SPECIFICATION FOR

TFT-LCD module

MODEL No. LQ050Y3DC02

S C I C
2015 -07- 1 5
発 行

CUSTOMER'S APPROVAL

DATE _____

BY _____

DATE _____

BY _____

PRESENTED

BY *T. Yamamoto*

TAKAHIRO YAMAMOTO

DEPARTMENT GENERAL MANAGER

DEVELOPMENT DIVISION II

DESIGN CENTER 2

DISPLAY DEVICE GROUP

SHARP(CHINA) INVESTMENT CO.,LTD

			DOC. First issue	Jul.10th.2015
RECORDS OF REVISION			Model No.	LQ050Y3DC02
			Spec. No.	LCY-W-15706

DATE	REF.PAGE PARAGRAPH DRAWING No.	REVISED NO.	SUMMARY
2015.07.10	—	—	First Issue

NOTICE

These specification sheets are the proprietary of SHARP and is copyrighted, with all rights reserved. Under the copyright laws, no part of these specification sheets may be reproduced or transmitted in any form or by any means, electronic or mechanical for any purpose, in whole or in part, without the express written permission of SHARP. Express written permission is also required before any use of these specification sheets may be made by a third party.

For the stable supply of this module,the components of the module may be changed or purchased from more than one suppliers,based on these specification sheets.Please understand this situation and we will inform you in advance.

The application circuit examples in these specification sheets are provided to explain the representative applications of SHARP's devices and are not intended to guarantee any circuit design or permit any industrial property right or other rights to be executed. SHARP takes no responsibility for any problems related to any industrial property right or a third party resulting from the use of SHARP's devices, except for those resulting directly from device manufacturing processes.

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that occur in equipment using any of SHARP's devices, shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP's device.

SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structures and other contents described herein at any time without notice in order to improve design or reliability. Contact SHARP in order to obtain the latest specification sheets before using any SHARP's device. Manufacturing locations are also subject to change without notice.

Observe the following points when using any device in these specification sheets. SHARP takes no responsibility for damage caused by improper use of the devices.

The devices in these specification sheets are designed for use in general electronic equipment designs, such as:
・Personal computers   ・Office automation   ・Telecommunication equipment
・Test and measurement equipment   ・Industrial control   ・Personal Digital Assistant
・Audio visual and multimedia equipment ・Consumer electronics

The appropriate design measures should be taken to ensure reliability and safety when SHARP's
devices are used for equipment such as:
・Transportation control and safety equipment(i.e., aircraft, trains, automobiles, etc.)
・Traffic signals   ・Gas leakage sensor breakers   ・Alarm equipment   ・Various safety devices etc.

SHARP's devices shall not be used for equipment that requires extremely high level of reliability, such as:
・Military and space applications   ・Nuclear power control equipment   ・Medical equipment for life support

Contact a SHARP representative, in advance, when intending to use SHARP's devices for any "specific" applications other than those recommended by SHARP.

Contact and consult with a SHARP representative if there are any questions about the contents of these specification sheets.

1. APPLICABLE SCOPE

This specification is applicable to TFT-LCD Module "LQ050Y3DC02" only.

2. General Description

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, Input FPC, a back light unit. Graphics and texts can be displayed on a 800×RGB×480 dots panel, four timing signals, serial interface, (typ. +3.3V) supply voltages for TFT-LCD panel driving and supply voltage for back light.

3. Mechanical (Physical) Specifications

Item	Specifications	Unit
Screen size	5.0	inch
Active area	108 (H)×64.8(V)	mm
Pixel format	800×480	Pixel
	1Pixel =R+G+B dots	
Pixel pitch	0.135(H)×0.135(V)	mm
Pixel configuration	R,G,B vertical stripes	
Display mode	Normally white	
Viewing Direction	6 o'clock	
Gray Scale Inversion Direction	6 o'clock	
Unit outline dimensions	118.50(W)×77.55(H)×2.90(D)	mm
Mass	55.8	g

*The above-mentioned table indicates module sizes without some projections and FPC.

For detailed measurements and tolerances, please refer to 16. Outline Dimensions.

