Laurel Electronics Co., Ltd.

LCD Module Specification

Model No.: LT043A-04AT

4.3", 480 (RGB) x 272 PIXELS TFT LCD WITH TOUCH PANEL

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RECORD OF REVISION

Rev.	Date	Page	Item	Description
0.1	2018/04/12	-	-	New release

1. BASIC SPECIFICATIONS

1.1 Features

Item	Specifications	Unit
Screen Size	4.3 (Diagonal)	inch
Resolution	480 (RGB) x 272	dot
Display Mode	Normally white, transmissive TFT	-
Color Configuration	RGB-stripe	-
Color Depth	24-bit (RGB=888), 16.7M colors	-
Viewing Direction	6:00 o'clock (Gray scale inversion direction)	-
Outline Dimension (WxHxT)	105.4 x 67.2 x 4.1 (FPC length not included)	mm
Viewing Area (WxH)	98.8 x 57.6	mm
Active Area (WxH)	95.04 x 53.856	mm
Dot Pitch (WxH)	0.066 x 0.198	mm
Touch Panel	4-wire resistive	-
Weight	55	g
LCD Controller	ST7282	-
Interface Mode	Digital 24-bit parallel RGB	-
Power Supply (VDD)	3.3	V

1.2 Block Diagram
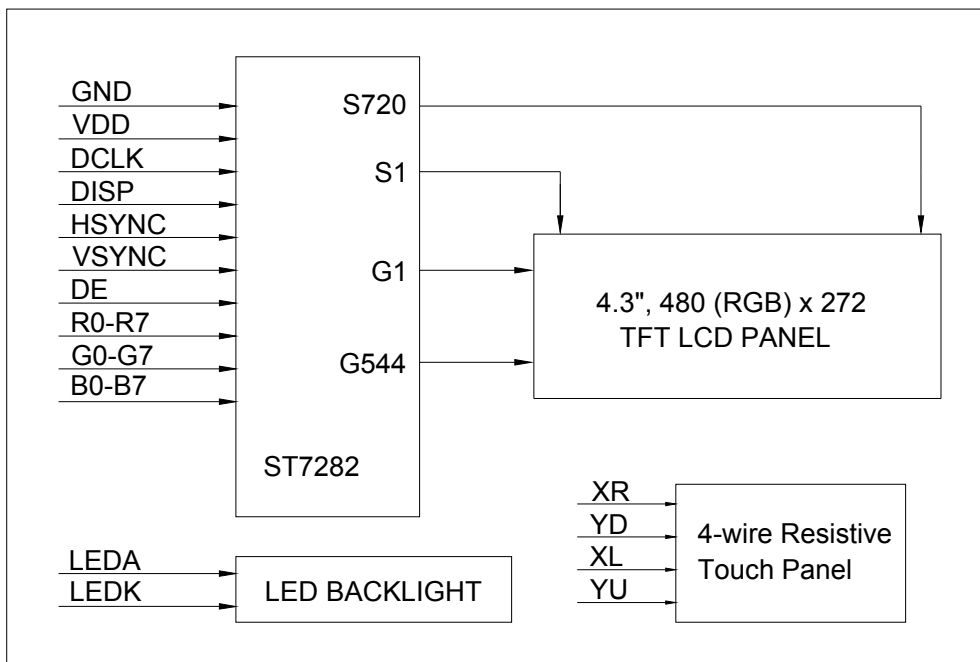
1.3 Terminals Functions

Pin No.	Symbol	I/O	Function
1	LEDK	P	LED backlight cathode
2	LEDA	P	LED backlight anode
3	GND	P	Power ground
4	VDD	P	Power supply
5	R0	I	Red data (LSB)
6	R1	I	Red data
7	R2	I	Red data
8	R3	I	Red data
9	R4	I	Red data
10	R5	I	Red data
11	R6	I	Red data
12	R7	I	Red data (MSB)
13	G0	I	Green data (LSB)
14	G1	I	Green data
15	G2	I	Green data
16	G3	I	Green data
17	G4	I	Green data
18	G5	I	Green data
19	G6	I	Green data
20	G7	I	Green data (MSB)
21	B0	I	Blue data (LSB)
22	B1	I	Blue data
23	B2	I	Blue data
24	B3	I	Blue data
25	B4	I	Blue data
26	B5	I	Blue data
27	B6	I	Blue data
28	B7	I	Blue data (MSB)
29	GND	P	Power ground
30	DCLK	I	Data clock. Latch data at falling edge.
31	DISP	I	Display control/standby mode selection. DISP="L": Standby; DISP="H": Normal display
32	HSYNC	I	Horizontal sync signal. Negative polarity. Connect it to "L" when not used.
33	VSYNC	I	Vertical sync signal. Negative polarity. Connect it to "L" when not used.
34	DE	I	Data enable signal. Active "H". Connect it to "L" when not used.
35	NC	-	No connection
36	GND	P	Power ground
37	XR	I/O	Touch panel right side terminal
38	YD	I/O	Touch panel down side terminal
39	XL	I/O	Touch panel left side terminal
40	YU	I/O	Touch panel up side terminal

I=Input; O=Output; P=Power

2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit
Supply Voltage (Logic)	VDD	-0.3	4.6	V
Input Voltage	VI	-0.3	VDD + 0.3	V
LED Forward Current	ILED	-	25	mA
Operating Temperature	Topr	-20	+70	°C
Storage Temperature	Tstg	-30	+80	°C

Cautions: Stresses above those listed as 'absolute maximum ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

3. ELECTRICAL CHARACTERISTICS

3.1 DC Characteristics for LCD (Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage (Logic)	VDD		3.0	3.3	3.6	V
Input High Voltage	VIH		0.7VDD	-	VDD	V
Input Low Voltage	VIL		0	-	0.3VDD	V
Supply Current (Logic)	IDD	VDD = 3.3V	-	25	35	mA

3.2 LED Backlight Characteristics (Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
LED Forward Voltage	VLED	Note 1	20.3	21.0	21.7	V
LED Forward Current	ILED		15	20	22	V
LED Life Time	-	Note 2	20,000	-	-	Hr

Note 1: The LED forward voltage is defined by the number of LED at Ta=25°C and ILED=20mA.
Note 2: The LED life time is defined as the module brightness decreases to 50% initial brightness at Ta=25°C and ILED=20mA. The LED life time could be decreased if operating ILED is larger than 20mA.

LED Backlight: 7 LED

3.3 AC Characteristics (V_{DD}=3.3V, Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit
DCLK Pulse Duty	Tcwh	40	50	60	%
DCLK Period	Tclk	83	111	125	ns
HSYNC Width	Thw	2	-	-	DCLK
HSYNC Period	Th	55	60	65	µs
VSYNC Setup Time	Tvst	12	-	-	ns
VSYNC Hold Time	Tvhd	12	-	-	ns
HSYNC Setup Time	Thst	12	-	-	ns
HSYNC Hold Time	Thhd	12	-	-	ns
Data Setup Time	Tdsu	12	-	-	ns
Data Hold Time	Tdhd	12	-	-	ns
DE Setup Time	Tdest	10	-		ns
DE Hold Time	Tdehd	10	-	-	ns
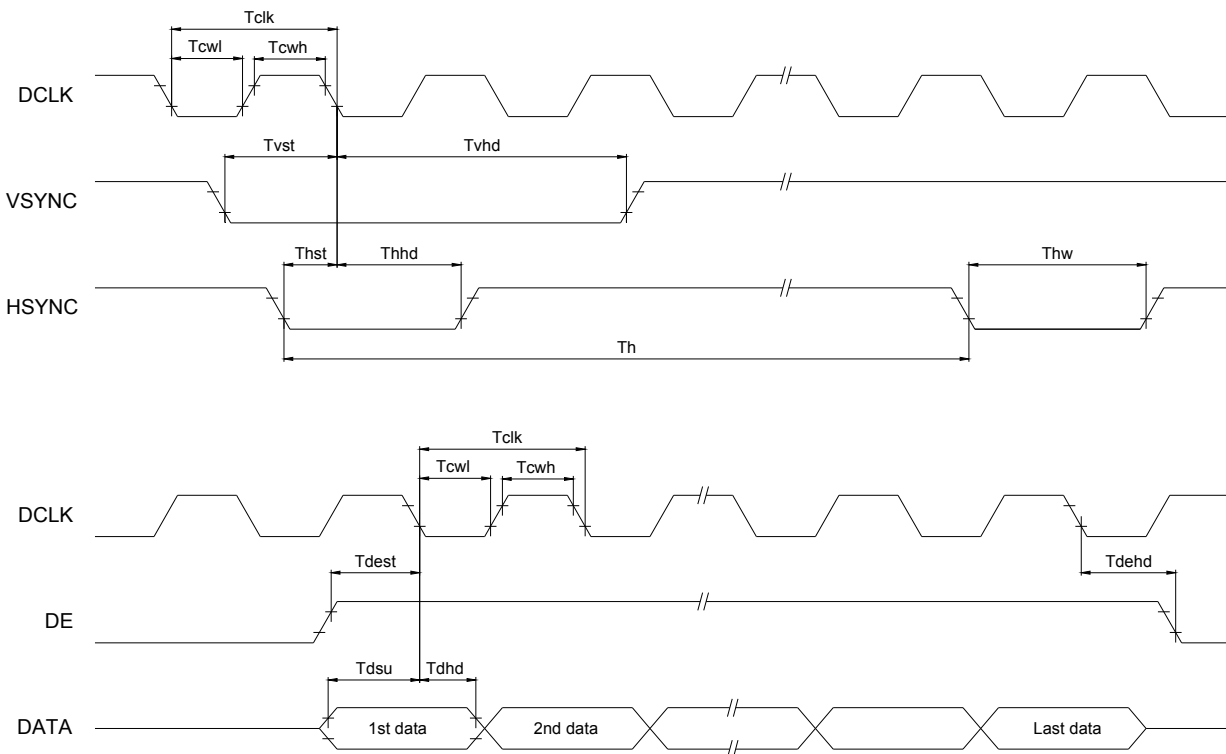
3.4 Timing Mode Selection

HSYNC	VSYNC	DE	Timing Mode
Input	Input	Input	SYNC-DE mode
Input	Input	GND	SYNC mode
GND	GND	Input	DE mode

3.5 Input Signals Timing Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
DCLK Frequency	Fclk	8	9	12	MHz
HSYNC Period	Th	485	531	598	DCLK
HSYNC Display Period	Thdisp	-	480	-	DCLK
HSYNC Back Porch	Thbp	3	43	43	DCLK
HSYNC Front Porch	Thfp	2	8	75	DCLK
HSYNC Pulse Width	Thw	2	4	75	DCLK
DEH Blanking (for DE mode only)	Thb=Thbp+Thfp	5	51	118	DCLK
VSYNC Period	Tv	276	292	321	Th
VSYNC Display Period	Tvdisp	-	272	-	Th
VSYNC Back Porch	Tvbp	2	12	12	Th
VSYNC Front Porch	Tvfp	2	8	37	Th
VSYNC Pulse Width	Tvw	2	4	37	Th
DEV Blanking (for DE mode only)	Tvb=Tvbp+Tvfp	4	20	49	Th

Note: It is necessary to keep Tvbp=12 and Thbp=43 in SYNC mode. It's unnecessary to keep it in SYNC-DE mode or DE mode.
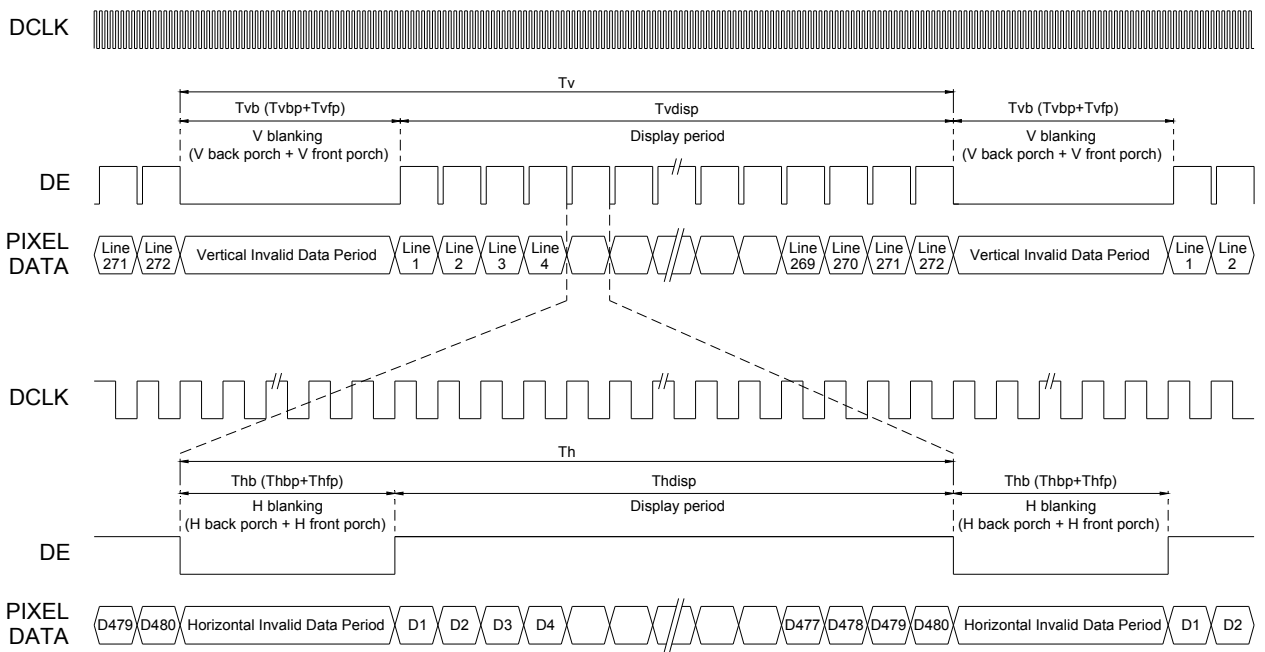
3.6 SYNC Mode Timing Diagram
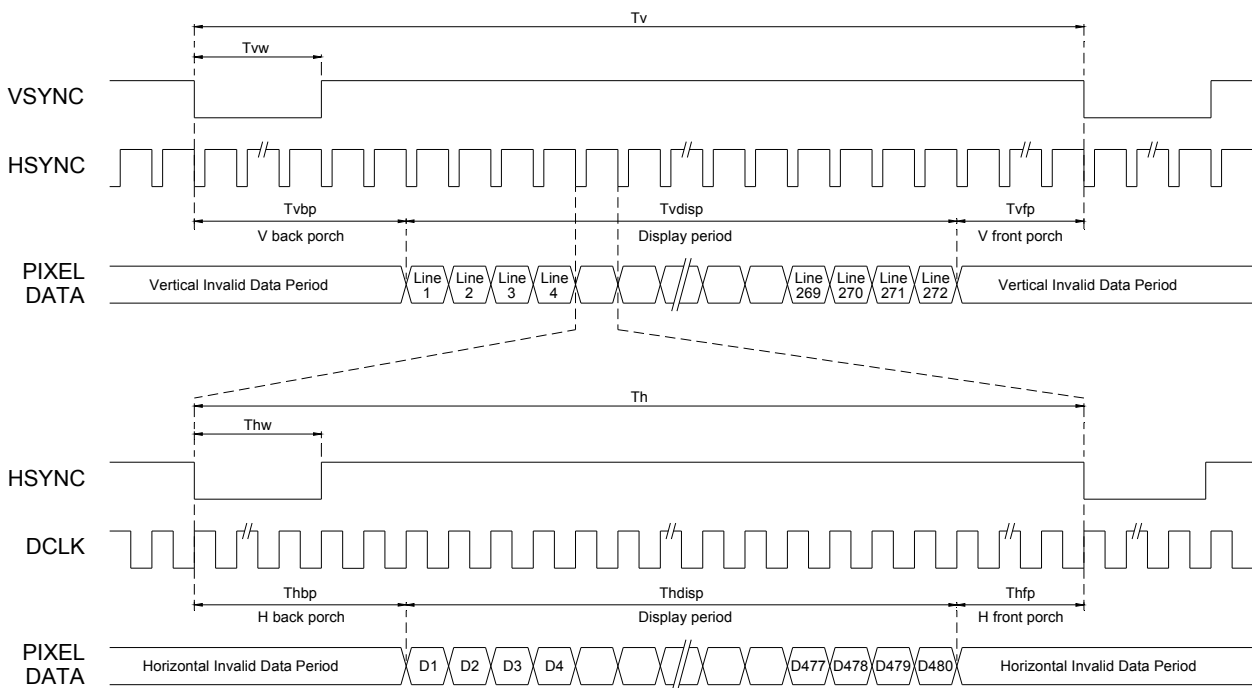
## 3.7 SYNC-DE Mode Timing Diagram
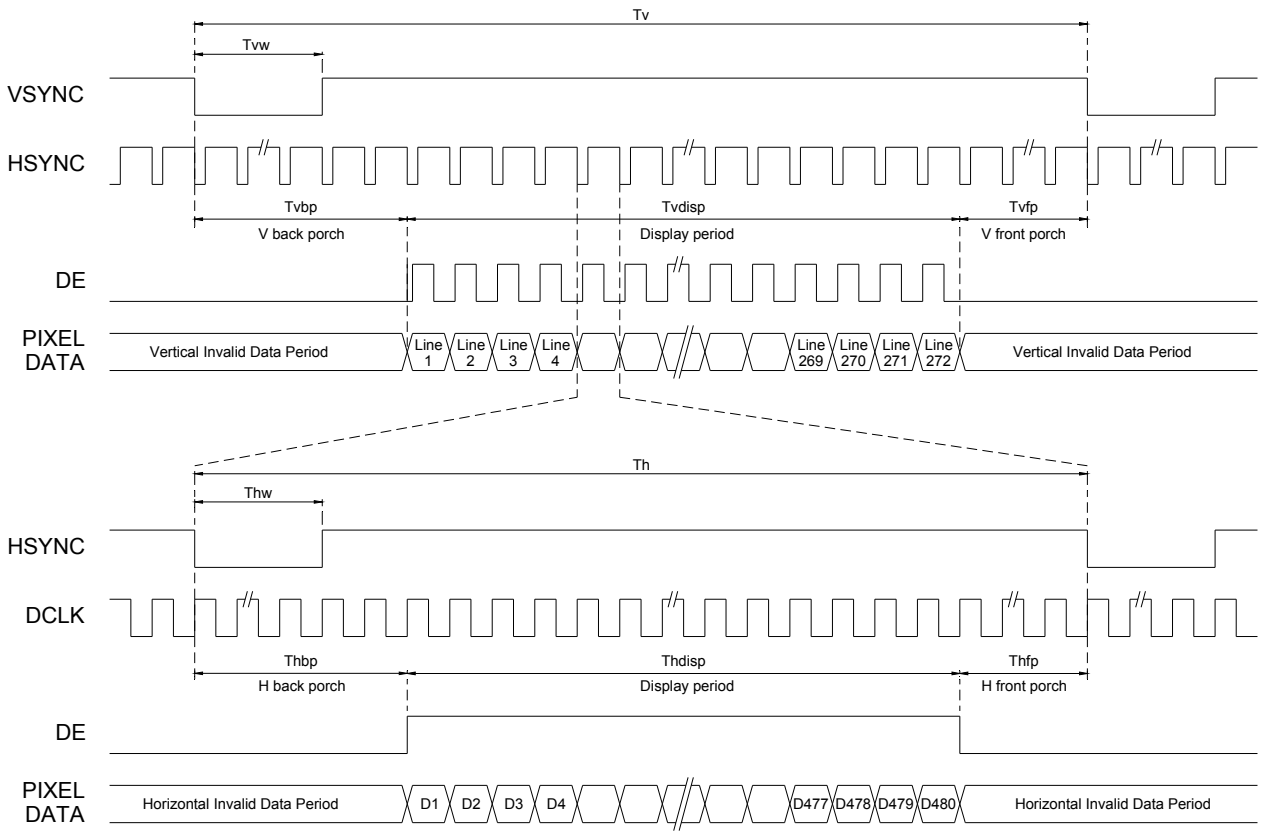
3.8 DE Mode Timing Diagram

4. TOUCH PANEL CHARACTERISTICS

## 4.1 Optical, Mechanical & Reliability Characteristics (Ta=25°C)

| Item	Min.	Typ.	Max.	Unit	Remark
Linearity	-1.5	-	1.5	%	X and Y directions
Circuit Resistance	350	-	1050	Ω	X direction
	110	-	350	Ω	Y direction
Insulation Resistance	20	-	-	MΩ	DC 25V
Operating Voltage	2.7	-	7	V	DC
Chatting Time	-	-	10	ms	
Transmittance	78	-	-	%	
Activation Force	-	-	100	g	
Surface Hardness	3	-	-	H	
Knocking Durability	1,000,000	-	-	time	
Writing Durability	100,000	-	-	word	
Surface Treatment	Anti-glare				

4.2 Touch Panel Circuit Diagram
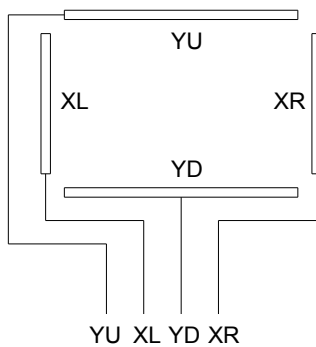
4.3 Housing Design Guide

1) Leave enough gaps (min. 0.5mm compressed) between housing and TP to avoid wrong operating.
2) Use buffer material (gasket) between housing and TP to avoid damaging or wrong operating.
3) Buffer material should not overlap and press on the inside of TP viewing area.
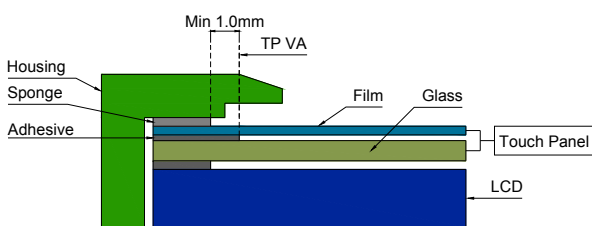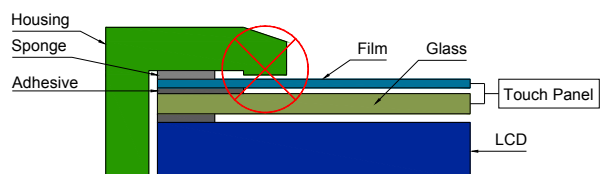

CORRECT　　　　　　　　　　　　　　　　WRONG

5. ELECTRO-OPTICAL CHARACTERISTICS (Ta=25°C)

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note
Brightness of White	Bp		Θ=0° Φ=0° ILED=20mA	-	240	-	cd/m^2	1
Uniformity	△Bp			70%	-	-	-	2
Viewing Angle	Hor	ΘR	Cr ≥10	-	70	-	deg.	3
		ΘL		-	70	-		
	Ver	ΘU		-	50	-		
		ΘD		-	70	-		
Contrast Ratio	Cr		Θ=0° Φ=0°	250	350	-	-	4
Response Time	Tr			-	10	20	ms	5
	Tf			-	15	30		
Color Chromaticity	Wx			0.26	0.31	0.36	-	1, 6
	Wy			0.28	0.33	0.38	-	

Note 1: The optical characteristics should be measured by BM-7 in dark room after 15 minutes operation. The optical properties are measured at the center point of the LCD.

Note 2: △ Bp=Bp (Min.) / Bp (Max.) × 100 (%)
Bp(Max.)=Maximum brightness in 9
Bp(Min.)=Minimum brightness in 9
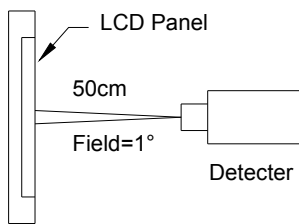
Note 3: Definition of Viewing Angle
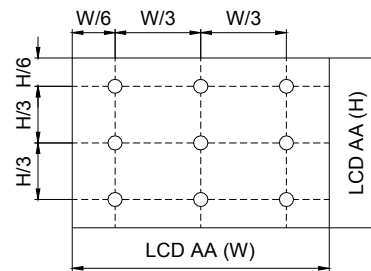
Note 5: Definition of Response Time
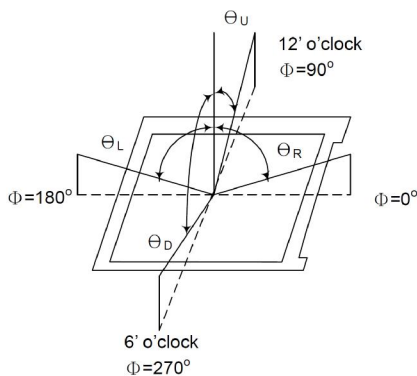
Note 4: Definition of Contrast Ratio

$$\text{Contrast Ratio (Cr)} = \frac{\text{Brightness measured when LCD on "White" State}}{\text{Brightness measured when LCD on "Black" state}}$$

Note 6: Definition of color chromaticity (CIE1931)
Color coordinates is measured at the center point of the LCD with ILED=20mA and the LCD displays white.

4.3" TFT LCD
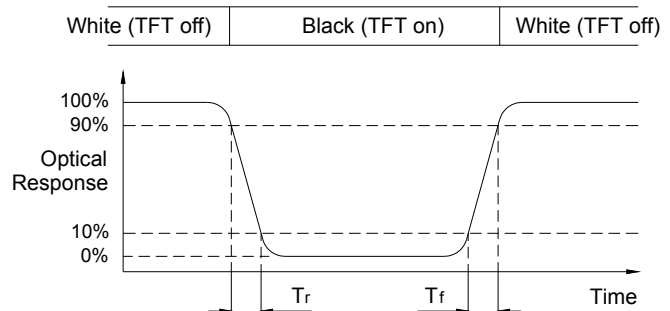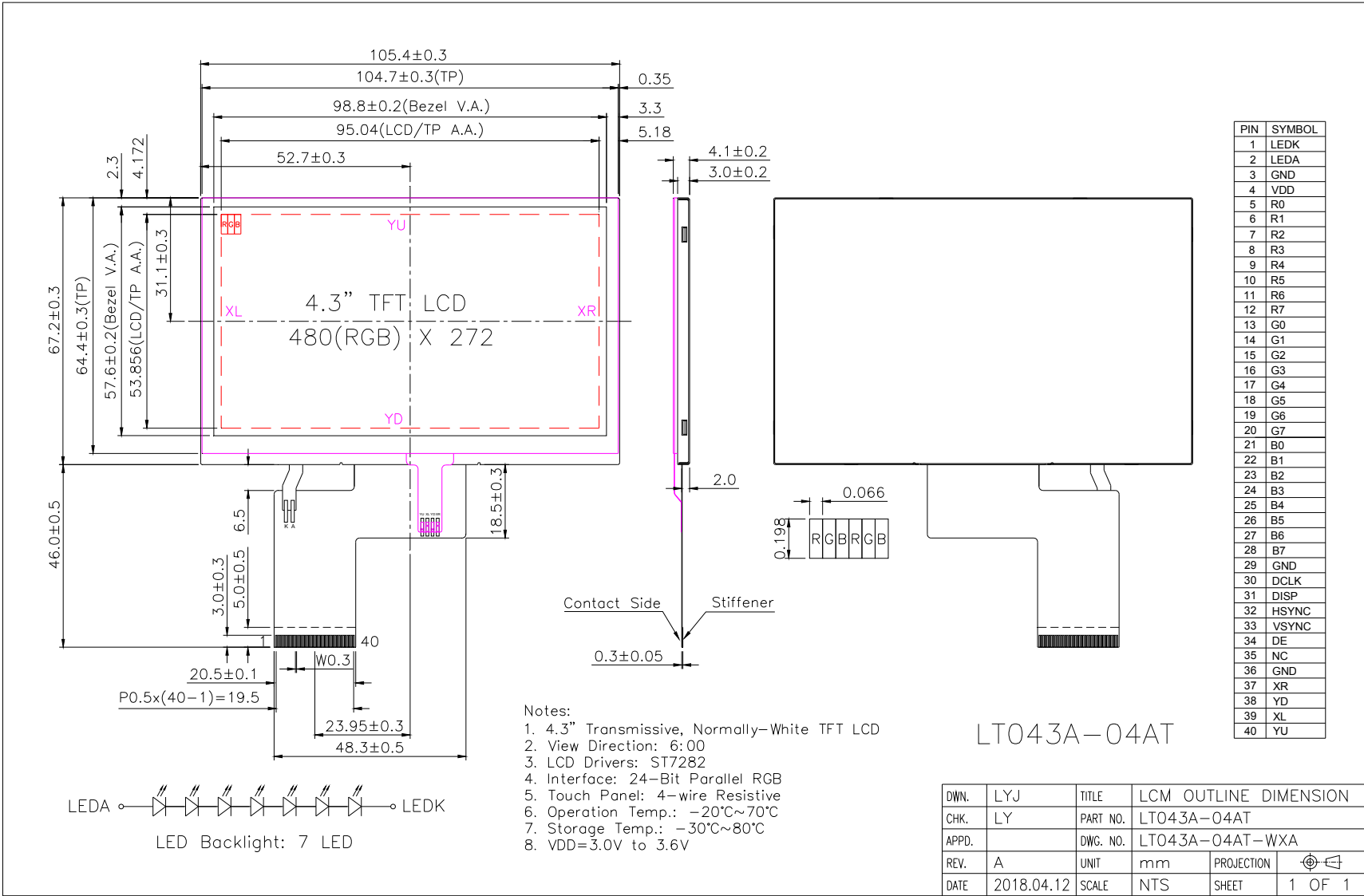480(RGB) X 272

105.4±0.3
104.7±0.3(TP)
98.8±0.2(Bezel V.A.)
95.04(LCD/TP A.A.)
52.7±0.3
0.35
3.3
5.18

2.3
4.172

67.2±0.3
64.4±0.3(TP)
57.6±0.2(Bezel V.A.)
53.856(LCD/TP A.A.)
31.1±0.3
46.0±0.5

YU
XL   XR
YD

6.5
K A
3.0±0.3
5.0±0.5
18.5±0.3

1   40
20.5±0.1
W0.3
P0.5x(40-1)=19.5
23.95±0.3
48.3±0.5

4.1±0.2
3.0±0.2

2.0

Contact Side   Stiffener
0.3±0.05

0.066
0.198
R G B R G B

LT043A-04AT

LEDA ○————————○ LEDK
LED Backlight: 7 LED

Notes:
1. 4.3" Transmissive, Normally-White TFT LCD
2. View Direction: 6:00
3. LCD Drivers: ST7282
4. Interface: 24-Bit Parallel RGB
5. Touch Panel: 4-wire Resistive
6. Operation Temp.: -20℃~70℃
7. Storage Temp.: -30℃~80℃
8. VDD=3.0V to 3.6V

PIN	SYMBOL
1	LEDK
2	LEDA
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	DCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	NC
36	GND
37	XR
38	YD
39	XL
40	YU

DWN.	LYJ	TITLE	LCM OUTLINE DIMENSION	
CHK.	LY	PART NO.	LT043A-04AT	
APPD.		DWG. NO.	LT043A-04AT-WXA	
REV.	A	UNIT	mm	PROJECTION
DATE	2018.04.12	SCALE	NTS	SHEET 1 OF 1

7. PRECAUTIONS FOR USE OF LCD MODULE

7.1 Handing Precautions

1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

2) If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth. If the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

3) Do not apply excessive force on the surface of display or the adjoining areas of LCD module since this may cause the color tone to vary.

4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

5) If the display surface of LCD module becomes contaminated, blow 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
    Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
    · Water
    · Ketone
    · Aromatic Solvents

6) When mounting the LCD module make sure that it is free of twisting, warping, and distortion. Distortion has great influence upon display quality. Also keep the stiffness enough regarding the outer case.

7) Be sure to avoid any solvent such as flux for soldering never stick to Heat-Seal. Such solvent on Heat-Seal may cause connection problem of heat-Seal and TAB.

8) Do not forcibly pull or bend the TAB I/O terminals.

9) Do not attempt to disassemble or process the LCD module.

10) NC terminal should be open. Do not connect anything.

11) If the logic circuit power is off, do not apply the input signals.

12) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
    · Be sure to ground the body when handling the LCD module.
    · Tools required for assembly, such as soldering irons, must be properly grounded.
    · To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
    · 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.

7.2 Storage Precautions

1) When storing the LCD module, avoid exposure to direct sunlight or to the light of fluorescent lamps and high temperature/high humidity. Whenever possible, the LCD module should be stored in the same conditions in which they were shipped from our company.

2) Exercise care to minimize corrosion of the electrodes. Corrosion of the electrodes is accelerated by water droplets or a current flow in a high humidity environment.

7.3 Design Precautions

1) The absolute maximum ratings represent the rated value beyond which LCD module can not exceed. When the LCD modules are used in excess of this rated value, their operating characteristics may be adversely affected.

2) To prevent the occurrence of erroneous operation caused by noise, attention must be paid to satisfy VIL, VIH specification values, including taking the precaution of using signal cables that are short.

3) The liquid crystal display exhibits temperature dependency characteristics. Since recognition of the display becomes difficult when the LCD is used outside its designated operating temperature range, be sure to use the LCD within this range. Also, keep in mind that the LCD driving voltage levels necessary for clear displays will vary according to temperature.

4) Sufficiently notice the mutual noise interference occurred by peripheral devices.

5) To cope with EMI, take measures basically on outputting side.

6) If DC is impressed on the liquid crystal display panel, display definition is rapidly deteriorated by the electrochemical reaction that occurs inside the liquid crystal display panel. To eliminate the opportunity of DC impressing, be sure to maintain the AC characteristics of the input signals sent to the LCD Module.

7.4 Others

1) Liquid crystals solidify under low temperatures (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the LCD module is subjected to a strong shock at a low temperature.

2) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

3) To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity, etc., exercise care to avoid touching the following sections when handling the module:
   · Terminal electrode sections.
   · Part of pattern wiring on TAB, etc.