MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI0430KT-4

This module uses ROHS material

For Customer's Acceptance:

Customer	
Approved	
Comment	

This specification may change without prior notice in order to improve performance or quality. Please contact Multi-Inno for updated specification and product status before design for this product or release of this order.	Revision	1.1
	Engineering	
	Date	2013-08-13
	Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2013-05-29	First Release	
1.1	2013-08-13	Update Absolute Maximum Ratings Update Electrical Characteristics Update Surface Luminance	

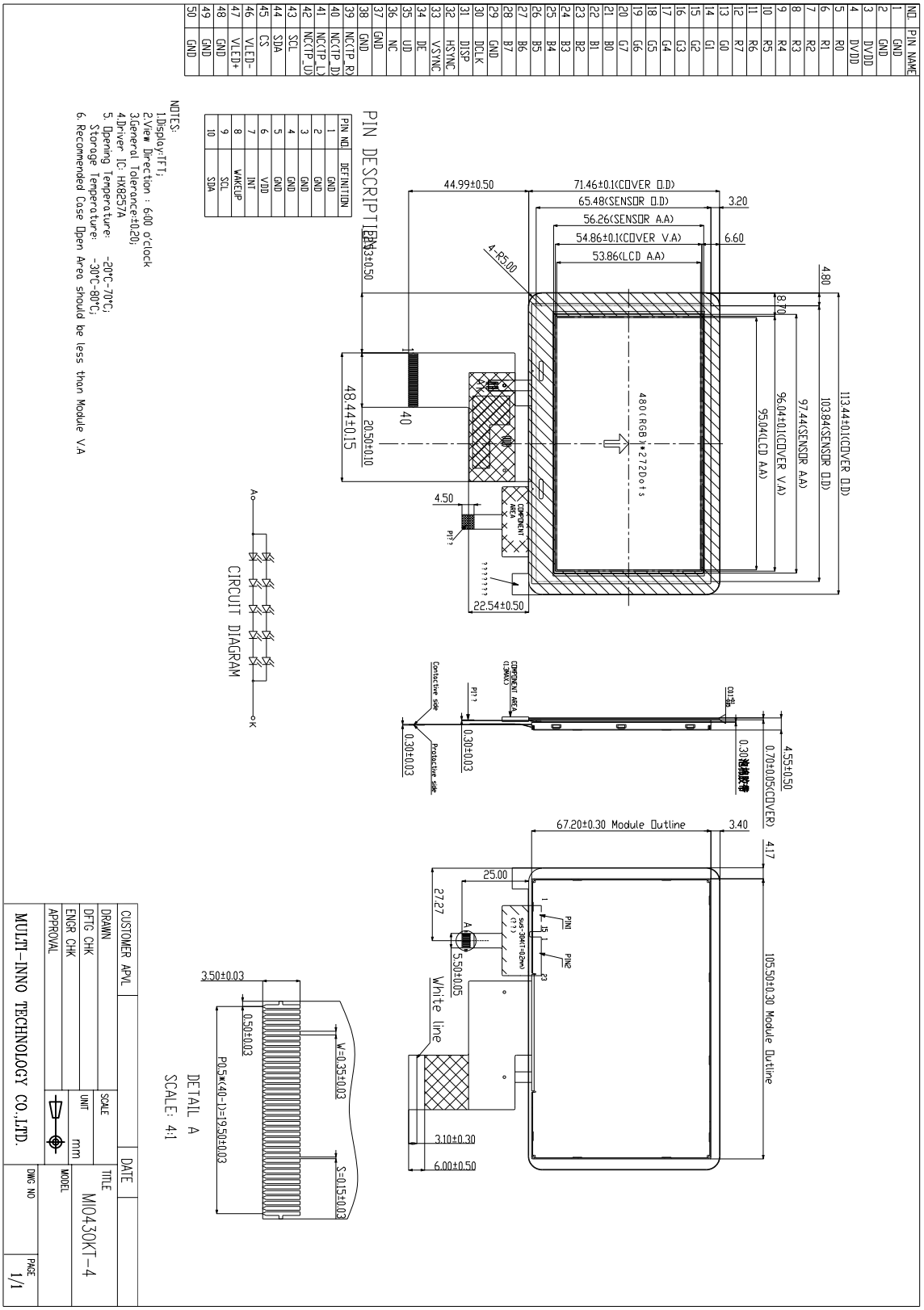
CONTENTS

■ GENERAL INFORMATION

Item	Contents	Unit
LCD type	TFT/Transmissive/Normally white	/
Size	4.3	Inch
Viewing direction	6:00	O'Clock
Gray scale inversion direction	12:00	O'Clock
LCM (W × H × D)	113.44×71.46×4.55	mm^3
LCD active area (W× H)	95.04×53.86	mm^2
CTP active area (W × H)	97.44×56.26	mm^2
Pixel pitch (W×H)	0.198×0.198	mm^2
Number of dots	480 (RGB) × 272	/
LCM driver IC	HX8257A	/
CTP controller	FT5306	/
Backlight type	10 LEDs	/
TFT LCD interface type	RGB 24 bits	/
CTP interface type	I2C	/
Color depth	16M	/
Pixel configuration	R.G.B vertical stripe	/
LCD surface treatment	AG(3H)	/
CTP surface treatment	6H hardness	/
CTP touch method	Bare finger	/
CTP structure	Glass lens-Glass sensor	/
Number of simultaneous touches	5 points	/
Minimum touch area	Φ6	mm
Finger touch pitch	13	mm
Input voltage	3.3	V
With/Without TSP	With CTP	/
Weight	TBD	g

Note 1:Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.
Note 2 : RoHS compliant;
Note 3: LCM weight tolerance: ± 5% .

■ EXTERNAL DIMENSIONS



NO.	PIN NAME
1	GND
2	GND
3	DVDD
4	DVDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	DCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	UD
36	NC
37	GND
38	GND
39	NC(TP_RX)
40	NC(TP_RD)
41	NC(TP_LY)
42	NC(TP_UD)
43	SCL
44	SDA
45	CS
46	VLED-
47	VLED+
48	GND
49	GND
50	GND

PIN NO.	DEFINITION
1	GND
2	GND
3	GND
4	GND
5	GND
6	VDD
7	INT
8	WAKEUP
9	SCL
10	SDA

■ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Supply voltage	VDD	-0.3	4.0	V
Backlight forward current	I_{LED}	0	25.0	mA
Operating temperature	T_{OP}	-20	70	°C
Storage temperature	T_{ST}	-30	80	°C
Humidity	RH	-	90%(Max60°C)	RH

Note1: The parameter is for driver IC (gate driver, source driver) only.
Note2: Signals include R0~R5, G0~G5, B0~B5, DCLK, DISP, HSYNC, VSYNC, DE

■ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS OF LCM

Parameter	Symbol	Min	Typ	Max	Unit
Voltage for logic circuit	VDD	3.0	3.3	3.6	V
Input voltage ' H ' level	V_{IH}	0.7VDD	-	VDD	V
Input voltage ' L ' level	V_{IL}	0	-	0.3VDD	V
Output voltage ' H ' level	V_{OH}	0.8VDD	-	VDD	V
Output voltage ' L ' level	V_{OL}	-	-	0.2VDD	V
(Panel+LSI)	Black mode(60Hz)	-	74.0	-	mW
Power consumption	Standby mode	-	50.0	-	uW

Note1: To test the current dissipation, use “all Black Pattern”.

DC CHARACTERISTICS OF CTP

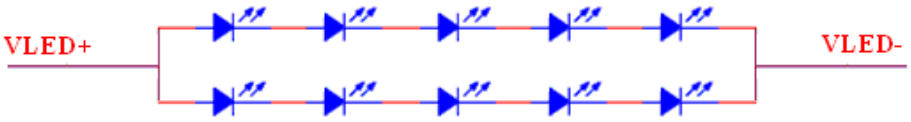
Item	Min	Typ	Max	Unit	Note
power supply voltage	--	3.3	--	V	DC(noise should be under 100mV)
Power supply current	--	20	--	mA	One finger on sensor
Sleep mode	--	2	--	mA	
Respond time	--	--	200	ms	

Note1: All current measurement is average current.

■ BACKLIGHT CHARACTERISTICS

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward voltage	Vf	15.0	16.0	18.0	V	Note 1
Forward current	If	-	20	25	mA	Note 1
Backlight power consumption	W_{BL}	-	640	900	mW	Note 1
Life time	-	10000	-	-	Hrs	Note 3

Note 1: I_F is defined for one channel LED. There are total three LED channels in back light unit.Under LCM operating, the stable forward current should be inputted.
Note 2: Optical performance should be evaluated at Ta=25℃ only.
Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



LED connection of backlight

■ELECTRO-OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time		Tr+Tf	θ=0° ∅=0° Ta=25℃	-	40	60	ms	FIG 1.	4
Contrast ratio		Cr		400	500	-	---	FIG 2.	1
Luminance uniformity		δ WHITE		75	80	-	%	FIG 2.	3
Surface Luminance		Lv		210	260	-	cd/m^2	FIG 2.	2
Viewing angle range		θ	∅ = 90°	60	70	-	deg	FIG 3.	6
			∅ = 270°	40	50	-	deg	FIG 3.	
			∅ = 0°	60	70	-	deg	FIG 3.	
			∅ = 180°	60	70	-	deg	FIG 3.	
CIE (x, y) chromaticity	Red	x	θ=0° ∅=0° Ta=25℃	0.531	0.581	0.631		FIG 2.	5
		y		0.295	0.345	0.395			
	Green	x		0.298	0.348	0.398			
		y		0.531	0.581	0.631			
	Blue	x		0.103	0.153	0.203			
		y		0.045	0.095	0.145			
	White	x		0.265	0.315	0.365			
		y		0.285	0.335	0.385			
NTSC	-	-	-	45	50	-	%	-	-
Reflectivity	-	-	-	-	-	4	%	-	8
HAZE	-	-	-	-	-	2	%	-	8

Note 1. Contrast Ratio(CR) is defined mathematically as For more information see FIG 2.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P 3,P4, P5)}}$$

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

Lv = Average Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)

Note 3. The uniformity in surface luminance ， δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 2.

$$\delta\ \text{WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}$$

Note 4. 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 FIG 1. The test equipment is Autronic-Melchers's ConoScope. Series.

