KOE
JDI Group

Kaohsiung Opto-Electronics Inc.

FOR MESSRS:_____

DATE: May 1st ,2012

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

SP14Q003-AZA

Contents

ACCEPTED BY:_____

PROPOSED BY:_____

KAOHSIUNG OPTO-ELECTRONICS INC.	SHEET NO.	7B64PS 2701-SP14Q003-AZA-2	PAGE	1-1/1

RECORD OF REVISION

DATE	SHEET No.	SUMMARY		
May.01,'12	All pages	Company name changed: KAOHSIUNG HITACHI ELECTRONICS CO.,LTD. ↓ KAOHSIUNG OPTO-ELECTRONICS INC.		
	7B64PS-2714-SP14Q003-AZA-2 Page 14-4/4	14.7 SAFETY AND ATTENTIONS Added : Item 1)		

3. GENERAL SPECIFICATIONS

(1)	Part Name	SP14Q003-AZA
(2)	Outer Dimensions	167.0(W)mm×109.0(H)mm×11.4(D) mm max.
(3)	Effective Area	120(W)mm min. × 89(H)mm min.
(4)	Dot Size	0.345(W)min. × 0.345(H)min.
(5)	Dot Pitch	0.360(W)mm × 0.360(H)mm
(6)	Dot Number (Resolution)	320 (W) × 240 (H) dots
(7)	Duty Ratio	1/240
(8)	LCD Type	Transmissive , Blue type (Negative type)
(9)	Viewing Direction	6 O'clock
(10)	Backlight Type	LED(Color : white)
		Life time : 40Kh @ 25℃
		Note : Life time for half of initial brightness
(11)	Touch Panel	Analog resistive
		Transparency : 76% min.
		Surface type : anti glare

4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS   VSS=0V : STANDARD

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARKS
Power Supply for Logic	VDD-VSS	0	6.0	V	
Power Supply for LC Driving	VDD-VEE	0	27.5	V	
Input Signal Voltage	Vi	-0.3	VDD+0.3	V	Note1
Input Signal Current	Ii	0	1	A	
Static Electricity	VESD0	-	±100	V	Note2,3,4
	VESD1	-	±10	kV	Note2,3,5

Note 1: $\overline{DOFF}$, FLM , CL1 , CL2 , D0~D3.

Note 2: Make certain you are grounded when handling LCM.

Note 3: Energy storage capacitance 200pF , discharge resistance 250Ω Ta=25℃ , 60%RH.

Note 4: Contact discharge to I/F connector pins.

Note 5: Contact discharge to front metal bezel.

4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		REMARKS
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-20℃	70℃	-30℃	80℃	Note2,3,6,7
Humidity	Note1		Note1		Without Condensation
Vibration	-	2.45m/s^2 0.25G	-	11.76m/s^2 1.2G Note5	Note4 1h max.
Shock	-	29.4m/s^2 3 G	-	490.0m/s^2 50 G Note5	X、Y、Z Directions
Corrosive Gas	Not Acceptable		Not Acceptable		

Note 1: Ta≦40℃ : 85%RH max.

　　　　Ta＞40℃ : Absolute humidity must be lower than the humidity of 85%RH at 40℃

Note 2: Ta at -30℃＜48h , at 80℃＜168h.

Note 3: Background color changes slightly depending on ambient temperature.
　　　　This phenomenon is reversible.

Note 4: 5Hz~100Hz (Except resonance frequency)

Note 5: This module should be operated normally after finish the test.

Note 6: The response time will be slower under low temperature.

Note 7: Operation temp not include touch panel.

5. ELECTRICAL CHARACTERISTICS

5.1 ELECTRICAL CHARACTERISTICS

I T E M	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARKS
Power Supply Voltage for Logic	VDD-VSS	-	4.75	5.0	5.25	V	
			3.2	3.3	3.4		
Power Supply Voltage for LC Driving	VEE-VSS	-	-23.1	-22.0	-20.9	V	
Input Signal Voltage1	Vi	H LEVEL	0.8VDD	-	VDD	V	Note1
		L LEVEL	0	-	0.2VDD	V	
Power Supply Current for Logic	IDD	VDD-VSS=5.0V VEE-VSS= -22.0V	-	6.0	-	mA	Note2
Power Supply Current for LC Driving	IEE	VDD-VSS=5.0V VEE-VSS= -22.0V	-	5.0	-	mA	Note2
Recommended LC Driving Voltage	VDD-V0	Ta= 0℃ , ϕ = 0°	23.0	24.0	25.0	V	Note3
		Ta=25℃ , ϕ = 0°	22.0	23.0	24.0	V	
		Ta=50℃, ϕ = 0°	21.0	22.0	23.0	V	
Frame Frequency	fFLM	-	70	75	80	Hz	Note4

Note 1: $\overline{DOFF}$, FLM , CL1 , CL2 , D0~D3.
Note 2: FLM=75Hz , test pattern is all "Q".
        VDD-V0=23.0V , Ta=25℃
Note 3: Recommended LC driving voltage may fluctuate about ±1.0V by each module.
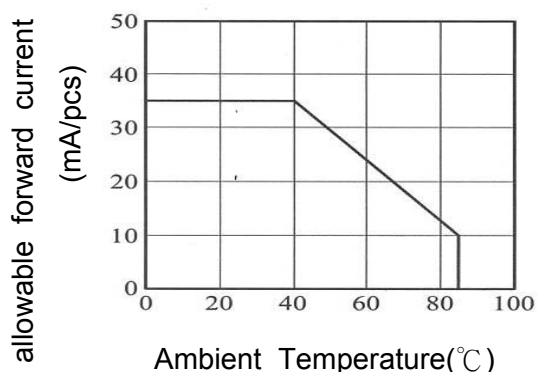   Test pattern is all "Q"
Note 4: Please set the frame frequency so as to avoid flicker and rippling on the display.

5.2 ELECTRICAL CHARACTERISTICS OF LED BACKLIGHT

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARKS
Power Supply Voltage for LED	VLED	-	-	5.0	5.2	V	
Power Supply Current for LED	ILED	VLED=5.0V	-	160	170	mA	Note1

Note 1: The ILED changes depending on ambient temperature.

6. OPTICAL CHARACTERISTICS

6.1 OPTICAL CHARACTERISTICS OF LCD   Ta=25℃(Backlight on)

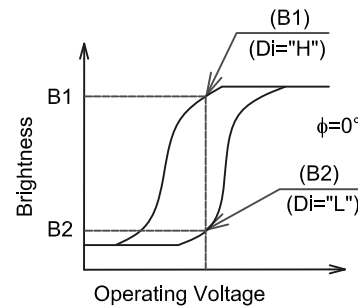| ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARKS
Viewing Area	$\phi2-\phi1$	K≧2.0	-	40	-	deg	Note1,2
	K	$\phi=0°,\ \theta=0°$	-	6	-	-	Note3
Response Time (Rise)	tr	$\phi=0°,\ \theta=0°$	-	250	-	ms	Note4
Response Time (Fall)	tf	$\phi=0°,\ \theta=0°$	-	190	-	ms	Note4

(Measure condition by KOE)

Note 1 : Definition of θ and ϕ
(Normal)
Viewing direction
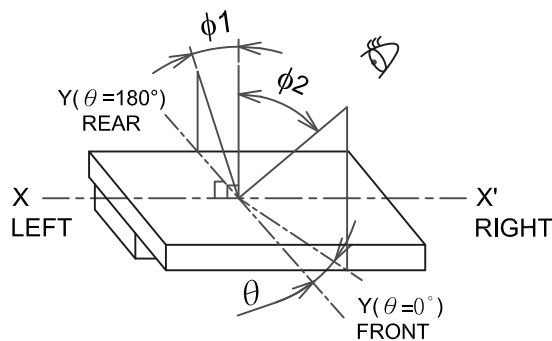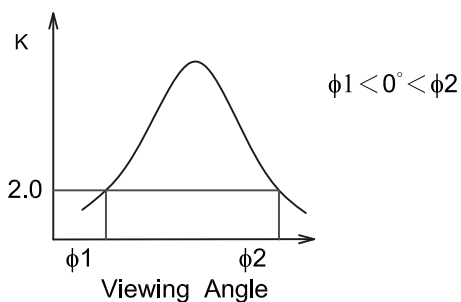

