

MAXEN ELECTRONICS LIMITED

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SPECIFICATION

Model: MX-B70HM30-TNX15

For Customer's Acceptance:

Approved By	Comment		
PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT

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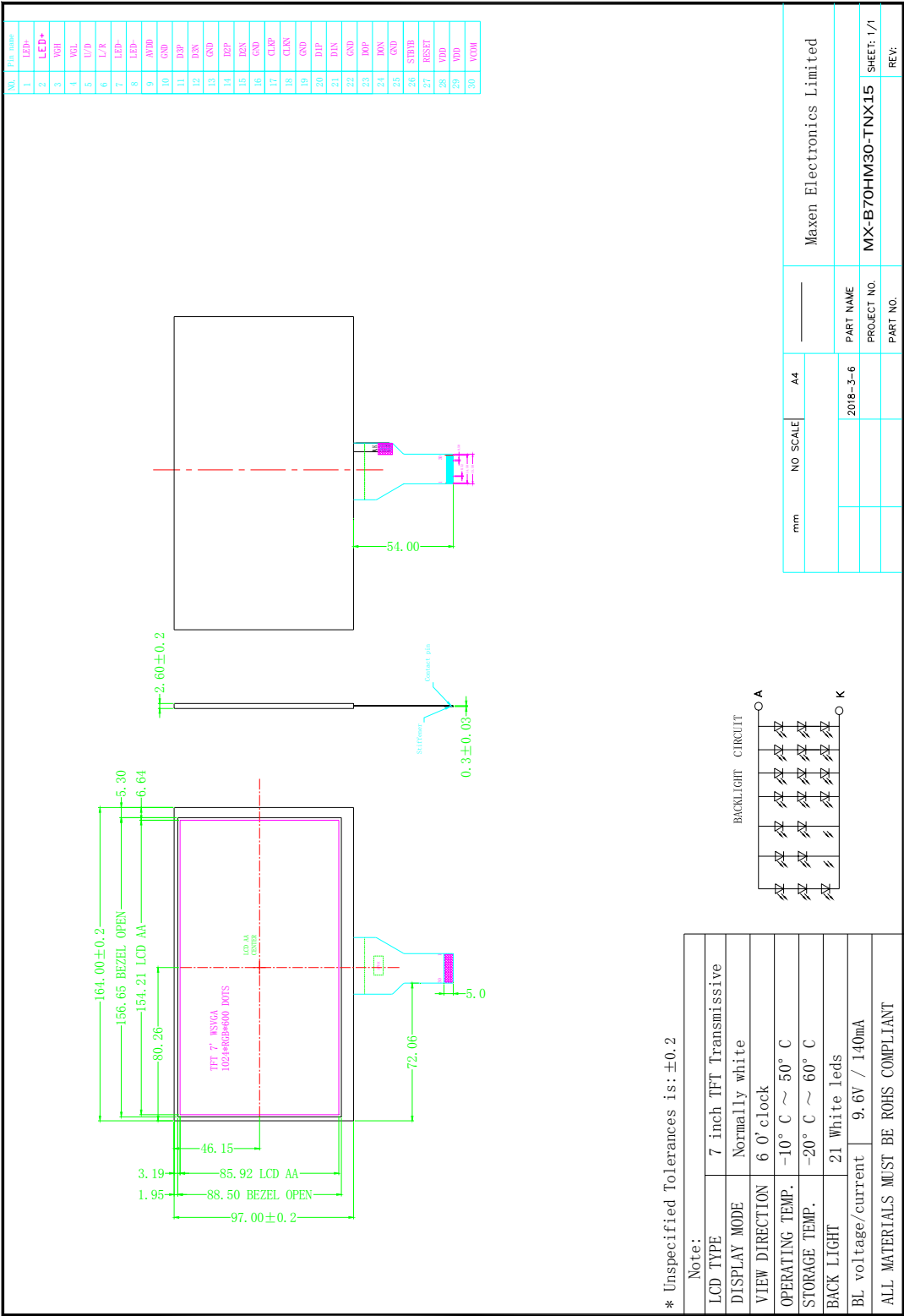
1. PHYSICAL DATA

