

POWERTIP CORPORATION

SPECIFICATIONS

CUSTOMER : PTC

SAMPLE CODE (Ver.) : _____
(This Code will be changed while mass production)

MASS PRODUCTION CODE (Ver.) : PG320240WRF-HNNHS5 (Rev.0)

Customer Approved

Date:

Sales Sign	QC Confirmed	Checked By	Designer

Approval For Specifications Only.

* This specification is subject to change without notice.

Please contact Powertip or it's representative before designing your product based on this specification.

Approval For Specifications and Sample.

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NO.PT-A-005-5

RECORDS OF REVISION

Date	Rev.	Description	Note	Page
2005/1/25	0	Mass Production		

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Note : For detailed information please refer to IC data sheet : SITRONIX---ST8024-F4
SITRONIX---ST8016-F3
(Or comparable IC)

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	320 * 240 Dots
LCD Type	FSTN, Positive, Transflective
Driver Condition	LCD Module: 1/240 Duty, 1/14 Bias
Viewing Direction	6 O'clock
Backlight	LED B/L
Weight	90 g
Interface	8 bits parallel data input
Driver IC	Driver IC:ST8024-F4,ST8016-F3

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	92.0 (L) * 71.3 (w) * 7.9(H)(Max)	mm
Viewing Area	78.78 (L) * 59.58 (w)	mm
Active Area	76.78 (L) * 57.58 (w)	mm
Dot Size	0.22 (L) * 0.22 (w)	mm
Dot Pitch	0.24 (L) * 0.24 (w)	mm

Note : For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	V_{DD}	—	-0.3	+7.0	V
LCD Driver Supply Voltage	V_{EE}	—	-0.3	45	V
Input Voltage	V_{IN}	—	-0.3	$V_{DD}+0.3$	V
Operating Temperature	T_{OP}	—	-20	70	°C
Storage Temperature.	T_{ST}	—	-30	80	°C
Storage Humidity	H_D	$T_a < 40\text{ °C}$	20	90	%RH

1.4 DC Electrical Characteristics

$V_{DD} = 5 V \pm 5\%$, $V_{SS} = 0V$, $T_a = 25^\circ C$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}	—	4.75	5	5.25	V
“H” Input Voltage	V_{IH}	—	$0.8 V_{DD}$	-	-	V
“L” Input Voltage	V_{IL}	—	-	-	$0.2 V_{DD}$	V
“H” Output Voltage	V_{OH}	—	$V_{DD} - 0.4$	-	-	V
“L” Output Voltage	V_{OL}	—	-	-	0.4	V
Supply current 1	I_{DD}	$V_{OP} = 20.5V$	-	0.2	0.6	mA
LCM driving voltage	V_{OP} (V_{C9})	-20°C	20.7	21.0	21.3	V
		0°C	20.2	20.5	20.8	
		25°C	20.2	20.5	20.8	
		50°C	19.8	20.1	20.4	
		70°C	18.8	19.1	19.4	

Test condition : M : 35Hz FLM : 70Hz

Note: Need to make sure that there is no flicker and ripper phenomenon when setting the frame frequency in your set .

1.5 Optical Characteristics

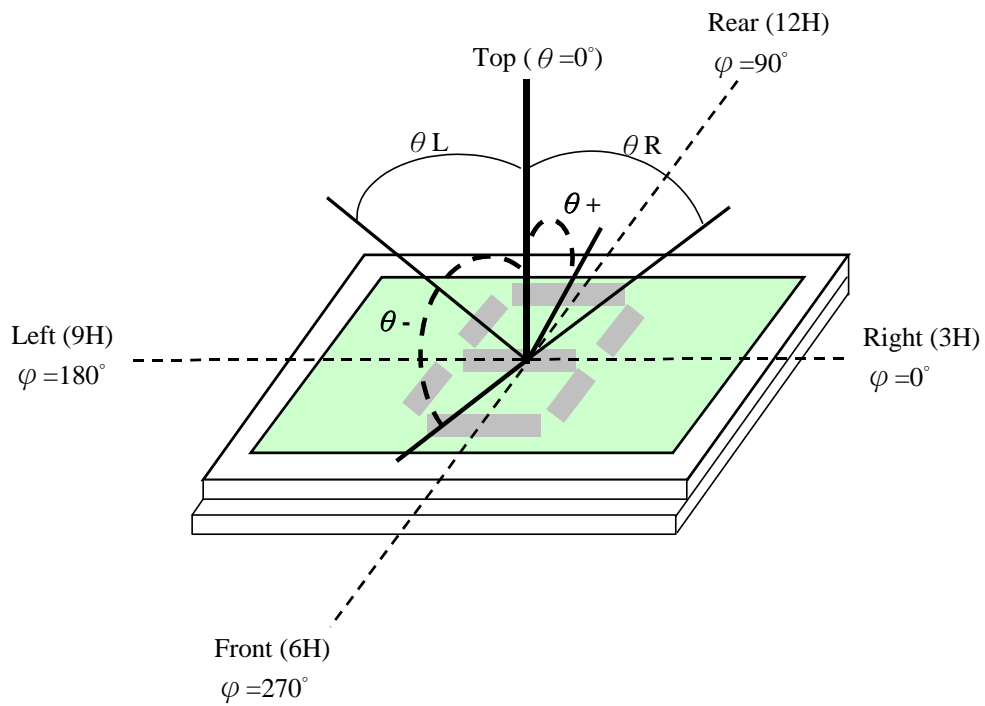
LCD Panel: 1/240 Duty, 1/15 Bias, $V_{LCD} = 22.0V$, $T_a = 25^\circ C$

Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	θ	$C \geq 2.0, \varnothing = 270^\circ$	-40°	-	40°	Notes 1
Contrast Ratio	C	$\theta = -5^\circ, \varnothing = 270^\circ$	2	3	-	Note 3
Response Time(rise)	t_r	$\theta = -5^\circ, \varnothing = 270^\circ$	-	170 ms	255 ms	Note 2
Response Time(fall)	t_f	$\theta = -5^\circ, \varnothing = 270^\circ$	-	350 ms	525 ms	

Note 1.