Note 3 : Definition of contrast"K"

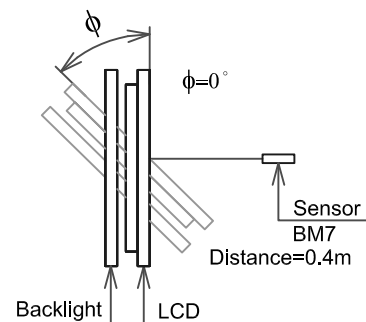$$K=\frac{\text{Brightness on selected dot (B1)}}{\text{Brightness on non-selected dot (B2)}}$$
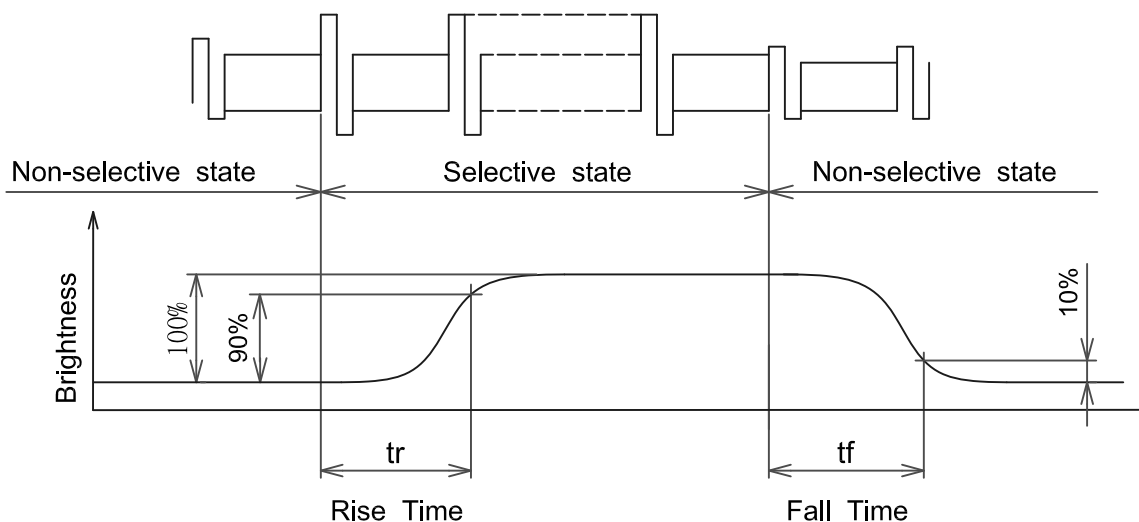

Operating Voltage

Note 2 : Definition of viewing angle $\phi1$ and $\phi2$

$\phi1<0°<\phi2$

Contrast ratio K vs viewing angle ϕ

Note 4 : Definition of optical response

| Non-selective state | Selective state | Non-selective state |

Brightness
100%
90%
10%

tr
Rise Time

tf
Fall Time

6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT

I T E M	MIN.	TYP.	MAX.	UNIT	REMAKS
Brightness	120	160	-	cd/m^2	ILED=160mA
Brightness Uniformity	-	-	±30	%	Note1

Ta=25℃, Display data should be all "ON".
The LCD driving voltage should be adjusted at the voltage where
the peak contrast is obtained.

Note 1: Measure of the following 9 places on the display.
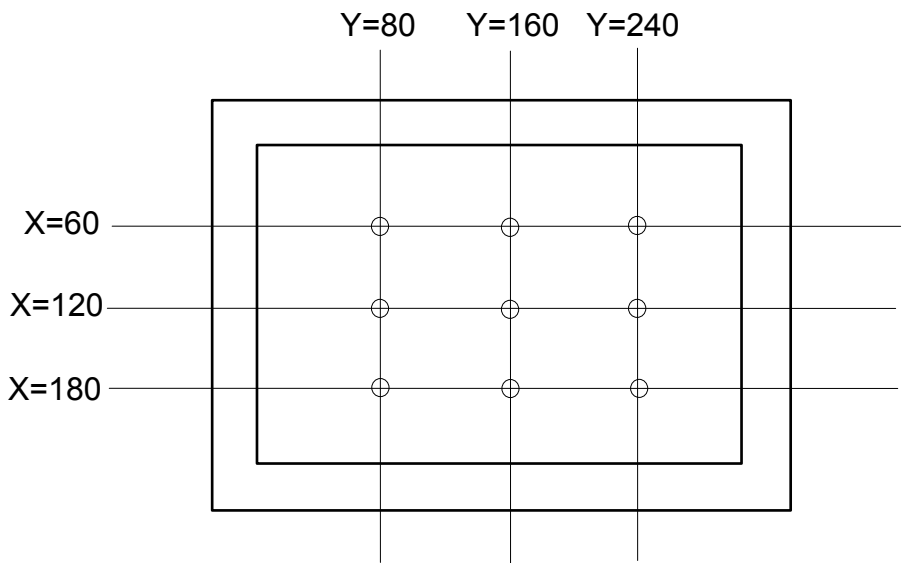
Definition of the brightness tolerance.

$$\left(\frac{\text{Max. or Min. Brightness - Average Brightness}}{\text{Average Brightness}} \right) \times 100\%$$

7. BLOCK DIAGRAM

Touch Panel

IC4
Y320
Y241

IC2
Y160
Y81

IC1
Y80
Y1

320×240 Dots

X1 D3 D2 D1 D0

IC5 X1 X80
IC6 X81 X160
IC7 X161 X240

* : TIMING CIRCUIT

XR
YU
XL
YB

D0~D3
CL2
FLM
CL1
*
DOFF

Power Supply
VDD
VSS
V0
VEE

LED
LED(+)
LED(-)
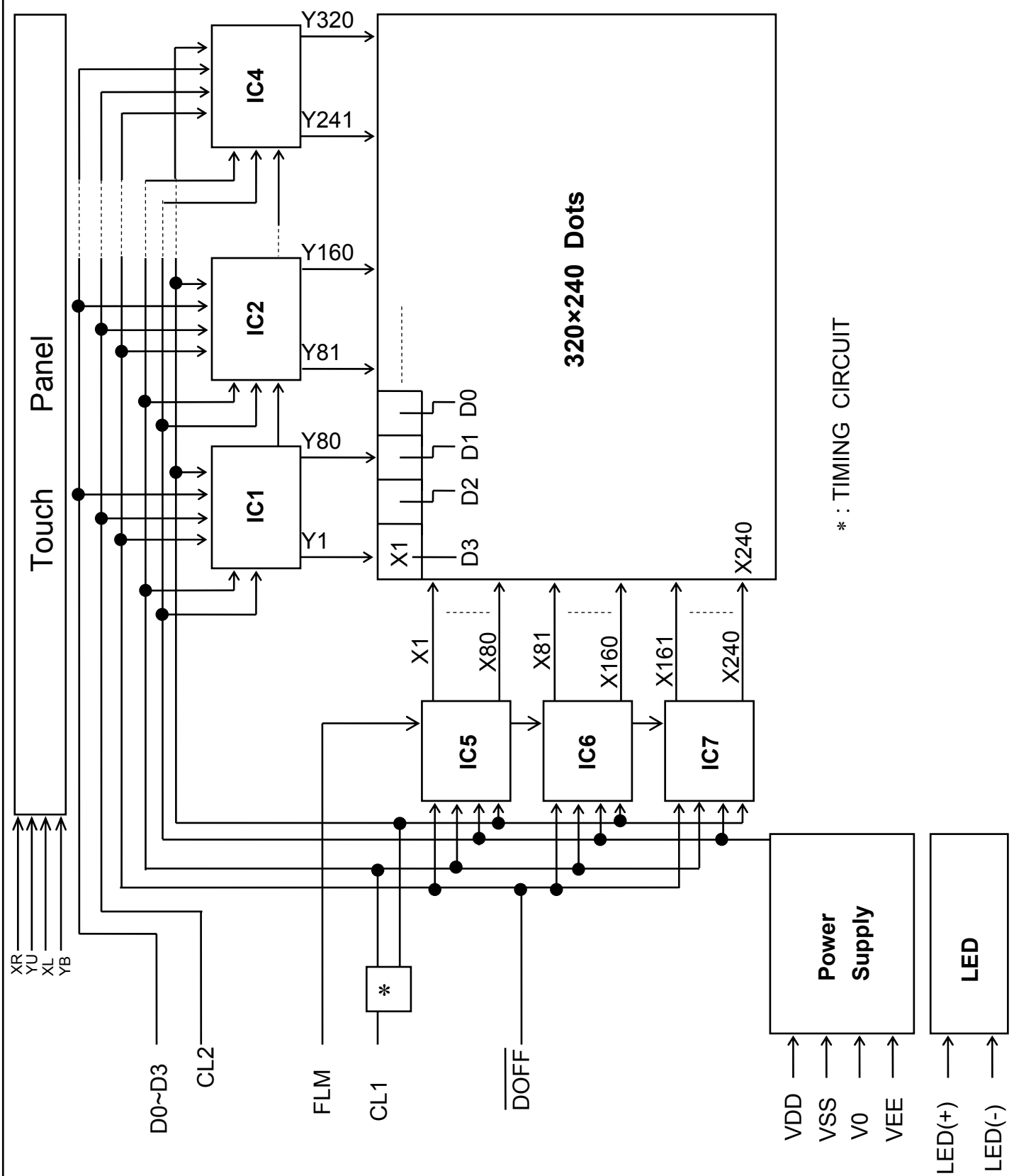
8. INTERFACE TIMING CHART
8.1 INTERFACE TIMING CHART

$52.1\mu s \leqq T \leqq 59.5\mu s$

CL1

CL2

X240 X1 X2

D3 Y1 Y5 Y317

D2 Y2 Y6 Y318

D1 Y3 Y7 Y319

D0 Y4 Y8 Y320

FLM

CL1

$240 \times T$

FLM

D0~D3 X1 X2 X239 X240
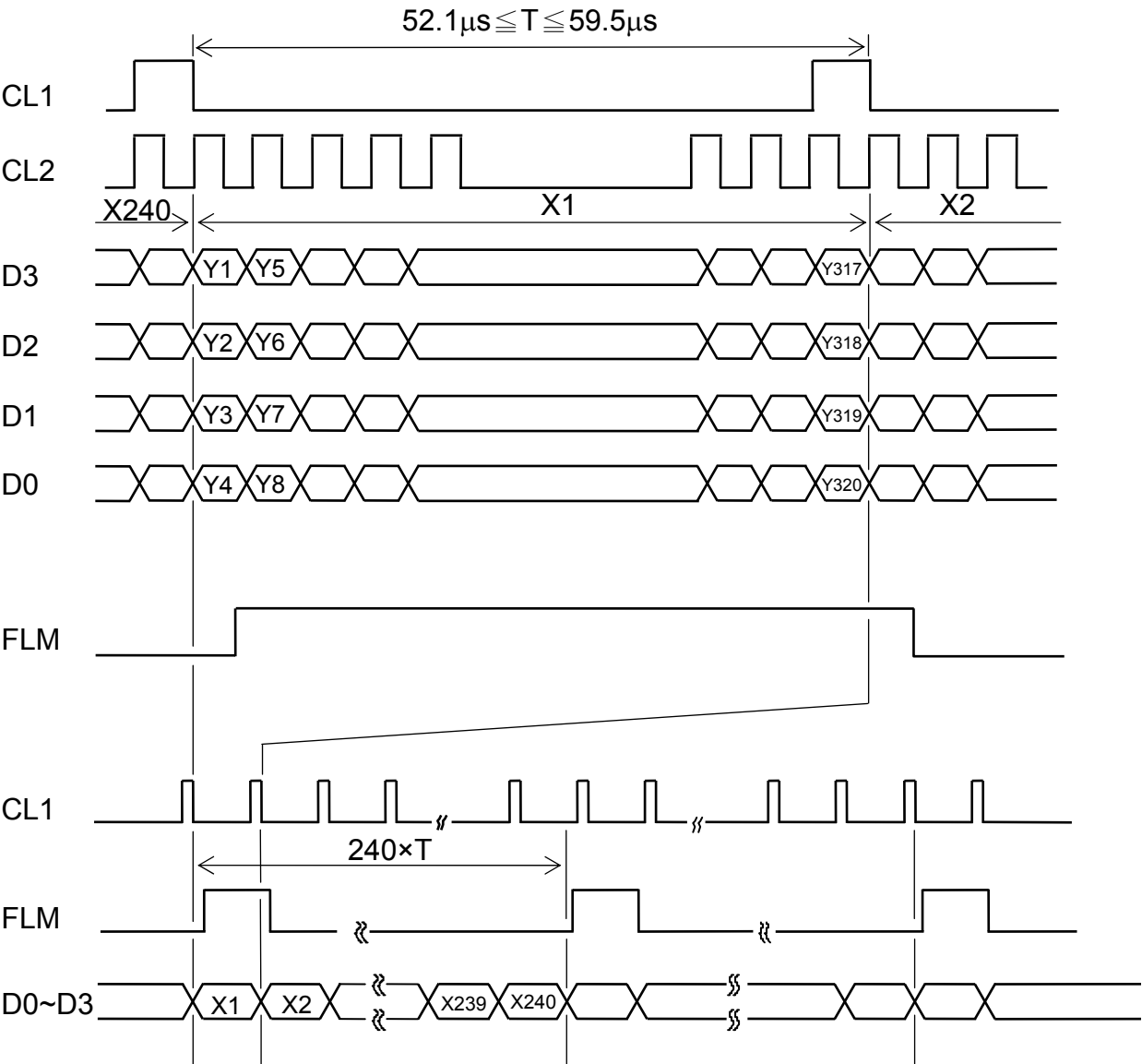
8.2 TIMING CHARACTERISTICS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CL2 frequency	fCP	-	-	6.5	MHz
CL2 pulse width	tw	45	-	-	ns
CL2 rise, fall time	tr,tf	-	-	50 Note1	ns
Data set up time	tDSU	30	-	-	ns
Data hold time	tDHD	30	-	-	ns
CL1 set up time	tLSU	80	-	-	ns
CL1 clock time	tLC	120	-	-	ns
"FLM" set up time	tSETUP	100	-	-	ns
"FLM" hold time	tHOLD	100	-	-	ns
"CL1" pulse width	twc	125	-	-	ns

Note 1: $tr , tf < \dfrac{1/fcp-2tW}{2}$ and $tr , tf \leqq 50ns$
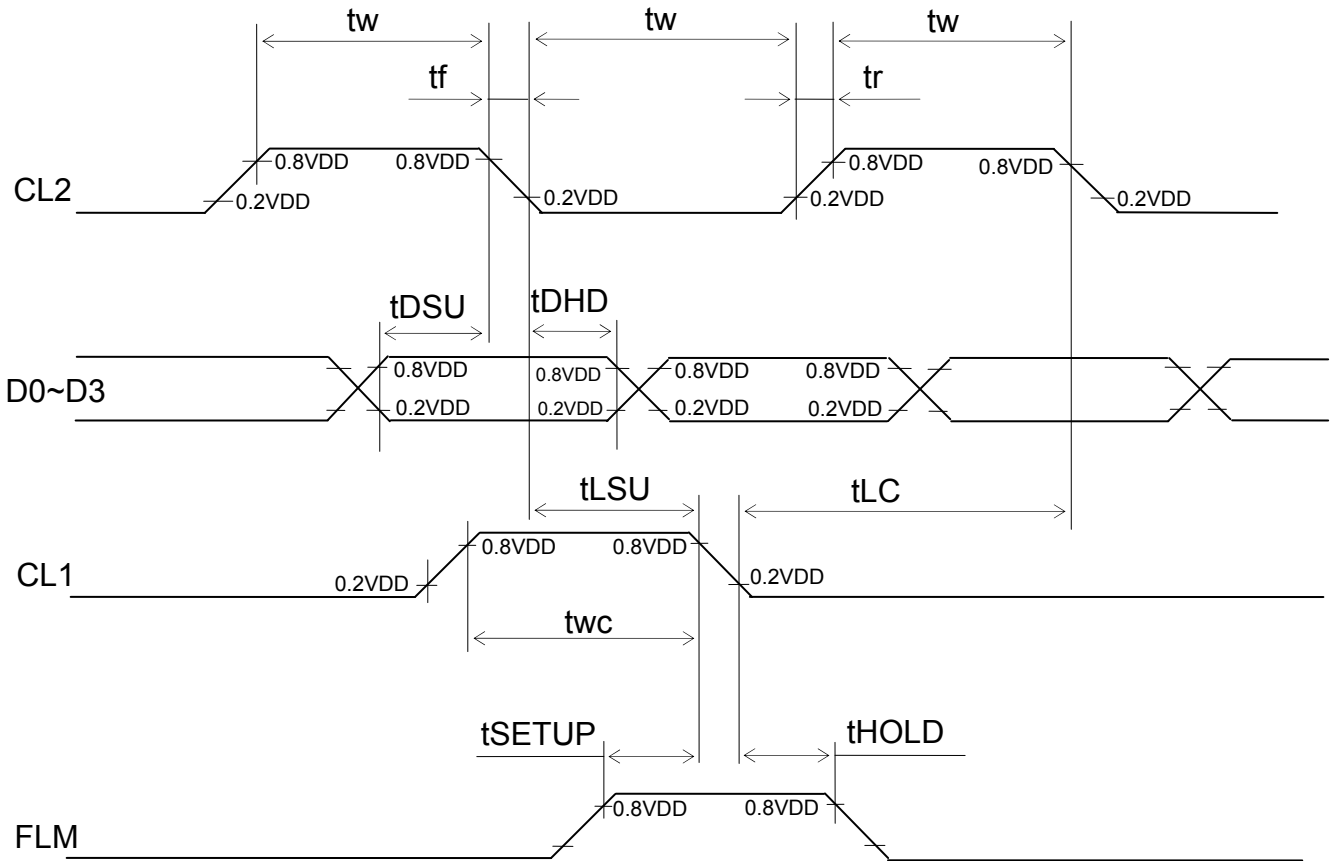
8.3 POWER ON/OFF TIMING SEQUENCE
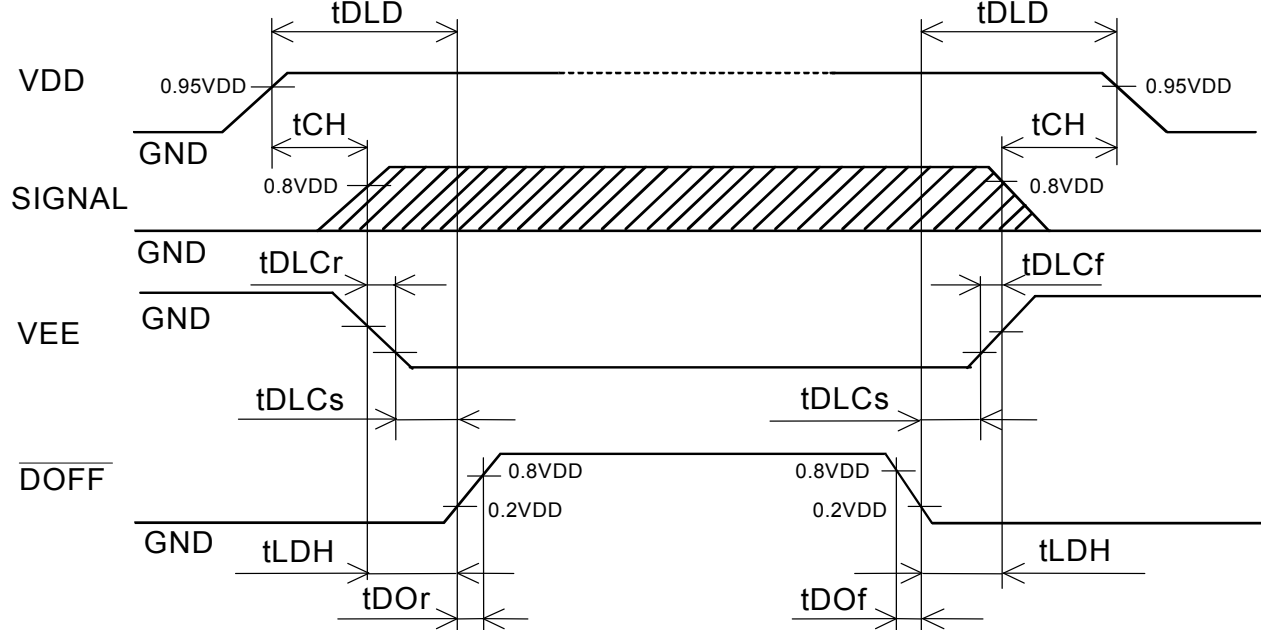
SYMBOL	MIN.	MAX.	UNIT	REMARKS
tDLD	50	-	ms	Note1
tCH	0	30	ms	Note1
tLDH	0	-	ms	Note1
tDOr	-	100	ns	Note2
tDOf	-	100	ns	Note2
tDLCr	0	-	ms	Note2
tDLCf	0	-	ms	Note2
tDLCs	20	-	ms	Note2

Note 1: Please keep the specified sequence because wrong
sequence may cause permanent damage to the LCD panel.
Note 2: KOE recommends you to use $\overline{DOFF}$ function.
Display quality may deteriorate if you don't use $\overline{DOFF}$ function.

8.4 POWER SUPPLY FOR LCM (EXAMPLE)
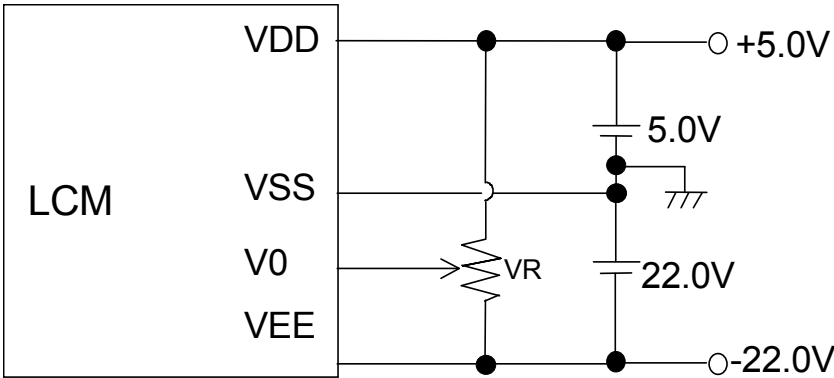
Note 1: VR : 10kΩ

9. OUTLINE DIMENSIONS

9.1 OUTLINE DIMENSIONS

167.0 ±0.5
160.0 ±0.5
152.0 ±0.3
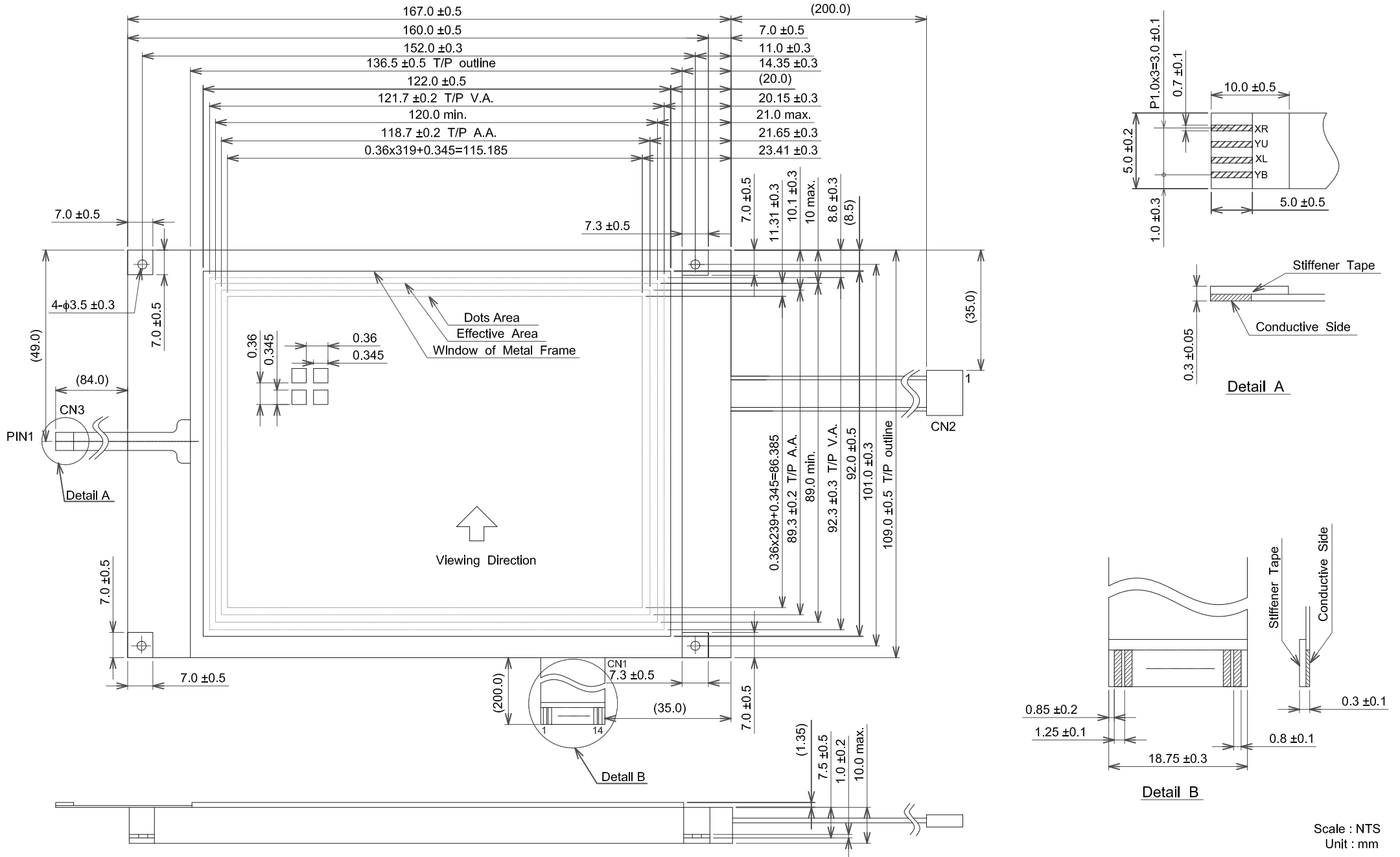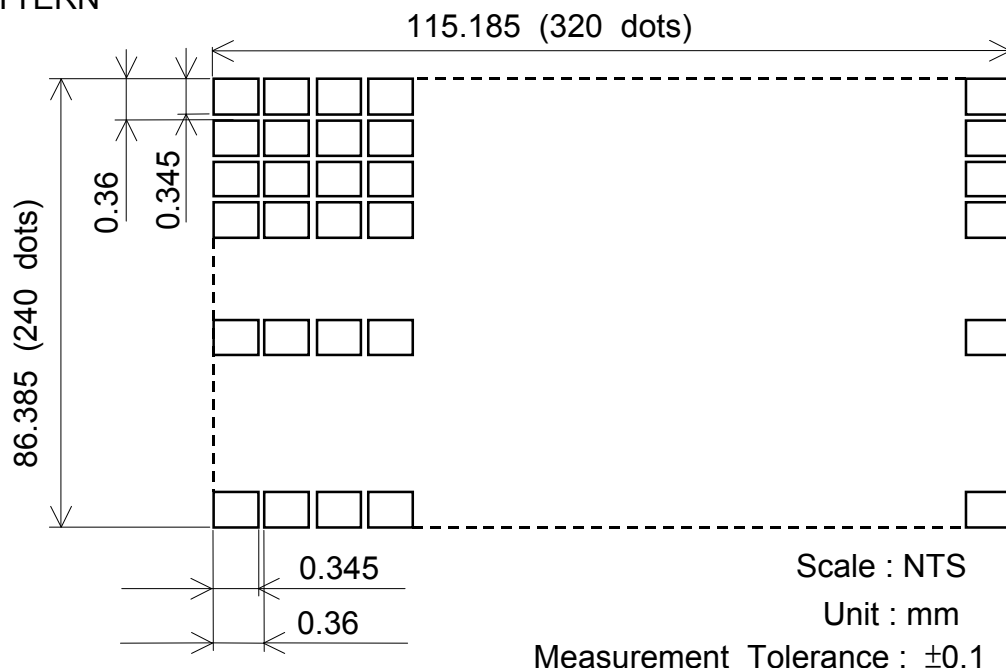136.5 ±0.5 T/P outline
122.0 ±0.5
121.7 ±0.2 T/P V.A.
120.0 min.
118.7 ±0.2 T/P A.A.
0.36x319+0.345=115.185

(200.0)
7.0 ±0.5
11.0 ±0.3
14.35 ±0.3
(20.0)
20.15 ±0.3
21.0 max.
21.65 ±0.3
23.41 ±0.3

7.0 ±0.5
11.31 ±0.3
10.1 ±0.3
10 max.
8.6 ±0.3
(8.5)

7.0 ±0.5
7.3 ±0.5

4-φ3.5 ±0.3
7.0 ±0.5

(49.0)
(84.0)
CN3
PIN1
Detail A

0.36
0.345
0.36
0.345

Dots Area
Effective Area
Window of Metal Frame

Viewing Direction

7.0 ±0.5
7.0 ±0.5

(200.0)

CN1
7.3 ±0.5
(35.0)
7.0 ±0.5
1   14
Detail B

0.36x239+0.345=86.385
89.3 ±0.2 T/P A.A.
89.0 min.
92.3 ±0.3 T/P V.A.
92.0 ±0.5
101.0 ±0.3
109.0 ±0.5 T/P outline

(35.0)
CN2
1

P1.0x3=3.0 ±0.1
0.7 ±0.1
10.0 ±0.5
5.0 ±0.2
XR
YU
XL
YB
1.0 ±0.3
5.0 ±0.5

Stiffener Tape
Conductive Side
0.3 ±0.05
Detail A

Stiffener Tape
Conductive Side
0.85 ±0.2
1.25 ±0.1
0.3 ±0.1
0.8 ±0.1
18.75 ±0.3
Detail B

(1.35)
7.5 ±0.5
1.0 ±0.2
10.0 max.

Scale : NTS
Unit : mm

Note 1 : Measurement when adding 9.8 x 10^{4}Pa at the measuring point.

| KAOHSIUNG OPTO-ELECTRONICS INC. | SHEET No. | 7B64PS 2709-SP14Q003-AZA-2 | PAGE | 9-1/2 |

9.2 DISPLAY PATTERN

115.185 (320 dots)

86.385 (240 dots)

0.36

0.345

0.345

0.36

Scale : NTS

Unit : mm

Measurement Tolerance : ±0.1

9.3 INTERFACE PIN CONNECTION

FPC : pitch 1.25mm 14 pins

INTERFACE		PIN No.	SIGNAL	LEVEL	FUNCTION
LCM	CN1	1	D0	H/L	Display Data
		2	D1		
		3	D2		
		4	D3		
		5	$\overline{\text{DOFF}}$	H/L	H : ON / L : OFF
		6	FLM	H	First Line Marker
		7	N.C	-	-
		8	CL1	H→L	Data Latch
		9	CL2	H→L	Data Shift
		10	VDD	-	Power Supply for Logic
		11	VSS	-	GND
		12	VEE	-	Power Supply for LC
		13	V0	-	Operating Voltage LC Driving
		14	VSS	-	GND

INTERFACE		PIN No.	SIGNAL	LEVEL	FUNCTION
LCM	CN2	1	VLED(+)	-	Power Supply for LED
		2	N.C	-	-
		3	N.C	-	-
		4	VLED(-)	-	LED GND

LED I/F : J.A.E / IL-G-4S-S3C2-SA

INTERFACE		PIN No.	SIGNAL	FUNCTION
T/P	CN3	1	XR	Analog Signal from Digitizer Right
		2	YU	Analog Signal from Digitizer Up
		3	XL	Analog Signal from Digitizer Left
		4	YB	Analog Signal from Digitizer Bottom

FPC : Pitch 1.0mm 4pins

Recommend Suitable connector : (HIROSE) FH12-10(4)SA-ISH

| KAOHSIUNG OPTO-ELECTRONICS INC.	SHEET NO.	7B64PS 2709-SP14Q003-AZA-2	PAGE	9-2/2

10. APPEARANCE STANDARD
10.1 APPEARANCE INSPECTION CONDITION

Visual inspection should be done under the following condition.
(1) The inspection should be done under in the dark room.
(2) The CFL should be lighted with the prescribed inverter.
(3) The distance between eyes of an inspector and the LCD module is 25cm.
(4) The viewing zone is shown the figure .
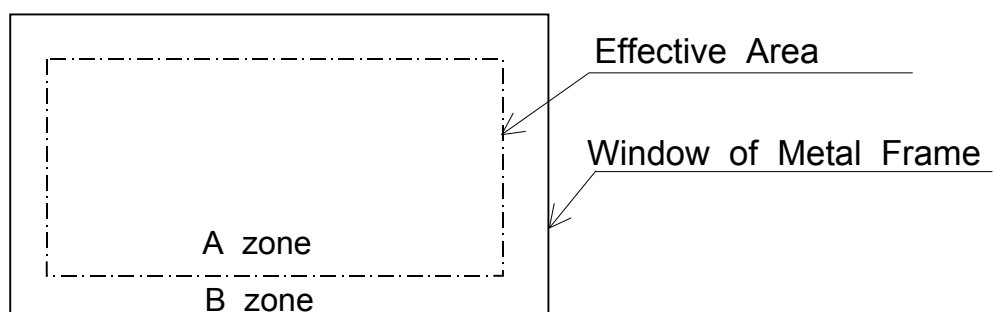Viewing angle $\leqq 25°$

eye   eye

25° 25°

LCD
Bezel
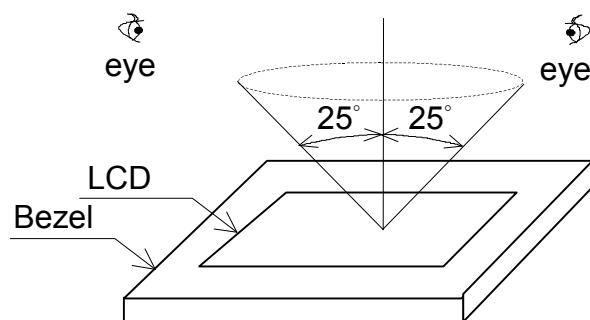
10.2 DEFINITION OF EACH ZONE
A zone : Within the effective area specified at page 9-1/2 of this document.
B zone : Area between the window of metal frame and the effective area line
specified at page 9-1/2 of this document.

Effective Area

Window of Metal Frame

A zone
B zone

| KAOHSIUNG OPTO-ELECTRONICS INC. | SHEET NO. | 7B64PS 2710-SP14Q003-AZA-2 | PAGE | 10-1/3 |

10.3 APPEARANCE SPECIFICATION
   *) If a problem occurs in respect to any of these items ,
      both parties(Customer and KOE) will discuss in more detail.

No.	ITEM	CRITERIA			A	B
	Scratches	Serious one is not allowed			*	-
	Dent	Serious one is not allowed			*	-
	Wrinkles in Polarizer	Serious one is not allowed			*	-
	Bubbles	Average Diameter D(mm)		Maximum Number Acceptable	○	-
		D≦0.2		Ignore		
		0.2＜D≦0.3		12		
		0.3＜D≦0.5		3		
		0.5＜D		None		
L C D	Stains, Foreign Materials, Dark Spot	Filamentous			○	-
		Length L(mm)	Width W(mm)	Maximum Number Acceptable		
		L≦2.0	W≦0.03	Ignore		
		L≦3.0	0.03＜W≦0.05	6		
		L≦2.5	0.05＜W≦0.1	1		
		Round			○	-
		Average Diameter D(mm)	Maximum Number Acceptable	Minimum Space		
		D＜0.2	Ignore	-		
		0.2 ≦D＜0.33	8	10mm		
		0.33≦D	None	-		
		Total	Filamentous + Round = 10			
		Those wiped out easily are acceptable			○	○
	Pinhole	Average Diameter D(mm)		Maximum Number Acceptable	○	-
		D≦0.15		Ignore		
		0.15＜D≦0.3		10		
		C≦0.015		Ignore		
	Contrast Irregularity (Spot)	Average Diameter D(mm)	Maximum Number Acceptable	Minimum Space	○	-
		D≦0.25	Ignore	-		
		0.25＜D≦0.35	10	20mm		
		0.35＜D≦0.5	4	20mm		
		0.5 ＜D	None	-		

No.	ITEM	CRITERIA					A	B
L C D	Contrast Irregularity (Line) (Filamentous)	Width D(mm)	Length L(mm)	Maximum Number Acceptable	Minimum Space		○	-
		W≦0.25	L≦1.2	2	20mm			
		W≦0.2	L≦1.5	3	20mm			
		W≦0.15	L≦2.0	3	20mm			
		W≦0.1	L≦3.0	4	20mm			
		Total		6				

No.	ITEM	CRITERIA		
L E D B / L	Dark Spots, White Spots Foreign Materials (Spot)	D≦0.4		Ignore
		D＞0.4		None
	Foreign Materials (Line)	W≦0.2	L<2.5	≦1
		W≦0.2	L>2.5	None
		W>0.2		None
	Scratches	W≦0.1		Ignore
		0.1＜W≦0.2	L≦11.0	≦1
		0.1＜W≦0.2	L≧11.0	None
		W＞0.2		None

Note 1 : Definition of average diameter D

$$D = \frac{a+b}{2}$$
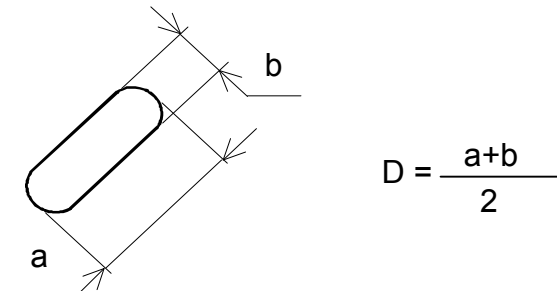
Note 2 : Definition of length L and width W
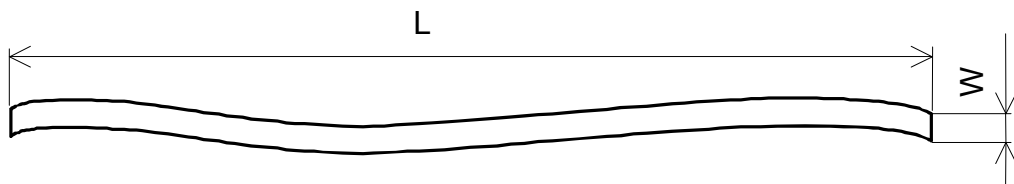
Note 3 : Definition of pinhole

c : Salience
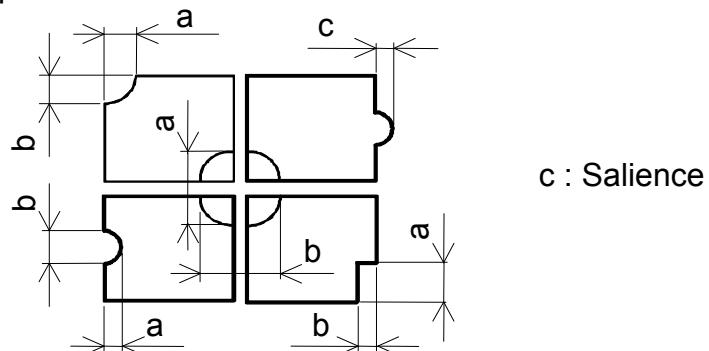
11. PRECAUTION IN DESIGN

11.1 LC DRIVING VOLTAGE (VEE) AND VIEWING ANGLE RANGE

Setting VEE out of the recommended condition will be a cause for a change of viewing angle range.

11.2 PRECAUTIONS AGAINST STATIC CHARGE

As this module contains C-MOS LSIs , it is not strong against electrostatic discharge. Make certain that the operator's body is connected to the ground through a list band etc. And don't touch I/F pins directly.

11.3 POWER ON SEQUENCE

Input signals should not be applied to LCD module before power supply voltage is applied and reaches to specified voltage (VDD).
If above sequence is not kept, C-MOS LSIs of LCD modules may be damaged due to latch up problem.

11.4 PACKAGING

(1) No leaving product is preferable in the place of high humidity for a long period of time. For their storage in the place where temperature is 35 ℃ or higher ,special care to prevent them from high humidity is required. A combination of high temperature and high humidity may cause them polarization degradation as well as bubble generation and polarizer peel-off. Please keep the temperature and humidity within the specified range for use and storage.

(2) Since polarizers tend to be easily damaged, They should be handled full with care so as not to get them touched, pushed or rubbed.

(3) As the adhesives used for adhering polarizers are made of organic substances which will be deteriorated by a chemical reaction with such chemicals as acetone, toluene , ethanol and isopropyl alcohol. The following solvents are recommended for use:
normal hexane

Please contact us when it is necessary for you to use chemicals.

(4) Lightly wipe to clean the dirty surface with absorbent cotton waste or other soft material like chamois , soaked in the chemicals recommended without scrubbing it hardly. To prevent the display surface from damage and keep the appearance in good state, it is sufficient, in general, to wipe it with absorbent cotton.

(5) Immediately wipe off saliva or water drop attached on the display area because its long period adherence may cause deformation or faded color on the spot.

(6) Foggy dew deposited on the surface due to coldness will be caused for polarizer damage, stain and dirt on product. When necessary to take out the products from some place at low temperature for test, etc. It is required for them to be warmed up in a container once at the temperature higher than that of room.

(7) Touching the display area and contact terminals with bare hands and contaminating them are prohibited, because the stain on the display area and poor insulation between terminals are often caused by being touched by bare hands.
(Some cosmetics are detrimental to polarizers.)

KAOHSIUNG OPTO-ELECTRONICS INC.	SHEET NO.	7B64PS 2711-SP14Q003-AZA-2	PAGE	11-1/2

(8) In general the quality of glass is fragile so that it tends to be cracked or chipped in handling, specially on its periphery. Be careful not to give it sharp shock caused by dropping down, etc.

11.5 CAUTION FOR OPAERATION

(1) It is an indispensable condition to drive LCDs within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life. An electrochemical reaction due to direct current causes LCDs undesirable deterioration , so that the use of direct current driver should be avoided.

(2) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCDs show dark blue color in them. However those phenomena do not mean malfunction or out of order with LCDs which will come back in the specified operating temperature range.

(3) If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.

(4) A slight dew depositing on terminals is a cause for electrochemical reaction resulting in terminal open circuit. Please operate the LCD module under the relative condition of 40℃ 85%RH.

11.6 STORAGE

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

(1) Storage in a polyethylene bag with the opening sealed , so the fresh air will not be entered from outside.

(2) Placing in a dark place where neither exposure to direct sunlight nor light is , keeping temperature in the range from 0 ℃ to 35 ℃.

(3) Storing with no touch on polarizer surface by anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery from us.)

11.7 SAFETY

(1) It is recommendable to crash damaged or unnecessary LCDs into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol , which should be burned up later.

(2) 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.

12. DESIGNATION OF LOT MARK

12.1 LOT MARK

Lot mark is consisted of 4 digital number.

| 8 | 0 | 4 | 1 | T |

Made in Taiwan

Week
Month
Year
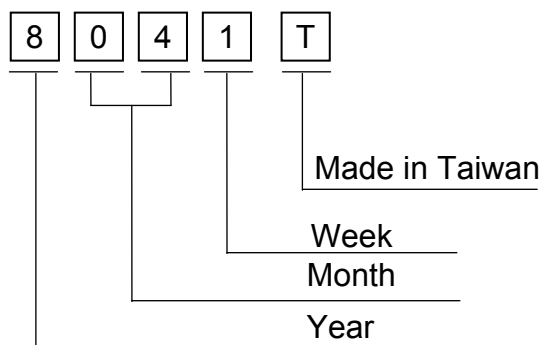
YEAR	FIGURE IN LOT MARK
2012	2
2013	3
2014	4
2015	5
2016	6

Note 1. Some products have alphabet at the end or the first.

MONTH	FIGURE IN LOT MARK	MONTH	FIGURE IN LOT MARK	WEEK (DAY IN CALENDAR	FIGURE IN LOT MARK
Jan.	01	Jul.	07	01~07	1
Feb.	02	Aug.	08	08~14	2
Mar.	03	Sep.	09	15~21	3
Apr.	04	Oct.	10	22~28	4
May	05	Nov.	11	29~31	5
Jun.	06	Dec.	12		

12.2 REVISION

REV No.	ITEM
-	-

12.3 LOCATION OF LOT MARK

on the back side of LCM

| 8 0 4 1 T |

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 handling of the problem should be decided through discussion and agreement between responsible persons of the both parties.

(1) When a question is arisen in the specifications.

(2) When a new problem is arisen which is not specified in this specifications.

(3) When an inspection specifications change or operating condition change in customer is reported to KOE, and some problem is arisen in this specification due to the change.

(4) When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

The precaution that should be observed when handling LCM have been explained above. If any points are unclear or if you have any request , please contact KOE.

14. TOUCH PANEL SPECIFICATION

14.1 RATINGS

14.1.1 ABSOLUTE MAXIMUM RATINGS

ITEM	SPECIFICATION	COMMENT
Operating Voltage	7V	Without
Contact Current	20mA	Condensation

14.1.2 OPERATING CONDITIONS

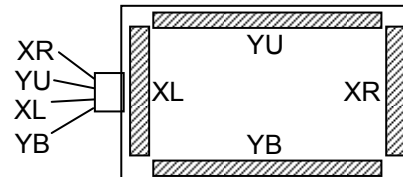| ITEM	SPECIFICATION
Operating Voltage	5.0 / 3.3 VDC
Contact Current	10 ~ 20 mA
Actuation Force	80g max. (R8,Silicone rubber)

14.2 SURFACE HARDNESS
2H

14.3 OPTICAL CHARACTERISTICS
14.3.1 TRANSPARENCY : 76%.min.
(WAVE LENGTH : 450 ~ 700nm)

14.4 ELECTRICAL CHARACTISTICS
14.4.1 CONDUCTIVE RESISTANCE

TERMINAL	CONDUCTIVE RESISTANCE
XR-XL	150~1300Ω
YU-YB	150~1300Ω

14.4.2 INSULATION RESISTINCE

TERMINAL	INSULATION RESISTANCE	TESTING VOLTAGE
X-Y	20MΩ	25VDC

14.4.3 BOUNCE CHATTERING
10ms max.

14.4.4 LINEARITY
    (1) LINEARITY
        Linearity Deviation : 2% max.
    (2) TESTING CIRCUIT
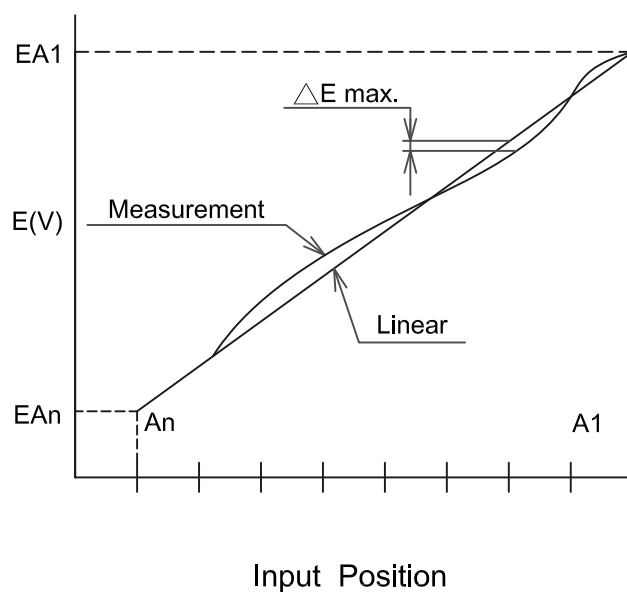   (a) X axis linearity testing method ,100g , VXR-VXL=5V , VOUT=VYU.
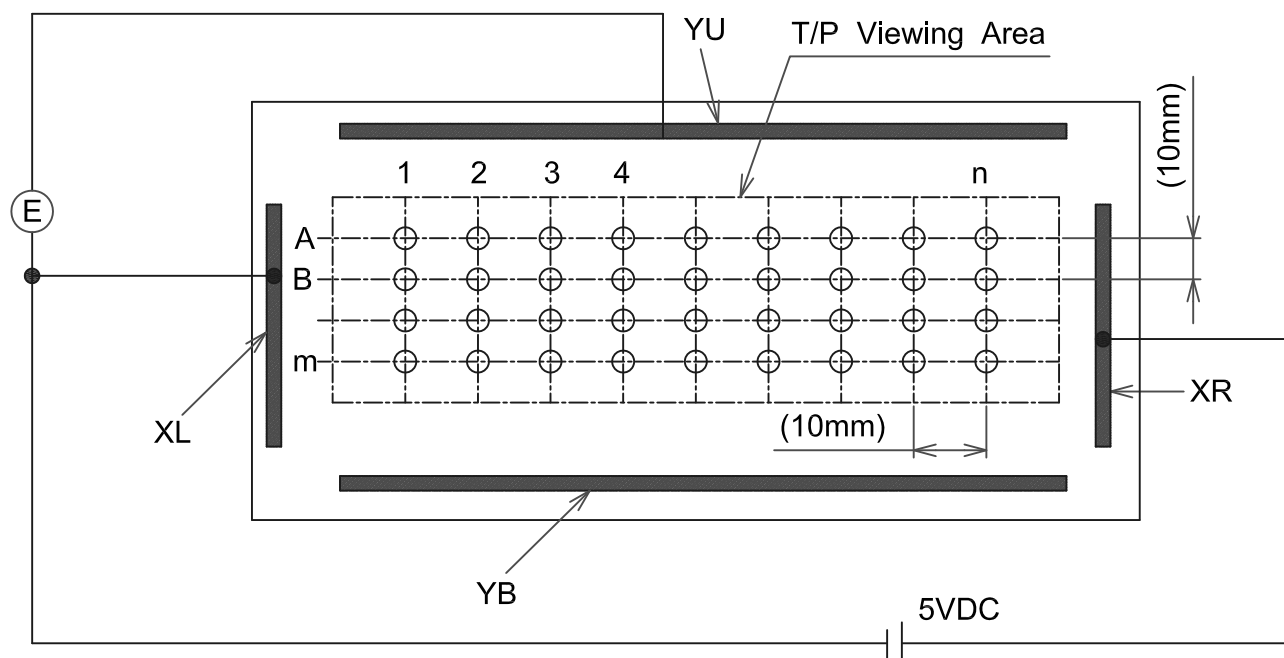
      (b) Y axis linearity method , 100g VYU-VYB=5V , VOUT=VXR

    (3) CALCULATION
        (a) X axis linearity

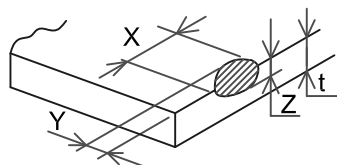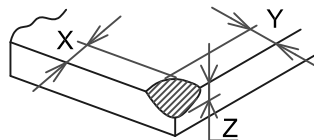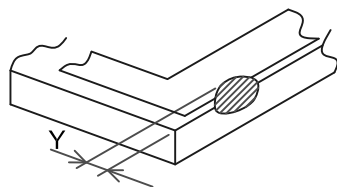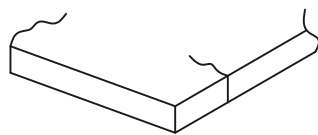$$\text{LINEARITY} = \frac{\triangle E \text{ max.}}{EA1 - EAn} \times 100(\%)$$

Input Position

14.5 ENVIRONMENTAL TESTING

| ITEM	CONDITIONS	CRITERIA
High Temperature Storage	60℃ : 120h & 25℃: 24h	After testing must to meet the specifications of the Electrical, Mechanical & Optical Characteristics.
Low Temperature Storage	-20℃ : 120h & 25℃ : 24h	
Temperature Cycle	-20℃ ←→ 70℃ : 10 Cycles within (30) (60) (30) : minutes & 25℃ : 24h (Without Condensation)	
Humidity Storage	60℃ , 90%RH. 120h	
Durability for Keystroke	150g , R8, HS40 Silicon Rubber (Speed : 330mm/sec) : 1000000 Activations	

14.6 APPEARANCE SPECIFICATION

No.	ITEM	CRITERIA			A	B
T / P	Hair Flaws	FILAMENTOUS			O	-
		Length L(mm)	Width W(mm)	Maximum Number Acceptable		
		L≦12	W≦0.05	Ignore		
		L≦5	0.05＜W≦0.1	3		
		L＞2	0.1＜W	None		
	Dot-shaped Impurities	Average Diameter D(mm)	Maximum Number Acceptable		O	-
		D≦0.1	Ignore			
		0.1＜D≦0.3	5			
		0.3＜D	None			
	Scratch	FILAMENTOUS			O	-
		Length L(mm)	Width W(mm)	Maximum Number Acceptable		
		L≦12	W≦0.05	Ignore		
		L≦12	0.05＜W≦0.1	5		
		L＞12	0.1＜W	None		

14.6.3 GLASS INDENTATION

ITEM	SPECIFICATIONS		
Common Indentation		X	Y	Z
≤5.0	≤3.0	≤t | But , indentation can not including seal area. t : Glass thuickness.		
Corner Broken		X	Y	Z
≤2.0	≤5.0	≤t | But , indentation can not including seal area.		
Indentation Witnin Pattern		Y≤1 Is ignore But , Must to meet the specification of conducting pattern indentation.		
Proceeding Crack		None		

14.6.4 BLISTERING (PUFFINESS) : 0.4 mm max.

0.4mm max.

0.4mm max.

Digitizer
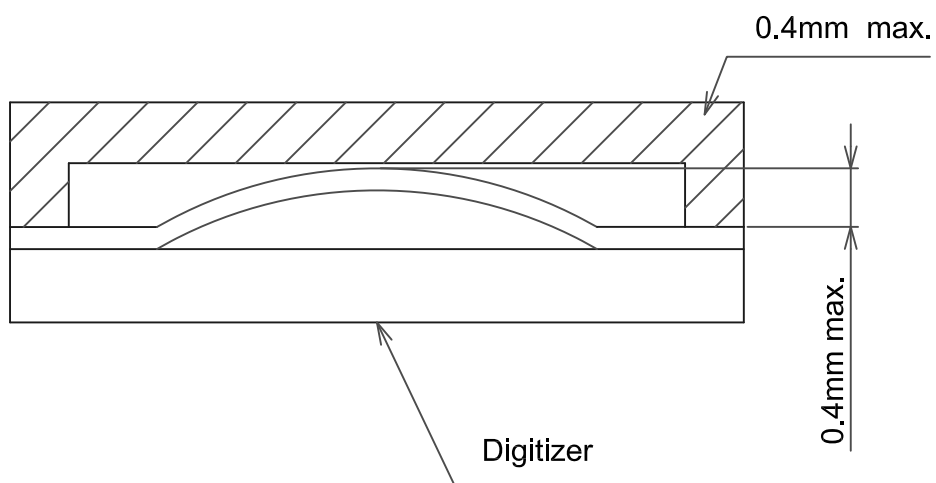
14.7 SAFETY AND ATTENTIONS

1) UV protection is recommended to avoid the possibility of performance degrading when touch panel is likely applied under UV environment for a long period of time.