



Microtips Technology

Innovative Solutions. Your Vision. Our Goal.

Module Specification

PRODUCT NO: MLTK-1024600-070SWTH-A01
VERSION : 1.0
ISSUED DATE: Sep-20-2022

This module uses ROHS material

CUSTOMER
APPROVED BY
DATE:

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History of Version

Date	Ver.	Description	Design
Sep-20-2022	1.0	The first release	Zhang Hao



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1. Basic specification

1.1 General specification

Item	specifications	Unit
Active screen size	7.0 inch Diagonal	-
Display resolution	1024 x RGB x 600	pixel
Module size (W x H x T)	165.0x100.0.x5.7	mm
Active area (W x H)	154.2144x85.92	mm
Pixel pitch (W×H)	0.1506x 0.1432	mm
Interface	RGB	-

Item	specifications
LCD type	TFT
Polarizer mode	Transmissive
Pixel arrangement	RGB-stripe
Backlight type	LED
Viewing direction(Gray inversion)	ALL

Product
specification

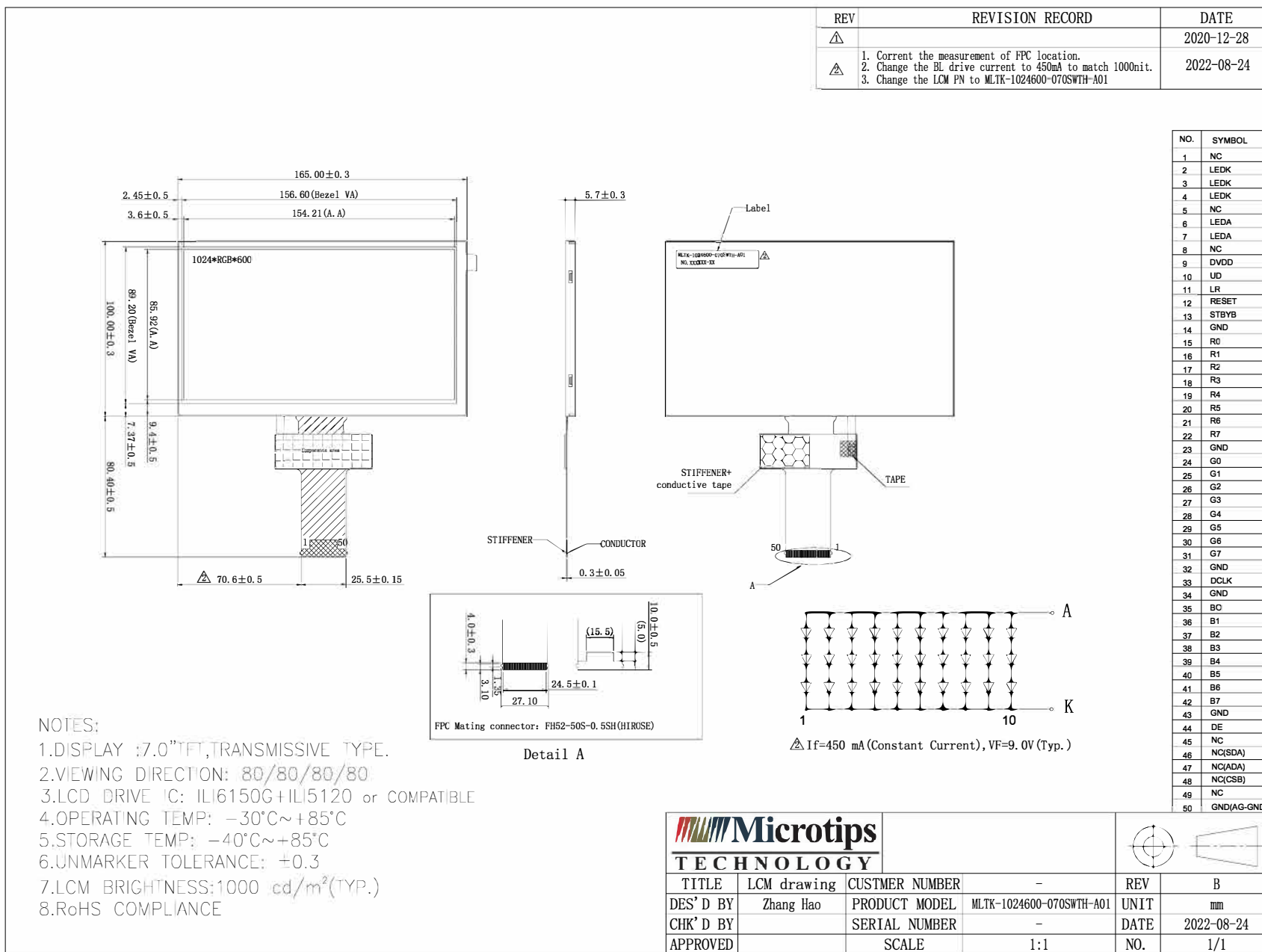
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1.2 Outline dimension



