

QUALITY MICROELECTRONICS INTERNATIONAL CO., LTD.

PRODUCT SPECIFICATIONS

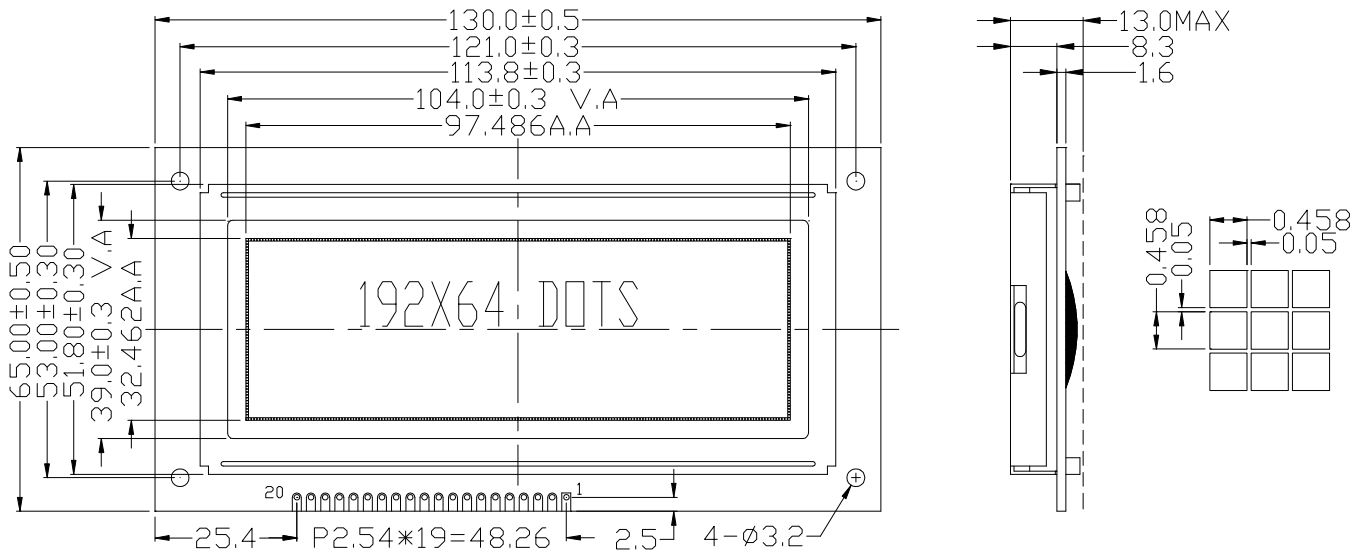
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- USING LCD MODULES

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■ PHYSICAL DATA

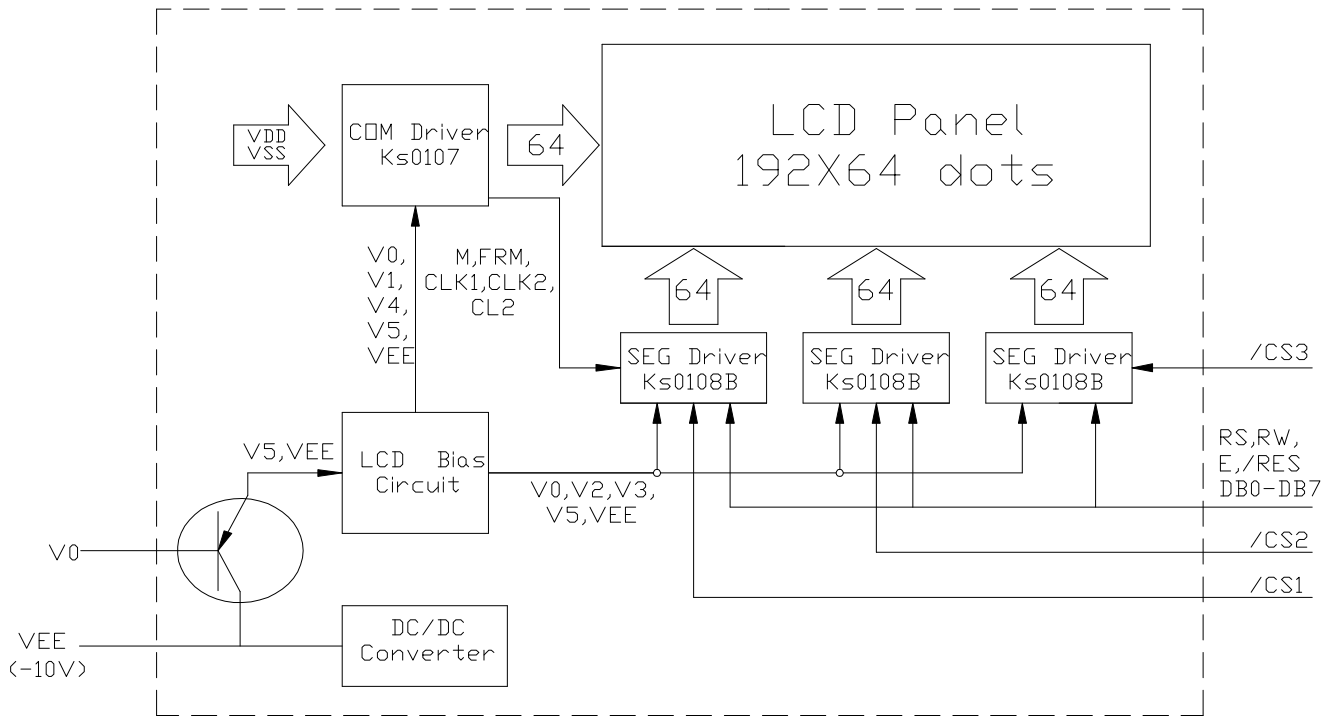
Item	Contents	Unit
LCD type	STN/YELLOW-GREEN	---
LCD duty	1/64	---
LCD bias	1/9	---
Viewing direction	6	o'clock
Module size (W×H×T)	130.0×65.0× 13.0MAX	mm
Viewing area (W×H)	104.0 × 39.0	mm

■ EXTERNAL DIMENSIONS



■ BLOCK DIAGRAM

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
VSS	VDD	V0	RS	R/W	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	/CS1	/RES	/CS2	/CS3	VEE	LED(+)



■ ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	VDD	-0.3	+7.0	V
Supply voltage for LCD	VDD-V0	-0.3	+19	V
Input voltage	VI	-0.3	VDD+0.3	V
Operating temperature	TOP	-20	+70	°C
Storage temperature	TST	-30	+80	°C
LED supply voltage	VLED	0	+5.5	V
LED supply current	ILED	0	450	mA

■ ELECTRICAL CHARACTERISTICS (VDD = +5V±10%, VSS = 0V, Ta = 25°C)

▼ DC Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Supply voltage for logic	VDD	---	4.5	5.0	5.5	V
Supply current for logic	IDD	---	---	6	8	mA
Operating voltage for LCD	VDD-V0	25°C	11.4	11.7	12	V
Supply voltage for back light	VF	---	0	5	5.5	V
Supply current for back light	IF	---	0	360	450	mA
Input voltage ' H ' level	VIH	---	2	---	VDD	V
Input voltage ' L ' level	VIL	---	0	---	0.8	V

▼ AC Characteristics

MPU Interface

Parameter	Symbol	Condition	Min	Typ	Max	Unit
E cycle	t _{cy}	---	1000	---	---	ns
E high level width	t _{wh}	---	450	---	---	ns
E low level width	t _{wl}	---	450	---	---	ns
E rise time	t _r	---	---	---	25	ns
E fall time	t _f	---	---	---	25	ns
Address set-up time	t _{asu}	---	140	---	---	ns

Address hold time	tah	---	10	---	---	ns
Data set-up time	tdsu	---	200	---	---	ns
Data delay time	td	---	---	---	320	ns
Data hold time(write)	tdhw	---	10	---	---	ns
Data hold time(read)	tdhr	---	20	---	---	ns

