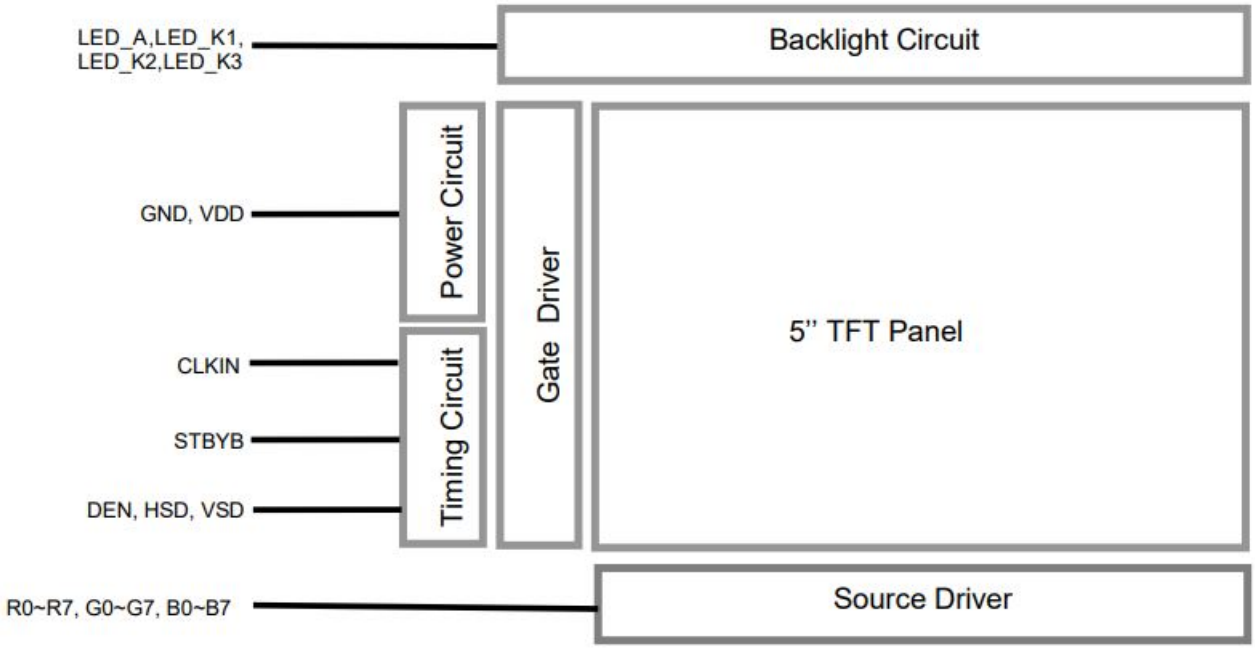
Note:

*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

Block Diagram



Input/ Output Terminals

Pin No.	Pin Name	I/O	Descriptions
1	NC	–	No connection
2	NC	–	No connection
3	GND	P	Ground
4	VDD	P	Power supply
5	R0	I	Data input
:	:		
12	R7		
13	G0		

:	:	I	Data input
20	G7		
21	B0	I	Data input
:	:		
28	B7		
29	GND	P	Ground
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 .
32	HSD	I	Horizontal sync input.
33	VSD	I	Vertical sync input
34	DEN	I	Data input enable(unnecessary)
35	NC	–	No connection
36	GND	P	Ground
37	LED_A	I	LED Anode(+)
38	LED_K1	I	LED Cathod (-)
39	LED_K2	I	LED Cathod (-)
40	LED_K3	I	LED Cathod (-)

Note:

* 1: Please add the FPC connector type and matched one if necessary.

* 2: I——Input, O——Output, P——Power/Ground

Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Remark
Power voltage	VDD	-0.5	4.5	V	Note1
Input voltage	VIN	-0.5	0.5	V	
Operating Temperature	TOP	-30	85	C°	
Storage Temperature	TST	-40	90	C°	
Relative Humidity Note2	RH	—	≤95	%	Ta≤40°C
		—	≤85	%	40°C Ta≤50°C
		—	≤55	%	50°C Ta≤60°C
		—	≤36	%	60°C Ta≤70°C
		—	≤24	%	70°C Ta≤80°C
Absolute Humidity	AH	—	≤70	g/m^3	Ta 70°C

Note:

*1. This rating applies to all parts of the module. And should not be exceeded.

