SPECIFICATION FOR LCM

☐ Preliminary Specification
■ Final Specification

Customer Approve：

QC 品 质 ： _____

R&D 研 发 ： _____

Approved 批准： _____

产品型号**(Description)：** __LG043J691K__

Compile by 编制	Quality/Engineer 品质/工程	Checked 审核	Approved 批准

SPECIFICATION FOR LCM

REVISION RECORD

REV NO	REV DATE	CONTENTS	REMARKS
V.0	2021-12-20	First Release	

Table of contents

1.0 General description

1.1 Introduction

LG043J691K **is Display model HSD043B9W3-A is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This TFT LCD has a 4.3 inch diagonally measured active display area with 480x272 (480 horizontal by 272 vertical pixel)resolution.**

1.2 Features

➢ **TTL Interface**
➢ Data enable signal mode
➢ 24-bit color depth,display 16.7M colors
➢ Low driving voltage and low power consumption
➢ ROHS Compliant

1.3 General information

Item	Specification	Unit	Remarks
Outline Dimension	105.4(H) x 67.1(V) x3.0(body)	mm	Tolerance:±0.2mm
Display area	95.04(H) x 53.856(V)	mm	
Number of Pixel	480 RGB(H) x 272(V)	pixels	
Pixel pitch	0.198 x 0.198	mm	
Pixel arrangement	Pixels RGB Vertical stripe		
Display mode	Normally White		
Surface treatment	TV Film		
Driver IC	NV3047		
Back-light	Single LED (Side-Light type)		

1.4 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	105.2	105.4	105.6	mm
	Vertical(V)	66.9	67.1	67.3	mm
	Depth(D)	2.8	3.0	3.2	mm

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Specification	Unit
Outline Dimension	105.4(H) x 67.1(V) x3.0(body)	mm
Display area	95.04(H) x 53.856(V)	mm
Number of Pixel	480 RGB(H) x 272(V)	pixels
Pixel pitch	0.198 x 0.198	mm
Pixel arrangement	Pixels RGB stripe arrangement	
Display mode	Normally White	
Surface treatment	TV Film	
Weight	TBD (Typ.)	gram
Back-light	Single LED (Side-Light type)	

2.1.2 Back-Light Unit

Item	Symbol	Typ	MIN.	TYP.	MAX.	Unit	Note
Forward voltage	Vf	12	18.9	21	23.1	V	(1)(2)
Forward current	If	20	--	--	--	mA	(1)(2) (3)
Power Consumption	PBL	--	--	--	--	mW	

Note:

(1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2) Ta =25±2℃

(3) Test Condition: LED current 20 mA

3.0 OPTICAL CHARACTERISTICS

3.1 Optical Specifications

Item		Symbol	Temp	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle range	Horizontal	θ		CR > 10	60	70	--	Deg	Note 1
	Vertical	θ			40	60	--	Deg	
Luminance Contrast ratio		CR	θ = 0°		--	800	--	--	Note 2
Brightness		YL			220	280	--	Cd/cm2	
Transmittance		T(%)	θ = 0°		4.0	5.7	--	%	Note 3
Color Gamut (C light)					--	57	--	%	
White chromaticity		Xw				0.302			Note 4
		Yw				0.338			
Reproduction of color （C-light）	Red	Rx	Θ=0°		TYP. -0.05	--	TYP. +0.05		
		Ry				--			
	Green	Gx				--			
		Gy				--			
	Blue	Bx				--			
		By				--			
Response Time (Rising + Falling)		Trt	Ta= 25°C θ = 0°		--	30	40	ms	Note 5

3.2 Measuring Condition

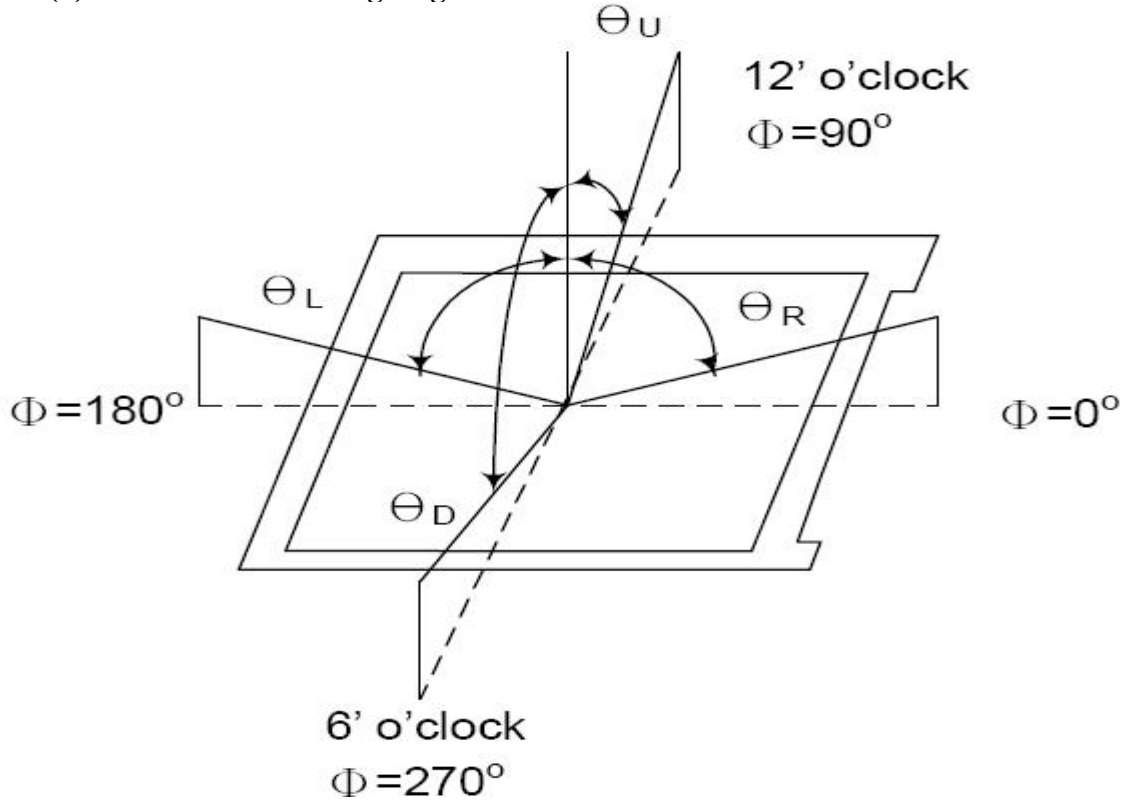Measuring surrounding: dark room ,LED current IL : 20mA

Ambient temperature: 25±2℃

15min. warm-up time.

