BI0500HT

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■ GENERAL INFORMATION

Item	Contents	Unit
LCD type	TFT/Transmissive/Normally white	/
Size	5.0	Inch
Viewing direction	12:00(without image inversion and least brightness	O' Clock
	change)	
Gray scale inversion direction	6:00 (contrast peak located at)	O' Clock
$LCM(W \times H \times D)$	120.7×75.8×3.1	mm ³
Active area (W×H)	108.0×64.8	mm^2
Pixel pitch (W×H)	0.135×0.135	mm^2
Number of dots	800 (RGB) × 480	/
Driver IC	HX8664B+HX8264D	/
Backlight type	12 LEDs	/
Interface type	24bit RGB	/
Color depth	16.7M	/
Pixel arrangement	RGB vertical stripe	/
Top polarizer surface treatment	Anti-glare	/
Backlight power consumption	730	mW
Panel power consumption	350	mW
Input voltage	3.3	V
With/Without TSP	Without TSP	/
Weight	TBD	g

Note 1: RoHS compliant; Note 2: LCM weight tolerance: $\pm 5\%$.

EXTERNAL DIMENSIONS



■ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	VDD	-0.3	4.0	V
Input voltage for logic	VIN	-0.5	VDD+0.3	V
Supply current (one LED)	I led	-	60	mA
Operating temperature	Тор	-20	70	°C
Storage temperature	Тѕт	-30	80	°C

■ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Тур	Max	Unit
Supply voltage	VDD	3.0	3.3	3.6	V
Input leakage current	ILKG	-	-	-	μA
Input voltage ' H ' level	Vih	0.8VDD	-	VDD	V
Input voltage ' L ' level	VIL	-0.3	-	0.2VDD	V

■ BACKLIGHT CHARACTERISTICS

Item	Symbol	Min.	Тур.	Max.	Unit	Condition
Voltage for LED backlight	VL	17.4	18.3	19.6	V	Note 1
Current for LED backlight	IL	30	40	50	mA	
LED life time	_	30000	50000	-	Hrs	serial

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and I_L =40mA.

Item		Symbol	Condition	Min	Тур	Max	Unit	Remark	Note
Response time		Tr+Tf		-	20	-	ms	FIG 1.	4
Contrast ratio		Cr	$\theta=0^{\circ}$	-	500	-		FIG 2.	1
Luminance uniformity		δ WHITE	Ø=0° Ta=25℃	75	80	-	%	FIG 2.	3
Surface Lun	ninance	Lv		550	600	-	cd/m ²	FIG 2.	2
			$\emptyset = 90^{\circ}$	40	50	-	deg	FIG 3.	
Viewing ang	la ranga		$\emptyset = 270^{\circ}$	60	70	-	deg	FIG 3.	6
viewing angle range		0		60	70	-	deg	FIG 3.	
				60	70	-	deg	FIG 3.]
	Dad	x		0.540	0.590	0.640			
	Reu	у]	0.300	0.350	0.400			
	Green	X]Ο°	0.298	0.348	0.398			
CIE (x, y)		у		0.520	0.570	0.620		FIG 2	5
chromaticity	Bhie	X	$T_{2}=25^{\circ}$	0.095	0.145	0.195		110 2.	5
	Diuc	у	1 a-25 C	0.060	0.110	0.160			
	White	X		0.270	0.320	0.370			
	winte	у		0.310	0.360	0.410			

■ELECTRO-OPTICAL CHARACTERISTICS

Note 1. Contrast Ratio(CR) is defined mathematically as For more information see FIG 2.:

Contrast Ratio = $\frac{\text{Average Surface Luminance with all white pixels } (P_1, P_2, P_3, P_4, P_5)}{\text{Average Surface Luminance with all black pixels } (P_1, P_2, P_3, P_4, P_5)}$

Average Surface Luminance with all black pixels $(P_1, P_2, P_3, P_4, P_5)$

Note 2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see FIG 2.

Lv = Average Surface Luminance with all white pixels $(P_1, P_2, P_3, P_4, P_5)$

Note 3. The uniformity in surface luminance , δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 2.

 $\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels } (P_1, P_2, P_3, P_4, P_5)}{\text{Maximum Surface Luminance with all white pixels } (P_1, P_2, P_3, P_4, P_5)}$

Note 4. Response time is the time required for the display to transition from White to black(Rise Time, Tr) and from black to white(Decay Time, Tf). For additional information see FIG 1. The test equipment is Autronic-Melchers's ConoScope. Series

Note 5. CIE (x, y) chromaticity, The x, y value is determined by measuring luminance at each test position 1 through 5, and then make average value

Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the conrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

Note 7. For Viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity,CIE The test data is base on TOPCON's BM-5 photo detector.

Note 8. For TFT module, Gray scale reverse occurs in the direction of panel viewing angle.