*2. Input voltage include R0~R5, G0~G5, B0~B5, User should set input voltage on recommend value.

*3. Ta means the ambient temperature. It is necessary to limit the relative humidity to Condensation on the module is not allowed.

*4. Ambient temperature when the backlight is lit (reference value)

*5. 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.

Electrical Characteristics

DC Characteristics

Items		Symbol	Min.	Typ.	Max.	Unit	Remark
Power voltage		VDD	3.0	3.3	3.6	V	
Input signal voltage	Low Level	VIL	0	—	0.3xVDD	V	
	High Level	VIH	0.7xVDD	—	VDD		
Input signal voltage	Low Level	VOL	—	—	GND+0.4	V	
	High Level	VOH	VDD-0.4	—	—	V	
Operating Current (*1)	IDD	—	TBD	—	mA	All black	

Note:

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

LED Backlight Circuit Characteristics

Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward Voltage	VF	—	9.3	9.9	V	
Forward Current	IF	—	175	—	mA	Note1
Backlight Power Consumption	W8L	—	1628	—	mW	
Life Time	—	5000	—	—	Hrs	Note3

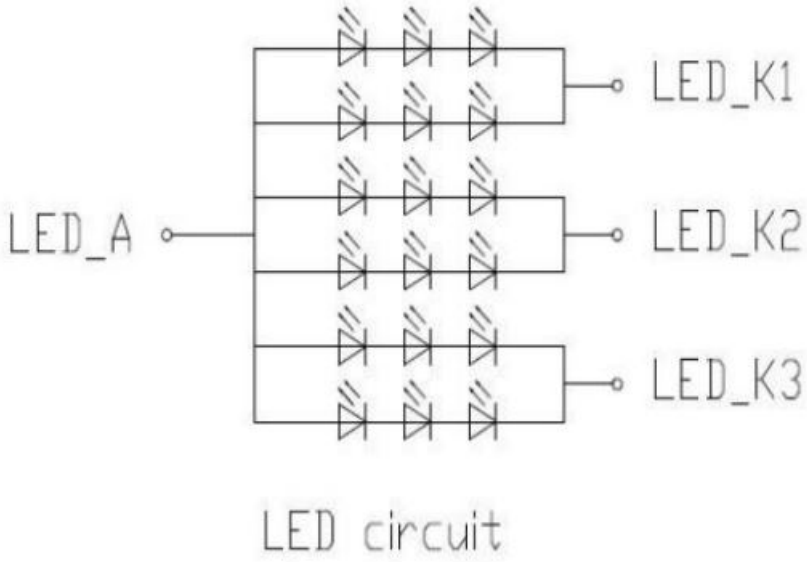
Note:

*1. The LED driving condition is defined for each LED module (3 LED Serial, 6 LED Parallel), and which depend on Forward Current setting.

*2. Under LCM operating, a constant forward current should be used. And forward voltage is for reference only.

*3. IF is defined for one channel LED. Optical performance should be evaluated at Ta=25°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% initial brightness. Typical operating life time is estimated data.