Note 5. CIE (x, y) chromaticity，The x, y value is determined by measuring luminance at each test position 1 through 5,and then make average value.

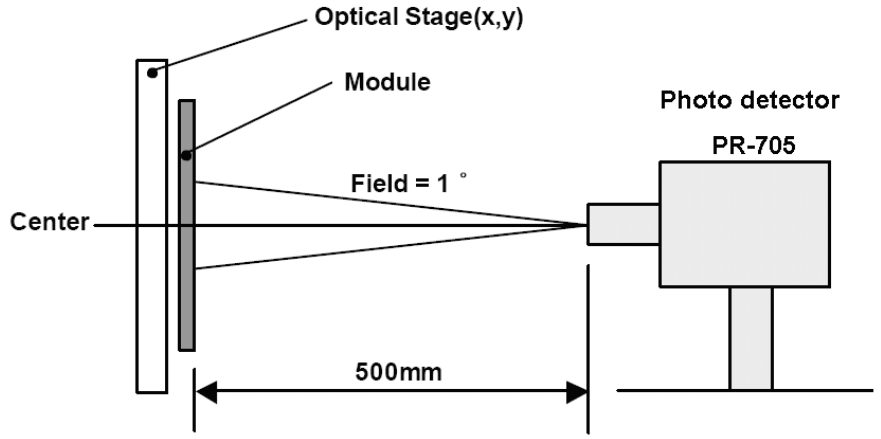
Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the conrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

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

Note8: Measuring equipments: DMS-501, PR-705. @550nm

Measuring condition:

- After stabilizing and leaving the panel alone at a given temperature for 30 min, the measurement should be executed,
- Measuring surroundings: a stable, windless and dark room,
- Measuring temperature: Ta=25°C,
- 30 min after lighting the back-light.



Note2: conform to National standard GB2410—80 /ASTM D1003—61(1997)

FIG. 1 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

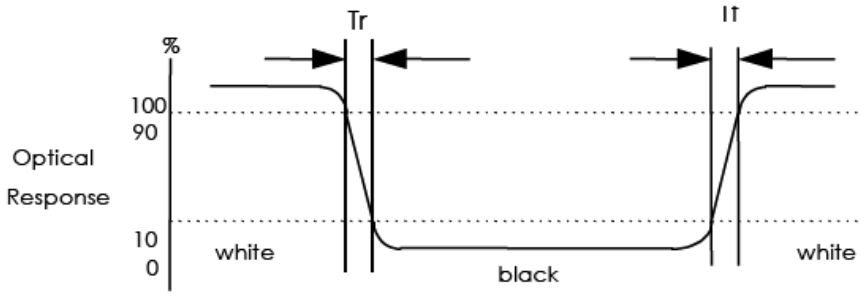
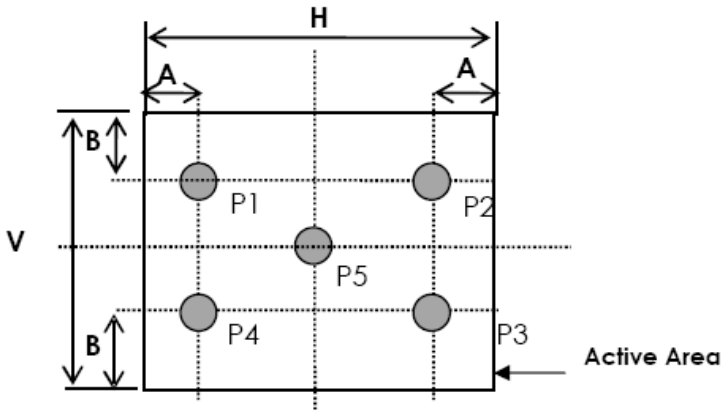
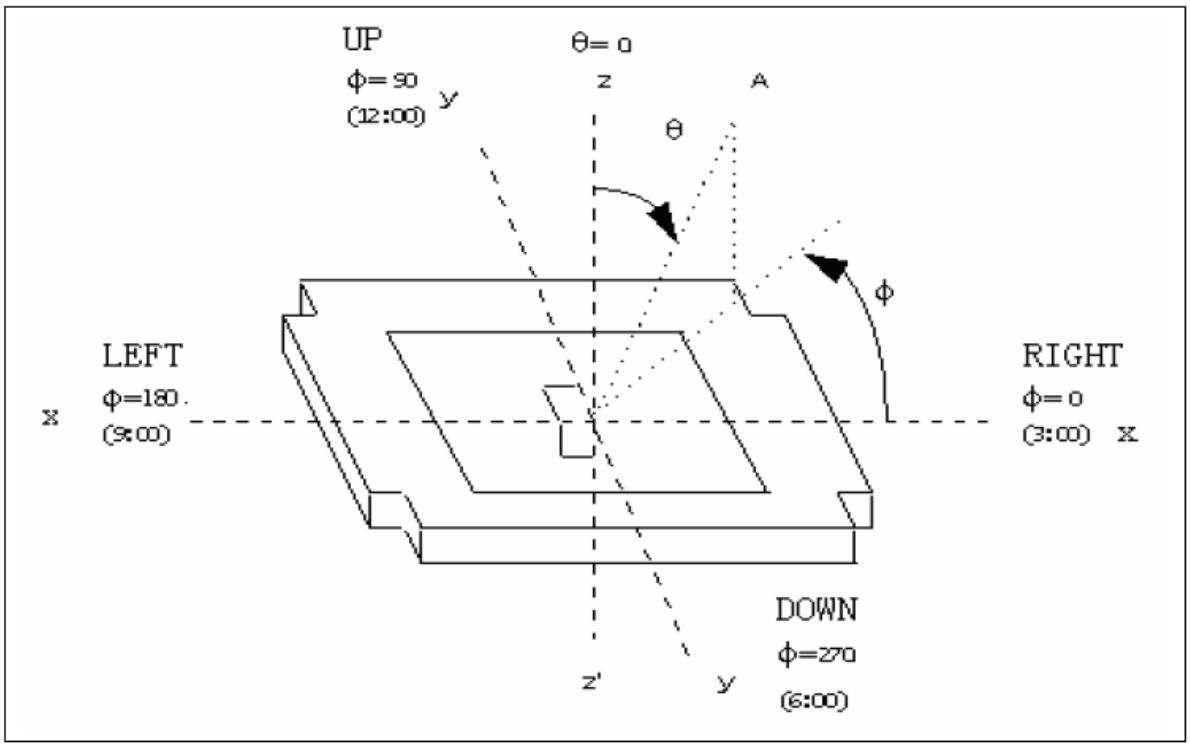


FIG. 2 Measuring method for Contrast ratio, surface luminance, Luminance uniformity , CIE (x, y) chromaticity



A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size ∅=7mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

FIG. 3 The definition of viewing angle



■ INTERFACE DESCRIPTION

1. THE FPC CONNECTION OF LCM

Connector type: FH28-40S-0.5SH

No	Symbol	I/O	Description	Remark
1	VLED-	P	Back light cathode	
2	VLED+	P	Back light anode	
3	GND	P	Ground	
4	VDD	P	Power supply	
5	R0	I	Data input	
6	R1	I	Data input	
7	R2	I	Data input	
8	R3	I	Data input	
9	R4	I	Data input	
10	R5	I	Data input	
11	R6	I	Data input	
12	R7	I	Data input	
13	G0	I	Data input	
14	G1	I	Data input	
15	G2	I	Data input	
16	G3	I	Data input	
17	G4	I	Data input	
18	G5	I	Data input	
19	G6	I	Data input	
20	G7	I	Data input	
21	B0	I	Data input	
22	B1	I	Data input	
23	B2	I	Data input	
24	B3	I	Data input	
25	B4	I	Data input	
26	B5	I	Data input	
27	B6	I	Data input	
28	B7	I	Data input	
29	GND	P	Ground	
30	DCLK	I	Clock for input data. Data latched at rising edge of this signal.	
31	DISP	I	Standby mode. DISP =“1”: Normally operation. DISP =“0”: Standby mode.	
32	HSYNC	I	Horizontal sync input with negative polarity. If unused, please pull high level.	
33	VSYNC	I	Vertical sync input with negative polarity. If unused, please pull high level.	
34	DE	I	Data input enable. If unused, please pull low level.	
35	NC	--	No connection	
36	GND	P	Ground.	
37	X_R	--	No connection	

38	Y_B	--	No connection	
39	X_L	--	No connection	
40	Y_T	--	No connection	

Note1: I/O definition.
I---Input, O---Output, P--- Power/Ground, N--- No connection

