Toshiba Mobile Display Co., Ltd

PRODUCT INFORMATION

18cm COLOUR TFT-LCD MODULE
(7 TYPE)

LT070AC46100
(p-Si TFT)

All information is subject to change without notice. Please read bottom notes.

FEATURES:(1)7"WVGA color display with High Luminance (280cd/m^2)
(2)Wide Viewing Angle(No Color Inversion)
(3)LED Back Light(25,000 hours MTTF)
(4)LED Unit Replaceable Structure

TENTATIVE

RoHS compatible

MECHANICAL SPECIFICATIONS

Item	Specifications
Dimensional Outline (typ.)	167.0(*W*) x 106.0max(*H*) x 7.6(*D*) mm
Number of Pixels	800(*W*) x 480(*H*) pixels
Active Area	152.4(*W*) x 91.44(*H*) mm
Pixel Pitch	0.1905(*W*) x 0.1905(*H*)
Weight (approximately)	165g
Backlight	LED, Sidelight type

ABSOLUTE MAXIMUM RATINGS

Item	Min.	Max.	Unit
Supply Voltage (V_{DD})	-0.3	4.0	V
LED forward voltage (V_{LED})*1	0	(25)	V
LED forward current (I_{LED})	---	30	mA
Input Signal Voltage (V_{IN})	-0.3	V_{DD}+0.3	V
Operating Temperature (Note	-20	60	°C
Storage Temperature	-30	80	°C
Storage Humidity (Max. wet bulb temperature = 39°C)	10	90	%(RH)

Note) Only operation is guarantied at Operating Temperature. Display quality is evaluated at +25°C.

ELECTRICAL SPECIFICATION (*T*a=25°C) (RECOMMENDED OPERATION CONDITION)

Item		Min.	Typ.	Max.	Unit	Remarks
Supply Voltage	(V_{DD})	3.0	3.3	3.6	V	
	*2(V_{LED})	0	15.3	17	V	
Common Mode Input Voltage	(V_{CM})	1.0	---	2.0	V	
Differential Input Amplitude	(V_{IA})	0.25	---	0.45	V	
Differential Input Voltage	(V_{ID})	V_{CM} - (V_{IA})/2		V_{CM} + (V_{IA})/2	V	
H Level Voltage	(V_{IH})	2.2		V_{DD}	V	
L Level Voltage	(V_{IL})	0		0.7	V	
Current Consumption *2*3	*1 (I_{DD})	---	205	270	mA	
	*2 (I_{LED})	---	15.0	---	mA	
Power Consumption *2*3		---	1.6	---	W	I_{LED}=15.0mA

*1: 8 color bars pattern *2 : between V_{LED-A} to V_{LED1-K}, V_{LED2-K}, V_{LED3-K}, V_{LED4-K} *3: Except the efficiency of LED driver

OPTICAL SPECIFICATION (*T*a=25°C)

Item		Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio (*CR*)		200	400	---	---	
Viewing Angle (*CR* ≥ 10)	(Upper / Lower)	55 / 55	80 / 80	---	°	
	(Left / Right)	55 / 55	80 / 80	---	°	
Response Time	Ton+Toff	---	21		ms	
Luminance		220	280	---	cd/m^2	I_{LED}=15.0mA
White Chromaticity	Wx		0.320			
	Wy		0.340			
Color Saturation		45			%	
LED Life Time (MTBF)*3 *4		25,000			hour	

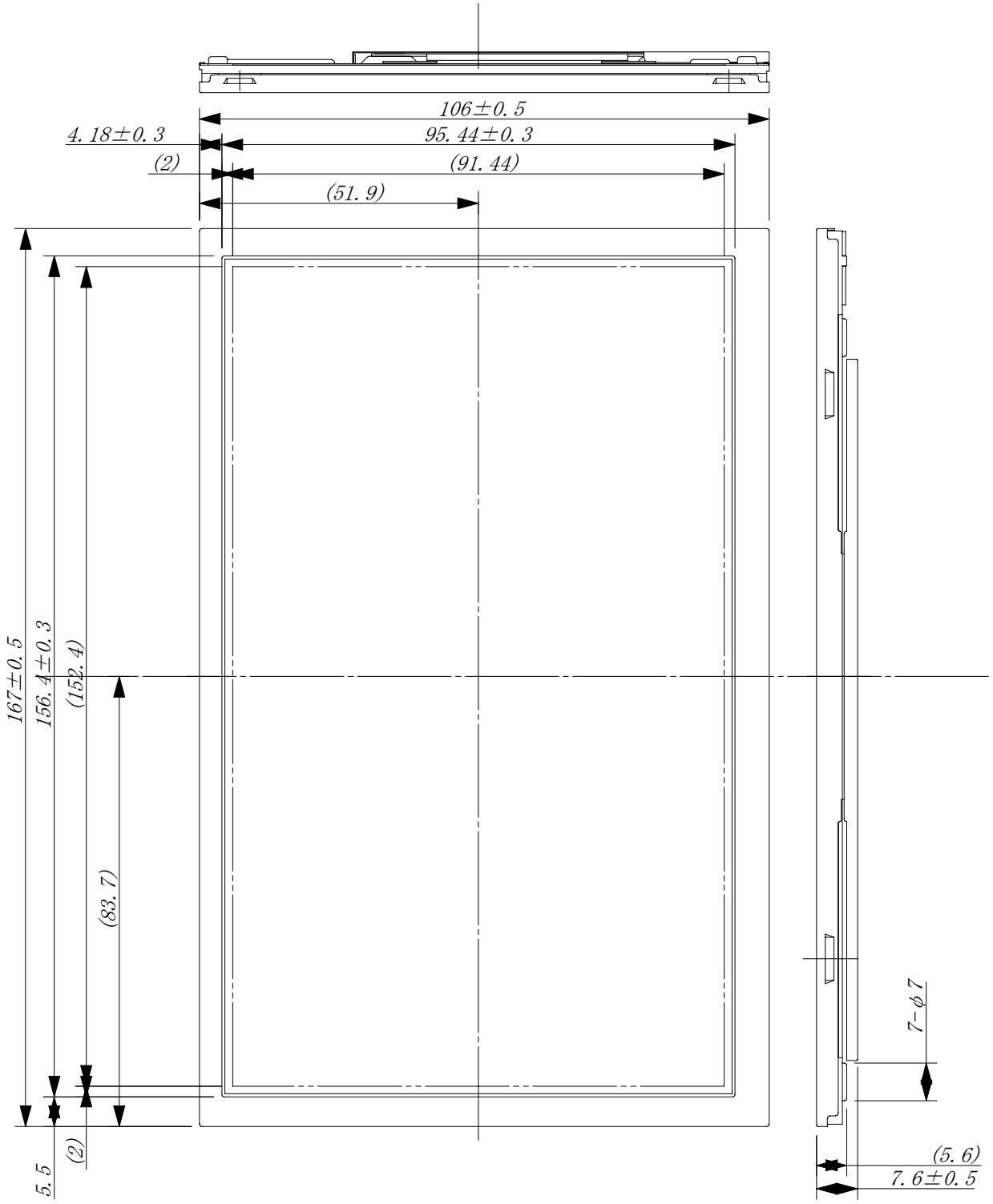
*3 : Conditions ; *T*a=25°C, I_{FL}=15.0mA(rms), continuous lighting

*4 : Definitions of failure ; 1) Lcd luminance becomes half of the minimum value. 2) LED doesn't light normally.

DIMENSIONAL OUTLINE
(Front)

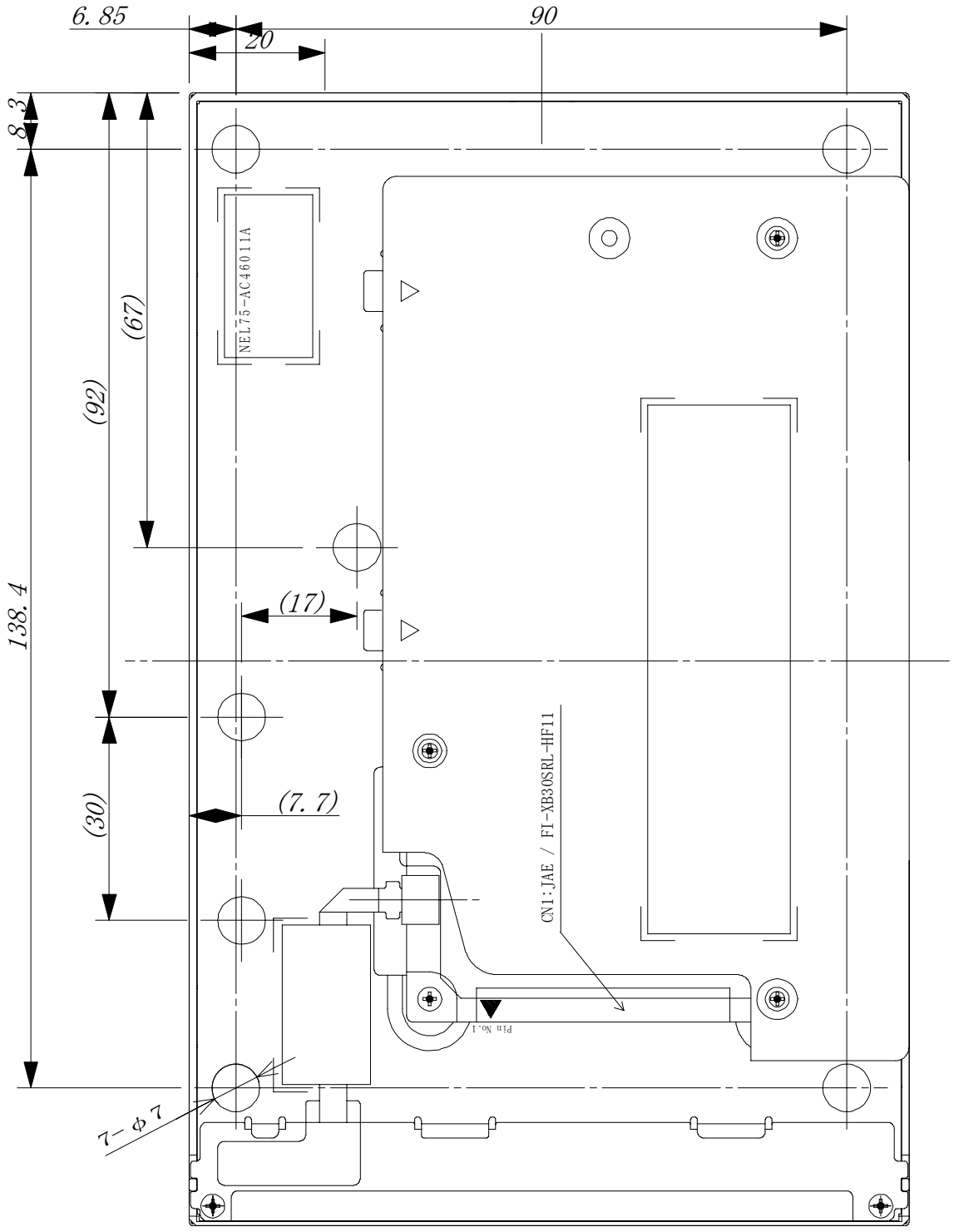
TENTATIVE

Unit : mm
Standard tolerance : ±0.5

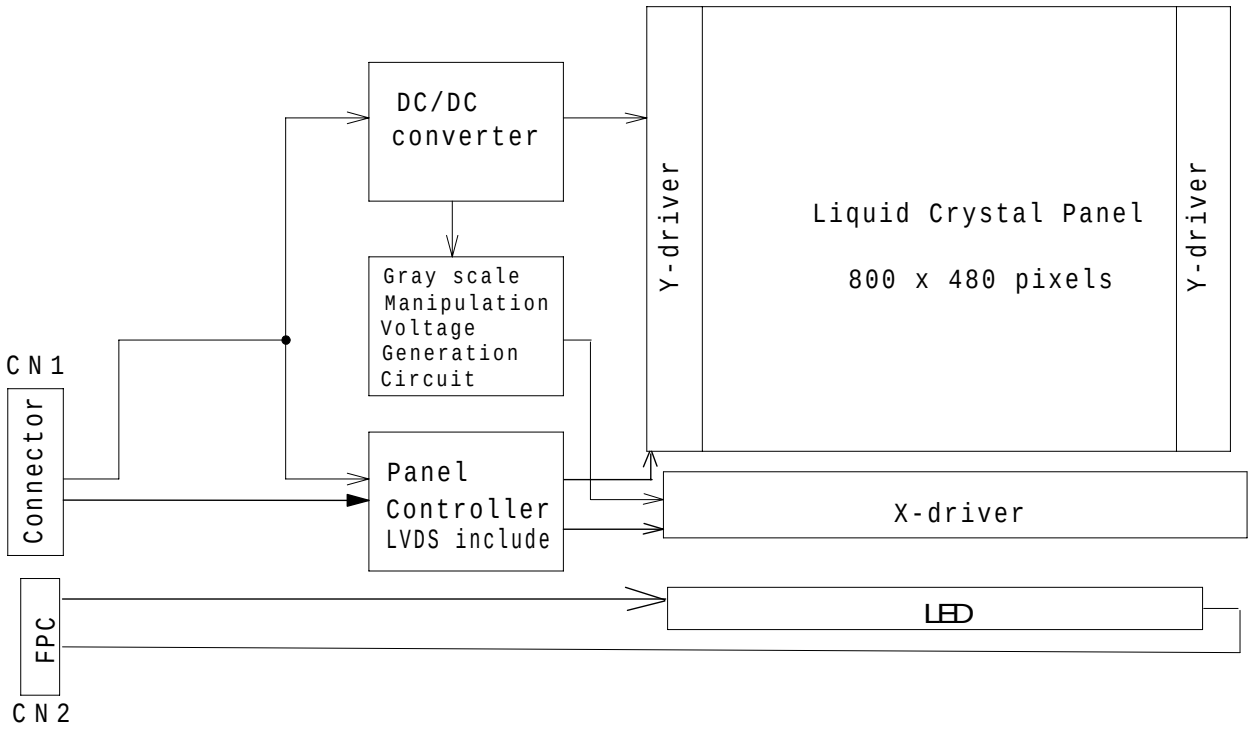


(Rear)