*4. The LED driving condition is defined for each LED module

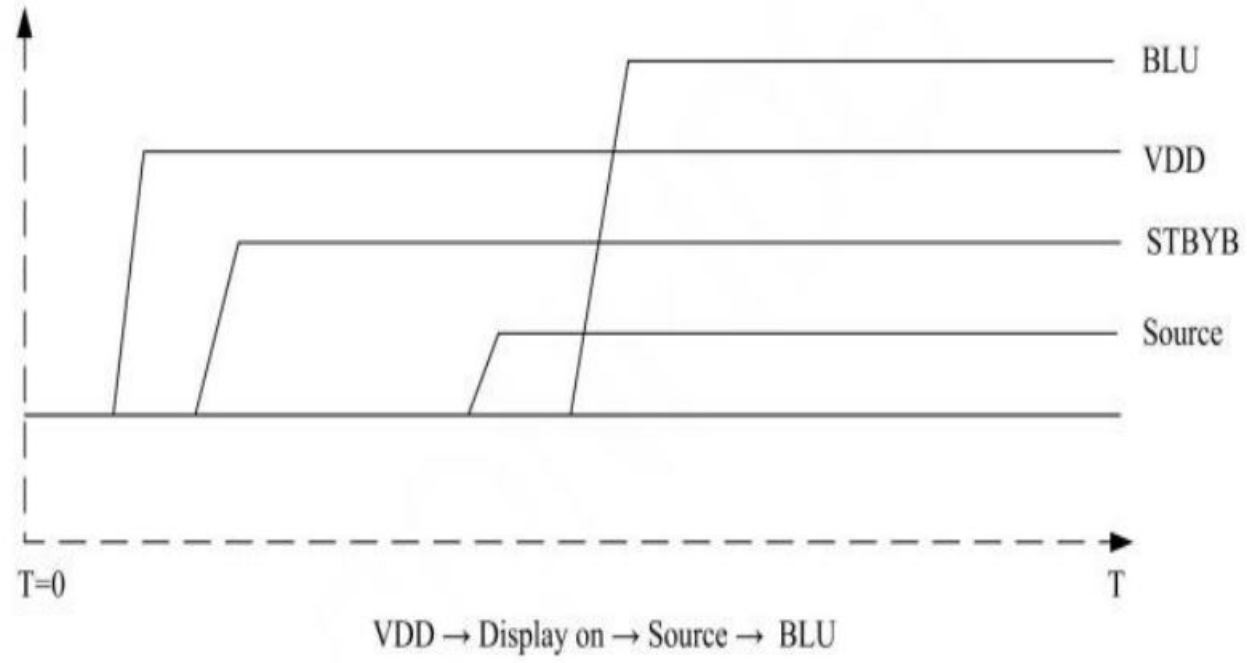


LED circuit

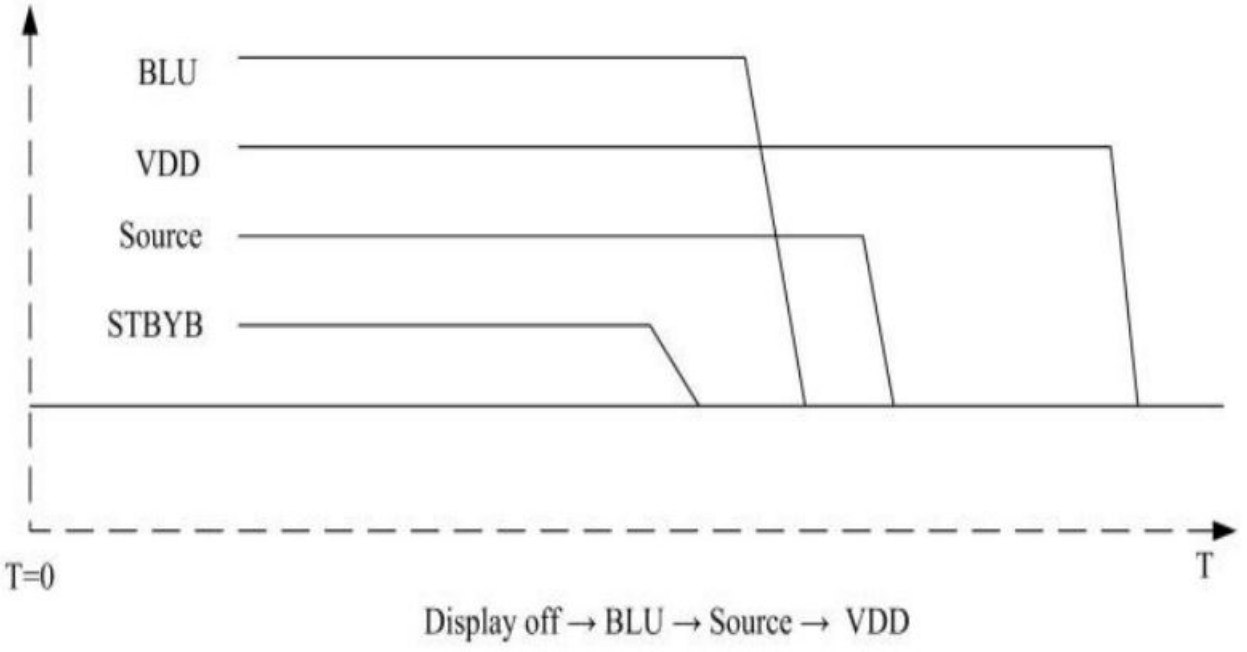
No. of LED = 6x3=18 pcs

—

Power ON/OFF Sequence



Power On Sequence



Power Off Sequence

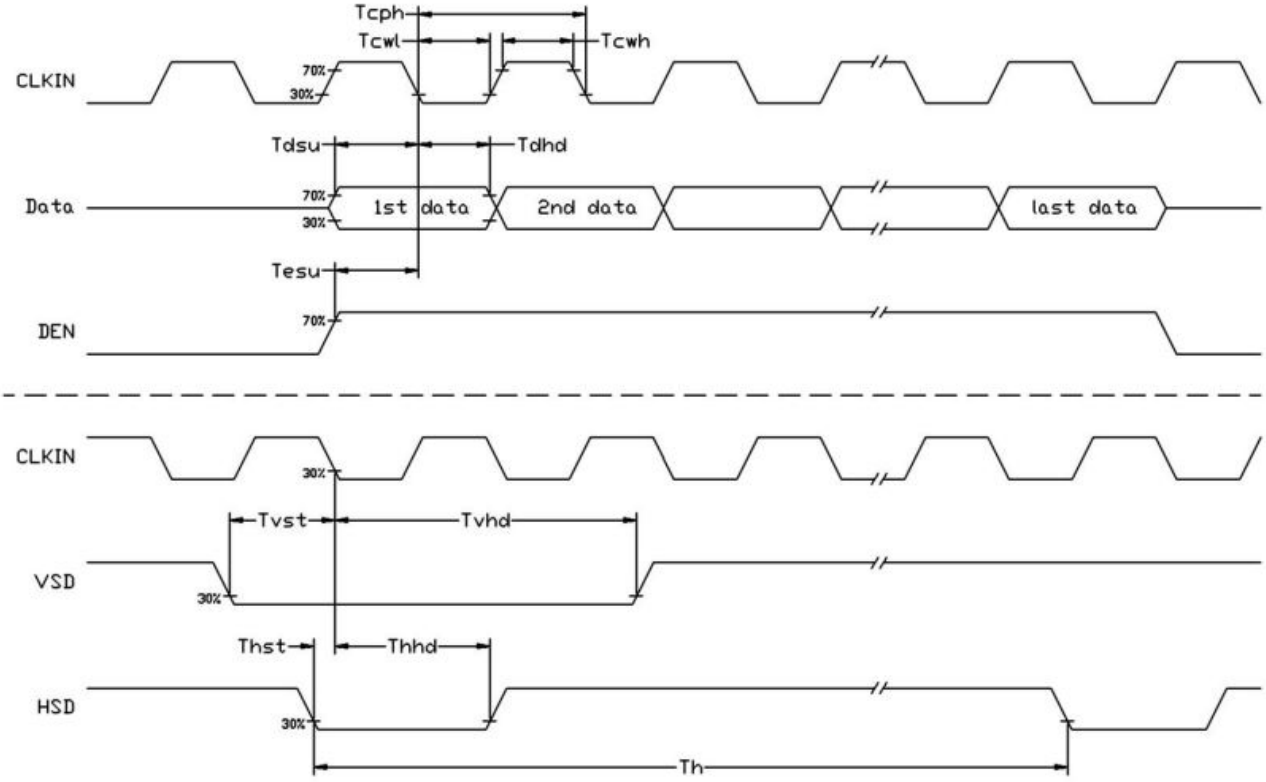
AC Characteristics

Timing Characteristics

Items	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 hold time	Tdhd	8	—	—	ns	
DE setup time	Tesu	8	—	—	ns	
DE hold time	Tehd	8	—	—	ns	
CLKIN cycle time	Tcph	20	—	—	ns	
CLKIN pulse width	Tcwh	40	50	60	ns	
VDD Power On Slew rate	TPOR	—	—	20	ns	

