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AVIDISPLAY

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SPECIFICATION FOR TFT MODULE

MODULE NO. : T101819-06A-GDC

CUSTOMER NO. :

Rev No. : O

AVD	PREPARED BY	CHECKED BY	APPROVED BY
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DATE	2020.06.05	2020.06.05	2020.06.05

CUSTOMER APPROVAL	SIGNATURE	DATE

Notes :

- 1、 Please contact AVD before assigning your product based on this module specification.
- 2、 To improve the quality of product, and this product specification is subject to change without any notice.

P. 1

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1. GENERAL INFORMATION

No.	Item	Contents	Unit
1	LCD size	10.1 inch (Diagonal)	/
2	Display mode	a-si TFT&CTP IPS/Normally black/Transmissive	/
3	Viewing direction(eye)	FREE	/
4	Gray scale inversion direction	-	/
5	Resolution(H*V)	800 *1280 Pixels(TFT)/ 800 *1280 Dots(CTP)	/
6	Module size (L*W*H)	186.92*270.06*4.51	mm
7	Active area (L*W)	135.36*216.58	mm
8	Pixel pitch (L*W)	0.1692*0.1692	mm
9	Interface type	MIPI interface(TFT)/I2C(CTP)	/
10	Color Depth	16.7M	/
11	Module power consumption	2.33	W
12	Back light type	LED	/
13	Driver IC	JD9365AA OR COMPATIBLE(TFT) FT5526EEZ(CTP)	/
14	Weight	387.0	g
15	Treatment of Lens	AF (Anti-Fingerprint) coating	

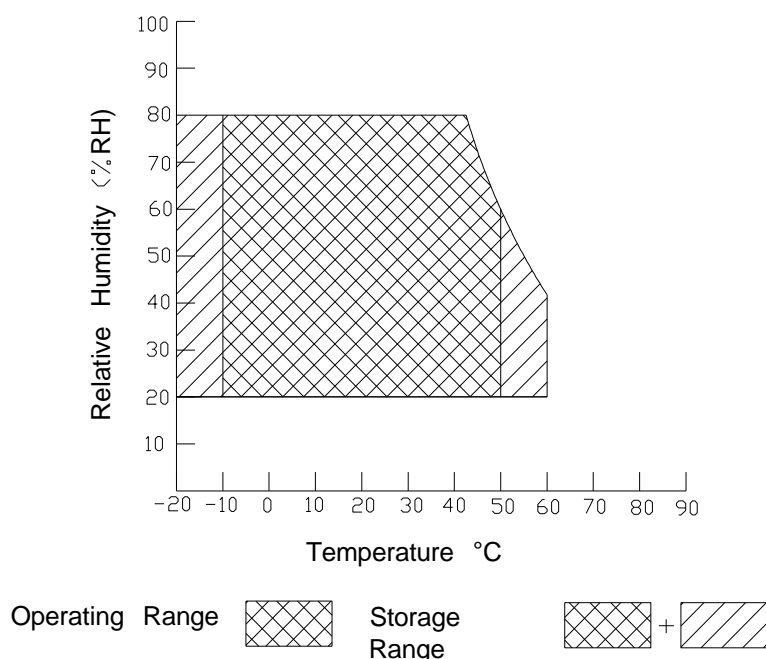
2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power supply input voltage for TFT	VCC-LCD	-0.3	4.6	V	
Power supply input voltage for CTP	VCC	-0.3	3.6	V	
Backlight current (normal temp.)	ILED	-	125	mA	
Operation temperature	Top	-10	+50	°C	Note1
Storage temperature	Tst	-20	+60	°C	Note1
Humidity	RH	20%	80%	/	Note1

Note1 :

1).The relative humidity and temperature range are as below sketch,80%RH Max.

2).The maximum wet bulb temperature $\leq 40^{\circ}\text{C}$ and without dewing.



3. ELECTRICAL CHARACTERISTICS

TFT DC CHARACTERISTICS(at Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power supply input voltage	VCC-LCD	3.0	3.3	3.6	V	
I/O logic voltage	VDDIO	-	-	-	V	
Input voltage 'H' level	VIH	0.7VDDIO	-	VDDIO	V	
Input voltage 'L' level	VIL	VSS	-	0.3VDDIO	V	
Power supply current	IVDD	-	70	-	mA	
TFT gate on voltage	VGH	-	-	-	V	
TFT gate off voltage	VGL	-	-	-	V	
Analog power supply voltage	AVDD	-	-	-	V	
Differential input common mode voltage	Vcom	-	-	-	V	Note1

Note1 : The value is just the reference value. The customer can optimize the setting value by the different D-IC
Vcom must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc..

CTP DC CHARACTERISTICS(at Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note	
Power supply input voltage	VCC	2.8	3.3	3.6	V	Note2	
Input Power ripple	Vpp	-	-	50	mV		
I/O Signal Voltage	VCCIO	1.7	1.8	1.9	V	Note2	
Input voltage 'H' level	VIH	0.7VCCIO	-	VCCIO	V		
Input voltage 'L' level	VIL	VSS	-	0.3VCCIO	V		
Operating Current (Normal Mode)	IVCC	-	-	-	mA		
Operating Current (Sleep mode)	IVCC	-	-	-	mA		

Note2 : If you need more information of CTP, please refer to our Spec of CTP.

