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		APPLICABLE DIVISION LCD CHINA DESIGN CENTER WUXI SHARP

SPECIFICATION

DEVICE SPECIFICATION for

TFT LCD Module

(240 × RGB × 400 dots)

Model No.

LQ030B3UX02

☐ CUSTOMER'S APPROVALDATE

DATE _____

BY _____

PRESENTED
BY K. Horiuchi

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LCD DESIGN DEVELOPMENT
WUXI SHARP

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O 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.

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

[For handling and system design]

(1) Do not scratch the surface of the polarizer film as it is easily damaged.

(2) If the cleaning of the surface of the LCD panel is necessary, wipe it swiftly with cotton or other soft cloth. Do not use organic solvent as it damages polarizer.

(3) Water droplets on polarizer must be wiped off immediately as they may cause color changes, or other defects if remained for a long time.

(4) Since this LCD panel is made of glass, dropping the module or banging it against hard objects may cause cracks or fragmentation.

(5) Epoxy resin (amine series curing agent), silicone adhesive material (dealcoholization series and oxime series), tray forming agent (azo compound) etc, in the cabinet or the packing materials may induce abnormal display with polarizer film deterioration regardless of contact or noncontact to polarizer film.
Be sure to confirm the component of them.

(6) Liquid crystal material will freeze below specified storage temperature range and it will not get back to normal quality even after temperature comes back within specified temperature range. Liquid crystal material will become isotropic above specified temperature range and may not get back to normal quality. Keep the LCD module always within specified temperature range.

(7) Do not expose LCD module to the direct sunlight or to strong ultraviolet light for long time.

(8) If the LCD driver IC (COG) is exposed to light, normal operation may be impeded. It is necessary to design so that the light is shut off when the LCD module is mounted.

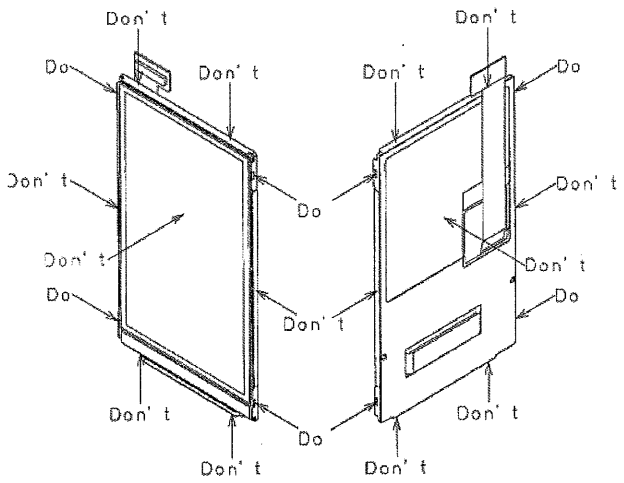
(9) Do not disassemble the LCD module as it may cause permanent damage.
(10) As this LCD module contains components sensitive to electrostatic discharge, be sure to follow the instructions in below.
① Operators
Operators must wear anti-static wears to prevent electrostatic charge up to and discharge from human body.
② Equipment and containers
Process equipment such as conveyer, soldering iron, working bench and containers may possibly generate electrostatic charge up and discharge. Equipment must be grounded through 100Mohms resistance. Use ion blower.
③ Floor
Floor is an important part to leak static electricity which is generated from human body or equipment.
There is a possibility that the static electricity is charged to them without leakage in case of insulating floor, so the
countermeasure(electrostatic earth:$1\times10^{8}\Omega$) should be made.
④Humidity
Proper humidity of working room may reduce the risk of electrostatic charge up and discharge. Humidity should be kept over 50% all the time.
⑤Transportation/storage
Storage materials must be anti-static to prevent causing electrostatic discharge.
⑥Others
Protective film is attached on the surface of LCD panel to prevent scratches or other damages. When removing this protective film, remove it slowly under proper anti-ESD control such as ion blower.

(11) Hold LCD very carefully when placing LCD module into the system housing. Do not apply excessive stress or pressure to LCD module. Do not to use chloroprene rubber as it may affect on the reliability of the electrical interconnection.

(12) Do not hold or touch LCD panel to flex interconnection area as it may be damaged.

(13) As the binding material between LCD panel and flex connector mentioned in (12) contains an organic material, any type of organic solvents are not allowed to be used. Direct contact by fingers is also prohibited.

(14) When carrying the LCD module, place it on the tray to protect from mechanical damage. It is recommended to use the conductive trays to protect the CMOS components from electrostatic discharge. When holding the module, hold the Plastic Frame of LCD module so that the panel, COG and other electric parts are not damaged.



(15) Do not touch the COG's patterning area. Otherwise the circuit may be damaged.

(16) Do not touch LSI chips as it may cause a trouble in the inner lead connection.

(17) Place a protective cover on the LCD module to protect the glass panel from mechanical damages.

(18) LCD panel is susceptible to mechanical stress and even the slightest stress will cause a color change in background. So make sure the LCD panel is placed on flat plane without any continuous twisting, bending or pushing stress.

(19) Protective film is placed onto the surface of LCD panel when it is shipped from factory. Make sure to peel it off before assembling the LCD module into the system. Be very careful not to damage LCD module by electrostatic discharge when peeling off this protective film. Ion blower and ground strap are recommended.

(20) Make sure the mechanical design of the system in which the LCD module will be assembled matches specified viewing angle of this LCD module.

(21) This LCD module does not contain nor use any ODS (1,1,1-Trichloroethane, CCL4) in all materials used, in all production processes.

[For operating LCD module]

(1) Do not operate or store the LCD module under outside of specified environmental conditions.
(2) At the shipment, adjust the contrast of each LCD module with electric volume. LCD contrast may vary from panel to panel depending on variation of LCD power voltage from system.
(3) As opt-electrical characteristics of LCD will be changed, dependent on the temperature, the confirmation of display quality and characteristics has to be done after temperature is set at 25 °C and it becomes stable.

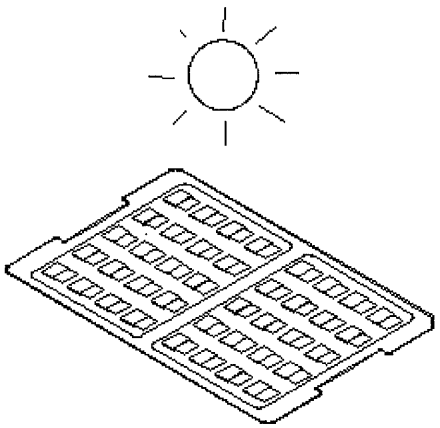
[Precautions for Storage]

(1) Do not expose the LCD module to direct sunlight or strong ultraviolet light for long periods. Store in a dark place.
(2) The liquid crystal material will solidify if stored below the rated storage temperature and will become an isotropic liquid if stored above the rated storage temperature, and may not retain its original properties. Only store the module at normal temperature and humidity (25±5°C,60±10%RH) in order to avoid exposing the front polarizer to chronic humidity.
(3) Keeping Method

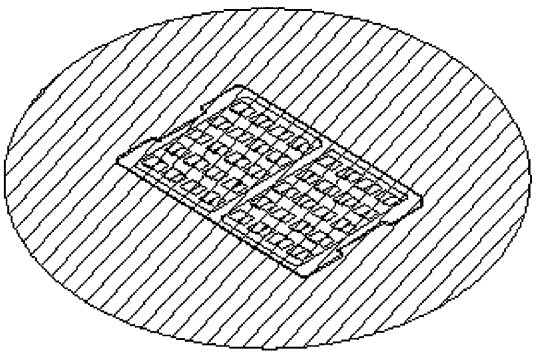
a. Don't keeping under the direct sunlight.

b. Keeping in the tray under the dark place.

DON'T



DO



(1) Do not operate or store the LCD module under outside of specified environmental conditions.
(2) Be sure to prevent light striking the chip surface.

[Other Notice]

(1) Do not operate or store the LCD module under outside of specified environmental conditions.

(2) As electrical impedance of power supply lines (VCC-GND) are low when LCD module is working, place the de-coupling capacitor near by LCD module as close as possible.

(3) Reset signal must be sent after power on to initialize LSI. LSI does not function properly until initialize it by reset signal.

(4) Generally, at power on, in order not to apply DC charge directly to LCD panel, supply logic voltage first and initialize LSI logic function including polarity alternation. Then supply voltage for LCD bias. At power off, in order not to apply DC charge directly to LCD panel, execute Power OFF sequence and Discharge command.

(5) Don't touch to FPC surface, exposed IC chip, electric parts and other parts, to any electric, metallic materials.

(6) No bromide specific fire-retardant material is used in this module.

(7) Do not display still picture on the display over 2 hours as this will damage the liquid crystal.

(8) The connector used in this LCD module is the one Sharp have not ever used.
Therefore, please note that the quality of this connector concerned is out of Sharp's guarantee.

(9) This module is not designed for TP bonding. If you are installing to a TP, please contact us.

[Precautions for Discarding Liquid Crystal Modules]

COG: After removing the LSI from the liquid crystal panel, dispose of it in a similar way to circuit boards from electronic devices.

LCD panel: Dispose of as glass waste. This LCD module contains no harmful substances. The liquid crystal panel contains no dangerous or harmful substances. The liquid crystal panel only contains an extremely small amount of liquid crystal (approx.100mg) and therefore it will not leak even if the panel should break.

-Its median lethal dose (LD50) is greater than 2,000 mg/kg and a mutagenetic (Aims test: negative) material is employed.

FPC: Dispose of as similar way to circuit board from electric device.

1. Application

This data sheet is to introduce the specification of LQ030B3UX02 active matrix 262,144 color LCD module.
Main color LCD module is controlled by Driver IC (TA8566).
If any problem occurs concerning the items not stated in this specification, it must be solved sincerely by both parties after deliberation.
As to basic specification of driver IC refer to the IC specification and handbook.

2. Construction and Outline

Construction: LCD panel, Driver (COG), FPC with electric components,
5 White LED lump, prism sheet, diffuser, light guide and reflector, plastic frame and metal frame to fix them mechanically.
Outline: See page 34
Connection: Board to board connector (PANASONIC AXT640124 40 pins, 0.4mm pitch)
There shall be no scratches, stains, chips, distortions and other external drawbacks that may affect the display function.

In order to realize thin module structure, double-sided adhesive tapes are used to fix LCD panels. As these tapes do not guarantee to permanently fix the panels, LCD panel may rise from the module when shipped from factory.
So please make sure to design the system to hold the edges of LCD panel by the soft material such as sponge when LCD module is assembled into the cabinet.

3. Mechanical Specification

Table 1

Parameter		Specifications	Unit
Outline dimensions (typ)		44.88 (W) × 74.9 (H) × 2.0 (D)	mm
Main LCD Panel	Active area	38.88 (W) × 64.8 (H)	mm
	Viewing area	40.08 (W) × 66 (H)	mm
	Display format	240×RGB(W)×400(H)	-
	Dot pitch	0.054 (W) ×0.162 (H)	mm
	Base color *1	Normally Black	-
Mass		Approx 15.5	g

*1 Due to the characteristics of the LC material, the colors vary with environmental temperature.

4. Absolute Maximum Ratings

(4-1) Electrical absolute maximum ratings

Table 2 Ta=25 ℃

Parameter	Symbol	Min	Max	Unit	Remark
Supply voltage	VDDIO-GND	-0.5	6.0	V	*1
	VCC-GND	-0.5	6.0	V	*1
Input Voltage	V_{IN}	-0.5	VDDIO+0.5	V	*2

*1: VCC>=VDDIO

*2: Input terminal of logic system.

Voltage value is based on GND = 0V.

Environment Conditions

Table 3

Item	Top		Tstg		Remark
	MIN.	MAX.	MIN.	MAX.	
Ambient temperature	-20 °C	+70°C	-30 °C	+80°C	Note 2)
Humidity	Note 1)		Note 1)		No condensation

Note1) Ta ≤ 40 °C.....95 % RH Max

Note2) Ta > 40 °C.....Absolute humidity shall be less than Ta=40 °C /95 % RH.

As opt-electrical characteristics of LCD will be changed, dependent on the temperature, the confirmation of display quality and characteristics has to be done after temperature is set at 25 °C and it becomes stable.

Be sure not to exceed the rated voltage, otherwise a malfunction may occur.

5. Electrical Specifications

(5-1) Electrical characteristics

Table 4

Ta=25 °C, GND=0V

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Applicable Pin
Supply voltage	VDDIO-GND	Ta=-20~70 °C	1.65	2.80	2.90	V	(note 1)
Supply voltage	VCC-GND	Ta=-20~70 °C	2.70	2.80	2.90	V	(note 1)
"H" level input voltage1	V_{IH1}	Ta=-20~70 °C VDDIO:1.65~1.95V	0.7 VDDIO	-	VDDIO	V	(note 2)
"L" level input voltage1	V_{IL1}		0	-	0.3 VDDIO	V	(note 2)
"H" level input voltage2	V_{IH2}	Ta=-20~70 °C VDDIO:1.95~3.3V	0.8 VDDIO	-	VDDIO	V	(note 2)
"L" level input voltage2	V_{IL2}		0	-	0.2VDDIO	V	(note 2)
"H" level output voltage	V_{OH1}	Ta=-20~70 °C VDDIO:1.65~3.3V	0.8 VDDIO	-	VDDIO	V	(note 3)
"L" level output voltage	V_{OL1}		0	-	0.2 VDDIO	V	
Current consumption	I_{cc2}	Ta=25 °C	-	9.6	12	mA	(note 4)

(note 1) The condition VDDIO ≤ VCC must be met

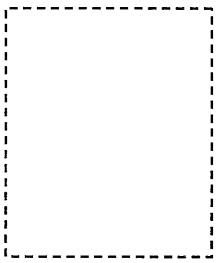
(note 2) Input mode of DB0~DB17, VSYNC_O, RDX, WRX, CSX, RESET, BS0, BS1, BS2, RS

(note 3) Output mode of DB0~DB17.

(note 4) Following Conditions

Ta=25°C, frame frequency=68Hz

Display Pattern: All ON (white) Pattern. No Host CPU access.



*All ON (white) Pattern

(5-2) LED back light

(1) At main panel the back light uses 5pcs edge light type white LED.

Table 5

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward current	Ta=25 °C	I_{LED}	-	20 *1	-	mA	LEDA-LEDC1 to 5
Forward Voltage	Ta=25 °C IF=20mA	V_F	-	(3.2)	3.5	V	LEDA-LEDC1 to 5

LED lamp: NSSW206T (NICHIA)

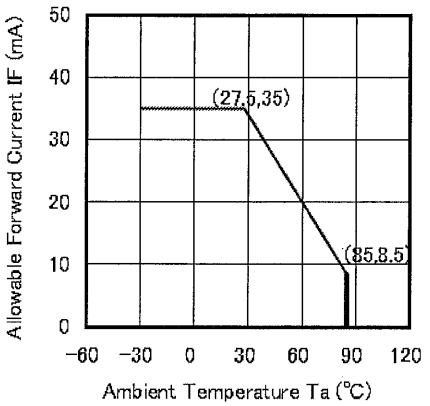
*1 per one piece of LED

*Please consider Allowable Forward Current on used temperature (refer to Ambient Temperature vs. Allowable Forward Current curve)

(1) Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	IF	35	mA
Pulse Forward Current	IFP	100	mA
Reverse Voltage	VR	5	V
Power Dissipation	PD	119	mW
Operating Temperature	Topr	-30 ~ + 85	°C
Storage Temperature	Tstg	-40 ~ +100	°C
Soldering Temperature	Tsld	Reflow Soldering : 260°C for 10sec. Hand Soldering : 350°C for 3sec.	

Ambient Temperature vs. Allowable Forward Current



(2) Initial Electrical/Optical Characteristics (Ta=25°C)

Item		Symbol	Condition	Typ.	Max.	Unit
Forward Voltage		VF	IF=20[mA]	(3.1)	3.4	V
Reverse Current		IR	VR= 5[V]	-	50	μA
Luminous Flux		φv	IF=20[mA]	(6.6)	-	lm
Luminous Intensity		Iv	IF=20[mA]	(2.4)	-	cd
Chromaticity Coordinate*	x	-	IF=20[mA]	0.300	-	-
	y	-	IF=20[mA]	0.295	-	-

* Please refer to CIE 1931 chromaticity diagram.

(3) Ranking (Ta=25°C)

Item		Symbol	Condition	Min.	Max.	Unit
Luminous Flux	Rank W700	φv	IF=20[mA]	7.00	7.25	lm
	Rank W675			6.75	7.00	
	Rank W650			6.50	6.75	
	Rank W625			6.25	6.50	
	Rank W600			6.00	6.25	
	Rank W575			5.75	6.00	

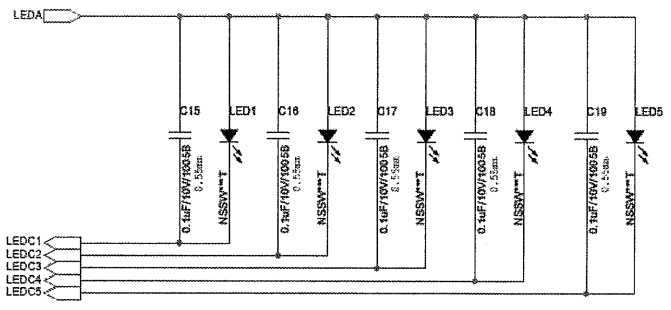
* Luminous Flux Measurement allowance is ± 7%.

