SPECIFICATION

Character Type STN Dot Matrix LCD Module

JM320240C

SHENZHEN JINGHUA DISPLAYS CO.,LTD

● GENERAL SPECIFICATION

320 X 240 dot display

Samsung LCD driver: S6B2086X01

Interface with 8-bit MPU (directly connected to Z80 serial MPU)

Display Specification

Display Mode: graphic, text and combination text-graphic mode

Display Dot: 320 X 240

Display type: FSTN

Display color-Display background color: White

Polarizer mode:Positive.　Transflective.

Viewing angle: 9:00

Display duty: 1/240

Driving bias: 1/16

Memory and External Memory:

A standard 160-word character generator ROM

64K external display RAM (static RAM)

Mechanical characteristics (Unit:mm)

Extenal dimension：166*109*13.1
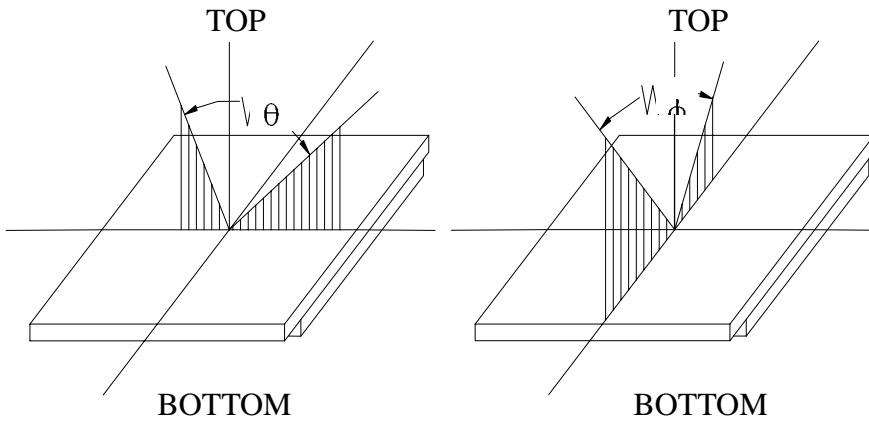
View area：122.0*92.0

Dot size：0.33*0.33

Dot pitch：0.36*0.36

POWER: negative power;+5V power

● Optical Characteristics

(1) Definition of viewing Angle
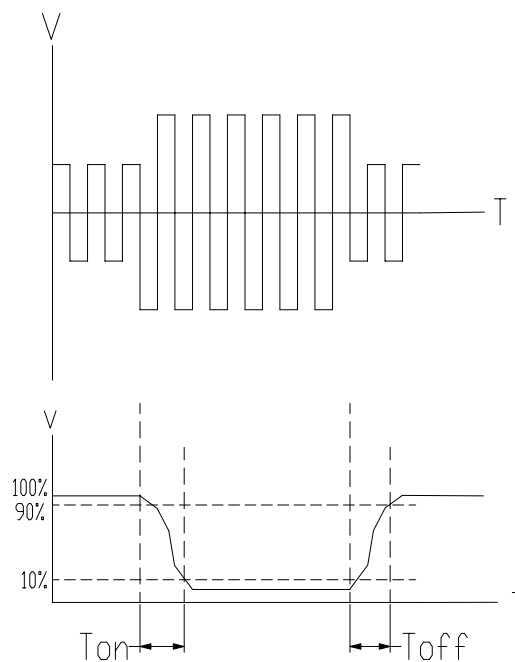

(2) Definition of Contrast Ratio:

$$\text{Contrast Ratio} = \frac{\text{Reflectance value of non-selected state brightness}}{\text{Reflectance value of selected state brightness}}$$
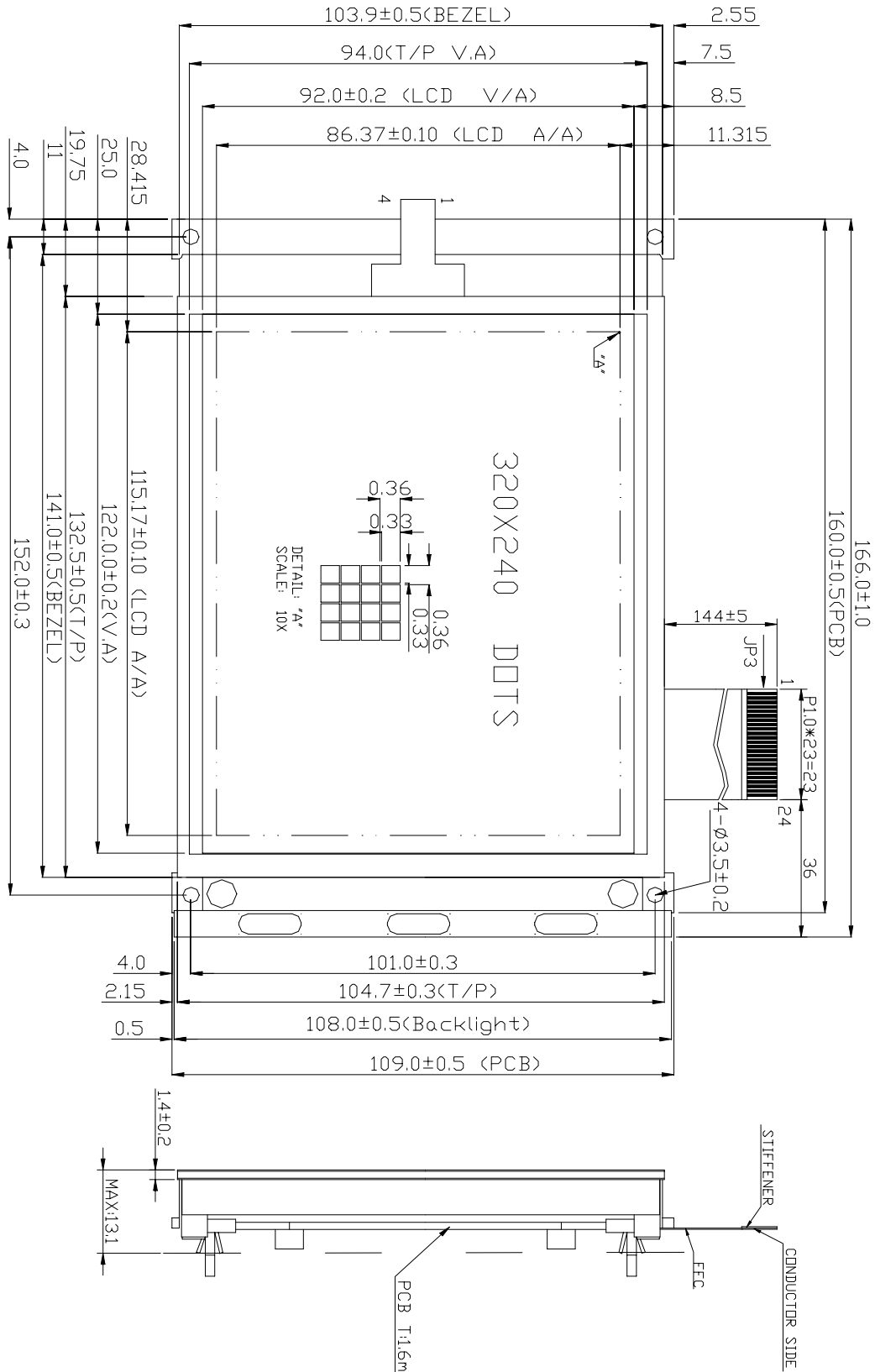
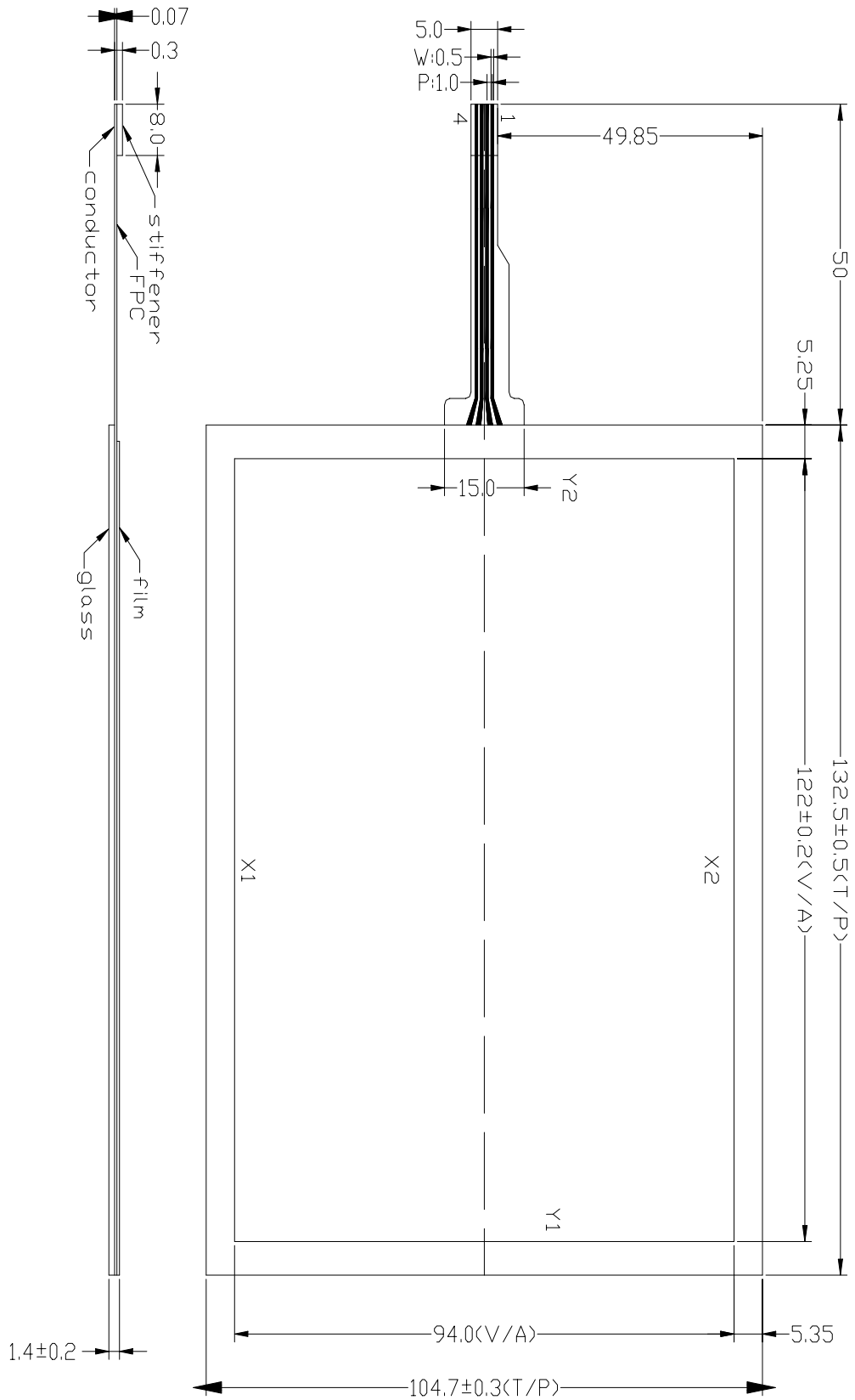Test condition : standard A light source

(3) Response Time

Response time is measured as the shortest period of time possible between the change

in state of an LCD segment as demonstrated below

● **External Dimension(For LED backlight and touch panel)**

103.9±0.5(BEZEL)
2.55
94.0(T/P V.A)
7.5
92.0±0.2 (LCD V/A)
8.5
86.37±0.10 (LCD A/A)
11.315

4.0
11
19.75
25.0
28.415

4
1

"A"

320X240 DOTS

0.36
0.33

DETAIL: "A"
SCALE: 10x

0.36
0.33

115.17±0.10 (LCD A/A)
122.0±0.2(V.A)
132.5±0.5(T/P)
141.0±0.5(BEZEL)
152.0±0.3

166.0±1.0
160.0±0.5(PCB)

144±5
JP3

1
P10*23=23
24
36

4-Ø3.5±0.2

4.0
101.0±0.3
2.15
104.7±0.3(T/P)
0.5
108.0±0.5(Backlight)
109.0±0.5 (PCB)

1.4±0.2
MAX:13.1

STIFFENER
CONDUCTOR SIDE
FFC
PCB T:1.6m

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● External Dimension(For LED backlight)

● TOUCH PANEL

● LED Backlight

Electrical/Optical Specifications:

	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	Vf	-	4.0	-	V	
Forward Currcnt	If	-	90	120	mA	Vf=4.0V
Power Dissipation	Pd	-	0.36	-	W	Vf=4.0V
Reverse Vollage	Vr	-	5.0	-	V	
Reverse Current	Ir	-	1.2	-	mA	
Luminous Intensity	Iv	-	160.0	-	Cd/m2	
Luminous Uniformity	-	70	-	-	%	Vf=4.0V
Chromaticity Coordinate	-	X=0.298 Y=0.305	-	X=0.328 Y=0.335	-	
Emission Wavclength	λ p	-	-	-	nm	If=15mA Ta=25℃ Each Chip
Spectral Range	△ λ	-	-	-	nm	

Absolute Maximum Ratings At Ta=25℃

Parameter	Symbol	Specification.	Unit	Remark
Power Dissipation	Pad	360	mW	
Forward Current	Iaf	90	mA	
Reverse Voltage	Vr	5	V	
Operating Temperature	Topr	-30℃ TO +85℃	℃	
Storage Temperature	Tstg	-40℃ TO +100℃	℃	

Electrical/Optical Characteristics At Ta=25℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Average Luminous Intensity	Iv	150	160		cd/m^2	Vf=4.0V
Luminous Intensity	-	70	-	-	%	
Chrornaticity Coordinatc	X	0.29	0.3	0.31	-	Vf=4.0V
	Y	0.26	0.3	0.33	-	
Forward Voltage	Vf	-	4.0	-	V	
Reverse Current	Ir	-	1.2	-	mA	

● Absolute Maximum Ratings

ITEM	Symbol	Min	Type	Max	Unit
Oprating temperature	Top	0	-	+50	℃
Storage temperature	Tst	-20	-	+70	℃
Input Voltage	Vi	-0.3	-	Vdd+0.3	V
Supply voltage for Logic	Vdd-Vss	-0.3	-	+7.0	V
Supply voltage for LCD	Vdd-V0	-0.3	-	+30.0	V
Static electricity	Be sure that you are grounded when handing LCM				

● Electrical Characteristics (Ta=25℃, Vdd= 5.0V)

Item	Symbol	Condition	Standard Value			Unit
			min	Type	max	
Supply Voltage for logic	Vdd-Vss	-	2.7	5.0	5.5	V
Supply Voltage for LCD	Vdd-V0	-	-	24.0	-	V
Input high voltage	Vih	-	0.8Vdd	-	Vdd	V
Input low voltage	Vil	-	-	-	0.2Vdd	V
Output high voltage	Vo_h	Ioh=0.4mA	Vdd-0.4	-	-	V
Output high voltage	V_{ol}	Iol=0.4mA	-	-	0.4	V
Supply Current for logic	*Idd	-	-	6	10	mA
Frame frequency	FLM	-	35	-	150	Hz
M signal frequency	Fm	-	35	-	150	Hz

*Idd Measurement condition is for all pixels on display.

● **Block Diagram**
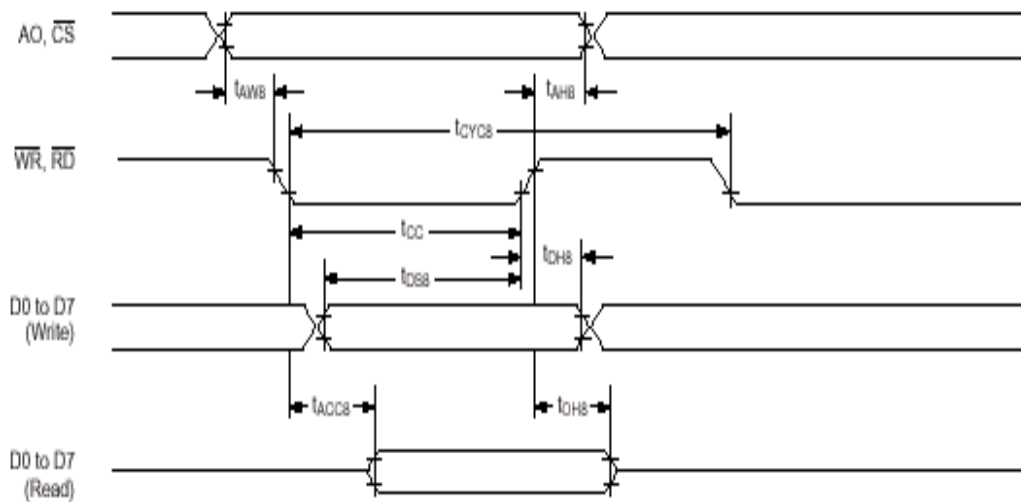
FLM

/DISPOFF

LP

VDD,VSS,VO

D0-D3

CP

A

K

(Diagram labels: Y-Driver*3 — 240 → 240; LCD PANEL 320; 320; X-Driver*4; TIMING CIRCUIT; POWER CIRCUIT SUPPLY; BACKLIGHT)

● 8080 family interface timing

Ta = −20 to 75°C

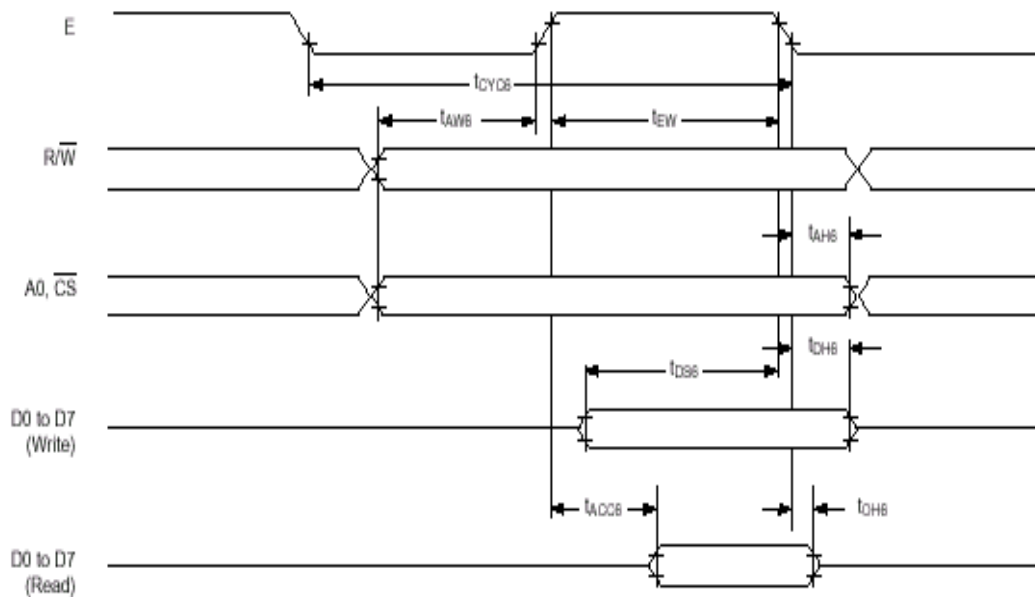| Signal	Symbol	Parameter	VDD = 4.5 to 5.5V		VDD = 2.7 to 4.5V		Unit	Condition
			min	max	min	max		
A0, $\overline{CS}$	tAH8	Address hold time	10	—	10	—	ns	CL = 100pF
	tAW8	Address setup time	0	—	0	—	ns	
$\overline{WR}$, $\overline{RD}$	tCYC8	System cycle time	See note.	—	See note.	—	ns	
	tCC	Strobe pulsewidth	120	—	150	—	ns	
D0 to D7	tDS8	Data setup time	120	—	120	—	ns	
	tDH8	Data hold time	5	—	5	—	ns	
	tACC8	$\overline{RD}$ access time	—	50	—	80	ns	
	tOH8	Output disable time	10	50	10	55	ns	

Note: For memory control and system control commands:

$$t_{CYC8} = 2t_C + t_{CC} + t_{CEA} + 75 > t_{ACV} + 245$$

For all other commands:

$$t_{CYC8} = 4t_C + t_{CC} + 30$$

● 6800 family interface timing

Note: t_{CYC6} indicates the interval during which CS is LOW and E is HIGH.

