Specification
For
Approval

□Preliminary specification
■Final specification

Title	16.2YU ADS TFT-LCD (TLCM)

Buyer	
Model	

Supplier	Cheng Du BOE Optoelectronics Technology CO., LTD
Model	AV162YUT-A10

SIGNATURE	DATE
CHZ HAZ	2019.7.31

Customer

SIGNATURE	DATE

BOE CHENG DU
Optoelectronics Technology CO., LTD

CONTENT LIST

Record of Revisions				
Revision	Date	Page	Description	Released by
Rev.0	2019.07.01		Initial Released	LIUHUI

1.0 GENERAL DESCRIPTION

1.1 Introduction

AV162YUT-A10 module is a color active matrix TFT-LCD Panel using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This model is composed of a TFT-LCD Panel, a driving circuit (Note1) and a back light system. It is a transmissive type display operating in the normal black. This TFT-LCD has a 16.2 inch diagonally measured active area with resolutions 2608 horizontal by 720 vertical pixel array. Each pixel is divided into Red, Green, Blue dots which are arranged in 2 domain stripe and this panel can display 16.7M colors.

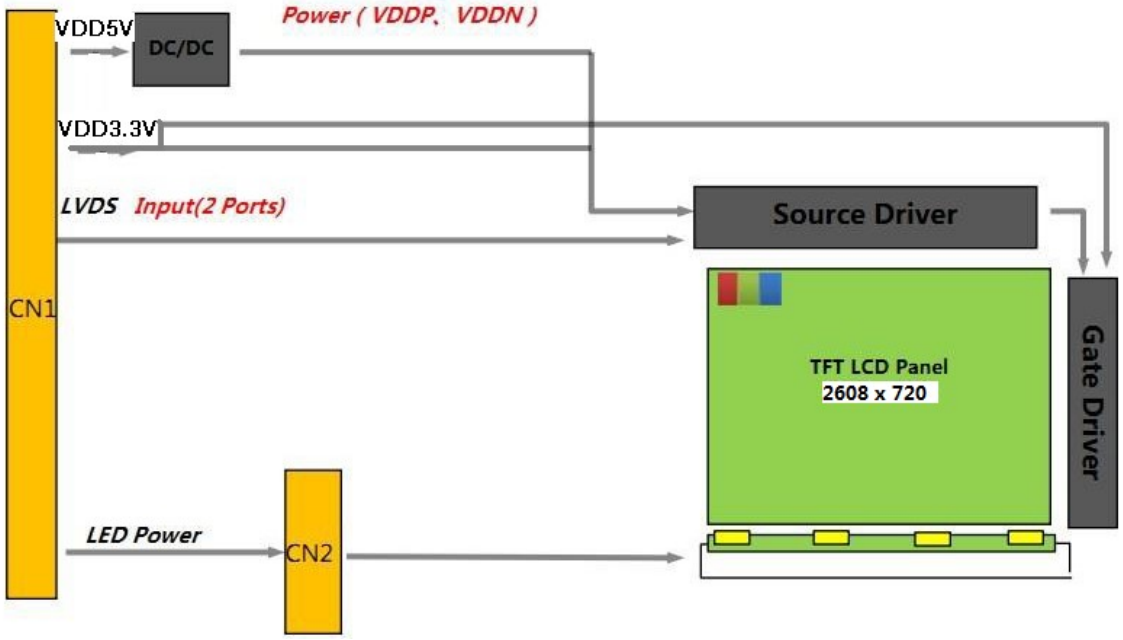


Figure 1: Function Diagram

1.2 Features

- 0.5t Glass (Single)
- Thin and light weight
- High luminance and contrast ratio, low reflection and wide viewing angle
- Module Design
- The source driving IC HX8240 can support the LVDS interface
- Mutual Type Projected Capacitive Touch Panel (with Synaptics S7885 controller)
- TP Logic voltage (TP_VDD): 3.3V
- AGAF surface coating on Gorilla Cover Lens

1.3 Application

- Automotive

1.4 General Specifications

The followings are general specifications at the model. (listed in Table 1.)

Table 1: General Specifications

Item	specification	Unit	Remarks
Display Size	16.2	Inch	
TFT Technology Type	a-Si		
Liquid Crystal Alignment Method	IPS or equivalence		
Display mode	Transmissive		
Active area(WxH)	396.6768 x109.512	mm	
Resolution	2608(W)xRGBx720(H)		
Pixel pitch(WxH)	0.1521x0.1521	mm	
Viewing area(WxH)	398.5 x111.3	Mm	Lens window
LCM Module Size	413.0±0.5(W) x 131.5±0.5(H) x 8.0±0.3(D)	mm	CPK>1.67 with W and H only
Driver IC	HX8240*4+HX8695*1		
Color depth	16.7M colors		
Brightness(cd/m^2)	Min:700 typ:850 TP surface	cd/m^2	9 point average
NTSC	Typ.80%		
Uniformity	Typ.80%		
Life time	Min50,000h to 50%		Ta=25°C
LCD power consumption	PNL:1.764W BLU:12.96W TYP	W	
Contrast Ratio	Min:800:1 Typical:1000:1		
Viewing direction (Human eye)	U/D/L/R free viewing direction		Note 1, 2
Light Source	LED Backlight		
Interface	LVDS		
Vcom type	DC Vcom		
Driver Inversion type	1+2 Dot inversion		
Aperture Ratio	11:3		
Environmental Protection Requirement	RoHS & REACH must be executed		
Connection method	ZIF		
Surface treatment	Glare Hard Coating:3H		
Diagonal Stripes & Morie & L0 light leakage	5% ND film Invisible		Note 3

Storage temperature	-40 ~ 90	℃	
Operate temperature	-30 ~ 85	℃	

Table 2: General Specifications for TP

Item		Specifications	Unit
Projected capacitive Touch Panel	Cover Lens dimension	442.42(W) x 149.1 (H) x 1.3(D)	mm
	Cover Lens material	Gorilla Glass	-
	Sensor dimension	415.7(W) x 127.1(H) x 0.7(D)	mm
	Sensor material	Soda-lime glass (Float glass)	-
	Viewing area	399.5(W)x 112.3(H)	mm
	Black mask opening	398.5(W)x 111.3(H)	
	Active area	399.5(W)x 112.3(H)	
Cover Lens	Surface treatment	AGAF Coating	-
	Haze	5% (TYP)	%
	AF	>=110′	
Surface hardness		≥7 (JIS-K-5600 (750g))	H
CS		>=700	MPa
DOL		>=40	um
CT		<=67	MPa
B10		>=600	MPa
Backlight		White LED	-
OD		>=4	-
Weight		Apporx.1100	gram

Note:

1. At the U/D/L/R direction, the viewing angle is same;
2. The TFT and CF Align Direction;

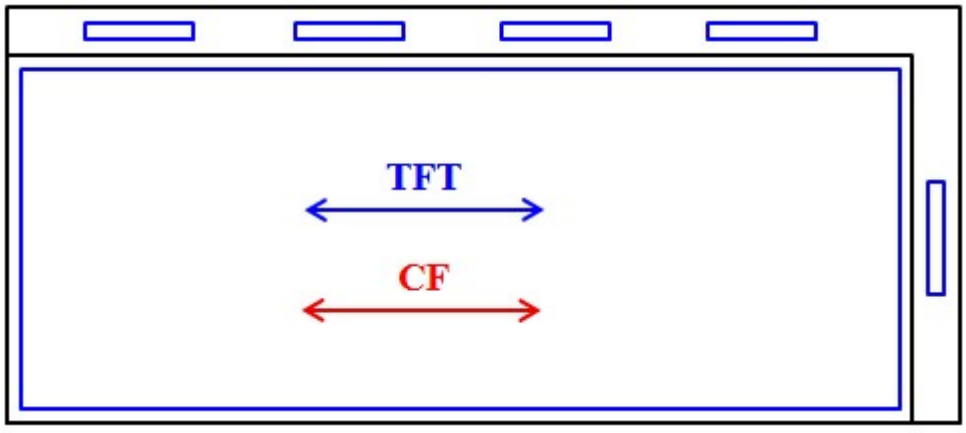
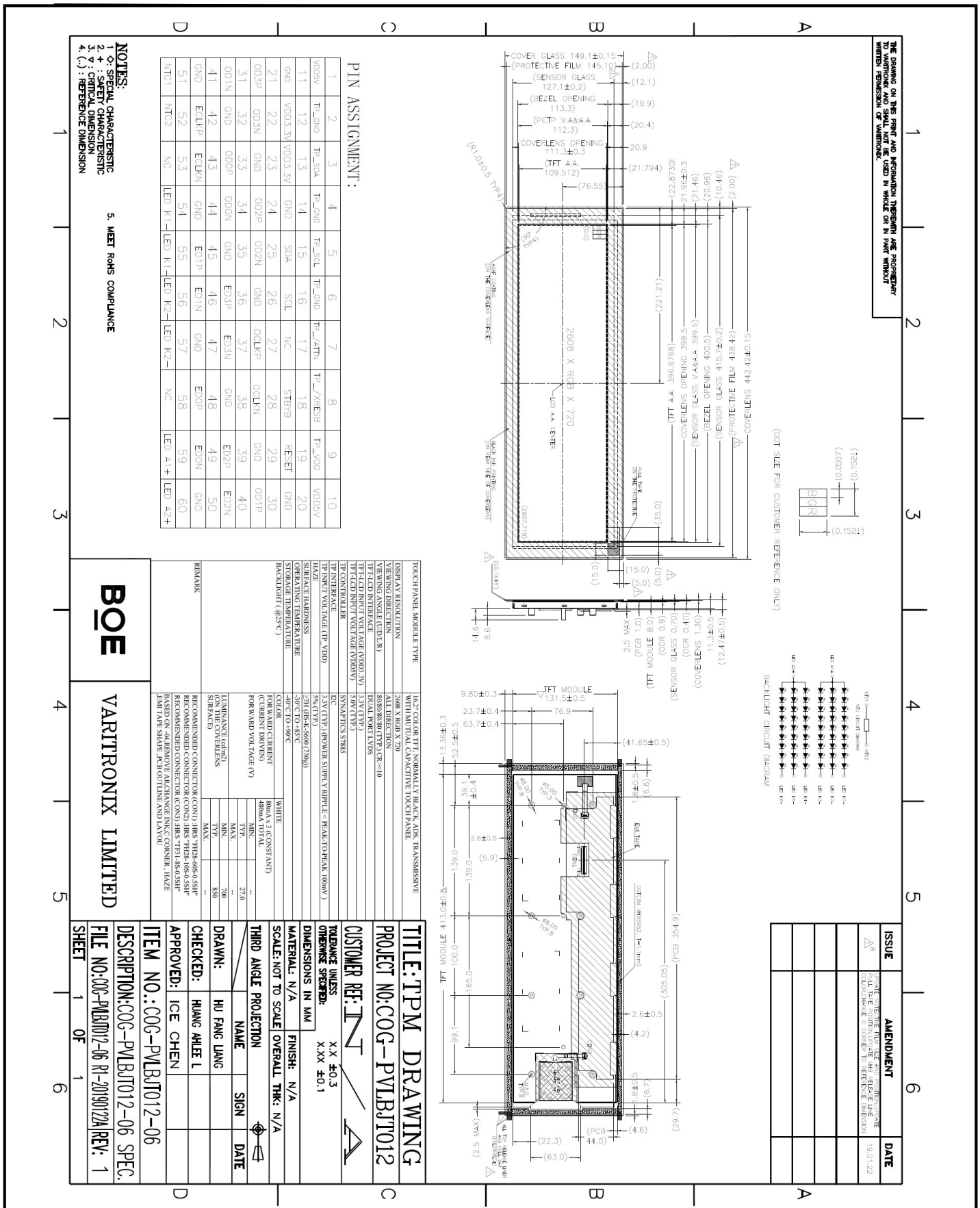


