



产品规格书

Specification For Approval

产品描述

DESCRIBE: 3.5" TFT

产品型号

PRODUCTS: K350C4516T

客户名称

CUSTOMER:

客户型号

Module NO.

制表 PREPARED BY :	批准 APPROVED BY

客户确认签章：
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RECORDS OF REVISION

History of Version

Date	Ver.	Description	Page	Design by
2016/05/18	0	Mass Production	-	CYF
2016/06/29	V3	Modify FPC	-	CYF

Total : 26Page



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Note : For detailed information please refer to IC data sheet: ILI9488



1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Size	3.5'
Display Format	320(RGB) * 480
LCD Type	TFT , Transflective , Positive
View direction (Gray inversion)	12 O'clock
polaroid	Up: 0.22mm,Down,:0.22mm
Backlight	White LED
Interface	RGB&MCU
Driver IC	Driver IC : ILI9488

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	54.48 (W) * 84.71 (L) * 3.5(H)(Max)	mm
Active Area	48.96 (W) * 73.44 (L)	mm
Dot Size	0.153 (W) * 0.153 (L)	mm

Note : For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings(Ta=25°C VSS=0V)

Item	Symbol	Min.	Type	Max.	Unit	Humidity
Supply Voltage for Logic	VCI	-0.3	--	4.6	V	--
	IOVCC	-0.3	--	4.6	V	--
Power Supply for LCD	VGH-VGL	-0.3	--	32	V	--
Operating Temperature	T _{OP}	-20	--	70	°C	Note1
Storage Temperature.	T _{ST}	-30	--	80	°C	Note2

Note1: Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Ta ≤ 70°C : 75%RH max

Ta > 50°C : absolute humidity must be lower than the humidity of 75%RH at 50°C

Note2: Ta at -10°C will be <48hrs, at 60 °C will be <120hrs when humidity is higher than 75%RH.

Ta ≤ 60°C : 75%RH max

Ta > 60°C : absolute humidity must be lower than the humidity of 75%RH at 60°C



1.4 DC Electrical Characteristics(Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply	V _{CI}	--	2.5	2.8	3.6	V
	IOVCC	--	1.65	1.8	3.6	V
“H” Input Voltage	V _{IH}	—	0.8 V _{VCI}	-	V _{CI}	V
“L” Input Voltage	V _{IL}	—	GND	-	0.2 V _{VCI}	V

1.5 Optical Characteristics

TFT LCD Panel

V_{CI}=IOVCC=2.8V, Ta = 25°C

Item		Symbol	Conditions	Min.	Typ.	Max.	unit	Reference
Response Time(rise)		tr	$\theta =-0^{\circ}\text{Ta} = 25^{\circ}\text{C}$	-	10	15	ms	Note 2
Response Time(fall)		tf	$\theta =0^{\circ}\text{Ta} = 25^{\circ}\text{C}$	-	10	25	ms	
Viewing angle (CR \geq 10)	Top	$\theta +$	Contrast Maximum direction	50	60	--	Deg	Note4
	Bottom	$\theta -$		50	60	--		
	Left	$\theta \text{ R}$		60	70	--		
	Right	$\theta \text{ L}$		60	70	--		
Contrast ratio		CR	Ta = 25°C	400	500	--	--	Note3
Color of CIE Coordinate (With B/L)	White	X		0.292	0.307	0.322		Note1
		Y		0.312	0.327	0.342		
	Red	X		0.609	0.624	0.639		
		Y		0.316	0.331	0.346		
	Green	X		0.281	0.296	0.311		
		Y		0.562	0.577	0.592		
	Blue	X		0.128	0.143	0.158		
		Y		0.094	0.109	0.124		
Brightness(With LCD)		IV	IF=20MA	250	280	--	cd/m2	Note1
Uniformity (With LCD)		$\triangle \text{B}$		80	85	--	%	Note1



Note1:

*1: $\Delta B = B(\min) / B(\max) * 100\%$

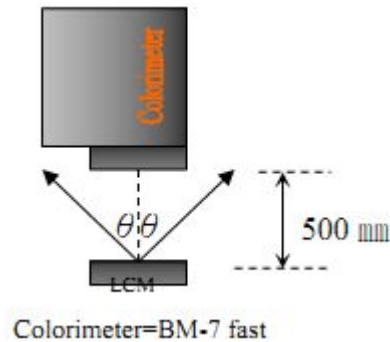
*2: Measurement Condition for Optical Characteristics:

a: Environment: $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ / $60 \pm 20\%\text{R.H.}$, no wind, dark room below 10 Lux at typical lamp current and typical operating frequency.

b: Measurement Distance: $500 \pm 50 \text{ mm}$, ($\theta = 0^{\circ}$)

c: Equipment: TOPCON BM-5 fast, (field 1°), after 10 minutes operation.

d: The uncertainty of the C.I.E coordinate measurement ± 0.01 , Average Brightness $\pm 4\%$



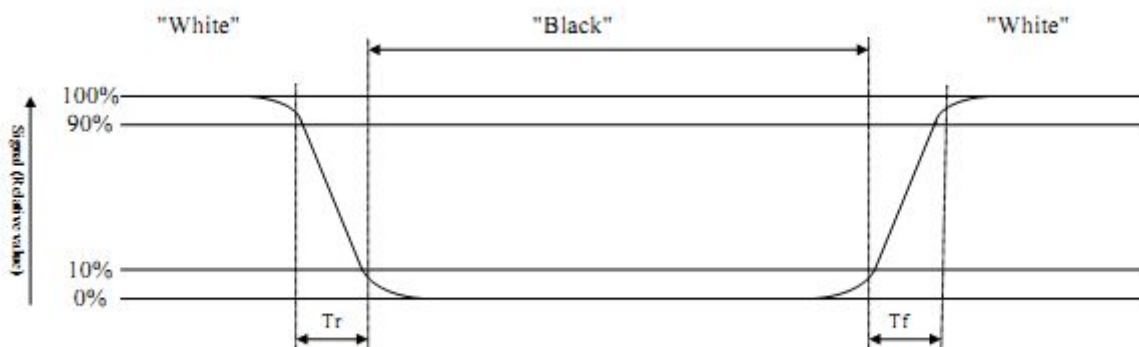
To be measured at the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-5, after 10 minutes operation (module)

Note2: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white" (falling time) and from "white" to "black" (rising time), respectively. The response time is defined as the time interval between the 10% and 90% of Amplitudes.

