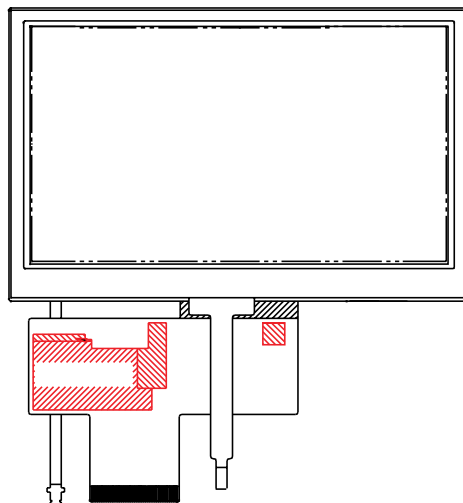




PRODUCT SPECIFICATION

HDA430T-3GH

4.3', 480x272 TFT COLOR GRAPHICS
LCD DISPLAY MODULE



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

Q.A.:
Z.W.

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1.0

HDA430T-3GH

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1 General Description and Features

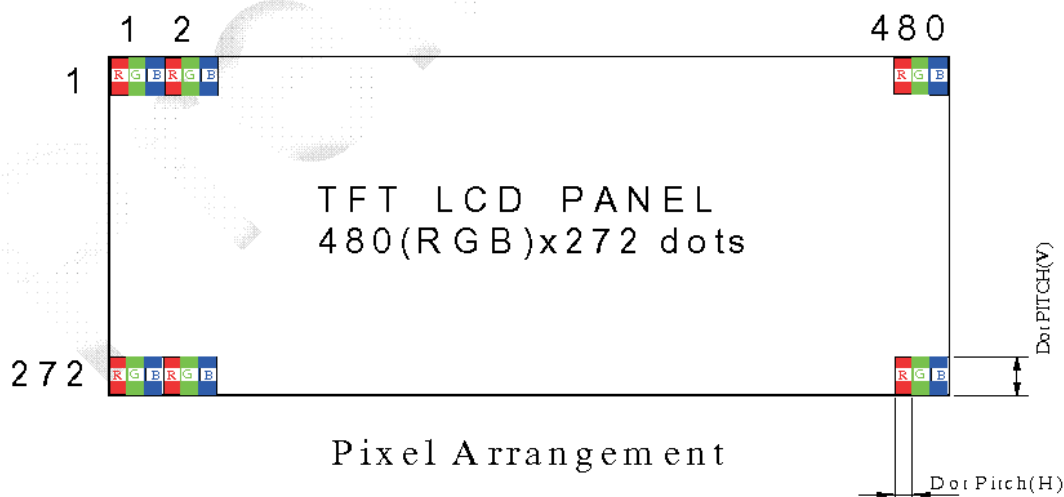
HDA430T-3GH is a TM (Transmissive) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit and a touch screen panel (TSP). The resolution of a 4.3" contains 480(RGB)x272 dots and can display up to 16.7M colors.

1.1 Features

- Transmissive and back-light with 10LEDs are available.
- TN (Twisted Nematic) mode.
- 24bit RGB Interface

1.2 LCD Module

Item	Specification	Unit
Screen Size	4.3 inches	Diagonal
Display Resolution	480(H) x RGB x 272(V)	Dot
Pixel size	0.198 (H) x 0.198 (V)	mm
Active Area	95.040 (H) x 53.856 (V)	mm
Outline Dimension	105.5 (W) x 67.2 (H) x 4.2 (D)	mm
Display Mode	Normally white/Transmissive	--
Pixel Arrangement	RGB Vertical-Stripe	--
Surface Treatment	Anti-glare (AG)	--
Display Color	16.7M	--
Viewing Direction (Gray Inversion)	6 o'clock (Gray Inversion)	--
Input Interface	Digital 24-bits parallel RGB	--
Color Gamut (NTSC%)	NTSC 50%	--



2 Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	105.5	--	mm	--
	Vertical (V)	--	67.20	--	mm	(1)
	Thickness (T)	--	4.2	--	mm	(1)
Weight		--	(58)	--	g	--

Note (1) Not include FPC.

Refer to the Dimensional Outlines for further information.

