



# MULTEK

## PRODUCT SPECIFICATION

7.0" 800 RGB x 480 TFT\_03

RFQ NUMBER: X-XXXXX-X

MODEL NUMBER: 9928DPTL070H-01

Rev: 1

CUSTOMER P/N:

Multek	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE	Rainy Li		
DATE	03/30/2011		

CUSTOMER APPROVAL	SIGNATURE	DATE

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This specification is subject to change without prior notice. Please contact Multek Display to confirm the latest revision.

**Revision History**

Revision	Date	Originator	Detail	Remarks
1	03/30/2011	Rainy Li	Preliminary specification	

Note: All parameters and dimensions in this specification are subject to change and will be confirmed once the program is awarded and kicked-off at Multek Display.

Preliminary Specification

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## 1. General Description

This display module consists of a 7.0 inch 800 RGB x 480, TFT a-Si Active Matrix Color LCD that is electronically and mechanically integrated. The TFT display is capable of displaying 16.7M colors. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes.

## 2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	7.0"	
LCD Type	α-Si TFT,	
Display Mode	Normally White	
Resolution	800 x3(RGB) x 480	Landscape
Module Outline	164.9(H) x 100.0(V) x 5.7(D)	mm
Active Area	154.08 (H) x 85.92 (V)	mm
Pixel Pitch	0.1926(H) x0.1790 (V)	mm
Pixel Arrangement	RGB Vertical stripe	
Interface	RGB 24bits	
Polarizer Surface Treatment	Glare	
Display Colors	16.7M	
Power Consumption	TBD	W
Weight	TBD	g

Note 1: Excluding hooks, posts, FPC/FPC tail etc.

### 3. Absolute Maximum Ratings

**GND=0V, Ta=25±2°C**

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage(Logic)	AVDD	-0.5	+13.5	V	
Power Supply Voltage(Digital)	DVDD	-0.3	+5.0	V	
Gate On Voltage	VDDG	-0.3	+42	V	
Gate Off Voltage	VEEG	-20	+0.3	V	
Gate On-Gate Off Voltage	VDDG-VEEG	12	40	V	
Operating temperature	Topa	-20	70	°C	
Storage temperature	Tstg	-30	80	°C	

**Note**

1. If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

Preliminary Specification

## 4. Electrical Characteristics

### 4.1. DC characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Digital Supply Voltage	DVDD		3	3.3	3.6	V
Analog Supply Voltage	AVDD		9.4	9.6	9.8	
Gate On Voltage	VDDG		17	18	19	
Gate Off Voltage	VEEG		-6.6	-6	-5.4	
Common Voltage	VCOM		3.8	4	4.2	
Logic Input Voltage	VIH		0.7DVDD	-	DVDD	
	VIL		GND	-	0.3DVDD	
Gate on Current	IVDDG	VDDG = 18 V	-	0.5	1	mA
Gate off Current	IVEEG	VEEG = -6 V	-	0.5	1	
Digital Current	IDVDD	DVDD = 3.3V	-	8	15	mA
Analog Current	IAVDD	AVDD = 9.6 V	-	30	40	
Total Power Consumption	PC		-	TBD	TBD	mA

### 4.2. Backlight Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward voltage	V <sub>f</sub>	T <sub>a</sub> =25 °C, I <sub>f</sub> =140mA	-	9.6	-	V
Forward current	I <sub>f</sub>	T <sub>a</sub> =25 °C, V <sub>f</sub> =9.6V	-	140	-	mA
Reverse current	I <sub>R</sub>		-	TBD	-	
Power dissipation	P <sub>d</sub>		-	TBD	-	
Drive method	Constant current					
LED configuration	21 White LED ,3 in series ,7 in Parallel					

**Note:** Test condition I<sub>f</sub>=140mA, T<sub>a</sub>=25°C.

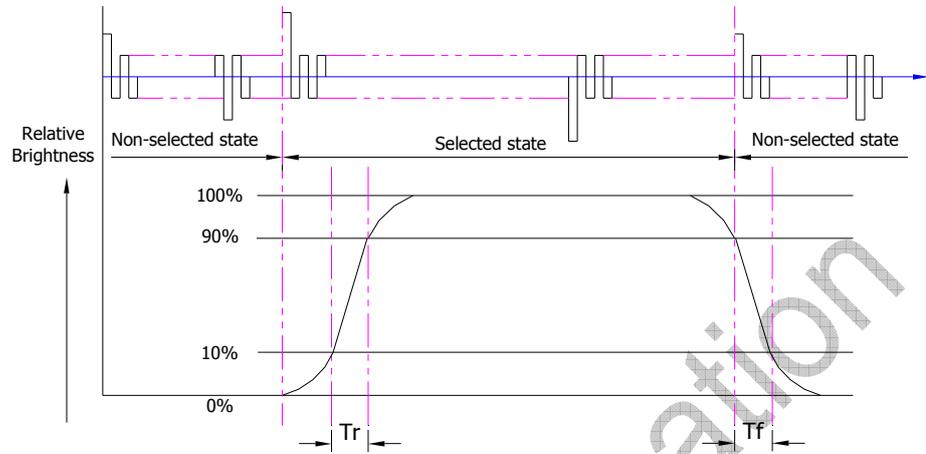
## 5. Optical Characteristics

### 5.1. Optical Characteristics

	Item	Symbol	Condition	Specification			Unit	
				Min.	Typ.	Max.		
Backlight On	Contrast ratio	CR	$\theta = 0^\circ$	--	TBD	-		
	Luminance ( $I_f=140mA$ )	$L_v$	Normal	-	240	-	cd/m <sup>2</sup>	
	Response time	$T_R + T_F$	viewing angle	-	25	35	ms	
	Color Chromaticity	Red	$X_R$		0.562	0.602	0.642	
			$Y_R$		0.297	0.337	0.377	
		Green	$X_G$		0.309	0.349	0.389	
			$Y_G$		0.547	0.587	0.627	
		Blue	$X_B$		0.123	0.163	0.203	
			$Y_B$		0.074	0.114	0.154	
		White	$X_W$		0.273	0.313	0.353	
$Y_W$			0.289		0.329	0.369		
Viewing Angle	Horizontal	$\phi$	$CR \geq 10$	120	140	-		
	Vertical	$\theta$		100	120	-		
	NTSC Ratio(Gamut)			-	52	-	%	

## 5.2. Definition of Response Time

### 5.2.1. Normally Black Type (Negative)

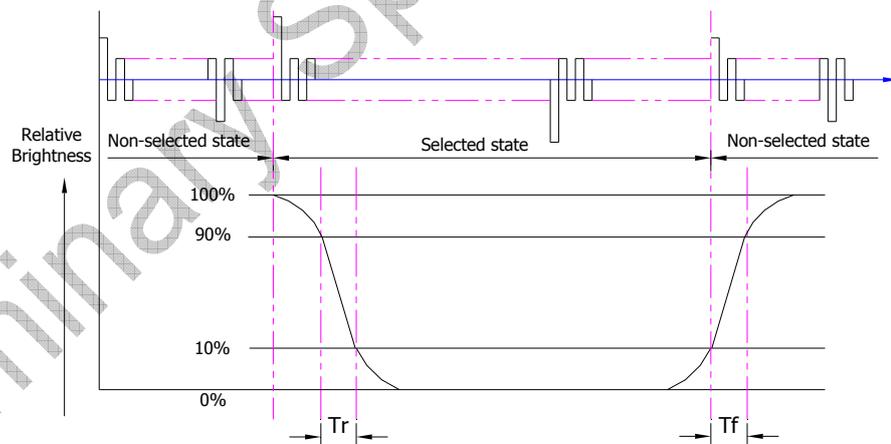


$T_r$  is the time it takes to change from non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

$T_f$  is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%.