Item	Contents	Unit
LCD type	TFT TRANSMISSIVE	---
Viewing direction	6	o'clock
Module size (W×H×T)	164 × 97 × 2.6	mm ³
Active area(W×H)	154.2144×85.92	mm ²
Number of dots(W×H)	1024(RGB) × 600	dots
Pixel Pitch(W×H))	0.1506×0.1432	mm
Driver IC	EK79007AD	---
Colors	16.7M	---
Backlight Type	21 white leds 9.6V /140mA	---
Interface Type	MIPI	---

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2. Mechanical Dimension



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3. Pin Descriptions

Pin No.	Symbol	Functional	Notes
1	LED+	Back light LED+	
2	LED+	Back light LED+	
3	LCD_VGH	Gate ON Voltage	
4	LCD_VGL	Gate OFF Voltage	
5	UPDN	Gate up or down scan control	
6	SHLR	Source right or left sequence control	
7	LED-	Back light LED-	
8	LED-	Back light LED-	
9	AVDD	Power for Analog Circuit	
10	GND	Ground	
11	MIPI_TDP3	MIPI data input	
12	MIPI_TDN3	MIPI data input	
13	GND	Ground	
14	MIPI_TDP2	MIPI data input	
15	MIPI_TDN2	MIPI data input	
16	GND	Ground	
17	MIPI_TDP	MIPI clock input	
18	MIPI_TDN	MIPI clock input	
19	GND	Ground	
20	MIPI_TDP1	MIPI data input	
21	MIPI_TDN1	MIPI data input	
22	GND	Ground	
23	MIPI_TDP0	MIPI data input	
24	MIPI_TDN0	MIPI data input	
25	GND	Ground	
26	STBYB	Standby mode, Normally pulled high	
27	RESET	Global reset pin	
28	VDD	Power supply for digital circuits +1.8V input	
29	VDD		
30	VCOM	Common voltage	

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4. ABSOLUTE MAXIMUM RATINGS

(GND=AGND=0V)

Parameter	Symbol	Min	Max	Unit
Power supply1	V _{DD}	-0.3	+2.0	V
Power supply2	Avdd	-0.5	+13.85	V
Operating temperature	T _{OPR}	-10	50	°C
Storage temperature	T _{STG}	-20	60	°C

Input voltage at temperature 25°C

VDD	1.8V
VGH	18V
VGL	-6V
AVDD	9.6V
VCOM	3.8V

Note: Please adjust Vcom to make the flicker level be minimum

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5. DC ELECTRICAL CHARACTERISTICS

(VDD=VDD_IF=1.8V, AVDD=8 to 13.5V, GND=AGND=GND_IF=0V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Low level input voltage	Vil	For the digital circuit	0	-	0.3×VDD	V
High level input voltage	Vih	For the digital circuit	0.7×VDD	-	VDD	V
Input leakage current	Ii	For the digital circuit	-	-	±1	μA
High level output voltage	Voh	Ioh= -400 μA	VDD - 0.4	-	-	V
Low level output voltage	Vol	Iol= +400 μA	-	-	GND+0.4	V
Pull low/high resistor	Ri	For the digital input pin @ VDD_IF=1.8V	200K	250K	300K	ohm
Digital Operation current	Idd	Fclk=51.2MHz, VDD=VDD_IF=1.8V	-	TBD	-	mA
Digital HW Stand-by current	Ist1	Clock and all functions are stopped	-	50	-	μA
Analog Operating Current	Idda	No load, Fclk=51.2MHz, @AVDD=13.5V, V1=13.4V, V14=0.1V	-	10	12	mA
Analog Stand-by current	Ist2	No load, clock and all functions are stopped	-	10	50	μA
Input level of V1 ~ V7	Vref1	Gamma correction voltage input	0.4×AVDD	-	AVDD-0.1	V
Input level of V8 ~ V14	Vref2	Gamma correction voltage input	0.1	-	0.6×AVDD	V
Output Voltage deviation	Vod1	Vo = AGND+0.1V ~ AGND+0.5V and Vo = AVDD-0.5V ~ AVDD-0.1V	-	±20	±35	mV
Output Voltage deviation	Vod2	Vo = AGND+0.5V ~ AVDD-0.5V	-	±15	±20	mV
Output Voltage Offset between Chips	Voc	Vo = AGND+0.5V ~ AVDD-0.5V	-	-	±20	mV
Dynamic Range of Output	Vdr	SO1 ~ 1536	0.1	-	AVDD-0.1	V
Sinking Current of Outputs	IOLy	SO1 ~ 1536; Vo=0.1V v.s 1.0V, AVDD=13.5V	80	-	-	uA
Driving Current of Outputs	IOHy	SO1 ~ 1536; Vo=13.4V v.s 12.5V, AVDD=13.5V	80	-	-	uA
Resistance of Gamma Table	Rg	Rn: Internal gamma resistor	0.7×Rn	1.0×Rn	1.3×Rn	ohm

