PREPARED BY : DATE	SHARP	SPEC No. LD-18Z36A
		FILE No.
APPROVED BY : DATE		ISSUE : Jan.16.2007
		PAGE : 22 pages
	MOBILE LIQUID CRYSTAL DISPLAY GROUP SHARP CORPORATION SPECIFICATION	APPLICABLE GROUP MOBILE LIQUID CRYSTAL DISPLAY GROUP

DEVICE SPECIFICATION FOR

TFT-LCD Module

MODEL No.

LQ201T1LZ01

These parts have corresponded with the RoHS directive.

☐ CUSTOMER'S APPROVAL

DATE

BY

PRESENTED BY

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RECORDS OF REVISION

LQ121S1LG61

SPEC No.	DATE	PAGE	SUMMARY	NOTE
LD-18Z36A	Jan.16.2007	-	-	1 st Issue

1. Application

This specification applies to the color 20.1" Wide XGA TFT-LCD module LQ201T1LZ01.

* The device listed in these specification sheets was designed and manufactured for use in general electronic equipment.

* In case of using the device for applications such as control and safety equipment for transportation (aircraft, trains, automobiles, etc.), rescue and security equipment and various safety related equipment which require higher reliability and safety, take into consideration that appropriate measures such as fail-safe functions and redundant system design should be taken.

* Do not use the device for equipment that requires an extreme level of reliability, such as aerospace applications, telecommunication equipment (trunk lines), nuclear power control equipment and medical or other equipment for life support.

* SHARP assumes no responsibility for any damage resulting from the use of the device that does not comply with the instructions and the precautions specified in these technical literatures.

* Confirm "11. Handling Precautions of module" item when you use the device.

* Contact and consult with a SHARP sales representative for any questions about this device.

2. Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuit, power supply circuit, inverter circuit and back light system etc. Graphics and texts can be displayed on a 1366×RGB×768 dots panel with 16.2M colors [6bits+FRC (Frame Rate Control)] by using LVDS (Low Voltage Differential Signaling) to interface, +5.0V of DC supply voltages and supply voltage for back lights.

This module also includes the DC/AC inverter to drive the CCFT. (+24V of DC supply voltage)

3. Mechanical Specifications

Parameter	Specifications	Unit
Display size	51.05 (Diagonal)	cm
	20.1 (Diagonal)	inch
Active area	444.633 (H) x 249.984(V)	mm
Pixel Format	1366 (H) x 768 (V) (1pixel = R + G + B dot)	pixel
Pixel pitch	0.3255(H) x 0.3255 (V)	mm
Pixel configuration	R, G, B vertical stripe	
Display mode	Normally black	
Unit Outline Dimensions (*1)	473.3(W) x 276.7(H) x 43.75(D)	mm
Mass	2400 (MAX)	g
Surface treatment	Anti glare coating Hard coating: 3H	

(*1) Outline dimensions are shown in Fig.16-1.

4. Input Terminals

4-1. TFT panel driving

CN7 (Interface signals and +5.0V DC power supply) (Shown in Fig.16-2.)

Using connector ：FI-X30SSL-HF(Japan Aviation Electronics Ind. , Ltd.) or compatible

Matching connector ：FI-X30HL,FI-X30HL-T, FI-X30C2L-NPB, FI-X30C2L-T-NPB,FI-X30M (Japan Aviation Electronics Ind. , Ltd.)

Mating LVDS transmitter：THC63LVDM83A or equivalent device

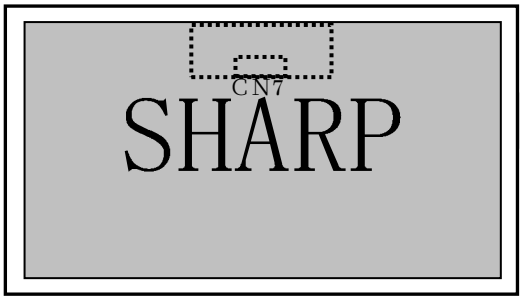
Pin No.	Symbol	Function	Remark
1	NC	NC	【Note 1】
2	RPF	Display Rotation	【Note 2】
3	NC	NC	【Note 1】
4	NC	NC	
5	NC	NC	
6	ODSEL	Overdrive Lookup Table Selection	【Note 3】
7	NC	NC	【Note 1】
8	GND	GND	
9	RIN0-	Negative (-) LVDS differential data input	LVDS
10	RIN0+	Positive (+) LVDS differential data input	LVDS
11	RIN1-	Negative (-) LVDS differential data input	LVDS
12	RIN1+	Positive (+) LVDS differential data input	LVDS
13	RIN2-	Negative (-) LVDS differential data input	LVDS
14	RIN2+	Positive (+) LVDS differential data input	LVDS
15	CLKIN-	Clock Signal(-)	LVDS
16	CLKIN+	Clock Signal(+)	LVDS
17	RIN3-	Negative (-) LVDS differential data input	LVDS
18	RIN3+	Positive (+) LVDS differential data input	LVDS
19	GND	GND	
20	NC	NC	【Note 1】
21	NC	NC	
22	NC	NC	
23	NC	NC	
24	GND	GND	
25	GND	GND	
26	GND	GND	
27	VCC	Power Supply：+5V	
28	VCC	Power Supply：+5V	
29	VCC	Power Supply：+5V	
30	VCC	Power Supply：+5V	

【Note 1】Reserved for internal use. Left it open.

【Note 2】Low：normal display(default), High：display with 180 degree rotation.

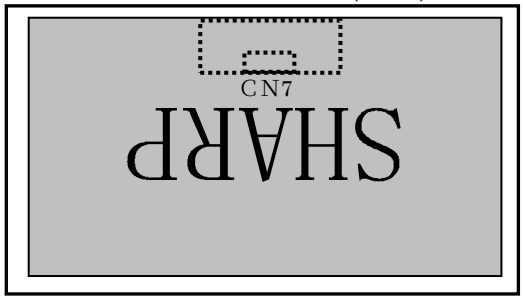
Normal (Default)

RPF：L（GND）



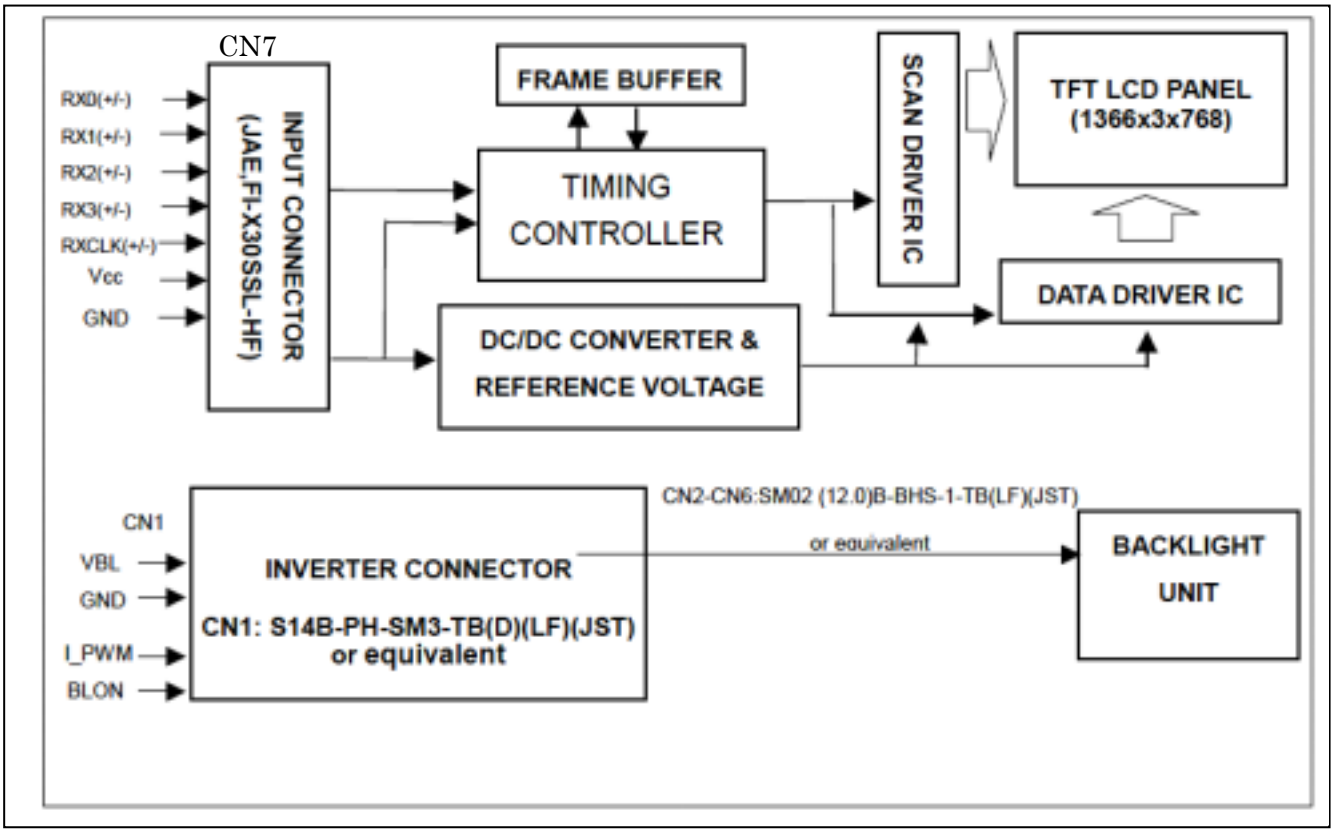
180 degree rotation

RPF：H（3.3V）



【Note 3】Overdrive lookup table selection. The Overdrive lookup table should be selected in accordance with the frame rate to optimize image quality.