Figure 2: The TFT and CF Align Direction

3. Viewing distance: 50cm. Viewing angle: θ_L <45° , θ_R <45° , ψ_T<45°, ψ_B<45°



1	2	3	4	5	6	7	8	9	10
VDD5V	TP_GND	TP_SDA	TP_GND	TP_SCL	TP_GND	TP_ATN	TP_XRES	TP_VDD	VDD5V
11	12	13	14	15	16	17	18	19	20
GND	VDD3.3V	VDD3.3V	GND	SDA	SCL	NC	ST8YB	RESET	GND
21	22	23	24	25	26	27	28	29	30
OD3P	OD3N	GND	OD2P	OD2N	GND	OCLKP	OCLKN	GND	OD1P
31	32	33	34	35	36	37	38	39	40
OD1N	GND	OD0P	OD0N	GND	ED3P	ED3N	GND	ED2P	ED2N
41	42	43	44	45	46	47	48	49	50
GND	EDLKP	EDLKN	GND	ED1P	ED1N	GND	ED0P	EDDN	GND
51	52	53	54	55	56	57	58	59	60
NTC1	NTC2	NC	LED K1-	LED K1+	LED K2-	LED K2+	NC	LED A1+	LED A2+

Figure 3: Outline Dimension (unit: mm)

2.0 Touch Panel Characteristics

Table 3: Touch panel features

Item	Contents	Unit
Type	Mutual type projected capacitive touch panel	-
Interface	I2C (Up to 400kbits/sec)	-
Function	Provide (X, Y) coordinates and number of touch points	-
No. of touch	10 touch	-
Pattern pitch	X pattern pitch 6.15 Y pattern pitch 5.91	mm
Sensing area	Ø8 (Typ.) finger touch	mm
Accuracy	<=1.5@center; <=2.0@edge by Φ8	mm
Linearity	<=1.5@center; <=2.0@edge by Φ8	mm
Jittering	<=0.5@center; <=0.5@edge by Φ8	mm
Finger Seperation	<13	mm
Latecy	<35	ms
Refresh rate or Report rate	101(typ)	Hz
Signal-to-Noise ratio (SNR) (Note 1)	20(min)	dB
Glove compatible	Yes	-
Wet surface compatible	Yes	-
Touch Orientation	1920 x 720	-
Input mode	Finger	-
Durability	100k touches	-

Note 1: Test should apply with cover glass.

Note 2: Durability is guaranteed with functional (Test is conduct after the durability test).

3. Interface Connection

3.1 The LCD Module Electrical Interface Connection

The Recommended connector is FH28-60S-0.5SH
The connector interface pin assignments are listed in Table 9.

Table 4(a): Pin Assignments for the LCD Connector

Pin No.	Symbol	I/O	Description	Remark
1	VDD5V	P	Power PIN	5V typ.
2	TP_GND	P	TP_Ground	
3	TP_SDA	I/O	TP_II2C interface data bus	3.3V typ.
4	TP_GND	P	TP_Ground	
5	TP_SCL	I	TP_ II2C interface clock	3.3V typ.
6	TP_GND	P	TP_Ground	
7	TP_/ATTN	O	TP Interrupt output pin	3.3V typ.
8	TP_/XRESB	I	TP_Reset Pin	L: reset H: Normal
9	TP_VDD	P	TP Power PIN(3.3V)	Power supply ripple
10	VDD5V	P	Power PIN	5V typ.
11	GND	P	Ground	
12	VDD3.3V	P	Power PIN	3.3V typ.
13	VDD3.3V	P	Power PIN	3.3V typ.
14	GND	P	Ground	
15	SDA	I/O	I2C interface data bus	
16	SCL	I	I2C interface clock	
17	NC	-	Dummy	
18	STBYB	I	Standby Pin	L: Standby H: Normal
19	RESET	I	Reset Pin	L: reset H: Normal
20	GND	P	Ground	
21	OD3P	I	Odd Data channel 3 +	
22	OD3N	I	Odd Data channel 3 -	
23	GND	P	Ground	
24	OD2P	I	Odd Data channel 2 +	
25	OD2N	I	Odd Data channel 2 -	
26	GND	P	Ground	
27	OCLKP	I	Odd Clock channel +	
28	OCLKN	I	Odd Clock channel -	
29	GND	P	Ground	

30	OD1P	I	Odd Data channel 1 +	

Table 4(b): Pin Assignments for the LCD Connector

31	OD1N	I	Odd Data channel 1 -	
32	GND	P	Ground	
33	OD0P	I	Odd Data channel 0 +	
34	OD0N	I	Odd Data channel 0 -	
35	GND	P	Ground	
36	ED3P	I	Even Data channel 3 +	
37	ED3N	I	Even Data channel 3 -	
38	GND	P	Ground	
39	ED2P	I	Even Data channel 2 +	
40	ED2N	I	Even Data channel 2 -	
41	GND	P	Ground	
42	ECLKP	I	Even Clock channel +	
43	ECLKN	I	Even Clock channel -	
44	GND	P	Ground	
45	ED1P	I	Even Data channel 1 +	
46	ED1N	I	Even Data channel 1 -	
47	GND	P	Ground	
48	ED0P	I	Even Data channel 0 +	
49	ED0N	I	Even Data channel 0 -	
50	GND	P	Ground	
51	NTC1	C	NTC thermistor terminal	
52	NTC2	C	NTC thermistor terminal	
53	NC	-	Dummy	
54	LED K1-	P	Cathode1	
55	LED K1-	P	Cathode1	
56	LED K2-	P	Cathode2	
57	LED K2-	P	Cathode2	
58	NC	-	Dummy	
59	LED A1+	P	Anode 1	
60	LED A2+	P	Anode 2	

Remarks: For I/O, "I" is Input, "O" is Output. "P" is for Power, and "C" is for passive

4. Absolute Maximum Ratings

The absolute maximum ratings are list on table as follows. When used out of the absolute maximum ratings, the LSI may be permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the LSI will malfunction and cause poor reliability.

Table 5: Absolute Maximum Ratings & Environmental Conditions

Item	Symbol	Min.	Max.	Unit
Power Supply voltage	VDD3.3V	-0.3	+3.96	V
Power Supply voltage	VDD5V	-0.3	+6	V
Single LED forward current	IF	-	150	mA
Total LED forward current	IF (Total)	-	900	mA
Relative Humidity (at 60°C, Note 3)	RH		90	%
Operating Temperature (Note 2)	Topr	-30	+85	°C
Storage Temperature	Tstg	-40	+90	°C

Note 1: GND=VSS=0V.
Note 2: Panel surface temperature should not exceed 85°C.
Note 3: No condensation allowed under any condition.
Note 4: No performance guarantee below -30 °C

[Caution]
Do not display fixed pattern for prolonged hours because it may develop image sticking on the display.

5.0 Electrical Specifications

5.1 TFT-LCD Module DC Characteristics

Table 6: Electrical specifications

Parameter	Symbol	values			Unit	Notes
		Min	Typ	Max		
Power Supply Voltage	VDD3.3V	3.15	3.3	3.45	V	Note 1
Power Supply Voltage	VDD5V	4.8	5	5.2	V	
Power Supply Current	IVDD3.3V	-	80	120	mA	
Power Supply Current	IVDD5V	-	100	150	mA	
Back-light Power Supply Voltage	VLED	23.4	27	31.5	V	
Back-light Power Supply Current	ILED	-	480		mA	
Power Consumption	PD	-	0.764	1.194	W	Note 2
	OBL		12.96	15.12	W	
	Ptotal	-	13.724	16.314	W	

Notes:
1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDD=3.3V 60Hz at 25℃
a) Typ: Window XP pattern
b) Max: Skip 2 dot 255 pattern
2. Frame rate=60HZ, Typ. Pattern: White pattern 25℃.

5.2 LVDS DC Characteristics

Table 7: LVDS DC Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Differential input high threshold voltage	Vth	VCM=1.2V	-	-	+0.1	V
Differential input low threshold voltage	Vtl		-0.1	-	-	V
Differential input common mode voltage	VCM		1	1.2	1.7-|Vid|/2	V
LVDS input voltage	VINLV		0.7	-	1.7	V
Differential input voltage	|Vid|		0.1	-	0.6	V

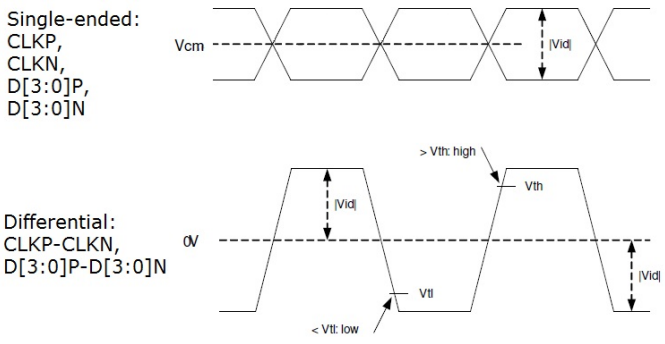


Figure 4: LVDS DC character

5.3 Typical Electrical Characteristics for Touch Panel

At Ta = 25°C, TP_VDD =3.3V, TP_GND=0V.