(VDD=VDD_IF=1.8V, AVDD=8 to 13.5V, GND=AGND=GND_IF=0V, TA=-20°C to 85°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
MIPI Characteristics for High Speed Receiver					
Single-ended input low voltage	VILHS	-40	-	-	mV
Single-ended input high voltage	VIHHS	-	-	460	mV
Common-mode voltage	VCDRXDC	70	-	330	mV
Differential input impedance	ZID	-	100	-	ohm
HS transmit differential voltage(VOD=VDP-VDN)	VOD	140	200	250	mV
MIPI Characteristics for Low Power Mode					
Pad signal voltage range	Vi	-50	-	1350	mV
Ground shift	VGNDSH	-50	-	50	mV
Logic 0 input threshold	VIL	0	-	550	mV
Logic 1 input threshold	VIH	880	-	1350	mV
Input hysteresis	VHYST	25	-	-	mV
Output low level	Vol	-50	-	50	mV
Output high level	VOH	1.1	1.2	1.3	V
Output impedance of Low Power Transmitter	ZOLP	80	100	125	ohm
Logic 0 contention threshold	VILCD,MAX	-	-	200	mV
Logic 0 contention threshold	VIHCD,MIN	450	-	-	mV

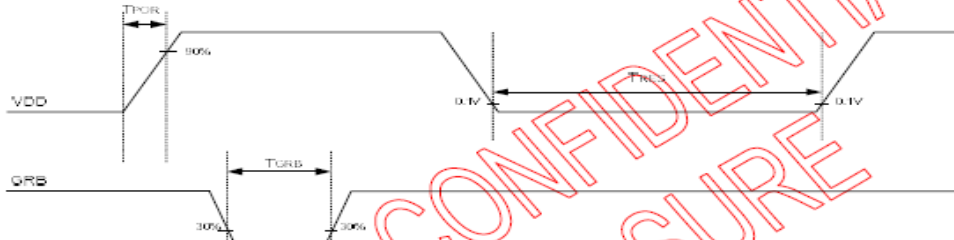
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6. AC ELECTRICAL CHARACTERISTICS

(VDD=VDD_IF=1.8V, AVDD=8 to 13.5V, GND=AGND=GND_IF=0V, TA=-20 to +85°C)
VDD/GRB AC characteristic

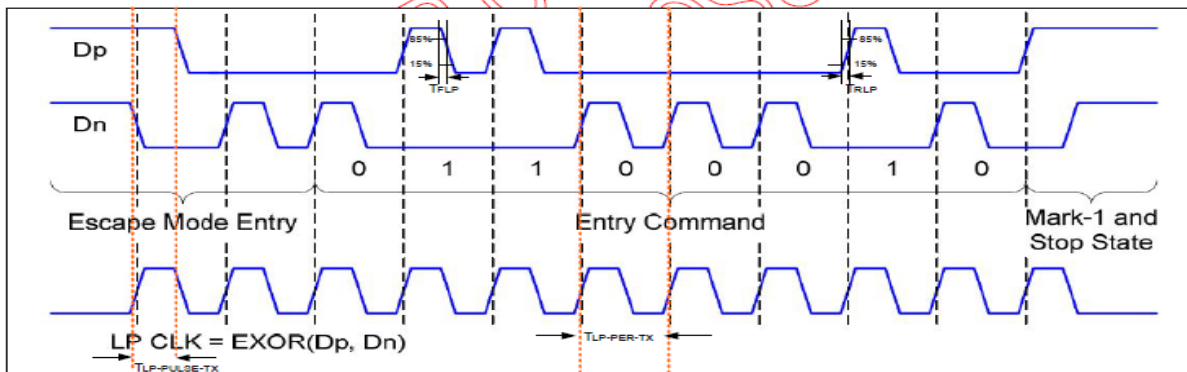
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
VDD power slew rate	T _{POR}	-	-	20	ms	From 0 to 90% VDD
GRB active pulse width	T _{GRB}	1	-	-	ms	VDD=VDD_IF=1.8V
VDD resetttle time	T _{RES}	1	-	-	s	