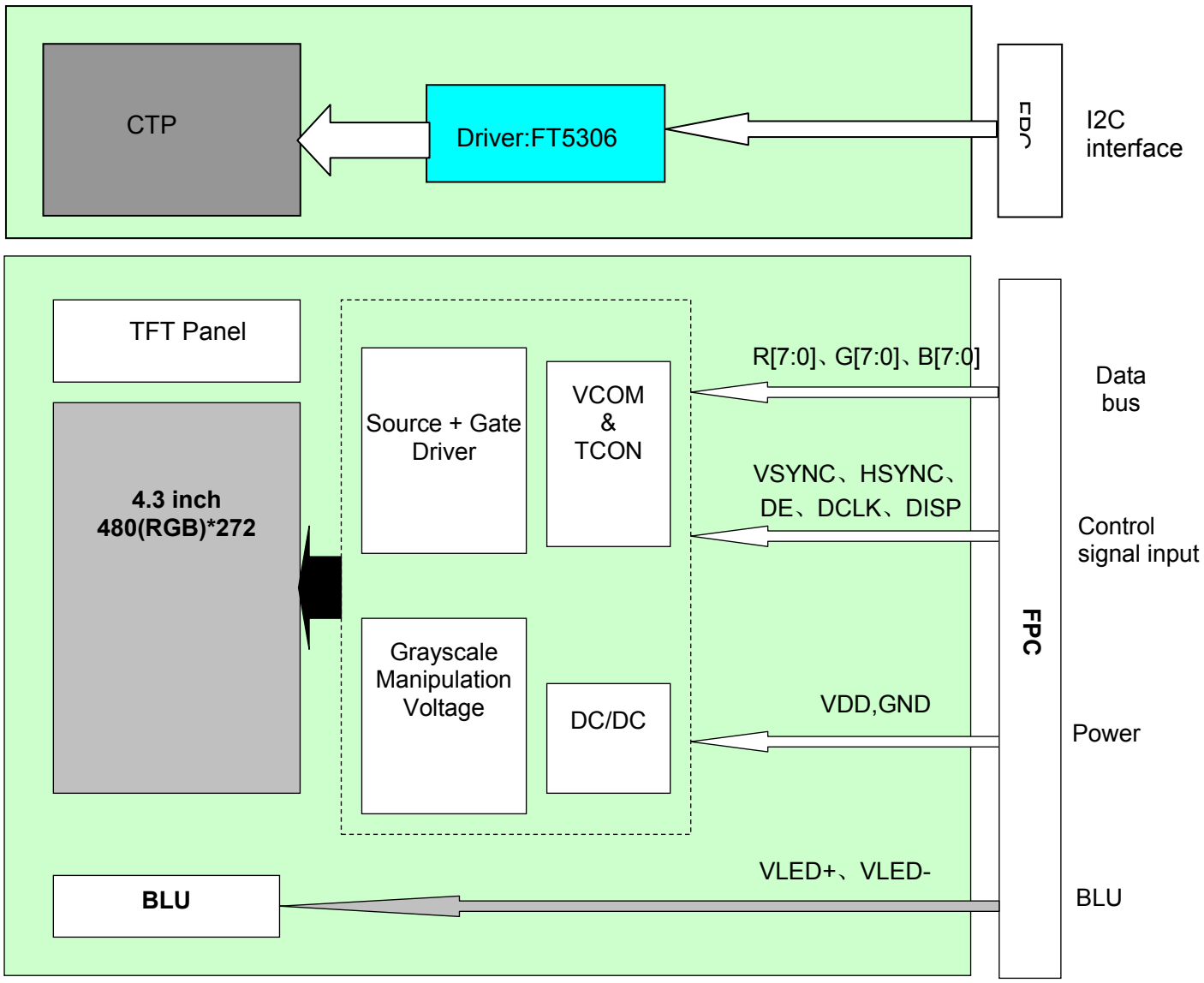
2. THE FPC CONNECTION OF CTP

Connector type: FH28-10S-0.5SH

Pin No.	Symbol	I/O	Description	Remark
1~5	GND	P	Groud	
6	VCC	P	CTP power supply	
7	INT	O	External interrupt to the host	
8	WAKEUP	I	External interrupt from the host	
9	SCL	I/O	I2C clock input	
10	SDA	I/O	I2C data input and output	

Note: I/O definition.
I---Input, O---Output, P--- Power/Ground, N--- No connection

■BLOCK DIAGRAM



■ APPLICATION NOTES

1 TFT LCD INPUT TIMING

1.1 Input Setup Timing Parameter Setting

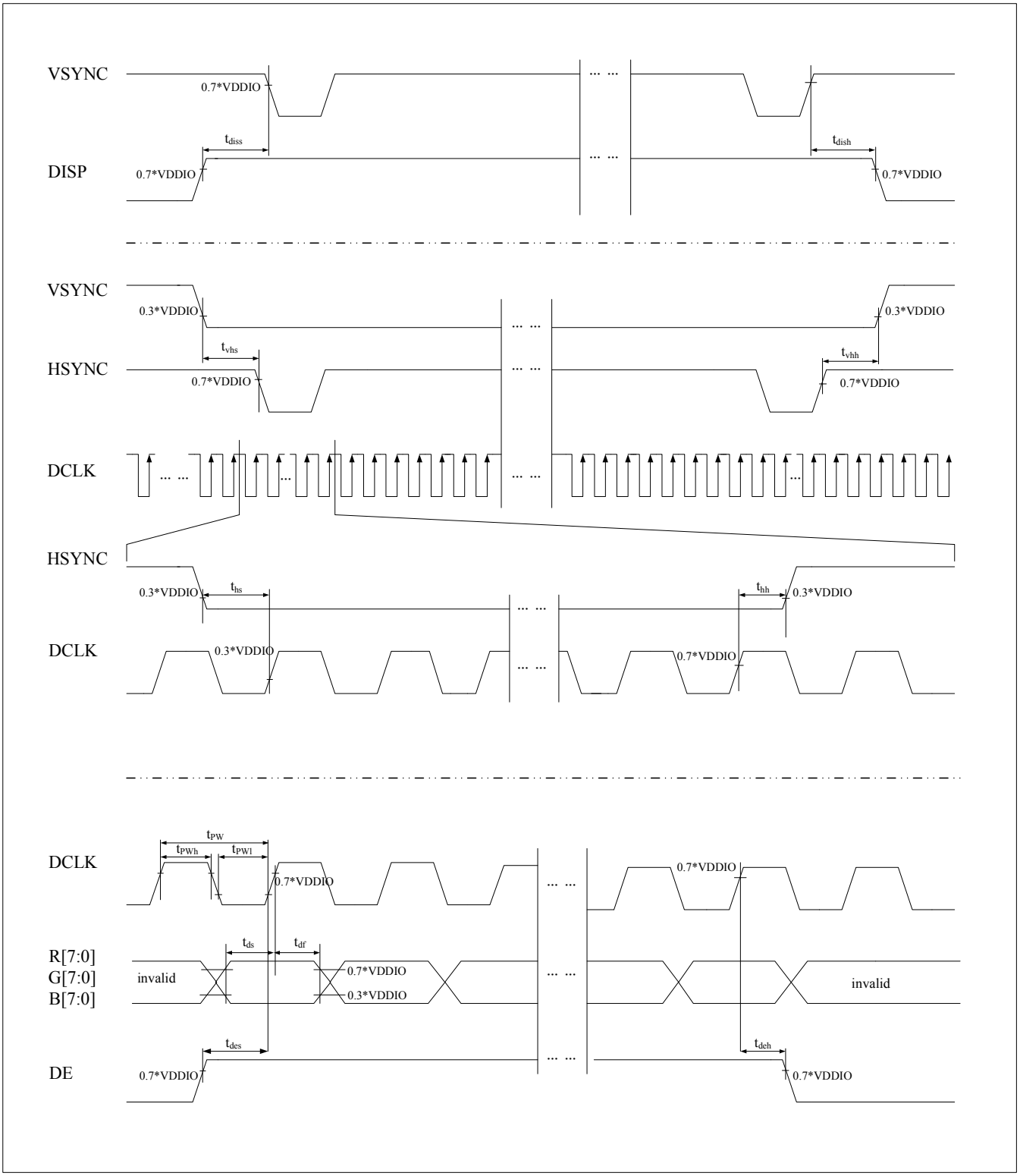
VDD=3.3V Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK Cycle Time	T_{pw}	66.7	-	-	ns	
DCLK Pulse High Width	T_{pwh}	26.7	-	-	ns	
DCLK Pulse Low Width	T_{pwl}	26.7	-	-	ns	
DE Setup Time	T_{des}	10	-	-	ns	
DE Hold Time	T_{deh}	10	-	-	ns	
HSYNC Setup Time	T_{hs}	10	-	-	ns	
HSYNC Hold Time	T_{hh}	10	-	-	ns	
VSYNC Setup Time	T_{vhs}	10	-	-	ns	
VSYNC Hold Time	T_{vhh}	10	-	-	ns	
Data Setup Time	T_{ds}	10	-	-	ns	
Data Hold Time	T_{dh}	10	-	-	ns	
DISP Setup Time	T_{diss}	10	-	-	us	
DISP Hold Time	T_{dish}	10	-	-	ms	

Note 1：t_r=t_f=2ns.t_r, t_f is defined 10% to 90% of signal amplitude.

Note 2：For parallel interface, maximum clock frequency is 15MHz.