3 Electrical Specifications

3.1 Absolute Max. Ratings

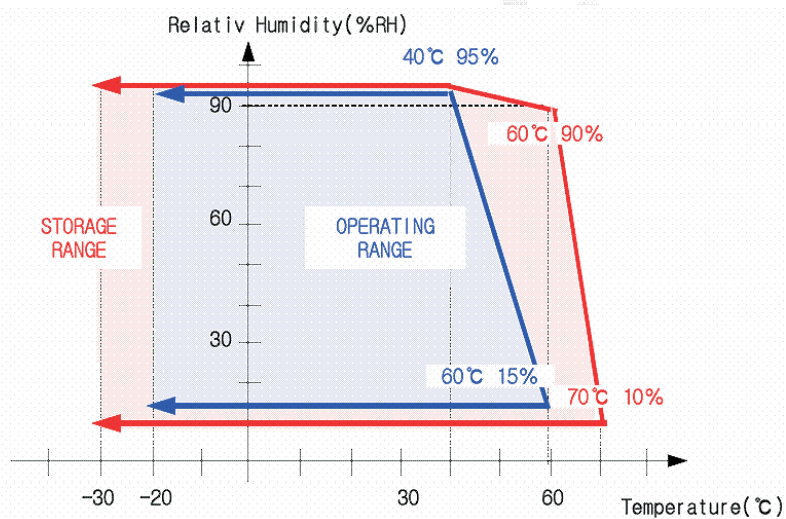
3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

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

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-30	80	$^\circ\text{C}$	(1)
Operating temperature	T_{OPR}	-20	70	$^\circ\text{C}$	(1,2,3)

Note (1) 95 % RH Max. ($40^\circ\text{C} \geq T_a$). Maximum wet-bulb temperature at 39°C or less. ($T_a > 40^\circ\text{C}$)
No condensation.



Note (2) In case of below 0° , the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at $+25^\circ\text{C}$.

3.2 Electrical Absolute Rating

3.2.1 TFT-LCD Module

(Ta=25±2°C, V_{SS}=GND=0)

Item	Symbol	Value		Unit	Condition
		Min.	Max.		
power supply voltage	DV _{DD}	-0.3	4.0	V	

3.2.2 Back-Light Unit

(Ta=25±2°C)

Item	Symbol	Min.	Max.	Unit	Note
Current of Backlight Unit	I _B	--	(25)	mA	(1)
Forward Current	V _R	--	50	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded. Functional operation should be restricted to the conditions described under normal operating conditions.

4 Electrical Characteristics

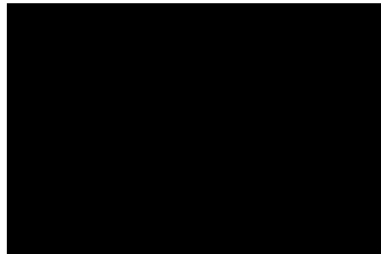
4.1 TFT-LCD Module

(Ta=25±2°C, V_{DD} =3.3V)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
Power supply voltage	V _{DD}	3.0	3.3	3.6	V	
Digital Current	I _{DD}	-	(22.8)	(32.5)	mA	

Note (1) The specified power consumption is under the conditions at V_{CC}=3.3V , F_V=60Hz, whereas a Power dissipation check pattern below is displayed.

Black Pattern / 0 Gray



Active Area

4.2 Backlight Unit

The back-light system is an edge-lighting type with white LED (Light Emitting Diode)s.

(Ta=25±2°C)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VL	-	(33)	-	V	
LED Current	I _F	-	(20)	-	mA	
Power Consumption	P _{LED}	-	(660)	-	mW	
LED Life Time (25°C)	-	(20000)	-	-	hr	

Note (1) 10LEDs serial type.

(2) Where I_B = 20mA, V_F = 33V, P_{BL} = V_F × I_B

5 Touch Screen Panel Specifications

5.1 Touch Screen Panel Specifications

5.1.1 Electrical Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Linearity	-1.5	-	1.5	%	Analog X and Y directions
Terminal resistance	(500)	-	(1300)	Ω	X (Glass side)
	(100)	-	(540)	Ω	Y (Film side)
Insulation resistance	20	-	-	M Ω	DC 25V
Voltage	-	5.0	7.0	V	DC
Chattering	-	-	10	ms	100k Ω pull-up

Caution (1) : Do not operate it with a thing except a polyacetal pen (tip R0.8mm or less) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.

