

# PRODUCT SPECIFICATION

DZT Model: **LBK\_H156DAN02.0 V02**

CUSTOMER Model:

Description: **15.6 寸 TFT-LCD Module**

Version: **V02**

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2024. 07. 18	2024. 07. 28	2024. 07. 28

CUSTOMER APPROVAL	SIGNATURE	DATE



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# 1. General Specifications

## 1.1 LCM General Information

Item	Specification	Unit
LCD Size	15.6	inch
Number of Pixels	1920(H) RGB x 1080 (V)	pixels
Display Mode	AHVA&Normally Black	-
Viewing Direction	Free	o' clock
Interface	2 port LVDS with JEIDA format DE mode	-
Display Colors	16.7M Colors (RGB 8 bit)	colors
Outline Dimension	360.0(H) x 212.3 (V) x 5.7 (D)	mm
Active Area	344.16(H) * 193.59(V)	mm
Pixel Pitch	0.17925(H) * 0.17925(V)	mm
Driver IC	Source: RM97030	-
Operation Temperature	-30~70°C	°C
Storage Temperature	-30~80°C	°C

Note1:Requirements on environmental protection RoHS compliant.

## 2. Absolute Maximum Ratings

Item	Symbol	MIN.	MAX.	Unit	Note
LCD Power Supply Voltage	LCD_VCC	-0.3	4.0	V	Note 1
LED Power Supply Voltage	LED_VCC	11	13	V	

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.

### 3. Electrical Characteristics

#### 3.1 Recommended Operating Condition for TFT LCD

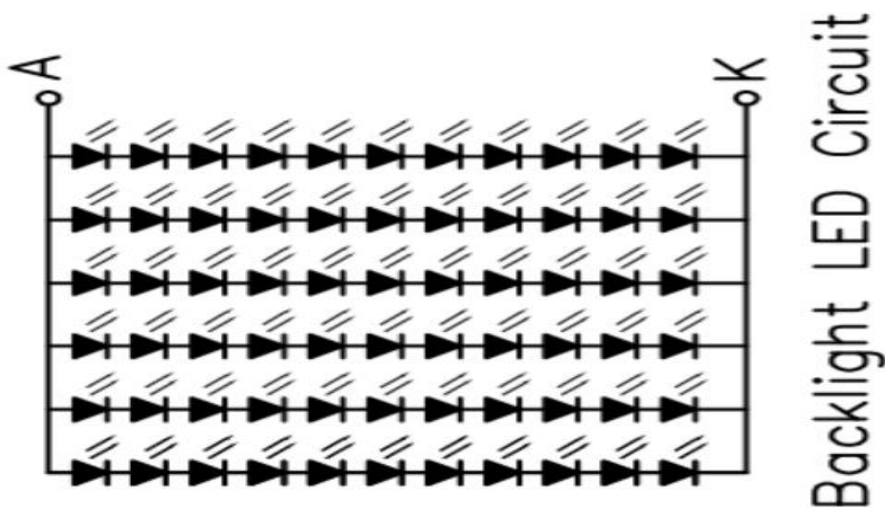
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	LCD_VCC	3.0	3.3	3.6	V	
Analog supply current	I <sub>VDD</sub>	-	TBD	-	mA	LCD_VCC=3.3 V
Logic input voltage	V <sub>IH</sub>	0.7*VDD	-	VDD	V	
	V <sub>IL</sub>	GND	-	0.3*VDD	V	

#### 3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I <sub>F</sub>	-	480	-	mA	
Driving Voltage	V <sub>F</sub>	-	33	-	V	
Power consumption	W <sub>BL</sub>	-	-	-	W	
Luminance(cd/m <sup>2</sup> )	L	850	<b>1000</b>	-	nit	
LED Life-Time	N/A	30,000	-	-	Hours	Ta=25°C Note 1

Note 1:LED lifetime is defined as the module brightness decay 50% of original brightness at Ta=25 degree, typical current.