1.2 Input Setup Timing Diagram



1.3 Data Input Timing Parameter Setting

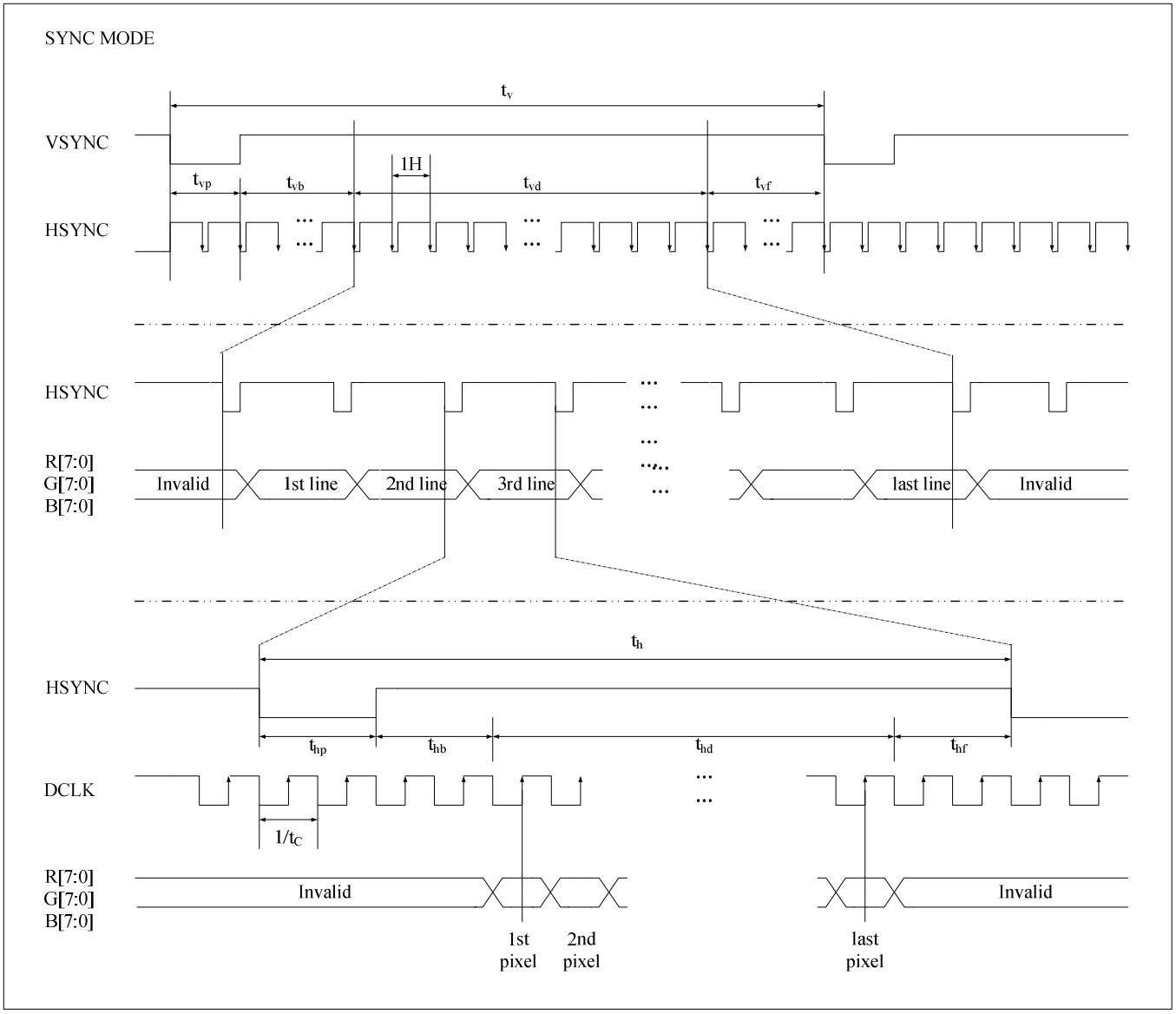
Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK frequency	f_{clk}	--	9	15	MHZ	
HSYNC frequency	$1/t_h$	--	17.14	--	KHz	
VSYNC frequency	$1/t_v$	--	59.94	--	Hz	
Horizontal cycle	t_h		525	605	DCLK	
Horizontal display period	t_{hd}		480		DCLK	
Horizontal pulse width	t_{hp}	2	41	41	DCLK	
Horizontal back porch	t_{hb}	2	2	41	DCLK	
Horizontal front porch	t_{hf}	2	2	82	DCLK	
Vertical cycle	t_v	285	286	399	HSYNC	
Vertical display period	t_{vd}		272		HSYNC	
Vertical pulse width	t_{vp}	1	10	11	HSYNC	
Vertical back porch	t_{vb}	1	2	11	HSYNC	
Vertical front porch	t_{vf}	1	2	227	HSYNC	

Note 1: Unit: CLK=1/ f_{CLK} , H= t_h,

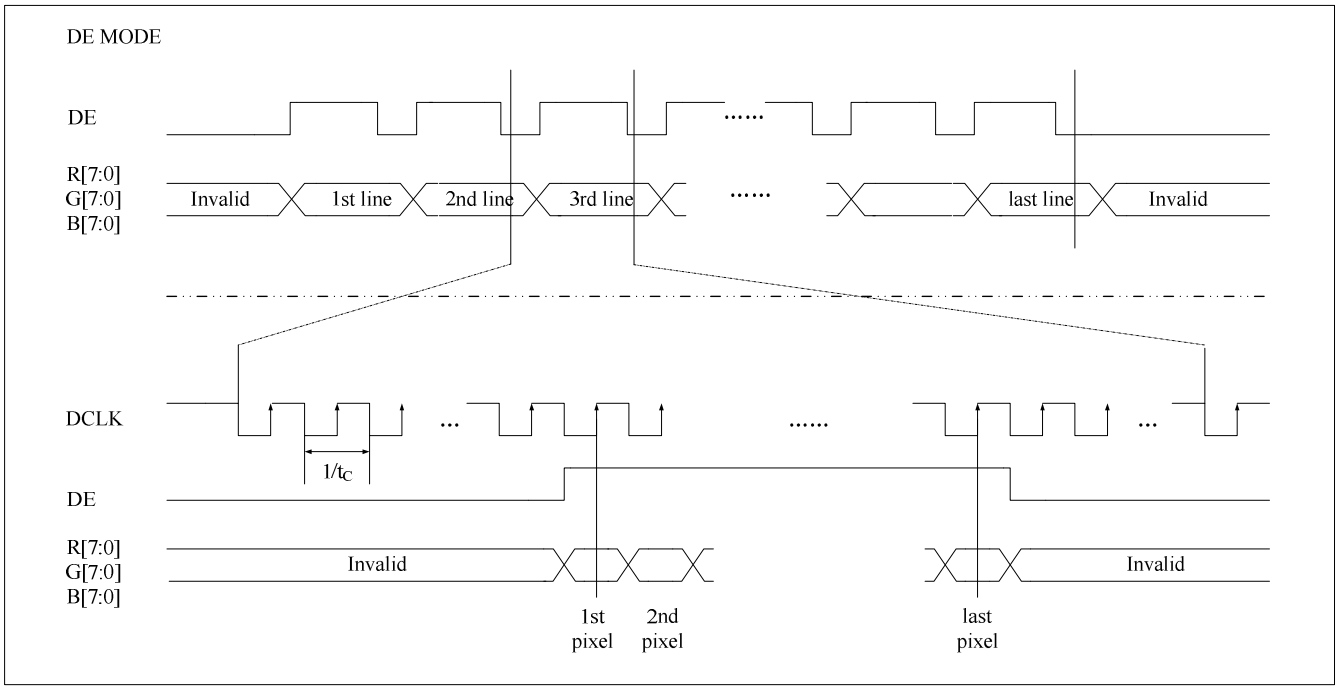
Note 2: It is necessary to keep $t_{vp}+t_{vb}=12$ and $t_{hp}+t_{hb}= 43$ in sync mode. DE mode is unnecessary to keep it.

