深圳市拓普微科技开发有限公司
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LMT070DNMFWU

LCD Module User Manual

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Date: 2016-06-03	Date:	Date:

Rev.	Descriptions	Release Date
0.1	Preliminary	2016-06-03

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1. General Specification

Signal Interface :	LVDS 24bit(VESA) or 18bit
Display Mode :	Transmissive with Normally White
Screen Size :	7.0 inch
Outline Dimension :	165.75 x 105.39 x 3.40(mm) (see outline drawing for details)
Active Area :	153.6x 90.0(mm)
Number of dots :	1024 x 3 (RGB) x 600
Pixel Pitch :	0.15x 0.15(mm)
Pixel Configuration :	R.G.B. Vertical Stripe
Backlight :	White LED
Viewing Direction :	12H (*1) 6H(Gray scale Inversion)(*2)
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C

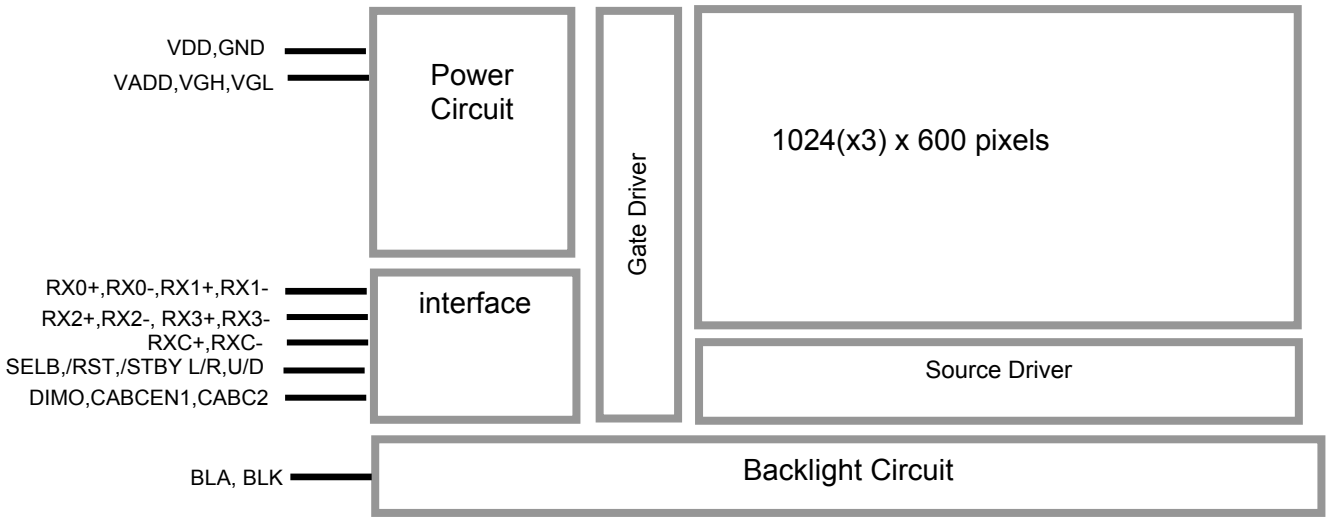
Note:

**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 Function

3.1 K1 Terminal (Matched connector:FH12A-40S-0.5SH)

K1 Pin No.	Pin Name	I/O	Descriptions	
			24bit LVDS	18bit LVDS
1	NC	-	No connection	
2,3	VDD	Power	Power Voltage for digital circuit	
4	NC	-	No connection	
5	/RST	Input	Global reset pin, (Active Low to enter Reset State)	
6	/STBY	Input	Standby mode, Normally pulled high(*1)	
7	GND	Power	Ground	
8	RX0-	Input	LVDS receiver negative signal channel 0	
9	RX0+	Input	LVDS receiver positive signal channel 0	
10	GND	Power	Ground	
11	RX1-	Input	LVDS receiver negative signal channel 1	
12	RX1+	Input	LVDS receiver positive signal channel 1	
13	GND	Power	Ground	
14	RX2-	Input	LVDS receiver negative signal channel 2	
15	RX2+	Input	LVDS receiver positive signal channel 2	
16	GND	Power	Ground	
17	RXC-	Input	LVDS receiver negative signal channel clock	
18	RXC+	Input	LVDS receiver positive signal channel clock	
19	GND	Power	Ground	
20	RX3-	Input	LVDS receiver negative signal channel 3	NC
21	RX3+	Input	LVDS receiver positive signal channel 3	NC
22	GND	Power	Ground	
23,24	NC	-	No connection	
25	GND	Power	Ground	
26:	NC	-	No connection	
27	DIMO	output	Backlight CABC controller signal output	
28	SELB	Input	High	Low
29	AVDD	Power	Power for Analog Circuit	
30	GND	Power	Ground	
31,32	BLK	Power	LED Cathode	
33	L/R	Input	Horizontal inversion(*3)	
34	U/D	Input	Vertical inversion(*3)	
35	VGL	Power	Gate OFF Voltage	
36	CABCEN1	Input	CABC H/W enable(*4)	
37	CABCEN2	Input		
38	VGH	Power	Gate ON Voltage	
39,40	BLA	Power	LED Anode	

Note:

** 1:/STBY="1" Normall operation.*
/STBY="0" Timing controller, source driver will turn off, all output are High-Z.

** 2:If LVDS input data is 18 bits ,/SEL must be set to High;*
If LVDS input data is 24 bits ,/SEL must be set to Low .

**3: U/D R/L Function Description*

U/D	L/R	Scanning Direction
L	L	Up to Down, Right to Left
L	H	Up to Down , Left to Right （normal）
H	L	Down to Up, Right to Left
H	H	Down to Up, Left to Right

**4: When CABC off, don ' t connect DIMO,else connect it bo backlight*

CABCEN1	CABCEN2	function
L	L	CABC OFF
L	H	user interface image
H	L	still picture
H	H	moving image

4. Absolute Maximum Ratings

AGND= GND=0V, Ta = 25℃

Items	Symbol	Min.	Max.	Unit	Condition
Power voltage	VDD	-0.3	5.0	V	
	AVDD	6.5	13.5	V	
	VGH	-0.3	20.0	V	
	VGL	-20.0	0.3	V	
Backlight Forward Current	I_{LED}	-	25	mA	For each LED
Operating Temperature	T_{OP}	-20	70	°C	
Storage Temperature	T_{ST}	-30	80	°C	
Relative Humidity Note2	RH		≤95	%	Ta≤40℃
	-	-	≤85	%	40℃＜Ta≤50℃
	-	-	≤55	%	50℃＜Ta≤60℃
	-	-	≤36	%	60℃＜Ta≤70℃
	-	-	≤24	%	70℃＜Ta≤80℃
Absolute Humidity	AH		≤70	g/m³	70℃＜Ta≤80℃

Note1: Input voltage include VDD,OVCC,SDA,CS,FMARK,LSAO,LASK,RST
Note2: Ta means the ambient temperature.
It is necessary to limit the relative humidity to the specified temperature range.
Condensation on the module is not allowed

5. Electrical Characteristics

5.1 DC Characteristics

VDD=3.3, AVDD=11V, AGND= GND=0V, Ta = 25℃

Items	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply Voltage	VDD	3.0	3.3	3.6	V	
Analog Supply Voltage	AVDD	10.7	11.0	11.3	V	
Gate On Voltage	VGH	15.7	16.0	16.3	V	
Gate Off Voltage	VGL	-7.1	-6.8	-6.5	V	
Digital Supply Current	I_{VDD}	-	16	24	mA	VDD=3.3 V
Analog Supply Current	I_{AVDD}	-	30	45	mA	AVDD=11.0 V
Gate On Current	I_{VGH}	-	0.3	1	mA	VGH=16.0 V
Gate Off Current	I_{VGL}	-	0.3	1	mA	VGL=-6.8 V
Power Consumption	Panel&Gamma	-	388	600	mW	
	Backlight	-	1.188		w	
	Total	-	1.573		w	