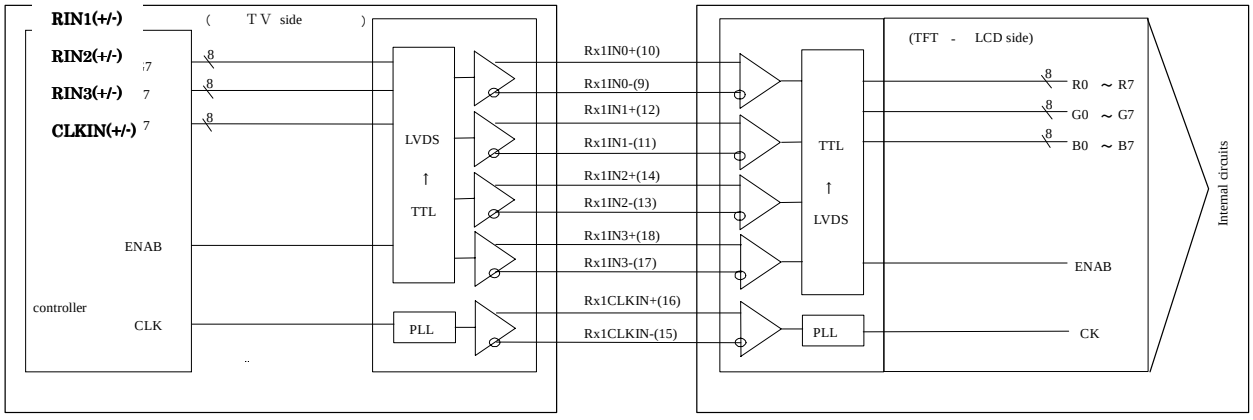
ODSEL	Note
L	Lookup table was optimized for 60 Hz frame rate.
H	Lookup table was optimized for 50 Hz frame rate.



・Block Diagram (LCD Module)

・Interface block diagram

RIN0(+/-) nding Transmitter: THC63LVDM83A (THine)



Note ・The system must have the transmitter to drive the module.

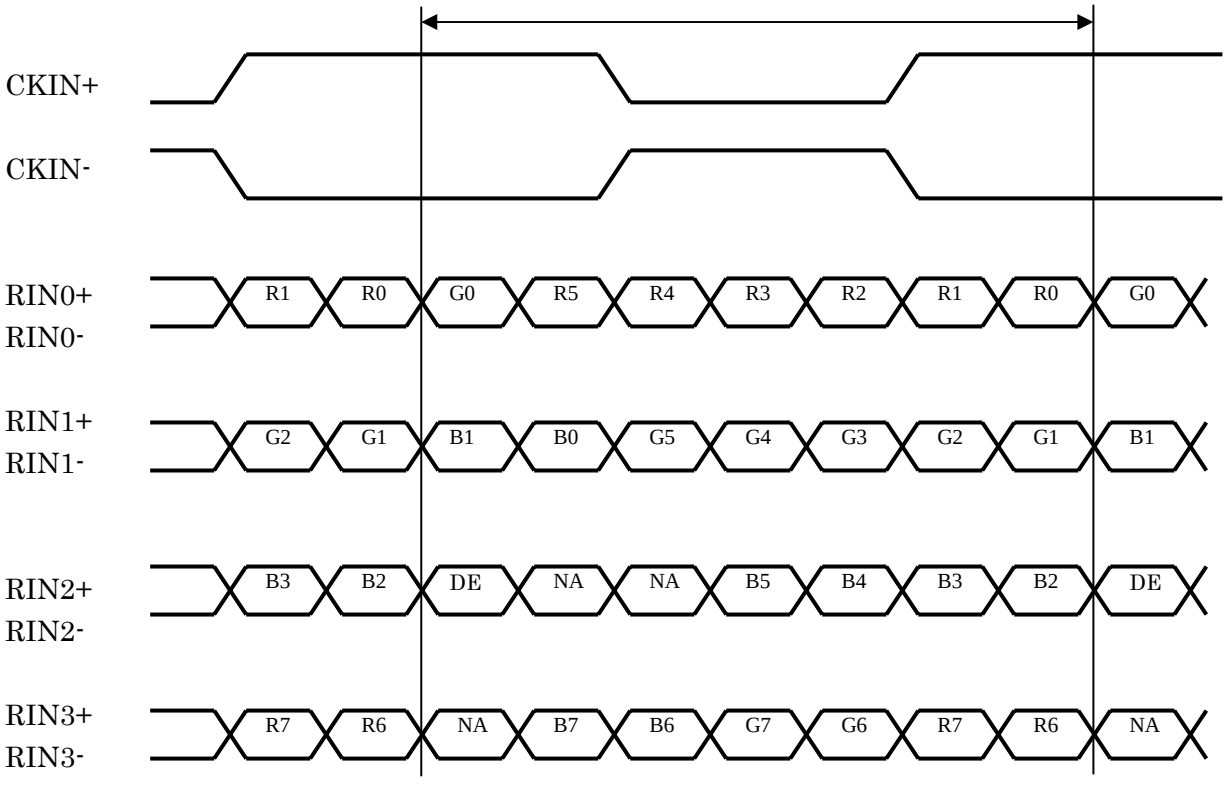
・LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line

when it is used differentially.

・LVDS INTERFACE

Input signal *1		Transmitter THC63LVDM83A		Interface connector			Receiver THC63LVDF84A		LCD Control input
		pin	INPUT	System side	LCD module pin		pin	OUTPUT	
24bit	R0	51	TxIN0	Tx OUT0+	10	RIN0+	27	RxOUT0	R0
	R1	52	TxIN1				29	RxOUT1	R1
	R2	54	TxIN2				30	RxOUT2	R2
	R3	55	TxIN3	Tx OUT0-	9	RIN0-	32	RxOUT3	R3
	R4	56	TxIN4				33	RxOUT4	R4
	R5	3	TxIN6				35	RxOUT6	R5
	G0	4	TxIN7				37	RxOUT7	G0
	G1	6	TxIN8	Tx OUT1+	12	RIN1+	38	RxOUT8	G1
	G2	7	TxIN9				39	RxOUT9	G2
	G3	11	TxIN12				43	RxOUT12	G3
	G4	12	TxIN13	Tx OUT1-	11	RIN1-	45	RxOUT13	G4
	G5	14	TxIN14				46	RxOUT14	G5
	B0	15	TxIN15				47	RxOUT15	B0
	B1	19	TxIN18				51	RxOUT18	B1
	B2	20	TxIN19	Tx OUT2+	14	RIN2+	53	RxOUT19	B2
	B3	22	TxIN20				54	RxOUT20	B3
	B4	23	TxIN21				55	RxOUT21	B4
	B5	24	TxIN22	Tx OUT2-	13	RIN2-	1	RxOUT22	B5
	RSVD	27	TxIN24				3	RxOUT24	Not connect
	RSVD	28	TxIN25				5	RxOUT25	Not connect
	DE	30	TxIN26				6	RxOUT26	DE
	R6	50	TxIN27	Tx OUT3+	18	RIN3+	7	RxOUT27	R6
	R7	2	TxIN5				34	RxOUT5	R7
	G6	8	TxIN10				41	RxOUT10	G6
	G7	10	TxIN11	Tx OUT3-	17	RIN3-	42	RxOUT11	G7
	B6	16	TxIN16				49	RxOUT16	B6
	B7	18	TxIN17				50	RxOUT17	B7
	RSVD	25	TxIN23				2	RxOUT23	Not connect
	DCLK	31	TxCLK IN	TxCLK OUT+ TxCLK OUT-	16 15	CLK IN+ CLK IN-	26	RxCLK OUT	DCLK

Notes ・RSVD(reserved)pins on the transmitter shall be “H” or “L”.



DE: Display Enable

NA: Not Available (Fixed Low)

4-2 Backlight driving

CN1 (Inverter control)

Using connector: S14B-PH-SM3-TB(D)(LF)　(JST)

Mating connector: PHR-14 (JST)

Pin No.	Symbol	Function	Note	Remark
1	V_{BL}	Power Supply +24V	Power Supply +24V	
2				
3				
4				
5				
6	GND	Power GND		
7				
8				
9				
10				
11	NC	NC		
12	NC	NC		
13	I_PWM	Internal PWM control signal		
14	BL_ON	Backlight on/off control		

Note ・Floating of any control signal is not allowed.

4-3. The back light system characteristics

The back light system is direct type with 5 CCFTs (Cold Cathode Fluorescent Tube).