2 DATA INPUT TIMING DIAGRAM

2.1 Data Input Timing Diagram Under SYNC Mode

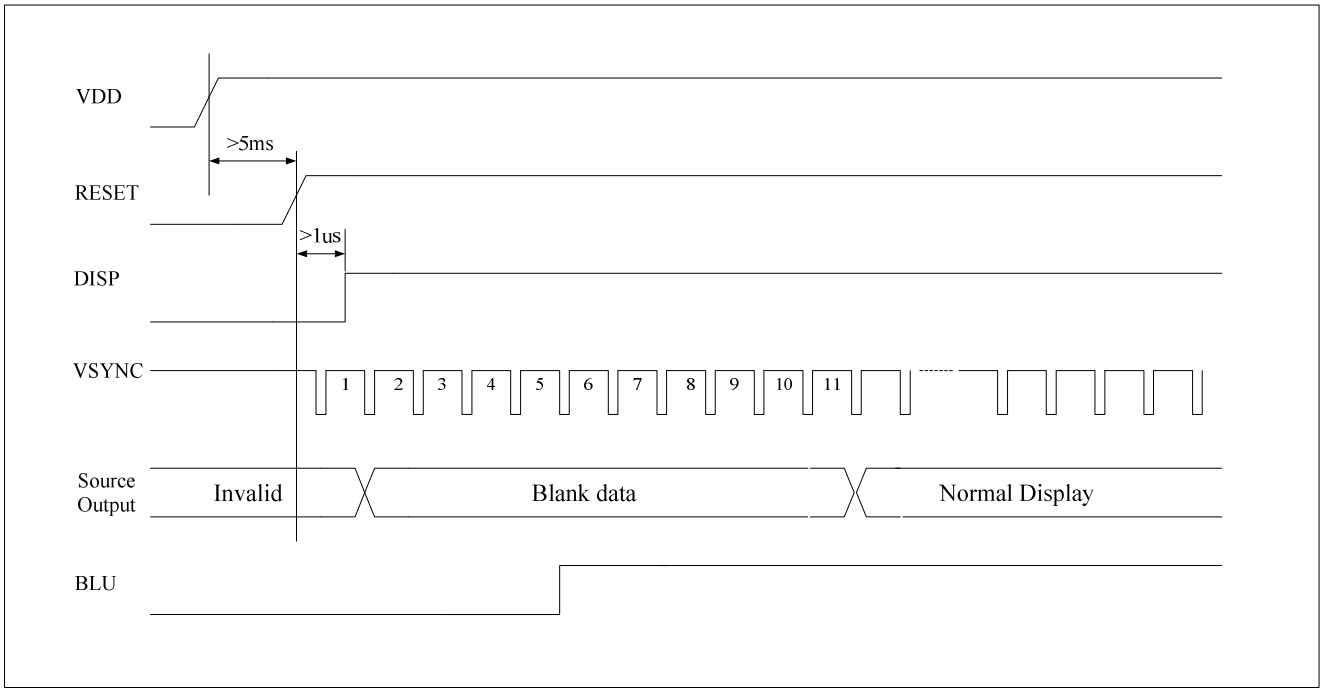


2.2 Data Input Timing Diagram Under DE Mode

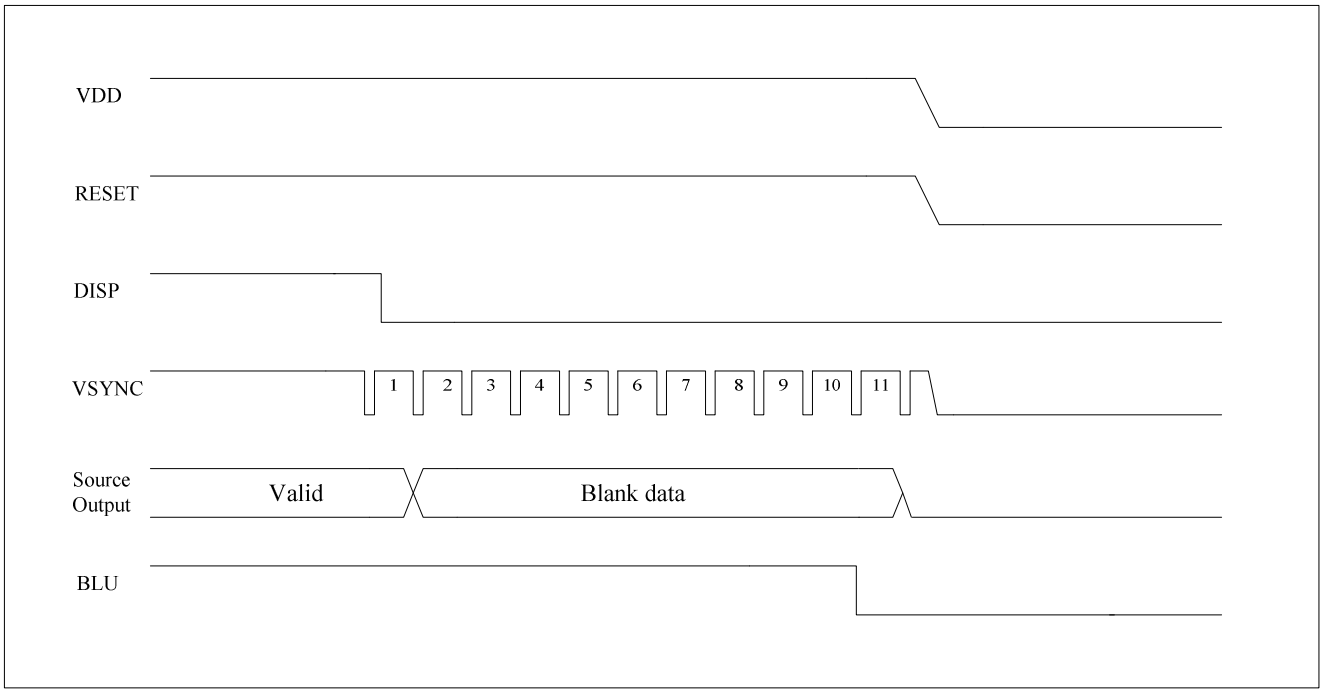


3 POWER ON/OFF SEQUENCE

3.1 Power ON/OFF Sequence



3.2 Power OFF Sequence

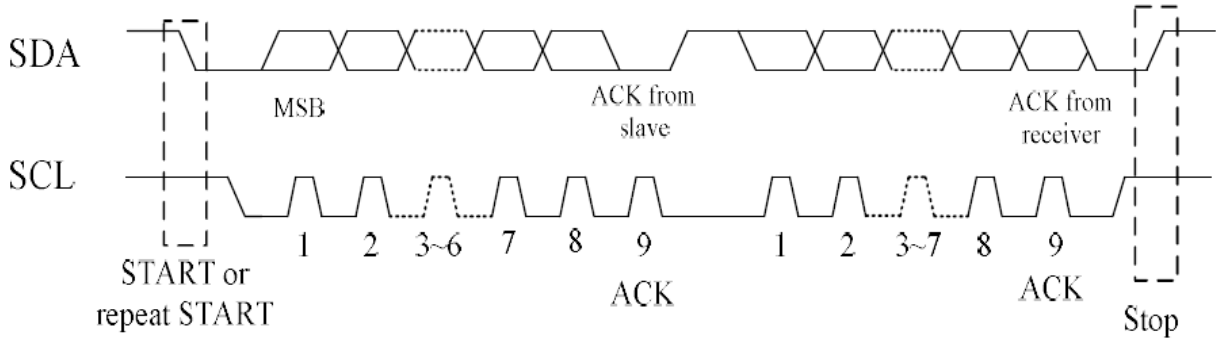


4 CTP TIMING

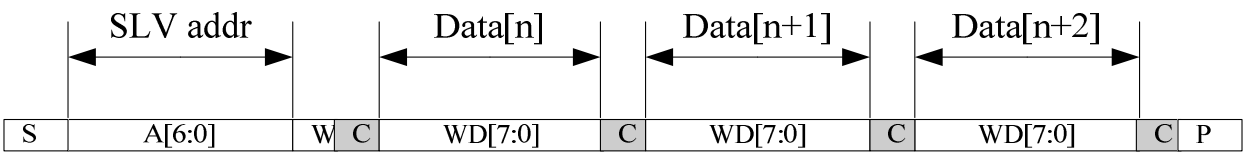
4.1 I2C Interface

FT5306iGMJ supports the I2C interfaces, which can be used by a host processor or other devices.

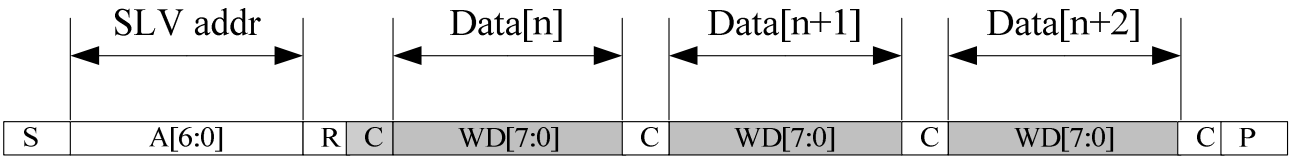
The I2C is always configured in the Slave mode. The data transfer format is shown in Figure 2-4.



I2C serial data transfer format



I2C master write, slave read

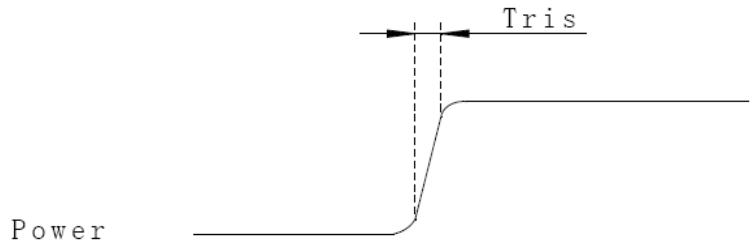


I2C master read, slave write

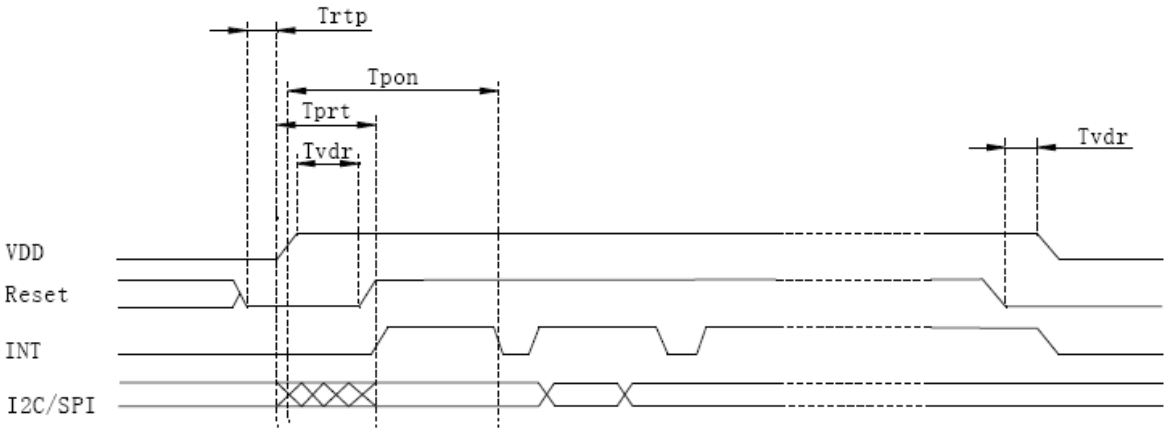
Parameter	Unit	Min	Max
SCL frequency	KHz	0	400
Bus free time between a STOP and START condition	us	4.7	\
Hold time (repeated) START condition	us	4.0	\
Data setup time	ns	250	\
Setup time for a repeated START condition	us	4.7	\
Setup Time for STOP condition	us	4.0	\

4.2 Power ON/RESET 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 IOVCC powering on (Tprt). INT signal will be sent to the host after initializing all parameters and then start to report points to the host.

