POWERTIP TECH. CORP.

SPECIFICATIONS

CUSTOMER	:	CKR001
SAMPLE CODE	:	
MASS PRODUCTION CODE	:	PC1602LRU-KWA-BY8Q
SAMPLE VERSION	:	01
SPECIFICATIONS EDITION	:	001
DRAWING NO. (Ver.)	:	DMD-08238 (Ver:0)
PACKAGING NO. (Ver.)	:	DPK- 08445(Ver:0)

Customer Approved

Date:

Approved	Checked	Designer
魏永超 7/31-08		杨兴华 7/31 2008

POWERTIP 2008.08.01 HK RD ARP

☐ Preliminary specification for design input

■ Specification for sample approval

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Http://www.powertip.com.tw

RECORDS OF REVISION

Date (mm / dd / yyyy)	Ver.	Edi.	Description	Page	Design by
2008.7.29	01	001	SWICH TO ROHS COMPLIANT PART NOMBER BASE ON **PC1602LRU-KWA-B-Y8**		楊興華

Total：26page

Contents

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	16*2 Characters
LCD Type	STN Gray. Positive Transflective Normal Temp
Driver Condition	LCD Module :1/16 duty 1/5bais
Viewing Direction	6 O'clock
Backlight	YG LED
Weight	25g
Interface	8 BIT PARALLEL
Other(controller / driver IC)	ST7066U-0A
ROHS	THIS PRODUCT CONFORMS THE ROHS OF PTC Detail information please refer web side : http://www.powertip.com.tw/news/LatestNews.asp

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	53.0(L) *20.0(w) *8.6(H)(Max)	mm
Viewing Area	36.0(L) * 10.0(w)	mm
Active Area	34.1(L) *7.4 (w)	mm
Character Size	3.15(L) * 1.85(w)	mm
Character Pitch	4.25(L) *2.15(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_{LCD}	—	V_{DD}-10.0	V_{DD}+0.3	V
Input Voltage	V_{IN}	—	-0.3	V_{DD}+0.3	V
Operating Temperature	T_{OP}	—	0	50	℃
Storage Temperature	T_{ST}	—	-20	70	℃
Storage Humidity	H_D	Ta＜60 ℃	0	90	%RH

1.4 DC Electrical Characteristics

V_{dd} =5.0 V ± 10%，V_{SS} = 0V， Ta = 25℃

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{dd}	-	4.5	5.0	5.5	V
“H” Input Voltage	V_{IH}	-	0.7 V_{dd}	-	V_{dd}	V
“L” Input Voltage	V_{IL}	-	-0.3	-	0.6	V
“H” Output Voltage	V_{OH}	I_{OH}=-0.1mA	3.9	-	V_{dd}	V
“L” Output Voltage	V_{OL}	I_{OL}=0.1mA	-	-	0.4	V
Supply Current	I_{dd}	V_{DD}=5.0V;V_{OP}=4.5V; Pattern= Full display	-	1.3	-	mA
		V_{DD}=5.0V;V_{OP}=4.5V; Pattern= Horizontal line*1	-	1.3	3.0	
LCM Driver Voltage	V_{OP}*2	0℃	4.7	4.9	5.1	V
		25℃	4.3	4.5	4.7	
		50℃	4.2	4.4	4.6	

NOTE: *1 The Maximum current display;

*2 The VOP test point is VDD-VO.

1.5 Optical Characteristics

LCD Panel：1/16Duty，1/5Bias，V_{LCD} =4.67V，Ta =25℃

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Reference
Response Time	Rise	tr	C≥2.0, ∅ = 270°	-	150	-	ms	Note2
	Fall	tf		-	300	-		
Viewing angle range	Top	ΘY+		40	-	-	Deg.	Notes 1
	Bottom	ΘY-		40	-	-		
	Left	ΘX-		45	-	-		
	Right	ΘX+		45	-	-		
Contrast Ratio		C	θ = 0°, ∅ = 270°	5	7	-		Note 3
Wavelength		Hue		-	570	-	nm	Note 4
Uniformity *2		△B		70	-	-	%	

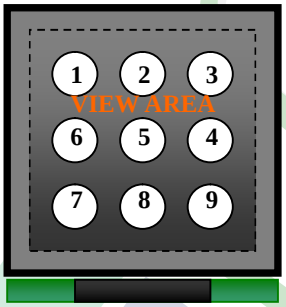
1：Measurement Condition for Optical Characteristics:

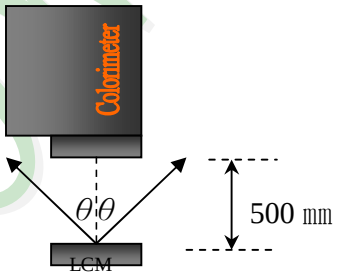
a：Environment: 25℃±5℃ / 60±20%R.H，no wind，dark room below 10 Lux at typical lamp current and typical operating frequency.

b：Measurement Distance: 500 ± 50 ㎜ ，(θ= 0°)

c：Equipment: TOPCON BM-7 fast，(field 1°)，after 10 minutes operation.

d：The uncertainty of the C.I.E coordinate measurement ±0.01，Average Brightness ± 4%



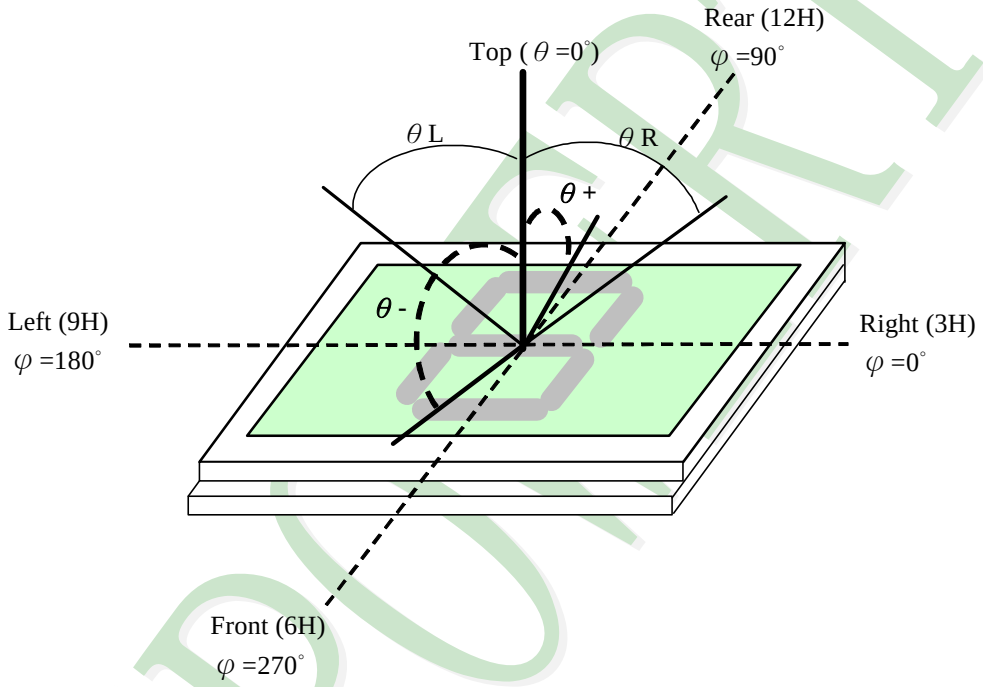


Colorimeter=BM-7 fast

Note 1.

