

PREPARED BY: _____ DATE _____	 DISPLAY DEVICE GROUP SHARP CORPORATION SPECIFICATION	SPEC No. LCY-W-15706
APPROVED BY: _____ DATE _____		FILE No.
		ISSUE: 10 th , Jul, 2015
		PAGE : 16 pages
		SHARP (CHINA) INVESTMENT CO.,LTD.

SPECIFICATION FOR

TFT-LCD module

MODEL No. LQ050Y3DC02



CUSTOMER'S APPROVAL

DATE _____
 BY _____

DATE _____
 BY _____

PRESENTED
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- Personal computers • Office automation • Telecommunication equipment
- Test and measurement equipment • Industrial control • Personal Digital Assistant
- Audio visual and multimedia equipment • Consumer electronics

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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

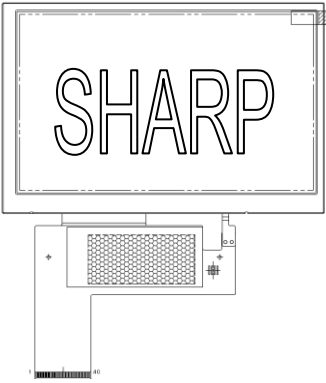

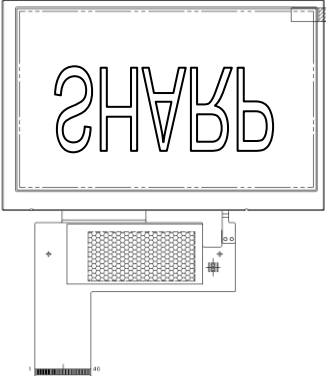
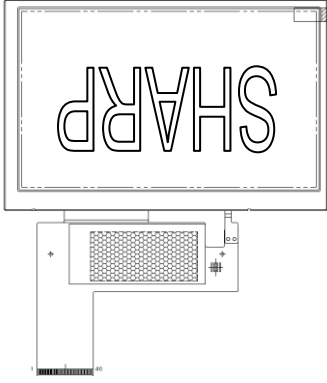
Note1: I/O definition: I---Input O---Output P---Power/Ground

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°C	-0.5~ +5.0	V	Note 1
Temperature for storage	Tstg	-	-30 ~ +80	°C	Note 2
Temperature for operation	Topr	-	-20 ~ +70	°C	Note 3
BL input electric current	I _{BL}	Ta = 25°C	60	mA	Note 4
LED electricity consumption	P _{LED}	Ta = 25°C	105	mW	Note 4

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

Note 2) $T_a > 60^{\circ}\text{C}$ Absolute humidity shall be less than $T_a=60^{\circ}\text{C}$ /90 % RH.

Note 3) Panel surface temperature prescribes.

(Reliability is examined at ambient temperature of 50°C .)

Note 4) Power consumption of one LED ($T_a = 25^{\circ}\text{C}$). (use 12 pieces LED)

6. Electrical Characteristics

6-1. Electrical characteristics

$T_a = 25^{\circ}\text{C}$

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}	-	$0.7 \times VDD$	-	VDD	V	For digital circuit
"L" level input voltage	V_{IL}		0	-	$0.3 \times VDD$	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}	$T_a=25^{\circ}\text{C}$	-	(135)		mA	(note 3)

(note 1) VDD=2.7 to 3.6V, GND=0V, $T_a=-40$ to 85°C

(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°C

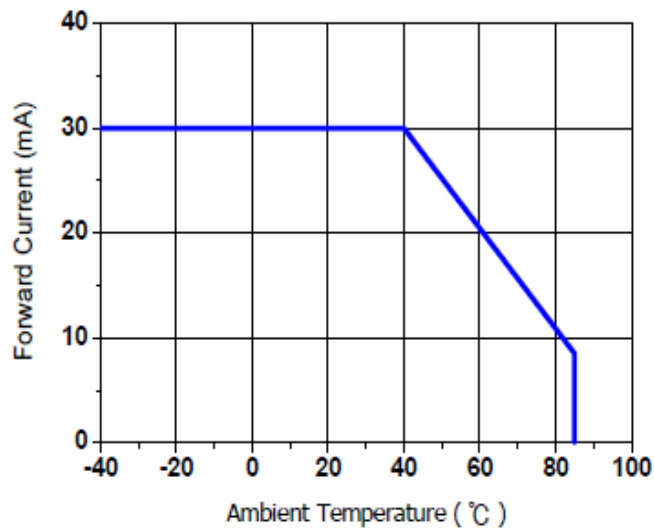
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Rated Voltage	V _{BL}	16.2	16.8	17.4	V	
Rated Current	I _{BL}	-	40	-	mA	I _{LED} =20mA,2Line
Power consumption	P _L	-	672	-	mW	
LED lifetime	-	-	15,000	-	h	[*1]

