Revision History

Date	Rev.	Sheet (New)	Item	Old	New	Reason
02/11/28	15	12	Power Supply Voltage	Vcc: min2.80 typ2.85 max2.90	Vcc: min2.72typ2.80 max2.87	Customer request
		-	Driver IC	MN838892	MNF8921	Improvement of White noise

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←# Special   ←& Addition   ← Change

Specification for TFT-LCD Module LTM018A02A

Caution and Handling Precausion

Introduction

Considerations to be given when creating an instruction manual for a system incorporating the module:

To allow the end user of a system incorporating this product to use it correctly, be sure to follow the marks attached to individual paragraphs under this section to incorporate the purports of the paragraphs into the instruction manual of the system or on the labels.

○ **mark: Be sure to include the paragraphs in the manual. (The paragraphs contain PL-related matters.)**

□ **mark: It is recommended that the paragraphs should be included.**

⚠ Warning for Safety

(1)   Do not use the module for any special application.

The LCD module covered by this specification has not been intended or designed for any applications or devices where its failure or malfunction could directly jeopardize human lives, or might adversely affect human health (including atomic power control, air and space crafts, combustion control, or various safety devices).

In case this module should be used for any of the above applications or devices, be sure to consult our office in advance.   Please understand that our company will not be liable for any damages that may have occurred as a result of using this product without consulting our company beforehand.

(2)   Be sure to prevent any electric shock accident from occurring.

Disconnect the power supply before handling an LCD module.   Do not touch the circuitry inside the module in operation.   Touching any of the electrode section for backlight, cables, and connectors, where high voltages are applied, may cause an electric shock accident to occur while the unit is in operation.

○**(3)   Do not disassemble or modify the module.**

Disassembly or any type of modifications to the module should never be attempted.   Disassembly of the module may cause an electric shock accident to occur or may damage a precision part inside the module or may lead to a defect on the surface, or may allow intrusion of foreign materials into the module.

In case the module should be used after having been disassembled or modified, its circuitry or parts may burn out or be damaged due to attachment of a foreign material, or when some circuitry parts may malfunction.

Any module disassembled or modified by a customer will not be covered by the warranty offered by Toshiba Matsushita Display Technology.

○**(4)   Do not touch the liquid crystal leaked out form the surface of the module.**

In case the surface of a module should inadvertently get damaged, causing the liquid inside (LCD) to leak out, never ingest, or inhale the liquid, or allow it to contact the skin.

In the event that liquid crystal should enter an eye or a mouth, rinse it with water as soon as possible.   If liquid crystal should adhere to the skin or to clothes, remove it with a piece of pad etc. soaked with alcohol, and wash the skin or the clothes with water and soap.

Do not leave the skin or the clothes with the material attached, or the skin may be injured or the clothes may get damaged.

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○**(5)** **Be careful with chips of glasses broken off from the display surface.**
Should the display surface be broken, take full measures for protecting the hand etc. from being injured by a chip of glasses. Although film is adhered on the display surface to protect the glasses from being scattered when it should be broken, a broken piece of glass may injure the hand when it is touched.

(6) **Do not allow the absolute maximum rating to be exceeded.**
The absolute maximum rating values specified in this specification must be observed.
These are the rating values that are specified for this LCD module that must not be exceeded under any circumstances. It is possible that parts used in the circuits may burned out or be damaged, or the characteristics of the module may never be restored if the module should be used with these ratings being exceeded. Therefore, it is indispensable that any design for using the LCD module should be drafted so as to eliminate any possibility for the absolute maximum rating values to be exceeded under any circumstances, by taking ambient temperatures, fluctuations in the input signals, and variation in the qualities of electrical parts being used into consideration.

(7) **Concerning the Power Supply Circuit Protection Device:**
In accordance with the conditions for use of the system incorporating the LCD module, be sure to examine the power supply circuit protection device in the case of any failure of the module.
Because there is no fuse installed inside the module, the PCB or some of the parts may burn out or be damaged if a foreign object should be attached to, or part of the circuitry should fail.

(8) **When discarding the module:**
Discarding of the module may be subject to the regulations of the local government. Make sure that the local regulations governing the area concerned are strictly observed when the module should be discarded.

Designing a System by Incorporating the Module

(1) **Mounting fixtures:**
When installing this module into a system, make sure that all mounting fixtures including mounting screws and holes are used in accordance with the provisions specified in this specification, and that the installation is performed in correct dimensions appropriate for the shapes and dimensions of the mounting fixtures.

(2) **For prevention of twists and warps:**
When installing this module into a system, pay attention to designing of the case for the system to ensure that the module is protected from any stresses including a twist or a warp etc. from being applied.

(3) **When applying input signals:**
Be sure to supply the power in accordance with the recommended conditions.
All input signals should be applied to the module at the same time or after the module is turned on. When turning off the module, be sure to turn it off after or at the same time the input signal is turned off. Any input made outside the recommended conditions may cause the module to malfunction or the display quality to deteriorate.

(4) **Recommendation for use of the protective cover and UV protection filter for the display surface:**
When the module is to be used under a severe condition such as out of doors, it is recommended that a transparent protective cover should be used over the display section within the bezel opening to protect the display surface from scratches or to prevent dust or water intruding into the module.
Furthermore, in case the module is to be used under direct sunlight for a long time, use of UV protection filter (that cuts off UV with a wavelength lower than 390 nm) is recommended.
In addition, care should be taken to protect the effective display section from direct sunlight to prevent deterioration of the PCB and FPC sections.

(5) **Concerning Burn-in of the display:**
When designing a system to incorporate this module, it is requested that proper considerations should be taken to prohibit any fixed patterns to be displayed for a long time on the display screen. Protracted and continued displaying of a same pattern or application of an input signal outside the recommended conditions (See item (3) above, and section 2.4.4 Specification for timing), a phenomenon called "burn-in" may occur, in which a pattern that has been displayed for a long time may remain on the display screen even after it has been changed.

Handling and Operating the Module

(1) Caution for transportation:
When transporting the LCD module with hand, be sure to hold the LCD cell and the plastic frame portion together. Do not apply any stress or load to the FPC section on the rear surface, or a malfunction may occur.
Take precautionary measures against cutting the hand with glass edges etc., including wearing of fingertipps, or soft, dust-free gloves.

(2) Prevention measures against electrostatic discharge damages:
See to it that sufficient prevention measures are taken against electrostatic dischage damages.
It is possible that the C-MOS LSI inside the module should be damaged by static electricity. Be sure to handle any modules on the floor or the worktable after placing a conductive mat on them, with the worker wearing a grounding belt to protect the modules from exposure to static electricity.

(3) Caution against foreign objects and contamination:
It is recommended that the modules should be handed in cleanest possible rooms free from dust.
Touching the display surface may cause contamination or defects, etc. Be sure not to touch the module display surfaces after the protective covers are removed at the receiving inspection or when installing the module into a system.