Table 8: DC characteristics of touch panel

Parameter	Symbol	Min.	Typ.	Max.	Unit
Touch panel supply voltage (Note 1)	TP_VDD	3.2	3.3	3.4	V
Touch panel supply current (Note 1)	ITP_VDD	-	-	40	mA

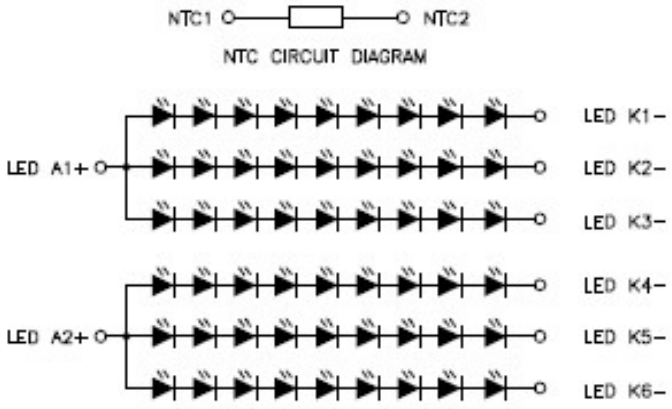
Note 1: Power supply ripple <Peak to Peak 100mV.

5.4 Backlight Driving Conditions

Table 9: LED Driving specifications

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Supply voltage of LED backlight	V_{LED}	Backlight current = 480 mA Number of LED dies = 54 pcs		27		V	Note 1
Supply current of LED backlight	$I_{LED1/6}$	Per LED string	-	80	-	mA	Note 2
Total Supply current of LED backlight	$I_{LEDTotal}$	$I_{LED1} + I_{LED2} + ...+ I_{LED6}$	-	480	-	mA	Note 2
Backlight Power Consumption	P_{LED}	-	-	12.96	-	W	Note 3
LED Life time	LIFE	Ta=25°C, ILED=80mA		50000		Hrs	Note 4

Note 1: Backlight Circuit Diagram



Note 2: The LED driving condition is defined for each LED module.
Total input current = 80 x 6= 480 mA

Note 3: Backlight power consumption is calculated by I_{LED} (Total) x V_{LED}

Note 4: The LED Life-time define as the estimated time to 50% of initial luminous

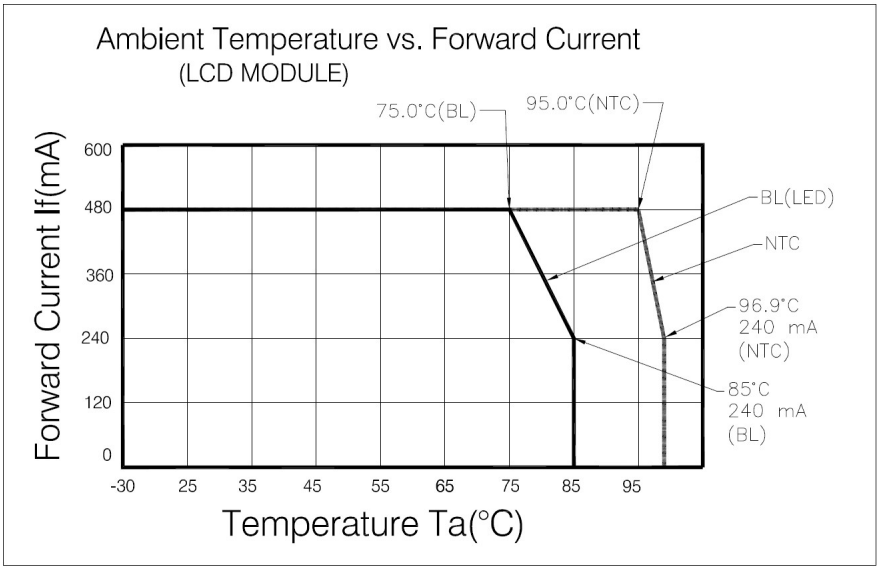


Figure 5: Backlight Driving Derating Curve

6 Signal Specification

1.1 LVDS AC electrical characteristics

Table 10: AC Characteristic of LVDS

Parameter	Symbol	Min.	Typ.	Max.	Unit
Clock frequency 1port	FLVCYC	15	-	110	MHz
Clock frequency 2port	TLVCYC	15		105	MHz
1 data bit time	UI		1/7		TLVCYC
Clock high time	TLVCH		4		UI
Clock low time	TLVCL		3		UI
Position 1	TPOS1	-0.2	0	0.2	UI
Position 0	TPOS0	0.8	1	1.2	UI
Position 6	TPOS6	1.8	2	2.2	UI
Position 5	TPOS5	2.8	3	3.2	UI
Position 4	TPOS4	3.8	4	4.2	UI
Position 3	TPOS3	4.8	5	5.2	UI
Position 2	TPOS2	5.8	6	6.2	UI
Input eye width	TEYEW	0.6			UI
Input eye border	TEX			0.2	UI
LVDS wake up time	TENLVDS			150	ms

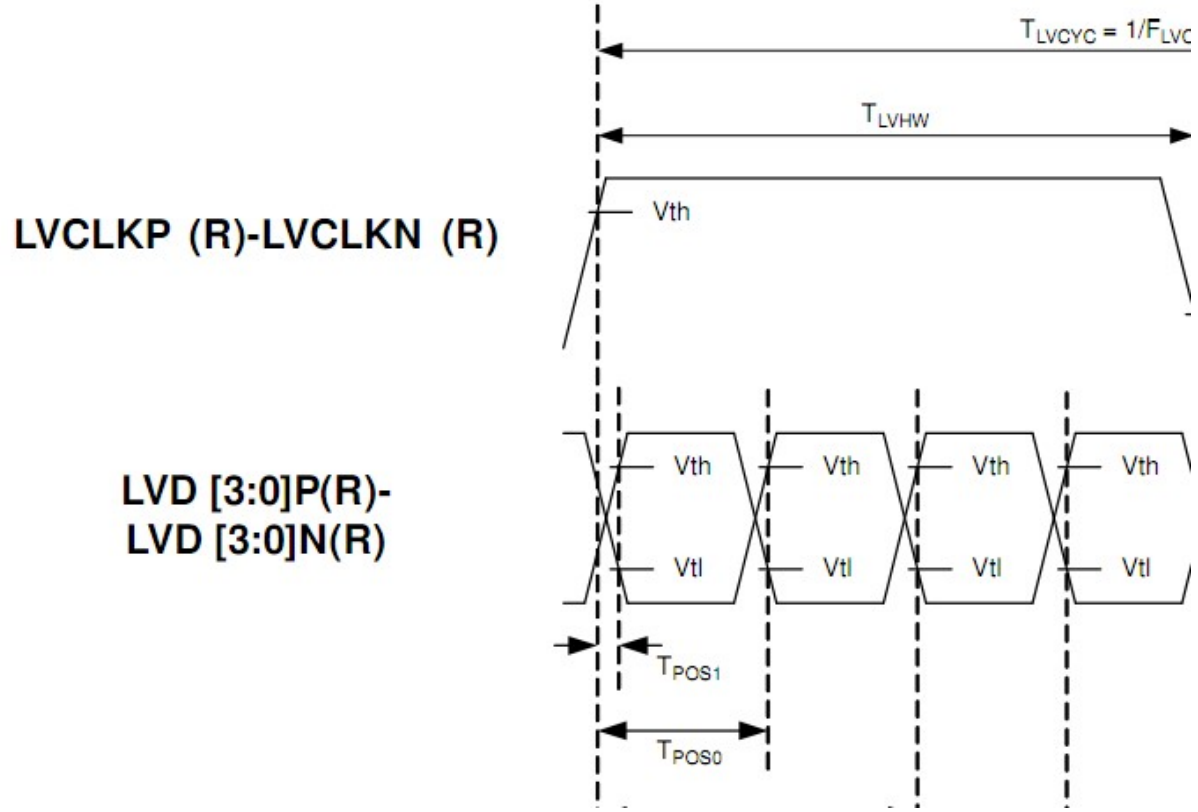
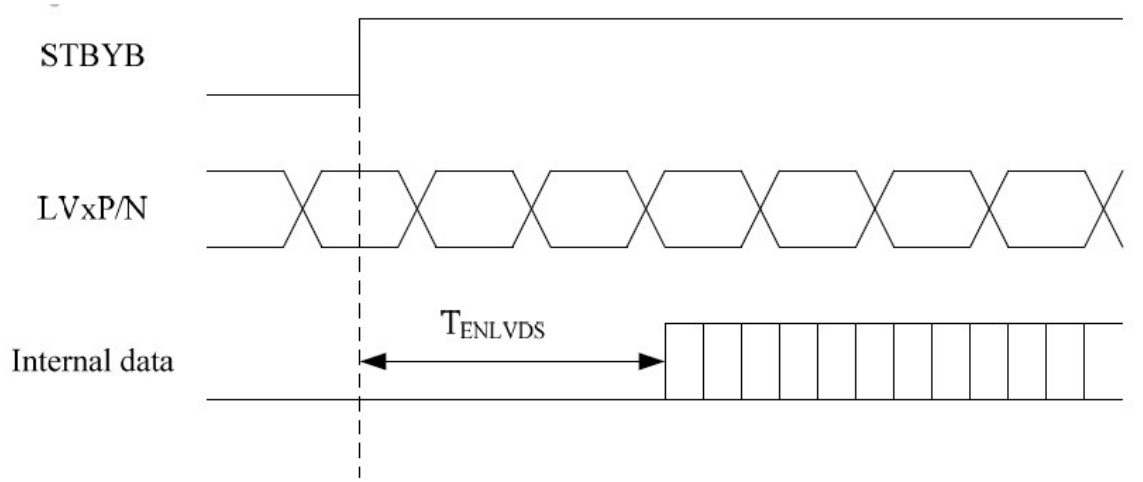
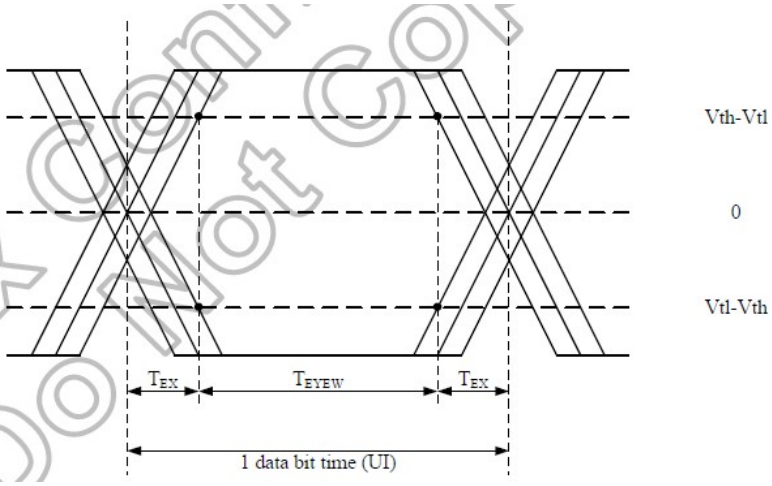