*1 per one piece of Backlight

*Please consider Allowable Forward Current on used temperature

[*1] Luminance becomes 50% of an initial value.(Ta=25°C)

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

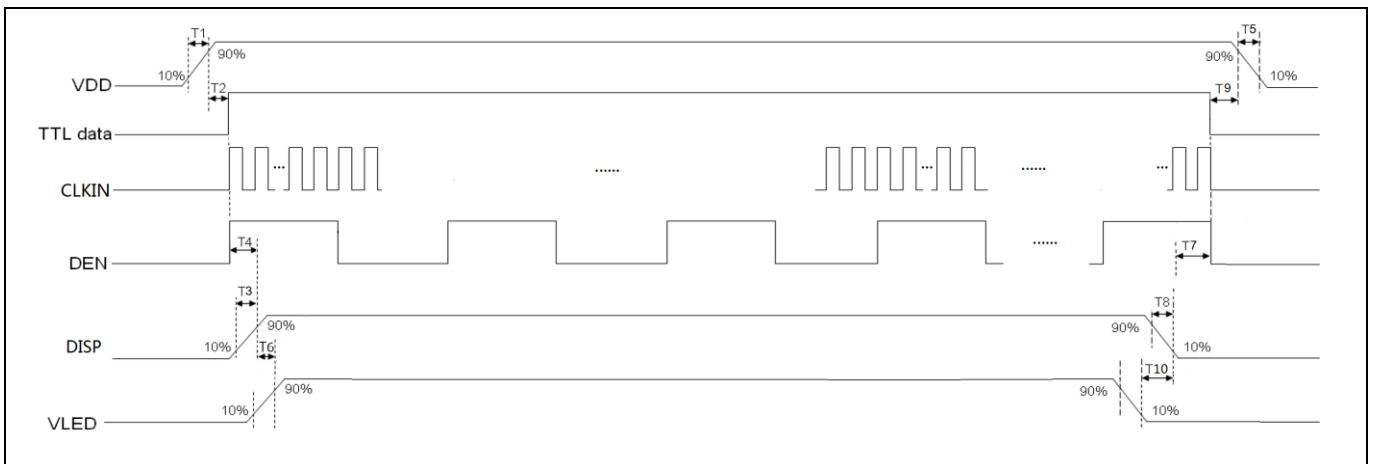


Figure 7. 1 Power on/off Timing Sequence

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 _{cpk}	20	-	-	ns
CLKIN pulse duty	T _{cwh}	40	50	60	%
Output stable time	T _{sst}	-	-	6	us