(4) Concerning the protective film for the display surface:
It is recommended that the process for peeling the protective film from the display surface of the module should be performed as close as possible to the end of the final process of the assembly to protect the display surface from dust or defects.
When removing a sheet of protective film, use tweezers with not sharp, Teflon-covered tips to pick up an end of the film, or paste a piece of adhesive cellophane tape to an end of the film to pick it up. Then, slowly peel the protective film off by taking one second or more. If the film is quickly peeled off, the static electricity may be generated to damage the electic circuitry inside the module.

☐**(5) When removing contamination from the display surfaces:**
In case the display surface of the module should get contaminated, clean the surface by lightly wiping it off with a piece of absorbent cotton or soft, clean cloth, or by lightly blowing the surface before wiping it.
In case this cannot remove the contamination, it is recommended that a piece of absorbent cotton or a piece of soft, clean cloth damped with petroleum benzine should be used to clean the surface. At this time, make sure that the petroleum benzine should remain only on the surface and not be allowed to intrude into the module. This type of solvents can easily damage the internal part of the module including ICs and PCBs.

☐**(6) Do not allow drops of water or chemicals to remain on the display surface.**
Care should be taken not to allow the display surface to be left alone with drops of water or of any type of chemical remaining on it. It is recommended any drops of water or of chemicals attached to the display surface should be removed as soon as possible with a piece of absorbent cotton or soft cloth. Drops of water or chemicals left alone on the surface may discolor the surface or cause it to be stained.
Water content allowed to enter the module may cause it to malfunction.

(7) Do not handle the module in a corrosive atmosphere.
Do not allow the module to be exposed to a gas. Do not use it in any atmosphere other than the nomal atmosphere. This may cause the module to malfunction.

(8) Do not warp or twist the module during assembly work.
When installing or incorporating the module into a system, be careful not to allow the module to get warped or twisted.
A twist or a warp, even if it is temporary, may cause the module to malfunction.

(9) Protect the module from mechanical shocks.
Make sure that no high mechanical shock be applied to the module, including those from dropping or from impacts. This may damage the glass of the module display surface or the backlight section, which may lead to a futher damage in the module.

☐ **(10) Protect the display surface of the module from application of pressures.**
Be sure not to apply any external forces to the display surface of the module, such as by pressing it forcefully. This may damage the surface or cause the display to malfunction, leading to a failure of the module.

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□**(11) Protect the display surface from defects.**

Be sure not to apply a hard object such as a tool against the display surface of the module, or press or scratch it with the tool.

Make sure, in addition, that no heavy objects including a tool etc. should be placed on top of the display surface, nor several modules should be stacked on top of each other.   This may lead to a defect or a trace or even a breakage of the display surface, because the lightguide used on the display surface is very soft and vulnerable.

(12) When inserting connectors into the module:

When inserting an board-to-board connector into a connector of the module, care should be taken to ensure that no strong external force is applied to the connector on the module side.

A strong external force applied to the PCB or the FPC may damage their connections.   When assembling a module into a system, pay extra attention to ensure that no part such as the FPC etc. should be caught between the case of the system and the module.

Make sure that the input signal connector of a module is securely and correctly connected to the connector on the system, not on a skew or in an incomplete condition.

Inputting a signal etc. into the module with connectors incorrectly inserted may cause a circuit component or components to malfunction.

(13) Do not supply the power to the module when performing installation or assembly work.

Be sure to disconnect the system from the power when performing installation or assembly work on the module.

If a connector of the module is disconnected or connected with the system power turned on, the electric circuits in the module may be damaged.   In case it should become necessary to supply the power to the module in the testing or inspection process, be sure to use the power that satisfy the power supply sequence as specified under 3. Recommended Operating Conditions

Storage and Transportation

(1) Storage under a high temperature and humidity condition:

It is recommended that the modules should not be stored under a high temperature and humidity condition (higher than 35ºC and 70% R.H.) for an extended period of time (about one month or more).   This may deteriorate the quality level of the display.

In case it becomes necessary to store the modules for an extended period of time, make sure that the modules are stored at a temperature range between 0 and 35ºC and at a dry place with a relative humidity of 70% or lower.

(2) Block strong ultraviolet rays.

When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

□**(3) No condensation**

It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.   In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

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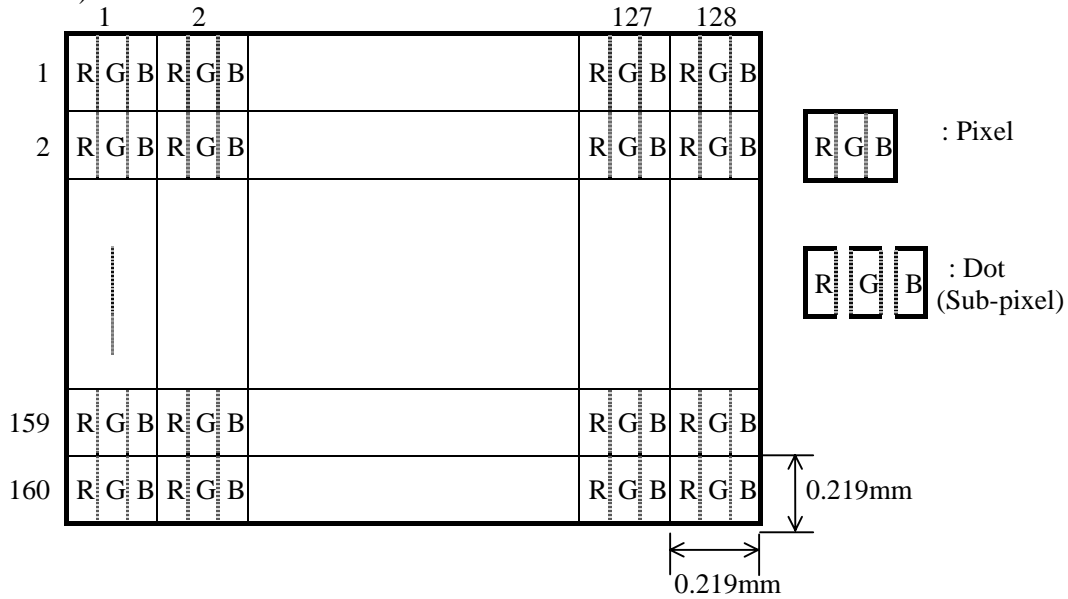
1. Scope of Application
    This specification shall be applicable to TFT LCD Module LTM018A02A, designed for cellular phones
    .

2. Product Specifications
    2.1 General Specifications

Item	Specifications	Remark
Display Mode	TN color (260k colors under normal driving mode) Transflective type, Normally white	
Viewing Direction	6 o'clock (lower side of the panel has better viewing angle) (Direction with no inversion of gray scale.)	
Driving Method	TFT active matrix	
Input Signals	CPU I/F	
Outside Dimensions	34.2 (W) × 47.0 × (H) × 3.1(D) (typ.) (mm)	
Active area	28.03(W) × 35.04 (H) (mm)	
Viewing area	29.432 (W) × 36.44(H) (mm))	
Number of Pixels	128 (W) × 160 (H)	1)
Pixel Pitch	0.219 (W) × 0.219 (H) (mm)	1)
Pixel Arrangement	RGB vertical stripes	1)
Weight	7.5 g (typ.)	