Optical characteristics-2

Viewing angle

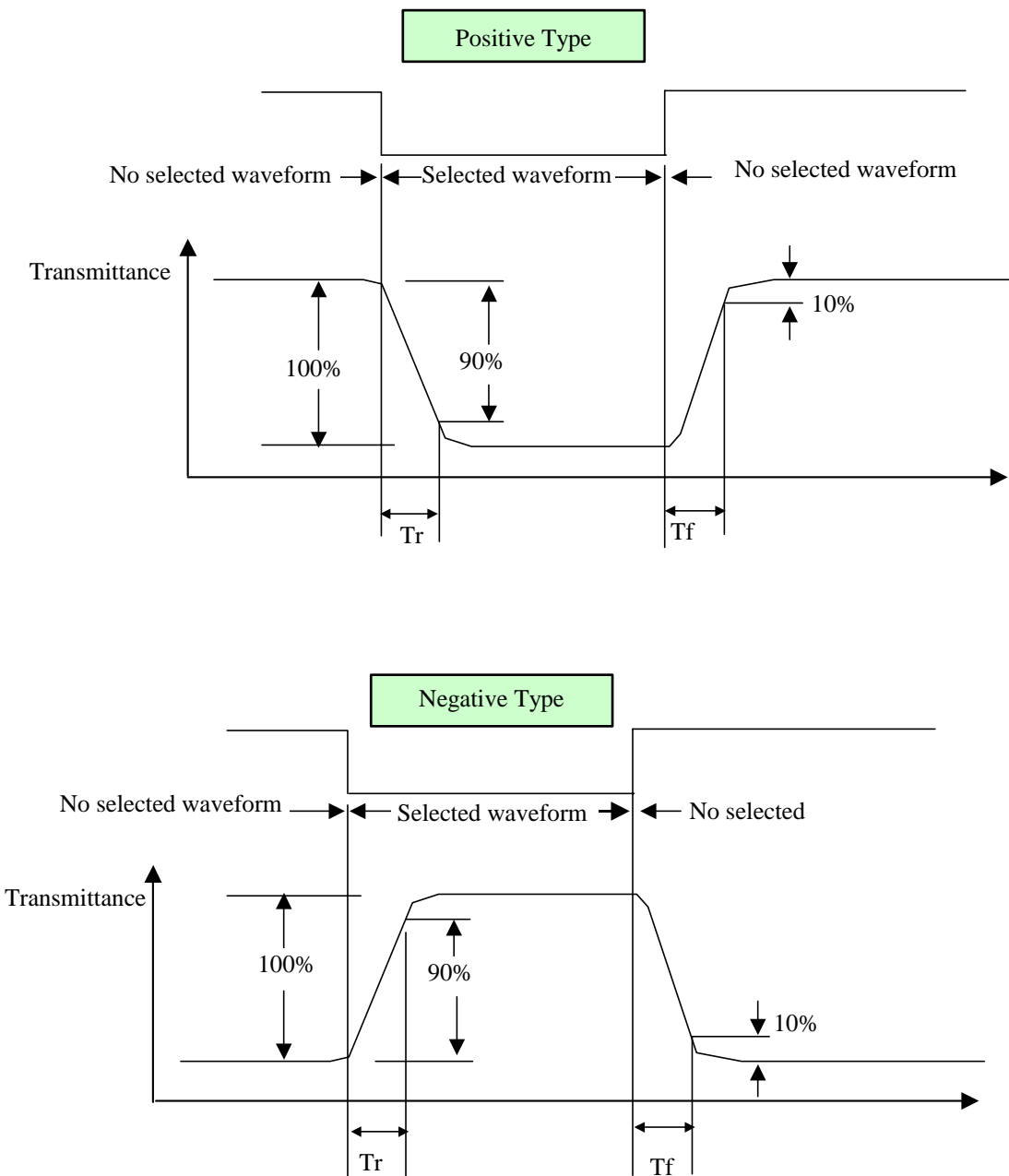


Viewing angle

Note 2.