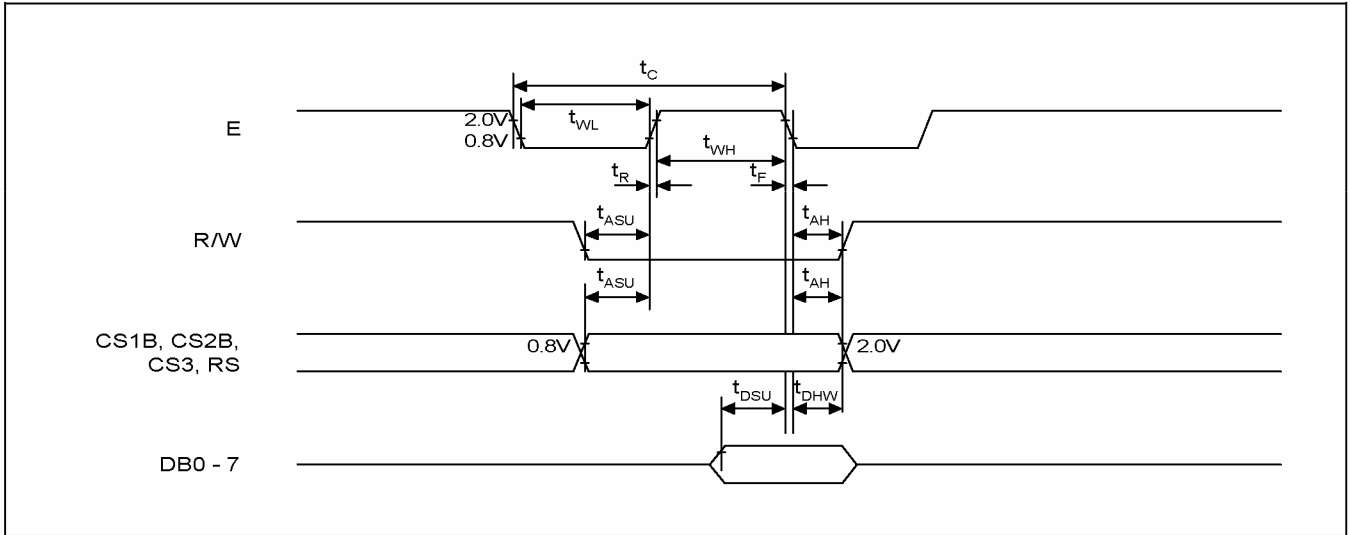


Figure 3. MPU Write Timing

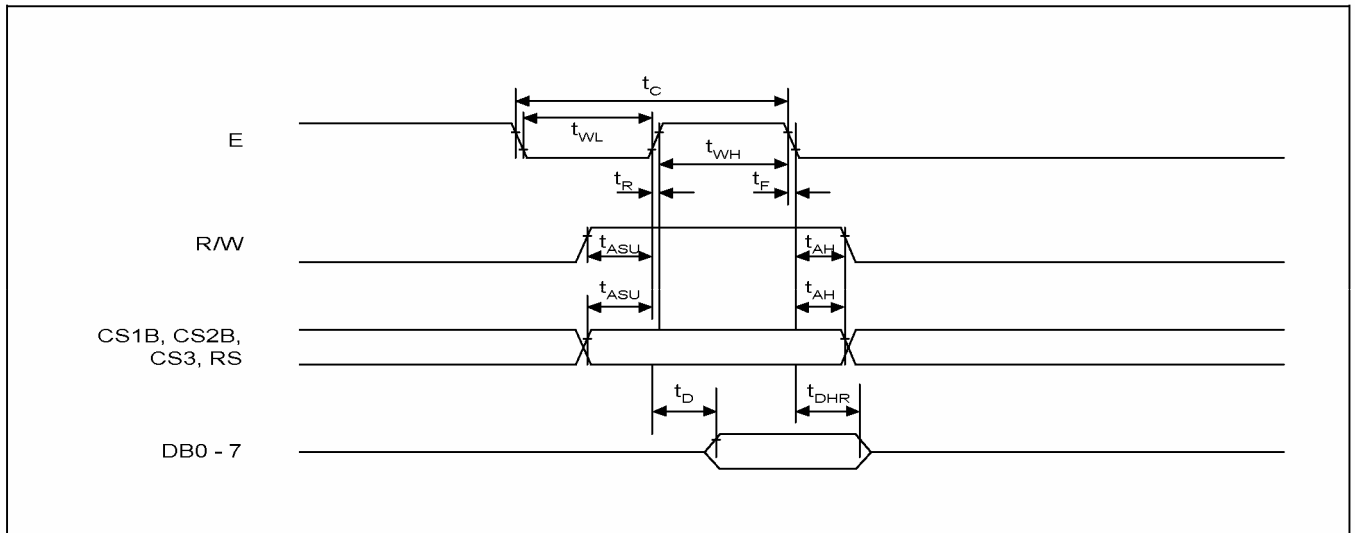


Figure 4. MPU Read Timing

■ OPERATING PRINCIPLES & METHODS

▼ I/O Buffer

Input buffer controls the status between the enable and disable of chip. Unless the CS1 or CS2 is in active mode, input or output of data and instruction do not execute. Therefore internal state is not changed. But RSTB can operate regardless of CS1 and CS2.

▼ Input Register

Input register is provided to interface with MPU which is different operating frequency. Input register stores the data temporarily before writing it into display data RAM.

When CS1 or CS2 is in the active mode, R/W and RS select the input register. The data from MPU is written into input register and then write it into display data RAM. Data is latched when falling of the E signal and written automatically into the display data RAM by internal operation.

▼ Output Register

Output register stores the data temporarily from display data RAM when CS1 or CS2 is in active mode and R/W and RS=H. Stored data in display data RAM is latched in output register. When CS1 or CS2 is in active mode and R/W=H, RS=L, status data (busy check) can be read out.

To read the contents of display data RAM, twice access of read instruction is needed. In first access, data in display data RAM is latched into output register. In second access, MPU can read data which is latched. That is, to read the data in display data RAM, it needs dummy read. But status read does not need dummy read.

RS	R/W	Function
0	0	Instruction
	1	Status read(busy check)
1	0	Data write(from input register to display data RAM)
	1	Data read(from display data RAM to output register)

▼ **Reset**

System reset can be initialized by setting RSTB terminal at low level when turning power on, receiving instruction from MPU. When RSTB becomes low, following procedure is occurred.

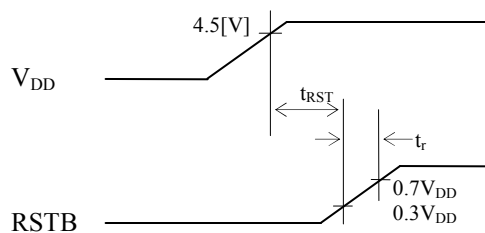
- Display off
- Display start line register become set by 0.(Z-address 0)

While RSTB is low level, no instruction except status read can be accepted. Reset status appears at DB4. After DB4 is low, any instruction can be accepted.

The Conditions of power supply at initial power up are shown in table 1.

Table 1. Power Supply Initial Conditions

Item	Symbol	Min	Typ	Max	Unit
Reset time	t_{RST}	1.0	---	---	us
Rise time	t_r	---	---	200	ns



▼ **Busy Flag**

Busy flag indicates that KS0108B is operating or not operating. When busy flag is high, KS0108B is in internal operating. When busy flag is low, KS0108B can accept the data or instruction.

DB7 indicates busy flag of the KS0108B.



▼ **Display ON/OFF Flip-Flop**

The display on/off flip-flop makes on/off of the liquid crystal display. When flip-flop is reset (logical low), selective voltage or non selective voltage appears on segment output terminals. When flip-flop is set (logical high), non selective voltage appears on segment output terminals regardless of display RAM data.

The display on/off flip-flop can change status by instruction. The display data at all segment disappear while RSTB is low. The status of the flip-flop is output to DB5 by read instruction.

▼ **X page Register**

X page register designates page of the internal display data RAM. It has not count function. An address is set by instruction.

▼ **Y Address Counter**

Y address counter designates address of the internal display data RAM. An address is set by instruction and is increased by 1 automatically by read or write operations of display data.

▼ **Display Data RAM**

Display data RAM stores a display data for liquid crystal display. To express on state of dot matrix of liquid crystal display. write data 1. The other way. off state writes 0.

▼ **Display Start Line Register**

The display start line register indicates address of display data RAM to display top line of liquid crystal display. Bit data (DB<0:5>) of the display start line set instruction is latched in display start line register. It is used for scrolling of the liquid crystal display screen.

▼ **Display Control Instruction**

The display control instructions control the internal state of the KS0108B. Instruction is received from MPU to KS0108B for the display control. The following table shows various instructions.

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display ON/OFF	0	0	0	0	1	1	1	1	1	0/1	Controls the display on or off. Internal status and display RAM data are not affected. 0:OFF, 1:ON
Set Address	0	0	0	1	Y address (0~63)					Sets the Y address in the Y address counter.	
Set Page (X address)	0	0	1	0	1	1	1	Page (0~7)			Sets the X address at the X address register.
Display Start Line	0	0	1	1	Display start line (0~63)					Indicates the display data RAM displayed at the top of the screen.	
Status Read	0	1	B U S Y	0	O N / O F F	R E S E T	0	0	0	0	Read status. BUSY 0 : Ready 1 : In operation ON/OFF 0 : Display ON 1 : Display OFF RESET 0 : Normal 1 : Reset
Write Display Data	1	0	Write Data								Writes data (DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read Display Data	1	1	Read Data								Reads data (DB0:7) from display data RAM to the data bus.

■ DISPLAY DATA RAM ADDRESS MAP

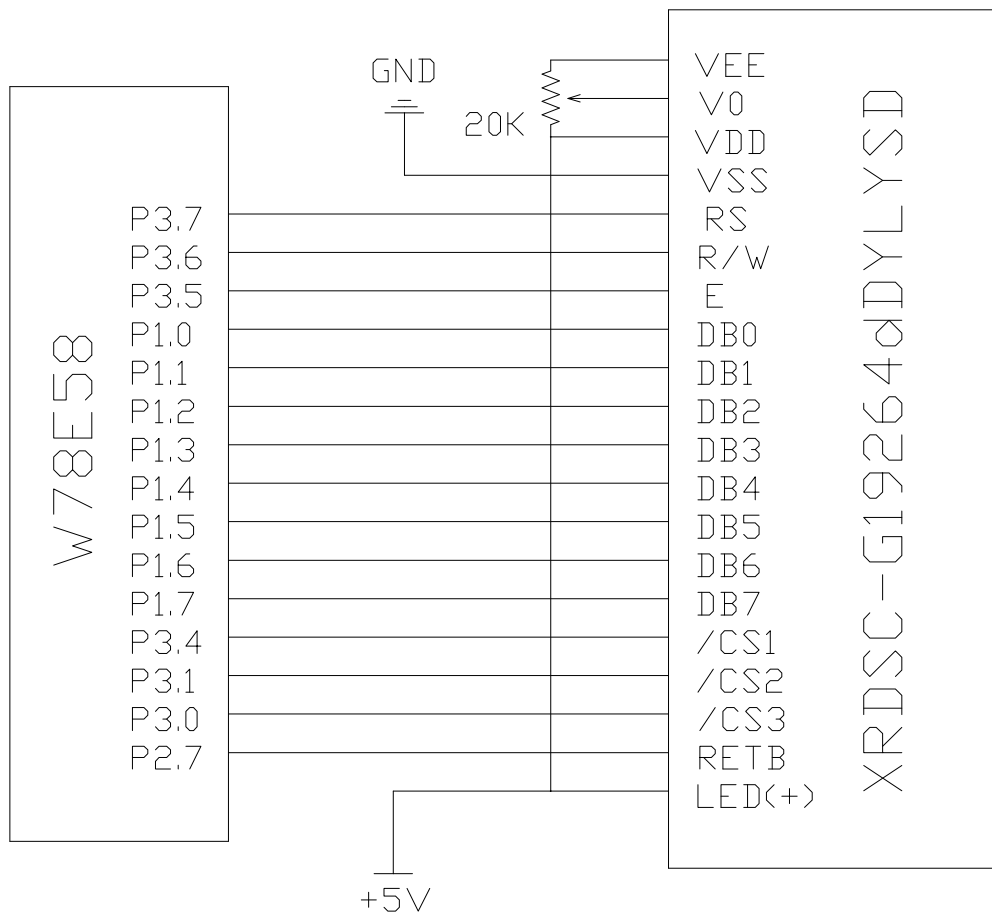
		/CS1=0					/CS2=0					/CS3=0					
Y=		0	1	...	62	63	0	1	...	62	63	0	1	...	62	63	行号
X=0		DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	0
		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
		DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	7
↓		DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	8
		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
		DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	55
X=7		DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	56
		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
		DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	63

■ INTERFACE PIN CONNECTIONS

Pin NO.	Symbol	Level	Description
1	VSS	0V	Ground
2	VDD	5.0V	Supply voltage for logic
3	VO	---	Input voltage for LCD
4	RS	H/L	H : Data signal, L : Instruction signal
5	R/W	H/L	H : Read mode, L : Write mode
6	E	H, H → L	Chip enable signal Write mode: data of is latched at the falling edge of E Read mode: data bus appears the reading data while E at high level
7	DB0	H/L	Data bit 0
8	DB1	H/L	Data bit 1
9	DB2	H/L	Data bit 2
10	DB3	H/L	Data bit 3
11	DB4	H/L	Data bit 4
12	DB5	H/L	Data bit 5
13	DB6	H/L	Data bit 6
14	DB7	H/L	Data bit 7
15	/CS1	L	Chip select signal for KS0108B(1); /CS1=L chip is active
16	RSTB	L	Reset signal
17	/CS2	L	Chip select signal for KS0108B(2); /CS2=L chip is active
18	/CS3	L	Chip select signal for KS0108B(3); /CS3=L chip is active
19	VEE	-10V	Output voltage for LCD
20	LED(+)	5.0V	Back light anode VDD=5..0

■ EXAMPLE

▼ Application Circuit



▼ Programme

```
TRS EQU P3.7
TRW EQU P3.6
TE EQU P3.5
TCS1 EQU P3.4
TCS2 EQU P3.1
TCS3 EQU P3.0
TRES EQU P2.7
    ORG 0000H
    AJMP MAIN
    ORG 0003H
    LJMP INNT
    ORG 0100H
MAIN:MOV SP,#60H
    MOV IE,#81H
    MOV IP,#01H
    MOV TCON,#00H
    LCALL initialize
    LCALL DIS0
    LCALL DIS1
    LCALL DIS2
    LCALL DISP_CHAR
    AJMP MAIN
initialize:SETB TRES
    LCALL DELY1
    CLR TRES
    LCALL DELY1
TT:LCALL RCMD1
    JB ACC.7,TT
    JNB ACC.4,initialize
TT1:LCALL RCMD2
    JB ACC.7,TT1
    JNB ACC.4,initialize
TT2:LCALL RCMD3
    JB ACC.7,TT2
    JNB ACC.4,initialize
    SETB TRES
    LCALL DELY1
TT3:LCALL RCMD1
    JB ACC.7,TT3
    JB ACC.4,initialize
TT4:LCALL RCMD2
    JB ACC.7,TT4
    JB ACC.4,initialize
TT5:LCALL RCMD3
    JB ACC.7,TT5
    JB ACC.4,initialize
    MOV A,#3FH
    LCALL WCMD1
    LCALL WCMD2
    LCALL WCMD3
    MOV A,#0C0H
    LCALL WCMD1
    LCALL WCMD2
    LCALL WCMD3
    MOV A,#0B8H
    LCALL WCMD1
    LCALL WCMD2
    LCALL WCMD3
    MOV A,#040H
    LCALL WCMD1
    LCALL WCMD2
```

```
LCALL WCMD3
RET
```

```
DIS0:MOV A,#0C0H    ;"*"
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV R0,#0B8H
D00:MOV A,R0
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV A,#40H
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV R7,#40H
MOV A,#0AAH
D01:LCALL WDAT1
LCALL WDAT2
LCALL WDAT3
CPL A
DJNZ R7,D01
INC R0
CJNE R0,#0C0H,D00
LCALL DELY2
DIS0E: MOV A,#0C0H    ;"*"
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV R0,#0B8H
D00E:MOV A,R0
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV R7,#40H
MOV R6,#40H
D01E:MOV A,R6
LCALL WCMD1
LCALL RDAT1
LCALL RDAT1
CPL A
MOV 21H,A
MOV A,R6
LCALL WCMD2
LCALL RDAT2
LCALL RDAT2
CPL A
MOV 22H,A
MOV A,R6
LCALL WCMD3
LCALL RDAT3
LCALL RDAT3
CPL A
MOV 23H,A
MOV A,R6
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV A,21H
LCALL WDAT1
MOV A,22H
LCALL WDAT2
```

```
MOV A,23H
LCALL WDAT3
INC R6
DJNZ R7,D01E
INC R0
CJNE R0,#0C0H,D00E
LCALL DELY2
RET
```

```
DIS1:MOV A,#0C0H    ;
      LCALL WCMD1
      LCALL WCMD2
      LCALL WCMD3
      MOV R0,#0B8H
D10:MOV A,R0
      LCALL WCMD1
      LCALL WCMD2
      LCALL WCMD3
      MOV A,#40H
      LCALL WCMD1
      LCALL WCMD2
      LCALL WCMD3
      MOV R7,#40H
      MOV A,#0AAH
D11:LCALL WDAT1
      LCALL WDAT2
      LCALL WDAT3
      DJNZ R7,D11
      INC R0
      CJNE R0,#0C0H,D10
      LCALL DELY2
DIS1E:MOV A,#0C0H    ;
      LCALL WCMD1
      LCALL WCMD2
      LCALL WCMD3
      MOV R0,#0B8H
D10E:MOV A,R0
      LCALL WCMD1
      LCALL WCMD2
      LCALL WCMD3
      MOV R7,#40H
      MOV R6,#40H
D11E:MOV A,R6
      LCALL WCMD1
      LCALL RDAT1
      LCALL RDAT1
      CPL A
      MOV 21H,A
      MOV A,R6
      LCALL WCMD2
      LCALL RDAT2
      LCALL RDAT2
      CPL A
      MOV 22H,A
      MOV A,R6
      LCALL WCMD3
      LCALL RDAT3
      LCALL RDAT3
      CPL A
      MOV 23H,A
      MOV A,R6
      LCALL WCMD1
```

```
LCALL WCMD2
LCALL WCMD3
MOV A,21H
LCALL WDAT1
MOV A,22H
LCALL WDAT2
MOV A,23H
LCALL WDAT3
INC R6
DJNZ R7,D11E
INC R0
CJNE R0,#0C0H,D10E
LCALL DELY2
RET
```

```
DIS2:MOV A,#0C0H    ;
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV R0,#0B8H
D20:MOV A,R0
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV A,#40H
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV R7,#20H
D21:MOV A,#0FFH
LCALL WDAT1
LCALL WDAT2
LCALL WDAT3
MOV A,#00H
LCALL WDAT1
LCALL WDAT2
LCALL WDAT3
DJNZ R7,D21
INC R0
CJNE R0,#0C0H,D20
LCALL DELY2
DIS2E: MOV A,#0C0H    ;
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV R0,#0B8H
D20E:MOV A,R0
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV R7,#40H
MOV R6,#40H
D21E:MOV A,R6
LCALL WCMD1
LCALL RDAT1
LCALL RDAT1
CPL A
MOV 21H,A
MOV A,R6
LCALL WCMD2
LCALL RDAT2
LCALL RDAT2
CPL A
```

```
MOV 22H,A
MOV A,R6
LCALL WCMD1
LCALL RDAT1
LCALL RDAT1
CPL A
MOV 23H,A
MOV A,R6
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
MOV A,21H
LCALL WDAT1
MOV A,22H
LCALL WDAT2
MOV A,23H
LCALL WDAT3
INC R6
DJNZ R7,D21E
INC R0
CJNE R0,#0C0H,D20E
LCALL DELY2
RET
```

```
DISP_CHAR:MOV DPTR,#M3
```

```
    MOV A,#0C0H
    LCALL WCMD1
    LCALL WCMD2
    LCALL WCMD3
    MOV R0,#0B8H
C00:MOV A,R0
    LCALL WCMD1
    LCALL WCMD2
    LCALL WCMD3
    MOV A,#40H
    LCALL WCMD1
    MOV R7,#40H
C01:MOV A,#00H
    MOVC A,@A+DPTR
    LCALL WDAT1
    INC DPTR
    DJNZ R7,C01
    MOV A,#40H
    LCALL WCMD2
    MOV R7,#40H
C02:MOV A,#00H
    MOVC A,@A+DPTR
    LCALL WDAT2
    INC DPTR
    DJNZ R7,C02
    MOV A,#40H
    LCALL WCMD3
    MOV R7,#40H
C03:MOV A,#00H
    MOVC A,@A+DPTR
    LCALL WDAT3
    INC DPTR
    DJNZ R7,C03
    INC R0
    CJNE R0,#0C0H,C00
    LCALL DELY2
    MOV R7,#0C0H
    MOV R0,#08H
```

```
FF:MOV A,R7
ADD A,#08H
MOV R7,A
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
LCALL DELY3
DJNZ R0,FF
MOV A,#0C0H
LCALL WCMD1
LCALL WCMD2
LCALL WCMD3
LCALL DELY3
RET
```

```
;  
WCMD1:PUSH ACC  
CLR TE  
CLR TCS1  
SETB TCS2  
SETB TCS3  
CLR TRS  
SETB TRW  
BUSY1:MOV P1,#0FFH  
SETB TE  
MOV A,P1  
CLR TE  
JB ACC.7,BUSY1  
POP ACC  
CLR TRW  
MOV P1,A  
SETB TE  
CLR TE  
SETB TCS1  
SETB TCS2  
SETB TCS3  
RET
```

```
;  
WCMD2:PUSH ACC  
CLR TE  
SETB TCS1  
CLR TCS2  
SETB TCS3  
CLR TRS  
SETB TRW  
BUSY2:MOV P1,#0FFH  
SETB TE  
MOV A,P1  
CLR TE  
JB ACC.7,BUSY2  
POP ACC  
CLR TRW  
MOV P1,A  
SETB TE  
CLR TE  
SETB TCS1  
SETB TCS2  
SETB TCS3  
RET
```

```
;  
WCMD3:PUSH ACC  
CLR TE  
SETB TCS1
```

```
SETB TCS2
CLR TCS3
CLR TRS
SETB TRW
BUSY3:MOV P1,#0FFH
SETB TE
MOV A,P1
CLR TE
JB ACC.7,BUSY3
POP ACC
CLR TRW
MOV P1,A
SETB TE
CLR TE
SETB TCS1
SETB TCS2
SETB TCS3
RET
```

```
;
-----
WDAT1:PUSH ACC
CLR TE
CLR TCS1
SETB TCS2
SETB TCS3
CLR TRS
SETB TRW
BUSY4:MOV P1,#0FFH
SETB TE
MOV A,P1
CLR TE
JB ACC.7,BUSY4
POP ACC
SETB TRS
CLR TRW
MOV P1,A
SETB TE
CLR TE
SETB TCS1
SETB TCS2
SETB TCS3
RET
```

```
;
-----
WDAT2:PUSH ACC
CLR TE
SETB TCS1
CLR TCS2
SETB TCS3
CLR TRS
SETB TRW
BUSY5:MOV P1,#0FFH
SETB TE
MOV A,P1
CLR TE
JB ACC.7,BUSY5
POP ACC
SETB TRS
CLR TRW
MOV P1,A
SETB TE
CLR TE
SETB TCS1
SETB TCS2
SETB TCS3
```


RET

;

WDAT3:PUSH ACC

CLR TE

SETB TCS1

SETB TCS2

CLR TCS3

CLR TRS

SETB TRW

BUSY6:MOV P1,#0FFH

SETB TE

MOV A,P1

CLR TE

JB ACC.7,BUSY6

POP ACC

SETB TRS

CLR TRW

MOV P1,A

SETB TE

CLR TE

SETB TCS1

SETB TCS2

SETB TCS3

RET

;

RCMD1:CLR TE

CLR TCS1

SETB TCS2

SETB TCS3

CLR TRS

SETB TRW

MOV P1,#0FFH

SETB TE

MOV A,P1

CLR TE

SETB TCS1

RET

;

RCMD2:CLR TE

SETB TCS1

CLR TCS2

SETB TCS3

CLR TRS

SETB TRW

MOV P1,#0FFH

SETB TE

MOV A,P1

CLR TE

SETB TCS2

RET

;

RCMD3:CLR TE

SETB TCS1

SETB TCS2

CLR TCS3

CLR TRS

SETB TRW

MOV P1,#0FFH

SETB TE

MOV A,P1

CLR TE

SETB TCS3

RET

;

```
RDAT1:CLR TE
  CLR TCS1
  SETB TCS2
  SETB TCS3
  CLR TRS
  SETB TRW
BUSY7:MOV P1,#0FFH
  SETB TE
  MOV A,P1
  CLR TE
  JB ACC.7,BUSY7
  SETB TRS
  SETB TRW
  SETB TE
  MOV A,P1
  CLR TE
  SETB TCS1
  SETB TCS2
  SETB TCS3
  RET
```

;

```
RDAT2:CLR TE
  SETB TCS1
  CLR TCS2
  SETB TCS3
  CLR TRS
  SETB TRW
BUSY8:MOV P1,#0FFH
  SETB TE
  MOV A,P1
  CLR TE
  JB ACC.7,BUSY8
  SETB TRS
  SETB TRW
  SETB TE
  MOV A,P1
  CLR TE
  SETB TCS1
  SETB TCS2
  SETB TCS3
  RET
```