3.3 Measuring Equipment

Any unauthorized use is prohibited.

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics. Measuring spot size: 20 ~ 21 mm
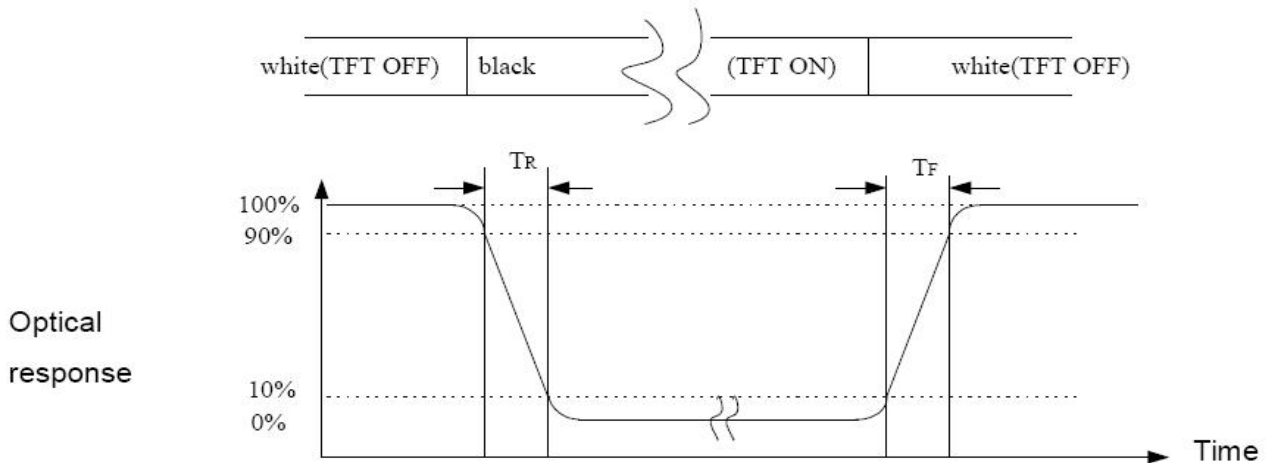
Note (1) Definition of Viewing Angle :

Note (2) Definition of Contrast Ratio (CR):
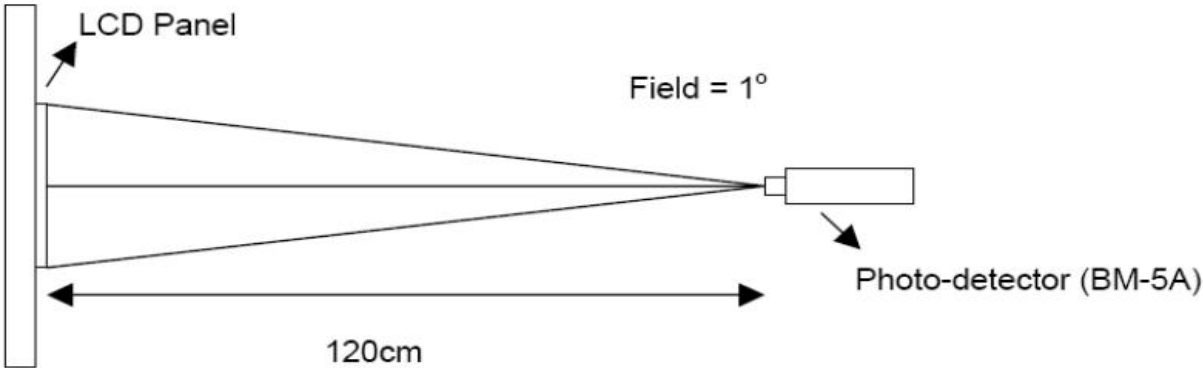**Measured at the center point of panel**

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3) Definition of Response Time: Sum of TR and TF
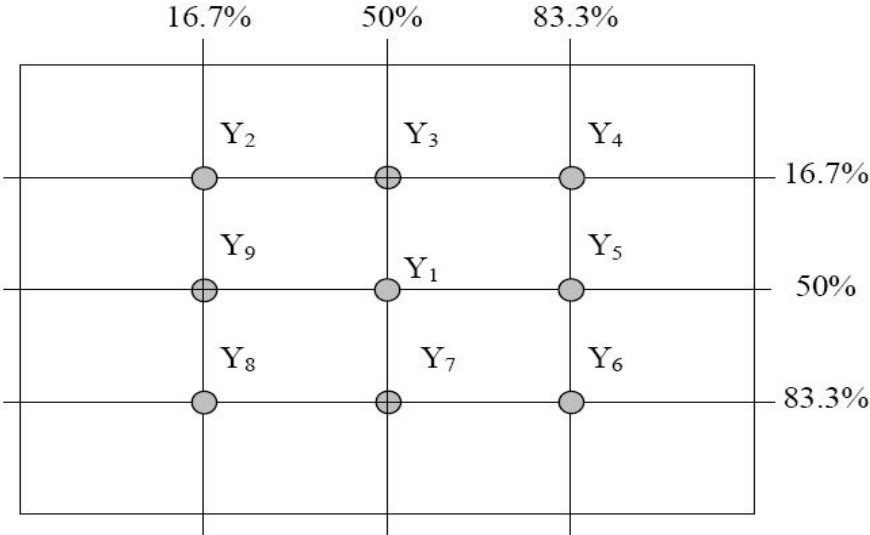
Note (4) Definition of optical measurement setup

