

4DLCD32Q
3.2” TFT LCD Display Datasheet

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TABLE OF CONTENTS

1. Overview 3
2. Features 3
3. Specifications 3
3.1 General Specifications 3
3.2 Absolute Maximum Ratings 3
3.3 Electrical Characteristics 4
3.4 Electrical Characteristics 4
4. Dimensional Drawing 5
5. Interface Signals 7
6. Electro-Optical characteristics 8
7. Touch Characteristics 9
8. Reliability 10
8.1 Reliability Tests 10
8.2 Color Performance 10
9. Precautions for Using LCD Modules 11
9.1 Handing Precautions 11
9.2 Storage Precautions 12
10. Using LCD Modules 13
10.1 Installing LCD Modules 13
10.2 Precaution for soldering the LCM 13
10.3 Precautions for Operation 14
10.4 Safety 14
10.5 Return LCM under warranty 15
Proprietary Information 16
Disclaimer of Warranties & Limitation of Liability 16
Contact Information 16

1. OVERVIEW

4DLCD32Q is a transmissive type Color Active Matrix Liquid Crystal Display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, Driver IC, Backlight and Touch Screen.

2. FEATURES

- 240 x RGB x 320 Dots TFT Transmissive Dot Matrix LCD Module
- 3.2" QVGA
- Viewing Angle: 12 O'clock
- 65K Color
- ILI9341 LCD Driver or equivalent
- Data interface: 80 Series (8/9/16/18 bit) interface, RGB (18 bit)
- White backlight
- Life Time 50,000 hrs

3. SPECIFICATIONS

3.1 General Specifications

Item	Description	Unit
Display Size (Diagonal)	3.2"	Inch
Display Type	Transmissive	-
Image Mode	Normally White	-
Number of Dots (HxV)	240 x RGB x 320	dot
Color Arrangement	CPU vertical stripe	-
Color Numbers	65K	-
Outline Dimension (HxVxT)	55.04(W) x77.70(H) x 3.65(D)	mm
Active Area (HxV)	47.87(W) x 63.84(H)	mm
Dot Pitch (HxV)	0.2025(W) x 0.2025(H)	mm
Operation Temperature	-20~70	℃
Storage Temperature	-30~80	℃

3.2 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	note
Supply voltage	Vcc	-0.3	4.6	V	-
Backlight Current	I_B	-	25	mA	Each LED

