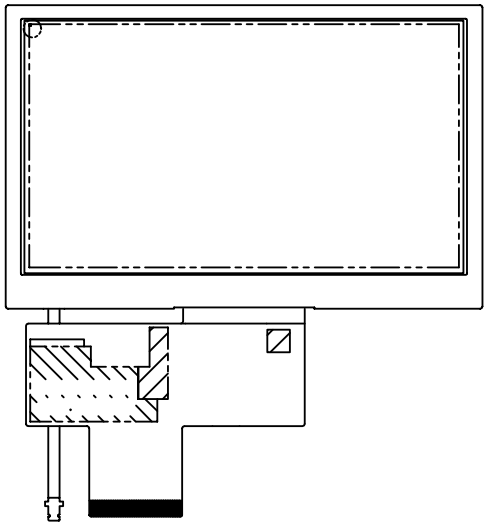
HANTRONIX

PRODUCT SPECIFICATION

HDA430-3H

4.3', 480x272 TFT COLOR GRAPHICS LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: ZW	REV.: 1.0	HDA430-3H	SHEET 1 OF 21 DATE: 9/11/09

Application

This specification is applied to the 4.3 inch supported TFT-LCD module, and can display true 16.7M colors(8 bit/ color).The module is designed for PMP, GPS application and other electronic products which require flat panel display of digital signal interface. The model is composed of a TFT LCD panel, a driver circuit and a back-light system.

Features

- WQVGA (480×272 pixels) resolution.
- 24 bit parallel RGB.

General Specifications

Item	Specifications	Unit
Screen Size	4.3 (Diagonal)	inch
Display Format	480RGB(H)×272(V)	dot
Active Area	95.04(H)×53.856(V)	mm
PIXEL Pitch	0.198(H)×0.198(V)	mm
Pixel Configuration	RGB Vertical Stripe	-
Display Mode	TN Type Transmissive Mode Normally White	-
Surface Treatment	Anti-Glare and Hard Coating(3H)	-
Viewing Direction	6 O'clock (The Gray Inversion will appear at this direction)	-
Outline Dimension	105.5(W)×67.2(H)×3.1(D)	mm
Weight	(44)	g

Absolute Maximum Ratings

Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-30	+80	°C	(1)
Operating Ambient Temperature	T_{OP}	-20	+70	°C	(1)

Note (1) Temperature and relative humidity range are shown in the figure below.

(a) 95%RH Max. (Ta≦50°C).

(b) Wet-bulb temperature should be 39°C Max. (Ta>50°C).

(c) No condensation.

Electrical Absolute Ratings

TFT-LCD Module

(Ta=25±2°C, VSS=0V)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Digital Power Supply Voltage	DVDD	-0.3	4.0	V	-

Backlight Unit

(Ta=25±2°C)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Current of Backlight Unit	I_B	-	25	mA	(1)
Reverse Voltage	V_R	-	50	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.

Electrical Characteristics
TFT-LCD Module

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Digital Power Supply Voltage	DVDD	3.0	3.3	3.6	V	-
Input High Threshold Voltage	VIH	0.7DVDD	-	DVDD	V	-
Input Low Threshold Voltage	VIL	0	-	0.3 DVDD	V	-
VSYNC Frequency	F_V	-	59.94	-	Hz	-
HSYNC Frequency	F_H	-	17.14	-	KHz	
Pixel Clock	PCLK	-	9.0	15.0	MHz	-

(VSS = 0V)

Parameter	SYMBOL	Condition	Min.	Typ.	Max.	Unit	Remarks
Digital Current	IDVDD	DVDD=3.3V	-	22.8	31.92	mA	(1)
Total Power Consumption	PC	-	-	75.24	105.34	mW	(1)

Note (1) The specified power consumption is under the conditions at DVDD = 3.3V,FV=60Hz, DCLK=9.0 MHz, whereas a power dissipation check Pattern below is displayed.

