POWERTIP TECH. CORP.

SPECIFICATIONS

CUSTOMER	:	PTC
SAMPLE CODE (Ver.)	:	PS320240LRF-DE9H03 (Ver.0)
MASS PRODUCTION CODE (Ver.)	:	PG320240LRF-DE9HZ3 (Ver.0)
DRAWING NO. (Ver.)	:	PG- 03100-198 (Ver.0)

Customer Approved

Date:

Approved	QC Confirmed	Designer
研發 2005-9-3	Q.A. DEPT. SEP 0 6. 2005 POWERTIP TECH. CORP.	研發 94. 9. 3 張慶源 / 生技 94. 9. 5 王大維 / 研發 2005-9-3 林忠聖

■ 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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RECORDS OF REVISION

Date	Ver.	Description	Page	Design by
2005/08/24	0	New Sample Short : JP(3-2),JDS(1-3),JMS(3-1),JF,JA1	-	Vodka

Total：21 Page

Contents

Note：For detailed information please refer to IC data sheet： EPSON---S1D13700

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, 1/16 Bias
Viewing Direction	6 O'clock
Backlight	Y/G LED
Weight	260 g
Interface	Support 8080 MPU Parallel 8 Bits data bus
Driver IC	Controller IC: S1D13700

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	148.02 (L) * 120.24 (w) * 21.0 (H)(Max)	mm
Viewing Area	120.14 (L) * 92.14 (w)	mm
Active Area	115.18 (L) * 86.38 (w)	mm
Dot Size	0.34 (L) * 0.34 (w)	mm
Dot Pitch	0.36 (L) * 0.36 (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_{DD}-V_{EE}	-	-0.3	25	V
Input Voltage	V_{IN}	—	-0.3	V_{DD}+0.5	V
Operating Temperature	T_{OP}	—	-20	70	°C
Storage Temperature	T_{ST}	—	-30	80	°C
Storage Humidity	H_D	Ta＜40 ℃	20	90	%RH

1.4 DC Electrical Characteristics

V_{DD} = 5.0 V ± 0.5 , V_{SS} = 0 V , Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}	—	4.5	5.0	5.5	V
"H" Input Voltage	V_{IH}	—	3.5	-	-	V
"L" Input Voltage	V_{IL}	—	-	-	1.0	V
"H" Output Voltage	V_{OH}	—	VDD -0.4	-	-	V
"L" Output Voltage	V_{OL}	—	-	-	0.4	V
Supply Current	I_{DD}	V_{DD} = 5.0 V	-	20	80	mA
LCM Driver Voltage	V_{OP}	(V_{OP}+) – (V_{OP}-) (-20°C)	22.3	22.5	22.7	V
		(V_{OP}+) – (V_{OP}-) (25°C)	21.8	22.0	22.2	
		(V_{OP}+) – (V_{OP}-) (70°C)	20.9	21.1	21.3	

1.5 Optical Characteristics

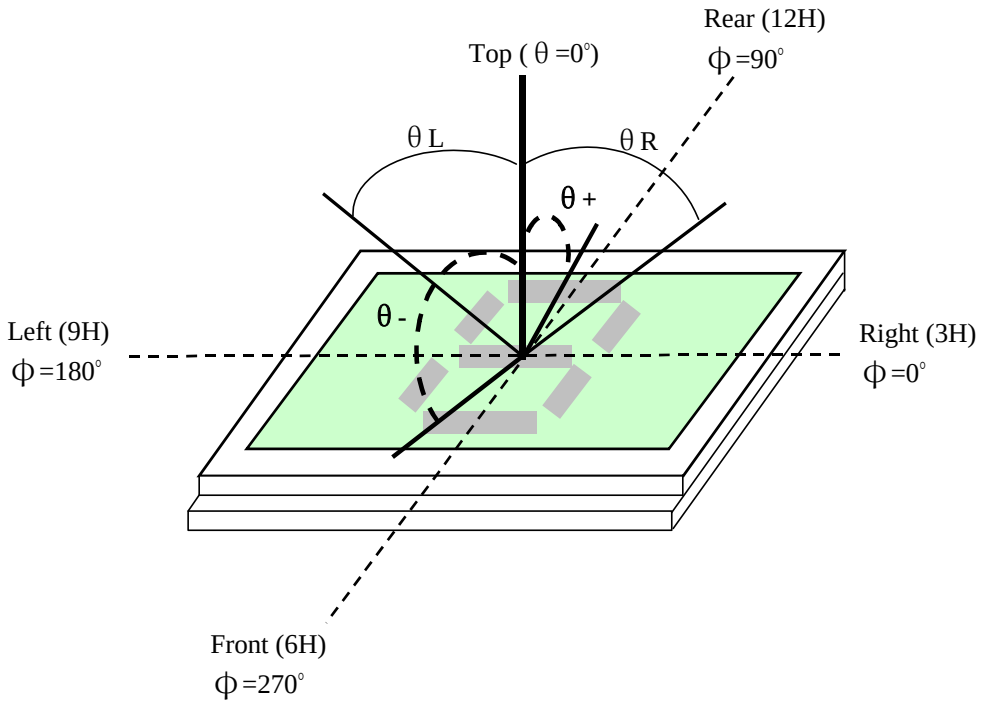
LCD Panel: 1/240 Duty, 1/15 Bias, V_{LCD} = 22.0 V, Ta = 25°C

Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	θ	C≥2.0 , ∅ = 270°	-40°	-	40°	Note 1
Contrast Ratio	CR	θ = -5° , ∅ = 270°	3	5	-	Note 3
Response Time(rise)	Tr	θ = -5° , ∅ = 270°	-	120 ms	180 ms	Note 2
Response Time(fall)	Tf	θ = -5° , ∅ = 270°	-	290 ms	435 ms	

Note 1.

