



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
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Revision Record

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DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

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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

 $V_{DD} = 5.0 \text{ V} \pm 5\%$, $V_{SS} = 0\text{V}$, $T_a = 25^\circ\text{C}$

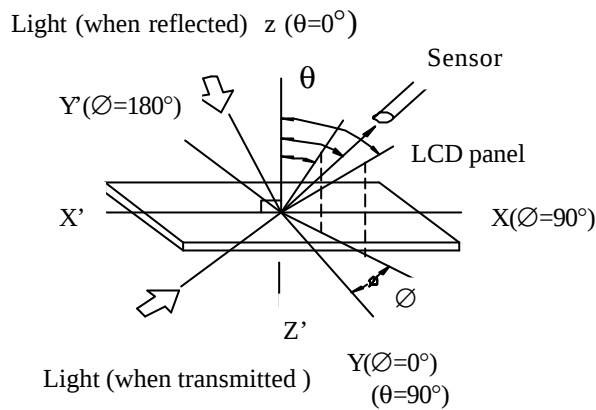
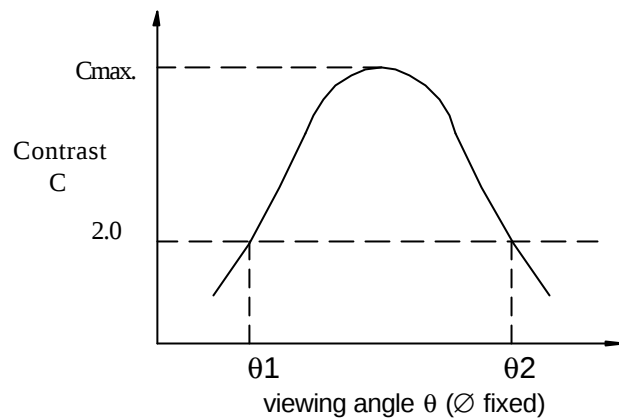
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}	-	4.5	5.0	5.5	V
“H” Input Voltage	V_{IH}	-	$0.7 V_{DD}$	-	V_{DD}	V
“L” Input Voltage	V_{IL}	-	0	-	$0.3 V_{DD}$	V
“H” Output Voltage	V_{OH}	$I_{OH} = -0.2\text{mA}$	2.4	-	-	V
“L” Output Voltage	V_{OL}	$I_{OL} = 1.6\text{mA}$	-	-	0.4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

1.5 Optical Characteristics

 $1/64\text{Duty}$, $1/9\text{Bias}$, $V_{OP} = 14.0 \text{ V}$, $T_a = 25^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	θ_1	$C \geq 2.0, \varnothing = 0^\circ$	-45°	-	-	Notes 1 & 2
	θ_2		50°	-	-	
Contrast Ratio	C	$\theta = 5^\circ, \varnothing = 0^\circ$	3	7	-	Note 3
Response Time(rise)	T_r	$\theta = 5^\circ, \varnothing = 0^\circ$	-	150 ms	-	Note 4
Response Time(fall)	T_f	$\theta = 5^\circ, \varnothing = 0^\circ$	-	300 ms	-	Note 4

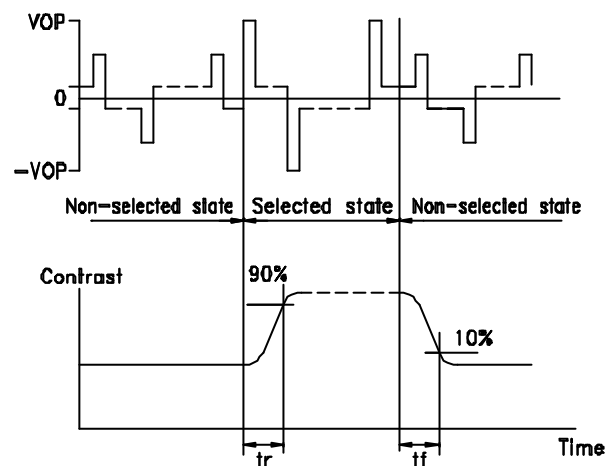
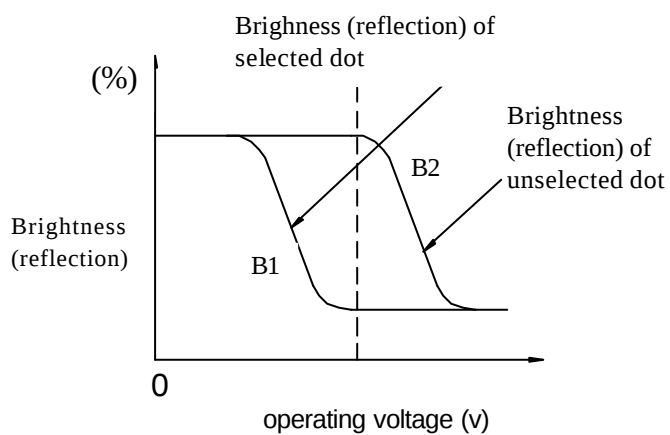