4. Input Terminal Names and Functions

Recommendation CN : FH19SC-40S-0.5SH(55) (HRS)(40pin/0.5mm pitch/Up contact)

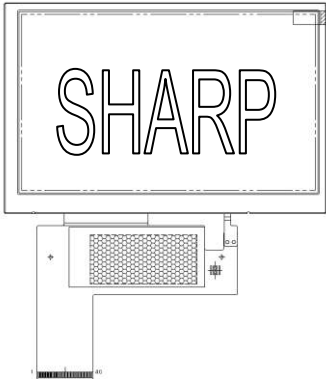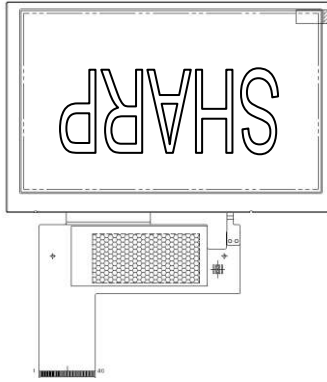| Pin No.	Symbol	I/O	Description	Remarks
1	VLED-	P	Power supply for LED (Low voltage)	
2	VLED+	P	Power supply for LED (High voltage)	
3	DGND	P	Digital Ground	
4	VDD	P	Power supply	
5	R0	I	RED data signal	
6	R1	I	RED data signal	
7	R2	I	RED data signal	
8	R3	I	RED data signal	
9	R4	I	RED data signal	
10	R5	I	RED data signal	
11	R6	I	RED data signal	
12	R7	I	RED data signal	
13	G0	I	GREEN data signal	
14	G1	I	GREEN data signal	
15	G2	I	GREEN data signal	
16	G3	I	GREEN data signal	
17	G4	I	GREEN data signal	
18	G5	I	GREEN data signal	
19	G6	I	GREEN data signal	
20	G7	I	GREEN data signal	
21	B0	I	BLUE data signal	
22	B1	I	BLUE data signal	
23	B2	I	BLUE data signal	
24	B3	I	BLUE data signal	
25	B4	I	BLUE data signal	
26	B5	I	BLUE data signal	
27	B6	I	BLUE data signal	
28	B7	I	BLUE data signal	
29	DGND	P	Digital Ground	
30	DCLK	I	Clock input pin in serial mode	
31	DISP	I	Display On/Off	High(VDD) normally operation
32	Hsync	I	Line synchronization signal	
33	Vsync	I	Frame synchronization signal	
34	DEN	I	Data input enable	
35	NC	I	No connection	
36	DGND	P	Digital Ground	
37	NC	-	No connection	
38	NC	-	No connection	
39	UPDN	-	Vertical scanning direction switching signal	Note2
40	SHLR	-	Horizontal scanning direction switching signal	Note2
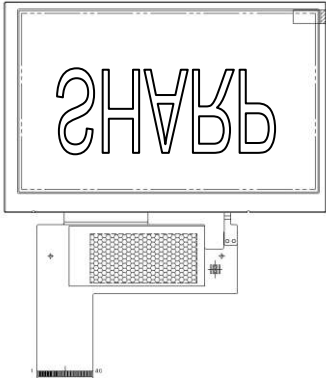
Note1: I/O definition: I---Input   O---Output   P---Power/Ground

Note2:

Display mode	UPDN	SHLR
Normal displayed	NC	NC
Right/Left reverse mode	NC	Lo
Up/Down reverse mode	Lo	NC
Right/Left & Up/Down reverse mode	Lo	Lo

NC---FLOAT (The NO.39 pin or NO.40 pin is pulled high in LCM internal circuit.)

Lo---GND

	SHLR= "FLOAT"	SHLR = "GND"
UPDN = "FLOAT"		
UPDN = "GND"		

5. Absolute Maximum Ratings

Item	Symbol	Conditions	Rated value	Unit	Remarks
Digital power supply voltage	VDD	Ta = 25℃	-0.5~ +5.0	V	Note 1
Temperature for storage	Tstg	-	-30 ~ +80	℃	Note 2
Temperature for operation	Topr	-	-20 ~ +70	℃	Note 3
BL input electric current	I_{BL}	Ta = 25℃	60	mA	Note 4
LED electricity consumption	P_{LED}	Ta = 25℃	105	mW	Note 4

Note 1) B7~B0, G7~G0, R7~R0, DISP,VSYNC, HSYNC, DEN,DCLK

Note 2) Ta > 60℃ Absolute humidity shall be less than Ta=60℃ /90 % RH.

