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Thin-Film-Transistor LCD Module  
 Model: GKSN121QLBL80


Acceptance

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### 1. General Description and Features

GKSN121QLBL80 is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a receiver circuit and a back-light unit. Graphics and texts can be displayed on a WXGA 1280(W) x RGB x 800 (H) dots (16:10 aspect ratio) with 16.7M colors. The following table described the features of GKSN121QLBL80.

#### 1.1 Features

- Transmissive and back-light with 48 LEDs are available.
- IPS mode.
- LVDS Receiver 8 Bits Interface.
- RoHS Compliance

#### 1.2 LCD Module


Item	Specification	Unit
Screen Size	12.1 inches	Diagonal
Display Resolution	1280 (H) x 800 (V)	Pixel
Active Area	261.12(H) x 163.2(V)	mm
Outline Dimension	292.12(H) x 198.2 (V) x 8.6 (T) (No fixed feature)	mm
Display Mode	Normally Black	--
Pixel Arrangement	RGB Vertical stripe	--
Pixel Size	0.204(H) x 0.204(V)	mm
Surface Treatment	Anti Glare	
Display Color	16.7M	--
Viewing Direction	Full View	--
Input Interface	LVDS 8 Bits Interface	--

### 2. Mechanical Information

Item	Min.	Typ.	Max.	Unit	Note	
Module Size	Horizontal (H)	291.62	292.12	292.62	mm	
	Vertical (V)	197	198.2	181.1	mm	
	Thickness (T)	8.1	8.6	9.1	mm	(1)
Weight	--	715	--	g	--	

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

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### 3. Electrical Specifications

#### 3.1 Absolute Max. Ratings

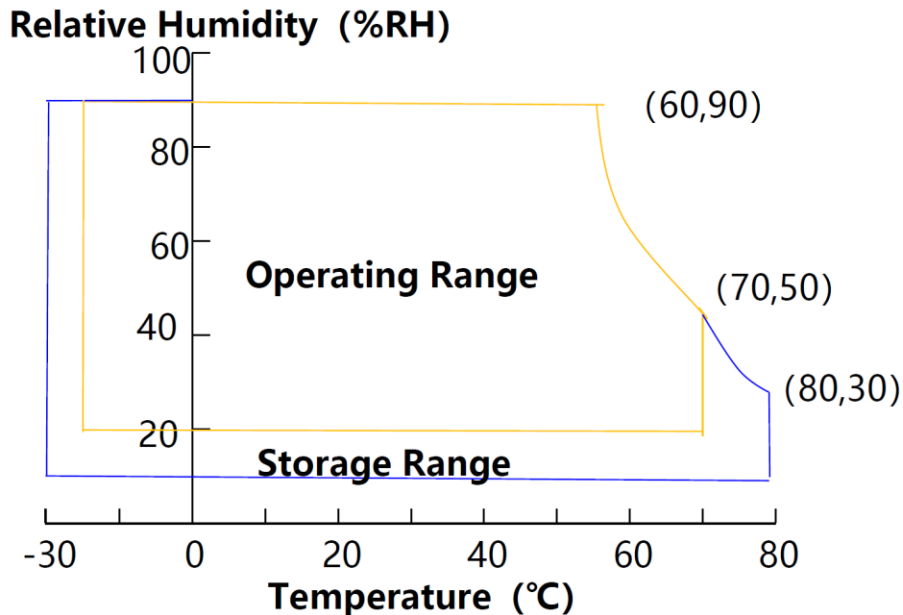
##### 3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.


[Ta = 25±2 °C]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	V <sub>DD</sub>	0.3	3.6	V	Ta = 25 °C
Operating Temperature	T <sub>OP</sub>	-20	+70	°C	Note 1
Storage Temperature	T <sub>ST</sub>	-30	+80	°C	
Operating Ambient Humidity	H <sub>OP</sub>	10	90	%RH	
Storage Humidity	H <sub>ST</sub>	10	90	%RH	

Note : 1) Temperature and relative humidity range are shown in the figure below.  
Wet bulb temperature should be 39 °C max. and no condensation of water.



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### 3.1.2 TFT LCD Module Electrical Specifications

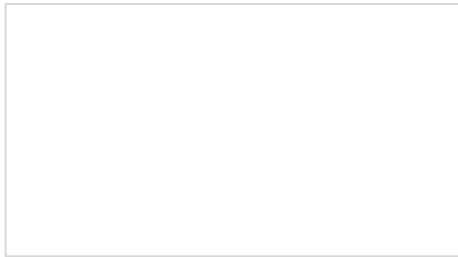
(Ta=25±2°C)

Parameter	Symbol	Values			Unit	Note	
		Min.	Typ.	Max.			
Power supply for Voltage	V <sub>DD</sub>	3.0	3.3	3.6	V	Note 1	
Power Supply Ripple Voltage	V <sub>RP</sub>	-	-	100	mV		
Power Supply Current	I <sub>DD</sub>	100	130	160	mA		
Rush current	IRUSH	-	-	1	A	Note 2	
LVDS Interface	Main link swing voltage	VID	200	-	600	mV	
	Common mode voltage	V <sub>cm</sub>	1	1.2	1.4	V	
Power Consumption	P <sub>D</sub>	0.33	0.429	0.528	W	Note 1	

Note1: The supply voltage is measured and specified at the interface connector of LCM.