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1.3 LCM Interface pin

Pin No.	Symbol	I/O	Function
1	NC	-	Not connect
2	LEDK	P	Blacklight ground
3	LEDK	P	Blacklight ground
4	LEDK	P	Blacklight ground
5	NC	-	Not connect
6	LEDA	P	Blacklight anode
7	LEDA	P	Blacklight anode
8	NC	-	Not connect
9	VDD	P	Power supply
10	UD	I	Gate Up or Down scan control. Normally pull low. UPDN = "L", STV2 output vertical start pulse and UD pin output logical "0" to Gate driver. UPDN = "H", STV1 output vertical start pulse and UD pin output logical "1" to Gate driver.
11	LR	I	Source Right or Left sequence control. Normally pullhigh. SHLR = "L", shift left: last data= S1_S2_S3.._S1536 = first data. SHLR= "H",shift right:first data=S1_S2_S3 .._S1536 = last data.
12	RESET	I	Global reset pin.
13	STBYB	I	Standby mode control.
14	GND	P	Power ground
15	RO	I	Red data
16	R1	I	Red data
17	R2	I	Red data
18	R3	I	Red data
19	R4	I	Red data
20	R5	I	Red data
21	R6	I	Red data
22	R7	I	Red data
23	GND	P	Power ground
24	G0	I	Green data
25	G1	I	Green data
26	G2	I	Green data
27	G3	I	Green data

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28	G4	I	Green data
29	G5	I	Green data
30	G6	I	Green data
31	G7	I	Green data
32	GND	P	Power ground
33	DCLK	I	Clock Input
34	GND	P	Power ground
35	B0	I	Blue data
36	B1	I	Blue data
37	B2	I	Blue data
38	B3	I	Blue data
39	B4	I	Blue data
40	B5	I	Blue data
41	B6	I	Blue data
42	B7	I	Blue data
43	GND	P	Power ground
44	DE	I	Data Input Enable. Active High to enable the data input bus under "DE Mode". Normally pull low.
45	NC	-	Not connect
46	NC(SDA)	-	Not connect
47	NC(SCL)	-	Not connect
48	NC(CSB)	-	Not connect
49	NC	-	Not connect
50	GND	P	Power ground

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2. Electrical characteristics

2.1.1 Absolute maximum ratings

(Ta=25°C VSS=0V)

Item	Symbol	Min		Max	Unit	Note
Power supply voltage	V _{DD}	-0.3		4.5	V	
Humidity	RH	/		90% (Max 60°C)	RH	
Operating temperature range	T _{OP}	-30		85	°C	
Storage temperature range	T _{ST}	-40		85	°C	

2.1.2 DC characteristics

(Ta=25°C)

Item	Symbol	Min	Typ.	Max	Unit	Note
Power supply voltage	V _{DD}	3.0	3.3	3.6	V	
Humidity	RH	/	/	90% (Max 60°C)	RH	
Input H/L Level Voltage	VIH	0.7*VCC	-	VCC	V	
	VIL	GND	-	0.3*VCC	V	
Output H/L Level Voltage	VOH	VCC-0.4	-	VCC	V	
	VOL	GND	-	GND+0.4	V	
Supply Current	IVCC	-	180	250.0	mA	VCC=3.3V

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2.2 Backlight Characteristics

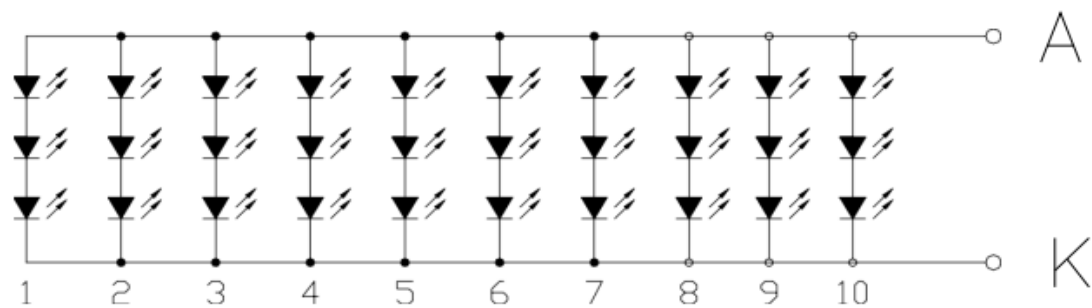
2.2.1 Electrical / Optical Characteristics

(Ta=25℃)

Item	Symbol	Min	Typ	Max	Unit	Note
Supply voltage	Vf	-	9.0	-	V	-
Supply current	IF	-	450	-	mA	-
Half-life time		-	20,000	-	Hrs.	IF= 450mA
Backlight color	White					

Note 1 : The "Half-life time" is defined as the module brightness decrease to 50% original brightness.