Refer to figure as below:

Normally White



The graph illustrates the signal level (relative value) over time for a video signal. The signal transitions from 'Black' to 'White' and back to 'Black'. The rising edge is labeled T_r (rise time) and the falling edge is labeled T_f (fall time). The signal level is 0% for 'Black' and 100% for 'White'.

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

Diagram illustrating the relationship between angles θX , θY , and ϕ for different orientations of a plane.

Key angles and conditions shown:

- $\theta X = \theta Y = 0^\circ$
- $\phi = 270^\circ$, $\theta X - = 90^\circ$
- $\phi = 180^\circ$, $\theta Y + = 90^\circ$
- $\phi = 90^\circ$, $\theta X + = 90^\circ$
- $\phi = 0^\circ$, $\theta Y - = 90^\circ$

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1.6 Backlight Characteristics

LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25°C	-	20	mA
Reverse Voltage	VR	Ta =25°C	-	5	V
Power Dissipation	PO	Ta =25°C	-	0.1	W

Electrical / Optical Characteristics

Ta =25°C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF=20mA	16.8	18	19.8	V
Average Brightness	IV	IF=20mA	6000	6500	-	cd/m ²
CIE Color Coordinate	X	IF=20mA	0.25	0.30	0.35	-
	Y		0.26	0.31	0.36	
Uniformity	ΔB	*2	80	85	-	%
Color	White					

*1 This value will be changed while mass production.

*2 : $\Delta B = B(\min) / B(\max)$



1.7 Touch Screen Characteristic

1. Input Method and Activation Force

Stylus 10~70 grams and Finger 20~80 grams

2. Typical Optical Characteristics

Visible Light Transmission : >80%

Haze : 5%±2% through hard coated PET only

3. Electrical Specifications

1. Operating Voltage 5.5V or less

2. Contact current 20mA(maximum)

3. Circuit close resistance X : 300~500Ω Y : 500~900Ω

4. Circuit open resistance > 20MΩ at 25V DC

5. Contact bounce < 15ms

6. Linear Test Specification : ± 1.5% (maximum)

4. Linearity Tolerance : ±1.5% (maximum)

5. Environment Specification

Operating Temperature -10°C ~ +60°C (Humidity less than 90% RH)

Storage Temperature -20°C ~ +70°C (at ambient Humidity)



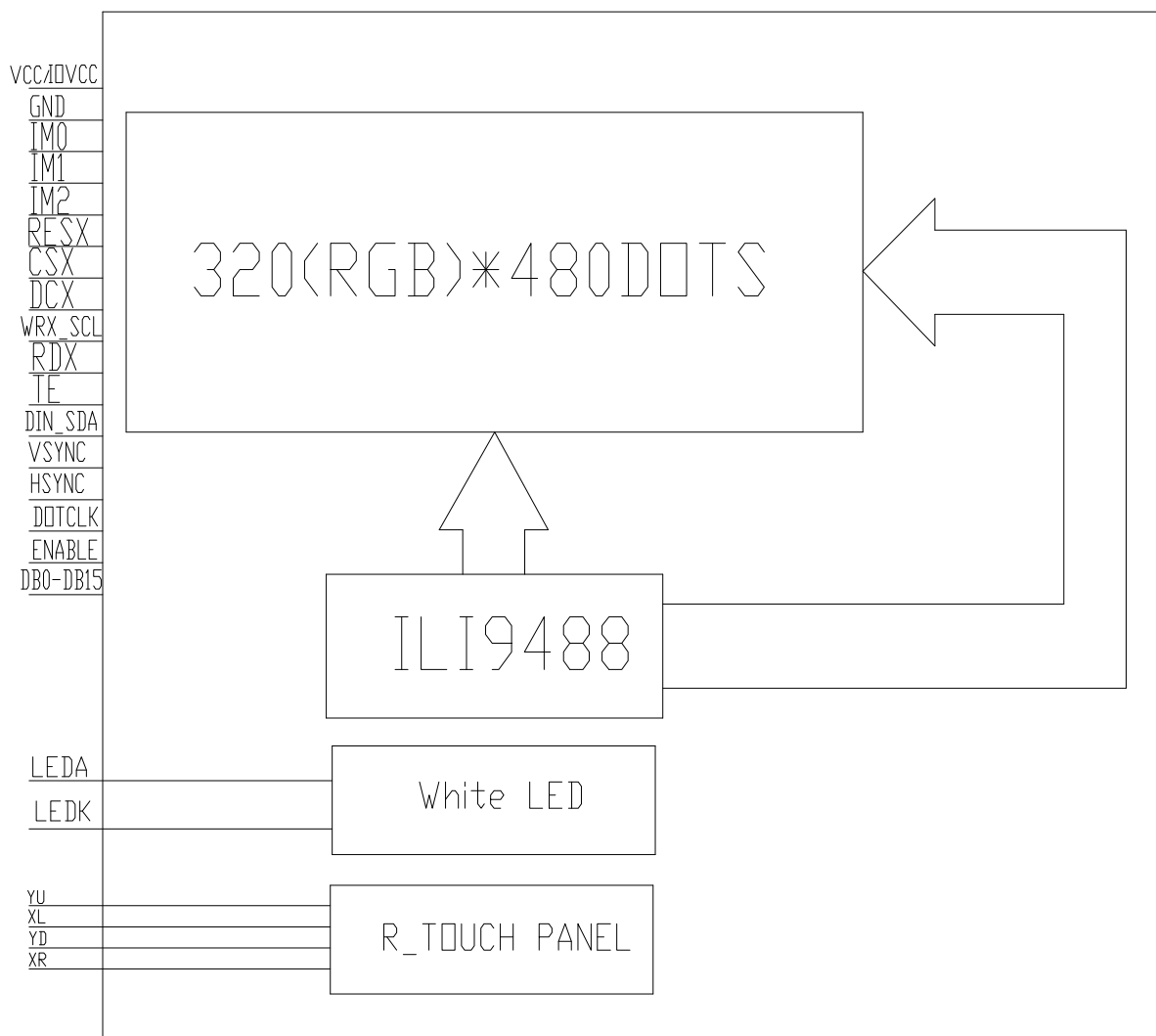
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram





2.2 Interface Pin Description

No.	Symbol	Function
1	GND	Ground
2	LEDA	Anode of backlight
3	LEDA	Anode of backlight
4	LEDK	Cathode of backlight
5	LEDK	Cathode of backlight
6	GND	Ground
7	GND	Ground
8	VCC	Connect to an external power supply of 2.5 ~ 3.3V.
9	IOVCC	Connect to an external power supply of 1.65 ~ 3.3V.
10	RESET	Reset input signal Initialize the chip with a low input. Be sure to execute a power-on reset after supplying power.
11	VSYNC	DPI: Frame synchronizing signal Fix to DGND level when not in use.
12	HSYNC	DPI: Line synchronizing signal Fix to DGND level when not in use.
13	GND	Ground
14	DOTCLK	DPI: Dot clock signal Fix to DGND level when not in use.
15	GND	GND
16	DE	DPI: A data ENABLE input signal Fix to DGND level when not in use.
17-34	DB17-DB0	Data bus
35	SDO	serial data output bi-direction pin Let it to open in MPU interface mode
36	SDI	DIN/SDA: serial data input/output bi-direction pin Fix to DGND level when not in use.
37	RDX	serve as a read signal Fix to IOVCC level when not in use.
38	WRX/SCL	WRX pin, serves as a write signal SCL pin as Serial Clock when operates in the serial interface Fix to IOVCC level when not in use



39	D/CX	Data/Command Selection pin Low: Command High: Parameter Fix to IOVCC level when not in use.
40	CS	Chip select input signal Low: the chip is selected and accessible High: the chip is not selected and not accessible Fix to IOVCC level when not in use.
41	TE	Serve as a TE (Tearing Effect) output signal Leave the pin open when not in use.
42	XR	Touch panel X coordinate right
43	YD	Touch panel Y coordinate down
44	XL	Touch panel X coordinate left
45	YU	Touch panel Y coordinate up

Note:

Interface description of choice on the FPC as below:

When R1 R4 R5=0 and R2 R3 R6=NC, Select SPI+RGB interface;

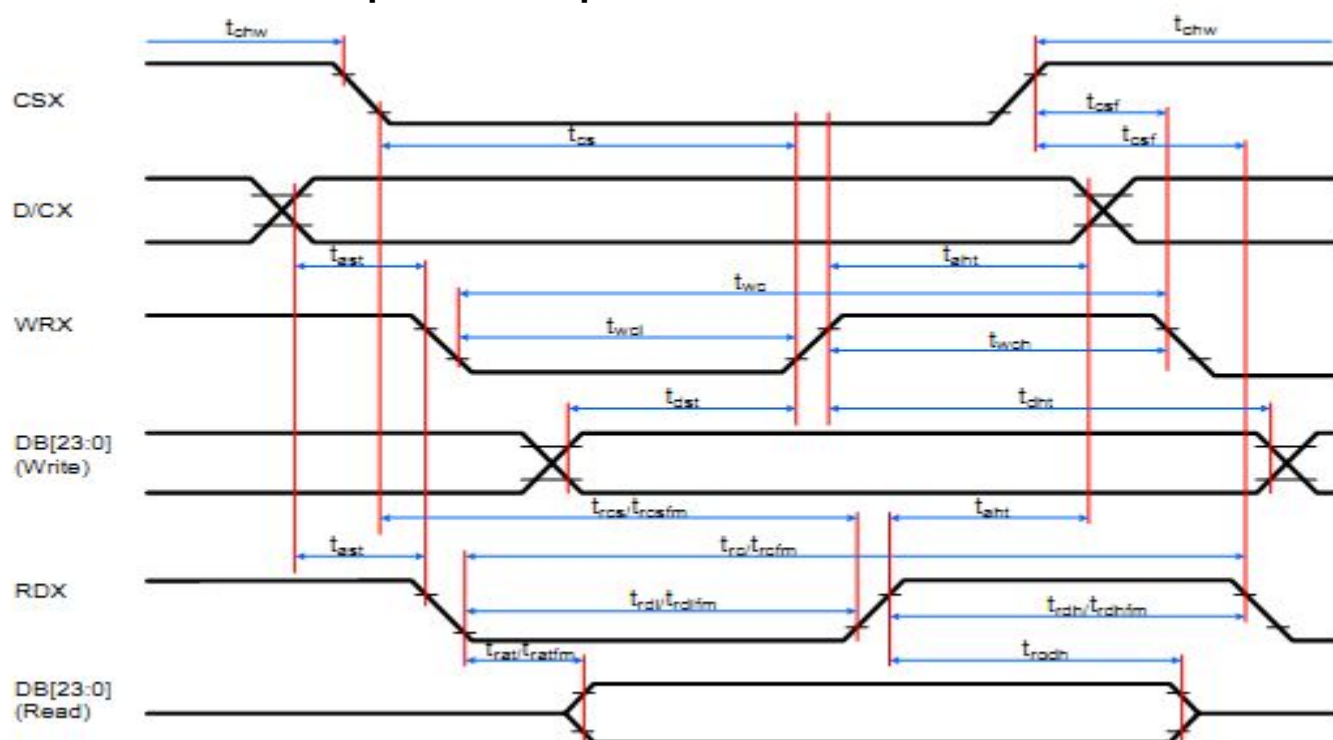
When R1 R3 R6=0 and R2 R4 R5=NC, Select i80-system 8bit DB7-DB0 is used;

When R2 R3 R6=0 and R1 R4 R5=NC, Select i80-system 16bit DB15-DB0 is used;



