深圳市诚皓光电有限公司
Shenzhen ChengHao Optoelectronic Co., Ltd.

SPECIFICATION

Product Model: CH280QV10-CT Rev.D

Designed by	R&D Checked by	Quality Department by	Approved by

Approval by Customer

OK

NG，Problem survey:

Approved By _____

Rev.D

Revision Record

REV NO.	REV DATE	CONTENTS	Note
A	2014-04-23	NEW ISSUE	
B	2014-10-18	Modify LED Circuit	Page5,11
C	2015-06-25	Modify double tape	Page5
D	2019-10-25	Change CTP driver IC	Page4,5

Table Of Contents

1. Numbering System
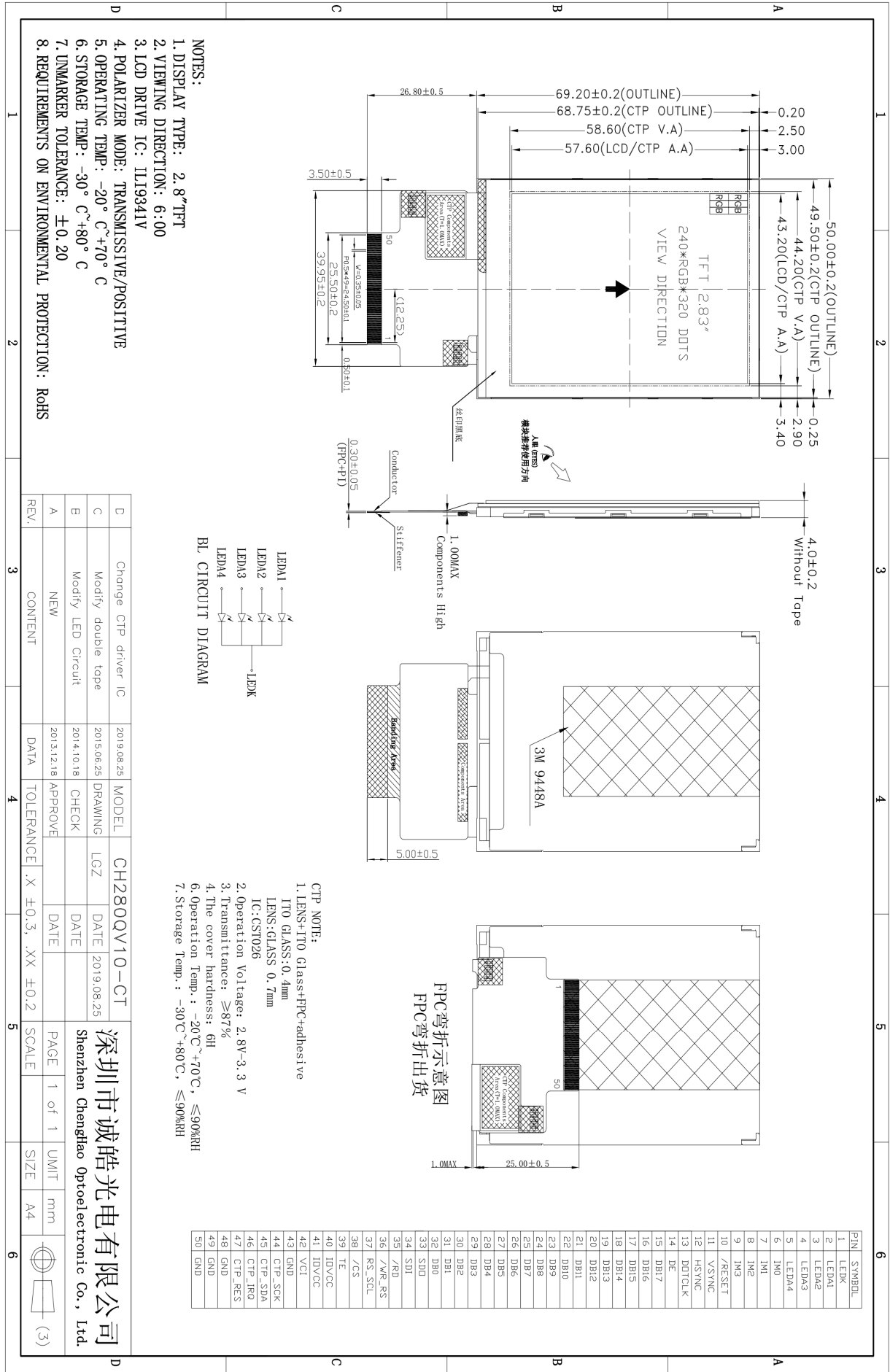
CH XXX XX XX X – XX X

7. Extended version: A~Z

6. Touch panel or other materials, e.g. T:RTP, CT:CTP, L:LENS

5. Extended version: A~Z

4. Serial number: 01~99

3. Resolution, e.g. QV:QVGA 240*320; WV:WVGA 480*800; FH:FHD 1080*1920

2. Size, e.g. 2.4″: 240; 7″:700

1. Shenzhen ChengHao Optoelectronic Co., Ltd.

2. General Information

ITEM	STANDARD VALUES	UNITS
LCD type	2.8"TFT With CTP	--
CTP type	G+G , Single point and gestures	--
Dot arrangement	240(RGB)×320	dots
Color filter array	RGB vertical stripe	--
Display mode	TN / Transmission / Normally White	--
Viewing Direction	6 o'clock	--
Gray Scale Inversion Direction	12 o'clock	--
TFT Driver IC	ILI9341V	--
CTP Driver IC	CST026	--
Module size	50.0(W)×69.2(H)×4.0(T)	mm
Active area	43.2(W)×57.6(H)	mm
Dot pitch	0.18(W)×0.18(H)	mm
Interface	4-lines_8bit / 3-lines_9bit SPI 8-/ 9-/16-/18-bit 8080-series system interface 6-/16-/18-bit RGB interface	--
Operating temperature	-20 ~ +70	℃
Storage temperature	-30 ~ +80	℃
Back Light	4 White LED In Parallel	--
Weight	TBD	g