Black Pattern / 0 Gray

Active Area

Backlight Unit

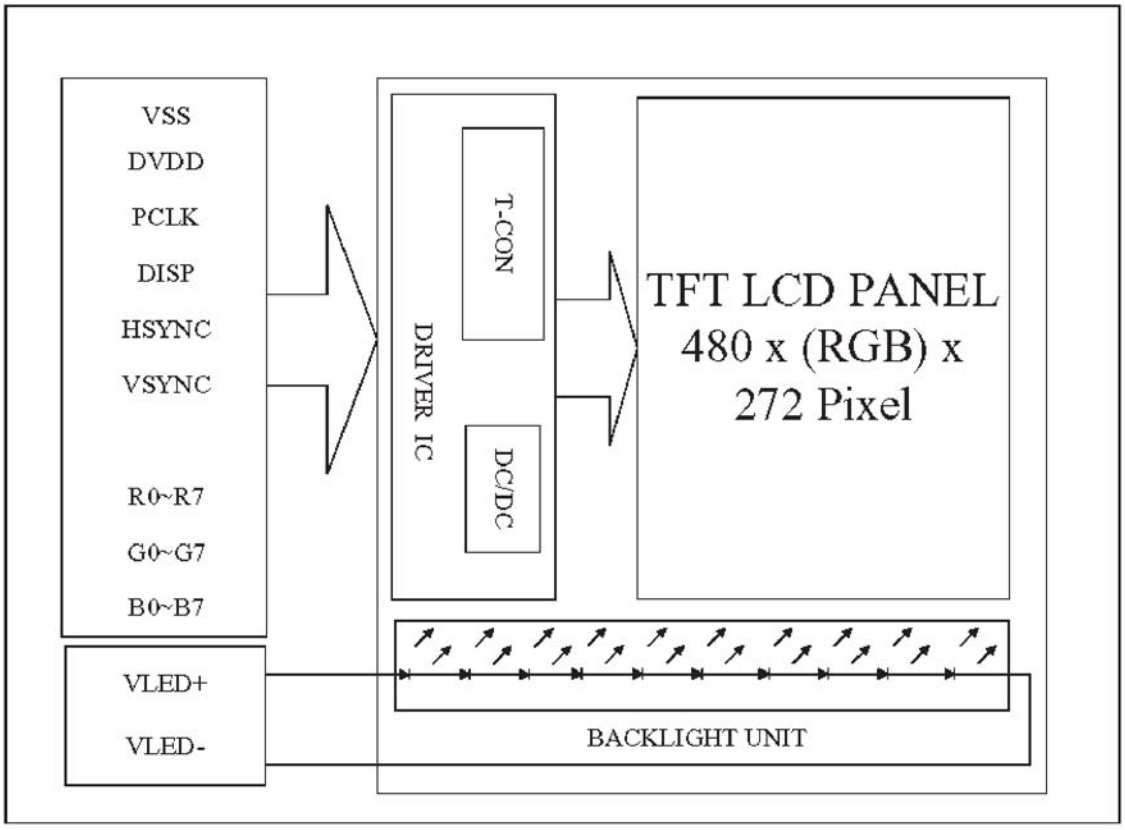
(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Voltage	VL	-	(33)	-	V	(1)
Current of Backlight Unit	I_B	-	20	-	mA	(1)
Power Consumption	P_{BL}	-	(660)	-	mW	(1)
LED life time	-	20000	30000	-	Hr	(2)

Note (1) The driving design of backlight unit is dependent on serial consideration of 10 LEDs.

(2) The LED life time is defined as the module brightness decrease to 50%, original brightness at Ta=25℃ , I_B =20mA.

Block Diagram
TFT-LCD Module with Backlight Unit



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: Z.W.	REV.: 1.0	HDA430-3H	SHEET 6 OF 21 DATE: 9/11/09

Input / Output Terminals Pin Assignment
TFT-LCD Module

(Reference Connector :
Hirose Electric CO., LTD. Product No.: FH12A-40S-0.5SH(55) Top contact type)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VSS	Ground	21	B0	Blue data(LSB)
2	VSS	Ground	22	B1	Blue data
3	DVDD	POWER SUPPLY(+3.3V)	23	B2	Blue data
4	DVDD	POWER SUPPLY(+3.3V)	24	B3	Blue data
5	R0	Red data(LSB)	25	B4	Blue data
6	R1	Red data	26	B5	Blue data
7	R2	Red data	27	B6	Blue data
8	R3	Red data	28	B7	Blue data(MSB)
9	R4	Red data	29	VSS	Ground
10	R5	Red data	30	PCLK	Pixel clock
11	R6	Red data	31	DISP	Display ON/OFF Signal
12	R7	Red data(MSB)	32	HSYNC	Horizontal Sync input with negative polarity
13	G0	Green data(LSB)	33	VSYNC	Vertical Sync input with negative polarity
14	G1	Green data	34	NC	NC
15	G2	Green data	35	NC	NC
16	G3	Green data	36	NC	NC
17	G4	Green data	37	NC	NC
18	G5	Green data	38	NC	NC
19	G6	Green data	39	NC	NC
20	G7	Green data(MSB)	40	NC	NC

Backlight

(Reference Connector :

Kyocera Elco Corporation Product No. : 6298 Bottom contact type)

Terminnal No.	Signal	Functions
1	VLED-	LED Power Source Input terminal (Cathode side)
2	NC	No Connection
3	NC	No Connection
4	VLED+	LED Power Source Input terminal (Anode side)

Color Data Input Assignment

The brightness of each primary color(red, green and blue) is based on the 8 bit gray scale data input for the color. The higher the binary input, the brighter the color. The table provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of RED	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Interface Timing

Timing Requirement 1

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Clock cycle	f_{CLK} (1)	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	thf	2	2	82	CLK
Horizontal pulse width	thp (2)	2	41	41	CLK
Horizontal back porch	thb (2)	2	2	41	CLK
Vertical Signal					
Vertical cycle	tv	285	286	399	H (1)
Vertical display period	tvd	272	272	272	H (1)
Vertical front porch	tvf	1	2	227	H (1)
Vertical pulse width	tvp (2)	1	10	11	H (1)
Vertical back porch	tvb (2)	1	2	11	H (1)

Note: (1) Unit: CLK=1/ f_{CLK} , H= th,
(2) It is necessary to keep tvp+tvb=12 and thp+thb=43 in sync mode. DE mode is unnecessary to keep it.