3.3 Electrical Characteristics

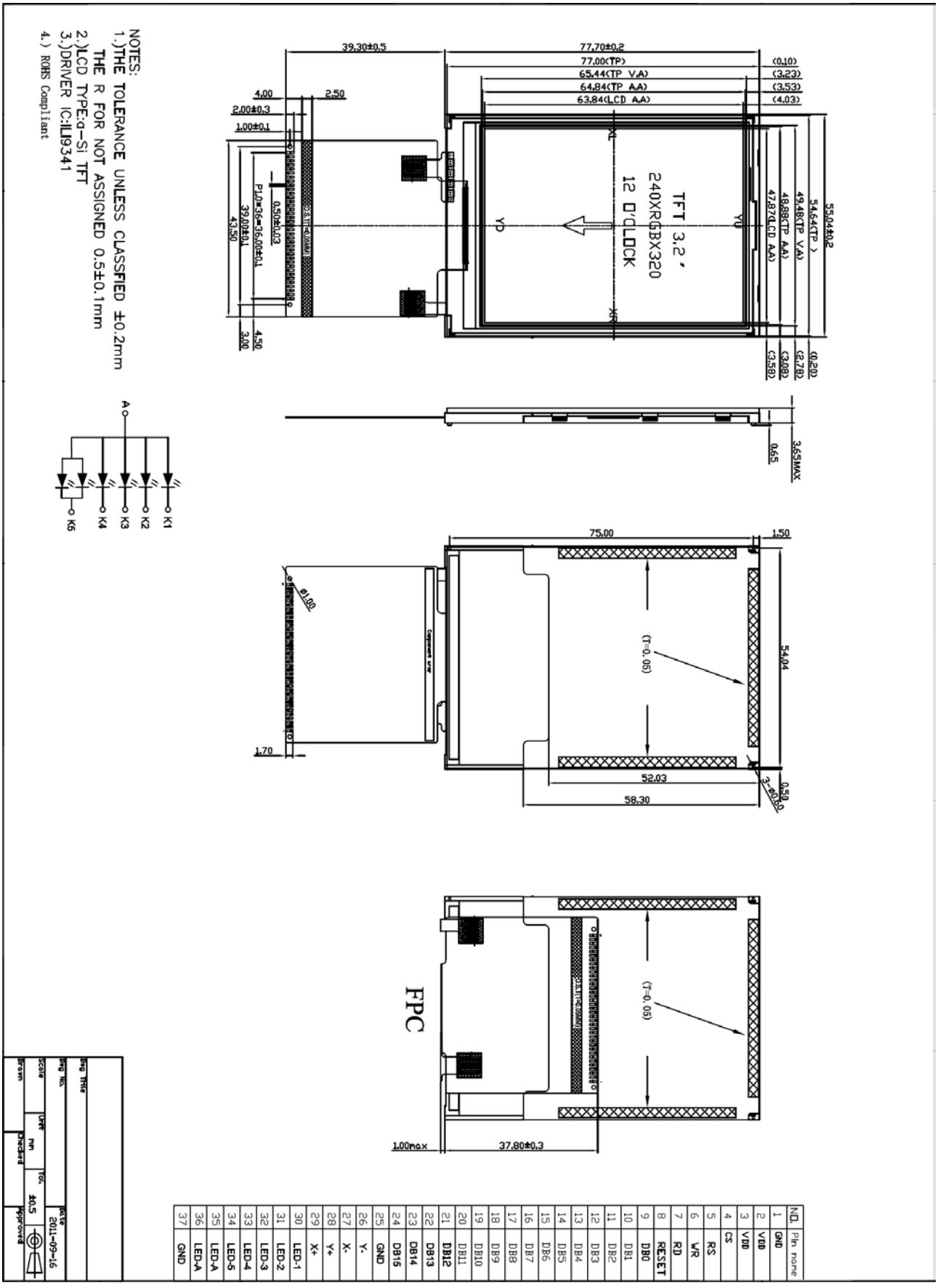
Parameter	Symbol	Min	Typ	Max	Unit	note
Supply voltage	Vcc	2.5	-	3.3	V	-
Supply Current	Icc	1.65	-	3.3	mA	
Driver Input Signal Voltage High	V_{IH}	0.8 x Vcc	-	Vcc	V	
Driver Input Signal Voltage Low	V_{IL}	Gnd	-	0.2 x Vcc	V	
Driver Input Signal Voltage High	V_{OH}	0.8 x Vcc	-	-	V	
Driver Input Signal Voltage Low	V_{OL}	-	-	0.2 x Vcc	V	
Power Consumption	P_{LCD}	-	30	-	mW	[1]

Ta=25 $\pm$ 2 ^{o}C
[1] Backlight power excluded.