3. External Dimensions

NOTES:
1. DISPLAY TYPE: 2.8"TFT
2. VIEWING DIRECTION: 6:00
3. LCD DRIVE IC: ILI9341V
4. POLARIZER MODE: TRANSMISSIVE/POSITIVE
5. OPERATING TEMP: -20°C~+70°C
6. STORAGE TEMP: -30°C~+80°C
7. UNMARKER TOLERANCE: ±0.20
8. REQUIREMENTS ON ENVIRONMENTAL PROTECTION: RoHS

CTP NOTE:
1. LENS+ITO Glass+FPC+adhesive
   ITO GLASS:0.4mm
   LENS:GLASS 0.7mm
   IC:CST026
2. Operation Voltage: 2.8V-3.3 V
3. Transmittance: ≥87%
4. The cover hardness: 6H
5. Operation Temp.: -20℃~+70℃, ≤90%RH
6. Operation Temp.: -20℃~+70℃, ≤90%RH
7. Storage Temp.: -30℃~+80℃, ≤90%RH

BL CIRCUIT DIAGRAM
LEDA1 LEDA2 LEDA3 LEDA4 → LEDK

Drawing dimensions:
- 26.80±0.5
- 69.20±0.2(OUTLINE)
- 68.75±0.2(CTP OUTLINE)
- 58.60(CTP V.A)
- 57.60(LCD/CTP A.A)
- 0.20 / 2.50 / 3.00
- 50.00±0.2(OUTLINE)
- 49.50±0.2(CTP OUTLINE)
- 44.20(CTP V.A)
- 43.20(LCD/CTP A.A)
- 0.25 / 2.90 / 3.40
- 3.50±0.5
- 39.95±0.2 / 25.50±0.2 / <12.25>
- W=0.35±0.05 / P0.5*49=24.50±0.1
- 0.50±0.1
- 0.30±0.05 (FPC+PI)
- TFT 2.83" 240*RGB*320 DOTS VIEW DIRECTION
- 1.00MAX Components High
- 4.0±0.2 Without Tape
- Stiffener / Conductor
- Bonding Area / 3M 9448A
- 5.00±0.5
- FPC弯折示意图 FPC弯折出货
- 1.0MAX / 25.00±0.5

REV.	CONTENT	DATA
A	NEW	2013.12.18
B	Modify LED Circuit	2014.10.18
C	Modify double tape	2015.06.25
D	Change CTP driver IC	2019.08.25

MODEL	CH280QV10-CT	
DRAWING LGZ	DATE	2019.08.25
CHECK	DATE	
APPROVE	DATE	
TOLERANCE .X ±0.3, .XX ±0.2	PAGE 1 of 1	SCALE
UNIT mm	SIZE A4	(3)

深圳市诚皓光电有限公司
Shenzhen ChengHao Optoelectronic Co., Ltd.

PIN	SYMBOL	PIN	SYMBOL
1	LEDK	26	DB6
2	LEDA1	27	DB5
3	LEDA2	28	DB4
4	LEDA3	29	DB3
5	LEDA4	30	DB2
6	IM0	31	DB1
7	IM1	32	DB0
8	IM2	33	SDO
9	IM3	34	/RD
10	/RESET	35	IDVCC
11	VSYNC	36	/WR_RS
12	HSYNC	37	RS_SCL
13	DOTCLK	38	/CS
14	DE	39	TE
15	DB17	40	IDVCC
16	DB16	41	IDVCC
17	DB15	42	VCI
18	DB14	43	GND
19	DB13	44	CTP_SCK
20	DB12	45	CTP_SDA
21	DB11	46	CTP_IRQ
22	DB10	47	CTP_RES
23	DB9	48	GND
24	DB8	49	GND
25	DB7	50	GND

4. Interface Description

Pin	Symbol	Description.
1	LEDK	LED backlight (Cathode).
2	LED-A1	LED backlight (Anode).
3	LED-A2	LED backlight (Anode).
4	LED-A3	LED backlight (Anode).
5	LED-A4	LED backlight (Anode).