5.1.2 Mechanical & Reliability Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Activation force	-		80	g	(1)
Durability-surface scratching	Write 100,000	-	-	characters	(2)
Durability-surface pitting	1,000,000	-	-	touches	(3)
Surface hardness	3	-	-	H	JIS K5400,ASTM D3363

Note (1) Stylus pen Input : R0.8mm polyacetal pen or Finger

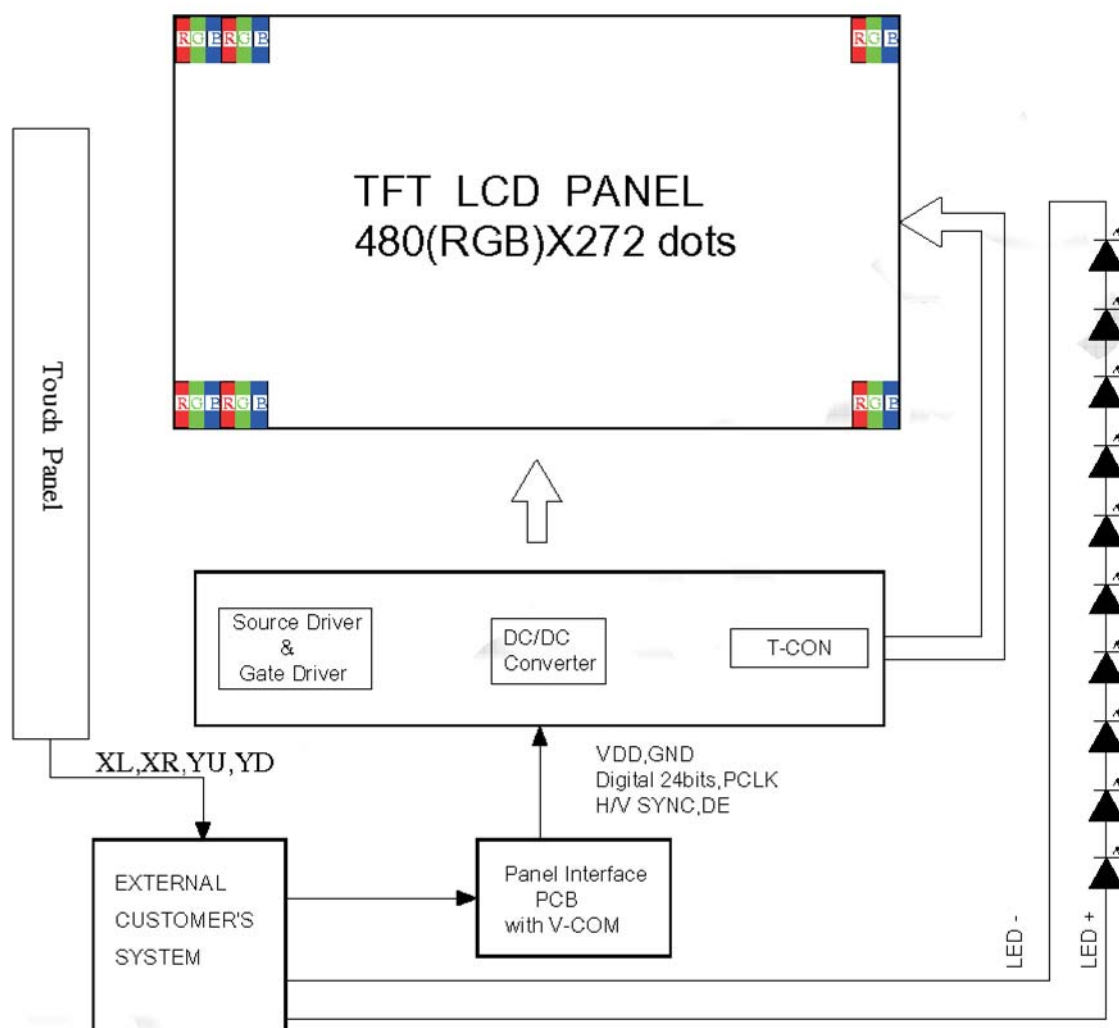
Note (2) Measurement for Surface area - Scratch 100,000 times straight line on the Film with a stylus change every 20,000times

- Force : 150gf
- Speed : 100mm/sec
- Stylus : R0.8 polyacetal tip

Note (2) Pit 1,000,000 times on the Film with a R8.0 silicon rubber.

