



ASI-T-700JA12LPCAP/AE

Item	Specifications	Unit
Screen Size	7 (Diagonal)	inch
Display Format	1024RGB(H)×600(V)	dot
Active Area	154.214(H)×85.92(V)	mm
Pixel Pitch	0.1506(H)×0.1432(V)	mm
Pixel Configuration	RGB Vertical Stripe	-
Display Mode	IPS Type / Transmissive Mode / Normally Black	-
Surface Treatment	Clear(7H)	-
Viewing Direction	Full view angle	-
Outline Dimension	165.0(W)×104.0(H)×10.86(D)	mm
Weight	(185)	g
RoHS Compliance	RoHS Compliance	-

1. Table of Contents

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2. Record of Revisions

Rev.	Comments	Page	Date
1	Preliminary Specification was first issued.	All	10/20'17
2	Modify Weight	4	5/11'18
2	Modify Digital Power Supply Current	6	5/11'18
2	Modify Current of LED Driver Unit	7	5/11'18
2	Modify 11. Optical Characteristics	23	5/11'18
2	Add 14.14 Cautions for PCT	31	5/11'18
2	Modify 15. Outline Drawing	32	5/11'18
3	Modify 5 General Specifications : Outline Dimension and RoHS Compliance	4	1/25'19
3	Modify 7.2 LED Driver Unit	7	1/25'19
3	Modify 13 Packaging	27	1/25'19
3	Modify 15 Outline Drawing	32	1/25'19

3. Application

This specification is applied to the 7 inch WSVGA supported TFT-LCD module With projected capacitive touch (PCT) and can display true 16.7M colors (RGB 6-bits + HiFRC data). The module is designed for OA, Car TV application and other electronic products which require flat panel display of digital signal interface. This module is composed of a 7" TFT-LCD panel, a driver circuit and backlight unit and used as the input devices for general electric appliances via both finger and Capacitive stylus pen.

4. Features

- WSVGA (1024×600 pixels) resolution.
- 8 bit LVDS Interface
- LED driver circuit is built in this module to provide PWM Dimmer function.
- Projected Capacitive Touch
 - I²C Interface
 - Multi Touch (Ten points)
 - 2048 x 2048 resolution

5. General Specifications

Item	Specifications	Unit
Screen Size	7 (Diagonal)	inch
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Pixel Configuration	RGB Vertical Stripe	-
Display Mode	IPS Type / Transmissive Mode / Normally Black	-
Surface Treatment	Clear(7H)	-
Viewing Direction	Full view angle	-
Outline Dimension	165.0(W)×104.0(H)×10.86(D)	mm
Weight	(185)	g
RoHS Compliance	RoHS Compliance	-

6. Absolute Maximum Ratings

6.1 Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-30	+80	°C	(1)(2)
Operating Ambient Temperature	T _{OP}	-20	+70	°C	(1)(2)

Note1: Background color changes slightly depending on ambient temperature.

This phenomenon is reversible.

Note2: Please refer to item of RELIABILITY.

6.2 Electrical Absolute Ratings

6.2.1 TFT-LCD Module

(Ta=25±2°C, GND=V_{SS}=0V)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Digital Power Supply Voltage	V _{CC}	-0.3	5.0	V	-

6.2.2 LED Driver Absolute Maximum Ratings

(Ta=25±2°C)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
LED Driver Supply Voltage	V _{LED}	-0.3	17	V	(1)
LED Driver PWM	PWM	-0.3	6	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.

7. Electrical Characteristics

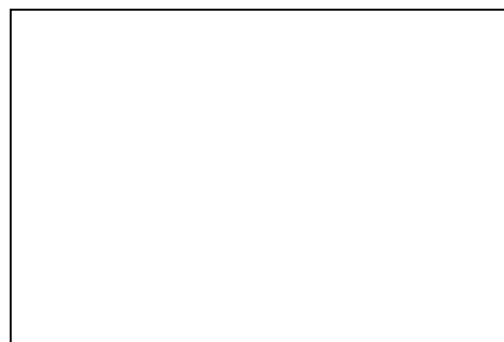
7.1 TFT-LCD Module

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Digital Power Supply Voltage	V _{DD}	3.0	3.3	3.6	V	-
Digital Power Supply Current	IDD	-	151	211	mA	(1)
Input logic high voltage	VIH	0.7 VDD	-	VDD	V	(2)
Input logic low voltage	VIL	0	-	0.3 VDD	V	
Differential Input High Threshold Voltage	RX _{VTH}	-	-	0.1	V	RXVCM=1.2V
Differential Input Low Threshold Voltage	RX _{VTL}	-0.1	-	-	V	
Input voltage range (singled-end)	RxVIN	0	-	2.4	V	-
Differential input common mode voltage	RxVCM	VID /2	-	2.4 - VID /2	V	-
Differential voltage	VID	0.2	-	0.6	V	-
Differential input leakage current	RVxliz	-10	-	+10	uA	-
DCLK Frequency	DCLK	-	51.2	-	MHz	-

Note (1) The specified power consumption is under the conditions at V_{DD} =3.3V, DCLK =51.2MHz, whereas a power dissipation check pattern below is displayed.

White Pattern / 255 Gray



Active Area

Note (2): LVDS, Reset.

7.2 LED Driver Unit

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Voltage of LED Driver Unit	VLED	11.5	12.0	12.5	V	-
Current of LED Driver Unit	ILED	-	560	784	mA	VLED=12V 、 B/L=420mA
PWM signal Low voltage	VPWML	0	-	0.4	V	-
PWM signal High voltage	VPWMH	1.5	-	5	V	-
PWM frequency	fPWM	100	-	1000	Hz	-
LED Life Time(25°C)	-	50000	-	-	hr	(1)

Note (1) : LED life time is defined as under 25±2°C , when the average brightness decrease to 50% of original brightness

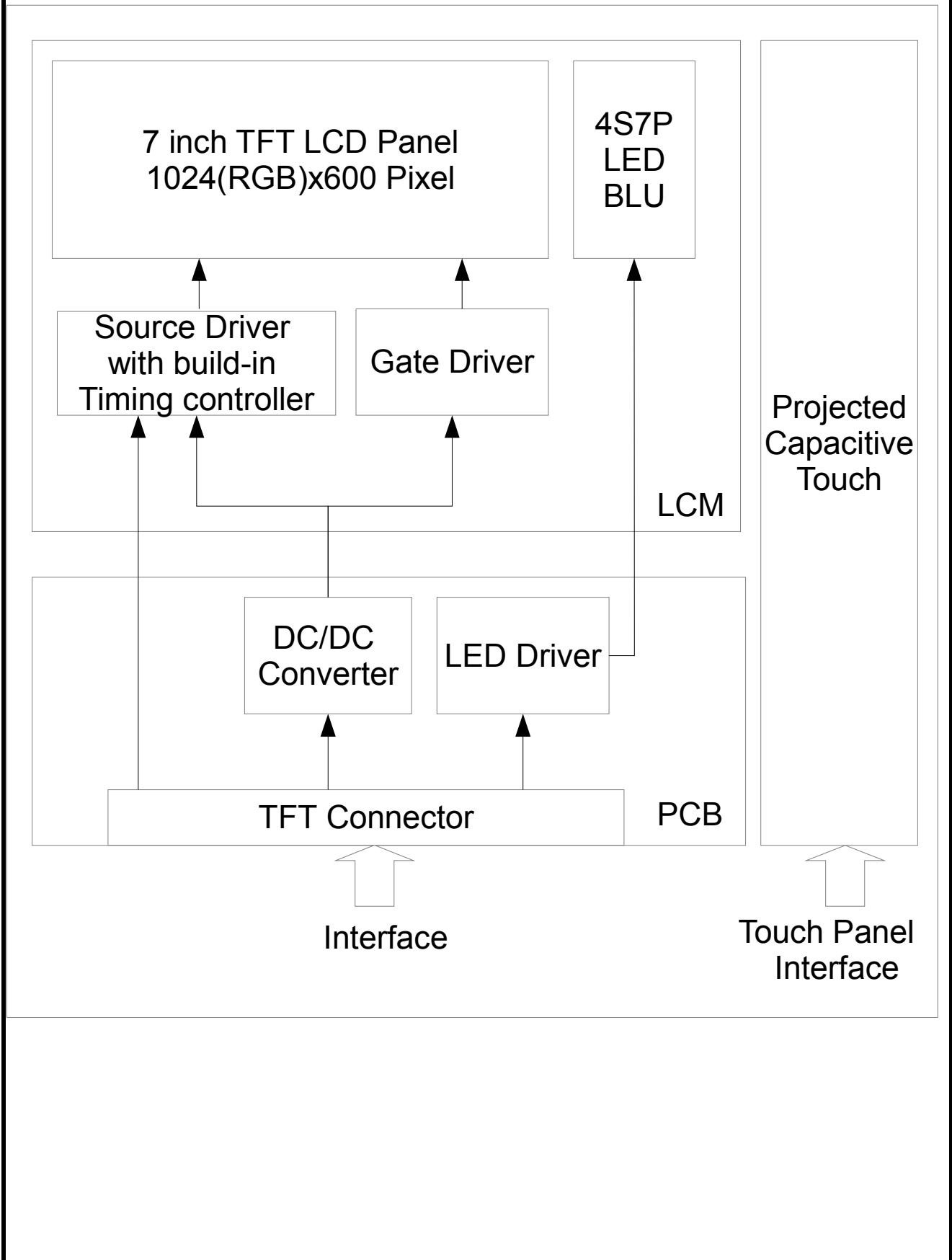
7.3 Projected Capacitive Touch

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Operating Voltage	VDD	3.0	3.3	3.6	V	-
Power Supply Current	IDD	-	20.5	28.7	mA	(1)
Input High Threshold Voltage	V _{IH}	0.7VDD	-	VDD	V	-
Input Low Threshold Voltage	V _{IL}	-0.3	-	0.3VDD	V	-
Output High Threshold Voltage	V _{OH}	0.7VDD	-	-	V	-
Output Low Threshold Voltage	V _{OL}	-	-	0.3VDD	V	-
Power Consumption	P _L	-	67.65	94.71	mW	@3.3V
Report Rate	R _R	-	60	-	Hz	-
Interface		I ² C				-
Function		Multi Touch				-

Note (1) This test condition is touched with 10 points.