Note (5) Definition of brightness uniformity

$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

SPECIFICATION FOR LCM

4.0 INTERFACE PIN CONNECTION

4.1 Signal of interface

| Terminal No.	Symbol	IO	Functions
1	VLED-	P	Power for LED backlight (Cathode)
2	VLED+	P	Power for LED backlight (Anode)
3	AGND	P	Analog Ground
4	VDD	I	Power for Digital Circuit
5	R0	I	Red data(LSB)
6	R1	I	Red data
7	R2	I	Red data
8	R3	I	Red data
9	R4	I	Red data
10	R5	I	Red data
11	R6	I	Red data
12	R7	I	Red data(MSB)
13	G0	I	Green data (LSB)
14	G1	I	Green data
15	G2	I	Green data
16	G3	I	Green data
17	G4	I	Green data
18	G5	I	Green data
19	G6	I	Green data
20	G7	I	Green data(MSB)
21	B0	I	Blue data(LSB)
22	B1	I	Blue data
23	B2	I	Blue data
24	B3	I	Blue data
25	B4	I	Blue data
26	B5	I	Blue data
27	B6	I	Blue data
28	B7	I	Blue data(MSB)
29	GND	P	Ground
30	DCLK	I	Sample clock
31	DISP	I	Display on/off
32	HS	I	Horizontal Sync Input
33	VS	I	Vertical Sync Input
34	DE	I	Data Input Enable
35	NC	-	No connection
36	GND	P	Ground
37	X_R	P	Touch panel X-right
38	Y_D	P	Touch panel Y-bottom
39	X_L	P	Touch panel X-left
40	Y_U	P	Touch panel Y-up

5.0 Power On/Off Sequence

In order to power on /off correctly, please follow the following recommended power on /off sequence.
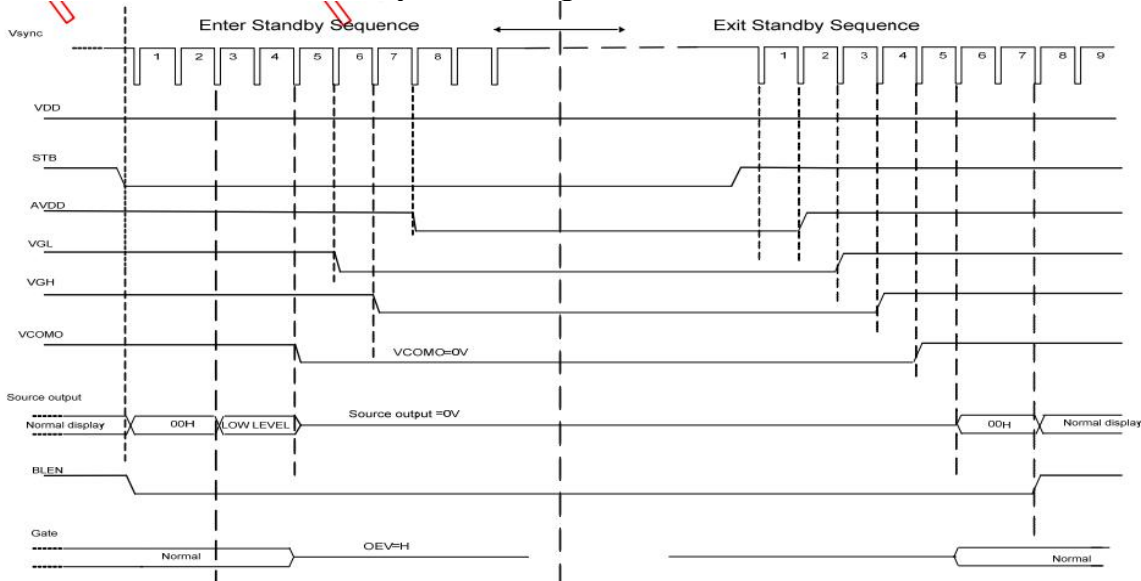
5.1 Power on control
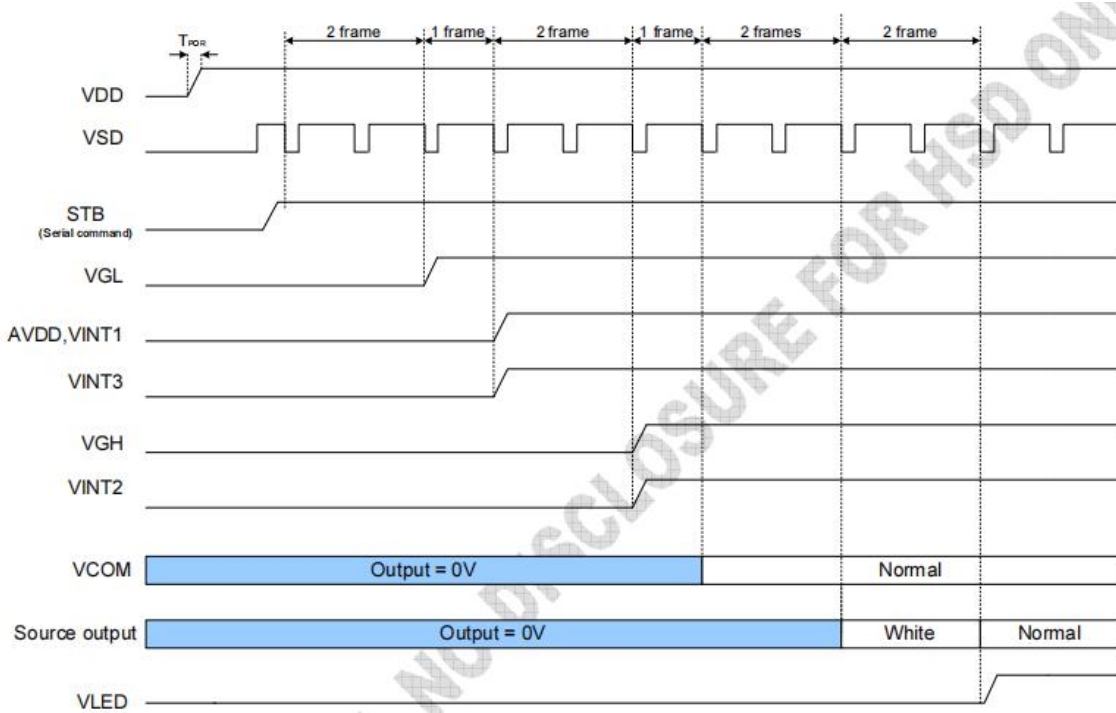
● power on timing sequence

