SPECIFICATIONS

CUSTOMER	:	CKR048
SAMPLE CODE	:	SC1602LRS-KWA-HY8Q
MASS PRODUCTION CODE	:	PC1602LRS-KWA-HY8Q
SAMPLE VERSION	:	01
SPECIFICATIONS EDITION	:	001
DRAWING NO. (Ver.)	:	JLMD - PC1602LRS-KWA-HY8Q (Ver.001)
PACKAGING NO. (Ver.)	:	JPKG - PC1602LRS-KWA-HY8Q (Ver.001)

Customer Approved

Date:

POWERTIP
2009.08.21
IS RD APPROVED

Approved	Checked	Designer
閆偉 魏永超 Ryan Yan Wesley Wei	張平 Ping Zhang	李德軍 Raymond Lee

□ Preliminary specification for design input

■ Specification for sample approval

POWERTIP TECH. CORP.

Headquarters: No.8, 6th Road, Taichung Industrial Park, Taichung, Taiwan
台中市 407 工業區六路 8 號

TEL: 886-4-2355-8168
FAX: 886-4-2355-8166

E-mail: sales@powertip.com.tw
Http://www.powertip.com.tw

RECORDS OF REVISION

Date	Ver.	Edi.	Description	Page	Design by
8/18/2009	**01**	**001**	**New sample**	**-**	**Raymond**

Total：27 pages

Contents

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	16* 2 Characters
LCD Type	STN,Gray, Transflective, Positive.
Driver Condition	LCD Module : 1/16 Duty , 1/5 Bias
Viewing Direction	6 O'clock
Backlight	Yellow green LED B/L
Weight	11.6g
Interface	8 bit
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) * 8.1(H)	mm
Viewing Area	36.0(L) *10.0 (W)	mm
Active Area	34.1 (L) *7.4 (W)	mm
Character Size	1.85 (L)* 3.15(W)	mm
Character Pitch	2.15 (L)* 4.25(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 Voltage	V_{LCD}	—	V_{DD} -10	V_{DD}+0.3	V
Input Voltage	V_{IN}	—	-0.3	V_{DD}+0.3	
Operating Temperature	T_{OP}	—	-20	70	℃
Storage Temperature	T_{ST}	Excluded B/L	-30	80	℃
Storage Humidity	H_D	Ta＜40℃	-	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}	-	0.7V_{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}= 4.67V; Pattern= Horizontal line*1	-	1.3	3	mA
LCM Driver Voltage	V_{OP}*2	-20℃	4.67	4.87	5.07	V
		25℃	4.47	4.67	4.87	
		70℃	4.27	4.47	4.67	

NOTE: *1 The Maximum current display;

*2 The VOP test point is VDD-VO.

1.5 Optical Characteristics

LCD Panel：1/16Duty，1/4Bias，V_{LCD} =4.67 V，Ta =25℃

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Reference
Response Time	Rise	tr	C≥2.0, ∅ = 270°	-	80	120	ms	Note2
	Fall	tf		-	150	225		
Viewing angle range	Top	ΘY+		-	40	-	Deg.	Notes 1
	Bottom	ΘY-		-	40	-		
	Left	ΘX-		-	35	-		
	Right	ΘX+		-	35	-		
Contrast Ratio		CR	25°C	1	2	-	-	Note 3
Wavelength		Hue	-	565	570	575	nm	Note 4
Uniformity *1		△B	-	70	-	-	%	

Note 4 ：

1：△B=B(min) / B(max) * 100%

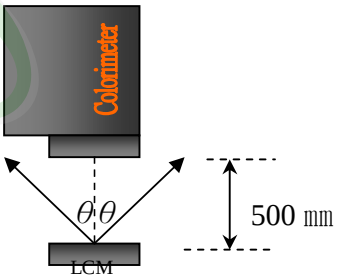
2：Measurement Condition for Optical Characteristics:

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%

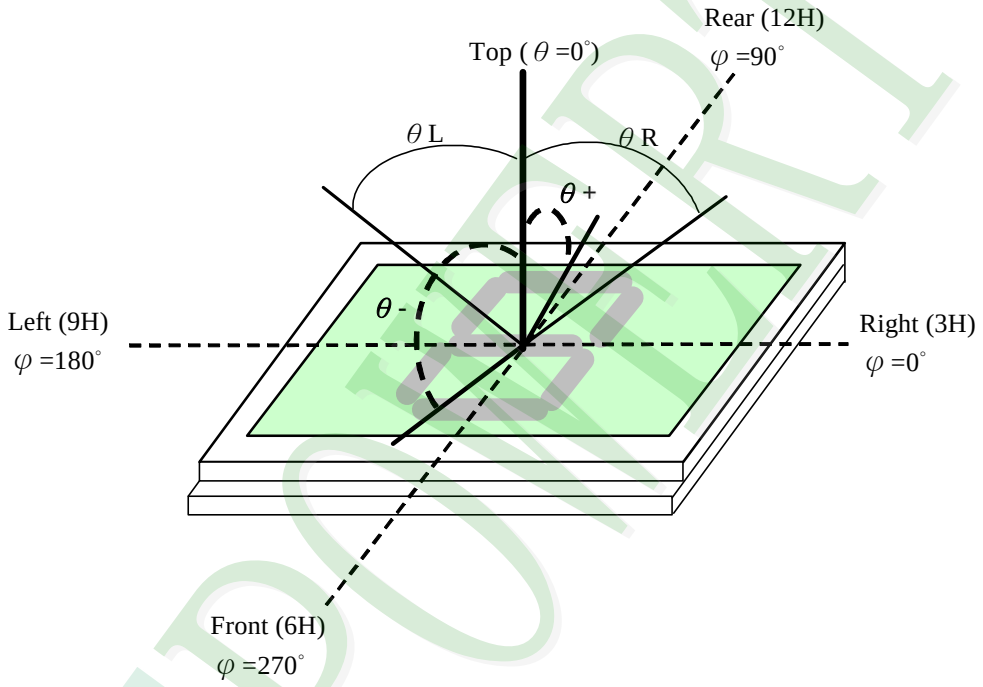


Colorimeter=BM-7 fast

Note 1.