Note 2:LED circuit :

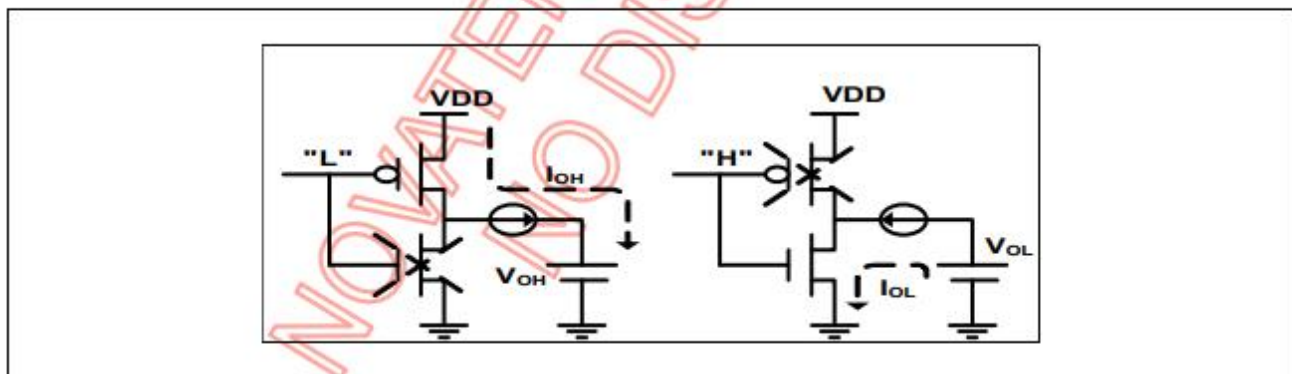


### 3.2 DC Electrical Characteristics

(VCC = 2.5V, VMM = 1.1V, TA = 25°C, unless otherwise noted)

Recommended Operating Conditions						
Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
LVDD_25 VCCIO_25 VCCTX_25	Supply Voltage	2.25	2.5	2.75	V	For 2.5V application case
VCC_11 VMM_11 VCCTX_11	Supply voltage	1.0	1.1	1.2	V	
$\Delta$ VMM	Supply power noise			100	mV	

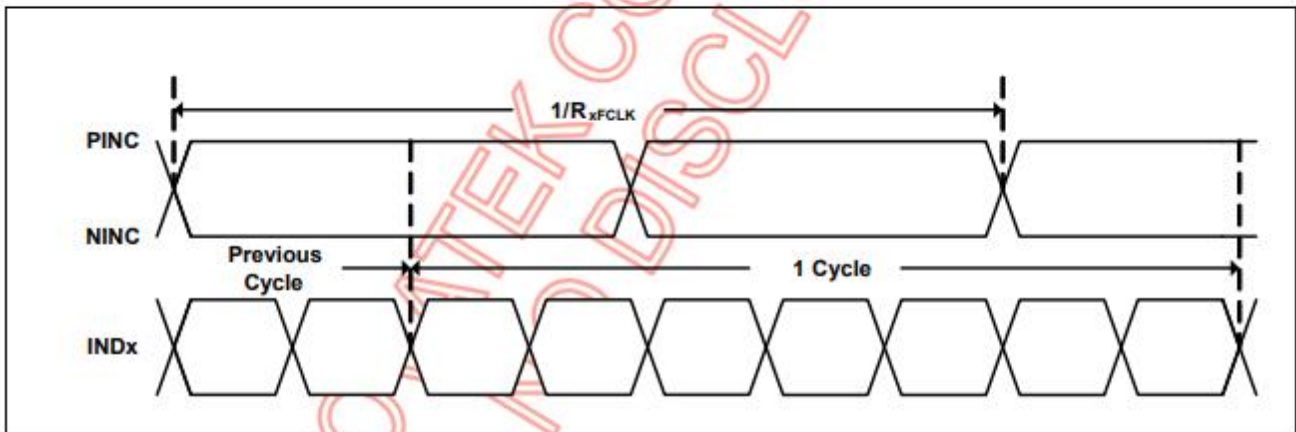
Output Control Signals						
Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
<b>V<sub>OH</sub></b>	High-level output voltage	1.9			V	VCCIO_25=2.5V @ I <sub>OH</sub> = -3mA(E4E2=01)
<b>V<sub>OL</sub></b>	Low-level output voltage			0.4	V	VCCIO_25=2.5V @ I <sub>OL</sub> = 3mA(E4E2=00)