The current draw and power consumption specified is for V<sub>BAT</sub>=3.3V, Frame rate f<sub>V</sub>=60Hz and Clock frequency = 72.4MHz. Test Pattern of power supply current

Test Pattern : White



Note2: The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

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### 3.1.3 Back-Light Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Back-Light Voltage	VF	-	24.8	-	V	
Back-Light Current	IF	-	360	-	mA	

### 3.2 Interface timing Parameter

#### 3.2.1 Timing Parameters (DE only mode)


For 1280RGBx800

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60Hz (LVDS)	F <sub>DCLK</sub>	66.3	72.4	78.9	MHz
HSYNC period time	T <sub>H</sub>	1380	1440	1500	DCLK
Horizontal display area	T <sub>HD</sub>	1280			DCLK
HSYNC pulse width	T <sub>HPW</sub>	Min.	2		
		Typ.	-		
		Max.	40		
HSYNC back porch(with pulse width)	T <sub>HBP</sub>	88	88	88	DCLK
HSYNC front porch	T <sub>HFP</sub>	12	72	132	DCLK
VSYNC period time	T <sub>V</sub>	824	838	872	H
Vertical display area	T <sub>VD</sub>	800			H
VSYNC pulse width	T <sub>VPW</sub>	Min.	2		H
		Typ.	-		
		Max.	20		
VSYNC back porch(with pulse width)	T <sub>VBP</sub>	23	23	23	H
VSYNC front porch	T <sub>VFP</sub>	1	15	49	H

For 1280RGBx800 DE mode

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60Hz (LVDS)	F <sub>DCLK</sub>	69.7	75	80.9	MHz
Horizontal display area	T <sub>HD</sub>	1280			DCLK
HSYNC period time	T <sub>H</sub>	1380	1440	1500	DCLK
HSYNC blanking	T <sub>HBP</sub> +T <sub>HFP</sub>	100	160	220	DCLK
Vertical display area	T <sub>VD</sub>	800			H
VSYNC period time	T <sub>V</sub>	842	838	872	H
VSYNC blanking	T <sub>VBP</sub> +T <sub>VFP</sub>	24	38	72	H

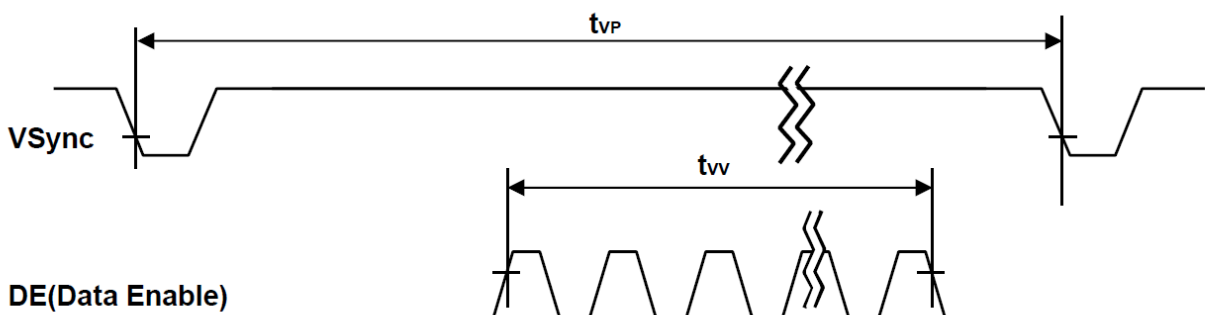
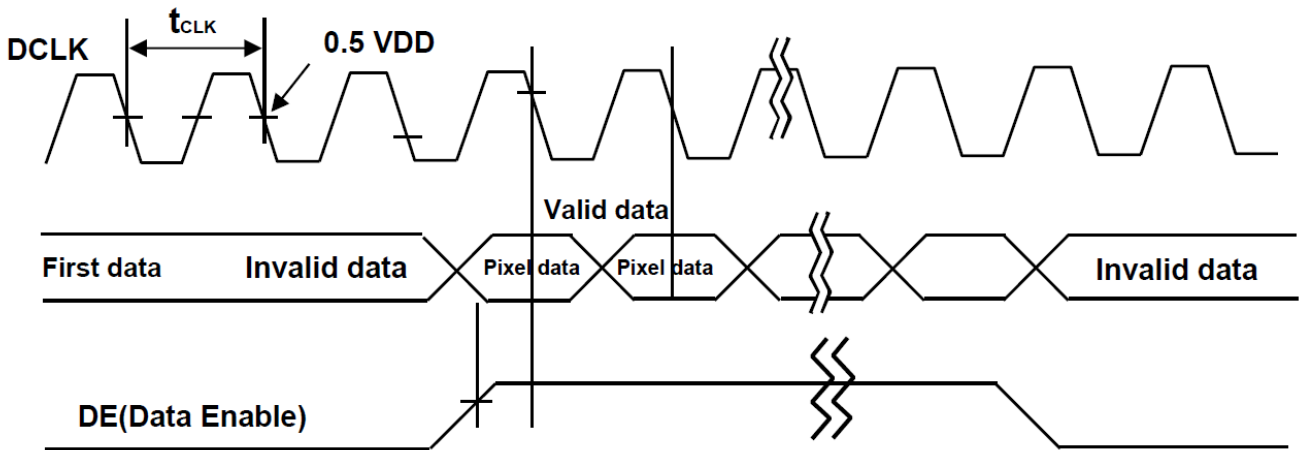
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**Note**

1. DE Only Mode · While operation, DE signal should be have the same cycle. The input of HSYNC & VSYNC signal does not have an effect on normal operation.
  2. Best operation clock frequency is 75Mhz.
  3. Frequency] = [H Total] \* [V Total] \* [vertical Frame rate]
- H Total, V Total and Frame rate]should operate within the range between Frequency\_Min and Frequency\_Max
4. Except Best operation clock frequency, FOS(Flicker & Brightness & Crosstalk, Etc.) are not guaranteed.
  5. Main frequency Max is 80.9Mhz MHz without spread spectrum