Note : Measuring machine:BM-7

### 5.2.2. Normally White Type (Positive)



$T_r$  is the time it takes to change from non-selected stage with relative luminance 90% to selected state with relative luminance 10%;

$T_f$  is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

### 5.3. Definition of Contrast Ratio

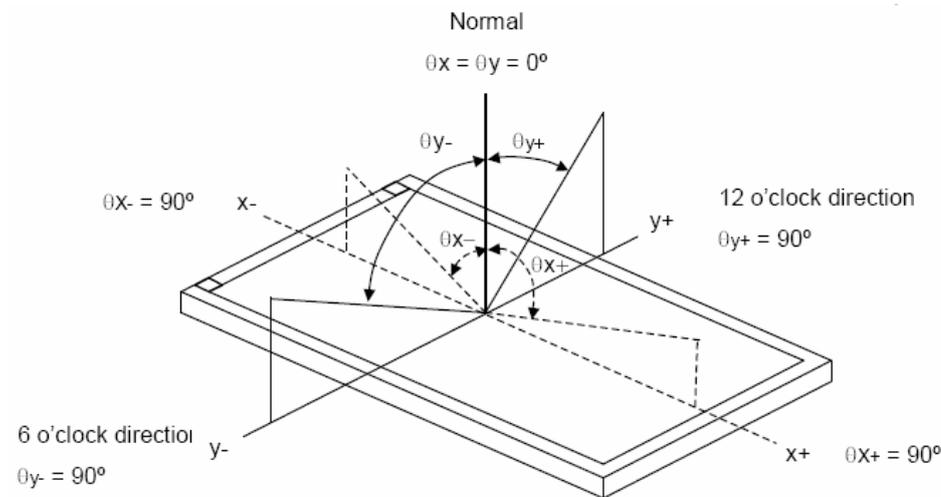
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	BM-7 or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

### 5.4. Definition of Viewing Angles



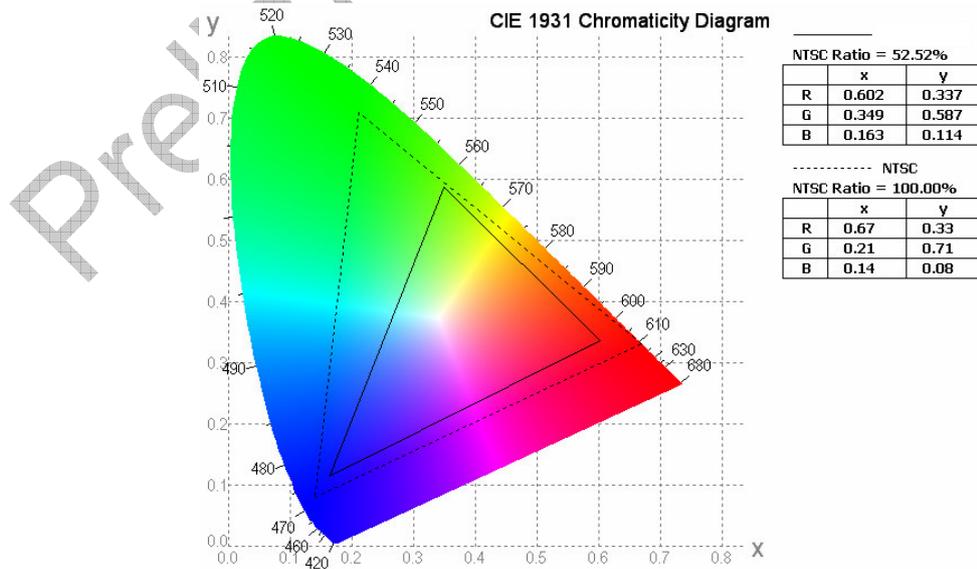
Measuring machine: LCD-5100 or EQUI

### 5.5. Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)

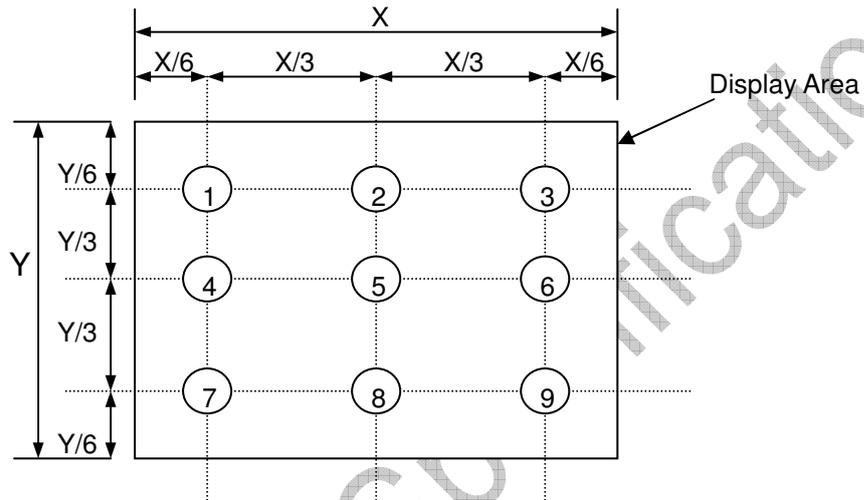


### 5.6. Definition of Surface Luminance, Uniformity and Transmittance

Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

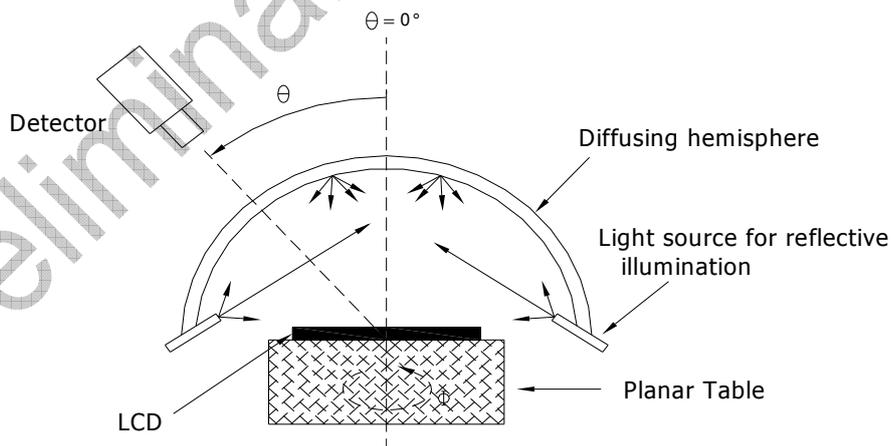
- 5.6.1 Surface Luminance:  $L_V = \text{average} (L_{P1}:L_{P9})$
- 5.6.2 Uniformity =  $\text{Minimal} (L_{P1}:L_{P9}) / \text{Maximal} (L_{P1}:L_{P9}) * 100\%$
- 5.6.3 Transmittance =  $L_V \text{ on LCD} / L_V \text{ on Backlight} * 100\%$

