POWERTIP TECH. CORP.

SPECIFICATIONS

CUSTOMER	:	**CJP001**
SAMPLE CODE	:	**SG240128WRFAGAHPCQ**
MASS PRODUCTION CODE	:	**PG240128WRFAGAHPCQ**
SAMPLE VERSION	:	**02**
SPECIFICATIONS EDITION	:	**003**
DRAWING NO. (Ver.)	:	**JLMD-PG240128WRFAGAHPCQ_001**
PACKAGING NO. (Ver.)	:	**JPKG-PG240128WRFAGAHPCQ_001**

Customer Approved

Date:

POWERTIP
2011.01.04
JS RD APPROVED

Approved	Checked	Designer
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□ Preliminary specification for design input

■ Specification for sample approval

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RECORDS OF REVISION

Date (mm / dd / yyyy)	Ver.	Edi.	Description	Page	Design by
07/21/2006	0	-	PG240128WRFAGAHPCQ is the ROSH compliant part number based on Powertip's standard PG240128WRF-AGAHPC	-	-
08/14/2007	A	-	Update Backlight Characteristics	-	-
12/30/2010	02	003	Modify LCM Mechanical Diagram	9	Kyo

Total：36 Pages

Contents

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	240*128 dots
LCD Type	FSTN, White Transflective, Positve,Extended temp
Driver Condition	LCD Module :1/128Duty, 1/12Bias
Viewing Direction	6 H
Backlight	White LED B/L
Weight	160 g
Interface	-
Other(controller / driver IC)	SAP1024B
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	144.0(L)*104.0(W)*16.0(H)(MAX)	mm
Viewing Area	114.0(L)*64.0(W)	mm
Active Area	107.95(L)*57.55(W)	mm
Dot Size	0.40(L)*0.40(W)	mm
Dot Pitch	0.45(L)*0.45(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	22.0	
Input Voltage	V_{IN}	-	-0.3	V_{DD}+0.3	V
Operating Temperature	T_{OP}	Excluded B/L	-20	70	℃
Storage Temperature	T_{ST}	Excluded B/L	-30	80	℃
Storage Humidity	H_D	Ta＜40 ℃	-	90	%RH

1.4 DC Electrical Characteristics

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}	-	V_{DD}-2.2	-	V_{DD}	V
"L" Input Voltage	V_{IL}	-	0	-	0.8	V
"H" Output Voltage	V_{OH}	-	V_{DD}-0.3	-	V_{DD}	V
Operating Frequency	f_{OSC}		0.4	-	5.5	MHz
"L" Output Voltage	V_{OL}	-	0	-	0.3	V
Supply Current	I_{DD}	V_{DD}=5.0V fosc=3.0MHz*1	-	35	50	mA
LCM Driver Voltage	V_{OP}	-20℃	-	-	-	V
		25℃*2	17.0	17.2	17.4	
		70℃	-	-	-	

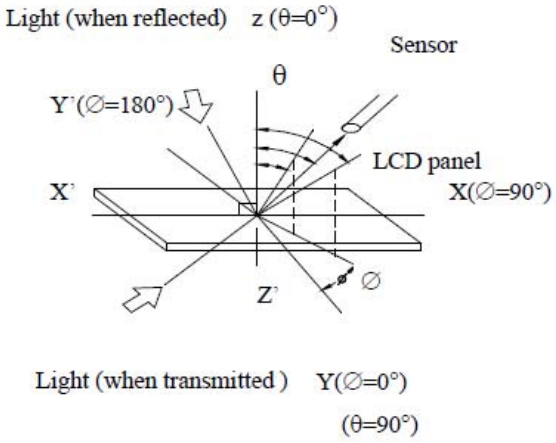
NOTE: *1 The Maximum current display

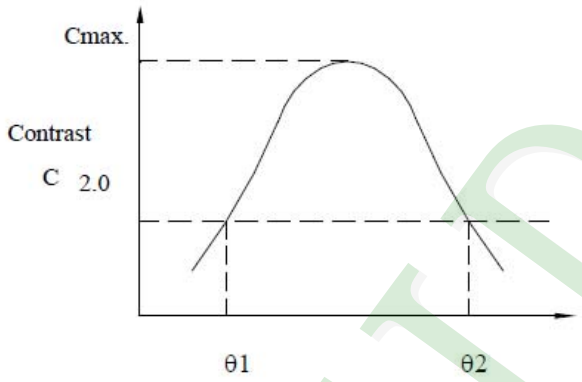
*2 The VOP test point is VDD- V_{EE}

1.5 Optical Characteristics

LCD Panel：1/128Duty，1/12Bias，VOP = 17.5V，Ta = 25°C

Item	Symbol	Conditions	Min.	Typ.	Max	Reference
Viewing angle range	θ	C≥2.0,∅=0°	0°	-	10°	Notes 1 & 2
Contrast ratio	CR	θ=25°, ∅=0°	2	2.7	-	Note 3
Response time	Tr	Ta =25 ℃	-	180ms	270ms	Note 4
	Tf	Ta =25 ℃	-	260ms	390ms	Note 4

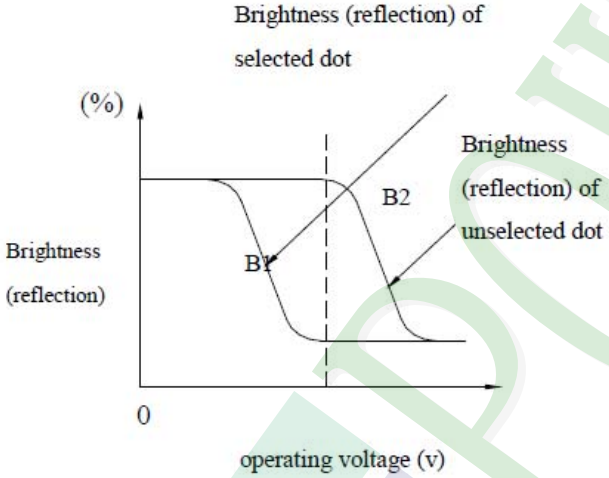




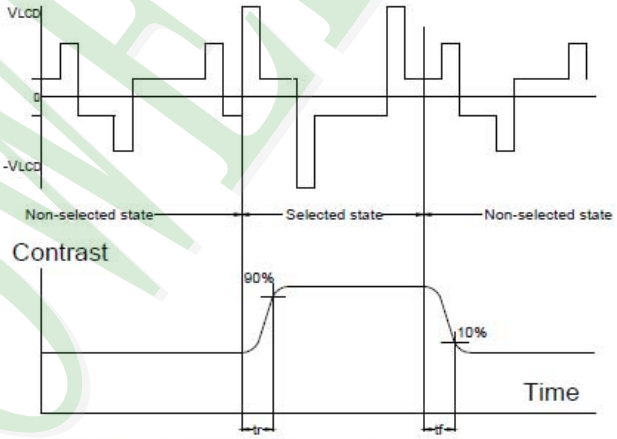
Note : Optimum viewing angle with the naked eye and viewing angle θ at Cmax. Above are not always the same

Note 3: Definition of contrast C

$$C = \frac{\text{Brightness (reflection) of unselected dot (B2)}}{\text{Brightness (reflection) of selected dot (B1)}}$$



Note 4: Definition of response time



Note: Measured with a transmissive LCD panel which is displayed 1 cm^2

V_{LCD} : Operating voltage f_{FRM} : Frame frequency

t_r : Response time (rise) t_f : Response time (fall)

1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25℃	-	160	mA
Reverse Voltage	VR	Ta =25℃	-	5	V
Power Dissipation	PO	Ta =25℃	-	0.67	W

Electrical / Optical Characteristics

Ta =25℃

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	I_F=160 mA	-	3.7	4.2	V
Reverse Current	I_R	V_R=5V	-	-	10	μA
Average Brightness (without LCD)	Iv	I_F=160 mA	210	-	-	cd/m^2
Average Brightness (with LCD)	Iv	I_F=160 mA	60	70	-	cd/m^2
Chromaticity Coordinate	X	I_F=160 mA	-	0.30	-	nm
	Y	I_F=160 mA	-	0.31	-	nm
Color	white					