Note: The value is for design stage only

5.2 LED Backlight Circuit Characteristics

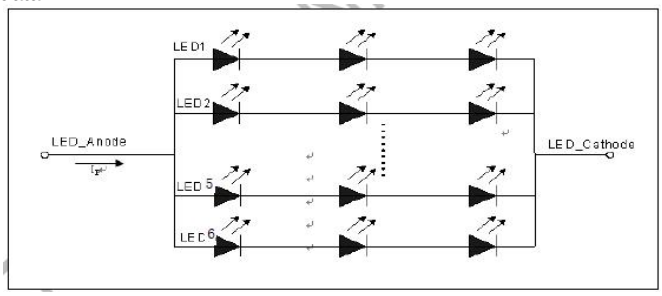
T_a=25°C

Items	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward Current	IF	-	120	-	mA	18 LEDs (3 LED Serial, 6 LED Parallel)
Forward Voltage	VF	-	9.3	-	V	
Operating Life Time	-	15,000	20,000		Hrs	

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 6 LED Parallel).For each LED: IF (1/6) =20mA, VF (1/3) =3.3V.

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: IF is defined for one channel LED. Optical performance should be evaluated at Ta=25℃ 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.



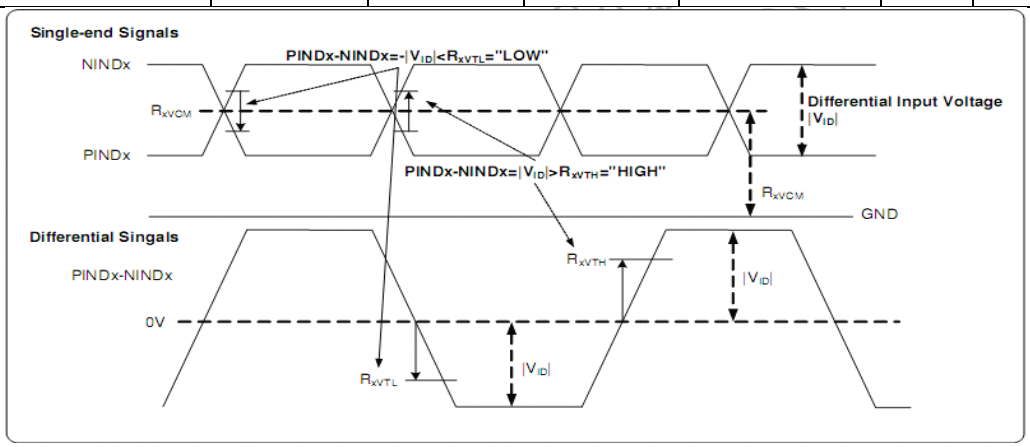
Note4: The LED driving condition is defined for each LED module.

6. LVDS Signal Characteristics

6.1 LVDS DC Characteristics

VDD=3.3V, AVDD=11V, AGND=GND=0V, Ta=25℃

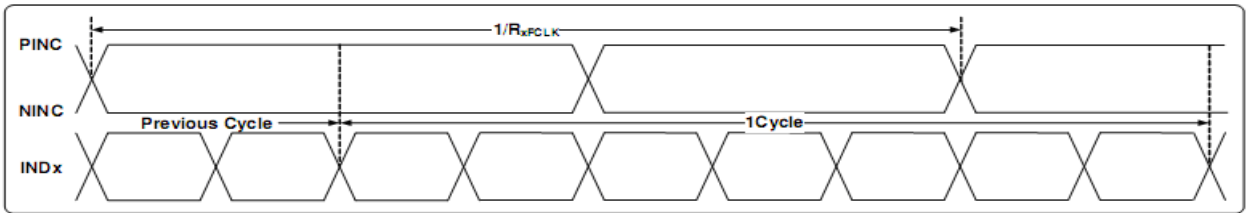
Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Differential input high Threshold voltage	RXVTH	-	-	+0.1	V	
Differential input Low Threshold voltage	RXVTL	-0.1	-	-	V	
Input voltage range	RXVIN	0	-	VDD-1.2+ |VID |/2	V	
Differential input Common Mode voltage	RXVCM	|VID |/2	-	VDD-1.2	V	
Differential input voltage	|VID |	0.2	v	0.6	V	
Differential input leakage Current	RVXliz	-10	v	+10	Ua	
Differential input leakage Current	Iddlvds	-	（15）	（30）	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	Istlvds	-	（15）	（50）	uA	Clock & all functions are stopped