Optical characteristics-2

Viewing angle

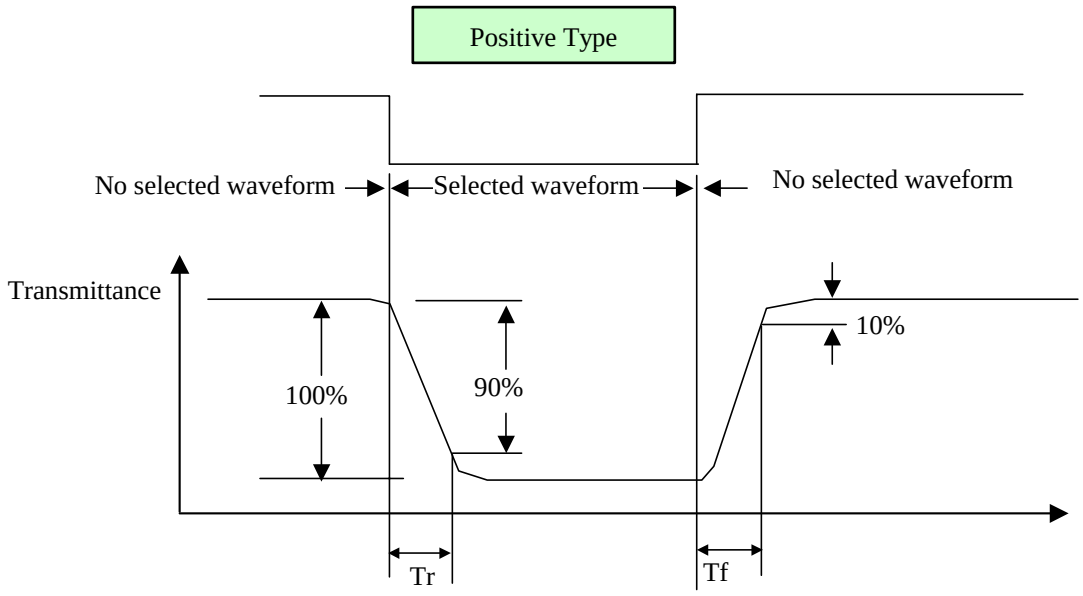


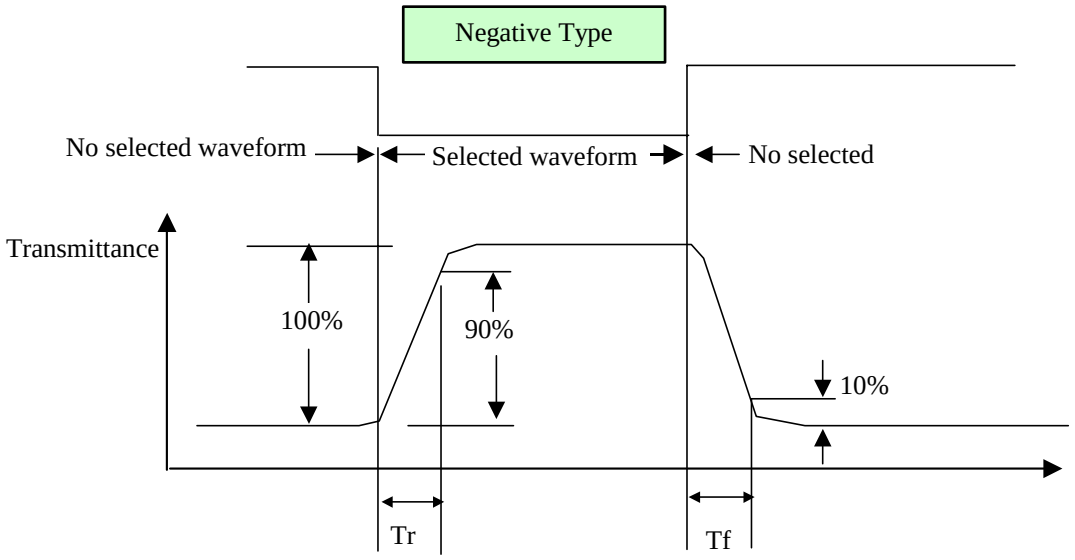
Viewing angle

Note 2.