2.3 Timing Characteristics

Read/Write operation sequence

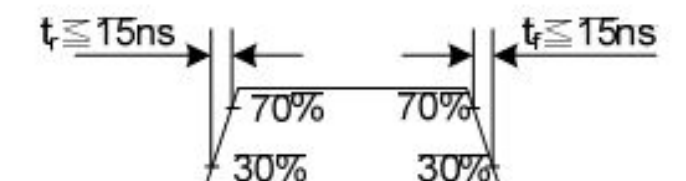


Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	-
	that	Address hold time (Write/Read)	0	-	ns	-
CSX	tchwh	CSX "H" pulse width	0	-	ns	-
	tcs	Chip Select setup time (Write)	15	-	ns	-
	trcs	Chip Select setup time (Read ID)	45	-	ns	-
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	-
	tcsf	Chip Select Wait time (Write/Read)	0	-	ns	-
WRX	twc	Write cycle	40	-	ns	-
	twrh	Write Control pulse H duration	15	-	ns	-
	twrl	Write Control pulse L duration	15	-	ns	-
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	When read from Frame Memory
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	When read ID data
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
DB [23:0], DB [17:0], DB [15:0], DB [8:0], DB [7:0]	tdst	Write data setup time	10	-	ns	For maximum, CL=30pF For minimum, CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

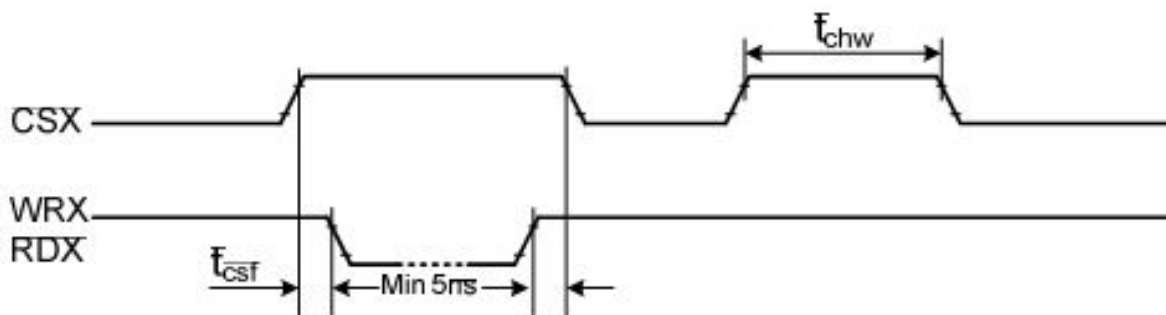


Notes:

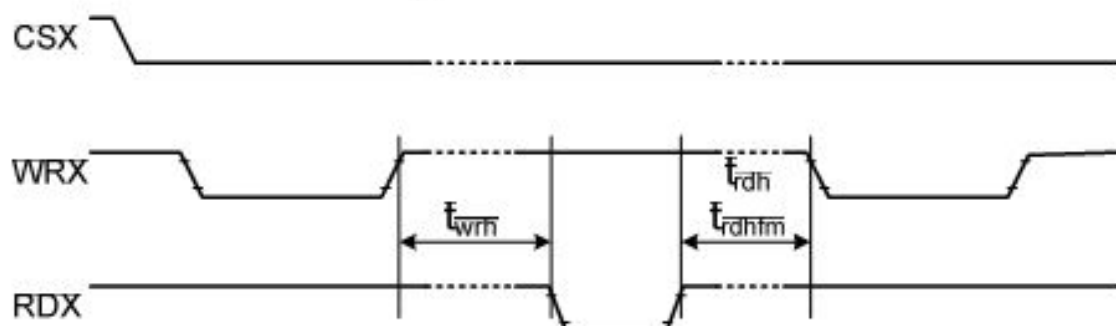
1. $T_a = -30$ to $70\text{ }^{\circ}\text{C}$, $\text{IOVCC} = 1.65\text{V}$ to 3.3V , $\text{VCI} = 2.5\text{V}$ to 3.3V , $\text{AGND} = \text{DGND} = 0\text{V}$
2. Logic high and low levels are specified as 30% and 70% of IOVCC for input signals.
3. Input signal rising time and falling time:



4. The CSX timing:

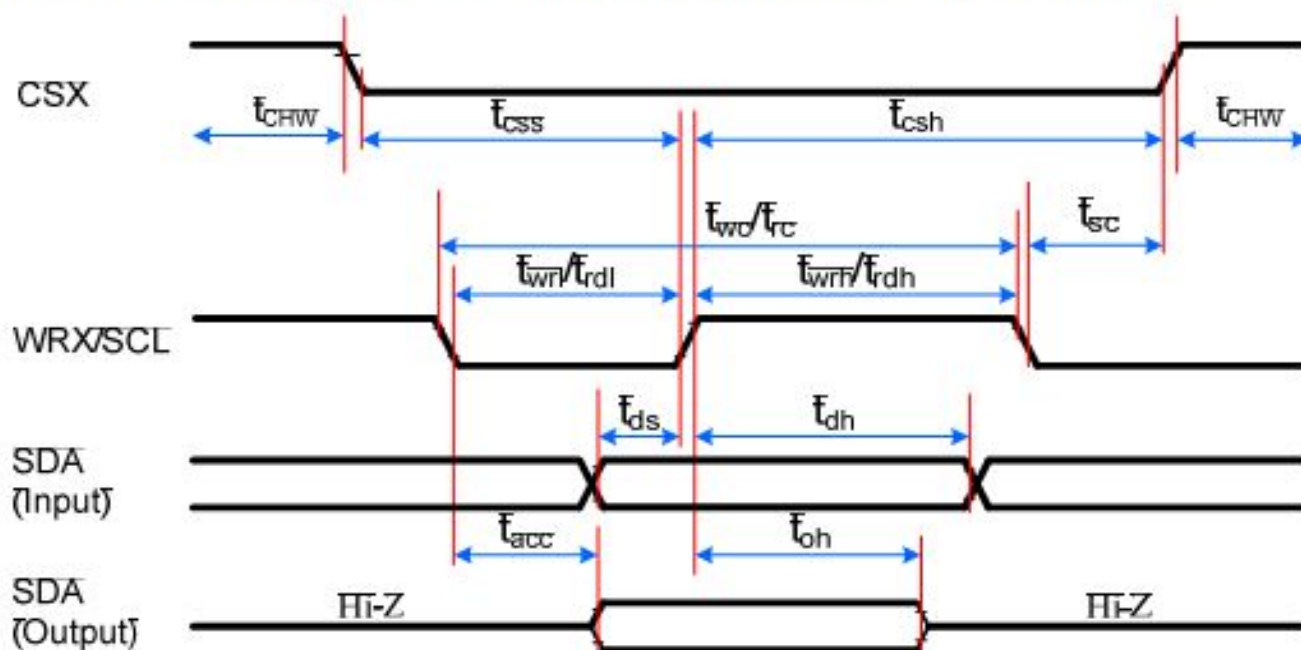


5. The Write to Read or the Read to Write timing:



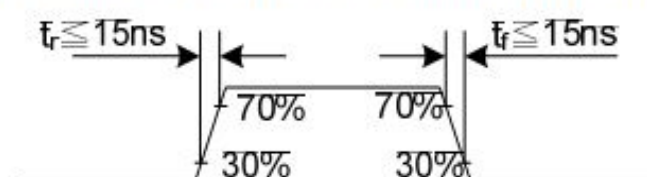


DBI Type C Option 1 (3-Line SPI System) Timing Characteristics



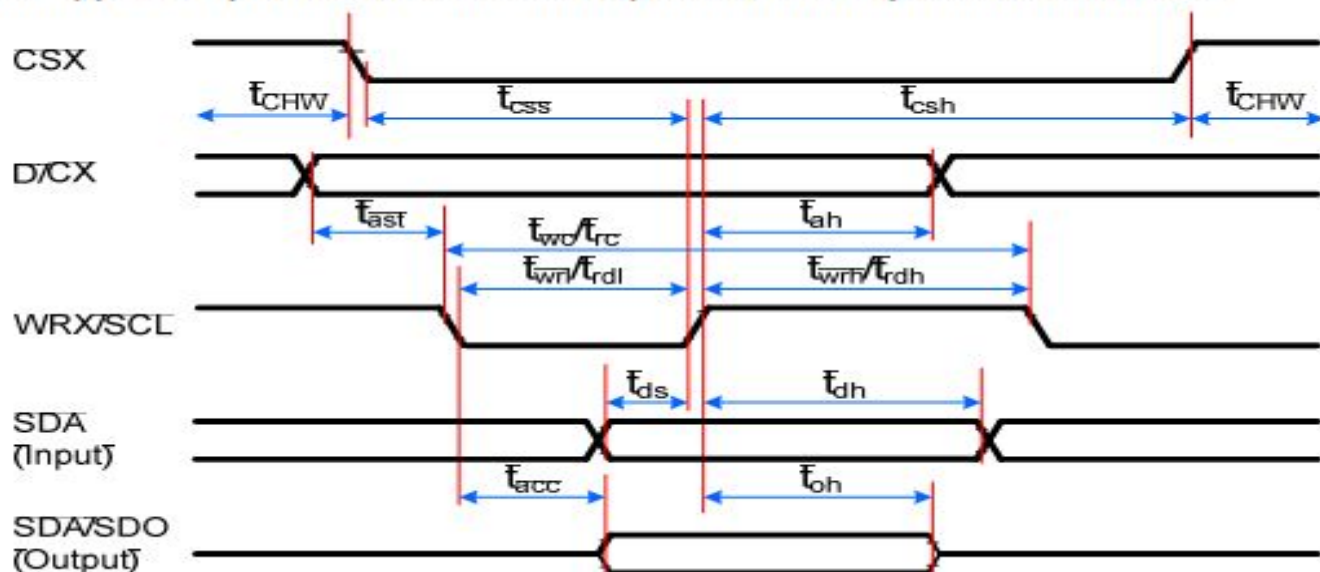
Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tsc	SCL-CSX	15	-	ns	
	tchwh	CSX H Pulse Width	40	-	ns	
	tcss	Chip select time (Write)	60	-	ns	
	tcswh	Chip select hold time (Read)	65	-	ns	
SCL	twc	Serial Clock Cycle (Write)	66	-	ns	
	twrh	SCL H Pulse Width (Write)	15	-	ns	
	twrl	SCL L Pulse Width (Write)	15	-	ns	
	trc	Serial Clock Cycle (Read)	150	-	ns	
	trdh	SCL H Pulse Width (Read)	60	-	ns	
	trdl	SCL L Pulse Width (Read)	60	-	ns	
SDA (Input)	tds	Data setup time (Write)	10	-	ns	
	tdh	Data hold time (Write)	10	-	ns	
SDA/SDO (Output)	tacc	Access time (Read)	10	50	ns	For maximum CL=30pF
	toh	Output disable time (Read)	15	50	ns	For minimum CL=8pF

Note: Ta = -30 to 70 °C, IOVCC = 1.65V to 3.6V, VCI = 2.5V to 3.6V, AGND = DGND = 0V, T = 10+/-0.5ns





