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<div>CUSTOMER ACCEPTANCE SPECIFICATIONS</div>		
<div style="text-align: center;"> <div> <div>MODEL NO. :</div> <div>ET020013DMA</div> <div>(RoHS)</div> <div>FOR MESSRS :</div> </div> </div>		
<div>CUSTOMER'S APPROVAL</div> <div>DATE :</div> <div>_____</div> <div>BY :</div> <div>_____</div>		

EMERGING DISPLAY
TECHNOLOGIES CORPORATION

MODEL NO.

ET020013DMA

VERSION

P

PAGE

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RECORDS OF REVISION

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DEC.10, 2018

DATE

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PAGE
NO.

SUMMARY

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1. GENERAL SPECIFICATIONS

1.1 DATA SHEETS FOR CONTROLLER/DRIVER

PLEASE REFER TO :

SITRONIX ST7789-V2

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), BIS(2-ETHYLHEXYL) PHTHALATE (DEHP), BUTYL BENZYL PHTHALATE (BBP), DIBUTYL PHTHALATE (DBP), DIISOBUTYL PHTHALATE (DIBP).

2. MECHANICAL SPECIFICATIONS

(1) DIAGONALS	-----	2.0 inch
(2) NUMBER OF DOTS	-----	240W(RGB) * 320H DOTS
(3) MODULE SIZE	-----	38.18W * 53.32H * 2.9D mm (WITHOUT FPC)
(4) VIEWING AREA	-----	32.6W * 42.8H mm
(5) ACTIVE AREA	-----	30.6W * 40.8H mm
(6) DOT SIZE	-----	0.0425W * 0.1275H mm
(7) PIXEL SIZE	-----	0.1275W * 0.1275H mm
(8) LCD TYPE	-----	TFT , TRANSMISSIVE
(9) COLOR	-----	262K
(10) VIEWING DIRECTION	-----	12 O'CLOCK (GRAY LEVEL INVERSION)
(11) BACK LIGHT	-----	LED , COLOR : WHITE
(12) INTERFACE MODE	-----	RGB 18 BIT, PARALLEL + SPI

3. ABSOLUTE MAXIMUM RATINGS

3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS.

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	IOVCC-VSS	-0.3	4.6	V	
	VCI-VSS	-0.3	4.6	V	
INPUT VOLTAGE	VIN	- 0.3	IOVCC+0.5	V	
STATIC ELECTRICITY	—	—	—	V	NOTE (1)
LED BACKLIGHT POWER DISSIPATION	PD	—	(213.5)	mW	
LED BACKLIGHT FORWARD CURRENT	IF	—	(70)	mA	
LED BACKLIGHT REVERSE VOLTAGE	VR	—	5	V	

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

3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS .

ITEM	OPERATING		STORAGE		REMARK
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	- 2 0 °C	7 0 °C	- 3 0 °C	8 0 °C	NOTE (1) , (2)
HUMIDITY	NOTE (3)		NOTE (3)		WITHOUT CONDENSATION
VIBRATION	—	2.45 m/S ² (0.25 G)	—	11.76 m/S ² (1.2 G)	5~20Hz , 1HR 20~500Hz(20Hz) , 1HR 20~500Hz(500Hz) , 1HR X,Y,Z,TOTAL 3HR
SHOCK	—	29.4 m/S ² (3 G)	—	490 m/S ² (5 0 G)	10ms XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (1) : Ta AT -30°C : WILL BE 48HR MAX.

80°C : WILL BE 168HR MAX.

NOTE (2) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE THIS PHENOMENON IS REVERSIBLE.

NOTE (3) : Ta ≤ 60°C : 90%RH MAX .(96 HRS MAX.)

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

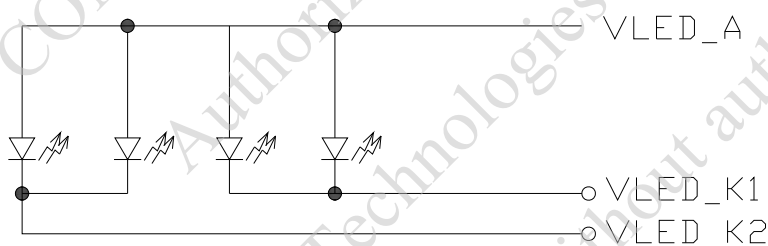
4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C, VSS=0V

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	IOVCC-VSS	—	2.5	2.8	3.3	V	
	VCI-VSS		2.5	2.8	3.3	V	
LOGIC-HIGH INPUT VOLTAGE	VIH	—	0.7IOVCC	—	IOVCC	V	
LOGIC-LOW INPUT VOLTAGE	VIL	—	VSS	—	0.3IOVCC	V	
LOGIC-HIGH OUTPUT VOLTAGE	VOH	IOH = -1.0mA	0.8IOVCC	—	IOVCC	V	
LOGIC-LOW OUTPUT VOLTAGE	VOL	IOL = +1.0mA	VSS	—	0.2IOVCC	V	
POWER SUPPLY CURRENT	ICC	—	—	(5)	(7.5)	mA	NOTE (1)
POWER SUPPLY FOR LED BACKLIGHT	VLED_A - VLED_K	IF =80 mA	—	(3.05)	(3.3)	V	NOTE (2)
LED LIFE TIME	—	ILED=20mA (PER.LED)	30K	—	—	HRS	NOTE (3) NOTE (4)

NOTE (1) : $ICC = I_{IOVCC} + I_{VCI}$

NOTE (2) : INTERNAL CIRCUIT DIAGRAM OF BACKLIGHT



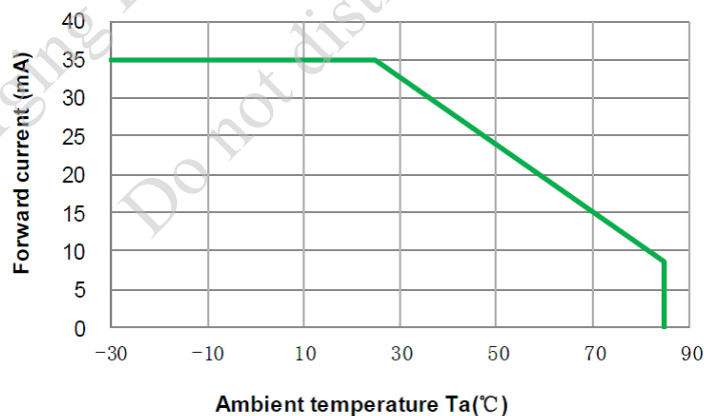
4 CHIP LED

NOTE (3) : CONDITIONS, TA=25°C, CONTINUOUS LIGHTING.