Optical characteristics-3

Fig.2 Definition of response time





Electrical characteristics-2

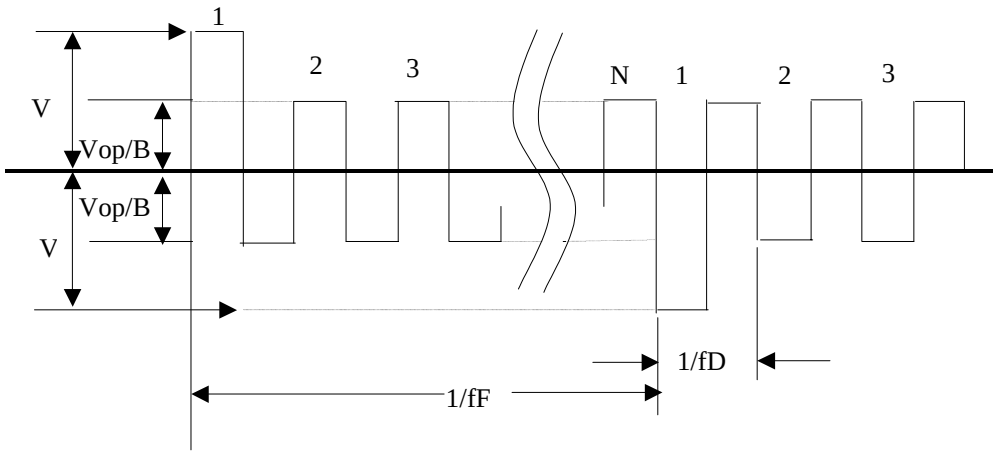
※2 Drive waveform

Vop: Drive voltage fF: Frame frequency

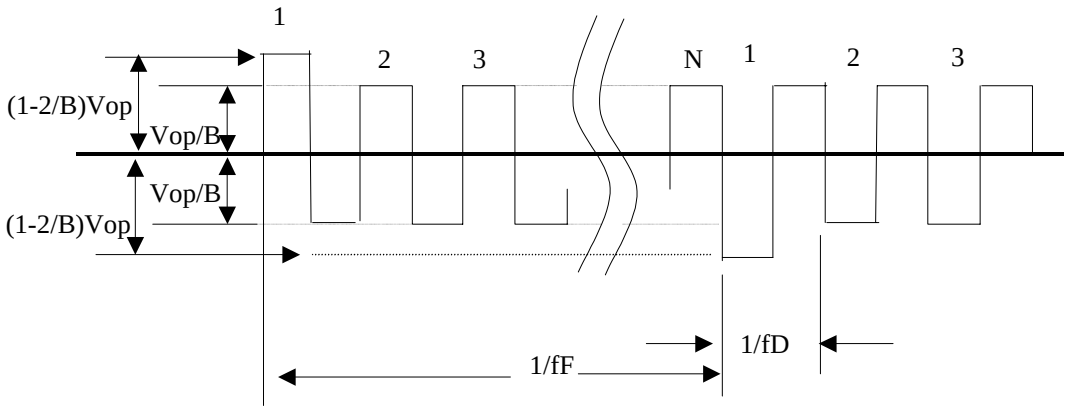
1/B: Bias fD: Drive frequency

N: Duty

(1) Selected waveform



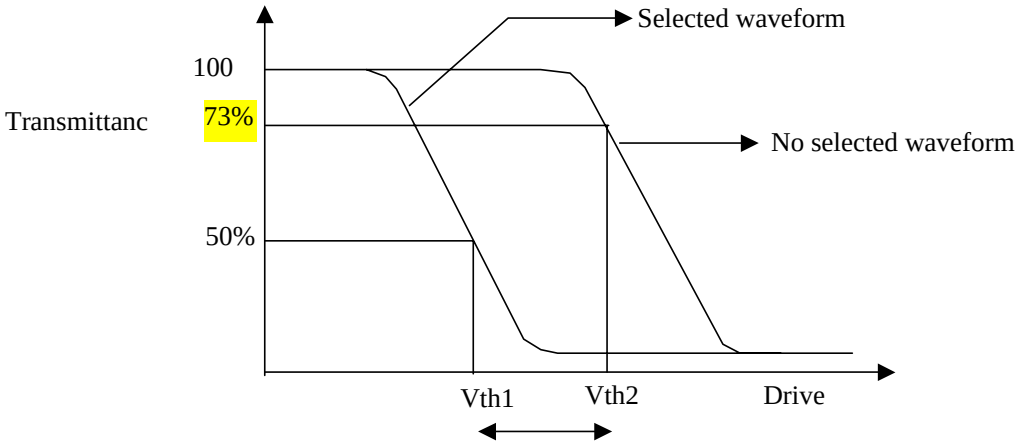
(2) Non- Selected waveform



Note:

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

Note 3. : Definition of Vth

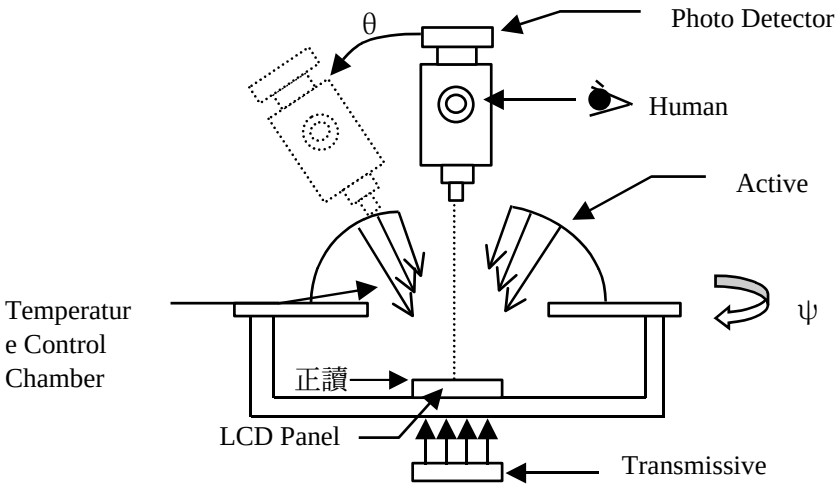


Active voltage range

	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



Measuring System: Autronic DMS-803

1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25℃	-	500	mA
Reverse Voltage	VR	Ta =25℃	-	8	V
Power Dissipation	PO	Ta =25℃	-	2.3	W

.Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Reverse Current	IR	VR= 8 V	-	-	0.2	mA
Forward Voltage	VF	IF= 200 mA	-	4.2	4.6	V
Average Brightness (with LCD)*1	IV		1	2.5	-	cd/m^2
Uniformity (With LCD)*2	△B		70	-	-	%
Wavelength (with LCD)*1	Hue		575	578	582	nm
Color	Y/G					