;

```
RDAT3:CLR TE
  SETB TCS1
  SETB TCS2
  CLR TCS3
  CLR TRS
  SETB TRW
BUSY9:MOV P1,#0FFH
  SETB TE
  MOV A,P1
  CLR TE
  JB ACC.7,BUSY9
  SETB TRS
  SETB TRW
  SETB TE
  MOV A,P1
  CLR TE
  SETB TCS1
  SETB TCS2
  SETB TCS3
```

```

RET
;
INNT:PUSH ACC
MOV A,R6
PUSH ACC
MOV A,R7
PUSH ACC
INNT1:SETB P3.3
SETB P3.3
LCALL DELY
MOV C,P3.3
MOV C,P3.3
JC INNT1
POP ACC
MOV R7,A
POP ACC
MOV R6,A
POP ACC
RETI
;
DELY:MOV R1,#01H
J0: MOV R2,#0FH
J1: DJNZ R2,J1
    DJNZ R1,J0
    RET

DELY1:MOV R1,#0FFH
J010:MOV R2,#0FFH
J011:DJNZ R2,J011
    DJNZ R1,J010
    RET
;
DELY2:MOV R3,#07H
J12: MOV R1,#0FFH
J10: MOV R2,#0FFH
J11: DJNZ R2,J11
    DJNZ R1,J10
    DJNZ R3,J12
    RET
DELY3:MOV R3,#06H
J22: MOV R1,#0FFH
J20: MOV R2,#0FFH
J21: DJNZ R2,J21
    DJNZ R1,J20
    DJNZ R3,J22
    RET

M3:
;-- 调入了一幅图像: E:\XYD\asm\19264\19264a.bmp --
;-- 宽度x高度=192x64 --
DB 0FFH,001H,001H,0E1H,019H,0E1H,001H,001H,009H,0F9H,049H,049H,049H,0B1H,001H,0E1H
DB 011H,009H,009H,009H,019H,001H,009H,0F9H,009H,009H,011H,0E1H,001H,009H,0F9H,089H
DB 089H,0C9H,019H,001H,009H,0F9H,089H,089H,0C9H,019H,001H,0E1H,011H,009H,009H,019H
DB 001H,001H,009H,0F9H,089H,081H,089H,0F9H,009H,001H,009H,009H,0F9H,009H,009H,001H
DB 001H,009H,009H,0F9H,009H,009H,001H,009H,0F9H,0C9H,0A1H,019H,009H,001H,009H,0F9H
DB 009H,001H,001H,001H,009H,0F9H,079H,081H,079H,0F9H,009H,009H,0F9H,039H,0C1H
DB 009H,0F9H,009H,0E1H,011H,009H,009H,011H,0E1H,001H,009H,0F9H,089H,089H,089H,071H
DB 001H,0E1H,011H,009H,009H,011H,0E1H,001H,009H,0F9H,049H,0C9H,049H,031H,001H,001H
DB 031H,049H,089H,089H,019H,001H,001H,019H,009H,0F9H,009H,019H,001H,009H,0F9H,009H
DB 001H,009H,0F9H,009H,009H,039H,0C9H,001H,0C9H,039H,009H,009H,0F9H,001H,0F9H,001H
DB 0F9H,009H,009H,039H,0C1H,0C9H,039H,009H,001H,009H,019H,069H,081H,069H,019H,009H
DB 001H,019H,009H,0C9H,039H,009H,001H,001H,081H,041H,041H,041H,081H,001H,001H,0FFH

```

DB 0FFH,048H,0CEH,009H,001H,009H,00EH,008H,008H,00FH,008H,008H,008H,007H,000H,003H
 DB 004H,008H,008H,048H,0C4H,000H,008H,00FH,008H,008H,004H,003H,000H,008H,00FH,088H
 DB 048H,049H,0CCH,000H,008H,00FH,008H,000H,001H,000H,000H,043H,0C4H,008H,009H,007H
 DB 001H,000H,008H,00FH,008H,040H,008H,00FH,008H,000H,008H,008H,00FH,008H,008H,000H
 DB 058H,0D0H,010H,00FH,000H,000H,000H,008H,04FH,048H,0C1H,00EH,008H,000H,008H,00FH
 DB 008H,008H,008H,00CH,000H,008H,00FH,000H,00FH,000H,00FH,008H,008H,00FH,008H,001H
 DB 006H,00FH,000H,003H,004H,008H,008H,004H,003H,000H,008H,00FH,008H,000H,000H,000H
 DB 000H,003H,004H,00AH,00AH,01CH,013H,000H,008H,00FH,008H,000H,003H,00CH,008H,000H
 DB 00CH,088H,008H,008H,007H,000H,000H,000H,008H,00FH,008H,000H,000H,000H,007H,008H
 DB 008H,008H,007H,000H,000H,000H,003H,00CH,003H,000H,000H,000H,001H,00FH,000H,00FH
 DB 001H,000H,008H,00EH,009H,001H,00EH,008H,000H,000H,000H,008H,00FH,008H,000H,000H
 DB 000H,008H,08EH,0C9H,008H,00CH,000H,000H,084H,04AH,049H,049H,08FH,008H,000H,0FFH
 DB 0FFH,000H,07FH,042H,042H,042H,03CH,000H,000H,03CH,042H,042H,042H,026H,000H,000H
 DB 03CH,042H,042H,042H,07FH,040H,000H,03CH,04AH,04AH,04AH,02CH,000H,002H,042H,07FH
 DB 042H,042H,000H,000H,000H,0ECH,052H,052H,04EH,082H,000H,040H,07FH,044H,002H,002H
 DB 07CH,040H,000H,042H,042H,07EH,040H,040H,000H,000H,0ECH,052H,052H,04EH,082H,000H
 DB 040H,07FH,050H,01AH,066H,042H,000H,000H,040H,040H,07FH,040H,040H,000H,042H,07EH
 DB 002H,07EH,002H,07CH,040H,042H,07EH,044H,002H,002H,07CH,040H,000H,03CH,042H,042H
 DB 042H,03CH,000H,002H,0FEH,042H,042H,042H,03CH,000H,000H,03CH,042H,042H,042H,0FEH
 DB 000H,000H,042H,07EH,044H,042H,002H,000H,000H,064H,04AH,04AH,052H,026H,000H,002H
 DB 002H,03FH,042H,042H,000H,000H,002H,03EH,040H,040H,042H,07EH,040H,002H,00EH,032H
 DB 040H,032H,00EH,002H,002H,01EH,060H,01EH,060H,01EH,002H,042H,066H,058H,01AH,066H
 DB 042H,000H,002H,006H,09AH,060H,01AH,006H,002H,000H,046H,062H,05AH,046H,062H,000H
 DB 000H,000H,040H,07FH,040H,000H,000H,000H,061H,050H,048H,044H,043H,000H,000H,0FFH
 DB 0FFH,000H,010H,008H,048H,048H,0B0H,000H,000H,0C0H,020H,010H,0F8H,000H,000H,000H
 DB 0F8H,048H,048H,048H,088H,000H,000H,0E0H,090H,048H,048H,098H,000H,000H,018H,008H
 DB 088H,078H,008H,000H,000H,030H,0C9H,089H,0C9H,030H,000H,000H,0F0H,008H,008H,088H
 DB 0F0H,000H,000H,0F0H,008H,008H,008H,0F0H,000H,080H,080H,081H,081H,081H,080H,000H
 DB 080H,080H,080H,0F0H,080H,080H,080H,040H,040H,040H,040H,040H,040H,000H,000H,018H
 DB 060H,080H,000H,000H,000H,000H,000H,0FEH,000H,000H,000H,000H,004H,002H,004H
 DB 008H,008H,004H,001H,001H,005H,000H,000H,000H,000H,000H,000H,000H,000H,001H,001H
 DB 001H,000H,000H,000H,000H,000H,000H,000H,000H,030H,008H,008H,088H,070H,000H,000H
 DB 000H,080H,060H,018H,004H,000H,000H,080H,040H,020H,010H,008H,000H,000H,008H,010H
 DB 020H,040H,080H,000H,000H,000H,000H,080H,07CH,004H,000H,000H,004H,07CH,080H,000H
 DB 000H,000H,001H,001H,001H,0FCH,004H,004H,000H,000H,004H,004H,0FCH,000H,000H,000H
 DB 040H,040H,040H,040H,040H,040H,040H,040H,040H,060H,040H,000H,000H,000H,0FFH
 DB 0FFH,000H,004H,008H,008H,008H,007H,000H,001H,002H,002H,00AH,00FH,088H,000H,000H
 DB 006H,008H,008H,008H,007H,000H,000H,007H,008H,008H,088H,007H,000H,000H,000H,080H
 DB 08FH,080H,080H,080H,080H,087H,088H,088H,088H,007H,000H,000H,08CH,089H,089H,084H
 DB 083H,080H,080H,087H,0C8H,088H,008H,007H,000H,000H,000H,000H,040H,080H,000H,000H
 DB 000H,000H,000H,007H,000H,000H,000H,002H,002H,002H,0C2H,002H,002H,000H,000H,000H
 DB 000H,003H,00CH,010H,000H,000H,080H,000H,03FH,0C0H,000H,000H,000H,000H,000H,000H
 DB 000H,000H,000H,0C0H,000H,000H,000H,000H,000H,000H,020H,02CH,01CH,000H,000H,000H
 DB 000H,0C0H,00CH,00CH,000H,000H,000H,000H,000H,000H,080H,08BH,080H,080H,080H,0D8H
 DB 086H,081H,080H,080H,080H,000H,000H,000H,001H,002H,004H,008H,000H,0C0H,008H,044H
 DB 082H,001H,000H,000H,000H,000H,000H,080H,05FH,010H,000H,080H,010H,01FH,000H,000H
 DB 000H,080H,080H,080H,080H,01FH,090H,0D0H,080H,080H,090H,010H,01FH,000H,000H,000H
 DB 0C0H,080H,080H,080H,080H,080H,080H,080H,000H,000H,000H,000H,000H,000H,000H,0FFH
 DB 0FFH,000H,000H,000H,000H,000H,001H,001H,001H,001H,001H,001H,001H,001H,001H,001H,001H,081H,000H
 DB 000H,000H,001H,011H,011H,011H,011H,011H,011H,019H,011H,081H,000H,000H,000H,0FFH
 DB 040H,020H,01FH,000H,000H,01FH,020H,020H,0FFH,000H,000H,000H,000H,000H,008H,008H,0F8H
 DB 00FH,008H,008H,008H,0F8H,000H,000H,000H,002H,002H,082H,062H,01AH,002H,003H,00AH
 DB 012H,062H,082H,002H,000H,010H,010H,010H,008H,008H,0FFH,008H,004H,004H,004H,002H
 DB 0C2H,000H,000H,000H,080H,060H,01FH,000H,000H,00FH,030H,0C0H,000H,000H,000H,000H
 DB 002H,082H,042H,03FH,002H,002H,002H,0FEH,000H,000H,080H,000H,008H,008H,008H,008H
 DB 008H,0FFH,008H,008H,008H,008H,00CH,008H,000H,000H,018H,00AH,0EAH,0AAH,0AAH,0ABH
 DB 0AAH,0AAH,0EAH,00AH,018H,000H,001H,0F5H,015H,0D5H,015H,0F5H,001H,01FH,061H,081H
 DB 001H,081H,000H,044H,044H,025H,095H,0ADH,0A7H,0A5H,0A5H,0ADH,095H,024H,024H,000H
 DB 0A0H,07FH,02AH,0AAH,020H,08AH,0AAH,0FFH,0AAH,0AAH,0AFH,082H,000H,008H,004H,0FFH
 DB 000H,008H,088H,07FH,008H,008H,0F8H,000H,000H,000H,000H,000H,000H,000H,000H,0FFH
 DB 0FFH,000H,000H,000H,0F0H,091H,051H,031H,001H,021H,021H,0F9H,021H,021H,021H,001H
 DB 000H,001H,091H,0A1H,049H,011H,041H,041H,0F9H,021H,021H,011H,091H,000H,040H,043H
 DB 0F9H,041H,0F1H,091H,091H,0F1H,001H,0E1H,003H,0F8H,000H,092H,092H,0F2H,092H,013H