The characteristics of the lamp are shown in the following table.

The value mentioned below is at the case of one CCFT.

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Life time	T_{L100}	50000	60000	-	Hour	【Note】

【Note】・The life time of a lamp is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the brightness at the center point of lamp.) as the time in which it continues to operate under the condition at Ta = 25 ±2℃ and I_L = 5.0 ~6.0 mA_{RMS}.

【Note】・Above value is applicable when lamp (the long side of LCD module) is placed horizontally. (Landscape position)
(Lamp lifetime may vary if lamp is in portrait position due to the change of mercury density inside the lamp.)
Lamp life time shortens according to the state of mounting and use.
In case of operating under lower temp environment, the lamp exhaustion is accelerated and the brightness becomes lower.
(Continuous operating for around 1 month under lower temp condition may reduce the brightness to half of the original brightness.)
In case of such usage under lower temp environment, periodical lamp exchange is recommended.

【Note】・Under the environment of 10lx or less, miss-lighting delay may occur.

5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
Input voltage (for Control)	V_I	Ta=25 ℃	-0.3 ~ + 3.6	V	【Note 1】
5V supply voltage (for Control)	VCC	Ta=25 ℃	-0.3 ~ + 6.0	V	
Input voltage (for Inverter)	V_{BLON} V_{IPWM}	Ta=25 ℃	-0.3 ~ + 7.0	V	【Note 1】
24V supply voltage (for Inverter)	V_{BL}	Ta=25 ℃	0 ~ +30.0	V	【Note 1,3】
Storage temperature	Tstg	-	-20 ~ +60	℃	【Note 4】
Operation temperature (Ambient)	Topa	-	0 ~ +50	℃	【Note 4,5】
Shock(Non-Operating)	S_{NOP}	-	50 MAX	G	【Note 6,8】
Vibration (Non-Operating)	V_{NOP}	-	1.0 MAX	G	【Note 7,8】

【Note 1】 Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

【Note 2】No moisture condensation or freezing.

【Note 3】The control signals includes Backlight On/Off Control, Internal PWM Control.

【Note 4】Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

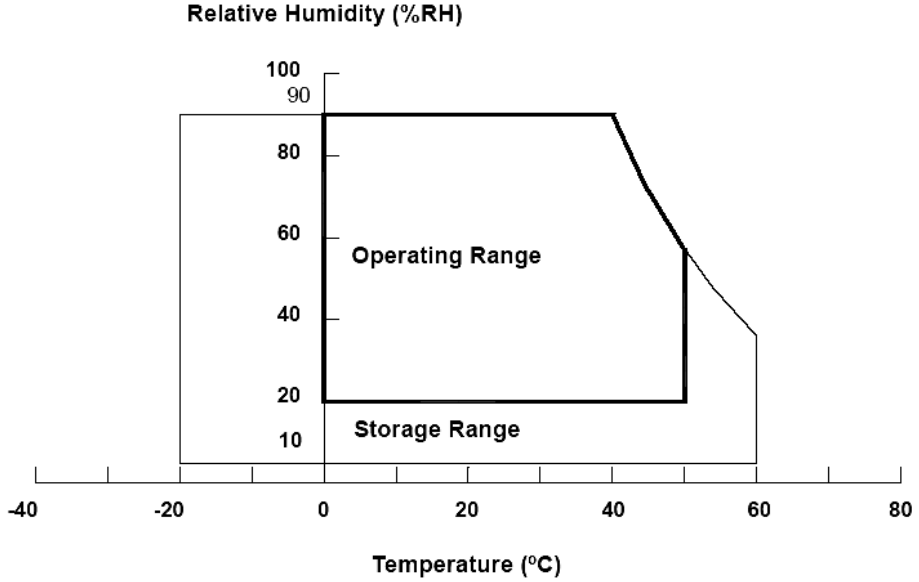
(c) No condensation.

【Note 5】The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 60 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 60 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

【Note 6】11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

【Note 7】10 ~ 500 Hz, 10 min, 1 time each X, Y, Z.

【Note 8】At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



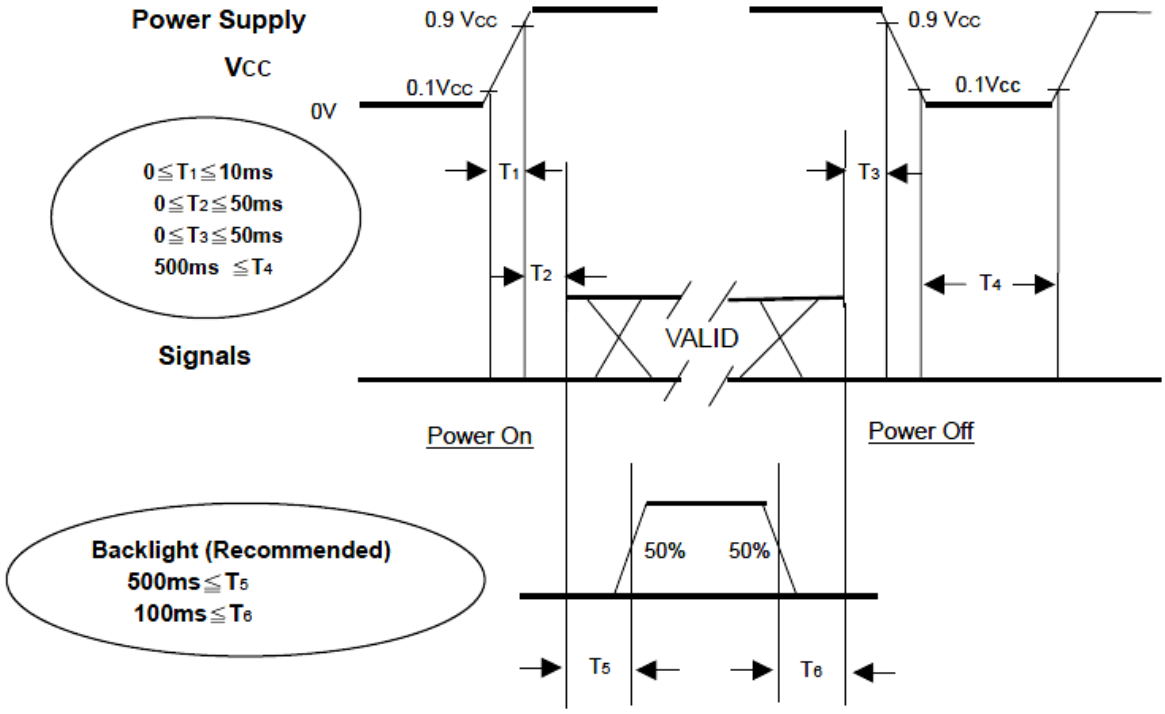
6. Electrical Characteristics

6-1. Control circuit driving

Ta=25 ℃

Parameter		Symbol	Min.	Typ.	Max.	Uniit	Remark
+5V supply voltage	Supply voltage	Vcc	+4.5	+5.0	+5.5	V	【Note 1】
	Current dissipation	Icc	-	1050	-	mA	【Note 2】
Permissible input ripple voltage		VRP	-	-	100	mVP-P	Vcc = +5.0V
Differential input threshold voltage	High	VTH	-	-	100	mV	VCM = +1.25V 【Note 3】
	Low	VTL	-100	-	-	mV	
Input Low voltage		VIL	0	-	0.7	V	【Note 4】
Input High voltage		VIH	2.7	-	3.3	V	
Terminal resistor		RT	-	100	-	Ω	Differential input

【Note 1】



※ The supply voltage of the external system for the module input should follow the definition of Vcc.

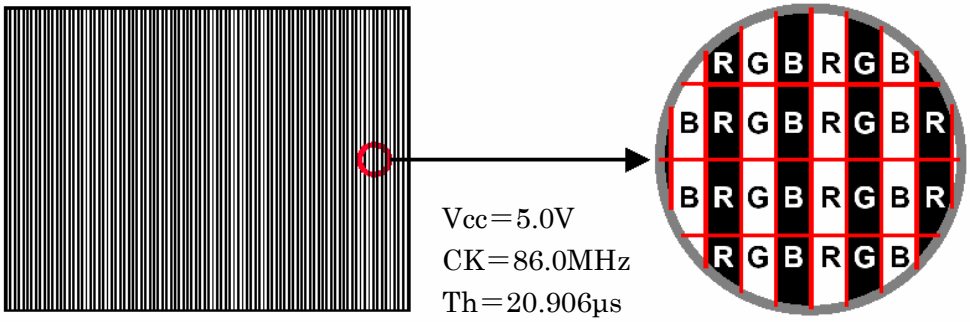
※ Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

※ In case of Vcc is in off level, please keep the level of input signals on the low or high impedance.

※ T4 should be measured after the module has been fully discharged between power off and on period.

※ Interface signal shall not be kept at high impedance when the power is on.