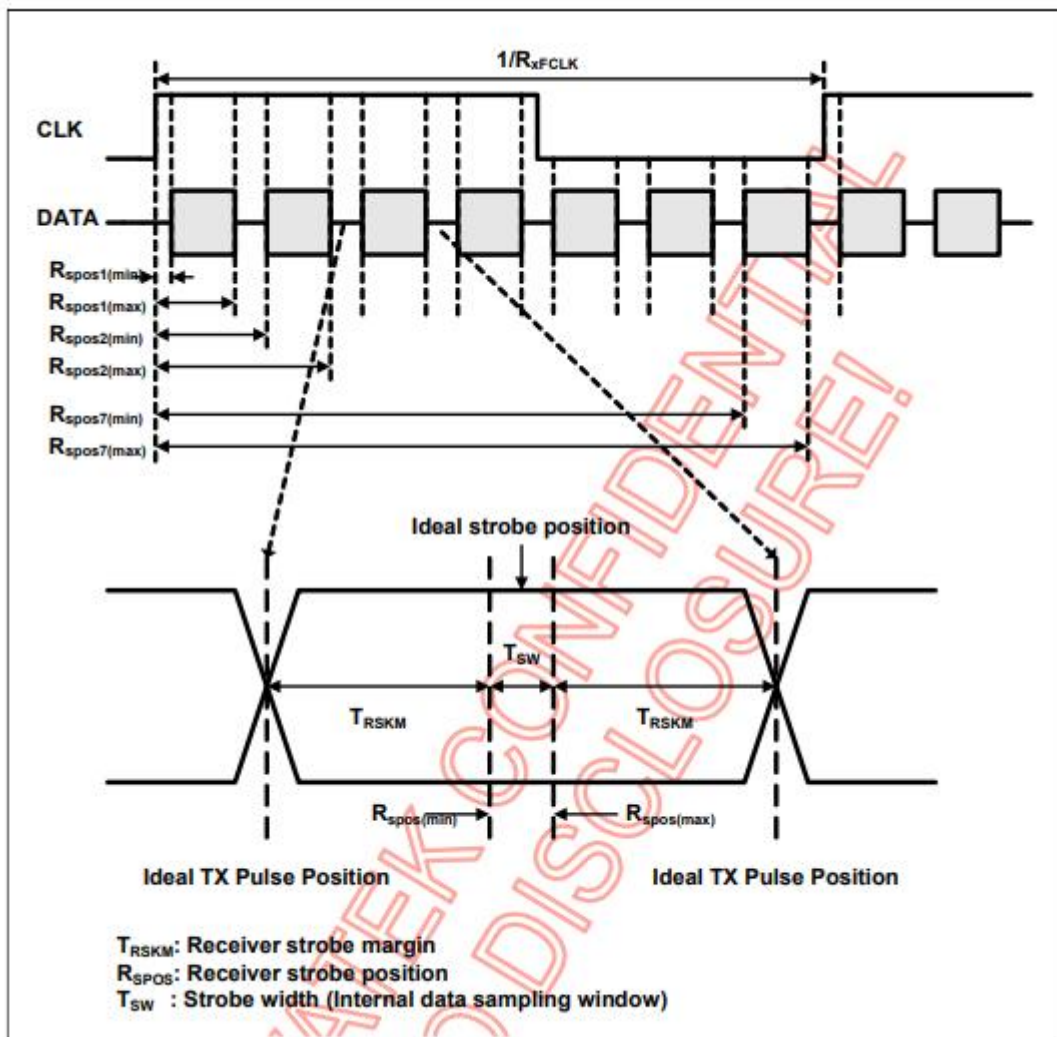


### 3.3 AC Electrical Characteristics

(VDD = 2.5V, TA = 25 degrees, unless otherwise noted)