COLOR RANKS

ランク Sa62				
x	0.2880	0.2820	0.2910	0.2960
y	0.2620	0.2720	0.2870	0.2760

ランク Sbj2				
x	0.2960	0.2910	0.2990	0.3040
y	0.2760	0.2870	0.3010	0.2900

*LED circuit diagram



(5-3) Interface signals

Table 6

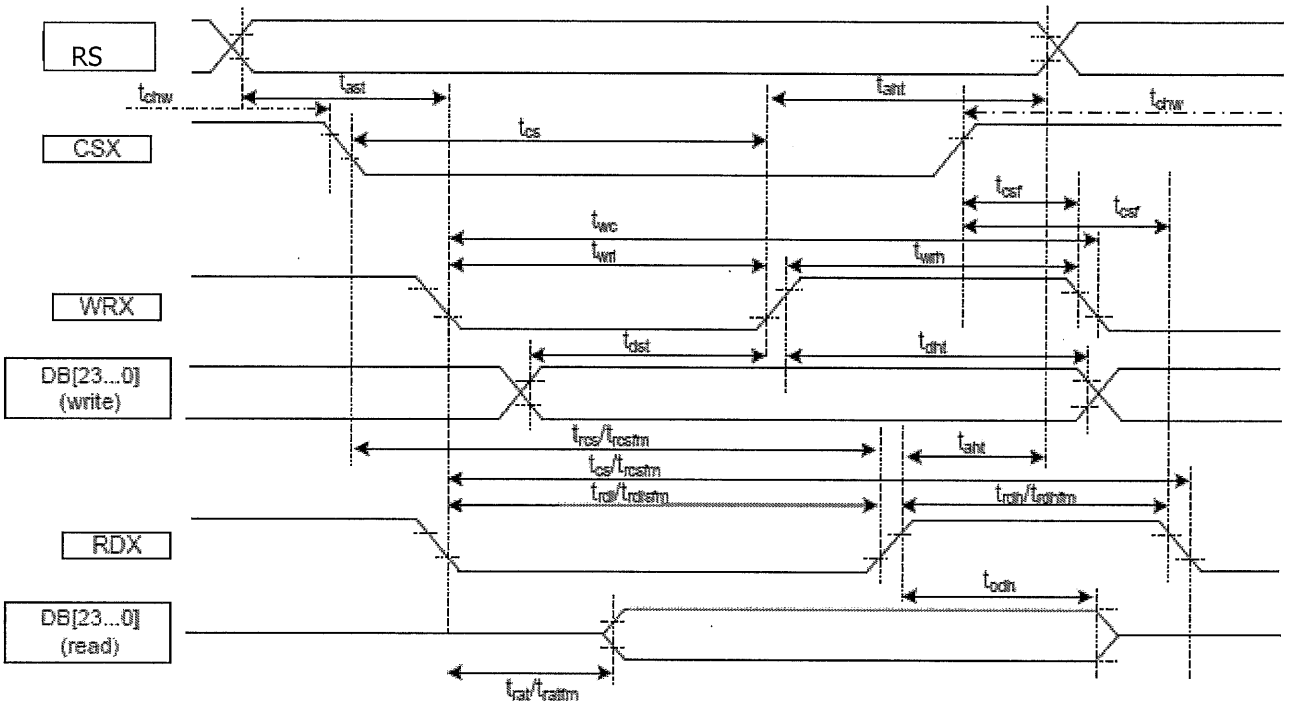
Pin No	Symbol	Description	I/O	Remarks
1	GND	GND level pin	-	
2	BS0	Bus width setting	-	Note 1)
3	MARKER_ID	MARKER_ID pin	O	LCD fixed GND level
4	LEDA	LED1~5 Anode Common	-	
5	LEDC1	LED1 Cathode	-	
6	LEDC2	LED2 Cathode	-	
7	LEDC3	LED3 Cathode	-	
8	LEDC4	LED4 Cathode	-	
9	LEDC5	LED5 Cathode	-	
10	GND	GND level pin	-	
11	BS1	Bus width setting	I	Note 1)
12	RS	Data / Command selectable	I	High(VDDIO) : Access to data Low(GND) : Access to Index
13	CSX	Chip Select	I	Low(GND) enable
14	RESETB	Reset enable	I	Low(GND) enable
15	RDX	Read enable	I	Low(GND) enable
16	WRX	Write enable	I	Low(GND) enable
17	VSYNC_O	Tearing Effect Output	O	See page 15 and 16
18	OPEN(OTP)	(OTP Program pin)	I	Don't care (open)
19	BS2	Bus width setting	I	Note 1)
20	DB17	Data Bus	I/O	
21	DB16	Data Bus	I/O	
22	DB15	Data Bus	I/O	
23	DB14	Data Bus	I/O	
24	DB13	Data Bus	I/O	
25	DB12	Data Bus	I/O	
26	DB11	Data Bus	I/O	
27	DB10	Data Bus	I/O	
28	DB9	Data Bus	I/O	
29	DB8	Data Bus	I/O	
30	DB7	Data Bus	I/O	
31	DB6	Data Bus	I/O	
32	DB5	Data Bus	I/O	
33	DB4	Data Bus	I/O	
34	DB3	Data Bus	I/O	
35	DB2	Data Bus	I/O	
36	DB1	Data Bus	I/O	
37	DB0	Data Bus	I/O	
38	VCC	Power supply for analog	-	2.8V typ
39	VDDIO	Power supply for I/O	-	2.8V typ
40	GND	GND level pin	-	

Corresponded connector : Board to board Connector (PANASONIC AXT640124)

Note1

BS2	BS1	BS0	IF Mode
GND	GND	VDDIO	8bit bus
GND	VDDIO	VDDIO	16bit bus
VDDIO	GND	GND	9bit bus
VDDIO	VDDIO	GND	18bit bus
VDDIO	VDDIO	VDDIO	Don't use

(5-4) Host Interface Timing Diagrams (80-family MPU access)



Note: Logic high and low levels are specified as 20% and 80% of VDDIO for input signal.

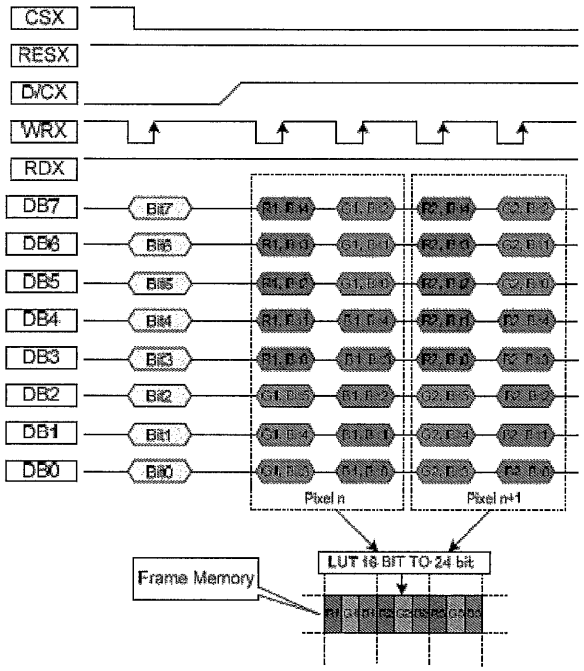
Table 7

Signal	Symbol	Parameter	min	max	unit	description
RS	tast	Address setup time	10	-	ns	
	taht	Address hold time (Write/Read)	10	-	ns	
CXS	tchw	CSX "H" Pulse Width	0	-	ns	
	tcs	Chip Select setup time (Write)	35	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	twc	Write cycle	66	-	ns	
	twrh	Control pulse H duration	18	-	ns	
	twrl	Control pulse L duration	18	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	When read ID data
	trdh	Control pulse H duration (ID)	90	-	ns	
	trdl	Control pulse L duration (ID)	45	-	ns	
RDX (FM)	trcfm	Read cycle (FM)	450	-	ns	When read from frame memory
	trdhfm	Control pulse H duration (FM)	90	-	ns	
	trdlfm	Control pulse L duration (FM)	355	-	ns	
DB[23..0]	tdst	Data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tdht	Data hold time	10	-	ns	
	trat	Read access time (ID)	-	40	ns	
	tratfm	Read access time (FM)	-	340	ns	
	todh	Output disable time	20	80	ns	

