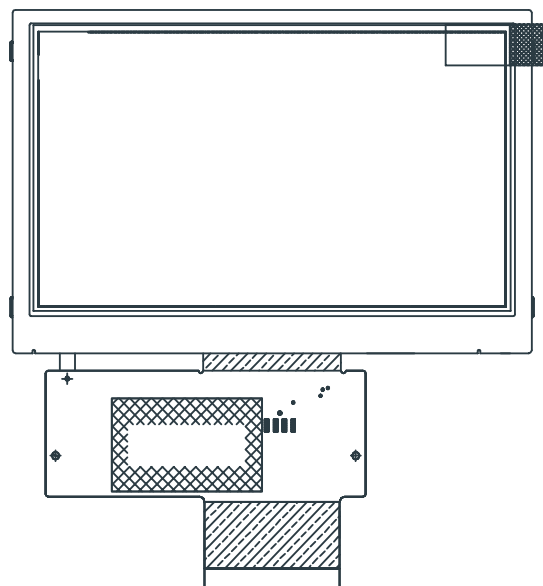




PRODUCT SPECIFICATION

HDA430-MVA

4.3', 480x272 TFT COLOR GRAPHICS
LCD DISPLAY MODULE



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

Q.A.:
Z.W.

REV.:
1.0

HDA430-MVA

SHEET 1 OF 20

DATE:
1/31/12

1 General Description and Features

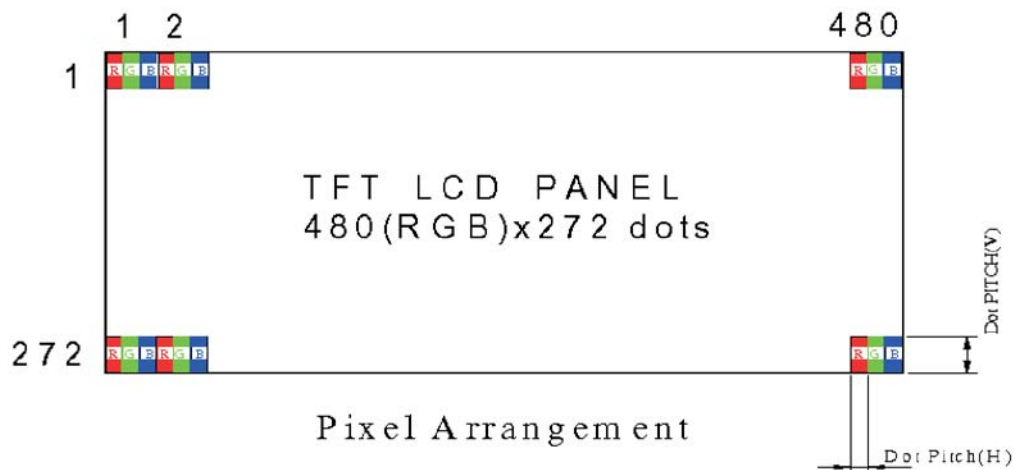
HDA430-MVA is a TM (Transmissive) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit. The resolution of a 4.3" contains 480(RGB)x272 dots and can display up to 16.7M colors.

1.1 Features

- Back-light with 12 LEDs are available.
- MVA mode.
- 24bit RGB Interface
- ROHS Compliance

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 3.75 (D)	mm
Display Mode	Normally Black/ Transmissive	--
Pixel Arrangement	RGB Vertical-Stripe	--
Surface Treatment	Clear type	--
Display Color	16.7M	--
Viewing Direction	Free Direction	--
Input Interface	Digital 24-bits parallel RGB	--



2 Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	105.5	--	mm	--
	Vertical (V)	--	67.20	--	mm	(1)
	Thickness (T)	--	3.75	--	mm	(1)
Weight		--	(60)	--	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.

(Ta=25±2°C, V_{SS}=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T _{STG}	-30	80	°C	(1)
Operating temperature	T _{OPR}	-20	70	°C	(1,2,3)

Note (1) 95 % RH Max. (40 °C ≥ Ta). Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °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°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	VDD	-0.3	4.5	V	
	VDDIO	-0.3	4.5	V	

3.2.2 Back-Light Unit

(Ta=25±2°C)

Item	Symbol	Min.	Max.	Unit	Note
Current of One LED	I _{LED}	--	(25)	mA	(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)