【Note 2】Vertical stripe pattern



【Note 3】V_{CM}: Common mode voltage of LVDS driver.
CKIN+/CKIN-, RIN0+/RIN0-, RIN1+/RIN1-, RIN2+/RIN2-, RIN3+/RIN3-,
【Note 4】RPF, ODSEL

6-2. Inverter driving for back light

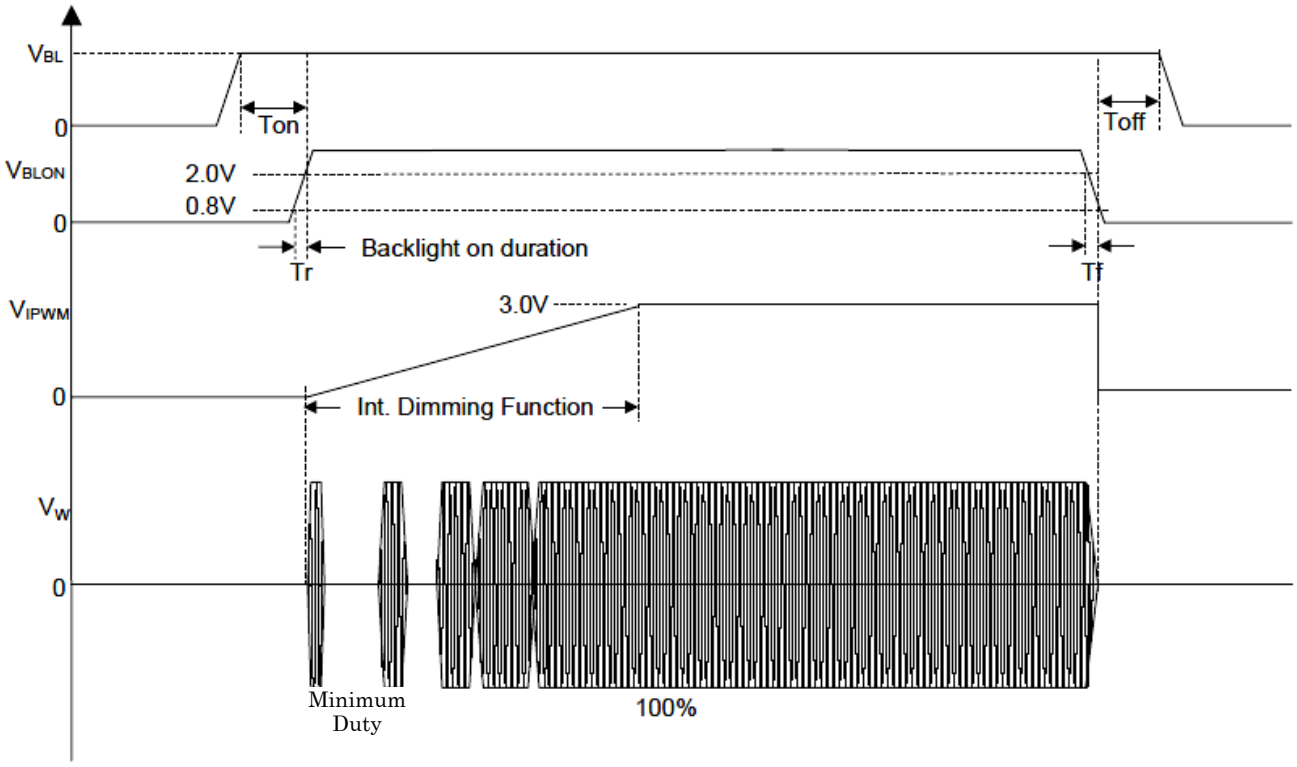
The back light system is direct type with 5 CCFTs (Cold Cathode Fluorescent Tube). Ta=25℃

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
+24V	Current dissipation	I_{BL}	-	1.9	-	A	Non Dimming
	electricity consumption	P_{BL}	-	46	-	W	【Note 1】 IL=5.5mA
	Supply voltage	V_{BL}	22.8	24.0	25.2	V	
Permissible input ripple voltage		V_{RF}	-	-	500	mV_{p-p}	V_{BL} = +22.8V
On/Off Control Voltage		V_{BLON}	0	-	0.8	V	BL-OFF
			2.0	-	5.0	V	BL-ON
Driving frequency		F_{BL}	49	52	55	kHz	
Dimming frequency		F_B	150	160	170	Hz	
Minimum Duty Ratio		D_{MIN}	-	20	-	%	
Internal PWM Control Voltage		V_{IPWM}	-	-	3.0	V	maximum duty ratio
			-	0	-	V	minimum duty ratio
Minimum duty ratio		Tr	-	-	100	ms	
Control Signal Falling Time		Tf	-	-	100	ms	
PWM Signal Rising Time		T_{PWMR}	-	-	50	us	
PWM Signal Falling Time		T_{PWMF}	-	-	50	us	
Input impedance		R_{IN}	1	-	-	MΩ	
BLON Delay Time		Ton	1	-	-	ms	
BLON Off Time		Toff	1	-	-	ms	

【Note 1】The power supply capacity should be higher than the total inverter power consumption PBL. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when inverter dimming.

【Note 2】The power sequence and control signal timing are shown as the following figure.

【Note 3】The power sequence and control signal timing must follow the figure below. For a certain reason, the inverter has a possibility to be damaged with wrong power sequence and control signal timing.



7. Timing characteristics of input signals

7-1. Timing characteristics

Timing diagrams of input signal are shown in Fig.7-1

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	65	86	88	MHz	
	Input cycle to cycle Jitter	Trcl	-	-	200	ps	
Data enable signal	Horizontal period	TH	1422	1798	1936	clock	
	Horizontal period (High)	THd	1366	1366	1366	clock	
	Frame Rate	Fr5	47	50	53	Hz	【Note 2】
		Fr6	57	60	63	Hz	
	Vertical period	TV	778	795	888	line	
	Vertical period (High)	TVd	768	768	768	line	

【Note 1】Since this module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

【Note 2】Please refer to 4-1 for detail information.

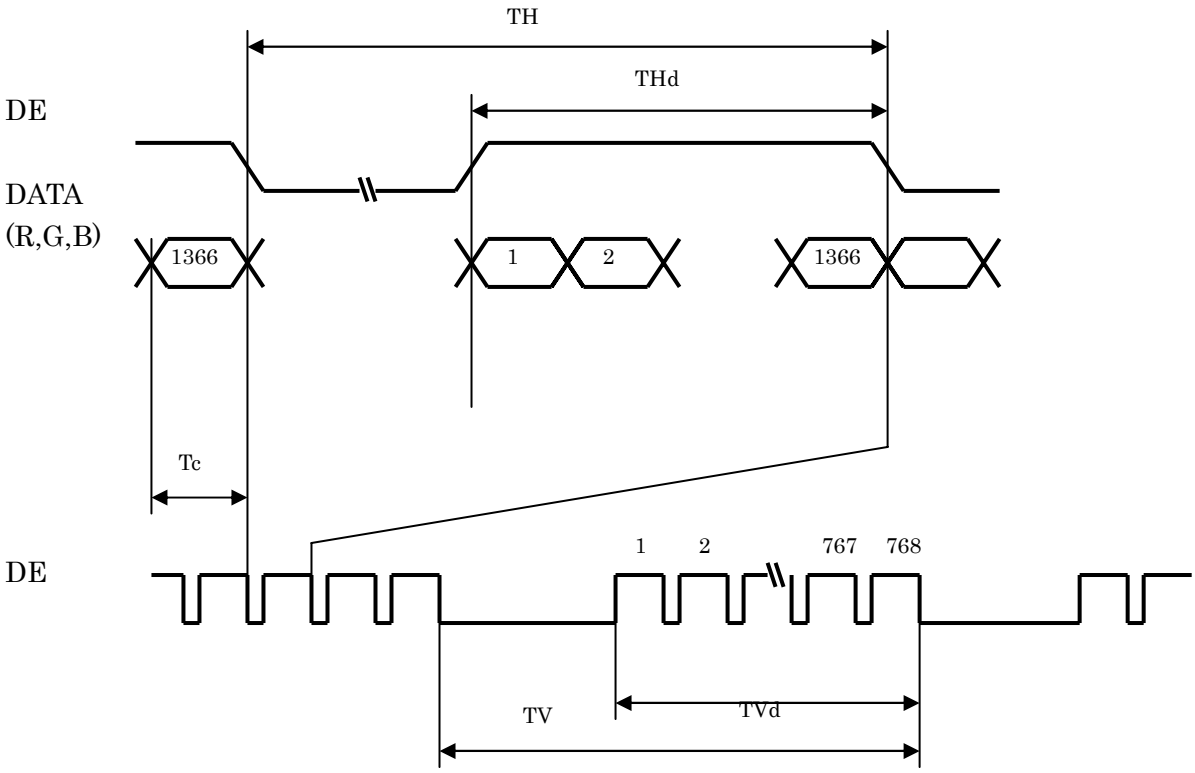
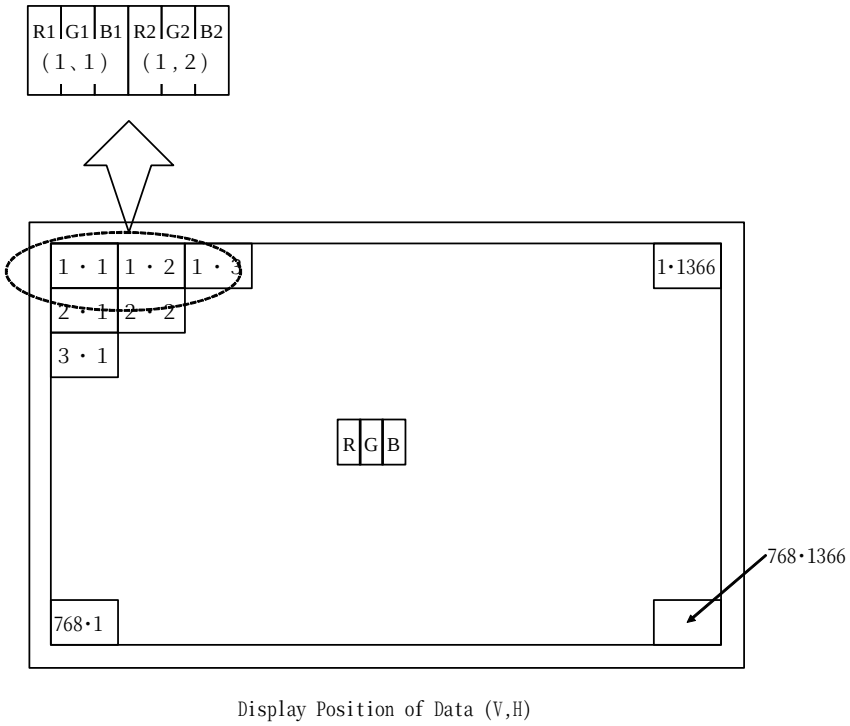