3-wire interface AC characteristic

Parameter	Symbol	Min.	Typ.	Max.	Unit
CSB falling to SCL rising time	T _{SCL}	200	-	-	ns
SCL pulse high period	T _{ICWH}	100	-	-	ns
SCL pulse low period	T _{ICWL}	100	-	-	ns
SCL pulse width	T _{ICWP}	250	-	-	ns
SDA data input setup time	T _{ISU}	100	-	-	ns
SDA data input hold time	T _{IHD}	100	-	-	ns
SCL to CSB rising time	T _{ISC}	250	-	-	ns
CSB rising to failing time	T _{ICD}	1	-	-	us

Parameter	Symbol	Min	Typ	Max	Units	Notes
15%~85% rising time and falling time	T _{RLP} / T _{FLP}	-	-	25	ns	-
30%~85% rising time and falling time	T _{REOT}	-	-	35	ns	-
Pulse width of LP EXOR clock First LP EXOR clock pulse after STOP state or Last pulse before stop state	T _{LP-PULSE-TX}	40	-	-	ns	-
		20	-	-	ns	-
Period of the LP EXOR clock	T _{LP-PER-TX}	90	-	-	mV/ns	-
Slew Rate @CLOAD =0pF	$\delta V / \delta t_{SR}$	30	-	500	mV/ns	-
Slew Rate @CLOAD =5pF		30	-	200	mV/ns	-
Slew Rate @CLOAD =20pF		30	-	150	mV/ns	-
Slew Rate @CLOAD =70pF		30	-	100	mV/ns	-
Load Capacitance	T _{RLP}	-	-	70	pF	-



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7. Data input format

DE mode

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2	67.2	Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	Tvd	600			H
VSYNC period time	Tv	610	635	800	H
VSYNC blanking	Tvb+Tvfp	10	35	200	H

HV mode

Horizontal input timing

Parameter	Symbol	Value			Unit
Horizontal display area	thd	1024			DCLK
DCLK frequency@ Frame rate=60hz	fclk	Min. 44.9	Typ. 51.2	Max. 63	Mhz
1 Horizontal Line	th	1200	1344	1400	DCLK
HSYNC pulse width	Min.	1			
	Typ.	—			
	Max.	140			
HSYNC blanking	thb	160	160	160	
HSYNC front porch	thfp	16	160	216	

HV mode

Vertical input timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			H
VSYNC period time	tv	624	635	750	H
VSYNC pulse width	tpw	1	—	20	H
VSYNC back porch	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

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8. Backlight Characteristic

Item	Symbol	Min	Typical	Max	Unit
LED module Forward voltage	V_{LED}	--	9.6	--	V
LED module current	I_{LED}	--	140	--	mA
L/G Surface Luminance ★1	L_S	--	220	--	mcđ
LCM Surface brightness uniform ★2	L_D	80	--	--	%

★ 1 Test condition is:

(a) Center point on active area.

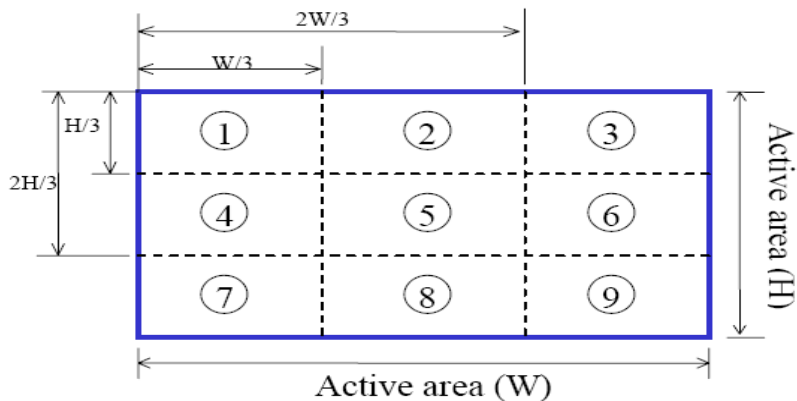
(b)Best Contrast.