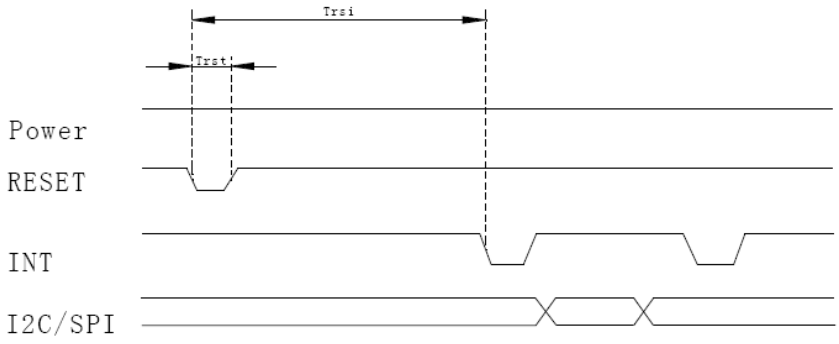


Power on Time



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
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Trtp	Time of resetting to be low before powering on	100	--	μs
Tpon	Time of starting to report point after powering on	300	--	ms
Tvdr	Reset time after VDD powering on	1	--	ms
Tprt	Reset time after IOVCC powering on	2Tris +Tvdr	--	ms
Trsi	Time of starting to report point after resetting	300	--	ms
Trst	Reset time	5	--	ms

4.3 CTP Instruction Description(More Information Refer To FT5306 Datasheet)

Address	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Host Access
Op,00h	DEVIDE_MODE		Device Mode[2:0]							RW
Op,01h	GEST_ID	Gesture ID[7:0]								R
Op,02h	TD_STATUS					Number of touch points[3:0]				R
Op,03h	TOUCH1_XH	1st Event Flag				1st Touch X Position[11:8]				R
Op,04h	TOUCH1_XL	1st Touch X Position[7:0]								R
Op,05h	TOUCH1_YH	1st Touch ID[3:0]				1st Touch Y Position[11:8]				R
Op,06h	TOUCH1_YL	1st Touch Y Position[7:0]								R
Op,07h	Reserved									
Op,08h	Reserved									
Op,09h	TOUCH2_XH	2nd Event Flag				2nd touch X Position[11:8]				R
Op,0Ah	TOUCH2_XL	2nd touch X Position[7:0]								R
Op,0Bh	TOUCH2_YH	2nd Touch ID[3:0]				2nd Touch Y Position[11:8]				R
Op,0Ch	TOUCH2_YL	2nd Touch Y Position[7:0]								R
Op,0Dh	Reserved									
Op,0Eh	Reserved									R
Op,0Fh	TOUCH3_XH	3st Event Flag				3st Touch X Position[11:8]				R
Op,10h	TOUCH3_XL	3st Touch X Position[7:0]								R
Op,11h	TOUCH3_YH	3st Touch ID[3:0]				3st Touch Y Position[11:8]				R
Op,12h	TOUCH3_YL	3st Touch Y Position[7:0]								R
Op,13h	Reserved									
Op,14h	Reserved									
Op,15h	TOUCH4_XH	4st Event Flag				4st Touch X Position[11:8]				R
Op,16h	TOUCH4_XL	4st Touch X Position[7:0]								R
Op,17h	TOUCH4_YH	4st Touch ID[3:0]				4st Touch Y Position[11:8]				R
Op,18h	TOUCH4_YL	4st Touch Y Position[7:0]								R
Op,19h	Reserved									
Op,1Ah	Reserved									
Op,1Bh	TOUCH5_XH	5st Event Flag				5st Touch X Position[11:8]				R
Op,1Ch	TOUCH5_XL	5st Touch X Position[7:0]								R
Op,1Dh	TOUCH5_YH	5st Touch ID[3:0]				5st Touch Y Position[11:8]				R
Op,1Eh	TOUCH5_YL	5st Touch Y Position[7:0]								R

Op,1Fh	Reserved			
Op,20h	Reserved			
Op,21h	TOUCH6_XH	6st Event Flag	6st Touch X Position[11:8]	R
Op,22h	TOUCH6_XL	6st Touch X Position[7:0]		R
Op,23h	TOUCH6_YH	6st Touch ID[3:0]	6st Touch Y Position[11:8]	R
Op,24h	TOUCH6_YL	6st Touch Y Position[7:0]		R
Op,25h	Reserved			
Op,26h	Reserved			
Op,27h	TOUCH7_XH	7st Event Flag	7st Touch X Position[11:8]	R
Op,28h	TOUCH7_XL	7st Touch X Position[7:0]		R
Op,29h	TOUCH7_YH	7st Touch ID[3:0]	7st Touch Y Position[11:8]	R
Op,2Ah	TOUCH7_YL	7st Touch Y Position[7:0]		R
Op,2Bh	Reserved			
Op,2Ch	Reserved			
Op,2Dh	TOUCH8_XH	8st Event Flag	8st Touch X Position[11:8]	R
Op,2Eh	TOUCH8_XL	8st Touch X Position[7:0]		R
Op,2Fh	TOUCH8_YH	8st Touch ID[3:0]	8st Touch Y Position[11:8]	R
Op,30h	TOUCH8_YL	8st Touch Y Position[7:0]		R
Op,31h	Reserved			
Op,32h	Reserved			
Op,33h	TOUCH9_XH	9st Event Flag	9st Touch X Position[11:8]	R
Op,34h	TOUCH9_XL	9st Touch X Position[7:0]		R
Op,35h	TOUCH9_YH	9st Touch ID[3:0]	9st Touch Y Position[11:8]	R
Op,36h	TOUCH9_YL	9st Touch Y Position[7:0]		R
Op,37h	Reserved			
Op,38h	Reserved			
Op,39h	TOUCH10_XH	10st Event Flag	10st Touch X Position[11:8]	R
Op,3Ah	TOUCH10_XL	10st Touch X Position[7:0]		R
Op,3Bh	TOUCH10_YH	10st Touch ID[3:0]	10st Touch Y Position[11:8]	R
Op,3Ch	TOUCH10_YL	10st Touch Y Position[7:0]		R
Op,3Dh	Reserved			
Op,3Eh	Reserved			
…	…	…		…
Op,FEh	LOG_MSG_CNT	The log MSG count		R
Op,FFh	LOG_CUR_CHA	Current character of log message, will point to the next character when one character is read.		R

■ RELIABILITY TEST

No.	Test Item	Test Condition	Remark
1	High Temperature Storage	80±2℃/240 hours	IEC60068-2-1 GB2423.2
2	Low Temperature Storage	-30±2℃/240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Operating	70±2℃/240 hours	Note 1,IEC60068-2-1 GB2423.2
4	Low Temperature Operating	-20±2℃/240 hours	IEC60068-2-1 GB2423.1
5	Temperature Cycle storage	-30±2℃~25~80±2℃×100cycles (30min.) (5min.) (30min.)	Start with cold temperature, with high temperature, IEC60068-2-14 GB2423.22
6	Damp proof Test operating	60℃±5℃×90%RH/240 hours	Note 2,IEC60068-2-78 GB/T2423.3
7	Vibration Test (non-operation)	Frequency range:10Hz~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2hours for each direction of X,Y,Z(6 hours for total)	IEC60068-2-6 GB/T2423.10
8	Package drop test	Height:60cm,1 corner,3 edges,6 surfaces	IEC60068-2-32,GB2423.8
9	ESD test (operation)	C=150pF,R=330Ω,5points/panel Air: ±8KV,5times Contact: ±4KV,5times(Environment: 15℃~35℃,30%~60%,86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
10	Shock(non-operation)	60G 6ms,±X,±Y,±Z 3times each direction	IEC60068-2-27 GB/T2423.5
11	Package vibration test	Random Vibration: 0.015G*G/Hzfor5-200Hz,-6dB/Octave from 200-500Hz 2hours for each direction of X,Y,Z(6hours for total)	IEC60068-2-34 GB/T2423.11

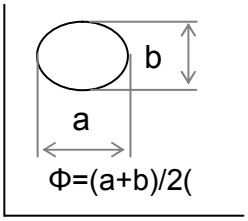
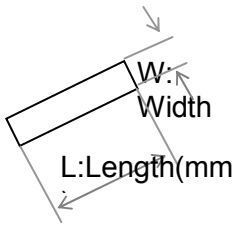
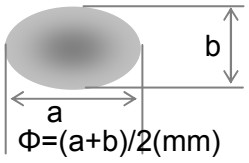
Note 1:Ts is the temperature of panel's surface.
Note 2:Ta is the ambient temperature of sample.