Fig.7-1 Timing characteristics of input signals

7-2. Input data signal and display position on the screen



Display Position of Data (V,H)

8. Input Signal, Basic Display Colors and Gray Scale of Each Color

	Colors & Gray scale	Gray Scale	Data signal																							
			R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
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
	Blue	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	—	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	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
	Red	—	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	⇩	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

0 : Low level voltage, 1 : High level voltage.

Each basic color can be displayed in 256 gray scales from 8 bit data signals. According to the combination of total 24 bit data signals, the 16-million-color display can be achieved on the screen.

9. Optical characteristics

Ta=25℃, Vcc = +12V, V_{INV} = +24V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ21 θ22	CR≧20	80	88	-	Deg.	【Note1,4】
	Vertical	θ11 θ12		80	88	-	Deg.	
Contrast ratio		CR	θ=0 deg.	800	1000	-		【Note2,4】 V_{IPWM} =0V
Response time		τ r	θ=0 deg.	-	8	12	ms	【Note3,4,5】 V_{IPWM} =3.0V
		τ d		-	8	12		
Chromaticity of white		x	θ=0 deg.	0.242	0.272	0.302	-	【Note 4】 V_{IPWM} =3.0V
		y		0.248	0.278	0.308	-	
Chromaticity of red		x	θ=0 deg.	0.620	0.650	0.680	-	
		y		0.300	0.330	0.360	-	
Chromaticity of green		x	θ=0 deg.	0.244	0.274	0.304	-	
		y		0.562	0.592	0.622	-	
Chromaticity of blue		x	θ=0 deg.	0.113	0.143	0.173	-	
		y		0.032	0.062	0.092	-	
Luminance of white		Y_{L1}	θ=0 deg.	400	500	-	cd/m²	【Note 4】 V_{IPWM} =3.0V
Luminance uniformity		δ_W	θ=0 deg.	-	-	1.3		【Note 6】

Measurement condition : Set the value of V_{IPWM} to maximum luminance of white.

*The measurement shall be executed 60 minutes after lighting at rating.

【Note】The optical characteristics are measured using the following equipment.

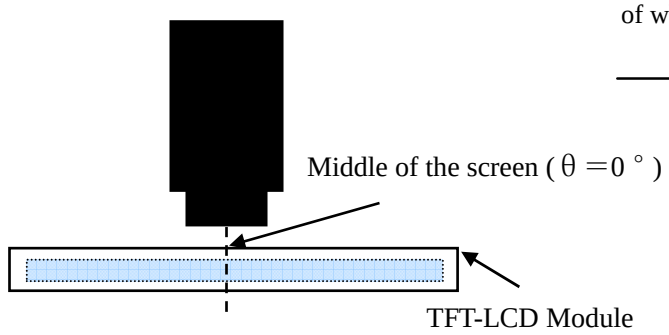


Fig.9-1 Measurement of viewing angle range.

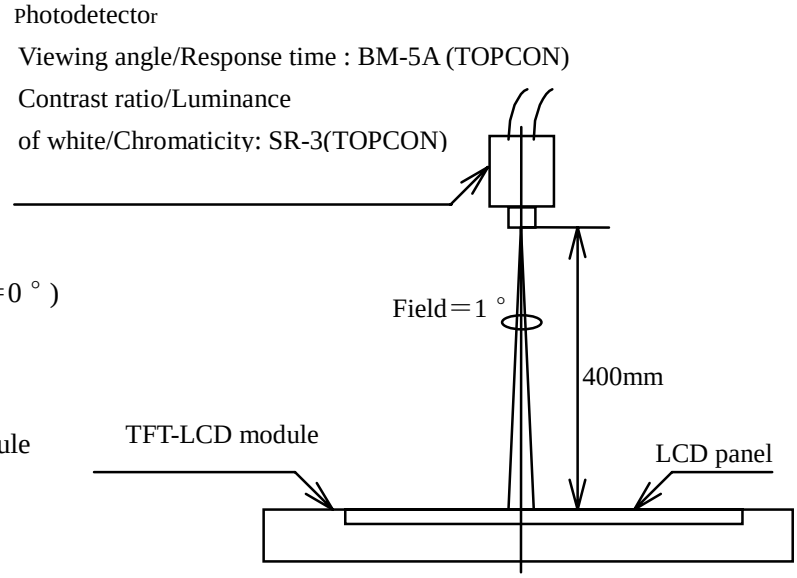
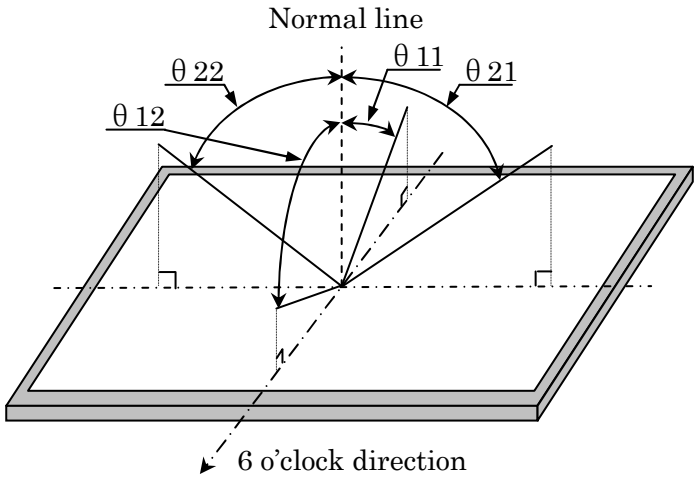


Fig.3 Optical characteristics measurement method

【Note 1】Definitions of viewing angle range：



【Note 2】Definition of contrast ratio：

The contrast ratio is defined as the following.

$$\text{Contrast Ratio} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

【Note 3】Definition of response time

Response time

The response time (τd and τr) is defined as the following figure and shall be measured by switching the input signal for "five luminance ratio (0%, 25%, 50%, 75%, 100%)" and "any five luminance ratio (0%, 25%, 50%, 75% , 100%)".

	0%	25%	50%	75%	100%
0%		tr:0%-25%	tr:0%-50%	tr:0%-75%	tr:0%-100%
25%	td:25%-0%		tr:25%-50%	tr:25%-75%	tr:25%-100%
50%	td:50%-0%	td:50%-25%		tr:50%-75%	tr:50%-100%
75%	td:75%-0%	td:75%-25%	td:75%-50%		tr:75%-100%
100%	td:100%-0%	td:100%-25%	td:100%-50%	td:0%-75%	

t*:x-y...response time from level of gray(x) to level of gray(y)

τr = Σ(tr:x-y)/36 , τd = Σ(td:x-y)/36

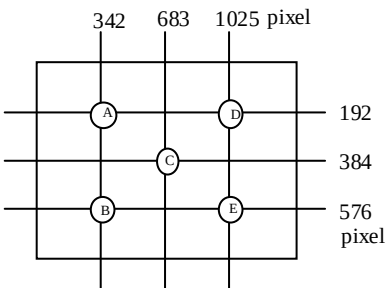
【Note 4】This shall be measured at center of the screen.

【Note 5】'Response time' is the value when O/S driving is used at typical input time value .

【Note 6】Definition of white uniformity；

White uniformity is defined as the following with five measurements. (A～E)

$$\delta_W = \frac{\text{Maximum luminance of five points (brightness)}}{\text{Minimum luminance of five points (brightness)}}$$



10. Display Quality

The display quality of the color TFT-LCD module shall be compliance with the incoming inspection standard.