NOTE (4) : DEFINITIONS OF LIFE TIME

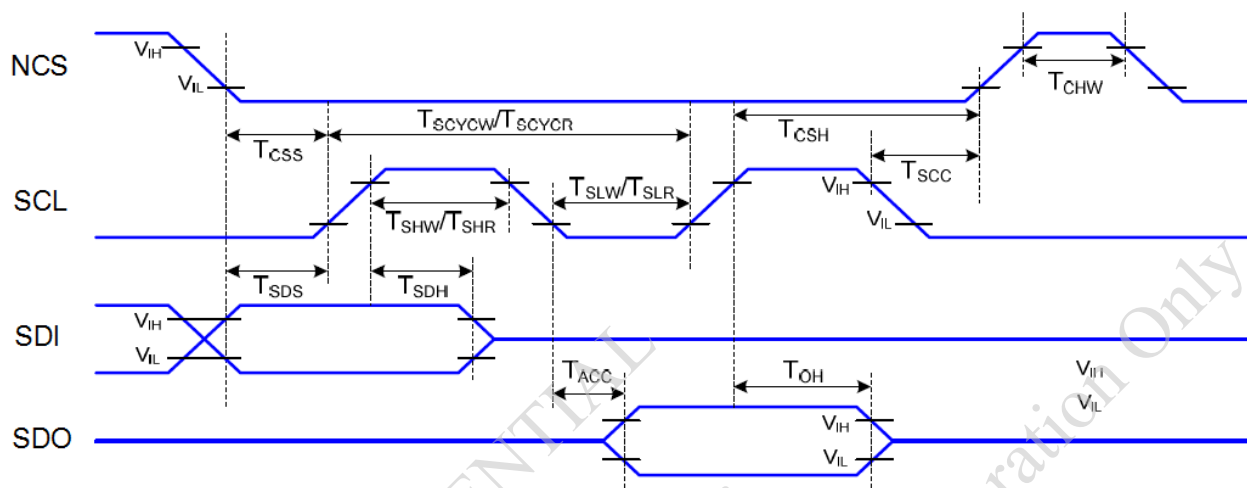
LCM LUMINANCE BECOMES HALF OF THE INITIAL VALUE.

NOTE (5) : AMBIENT TEMP. VS. ALLOWABLE FORWARD CURRENT. (PER LED)



5. TIMING CHARACTERISTICS

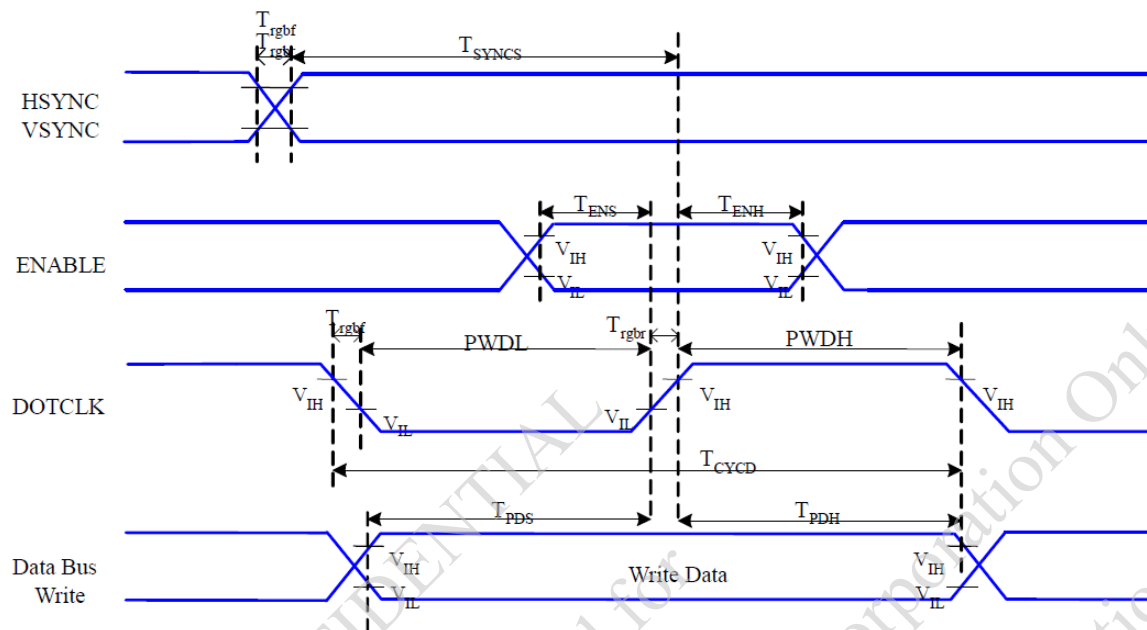
5.1 SERIAL PERIPHERAL INTERFACE TIMING CHARACTERISTICS



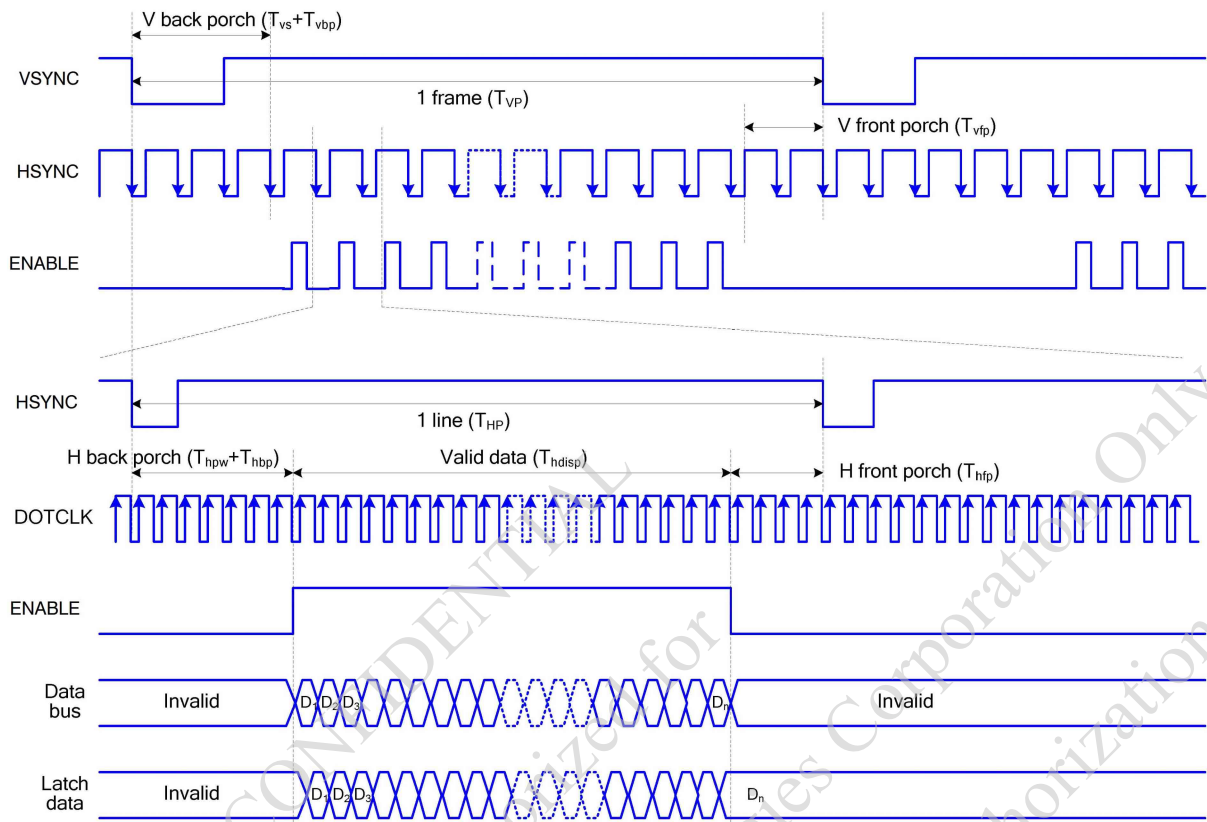
ITEM	SYMBOL	SIGNAL	MIN.	MAX.	UNIT
CHIP SELECT SETUP TIME (WRITE)	T_{CSS}	CSX	15	—	ns
CHIP SELECT HOLD TIME (WRITE)	T_{CSH}		15	—	ns
CHIP SELECT SETUP TIME (READ)	T_{CSS}		60	—	ns
CHIP SELECT HOLD TIME (READ)	T_{SCC}		65	—	ns
CHIP SELECT "H" PULSE WIDTH	T_{CHW}		40	—	ns
SERIAL CLOCK CYCLE (WRITE)	T_{SCYCW}	SCL	16	—	ns
SCL "H" PULSE WIDTH (WRITE)	T_{SHW}		7	—	ns
SCL "L" PULSE WIDTH (WRITE)	T_{SLW}		7	—	ns
SERIAL CLOCK CYCLE (READ)	T_{SCYCR}		150	—	ns
SCL "H" PULSE WIDTH (READ)	T_{SHR}		60	—	ns
SCL "L" PULSE WIDTH (READ)	T_{SLR}		60	—	ns
DATA SETUP TIME	T_{SDS}	SDI	7	—	ns
DATA HOLD TIME	T_{SDH}		7	—	ns
ACCESS TIME	T_{ACC}	SDO	10	50	ns
OUTPUT DISABLE TIME	T_{OH}		15	50	ns