Optical characteristics-3

Fig.2 Definition of response time



Electrical characteristics-2

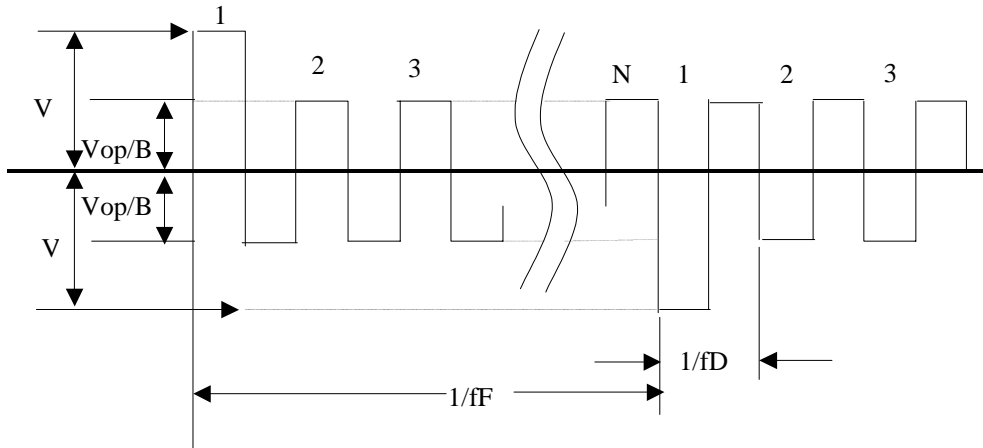
2 Drive waveform

V_{op} : Drive voltage f_F : Frame frequency

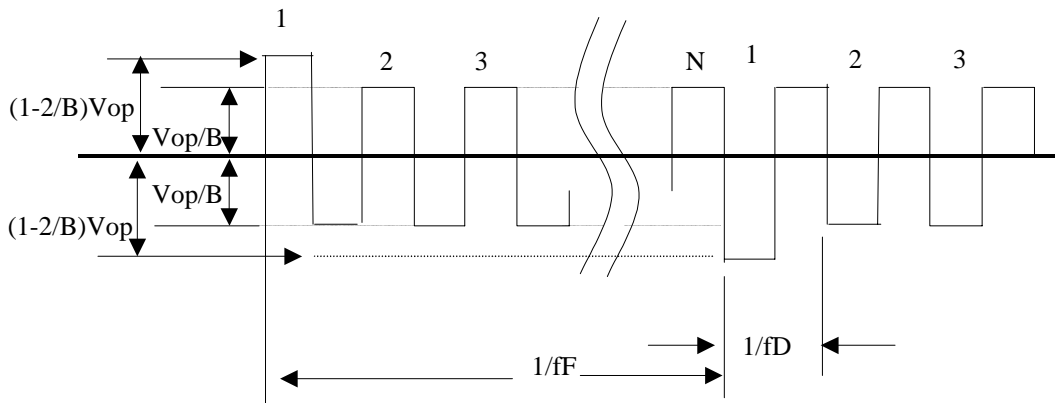
$1/B$: Bias f_D : Drive frequency

N: Duty

(1) Selected waveform



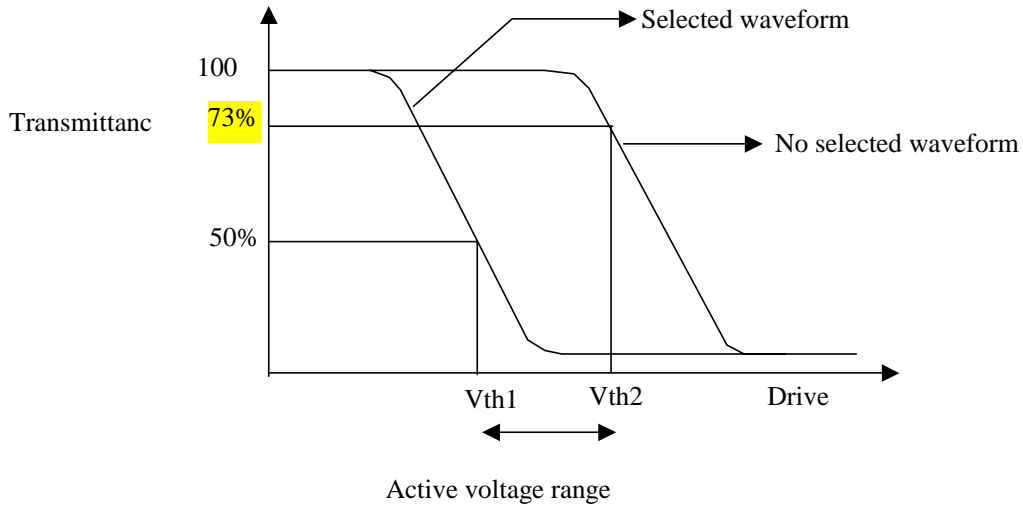
(2) Non- Selected waveform



Note:

Frame frequency is defined as follows: Common side supply voltage peak - to - peak / 2 = 1 period

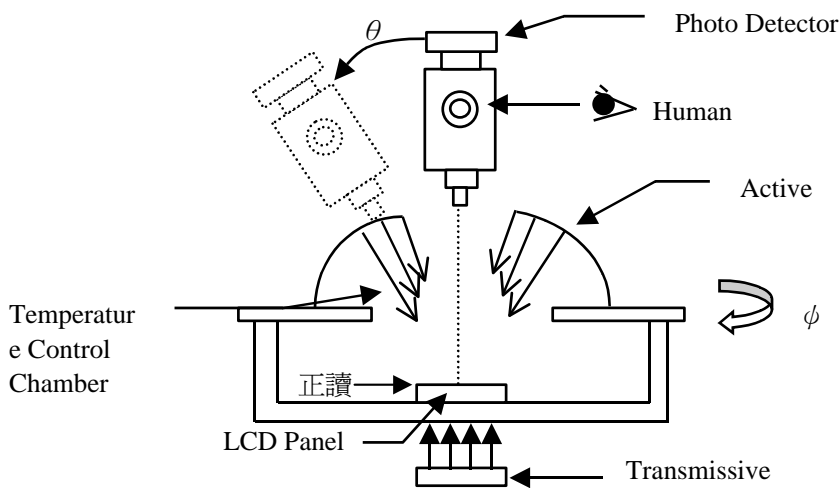
Note 3. : Definition of Vth



	Vth1	Vth2
View direction	10°	40°
Drive waveform	(Selected waveform)	(No selected waveform)
Transmittance	50%	73%

※1 Contrast ratio
 = (Brightness in OFF state) / (Brightness in ON state)

Outline of Electro-Optical Characteristics Measuring System



1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25°C	-	120	mA
Reverse Voltage	VR	Ta =25°C	-	5	V
Power Dissipation	PO	Ta =25°C	-	0.51	W

Electrical / Optical Characteristics

						Ta =25°C
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF= 120 mA	-	3.7	4.2	V
Reverse Current	IR	VR= 5 V	-	-	10	uA
Average Brightness	IV	IF= 120 mA	15.0	30.0		cd/m ²
CIE Color Coordinate (With LCD)	X	IF= 120 mA	0.25	0.31	0.37	-
	Y		0.28	0.34	0.40	
Uniformity	ΔB	IVMin / IVMax *100%	70	-	-	%
Color	White					

*1 This value will be changed while mass production.

*2 $\Delta B = (\text{min} / \text{max}) \%$

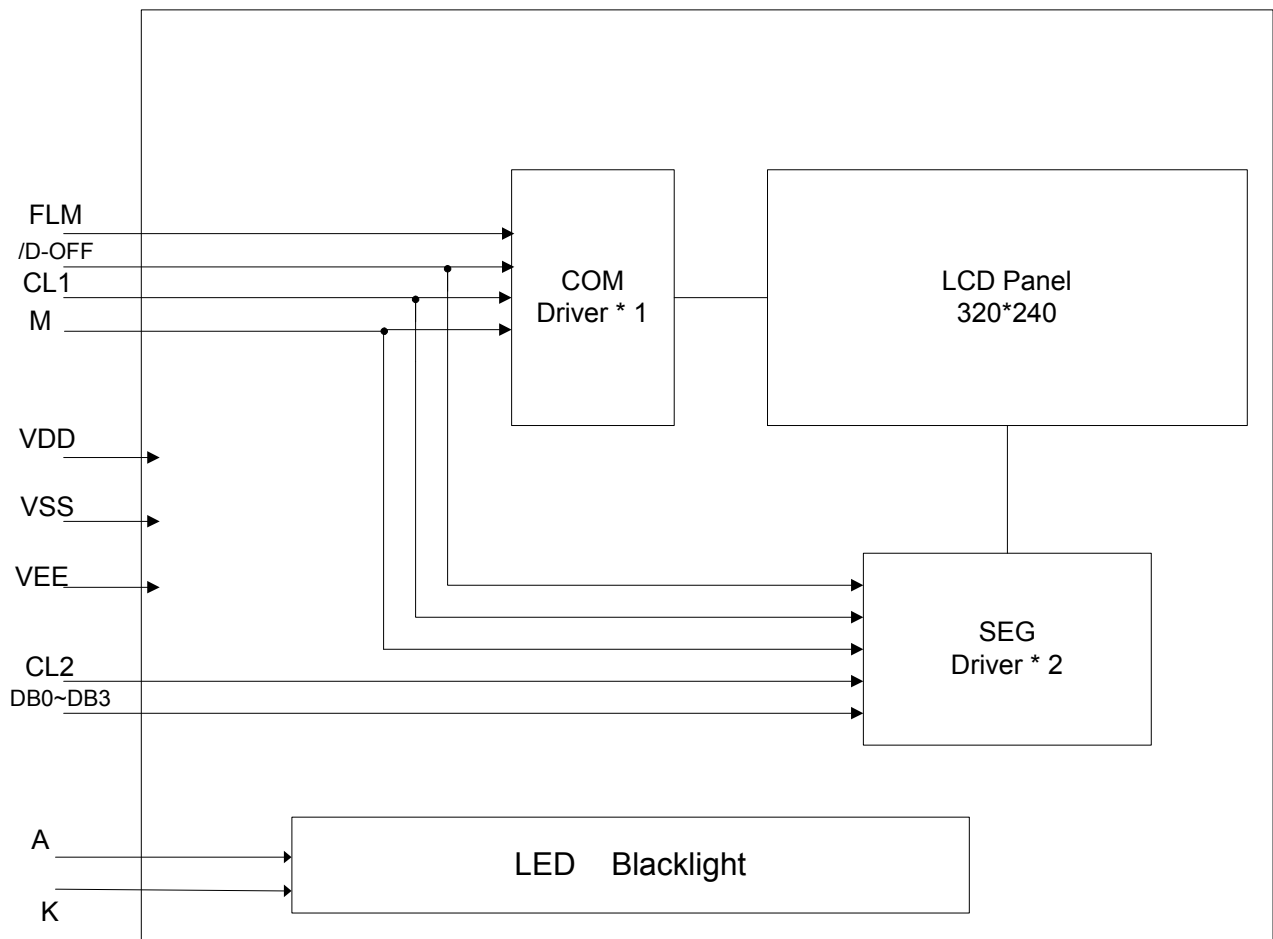
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