Figure 6: Signal Format



Differential:
LVD[3:0]P-LVD[3:0]N



Single-ended:
LVD[3:0]P,
LVD[3:0]N

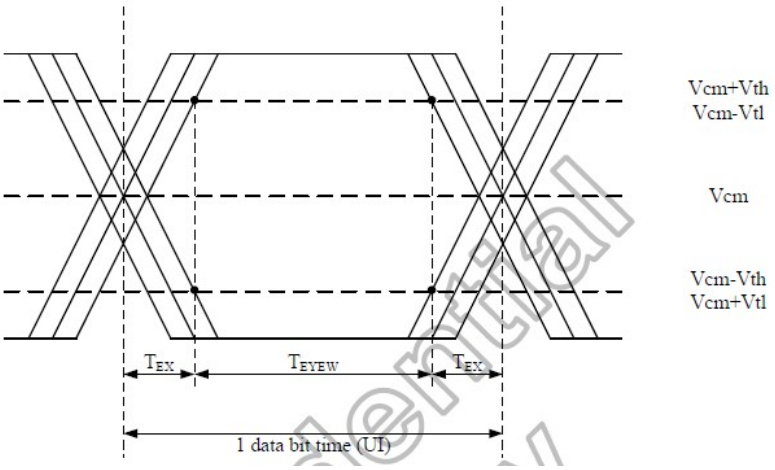


Figure 9

6.1.1 LVDS Input Format (VESA 8bit)

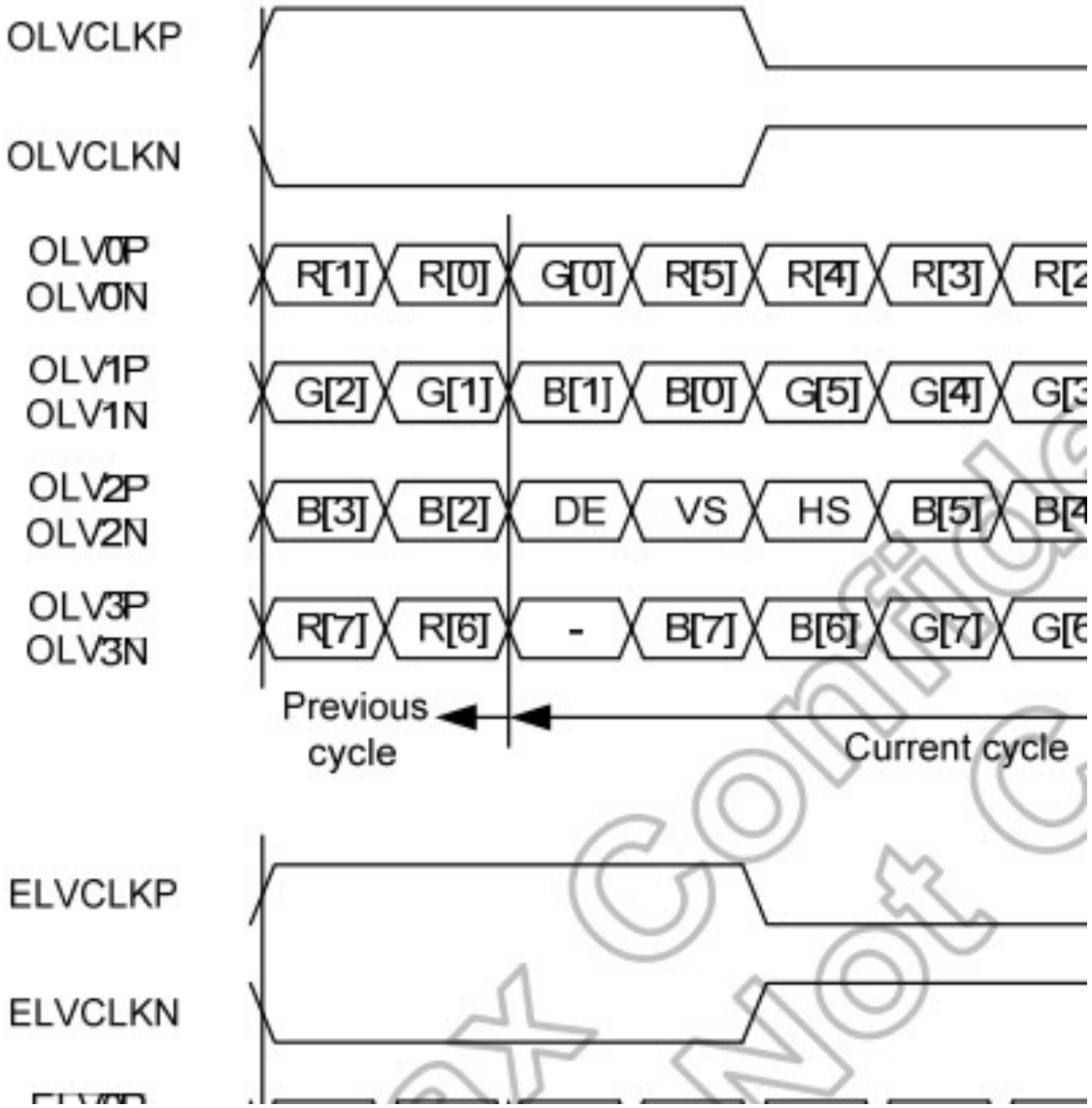
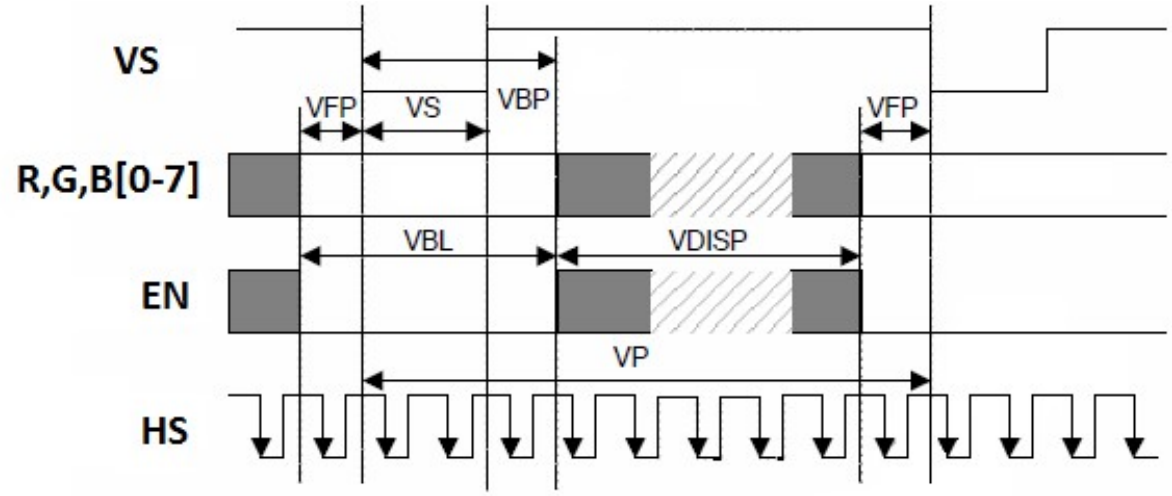


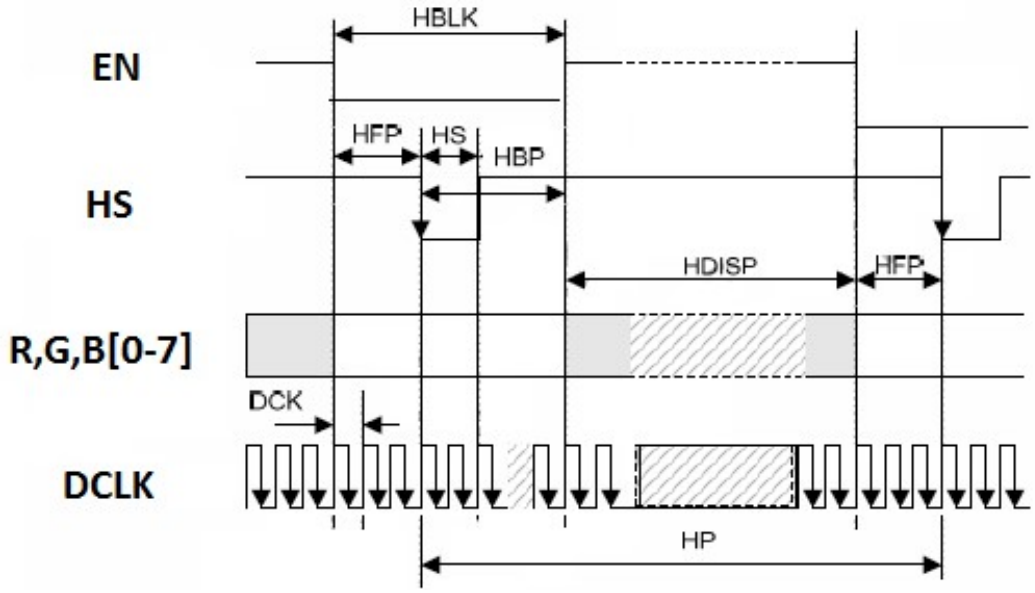
Figure 10: LVDS input data format (VESA format)