NOTE : THE RISING TIME AND FALLING TIME (T_R , T_F) OF INPUT SIGNAL ARE SPECIFIED AT 15 ns OR LESS. LOGIC HIGH AND LOW LEVELS ARE SPECIFIED AS 30% AND 70% OF VCI FOR INPUT SIGNALS.

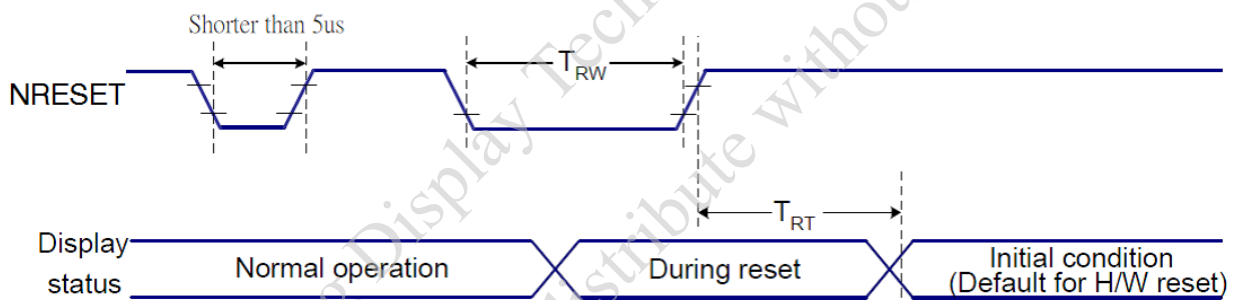
5.2 RGB INTERFACE TIMING CHARACTERISTICS



ITEM	SYMBOL	SIGNAL	MIN.	MAX.	UNIT
VSYNC, HSYNC SETUP TIME	T_{SYNCS}	HSYNC, VSYNC	30	—	ns
ENABLE SETUP TIME	T_{ENS}	ENABLE	25	—	ns
ENABLE HOLD TIME	T_{ENH}		25	—	ns
DOTCLK HIGH-LEVEL PULSE WIDTH	$PWDH$	DOTCLK	60	—	ns
DOTCLK LOW-LEVEL PULSE WIDTH	$PWDL$		60	—	ns
DOTCLK CYCLE TIME	T_{CYCD}		120	—	ns
DOTCLK RISE/FALL TIME	T_{rgbr}, T_{rgbf}		—	20	ns
PD DATA SETUP TIME	T_{PDS}	DB	50	—	ns
PD DATA HOLD TIME	T_{PDH}		50	—	ns



5.3 RESET TIMING



ITEM	SYMBOL	RELATED PINS	MIN.	MAX.	UNIT
RESET PULSE DURATION	TRW	NRESET	10	—	us
RESET CANCEL	TRT		—	5	ms
			—	120	ms

6. OPTICAL CHARACTERISTICS (NOTE 1)

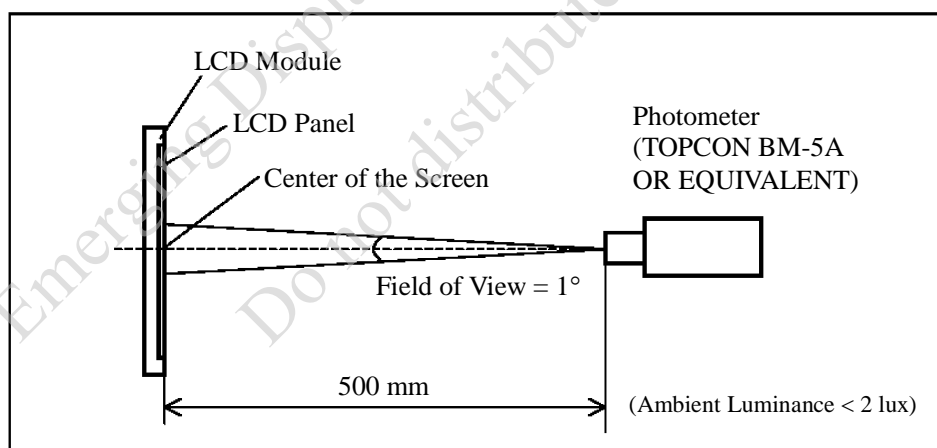
6.1 OPTICAL CHARACTERISTICS

Ta=25 °C

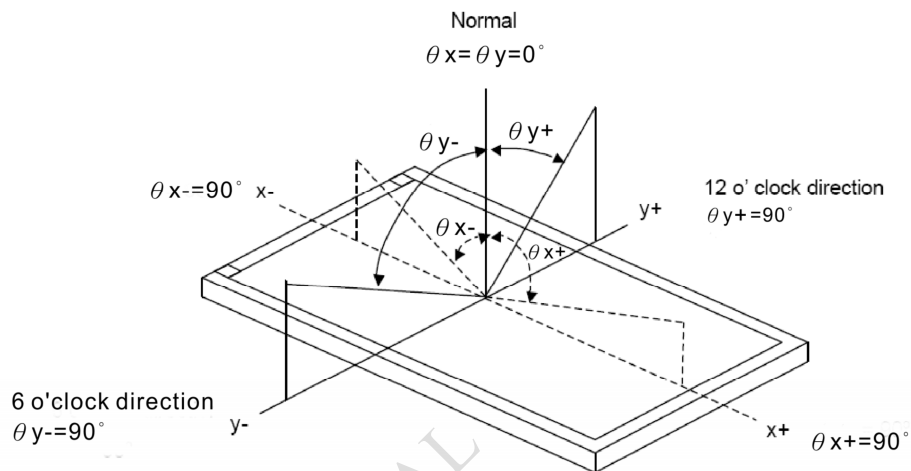
ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT	REMARK
VIEWING ANGLE		θy+	CR ≥ 10	θx = 0°	—	(80)	—	d e g .	NOTE (2) NOTE (3)
		θy-			—	(80)	—		
		θx-		θy = 0°	—	(80)	—		
		θx+			—	(80)	—		
CONTRAST RATIO (CENTER)		CR	θx = θy = 0°		(640)	(800)	—		NOTE (3)
RESPONSE TIME		T r+ T f	θx = θy = 0°		—	(30)	(40)	msec	NOTE (4)
COLOR CHROMATICITY (CENTER)	WHITE	Wx	θx = 0°,θy = 0° IF = 80mA NTSC : (54)%		(0.26)	(0.31)	(0.36)	—	NOTE (5)
		Wy			(0.28)	(0.33)	(0.38)		
	RED	Rx			(0.57)	(0.62)	(0.67)	—	
		Ry			(0.28)	(0.34)	(0.39)		
	GREEN	Gx			(0.28)	(0.33)	(0.38)	—	
		Gy			(0.55)	(0.60)	(0.65)		
	BLUE	Bx			(0.10)	(0.15)	(0.20)	—	
		By			(0.03)	(0.08)	(0.13)		
THE BRIGHTNESS OF MODULE (CENTER)		B	θx = θy = 0° IF = 80mA		(500)	—	—	cd/m²	NOTE (6)
THE BRIGHTNESS OF UNIFORMITY		—			70	75	—	%	NOTE (7)