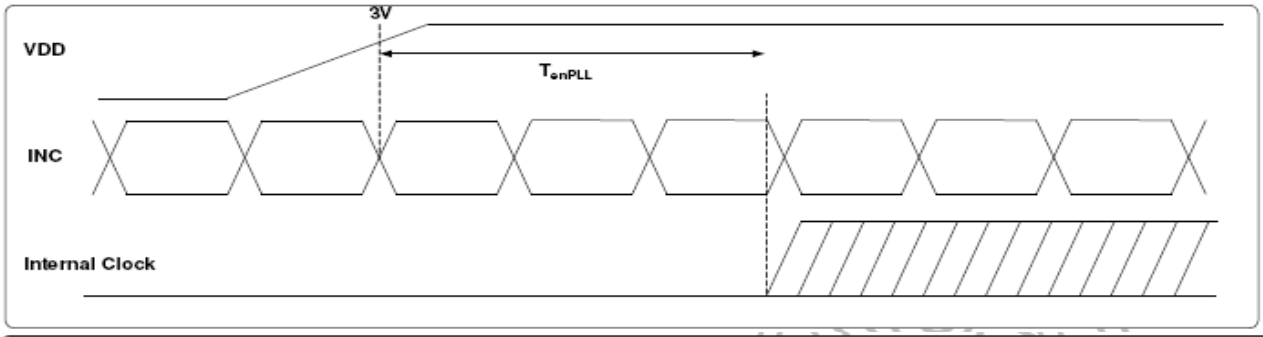


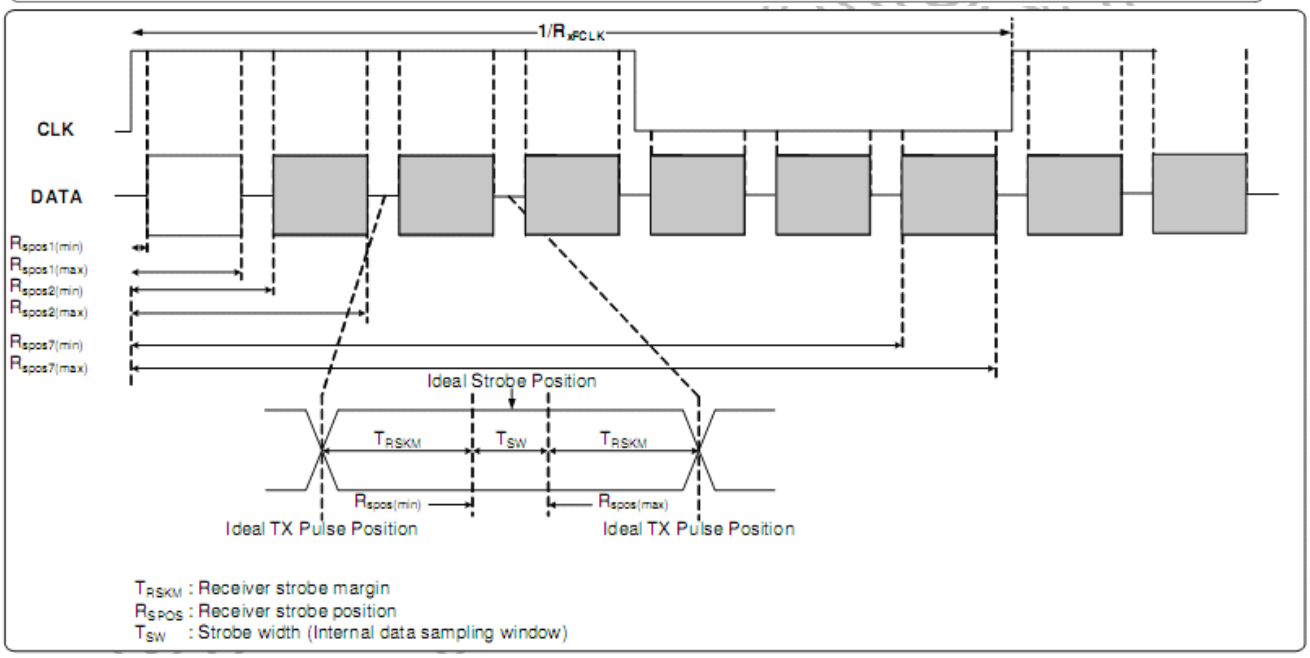
6.2 LVDS AC Characteristics

VDD=3.3V, AVDD=11V, AGND=GND=0V, Ta=25℃

Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Clock Frequency	RxFCLK	40.8	51.2	71	MHZ	
Input data skew margin	TRSKM	500	-	-	Ps	
Input data skew margin	TLVCH	-	4/(7*RxFCLK)	-	ns	
Clock low time	TLVCL	-	3/(7*RxFCLK)	-	ns	
PLL wake-up time	TenPLL	-	-	150	ns	