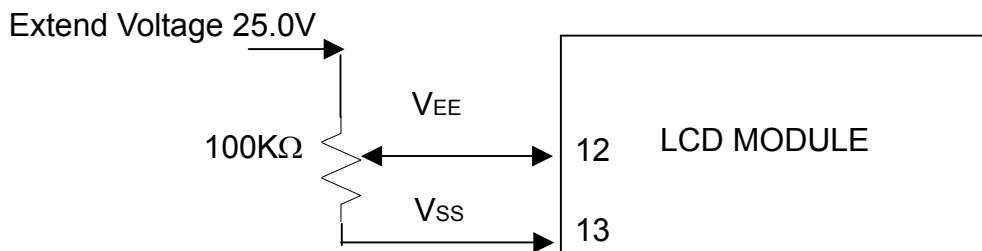
2.2 Interface Pin Description

PIN	Symbol	DESCRIPTION
1	FLM	Indicates the beginning of each display cycle.
2	M	AC signal input for LC driving waveform
3	CL1	Shift clock pulse input pin.
4	CL2	Clock input pin for taking display data
5	/D-OFF	Control input pin for output deselect level, active "L"
6	DB0	Display data input pin
7	DB1	Display data input pin
8	DB2	Display data input pin
9	DB3	Display data input pin
10	V _{DD}	Logic system power supply pin
11	V _{SS}	Ground pin
12	V _{EE}	LCD Operator Voltage
13	V _{SS}	Ground pin
14	NC	Must be open.
15	A	Power supply for LED B/L. (Anode)
16	K	Power supply for LED B/L. (Cathode)