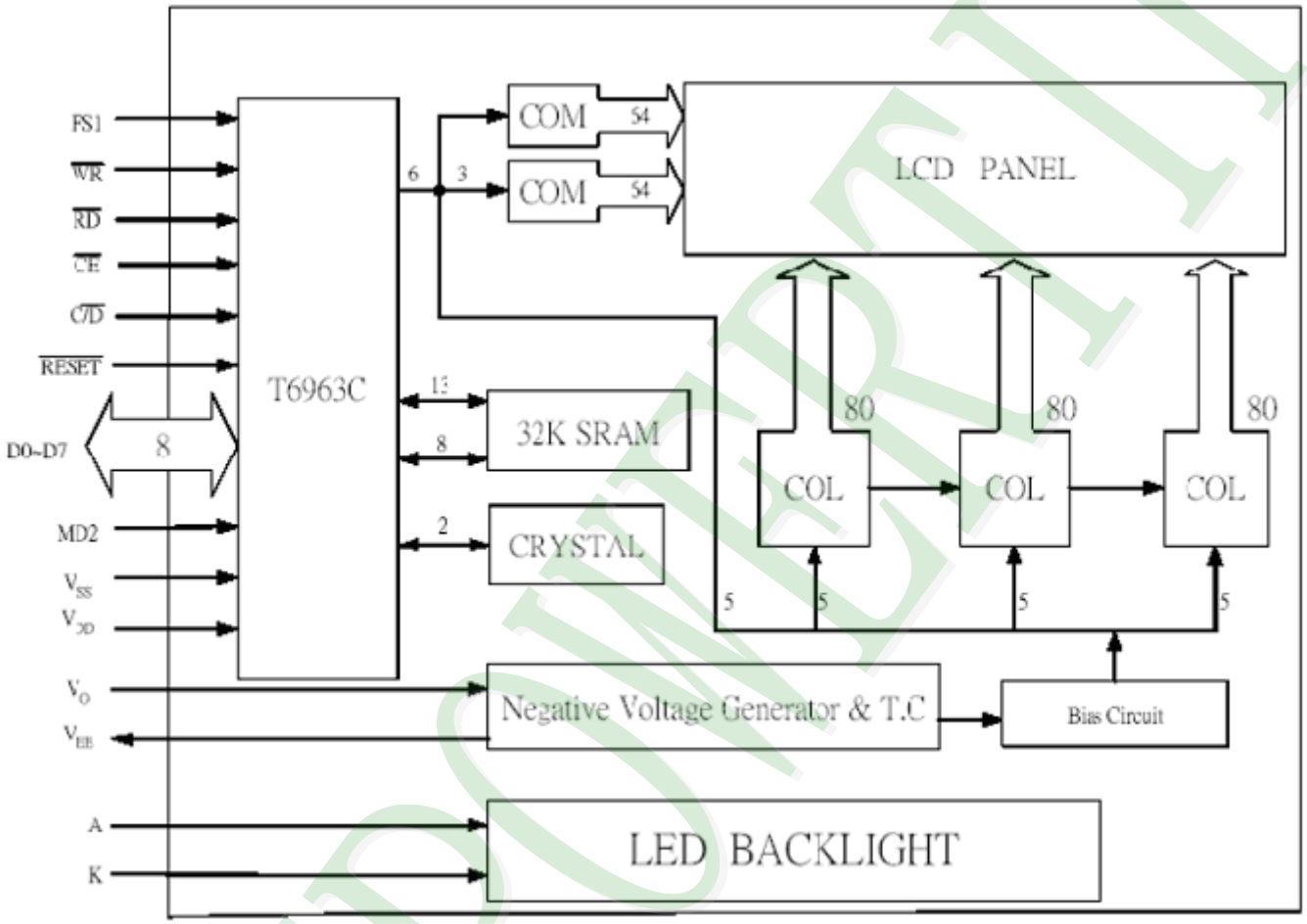
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

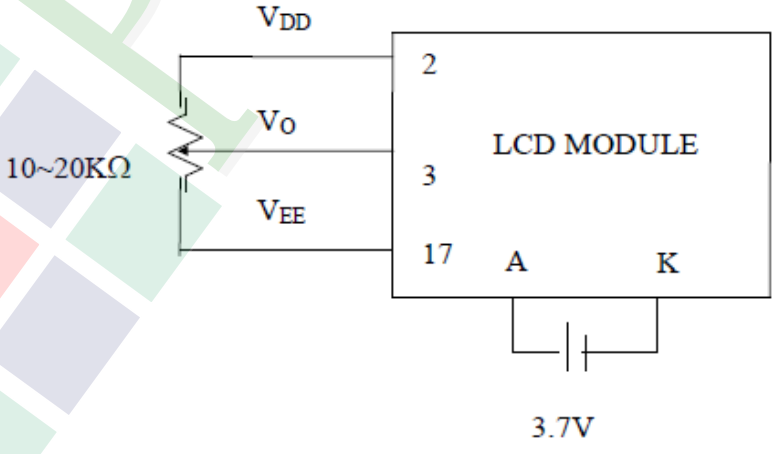
2.1.2 Block Diagram



2.2 Interface Pin Description

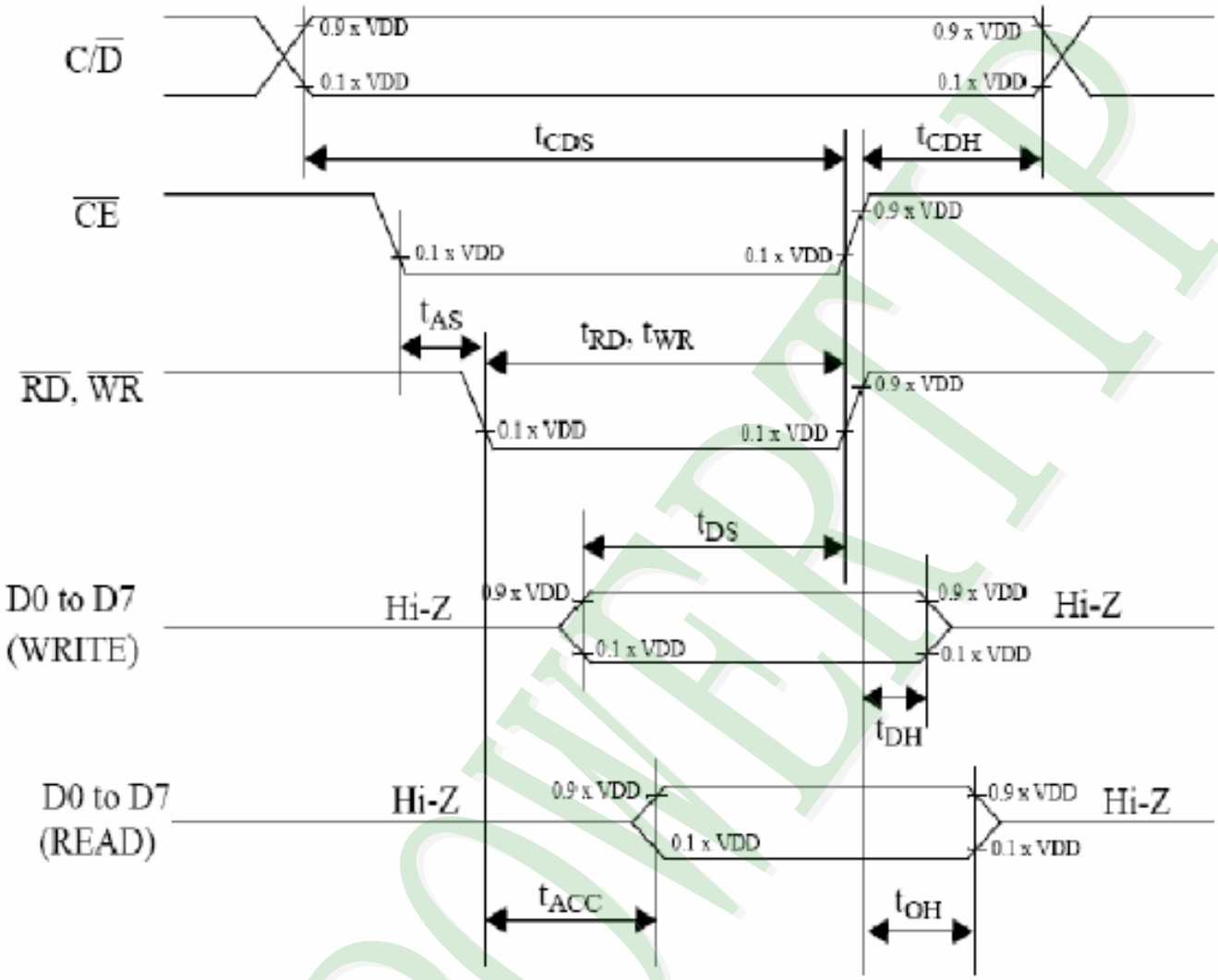
Pin No.	Symbol	Function
1	V_{SS}	Power Supply (Vss=0)
2	V_{DD}	Power Supply (V_{DD}>V_{SS})
3	V_0	Operating voltage (LCD Driver)
4	C/$\overline{D}$	$\overline{WR}$ ="L";C/$\overline{D}$ = "H" :command write, C/$\overline{D}$ ="L":data write $\overline{RD}$ ="L";C/$\overline{D}$ = "H" :command read, C/$\overline{D}$ ="L":data read
5	$\overline{RD}$	Data read (read data from the module at "L")
6	$\overline{WR}$	Data write (write data to the module at "L")
7~14	D0~D7	Data bus (D0=MSB, D7=LSB)
15	$\overline{CE}$	Chip enable for the module (active at "L")
16	$\overline{RESET}$	Controller reset (module reset)
17	V_{EE}	Power supply for LCD drive (build in)
18	MD2	Columns select ; connect to V_{DD} :32 columns; connect to V_{SS} :40 columns
19	FS1	Font select : connect to V_{DD} : 6*8 Dots font; connect to V_{SS} : 8*8 Dots font
20	A	Not connection
A	A	B/L(+)
K	K	B/L(-)

Contrast Adjust



2.3 Timing Characteristics

Bus timing



Unless otherwise noted, V_{DD}=5.0V±10%, V_{SS}=0V, Ta=25℃

ITEM	SYMBOL	TEST CONDITION	MIN.	MAX.	UNIT
C/D Set Up Time	t_{CDS}	-	100	-	ns
C/D Hold Time	t_{CDH}	-	10	-	ns
CE, RD, WR Pulse Width	t_{CE},t_{RD},t_{WR}	-	80	-	ns
Data Set Up Time	t_{DS}	-	80	-	ns
Data Hold Time	t_{DH}	-	40	-	ns
Access Time	t_{ACC}	-	-	150	ns
Output Hold Time	t_{OH}	-	10	50	ns

2.4 Display Command

1.Register Set

Code	Hex.	Function	D1	D2
00100001	21H	Cursor pointer set	X ADRS	Y ADRS
00100010	22H	Offset register set	Data	00H
00100100	24H	Address pointer set	Low ADRS	High ADRS

(1) Cursor pointer set

The position of cursor is specified by X ADRS, Y ADRS. The cursor position is moved only by this command. The cursor pointer doesn't have the function of increment and decrement. The shift of cursor are set by this command. X ADRS, Y ADRS are specified following.