### 3.2.2 Signal Timing Waveform



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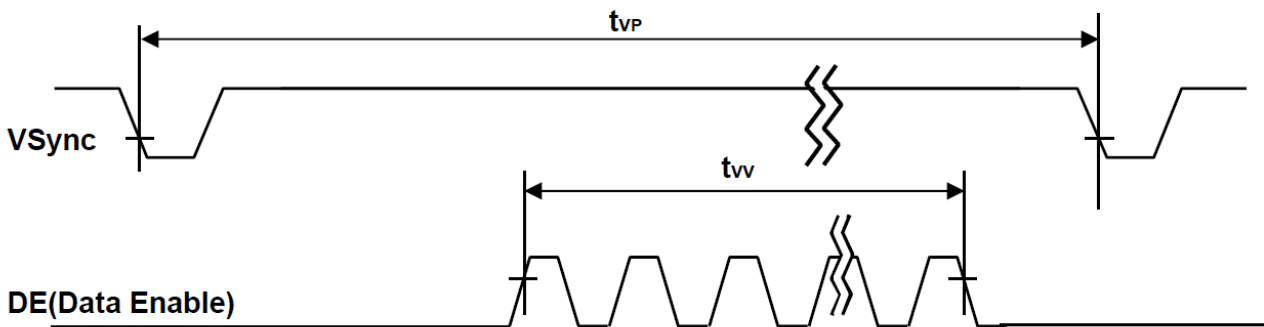
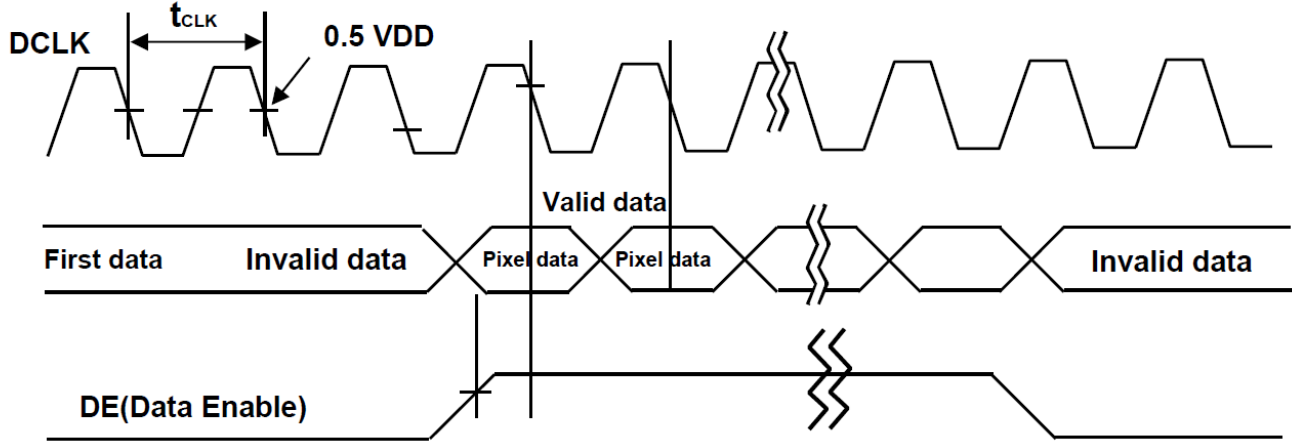
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## 3.2.3 Signal Timing Waveform

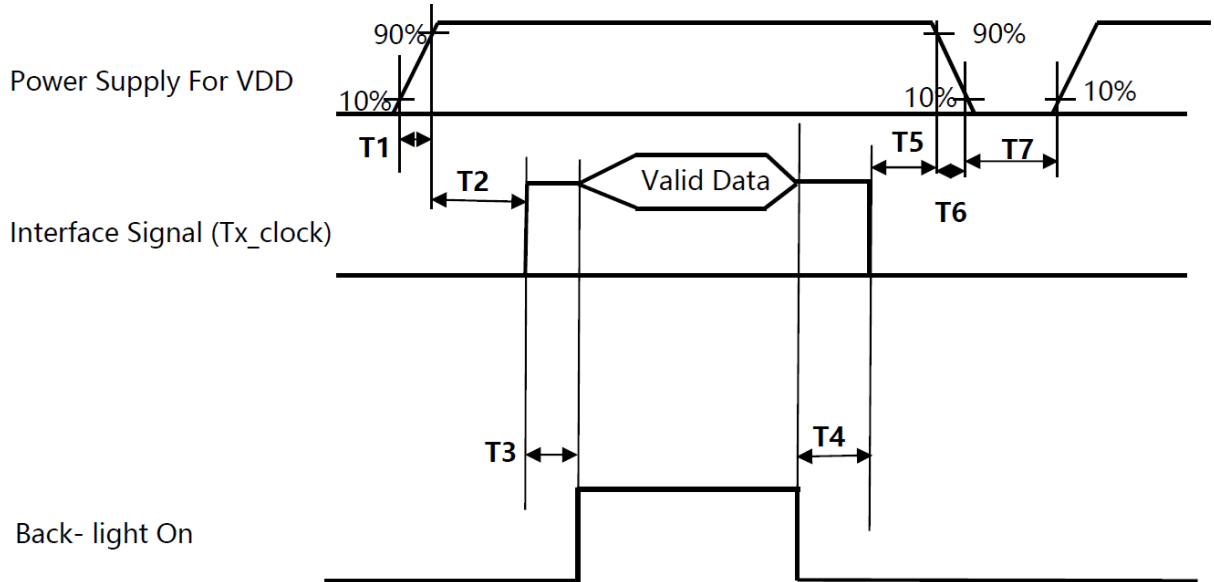


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### 3.3 POWER SEQUENCE

To prevent a latch-up or DC operation of the Open Cell, the power on/off sequence shall be as shown in below



Parameter	Values			Units
	Min	Typ	Max	
T1	0.1	-	10	ms
T2	0.1	-	50	ms
T3	300	-	-	ms
T4	200	-	-	ms
T5	0.1	-	50	s
T6	0.1	-	10	ms
T7	500	-	-	ms

Note 1: Even though T1 is over the specified value, there is no problem if the rush current is within Spec.