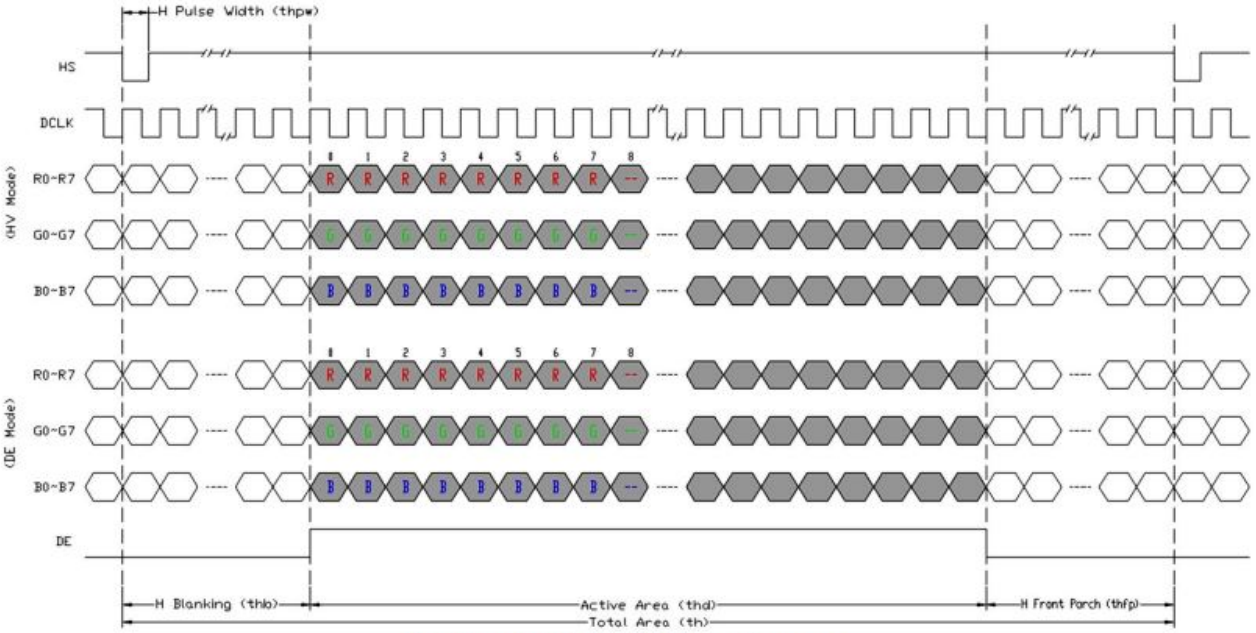
—

Input Clock and Data Timing Diagram

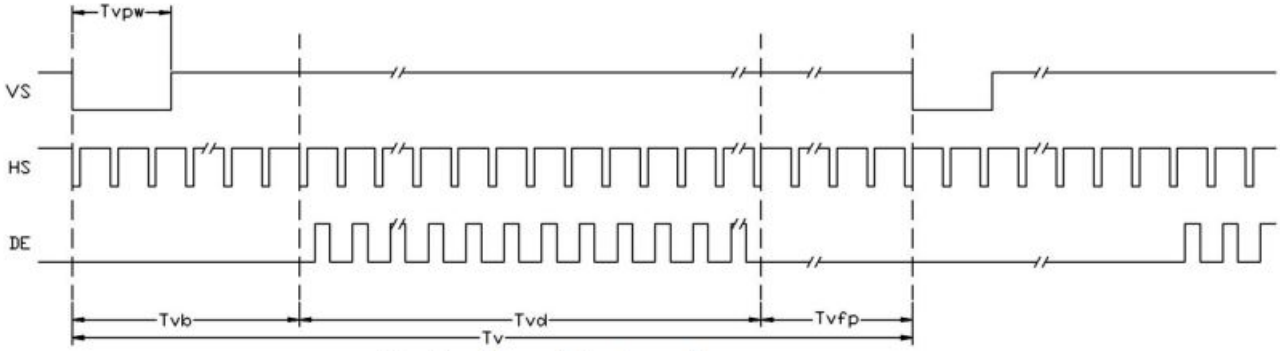


Data Input Format

Items	Symbol	MIN.	TYP.	MAX.	Unit
Horizontal Display Area	thd		800		CLKIN
CLKIN Frequency	fclk	—	30	50	MHz
One Horizontal Line	th	889	928	1143	CLKIN
HSD pulse width	hpw	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

Optical Characteristics

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Note.
Viewing angle	Θt	(CR≥10)	40	50	—	degree	Note 2,3
	θB		60	70	—		
	ΘL		60	70	—		
	ΘB		60	70	—		
Contrast ratio	CR	θ=0	500	600	—		Note3