X ADRS 00H~4FH (Lower 7bits are valid)

Y ADRS 00H~1FH (Lower 5 bits are valid)

1. 1 screen drive

X ADRS 00~4FH

Y ADRS 00H~0FH

2. 2 screens drive

X ADRS 00~4FH

Y ADRS 00H~0FH
Upper screen

Y ADRS 10H~1FH
Lower screen

(2) Offset register set

The offset register is used to determine external character generator RAM area.

SAP1024B has 16 bit address lines as follow.

MSB LSB

ad15	ad14	ad13	ad12	ad11	ad10	ad9	ad8	ad7	ad6	ad5	ad4	ad3	ad2	ad1	ad0

The upper 5 bit (ad15~ad11) are determined by offset register. The middle 8 bit (ad10~ad3) are determined by character code. The lower 3 bit (ad2~ad0) are determined by vertical counter. The lower 5 bit of D1 (data) are valid.

The data format of external character generator RAM.

The relationship of display RAM address and offset register

Data of offset register	CG RAM HEX. Address (start-end)
00000	0000-07FFH
00001	0800-0FFFH
00010	1000-17FFH
11100	E000-E7FFH
11101	E800-EFFFH
11110	F000-F7FFH
11111	F800-FFFFH

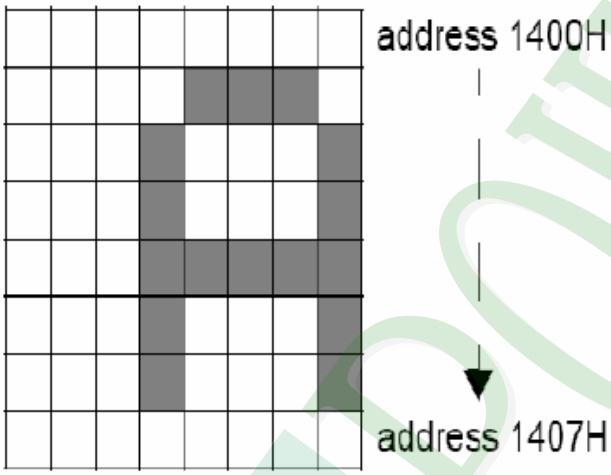
(Example 1)

Offset register 02H

Character code 80H

Character generator RAM start address 0001 0100 0000 0000

1 4 0 0 H



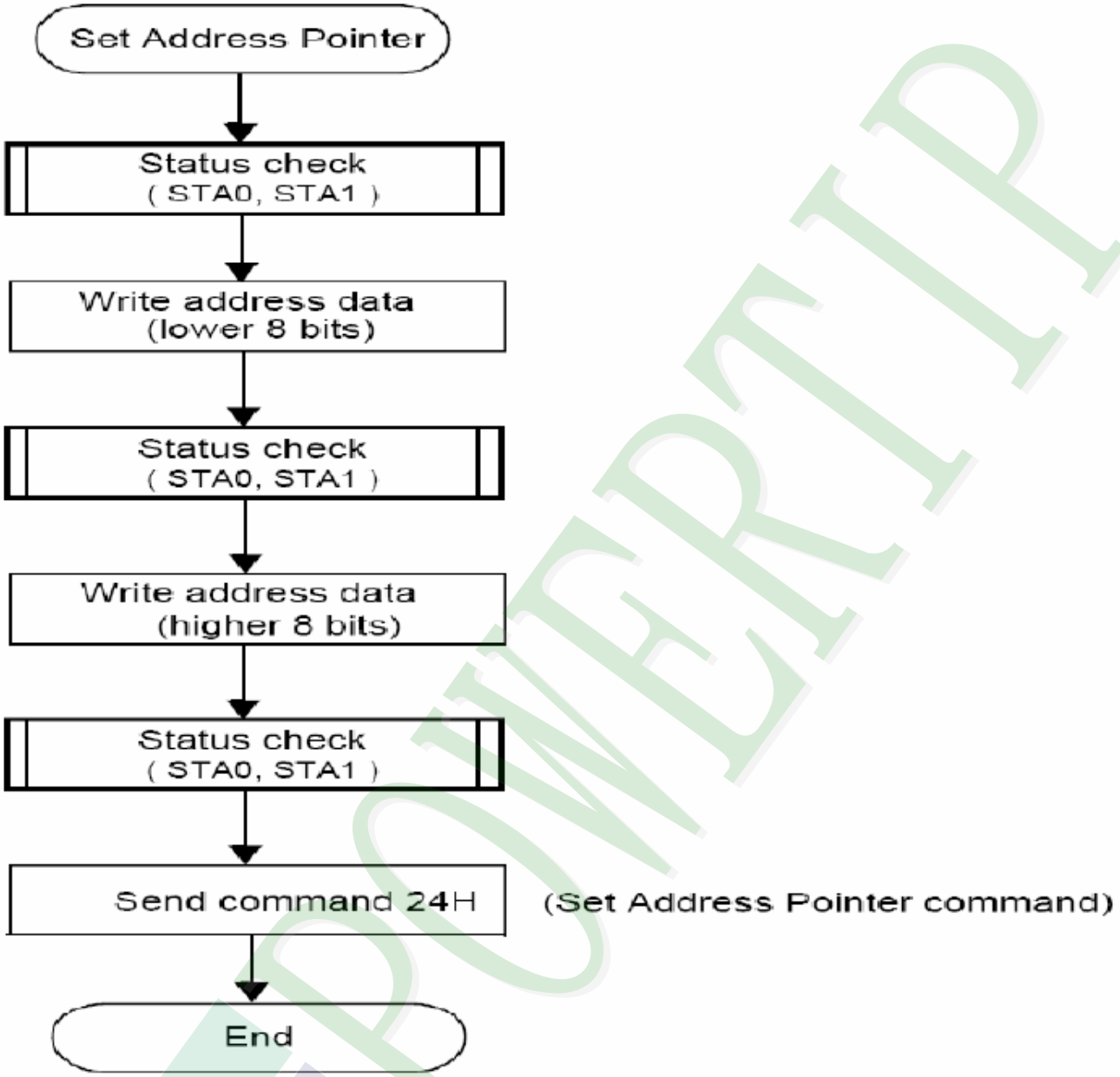
Address	Data
1400H	00H
1401H	0EH
1402H	11H
1403H	11H
1404H	1FH
1405H	11H
1406H	11H
1407H	00H

Note: blank pixel=0, black pixel=1.

(3)Address pointer set

The address pointer set command is used to indicate the start address for writing (or reading) to external RAM.

The flow chart address pointer set command



2.Control word set

Code	Hex.	Function	D1	D2
01000000	40H	Text home address set	Low address	High address
01000001	41H	Text area set	Columns	00H
01000010	42H	Graphic home address set	Low address	High address
01000011	43H	Graphic area set	Columns	00H

The home address and column size are defined by this command.

(1)Text home address set

The starting address of external display RAM for Text display is defined by this command. The text home address shows the left end and most upper position.

The relationship of external display RAM address and display position

TH		TH+CL
TH+TA		TH+TA+CL
(TH+TA)+TA		TH+2TA+CL
(TH+2TA)+TA		TH+3TA+CL
TH+(n-1)TA		TH+(n-1)TA+CL

TH : Text home address

TA : Text area number (columns)

CL : Columns are fixed by hardware. (pin-programmable)

(Example)

Text home address : 0000H

Text area : 0020H

MD2=H, MD3=H : 32 columns

DUAL=H, MDX=L, MD1=H : 4 lines

0000H	0001H		001EH	001FH
0020H	0021H		003EH	003FH
0040H	0041H		005EH	005FH
0060H	0061H		007EH	007FH

(2)Graphic home address set

The starting address of external display RAM for Graphic display is defined by this command.

The Graphic home address show the left end most upper line.

The relationship of external display RAM address and display position

GH		GH+CL
GH+GA		GH+GA+CL
(GH+GA)+GA		GH+2GA+CL
(GH+2GA)+GA		GH+3GA+CL
GH+(n-1)GA		GH+(n-1)GA+CL

GH : Graphic home address

GA : Graphic area number (columns)

CL : Columns area fixed by hardware. (pin-programmable)

(Example)

Graphic home address : 0000H

Graphic area : 0020H

MD2=H, MD3=H : 32 columns

$\overline{\text{DUAL}}$ =H, MDS=L, MD0=H, MD1=H : 2 lines

0000H	0001H		001EH	001FH
0020H	0021H		003EH	003FH
0040H	0041H		005EH	005FH
0060H	0061H		007EH	007FH
0080H	0081H		009EH	009FH
00A0H	00A1H		00BEH	00BFH
00C0H	00C1H		00DEH	00DFH
00E0H	00E1H		00FEH	00FFH
0100H	0101H		011EH	011FH
0120H	0121H		013EH	013FH
0140H	0141H		015EH	015FH
0160H	0161H		017EH	017FH
0180H	0181H		019EH	019FH
01A0H	01A1H		01BEH	01BFH
01C0H	01C1H		01DEH	01DFH
01E0H	01E1H		01FEH	01FFH

(3)Text area set

The columns of display are defined by the hardware setting. This command can be used to adjust columns of display.

(Example)

LCD size : 20 columns, 4 lines

Text home address : 0000H

Text area : 0014H

MD2=H, MD3=H : 32 columns

DUAL=H, MDS=L, MD0=L, MD1=H : 4 lines

0000	0001	.....	0013	0014	.....	001F
0014	0015	.....	0027	0028	.....	0033

0028	0029	……	003B	003C	……	0047
003C	003D	……	004F	0050	……	005B

LCD

(4)Graphic area set

The columns of display are defined by the hardware setting. This command can be used to adjust columns of graphic display.