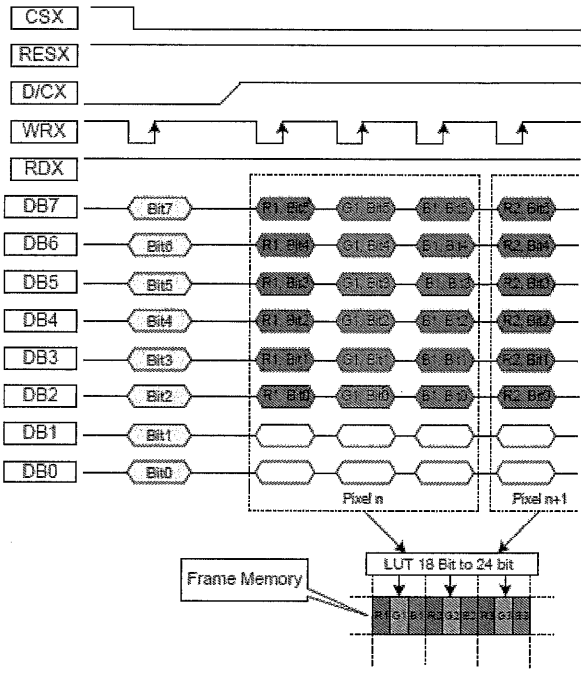
(5-5) Display module date color coding

8bit data bus

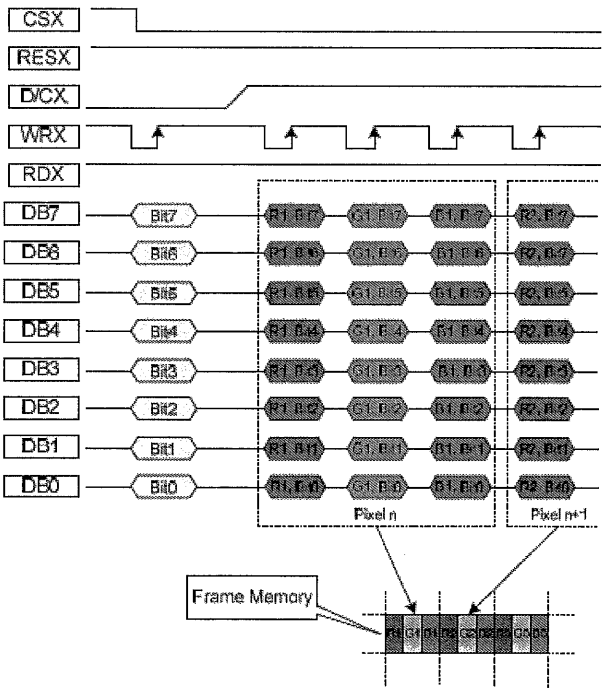
65,536 colors



262,144 color

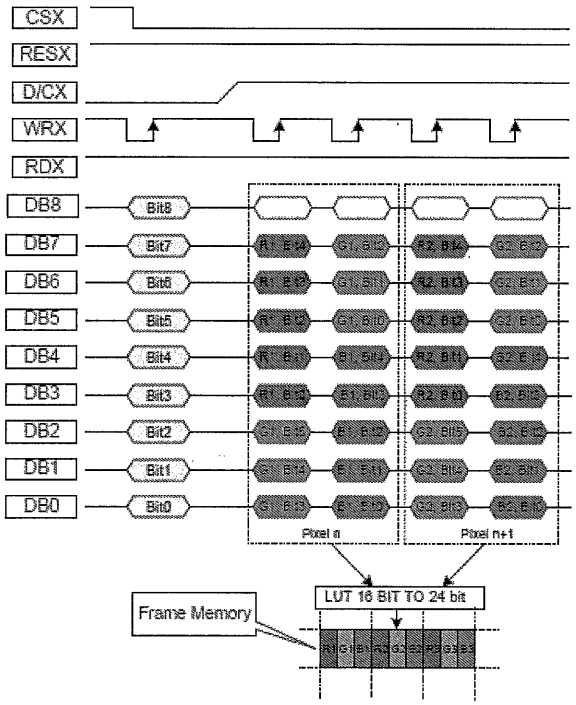


16,777,216 color

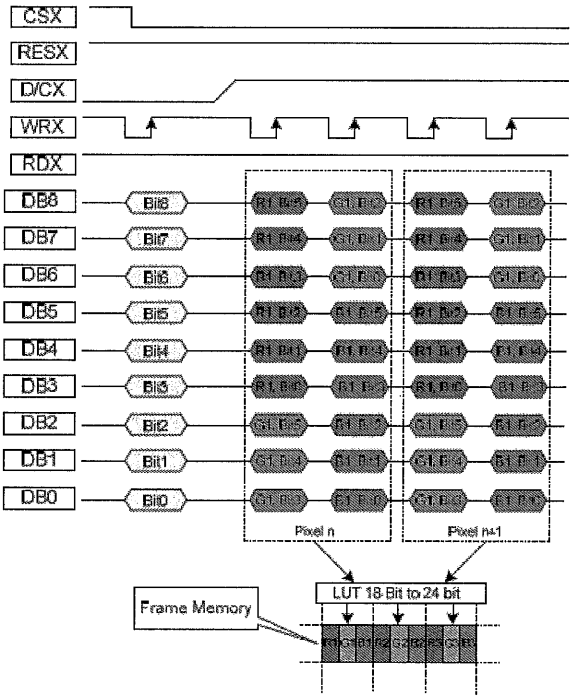


9bit data bus

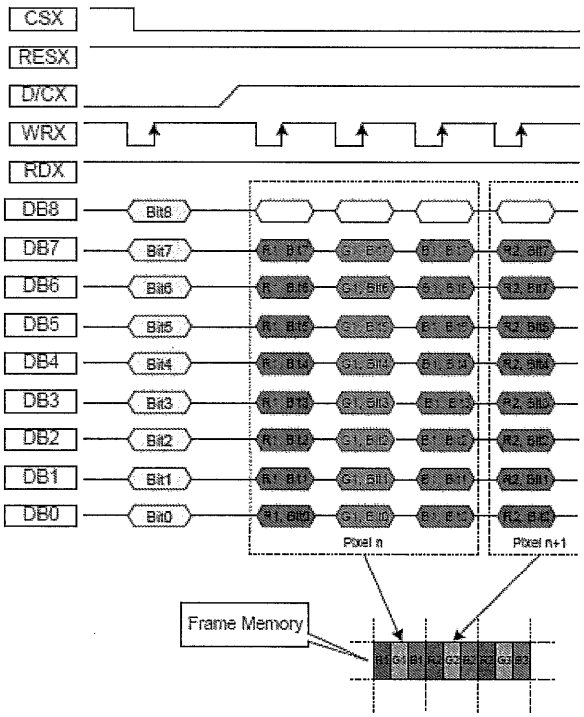
65,536 colors



262,144 color

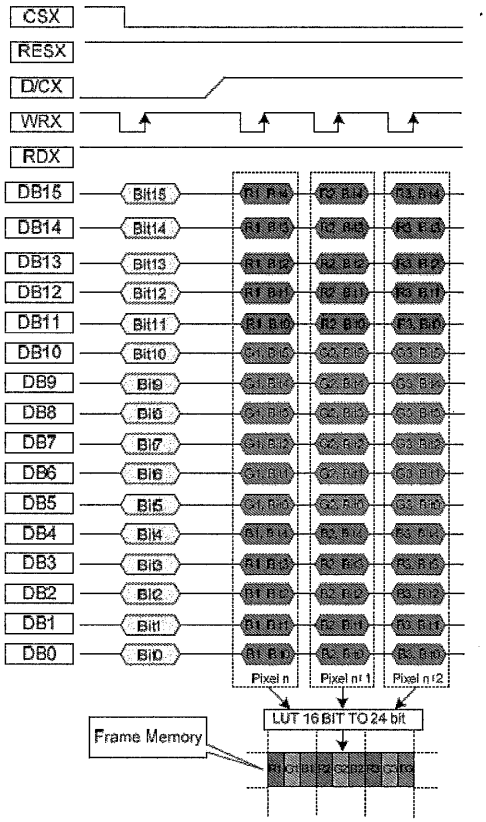


16,777,216 color

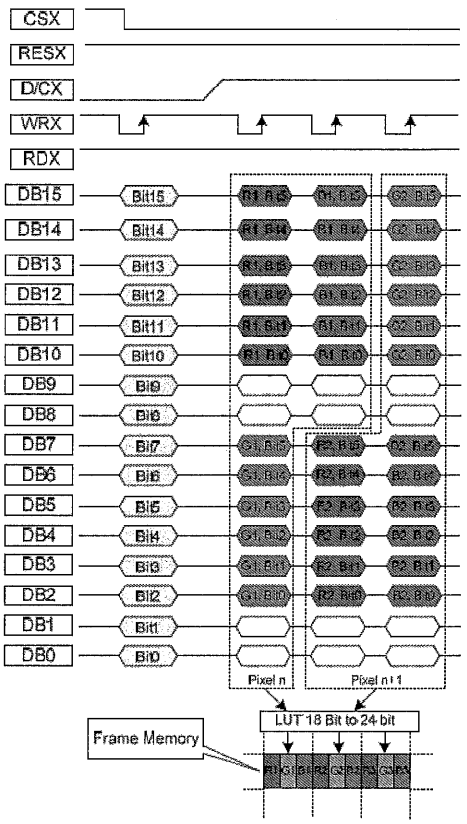


16 bit data bus

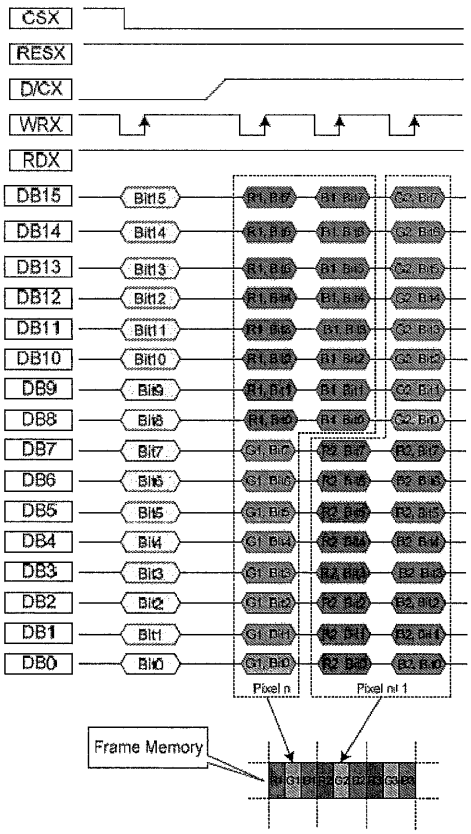
65,546 color



262,144 color

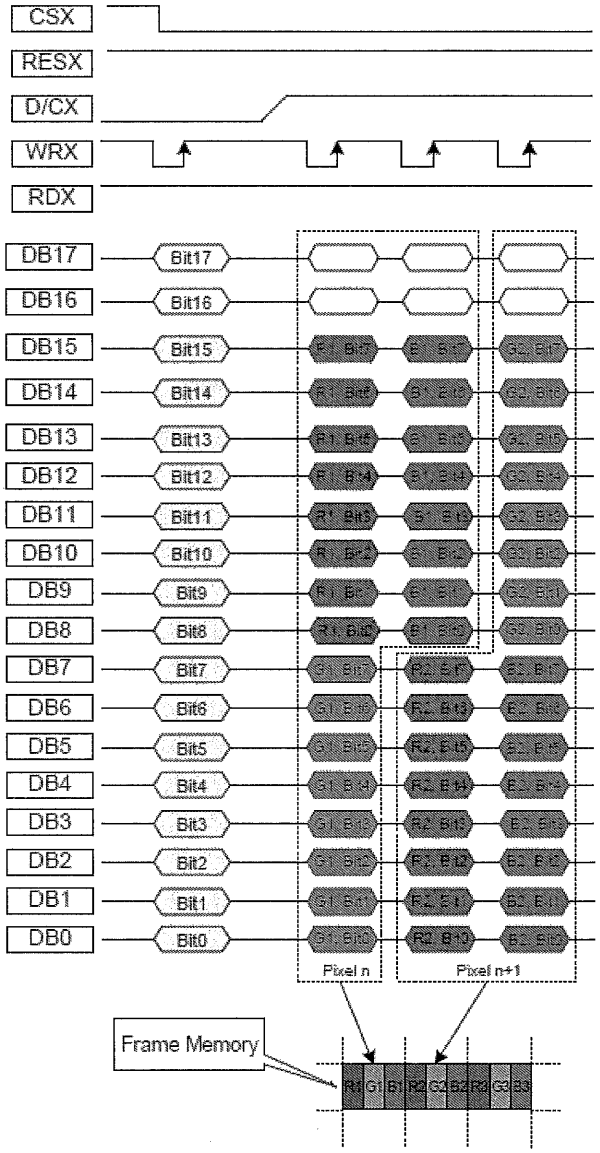


16,777,216 color

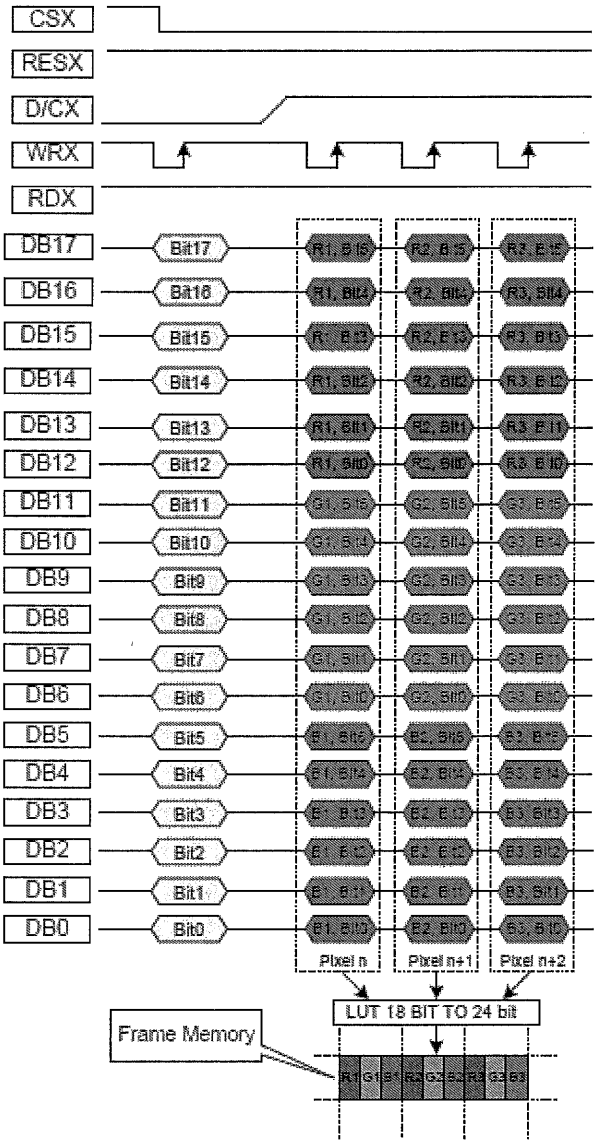


18 bit data bus

262,144 color



16,777,216 color



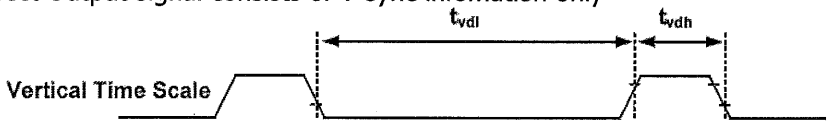
(5-6) Tearing Effect Output line (VSYNC_O)

The Tearing Effect output (VSYNC_O) supplie to the MPU a Panel synchronization signal. This signal can be enabled or disabled by Tearing Effect Line Off & On commands. The mode of the Tearing Effect Signal is defined by the Parameter of the Tearing Effect Line On command.