8. Block Diagram

8.1 TFT-LCD Module with Backlight Unit



9. Input / Output Terminals Pin Assignment

9.1 TFT-LCD Module

Connector: HIROSE DF19G-30P-1H

Pin No.	Symbol	I/O	Description
1	V _{CC}	I	+3.3V power supply
2	V _{CC}	I	+3.3V power supply
3	GND	I	Ground
4	GND	I	Ground
5	RIN3+	I	LVDS Signal (+) Channel 3
6	RIN3-	I	LVDS Signal (-) Channel 3
7	GND	I	Ground
8	RCLK+	I	LVDS Clock Signal (+)
9	RCLK-	I	LVDS Clock Signal (-)
10	GND	I	Ground
11	RIN2+	I	LVDS Signal (+) Channel 2
12	RIN2-	I	LVDS Signal (-) Channel 2
13	GND	I	Ground
14	RIN1+	I	LVDS Signal (+) Channel 1
15	RIN1-	I	LVDS Signal (-) Channel 1
16	GND	I	Ground
17	RIN0+	I	LVDS Signal (+) Channel 0
18	RIN0-	I	LVDS Signal (-) Channel 0
19	GND	I	Ground
20	GND	I	Ground
21	NC	I	Not Connection
22	NC	I	Not Connection
23	NC	I	Not Connection

24	NC	I	Not Connection
25	BLEN	I	Note 1
26	NC	I	Not Connection
27	VLED	I	LED driver power supply
28	VLED	I	LED driver power supply
29	GND	I	Ground
30	GND	I	Ground

Note 1: To use PWM dimming, apply a 100Hz to 1kHz square wave signal with amplitude greater than 1.5V to this pin.

9.2 Improved Projected Capacitive Touch

Connector: CVILUX CF25101D0R0-05

Pin No.	Symbol	I/O	Description
1	GND	I	System ground.
2	VDD	I	+3.3V power supply.
3	/RST	I	External reset signal, active low.
4	/INT	O	Interrupt signal, active low, asserted to request Host start a new transaction.
5	SDA	I/O	I ² C data signal.
6	SCL	I	I ² C clock signal.
7	NC	-	Not Connection
8	NC	-	Not Connection
9	NC	-	Not Connection
10	GND	I	System ground.

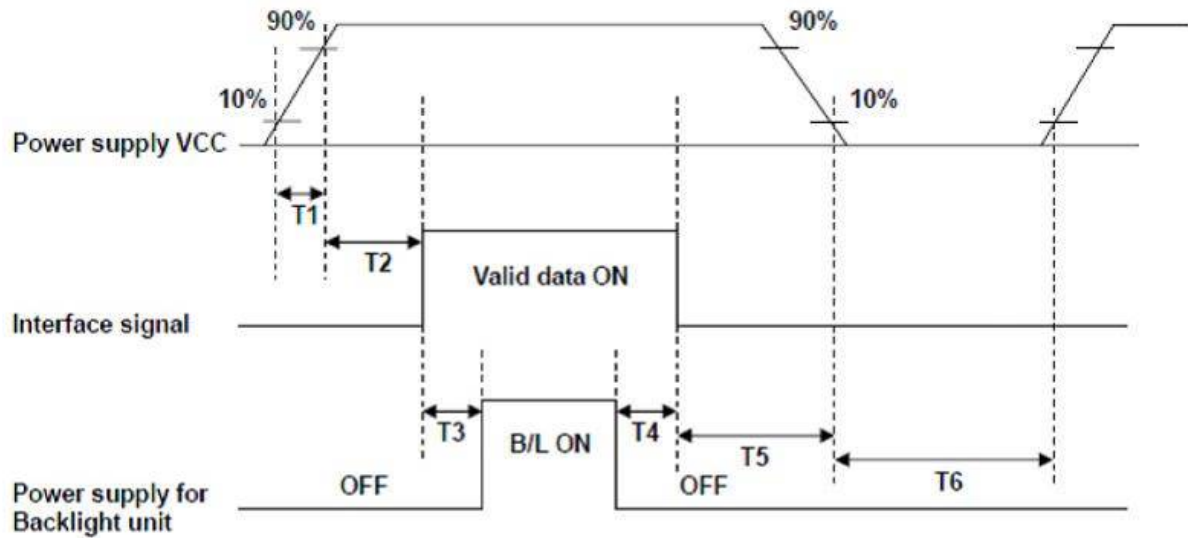
9.3 Color Data Input Assignment

The brightness of each primary color (red, green and blue) is based on the 8 bit gray scale data input for the color. The higher the binary input, the brighter the color. The table provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Gray Scale Of RED	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Gray Scale Of Gree	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0		
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0		
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0		
Gray Scale Of Blue	Blue 0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0		
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0		
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1		

9.4 Power ON/OFF Sequence

Power ON/OFF Sequence



POWER SEQUENCE TABLE

Parameter	Value			Units
	Min.	Typ	Max.	
T1	0.5	-	10	ms
T2	50	-	100	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	50	-	100	ms
T6	1000	-	-	ms

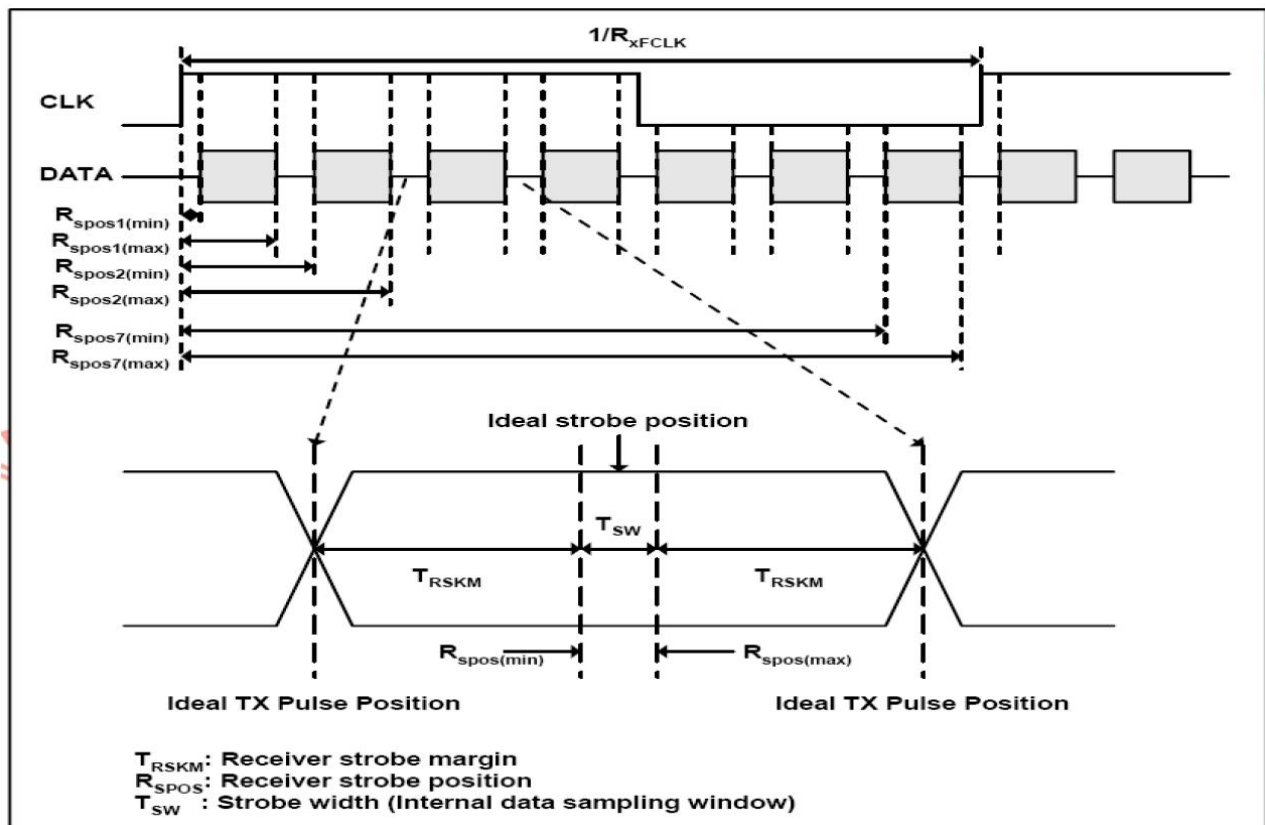
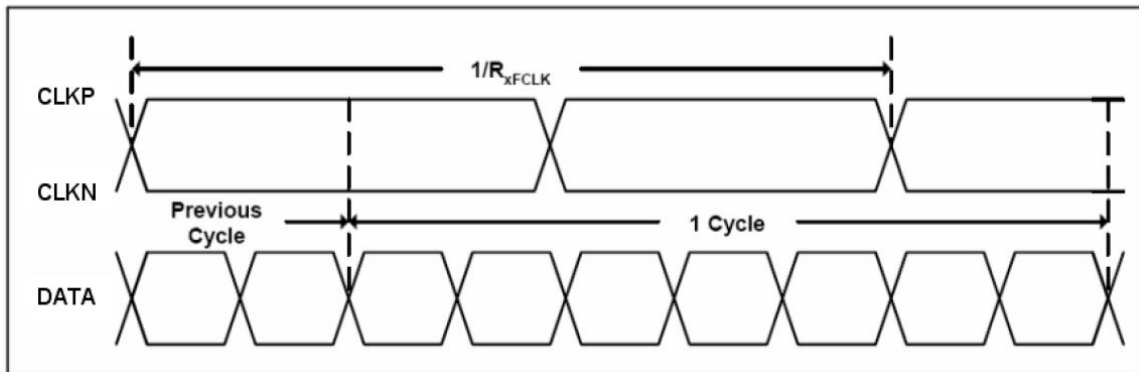
10. Interface Timing

