

深圳市阿美林电子科技有限公司 Shenzhen Amelin Electronic Technology Co. ,Ltd	Doc.No.:AML280H40026-A	
	REV : A	PAGE : 1/17
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2018-05-17	

PRODUCT SPECIFICATION
TFT-LCD MODULE

Model No: AML280H40026-A

For Customer's Acceptance	
Approved by	Comment

	Signature	Date
Prepared by		
Checked by		
Approved by		

	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 2/17
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2018-05-17	

Contents

No.	ITEM
1	Document Revision History
2	General Description
3	Outline Dimension
4	Interface Specification
5	Absolute Maximum Ratings
6	Electrical Specifications
7	Timing Characteristics
8	Power Supply Configuration
9	Optical Specification
10	Reliability Test Items
11	Precautions

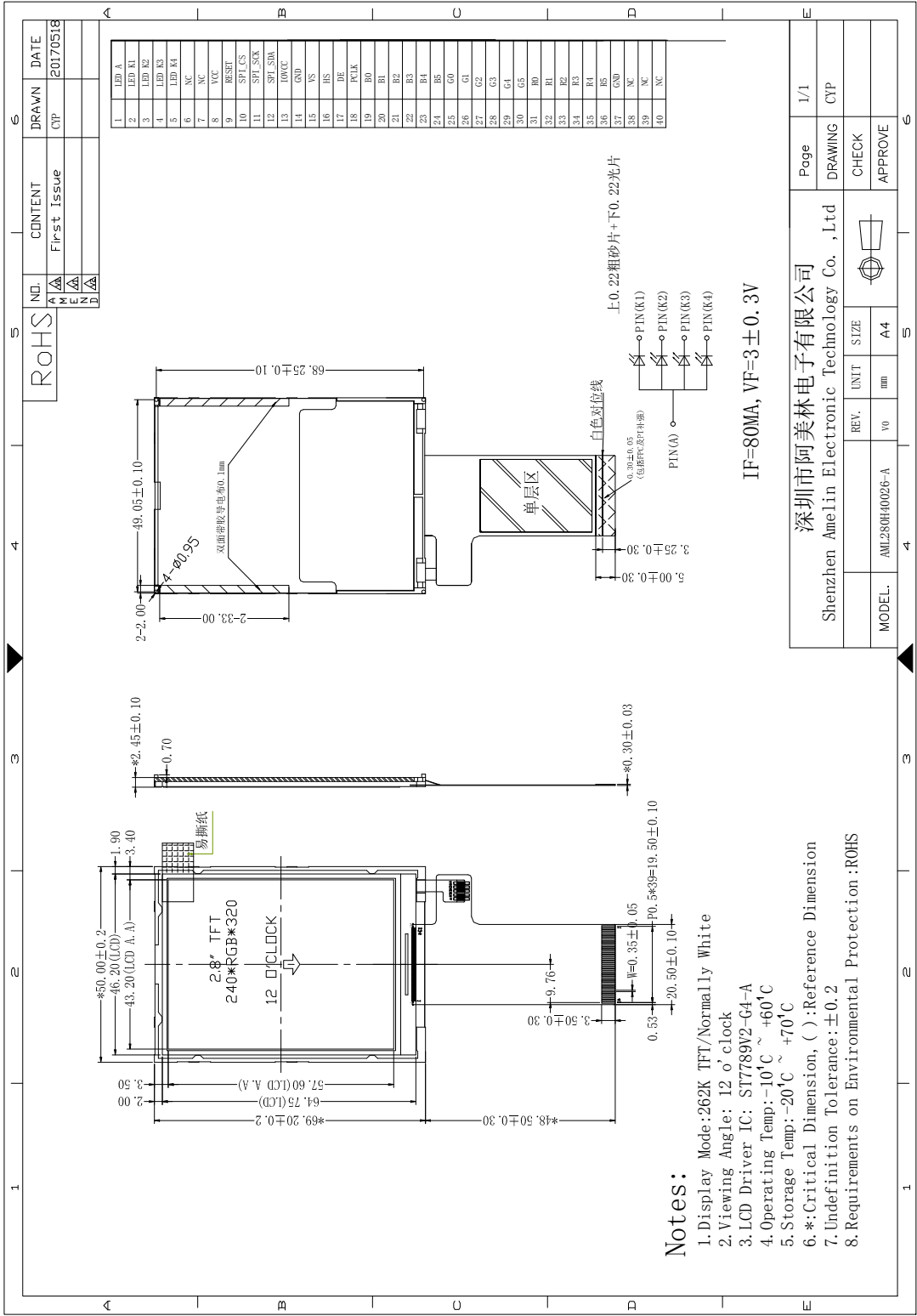
	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 4/17
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2018-05-17	