5.1 Power off control

Any unauthorized use is prohibited.
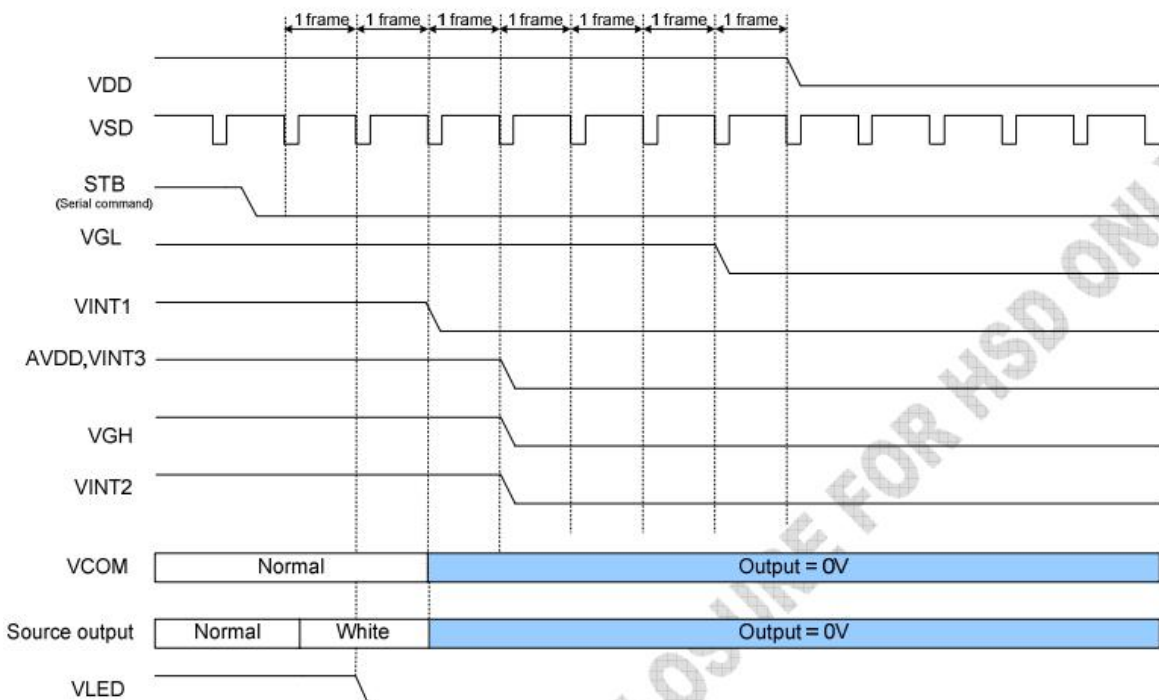
- power on timing sequence

5.2 Enter and exit standby mode sequence

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VCC	3.0	3.3	3.6	V

6.2 Back-Light Unit

The backlight system is an edge-lighting type with 8LED.
The characteristics of the LED are shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED current	IL	-	20	-	mA	(2)
LED Voltage	VL	-	23.6	-	V	
Operating LED life time	Hr	20000	-	-	Hour	(1)(2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 ° C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL=20mA. The LED lifetime could be decreased if operating IL is larger than 20mA. The constant current driving method is suggested.

LED CIRCUIT DIAGRAM：7 x 1 = 2 LED

IF=20MA,VF=18.9V~23.1

6.3 DC Characteristics

6.3.1 Absolute Maximum Rating (GND=AGND=0V)

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Power supply voltage 1	Vdd	−0.5	–	+3.6	V
Operation temperature	T_{OPR}	−20	–	+70	℃
Storage temperature	T_{STG}	−30	–	+80	℃

Note：（1）All of the Voltages listed above are with respective to GND=0V.

（2）Device is subject to be damaged permanently if stresses belong those absolute maximum ratings listed above.

6.3.2 TTL mode DC electrical characteristics

(VDDIO=VDD=3.0~3.6V, GND=AGND=0V, TA=-20℃~+85℃)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
Digital Block Circuit						
Low Level Input Voltage	Vil	GND	-	0.3xVDDIO	V	Digital input pins
High Level Input Voltage	Vih	0.7xVDDIO	-	VDDIO	V	Digital input pins
Input Leakage Current	Ii	-	-	±1	uA	Digital input pins
Pull-high/low Impedance	Rin	-	200K	-	ohm	Digital control input pins VDDIO=3.3V
High Level Output Voltage	Voh	VDDIO-0.4	-	-	V	Digital input pins Ioh=400uA
Low Level Output Voltage	Vol	GND	-	GND+0.4	V	Digital output pins Iol=-400uA
Digital Stand-by Current	Idst	-	TBD	TBD	uA	Output are High-Z, all pins are default
Digital Operating Current	Icc	-	TBD	-	mA	DCLK=9MHz, Fld=17.28KHz (@ 24bit RGB mode), no load