Optical characteristics-2

Viewing angle

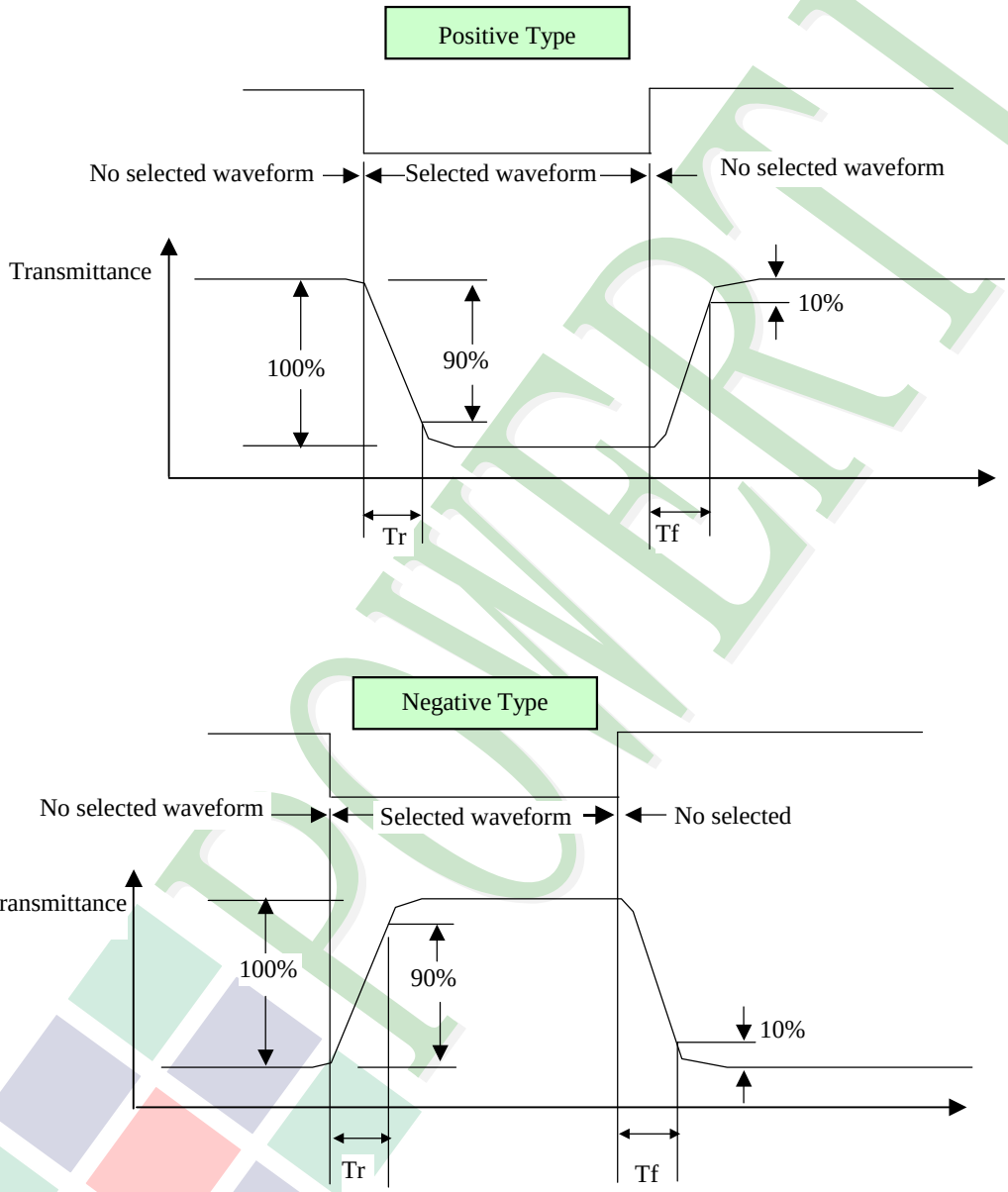


Viewing angle

Note 2.