LED circuit diagram :





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2.3 Timing characteristics

2.3.1 AC Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
VDD Power On Slew rate	TPOR	From 0V to 90% VDD	-	-	20	ms
RSTB pulse width	TRST	DCLK = 65MHz	50	-	-	us
DCLK cycle time	Tcph	-	14	-	-	ns
DCLK pulse duty	Tcwh	-	40	50	60	%
VSD setup time	Tvst	-	5	-	-	ns
VSD hold time	Tvhd	-	5	-	-	ns
HSD setup time	Thst	-	5	-	-	ns
HSD hold time	Thhd	-	5	-	-	ns
Data set-up time	Tdsu	D0[7:0], D1[7:0], D2[7:0] to DCLK	5	-	-	ns
Data hold time	Tdhd	D0[7:0], D1[7:0], D2[7:0] to DCLK	5	-	-	ns
DE setup time	Tesu	-	5	-	-	ns
DE hold time	Tehd	-	5	-	-	ns
Output stable time	Tsst	10% to 90% target voltage. CL=90pF R=10K ohm (Cascade)	-	-	6	us
		Dual gate			3	

2.3.2 AC Timing Diagram

Clock and Data Input Timing Diagram

DE mode

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

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HV mode(1)

HV mode

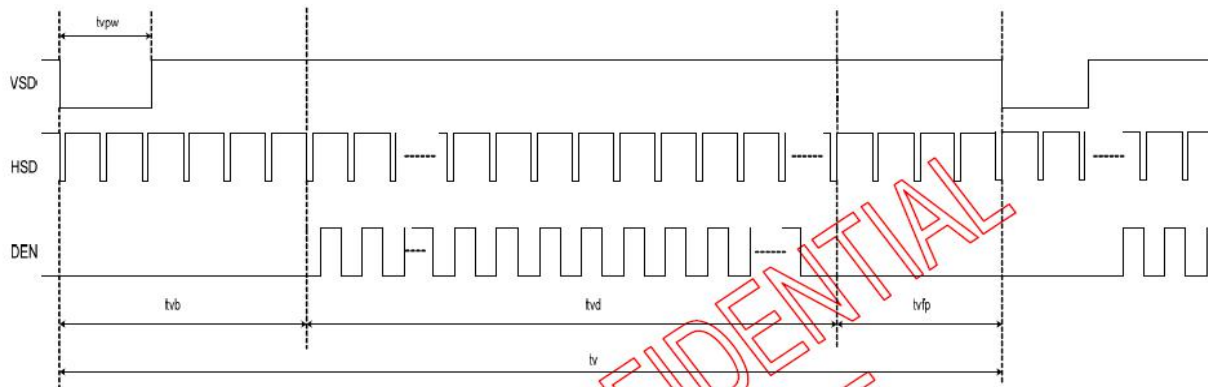
Horizontal input timing

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

HV mode(2)

Vertical input timing

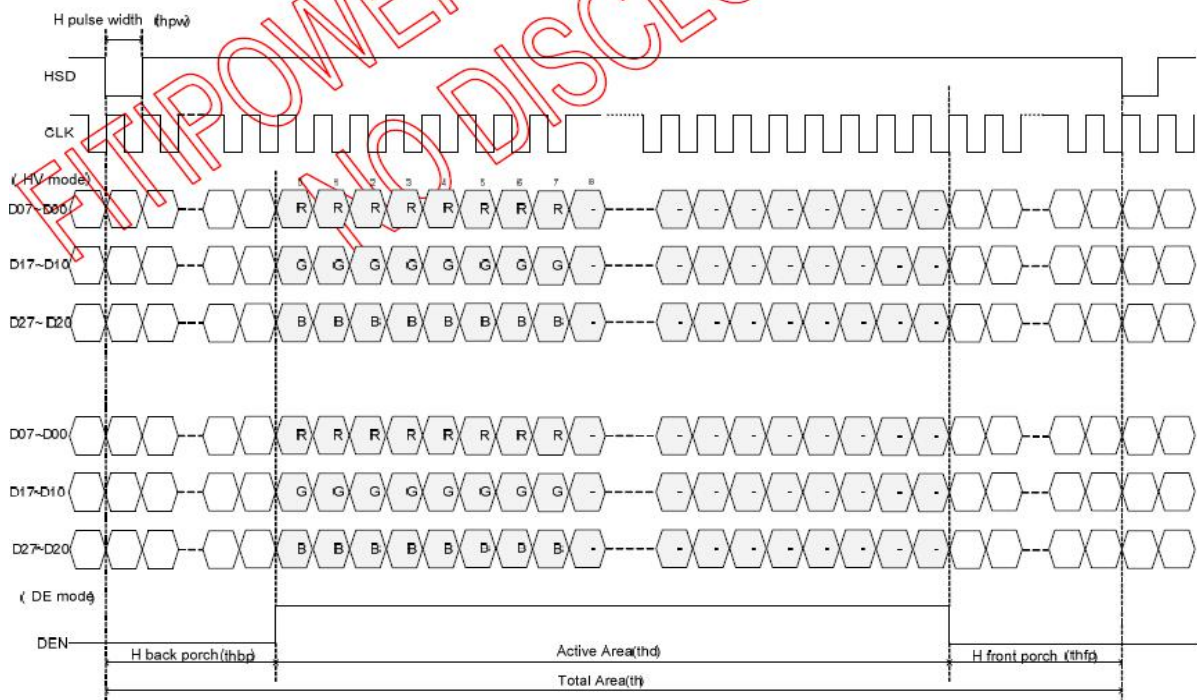
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			H
VSYNC period time	tv	624	635	750	H
VSYNC pulse width	tvpw	1	—	20	H
VSYNC back porch	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