Analog Block Circuit						
Analog Supply Voltage	AVDD	-	5.2	5.6	V	
GAMMA reference voltage	VDDA	-	5	-	V	
Step-up Circuit 1 Output Voltage	VINT1	5.8	-	-	V	
VCOMH Output Level	VCOMH	2.6		5	V	By VCOMH[6:0] setting
VCOML Output Level	VCOML	-3		-0.46	V	By VCOML[6:0] setting; VCOML>VINT3
Feed back voltage for PWM	VFB	0.25	0.6	0.8	V	DC-DC operating.
Base drive current for PWM	IDRV	-	20	-	mA	VDD=3.3V
Voltage Deviation of Outputs	Vvd	-	±20	±35	mV	Vo=0.1V ~ 0.5V & AVDD-0.5 ~ AVDD-0.1
			±15	±20	mV	Vo=0.5V ~ AVDD-0.5V
Dynamic Range of Ouput	Vdr	0.1	-	AVDD-0.1	V	S1 to S720
Low-level Output Current of VCOM	IOLC	-	TBD	-	mA	VCOMH=4V, VCOML=-1V VCOM output=-1V V.S. -0.1V
High-level Output Current of VCOM	IOHC	-	TBD	-	mA	VCOMH=4V, VCOML=-1V VCOM output=4V V.S. 3.1V
Source Low-level Output Current	IOLS	TBD	-	-	uA	S1 to S720; VO=0.1 V.S. 1V
Source High-level Output Current	IOHS	TBD	-	-	uA	S1 to S720; VO=4.9 V.S 4.0
Gate Low-level Output Current	IOLG	TBD	-	-	uA	G1 to G544; VO=VGL V.S. VGL+0.5
Gate High-level Output Current	IOHG	TBD	-	-	uA	G1 to G544; VO=VGH V.S. VGH-0.5
Analog Stand-by Current	Iast	-	-	100	uA	STB="L", all function are shutdown
Analog Operating Current	IDD	-	TBD	-	mA	DCLK=9MHz, Fld=17.28KHz (@ 24bit RGB mode), No load

● **TTL mode DC electrical characteristics**

6.4 AC Characteristics

6.4.1 Input signal characteristics

AC Electrical Characteristics (VDDIO=VDD=3.0 to 3.6v, GND=0V, TA=-20℃ to +85℃)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VDD power source slew time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
Input Output timing						
DCLK clock time	Tclk	33.3	-	-	ns	DCLK=30MHz
DCLK clock low period	Tcwl	40	-	60	%	
DCLK clock high period	Tcwh	40	-	60	%	
Clock rising time	Trck	9	-	-	ns	
Clock falling time	Tfck	9	-	-	ns	
HSD width	Thwh	1	-	-	DCLK	
HSD period time	Th	55	60	65	us	
HSD setup time	Thsu	12	-	-	ns	
HSD hold time	Thhd	12	-	-	ns	
VSD width	Tvwh	1	-	-	Th	
VSD setup time	Tvsu	12	-	-	ns	
VSD hold time	Tvhd	12	-	-	ns	
Data setup time	Tdasu	12	-	-	ns	
Data hold time	Tdahd	12	-	-	ns	
DE setup time	Tdesu	12	-	-	ns	
DE hold time	Tdehd	12	-	-	ns	
Source output setting time	Tsst	-	-	TBD	us	10% to 90% CL=60pF, RL=2Kohm
Gate output setting time	Tgst	-	-	1200	ns	10% to 90%, CL=60pF
VCOM output setting time	Tcst	-	-	TBD	us	10% to 90%, CL=40nF, RL=50ohm
Time from VSD to 1st line data input	Tvs	3	8	31	Th	HV mode By HDL[4:0] setting
3-wire serial communication AC timing						
Serial clock	Tsck	200	-	-	ns	For SCL pin
SCL pulse low period	Tckl	40	-	60	%	
SCL pulse low period	Tckh	40	-	60	%	
Serial data setup time	Tisu	50	-	-	ns	
Serial data hold time	Tihd	50	-	-	ns	
Serial clock high/low	Tssw	50	-	-	ns	
CSB to VSD	Tcv	1			us	
CSB distinguish time	Tcd	400	-	-	ns	
CSB input setup time	Tcsu	50	-	-	ns	
CSB input hold time	Tchd	50	-	-	ns	