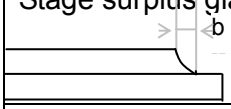
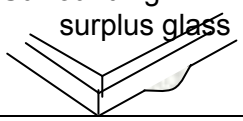
■ INSPECTION CRITERION

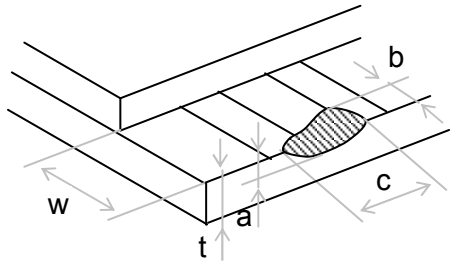
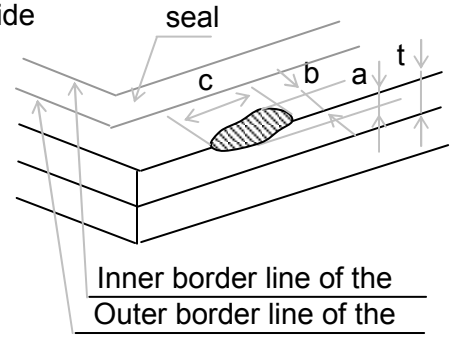
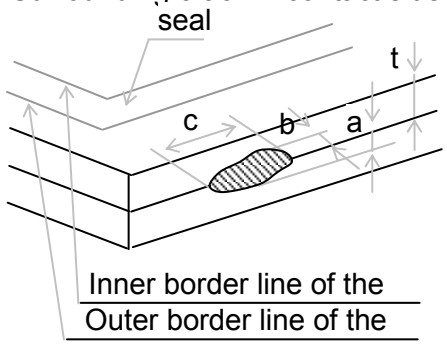
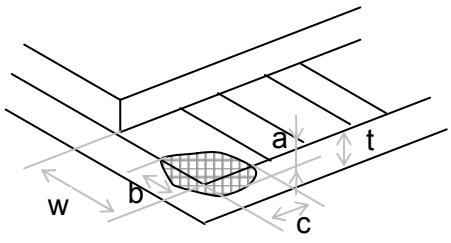
1. Outgoing Inspection Level

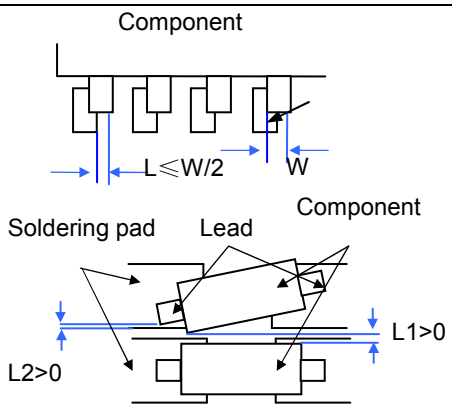
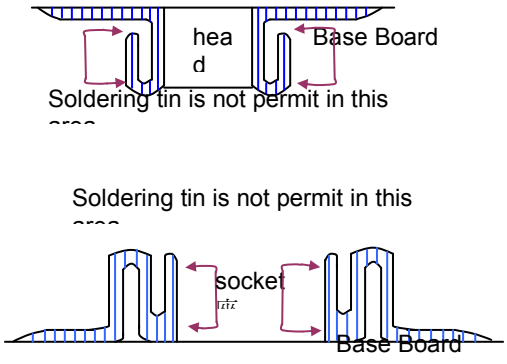
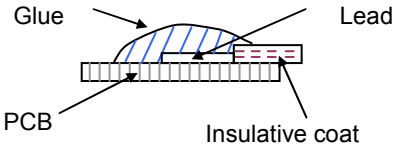
Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 9.3 general notes	See 11.5			II	0.65
Minor Defects	See 9.3 general notes	See 11.5			II	1.5
Note：Sampling standard conforms to GB2828						

2. Inspection Items And Criteria

Inspection items			Judgment standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot, Bright Spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass		A	Φ≦0.10	Neglected	Neglected
			B	0.10<Φ≦0.15	2	
			C	0.15<Φ≦0.20	1	
			D	0.20<Φ	0	
			Total defective point(B,C)		3	
2	Black line, White line, and Particle Between Polarizer and glass, Scratch on glass		A	W≦0.01	Neglected	Neglected
			B	0.01<W≦0.03 L≦3.0	2	
			C	0.03<W≦0.05 L≦3.0	1	
			D	0.05<W	0	
			Total defective point(B,C)		3	
3	Contrast variation		A	Φ≦0.2	Neglected	Neglected
			B	0.2<Φ≦0.3	2	
			C	0.3<Φ≦0.4	1	
			D	0.4<Φ	0	
			Total defective point(B,C)		3	
4	Dot defect (if TFT LCD is	TFT LCD is smaller than 3 inches	LCD Class	Defect	A area	B area
			A	Bright dot	1	Neglecte

<table>
<tr><td rowspan="11"></td><td rowspan="11">used)</td><td rowspan="4"></td><td rowspan="2"></td><td>Dark dot</td><td colspan="2">2</td><td rowspan="4">d</td></tr>
<tr><td>Total</td><td colspan="2">2</td></tr>
<tr><td rowspan="3">B</td><td>Bright dot</td><td colspan="2">2</td></tr>
<tr><td>Dark dot</td><td colspan="2">3</td></tr>
<tr><td>Total</td><td colspan="2">4</td></tr>
<tr><td rowspan="7">TFT LCD between 3~10.4 inches</td><td>LCD Class</td><td>Defect</td><td>A area</td><td>B area</td><td>C area</td></tr>
<tr><td rowspan="3">A</td><td>Bright dot</td><td>1</td><td>1</td><td rowspan="6">Neglected</td></tr>
<tr><td>Dark dot</td><td>1</td><td>2</td></tr>
<tr><td>Total</td><td colspan="2">4</td></tr>
<tr><td rowspan="3">B</td><td>Bright dot</td><td>2</td><td>2</td></tr>
<tr><td>Dark dot</td><td>2</td><td>3</td></tr>
<tr><td>Total</td><td colspan="2">6</td></tr>
<tr><td colspan="6">Notes:
Bright dot: in R、G、B or dark display figure, the pixel appears bright.
Dark dot: in R、G、B or white display figure, the pixel appears dark.
Defect area must be less than an half size of the dot.</td></tr>
<tr><td>5</td><td colspan="2">Bubble inside cell</td><td colspan="3">any size</td><td>none</td><td>none</td></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Polarizer defect (if Polarizer is used)</td><td>Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.</td><td colspan="4">Refer to item 1 and item 2.</td></tr>
<tr><td rowspan="3">Bubble, dent and convex</td><td>A</td><td>Φ≦0.3</td><td>Neglected</td><td rowspan="3">Neglected</td></tr>
<tr><td>B</td><td>0.3<Φ≦0.7</td><td>2</td></tr>
<tr><td>C</td><td>0.7<Φ</td><td>0</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">Surplus glass</td><td>Stage surplus glass
 
</td><td colspan="4">b≦0.3mm</td></tr>
<tr><td>Surrounding surplus glass
  </td><td colspan="4">Should not influence outline dimension and assembling.</td></tr>
<tr><td>8</td><td colspan="2">Open segment or open common</td><td colspan="5">Not permitted</td></tr>
<tr><td>9</td><td colspan="2">Short circuit</td><td colspan="5">Not permitted</td></tr>
<tr><td>10</td><td colspan="2">False viewing direction</td><td colspan="5">Not permitted</td></tr>
<tr><td>11</td><td colspan="2">Contrast ratio uneven</td><td colspan="5">According to the limit specimen</td></tr>
<tr><td>12</td><td colspan="2">Crosstalk</td><td colspan="5">According to the limit specimen</td></tr>
<tr><td>13</td><td colspan="2">Black /White spot(display)</td><td colspan="5">Refer to item 1</td></tr>
<tr><td>14</td><td colspan="2">Black /White line(display)</td><td colspan="5">Refer to item 2</td></tr>
</table>

Inspection items			Judgment standard		
			Category(application: B zone)		Acceptable number
15	Glass defect crack	①The front of lead terminals 	A	a≤ t, b≤1/5W, c≤3mm	Max.3 defects allowed
			B	Crack at two sides of lead terminals should not cover patterns and alignment mark	
		②Surrounding crack—non-contact side 	b < Inner borderline of the seal		
		③ Surrounding crack— contact side 	b < Outer borderline of the seal		
		④Corner 	A	a ≦ t, b ≦ 3.0, c ≦ 3.0	
			B	Glass crack should not cover patterns u and alignment mark and patterns.	

Inspection items			Judgment standard Category(application: B zone)
16	PCB defect	Component soldering: No cold soldering、short、open circuit、burr、tin ball The flat encapsulation component position deviation must be less than 1/3 width of the pin (Pic.1)； the sheet component deviation: Pin deviates from the pad and contact with the near components is not permitted（Pic.2）	
		lead defect: The lead lack must be less than 1/3 of its width; The lead burr must be less than 1/3 of the seam; Impurities connect with the near leads is not permitted	
		Connector soldering: Soldering tin is at contact position of the plug and socket is not permitted No foundation is scald Serious cave distortion on plug and socket contact pin is not permitted	
		Glue on root of the speaker receiver and motor lead: The insulative coat of the lead must join into the PCB; the protected glue must envelop to the insulative coat.	