Note 3) Panel surface temperature prescribes.

   (Reliability is examined at ambient temperature of 50℃.)

Note 4) Power consumption of one LED (Ta = 25℃). (use 12 pieces LED)

6. Electrical Characteristics

6-1. Electrical characteristics   Ta = 25℃

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Applicable Pin
Supply voltage	VDD-GND	Operating voltage	2.7	3.3	3.6	V	(note 1)
"H" level input voltage	V$_{IH}$	-	0.7xVDD	-	VDD	V	For digital circuit
"L" level input voltage	V$_{IL}$		0	-	0.3xVDD	V	
Input leakage current	I$_{LI}$	VIN=VDD or VSS	-	-	±0.1	µA	(note 1,2)
"H" level output voltage	V$_{OH}$	IOL=-1.0mA	VDD-0.4	-	-	V	(note 1,2)
"L" level output voltage	V$_{OL}$	IOL=1.0mA	-	-	VSS+0.4	V	
Current consumption 1 (normal display)	I$_{CC}$	Ta=25℃	-	(135)		mA	(note 3)

(note 1) VDD=2.7 to 3.6V, GND=0V,Ta=-40 to 85℃

(note 2) B7~B0, G7~G0, R7~R0, DISP,VSYNC, HSYNC, DEN,DCLK.

(note 3) Following Conditions

   Display Pattern: All OFF (black) Pattern.

   *All OFF (black) Pattern

6-2. Back light driving

The back light system has twelve LEDs   Ta=25℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Rated Voltage	V_{BL}	16.2	16.8	17.4	V	
Rated Current	I_{BL}	-	40	-	mA	I_{LED}=20mA,2Line
Power consumption	P_L	-	672	-	mW	
LED lifetime	-	-	15,000	-	h	[*1]

*1 per one piece of Backlight
*Please consider Allowable Forward Current on used temperature
[*1] Luminance becomes 50% of an initial value.(Ta=25℃)

Ambient temperature and the maximum input of 1 per LED are fulfilling the following operating conditions.
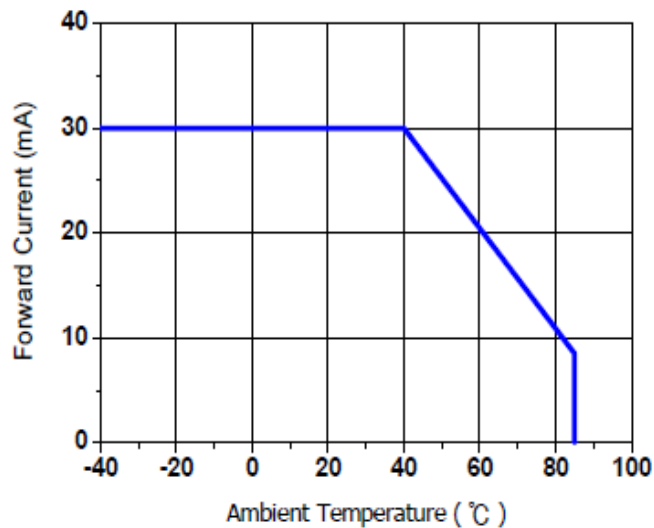
Ambient temperature and the maximum input of 1 per LED