- Force : Force : 250gf
- Speed : 3times/sec

6 Block Diagram



7 Input Terminal Pin Assignment

7.1 CN1 Pin Assignment (LCD)

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

Pin No.	Symbol	I/O	Function	Remark
1	VSS	P	Ground	
2	VSS	P	Ground	
3	DV _{DD}	P	Logic power supply(+3.0~3.6V)	
4	DV _{DD}	P	Logic power supply(+3.0~3.6V)	
5	R0	I	Red Data Bit 0(LSB)	
6	R1	I	Red Data Bit 1	
7	R2	I	Red Data Bit 2	
8	R3	I	Red Data Bit 3	
9	R4	I	Red Data Bit 4	
10	R5	I	Red Data Bit 5	
11	R6	I	Red Data Bit 6	
12	R7	I	Red Data Bit 7(MSB)	
13	G0	I	Green Data Bit 0(LSB)	
14	G1	I	Green Data Bit 1	
15	G2	I	Green Data Bit 2	
16	G3	I	Green Data Bit 3	
17	G4	I	Green Data Bit 4	
18	G5	I	Green Data Bit 5	
19	G6	I	Green Data Bit 6	
20	G7	I	Green Data Bit 7(MSB)	
21	B0	I	Blue Data Bit 0 (LSB)	
22	B1	I	Blue Data Bit 1	
23	B2	I	Blue Data Bit 2	
24	B3	I	Blue Data Bit 3	
25	B4	I	Blue Data Bit 4	
26	B5	I	Blue Data Bit 5	
27	B6	I	Blue Data Bit 6	
28	B7	I	Blue Data Bit 7(MSB)	
29	VSS	P	Ground	
30	P _{CLK}	I	Dot Data Clock	
31	DISP	I	Display on/off	
32	H _{SYNC}	I	Horizontal Sync Input	

33	V _{SYNC}	I	Vertical Sync Input	
34	NC	I	NC	
35	NC	I	NC	
36	NC	I	NC	
37	NC	I	NC	
38	NC	I	NC	
39	NC	I	NC	
40	NC	I	NC	

7.2 Backlight

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

Pin No.	Symbol	Function	Remark
1	VLED-	Power for LED backlight cathode	--
2	NC	NC	--
3	NC	NC	--
4	VLED+	Power for LED backlight anode	--

8 Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (1).
Measuring equipment: BM-5A/BM-7

(Ta=25±2°C, VDD = 3.3V, I_f=20mA)

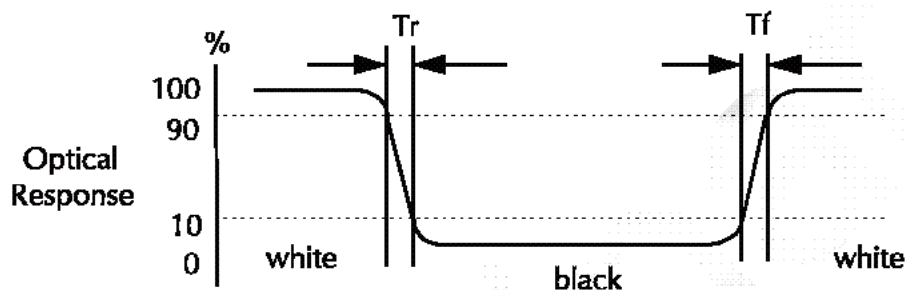
Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness		--	--	(400)	(500)	--	cd/m ²	--
Response time		T _R	θ=0°	--	5	--	ms	--
		T _F		--	15	--	ms	
Contrast ratio		CR	At optimized viewing angle	(300)	(450)	--	--	--
Color Chromaticity	Red	R _x	θ=0° Normal Viewing Angle	(0.57)	(0.62)	(0.67)	--	--
		R _y		(0.29)	(0.34)	(0.39)		
	Green	G _x		(0.29)	(0.34)	(0.39)	--	
		G _y		(0.52)	(0.57)	(0.62)		
	Blue	B _x		(0.09)	(0.14)	(0.19)	--	
		B _y		(0.05)	(0.10)	(0.15)		
	White	W _x		(0.27)	(0.32)	(0.37)	--	
		W _y		(0.29)	(0.34)	(0.39)		
Viewing Angle (6H)	Hor.	θ _R	CR≥10	50	(60)		Degree	--
		θ _L		50	(60)			
	Ver.	φ _H		40	(50)			
		φ _L		50	(60)			