6.2 Video Signal Timing

Table 11: Video signal timing

Symbol	Parameter	Conditions	Related Pins	Min.	Typ.	Max.	Unit
VP	Vertical Total	-	VSYNC	728	760	1080	Line
VS	VSYNC Low Pulse Width	-	VSYNC	1	3	254	Line
VBP	Vertical Back Porch	-	VSYNC	2	24	255	Line
VFP	Vertical Front Porch	-	VSYNC	6	16		Line
VDISP	Vertical Active Area	-	VSYNC, HSYNC		720		Line
HP	Horizontal Total		HSYNC	1355	1376	4000	
HS	HSYNC Low Pulse Width	-	HSYNC	6	12	254	DCK
HBP	Horizontal Back Porch	-	HSYNC	7	16	255	DCK
HFP	Horizontal Front Porch	-	HSYNC	46	56		DCK
HDISP	Horizontal Active Area	-	HSYNC		1304		DCK
Fframe	Frame Frequency	-	CLK	-	60	-	Hz
fCLK	CLK frequency		CLK		62.75		MHz





6.3 SPI interface (3 wires)

SPI interface is used to read and write the setting registers of the TFT module.
All registers setting have been OTP in driver IC.
So no need to using the SPI to initialize module, just pull high SPI pins at customer's system side.
When write register, customer should write the same data to all source driver ICs .
ID[1:0]=0,1,2,3 correspond to Master IC, Slave IC1,Slave IC2,Slave IC3

9.2.8 I2C timing

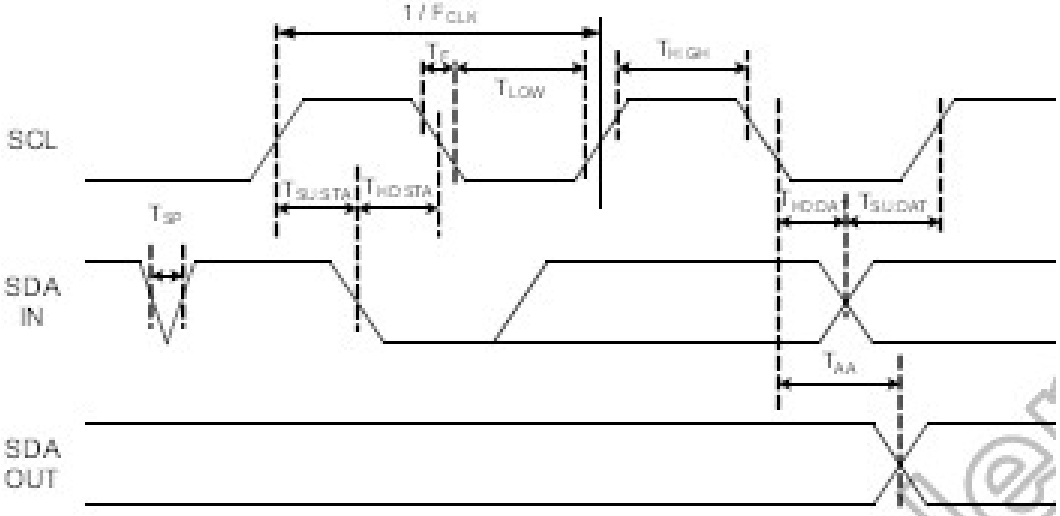


Figure 9.8: I2C signal timing

(VCC1=VCC1P=VCC2=VCCIF=3.0V to 3.6V, VSS1=VSS2=VSSA=0V, T_{OP}

Parameter	Symbol	Condition	M
Clock frequency	F_{CLK}	-	
Clock high time	T_{HIGH}	-	6
Clock low time	T_{LOW}	-	13
SDA and SCL rise time	T_R	-	
SDA and SCL fall time	T_F	-	
Start condition hold time	$T_{HD;STA}$	-	6

6.4 Reset Timing

Table 13

Symbol	Parameter	Min.	Typ.	Max.	Unit
tRW	Reset puls width	10(note1)	-	-	us
tRT	Reset complete time	-	-	5	us

tNNS	Negative spike noise width	-	-	100	ns

Note1: There is a RC filter on STB and RESET signal line. R=10K ohm , C=0.1uF.