Optical characteristics-3

Fig.2 Definition of response time



Electrical characteristics-2

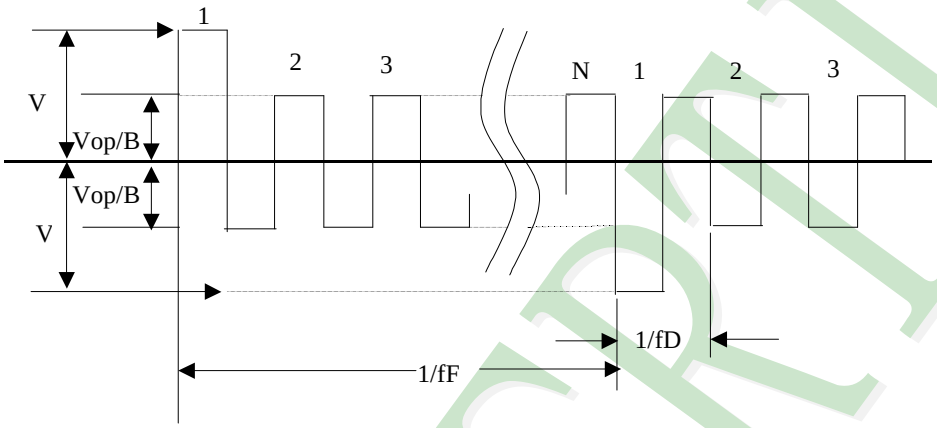
※2 Drive waveform

Vop: Drive voltage　　fF: Frame frequency

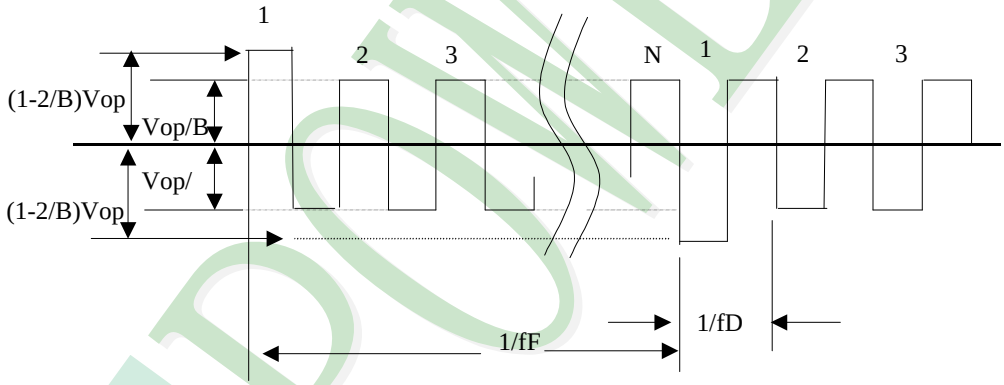
1/B: Bias　　fD: Drive frequency

N: Duty

(1) Selected waveform

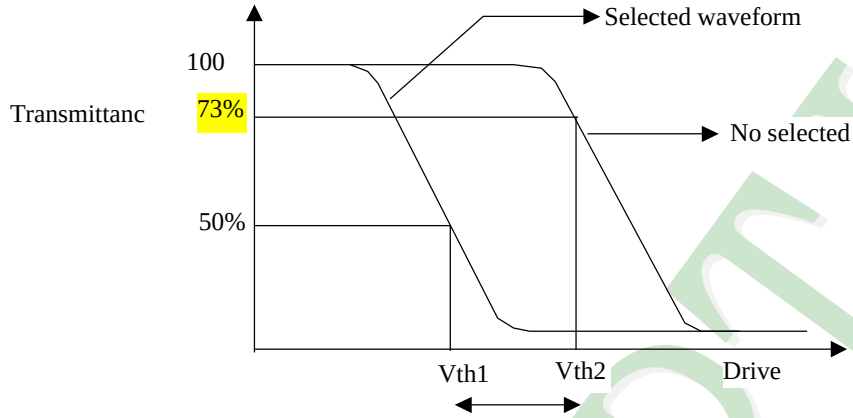


(2) Non- Selected wave form



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

Note 3. : Definition of Vth

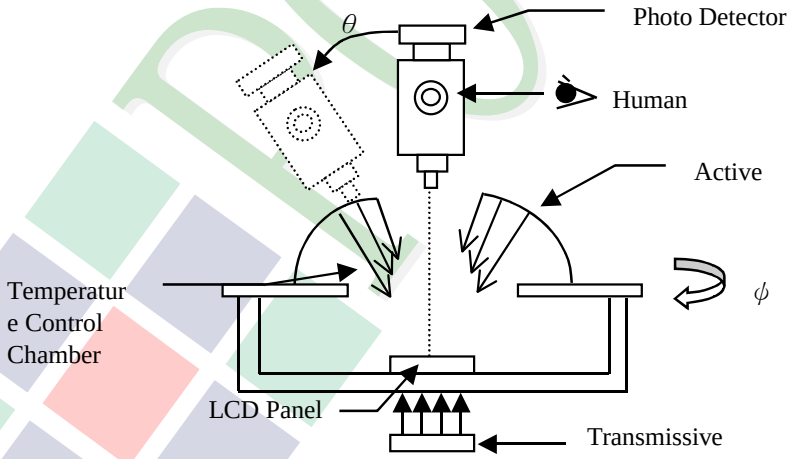


Active voltage range

	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℃	-	40	mA
Reverse Voltage	VR	Ta =25℃	-	8	V
Reverse Current	IR	VR= 8V	-	0.2	mA
Power Dissipation	PD	Ta =25℃	-	0.19	W

Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF= 28mA	-	4.2	4.8	V
Average Brightness (without LCD)	IV		4	5	-	cd/m^2
Wavelength (Without LCD)		IF= 28mA	565	570	575	nm
Color	YELLOW GREEN					

2. MODULE STRUCTURE

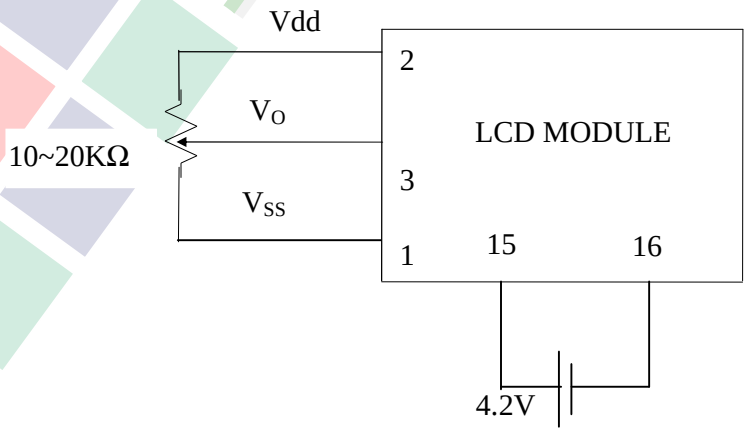
2.1 Counter Drawing

See Appendix

2.2 Interface Pin Description

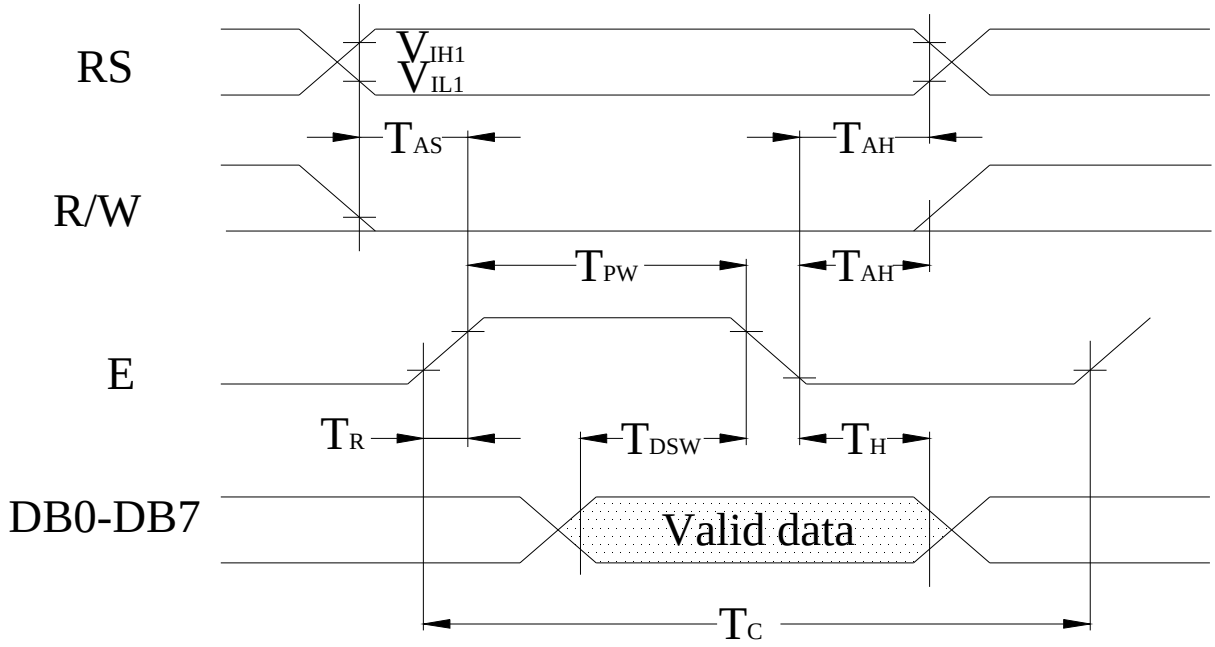
Pin No.	Symbol	Signal Description
1	VSS	Signal ground (GND)
2	Vdd	Power Supply (V_{dd}>V_{SS})
3	VO	Operating voltage(LCD Driver)
4	RS	Register Selection input High = Data register Low = Instruction register (for write) Busy flag address counter (for read)
5	R/$\overline{W}$	Read/Write signal input is used to select the read/write mode. High = Read mode, Low = Write mode
6	E	Start enable signal to read or write the data
7	DB0	Databus pin
8	DB1	Databus pin
9	DB2	Databus pin
10	DB3	Databus pin
11	DB4	Databus pin
12	DB5	Databus pin
13	DB6	Databus pin
14	DB7	Databus pin
15	A	Power supply for LED B / L (+)
16	K	Power supply for LED B / L (-)

