POWERTIP TECH. CORP.

DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

Specification For Approval

Customer : _____

Model Type : __LCD   MODULE__

Sample Code : _____

Mass Production Code : __PG12864LRS-KNN-H__

Edition : __0__

Customer Sign	Sales Sign	Checked By (QA)	Approved By	Prepared By
			cole	赵好蓮

Revision Record

Date(y/m/d)	Rev.	Description	Note	Page
2002/07/06	0	Revised Contents		

Total Page : 1 ~ 26

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Contents

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	128 * 64 dots
LCD Type	STN, Gray, Transflective, Positive, Extended Temp.
Driver Type	1/64 Duty , 1/9 Bias
Viewing Direction	6 O' clock
Backlight	Yellow-Green LED B/L
Weight	67.2g
Other	

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	93.0mm(L) * 70.0mm(w) * 14.0mm(H)(Max)	mm
Viewing Area	72.0mm(L) * 40.0mm(w)	mm
Active Area	66.52mm(L) * 33.24mm(w)	mm
Dot Size	0.48mm(L) * 0.48mm(w)	mm
Dot Pitch	0.52mm(L) * 0.52mm(w)	mm

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_{DD}-V_{EE}		V_{DD}-19.0	V_{DD}+0.3	V
Input Voltage	V_{IN}		-0.3	V_{DD}+0.3	V
Operating Temperature	T_{OP}		-20	70	°C
Storage Temperature.	T_{ST}		-30	80	°C
Humidity	H_D			90	%RH

1.4 DC Electrical Characteristics

$V_{DD} = 5.0$ V $\pm 5\%$ $V_{SS} = 0$V Ta $= 25°$C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}		4.5	5.0	5.5	V
"H" Input Voltage	V_{IH}		$0.7\,V_{DD}$	-	V_{DD}	V
"L" Input Voltage	V_{IL}		0	-	$0.3\,V_{DD}$	V
"H" Output Voltage	V_{OH}	$I_{OH}=-0.2mA$	2.4	-	-	V
"L" Output Voltage	V_{OL}	$I_{OL}=1.6mA$	-	-	0.4	V
Supply Current	I_{DD}	$V_{DD} = 5.0$ V	-	2.5	5.0	mA
LCD Driver Voltage	V_{OP}	$V_{DD} - V_O$ (-20°C)	-	-	-	V
		$V_{DD} - V_O$ (25°C)	-	14.0	-	
		$V_{DD} - V_O$ (70°C)	-	-	-	

1.5 Optical Characteristics

1/64Duty   1/9Bias   VOP $=14.0$ V   Ta $= 25°$C

Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	$\theta1$	$C \geq 2.0, \varnothing = 0°$	-45°	-	-	Notes 1 & 2
	$\theta2$		50°	-	-	
Contrast Ratio	C	$\theta = 5°, \varnothing = 0°$	3	7	-	Note 3
Response Time(rise)	Tr	$\theta = 5°, \varnothing = 0°$	-	150 ms	-	Note 4
Response Time(fall)	Tf	$\theta = 5°, \varnothing = 0°$	-	300 ms	-	Note 4

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Note 1: Definition of angles θ and ∅

Light (when reflected) z (θ=0°)

Sensor

Y(∅=180°)

θ

LCD panel

X'

X(∅=90°)

∅

Z'

Y(∅=0°)
(θ=90°)

Light (when transmitted)
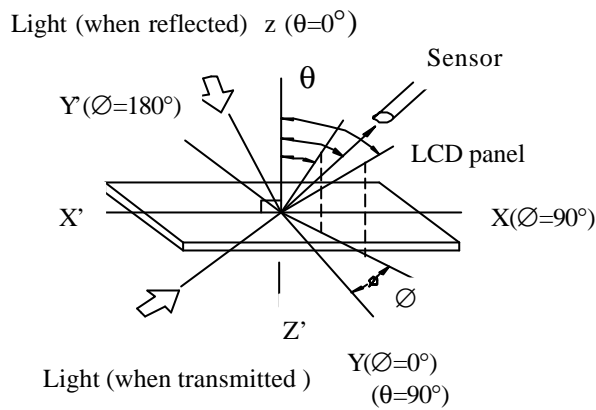
Note 2: Definition of viewing angles θ1 and θ2

Cmax.

Contrast
C

2.0

θ1   θ2

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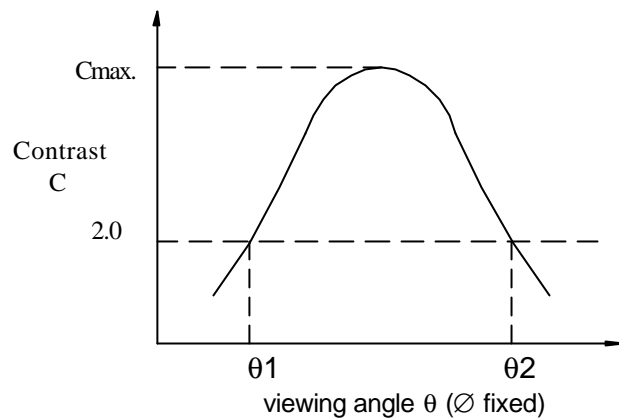
Note :   Optimum viewing angle with the
naked eye and viewing angle θ at
Cmax. Above are not always the same

Note 3: Definition of contrast C

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

(%)

Brighness (reflection) of
selected dot

Brightness
(reflection) of
unselected dot

B2

Brightness
(reflection)

B1

0

operating voltage (v)