DBI Type C Option 3 (4-Line SPI System) Timing Characteristics



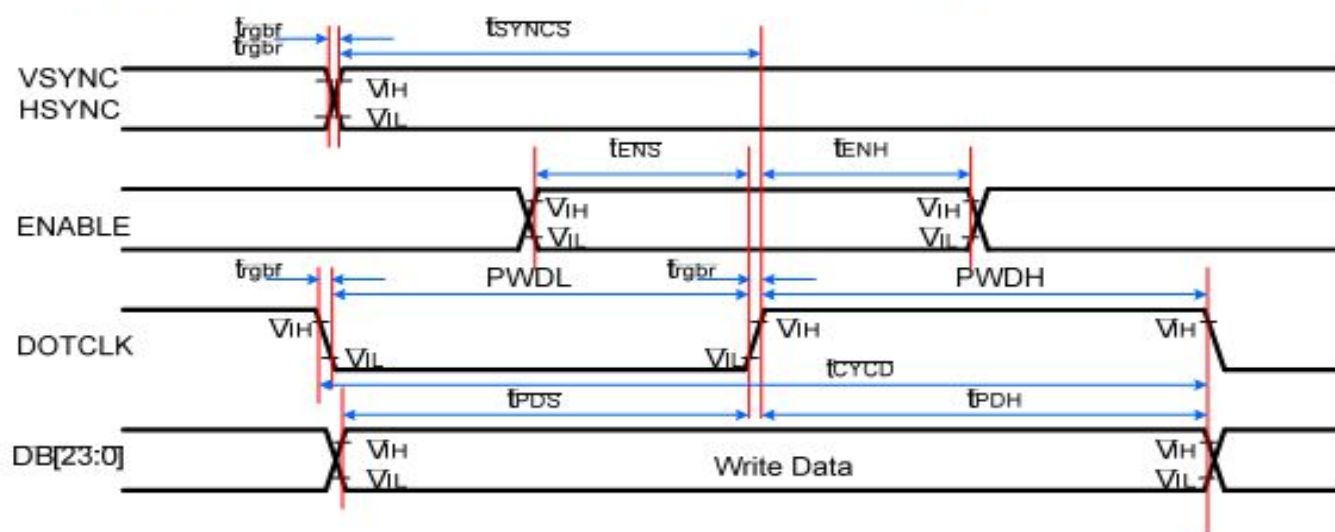
Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tcss	Chip select time (Write)	15	-	ns	
	tcsh	Chip select hold time (Read)	15	-	ns	
	tCHW	CS H pulse width	40	-	ns	
SCL	twc	Serial clock cycle (Write)	50	-	ns	
	twrh	SCL H pulse width (Write)	10	-	ns	
	twrl	SCL L pulse width (Write)	10	-	ns	
	trc	Serial clock cycle (Read)	150	-	ns	
	trdh	SCL H pulse width (Read)	60	-	ns	
	trdl	SCL L pulse width (Read)	60	-	ns	
D/CX	tas	D/CX setup time	10	-	ns	
	tah	D/CX hold time (Write/Read)	10	-	ns	
SDA (Input)	tds	Data setup time (Write)	10	-	ns	
	tdh	Data hold time (Write)	10	-	ns	
SDA/SDO (Output)	tacc	Access time (Read)	10	50	ns	For maximum CL=30pF
	tod	Output disable time (Read)	15	50	ns	For minimum CL=8pF

Notes:

1. Ta = -30 to 70 °C, IOVCC = 1.65V to 3.3V, VCI = 2.5V to 3.3V, AGND = DGND = 0V, T = 10+/-0.5ns.
2. Does not include signal rising and falling times.

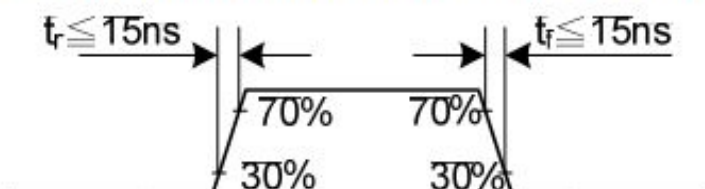


DPI (Display Parallel 16-/18-/24-bit interface) Timing Characteristics



Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC/ HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	16-/18-/24-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
ENABLE	t_{ENS}	ENABLE setup time	15	-	ns	
	t_{ENH}	ENABLE hold time	15	-	ns	
DB [23:0]	t_{POS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	20	-	ns	
	PWDL	DOTCLK low-level period	20	-	ns	
	t_{CYCD}	DOTCLK cycle time	50	-	ns	
	t_{rgb}, t_{grb}	DOTCLK, HSYNC, VSYNC rise/fall time	-	15	ns	

Note: $T_a = -30$ to 70°C , $IOVCC = 1.65\text{V}$ to 3.3V , $VCI = 2.5\text{V}$ to 3.3V , $AGND = DGND = 0\text{V}$





3. Reliability

3.1 Environmental Test

NO	Test Item	Test Condition	
1	Low temperature storage	$-30\pm 2^{\circ}\text{C}$, 240H	
2	High temperature storage	$80\pm 2^{\circ}\text{C}$, 240H	
3	Low temperature operation	$-20\pm 2^{\circ}\text{C}$, 96H	
4	High temperature operation	$70\pm 2^{\circ}\text{C}$, 96H	
5	High temperature/ Humidity storage	$60\pm 2^{\circ}\text{C}$ 90% \pm 5%RH(Without dewing), 240H	
6	Thermal shock storage	$-20^{\circ}\text{C} \rightarrow 25^{\circ}\text{C} \rightarrow 70^{\circ}\text{C} \rightarrow 25^{\circ}\text{C}$ (30mins) (5mins) (30mins) (5mins) 10 Cycle	
7	ESD Test	Air Discharge: Apply 2 KV with 5 times discharge for each polarity +/-	Contact Discharge: Apply 250V with 5 times discharge for each polarity +/-
		Testing location: Around the face of LCD	Testing location: 1.Apply to bezel. 2.Apply to Vdd, Vss.

*Suggest not to light the LCM all the time.

3.2 Mechanical Test

NO.	Test Item	Test Condition	Note
1	Vibration test	Sweep for 1 min at 10Hz , 55Hz , 10Hz , amplitude 1.5mm 15 minutes each in the X , Y and Z directions (Total 45 minutes)	Non operation state
2	Drop test	One angle , three edges and six sides. 75cm above the ground(no weight difference)	Non operation state

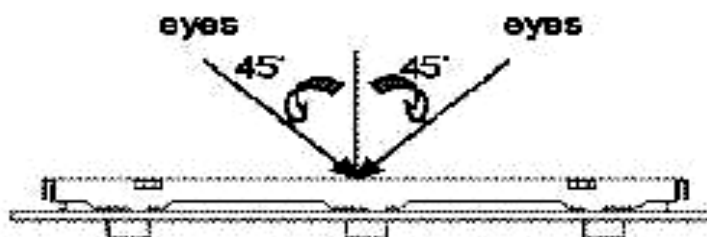


4. Appearance Standard

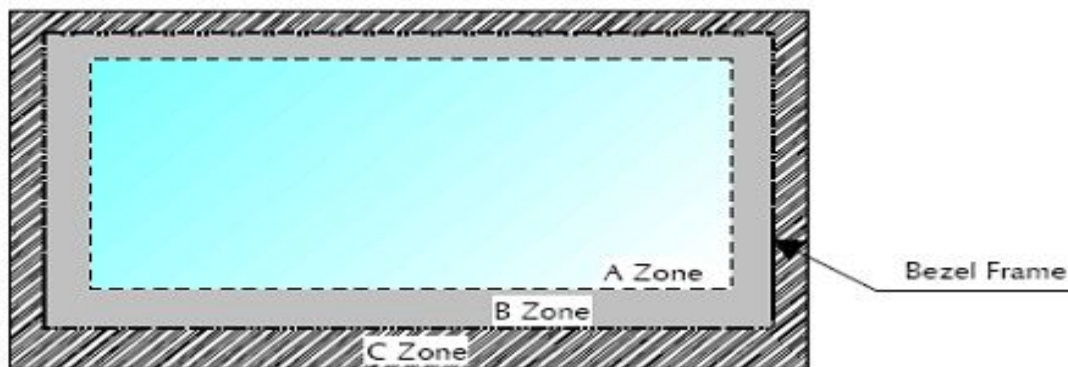
4.1 Inspection Conditions

The LCD shall be inspected under 40W white fluorescent light. The distance between the eyes and the sample

