KENTEC DISPLAY

K200QAS-V1-F

Product

Standard LCD Module
176 x RGB x 220 Dots
2.0" 262K colors TFT display
Wide temperature
With white LED backlight
With resistive touch screen

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1. Document revision history :

DOCUMENT REVISION	DATE	DESCRIPTION	PREPARED BY	APPROVED BY
01	2010.12.11	Preliminary.	MF Zou	
02	2010.12.15	Change pinout symbol and module dimensions	MF Zou	

2. General Description

- 2.0"(diagonal), 176 x RGB x 220 dots, 262K colors, Transmissive, TFT LCD module.
- Viewing Direction: 12 o'clock.
- Driving IC: ILI9225B or equivalent TFT controller/driver.
- 16-bits or 18-bits data bus (parallel RGB interface/8080 system interface/SPI interface).
- With internal voltage booster.
- With 4-wire resistive touch screen.
- Logic voltage: 3.3V (typ.).

3. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameter		Specifications	Unit
Outline dimensions		37.68(W) x 51.3(H) x 3.85(D) (Exclude FPC, cables of backlight)	mm
Color TFT 176xRGBx220	View area	33.68(W) x 45.04(H)	mm
	TP view area	33.68(W) x 45.04(H)	mm
	LCD active area	31.68(W) x 39.6(H)	mm
	Display format	176 x RGB x 220	dots
	Color configuration	RGB stripes	-
	Dot size	0.18(RGB)(W) x 0. 18(H)	mm
Weight		T.B.D.	grams

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PIN ASSIGNMENT

NO.	SYMBOL	NO.	SYMBOL
1	LED_A	24	DB12
2	LED_K1	25	DB13
3	LED_K2	26	DB14
4	LED_K3	27	DB15
5	NC	28	DB16
6	VDD	29	DB17
7	VSS	30	RD
8	IM0	31	RS
9	IM1	32	SDO
10	IM2	33	SDI
11	IM3	34	WR(SCL)
12	DB0	35	CS
13	DB1	36	RST
14	DB2	37	ENABLE
15	DB3	38	DCLK
16	DB4	39	HSYNC
17	DB5	40	VSYNC
18	DB6	41	VSS
19	DB7	42	YU
20	DB8	43	XL
21	DB9	44	YD
22	DB10	45	XR
23	DB11		

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PROJECTION	PART TYP: Spec Sheet
UNIT mm	K200QAS-V1-F

SCALE:	FIT	
SHEET:	1	OF 1
GENERAL TOL: ± 0.2	MODEL NUMBER	
	K200QAS	DO NOT SCALE THIS DRAWING.

APPROVALS	DATE
APP:	
CHK:	
DWN: MF Zou	2010-12-15

LED BACKLIGHT CIRCUIT

LED_K1
LED_K2
LED_K3
LED_A

Recommended connector:
HRS:FH26-45S-0.3SHW

PULL TAPE

XR
YU
XL
YD

NOTES:
1. DISPLAY TYPE: 2.0 INCH TFT−LCD, 262K COLOR
2. BACKLIGHT: White LEDs
3. :CRITICAL DIMENSION, ():REFERENCE DIMENSION
4. MEASURING UP THE ROHS RULES

REV 版本	DESCRIPTION 描述	DATE 日期
01	1st ISSUE	2010-12-15

3-Φ0.7±0.1
36.68±0.1
D.S.T T=0.05mm
3-0.50
2-0.5
50.3±0.1
1.0max
3.85
13.80
5.00
9.30
3.65±0.10 (Not include D.S.T)
3-0.6
0.14
2.00
2.50
3.01
37.68±0.2
37.40(TP)
33.68 (TP V.A)
32.68 (TP A.A)
31.68 (LCD A.A)
2.80
2.50
2.00
39.60(LCD A.A)
44.15(TP A.A)
45.04(TP V.A)
50.90(TP)
51.30±0.2

Figure 1: Outline Drawing

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4. Interface signals

Table 2: Pin assignment

Pin No.	Symbol	Description
1	LED_A	Power supply for LED backlight
2	LED_K1	
3	LED_K2	
4	LED_K3	
5	NC	No connection
6	VDD	Power supply.
7	VSS	Power supply (system ground)
8-11	IM0-IM3	Select the MPU interface mode <table><tr><th>IM3</th><th>IM2</th><th>IM1</th><th>IM0</th><th>MPU interface mode</th><th>DB pin in use</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>M68-system 16-bit interface</td><td>DB[17:10], DB[8:1]</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>M68-system 8-bit interface</td><td>DB[17:10]</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>i80-system 16-bit interface</td><td>DB[17:10], DB[8:1]</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>i80-system 8-bit interface</td><td>DB[17:10]</td></tr><tr><td>0</td><td>1</td><td>0</td><td>ID</td><td>24-bit 4 wires Serial Peripheral Interface (SPI)</td><td>SDI, SDO, SCL, CS</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>9-bit 3 wires Serial Peripheral Interface</td><td>SDA, SCL, CS</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>8-bit 4 wires Serial Peripheral Interface</td><td>SDA, SCL, CS, RS(D/CX)</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>M68-system 18-bit interface</td><td>DB[17:0]</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>M68-system 9-bit interface</td><td>DB[17:9]</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>i80-system 18-bit interface</td><td>DB[17:0]</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>i80-system 9-bit interface</td><td>DB[17:9]</td></tr><tr><td>1</td><td>1</td><td>*</td><td>*</td><td>Setting invalid</td><td></td></tr></table> When the serial peripheral interface is selected, IM0 pin is used for the device code ID setting.

12-29	DB[0-17]	18-bit parallel bi-directional data bus for MPU system interface mode
		  8-bit I/F: DB[17:10] is used.
		  9-bit I/F: DB[17:9] is used.
		  16-bit I/F: DB[17:10] and DB[8:1] is used.
		  18-bit I/F: DB[17:0] is used.
		18-bit parallel bi-directional data bus for RGB interface operation
		  6-bit RGB I/F: DB[17:12] are used.
		  16-bit RGB I/F: DB[17:13] and DB[11:1] are used.
		  18-bit RGB I/F: DB[17:0] are used.
		Unused pins must be fixed to GND level.

30	RD	A read strobe signal and enables an operation to read out data when the signal is low. Fix to either VDD or GND level when not in use.
31	RS	A register select signal. Fix to either VDD or GND level when not in use.
32	SDO	SPI interface output pin
33	SDI	SPI interface input pin. The data is latched on the rising edge of the SCL signal. In the 8/9-bit serial peripheral interface, this pin is used as bi-directional data pin.
34	WR(SCL)	Write strobe signal and enables an operation to write data when the signal is low. Fix to either VDD or GND level when not in use. SPI Mode: Synchronizing clock signal in SPI mode.
35	CS	A chip select signal, low active. Fix to the GND level when not in use.

Pin No.	Symbol	Description
36	RST	System reset pin
37	ENABLE	Data ENEABLE signal for RGB interface operation. Fix to either VDD or GND level when not in use.
38	DCLK	Dot clock signal for RGB interface operation. Fix to the GND level when not in use.
39	HSYNC	Line synchronizing signal for RGB interface operation. Fix to the GND level when not in use.
40	VSYNC	Frame synchronizing signal for RGB interface operation. Fix to the GND level when not in use.
41	VSS	Power supply (system ground)
42	YU	Terminal of touch panel.
43	XL	
44	YD	
45	XR	

5. Absolute Maximum Ratings

5.1   Electrical Maximum Ratings – for IC Only

Table 3: Electrical Maximum Ratings – for IC

Parameter	Symbol	Min.	Max.	Unit	Note
Supply voltage	VDD	-0.3	+4.0	V	1
Input voltage	VIN	-0.3	+5.0	V	

Note:

1. VDD, GND must be maintained.

2. The modules may be destroyed if they are used beyond the absolute maximum ratings.

5.2   Environmental Condition

Table 4

Item	Operating temperature (Topr)		Storage temperature (Tstg) (Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient temperature	-20°C	+70°C	-30°C	+80°C	Dry
Humidity (Note 1)	80% max. RH for Ta $\leq$ 40°C $<$ 50% RH for 40°C $<$ Ta $\leq$ Maximum operating temperature				No condensation

Note 1: Product cannot sustain at extreme storage conditions for long time.

6. Electrical Specifications

Typical Electrical Characteristics

At Ta = 25 °C, VDD= 2.8V, GND=0V.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Supply voltage	VDD		2.5	-	3.3	V	
Supply current (Logic & Analog)	IDD	VDD=2.8V	-	-	10	mA	
Supply current of white LED backlight	VLED	Forward voltage =3.3V	-	15	20	mA	(1)
Luminance (on the module surface)		Number of LED dies = 3 (parallel)	120	160	-	cd/m^2	

Note: (1) Constant current 15~20mA required for each LED (total 45~60mA for 3LED parallel).

7. Optical Characteristics

Table 7: Optical specifications

Items		Symbol	Condition	Specifications			Unit	
				Min.	Typ.	Max.		
Contrast Ratio		CR		150	300	-	-	
Response Time		T_R		-	15	30	ms	
		T_F		-	35	50	ms	
Chromaticity	Red	X_R		0.606	0.626	0.646	-	
		Y_R		0.314	0.334	0.354	-	
	Green	X_G		0.257	0.277	0.297	-	
		Y_G		0.529	0.549	0.569	-	Note
	Blue	X_B		0.122	0.142	0.162	-	
		Y_B		0.102	0.122	0.142	-	
	White	X_W		-	0.303	-	-	
		Y_W		-	0.325	-	-	
Viewing angle	Hor.	ϕ1(3 o'clock)	Center CR=10	-	45	-	deg.	
		ϕ2(9 o'clock)		-	45	-		
	Ver.	θ2(12 o'clock)		-	45	-		
		θ1(6 o'clock)		-	20	-		
NTSC ratio					61.5		%	

Note 1: Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63

L0: Luminance of gray level 0

CR = CR (10)

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CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note 5.

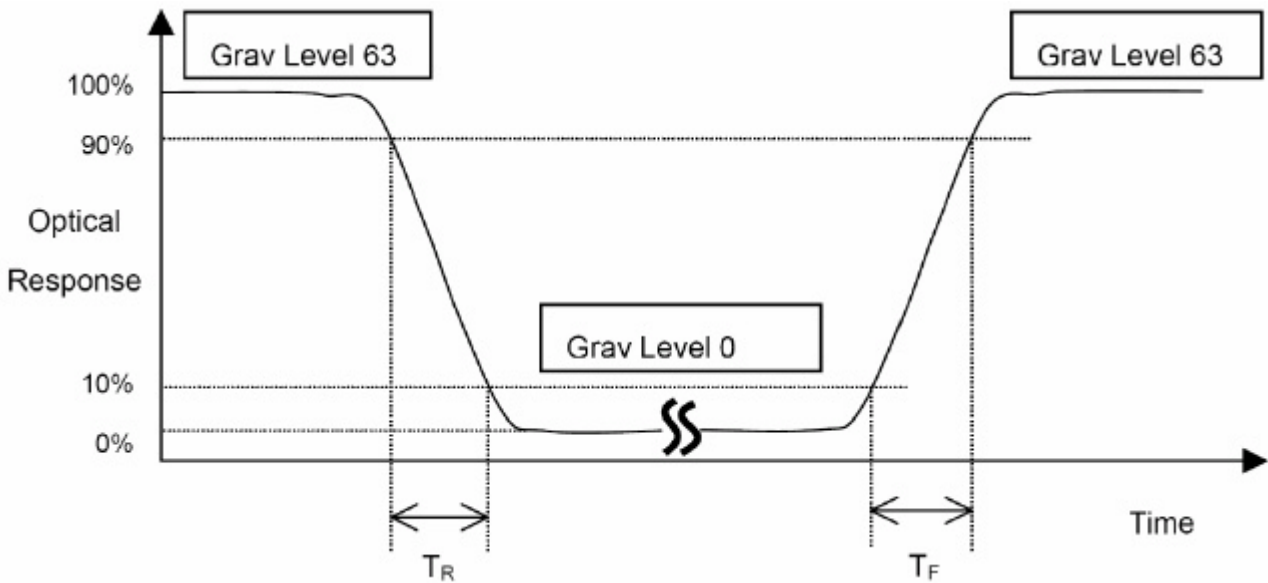Note 2: Definition of Response Time (TR, TF):
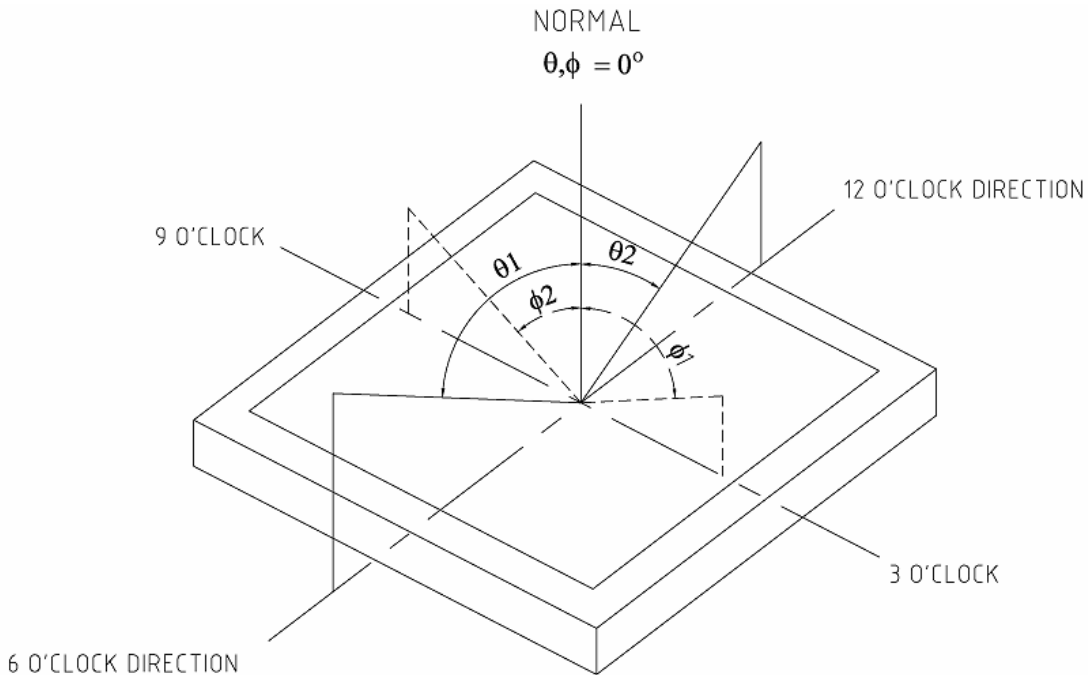

Figure 3

Note 3: Viewing Angle

Figure 4

The above "Viewing Angle" is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is 6 O'clock. Module maker can increase the "Viewing Angle" by applying Wide View Film.

Note 4: Measurement Set-Up:
The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt

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temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.
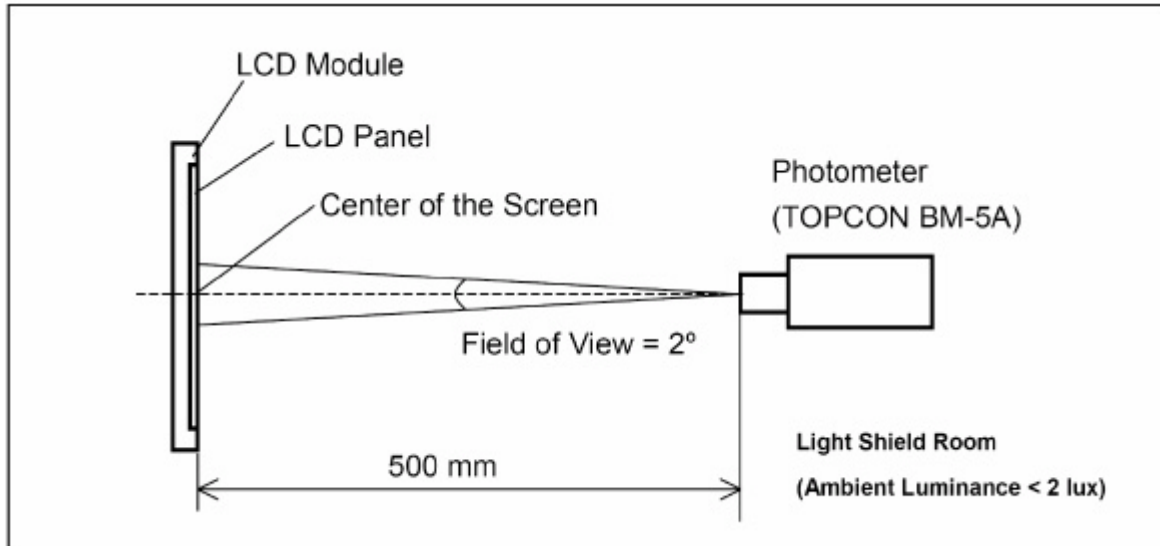
Figure 5

8. AC Characteristics
Please refer ILI9225B datasheet.

9. Reliability Test Item

Test Item	Sample Type	Test Condition	Test result determinant gist
High temperature storage	Normal temperature	70±3 ;96H	the inspection of appearance and function character.
	Wide temperature	80±3 ;96H	
Low temperature storage	Normal temperature	-20±3 ;120H	
	Wide temperature	-30±3 ;120H	
High temperature /humidity storage	Normal temperature	50 ±3 ,90%±3%RH;96H	
	Wide temperature	60 ±3 ,90%±3%RH;96H	
High temperature operation	Normal temperature	60±3 ;96H	no objection of the function character; no fatal objection of the appearance.
	Wide temperature	70±3 ;96H	
Low temperature operation	Normal temperature	0±3 ;96H	
	Wide temperature	-20±3 ;96H	
High temperature /humidity operation	Normal temperature	40 ±3 ,90%±3%RH;96H	
	Wide temperature	50 ±3 ,90%±3%RH;96H	
Temperature Shock	Normal temperature	-20±3 ,30min? 70±3 ,30 min;10cycle	inspect the objections appearance function & the whole structure
	Wide temperature	-30±3 ,30min 80±3,30min;10cycle	The inspection of appearance function & the whole structure

10. Suggestions for using LCD modules

10.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.

2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.

3. Don't apply excessive force on the surface of the LCM.

4. If the surface is contaminated ,clean it with soft cloth. If the LCM is severely contaminated , use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer . The following solvents is especially prohibited: water , ketone Aromatic solvents etc.

5. 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.

6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

7. Don't disassemble the LCM.

8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

   - Be sure to ground the body when handling the LCD modules.

   - Tools required for assembling, such as soldering irons, must be properly grounded.

   - To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.

   - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

9. Do not alter, modify or change the the shape of the tab on the metal frame.

10. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

11. Do not damage or modify the pattern writing on the printed circuit board.

12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector

13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

14. Do not drop, bend or twist LCM.

10.2 Cautions for installing and assemabling if the module has Touch Panel

1. Use a buffer material (Gasket) between the touch panel and Front-case to protect damage and wrong operating. The dimension of the buffer material's edge between the TP V.A. edge is Min. 0.3mm.

2. We recommend to design a case that it can't over the boundary of the active area Max. 0.5mm in order to prevent an operation at outside of the active area which can't guarantee the specified durability,

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because operation at the outside of the active area cause serious damage of a transparent.

3. When design case for installing Module, you would consider give a distance about 0.2± 0.15mm between the module edge to case inside.

4. The corners of the product are not chamfered. When positioning and fixing the product on the case, we sugguest that you would provide a R part on the conner of the case so as not to apply load on the corner of the transparent module.
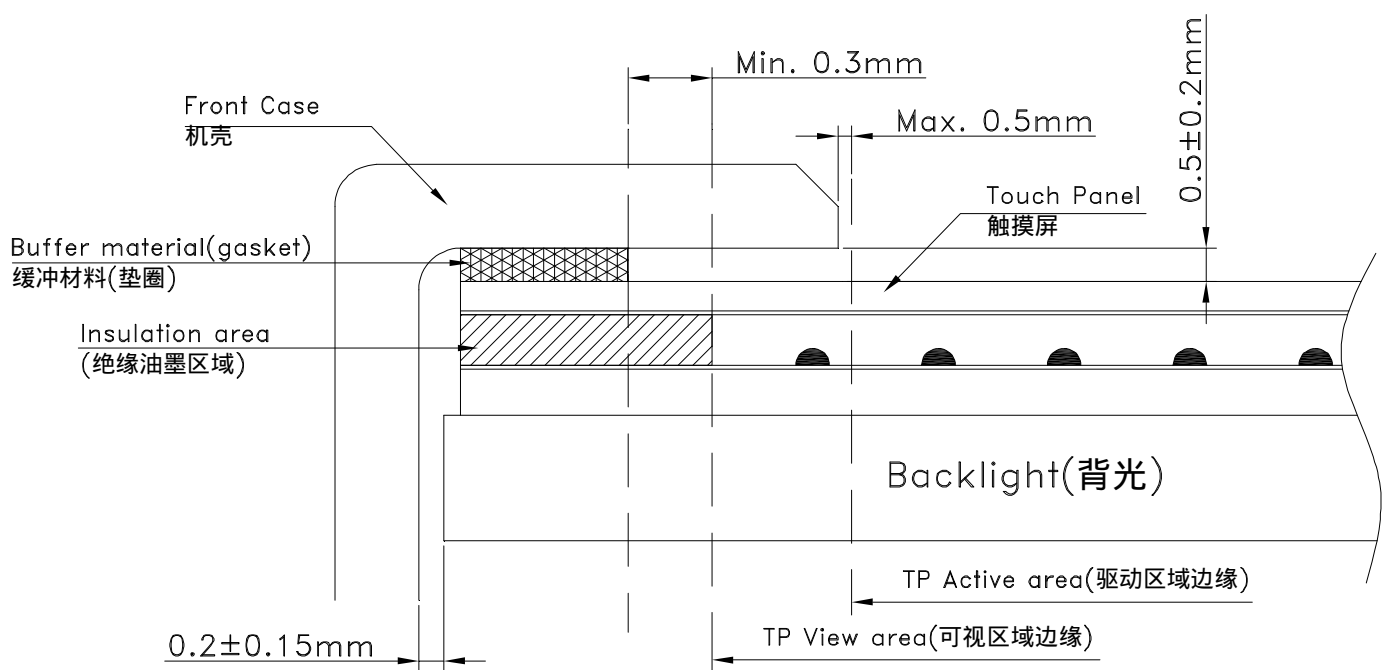
10.3 Storage

1. Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.

2. Storage in a clean environment, free from dust, active gas, and solvent.

3. Store in antistatic container.

11. Inspection Standard

This specification is made to be used as the standard acceptance/rejection criteria for Color mobile phone LCM with touch pannel.

11.1 Sample plan and Inspection condition

11.1.1 Sample plan

Sampling plan according to MIL-STD-105E , normal level 2 and based on:

Major defect: AQL 0.65;

Minor defect: AQL 1.5.

11.1.2 Inspection condition

Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45 against perpendicular line.

11.2 Definition of inspection zone in LCD
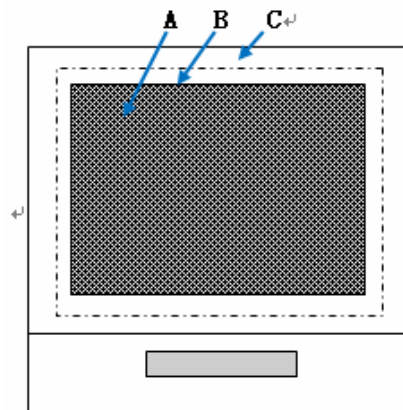
Inspection zones in an LCD

Zone A: character/Digit area;

Zone B: viewing area except Zone A (ZoneA+ZoneB=minimum Viewing area);

Zone C: Outside viewing area (invisible area after assembly in customer's product);

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product. Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

11.3 Major defects and Minor defects

11.3.1 Major defects

A major defect is a defect that is likely to result in failure, or to reduce the usability of the product for its intended purpose.

11.3.1.1 Abnormal operation: modules cannot display normally;

11.3.1.2 Line defect;

11.3.1.3 There is serious distortion or sharp burr on mechanical housing;

11.3.1.4 Glass breakage.

11.3.2 Minor defects:

A minor defect is a defect that is not likely to reduce the usability of the product for its intended purpose.

11.3.2.1 Dot defect:

11.3.2.1.1 Inspection pattern : Full white, full black, red, green and blue screens;

11.3.2.1.2 Criteria :(acceptable);
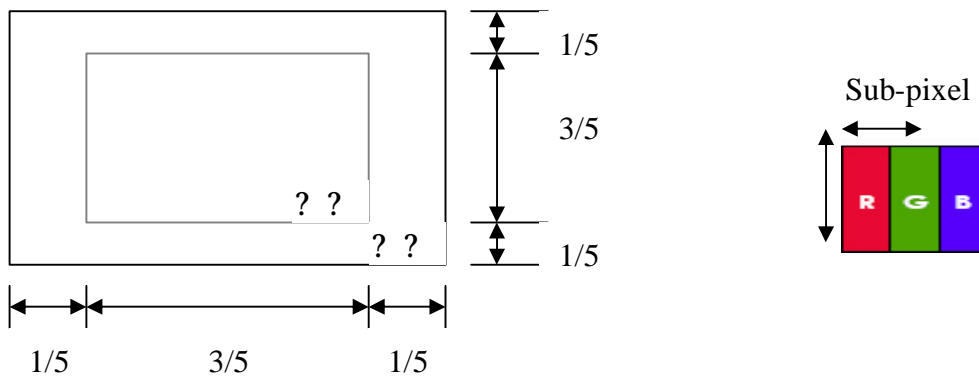
Note: 1. Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area . And the bright dot defect must be visible through 5% ND filter.

2. Except for the allowed numbers of adjacent dots, the distance between dot defects should be more than 3mm apart.

11.3.2.1.3 The definitions of the inner display area and outer display area.
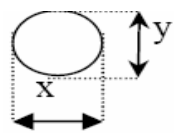
11.4 Inspection standards table:

11.4.1 Major defect

Item No.	Items to be	Inspection Standard	Classification of defects
11.4.1.1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical/horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting.	Major
11.4.1.2	Missing	Missing component	
11.4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
11.4.1.4	linearity	No more than 1.5%	

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11.4.2 Cosmetic Defect (spot defect)

Item No	Itemsto be	Inspection Standard	Classification of defects
11.4.2.1	**Clear Spots** Black and white Spot defect Pinhole, Foreign Particle, polarizer Dirt	For dark/white spot, sizeF is defined as $F =(x +y)/2$	Minor

Zone Size(mm)	Acceptable Qty A	B	C
F =0.1	Ignore		
0.10< F =0.15	2		Ignore
0.15< F =0.20	1		
F > 0.20	0		

Classification of defects: Minor

Item No	Items to be				Classification of defects
11.4.2.2	**Clear Spots** TP Dirt				Minor

Zone Size(mm)	Acceptable Qty A	B	C
F =0.1	Ignore		
0.10< F =0.15	2		Ignore
0.15< F =0.25	1		
F > 0.25	0		

11.4.2.3	**Dim Spots** Circle shaped and dim edged defects				Minor

Zone Size(mm)	Acceptable Qty A	B	C
F =0.2	Ignore		
0.20< F =0.4	2		Ignore
0.4< F =0.6	1		
F > 0.6	0		

11.4.2.4	**Dot defect**	dot =sub-pixel		Minor

	Acceptable Qty I	II
Bright dot	0	2
Dark dot	1	2

The distance of two point >5mm
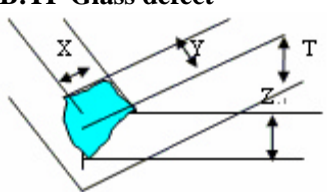
11.4.3 Cosmetic Defect (linear defect)

Item No	Items to be	Inspection Standard				Classification of defects
11.4.3.1	**Line defect** Black line, White line, Foreign material on polarizer					Minor

Size(mm) L(Length)	W(Width)	Acceptable Qty zone A	B	C
Ignore	W=0.02	Ignore		
L=3.0	0.02< W=0.03	2		Ignore
L=2.0	0.03< W=0.05	1		
	W> 0.05	Define as spot defect		

Item	Items	Inspection Standard	Classification
11.4.3.2	Foreign Material on TP film	The line can be seen after mobile phone in the operating condition: See table below	Minor

The line can be seen after mobile phone in the operating condition:

Size(mm)		Acceptable Qty		
L(Length)	W(Width)	zone		
		A	B	C
Ignore	W=0.03	Ignore		Ignore
L=3.0	0.03 W=0.05	3		
	W> 0.05	Define as spot defect		

11.4.3.3 — Dim line defect — Polarizer &BL scratch TP film scratch — Minor

If the scratch can be seen after mobile phone cover assembling or in the operating condition, judge by the line defect of 11.4.3.1. If the scratch can be seen only in non-operating condition or some special angle, judge by the following.

Size(mm)		Acceptable Qty		
L(Length)	W(Width)	zone		
		A	B	C
Ignore	W=0.02	Ignore		Ignore
L=3.0	0.02< W=0.03	2		
L=2.0	0.03< W=0.05	1		
	W> 0.05	Define as spot defect		

11.4.3.4 — Polarize Air bubble — Minor

Air bubbles between glass & polarizer

	Acceptable Qty		
	A	B	C
F =0.2	Ignore		Ignore
0.20< F =0.3	2		
0.3< F =0.5	1		
F > 0.5	0		

11.4.4 Chipping Defect

Item No	Items to be	Inspection Standard	Classification of defects
11.4.4.1	Glass defect	Chips on corner **A:LCD Glass defect** Notes: S=contact pad length Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal. **B:TP Glass defect** 	Minor

A:LCD Glass defect

X	Y	Z
=0.2	=S	Disregard

B:TP Glass defect

X	Y	Z
=3.0	=3.0	Disregard

Usual surface cracks
A:LCD Glass defect
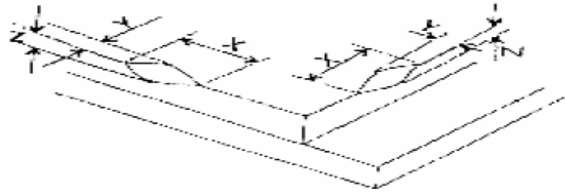
X	Y	Z
=3.0	<Inner border line of the seal	Disregard

B:TP Glass defect
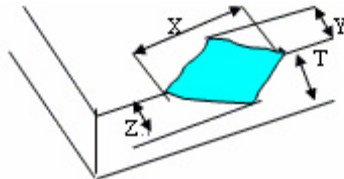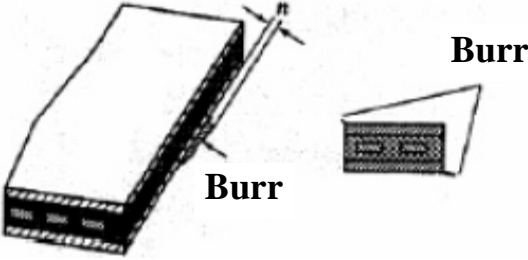

X	Y	Z
=6.0	=2.0	Disregard

Crack: Cracks tend to break are not allowed.
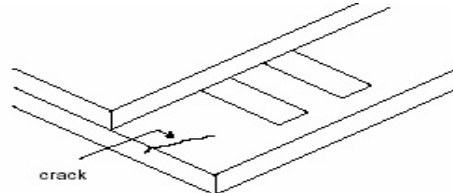
11.4.5 Parts Defect

Item No	Items to be	Inspection Standard	Classification of defects
11.4.5.1	Parts contra position	1　Not allow IC and FPC/heat-seal lead width is more than 50% beyond lead pattern. 2　Not allow chip or solder component is off center more than 50% of the pad outline.	Major
11.4.5.2	SMT	According to the <Acceptability of electronic assemblies>IPC-A-610C class 2 standard. Component missing or function defect are Major defect, the others are Minor defect.	Major
11.4.5.3	TP Defect	1　Pattern font Pattern fonts are clear and symmetrical　pattern fonts filter lightly are allowed; The fort line is not allow to thinner or thicker than 1/3 of normal size, and swing is not more than 0.1mm. the line is smooth and not broken. **Pattern font** 2　The wing forward in the side of Visual Area The length of wing forward inside of the Visual Area: n=0.2mm　Not excess 3 point　and the distance D=20mm	Major

KENTEC DISPLAY

Burr

Burr

3　Film impression: With operation, must be invisibility.
4　Touch panel knob　if writing function normally, it could be allowed.

TP knob

5　Newton ring
Without operation, the color circle of Regularity or Non-regularity from the normal or slope angle of view.
1　Regularity　The area of the newton ring is less than 1/3 area of the touch panel; and no character affected and line distorted after touch panel lightening. It's ok.
2　Non-regularity　The area of the Newton ring is less than the 1/2 area of touch panel with lightening. And no character affected and line

Regular　　　　**Irregular**

11.4.5.4	Backlight elements	1 Illumination source flickers when lit. 2 Spots or scratches that appear when lit must be judged using LCD spot, lines and contamination standards. 3 Backlight doesn't light or color is wrong	Major
11.4.5.5	Soldering	1 No unmelted solder paste may be present on the FPC 2 No cold solder joints, missing solder connections, oxidation or icicle. 3 No short circuits in components on FPC	Major

11. Packing
　T.B.D.