Note : Measuring machine: BM-7

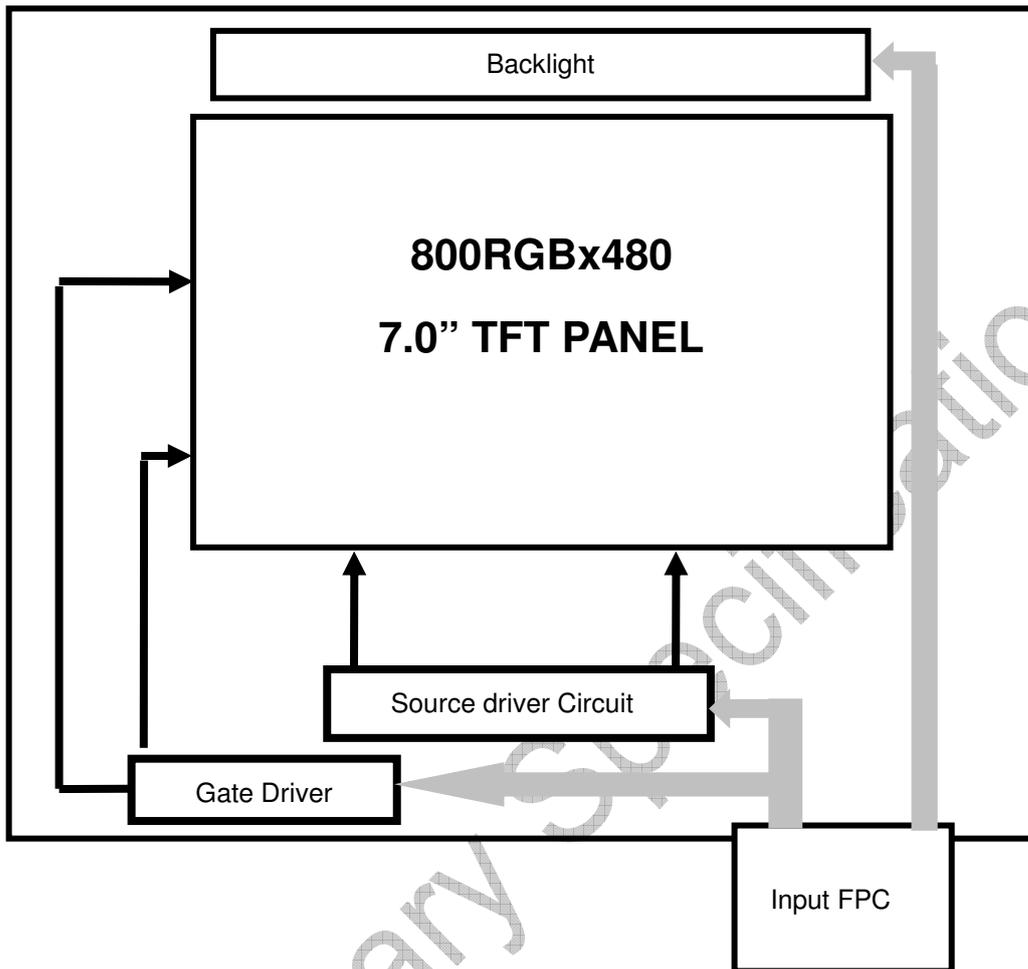


### 5.7. Definition of Reflectivity

To measure the reflectivity, the detector should be aligned to the normal direction of the LCD surface corresponding azimuthally angle  $\theta=0^\circ$



## 6. Block Diagram and Power Supply



## 7. Interface Pins Definition

### 7.1. TFT LCD Module

CN1

No.	Symbol	I/O	Function
1	A	P	Power for LED backlight (Anode)
2	A	P	
3	K	P	Power for LED backlight (Cathode)
4	K	P	
5	GND	P	Ground
6	VCOM	P	Common Voltage
7	DVDD	P	Digital Power
8	MODE	I	DE/SYNC mode select. Normally pull high H: DE mode. L: HSD/VSD mode
9	DE	I	Data Enable signal
10	VSD	I	Vertical sync input. Negative polarity
11	HSD	I	Horizontal sync input. Negative polarity
12	B7	I	Blue Data Input(MSB)
13	B6	I	Blue Data Input
14	B5	I	Blue Data Input
15	B4	I	Blue Data Input
16	B3	I	Blue Data Input
17	B2	I	Blue Data Input
18	B1	I	Blue Data Input
19	B0	I	Blue Data Input(LSB)
20	G7	I	Green Data Input(MSB)
21	G6	I	Green Data Input
22	G5	I	Green Data Input
23	G4	I	Green Data Input
24	G3	I	Green Data Input
25	G2	I	Green Data Input
26	G1	I	Green Data Input
27	G0	I	Green Data Input(LSB)
28	R7	I	Red Data Input(MSB)
29	R6	I	Red Data Input
30	R5	I	Red Data Input
31	R4	I	Red Data Input
32	R3	I	Red Data Input
33	R2	I	Red Data Input
34	R1	I	Red Data Input
35	R0	I	Red Data Input(LSB)
36	GND	P	Ground

37	DCLK	I	Clock input
38	GND	P	Ground
39	SHLR	I	Left or Right Display Control
40	UPDN	I	Up / Down Display Control
41	VDDG	P	Positive Power for TFT
42	VEEG	P	Negative Power for TFT
43	AVDD	P	Analog Power
44	RSTB	I	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ · C=1 μF)
45	NC	--	Not connect
46	VCOM	P	Common Voltage
47	DITH	I	Dithering setting DITH="H" 6bit resolution(last 2 bit of input data truncated) DITH="L" 8bit resolution(default setting)
48	GND	P	Ground
49	NC	--	Not connect
50	NC	--	Not connect

Note:

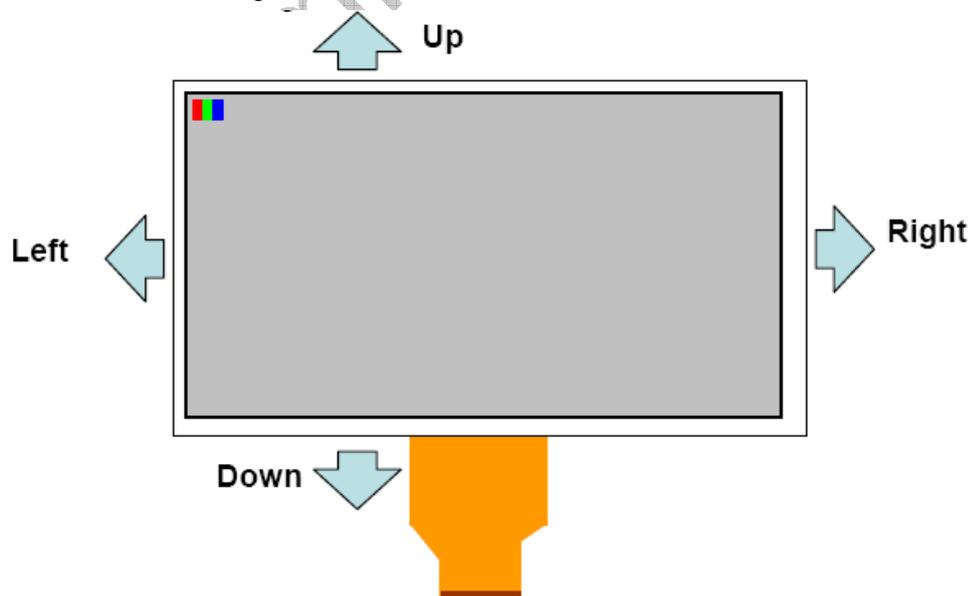
I/O Definition

I – Input ; O – Output ; P – Power/ground

1. SHLR : left or right setting    UPDN : up or down setting

SHLR	UPDN	Data Shifting
DVDD	GND	Left→Right · Up→Down(default)
GND	GND	Right→Left · Up→Down
DVDD	DVDD	Left→Right · Down→Up
GND	DVDD	Right→Left · Down→Up

Definition of scanning direction.

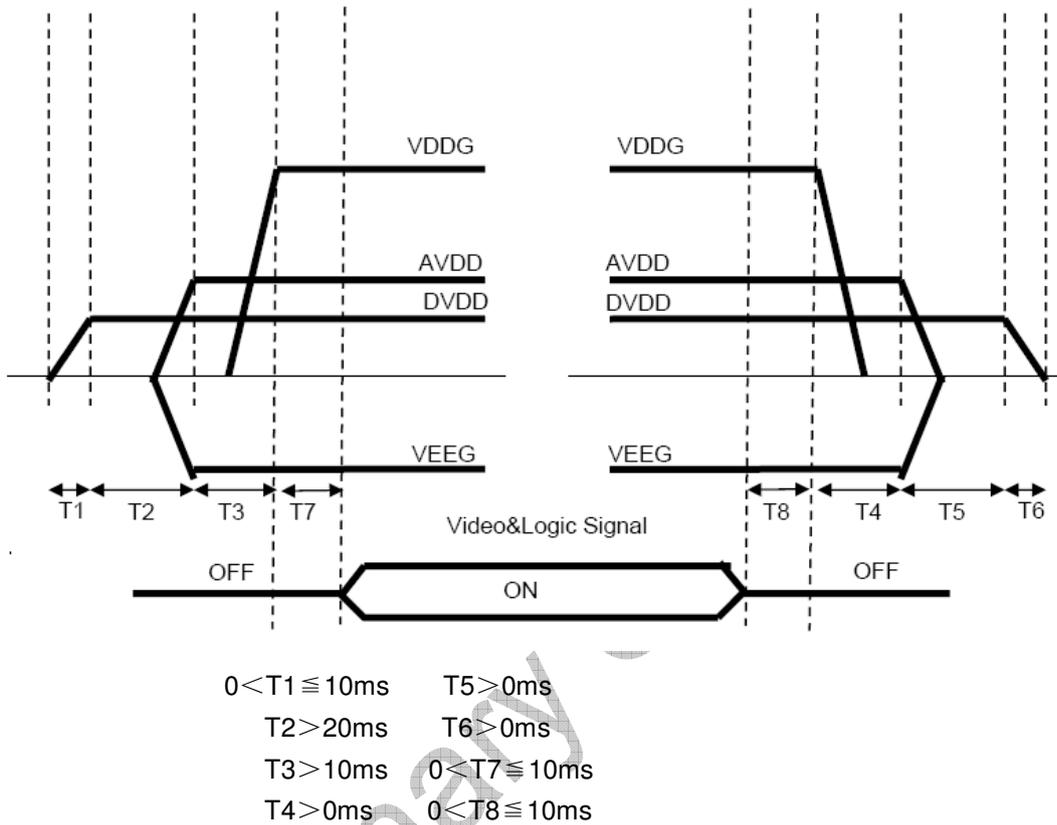


## 8. AC Characteristics

### 8.1. Power Sequence

Power On: DVDD→AVDD/VEEG→VDDG→Video & Logic Signal

Power Off: Video & Logic Signal→VDDG→AVDD/VEEG→DVDD



### 8.2. Reset Timing

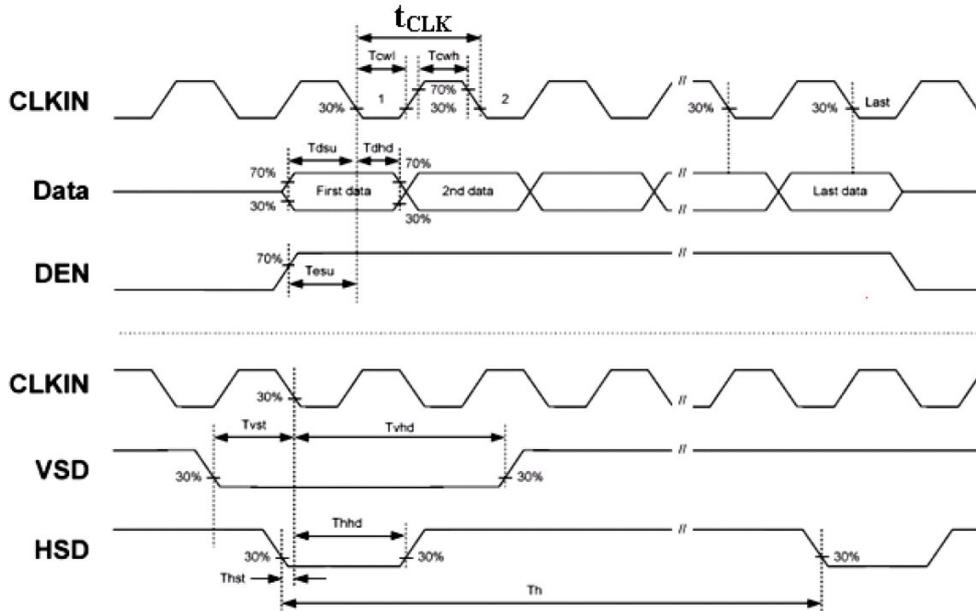
TBD

### 8.3. Timing Specification

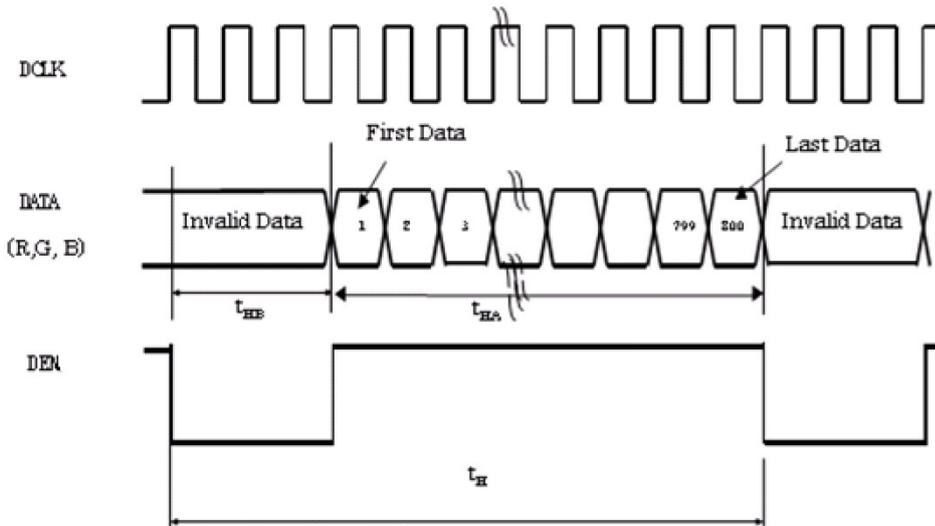
GND=0V, Ta=25°C

	ITEM	SYMBOL	MIN.	TYP	MAX.	UNIT	NOTE
DCLK	Dot Clock	$1/t_{CLK}$	--	33	--	MHZ	
	DCLK pulse duty	Tcwh	40	50	60	%	
DE	Setup time	Tesu	8	--	--	ns	
	Hold time	Tehd	8	--	--	ns	
	Horizontal period	$t_H$	--	1056	--	$t_{CLK}$	
	Horizontal Valid	$t_{HA}$	800			$t_{CLK}$	
	Horizontal Blank	$t_{HB}$	--	256	--	$t_{CLK}$	
	Vertical Period	$t_V$	--	525	--	$t_H$	
	Vertical Valid	$t_{VA}$	480			$t_H$	
	Vertical Blank	$t_{VB}$	--	45	--	$t_H$	
SYNC	HSYNC setup time	Thst	8	--	--	ns	
	HSYNC hold time	Thhd	8	--	--	ns	
	VSYNC Setup Time	Tvst	8	--	--	ns	
	VSYNC Hold Time	Tvhd	8	--	--	ns	
	Horizontal Period	th	--	1056	--	$t_{CLK}$	
	Horizontal Pulse Width	thpw	--	30	--	$t_{CLK}$	thb+thpw=46DCLK is fixed
	Horizontal Back Porch	thb	--	16	--	$t_{CLK}$	
	Horizontal Front Porch	thfp	--	210	--	$t_{CLK}$	
	Horizontal Valid	thd	800			$t_{CLK}$	
	Vertical Period	tv	--	525	--	th	
	Vertical Pulse Width	tpw	--	13	--	th	tpw + tvb = 23th is fixed
	Vertical Back Porch	tvb	--	10	--	th	
	Vertical Front Porch	tvfp	--	22	--	th	
	Vertical Valid	tvd	480			th	
DATA	Setup time	Tdsu	8	--	--	ns	
	Hold time	Tdsu	8	--	--	ns	

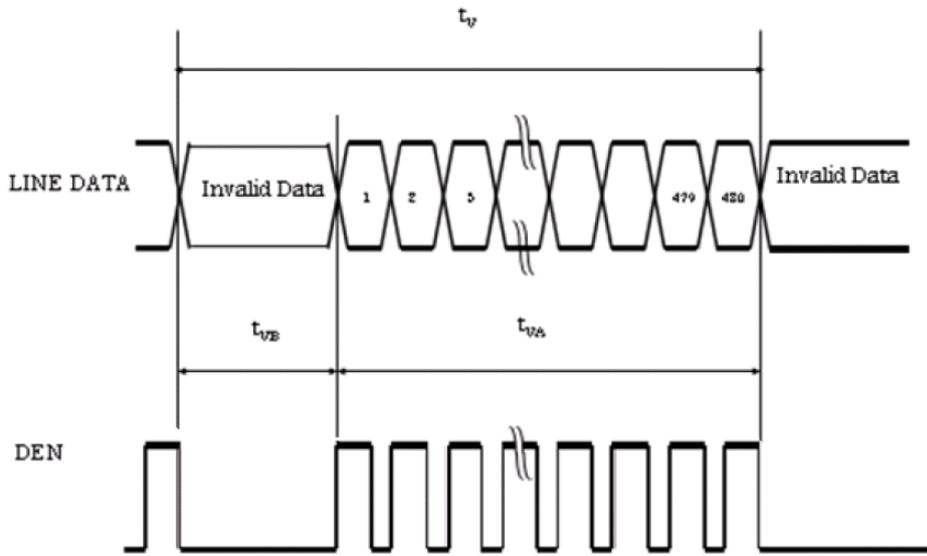
### 8.3.1. Timing Sequence



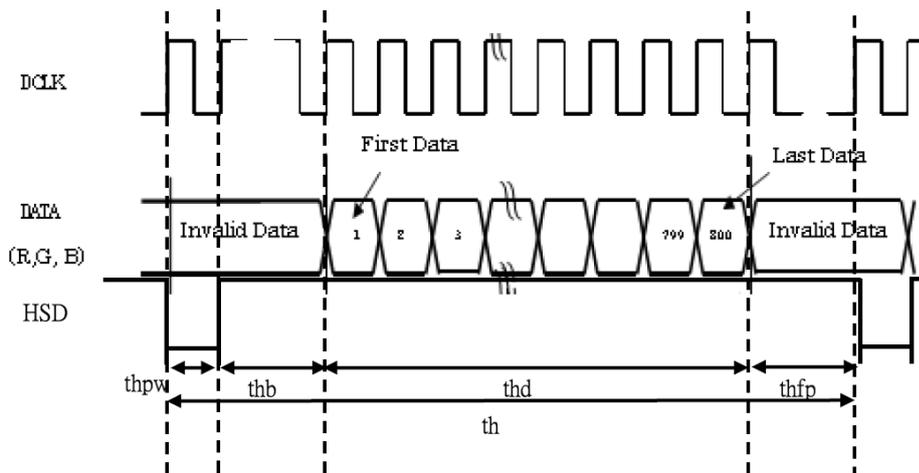
### 8.3.2. DE Mode Horizontal Timing Sequence



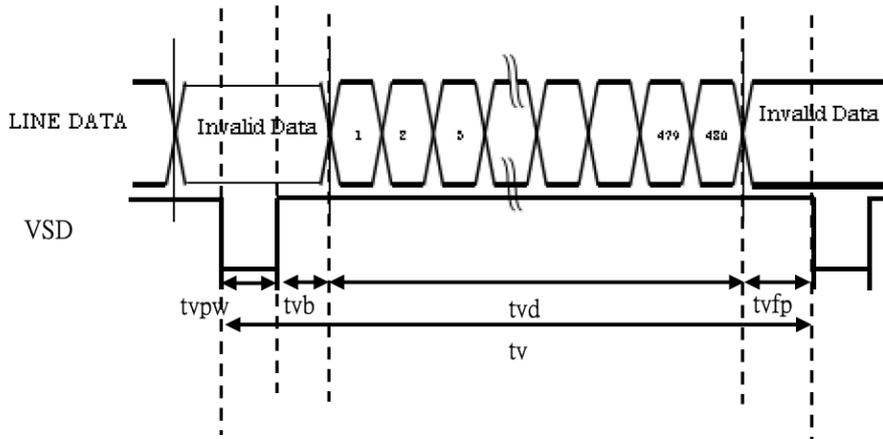
### 8.3.3. DE Mode Vertical Timing Sequence



### 8.3.4. SYNC Mode Horizontal Timing Sequence



## 8.3.5. SYNC Mode Vertical Timing Sequence



Preliminary Specification

## 9. Command Table

TBD

Preliminary Specification

## 10. Recommended Setting and Initialization Flow for Reference

TBD

Preliminary Specification

## 11. Quality Assurance

### 11.1. Purpose

This standard for Quality Assurance assures the quality of LCD module products supplied to customer by Multek Display.

### 11.2. Standard for Quality Test

Multek Display performs the following tests to ensure the quality of product before shipment.

- 11.2.1. Sampling Plan:  
ANSI / ASQC Z1.4-1993.  
Single sampling, normal inspection.
- 11.2.2. Sampling Criteria:  
Visual inspection: AQL 1.5%  
Electrical functional inspection: AQL 0.65%.
- 11.2.3. Reliability Test:  
Detailed requirement refer to Reliability Test Specification. Reliability test is Performed before mass production, that is say, in pilot run state.

### 11.3. Nonconforming Analysis & Disposition

- 11.3.1. Nonconforming analysis:
  - 11.3.1.1. Customer should provide overall information of non-conforming sample for their complaints.
  - 11.3.1.2. After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.
  - 11.3.1.3. If Multek Display can not finish the analysis on time, customer will be notified with the progress status.
  - 11.3.1.4. Disposition of nonconforming:
  - 11.3.1.5. Non-conforming product over PPM level will be replaced.
  - 11.3.1.6. The cause of non-conformance will be analyzed. Corrective action will be discussed and implemented.

### 11.4. Agreement Items

Multek Display and customer shall negotiate if the following situation occurs:

- 11.4.1. Discrepancies between Multek Display's QA standards and customer's QA standards.
- 11.4.2. Additional requirement to be added in product specification.
- 11.4.3. Any other special problem.

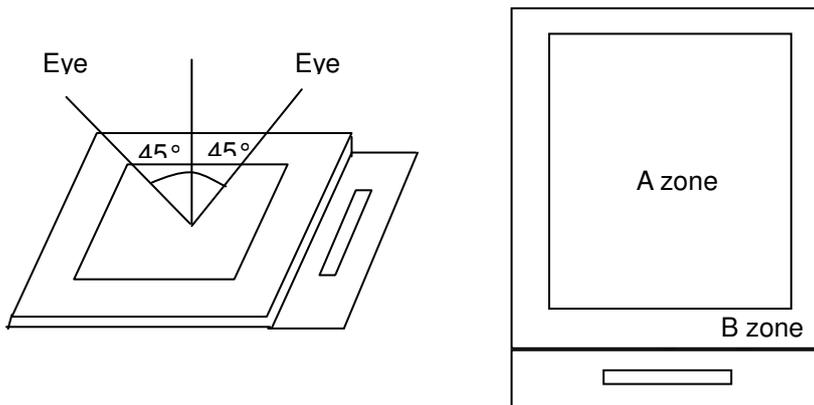
## 11.5. Standard of the Product Visual Inspection

### 11.5.1. Appearance inspection:

11.5.1.1. The inspection must be under illumination about 1000 – 1500 lx, and the distance of view must be at 30cm  $\pm$  2cm.

11.5.1.2. The viewing angle should be 45° from the vertical line without reflection light or follows customer's viewing angle specifications.

11.5.1.3. Definition of area: A Zone: Active Area, B Zone: Viewing Area,

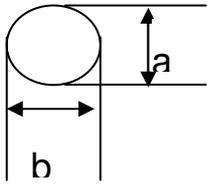
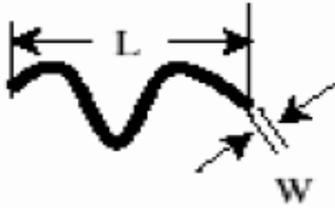
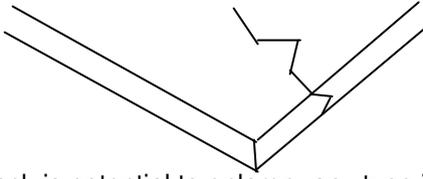


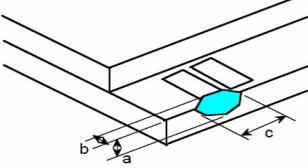
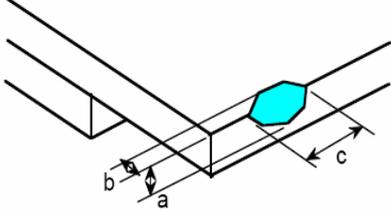
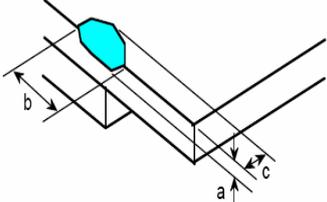
### 11.5.2. Basic principle:

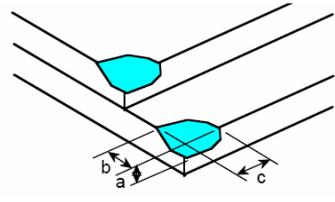
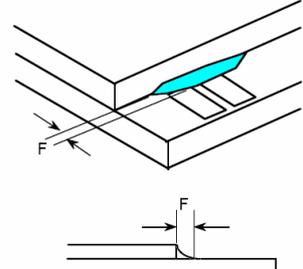
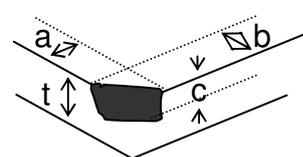
11.5.2.1. A set of sample to indicate the limit of acceptable quality level must be discussed by both Multek Display and customer when there is any dispute happened.

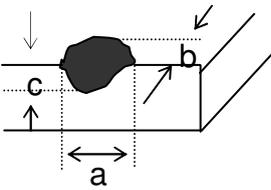
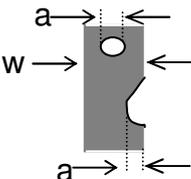
11.5.2.2. New item must be added on time when it is necessary.

**11.6. Inspection Specification**

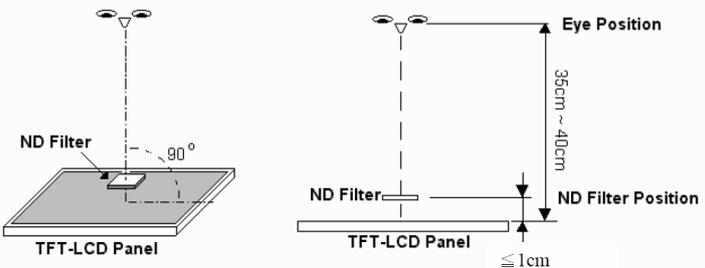
No.	Item	Criteria (Unit: mm)																		
01	Dot(Visual Defect)	<div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Size \ Area</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.10</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.10 &lt; \phi \leq 0.15</math></td> <td>2</td> </tr> <tr> <td><math>0.15 &lt; \phi \leq 0.25</math></td> <td>1</td> </tr> <tr> <td><math>0.25 &lt; \phi</math></td> <td>0</td> </tr> <tr> <td>Total</td> <td>2 no include <math>\phi \leq 0.10</math></td> </tr> </tbody> </table> </div> <p style="margin-top: 10px;"><math>\phi = (a + b) / 2</math></p> <p>Distance between 2 defects should more than 3mm apart.</p>	Size \ Area	Acc. Qty	$\phi \leq 0.10$	Ignore	$0.10 < \phi \leq 0.15$	2	$0.15 < \phi \leq 0.25$	1	$0.25 < \phi$	0	Total	2 no include $\phi \leq 0.10$						
Size \ Area	Acc. Qty																			
$\phi \leq 0.10$	Ignore																			
$0.10 < \phi \leq 0.15$	2																			
$0.15 < \phi \leq 0.25$	1																			
$0.25 < \phi$	0																			
Total	2 no include $\phi \leq 0.10$																			
02	Black and White line Scratch Foreign material (Line type) (Minor defect)	 <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>/</td> <td><math>W \leq 0.03</math></td> <td>Ignore</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> <td>3</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.05 &lt; W \leq 0.10</math></td> <td>2</td> </tr> <tr> <td>/</td> <td><math>0.1 &lt; W</math></td> <td>0</td> </tr> <tr> <td colspan="2" style="text-align: center;">Total</td> <td>3</td> </tr> </tbody> </table> <p>Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.</p>	Length	Width	Acc. Qty	/	$W \leq 0.03$	Ignore	$L \leq 2.5$	$0.03 < W \leq 0.05$	3	$L \leq 2.5$	$0.05 < W \leq 0.10$	2	/	$0.1 < W$	0	Total		3
Length	Width	Acc. Qty																		
/	$W \leq 0.03$	Ignore																		
$L \leq 2.5$	$0.03 < W \leq 0.05$	3																		
$L \leq 2.5$	$0.05 < W \leq 0.10$	2																		
/	$0.1 < W$	0																		
Total		3																		
03	Glass Crack (Minor defect)	 <p>Crack is potential to enlarge, any type is not allowed.</p>																		