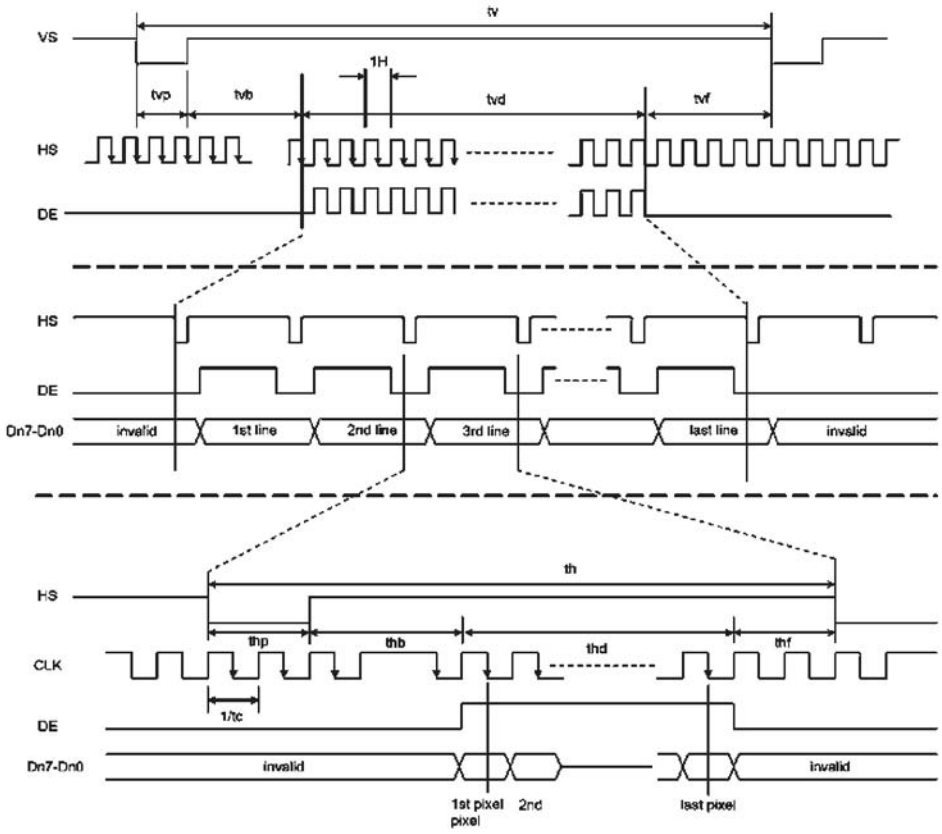


Figure 11.1 Input timing

Timing Requirement 2

(TA =25ºC, DVDD=3.0V to 3.6V, VSS= 0V, tr (1)=tf (1)=2ns)

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
DISP setup time	t_{diss}	10	-	-	ns
DISP hold time	t_{dish}	10	-	-	ns
Clock period	PW_{CLK} *1	66.7	-	-	ns
Clock pulse high period	PWH *1	26.7	-	-	ns
Clock pulse low period	PWL *1	26.7	-	-	ns
Hsync setup time	t_{hs}	10	-	-	ns
Hsync hold time	t_{hh}	10	-	-	ns
Data setup time	t_{ds}	10	-	-	ns
Data hold time	t_{dh}	10	-	-	ns
Vsync setup time	t_{vhs}	10	-	-	ns
Vsync hold time	t_{vhh}	10	-	-	ns

Note:

1. For parallel interface, maximum clock frequency is 15MHz.
2. tr, tf is defined 10% to 90% of signal amplitude.

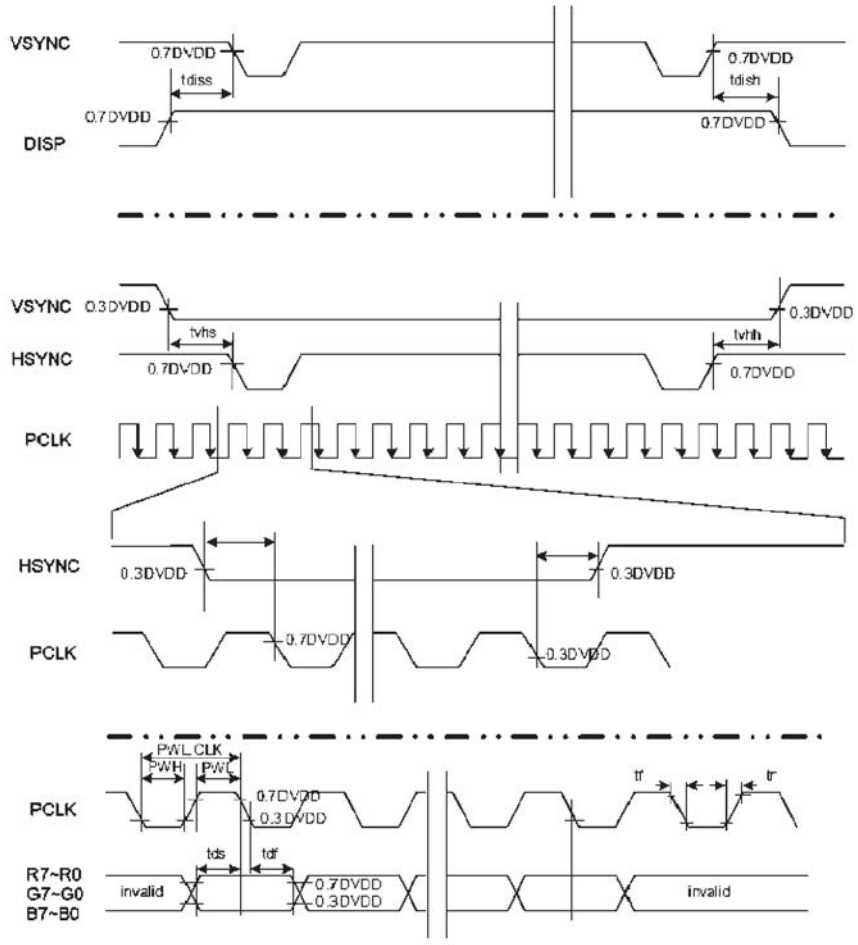


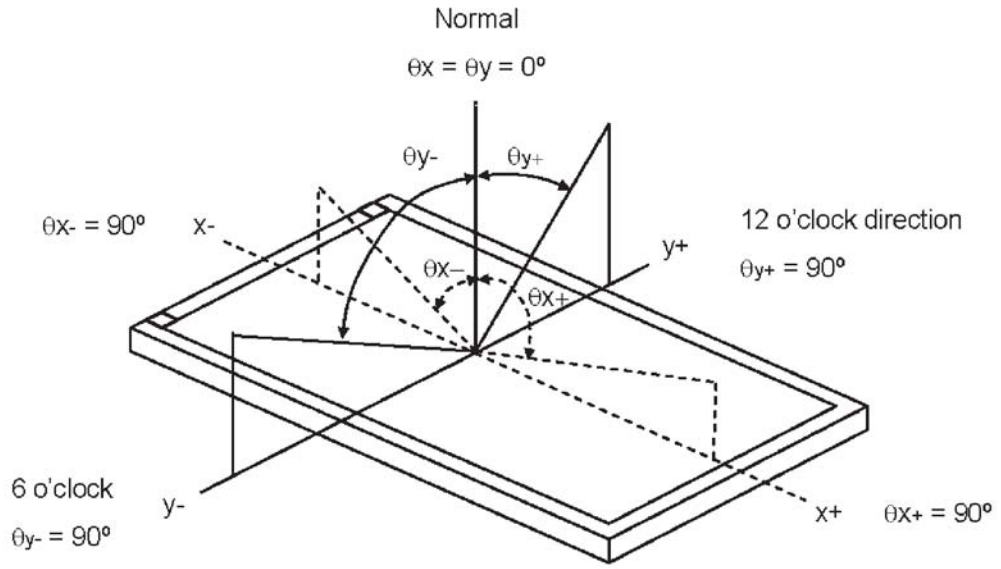
Figure 11.2 Input setup timing

Optical Characteristics

The optical characteristics should be measured in a dark environment ($\leq$ 1 lux) or equivalent state with the methods shown in Note (5).

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_X=0°, θ_Y =0° Viewing Normal Angle	300	(450)	-	-	(2),(5)
Response Time		T_{R+} T_F		-	20	-	ms	(3)
Luminance(Center)		LC		500	(650)	-	cd/m^2	(4),(5)
Brightness uniformity		BUNI		70	(75)	-	%	(5),(6)
Color Chromaticity	Red	Rx		0.570	0.620	0.670	-	(1),(5)
		Ry		0.290	0.340	0.390	-	
	Green	Gx		0.290	0.340	0.390	-	
		Gy		0.510	0.560	0.610	-	
	Blue	Bx		0.090	0.140	0.190	-	
		By		0.050	0.100	0.150	-	
	White	Wx		0.260	0.310	0.360	-	
		Wy		0.270	0.320	0.370	-	
Viewing Angle	Horizontal	θ_X+	CR≥10	55	(65)	-	deg.	
		θ_X-		55	(65)	-		
	Vertical	θ_Y+		40	(50)	-		
		θ_Y-		50	(60)	-		