Optical characteristics-2

Viewing angle

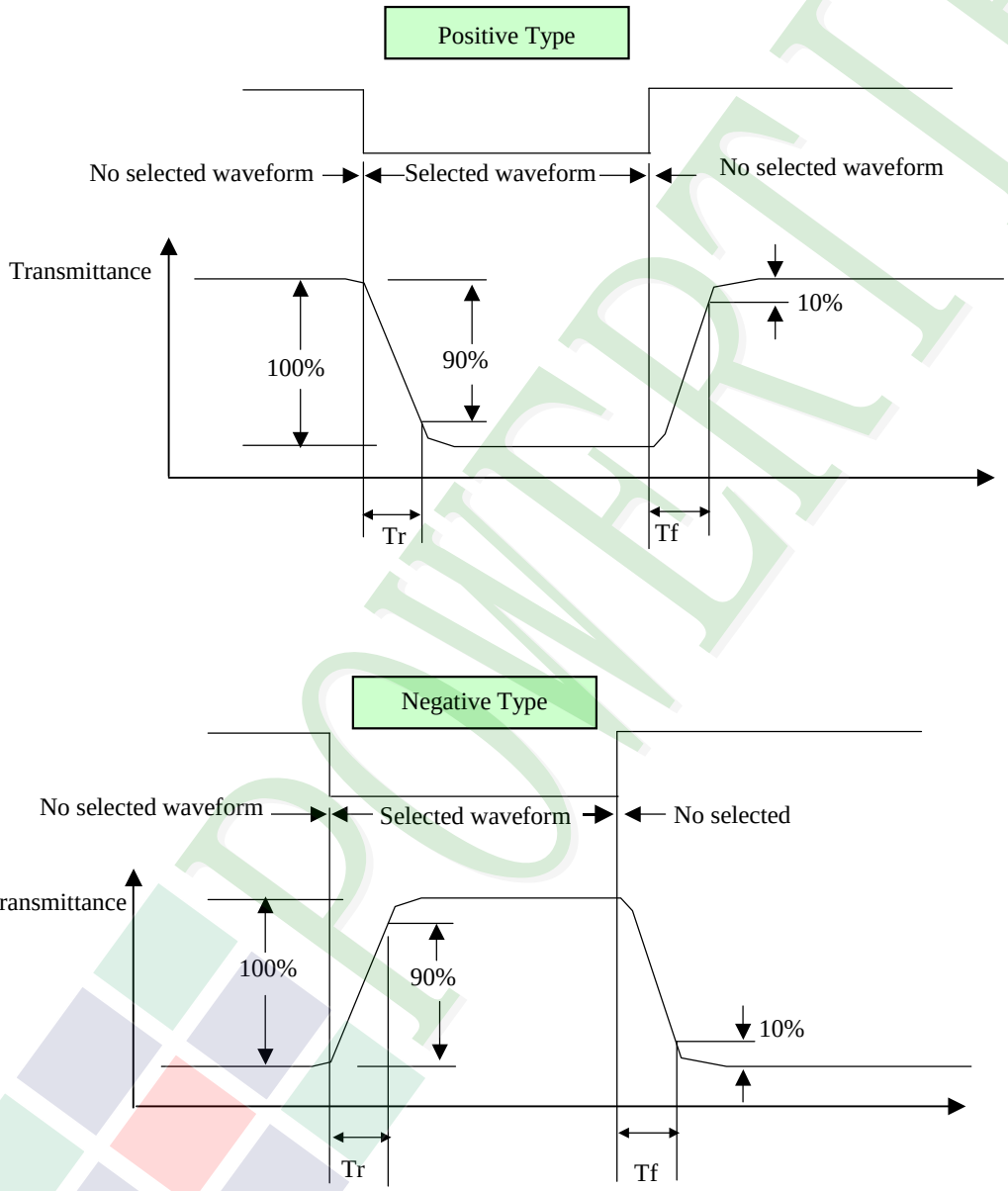


Viewing angle

Note 2.

Optical characteristics-3

Fig.2 Definition of response time



Electrical characteristics-2

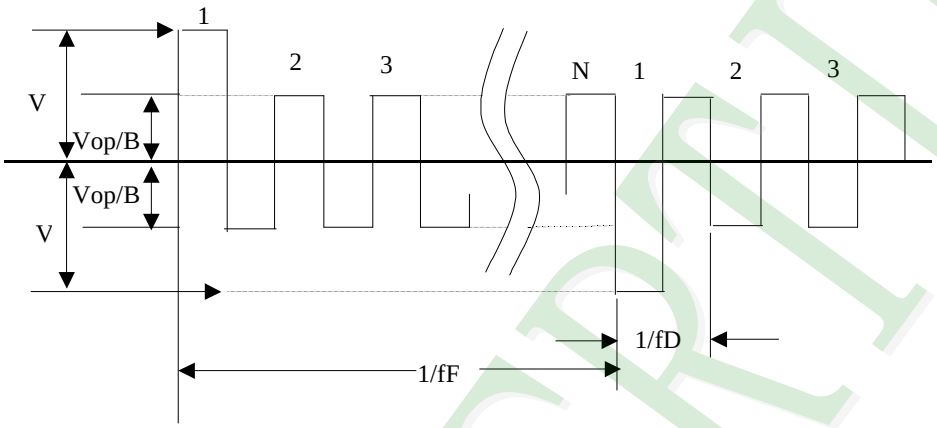
※2 Drive waveform

Vop: Drive voltage fF: Frame frequency

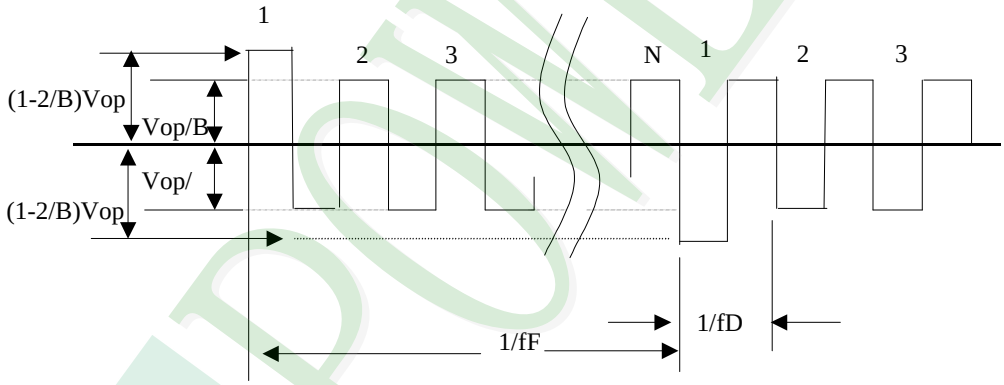
1/B: Bias fD: Drive frequency

N: Duty

(1) Selected waveform



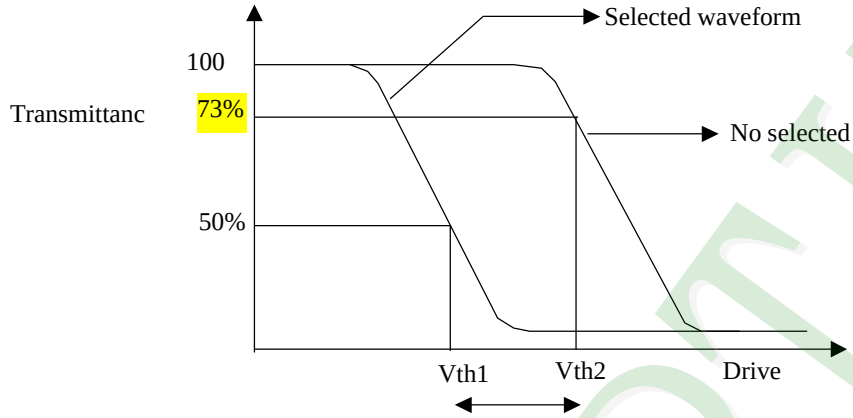
(2) Non- Selected wave form



Note:

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

Note 3. : Definition of Vth

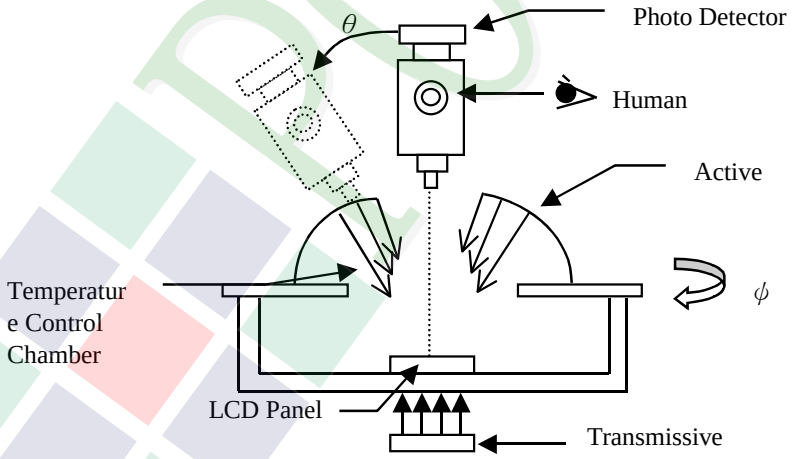


Active voltage range

	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
Power Dissipation	PD	Ta =25℃	-	0.19	W

Electrical / Optical Characteristics

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

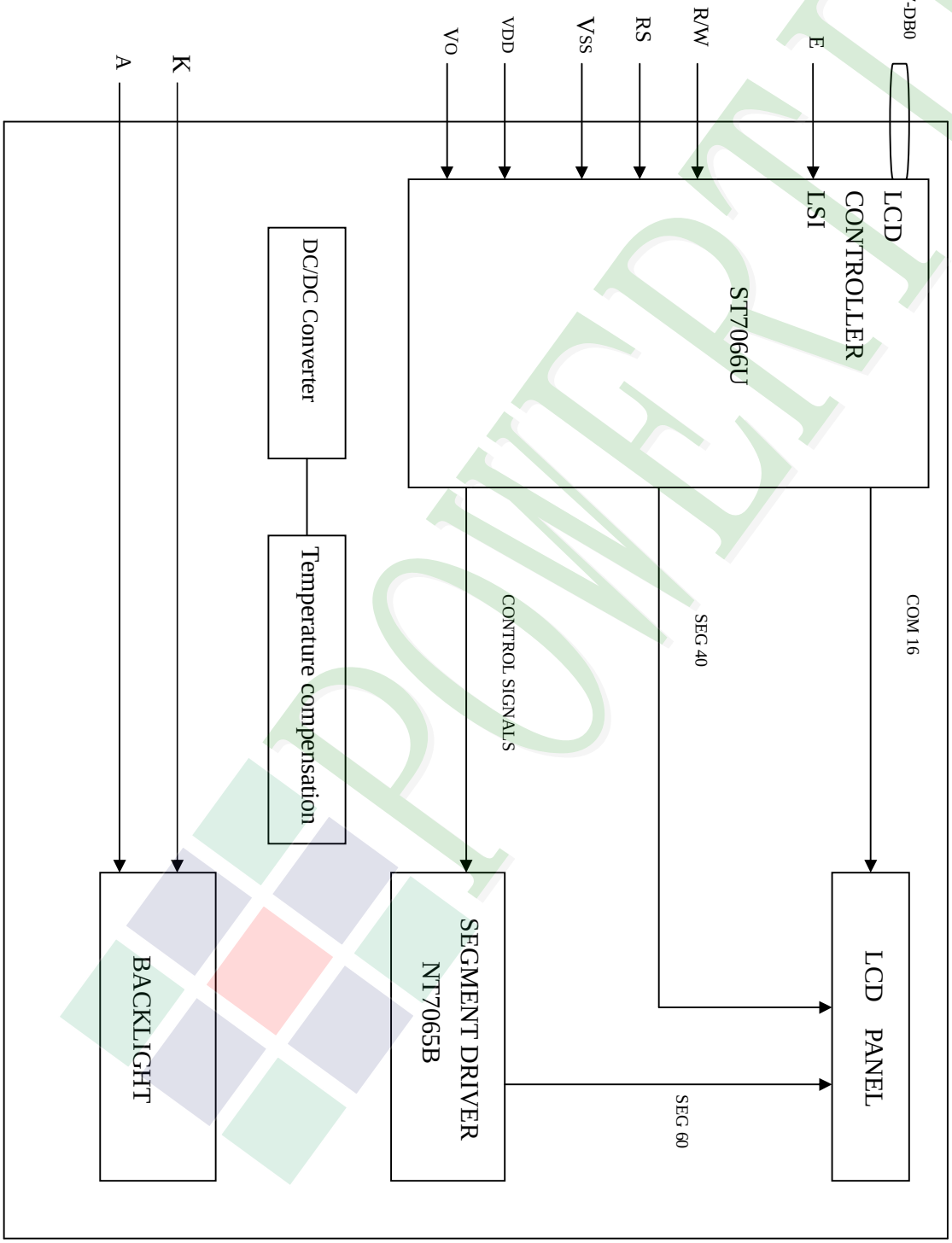
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