7-3. Timing of input signal

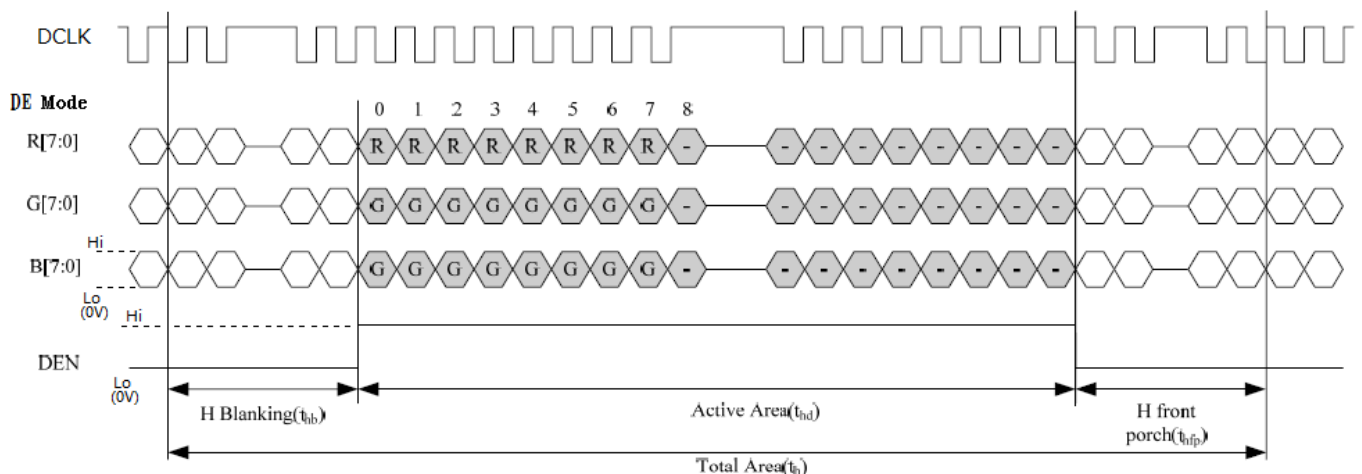
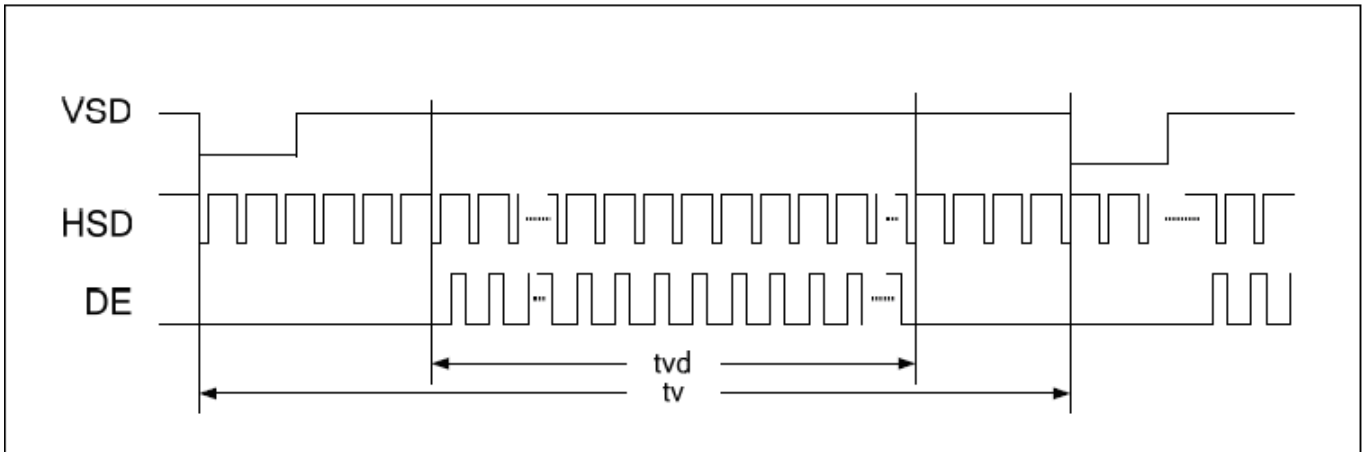


Figure 7.3 Input Timing Diagram

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°C, 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	τ _r	θ=0°	-	6	-	ms	【Note3,4】
	Decay	τ _d		-	2	-	ms	
Chromaticity of White		x		-	0.31	-	-	【Note4】
		y		-	0.33	-	-	
Luminance of white		X _{L1}		240	300	-	cd/m ²	I _{LED} =20mA 【Note6】
Uniformity		U		70	80	-	%	【Note5】

* The optical characteristics measurements are operated under a stable luminescence (IBL = 40mA) and a dark condition. (Refer to Fig.1)