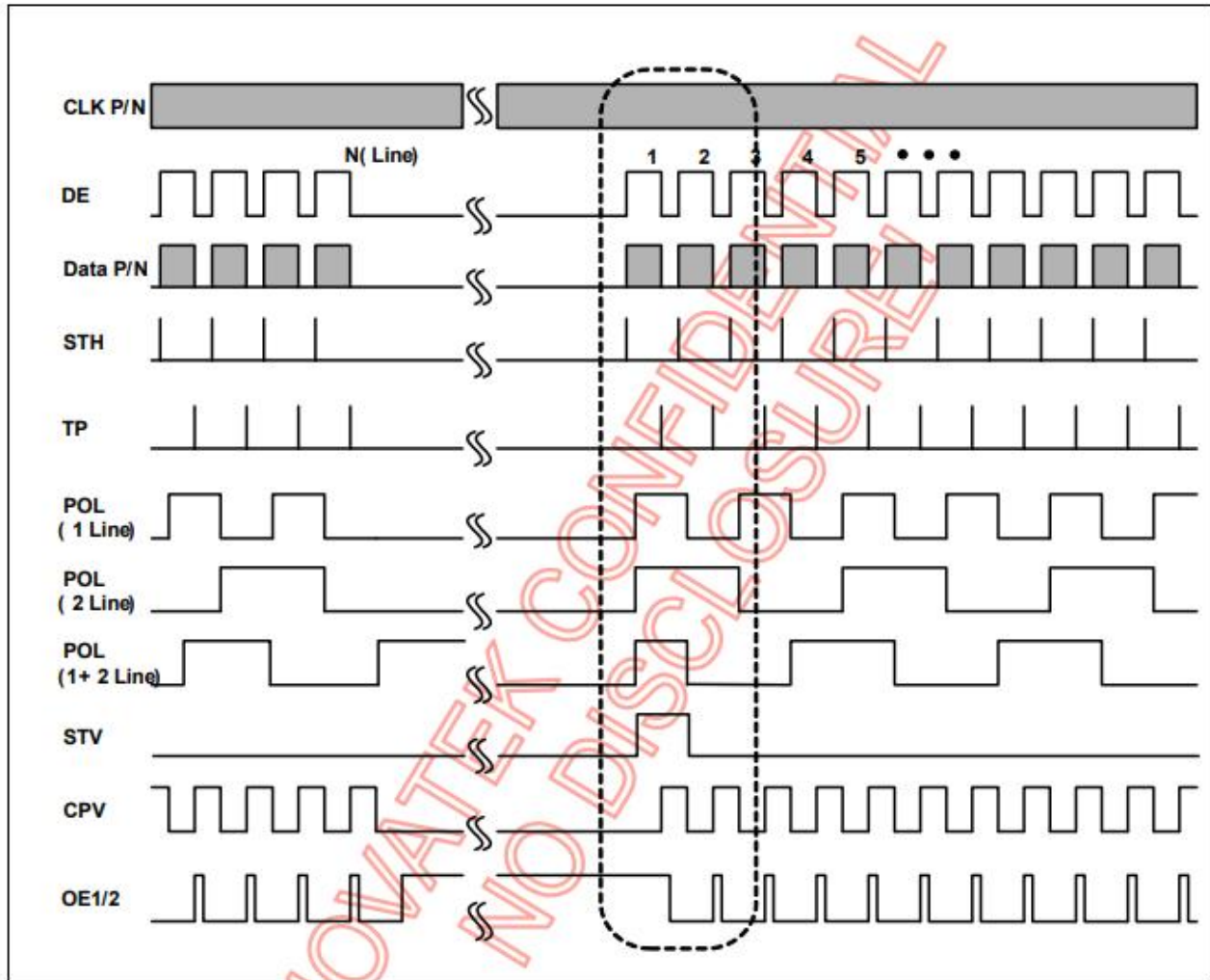
LVDS Receiver Differential Input						
Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
<b>R<sub>x</sub>FCLK</b>	Clock frequency	20		120	MHz	
<b>T<sub>RSKM</sub></b>	Input data skew margin	-350		+350	ps	<b>120Mhz for 2Port only</b> LVDD_25=2.5V Rxcclk= <b>120M</b> VID=400mV RXVCM=1.2V
		-380		+380	ps	LVDD_25=2.5V Rxcclk=100M VID=400mV RXVCM=1.2V
<b>F<sub>MODU</sub></b>	Input LVDS Signal Modulation Frequency	30		300	KHz	
<b>R<sub>MODU</sub></b>	Input LVDS Signal Modulation Range			+/-3	%	