2. General Description

No	Item	Specification	Remark
1	Screen Size	2.8 inch	
2	Display Mode	Normally White	
3	Resolution	240 × RGB × 320	
4	Active Area	43.2*57.6	
5	Outline Dimension	50*69.2*2.45	
6	Viewing Direction	12 o' clock	
7	Driver IC	ST7789V2-G4-A	
8	Color Number	262K	
9	Interface	RGB	
10	Back Light	White Led*4	
11	Touch Panel		

SPEC TITLE DOCUMENT CONTROL SPECIFICATION	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 5/17
	EFFECTIVE DATE : 2018-05-17	

3. Outline Dimension



	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 6/17
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2018-05-17	

4. Interface Specification

Pin No	Symbol	Description	Note
1	LEDA	LED backlight anode power supply.	
2-5	LEDK	LED backlight cathode power supply.	
6-7	NC	No Connection.	
8	VCC	Power Supply For LCD.	
9	RESET	Reset Signal input pin.	
10	SPI_CS	Chip selection signal.	
11	SPI_SCK	Serial clock signal pin.	
12	SPI_SDA	Serial data input/output pin.	
13	IOVCC	Power Supply For I/O	
14	GND	Ground	
15	VS	Frame synchronous signal for RGB interface operation.	
16	HS	Line synchronous signal for RGB interface operation.	
17	DE	High speed interface CLOCK differential signal input pins.	
18	PCLK	Dot clock signal for RGB interface operation.	
19-24	B0-B5	Blue data (B0-LSB;B5-MSB)	
25-30	G0-G5	Green data (G0-LSB; G5-MSB)	
31-36	R0-R5	Red data (R0-LSB;R5-MSB)	
38-40	NC	No Connection.	

	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 7/17
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2018-05-17	

5. Absolute Maximum Ratings

Electrical Maximum Ratings – for IC Only

Parameter	Symbol	Min.	Max.	Unit	Note
Power supply voltage (VCC)	VCC	-0.3	+4.6	V	1
Power supply voltage (IOVCC)	IOVCC	-0.3	+4.6	V	1

Note:

1. IOVCC, VCC, GND must be maintained.
2. The modules may be destroyed if they are used beyond the absolute maximum ratings.

6. Electrical Specifications

At Ta = 25 °C, VCC = 2.6V to 3.3V, IOVCC= 1.65V to 3.3V GND=0V.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (analog)	VCC-GND		2.6	2.8	3.3	V
Supply voltage (logic)	IOVCC-GND		1.65	1.8	3.3	V
Supply current (Logic & LCD)	ICC	VCC=2.8V	-	-	80	mA
Supply voltage of white LED backlight	VLED	Forward current =80mA Number of LED = 4	2.7	3	3.3	V

SPEC TITLE DOCUMENT CONTROL SPECIFICATION	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 8/17
	EFFECTIVE DATE : 2018-05-17	

7.Timing Characteristics

RGB Interface Characteristics:

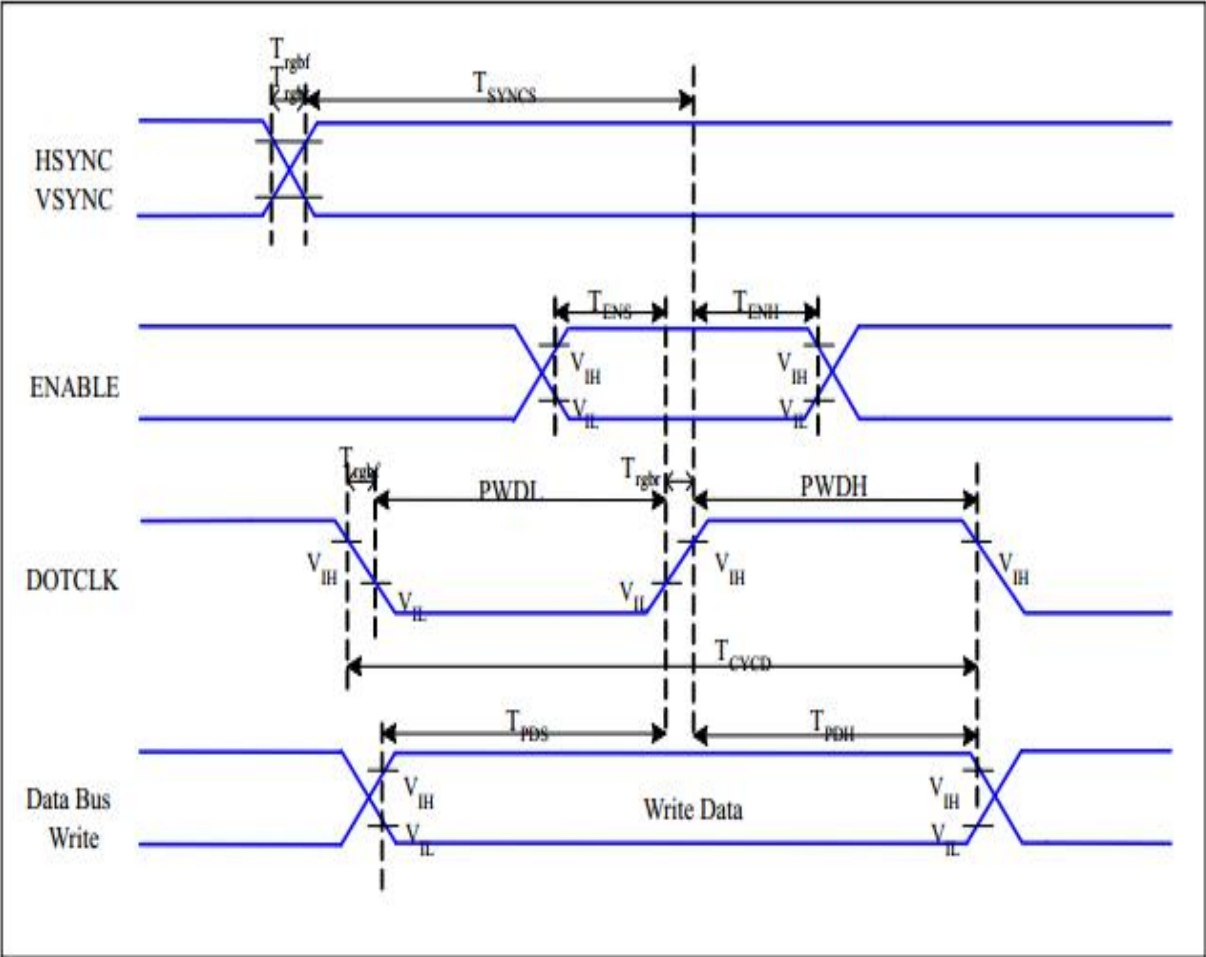


Figure 6 RGB Interface Timing Characteristics

SPEC TITLE DOCUMENT CONTROL SPECIFICATION	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 9/17
	EFFECTIVE DATE : 2018-05-17	

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T _{SYNCS}	VSYNC, HSYNC Setup Time	30	-	ns	
ENABLE	T _{ENS}	Enable Setup Time	25	-	ns	
	T _{ENH}	Enable Hold Time	25	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	60	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	60	-	ns	
	T _{CYCD}	DOTCLK Cycle Time	120	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	20	ns	
DB	T _{PDS}	PD Data Setup Time	50	-	ns	
	T _{PDH}	PD Data Hold Time	50	-	ns	