The signal can be used by the MCU to synchronize Frame Memory Writing when display video image.

Mode1,

Tearing Effect Output signal consists of V-sync infomation only

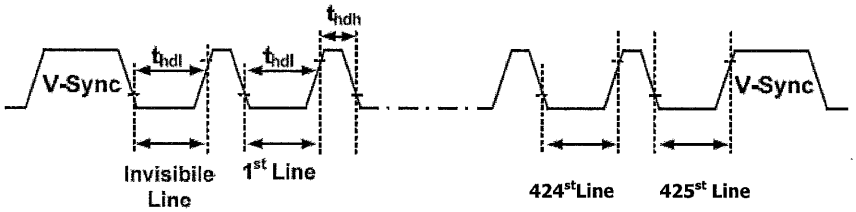


thdh=The LCD display is not updated from the Frame Memory.

Thdl=The LCD display is updated from the Frame Memory (except Invisible Line – see above)

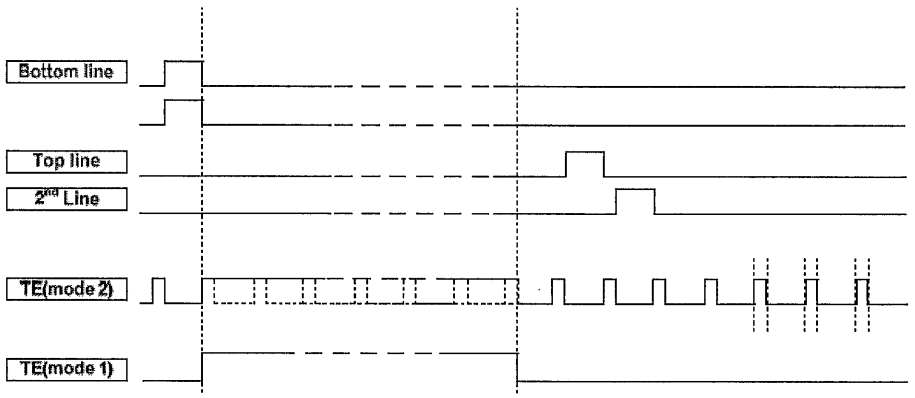
Mode2,

Tearing Effect Output signal consists V-sync and H-sync infomation. There is one V-sync and 425 H-sync pulses per field :

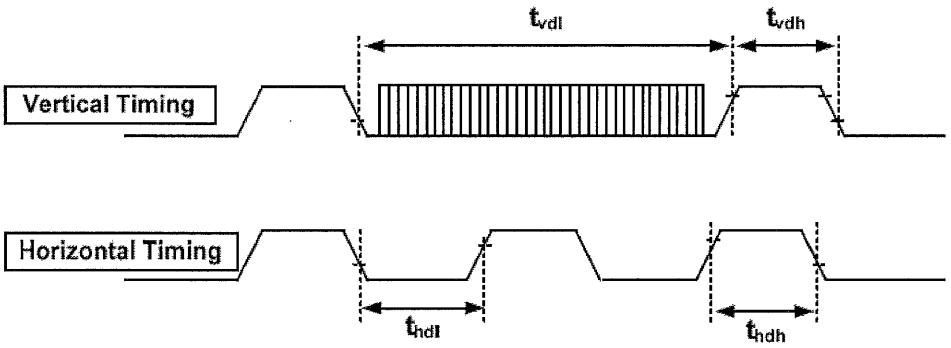


thdh=The LCD display is not updated from the Frame Memory.

Thdl=The LCD display is updated from the Frame Memory (except Invisible Line – see above)

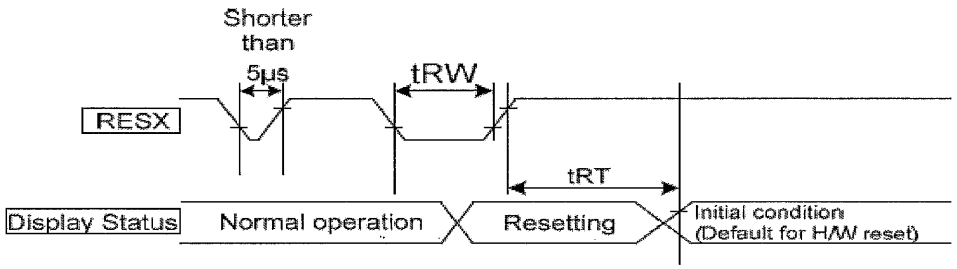


Tearing Effect timing



Symbol	Parameter	min	max	unit	description
t_{vdl}	Vertical Timing Low Duration	TBD	-	ms	
t_{vdh}	Vertical Timing High Duration	1000	-	us	
t_{hdl}	Horizontal Timing Low Duration	TBD	-	us	
t_{hdh}	Horizontal Timing High Duration	TBD	500	us	

(5-7)Reset timing



Signal	Symbol	parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		us
tRT		Reset cancel	-	120	ms

(5-8)Schematic of LCD module system

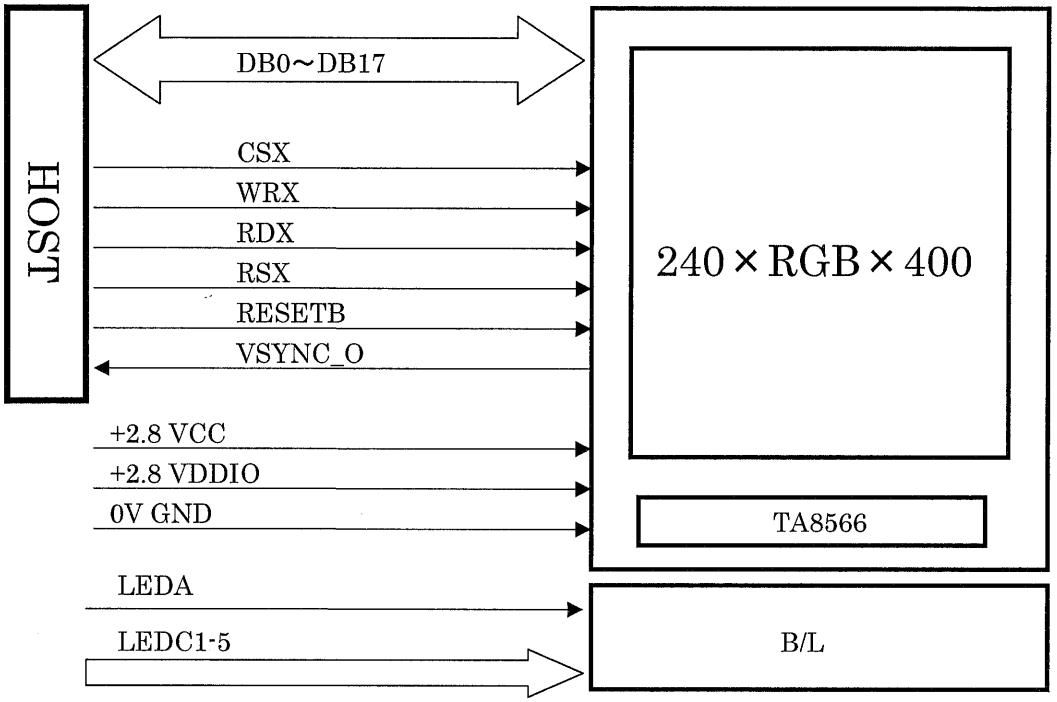
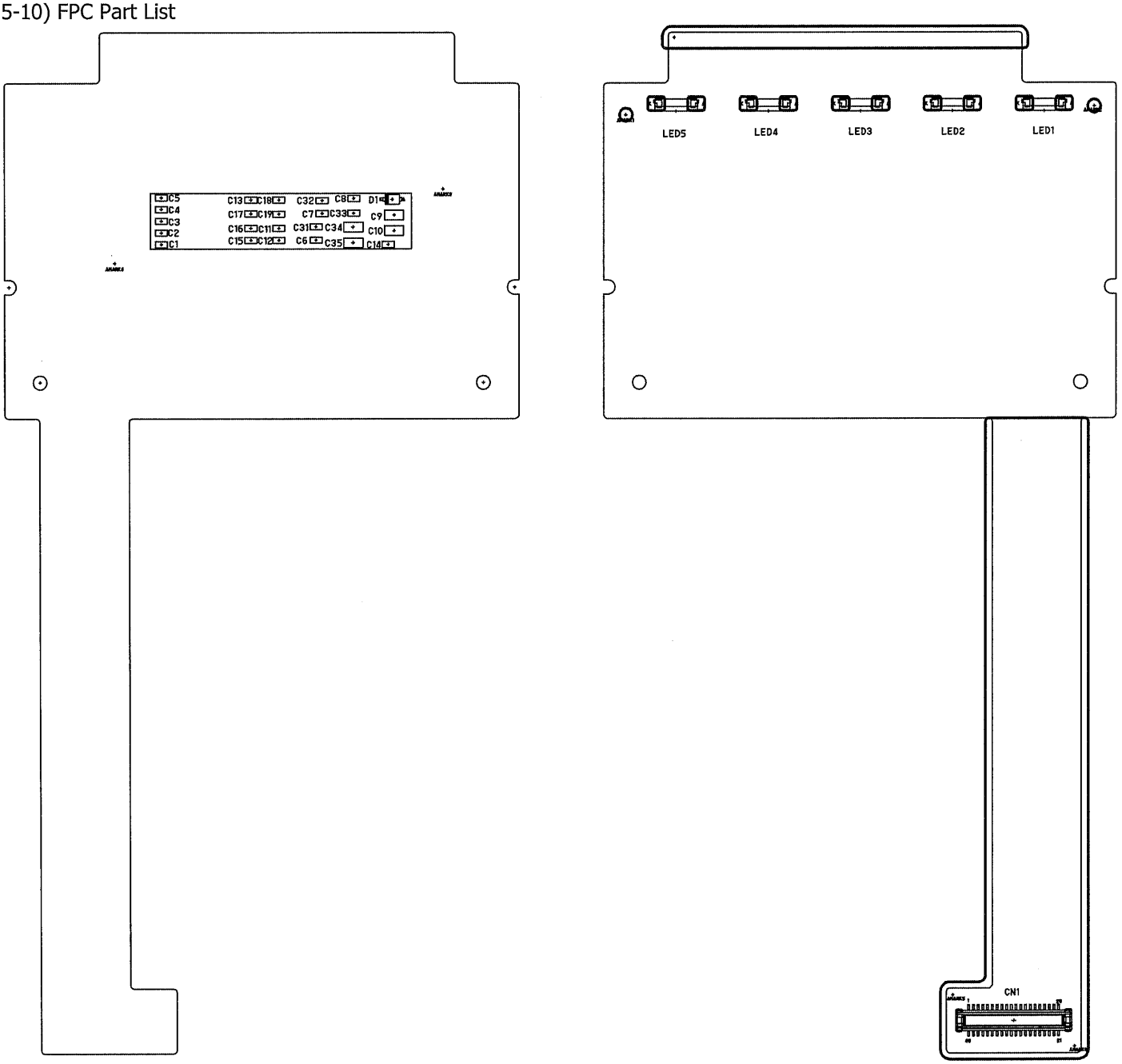