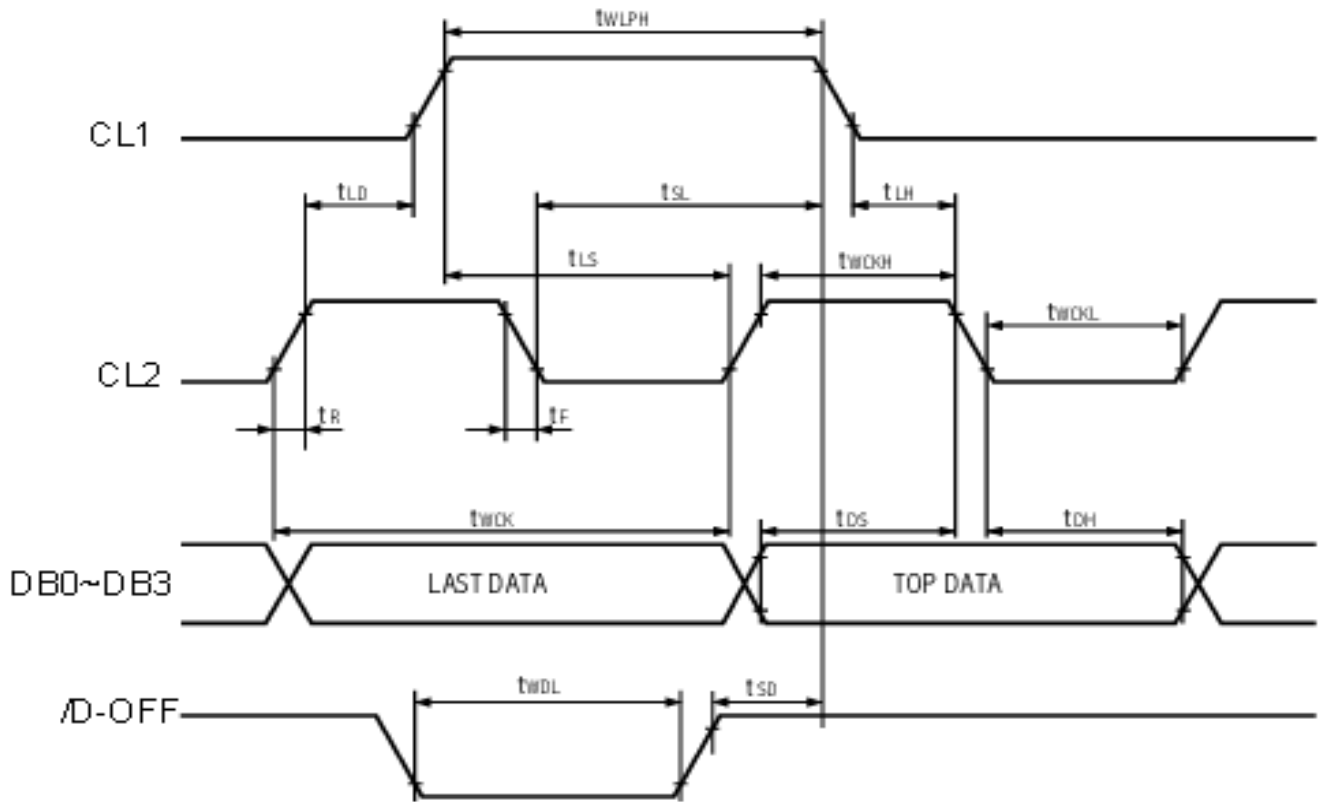
Note : FLM Recommended 55Hz ~ 75Hz

M Recommended 200Hz ~ 400Hz

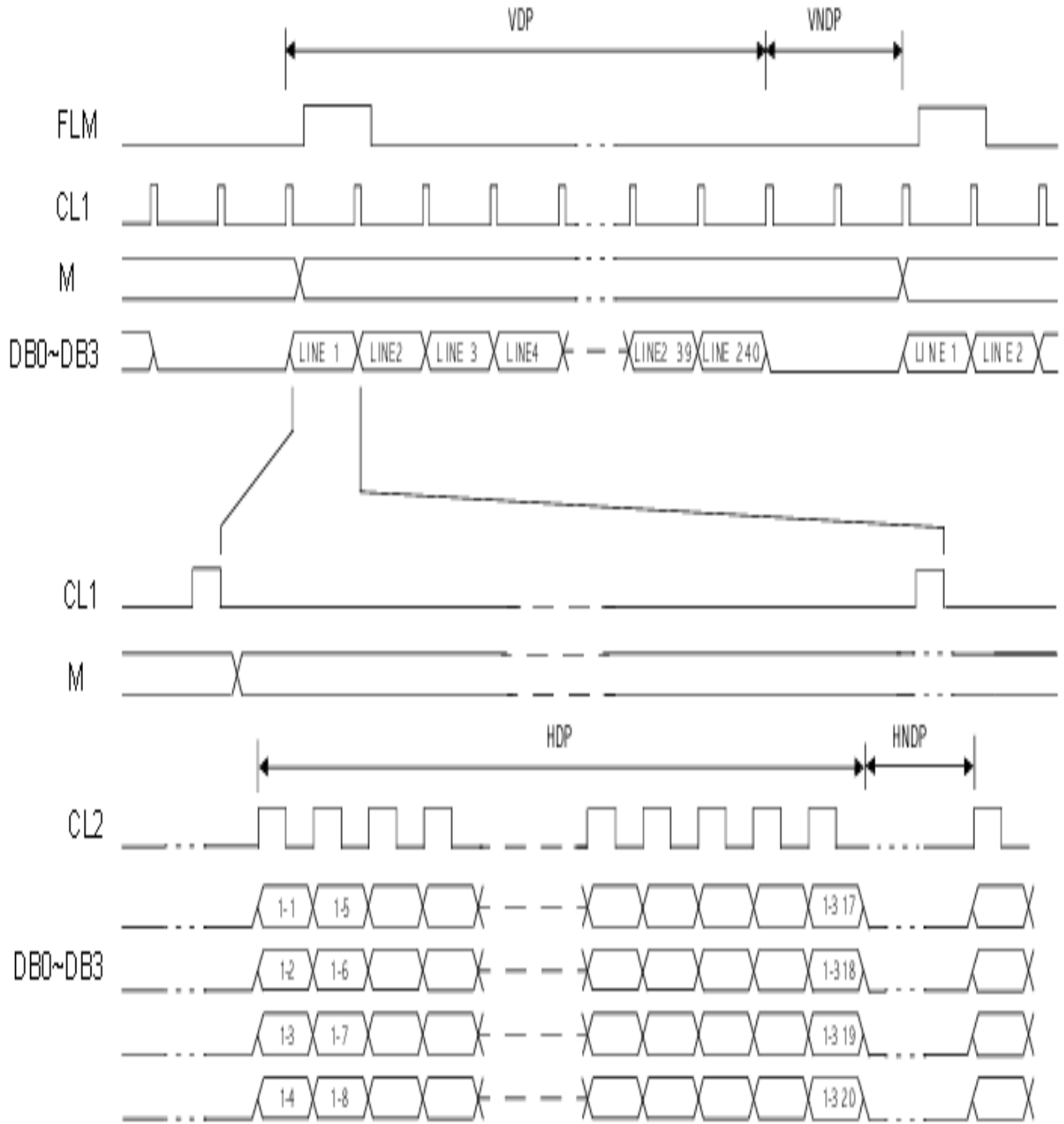
• Contrast Adjust



2.3 Timing Characteristics

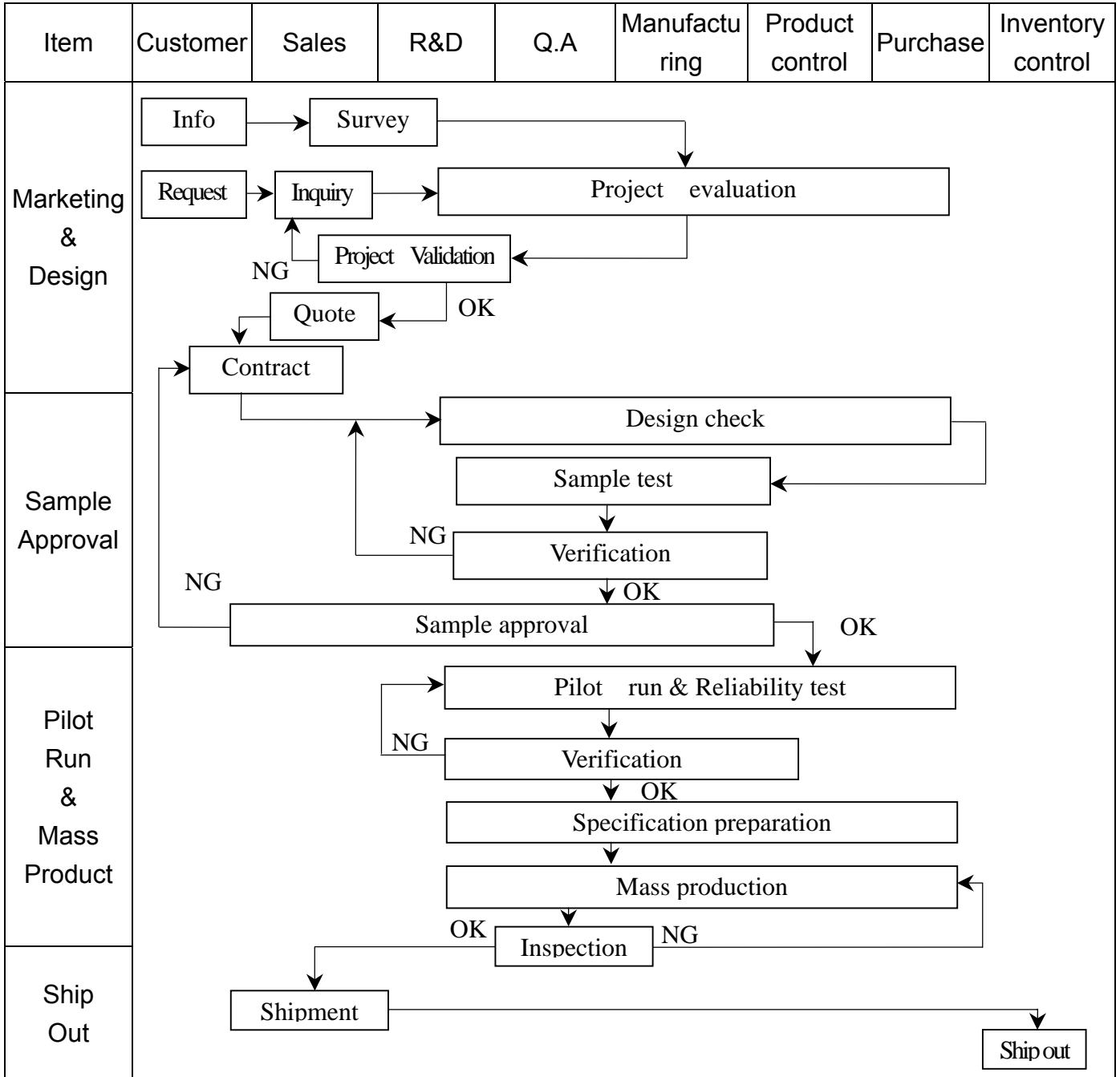


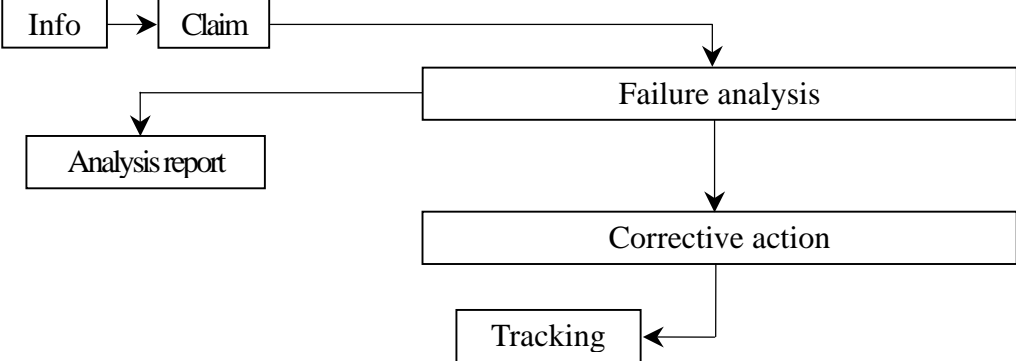
Parameter	Symol	Condition	Min.	Typ.	Max.	Unit
Shift clock period	t_{WCK}	$t_r, t_f \leq 11 \text{ ns}$	125			ns
Shift clock "H" pulse width	t_{WCKH}		51			ns
Shift clock "L" pulse width	t_{WCKL}		51			ns
Data setup time	t_{DS}		30			ns
Data hold time	t_{DH}		40			ns
Latch pulse "H" pulse width	t_{WLPH}		51			ns
Shift clock rise to Latch pulse rise time	t_{LD}		0			ns
Shift clock fall to Latch pulse fall time	t_{SL}		51			ns
Latch pulse rise to Shift clock rise time	t_{LS}		51			ns
Latch pulse fall to Shift clock fall time	t_{LH}		51			ns
Input signal rise time	t_r				50	ns
Input signal fall time	t_f				50	ns
/D-off removal time	t_{SD}		100			ns
/D-off "L" pulse width	t_{WDL}		1.2			us
Output delay time (1)	t_{pd1}, t_{pd2}	CL=15 pF			1.2	us
Output delay time (2)	t_{pd3}	CL=15 pF			1.2	us



3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service	 <pre> graph TD Info[Info] --> Claim[Claim] Claim --> Failure[Failure analysis] Failure --> Report[Analysis report] Failure --> Action[Corrective action] Action --> Tracking[Tracking] </pre>							
Q.A Activity	1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management				2. Process improvement proposal 4. Education And Training Activities			

3.2 Inspection Specification

Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II ◦

Equipment : Gauge 、 MIL-STD 、 Powertip Tester 、 Sample ◦

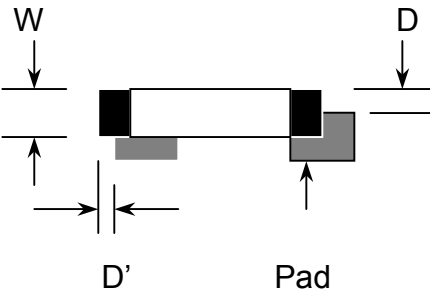
IQC Defect Level : Major Defect AQL 0.4; Minor Defect AQL 1.5 ◦

FQC Defect Level : 100% Inspection ◦

OUT Going Defect Level : Sampling ◦

Specification :

NO	Item	Specification	Judge	Level
