

LCM MODULE SPECIFICATION

MODULE NO.
HTM12232A

Customer Approval

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Designed	Checked	Approved

Revision history

revision	date	description	remark
A00	2007-10-05	First release	

Content

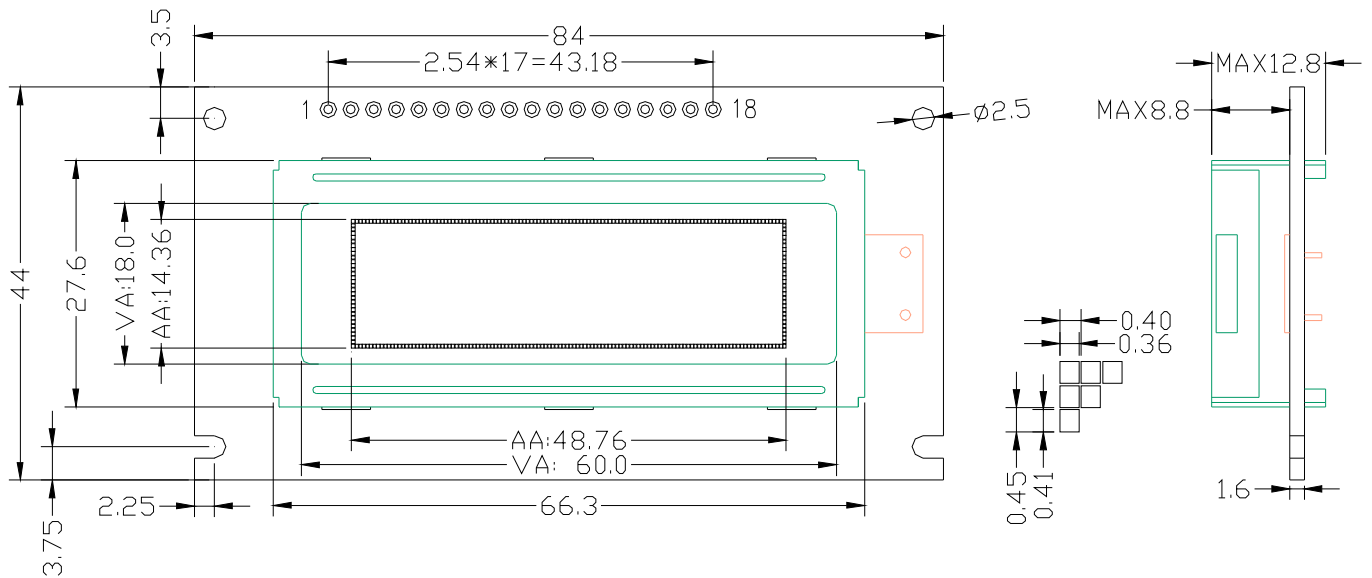
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1. Feature

Display resolution	: 122(w)*32(h)
Display mode	: STN , Yellow-Green , Positive , transfective
Driving method	: 1/32 duty , 1/5 bias
Viewing direction	: 6 o'clock
Backlight	: LED , Yellow-Green
Built-in controller	: SED1520(or equivalence)
Operation temp	: -20°C~70°C
Storage temp	: -30°C~80°C