04	Glass Chipping Pad Area: (Minor defect)	 <table border="1" data-bbox="582 454 999 627"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &gt; 3.0, b &lt; 1.0</math></td> <td>1</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 1.0</math></td> <td>3</td> </tr> <tr> <td colspan="2" style="text-align: center;"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	3	$a < \text{Glass Thickness}$			
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	3											
$a < \text{Glass Thickness}$												
05	Glass Chipping Rear of Pad Area: (Minor defect)	 <table border="1" data-bbox="582 976 999 1193"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &gt; 3.0, b &lt; 1.0</math></td> <td>1</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 1.0</math></td> <td>2</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 0.5</math></td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
06	Glass Chipping Except Pad Area: (Minor defect)	 <table border="1" data-bbox="582 1594 999 1812"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &gt; 3.0, b &lt; 1.0</math></td> <td>1</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 1.0</math></td> <td>2</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 0.5</math></td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												

07	Glass Corner Chipping: (Minor defect)	 <table border="1" data-bbox="606 492 973 739"> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> <tr> <td>c &lt; 3.0, b &lt; 3.0</td> <td>Ignore</td> </tr> <tr> <td colspan="2">a &lt; Glass Thickness</td> </tr> </table>	Length and Width	Acc. Qty	c < 3.0, b < 3.0	Ignore	a < Glass Thickness	
Length and Width	Acc. Qty							
c < 3.0, b < 3.0	Ignore							
a < Glass Thickness								
08	Glass Burr: (Minor defect)	 <table border="1" data-bbox="574 1153 997 1332"> <tr> <th>Length</th> <th>Acc. Qty</th> </tr> <tr> <td>F &lt; 1.0</td> <td>Ignore</td> </tr> </table> <p style="text-align: right;">Glass burr don't affect assemble</p>	Length	Acc. Qty	F < 1.0	Ignore		
Length	Acc. Qty							
F < 1.0	Ignore							
09	Chip on IC	<p>9.1 Corner chip</p>  <table border="1" data-bbox="790 1702 1189 1792"> <tr> <td>a</td> <td>b</td> <td>c</td> </tr> <tr> <td colspan="2">≤ 0.4mm</td> <td>≤ 1/2t</td> </tr> </table> <p>Inner bonding wires invisible. The chip can't attach on the surface of IC.              Size a, b and c should be measured after removing the chip.              t: Thickness of individual IC</p> <p>9.2 Rim chip</p>	a	b	c	≤ 0.4mm		≤ 1/2t
a	b	c						
≤ 0.4mm		≤ 1/2t						

		 <table border="1" data-bbox="582 481 1029 582"> <tr> <td>a</td> <td>b</td> <td>c</td> </tr> <tr> <td>Acceptable</td> <td colspan="2"><math>\leq 0.2\text{mm}</math></td> </tr> </table> <p>Inner bonding wires invisible. The chip can't attach on the surface of IC. Size a, b and c should be measured after removing the chip.</p>	a	b	c	Acceptable	$\leq 0.2\text{mm}$			
a	b	c								
Acceptable	$\leq 0.2\text{mm}$									
10	FPC Defect: (Minor defect) 	10.1 Dent, pinhole width $a < w/3$ . (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.								
11	Bubble on Polarizer (Minor defect)	<table border="1" data-bbox="582 1232 997 1411"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.20</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.20 &lt; \phi \leq 0.30</math></td> <td>4</td> </tr> <tr> <td><math>0.30 &lt; \phi</math></td> <td>None</td> </tr> </tbody> </table> <p>"<math>\phi</math>" is defined as item 1.</p>	Diameter	Acc. Qty	$\phi \leq 0.20$	Ignore	$0.20 < \phi \leq 0.30$	4	$0.30 < \phi$	None
Diameter	Acc. Qty									
$\phi \leq 0.20$	Ignore									
$0.20 < \phi \leq 0.30$	4									
$0.30 < \phi$	None									
12	Dent on Polarizer (Minor defect)	<table border="1" data-bbox="582 1523 997 1702"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.20</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.20 &lt; \phi \leq 0.30</math></td> <td>4</td> </tr> <tr> <td><math>0.30 &lt; \phi</math></td> <td>None</td> </tr> </tbody> </table> <p>"<math>\phi</math>" is defined as item 1.</p>	Diameter	Acc. Qty	$\phi \leq 0.20$	Ignore	$0.20 < \phi \leq 0.30$	4	$0.30 < \phi$	None
Diameter	Acc. Qty									
$\phi \leq 0.20$	Ignore									
$0.20 < \phi \leq 0.30$	4									
$0.30 < \phi$	None									
13	Bezel	13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.								

14	Touch Panel	<p>D: Diameter W: width L: length</p> <p>14.1 Spot: <math>D &lt; 0.25</math> is acceptable  <math>0.25 \leq D \leq 0.4</math></p> <p>2dots are acceptable and the distance between defects should more than 10 mm.</p> <p><math>D &gt; 0.4</math> is unacceptable</p> <p>14.2 Dent: <math>D &gt; 0.40</math> is unacceptable</p> <p>14.3 Scratch: <math>W \leq 0.03</math>, <math>L \leq 10</math> is acceptable,  <math>0.03 &lt; W \leq 0.10</math>, <math>L \leq 10</math> is acceptable</p> <p>Distance between 2 defects should more than 10 mm.  <math>W &gt; 0.10</math> is unacceptable.</p>
15	PCB	<p>15.1 No distortion or contamination on PCB terminals.</p> <p>15.2 All components on PCB must same as documented on the BOM/component layout.</p> <p>15.3 Follow IPC-A-600F.</p>
16	RTV	<p>16.1 The RTV glue on the surface of IC isn't permissible to be scratched. The RTV glue can't exist on the surface of polarizer.</p> <p>16.2 No visible non-metal foreign material and metal material in RTV.</p> <p>16.3 Entrapped air bubble isn't permissible to exist on the juncture of RTV glue and pins of LCD.</p> <p>16.4 Air bubble and scratch on the surface of RTV glue invisible within 0.3 m distance is acceptable and the surface of the RTV glue can't flow.</p>
17	Soldering	Follow IPC-A-610C standard