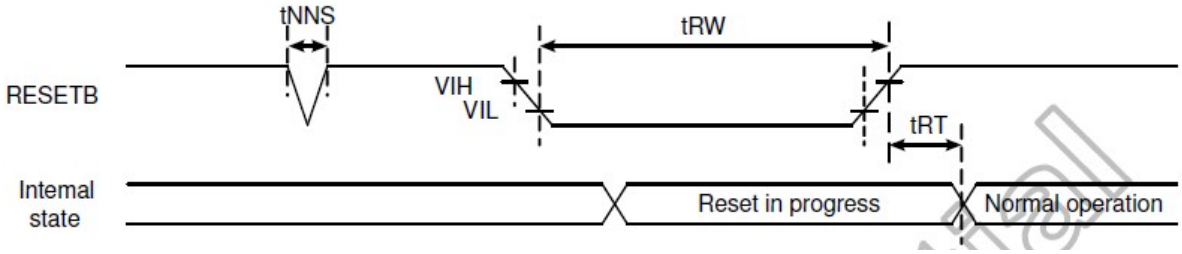


Figure 11

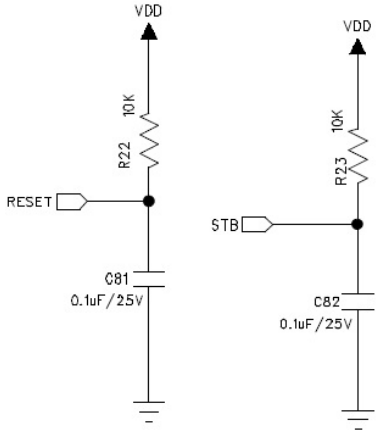


Figure 12

7. Power ON/OFF Sequence

7.1 TFT Power on sequence

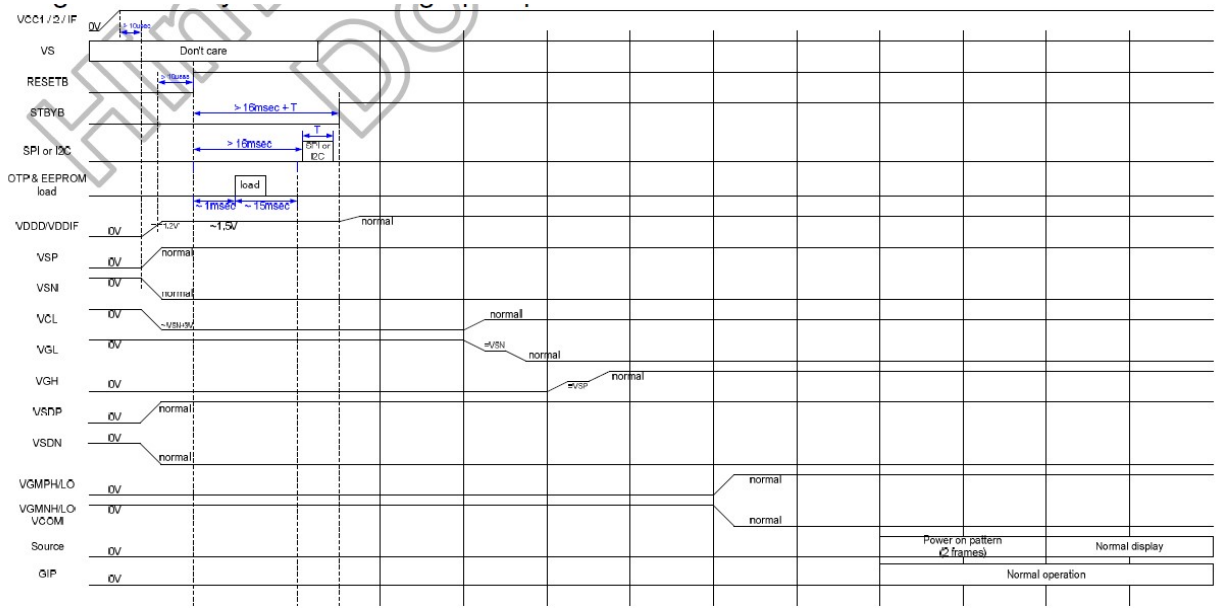


Figure 13

7.2 TFT Power off sequence

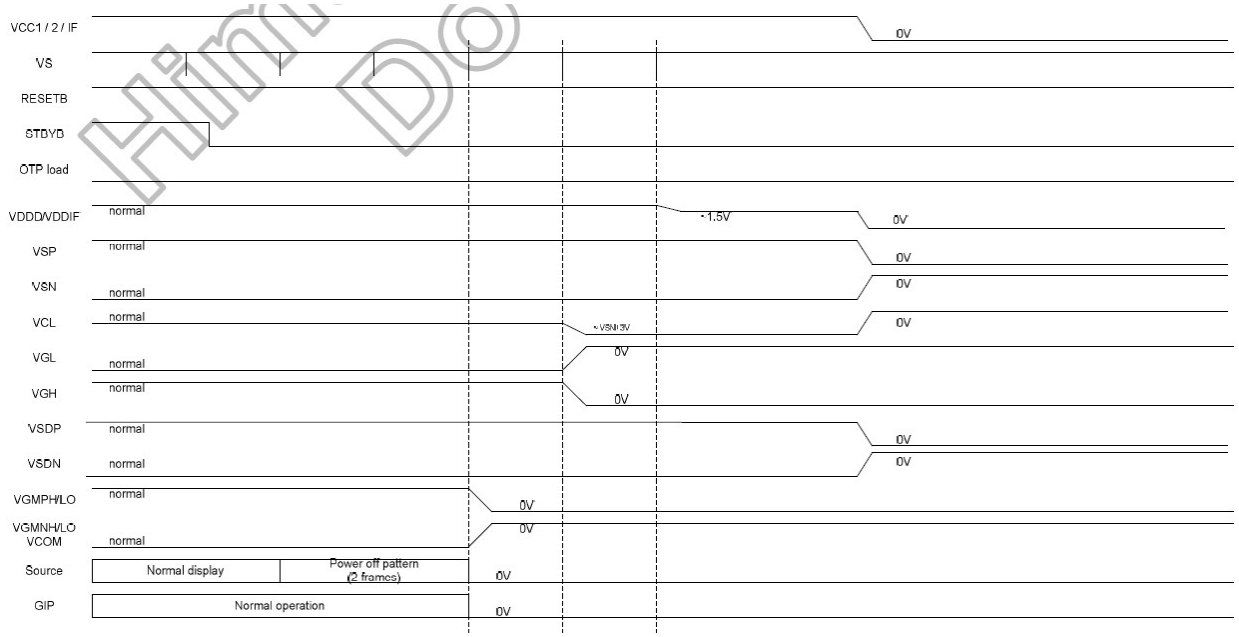


Figure 14

7.3 Touch Panel Timing Characteristics

7.3.1 Power Up/Reset

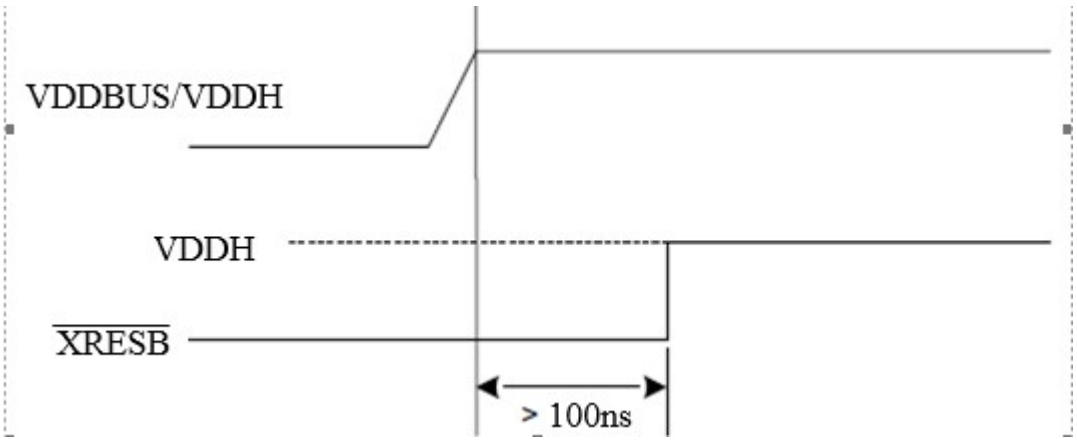


Figure 15: Power sequencing on the S7885

Note: VDDBUS/VDDH can be powered up in any order.
The XRESB pin can be used to reset the device whenever necessary. The XRESB

pin must be asserted low for at least 100ns to cause a reset. After releasing the XRESB pin the device takes 45ms before it is ready to start communications. It is recommended to connect the XRESB pin to a host controller to allow it to initiate a full hardness reset without requiring a power-down.

7.3.2 I2C Device Address for the Touch IC

Table 14: Format of SLA+W and SLA+R

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Device Address: **0x20**							Read/Write

7.3.3 I2C Compatible Specification

Table 15

Parameter	Operation
Addresses	**0x20**
Maximum bus speed (SCL)	400kHz
I^2C specification	Version 2.1

7.3.4 I2C host interface

To ensure software compatibility, full details of the Synaptics register-mapped interface protocol can be founf in the Synaptics RMI4 Specification (PN: 511-000405-01 and 511-000405-02).

8. Optical Specification

8.1 Overview

The test of Optical specifications shall be measured in a dark room(ambient luminance≤ 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Topcon SR-UL1R and Westar TRD-100A) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°.The center of the measuring spot on the Display surface shall stay fixed.
The backlight should be operating for 30 minutes prior to measurement.

8.2 Optical Specifications

Table 16: Optical Specifications

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing	Horizontal	Θ3		75	80	-	deg.	
		Θ9		75	80	-		

Angle	Vertical	Θ12	CR>10	75	80	-		
		Θ6		75	80	-		
Contrast Ratio		CR	Θ= 0° 25℃	800	1000	-	-	Note 1
			Θ= 0° 85℃	400	500	-	-	
Luminance (On the TFT Surface)		-	Θ= 0°	800	1000	-	-	Note 2
Luminance (On the Cover Lens Surface)		-	Θ= 0°	700	850	-	-	Note 2
Uniformity		-	Θ= 0°	75	80	-	-	Note 3
NTSC		-	Θ= 0°	75	80	-	-	
Reproduction Of color	Red	Rx	Θ= 0°	-0.03	0.66	+0.03	-	Note 4 * Module
		Ry		-0.03	0.32	+0.03	-	
	Green	Gx		-0.03	0.29	+0.03	-	
		Gy		-0.03	0.65	+0.03	-	
	Blue	Bx		-0.03	0.15	+0.03	-	
		By		-0.03	0.09	+0.03	-	
White		Wx	Θ= 0°	-0.03	0.296	+0.03	-	-
		Wy		-0.03	0.322	+0.03	-	-
Response Time		Tr+Tf	Θ= 0° 25℃	-	25	35	ms	Note 5
		Tr+Tf	Θ= 0° -20℃	-	-	300	ms	
		Tr+Tf	Θ= 0° -30℃	-	-	600	ms	
Flicker		-	-	-	-	22.5%	-	Note 6
Gamma		-	25℃	1.9	2.2	2.5	-	
Crosstalk		△CT	-	-	1.10	1.20	-	Note 7
Reflectance		Rf	@550nm	-	2.0	2.5	-	-
Sunglass Readability		-	-	YES			-	-
Afterimage@25℃		-	-	5			Minute	-
Image Sticking		LEVEL	-	-	-	2	-	Note 9

Note:

1. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

2. Surface luminance is on the surface with all pixels displaying white and the average values of 9 points measurement will be the the luminance value. This measurement shall be taken at the locations shown in FIG.16.

3. Uniformity measurement shall be taken at the locations shown in FIG. 16, for a total of the measurements per display, measure surface luminance of these nine points across the LCD surface 50cm from the surface with all pixels displaying white.

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

4. The color chromaticity coordinates specified in Table 16 shall be calculated from The spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the Module.

5. The electro-optical response time measurements shall be made as FIG.17 by switching the "data" input signal ON and OFF.The times needed for the luminance to change from 10% to 90% is Tr and 90% to 10% is Tf.

6. 1+2 Dot inversion flicker pattern, in the center of the TFT panel measurement.

7. Crosstalk:

There should be no visible cross-talk in normal direction of the display when the two "Cross-talk Test Patterns " below are loaded.Measurement equipment: BM5 or similar equipmentsThe point should be marked is, the background of Cross-talk Test Pattern-"gray " are defined as middle gray scale . For example, RGB 24bit "gray" defined as below:

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

△Bpn = Bpn (gray) / Bpn (white)

Which n means the dot No. In the Cross-talk Test Pattern ;
Bpn (gray) means the brightness of the No.n spots in Cross-talk Test Pattern;
Bpn (white) means the brightness of the No.n spots in Full white Test Pattern;
△Bp (Max.) = Maximum value in △Bp1~△Bp9, except the No. 5 spot.
△Bp (Min.) = Minimum value in △Bp1~△Bp9, except the No.5 spot.
△CT=△Bp (Max.)/ △Bp(Min.).

8. Afterimage judgement

Power on the LCD 1 hour@25℃ at tessellated picture(8*8)，then switch to 128 gray

picture, if the after image can't be seen within 5 minutes, the LCD is OK.
Power on the LCD 1 hour @65℃ at tessellated picture(8*8), then switch 128 gray picture, Invisible after 5 minutes

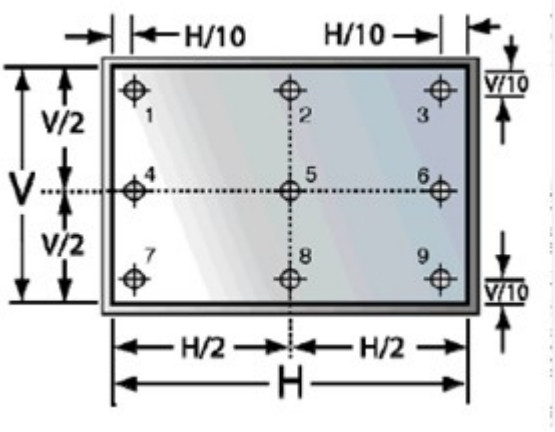


Figure 16: Luminance & Uniformity Measurement Locations

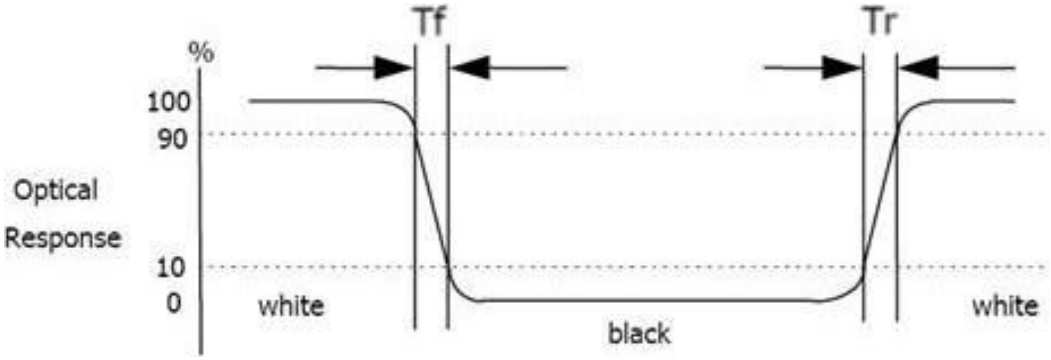


Figure 17: Response Time Testing

Note 9: Image Sticking, Test condition: Chess pattern; 50% grey scale; 65degC, 1hr,After 5min< Level2. (FIG.18)