NOTE (1) : TEST CONDITION :

AFTER STABILIZING AND LEAVING THE PANEL ALONE AT A GIVEN TEMPERATURE FOR 30 MINUTES. MEASUREMENT SHOULD BE EXECUTED IN A STABLE, WINDLESS, AND DARK ROOM.



NOTE (2) : DEFINITION OF VIEWING ANGLE :



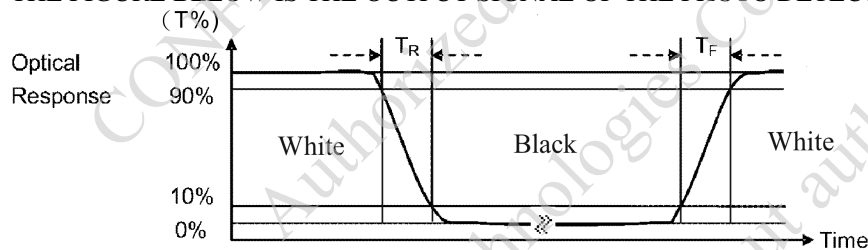
NOTE (3) : DEFINITION OF CONTRAST RATIO (CR) :

MEASURED AT THE CENTER POINT OF MODULE

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

NOTE (4) : DEFINITION OF RESPONSE TIME : T_R AND T_F

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



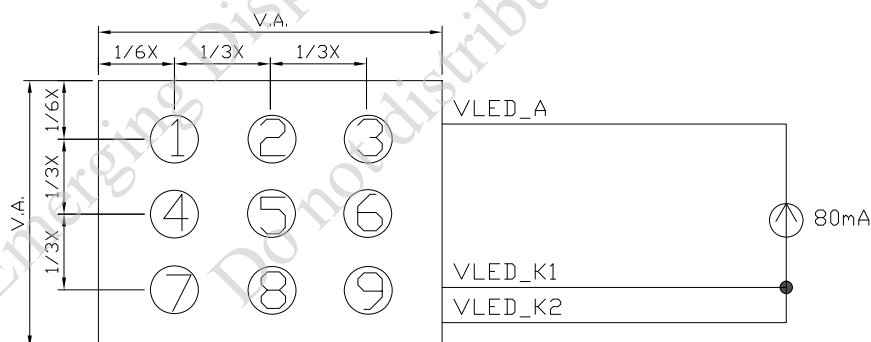
NOTE (5) : DEFINITION OF COLOR CHROMATICITY

(a)100% RGB PIXEL DATA TRANSMISSION WHEN ALL THE INPUT TERMINALS OF MODULE ARE ELECTRICALLY POWERED ON.

(b)MEASURED AT THE CENTER POINT OF MODULE

NOTE (6) : MEASURED THE BRIGHTNESS OF WHITE STATE AT CENTER POINT.

