



东莞市方胜电子有限公司

FANGSHENG ELECTRONICS(DONGGUAN) CO.,LTD.

LCM Specification

PRODUCT TYPE:	TFT MODULE
PRODUCT P/N:	NC350CM54M20-A
VERSION:	V00

Customer (客户)		
INSPECTIONRESULT	TESTED BY	APPROVED BY
检测结果	检测人	确认人

Supplier(屏厂)		
DESIGNED BY	CHECKED BY	APPROVED BY

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■ GENERAL DESCRIPTION

NC350CM54M30-A is a TFT dot matrix LCD module. It is composed of a PCBA, color-LCD panel, driver IC, FPC and a backlight unit. The module display area contains **320x240** pixels. This product accords with RoHS environmental criterion.

■ GENERAL FEATURES

Item	Contents	Unit
LCD Type	TFT TRANSMISSIVE	/
Viewing direction	12:00	O' Clock
PCBA Outside Dimensions	93.00(W)*70.00(H)*1.6(T)	mm
LCM Outside Dimensions	76.90(W)*63.9(H)*3.5(T)	mm
Active area (WxH)	70.08(W)*52.56(H)	mm
Number of Dots	320x240	/
Driver IC	SSD1963	/
Colors	65K/262K/16.7M	/
Backlight Type	6LEDS / White	/
Interface Type	MCU-8bit (8080 OR 6800)	/
Input voltage	3.3V	V

■ ABSOLUTE MAXIMUM RATINGS(LCM,非 PCBA)

Parameter	Symbol	Min	Max	Unit
Power for Circuit Driving	VCC	-0.3	4.6	V
Power for Circuit Logic	IOVCC	-0.3	4.6	V
Input voltage	Vin	-0.3	VCC + 0.3	V
Operating temperature	Top	-20	70	℃
Storage temperature	Tst	-30	80	℃
Humidity	RH	/	90%(Max60℃)	RH

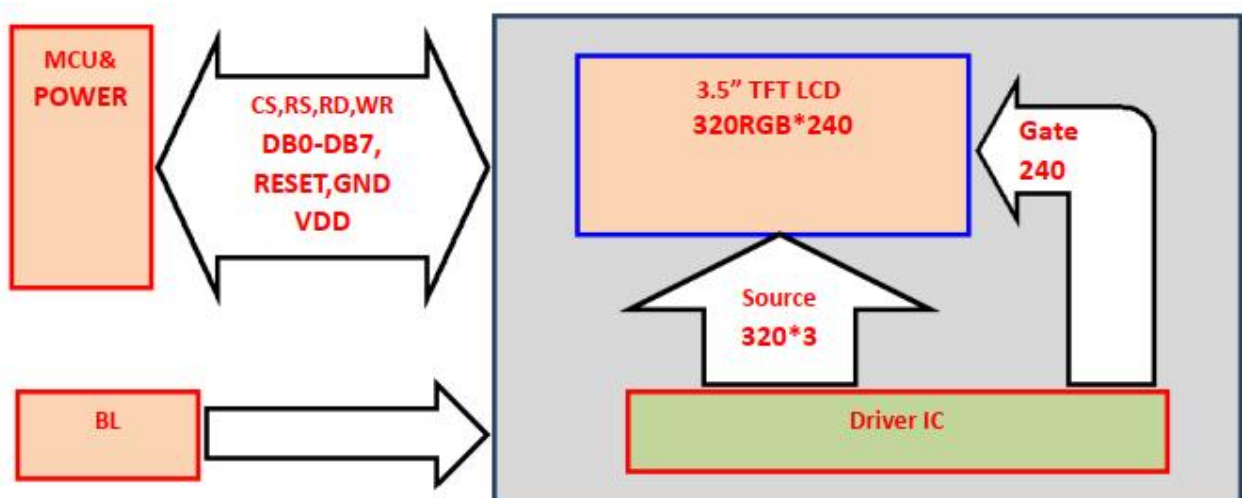
■ ELECTRICAL SPECIFICATIONS(LCM,非 PCBA)