■ PRECAUTIONS FOR USING LCD MODULES

1 Handing Precautions

1.1 The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

1.2 If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air.

1.5 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents

- Isopropyl alcohol
- Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

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

- Water
- Ketone
- Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats.

1.7 Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets moisture condensation or a current flow in a high-humidity environment

1.8 Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

1.9 Do not attempt to disassemble or process the LCD module.

1.10 NC terminal should be open. Do not connect anything.

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

1.12 Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.

- Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dry. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

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

1.13 Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- Do not alter modify or change the shape of the tab on the metal frame.

- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

- Do not damage or modify the pattern writing on the printed circuit board.

- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

- Do not drop, bend or twist the LCM.

2 Handling precaution for LCM

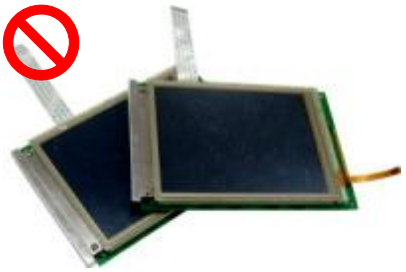
2.1 LCM is easy to be damaged. Please note below and be careful for handling.

2.2 Correct handling:

As above picture, please handle with anti-static gloves around LCM edges.

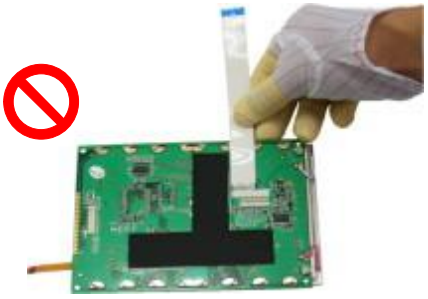
2.3 Incorrect handling:

Please don't touch IC directly.

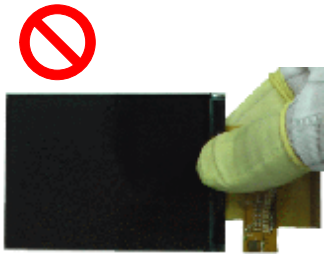


Please don't stack LCM.

Please don't hold the surface of panel.



Please don't stretch interface of output, such as FPC cable.



Please don't hold the surface of IC.

Please don't operate with sharp stick such as pens.

3 Storage Precautions

3.1 When storing the LCD modules, the following precaution are necessary.

3.1.1 Store them in a sealed polyethylene bag. If properly sealed, there is no need for the desiccant.

3.1.2 Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.

3.1.3 The polarizer surface should not come in contact with any other objects (We advise you to store them in the anti-static electricity container in which they were shipped).

3.2 Transportation Precautions

3.2.1 During shipment, please handle with care. The packaging bag can not be broken, step on trap. Packaging Carton layer height can not be over two meters.

3.2.2 The transportation process should pay attention to the waterproof and moisture-proof measures. Product can not be watering. Ethylene sealed bags can not be unsealed.

3.3 Others

3.3.1 Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

3.3.2 If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

3.3.3 To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

3.3.3.1 - Exposed area of the printed circuit board.

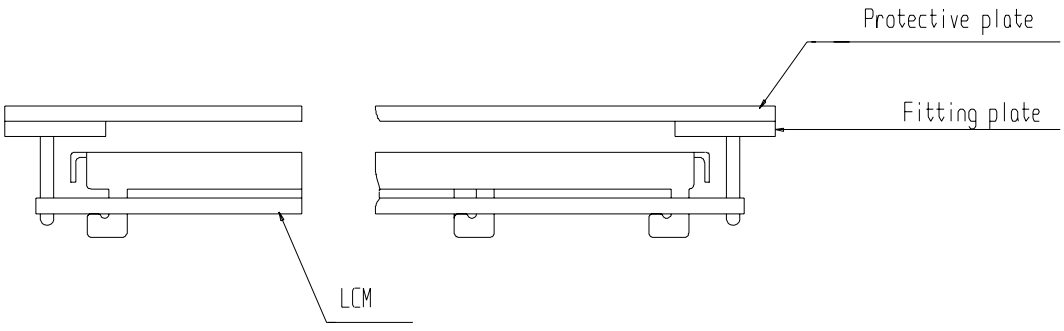
3.3.3.2 -Terminal electrode sections.

4 USING LCD MODULES

4.1 Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

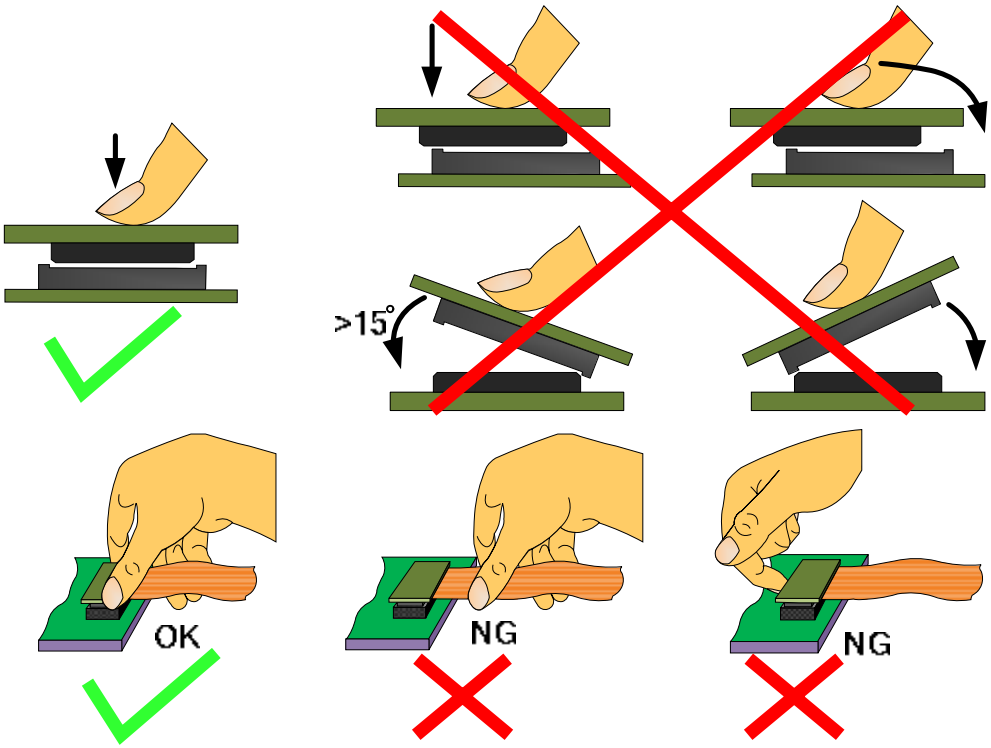
4.1.1 Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



4.1.2 When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0 1mm

4.2 Precaution for assemble the module with BTB connector:

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows



4.3 Precaution for soldering the LCM

	Manual soldering	Machine drag soldering	Machine press soldering
No RoHS Product	290°C ~350°C. Time : 3-5S.	330°C ~350°C. Speed : 4-8 mm/s.	300°C ~330°C. Time : 3-6S. Press: 0.8~1.2Mpa
RoHS Product	340°C ~370°C. Time : 3-5S.	350°C ~370°C. Time : 4-8 mm/s.	330°C ~360°C. Time : 3-6S. Press: 0.8~1.2Mpa

4.3.1 If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation (This does not apply in the case of a non-halogen type of flux). It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters

4.3.2 When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

4.3.3 When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

4.4 Precautions for Operation

4.4.1 Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.

4.4.2 It is an indispensable condition to drive LCD s within the specified voltage limit since the higher voltage then the limit cause 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

4.4.3 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 operating temperature.

4.4.4 If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

4.4.5 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

4.4.6 Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable.

4.4.7 Please keep the temperature within the specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity

4.5 Safety

4.5.1 It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol which should later be burned

4.5.2 If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water

4. 6 Limited Warranty

Unless agreed between Multi-Inno and the customer Multi-Inno will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with Multi-Inno LCD acceptance standards (copies available upon request) for a period of one year from date of production. Cosmetic/visual defects must be returned to Multi-Inno within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of Multi-Inno limited to repair and/or replace on the terms set forth above. Multi-Inno will not be responsible for any subsequent or consequential events.

4.7 Return LCM under warranty

4.7.1 No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

4.7.1.1 - Broken LCD glass.

4.7.1.2 - PCB eyelet is damaged or modified.

4.7.1.3 -PCB conductors damaged.

4.7.1.4 - Circuit modified in any way, including addition of components.

4.7.1.5 - PCB tampered with by grinding, engraving or painting varnish.

4.7.1.6 - Soldering to or modifying the bezel in any manner.

4.7.2 Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

PACKING SPECIFICATION

Please consult our technical department for detail information.

PRIOR CONSULT MATTER

1 For Multi-Inno standard products, we keep the right to change material, process ... for improving the product property without prior notice to our customer.

2 For OEM products, if any changes are needed which may affect the product property, we will consult with our customer in advance.

3 If you have special requirement about reliability condition, please let us know before you start the test on our samples.