Note 1: Definition of angles θ and ϕ Note 2: Definition of viewing angles θ_1 and θ_2 

Note : Optimum viewing angle with the naked eye and viewing angle θ at C_{max} . Above are not always the same

Note 3: Definition of contrast C

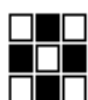
$$C = \frac{\text{Brightness (reflection) of unselected dot (B2)}}{\text{Brightness (reflection) of selected dot (B1)}}$$



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

V_{OPR} : Operating voltage
 t_r : Response time (rise)

f_{FRM} : Frame frequency
 t_f : Response time (fall)



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1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

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

Electrical Ratings

$T_a = 25^{\circ}\text{C}$

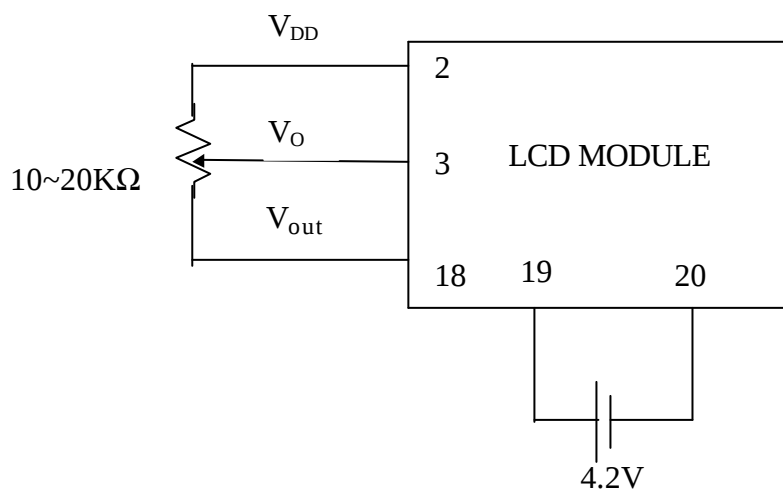
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	$I_F = 390\text{ mA}$	-	4.2	4.6	V
Reverse Current	I_R	$V_R = 8\text{V}$	-	-	0.2	mA
Luminous Intensity (with LCD, Dots Off)	I_v	$I_F = 390\text{ mA}$	184	230	-	cd/m^2
Wavelength	λ_p	$I_F = 390\text{ mA}$	571	-	576	nm
Color	Yellow-Green					



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 (-)