Table 7 18/16 Bits RGB Interface Timing Characteristics

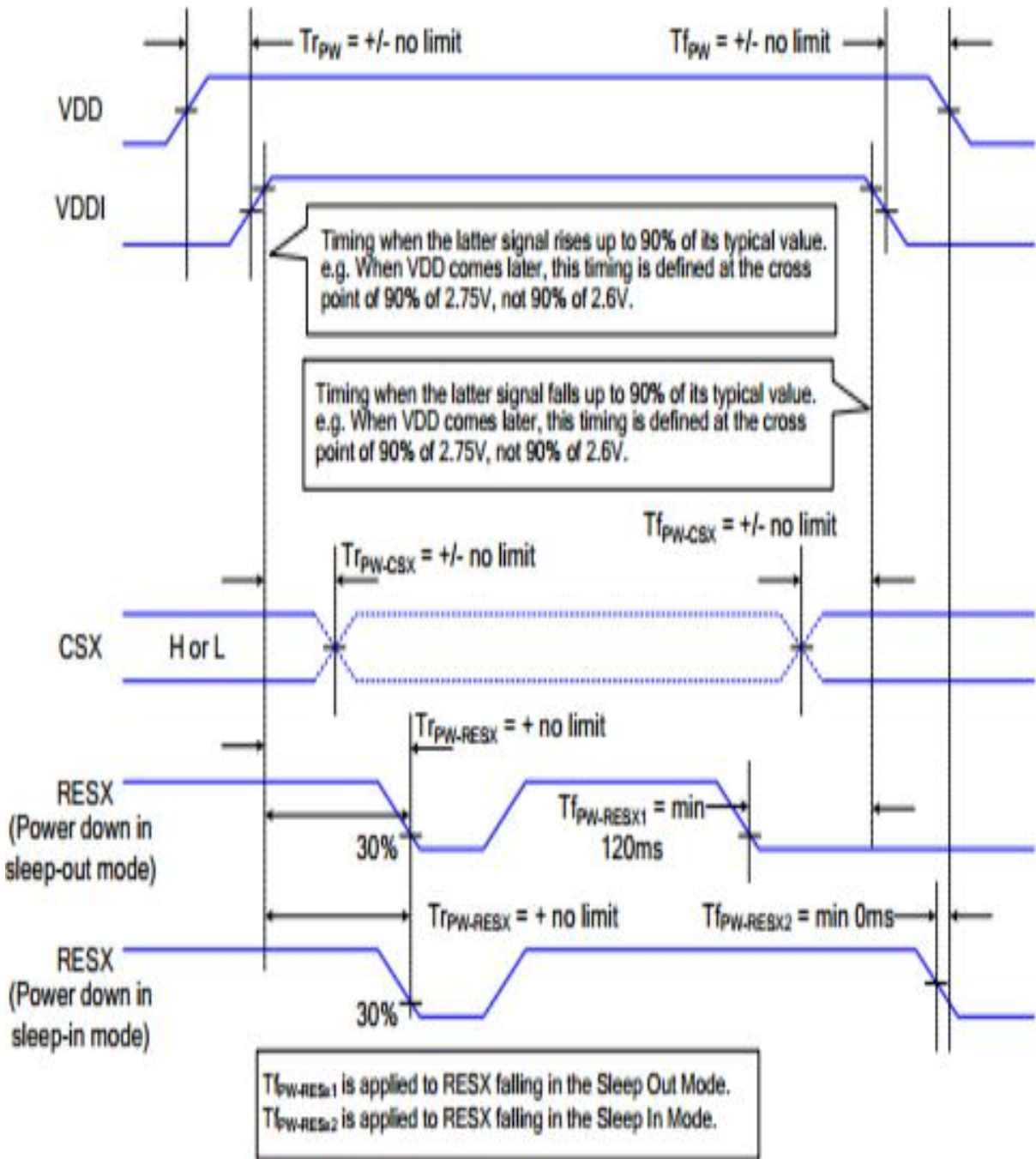
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T _{SYNCS}	VSYNC, HSYNC Setup Time	35	-	ns	
ENABLE	T _{ENS}	Enable Setup Time	35	-	ns	
	T _{ENH}	Enable Hold Time	35	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	35	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	35	-	ns	
	T _{CYCD}	DOTCLK Cycle Time	80	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	10	ns	
DB	T _{PDS}	PD Data Setup Time	35	-	ns	
	T _{PDH}	PD Data Hold Time	35	-	ns	