*1:This value will be changed while mass production

*2: △B = B(min) / B(max) %

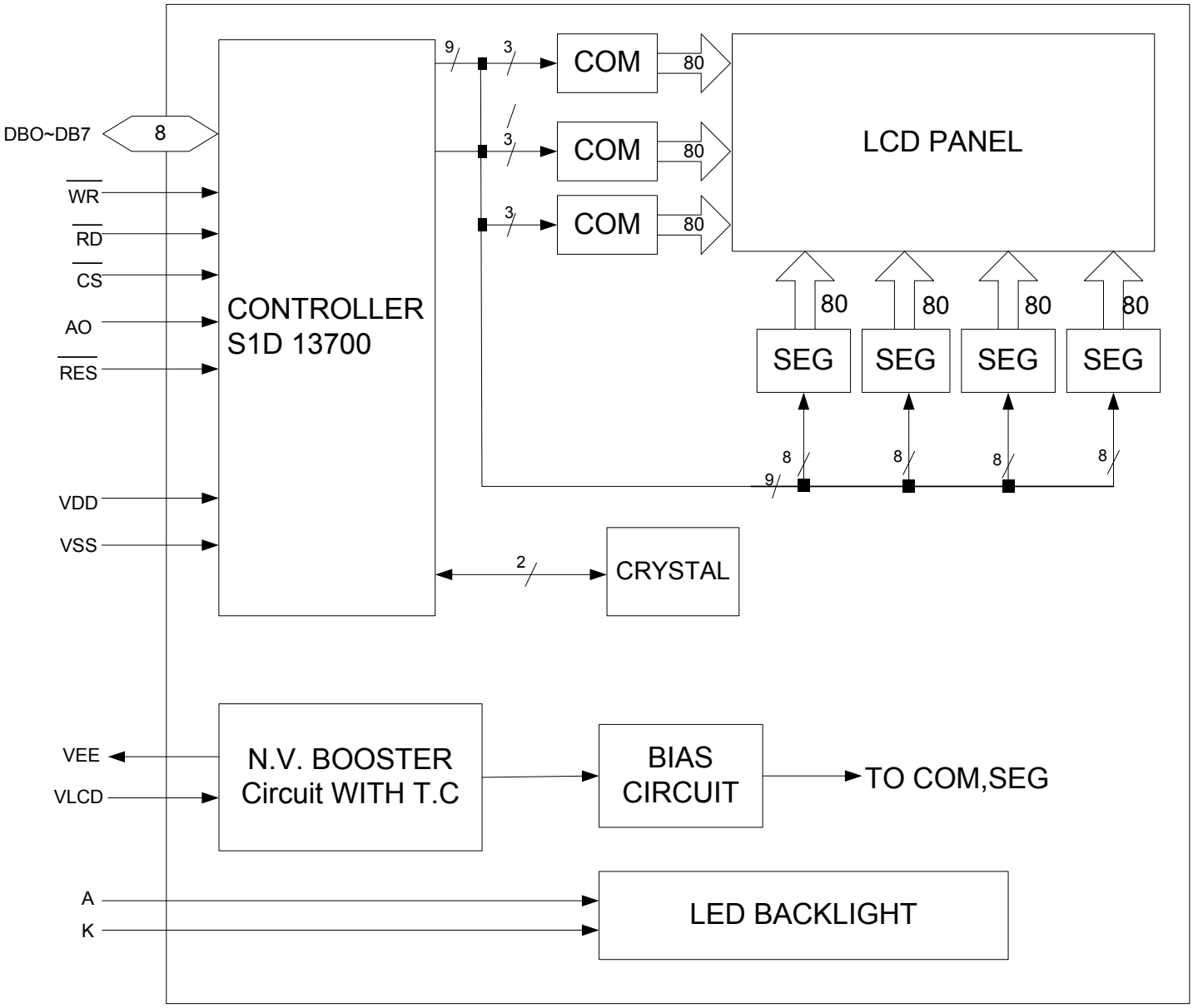
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