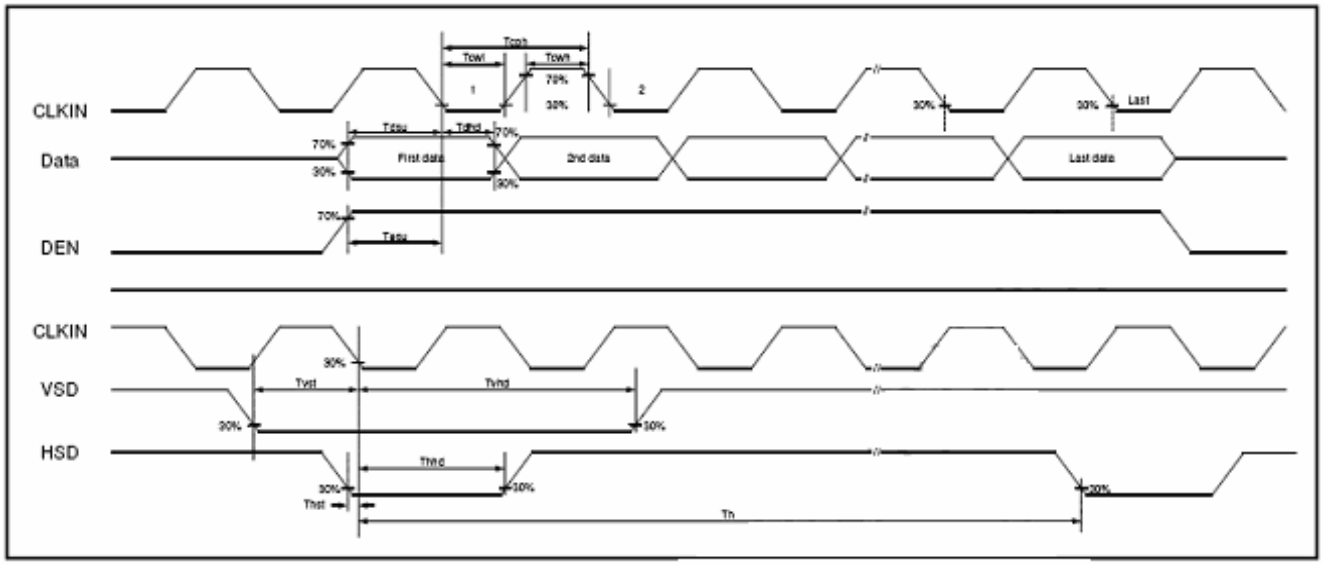




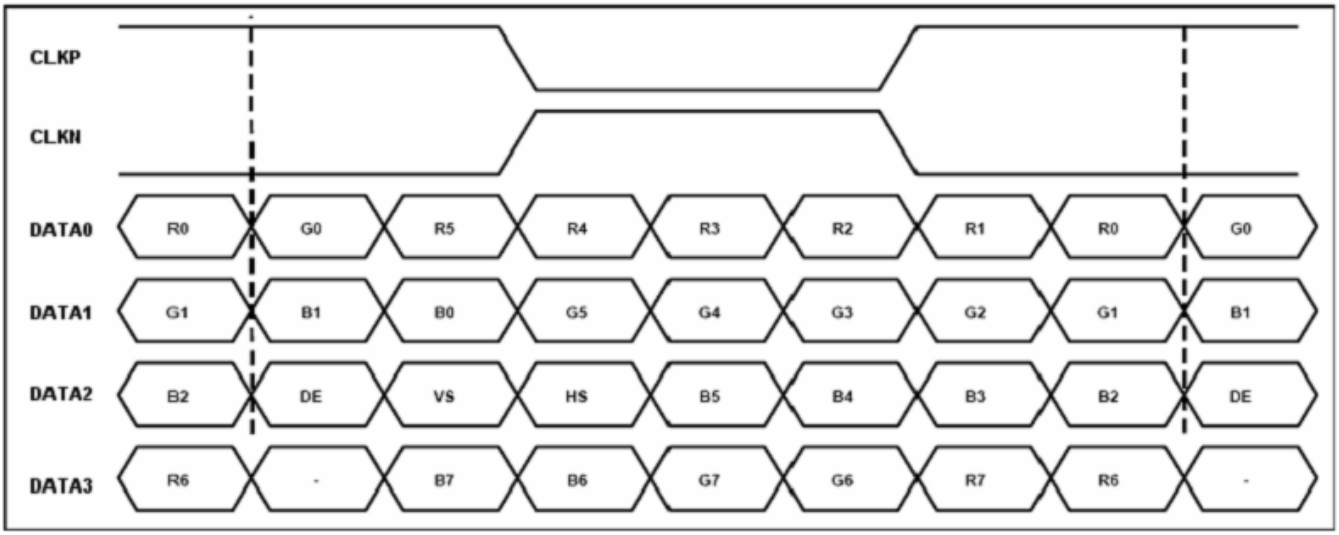
6.3 Timing

Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Clock Frequency	fclk	40.8	51.2	51.2	MHZ	Frame rate=60Hz
Horizontal display area	thd		1024		DCLK	
HS period time	th	1114	1344	1400	DCLK	
HS Blanking	thbp+thfp	90	320	376	DCLK	
Vertical display area	tvd		600		H	
VS period time	tv	610	635	800	H	
VS Blanking	tvbp+tvfp	10	35	200	H	