Note 1)

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2.2   Absolute Maximum Ratings [1]

Item	Symbol	Min.	Max.	Unit	Remark
LED Forward Direction Current[3]	I_f		30	mA	Per piece of LED
LED DC Reverse Withstand Pressure[3]	V_R		5	V	Per piece of LED
LED Permissible Loss[3]	P_D		120	mW	Per piece of LED
LED Peak Pulse Forward Direction Current[3]	I_{FP}		100	mA	Per piece of LED Pulse width $\leq$10ms, Duty ratio$\leq$1/10
Operating Ambient Temperature [2]	T_{op}	-20	+70	˚C	
Operating Ambient Humidity [2]	H_{op}	10	90	% (RH)	
Storage Temperature [2]	T_{stg}	-30	+80	˚C	
Storage Humidity [2]	H_{stg}	10	90	% (RH)	

Note 1)   The absolute maximum ratings are the values that must not be exceeded at any time for this product. It is not allowed for any of these ratings to be exceeded. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.
Therefore, when desigining a system incorporating the module, make sure that adequate attentions be paid to the variations in the supply voltages, the characteristics of parts that are connected, surges in the input and output lines, and the ambient temperatures.

Note 2)   The diagram below indicates the peripheral environment of the module. The wet bulb temperature should be kept under 39˚C and there should be no condensation.
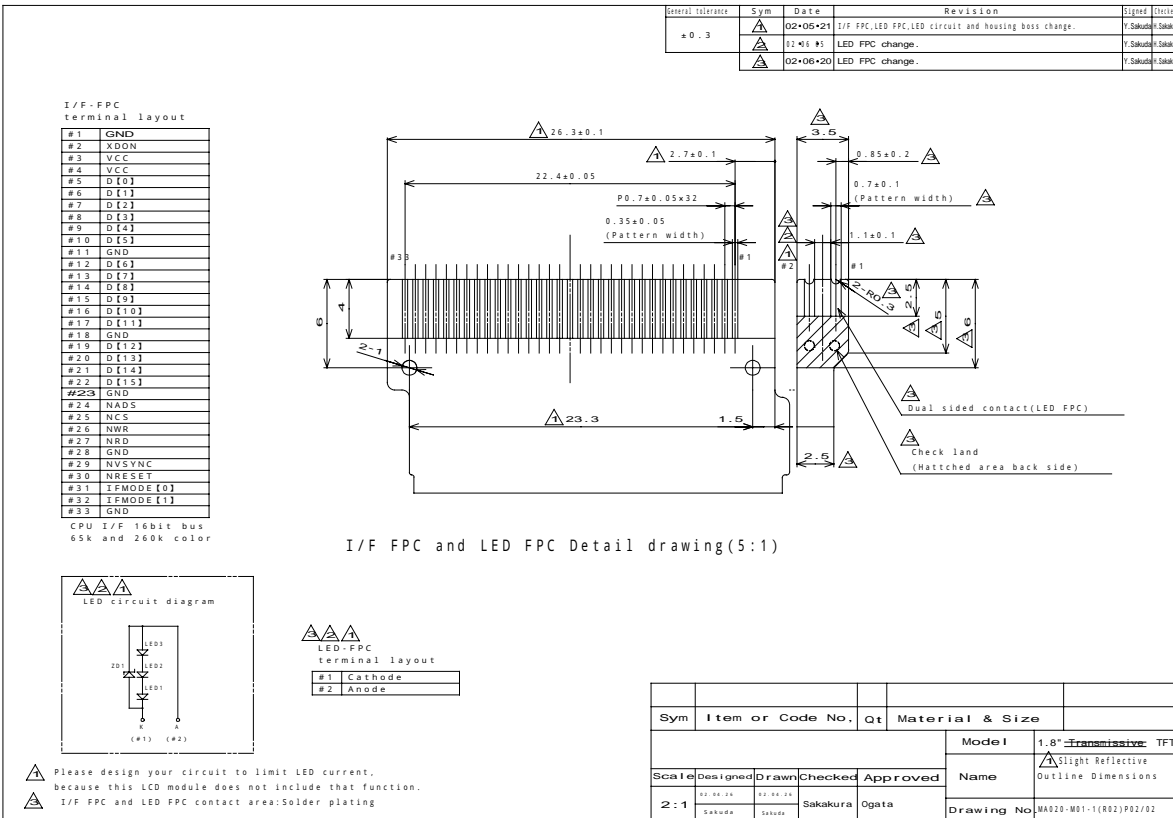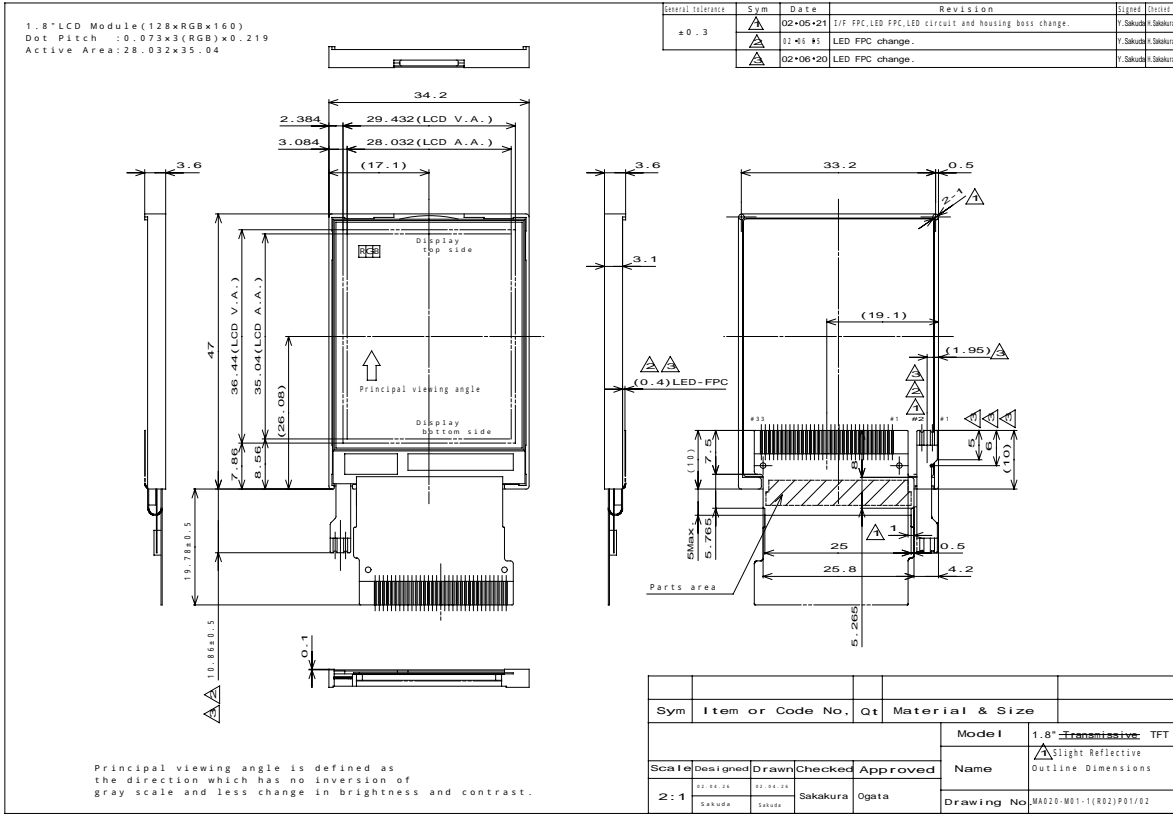
Note 3)   Value for one LED under 25 . Please use under safety area shown as below chart.

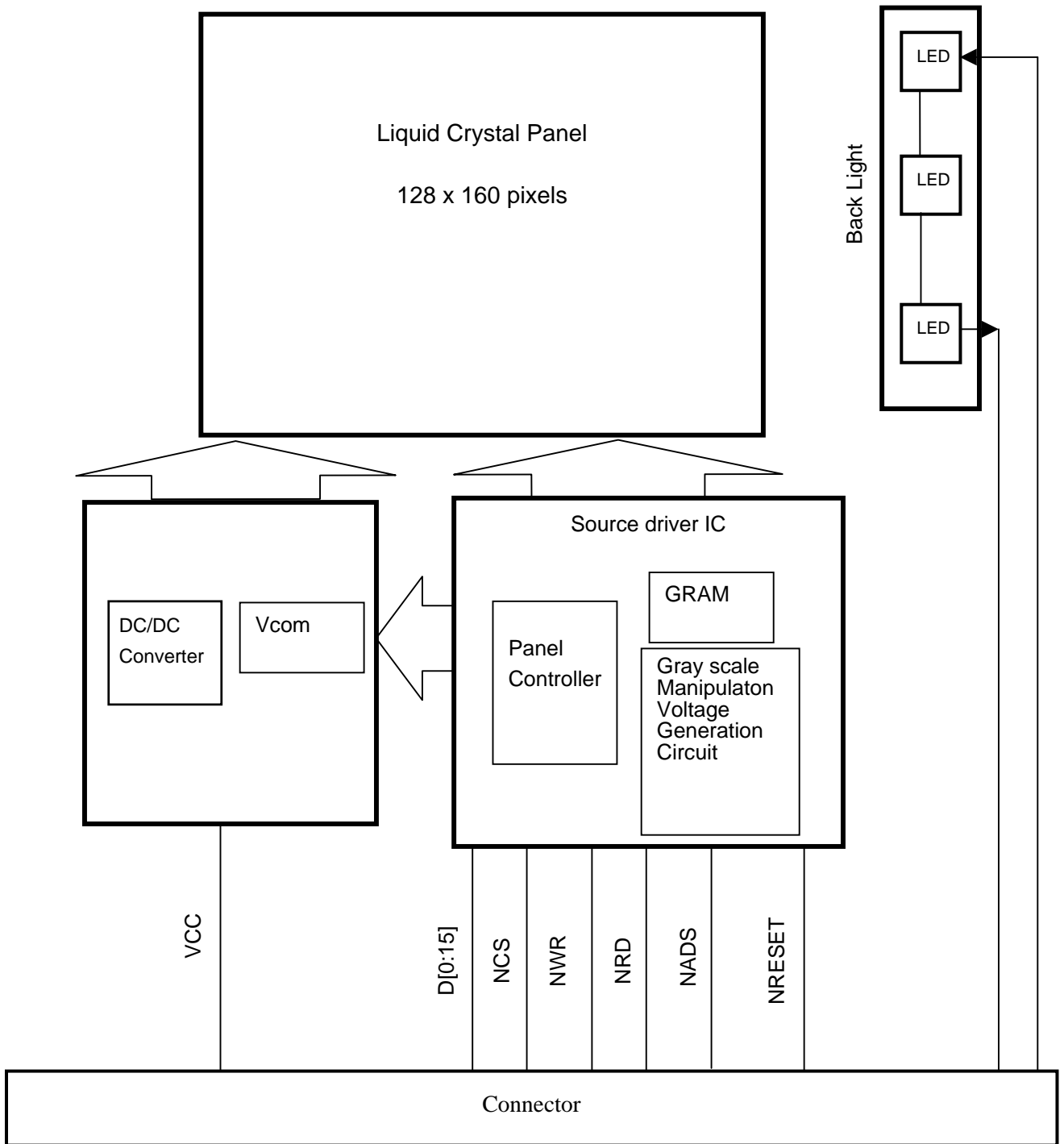| Toshiba Matsushita Display Technology Co., Ltd.	Date: 2002-11-29	New	No. LTM018A02A-15
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←#   Special   ←& Addition   ←   Change
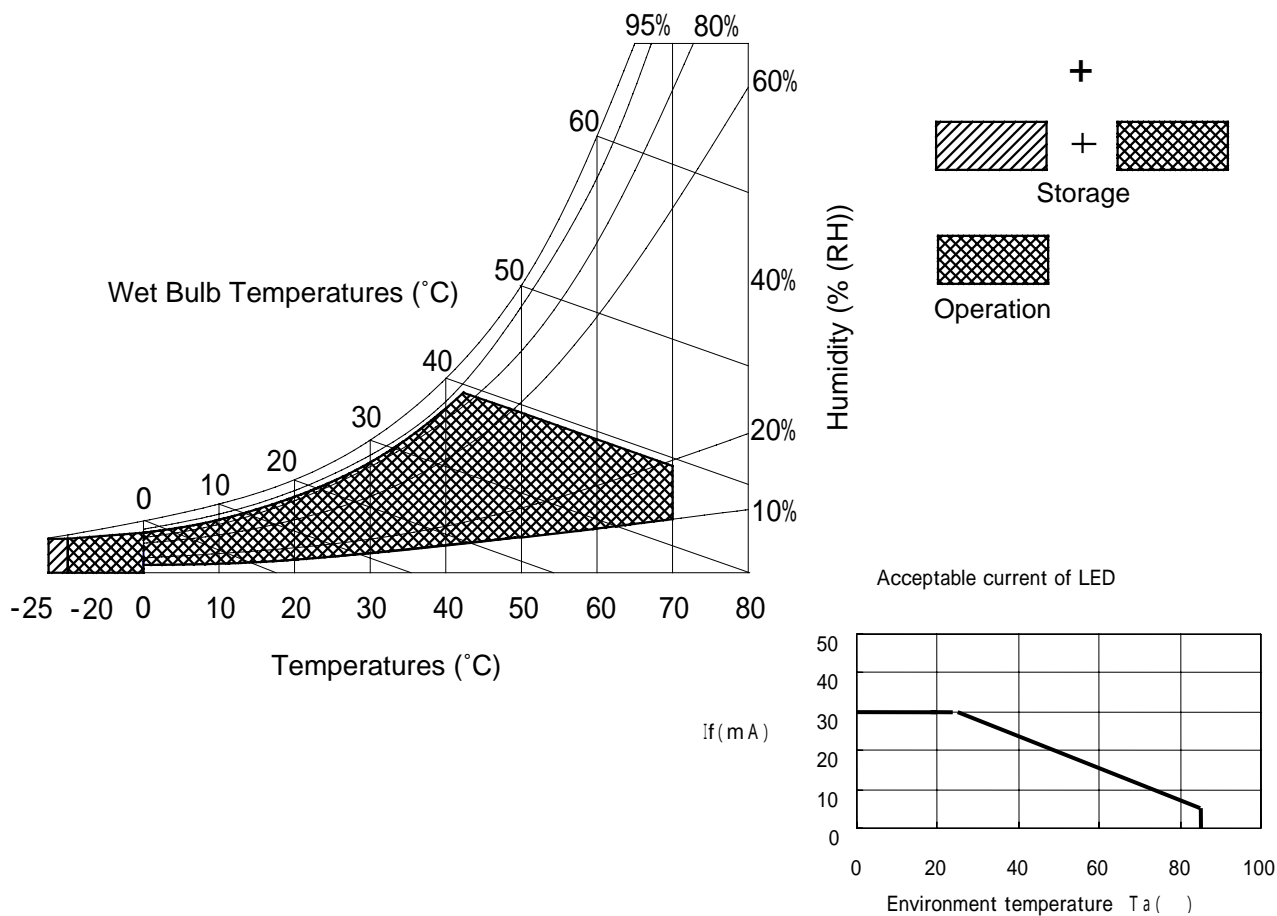
2.3   Mechanical Specifications

2.3.1   Outline Drawing   Unit: mm

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2.4　　Eclectrical Specifications
　　2.4.1　Block Diagram

Liquid Crystal Panel

128 x 160 pixels

Back Light

LED

LED

LED

Source driver IC

DC/DC
Converter

Vcom

Panel
Controller

GRAM

Gray scale
Manipulaton
Voltage
Generation
Circuit

VCC

D[0:15]

NCS

NWR

NRD

NADS

NRESET

Connector

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2.4.2 I/O Terminals

I/F -FPC

PIN	SYMBOL	I/O	SIGNAL
	GND		GROUND
	XDON		GROUND
	VCC		POSITIVE SUPPLY VOLTAGE
4	VCC		POSITIVE SUPPLY VOLTAGE
5	D[0]	I/O	DATA
6	D[1]	I/O	DATA
7	D[2]	I/O	DATA
8	D[3]	I/O	DATA
9	D[4]	I/O	DATA
10	D[5]	I/O	DATA
11	GND		GROUND
12	D[6]	I/O	DATA
13	D[7]	I/O	DATA
14	D[8]	I/O	DATA
15	D[9]	I/O	DATA
16	D[10]	I/O	DATA
17	D[11]	I/O	DATA
18	GND		GROUND
19	D[12]	I/O	DATA
20	D[13]	I/O	DATA
21	D[14]	I/O	DATA
22	D[15]	I/O	DATA
23	GND		GROUND
24	NADS	I	DATA DISCRIMINATION
25	NCS	I	CHIP SELECT
26	NWR	I	WRITE
27	NRD	I	READ
28	GND		GROUND
29	NVSYNC	I	GROUND
30	NRESET	I	RESET
31	IFMODE[0]	I	INTERFACE MODE SELECTION
32	IFMODE[1]	I	INTERFACE MODE SELECTION
33	GND		GROUND

LED –FPC

PIN	SYMBOL
1	CATHODE
2	ANODE COMMON

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3. Recommended Operating Conditions for Driving LCD[1]

Ta=25

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
LED DC Forward Current	I_F	-	15	-	mA	
Power Supply Voltage	Vcc	2.72	2.80	2.87	V	←
Logic signal input Voltage	$VIdL$	0	-	0.2*Vcc	V	
	$VIdH$	0.8*Vcc	-	Vcc	V	
Logic signal output Voltage	$VOdL$	0	-	0.2*Vcc	V	
	$VodH$	0.8*Vcc	-	Vcc	V	
Input leak current	IIL	-	-	± 10	μ A	VI=VCC or GND
Output leak current	IOL	-	-	± 10	μ A	VO=VCC or GND

Note 1)   The recommended operating conditions refers to a range in which operation of this product is guaranteed.   Should this range is exceeded, the operation cannot be guranteed even if the values may be withing the absolute maximum ratings.   Accordingly, please make sure that the module is used within this range.
And these current values are measured under the condition that all device are stopped, each component is stable and Logic signal is input.

Note 2)   All the unused input terminals have to be connected to VDD or VSS.   Please select appropriate one which meet the function required by unused terminal.

4. Product specifications
  4.1 Mechanical Test
    4.1.1 External View
      (1) Test Conditions
        Test environment (Luminance)   : Approximately 500 lx (illumination by fluorescent light)
        Distance between eyes and the module: : Approximately 300 mm
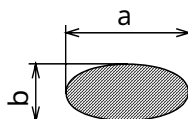   Driving condition   : Operation

      (2) Standard for External View

Item	Criteria
External view of plastic frame	No conspicuous contamination, crack or chip
External view of LCD panel [1)2)]	Any dirt or defect in the active display area should satisfy the following conditions

• Granular

Ave. dia. (mm) [2)]	Numbe of pieces (n)	Inter-dust/defect distance [3)]
$D \leq 0.1$	Ignored	5 mm or more
$0.1 < D \leq 0.2$	$n \leq 3$	
$0.2 < D \leq 0.25$	$n \leq 1$	
$0.25 < D$	$n = 0$	

• Linear

Length L (mm)	Width W (mm)	Number of pieces (n)	Inter-dust/defect distance [3)]
–	$W \leq 0.02$	Ignored	5 mm or more
$L \leq 2.0$	$0.02 < W \leq 0.03$	$n \leq 5$	
$L \leq 1.0$	$0.03 < W \leq 0.05$	$n \leq 2$	
–	$0.05 < W$	$n = 0$	

However, the following standard shall apply only to bubbles on lightguides.

• Granular

Average Diameter (mm) [2)]	Number of Pieces (n)
$D \leq 0.20$	Ignored
$0.20 < D \leq 0.50$	$n \leq 2$
$0.50 < D$	$n = 0$

• Linear

Length L (mm)	Width W (mm)	Number of pieces (n)
$L \leq 1.0$	$W \leq 0.10$	Ignored
$L \leq 5.0$	$W \leq 0.10$	$n \leq 2$
$L \leq 10$	$W \leq 0.10$	$n \leq 1$
–	$0.10 < W$	$n = 0$

Note 1) Any unconspicuous defects without real damages are typically not counted.
Note 2) Any defects or bubbles, etc. with a width of 0.10 mm or more will be judged according to the average diameter (granular shape).

Average diameter $\dfrac{a + b}{2}$

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Note 3)   This standard will not apply to any standard in which dirt, defects, or number of bubbles are ignored.

4.1.2 Outside Dimensions
   Outside dimensions should satisfy the values indicated on 2.3.1 Outline Drawing.

4.1.3 Markings

(1)   Product Label

Serial Number

π   2 C   0 0 0 0 0 0 1   T
1)   2)   3)   4)

MADE   IN   PHL
         5)

```
┌─────────────────────┐   ↑
│   LTM018A02A        │   │
│   2C0000001 T       │   6
│  MADE  IN  PHL      │   │
└─────────────────────┘   ↓
  ←──────── 10 ────────→
```
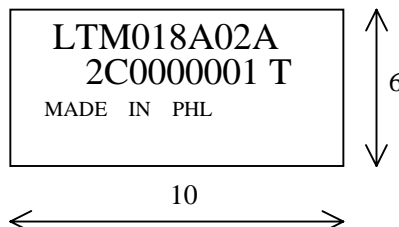
1)：   Manufacture location code
2)：   Manufacture date code
      2   B   Unit: mm
      1   2
    1: Production year code: The last digit of the Christian year is indicated.
    2: Production month code: The month is indicated by using the alphabet.
           January – December
             A   –   L
     Example: 2C □ Manufactured in March 2002
3)：   Lot code
     7 digits in decimal notation
4)：   Private code by our company
5)：   Production country

(2) Location for Markings

Label

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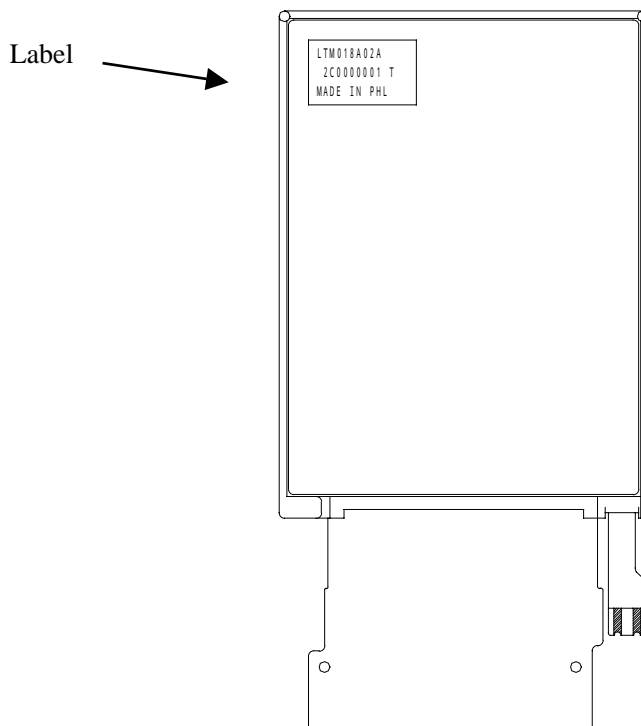
4.2   Electrical Characteristic Test
   4.2.1 Common Conditions for Inspections
     Ambient Temperature   : T_a 25 ± 5°C
     Ambient Humidity   : H_a 65 ± 20% (RH)
     Supply Voltage: : Vcc = 2.85V

   4.2.2 Electrical Specifications

Item	Symbol	Min.	Typ.[1]	Max.	Unit	Remark
Power Consumption 1	P_{cc1}		5.4	7.0	mW	Normal mode[1]
Power Consumption 2	P_{cc2}			50	uW	Standby mode [2]

Note 1)   Display pattern

    1. White
    2. Yellow
    3. Light blue
    4. Green
    5. Purple
    6. Red
    7. Blue
    8. Black

1	2	3	4	5	6	7	8

Note 2)   Display IC standstills while LCD is in the standby mode.
      Standby mode means Vcc is supplied and display IC has been reset.
      And these values are not peak current but constant current.

4.3　　Optical Characteristics
　　　4.3.1　Common Conditions for Inspections
　　　　　Ambient Temperature　　:　T_a　25 ± 5°C
　　　　　Conditions other than for the ambient temperature are the same as those under 4.2.1 Common Verificaiton
　　　　　Conditions.　For Test Procedures, see 6.1 Optical Test Procedures.

　　　4.3.2　Optical Characteristic Specifications

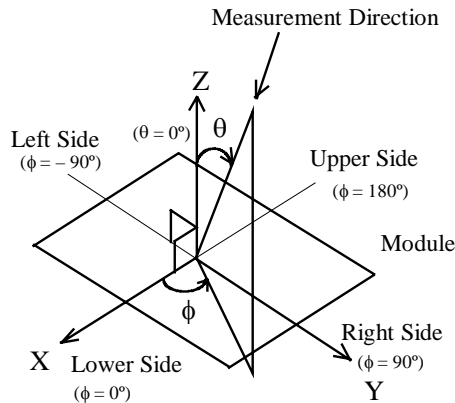| Spec.	Item		Symbol	Conditions			Specifications			Unit	Remark
							Min.	Typ.	Max.		
With Backlight turned on [1]	Contrast		CR	Display: White/Black			200	300			
	Viewing Angle (Vertical)		θ	$CR \geq 10$	$\phi = 180°$	Display B/W	50	70		°	
					$\phi = 0°$		10	18		°	
	Viewing Angle (Horizontal)				$\phi = -90°$		30	40		°	
					$\phi = +90°$		30	40		°	
	Luminance			Display: White			150	240		cd/m²	
	Luminance Uniformity		$Lunf$	Display: White			70	80		%	
	Displayed Color	Red	x_R	Display: Red				0.560			
			y_R					0.350			
		Green	x_G	Display: Green				0.350			
			y_G					0.520			
		Blue	x_B	Display: Blue				0.150			
			y_B					0.160			
		White	x_W	Display: White			0.280	0.330	0.370		
			y_W				0.280	0.350	0.400		
	Response Time	Rising	t_{ON}	Display: White → Black				15	40	msec	
		Falling	T_{OFF}	Display: Black → White				15	40	msec	

Note 1)　LED current value = 15 mA (per chip)

Measurement Direction

Z

Left Side
(φ = − 90°)　　(θ = 0°)　θ

Upper Side
(φ = 180°)

Module

φ

Right Side
(φ = 90°)

X　Lower Side
(φ = 0°)

Y

4.4　　Display Quality Level

4.4.1　Common Conditions for Inspections

Display surface luminance	:	Approximately 500 lx (illumination by fluorescent light)
Range of inspections	:	Active display area
Distance between eyes and the module	:	Approximately 300 mm
Driving conditions	:	Shall be the same as specified under 4.2.1 Common Conditions for Inspections.
Diplay pattern	:	Unless specified otherwise, the display pattern shall be white raster display (gradation level L63) and black raster display (gradation level L0). * The term "raster" signifies that the same data is indicated over the entire surface.