DB 082H,07AH,022H,022H,0E3H,002H,002H,000H,020H,021H,0F8H,020H,0A0H,040H,020H,018H
 DB 020H,040H,081H,080H,000H,000H,070H,050H,070H,000H,001H,002H,002H,002H,002H,002H
 DB 003H,000H,002H,0C1H,030H,000H,000H,000H,000H,000H,000H,001H,002H,000H,002H
 DB 001H,0C0H,030H,0C0H,030H,000H,000H,001H,002H,002H,003H,000H,000H,000H,0E0H
 DB 010H,013H,0F8H,020H,070H,000H,000H,000H,000H,000H,002H,002H,002H,0E3H,012H,012H
 DB 012H,023H,002H,002H,002H,000H,002H,002H,082H,042H,022H,012H,002H,002H,050H,030H
 DB 011H,003H,000H,0E2H,012H,0E2H,002H,002H,082H,042H,022H,012H,002H,002H,000H
 DB 001H,0E1H,011H,011H,0E1H,000H,000H,083H,040H,020H,010H,000H,000H,000H,030H,033H
 DB 002H,0C2H,023H,012H,012H,012H,023H,0F2H,002H,000H,000H,000H,000H,000H,0FFH
 DB 0FFH,080H,080H,080H,0FFH,088H,091H,08EH,081H,0FDH,0C1H,0FFH,0C1H,0C1H,0FDH,081H
 DB 080H,0C4H,0C4H,0A7H,094H,08CH,084H,0FEH,08DH,095H,0A5H,0C5H,0C5H,080H,0A4H,0C2H
 DB 0BFH,0C1H,0A2H,09FH,0C2H,0BEH,080H,08FH,0C0H,0FFH,080H,090H,090H,08FH,0C8H,0C9H
 DB 0A0H,090H,08CH,083H,08CH,0B0H,0C0H,080H,084H,0C2H,0FFH,081H,080H,0FDH,0A5H,0A5H
 DB 0A5H,0FDH,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H
 DB 080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H
 DB 080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,080H,0B8H
 DB 091H,0A1H,0FFH,0A2H,09CH,080H,080H,080H,080H,080H,080H,099H,095H,095H,08FH,089H
 DB 091H,091H,090H,088H,080H,080H,080H,080H,082H,082H,0A2H,0BFH,0A2H,082H,082H
 DB 080H,080H,080H,090H,089H,084H,082H,081H,09CH,0A2H,09CH,080H,09CH,0A2H,09CH,080H
 DB 080H,0A0H,091H,089H,084H,082H,081H,09CH,0A2H,0A2H,09CH,080H,080H,080H,080H,080H
 DB 080H,08FH,090H,0A0H,0A0H,0A0H,090H,088H,080H,080H,080H,080H,080H,080H,0FFH
 END

RELIABILITY

Content of Reliability Test

Environmental Test				
No.	Test Item	Content of Test	Test Condition	Applicable Standard
1	High temperature storage	Endurance test applying the high storage temperature for a long time.	80 °C 200 hrs	-----
2	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-30 °C 200 hrs	-----
3	High temperature operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70 °C 200 hrs	-----
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	-30 °C 200 hrs	-----
5	High temperature / Humidity storage	Endurance test applying the high temperature and high humidity storage for a long time.	80 °C , 90 %RH 96 hrs	MIL-202E-103B JIS-C5023
6	High temperature / Humidity operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	70 °C , 90 %RH 96 hrs	MIL-202E-103B JIS-C5023
7	Temperature cycle	Endurance test applying the low and high temperature cycle. $\begin{matrix} -20^{\circ}\text{C} & \rightleftharpoons & 25^{\circ}\text{C} & \rightleftharpoons & 70^{\circ}\text{C} \\ 30\text{min} & \longleftarrow & 5\text{min.} & \longrightarrow & 30\text{min} \\ & \longleftarrow & & \longrightarrow & \\ & & 1 \text{ cycle} & & \end{matrix}$	-20°C / 70°C 10 cycles	-----
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz → 1.5mmp-p 22~500Hz → 1.5G Total 0.5hrs	MIL-202E-201A JIS-C5025 JIS-C7022-A-10
9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G half sign wave 11 msdc 3 times of each direction	MIL-202E-213B
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115 mbar 40 hrs	MIL-202E-105C
Others				
11	Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V , RS=1.5 kΩ CS=100 pF 1 time	MIL-883B-3015.1

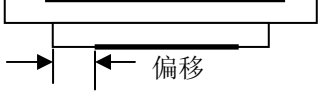
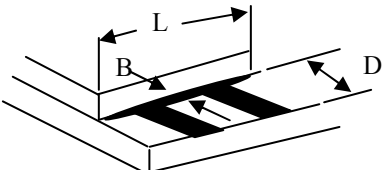
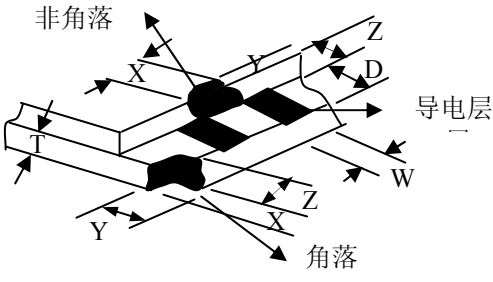
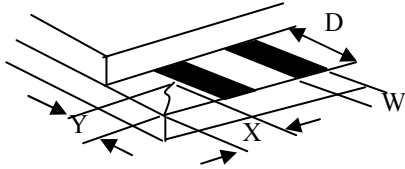
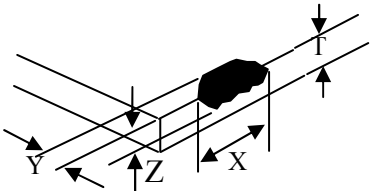
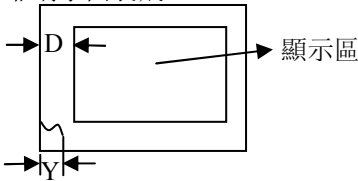
*** Supply voltage for logic system = 5V. Supply voltage for LCD system = Operating voltage at 25°C.