4. BACKLIGHT CHARACTERISTICS

(at Ta=25°C, RH=60%)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED forward voltage	VF	20.3	21.0	23.8	V	
LED forward current	IF	-	100	-	mA	IF=25*4mA
LED power consumption	PLED	-	2.1	-	W	Note1
Number of LED	-		28		PCS	
Connection mode	-	7 in series 4 in parallel			/	
LED life-time	-	-	-	-	Hrs	Note2

Note1 : Calculator value for reference : IF*VF = PLED

Note2 : The LED life-time define as the estimated time to 50% degradation of initial brightness at Ta=25°C and IF =100mA. The LED lifetime could be decreased if operating IF is larger than 100mA.

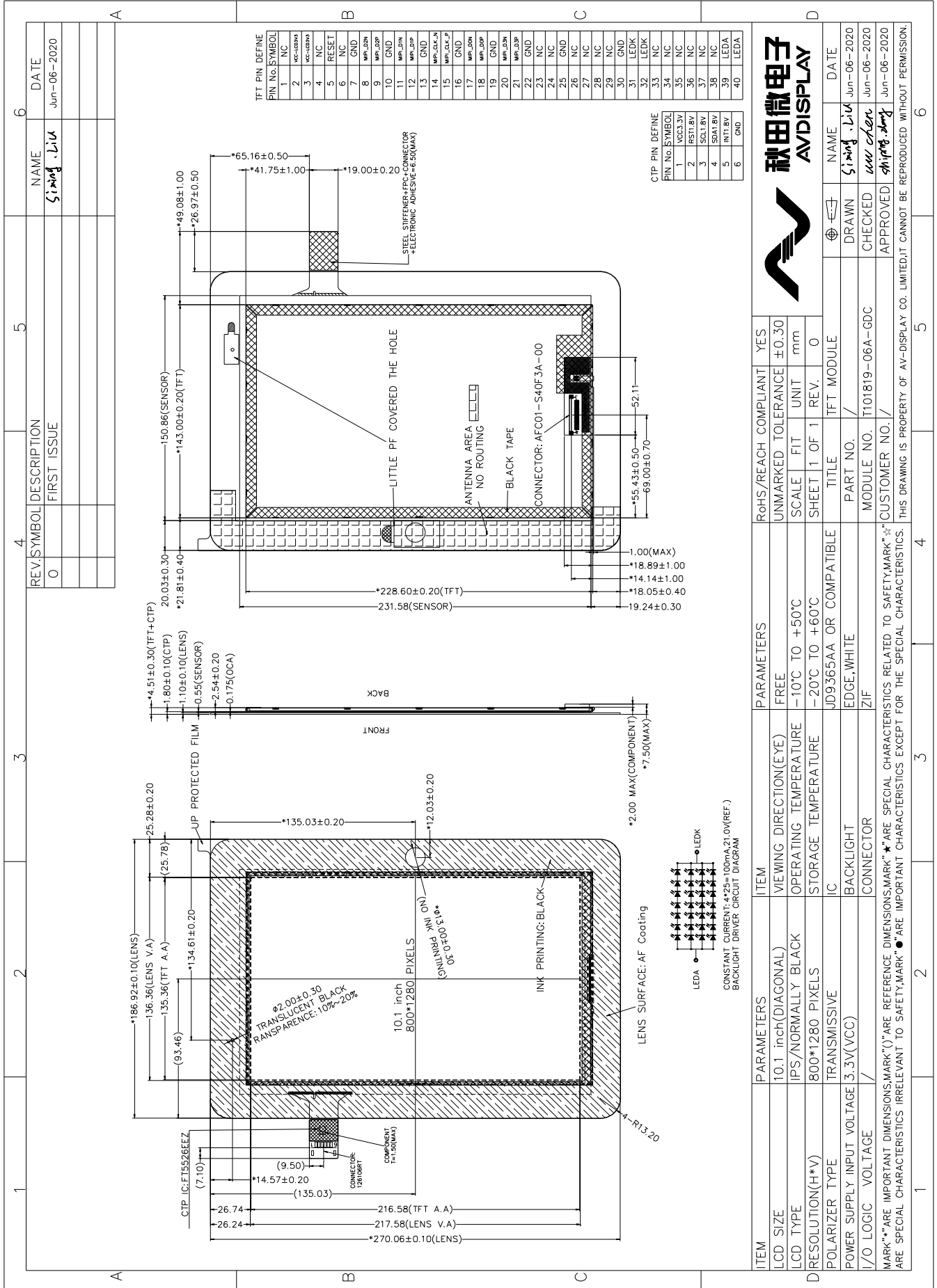
5. TOUCH PANEL CHARACTERISTICS

(at Ta=25°C)