★2 Uniform measure condition:

(1)Measure 9 point. Measure location show below;

(2)Uniform=(Min. brightness /Max. brightness)*100%

(3)Best Contrast.



9. Electro-optical Characteristics

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing angle range	Hor.	$\phi 3$	$CR \geq 10$	40	50		Deg.	
		$\phi 9$		40	50		Deg.	
	Ver.	$\phi 12$		30	40		Deg.	
		$\phi 6$		40	50		Deg.	
Color gamut (C light)					50		%	
Luminance Contrast ratio		T(%)	$\phi 0^\circ$	600	800			
Response Time		T_{RT}	Temp=25° C		25	40	ms	

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10. Reliability

10.1 Mtbf

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal

10.2 Test condition

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating Test	60°C*240Hrs	。 No Defect Of Operational Function In Room Temperature Are Allowable
2	Low Temperature Non-Operating Test	-20°C*240Hrs	
3	High Temperature/Humidity Non Operating Test	60°C*90%RH*240Hrs	
4	High Temperature Operating Test	50°C*240Hrs	。 IDD of LCM in Pre-and Post-Test Should Follow Specification
5	Low Temperature Operating Test	-10°C*240Hrs	
6	Thermal Shock Test	-10 °C (30Min) - 50 °C (30Min) *10CYCLES	

Notes:

1. Judgments should be made after exposure in room temperature for two hours.
2. The distill water is used for the high temperature/humidity test.
3. The sample above is individually for every reliability tests condition.

11. Inspection standards

1.AQL(Acceptable Quality Level

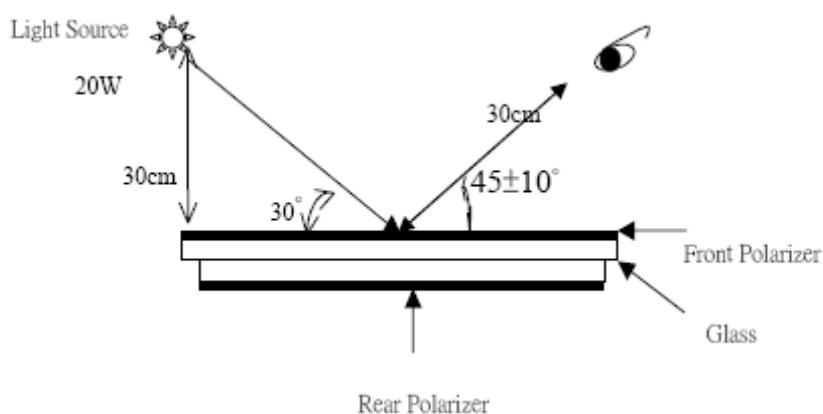
AQL of major and minor defect.

	MAJOR DEFECT	MINOR DEFECT
AQL	0.65	1.5

2. Basic conditions for inspection

The LCM face to us, in normal environment, the lux is 1000 ± 200 . (Darkroom's lux: 100 ± 50), About an angle of incidence 30°, a distance of 30 cm with an angle of 45 degree to check the products without uncovering the film!

(As shown below)



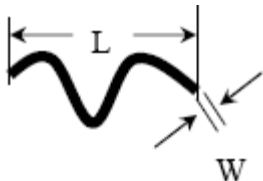
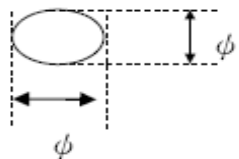
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3.Inspection item and criteria

3.1 Visual inspection criterion in immobility

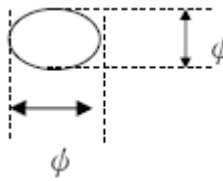
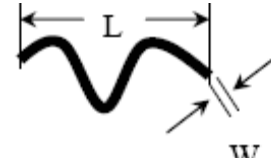
3.1.1LCD appearance defect(View area)