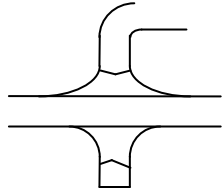
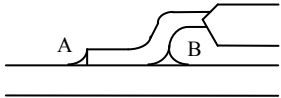
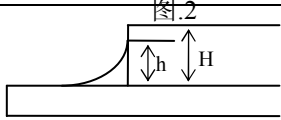
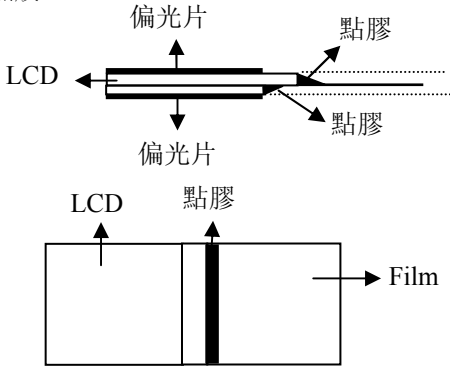
▼ Failure Judgement Criterion

Criterion Item	Test Item No.											Failure Judgment Criterion
	1	2	3	4	5	6	7	8	9	10	11	
Basic specification												Out of the Basic Specification
Electrical characteristic												Out of the DC and AC Characterstic
Mechanical characterstic												Out of the Mechanical Specification Color change : Out of Limit Apperance Specification
Optical characterstic												Out of the Apperance Standard

■ INSPECTION CRITERIA

检 验 项 目	缺点判定	检 验 标 准																								
1、确认： 料号是否与材料相符。	主要缺点	以BOM为准。																								
2、尺寸检查： (1)外型尺寸。 (2)锡点之位置。	主要缺点 主要缺点	以尺寸工程图面为准。 以尺寸工程图面为准。																								
3、外观：																										
3.1、LCD外观： (1) 确认：LCD之颜色与制令相符 (2) 黑点、红点、白点、异物(含偏光片)	主要缺点 次要缺点																									
A· 圆型暇疵：		<table border="1"> <thead> <tr> <th>暇疵限制</th> <th colspan="2">允收标准</th> </tr> <tr> <th>直径(Φ)mm</th> <th>a</th> <th>b</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.13$</td> <td colspan="2">允收(须分散)</td> </tr> <tr> <td>$0.13 < \Phi \leq 1.05$</td> <td>2</td> <td>2</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.25$</td> <td>1</td> <td>2</td> </tr> <tr> <td>$0.25 < \Phi$</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>黑点不可两点集中于同一区域, 须分散(5mm以上)</p>	暇疵限制	允收标准		直径(Φ)mm	a	b	$\Phi \leq 0.13$	允收(须分散)		$0.13 < \Phi \leq 1.05$	2	2	$0.15 < \Phi \leq 0.25$	1	2	$0.25 < \Phi$	0	1						
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(3)LCD与偏光片刮伤：	次要缺点	<table border="1"> <thead> <tr> <th>W</th> <th>L</th> <th>容许刮痕数</th> </tr> </thead> <tbody> <tr> <td>$W \leq 0.02$</td> <td>-----</td> <td>不计</td> </tr> <tr> <td></td> <td>-</td> <td></td> </tr> <tr> <td>$0.02 \leq W \leq 0.05$</td> <td>$L \leq 3.0$</td> <td>2</td> </tr> <tr> <td>$W > 0.05$</td> <td>-----</td> <td>0</td> </tr> </tbody> </table> <p>距LCM30cm, 以目视可见为准。</p>	W	L	容许刮痕数	$W \leq 0.02$	-----	不计		-		$0.02 \leq W \leq 0.05$	$L \leq 3.0$	2	$W > 0.05$	-----	0									
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(4)LCD刮背：	次要缺点	以限度样本判定。																								
(5)LCD彩虹现象、颜色不均(泛蓝、泛红现象)：	次要缺点	依照LCD色差限度Sample为准。																								
(6)LCD牛顿环：	次要缺点	不可影响电性功能, 且以限度样本判定且面积不得大于总面积的10%。																								
(7)LCD水痕、水纹现象：	次要缺点	以30cm目测。 A. 可擦拭干净者, 列为良品。 B. 不可擦拭干净者, 列为不良品。																								
3.2、偏光片外观检验：																										

<p>(1) 偏光片贴歪、偏移:</p> 	次要缺点	超出玻璃边0.2cm								
<p>(2) 偏光片贴反、漏贴</p>	主要缺点	不可有贴反及漏贴现象								
<p>(3) 偏光片离起</p>	主要缺点	不可有离起现象								
<p>(4) 偏光片(LCD)脏污:</p>	次要缺点	以30cm目测。 A. 可擦拭干净者, 列为良品。 B. 不可擦拭干净者, 列为不良品。								
<p>(5) 偏光片气泡</p>	主要缺点	<table border="1" data-bbox="874 533 1461 678"> <thead> <tr> <th>尺寸</th> <th>允收个数</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2\text{mm}$</td> <td>不计</td> </tr> <tr> <td>$0.2\text{mm} < \Phi \leq 0.8\text{mm}$</td> <td>3</td> </tr> <tr> <td>$0.8\text{mm} < \Phi$</td> <td>0</td> </tr> </tbody> </table> 以目视可见为准。	尺寸	允收个数	$\Phi \leq 0.2\text{mm}$	不计	$0.2\text{mm} < \Phi \leq 0.8\text{mm}$	3	$0.8\text{mm} < \Phi$	0
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<p>3.3、LCD切裂不良:</p> 	次要缺点	1. $B \leq 1/3D$ 则L不计。 2. $B > 1/3D$, 不合格。								
<p>3.4、LCD破损:</p> <p>非角落</p>  <p>导电层</p> <p>角落</p>	主要缺点	1. 不可受损在导电层。 2. $Y > 1/2D$ 时, 不合格。 3. $X > 1/8$ 边长时或3mm时, 不合格。 4. $Z > T$ 时, 不合格。								
<p>3.5、LCD裂痕:</p> 	主要缺点	1. $Y > 1/2D$ 时, 不合格。 2. 裂痕触及导电线时, 不合格。								
<p>3.6、LCD非端子面破损:</p> 	主要缺点	1. $Y > D$ 时, 不合格。 2. $X > 1/8$ 边长时, 不合格。 3. $Z > T$ 时, 不合格。								
<p>3.7 LCD、非端子面裂痕:</p> 	主要缺点	$Y > 2/3D$ 或裂至显示区时, 不合格。								
<p>4、模块电性功能检验:</p>		以本公司模块测试机及测具检查。								
<p>(1). 不显示:</p>	主要缺点	不合格。								
<p>(2). 断线(缺Com、Seg):</p>	主要缺点	不合格。								

(3). 显示深浅(淡白、淡黑) :	主要缺点	1. 以最佳对比度测试判定。 2. 淡黑或淡白仅出现在一画面。 3. 淡黑或淡白线仅可有二条线以下(含), 宽为0.5mm, 相隔至少1cm以上。
(4) 显示乱码:	主要缺点	不合格。
(5) VOP不符:	主要缺点	在最佳对比度下, 电压超出VOP指标±0.3范围时, 不合格。
(6) 电压、电流不符:	主要缺点	电压或电流值超出LCM范围时, 不合格。
5、模块外观检查:		以目视检查为准。
(1). 确认零件部品正确性:	主要缺点	以BOM 及成品图面为准。
(2). 图案分离	主要缺点	无玻璃图案分离和漂动
(3). 焊接缺陷	主要缺点	无漏焊, 无虚焊, 无锡尖、无锡渣、无锡球
焊接量 (1.引接处部分)	次要缺点	a. 线路板焊接侧 焊接引接处周围要形成“凸焊”, 焊接不应盖住引接头太多。 b. 元件侧 (就过孔线路板而言焊接要达到线路板元件侧)  图.1
焊接量 (2.贴封元件)	次要缺点	无论引接“焊边”(A) 或“接合处”(B) 都填满焊锡, 焊脚要完全焊接。 
焊接量 (3. Chips)	次要缺点	(3/2) $H \geq h \geq (1/2) H$ in Fig.3.  图.2 Fig.3
. PCB刮伤不可跨相邻线路且露铜:	次要缺点	允许一处跳线<5mm、刮伤、撞伤允许一处、弯脚须商切与PCB之PAD接触。
(4) 零件破损:	主要缺点	IC零件、电容、电阻、晶体管等不可有破损等现象。
(5) 锁角:	次要缺点	1. 目视检查各部锁角是否正确锁上。 2. 不可悬空。 3. 锁角方向是否正确。 4. 且角度约30-45°。
(6) 喷墨印码:	主要缺点	目视检查是否有漏印, 字体模糊等现象。
(7) 点胶: 	次要缺点	1. 以LCM工程图为准。 2. 不可溢至可视区或溢至上下偏光片。 3. 点胶需均匀, 不可一端有, 一端无。
(8) 贴胶带:	次要缺点	以LCM工程图为准。
6、背光组件检查:		以点灯方式与目视检查为主。
(1) 点亮时各亮点不亮或闪烁:	主要缺点	不合格。
(2) 亮点不均:	主要缺点	不合格。
(3) 背光颜色错误:	主要缺点	不合格。
(4) 背光点亮时出现污点, 毛屑及异物等点, 线状规格:	次要缺点	依点, 线, 毛等外观判定标准为准。
(5) 电压、电流不符:	主要缺点	电压或电流值超出BOM范围时, 不合格。
7、触控式面板(Touch Panel):		使用测试治具或三用电表连行量测。
7.1、尺寸:	主要缺点	依BOM及成品图为准。