Pin	Symbol	System interface Mode					
		IM3	IM2	IM1	IM0	Interface mode	DB Pin
6	IM0	0	0	0	0	i80-system 8-bit interface Ⅰ	DB[7:0]
		0	0	0	1	i80-system 16-bit interface Ⅰ	DB[15:0]
7	IM1	0	0	1	0	i80-system 9-bit interface Ⅰ	DB[8:0]
		0	0	1	1	i80-system 18-bit interface Ⅰ	DB[17:0]
		0	1	0	1	3-wires_9-bit SPI Ⅰ	/CS,SDI,SCL
		0	1	1	0	4-wires_8-bit SPI Ⅰ	/CS,RS,SDI,SCL
8	IM2	1	0	0	0	i80-system 16-bit interface Ⅱ	DB[17:10],DB[8:1]
		1	0	0	1	i80-system 8-bit interface Ⅱ	DB[17:10]
		1	0	1	0	i80-system 18-bit interface Ⅱ	DB[17:0]
9	IM3	1	0	1	1	i80-system 9-bit interface Ⅱ	DB[17:9]
		1	1	0	1	3-wires_9-bit SPI Ⅱ	/CS,SDI,SDO,SCL
		1	1	1	0	4-wires_8-bit SPI Ⅱ	/CS,RS,SDI,SDO,SCL

Pin	Symbol	Description.
10	/RESET	Reset input pin, Active "L".
11	VSYNC	Vertical sync signal in RGB I/F.
12	HSYNC	Horizontal sync signal in RGB I/F.
13	DOTCLK	Pixel clock signal in RGB I/F.
14	DE	Data enable signal in RGB I/F mode
15	DB17	
16	DB16	

17	DB15	18-bit parallel bi-directional data bus for MPU-Ⅰ system:
		  8-bit I/F: DB[7:0] is used.
		  9-bit I/F: DB[8:0] is used.
		  16-bit I/F: DB[15:0] is used.
		  18-bit I/F: DB[17:0] is used.

18	DB14	
19	DB13	
20	DB12	
21	DB11	

22	DB10	18-bit parallel bi-directional data bus for MPU-Ⅱ system:
		  8-bit I/F: DB[17:10] is used.
		  9-bit I/F: DB[17:9] is used.
		  16-bit I/F: DB[17:10] and DB[8:1] is used.
		  18-bit I/F: DB[17:0] is used.

23	DB9	
24	DB8	
25	DB7	
26	DB6	

27	DB5	18-bit input data bus for RGB I/F.
		  6-bit/pixel: DB[5:0] is used;
		  16-bit/pixel: DB[17:13]=R[4:0], DB[11:6]=G[5:0] and DB[5:1]=B[4:0];
		  18-bit/pixel: DB[17:12]=R[5:0], DB[11:6]=G[5:0] and DB[5:0]=B[5:0];

28	DB4	
29	DB3	
30	DB2	Connect unused pins to GND.
31	DB1	
32	DB0	
33	SDO	Serial output signal in SPI I/F.
34	SDI	Serial input signal in SPI I/F.

35	/RD	Reads strobe signal to write data when /RD is "Low" in MPU interface.
36	/WR_RS	MCU: Serves as a write signal and writes data at the rising edge. 4-line SPI: Serves as command or parameter select.
37	RS_SCL	Display data / command selection in 80-series MPU I/F. RS = "0" : Command RS = "1" : Display data. SPI: This pin is used serial interface clock in SPI.
38	/CS	Chip select input pin ("Low" enable) in MPU I/F and SPI I/F.
39	TE	Tearing effect output pin to synchronize MPU to frame writing.
40	IOVCC	I/O power supply.
41	IOVCC	I/O power supply.
42	VCI	System power supply.
43	GND	Power ground
44	CTP_SCL	I2C clock line
45	CTP_SDA	I2C data line
46	CTP_IRQ	Interrupt
47	CTP_RES	CTP reset line
48	GND	Power ground
49	GND	Power ground
50	GND	Power ground

5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	4.6	V
Analog Supply Voltage	VCI	-0.3	4.6	V
Input Voltage	Vin	-0.3	IOVCC+0.3	V
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Logic Supply Voltage	IOVCC	1.65	1.8/2.8	3.3	V	-
Analog Supply Voltage	VCI	2.5	2.8	3.3	V	-
Input High Voltage	V_{IH}	0.7IOVCC	-	IOVCC	V	Digital input pins
Input Low Voltage	V_{IL}	GND	-	0.3IOVCC	V	Digital input pins
Output High Voltage	V_{OH}	0.8IOVCC	-	IOVCC	V	Digital output pins
Output Low Voltage	V_{OL}	GND	-	0.2IOVCC	V	Digital output pins
I/O Leak Current	I_{LI}	-0.1	-	0.1	uA	-

7. Timing Characteristics
7.1 Reset Timing Characteristics
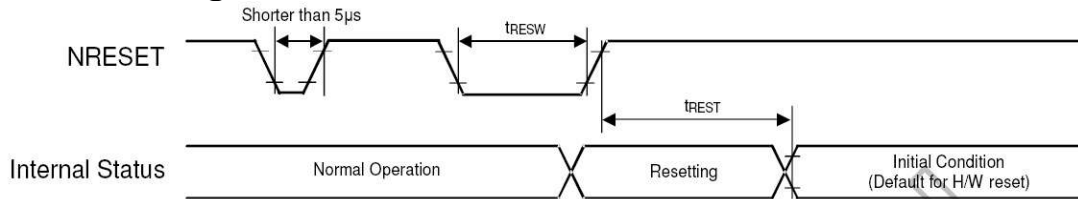
Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width[1]	NRESET	10	-	-	-	μs
tREST	Reset complete time[2]	-	5	-	-	When reset applied during SLPIN mode	ms
		-	120	-	-	When reset applied during SLPOUT mode	ms