(Example)

LCD size : 20 columns, 2 lines

Text home address : 0000H

Text area : 0014H

MD2=H, MD3=H : 32 columns

DUAL=H, MDS=L, MDD=H, MD1=H : 2 lines

0000	0001	……	0013	0014	……	001F
0014	0015	……	0027	0028	……	0033
0028	0029	……	003B	003C	……	0047
003C	003D	……	004F	0050	……	005B
0050	0051	……	0063	0064	……	006F
0064	0065	……	0077	0078	……	0083
0078	0079	……	008B	008C	……	0097
008C	008D	……	009F	00A0	……	00AB
00A0	00A1	……	00B3	00B4	……	00BF
00B4	00B5	……	00C7	00C8	……	00D3
00C8	00C9	……	00DB	00DC	……	00E7
00DC	00DD	……	00EF	00F0	……	00FD
00F0	00F1	……	0103	0104	……	011F
0104	0105	……	0127	0128	……	0123
0128	0129	……	013B	013C	……	0147
013C	013D	……	014F	0150	……	0158

LCD

The address in graphic area can be continuous and RAM area can be used without ineffective area, if graphic area is defined the same number as the actual column number of LCD display.

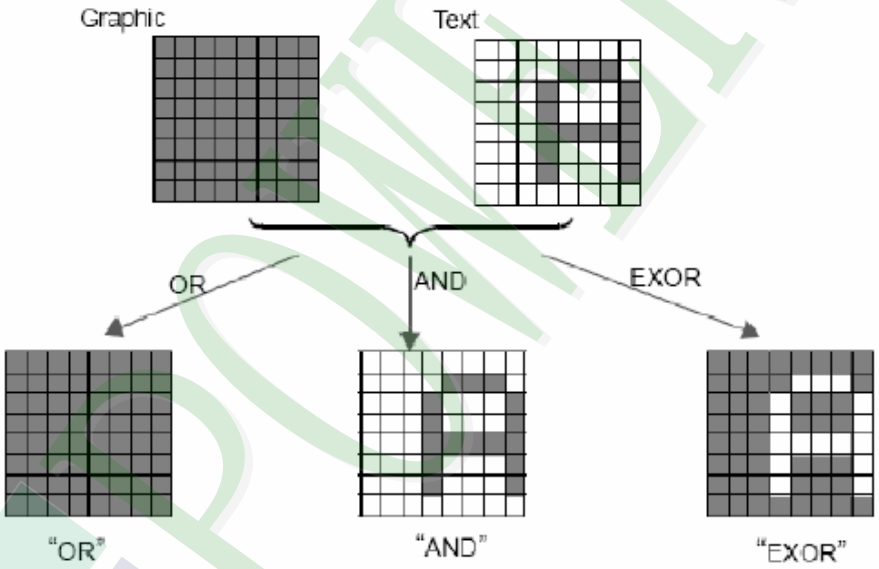
3.Mode set

Code	Function	Operand
1000x000	"OR" Mode	-
1000x001	"EXOR" Mode	-
1000x011	"AND" Mode	-
1000x100	"TEXT ATTRIBUTE" Mode	-
10000xxx	Internal Character Generator Mode	-
10001xxx	External Character Generator Mode	-

The display mode is defined by this command. The display mode don't have changed until to send next this command. Logically "OR", "EXOR", "AND" of text and graphic display can be displayed.

When internal character generator mode is selected, character code 00H~7FH are selected from built-in character generator ROM. The character code 80H~FFH are automatically selected external character generator RAM.

(Example)



Note:Since the attribute function of text data is stored in the corresponding area of the graphic RAM area,the attribute function is only available to textdisplay.

Attribute function

"Reverse display" , "Character blink" and "Inhibit" are called "Attribute". The attribute data is written in the graphic area defined by Control word set command.

The mode set command selects text display only and graphic display cannot be displayed.

The attribute data of the 1st character in text area is written at the 1st 1byte in graphic area, and attribute data of n-th character is written at the n-th 1byte in graphic area. Attribute function is defined as follow.

Attribute RAM 1byte

X	X	X	X	d3	d2	d1	d0

d3	d2	d1	d0	Function
0	0	0	0	Normal display
0	1	0	1	Reverse display
0	0	1	1	Inhibit display
1	0	0	0	Blink of normal display
1	1	0	1	Blink of reverse display
1	0	1	1	Blink of inhibit display

4.Display mode

Code	Function	Operand
10010000	Display off	-
1001xx10	Cursor on , blink off	-
1001xx11	Cursor on , blink on	-
100101xx	Text on, graphic off	-
100110xx	Text off, graphic on	-
100111xx	Text on , graphic on	-

1	0	0	1	d3	d2	d1	d0

d1 — Cursor blink — on: 1, off: 0
d0 — Cursor display — on: 1, off: 0
d2 — Text display — on: 1, off: 0
d3 — Graphic display — on: 1, off: 0

Note: It is necessary to turn on "Text display" and " Graphic display " in following case.

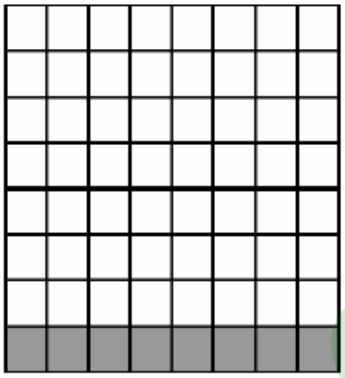
(1) Combination of text/graphic display

(2) Attribute function

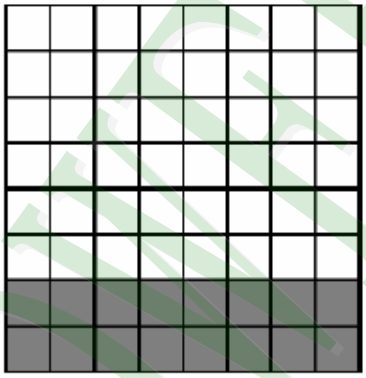
5.Cursor pattern select

Code	Function	Operand
10100000	1 line cursor	-
10100001	2 lines cursor	-
10100010	3 lines cursor	-
10100011	4 lines cursor	-
10100100	5 lines cursor	-
10100101	6 lines cursor	-
10100110	7 lines cursor	-
10100111	8 lines cursor	-

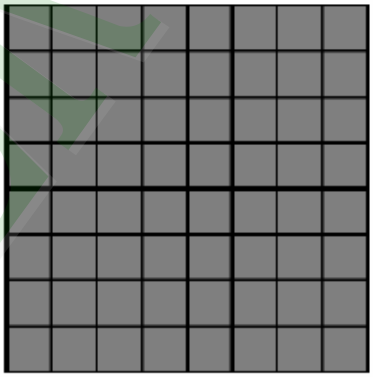
When cursor display is ON, this command selects the cursor pattern from 1 line to 8 lines. The cursor address is defined by cursor pointer set command.



1 line cursor



2 lines cursor



8 lines cursor

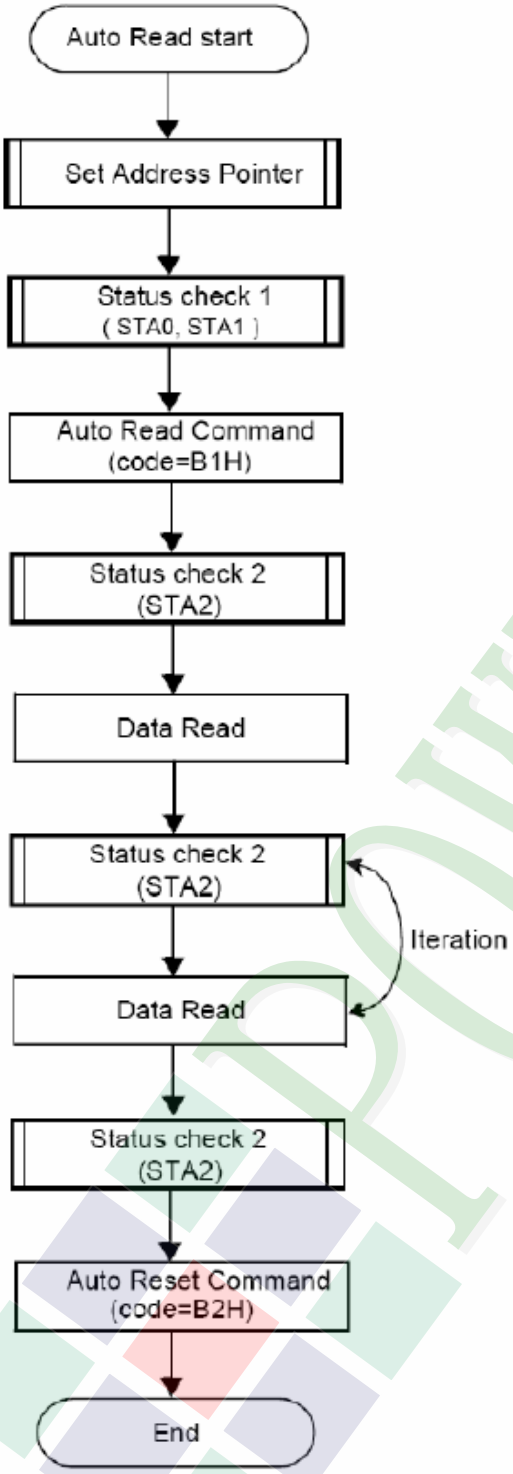
6.Data auto read/write

Code	Hex.	Function	Operand
10110000	B0H	Data auto write set	-
10110001	B1H	Data auto read set	-
10110010	B2H	Terminate Auto Read/Wite mode	-