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-5A/BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



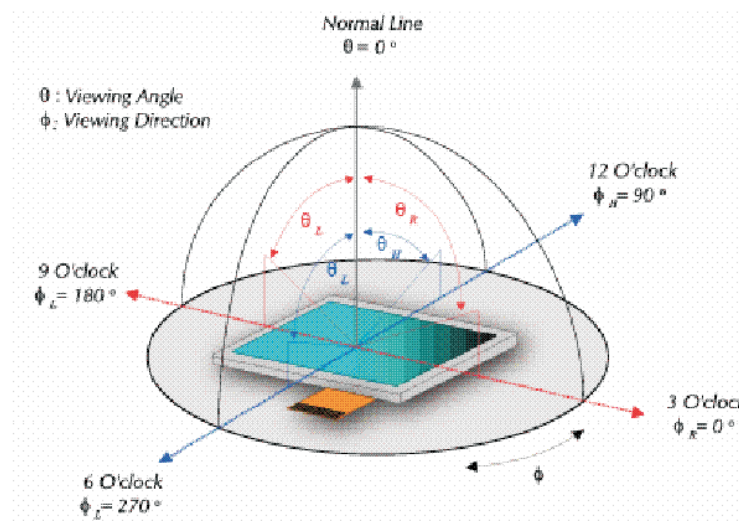
c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

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e. View Angle



f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type
---------------------------------	----------

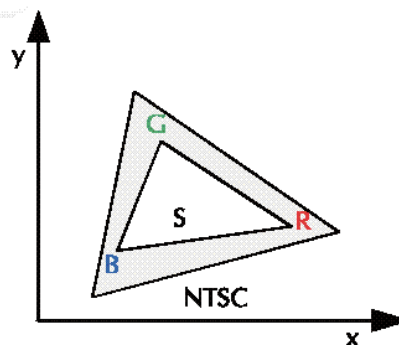
g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}}$$

h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut : NTSC(%) = (RGB Triangle Area / NTSC Triangle Area) x 100



9 Basic Display Color and Gray Scale

		Color & Gray Scale	Data Signal																							
			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 Color		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(0)	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	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	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
Red		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)	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(127)	0	1	1	1	1	1	1	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
Green		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
		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(127)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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
Blue		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
		Blue(1)	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	1	0	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		Blue(127)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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