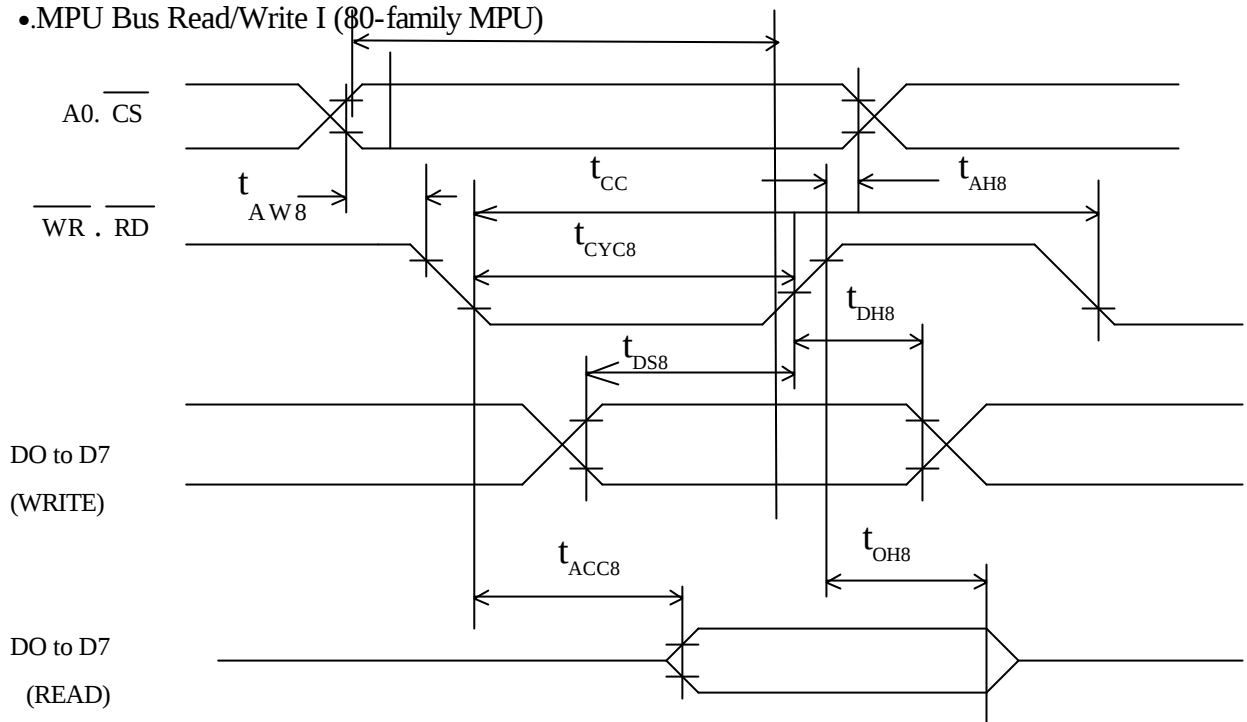
Contrast Adjust



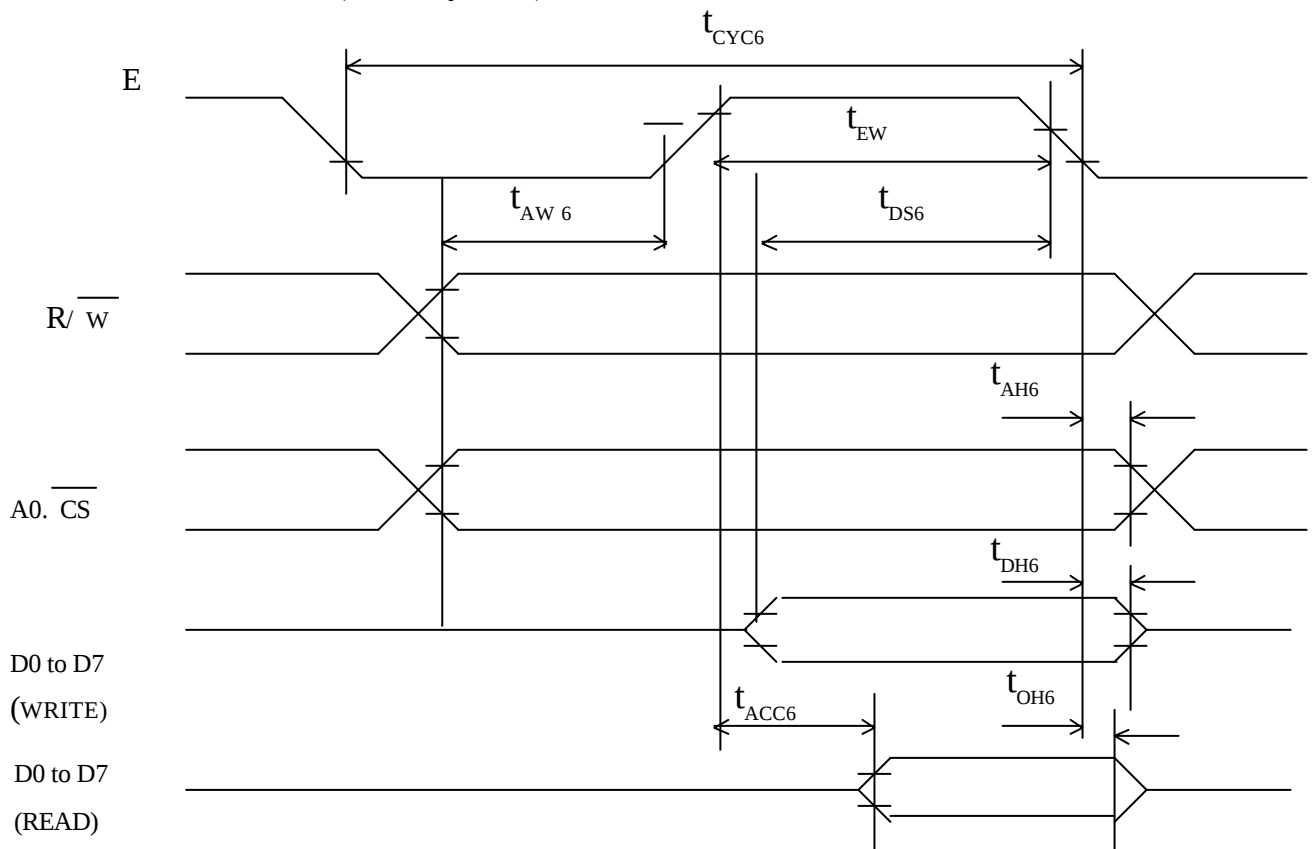
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2.3 Timing Characteristics