Note 4: Definition of response time

VOP

0

−VOP

Non−selected state | Selected state | Non−selected state

Contrast

90%

10%

tr   tf   Time
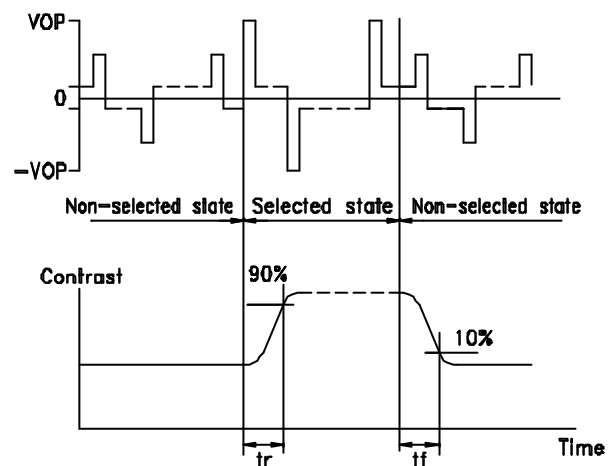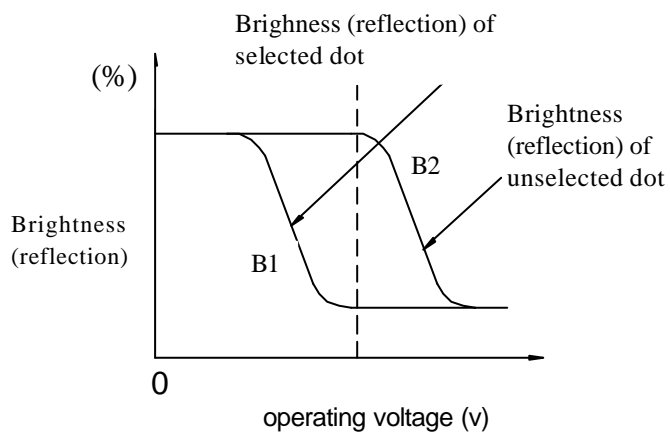
Note: Measured with a transmissive LCD
panel which is displayed 1 cm²

V_{OPR} : Operating voltage f_{FRM} : Frame frequency
t_r : Response time (rise) t_f : Response time (fall)
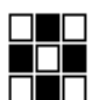
1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	I_F	Ta =25°C	-	975	mA
Reverse Voltage	V_R	Ta =25°C	-	8	V
Power Dissipation	P_O	Ta =25°C	-	4.5	W
Operating Temperature	T_{OP}	-	-20	70	°C
Storage Temperature	T_{ST}	-	-40	80	°C

Electrical Ratings

Ta =25°C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	I_F=390 mA	-	4.2	4.6	V
Reverse Current	I_R	V_R=8V	-	-	0.2	mA
Luminous Intensity (with LCD, Dots Off)	I_V	I_F=390 mA	184	230	-	cd/m^2
Wavelength	p	I_F=390 mA	571	-	576	nm
Color	Yellow-Green					

2. MODULE STRUCTURE

2.1 Counter Drawing
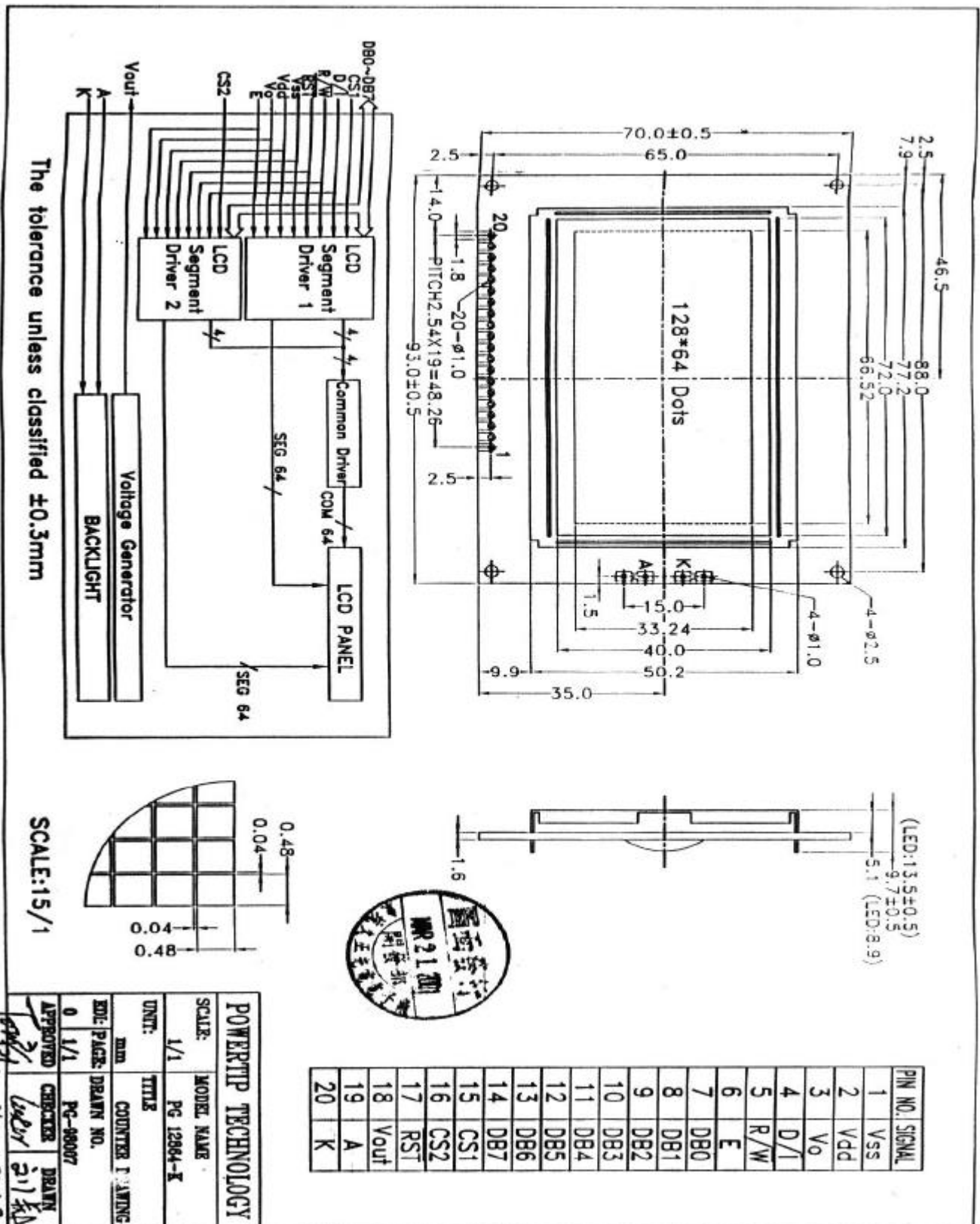
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2.2 Interface Pin Description