Response Time		Ton	25℃	—	20	30	ms	Note4
		Toff						
Chromaticity	White	X	Backlight is on	0.268	0.318	0.368		Note1,5
		Y		0.302	0.352	0.402		
	Red	X		0.547	0.597	0.647		Note1,5
		Y		0.298	0.348	0.398		
	Green	X		0.279	0.329	0.379		Note1,5
		Y		0.553	0.603	0.653		
	Blue	X		0.101	0.151	0.201		Note1,5
		Y		0.065	0.115	0.165		
Uniformity		U		75	80	—	%	Note6
NTSC				45	50		%	Note5
Luminance		L		800	1000	—	cd/m2	Note7

Test Conditions:

1. IF= 175mA, VF=9.3V, and the ambient temperature is 25. ℃
2. The test systems refer to Note 1 and Note 2.

Note

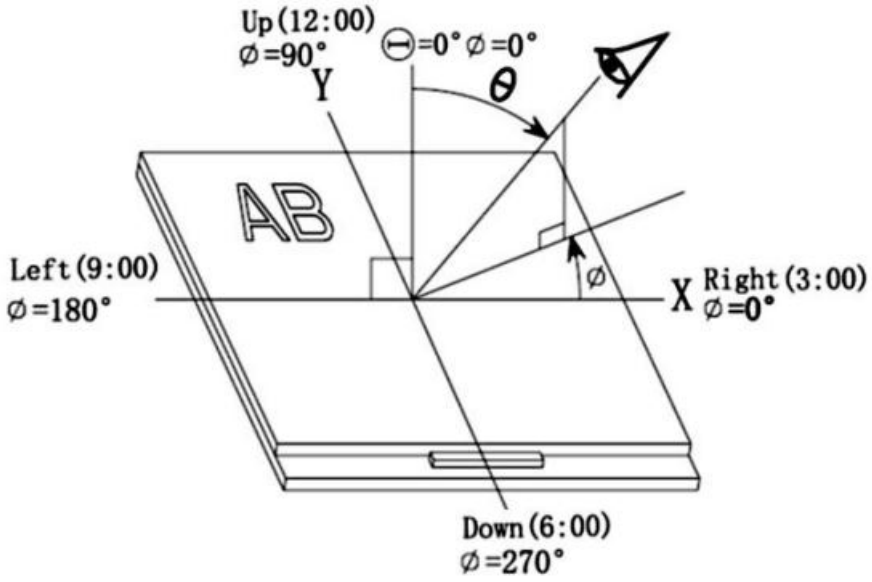
1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment SR-3A (1°)

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

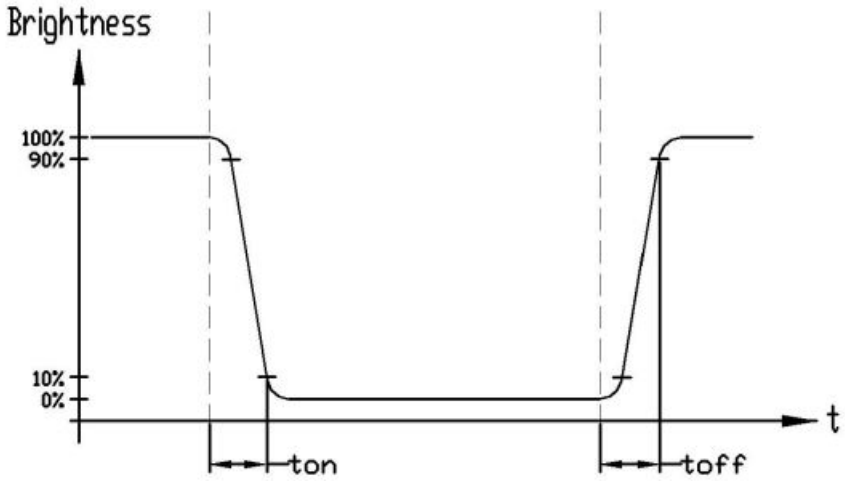


Note 3: The definition of contrast ratio (Test LCM using SR-3A (1°)):

Contrast Ratio(CR) = Luminance When LCD is at “White” state / 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



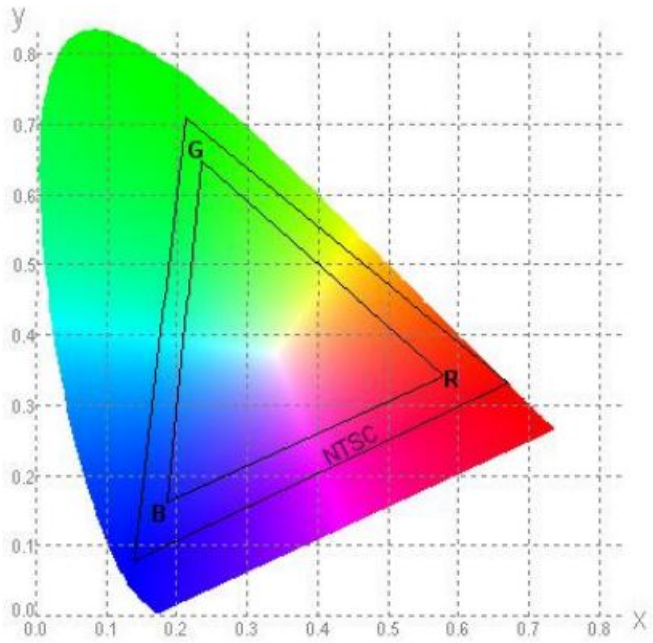
Note 5: Definition of Color of CIE1931 Coordinate and NTSC Ratio.

Color gamut:

S= Area of RGB triangle / Area of NTSC triangle X 100%

Color gamut:

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

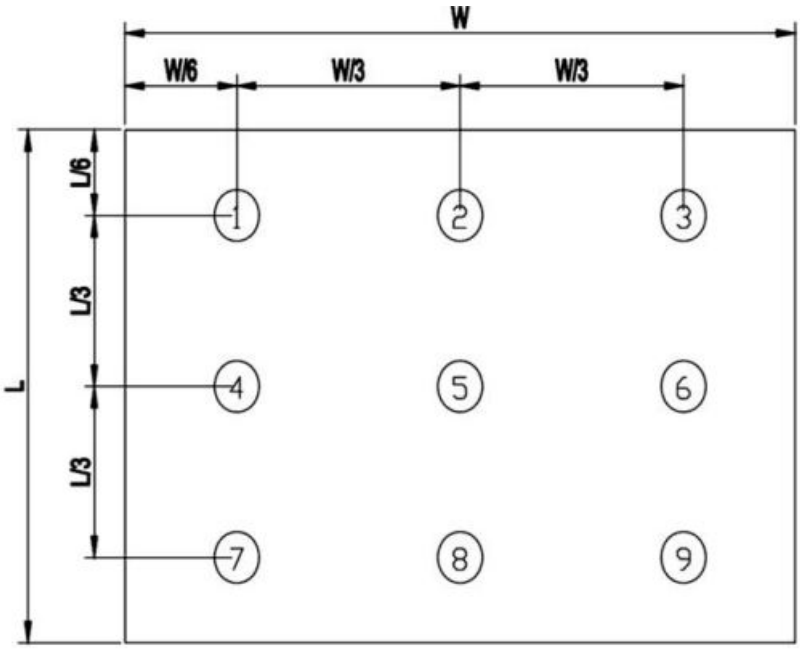


Note 6: The luminance uniformity is calculated by using following formula.

△Bp = Bp (Min.) / Bp (Max.)×100 (%)

Bp (Max.) = Maximum brightness in 9 measured spots

Bp (Min.) = Minimum brightness in 9 measured spots.



LCD Module Design and Handling Precautions

- 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 come 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.