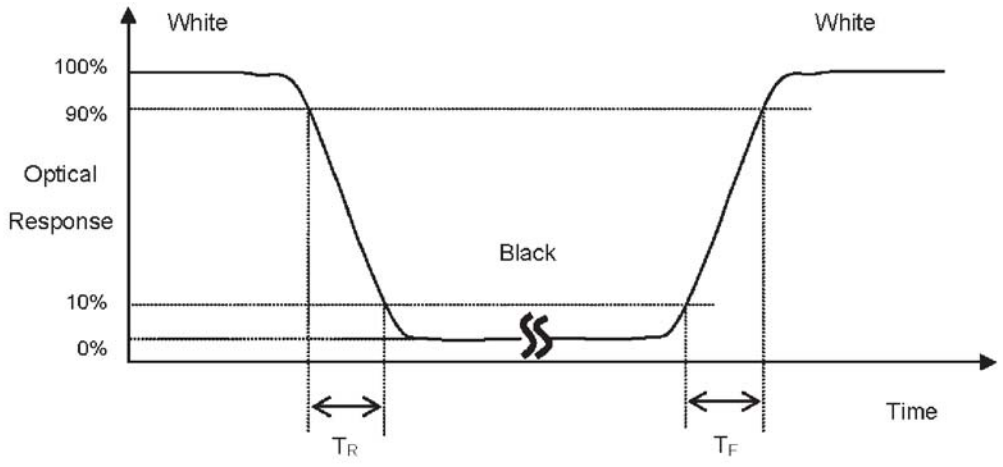
Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

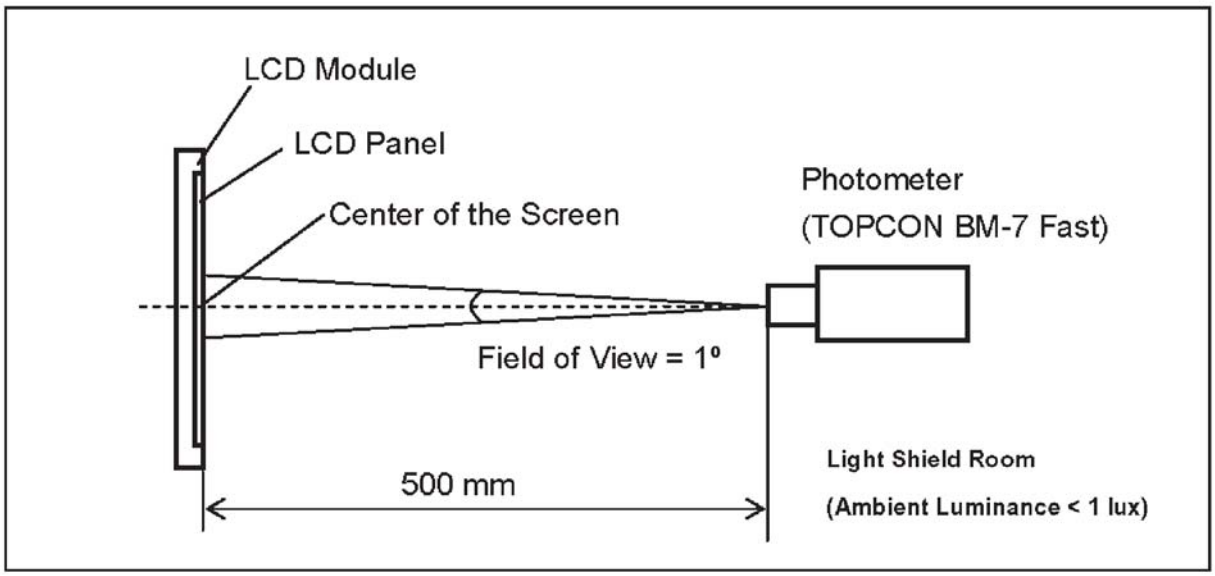
Note (3) Definition of Response Time (T_R, T_F):



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: Z.W.	REV.: 1.0	HDA430-3H	SHEET 13 OF 21 DATE: 9/11/09

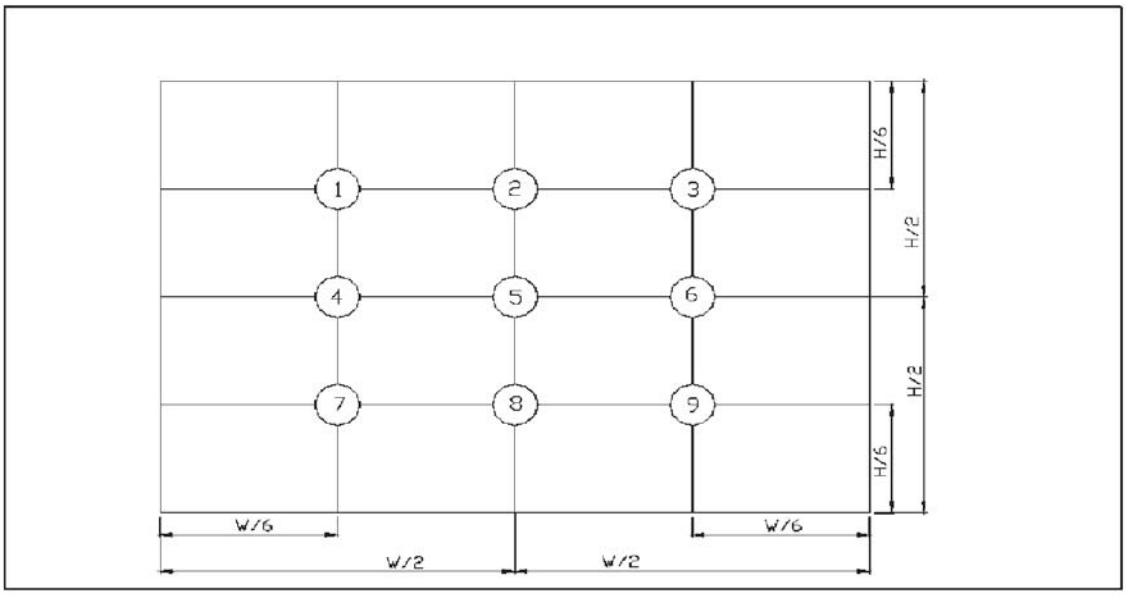
Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.



Note (5) Definition of brightness uniformity

Brightness uniformity=(Min Luminance of 9 points)/(Max Luminance of 9 points)x100%



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: Z.W.	REV.: 1.0	HDA430-3H	SHEET 14 OF 21 DATE: 9/11/09

Reliability Test

No.	Test Items	Test Condition	Remark
1	High Temperature Storage Test	T_a= 80℃ 240 hours	-
2	Low Temperature Storage Test	T_a= -30℃ 240 hours	-
3	High Temperature Operation Test	T_a= 70℃ 240 hours	-
4	Low Temperature Operation Test	T_a= -20℃ 240 hours	-
5	High Temperature and High Humidity Operation Test	T_a=60℃ 90%RH 240 hours	-
6	Electro Static Discharge Test (non-operating)	-Panel Surface/Top Case : 150pF, 330Ω Air: ±15kV, Contact: ±8kV	-
7	Mechanical Shock Test (non-operating)	Half sine wave, 100G, 6ms 3 times shock of each six surfaces	-
8	Vibration Test (non-operating)	Sine wave, 10 ~ 55 ~ 10Hz, 3 axis, 2 hours/axis	-
9	Thermal Shock Test (non-operating)	-20℃(30min) ~ 70℃(30min),100 cycles	-
10	Drop Test(with Carton) (non-operating)	Height: 80cm 1 corner, 3 edges, 6 surfaces	-

Incoming Inspection Standards

The environmental condition of inspection

The environmental condition and visual inspection shall be conducted as below.

(1) Ambient temperature 25 ± 5℃

(2) Humidity: 60 ± 5% RH

(3) Viewing distance is approximately 35 ~ 40 cm

(4)Viewing angle is normal to the LCD panel as Fig _1(10°)

(5) Ambient Illumination: 300 ~ 500 Lux for external appearance inspection

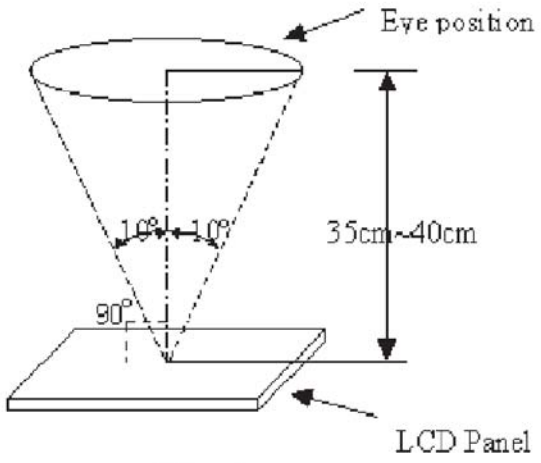


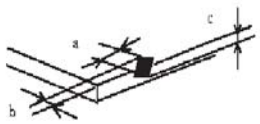
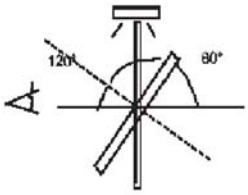
Fig _ 1

The defects classify of AQL as following:

Class of defects	AQL	Definition
Major	0.65%	It is defect that is likely to result in failure or to reduce materially the usability of the intended function.
Minor	1.5%	It is a defect that will not result in functioning problem with deviation classified.