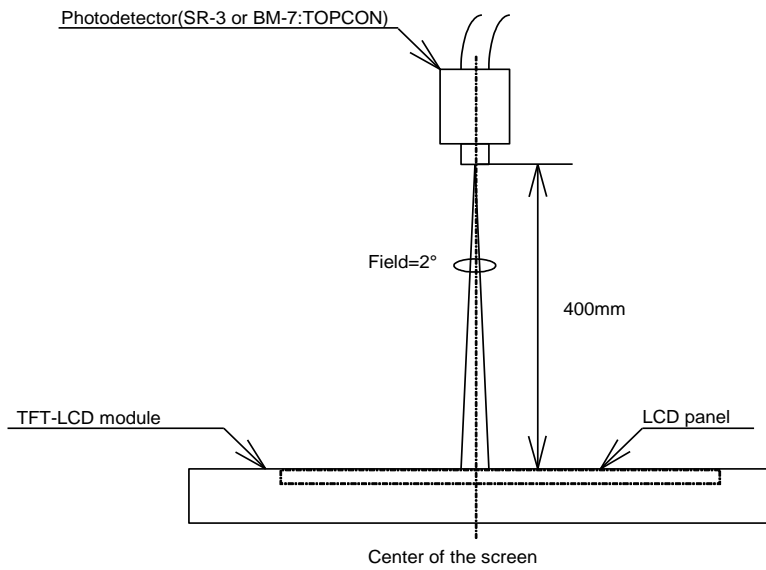
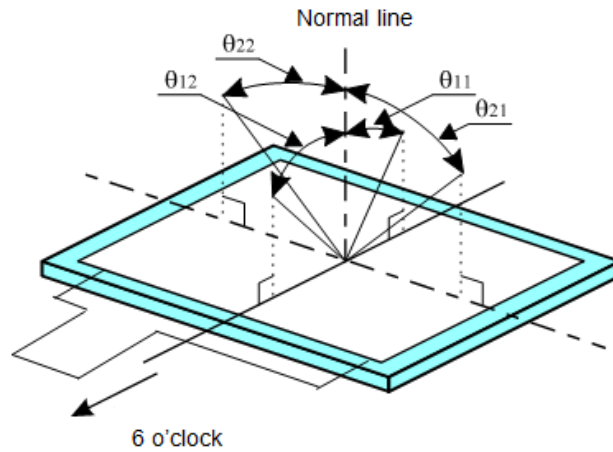


Fig.1 Optical characteristics measurement method

【 Note 1 】 Definitions of viewing angle range



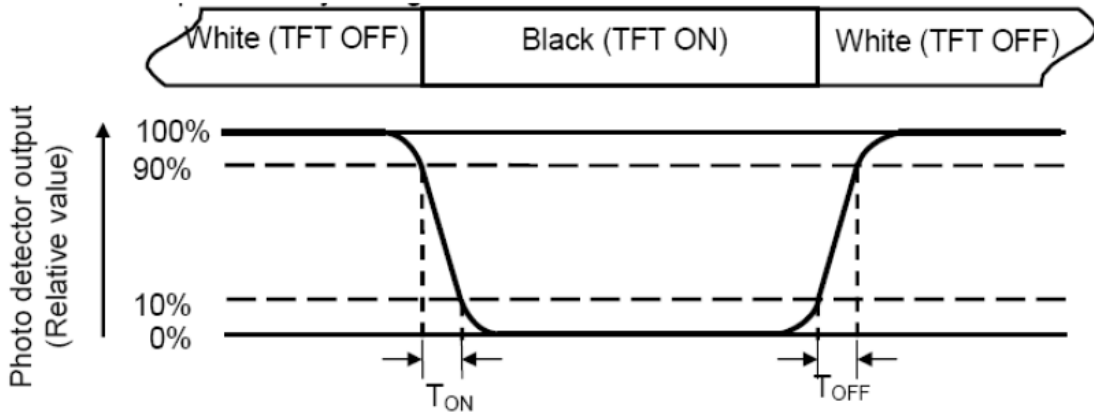
【 Note 2 】 Definition of contrast ratio

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%.