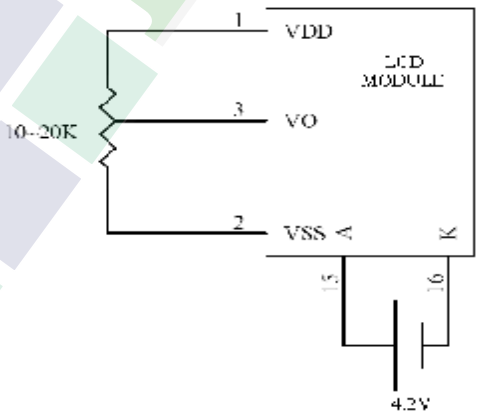
2.1.2 Block Diagram



2.2 Interface Pin Description

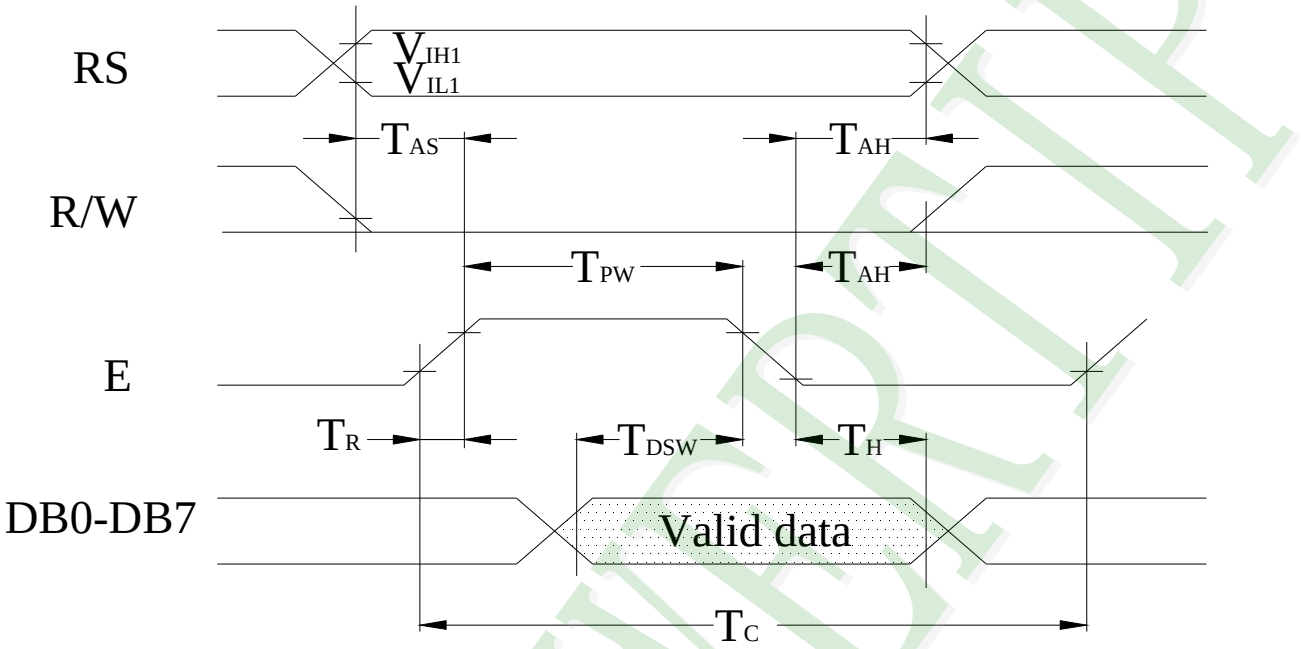
Pin No.	Symbol	Signal Description
1	V_{SS}	Power Supply (Vss=0)
2	V_{DD}	Power Supply (V_{DD}>V_{SS})
3	V_O	Operating voltage for LCD
4	RS	Register Selection input High = Data register Low = Instruction register (for write) Busy flag address counter (for read)
5	R/W	Read/Write signal input is used to select the read/write mode High = Read mode, Low = Write mode
6	E	Start enable signal to read or write the data
7~10	DB0	Four low order bi-directional three-state data bus lines. Use for data transfer between the MPU and the LCD module. These four are not used during 4-bit operation.
	DB1	
	DB2	
	DB3	
11~14	DB4	Four high order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCD module. DB7 can be used as a busy flag.
	DB5	
	DB6	
	DB7	
15	A	Connect the anode of the back light
16	K	Connect the cathode of the back light

Contrast Adjust

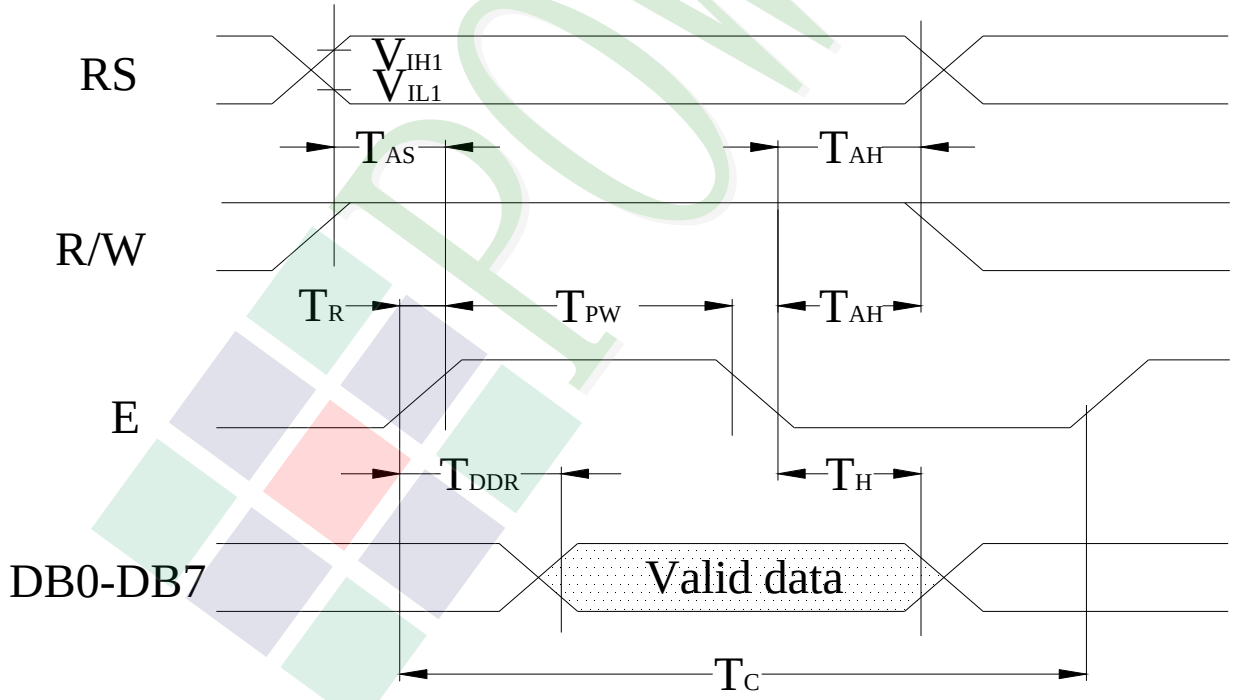


2.3 Timing Characteristics

- 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℃

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

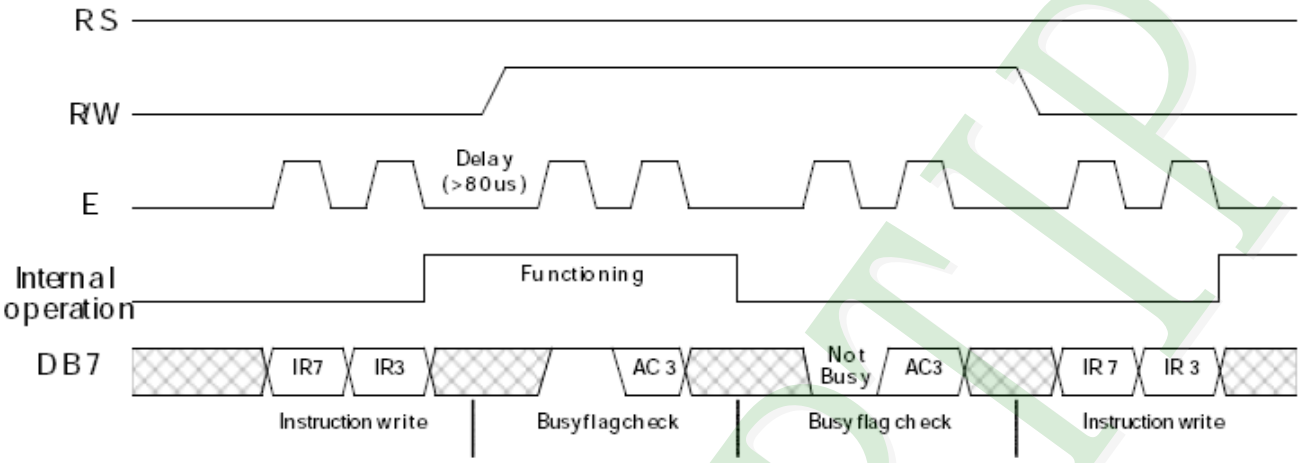
• Read Mode (Reading data from ST7066U to MPU)