Item		Symbol	Value			Unit	Condition
			Min.	Typ.	Max.		
Power supply voltage		VDD	3.0	3.3	3.6	V	
		VDDIO	1.65	1.8	VDD	V	
Input Voltage for logic	H Level	VIH	0.7xVDDIO	-	VDDIO	V	
	L Level	VIL	0	-	0.3xVDDIO	V	
Digital Current		I _{DD}	-	(12.5)	(19)	mA	

4.2 Backlight Unit

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

(Ta=25±2°C)

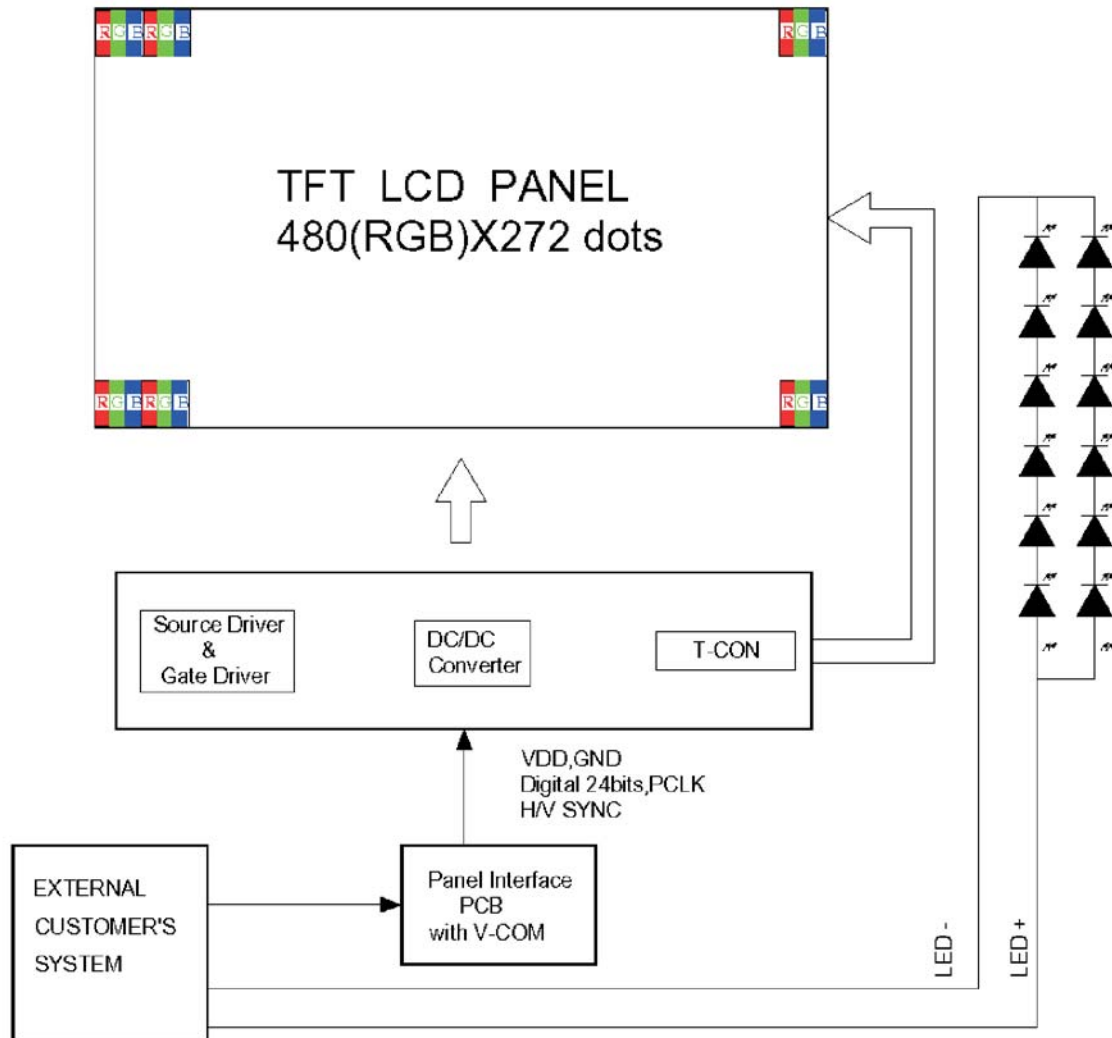
Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	V _L	(18.6)	(19.8)	(21)	V	
LED Current	I _f	-	(40)	(50)	mA	
Power Consumption	P _{BL}	-	(792)	(1050)	mW	(2)
LED Life Time (25°C)	-	(20000)	-	-	hr	(3)

Note : (1) 6 LEDs serial 2 parallel type.