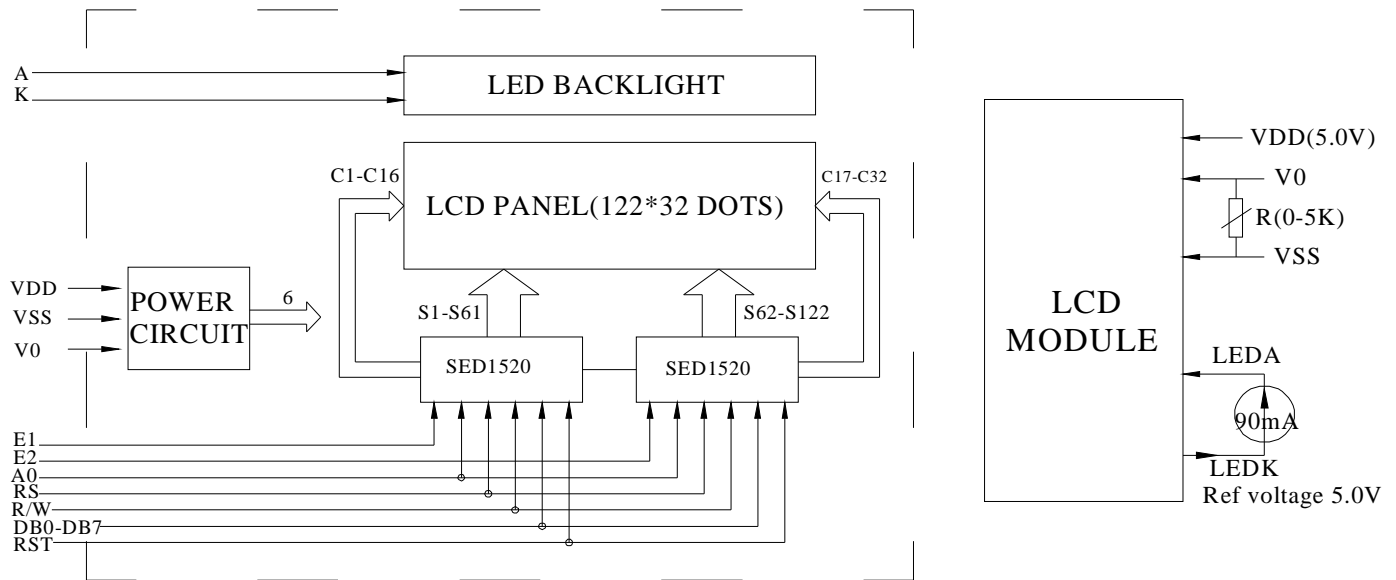
2. Mechanical Specifications

Dimensional outline (W*H*T)	: 84.0mm*44.0mm*12.8mm
Viewing area (W*H)	: 60.0mm*18.0mm
Dot pitch (W*H)	: 0.40mm*0.40mm
Dot size (W*H)	: 0.36mm*0.36mm
Weight	: Approx



outline dimension

3. Block Diagram & Power supply



4. Pin description

Pin No.	Pin Name	Function
1	VSS	Ground for logic
2	VDD	Power supply for logic
3	VO	Power supply for LCD driver
4	A0	Register selection (H : data register ; L : instruction register)
5	E1	Chip enable signal for ic1 (left half of the panel)
6	E2	Chip enable signal for ic2 (right half of the panel)
7	R/W	Read/write signal (H :read ; L : write)
8~15	DB0~DB7	Data bus
16	RST	Reset signal (Low effective)
17	A	Power supply for backlight+
18	K	Power supply for backlight-

5. Absolute Maximum Ratings

Items	Symbol	MIN.	MAX.	Unit	Condition
Supply Voltage	V _{DD}	-0.3	+7.0	V	V _{SS} = 0V
	V _{lcd}	-0.3	+7.0	V	V _{SS} = 0V
Input Voltage	V _{IN}	-0.3	V _{DD} +0.3	V	V _{SS} = 0V
LED forward current	I _f	0	140	mA	---
Operating Temperature	T _{OP}	-20	+70	°C	---
Storage Temperature	T _{st}	-30	+80	°C	---

6. Electrical Characteristics

6.1 DC Characteristics

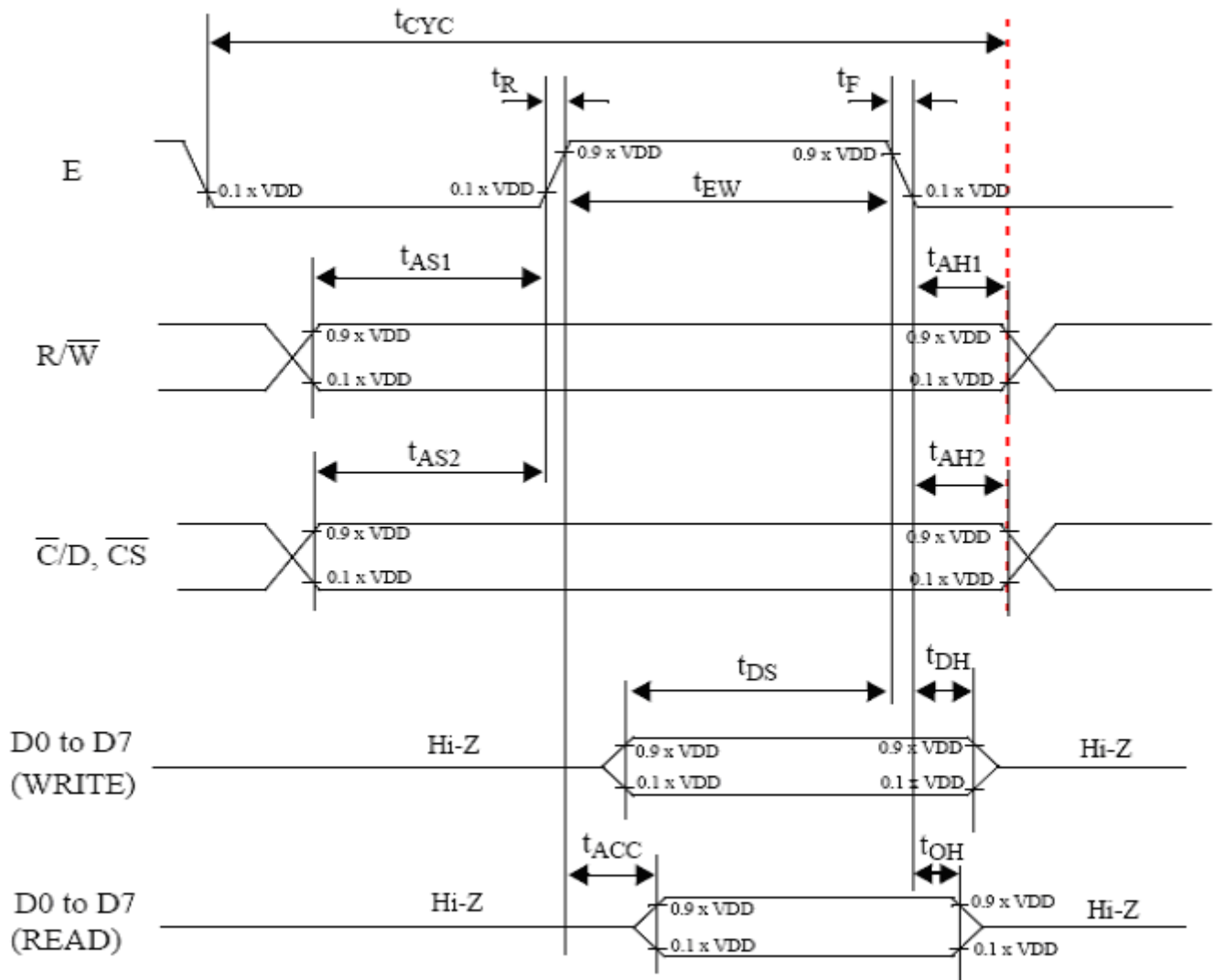
(V_{SS} = 0V, V_{DD} = 5.0V ± 10%, T_a = -20~75°C)

Items	Symbol	MIN.	TYP.	MAX.	Unit
Operating Voltage	V _{DD}	4.5	5.0	5.5	V
Input High Voltage	V _{IH}	V _{DD} -1.2	-	V _{DD}	V
Input Low Voltage	V _{IL}	0	-	0.8	V
Output High Voltage	V _{OH}	V _{DD} -0.3	-	V _{DD}	V
Output Low Voltage	V _{OL}	0	-	0.3	V
Supply Current	I _{DD}	---	2	3	mA

6.2 AC Characteristics

V_{DD} = 5 V ± 10%; V_{SS} = 0 V; T_{amb} = -20 °C to +75°C.

symbol	parameter	min.	max.	test conditons	unit
t _{AS1}	Address set-up time with respect to R/W	20			ns
t _{AS2}	Address set-up time with respect to C/D, CS	20			ns
t _{AH1}	Address hold time with respect to R/W	10			ns
t _{AH2}	Address hold time respect with to C/D, CS	10			ns
t _F , t _R	Enable (E) pulse falling/rising time		15		ns
t _{CYC}	System cycle time	1000			ns
t _{EWR}	Enable pulse width for READ	100			ns
t _{EWV}	Enable pulse width for WRITE	80			ns
t _{DS}	Data setup time	80			ns
t _{DH}	Data hold time	10			ns
t _{ACC}	Data access time		90		ns
t _{OH}	Data output hold time	10	60		ns



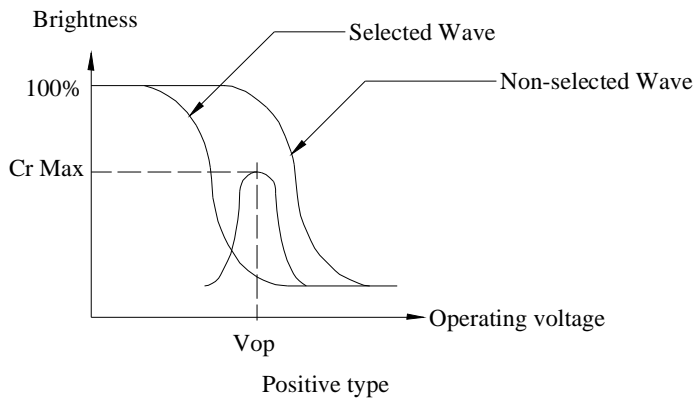
7. Backlight Characteristics

Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Forward Voltage	V_f	4.0	4.2	4.4	V	$I_f=90\text{mA}$
Reverse current	I_r	---	-	100	μA	$V_r=5\text{V}$
Peak wave length	λ	569	571	573	nM	$I_f=90\text{mA}$
Luminance	L_v	---	---	---	Cd/m^2	$I_f=90\text{mA}$
Color	Yellow-green					

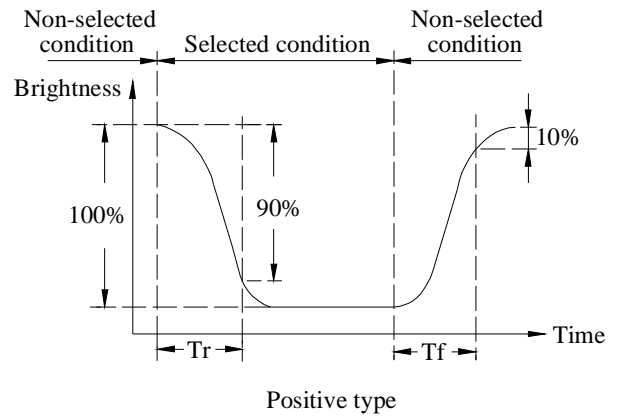
8. Electrical-Optical Characteristics

Items	Symbol	Condition	MIN.	TYP.	MAX.	Unit	NOTE
Operation Voltage	Vop	Ta= -20℃	4.7	5.0	5.3	V	1
		Ta= 25℃	4.2	4.5	4.8		
		Ta= 70℃	3.7	4.0	4.3		
Response time	Tr	Ta= 25℃	---	185	---	ms	2
	Tf		---	200	---		
Contrast ratio	Cr	Ta= 25℃	---	5	---	degree	3
Viewing angle range	θ	Cr \geq 2	-40	---	40		

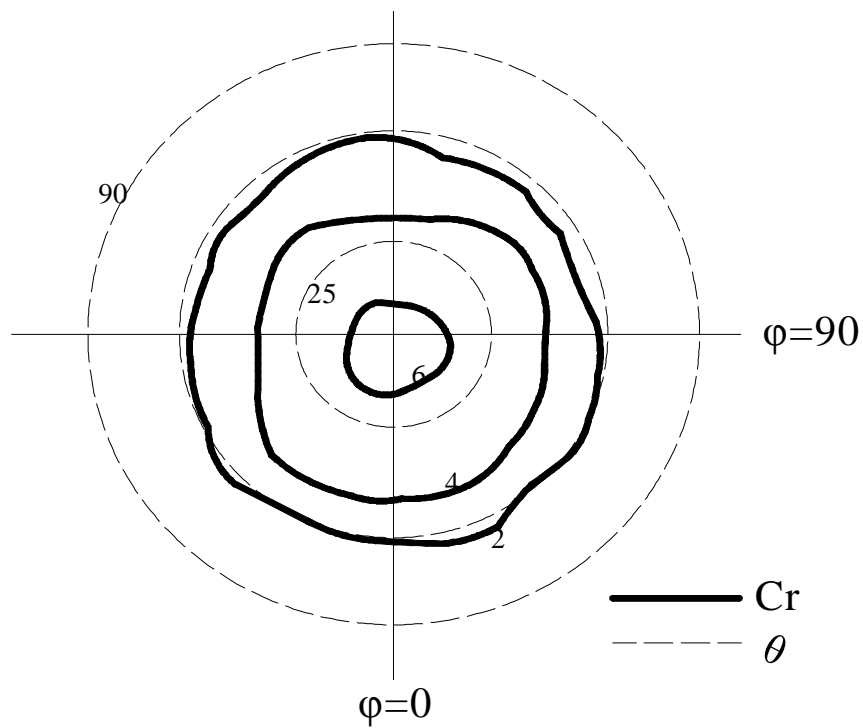
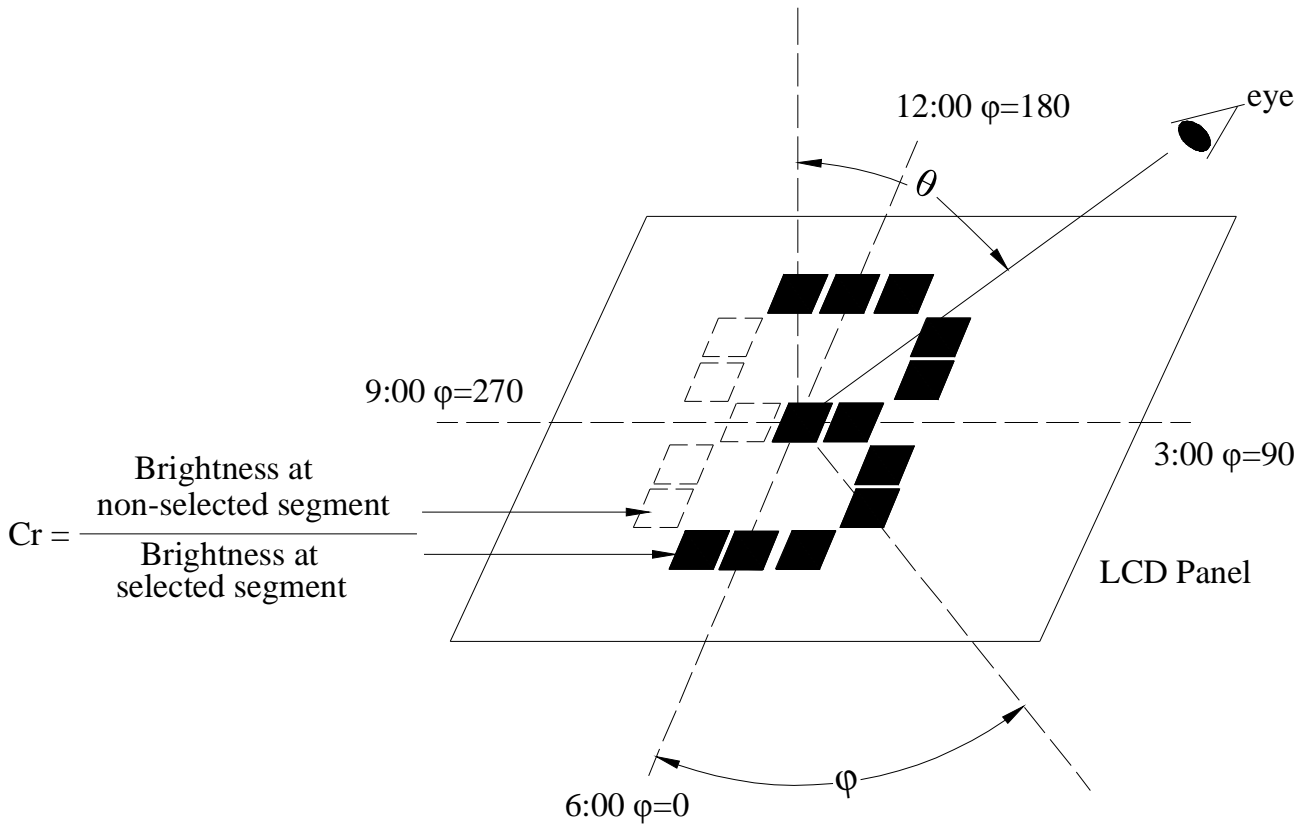
Note1 Definition of Operation voltage



Note2 Definition of Response time



Note3 Definition of Contrast ratio、 Viewing angle and direction

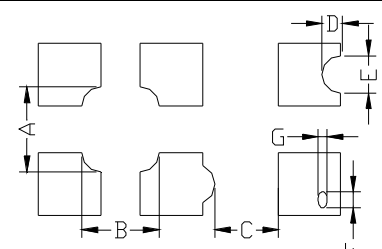


9. Control and display commands

	Command	Code										Function	
		A0	\overline{RD}	\overline{WR}	D7	D6	D5	D4	D3	D2	D1		D0
(1)	Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0/1	Turns all display on or off, independently of display RAM data or internal status. 1: ON 0: OFF (Power-saving mode with static drive on)*
(2)	Display start line	0	1	0	1	1	0	Display Start Address (0–31)				Specifies RAM line corresponding to uppermost line (COM0) of display.	
(3)	Set page address	0	1	0	1	0	1	1	1	0	Page (0–3)	Sets display RAM page in page address register.	
(4)	Set column (segment) address	0	1	0	0	Column Address (0–70)						Sets display RAM column address in column address register.	
(5)	Read status	0	0	1	Busy	ADC	ON/OFF	RESET	0	0	0	0	Reads the following status: BUSY 1: Internal operation, 0: Ready ADC 1: CW output (forward), 0: CCW output (reverse) ON/OFF 1: Display off, 0: Display on RESET 1: Being reset, 0: Normal
(6)	Write display data	1	1	0	Write Data							Writes data from data bus into display RAM.	Display RAM location whose address has been preset is accessed. After access, the column address is incremented by 1.
(7)	Read display data	1	0	1	Read Data							Reads data from display RAM onto data bus.	
(8)	Select ADC	0	1	0	1	0	1	0	0	0	0	0/1	Used to invert relationship of assignment between display RAM column addresses and segment driver outputs. 0: CW output (forward) 1: CCW output (reverse)
(9)	Static drive ON/OFF	0	1	0	1	0	1	0	0	1	0	0/1	Selects normal display or static driving operation. 1: Static drive (power-saving mode) 0: Normal driving
(10)	Select duty	0	1	0	1	0	1	0	1	0	0	0/1	Selects LCD cell driving duty. 1: 1/32 0: 1/16
(11)	Read modify write	0	1	0	1	1	1	0	0	0	0	0	Increments column address counter by 1 when display data is written. (This is not done when data is read.)
(12)	End	0	1	0	1	1	1	0	1	1	1	0	Clears read modify write mode.
(13)	Reset	0	1	0	1	1	1	0	0	0	1	0	Sets display start line register on the first line. Also sets column address counter and page address counter to 0.

* With display off (command (1)), static drive going on (9) invokes power-saving mode.

10. Inspection Standards

Item	Criterion for defects	Defect type
1) Display on inspection	(1) Non display (2) Vertical line is deficient (3) Horizontal line is deficient (4) Cross line is deficient	Major
2) Black / White spot	Size Φ (mm) $\Phi \leq 0.3$ Ignore (note) $0.3 < \Phi \leq 0.45$ 3 $0.45 < \Phi \leq 0.6$ 1 $0.6 < \Phi$ 0	Minor
3) Black / White line	Length (mm) Width (mm) Acceptable number $L \leq 10$ $W \leq 0.03$ Ignore $5.0 \leq L \leq 10$ $0.03 < W \leq 0.04$ 3 $5.0 \leq L \leq 10$ $0.04 < W \leq 0.05$ 2 $1.0 \leq L \leq 10$ $0.05 < W \leq 0.06$ 2 $1.0 \leq L \leq 10$ $0.06 < W \leq 0.08$ 1 $L \leq 10$ $0.08 < W$ follows 2) point defect Defects separate with each other at an interval of more than 20mm	Minor
4) Display pattern	 <p style="text-align: center;"> $\frac{A+B \leq 0.28}{2}$ $0 < C$ $\frac{D+E \leq 0.25}{2}$ $\frac{F+G \leq 0.25}{2}$ </p> <p>Note: 1) Up to 3 damages acceptable 2) Not allowed if there are two or more pinholes every three-fourth inch.</p>	Minor
5) Spot-like contrast irregularity	Size Φ (mm) Acceptable Number $\Phi \leq 0.7$ Ignore (note) $0.7 < \Phi \leq 1.0$ 3 $1.0 < \Phi \leq 1.5$ 1 $1.5 < \Phi$ 0 Note: 1) Conformed to limit samples. 2) Intervals of defects are more than 30mm.	Minor
6) Bubbles in polarizer	Size Φ (mm) Acceptable Number $\Phi \leq 0.4$ Ignore (note) $0.4 < \Phi \leq 0.65$ 2 $0.65 < \Phi \leq 1.2$ 1 $1.2 < \Phi$ 0	Minor
7) Scratches and dent on the polarizer	Scratches and dent on the polarizer shall be in the accordance with "2) Black/white spot", and "3) Black/White line".	Minor
8) Stains on the surface of LCD panel	Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning.	Minor
9) Rainbow color	No rainbow color is allowed in the optimum contrast on state within the active area.	Minor
10) Viewing area encroachment	Polarizer edge or line is visible in the opening viewing area due to polarizer shortness or sealing line.	Minor
11) Bezel appearance	Rust and deep damages that are visible in the bezel are rejected.	Minor
12) Defect of land surface contact	Evident crevices that are visible are rejected.	Minor
13) Parts mounting	(1) Failure to mount parts (2) Parts not in the specifications are mounted (3) For example: Polarity is reversed, HSC or TCP falls off.	Minor
14) Part alignment	(1) LSI, IC lead width is more than 50% beyond pad outline. (2) More than 50% of LSI, IC leads is off the pad outline.	Minor
15) Conductive foreign matter (solder ball, solder hips)	(1) $0.45 < \Phi$, $N \geq 1$ (2) $0.3 < \Phi \leq 0.45$, $N \geq 1$, Φ : Average diameter of solder ball (unit: mm) (3) $0.5 < L$, $N \geq 1$, L : Average length of solder chip (unit: mm)	Minor
16) Bezel flaw	Bezel claw missing or not bent	Minor
17) Indication on name plate (sampling indication label)	(1) Failure to stamp or label error, or not legible.(all acceptable if legible) (2) The separation is more than 1/3 for indication discoloration, in which the characters can be checked.	Minor

11. Reliability test

item	condition	criterion
High temp. operation	80°C 24hrs	No abnormality in function and appearance
High temp. storage	70°C 24hrs	
Low temp. operation	-20°C 24hrs	
Low temp. storage	-30°C 24hrs	
Humidity	40°C 90%RH 24hrs	
Thermal shock	0°C(30min) \rightarrow 50°C(30min) 10cycles	
Vibration	Frequency :10~55HZ Duration : 3times , 3min/time Amplitude : 0.75mm	-

12. Handling precautions

1. Refrain from strong mechanical shock and forces to the module. It may cause improper operating or damage to the module.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. When cleaning the display surface, use soft cloth with a solvent recommended : ethyl alcohol , isopropyl or hexane) and wipe gently, do not use the following solvents : water, ketone or aromatics .
3. Wipe off water or oil drop immediately If you leave drop for a long time, stain and discoloration may occur.
4. Do not touch pads or pins of interface directly with bare hands. When handling the LCD module, put on a soft glover like finger-glover.
5. Protect the module from static electricity, it may cause damage to CMOS LSI.
6. To prevent LCD panels from degradation, do not operate or store them exposed directly to sunlight or high temperature/humidity.
7. If the liquid crystal leaks from the panel it should be kept away from the eyes and mouths. In case of contact with skins, wash away thoroughly with soap and water.
8. Soldering should be only performed on the I/O terminals within the temperature of $280 \pm 20^\circ\text{C}$ and soldering time should be less than 4 seconds.
9. Supply voltage within the specified voltage limit, the maximum rating, higher voltage cause the shorter LCD life or damaged.
10. Do not input any signals before power is turned on. Do not connect or disconnect the module on the state of Power-ON.