7.2 i80-System Interface Timing Characteristics
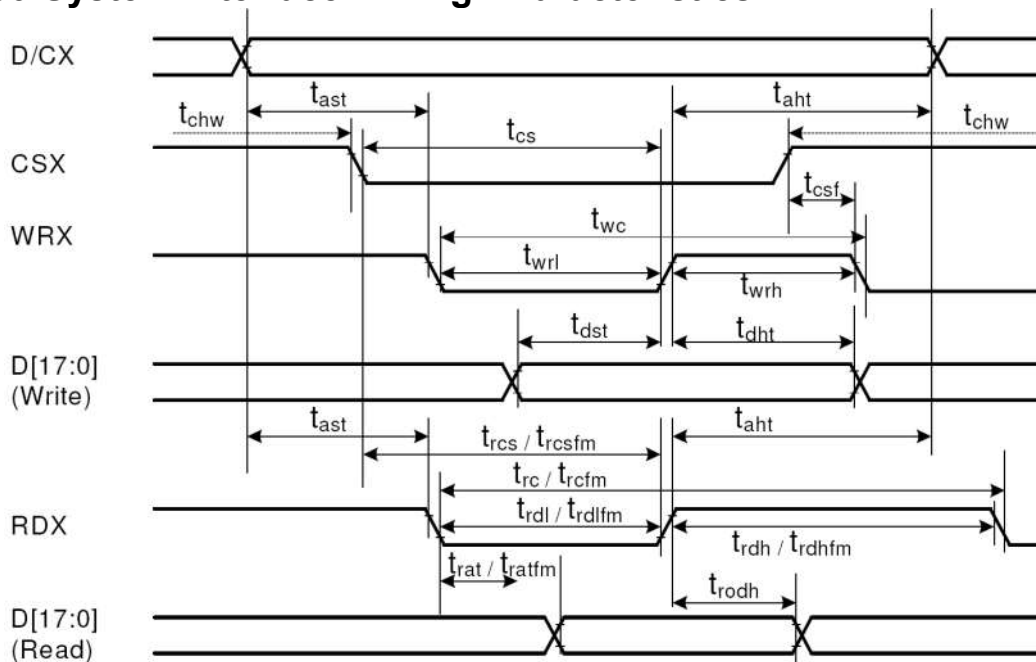
Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	0	-	ns	
CSX	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	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[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	

7.3 3-line SPI Timing Characteristics
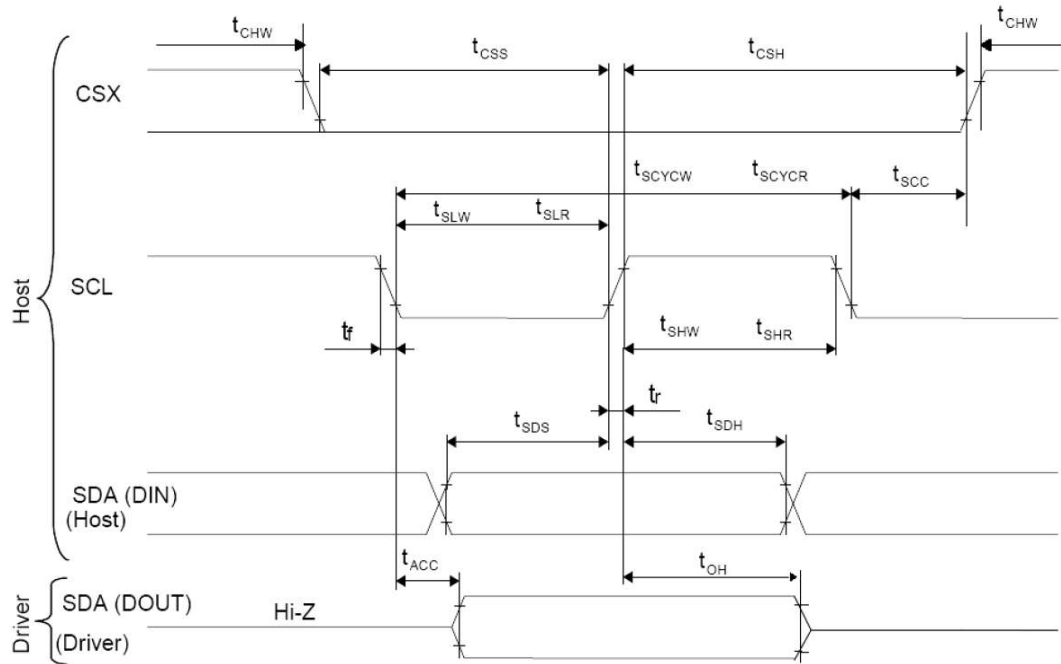
Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	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	tscc	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcsh		65	-	ns	