Note 2: When the power supply VDD is 0V, keep the level of input signals on the low or high impedance :

※ Please avoid floating state of interface signal at invalid period.

※ When the power supply for LCD (VDD) is off, be sure to pull down the valid and invalid data to 0V.

Note 3: The T3 / T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.

Note 4: T6: Voltage of VDD must decay smoothly after power-off , there should be none re-bouncing voltage. (customer system decide this value)

Note 5 : T7 should be measured after the Module has been fully discharged between power off and on period

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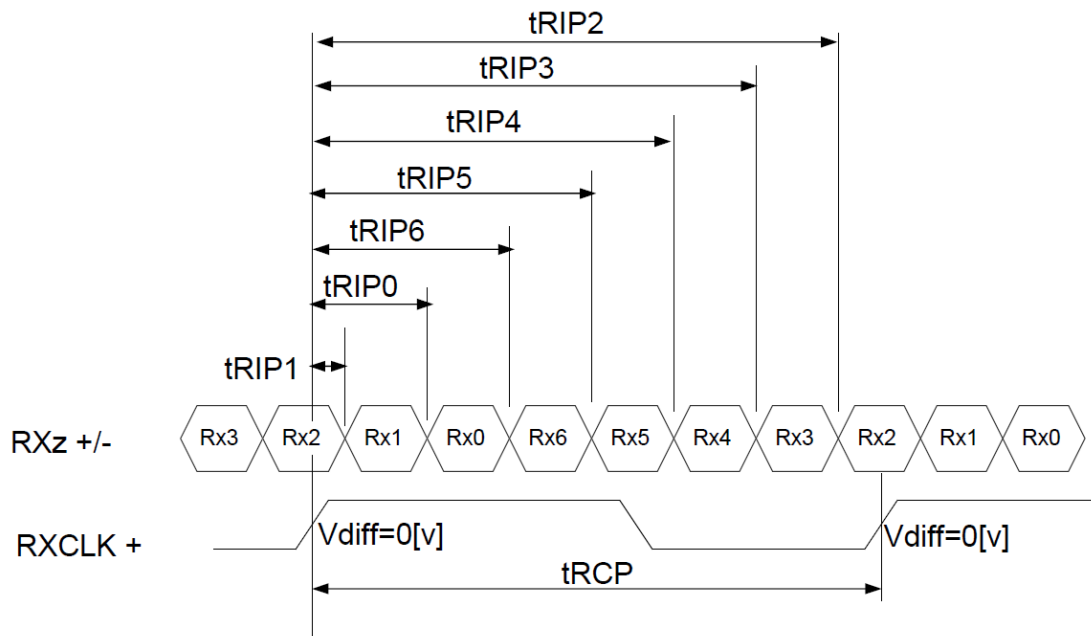
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### 3.4 LVDS Rx Interface Timing Parameter


The specification of the LVDS Rx interface timing parameter is shown in the following Table.

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCP	10	T	40	nsec	
Receiver Data Input Margin	tRMG	-0.45	-	+0.45	nsec	fCLKIN=80.9MHz
		-0.60	-	+0.60	nsec	fCLKIN=75MHz
Input Data 0	tRIP1	-   tRMG	0.0	tRMG	Clock	
Input Data 1	tRIP0	T/7-   tRMG	T/7	T/7+   tRMG	Clock	
Input Data 2	tRIP6	2 T/7-   tRMG	2T/7	2T/7+   tRMG	Clock	
Input Data 3	tRIP5	3T/7-   tRMG	3T/7	3T/7+   tRMG	Clock	
Input Data 4	tRIP4	4T/7-   tRMG	4T/7	4T/7+   tRMG	Clock	
Input Data 5	tRIP3	5T/7-   tRMG	5T/7	5T/7+   tRMG	Clock	
Input Data 6	tRIP2	6T/7-   tRMG	6T/7	6T/7+   tRMG	Clock	



\* Vdiff = (RXz+)-(RXz-),..., (RXCLK+)-(RXCLK-)

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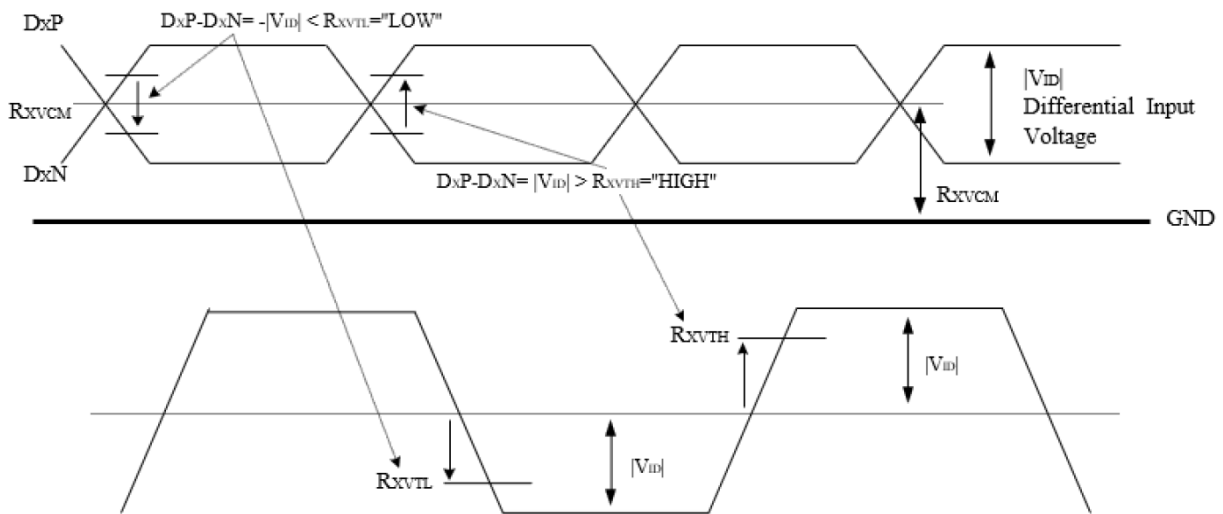
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### 3.5 DC Specification