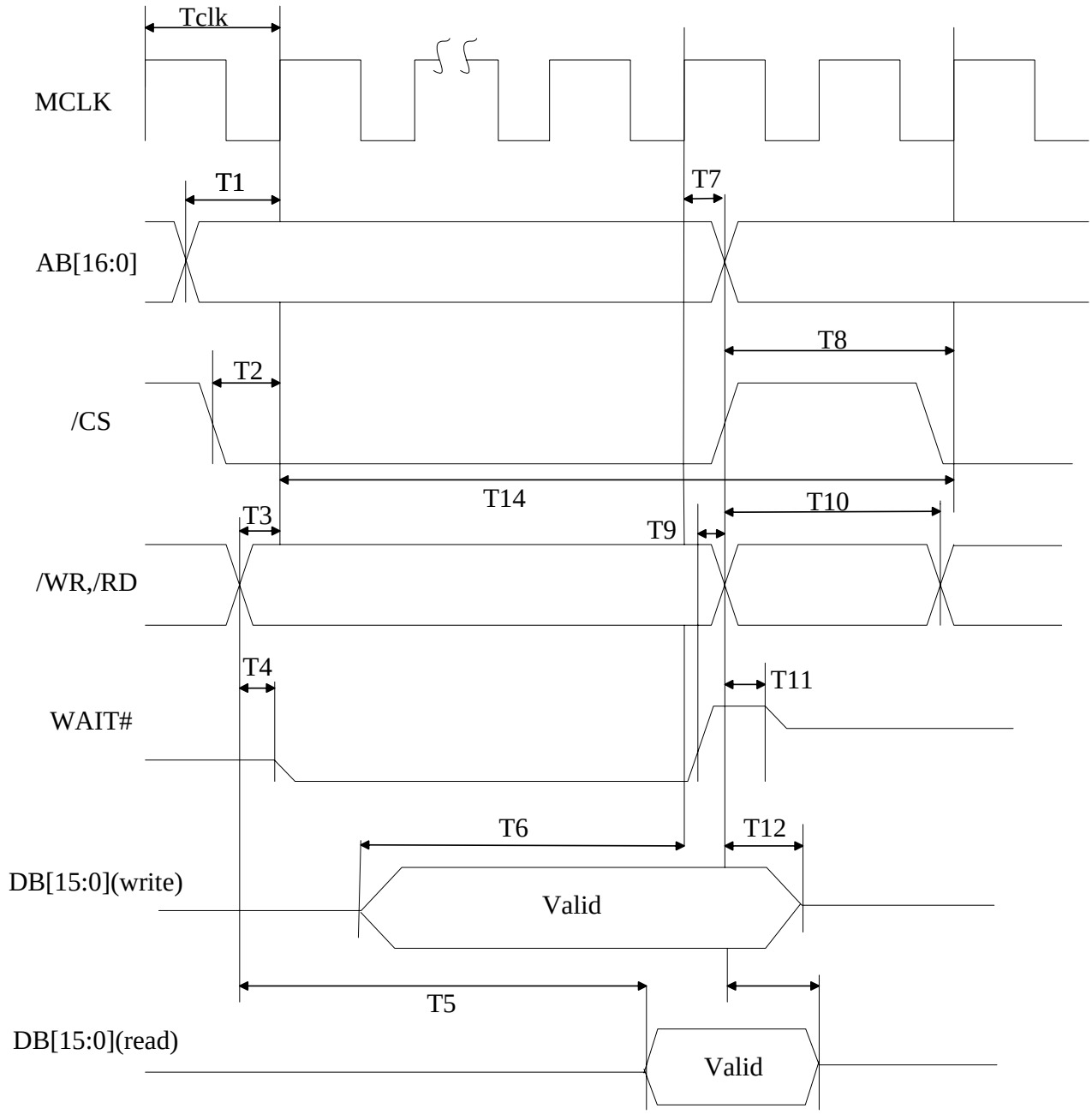
2.2 Interface Pin Description

Pin No.	Symbol	Function
1	V_{SS}	Ground (V_{SS}=0 V)
2	V_{DD}	Power Supply (V_{DD} = 5.0 V)
3	V_{LCD}	Operating voltage for LCD.
4	/RD	Data read (read data from the module at "L")
5	/WR	Data write (write data to the module at "L")
6	A0	Command / Data read or write select (H : command L : data)
7	DB0	Data bus bit 0
8	DB1	Data bus bit 1
9	DB2	Data bus bit 2
10	DB3	Data bus bit 3
11	DB4	Data bus bit 4
12	DB5	Data bus bit 5
13	DB6	Data bus bit 6
14	DB7	Data bus bit 7
15	/CS	Chip select , active “L”
16	/RES	Reset input , active “L”
17	V_{EE}	Negative voltage out.
18	FG	Frame ground (connected to metal bezel)
19	A	Power supply for LED backlight Anode input
20	K	Power supply for LED backlight cathode input
21	NC	Not connection
22	NC	Not connection

Built in negative voltage generator circuit and temperature compensation circuit.

Built in Timing mode for 8080 family.

2.3 Timing Characteristics



[VSS= 0V , VDD= 4.5~5.5V , Ta=-20℃~70℃]

Symbol	Parameter	Spec		Unit
		Min	Max	
Fclk	Bus clock frequency	-	64	MHz
Tclk	Bus clock period	1/ Fclk	-	ns
T1	AB[16:0] setup to first CLK rising edge where /CS=0 and either /RD=0 or /WR=0	11	-	ns
T2	/CS setup to CLK rising edge	9	-	ns
T3	/RD,/WR setup to CLK rising edge	9	-	ns
T4	/RD,/WR state change to WAIT# driven low	1	5	ns
T5	/RD failing edge to DB[15:0] driven (end cycle)	3Tc+9ns	-	Tclk
T6	DB[15:0]setup to 4th rising CLK edge after /CS = 0 and WR=0	1	-	Tclk
T7	Ab[16:0],/CS# hold from /RD,/WR rising edge	8	-	ns
T8	/CS dieasserted to seasserted - when read - when write (next cycle =write cycle) - when write (next cycle =read cycle)	 1Tclk 2Tclk+8ns 5Tclk+8ns	-	 ns ns ns
T9	WAIT# rising edge to RD,WR rising edge	0		
T10	/WR,/RD dieasserted to seasserted - when read - when write (next cycle =write cycle) - when write (next cycle =read cycle)	 1Tclk 2Tclk+8ns 5Tclk+8ns	-	 ns ns ns
T11	Rising edge of either /RD or /WR to WAIT# high impedance 0.5 Tclk	-	0.5	Tclk
T12	D[15:0] hold from /WR rising edge (write cycle)	1	-	ns
T13	D[15:0] hold from /RD rising edge (read cycle)	1	-	ns
T14	Cycle length read Write (next write cycle) Write (next read cycle)	6 7 10	-	Tclk

2.4 Display Command

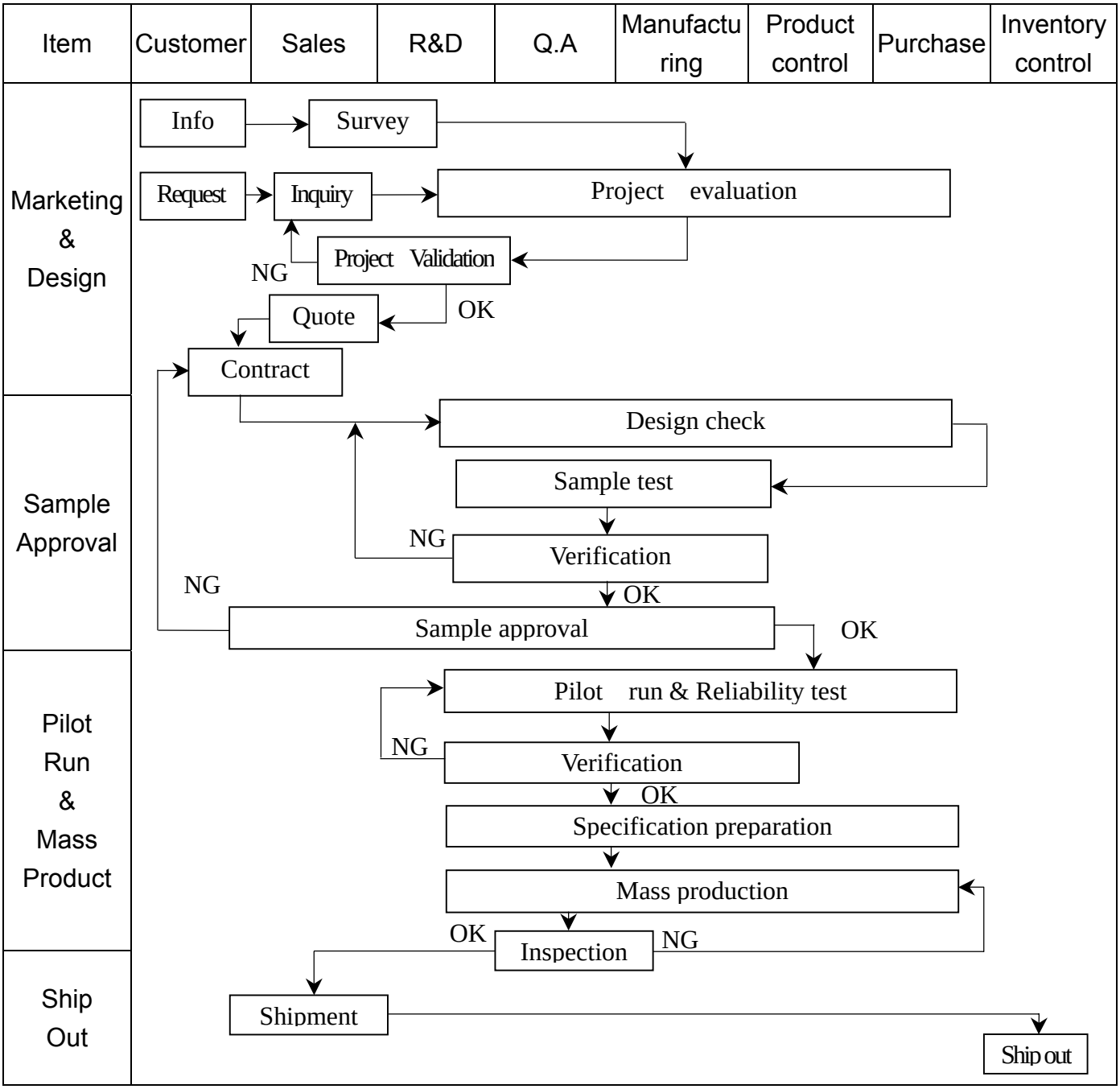
Class	Command	Code											Hex	Command description
		RD	WR	A0	D7	D6	D5	D4	D3	D2	D1	D0		
System control	SYSTEM SET	1	0	1	0	1	0	0	0	0	0	0	40	Initialize device and display
	SLEEP IN	1	0	1	0	1	0	1	0	0	1	1	53	Enter standby mode
Display control	DISP ON/OFF	1	0	1	0	1	0	1	1	0	0	D	58. 59	Enable and disable display and display flashing
	SCROLL	1	0	1	0	1	0	0	0	1	0	0	44	Set display start address and display regions
	CSRFORM	1	0	1	0	1	0	1	1	1	0	1	5D	Set cursor type
	CGRAM ADR	1	0	1	0	1	0	1	1	1	0	0	5C	Set start address of character generator RAM
	CSRDIR	1	0	1	0	1	0	0	1	1	CD 1	CD 0	4C to 4F	Set direction of cursor movement
	HDOT SCR	1	0	1	0	1	0	1	1	0	1	0	5A	Set horizontal scroll position
	OVLAY	1	0	1	0	1	0	1	1	0	1	1	5B	Set display overlay format
	GRAY SCALE	1	0	1	0	1	1	0	0	0	0	0	40	Setup grayscale display mode
Drawing control	CSRW	1	0	1	0	1	0	0	0	1	1	0	46	Set cursor address
	CSRR	1	0	1	0	1	0	0	0	1	1	1	47	Read cursor address
Memory control	MWRITE	1	0	1	0	1	0	0	0	0	1	0	42	Write to display memory
	MRAD	1	0	1	0	1	0	0	0	0	1	1	43	Read from display memory

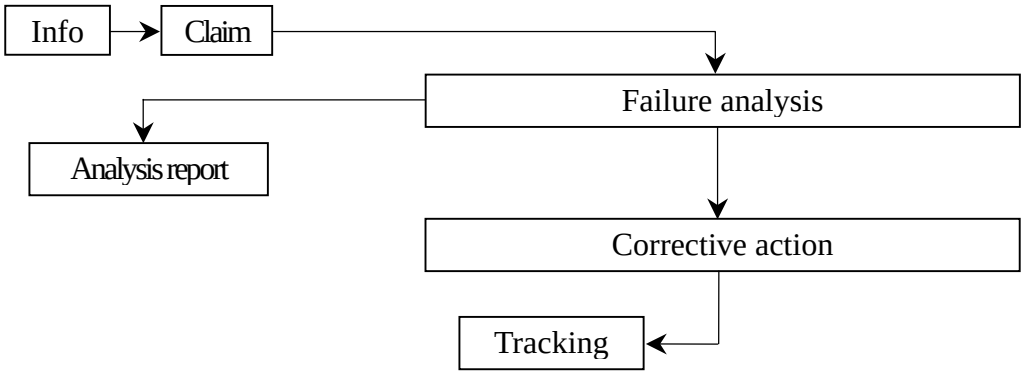
Notes

1. In general, the internal registers of the SED 13700 series are modified as each command parameter is input. However, the microprocessor does not have to set all the parameters of a command and may send a new input will have been changed but the remaining parameter registers are unchanged.
   2-byte parameters (where two bytes are treated as 1 data item) are handled as follows:
   a. CSRW, CSRR: Each byte is processed individually. The microprocessor may read or write just the low byte of the cursor address.
   b. SYSTEM SET, SCROLL, CGRAM ADR: Both parameter bytes are processed together. If the command is changed after half of the parameter has been input, the single byte is ignored.
2. APL and APH are 2-byte parameters, but are treated as two 1-byte parameters.