Fig.1 Schematic of LCD module system

(5-9) ID code and register address

model	READ REGISTER	ID Code
		ID0(Parameter 2nd)
LQ030B3UX02	04h	02h

(5-10) FPC Part List



Part List

Part	Characteristics
Capacitor1 (C4)	47nF 10V 1005 B t=0.5 mm
Capacitor2 (C7)	1uF 10V 1005 B t=0.55 mm
Capacitor3 (C9,C10,C34,C35)	1uF 25V 1608 B t=0.55 mm
Capacitor4 (C1,C2,C3,C5,C6,C8 C12,C31,C32,C33)	1uF 6.3V 1005 B t=0.55 mm
Capacitor5 (C15,C16,C17 C18,C19)	0.1uF 10V 1005 B t=0.55 mm
Capacitor6 (C11)	2.2uF 6.3V 1005 X5R t=0.55 mm
Diode1 (D1)	VF≦0.5V(@IF=200mA)VR<30V t=0.70 mm
LED (LED1,LED2,LED3 LED4,LED5)	White LED NICHIA:NSSW206T
Connector (CN1)	AXT640124 Panasonic

6. Optical Characteristics

Table 8 VDDIO=2.8 V, VCC=2.8V, ILED=20mA/pcs, Ta = 25°C

Optical Characteristics								
Parameter		symbol	condition	MIN	TYP	MAX	unit	Remark
Brightness		Br	θ=0°	300	400	-	cd/m²	Note1,2
Contrast		Co	θ=0°	400	500	-		Note1,3
Viewing Angle		θ11	Co > 5	70	80	-	deg	Note1
		θ12		70	80	-		
		θ21		70	80	-		
		θ22		70	80	-		
Response Time	Rise	τr1	θ=0°	-	11	22	ms	Note1,4
	Deca	τd1		-	24	48	ms	
Uniformity		—	θ=0°	80	-	-	%	Note.5
NTSC ratio		—	θ=0°	-	75	-	%	
White chromaticity		x	θ=0°	0.25	0.30	0.35		Note.1,3
		y		0.26	0.31	0.36		
Red chromaticity		x	θ=0°	0.60	0.65	0.70		
		y		0.29	0.34	0.39		
Green chromaticity		x	θ=0°	0.26	0.31	0.36		
		y		0.59	0.64	0.69		
Blue chromaticity		x	θ=0°	0.09	0.14	0.19		
		y		0.02	0.07	0.12		

Note 1) Definition of range of visual angle

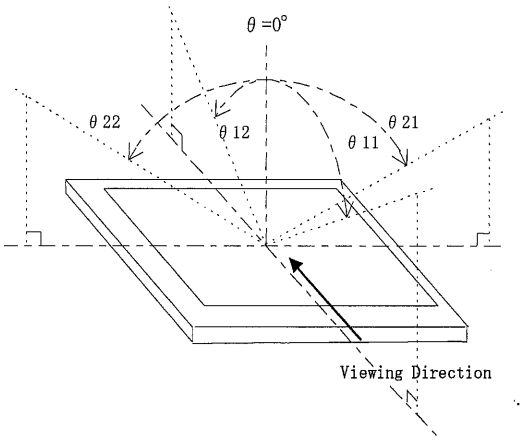


Fig .2 Definition of viewing angle

Note 2) Brightness is measured as shown in Fig.3, and is defined as the brightness of all pixels "White" at the center of display area on optimum contrast.

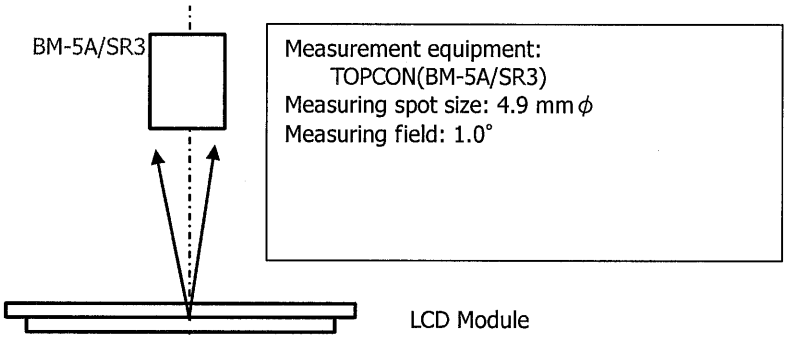


Fig. 3 Optical characteristics Test Method (Brightness)

Note 3) Contrast ratio is defined as follows:

$$Co = \frac{\text{Luminance(brightness) all pixcels "White"}}{\text{Luminance(brightness) all pixcels "Black"}}$$

Note 4) Response time is defined as follows:

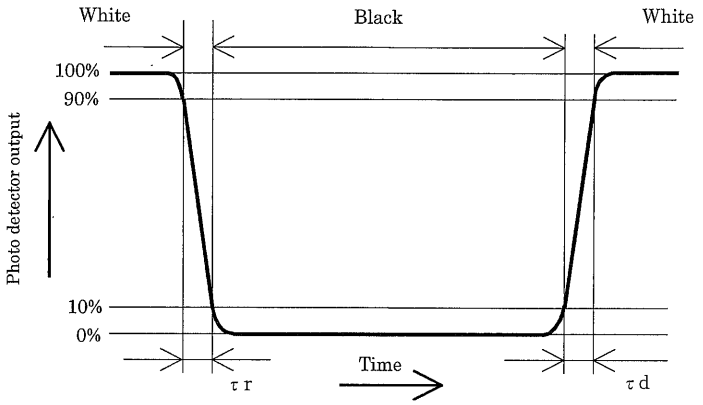
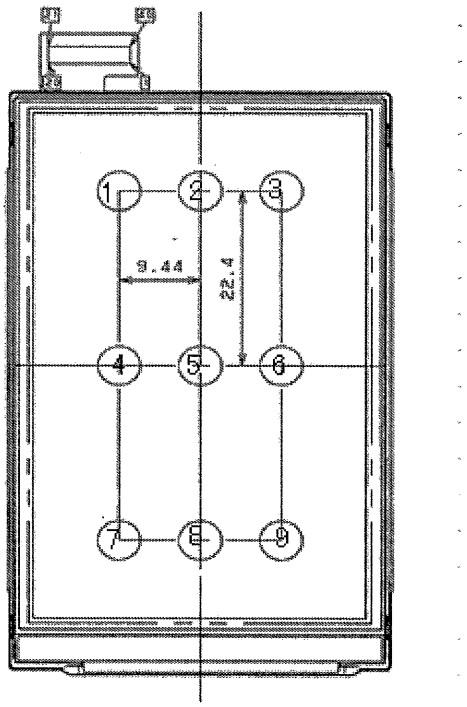


Fig. 4 Response time

Note 5) Uniformity is defined as follows:

$$\text{Uniformity} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}} \times 100\%$$



7. Reliability

Table. 9

No.	Test	Condition	Judgment criteria
1	Temperature Cycling	-30℃ → 80℃ → -30℃ ... 60min (3min) 60min (3min) 60min 10cycle	Per table in below
2	High Temp. Storage	Ta=80℃ 96h	Per table in below
3	Low Temp. Storage	Ta=-30℃ 96h	Per table in below
4	Humidity Operation	Ta=60℃ 90%RH 96h	Per table in below (polarizer discoloration is excluded)
5	High Temp. Operation	Ta=70℃ 96h	Per table in below
6	Low Temp. Operation	Ta=-20℃ 96h	Per table in below
7	ESD	Discharge resistance: 0 Ω Discharge capacitor: 200 pF Discharge voltage: ±200 V Max Discharge 1 time to each input line ※ "GND" of display module is connected GND of test system ground.	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

9. Packaging specifications

(9-1) Details of packaging

1) Packaging materials: Table.11

2) Packaging style : Fig. 5, 6

(9-2) Reliability

1) Vibration test

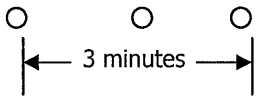
Table.10

Item	Test			
Frequency	5 Hz to 50 Hz (3 minutes cycle)			
Direction	Up-Down, Left-Right, Front-Back (3 directions)			
Period	Up-Down	Left-Right	Front-Back	Total
	60min	15min	15min	90min

The frequency should start at 5 Hz and vary continuously.