#### LVDS Receiver Differential Input ( DC Characteristics )

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Differential Input High Threshold Voltage	VTH	-	-	+100	mV	VCM=1.2V
Differential Input Low Threshold Voltage	VTL	-100	-	-	mV	
Differential Input Common Mode Voltage	VCM	1	1.2	1.4	V	
Differential Input Voltage	VID	200	-	600	mV	

#### Single-end Signals



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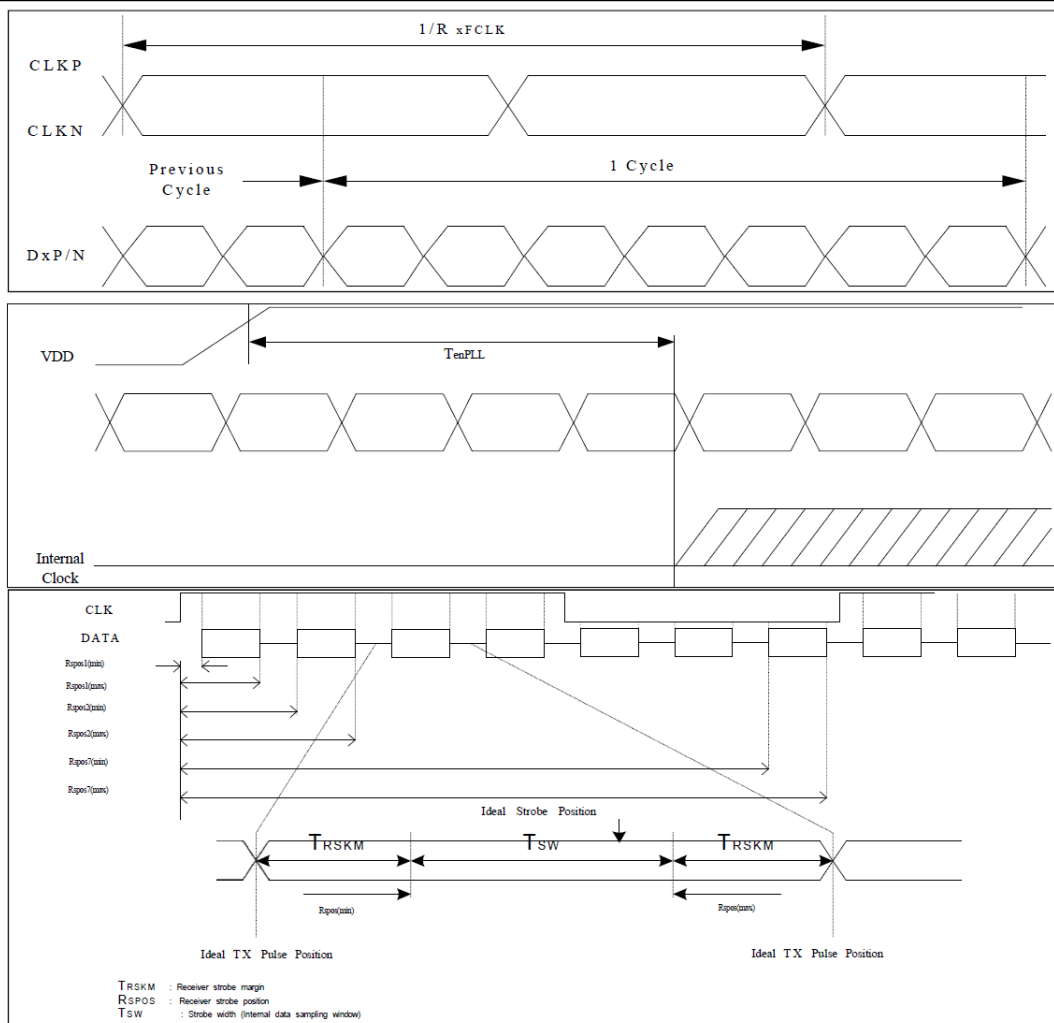
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## 3.6 AC Specification

### LVDS Receiver Differential Input ( AC Characteristics )

Parameter	Symbol	Min	Typ	Max	Unit	Notes
LVDS Strobe Width	$t_{SW}$	200	-	-	ps	V <sub>cm</sub> =1.2V VID = 200mV @81MHz
LVDS Receiver Skew Margin	$t_{RSM}$	500	-	-	ps	



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### 4. Optical Characteristics

#### 4.1 Optical characteristic of the LCD

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods.

Measuring equipment: BM-7A

Item	Symbol	Condition	Min	Type	Max	Unit	Note	
Brightness	B		700	800	-	cd/m <sup>2</sup>		
Response time	T <sub>r</sub> +T <sub>f</sub>	θ=0°	-	30	35	ms		
Contrast ratio(Center)	CR	At optimized viewing angle	1000	1200	-	-		
Luminance Uniformity (9 Points)	ΔL		70	-	-	%		
Color Chromaticity (CIE 1931)	White	W <sub>x</sub>	θ=0° Normal Viewing Angle	0.249	0.299	0.349	--	BM-7A
		W <sub>y</sub>		0.327	0.377	0.427		
	Red	R <sub>x</sub>		0.596	0.646	0.696	--	
		R <sub>y</sub>		0.288	0.338	0.388		
	Green	G <sub>x</sub>		0.247	0.297	0.347	--	
		G <sub>y</sub>		0.582	0.632	0.682		
	Blue	B <sub>x</sub>		0.061	0.111	0.161	--	
		B <sub>y</sub>		0.031	0.081	0.131		
Viewing Angle	Hor.	θ <sub>R</sub>	CR≥10	80	85	--	Degree	
		θ <sub>L</sub>		80	85	--		
	Ver.	θ <sub>U</sub>		80	85	--		
		θ <sub>D</sub>		80	85	--		
LED Life Time	-	-	70000	-	-	hr		