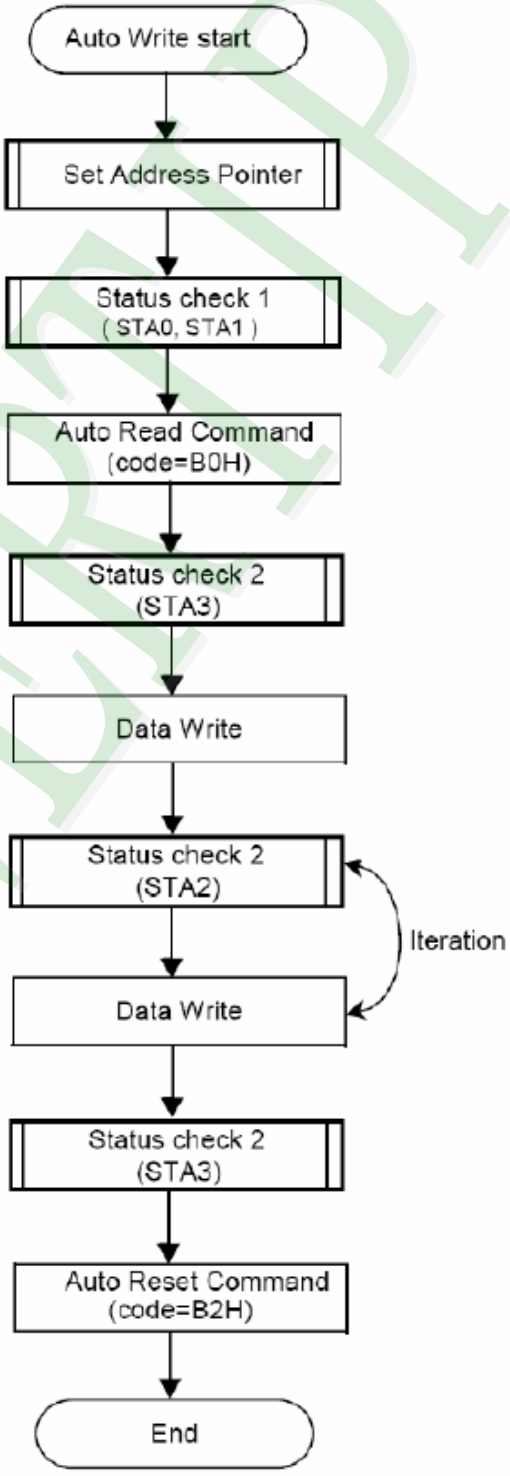
This command is convenient to send full screen data from external display RAM.

After setting auto mode, "Data write (or read)" command is not necessary between each data. "Data write (or read)" command should follow the "Address pointer set" and address pointer is automatically increment by + 1 after each data. After sending (or receiving) all data "Terminate Auto Read/Wite mode" is necessary to return normal operation because all data is regarded "Display data" and no command can be accepted in the auto mode.

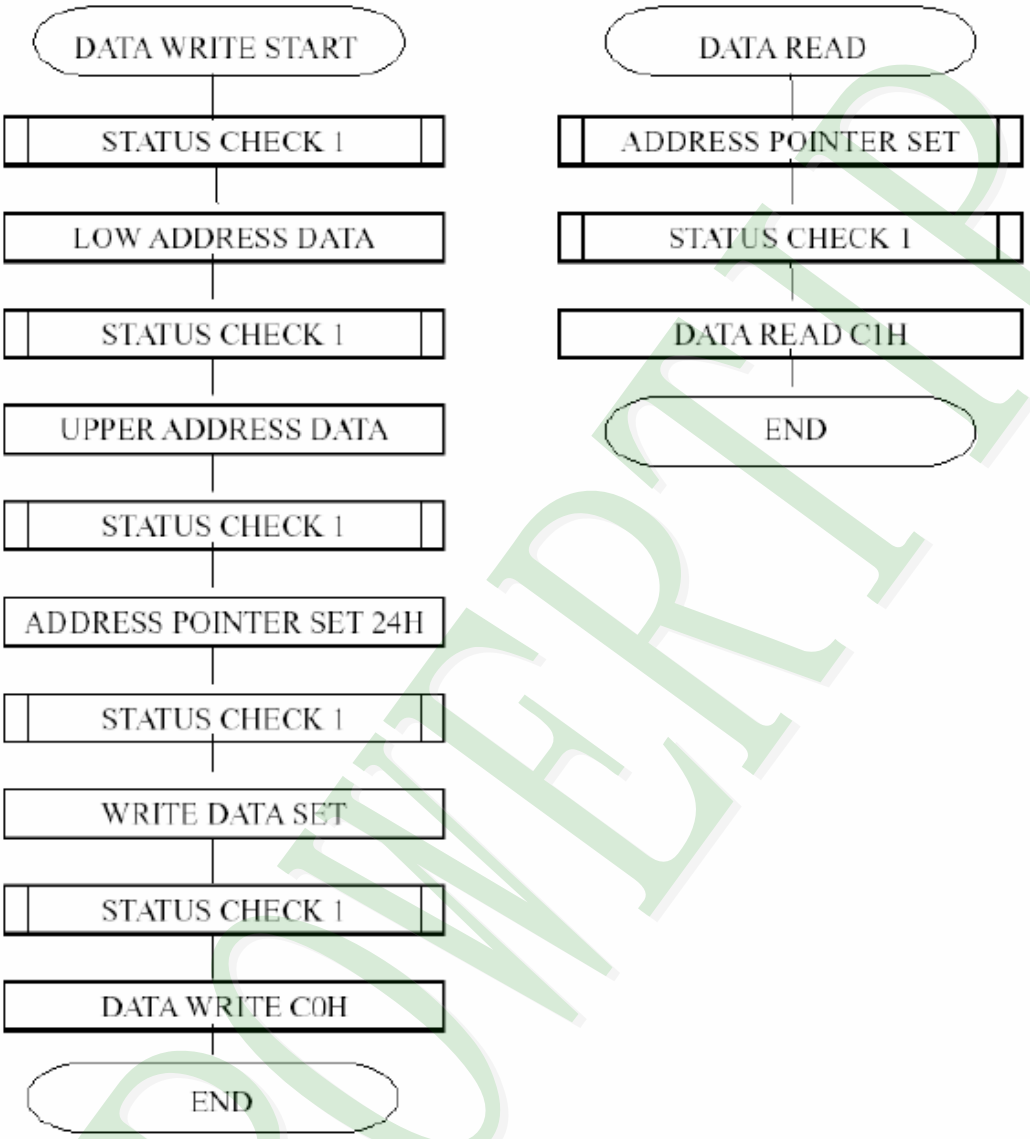
A) Auto Read Mode



B) Auto Write Mode



Please refer following flow chart.



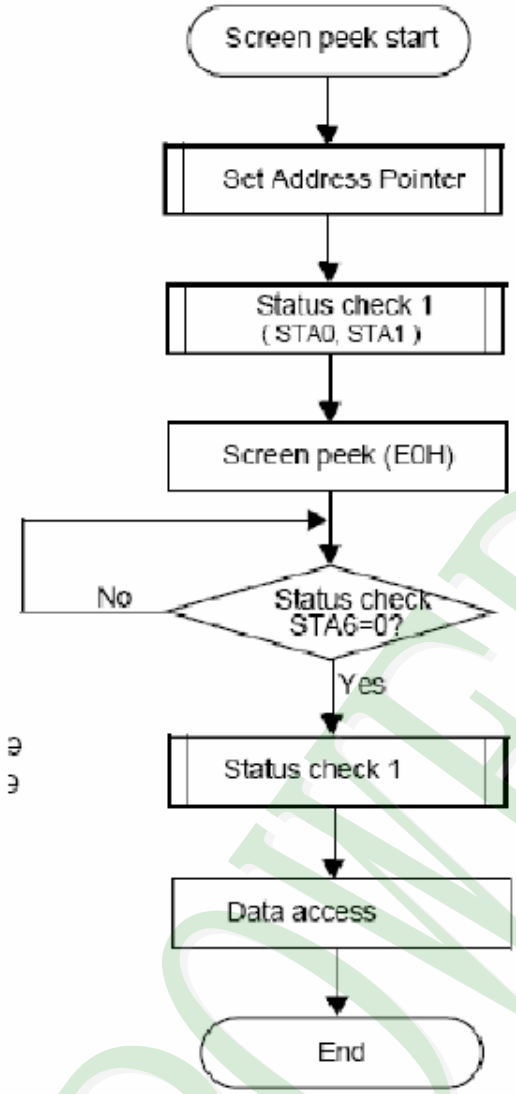
8.Screen peek

Code	Hex.	Function	Operand
11100000	E0H	screen peek	-

This command is used to transfer displayed 1 byte data to data stack, and this 1 byte data can be read from MPU by data access. The logical combination data of text and graphic display on LCD screen can be read by this command.

The status (STA6) should be checked just after "Screen peek" command. If the address determined by "Address pointer set" command is not in graphic area, this command ignored and status flag (STA6) is set.

Please refer following flow chart.