1	Part Number	The part number is inconsistent with work order of production	N.G.	Major
2	Quantity	The quantity is inconsistent with work order of production	N.G.	Major
3	Electronic characteristics of LCM $A=(L+W)\div 2$	The display lacks of some patterns.	N.G.	Major
		Missing line.	N.G.	Major
		The size of missing dot, A is $> 1/2$ Dot size	N.G.	Major
		There is no function.	N.G.	Major
		Output data is error	N.G.	Major
4	Appearance of LCD $A=(L+W)\div 2$	Material is different with work order of production	N.G.	Major
		LCD is assembled in inverse direction	N.G.	Major
		Bezel is assembled in inverse direction	N.G.	Major
		Shadow is within LCD viewing area + 0.5 mm	N.G.	Major
		The diameter of dirty particle, A is > 0.4 mm	N.G.	Minor
	Dirty particle (Including scratch 、 bubble)	Dirty particle length is > 3.0 mm, and 0.01 mm $<$ width ≤ 0.05 mm	N.G.	Minor
		Display is without protective film	N.G.	Minor
		Conductive rubber is over bezel 1mm	N.G.	Minor
		Polarizer exceeds over viewing area of LCD	N.G.	Minor
		Area of bubble in polarizer, $A > 1.0$ mm, the number of bubble is > 1 piece.	N.G.	Minor
		0.4 mm $<$ Area of bubble in polarizer, $A < 1.0$ mm, the number of bubble is > 4 pieces.	N.G.	Minor
5	Appearance of PCB $A=(L+W)\div 2$	Burned area or wrong part number is on PCB	N.G.	Major
		The symbol, character, and mark of PCB are unidentifiable.	N.G.	Minor
		The stripped solder mask , A is > 1.0 mm	N.G.	Minor
		0.3 mm $<$ stripped solder mask or visible circuit, $A < 1.0$ mm, and the number is ≥ 4 pieces	N.G.	Minor
		There is particle between the circuits in solder mask	N.G.	Minor
		The circuit is peeled off or cracked	N.G.	Minor
		There is any circuits risen or exposed.	N.G.	Minor
		0.2 mm $<$ Area of solder ball, A is ≤ 0.4 mm	N.G.	Minor
		The number of solder ball is ≥ 3 pieces	N.G.	Minor
The magnitude of solder ball, A is > 0.4 mm.	N.G.	Minor		