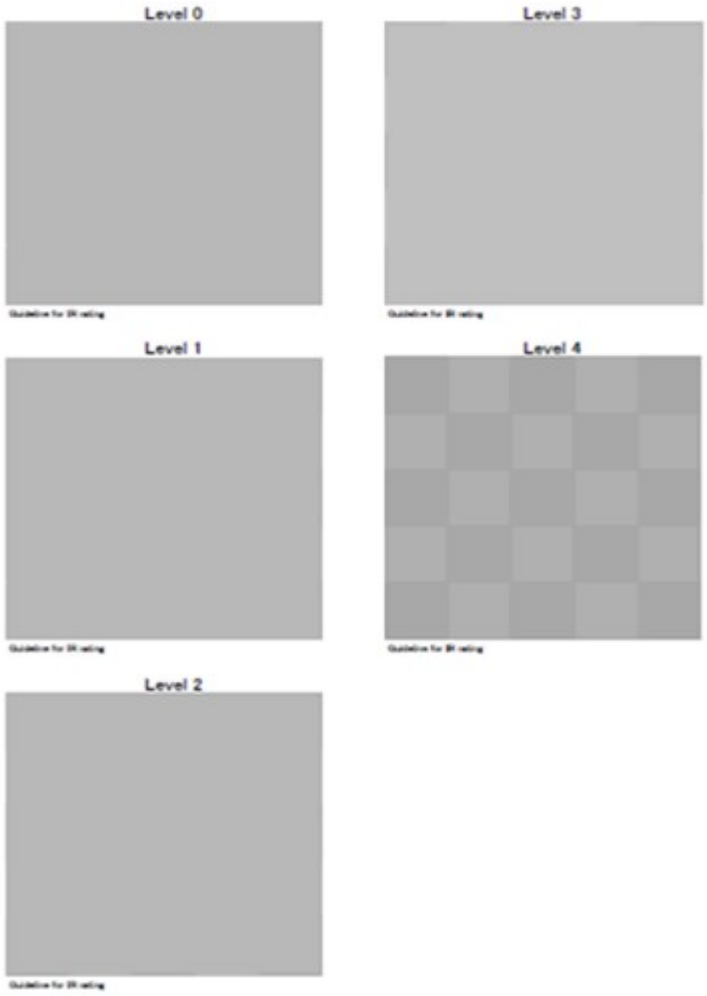


Figure 18

9.Reliability Test

9.1 Reliability Test Conditions

Table 17: List of Reliability Tests

Test		Symbol	Condition	Sample Qty	Reference
1	High Temperature Storage	HST	+90°C / 500 hrs Recovery Time 2 Hrs.	4pcs	IEC 60068-2-2 Bb
2	Low Temperature Storage	LST	-40°C / 500 hrs Recovery Time 2 Hrs.	4pcs	IEC 60068-2-1 Ab
3	High Temperature Operating (Note 1)	HOT	+85°C / 500 hrs	4pcs	IEC 60068-2-2 Bb
4	Low Temperature Operating	LOT	-30°C / 500 hrs	4pcs	IEC 60068-2-1 Ab
5	Accelerated Humidity Test Operating	AHTO	+60°C / 90% RH / 500 hrs	4pcs	IEC60068-2-78 Cab
6	Temperature Shock Test	TST	-30°C <> +85°C, 30min/5min/30min,100cycles Non-Operating	4pcs	IEC 60068-2-14Na
7	UV exposure resistance	UV	1KW Xenon/ 100 hrs Power off.	4pcs	IEC 60068-2-5 Sa
8	Mechanical Shock (Note 2)	-	3 directions: X,Y,Z axes Repeats:6 Peak acc.:100 G Pulse duration: 6 ms (half sine wave) Non-Operating	4pcs	IEC 60068-2-27Ea
9	Mechanical Vibration (Note 2)	-	3 directions: X,Y,Z axes Sweep time: 10 (1Oct/ min) Frequency: 10 -> 150->10 Hz 10-58 Hz: constant amplitude 0.75mm peak. 58-150Hz: constant acceleration 10g peak Sinusoidal, Non-Operating	4pcs	IEC 60068-2-6Fc
10	Vibration (with carton)		1.47Grms X, Y, Z three axes (30min /axis) [Spectrum：5Hz(0.015G2/Hz), 100Hz(0.015G2/Hz) , 200Hz(0.0037G2/Hz)]	4pcs	

Test		Symbol	Condition	Sample Qty	Reference
11	Drop (with carton)		1corner, 3edges, 6faces (1 time/direction) weight<5Kg：height of face drop is 1000mm；height of edge and corner drop is 800mm 5Kg<weight<10Kg： height of face drop is 800mm；height of edge and corner drop is 600mm 10Kg<weight<25Kg：height of face drop is 600mm；height of edge and corner drop is 450mm 25Kg<weight<50Kg：height of face drop is 450mm；height of edge and corner drop is 350mm	4pcs	ISO16750-3

Note 1: LCD panel surface temperature should not exceed 85ºC.
Note 2: For module internal structure robustness test purpose only. Customer application cluster design should take care of overall mounting robustness with display module.

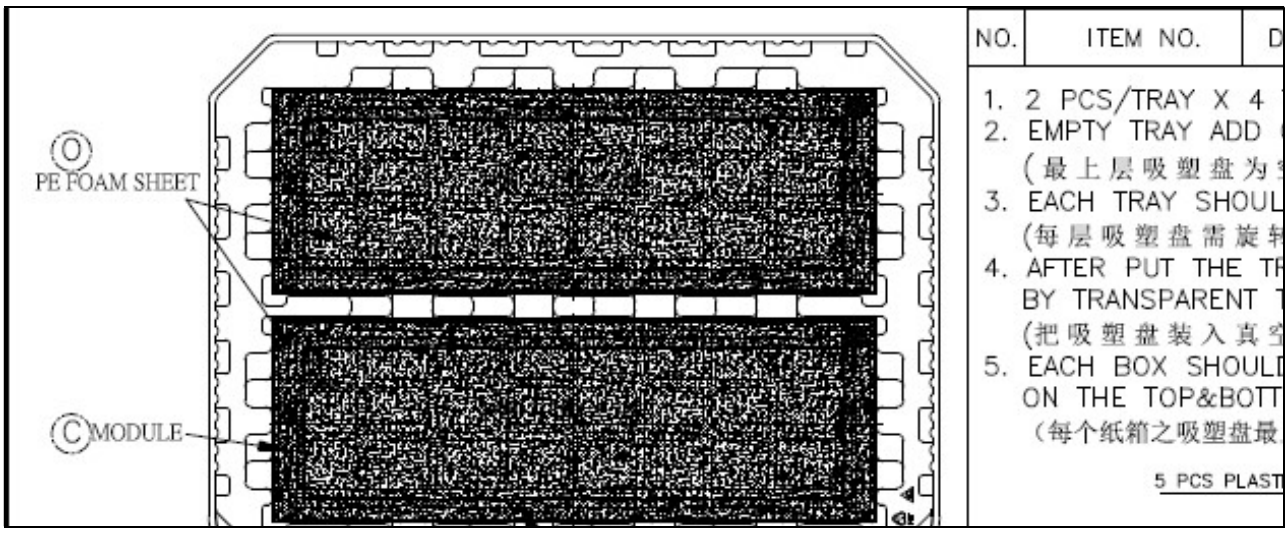
9.2 Electrostatic Discharge (ESD)

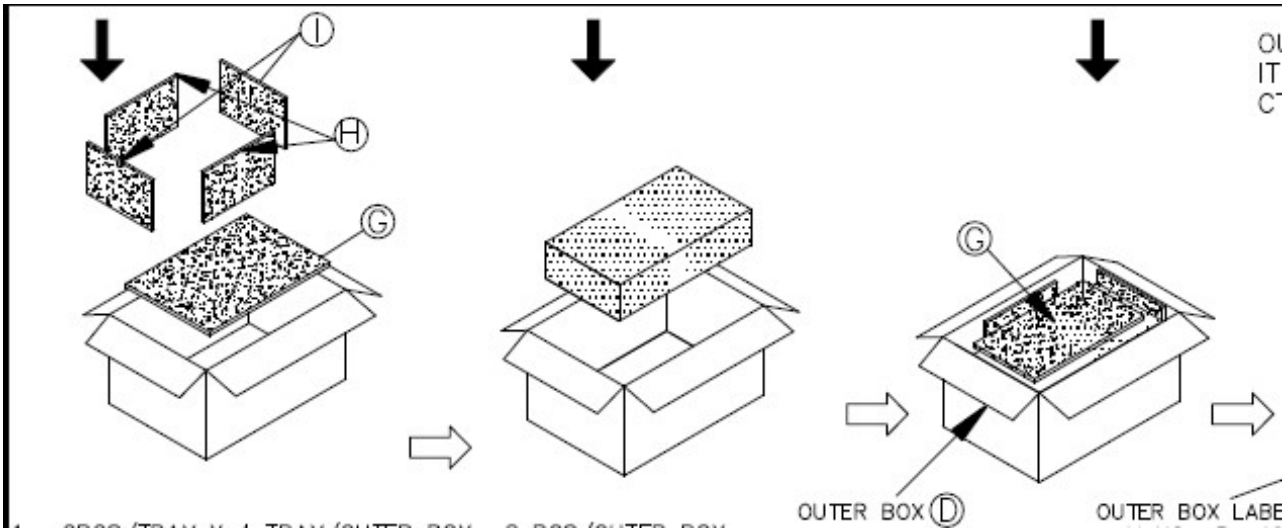
Table 18: ESD Test Conditions

Test	Condition	Method	Sample Qty	Remark
Human body model	R = 330Ω, C = 150pF, • Air discharge: ±15 KV to display surface • Contact discharge: ±8 KV to metal frame	IEC61000-4-2	2pcs	operating
Machine model	R = 0Ω, C = 200pF, ±200V to I/O pins	MIL-STD-883, method 3015	2pcs	operating

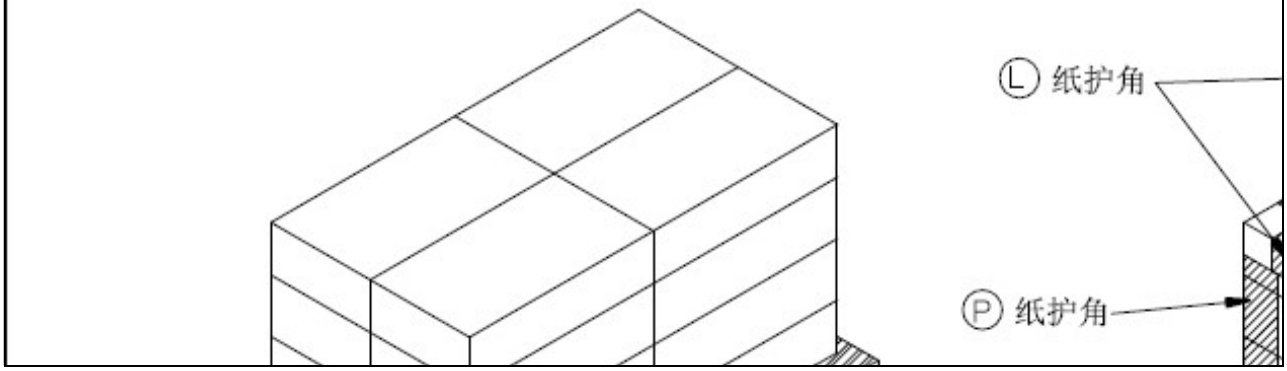
Note 1: The TFT-LCD panel and IC on module are sensitive to electrostatic discharge; please make sure equipments and operators are properly ground before and during handling
Note 2: As different customer application have different interfacing designs and assembly processes, the display module has no ESD protection circuitry. Customer is required to take special care on ESD level control in the assembly and test processes.