V_{DD} =5V Ta = 25℃

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

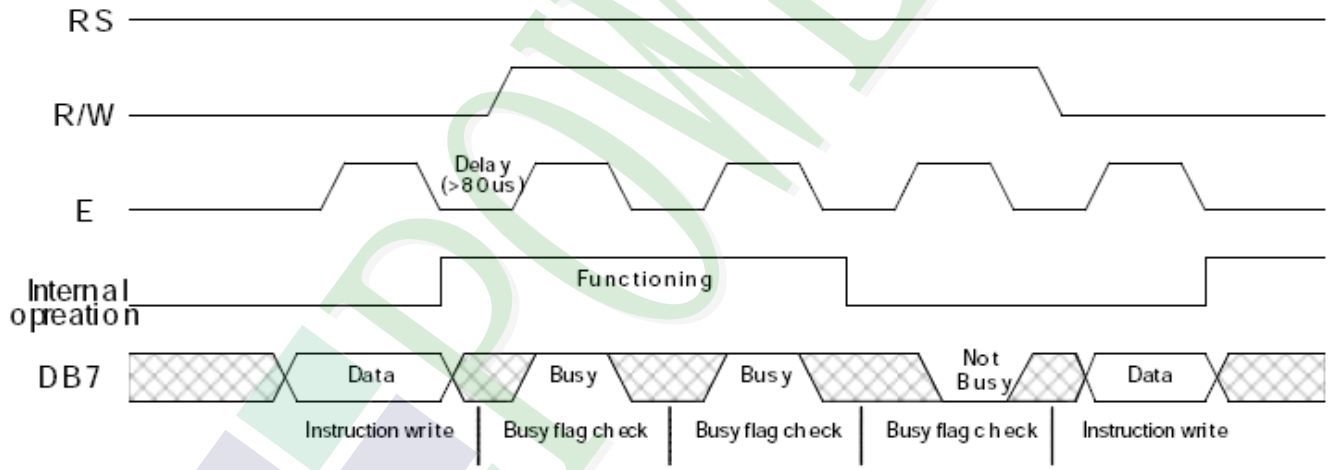
For 4-bit interface date, only four bus lines (DB4 to DB7) are used for transfer.

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

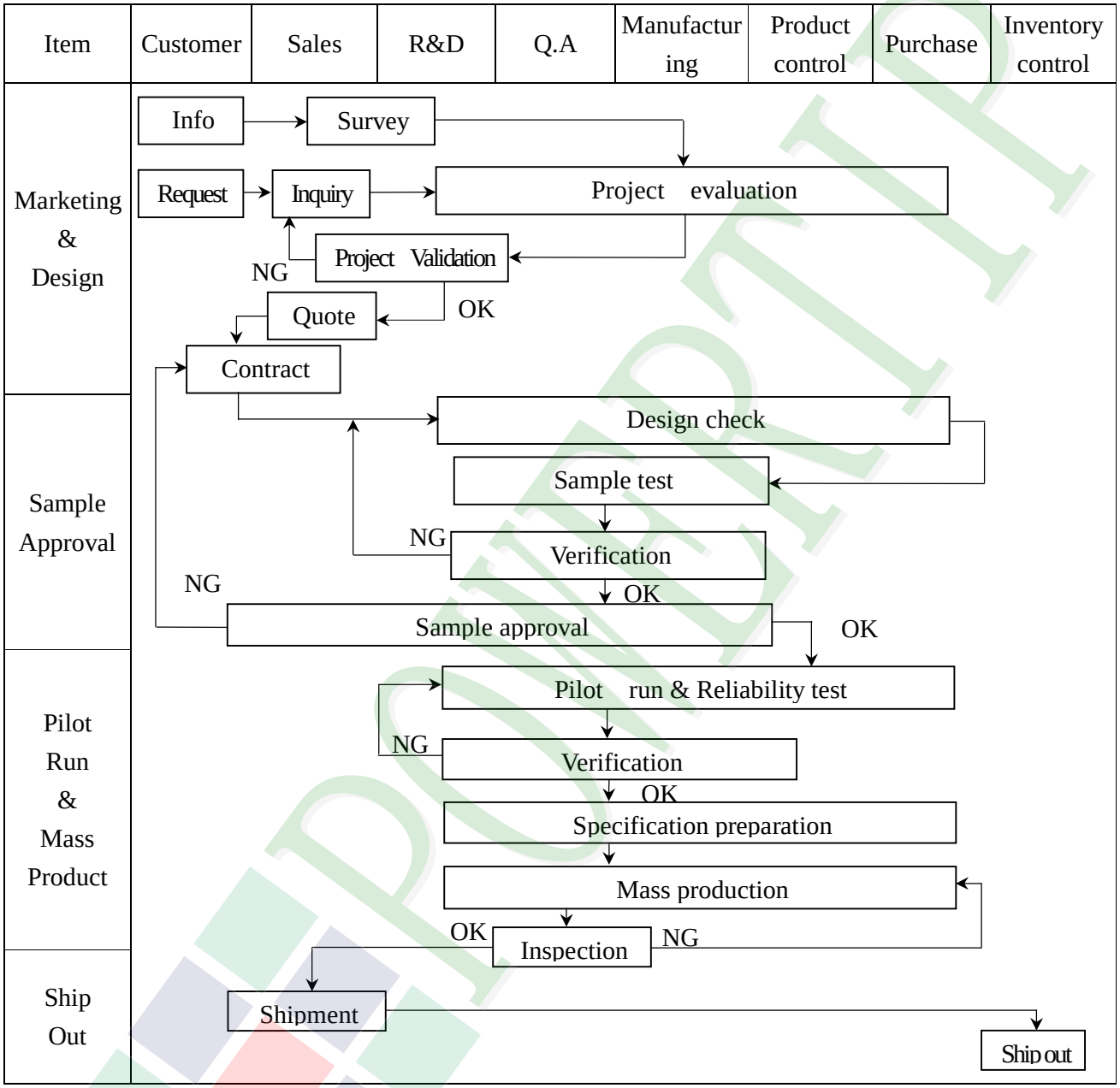


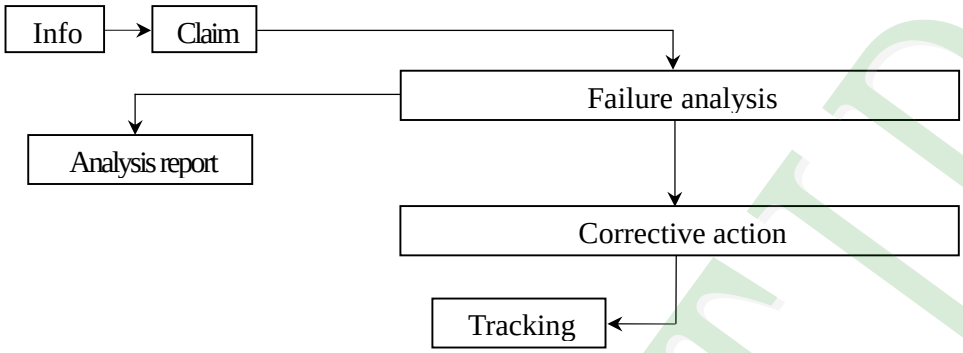
2.4 Character Pattern

NO.7066-0A

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

◆Scope : The document shall be applied to LCD Module for Monotype and Color STN (Ver. 03).