7.4 4-line SPI Timing Characteristics
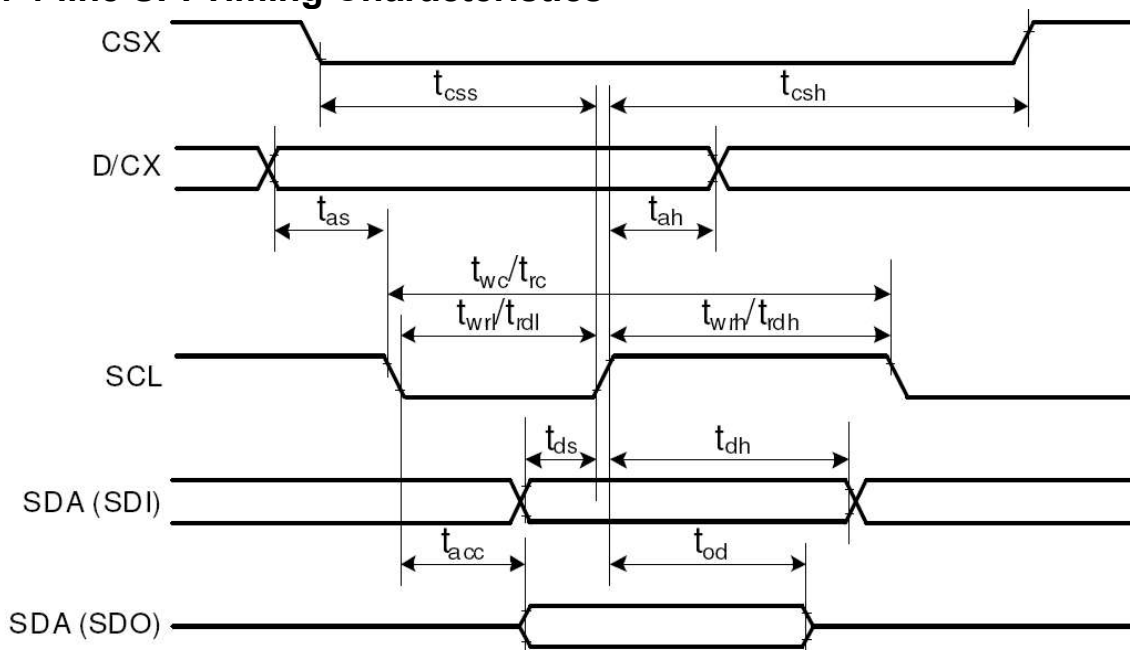
Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tcss	Chip select time (Write)	40	-	ns	
	tcsh	Chip select hold time (Read)	40	-	ns	
SCL	twc	Serial clock cycle (Write)	100	-	ns	
	twrh	SCL "H" pulse width (Write)	40	-	ns	
	twrl	SCL "L" pulse width (Write)	40	-	ns	
	trc	Serial clock cycle (Read)	150	-	ns	
	trdh	SCL "H" pulse width (Read)	60	-	ns	
	trdl	SCL "L" pulse width (Read)	60	-	ns	
D/CX	tas	D/CX setup time	10	-		
	tah	D/CX hold time (Write / Read)	10	-		
SDA / SDI (Input)	tds	Data setup time (Write)	30	-	ns	
	tdh	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	-	ns	For maximum CL=30pF
	tod	Output disable time (Read)	10	50	ns	For minimum CL=8pF

7.5 Parallel 18/16/6-bit RGB Interface Timing Characteristics
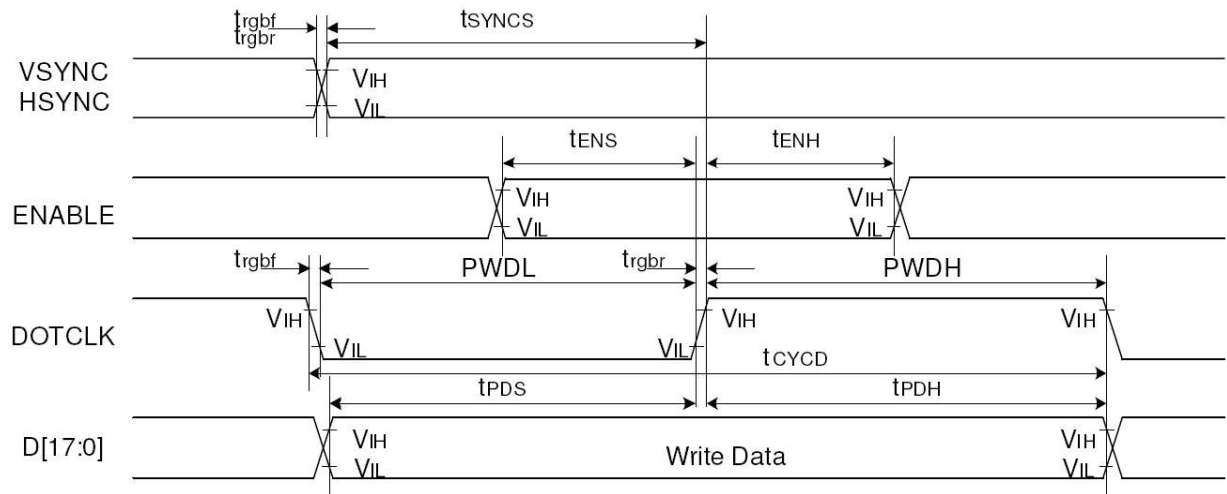
Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{POS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	15	-	ns	
	PWDL	DOTCLK low-level period	15	-	ns	
	t_{CYCD}	DOTCLK cycle time	100	-	ns	
	t_{rgbr}, t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	6-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{POS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level pulse period	15	-	ns	
	PWDL	DOTCLK low-level pulse period	15	-	ns	
	t_{CYCD}	DOTCLK cycle time	100	-	ns	
	t_{rgbr}, t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