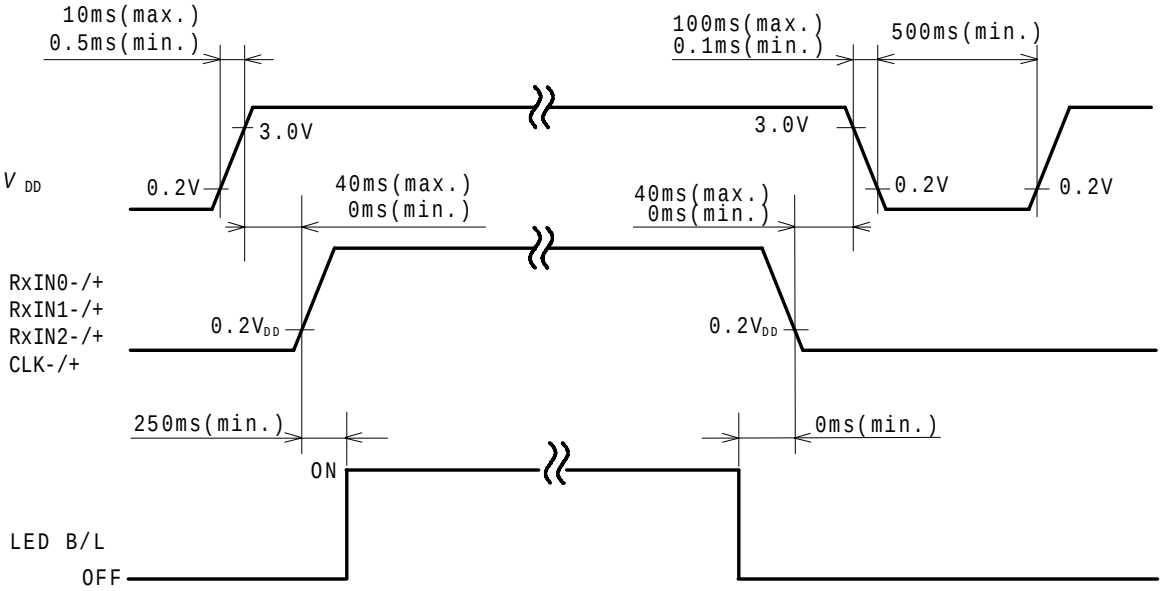
Unit : mm
Standard tolerance : ±0.5



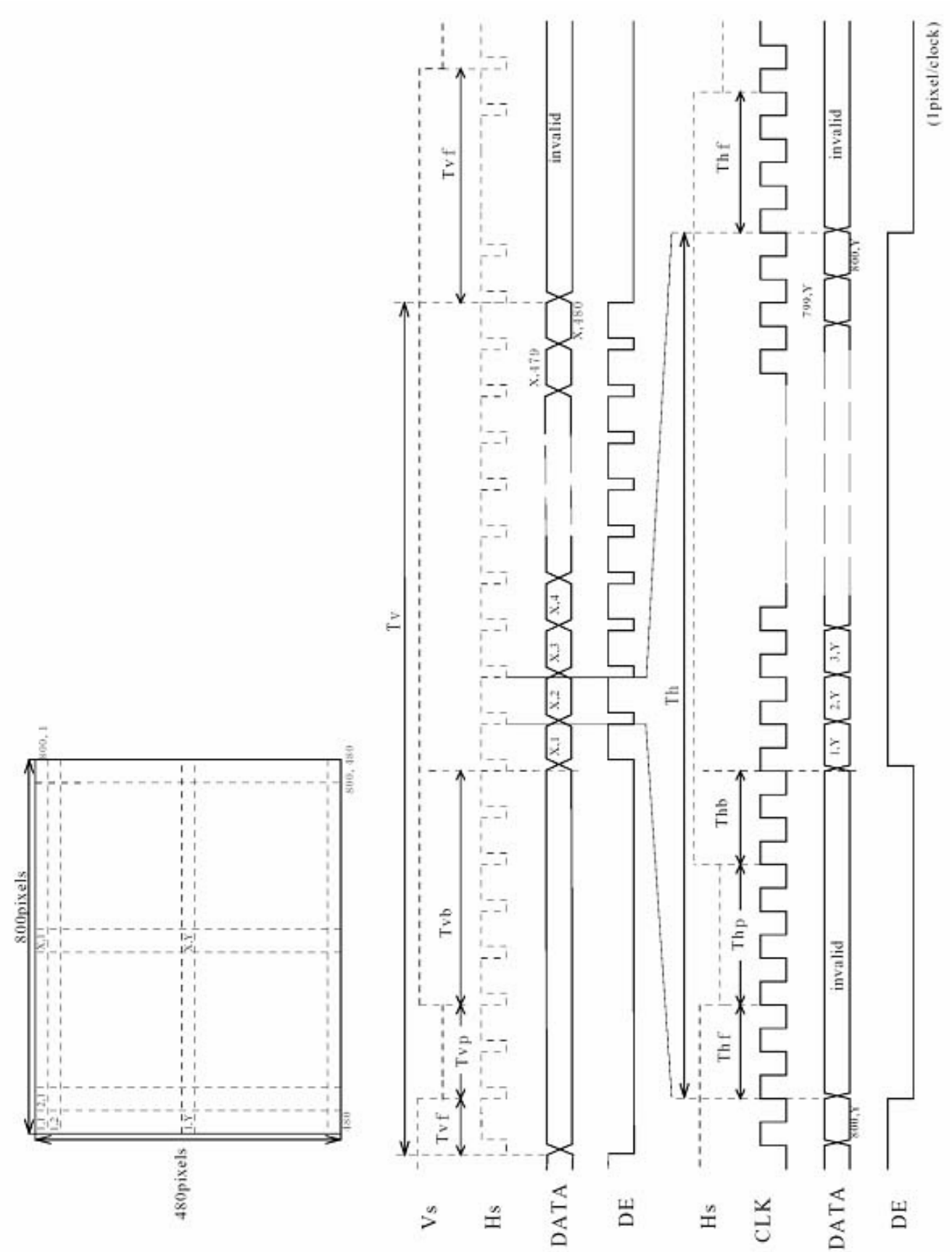
BLOCK DIAGRAM



SEQUENCE OF POWER SUPPLIES AND SIGNALS



TIMING CHART



TIMING SPECIFICATION [1) 2) 3) 4) 5) 6)]

Item		Symbol	min.	typ.	max.	unit
CLK	frequency	*Fck*	29.88	33.2	36.52	MHz
	Period	*Clk*	27.4	30.1	33.5	ns
Clock	High Time	*Tch*	12	-	-	ns
	Low time	*Tcl*	12	-	-	ns
HS	Period	*Th*	944	1056	1088	(Clk)
			-	31.8	-	us
Horizontal Sync	Pulse Width	*Thp*	4	128	-	(Clk)
	Front Porch	*Thf*	-	40	-	(Clk)
	Back Porch	*Thb*	7	88	-	(Clk)
VS	Period	*Tv*	516	525	534	(Th)
			14.7	16.6	17.4	ms
Vertical Sync	Pulse Width	*Tvp*	1	2	-	(Th)
	Front Porch	*Tvf*	-	11	-	(Th)
	Back Porch	*Tvb*	4	32	-	(Th)

Note 1) If NCLK is fixed to "H" or "L" level for certain period while DE is supplied, the panel may be damaged.

Note 2) Please adjust LCD operating signal timing and FL driving frequency, to optimize the display quality.
There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition (especially driving frequency), even if the condition satisfies above timing specifications.

Note3) Do not make *tv*, *th* and thp fluctuate.

Note4) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note5) NCLK count of each Horizontal Scanning Time should be always the same.
V-Blanking period should be “*n*” X “Horizontal Scanning Time”. (*n*: integer)
Frame period should be always the same.

CONNECTOR PIN ASSIGNMENT FOR INTERFACE

CN1 INPUT SIGNAL

Connector : FI-XB30SRL-HF11 / Japan Aviation Electronics Industry, Ltd.

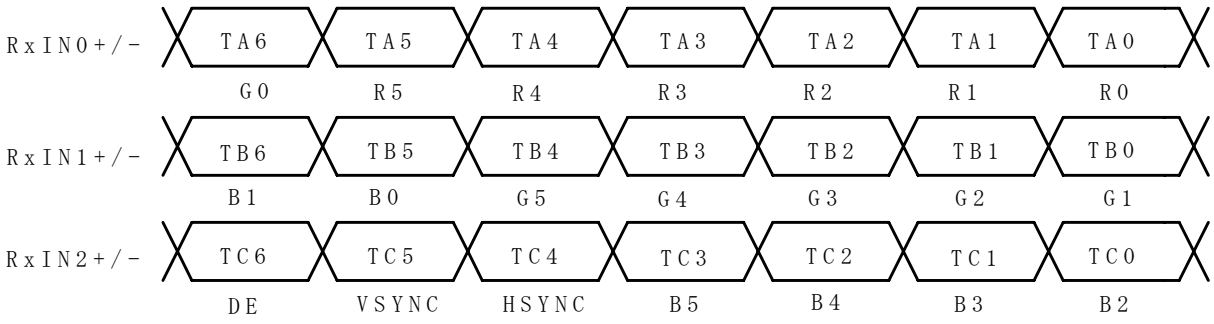
Terminal No.	Symbol	Function
1	NC	NC
2	V_{LED1-K}	LED1 Power Supply(Cathode)
3	V_{LED2-K}	LED2 Power Supply(Cathode)
4	V_{LED3-K}	LED3 Power Supply(Cathode)
5	V_{LED4-K}	LED4 Power Supply(Cathode)
6	NC	NC
7	V_{LED-A}	LED POWER SUPPLY(Anode)
8	NC	NC
9	NC	NC
10	Reserve	Reserve(NC)
11	Reserve	Reserve(NC)
12	NC	
13	Reserve	Reserve(NC)
14	Reserve	Reserve(NC)
15	GND	GND
16	CLK+	Positive Clock
17	CLK-	Negative Clock
18	GND	GND
19	RxIN2+	Positive LVDS differential data input (B2-B5, HS, VS, DE)
20	RxIN2-	Negative LVDS differential data input (B2-B5, HS, VS, DE)
21	GND	GND
22	RxIN1+	Positive LVDS differential data input (G1-G5, B0-B1)
23	RxIN1-	Negative LVDS differential data input (G1-G5, B0-B1)
24	GND	GND
25	RxIN0+	Positive LVDS differential data input (R0-R5, G0)
26	RxIN0-	Negative LVDS differential data input (R0-R5, G0)
27	GND	GND
28	GND	GND
29	VDD	+3.3V POWER SUPPLY
30	VDD	+3.3V POWER SUPPLY

Note 1) NC terminal should be open.

RECOMMENDED TRANSMITTER TRANSMITTER (THC63LVDF63A,THC63LVDM63A by THine Electronics,Inc.) TO LT070AC46100 INTERFACE ASSIGNMENT

Case1: 6Bit TRANSMITTER

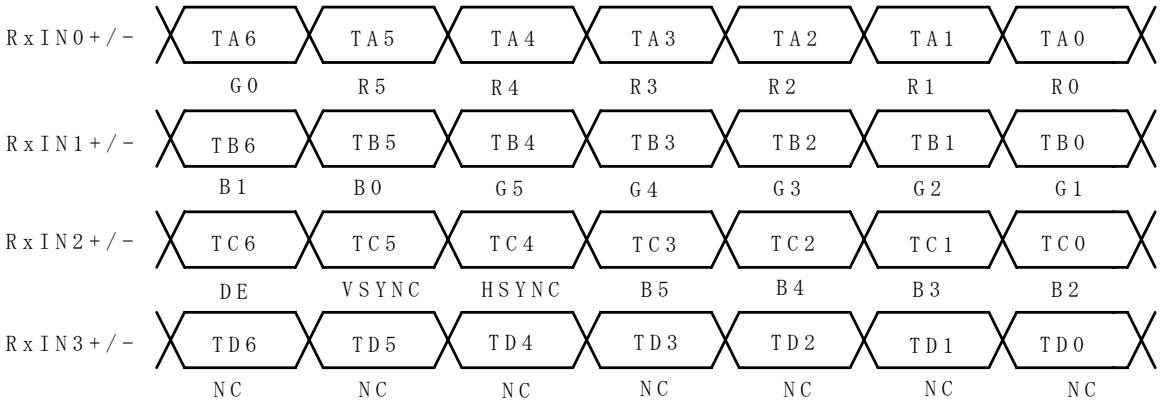
Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	To LT070AC46100 Interface(CN1)	
Symbol	Terminal	Symbol	Function		Terminal	Symbol
TA0	44	R0	Red Pixels Display Data (LSB)	TA- TA+	No.26 No.25	RxIN0- RxIN0+
TA1	45	R1	Red Pixels Display Data			
TA2	47	R2	Red Pixels Display Data			
TA3	48	R3	Red Pixels Display Data			
TA4	1	R4	Red Pixels Display Data			
TA5	3	R5	Red Pixels Display Data (MSB)			
TA6	4	G0	Green Pixels Display Data (LSB)			
TB0	6	G1	Green Pixels Display Data	TB- TB+	No.23 No.22	RxIN1- RxIN1+
TB1	7	G2	Green Pixels Display Data			
TB2	9	G3	Green Pixels Display Data			
TB3	10	G4	Green Pixels Display Data			
TB4	12	G5	Green Pixels Display Data (MSB)			
TB5	13	B0	Blue Pixels Display Data (LSB)			
TB6	15	B1	Blue Pixels Display Data			
TC0	16	B2	Blue Pixels Display Data	TC- TC+	No.20 No.19	RxIN2- RxIN2+
TC1	18	B3	Blue Pixels Display Data			
TC2	19	B4	Blue Pixels Display Data			
TC3	20	B5	Blue Pixels Display Data (MSB)			
TC4	22	HSYNC	H-Sync			
TC5	23	VSYNC	V-Sync			
TC6	25	DE	Compound Synchronization Signal			
CLK IN	26	NCLK	Data Sampling Clock	TCLK - TCLK +	No.17 No.16	CLK IN- CLK IN+



RECOMMENDED TRANSMITTER TRANSMITTER (THC63LVDF63A,THC63LVDM63A by THine Electronics,Inc.) TO LT070AC46100 INTERFACE ASSIGNMENT

Case2: 8Bit TRANSMITTER

Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	To LT070AC46100 Interface(CN1)	
Symbol	Terminal	Symbol	Function		Terminal	Symbol
TA0	51	R0	Red Pixels Display Data (LSB)	TA- TA+	No.26 No.25	RxIN0- RxIN0+
TA1	52	R1	Red Pixels Display Data			
TA2	54	R2	Red Pixels Display Data			
TA3	55	R3	Red Pixels Display Data			
TA4	56	R4	Red Pixels Display Data			
TA5	3	R5	Red Pixels Display Data (MSB)			
TA6	4	G0	Green Pixels Display Data(LSB)			
TB0	6	G1	Green Pixels Display Data	TB- TB+	No.23 No.22	RxIN1- RxIN1+
TB1	7	G2	Green Pixels Display Data			
TB2	11	G3	Green Pixels Display Data			
TB3	12	G4	Green Pixels Display Data			
TB4	14	G5	Green Pixels Display Data(MSB)			
TB5	15	B0	Blue Pixels Display Data (LSB)			
TB6	19	B1	Blue Pixels Display Data			
TC0	20	B2	Blue Pixels Display Data	TC- TC+	No.20 No.19	RxIN2- RxIN2+
TC1	22	B3	Blue Pixels Display Data			
TC2	23	B4	Blue Pixels Display Data			
TC3	24	B5	Blue Pixels Display Data (MSB)			
TC4	27	HSYNC	H-Sync			
TC5	28	VSYNC	V-Sync			
TC6	30	DE	Compound Synchronization Signal			
TD0	50	NC	Non Connection (open)	TD- TD+	-	-
TD1	2	NC	Non Connection (open)			
TD2	8	NC	Non Connection (open)			
TD3	10	NC	Non Connection (open)			
TD4	16	NC	Non Connection (open)			
TD5	18	NC	Non Connection (open)			
TD6	25	NC	Non Connection (open)			
CLK IN	31	NCLK	Data Sampling Clock	TCLK- TCLK+	No.14 No.15	CLK- CLK+



256k (k=1024) COLORS COMBINATION TABLE

	Display	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0	Gray Scale Level
Basic Color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	L	L	L	L	L	L	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray Scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L 0
	Dark ↑ ↓ Light	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L 1
		L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L 2
					:						:						:			L3…
					:						:						:			L60
		H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L61
		H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L62
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	Red L63
Gray Scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L 0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L 1
		L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L 2
					:						:						:			L3…
					:						:						:			L60
		L	L	L	L	L	L	H	H	H	H	L	H	L	L	L	L	L	L	L61
		L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L62
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	Green L63
Gray Scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L 0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L 1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L 2
					:						:						:			L3…
					:						:						:			L60
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	H	L61
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L62
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	Blue L63
Gray Scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L 0
	Dark ↑ ↓ Light	L	L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L 1
		L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L	L 2
					:						:						:			L3…
					:						:						:			L60
		H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L61
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	L62
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L63

FOR SAFETY

LCD module is generally designed with precise parts to achieve light weighted thin mechanical dimensions.
In using our Modules, make certain that you fully understand and put into practice the warnings and safety precautions detailed in Engineering Information No.EE-N001,"CAUTIONS AND INSTRUCTIONS FOR TOSHIBA LCD MODULES".
Refer to individual specifications and TECHNICAL DATA sheets (hereinafter called "TD") for more detailed technical information.

1) SPECIAL PURPOSES

A) Toshiba Mobile Display Co., Ltd 's Standard LCD Modules have not been customized for operation in extreme environments or for use in applications where performance failures could be life-threatening or otherwise catastrophic.

B) Since Toshiba Mobile Display Co., Ltd 's Standard LCD Modules have not been designed for operation in extreme environments, they must never be used in devices that will be exposed to abnormally high levels of vibration or shock which exceed Toshiba Mobile Display Co., Ltd 's published specification limits.

C) In addition, since Toshiba Mobile Display Co., Ltd Standard LCD Modules have not been designed for use in applications where performance failures could be life-threatening or catastrophic, they must never be installed in aircraft navigation control systems (such as, but not limited to Traffic Collision Avoidance System and Air Traffic Indicator), in military defense or weapons systems, in critical industrial process-control systems (e.g., those involved in the production of nuclear energy), or in critical medical device or patient life-support systems.

2) DISASSEMBLING OR MODIFICATION

DO NOT DISASSEMBLE OR MODIFY the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display.
Toshiba Mobile Display Co., Ltd doses not warrant the module, if customer disassembled or modified it.

3) BREAKAGE OF LCD PANEL

DO NOT INGEST liquid crystal material, DO NOT INHALE this material, and DO NOT CONTACT the material with skin, if LCD panel is broken and liquid crystal material spills out.
If liquid crystal material comes into mouth or eyes, rinse mouth or eyes out with water immediately.
If this material contact with skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

4) GLASS OF LCD PANEL

BE CAREFUL WITH CHIPS OF GLASS that may cause injuring fingers or skin, when the glass is broken.

5) ELECTRIC SHOCK

DISCONNECT POWER SUPPLY before handling LCD module.
DO NOT TOUCH the parts inside LCD module and the fluorescent lamp's connector or cables in order to prevent electric shock, because high voltage is supplied to these parts from the inverter unit while power supply is turned on.

6) ABSOLUTE MAXIMUM RATINGS AND POWER PROTECTION CIRCUIT

DO NOT EXCEED the absolute maximum rating values under the worst probable conditions caused by the supply voltage variation, input voltage variation, variation in parts' constants, environmental temperature, etc., otherwise LCD module may be damaged.
Employ protection circuit for power supply, whenever the specification or TD specifies it.
Suitable protection circuit should be applied for each system design.

7) RECOMMENDED OPERATION CONDITIONS

The performance and quality of the LCD panel are warranted only when the LCD panel is used within “the recommended operation conditions”. Toshiba Mobile Display Co., Ltd. never warrants the performance and quality of the LCD panel when you use the LCD panel over “the recommended operation conditions”, although within “the absolute maximum rating”.
To use the LCD panel over “the recommended operation conditions” may have bad influence on the characteristics and reliability of the LCD panel and may shorten the life of the LCD panel.
Therefore, when designing the whole set, not to be over “the recommended operation conditions”, you should fully take care of supply voltage change, characteristic of connection parts, serge of input-and-output line, and surrounding temperature.

8) DISPOSAL

When dispose LCD module, obey to the applicable environmental regulations.