

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

- FEATURES:**(1)3.5" QVGA color display  
 (2)LED B/L (8pcs.(4pcs. x 2rows))  
 (3)Replaceable structure of LED unit  
 (4)RoHS compatible

**TENTATIVE****RoHS compatible****MECHANICAL SPECIFICATIONS**

Item	Specifications
Dimensional Outline (typ.)	90.0 (W) x 72.0 (H) x 7.5max. (D) mm
Number of Pixels	320 (W) x 240 (H) pixels
Active Area	71.04 (W) x 53.28 (H) mm
Pixel Pitch	0.22 (W) x 0.22 (H)
Weight (approximately)	60 g
Backlight	Sidelight (LEDs)

**ABSOLUTE MAXIMUM RATINGS**

Item	Min.	Max.	Unit	
Supply Voltage	(V <sub>DD</sub> )	-0.3	4.0	V
	(V <sub>LED</sub> )	0	20.0	V
Input Signal Voltage	(V <sub>IN</sub> )	-0.3	V <sub>DD</sub> +0.3	V
Operating Temperature *1	-20	70	°C	
Storage Temperature	-30	80	°C	
Storage Humidity (Max. wet bulb temperature = 39°C)	10	90	%(RH)	

\*1 : Only operation is guaranteed at Operating Temperature. Display quality is evaluated at +25°C.

**ELECTRICAL SPECIFICATION (T<sub>a</sub>=25°C) (RECOMMENDED OPERATION CONDITION)**

Item	Min.	Typ.	Max.	Unit	Remarks	
Supply Voltage	(V <sub>DD</sub> )	3.0	3.3	3.6	V	
	(V <sub>LED</sub> )	12.0	12.4	13.2	V	I <sub>LED</sub> =15.0mA, between V <sub>LED+</sub> to V <sub>LED-</sub>
High Level Input Voltage	(V <sub>IH</sub> )	0.8 V <sub>DD</sub>	---	V <sub>DD</sub>	V	
Low Level Input Voltage	(V <sub>IL</sub> )	0	---	0.2 V <sub>DD</sub>	V	
Current Consumption	(I <sub>DD</sub> ) *2	---	150	---	mA	
	(I <sub>LED</sub> ) *3	---	15.0	25.0	mA	
Power Consumption *2 *3	---	0.87	---	W	I <sub>LED</sub> =15mA	

\*2 : 8 color bars pattern \*3 : Except the efficiency of LED driver

**OPTICAL SPECIFICATION (T<sub>a</sub>=25°C)**

Item	Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio	(CR)	250	500	---	---
Viewing Angle (CR ≥ 10)	(Upper+Lower)	---	120	---	°
	(Left+Right)	---	140	---	°
Response Time	(T <sub>ON</sub> )	---	15	50	ms
	(T <sub>OFF</sub> )	---	25	50	ms
Luminance	(L)	250	350	---	cd/m <sup>2</sup> I <sub>LED</sub> =15mA
Lamp Life Time (MTBF) *4 *5			20,000		h I <sub>LED</sub> =15mA

\*4 : Conditions ; T<sub>a</sub>=25°C, continuous lighting

\*5 : Definitions of failure ; 1) Lcd luminance becomes half of the minimum value. 2) LED doesn't light normally.

\*The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by Toshiba Matsushita Display Technology or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Toshiba Matsushita Display Technology or others.

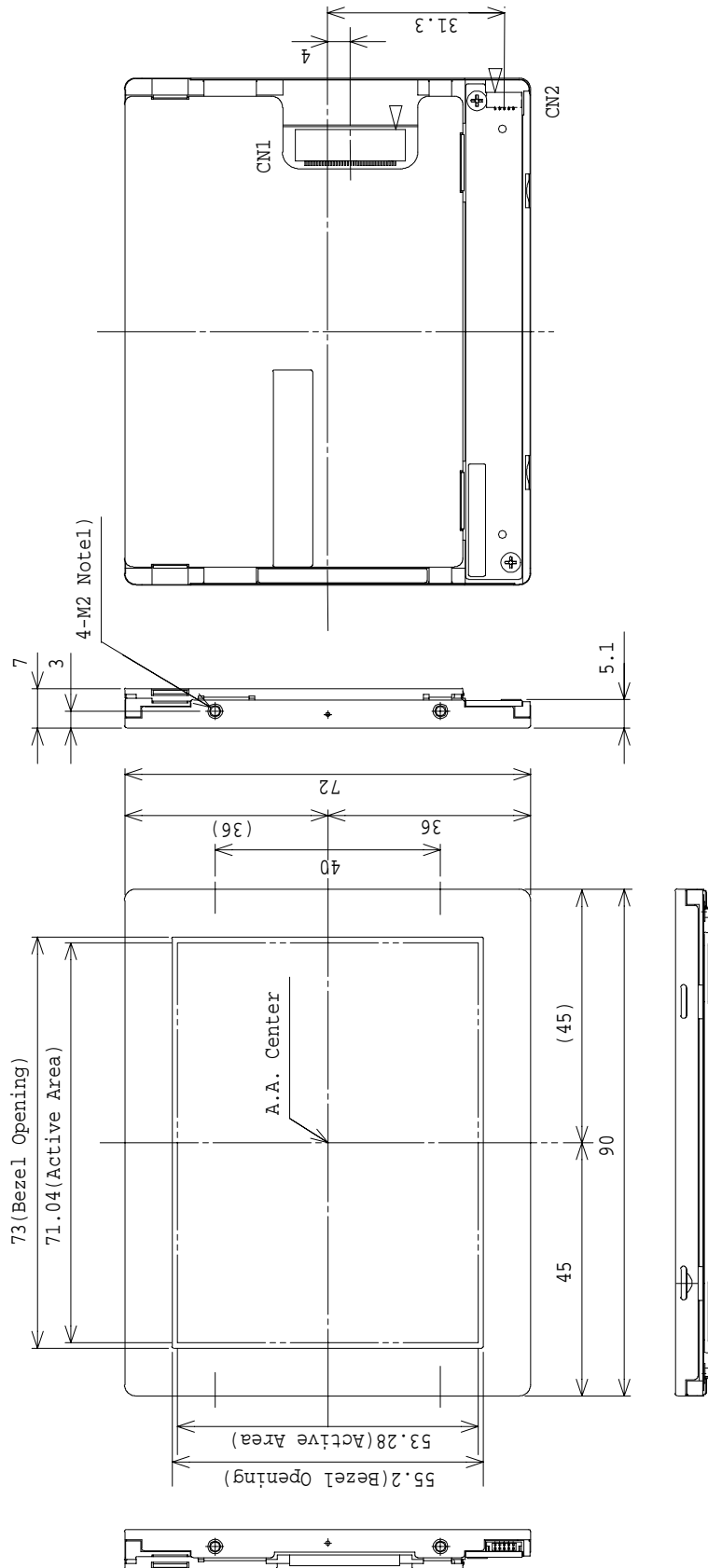
\*The information contained herein may be changed without prior notice. It is therefore advisable to contact Toshiba Matsushita Display Technology before proceeding with the design of equipment incorporating this product.

DIMENSIONAL OUTLINE

**TENTATIVE**

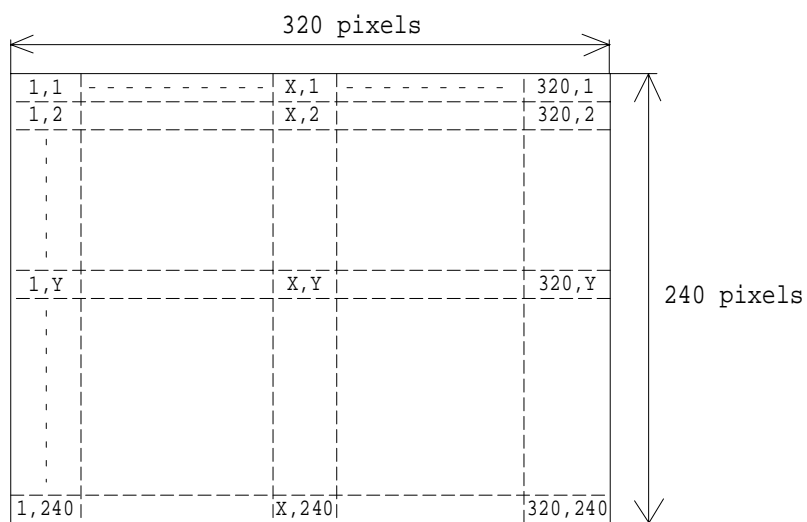
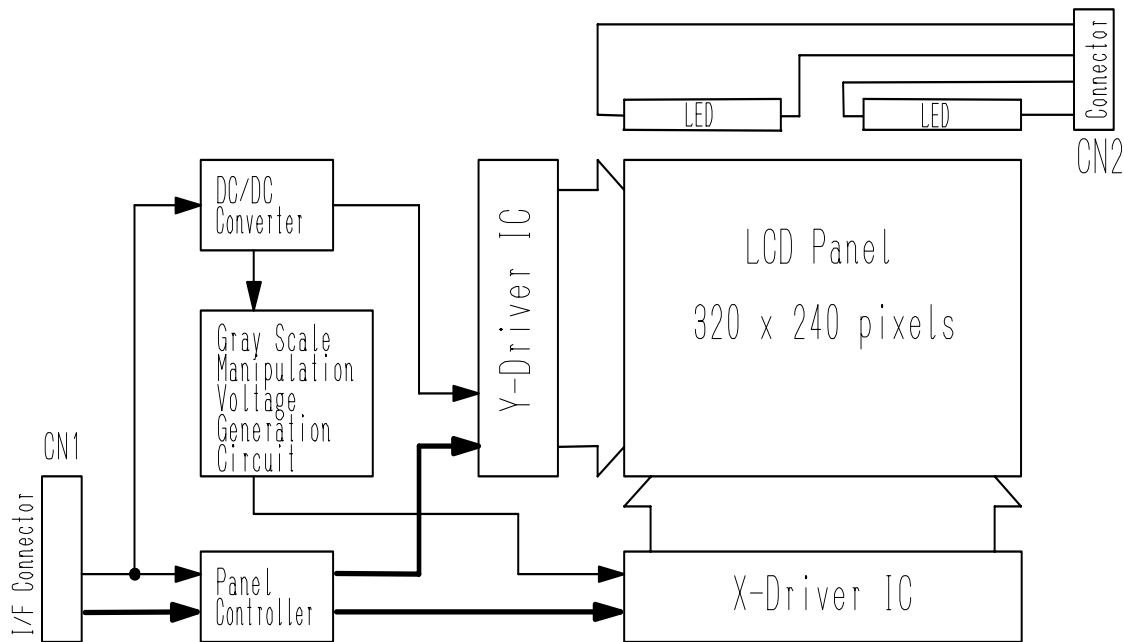
Unit : mm

Standard tolerance : ± 0.5

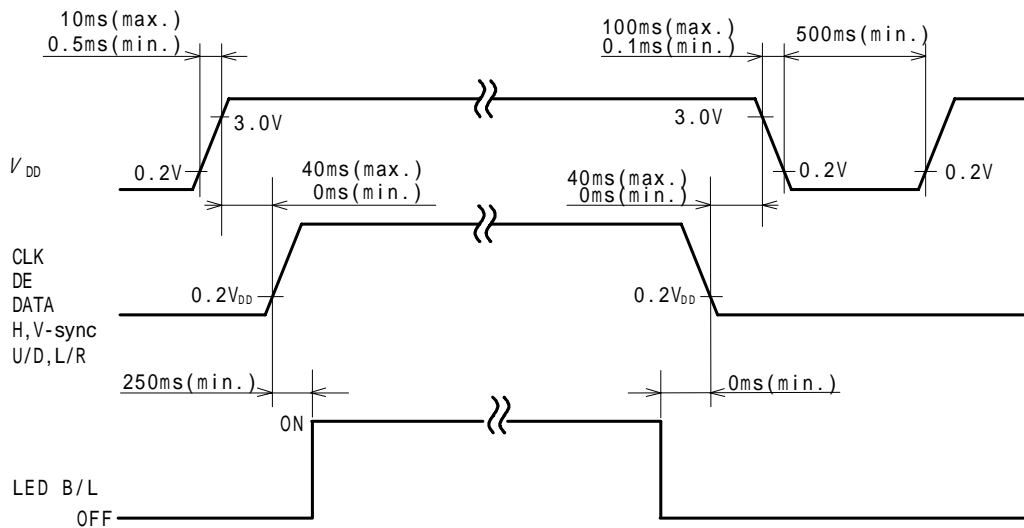


Note1) Max.depth: 3.0mm

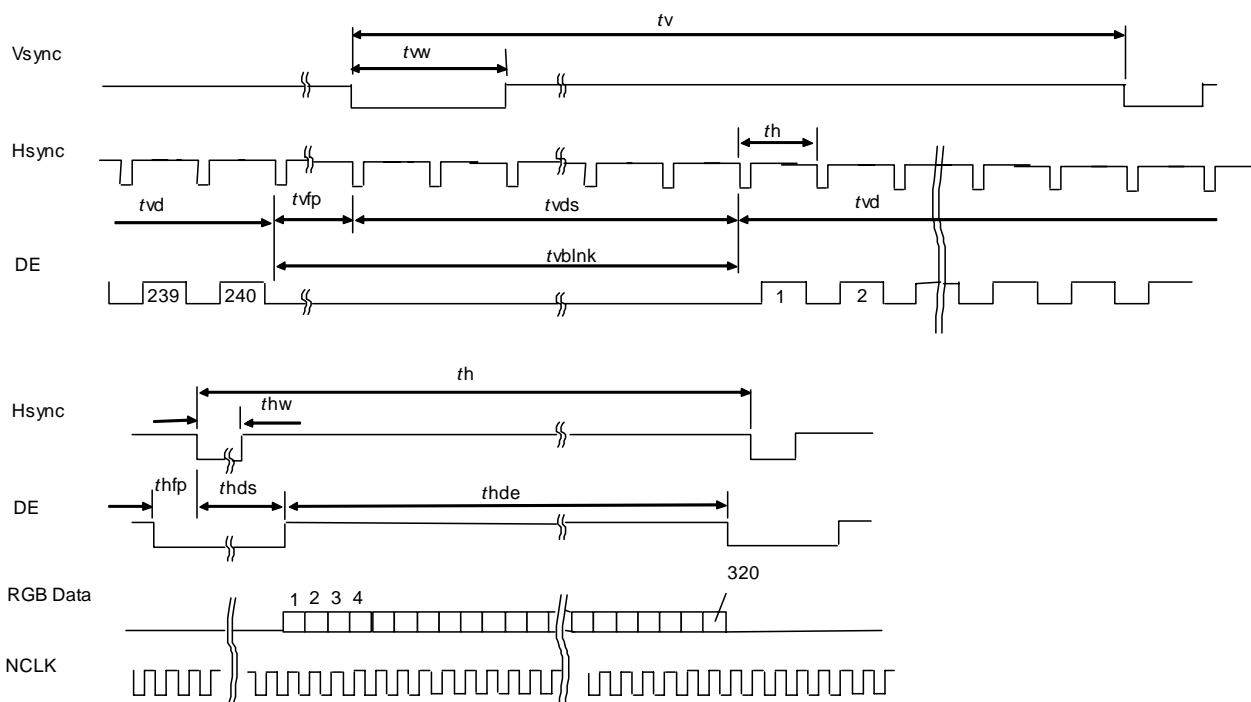
**BLOCK DIAGRAM**



**SEQUENCE OF POWER SUPPLIES AND SIGNALS**



## TIMING CHART



## TIMING SPECIFICATION

Item	Symbol	min.	typ.	Max.	unit
Frame Period	$tv$	260	262	340	$th$
		15.9	16.67	17.8	ms
Vertical blanking Term	$tvblnk$	20	22	100	$th$
V-sync Pulse Width	$tvw$	1	2	3	$th$
Vertical Front Porch	$tvfp$	2	---	---	$th$
Vertical Data Sync Period	$tvds$	18	---	---	$th$
Vertical Display Term	$tvde$	240	240	240	$th$
Horizontal Period	$th$	410	424	436	$tc$
		49.5	63.6	64.1	us
H-sync Pulse Width	$thw$	3	51	80	$tc$
Horizontal Front Porch	$thfp$	8	---	---	$tc$
Horizontal Data Sync Period	$thds$	16	---	---	$tc$
Horizontal Display Term	$thde$	320	320	320	$tc$
Clock Period	$tc$	120	150	156	ns
Clock "L" Time	$tcl$	7	---	---	ns
Clock "H" Time	$tch$	7	---	---	ns
Data Setup Time	$tds$	5	---	---	ns
Data Hold Time	$tdh$	10	---	---	ns

**CONNECTOR PIN ASSIGNMENT FOR INTERFACE**CN1 INPUT SIGNAL

Connector : IMSA-9637S-33A-GF (IRISO ELECTRONICS CO., LTD.)

0.5mm pitch, Bottom contact type, Gold plating

Terminal No.	Symbol	Function
1	GND	
2	CLK	Clock
3	H-sync	Horizontal Sync
4	V-sync	Vertical Sync
5	GND	
6	R0	Red Display Data (LSB)
7	R1	Red Display Data
8	R2	Red Display Data
9	R3	Red Display Data
10	R4	Red Display Data
11	R5	Red Display Data (MSB)
12	GND	
13	G0	Green Display Data (LSB)
14	G1	Green Display Data
15	G2	Green Display Data
16	G3	Green Display Data
17	G4	Green Display Data
18	G5	Green Display Data (MSB)
19	GND	
20	B0	Blue Display Data (LSB)
21	B1	Blue Display Data
22	B2	Blue Display Data
23	B3	Blue Display Data
24	B4	Blue Display Data
25	B5	Blue Display Data (MSB)
26	GND	
27	DE	Data Enable
28	VDD	3.3V
29	VDD	3.3V
30	R/L	Horizontal Reverse("L" level or Open : Normal, "H" level : Reverse)
31	U/D	Vertical Reverse("H" level : Normal, "L" level or Open : Reverse)
32	GND	
33	NC	Non Connection