Ta = –20 to 75°C

Signal	Symbol	Parameter	VDD = 4.5 to 5.5V		VDD = 2.7 to 4.5V		Unit	Condition
			min	max	min	max		
A0, CS̄, R/W̄	tCYC6	System cycle time	See note.	—	See note.	—	ns	CL = 100 pF
	tAW6	Address setup time	0	—	10	—	ns	
	tAH6	Address hold time	0	—	0	—	ns	
D0 to D7	tDS6	Data setup time	100	—	120	—	ns	
	tDH6	Data hold time	0	—	0	—	ns	
	tOH6	Output disable time	10	50	10	75	ns	
	tACC6	Access time	—	85	—	130	ns	
E	tEW	Enable pulsewidth	120	—	150	—	ns	

Note: For memory control and system control commands:

$$t_{CYC6} = 2t_C + t_{EW} + t_{CEA} + 75 > t_{ACV} + 245$$

For all other commands:

$$t_{CYC6} = 4t_C + t_{EW} + 30$$

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● AC CHARACTERISTICS

(1) SEGMENT DRIVER APPLICATION

(Vss = 0 V, Ta = -30 ~ +85°C)

| Characteristic	Symbol	Test Condition	(1) VDD=5 V ± 10%			(2) VDD=3 V ± 10%			Unit
			MIN	TYP	MAX	MIN	TYP	MAX	
Clock cycle time	t_{CY}	Duty=50%	125	-	-	250	-	-	ns
Clock pulse width	t_{WCK}	-	45	-	-	95	-	-	
Clock rise/fall time	$t_{R/tF}$	-	-	-	-	-	-	30	
Data set-up time	t_{DS}	-	30	-	-	65	-	-	
Data hold time	t_{DH}	-	30	-	-	65	-	-	
Clock set-up time	t_{CS}	-	80	-	-	120	-	-	
Clock hold time	t_{CH}	-	80	-	-	120	-	-	
Propagation delay time	t_{PHL}	ELB Output	-	-	60	-	-	125	
		ERB Output			60			125	
ELB,ERB set-up time	t_{PSU}	ELB Input	30	-	-	65	-	-	
		ERB Input	30			65			
DISPOFFB low pulse width	t_{WDL}	-	1.2	-	-	1.2	-	-	μs
DISPOFFB clear time	t_{CD}	-	100	-	-	100	-		ns
M - OUT propagation delay time	t_{PD1}		-	-	1.0	-	-	1.2	μs
CL1 - OUT propagation delay time	t_{PD2}	CL=15 pF	-	-	1.0	-	-	1.2	
DISPOFFB - OUT propagation delay time	t_{PD3}		-	-	1.0	-	-	-	

● AC CHARACTERISTICS(CONTINUED)

(2) COMMON DRIVER APPLICATION

(Vss = 0 V, Ta = -30 ~ +85°C)

Characteristic	Symbol	Test Condition	(1) VDD=5 V ± 10%			(2) VDD=3V±10%			Unit
			MIN	TYP	MAX	MIN	TYP	MAX	
Clock cycle time	t_{CY}	Duty=50%	250	-	-	500	-	-	ns
Clock pulse width	t_{WCK}	-	45	-	-	95	-	-	
Clock rise/fall time	$t_{R/tF}$	-	-	-	50	-	-	50	
Data set-up time	t_{DS}	-	30	-	-	65	-	-	
Data hold time	t_{DH}	-	30	-	-	65	-	-	
DISPOFFB low pulse width	t_{WDL}	-	1.2	-	-	1.2	-	-	μs
DISPOFFB clear time	t_{CD}	-	100	-	-	100	-	-	ns
Output delay time	t_{DL}	CL=15 pF	-	-	200	-	-	250	
M - OUT propagation delay time	t_{PD1}		-	-	1.0	-	-	1.2	μs
CL1 - OUT propagation delay time	t_{PD2}		-	-	1.0	-	-	1.2	
DISPOFFB - OUT propagation delay time	t_{PD3}		-	-	1.0	-	-	1.2	

● AC CHARACTERISTICS(CONTINUED)

(3) SEGMENT DRIVER APPLICATION TIMING
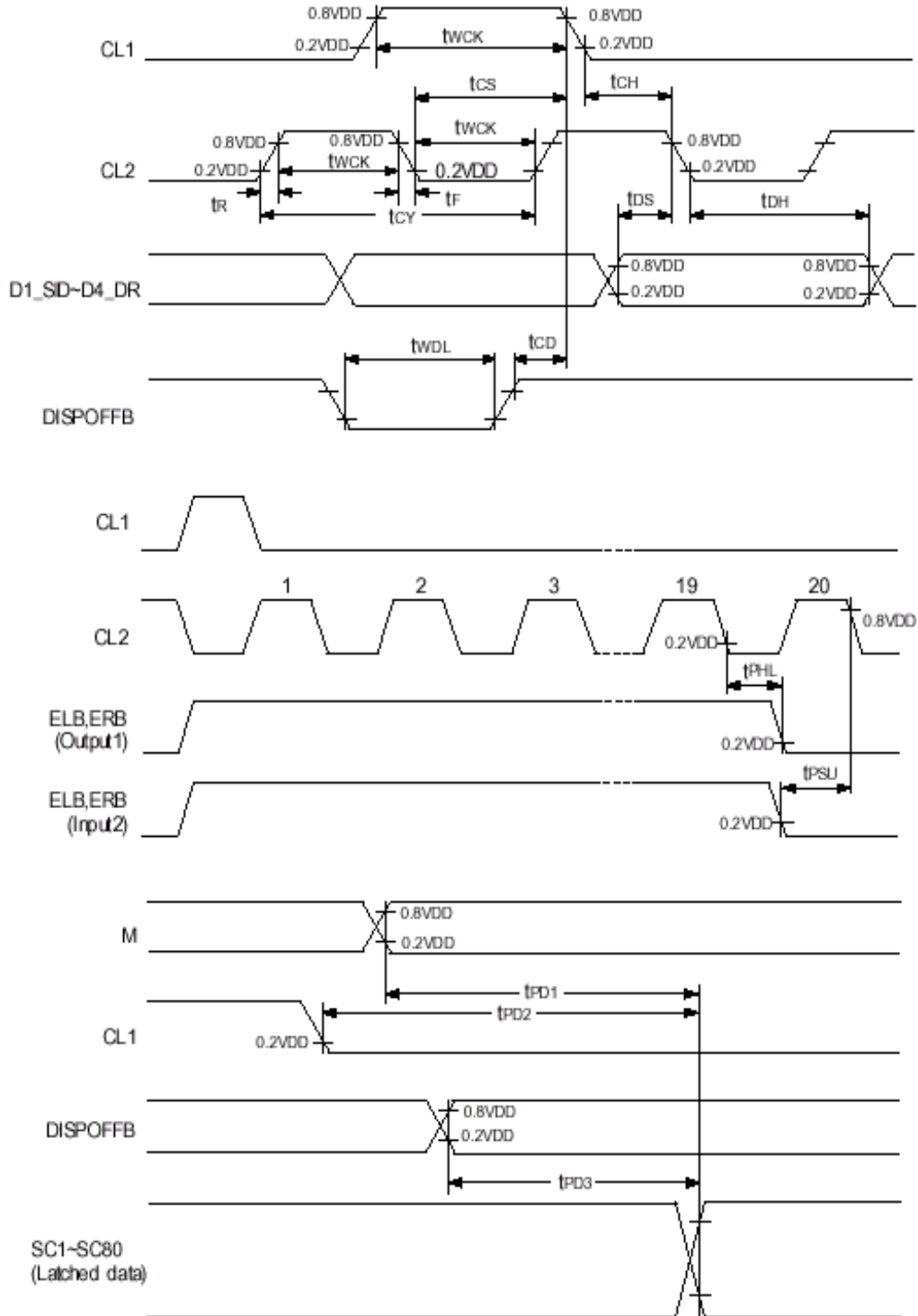
● AC CHARACTERISTICS(CONTINUED)

(4) COMMON DRIVER APPLICATION TIMING
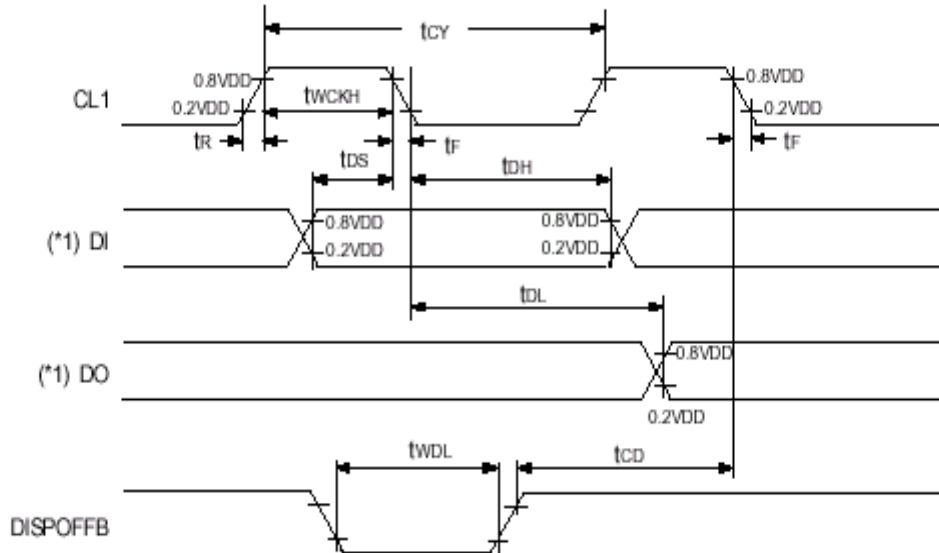
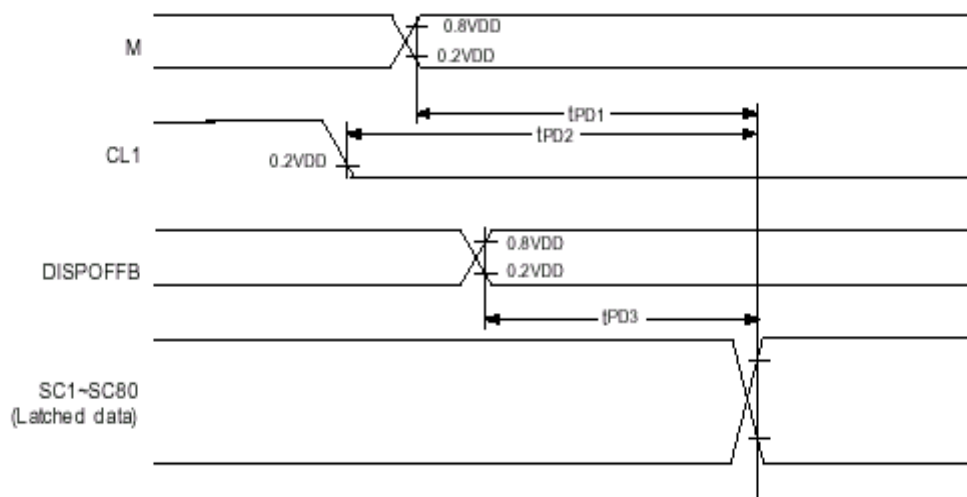(*1) When in single-type interface mode
   DI ⇒ D2_DL(SHL="L"), D4_DR(SHL="H")
   DO ⇒ D4_DR(SHL="L"), D2_DL(SHL="H")
When in dual-type interface mode
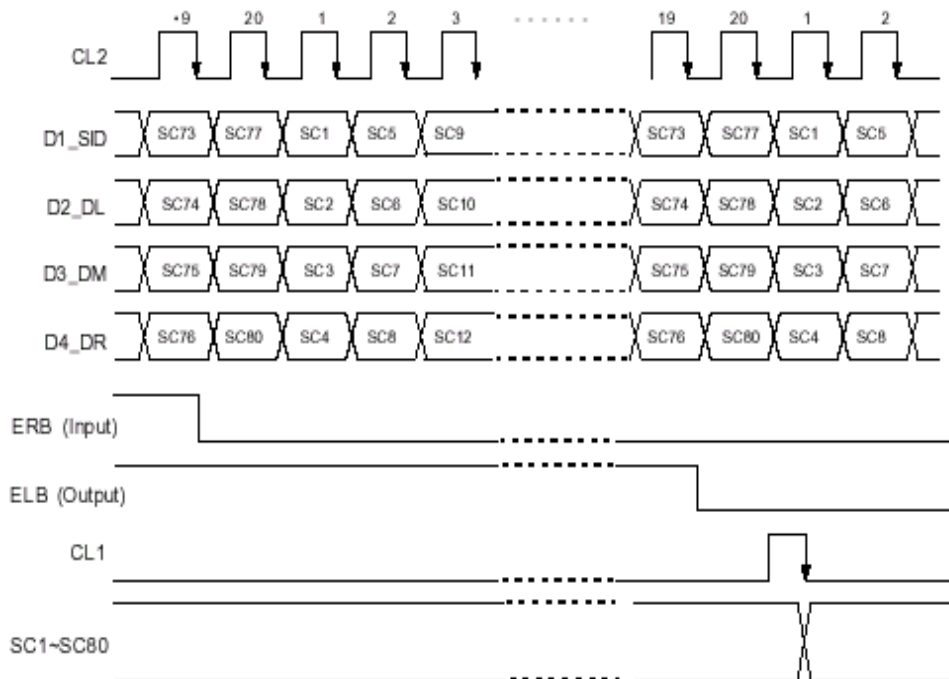   DI ⇒ D2_DL and D3_DM(SHL="L"), D4_DR and D3_DM(SHL="H")
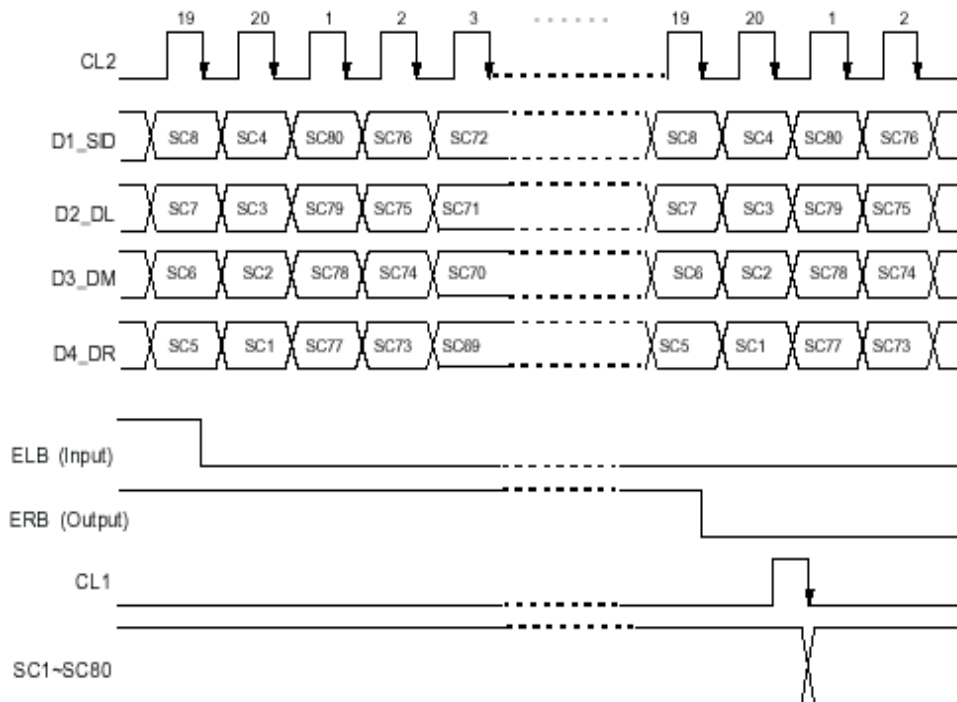   DO ⇒ D4_DR(SHL="L"), D2_DL(SHL="H")

● OPERATION TIMING DIAGRAM
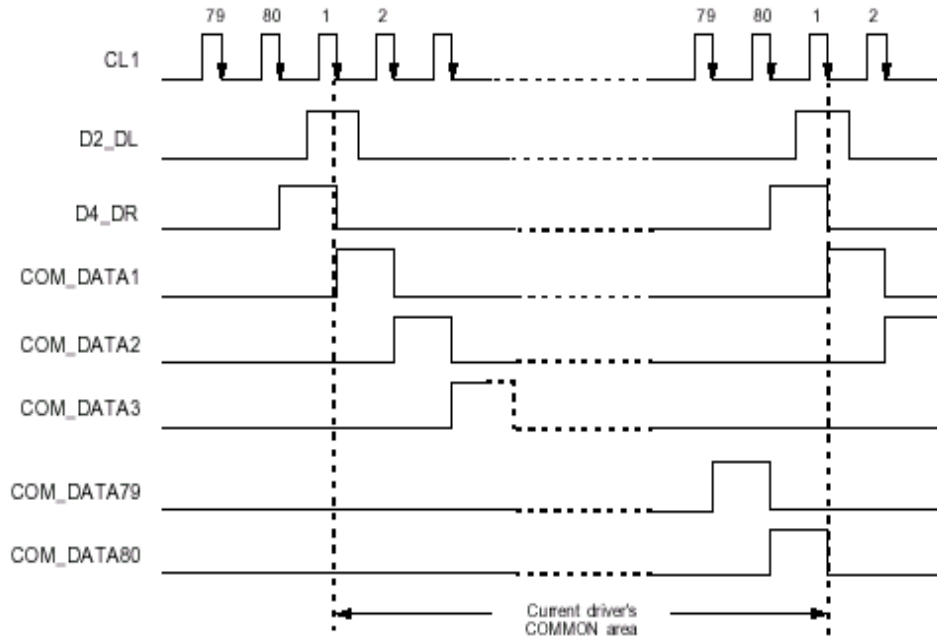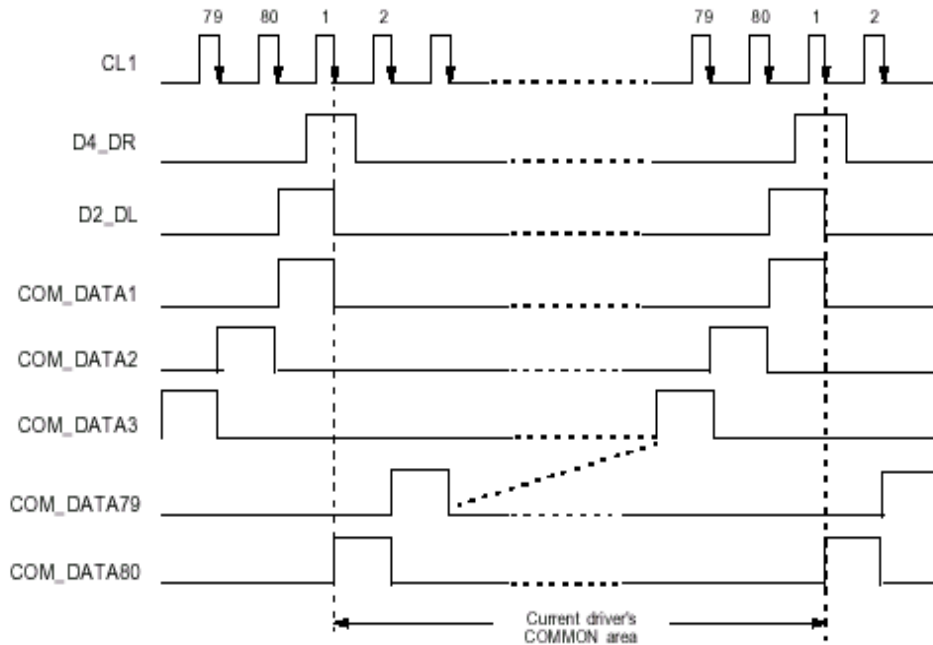
4-BIT PARALLEL MODE INTERFACE SEGMENT DRIVER

When SHL = "Low"

When SHL = "High"

SINGLE-TYPE INTERFACE MODE COMMON DRIVER

When SHL = "Low"

When SHL = "Low"

● **Pin assignment**

JP3:

Pin NO.	Symbol	Function	I/O
1	D0		I/O
2	D1		I/O
3	D2	Data Bus	I/O
4	D3		I/O
5	/DISPOFF	H:ON L:OFF	I
6	FLM	First LINE MARKER	I
7	NC	/	/
8	LP	LATCH PULSE	
9	CP	DATA SHIFT2	I
10	VDD	POWER SUUPLY FOR LOGIC	P
11	VSS	GND	P
12	VEE	POWER SUUPLY FOR LCD	P
13	V0	OPERATING VOLTAGE LCD DRIVING	
14	FG	FRAME GROUND	
15	X1	TOUCH PANEL LOW SIGNAL IN Y AXIS	I/O
16	X2	TOUCH PANEL UPPER SIGNAL IN Y AXIS	I/O
17	Y1	TOUCH PANEL RIGHT SIGNAL IN X AXIS	I/O
18	Y2	TOUCH PANEL LEFT SIGNAL IN X AXIS	I/O
19	NC	/	/
20	A	ANODE of LED UNIT	/
21	K	CATHODE of LED UNIT	/
22	NC	/	/
23	NC	/	/
24	NC	/	/

● LCD Driving Source(1/16 Bias)
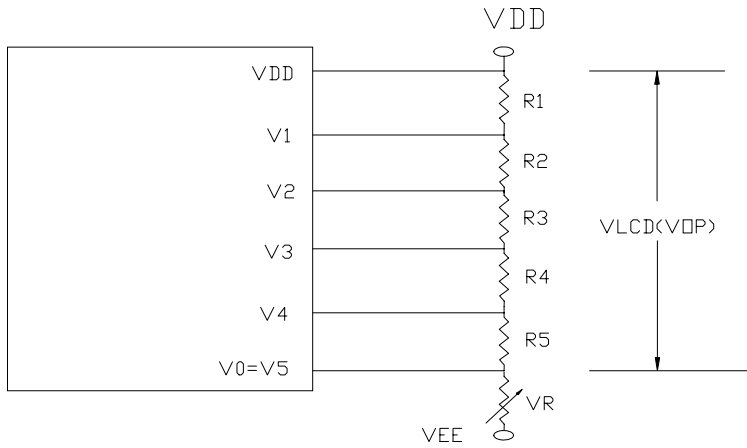
V1=Vdd - 1/16Vlcd

V2= Vdd - 2/16Vlcd

V3=Vdd - 14/16Vlcd

V4= Vdd - 15/16Vlcd

V5= Vdd - Vlcd

Dual Supply Voltage Types
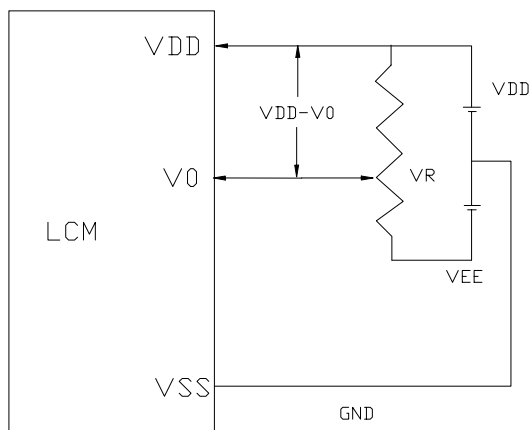
Vdd-V0: LCD Driving Voltage

● Quality Units

1.Quality level

 1.1 Inspection conditions

　1.1.1The environmental conditions for inspection shall be as follows

　　　Room temperature: 22±5℃

　　　Humidity 　　　: 65±20%RH

　1.1.2 The external visual inspection

　　　The inspection shall be performed by using a single 20W fluorescent lamp for illumination and the distance from LCD to eyes of the inspector should be 30±5cm.

　1.1.3 Light method

Display surface

Fluorescent lamp set the perpendicular to the display surface
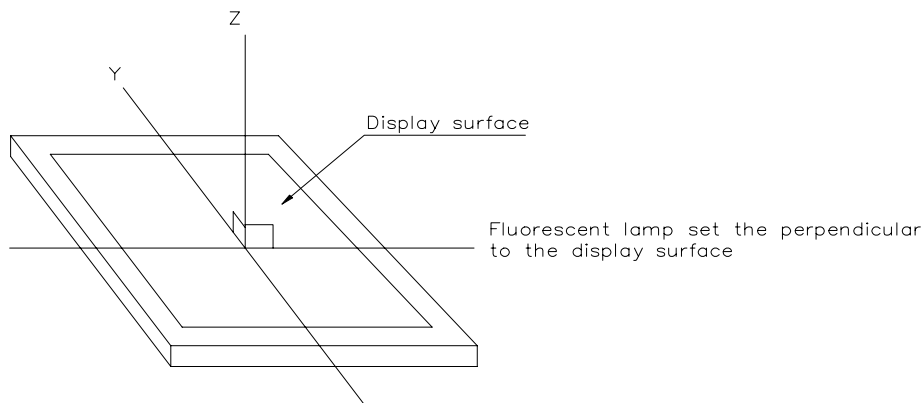
　1.1.4 Inspection distance and angle
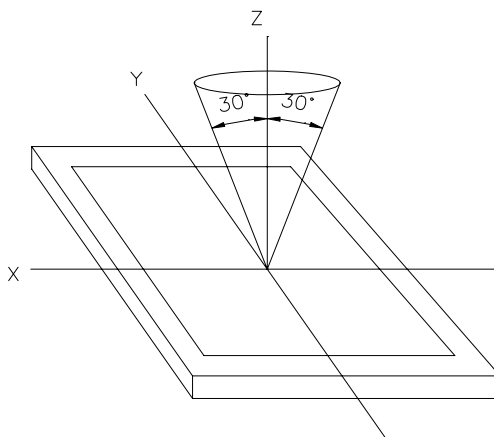
Inspection should be performed within Φ(Φ is usually 30°) from Z axis to each X and Y axis.

Inspection distance of any direction within Φ must be kept 30±5cm to the display surface.

1.2 Sampling procedures for each item's acceptance level table

Defect type	Sampling procedures	AQL
Major defect	GB2828-87 single sampling plans for normal inspection.	0.65
Minor defect	GB2828-87 single sampling plans for normal inspection.	1.5

1.3 Classification of defects

1.3.1 Major defect

A major defect refers to a defect that is considered to substantially degrade usability for product applications.

1.3.2 Minor defect

A minor defect refers to a defect that is not considered to substantially degrade product application, or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation

2. Nonconforming Analysis and Deal With Manner

2.1 Nocconforming analysis

(1)Customer should supply the detal data of nonconforming sample and the non-suitable sample.

(2)After accepting detail data non-suitable sample from customer,the analysis of nonconforming should be finished in two weeks.

2.2 Deal with nonconforming

(1)Both supplier and customer should analyze the reason together and discuss the disposition of nonconforming when the reason of

nonconforming is not sure.

3. Standard of The Product Appearance Test

  3.1 manner of appearance test

   (1)The test must be under 20w*2 or 40w fluorescent light ,and the distance of view must be at 30 cm.

   (2)When test the model of transmissive product must add the reflective plate.

   (3)The test direction is base on about around 45° of vertical line.

   (4)Definition of area:

"A" ZONE : dots area (Viewing Area)
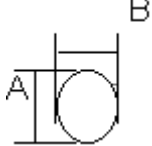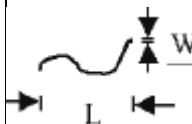
"B" zone : out of dots area
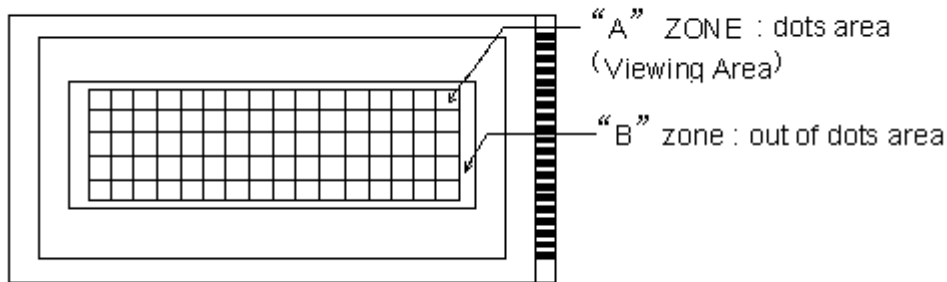
     A area: dots area.

     B area: out of dots area.(outside dots area)

  3.2 basic principle:

   (1)it will accord to the AQL when the standard can not be described.

   (2)the sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

   (3)must add new item on time when it is necessary.

  3.3 standard of inspection (unit:mm)

NO	Itms	Criterion of defects				AQL
01	Electrical testing	Display Missing,Short-circuit; No Display,Display malfunction; Current consumption exceeds product specifications; LCD viewing angle defect; Mixed product types; Contrast defect.				Major
02	Black or white spots on LCD(display only)	White and black spots on display 0.25mm ,no more than three white or black spots present. No more than two spots or lines within 3mm.				Minor
03	LCD black or white spots, (non-display) contamination (non-display)	D=(A+B)/2	Size D(mm)		Acceptable number	Minor
			D≤0.15		Ignore	
			0.15 D≤0.20		3	
			0.20 D≤0.25		2	
			0.25 D≤0.30		1	
04	Dark lines and scratches		Width (mm)	Length (mm)	Acceptable number	Minor
			W≤0.03	L≤3.0	3	
			0.03 W≤0.05	L≤2.0	2	
			0.05 W≤0.08	L≤2.0	1	
			0.08 W ≤0.1	L≤3.0	0	
			0.1 W	L>3.0	0	
05	bubble in polarizer	Size D (mm)		Acceptable number		Minor
		D≤0.20		Ignore		
		0.20 D≤0.40		3		
		0.40 D≤0.60		2		
		0.60 D		0		

06	Display Pattern	(1)Dot type Unit: mm $(A+B)/2 \leqslant 0.25$ $C \geqslant 0$ $(D+E)/2 \leqslant 0.25$ $(F+G)/2 \leqslant 0.25$ Note: 1) Acceptable up to 3 damages. 2) If there're two or more pinholes per digit, it is rejected.	Minor

07	Chip in corner		Minor

a	b	c	Acceptable number
a 4mm	b $\leqslant$ W	C $\leqslant$ T	3

08	Chip in seal area		Minor

a	b	c	Acceptable number
a 3mm	b ≤ 1.5mm	c ≤ 1/2T	3

Chip is rejectable, if c is greater than 50% of the glass thickness or the seal area is damaged.

09	Chip in pad(1)		Minor

a	b	c	Acceptable number
a ≤ 2mm	b ≤ W/4	c ≤ T	ignore
a ≤ 3mm	b ≤ W/4	c ≤ T	3

10	Chip in pad(2)					Minor
		a	b	c	Acceptable number	
		a ≤ 2mm	b ≤ W/3	c ≤ T	ignore	
		a ≤ 4mm	b ≤ W/2	c ≤ T	3	
11	Chip in other sides					Minor
		a	b	b	Acceptable number	
		a ≤ 3mm	b ≤ 1mm	c ≤ T	ignore	
		a ≤ 4mm	b ≤ 1.5mm	c ≤ T	3	
12	Glass rest					Minor
		a ≤ 1/4W				

13	Black light	1、 lumimation source flikers when it. 2、 Spots or scratches that apper when lit must be judged using LCD spot,lines and contamination standards. 3、 Backlight doesn't light or color is wrong. 4、 Colour and luminance of backlight isn't permission to exceed criterion that customer affirmed.	0.65 1.5 0.65 0.65
14	PCB COB	1、 COB seal may not have pinholes larger than 0.2mm or contamination. 2、 COB seal surgace may not have pinholes through to the IC 3、 The height of the COB should not exceed the height indicated in the assembly diagram. 4、 There may not be more than 2mm of sealant outside the seal area on the PCB.And there should be no more than three places. 5、 No oxidation or contamination PCB terminals. 6、 Parts on PCB must be the same as on the production charactersitic chart.There should be no wrong parts,,,missing partsor excess parts. 7、 The jumper on the PCB should conform to the product characteristic chart. 8、 If solder gets on bezel tab pads, LED pad,zebra pad or screw hole pad,make sure it is smoothed down.	Minor Minor Major Minor Minor Major Minor Major
15	Soldering	1、 No unmelted solder paste may be present on the PCB. 2、 No cold solder joints,missing solder connections,oxidation or icile. 3、 No short circuits in components on PCB. 4、 No short cicuits in components on PCB.	Minor Minor Minor Major
16	General appearance	1、 No oxidation,contamiation,curves or, bends on interface Pin or TCP. 2、 No cracks on interface pin of TCP. 3、 No contamination.solder residue or solder balls on product. 4、 The IC on the TCP may not be damaged, circuits.	Minor Major Minor **Minor**

		5、 The uppermost dege of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever.	Minor
		6、 The residual rosin or tin oil of sldering (compontnt or chip component) is not bumed into brown or black color.	Minor
		7、 Sealant on top of the ITO circuit has not hardeed .	Minor
		8、 Pin type must match type in specification sheet.	Major
		9、 LCD pin loose or missing pins.	Major
		10、 Product packaging must the same as specified on packaging specification sheet.	Major
		11、 Product dimension and structure must conform to product specification sheet.	Major
		12、 The appearance of Heat Seal should not admit any dirt and break.	Major

3、Standard specification for reliability of LCD Module

ITEM	Condition	Criterion
1)High temperature operating	50℃ 24h	Total current consumption should be below double of initial value. Cosmetic defects should not be happened.
2)Low temperature operating	-30℃ 8h	
3)Humidity(without polarizer)	40℃　90%RH　240hours	
4)High temperature storage	60℃ 16hours	
5)Low temperature storage	-10℃ 8hours	
6)Thermal shock storage	-20℃→25℃→70℃→25℃ 30min　　5min　　30min 5min 5cycle	

7)Vibration (package state)	10 ~ 150Hz 5m/s^2 45min	
8)Shock test (package state)	50Hz amplitude :0.7mm 30min for each direction (X.Y.Z)	