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart

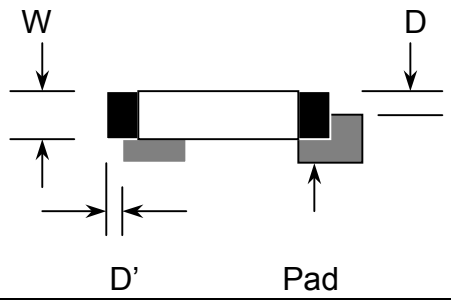


Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service								
Q.A Activity	1. ISO 9001 Maintenance Activities 2. Process improvement proposal 3. Equipment calibration 4. Education And Training Activities 5. Standardization Management							

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)÷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)÷2 Dirty particle (Including scratch、bubble)	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 length is ＞3.0mm, and 0.01mm＜ width ≦0.05mm	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＞1.0mm, the number of bubble is ＞1 piece.	N.G.	Minor
		0.4mm＜Area of bubble in polarizer, A＜1.0mm, the number of bubble is ＞4 pieces.	N.G.	Minor
5	Appearance of PCB A=(L + W)÷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＞1.0mm	N.G.	Minor
		0.3mm＜stripped solder mask or visible circuit, A ＜ 1.0mm, 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
		0.2mm＜Area of solder ball, A is ≦0.4mm The number of solder ball is ≧3 pieces	N.G	Minor
		The magnitude of solder ball, A is ＞0.4mm.	N.G	Minor

NO	Item	Specification	Judge	Level
6	Appearance of molding A=(L + W)÷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 ＞20mm or height is ＞2.5mm	N.G.	Minor
		The diameter of pinhole in modeling, A is ＞0.2mm.	N.G.	Minor
7	Appearance of frame A=(L + W)÷2	The folding angle of frame must be ＞45° +10°	N.G.	Minor
		The area of stripped electroplate in top-view of frame, A is ＞1.0mm.	N.G.	Minor
		Rust or crack is (Top view only)	N.G.	Minor
		The scratched width of frame is ＞0.06mm. (Top view only)	N.G.	Minor
8	Electrical characteristic of backlight A=(L + W)÷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 ＞2.0mm	N.G.	Minor
10	Assembly parts A=(L + W)÷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 ＞0.7mm	N.G.	Minor
		D＞1/4W 	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 ＜0.5mm.	N.G.	Minor

4. RELIABILITY TEST

4.1 Reliability Test Condition

NO	Item	Test Condition	
1	High Temperature Storage	Storage at 80 ±2℃ 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
2	Low Temperature Storage	Storage at -30 ±2℃ 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
3	High Temperature /Humidity Storage	1.Storage 96~100 hrs 60±2℃, 90~95%RH surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer). or 2.Storage 96~100 hrs 40±2℃, 90~95%RH surrounding temperature, then storage at normal condition 4 hrs.	
4	Temperature Cycling	-20℃ → 25℃ → 70℃ → 25℃ (30mins) (5mins) (30mins) (5mins) 10 Cycle	
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℃ ±5℃ 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.

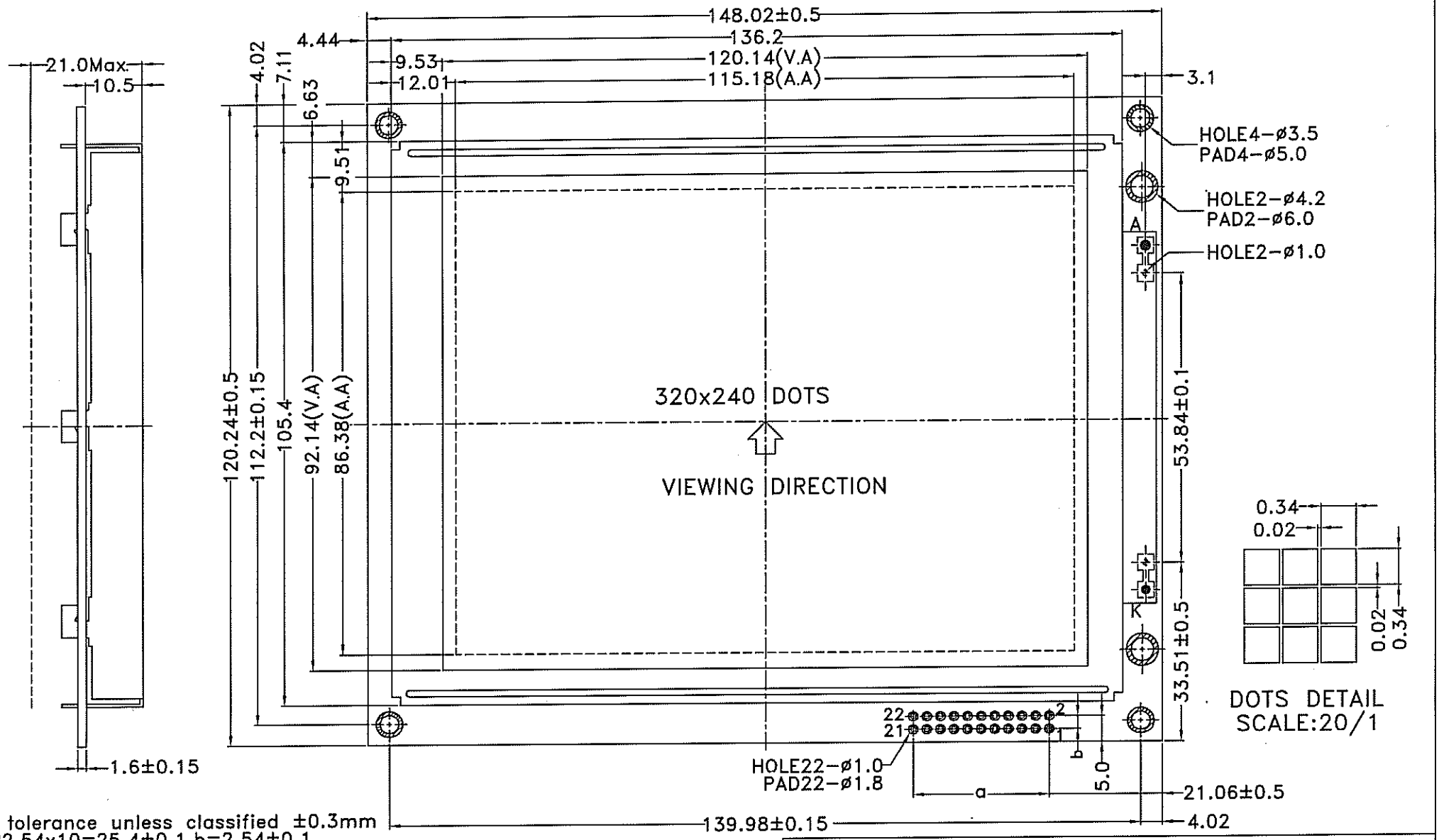
5.4 TERMS OF WARRANTY

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.a=P2.54x10=25.4±0.1,b=2.54±0.1
3.LCD type : FSTN
4.LCD mode : Positive / Transflective
5.T_{op}:-20°C~70°C , T_{st}:-30°C~80°C
6.Viewing Direction : 6 O'clock