Table 8 6 Bits RGB Interface Timing Characteristics

	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 10/17
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2018-05-17	

8. Power Supply Configuration

The power on/off sequence is illustrated below



SPEC TITLE DOCUMENT CONTROL SPECIFICATION	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 11/17
	EFFECTIVE DATE : 2018-05-17	

Voltage Generation

The following is the ST7789V2 analog voltage pattern diagram:

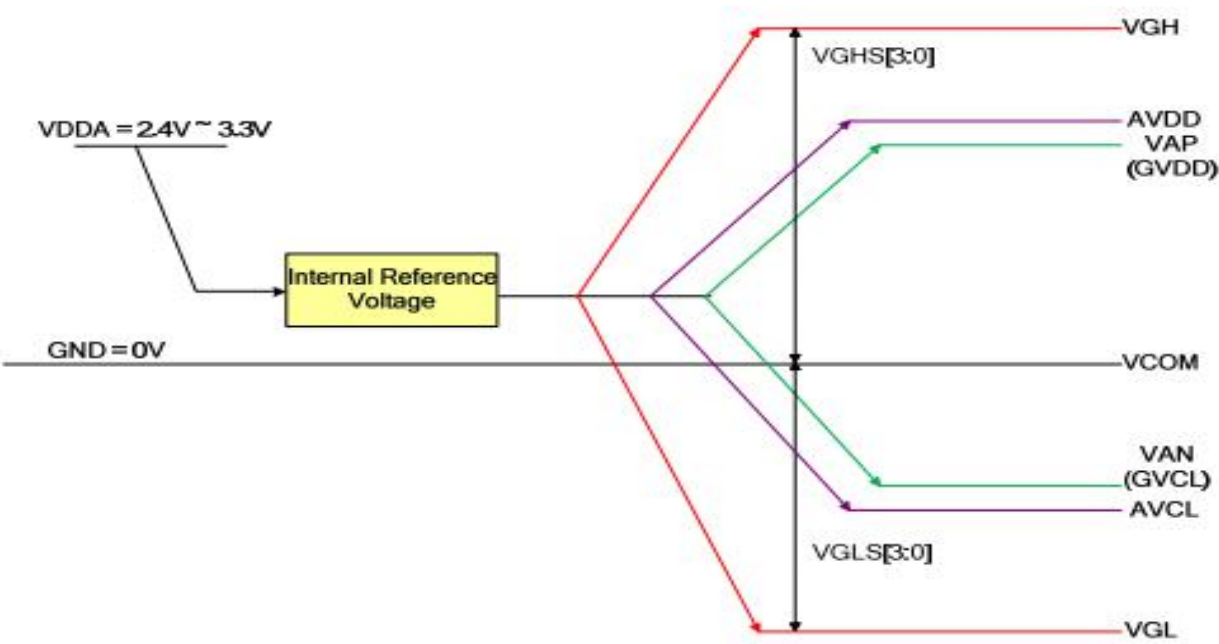


Figure 38 Power Booster Level

	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 12/17
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2018-05-17	