0 : Low level voltage, 1 : High level voltage

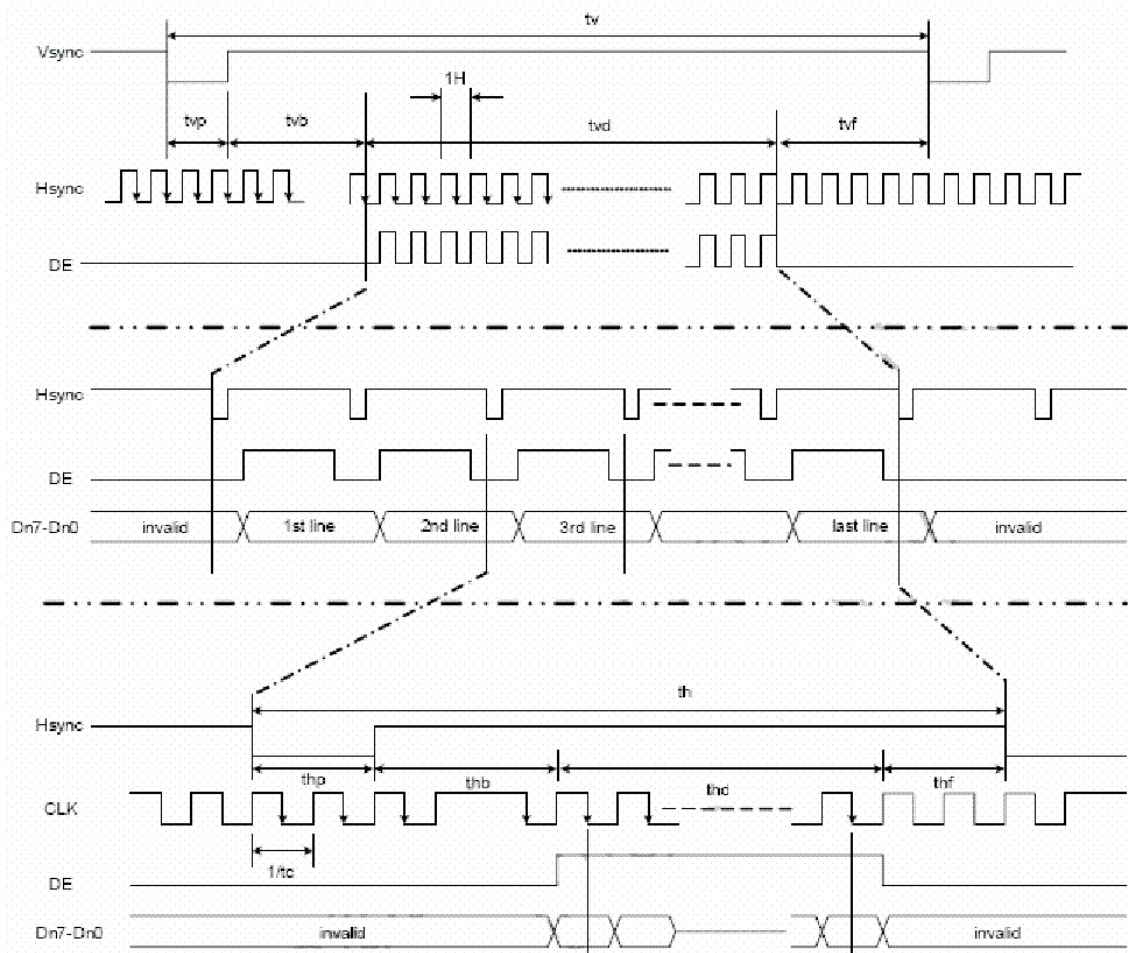
Each basic color can be displayed in 256 gray scales from 8 bit data signals. With the combination of total 24 bit data signals, the 16,777,216-color display can be achieved on the screen.

10 AC Timing

10.1 Parallel RGB input timing requirement

(480RGB x 272 , TA = 25°C , VDDIO=1.8V to 3.6V , DVSS=0V)

Parameter	Symbol	Min	Typ	Max	Unit
Clock cycle	fclk	-	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	41	41	CLK
Horizontal back porch	Thb	2	2	41	CLK
Vertical Signal					
Vertical cycle	Tv	285	286	399	H
Vertical display period	Tvd	272	272	272	H
Vertical front porch	Tvf	1	2	227	H
Vertical pulse width	Tvp	1	10	11	H
Vertical back porch	Tvb	1	2	11	H



11 Test

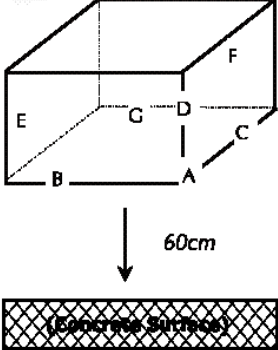
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: $20 \pm 5^\circ\text{C}$.

Humidity: $65 \pm 5\%\text{RH}$.

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	$70^\circ\text{C} \pm 2^\circ\text{C}$, 240hrs (Operation state).	
2	Low Temperature Operating	$-20^\circ\text{C} \pm 2^\circ\text{C}$, 240hrs (Operation state).	1
3	High Temperature Storage	$80^\circ\text{C} \pm 2^\circ\text{C}$, 240hrs.	2
4	Low Temperature Storage	$-30^\circ\text{C} \pm 2^\circ\text{C}$, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	$60^\circ\text{C} \pm 2^\circ\text{C}$, 90%, 240hrs	1,2
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10~55Hz. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	3
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  <i>Dropping method corner dropping:</i> <i>A corner: Once edge dropping.</i> <i>B, C, D edge: Once face dropping.</i> <i>E, F, G face: Once.</i>	