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



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



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

$V_{DD}=+5V\pm10\%$, $V_{SS}=0V$, $T_a=25^{\circ}C$

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}	$C_L=100\text{ PF}$	-	90	ns
Output disable time	t_{CH8}		10	60	ns

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

$V_{DD}=+5V\pm10\%$, $V_{SS}=0V$, $T_a=25^{\circ}C$

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}	$C_L=100\text{ PF}$	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	RD	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



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	$\overline{RD}$	$\overline{R/\overline{W}}$	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 in 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	$\overline{RD}$	$\overline{R/\overline{W}}$	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	$\overline{\text{RD}}$	$\overline{\text{R}}/\overline{\text{W}}$	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	$\overline{\text{RD}}$	$\overline{\text{R}}/\overline{\text{W}}$	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



Read Status

A0	$\overline{\text{RD}}$	$\frac{\text{R}}{\text{W}}$ $\overline{\text{WR}}$	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 $\rightarrow$ segment driver n.
 ADC=0: Inverted. Column address 79-u $\rightarrow$ 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	$\overline{\text{RD}}$	$\frac{\text{R}}{\text{W}}$ $\overline{\text{WR}}$	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	$\overline{\text{RD}}$	$\text{R}/\overline{\text{W}}$	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	$\overline{\text{RD}}$	$\text{R}/\overline{\text{W}}$	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	$\overline{\text{RD}}$	$\text{R}/\overline{\text{W}}$	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	$\overline{\text{RD}}$	$\text{R}/\overline{\text{W}}$	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

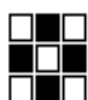
Read-Modify-Write

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

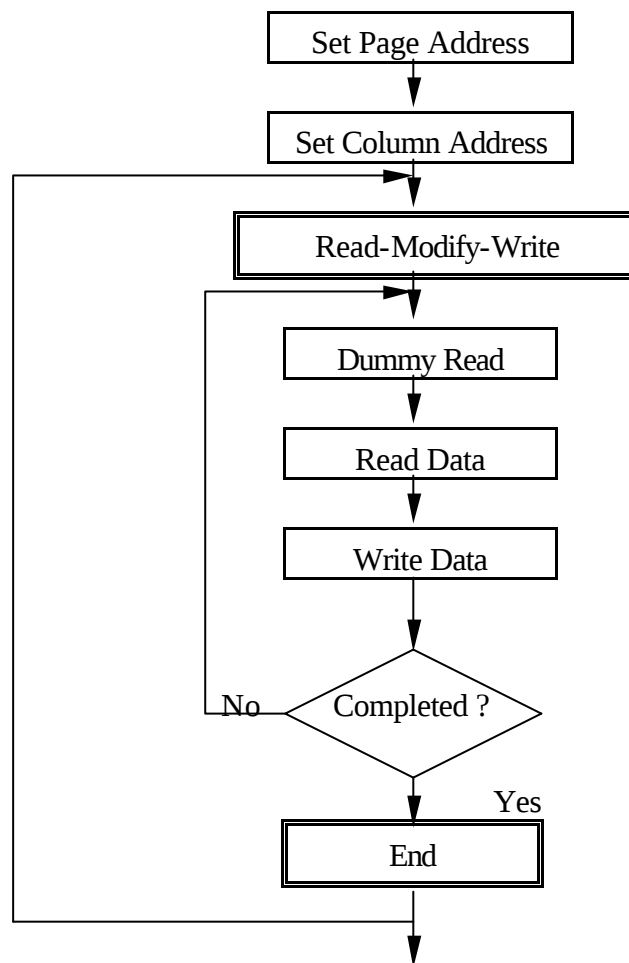
This command defeats column address register auto-increment after data reads. The current contents of the column address register are saved. This mode remains active until an End command is received.