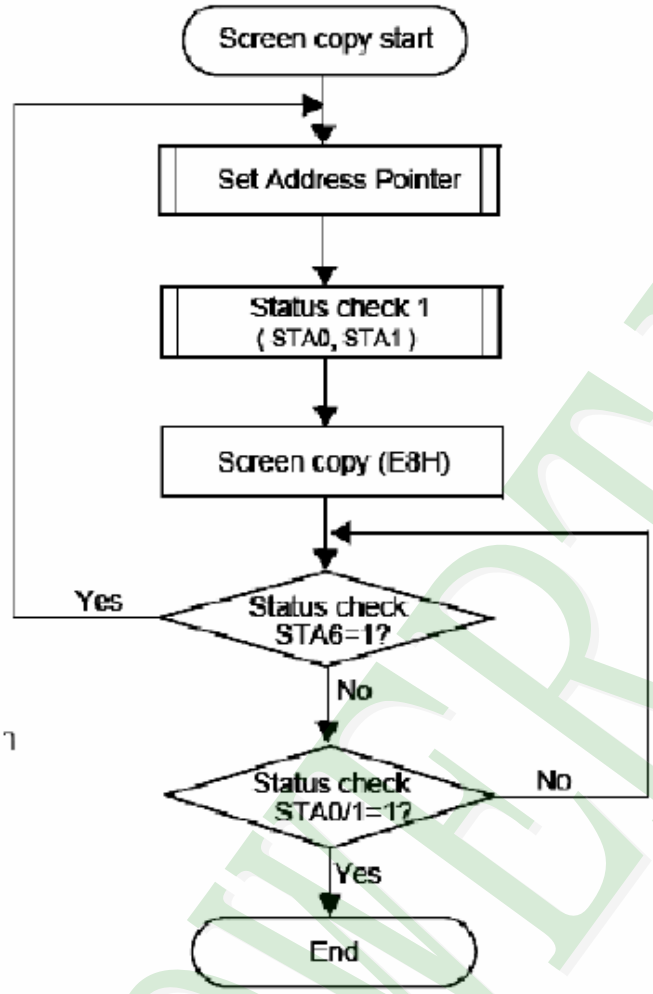
9.Screen copy

Code	Hex.	Function	Operand
11101000	E8H	screen copy	-

This command is used to copy displayed 1 line data to graphic area. The start point of 1 line data in the screen is determined by the address pointer.

Note: (1) In attribute function, this command is invalid. (Because attribute data is in the graphic area.)
(2) In case of 2 screen drive, this command is invalid. (Because SAP1024Bcannot separate upper screen data and lower screen data.)

Please refer following flow chart.

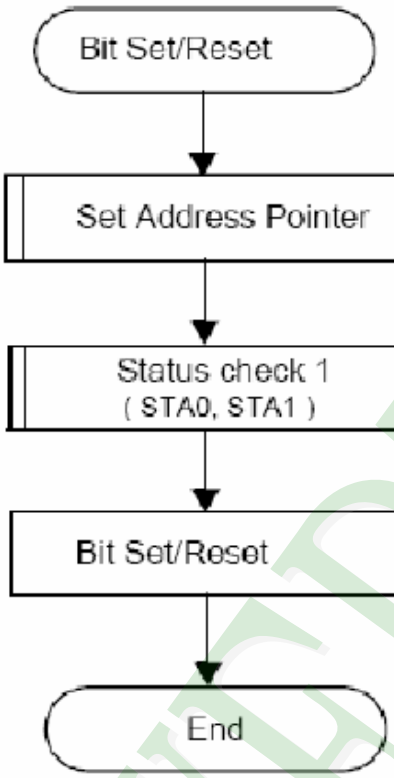


10.Bit set/reset

Code	Function	Operand
11110xxx	bit reset	-
11111xxx	bit set	-
1111x000	bit 9 (LSB)	-
1111x001	bit 1	-
1111x010	bit 2	-
1111x011	bit 3	-
1111x100	bit 4	-
1111x101	bit 5	-
1111x110	bit 6	-
1111x111	bit 7 (MSB)	-

This command is used to set or reset a bit of 1 byte is specified by address pointer. Plural bits in the 1 byte data cannot be set/reset at a time.

Please refer following flow chart.



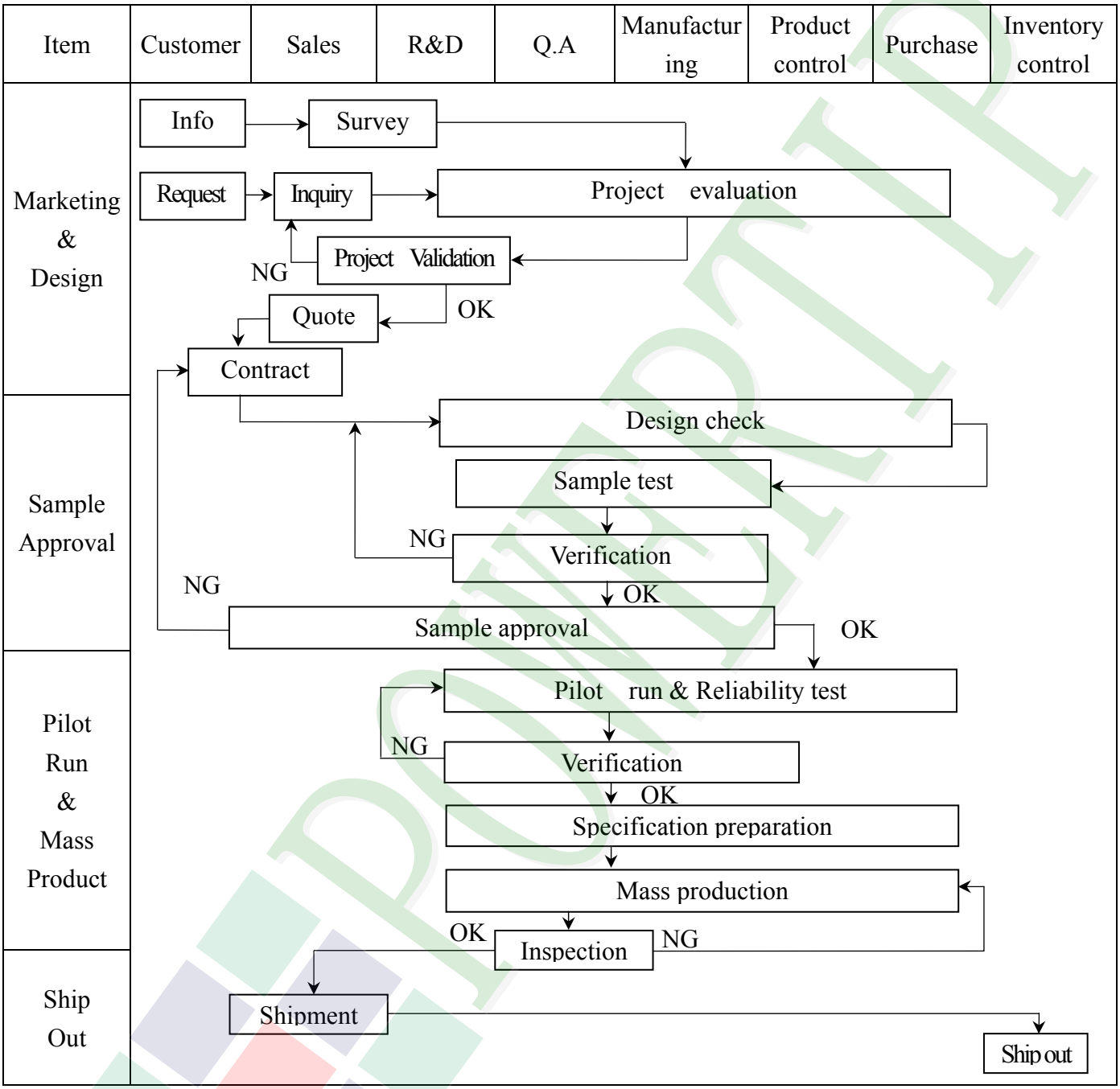
• **Command list**

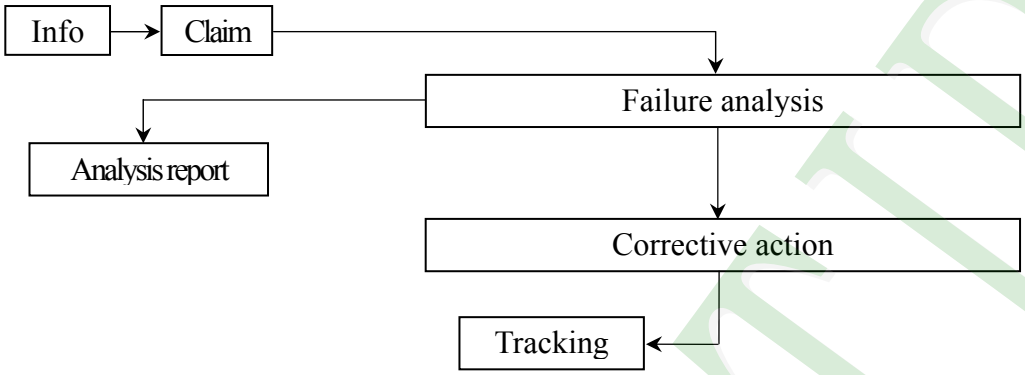
Command	Code	D1	D2	Function
Register Set	00100001	X address	Y address	Cursor pointer set
	00100010	Data	00H	Offset register set
	00100100	Low address	High address	Address pointer set
Control Word Set	01000000	Low address	High address	Text home address set
	01000001	Columns	00H	Text area set
	01000010	Low address	High address	Graphic home address set
	01000011	Columns	00H	Graphic area set
Mode Set	1000x000	-	-	"OR" mode
	1000x001	-	-	"EXOR" mode
	1000x011	-	-	"AND" mode
	1000x100	-	-	"Text attribute" mode
	10000xxx	-	-	"Internal CG ROM mode
	10001xxx	-	-	"External CG CG RAM mode
Display Mode	10010000	-	-	Display off
	1001xx10	-	-	Cursor on, blink off

	1001xx11	-	-	Cursor on, blink on
	100101xx	-	-	Text on, graphic off
	100110xx	-	-	Text off, graphic on
	100111xx	-	-	Text on, graphic on
Cursor Pattern Select	10100000	-	-	1 line cursor
	10100001	-	-	2 lines cursor
	10100010	-	-	3 lines cursor
	10100011	-	-	4 lines cursor
	10100100	-	-	5 lines cursor
	10100101	-	-	6 lines cursor
	10100110	-	-	7 lines cursor
	10100111	-	-	8 lines cursor
Data Auto Read/Write	10110000	-	-	Data auto write set
	10110001	-	-	Data auto read set
	10110010	-	-	Auto reset
Data Read Write	11000000	Data	-	Data write and ADP increment
	11000001	-	-	Data read and ADP increment
	11000010	Data	-	Data write and ADP decrement
	11000011	-	-	Data read and ADP decrement
	11000100	Data	-	Data write and ADP nonvariable
	11000101	-	-	Data read and ADP nonvariable
Screen Peek	11100000	-	-	Screen peek
Screen Copy	11101000			Screen copy
Bit Set/Reset	11110xxx	-	-	bit reset
	11111xxx	-	-	bit set
	1111x000	-	-	bit0 (LSB)
	1111x001	-	-	bit1
	1111x010	-	-	bit2
	1111x011	-	-	bit3
	1111x100	-	-	bit4
	1111x101	-	-	bit5
	1111x110	-	-	bit6
	1111x111	-	-	bit7 (MSB)

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. B01).