◆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 20W×2 fluorescent light ' and distance of view must be at 30 cm.

(2). Standard of inspection : (Unit : mm)

(3). The test direction is base on about around 45° of vertical line. (Fig. 1)

(4). Definition of area . (Fig. 2)

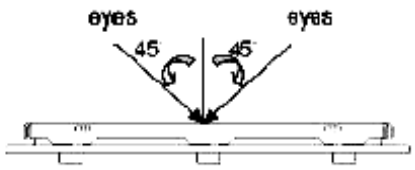


Fig.1

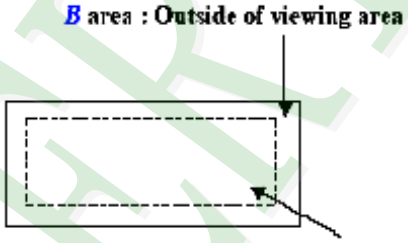


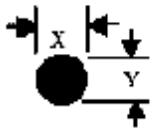
Fig. 2

◆ Specification:

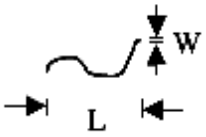
NO	Item	Criterion	level
01	Product condition	1.1 The part number is inconsistent with work order of Production.	Major
		1.2 Mixed production types.	Major
		1.3 Assembled in inverse direction.	Major
02	Quantity	2.1 The quantity is inconsistent with work order of production.	Major
03	Outline dimension	3.1 Product dimension and structure must conform to Structure diagram.	Major
04	Electrical Testing	4.1 Missing line character 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

◆Specification For Monotype and Color STN：　(Ver. 03)

<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

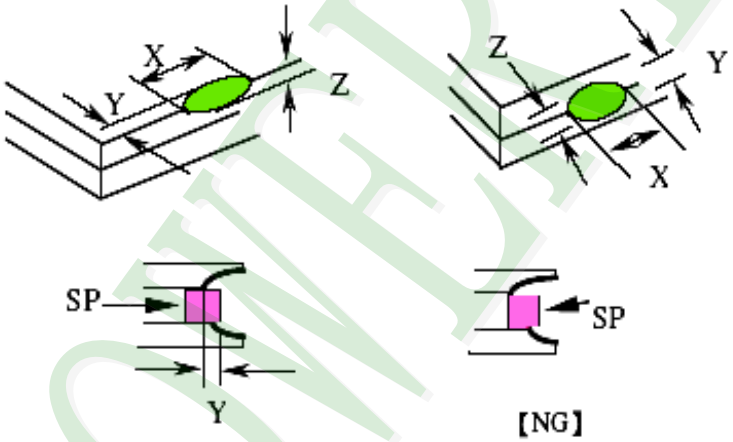
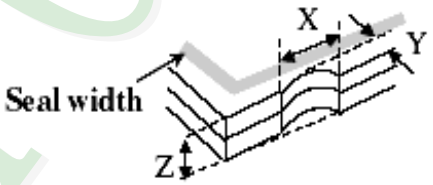
Round type
 

Φ=(x+y)/2

Line type
 
</td><td>5. 1 Round type:
5. 1. 1 display only :
• White and black spots on display ≦ 0. 30 mm , no more than 4 white or black spots present.
• Densely spaced : NO more than two spots or lines within 3 mm.

5. 1. 2 Non-display :
<table>
<tr><th rowspan="2">Dimension (diameter : Φ)</th><th colspan="2">Acceptance (Q'ty)</th></tr>
<tr><th>A area</th><th>B area</th></tr>
<tr><td>Φ ≦ 0. 10</td><td>Accept no dense</td><td rowspan="4">Ignore</td></tr>
<tr><td>0. 10 ＜ Φ ≦ 0. 20</td><td>3</td></tr>
<tr><td>0. 20 ＜ Φ ≦ 0. 30</td><td>2</td></tr>
<tr><td>Total quantity</td><td>4</td></tr>
</table>
5. 1. 3 Line type:
<table>
<tr><th colspan="2">Dimension</th><th colspan="2">Acceptance (Q'ty)</th></tr>
<tr><th>Length (L)</th><th>Width (W)</th><th>A area</th><th>B area</th></tr>
<tr><td>---</td><td>W ≦ 0. 03</td><td>Accept no dense</td><td rowspan="3">Ignore</td></tr>
<tr><td>L ≦ 3. 0</td><td>0. 03 ＜ W ≦ 0. 05</td><td rowspan="2">4</td></tr>
<tr><td>L ≦ 2. 5</td><td>0. 05 ＜W ≦ 0. 075</td></tr>
<tr><td>---</td><td>W ＞0. 075</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><th rowspan="2">Dimension (diameter : Φ)</th><th colspan="2">Acceptance (Q'ty)</th></tr>
<tr><th>A area</th><th>B area</th></tr>
<tr><td>Φ ≦ 0. 20</td><td>Accept no dense</td><td rowspan="5">Ignore</td></tr>
<tr><td>0. 20 ＜Φ ≦ 0. 50</td><td>3</td></tr>
<tr><td>0. 50 ＜Φ ≦ 1. 00</td><td>2</td></tr>
<tr><td>Φ ＞ 1. 00</td><td>0</td></tr>
<tr><td>Total quantity</td><td>4</td></tr>
</table></td><td>Minor</td></tr>
</table>

◆Specification For Monotype and Color STN : (Ver. 03)

NO	Item	Criterion	Level
07	The crack of glass	Symbols : X : The length of crack Y : The width of crack. Z : The thickness of crack W : terminal length t : The thickness of glass a : LCD side length 7.1 General glass chip : 7.1.1 Chip on panel surface and crack between panels:  【OK】 【NG】  	Minor

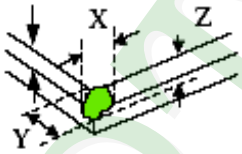
X	Y	Z
≦ a	Crack can't enter viewing area	≦1/2 t
≦ a	Crack can't exceed the half of SP width.	1/2 t < Z ≦2 t

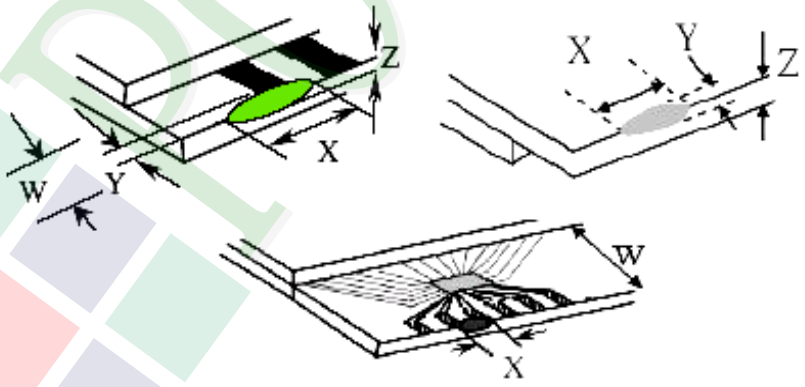
◆Specification For Monotype and Color STN：