8. Backlight Charasterics
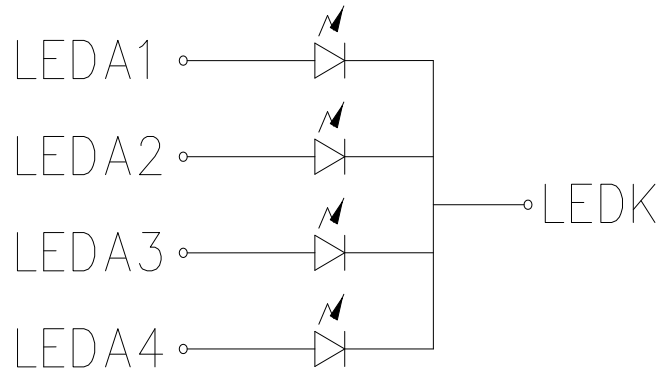
Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	2.9	3.2	3.5	V	If=80mA
Supply Current	If	-	80	-	mA	-
Luminous Intensity for LCM	-	250	300	-	Cd/m^2	If=80mA
Uniformity for LCM	-	80	-	-	％	If=80mA
Life Time	-	20000	-	-	Hr	If=80mA
Backlight Color	White					

9. Optical Characteristics

(Taransmittance、contrast、RT、viewing angle results are using CPT LC+ CPT EWV Polarizer +Corresponding Backlight, reference only)

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
Transmittance		T			(5.8)		%	
Contrast Ratio		CR	θ =ψ= 0°		(300)		--	Note 3
Response Time		Tr+ Tf	θ =ψ= 0°		(25)		ms	Note 4
Viewing Angle	Upper	θ	CR≧10		(60)		°	Note 5
	Down				(55)		°	
	Right	ψ			(50)		°	
	Left				(50)		°	
Color Filter Chromacicity	White	x	θ=φ= 0°	(0.288)	(0.308)	(0.328)	--	Note 6
		y		(0.319)	(0.339)	(0.359)	--	
		Y		(27.1)	(30.1)	(33.1)	--	
	Red	x	θ=φ= 0°	(0.632)	(0.652)	(0.672)	--	
		y		(0.311)	(0.331)	(0.351)	--	
		Y		(14.8)	(17.8)	(20.8)	--	
	Green	x	θ=φ= 0°	(0.294)	(0.314)	(0.334)	--	
		y		(0.555)	(0.575)	(0.595)	--	
		Y		(53.7)	(57.7)	(61.7)	--	
	Blue	x	θ=φ= 0°	(0.118)	(0.138)	(0.158)	--	
		y		(0.112)	(0.132)	(0.152)	--	
		Y		(11.8)	(14.8)	(17.8)	--	
	NTSC			--	(61)	--	%	

Note 1.Ambient condition：25℃±2℃，60±10%RH，under 10 Lunx in the darkroom。
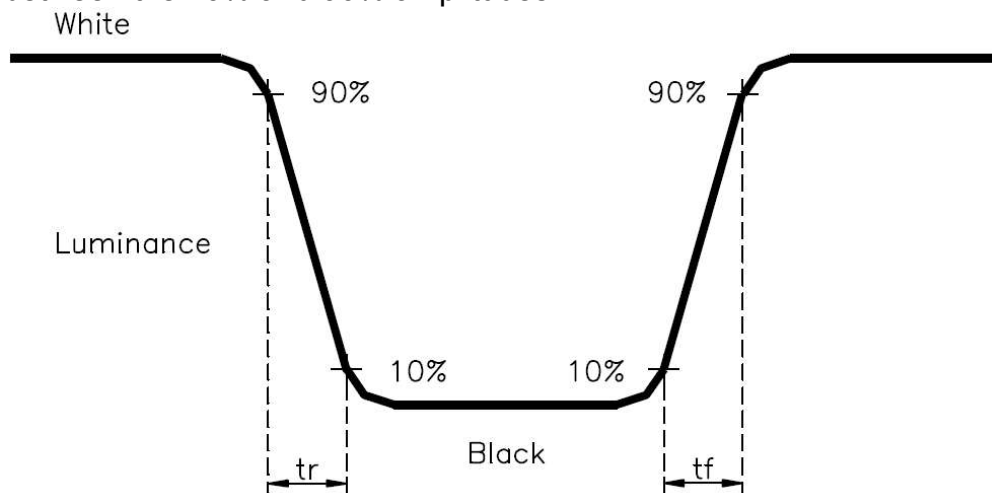Note 2.Measure device：BM-5A (TOPCON)，viewing cone=１°，IL=20mA。

L=500mm
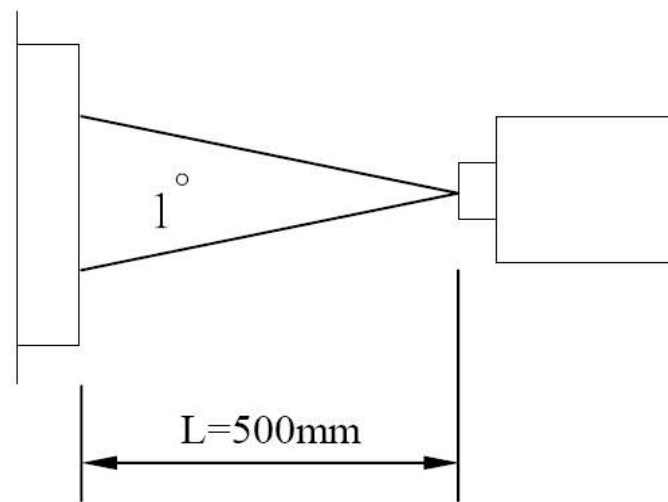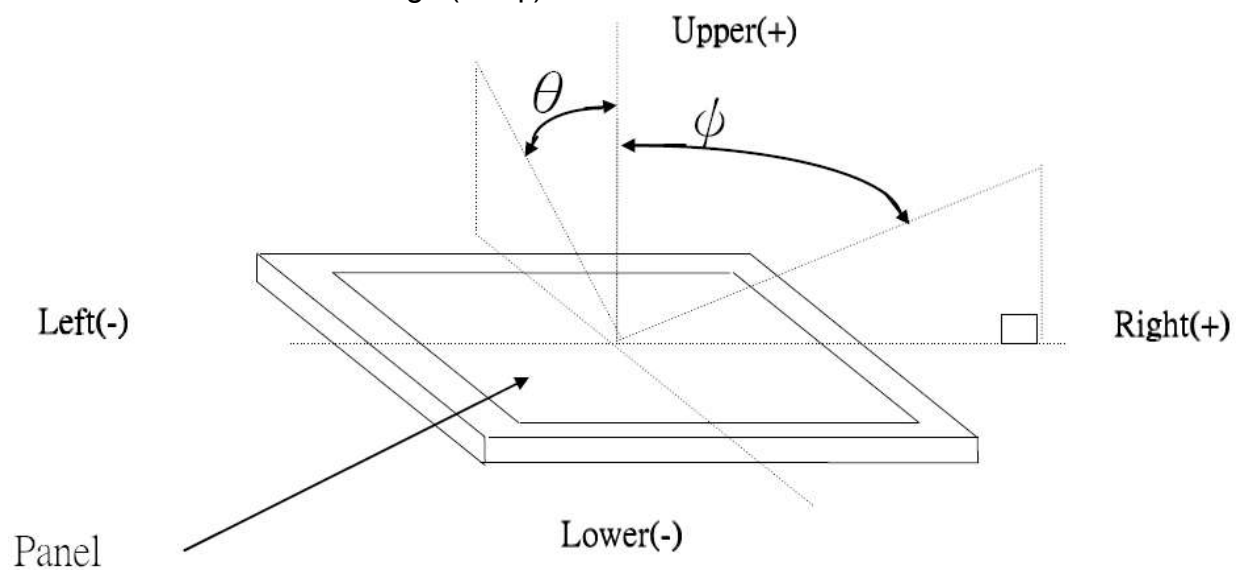
Note 3. Definition of Contrast Ratio：
    CR = White Luminance (ON) / Black Luminance (OFF)

Note 4. Definition of response time： The response time is defined as the time interval between the 10% and 90% amplitudes.

Note 5. Definition of view angle(θ，ψ)：

Note 6. Light source: C light.

10. Reliability Test Conditions And Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
①	High Temperature Storage	80℃±2℃×200Hours	Inspection after 2~4hours storage at room temperature,the samples should be free from defects: 1,Air bublle in the LCD. 2,Sealleak. 3,Non-display. 4,Missing segments. 5,Glass crack. 6,Current IDD is twice higher than initial value. 7,The surface shall be free from damage. 8,The electric charateristic requirements shall be satisfied.
②	Low Temperature Storage	-30℃±2℃×200Hours	
③	High Temperature Operating	70℃±2℃×120Hours	
④	Low Temperature Operating	-20℃±2℃×120Hours	
⑤	Temperature Cycle(Storage)	-20℃ ⟷ 25℃ ⟷ 70℃ (30min)　(5min)　(30min) 1cycle Total 10cycle	
⑥	Damp Proof Test (Storage)	50℃±5℃×90%RH×120Hours	
⑦	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5mm X,Y,Z direction for total 3hours (Packing Condition)	
⑧	Drooping Test	Drop to the ground from 1M height one time every side of carton. (Packing Condition)	
⑨	ESD Test	Voltage:±8KV,R:330Ω,C:150PF,Air Mode,10times	

REMARK:
1,The Test samples should be applied to only one test item.
2,Sample side for each test item is 5~10pcs.
3,For Damp Proof Test,Pure water(Resistance＞10MΩ)should be used.
4,In case of malfunction defect caused by ESD damage,if it would be recovered to normal state after resetting,it would be judge as a good part.
5,EL evaluation should be excepted from reliability test with humidity and temperature:Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6,Failure Judgment Criterion:Basic Specification Electrical Characteristic,Mechanical Characteristic,Optical Characteristic.

11. Inspection Standard
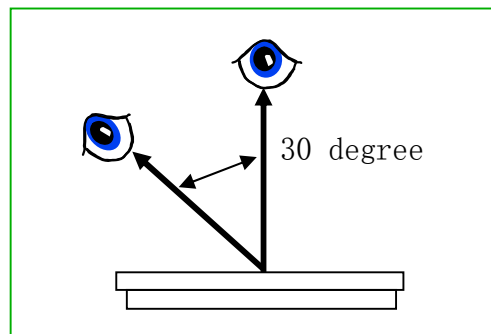
This standard apply to C-STN/TFT module

1. **Spot check plan：**

    According to spot check level Ⅱ,MIL-STD-105E Level Ⅱ,the rank of accept or reject is below:

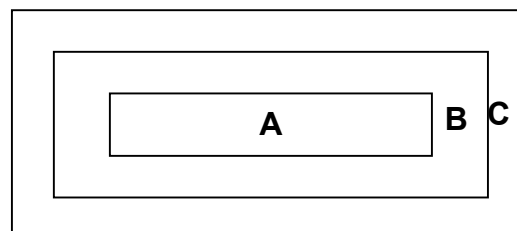   3A 级、2A 级：major non-conformance：AQL 0.25 minor non-conformance：AQL 0.4

    A 级：major non-conformance： AQL 0.65   minor non-conformance： AQL 1.

2. **Inspection condition：**

30 degree

    Under daylight lamp 20～40W，product distance inspector'eye 30cm,incline degree 30°。

3. **LCD area define：**

A   B C

    Area A：display area

    Area B：VA area
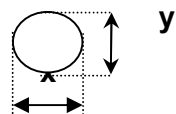
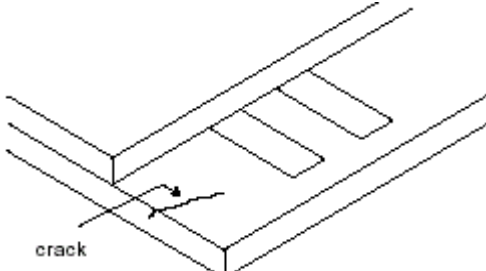   Area C：out of VA area,not in sight after assemby
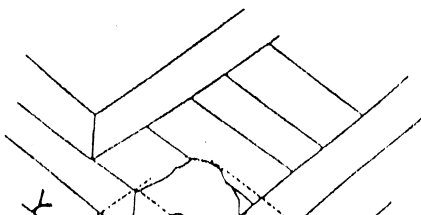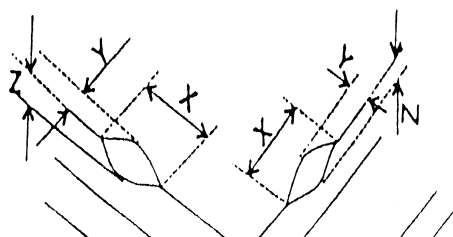
   Remark :non-conformance at area C,but is OK that isn't influence raliability of product & assembly by customer.

4. Inspection standard

4.1 Major non-conformance

NO.	Item	Inspection standard	Rate
4.1.1	**Function non-conformance**	1) No display,display abnormaly 2) Miss line, short 3) B/L no function or function abnormaly 4) TP no function	**major**
4.1.2	**miss**	No matter miss what component	
4.1.3	**Out of size**	Module dimension out of spec	

4.2 Appearance non-conformance

NO.	Item	Inspection standard	Rate
4.2.1	**Black or white spot（power on）**	dot non-conformance define Φ $\Phi = \dfrac{(x+y)}{2}$ **A grade** (see table below)	**Minor**

4.2.1 — A grade

area / size（mm）	Most approve q'ty A	B	C
Φ≤0.10	ignore		ignore
0.10＜Φ≤0.15	3		
0.15＜Φ≤0.20	2		
0.20＜Φ≤0.25	1		
0.25＜Φ	0		

Most approve 4 damages, dot to dot ≥10mm

NO.	Item	Inspection standard	Rate
4.2.2	**Black or white line（power on）**	A grade (see table below)	**Minor**

4.2.2 — A grade

Size(mm) L(length）	W(width)	Most approve q'ty A	B	C
ignore	W≤0.03	ignore		ignore
L≤5.0	0.03＜W≤0.05	2		
L≤3.0	0.05＜W≤0.07	1		
	0.07＜W	Treat with dot non-conformance		

Most approve 3 damages, line to line ≥10mm

NO.	Item	Inspection standard	Rate
4.2.3	**Polarizer position**	1) polarizer attach meet drawing,disallow out of LCD. 2) polarizer must cover display area（special require unless）	**Minor**

4.2.4	LCD non-conformance	**(i) crash at side**（remark: S=ITO length） **Crash disallow extend to ITO or seal.** **(ii) commonly surface scathe** **(iii) crack** **Disallow extend crack**	Minor

For (i):

X	Y	Z
≤3.0	≤S	ignore

For (ii):

X	Y	Z
≤2.0	<frame edge	ignore

4.2.5	Contrast voltage warp	**VOP/Vlcd voltage of confirmed sample±0.15V**	Minor
4.2.6	color	**Color & luminance of module scope reference spec**	Minor
4.2.7	Cross talk	**Reference confirmed limit sample**	Minor

12. Handling Precautions

12.1 Mounting method

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

Extreme care should be needed when handling the LCD modules.

12.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent
[recommended below] and wipe lightly
- Isopropyl alcohol
- Ethyl alcohol

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

Do not use the following solvent:
- Water
- Aromatics

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

Do not use the following solvent on the pad or prevent it from being contaminated:
- Soldering flux
- Chlorine (Cl) , Salfur (S)

If goods were sent without being sili8con coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

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

12.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

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

12.4 packing

- Module employ LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

12.5 Caution for operation

- 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.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

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

12.6 storage

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

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
  [It is recommended to store them as they have been contained in the inner container at the time of delivery from us

12.7 Safety

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

13. Precaution For Use

13.1

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

13.2

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

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

14. Packing Method