Parameter	Symbol	Min	Typ	Max	Unit
Power for analog/logic	Vcc -GND	2.65	3.3	3.6	V
I/O power supply	IOVCC	1.65	3.3	3.6	V
Input Current	Idd	TBD	TBD	TBD	V
Input voltage ' H ' level	Vih	0.7IOVCC	--	IOVCC	°C
Input voltage ' L ' level	Vil	GND	0	0.3IOVCC	
Output voltage ' H ' level	Voh	0.8IOVCC	--	IOVCC	°C
Output voltage ' L ' level	Vol	GND	0	0.2IOVCC	RH

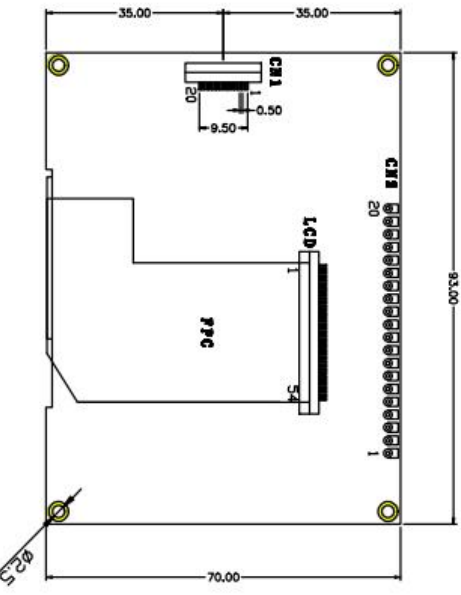
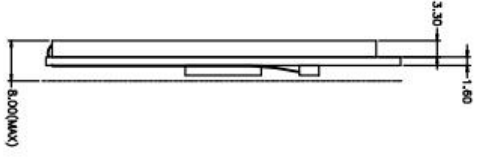
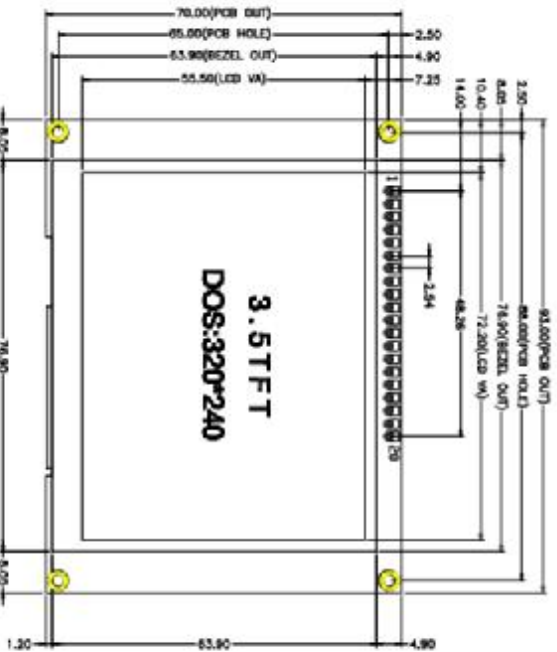
■ BACKLIGHT CHARACTERISTICS

Using condition: constant current driving method If=20mA(+/-10%)

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward voltage	Vf	17.4	19.2	20.4	V	If=20mA
Luminance with LCD	Lv	--	280	--	cd/m2	If=20mA
Number of LED	--		6		Pcs	--
Connection mode	S		serial		--	--

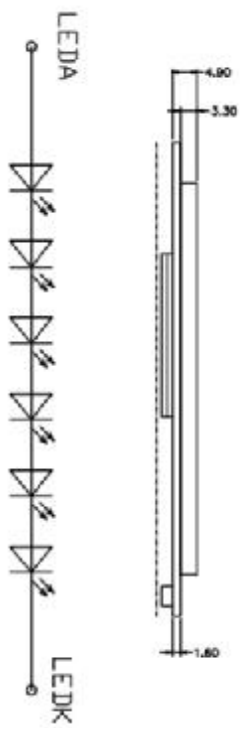
■ BLOCK DIAGRAM


REV	DESCRIPTION:	BY	DATE
A0	FIRST ISSUE	LTY	2016.09.06



PIN FUNCTION

PIN NO	SYMBOL	FUNCTION	PIN NO	SYMBOL	FUNCTION
1	VSS	GND(GV)	11	DB4	Data Bit4
2	VDD	VDD(+3.3V)	12	DB5	Data Bit5
3	VD	Contrast Adjust	13	DB6	Data Bit6
4	A0	Data Instruction code	14	DB7	Data Bit7
5	/WR	DATA Write	15	/CS	Chip Select
6	/RD	DATA Read	16	/RESET	Reset Signal
7	D0	Data Bit0	17	VEE(NC)	Negative-Voltage-Input
8	DB1	Data Bit1	18	SEL	H6800, L8080
9	DB2	Data Bit2	19	LED+	LED Backlight +19.2V
10	DB3	Data Bit3	20	LED-	LED Backlight 0V



NOTES:

1. DISPLAY TYPE: 3.5FTT(262K COLOR)
2. VIEWING DIRECTION: 6:00
3. DISPLAY MODE: NORMALLY WHITE
4. DRIVER IC: JDI963(MCU)
5. BACK LIGHT: 6CHIP-WHITE LED, LUMINANCE 300cd/m²
6. OPERATING TEMP: -20°C~70°C
7. STORAGE TEMP: -30°C~80°C
8. UNMARKED TOLERANCE:±0.2

Fang Sheng Electronic Co., LTD.

UNLESS OTHERWISE NOTED:		DRAWING TYPE:	CD	REV:	A0
UNITS	DECIMAL	DRAWING No.:	MCS50016-120-A		
MM	0 TO 6 ±0.1 6 TO 30 ±0.2 30 TO 100 ±0.3	CHECKED BY:	DATE:		
ANGLES	PLATED THRU HOLES -0.03 NON-PLATED THRU HOLES +0.03	THIRD ANGLE PROJECTION	SHEET: 1 OF 1		
SCALE	1 : 1				

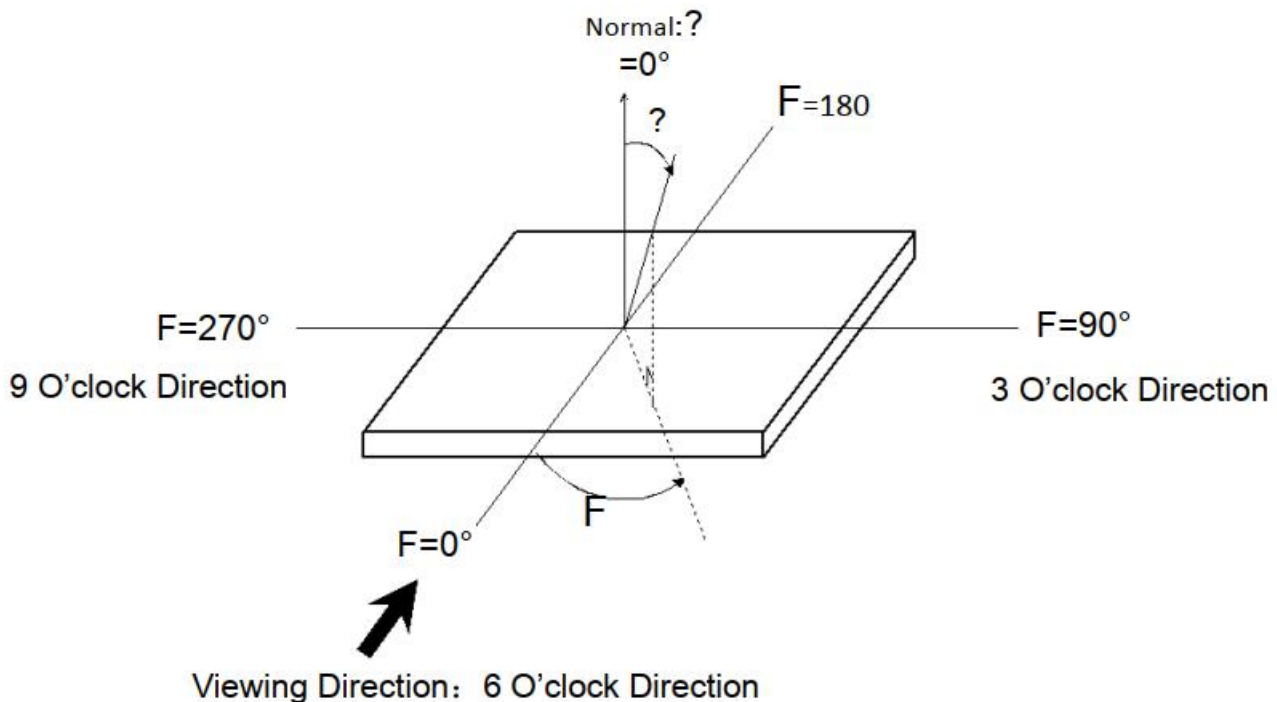
■ PIN DESCRIPTION

Pin.No	Symbol	DESCRIPTION
1	VSS	Ground
2	VDD	Power Supply Voltage(3.3V+/-0.3V)
3	NC	NC
4	A0	Data or Commandselect input pin
5	WR	6800 mode: R/W# 0: Write cycle 1: Read cycle 8080 mode: WR# (write strobe signal)
6	RD	6800 mode: E (enable signal) 8080 mode: RD# (read strobe signal)
7	DB0	Databus
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	CS	Chip select input pin. Enabled when CS is "L".
16	RESET	A reset pin
17	NC	NC
18	SEL	MCU interface configuration 0: 6800 Interface 1: 8080 Interface
19	LEDA	Backlight Anode
20	LEDK	Backlight Cathode

■ OPTICAL SPECIFICATIONS

Item	Symbol	Condition	Min	Typ	Max	Unit	Note	
Response time	Tr+Tf	$\theta=0^\circ$ $\Phi=0^\circ$ $T_a=25^\circ\text{C}$	-	20	40	ms	/	
Contrast ratio	Cr		-	350	-	-	/	
Luminance uniformity	d WHITE		80	-	-	%	/	
Viewing angle range	?	$\theta=0^\circ$ $\Phi=0^\circ$ $T_a=25^\circ\text{C}$	$\Phi=90^\circ$	-	60	-	deg	/
			$\Phi=270^\circ$	-	60	-	deg	
			$\Phi=0^\circ$	-	60	-	deg	
			$\Phi=180^\circ$	-	45	-	deg	
Red	x	$\theta=0^\circ$ $\Phi=0^\circ$ $T_a=25^\circ\text{C}$	-	0.610	-	/	/	
	y		-	0.329	--			
Green	x		-	0.299	-			
	y		-	0.567	-			
CIE(x,y) chromaticity	x		-	0.143	-			
	y		-	0.111	-			
Blue	x		-	0.308	-			
	y		-	0.327	-			

Definition of Viewing Angle θ and Φ



■ TIMING CHARACTERISTICS

TBD

■ INITIAL CODE DESCRIPTION

//宏定义

```
#define XW 320      // Displays the dots of pixels in the horizontal direction
#define YW 240      // Displays the dots of pixels in the vertical direction

#define HPW 1       //Horizontal 脉宽
#define HFP 68      //Horizontal 前沿      //图像左右偏移, 可调试 HFP,HBP,LPS
#define HBP 38      //Horizontal 后沿

#define VPW 1       //Vertical 脉宽
#define VFP 18      //Vertical 前沿      //图像上下偏移, 可调试 VFP,VBP,FPS
#define VBP 18      //Vertical 后沿

#define LPS0        //Horizontal Display Period start Position = LPS pixels
#define FPS0        //Vertical Display Period start Position = FPS lines
```

//初始化

```
void NC350CM54M20A_init(void)
{
    RESET=1;  delayms(20);
    RESET=0;  delayms(20);
    RESET=1;  delayms(120);

    WriteComm(0x01);      // software reset
    delayms(50);

    //PLL multiplier, set PLL clock to 120M, Reference input clock = 10MHz
    WriteComm(0xE2);      //PLL frequency = VCO / (N + 1) = 10 *(M + 1) / (N + 1)-----单位:MHz
    WriteData(0x23);      //Multiplier (M) of PLL
    WriteData(0x02);      //Divider (N) of PLL
    WriteData(0x04);      //Effectuate the multiplier and divider value
    delayms(10);
    WriteComm(0xE0);      // PLL enable
    WriteData(0x01);
    delayms(10);

    WriteComm(0xE0);
    WriteData(0x03);
}
```



delaysms(10);

// state: E6 register can be adjustable, use to change the value of PCLK, suggest adjust between 27~33M on PCLK.

WriteComm(0xE6); //PLL setting for PCLK, depends on resolution

WriteData(0x01); //PCLK=120MHz*LCDC_FPR/(1024*1024)

WriteData(0x33); //LCDC_FPR=1024*1024*PCLK/120

WriteData(0x33); //013333

WriteComm(0xB0); //LCD SPECIFICATION

WriteData(0x24); // A2_PCLK=0 A1_HS=0 A0_VS=0 DE=1

WriteData(0x00);

WriteData(0x01); // Sets the horizontal display of pixels = 0x013F = 319, actual 320;

WriteData(0x3F);

WriteData(0x00); // Set the vertical direction to display pixels = 0x00EF =239, actual 240.

WriteData(0xEF);

WriteData(0x00);

delaysms(5);

WriteComm(0xB4); //HSYNC

WriteData(((XW+HPW+HFP+HBP)>>8)&0xFF);

WriteData((XW+HPW+HFP+HBP)&0xFF);

WriteData((HFP>>8)&0xFF);

WriteData(HFP&0xFF);

WriteData(HPW -1);

WriteData((LPS>>8)&0xFF);

WriteData(LPS&0xFF);

WriteData(0x00);

WriteComm(0xB6); //VSYNC

WriteData(((YW+VPW+VFP+VBP)>>8)&0xFF);

WriteData((YW+VPW+VFP+VBP)&0xFF);

WriteData((VFP>>8)&0xFF);

WriteData(VFP&0xFF);

WriteData(VPW -1);

WriteData((FPS>>8)&0xFF);

WriteData(FPS&0xFF);

WriteComm(0x36); //Set Address Mode

WriteData(0x00); // red, green and blue, when red and blue are reversed, it can be change to 0x08

WriteComm(0xF0); //CPU Interface bit selection

WriteData(0x00); // 0x00: 8bit 0x03: 16bit 0x04: 18bit 0x05: 24BIT

WriteComm(0x13); //Enter Normal Mode

WriteComm(0x29); //display on

delaysms(5);

}

//51-MCU-8080-8bit 驱动此模块的 WriteComm 与 WriteData 函数例程:

```
void WriteComm(unsigned char cmd)// Initializes the write register address
```

{

```
    CS=0;
```

```
    RD=1;
```

```
    RS=0;
```

```
    WR=0;
```

```
    DBL=cmd;           // P1 口作为 DBL
```

```
    WR=1;
```

```
    CS=1;
```

}

```
// Initializes write register data // Write to show color and pay attention to data bits, for instance : the  
RGB565 needs to pass twice, if to display RGB888, it needs to be passed 3 times
```

```
void WriteData(unsigned char dat)
```

{

```
    CS=0;
```

```
    RD=1;
```

```
    RS=1;
```

```
    WR=0;
```

```
    DBL=dat; //寄存器数据为 8 位，传一次即可。
```

```
    WR=1;
```

```
    CS=1;
```

}

//图像显示窗口函数:

```
void BlockWrite(unsigned int Xstart,unsigned int Xend,unsigned int Ystart,unsigned int Yend)
```

{

```
    WriteComm(0x2a);
```

```
    WriteData(Xstart>>8);
```

```
    WriteData(Xstart&0xff);
```

```
    WriteData(Xend>>8);
```

```
    WriteData(Xend&0xff);
```

```
    WriteComm(0x2b);
```

```
    WriteData(Ystart>>8);
```

```
    WriteData(Ystart&0xff);
```

```
    WriteData(Yend>>8);
```

```
    WriteData(Yend&0xff);
```

```
    WriteComm(0x2c);}
```



INSPECTION CRITERION

Sampling Method

Unless otherwise agreed upon in writing, the sampling inspection shall be applied to the Customer's incoming inspection.

1 Lot size: Quantity per shipment lot

2 Sampling type: Normal inspection , single sampling

3 Inspection level: II

4 Sampling table: MIL-STD-105D

5 Acceptable Quality Level(AQL): Major=0.65 Minor=1.5

Inspection Method

1) Ambient Condition:

a. Temperature: Room temperature $25 \pm 5^{\circ}\text{C}$

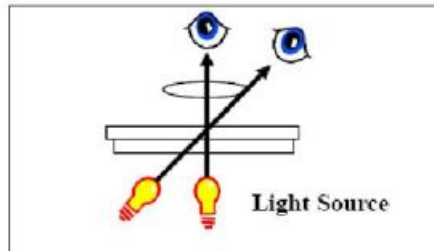
b. Illumination: Single fluorescent lamp non-directive(300 to 700 Lux)

2) Viewing distance

The distance between the LCD and the inspector' s eyes shall be at least 30-50cm.

3) Viewing Angle

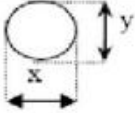

The inspection shall be conducted within normal viewing angle range.


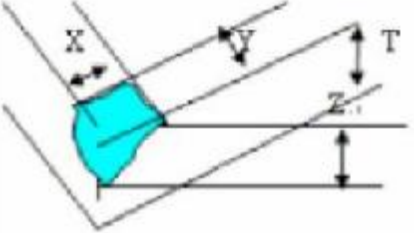
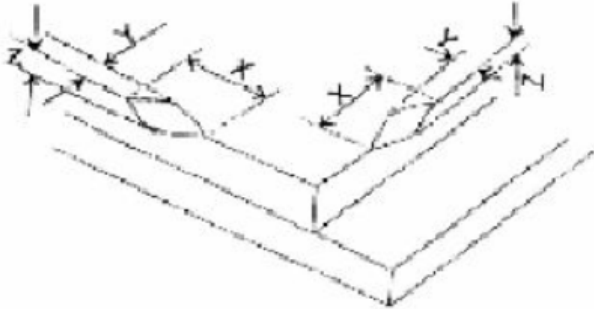
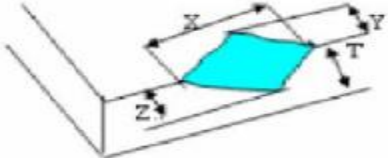


Major Defect

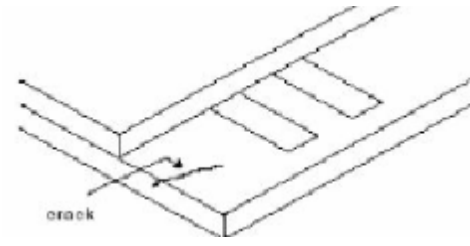
No	Items	Inspection Standard	Classification of defects
1	All functional defects	1.No display	Major
		2.Display abnormally	
		3.Missing vertical, horizontal segment	
		4.Short circuit	
		5. Back-light no lighting, flickering and abnormal lighting.	
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
4	linearity	No more than 1.5%	

Cosmetic Defect

No	Items	Inspection Standard		Classification of defects
1	Clear Spot, Black Spot, white Spot, defect Pinhole, Foreign Particle, polarizer Dirt TP Dirt	For dark/white spot, size ϕ is defined as $\phi=(x+y)/2$		Minor
				
		Size(mm)	Acceptable Qty	
		$F=0.15$	Ignore	
		$0.15 < F < 0.20$	2	
		$0.20 < F < 0.30$	1	
	$F > 0.30$	0		
2	(line defect) Black and White line Polarizer scratch	Define: 		Minor
		Width(mm)	Length(mm);Acceptable Qty	
		$W=0.03$	Ignore	
		$0.03 < W = 0.05$	$L=3.0; N=2$	
		$0.05 < W = 0.1$	$L=2.0; N=2$	
		$0.1 < W$	Define as spot defect	
3	Dim Spots Circle shaped and dim edged defects	/		Minor
		Size(mm)	Acceptable Qty	
		$F=0.2$	Ignore	
		$0.20 < F < 0.40$	2	
		$0.40 < F < 0.60$	1	
		$F > 0.60$	0	

No	Items	Inspection Standard	Classification of defects						
4	Glass defect TP defect	<p>(1) Chips on corner (A:LCD Glass defect)</p>  <table border="1" data-bbox="863 488 1214 613"> <thead> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>Z(mm)</th> </tr> </thead> <tbody> <tr> <td>=2.0</td> <td>=S</td> <td>Disregard</td> </tr> </tbody> </table> <p>Notes: S=contact pad length Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.</p>	X(mm)	Y(mm)	Z(mm)	=2.0	=S	Disregard	
		X(mm)	Y(mm)	Z(mm)					
		=2.0	=S	Disregard					
		<p>(2) Chips on corner (TP Glass defect)</p>  <table border="1" data-bbox="863 994 1214 1120"> <thead> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>Z(mm)</th> </tr> </thead> <tbody> <tr> <td>=2.0</td> <td>=S</td> <td>Disregard</td> </tr> </tbody> </table>	X(mm)	Y(mm)	Z(mm)	=2.0	=S	Disregard	
X(mm)	Y(mm)	Z(mm)							
=2.0	=S	Disregard							
<p>(3) Usual surface cracks (LCD Glass defect)</p>  <table border="1" data-bbox="331 1621 1214 1697"> <thead> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>Z(mm)</th> </tr> </thead> <tbody> <tr> <td>=3.0</td> <td><Inner border line of the seal</td> <td>Disregard</td> </tr> </tbody> </table>	X(mm)	Y(mm)	Z(mm)	=3.0	<Inner border line of the seal	Disregard			
X(mm)	Y(mm)	Z(mm)							
=3.0	<Inner border line of the seal	Disregard							
<p>(4) Usual surface cracks TP Glass defect</p>  <table border="1" data-bbox="331 1951 1155 2027"> <thead> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>Z(mm)</th> </tr> </thead> <tbody> <tr> <td>=6.0</td> <td><2.0</td> <td>Disregard</td> </tr> </tbody> </table>	X(mm)	Y(mm)	Z(mm)	=6.0	<2.0	Disregard			
X(mm)	Y(mm)	Z(mm)							
=6.0	<2.0	Disregard							

() Crack Cracks tend to break are not allowed



■ RELIABILITY

NO.	TEST ITEM	CONDITIONS
1	High Temperature Storage	80℃; 96hrs
2	Low Temperature Storage	-30℃; 96hrs
3	HighTemperature Operation	70℃; 96hrs
4	Low Temperature Operation	-20℃; 96hrs
5	High Temperature and HighHumidity Operation	50℃, 90% RH; 240 hrs
6	Thermal shock(Storage)	-20℃(0.5Hr)→70℃(0.5Hr) 100 Cycles

NOTE:

1. All judgement of display are performed after temperature of panel return to room temperature.
2. Display function should be no change under normal operating condition.
3. Under no condensation of dew.
4. WE only guarantee the above 6 test items, and without guarantee the others.

■ PRECAUTIONS

Handing Precautions

- (1) The display panel is made of glass and polarizer. As 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.
- (2) 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.
- (3) 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).
- (4) 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 polarizers 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.

(5) 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.

(6) 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.

(7) 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.

(8) 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/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) 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.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

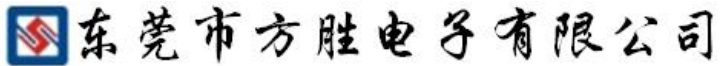
(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the desiccant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0° C and 35° C.

(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the 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.



FANGSHENG ELECTRONICS(DONGGUAN) CO.,LTD.

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.

In Building 2, BaiDai Industrial Park, ChangPing Road DaoJiaoTownDongguan, Guangdong, P.R. China.

E-mail: Fancy@fsdzlcd.com | Website: <http://www.fslcd.cn/> | <https://www.tftlcd-display.com>

T: +86-769-22705821 EXT 815 | F: +86 769-2270-5825 | M: +86-134 1284 8038 (24 hours)

P/N: NC350CM54M20-A18 / 18Ver: 00