9.Optical Specification

Item 项目	Symbol 符号	Condition 条件	Min 最小值	Typ 典型值	Max 最大值	Unit 单位	Note 备注
Response time 响应时间	Tr+Tf	$\Theta=0^{\circ}$ $\varnothing=0^{\circ}$ Ta=25°C	-	12	24	ms	1
Contrast ratio 对比度	Cr		400	500	-	-	2
Color gamut 饱和度	S(%)		-	60	-	%	-
Luminance uniformity 均匀度	δ WHITE		80	-	-	%	3
Viewing angle range 视角范围	Θ_{x+}	CR \geq 10 Ta=25°C	-	65	-	deg	4
	Θ_{x-}		-	65	-	deg	
	Θ_{y+}		-	70	-	deg	
	Θ_{y-}		-	40	-	deg	
LCM Luminance LCM 亮度	Lv	$\Theta=0^{\circ}$ $\varnothing=0^{\circ}$ Ta=25°C	-	TBD	-	Cd/m ²	5
CIE (X,Y) Chromaticity 色度坐标	White(X)			TBD		-	6
	White(Y)			TBD		-	

Note1.Response time is the time required for the display to transition from White to black(Rise Time,Tr)and from black to white(Decay Time,Tf).For additional information see FIG1...

Note2.contrast Ratio(CR) is defined mathematically by the following formula ,For more information see FIG2.

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

Note3.The uniformity in surface luminance(WHITE) is determined by measuring luminance at each test position,and then dividing the maximum luminance of all white pixels by minimum luminance of all white pixels,For more information seeFIG2.

WHITE=Minimum Surface Luminance with all white pixels(P1,P2,.....)/Maximum Surface Luminance with all white pixels(P1,P2,.....)

SPEC TITLE DOCUMENT CONTROL SPECIFICATION	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 13/17
	EFFECTIVE DATE : 2018-05-17	

Note4.Viewing angle is the angel at which contrast ratio is greater than a specific value.For TET module,the specific value of contrast ratio is 10.For monochrome and color stn module,the specific value of contrast ratio is2.The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.For more information see FIG3

Note5. Surface luminance is the LCD surface luminance with all white pixels,For more information see FIG2.

LV=Average Surface Luminance with all white pixels(P1,P2,.....)

Note6.CIE(X,Y)chromaticity is the Center point value.For more information see FIG2.

Note7.For Viewing angle and response time testing,the testing date is base on Autronic-Melchers' s ConScope.Series instruments.For contrast ratio,Surface Luminance,Luminance uniformity and CIE,the testing date is base on CS-2000 photo detector.

Note8.For TN type TFT transmissive module,Gray scale reverse occurs in the direction of panel viewing angle

FIG1. The definition of Response time

响应时间定义

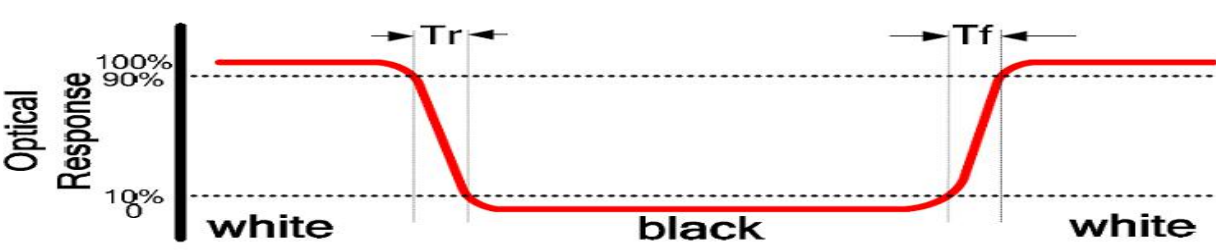


FIG2. Measuring method for Contrast ratio,surface luminance,Luminance uniformity,CIE(X,Y)chromaticity.

SPEC TITLE DOCUMENT CONTROL SPECIFICATION	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 14/17
	EFFECTIVE DATE : 2018-05-17	

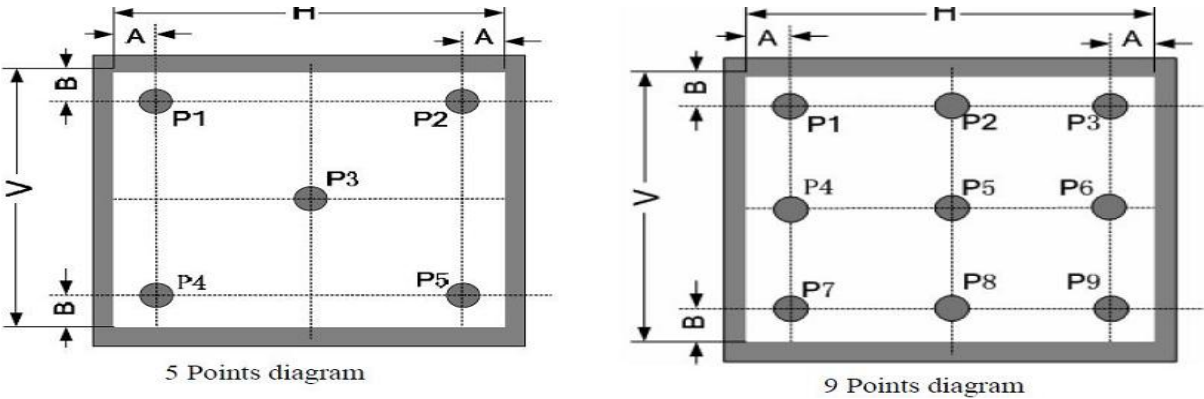
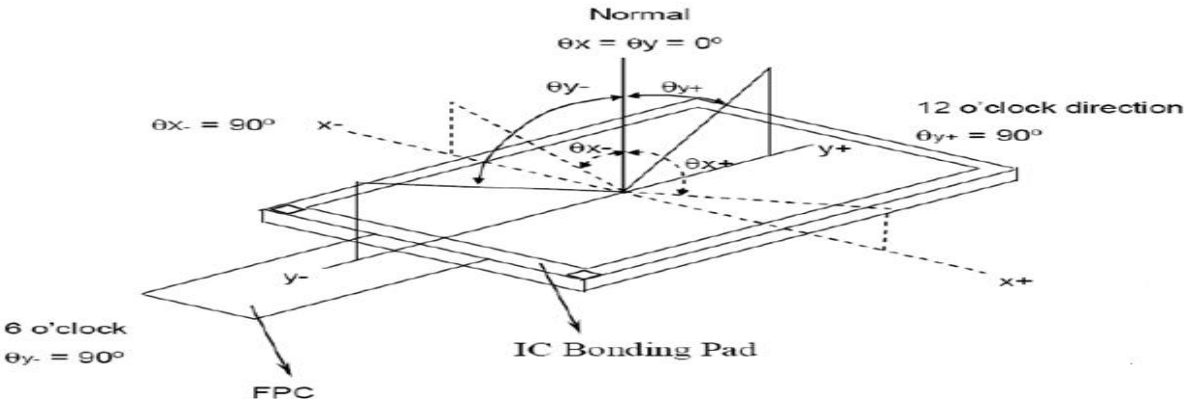


FIG3 The definition of viewing angle 视角定义



	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 15/17
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2018-05-17	

10. Reliability Test Items

Item	Test Condition	Criterion
High Temperature Storage	70 °C, 48 hrs	Note1, Note2
Low Temperature Storage	-20 °C, 48 hrs	
High Temp. & High Humidity Storage	40 °C, 80% RH, 48hrs	
Thermal Shock (Static)	-20°C, 30 min / 70°C, 30 min, 20 cycles	
High Temperature Operation	60 °C, 48 hrs	
Low temperature Operation	-10 °C, 48 hrs	

Note1: Evaluation should be tested after storage at room temperature for two hours.

Note2:

Pass: Normal display image no line defect.

Fail: No display image, or line defects.

Partial transformation of the module parts should be ignored.

11. Precautions

Please pay attentions to the followings as using the LCD module.

Handling

- Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.
- Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.
- Do not put heavy or hard material on the display surface, and do not stack LCD modules.
- If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.