- 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).



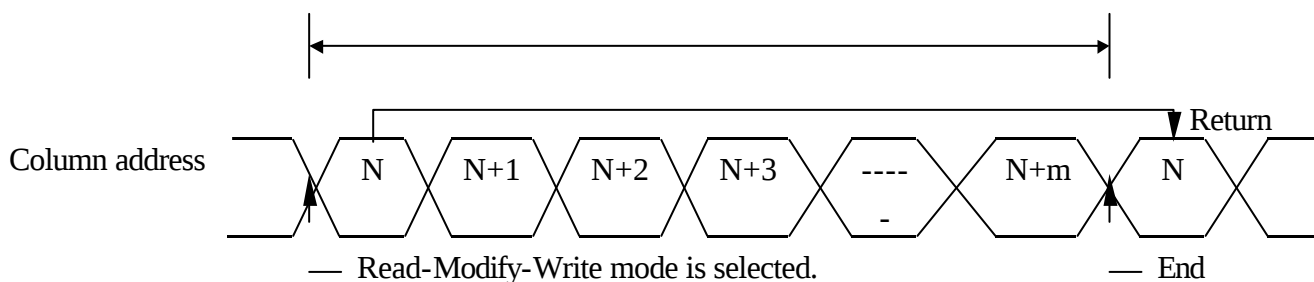
* Any command other than Data Read or Write can be used in the Read-Modify-Write mode. However, the Column Address Set command cannot be used.



End

A0	$\overline{\text{RD}}$	$\text{R}/\overline{\text{W}}$	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.



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Reset

A0	$\overline{\text{RD}}$	$\text{R}/\overline{\text{W}}$	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.

