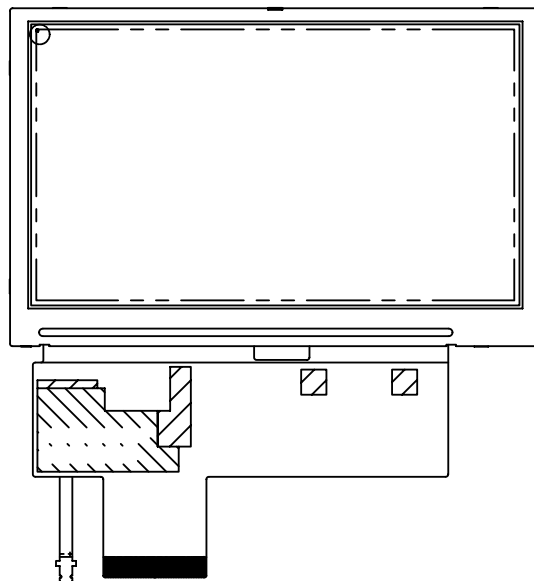




PRODUCT SPECIFICATION

HDA430-2

4.3', 480x272 TFT COLOR GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC.
10080 BUBB RD.
CUPERTINO, CA 95014

Q.A.:

ZW

REV:

1.0

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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)×3.95(D)	mm
Weight	(45.2)	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. ($T_a \leq 50^\circ\text{C}$).

(b) Wet-bulb temperature should be 39 °C Max. ($T_a > 50^\circ\text{C}$).

(c) No condensation.

Electrical Absolute Ratings

TFT-LCD Module

($T_a = 25 \pm 2^\circ\text{C}$, $V_{SS} = 0\text{V}$)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Analog Power Supply Voltage	AVDD	-0.3	6.0	V	-
Digital Power Supply Voltage	DVDD	-0.3	6.0	V	-

Backlight Unit

($T_a = 25 \pm 2^\circ\text{C}$)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Current of Backlight Unit	I _B	-	30	mA	(1)
Reverse Voltage	V _R	-	35	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.		
Analog Power Supply Voltage	AVDD	4.8	5.0	5.2	V	-
Digital Power Supply Voltage	DVDD	2.3	2.5	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	-
Dot Clock	DCLK	-	9.0	15.0	MHz	-

(VSS = 0V)

Parameter	SYMBOL	Condition	Min	Typ	Max	Unit	Remarks
Analog Current	IAVDD	AVDD = 5V	-	17.4	27	mA	(1)
Digital Current	IDVDD	DVDD=2.5V	-	3.2	6	mA	(1)
Total Power Consumption	PC	-	-	95	150	mW	(1)

Note (1) The specified power consumption is under the conditions at DVDD = 2.5V, AVDD = 5.0V, FV=60Hz, DCLK=9.0 MHz, whereas a power dissipation check Pattern below is displayed.

Black Pattern / 0 Gray



Active Area

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Backlight Unit

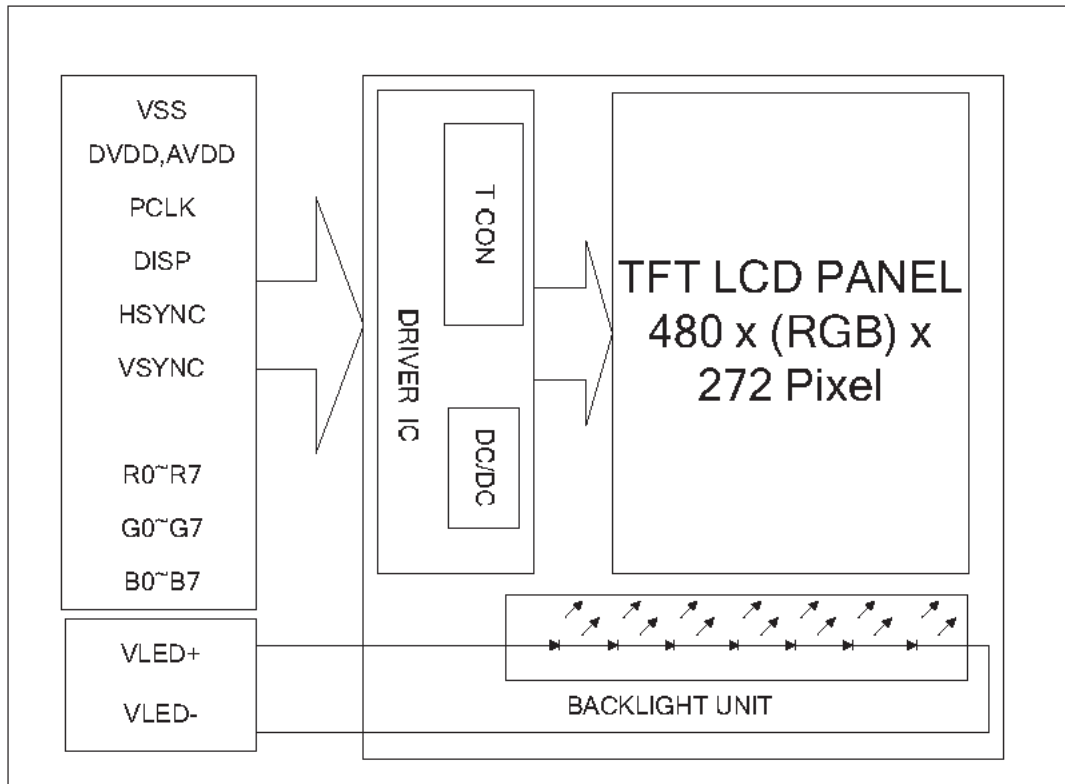
(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Voltage	V _L	-	(23.1)	-	V	(1)
Current of Backlight Unit	I _B	-	20	-	mA	(1)
Power Consumption	P _{BL}	-	(462)	-	mW	(1)
LED life time	-	10000	-	-	Hr	(2)

Note (1) The driving design of backlight unit is dependent on serial consideration of 7 LEDs.

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

Block Diagram TFT-LCD Module with Backlight Unit



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(+2.5V)	23	B2	Blue data
4	DVDD	POWER SUPPLY(+2.5V)	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	VSNC	Vertical Sync input with negative polarity
14	G1	Green data	34	NC	NC
15	G2	Green data	35	AVDD	Power supply(+5V)
16	G3	Green data	36	AVDD	Power supply(+5V)
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

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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)

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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
Basic Colors	Black	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
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	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
	Cyan	0	0	0	0	0	0	0	0	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
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	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
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
	Red(1)	0	0	0	0	0	0	0	1	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	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
	Red(255)	1	1	1	1	1	1	1	1	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
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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
	Blue(1)	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	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1

Interface Timing

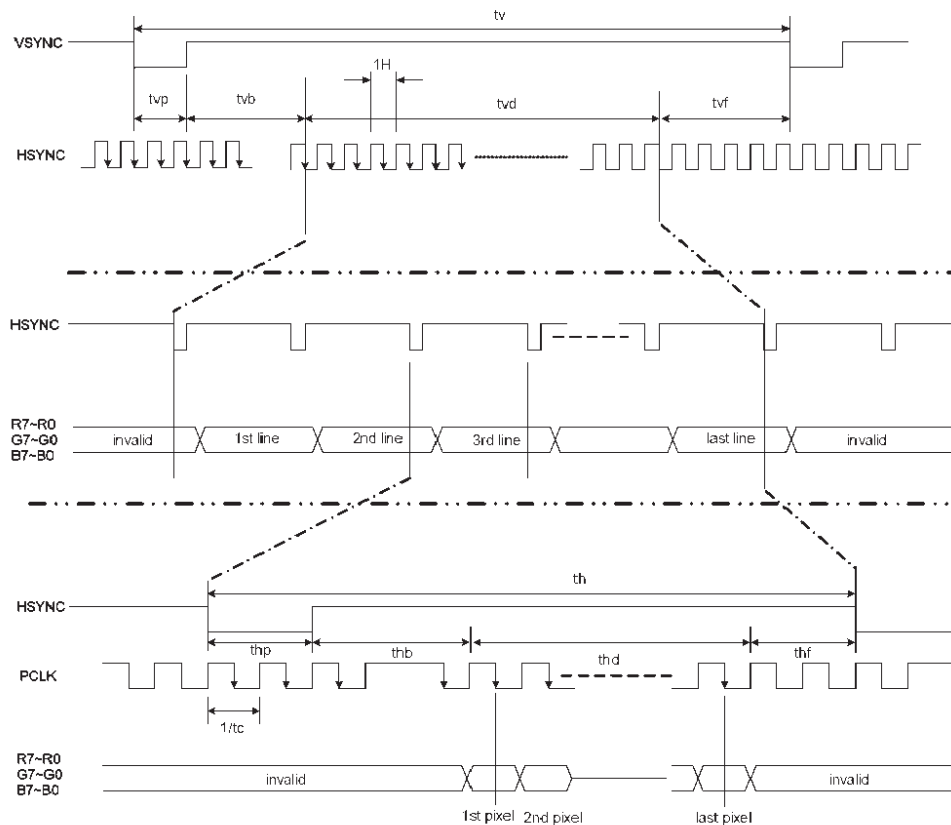
Timing Requirement 1

(480RGBx272, $T_A=25^\circ\text{C}$, DVDD=2.25V to 3.6V, DVSS= 0V)

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
Clock cycle	$1/t_c$	-	9	15	MHz
Hsync cycle	$1/f_H$	-	17.14	-	KHz
Vsync cycle	$1/f_V$	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	-	525	-	CLK
Horizontal display period	thd	-	480	-	CLK
Horizontal front porch	thf	2	-	-	CLK
Horizontal pulse width	thp	2	41	-	CLK
Horizontal back porch	thb	2	2	-	CLK
Vertical Signal					
Vertical cycle	tv	-	286	-	H
Vertical display period	tv_d	-	272	-	H
Vertical front porch	tvf	1	2	-	H
Vertical pulse width	tv_p	1	10	-	H
Vertical back porch	tvb	1	2	-	H

Note:

- $thd=480\text{CLK}$, $thf=2\text{CLK}$, $thp=41\text{CLK}$, $thb=2\text{CLK}$, $thf + thp + thb > 44$
- $525\text{CLK} = 480\text{CLK} + 2\text{CLK} + 41\text{CLK} + 2\text{CLK}$



Timing Requirement 2

($T_A = 25^\circ\text{C}$, $DVDD = 2.25\text{V}$ to 3.6V , $DVSS = 0\text{V}$, $t_r = t_f = 2\text{ns}$)

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:

- For parallel interface, maximum clock frequency is 15MHz.
- t_r , t_f is defined 10% to 90% of signal amplitude.

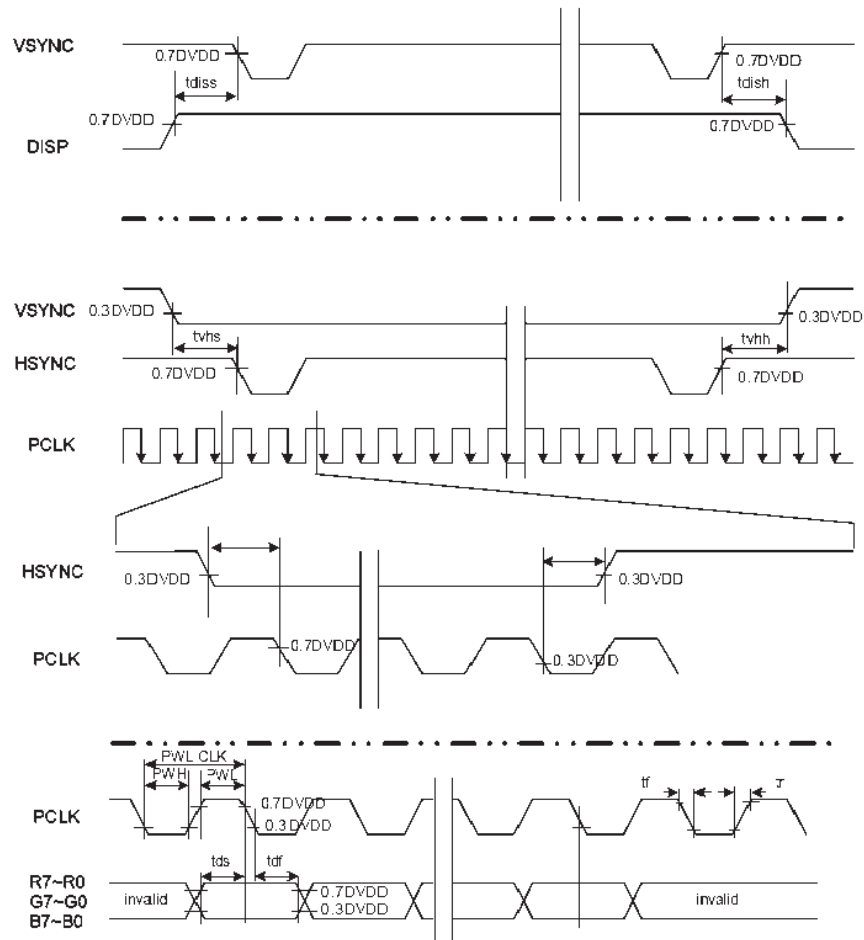
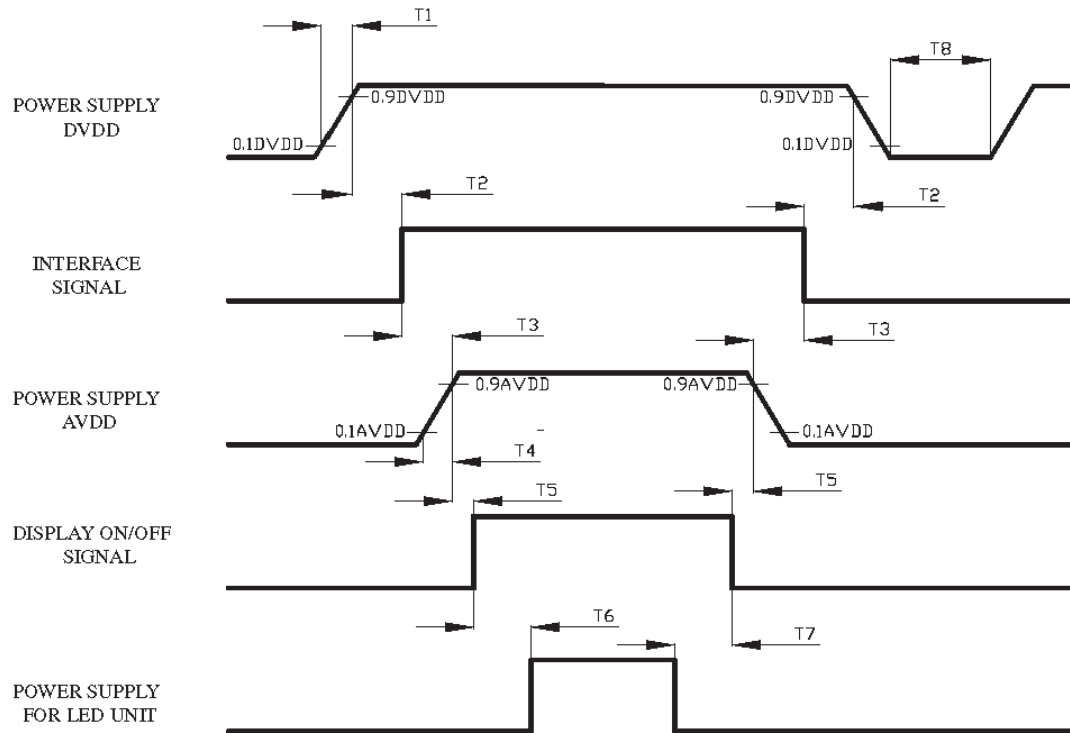


Figure 11.2 Input setup timing

Power On / Off Sequence

To prevent the latch-up or DC operation of LCD module, the power on/off sequence shown below must be followed.



Power ON/OFF Sequence

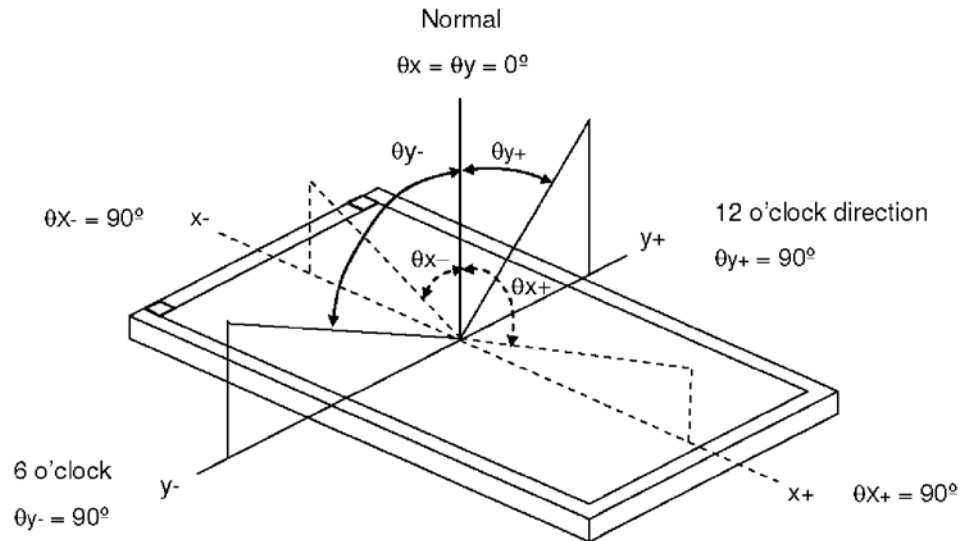
Symbol	Specification	Symbol	Specification
T1	$0 \leq T1 \leq 10 \text{ msec}$	T5	$0 \leq T5 \leq 50 \text{ msec}$
T2	$0 \leq T2 \leq 50 \text{ msec}$	T6	$160 \text{ msec} \leq T6$
T3	$0 \leq T3 \leq 50 \text{ msec}$	T7	$160 \text{ msec} \leq T7$
T4	$0 \leq T4 \leq 10 \text{ msec}$	T8	$1 \text{ sec} \leq T8$

Optical Characteristics

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

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_X=0^\circ, \theta_Y=0^\circ$ Viewing Normal Angle	300	450	-	-	(2),(5)
Response Time		$T_{R+} T_F$		-	50	70	ms	(3)
Luminance(Center)		LC		400	(500)	-	cd/m ²	(4),(5)
Brightness uniformity		B _{UNI}		70	-	-	%	(5),(6)
Color Chromaticity	Red	R _x	$\theta_X=0^\circ, \theta_Y=0^\circ$ Viewing Normal Angle	(0.532)	(0.582)	(0.632)	-	(1),(5)
		R _y		(0.315)	(0.365)	(0.415)	-	
	Green	G _x		(0.264)	(0.314)	(0.364)	-	
		G _y		(0.521)	(0.571)	(0.621)	-	
	Blue	B _x		(0.089)	(0.139)	(0.189)	-	
		B _y		(0.049)	(0.099)	(0.149)	-	
	White	W _x		(0.257)	(0.307)	(0.357)	-	
		W _y		(0.306)	(0.356)	(0.406)	-	
Viewing Angle	Horizontal	θ_{X+}	CR $\geq$ 10	50	(65)	-	deg.	
		θ_{X-}		50	(65)	-		
	Vertical	θ_{Y+}		45	(50)	-		
		θ_{Y-}		55	(60)	-		

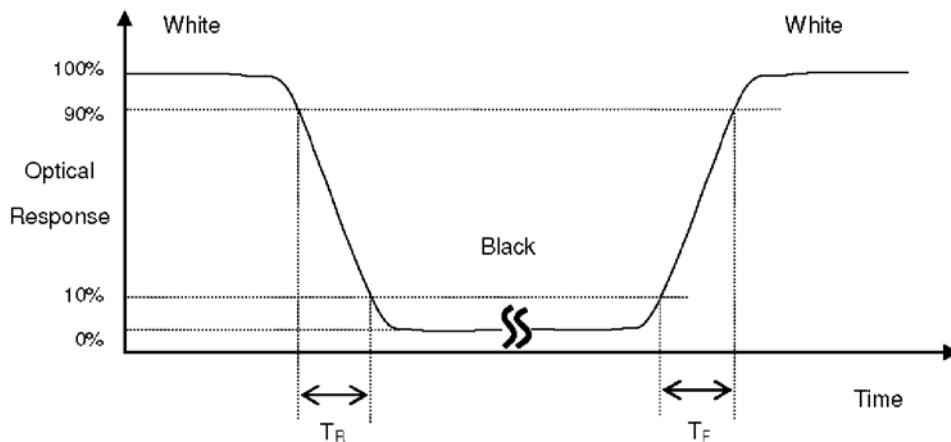
Note (1) Definition of Viewing Angle (θ_x , θ_y):



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

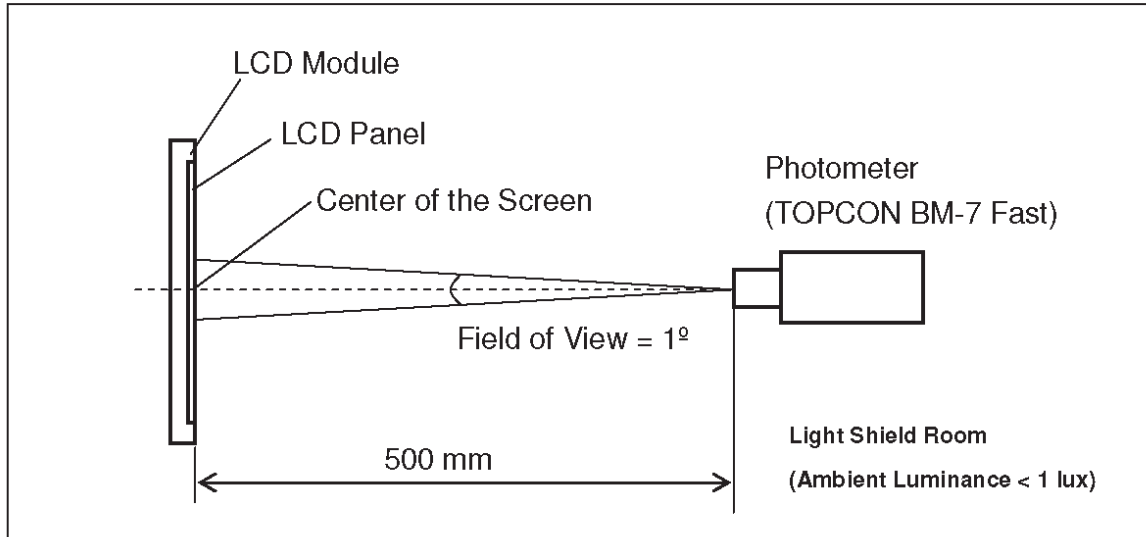
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

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



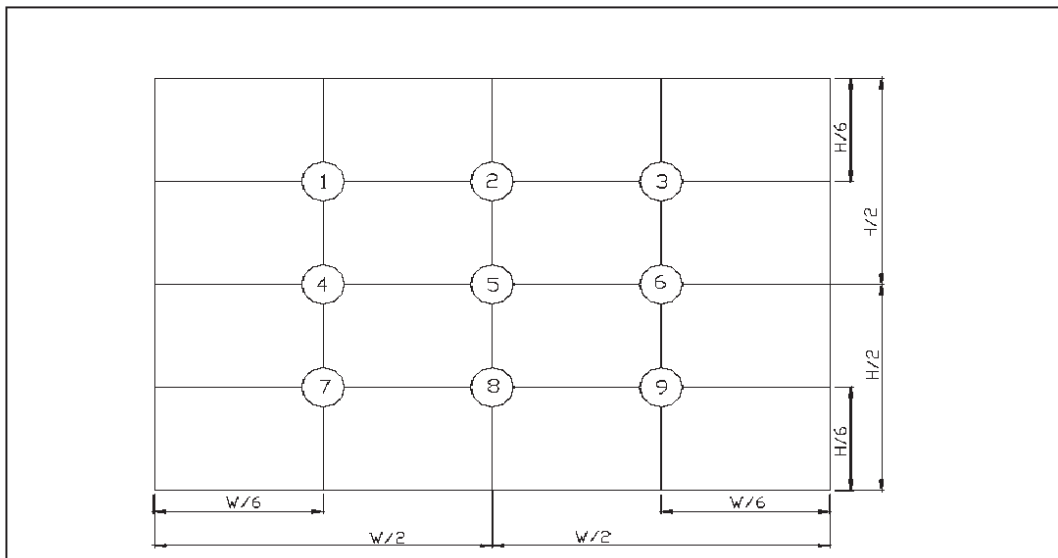
Note (4) Measurement Set-Up:

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 = $(\text{Min Luminance of 9 points}) / (\text{Max Luminance of 9 points}) \times 100\%$



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Reliability Test

No.	Test Items	Test Condition	Remark
1	High Temperature Storage Test	T _a = 80°C 240 hours	-
2	Low Temperature Storage Test	T _a = -30°C 240 hours	-
3	High Temperature Operation Test	T _a = 70°C 240 hours	-
4	Low Temperature Operation Test	T _a = -20°C 240 hours	-
5	High Temperature and High Humidity Operation Test	T _a =60°C 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, 80G, 11ms 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°C(30min) ~ 70°C(30min),100 cycles	-
10	Drop Test(with Carton) (non-operating)	Height: 80cm 1 corner, 3 edges, 6 surfaces	-

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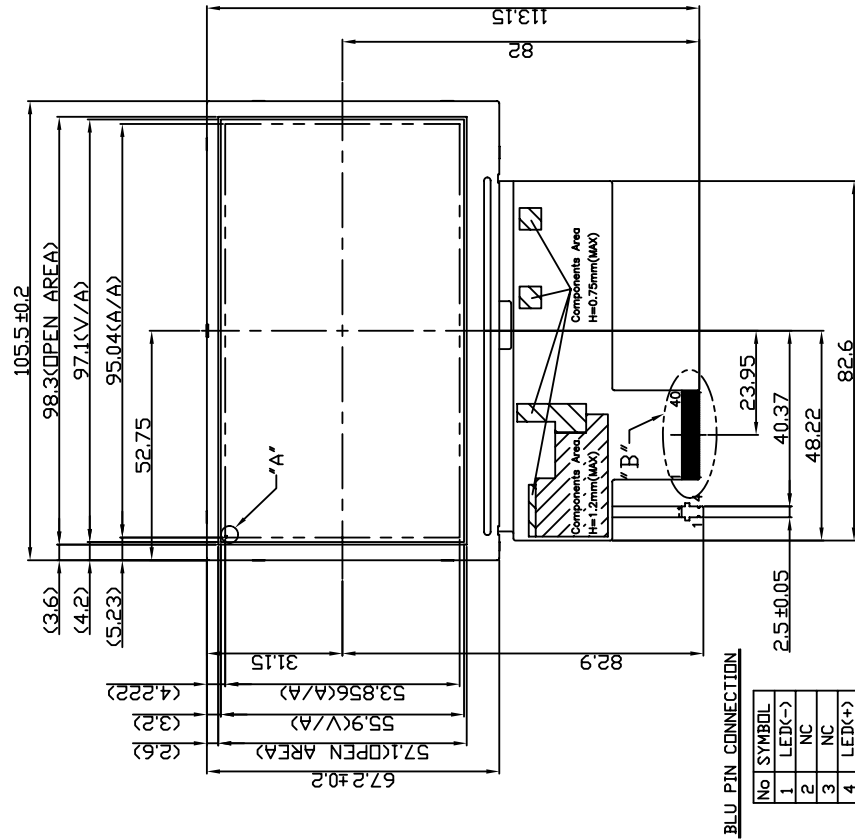
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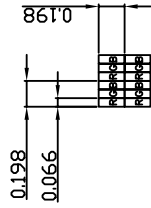
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BLU PIN CONNECTION

No	SYMBOL
1	LED(-)
2	NC
3	NC
4	LED(+)



Detail "A"
Scale: 30x

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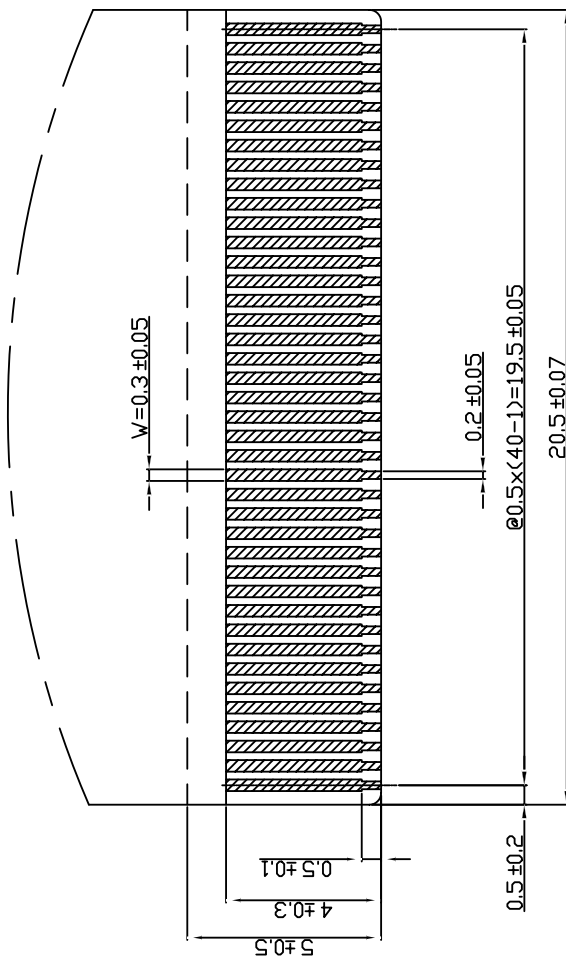
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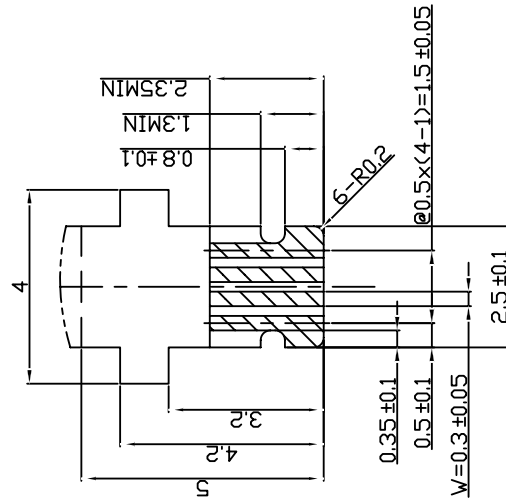
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Detail "B"
Scale: 8x



Detail "C"
Scale: 10x

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