NOTE (7) : (a)DEFINITION OF BRIGHTNESS UNIFORMITY

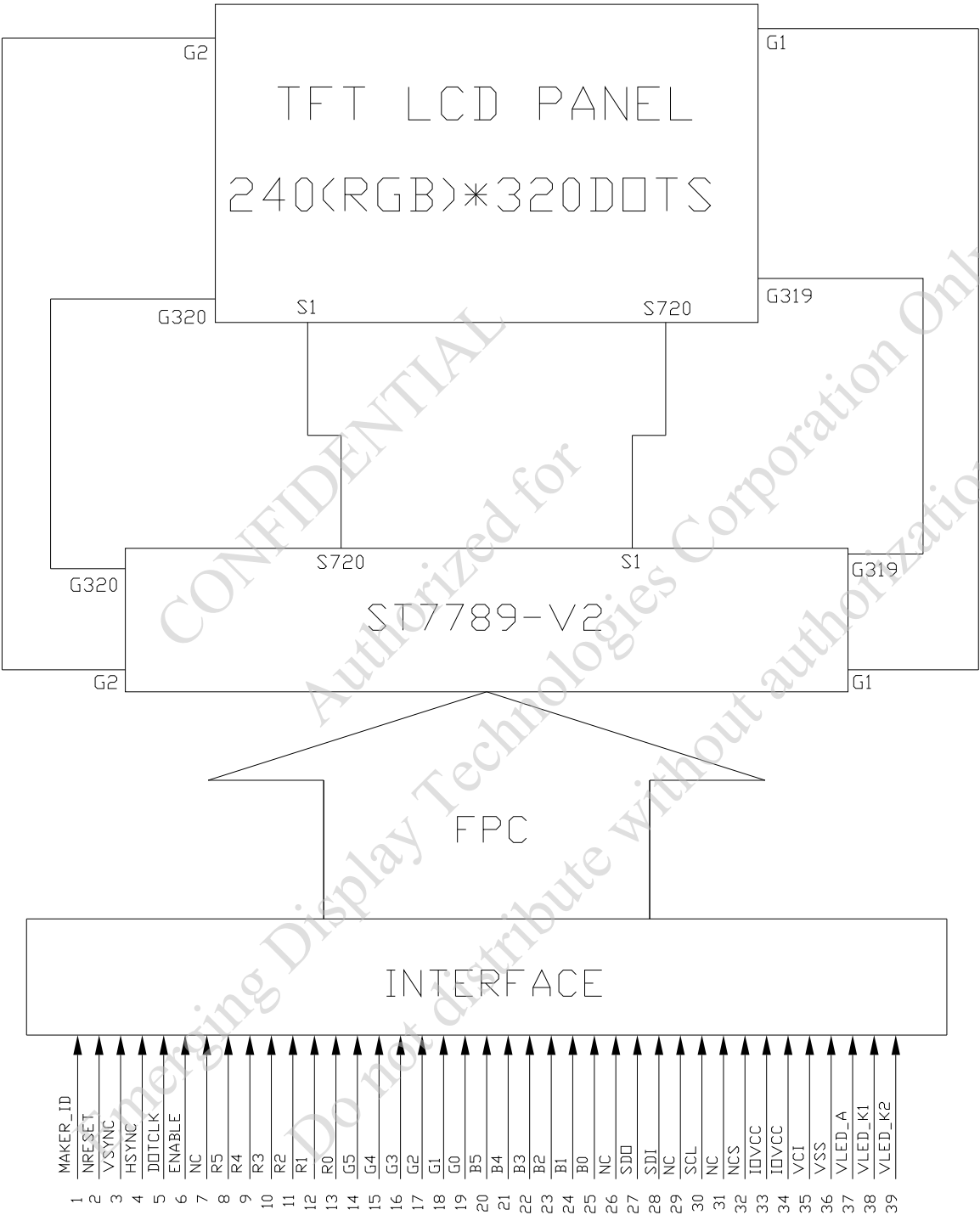


UNIT : mm

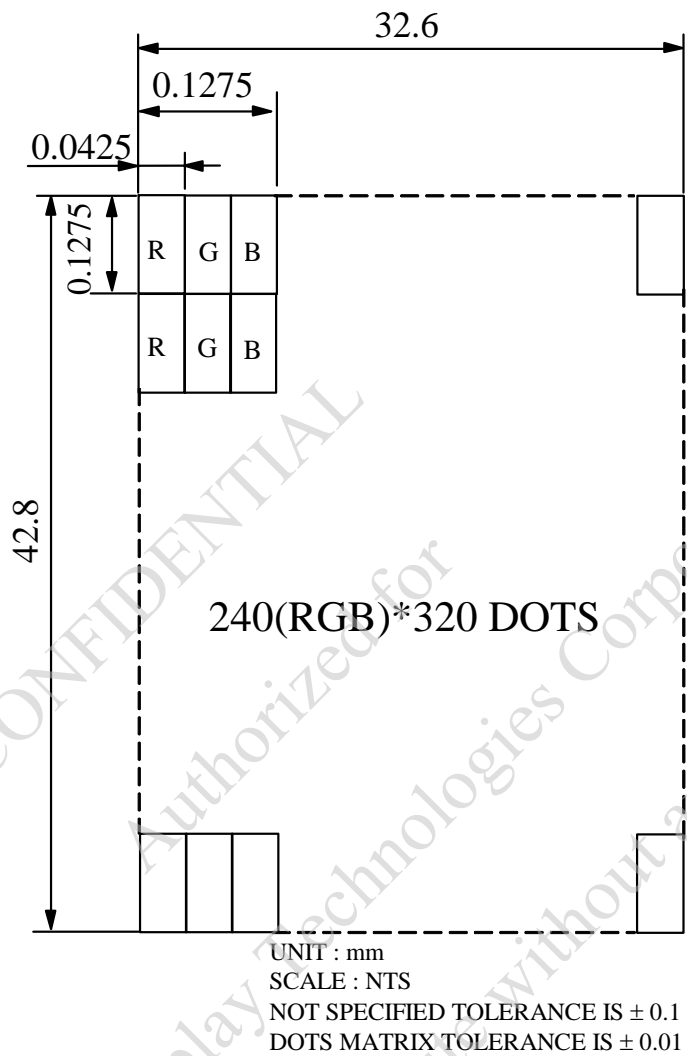
(b)THE BRIGHTNESS UNIFORMITY CALCULATING METHOD

$$\text{UNIFORMITY} : \frac{\text{MINIMUM BRIGHTNESS}}{\text{MAXIMUM BRIGHTNESS}} * 100\%$$

8. BLOCK DIMENSION



9. DETAIL DRAWING OF DOT MATRIX



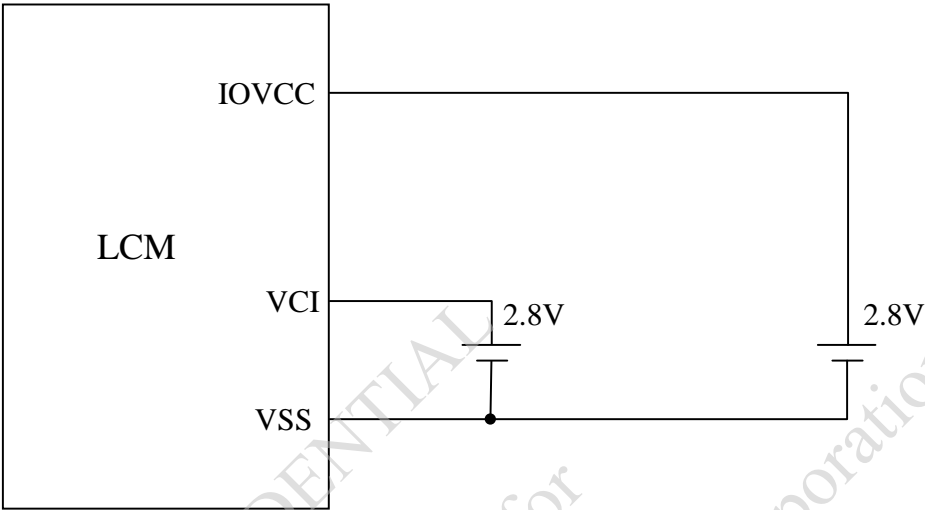
10. INTERFACE SIGNALS

PIN NO.	SYMBOL	FUNCTION
1	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".
2	NRESET	RESET
3	VSYNC	VERTICAL SYNCHRONIZING SIGNAL IN RGB INTERFACE. HAS TO BE FIXED TO IOVCC LEVEL IF IT IS NOT USED.
4	HSYNC	HORIZONTAL SYNCHRONIZING SIGNAL. HAS TO BE FIXED TO IOVCC LEVEL IF IT IS NOT USED.
5	DOTCLK	PIXEL CLOCK SIGNAL IN RGB INTERFACE. HAS TO BE FIXED TO VSS LEVEL IF IT IS NOT USED.
6	ENABLE	DATA ENABLE SIGNAL IN RGB INTERFACE. HAS TO BE FIXED TO VSS LEVEL IF IT IS NOT USED.
7	NC	NOT CONNECTED
8	R5	INPUT DATA BUS IF NOT USED, PLEASE FIX THIS PIN AT GND LEVEL.
9	R4	
10	R3	
11	R2	
12	R1	
13	R0	
14	G5	
15	G4	
16	G3	
17	G2	
18	G1	
19	G0	
20	B5	
21	B4	
22	B3	
23	B2	
24	B1	
25	B0	
26	NC	NOT CONNECTED
27	SDO	SERIAL DATA OUTPUT PIN IN SERIAL BUS SYSTEM INTERFACE. THE DATA IS OUTPUTTED ON THE FALLING EDGE OF SCL SIGNAL. IF NOT USED, PLEASE LET THIS PIN FLOATING.
28	SDI	SERIAL DATA INPUT PIN IN SERIAL BUS SYSTEM INTERFACE. THE DATA IS INPUTTED ON THE RISING EDGE OF THE SCL SIGNAL. IF NOT USED, PLEASE FIX THIS PIN AT GND LEVEL.
29	NC	NOT CONNECTED