Pin No.	Symbol	Function
1	VSS	Signal ground (GND)
2	VDD	Power supply for logic (VDD> VSS)
3	Vo	Operating voltage for LCD (variable)
4	D/$\overline{\text{I}}$	Register selection input High =Data register Low =Instruction register (for write) Busy flag address counter (for read)
5	R/$\overline{\text{W}}$	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
7-14	DB0-DB7	Data bus
15	CS1	Chip enable for D2 (segment 1 to segment 64)
16	CS2	Chip enable for D3 (segment 65 to segment 128)
17	$\overline{\text{RST}}$	Reset signal
18	Vout	Negative voltage power supply
19	A	Power supply for LED backlight (+)
20	K	Power supply for LED backlight (-)

Contrast Adjust
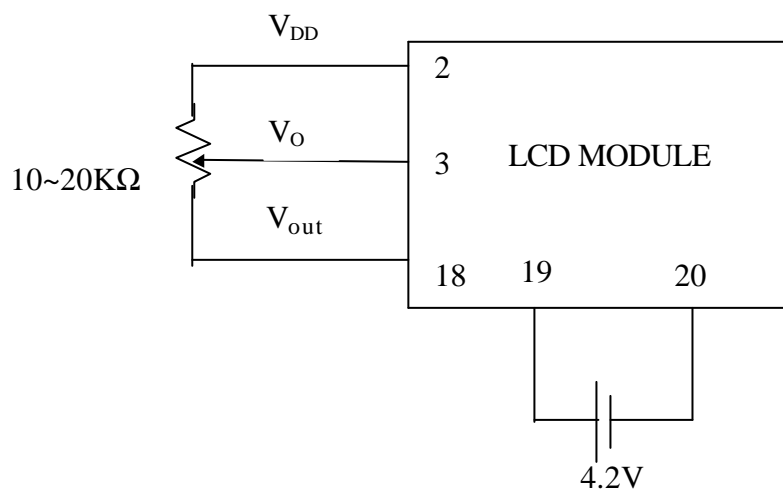
2.3 **Timing Characteristics**

•.MPU Bus Read/Write I (80-family MPU)
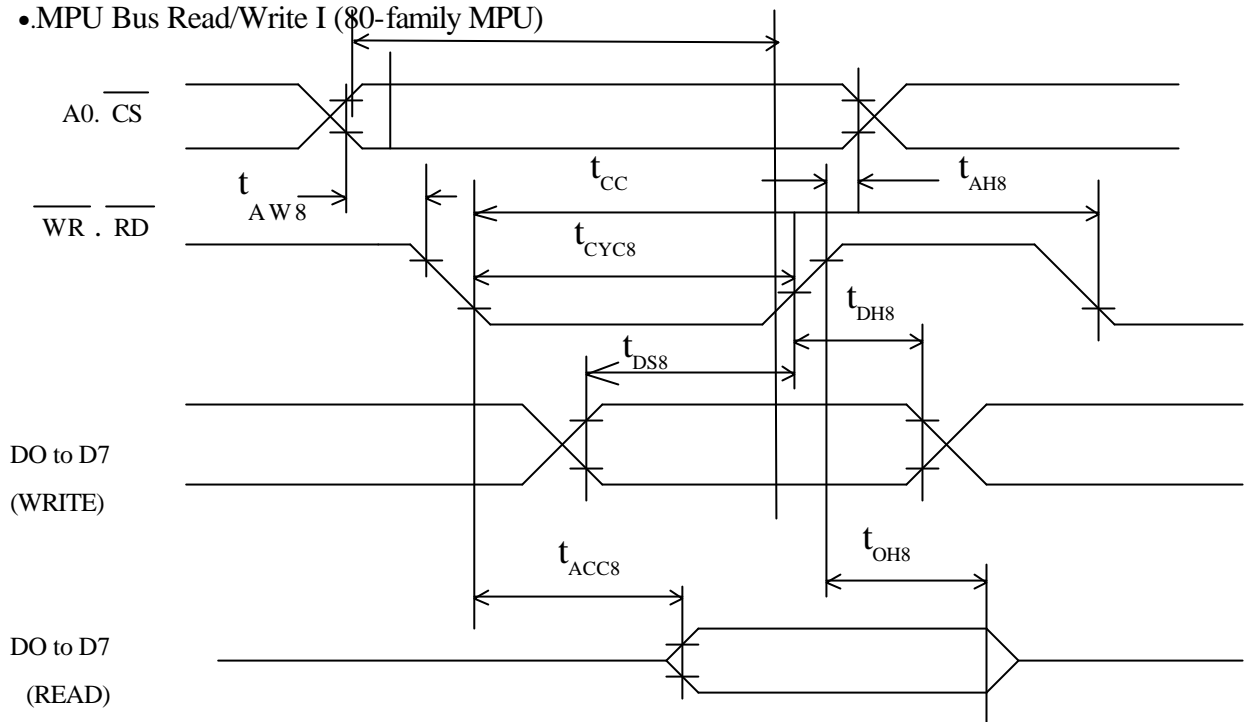
A0. $\overline{CS}$