NO	Item	Specification	Judge	Level
6	Appearance of molding $A=(L+W)\div 2$	The shape of modeling is deformed by touching.	N.G.	Major
		Insufficient epoxy: Circuit or pad of IC is visible	N.G.	Minor
		Excessive epoxy: Diameter of modeling is $>20\text{mm}$ or height is $>2.5\text{mm}$	N.G.	Minor
		The diameter of pinhole in modeling, A is $>0.2\text{mm}$.	N.G.	Minor
7	Appearance of frame $A=(L+W)\div 2$	The folding angle of frame must be $>45^\circ +10^\circ$	N.G.	Minor
		The area of stripped electroplate in top-view of frame, A is $>1.0\text{mm}$.	N.G.	Minor
		Rust or crack is (Top view only)	N.G.	Minor
		The scratched width of frame is $>0.06\text{mm}$. (Top view only)	N.G.	Minor
8	Electrical characteristic of backlight $A=(L+W)\div 2$	The color of backlight is nonconforming	N.G.	Major
		Backlight can't work normally.	N.G.	Major
		The LED lamp can't work normally	N.G.	Major
		The unsoldering area of pin for backlight, A is $>1/2$ solder joint area.	N.G.	Minor
		The height of solder pin for backlight is $>2.0\text{mm}$	N.G.	Minor
10	Assembly parts $A=(L+W)\div 2$	The mark or polarity of component is unidentifiable.	N.G.	Minor
		The height between bottom of component and surface of the PCB is floating $>0.7\text{mm}$	N.G.	Minor
		$D > 1/4W$  <p>The diagram illustrates a component of width W mounted on a pad of width D. The solder joint width is labeled D'. The condition $D > 1/4W$ is noted above the diagram.</p>	N.G.	Minor
		End solder joint width, D' is $>50\%$ width of component termination or width of pad	N.G.	Minor
		Side overhang, D is $>25\%$ width of component termination.	N.G.	Minor
		Component is cracked, deformed, and burned, etc.	N.G.	Minor
		The polarity of component is placed in inverse direction.	N.G.	Minor
		Maximum fillet height of solder extends onto the component body or minimum fillet height is $<0.5\text{mm}$.	N.G.	Minor

4. RELIABILITY TEST

4.1 Reliability Test Condition

NO	Item	Test Condition	
1	High Temperature Storage	Storage at 80 ±2°C 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
2	Low Temperature Storage	Storage at -30 ±2°C 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
3	High Temperature /Humidity Storage	1.Storage 96~100 hrs 60±2°C, 90~95%RH surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer). or 2.Storage 96~100 hrs 40±2°C, 90~95%RH surrounding temperature, then storage at normal condition 4 hrs.	
4	Temperature Cycling	$-20^{\circ}\text{C} \rightarrow 25^{\circ}\text{C} \rightarrow 70^{\circ}\text{C} \rightarrow 25^{\circ}\text{C}$ $\leftarrow (30\text{mins}) (5\text{mins}) (30\text{mins}) (5\text{mins}) \rightarrow$ <p style="text-align: center;">10 Cycle</p>	
5	Vibration	10~55Hz (1 minute) 1.5mm X,Y and Z direction * (each 2hrs)	
6	ESD Test	Air Discharge: Apply 6 KV with 5 times discharge for each polarity +/-	Contact Discharge: Apply 250V with 5 times discharge for each polarity +/-
		Testing location: Around the face of LCD	Testing location: 1.Apply to bezel. 2.Apply to Vdd, Vss.
7	Drop Test	Packing Weight (Kg)	Drop Height (cm)
		0 ~ 45.4	122
		45.4 ~ 90.8	76
		90.8 ~ 454	61
		Over 454	46

5. PRECAUTION RELATING PRODUCT HANDLING

5.1 SAFETY

- 5.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.
- 5.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

5.2 HANDLING

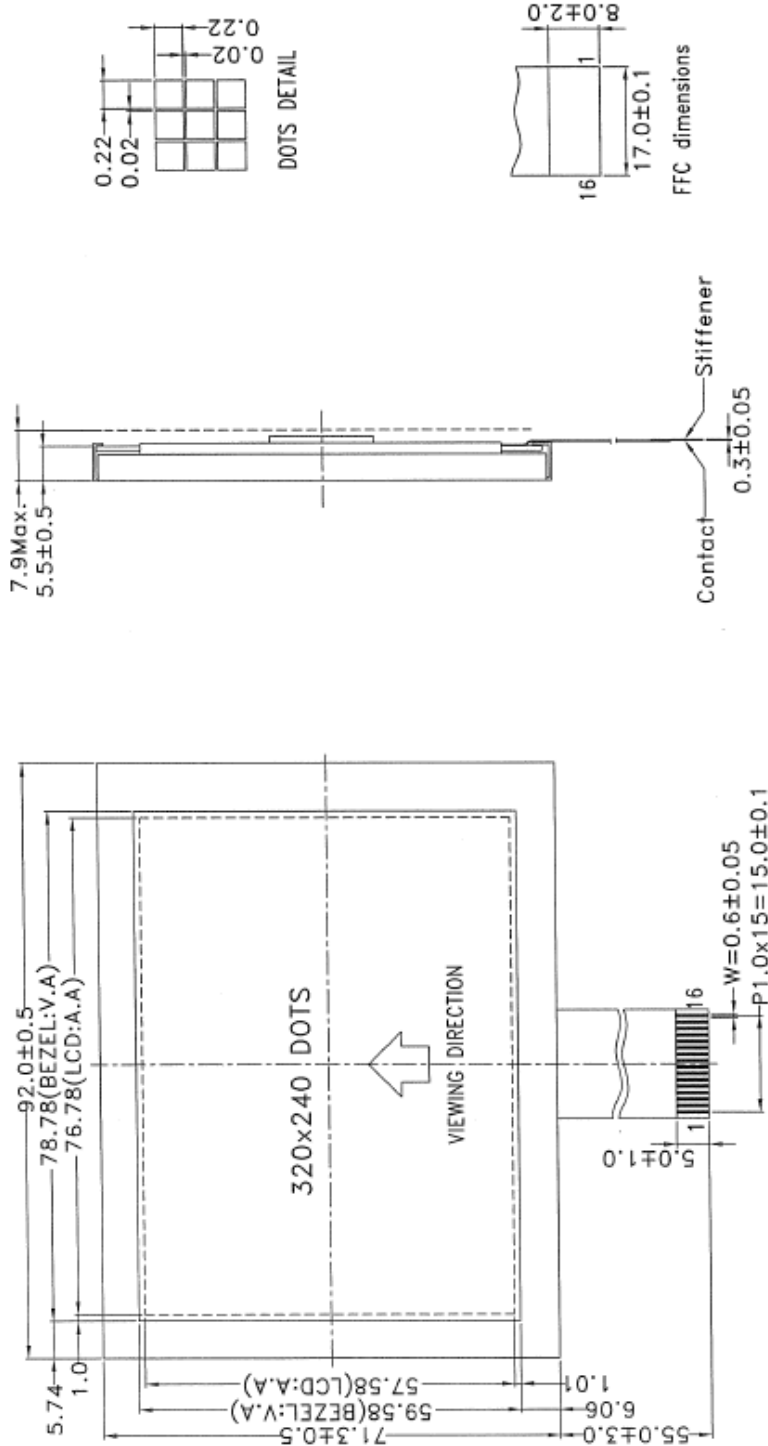
- 5.2.1 Avoid any strong mechanical shock which can break the glass.
- 5.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module , be sure to ground your body and any electrical equipment you may be using.
- 5.2.3 Do not remove the panel or frame from the module.
- 5.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully ,do not touch , push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)
- 5.2.5 Do not wipe the polarizing plate with a dry cloth , as it may easily scratch the surface of plate.
- 5.2.6 Do not touch the display area with bare hands , this will stain the display area.
- 5.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