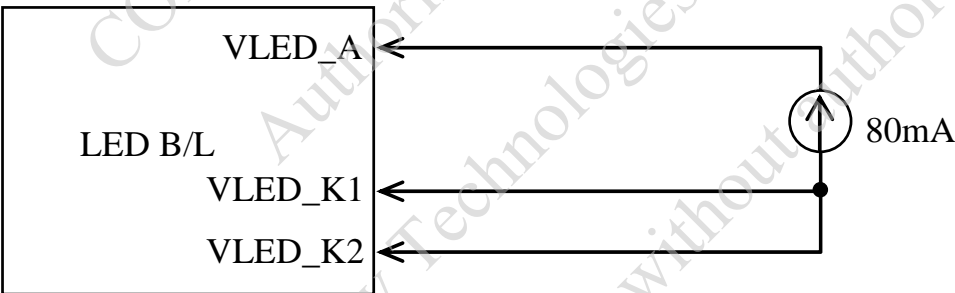
PIN NO.	SYMBOL	FUNCTION
30	SCL	(SCL) SERVER AS SERIAL DATA CLOCK IN SERIAL BUS SYSTEM INTERFACE. IF NOT USED, PLEASE FIX THIS PIN AT IOVCC OR GND LEVEL.
31	NC	NOT CONNECTED
32	NCS	CHIP SELECT INPUT PIN. LOW : CHIP CAN BE ACCESSED; HIGH : CHIP CANNOT BE ACCESSED.
33	IOVCC	POWER SUPPLY VOLTAGE FOR INTERFACE SIGNAL
34	IOVCC	POWER SUPPLY VOLTAGE FOR INTERFACE SIGNAL
35	VCI	POWER SUPPLY VOLTAGE FOR ANALOG
36	VSS	GROUND
37	VLED_A	POWER SUPPLY VOLTAGE FOR LED BACKLIGHT (A)
38	VLED_K1	POWER SUPPLY VOLTAGE FOR LED BACKLIGHT (K1).
39	VLED_K2	POWER SUPPLY VOLTAGE FOR LED BACKLIGHT (K2)

11. POWER SUPPLY

11.1 POWER SUPPLY FOR LCM



11.2 POWER SUPPLY FOR LCM BACKLIGHT



12. INSPECTION CRITERION

12.1 APPLICATION

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

12.2 INSPECTION CONDITIONS

12.2.1 (1)OBSERVATION DISTANCE : 45 ± 5 cm

(2)VIEWING ANGLE : $\pm 45^\circ$

$\pm 45^\circ$ (FOR SECTION WITHIN VIEWING AREA), REFER TO FIG.A
 90° (FOR SECTION OUTSIDE OF VIEWING AREA), REF TO FIG.B
 PERPENDICULAR TO MODULE SURFACE

VIEWING ANGLE SHOULD BE SMALLER THAN 45°

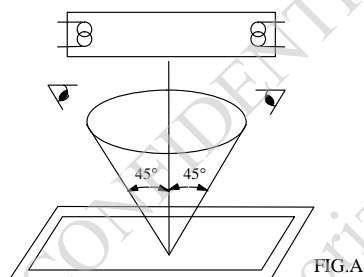


FIG.A

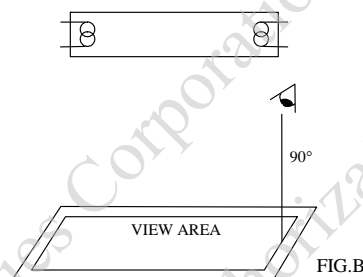


FIG.B

THE INSPECTION CRITERIA IS ACCORDING TO LINE OF SIGHT. INSPECTION SHALL BE MADE WITHIN THE HALF SECTION OF THE VIEWING CONE GENERATED BY LINE SEGMENT OF 45° WITH RESPECTS TO THE VERTICAL AXIS FROM CENTER VERTEX OF LCD, THE FLUORESCENT LAMP AND THE CONE AXIS MUST BE PERPENDICULAR TO THE LCD SURFACE.

IF THE DEFECTS ARE OUTSIDE OF VIEWING AREA, IT SHALL BE INSPECTED BY 90° WITH RESPECTS TO THE VERTICAL AXIS FROM EDGE OF VIEWING AREA.

12.2.2 ENVIRONMENT CONDITIONS :

AMBIENT TEMPERATURE		$25 \pm 5^\circ\text{C}$
AMBIENT HUMIDITY		$65 \pm 20\%\text{RH}$
AMBIENT ILLUMINATION	COSMETIC INSPECTION	600~800 lux
	FUNCTIONAL INSPECTION	300~500 lux
INSPECTION TIME		10 secs

12.2.3 INSPECTION LOT

QUANTITY PER DELIVERY LOT FOR EACH MODEL

12.2.4 INSPECTION METHOD

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

(a)APPLICABLE STANDARD :

ANSI/ ASQ Z1.4 NORMAL INSPECTION LEVEL II

(b)AQL : MAJOR DEFECT : AQL 0.65

MINOR DEFECT : AQL 1.0

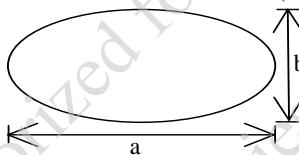
12.3 INSPECTION STANDARDS

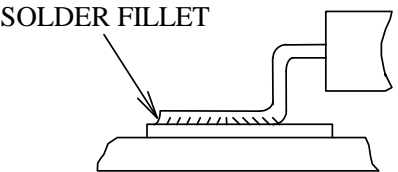
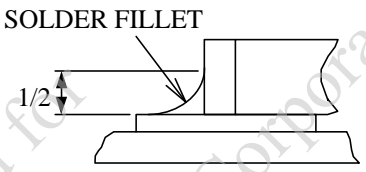
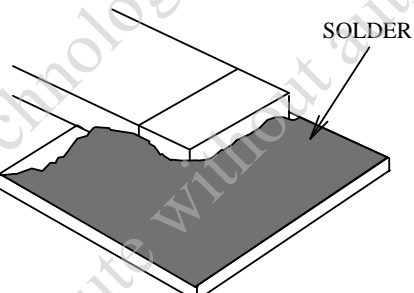
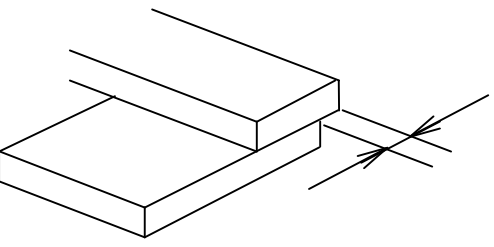
12.3.1 VISUAL DEFECTS CLASSIFICATION

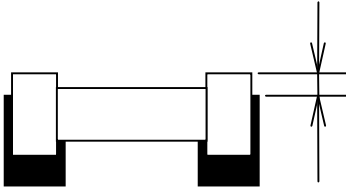
TYPE OF DEFECT	INSPECTION ITEM	DEFECT FEATURE	AQL
MAJOR DEFECT	1.DISPLAY ON	<ul style="list-style-type: none"> • DEFECT TO MISS SPECIFIED DISPLAY FUNCTION, FOR ALL AND SPECIFIED DOTS EX: DISCONNECTION , SHORT CIRCUIT ETC 	0.65
	2.BACKLIGHT	<ul style="list-style-type: none"> • NO LIGHT • FLICKERING AND OTHER ABNORMAL ILLUMINATION 	
	3.DIMENSIONS	<ul style="list-style-type: none"> • SUBJECT TO INDIVIDUAL ACCEPTANCE SPECIFICATIONS 	
MINOR DEFECT	1.DISPLAY ZONE	<ul style="list-style-type: none"> • BLACK/WHITE SPOT • BUBBLES ON POLARIZER • BLACK/WHITE LINE • SCRATCH • CONTAMINATION • LEVER COLOR SPREAD 	1.0
	2.BEZEL ZONE	<ul style="list-style-type: none"> • STAINS • SCRATCHES • FOREIGN MATTER 	
	3.SOLDERING	<ul style="list-style-type: none"> • INSUFFICIENT SOLDER • SOLDERED IN INCORRECT POSITION • CONVEX SOLDERING SPOT • SOLDER BALLS • SOLDER SCRAPS 	
	4.DISPLAY ON (ALL ON)	<ul style="list-style-type: none"> • LIGHT LINE 	