Item	Description	Remark
Product Structure	G+G	
Surface Hardness	≤6H	Pencil, Loading 500g, 45 deg
Ball-falling Test	≤80cm	Steel ball weight 64g
Touch Count Max	10 point	
I2C Slave Address*	-	
Origin of Coordinate*	top left corner	



6. EXTERNAL DIMENSIONS



7. ELECTRO-OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Note
Response time	Tr+ Tf	-	-	30	-	ms	FIG.1	Note 1
Contrast ratio	Cr		800	1000	-	-	FIG.2	Note 2
Surface luminance	Lv	$\theta=0^\circ$	200	250	-	cd/m ²	FIG.2	Note 3
Luminance uniformity	Yu	$\theta=0^\circ$	75	80	-	%	FIG.2	Note 4
NTSC	-	$\theta=0^\circ$	-	50	-	%	FIG.2	Note 5
Viewing angle	θ	$\phi=90^\circ$	75	80	-	deg	FIG.3	Note 6
		$\phi=270^\circ$	75	80	-	deg	FIG.3	
		$\phi=0^\circ$	75	80	-	deg	FIG.3	
		$\phi=180^\circ$	75	80	-	deg	FIG.3	
CIE (x,y) chromaticity	Red x	$\theta=0^\circ$ $\phi=0^\circ$ $T_a=25^\circ\text{C}$	Typ -0.04	0.58	Typ +0.04	-	FIG.2 CIE1931	Note 5
	Red y			0.35		-		
	Green x			0.32		-		
	Green y			0.61		-		
	Blue x			0.14		-		
	Blue y			0.08		-		
	White x			0.31		-		
	White y			0.34		-		

Note1. Definition of response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%. For additional information see FIG1.

Note2. Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula.
For more information see FIG.2.

Contrast ratio= $\frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$

Measured at the center area of the LCD

Note3. Definition of surface luminance

Surface luminance is the luminance with all pixels displaying white.
For more information see FIG.2.

L_v = Average Surface Luminance with all white pixels($P_1, P_2, P_3, \dots, P_n$)

Note4. Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance. For more information see FIG.2.

$Y_u = \frac{\text{Minimum surface luminance with all white pixels } (P_1, P_2, P_3, \dots, P_n)}{\text{Maximum surface luminance with all white pixels } (P_1, P_2, P_3, \dots, P_n)}$

Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity, The x,y value is determined by screen active area center position P5. For more information see FIG.2.

Note6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10. 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 FIG.3.

For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope or DMS series Instruments or compatible. For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is base on TOPCON's BM-5or BM-7 photo detector or compatible.

FIG.1. The definition of response Time

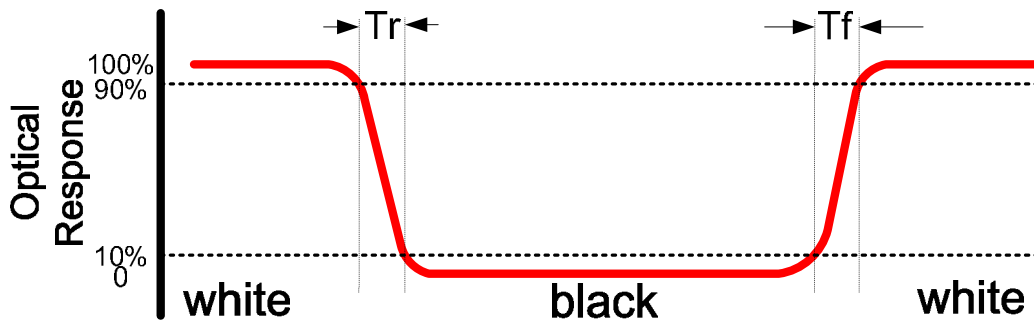


FIG.2. Measuring method for contrast ratio, surface luminance, luminance uniformity, CIE (x,y) chromaticity

H,V : Active area

Light spot size $\varnothing=5\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCM surface to detector lens.

Test spot position : see Figure a.

measurement instrument : TOPCON's luminance meter BM-7 or compatible ,see Figure b.

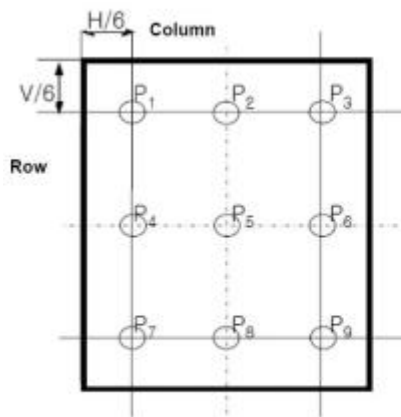


Figure a

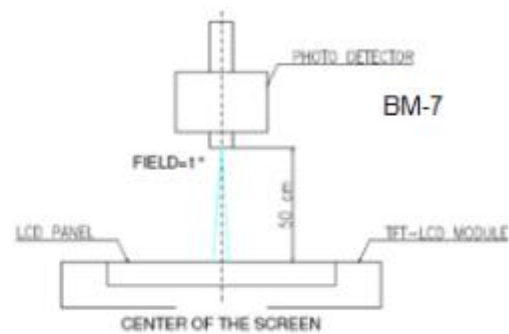
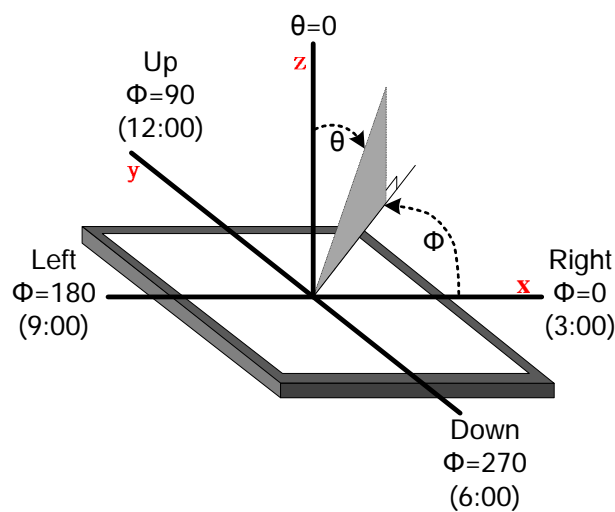


Figure b

FIG.3. The definition of viewing angle





8. INTERFACE DESCRIPTION

TFT Module Interface description

Interface No.	Name	I/O or connect to	Description
1	NC	/	/
2-3	VCC-LCD3V3	P	Power for LCD
4	NC	/	/
5	RESET	I	The external reset input
6	NC	/	/
7	GND	P	Power ground
8	MIPI_D2N	I	Negative DSI Data2 differential signal input pins
9	MIPI_D2P	I	Positive DSI Data2 differential signal input pins
10	GND	P	Power ground
11	MIPI_D1N	I	Negative DSI Data1 differential signal input pins
12	MIPI_D1P	I	Positive DSI Data1 differential signal input pins
13	GND	P	Power ground
14	MIPI_CLKN	I	Positive DSI clock differential signal input pins
15	MIPI_CLKP	I	Negative DSI clock differential signal input pins
16	GND	P	Power ground
17	MIPI_D0N	I	Negative DSI Data0 differential signal input pins
18	MIPI_D0P	I	Positive DSI Data0 differential signal input pins
19	GND	P	Power ground
20	MIPI_D3N	I	Negative DSI Data3 differential signal input pins
21	MIPI_D3P	I	Positive DSI Data3 differential signal input pins
22	GND	P	Power ground
23-24	NC	/	/
25	GND	P	Power ground
26-29	NC	/	/
30	GND	P	Power ground
31-32	LEDK	P	Power for LED backlight(Cathode)
33-38	NC	/	/
39-40	LEDA	P	Power for LED backlight(Anode)

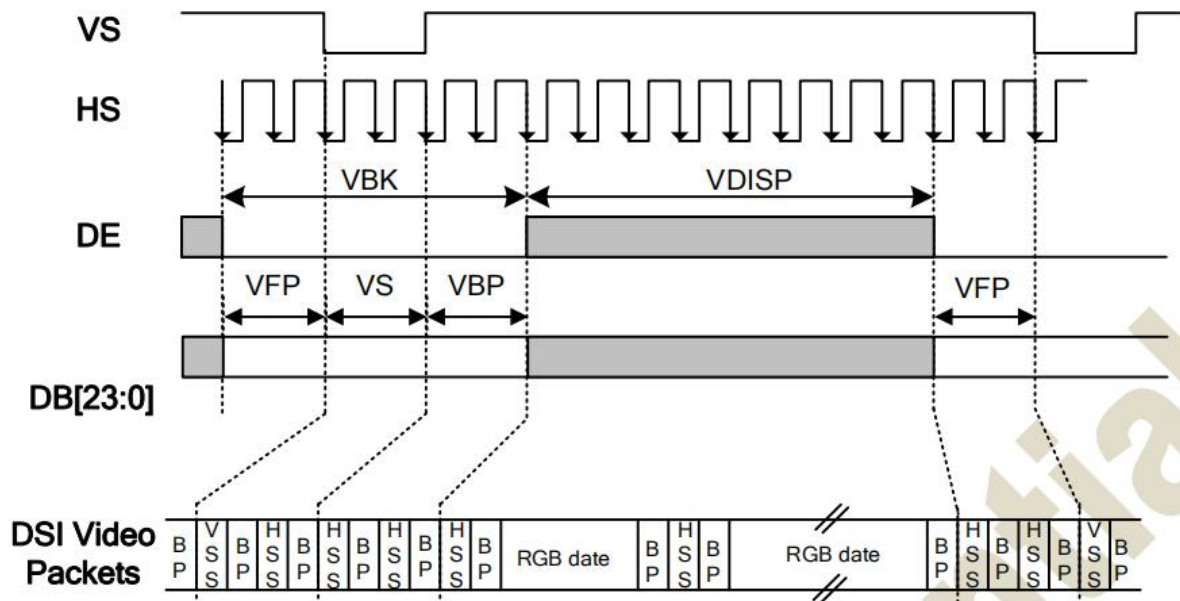
CTP interface description

Interface No.	Name	I/O or connect to	Description
1	VCC3V3	P	Power Supply of CTP
2	RST1.8V	I	Reset low
3	SCL1.8V	I	Serial interface clock
4	SDA1.8V	I/O	Serial interface data
5	INT1.8V	O	State change interrupt
6	GND	P	Ground



9. CHARACTERISTICS

Vertical Timings



(at Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical low pulse width	VS	-	2	4	200 Note(1)	Line
Vertical front porch	VFP	-	4	20	200	Line
Vertical back porch	VBP	-	2	10	200 Note(1)	Line
Vertical blanking period	VBK	VS+VBP+VFP	8	34	250	Line
Vertical active area	-	VDISP	-	1280	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Note: (1) The VS and VBP pulse width are related to GIP start pulse and GIP clock pulse timing. The GIP start pulse and GIP clock pulse must be set at corresponding position for LCD normal display.

(at Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS low pulse width	HS	-	6	18	78	DCK
Horizontal back porch	HBP	-	5	18	78	DCK
Horizontal front porch	HFP	-	5	18	78	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	16	54 (Note1)	88	DCK
Horizontal active area	HDISP	-	-	800	-	DCK
Pixel Clock	PCLK	-	63.06 (Note2)	67.33 (Note2)	81.51 (Note2)	MHz

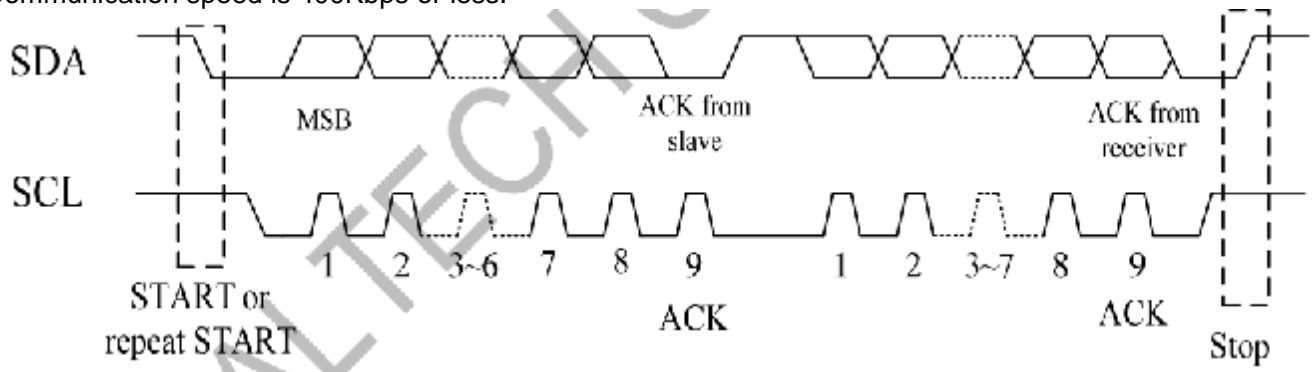
Note 1: HS+HBP > 0.5us.

Note 2: Pixel Clock = (HBLK+HDISP) * (VBK+VDISP) * Frame rate, Frame rate=60Hz.

Horizontal Timing for DSI Video mode I/F

CTP AC CHARACTERISTICS

Communication speed is 400Kbps or less.