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3. Optical characteristics

3.1 Characteristics

Electrical and Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View angles		3:00	CR≥10	80	-	-	Degree	Note 4
		6:00		80	-	-		
		9:00		80	-	-		
		12:00		80	-	-		
Response time		Tr+T0ff	$\theta=0^{\circ}$ $\Phi=0^{\circ}$	-	25	-	ms	Note 2
Contrast ratio		CR		600	800	-	-	Note 3
Color of CIE Coordinate (With B/L)	White	X	$T_a = 25^{\circ}\text{C}$ $\Theta X, \Theta Y = 0^{\circ}$	-	0.315	-	-	Note 1
		Y		-	0.326	-		
	Red	X		-	0.576	-		
		Y		-	0.344	-		
	Green	X		-	0.359	-		
		Y		-	0.568	-		
	Blue	X		-	0.177	-		
		Y		-	0.116	-		
Average Brightness Pattern= white		IV	IF=450mA	-	1000	-	cd/m2	Note 1



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3.2 Definition of optical characteristics

Note1 :

1 : $\Delta B = B(\min) / B(\max) \times 100\%$

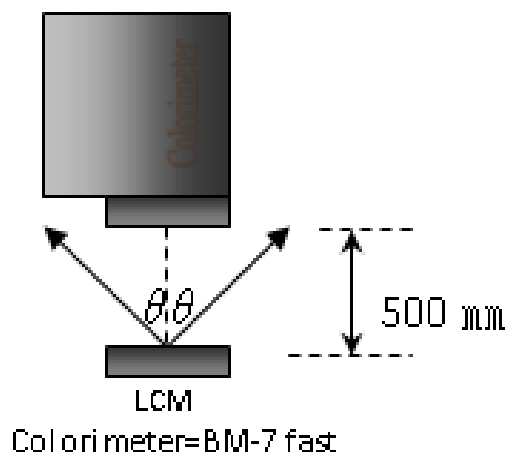
2 : Measurement Condition for Optical Characteristics:

a : Environment: $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ / $60 \pm 20\%$ R.H, no wind, dark room below 10 Lux at typical lamp current and typical operating frequency.

b : Measurement Distance: $500 \pm 50\text{mm}$, ($\theta = 0^{\circ}$)

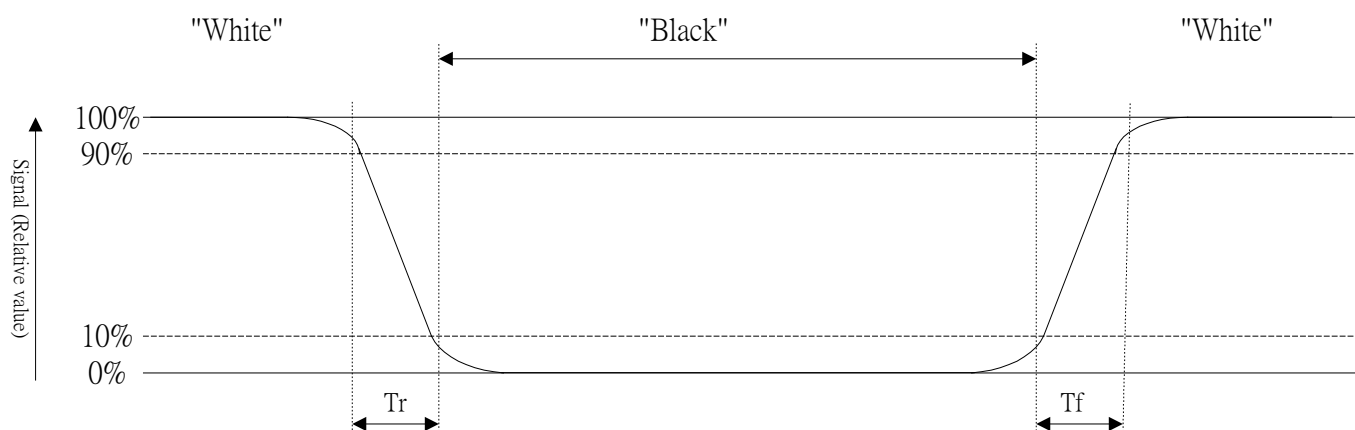
c : Equipment : TOPCON BM-7 fast, (field 1°), after 10 minutes operation.

d : The uncertainty of the C.I.E coordinate measurement ± 0.01 , Average Brightness $\pm 4\%$



Note2 : Definition of response time

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of Amplitudes. Refer to figure as below :



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Note3 : Definition of contrast ratio

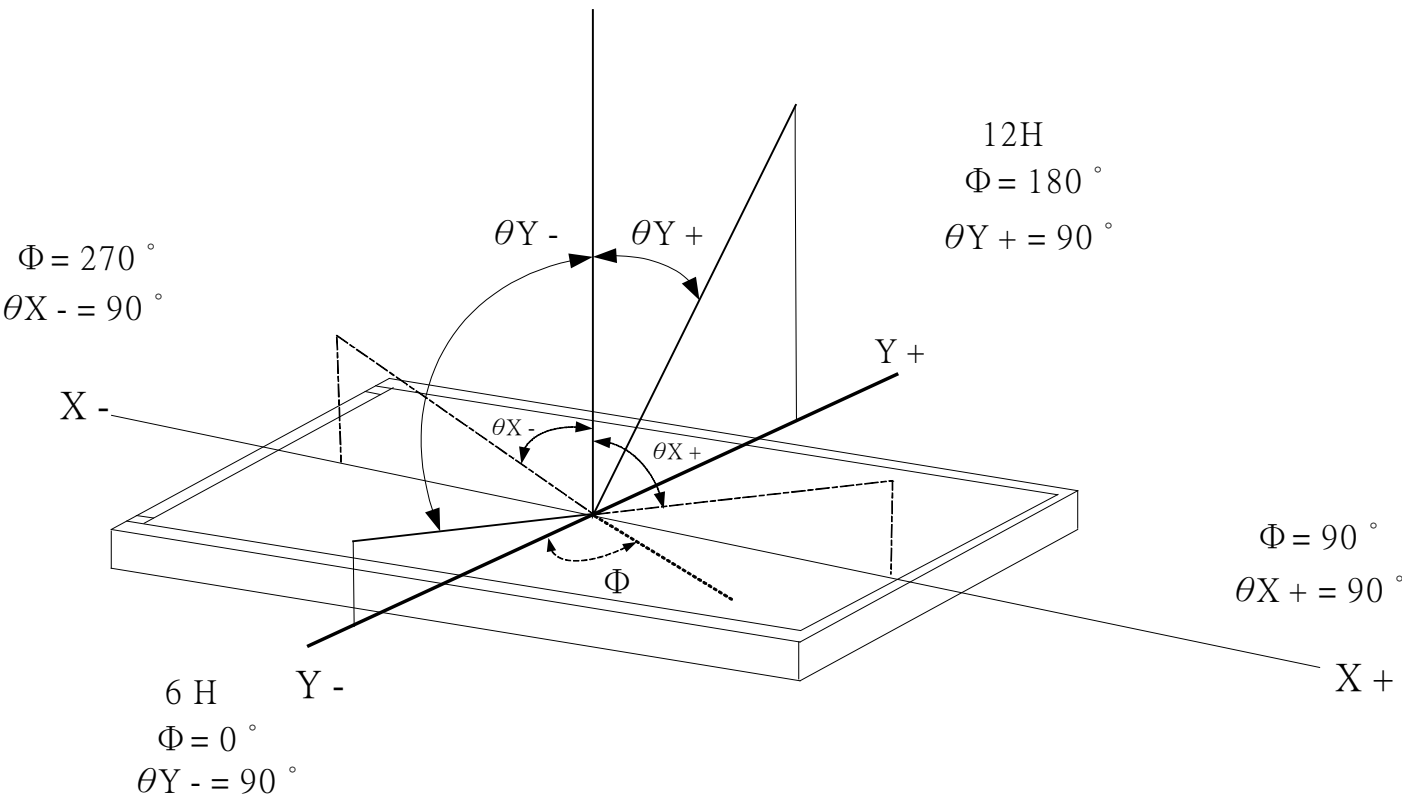
Contrast ratio is calculated with the following formula

Contrast ratio (CR) = $\frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$

Note4 : Definition of viewing angle

Refer to figure as below :

$\theta X = \theta Y = 0^\circ$





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4. Reliability

No.	Test item	Test condition		Judgment Standard							
1	High Temperature Operation	Ts= +85±2℃ , 200 hrs		NOTE 1							
2	Low Temperature Operation	Ta= -30±2℃ , 200 hrs									
3	High Temperature Storage	Ta= +85±2℃℃ , 200 hrs									
4	Low Temperature Storage	Ta= -40±2℃℃ , 200 hrs									
5	High Temperature &High Humidity Storage	Ta= 60±2℃ , 90±5%RH, 200 hrs									
6	Thermal Shock Storage	-30℃ → +25℃ → +85℃ → +25℃ (30mins) (5mins) (30mins) (5mins) ← 10cycle → Surrounding temperature, then storage at normal condition 4hrs.									
7	ESD test	Air Discharge: Apply 8 KV with 5 times	Contact Discharge: Apply 4KV with 5 times	NOTE 2							
		1.Temperature ambience:15℃ ~ 35℃ 2.Humidity relative:30%~60% 3.Energy Storage Capacitance(Cs+Cd):150pF±10% 4.Discharge Resistance(Rd):330Ω±10% 5.Discharge, mode of operation: Single Discharge (time between successive discharges at least 1 s)(Tolerance if the output voltage indication: ±5%)									
8	Vibration Storage	1. Sine wave 10~55 Hz frequency 2. The amplitude of vibration :1.5 mm 3. Each direction (X, Y, Z) duration for 1 hrs.		NOTE 3							
9	Package Drop Test	<table><tr><td>Package Weight (W)</td><td>Drop Height (cm)</td></tr><tr><td>W ≤ 9 Kg</td><td>100</td></tr><tr><td>9 Kg < W ≤18 Kg</td><td>80</td></tr><tr><td>W > 18 Kg</td><td>60</td></tr></table> Drop direction :※ 1 corner / 3 edges / 6 sides each 1times			Package Weight (W)	Drop Height (cm)	W ≤ 9 Kg	100	9 Kg < W ≤18 Kg	80	W > 18 Kg
Package Weight (W)	Drop Height (cm)										
W ≤ 9 Kg	100										
9 Kg < W ≤18 Kg	80										
W > 18 Kg	60										

※Note1 : (a)No LC air bubble & leakage. (b)No display function related objection contrast before test.

※Note2 : No error of operational function after rebooting.

※Note3 : The inspection of appearance, the whole structure no error.



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5. Precaution relating product handling

5.1 SAFETY

5.1.1 If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.

5.1.2 If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

5.2 HANDLING

5.2.1 Avoid any strong mechanical shock which can break the glass.

5.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module, be sure to ground your body and any electrical equipment you may be using.

5.2.3 Do not remove the panel or frame from the module.

5.2.4 The polarizing plate of the display is very fragile. So, please handle it very carefully, do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass, tweezers, etc.)

5.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

5.2.6 Do not touch the display area with bare hands, this will stain the display area.

5.2.7 Do not use ketone solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

5.2.8 To control temperature and time of soldering is $320 \pm 10^{\circ}\text{C}$ and 3-5 sec.

5.2.9 To avoid liquid (include organic solvent) stained on LCM

5.3 STORAGE

5.3.1 Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.

5.3.2 Do not place the module near organics solvents or corrosive gases.

5.3.3 Do not crush, shake, or jolt the module.

5.4 TERMS OF WARRANTY

5.4.1 Applicable warrant period

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

5.4.2 Unaccepted responsibility

This product has been manufactured to your company's specification as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in nuclear power control equipment, aerospace equipment, fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.

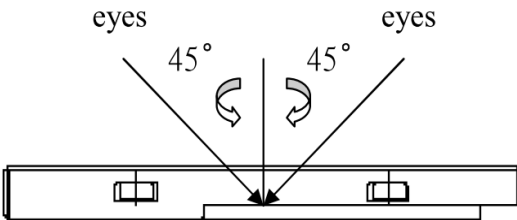


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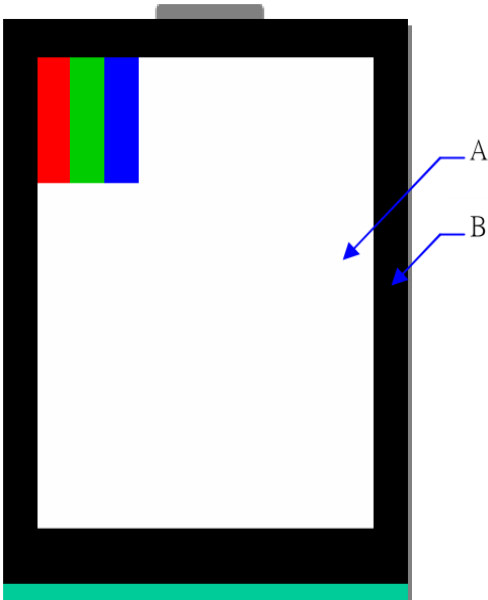
6.Inspection specification