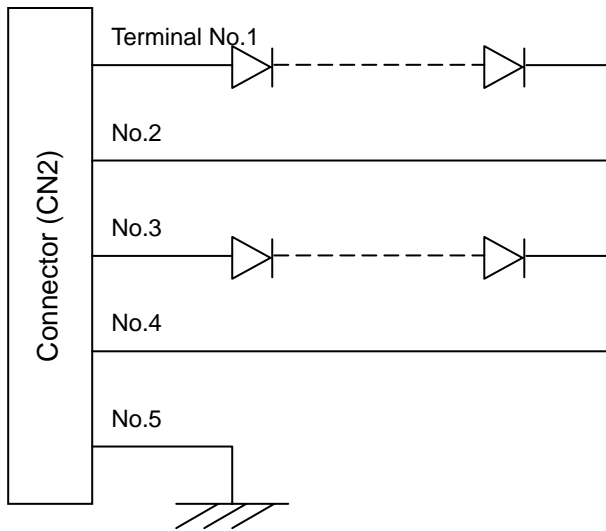
CN2 LED POWER SOURCE

Connector : SM05B-SURS-TF (LF)(SN) ( JAPAN SOLDERLESS TERMINAL MFG CO., LTD. )

Mating Connector : 05SUR-32S or 05SUR-36L ( JAPAN SOLDERLESS TERMINAL MFG CO., LTD. )

Terminal No.	Symbol	Function
1	V <sub>LED1+</sub>	LED1 POWER SUPPLY(Anode)
2	V <sub>LED1-</sub>	LED1 POWER SUPPLY(Cathode)
3	V <sub>LED2+</sub>	LED2 POWER SUPPLY(Anode)
4	V <sub>LED2-</sub>	LED2 POWER SUPPLY(Cathode)
5	GND	

**EQUIVALENT CIRCUIT OF LED**



## 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 L L L	---
	Blue	L L L L L L L	L L L L L L L	H H H H H H H	---
	Green	L L L L L L L	H H H H H H H	L L L L L L L	---
	Light Blue	L L L L L L L	H H H H H H H	H H H H H H H	---
	Red	H H H H H H H	L L L L L L L	L L L L L L L	---
	Purple	H H H H H H H	L L L L L L L	H H H H H H H	---
	Yellow	H H H H H H H	H H H H H H H	L 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 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 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 L L	L 1
		L L L L L L L	L 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 L L L	L61
	H H H H H L L	L L L L L L L	L L L L L L L	L62	
Red	H H H H H H H	L L 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 L L	L 0
	Dark ↑ ↓ Light	L L L L L L L	L L L L L L H	L L L L L L L	L 1
		L L L L L L L	L L L L L H L	L L L L L L L	L 2
		⋮	⋮	⋮	L3... L60
		L L L L L L L	H H H H L H L	L L L L L L L	L61
	L L L L L L L	H H H H H H L	L L L L L L L	L62	
Green	L L L L L L L	H H H H H H H	L 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 L L	L 0
	Dark ↑ ↓ Light	L L L 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 L L L H L	L 2
		⋮	⋮	⋮	L3... L60
		L L L L L L L	L L L L L L L	H H H H L H L	L61
	L L L L L L L	L L L L L L L	H H H H H H L	L62	
Blue	L L L L L L L	L L L L L L L	H 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 L L	L 0
	Dark ↑ ↓ Light	L L L L L L H	L L L L L L H	L L L L L L H	L 1
		L L L L L H L	L L L L L H L	L L L L L H L	L 2
		⋮	⋮	⋮	L3... L60
		H H H H L H L	H H H H L H L	H H H H L H L	L61
	H H H H H L L	H H H H H L L	H H H H H L L	L62	
White	H H H 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 Matsushita Display Technology'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 Matsushita Display Technology'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 Matsushita Display Technology's published specification limits.

C) In addition, since Toshiba Matsushita Display Technology 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 Matsushita Display Technology does 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 Matsushita Display Technology 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, surge of input-and-output line, and surrounding temperature.

**8) DISPOSAL**

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