

TENTATIVE

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9.0" WVGA

TECHNICAL SPECIFICATION

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AA090ME01

mitsubishi MITSUBISHI ELECTRIC Corp.

Date: Nov.6,'09

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1. APPLICATION

This specification applies to color TFT-LCD module, AA090ME01.

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(1) Standard Usage

Computers, office equipment, factory automation equipment, test and measurement equipment, communications, transportation equipment(automobiles, ships, trains, etc.), provided, however, that operation is not influenced by TFT-LCD directly.

(2) Special Usage

Medical equipment, safety equipment, transportation equipment, provided, however, that TFT-LCD is necessary to its operation.

(3) Specific Usage

Cockpit Equipment, military systems, aerospace equipment, nuclear reactor control systems, life support systems and any other equipment. MITSUBISHI should make a contract that stipulate apportionment of responsibilities between MITSUBISHI and our customer.

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2. OVERVIEW

AA090ME01 is 9.0" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit, and backlight unit.

By applying 6 bit or 8 bit digital data, 800×480 , 262k-color or 16.7M-color images are displayed on the 9.0" diagonal screen. Input power voltage is 3.3V for LCD driving.

The type of data and control signals are digital and transmitted via LVDS interface per Typ. 30.4 MHz clock cycle.

Driver circuit for LED backlight is not included in this module. General specifications are summarized in the following table:

ITEM	SPECIFICATION
Display Area (mm)	196.8 (H) $\times$ 118.08 (V) (9.0-inch diagonal)
Number of Dots	800×3 (H) $\times$ 480 (V)
Pixel Pitch (mm)	0.246 (H) $\times$ 0.246 (V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally black IPS
Number of Color	262k(6 bit/color), 16.7M(8 bit/color)
Luminance (cd/m ²)	400
Wide Viewing Angle Technology	IPS
Viewing Angle (CR $\geq$ 10)	-85~85°(H), -85~85°(V)
Surface Treatment	Anti-glare and hard-coating 3H
Electrical Interface	LVDS (6 bit/8 bit)
Module Size (mm)	219.0 (W) $\times$ 136.2 (H) $\times$ 9.5 (D)
Module Mass (g)	320
Backlight Unit	LED, edge-light, replaceable

Characteristic value without any note is typical value.

3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX	UNIT
Power Supply Voltage for LCD	VCC	0	4.0	V
Logic Input Voltage	VI	-0.3	VCC+0.3	V
Backlight (LED) Current	IF	0	180	mA
Operation Temperature (Panel) Note 1,2)	T _{op} (Panel)	-30	80	°C
Operation Temperature (Ambient) Note 2)	T _{op} (Ambient)	-30	80	°C
Storage Temperature Note 2)	T _{stg}	-30	80	°C

[Note]

1) Measured at the center of active area and at the center of panel back surface

2) Top, Tstg ≤ 40°C : 90%RH max. without condensation

Top, Tstg > 40°C : Absolute humidity shall be less than the value of 90%RH at 40°C without condensation.

4. ELECTRICAL CHARACTERISTICS

(1) TFT-LCD

Ambient temperature: Ta = 25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	Remarks
Power Supply Voltages for LCD	VCC	3.0	3.3	3.6	V	*1)
Power Supply Currents for LCD	ICC	--	250	410	mA	*2)
Permissive Input Ripple Voltage	VRP	--	--	100	mVp-p	VCC = +3.3V
Logic Input Voltage	High	VIH	0.8×VCC	--	V	MODE, SC
	Low	VIL	0	--	V	MODE, SC

*1) Power and signals sequence:

$$t1 \leq 10 \text{ ms}$$

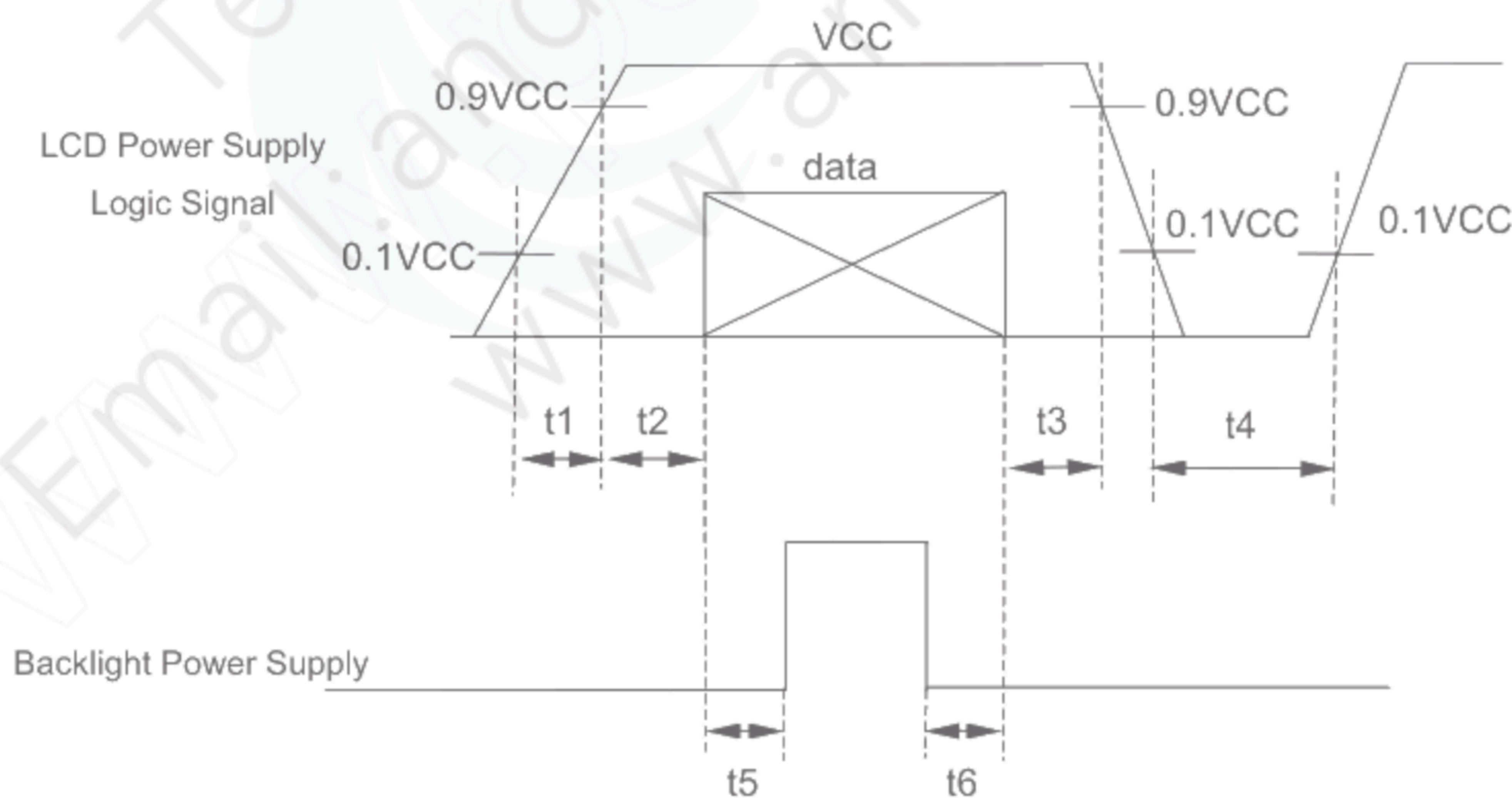
$$0 < t2 \leq 50 \text{ ms}$$

$$0 < t3 \leq 50 \text{ ms}$$

$$200 \text{ ms} \leq t4$$

$$200 \text{ ms} \leq t5$$

$$0 \leq t6$$



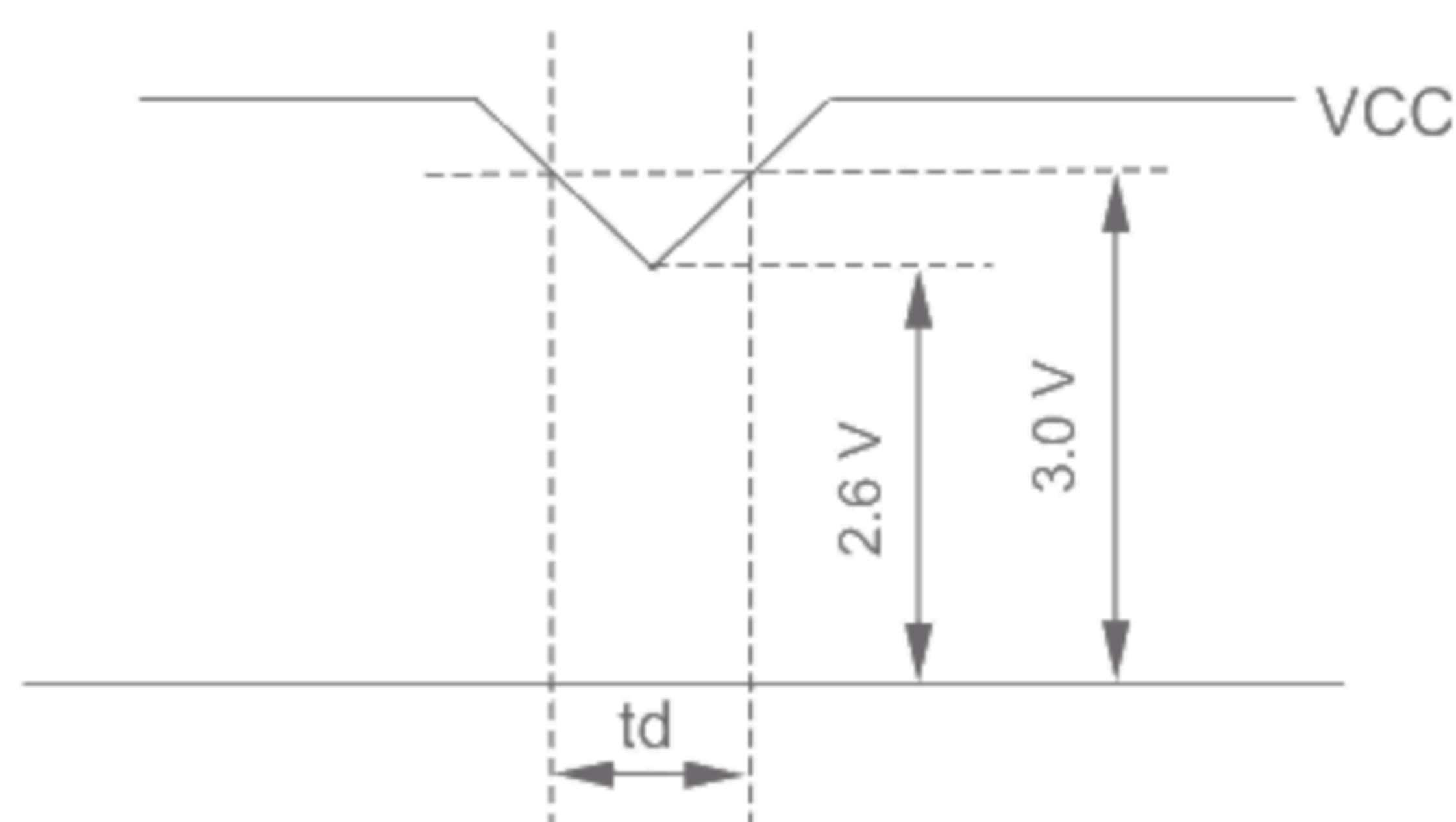
data: RGB DATA, DCLK, DENA, MODE, SC

VCC-dip conditions:

1) When $2.6 \text{ V} \leq \text{VCC} < 3.0 \text{ V}$, $t_d \leq 10 \text{ ms}$

2) When $\text{VCC} < 2.6 \text{ V}$

VCC-dip conditions should also follow the power and signals sequence.



*2) $\text{VCC} = +3.3 \text{ V}$, $f_H = 31.7 \text{ kHz}$, $f_V = 60 \text{ Hz}$, $f_{CLK} = 30.4 \text{ MHz}$

Display image at typical power supply current value is 256-gray-bar pattern (8 bit), 480 line mode.

*3) Fuse

Parameter	Fuse Type Name	Supplier	Remark
VCC	FCC16162AB	Kamaya Electric Co., Ltd.	*)

*) The power supply capacity should be designed to be more than the fusing current.

(2) Backlight

$T_a = 25^\circ\text{C}$

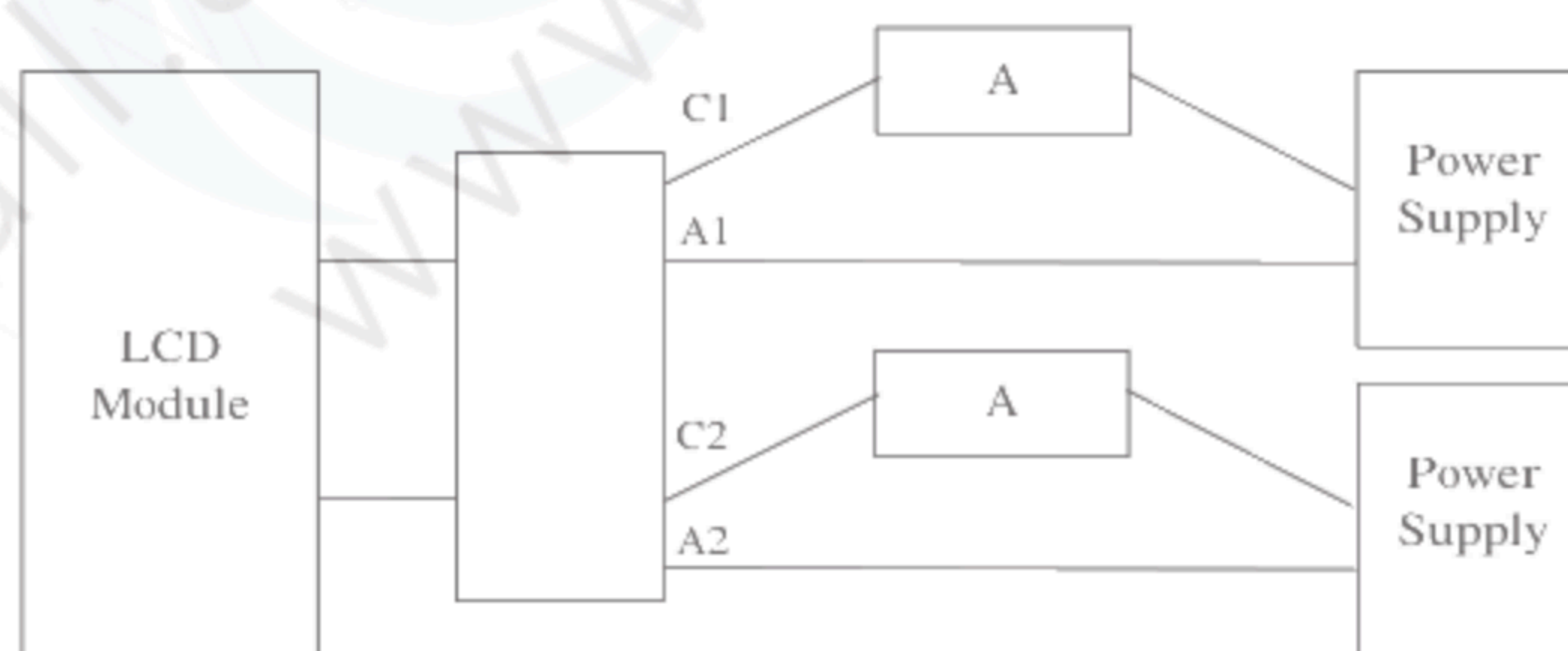
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	Remarks
LED Voltage	VF	--	(24)	30.2	V	$I_F = 90 \text{ mA}$, $T_a = 25^\circ\text{C}$
		--	--	31.3	V	$I_F = 90 \text{ mA}$, $T_a = 0^\circ\text{C}$
		--	--	32.6	V	$I_F = 90 \text{ mA}$, $T_a = -30^\circ\text{C}$
LED Current	IF	--	90	100	mA	*1), *3)
LED Life Time	LT	60000	--	--	h	$I_F = 90 \text{ mA}$, $T_a = 25^\circ\text{C}$ *4), *5), Continuous operation

[Note]

*1) Constant Current Drive

*2) The Voltage deviation between strings: $|V_{f1} - V_{f2}| \leq 2\text{V}$

*3) LED Current measurement method



*4) LED life time is defined as the time when the brightness becomes 50% of the initial value.

*5) The life time of the backlight depends on the ambient temperature. The life time will decrease under low/high temperature.

5. INTERFACE PIN CONNECTION

(1) CN 1(Interface Signal)

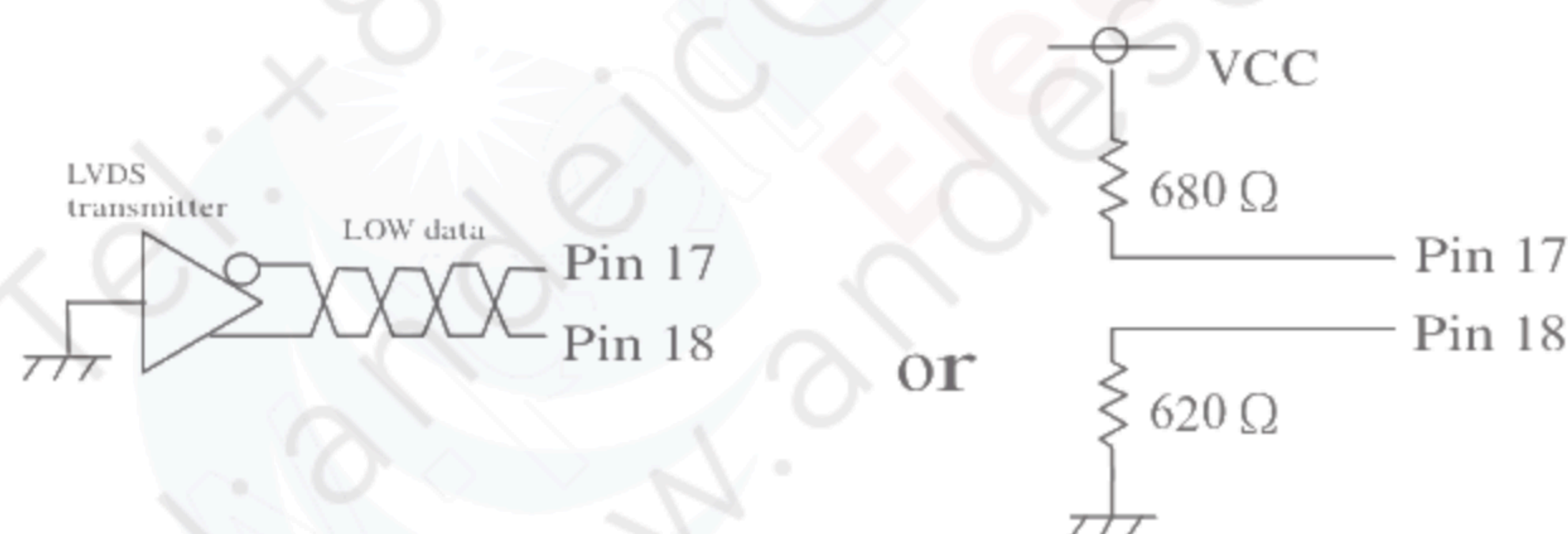
Used connector: FI-SE20P-HFE (JAE)

Corresponding connector: FI-S20S[for discrete Wire], FI-SE20ME[for FPC] (JAE)

Pin No.	Symbol	Function (ISP 6 bit compatibility mode)		Function (ISP 8 bit compatibility mode)
		6 bit input	8 bit input	
1	VCC	+3.3 V Power supply		←
2	VCC	+3.3 V Power supply		←
3	GND	GND		←
4	GND	GND		←
5	Link 0-	R0, R1, R2, R3, R4, R5, G0	R2, R3, R4, R5, R6, R7, G2	R0, R1, R2, R3, R4, R5, G0
6	Link 0+	R0, R1, R2, R3, R4, R5, G0	R2, R3, R4, R5, R6, R7, G2	R0, R1, R2, R3, R4, R5, G0
7	GND	GND		←
8	Link 1-	G1, G2, G3, G4, G5, B0, B1	G3, G4, G5, G6, G7, B2, B3	G1, G2, G3, G4, G5, B0, B1
9	Link 1+	G1, G2, G3, G4, G5, B0, B1	G3, G4, G5, G6, G7, B2, B3	G1, G2, G3, G4, G5, B0, B1
10	GND	GND		←
11	Link 2-	B2, B3, B4, B5, DENA	B4, B5, B6, B7, DENA	B2, B3, B4, B5, DENA
12	Link 2+	B2, B3, B4, B5, DENA	B4, B5, B6, B7, DENA	B2, B3, B4, B5, DENA
13	GND	GND		←
14	CLKIN-	Clock -		←
15	CLKIN+	Clock +		←
16	GND	GND		←
17	Link3-	See: *2)	R0, R1, G0, G1, B0, B1	R6, R7, G6, G7, B6, B7
18	Link3+	See: *2)	R0, R1, G0, G1, B0, B1	R6, R7, G6, G7, B6, B7
19	MODE	Low=ISP 6 bit compatibility mode		High=ISP 8 bit compatibility mode
20	SC	Scan direction control (Low=Normal, High=Reverse)		←

*1) Metal frame is connected to signal GND.

*2) Recommended wiring of Pin 17,18 (6 bit input)



(2) CN 2(Backlight)

Backlight-side connector: SM06B-SHLS-TF(LF)(SN) (JST)

Corresponding connector: SHLP-06V-S-B (JST)

Pin No.	Symbol	Function
1	NC	This pin should be open.
2	NC	This pin should be open.
3	LED C 1	LED cathode 1
4	LED A 1	LED anode 1
5	LED A 2	LED anode 2
6	LED C 2	LED cathode 2

(3) ISP data mapping

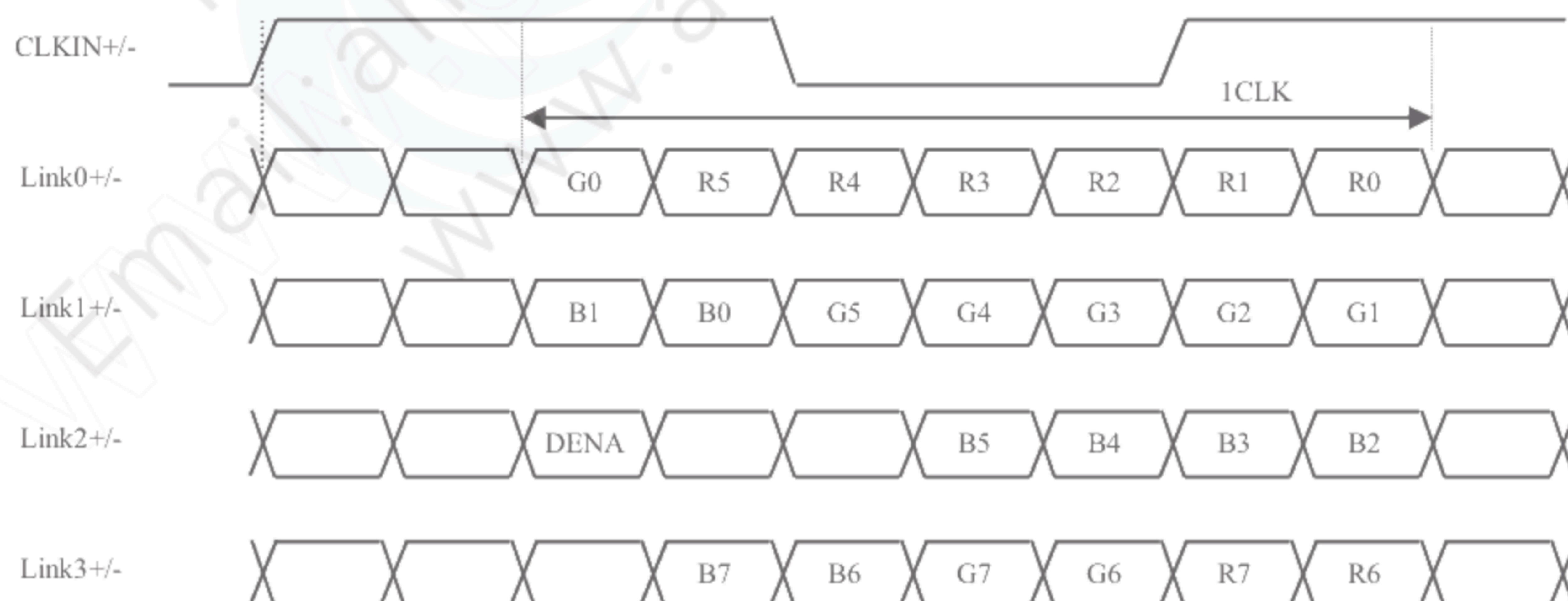
a. ISP 6 bit compatibility mode(6 bit input)



b. ISP 6 bit compatibility mode(8 bit input)



c. ISP 8 bit compatibility mode



6. INTERFACE TIMING

LVDS transmitter input signal

(1) Timing Specifications

ITEM			SYMBOL	MIN	TYP	MAX	UNIT
DCLK	Frequency		f _{CLK}	25	30.4	45	MHz
	Period		t _{CLK}	22.2	32.9	40	ns
DENA	Horizontal	Active Time	t _{HA}	800	800	800	t _{CLK}
		Blanking Time	t _{HB}	20	160	--	t _{CLK}
		Frequency	f _H	26.4	31.7	45	kHz
		Period	t _H	22.2	31.6	37.9	μs
	Vertical	Active Time	t _{VA}	480	480	480	t _H
		Blanking Time	t _{VB}	3	48	--	t _H
		Frequency	f _V	55	60	75	Hz
		Period	t _V	13.3	16.7	18.2	ms

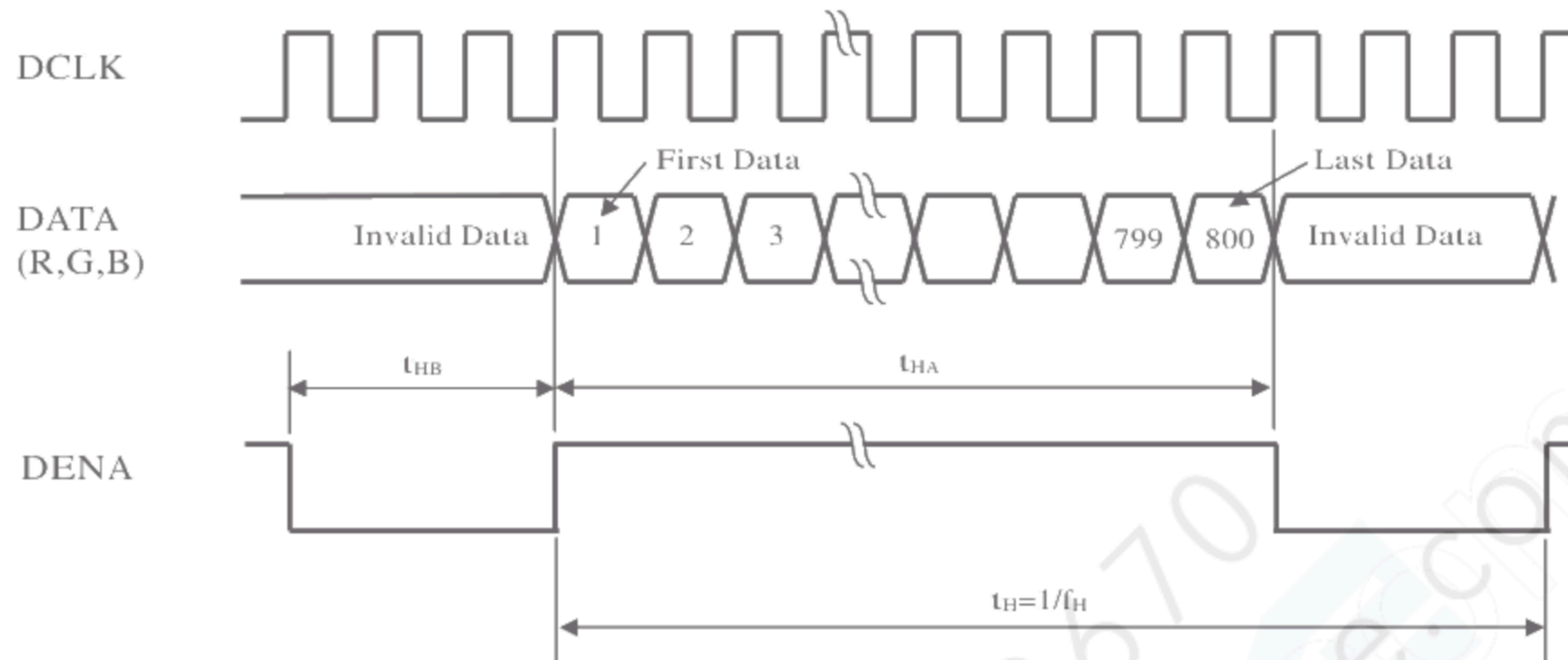
[Note]

- 1) DENA (Data Enable) should always be positive polarity as shown in the timing specification.
- 2) DCLK should appear during all invalid period.
- 3) LVDS timing follows the timing specifications of LVDS receiver IC: THC63LVDF84B(Thine).
- 4) In case of blanking time fluctuation, please satisfy following condition.

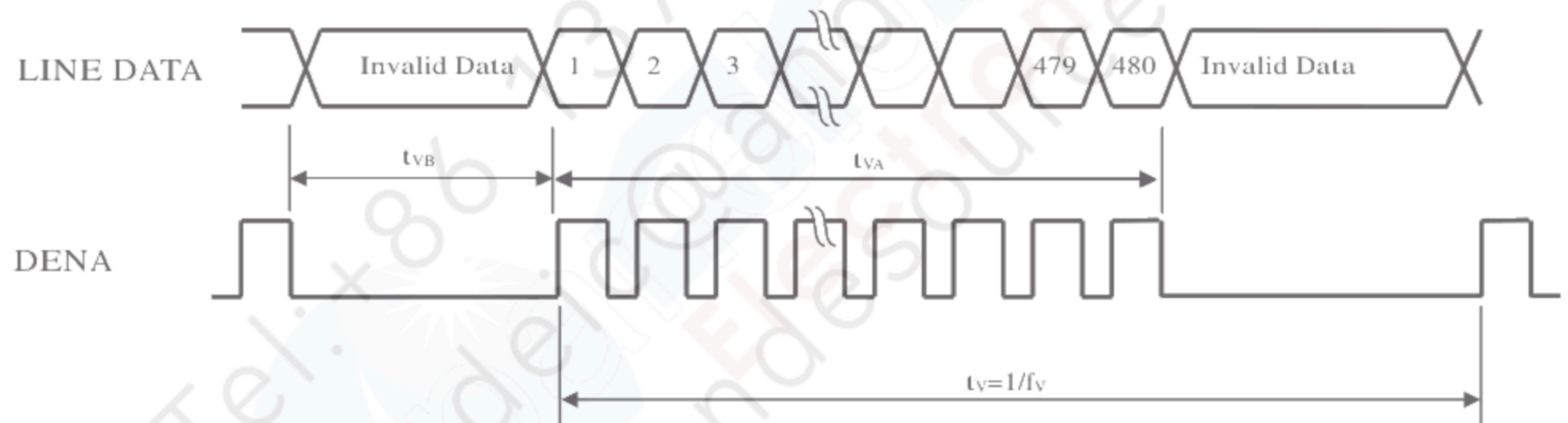
$$t_{VBn} > t_{VBn-1} - 3(t_H)$$

(2) Timing Chart

a. Horizontal Timing Chart



b. Vertical Timing Chart



(3) Color Data Assignment

a. 6 bit input

COLOR		INPUT DATA																	
		R DATA						G DATA						B DATA					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	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	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

[Note]

1) Definition of gray scale

Color (n) --- n indicates gray scale level.

Higher n means brighter level.

2) Data

1:High, 0: Low

b. 8 bit input

COLOR		INPUT DATA																							
		R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							
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(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(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(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
	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	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(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	GREEN(1)	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(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	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	0	0	0	0	0	0	0	0	0
BLUE	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(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1

[Note]

1) Definition of gray scale

Color (n) --- n indicates gray scale level.

Higher n means brighter level.

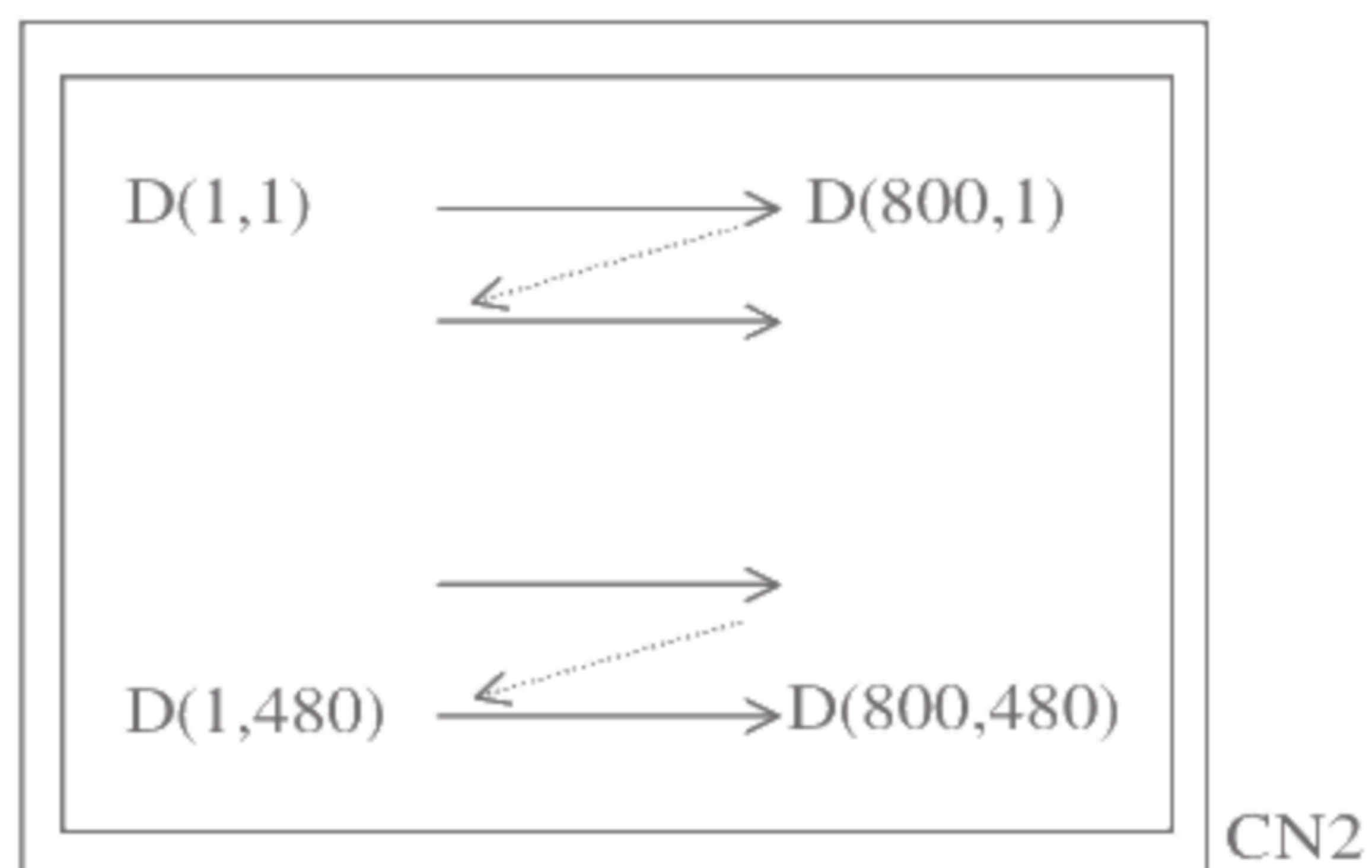
2) Data

1:High, 0: Low

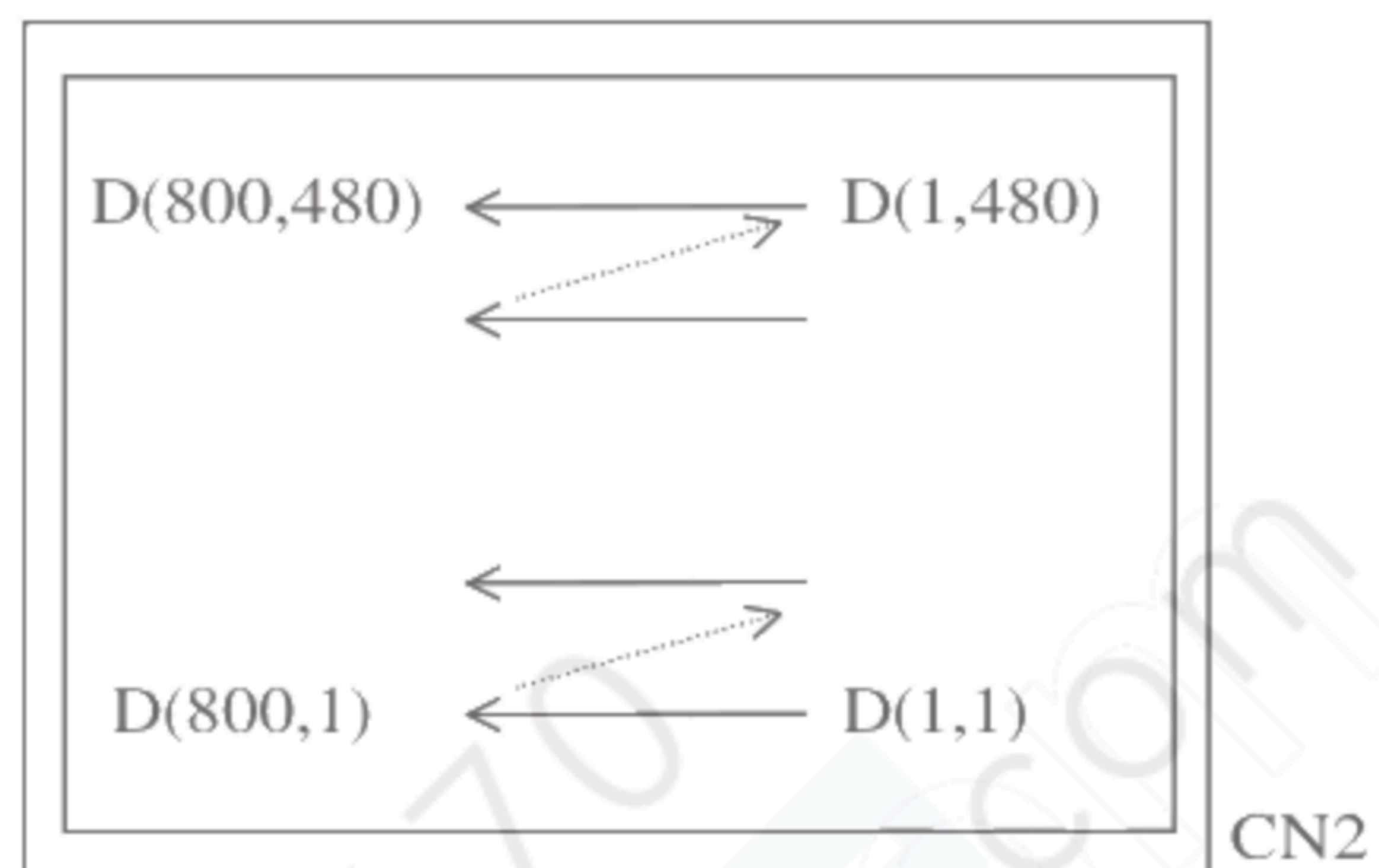
(4) Display Position and Scan Direction

D(X,Y) shows the data number of input signal.

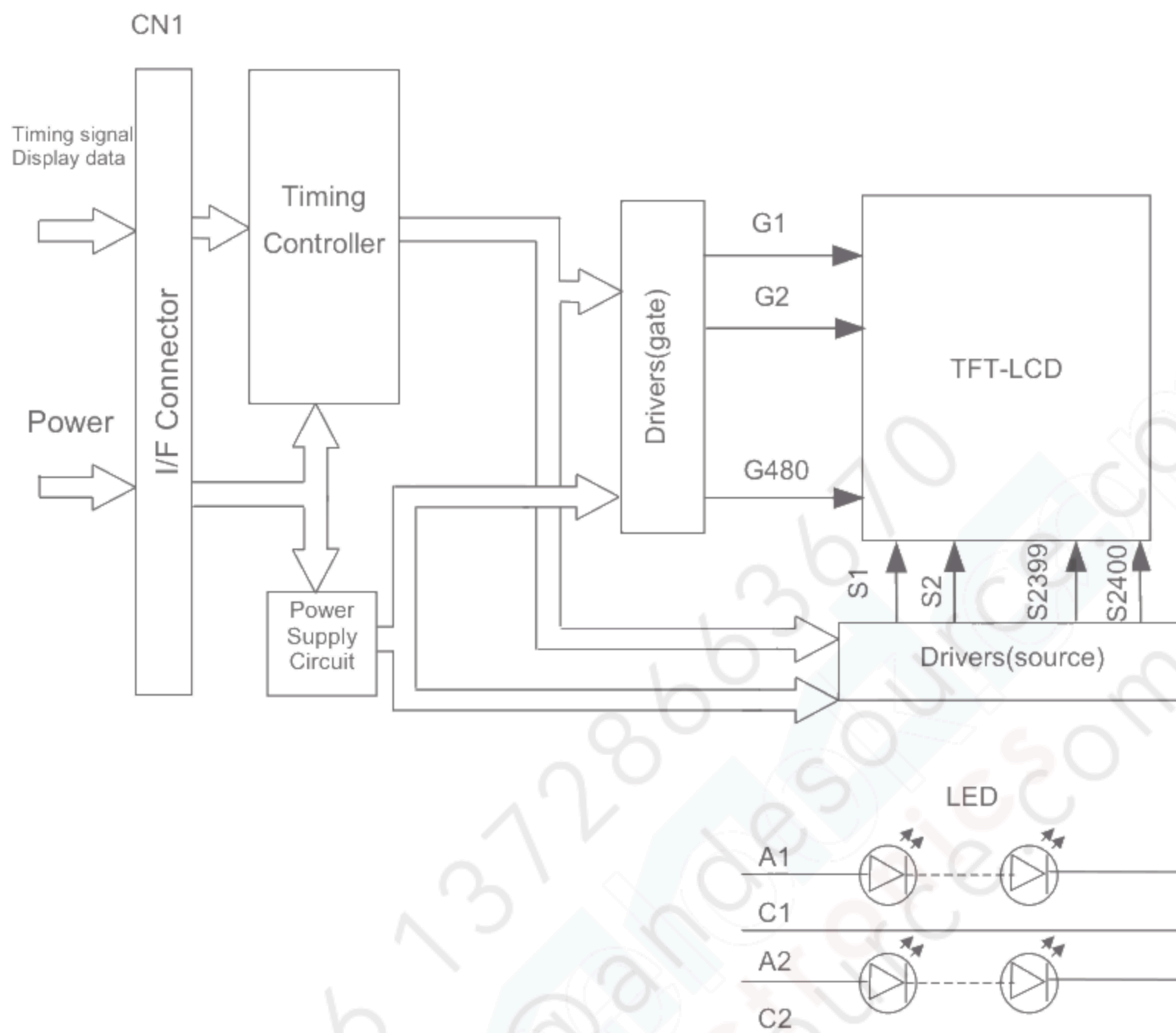
SC: Low



SC: High

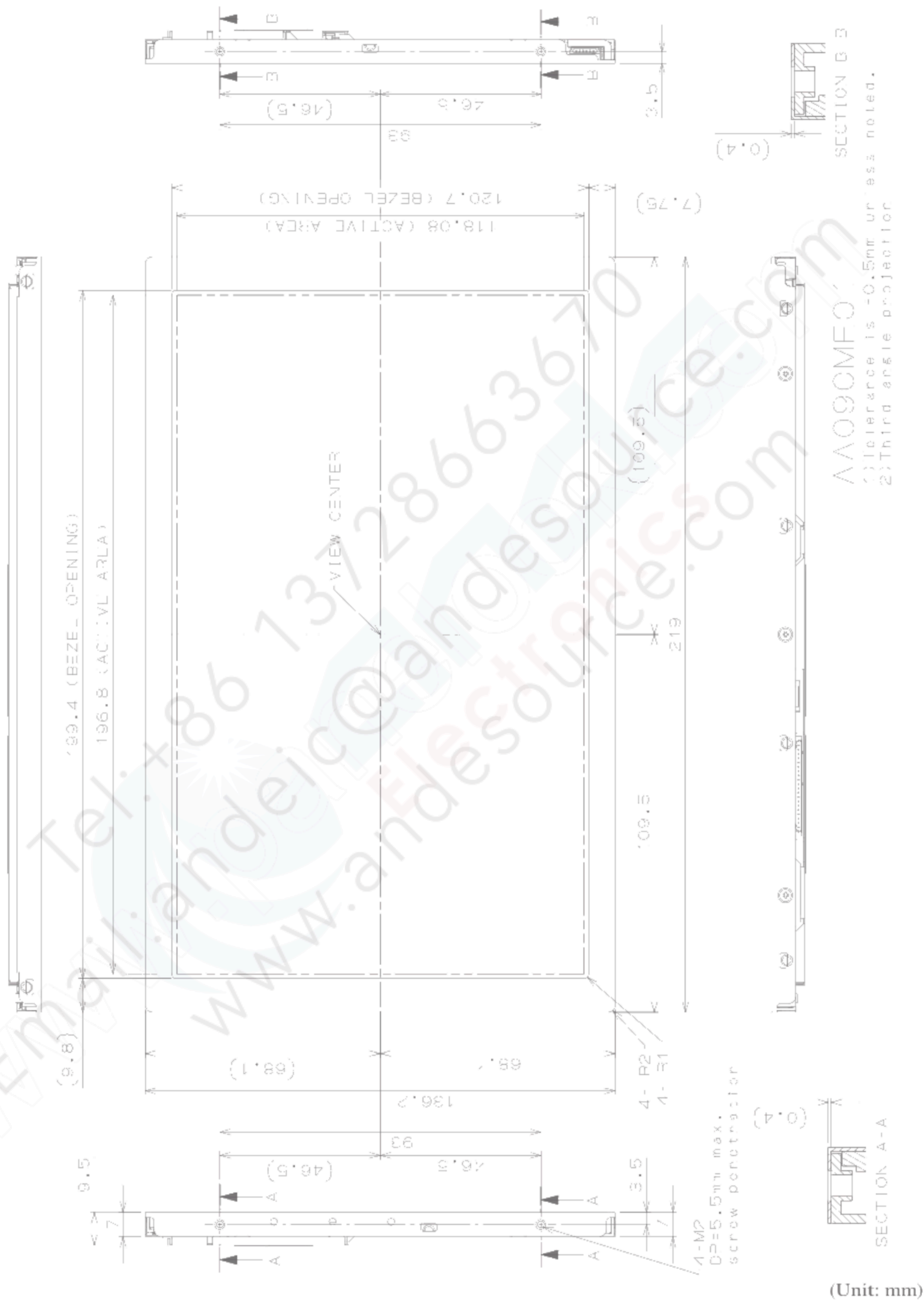


7. BLOCK DIAGRAM



8. MECHANICAL SPECIFICATIONS

(1) Front Side



(2) Rear Side

C\:\FI-SE20P-HFE (JAE)
C\2:SVC6B \$:LS TF(_F) (SN) (JST)

AAC90ME01

- 1) To grade is 10.5mm unless noted.
- 2) In the angle protection

(Unit:mm)

9. OPTICAL CHARACTERISTICS

Ta=25°C, VCC=3.3V, Input Signals: Typ. values shown in Section 6

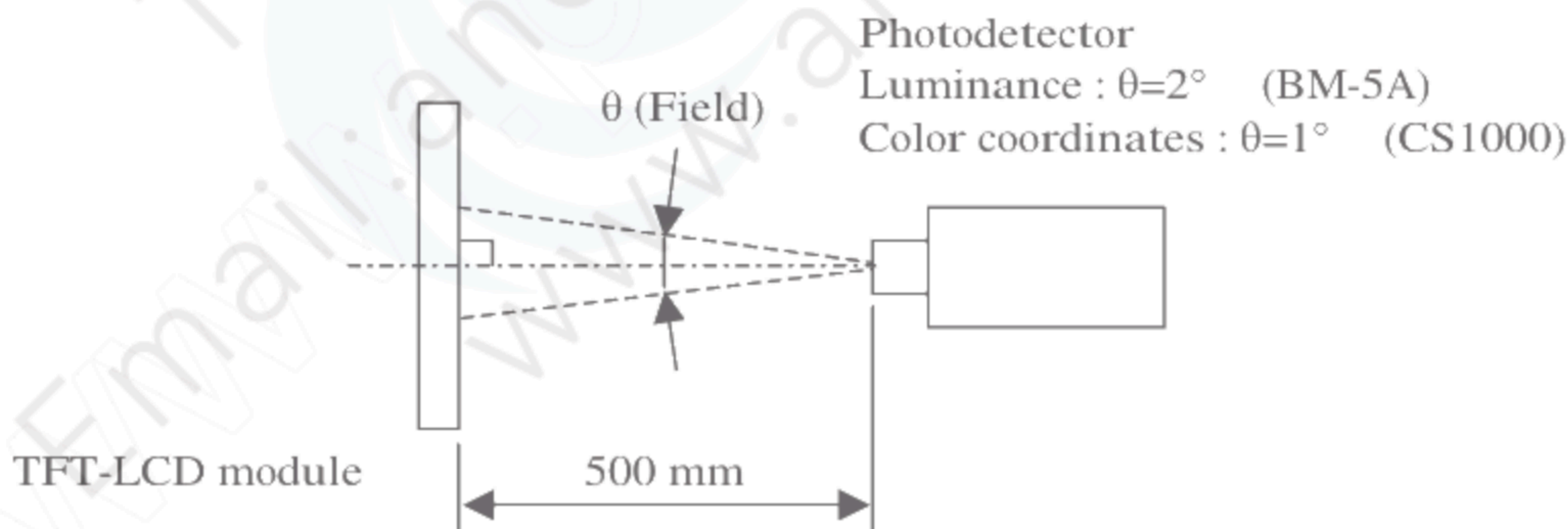
ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	Remarks
Contrast Ratio		CR	$\theta_V=0^\circ, \theta_H=0^\circ$	580	900	--	--	*1)*2)*5)
Luminance		Lw	$\theta_V=0^\circ, \theta_H=0^\circ$	320	400	--	cd/m ²	*1)*5)
Luminance Uniformity		ΔLw	$\theta_V=0^\circ, \theta_H=0^\circ$	--	--	30	%	*1)*3)*5)
Response Time		tr	$\theta_V=0^\circ, \theta_H=0^\circ$	--	12	--	ms	*1)*4)*5)
		tf	$\theta_V=0^\circ, \theta_H=0^\circ$	--	12	--	ms	*1)*4)*5)
Viewing Angle	Horizontal	θ_H	CR ≥ 10	-70~70	-85~85	--	°	*1)*5)
	Vertical	θ_V		-70~70	-85~85	--	°	*1)*5)
Image sticking		tis	2 h	--	--	2	s	*6)
Color Coordinates	Red	Rx	$\theta_V=0^\circ, \theta_H=0^\circ$	0.597	0.637	0.677	--	*1)*5)
		Ry		0.281	0.321	0.361		
	Green	Gx		0.279	0.319	0.359		
		Gy		0.591	0.631	0.671		
	Blue	Bx		0.112	0.152	0.192		
		By		0.028	0.068	0.108		
	White	Wx		0.273	0.313	0.353		
		Wy		0.289	0.329	0.369		

[Note]

These items are measured using CS1000(MINOLTA) for color coordinates, EZContrast(ELDIM) for viewing angle and CS1000 or BM-5A(TOPCON) for others under the dark room condition (no ambient light) after more than 30 minutes from turning on the backlight unless noted.

Condition: IF = 90 mA

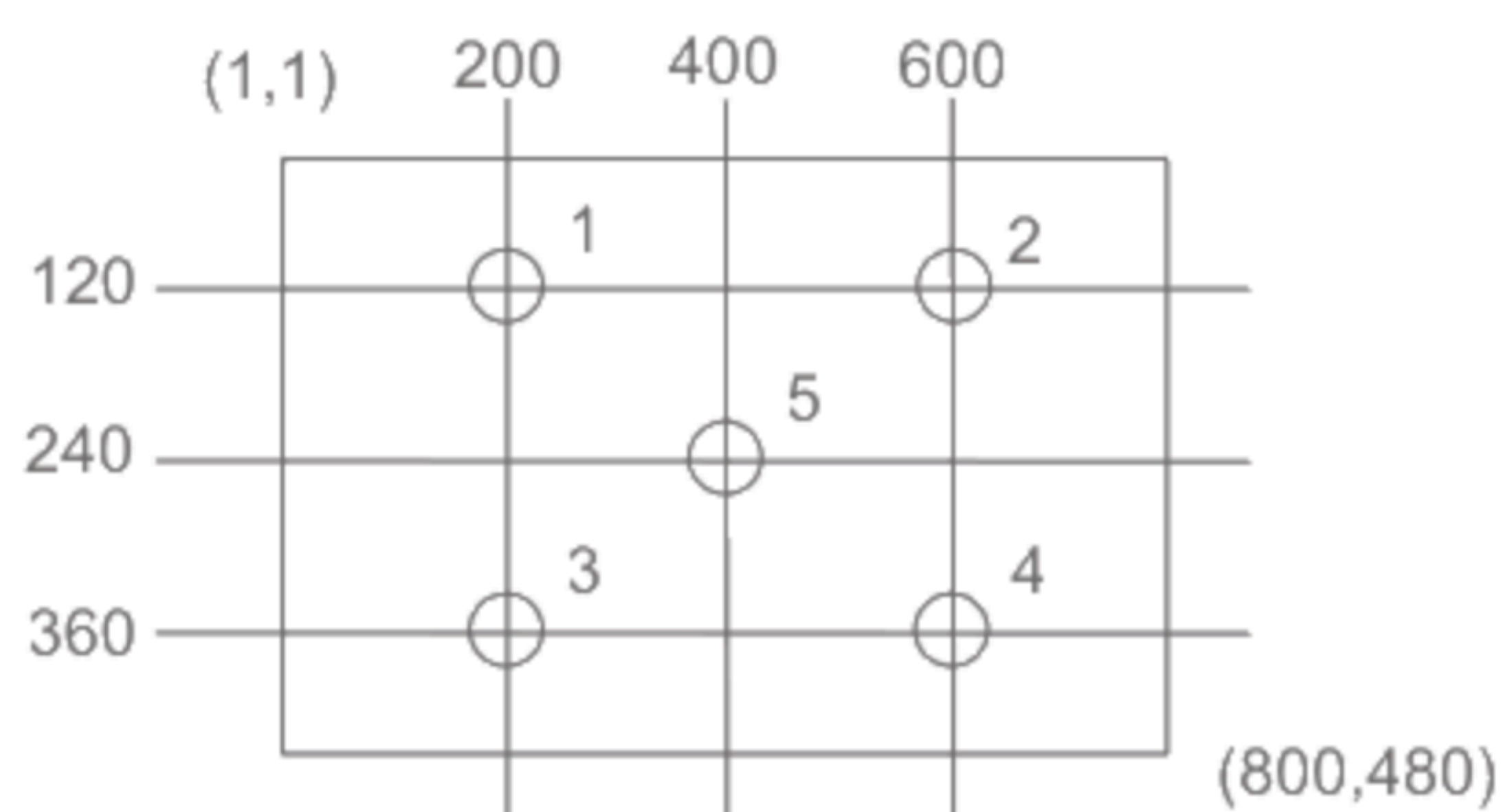
Measurement method for luminance and color coordinates is as follows.



The luminance is measured according to FLAT PANEL DISPLAY MEASUREMENTS STANDARD (VESA Standard).

*1) Measurement Point

Contrast Ratio, Luminance, Response Time, Viewing Angle, Color Coordinates: Display Center
Luminance Uniformity: point 1~5 shown in a figure below



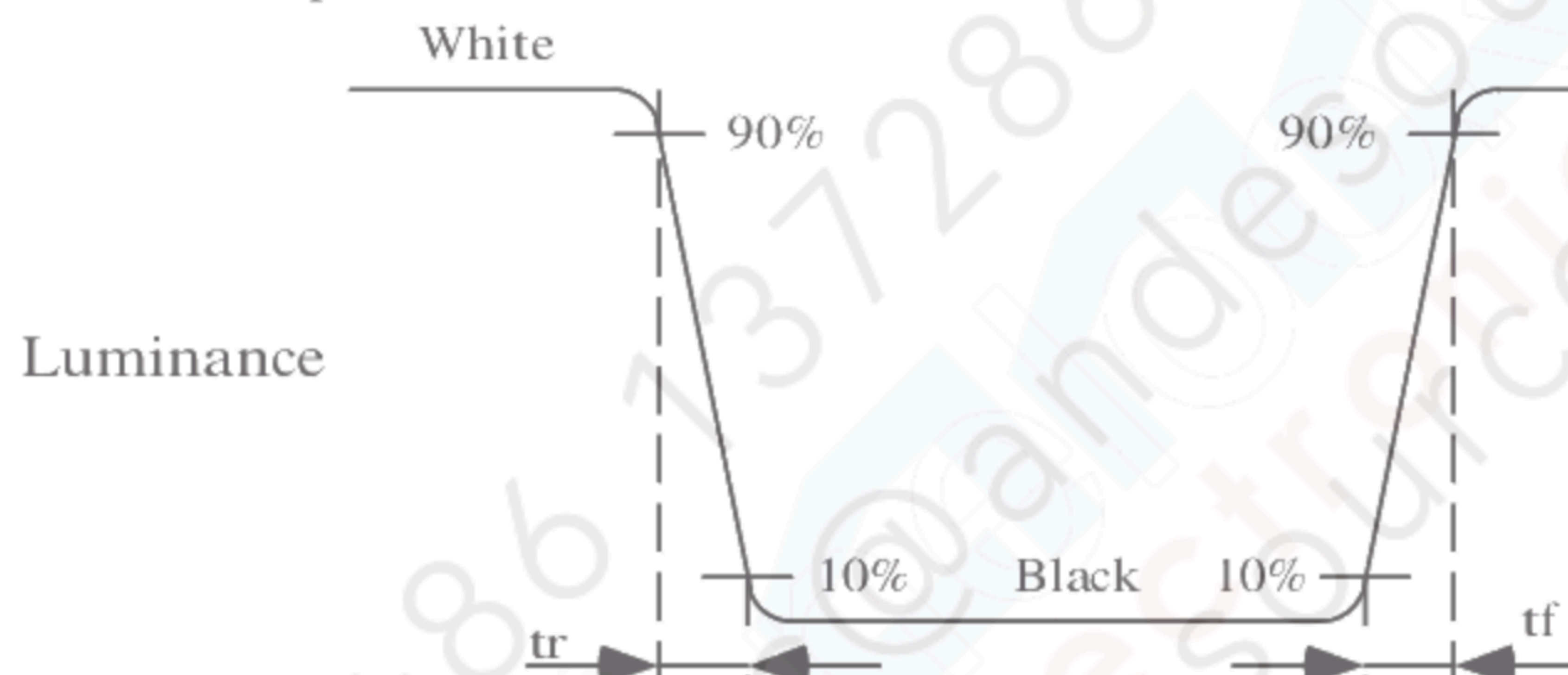
*2) Definition of Contrast Ratio

$CR = \text{Luminance with all white pixels} / \text{Luminance with all black pixels}$

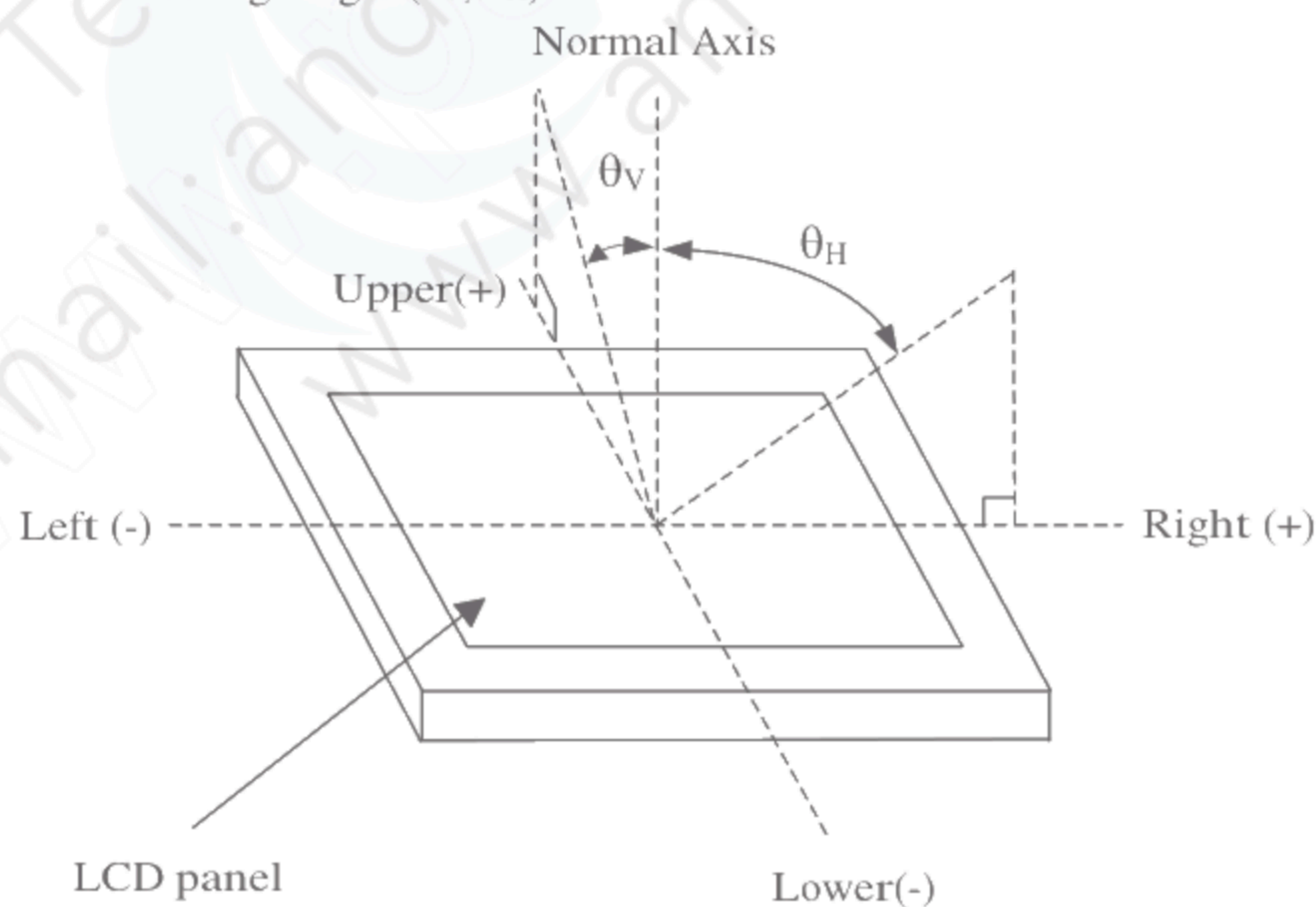
*3) Definition of Luminance Uniformity

$\Delta Lw = [Lw(\text{MAX}) / Lw(\text{MIN}) - 1] \times 100$

*4) Definition of Response Time

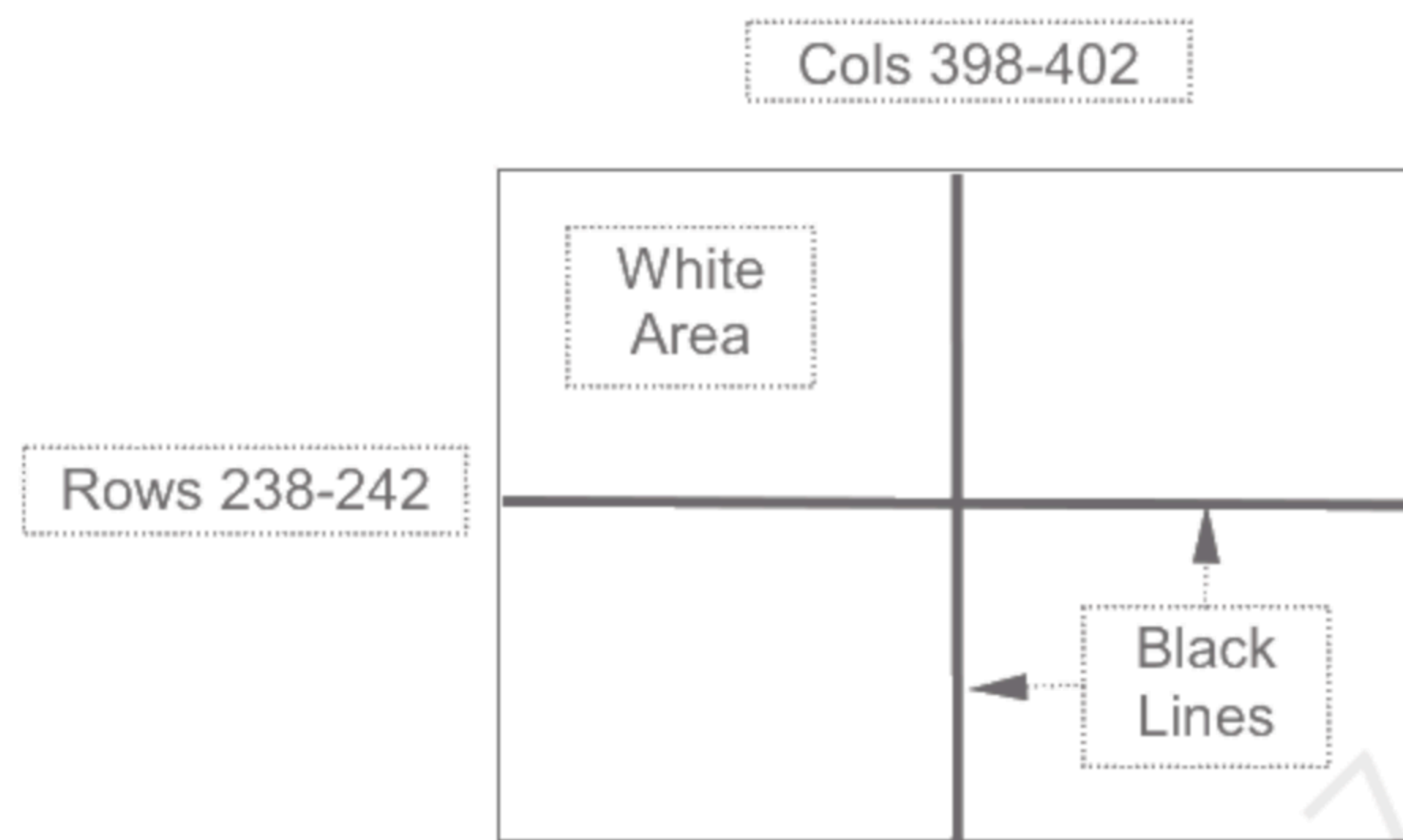


*5) Definition of Viewing Angle (θ_v , θ_H)



*6) Image sticking:

Continuously display the test pattern shown in the figure below for two-hours. Then display a completely white screen. The previous image shall not persist more than two seconds at 25°C.



TEST PATTERN FOR IMAGE STICKING TEST

10. RELIABILITY TEST CONDITION

(1) Temperature and Humidity

ITEM	CONDITIONS
HIGH TEMPERATURE HIGH HUMIDITY OPERATION	40°C, 90%RH, 240 h (No condensation)
HIGH TEMPERATURE OPERATION	80°C, 240 h
LOW TEMPERATURE OPERATION	-30°C, 240 h
HIGH TEMPERATURE STORAGE	80°C, 240 h
LOW TEMPERATURE STORAGE	-30°C, 240 h
THERMAL SHOCK (NON-OPERATION)	-30°C (1h) ~ 80°C(1h), 100 cycles

(2) Shock & Vibration

ITEM	CONDITIONS
SHOCK (NON-OPERATION)	Shock level: 1470 m/s ² (150G) Waveform: half sinusoidal wave, 2 ms Number of shocks: one shock input in each direction of three mutually perpendicular axes for a total of six shock inputs
VIBRATION (NON-OPERATION)	Vibration level: 9.8 m/s ² (1.0G) Waveform: sinusoidal Frequency range: 5 to 500 Hz Frequency sweep rate: 0.5 octave /min Duration: one sweep from 5 to 500 Hz in each of three mutually perpendicular axis(each x,y,z axis: 1 hour, total 3 hours)

(3) Judgment standard

The judgment of the above tests should be made as follow:

Pass: Normal display image, no damage of the display function. (ex. no line defect)

Partial transformation of the module parts should be ignored.

Fail: No display image, damage of the display function. (ex. line defect)

11. OTHER FEATURE

This LCD module complies with RoHS^{*)} directive.

^{*)} RoHS: Restriction of the use of certain hazardous substances in electrical and electronic equipment

12. HANDLING PRECAUTIONS FOR TFT-LCD MODULE

Please pay attention to the followings in handling TFT-LCD products;

(1) ASSEMBLY PRECAUTION

- a. Pea e o t t e LCD o e o t o e t a r e a p t o r e e t a 0.2 N . Pea e o o t e o r r e t e LCD o e a e . Pea e o o t r o p, e o r t t t e LCD o e a .
- . Pea e e p a o a o r a e t t e o o e e .
- (a) Ho a e t e e e a r e o a o t t o p t t r e e o LCD a o t t o r e o e .
- () U e r t e p e r a t r e e v r o e t, p e r o r a e a e t e o LED a e a v o r t e . e o e t o r LCD p r o t, p e a e o e r r a t e a t a v e t a t o o r o o e a t a a e e t .
- () e e p e t e a r a e e t e e LCD o e a r a e a o e t e LCD o e o t e . A p p r o a t e 1.0 o t e e a r a e t e e r e o e e t a t o a o t t e t o e r a e o LCD o e t e a o t t r t r e e t o t e o .
- () e o e p a r t , a , F P C a e a e r r t e p a t e, a r e t a e e r e a t t e LCD o e, t e t e a r a e r e r e , a 0. . T e a r a e , e p e a , t o e r e o e r e e t e a t o a p a r t a r e p e e t e o r E M I o t e r e a r e .
- (e) D e t e LED r v e r o a t o a o e t o r p o t o a r e o a o t t o v e t r e t o LED a t a e .
- () e e p e t e a r a e e t e e LCD o e a t e o t e r p a r t , a v e r t e r a p e a e r o a o t t o t e r e r e t e LCD o e . A p p r o a t e 1.0 o t e e a r a e t e e r e o e e .
- () T o a v o o a e e v a t o / e r e a e o t e p e r a t r e, o e r o a t o o e a t e e e t, e a t r e e a e, t e r a e o e o e .
- . Pea e o o t p o r r a t LCD p a e r a e t a t a r . A o o t o LCD p a e r a e t o t a r e a . (P o a r e r , r a e o LCD p a e e a t o e a e .)
- . Pea e p e o LCD p a e r a e t a o r e t o t t o r o t o t a e o t e o e .
- e. Pea e p e o r o p o a e v e e a v a a a t e r o LCD p a e r a e e a t e . T e t a a e t o a e p a e r a e v a r a t o a o o r a e .
- . Pea e o o t t a e a LCD o e t o p e e a r e o t r t t . R e o v a r e o t r t o e a a e t e o t t o o r e .
- . Pea e o o t t o e t a r a e t a r e a a o e o v e . A o o r a e o t e e t a r a e a a p p e r a o p r e e r v a t o o o e LCD o e .
- . Pea e a e e t a r a e a r e e a e e e o e t a r a e v e r a r p .

- . Please do not let the LCD module be exposed to direct sunlight or other sources of heat for a long time.
- . Be sure to use the correct handling method.

(2) OPERATING PRECAUTIONS

- Please do not touch the power supply or other parts of the LCD module.
- Please do not use a variable resistor to adjust the LCD module. The LCD module is a fixed resistor. If the LCD module is used as a variable resistor, the LCD module will be damaged.
- The LCD module is a passive device. Please do not connect the LCD module to a power source or a load.
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- Please do not connect the LCD module to a power source or a load.

(3) PRECAUTIONS WITH ELECTROSTATICS

- The LCD module is a CMOS IC. It is very sensitive to electrostatic discharge (ESD). Please do not touch the LCD module with your bare hands.
- Please do not touch the LCD module with your bare hands.

(4) STORAGE PRECAUTIONS

The LCD module should be stored in a dry, cool, and dark place. The LCD module should not be exposed to moisture or other environmental factors.

(5) SAFETY PRECAUTIONS

- Please do not use the LCD module in a high-temperature environment.
- Please do not use the LCD module in a high-humidity environment.
- Please do not use the LCD module in a high-voltage environment.

. LED rver o e e e are to t or top t to e over rre t
ete te o t e LED.

(6) OTHERS

- a. A tro e t t to LCD pa e a a e eter orat o to po ar er , o or ter,
a ot er ater a , e ra e t e a t o pa ara ter t . Pea e o ot
e po e LCD o e er tro U trav o et ra ora o t e.
- . Pea e pa atte to to a pa e e o LCD o e ot to o ta t t ot er ater a
pre erv t a o e.
- . For t e pa a o a , pea e ee a o e t t e pa a pe at o
ata eet.
- . Pea e o ot re e t e LED t o e re ove .