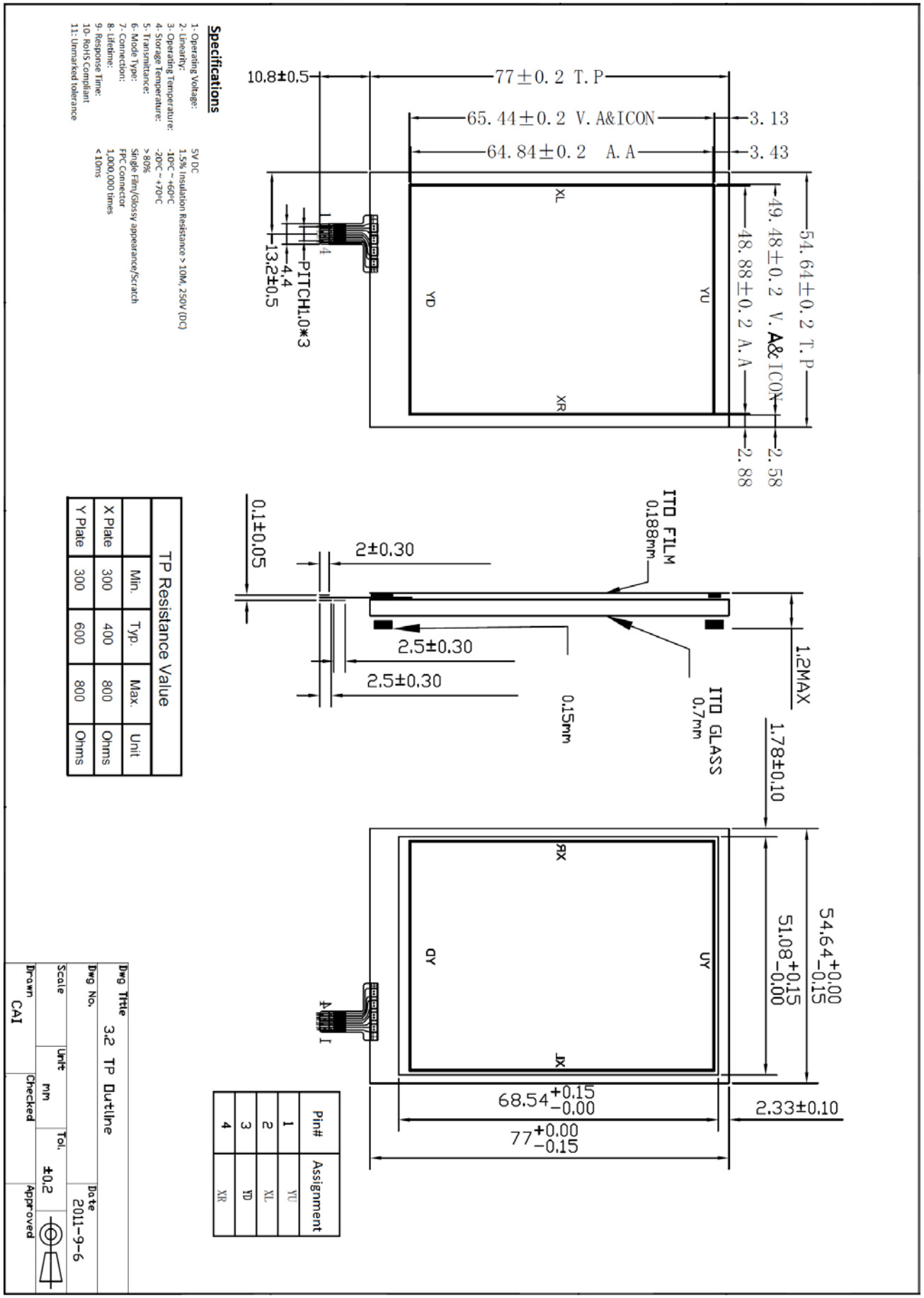
3.4 Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	note
LED Voltage	V_{LED}	3.2	3.3	3.6	V	Single LED
LED Current	I_{LED}	18	20	25	mA	Single LED
Power Consumption	P	288	330	450	mW	Backlight Unit

4. DIMENSIONAL DRAWING



NO.	Pin none
1	GND
2	VDD
3	VDD
4	CS
5	RS
6	WR
7	RD
8	RESET
9	DB0
10	DB1
11	DB2
12	DB3
13	DB4
14	DB5
15	DB6
16	DB7
17	DB8
18	DB9
19	DB10
20	DB11
21	DB12
22	DB13
23	DB14
24	DB15
25	GND
26	Y-
27	X-
28	Y+
29	X+
30	LED-1
31	LED-2
32	LED-3
33	LED-4
34	LED-5
35	LED-A
36	LED-A
37	GND



Specifications

1- Operating Voltage:	5V DC
2- Linearity:	1.5% Insulation Resistance > 10M, 250V (DC)
3- Operating Temperature:	-10°C ~ +60°C
4- Storage Temperature:	-20°C ~ +70°C
5- Transmittance:	> 80%
6- Mode Type:	Single Film/Glossy appearance/Scratch
7- Connection:	FPC Connector
8- Lifetime:	1,000,000 times
9- Response Time:	<10ms
10- RoHS Compliant	
11: Unmarked tolerance	

TP Resistance Value				
	Min.	Typ.	Max.	Unit
X Plate	300	400	800	Ohms
Y Plate	300	600	800	Ohms

5. INTERFACE SIGNALS

Pin No.	Symbol	Description
1	GND	Ground
2	VCC	Power supply
3	VCC	Power supply
4	CS	A chip select signal
5	RS	A register select signal
6	WR	A write strobe signal
7	RD	A read strobe signal
8	RESET	System Reset
9	DB0	Data bus
10	DB1	Data bus
11	DB2	Data bus
12	DB3	Data bus
13	DB4	Data bus
14	DB5	Data bus
15	DB6	Data bus
16	DB7	Data bus
17	DB8	Data bus
18	DB9	Data bus
19	DB10	Data bus
20	DB11	Data bus
21	DB12	Data bus
22	DB13	Data bus
23	DB14	Data bus
24	DB15	Data bus
25	GND	Ground
26	Y-	Touch Panel control pin
27	X-	Touch Panel control pin
28	Y+	Touch Panel control pin
29	X+	Touch Panel control pin
30	LED-1	B/L power pin -
31	LED-2	B/L power pin -
32	LED-3	B/L power pin -
33	LED-4	B/L power pin -
34	LED-5	B/L power pin -
35	LED-A	B/L power pin +
36	LED-A	B/L power pin +
37	GND	Ground