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

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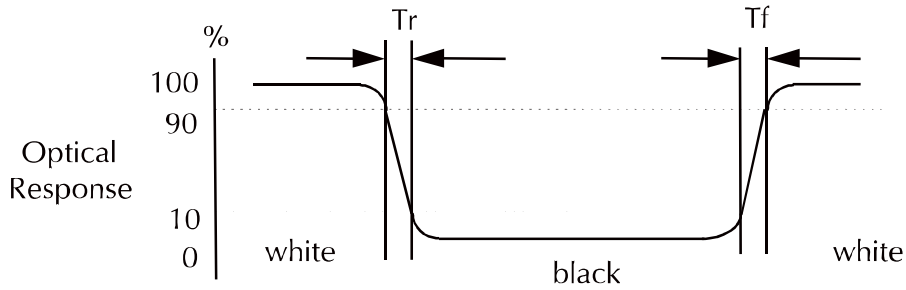
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c. Definition of contrast ratio:

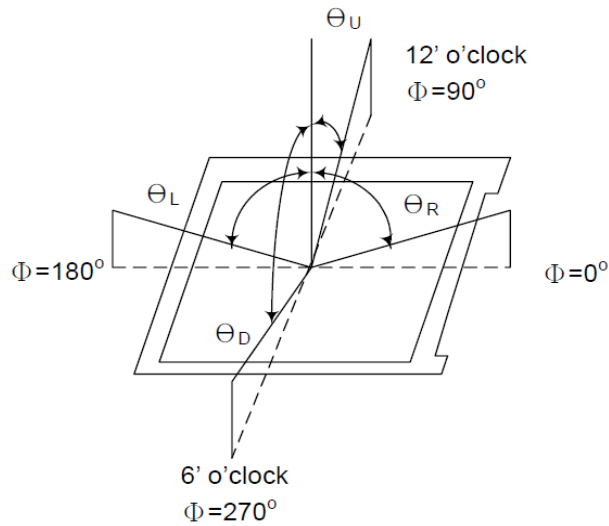
Brightness measured when LCD is at "white state"

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$


Brightness measured when LCD is at "black state"

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

e. View Angle



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f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type
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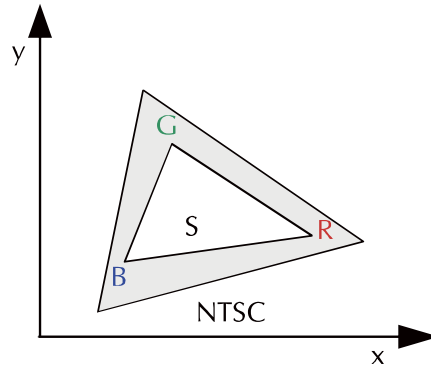
g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$


h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut : NTSC(%) = ( RGB Triangle Area / NTSC Triangle Area ) x 100



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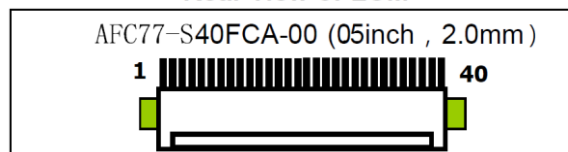
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### 5. I/O Terminal

Pin Assignment (Part No: AFC77-S40FCA-00 ) or equivalent

Pin No.	Symbol	Function	Remark
1	NC	No Connection.	
2-4	VDD	Power Supply For LCD,VDD=3.3V.	
5	NC	No Connection.	
6-7	GND	Ground.	
8	RIN0-	LVDSData differential signal input pins.	
9	RIN0+	LVDS Data differential signal input pins.	
10	GND	Ground.	
11	RIN1-	LVDS Data differential signal input pins.	
12	RIN1+	LVDS Data differential signal input pins.	
13	GND	Ground.	
14	RIN2-	LVDS Data differential signal input pins.	
15	RIN2+	LVDS Data differential signal input pins.	
16	GND	Ground.	
17	LVDS_CLK-	LVDS CLOCK differential signal input pins.	
18	LVDS_CLK+	LVDS CLOCK differential signal input pins.	
19	GND	Ground.	
20	RIN3-	LVDSData differential signal input pins.	
21	RIN3+	LVDS Data differential signal input pins.	
22	GND	Ground.	
23-24	NC	No Connection.	
25	GND	Ground.	
26	SDA	Serial data input/output for I2C Interface.	
27	SCL	Clock Input for I2C interface.	
28	GND	Ground.	
29-30	NC	No Connection.	
31-33	GND	Ground.	
34	NC	No Connection.	
35	NC	No Connection.	
36	NC	No Connection.	
37	NC	No Connection.	
38-40	NC	No Connection.	