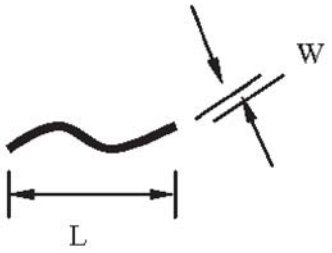
Inspection Parameters

<table>
<tr><th colspan="2">Item</th><th colspan="4">Specification/Description</th><th>Note</th></tr>
<tr><td rowspan="2">Display</td><td rowspan="2">Function</td><td colspan="4">No Display</td><td>-</td></tr>
<tr><td colspan="4">Malfunction</td><td>-</td></tr>
<tr><td rowspan="8">Operating</td><td>Contrast ratio</td><td colspan="4">Out of Spec</td><td>-</td></tr>
<tr><td>Line defect</td><td colspan="4">No obvious Vertical and Horizontal line defect in bright , dark and colored.</td><td>-</td></tr>
<tr><td rowspan="7">Point Defect (red,green,blue,dark, white)</td><td rowspan="2">Item</td><td colspan="3">Acceptable number</td><td rowspan="7">Note: 1・4・5・6</td></tr>
<tr><td>A</td><td>B</td><td>Total</td></tr>
<tr><td>BRIGHT DOT</td><td>N≦2</td><td>N≦2</td><td rowspan="3">N≦7</td></tr>
<tr><td>DARK DOT</td><td>N≦3</td><td>N≦4</td></tr>
<tr><td>TOTAL DOT</td><td>N≦4</td><td>N≦5</td></tr>
<tr><td>TWO ADJACENT DOT</td><td colspan="3">NOT ALLOWED</td></tr>
<tr><td>THREE OR MORE ADJACENT DOT</td><td colspan="3">NOT ALLOWED</td></tr>
<tr><td rowspan="3">External Inspection (non-operating)</td><td>Scratch on the polarizer</td><td colspan="4"><table><tr><td>L(mm)</td><td>W(mm)</td><td>Acceptable number</td></tr><tr><td>L≦2.5</td><td>W≦0.1</td><td>4</td></tr><tr><td>L>2.5</td><td>W>0.1</td><td>0</td></tr></table></td><td>Note:2</td></tr>
<tr><td>Dent or bubble on the polarizer</td><td colspan="4"><table><tr><td>Dimension(mm)</td><td>Acceptable number</td></tr><tr><td>D≦0.5</td><td>4</td></tr><tr><td>D≦0.15</td><td>Disregard</td></tr></table></td><td>Note:3</td></tr>
<tr><td>Foreign material on the polarizer</td><td colspan="4"><table><tr><td>Dimension(mm)</td><td>Acceptable number</td></tr><tr><td>D≦0.5</td><td>4</td></tr><tr><td>D≦0.15</td><td>Disregard</td></tr></table></td><td>Note:3</td></tr>
</table>

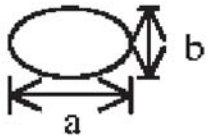
Item		Specification/Description			Note
Touch Panel	Scratch	L(mm)	W(mm)	Acceptable number	Note:2
		L≦10	W<0.05	Disregard	
			0.05≦W<0.1	N≦4	
			W≧0.1	0	
	Foreign Materials (Linear shape)	L≦10	W<0.05	Disregard	Note:2
			0.05≦W<0.1	N≦3	
			W≧0.1	0	
	Foreign Materials (Circular shape)	Dimension(mm)		Acceptable number	Note:3
		D≦0.25		Disregard	
		0.25<D≦0.5		N≦6	
		D>0.5		0	
	Glass chipping			a≦5mm b≦3mm c≦t (t：Glass think)	Note:7
				a≦3mm b≦3mm c≦t (t：Glass think)	Note:7
	Newton-ring	(In case of doubtful situations) Observe on 60° from the product surface under a while Fluorescent lamp(3-wavelength lamp). 		Average diameter ≦1/3 Touch Panel area Disregard.	Note:7

Note1. The definition of dot defect : The dot defect was judged after repair and the size of a defective dot over 1/2 of whole dot is regarded as one defective dot.

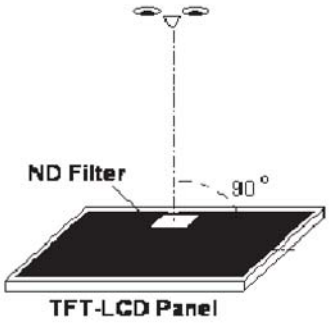
Note2.

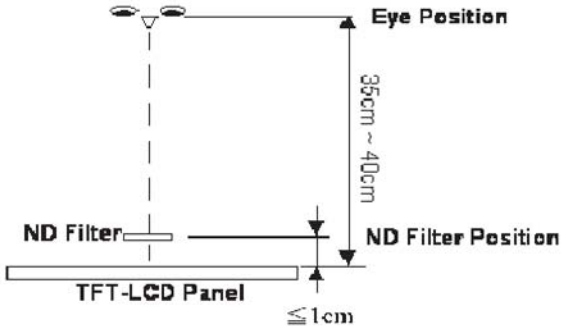


Note3. D：Diameter D=(a+b)/2



Note4. Bright dot is defined through 6% transmission ND Filter as following.