Contrast Adjust

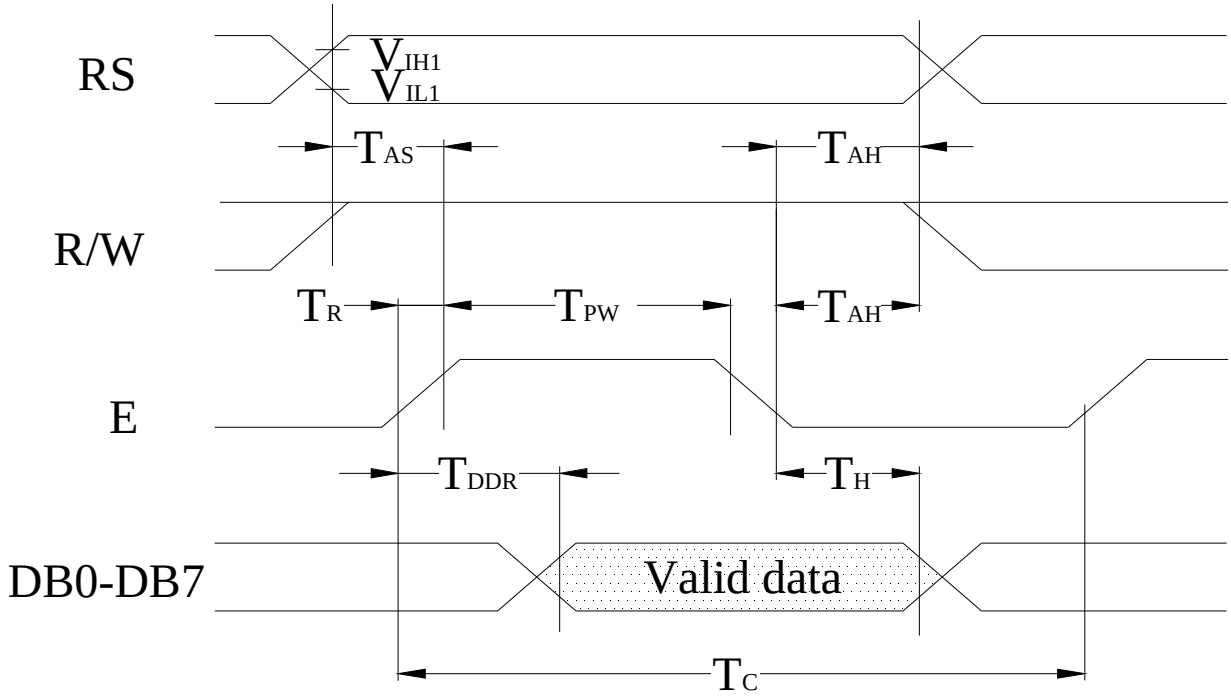


2.3 Timing Characteristics

- Writing data from MPU to ST7066U



- Reading data from ST7066U to MPU



- Write Mode (Writing data from MPU to ST7066U)

(V_{DD} = +5V,Ta=25°C)

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
T_C	Enable Cycle Time	Pin E	1200	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T_R , T_F	Enable Rise / Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS , RW,E	0	-	-	ns
T_{AH}	Address Hold Time	Pins :RS,RW,E	10	-	-	ns
T_{DSW}	Data Setup Time	Pins:DB0~DB7	40	-	-	ns
T_H	Data Hold Time	Pins:DB0~DB7	10	-	-	ns

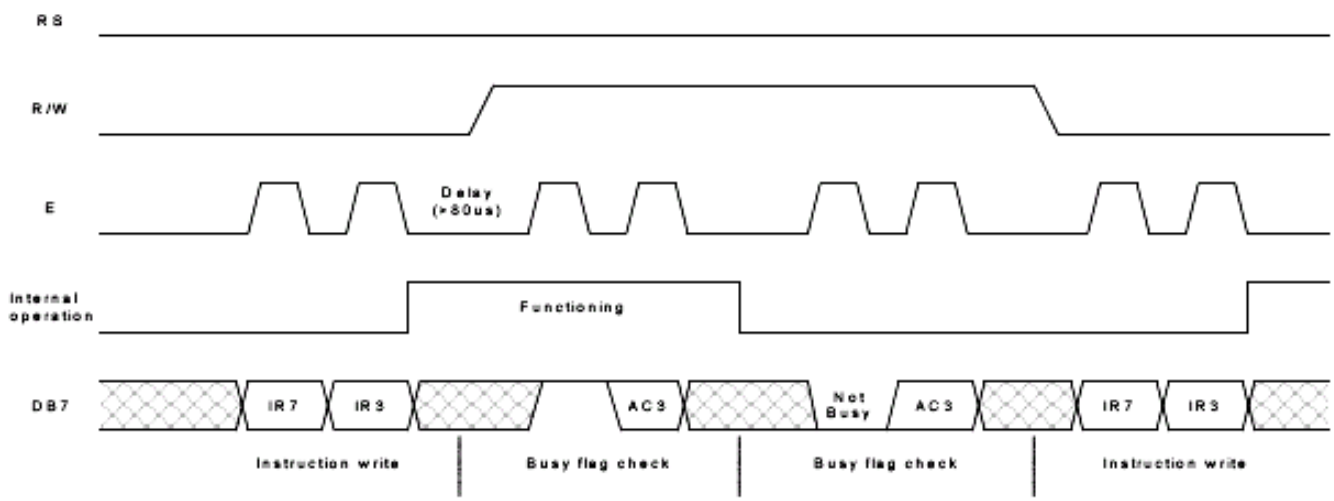
- Read Mode (Reading data from ST7066U to MPU)

(V_{DD} = +5V,Ta=25°C)

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
T_C	Enable Cycle Time	Pin E	1200	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T_R , T_F	Enable Rise / Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS , RW,E	0	-	-	ns
T_{AH}	Address Hold Time	Pins :RS,RW,E	10	-	-	ns
T_{DDR}	Data Setup Time	Pins:DB0~DB7	-	-	100	ns
T_H	Data Hold Time	Pins:DB0~DB7	10	-	-	ns

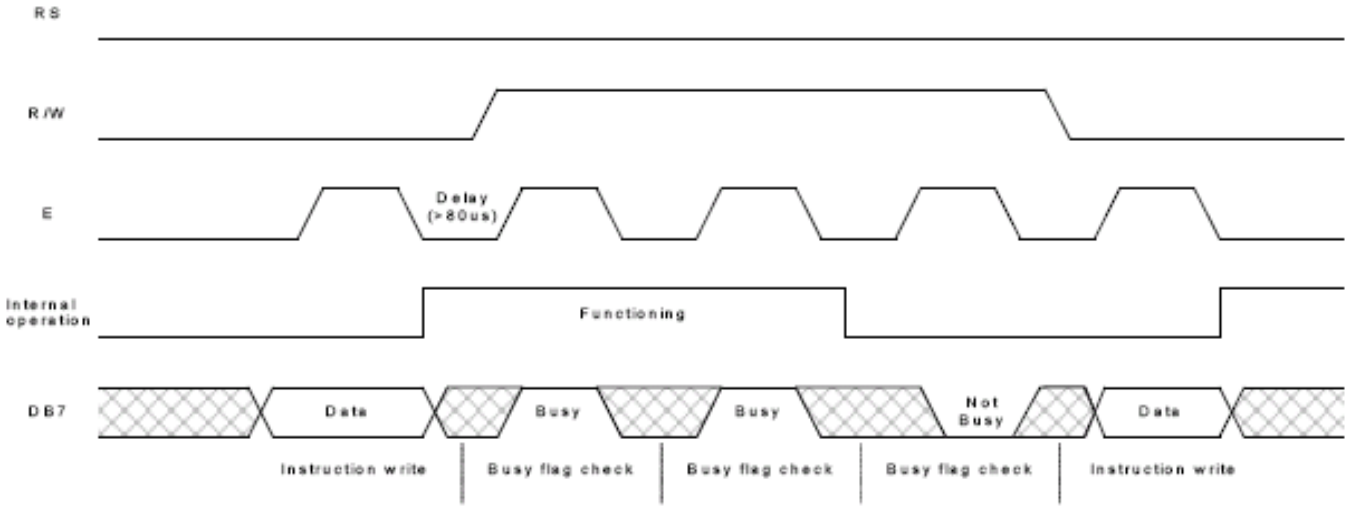
For 4-bit interface date, only four bus lines (DB4 to DB7) are used for transfer.

Example of busy flag check timing sequence



For 8-bit interface date, all eight bus lines (DB0 to DB7) are used .

Example of busy flag check timing sequence



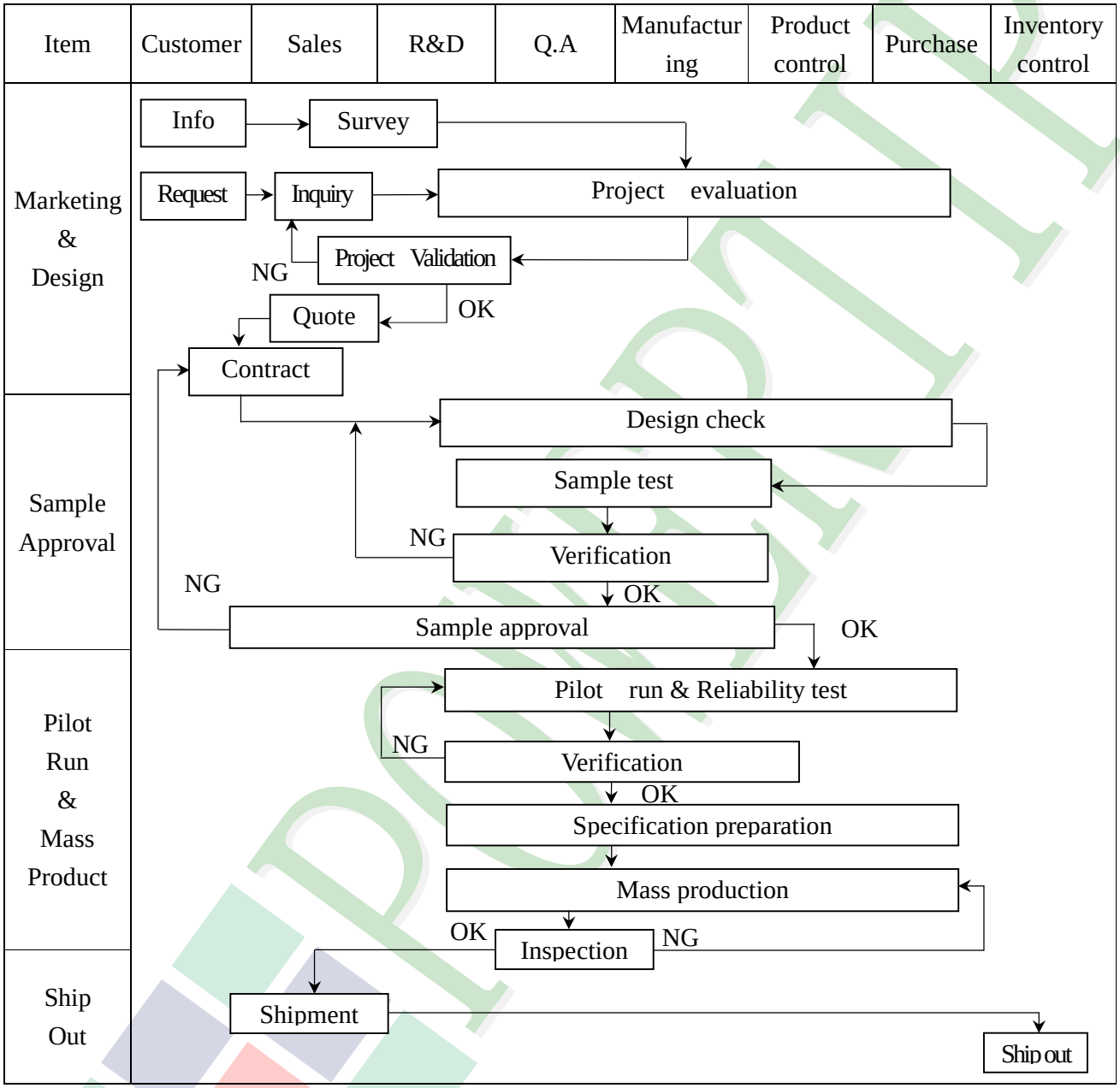
2.4 Character Pattern

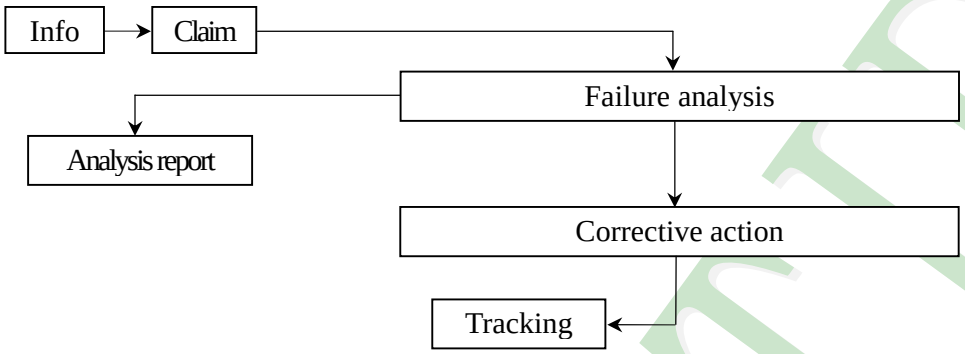
■ CHARACTER PATTERN(SO/HO/EA,WA)

Upper 4 Bits / Lower 4 Bits	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
xxxx0000	CG RAM (1)															
xxxx0001	(2)															
xxxx0010	(3)															
xxxx0011	(4)															
xxxx0100	(5)															
xxxx0101	(6)															
xxxx0110	(7)															
xxxx0111	(8)															
xxxx1000	(1)															
xxxx1001	(2)															
xxxx1010	(3)															
xxxx1011	(4)															
xxxx1100	(5)															
xxxx1101	(6)															
xxxx1110	(7)															
xxxx1111	(8)															

3. QUALITY ASSURANCE SYSTEM

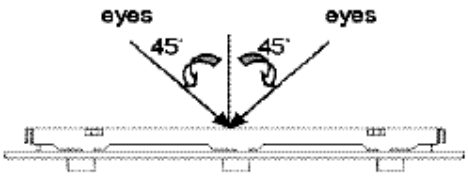
3.1 Quality Assurance Flow Chart

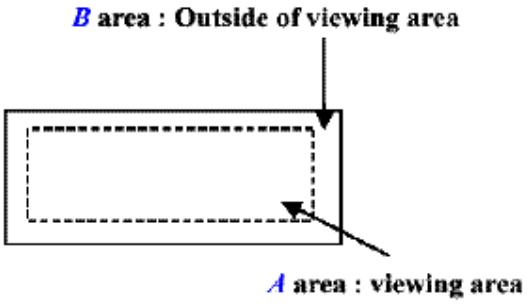


Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service								
Q.A Activity	1. ISO 9001 Maintenance Activities 2. Process improvement proposal 3. Equipment calibration 4. Education And Training Activities 5. Standardization Management							

3.2 Inspection Specification

◆Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level Ⅱ .
◆Equipment : Gauge、MIL-STD、Powertip Tester、Sample
◆Defect Level : Major Defect AQL 0.4; Minor Defect AQL 1.5 .
◆OUT Going Defect Level : Sampling .
◆Manner of appearance test :
(1). The test be under 40W×2 fluorescent light ’ and distance of view must be at 30 cm.
(2). The test direction is base on about around 45° of vertical line. (Fig. 1)
(3). Definition of area . (Fig. 2)

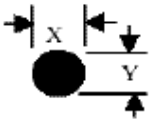


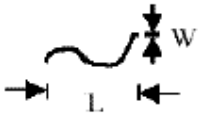


◆ Specification:

NO	Item	Criterion	level
01	Product condition	1.1 The part number is inconsistent with work order of Production.	Major
		1.2 Mixed production types.	Major
		1.3 Assembled in inverse direction.	Major
02	Quantity	2.1 The quantity is inconsistent with work order of production.	Major
03	Outline dimension	3.1 Product dimension and structure must conform to Structure diagram.	Major
04	Electrical Testing	4.1 Missing line character、dot and icon.	Major
		4.2 No function or no display.	Major
		4.3 Output data is error.	Major
		4.4 LCD viewing angle defect.	Major
		4.5 Current consumption exceeds product specifications.	Major
05	Black or white dot、scratch、contamination Round type	5.1 Round type: 5.1.1 display only : • White and black spots on display ≦ 0.30mm, no more than Four white or black spots present. • Densely spaced : NO more than two spots or lines within 3mm	Minor

◆Specification :

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>level</th></tr>
<tr><td>05</td><td>Black or white dot、scratch、contamination
Round type
 

Φ=(x+y)/2
 
</td><td>5.1.2 Nom-display :
<table><tr><td>Dimension (diameter : Φ)</td><td>Acceptance(Q’ty)</td></tr><tr><td>Φ ≦0.10mm</td><td>Accept no dense</td></tr><tr><td>0.10mm＜Φ ≦0.20mm</td><td>3</td></tr><tr><td>0.20mm＜Φ ≦0.30mm</td><td>2</td></tr><tr><td>Total</td><td>4</td></tr></table>5.1.3 Line type:
<table><tr><td colspan="2">Dimension (diameter : Φ)</td><td colspan="2">Acceptance (Q’ty)</td></tr><tr><td>Length</td><td>width</td><td>A area</td><td>B area</td></tr><tr><td>---</td><td>w≦0.03mm</td><td>Accept no dense</td><td>Don’t count</td></tr><tr><td>L≦3.0mm</td><td>0.03mm＜Φ ≦0.05mm</td><td rowspan="2">4</td><td>Don’t count</td></tr><tr><td>L≦2.5mm</td><td>0.05mm＜Φ ≦0.075mm</td><td>Don’t count</td></tr><tr><td>---</td><td>w＞0.075mm</td><td colspan="2">As round type</td></tr></table></td><td>Minor</td></tr>
<tr><td>06</td><td>Polarizer
Bubble</td><td><table><tr><td rowspan="2">Dimension (diameter : Φ)</td><td colspan="2">Acceptance(Q’ty)</td></tr><tr><td>A area</td><td>B area</td></tr><tr><td>Φ ≦0.20mm</td><td>Accept no dense</td><td>Don’t count</td></tr><tr><td>0.20mm＜Φ ≦0.50mm</td><td>3</td><td>Don’t count</td></tr><tr><td>0.50mm＜Φ ≦1.00mm</td><td>2</td><td>Don’t count</td></tr><tr><td>Φ＞1.00mm</td><td>0</td><td>Don’t count</td></tr><tr><td>Total quantity</td><td>4</td><td>Don’t count</td></tr></table></td><td>Minor</td></tr>
<tr><td>07</td><td>The crack of glass</td><td>● Glass Crack:
7.1 Crack on the circuit of electrode terminal :
 

<table><tr><td></td><td>X</td><td>Y</td><td>Z</td></tr><tr><td>Front</td><td>X≦1/5 a</td><td>Y≦ 1/2 D</td><td>Z≦ t</td></tr><tr><td>Back</td><td colspan="3">Neglect</td></tr></table></td><td>Minor</td></tr>
</table>

◆Specification :

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td rowspan="2">07</td><td>The crack of glass

X: The length of Crack

Y: The width of crack

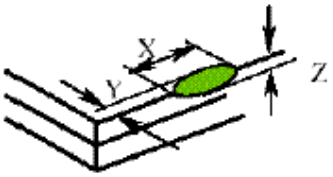
Z: The thickness of crack

D: terminal length

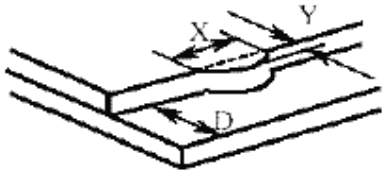
T: The thickness of glass

A : The length of glass</td><td>● Glass Crack:

7.2 General glass crack and corner edge:

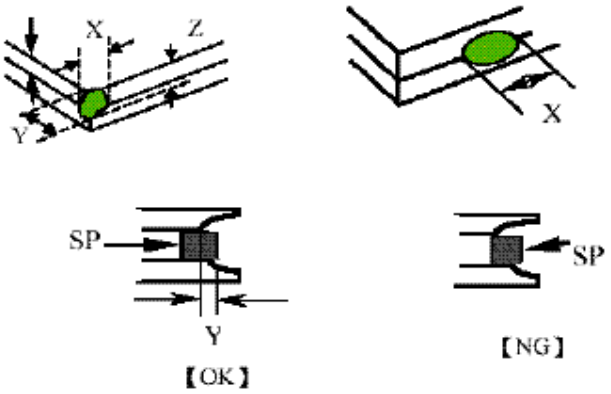
7.2.1
 

<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>Neglect</td><td>Out A area</td><td>Neglect</td></tr></table>
7.2.2
 

<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>Neglect</td><td>Out A area</td><td>Neglect</td></tr></table></td><td>Minor</td></tr>
<tr><td>7.3 Glass remain:
 

<table><tr><td>X</td><td>Y</td></tr><tr><td>Neglect</td><td>≦ 1/3 d</td></tr></table></td><td>Minor</td></tr>
</table>

◆Specification :

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td>07</td><td>The crack of glass
X: The length of Crack
Y: The width of crack
Z: The thickness of crack
D: terminal length
T: The thickness of glass
A : The length of glass</td><td>7.4 Corner crack and medial crack:
 

<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≦1/5a</td><td>Crack can’t enter viewing area</td><td>≦1/2t</td></tr>
<tr><td>≦1/5a</td><td>Crack can’t exceed the half of width of SP width of SP</td><td>1/2t<Z≦2t</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>08</td><td>Backlight elements</td><td>8.1 Backlight can’t work normally.</td><td>Major</td></tr>
<tr><td></td><td></td><td>8.2 Backlight doesn’t light or color is wrong.</td><td>Major</td></tr>
<tr><td></td><td></td><td>8.3 Illumination source flickers when lit.</td><td>Major</td></tr>
<tr><td>09</td><td>General appearance</td><td>9.1 pin type must match type in specification sheet</td><td>Major</td></tr>
<tr><td></td><td></td><td>9.2 No short circuits in components on PCB or FPC</td><td>Major</td></tr>
<tr><td></td><td></td><td>9.3Product packaging must the same as specified on packaging specification sheet.</td><td>Major</td></tr>
<tr><td></td><td></td><td>9.4 The folding and peeled off in polarizer are not acceptable</td><td>Major</td></tr>
<tr><td></td><td></td><td>9.5 The PCB or FPC between B/L assembled distance (PCB or FPC) is ≦1.5mm</td><td>Major</td></tr>
</table>

4. RELIABILITY TEST

4.1 Reliability Test Condition

NO.	TEST ITEM	TEST CONDITION
1	High Temperature Storage Test	Keep in 70 ±2℃ 96 hrs Surrounding temperature, then storage at normal condition 4hrs
2	Low Temperature Storage Test	Keep in -20 ±2℃ 96 hrs Surrounding temperature, then storage at normal condition 4hrs
3	High Humidity Storage	Keep in +40℃/90%RH duration for 96 hrs Surrounding temperature, then storage at normal condition 4hrs
4	ESD Test	Air Discharge: Apply 2 KV with 5 times Discharge for each polarity +/- Contact Discharge: Apply 250V with 5 times discharge for each polarity +/- 1. Temperature Ambient:15℃～35℃ 2. Humidity relative:30%～60% 3. Energy Storage Capacitance(Cs+Cd):150pF±10% 4. Discharge Resistance(Rd):330Ω±10% 5. Discharge, mode of operation: Single Discharge (time between successive discharges at least 1 s) (Tolerance lf the output voltage indication: ±5%)
5	Temperature Cycling Test	0℃ → 25℃ → 50℃ → 25℃ (30mins) (5mins) (30mins) (5mins) 10 Cycle Surrounding temperature, then storage at normal condition 4hrs
6	Vibration Test (Packaged)	1. Sine wave 10～55HZ frequency (1 min) 2. The amplitude of vibration :1.5 mm 3. Each direction (XYZ) duration for 2 Hrs
7	Drop Test (Packaged)	Packing Weight (Kg) / Drop Height (cm): 0 ~ 45.4 — 122 45.4 ~ 90.8 — 76 90.8 ~ 454 — 61 Over 454 — 46 Drop direction :※3 comer /1 edges /6 sides etch 1times

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.

5.2.8 To control temperature and time of soldering is 320±10℃and 3-5 sec.

5.2.9 To avoid liquid (include organic solvent) stained on LCM .

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.

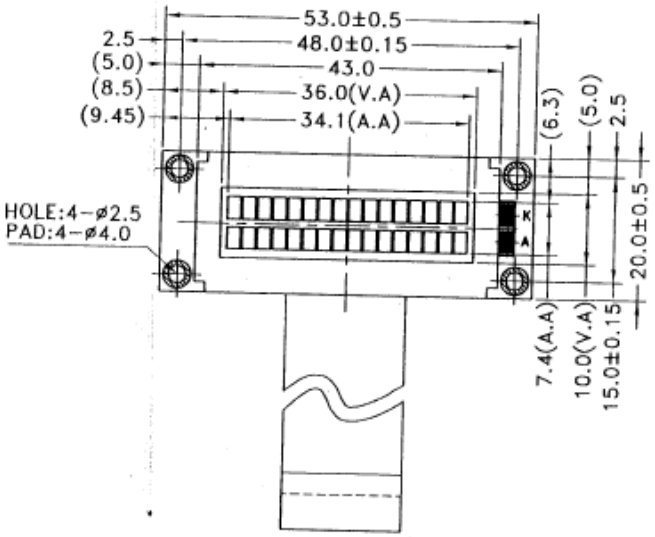
5.4 TERMS OF WARRANTY

5.4.1 Applicable warrant period

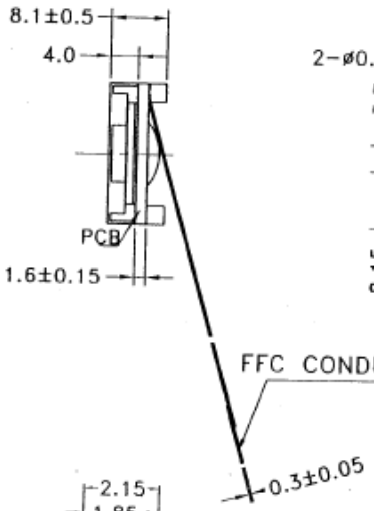
The period is within thirteen months since the date of shipping out under normal using and storage conditions.

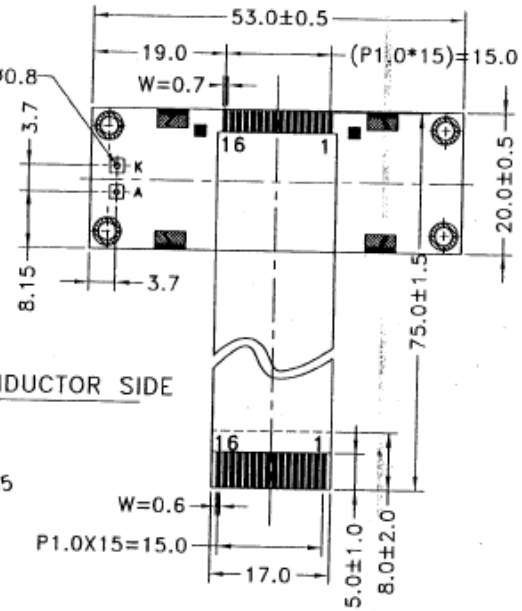
5.4.2 Unaccepted responsibility

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.