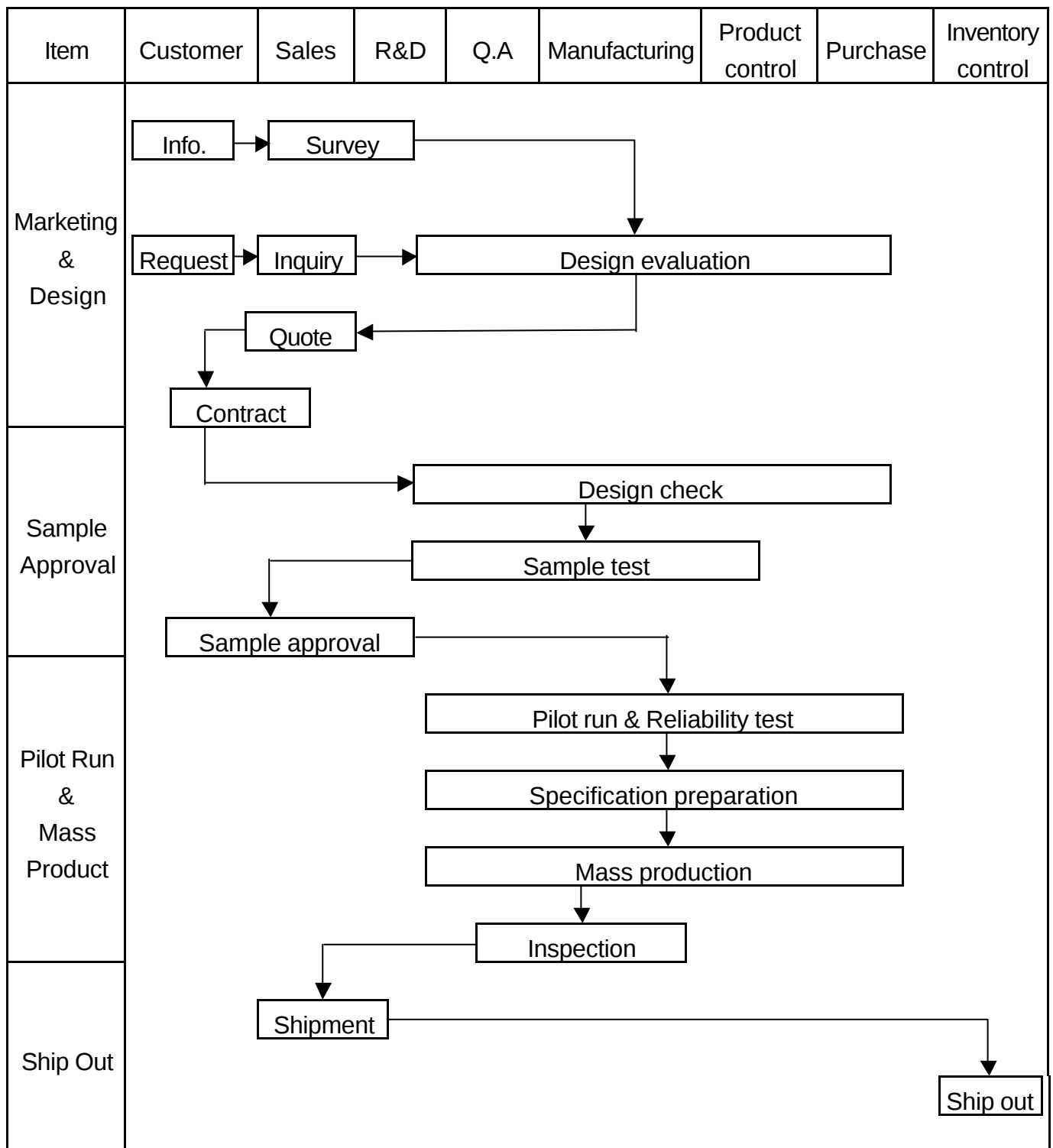
It does not affect the contents of the display data RAM.

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.

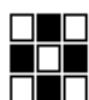


3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



Sales Service	<pre> graph TD Info[Info.] --> Claim[Claim] Claim --> Failure[Failure analysis] Failure --> Analysis[Analysis report] Failure --> Corrective[Corrective action] Corrective --> Tracking[Tracking] </pre>
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。

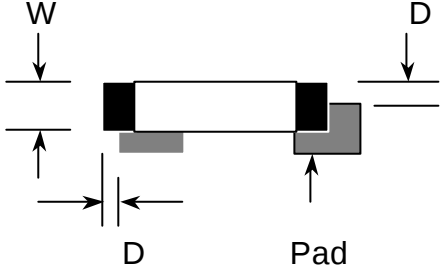
FQC Defect Level : 100% Inspection,

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 $A = (L + W) \div 2$	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 (Include scratch、 bubble)	Dirty particle length > 3.0 mm And $0.01\text{mm} < \text{Width} < 0.05\text{mm}$ (Width $> 0.05\text{mm}$ 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 $A > 1.0$ mm (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
		$0.2\text{mm} < \text{Tin ball area} A < 0.4\text{mm}$ And Q'TY > 4 Pieces	N.G.	Minor
		Tin ball area $A > 0.4\text{mm}$	N.G.	Minor



N O	Item	Specification	Judge	Level
6	Molding appearance $A = (L + W) \div 2$	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 $A = (L + W) \div 2$	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 $A = (L + W) \div 2$	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 $A = (L + W) \div 2$	Polarize rise over V/A	N.G.	Minor
10	Assembly parts $A = (L + W) \div 2$	Components mark unclearly	N.G.	Minor
		Components' distance more than 0.7mm from 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
			N.G.	Minor



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 4hrs.		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	Packing Weight (Kg)	Drop High (Cm)	MIL-810E
		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.

5.3 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.