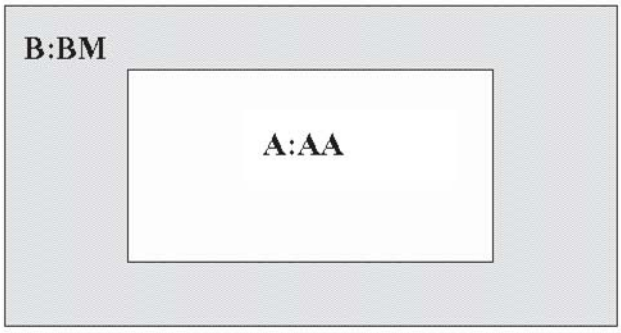




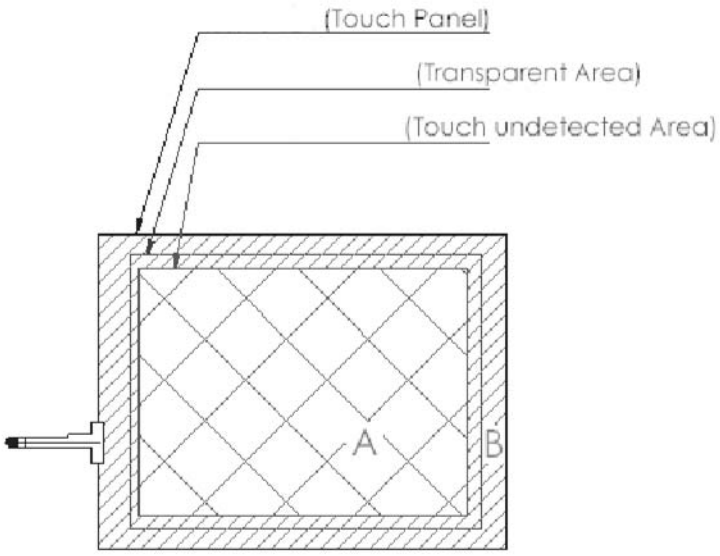
Note5. ADJACENT DOT

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: Z.W.	REV.: 1.0	HDA430-3H	SHEET 19 OF 21 DATE: 9/11/09

Note6.

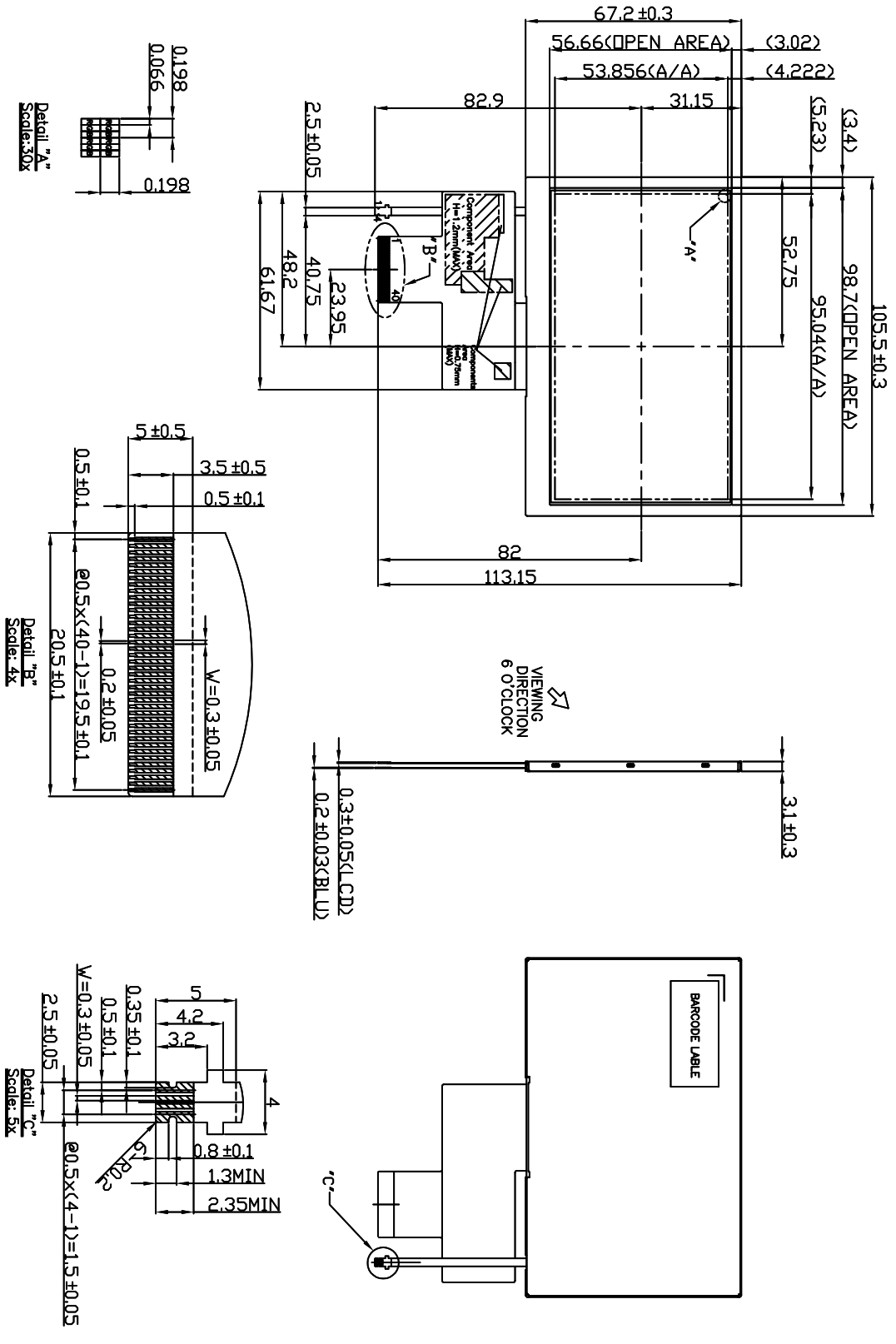


Note7.



A area : Without any defect point effect on normal operation.

B area : None-specify



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: Z.W.	REV.: 1.0	HDA430-3H	SHEET 21 OF 21 DATE: 9/11/09