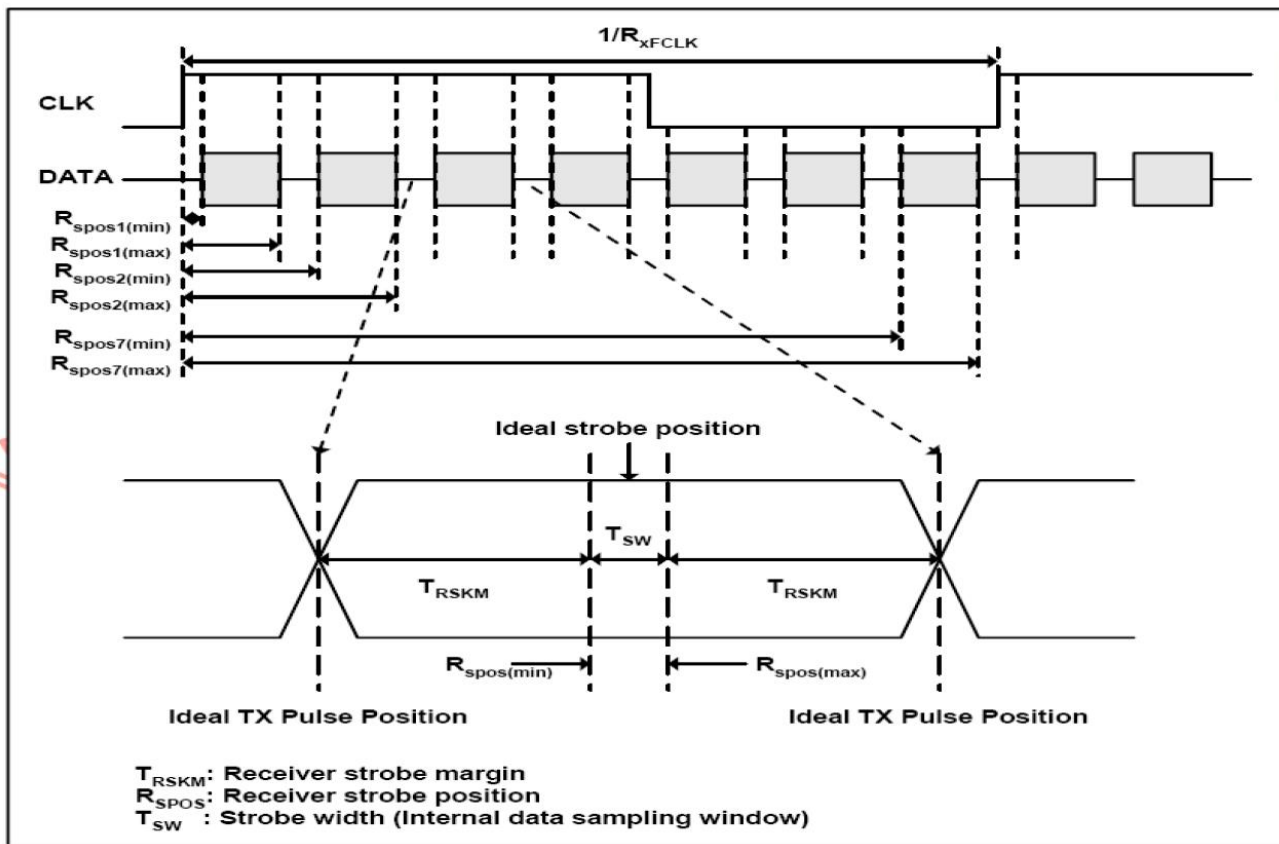
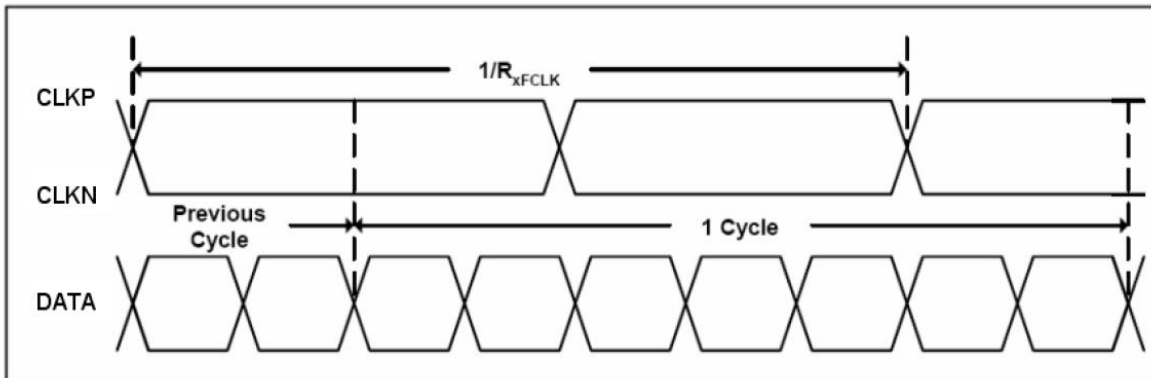
10.1 Input Signal Characteristics

10.1.1.AC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock frequency	R_{XFCLK}	40.8	51.2	71	MHz	
Input data skew margin	T_{RSKM}	500	-	-	ps	
Clock high time	T_{LVCH}	-	$4/(7 * R_{XFCLK})$	-	ns	
Clock low time	T_{LVCL}	-	$3/(7 * R_{XFCLK})$	-	ns	

10.1.2. Input Clock and Data Timing Diagram





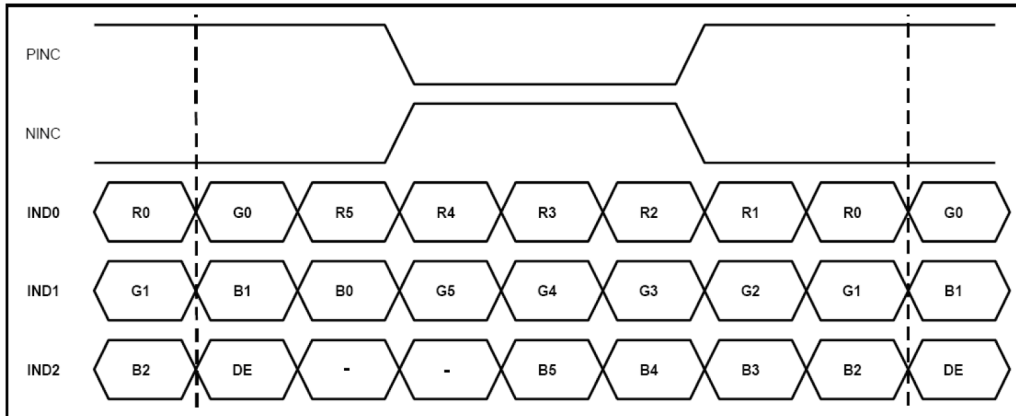
10.1.3. Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	fclk	40.8	51.2	67.2	MHz	Frame rate =60Hz
Horizontal display area	thd	1024			DCLK	