$\overline{WR}$. $\overline{RD}$

t_{AW8}

t_{CC}

t_{AH8}

t_{CYC8}

t_{DH8}

t_{DS8}

DO to D7
(WRITE)

t_{ACC8}

t_{OH8}

DO to D7
(READ)

• MPU Bus Read/Write II (68-family MPU)

t_{CYC6}

E

t_{EW}

t_{AW6}

t_{DS6}

R/ $\overline{W}$

t_{AH6}

A0. $\overline{CS}$

t_{DH6}

D0 to D7
(WRITE)

t_{ACC6}

t_{OH6}

D0 to D7
(READ)

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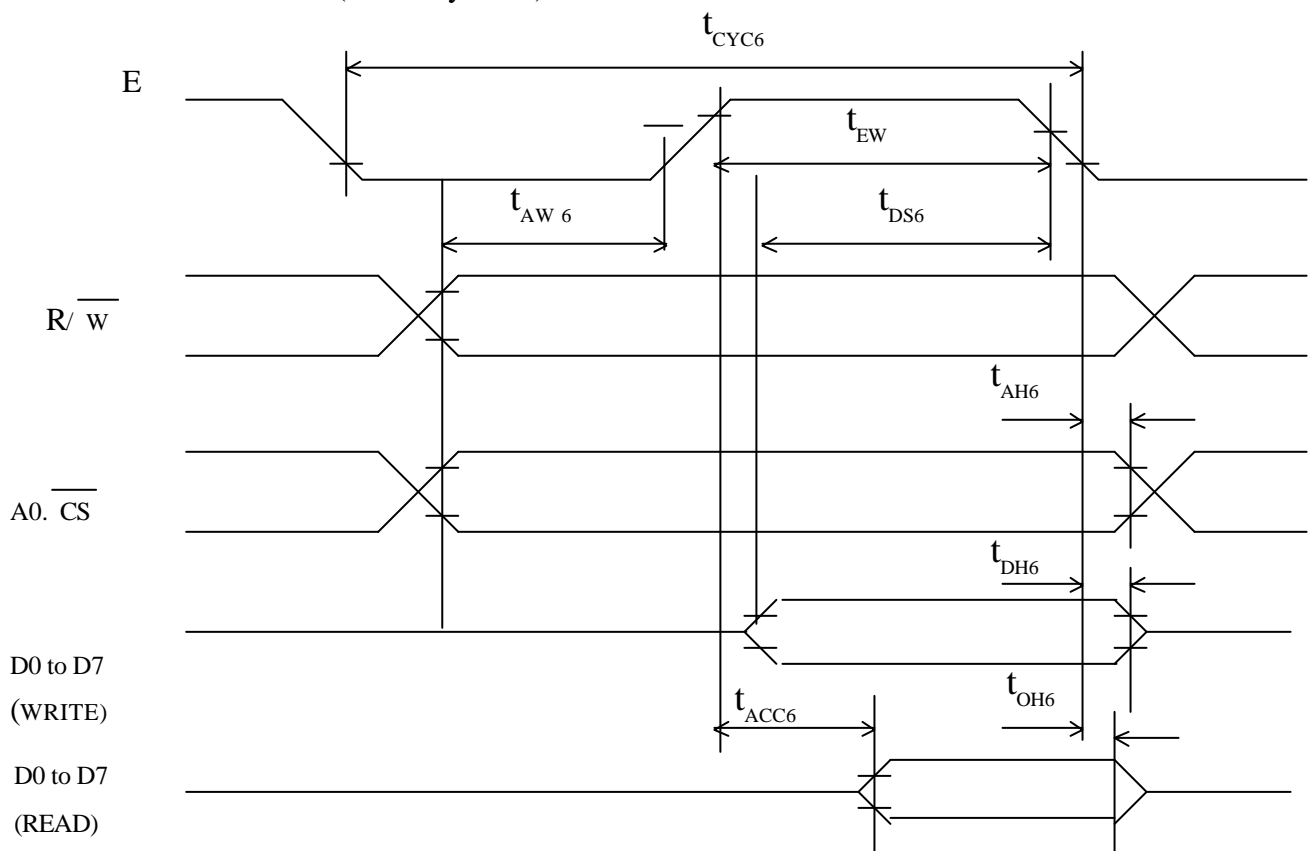DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

• MPU Bus Read/Write I (80-family MPU)

$V_{DD}=+5V\pm10\%, V_{SS}=0V, Ta=25°C$

Item	Symbol	Conditions	Min.	Max.	Unit
Address hold time	t_{AH8}	-	10	-	ns
Address setup time	t_{AW8}	-	20	-	ns
System cycle time	t_{CYC8}	-	1000	-	ns
Control pulse width	t_{CC}	-	200	-	ns
Data setup time	t_{DS8}	-	80	-	ns
Data hold time	t_{DH8}	-	10	-	ns
RD access time	t_{ACC8}	C_L=100 PF	-	90	ns
Output disable time	t_{CH8}		10	60	ns

• MPU Bus Read/Write II (68-family MPU)