11. Handling Precautions of the module

a) Be sure to turn off the power supply when inserting or disconnecting the cable.

b) This product is using the parts (inverter, CCFT etc), which generate the high voltage. Therefore, during operating, please don't touch these parts.

c) Brightness control voltage is switched for "ON" and "OFF", as shown in Fig.11-1. Voltage difference generated by this switching, ΔV_{BL}, may affect a sound output, etc. when the power supply is shared between the inverter and its surrounding circuit. So, separate the power supply of the inverter circuit with the one of its surrounding circuit.

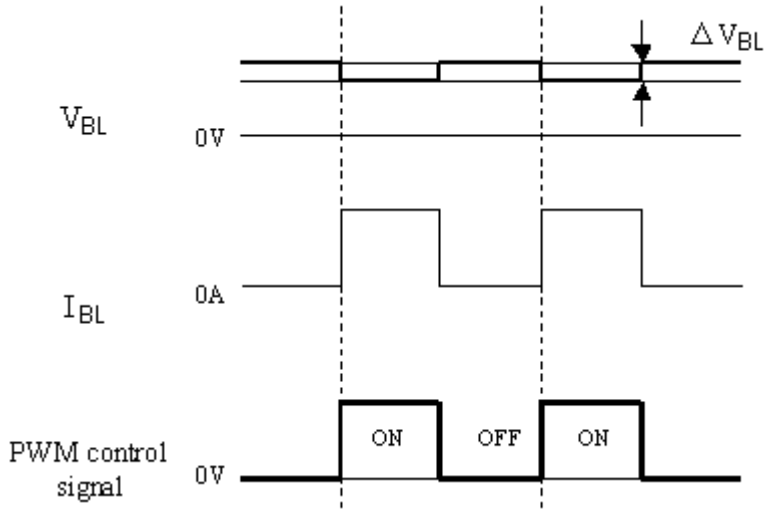


Fig.11-1 Brightness control voltage.

*Since inverter board's GND is not connected to the frame of the LCD module, please connect it with the Customer's GND of inverter power supply.

d) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.

e) Screw on a mounting hole in the module side surely.

f) Since the front polarizer is easily damaged, pay attention not to scratch it.
Blow away dust on the polarizer with antistatic N_2 blow. It is undesirable to wipe off because a polarizer is sensitive.
It is recommended to peel off softly using the adhesive tape when soil or finger oil is stuck to the polarizer.
When unavoidable, wipe off carefully with a cloth for wiping lenses.

g) Since long contact with water may cause discoloration or spots, wipe off water drop immediately.

h) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

i) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.

j) Since CMOS LSI is used in this module, take care of static electricity and take the human earth into consideration when handling.

k) The module has some printed circuit boards (PCBs) on the back side, take care to keep them form any stress or pressure when handling or installing the module; otherwise some of electronic parts on the PCBs may be damaged.

l) Observe all other precautionary requirements in handling components.

m) When some pressure is added onto the module from rear side constantly, it causes display non-uniformity issue, functional defect, etc.. So, please avoid such design.

n) When giving a touch to the panel at power on supply, it may cause some kinds of degradation. In that case, once turn off the power supply, and turn on after several seconds again, and that is disappear.

o) When handling LCD modules and assembling them into cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the LCD modules.

p) Protection film is attached to the module surface to prevent it from being scratched .
Peel the film off slowly, just before the use, with strict attention to electrostatic charges.
Blow off 'dust' on the polarizer by using an ionized nitrogen.

q) The polarizer surface on the panel is treated with Anti-Glare for low reflection. In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.

r) Do not expose the LCD panel to direct sunlight. Lightproof shade etc. should be attached when LCD panel is used under such environment.

s) Connect GND to 4 place of mounting holes to stabilize against EMI and external noise.

t) There are high voltage portions on the backlight and very dangerous. Careless touch may lead to electrical shock. When exchange lamps or service, turn off the power without tail.

u) Cold cathode fluorescent lamp in LCD panel contains a small amount of mercury, please follow local ordinances or regulations for disposal.

v) Be careful of a back light lead not to pull by force at the time of the wiring to an inverter, or line processing.

w) When install LCD modules in the cabinet, recommended torque value is Max 0.392N・m (Max 4kgf・cm).
Be sure to confirm it in the same condition as it is installed in your instrument.

x) Liquid crystal contained in the panel may leak if the LCD is broken.
Rinse it as soon as possible if it gets inside your eye or mouth by mistake.

y) Notice: Never dismantle the module, because it will cause failure.

z) Be careful when using it for long time with fixed pattern display as it may cause afterimage.

aa) Adjusting volume has been set optimally before shipment, so do not change any adjusted value. If adjusted value is changed, the specification may not be satisfied.

bb) If a minute particle enters in the module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.

cc) The lamp used for this product is very sensitive to the temperature. Luminance decreases rapidly when it is used for a long time or repeatedly under the environment of the low temperature or the module is being cooled. Please avoid the continuous or repeating use of it under such an environment. It may decrease up to 50% of the initial luminance in about one month under the low temperature environment. Please consult our company when it is used under the environment like the above mentioned.

12. Packing form

12-1.Packing specifications

(1) 5LCD module / 1 Box

(2) Box dimensions：566(L)×428(W)×387(H)

(3) Weight：approximately 14Kg (5 modules per box)

12-2.Packing method

Figures 12-1 and 12-2 are the packing method

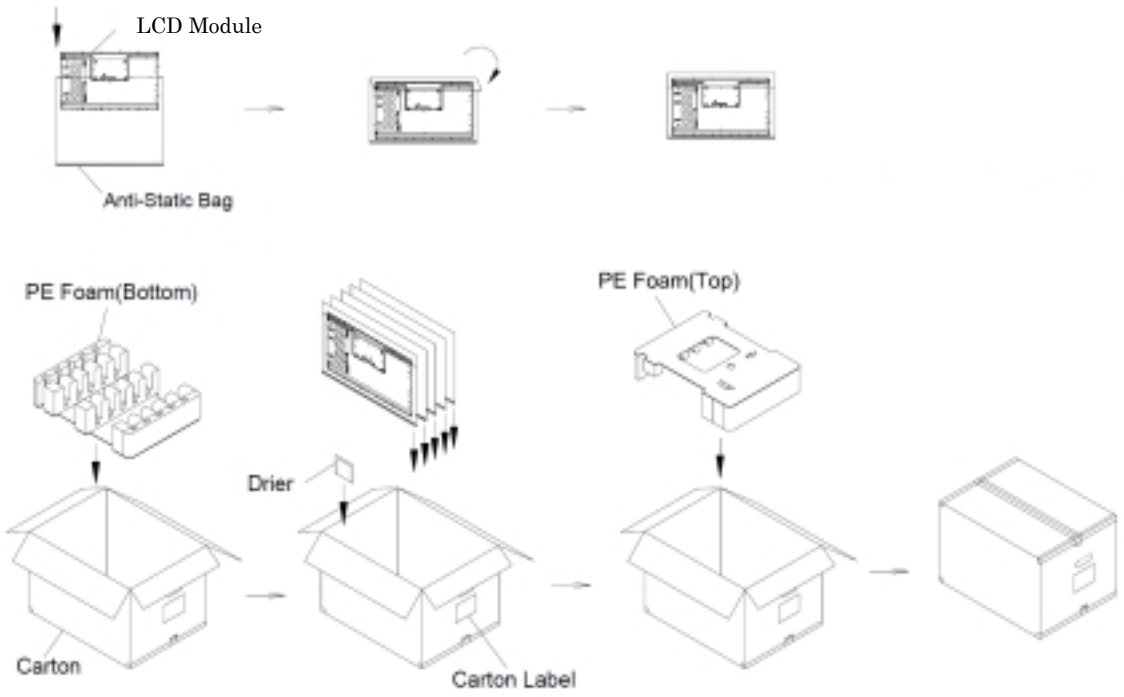
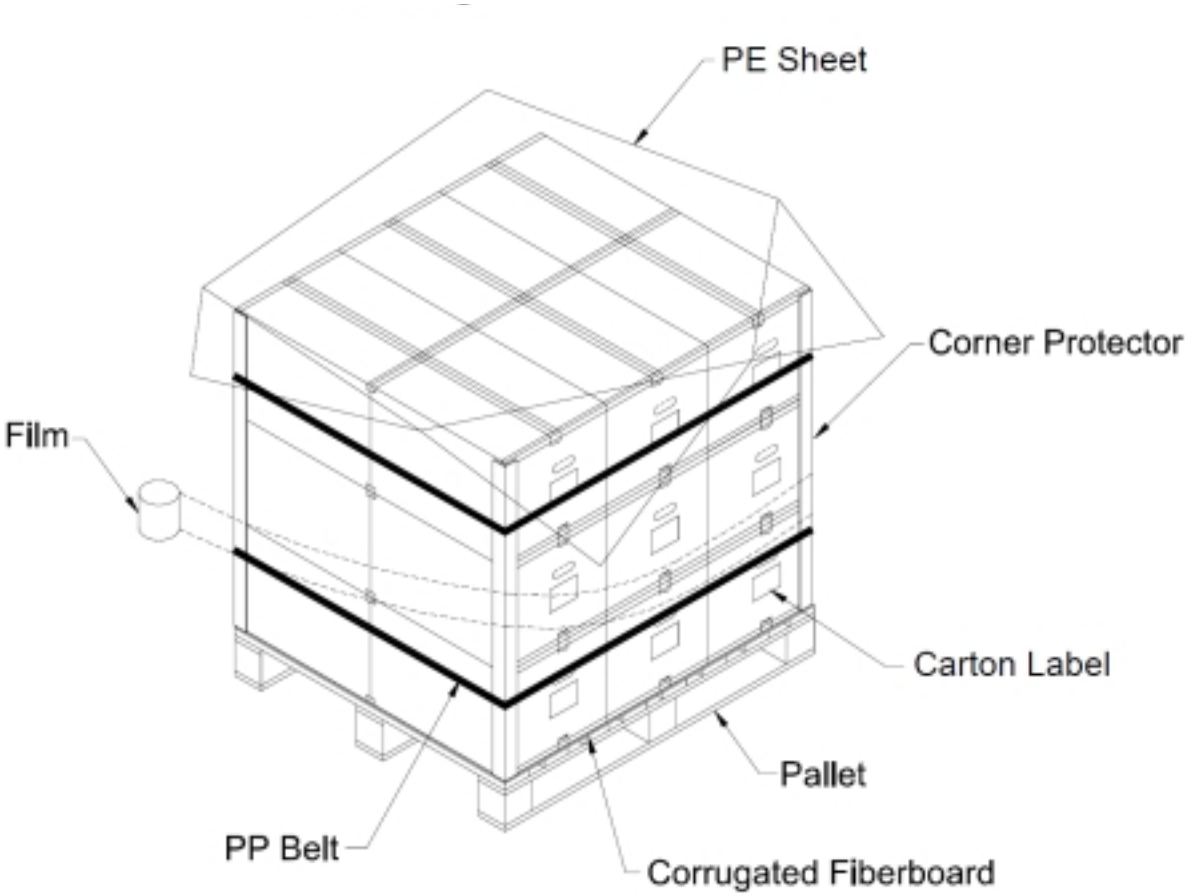