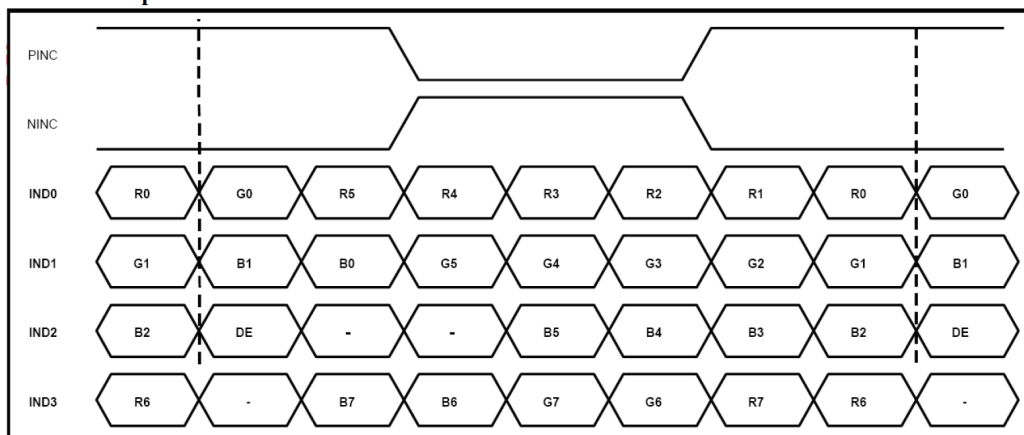
HS period time	th	1114	1344	1400	DCLK	
HS Blanking	thb	90	320	376	DCLK	
Vertical display area	tvd	600			H	
VS period time	tv	610	635	800	H	
VS Blanking	thb	10	35	200	H	

10.1.4. Data Input Format

6bit LVDS input



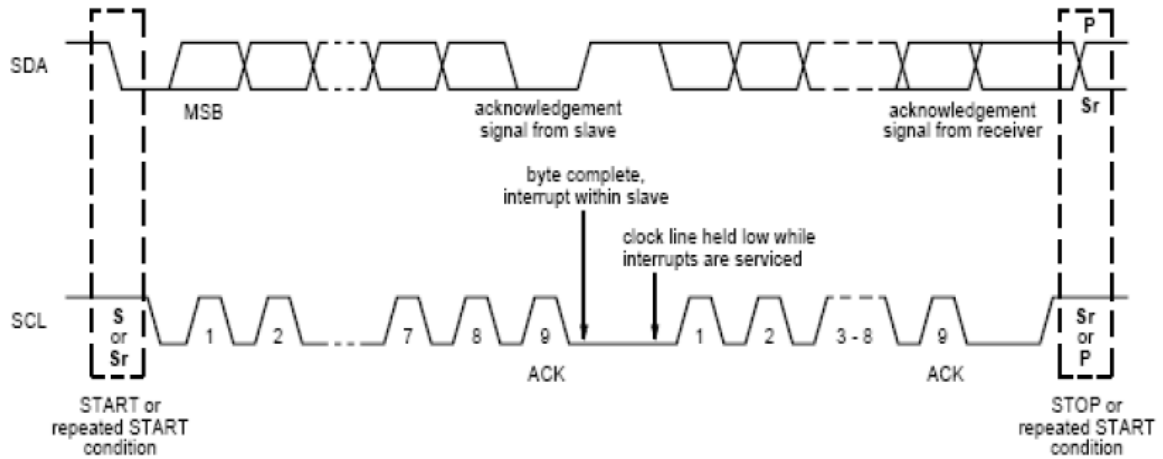
8bit LVDS input



Note: Support DE timing mode only, SYNC mode not supported.

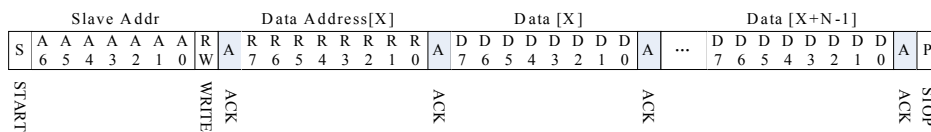
10.2 Timing Requirement of Improved Projected Capacitive Touch

10.2.1 I2C Data Transfer Format

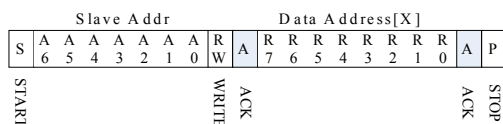


Mnemonics	Description
S	I ² C Start or I ² C Restart
A[6:0]	Slave Address = 7'b0111000
W	1'b0: Write
R	1'b1: Read
C	ACK
P	STOP: the indicate the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

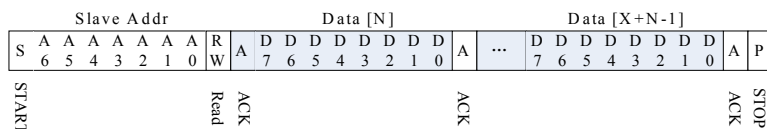
Write N bytes to I2C slave



Set Data Address



Read X bytes from I²C Slave

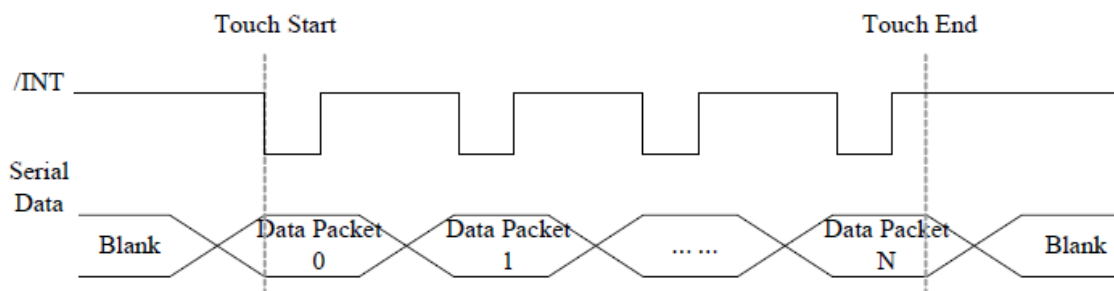


10.2.2 I2C Timing Characteristics

(Ta=25±2°C)

Parameter	Min	Max	Unit
SCL frequency	-	400	kHz
Bus free time between a STOP and START condition	4.7	-	μs
Hold time (repeated) START condition	4.0	-	μs
Data setup time	250	-	ns
Setup time for a repeated START condition	4.7	-	μs
Setup time for STOP condition	4.0	-	μs

10.2.3 Interrupt Trigger Mode



10.2.4 I2C Operating Mode Register Map

Address	ame	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Host Access	
Op,00h	DEVICE_MODE		Device Mode[2:0]							RW	
Op,01h	Reserved									R	
Op,02h	TD_STATUS					Number of touch points[3:0]				R	
Op,03h	TOUCH1_YH	1 st Event Flag				1 st Touch Y Position[11:8]				R	
Op,04h	TOUCH1_YL	1 st Touch Y Position[7:0]									R
Op,05h	TOUCH1_XH	1 st Touch ID[3:0]					1 st Touch X Position[11:8]				R
Op,06h	TOUCH1_XL	1 st Touch X Position[7:0]									R
Op,07h	Reserved									R	
Op,08h	Reserved									R	
Op,09h	TOUCH2_YH	2 nd Event				2 nd Touch				R	

		Flag		Y Position[11:8]	
Op,0Ah	TOUCH2_YL	2 nd touch Y Position[7:0]			R
Op,0Bh	TOUCH2_XH	2 nd Touch ID[3:0]		2 nd Touch X Position[11:8]	R
Op,0Ch	TOUCH2_XL	2 nd Touch X Position[7:0]			R
Op,0Dh	Reserved				R
Op,0Eh	Reserved				R
Op,0Fh	TOUCH3_YH	3 rd Event Flag		3 rd Touch Y Position[11:8]	R
Op,10h	TOUCH3_YL	3 rd Touch Y Position[7:0]			R
Op,11h	TOUCH3_XH	3 rd Touch ID[3:0]		3 rd Touch X Position[11:8]	R
Op,12h	TOUCH3_XL	3 rd Touch X Position[7:0]			R
Op,13h	Reserved				R
Op,14h	Reserved				R
Op,15h	TOUCH4_YH	4 th Event Flag		4 th Touch Y Position[11:8]	R
Op,16h	TOUCH4_YL	4 th Touch Y Position[7:0]			R
Op,17h	TOUCH4_XH	4 th Touch ID[3:0]		4 th Touch X Position[11:8]	R
Op,18h	TOUCH4_XL	4 th Touch X Position[7:0]			R
Op,19h	Reserved				R
Op,1Ah	Reserved				R
Op,1Bh	TOUCH5_YH	5 th Event Flag		5 th Touch Y Position[11:8]	R
Op,1Ch	TOUCH5_YL	5 th Touch Y Position[7:0]			R
Op,1Dh	TOUCH5_XH	5 th Touch ID[3:0]		5 th Touch X Position[11:8]	R
Op,1Eh	TOUCH5_XL	5 th Touch X Position[7:0]			R
Op,1Fh	Reserved				R
Op,20h	Reserved				R
Op,21h	TOUCH6_YH	6 th Event Flag		6 th Touch Y Position[11:8]	R
Op,22h	TOUCH6_YL	6 th Touch Y Position[7:0]			R
Op,23h	TOUCH6_XH	6 th Touch ID[3:0]		6 th Touch X Position[11:8]	R