## 4. Timing

### 4.1 Data Input Format for LVDS



## 4.2 Input Timing Characteristics

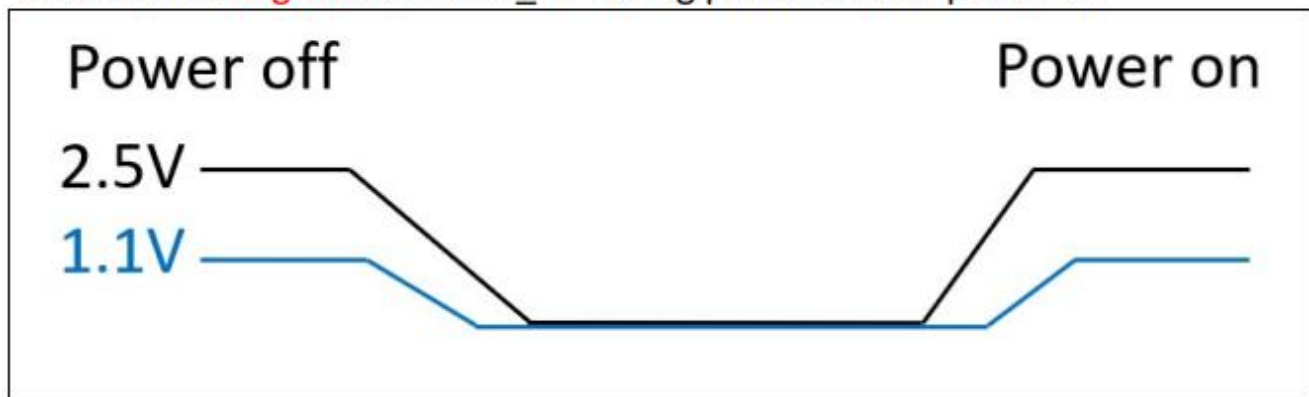
ITEM	Symbol	Min.	Typ.	Max.	Unit
Clock frequency	F <sub>DCLK</sub>	138	150	165	MHz
Horizontal period area	T <sub>H</sub>	2200	2240	2280	DCLK
Horizontal display area	T <sub>HD</sub>	1920	1920	1920	DCLK
Horizontal blanking area	T <sub>HB</sub>	280	320	360	DCLK
Vertical period area	T <sub>V</sub>	1110	1115	1120	T <sub>H</sub>
Vertical display area	T <sub>VD</sub>	1080	1080	1080	T <sub>H</sub>
Vertical blanking area	T <sub>VB</sub>	30	35	40	T <sub>H</sub>
Frame rate	F <sub>R</sub>	55	60	65	Hz

## 4.3 Internal VCO OSC timing Specification

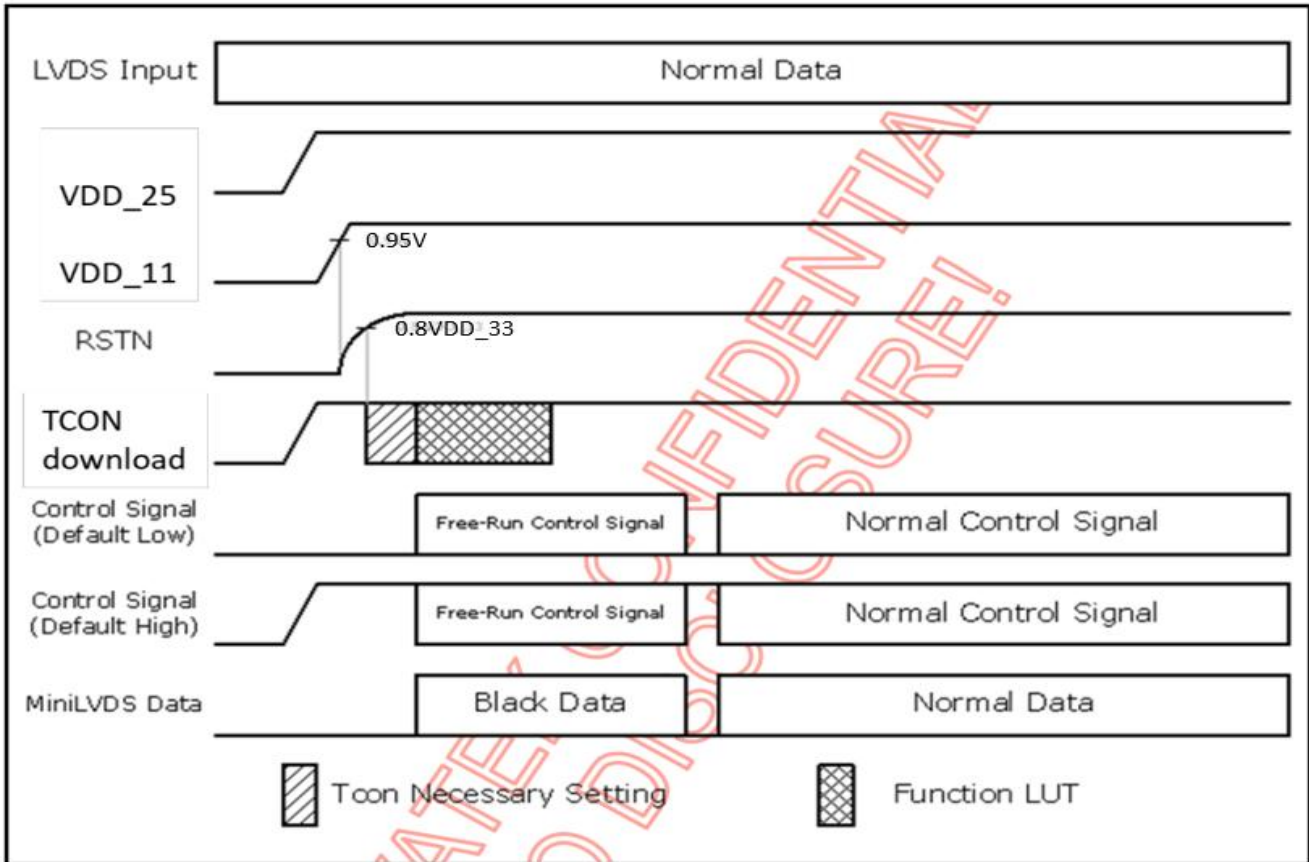
Internal Built-in Oscillator						
Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
fosc	Internal oscillator frequency	91.2	96	100.8	MHz	+/-5% 0~85 degrees With thermal compensation

