

TFT SPECIFICATION

Part Number	USMP-T070-080048CAV-A0
Size	7"
Resolution	800 x 480
Brightness	850 cd/m²
Contrast	400:1
Viewing Angle	65/65/70/70
Operating Temp.	-30 ~ 80°C

FOR ADDITIONAL INFORMATION
PLEASE CONTACT:
engineering@usmicroproducts.com

Issue Date	Approved by (customer use)	Checked by	Prepared by

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3. LCD GENERAL SPECIFICATIONS

Composition: 7inch WSVGA resolution display with a projected Capacitive Touch Panel (CTP).
 Interface : LVDS Interface for panel and USB for the CTP.

Parameter	Specifications	Unit
Screen Size	7 (diagonal)	inch
Display Format	800 (H) x (R,G,B) x 480 (V)	dot
Outline Dimension	187.76(W) x 132.18(H) x 12.6(D)	mm
LCD Active Area	152.4 (H) x 91.44(V)	mm
Pixel Pitch	0.1905 (W) x 0.1905(H)	mm
Pixel Configuration	Stripe	
Back-light	LED	
Display mode	Normally white	
Weight	TBD	g
LCM Part Number	USMP-T070-080048CAV-A0	

4. LCD ABSOLUTE MAXIMUM RATINGS

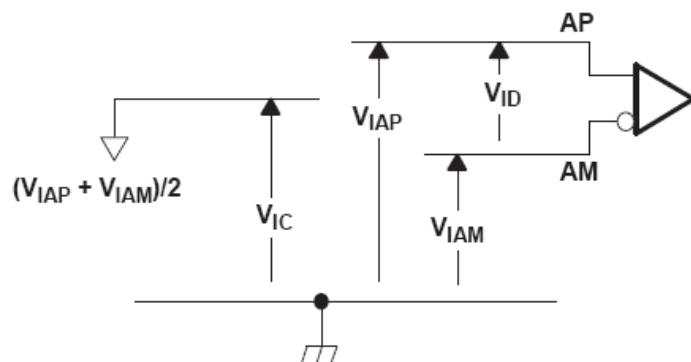
Parameter	Symbol	MIN.	MAX.	Unit	Remark
Power supply voltage	V _{CC}	-0.5	4.0	V	GND=0V
Voltage range at any terminal		-0.5	V _{CC} +0.3	V	
Operating temperature	Top	-30	80	°C	
Storage temperature	Tst	-30	85	°C	

5. LCD ELECTRICAL CHARACTERISTICS

5.1 Operating Conditions

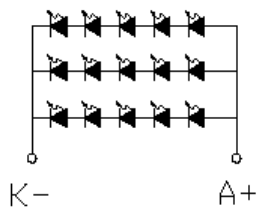
f_H=31.5KHz, f_V=60Hz, f_{CLK}=33.26MHz, T_a=25°C

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage for LCD	V _{CC}	+3.0	+3.3	+3.6	V	
Power Supply Current for LCD	I _{CC}	-	180	230	mA	Black pattern
Power Supply voltage for LED	V _{LED}	-	12	14	V	
ADJ frequency	f _{PWM}	5	-	100	KHz	
ADJ signal logic level High	V _{TH}	-	3.3	5.0	V	
ADJ signal logic level Low	V _{TL}	-	-	0.5	V	



5.2 LED Driving Conditions

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
LED Backlight Voltage	V_{BL}	15	16.5	18	V	For reference
LED Backlight Current	I_{BL}	-	240	-	mA	$T_a=25^{\circ}\text{C}$
LED Life Time		50,000			Hr	



Voltage: 15V (min), 16.5V(Typ), 18V(Max)
 Current: 240mA

6. LCD TIMING SPECIFICATIONS

6.1 LVDS Signal

switching characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
t_{su} Setup time, D0–D20 to CLKOUT↓	$C_L = 8 \text{ pF}$, See Figure 5	5			ns
t_h Data hold time, CLKOUT↓ to D0–D20		5			ns
$t_{(RSKM)}$ Receiver input skew margin§ (see Figure 7)	$t_c = 15.38 \text{ ns } (\pm 0.2\%)$, Input clock jitter < 50 ps¶	550	700		ps
t_d Delay time, CLKIN↑ to CLKOUT↓ (see Figure 7)	$V_{CC} = 3.3 \text{ V}$, $t_c = 15.38 \text{ ns } (\pm 0.2\%)$, $T_A = 25^\circ\text{C}$	3	5	7	ns
t_{en} Enable time, $\overline{\text{SHTDN}}$ to phase lock	See Figure 7		1		ms
t_{dis} Disable time, $\overline{\text{SHTDN}}$ to off state	See Figure 8		400		ns
t_t Transition time, output (10% to 90% t_r or t_f) (data only)	$C_L = 8 \text{ pF}$		3		ns
t_t Transition time, output (10% to 90% t_r or t_f) (clock only)	$C_L = 8 \text{ pF}$		1.5		ns
t_w Pulse duration, output clock			0.50 t_c		ns

† All typical values are at $V_{CC} = 3.3 \text{ V}$, $T_A = 25^\circ\text{C}$.