7. Timing characteristics of input signals (DE Mode selection)
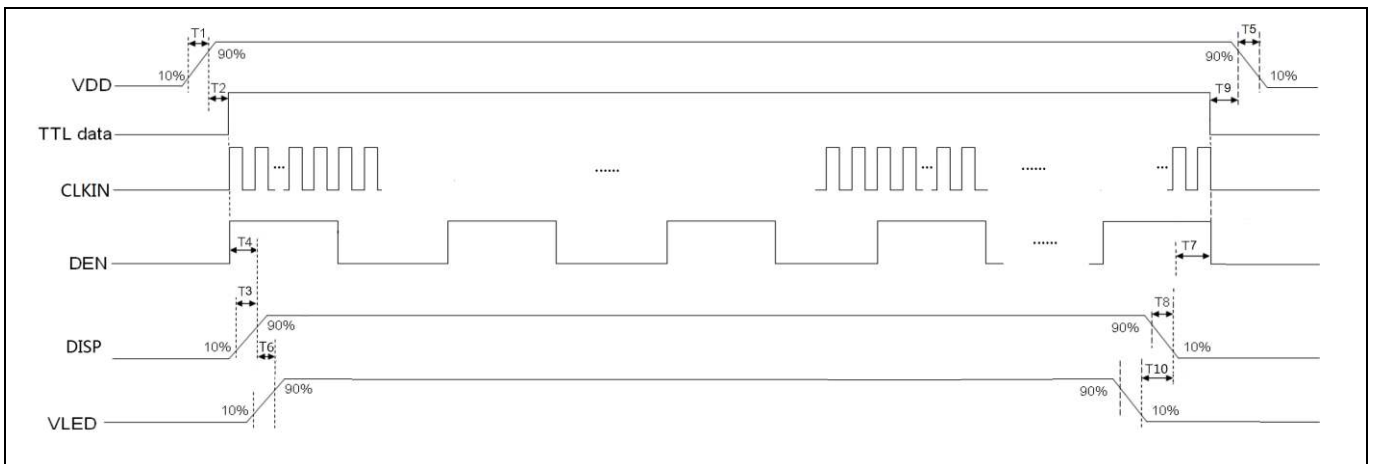   7-1. Power on/off control

Figure 7. 1 Power on/off Timing Sequence

Symbol	Spec.			Unit
	Min.	Typ.	Max.	
T1	0	-	20	ms
T2	2	-	32	ms
T3	0	-	0.1	us
T4	0	-	0.5*tvd	T$_H$
T5	0	-	20	ms
T6	300	-	-	ms
T7	0.5*tvd	-	tvd	T$_H$
T8	0	-	0.1	us
T9	8	-	18	T$_V$
T10	300	-	-	ms

NOTE3:

The relation between the data input and the backlight lighting will recommend the above-mentioned input sequence.When the backlight is turned on before the panel operates,there is a possibility of abnormally displaying.The liquid crystal module is not damaged.

Please advise a power supply ON period that an input signal is not set to High-Z or it does not input an unusual signal.

7-2. AC electrical characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Data setup time	T$_{dsu}$	8	-	-	ns
Data hold time	T$_{dhd}$	8	-	-	ns
DE setup time	T$_{esu}$	8	-	-	ns
DE hold time	T$_{ehd}$	8	-	-	ns
VDD Power On Slew rate	T$_{POR}$	-	-	20	ms
RSTB pulse width	T$_{Rst}$	10	-	-	us
CLKIN cycle time	T$_{cph}$	20	-	-	ns
CLKIN pulse duty	T$_{cwh}$	40	50	60	%
Output stable time	T$_{sst}$	-	-	6	us

