AMP DISPLAY INC.

A Brighter Solution

SPECIFICATIONS

7.0-in Color TFT Module w/ Touch Panel

CUSTOMER:	
CUSTOMER PART NO.	
AMP DISPLAY PART NO.	A M 8 0 0 4 8 0 E 3 T M Q W - T 1 1 H A
APPROVED BY:	
DATE:	

☐ APPROVED FOR SPECIFICATIONS

☐ APPROVED FOR SPECIFICATION AND PROTOTYPES

AMP DISPLAY INC

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2009/7/13	-	New Release (Remove C26 & C27, L3 change from 0 to 100ohm)	John

1. FEATURES

(1) Construction : a-Si TFT-LCD with driving system, White LED Backlight and Touch
Panel

(2) LCD type : Transmissive , Normally White

(3) Number of the Colors : 262K colors (R,G,B 6 bit digital each)

(4) RGB Interface 40 pin, DE only mode.

(5) LCD Power Supply Voltage : 3.3V single power input, built-in power supply circuit.

(6) Rohs compliant.

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	800RGB (W) x 480(H)	dots
Active area	152.4 (W) x 91.44 (H)	mm
Pixel pitch	0.1905 (W) x 0.1905 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	165.0(W)x104.0(H)x6.7(D)	mm
Brightness	240 nit(typ)	cd/m^2
Contrast ratio	250 : 1	
Backlight unit	LED	
Display color	262,144	colors

3. ABSOLUTE MAX. RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT
Power Supply Voltage for LCD	Vcc	-0.5	3.6	V
Signal input voltage	DCLK DE R0~R5 G0~G5 B0~b5	-0.5	VCC+0.5	V
Operation Temperature	Top	-20	70	℃
Storage Temperature	Tstg	-30	80	℃

The following values are maximum operation conditions , If exceeded , it may cause faulty operation or damage

4. ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
Input low current	I_{IL}	No pull-up or pull-down	-1	-	1	µA	
Input high current	I_{IH}	No pull-up or pull-down	-1	-	1	µA	
Tri-state leakage current	I_{OZ}		-10	-	10	µA	
Logic input low voltage	V_{IL}	CMOS	-	-	$0.2V_{DD}$	V	Note 1
Schmitt input low voltage	V_{SIL}	CMOS	-	-	$0.3V_{DD}$	V	Note 2
Logic input high voltage	V_{IH}	CMOS	$0.8V_{DD}$	-	-	V	Note 1
Schmitt input high voltage	V_{SIH}	CMOS	$0.7V_{DD}$	-	-	V	Note 2
Output low voltage	V_{OL}	$I_{OL} = 4mA$	-	-	$0.3V_{DD}$	V	Note 3
Output high voltage	V_{OH}	$I_{OH} = -4mA$	$0.7V_{DD}$	-	-	V	Note 3
Output low voltage	V_{OL}	$I_{OL} = 8mA$	-	-	$0.3V_{DD}$	V	Note 4
Output high voltage	V_{OH}	$I_{OH} = -8mA$	$0.7V_{DD}$	-	-	V	Note 4
Input pull up / down resistance	R_i	$V_{IL} = 0V$ or $V_{IH} = V_{DD}$	-	90	-	KΩ	Note 5

Note 1: MODE, UDC, LRC, RI0~RI5, GI0~GI5, BI0~BI5.
Note 2: DCLK, HSYNC, VSYNC, DE, RESETB
Note 3: CKV, POL, REV, LD, DIO1, DIO2, STV1, STV2, OEV, AP, RO0~RO5, GO0~GO5, BO0~BO5.
Note 4: HCLK
Note 5: RESETB, HSYNC, VSYNC, DE, MODE, UDC, LRC.

4. ELECTRICAL CHARACTERISTICS

4-1 TFT LCD Module voltage

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Power Supply Voltage For LCD	Vcc	3.0	3.3	3.6	V
Power Supply Current For LCD	Idd	200	250	300	mA
Power Supply Voltage For LED	VLED	9.3	9.6	10	V
Power Supply Current For LED	ILED	-	-	180	mA
Logic Input High Voltage	V_{IH}	0.8Vcc	-	-	V
Logic Input Low Voltage	V_{IL}	-	-	0.2 Vcc	V

VCC –dip codition:
1) When $2.7 V \leq VCC < 3.0V$, $td \leq 10ms$.
2) VCC > 3.0V , VCC-dip condition should be same as VCC-turn-on condition.
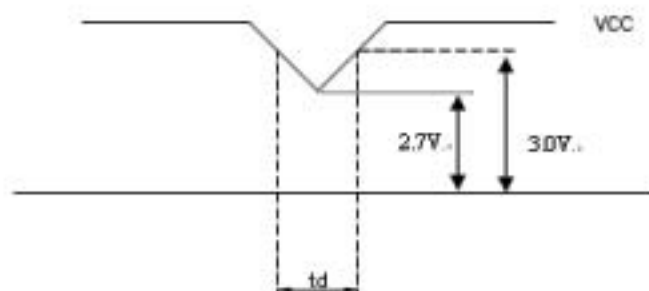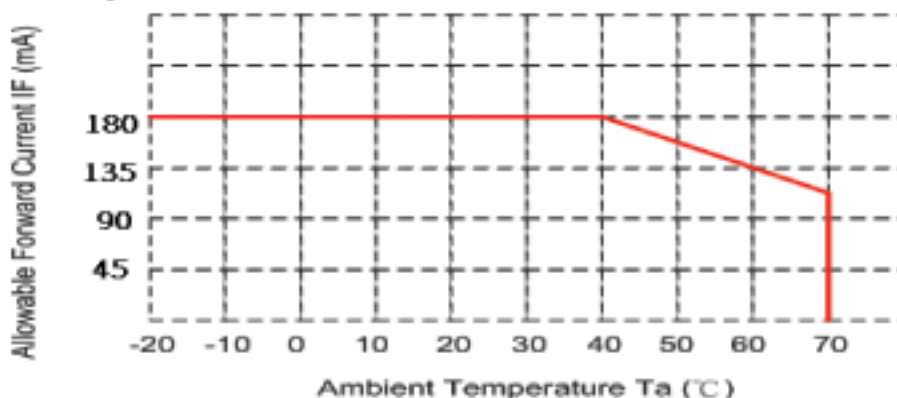

4-2 Backlight structure
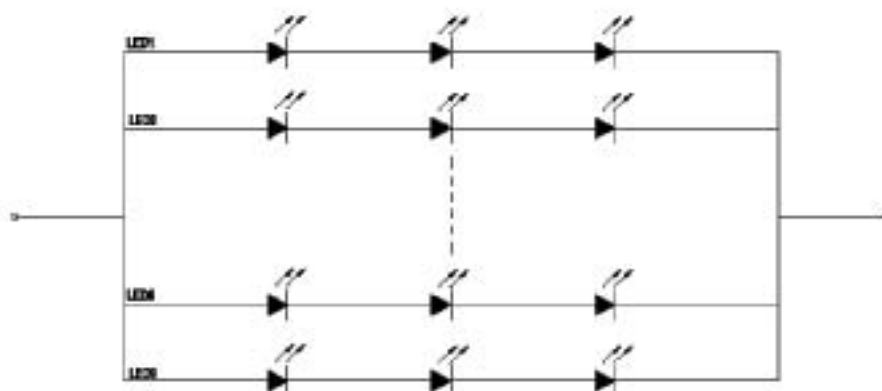
1) The LED Life Time define : Module brightness decay to 50% , Ta=25℃ ,
   IL=20mA

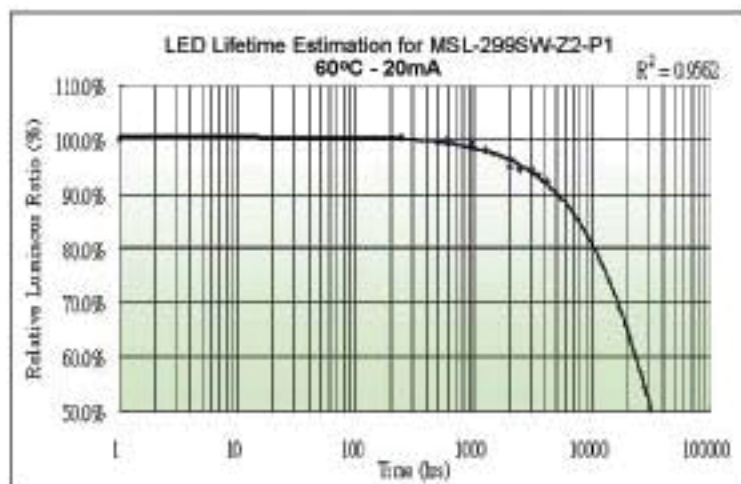Date : 2009/7/13   AM800480E3TMQW-T09HA(TFT800480-47-0)

■ The constant current source is needed for white LED back-light driving.

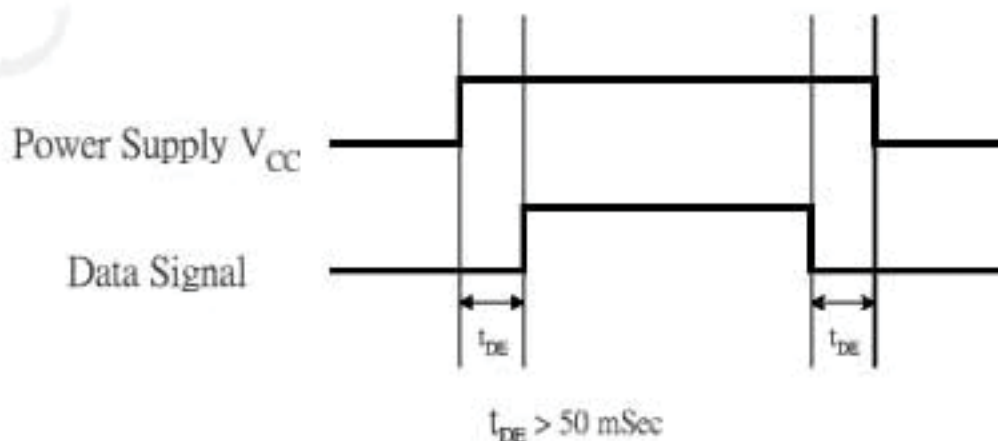When LCM is operated over 60℃ ambient temperature, the I_{LED} of the LED back-light should
be adjusted to 135mA max

■ The Estimation of LED Curve

4-3 Power Sequence

$t_{DE} > 50$ mSec

5. INTERFACE

Pin no	Symbol	Function
1	GND	Ground
2	GND	Ground
3	AGING (NC)	Aging test mode, No Connection.
4	VCC	Power supply (3.3V)
5	VCC	Power supply (3.3V)
6	VCC	Power supply (3.3V)
7	VCC	Power supply (3.3V)
8	HS (NC)	HSYNC for test mode, NO Connection.
9	DE	Data Enable Timing Signal
10	GND	Ground
11	GND	Ground
12	GND	Ground
13	B5	Blue data (MSB)
14	B4	Blue data
15	B3	Blue data
16	GND	Ground
17	B2	Blue data
18	B1	Blue data
19	B0	Blue data (LSB)
20	GND	Ground
21	G5	Green data (MSB)
22	G4	Green data
23	G3	Green data
24	GND	Ground
25	G2	Green data
26	G1	Green data
27	G0	Green data (LSB)
28	GND	Ground
29	R5	Red data (MSB)
30	R4	Red data
31	R3	Red data
32	GND	Ground
33	R2	Red data
34	R1	Red data
35	R0	Red data (LSB)
36	GND	Ground
37	GND	Ground
38	DCLK	Data Clock
39	GND	Ground
40	GND	Ground

6. OPTICAL CHARACTERISTICS

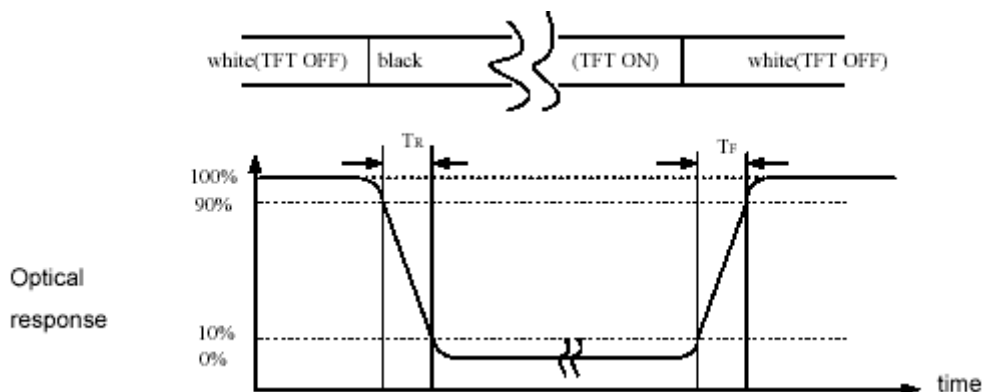| Item		Symbol	Condition	Values			Unit	Note
				Min.	Typ.	Max.		
Viewing angle (CR≧10)		θL	Φ = 180° (9 o'clock)	--	70	--	degree	Note7
		θR	Φ = 0° (3 o'clock)	--	70	--		
		θT	Φ = 90° (12 o'clock)	--	70	--		
		θB	Φ = 270° (6 o'clock)	--	50	--		
Response time		$T_r + T_f$		--	25		msec	Note3
Contrast ratio		CR		--	250	--	--	Note4
Color chromaticity	Red	Rx	Normal θ =Φ=0°	0.541	0.591	0.641	--	Note1
		Ry		0.315	0.365	0.415	--	
	Green	Gx		0.302	0.352	0.402		
		Gy		0.520	0.570	0.620		
	Blue	Bx		0.098	0.148	0.198		
		By		0.083	0.133	0.183		
	White	Wx		0.274	0.324	0.374		
		Wy		0.320	0.370	0.429		
Luminance		L		192	240	--	cd/㎡	Note5
Luminance uniformity		YU		70	75	--	%	Note6

Note1: These items are measured by BM-7(TOPCON) in the dark room (no ambient light)

Note2: Brightness conditions : IL=180mA.

Note3: Definition of Response Time (White-Black)

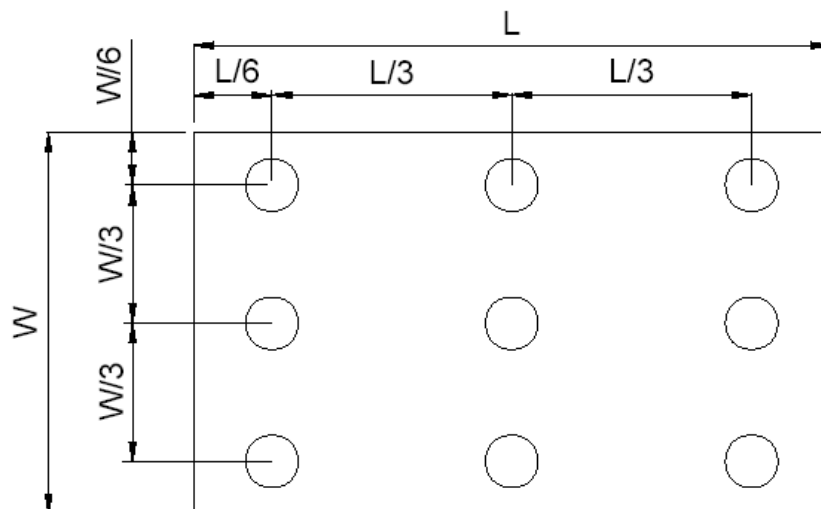
Note4 : Definition of Contrast Ratio

Measure contrast ratio on the below 9 points(refer to figure1,#1~#9point) and take the average value
Contrast ratio is calculated with the following formula :

Contrast Ratio(CR)=(White)Luminance of ON ÷ (Black)Luminance of OFF

Note5 : Definition of Luminance :

Measure white luminance on the same 9 points and take the average value

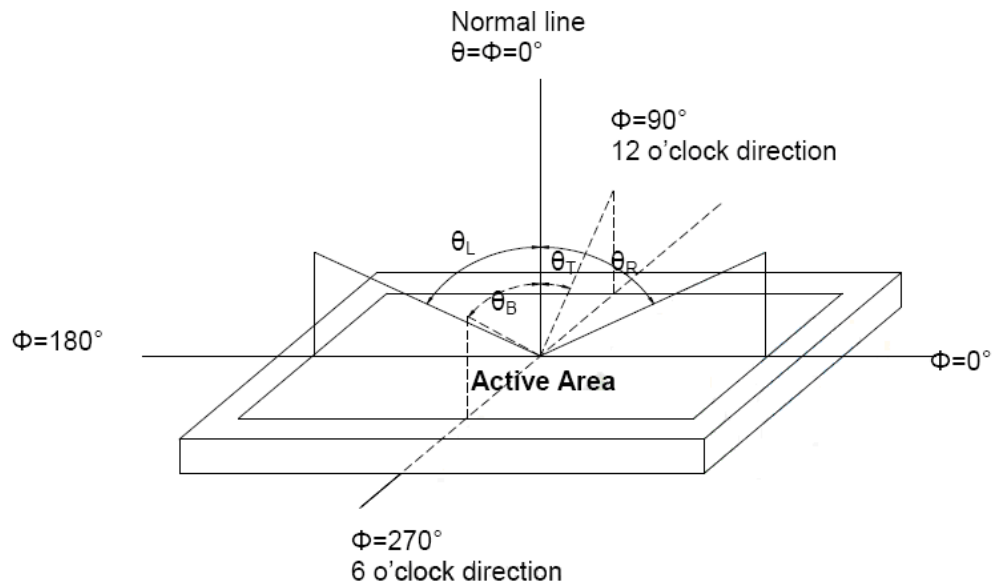Note 6: Definition of Luminance Uniformity :

Measured Maximum luminance[L(MAX)] and Minimum luminance[L(MIN)] on the 9 points
Luminance Uniformity is calculated with the following formula :

ΔL =[L(MIN) / L(MAX)] X 100%

Note 7: Definition of Viewing Angle

Item	Symbol	Condition	Values			Unit	Note
			Min.	**Typ.**	**Max.**		
Portrait Mode Viewing angle (CR≧10)	θ L	Φ = 180° (9 o'clock)	--	50	--	degree	Note7
	θ R	Φ = 0° (3 o'clock)	--	70	--		
	θ T	Φ = 90° (12 o'clock)	--	70	--		
	θ B	Φ = 270° (6 o'clock)	--	70	--		

7. TOUCH PANEL ELECTRICAL SPECIFICATION

Parameter	Condition	Standard Value
Terminal Resistance	X Axis	500 ~ 1200 Ω
	Y Axis	150 ~ 800 Ω
Insulating Resistance	DC 25 V	More than 20MΩ
Linearity	--	≦1.5 %
Notes life by Pen	Note a	100,000 times(min)
Input life by finger	Note b	1,000,000 times (min)
Operation Force	80gf Max (with in AA 2mm)	
Edge sliding	5000 time min. (Polyacetal, R0.8, 250gf, 1mm inside of "AA")	
Hardness of surface	3H (JIS-K5600-5-4)	
Plotting Line	100,000 times (Polyacetal, R0.8 , 250gf)	
FPC Peeling Force	5N min	

Note A .

Notes area for pen notes life test is 10 x 9 mm.

Size of word is 7.5 x 6.75

Shape of pen end : R0.8mm
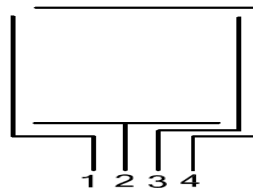
Load : 250 gf

Note B

By Silicon rubber tapping at same point

Shape of rubber end : R8 Hardness

Load : 250gf

Frequency : 5 Hz

Interface

No.	Symbol	Function
1	X1	Touch Panel Left Signal in X Axis
2	Y1	Touch Panel Bottom Signal in Y Axis
3	X2	Touch Panel Right Signal in X Axis
4	Y2	Touch Panel Top Signal in Y Axis

8. INPUT SIGNAL (DE ONLY MODE)

Timing Characteristics

DE mode Input signal characteristics, 800 x 480

PARAMETER		SYMBOL	MIN	TYP	MAX	UNIT	REMARK
DCLK	PERIOD	TCLK	25	34	-	NS	
	FREQUENCY	FCLK	-	29.5	40	MHZ	
	LOW LEVEL WIDTH	TWCL	6	-	-	NS	
	HIGH LEVEL WIDTH	TWCH	6	-	-	NS	
	DUTY	-	0.45	0.50	0.55	-	
DE	SETUP TIME	TDES	5	-	-	NS	
	HOLD TIME	TDEH	5	-	-	NS	
	RISE, FALL TIME	TDER, TDEF	-	-	5	NS	
	HORIZONTAL PERIOD	THP	810	928	1600	TCLK	
	HORIZONTAL VALID	THV	800			TCLK	
	HORIZONTAL BLANK	THBK	THP - THV			TCLK	
	VERTICAL PERIOD	TVP	485	525	960	THP	
	VERTICAL VALID	TW	480			THP	
	VERTICAL BLANK	TVBK	TVP - TW			THP	
DATA	SETUP TIME	TDS	5	-	-	NS	
	HOLD TIME	TDH	5	-	-	NS	
	RISE, FALL TIME	TDR, TDF	-	-	-	-	

● **This module is operated by DE only mode**

Output Signal Characteristics, 800 x 480

PARAMETER		SYMBOL	VALUE	UNIT
HCLK FREQUENCY	NORMAL	FHCLK	1	FCLK
HCLK FREQUENCY	DUAL	1/2FHCLK	0.5	FCLK
HCLK PERIOD	NORMAL	THCLK	1	TCLK
HCLK PERIOD	DUAL	2THCLK	2	TCLK
DATA, REV DIO VALID TO HCLK RISING		TSU	0.5	THCLK
HCLK RISING TO DATA, REV, DIO VALID		THD	0.5	THCLK
POL PULSE WIDTH		TPOL	1	THP
POL VALID TO LD RISING		TPSU	0.5 THP + 12	THCLK
LD RISING TO POL VALID		TPHD	THP - TPSU	THCLK
STV PULSE WIDTH		TSTV	1	THP
STV VALID TO CKV RISING		TVSU	0.5	THP
CKV RISING TO STV VALID		TVHD	0.5	THP
DIO PULSE WIDTH		TDIOW	1	THCLK
LD PULSE WIDTH		TLDW	4	THCLK
OEV PULSE WIDTH		TOEV	66	THCLK
CKV PULSE WIDTH		TCKV	0.5	THP
TIME FROM LD TO CKV		TGS	1	THCLK
TIME FROM LD TO DIO		TLDO	THBK – 6	THCLK
TIME FROM THE LAST DATA TO LD		TED	5.5	THCLK
AP PULSE WIDTH		TAPW	THP – 62	THCLK
TIME FROM LD TO AP		TLDAP	44	THCLK

◆ Waveform : DE mode, Horizontal timing

DE mode: 800x480, Horizontal timing

THP : min=850T, typ=900T, max=1056T

DE

DCLK

R/G/B in — Valid data — Invalid data

THV: 800T

THBK : min=50T,typ=100T,max=256T
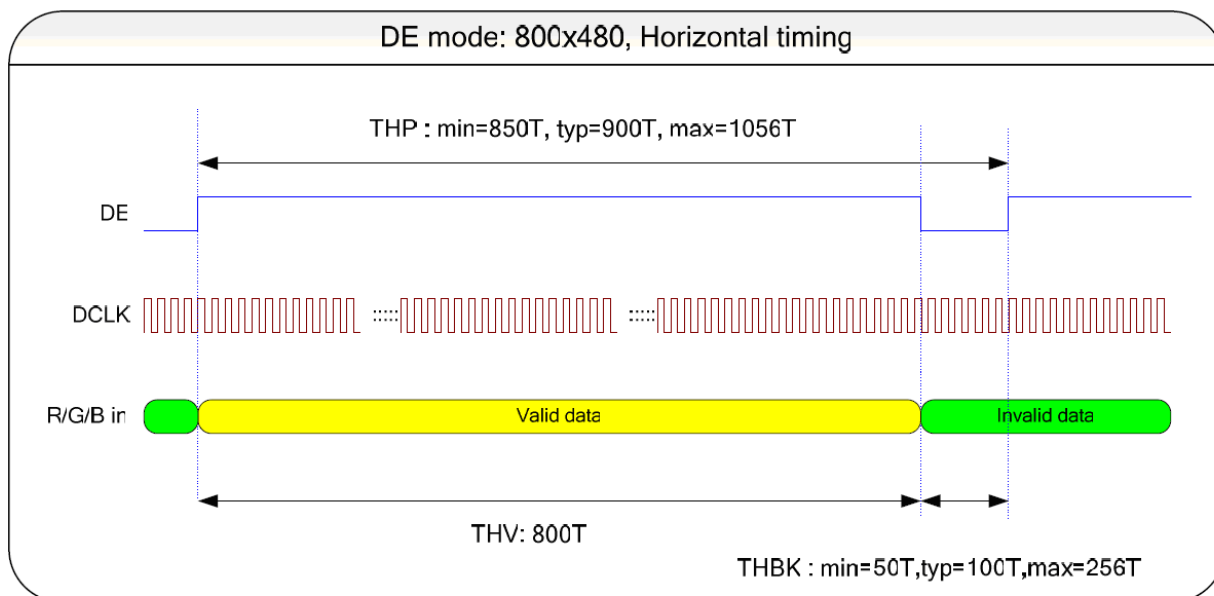
◆ Waveform : input clock, setup/hold time
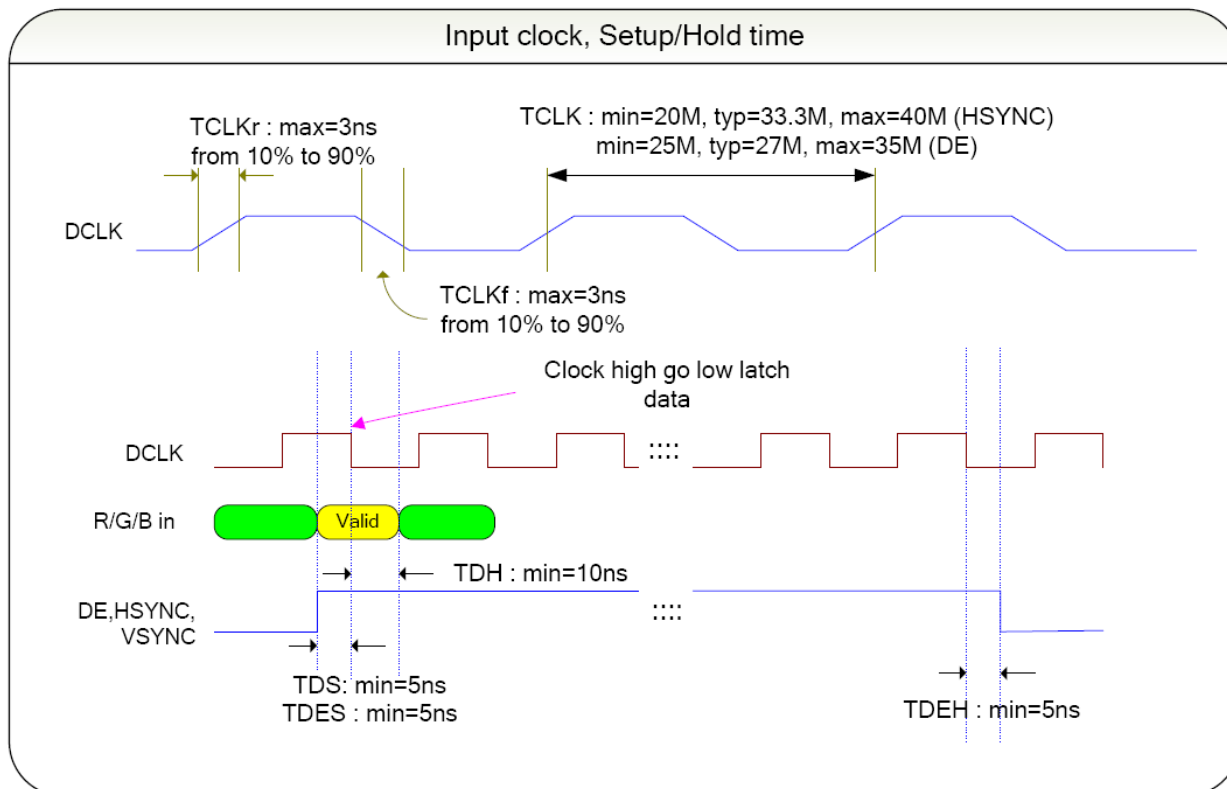
Input clock, Setup/Hold time

TCLKr : max=3ns from 10% to 90%

TCLK : min=20M, typ=33.3M, max=40M (HSYNC)
min=25M, typ=27M, max=35M (DE)

DCLK

TCLKf : max=3ns from 10% to 90%

Clock high go low latch data

DCLK

R/G/B in — Valid

TDH : min=10ns

DE,HSYNC, VSYNC

TDS: min=5ns
TDES : min=5ns

TDEH : min=5ns

9. QUALITY AND RELIABILITY

9.1   TEST CONDITIONS

Tests should be conducted under the following conditions :
Ambient temperature   : $25 \pm 5°C$
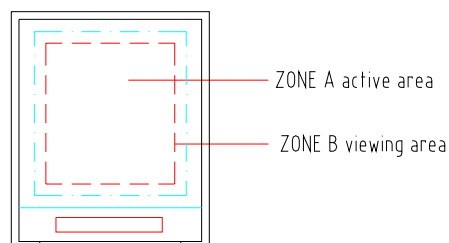Humidity   : $60 \pm 25\%$ RH.

9.2   SAMPLING PLAN

Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

9.3   ACCEPTABLE QUALITY LEVEL

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

9.4   APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under florescent light. The inspection area of LCD panel shall be within the range of following limits.

ZONE A active area
ZONE B viewing area

9.5   INCOMING INSPECTION STANDARD FOR   TFT-LCD PANEL

DEFECT TYPE			LIMIT			Note
VISUAL DEFECT	INTERNAL	SPOT	$\varphi < 0.15mm$		Ignore	Note1
			$0.15mm \leqq \varphi \leqq 0.5mm$		N≦4	
			$0.5mm < \varphi$		N=0	
		FIBER	0.03mm<W≦0.1mm, L≦5mm		N≦3	Note1
			1.0mm<W, 1.5mm<L		N=0	
		POLARIZER BUBBLE	$\varphi < 0.15mm$		Ignore	Note1
			$0.15mm \leqq \varphi \leqq 0.5mm$		N≦2	
			$0.5mm < \varphi$		N=0	
		Mura	It' OK if mura is slight visible through 6%ND filter			
ELECTRICAL DEFECT		BRIGHT DOT	A Grade			Note3
			C Area	O Area	Total	
			N≦0	N≦2	N≦2	Note2
		DARK DOT	N≦2	N≦3	N≦3	
		TOTAL DOT	N≦4			Note2
		TWO ADJACENT DOT	N≦0	N≦1 pair	N≦1 pair	Note4
		THREE OR MORE ADJACENT DOT	NOT ALLOWED			
		LINE DEFECT	NOT ALLOWED			

(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)

(2) LITTLE BRIGHT DOT ACCEPTITABLE UNDER 6 % ND-Filter

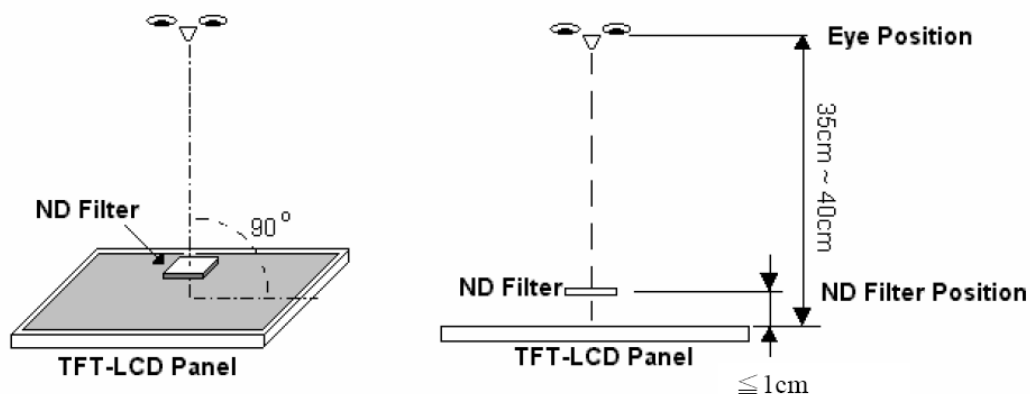   **[Note1]** W : Width[mm], L : Length[mm], N : Number, φ : Average Diameter

$\phi = (a + b) / 2$

1. (White, black) Spot
2. Polarizer Bubble

1. fiber
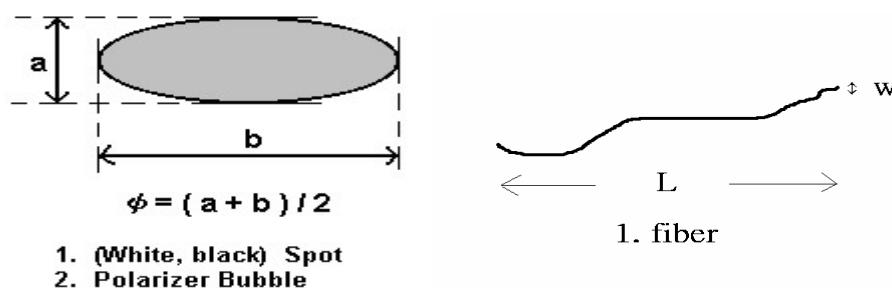
[Note2] Bright dot is defined through 6% transmission ND Filter as following.

[Note3]
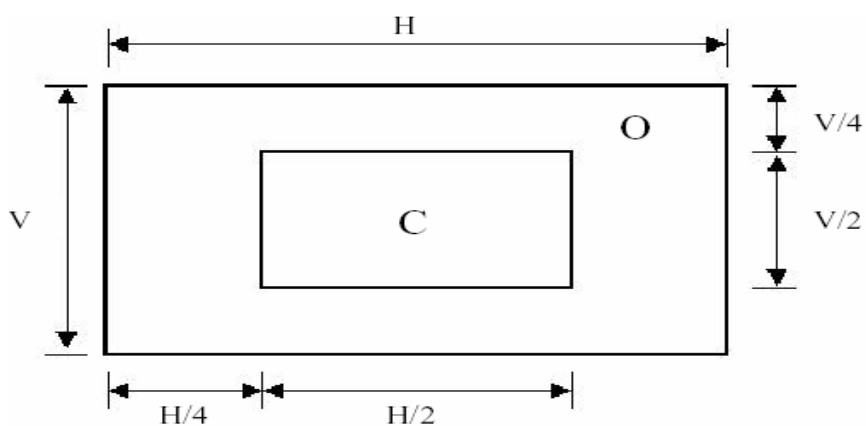
C Area: Center of display area

O Area: Outer of display area

[Note4]

Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.

(1) The defects that are not defined above and considered to be problem shall be reviewed

and discussed by both parties.

(2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

9.6   RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=96 hrs	3
Low Temperature Operation	-20±3°C , t=96 hrs	3
High Temperature Storage	80±3°C , t=96 hrs	1,2,3
Low Temperature Storage	-30±3°C , t=96 hrs	1,2,3
Thermal Shock Test	-30°C ~ 25°C ~ 80°C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2,3
Humidity Test	40 °C, Humidity 90%, 96 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2
ESD	150Pf,330Ω, ±8Kv & ±15kV air & contact test	4
SHOCK (NON-OPERATIONS)	● 980m/S^2(equal t0 100G),6ms ● (1/2 Sine wave),XYZ	

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions
(15-35°C , 45-65%RH).

Note 3 : The temperature tolerance of the whole module is guaranteed as stated, except the temperature tolerance of the Touch panel (-10~60℃ for operation, -30~70℃ for storage). Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

Note 4: LCD glass and bezel

10. USE PRECAUTIONS

10-1 Handling precautions

(1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.

(2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.

(3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.

(4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

10-2 Installing precautions

(1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. 1MΩ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.

(2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.

(3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.

(4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off

10-3 Storage precautions

(1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.

(2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.

(3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

10-4 Operating precautions

(1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.

(2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.

(3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC dive voltage.

(4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.

(5) Make certain that each signal noise level is within the standard (L level: 0.2Vdd or less and H level: 0.8Vdd or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.

(6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.

(7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.

(8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

10-5 Other

(1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.

(2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.

(3) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

Label note:

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AM800480E3        ──── Part No.
TMQWT09H
    08.27         ──── Date Code.
   D38682         ──── Batch No.
```

11. OUTLINE DIMENSION
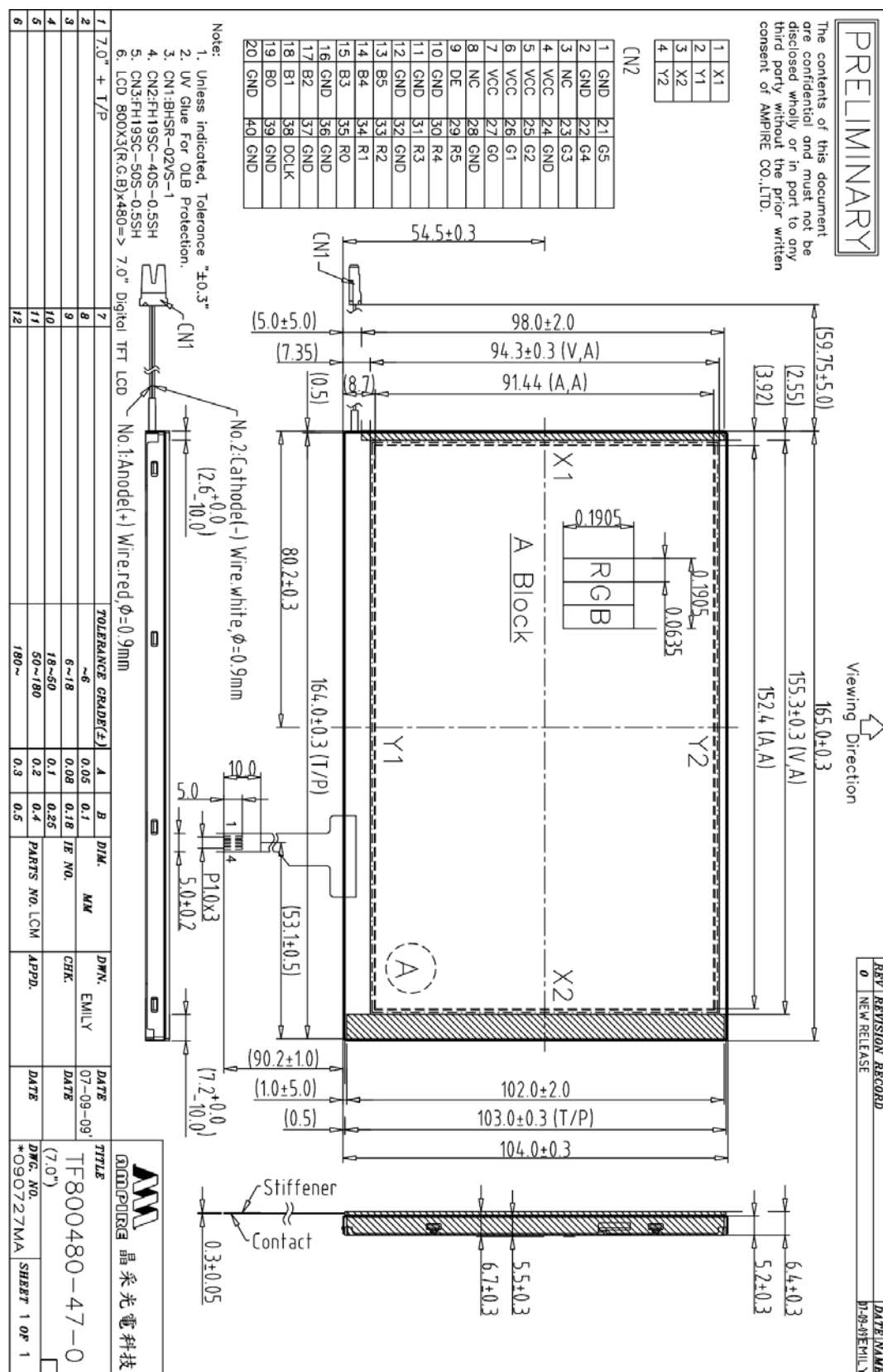### 11-1 Front view(unit:mm)

Preliminary

The contents of this document are confidential and must not be disclosed wholly or in part to any third part without the prior written consent of AMP DISPLAY INC

CN2

1 GND	21 G5
2 GND	22 G4
3 NC	23 G3
4 VCC	24 GND
5 VCC	25 G2
6 VCC	26 G1
7 VCC	27 G0
8 NC	28 GND
9 DE	29 R5
10 GND	30 R4
11 GND	31 R3
12 GND	32 GND
13 B5	33 R2
14 B4	34 R1
15 B3	35 R0
16 GND	36 GND
17 B2	37 GND
18 B1	38 DCLK
19 B0	39 GND
20 GND	40 GND

1 X1	2 Y1	3 X2	4 Y2

A Block RGB

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. CN1:BHSR-02VS-1
4. CN2:FH19SC-40S-0.5SH
5. CN3:FH19SC-50S-0.5SH
6. LCD 800x3(R.G.B)x480=> 7.0" Digital TFT LCD

7.0" + T/P

TOLERANCE GRADE(±)	A	B
~6	0.05	0.1
6~18	0.08	0.18
18~50	0.1	0.25
50~180	0.2	0.4
180~	0.3	0.5

DIM.	MM
IE NO.	PARTS NO.LCM-1

Back View

	DWN.	CHK	APPD.
	EMILY		
DATE	07-10-09		DATE

REV | REVISION RECORD
0 | NEW RELEASE

DATE/NAME 07-10-09 EMILY

TITLE TF800480-47-0 (7.0")

DWG. NO. *090728MA

SHEET 1 OF 1

Date : 2009/7/13   AM800480E3TMQW-T09HA(TFT800480-47-0)   24