● **TTL mode AC electrical characteristics**

6.4.2 TTL mode data input format

SYNC Mode :
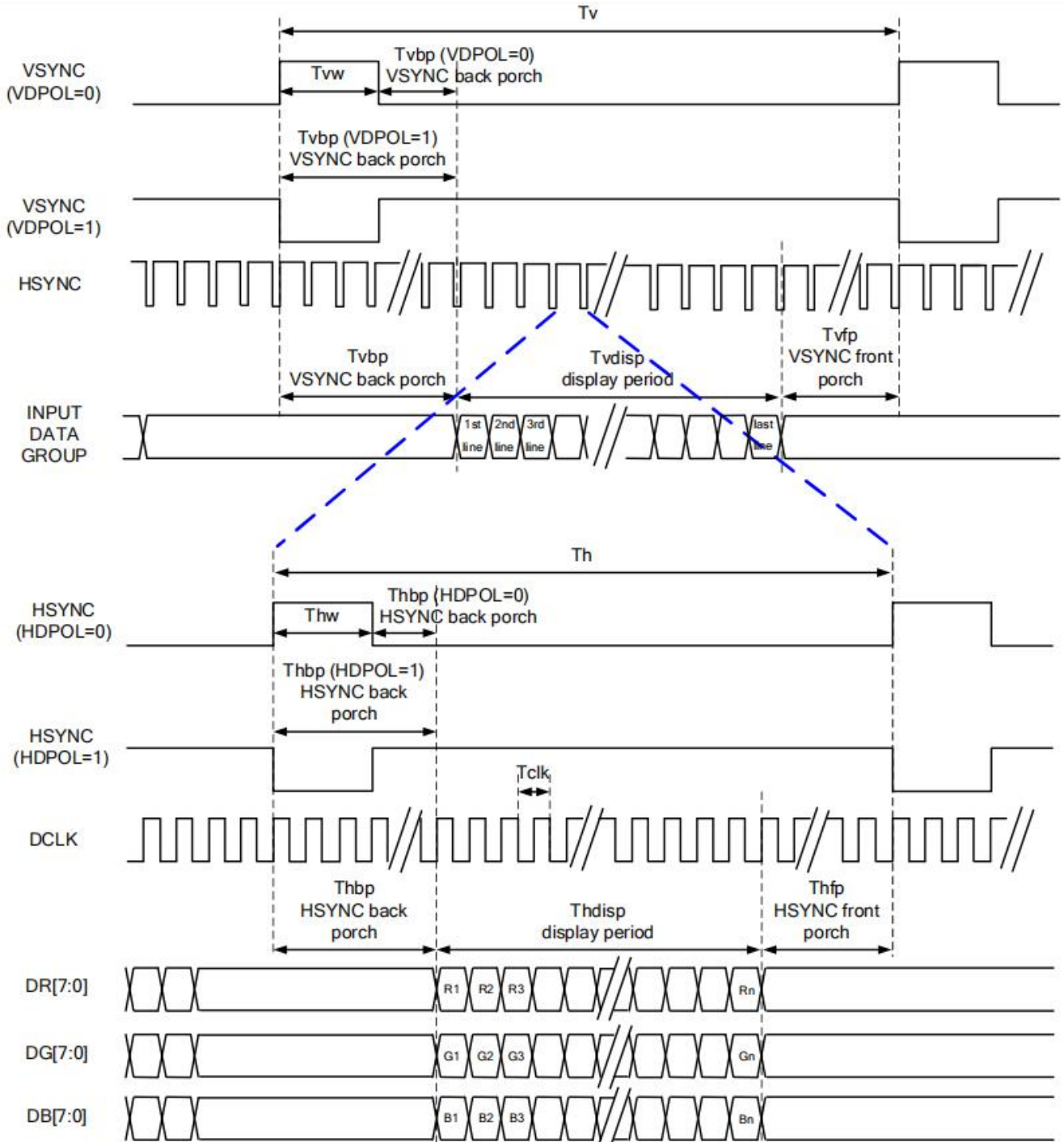
