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SPECIFICATION

KOE
JDI Group

TX20D26VM0AAA

Date: May 2012

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KOE

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Kaohsiung Opto-Electronics Inc.

FOR MESSRS:_____ DATE: May 1st ,2012

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

TX20D26VM0AAA

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2. RECORD OF REVISION

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<tr><td>Operating Temperature</td><td>-40</td><td>85</td></tr>
<tr><td>Storage Temperature</td><td>-40</td><td>95</td></tr>
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<tr><th>ITEM</th><th>Min.</th><th>Max.</th></tr>
<tr><td>Operating Temperature</td><td>-30</td><td>80</td></tr>
<tr><td>Storage Temperature</td><td>-40</td><td>90</td></tr>
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<table>
<tr><th>Test Item</th><th>Condition</th></tr>
<tr><td>High Temperature</td><td>2)85°C</td></tr>
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<tr><td>Thermal Shock</td><td>2)-40°C ↔85°C</td></tr>
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<tr><td>Vibration</td><td>2)20~100 Hz
3)2G</td></tr>
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<tr><th>Test Item</th><th>Condition</th></tr>
<tr><td>High Temperature</td><td>2)80°C</td></tr>
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Delete
<table>
<tr><th>Test Item</th><th>Condition</th><th></th></tr>
<tr><td>ESD</td><td>5)Contact discharge for LCD Interface: ±100V</td><td>3) Connector: all pins (CN1&CN2)</td></tr>
</table>
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<tr><td></td><td>7B64PS 2709 –
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<table>
<tr><th>Pin No.</th><th>Signal</th><th>Function</th></tr>
<tr><td>31</td><td>NC</td><td rowspan="2">No Connection</td></tr>
<tr><td>32</td><td>NC</td></tr>
<tr><td>35</td><td>Reset</td><td>Reset of timing controller (Low=Reset)</td></tr>
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<table>
<tr><th>Pin No.</th><th>Signal</th><th>Function</th></tr>
<tr><td>31</td><td>VDD</td><td rowspan="2">Power Supply for Logic</td></tr>
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<table>
<tr><td>Power Supply Voltage</td><td>3.3V for LCD; 26.6V for Backlight</td></tr>
<tr><td>Power Consumption</td><td>1.32 W for LCD; 10.6W for backlight</td></tr>
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<table>
<tr><td>Power Supply Voltage</td><td>3.3V for LCD; 21.7V for Backlight</td></tr>
<tr><td>Power Consumption</td><td>1.32 W for LCD; 8.68W for backlight</td></tr>
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<tr><td></td><td>7B64PS 2705 – TX20D26VM0AAA-3
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<table>
<tr><th>Item</th><th>Typ.</th></tr>
<tr><td>LED Input Voltage</td><td>-</td></tr>
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<tr><th>Item</th><th>Typ.</th></tr>
<tr><td>LED Input Voltage</td><td>21.7</td></tr>
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<tr><td></td><td>7B64PS 2708 – TX20D26VM0AAA-3
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</table>
↓
<table>
<tr><th>Test Item</th><th>Condition</th></tr>
<tr><td>Heat Cycle</td><td>2)–20°C~70°C</td></tr>
<tr><td>High Temperature & Humidity</td><td>2)65°C & 85%RH</td></tr>
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<tr><td></td><td>7B64PS 2710 – TX20D26VM0AAA-3
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Add new traits of upper frame and PCB cover.</td></tr>
<tr><td>May 01,'12</td><td>All pages</td><td>Company name changed:
KAOHSIUNG HITACHI ELECTRONICS CO.,LTD.
↓
KAOHSIUNG OPTO-ELECTRONICS INC.</td></tr>
<tr><td></td><td>7B64PS-2704-TX20D26VM0AAA-4
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<tr><td></td><td>7B64PS-2705-TX20D26VM0AAA-4
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Revised: LED FPC drawing corrected.</td></tr>
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3. GENERAL DATA

3.1 DISPLAY FEATURES

This module is a 8" WVGA of 16:9 format amorphous silicon TFT.The pixel format is vertical stripe and sub pixels are arranged as R(red), G(green), B(blue) sequentially. This display is RoHS compliant, and COG (chip on glass) technology and LED backlight are applied on this display.

Part Name	TX20D26VM0AAA
Module Dimensions	190.0(W) mm x 120.0(H) mm x 12.8(D) mm typ.
LCD Active Area	174.0(W) mm x 104.4(H) mm
Dot Pitch	0.0725(W) mm x 3(R, G, B)(W) x 0.2175(H) mm
Resolution	800 x 3(RGB)(W) x 480(H) dots
Color Pixel Arrangement	R, G, B Vertical stripe
LCD Type	Transmissive Color TFT; Normally Black
Display Type	Active Matrix
Number of Colors	262k Colors
Backlight	7 LEDs parallel x 4 serial (28 LEDs in total)
Weight	370 g (typ.)
Interface	C-MOS; 6-bit RGB; 40 pins
Power Supply Voltage	3.3V for LCD; 21.7V for Backlight
Power Consumption	1.32 W for LCD; 8.68W for backlight
Viewing Direction	Super Wide Version (In-Plane Switchimg)

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4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Remarks
Supply Voltage	VDD	-0.3	4.0	V	-
Input Voltage of Logic	VI	-0.3	VDD+0.3	V	Note 1
Operating Temperature	Top	-30	80	°C	Note 2
Storage Temperature	Tst	-40	90	°C	Note 2
Backlight Input Voltage	VLED	-	26.6	V	-
	ILED	-	180	mA	-

Note 1: The rating is defined for the signal voltages of the interface such as DE, DCLK and RGB data bus.

Note 2: The maximum rating is defined as above based on the chamber temperature, which might be different from ambient temperature after assembling the panel into the application. Moreover, some temperature-related phenomenon as below needed to be noticed:

- Background color, contrast and response time would be different in temperatures other than 25°C.
- Operating under high temperature will shorten LED lifetime.

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5. ELECTRICAL CHARACTERISTICS

5.1 LCD CHARACTERISTICS

T_a = 25 °C, VSS = 0V

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	VDD	-	2.97	3.3	3.6	V	-
Input Voltage of Logic	VI	"H" level	0.7VDD	-	VDD+0.3	V	Note 1
		"L" level	VSS-0.3	-	0.3VDD		
Power Supply Current	IDD	VDD=3.3V	-	400	500	mA	Note 2
Vsync Frequency	f_v	-	47	60	75	Hz	-
Hsync Frequency	f_H	-	16.7	31.5	41.7	KHz	-
CLK Frequency	f_{CLK}	-	25.00	33.26	36.00	MHz	-

Note 1: The rating is defined for the signal voltages of the interface such as DE, DCLK and RGB data bus.

Note 2: An all black check pattern is used when measuring IDD. f_v is set to 60 Hz.

Note 3: 1.0A fuse is applied in the module for IDD. For display activation and protection purpose, power supply is recommended larger than 2.5A to start the display and break fuse once any short circuit occurred.

5.2 BACKLIGHT CHARACTERISTICS

T_a = 25 °C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
LED Input Voltage	VLED	-	-	21.7	26.6	V	Note 1
LED Input Current	ILED	Per Series	-	100	110	mA	-
LED Lifetime	-	400mA	-	70K	-	hrs	Note 2

Note 1: Fig. 5.1 shows the LED backlight circuit. The circuit has 28 LEDs in total. Please keep pin8~pin10 open electrically, Hitachi test use only.

Note 2: The estimated lifetime is specified as the time to reduce 50% brightness by applying 400mA at 25°C.

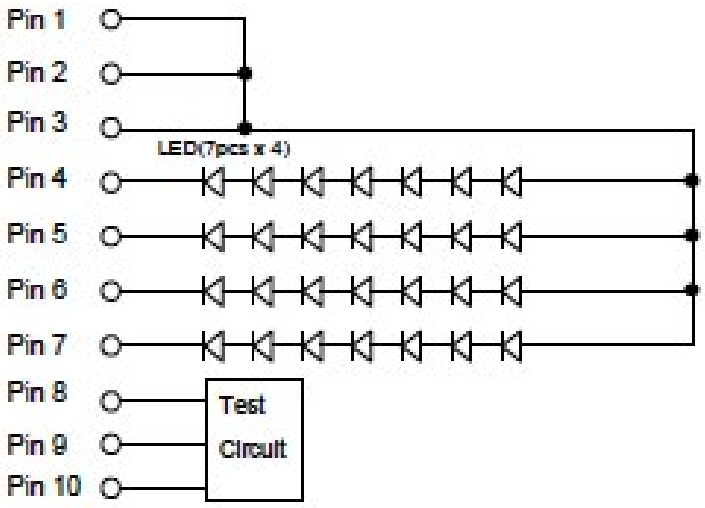

Fig. 5.1

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6. OPTICAL CHARACTERISTICS

The optical characteristics are measured based on the conditions as below:

- Supplying the signals and voltages defined in the section of electrical characteristics.
- The backlight unit needs to be turned on for 30 minutes.
- The ambient temperature is 25°C.
- In the dark room around 500~1000 lx, the equipment has been set for the measurements as shown in Fig 6.1.

T_a = 25 °C, f_v = 60 Hz, VDD = 3.3V

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Brightness of White		-	$\phi=0°, \theta=0°$, ILED= 100 mA/series	380	600	-	cd/m^2	Note 1
Brightness Uniformity		-		60	70	-	%	Note 2
Contrast Ratio		CR		400	600	-	-	Note 3
Response Time (Rising + Falling)		T_r+T_f	$\phi=0°, \theta=0°$	-	26		ms	Note 4
Viewing Angle		θx	$\phi=0°$, CR ≥ 10	-	85	-	Degree	Note 5
		$\theta x'$	$\phi=180°$, CR ≥ 10	-	85	-		
		θy	$\phi=90°$, CR ≥ 10	-	85	-		
		$\theta y'$	$\phi=270°$, CR ≥ 10	-	85	-		
Color Chromaticity	Red	X	$\phi=0°, \theta=0°$	0.560	0.610	0.660	-	Note 6
		Y		0.270	0.320	0.370		
	Green	X		0.290	0.340	0.390		
		Y		0.500	0.550	0.600		
	Blue	X		0.100	0.150	0.200		
		Y		0.060	0.110	0.160		
	White	X		0.260	0.310	0.360		
		Y		0.260	0.310	0.360		

Note 1: The brightness is measured from the panel center point, P3 in Fig. 6.2, for the typical value.

Note 2: The brightness uniformity is calculated by the equation as below:

$$\text{Brightness uniformity} = \frac{\text{Min. Brightness}}{\text{Max. Brightness}} \times 100\%$$

, which is based on the brightness values of the 5 points measured by BM-5 as shown in Fig. 6.2.

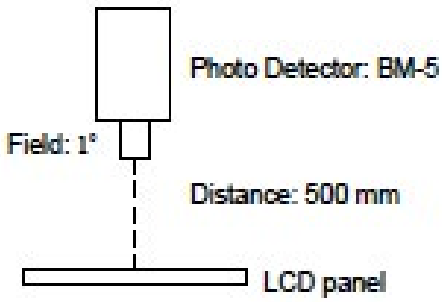

Fig. 6.1

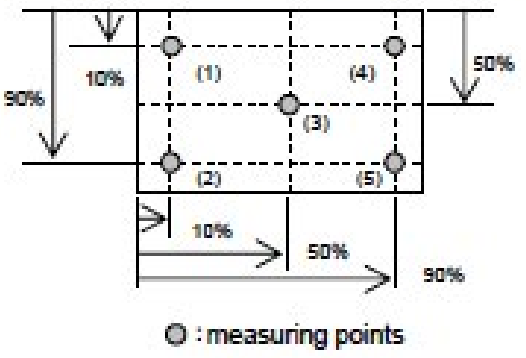

Fig. 6.2

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Note 3: The Contrast Ratio is measured from the center point of the panel, P3, and defined as the following equation:

$$CR = \frac{\text{Brightness of White}}{\text{Brightness of Black}}$$

Note 4: The definition of response time is shown in Fig. 6.3. The rising time is the period from 10% brightness to 90% brightness when the data is from black to white. Oppositely, falling time is the period from 90% brightness rising to 10% brightness.

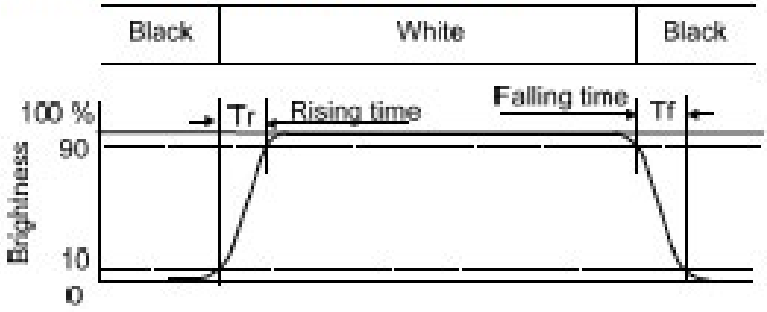

Fig 6.3

Note 5: The definition of viewing angle is shown in Fig. 6.4. Angle ϕ is used to represent viewing directions, for instance, $\phi = 270°$ means 6 o'clock, and $\phi = 0°$ means 3 o'clock. Moreover, angle θ is used to represent viewing angles from axis Z toward plane XY.

The display is super wide viewing angle version, so that the best optical performance can be obtained from every viewing direction.

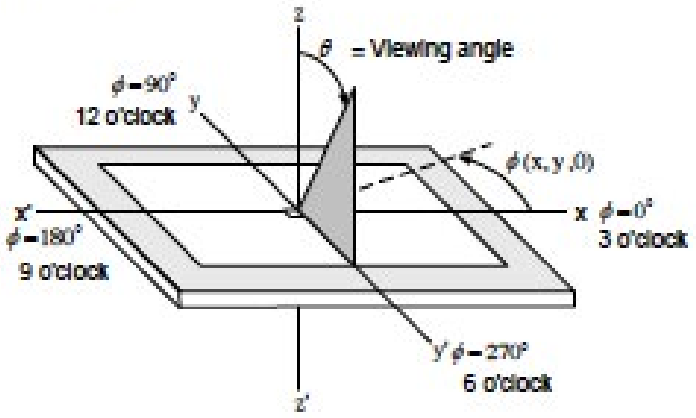

Fig 6.4

Note 6: The color chromaticity is measured from the center point of the panel, P3, as shown in Fig. 6.2.

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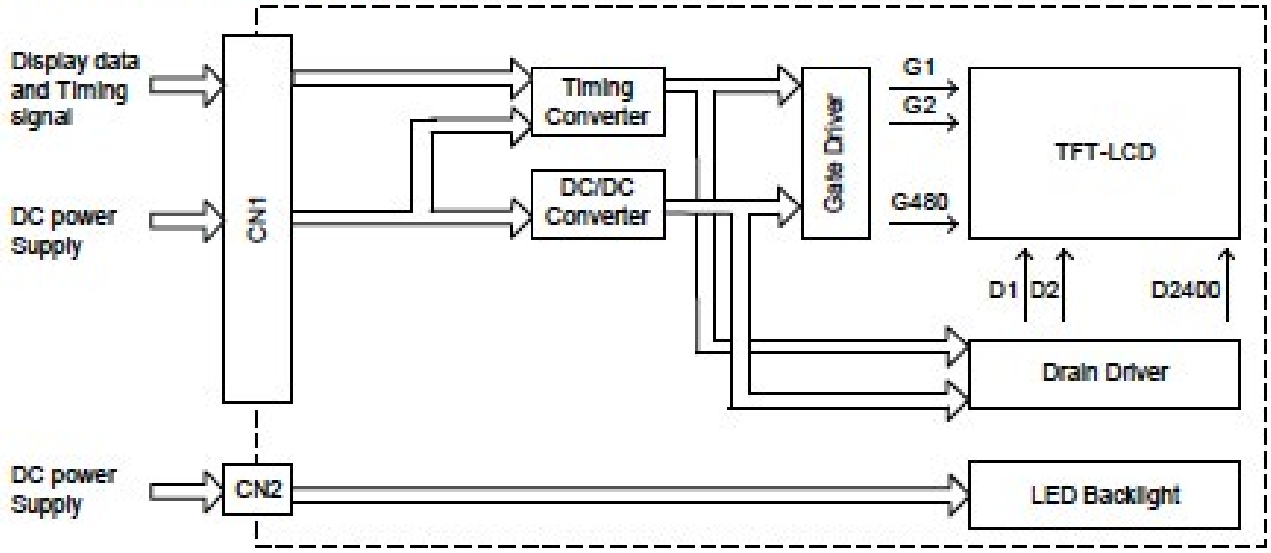
7. BLOCK DIAGRAM



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8. RELIABILITY TESTS

Test Item	Condition	
High Temperature	1) Operating 2) 80°C	500 hrs
Low Temperature	1) Operating 2) -30°C	500 hrs
High Temperature	1) Storage 2) 90°C	500 hrs
Low Temperature	1) Storage 2) -40°C	500 hrs
Heat Cycle	1) Operating 2) –30°C ~80°C 3) 3hrs~1hr~3hrs	500 hrs
Thermal Shock	1) Non-Operating 2) -35°C ↔ 85°C 3) 0.5 hr ↔ 0.5 hr	500 hrs
High Temperature & Humidity	1) Operating 2) 40°C & 85%RH 3) Without condensation (Note4)	500 hrs
Vibration	1) Non-Operating 2) 10~200 Hz 3) 5G 4) X, Y, and Z directions	1 hr for each direction
Mechanical Shock	1) Non-Operating 2) 10 ms 3) 80G 4) ±X, ±Y and ±Z directions	Once for each direction
ESD	1) Operating 2) Tip: 150 pF, 330Ω 3) Air discharge for glass: ± 12KV 4) Contact discharge for metal frame: ± 15KV	1) Glass: 9 points 2) Metal frame: 8 points (Note3)
Restart Test	1) Test period 0.5S(on)→0.5S(off)→0.5S(on) for 5 times 2) Repeat 1) every 5 min. later for 5 times	Operating for 1hr @ 80°C Operating for 1hr @ -30°C

Note 1: Display functionalities are inspected under the conditions defined in the specification after the reliability tests.

Note 2: The display is not guaranteed for use in corrosive gas environments.

Note 3: All pins of LCD interface (CN1) have been tested by ±100V contact discharge of ESD under non-operating condition.

Note 4: Under the condition of high temperature & humidity, if the temperature is higher than 40°C, the humidity needs to be reduced as Fig. 8.1 shown.

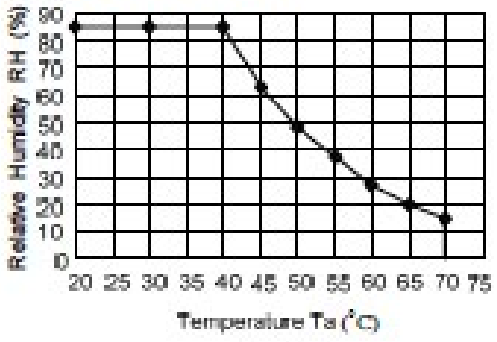

Fig. 8.1

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9. LCD INTERFACE

9.1 INTERFACE PIN CONNECTIONS

The display interface connector is 40FLZ-SM2-R-GB-TB(LF)(SN) made by JST (Thickness: 0.3±0.05mm; Pitch: 0.5±0.05mm) and more details of the connector are shown in the section of outline dimension.

Pin assignment of LCD interface is as below:

Pin No.	Signal	Function	Pin No.	Signal	Function
1	VSS	GND	21	B3	Blue Data
2	DCLK	Dot Clock	22	B4	
3	VSS	GND	23	B5	
4	R0	Red Data	24	VSS	GND
5	R1		25	NC	No Connection
6	R2		26	DE	Data Enable
7	R3		27	NC	No Connection
8	R4		28	VSS	GND
9	R5		29	NC	No Connection
10	VSS	GND	30	NC	
11	G0	Green Data	31	VDD	Power Supply for Logic
12	G1		32	VDD	
13	G2		33	VSS	GND
14	G3		34	VSS	
15	G4		35	VDD	Power Supply for Logic
16	G5		36	VDD	
17	VSS	GND	37	VDD	
18	B0	Blue Data	38	VDD	
19	B1		39	VSS	GND
20	B2		40	VSS	

Note 1: All VDD pins shall be connected to +3.3V,and VSS pins shall be grounded.

The recommend backlight connector (CN2) is 10pin-0.5mm pitch and pin assignment is as below:

Pin No.	Symbol	Description
1	VLA	Anode Chain1(+)
2	VLA	Anode Chain2(+)
3	VLA	Anode Chain3(+)
4	VLC1	Cathode Chain1(-)
5	VLC2	Cathode Chain2(-)
6	VLC3	Cathode Chain3(-)
7	VLC4	Cathode Chain4(-)
8	(IC)	Note 1
9	(IC)	Note 1
10	(IC)	Note 1

Note 1: Please keep open electrically, KOE test use only.

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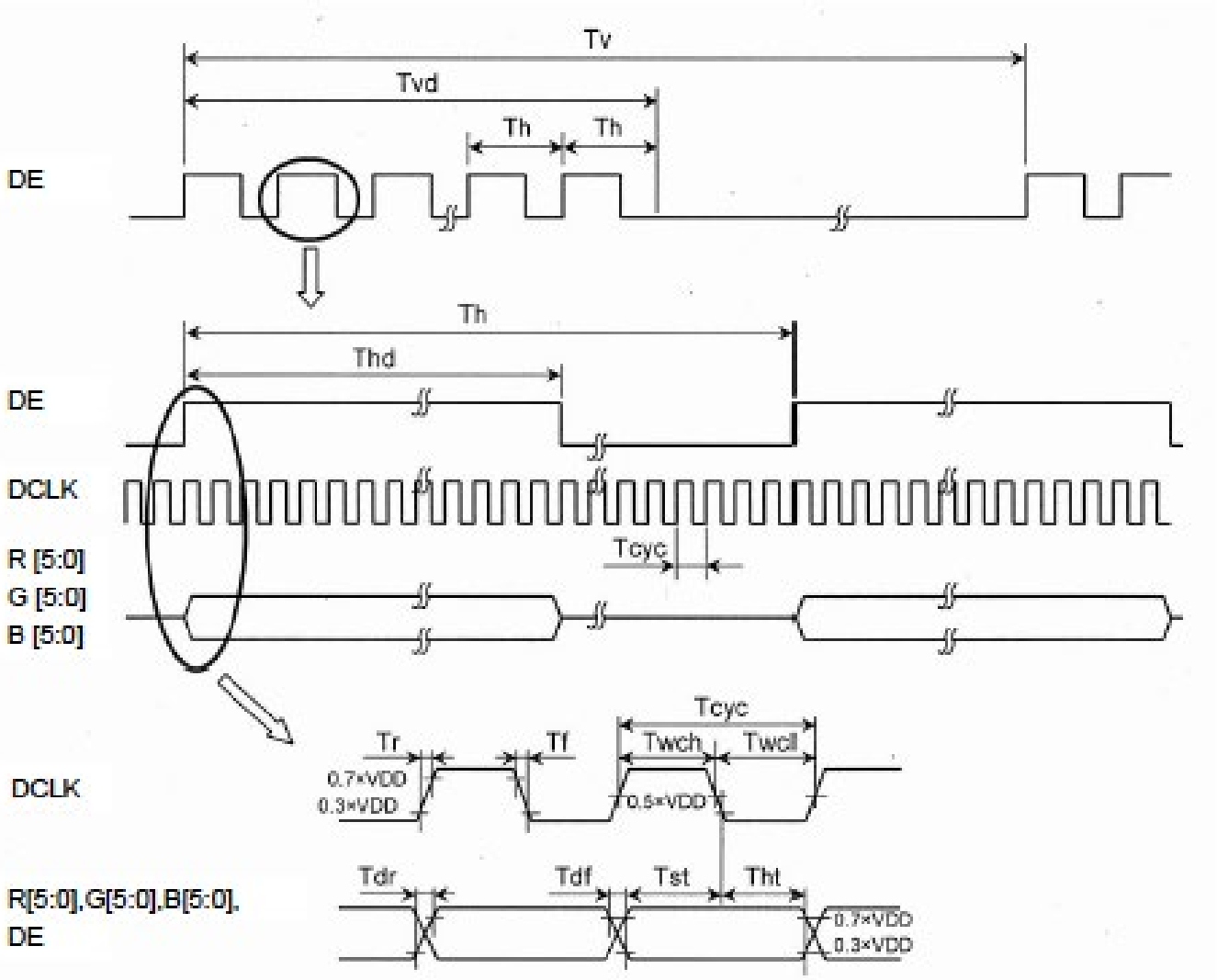
9.2 TIMING CHART



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9.3 INTERFACE TIMING SPECIFICATIONS

The parameter sets including minimum, typical, and maximum column as below are based on frame frequency (Vsync) = 60 Hz and 50Hz to adjust timing. In order to obtain better optical performance, 47~75 Hz for Vsync should be applied at least by other parameter combination if 60 Hz and 50Hz are not the aim to set.

AC characteristic(60Hz)

Item		Symbol	Min.	Typ.	Max.	Unit
DCLK	Frequency	1/Tcyc	30.00	33.26	36.00	M Hz
	High Width	Twch	8	-	-	ns
	Low Width	Twcl	8	-	-	
	Rise Time	Tr	-	-	4	
	Fall Time	Tf	-	-	4	
	Duty(D=Twcl / Twch)	D	0.45	0.50	0.55	-
R,G,B DE	Set Up Time	Tst	4	-	-	ns
	Hold Time	Tht	4	-	-	
	Rise Time	Tdr	-	-	4	
	Fall Time	Tdf	-	-	4	
	Horizontal Cycle Time	Th	840	1,056	1,500	Tcyc
	Horizontal Active Width	Thd	800	800	800	
	Vertical Cycle Time	Tv	482	525	640	Th
	Vertical Active Width	Tvd	480	480	480	

AC characteristic(50Hz)

Item		Symbol	Min.	Typ.	Max.	Unit
DCLK	Frequency	1/Tcyc	25.00	33.00	36.00	M Hz
	High Width	Twch	8	-	-	ns
	Low Width	Twcl	8	-	-	
	Rise Time	Tr	-	-	4	
	Fall Time	Tf	-	-	4	
	Duty(D=Twcl / Twch)	D	0.45	0.50	0.55	-
R,G,B DE	Set Up Time	Tst	4	-	-	ns
	Hold Time	Tht	4	-	-	
	Rise Time	Tdr	-	-	4	
	Fall Time	Tdf	-	-	4	
	Horizontal Cycle Time	Th	840	1,056	1,500	Tcyc
	Horizontal Active Width	Thd	800	800	800	
	Vertical Cycle Time	Tv	482	525	640	Th
	Vertical Active Width	Tvd	480	480	480	

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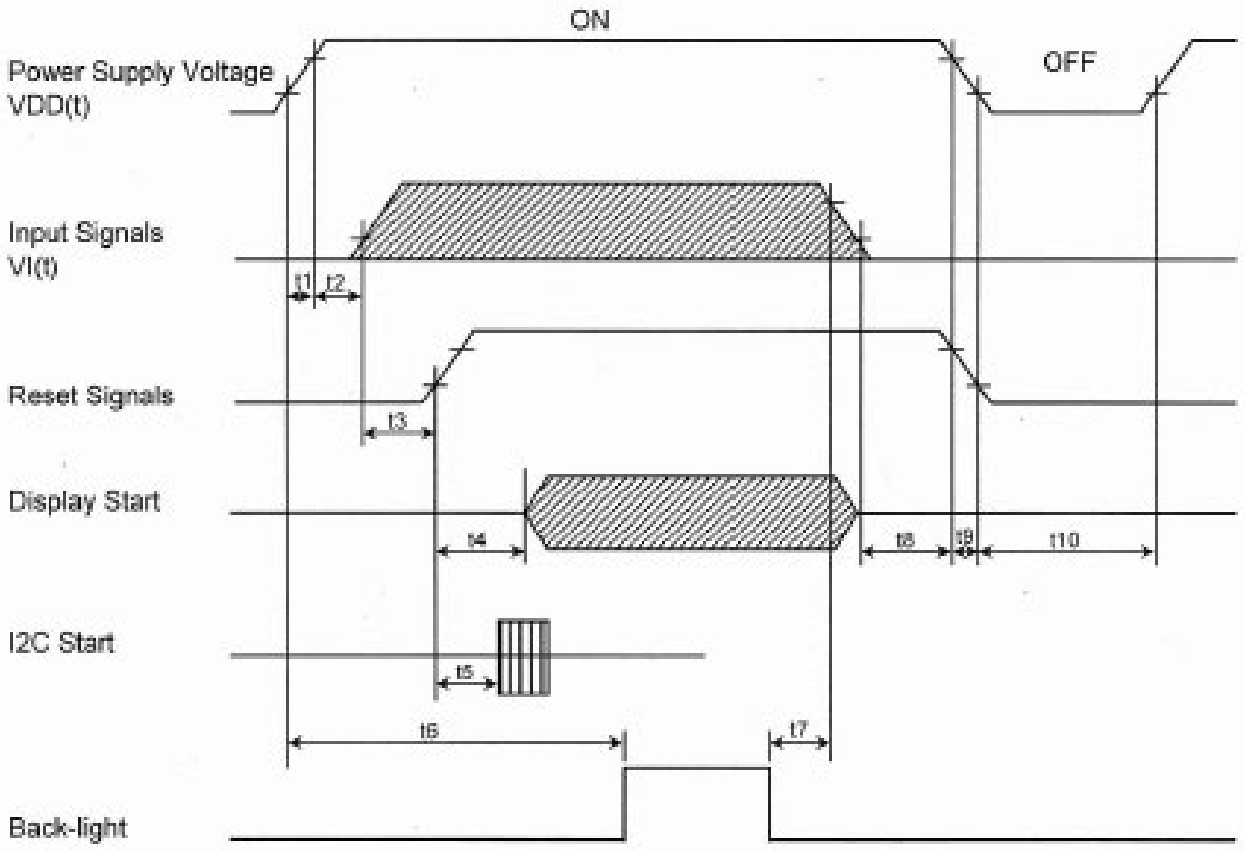
9.4 POWER SEQUENCE



POWER ON

t1 ≤ 15ms
0ms < t2 ≤ 45ms
0ms < t3 ≤ 45ms
t4 (max) = 60ms
t5 (min) = 25ms
t6 (min) = 100ms

POWER OFF

t7 (max) = 5ms
0ms < t8 ≤ 45ms
0ms < t9 ≤ 20ms
t10 (min) = 500ms

Note 1: Set 0V ≤VI (t) ≤VDD (t)

Here, VI(t), VDD(t) indicate the transitional state of VI, VDD when power supply is turned ON or OFF.

Note 2: Do not keep interface signal high-impedance when power on.

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9.5 DATA INPUT for DISPLAY COLOR

	COLOR & Gray Scale	Data Signal																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red (0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green (0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue (0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (62)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (61)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red (1)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (0)	1	1	1	1	1	1	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
	Green (62)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green (61)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green (1)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green (0)	0	0	0	0	0	0	1	1	1	1	1	1	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
	Blue (62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (61)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue (0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

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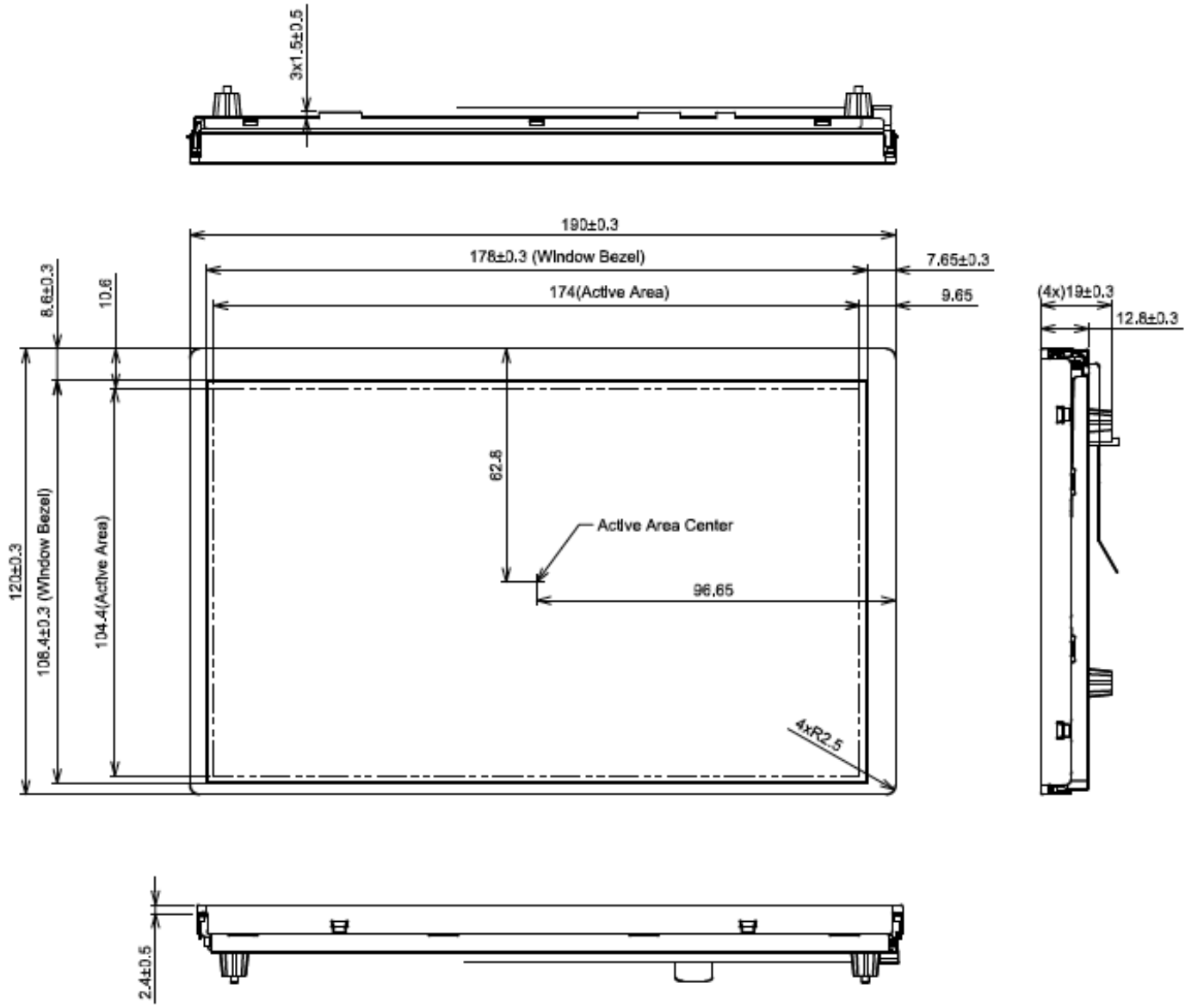
10. OUTLINE DIMENSIONS

10.1 FRONT VIEW



Note : Dimensions without tolerance are reference values.

Scale : NTS
Unit : mm

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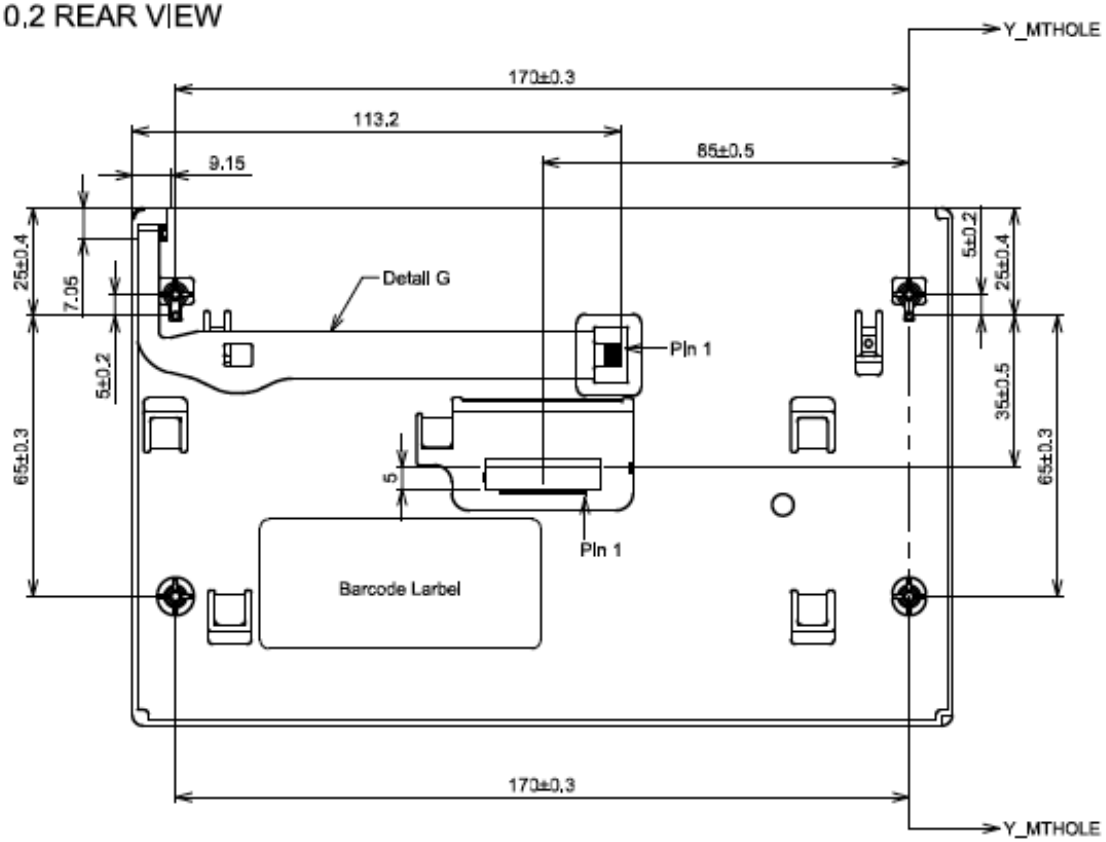
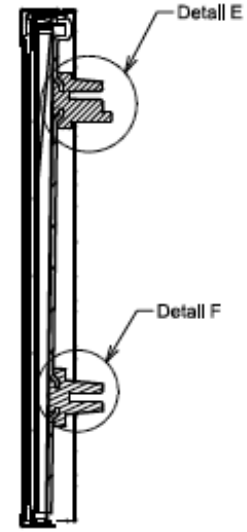
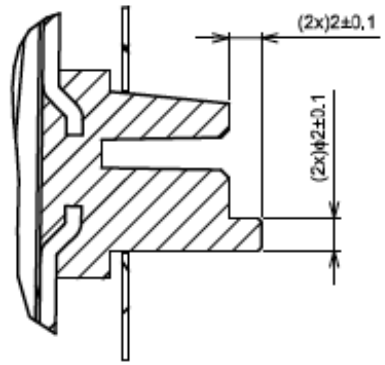
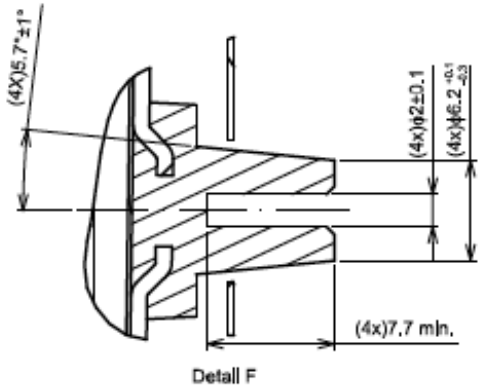
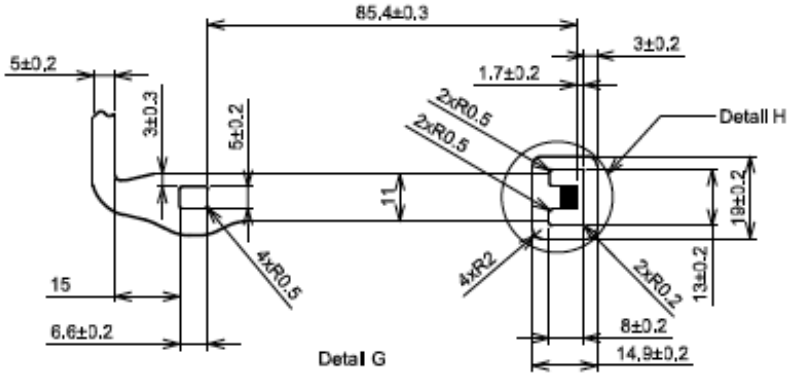
10,2 REAR VIEW

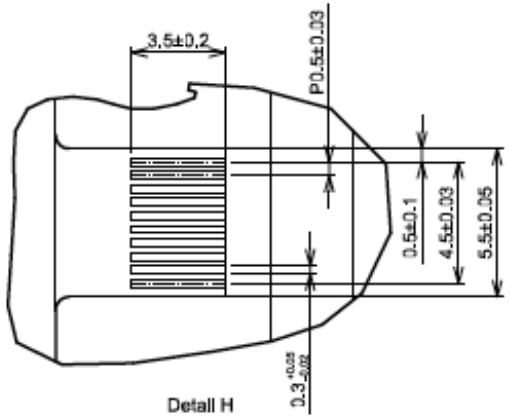












Scale : NTS
Unit : mm

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11. APPEARANCE STANDARD

The appearance inspection is performed in a dark room around 2000 lx based on the conditions as below:

- The distance between inspector's eyes and display is 30 cm.
- The viewing zone is defined with angle θ shown in Fig. 11.1 The inspection should be performed within 45° when display is shut down. The inspection should be performed within 5° when display is power on.

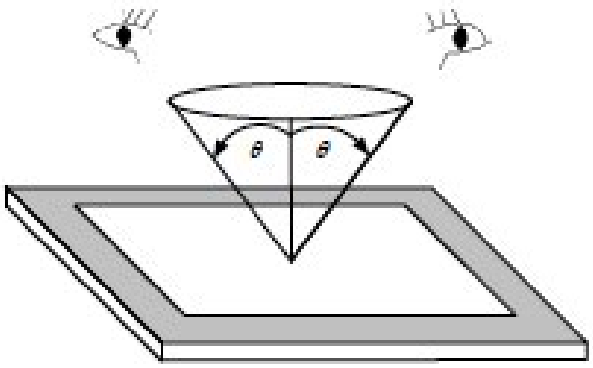

Fig 11.1

11.1 THE DEFINITION OF LCD ZONE

LCD panel is divided into 3 areas as shown in Fig.11.2 for appearance specification in next section. A zone is the LCD active area (dot area); B zone is the area, which extended 1 mm out from LCD active area; C zone is the area between B zone and metal frame.

In terms of housing design, B zone is the recommended window area customers' housing should be located in.

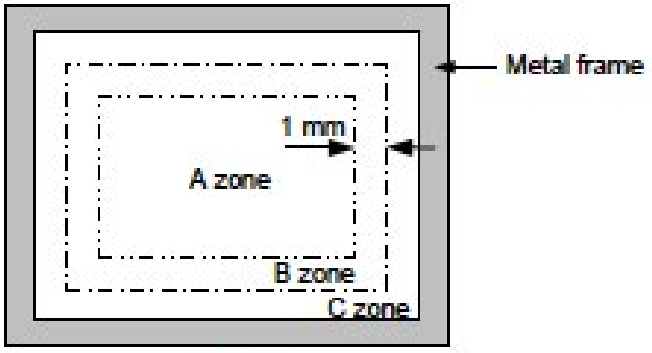

Fig 11.2

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11.2 LCD APPEARANCE SPECIFICATION

The specification as below is defined as the amount of unexpected phenomenon or material in different zones of LCD panel. The definitions of length, width and average diameter using in the table are shown in Fig. 11.3 and Fig. 11.4.

Item	Criteria				Applied zone
Scratches	Length (mm)	Width (mm)	Maximum number	Minimum space	A
	Ignored	W≦0.01	Ignored	-	
	L≦40	W≦0.02	10	-	
	L≦20	W≦0.04	10	-	
	Round (Dot Shape)				
	Average diameter (mm)	Maximum number	Minimum space		
	D≦0.2	Ignore	-		
	D≦0.4	10	-		
Dent	Serious one is not allowed				A
Wrinkles in polarizer	Serious one is not allowed				A
Bubbles on polarizer	Average diameter (mm)	Maximum number			A
	D≦0.3	Ignored			
	D≦0.5	10			
	D≦1.0	5			
1) Stains 2) Foreign Materials 3) Dark Spot	Filamentous (Line shape)				A
	Length (mm)	Width (mm)	Maximum number		
	Ignored	W≦0.02	Ignored		
	L≦2.0	W≦0.03	10		
	L≦1.0	W≦0.06	10		
	Round (Dot shape)				A
	Average diameter (mm)	Maximum number	Minimum Space		
	D≦0.22	Ignored	-		
	D≦0.33	5	-		
	D>0.33	0	-		
	In total	Filamentous + Round=10			
	Those wiped out easily are acceptable				
Dot-Defect (Note 1)		Type	Maximum number		A
	Bright dot-defect	1 dot	4		
		2 adjacent dot	1		
		3 adjacent dot or above	Not allowed		
		Density	2(ϕ 20mm)		
		In total	5		
	Dark dot-defect	1 dot	5		
		2 adjacent dot	2		
		3 adjacent dot or above	Not allowed		
		Density	3(ϕ 20mm)		
		In total	5		
	In total		10		

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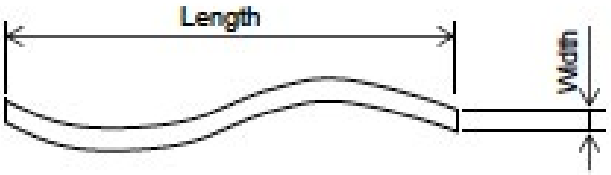

Fig 11.3

Fig 11.4

Note 1: The definitions of dot defect are as below:

- The defect area of the dot must be bigger than half of a dot.
- For bright dot-defect, showing black pattern, the dot's brightness must be over 30% brighter than others.
- For dark dot-defect, showing white pattern, the dot's brightness must be under 70% darker than others.
- The definition of 1-dot-defect is the defect-dot, which is isolated and no adjacent defect-dot.
- The definition of adjacent dot is shown as Fig. 11.5.
- The Density of dot defect is defined in the area within diameter ϕ =20mm.

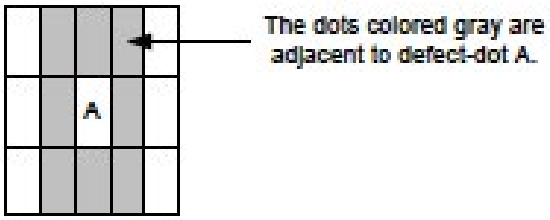

Fig 11.5

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12. PRECAUTIONS

12.1 PRECAUTIONS of ESD

1) Before handling the display, please ensure your body has been connected to ground to avoid any damages by ESD. Also, do not touch display's interface directly when assembling.

2) Please remove the protection film very slowly before turning on the display to avoid generating ESD.

12.2 PRECAUTIONS of HANDLING

1) In order to keep the appearance of display in good condition, please do not rub any surfaces of the displays by sharp tools harder than 3H, especially touch panel, metal frame and polarizer.

2) Please do not pile the displays in order to avoid any scars leaving on the display. In order to avoid any injuries, please pay more attention for the edges of glasses and metal frame, and wear finger cots to protect yourself and the display before working on it.

3) Touching the display area or the terminal pins with bare hand is prohibited. This is because it will stain the display area and cause poor insulation between terminal pins, and might affect display's electrical characteristics furthermore.

4) Do not use any harmful chemicals such as acetone, toluene, and isopropyl alcohol to clean display's surfaces.

5) Please use soft cloth or absorbent cotton with ethanol to clean the display by gently wiping. Moreover, when wiping the display, please wipe it by horizontal or vertical direction instead of circling to prevent leaving scars on the display's surface, especially polarizer.

6) Please wipe any unknown liquids immediately such as saliva, water or dew on the display to avoid color fading or any permanently damages.

7) Maximum pressure to the surface of the display must be less than $1{,}96 \times 10^4$ Pa. If the area of adding pressure is less than 1 cm^2, the maximum pressure must be less than 1.96N.

12.3 PRECAUTIONS OF OPERATING

1) Please input signals and voltages to the displays according to the values defined in the section of electrical characteristics to obtain the best performance. Any voltages over than absolute maximum rating will cause permanent damages to this display. Also, any timing of the signals out of this specification would cause unexpected performance.

2) When the display is operating at significant low temperature, the response time will be slower than it at 25 C°. In high temperature, the color will be slightly dark and blue compared to original pattern. However, these are temperature-related phenomenon of LCD and it will not cause permanent damages to the display when used within the operating temperature.

3) The use of screen saver or sleep mode is recommended when static images are likely for long periods of time. This is to avoid the possibility of image sticking.

4) Spike noise can cause malfunction of the circuit. The recommended limitation of spike noise is no bigger than ± 100 mV.

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12.4 PRECAUTIONS of STORAGE

If the displays are going to be stored for years, please be aware the following notices.

1) Please store the displays in a dark room to avoid any damages from sunlight and other sources of UV light.

2) The recommended long term storage temperature is between 10℃~35℃ and 55%~75% humidity to avoid causing bubbles between polarizer and LCD glasses, and polarizer peeling from LCD glasses.

3) It would be better to keep the displays in the container, which is shipped from KOE, and do not unpack it.

4) Please do not stick any labels on the display surface for a long time, especially on the polarizer.

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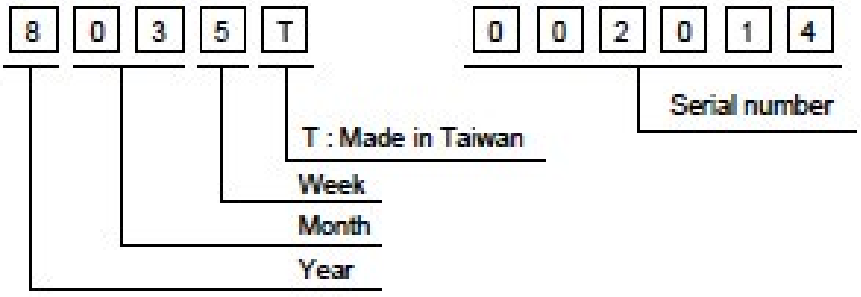
13. DESIGNATION of LOT MARK

1) The lot mark is showing in Fig.13.3. First 4 digits are used to represent production lot, T represented made in Taiwan, and the last 5 digits are the serial number.



2) The tables as below are showing what the first 4 digits of lot mark are shorted for.

Year	Mark
2012	2
2013	3
2014	4
2015	5
2016	6

Month	Mark	Month	Mark
1	01	7	07
2	02	8	08
3	03	9	09
4	04	10	10
5	05	11	11
6	06	12	12

Week (Days)	Mark
1~7	1
8~14	2
15~21	3
22~28	4
29~31	5

3) Except letters I and O, revision number will be showen on lot mark and following letters A to Z.

4) The location of the lot mark is on the back of the display shown in Fig. 13.3.

Fig 13.3

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