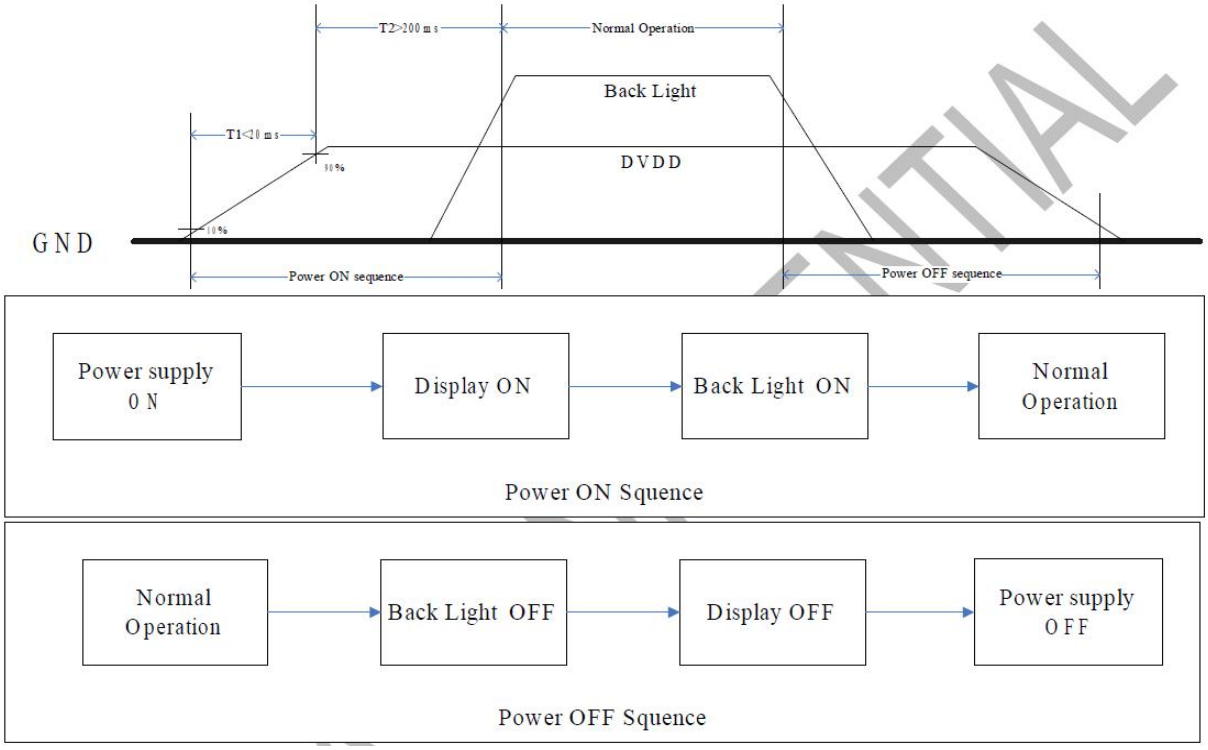
Input Clock and Data Timing Diagram



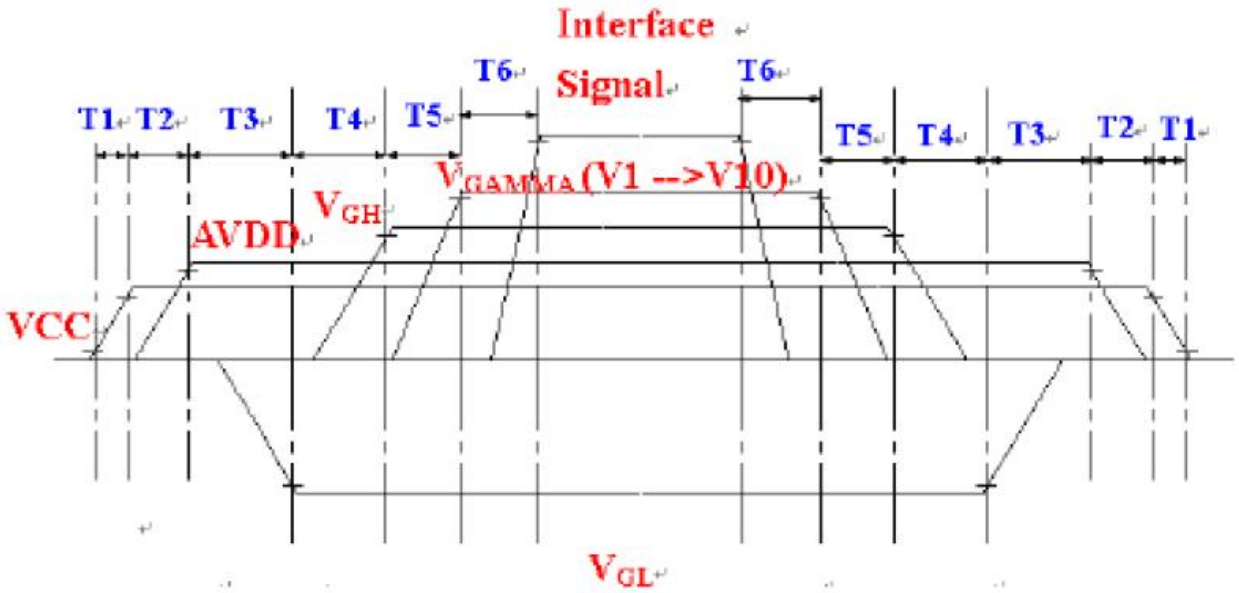
LVDS Signal mapping



6.4 POWER ON/OFF SEQUENCE



System power ON/OFF sequence



	MIN.	TYP.	MAX.	Unit
T1	-	-	20	ms
T2	16	-	-	ms
T3	>0			ms
T4	>0			ms
T5	>0			ms
T6	>0			ms