For Inspection Procedures, see 6.2 Display Quality Level Test Procedures.

4.4.2　Display Quality Level Specificaitons

(1)　Difects in Display [1]

Item	Criteria			Remarks
Dot Defects		Specifications		Irregular light emmissions by individual dots, caused by a failure or failures in TFT or color filter, etc. are counted as dot defects.
	Item [1] [2]	Number of missing dots	Total	
	Bright defects[3]	1 or less	1 or less	
	Dark defects[4]	1 or less		

Note 1)　Any missing dots in color filter or black matrix are counted as bright defects.
Note 2)　Any unconspicuous dot defect shall not be counted as a defect. (Any defect that cannot be verified by using 5% ND-filter shall not be counted.)
Note 3)　A bright defect refers to a bright dot at gradation level L0 (black).
Note 4)　A dark defect refers to a dark dot at gradation level L63 (R, G, B).

(2)　Quality Level of Display Screen

Item	Criteria	Remarks
Line defect	Shall not be observed.	
Interference streak	No conspicuous streak shall exist.	
Stain	Shall not be conspicuous.	Punctuate irregularity of luminance
Irregularity	Shall not be conspicuous.	Irregularity of luminance and color, larger in size than stain
Streak	Shall not be conspicuous	Linear irregularity of luminance (including vertical, horizontal, and diagonal streaks)
Flicker	Shall not be conspicuous	
Crosstalk	Shall not be conspicuous	Irregularity of luminance in the background when a window pattern (white against black background) is displayed

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4.5   Reliability Test
    4.5.1 Mechanical/Environment Test [1) 2)]

      After the tests as listed below have been performed, this module shall satisfy the criteria as listed under 4.5.2.
      However, only a single item of these tests shall be executed on a single module.   A number of test items shall not be executed on a single module.

Test Item	Test Conditions	Remark
High Temperature Operation	70+/-3°C, 240 hours	Operating 3)
High Temperature Storage	80+/-3°C, 240 hours	
High Temperature and High Humidity Storage	60+/-3°C, 90 %, 240 hours	
High Temperature and High Humidity Operation	60+/-3°C, 90 %, 240 hours	Operating 3)
Low Temperature Operation	-20+/-3°C, 240 hours	Operating 3)
Low Temperature Storage	-30+/-3°C, 240 hours	
Heat Cycle	-30 +/-3°C(0.5h) - 25°C(5min) - 80°C+/-3°C(0.5h) 5cyc	
Vibration test	5 50Hz Z diretion 9.8m/s^2,54min X,Ydirection 4.9m/s^2,27min	package
Mechanical shock test	Drop onto the tiled floor from 60cm height, 6faces	package
Electrostatic withstanding voltage	Air : 0 200pF +/- 200V	
	Contact : 0 200pF +/- 200V	

Note 1)   The test shall be executed under a condition where no condensation is formed.
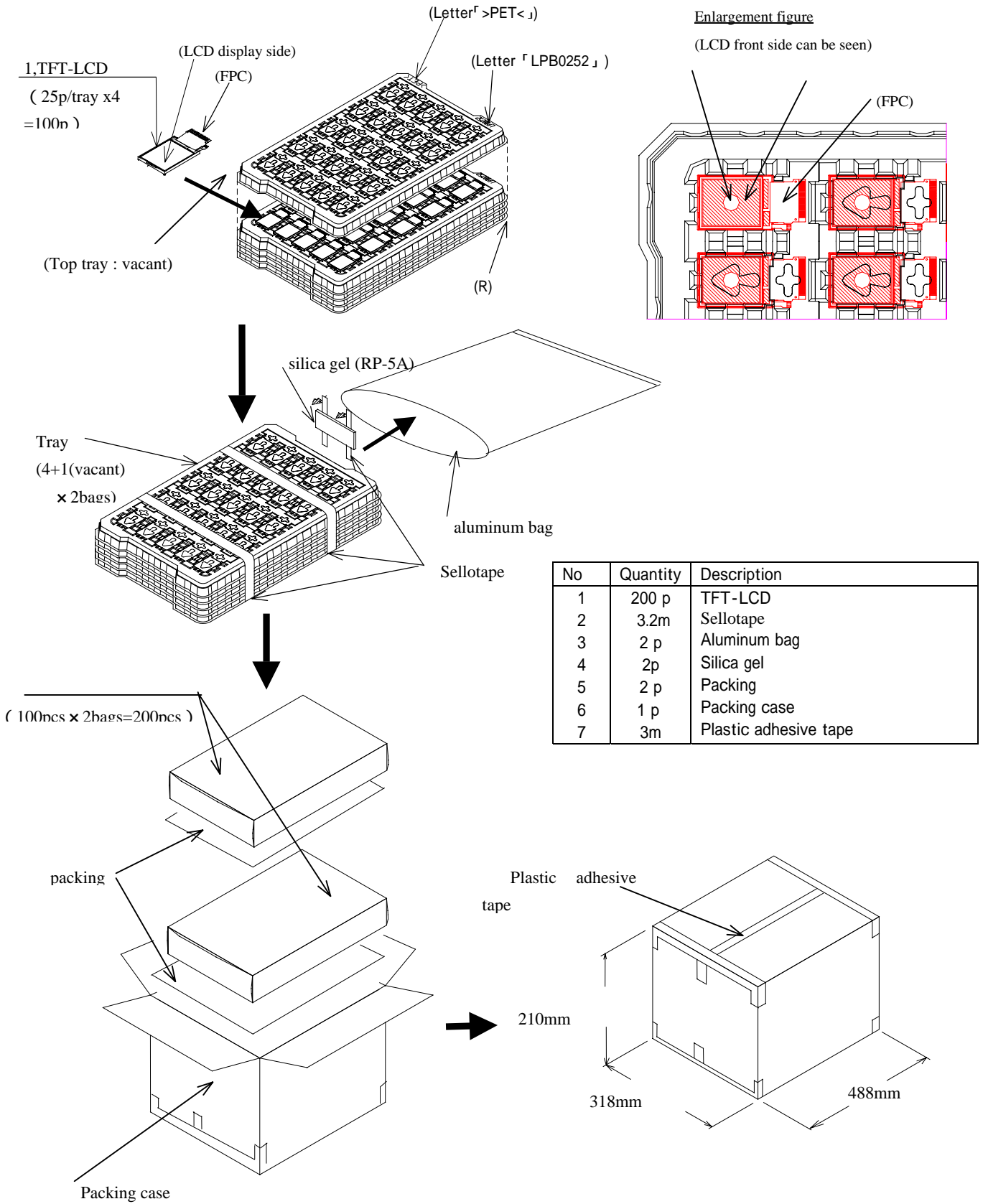Note 2)   After the test, the module should be left at normal temperatures and normal humidities (15 – 35°C, 45 – 65%, R.H.). Then the module should be inspected for normal operation.
Note 3)   The conditions for driving at operation tests shall be the same as those specified under 4.2.1 Common Conditions for Inspections, except for the temperature and humidity conditions as indicated on the above table.