## 4.4 Power on/off Timing

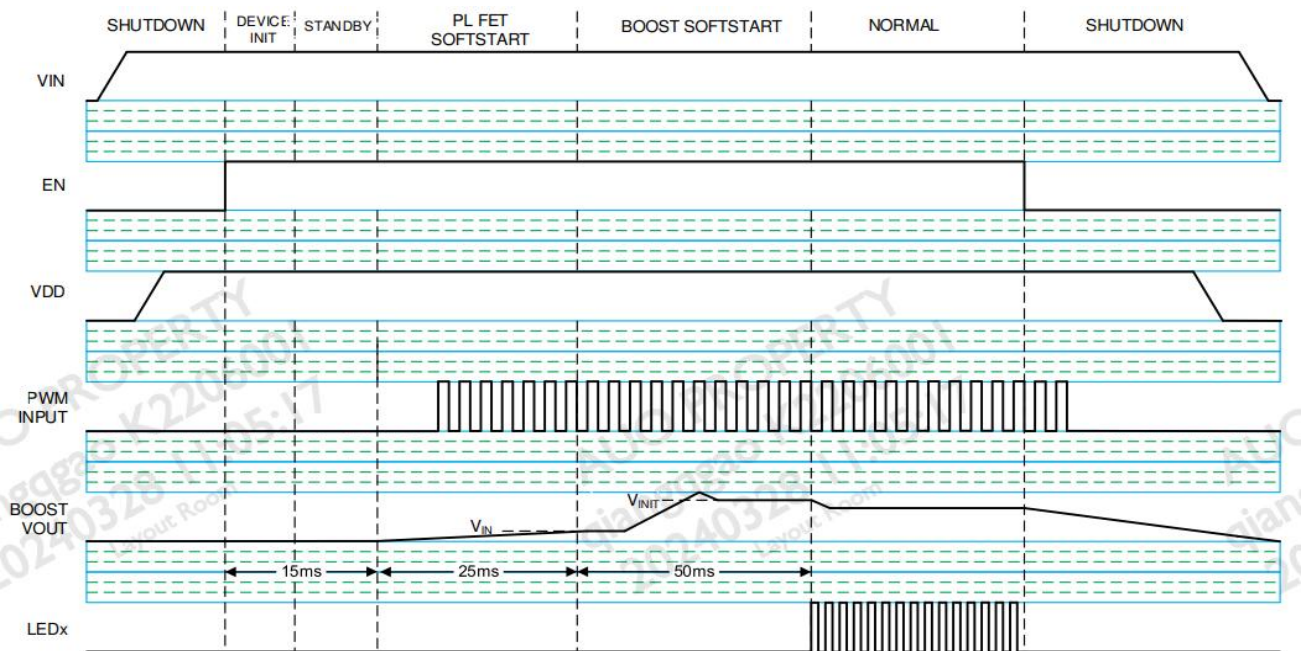
VDD25 must **higher** than VDD\_11 during power on and power off