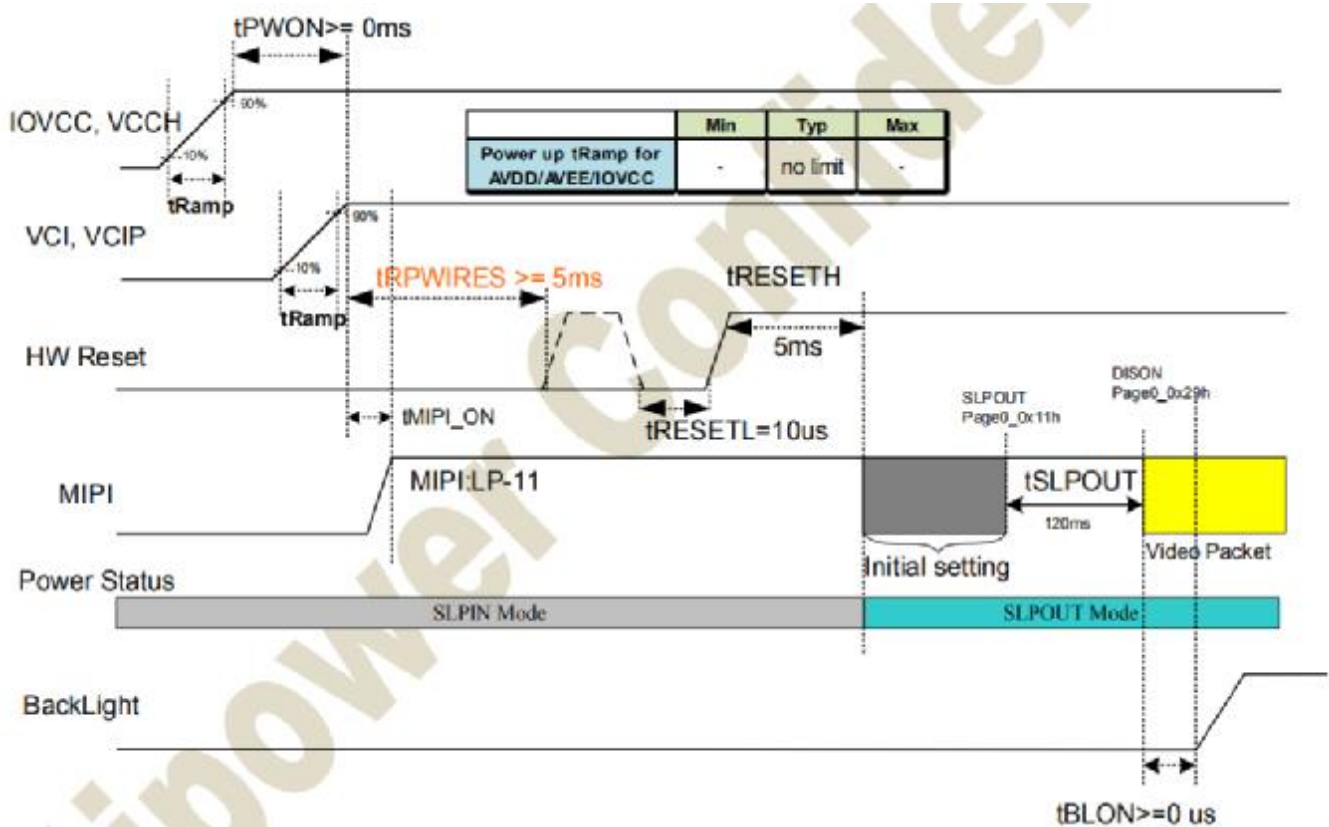




9. POWER SEQUENCE

TFT Module POWER SEQUENCE

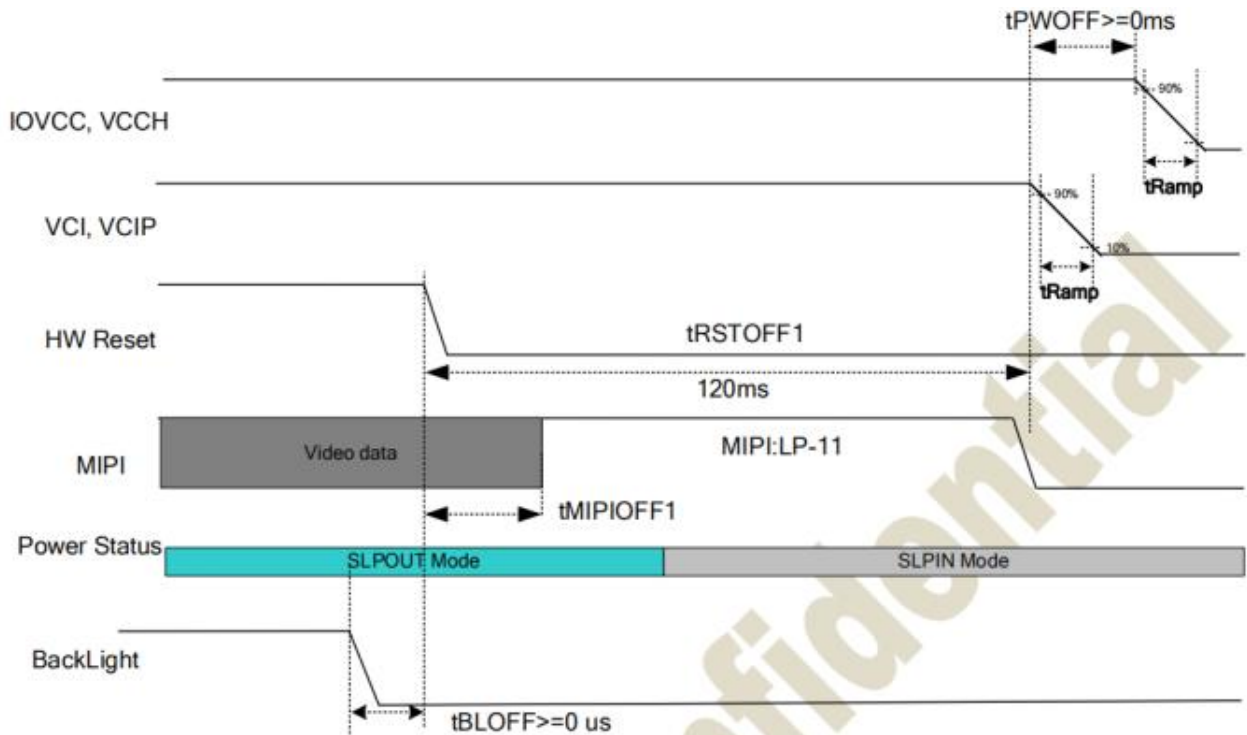
Power on:



Symbol	Min	Typ	Max	Unit	Remark
tRamp	-	no limit	-	us	
tPWON	0	-	-	ms	
tON1	0	-	-	ms	
tMIPI-ON	0	-	tRPWIRES	ms	
tRPWIRES	5	-	-	ms	
tRESETL	10	-	-	us	
tRESETH	5	-	-	ms	
tSLPOUT	120	-	-	ms	
tBLON	0	-	-	ms	



Power off:

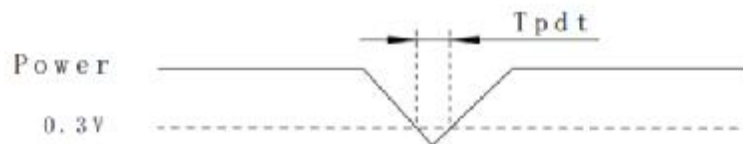
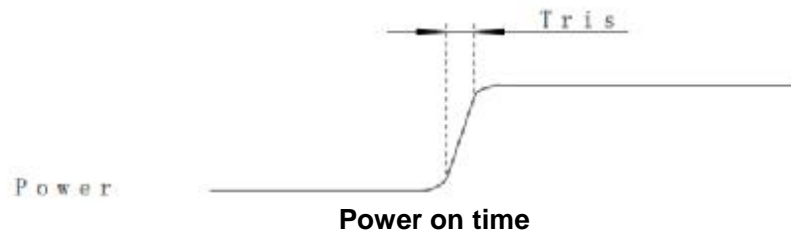


Symbol	Min	Typ	Max	Unit	Remark
tRamp	-	no limit	-	us	
tPWOff	0	-	-	ms	
tPWOff1	0	-	-	ms	
tPWOff2	0	-	-	ms	
tMIPIOFF1	0	-	-	ms	power off case 1
tRSTOFF1	120	-	-	ms	power off case 1
tMIPIOFF2	0	-	-	ms	power off case 2
tRSTOFF2	0	-	-	ms	power off case 2
tCMD_OFF	1	-	-	ms	power off case 2
tDISOFF	50	-	-	ms	power off case 2
tSLPIN	100	-	-	ms	power off case 2
tBLOFF	0	-	-	ms	

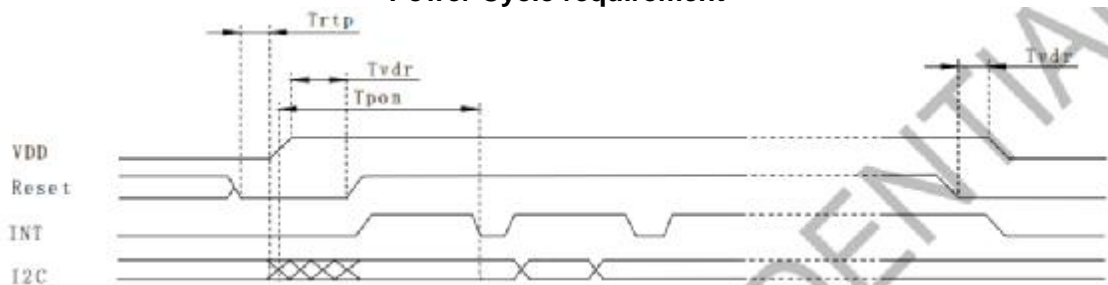


CTP POWER SEQUENCE

Reset should be pulled down to be low before powering on and powering down. I2C shouldn't be used by other devices during Reset time after VDD powering on (T_{rtp}). INT signal will be sent to the host after initializing all parameters and then start to report points to the host. If Power is down, the voltage of supply must be below 0.3V and T_{pdt} is more than 1ms.

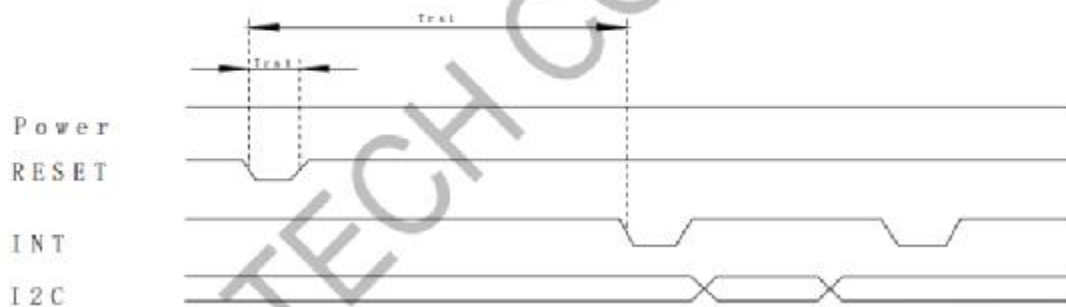


Power Cycle requirement



Power on Sequence

Reset time must be enough to guarantee reliable reset, the time of starting to report point after resetting approach to the time of starting to report point after powering on.