    4.5.2 Criteria for Reliability Test
      (1)   There shall be no abnormality in the functions and the display.
      (2)   Appearance and display quality should not have distinguished degradation.

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5. Packaging

(LCD display side)
(FPC)
1,TFT-LCD
    25p/tray x4
=100p

(Letter >PET<)
(Letter LPB0252)

(Top tray : vacant)

(R)

(FPC)

silica gel (RP-5A)

Tray
(4+1(vacant)
 × 2bags)

aluminum bag

Sellotape

No	Quantity	Description
1	200 p	TFT-LCD
2	3.2m	Sellotape
3	2 p	Aluminum bag
4	2p	Silica gel
5	2 p	Packing
6	1 p	Packing case
7	3m	Plastic adhesive tape

100pcs× 2bags=200pcs

packing

Plastic adhesive
tape

210mm

318mm

488mm

Packing case

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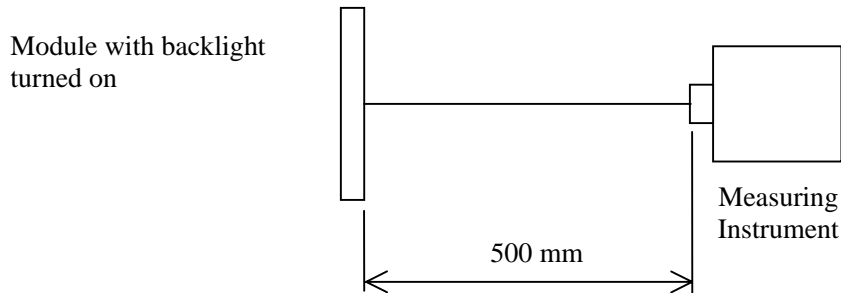6.　Test Procedures
　　6.1　Optical Test Procedures
　　　　(1)　Measurement System
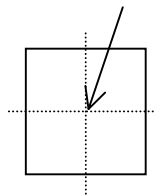　　　　　　<u>(Measurement Procedure A) With backlight turned on</u>
　　　　　　Measuring Instrument:　BM-5A made by TOPCON
　　　　　　Environment:　　　　　Inside a darkroom

Module with backlight
turned on

Measuring
Instrument

500 mm

Center　of　display
area
$(X,Y) = (64,80)$

　　　　(2)　Contrast
　　　　　　Use (1) Measurement System to measure the luminance when black is displayed (gradation level L0),
　　　　　　and the luminance when white is displayed (gradation level L63), and then contrast *CR* should be
　　　　　　obtained from the next expression:

　　　　　　　　　CR = L63 / L0

　　　　(3)　Viewing Angle
　　　　　　Use (1) (Measurement Procedure A) under Measurement System to measure the contrast from the
　　　　　　measuring direction specified by the conditions under item 4.3.2.

(4) Response Time

Response time is obtained by measuring the output waveforms when the display is switched from raster (black: gradation level L0) to raster (white: gradation level L63), and from raster (white: gradation level L63) to raster (black: gradation level L0).
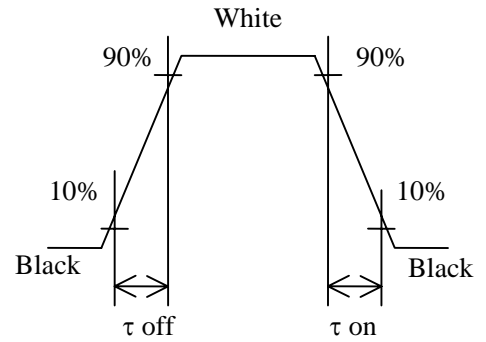
(5) Display Colors

Use (1) Measurement System to display white raster (white: gradation level L63), red raster (red: gradation level L63), green raster (green: gradation level L63), blue raster (blue: gradation raster L63), and measure each of the chromaticity coordinates: x_W, y_W, x_R, y_R, x_G, y_G, x_B, and y_B.
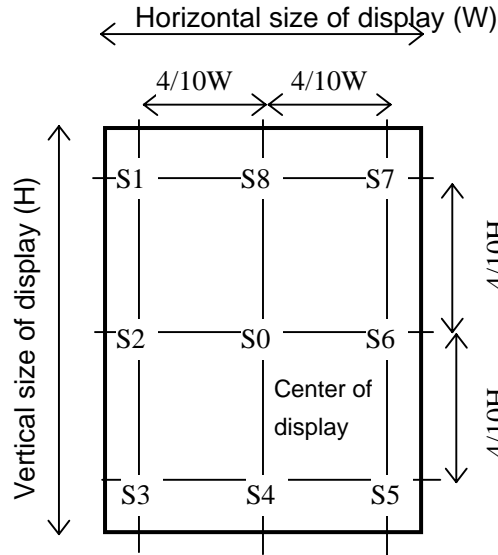
(6) Luminance

Use (1) (Measurement Procedure A) under Measurement System with the backlight turned on to measure the luminance L when white raster (white: gradation level L63) is displayed.

(7) Luminance Uniformity

Use (1) (Measurement Procedure A) under Measurement System with the backlight turned on, the luminance uniformity should be obtained from the next expression, when white raster (white: gradation level L63) is displayed:

$$\text{Luminance uniformity} \quad \frac{\text{Minimum value from S0 to S8}}{\text{Maximum value from S0 to S8}} \times 100(\%)$$

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6.2 Display Quality Level Test Procedures
Under 4.4.1 Common Conditions for Inspections, visually observe the active display area.   Depending on the size of a defect, use a spot gauge and a magnifying glass.   Judgments shall be made in accordance with 4.4.2 Display Quality Level Specifications.

7. Others
7.1 Applicable Standard
No warranty that satisfies the standards as shown below will be offered from our company, with the LCD module incorporated into a system.
In addition, no warranty that satisifiles the standards as shown below will be offered from our company for a stand-alone unit of the LCD module.
Should compliance to the standards as shown below be required for a system, it is requested that the required measures be taken on the system side.

    a)   Unwanted Radiation (example)
         FCC   :   PARTS15 CLASS B
         CISPR   :   CLASS B
         VCCI   :   CLASSB

    b)   Safety Standard (example)
         IEC 950
         UL 1950

7.2 Consultations on Doubtful and Unsettled Matters
Any actions to deal with any doubtful matters arising from or any matters not specified in this delivery specification shall be determined by both parties hereof after mutual consultations.

7.3 Warranty
This LCD module is warranted for 15 months from manufactured date.

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