Total amplitude 20mm 0.2mm 20mm 0.2mm

Frequency 5 Hz 50 Hz 5 Hz 50 Hz (For 9.8m/s^2)



2) Drop test

Drop height: 750mm

Number of drop: 10 times (Drop sequence: 1 corner, 3 edges, 6 faces)

(9-3) Packaging quantities

200 modules per master carton

(9-4) Packaging weight

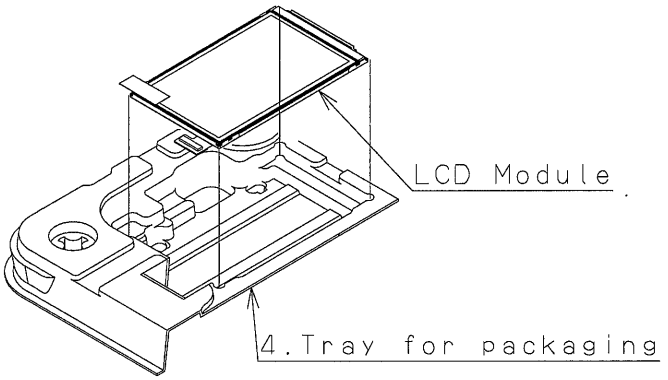
About 7 kg

(9-5) Packaging outline dimensions

360 mm×525 mm×225 mm (H)

(Packaging materials) Table.11

	Parts name	Materials
1	Master carton	Corrugate card board
2	Inside sleeve	Corrugate card board
3	Outside sleeve	Corrugate card board
4	Tray for packaging	polystyrene with anti-static treatment + anti-static polystyrene Surface Resistivity: 10^5~10^{11} Ω
5	Protective bag	Polyethylene with anti-static treatment Surface Resistivity: 10^5~10^{11} Ω
6	OPP tape	Polypropylene
7	Bar code label	Anti-static polyethylene
8	Product label	Anti-static polyethylene



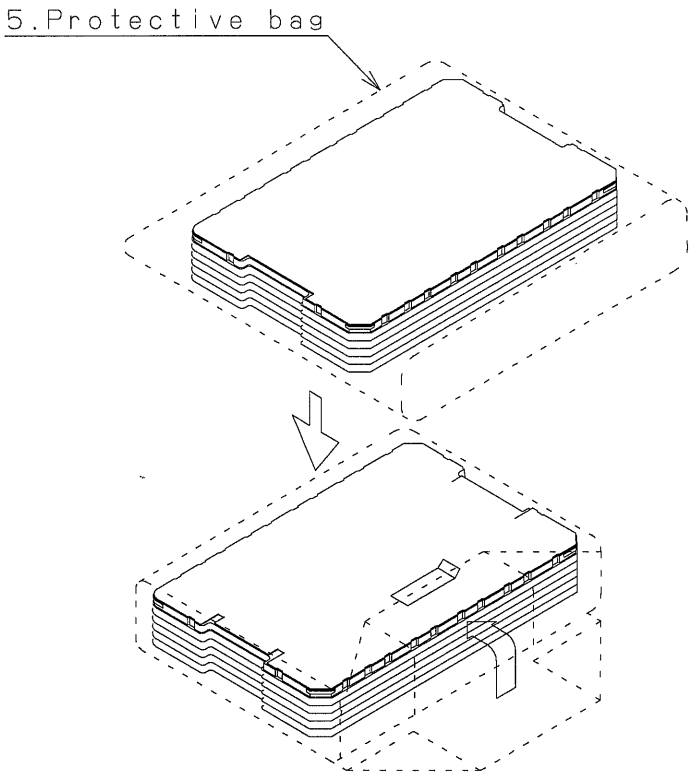


Fig.5 Packaging style (Tray for packaging)

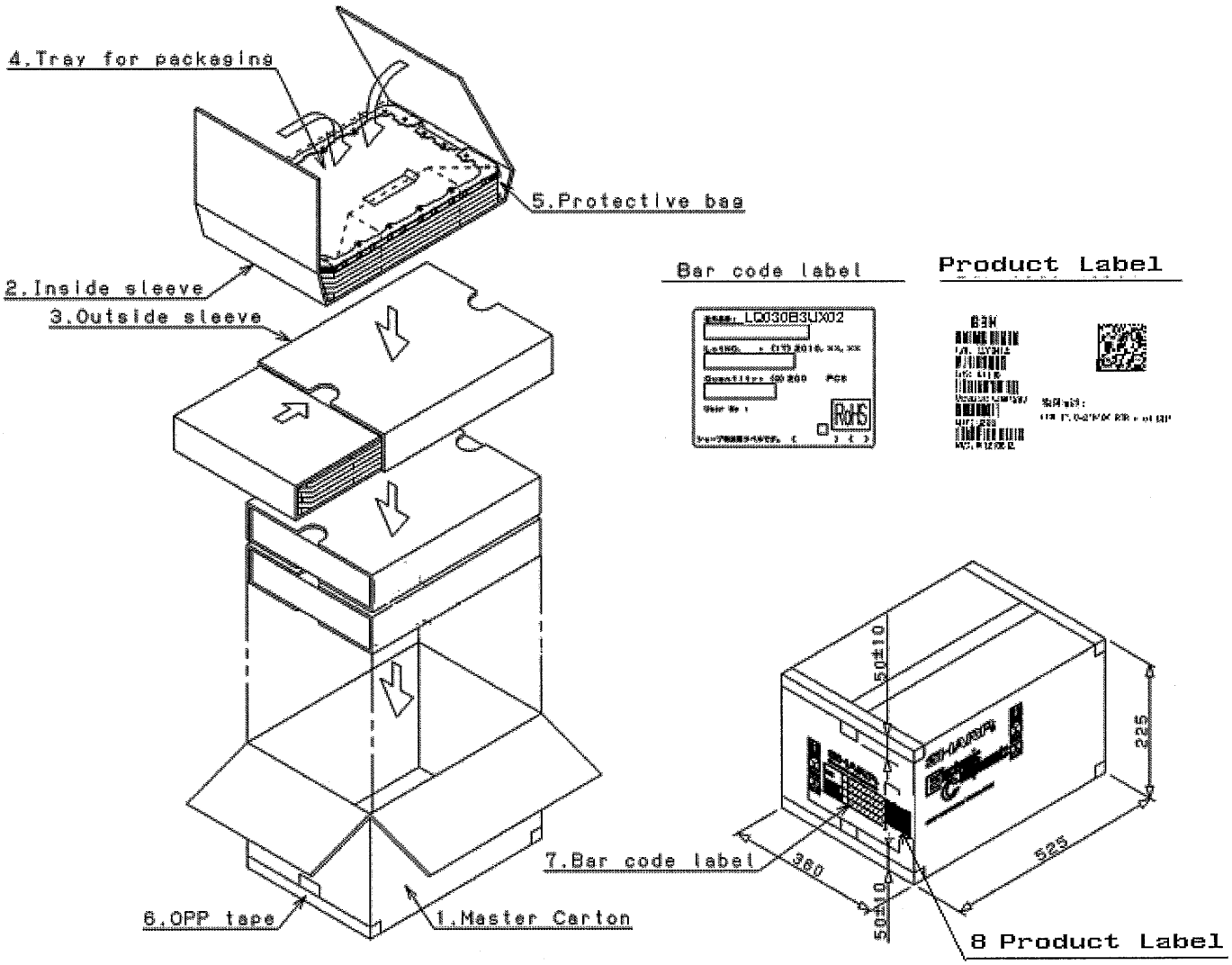


Fig. 6 Packaging style (Master carton for packaging)

10. Initial Sequence

Conditions:

LCD DRIVER	TA8566 (MAGNA CHIP)
CPU TYPE	i80 CPU
I/F	8 bit parallel,16 bit parallel,9 bit parallel, 18 bit parallel
RS Function	index : RS = " L ", data : RS ="H"
Frame frequency	TYP 68Hz

10-1 Power On Sequence

ITEM	"I"NDEX or "D"ATA	HEX	REMARK
VDDIO=2.8V			
WAIT **min**10ms (for Logic stable)			
VCC=2.8V			
WAIT **min**10ms (for power stable)			
BS2="H"BS1="H"BS0="L" (18bit Bus mode)			
HW RESET (Low pulse Min 30us)			
WAIT **min**10ms (Command issue prohibit period)			
	Command	BAh	
	1st parameter	85h	
	2st parameter	66h	
POWCTL1	Command	B6h	
	1st parameter	26h	
	2st parameter	03h	
	3st parameter	10h	
POWCTL2	Command	B7h	
	1st parameter	66h	
	2st parameter	44h	
	3st parameter	01h	
POWCTL3	Command	B8h	
	1st parameter	68h	
	2st parameter	54h	
	3st parameter	11h	
	4st parameter	00h	
DISPCTL1	Command	B0h	
	1st parameter	00h	
	2st parameter	00h	
	3st parameter	0Ah	
	4st parameter	0Fh	
DISPCTL2	Command	B1h	

	1st parameter	01h	
	2st parameter	90h	
DISPCTL3	Command	B2h	
	1st parameter	53h	
	2st parameter	4Fh	
	3st parameter	11h	
	4st parameter	13h	
	5st parameter	51h	
	6st parameter	20h	
	7st parameter	66h	
	8st parameter	12h	
	9st parameter	36h	
DISPCTL4	Command	B3h	
	1st parameter	B4h	
	2st parameter	88h	
	3st parameter	00h	
	4st parameter	00h	
RGAMMA	Command	C0h	
	1st parameter	00h	
	2st parameter	23h	
	3st parameter	00h	
	4st parameter	17h	
	5st parameter	13h	
	6st parameter	27h	
	7st parameter	2Dh	
	8st parameter	30h	
	9st parameter	26h	
	10st parameter	23h	
	11st parameter	1Fh	
	12st parameter	1Fh	
	13st parameter	0Eh	
	14st parameter	08h	
	15st parameter	00h	
	16st parameter	1Ch	
	17st parameter	3Fh	
	18st parameter	3Fh	
	19st parameter	3Eh	
	20st parameter	30h	
	21st parameter	27h	
	22st parameter	1Ch	
	23st parameter	14h	
	24st parameter	06h	