	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 16/17
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2018-05-17	

- (e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the touch panel surface permanently. The recommended solvents are water and Isopropyl alcohol.
- (f) Wipe off water droplets or oil immediately.
- (g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.
- (h) Do not touch the output pins directly with bare hands.
- (i) Do not disassemble the LCD module.
- (j) Do not lift the FPC of Touch Panel.

Storage

- (a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.
- (b) Do not expose the LCD modules to sunlight directly.
- (c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.
- (d) Avoid condensation of water. It may cause improper operation.
- (e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

Operation

- (a) When mounting or dismounting the LCD modules, turn the power off.
- (b) Protect the LCD modules from electric shock.
- (c) The Driver IC control algorithms stated above should always obeyed to avoid damaging the LSI and electronic circuit.
- (d) Be careful to avoid mixing up the polarity of power supply for backlight.
- (e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.
- (f) When a static image is displayed for a long time, remnant image is likely to occur.
- (g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.
- (h) Most of the touch screens have air vent to equalize the inside air pressure to the outside one. The air vent must be open and liquid contact must be avoided as the liquid may be

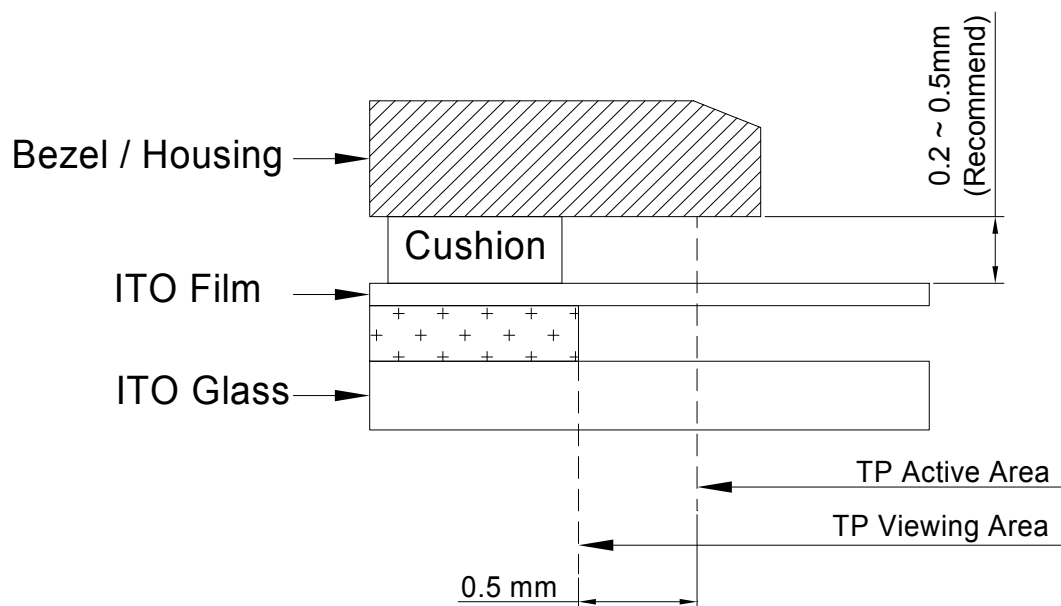
	Doc.No.: AML280H40026-A	
	REV : A	PAGE : 17/17
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2018-05-17	

absorbed if the liquid is accumulated near the air vent.

- (i) For the fragility of ITO film, it should avoid to use too tapering pen as the input material.

Touch Panel Mounting Notes

- (a) If a cushion is used between bezel/housing and film must be choose as free as enough to absorb the expansion and contraction to avoid the distortion of film.
- (b) The cushion must be placed out of the Viewing Area.
- (c) Bezel/Housing edge must be posited between Key Area and Viewing Area. The edge enters the Key Area may cause unexpected input if the gap is too narrow or foreign particles like dusts exist between Bezel/Housing and ITO film.
- (d) Mounting example:



The corner part has conductivity. Do not touch any metal part after mounting.

Others

- a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.
- b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.
- c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.