



## ASI-T-283DA3CN/A

Item	Contents	Unit/Note
LCD type	TFT/TRANSMISSIVE/POSITIVE	/
Viewing direction	6:00	O•Clock
Gray scale inversion direction	12:00	O•Clock
Module area (W× H)	50.2×69.3× 2.9	mm <sup>2</sup>
Active area (W×H)	43.2×57.6	mm <sup>2</sup>
Number of Dots	240(RGB)×320	/
Pixel pitch(W× H)	0.18× 0.18	mm <sup>2</sup>
DriverIC	ILI9341V	/
Colors	65K/262K	/
Backlight Type	4 LEDs	/
Module Power consumption	298(max.)	mw
InterfaceType	CPU/RGB/SPI	/
Input voltage	2.8	V
With/Without TSP	Without TSP	V
Weight	22.5	g



**REVISION RECORD**

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2013-02-25	First release	
1.1	2013-12-05	Add lifetime	
1.2	2015-08-13	Adding dimensions information, but the module do not change	P.5
1.3	2015-12-16	Change IC driver from ILI9341 to ILI9341V	P.4~6

# CONTENTS

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■ GENERAL INFORMATION

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Backlight Type	4 LEDs	/
Module Power consumption	298(max.)	mw
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Input voltage	2.8	V
With/Without TSP	Without TSP	V
Weight	22.5	g

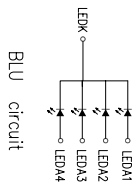
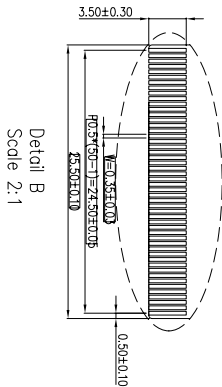
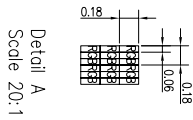
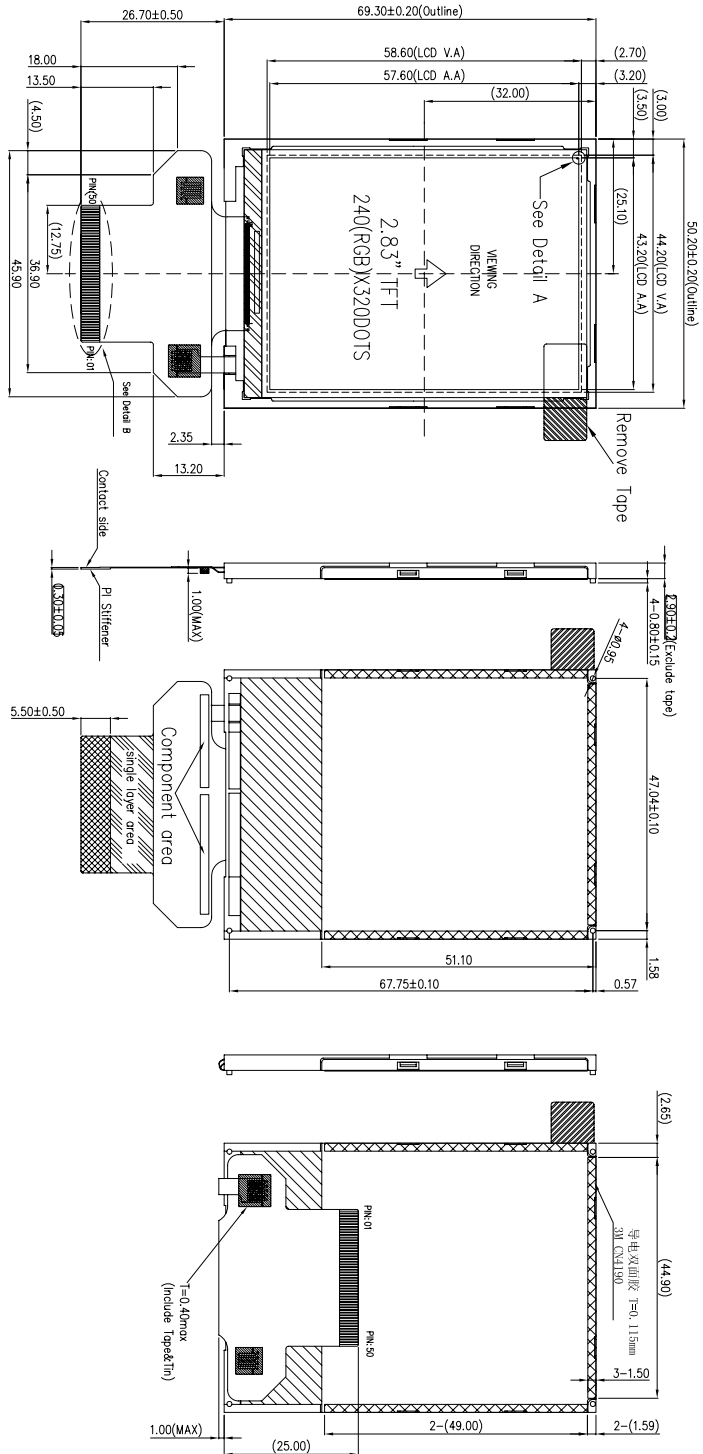
Note 1: Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

Note 2 : RoHS compliant;

Note 3: LCM weight tolerance: ± 5% .

**EXTERNAL DIMENSIONS**

1	LEDK
2	LEDA1
3	LED2
4	LED3
5	LED4
6	M0
7	M1
8	M2
9	M3
10	RESET
11	VSING
12	HSING
13	DOICLK
14	DE
15	DE7
16	DB16
17	DB15
18	DB14
19	DB13
20	DB12
21	DB11
22	DB10
23	DB9
24	DB8
25	DB7
26	DB6
27	DB5
28	DB4
29	DB3
30	DB2
31	DB1
32	DB0
33	S00
34	S01
35	S0
36	M0(CX)
37	CX(SCU)
38	CSX
39	TE
40	V00
41	V01
42	V0
43	SND
44	NC
45	NC
46	NC
47	NC
48	GND
49	GND
50	GND



- NOTES:
1. DISPLAY TYPE: TFT
  2. VIEWING DIRECTION: 6:00
  3. POLARIZER MODE: TRANSMISSIVE/POSITIVE
  4. DRIVE METHOD: 1/320 DUTY
  5. I/O(C)=2, 8V(TTP), VCC=2, 8V, VCI=2, 8V
  6. OPERATING TEMP: -20° C --- +70° C
  7. STORAGE TEMP: -30° C --- +80° C
  8. LCD DRIVE IC: IL19941V
  9. CONNECTION: FPC
  10. BACKLIGHT: 4CHIP-WHITE LED/80mA/3.2V(TTP)
  11. UNMARKED TOLERANCE: ±0.20
  12. REQUIREMENTS ON ENVIRONMENTAL PROTECTION: ROHS
  13. THE CONTROLLED DIMENSION MASK TO BE ( )
  14. REFERENCE DIMENSION MASK TO BE ( )

03	Change IC driver from U9341 to U9341V	2015.12.16	DRAWN BY:	CAROL	2015.12.16	SCALE : 1/1	MODULE P/N:
02	Adding dimensions information, but the module do not change	2015.08.13	CHECKED BY:			UNIT:	
01	First issue	2013.02.25	APPROVED BY:			mm	DESCRIPTION:
VER.	REVISED DESCRIPTION	DATE	VERSION NO:	03			TFT MODULE

**■ ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Min	Max	Unit
Power supply voltage	VCI	-0.3	4.6	V
Logic signal voltage	VDDI	-0.3	4.6	V
Operating temperature	Top	-20	70	°C
Storage temperature	TST	-30	80	°C
Humidity	RH	-	90%(Max60°C)	RH

**■ ELECTRICAL CHARACTERISTICS**

DC CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
Power supply voltage	VCI	2.5	2.8	3.3	V
Logic signal/O voltage	VDDI	1.65	2.8	3.3	V
Input voltage'H'level	VIH	0.7VDDI	-	VDDI	V
Input voltage'L'level	VIL	VSS	-	0.3VDDI	V
Output voltage'H'level	VOH	0.8VDDI	-	VDDI	V
Output voltage'L'level	VOL	VSS	-	0.2VDDI	V

Note:

1: Display full white. Backlight on state.

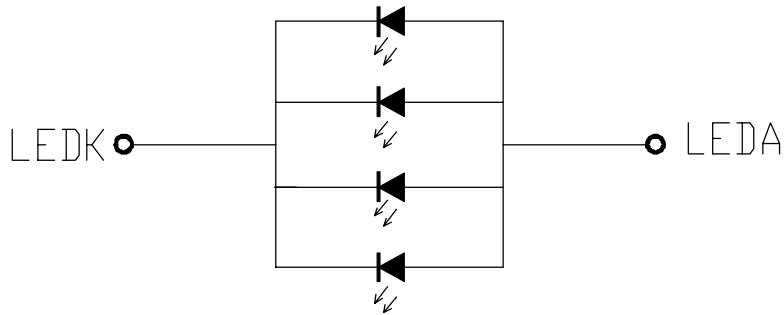
2: IC on standby mode.

3: the default voltage is 2.8V, for N lights in series, the power is that the current multiply N.

**■ BACKLIGHT CHARACTERISTICS**

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	Vf	If=80mA	-	3.2	3.4	V	
Supply current	-	-	-	-	-	mA	
Reverse voltage	Vr	-	-	-	-	V	
Forward current	Normal	4-chip Parallel		80		mA	1
	Dimming			I <sub>pd</sub>			
Reverse Current	I <sub>r</sub>	-	-	-	-	μA	
LED lifetime	-	-	30000	40000	-	hrs	
Uniformity	ΔBp	I <sub>f</sub> =80mA	80%				
Color coordinate*	X		0.270	-	0.315	-	
	Y		0.270	-	0.315	-	

White LED CIRCUIT DIAGRAM:



CIRCUIT DIAGRAM  
If=80mA,Constant Current

NOTE:

1 The LED •s driver mode needs to be constant current mode.

Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded .Functional operation should be restricted to the conditions described under normal operating conditions.

ELECTRO-OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time	Tr +Tf	=0° =0° Ta=25	-	25	30	ms	Fig.1	4
Contrastratio	Cr		-	500	-	-	-- FIG 2.	1
Luminance uniformity	WHITE		80	90.8	-	%	FIG 2.	3
Surface Luminance	Lv		187	300	-	cd/m <sup>2</sup>	FIG 2.	2
Viewing angle range		= 90°	-	70	-	deg	FIG 3.	6
		= 270°	-	57	-	deg	FIG 3.	
		= 0°	-	70	-	deg	FIG 3.	
		= 180°	-	70	-	deg	FIG 3.	
CIE (x, y) chromaticity	Red x	=0° =0° Ta=25	-	0.6368	-		FIG 2.	5
	Red y		-	0.3329	-			
	Green x		-	0.3397	-			
	Green y		-	0.6138	-			
	Blue x		-	0.1433	-			
	Blue y		-	0.0807	-			
	White x		-	0.2886	-			
	White y		-	0.3194	-			
NTSC Ratio	S		55	67		%		

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

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels}(P_1, P_2, P_3, P_4, P_5)}{\text{Average Surface Luminance with all black pixels}(P_1, P_2, P_3, P_4, P_5)}$$

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

$$Lv = \text{Average Surface Luminance with all white pixels}(P_1, P_2, P_3, P_4, P_5)$$

Note 3. The uniformity in surface luminance ,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.

$$\text{WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels}(P_1, P_2, P_3, P_4, P_5)}{\text{Maximum Surface Luminance with all white pixels}(P_1, P_2, P_3, P_4, P_5)}$$

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 contrast 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.

Note 8. For TFT module, Gray scale reverse occurs in the direction of panel viewing angle.



FIG.1. The definition of Response Time

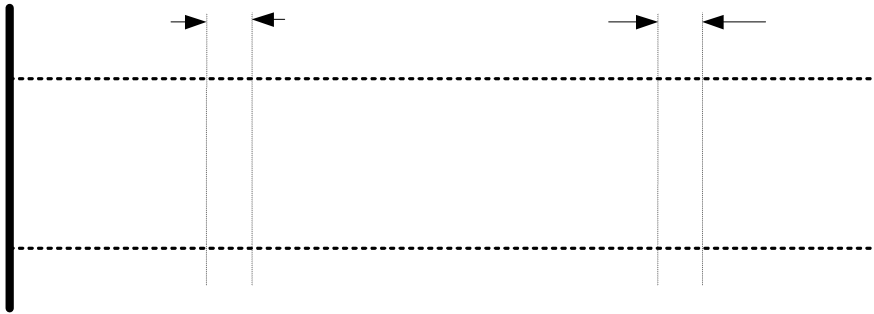


FIG.2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity CIE (x, y) chromaticity

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

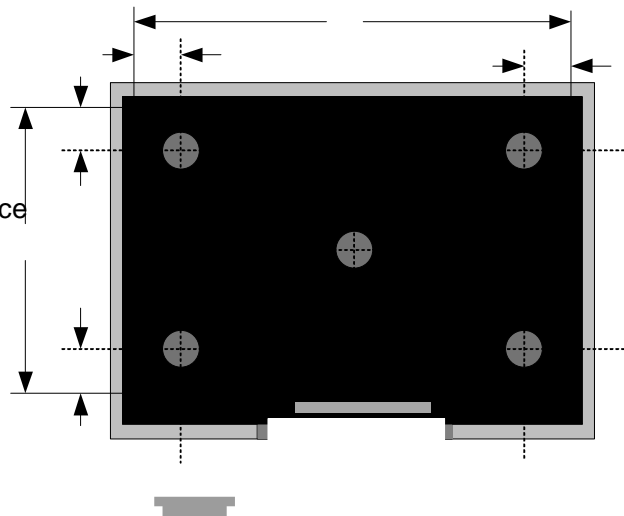
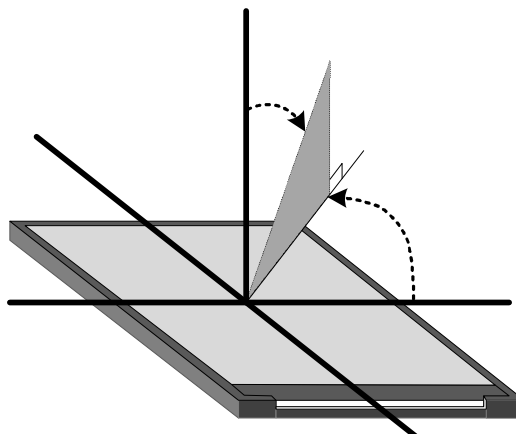


FIG.3. The definition of viewing angle



INTERFACE DESCRIPTION

Pin No.	Symbol	I/O	Function
1	LEDK	I	Cathode for LED backlighting
2	LEDA1	I	Anode No.1 for LED backlighting
3	LEDA2	I	Anode No.2 for LED backlighting
4	LEDA3	I	Anode No.3 for LED backlighting
5	LEDA4	I	Anode No.4 for LED backlighting
6	IM0	I	Select Interface Mode ;Note1
7	IM1	I	
8	IM2	I	
9	IM3	I	
10	RESET	I	Reset pin
11	VSYNC	IO	Frame Synchronizing Signal For RGB Interface
12	HSYNC	IO	Line Synchronizing Signal For RGB Interface
13	DOTCLK	IO	Dot Clock Signal For RGB Interface
14	DE	IO	Data Enable Signal For RGB Interface
15	DB17	IO	DATA BUS
32	DB0		
33	SDO	IO	Serial Output Signal
34	SDI	IO	Serial Input Signal
35	RD	IO	Read execution control pin
36	WRX(D/CX)	IO	Write execution control pin; Serial Register select s Signal
37	D/CX(SCL)	IO	Register select signal; Serial Interface Clock
38	CSX	IO	Chip Select Signal
39	TE	IO	Tearing effect out pin synchronize MPU to frame writng
40	VDDI	P	Logic power,provide with 1.8/2.8V
41	VDDI	P	Logic power,provide with 1.8/2.8V
42	VCI	P	Power Supply to the interface pins ,provide with 2.8V
43	GND	G	Ground
44	NC	O	Noconnection
45	NC	O	Noconnection
46	NC	O	Noconnection
47	NC	O	Noconnection
48	GND	O	Ground
49	GND	O	Ground
50	GND	-	Ground



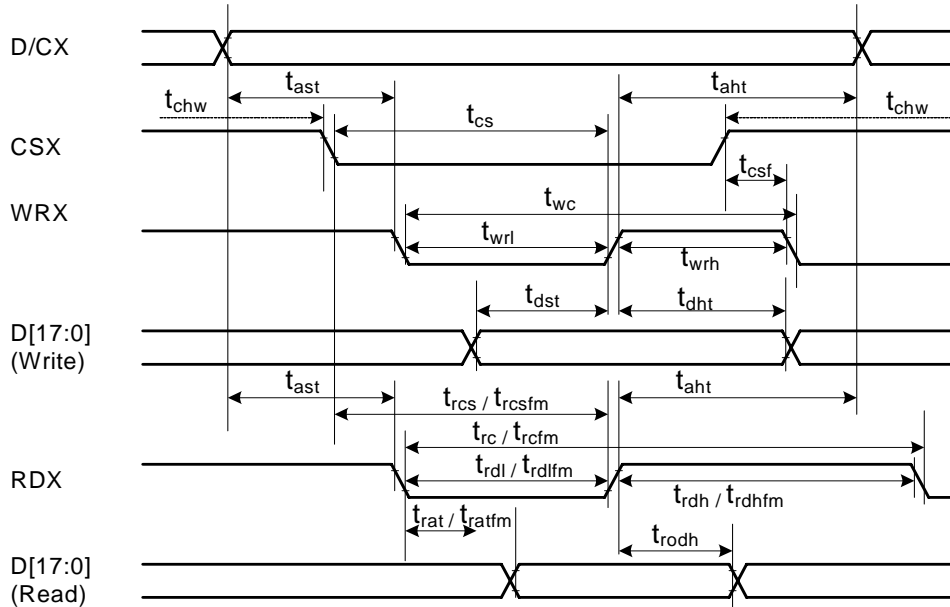
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## APPLICATION NOTES

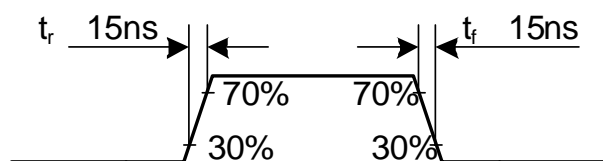
### 1. AC Characteristics

#### 1.1 Display Parallel 18/16/9/8-bit Interface Timing Characteristics (8080- system)

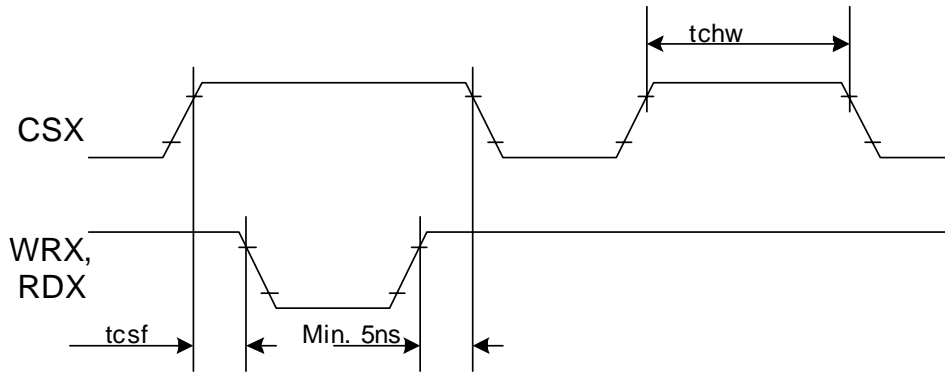


Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	0	-	ns	
	tchw	CSX •HŽ pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
CSX	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	twc	Write cycle	66	-	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	
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
D[17:0], D[15:0], D[8:0], D[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	

Note: Ta = -30 to 70 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, VSS=0V

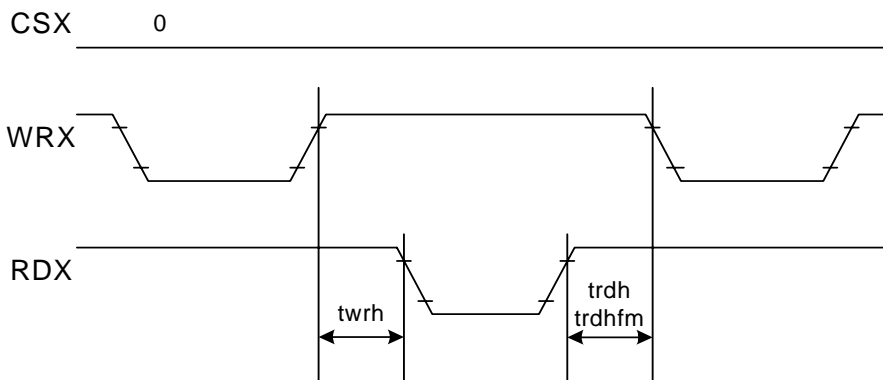


CSX timings :



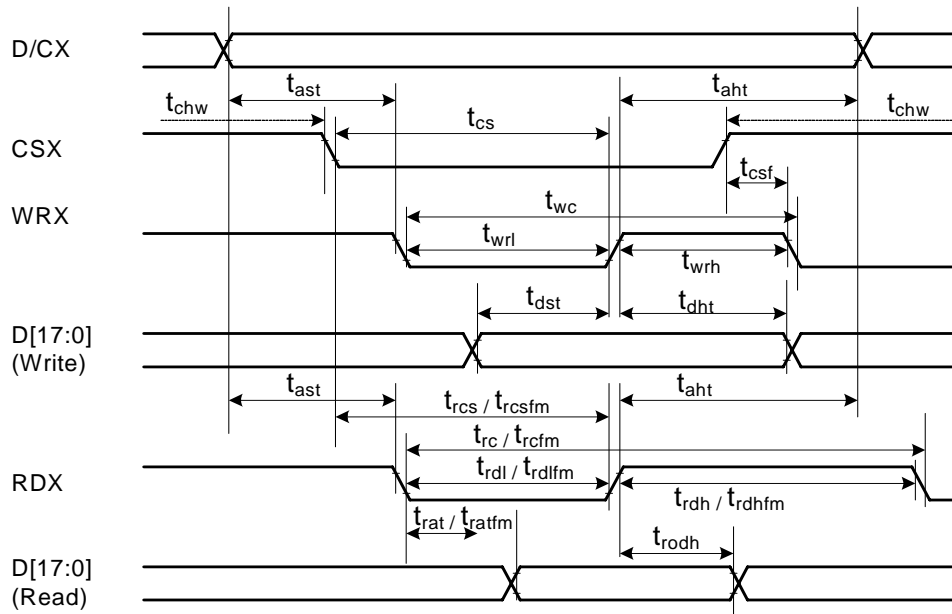
Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Write to read or read to write timings:



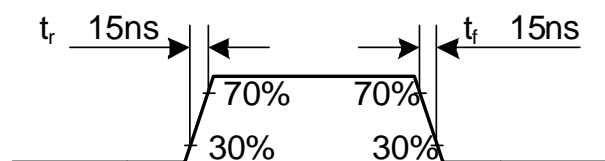
Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

## 1.2 Display Parallel 18/16/9/8-bit Interface Timing Characteristics(8080- system)

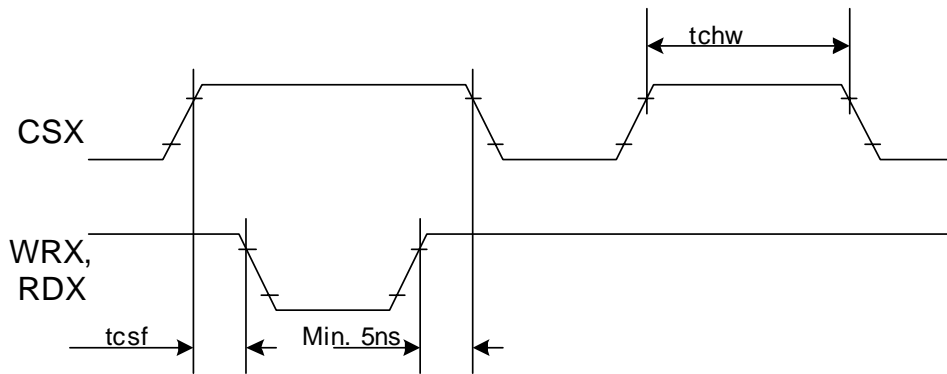


Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	0	-	ns	
	tchw	CSX •HŽ pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
CSX	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	twc	Write cycle	66	-	ns	
	twrh	Write Control pulse H duration	15	-	ns	
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
RDX (ID)	trdlfm	Read Control L duration (FM)	355	-	ns	
	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
D[17:0], D[17:10]&D[8:1], D[17:10], D[17:9]	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	

Note: Ta = -30 to 70 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, VSS=0V.

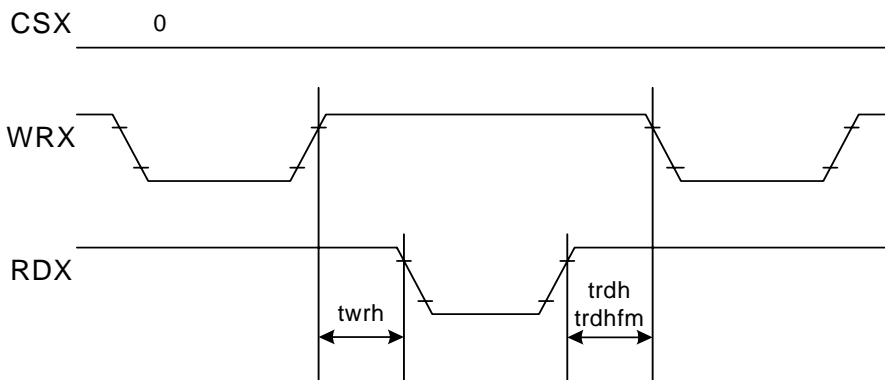


CSX timings :



Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Write to read or read to write timings:

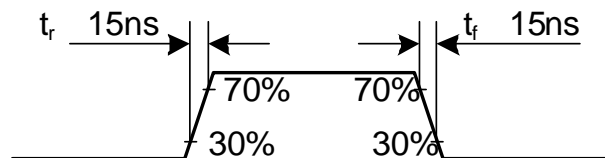


Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

## 1.3 Display Serial Interface Timing Characteristics (3-line SPI system)

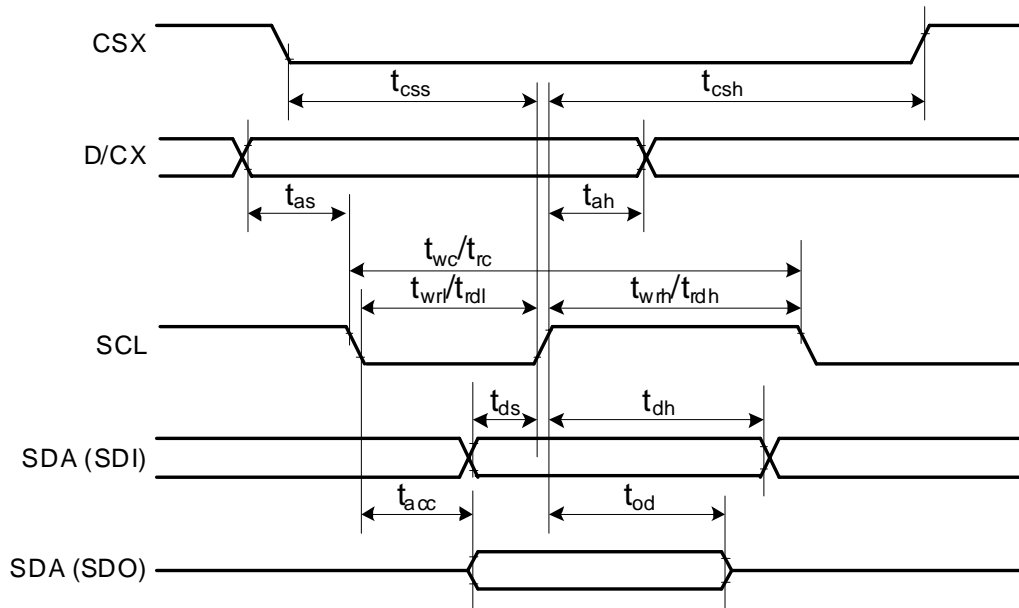
Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL •H $\bar{Z}$ Pulse Width (Write)	40	-	ns	
	tslw	SCL •L $\bar{Z}$ Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL •H $\bar{Z}$ Pulse Width (Read)	60	-	ns	
	tslr	SCL •L $\bar{Z}$ Pulse Width (Read)	60	-	ns	
SDA / SDI (Input)	tsds	Data setup time (Write)	30	-	ns	
	tsdh	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	-	ns	
	toh	Output disable time (Read)	10	50	ns	
CSX	tsc	SCL-CSX	20	-	ns	
	tch	CSX •H $\bar{Z}$ Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcs		65	-	ns	

Note: Ta = 25 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V



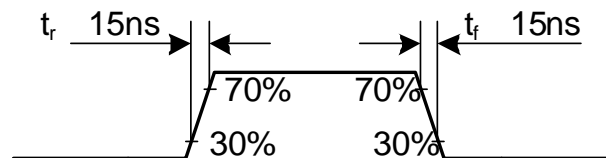


## 1.4 Display Serial Interface Timing Characteristics (4-line SPI system)

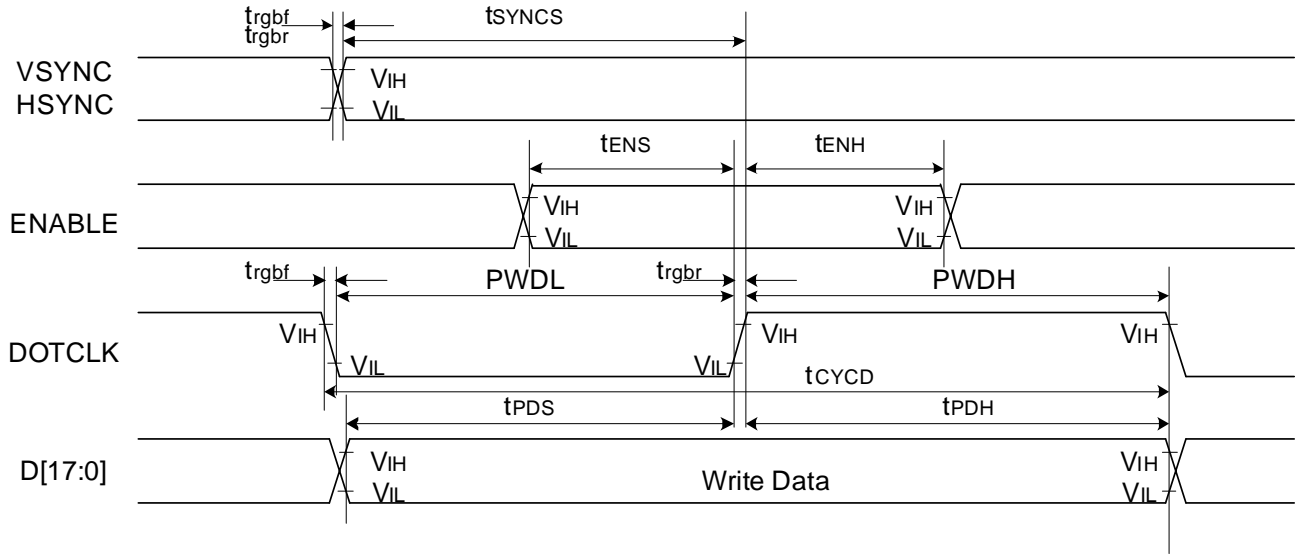


Signal	Symbol	Parameter	min	max	Unit	Description
CSX	$t_{css}$	Chip select time (Write)	40	-	ns	
	$t_{csh}$	Chip select hold time (Read)	40	-	ns	
SCL	$t_{wc}$	Serial clock cycle (Write)	100	-	ns	
	$t_{wrh}$	SCL •HŽ pulse width (Write)	40	-	ns	
	$t_{trc}$	Serial clock cycle (Read)	150	-	ns	
	$t_{trdh}$	SCL •HŽ pulse width (Read)	60	-	ns	
D/CX	$t_{rdl}$	SCL •LŽ pulse width (Read)	60	-	ns	
	$t_{as}$	D/CX setup time	10	-		
	$t_{ah}$	D/CX hold time (Write / Read)	10	-		
SDA / SDI (Input)	$t_{ds}$	Data setup time (Write)	30	-	ns	
	$t_{dh}$	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	$t_{acc}$	Access time (Read)	10	-	ns	For maximum CL=30pF
	$t_{od}$	Output disable time (Read)	10	50	ns	For minimum CL=8pF

Note:  $T_a = 25\text{ }^\circ\text{C}$ ,  $V_{DDI}=1.65\text{V to }3.3\text{V}$ ,  $V_{CI}=2.5\text{V to }3.3\text{V}$ ,  $AGND=VSS=0\text{V}$

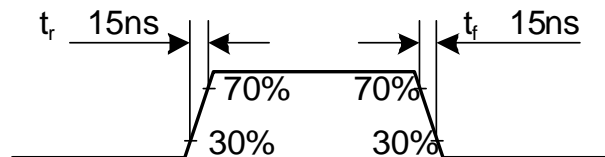


## 1.5 Parallel 18/16/6-bit RGB Interface Timing Characteristics



Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC / HSYNC	tSYNCS	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode
	tSYNCH	VSYNC/HSYNC hold time	15	-	ns	
DE	tENS	DE setup time	15	-	ns	
	tENH	DE hold time	15	-	ns	
D[17:0]	tPOS	Data setup time	15	-	ns	
	tPDH	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	15	-	ns	
	PWDL	DOTCLK low-level period	15	-	ns	
	tCYCD	DOTCLK cycle time	100	-	ns	
VSYNC / HSYNC	trgbr, trgbf	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	
	tSYNCS	VSYNC/HSYNC setup time	15	-	ns	
DE	tSYNCH	VSYNC/HSYNC hold time	15	-	ns	6-bit bus RGB interface mode
	tENS	DE setup time	15	-	ns	
D[17:0]	tENH	DE hold time	15	-	ns	
	tPOS	Data setup time	15	-	ns	
DOTCLK	tPDH	Data hold time	15	-	ns	
	PWDH	DOTCLK high-level pulse period	15	-	ns	
	PWDL	DOTCLK low-level pulse period	15	-	ns	
	tCYCD	DOTCLK cycle time	100	-	ns	
	trgbr, trgbf	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

Note: Ta = -30 to 70 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V





INSTRUCTION DESCRIPTION(ILITEK's ILI9341)

Regulative Command Set													
Command Function	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	Hex
No Operation	0	1		XX	0	0	0	0	0	0	0	0	00h
Software Reset	0	1		XX	0	0	0	0	0	0	0	1	01h
	0	1		XX	0	0	0	0	0	1	0	0	04h
Read Display Identification Information	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX				ID1 [7:0]					XX
	1		1	XX				ID2 [7:0]					XX
	1		1	XX				ID3 [7:0]					XX
	0	1		XX	0	0	0	0	1	0	0	1	09h
	1		1	XX	X	X	X	X	X	X	X	X	XX
Read Display Status	1		1	XX				D [31:25]					00
	1		1	XX	X		D [22:20]			D [19:16]			61
	1		1	XX	X	X	X	X		D [10:8]			00
	1		1	XX		D [7:5]		X	X	X	X	X	00
Read Display Power Mode	0	1		XX	0	0	0	0	1	0	1	0	0Ah
	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX			D [7:2]				0	0	08
Read Display MADCTL	0	1		XX	0	0	0	0	1	0	1	1	0Bh
	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX			D [7:2]				0	0	00
Read Display Pixel Format	0	1		XX	0	0	0	0	1	1	0	0	0Ch
	1		1	XX	X	X	X	X	X	X	X	X	XX
Read Display Image Format	0	1		XX	0	0	0	0	1	1	0	1	0Dh
	1		1	XX	RIM		DPI [2:0]		X		DBI [2:0]		06
	1		1	XX	X	X	X	X	X		D [2:0]		00
Read Display Signal Mode	0	1		XX	0	0	0	0	1	1	1	0	0Eh
	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX			D [7:2]				0	0	00
Read Display Self-Diagnostic Result	0	1		XX	0	0	0	0	1	1	1	1	0Fh
	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX		D [7:6]		X	X	X	X	X	00
Enter Sleep Mode	0	1		XX	0	0	0	1	0	0	0	0	10h
Sleep OUT	0	1		XX	0	0	0	1	0	0	0	1	11h
Partial Mode ON	0	1		XX	0	0	0	1	0	0	1	0	12h
Normal Display Mode ON	0	1		XX	0	0	0	1	0	0	1	1	13h
Display Inversion OFF	0	1		XX	0	0	1	0	0	0	0	0	20h
Display Inversion ON	0	1		XX	0	0	1	0	0	0	0	1	21h
Gamma Set	0	1		XX	0	0	1	0	0	1	1	0	26h
	1	1		XX				GC [7:0]					01
Display OFF	0	1		XX	0	0	1	0	1	0	0	0	28h
Display ON	0	1		XX	0	0	1	0	1	0	0	1	29h
	0	1		XX	0	0	1	0	1	0	1	0	2Ah
Column Address Set	1	1		XX				SC [15:8]					XX
	1	1		XX				SC [7:0]					XX
	1	1		XX				EC [15:8]					XX
	1	1		XX				EC [7:0]					XX
	0	1		XX	0	0	1	0	1	0	1	1	2Bh
Page Address Set	1	1		XX				SP [15:8]					XX
	1	1		XX				SP [7:0]					XX
	1	1		XX				EP [15:8]					XX
	1	1		XX				EP [7:0]					XX



# ASI-T-283DA3CN/A

Memory Write	0	1		XX	0	0	1	0	1	1	0	0	2Ch
	1	1					D [17:0]						XX
Color SET	0	1		XX	0	0	1	0	1	1	0	1	2Dh
	1		1	XX							R00 [5:0]		XX
	1		1	XX							Rnn [5:0]		XX
	1		1	XX							R31 [5:0]		XX
	1		1	XX							G00 [5:0]		XX
	1		1	XX							Gnn [5:0]		XX
	1		1	XX							G64 [5:0]		XX
	1		1	XX							B00 [5:0]		XX
	1		1	XX							Bnn [5:0]		XX
	1		1	XX							B31 [5:0]		XX
Memory Read	0	1		XX	0	0	1	0	1	1	1	0	2Eh
	1		1	XX	X	X	X	X	X	X	X	X	XX
Partial Area	1		1				D [17:0]						XX
	0	1		XX	0	0	1	1	0	0	0	0	30h
	1	1		XX							SR [15:8]		00
	1	1		XX							SR [7:0]		00
	1	1		XX							ER [15:8]		01
	1	1		XX							ER [7:0]		3F
	0	1		XX	0	0	1	1	0	0	1	1	33h
	1	1		XX							TFA [15:8]		00
Vertical Scrolling Definition	1	1		XX							TFA [7:0]		00
	1	1		XX							VSA [15:8]		01
	1	1		XX							VSA [7:0]		40
	1	1		XX							BFA [15:8]		00
	1	1		XX							BFA [7:0]		00
	0	1		XX	0	0	1	1	0	1	0	0	34h
Tearing Effect Line OFF	0	1		XX	0	0	1	1	0	1	0	0	35h
Tearing Effect Line ON	0	1		XX	0	0	1	1	0	1	0	1	00
Memory Access Control	1	1		XX	X	X	X	X	X	X	X	M	00
	0	1		XX	0	0	1	1	0	1	1	0	36h
Vertical Scrolling Start Address	1	1		XX	MY	MX	MV	ML	BGR	MH	X	X	00
	0	1		XX	0	0	1	1	0	1	1	1	37h
	1	1		XX							VSP [15:8]		00
Idle Mode OFF	1	1		XX							VSP [7:0]		00
	0	1		XX	0	0	1	1	1	0	0	0	38h
Idle Mode ON	0	1		XX	0	0	1	1	1	0	0	1	39h
	0	1		XX	0	0	1	1	1	0	1	0	3Ah
Pixel Format Set	1	1		XX	X		DPI [2:0]		X		DBI [2:0]		66
	0	1		XX	0	0	1	1	1	1	0	0	3Ch
Write Memory Continue	1	1					D [17:0]						XX
	0	1		XX	0	0	1	1	1	1	1	0	3Eh
Read Memory Continue	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1				D [17:0]						XX
Set Tear Scanline	0	1		XX	0	1	0	0	0	1	0	0	44h
	1	1		XX	X	X	X	X	X	X	X	STS [8]	00
	1	1		XX							STS [7:0]		00
Get Scanline	0	1		XX	0	1	0	0	0	1	0	1	45h
	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX	X	X	X	X	X	X	GTS [9:8]		00
	1		1	XX							GTS [7:0]		00
Write Display Brightness	0	1		XX	0	1	0	1	0	0	0	1	51h
	1	1		XX							DBV [7:0]		00



# ASI-T-283DA3CN/A

Read Display Brightness	0	1		XX	0	1	0	1	0	0	1	0	52h
	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX									00
Write CTRL Display	0	1		XX	0	1	0	1	0	0	1	1	53h
	1	1		XX	X	X	BCTRL	X	DD	BL	X	X	00
	0	1		XX	0	1	0	1	0	1	0	0	54h
Read CTRL Display	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX	X	X	BCTRL	X	DD	BL	X	X	00
	0	1		XX	0	1	0	1	0	1	0	1	55h
Write Content Adaptive Brightness Control	1	1		XX	X	X	X	X	X	X		C [1:0]	00
	0	1		XX	0	1	0	1	0	1	1	0	56h
Read Content Adaptive Brightness Control	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX	X	X	X	X	X			C [1:0]	00
	0	1		XX	0	1	0	1	1	1	1	0	5Eh
Write CABC Minimum Brightness	1	1		XX									00
	0	1		XX	0	1	0	1	0	1	1	1	5Fh
Read CABC Minimum Brightness	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX									00
	0	1		XX	1	1	0	1	1	0	1	0	DAh
Read ID1	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX									XX
	0	1		XX	1	1	0	1	1	0	1	1	DBh
Read ID2	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX									XX
	0	1		XX	1	1	0	1	1	1	0	0	DCh
Read ID3	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX									XX

Extended Command Set													
Command Function	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	Hex
RGB Interface	0	1		XX	1	0	1	1	0	0	0	0	B0h
Signal Control	1	1		XX	ByPass_MODE	RCM [1:0]		X	VSPL	HSPL	DPL	EPL	40
Frame Control (In Normal Mode)	0	1		XX	1	0	1	1	0	0	0	1	B1h
	1	1		XX	X	X	X	X	X	X		DIVA [1:0]	00
Frame Control (In Idle Mode)	1	1		XX	X	X	X						1B
	0	1		XX	1	0	1	1	0	0	1	0	B2h
	1	1		XX	X	X	X	X	X	X		DIVB [1:0]	00
Frame Control (In Partial Mode)	1	1		XX	X	X	X						1B
	0	1		XX	1	0	1	1	0	0	1	1	B3h
	1	1		XX	X	X	X	X	X	X		DIVC [1:0]	00
Display Inversion Control	1	1		XX	X	X	X						1B
	0	1		XX	1	0	1	1	0	1	0	0	B4h
	1	1		XX	X	X	X	X	X	NLA	NLB	NLC	02
Blanking Porch Control	0	1		XX	1	0	1	1	0	1	0	1	B5h
	1	1		XX	0								02
	1	1		XX	0								02
	1	1		XX	0	0	0						0A
	1	1		XX	0	0	0						14



# ASI-T-283DA3CN/A

	0	1		XX	1	0	1	1	0	1	1	0	B6h
	1	1		XX	X	X	X	X	PTG [1:0]		PT [1:0]		0A
Display Function Control	1	1		XX	REV	GS	SS	SM	ISC [3:0]				82
	1	1		XX	X	X			NL [5:0]				27
	1	1		XX	X	X			PCDIV [5:0]				XX
Entry Mode Set	0	1		XX	1	0	1	1	0	1	1	1	B7h
	1	1		XX	X	X	X	X	DSTB	GON	DTE	GAS	07
	0	1		XX	1	0	1	1	1	0	0	0	B8h
Backlight Control 1	1	1		XX	X	X	X	X	X	X	X	X	XX
	1	1		XX	X	X	X	X	TH_UI [3:0]				04
Backlight Control 2	0	1		XX	1	0	1	1	1	0	0	1	B9h
	1	1		XX	X	X	X	X	X	X	X	X	XX
	1	1		XX	TH_MV [3:0]			TH_ST [3:0]				B8	
Backlight Control 3	0	1		XX	1	0	1	1	1	0	1	0	BAh
	1	1		XX	X	X	X	X	X	X	X	X	XX
	1	1		XX	X	X	X	X	DTH_UI [3:0]				04
Backlight Control 4	0	1		XX	1	0	1	1	1	0	1	1	BBh
	1	1		XX	X	X	X	X	X	X	X	X	XX
	1	1		XX	DTH_MV [3:0]			DTH_ST [3:0]				C9	
Backlight Control 5	0	1		XX	1	0	1	1	1	1	0	0	BCh
	1	1		XX	X	X	X	X	X	X	X	X	XX
	1	1		XX	DIM2 [3:0]			DIM1 [2:0]				44	
Backlight Control 7	0	1		XX	1	0	1	1	1	1	1	0	BEh
	1	1		XX	PWM_DIV [7:0]							0F	
Backlight Control 8	0	1		XX	1	0	1	1	1	1	1	1	BFh
	1	1		XX	X	X	X	X	X	LEDONR	LEDONPOL	LEDPWMOPL	00
Power Control 1	0	1		XX	1	1	0	0	0	0	0	0	C0h
	1	1		XX	X	X			VRH [5:0]				26
Power Control 2	0	1		XX	1	1	0	0	0	0	0	1	C1h
	1	1		XX	X	X	X	X	X	BT [2:0]			00
	0	1		XX	1	1	0	0	0	1	0	1	C5h
VCOM Control 1	1	1		XX	X				VMH [6:0]				31
	1	1		XX	X				VML [6:0]				3C
VCOM Control 2	0	1		XX	1	1	0	0	0	1	1	1	C7h
	1	1		XX	nVM				VMF [6:0]				C0
	0	1		XX	1	1	0	1	0	0	0	0	D0h
NV Memory Write	1	1		XX	X	X	X	X	PGM_ADR [2:0]				00
	1	1		XX	PGM_DATA [7:0]							XX	
	0	1		XX	1	1	0	1	0	0	0	1	D1h
NV Memory Protection Key	1	1		XX	KEY [23:16]							55	
	1	1		XX	KEY [15:8]							AA	
	1	1		XX	KEY [7:0]							66	
	0	1		XX	1	1	0	1	0	0	1	0	D2h
NV Memory Status Read	1		1	XX	X	X	X	X	X	X	X	X	XX
	1		1	XX	X	ID2_CNT [2:0]			X	ID1_CNT [2:0]			XX
	1		1	XX	BUSY	VMF_CNT [2:0]			X	ID3_CNT [2:0]			XX



# ASI-T-283DA3CN/A

	0	1	XX	1	1	0	1	0	0	1	1	D3h
	1	1	XX	X	X	X	X	X	X	X	X	XX
Read ID4	1	1	XX	0	0	0	0	0	0	0	0	00
	1	1	XX	1	0	0	1	0	0	1	1	93
	1	1	XX	0	1	0	0	0	0	0	1	41
	0	1	XX	1	1	1	0	0	0	0	0	E0h
	1	1	XX	X	X	X	X	VP0 [3:0]			08	
	1	1	XX	X	X	VP1 [5:0]					0E	
	1	1	XX	X	X	VP2 [5:0]					12	
	1	1	XX	X	X	X	X	VP4 [3:0]			05	
	1	1	XX	X	X	X	VP6 [4:0]				03	
	1	1	XX	X	X	X	X	VP13 [3:0]			09	
Positive Gamma Correction	1	1	XX	X	VP20 [6:0]					47		
	1	1	XX		VP36 [3:0]			VP27 [3:0]			86	
	1	1	XX	X	VP43 [6:0]					2B		
	1	1	XX	X	X	X	X	VP50 [3:0]			0B	
	1	1	XX	X	X	X	VP57 [4:0]				04	
	1	1	XX	X	X	X	X	VP59 [3:0]			00	
	1	1	XX	X	X	VP61 [5:0]				00		
	1	1	XX	X	X	VP62 [5:0]				00		
	1	1	XX	X	X	X	X	VP63 [3:0]			00	
	0	1	XX	1	1	1	0	0	0	0	1	E1h
	1	1	XX	X	X	X	X	VN0 [3:0]			08	
	1	1	XX	X	X	VN1 [5:0]				1A		
	1	1	XX	X	X	VN2 [5:0]				20		
	1	1	XX	X	X	X	X	VN4 [3:0]			07	
	1	1	XX	X	X	X	VN6 [4:0]				0E	
Negative Gamma Correction	1	1	XX	X	X	X	X	VN13 [3:0]			05	
	1	1	XX	X	VN20 [6:0]					3A		
	1	1	XX		VN36 [3:0]			VN27 [3:0]			8A	
	1	1	XX	X	VN43 [6:0]					40		
	1	1	XX	X	X	X	X	VN50 [3:0]			04	
	1	1	XX	X	X	X	VN57 [4:0]				18	
	1	1	XX	X	X	X	X	VN59 [3:0]			0F	
	1	1	XX	X	X	VN61 [5:0]				3F		
	1	1	XX	X	X	VN62 [5:0]				3F		
	1	1	XX	X	X	X	X	VN63 [3:0]			0F	
Digital Gamma Control 1	0	1	XX	1	1	1	0	0	0	1	0	E2h
1 <sup>st</sup> Parameter	1	1	XX		RCA0 [3:0]			BCA0 [3:0]			XX	
:	1	1	XX		RCAx [3:0]			BCAx [3:0]			XX	
16 <sup>th</sup> Parameter	1	1	XX		RCA15 [3:0]			BCA15 [3:0]			XX	
Digital Gamma Control 2	0	1	XX	1	1	1	0	0	0	1	1	E3h
1 <sup>st</sup> Parameter	1	1	XX		RFA0 [3:0]			BFA0 [3:0]			XX	
:	1	1	XX		RFAx [3:0]			BFAX [3:0]			XX	
64 <sup>th</sup> Parameter	1	1	XX		RFA63 [3:0]			BFA63 [3:0]			XX	
	0	1	XX	1	1	1	1	0	1	1	0	F6h
Interface Control	1	1	XX	MY_EOR	MX_EOR	MV_EOR	X	BGR_EOR	X	X	WEMODE	01
	1	1	XX	X	X	EPF [1:0]		X	X	MDT [1:0]		00
	1	1	XX	X	X	ENDIAN	X	DM [1:0]	RM	RIM	00	

Note 1: Undefined commands are treated as NOP (00h) command.

Note 2: B0 to D9 and DE to FF are for factory use of display supplier. USER can decide if these commands are available or they are treated as NOP (00h) commands before shipping to USER. Default value is NOP (00h).

Note 3: Commands 10h, 12h, 13h, 26h, 28h, 29h, 30h, 36h (Bit B4 only), 38h and 39h are updated during V-SYNC when ILI9341 is in Sleep OUT mode to avoid abnormal visual effects. During Sleep IN mode, these commands are updated immediately. Read status (09h), Read display power mode (0Ah), Read display MADCTL (0Bh), Read display pixel format (0Ch), Read display image mode (0Dh), Read display signal mode (0Eh) and Read display self diagnostic result (0Fh) of these commands are updated



RELIABILITY TEST

No.	Test Item	Test Condition	Remark
1	High Temperature Storage	80 2 /96 hours	The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample shall be free from defects: 1. Air bubble in the LCD; 2. Sealleak; 3. Non-display; 4. Missing segments; 5. Glass crack;
2	Low Temperature Storage	-30 2 /96 hours	
3	High Temperature Operating	70 2 /96 hours	
4	Low Temperature Operating	-20 2 /96 hours	
5	Temperature Cycle storage	-30 2 ~25~80 2 10cycles (30min.) (5min.) (30min.)	
6	Damp proof Test operating	60 5 90%RH/96hours	
7	Vibration Test	10Hz~150Hz,100m/s ,120min	
8	Drop test(package state)	800mm, concrete floor,1corner,	
9	ESD test	C=150pF,R=330 Air: ±8KV,30times Contact± 4KV,20times	
10	Shock test	Half-sine,wave,300m/s	





## ■ PRECAUTIONS FOR USING LCD MODULES

### 1 Handling 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 alcoholDo 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 solventsWipe 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.

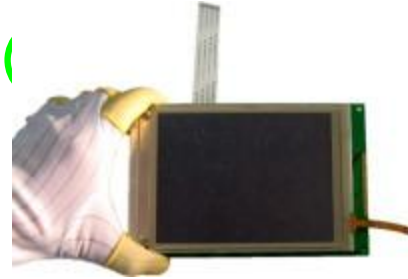
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

- 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:**

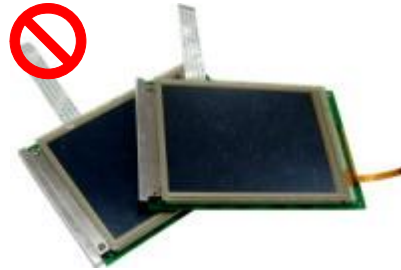


As above picture, please handle with anti-static gloves around LCM edges.

**2.3 Incorrect handling:**



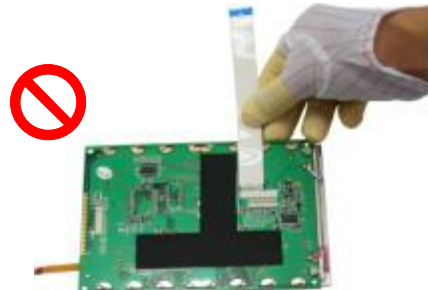
Please don't touch IC directly.



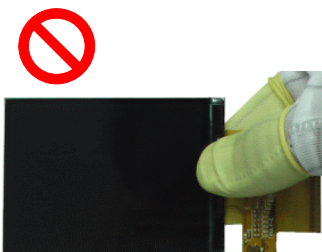
Please don't stack LCM.



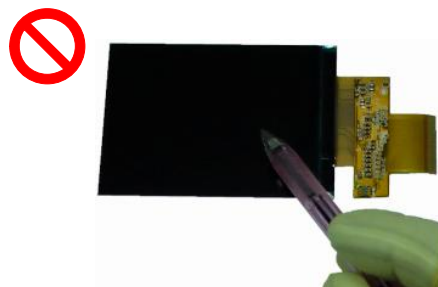
Please don't hold the surface of panel.



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 Others 其它

- 3.2.1 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.
- 3.2.2 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.
- 3.2.3 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.
  - 3.2.3.1 - Exposed area of the printed circuit board.
  - 3.2.3.2 -Terminal electrode sections.

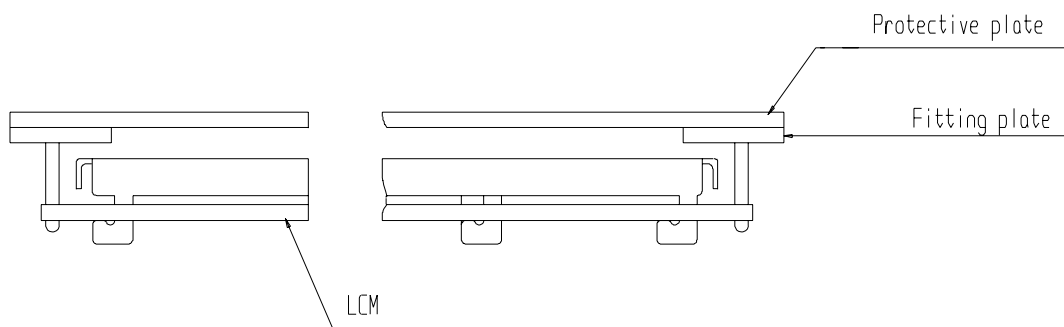
### 4 USING LCD MODULES

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.

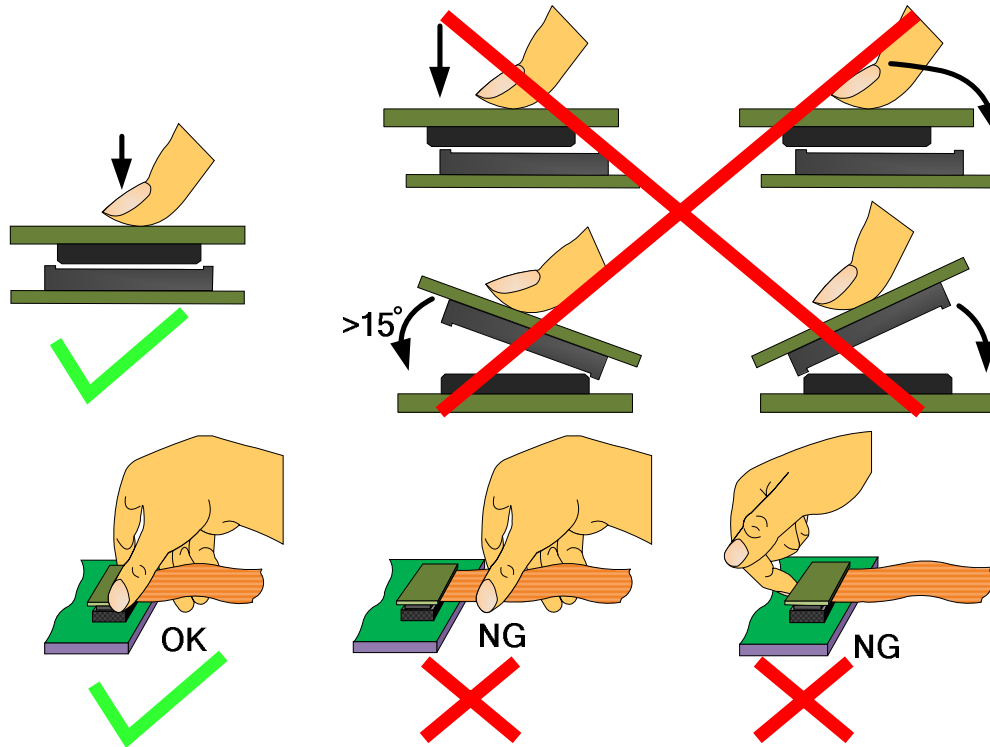
4.1.1 Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



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  $\pm 0.1$ mm.

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 : 15-17 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. Speed : 15-17 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 All Shore and the customer, All Shore will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with All Shore LCD acceptance standards (copies available upon request) for a period of one year from date of production. Cosmetic/visual defects must be returned to All Shore within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of All Shore limited to repair and/or replace on the terms set forth above. All Shore 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 All Shore 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.