◆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)

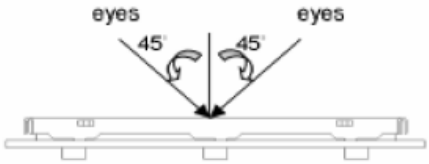


Fig.1

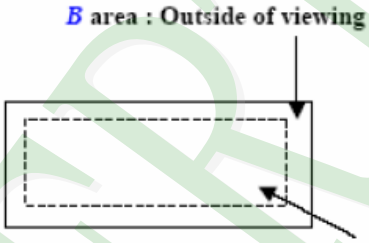


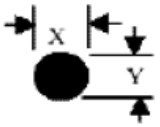
Fig. 2

◆ Specification:

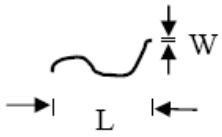
NO	Item	Criterion	Level
01	Product condition	1.1 The part number is inconsistent with work order of Production.	Major
		1.2 Mixed production types.	Major
		1.3 Assembled in inverse direction.	Major
02	Quantity	2.1 The quantity is inconsistent with work order of production.	Major
03	Outline dimension	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. B01)

<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

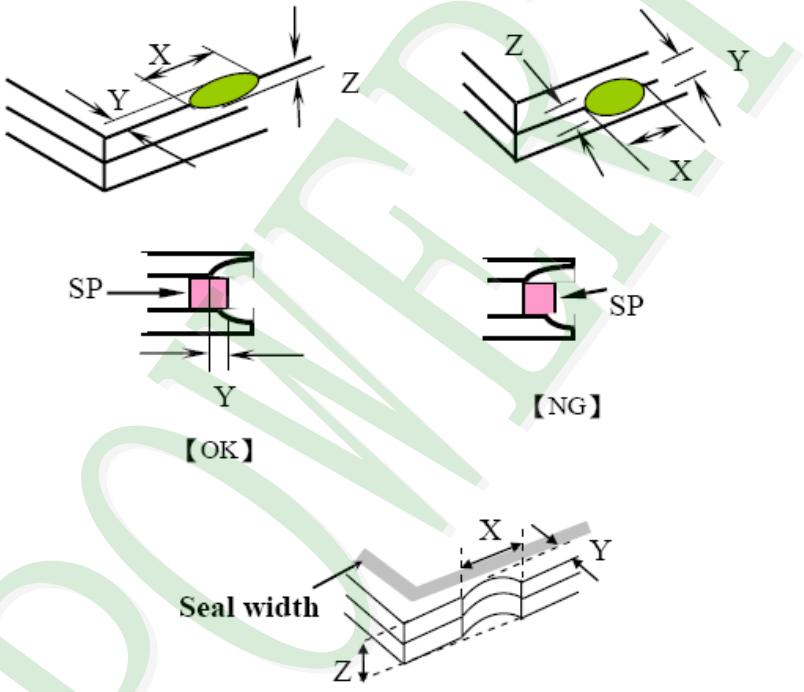
Round type
 

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="4">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. B01)

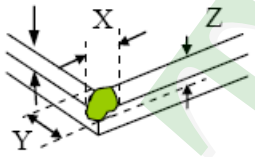
NO	Item	Criterion	Level
07	The crack of glass	Symbols： X : The length of crack　Y : The width of crack. Z : The thickness of crack　W : terminal length t : The thickness of glass　a : LCD side length 7.1 General glass chip： 7.1.1 Chip on panel surface and crack between panels: 	Minor

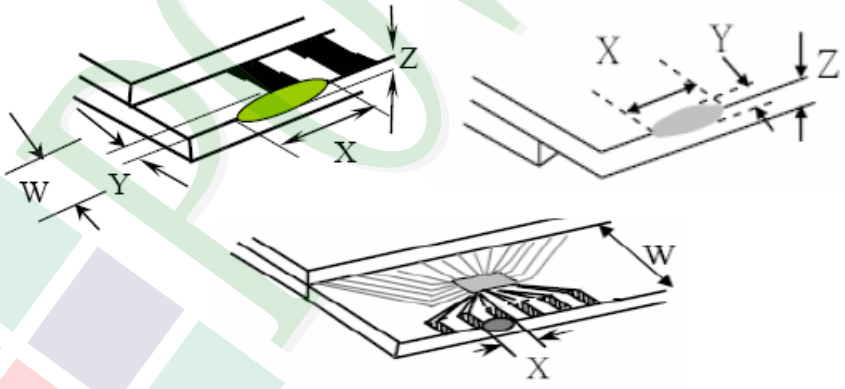
X	Y	Z
≦ a	Crack can't enter viewing area	≦1/2 t
≦ a	Crack can't exceed the half of SP width.	1/2 t < Z ≦2 t

◆Specification For Monotype and Color STN：　(Ver. B01)

<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：


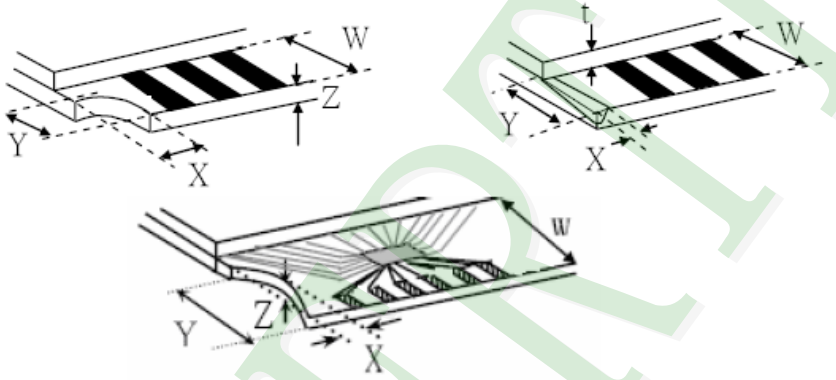
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≦1/5 a</td><td>Crack can’t enter viewing area</td><td>Z ≦ 1/2 t</td></tr>
<tr><td>≦1/5 a</td><td>Crack can’t exceed the half of SP width.</td><td>1/2 t < Z ≦ 2 t</td></tr>
</table>
</td><td rowspan="2">Minor</td></tr>
<tr><td>
7.2 Protrusion over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

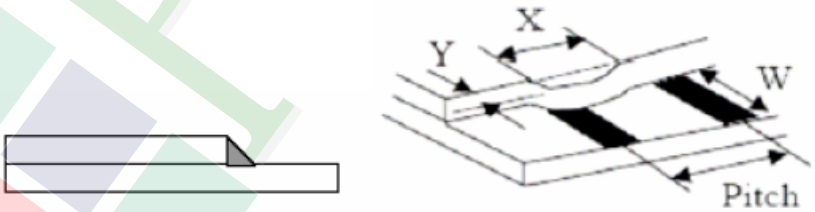
◆Specification For Monotype and Color STN：　(Ver. B01)

<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

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. B01)

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 (Ver.B01)

<table>
<tr><th>NO.</th><th>TEST ITEM</th><th>TEST CONDITION</th></tr>
<tr><td>1</td><td>High Temperature Storage Test</td><td>Keep in +80 ±2℃ 96 hrs
Surrounding temperature, then storage at normal condition 4hrs.</td></tr>
<tr><td>2</td><td>Low Temperature Storage Test</td><td>Keep in -30 ±2℃ 96 hrs
Surrounding temperature, then storage at normal condition 4hrs.</td></tr>
<tr><td>3</td><td>High Temperature / High Humidity Storage Test</td><td>Keep in +60 ℃ / 90% R.H duration for 96 hrs
Surrounding temperature, then storage at normal condition 4hrs.
(Excluding the polarizer)</td></tr>
<tr><td>4</td><td>Temperature Cycling Storage Test</td><td>-30℃→ +25℃ → +80℃ → +25℃
(30mins) (5mins) (30mins) (5mins)
10 Cycle
Surrounding temperature, then storage at normal condition 4hrs.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">ESD Test</td><td>Air Discharge:
Apply 2 KV with 5 times
Discharge for each polarity +/-
Contact Discharge:
Apply 250 V with 5 times
discharge for each polarity +/-</td></tr>
<tr><td>1. Temperature ambiance : 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 sec)
(Tolerance if the output voltage indication : ±5%)</td></tr>
<tr><td>6</td><td>Vibration Test (Packaged)</td><td>1. Sine wave 10～55 Hz frequency (1 min/sweep)
2. The amplitude of vibration :1.5 mm
3. Each direction (X、Y、Z) duration for 2 Hrs</td></tr>
<tr><td>7</td><td>Drop Test (Packaged)</td><td><table><tr><th>Packing Weight (Kg)</th><th>Drop Height (cm)</th></tr><tr><td>0 ~ 45.4</td><td>122</td></tr><tr><td>45.4 ~ 90.8</td><td>76</td></tr><tr><td>90.8 ~ 454</td><td>61</td></tr><tr><td>Over 454</td><td>46</td></tr></table>Drop Direction :※1 corner / 3 edges / 6 sides each 1time</td></tr>
</table>

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.

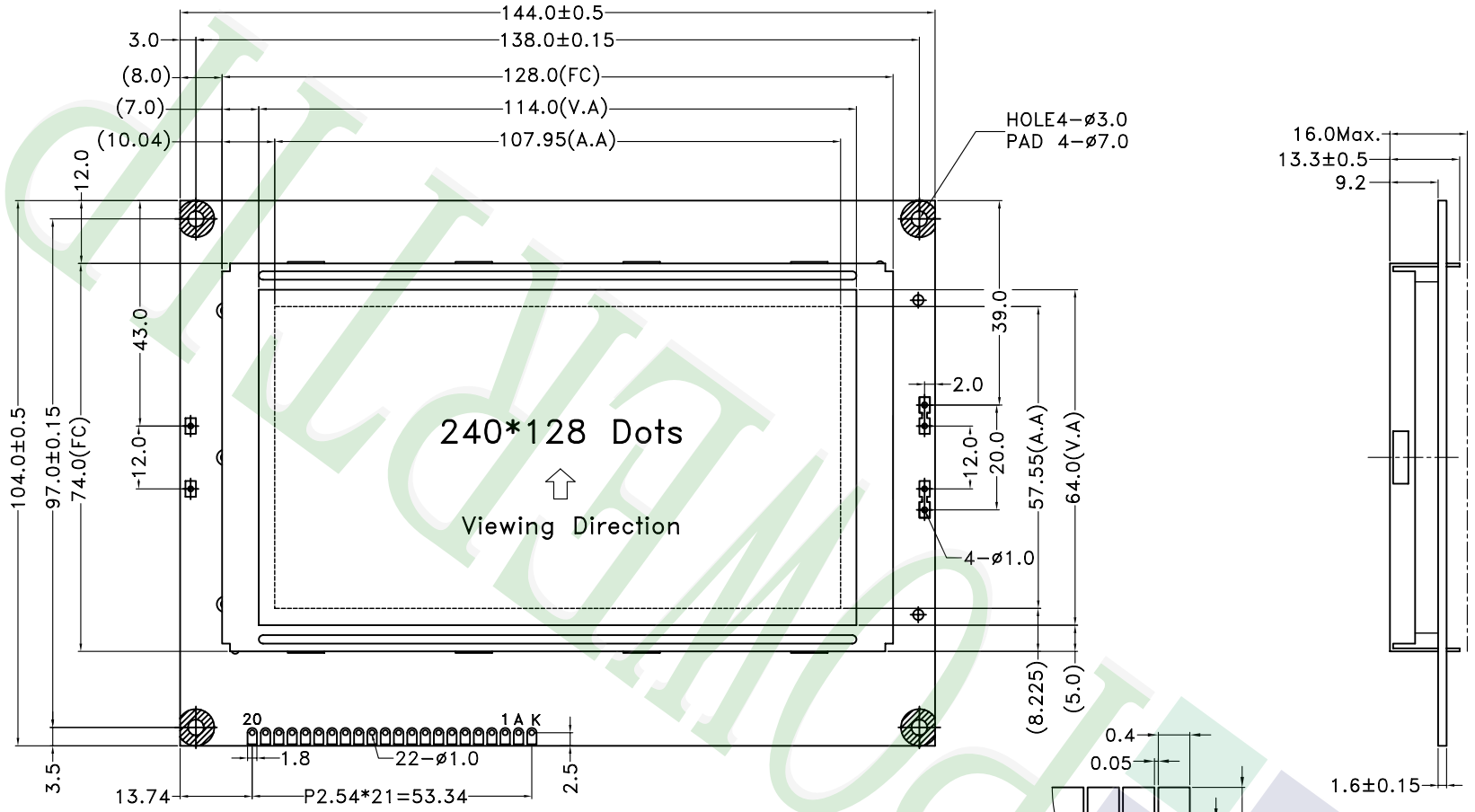
5.4 TERMS OF WARRANTY

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: FSTN,TRANSFLECTIVE,POSITIVE
2.Viewing Direction: 6 O'clock
3.Top: −20~70°C Tst:−30~80°C
4.This product conforms ROHS
5.The tolerance unless classified ±0.3mm

REV	REV BY	REVISER	DATE
007			
006			
005			
004			
003			
002			
001	NEW DRAWING	Terry	2010/12/27

PART NO: PG240128WRFAGAHPCQ
DRAWING NAME : JLMD-PG240128WRFAGAHPCQ
TITLE: LCD MODULE DRAWING

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

Design	Terry	⟨3⟩	Surface		
Check	Eddy	Unit	MM	Material	
Approve	Ryan	Scale	1:1	Thickness	
		Page	1/1	Quantity	

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

PT-A-054-01

Ver.001

Documents NO.	JPKG-PG240128WRFAGAHPCQ

LCM包裝規格書
LCM Packaging Specifications

Approve	Check	Contact
Ryan	Eddy	Terry

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

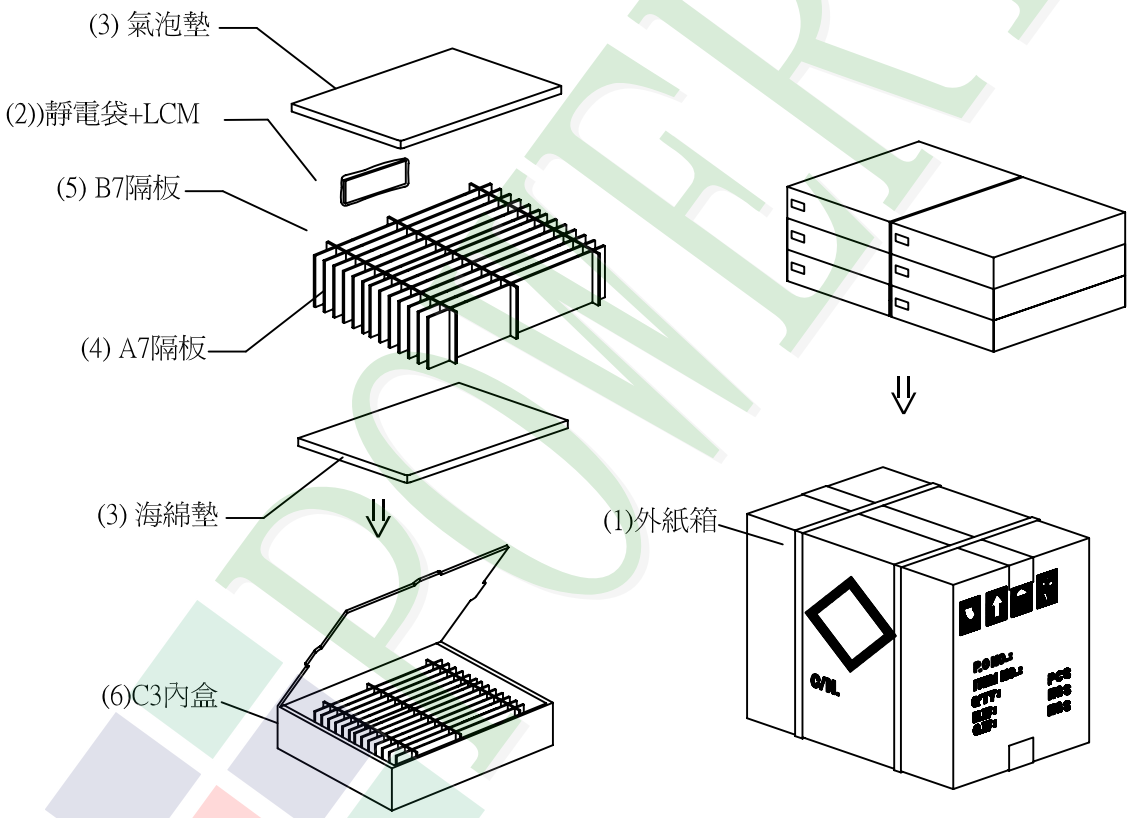
No.	Item	Model	Dimensions (mm)	1Pcs Weight	Quantity	Total Weight
1	成品 (LCM)	PG240128WRFAGAHPCQ	128 X 104X16	0.16	66	10.56
2	靜電袋(2)	BAG240170ARABA	240X170X0.05	0.0036	66	0.2376
3	氣泡墊(3)	BAG290240BRBBA	240X290X5	0.0029	12	0.0348
4	A7隔板(4)	BX29500010BZBA	295X105X4	0.038	78	2.964
5	B7隔板(5)	BX24500010BZBA	245105X4	0.023	18	0.414
6	C3內盒(6)	BX31025511AABA	310X 255X116	0.203	6	1.218
7	外紙箱(1)	BX52532536CCBA	525 X 325 X 360	1.092	1	1.092
8						
9						

2.一 整箱總重量 (Total LCD Weight in carton) : 16.52 Kg±10%

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

(1)Quantity Of Spacer : A7隔板 X 13 , B7隔板 X 3

(2)Total LCM quantity in carton : quantity per box 11 x No of boxes 6 = 66



特 記 事 項 (REMARK)

1. Label Specifications :

MODEL:
LOT NO:
QUANTITY:
CHECK:

前、中、后各空一格