SYNC-DE Mode :
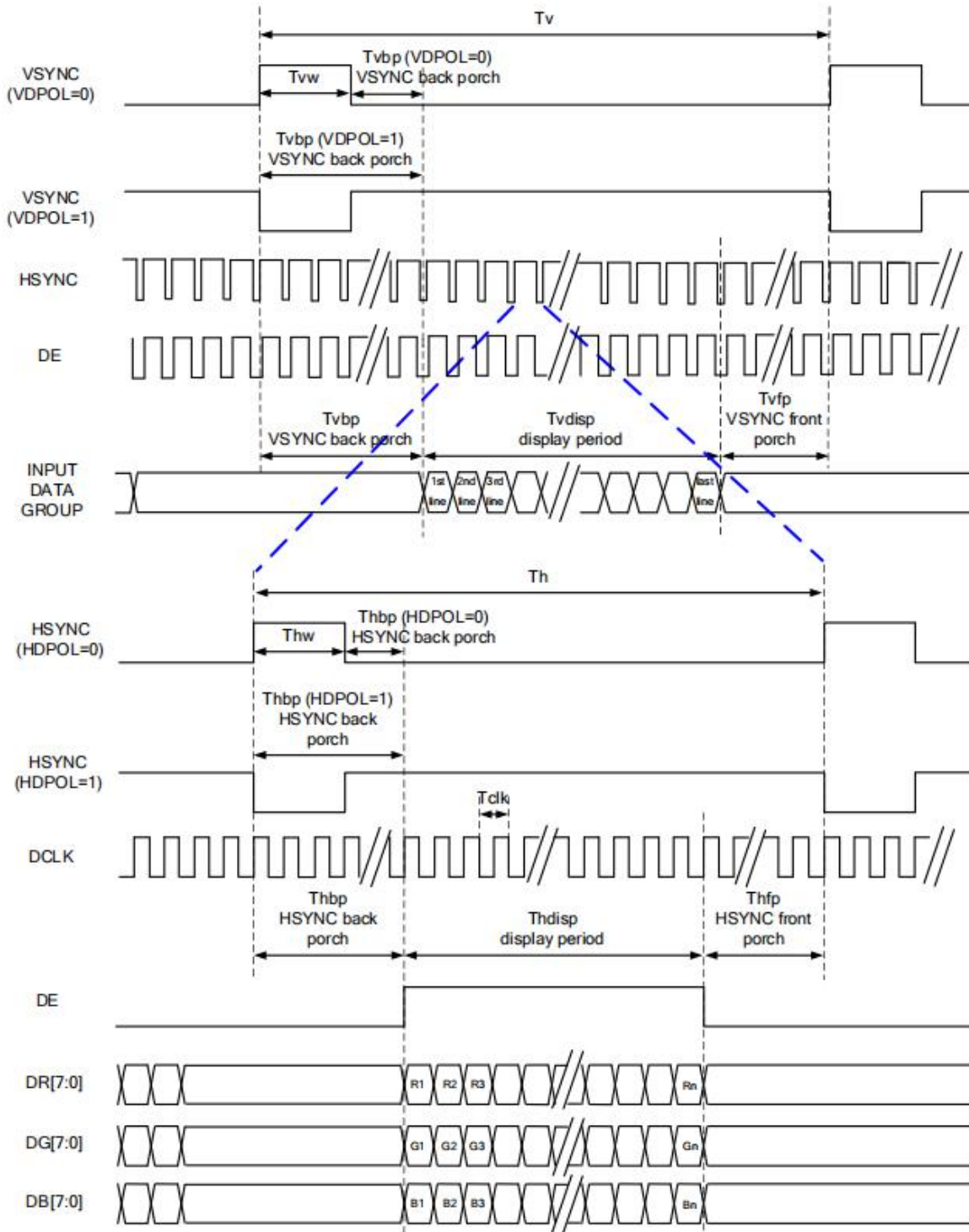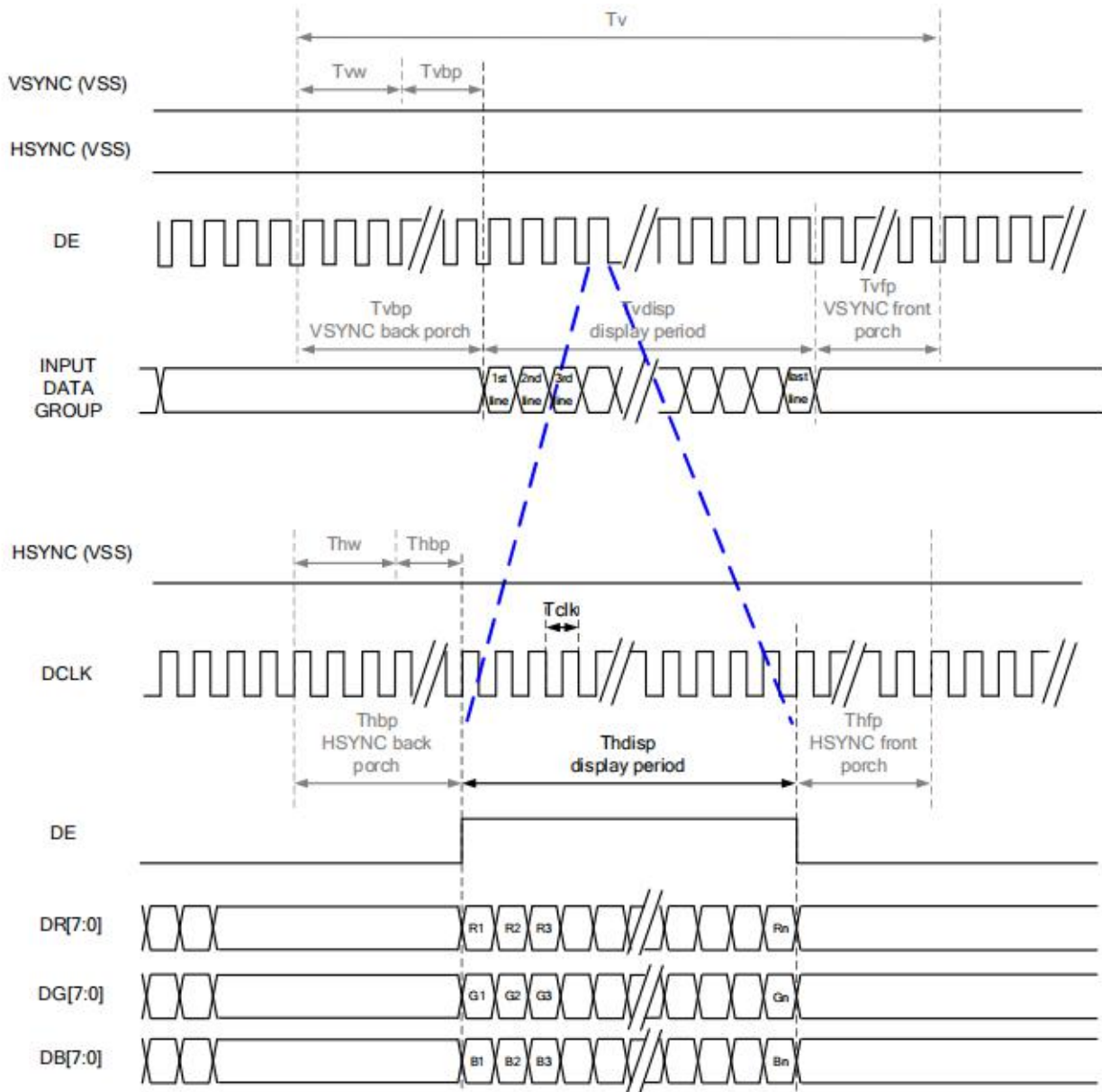
DE Mode:

RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

Note: "Input" means these signals are driven by host side.

6.4.3 Input timing table

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	8	9	12	MHz	
DCLK Period		Tclk	83	111	125	ns	
HSYNC	Period Time	Th	485	531		DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	30	43	64	DCLK	By H_Blanking setting
	Front Porch	Thfp	2	8	64	DCLK	
	Pulse Width	Thw	2	4		DCLK	
VSYNC	Period Time	Tv	276	292		H	
	Display Period	Tvdisp		272		H	
	Back Porch	Tvbp	2	12	64	H	By V_Blanking setting
	Front Porch	Tvfp	2	8	64	H	
	Pulse Width	Tvw	2	4		H	

Note: It is necessary to keep Tvbp =12, Tvfp = 8, Tvw = 4 and Thbp = 43, Thfp = 8 Thw = 4 in sync mode.

6.5 Timing Diagram of Interface Signal

6.5.1 3-wire Timing Diagram
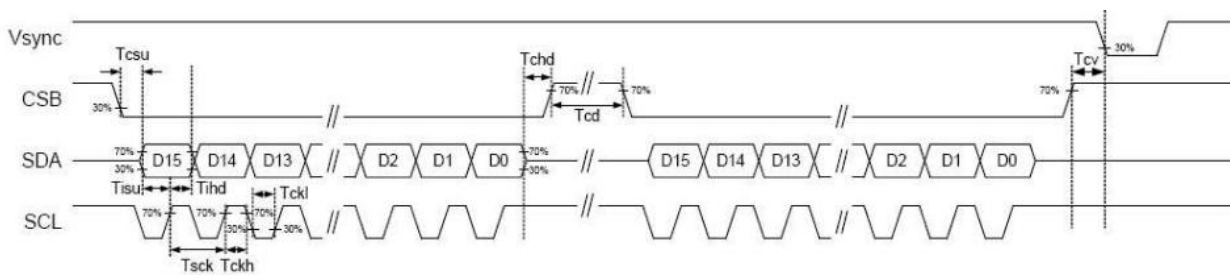
6.5.2 Output Timing Diagram
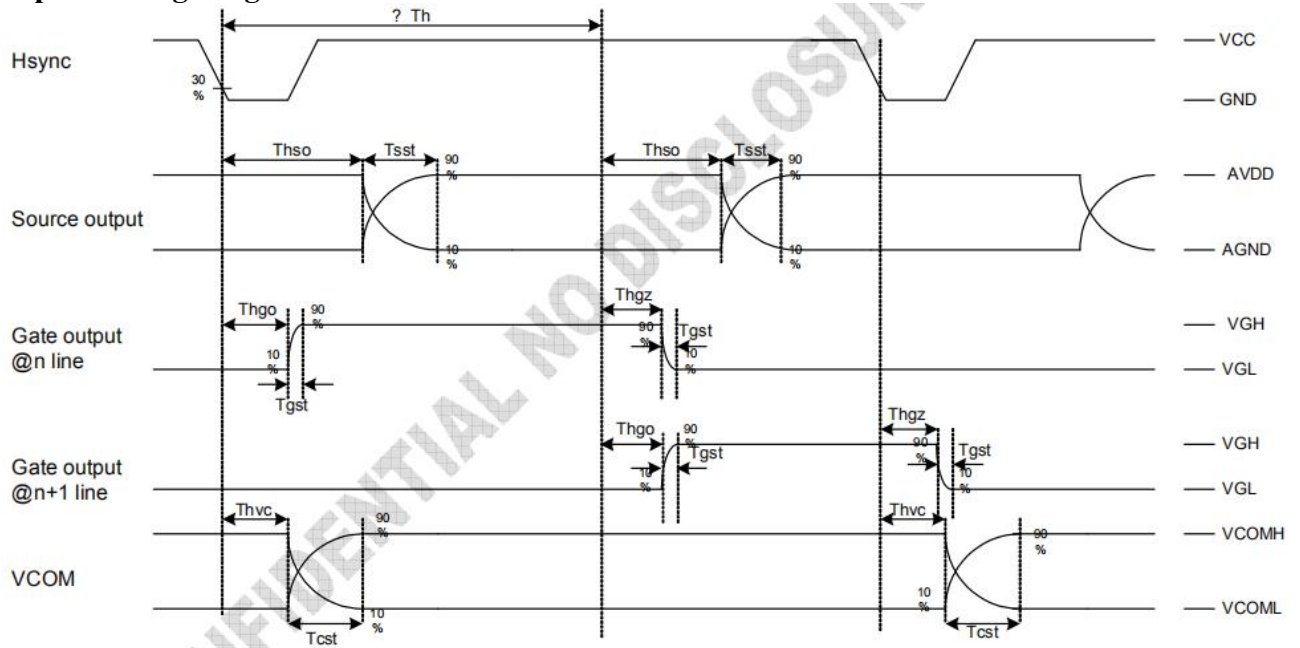
7.0 Reliability test items

Test Item	Test Conditions	Notes
High temperature Operation	Ta= +70℃, 120hrs	
Low temperature Operation	Ta= -20℃, 120hrs	
High Temperature Storage	Ta= +80℃, 120hrs	
Low Temperature Storage	Ta= -30℃, 120hrs	
Humidity Test	60℃ ,Humidity 90% ,96hrs	
Thermal Shock Test	-20℃,30min ~ +70℃,30min (10 cycle)	
Vibration Test(Packing)	Sine Wave 1.04G, 5~500Hz, XYZ 30min/each direction	
	Half-Sine, 100G, 6ms, ±XYZ, 3 cycle	

8.0 OUTLINE DIMENSION

MODEL NO.: LG043J691K

Notes:
1. RoHS must be complied.
2. ⚠Modification rev.number
3. Draft angle 1.5°:
4. ( ) reference dimension, * :critical dimension
5. All radii without dimensionR0.3 , Unspecified Tolerances is:±0.20mm

ELECTRICAL/OPTICAL CHARACTERISTICS AT Ta=25℃

PARAMETER		SYMBOL	MIN	TYP	MAX	UNIT	REMARK
Center Luminous Intensity		Iv	220	280		cd/㎡	IF=20mA (中心点)
LCM coordinaies	X	0.240	0.250	0.340			IF=20mA
	Y	0.250		0.350			IF=20mA
Forward Voltage		Vf	18.9	21	23.1	V	IF=20mA
Reverse Current		Ir			50	uA	R=21V, ※1
Luminous Tolerance	Iv−m	80			%	(min/max)*100	※1

ABSOLUTE MAXIMUM RATINGS AT Ta=25℃

PARAMETER	SYMBOL	SPECIFICATION	UNITS	REMARK
Power Dissipation	Pd	528	mW	※7
Peak Forward Current	IFP	20	mA	※1
Reverse Voltage	VR	5	V	※1
Operaring Temperature	TOPR	−20 ℃ TO+70 ℃	℃	
Storage Temperature	TSTG	−30 ℃ TO+80℃	℃	

LED-A○— ☆ ☆ ☆ ☆ ☆ ☆ ☆ —○LED-K

IF=20MA, VF=18.9V~23.1

TFT 4.3"
480(RGB)X272
6 O'CLOCK

*44.17±1.0
*67.1±0.2(BL OD)
56.7 (BZ OPENING)
53.856 (LCD AA)
3.5±0.3

UNIT(单位) mm

THE THIRD ANGLE PRORZCTION (第三角法)
EDITION 版本号: A/1

DESIGN 设计:	DATE日期:
CHECKED 审检:	DATE日期:
APPROVED批准:	DATE日期:

PIN FUCTION
PIN	FUCTION
1	LEDK
2	LEDA
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	CLK
31	DISP
32	HSYNC
33	VSYNC
34	DEN
35	NC
36	GND
37	XR
38	YD
39	XL
40	YU

9.0 General precaution

9.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life threatening or otherwise catastrophic.

9.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. LX does not warrant the module, if customers disassemble or modify the module.

9.3 Breakage of LCD Panel

8.3.1.If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

8.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.

8.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

8.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

9.4 Electric Shock

8.4.1. Disconnect power supply before handling LCD module.

8.4.2. Do not pull or fold the LED cable.

8.4.3. Do not touch the parts inside LCD modules and the fluorescent LED's connector   or cables in order to prevent electric shock.

9.5 Absolute Maximum Ratings and Power Protection Circuit

8.5.1. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

8.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

8.5.3. It's recommended to employ protection circuit for power supply.

9.6 Operation

8.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

8.6.2 Use finger stalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

8.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

8.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

8.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

9.7 Mechanism

Please mount LCD module by using mouting holes arranged in four corners tightly.

9.8 Static Electricity

8.8.1 Protection film must remove very slowly from the surface of LCD module to   prevent from electrostatic occurrence.

8.8.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.   Persons who handle the module should be grounded through adequate methods.

9.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise,   display characteristics may be changed.

ntal regulations.