shall be more than 30cm. All directions for inspecting the sample should be within 45° against perpendicular line.



4.2 Definition of Applicable Zones



A Zone : Active display area

B Zone : Area from outside of "A Zone" to validity viewing area

C Zone : Rest parts

A Zone + B Zone = Validity viewing area

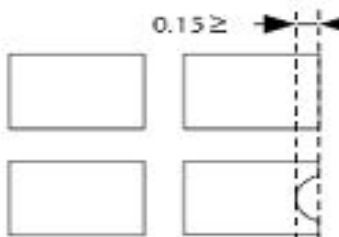
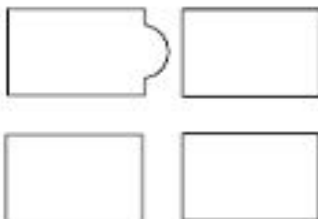
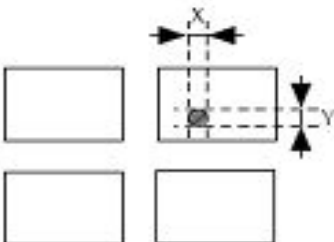
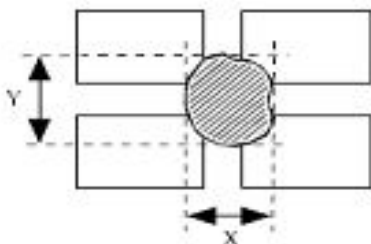


4.3 Standards

No.	Parameter	Criteria									
1.	Black and White Spots, Foreign Substances	(1) Round Shape									
		<div><div>Zone</div><div>Dimension (mm)</div></div>					Acceptable Number				
							A	B	C		
				D	≤	0.2	*	*	*		
		0.2	<	D	≤	0.3	5	6	*		
		0.3	<	D	≤	0.5	3	4	*		
		0.5	<	D			0	1	*		
		D = (Long + Short)/2 *: Disregard									
		(2) Line Shape									
		<div><div>X (mm)</div><div>Y (mm)</div></div>		<div><div>Zone</div></div>		Acceptable Number					
						A	B	C			
		-	W ≤ 0.03			*	*	*			
		L ≤ 2.0	0.03 < W ≤ 0.1			*	*	*			
		2.0 ≤ L ≤ 4.0				3	*	*			
		4.0 < L				0	2	*			
		-	0.1 < W			In the same way (1)					
		X : Length Y: Width *: Disregard									
2.	Air Bubbles (between glass & polarizer)										
		<div><div>Zone</div><div>Dimension (mm)</div></div>					Acceptable Number				
							A	B	C		
				D	≤	0.3	*	*	*		
		0.3	<	D	≤	0.4	5	*	*		
		0.4	<	D	≤	0.6	3	3	*		
		0.6	<	D			0	0	*		
		*: Disregard									

To be continued.....



No.	Parameter	Criteria
3.	The Shape of Dot	<p>  </p> <p>(1) Dot Shape (with Dent)</p> <p>As per the sketch of left hand.</p> <p>  </p> <p>(2) Dot Shape (with Projection)</p> <p>Should not be connected to next dot.</p> <p>  </p> <p>(3) Pin Hole</p> <p>$(X+Y)/2 \leq 0.2\text{mm}$ (Less than 0.1mm is no counted.)</p> <p>  </p> <p>(4) Deformation</p> <p>$(X+Y)/2 \leq 0.2\text{mm}$</p> <p>Total acceptable number: 1/dot, 5/cell (Defect number of (4): 1pc.)</p>
4.	Polarizer Scratches	Not to be conspicuous defects.
5.	Polarizer Dirts	If the stains are removed easily from LCDP surface, the module is not defective.
6.	Complex Foreign Substance Defects	Black spots, line shaped foreign substance or air bubbles between glass & polarizer should be 5pcs maximum in total.
7.	Distance between different Foreign	$D \leq 0.2 : 20\text{mm}$ or more $0.2 < D : 40\text{mm}$ or more



5. Precautions

5.1 Operation



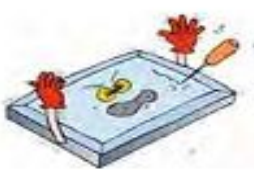


Burn-in sometimes happens when the same character was displayed at along time. Therefore, to prevent

Burn-in, it is recommended to set up a Screen-saver function.






5.2 Safety

The liquid crystal in the LCD is poisonous, DO NOT put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

5.3 Handling


	<ul style="list-style-type: none">a. The LCD module shall be installed flat , without twisting or bending.b. COF or FPC has narrow pattern width, so easily become open circuit by external force. DO NOT apply pressure to COF or FPC especially in bending area.
	<ul style="list-style-type: none">c. To avoid damage in appearance or malfunction, DO NOT subject the module to mechanical shock or to excessive force on its surface.
	<ul style="list-style-type: none">d. The polarizer attached to the display is very easy to damage, handle it with care to avoid scratching
	<ul style="list-style-type: none">e. To avoid contamination on the display surface, DO NOT touch the display surface with bare hands.f. Provide a space so that the LCD module does not come into contact with other components components.
	<ul style="list-style-type: none">g. To protect the LCD panel from external pressure, put covering glass (acrylic board or similar board) to keep appropriate space between them.



	<p>h. Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.</p>
	<p>i. Property of semiconductor devices may be affected when they are exposed to light possibly resulting in malfunctioning of the ICs. To prevent such malfunctioning of the ICs, your design and mounting layout done are so that the IC is not exposed to light in actual use.</p>
	<p>j. Strong light exposure causes degradation of color filter. It may not recover</p>
	<p>k. DO NOT contact with water to avoid Metal corrosion. l. When it is not in use, the screen must be turned off or the pattern must be frequently changed by a screen saver. If it displays the same pattern for a long period of time, brightness down/image sticking may develop due to the LCD structure.</p>
	<p>m. Never disassemble LCD product under any circumstances. If unqualified operators or users assemble the product after disassembling it, it may not function or its operation may be seriously affected.</p>


5.4 Static electricity

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge.


	<p>a. The LCD module shall be installed flat, without twisting or bending. Ground they operate.soldering iron tips, tools and testers when they operat. b. Ground your body when handling the products. c. DO NOT apply voltage to the input terminal without applying power supply. d. DO NOT apply voltage that exceeds the absolute maximum rating. e. Peel off protect tape, attached to polarizer, slowly to minimize ESD damage f. Store the products in an anti-electrostatic container.</p>
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5.5 Storage

	Store the products in a dark place at +5 ~+25℃, low humidity (50%RH or less). DO NOT store the products in an atmosphere containing organic solvents or corrosive gases.
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5.6 Cleaning

	DO NOT wipe the polarizer with dry cloth, as it might cause scratch. Wipe the polarizer with a soft cloth soaked with petroleum IPA, other chemicals might damage.
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5.7 Waste

	When dispose of LCD module, manage it at the production waste according to the relevant laws and regulations.
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6. Warranty

This product has been manufactured to your company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from

general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the

above applications, we will need to enter into a separate product liability agreement.

(1) We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including

disassembly and reassembly), after product delivery

We cannot accept responsibility for any defect, which may arise after the application of strong

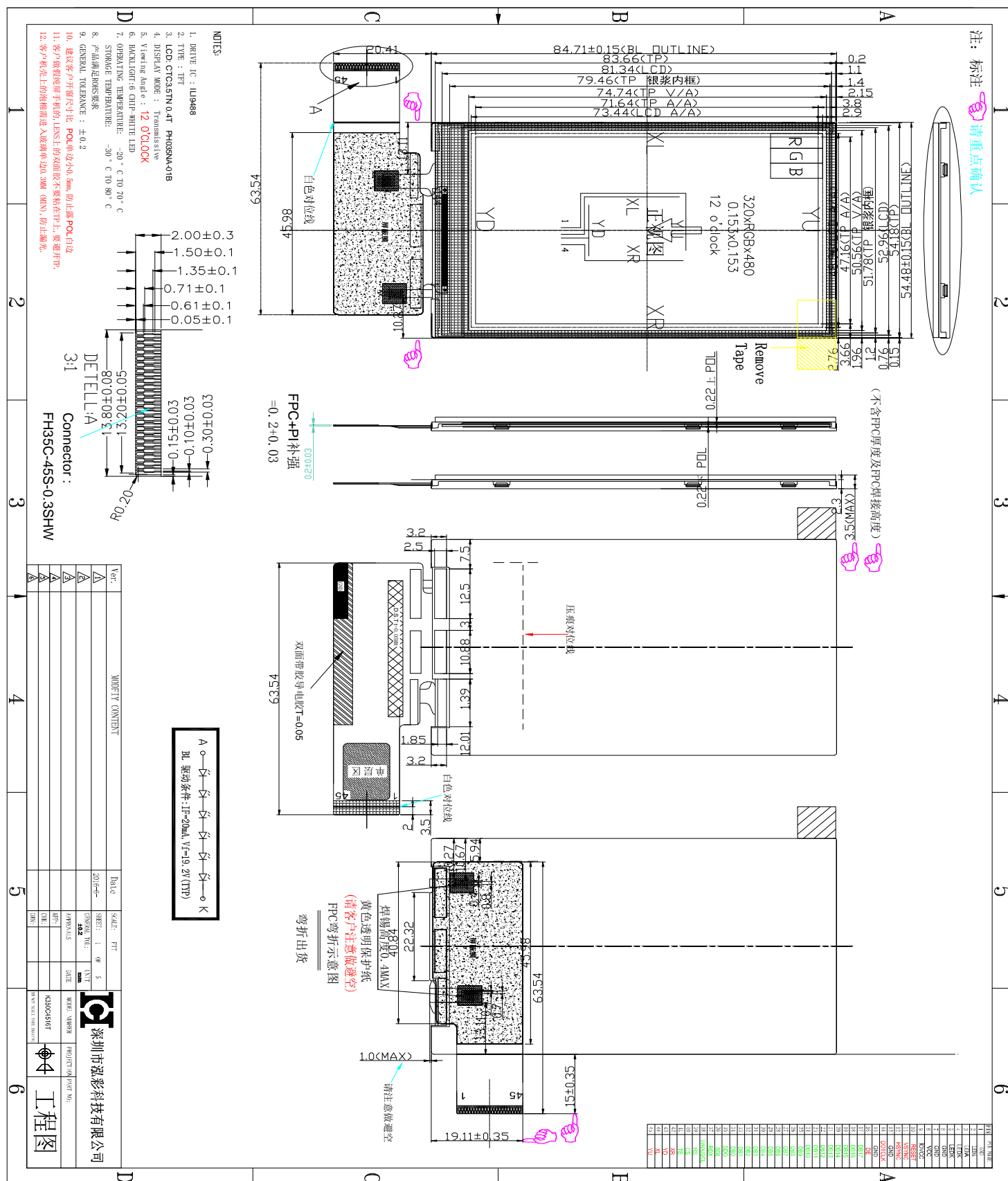
(2) external force to the product

(3) We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed your company's acceptance inspection procedures

(4) We cannot accept responsibility for industrial property, which may arise through the use of your product, with exception to those issues relating directly to the structure or method of manufacturing of our product. Microtips-origin longer than one year from Microtips production.



Appendix: 1. LCM Drawing





Appendix: 2. Package

TBD