Fig.12-1 packing method



Corner Protector:L1170*50mm*50mm
Pallet:L1300*W1140*H143mm
Pallet Stack:L1300*W1140*H1304mm
Gross:270kg
Corrugated Fiberboard:L1300*W1140mm

Fig.12-2 packing method

13. Reliability test item

No.	Test item	Condition
1	High temperature operation test	Ta=55℃, 240hr
2	High temperature storage test	Ta=60℃, 240hr
3	Low temperature operation test	Ta=0℃, 240hr
4	Low temperature storage test	Ta=－20℃, 240hr
5	High temperature & High humidity operation test	Ta=50℃, 80%RH, 240hr
6	High temperature & High humidity storage test	Ta=50℃, 90%RH, 240hr
7	Vibration test	10～500Hz, 1G, 10 min./cycle for 1 cycles, X, Y, Z, each direction for 1 time. @RT
8	Mechanical Shock Test	50 G, 11 ms, half sine wave, ±X,±Y,±Z directions, each direction for 1 time.

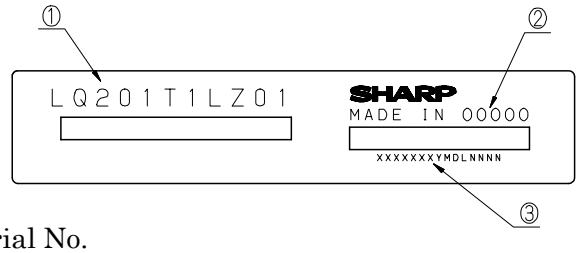
【Result evaluation criteria】

Under the display quality test condition with normal operation state, there shall be no change, which may affect practical display function.

14. Others

1)Lot No. Label ;

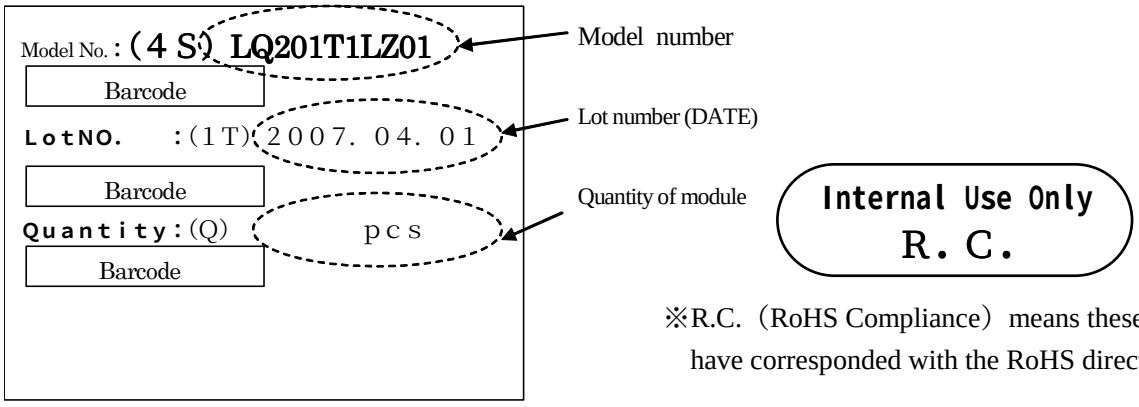
① Model Number
② Manufacturer Country Name
③ Manufacturing Number



XX XX X XX YMD L NNNN

- Serial No.
- Product Line
- Year(0~9) Month (1~9,A~C),Day(1~9,A~Y)
- SHARP Internal Use.
- SHARP Internal Use.
- Revison
- SHARP Internal Use.

2) Packing Label



※R.C.（RoHS Compliance）means these parts have corresponded with the RoHS directive.

15. Carton storage condition

Temperature	0℃ to 40℃
Humidity	95%RH or less
Reference condition	: 20℃ to 35℃ , 85%RH or less (summer)
	: 5℃ to 15℃ , 85%RH or less (winter)
	・the total storage time (40℃,95%RH) : 240H or less
Sunlight	Be sure to shelter a product from the direct sunlight.
Atmosphere	Harmful gas, such as acid and alkali which bites electronic components and/or wires must not be detected.
Notes	Be sure to put cartons on palette or base, don't put it on floor, and store them with removing from wall.
	Please take care of ventilation in storehouse and around cartons, and control changing temperature is within limits of natural environment.
Storage life	1 year

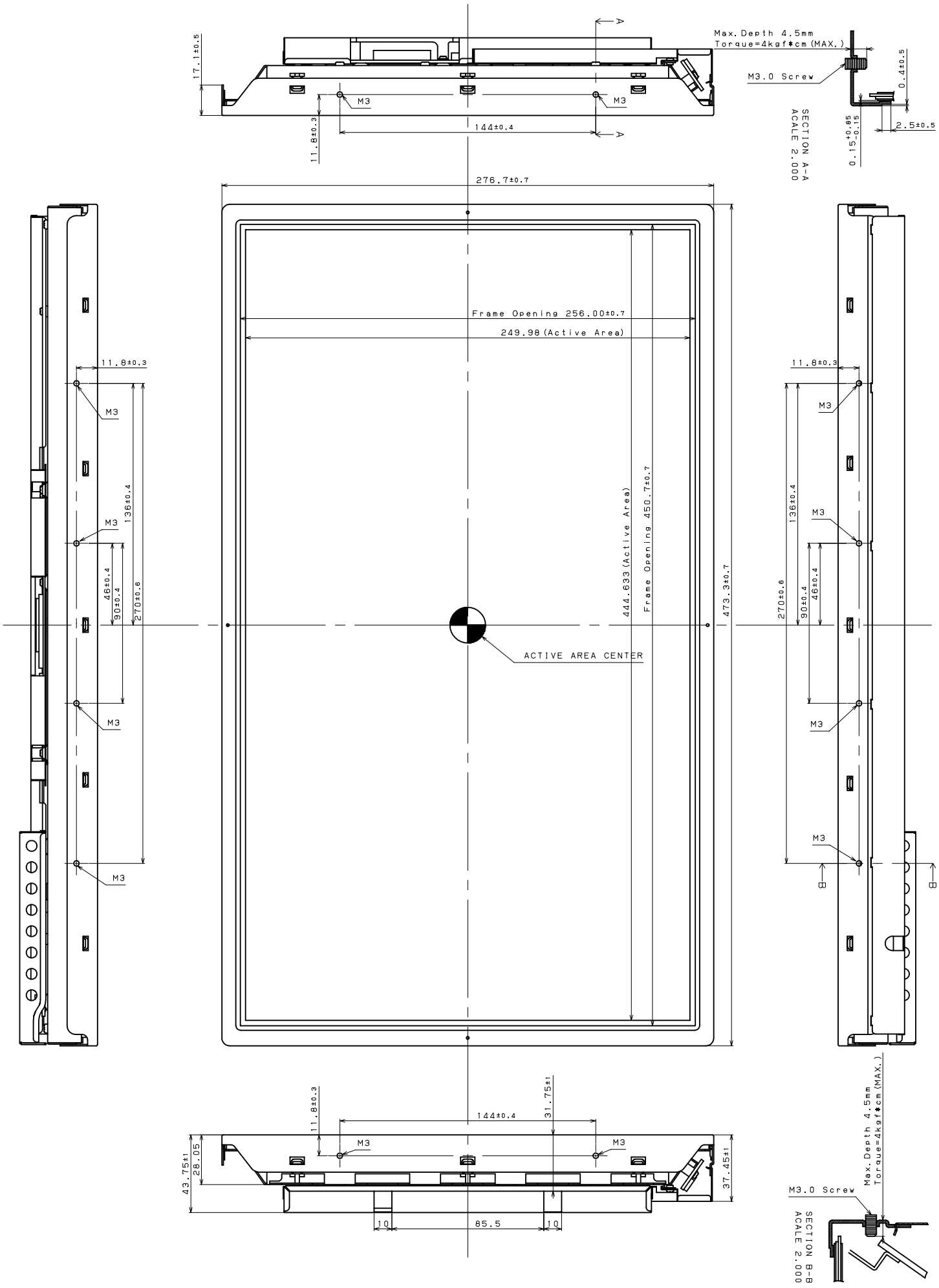


Fig. 16-1 OUTLINE DIMENSIONS (FRONT SIDE)

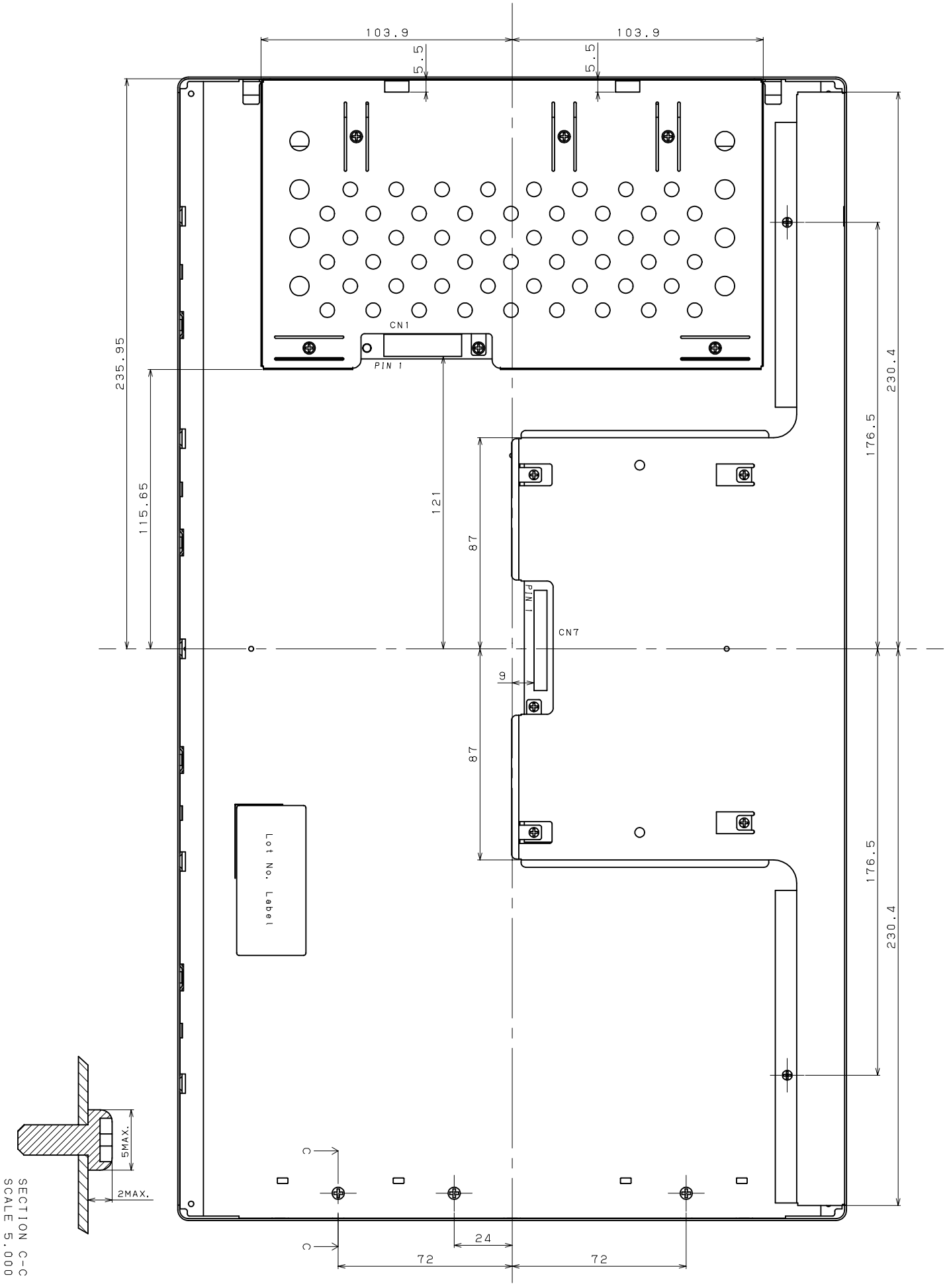


Fig.16-2 OUTLINE DIMENSIONS (REAR SIDE)

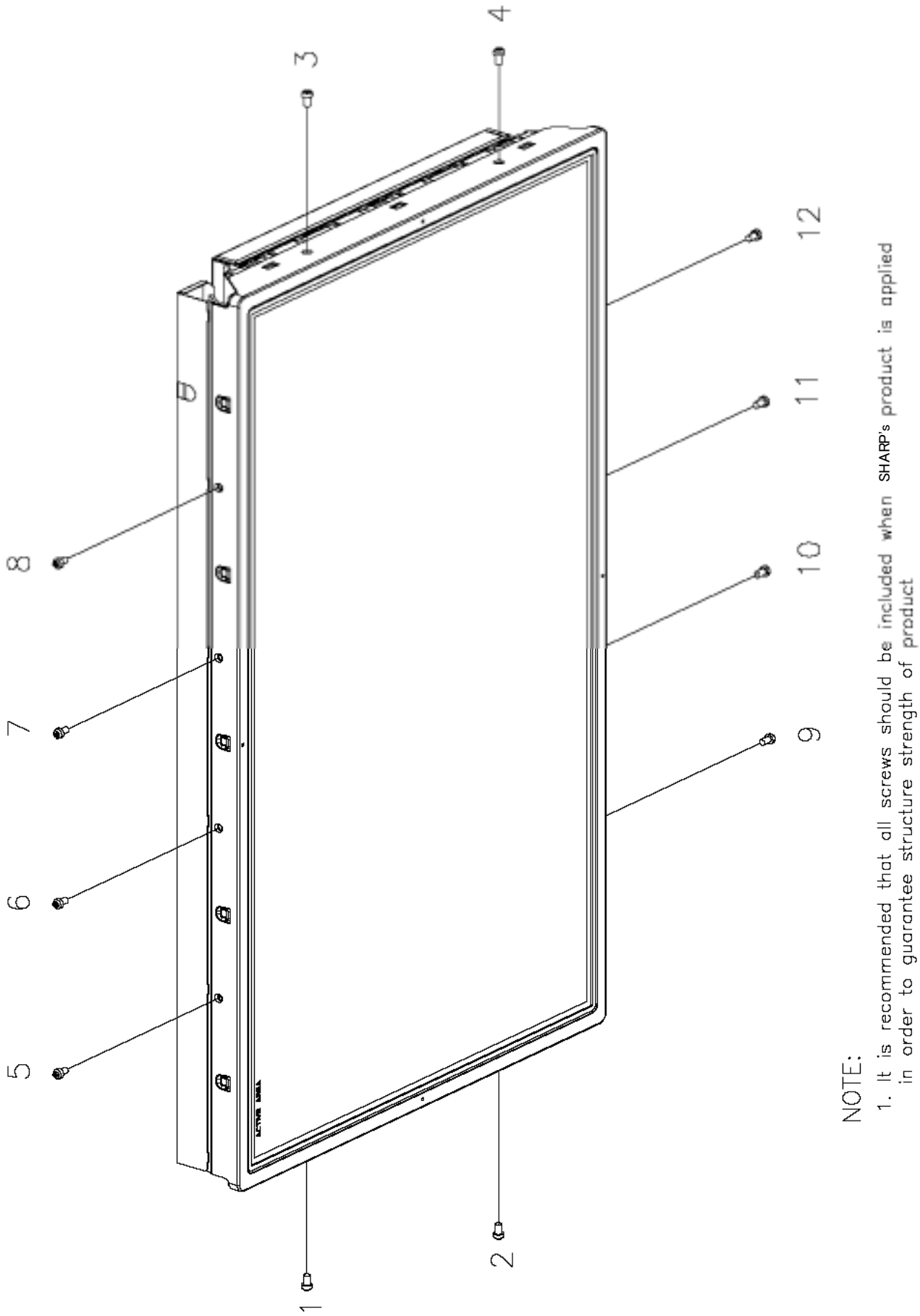


Fig.16-3 OUTLINE DIMENSIONS (Screws)