(Ver. 03)

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

X：The length of crack　　Y：The width of crack.
Z：The thickness of crack　　W：terminal length
t：The thickness of glass　　a：LCD side length

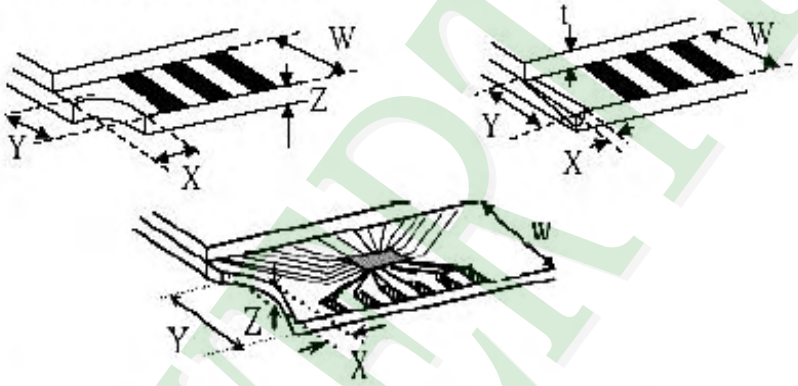
7.1.2 Corner crack：


<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≦1/5 a</td><td>Crack can’t enter viewing area</td><td>Z ≦ 1/2 t</td></tr>
<tr><td>≦1/5 a</td><td>Crack can’t exceed the half of SP width.</td><td>1/2 t < Z ≦ 2 t</td></tr>
</table>
</td><td rowspan="2">Minor</td></tr>
<tr><td>
7.2 Protrusion over terminal：
7.2.1 Chip on electrode pad：


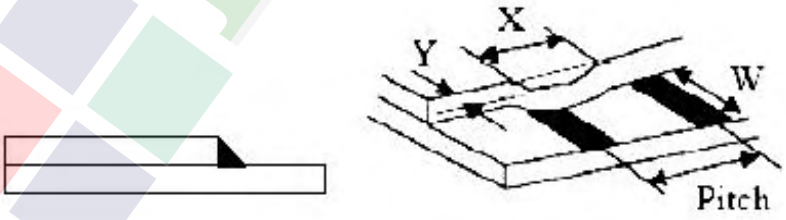
<table>
<tr><th></th><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>Front</td><td>≦ a</td><td>≦ 1/2 W</td><td>≦ t</td></tr>
<tr><td>Back</td><td colspan="3">Neglect</td></tr>
</table>
</td></tr>
</table>

◆Specification For Monotype and Color STN：　(Ver. 03)

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td>07</td><td>The crack of glass</td><td>
Symbols：

X：The length of crack　　Y：The width of crack.
Z：The thickness of crack　　W：terminal length
t：The thickness of glass　　a：LCD side length
<hr>
7.2.2 Non-conductive portion：


<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≦1/3 a</td><td>≦W</td><td>≦t</td></tr>
</table>
⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.

7.2.3 Glass remain：


<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≦ a</td><td>≦ 1/3 W</td><td>≦ t</td></tr>
</table>
</td><td>Minor</td></tr>
</table>

◆Specification For Monotype and Color STN：　(Ver. 03)

NO	Item	Criterion	Level
08	Backlight elements	8. 1 Backlight can't work normally.	Major
		8. 2 Backlight doesn't light or color is wrong.	Major
		8. 3 Illumination source flickers when lit.	Major
09	General appearance	9. 1 Pin type must match type in specification sheet.	Major
		9. 2 No short circuits in components on PCB or FPC.	Major
		9. 3 Product packaging must the same as specified on packaging specification sheet.	Minor
		9. 4 The folding and peeled off in polarizer are not acceptable.	Minor
		9. 5 The PCB or FPC between B/L assembled distance (PCB or FPC) is ≦1. 5 mm.	Minor

4. RELIABILITY TEST

4.1 Reliability Test Condition

NO.	TEST ITEM	TEST CONDITION
1	High Temperature Storage Test	Keep in 80 ±2℃ 240 hrs Surrounding temperature, then storage at normal condition 4hrs
2	Low Temperature Storage Test	Keep in -30±2℃ 240 hrs Surrounding temperature, then storage at normal condition 4hrs
3	High Temperature Operating Test	Keep in 70 ±2℃ 240 hrs Surrounding temperature, then storage at normal condition 4hrs
4	Low Temperature Operating Test	Keep in -20±2℃ 240 hrs Surrounding temperature, then storage at normal condition 4hrs
5	High Humidity Storage	Keep in +40℃/90%RH duration for 240 hrs Surrounding temperature, then storage at normal condition 4hrs (Excluding the polarizer)
6	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%)
7	Temperature Cycling Test	-20℃ → 25℃ → 70℃ → 25℃ (30mins) (5mins) (30mins) (5mins) 10 Cycle Surrounding temperature, then storage at normal condition 4hrs
8	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
9	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.

