

EXAMINED BY :  <i>Bob Hu</i>	EMERGING DISPLAY  TECHNOLOGIES CORPORATION	FILE NO . CAS-0006544
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CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO. :  
  
ET024006DHU  
(RoHS)  
  
FOR MESSRS :  
  
\_\_\_\_\_

CUSTOMER'S APPROVAL

DATE :  
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BY :  
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EMERGING DISPLAY  
TECHNOLOGIES CORPORATION

MODEL NO.	VERSION	PAGE
ET024006DHU	1	0-1

RECORDS OF REVISION	DOC . FIRST ISSUE	NOV.28, 2007
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1. GENERAL SPECIFICATIONS

1.1 APPLICATION NOTES FOR CONTROLLER/DRIVER  
PLEASE REFER TO :

HIMAX HX8347 - A

1.2 MATERIAL SAFETY DESCRIPTION

ASSEMBLIES SHALL COMPLY WITH EUROPEAN ROHS REQUIREMENTS, INCLUDING PROHIBITED MATERIALS/COMPONENTS CONTAINING LEAD, MERCURY, CADMIUM, HEXAVALENT CHROMIUM, POLYBROMINATED BIPHENYLS (PBB) AND POLYBROMINATED DIPHENYL ETHERS (PBDE)

2. MECHANICAL SPECIFICATIONS

(1) DIAGONALS	-----	2.4 inch
(2) NUMBER OF DOTS	-----	240W * (RGB) * 320H DOTS
(3) MODULE SIZE	-----	43.12W * 60.46H * 4.16D mm (WITHOUT FPC SIZE)
(4) VIEW AREA	-----	38.72W * 53.96H mm (T/P)
(5) ACTIVE AREA	-----	36.72W * 48.96H mm (LCD) 37.72W * 52.96H mm ( T/P)
(6) DOT SIZE	-----	0.051W * 0.153H mm
(7) PIXEL SIZE	-----	0.153W * 0.153H mm
(8) LCD TYPE	-----	TFT , TRANSMISSIVE
(9) COLOR	-----	262K (18BIT)
(10) VIEWING DIRECTION	-----	12 O'CLOCK
(11) BACK LIGHT	-----	LED , COLOR : WHITE
(12) INTERFACE MODE	-----	MPU-8 BIT PARALLEL (80 SERIES) MPU-16 BIT PARALLEL (80 SERIES) MPU-18 BIT PARALLEL (80 SERIES) 4 - LINES SPI

### 3. ABSOLUTE MAXIMUM RATINGS

#### 3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS .

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	REMARK
INPUT POWER SUPPLY	IOVCC/VCI	-0.3	4.6	V	
INPUT VOLTAGE	$V_I$	-0.3	VCI+0.3	V	
STATIC ELECTRICITY	—	—	—	V	NOTE ( 1 )
LED BACKLIGHT POWER DISSIPATION	PD	—	324	mW	
LED BACKLIGHT FORWARD CURRENT	IF	—	90	mA	
LED BACKLIGHT REVERSE VOLTAGE	VR	—	5	V	

NOTE(1) : LCM SHOULD BE GROUNDED DURING HANDLING LCM.

#### 3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS .

I T E M	OPERATING		STORAGE		REMARK
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-20°C	70°C	-30°C	80°C	NOTE ( 2 ), ( 3 )
HUMIDITY	NOTE ( 4 )		NOTE ( 4 )		WITHOUT CONDENSATION
VIBRATION	—	2.45m/S <sup>2</sup> ( 0.25G )	—	11.76m/S <sup>2</sup> ( 1.2 G )	5~20Hz , 1HR 20~500Hz(20Hz) , 1HR 20~500Hz(500Hz) , 1HR X,Y,Z,TOTAL 3HRS
SHOCK	—	29.4 m/S <sup>2</sup> ( 3G )	—	490m/S <sup>2</sup> ( 50 G )	10 m SECONDS XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE ( 2 ) : Ta AT -30°C : 48HRS MAX .

80°C : 168HRS MAX .

NOTE ( 3 ) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE THIS PHENOMENON IS REVERSIBLE .

NOTE ( 4 ) : Ta ≤ 60°C : 90%RH (96HRS MAX .)

Ta > 60°C : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 90%RH AT 60°C.(96 HRS MAX.)

4. ELECTRICAL CHARACTERISTICS

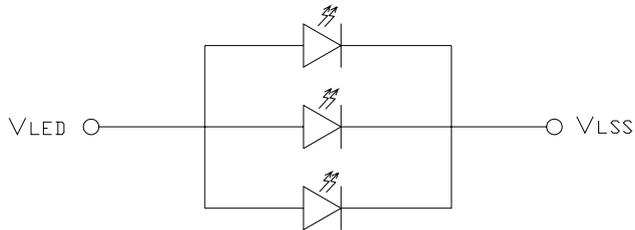
Ta = 25 °C

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY FOR ANALOG	VCI	—	2.3	2.8	3.3	V	
POWER SUPPLY FOR INTERFACE SIGNAL	Iovcc	—	1.65	2.8	3.3	V	
INPUT VOLTAGE NOTE ( 1 )	V <sub>IH</sub>	H LEVEL	0.8Iovcc	—	Iovcc	V	
	V <sub>IL</sub>	L LEVEL	-0.3	—	0.2 Iovcc	V	
OUTPUT VOLTAGE NOTE ( 1 )	V <sub>OH</sub>	H LEVEL	0.8Iovcc	—	—	V	
	V <sub>OL</sub>	L LEVEL	—	—	0.2 Iovcc	V	
OUTPUT CURRENT NOTE (2)	IC	—	—	5	10	mA	NOTE(2)
VOLTAGE OF B/L	VF	IF = 60mA	3.0	3.3	3.6	V	NOTE(3)

NOTE ( 1 ) : APPLIED TO TERMINALS , NRESET, D0~D17 , SDO ,SDI , RD\_E , NWR\_RNW , DNC\_SCL ,TE.

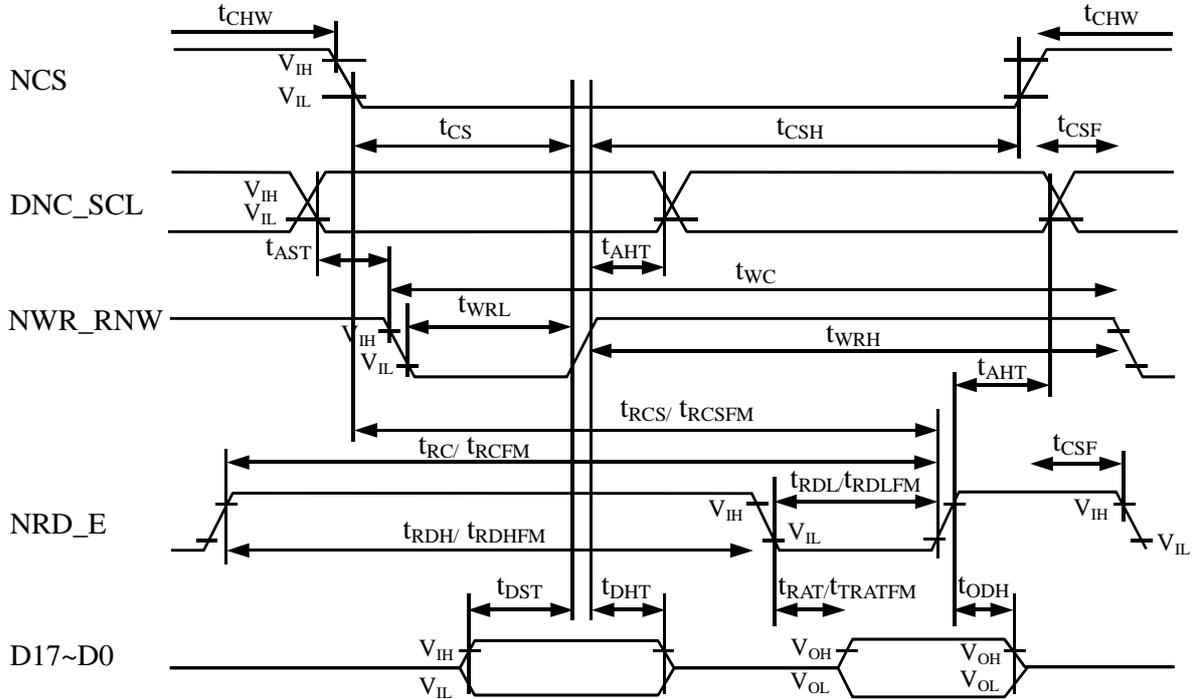
NOTE ( 2 ) : IC : I<sub>vci</sub> + I<sub>ovcc</sub>

NOTE ( 3 ) : INTERNAL CIRCUIT DIAGRAM



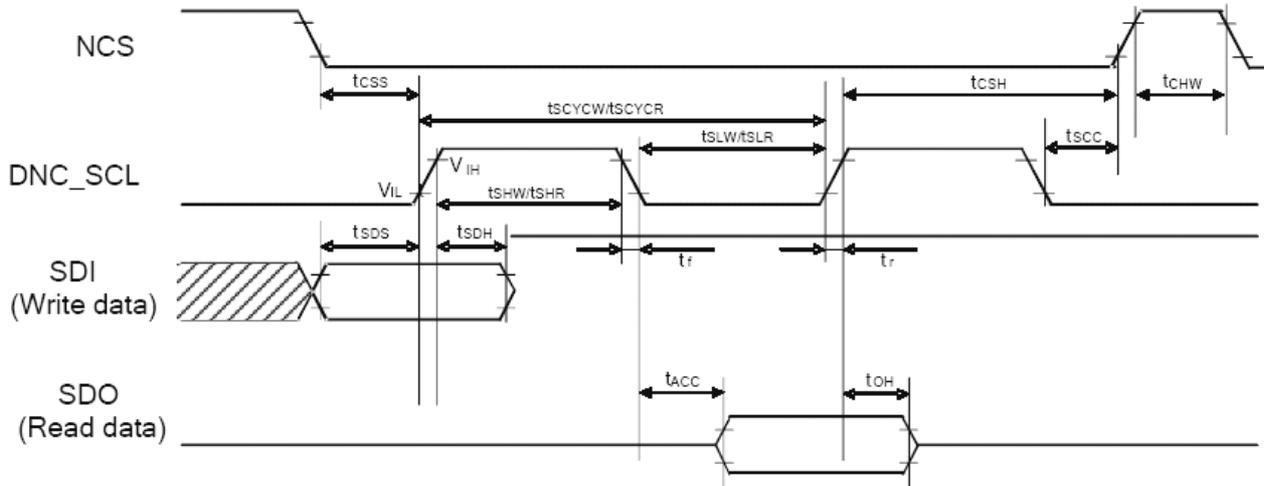
5. TIMING CHARACTERISTICS

5.1 PARALLEL INTERFACE CHARACTERISTICS (8080-SERIES MPU)



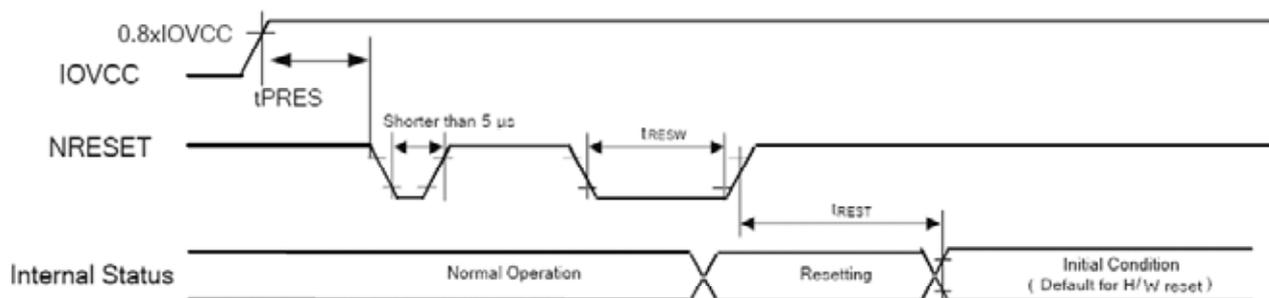
SIGNAL	SYMBOL	PARAMETER	MIN.	TYP.	MAX.	DESCRIPTION
DNC_SCL	$t_{AST}$	ADDRESS SETUP TIME	10	—	ns	
	$t_{AHT}$	ADDRESS HOLD TIME (WRITE/READ)	10	—	ns	
NCS	$t_{CHW}$	CHIP SELECT "H" PULSE WIDTH	0	—		
	$t_{CS}$	CHIP SELECT SETUP TIME(WRITE)	35	—		
	$t_{RCSFM}$	CHIP SELECT SETUP TIME	180	—	ns	
	$t_{CSF}$	SHIP SELECT WAIT TIME(WRITE/READ)	10	—		
	$t_{CSH}$	CHIP SELECT HOLD TIME	10	—		
NWR_RNW	$t_{WC}$	WRITE CYCLE	100	—		
	$t_{WRH}$	CONTROL PULSE "H" DURATION	15	—	ns	
	$t_{WRL}$	CONTROL PULSE "L" DURATION	20	—		
NDR_E	$t_{DRCFM}$	READ CYCLE	250	—		
	$t_{RDHFM}$	CONTROL PULSE "H" DURATION	15	—	ns	WHEN READ FROM GRAM
	$t_{RDLFM}$	CONTROL PULSE "L" DURATION	180	—		
D17 TO D0	$t_{DST}$	DATA SETUP TIME	10	—		FOR MAXIMUM $C_L = 30pF$
	$t_{DHT}$	DATA HOLD TIME	10	—		FOR MINIMUM $C_L = 8pF$
	$t_{RATFM}$	READ ACCESS TIME	—	180	ns	
	$t_{ODH}$	OUTPUT DISABLE TIME	20	80		

5.2 SERIAL INTERFACE CHARACTERISTICS



PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
SERIAL CLOCK CYCLE(WRITE)	$t_{SCYCW}$		100	—	—	
DNC_SCL "H" PULSE WIDTH(WRITE)	$t_{SHW}$	DNC_SCL	35	—	—	ns
DNC_SCL "L" PULSE WIDTH ( WRITE)	$t_{SLR}$		35	—	—	
DATA SETUP TIME(WRITE)	$t_{SDS}$	SDI	30	—	—	ns
DATA HOLD TIME(WRITE)	$t_{SDH}$		30	—	—	
SERIAL CLOCK CYCLE (READ)	$t_{SCYCR}$		150	—	—	
DNC_SCL "H" PULSE WIDTH (READ)	$t_{SHR}$	DNC_SCL	60	—	—	ns
DNC_SCL "L" PULSE WIDTH (READ)	$t_{SLR}$		100	—	—	
ACCESS TIME	$t_{ACC}$	SDO FOR MAXIMUM $C_L=30pF$ FOR MINIMUM $C_L = 8pF$	10	—	100	ns
OUTPUT DISABLE TIME	$t_{OH}$	SDO FOR MAXIMUM $C_L=30pF$ FOR MINIMUM $C_L = 8pF$	15	—	100	ns
DNC_SCL TO CHIP SELECT	$t_{SCC}$	DNC_SCL , NCS	50	—	—	ns
NCS "H" PULSE WIDTH	$t_{CHW}$	NCS	45	—	—	ns
CHIP SELECT SETUP TIME	$t_{CSS}$		60	—	—	ns
CHIP SELECT HOLD TIME	$t_{CSH}$		80	—	—	ns

### 5.3 RESET INPUT TIMING



SYMBOL	PARAMETER	RELATED PINS	MIN.	TYP.	MAX.	NOTE	UNIT
tRESW	RESET LOW PULSE WIDTH <sup>(1)</sup>	NRESET	10	—	—	—	μs
tREST	RESET COMPLETE TIME <sup>(2)</sup>	—	—	—	5	WHEN RESET APPLIED DURING STB MODE	ms
		—	—	—	120	WHEN RESET APPLIED DURING STB MODE	ms
tPRES	RESET GOES HIGH LEVEL AFTER POWER ON TIME	NRESET & IOVCC	1	—	—	RESET GOES HIGH LEVEL AFTER POWER ON	ms

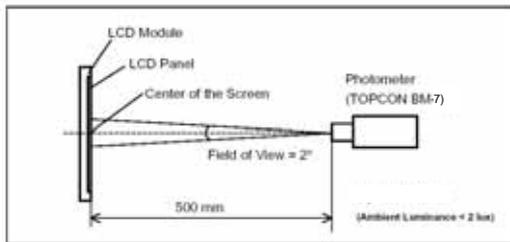
**6. OPTICAL CHARACTERISTICS NOTE ( 1 )**

Ta = 25 °C

I T E M		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
VIEWING ANGLE	HOR.	$\theta_{x+}$	CENTER CR $\geq$ 10	$\theta_{y=0^{\circ}}$	60	65	—	deg . NOTE(2)
		$\theta_{x-}$			35	40	—	
	VER.	$\theta_{y+}$		$\theta_{x=0^{\circ}}$	60	65	—	
		$\theta_{y-}$			25	30	—	
CONTRAST RATIO		CR	$\theta_x = \theta_y = 0^{\circ}$	200	250	—		NOTE(2)
RESPONSE TIME		t r ( rise )	$\theta_x = \theta_y = 0^{\circ}$	—	10	20	ms	NOTE(2)
		t f ( fall )	$\theta_x = \theta_y = 0^{\circ}$	—	20	30		
THE BRIGHTNESS OF MODULE		B	IF = 60mA $\theta_x = \theta_y = 0^{\circ}$	200	250	—	cd/m <sup>2</sup>	NOTE(3)
COLOR OF CIE COORDINATE	RED	Rx	VIEWING NORMAL ANGLE $\theta_x = \theta_y = 0^{\circ}$ NTSC = 60%	0.587	0.617	0.647	—	—
		Ry		0.312	0.342	0.372		
	GREEN	Gx		0.293	0.323	0.352	—	—
		Gy		0.571	0.601	0.631		
	BLUE	Bx		0.112	0.142	0.172	—	—
		By		0.047	0.077	0.107		
	WHITE	Wx		0.250	0.300	0.350	—	—
		Wy		0.270	0.320	0.370		
THE BRIGHTNESS OF UNIFORMITY		—	—	70	75	—	—	NOTE(3) NOTE(4)

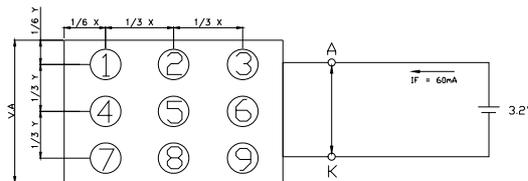
**NOTE (1) : TEST EQUIPMENT SETUP :**

AFTER STABILIZING AND LEAVING THE PANEL ALONE AT A GIVEN TEMPERATURE FOR 30 MINUTES, THE MEASUREMENT SHOULD BE EXECUTED. MEASUREMENT SHOULD BE EXECUTED IN A STABLE, WINDLESS , AND DARK ROOM. OPTICAL SPECIFICATIONS ARE MEASURED BY TOPCON BM-7(FAST) WITH A VIEWING ANGLE OF 2° AT A DISTANCE OF 50cm AND NORMAL DIRECTION.



NOTE (2) : PLEASE REFER TO 12.3 DEFINITION OF OPTICAL CHARACTERISTICS.

NOTE (3) : THE BRIGHTNESS TEST METHOD (BRIGHTNESS MEASURED WHEN LCD IS AT “ WHITE STATE” )

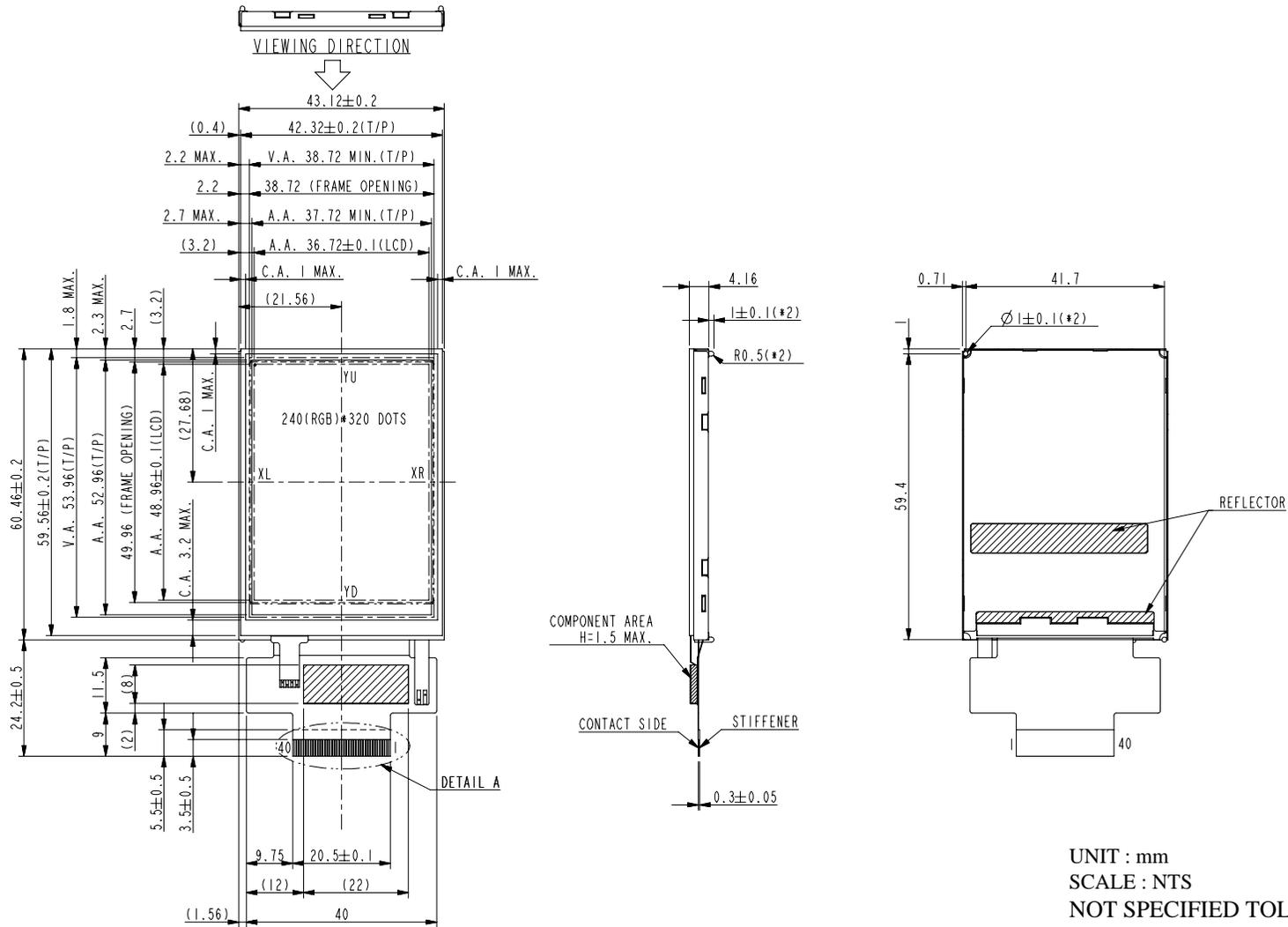


ADD POWER TO LED, A, K PIN TEST POINT ARE 1 ~ 9

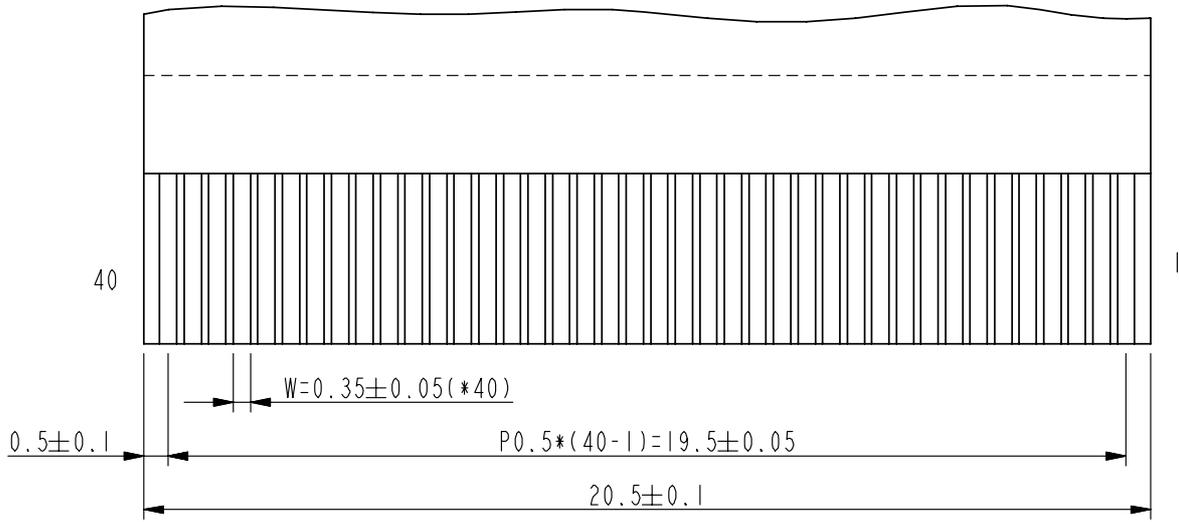
NOTE (4) : TNE BRIGHTNESS VNIFORMITY CALCULATE METHOD

$$\text{UNIFORMITY: } \left[ 1 - \frac{\text{MAXIMUN BRIGHTNESS} - \text{MINIMUN BRIGHTNESS}}{\text{AVERAGE BRIGHTNESS}} \right] \times 100\%$$

7. OUTLINE DIMENSIONS

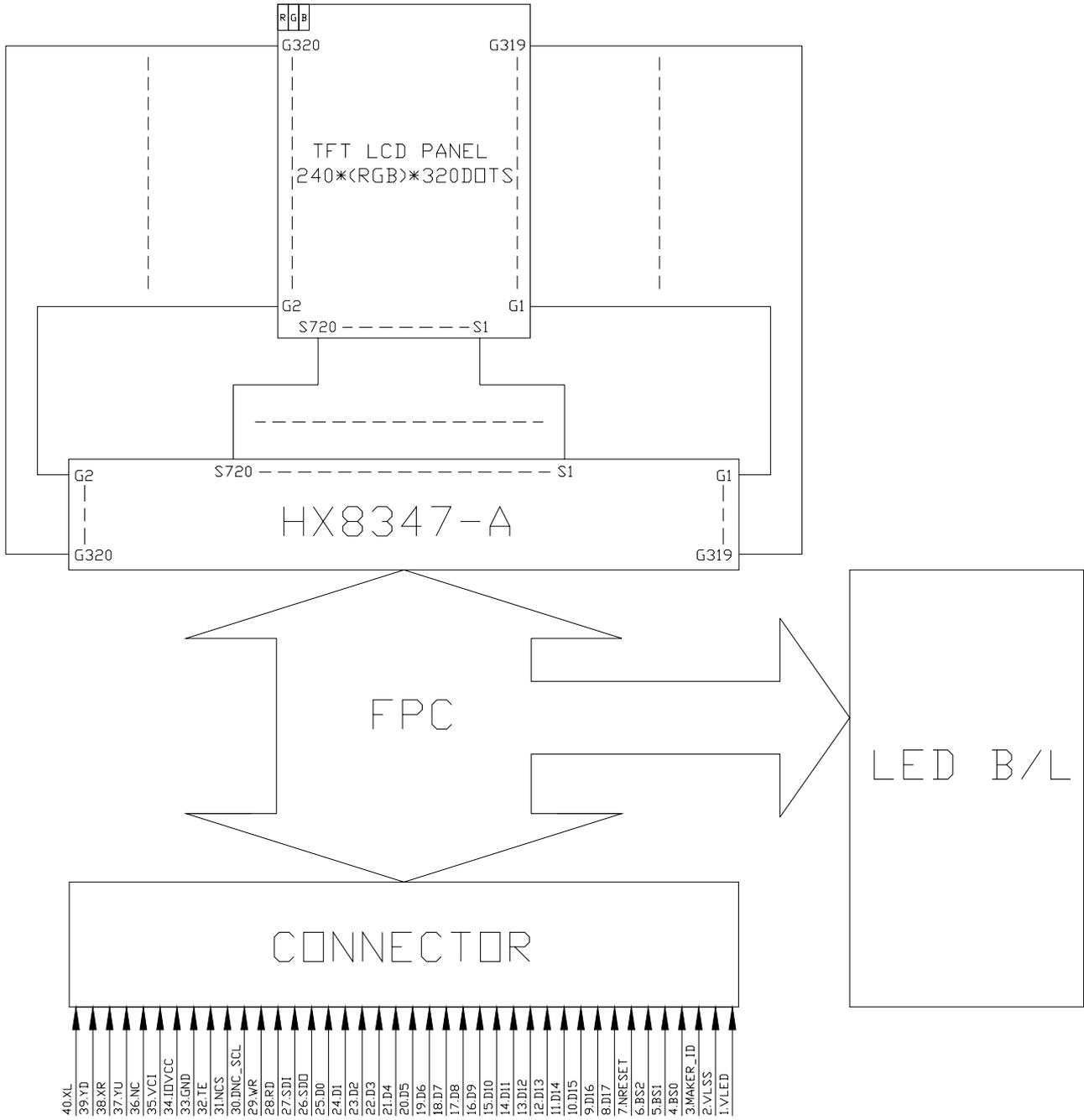


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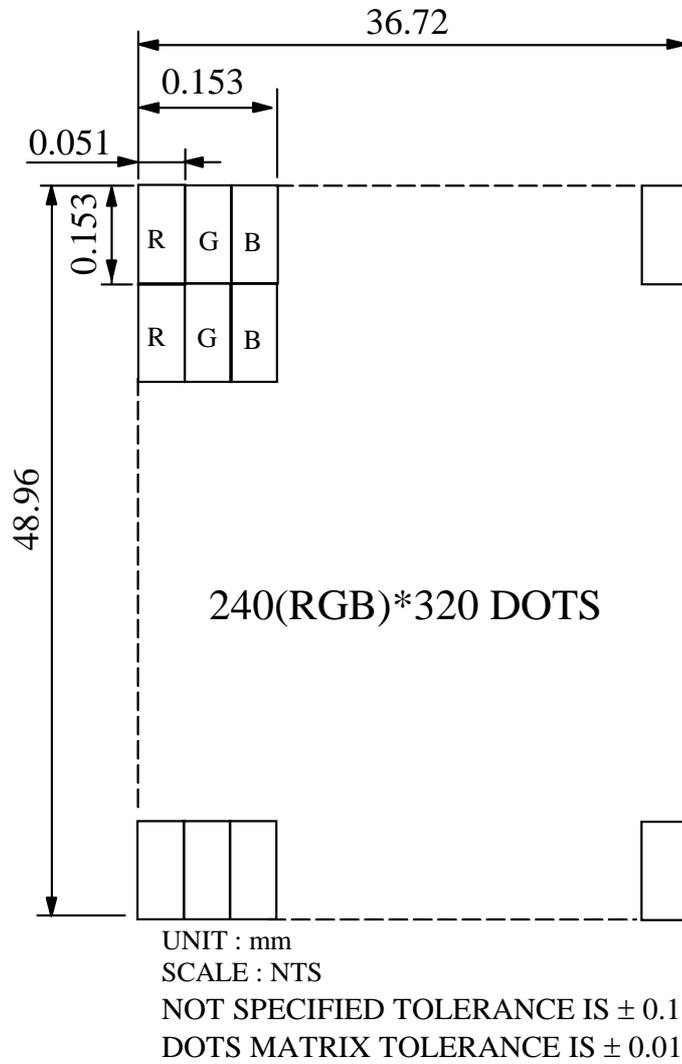


DETAIL A

8. BLOCK DIMENSION



9. DETAIL DRAWING OF DOT MATRIX



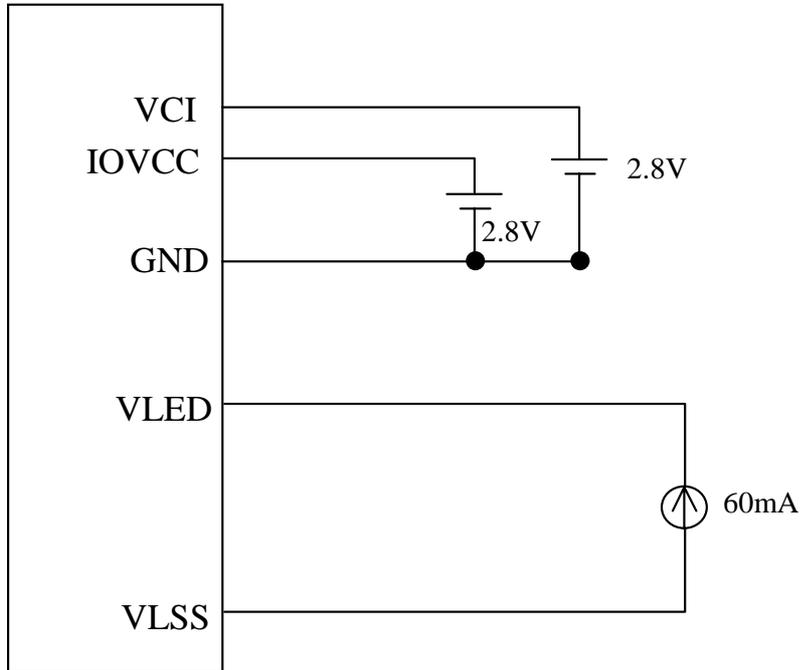
10. INTERFACE SIGNALS

PIN NO	SYMBOL	FUNCTION																																
1	VLED	POWER SUPPLY FOR LED ( + )																																
2	VLSS	POWER SUPPLY FOR LED ( - )																																
3	MAKER_ID	MAKER'S IDENTIFICATION (MAY ESTABLISH "H", "L" OR "NC") IF THE CUSTOMER HAS MORE THAN TWO MAKERS WHO APPLIED DIFFERENT S/W, CAN USE THIS PIN TO DETECT THE CODE BY THE MPU AND DECIDE THE MAKER'S ID. MOST IMPORTANTLY, THE CUSTOMER MUST DESIGN THIS PIN ON THE MAIN BOARD AS WELL AND LEAVE IT OPEN AS NOT USED. NOTE : EDT MODULE'S SETTING IS "H".																																
4	BS0	<table border="1"> <thead> <tr> <th>BS2</th> <th>BS1</th> <th>BS0</th> <th>INTERFACE MODE</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>16-BIT BUS INTERFACE, 80-SYSTEM, 65K-COLOR</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>16-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>18-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>8-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>16-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>18-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR</td> </tr> <tr> <td>1</td> <td>1</td> <td>ID</td> <td>SERIAL BUS IF</td> </tr> </tbody> </table>	BS2	BS1	BS0	INTERFACE MODE	0	0	0	16-BIT BUS INTERFACE, 80-SYSTEM, 65K-COLOR	0	0	1	16-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR	0	1	0	18-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR	0	1	1	8-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR	1	0	0	16-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR	1	0	1	18-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR	1	1	ID	SERIAL BUS IF
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1	0	1	18-BIT BUS INTERFACE, 80-SYSTEM, 262K-COLOR																															
1	1	ID	SERIAL BUS IF																															
5	BS1																																	
6	BS2																																	
7	NRESET	RESET																																
8	D17	<p>DATA BUS</p> <p>8-BIT BUS : USE D7-D0 AND D17-D8 UNUSED</p> <p>16-BIT BUS : USE D15-D0 AND D17-D16 UNUSED</p> <p>18-BIT BUS : USE D17-D0</p> <p>CONNECTED UNUSED PINS TO THE GND LEVEL</p>																																
9	D16																																	
10	D15																																	
11	D14																																	
12	D13																																	
13	D12																																	
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22	D3																																	
23	D2																																	
24	D1																																	
25	D0																																	
26	SDO	SERIAL INSTRUCTION DATA OUTPUT IF NOT USE, LET IT TO OPEN																																
27	SDI	SERIAL INSTRUCTION DATA INPUT IF NOT USE, LET IT CONNECTED TO IOVCC OR GND																																
28	RD	READ SIGNAL AND READ DATA AT THE LOW LEVEL FIX IT TO IOVCC OR GND WHEN USING SERIAL BUS INTERFACE																																
29	WR	WRITE SIGNAL AND WRITES DATA AT RISING EDGE FIX IT TO IOVCC OR GND WHEN USING SERIAL BUS INTERFACE																																

PIN NO	SYMBOL	FUNCTION
30	DNC_SCL	THE SIGNAL FOR COMMAND OR PARAMETER SELECT UNDER PARALLEL MOED(i.e. NOT SERIAL INTERFACE) : LOW : COMMAND HIGH : PARAMETER WHEN UNDER SERIAL INTERFACE, IT SERVES AS SCL
31	NCS	CHIP SELECT SIGNAL
32	TE	TEARING EFFECT OUTPUT, IF NOT USED LET IT OPEN
33	GND	GROUND
34	IOVCC	POWER SUPPLY FOR INTERFACE SIGNAL
35	VCI	POWER SUPPLY FOR ANALOG
36	NC	NOT CONNECTION
37	YU	TOP PANEL
38	XR	RIGHT PANEL
39	YD	BOTTOM PANEL
40	XL	LEFT PANEL
		TOUCH PANEL INTERFACE SIGNALS

1.1. POWER SUPPLY

1.1.1 POWER SUPPLY FOR LCM



LCD MODULE

NOTE :  $IOVCC \leq VCI$

12. TOUCH PANEL SPECIFICATION

12.1 ELECTRICAL CHARACTERISTICS

Ta = 25°C

ITEM	CONDITION	SPEC.	UNIT
LINEARITY	—	≤ 1.5	%
TRANSMISSION	ASTM D1003	Min 80	%
TERMINAL RESISTANCE	X AXIS	200 ~ 900	Ω
	Y AXIS	200 ~ 900	
INSULATION RESISTANCE	DC25V	≥ 20	MΩ

12.2 ABSOLUTE MAXIMUM RATINGS :

ITEM	MIN.	TYP.	MAX.
OPERATING TEMPERATURE (Top)	-30°C	—	70°C
STORAGE TEMPERATURE (Tst)	-40°C	—	+80°C
INPUT VOLTAGE ( V )	—	5	—

12.3 PRECAUTIONS IN USE OF TOUCH PANEL

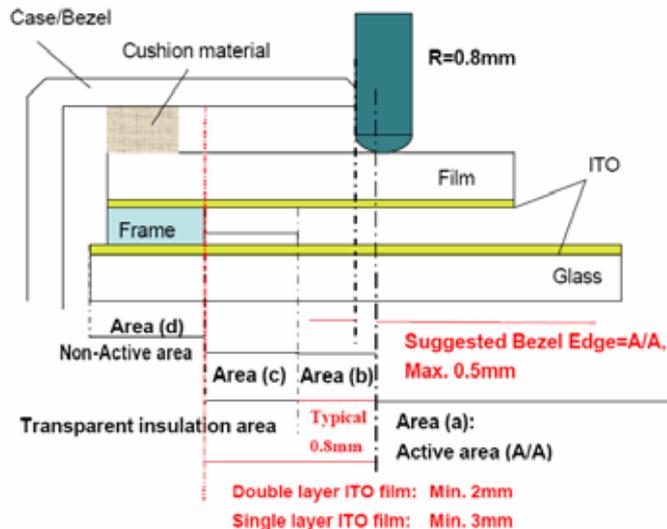
12.3.1 PURPOSE :

IN ORDER TO PREVENT ACCIDENTAL USE AND PERFORMANCE DETERIORATION, PLEASE KEEP THE FOLLOWING PRECAUTIONS AND INHIBITED POINTS.

12.3.2 ITEM AND ILLUSTRATION :

( 1 ) STRUCTURE, AREA DEFINITION

THE STRUCTURE AND THE PERFORMANCE GUARANTEED AREA OF THIS TOUCH PANEL ARE DEFINED BELOW :



THE ABOVE FIGURE IS OUR DESIGN RULE OF TOUCH PANEL. IF IT CANNOT MEET YOUR REQUIREMENT, PLEASE CONTACT WITH OUR ENGINEERS FOR FURTHER DISCUSSION.

ABOVE FIGURE ILLUSTRATES THE RECOMMENDED BEZEL AND CUSHION DESIGN. IN ORDER TO PREVENT UNUSUAL PERFORMANCE DEGRADATION AND MALFUNCTION OF A TOUCH PANEL, PLEASE CARRY OUT THE SET CASE DESIGNING AND A TOUCH PANEL ASSEMBLING METHOD AFTER SURELY CONSIDERING THE DEFINITION OF EACH AREA ILLUSTRATED IN ABOVE FIGURE.

**AREA(a) : ACTIVE AREA**

THE ACTIVE AREA IS GUARANTEED THE POSITION DATA DETECTABLE PRECISION, OPERATION FORCE AND OTHER OPERATIONS. IT IS STRONGLY RECOMMENDED TO PLACE THE OPERATION BUTTON OR MENU KEYS WITHIN THE ACTIVE AREA. DUE TO STRUCTURE, THE ACTIVE AREA IS LESS DURABLE AT THE EDGE OR CLOSE TO THE EDGE.

**AREA(b) : OPERATION NON-GUARANTEED AREA**

THIS AREA DOES NOT GUARANTEE A TOUCH PANEL OPERATION AND ITS FUNCTION. WHEN THIS AREA IS PRESSED, TOUCH PANEL SHOWS DEGRADATION OF ITS PERFORMANCE AND DURABILITY SUCH AS A PEN SLIDING DURABILITY BECOMES ABOUT ONE-TENTH COMPARED WITH THE ACTIVE AREA (AREA-(A) AS GUARANTEED AREA) AND ITS OPERATION FORCE REQUIRES ABOUT DOUBLE. ABOUT 0.5 MM OUTSIDE FROM A BOUNDARY OF THE ACTIVE AREA CORRESPONDS TO THIS AREA.

**AREA(c) : PRESSING PROHIBITION AREA**

THE AREA WHICH FORBIDS PRESSING, BECAUSE AN EXCESSIVE LOAD IS APPLIED TO A TRANSPARENT ELECTRODE (ITO) AND A SERIOUS DAMAGE IS GIVEN TO A TOUCH PANEL FUNCTION BY PRESSING.

**AREA(d) : NON-ACTIVE AREA**

THE AREA DOES NOT ACTIVATE EVEN IF PRESSED.

**( 2 ) CAUTIONS FOR INSTALLING AND ASSEMBLING**

( i ) DO NOT GIVE EXCESSIVE STRAIN TO THE PRODUCT.

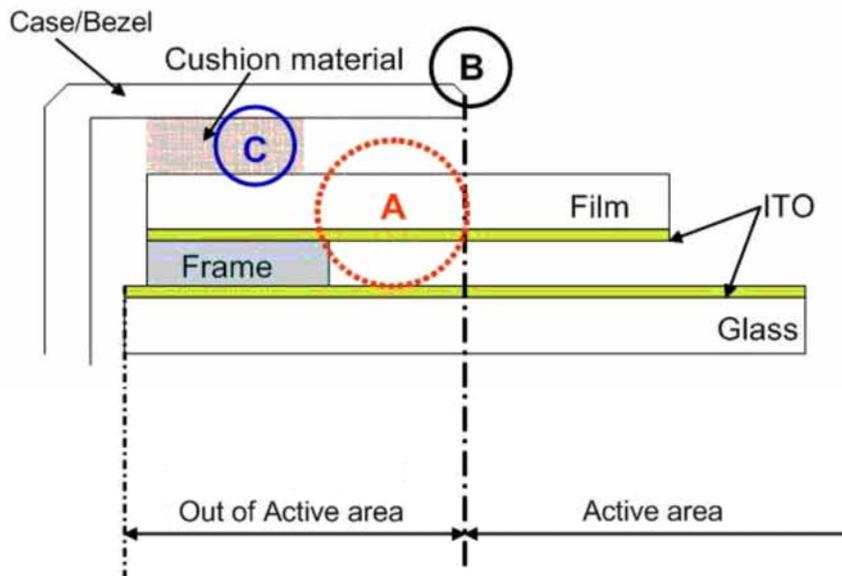
( ii ) FLEXIBLE PATTERN CABLE IS CONNECTED TO THE BODY BY THERMAL PRESSURE METHOD. SO, DO NOT APPLY EXCESSIVE FORCES TO THE FLEXIBLE PATTERN. DO NOT ADD AN EXCESSIVE FORCE TO A FPC (FLEX TAIL) THAT MAKES PEELING OFF OF THE FPC FROM THE PRODUCT. DO NOT FIX, ADHERE OR MOUNT ANY ADDITIONAL GOODS ON THE FPC SUCH AS ADDITIONAL FILM/PLATE ON THE FPC, BECAUSE SUCH ADDITIONAL GOODS WILL APPLY A STRESS AT THE FPC BONDING AREA. IT MAY AFFECT THE CONDUCTIVITY OF FPC WITH TOUCH PANEL.

( iii ) IN ORDER NOT TO APPLY LOAD ON THE DISPLAY, PROVIDE A CLEARANCE OF AT LEAST 0.3MM BETWEEN THE PRODUCT AND DISPLAY.

( iv ) WE RECOMMEND THE DESIGN OF A CASE OR BEZEL SHOULD COVERS THE BOUNDARY OF THE ACTIVE AREA INSIDE IN ORDER TO PREVENT AN OPERATION AT OUTSIDE OF THE ACTIVE AREA WHICH CAN NOT GUARANTEE THE FUNCTION OR DURABILITY.

BEZEL'S EDGE PART MAY GUIDE THE PEN SLIDING ON THE SAME POSITION REPEATEDLY. IF THE BEZEL IS PLACED OUTSIDE OF THE ACTIVE AREA, IT MAY CAUSE THE DAMAGE OF THE ITO FILM.

- (v) PRESSING INSIDE OF BOUNDARY OF THE FRAME(PART (A) AS SHOWN IN BELOW) MAY CAUSES FAULT OPERATION, SO PLEASE DESIGN TO AVOID PRESSING OF TOUCH PANEL AT PART (A) SUCH AS HAVING GASKET/CUSHION AT PART (C). PARTICULARLY THE AREA (B) SHALL BE FREE FROM BURR. THE GASKET/CUSHION MATERIAL AT THE PART (C) SHOULD NOT BE EXCEEDED TO INSIDE OF THE BOUNDARY OF THE FRAME.



- (vi) TO PREVENT GIVING DISTORTION TO THE FILM OF THE PRODUCT AND PEELING OFF OF THE FILM FROM THE PRODUCT, DO NOT FIX THE FILM AND A SET CASE OR A SHOCK ABSORBING MATERIAL ADHERED TO A SET CASE BY ADHESION.
- (vii) WIPE OFF THE STAIN ON THE PRODUCT BY USING SOFT CLOTH MOISTENED WITH ETHANOL. TAKE CARE NOT TO ALLOW ETHANOL TO SOAK INTO THE JOINT OF UPPER FILM AND BOTTOM GLASS. IT MAY OTHERWISE CAUSE PEELING OR DEFECTIVE OPERATION. DO NOT USE ANY ORGANIC SOLVENT OR DETERGENT OTHER THAN ETHANOL.
- (viii) THE CORNERS OF THE PRODUCT ARE NOT CHAMFERED AND ARE SHARP. WHEN POSITIONING AND FIXING THE PRODUCT ON THE CASE, PROVIDE A ROUND PART ON THE CORNER OF THE CASE SO AS NOT TO APPLY LOAD ON THE CORNER OF THE TRANSPARENT TOUCH PANEL.
- (ix) DO NOT PRESS THE FILM OF THE PRODUCT WHEN THIS PRODUCT IS BUILT INTO A SET.
- (3) CAUTIONS FOR OPERATION
- (i) OPERATE IT WITH A POLYACETAL PEN (TIP R0.8 OR OVER) OR A BELLY OF A FINGER WITHOUT APPLYING EXCESSIVE LOAD. NEVER USE ANY MECHANICAL PENCILS, BALL POINT PENS AND HARD FINGERTIPS WHOSE TIP IS HARD FOR INPUT, OTHERWISE MALFUNCTIONS MAY RESULT.

- (ii) THE INPUT POSITION MAY BE FLUCTUATED A LITTLE THROUGH LONG-TIME USE. IT IS DESIRABLE TO PROVIDE A ZERO-ADJUSTMENT FUNCTION BY USING A CIRCUIT AND SOFTWARE.
- (iii) OPERATION AT THE OUT OF ACTIVE AREA IS OUT OF OUR GUARANTEE. IT CAUSES A SERIOUS DAMAGE OF A TRANSPARENT ELECTRODE. DO NOT OPERATE AT THE OUT OF ACTIVE AREA.
- (iv) IN CASE OF CLEANING THE PART OF THE CASE BOUNDARY OF ACCOMPLISHED SET, USE A SOFT CLOTH WITH A FINGER BERRY OR A COTTON BUD. DO NOT CLEAN WITH A THING OTHER THAN THE FINGER SUCH AS HARD OR SHARP EDGES LIKE A FINGER NAIL ETC. ON THE CLOTH, BECAUSE IT CAUSE TRANSPARENT CONDUCTIVE FILM CRACKS. PLEASE ADVISE THIS PROHIBITION TO YOUR LAST CUSTOMERS.

#### 12.4 DURABILITY

##### 12.4.1 STYLUS HITTING :

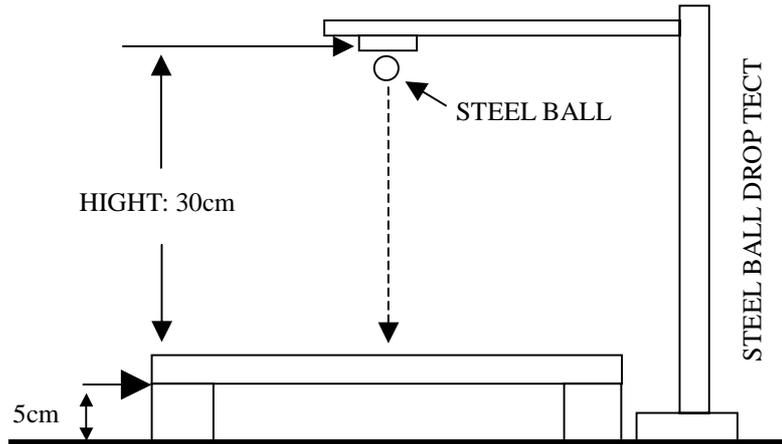
ONE MILLION TIMES OR OVER  
NO DAMAGE ON FILM SURFACE  
PEN : R8 mm SILICON RUBBER  
LOAD : 250g  
FREQUENCY : 120 times/min  
MEASUREMENT POSITION:  
1 POINT OF TOUCH PANEL ACTIVE AREA  
REPEATED : OVER 1,000,000 TIMES

##### 12.4.2 PEN TOUCH SLIDING DURABILITY :

100,000 TIMES OR OVER  
WRITING WITH R0.8mm PLASTIC STYLUS PEN; WRITING FORCE 150g  
IN ACTIVE AREA.  
SPEED IS 70mm/sec.

### 12.5 STEEL BALL DROP TEST

BY USING Ø9mm STEEL BALL FROM THE HEIGHT OF 30cm AND FALLING ON TOUCH PANEL SURFACE, MUST PASS BELOW CONDITIONS :  
APPEARANCE : THE APPEARANCE WITHOUT ANY CHANGE, INCLUDING THE PANEL BROKEN.



### 12.6 APPEARANCE INSPECTION

PURPOSE :

TO ESTABLISH APPEARANCE STANDARD AND MAINTAIN PRODUCT QUALITY.

SCOPE :

TOUCH PANEL VIEW AREA WITHIN TOUCH PANEL.

#### 12.6.1 RULE :

INSPECTION CONDITION

(A) ENVIRONMENTAL LUMINANCE : 500 LUX.

(B) DISTANCE BETWEEN HUMAN EYES AND PANEL : 30 CM

(PANEL MUST BE TESTED UNDER LIGHT TRANSPARENT).

(C) VISUAL ANGEL : > 60°.

(D) LIGHT SOURCE : FLUORESCENT LIGHT SOURCE.

#### 12.6.2 JUDGE CRITERION :

JUDGEMENT UNDER ABOVE MENTIONED CRITERION (PANEL MUST BE TESTED UNDER LIGHT TRANSPARENT),

TESTING GOODS DEFECT CAN BE VISIBLE WITHIN 10 SECONDS, WHICH WILL BE JUDGED AS MAJOR DEFECTS.

#### 12.6.3 SAMPLING STANDARD :

THE SAMPLING STANDARD WILL BE CONFIRMED BY BOTH OF EDT AND CUSTOMER.

INSPECTION ITEMS	SEPC.	JUDGE CRITERION	OPERATION GUIDELINE
SCRATCH	$W \leq 0.05\text{mm} \ \& \ L \leq 5\text{mm}$	ACCEPTABLE	
	$W > 0.05\text{mm} \ \text{or} \ L > 5\text{mm}$	NOT ACCEPTABLE	
LINEAR FOREIGN OBJECT	$W \leq 0.05\text{mm} \ \& \ L \leq 5\text{mm}$	ACCEPTABLE	
	$W > 0.05\text{mm} \ \text{or} \ L > 5\text{mm}$	NOT ACCEPTABLE	
GRANULAR FOREIGN OBJECT	$D \leq 0.20\text{mm}$	ACCEPTABLE	
	$0.20\text{mm} < D \leq 0.35\text{mm}$	MAX. 3 EA	
	$D > 0.35\text{mm}$	NOT ACCEPTABLE	
PET BUBBLES	$D \leq 0.5\text{mm}$	ACCEPTABLE	
	$D > 0.5\text{mm}$	NOT ACCEPTABLE	
CHIP ON GLASS	CORNER $X \leq 3\text{mm}, Y \leq 3\text{mm}, Z < t$ (t = thickness)	ACCEPTABLE	
	EDGE $W \leq 2\text{mm}, Y \leq 3\text{mm}, Z < t$		
FLAW	—	NOT ACCEPTABLE	

13. INSPECTION CRITERION

13.1 APPLICATION

THIS INSPECTION STANDARD IS TO BE APPLIED TO THE LCD MODULE DELIVERED FROM EMERGING DISPLAY TECHNOLOGIES CORP.( E.D.T ) TO CUSTOMERS

13.2 INSPECTION CONDITIONS

13.2.1 (1)OBSERVATION DISTANCE : 35CM±5CM

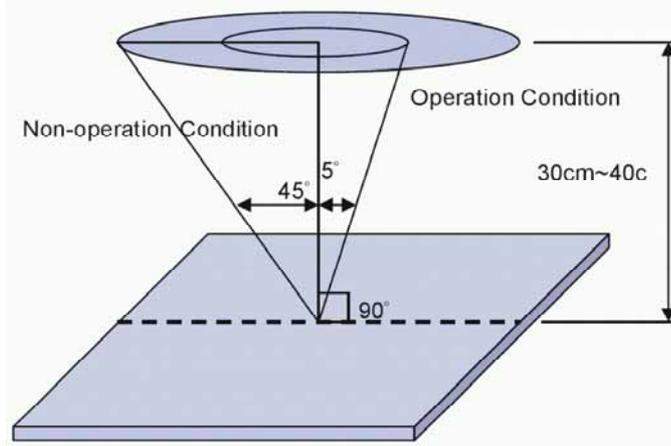
(2)VIEW ANGLE :

NON-OPERATION CONDITION : ±5°

(PERPENDICULAR TO LCD PANEL SURFACE)

OPERATION CONDITION : ±45°

(PERPENDICULAR TO LCD PANEL SURFACE)



13.2.2 ENVIRONMENT CONDITIONS :

AMBIENT TEMPERATURE		20°C~25°C
AMBIENT HUMIDITY		65±20% RH
AMBIENT ILLUMINATION	COSMETIC INSPECTION	More than 600Lux
	FUNCTIONAL INSPECTION	300~500 Lux

13.2.3 INSPECTION LOT

QUANTITY PER DELIVERY LOT FOR EACH MODEL

13.2.4 INSPECTION METHOD

A SAMPLING INSPECTION SHALL BE MADE ACCORDING TO THE FOLLOWING PROVISIONS TO JUDGE THE ACCEPTABILITY

(a)APPLICABLE STANDARD : MIL-STD-105E

NORMAL INSPECTION, SINGLE SAMPLING LEVEL

(b)AQL : MAJOR DEFECT : AQL 0.65

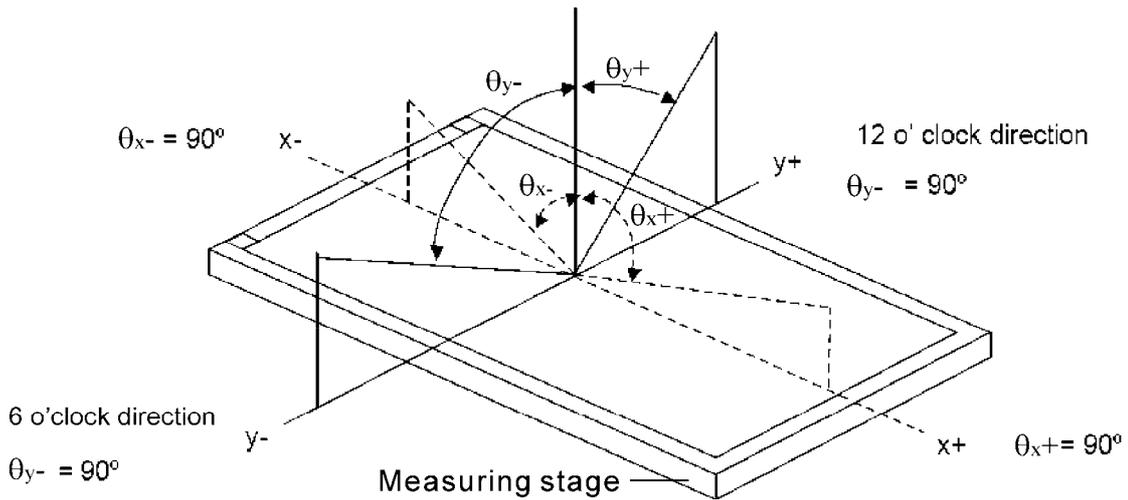
MINOR DEFECT : AQL 2.5

TOTAL DEFFCTS : AQL 2.5

13.3 DEFINITION OF OPTICAL CHARACTERISTICS

13.3.1 DEFINITION OF VIEWING ANGLE  $\theta_x$  AND  $\theta_y$

Normal  
 $\theta_x = \theta_y = 0^\circ$

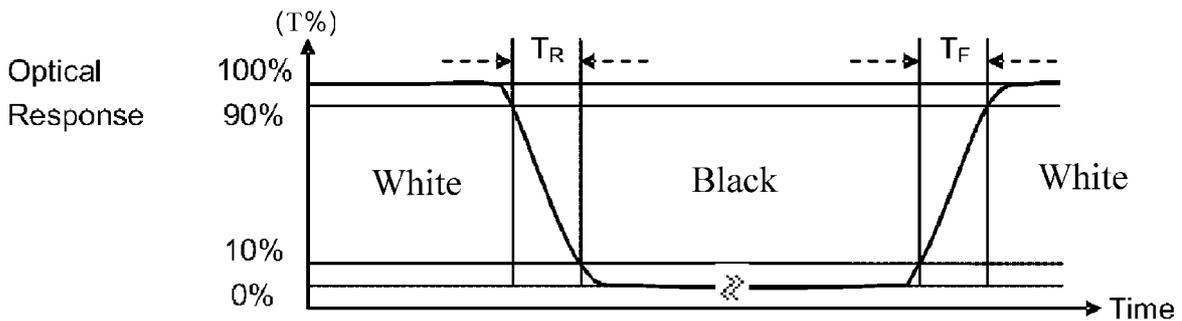


13.3.2 DEFINITION OF CONTRAST RATIO

$$\text{CONTRAST RATIO (CR)} = \frac{\text{BRIGHTNESS MEASURED WHEN LCD IS AT "WHITE STATE"}}{\text{BRIGHTNESS MEASURED WHEN LCD IS AT "BLACK STATE"}}$$

13.3.3 DEFINITION OF RESPONSE TIME : ( $T_R$  AND  $T_F$ )

THE FIGURE BELOW IS THE OUTPUT SIGNAL OF THE PHOTO DETECTOR.



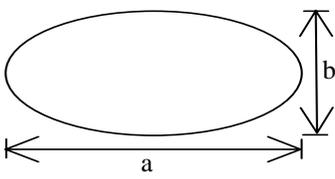
MEASURED AT THE CENTER AREA OF THE PANEL WHEN ALL THE INPUT TERMINALS OF LCD PANEL ARE ELECTRICALLY OPENED.

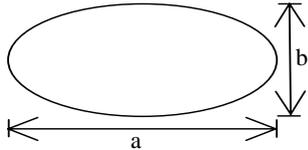
13.4 INSPECTION STANDARDS

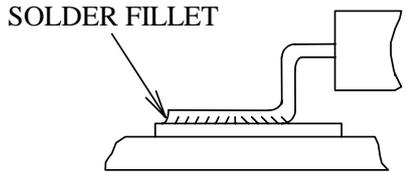
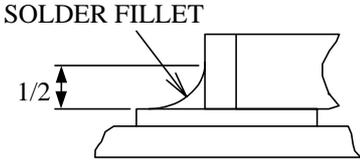
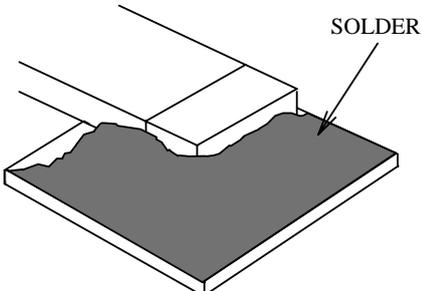
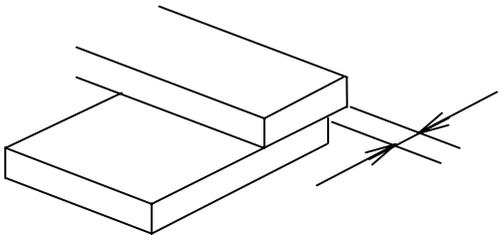
13.4.1 VISUAL DEFECTS CLASSIFICATION

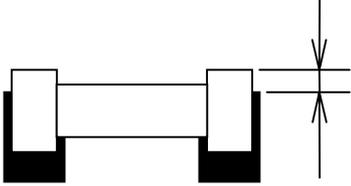
TYPE OF DEFECT	INSPECTION ITEM	DEFECT FEATURE	AQL
MAJOR DEFECT	1.DISPLAY ON	<ul style="list-style-type: none"> <li>• DEFECT TO MISS SPECIFIED DISPLAY FUNCTION , FOR ALL AND SPECIFIED DOTS</li> <li>EX : DISCONNECTION , SHORT CIRCUIT ETC</li> </ul>	0.65
	2.BACKLIGHT	<ul style="list-style-type: none"> <li>• NO LIGHT</li> <li>• FLICKERING AND OTHER ABNORMAL ILLUMINATION</li> </ul>	
	3.DIMENSIONS	<ul style="list-style-type: none"> <li>• SUBJECT TO INDIVIDUAL ACCEPTANCE SPECIFICATIONS</li> </ul>	
MINOR DEFECT	1.DISPLAY ZONE	<ul style="list-style-type: none"> <li>• BLACK/WHITE SPOT</li> <li>• BUBBLES ON POLARIZER</li> <li>• BLACK/WHITE LINE</li> <li>• SCRATCH</li> <li>• CONTAMINATION</li> <li>• LEVER COLOR SPREED</li> </ul>	2.5
	2.BEZEL ZONE	<ul style="list-style-type: none"> <li>• STAINS</li> <li>• SCRATCHES</li> <li>• FOREIGN MATTER</li> </ul>	
	3.PCB	<ul style="list-style-type: none"> <li>• CRACKS</li> <li>• SCRATCHES</li> <li>• STAINS</li> </ul>	
	4.SOLDERING	<ul style="list-style-type: none"> <li>• INSUFFICIENT SOLDER</li> <li>• SOLDERED IN INCORRECT POSITION</li> <li>• CONVEX SOLDERING SPOT</li> <li>• SOLDER BALLS</li> <li>• SOLDER SCRAPS</li> </ul>	
	5.DISPLAY ON (ALL ON)	<ul style="list-style-type: none"> <li>• LIGHT LINE</li> </ul>	

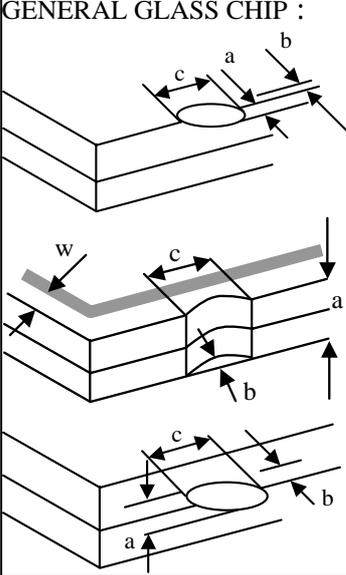
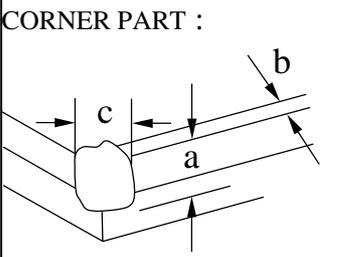
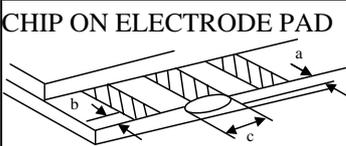
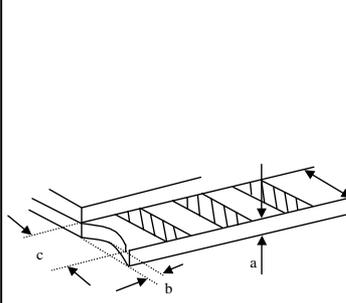
**13.4.2 MODULE DEFECTS CALSSIFICATION**

NO.	ITEM	CRITERIA												
1.	DISPLAY ON INSPECTION	(1)INCORRECT PATTERN (2)MISSING SEGMENT (3)DIM SEGMENT (4)OPERATING VOLTAGE BEYOND SPEC												
2.	OVERALL DIMENSIONS	(1)OVERALL DIMENSION BEYOND SPEC												
3.	DOT DEFECT	<p>(1) INSPECTION PATTERN: FULL WHITE, FULL BLACK, RED, GREEN AND BLUE SCREENS.</p> <p>(2)</p> <table border="1"> <thead> <tr> <th>ITEMS</th> <th>ACCEPTABLE COUNT</th> </tr> </thead> <tbody> <tr> <td>BRIGHT DOT</td> <td align="center">N ≤ 1</td> </tr> <tr> <td>DARK DOT</td> <td align="center">N ≤ 3</td> </tr> <tr> <td>TOAL BRIGHT AND DARK DOTS</td> <td align="center">N ≤ 3</td> </tr> </tbody> </table> <p>NOTE :</p> <p>1. THE DEFINITION OF DOT : THE SIZE OF A DEFECTIVE DOT OVER 1/2 OF WHOLE DOT IS REGARDED AS ONE DEFECTUVE DOT.</p> <p>2. BRIGHT DOT : DOTS APPEAR BRIGHT AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER BLACK PATTERN.</p> <p>3. DARK DOT : DOTS APPEAR DARK AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER PURE RED, GREEN, BLUE PICTURE.</p>	ITEMS	ACCEPTABLE COUNT	BRIGHT DOT	N ≤ 1	DARK DOT	N ≤ 3	TOAL BRIGHT AND DARK DOTS	N ≤ 3				
ITEMS	ACCEPTABLE COUNT													
BRIGHT DOT	N ≤ 1													
DARK DOT	N ≤ 3													
TOAL BRIGHT AND DARK DOTS	N ≤ 3													
4.	FOREIGN BLACK/WHITE/ BRIGHT LINE/ SCRATCH OF VIEWING AREA	<table border="1"> <thead> <tr> <th>LENGTH : L</th> <th>WIDTH : W</th> <th>PERMISSIBLE NO.</th> </tr> </thead> <tbody> <tr> <td align="center"><math>L \leq 0.3</math></td> <td align="center"><math>W \leq 0.05</math></td> <td align="center">IGNORE</td> </tr> <tr> <td align="center"><math>0.3 &lt; L \leq 2</math></td> <td align="center"><math>0.05 &lt; W \leq 0.1</math></td> <td align="center">3</td> </tr> <tr> <td align="center"><math>2 &lt; L</math></td> <td align="center"><math>0.1 &lt; W</math></td> <td align="center">NONE</td> </tr> </tbody> </table> <p>WIDTH : W mm, LENGH : L mm</p>	LENGTH : L	WIDTH : W	PERMISSIBLE NO.	$L \leq 0.3$	$W \leq 0.05$	IGNORE	$0.3 < L \leq 2$	$0.05 < W \leq 0.1$	3	$2 < L$	$0.1 < W$	NONE
LENGTH : L	WIDTH : W	PERMISSIBLE NO.												
$L \leq 0.3$	$W \leq 0.05$	IGNORE												
$0.3 < L \leq 2$	$0.05 < W \leq 0.1$	3												
$2 < L$	$0.1 < W$	NONE												
5.	FOREIGN MATTER \ BLACK SPOTS \ WHITE SPOTS \ DENT (INCLUDING LIGHT LEAKAGE DUE TO POLARIZING PLATES PINHOLES, ETC.)	<table border="1"> <thead> <tr> <th>AVERAGE DIAMETER (mm): D</th> <th>NUMBER OF PIECES PERMITTED</th> </tr> </thead> <tbody> <tr> <td align="center"><math>D \leq 0.1</math></td> <td align="center">IGNORE</td> </tr> <tr> <td align="center"><math>0.1 &lt; D \leq 0.3</math></td> <td align="center">3</td> </tr> <tr> <td align="center"><math>0.3 &lt; D</math></td> <td align="center">NONE</td> </tr> </tbody> </table> <p>NOTE : DIAMETER <math>D=(a+b)/2</math></p> 	AVERAGE DIAMETER (mm): D	NUMBER OF PIECES PERMITTED	$D \leq 0.1$	IGNORE	$0.1 < D \leq 0.3$	3	$0.3 < D$	NONE				
AVERAGE DIAMETER (mm): D	NUMBER OF PIECES PERMITTED													
$D \leq 0.1$	IGNORE													
$0.1 < D \leq 0.3$	3													
$0.3 < D$	NONE													

NO.	ITEM	CRITERIA		
			AVERAGE DIAMETER (mm) : D	NUMBER OF PIECES PERMITTED
6.	BUBBLES OF POLARIZER /DIRT/CF FAIL /SURFACE STAINS	BUBBLE ON THE POLARIZER	$D \leq 0.25$	LGNORE
			$0.25 < D \leq 0.5$	$N \leq 5$
			$0.5 < D$	NOTE
		SURFACE STATUS	$D < 0.1 \text{ mm}$	IGNORE
			$0.1 < D \leq 0.3\text{mm}$	$N \leq 3$
		CF FAIL / SPOT	$D < 0.1 \text{ mm}$	IGNORE
$0.1 < D \leq 0.3\text{mm}$	$N \leq 3$			
		<p>NOTE : (1)POLARIZER BUBBLE IS DEFINED AS THE BUBBLE APPEARS ON ACTIVE DISPLAY AREA. THE DEFECT OF POLARIZER BUBBLE SHALL BE IGNORED IF THE POLARIZER BUBBLE APPEARS ON THE OUTSIDE OF ACTIVE DISPLAY AREA.</p> <p>(2)THE EXTRANEIOUS SUBSTANCE IS DEFINED AS IT CAN BE OBSERVED WHEN THE MODULE IS POWER ON.</p> <p>(3)THE DEFINITION OF AVERAGE DIAMETER, D IS DEFINED AS FOLLOWING.</p> <p>AVERAGE DIAMETER (D)=(a+b)/2</p> 		
7.	LINE DEFECT ON DISPLAY	OBVIOUS VERTICAL OR HORIZONTAL LINE DEFECT IS NOT ALLOW		
8.	MURA ON DISPLAY	IT'S OK IF MURA IS SLIGHT VISIBLE THROUGH 6% ND FILTER		
9.	UNEVEN COLOR SPREAD, COLORATION	(1)TO BE DETERMINED BASED UPON THE STANDARD SAMPLE.		
10.	BEZEL APPEARANCE	(1)BEZEL MAY NOT HAVE RUST, BE DEFORMED OR HAVE FINGER PRINTS STAINS OF OTHER CONTAMINATION. (2)BEZEL MUST COMPLY WITH JOB SPECIFICATIONS.		
11	PCB	<p>(1)THERE MAY NOT BE MORE THAN 2mm OF SEALANT OUTSIDE THE SEAL AREA ON THE PCB, AND THERE SHOULD BE NO MORE THAN THREE PLACES.</p> <p>(2)NO OXIDATION OR CONTAMINATION PCB TERMINALS.</p> <p>(3)PARTS ON PCB MUST BE THE SAME AS ON THE PRODUCTION CHARACTERISTIC CHART. THERE SHOULD BE NO WRONG PARTS, MISSING PARTS OR EXCESS PARTS.</p> <p>(4)THE JUMPER ON THE PCB SHOULD CONFORM TO THE PRODUCT CHARACTERISTIC CHART.</p> <p>(5)IF SOLDER GETS ON BEZEL TAB PADS, LED PAD, ZEBRA PAD OR SCREW HOLD PAD, MAKE SURE IT IS SMOOTHED DOWN.</p>		

NO.	ITEM	CRITERIA
12.	SOLDERING	<p>(1)NO SOLDERING FOUND ON THE SPECIFIED PLACE (2)INSUFFICIENT SOLDER</p> <p>(a)LSI, IC A POOR WETTING OF SOLDER IS BETWEEN LOWER BEND OR "HEEL" OF LEAD AND PAD</p>  <p>(b)CHIP COMPONENT SOLDER IS LESS THAN 50% OF SIDES AND FRONT FACE WETTING</p>  <ul style="list-style-type: none"> <li>SOLDER WETS 3 SIDES OF TERMINAL, BUT LESS THAN 25% OF SIDES AND FRONT SURFACE AREA ARE COVERED</li> </ul>  <p>(3)PARTS ALIGMENT (a)LSI, IC LEAD WIDTH IS MORE THAN 50% BEYOND PAD OUTLINE</p> 

NO.	ITEM	CRITERIA
12.	SOLDERING	<p>(b)CHIP COMPONENT COMPONENT IS OFF CENTER, AND MORE THAN 50% OF THE LEADS IS OFF THE PAD OUTLINE</p>  <p>(4)NO UNMELTED SOLDER PASTE MAY BE PRESENT ON THE PCB.            (5)NO COLD SOLDER JOINTS, MISSING SOLDER CONNECTIONS, OXIDATION OR ICICLE.            (6)NO RESIDUE OR SOLDER BALLS ON PCB.            (7)NO SHORT CIRCUITS IN COMPONENTS ON PCB.</p>
13.	BACKLIGHT	<p>(1)NO LIGHT            (2)FLICKERING AND OTHER ABNORMAL ILLUMINATION            (3)SPOTS OR SCRATCHES THAT APPEAR WHEN LIT MUST BE JUDGED USING LCD SPOT, LINES AND CONTAMINATION STANDARDS.            (4)BACKLIGHT DOESN'T LIGHT OR COLOR IS WRONG.</p>
14.	GENERAL APPEARANCE	<p>(1)NO OXIDATION, CONTAMINATION, CURVES OR, BENDS ON INTERFACE PIN (OLB) OF TCP.            (2)NO CRACKS ON INTERFACE PIN (OLB) OF TCP.            (3)NO CONTAMINATION, SOLDER RESIDUE OR SOLDER BALLS ON PRODUCT.            (4)THE IC ON THE TCP MAY NOT BE DAMAGED, CIRCUITS.            (5)THE UPPERMOST EDGE OF THE PROTECTIVE STRIP ON THE INTERFACE PIN MUST BE PRESENT OR LOOK AS IF IT CAUSE THE INTERFACE PIN TO SEVER.            (6)THE RESIDUAL ROSIN OR TIN OIL OF SOLDERING (COMPONENT OR CHIP COMPONENT) IS NOT BURNED INTO BROWN OR BLACK COLOR.            (7)SEALANT ON TOP OF THE ITO CIRCUIT HAS NOT HARDENED.            (8)PIN TYPE MUST MATCH TYPE IN SPECIFICATION SHEET.            (9)LCD PIN LOOSE OR MISSING PINS.            (10)PRODUCT PACKAGING MUST THE SAME AS SPECIFIED ON PACKAGING SPECIFICATION SHEET.            (11)PRODUCT DIMENSION AND STRUCTURE MUST CONFORM TO PRODUCT SPECIFICATION SHEET.            (12)THE APPEARANCE OF HEAT SEAL SHOULD NOT ADMIT ANY DIRT AND BREAK.</p>

NO.	ITEM	CRITERIA									
15.	CRACKED GLASS	<p>THE LCD WITH EXTENSIVE CRACK IS NOT ACCEPTABLE</p> <p>GENERAL GLASS CHIP :</p>  <table border="1"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t/2</math></td> <td>&lt; VIEWING AREA</td> <td><math>\leq 1/8X</math></td> </tr> <tr> <td><math>t/2 &gt; , \leq 2t</math></td> <td><math>\leq W/2</math></td> <td><math>\leq 1/8X</math></td> </tr> </tbody> </table> <p>*W=DISTANCE BETWEEN SEALANT AREA AND LCD PANEL EDGE X = LCD SIDE LENGTH t = GLASS THICKNESS</p>	a	b	c	$\leq t/2$	< VIEWING AREA	$\leq 1/8X$	$t/2 > , \leq 2t$	$\leq W/2$	$\leq 1/8X$
		a	b	c							
		$\leq t/2$	< VIEWING AREA	$\leq 1/8X$							
		$t/2 > , \leq 2t$	$\leq W/2$	$\leq 1/8X$							
<p>CORNER PART :</p>  <table border="1"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t/2</math></td> <td>&lt; VIEWING AREA</td> <td><math>\leq 1/8X</math></td> </tr> <tr> <td><math>&gt; t/2 , \leq 2t</math></td> <td><math>\leq W/2</math></td> <td><math>\leq 1/8X</math></td> </tr> </tbody> </table> <p>*W=DISTANCE BETWEEN SEALANT AREA AND LCD PANEL EDGE X = LCD SIDE LENGTH t = GLASS THICKNESS</p>	a	b	c	$\leq t/2$	< VIEWING AREA	$\leq 1/8X$	$> t/2 , \leq 2t$	$\leq W/2$	$\leq 1/8X$		
a	b	c									
$\leq t/2$	< VIEWING AREA	$\leq 1/8X$									
$> t/2 , \leq 2t$	$\leq W/2$	$\leq 1/8X$									
<p>CHIP ON ELECTRODE PAD</p>  <table border="1"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t</math></td> <td><math>\leq 0.5\text{mm}</math></td> <td><math>\leq 1/8X</math></td> </tr> </tbody> </table> <p>* X=LCD SIDE WIDTH t=GLASS THICKNESS</p>	a	b	c	$\leq t$	$\leq 0.5\text{mm}$	$\leq 1/8X$					
a	b	c									
$\leq t$	$\leq 0.5\text{mm}$	$\leq 1/8X$									
 <table border="1"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t</math></td> <td><math>\leq 1/8X</math></td> <td><math>\leq L</math></td> </tr> </tbody> </table> <p>*X=LCD SIDE WIDTH t = GLASS THICKNESS L=ELECTRODE PAD LENGTH ①IF GLASS CHIPPING THE ITO TERMINAL, OVER 2/3 OF THE ITO MUST REMAIN AND BE, INSPECTED ACCORDING TO ELECTRODE TERMINAL SPECIFICATIONS ②IF THE PRODUCT WILL BE HEAT SEALED BY THE CUSTOMER, THE ALIGNMENT MARK MUST NOT BE DAMAGED</p>	a	b	c	$\leq t$	$\leq 1/8X$	$\leq L$					
a	b	c									
$\leq t$	$\leq 1/8X$	$\leq L$									

13.5 RELIABILITY TEST

13.5.1 STANDARD SPECIFICATIONS FOR RELIABILITY OF LCD MODULE

NO	ITEM	DESCRIPTION
1	HIGH TEMPERATURE OPERATION	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +70°C FOR 240 hrs
2	LOW TEMPERATURE OPERATION	THE SAMPLE SHOULD BE ALLOWED TO STAND AT -20°C FOR 240 hrs
3	HIGH TEMPERATURE STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +80°C FOR 240 hrs
4	LOW TEMPERATURE STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT -30°C FOR 240 hrs
5	HIGH TEMPERATURE / HUMIDITY TEST	THE SAMPLE SHOULD BE ALLOWED TO STAND AT 40°C, 90% RH 240 hrs
6	HIGH TEMPERATURE / HIGH HUMIDITY STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT 40°C, 90% RH 240 hrs
7	THERMAL SHOCK ( NOT OPERATED )	THE SAMPLE SHOULD BE ALLOWED TO STAND THE FOLLOWING 10 CYCLES OF OPERATION : -30°C FOR 30 MINUTES +80°C FOR 30 MINUTES
8	ESD ( ELECTROSTATIC DISCHARGE )	AIR DISCHARGE ± 15KV CONTACT DISCHARGE ± 8KV

13.5.2 TESTING CONDITIONS AND INSPECTION CRITERIA

FOR THE FINAL TEST THE TESTING SAMPLE MUST BE STORED AT ROOM TEMPERATURE FOR 24 HOURS, AFTER THE TESTS LISTED IN TABLE 6.2 , STANDARD SPECIFICATIONS FOR RELIABILITY HAVE BEEN EXECUTED IN ORDER TO ENSURE STABILITY .

NO	ITEM	TEST MODEL	INSPECTION CRITERIA
1	CURRENT CONSUMPTION	REFER TO SPECIFICATION	THE CURRENT CONSUMPTION SHOULD CONFORM TO THE PRODUCT SPECIFICATION.
2	CONTRAST	REFER TO SPECIFICATION	AFTER THE TESTS HAVE BEEN EXECUTED , THE CONTRAST MUST BE LARGER THAN HALF OF ITS INITIAL VALUE PRIOR TO THE TESTS.
3	APPEARANCE	VISUAL INSPECTION	DEFECT FREE

12.5.3 LIFE TIME

LIFE TIME	FUNCTIONS , PERFORMANCE , APPEARANCE , ETC . SHALL BE FREE FROM REMARKABLE DETERIORATION WITHIN 50,000 HOURS UNDER ORDINARY OPERATING AND STORAGE CONDITIONS ROOM TEMPERATURE (25±10°C) , NORMAL HUMIDITY ( 45±20% RH ) , AND IN AREA NOT EXPOSED TO DIRECT SUN LIGHT. ( LIFE TIME OF BACKLIGHT , PLEASE REFER TO DATA ABOUT BACKLIGHT . )
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NOTE : FROM OUR EXPERIENCE THE LIFE TIME OF HIGH HUMIDITY OPERATION AND HIGH TEMPERATURE OPERATION AS ABOVE MENTIONED COULD BE ACHIEVED.

### 13.6 OPERATION

- 13.6.1 Do not connect or disconnect modules to or from the main system while power is being supplied .
- 13.6.2 Use the module within specified temperature ; lower temperature causes the retardation of blinking speed of the display ; higher temperature makes overall display discolor . When the temperature returns to normality , the display will operate normally .
- 13.6.3 Adjust the LC driving voltage to obtain the optimum contrast .
- 13.6.4 Power On Sequence input signals should not be supplied to LCD module before power supply voltage is applied and reaches the specified value (  $5 \pm 0.25v$  ) .  
If above sequence is not followed , CMOS LSIs of LCD modules may be damaged due to latch - up problem .

### 13.7 NOTICE

- 13.7.1 Use a grounded soldering iron when soldering connector I/O terminals . For soldering or repairing , take precaution against the temperature of the soldering iron and the soldering time to prevent peeling off the through-hole-pad .
- 13.7.2 Do not disassemble . EDT shall not be held responsible if the module is disassembled and upon the reassembly the module failed .
- 13.7.3 Do not charge static electricity , as the circuit of this module contains CMOS LSIs. A workman's body should always be static-protected by use of an ESD STRAP . Working clothes for such personnel should be of static-protected material .
- 13.7.4 Always ground the electrically-powered driver before using it to install the LCD module . While cleaning the work station by vacuum cleaner , do not bring the sucking mouth near the module ; static electricity of the electrically-powered driver or the vacuum cleaner may destroy the module .
- 13.7.5 Don't give external shock.
- 13.7.6 Don't apply excessive force on the surface.
- 13.7.7 Liquid in LCD is hazardous substance .Must not lick and swallow.  
When the liquid is attach to your,skin,cloth etc.wash it out thoroughly and immediately.
- 13.7.8 Don't operate it above the absolute maximum rating.
- 13.7.9 Storage in a clean environment , free from dust,active gas,and solvent.
- 13.7.10 Store without any physical load.
- 13.7.11 Rewiring : no more than 3 times .