Op,24h	TOUCH6_XL	6 th Touch X Position[7:0]		R
Op,25h	Reserved			R
Op,26h	Reserved			R
Op,27h	TOUCH7_YH	7 th Event Flag	7 th Touch Y Position[11:8]	R
Op,28h	TOUCH7_YL	7 th Touch Y Position[7:0]		R
Op,29h	TOUCH7_XH	7 th Touch ID[3:0]	7 th Touch X Position[11:8]	R
Op,2Ah	TOUCH7_XL	7 th Touch X Position[7:0]		R
Op,2Bh	Reserved			R
Op,2Ch	Reserved			R
Op,2Dh	TOUCH8_YH	8 th Event Flag	8 th Touch Y Position[11:8]	R
Op,2Eh	TOUCH8_YL	8 th Touch Y Position[7:0]		R
Op,2Fh	TOUCH8_XH	8 th Touch ID[3:0]	8 th Touch X Position[11:8]	R
Op,30h	TOUCH8_XL	8 th Touch X Position[7:0]		R
Op,31h	Reserved			R
Op,32h	Reserved			R
Op,33h	TOUCH9_YH	9 th Event Flag	9 th Touch Y Position[11:8]	R
Op,34h	TOUCH9_YL	9 th Touch Y Position[7:0]		R
Op,35h	TOUCH9_XH	9 th Touch ID[3:0]	9 th Touch X Position[11:8]	R
Op,36h	TOUCH9_XL	9 th Touch X Position[7:0]		R
Op,37h	Reserved			R
Op,38h	Reserved			R
Op,39h	TOUCH10_YH	10 th Event Flag	10 th Touch Y Position[11:8]	R
Op,3Ah	TOUCH10_YL	10 th Touch Y Position[7:0]		R
Op,3Bh	TOUCH10_XH	10 th Touch ID[3:0]	10 th Touch X Position[11:8]	R
Op,3Ch	TOUCH10_XL	10 th Touch X Position[7:0]		R
Op,3Dh	Reserved			R
Op,3Eh	Reserved			R

10.2.5 DEVICE_MODE

This register is the device mode register, configure it to determine the current mode of the chip.

Address	Bit Address	Register Name	Description
Op,00h	6:4	Device Mode [2:0]	000b Normal operating Mode 001b System Information Mode (Reserved) 100b Test Mode – read raw data (Reserved)

10.2.6 TD_STATUS

This register is the Touch Data status register.

Address	Bit Address	Register Name	Description
Op,02h	3:0	Number of touch points[3:0]	How many points detected. 1-10 is valid.

10.2.7 TOUCHn_YH (n:1-10)

This register describes MSB of the Y coordinate of the nth touch point and the corresponding event flag.

Address	Bit Address	Register Name	Description
Op,03h ~ Op,39h	7:6	Event Flag	00b: Put Down 01b: Put Up 10b: Contact 11b: No event
	5:4		Reserved
	3:0	Touch Y Position [11:8]	MSB of Touch Y Position in pixels

10.2.8 TOUCHn_YL (n:1-10)

This register describes LSB of the Y coordinate of the nth touch point.

Address	Bit Address	Register Name	Description
Op,04h ~ Op,3Ah	7:0	Touch Y Position [7:0]	LSB of the Touch Y Position in pixels

10.2.9 TOUCHn_XH (n:1-10)

This register describes MSB of the X coordinate of the nth touch point and corresponding touch ID.

Address	Bit Address	Register Name	Description
Op,05h ~ Op,3Bh	7:4 3:0	Touch ID[3:0] Touch X Position [11:8]	Touch ID of Touch Point MSB of Touch X Position in pixels

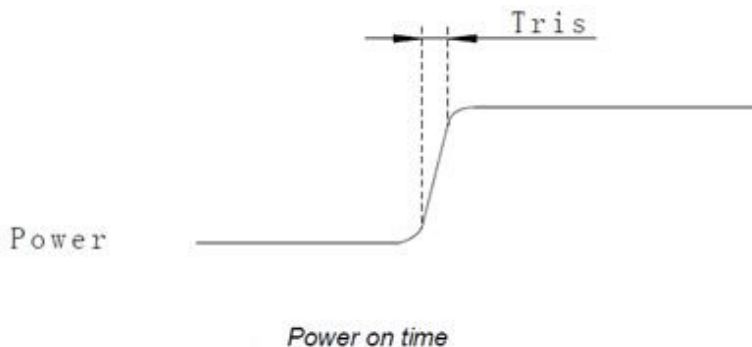
10.2.10 TOUCHn_XL (n:1-10)

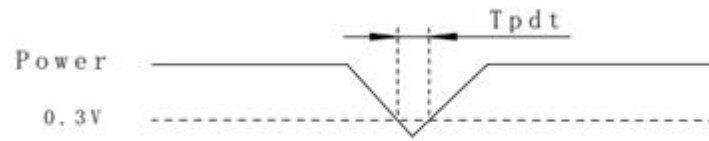
This register describes LSB of the X coordinate of the nth touch point.

Address	Bit Address	Register Name	Description
Op,06h ~ Op,3Ch	7:0	Touch X Position [7:0]	LSB of The Touch X Position in pixels

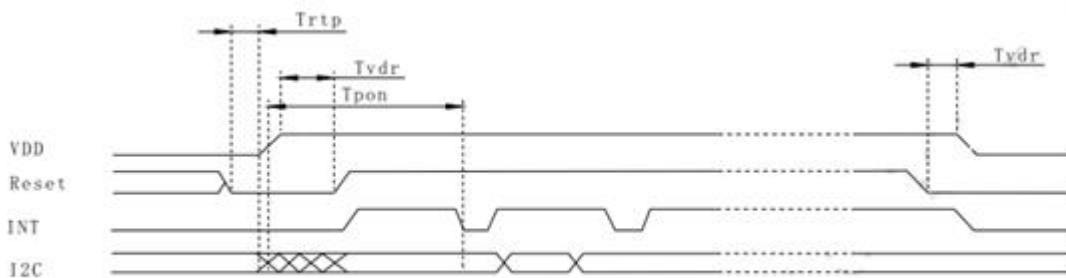
10.3 POWER ON/Reset Sequence

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 VDD powering on (Trtp). 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 Tpd is more than 1ms.



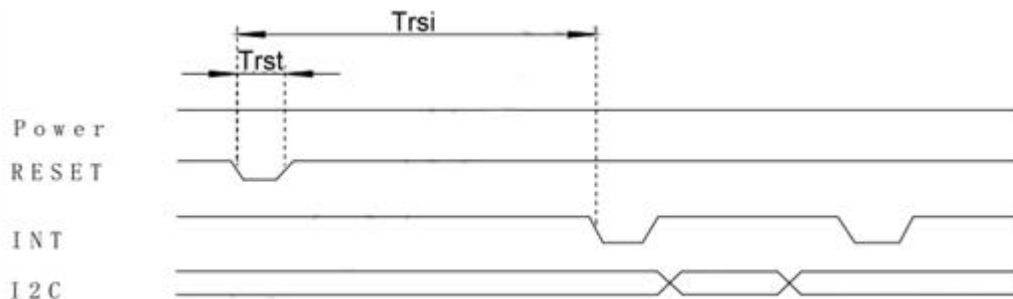


Power Cycle requirement



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

Power on/Reset Sequence Parameters

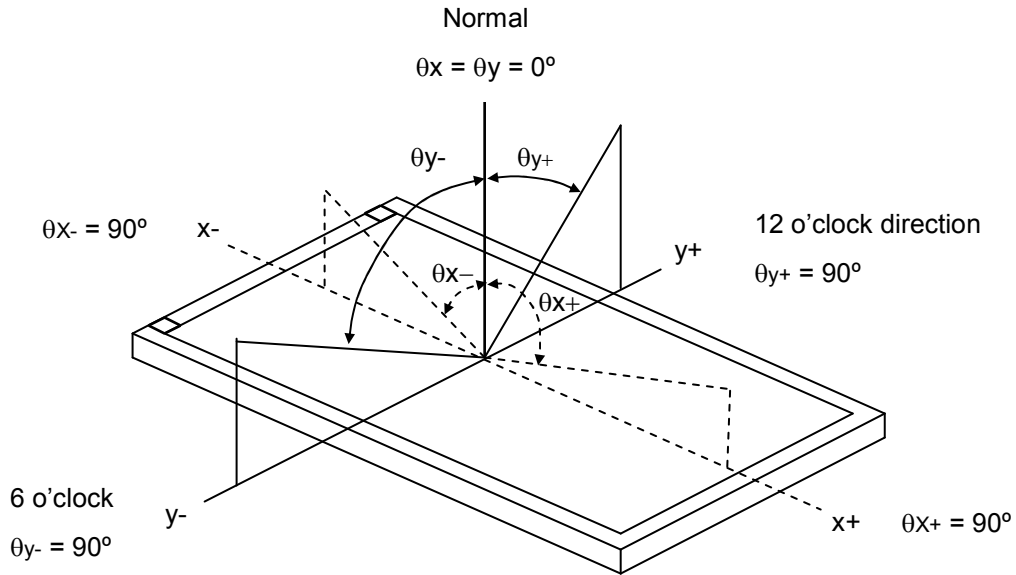
Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Tpdt	Time of the voltage of supply being below 0.3V	5	--	ms
Trtp	Time of resetting to be low before powering on	100	--	μs
Tpon	Time of starting to report point after powering on	--	200	ms
Tvdr	Reset time after VDD powering on	1	--	ms
Trsi	Time of starting to report point after resetting	--	200	ms
Trst	Reset time	1	--	ms

11. Optical Characteristics

The optical characteristics should be measured in a dark environment (≤ 1 lux) or equivalent state with the methods shown in Note (4).