(2) Where I_f = 40mA, V_L = 19.8V, P_{BL} = V_L × I_f

(3) The environmental conducted under ambient air flow ,at Ta=25±2°C,60%RH±5%

5 Block Diagram



6 Input Terminal Pin Assignment

6.1 CN1 Pin Assignment

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

Pin No.	Symbol	I/O	Function	Remark
1	GND	P	Ground	
2	GND	P	Ground	
3	NC	-	No connect	
4	NC	-	No connect	
5	NC	-	No connect	
6	NC	-	No connect	
7	VDDIO	P	Power supply for digital interface I/O pin	
8	VDD	P	Power supply for digital circuit	
9	VDD	P	Power supply for digital circuit	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	GND	P	Ground	
13	DCLK	I	Dot Data Clock, latching data at the falling edge	
14	GND	P	Ground	
15	DE	I	Data enable	
16	L/R	I	Horizontal scan direction control	
17	U/D	I	Vertical scan direction control	
18	CS	I	Serial communication chip select	
19	SDA	I	Serial communication data input and output	
20	SCL	I	Serial communication clock input	
21	DISP	I	DISP = Low: standby mode DISP = High : Normal display	
22	RESET	I	Global reset	
23	MODE	I	Charge pump power selection	
24~31	R7~R0	I	Red data(MSB~LSB)	
32~39	G7~G0	I	Green data(MSB~LSB)	
40~47	B7~B0	I	Blue data(MSB~LSB)	
48	VDD	P	Power supply for digital circuit	
49	GND	P	Ground	
50	GND	P	Ground	
51~52	LED_A	P	Power supply for backlight	
53~54	LED_K	P	Power supply for backlight	

7 Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room

Measuring equipment: BM-7A

(Ta=25±2°C, VDD =3.3V, I_F=40mA)

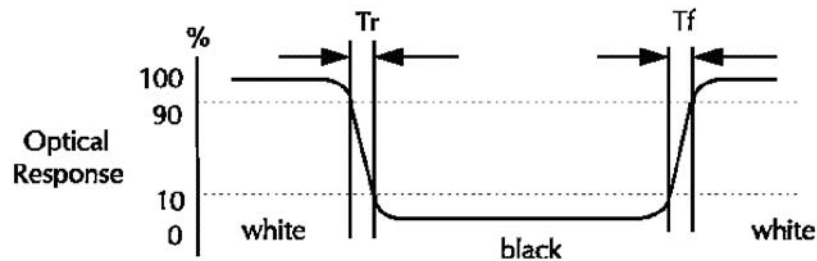
Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness		--	--	(650)	(800)	--	cd/m ²	--
Response time		T _R	θ=0°	-	10	-	ms	--
		T _F		-	20	-	ms	
Contrast ratio		CR	At optimized viewing angle	(300)	(500)	--	--	--
Color Chromaticity	Red	R _X	θ=0° Normal Viewing Angle	(0.57)	(0.62)	(0.67)	--	--
		R _Y		(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	80	-	-	Degree	--
		θ _L		80	-	-		
	Ver.	θ _U		80	-	-		
		θ _D		80	-	-		

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".



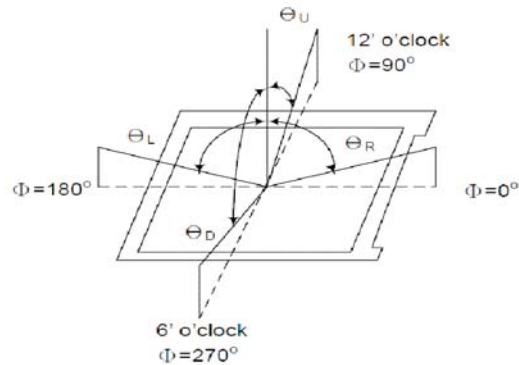
c. Definition of contrast ratio:

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

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
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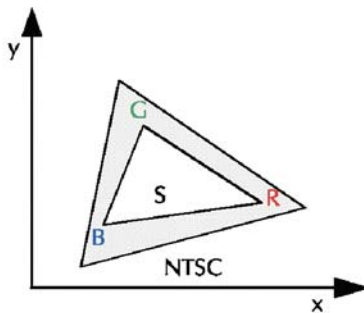
g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

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

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

$$\text{Color Gamut : NTSC(\%)} = \left(\frac{\text{RGB Triangle Area}}{\text{NTSC Triangle Area}} \right) \times 100$$



8 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	0
		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	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Blue(127)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

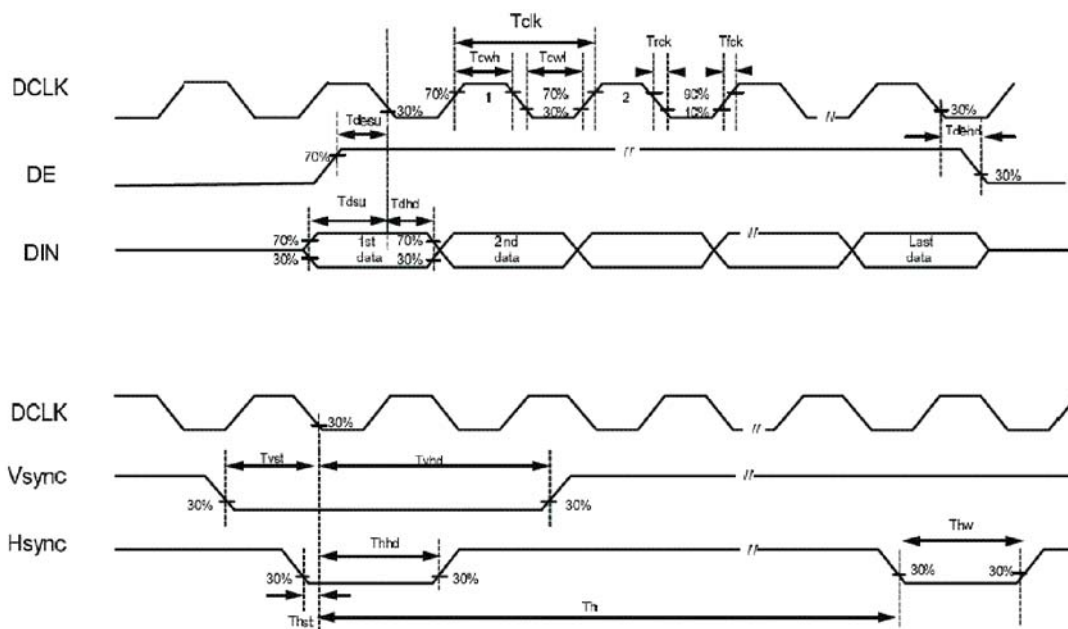
0 : Low level voltage, 1 : High level voltage

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.

9 AC Timing

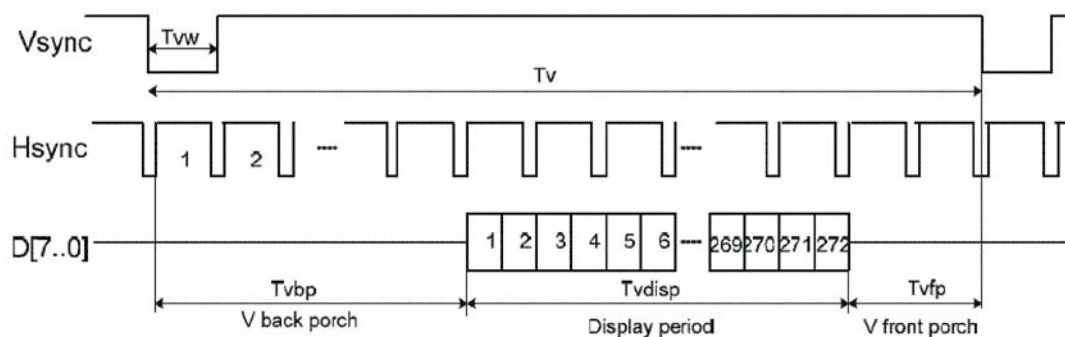
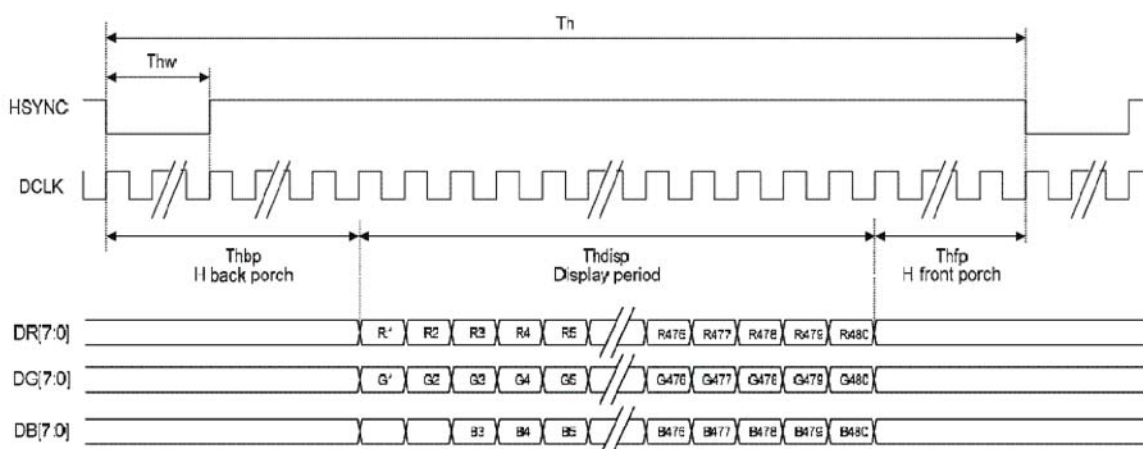
9.1 AC Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
CLK pulse duty	T _{cw}	40	50	60	%
Hsync width	T _{hw}	1.0	-	-	DCLK
Hsync period	T _h	55	60	65	us
Vsync setup time	T _{vst}	12	-	-	ns
Vsync hold time	T _{vhd}	12	-	-	ns
Hsync setup time	T _{hst}	12	-	-	ns
Hsync hold time	T _{hhd}	12	-	-	ns
Data set-up time	T _{dsu}	12	-	-	ns
Data hold time	T _{dhd}	12	-	-	ns
DE set-up time	T _{desu}	12	-	-	ns
DE hold time	T _{dehd}	12	-	-	ns