7-3. Timing of input signal
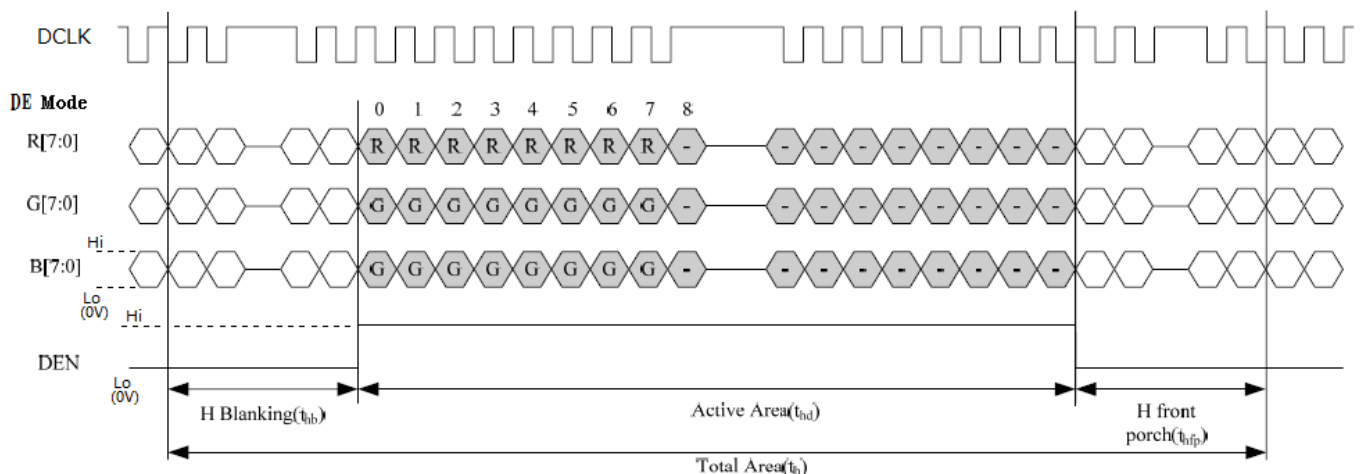
Figure 7.3 Input Timing Diagram

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd		800		DCLK
DCLK frequency	fclk	-	30	50	MHz
One Horizontal Line	th	889	928	1143	DCLK
HS pulse width	thpw	1	48	255	DCLK
HS Back Porch (Blanking)	thb		88		DCLK
HS Front Porch	thfp	1	40	255	DCLK
DE mode Blanking	th-thd	85	128	512	DCLK

7-4. Vertical timing
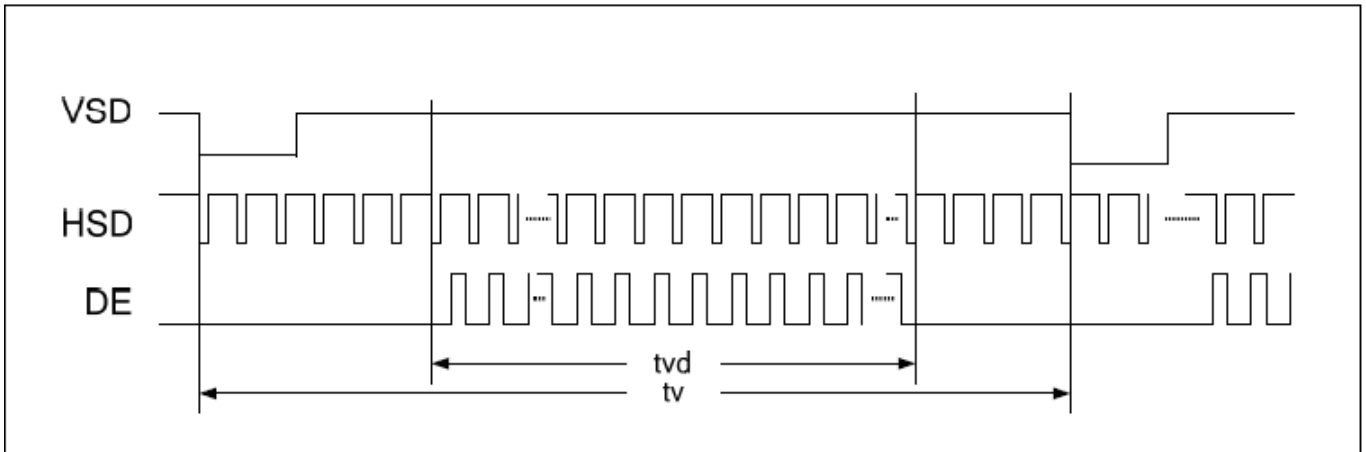
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd		480		T_H
DE mode Blanking	tv-tvd	4	45	255	T_H

8. Optical Characteristics of Module

Ta = 25℃, VDD = +3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range (Without Wide View)	Horizontal	θ21	CR＞10	65	75	-	deg.	【Note1,4】
		θ22		65	75	-	deg.	
	Vertical	θ11		50	60	-	deg.	
		θ12		60	70	-	deg.	
Contrast ratio		CR	Optimum viewing angle	500	600	-	-	【Note2,4】
Response Time	Rise	Tr	θ=0°	-	6	-	ms	【Note3,4】
	Decay	Td		-	2	-	ms	
Chromaticity of White	x			-	0.31	-	-	【Note4】
	y			-	0.33	-	-	
Luminance of white		XL1		240	300	-	cd/m²	ILED=20mA 【Note6】
Uniformity		U		70	80	-	%	【Note5

* The optical characteristics measurements are operated under a stable luminescence (I_{BL} = 40mA) and a dark condition. (Refer to Fig.1)
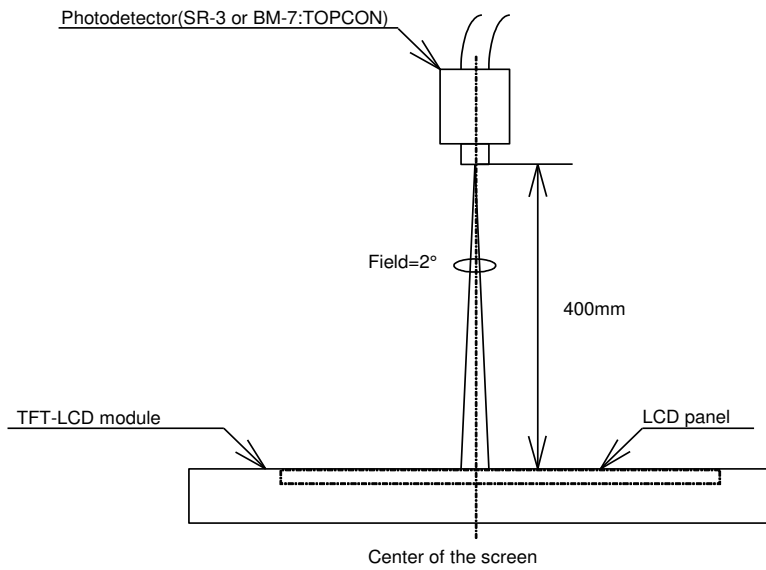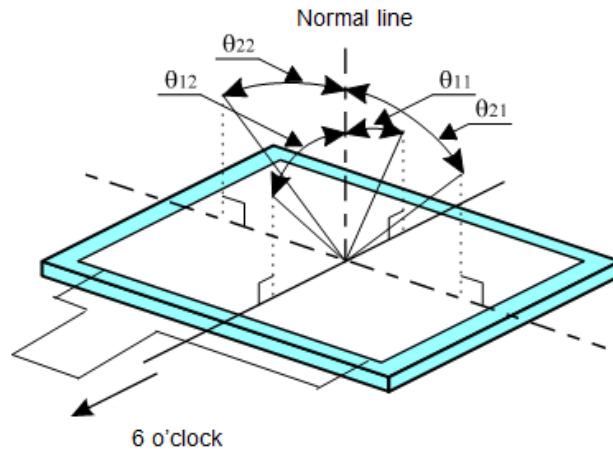
Photodetector(SR-3 or BM-7:TOPCON)

Field=2°

400mm

TFT-LCD module

LCD panel

Center of the screen

Fig.1 Optical characteristics measurement method

【 Note 1 】 Definitions of viewing angle range

Normal line

θ_{22}

θ_{12}

θ_{11}

θ_{21}

6 o'clock

【 Note 2 】 Definition of contrast ratio

The contrast ratio is defined as the following

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

【 Note 3 】 Definition of response time
The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.
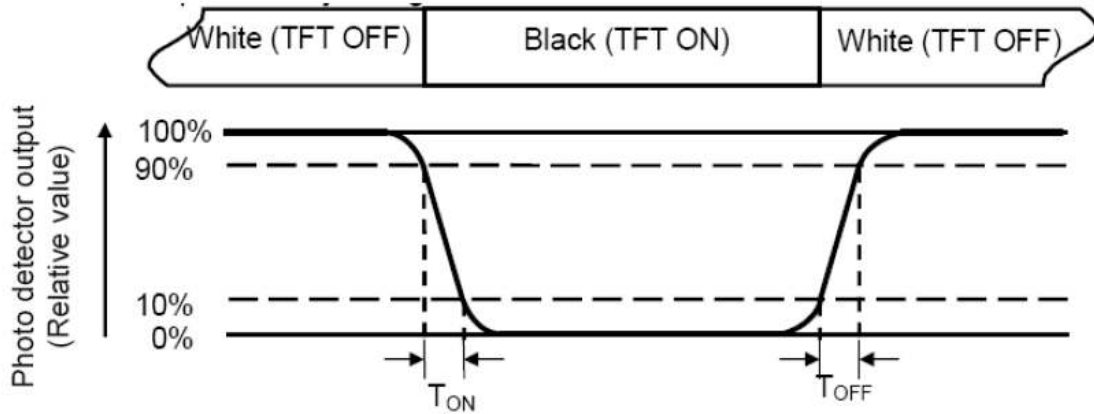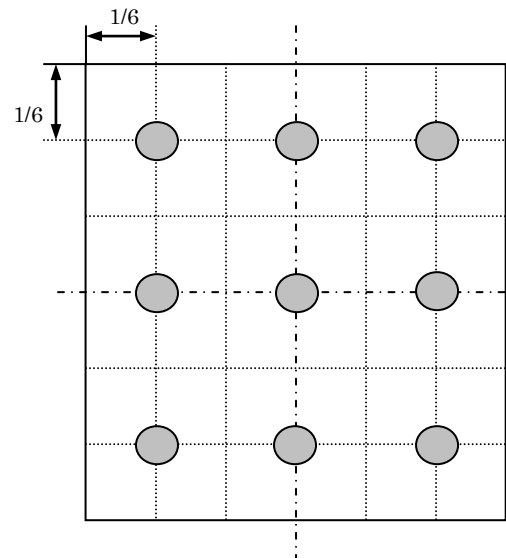

【 Note 4 】 This shall be measured at center of the screen.

【 Note 5 】 Definition of Uniformity

$$Uniformity = \frac{Minimum\,Brightness}{Maximum\,Brightness} \times 100\,(\%)$$

The brightness should be measured on the 9-point as shown in the right figure.

【 Note 6 】 This shall be measured on the 9-point as shown in the right figure.

$$Luminance\ of\ white = \frac{Summation\ of\ the\ 9\text{-}point\ Brightness}{9}$$

9. Reliability test items

No.	Test	Condition	Judgment criteria
1	Temperature Cycling Storage	-30deg.C(0.5h) ←→ 80 deg.C(0.5h) *1cycle 200cycle	Per table in below
2	High Temp. Storage	Ta=80℃ 240h	Per table in below
3	Low Temp. Storage	Ta=-30℃ 240h	Per table in below
4	High Temperature & High Humidity Storage	Ta=60℃90%RH 240h	Per table in below (polarizer discoloration is excluded)
5	High Temp. Operation	Ta=70℃ 240h	Per table in below
6	Low Temp. Operation	Ta=-20℃ 240h	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

【Note】Ta = Ambient temperature

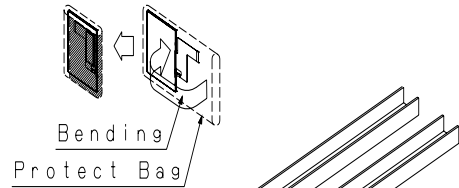| INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No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

10. Packaging specifications

・(10-1) Details of packaging

　　1) Packaging materials:

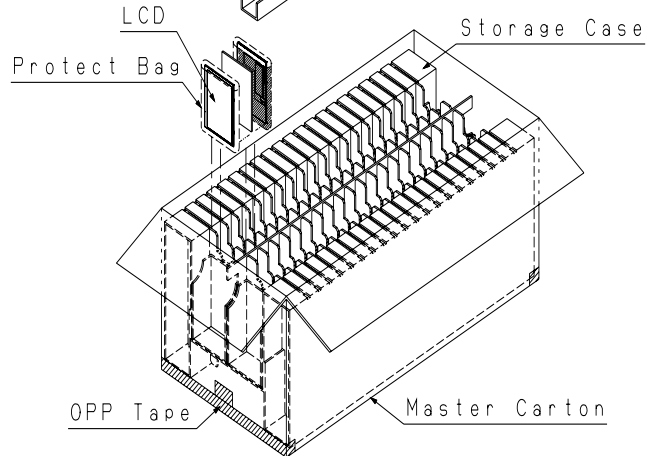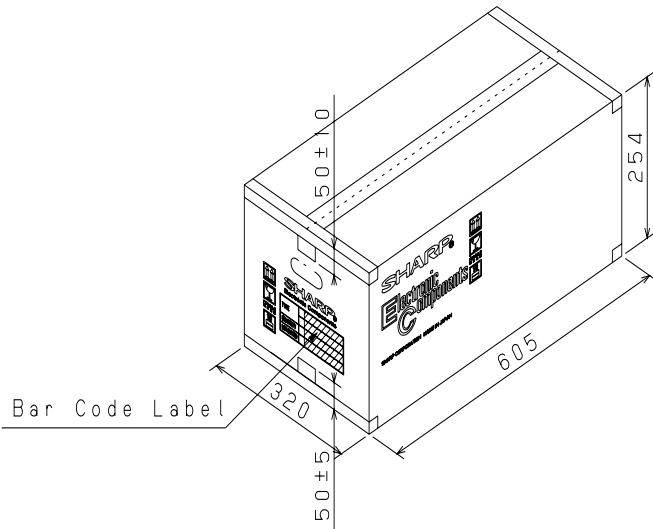|	Parts name	Materials
1	Master carton	Corrugate card board
2	Storage case	Corrugate card board
3	Protective bag	Polyethylene with anti-static treatment
4	OPP tape	Polypropylene
5	Bar code label	Anti-static polyethylene

2) Packaging style:

Internal NO. :(4S) LQ050Y3DC02

LotNO. :(1T) 2014.08.26

Quantity: (Q) 76 PCS

User NO. :

SHARP Distribution Label: ( )( )

TYPE

QUANTITY

LOT(DATE)

Bending
Protect Bag

[Quantities]

1 carton: 76 modules(MAX)

LCD

Protect Bag

Storage Case

Bar Code Label

OPP Tape

Master Carton

50±10

254

605

320

50±5

・(10-2) Reliability

1) Vibration test

Item	Test
Frequency range	10 Hz to 55 Hz
Stroke	1.5mm
Sweep	10Hz～55Hz～10Hz　(2 hours)
Direction	For each direction of X,Y,Z (6 hours for total)(Package condition)

2) Drop test

Drop height:　　800mm

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

・(10-3) Packaging quantities

76 modules per master carton

・(10-4) Packaging weight

6.3kg

・(10-5) Packaging outline dimensions

605mm×320mm×254mm

SHARP

11. LCD Module Code

LQ050Y3DC02

12. Serial Number Label Identification

<u>4</u> <u>8</u> <u>11</u> <u>00001</u> <u>A</u> <u>Q</u>
① ② ③   ④   ⑤   ⑥

         ① Production Year (0～)
         ② Production Month (1～9,X,Y,Z)
         ③ Production Day
         ④ Serial No (00001～)
         ⑤ Revision Code (A,B,C～)
         ⑥ Production Plant Code

[Note] Production Year   : 0(2010)、1(2011)、2(2012)、…
         Production Month : 1(Jan)、2(Feb)、…、9(Sep)、X(Oct)、Y(Nov)、Z(Dec)

13. Other

   13-1 RoHS
     This TFT-LCD module is RoHS compliant products.

   13-2 Attention when abandoning it
     Please abandon it according to regulations and the ordinance when this module.

   13-3 The country of origin of the TFT-LCD module
     This LCD module manufacturing in CHINA (Wuxi Sharp Electronic Components Co., Ltd.)

13. Outline Dimensions