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle	560	(700)	-	-	(2)
Response Time		T_R		-	10	20	ms	(3)
		T_F		-	15	30	ms	
Luminance(Center)				1050	(1230)	-	cd/m ²	(4)
Brightness uniformity		BUNI		70	75	-	%	(5)
Color Chromaticity	Red	Rx	CR \geq 10	0.576	0.626	0.676	-	(1),(4)
		Ry		0.275	0.325	0.375	-	
	Green	Gx		0.278	0.328	0.378	-	
		Gy		0.498	0.548	0.598	-	
	Blue	Bx		0.086	0.136	0.186	-	
		By		0.091	0.141	0.191	-	
	White	Wx		0.26	0.31	0.36	-	
		Wy		0.28	0.33	0.38	-	
Viewing Angle	Horizontal	θ_{x+}	75	(80)	-	deg.	(1),(4)	
		θ_{x-}	75	(80)	-			
	Vertical	θ_{y+}	75	(80)	-			
		θ_{y-}	75	(80)	-			

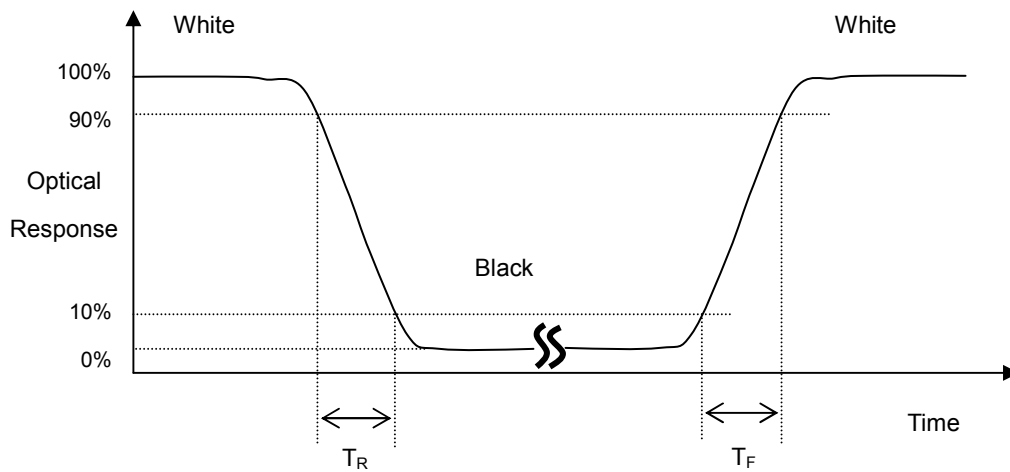
Note (1) Definition of Viewing Angle (θ_x , θ_y):



Note (2) Definition of Contrast Ratio (CR):

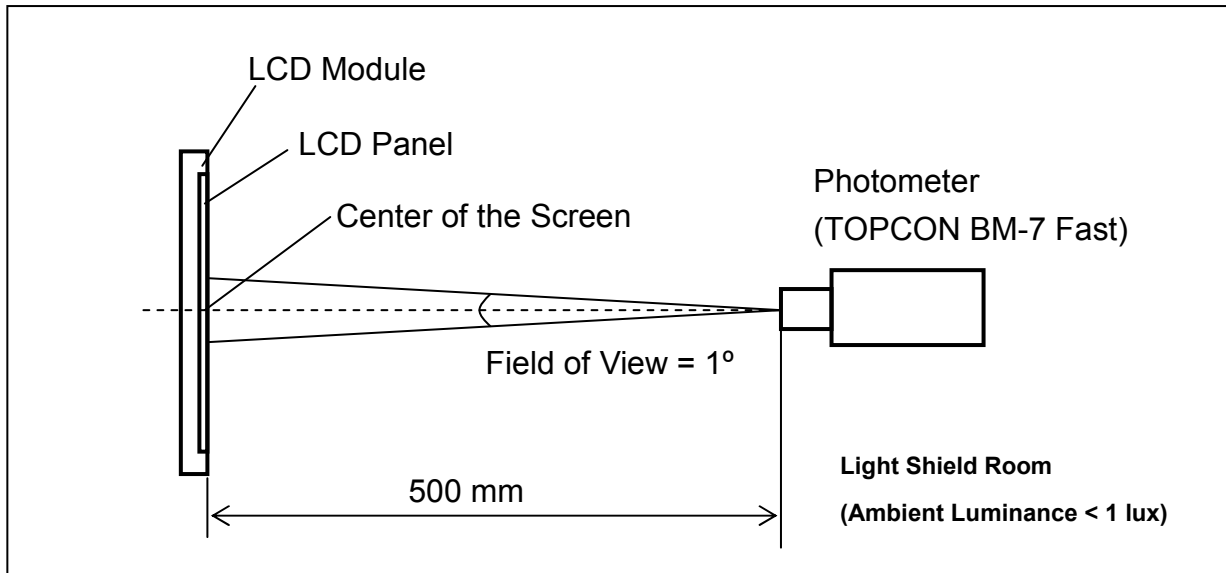
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note (3) Definition of Response Time (T_R , T_F):



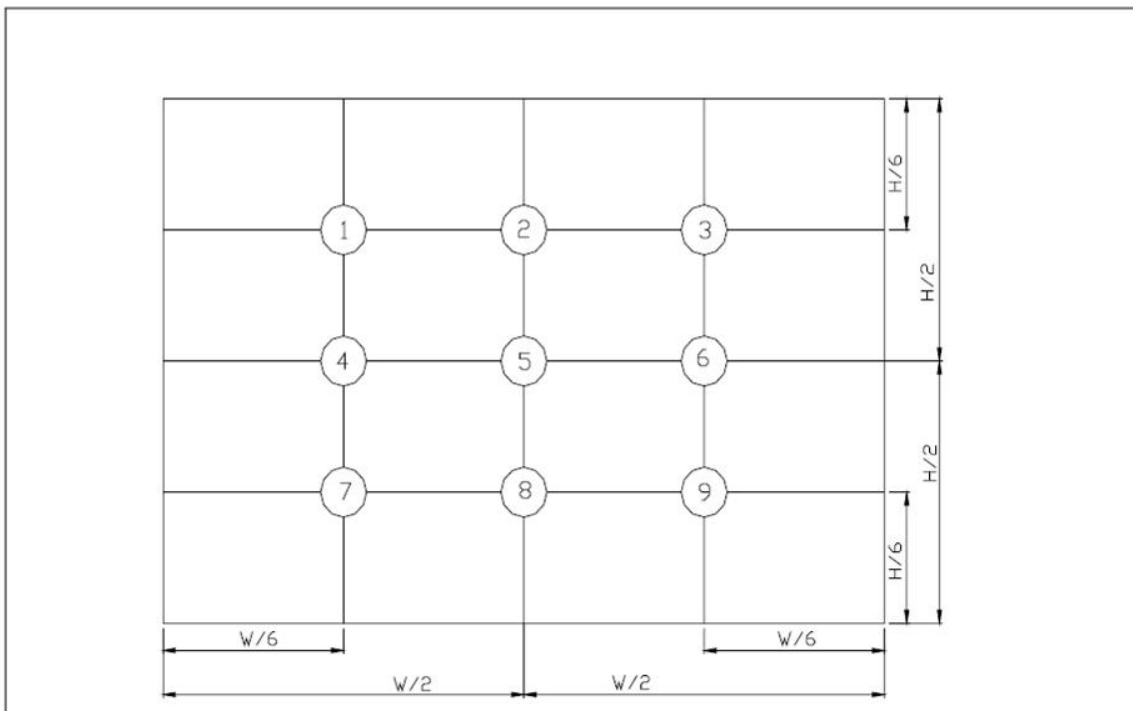
Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a dark room or equivalent condition.



Note (5) Definition of brightness uniformity

$$\text{Brightness uniformity} = (\text{Min Luminance of 9 points}) / (\text{Max Luminance of 9 points}) \times 100\%$$



(單位 : mm)

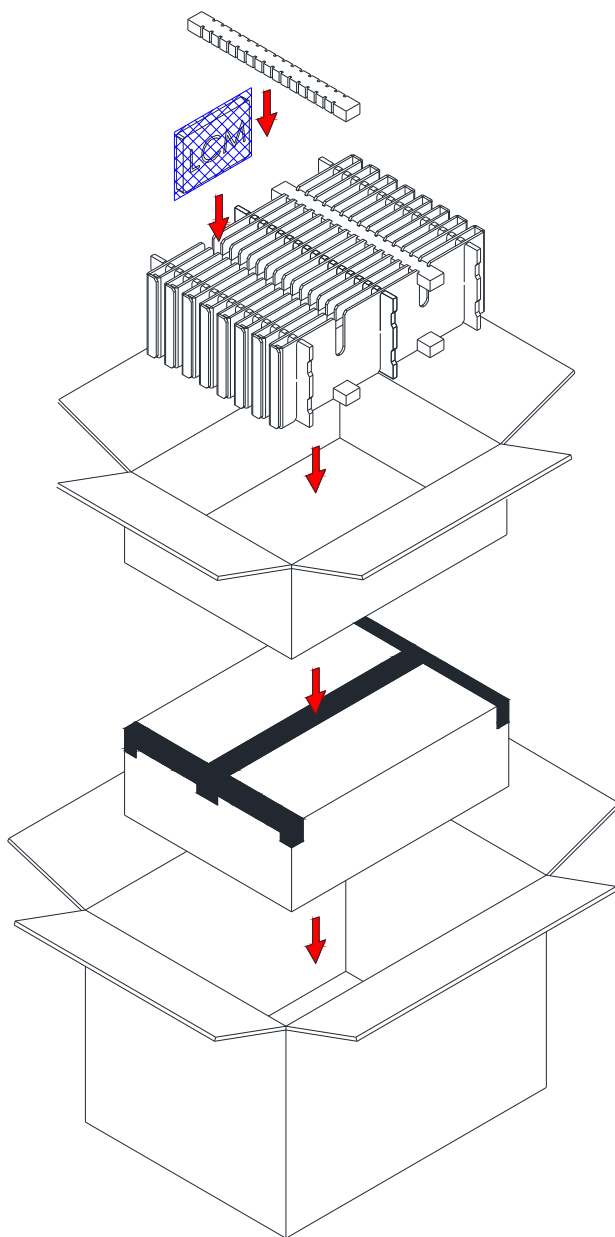
12. Reliability Test

NO.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+80°C,240hrs	Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects 1. Air bubble in the LCD 2. Sealleak 3. non-display 4. missing segments 5. glass crack 6. current idd is twice higher than initial value.
2	Low Temperature Storage	Ta=-30°C,240hrs	
3	High Temperature Operation	Ta=+70°C,240hrs	
4	Low Temperature Operation	Ta=-20°C,240hrs	
5	High Temperature and High Humidity(Operation)	Ta=+60°C, 90%RH, 240hrs	
6	Thermal cycling Test (non operation)	-20°C(30min)→+70°C(30min),10cycles	
7	Electrostatic discharge	200V 200pf(0ohm) 1time/each terminal	
8	Vibration	1. Random: 1.04 Grms,5~500HZ, X/Y/Z,30min/each direction 2. Sine: Freq. Range:8~33.3hz Stoke:1.3mm Sweep:2.9G,33.3~400HZ X/Z:2hr,Y:4hr,cyc:15min	
9	Shock	100G,6ms,±X, ±Y, ±Z 3 times for each direction	JIS C7021,A-10 (Condition)
10	Vibration(with carton)	Random:0.015G ∧ 2/HZ, 5~200HZ -6dB/octave,200~400HZ XYZ each dirction:2hr	
11	Drop (with carton)	Height:60cm 1corner,3edges,6surfaces	JIS Z0202

Note:

1. There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.
2. the test samples should be applied to only one test item
3. for damp proof test, Pure water(resistance>10M ohm)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. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Charateristic, Optical Characteristic

13. Packaging



PARTS LIST					
	ITEM	SIZE(L×W×H) unit : mm	MATERIAL	Q.T.Y	NOTE
1	STATIC SHIELDING BAGS	300.0×145.0×0.09		60	
2	EPE PAD	345.0×30.0×20.0	EPE	8	
3	CARD BOARD	345.0×150.0×3.5	CARTON	6	
4	CARD BOARD	450.0×23.0×150.0	CARTON	16	
5	INTERNAL BOX	455.0×350.0×164.0	CARTON	2	
6	EXTERNAL BOX	475.0×370.0×375.0	CARTON	1	
7	PRODUCT	165.0×104.0×10.86		60	

14. Precautions

14.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life threatening or otherwise catastrophic.

14.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. All Shore does not warrant the module, if customers disassemble or modify the module.

14.3 Breakage of LCD Panel

14.3.1. If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

14.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.

14.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

14.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

14.4 Electric Shock

14.4.1. Disconnect power supply before handling LCD module.

14.4.2. Do not pull or fold the LED cable.

14.4.3. Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

14.5 Absolute Maximum Ratings and Power Protection Circuit

14.5.1. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

14.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

14.5.3. It's recommended to employ protection circuit for power supply.

14.6 Operation

14.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

14.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

14.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

14.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

14.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

14.7 Mechanism

Please mount LCD module by using mouting holes arranged in four corners tightly.

14.8 Static Electricity

14.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

14.8.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

14.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

14.10 Disposal

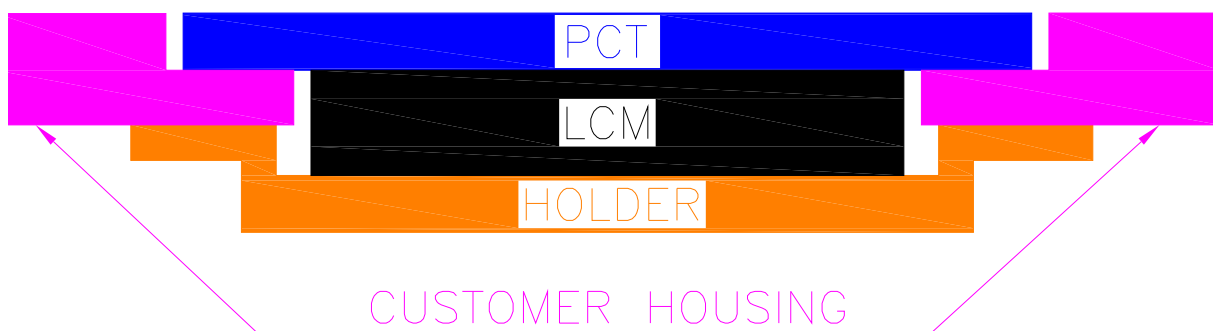
When disposing LCD module, obey the local environmental regulations.

14.11 Caution

This All Shore LCD module has been specifically designed for use only in electronic devices in the areas of audio control, office automation, industrial control, home appliances, etc. The modules should not be used in applications where module failure could result in physical harm or loss of life, and All Shore expressly disclaims any and all liability relating in any way to the use of the module in such applications.

14.12 Cautions for LCM installation

To secure the LCM within customer housing, having appropriate structural support underneath the LCM is a must. The recommended LCM installation with a holder type of the structure into the customer housing is shown below figure. By attaching ONLY the protruding edges of the PCT with cover lens onto the customer housing does not provide a proper structural support required for the LCM. Such construction may deteriorate the adhesivity between the PCT with cover lens and the TFT module, especially after a long period of time or from the vibrations encountered during product transportation.



14.13 PRECAUTIONS of STORAGE

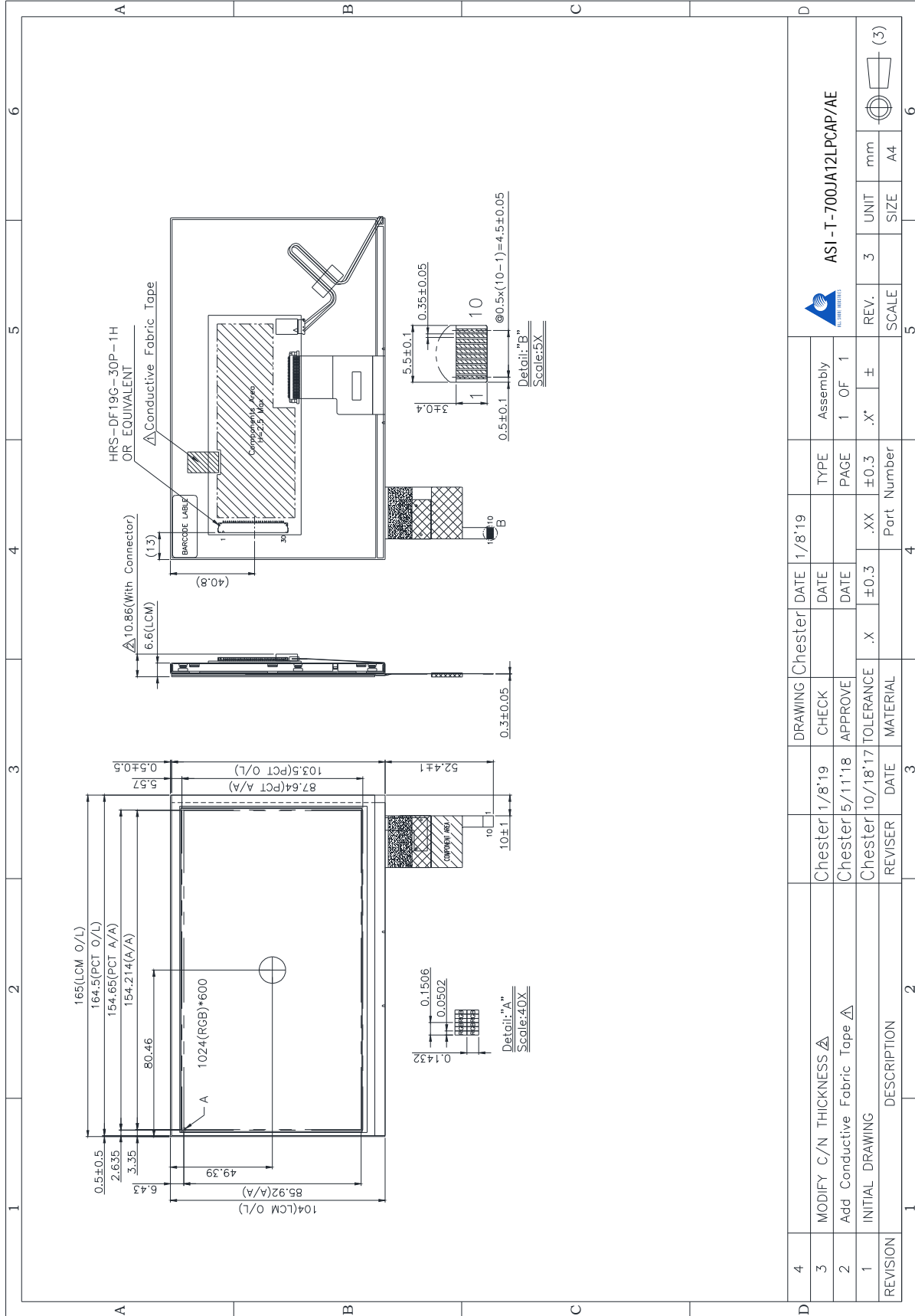
If the displays are going to be stored for years, please be aware the following notices.

- (1) Please store the displays in a dark room to avoid any damages from sunlight and other sources of UV light.
- (2) The recommended long term storage temperature is between 10 ~35°C and <60% humidity to avoid causing bubbles between polarizer and LCD glasses, and polarizer peeling from LCD glasses.
- (3) It would be better to keep the displays in the container, which is shipped from All Shore, and do not unpack it.
- (4) Please do not stick any labels on the display surface for a long time, especially on the polarizer.

14.14 Cautions for PCT

To prevent un-expected touch issue and suppress influence noise from system, the LCM metal frame should be connected to system ground in customer's device.

15.Outline Drawing



16. Incoming Inspection Standards

1.0 Purpose:

This incoming inspection standards shall be apply to TFT-LCD Module

2.0: Visual inspection criteria

2.1. Inspection condition is as followings

- Viewing distance is approximately 30cm
- Viewing angle is referred to the CAS
- Ambient temperature is in the room temperature
- Ambient illumination is 300+-50 LUX

Defect type		Criteria		
Electrical defect	Area (Note 2)		I	O
		Bright dots (Note3: Visible under:ND5% 1:D≤0.15mm:No count); D>0.15mm Not allowable		N≤0
	Dark dots (Note4: 0.15mm<D≤0.3mm), D>0.3mm Not allowable		N≤3	
	Bright dot-2Adjacent (note5)		N≤0	
	Dark dot-2Adjacent (note6)		N≤0	
	Dark or bright dots-3 and more adjacent (note6)		N≤0	
	Total bright and dark dots		N≤3	
	Minimum distance between bright dots		5mm	
	Minimum distance between dark dots		5mm	
	Minimum distance between bright and bright dots		5mm	
Visual defect	Foreign material	Circular foreign material: dark/bright sport	Visible under:ND5% 1:D≤0.15mm:No count 2:0.15mm<D≤0.3mm, N≤4 3:D>0.3mm:Not allowable	
		Linear foreign material: bright or dark line	Invisible under ND5% 0.1mm<W≤0.3mm, 0.3mm<L≤1.5mm, N≤4 Visible under ND5% 0.05mm≤w≤0.1mm, 0.3mm≤L≤0.7mm, N≤4	
	Polarizer	Linear scratch	1:BM:No Count 2:Pixel area 0.05mm≤w≤0.2mm, 1.0mm≤L≤5.0mm, N≤4	
		Bubble peeling	1:BM:No Count 2:Pixel area 0.15mm≤D<0.3mm, N≤4	
	Mura & leak		ND5%	

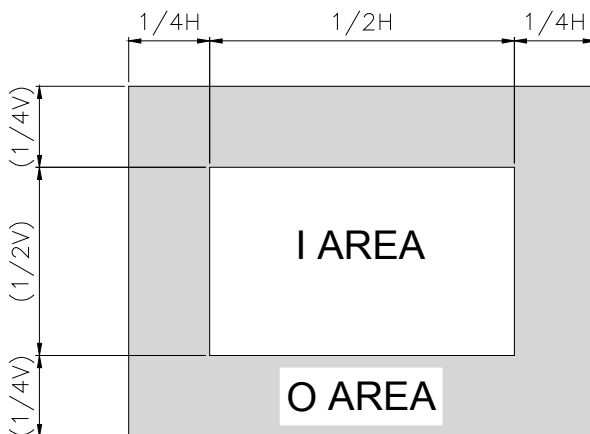
D: diameter, N: number, W: horizontal width, L: vertical height

2.2: others

Note(1)

- a. every dot herein means sub-pixel(each red ,green ,blue color)
- b. damaged less than half size of sub-pixel is not counted as defect
- c. extraneous substances which can be wiped out are not considered as defect
- d. defects which is on the black(outside of active area) ore not considered as defect.

Note (2) definition of area.



Note(3) Bright dot defect definition

All bright dot defect must be visible through 5% ND filter

Visible under:ND5%

1: $D \leq 0.15\text{mm}$:No count (that will seen is no bright)

2: $D > 0.15\text{mm}$ Not allowable

Note(4) Dark dot defect definition

-dark area is more than 50% of one dot. All bright dot defect must be visible through 5% ND filter

Visible under:ND5%

1: $D \leq 0.15\text{mm}$:No count (that will seen is no bright)

2: $D > 0.3\text{mm}$ Not allowable

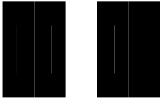
3: $0.15\text{mm} < D \leq 0.3\text{mm}, N \leq 3$



Note (5) bright dot defect description

-two adjacent

Type 1



Note (6) Dark dot defect description

-two adjacent

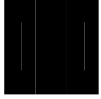
Type 1



Note(7) dark dot defect description

-three adjacent

Type1



Type2



type3



type4



Note(8) minimum distance between dot defects

Bright dot to bright dot

The pitch is less than 5mm.

Dark dot to dark dot

The pitch is less than 5mm.

Bright dot to dark dot

The pitch is less than 5mm.

Note(9) "Average diameter" description

Average diameter= $(a+b)/2$

The defect that are not defined above and considered to be problem shall be reviewed and discussed by both parties

Note(10) Bright dot, mura and leak are defined through transmission ND Filter as following.

Form the eyes to the TFT LCM surface is 30cm.

Incoming Inspection Touch Panel

Circular Defects
 Linear Defects
 Scratch
 Air Bubble
 Crack

Y:
 Long breakage

Z:
 Wide breakage

D:
 thickness
 breakage

T:
 single piece of
 glass thickness
 (Touch sensor
 single thickness)

VA:
 Touch control
 panel viewing
 area.

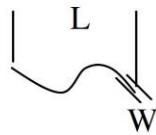
Sensor wide:
 the size of the
 long side of the
 touch panel.

(1) Circular Defects

$$\phi = (L+W)/2$$

Diameter(mm)	Spec
$\phi \leq 0.25$	No quantity limit
$0.25 < \phi \leq 0.5$	Max 5 defect
$0.5 < \phi$	Reject

(2) Linear Defects



Length	Width	Acceptable
$12.0 \geq L$	$0.06 \geq W$	Accept
$12.0 \geq L$	$0.08 \geq W$	Max 5 defect
$L > 12.0$	$W > 0.08$	Reject

The Min distance of defects must be above 15.0mm.

(3) Scratch

Length	Width	Acceptable
$12.0 \geq L$	$0.06 \geq W$	Accept
$12.0 \geq L$	$0.08 \geq W$	Max 5 defect
$L > 12.0$	$W > 0.08$	Reject

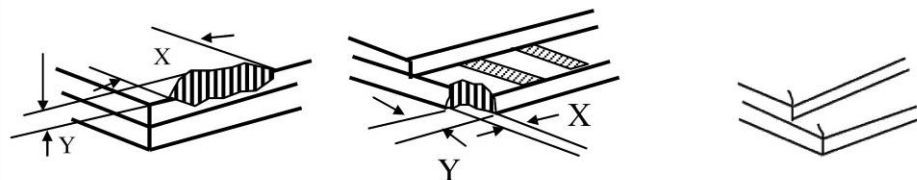
The Min distance of defects must be above 15.0mm.

(4) Air Bubble

Diameter(mm)	Spec
$\phi \leq 0.2$	No quantity limit
$0.2 < \phi \leq 0.6$	Max 5 defect

The Min distance of defects must be above 10.0mm.

(5) Crack



$Z \leq T, X \leq 1/8$ Sensor wide

$X \leq 3\text{mm}$ and $Y \leq 1/3D$

Y: Did not enter the VA

(Accept)

(Accept)

(Reject)

16.2 Handling of LCM

- (1) Don't give external shock.
- (2) Don't apply excessive force on the surface.
- (3) Liquid in LCD is hazardous substance. Must not lick and swallow. when the liquid is attach to your hand, skin, cloth etc. Wash it out thoroughly and immediately.
- (4) Don't operate it above the absolute maximum rating.
- (5) Don't disassemble the LCM.