Reset Sequence

Parameter	Description	Min	Max	Units
T_{ris}	Rise time from 0.1VDD to 0.9VDD	--	5	ms
T_{pdt}	Time of the voltage of supply being below 0.3V	5	--	ms
T_{rtp}	Time of resetting to be low before powering on	100	--	μ s
T_{pon}	Time of starting to report point after powering on	200	--	ms
T_{vdr}	Reset time after VDD powering on	1	--	ms
T_{rsi}	Time of starting to report point after resetting	200	--	ms
T_{rst}	Reset time	1	--	ms

11. RELIABILITY TEST CONDITIONS

No.	Test item	Test condition		Inspection after test
11.1	High temperature storage test	+60°C/120 hours		Inspection after 2~4hours storage at room temperature, the sample shall be free from defects : 1.Current changing value before test and after test is 50% larger; 2. Function defect : Non-display,abnormal-d isplay,missing lines, Short lines,ITO corrosion; 3.Visual defect : Air bubble in the LCD,Seal leak,Glass crack.
11.2	Low temperature storage test	-20°C/120 hours		
11.3	High temperature operating test	+50°C/120 hours		
11.4	Low temperature operating test	-10°C/120 hours		
11.5	Temperature cycle storage test	-20°C ~ 25°C ~ +60°C/10cycles (30min.) (10min.) (30min.)		
11.6	High temperature high humidity test	+50°C*80% RH/120 hours		
11.7	Vibration test	Frequency : 250 r/min Amplitude : 1 inch Time: 45min		
11.8	Drop test	Drop direction: 1 corner/3 edges/6 sides 10 times		
		Packing weight(kg)	Drop height(cm)	
		<11	80±1.6	
		11 ≤ G<21	60±1.2	
		21 ≤ G<31	50±1.0	
		31 ≤ G<40	40±0.8	
11.9	ESD test	Air discharge: ±8KV, 10times Contact discharge: ±4KV, 10times		

Remark :

- 1.The test samples should be applied to only one test item.
- 2.Sample size for each test item is 3~5pcs.
- 3.For High temperature high humidity test, Pure water(Resistance>10MΩ) should be used.
- 4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
- 5.B/L evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence B/L has.
- 6.Failure judgment criterion: Basic specification, Electrical characteristic, Mechanical characteristic, Optical characteristic.
- 7.After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

12. INSPECTION CRITERION

Refer to《Inspection Criterion for MTP Products--To customer》V2.0, DOCUMENT NO.: AVD (WI) -00-QA-009

13. HANDLING PRECAUTIONS

13.1 Mounting method

The LCD module consists of two thin glass plates with polarizers which easily be damaged. And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

13.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent [recommended below] and wipe lightly :

- .Isopropyl alcohol
- .Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent :

- .Water
- .Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated :

- .Soldering flux
- .Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

13.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend that you :

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

13.4 Packing

Module employs LCD elements 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 direct to sunshine or high temperature/humidity.

13.5 Caution for operation

●.It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life.

●.An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.

●.Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.

●.If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.

●.A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

●.Usage under the maximum operating temperature, 50%Rh or less is required.

●.When fixed patterns are displayed for a long time, remnant image is likely to occur.

13.6 Storage

In the case of storing for a long period of time for instance, for years for the purpose of replacement use, the following ways are recommended.

●.Storing in an ambient temperature 10°C to 30°C, and in a relative humidity of 45% to 75%. Don't expose to sunlight or fluorescent light.

●.Storing in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.

●.Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature

range.

- Storing with no touch on polarizer surface by anything else.

It is recommended to store them as they have been contained in the inner container at the time of delivery from us.

13.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

14. PRECAUTION FOR USE

14.1 A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

14.2 On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification.
- When a new problem is arisen which is not specified in this specifications.
- When an inspection specifications change or operating condition change in customer is reported to AVD, and some problem is arisen in this specification due to the change.
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

15. PACKING SPECIFICATION

Please consult our technical department for detail information.

16. INITIALIZATION CODE

```
//----- JD EVB RGB setting -----//
```

```
Display Resolution:800*1280
params->dsi.vertical_sync_active=4
params->dsi.vertical_backporch=8
params->dsi.vertical_frontporch=8
params->dsi.horizontal_sync_active=20
params->dsi.horizontal_backporch=20
params->dsi.horizontal_frontporch=40
params->dsi.PLL_CLOCK=206
```

```
LCD_nReset=1;
Delayms(5);
LCD_nReset=0;
Delayms(10);
LCD_nReset=1;
Delayms(120);
//-----//
```

```
{0xE0,1,{0x00}},
{0xE1,1,{0x93}},
{0xE2,1,{0x65}},
{0xE3,1,{0xF8}},
{0x80,1,{0x03}},
```

```
{0xE0,1,{0x01}},
{0x00,1,{0x00}},
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{0x03,1,{0x00}},
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