## 4.5 Power on Sequence



## 4.6 LED Driver IC Power on Sequence



## 4.7 Optical Specification

All optical specification is measured under typical condition (Note 1, 2)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time	Tr+Tf	$\theta=0^\circ$	--	25	30	ms	Note 3
Contrast ratio	CR	$\theta=0^\circ$	700	800	--	--	Note 4
NTSC	%	$\theta=0^\circ$	67%	72%	--	%	C-light
Viewing Angle	Top	$CR \geq 10$	80	85	--	deg.	Note 5
	Bottom						
	Left						
	Right						
Transmittance	Tr	$\theta=0^\circ$	2.79%	3.17%	--	%	w/o APCF & Haze @ PS06W12 V3 (Silicate)
Chromaticity	White	X	$\theta=0^\circ$	0.270	0.300	0.330	@C-Light Note 6
		Y	$\theta=0^\circ$	0.300	0.330	0.360	
	Red	X	$\theta=0^\circ$	0.631	0.661	0.691	
		Y	$\theta=0^\circ$	0.290	0.320	0.350	
	Green	X	$\theta=0^\circ$	0.230	0.260	0.290	
		Y	$\theta=0^\circ$	0.555	0.585	0.615	
	Blue	X	$\theta=0^\circ$	0.109	0.139	0.169	
		Y	$\theta=0^\circ$	0.049	0.079	0.109	

Remark: *Above table, all Values are simulated only. AUO will amend the data, when the actual Products output*

Note 1: Measurement should be performed in the dark room, optical ambient temperature = 25° C

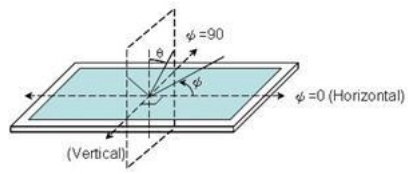
Note 2: To be measured on the center area of panel with a field angle of 1° by Topcon luminance meter BM-5, or SR3 or DMS-803 after 10 minutes operation.

Note 3: The Optical features are based on emissive spectrum of the reference light source by CIE1931C-light. The LCD spectrum of transmission must be verified with the reference light-source to achieve the specified optical characteristics.

Note 4: Contrast ratio is calculated with the following formula.

Contrast ratio =  $\frac{\text{Photo detector output when LCD is at " White" state}}{\text{Photo detector output when LCD is at " Black" state}}$

Note 5. Definition of viewing angle: refer to figure as below (FPC direction is at  $\psi=90$ ).



Note 6. The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

## 5. Interface Pin Assignment

### 5.1 LCM Pin Assignment

Recommended connector: I-PEX, 20455-040E-76B

Pin no	Symbol	Description	Remark
1	LED_VCC	LED Power Supply, 12V(typical)	
2	LED_VCC	LED Power Supply, 12V(typical)	
3	LED_VCC	LED Power Supply, 12V(typical)	
4	LED_VCC	LED Power Supply, 12V(typical)	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	LED_EN	LED Enable	LED driver H: Enable L: Disable
10	LED_PWM	LED PWM Control	Note 1
11	LCD_VCC	LCD Power Supply, 3.3V(typical)	
12	LCD_VCC	LCD Power Supply, 3.3V(typical)	
13	LCD_VCC	LCD Power Supply, 3.3V(typical)	
14	NC	No Connection	
15	NC	No Connection	
16	NC	No Connection	
17	GND	Ground	
18	RX00-	-LVDS differential data input	
19	RX00+	+LVDS differential data input	
20	RX01-	-LVDS differential data input	
21	RX01+	+LVDS differential data input	
22	RX02-	-LVDS differential data input	
23	RX02+	+LVDS differential data input	
24	GND	Ground	
25	RX0C-	-LVDS differential clock input	
26	RX0C+	+LVDS differential clock input	
27	GND	Ground	
28	RX03-	-LVDS differential data input	
29	RX03+	+LVDS differential data input	
30	RXE0-	-LVDS differential data input	
31	RXE0+	+LVDS differential data input	
32	RXE1-	-LVDS differential data input	
33	RXE1+	+LVDS differential data input	
34	GND	Ground	
35	RXE2-	-LVDS differential data input	
36	RXE2+	+LVDS differential data input	
37	RXEC-	-LVDS differential clock input	
38	RXEC+	+LVDS differential clock input	
39	RXE3-	-LVDS differential data input	
40	RXE3+	+LVDS differential data input	