7.2、材质颜色:	主要缺点	依BOM及成品图为准,需与规格相符且外观不可渗入其它颜色,造成色差。												
7.3、印刷:	次要缺点	文字图形及颗粒大小需均匀,线条不可粗细不均及脱漆现象。												
7.4、T/P外观:														
(1)点状异物:	次要缺点	<table border="1"> <thead> <tr> <th>尺寸</th> <th>允收个数</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2\text{mm}$</td> <td>不计</td> </tr> <tr> <td>$0.2\text{mm} < \Phi \leq 0.3\text{mm}$</td> <td>5</td> </tr> <tr> <td>$0.3\text{mm} < \Phi$</td> <td>0</td> </tr> </tbody> </table> <p>以目视可见为准。</p>	尺寸	允收个数	$\Phi \leq 0.2\text{mm}$	不计	$0.2\text{mm} < \Phi \leq 0.3\text{mm}$	5	$0.3\text{mm} < \Phi$	0				
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(3)气泡:	次要缺点	<ol style="list-style-type: none"> 以目视可见为准。 气泡 $\Phi \leq 0.3\text{mm}$, 则允许1个。 												
(4)毛屑:	次要缺点	<table border="1"> <thead> <tr> <th>W</th> <th>L</th> <th>容许个数</th> </tr> </thead> <tbody> <tr> <td>$W \leq 0.05\text{mm}$</td> <td>$3\text{mm} < L$</td> <td>不计</td> </tr> <tr> <td>$0.05\text{mm} \leq W \leq 0.1\text{mm}$</td> <td>$3\text{mm} < L$</td> <td>1</td> </tr> <tr> <td>$0.1\text{mm} \leq W$</td> <td>$3\text{mm} < L$</td> <td>0</td> </tr> </tbody> </table> <p>以目视可见为准。</p>	W	L	容许个数	$W \leq 0.05\text{mm}$	$3\text{mm} < L$	不计	$0.05\text{mm} \leq W \leq 0.1\text{mm}$	$3\text{mm} < L$	1	$0.1\text{mm} \leq W$	$3\text{mm} < L$	0
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(5)刺、凸、凹点:	次要缺点	<table border="1"> <thead> <tr> <th>尺寸</th> <th>允收个数</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2\text{mm}$</td> <td>不计</td> </tr> <tr> <td>$0.2\text{mm} < \Phi \leq 0.3\text{mm}$</td> <td>3</td> </tr> <tr> <td>$0.3\text{mm} < \Phi$</td> <td>0</td> </tr> </tbody> </table> <p>以目视可见为准。</p>	尺寸	允收个数	$\Phi \leq 0.2\text{mm}$	不计	$0.2\text{mm} < \Phi \leq 0.3\text{mm}$	3	$0.3\text{mm} < \Phi$	0				
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(6)毛边:	次要缺点	1. $W \leq 0.05, L \leq 0.03\text{mm}$, 且不影响组装。												
(7)线路:	主要缺点	线路不可有刮伤、断路、短路。												
(8)破裂:	主要缺点	 <p>角落</p> <p>角落$X=3\text{mm}, Z=1/2T$以内可允收, 其它区域$X=5\text{mm}, Y=3\text{mm}, Z=1/2T$以内可允收。</p>												
(9)牛顿环:	主要缺点	<ol style="list-style-type: none"> 不可影响电性功能。 不可影响电性功能, 以限度样本判定且面积不得大于总面积的10%。 												
6.5、T/P电性功能	主要缺点	<ol style="list-style-type: none"> 以测试软件或测试治具或三用电表量测。 无动作时, 不合格。 动作不良或部份动作时, 不合格。 经测试软件测试, 直(横)线斜率或弯曲率$>1\%$时, 不合格。 												

■ PRECAUTIONS FOR USING LCD MODULES

▼ Handling Precautions

(1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it or impact.

- (2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- (5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents :
 - Isopropyl alcohol
 - Ethyl alcohol
- (6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solvents
- (7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

■ USING LCD MODULES

▼ Liquid Crystal Display Modules

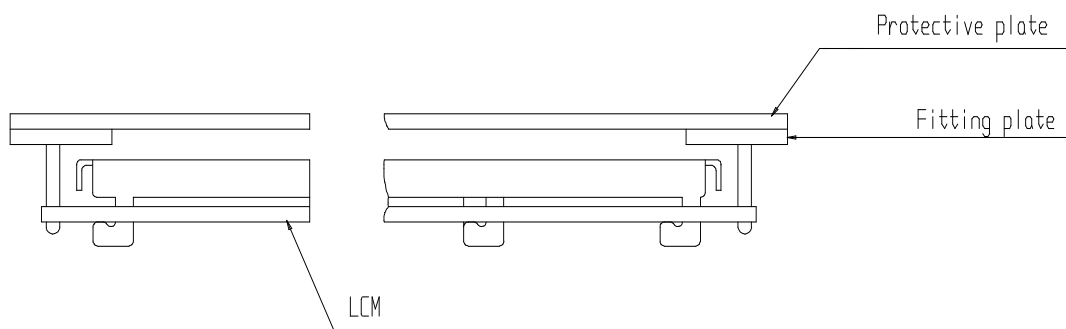
LCD is composed of glass and polarizer. Pay attention to the following items when handling.

- (1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
- (2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).
- (3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.
- (4) When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum benzin. Do not scrub hard to avoid damaging the display surface.
- (5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.
- (6) Avoid contacting oil and fats.
- (7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
- (8) Do not put or attach anything on the display area to avoid leaving marks on.
- (9) Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).
- (10) As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

▼ Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

- (1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



- (2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be $\pm 0.1\text{mm}$.

▼ Precaution for Handing LCD Modules

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- (1) Do not alter, modify or change the the shape of the tab on the metal frame.
- (2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- (3) Do not damage or modify the pattern writing on the printed circuit board.

- (4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- (5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- (6) Do not drop, bend or twist LCM.

▼ **Electro-Static Discharge Control**

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

- (1) Make certain that you are grounded when handling LCM.
- (2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
- (3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak. (4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- (5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
- (6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

▼ **Precaution for soldering to the LCM**

- (1) Observe the following when soldering lead wire, connector cable and etc. to the LCM.
 - Soldering iron temperature : 280°C ± 10°C.
 - Soldering time : 3-4 sec.
 - Solder : eutectic solder.

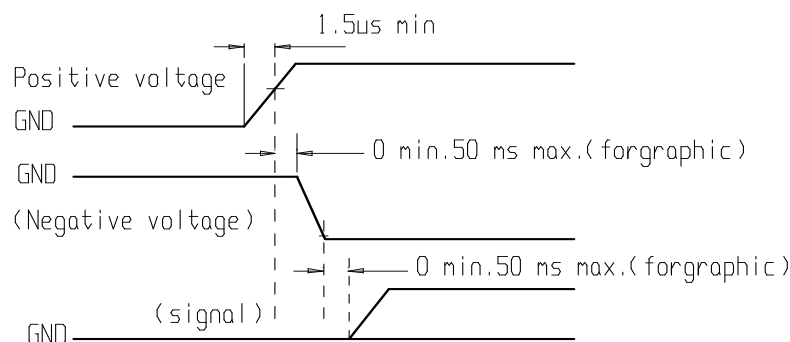
If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

(2) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

(3) When remove the electoluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

▼ **Precautions for Operation**

- (1) Viewing angle varies with the change of liquid crystal driving voltage (Vo). Adjust Vo to show the best contrast.
- (2) Driving the LCD in the voltage above the limit shortens its life.
- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
- (5) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.
- (6) When turning the power on, input each signal after the positive/negative voltage becomes stable.



▼ **Storage**

When storing LCDs as spares for some years, the following precaution are necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.
- (2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
- (3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)
- (4) Environmental conditions :
 - Do not leave them for more than 168hrs. at 80°C.
 - Should not be left for more than 48hrs. at -30°C.

▼ **Safety**

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

(2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

▼ **Limited Warranty**

Unless agreed between Quality and customer, Quality will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with Quality LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to Quality within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of Quality limited to repair and/or replacement on the terms set forth above. Quality will not be responsible for any subsequent or consequential events.

▼ **Return LCM under warranty**

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- PCB eyelet's damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
- soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet's, conductors and terminals.