7. Optical Characteristics

Item	Symbol	Condition	MIN.	TYP.	MAX.	UNIT	Note.
Viewing angle (CR⩾10)	θ_L	9 o'clock	65	75	-	degree	*2
	θ_R	3 o'clock	65	75	-		
	θ_T	12 o'clock	60	70	-		
	θ_B	6 o'clock	65	75	-		
Response Time	T_f	Normal θ=0°	-	20	30	ms	*3
	T_r		-	20	30	ms	
Contrast ratio	CR		800	1000	-	-	*1
Color Chromaticity	W_X		0.26	0.31	0.36	-	
	W_Y		0.28	0.33	0.38	-	
Luminance	L		280	320	-	cd/m^2	*4
Luminance uniformity	Y_U		70	75	-	%	*4

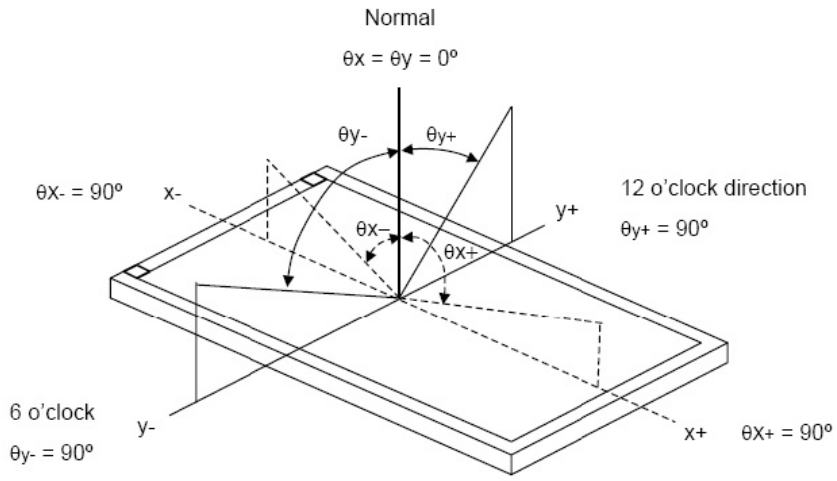
Note:

**1. Definition of Contrast Ratio*

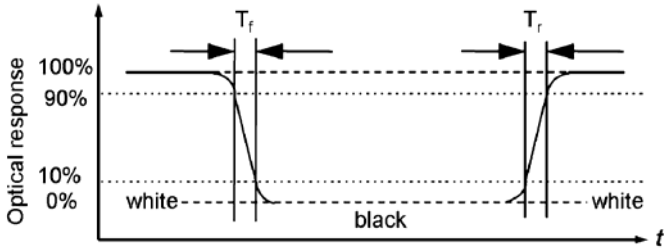
The contrast ratio could be calculate by the following expression:

Contrast Ratio (CR) = Luminanc with all pixels white / Luminance with all pixels black

**2 Definition of Viewing Angle*



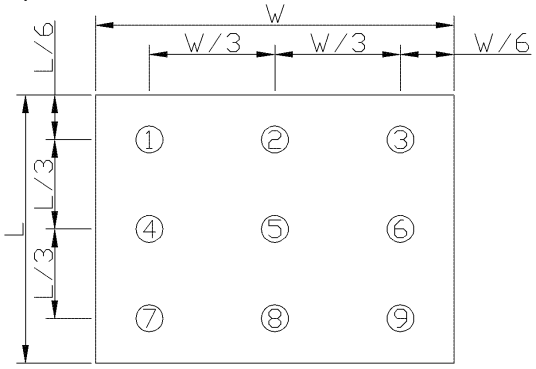
**3 Definition of response time*



**4 Definition of Luminance Uniformity*

Luminance uniformity (Lu)=

Min. Luminance form pt1~pt9 / Max Luminance form Pt1~pt9



8. Precautions for Use of 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.
- Wipe off saliva or water drops as soon as possible. Their long time contact with 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.