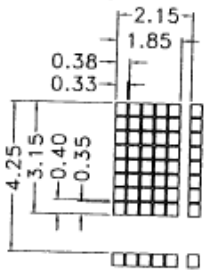


PCB LCD SIDE





PCB IC SIDE



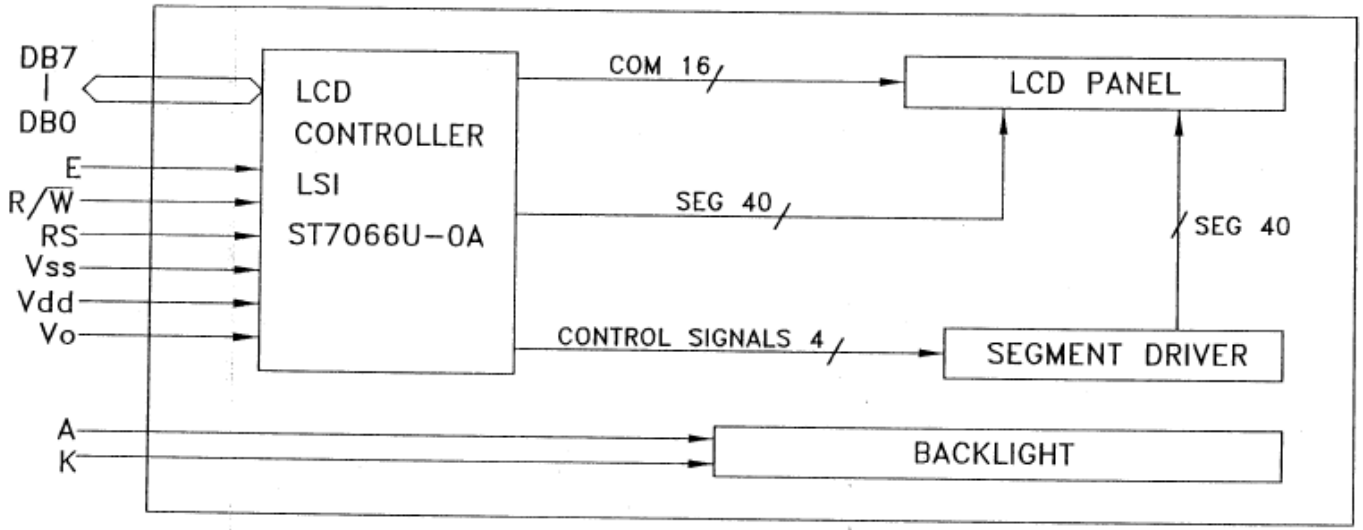
LCD DOTS
SCALE:5/1

NOTES:
1. LCD type:STN Gray,Positive,Transflective.
2. LCD Module:1/16Duty,1/5Bias;
3. Viewing direction:6H;
4. T_{OP}=0°C~50°C, T_{ST}=-20°C~70°C;
5. The tolerance unless classified ±0.3mm;
6. This product conforms ROHS;

REV	DESCRIPTION	DATE

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

SCALE:1/1	UNIT:mm	PAGE:1/2	APPROVED	CHECKER	DRAWN
圖面名稱	PC1602LRS-KWA-BY8Q				
圖面編號	DMD-08238	EDI	0			



PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	K

REV	DESCRIPTION	DATE

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

SCALE:no	UNIT:no	PAGE:2/2	APPROVED	CHECKER	DRAWN
圖面名稱	PC1602LRS-KWA-BY8Q				
圖面編號	DMD-08238	EDI 0			

LCM Model	PC1602LRS-KWA-BY8Q
Drawing NO.	DPK-08445

LCM包裝規格書
LCM Packaging Specifications

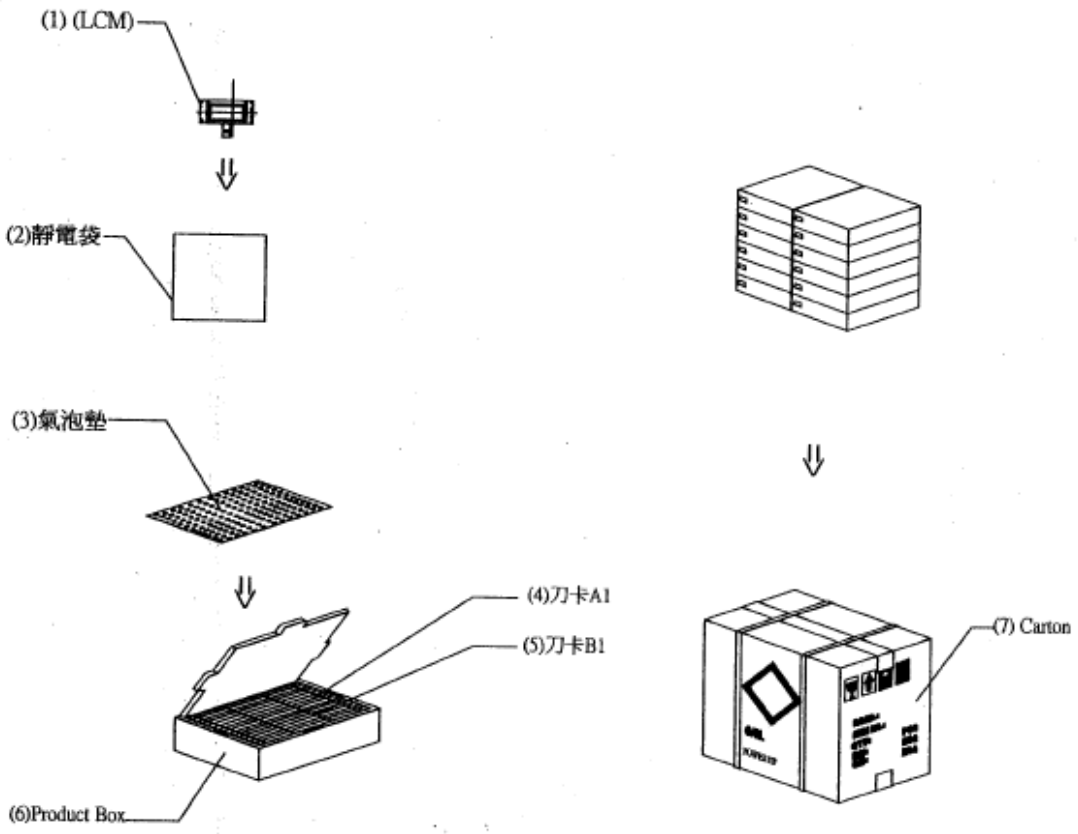
Approve	Check	
		王慧 08.07.28
DATE	初版	版次Ver
08'07'28	08'07'28	0

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

No.	Item	Model	Dimensions (mm)	Quantity
1	成品(1) LCM	PC1602LRS-KWA-BY8Q	(53.0*20.0*8.6)	540
2	靜電袋 (2)BAG	BAG100100ARABA	100*100*0.05	540
3	氣泡墊(3)BAG	BAG290240BRBBA	240*290*5	24
4	刀卡A1(4)BX	BX29500047BZBA	295*47*3	168
5	刀卡B1(5)BX	BX24500047BZBA	245*47*4.5	48
6	C1內盒(6)Product Box	BX31025555AABA	310*255*55	12
7	外紙箱(7)Carton	BX52532536CCBA	525 *325 * 360	1
8				
9				

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

(1)LCM quantity per box : no. per box	15	x no. of box	3	=	45
(2)Total LCM quantity in carton : quantity per box	45	x no. of boxes	12	=	540



特 記 事 項 (REMARK)

1. Label Specifications :

MODEL:
LOT NO:
QUANTITY:
CHECK: