ECR #	Rev. Hist.	Description	Approved	Date
	A	First Release	Ion Cenuse	12/12/99

Technical Specification

AA084VC03

8.4-inch TFT-LCD Module

For

Industrial Applications

Approvals		Date
MELA Eng.	Ion Cenuse	Dec. 3RD, '99
MELA Mktg.	Dale Maunu	
Mitsubishi/ADI		

MITSUBISHI ELECTRIC

TFT-LCD Module
8.4-inch VGA Color
AA084VC03

Size	Mitsubishi Electric Specification	Rev.				
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1. OVERVIEW

1.1. Description: AA084VC03 is a 8.4-inch color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit, and backlight. By applying 6 bit digital data 640 x 480, 262K – color images are displayed on the 8.4-inch diagonal screen. Input power voltage is 3.3 V (does not includes power for the backlight). Both 3.3V-CMOS and 5.0V-CMOS voltage levels are acceptable for logic input voltage. Inverter for backlight is not included in this module.

1.2. General specifications summary table:

ITEM	SPECIFICATION
Display Area (mm)	170.9 X 128.2 (8.4-inch diagonal)
Number of Pixels	640(H) X 480(V)
Pixel Pitch (mm)	0.267(H) X 0.267 (V)
Color Pixel Arrangement	RGB Vertical Stripe
Display Mode	Normally White
Number of colors	262K
Wide Viewing Angle Technology	Optical Compensation Film
Optimum Viewing Angle (Contrast Ratio)	12 O'clock
Brightness (cd/m^2)	350
Power Consumption (W)	5.4
Module Size (mm)	199.5(W) X 149.0(H) X 11.5 (D)
Module Weight (g)	420
Backlight Unit	CCFL, Two Lamps, Replaceable

1.3. Product Disclaimer

The LCD products listed in this document are not suitable for safety related applications that do not have redundant back-up system(s). In other words, these LCD products are not designed for use as a single source safety related application, and therefore, are not recommended for applications in which human life and/or environment may be affected in the event of the failure of the LCD product. More specifically, if there is no back-up system or product in place that will continue operating the system, the LCD products should not be used in such things as:

(i) aircraft navigation or aerospace equipment;
(ii) nuclear reactor control systems;
(iii) any application where failure or inaccuracy might cause death or personal injury (e.g., life support systems); or
(iv) military and submarine critical systems.

The LCD products are designed for typical industrial applications such as, but not are limited to the following: computers, office equipment, industrial controllers, audio and visual equipment, test and measurement devices, communication equipment, point of sale, medical imaging and automotive and various other consumer products. If there are any questions regarding the use, ability or application of these LCD products, please contact an authorized sales representative.

2. ABSOLUTE MAXIMUM RATINGS

2.1. Environmental conditions: humidity ≤85% RH, no condensation

2.2. Summary Table:

ITEM	SYMBOL	MIN	MAX	UNIT
Power Supply Voltage for LCD	V_{CC}	–0.3	5.5	V
Logic Input Voltage	VIN	0	7	V
Operating Temperature	T_{op}	0	50	°C
Storage Temperature	T_{stg}	–20	60	°C

3. ELECTRICAL CHARACTERISTICS

3.1. Conditions: TFT-LCD module ambient temperature is 25°C

3.2. Summary table:

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	COMMENTS
Power Supply Voltage for LCD*		V_{CC}	3.0	3.3	3.6	V	(Note)
Power Supply Current for LCD*		I_{CC}		240	400	mA	(Note)
Permissive Input Ripple Voltage		V_{RP}			100	mV_{p-p}	V_{CC}=+3.3V
Logic Input Voltage	High	V_{LH}	2.4		5.5	V	
	Low	V_{LL}	0.0		0.8	V	

Note * : See paragraph 3.4

3.3. Backlight

3.3.1. The table below shows data for one lamp only.

3.3.2. The TFT-LCD module has two identical lamps operated independently.

3.3.3. Operation of both lamps is required in order to meet all the parameters in the AA084VC03 specification.

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Lamp Voltage	V_L		465		V
Lamp Current	I_L		5.0 *		mA
Lamp Starting Voltage	V_S	980			V

Note * : For typical luminance of 350cd/m^2

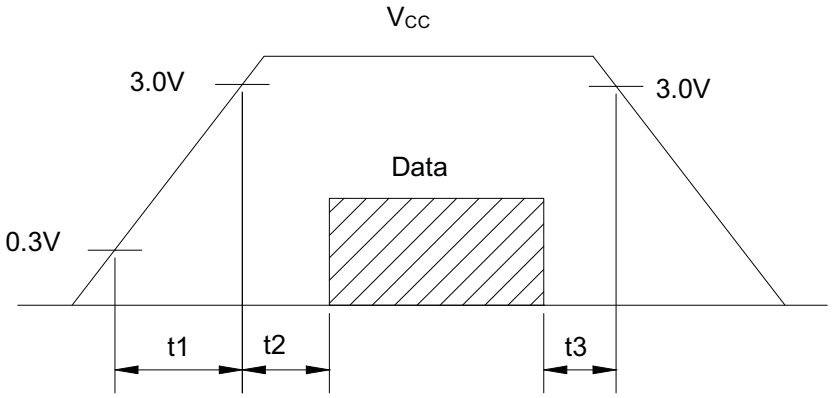
3.4. Notes

3.4.1. V_{CC} turn-on conditions :

t1 ≤ 10ms

0 < t2 ≤ 50ms

0 < t3 ≤ 50ms

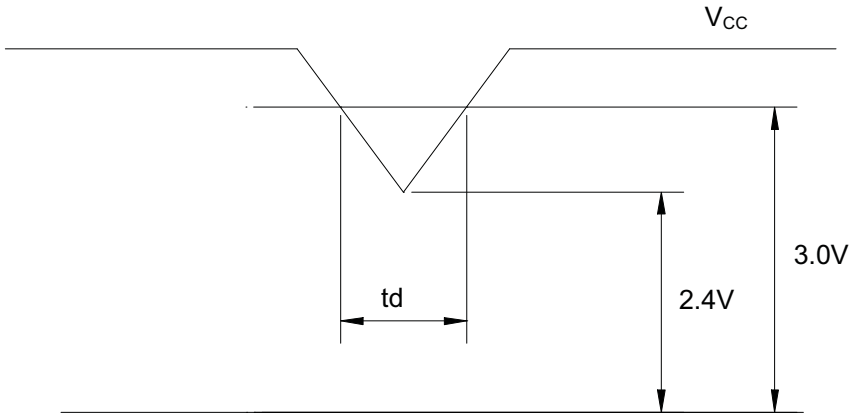


3.4.2. V_{CC}-dip conditions :

2.4V ≤ V_{CC} < 3.0V and td ≤ 10ms

V_{CC} < 2.4V

V_{CC}-dip conditions should also follow the V_{CC} turn-on conditions.



3.4.3. Test condition for I_{CC} Typical:

64 gray-bar pattern

480 line mode

V_{CC} = +3.3V

3.4.4. Test conditions for I_{CC} (MAX) :

1 X 1 checkerboard, black and white pattern

DC input voltage = 3.3V

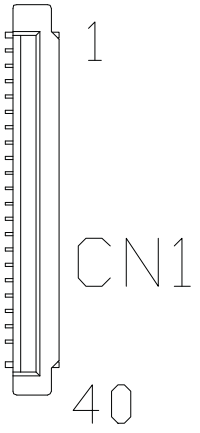
4. INTERFACE CONNECTORS PIN ASSIGNMENT

4.1. Used connector: DF9C-31P-1V

4.2. Input connector pin assignment table:

PIN	SYMBOL	FUNCTION
1	GND	Ground
2	CLK	Dot clock
3	Hsync	Horizontal sync.
4	Vsync	Vertical sync.
5	GND	Ground
6	R0	Red data (LSB)
7	R1	Red data
8	R2	Red data
9	R3	Red data
10	R4	Red data
11	R5	Red data (MSB)
12	GND	Ground
13	G0	Green data (LSB)
14	G1	Green data
15	G2	Green data
16	G3	Green data
17	G4	Green data
18	G5	Green data (MSB)
19	GND	Ground
20	B0	Blue data (LSB)
21	B1	Blue data
22	B2	Blue data
23	B3	Blue data
24	B4	Blue data
25	B5	Blue data (MSB)
26	GND	Ground
27	DE	Data enable
28	VCC	Power supply
29	VCC	Power supply
30	HREV	Horizontal Image Shift-direction Select Signal
31	VREV	Vertical Image Shift-direction Select Signal

Top view of input connector pin assignment



*Note: The metal frame of the TFT-LCD module is connected to ground.

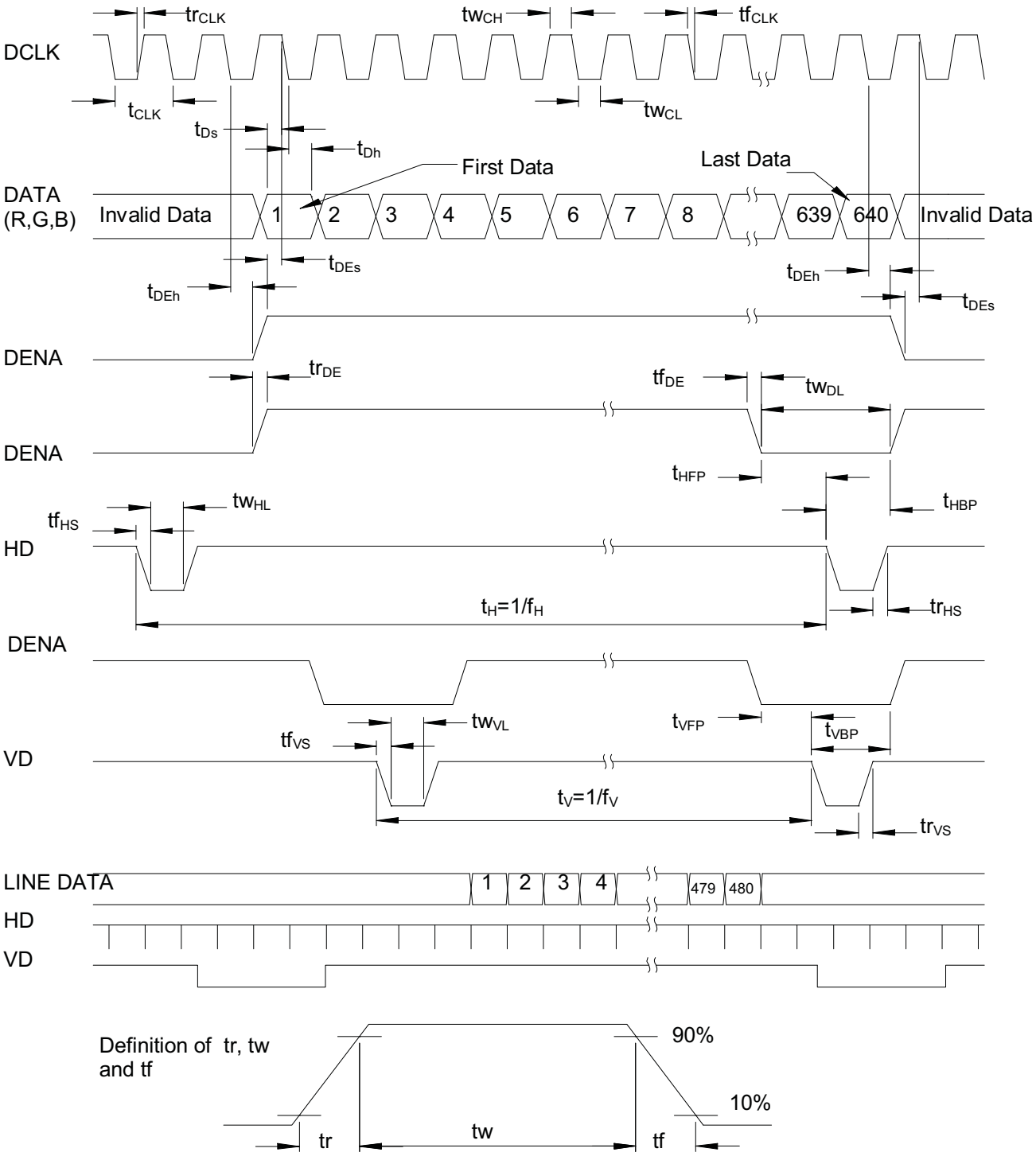
4.3. Backlight connector type (See paragraph 6)
Backlight connector (CN2 and CN3): BHR-03VS-1 (JST)
Backlight mating connector: SM02(8.0)B-BHS-TB (JST)

4.4. Backlight connector pin assignment table:

PIN NUMBER	SYMBOL	FUNCTION
1	CTH	VBLH(High voltage)
3	CTL	VBLL(Low voltage)

5. INTERFACE TIMING

5.1. Timing Chart



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5.2. Timing Specification

ITEM		SYMBOL	MIN	TYP	MAX	UNIT
DCLK *	Frequency	f_{CLK}	20	25	30	MHz
	Period	t_{CLK}	33.3	40	50	ns
	Width-Low	tw_{CL}	10	—	—	ns
	Width-High	tw_{CH}	10	—	—	ns
	Rise Time	tr_{CLK}	—	—	5	ns
	Fall Time	tf_{CLK}	—	—	5	ns
DATA (R, G, B)	Set up Time	t_{Ds}	5	—	—	ns
	Hold Time	t_{Dh}	5	—	—	ns
DENA	Set up Time	t_{DEs}	5	—	—	ns
	Hold Time	t_{DEh}	5	—	—	ns
	Low Time	tw_{DL}	90	—	168	t_{CLK}
	Rise Time	tr_{DE}	—	—	5	ns
	Fall Time	tf_{DE}	—	—	5	ns
	Horizontal Front Porch	t_{HFP}	0	—	—	t_{CLK}
	Horizontal Back Porch	t_{HBP}	7	—	—	t_{CLK}
	Vertical Front Porch	t_{VFP}	1	20	—	t_H
	Vertical Back Porch	t_{VBP}	8	20	—	t_H
HD*	Frequency	f_H	27	31.5	38	kHz
	Period	t_H	730	—	808	t_{CLK}
	Width Low	tw_{HL}	5	—	—	t_{CLK}
	Rise Time	tr_{HS}	—	—	10	ns
	Fall Time	tf_{HS}	—	—	10	ns
VD	Frequency	f_V	55	60	70	Hz
	Period	t_V	489	—	—	t_H
	Width Low	tw_{VL}	3	—	—	t_H
	Rise Time	tr_{VS}	—	—	10	ns
	Fall Time	tf_{VS}	—	—	10	ns

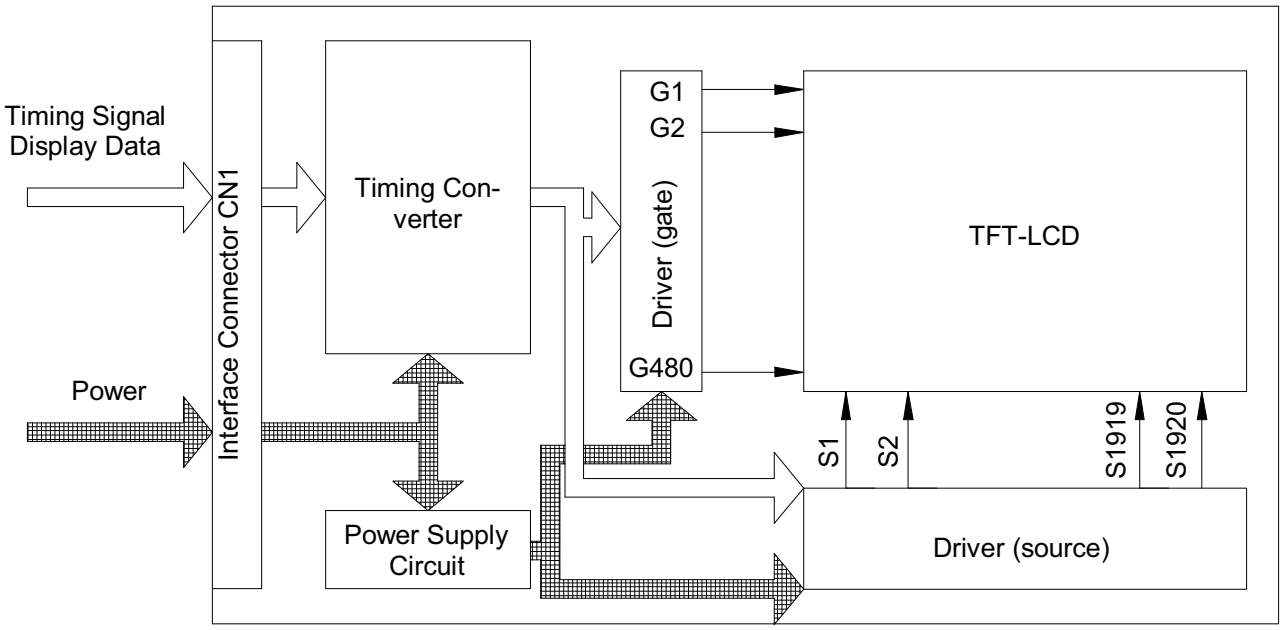
Note 1: DCLK and HD should be applied continuously at the input connector of the TFT-LCD module during operation, subject to V_{CC} turn-on conditions.
Note 2: Accepted only 640 data and 480 lines.
Note 3: Both HREV and VREV should be stable during operation.

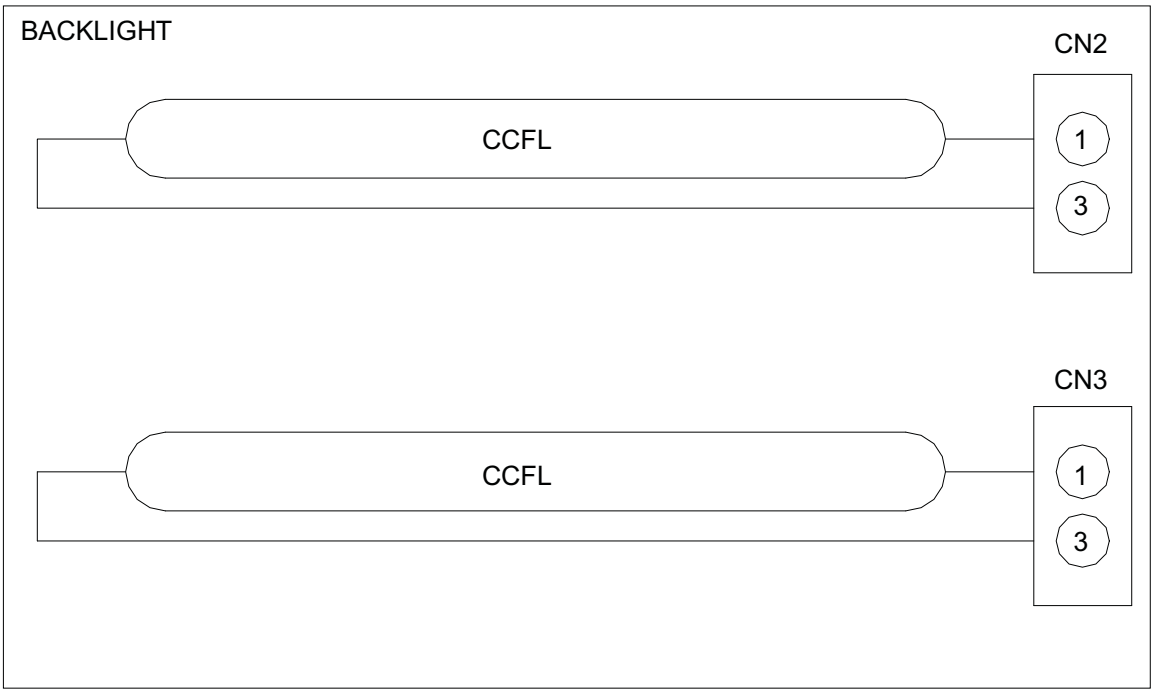
5.3. Color Data Assignment

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(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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

5.3.1. Definitions
Gray scale: Color (n) → n indicates gray scale level.
Data: 1=High, 0=Low

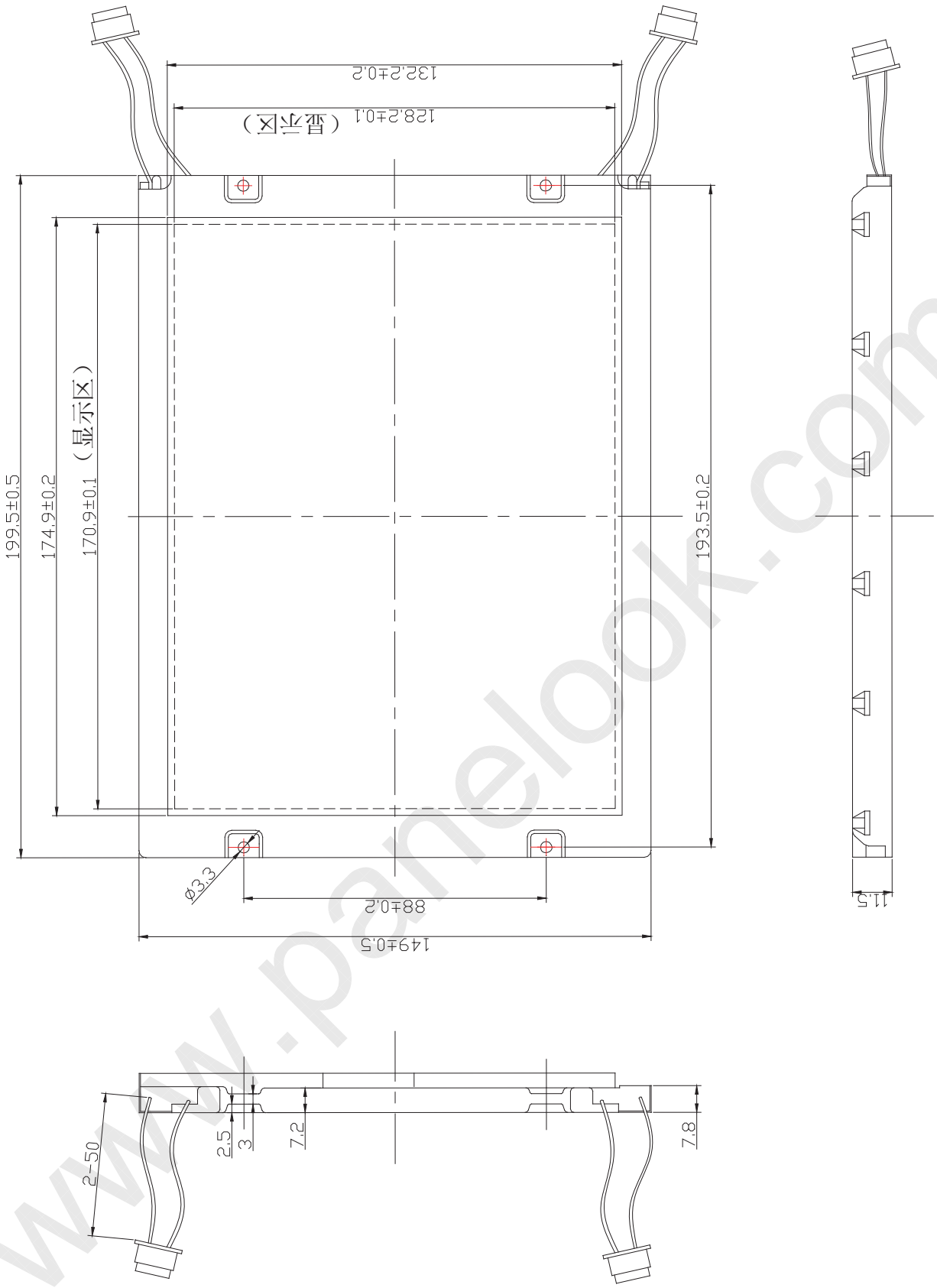
6. BLOCK DIAGRAM





7. MECHANICAL SPECIFICATION

7.1 Front Side Drawing



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