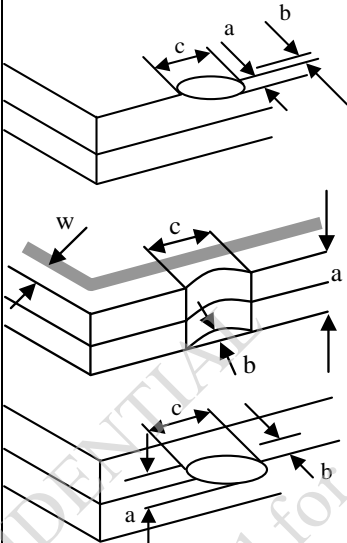
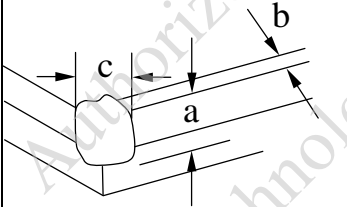

12.3.2 MODULE DEFECTS CLASSIFICATION

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	(1)INSPECTION PATTERN: FULL WHITE, FULL BLACK, RED, GREEN AND BLUE SCREENS. (2) <table><tr><th>ITEMS</th><th>ACCEPTABLE COUNT</th></tr><tr><td>BRIGHT DOT</td><td>$N \leq 1$</td></tr><tr><td>DARK DOT</td><td>$N \leq 3$</td></tr><tr><td>TOTAL BRIGHT AND DARK DOTS</td><td>$N \leq 3$</td></tr></table> NOTE : 1. THE DEFINITION OF DOT : THE SIZE OF A DEFECTIVE DOT OVER 1/2 OF WHOLE DOT IS REGARDED AS ONE DEFECTIVE DOT. 2. BRIGHT DOT : DOTS APPEAR BRIGHT AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER BLACK PATTERN. 3. DARK DOT : DOTS APPEAR DARK AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER PURE RED, GREEN, BLUE PICTURE.	ITEMS	ACCEPTABLE COUNT	BRIGHT DOT	$N \leq 1$	DARK DOT	$N \leq 3$	TOTAL BRIGHT AND DARK DOTS	$N \leq 3$				
ITEMS	ACCEPTABLE COUNT													
BRIGHT DOT	$N \leq 1$													
DARK DOT	$N \leq 3$													
TOTAL BRIGHT AND DARK DOTS	$N \leq 3$													
4	FOREIGN BLACK/WHITE/ BRIGHT LINE/ SCRATCH OF VIEWING AREA	<table><tr><th>LENGTH : L</th><th>WIDTH : W</th><th>PERMISSIBLE NO.</th></tr><tr><td>—</td><td>$W \leq 0.05$</td><td>IGNORE</td></tr><tr><td>$L \leq 3$</td><td>$0.05 < W \leq 0.1$</td><td>3</td></tr><tr><td>$3 < L$</td><td>$0.1 < W$</td><td>NONE</td></tr></table> WIDTH : W mm, LENGTH : L mm	LENGTH : L	WIDTH : W	PERMISSIBLE NO.	—	$W \leq 0.05$	IGNORE	$L \leq 3$	$0.05 < W \leq 0.1$	3	$3 < L$	$0.1 < W$	NONE
LENGTH : L	WIDTH : W	PERMISSIBLE NO.												
—	$W \leq 0.05$	IGNORE												
$L \leq 3$	$0.05 < W \leq 0.1$	3												
$3 < L$	$0.1 < W$	NONE												
5	FOREIGN MATTER \ BLACK SPOTS \ WHITE SPOTS \ DENT (INCLUDING LIGHT LEAKAGE DUE TO POLARIZING PLATES PINHOLES, ETC.)	<table><tr><th>AVERAGE DIAMETER (mm): D</th><th>NUMBER OF PIECES PERMITTED</th></tr><tr><td>$D \leq 0.15$</td><td>IGNORE</td></tr><tr><td>$0.15 < D \leq 0.3$</td><td>3</td></tr><tr><td>$0.3 < D$</td><td>NONE</td></tr></table> NOTE : DIAMETER $D=(a+b)/2$ 	AVERAGE DIAMETER (mm): D	NUMBER OF PIECES PERMITTED	$D \leq 0.15$	IGNORE	$0.15 < D \leq 0.3$	3	$0.3 < D$	NONE				
AVERAGE DIAMETER (mm): D	NUMBER OF PIECES PERMITTED													
$D \leq 0.15$	IGNORE													
$0.15 < D \leq 0.3$	3													
$0.3 < D$	NONE													

NO.	ITEM	CRITERIA																				
6	BUBBLES OF POLARIZER /DIRT/CF FAIL /SURFACE STAINS	<table><tr><td></td><td>AVERAGE DIAMETER (mm) : D</td><td>NUMBER OF PIECES PERMITTED</td></tr><tr><td rowspan="3">BUBBLE ON THE POLARIZER</td><td>$D \leq 0.25$</td><td>IGNORE</td></tr><tr><td>$0.25 < D \leq 0.5$</td><td>$N \leq 5$</td></tr><tr><td>$0.5 < D$</td><td>NONE</td></tr><tr><td rowspan="2">SURFACE STAINS</td><td>$D < 0.1$</td><td>IGNORE</td></tr><tr><td>$0.1 < D \leq 0.3$</td><td>$N \leq 3$</td></tr><tr><td rowspan="2">CF FAIL / SPOT</td><td>$D < 0.1$</td><td>IGNORE</td></tr><tr><td>$0.1 < D \leq 0.3$</td><td>$N \leq 3$</td></tr></table>		AVERAGE DIAMETER (mm) : D	NUMBER OF PIECES PERMITTED	BUBBLE ON THE POLARIZER	$D \leq 0.25$	IGNORE	$0.25 < D \leq 0.5$	$N \leq 5$	$0.5 < D$	NONE	SURFACE STAINS	$D < 0.1$	IGNORE	$0.1 < D \leq 0.3$	$N \leq 3$	CF FAIL / SPOT	$D < 0.1$	IGNORE	$0.1 < D \leq 0.3$	$N \leq 3$
			AVERAGE DIAMETER (mm) : D	NUMBER OF PIECES PERMITTED																		
		BUBBLE ON THE POLARIZER	$D \leq 0.25$	IGNORE																		
			$0.25 < D \leq 0.5$	$N \leq 5$																		
			$0.5 < D$	NONE																		
		SURFACE STAINS	$D < 0.1$	IGNORE																		
			$0.1 < D \leq 0.3$	$N \leq 3$																		
		CF FAIL / SPOT	$D < 0.1$	IGNORE																		
			$0.1 < D \leq 0.3$	$N \leq 3$																		
		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. (2)THE EXTRANEIOUS SUBSTANCE IS DEFINED AS IT CAN BE OBSERVED WHEN THE MODULE IS POWER ON. (3)THE DEFINITION OF AVERAGE DIAMETER, D IS DEFINED AS FOLLOWING. AVERAGE DIAMETER (D)=(a+b)/2																				
																						
7	LINE DEFECT ON DISPLAY	OBVIOUS VERTICAL OR HORIZONTAL LINE DEFECT IS NOT ALLOWED																				
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	(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. (2)NO OXIDATION OR CONTAMINATION PCB TERMINALS. (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. (4)THE JUMPER ON THE PCB SHOULD CONFORM TO THE PRODUCT CHARACTERISTIC CHART. (5)IF SOLDER GETS ON BEZEL TAB PADS, LED PAD, ZEBRA PAD OR SCREW HOLD PAD; MAKE SURE IT IS SMOOTHED DOWN.																				

NO.	ITEM	CRITERIA
12	SOLDERING	<p>(1)NO SOLDERING FOUND ON THE SPECIFIED PLACE</p> <p>(2)INSUFFICIENT SOLDER</p> <p>(a)LSI, IC</p> <p>A POOR WETTING OF SOLDER IS BETWEEN LOWER BEND OR "HEEL" OF LEAD AND PAD</p>  <p>(b)CHIP COMPONENT</p> <ul style="list-style-type: none"> · SOLDER IS LESS THAN 50% OF SIDES AND FRONT FACE WETTING  <ul style="list-style-type: none"> · SOLDER WETS 3 SIDES OF TERMINAL, BUT LESS THAN 25% OF SIDES AND FRONT SURFACE AREA ARE COVERED  <p>(3)PARTS ALIGNMENT</p> <p>(a)LSI, IC</p> <p>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	THE LCD WITH EXTENSIVE CRACK IS NOT ACCEPTABLE									
		GENERAL GLASS CHIP :  <table><tr><td>a</td><td>b</td><td>c</td></tr><tr><td>$\leq t/2$</td><td>< VIEWING AREA</td><td>$\leq 1/8X$</td></tr><tr><td>$t/2 > , \leq 2t$</td><td>$\leq W/2$</td><td>$\leq 1/8X$</td></tr></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	$\leq 1/8X$							
$t/2 > , \leq 2t$	$\leq W/2$	$\leq 1/8X$									
CORNER PART :  <table><tr><td>a</td><td>b</td><td>c</td></tr><tr><td>$\leq t/2$</td><td>< VIEWING AREA</td><td>$\leq 1/8X$</td></tr><tr><td>$> t/2 , \leq 2t$</td><td>$\leq W/2$</td><td>$\leq 1/8X$</td></tr></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	$\leq 1/8X$									
$> t/2 , \leq 2t$	$\leq W/2$	$\leq 1/8X$									
CHIP ON ELECTRODE PAD  <table><tr><td>a</td><td>b</td><td>c</td></tr><tr><td>$\leq t$</td><td>$\leq 0.5\text{mm}$</td><td>$\leq 1/8X$</td></tr></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><tr><td>a</td><td>b</td><td>c</td></tr><tr><td>$\leq t$</td><td>$\leq 1/8X$</td><td>$\leq L$</td></tr></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									
$\leq t$	$\leq 1/8X$	$\leq L$									

12.4 RELIABILITY TEST

12.4.1 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 / HIGH HUMIDITY STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT 60°C, 90% RH 240 HRS
6	THERMAL SHOCK (NOT OPERATED)	<p>THE SAMPLE SHOULD BE ALLOWED TO STAND THE FOLLOWING 10 CYCLES OF OPERATION :</p>
7	ESD (ELECTROSTATIC DISCHARGE) (NOT OPERATED)	<p>AIR DISCHARGE $\pm 12\text{KV}$ CONTACT DISCHARGE $\pm 8\text{KV}$ (ACCORDING TO IEC-61000-4-2)</p>

NOTE (1) : THE TEST SAMPLES HAVE RECOVERY TIME FOR 2 HOURS AT ROOM TEMPERATURE BEFORE THE FUNCTION CHECK. IN THE STANDARD CONDITIONS, THERE IS NO DISPLAY FUNCTION NG ISSUE OCCURRED.

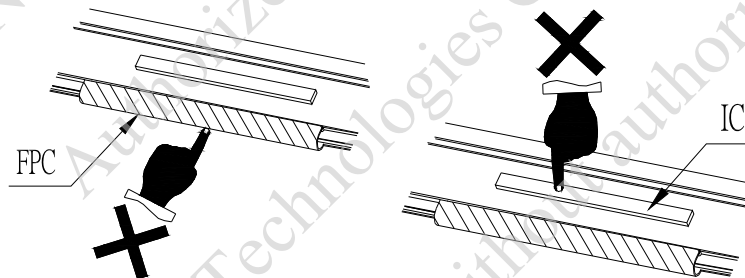
12.5 TESTING CONDITIONS AND INSPECTION CRITERIA

FOR THE FINAL TEST THE TESTING SAMPLE MUST BE STORED AT ROOM TEMPERATURE FOR 24 HOURS, AFTER THE TESTS LISTED IN TABLE 12.5, 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

12.6 OPERATION

- 12.6.1 DO NOT CONNECT OR DISCONNECT MODULES TO OR FROM THE MAIN SYSTEM WHILE POWER IS BEING SUPPLIED .
- 12.6.2 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 .
- 12.6.3 ADJUST THE LC DRIVING VOLTAGE TO OBTAIN THE OPTIMUM CONTRAST.
- 12.6.4 POWER ON SEQUENCE INPUT SIGNALS SHOULD NOT BE SUPPLIED TO LCD MODULE BEFORE POWER SUPPLY VOLTAGE IS APPLIED AND REACHES THE SPECIFIED VALUE .
IF ABOVE SEQUENCE IS NOT FOLLOWED , CMOS LSIS OF LCD MODULES MAY BE DAMAGED DUE TO LATCH - UP PROBLEM .
- 12.6.5 NOT ALLOWED TO INFLICT ANY EXTERNAL STRESS AND TO CAUSE ANY MECHANICAL INTERFERENCE ON THE BENDING AREA OF FPC DURING THE TAIL BENDING BACKWARDS!
DO NOT STRESS FPC AND IC ON THE MODULE!



12.7 NOTICE

- 12.7.1 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 .
- 12.7.2 DO NOT DISASSEMBLE . EDT SHALL NOT BE HELD RESPONSIBLE IF THE MODULE IS DISASSEMBLED AND UPON THE REASSEMBLY THE MODULE FAILED .
- 12.7.3 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 .
- 12.7.4 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 .
- 12.7.5 DON'T GIVE EXTERNAL SHOCK.
- 12.7.6 DON'T APPLY EXCESSIVE FORCE ON THE SURFACE.
- 12.7.7 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.
- 12.7.8 DON'T OPERATE IT ABOVE THE ABSOLUTE MAXIMUM RATING.
- 12.7.9 STORAGE IN A CLEAN ENVIRONMENT, FREE FROM DUST, ACTIVE GAS AND SOLVENT.
- 12.7.10 STORE WITHOUT ANY PHYSICAL LOAD.
- 12.7.11 REWIRING: NO MORE THAN 3 TIMES.