6.1 Incoming inspection

- ◆Scope : The document shall be applied to
 - ◆Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II.
 - ◆Equipment : Gauge 、MIL-STD 、Smartwin Tester 、Sample
 - ◆Defect Level : Major Defect AQL : 0.4 ; Minor Defect AQL : 1.0
 - ◆Out Going Defect Level : Sampling
 - ◆Standard of the product appearance test :
 - a. Manner of appearance test :
 - (1). The test best be under 20Wx2 fluorescent light, and distance of view must be at 30cm.
 - (2). The test direction is base on about around 45° of vertical line.



(3). Definition of area.



A area : Active Area
B ares : Outside of active area

(4). Standard of inspection : (unit : mm)



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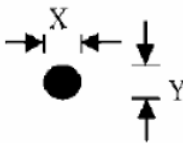
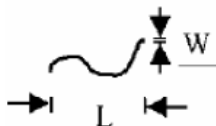
6.2 Inspection plan

Major Defect

NO.	Item	Criterion	Level								
01	Product condition	1.1 The part number is inconsistent with work order of production.	Major								
		1.2 Mixed product types.	Major								
		1.3 Assembled in inverse direction.	Major								
02	Quantity	The quantity is inconsistent with work order of production.	Major								
03	Outline dimension	Product dimension and structure must conform to structure diagram.	Major								
04	Eletrical testing	4.1 Missing line character and icon.	Major								
		4.2 No function or no display.	Major								
		4.3 Display malfunction.	Major								
		4.4 LCD viewing angle defect.	Major								
		4.5 Current consumption exceeds product specifications.	Major								
05	Dot defect (Bright dot, dark dot) on display	<table><tr><th colspan="2">Item</th><th>Acceptance(Q'ty)</th></tr><tr><td rowspan="2">Sub-Pixel</td><td>Bright dot</td><td>≤ 4</td></tr><tr><td>Drak dot</td><td>≤ 4</td></tr></table> 5.1 Inspection pattern : full white, full black, red, green and blue screens. 5.2 It is defined as dot defect if defect area >1/2 dot. 5.3 The distance between two dot defect ≥5mm. 5.4 Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern. 5.5 Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under black pattern. 5.6 The bright dot defect must be visible through 2% ND filter. R G B <Sub-Pixel> R G B <Pixel> 1 pixel is a combination of one red, one green and one blue sub-pixel	Item		Acceptance(Q'ty)	Sub-Pixel	Bright dot	≤ 4	Drak dot	≤ 4	Major
Item		Acceptance(Q'ty)									
Sub-Pixel	Bright dot	≤ 4									
	Drak dot	≤ 4									



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NO.	Item	Criterion	Level																		
06	Panel dirt and spot FOREIGN MATERIEL	Define:  $\Phi = (X+Y) / 2$ <table><tr><th rowspan="2">Dimension (diameter : Φ)</th><th colspan="2">Acceptance(Q'ty)</th></tr><tr><th>A area</th><th>B area</th></tr><tr><td>$\Phi \leq 0.2$</td><td>Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>$0.2 < \Phi \leq 0.4$</td><td>3</td></tr><tr><td>$0.4 < \Phi$</td><td>0</td></tr></table> *Ignore it that can be removed.	Dimension (diameter : Φ)	Acceptance(Q'ty)		A area	B area	$\Phi \leq 0.2$	Ignore	Ignore	$0.2 < \Phi \leq 0.4$	3	$0.4 < \Phi$	0	Minor						
Dimension (diameter : Φ)	Acceptance(Q'ty)																				
	A area	B area																			
$\Phi \leq 0.2$	Ignore	Ignore																			
$0.2 < \Phi \leq 0.4$	3																				
$0.4 < \Phi$	0																				
07	Bubble in polerizer/Dent on polerizer	Define <table><tr><th rowspan="2">Dimension (diameter : Φ)</th><th colspan="2">Acceptance(Q'ty)</th></tr><tr><th>A area</th><th>B area</th></tr><tr><td>$\Phi \leq 0.20$</td><td>Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>$0.20 < \Phi \leq 0.5$</td><td>3</td></tr><tr><td>$0.5 < \Phi$</td><td>0</td></tr></table> *Ignore it that can be removed.	Dimension (diameter : Φ)	Acceptance(Q'ty)		A area	B area	$\Phi \leq 0.20$	Ignore	Ignore	$0.20 < \Phi \leq 0.5$	3	$0.5 < \Phi$	0	Minor						
Dimension (diameter : Φ)	Acceptance(Q'ty)																				
	A area	B area																			
$\Phi \leq 0.20$	Ignore	Ignore																			
$0.20 < \Phi \leq 0.5$	3																				
$0.5 < \Phi$	0																				
08	White line Scratch Line Defect Including Black line	Define  $\Phi = (X+Y) / 2$ <table><tr><th colspan="2">Dimension</th><th colspan="2">Acceptance(Q'ty)</th></tr><tr><th>Length(L)</th><th>Width(W)</th><th>A area</th><th>B area</th></tr><tr><td>----</td><td>$W \leq 0.05$</td><td>Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>$L \leq 5$</td><td>$0.05 < W \leq 0.1$</td><td>3</td></tr><tr><td></td><td>$0.1 < W$</td><td>As round type</td></tr></table> *Ignore it that can be removed.	Dimension		Acceptance(Q'ty)		Length(L)	Width(W)	A area	B area	----	$W \leq 0.05$	Ignore	Ignore	$L \leq 5$	$0.05 < W \leq 0.1$	3		$0.1 < W$	As round type	Minor
Dimension		Acceptance(Q'ty)																			
Length(L)	Width(W)	A area	B area																		
----	$W \leq 0.05$	Ignore	Ignore																		
$L \leq 5$	$0.05 < W \leq 0.1$	3																			
	$0.1 < W$	As round type																			

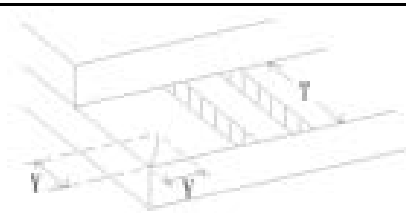
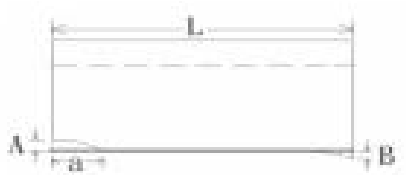
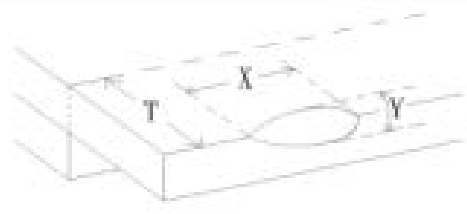
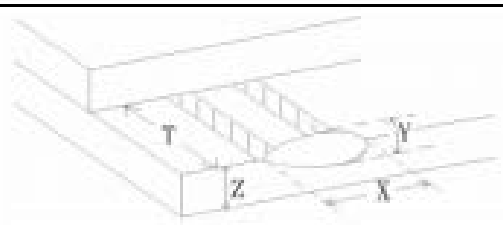
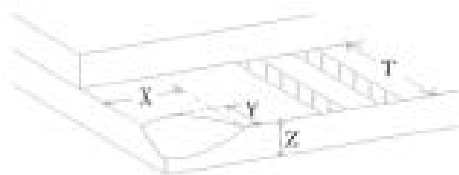


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NO.	Item	Criterion	Level
09	Backlight elements	9.1 Backlight can't word normally.	Major
		9.2 Backlight doesn't light or color is wrong.	
		9.3 Illumination source flickers when lit.	
10	Newton's ring	N : Area of Newton's ring. VA : LCM view area $N \leq 1/2 \cdot VA$	Minor
11	General appearance	11.1 Pin type, quantity, dimension must match type in structure diagram	Minor
		11.2 No short circuits in components on PCB or FPC.	
		11.3 Parts on PCB or FPC must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts.	
		11.4 Product packing must the same as specified on packing specification sheet.	
		11.5 The folding and peeled off in polarizer are not acceptable.	
		11.6 The PCB or FPC between B/L assembled distance(PCB or FPC) is $\leq 1.5\text{mm}$.	

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Standard Of LCD Visual Inspection

CHIPPING	JUDGEMENT
CHIPPING	 $Y > S$ REJ.
CHIPPING	 $X \text{ or } Y > S$ REJ.
GLASS CRACK	 $Y > (1/2) T$ REJ.
SCRIBE DEFECT	 1. $a \geq L/3$, $A > 1.5\text{mm}$. REJ. 2. B : ACCORDING TO DIMENSION
CHIPPING (ON THE TERMINAL AREA)	 $\Phi = (x+y)/2 > 2.5 \text{ mm}$ REJ.
CHIPPING (ON THE TERMINAL SURFACE)	 $Y > (1/3) T$ REJ.
CHIPPING	 $Y > T$ REJ.



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7. Packing

T.B.D.

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