6. ELECTRO-OPTICAL CHARACTERISTICS

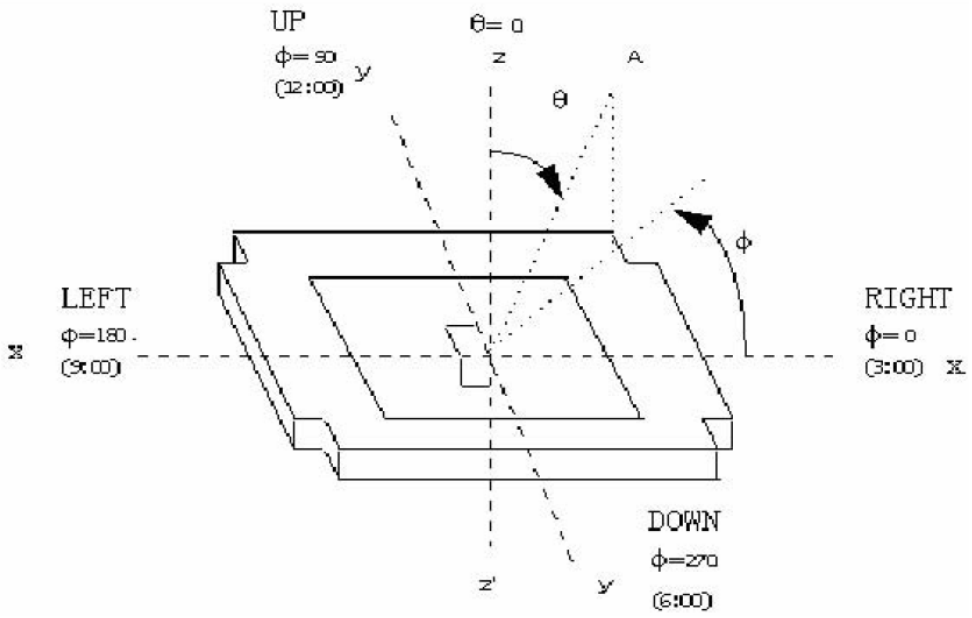
The following items are measured under stable conditions。 The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (2).

Operating Conditions: Ta=25 ± 2℃,

Item		Symbol	Condition	Min	Typ	Max	Unit
Brightness		L	White pattern	160	200	-	Cd/m^2
Response Time		$T_R + T_F$	$\theta = \emptyset = 0$	-	25	-	ms
Contrast Ratio		CR	At the Center point of A.A	300	350	-	
Color Chromaticity	White	W_X	$\theta = \emptyset = 0$	0.237	0.313	0.353	
		W_Y		0.289	0.329	0.369	
Viewing Angle	Horizontal		CR ≥ 10	-	110	-	Deg
	Vertical			-	120	-	Deg

Note1. These parameters are measured by C light.

Note2. Definition of Viewing Angle



Note: The Screens used are the highest rated **'Grade A'** Displays which allow for 0-4 defective pixels. A defective pixel could be solid Black (Dead), Red, Green or Blue. 4D Systems is not liable for a return/replacement for any Display that has 4 or less defective pixels.

7. TOUCH CHARACTERISTICS

Touch Parameters					
Parameter	Conditions	Min	Typ	Max	Units
Operating Voltage		-	5	-	V
Linearity		±1.5			%
Terminal Resistance X	X film side	300	400	800	Ohm
Terminal Resistance Y	Y film side	300	600	800	Ohm
Durability – Tap Test	Stylus Pen or Finger Press	1	-	-	Million
Operating Temperature		-10	-	60	°C
Storage Temperature		-20	-	70	°C
Transmittance		80	-	-	%
Life Time		1	-	-	Million
Response Time				10	ms

- **Mode Type**: Single Film/Glossy Appearance/Scratch
- **Connection**: FPC Connector
- **RoHS Compliant**

8. RELIABILITY

The LCD Module should be designed to meet a minimum MTTF value of 50,000hrs under normal operating conditions. T = 25°C, Indoors, Not exposed to sunlight. Note, Backlight life time is not included.

Criterion:

- No defect of Operational Function in Room Temperature is allowable-
- Leakage current should be below double the initial value-

8.1 Reliability Tests

S. No.	Item	Condition	Pass/Fail
1	High Temperature Operating	70°C, 240hrs	Pass
2	Low Temperature Operating	-20°C, 240hrs	Pass
3	High Temperature Non-Operating	80°C, 240hrs	Pass
4	Low Temperature Non-Operating	-30°C, 240hrs	Pass
5	High Temperature/Humidity Non-Operating	50°C, 90% RH, 240hrs	Pass
6	Temperature Shock Non-Operating	-30°C ← → 80°C , 10 cycles 30min----5min----30min	Pass
7	Electro-Static Discharge	HBM: ±2KV	Pass

Note1: Test after 24 hrs in room temperature.
Note2: The sampling above is individual for each reliability testing.
Note3: The color fading of polarization filter should not care.
Note4: The entire reliability testing chamber above is using D.I. water (Min value: 1.0MOhm-cm)
Note5: In case of malfunction defect cause by the ESD Damage, If it could be recovered to normal state after resetting, it would be considered as a good part.

8.2 Color Performance

S. No.	Item	Condition
1	Luminance	> 50%
2	NTSC	> 70%
3	Contrast Ratio	> 50%

9. PRECAUTIONS FOR USING LCD MODULES

9.1 Handing Precautions

- The display panel is made of glass and polarizer. The glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
- If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizer with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
- If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
    - Isopropyl alcohol
    - Ethyl alcohol

  Do not scrub hard to avoid damaging the display surface.

- Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
    - Water
    - Ketone
    - Aromatic solvents

  Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.
- Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I□D cable or the backlight cable.
- Do not attempt to disassemble or process the LCD module.
- NC terminal should be open. Do not connect anything.
- If the logic circuit power is off, do not apply the input signals.
- Electro-Static Discharge Control. Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
    - Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.
    - Tools required for assembling, such as soldering irons, must be properly grounded. Make sure the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
    - To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended. As far as possible

make the electric potential of your work clothes and that of the work bench the ground potential
    - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
- Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.
    - Do not alter, modify or change the shape of the tab on the metal frame.
    - Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
    - Do not damage or modify the pattern writing on the printed circuit board.
    - Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
    - Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
    - Do not drop, bend or twist LCM.

9.2 Storage Precautions

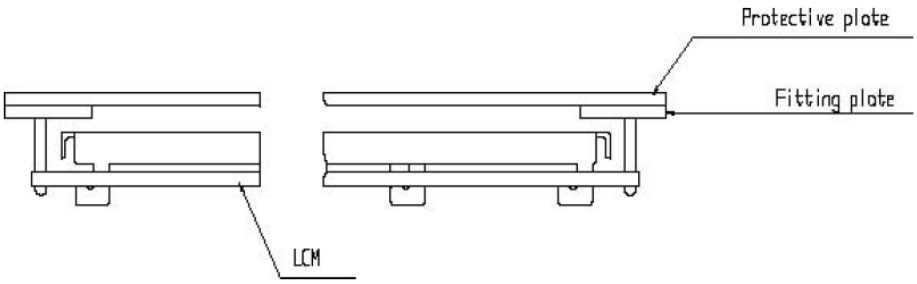
- When storing the LCD modules, the following precaution is necessary.
- Store them in a sealed polyethylene bag. If properly sealed, there is no need for the desiccant.
- Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0℃ and 35℃, and keep the relative humidity between 40%RH and 60%RH.
- The polarizer surface should not come in contact with any other objects. (We advise you to store them in the anti-static electricity container in which they were shipped. Others Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.
- If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
- To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules'
    - Exposed area of the printed circuit board
    - Terminal electrode sections

10. USING LCD MODULES

10.1 Installing LCD Modules

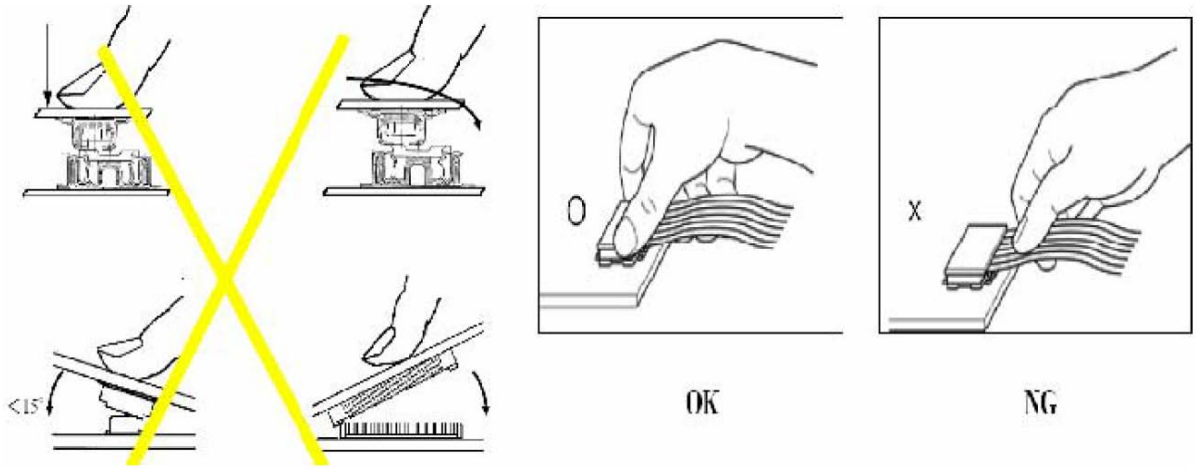
The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

1. Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



2. When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm. Precaution for assemble the module with BTB connector:

   Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows.



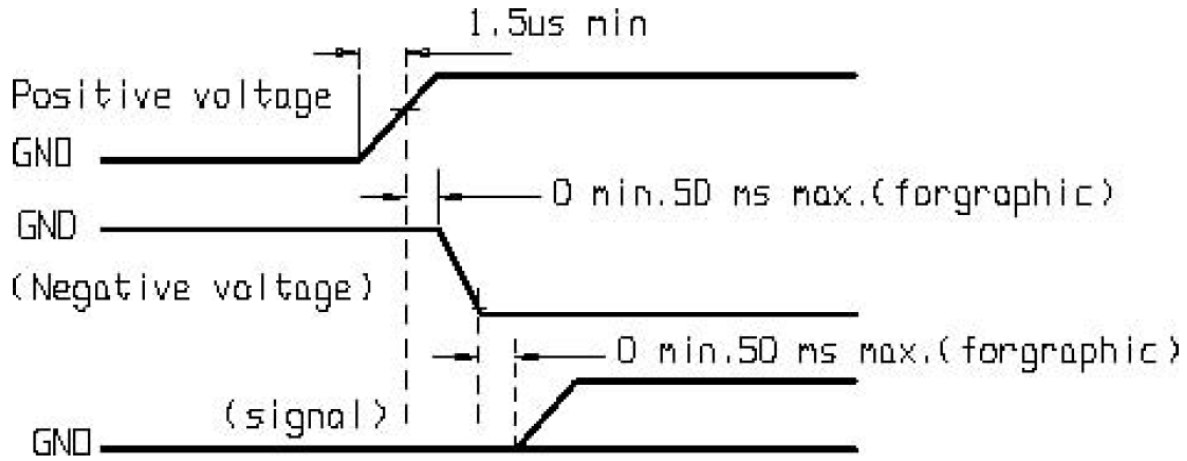
10.2 Precaution for soldering the LCM

Manual soldering	Machine drag soldering		Machine press soldering
No ROHS product	290℃ ~350℃. Time: 3-5S.	330℃ ~350℃. Speed : 4-8 mm/s.	300℃ ~330℃. Time: 3-6S. Press: 0.8~1.2Mpa
ROHS product	340℃ ~370℃. Time: 3-5S.	350℃ ~370℃. Time : 4-8 mm/s.	330℃ ~360℃. Time: 3-6S. Press: 0.8~1.2Mpa

- If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.
- When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.
- When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

10.3 Precautions for Operation

1. Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.
2. It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
3. Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operating temperature.
4. If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
5. Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required.
6. Input each signal after the positive/negative voltage becomes stable.
7. Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.



10.4 Safety

- It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water. Limited Warranty.

10.5 Return LCM under warranty

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are,

- Broken LCD glass.
- PCB eyelet is damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
- Soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

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