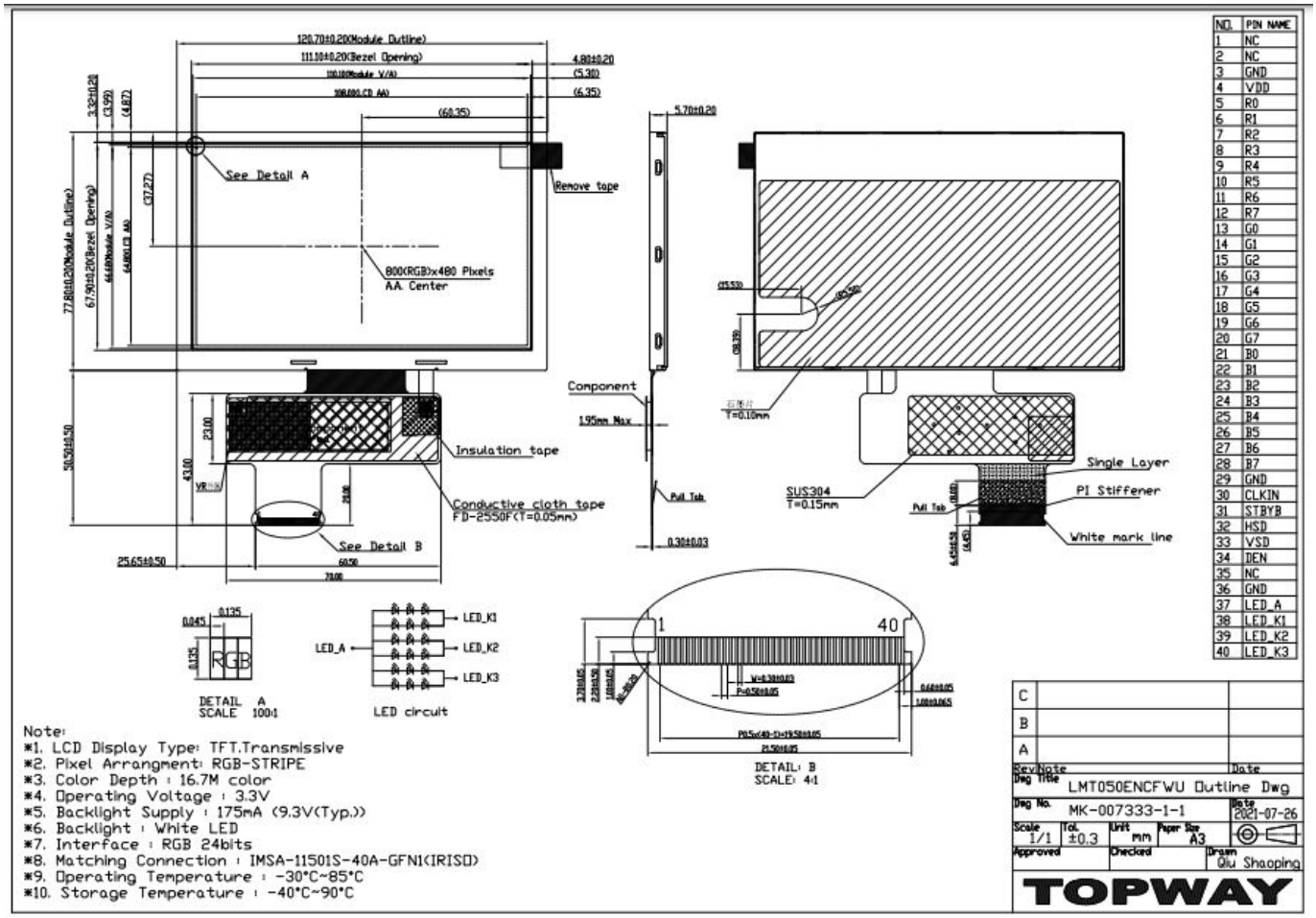
- LCD module can be easily damaged by static electricity. Please maintain an optimum anti-static working environment to protect the LCD module. (eg. ground the soldering irons properly)
- Be sure to ground the body when handling LCD module.
- Only hold LCD module by its sides. Never hold LCD module by 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.
- 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
- 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.

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.

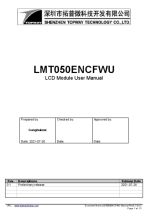
- We cannot accept responsibility for any defect, which may arise form additional manufacturing of the product (including disassembly and reassembly), after product delivery.
- We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
- 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.



NO.	PIN NAME
1	NC
2	NC
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	CLKIN
31	STBYB
32	HSD
33	VSD
34	DEN
35	NC
36	GND
37	LED_A
38	LED_K1
39	LED_K2
40	LED_K3

Documents / Resources

	TOPWAY LMT050ENCFWU LCD Module [pdf] User Manual LMT050ENCFWU Top Way LCD Module, LMT050ENCFWU, Top Way LCD Module, Way LCD Module, LCD Module

References

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