10.0 PACKING METHOD

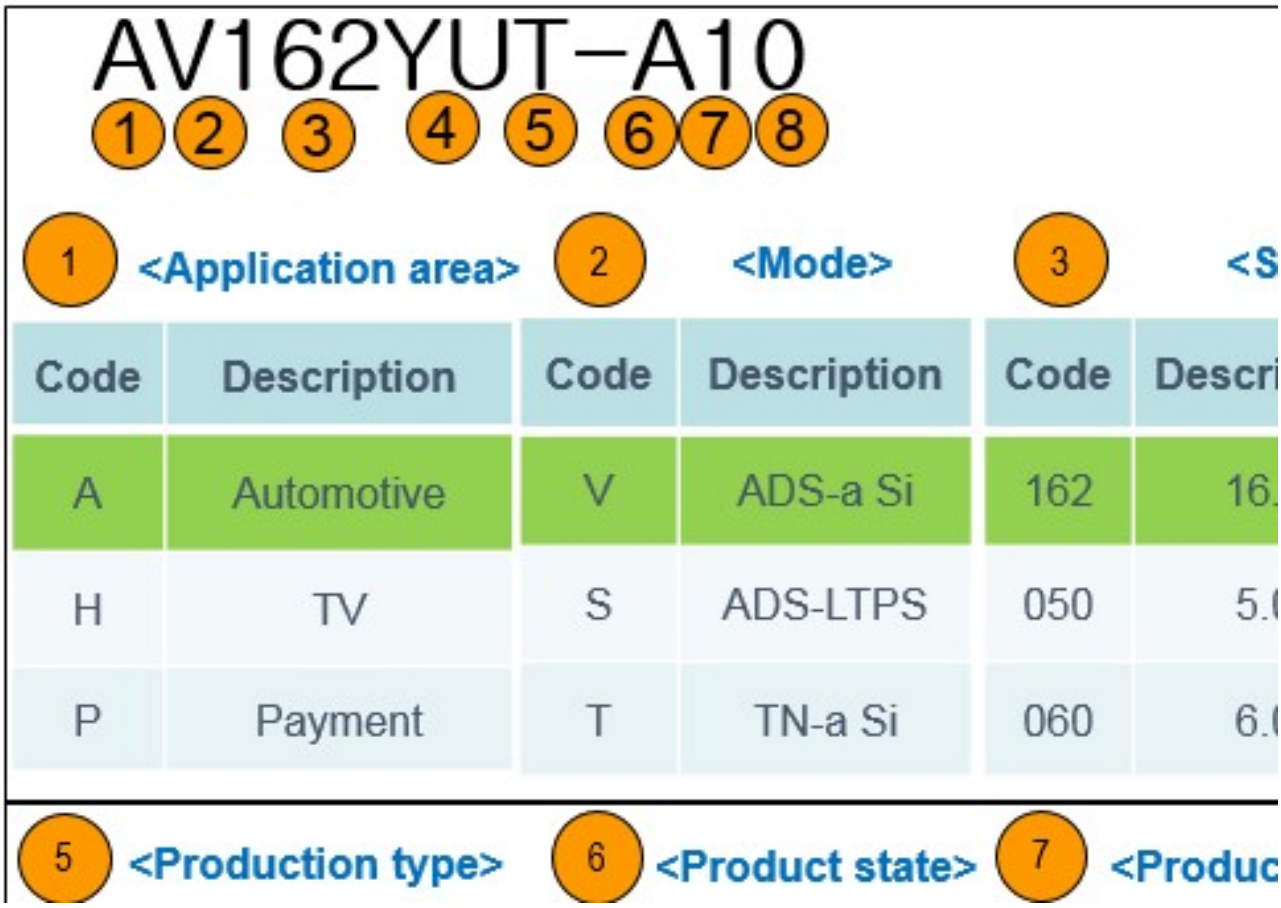




1.STACK THE CARTON BOXES ON THE PALLET.
（把纸箱放在卡板上）
2.PUT THE HARD EDGES ON THE EIGHT SIDES, USE TRANSPARENT TAPE TO
（把纸护角放在纸箱的八条侧边，并用透明胶纸固定）



11.0 PRODUCT ID RULE



1 <Application area>

Code	Description
A	Automotive
H	TV
P	Payment

2 <Mode>

Code	Description
V	ADS-a Si
S	ADS-LTPS
T	TN-a Si

3 <S

Code	Descri
162	16.
050	5.(
060	6.(

5 <Production type> 6 <Product state> 7 <Produc

12.0 General Precautions

12.1 Mounting Method

1. The panel of the LCM consists of two thin glasses with polarizer which easily get damaged. So extreme care should be taken when handling the LCM.
2. Excessive stress or pressure on the glass of the LCM should be avoided. Care must be taken to insure that no torsional or compressive forces are applied to the LCM unit when it is mounted.
3. If the customer's set presses the main parts of the LCM, the LCM may show the abnormal display. But this phenomenon does not mean the malfunction of the LCM and should be pressed by the way of mutual agreement.
4. To determine the optimum mounting angle, refer to the viewing angle range in the specification for eachmodel.
5. Mount a LCM with the specified mounting parts.

12.2 Caution of LCM Handling and Cleaning

1. Since the LCM is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass maybe broken.
2. The polarizer on the surface of panel are made from organic substances. Be very careful for chemicals not to touch the polarizer or it leads the polarizer to be deteriorated.
3. If the use of a chemical is unavoidable, use soft cloth with solvent recommended below to clean the LCM's surface with wipe lightly.
   -IPA (Isopropyl Alcohol), Ethyl Alcohol, Tri-chloro, tri-florothane.
4. Do not wipe the LCM's surface with dry or hard materials that will damage the polarizer and others. Do not use the following solvent—Water, acetone, Aromatics.
5. It is recommended that the LCM be handled with soft gloves during assembly, etc. The polarizer on the LCM's surface are vulnerable to scratch and thus to be damaged by shape particles.
6. Do not drop water or any chemicals onto the LCM's surface.
7. A protective film is supplied on the LCM and should be left in place until the LCM is required for operation.
8. The ITO pad area needs special careful caution because it could be easily corroded. Do not contact the ITO pad area with HCFC, Soldering flux, Chlorine, Sulfur, saliva or fingerprint. To prevent from the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.
9. Please handle FPC with care.

12.3 Caution Against Static Charge

1. The LCM use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
2. Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, if possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
3. Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
4. In handling the LCM, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

12.4 Caution For Operation

1. It is indispensable to drive the LCM within the specified voltage limit since the higher voltage than the limit causes LCM's life shorter. An electro-chemical reaction due to DC causes undesirable deterioration of the LCM so that the use of DC drive should avoid.
2. Do not connect or disconnect the LCM to or from the system when power is on.
3 .Never use the LCM under abnormal conditions of high temperature and high humidity.
4. When expose to drastic fluctuation of temperature(hot to cold or cold to hot), the LCM may be affected; specifically, drastic temperature fluctuation from cold to hot, produces dew on the LCM's surface which may affect the operation of the polarizer on the LCM.
5. Response time will be extremely delay at lower temperature than the operating temperature range and on the other hand LCM may turn black at temperature above its operational range. However those phenomenon do not mean malfunction or out of order with the LCM. The LCM will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.
6. Do not display the fixed pattern for a long time because it may develop image sticking due to the LCM structure. If the screen is displayed with fixed pattern, use a screen saver.
7. Do not disassemble and/or re-assemble LCM module

12.5 Packaging

1. Modules use LCM element, and must be treated as such.
   -Avoid intense shock and falls from a height.
   -To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity for long periods.

12.6 Storage

1. A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Relative humidity of the environment should therefore be kept below 60%RH.
2. Original protective film should be used on LCM’s surface (polarizer). Adhesive type protective film should be avoided, because it may change color and/or properties of the polarizer.
3. Do not store the LCM near organic solvents or corrosive gasses.
4. Keep the LCM safe from vibration, shock and pressure.
5. Black or white air-bubbles may be produced if the LCM is stored for long time in the lower temperature or Mechanical shocks are applied onto the LCM.
6. In the case of storing for a long period of time for the purpose or replacement use, the following ways are recommended.
   -Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.
   -Store in a dark place where neither exposure to direct sunlight nor light is.
   -Keep temperature in the specified storage temperature range.
   -Store with no touch on polarizer surface by the anything else. If possible, store the LCM in the packaging situation when it was delivered.

12.7 Safety

1. For the crash damaged or unnecessary LCM, it is recommended to wash off liquid crystal by either of solvents

such as acetone and ethanol an should be burned up later.

2. In the case of LCM is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water and soap as soon as possible.
3. If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.
4. If the liquid crystal get in your eyes, flush your eyes with running water for at least fifteen minutes.
5. If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.

13.0 Applicable Scope

- This product specification only applies to the products manufactured and sold by our company.
- Any specification, quality etc. about other parts mentioned in this product spec are no concern of our company.