REV	DESCRIPTION	DATE

久正光電股份有限公司
POWERTIP TECHNOLOGY CORPORATION

				APPROVED	CHECKER	DRAWN
SCALE:1/1	UNIT:mm	PAGE:1/1				
圖面名稱	PG320240LRF-DE9HZ3			研發 2005-9-6 廖志豪	研發 2005-9-2 李美倫	研發 2005-9-2 賴銘信
圖面編號	PG-03100-198	EDI	0			

PT-R-251

LCM Model	PG320240LRF-DE9HZ3
版次Ver.0	

LCM包裝規格書
LCM Packaging Specifications

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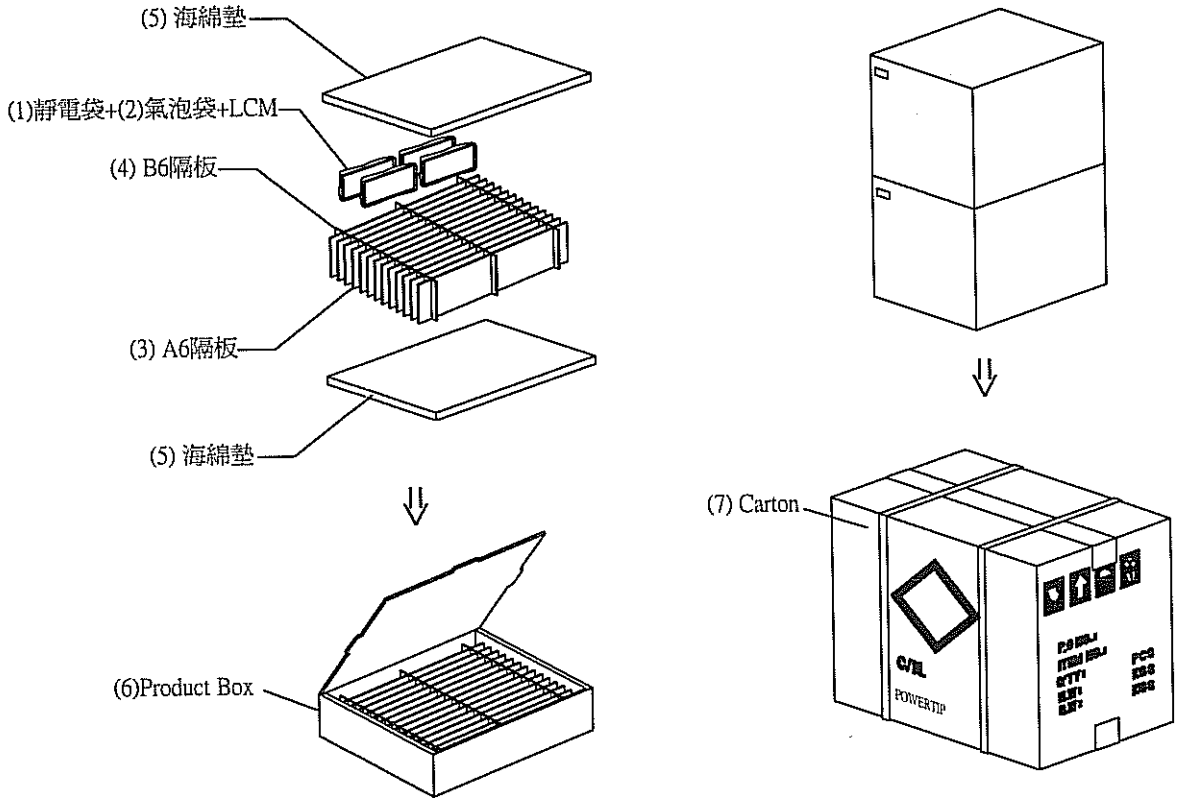
1.包裝材料規格表 (Packaging Material) : (per carton)

No.	Item	Model	Dimensions (mm)	Quantity
1	成品 (LCM)	PG320240LRF-DE9HZ3	148.02 X 120.24	28
2	靜電袋(1)	BAG240170ARA0A	240 X 170	28
3	氣泡袋(2)	BAG170150AWB0A	170 X 150	28
4	A6隔板(3)	BX33800012BZ0A	338 X 125 X 3	16
5	B6隔板(4)	BX29800012BZ0A	293 X 125 X 3	6
6	海綿墊(5)	OTFOAM00005A0A	330 X 290 X 10	4
7	C4內盒(6)Product Box	BX36031014AABA	360 X 310 X 142	2
8	外紙箱(7)Carton	BX39432432CCBA	394 X 324 X 321	1
9				

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

(1)Quantity Of Spacer : A6隔板 X 8 , B6隔板 X 3

(2)Total LCM quantity in carton : quantity per box 14 x no of boxes 2 = 28



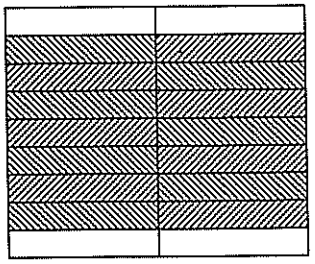
特 記 事 項 (REMARK)

1. Label Specifications :

MODEL:
LOT NO:
QUANTITY:
CHECK:

2. 每個間隔放1片模組，前後間隔不放置模組。(如放置格示意圖)

3.放置格示意圖:



1. 模組 2. 空格