



SPECIFICATIONS FOR LCD MODULE

Module No. JH43540960A

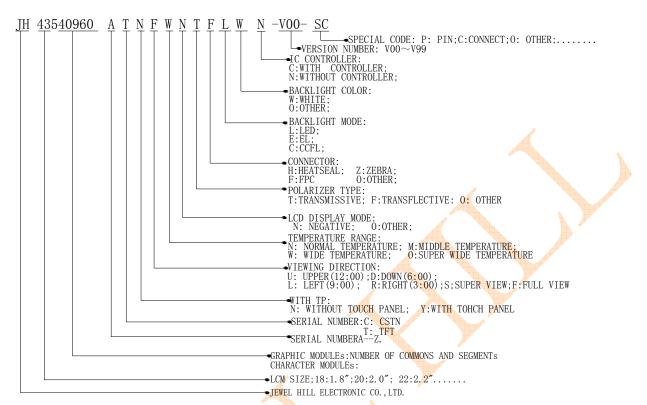
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LCM Number System





1. GENERAL DESCRIPTION.

JH43540960A model is a Color TFT LCD. This main Module has a 4.3 inch diagonally measured active display area with 540(RGB)×960 resolution. Each pixel is divided into Red, Green and Blue sub-pixels and dots which are arranged in vertical stripes.

The LCD color is determined with 262,000 colors signal for each pixel.

The JH43540960A has been designed to apply the interface method that enables low power, high speed, and high contrast.

JH43540960A is intended to support applications where thin thickness, wide viewing angle and low power are critical factors and graphic displays are important.

ltem	Display Panel	Remark
Display Mode	Normally White, Transmissive LCD	
Viewing Direction	Full view	and the second se
Input Signals	MIPI	
Outside Dimensions	57.96(W)*104.57(H)*1.85(N)	
Effective Area		
Active Area	53.46mm(W)×95.04mm(H)	
Number of Pixels	540×RGB×960Pixels	
Pixel Pitch	0.099mm(H) × 0.099mm(W)	
Pixel Arrangement	RGB Vertical stripes	
Drive IC	NT35516	

2. GENERAL FEATURES.

3.Absolute Maximum Ratings

The following are maximum values which, if exceeded may cause operation or damage to the unit.

ITEM	Symbol	Min.	Тур.	Max.	Unit	Remark
Power for Circuit Driving	VDD	-0.3	-	3.3	V	
Power for Circuit Logic	VCI	-0.3	-	4.6	V	
LC Operating Voltage *1)	Vop		-		V	
LED Forward Voltage	V _{f.}	26.1	28.8	29.7	V	
LED Forward Current	lf	-	15	-	mA	
LED Luminance	B _{P.}	4000	-	-	cd/m ²	
Storage Humidity	H _{ST.}	10	-	90	%RH	
Storage Temperature	T _{ST}	-30	-	80	°C	At
Operating Ambient Humidity	H _{OP}	10	-	90	%RH	25±5 ℃
Operating Ambient temperature	T _{OP}	-20	-	70	°C	



Note:

*1) Liquid Crystal driving voltage.

Due to the characteristics of LC Material, this voltage vary with environmental temperature.

- *2) Temp. >60 $^{\circ}$ C, Absolute humidity shall be less than 90%RH at 60 $^{\circ}$ C
- *3) Temp. ≤60°C, 90%RH MAX.

4.Electrical Specification Main Window Display

		(Unles	ss specifie	d, the amb	ient temper	ature Ta=2	5℃)
Prop	perties	Sym.	Min	Тур.	Мах	Unit	Note
Power for C	Circuit Driving	VDD	1.65	2.8	3.3	V	Note
Power for	Circuit Logic	VCI	2.7	2.8	3.3	V	Note
BLU Dri	ving Logic	Vbat	-			V	
Logic Input	Low Voltage	VIL	0		0.2VDD	V	
Voltage	High Voltage	VIH	0.8VDD	-	VDD	V	
Logic Output	Low Voltage	VOL	0	-	0.1VDD	V	
Voltage	High Voltage	VOH	0.9VDD		VDD	V	
	White	Pw	T.B.D	T.B.D	T.B.D	mW	
Power	Black	Pb	T.B.D	T.B.D	T.B.D	mW	
Consumption	Vertical Stripe	Pv	T.B.D	T.B.D	T.B.D	mW	

Note:

The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings. Accordingly, please make sure that the module is used within this range. And these current values are measured under the condition that all devices are stopped, each component is stable and logic signal is input.

5.Optical Specification.

Item		Symbol	Conditions	Spe	cificatio	ons	Unit	Noto
		Symbol	Conditions	Min.	Тур.	Max.	Unit	Note
Transmittance	÷	Т%			4.7		%	
Contrast Ratio	С	CR		150	250	-	-	
Response Tin	20	T _R		-	10	20	ms	
Response nin	le	T _F		-	20	30	ms	All loft side data
	Red	X _R		0.604	0.634	0.664	-	All left side data are based on
	Reu	Y _R	Viewing normal angle θ _x = θ _y =0°	0.296	0.326	0.356	-	CMO's following
	Green	X _G		0.260	0.290	0.320	-	condition
Chromaticity		Y _G		0.551	0.581	0.611	-	NTSC: 60%
Chilomationy	Blue	X _B		0.102	0.132	0.162	-	Light : C light
		Υ _B		0.096	0.126	0.156	-	(Machine:BM5A)
		Xw		0.262	0.292	0.322	-	Normal Polarizer
		Yw		0.306	0.336	0.366	-	Reference Only
	Hor.	θ_{X^+}		-	45	-		
Viewing		θ _{X-}	Center	-	45	-	deg.	
Angle	Ver.	θ_{Y^+}	CR≥10	-	35	-		
		θ _{Υ-}		-	15	-		

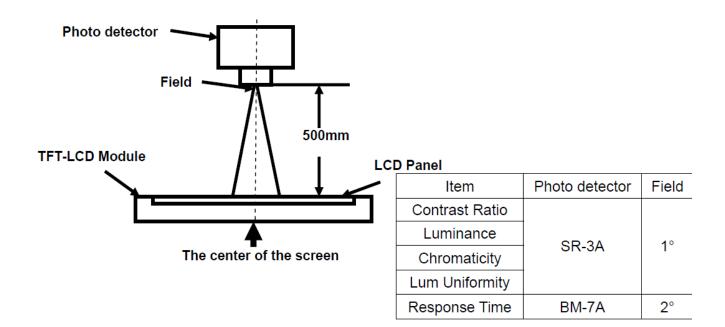
*Note (1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.



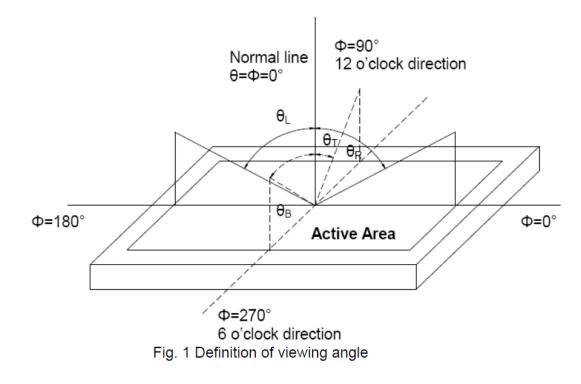
Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).



Note 3: Definition of contrast ratio

 $Contrast ratio (CR) = \frac{Luminance measured when LCD is on the "White" state}{Luminance measured when LCD is on the "Black" state}$

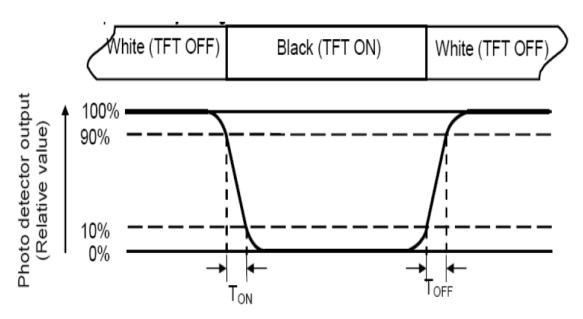
"White state ": The state is that the LCD should driven by Vwhite.

"Black state": The state is that the LCD should driven by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

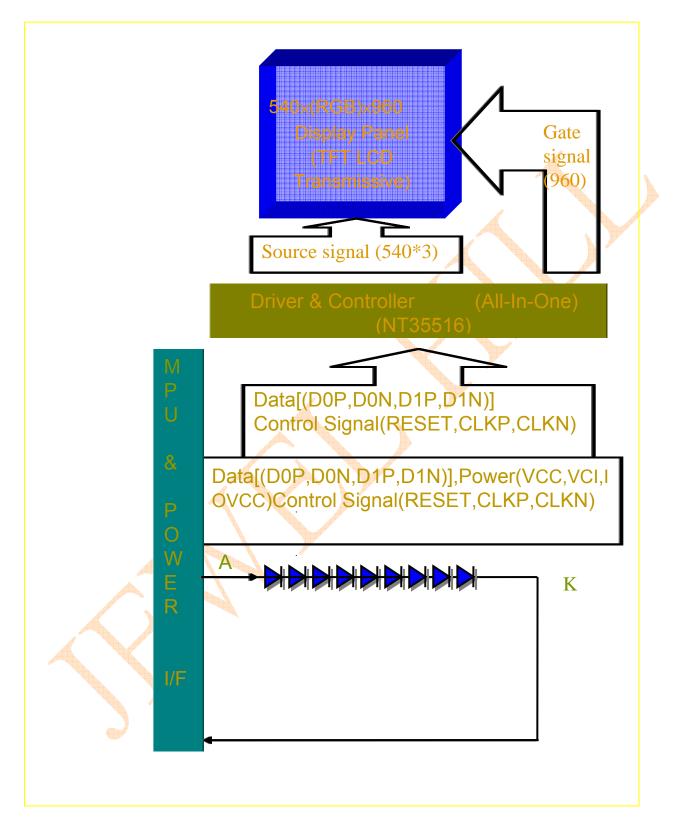
The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931) Color coordinates measured at center point of LCD.



6.Block Diagram.

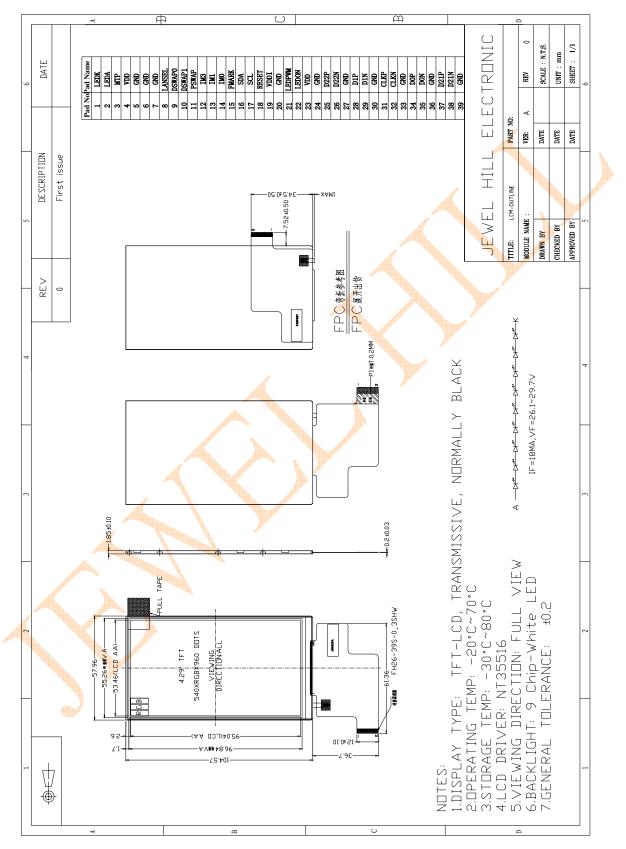


7.Pin Description

Pin NO.	Symbol	Description
1	LED_K	LED-
2	LED_A	LED+
3	MTP	NC
4	VDD	Power Supply2.8V
5-7	GND	Ground
8	LANSEL	NC
9	DSWAP0	NC
10	DSWAP1	NC
11	PSWAP	NC
12-14	IM3,1M1,IM0	NC
15	TE (FMARK)	Tearing effect output pin
16~17	SDA, SCL	NC
18	RESET	System Reset Pin
19	VDDI	Power Supply(2.8V/1.8V)
20	GND	Ground
21	LEDPWM	Control singal for brihtness of the LED backlight
22	LEDON	Control signal for LED is on/off
23	VDD	Power Supply2.8V
24	GND	Ground
25~26	D22P, D22N	NC
27	GND	Ground
28	D1P	Data signals if MIPI interface is used
29	D1N	Data signals if MIPI interface is used
30	GND	Ground
31	CLKP	Clock signals if MIPI interface is used
32	CLKN	Clock signals if MIPI interface is used
33	GND	Ground
34	D0P	Data signals if MIPI interface is used
35	D0N	Data signals if MIPI interface is used
36	GND	Ground
37~38	D21P, D21N	NC
39	GND	Ground



8.Outline Dimension



9. Timing Characteristics 9.1. MIPI/MDDI interface operation DSI-D0-V DEPRX (Mrs V ILLPRX (Max 031-00 Capture 1^s THS-TERM-EN Data Bit THS- SE THS-TRAI LP-11 LP-01 LP-00 Lo ow Power Mode, Disable Rx Line Low Power Mode, Disable Rx Line Termination High Speed Mode, Enable Rx Line Termination Termination Fig. 7.6.8 Data lanes-Low Power Mode to/trom High Speed Mode Timing Тська T_{CLK} VILLPRX (Ms DSI_CLK+ X\$XXXXX X\$X DSI CLK Тиз-е Tci Так HS-0/1 HS-0 LP-11 **LP-01** LP-00 HS-0 HS-0/1 VILLPRX (DSI-D0+

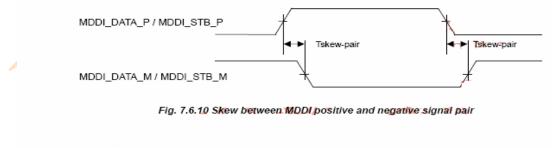
Fig. 7.6.9 Clock lanes- High Speed Mode to/from Low Power Mode Timing

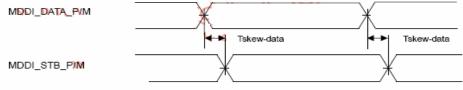
9.2. Timing Characteristics

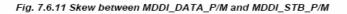
Normal Write Mode, IOVcc=1.65V~3.3V,Vcc=2.5V~3.3V

Signal	Symbol	Parameter	MIN	TYP	MAX	Unit	Description
MDDI_STB_P/M MDDI_DATA_P/M	1/Tbit	Data transfer rate	-	384	450	Mbps	
MDDI_STB_P/M MDDI_DATA_P/M	Tskew-pair	Differential transfer input skew	-	-	0.05	ns	
MDDI_STB_P/M MDDI_DATA_P/M	Tskew-data	Data/Strobe input skew	-	-	0.3	ns	

Note) MDDI_DATA_P/M = MDDI_DATA0_P/M and MDDI_DATA1_P/M.

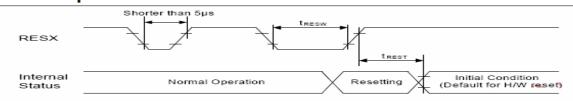








9. 3 Reset Operation



(VCC=1.65~3.1 V)

Table 13-6					
Item	Symbol	Unit	Min.	Тур.	Max.
Reset low-level width	tRES	ms	1	_	_
Reset rise time	trRES	μs	_	_	10

10.Reliability and Inspection Standard

No.	Test Iten	<u>ו</u>	Test Conditions	Remark
4		Storage	80°C, 120Hr	Note
1	High Temperature	Operation	70 ℃, 120Hr	Note
2	Low Temperature	Storage	- <mark>30</mark> ℃, 120Hr	Note
2		Operation	-20℃, 120Hr	NOLE
3	High Temperature ar Humidity	nd High	60℃, 90%RH, 120Hr	Note
		Storage	-10℃(1Hr)→25℃(5min)→60℃(1Hr)	
4	Temperature Cycle		32 Cycles	Note
		Operation	-2 <mark>0</mark> ℃(1Hr)→25℃(5min)→60℃(1Hr)	Note
		Operation	25 Cycles	
5	Peeling Off (Storage)		≧500gf/cm	Note
6	FPC Bending Test		\geq 6,000 times, 2/sec	Note
7	Vibration Tast(S	torogo)	50HZ, 30min,	Noto
/	Vibration Test(S	lorage)	Amplitude: 2 cm, X/Y/Z directions	Note
8	Drop Test	t	60cm/ 3Corner/ 8Face, 1Cycle	Note

Note:

- 1) The test samples should be applied to only one test item.
- 2) Sample size for each test item is 5~10pcs.
- 3) For Damp Proof Test, pure water(Resistance>1M Ω) should be used.
- 4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
- 5) EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and fluorescence EL has.
- 6) After the reliability test, the test samples should be inspected after 2 hours at least.
- 7) Functional test is OK. Missing segment, shorts, unclear segment, non display,



display abnormally, liquid crystal leak are not allowed.

- 8) After testing, the current Idd should be within initial value $\pm 20\%$.
- 9) No low temperature bubbles ,end seal loose and fall, frame rainbow, ACF bubble growing are allowable in the appearance test.

11.Inspection Criterion

11.1. 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:
 □
- 4) Sampling table: MIL-STD-105D
- 5) Acceptable Quality Level(AQL): Major=0.65 Minor=1.5

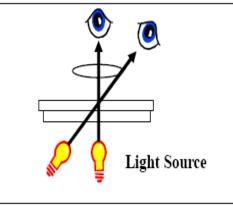
11.2. Inspection Method

- 1) Ambient Condition:
 - a. Temperature: Room temperature 25±5°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.



11.3. Inspection Criteria 11.3.1. Major defect

No.	Item	Inspection Standard	Classification of defects
1	All functional defects	 No display Display abnormally Open or missing segment Short circuit Excess power consumption Backlight no lighting, flickering and abnormal lighting 	Major
2	Missing	Missing component	Major



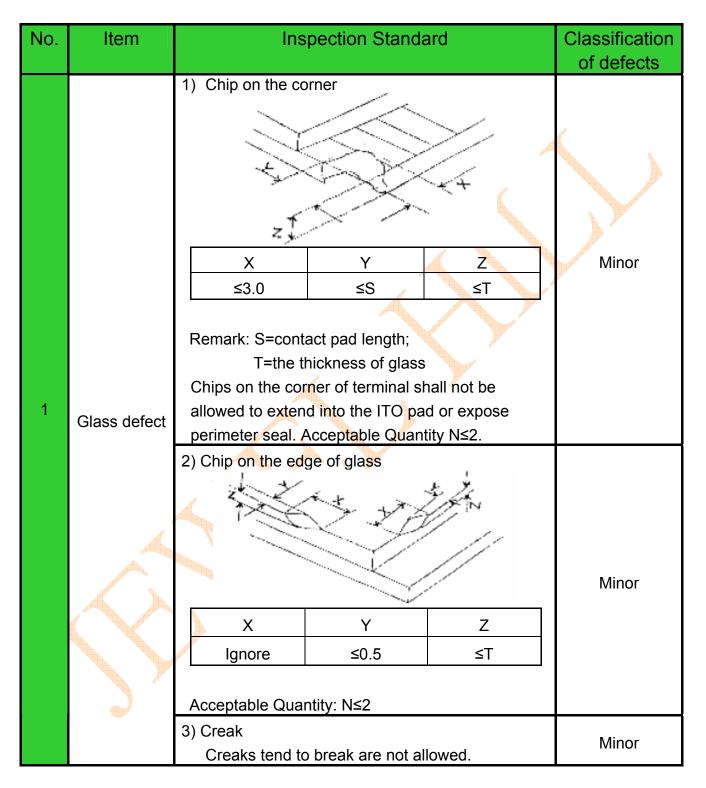
3	Outline	Overall outline dimension beyond the drawing is not	Major
5	dimension	allowed	IVIAJOI

11.3.2. Cosmetic Defect

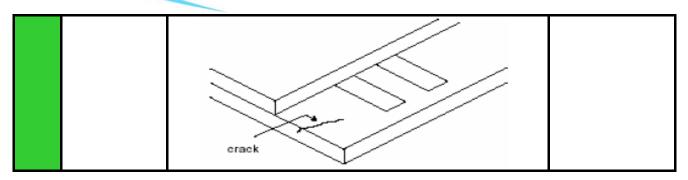
No.	Item		on Standard	Classification of defects
		For dark/white spot, size Φ is defined as Φ=(x+y)/2	y x	
1	(spot defect) Black and White spot pinhole	Size Φ (mm) $\Phi \le 0.1$ $0.10 \le \Phi \le 0.15$ $0.15 \le \Phi \le 0.2$ $0.2 < \Phi$	Acceptable Quantity Ignore 2 1 0	Minor
2	(line defect) Black and White line Polarizer scratch	Define: Width W Width(mm) Ler $\Phi \le 0.03$ 0.03 $0.03 < W \le 0.05$ 0.05 $0.05 < W \le 0.1$ 0.1	Minor	
3	Polarizer defect	Dent or bubble(between the polarizer and glass)Size $\Phi(mm)$ Acceptable Qty $\Phi \le 0.10$ Ignor $0.10 < \Phi \le 0.20$ 2 $0.20 < \Phi \le 0.30$ 1 $0.30 < \Phi$ 0		Minor



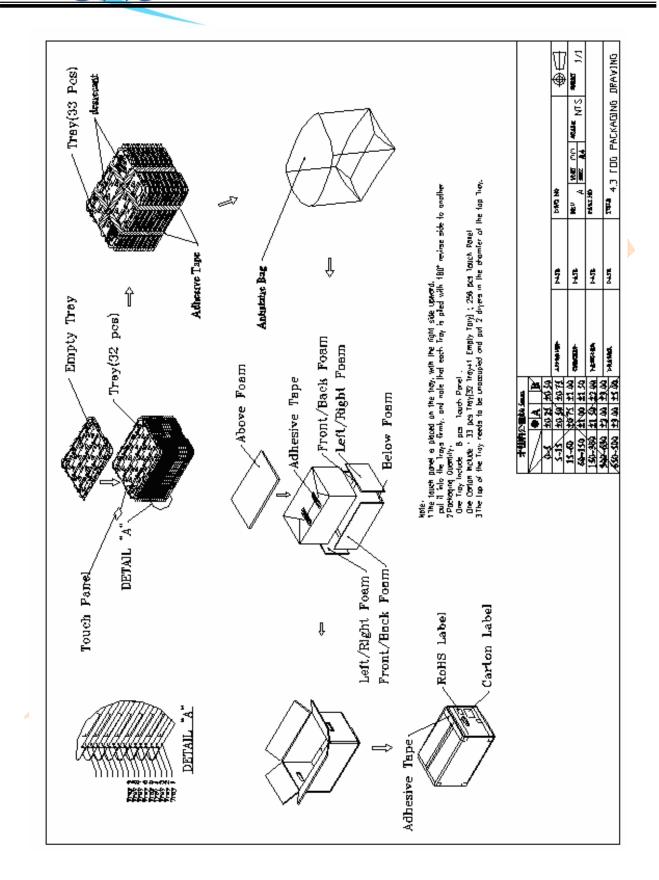
11.3.3. Cosmetic Defect







12. PACKAGE INFORMATION.



13.ROHS COMPLIANT WARRANTY.



RoHs Hazardous substances including:

- Cd< 100 ppm
- Pb< 1000 ppm
- Hg< 1000 ppm
- Cr +6 < 1000 ppm
- PBDE < 1000 ppm
- PBB < 1000 ppm

14.PRECAUTIONS FOR USING LCD MODULES

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 dessicant.
- (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. 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.

15. REVISION HISTORY.



Version	Revise record	Date
	Original version	13-08-15
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SAMPLE APPROVED REPORT

(样品确认单)

SAMPLE MODEL NO. (样品型号)	JH43540960A		
SAMPLE SERIES NUMBER NO. (样品序号)			
SAMPLE QUANTITY (样品数量)			
COLOR/TYPE (底色/类型)	TFT/NEGATIVE		
VIEWING DIRECTION (视角)	FULL VIEW		
DRIVING METHOD (驱动参数)	1/960DUTY		
LOGIC VOLTAGE (工作电压)	2.8V		
LCD VOP (LCD 驱动电压)			
OPERATING TEMP. (操作温度) ℃	-20 ~ 70℃		
STORAGE TEMP. (储存温度) ℃	-30 ~ 80°C		
POLARIZERFRONT (首偏光片)			
POLARIZERBACK (后偏光片)	TRANSMISSIVE		
CONTROLLER/DRIVER IC(控制/驱动 IC) /	NT35516 (COG)		
BACKLIGHT COLOR/TYPE (背光源类型/颜色)	WHITE		
DRAWING REV/NO./QUANTITY (图纸版本/数量) // // // // // // // // // // // // //			
SPECIFICATION (规格书 份数)			
REMARKS:			
(备注)			
WRIT BY: DATE: APROV BY: _	DATE:		
CUSTOMER'S APPROVAL (客户确认):			
1) FUNCTION (功能):] N.G.		
2) DRIVER CONDITION (驱动条件): □ OK	□ N.G.		
3) DISPLAY MODE (显示模式): □ OK	\square N.G.		
4) VIEWING ANGLE (视角): □ OK	\square N.G.		
	□ N.G.		
6) DISPLAYING PATTERN (显示效果): □ OK □ N.G.			
CUSTOMER'S CONCLUSIONS (客户意见):			
CUSTOMER'S SIGNATURE (客户签名): DATE (日期):			