**Rear view of LCM**



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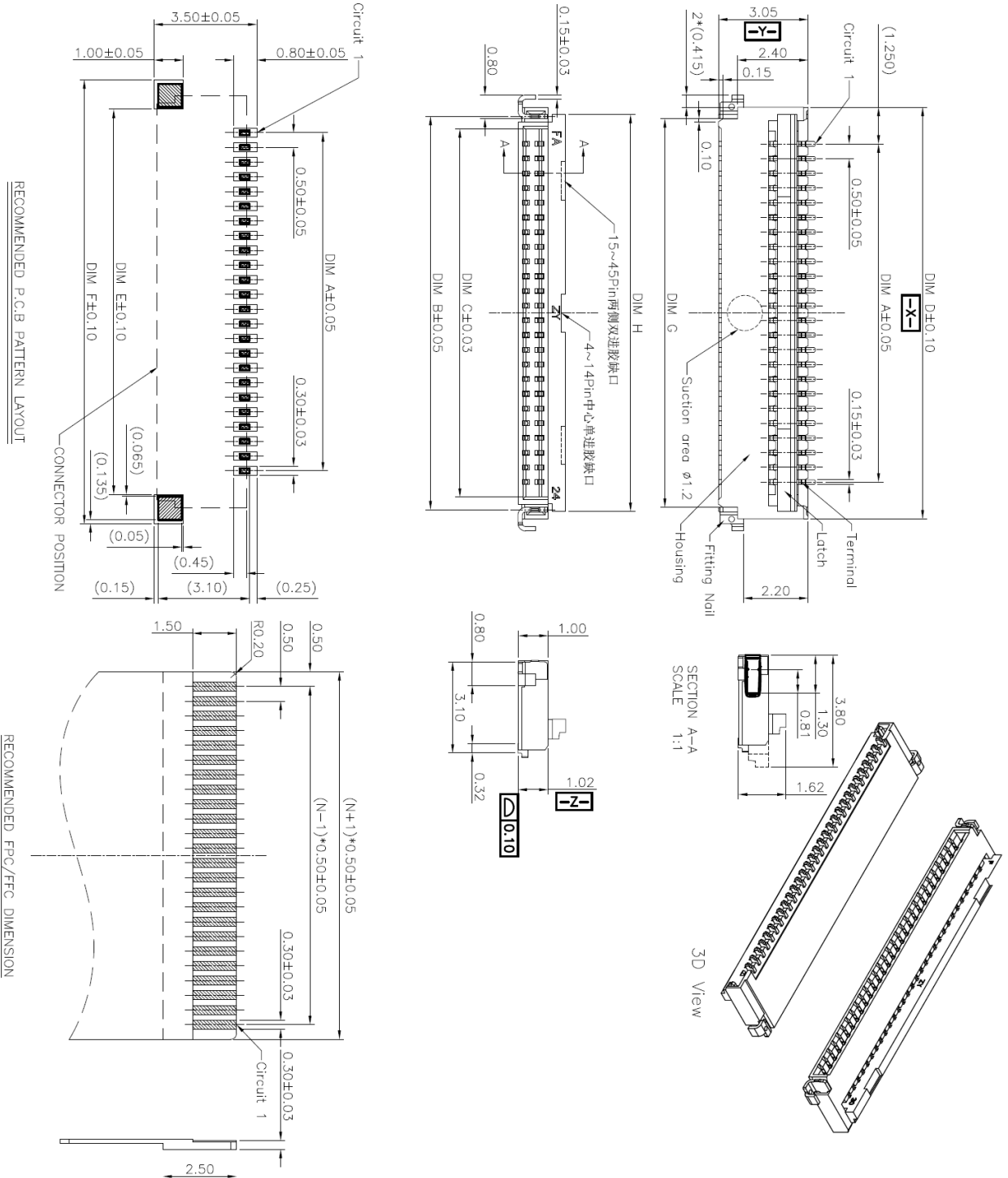
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-40pin Connector : AFC77-S40FCA-00(0.5inch , 2.0mm )

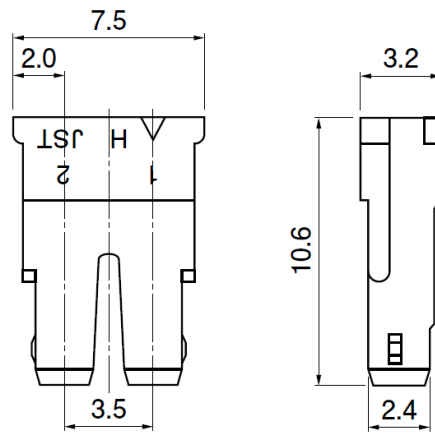


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Pin Assignment (Part No: BHSR-02VS-1 ) or equivalent

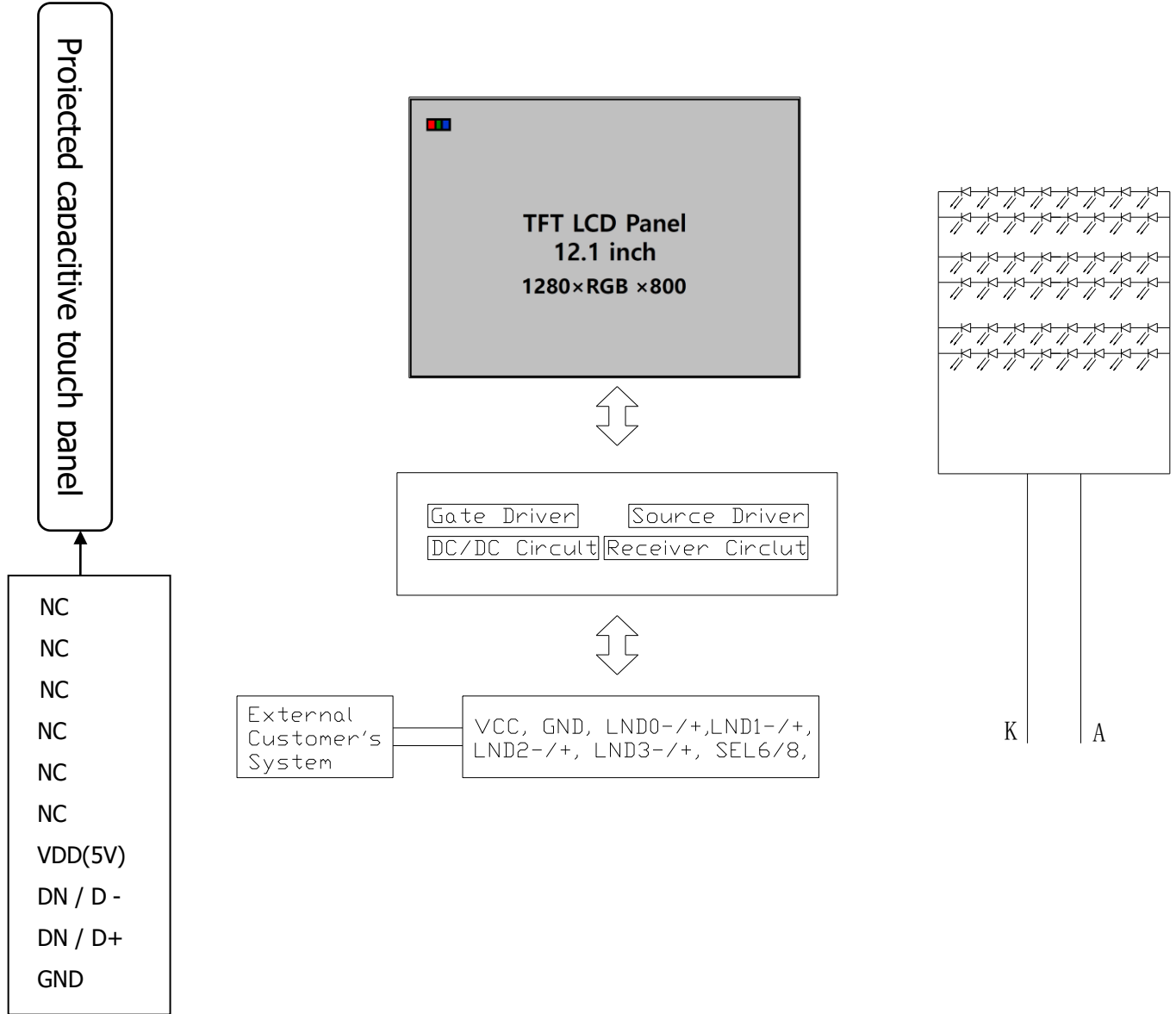
Pin No.	Symbol	Function	Remark
1	LEDA	Power Supply for LED backlight	RED
2	LEDK	GND for LED backlight	BLACK