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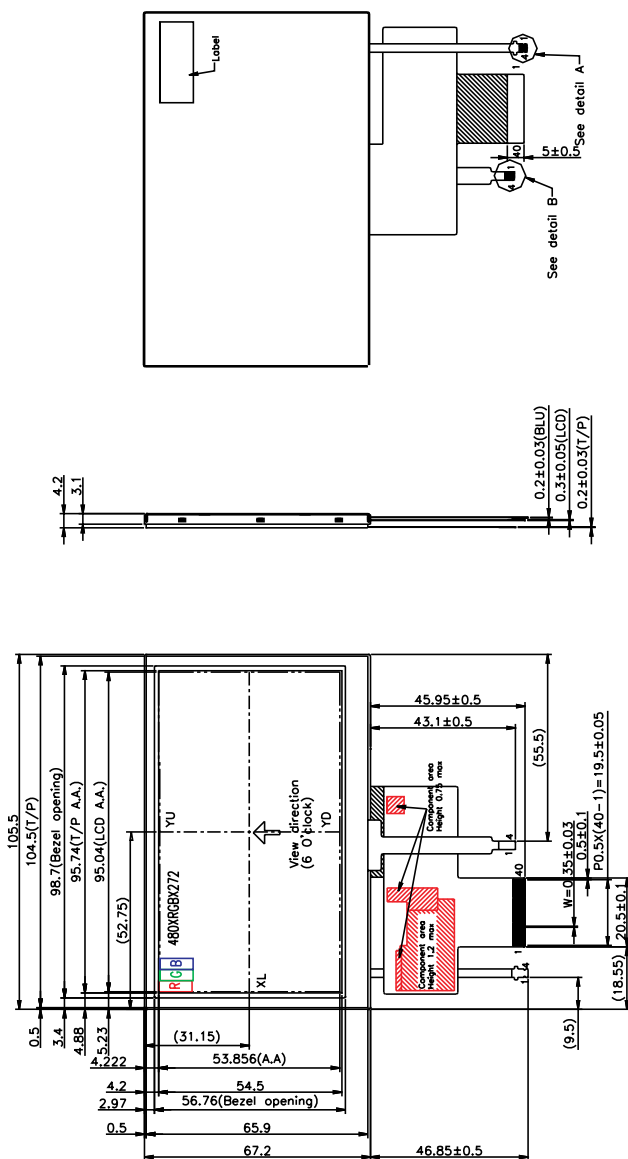
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12 Dimensional outlines

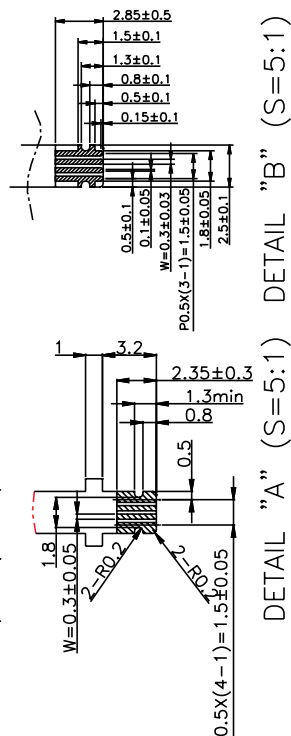
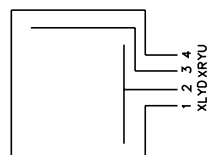
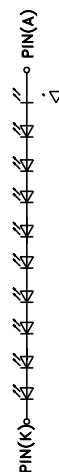


PIN FUNCTION			PIN SYMBOL		
1	PIN	VSS	21	B0	
2	VSS	22	B1		
3	DVDD	23	B2		
4	DVDD	24	B3		
5	R0	25	B4		
6	R1	26	B5		
7	R2	27	B6		
8	R3	28	B7		
9	R4	29	VSS		
10	PCLK	30	PCLK		
11	R6	31	DISP		
12	R7	32	HSYNC		
13	G0	33	VSYNC		
14	G1	34	NC(DE)		
15	G2	35	NC(XR)		
16	G3	36	NC(YD)		
17	G4	37	NC(XU)		
18	G5	38	NC(YU)		
19	G6	39	NC(LEDK)		
20	G7	40	NC(LEDK)		

BLU PIN CONNECTION

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

Circuit Diagram:



DETAIL "A" (S=5:1) DETAIL "B" (S=5:1)

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