§ The parameter $t_{(RSKM)}$ is the timing margin available to allocate to the transmitter and interconnection skews and clock jitter. The value of this parameter at clock periods other than 15.38 ns can be calculated from $t_{RSKM} = t_c/14 - 550 \text{ ps}$.

¶ |Input clock jitter| is the magnitude of the change in input clock period.

PARAMETER MEASUREMENT INFORMATION

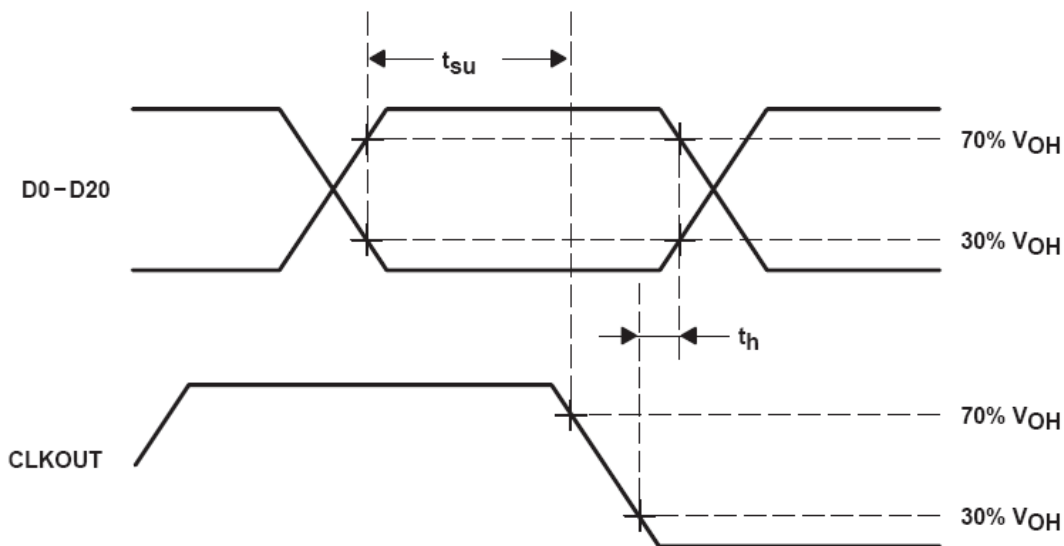


Figure 5. Setup and Hold Time Waveforms

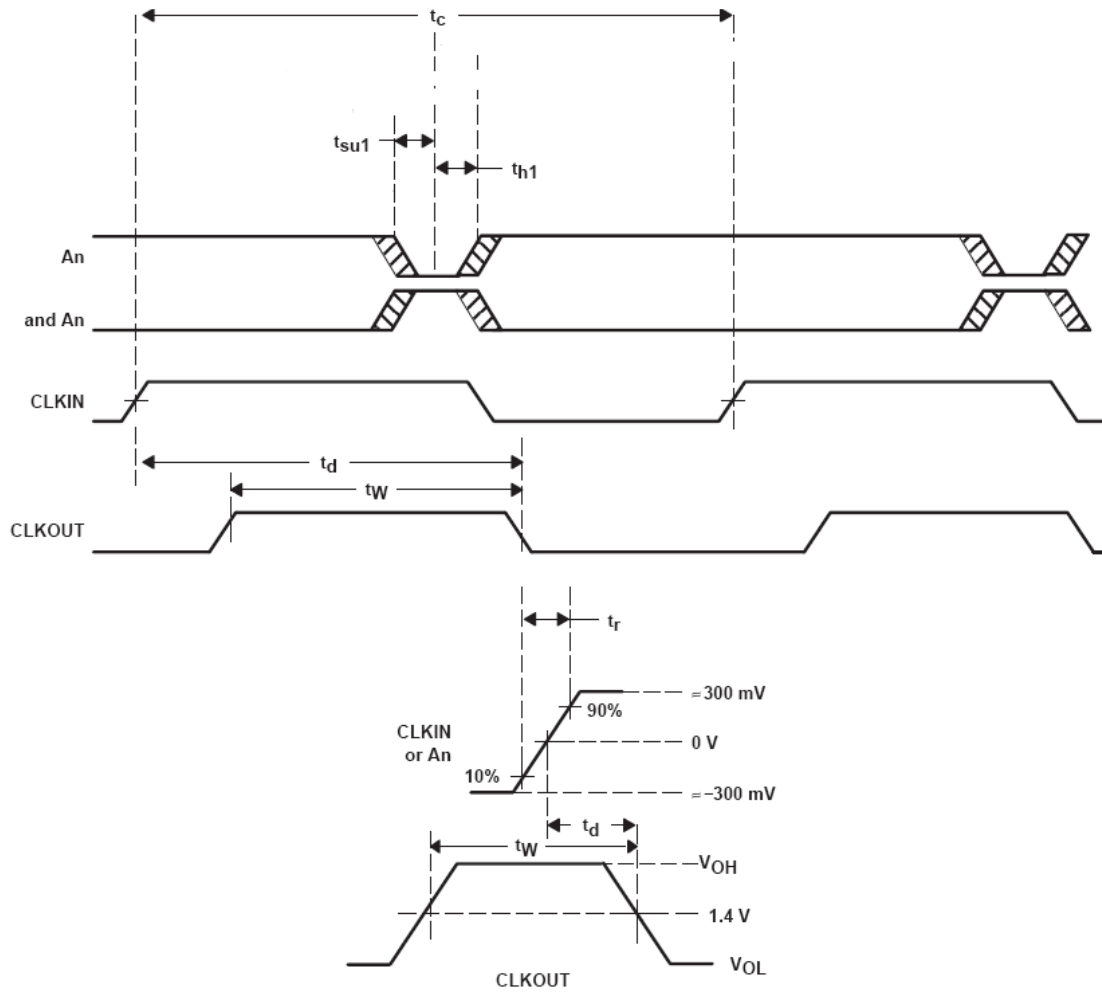


Figure 7. Enable Time Waveforms

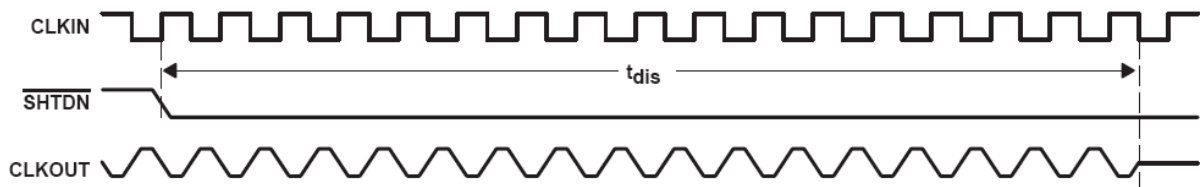
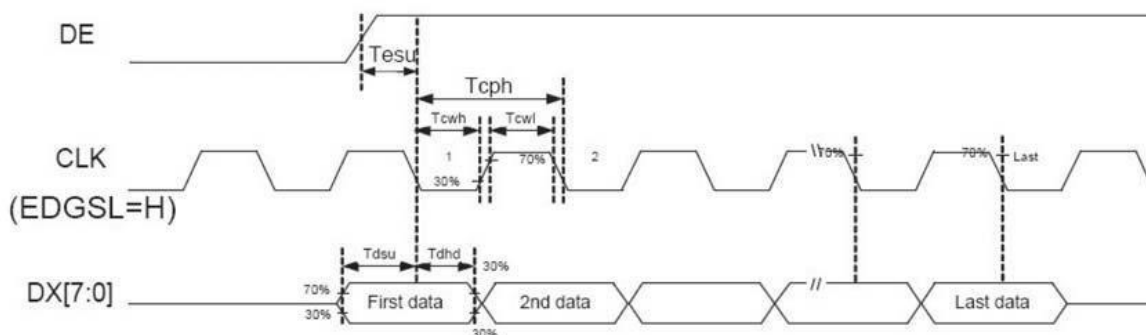
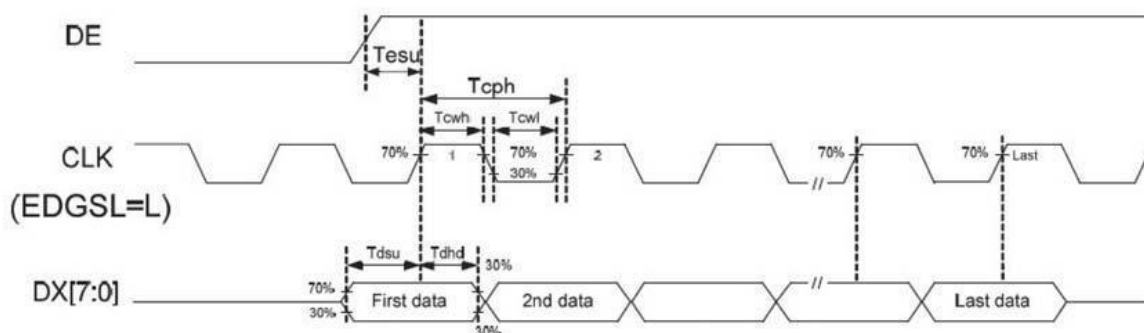


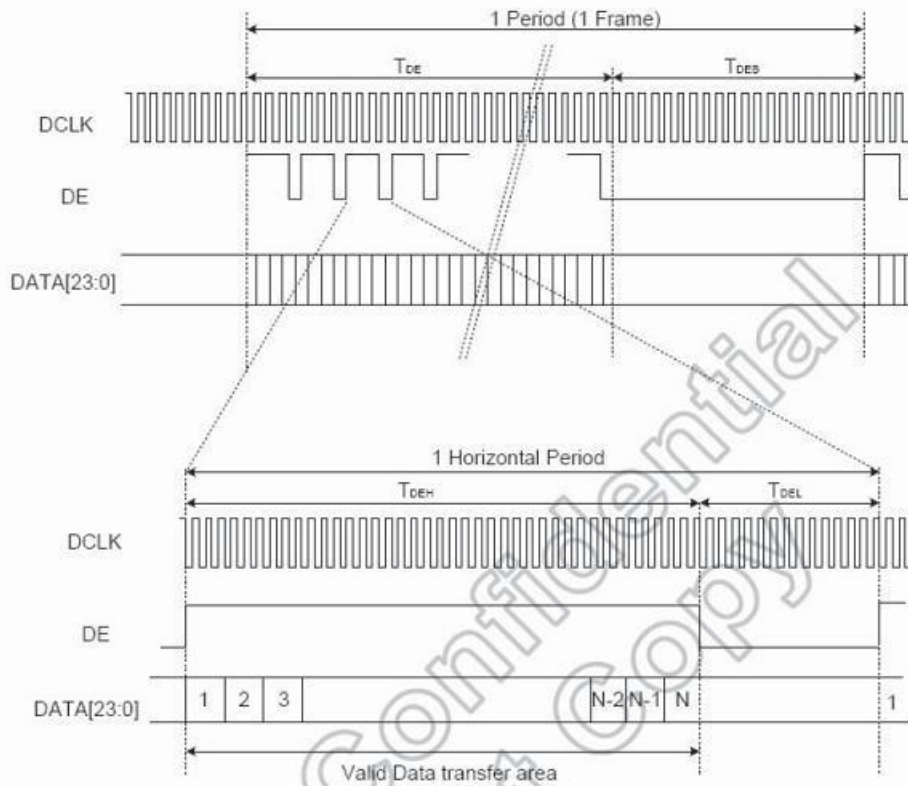
Figure 8. Disable Time Waveforms

6.2 TTL Signal (DE Only mode)

Parameter	Symbol				Unit
		Min.	Typ.	Max.	
Data setup time	Tdsu	6	-	-	ns
Data hold time	Tdhd	6	-	-	Tcph
DE setup time	Tesu	6	-	-	Tcph
CLK frequency	F _{CPH}		33.26		MHz
CLK period	T _{CPH}		30.06		ns
CLK pulse duty	T _{CWH}	40	50	60	%
DE period	T _{DEH} +T _{DEL}	1000	1056	1200	T _{CPH}
DE pulse width	T _{DEH}	-	800	-	T _{CPH}
DE frame blanking	T _{DEB}	10	45	110	T _{DEH} +T _{DEL}
DE frame width	T _{DE}	-	480	-	T _{DEH} +T _{DEL}

Note : We suggest using the typical value, so it can have better performance.



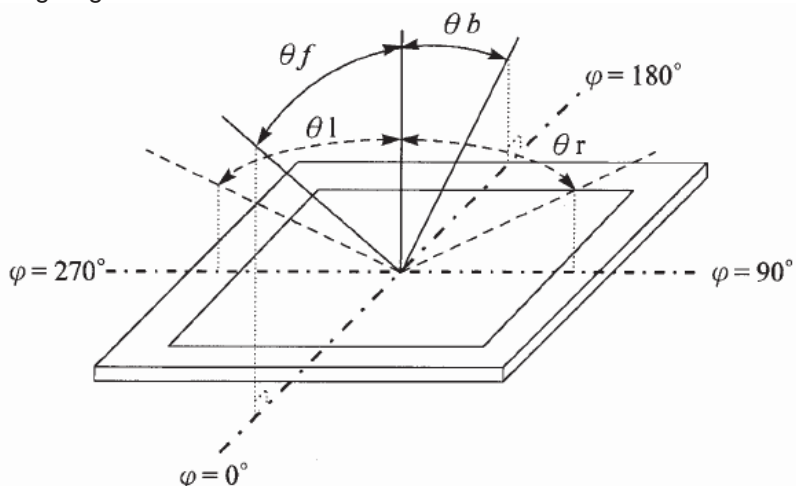


7. OPTICAL CHARACTERISTIC

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Vertical	θ_{y+}	Center CR≥10	60	65	-	deg	Note 1,2,3
		θ_{y-}		60	65	-		
	Horizontal	θ_{x+}		65	70	-		
		θ_{x-}		65	70	-		
Contrast Ratio		CR	at optimized viewing angle	-	400	-		Note 1,3
Response time	Rise	Tr	Center $\theta_x=\theta_y=0^\circ$	-	5	10	ms	Note 1,4
	Fall	Tf		-	11	16	ms	
Uniformity		B-uni	$\theta_x=\theta_y=0^\circ$	70	-	-	%	Note1,5,6
Brightness		L	$\theta_x=\theta_y=0^\circ$	650	850	-	cd/m ²	Note 1
Chromaticity		x _w	Center	0.239	0.299	0.359		Note 1,7
		y _w	$\theta_x=\theta_y=0^\circ$	0.268	0.328	0.388		

Note 1: $T_a = 25^\circ\text{C}$. To be measured on the center area of panel after 10 minutes operation.

Note 2: Definition of Viewing Angle



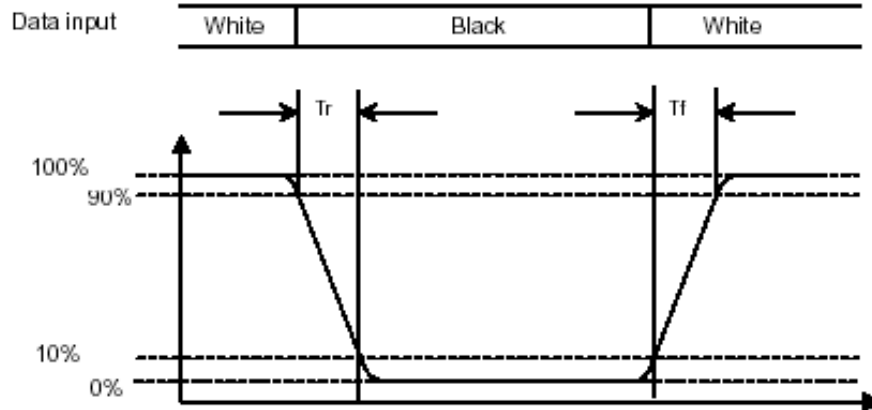
Note 3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

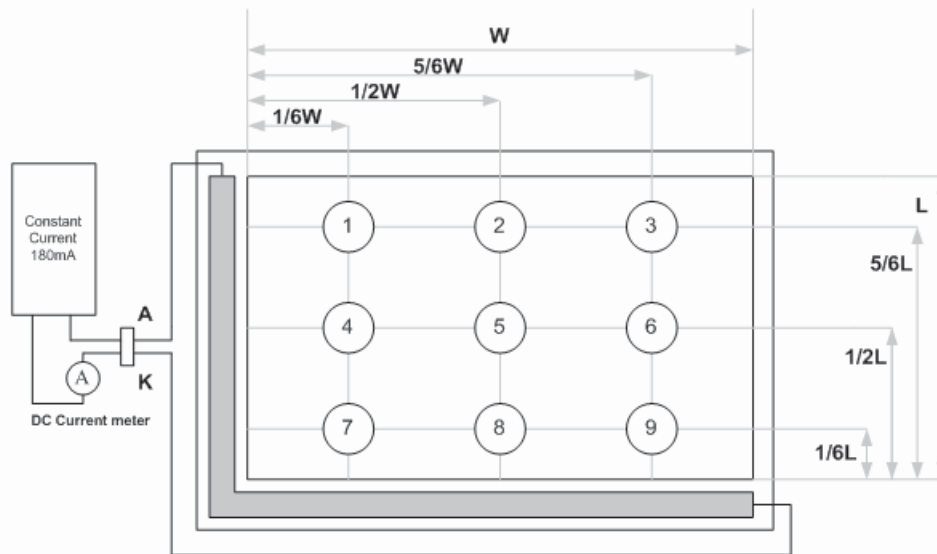
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

Note 4: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white" (falling time) and from "white" to "black" (rising time) respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



Note 5 : Luminance is measured at point 5 of the display.



Note 6 : Definition of Luminance Uniformity

$$\Delta L = [L(\text{min.}) \text{ of 9 points} / L(\text{max.}) \text{ of 9 points}] \times 100\%$$

8. LCD PIN CONNECTIONS

Pin No	Symbol	Function	Remark
1	VDD	power supply for Digital Circuit	
2	VDD	power supply for Digital Circuit	
3	GND	Ground	
4	GND	Ground	
5	IN0-	Differential Data Input ,CH0(Negative)	
6	IN0+	Differential Data Input ,CH0(Positive)	
7	GND	Ground	
8	IN1-	Differential Data Input ,CH1(Negative)	
9	IN1+	Differential Data Input ,CH1(Positive)	
10	GND	Ground	
11	IN2-	Differential Data Input ,CH2(Negative)	
12	IN2+	Differential Data Input ,CH2(Positive)	
13	GND	Ground	
14	CLK-	Differential Clock Input (Negative)	
15	CLK+	Differential Clock Input (Positive)	
16	GND	Ground	
17	VLED	Power Supply for LED Driver Circuit, 12V	
18	VLED	Power Supply for LED Driver Circuit, 12V	
19	GND	Ground	
20	ADJ	Brightness control for LED B/L	

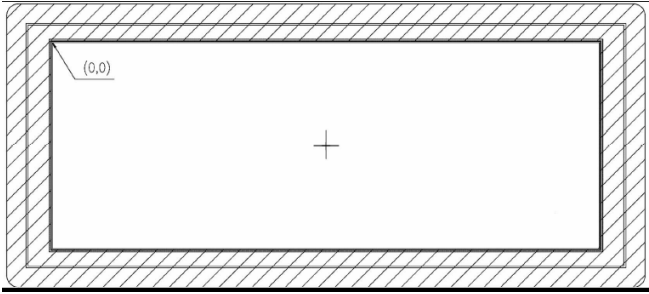
Remarks :

- 1) ADJ is brightness control Pin. The larger of the pulse duty is, the higher of the brightness.
- 2) ADJ signal is 0~3.3V.Operation frequency is 20KHz
- 3) GND PIN must be grounding, can not be floating.

9. CTP SPECIFICATIONS

9.1 CTP GENERAL SPECIFICATIONS

Composition: It's 7 inch Capacitive Touch Panel (CTP).

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Multi touch	2	Point
Interface	USB	
(X,Y) Position		

9.2 ABSOLUTE MAXIMUM RATING

Symbol	Description	Min	Typ.	Max	Unit	Notes
VIN	Supply voltage	-0.5	-	6	V	
VIO	Input I/O pin voltage	GND-0.3	-	VCC+0.3	V	

9.3 ELECTRICAL CHARACTERISTIC

Symbol	Description	Min	Typ.	Max	Unit	Notes
VI	Supply voltage	4.75	5	5.25	V	USB 5V

9.4 PIN CONNECTIONS

Pin Number	Pin Name	Description
1	DGND	USB Power GND
2	D-	USB data -
3	D+	USB data +
4	VIN	USB Power 5V
5	NC	Non Use
6	NC	Non Use

10. QUALITY ASSURANCE

10.1 Test Condition

10.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $65 \pm 5\%$

10.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

10.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

10.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

10.1.5 Test Method

No.	Reliability Test Item & Level Test Item	Test Level	Remark
1	High Temperature Storage Test	T=85°C,240hrs	IEC68-2-2
2	Low Temperature Storage Test	T=-30°C, 240hrs	IEC68-2-1
3	High Temperature Operation Test	T=80°C, 240hrs	IEC68-2-2
4	Low Temperature Operation Test	T=-30°C, 240hrs	IEC68-2-1
5	High Temperature and High Humidity Operation Test	T=60°C,90%RH, 240hrs	IEC68-2-3
6	Thermal Cycling Test	-20°C (30min) ~ 70°C (30min) 100 cycles	IEC68-2-14
7	Vibration Test (No operation)	Sweep frequency : 10 ~ 55 ~ 10Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	IEC68-2-6
8	ESD Test	State: operating Location: LCM/TP surface Condition:150pf 330Ω Contact +/- 4kV Air +/-8kV Criteria: Class C	IEC 6100-4-2

Note1, All of the reliability testing chamber above, is using D.I. water.

Note2, Condensation of water is not permitted on the module.

Note3, Display must be in a completely sealed water-tight enclosure.

11. PRECAUTIONS IN USE LCM

1. ASSEMBLY PRECAUTIONS

- (1) Since Touch Panel is consist of glass, please be careful your hands to be injured during handing. You must wear gloves during handing.
- (2) Do not touch, push or rub the exposed touch panel, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
- (3) Do not stack the touch panels together. Do not put heavy objects on touch panel.
- (4) Please do not take a CTP to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
- (5) Please excessive force or strain to the panel or tail is prohibited, Do not lift touch panel by cable (FPC).
- (6) Use clean sacks or glove to prevent fingerprints and/or stains left on the panel. Extra attention and carefulness should be taken while handling the glass edge.
- (7) Please pay attention for the matters stated below at mounting design of touch panel enclosure.
Enclosure support to fix touch panel must be out of active area.(do not design enclosure presses the active area to protect from miss put)

2. OPERATING PRECAUTIONS

- (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
- (2) Please do not change variable resistance settings in CTP. They are adjusted to the most suitable value. If they are changed, it might happen CTP does not satisfy the characteristics specification
- (3) Be careful for condensation at sudden temperature change. Condensation makes damage to sensor or electrical contacted parts.
- (4) CTP has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (5) Touch the panel with your finger or stylus only to assure normal operation. Any sharp edged or hard objects are prohibited.
- (6) Operate the panel in a steady environment. Abrupt variation on temperature and humidity may cause malfunction of the panel.

3. ELECTROSTATIC DISCHARGE CONTROL

- (1) The operator should be grounded whenever he/she comes into contact with the CTP. Never touch any of the conductive parts such the copper leads on the FPC and the interface terminals with any parts of the human body.

- (2) The CTP should be kept in antistatic bags or other containers resistant to static for storage.
- (3) Only properly grounded soldering irons should be used.
- (4) If an electric screwdriver is used, it should be well grounded and shielded from commentator sparks.
- (5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended
- (6) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

2. STORAGE PRECAUTIONS

- (1) When you store touch panel for a long time, it is recommended to keep the temperature between 0°C-40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
- (2) Please do not leave touch panel in the environment of high humidity and high temperature such as 60°C 90%RH
- (3) Please do not leave touch panel in the environment of low temperature; below -20°C.

3. OTHERS

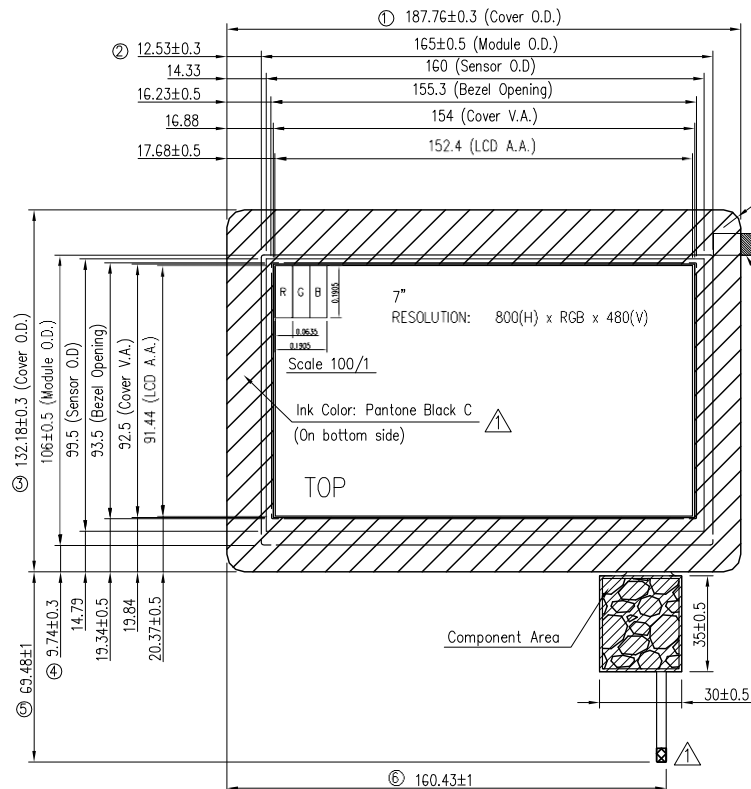
For the packaging box, please pay attention to the followings:

- a. Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
- b. Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
- c. Packing box and inner case for CTP are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)

4. LIMITED WARRANTY

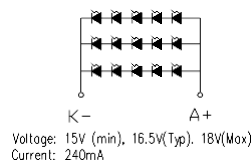
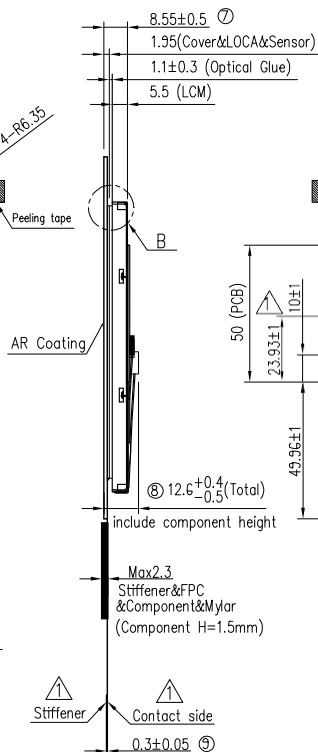
Unless otherwise agreed between USMP and customer, USMP will replace or repair any of its CTP which is found to be defective electrically and visually when inspected in accordance with USMP acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of USMP is limited to repair and/or replacement on the terms set forth above. USMP will not responsible for any subsequent or consequential events.

12. OUTLINE DRAWING

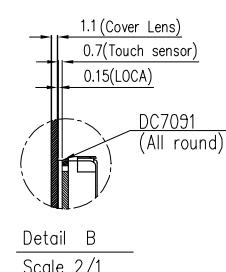
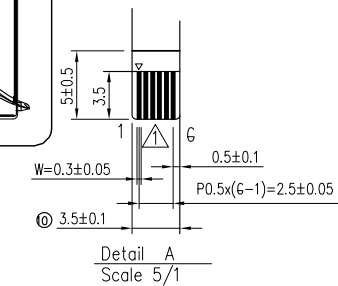
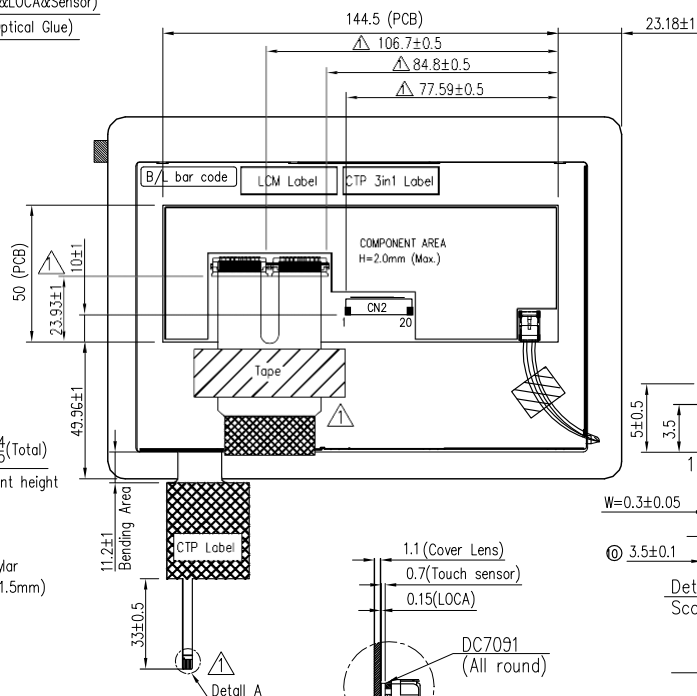


NOTE:

1. Tolerance is ± 0.3 unless otherwise noted.
2. For RoHS2.
3. Important dimension. ① ~ ⑩
4. Center brightness : 600 cd/m² (Min) ; 850 cd/m² (Typ)
5. CN2 connector: CP100-S20G-H16 or equivalent,
6. CTP sensor FPC matching connector: Molex 52745-0697 or equivalent.
7. CTP IC: EETI EXC7200+EX5404
8. LED dice life: 50,000hrs(Typ.)
9. Uniformity: 70% (Min.)
10. INK P/N: SEIKO BLACK HF GV3 RX01 710



LED circuit



CTP Pin Functions

1 DGND	4 VIN
2 DA-	5 NC
3 DA+	6 NC

CN2 PIN FUNCTION

1 VDD	6 IN0+	11 IN2-	16 GND
2 VDD	7 GND	12 IN2+	17 VLED
3 GND	8 IN1-	13 GND	18 VLED
4 GND	9 IN1+	14 CLK-	19 GND
5 IN0-	10 GND	15 CLK+	20 ADJ

				DATE:		USMP-T070-080048CAV-A0		
				DRAWN:				
⚠	Modify FPC PAD location & Modify ink spec & Change TFT FPC	ESR0507013	2016/09/08	CHECK:		DWG. NO.		
	ESR0507013			APPROVE:		UNITS	M M	
AUTH	DESCRIPTION	DATE	APPROVED			SCALE	1 / 1	
REVISIONS							SHEET 1 OF 1	

13. PACKAGE INFORMATION

TBD