$V_{DD}=+5V\pm10\%, V_{SS}=0V, Ta=25°C$

Item		Symbol	Conditions	Min.	Max.	Unit
System cycle time		t_{CYC6}	-	1000	-	ns
Address setup time		t_{AW6}	-	20	-	ns
Address hold time		t_{AH6}	-	10	-	ns
Data hold time		t_{DS6}	-	80	-	ns
Data hold time		t_{DH6}	-	10	-	ns
Output disable time		t_{OH6}	C_L=100 PF	10	60	ns
Access time		t_{ACC6}		-	90	ns
Enable pulse width	Read	t_{EW}		-	100	-	ns
	Write			-	80	-	ns

2.4 Display Command Summary

Command	Code											Function
	A0	$\overline{RD}$	$\overline{WR}$	D7	D6	D5	D4	D5	D2	D1	D0	
Display On/Off	0	1	0	1	0	1	0	1	1	1	0/1	Turns display on or off. 1: ON, 0:OFF
Display start line	0	1	0	1	1	0	Display start address(o to 31)					Specifies RAM line corresponding to top line of display.
Set page address	0	1	0	1	0	1	1	1	0	Page(o to 3)		Sets display RAM page in page address register.
Set column (segment) address	0	1	0	0	Column address (o to 79)							Sets display RAM column address in column address register.
Read status	0	0	1	Busy	ADC	ON/OFF	Reset	0	0	0	0	Reads the following status: BUSY 1: Busy 0: Ready ADC 1: CW output 0: CCW output ON/OFF 1: Display off 0: Display on RESET 1: Being reset 0: Normal
Write display data	1	1	0	Write data								Writes data from data bus into display RAM.
Read display data	1	0	1	Read data								Reads data from display RAM onto data bus.
Select ADC	0	1	0	1	0	1	0	0	0	0	0/1	0: CW output, 1:CCW output
Statis drive ON/OFF	0	1	0	1	0	1	0	0	1	0	0/1	Selects static driving operation. 1:static drive, 0: Normal driving
Select duty	0	1	0	1	0	1	0	1	0	0	0/1	Selects LCD duty cycle 1: 1/32, O: 1/16
Read-Modify-Write	0	1	0	1	1	1	0	0	0	0	0	Read-modify-write ON
End	0	1	0	1	1	1	0	1	1	1	0	Read-modify-write OFF
Reset	0	1	0	1	1	1	0	0	0	1	0	Software reset

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Command description

Table 3 is the command table. The SED1520 series identifies a data bus using a combination of A0 and R/W (RD or $\overline{WR}$) signals. As the MPU translates a command in the internal timing only (independent from the external clock). Its speed is very high. The busy check is usually not required.

Display ON/OFF

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
0	1	0	1	0	1	0	1	1	1	D	AEH,AFH

This command turns the display on and off.
- D=1: Display ON
- D=0: Display OFF

Display Start Line

This command specifies the line address shown if Figure 3 and indicates the display line that corresponds to COM0. The display area begins at the specified line address and continues in the line address increment direction. This area having the number of lines of the specified display duty is displayed. If the line address is changed dynamically by this command the vertical smooth scrolling and paging can be used.

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
0	1	0	1	1	0	A4	A3	A2	A1	A0	C0H to DFH

This command loads the display start line register.

A4	A3	A2	A1	A0	Line Address
0	0	0	0	0	0
0	0	0	0	1	1
:		:			:
		:			:
1	1	1	1	1	31
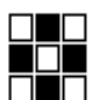
Set Page Address

This command specifies the page address that corresponds to the low address of the display data RAM when it is accessed by the MPU. Any bit of the display data RAM can be accessed when its page address and column address are specified. The display status is not changed even when the page address is changed.

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
0	1	0	1	0	1	1	1	0	A1	A0	B8H to BBH

This command loads the page address register.

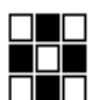| A1	A0	Page
0	0	0
0	1	1
1	0	2
1	1	3

Set column Address

This command specifies a column address of the display data RAM. When the display data RAM is accessed by the MPU continuously, the column address is incremented by 1 each time it is accessed from the set address. Therefore, the MPU can access to data continuously. The column address stops to be incremented at address 80, and the page address is not changed continuously.

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
0	1	0	0	A6	A5	A4	A3	A2	A1	A0	00H to 4FH

This command loads the column address register.

A6	A5	A4	A3	A2	A1	A0	Line Address
0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	1
			:				:
			:				:
1	0	0	1	1	1	1	79

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Read Status

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0
0	0	1	BUSY	ADC	ON/OFF	RESET	0	0	0	0

Reading the command I/O register (A0=0) yields system status information.

- The busy bit indicates whether the driver will accept a command or not.

  Busy=1: The driver is currently executing a command or is resetting. No new command will be accepted.

  Busy=0: The driver will accept a new command.

- The ACD bit indicates the way column addresses are assigned to segment drivers.

  ADC=1: Normal. Column address n → segment driver n.

  ADC=0: Inverted. Column address 79-u → segment driver u.

- The ON/OFF bit indicates the current status of the display.

  It is the inverse of the polarity of the display ON/OFF command.

  ON/OFF=1: Display OFF

  ON/OFF=0: Display ON

- The RESET bit indicates whether the driver is executing a hardware or software reset or if it is in normal operating mode.

  RESET=1: Currently executing reset command.

  RESET=0: Normal operation

Write Display Data

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0
1	1	0				Write data				

Writes 8-bit of data into the display data RAM, at a location specified by the contents of the column address and page address registers and then increments the column address register by one.

Read Display Data

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0
1	0	1				Read	data			

Reads 8-bits of data from the data I/O latch, updates the contents of the I/O latch with display data from the display data RAM location specified by the contents of the column address and page address registers and then increments the column address register.

After loading a new address into the column address register one dummy read is required before valid data is obtained.

Select ADC

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
0	1	0	1	0	1	0	0	0	0	D	A0H, A1H

This command selects the relationship between display data RAM column addresses and segment drivers.