5.3 STORAGE

- 5.3.1 Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.
- 5.3.2 Do not place the module near organics solvents or corrosive gases.
- 5.3.3 Do not crush , shake , or jolt the module.

5.4 TERMS OF WARRANTY

- 5.4.1 Applicable warrant period
The period is within thirteen months since the date of shipping out under normal using and storage conditions.
- 5.4.2 Unaccepted responsibility
This product has been manufactured to your company's specification as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment , we cannot take responsibility if the product is used in nuclear power control equipment , aerospace equipment , fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.



- NOTE:
 1.The tolerance unless classified ±0.3mm
 2.LCD type : FSTN
 3.LCD mode : Positive / Transflective
 4.T_{op}: -20°C~70°C , T_{st}: -30°C~80°C
 5.Viewing Direction : 6 O'clock

久正光電股份有限公司 POWERTIP TECHNOLOGY CORPORATION		APPROVED	CHECKER	DRAWN
SCALE:1/1 圖面名稱 PG 320240WRF-HNNHS5	UNIT:mm 圖面編號 PG-03104-126	PAGE:1/1 EDI 0	研發 廖子信 廖志豪 研發 廖子信 廖志豪 研發 廖子信 廖志豪	研發 廖子信 廖志豪
REV	DESCRIPTION	DATE	NO.PT-R-251	

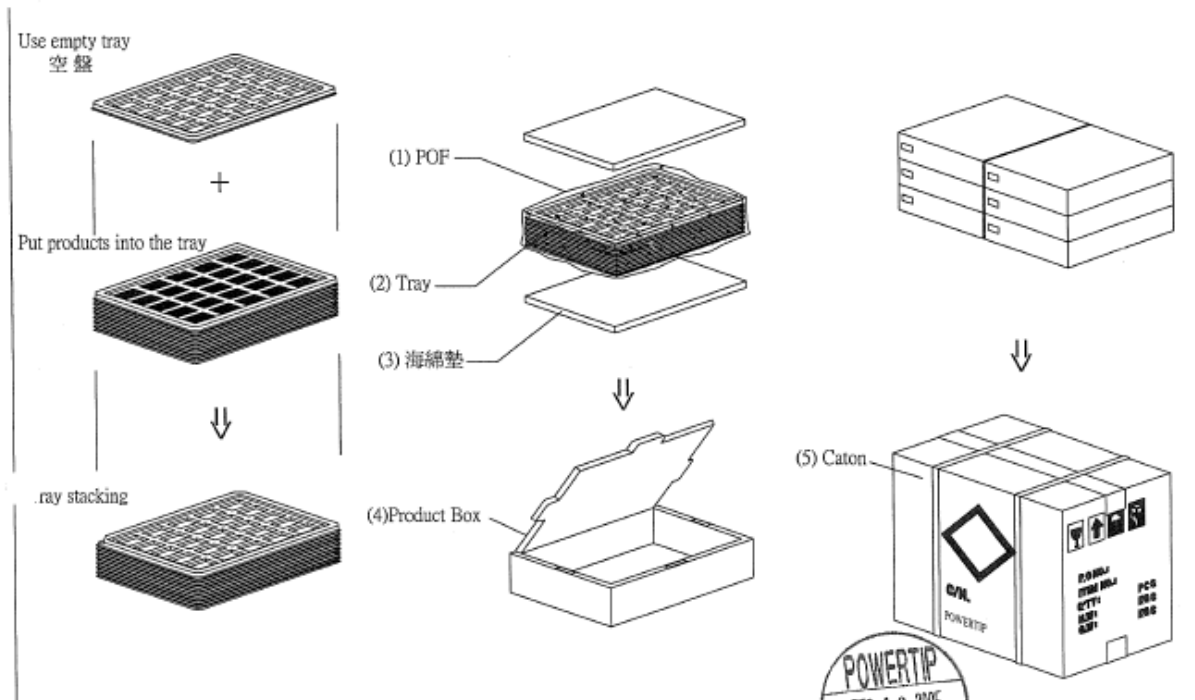
Customer	PTC	LCM包裝規格書 LCM Packaging Specifications (For Tray)	DATE 05'01.26	DATE 05'01.26	版次Ver 01
LCM Model	PG320240WRF-HNNHS5				

1. 包裝材料規格表 (Packaging Material) : (per carton)

No.	Item	Model	Dimensions (mm)	Quantity
1	成品 (LCM)	PG320240WRF-HNNHS5	92.0 X 71.3	96
2	多層薄膜(1)POF	BA03	19"X350X0.015	6
3	TRAY 盤 (2)	BX320240H6TZ0A	295 X 245 X 18.8	30
4	海綿墊(3)	OTFOAM00006A0A	290 X 240 X 10	12
5	C3內盒(4)Product Box	BX31025510AA0A	310 X 255 X 100	6
6	外紙箱(5)Carton	BX52732536CC0A	527 X 325 X 360	1
7				
8				
9				

2. 單箱數量規格表 (Packaging Specifications and Quantity) :

(1) LCM quantity per box : no per tray	4	x no of tray	4	=	16
(2) Total LCM quantity in carton : quantity per box	16	x no of boxes	6	=	96



特 記 事 項 (REMARK)

1. Label Specifications :

MODEL:
LOT NO:
QUANTITY:
CHECK:

Rotate tray 180 degrees and place on top of stack.
TRAY盤相疊時,需旋轉180度