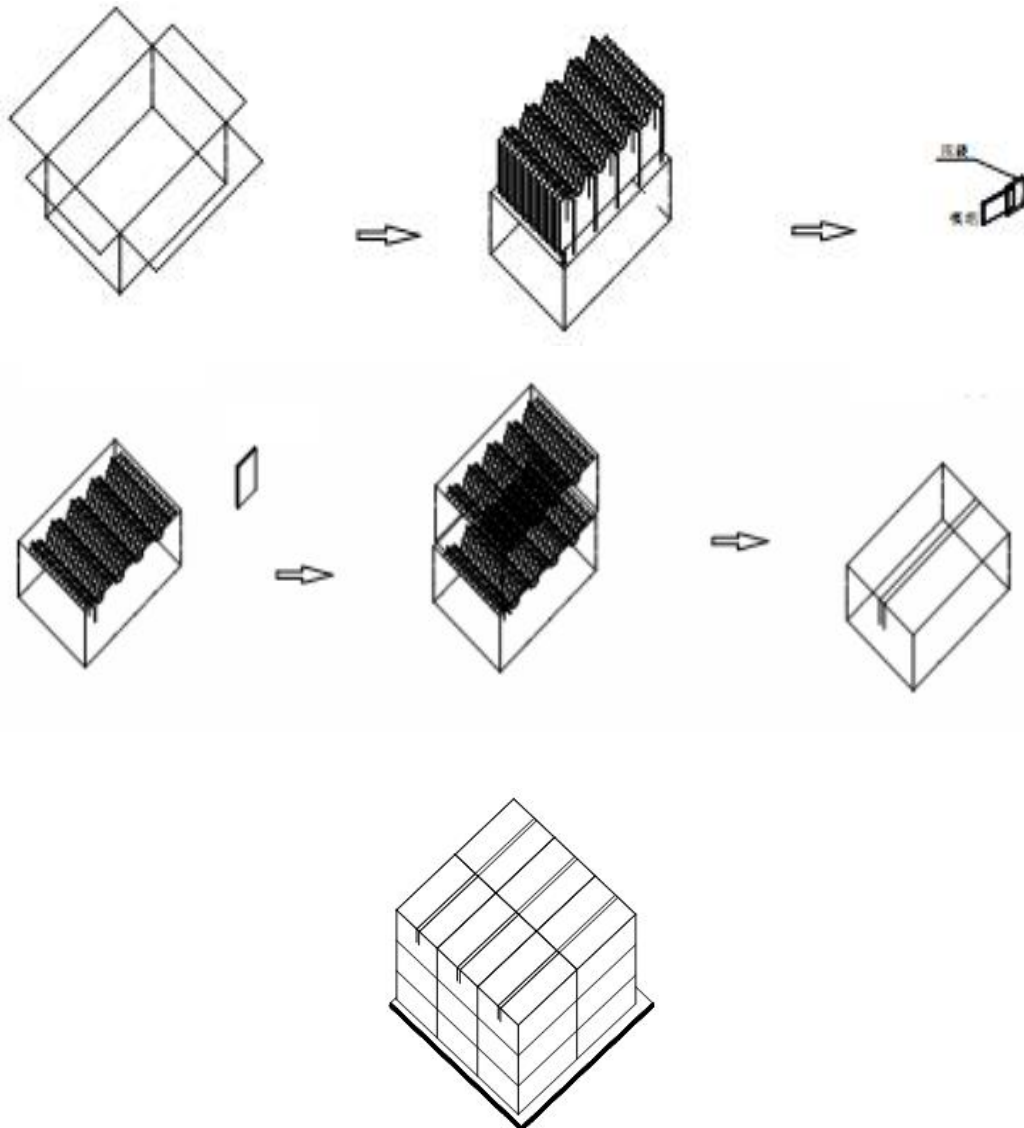
Note1: Refer to TI LP8866SQDCPRQ1 PWM control signal setting for Hybrid dimming mode with 19531Hz PWM frequency.





## 8. Packing

### Packing Method



#### Steps:

1. Put module into tray cavity
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above
4. Fix the cardboard to the tray stack with adhesive tape
5. Put the tray stack into carton
6. Carton sealing with adhesive tape

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## 9. Precautions for Use of LCD modules

### 9.1 Handling Precautions

9.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

9.1.2. If the display panel is damaged and the liquid crystal substance inside it 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.

9.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

9.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

9.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketene
- Aromatic solvents

9.1.6. Do not attempt to disassemble the LCD Module.

9.1.7. If the logic circuit power is off, do not apply the input signals.

9.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

9.1.8.1. Be sure to ground the body when handling the LCD Modules.

9.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

9.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

9.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

### 9.2 Storage Precautions

9.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

9.2.2. The LCD modules should be stored under the storage temperature range if the LCD modules will be stored for a long time, the recommend condition is :

Temperature : 0°C ~40°C    Relatively humidity: ≤80%

9.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

### 9.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.