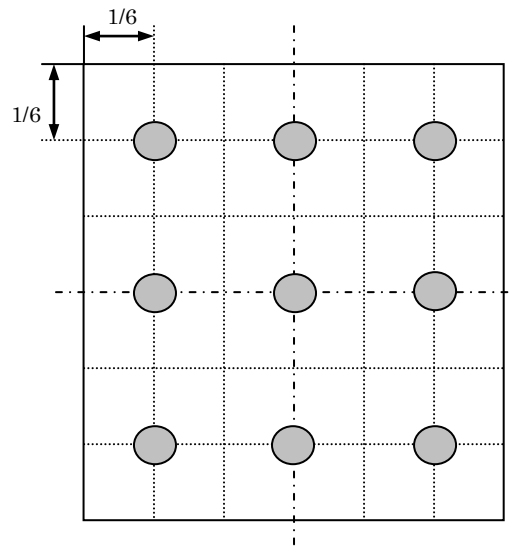


【 Note 4 】 This shall be measured at center of the screen.

【 Note 5 】 Definition of Uniformity

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

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.

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

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°C 240h	Per table in below
3	Low Temp. Storage	Ta=-30°C 240h	Per table in below
4	High Temperature & High Humidity Storage	Ta=60°C90%RH 240h	Per table in below (polarizer discoloration is excluded)
5	High Temp. Operation	Ta=70°C 240h	Per table in below
6	Low Temp. Operation	Ta=-20°C 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

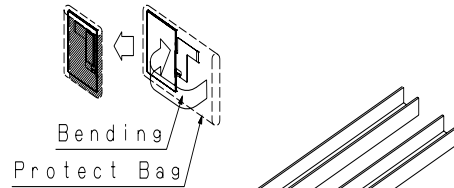
10. Packaging specifications

- (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

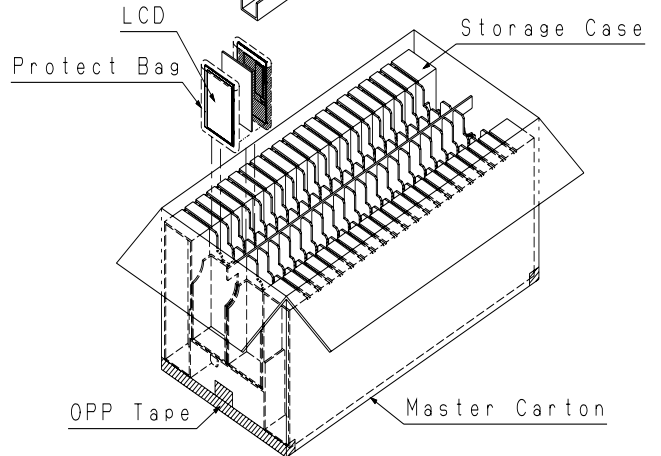
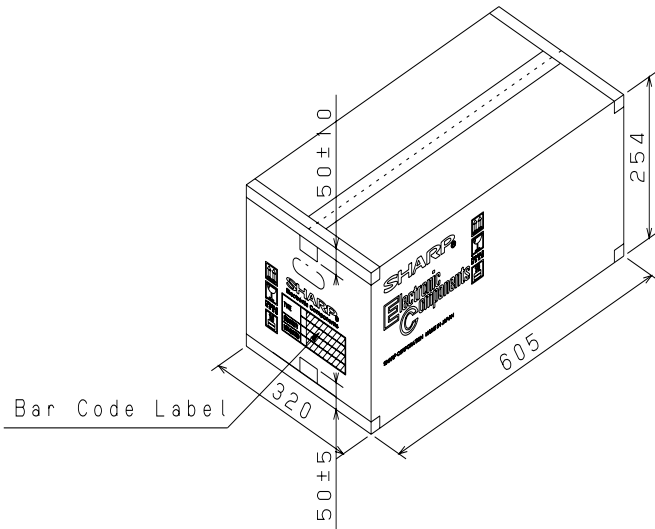
2) Packaging style:

TYPE		Internal NO. (4S) L0050Y3DC02
QUANTITY		LotNO. : (1T) 2014, 08, 26
LOT (DATE)		Quantity: (Q) 76 PCS
		User NO. :
		SHARP Distribution Label: () ()



[Quantities]

1 carton: 76 modules (MAX)



• (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

LQ050Y3DC02

12. Serial Number Label Identification

4 8 11 00001 A Q
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.)