NO	Defect item	Criteria		Remark
1	Fiber、glass cratch、polarizer scratch/folded (minor defect)	Specification	Allowable	note1:L: Length, W: Width note2: disregard if out of AA 
		$W \leq 0.03\text{mm}$	disregard	
		$0.03\text{mm} < W \leq 0.05\text{mm};$ $L \leq 3.0\text{mm}$	2	
		$0.05\text{mm} < W \leq 0.1\text{mm};$ $L \leq 3.0\text{mm}$	1	
		$W > 0.1\text{mm}; L > 3.0\text{mm}$	0	
2	Polarizer bubble、 concave and convex (minor defect)	$\phi \leq 0.2\text{mm}$	disregard	note1: $\phi = (L+W)/2$, L:Length, W :Width note2:disregard if out of AA
		$0.2\text{mm} < \phi \leq 0.3\text{mm}$	2	
		$0.3\text{mm} < \phi \leq 0.5\text{mm}$	1	
		$0.5\text{mm} < \phi$	0	
3	Black dots、dirty dots、 impurities、eye winker (minor defect)	$\phi \leq 0.15\text{mm}$	disregard	note2:disregard if out of AA 
		$0.15\text{mm} < \phi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \phi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \phi$	0	
4	Polarizer prick (minor defect)	$\phi \leq 0.1\text{mm}$	disregard	note1: $\phi = (L+W)/2$, L=Length, W=Width note2:the distance between two dots>5mm
		$0.1\text{mm} < \phi \leq 0.25\text{mm}$	3	
		$\phi > 0.25\text{mm}$	0	

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3.2Electrical criteria

NO	Defect item	Criteria	Remark	
1	No display (major defect)	No display 【Reject】		
2	Missing line (major defect)	Missing line 【Reject】		
3	Seg-com light and dark (major defect)	Seg-com light and dark 【Reject】	ND filter 2% test	
4	No display in immobility (major defect)	No display in immobility 【Reject】		
5	Flicker of Pattern (major defect)	Flicker of Pattern 【Reject】		
6	Mura (major defect)	ND filter 2%test		
7	Over current (major defect)	Over current 【Reject】		
8	Voltage out of specification (major defect)	Voltage out of specification 【Reject】		
9	Pattern blur, error code (major defect)	Pattern blur, error code 【Reject】		
10	Dark light, Flicker (major defect)	Dark light, Flicker 【Reject】		
11	Black/white dots 、 Dirty dots、 eye winker (major defect)	Specification	Allowable	Note1:disregard if out of AA 
		$\phi \leq 0.15\text{mm}$	disregard	
		$0.15\text{mm} < \phi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \phi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \phi$	0	
12	Fiber、glass crutch、Polarizer scratch/folded (major defect)	$W \leq 0.03\text{mm}$	disregard	Note1:L: Length, W: Width Note2: disregard if out of AA 
		$0.03\text{mm} < W \leq 0.05\text{mm}$ $L \leq 3.0\text{mm}$	2	
		$0.05\text{mm} < W \leq 0.1\text{mm}$ $L \leq 3.0\text{mm}$	1	
		$W > 0.1\text{mm}; L > 3.0\text{mm}$	0	

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12.Precautions for using LCD modules.

12.1 Safety

- (1)Do not swallow any liquid crystal ,even if there is no proof that liquid crystal is poisonous.
- (2)If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3)If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

12.2 Storage Conditions

- (4)Store the panel or module in a dark place where the temperature is $23 \pm 5^{\circ}\text{C}$ and the humidity is below $45 \pm 20\% \text{RH}$.
- (5)Store in anti-static electricity container.
- (6)Store in clean environment, free from dust, active gas, and solvent.
- (7)Do not place the module near organics solvents or corrosive gases.
- (8))Do not crush, shake, or jolt the module.

12.3Handling Precautions

- (9)Avoid static electricity, which can damage the CMOS LSI.
- (10)The polarizing plate of the display is very fragile, please handle if very carefully.
- (11)Do not give external shock.
- (12)DO not apply excessive force on the surface.
- (13)Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (14)Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (15)Do not operate it above the absolute maximum rating.
- (16)Do not remove the panel or frame from the module.

12.4 Warranty

The period is within twelve months since the date of shipping out under normal using and storage conditions.