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## 5.1 Block Diagram



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### 6. Displayed Color and Input Data

Color & Gray Scale		Input Data Signal																							
		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray Scale of White	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals. With the combination of total 24 bit data signals, the 16,777,216-color display can be achieved on the screen.

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### 7. Projected capacitive touch Screen Panel Specifications


#### 7.1 Touch Panel

Item	Specification	Unit
Screen Size	12.1 inches	Diagonal
Type	Transparent Type Projected Capacitive Touch Panel	--
Input Mode	Human's Finger/ Gloves	--
Point	10	--
CL V.A	262.12(W) × 164.2(H)	mm
Interface	USB	--
Cover glass pencil-handness	6H(min)	--
IC solution	IC : SIS9509V	--

#### 7.2 Pin Assignments and Definitions.

Item	Name	Function
1	NC	NC
2	NC	NC
3	NC	NC
4	NC	NC
5	NC	NC
6	NC	NC
7	VDD(5V)	Power supply 5V(USB)
8	DN/D-	Data-(USB)
9	DN/D+	Data+(USB)
10	GND	Ground(USB)

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### 8. Reliability Condition

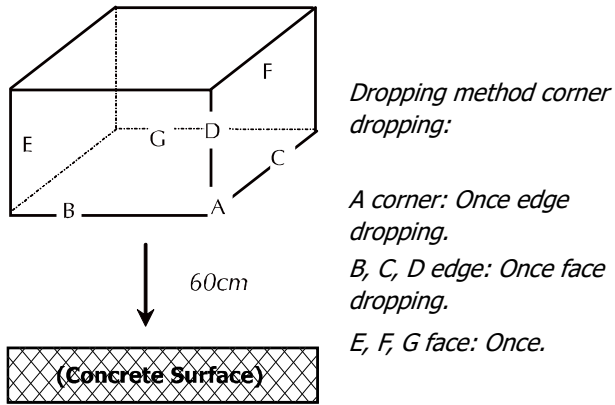
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature:  $20 \pm 5^\circ\text{C}$ .

Humidity:  $65 \pm 5\% \text{RH}$ .

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	$70^\circ\text{C} \pm 2^\circ\text{C}$ , 240hrs (Operation state).	
2	Low Temperature Operating	$-20^\circ\text{C} \pm 2^\circ\text{C}$ , 240hrs (Operation state).	1
3	High Temperature Storage	$80^\circ\text{C} \pm 2^\circ\text{C}$ , 240hrs.	2
4	Low Temperature Storage	$-30^\circ\text{C} \pm 2^\circ\text{C}$ , 240hrs.	1,2
5	High Temperature and High Humidity Storage Test	$60^\circ\text{C} \pm 2^\circ\text{C}$ , 90%, 240hrs.	1,2
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10~55Hz. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	3
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  	

- Notes:
1. No dew condensation to be observed.
  2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
  3. Vibration test will be conducted to the product itself without putting I in a container.

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## 9. Dimensional Outlines

REV	REVISION RECORD	DATE	APPROVED	NAME
△/Ab	The first release.	2022/05/14		Weber

USF 接口可膠皮繩 PRO. 5 * 10P1h	
1	NC
2	NC
3	NC
4	NC
5	NC
6	NC
7	UBIS (GND)
8	DN/D-
9	DP/D+
10	GND

TOLERANCE	MATERIAL	FINISH	MODEL NAME
±0.3			
SCALE	NO.	UNIT	TITLE
A00	1/1	mm	GKSNI21QLBL80
DATE	APPROVED	CHECKED	FILE NAME
11.4.05.15			Weber

Note:  
 CN1: AFC77-S40FCA-00  
 CN2: JST BHSR-02VS-1

Specification	
Display type	12.1" TFT LCD
Resolution	1280x800
Display mode	Normally black
Viewing Angle(U/D/L/R)	80/80/80/80
Contrast Ratio	1200 Typ.
Brightness(Center point)	800 cd/m <sup>2</sup> Typ.
Operating Temperature	-20~+70°C
Storage Temperature	-30~+60°C
LCD Interface	LVDS