	25st parameter	07h	
	26st parameter	0Dh	
	27st parameter	1Eh	
	28st parameter	29h	
	29st parameter	2Fh	
	30st parameter	3Fh	
	31st parameter	00h	
GGAMMA	Command	C1h	
	1st parameter	00h	
	2st parameter	23h	
	3st parameter	00h	
	4st parameter	17h	
	5st parameter	13h	
	6st parameter	27h	
	7st parameter	2Dh	
	8st parameter	30h	
	9st parameter	26h	
	10st parameter	23h	
	11st parameter	1Fh	
	12st parameter	1Fh	
	13st parameter	0Eh	
	14st parameter	08h	
	15st parameter	00h	
	16st parameter	1Ch	
	17st parameter	3Fh	
	18st parameter	3Fh	
	19st parameter	3Eh	
	20st parameter	30h	
	21st parameter	27h	
	22st parameter	1Ch	
	23st parameter	14h	
	24st parameter	06h	
	25st parameter	07h	
	26st parameter	0Dh	
	27st parameter	1Eh	
	28st parameter	29h	
	29st parameter	2Fh	
	30st parameter	3Fh	
	31st parameter	00h	
BGAMMA	Command	C2h	
	1st parameter	00h	
	2st parameter	23h	

	3st parameter	00h	
	4st parameter	17h	
	5st parameter	13h	
	6st parameter	27h	
	7st parameter	2Dh	
	8st parameter	30h	
	9st parameter	26h	
	10st parameter	23h	
	11st parameter	1Fh	
	12st parameter	1Fh	
	13st parameter	0Eh	
	14st parameter	08h	
	15st parameter	00h	
	16st parameter	1Ch	
	17st parameter	3Fh	
	18st parameter	3Fh	
	19st parameter	3Eh	
	20st parameter	30h	
	21st parameter	27h	
	22st parameter	1Ch	
	23st parameter	14h	
	24st parameter	06h	
	25st parameter	07h	
	26st parameter	0Dh	
	27st parameter	1Eh	
	28st parameter	29h	
	29st parameter	2Fh	
	30st parameter	3Fh	
	31st parameter	00h	
	Command	BAh	
	1st parameter	00h	
	2st parameter	00h	
SLPOUT	Command	11h	
WAIT **min**120ms			
TEON	Command	35h	
	1st parameter	00h	
CASET	Command	2Ah	
	1st parameter	00h	
	2nd parameter	00h	
	3rd parameter	00h	
	4th parameter	EFh	
PASET	Command	2Bh	

	1st parameter	00h	
	2nd parameter	00h	
	3rd parameter	01h	
	4th parameter	8Fh	
MADCTL	Command	36h	
	1st parameter	48h	
COLMOD	Command	3Ah	
	1st parameter	06h	
WAIT **min**20ms			
RAMWR	Command	2Ch	
	Image	**h	Black Pattern
DISPON	Command	29h	
WAIT 10ms			
B/L ON			
RAMWR	Command	2Ch	
	Image	**h	ANY Pattern

10-2 Power OFF Sequence

ITEM	"I"NDEX or "D"ATA	HEX	REMARK
B/L OFF			
DISPOFF	Command	28h	
WAIT 40ms			
SLPIN	Command	10	
WAIT **min**120ms (for Power down)			
VCC=GND			
WAIT **min**10ms (for Logic stable)			
VDDIO=GND			

10-3 Sleep IN

ITEM	"I"NDEX or "D"ATA	HEX	REMARK
B/L OFF			
DISPOFF	Command	28h	
WAIT 40ms			
SLPIN	Command	10	
WAIT **min**120ms (for Power down)			

10-4 Sleep OUT

ITEM	"I"NDEX or "D"ATA	HEX	REMARK
SLPOUT	Command	11h	
WAIT 120ms			
DISPON	Command	29h	
WAIT 10ms			
B/L ON			

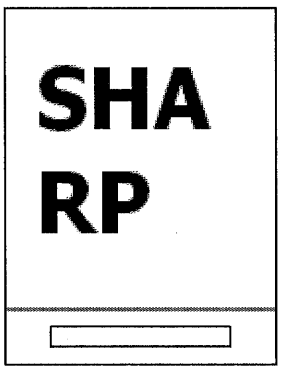
***LCD ROTATION**

Memory data access control(36h)

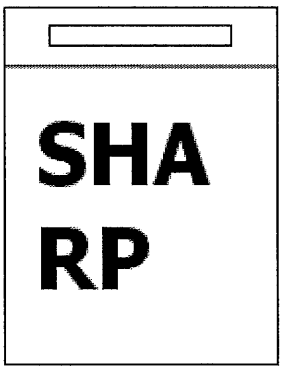
Reg/Para	D15-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
COLMOD	X	0	0	1	1	1	0	1	0	36
Parameter	X	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	X X

Note: ' X ' Don't care.

Location



Reg/Para	D15-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
COLMOD	X	0	0	1	1	1	0	1	0	36
Parameter	X	0	1	0	0	1	0	0	0	48



Reg/Para	D15-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
COLMOD	X	0	0	1	1	1	0	1	0	36
Parameter	X	1	0	0	0	1	0	0	0	88

11. Serial Number Label identification

Numbering is specified as follows.

1 Z 000001 A Q

① ② ③ ④ ⑤

① product year (lower 1 digits)

1: 2011

2: 2012

② product month

1: January
2: February
3: March
:
9: September
X: October
Y: November
Z: December

③ serial number

000001 ~ 999999

④ Version number

⑤ factory code

12. LCD Module Code Rule

LQ 030 B 3 U X 02

① ② ③ ④ ⑤ ⑥ ⑦

①Parts type

a-si LCD

②Active area size

3.0inch

③Dot format

WQVGA format

④LCD type

Transmissive

⑤Interface type

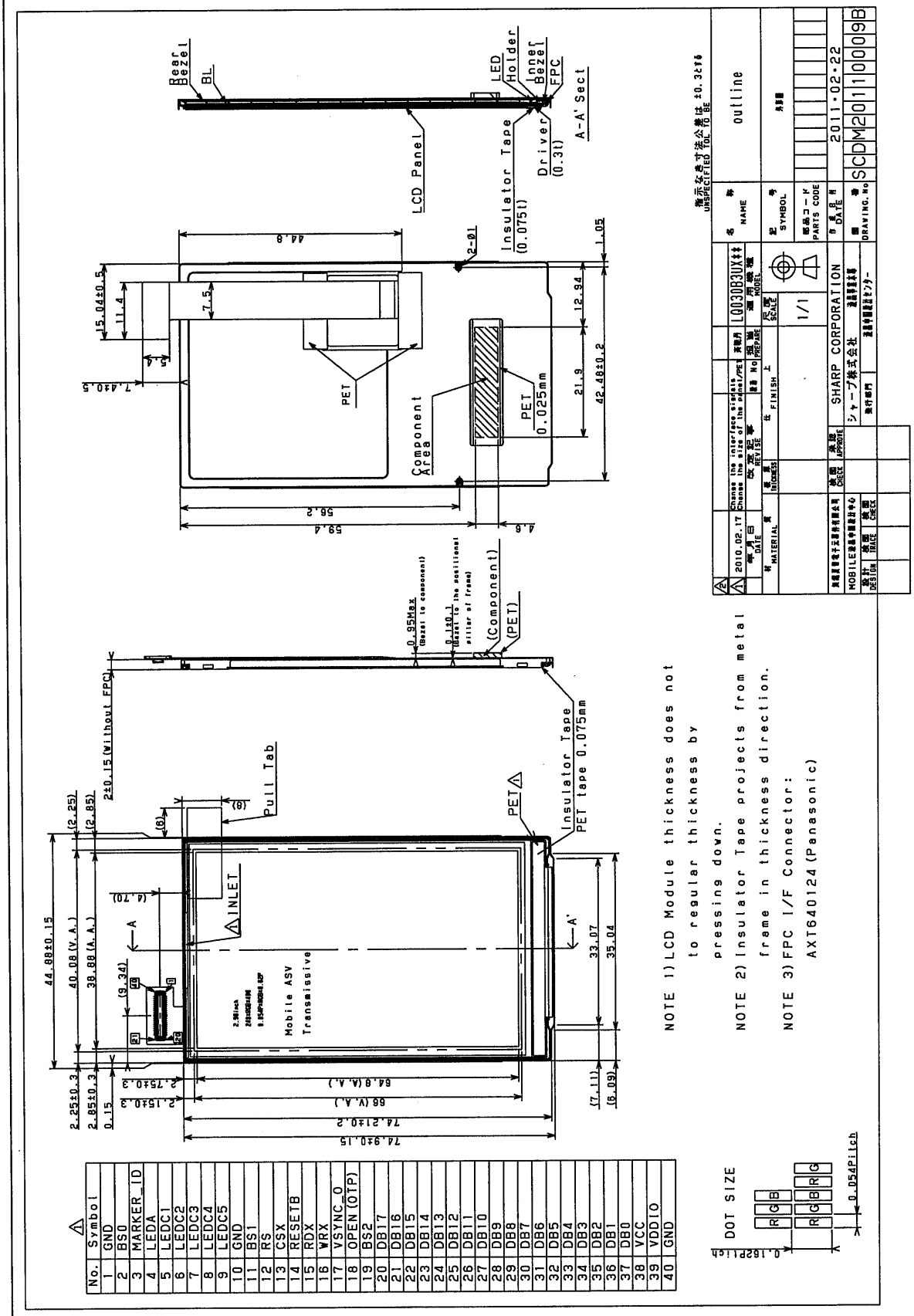
CPU interface

⑥Polarizer / LCD viewing type

Clear type / Wide viewing angle

⑦Serial Code

13. Outline dimensions



No.	Symbol
1	GND
2	BS0
3	MARKER_ID
4	LEDA
5	LEDC1
6	LEDC2
7	LEDC3
8	LEDC4
9	LEDC5
10	GND
11	BS1
12	RS
13	CSX
14	RESETB
15	RDX
16	WRX
17	VSYNC_O
18	OPEN (OTP)
19	BS2
20	DB17
21	DB16
22	DB15
23	DB14
24	DB13
25	DB12
26	DB11
27	DB10
28	DB9
29	DB8
30	DB7
31	DB6
32	DB5
33	DB4
34	DB3
35	DB2
36	DB1
37	DB0
38	VCC
39	VDDIO
40	GND

Fig. 7 Outline dimensions