FIG.1. The definition of Response Time



FIG.2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

A : 5 mm B : 5 mm H,V : Active Area Light spot size \emptyset =5mm, 500mm distance from the LCD surface to detector lens measurement instrument is TOPCON's luminance meter BM-5



FIG.3. The definition of viewing angle



■ INTERFACE DESCRIPTION

Pin No	Symbol	Function
1	VLED-	BACK LIGHT POWER GROUND
2	VLED+	BACK LIGHT POWER SUPPLY
3	GND	POWER GROUND
4	VDD	POWER SUPPLY
5-12	R0-R7	RED DATA
13-20	G0-G7	GREEN DATA
21-28	B0-B7	BLUE DATA
29	GND	POWER GROUND
30	CLKIN	In external interface mode, served as a dot clock signal.
31	STBYB	standby mode control pin
32	HSD	In external interface mode, served as a horizontal synchronized signal input
33	VSD	In external interface mode, served as a vertical synchronize signal input
34	DEN	In external interface mode, polarity of ENABLE signal is synchronized with valid graphic data input.
35	NC	NC
36	GND	POWER GROUND
37	XR(NC)	
38	YD(NC)	
39	XL(NC)	
40	YU(NC)	

NOTE:For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If ENB signal is fixed low. SYNC mode is used. Otherwise, DEN+SYNC is used

■ BLOCK DIAGRAM



■ APPLICATION CIRCUIT NOTES

1. AC Characteristics

1.1 AC electrical characteristics

I.t	Symbol		Values		Luit	Domorit
Item	Symbol	Min.	Тур.	Max.	Unit	Kemark
HS setup time	Thst	8	-	-	ns	
HS hold time	Thhd	8	-	-	ns	
VS setup time	Tvst	8	-	-	ns	
VS hold time	Tvhd	8	-	-	ns	
Data setup time	Tdsu	8	-	-	ns	
Data hold time	Tdhd	8	-	-	ns	
DE setup time	Tesu	8	-	-	ns	
DE hold time	Tehd	8	-	-	ns	
DV _{DD} Power On Slew rate	Tpor	-	-	20	ms	From 0 to 90% DV _{DD}
RESET pulse width	TRst	10	-	-	ms	
DCLK cycle time	Tcoh	20	-	-	ns	
DCLK pulse duty	Tcwh	40	50	60	%	

1.2 Data input format



Horizontal input timing diagram.



Vertical input timing diagram.

1.2.1 Timing

I.t. a	Symphol		Values	I La ia	Domorit	
Item	Symbol	Min.	Тур.	Max.	Unit	Kelliark
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk		30	50	MHz	
One Horizontal Line	th	889	928	1143	DCLK	
HS pulse width	thpw	1	48-	255	DCLK	
HS Blanking	thb		88		DCLK	
HS Front Porch	thfp	1	40	255	DCLK	

L.	Course la cal		Values	I les it	Domorit	
ltem	Symbol	Min.	Тур.	Max.	Unit	Kelliark
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	513	525	767	TH	
VS pulse width	tvpw	3	3	255	TH	
VS Blanking	tvb		32		TH	
VS Front Porch	tvfp	1	13	255	TH	

■ RELIABILITY TEST

No.	Test Item	Test Condition
1	High Temperature Storage	$80\pm2^{\circ}C/240$ hours
2	Low Temperature Storage	-30 ± 2 °C/240hours
3	High Temperature Operating	$70\pm2^{\circ}C/120$ hours
4	Low Temperature Operating	$-20\pm2^{\circ}C/120$ hours
5	Temperature Cycle	-30±2℃~25~80±2℃×10cycles (30min.) (5min.) (30min.)
6	Damp Proof Test	$60^{\circ}\text{C} \pm 5^{\circ}\text{C} \times 90\%$ RH/240hours
7	Vibration Test	Frequency: 10Hz~55Hz Amplitude of vibration : 1.5mm Sweep time: 12 min X,Y,Z 2 hours for each direction.
8	Packing drop test	According to ASTM-D-5327
9	Electrical static discharge	Air: ±4KV 150pF/330Ω 5 times
7	Licenteal static discharge	Contact: ± 2 KV 150pF/330 Ω 5 time

■ INSPECTION CRITERION

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MDS Product

This specification is made to be used as the standard acceptance/rejection criteria for TFT module.

1 Sample plan

Sampling plan according to GB/T2828.1-2003/ISO 2859-1: 1999 and ANSI/ASQC Z1.4-1993, normal level 2 and based on:

Major defect: AQL 0.65

Minor defect: AQL 1.5

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.

3. Definition of inspection zone in 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)

Fig.1 Inspection zones in an LCD.

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.

4. Inspection standards

NO	Item	Criterion							
01	Electrical Testing	 1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker 							
02	Black or White spots or Bright spots or Color spots on LCD (Display only)	2.1 White and black or colo 2.2 Densely spaced: No mo	2.1 White and black or color spots on display ≤ 0.25 mm, no more than Five spots. 2.2 Densely spaced: No more than three spots within 3mm.						
	LCD and Touch Panel black spots.	3.1 Round type: As followin $\Phi = (X+Y)/2$ \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow	* Densely s	Size(mm) $\Phi \leq 0.10$ $0.10 < \Phi \leq 0.20$ $0.20 < \Phi \leq 0.25$ $0.25 < \Phi \leq 0.30$ $0.30 < \Phi$ spaced: No more that	Acceptable Q'ty Accept no dense 2 2 1 0 an two spots within 3mm.	1.5			
03	white spots, contamination (non – display)	3.2 Line type: (As following W	g drawing) Length(m m) L ≤ 3.0 L ≤ 2.5 * Densely	Width(mm) $W \le 0.02$ $0.02 < W \le 0.05$ $0.03 < W \le 0.08$ $0.08 < W$ spaced: No more th	Acceptable Q'ty Accept no dense 2 Rejection an two lines within 3mm.	1.5			

NO	Item	Cri	terion		AQL
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction	Size $\Phi(mm)$ $\Phi \leq 0.20$ $0.20 < \Phi \leq 0.50$ $0.50 < \Phi \leq 1.00$ $1.00 < \Phi$ Total Q'ty	Acceptable Q'ty Accept no dense 3 2 0 3	1.5
05	Scratches	Follow NO.3 -2 Line Type.			
06	Chipped glass	Symbols: x: Chip length y: Chip width z: Chip the k: Seal width t: Glass thickness a: LCE L: Electrode pad length 6.1 General glass chip: 6.1.1 Chip on panel surface and crack between $\begin{array}{c c} \hline & & & & & & & & & & & & & & & & & & $	thickness b side length een panels: $\hline x: Chip lenng area x \le 1.\frac{1}{3k} x \le 1.length of each chip\hline x: Chip lenng area x \le 1.\frac{1}{3k} x \le 1.$	gth /8a /8a /8a /8a /8a /8a /8a /8a /8a O Unit:	1.5



NO	Item	Criterion	AOL
08	Cracked glass	The LCD with extensive crack is not acceptable.	1.5
09	Backlight elements	 9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color is wrong. 	1.5 1.5 0.65
10	Bezel	Bezel must comply with product specifications.	1.5
11	PCB、COB	 11.1 COB seal may not have pinholes larger than 0.2mm or contamination. 11.2 COB seal surface may not have pinholes through to the IC. 11.3 The height of the COB should not exceed the height indicated in the assembly diagram. 11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places. 11.5 Parts on PCB must be the same as on the production characteristic chart, There should be no wrong parts, missing parts or excess parts. 11.6 The jumper on the PCB should conform to the product characteristic chart. 	1.5 1.5 1.5 1.5 0.65 0.65
12	FPC	12.1 FPC terminal damage $\leq 1/2$ FPC terminal width and can not affect the function , we judge accept. 12.2 FPC alignment hole damage $\leq 1/2$ alignment area and can not affect the function , we judge accept.	1.5 1.5
13	Soldering	13.1 No cold solder joints, missing solder connections, oxidation or icicle.13.2 No short circuits in components on PCB or FPC.	1.5 0.65

NO	Item		Criterion			AOL
NO 14	Item Touch Panel Chipped glass	CriterionSymbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Touch Panel Total thickness a: LCD side length L: Electrode pad length 14.1 General glass chip: 14.1.1 Chip on panel surface and crack between panels:14.1.1 Chip on panel surface and crack between panels:Image: transform of the second se		AQL		
		14.1.2 Corner crack: z: Chip thickness $z \le t$ there are 2 or more chips	y: Chip width ≤ 1/2 k and not over viewing area , x is the total length of each	x: Chip length x≤1/8a chip	⊙ Unit: mm ⊙ If	

NO	Item	Criterion	AQL
15	Touch Panel(Fish eye、dent and bubble on film)	SIZE(mm)Acceptable Q'ty $\Phi \le 0.2$ Accept no dense $0.2 < D \le 0.4$ 5 $0.4 < D \le 0.5$ 2 $0.5 < D$ 0	1.5
16	Touch Panel Newton ring	Newton ring dimension $\leq 1/2$ touch panel area and not affect font and line distortion($\leq 2.5\%$), it is acceptable.	1.5
17	Touch Panel Linearity	Less than 2.5% is acceptable.	
18	LCD Ripple	Touch the touch panel, can not see the LCD ripple. Pen: R 1.0mm silicon rubber. Operation Force: 80g	1.5
19	General appearance	 19.1 Pin type must match type in specification sheet. 19.2 LCD pin loose or missing pins. 19.3 Product packaging must the same as specified on packaging specification sheet. 19.4 Product dimension and structure must conform to product specification sheet. 	

■ PRECAUTIONS FOR USING LCD MODULES

1 Handing Precautions

- 1.1 The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
- 1.2 If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- 1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
- 1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air.
- 1.5 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
 - Isopropyl alcohol
 - Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

- 1.6 Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats.

- 1.7 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.
- 1.8 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.
- 1.9 Do not attempt to disassemble or process the LCD module.
- 1.10 NC terminal should be open. Do not connect anything.
- 1.11 If the logic circuit power is off, do not apply the input signals.
- 1.12 Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.

- Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

- To reduce the amount of static electricity generated, do not conduct assembling

and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dry. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

- 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.

1.13 Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

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

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

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

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

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

- Do not drop, bend or twist the LCM.