TFT LCD MODULE
SPECIFICATIONS

CUSTOMER	
MODEL	BLT3503248I-40A
CUSTOMER APPROVED	

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1.1 Caution

1. This TFT LCD module has been specifically designed for use only in Electronic devices. The module should not be used in applications where panel failure could result in physical harm or loss of life, and we expressly disclaims any and all liability relating in any way to the use of the module in such applications.

1.2 Description

BLT3503248I-40A is a transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is composed of a TFT-LCD module , a driver circuit and back-light unit. The resolution of 3.5" contains 320*480 pixels.

1.3 General Specifications

ITEM	Specification
LCD Mode	TFT; RGB Color; Normal White; Transmissive
Color	262K Colors
Backlight	LED white colored Backlight (6 chip LED in parallel)
Driver IC	ILI9488
Resolution	320(RGB)×480
Outline area(mm)	53.36*82.93*1.70
Active Area (mm)	48.96*73.44
Viewing Direction	FULL
Weight (g)	TBD

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2.1 Absolute maximum ratings

Item	Symbol	Value	Unit
Operation Temperature	Top	-20~70	℃
Storage Temperature	Tstr	-30~80	℃
Power supply voltage	V_{CC}	-0.3~4.6	V

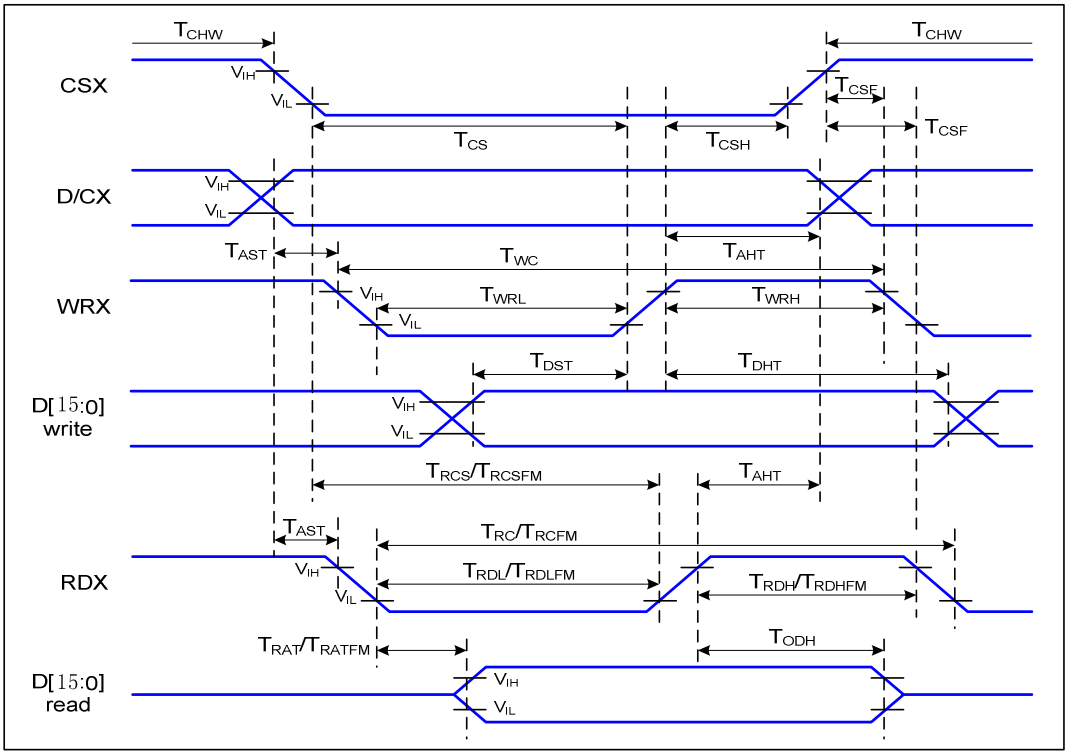
2.2 LED back light specification (per a Chip)

Item		Symbol	Condition	Min	Type	Max	Unit
Forward voltage		V_f	I_f=15mA /1-chip per chip	-	3.2	-	V
Forward current		I_{pn}		-	15	-	mA
Reverse voltage		V_r		-	-	4.0	V
Reverse Current		I_r	V_r=4V		-	15	uA
Uniformity (with L/G)		-	I_f=15mA	-	80	-	%
Luminance	No LCD	Lv	I_f=15mA	-	-	-	cd/m2
	With LCD	Lv	I_f=15mA	-		-	cd/m2
Luminous color		White					

Driver Voltage	V_{ak}		-	3.2	3.5	V
Driver Current	I_{ak}		-	90	120	mA
LED Configuration	6PCS LED Chip					

2.3 Time Sequence

2.3.1 Display Parallel 18/16/9/8-bit Interface Timing Characteristics (8080-series)



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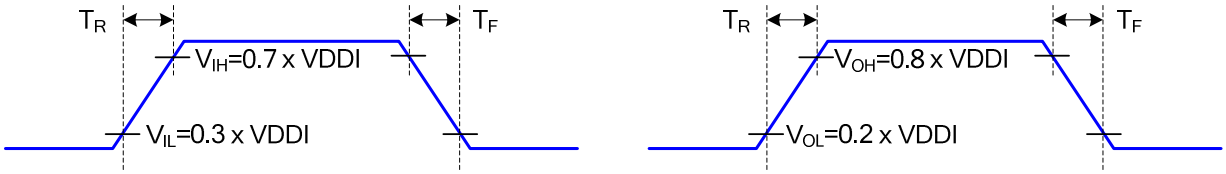
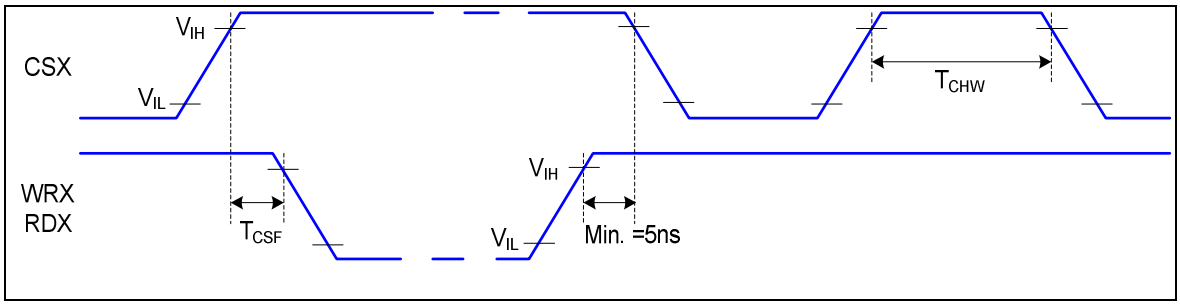
Ta=25 ℃, IOVCC=1.65~3.7V, VDD=2.3~4.8V

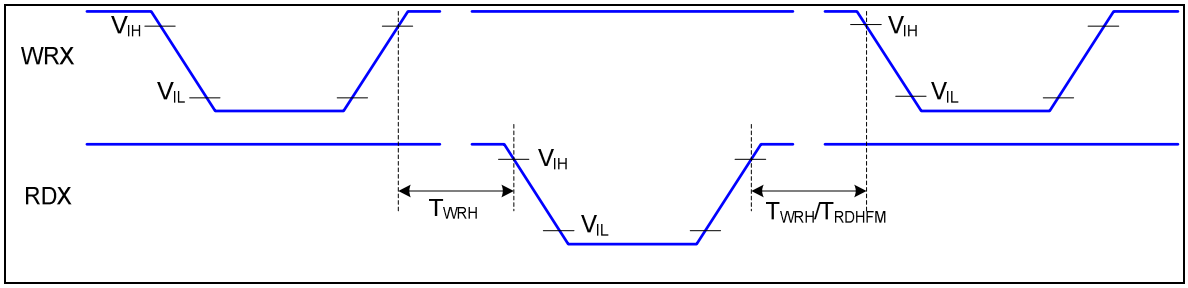
Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	TAST	Address setup time	10		ns	-
	TAHT	Address hold time (Write/Read)	10		ns	
CSX	TCHW	Chip select “H” pulse width	0		ns	-
	TCS	Chip select setup time (Write)	15		ns	
	TRCS	Chip select setup time (Read ID)	45		ns	
	TRCSFM	Chip select setup time (Read FM)	355		ns	
	TCSF	Chip select wait time (Write/Read)	10		ns	
	TCSH	Chip select hold time	10		ns	
WRX	TWC	Write cycle	66		ns	
	TWRH	Control pulse “H” duration	15		ns	
	TWRL	Control pulse “L” duration	15		ns	
RDX (ID)	TRC	Read cycle (ID)	160		ns	When read ID data
	TRDH	Control pulse “H” duration (ID)	90		ns	
	TRDL	Control pulse “L” duration (ID)	45		ns	
RDX (FM)	TRCFM	Read cycle (FM)	450		ns	When read from frame memory
	TRDHFM	Control pulse “H” duration (FM)	90		ns	
	TRDLFM	Control pulse “L” duration (FM)	355		ns	
D[17:0]	TDST	Data setup time	10		ns	For CL=30pF
	TDHT	Data hold time	10		ns	
	TRAT	Read access time (ID)		40	ns	
	TRATFM	Read access time (FM)		340	ns	
	TODH	Output disable time	20	80	ns	



Rising and falling timing for input and output signal



Chip selection (CSX) timing



Write-to-read and read-to-write timing

Note: The rising time and falling time (Tr, Tf) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

4. Electrical &Optical Characteristics

4.1 Electrical characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Power supply voltage	IOVCC	1.65	1.8	3.3	V	
Power supply voltage	VCI	2.5	2.8	3.3	V	
Normal mode Current consumption	V_{CCI}		10	15	mA	
Level input voltage	V_{IH}	$0.8V_{DDIO}$		–	V	
	V_{IL}	–		$0.2V_{DDIO}$	V	
Level output voltage	V_{OH}	$0.8V_{DDIO}$		–	V	
	V_{OL}	–		$0.2V_{DDIO}$	V	

4.2. Optical Characteristics

Ta=25ºC, VCC=2.8V, TN LC+ Polarizer

	Item		Symbol	Condition	Specification			Unit
					Min.	Typ.	Max.	
Backlight On (Transmissive Mode)	Luminance			Normally viewing angle	-	250	-	cd/m²
	Contrast ratio		*CR*	$\theta_X = \theta_Y$ =0º	-	500	-	-
	Response time		$T_R + T_F$		-	25	30	ms
	Chromaticity Transmissive	Red	X_R	-	0.589	0.609	0.629	
			Y_R		0.310	0.330	0.350	
		Green	X_G		0.267	0.287	0.307	
			Y_G		0.507	0.527	0.547	
		Blue	X_B		0.127	0.147	0.167	
			Y_B		0.118	0.138	0.158	
		White	X_W		0.283	0.303	0.323	
			Y_W		0.304	0.324	0.344	
	Viewing Angle	Horizontal	θX+	Center CR≥10	-	80	-	Deg.
			θX-		-	80	-	
		Vertical	θY+		-	80	-	
			θY-		-	80	-	
	NTSC Ratio(Gamut)		-	-	-	53	-	%

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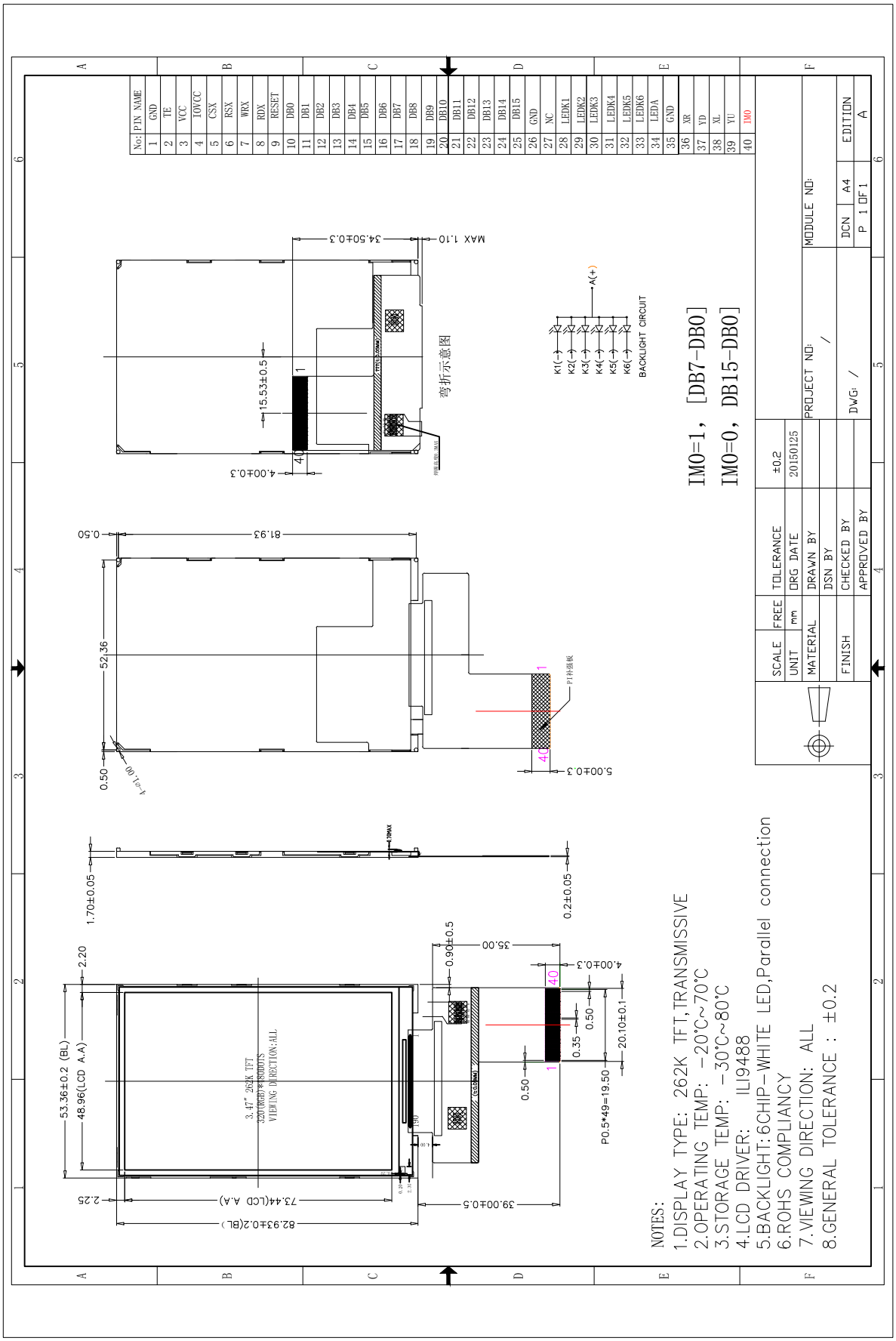
5. Module outline



6. Interface

Pin.No	Symbol	Function
1	GND	
2	TE	
3	VCC	
4	IOVCC	
5	CSX	
6	RSX	
7	WRX	
8	RDX	
9	RESET	
10～25	DB0~DB15	Data Bus
26	GND	
27	NC	
28	LEDK1	
29	LEDK2	
30	LEDK3	
31	LEDK4	
32	LEDK5	
33	LEDK6	
34	LEDA	
35	GND	
36	XR	
37	YD	
38	XL	
39	YU	
40	IM0	

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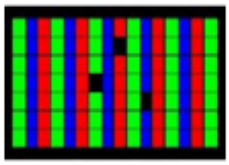
7. Reliability Test Conditions And Methods

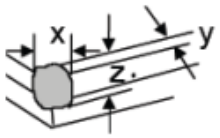
NO	Item	Condition	Method
1	High temperature and high humidity operation	60℃,90%RH,240H	Check and record every 48Hrs
2	High Temperature storage	80℃±2℃ 240H	Check and record every 48Hrs
	Low Temperature storage	-30℃±2℃ 240H	
3	High Temperature operating	70℃±2℃ 240H	Check and record every 48Hrs
	Low Temperature operating	-20℃±2℃ 240H	
4	Temperature Cycle	Temperature cycle -30℃ → 25℃ → 80℃ → 25℃ 30min 30min 30min 30min 1 cycle 10 cycles	Each 5 cycles end, check and record
5	Vibration	10Hz~55Hz~10Hz Amplitude: 1.5mm 2hrs for each direction (X, Y, Z)	Each direction end, Check the Appearance and Electrical Characteristics
6	Slump	A packing case product, in 80 centimeters place, along 6 surface two edge two cents for each face, edge and corner of the once free-falling campaign	Meets the LCD each performance index requirement
7	Poach	Ordinary product 6Hrs, distinctive product 8Hrs	

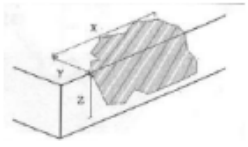
8. Inspection standard

<table>
<tr><th>NO</th><th>ITEM</th><th>Content</th><th>Standard</th><th>Method</th><th>AQL</th></tr>
<tr><td>1</td><td>Model confirmed</td><td>With Model</td><td>An unusual mixed model, not allowed</td><td>Compared with the sample (visual or sounding)</td><td>0.65</td></tr>
<tr><td rowspan="10">2</td><td rowspan="10">Polarizer</td><td>Air Bubble</td><td><table><tr><th>Size</th><th>Allow a few</th></tr><tr><td>Φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20＜Φ≤0.30</td><td>2</td></tr><tr><td>0.30＜Φ≤0.40</td><td>1</td></tr><tr><td>Φ＞0.40</td><td>0</td></tr><tr><td>Total QTY</td><td>3</td></tr></table></td><td>Open backlight or visual observation, Benchmark testing</td><td rowspan="10">1.5</td></tr>
<tr><td>Protective film</td><td>1. Protective film or falling over sideways area of LCD 1/3 be allowed
2. Polarizer protective film off, not allowed</td><td>Visual</td></tr>
<tr><td>Partial affixed</td><td>Polarizer edges cannot exceed the LCD glass as a fringe.</td><td>Visual</td></tr>
<tr><td>Scratch</td><td>LCD boxes linear defects</td><td rowspan="2">Open backlight or visual observation, Benchmark testing</td></tr>
<tr><td>Injured</td><td>LCD boxes Point defects.</td></tr>
<tr><td>Wrinkles</td><td>The naked eye can clearly distinguish allowed</td><td>Visual</td></tr>
<tr><td>Cock</td><td>Polarizer edge cock (unglued), not allowed.</td><td>Visual</td></tr>
<tr><td>Water bellows</td><td>Limits of reference samples.</td><td>Visual</td></tr>
<tr><td>Surface dirt</td><td>Surface dirt alcohol cloth to clean the surface dirt is prinked gently, as if to remove qualified, wiping not to be ineligible.</td><td>Visual</td></tr>
<tr><td>3</td><td>LCD</td><td>Rainbow (box uneven thickness)</td><td>Rainbow emphasis on "restrictions" for failure.</td><td>Polarizing inspection</td><td>0.65</td></tr>
</table>

<table>
<tr><td rowspan="3"></td><td rowspan="3"></td><td>Electrical not defect</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Glass defect</td><td>
Bright and Black dot define:

and


Inspection pattern: Full white、Full black、Red、green and blue screens
<table>
<tr><th>Item</th><th>Acceptable Quantity</th></tr>
<tr><td>Black dot defect</td><td>2</td></tr>
<tr><td>Bright dot defect</td><td>0</td></tr>
<tr><td>Total Dot</td><td>2</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>
1.Corner Fragment:


<table>
<tr><th>Size(mm)</th><th>Acceptable Quantity</th></tr>
<tr><td>X≤3mm
Y≤3mm
Z≤T</td><td>Ignore
T：Glass thickness
X: Length
Y: Width
Z: thickness</td></tr>
</table>
2. Side Fragment:

<table>
<tr><th>Size(mm)</th><th>Acceptable Quantity</th></tr>
<tr><td>X≤5.0mm
Y ≤1mm
Z≤T</td><td>Ignore
T：Glass thickness
X: Length
Y: Width
Z: thickness</td></tr>
</table>
</td><td>Caliper</td><td></td></tr>
</table>

4	**FPC**	**FPC bad press**	**FPC visually evident with the undocking LCD，Unqualified**	**Visual**	**0.65**
		FPC deviation	**FPC deviation，Unqualified**	**Visual**	
		FPC damaged	**FPC Wrinkle, torn and damaged, FPC damage to the components Unqualified**	**Visual**	
		FPC surface dirt	**Obviously the milk attachment，Unqualified**	**Visual**	
5	**Back light**	**Crack**	**In light district are obvious cracks, or from the brink of a regional extension to the light of the trend of the cracks. Unqualified.**	**Visual**	
		Breaking	**The edge or corner breaking display has been exposed. Unqualified**	**Visual**	
6	**IC**	**IC breaking**	**IC any degree of damage, Unqualified.**	**Visual**	
7	**Sillicone**	**Silicone Uniformity**	**Silicone uneven, as well as some regional non-gel, but in some regions and the impact of too many plastic assembly, Unqualified.**	**Visual**	
8	**Other**	**Bad labeling**	**Marking and labeling requirements of the position and inconsistent, Unqualified.**	**Visual**	**1.5**
		Shading belt	**There were bubbles and the crimp, tilt beyond Zebra paper edge, and polarizer overlapping folds, such as scratches phenomenon to be ineligible,**	**Visual**	
		Separation of components	**Backlight LCD screen with the undocking, not allowed.**	**Visual**	**0.65**

9. Handling Precautions

9.1 Mounting method

The LCD panel of this LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

9.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent

[Recommended below] and wipe lightly

- **Isopropyl alcohol**
- **Ethyl alcohol**

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- **Water**
- **Aromatics**

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- **Soldering flux**
- **Chlorine (Cl), Salfur (S)**

If goods were sent without being sili8con coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss handling or using some materials such as Chlorine (Cl), Salfur (S) from customer, Responsibility is on customer.

9.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:
Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

9.4 packing

- **Modules employ LCD elements and must be treated as such.**
- **Avoid intense shock and falls from a height.**
- **To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity**

9.5 Caution for operation

- **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.**
- **Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how 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 operation temperature.**
- **If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.**
- **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.

9.6 Storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- **Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.**
- **Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.**
- **Storing with no touch on polarizer surface by the anything else.**

[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

9.7 Safety

- **It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.**
- **When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water**

10. Precaution for use

10.1 A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

10.2 On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- **When a question is arisen in this specification**
- **When a new problem is arisen which is not specified in this specifications**
- **When an inspection specifications change or operating condition change in customer is reported to HCH, and some problem is arisen in this specification due to the change**
- **When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.**