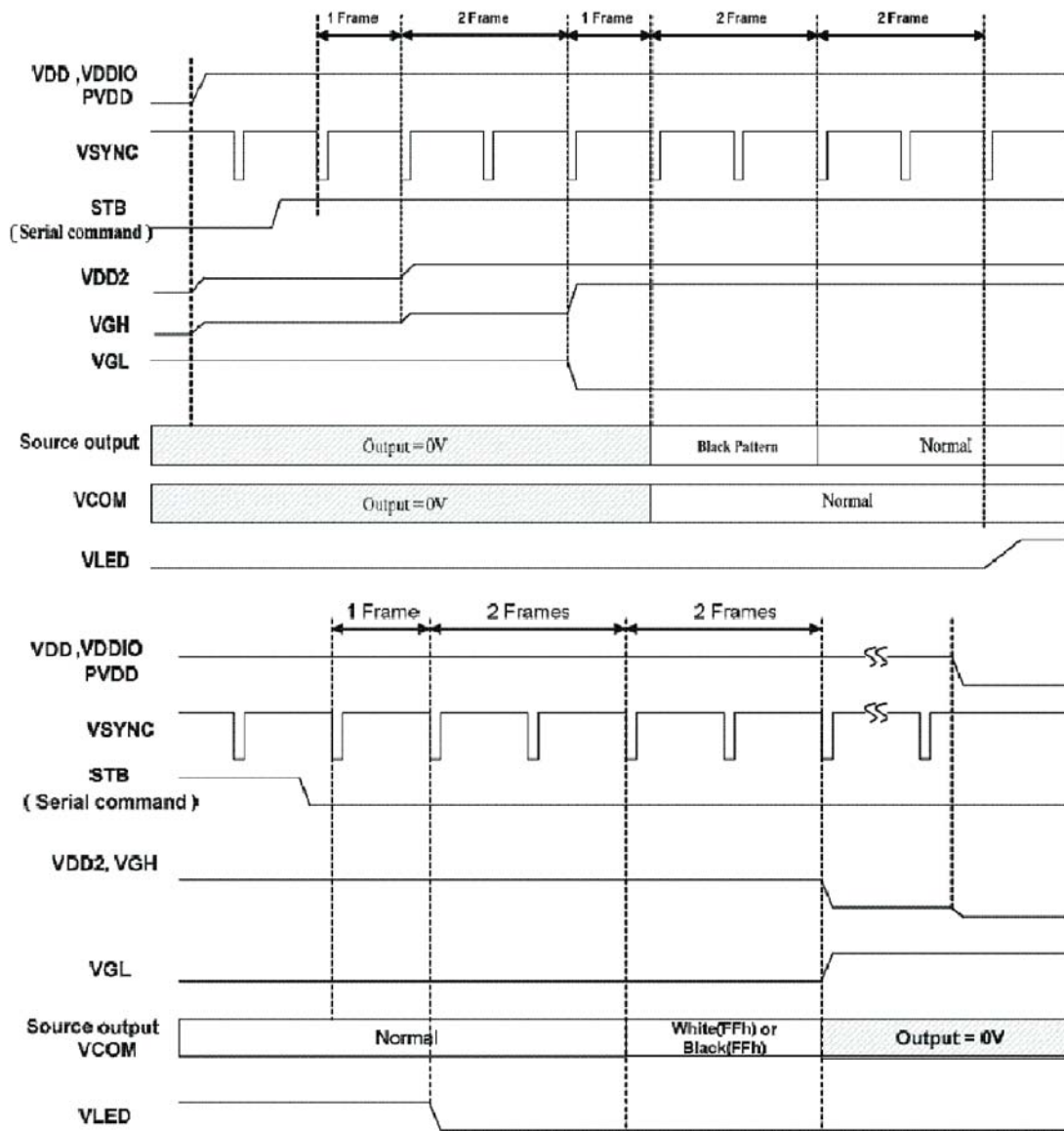
9.2 Parallel RGB Input Timing Table (SYNC MODE)

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Remar
DCLK	DCLK frequency	Fclk	5	9	12	MHz	
	DCLK period	Tclk	83	110	200	ns	
Hsync	Period Time	Th	490	531	605	DCLK	
	Display Period	Thdisp	-	480	-	DCLK	
	Back Porch	Thbp	8	43	-	DCLK	
	Front Porch	Thfp	2	8	-	DCLK	
	Pulse Width	Thw	1	-	-	DCLK	
Vsync	Period Time	Tv	275	288	335	H	
	Display Period	Tvdisp	-	272	-	H	
	Back Porch	Tvbp	2	12	-	H	
	Front Porch	Tvfp	1	4	-	H	
	Pulse Width	Tvw	1	10	-	H	



9.3 POWER ON/OFF SEQUENCE

9.3.1 Power ON Sequence



10 Test

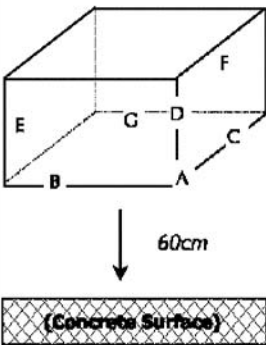
No change on display and in operation under the following test condition.

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

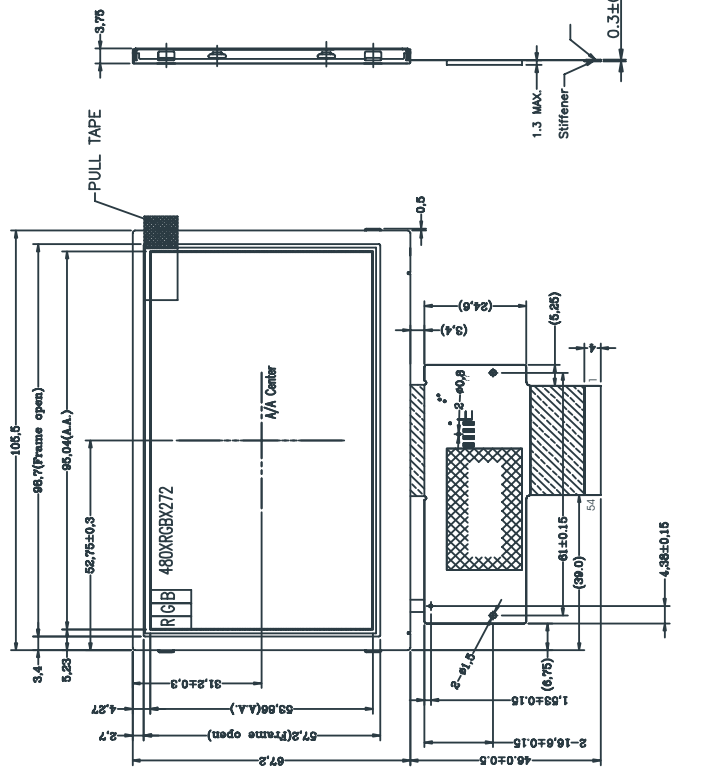
Temperature: $20 \pm 5^\circ\text{C}$.

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	Electro Static Discharge Test (non-operating)	Panel Surface/Top Case: 150pF, 330 ohm Air: $\pm 15\text{kV}$, Contact: $\pm 8\text{kV}$	
8	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>	

?? ??????????`????????`



PULL TAPE

PIN FUNCTION		PIN	SYMBOL	PIN	SYMBOL
1	GND	21	DSP	41	B6
2	GND	22	RESET	42	B5
3	NC(XR)	23	MODE	43	B4
4	NC(YD)	24	R7	44	B3
5	NC(XL)	25	R6	45	B2
6	NC(XU)	26	R5	46	B1
7	VDDIO	27	R4	47	B0
8	VDD	28	R3	48	VDD
9	VDD	29	R2	49	GND
10	VS	30	R1	50	GND
11	HS	31	R0	51	LED_A
12	GND	32	G7	52	LED_A
13	INCLK	33	G6	53	LED_K
14	GND	34	G5	54	LED_K
15	DE	35	G4		
16	L/R	36	G3		
17	U/D	37	G2		
18	CS	38	G1		
19	SDA	39	G0		
20	SCL	40	B7		



Cover layer open

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CUPERTINO, CA 95014

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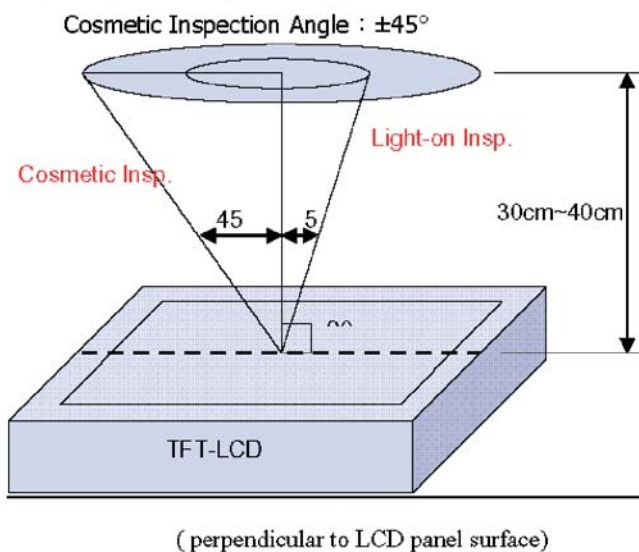
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12 Incoming Inspection Standards

12.1 Inspection and Environment Conditions

12.1.1 Inspection Conditions:

- (1) Inspection Distance: 35 cm $\pm$ 5cm
- (2) View Angle : Light-on Inspection Angle : $\pm 5^\circ$



12.1.2 Environment Conditions:

Ambient Temperature		23 $^\circ$ C $\pm$ 5 $^\circ$ C
Ambient Humidity		55 $\pm$ 10%RH
Ambient Illumination	Cosmetic Inspection	more than 600 Lux
	Functional Inspection	300~500 Lux

12.1.3 Sampling Conditions:

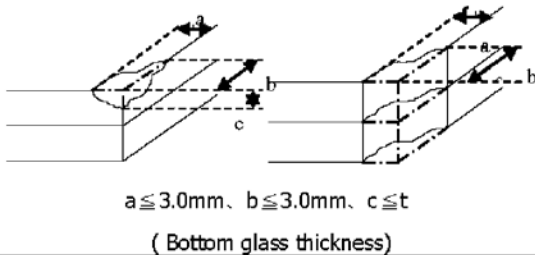
- (1) Lot Size: Quantity of shipment lot per model
- (2) Sampling Method:

Sampling Plan		MIL-STD-105E
		Normal Inspection, Single Sampling
		Level II
AQL	Major Defect	1.0%
	Minor Defect	1.5%

- (3) The classification of Major(MA) and Minor(MI) defects is shown as 3. Inspection Criteria.

12.1.4 Inspection Criteria

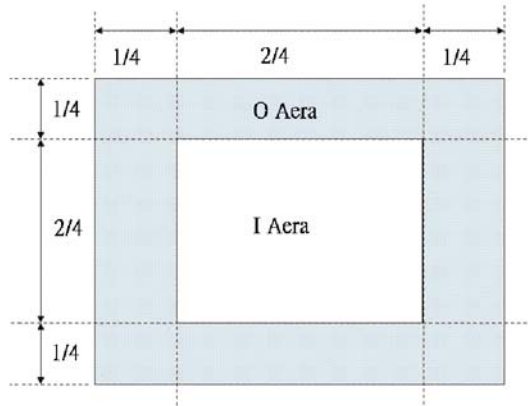
12.1.4.1 Cosmetic Inspection(Panel):

Item	Judgment Criteria	Classification
Chipping on Panel	 $a \leq 3.0\text{mm}$, $b \leq 3.0\text{mm}$, $c \leq t$ (Bottom glass thickness)	MA
Scratch on Panel *Note-2	$W \leq 0.05\text{mm}$ or $L < 5\text{mm}$: Ignored $0.05\text{mm} < W \leq 0.1\text{mm}$ and $L \leq 5\text{mm}$: $N \leq 5$ $W > 0.1\text{mm}$ or $L > 5\text{mm}$: Not allowed	MI
Bubble or Dent on Panel *Note-3	$D \leq 0.2\text{mm}$: Ignored $0.2\text{mm} < D \leq 0.3\text{mm}$: $N \leq 5$ $D > 0.3\text{mm}$: Not allowed	MI
Panel Crack	 Not Allowed crack	MA
Bezel Deformation	Obvious deformation is not allowed.	MI
Bezel Oxidation	Not allowed if it rusts continuously over 1 cm (It is out of warranty with rusted tin plate)	MI
Bezel Scratch	$L \leq 20\text{mm}$, $W \leq 0.2$, $N \leq 3$	MI
Metal Squash Dent /Flange(Front Side)	$D(W) \leq 1, L \leq 3, N \leq 3$;	MI
B/L High Voltage Wire Denudation	Not allowed	MA
Polarizer flaw or leak out resin	Defect is defined as the active area.	MI

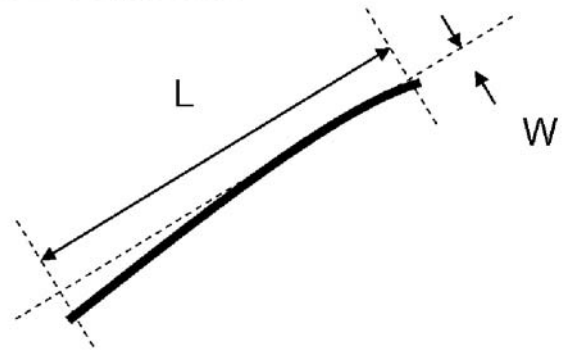
12.1.4.2 Functional Inspection:

Item	Judgment Criteria			Classification	
	Area(Note1)		I		O
Point Defect	Bright dot	Random	2		MI
		2 dots adjacent	0	0	
		3 dots adjacent or more	0	0	
	Dark dot	Random	3		
		2 dots adjacent	0		
		3 dots adjacent or more	0	0	
	Total Dot Defect		5		
	Distance	Distance between Bright and Bright dot	L≥ 5mm		
		Distance between Bright and Dark dot	L≥ 5mm		
		Distance between Dark dot	L≥ 5mm		
	(1) It is defined as Point Defect if defect area > 0.5dot (2) It is ignored if defect area ≤0.5dot (3)Weak point defect will be defined as Bright Dot if it can be observed through ND filter 5%(Full Screen Black Inspection)				
Line Defect	Obvious vertical or horizontal line defect is not allowed.			MA	
Mura	Not allowed if it can be observed through ND Filter 5 %			MI	
Foreign Material in spot shape *Note-3	D≤0.2mm: Ignored 0.2mm<D≤0.5mm: N≤8 D>0.5mm: Not allowed			MI	
Foreign Material in line or spiral shape *Note-4	W≤0.05mm or L≤5mm: Ignored 0.05mm<W≤0.2mm and L1.0mm≤5mm: N≤8 W>0.2mm or L>5mm: Not allowed			MI	
Display Function Abnormal	No Malfunction can be allowed			MA	

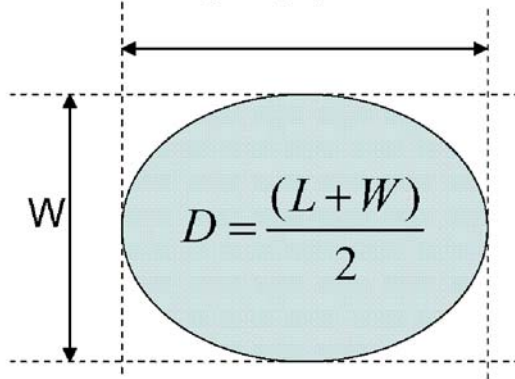
Note-1 : I/O Area Definition



Note-2 : Polarizer Scratch



Note-3 : Spot Foreign Material
($W \geq L / 4$)



Note-4 : Line or Spiral Foreign Material
($W < L / 4$)