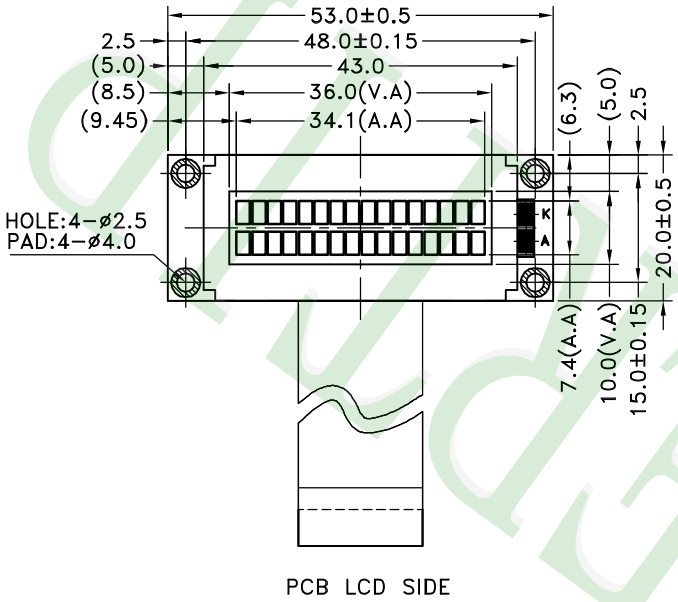
5.4 TERMS OF WARRANTY

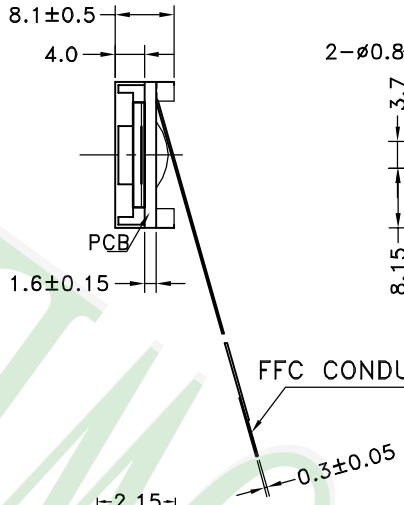
5.4.1 Applicable warrant period

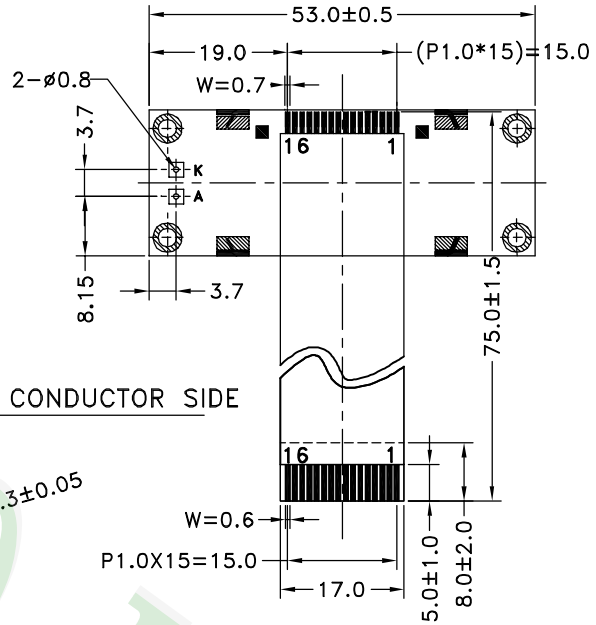
The period is within thirteen months since the date of shipping out under normal using and storage conditions.

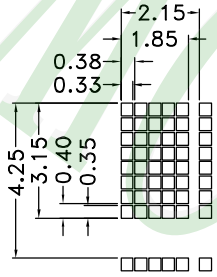
5.4.2 Unaccepted responsibility

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.









NOTES:
1.LCD type:STN Gray,Positive,Transflective.
2.LCD Module:1/16Duty,1/5Bias;
3.Viewing direction:6H;
4.T_{OP}=-20°C~70°C, T_{ST}=-30°C~80°C;
5.The tolerance unless classified ±0.3mm;
6.This product conforms ROHS;

REV	REV BY	REVISER	DATE
007			
006			
005			
004			
003			
002			
001	New drawing	Tang yunxian	2009/7/9

PART NO: PC1602LRS-KWA-HY8Q

DRAWING NAME: JLMD-PC1602LRS-KWA-HY8Q

TITLE: LCD Module Drawing

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

Design	Tang yunxian	Surface	
Check	Eddy	Material	
Approve	Ryan	Thickness	
Unit	MM	Quantity	
Scale	1:1		
Page	1/1		

Tolerance / Precision Length(Min) (mm)	Precision Level
1 ~ 4	-
4 ~ 16	-
16 ~ 63	-
63 ~ 250	-
250 ~ 1000	-

PT-A-054-01

Ver.001

Documents NO.	JPKG-PC1602LRS-KWA-HY8Q

LCM包裝規格書
LCM Packaging Specifications

Approve	Check	Contact
Ryan	Eddy	Tang yunxian

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

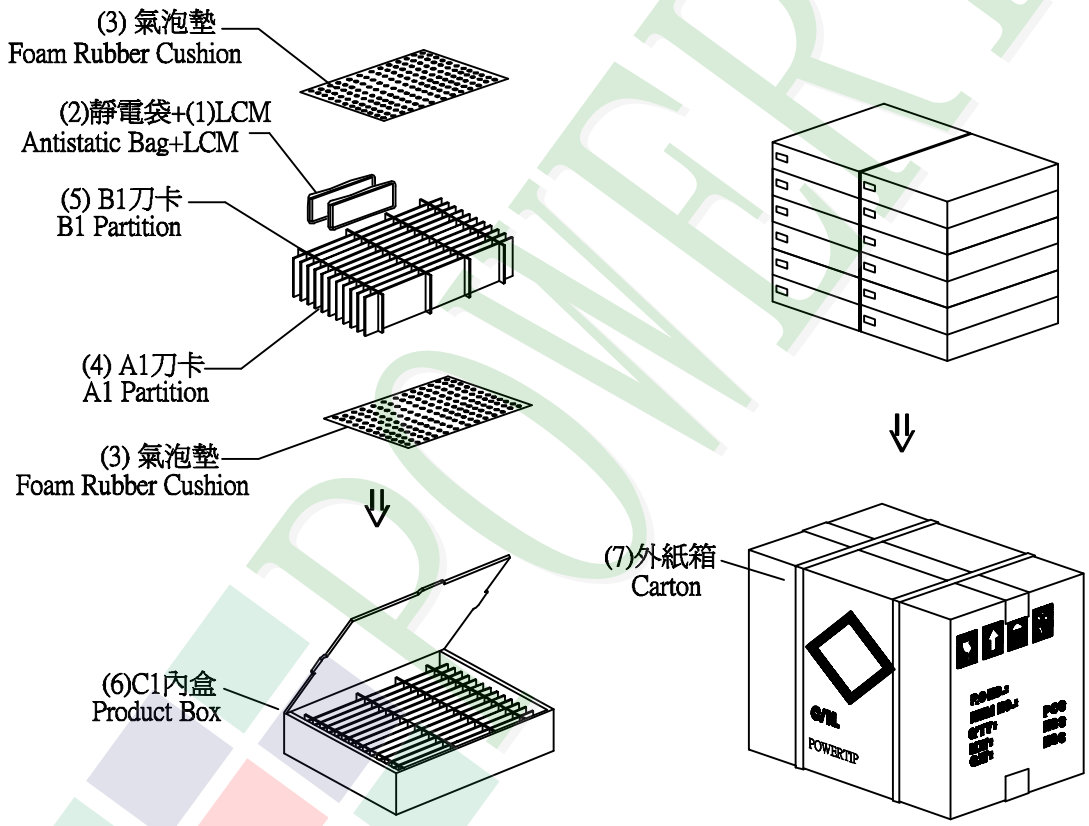
No.	Item	Model	Dimensions (mm)	1Pcs Weight	Quantity	Total Weight
1	成品(1) (LCM)	PC1602LRS-KWA-HY8Q	53*20*8.1	0.025	540	13.5
2	靜電袋 (2)BAG	BAG100100ARABA	100*100*0.05	0.002	540	1.08
3	氣泡墊(3)BAG	BAG290240BRBBA	240*290*5	0.0029	24	0.0696
4	刀卡A1(4)BX	BX29500047BZBA	295*47*3	0.0069	168	1.1592
5	刀卡B1(5)BX	BX24500047BZBA	245*47*4.5	0.009	48	0.432
6	C1內盒(6)Product Box	BX31025555AABA	310*255*55	0.1101	12	1.3212
7	外紙箱(7)Carton	BX52532536CCBA	525*325*360	1.092	1	1.092
8						
9						

2.一 整箱總重量 (Total LCD Weight in carton) : 18.65 Kg±10%

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

(1)Quantity Of Spacer : A1刀卡 * 14 , B1刀卡 * 4

(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: