POWERTIP TECH. CORP.

SPECIFICATIONS

CUSTOMER	:	大鵬
SAMPLE CODE (Ver.)	:	
MASS PRODUCTION CODE (Ver.)	:	**PG16032LRU-BWHHP2Q (Ver.0)**
DRAWING NO. (Ver.)	:	**DMD-02016**

Customer Approved

Date:

Approved	QC Confirmed	Designer
技術部 2006-3-16 陳銘振		蔡本榮 3/14-06

■ 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	Rev.	Description	Note	Page
2005/4/25	0	PG16032LRU-BWHHP2Q is the ROHS compliant part number based on Powertip's standard PG16032LRU-BWH-HP2		

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Note：For detailed information please refer to IC data sheet：ST7920,ST7921

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	160 * 32 dots
LCD Type	STN, YG, Transflective, Positive, Extended Temp.
Driver Condition	LCD Module:1/32 Duty , 1/5.6 Bias
Viewing Direction	6 O'clock
Backlight	YG LED B/L
Weight	69.5 g
Other	—

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	116.0(L) * 44.0(w) * 14.0(H)(Max)	mm
Viewing Area	99.0(L) * 24.0(w)	mm
Active Area	94.36(L) * 18.84(w)	mm
Dot Size	0.55(L) * 0.59(w)	mm
Dot Pitch	0.55(L) * 0.59(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	5.5	V
LCD Driver Supply Voltage	V_{LCD}	—	-0.3	7.0	V
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

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

Item	Symbol	Condition	Min.	Type	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}	—	0.8 V_{DD}	-	V_{DD}	V
"L" Output Voltage	V_{OL}	—	-	-	0.4	V
Supply Current	I_{DD}	V_{DD} = 5.0 V f_{OSC}=3.0MHz	-	1.1	2.0	mA
LCM Driver Voltage	V_{OP}	-20°C	-	-	-	V
		25°C*1	1.5	1.7	1.9	
		70°C	-	-	-	

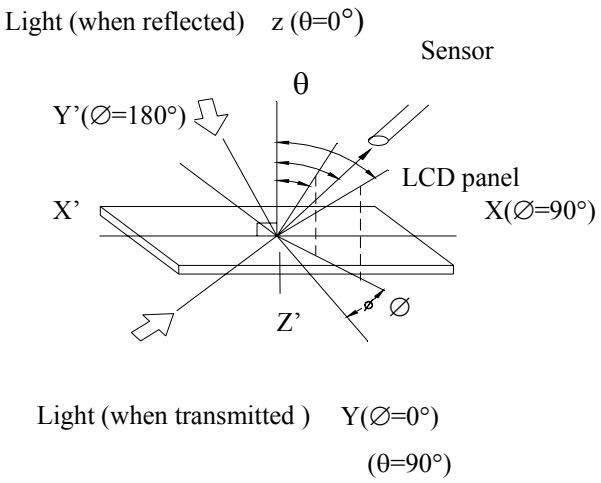
Note: *1. THE V_{OP} TEST POINT IS V_{DD} - V_O.

1.5 Optical Characteristics

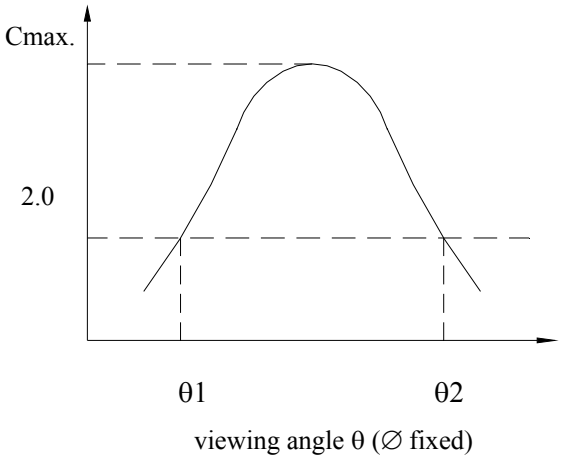
LCD Panel：1/32 Duty，1/5.6 Bias，V_{LCD} =6.7 V，Ta = 25℃

Item	Symbol	Conditions	Min.	Type	Max.	Reference
View Angle	θ	C≥2.0, ∅ = 0°	40°	-	-	Notes 1 & 2
Contrast Ratio	C	θ = 5°, ∅ = 0°	6	8	-	Note 3
Response Time(rise)	tr	θ = 5°, ∅ = 0°	-	200ms	300ms	Note 4
Response Time(fall)	tf	θ = 5°, ∅ = 0°	-	150 ms	225ms	Note 4

Note 1: Definition of angles θ and ∅



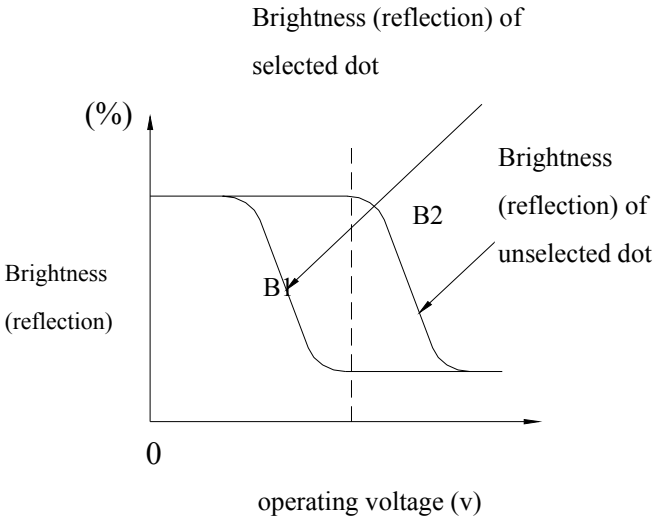
Note 2: Definition of viewing angles θ1 and θ2



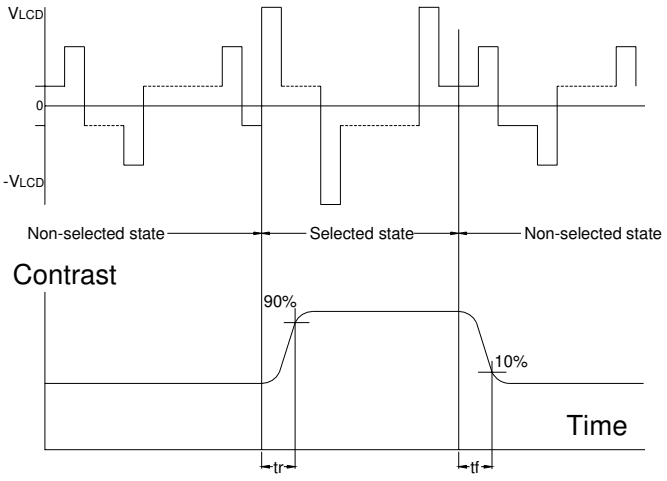
Note : Optimum viewing angle with the naked eye and viewing angle θ at Cmax. Above are not always the same

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℃	-	384	mA
Reverse Voltage	VR	Ta =25℃	-	8	V
Power Dissipation	PO	Ta =25℃	-	1.766	W
Operating Temperature	T_{OP}	-	-30	80	℃
Storage Temperature	T_{ST}	-	-40	90	℃

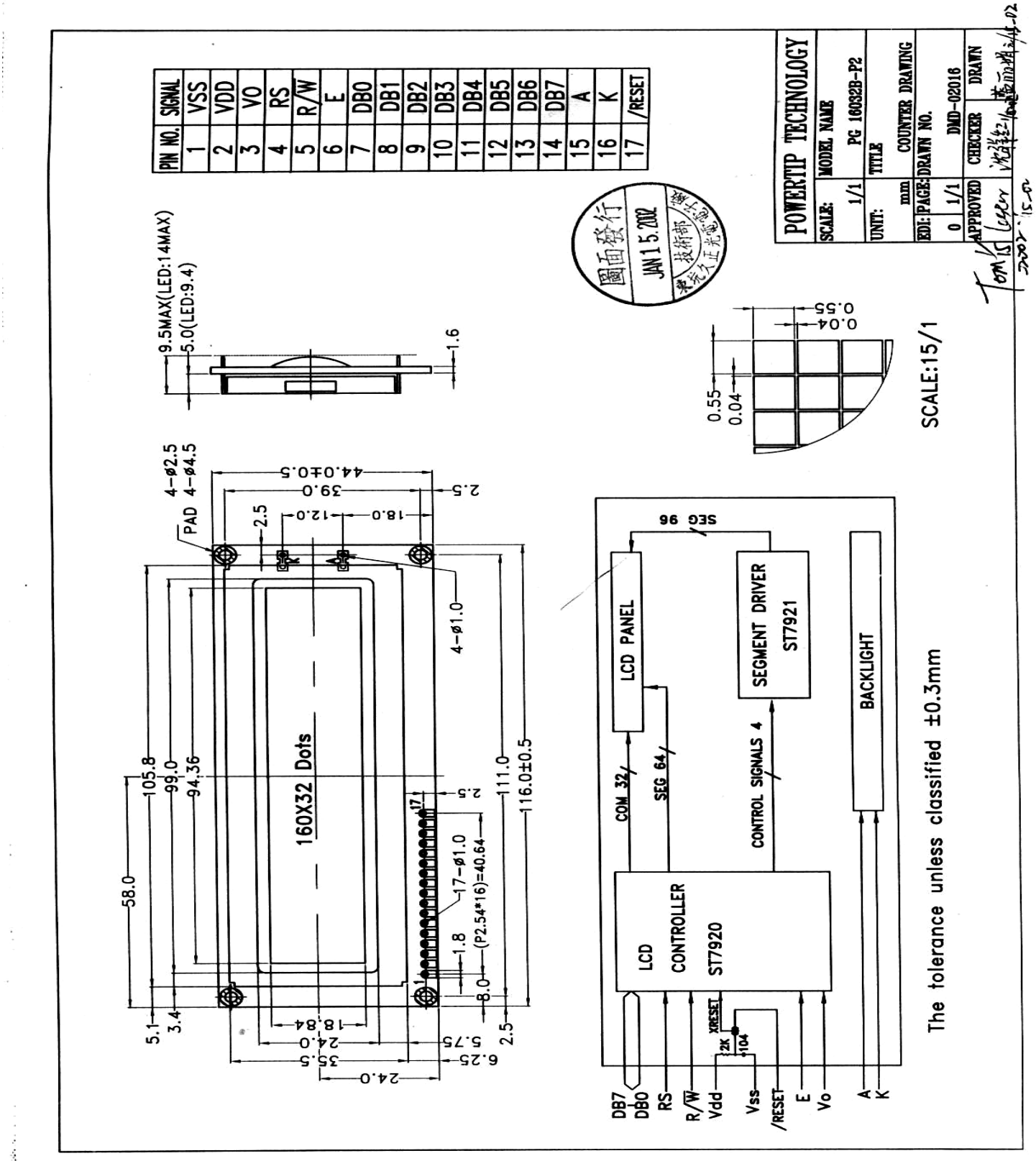
Electrical / Optical Characteristics

Ta =25℃

Item	Symbol	Conditions	Min.	Type	Max.	Unit
Forward Voltage	VF	IF= 240 mA	-	4.2	4.6	V
Reverse Current	IR	VR= 8 V	-	0.24	-	mA
Wavelength	λ p	IF= 240 mA	-	570	572	nm
Luminous Intensity (without LCD)	Iv	IF=240 mA	80	100	-	cd/m^2
Color	Yellow-green					

2. MODULE STRUCTURE

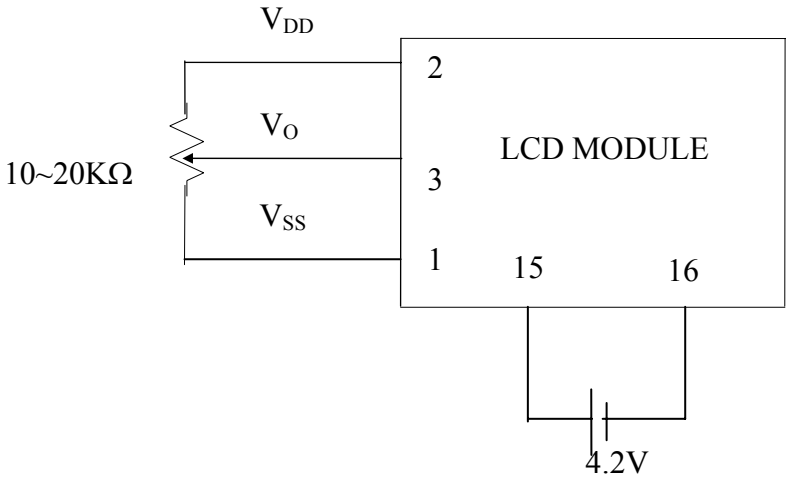
2.1 Counter Drawing



2.2 Interface Pin Description

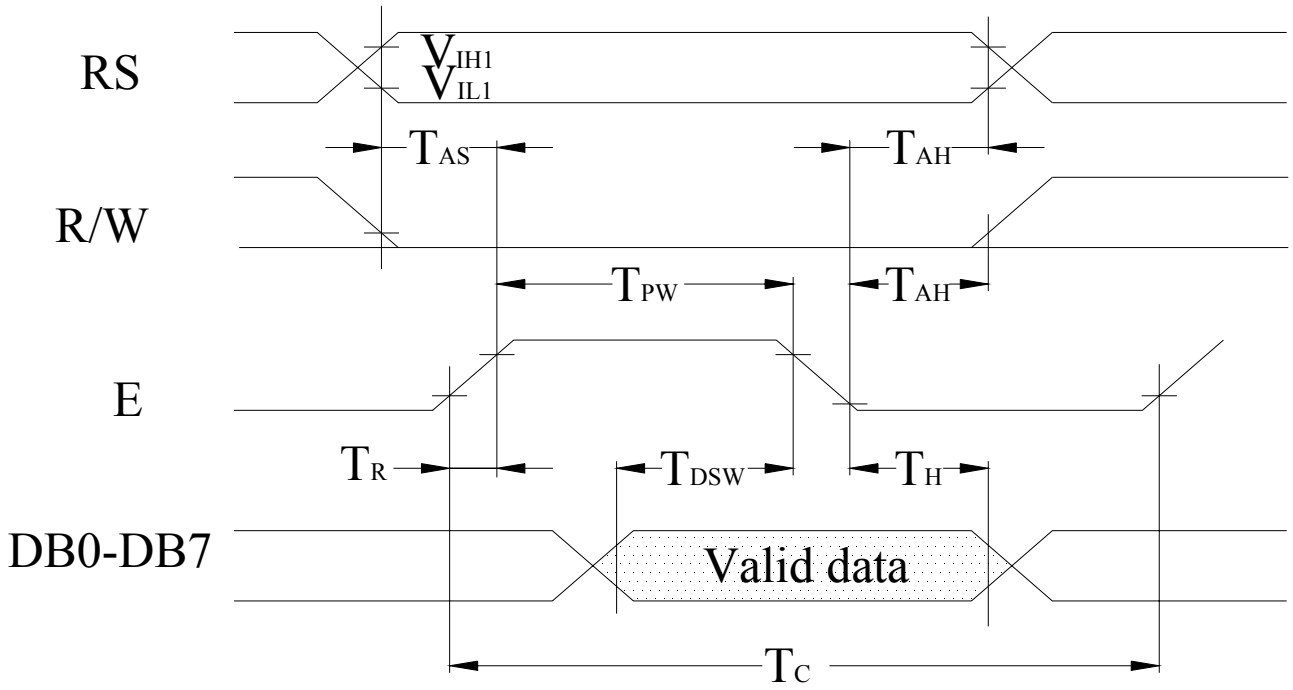
Pin No.	Symbol	Signal Description
1	V_{SS}	Power Supply (Vss=0)
2	V_{DD}	Power Supply (V_{DD}>V_{SS})
3	V_O	Operating voltage for LCD
4	RS	Register Selection input High = Data register Low = Instruction register (for write) Busy flag address counter (for read)
5	$\overline{R/W}$	Read/Write signal input 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 ~ DB3	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.
11~14	DB4~DB7	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.
15	A	Power supply LED backlight (+)
16	K	Power supply LED backlight (-)
17	$\overline{RESET}$	RESET PIN

Contrast Adjust

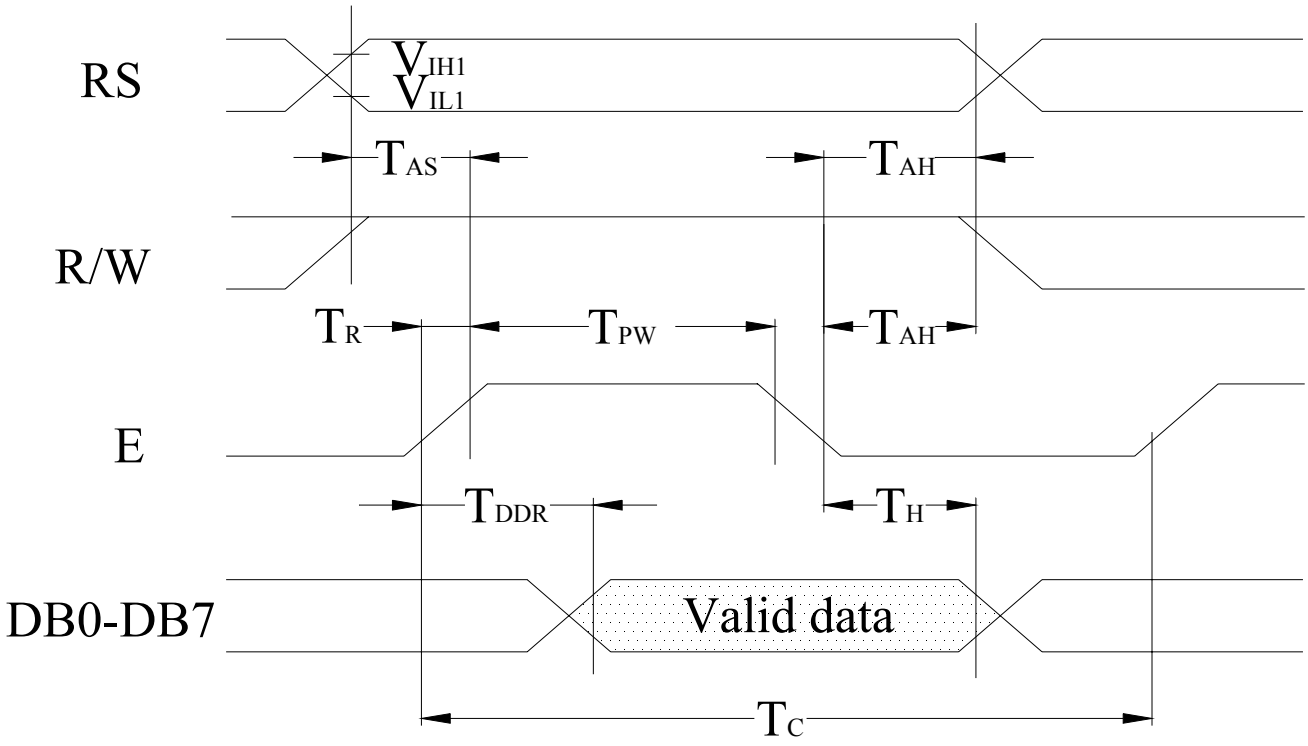


2.3 Timing Characteristics

●Writing data from MPU to ST7920



●Reading data from ST7920 to MPU



- Write Mode (Writing data from MPU to ST7920)

(V_{DD}= +5V±0.5V,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	10	-	-	ns
T_{AH}	Address Hold Time	Pins :RS,RW,E	20	-	-	ns
T_{DSW}	Data Setup Time	Pins:DB0~DB7	40	-	-	ns
T_H	Data Hold Time	Pins:DB0~DB7	20	-	-	ns

- Read Mode (Reading data from ST7920 to MPU)

(V_{DD}= +5V±0.5VTa=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	10	-	-	ns
T_{AH}	Address Hold Time	Pins :RS,RW,E	20	-	-	ns
T_{DDR}	Data Setup Time	Pins:DB0~DB7	-	-	100	ns
T_H	Data Hold Time	Pins:DB0~DB7	20	-	-	ns

2.4 Display Command

Instruction set 1: (RE=0: basic instruction)

Ins	code										Description	Exec time (540KHZ)
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
CLEAR	0	0	0	0	0	0	0	0	0	1	Fill DDRAM with "20H", and set DDRAM address counter (AC) to "00H"	1.6 ms
HOME	0	0	0	0	0	0	0	0	1	X	Set DDRAM address counter (AC) to "00H", and put cursor to origin : the content of DDRAM are not changed	72 us
ENTRY MODE	0	0	0	0	0	0	0	1	I/D	S	Set cursor position and display shift when doing write or read operation	72 us
DISPLAY ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1: display ON C=1: cursor ON B=1: blink ON	72 us
CURSOR DISPLAY CONTROL	0	0	0	0	0	1	S/C	R/L	X	X	Cursor position and display shift control : the content of DDRAM are not changed	72 us
FUNCTION SET	0	0	0	0	1	DL	X	0 RE	X	X	DL=1 8-BIT interface DL=0 4-BIT interface **RE=1: extended instruction** **RE=0: basic instruction**	72 us
SET CGRAM ADDR.	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address to address counter (AC) **Make sure that in extended instruction SR=0 (scroll or RAM address select)**	72 us
SET DDRAM ADDR.	0	0	1	0 AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address to address counter (AC) AC6 is fixed to 0	72 us
READ BUSY FLAG (BF) & ADDR.	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Read busy flag (BF) for completion of internal operation, also Read out the value of address counter (AC)	0 us
WRITE RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data to internal RAM (DDRAM/CGRAM/IRAM/GDRAM)	72 us
READ RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM/IRAM/GDRAM)	72 us

Instruction set 2: (RE=1: extended instruction)

Inst.	code										description	Exec. time (540KHZ)
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
STAND BY	0	0	0	0	0	0	0	0	0	1	Enter stand by mode, any other instruction can terminate (Com1..32 halted, only Com33 ICON can display)	72 us
SCROLL or RAM ADDR. SELECT	0	0	0	0	0	0	0	0	1	SR	SR=1: enable vertical scroll position SR=0: enable IRAM address (extended instruction) SR=0: enable CGRAM address(basic instruction)	72 us
REVERSE	0	0	0	0	0	0	0	1	R1	R0	Select 1 out of 4 line (in DDRAM) and decide whether to reverse the display by toggling this instruction **R1,R0 initial value is 00**	72 us
SLEEP	0	0	0	0	0	0	1	SL	X	X	SL=1: leave sleep mode SL=0: enter sleep mode	72 us
EXTENDED FUNCTION SET	0	0	0	0	1	DL	X	1 RE	G	0	DL=1 8-BIT interface DL=0 4-BIT interface **RE=1: extended instruction set** **RE=0: basic instruction set** G=1 :graphic display ON G=0 :graphic display OFF	72 us
SET IRAM or SCROLL ADDR	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	SR=1: AC5~AC0 the address of vertical scroll SR=0: AC3~AC0 the address of ICON RAM	72 us
SET GRAPHIC RAM ADDR.	0	0	1	0 AC6	0 AC5	0 AC4	AC3 AC3	AC2 AC2	AC1 AC1	AC0 AC0	Set GDRAM address to address counter (AC) First set vertical address and the horizontal address by consecutive writing Vertical address range AC6...AC0 Horizontal address range AC3...AC0	72 us

2.5 Function Description

System interface

ST7920 supports 3 kinds of bus interface to MPU. 8 bits parallel, 4 bits parallel and clock synchronized serial interface. Parallel interface is selected by PSB="1" and serial interface by PSB="0". 8 bit / 4 bit interface is selected by function set instruction DL bit.

Two 8 bit registers (data register DR, instruction register IR) are used in ST7920's write and read operation. Data Register (DR) can access DDRAM/CGRAM/GDRAM and IRAM's data through the address pointer implemented by Address Counter (AC). Instruction Register (IR) stores the instruction by MPU to ST7920.

4 modes of read/write operation specified by RS and RW :

RS	RW	description
L	L	MPU write instruction to instruction register (IR)
L	H	MPU read busy flag (BF) and address counter (AC)
H	L	MPU write data to data register (DR)
H	H	MPU read data from data register (DR)

Busy Flag (BF)

Internal operation is in progress when BF="1", ST7920 is in busy state. No new instruction will be accepted until BF="0". MPU must check BF to determine whether the internal operation is finished and new instruction can be sent.

Address counter (AC)

Address counter (AC) is used for address pointer of DDRAM/CGRAM/IRAM/GDRAM. (AC) can be set by instruction and after data read or write to the memories (AC) will increase or decrease by 1 according to the setting in "entry mode set". When RS= "0" and RW= "1" and E="1" the value of (AC) will output to DB6~DB0.

16x16 character generation ROM (CGROM) and 8x16 half height ROM (HCGROM)

ST7920 provides character generation ROM supporting 8192 16 x 16 character fonts and 126 8 x 16 alphanumeric characters. It is easy to support multi languages application such as Chinese and English. Two consecutive bytes are used to specify one 16x16 character or two 8x16 half-height characters. Character codes are written into DDRAM and the corresponding fonts are mapped from CGROM or HCGROM to the display drivers.

Character generation RAM (CGRAM)

ST7920 provides RAM to support user-defined fonts. Four sets of 16x16 bit map area are available. These user-defined fonts are displayed the same ways as CGROM fonts through writing character cod data to DDRAM.

ICON RAM (IRAM)

ST7920 provides 240 ICON display. It consists of 15 sets of IRAM address. Each IRAM address has 16 bits data. IRAM address should be set first before writing to the IRAM. Two bytes for each address. First higher byte (D15~D8) and then lower byte (D7~D0).

Graphic RAM (GDRAM)

Graphic display RAM supports 64x256 bits bit-mapped memory space. GDRAM address is set by writing 2 consecutive bytes for vertical address and horizontal address. Two-bytes data write to GDRAM for one address. Address counter will automatically increase by one for the next two-byte data. The procedure is as followings.

1. Set vertical address (Y) for GDRAM
2. Set horizontal address (X) for GDRAM
3. Write D15~D8 to GDRAM 中(first byte)
4. Write D7~D0 to GDRAM 中(second byte)

Graphic display memory map please refer to Table-8

LCD driver

LCD driver have 33 common and 64 segments to drive the LCD panel. Segment data from CGRAM /CGROM /HCGROM are shifted into the 64 bits segment latches to display. Extended segment driver ST7921 can be used to extend the segment drivers to 256.

Display data RAM (DDRAM)

There are 64x2 bytes for display data RAM area. Can store display data for 16 characters(16x16) by 4 lines or 32 characters(8x16) by 4 lines. However, only 2 lines can be displayed at a time. Character codes stored in DDRAM point to the fonts specified by CGROM、HCGROM and CGRAM. ST7920 display half height HCGROM fonts, user-defined CGRAM fonts and full 16x16 CGROM fonts. Data codes 0000H~0006H are for CGRAM user-defined fonts. Data codes 02H~7FH are for half height alpha numeric fonts. Data codes (A140~D75F) are for BIG5 code and (A1A0~F7FF) are for GB code.

1. display HCGROM fonts : Write 2 bytes data to DDRAM to display two 8x16 fonts. Each byte represents 1 character font. The data of each byte is 02H~7FH.
2. display CGRAM fonts : Write 2 bytes data to DDRAM to display one 16x16 font. Only 0000H、0002H、0004H、 0006H are allowed.
3. display CGROM fonts : Write 2 bytes data to DDRAM to display one 16x16 font. A140H~D75FH are for (BIG5) code, A1A0H~F7FFH are for (GB) code.

Higher byte (D15~D8) are written first and then lower byte (D7~D0).

DDRAM data (char. code)					CGRAM Addr.						CGRAM data (higher byte)								CGRAM data (lower byte)							
B15~ B4	B3	B2	B1	B0	B5	B4	B3	B2	B1	B0	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	X	00	X	00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0
					0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0
					0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0
					0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0
					0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0
					0	1	0	1	0	0	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0	0
					0	1	1	0	0	1	1	0	0	1	0	1	0	0	1	0	0	1	0	0	0	0
					0	1	1	1	1	0	0	1	0	0	1	1	1	0	0	1	0	0	1	0	0	0
					1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	1	0	0	0	0	0
					1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0
					1	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	1	1	0	0	0
					1	0	1	1	0	0	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0
					1	1	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0
					1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
					1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
					1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	X	01	X	01	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	0
					0	0	0	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0
					0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0
					0	0	1	1	0	1	1	0	1	1	1	0	1	0	0	1	0	0	1	0	0	0
					0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0
					0	1	0	1	0	1	1	1	1	1	1	1	1	0	0	1	0	0	1	0	0	0
					0	1	1	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0
					0	1	1	1	0	1	1	1	1	1	1	1	1	0	0	1	0	0	1	0	0	0
					1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0
					1	0	0	1	0	1	1	1	1	1	1	1	1	0	0	1	0	0	1	0	0	0
					1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
					1	0	1	1	0	1	1	1	1	1	1	1	1	0	0	1	0	0	1	0	0	0
					1	1	0	0	1	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0
					1	1	0	1	1	0	1	1	1	1	1	1	1	0	0	1	0	0	1	0	0	0
					1	1	1	0	1	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0
					1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5： DDRAM data（character code）， CGRAM data / address map

Note：

1. DDRAM data (character code) bit1 and bit2 are the same as CGRAM address bit4 and bit5.
2. CGRAM address bit0 to bit3 specify total 16 rows. Row16 is for cursor display. The data in row 16 will be logical OR to the cursor.
3. CGRAM data for each address is 16 bits.
4. DDRAM data to select CGRAM bit4 to bit15 must be "0". Bit0 and bit3 value are "don't care".

ICON RAM address Set SR "0", and then set IRAM address AC3 ... AC0				ICON RAM data															
				Higher byte								Lower byte							
AC3	AC2	AC1	AC0	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	SEG0	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7	SEG8	SEG9	SEG10	SEG11	SEG12	SEG13	SEG14	SEG15
0	0	0	1	SEG16	SEG17	SEG18	SEG19	SEG20	SEG21	SEG22	SEG23	SEG24	SEG25	SEG26	SEG27	SEG28	SEG29	SEG30	SEG31
0	0	1	0	SEG32	SEG33	SEG34	SEG35	SEG36	SEG37	SEG38	SEG39	SEG40	SEG41	SEG42	SEG43	SEG44	SEG45	SEG46	SEG47
0	0	1	1	SEG48	SEG49	SEG50	SEG51	SEG52	SEG53	SEG54	SEG55	SEG56	SEG57	SEG58	SEG59	SEG60	SEG61	SEG62	SEG63
0	1	0	0	SEG64	SEG65	SEG66	SEG67	SEG68	SEG69	SEG70	SEG71	SEG72	SEG73	SEG74	SEG75	SEG76	SEG77	SEG78	SEG79
0	1	0	1	SEG80	SEG81	SEG82	SEG83	SEG84	SEG85	SEG86	SEG87	SEG88	SEG89	SEG90	SEG91	SEG92	SEG93	SEG94	SEG95
0	1	1	0	SEG96	SEG97	SEG98	SEG99	SEG100	SEG101	SEG102	SEG103	SEG104	SEG105	SEG106	SEG107	SEG108	SEG109	SEG110	SEG111
0	1	1	1	SEG112	SEG113	SEG114	SEG115	SEG116	SEG117	SEG118	SEG119	SEG120	SEG121	SEG122	SEG123	SEG124	SEG125	SEG126	SEG127
1	0	0	0	SEG128	SEG129	SEG130	SEG131	SEG132	SEG133	SEG134	SEG135	SEG136	SEG137	SEG138	SEG139	SEG140	SEG141	SEG142	SEG143
1	0	0	1	SEG144	SEG145	SEG146	SEG147	SEG148	SEG149	SEG150	SEG151	SEG152	SEG153	SEG154	SEG155	SEG156	SEG157	SEG158	SEG159
1	0	1	0	SEG160	SEG161	SEG162	SEG163	SEG164	SEG165	SEG166	SEG167	SEG168	SEG169	SEG170	SEG171	SEG172	SEG173	SEG174	SEG175
1	0	1	1	SEG176	SEG177	SEG178	SEG179	SEG180	SEG181	SEG182	SEG183	SEG184	SEG185	SEG186	SEG187	SEG188	SEG189	SEG190	SEG191
1	1	0	0	SEG192	SEG193	SEG194	SEG195	SEG196	SEG197	SEG198	SEG199	SEG200	SEG201	SEG202	SEG203	SEG204	SEG205	SEG206	SEG207
1	1	0	1	SEG208	SEG209	SEG210	SEG211	SEG212	SEG213	SEG214	SEG215	SEG216	SEG217	SEG218	SEG219	SEG220	SEG221	SEG222	SEG223
1	1	1	0	SEG224	SEG225	SEG226	SEG227	SEG228	SEG229	SEG230	SEG231	SEG232	SEG233	SEG234	SEG235	SEG236	SEG237	SEG238	SEG239
1	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 6 ICON RAM address, data and Segment pins

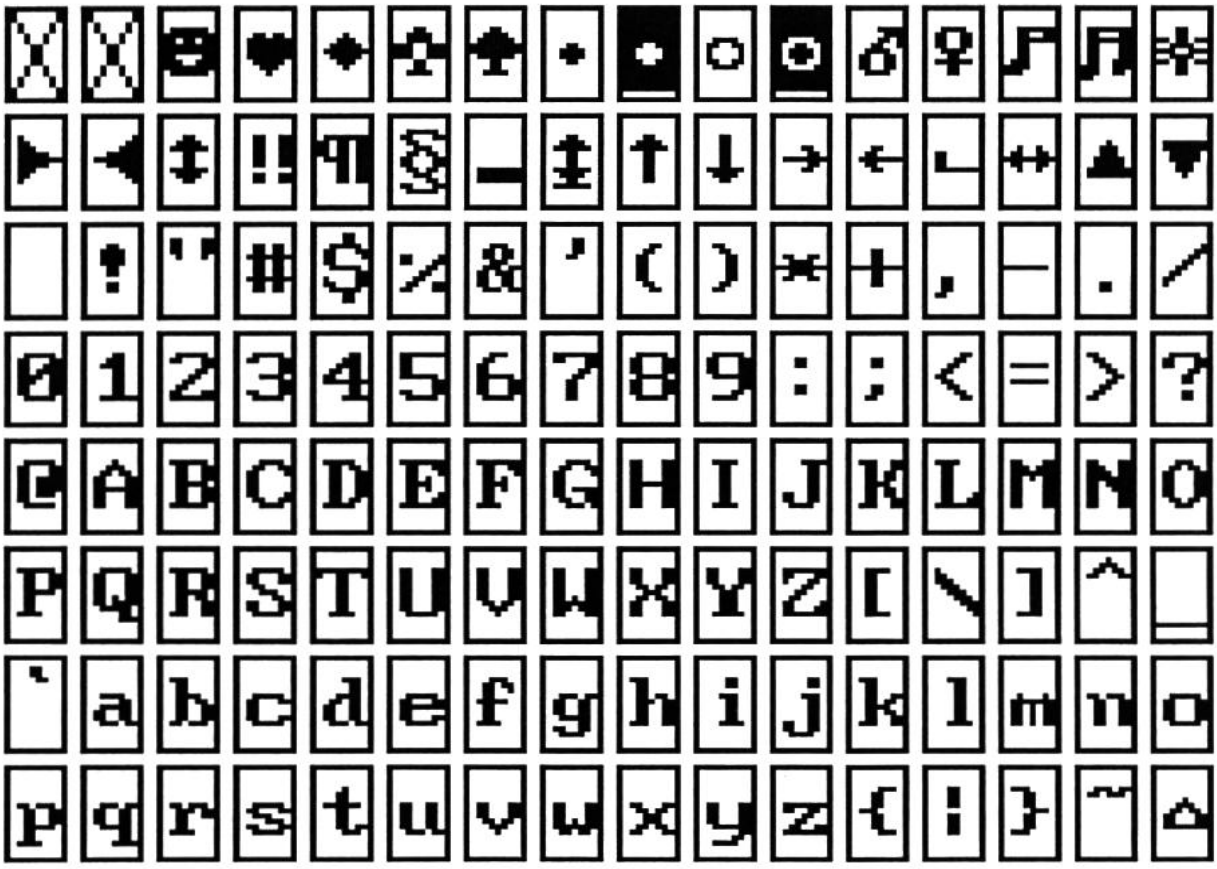
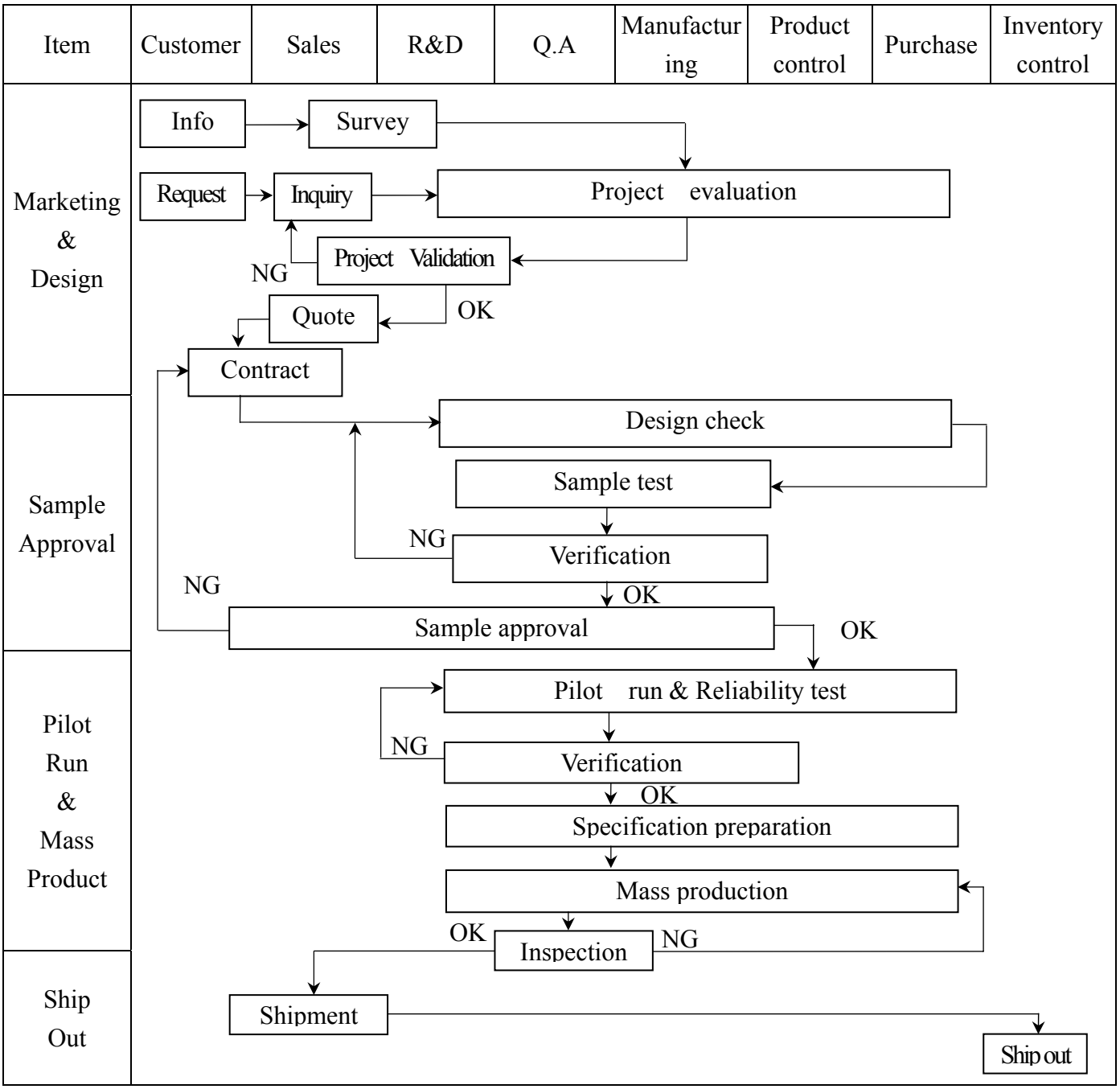
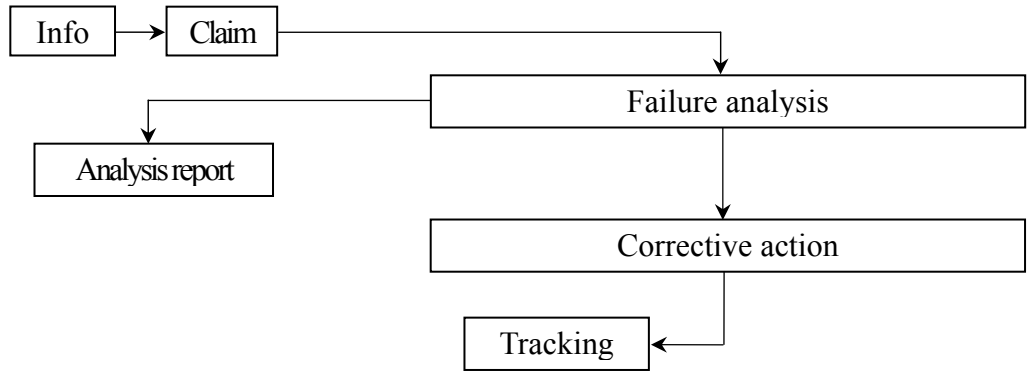


Table 7 16x8 half-height characters

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart

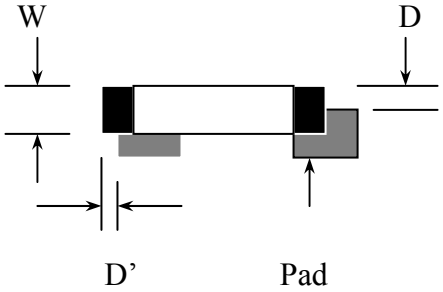


Item	Customer	Sales	R&D	Q.A	Manufactu ring	Product control	Purchase	Inventory control
Sales Service								
Q.A Activity	1. ISO 9001 Maintenance Activities 2. Process improvement proposal 3. Equipment calibration 4. Education And Training Activities 5. Standardization Management							

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.

5.2.8 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.