D=1: SEG0 ← column address 4FH,...(inverted)

D=0: SEG0 ← column address 00H,...(normal)

This command is provided to reduce restrictions on the placement of driver ICs and routing of traces during printed circuit board design. See Figure 2 for a table of segments and column addresses for the two values of D.

Static Drive ON/OFF

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
0	1	0	1	0	1	0	0	1	0	D	A4H, ,A5H

Forces display on and all common outputs to be selected.

D=1: Static drive on

D=0: Static drive off

Select Duty

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
0	1	0	1	0	1	0	1	0	0	D	A8H, ,A9H

This command sets the duty cycle of the LCD drive and is only valid for the SED1520F and SED1522F. It is invalid for the SED1521F which performs passive operation. The duty cycle of the SED1521F is determined by the externally generated FR signal.

SED1520   SED1522

D=1:   1/32 duty cycle   1/16 duty cycle

D=0:   1/16 duty cycle   1/8 duty cycle

When using the SED1520F0A,SED1522F0A(having a built-in oscillator) and the SED1521F0A continuously, set the duty as follows:

		SED1521F0A
SED1520F0A	1/32	1/32
	1/16	1/16
SED1522F0A	1/16	1/32
	1/8	1/16

Read-Modify-Write

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
0	1	0	1	1	1	0	0	0	0	0	EOH

This command defeats column address register auto-increment after data reads. The current contents of the column address register are saved. This mode remains active until an End command is received.

• Operation sequence during cursor display

When the End command is entered, the column address is returned to the one used during input of Read-Modify-Write command. This function can reduce the load of MPU when data change is repeated at a specific display area(such as cursor blinking).
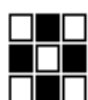
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* Any command other than Data Read or Write can be used in the Read-Modify-Write mode. However, the Column Address Set command cannot be used.

```
                    ┌─────────────────────┐
                    │  Set Page Address   │
                    └─────────────────────┘
                               │
                               ▼
                    ┌─────────────────────┐
          ┌────────▶│ Set Column Address  │
          │         └─────────────────────┘
          │                    │
          │                    ▼
          │         ╔═════════════════════╗
          │         ║  Read-Modify-Write  ║
          │         ╚═════════════════════╝
          │                    │
          │         ┌──────────┤
          │         │          ▼
          │         │ ┌─────────────────────┐
          │         │ │     Dummy Read      │
          │         │ └─────────────────────┘
          │         │          │
          │         │          ▼
          │         │ ┌─────────────────────┐
          │         │ │     Read Data       │
          │         │ └─────────────────────┘
          │         │          │
          │         │          ▼
          │         │ ┌─────────────────────┐
          │         │ │     Write Data      │
          │         │ └─────────────────────┘
          │         │          │
          │         │          ▼
          │         │      ◇Completed ?◇── No
          │         └───────────
          │                    │ Yes
          │                    ▼
          │         ╔═════════════════════╗
          │         ║        End          ║
          │         ╚═════════════════════╝
          │                    │
          └────────────────────┘
                               ▼
```
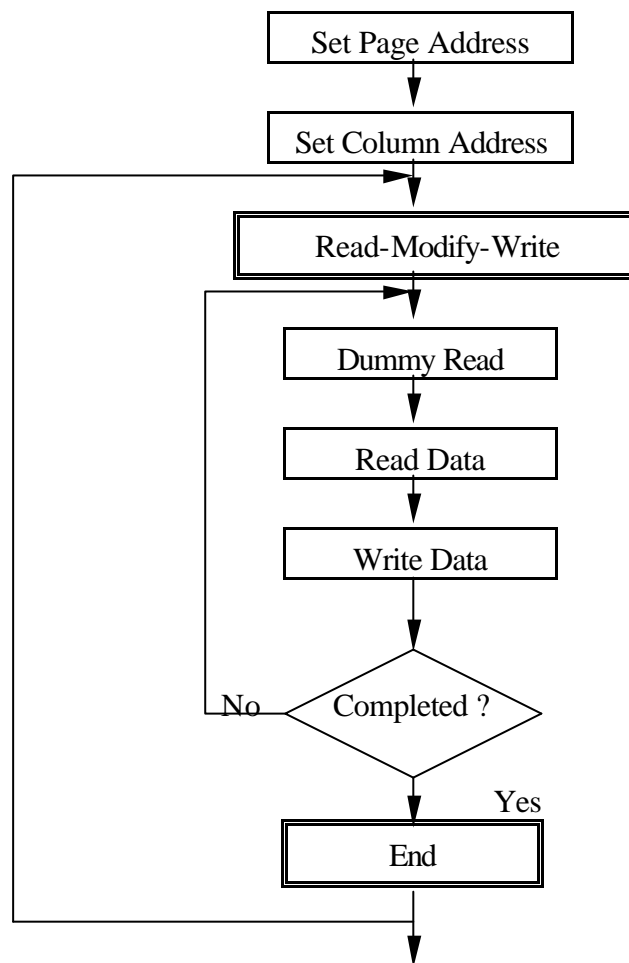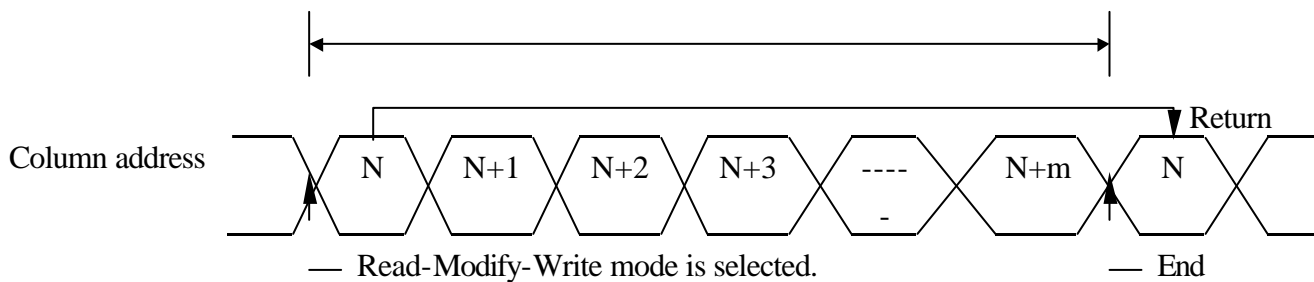
End

A0	$\overline{RD}$	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
0	1	0	1	1	1	0	1	1	1	0	EEH

This command cancels read-modify-write mode and restores the contents of the column address register to their value prior to the receipt of the Read-Modify-Write command.

```
Column address ──┐ ┌─┐ ┌─┐ ┌─┐ ┌─┐ ┌─┐ ┌─┐ ┌─┐ ┌──
                 └┤N├┤N+1├┤N+2├┤N+3├┤---├┤N+m├┤N├──
                  └─┘ └─┘ └─┘ └─┘ └─┘ └─┘ └─┘
                  ↑                           ↑ Return
    — Read-Modify-Write mode is selected.     — End
```

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Reset

A0	RD	R/$\overline{W}$ $\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
0	1	0	1	1	1	0	0	0	1	0	E2H

This command clears

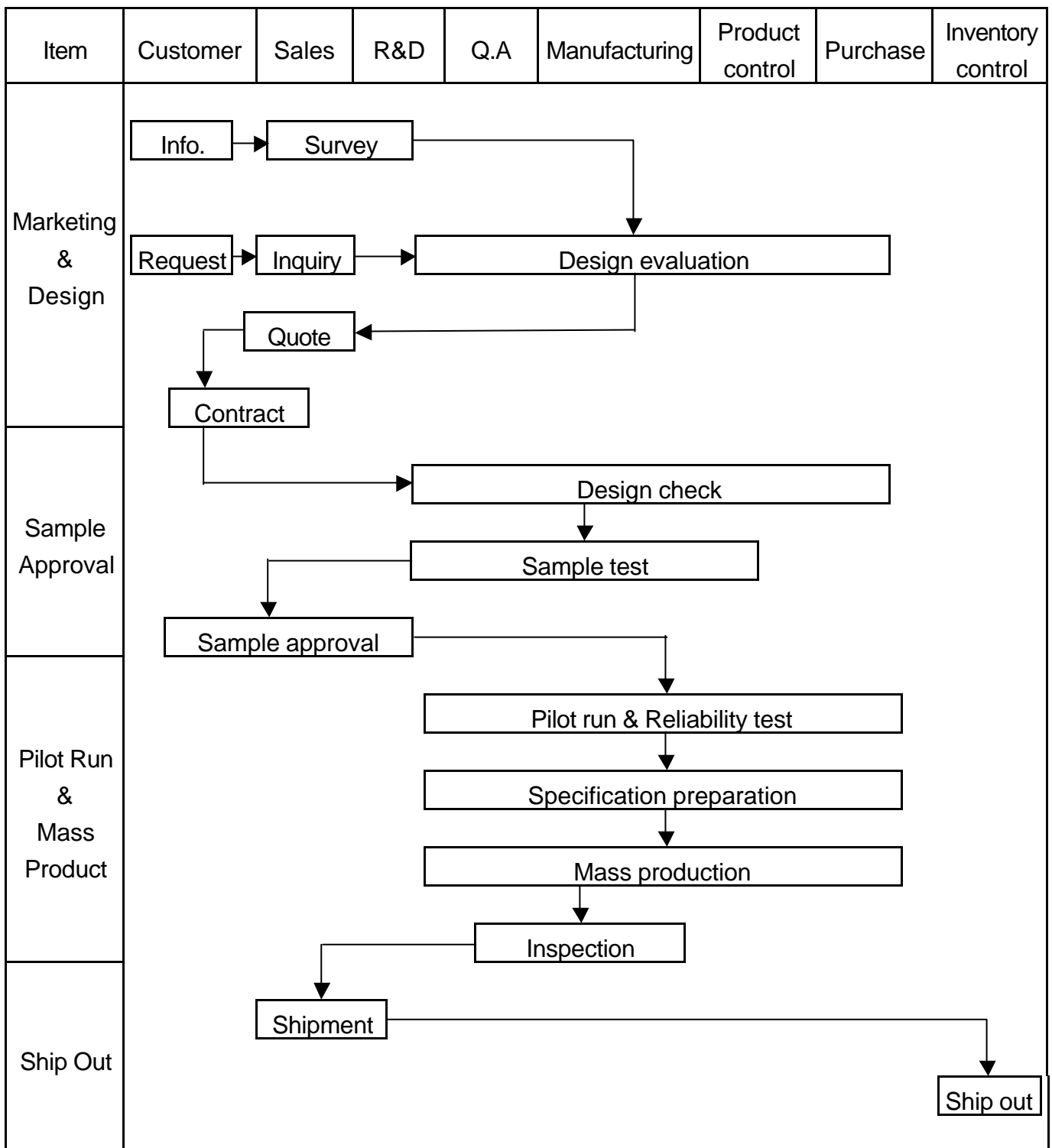- the display start line register.
- and set page address register to 3 page.

  It does not affect the contents of the display data RAM.

When the power supply is turned on, a Reset signal is entered in the RES pin. The Reset command cannot be used instead of this Reset signal.

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart

Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Marketing & Design	Info. → Survey				Design evaluation			
	Request → Inquiry							
	Quote							
	Contract							
Sample Approval					Design check			
					Sample test			
	Sample approval							
Pilot Run & Mass Product					Pilot run & Reliability test			
					Specification preparation			
					Mass production			
					Inspection			
Ship Out	Shipment							Ship out

Sales Service	Info. → Claim → Failure analysis → Analysis report, Failure analysis → Corrective action → Tracking
Q.A Activity	1. ISO 9001 Maintenance Activities 2. Process improvement proposal 3. Equipment calibration 4. Education And Training Activities 5. Standardization Management

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3.2 Inspection Specification

Inspection Standard   MIL-STD-105E Table Normal Inspection Single Sampling Level

Equipment   Gauge   MIL-STD   Powertip Tester   Sample

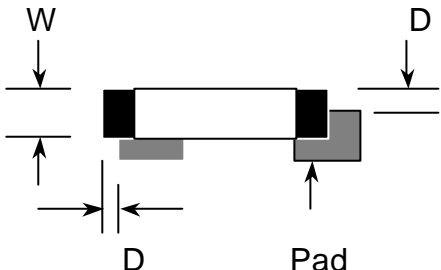IQC Defect Level   Major Defect AQL 0.65; Minor Defect AQL 1.0

FQC Defect Level   100% Inspection

OUT Going Defect Level   Sampling

Specification

N O	Item	Specification	Judge	Level
1	Part Number	Inconsistent with the P/N on the flow chart of production	N.G.	Major
2	Quantity	Inconsistent Q'TY with the flow chart of production	N.G.	Major
3	Electronic characteristics $A=(L + W)\div 2$	Display short	N.G.	Major
		Missing line	N.G.	Major
		Dot missing A 1/2 Dot size	N.G.	Major
		No function	N.G.	Major
		Out put data error	N.G.	Major
4	Appearance $A=(L + W)\div 2$ Dirty particle (Include scratch bubble)	Material difference with flow chart	N.G.	Major
		LCD Assembled in opposite direction	N.G.	Major
		Bezel assembled in opposite direction	N.G.	Major
		Shadow within LCD V./A + 1.0 mm	N.G.	Major
		Dirty particle A 0.4 mm	N.G.	Minor
		Dirty particle length 3.0mm And 0.01mm Width 0.05mm (Width 0.05mm Measure by area)	N.G.	Minor
		Without protective film	N.G.	Minor
		Conductive rubber over bezel	N.G.	Minor
5	PCB Appearance $A=(L + W)\div 2$	Burned PCB	N.G.	Major
		Green paint stripped & visible circuit A 1.0mm (Finish coat not counted in)	N.G.	Minor
		A particle across the circuit	N.G	Minor
		Circuit split 1/2 Circuit width	N.G	Minor
		Any circuit risen	N.G	Minor
		0.2mm Tin ball area A 0.4mm And Q'TY 4 Pieces	N.G	Minor
		Tin ball area A 0.4mm	N.G	Minor

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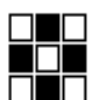
N O	Item	Specification	Judge	Level
6	Molding appearance A=(L + W)÷ 2	Too soft　Shape by touch changed	N.G.	Major
		Insufficient epoxy　IC circuit or IC pad visible	N.G.	Minor
		Excessive epoxy　Diameter　20mm Or 　　　　　　　High　2.5mm	N.G.	Minor
		Pin hole through to IC and A　0.2mm	N.G.	Minor
7	Bezel appearance A=(L + W)÷ 2	Angle between frame and TAB　45　+10	N.G.	Minor
		Electroplate strip A　1.0mm (Top view only)	N.G.	Minor
		Rust (Top view only)	N.G.	Minor
		Crack	N.G.	Minor
8	Backlight electric characteristics A=(L + W)÷ 2	Error backlight color	N.G.	Major
		No function	N.G.	Major
		Any LED dot no function	N.G.	Major
		PIN soldering without tin A　1/2 solder pad	N.G.	Minor
		Solder PIN　high　1.5mm	N.G.	Minor
9	LCD Appearance A=(L + W)÷ 2	Polarize rise over V/A	N.G.	Minor
10	Assembly parts A=(L + W)÷ 2	Components mark unclearly	N.G.	Minor
		Components' distance more than 0.7mm firm the PCB	N.G.	Minor
		Error position ,not in center D　1/4W	N.G.	Minor
		Non- solder area　Twice solder area	N.G.	Minor
		Flux area A　1/4 solder area	N.G.	Minor
		Component broken	N.G.	Minor

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4. RELIABILITY TEST

4.1 Reliability Test Condition

NO	Item	Test Condition	Applicable Standard
1	High Temperature Storage	Storage At 80 ± 2 96~100 hrs Surrounding Temperature Then Storage At Normal Condition 4hrs.	MIL-202E
2	Low Temperature Storage	Storage At -30 ± 2 96~100 hrs Surrounding Temperature, Then Storage At Normal Condition 4 hrs.	MIL-202E
3	High Temperature Humidity Storage	1.Storage 96~100 hrs 60 ± 2 , 90~95%RH Surrounding Temperature, Then Storage At Normal Condition 4hrs .(Polarizer may fail in this environment). or 2.Storage 96~100 hrs 40 ± 2 , 90~95%RH Surrounding Temperature, Then Storage At Normal Condition 4 hrs.	MIL-202E
4	Temperature Cycling	-20 25 70 25 (30Mins) (5Mins) (30Mins) (5Mins) 10 Cycle	MIL-202E
5	Vibration	10~55Hz (1 Minute) 1.5mm X,Y And Z Direction (Each 2hrs)	MIL-202E
6	Drop Test	<table><tr><td>Packing Weight (Kg)</td><td>Drop High (Cm)</td></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>	MIL-810E

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.

5.3 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

medical devices , 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.