18	Dot(Electrical Defect)	<table border="1"> <tr> <td>Bright Dot</td> <td>A&amp;B Zone</td> <td>Total</td> <td rowspan="2">Note 1</td> </tr> <tr> <td></td> <td><math>N \leq 0</math></td> <td><math>N \leq 0</math></td> </tr> <tr> <td>Dark Dot</td> <td><math>N \leq 2</math></td> <td><math>N \leq 2</math></td> <td></td> </tr> <tr> <td>Total Dot</td> <td><math>N \leq 2</math></td> <td><math>N \leq 2</math></td> <td></td> </tr> <tr> <td>Two or More Adjacent Dot</td> <td colspan="3">Not Allowed</td> </tr> </table>	Bright Dot	A&B Zone	Total	Note 1		$N \leq 0$	$N \leq 0$	Dark Dot	$N \leq 2$	$N \leq 2$		Total Dot	$N \leq 2$	$N \leq 2$		Two or More Adjacent Dot	Not Allowed		
		Bright Dot	A&B Zone	Total	Note 1																
	$N \leq 0$	$N \leq 0$																			
Dark Dot	$N \leq 2$	$N \leq 2$																			
Total Dot	$N \leq 2$	$N \leq 2$																			
Two or More Adjacent Dot	Not Allowed																				
<p>Remark: One pixel consists of 3 sub-pixels, including R,G and B dot(Sub-pixel=Dot)</p> <p>Note 1 Bright dot is defined through 5% transmission ND filter as following:</p>  <p>Defects on the black Matrix, out of viewing area, aren't considered as a defect counted.</p>																					
19	Electrical Defect (Major defect)	<p>The below defects must be rejected.</p> <ul style="list-style-type: none"> <li>19.1 Missing vertical / horizontal segment,</li> <li>19.2 Abnormal Display.</li> <li>19.3 No function or no display.</li> <li>19.4 Current exceeds product specifications.</li> <li>19.5 LCD viewing angle defect.</li> <li>19.6 No Backlight.</li> <li>19.7 Dark Backlight.</li> <li>19.8 Touch Panel no function.</li> </ul>																			

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

**11.7. Classification of Defects**

- 11.7.1. Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.
- 11.7.2. Two minor defects are equal to one major in lot sampling inspection.

**11.8. Identification/marketing Criteria**

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

**11.9. Packing**

- 11.9.1. There should be no damage of the outside carton box, each packaging box should have one identical label.
- 11.9.2. Modules inside package box should have compliant mark.
- 11.9.3. All direct package materials shall provide ESD protection.

Preliminary Specification

## 12. Reliability Specification

Item	Condition	Cycle Time	Quantity	Remark
High Temp. Operation Test	+70 °C	96hrs	5pcs	
Low Temp. Operation Test	-20 °C	96hrs	5pcs	
High Temp. Storage Test	+80 °C	96hrs	5pcs	
Low Temp. Storage Test	-30 °C	96hrs	5pcs	
High Temperature and High Humidity (operation)	Ta=+50 °C, 90%RH	96 hrs	5pcs	
Thermal Shock Test	-20°C (30min) → +70°C (30min)	10cycles		
Vibration Test (for packaging)	Frequency: 10Hz to 55Hz to 10Hz, Swing:1.5mm,time: X,Y,Z each 2H.	6hrs	One inner carton	
Packing Drop test (for packaging)	1 drop on a corner, 1 drop on three arris, 1 drop on six sides	1time	One inner carton	
ESD(On Final Product)	150pF, 330Ω, ±8KV & ±10KV air & contact test	10times	5pcs	

### Note

- For humidity test, DI water should be used.

Inspection Standard: Inspect after 1-2hrs storage at room temperature, the sample shall be free from the following defects:

- Air bubble in the LCD
- Seal Leakage
- Non-display
- Missing Segment
- Glass Crack
- IDD is greater than twice initial value.
- Others as per QA Inspection Criteria

- No defect is allowed after testing.
- ESD should be applied to LCD glass panel, not other areas (such as on IC and so on)

IDD should be within twice initial value.

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.

## 13. Precautions and Warranty

### 13.1. Safety

- 13.1.1. The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.
- 13.1.2. Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

### 13.2. Handling

- 13.2.1. Reverse and use within ratings in order to keep performance and prevent damage.
- 13.2.2. Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

### 13.3. Storage

- 13.3.1. Do not store the LCD module beyond the specified temperature ranges.

### 13.4. Metal Pin (Apply to Products with Metal Pins)

#### 13.4.1. Pins of LCD and Backlight

- 13.4.1.1. Solder tip can touch and press on the tip of Pin LEAD during the soldering

#### 13.4.1.2. Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

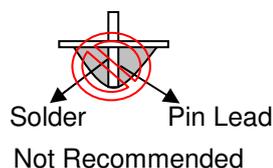
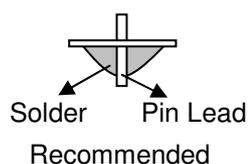
Maximum Solder Temperature: 370℃

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

#### 13.4.1.3. Solder Wetting



#### 13.4.2. Pins of EL

- 13.4.2.1. Solder tip can touch and press on the tip of EL leads during soldering.

- 13.4.2.2. No Solder Paste on the soldering pad on the motherboard is recommended.

#### 13.4.2.3. Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270~290℃

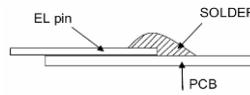
Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body): 2.0mm

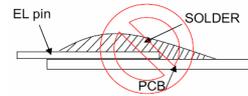
13.4.2.4. No horizontal press on the EL leads during soldering.

13.4.2.5. 180° bend EL leads three times is not allowed.

13.4.2.6. Solder Wetting

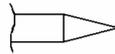


Recommended

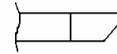


Not Recommended

13.4.2.7. The type of the solder iron:

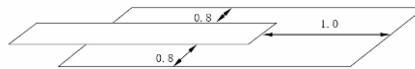


Recommended



Not Recommended

13.4.2.8. Solder Pad



### 13.5. Operation

- 13.5.1. Do not drive LCD with DC voltage
- 13.5.2. Response time will increase below lower temperature
- 13.5.3. Display may change color with different temperature
- 13.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear "fractured".

### 13.6. Static Electricity

- 13.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.
- 13.6.2. The normal static prevention measures should be observed for work clothes and benches.
- 13.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

### 13.7. Limited Warranty

- 13.7.1. Unless otherwise agreed between Multek Display and customer, Multek Display will replace or repair any of its LCD and LCM which Multek Display found to be defective electrically and visually when inspected in accordance with Multek Display Quality Standards, for a period of one year from date of shipment.
- 13.7.2. The warranty liability of Multek Display is limited to repair and/or replacement. Multek Display will not be responsible for any consequential loss.
- 13.7.3. If possible, we suggest you use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.

## 14. Packaging

TBD

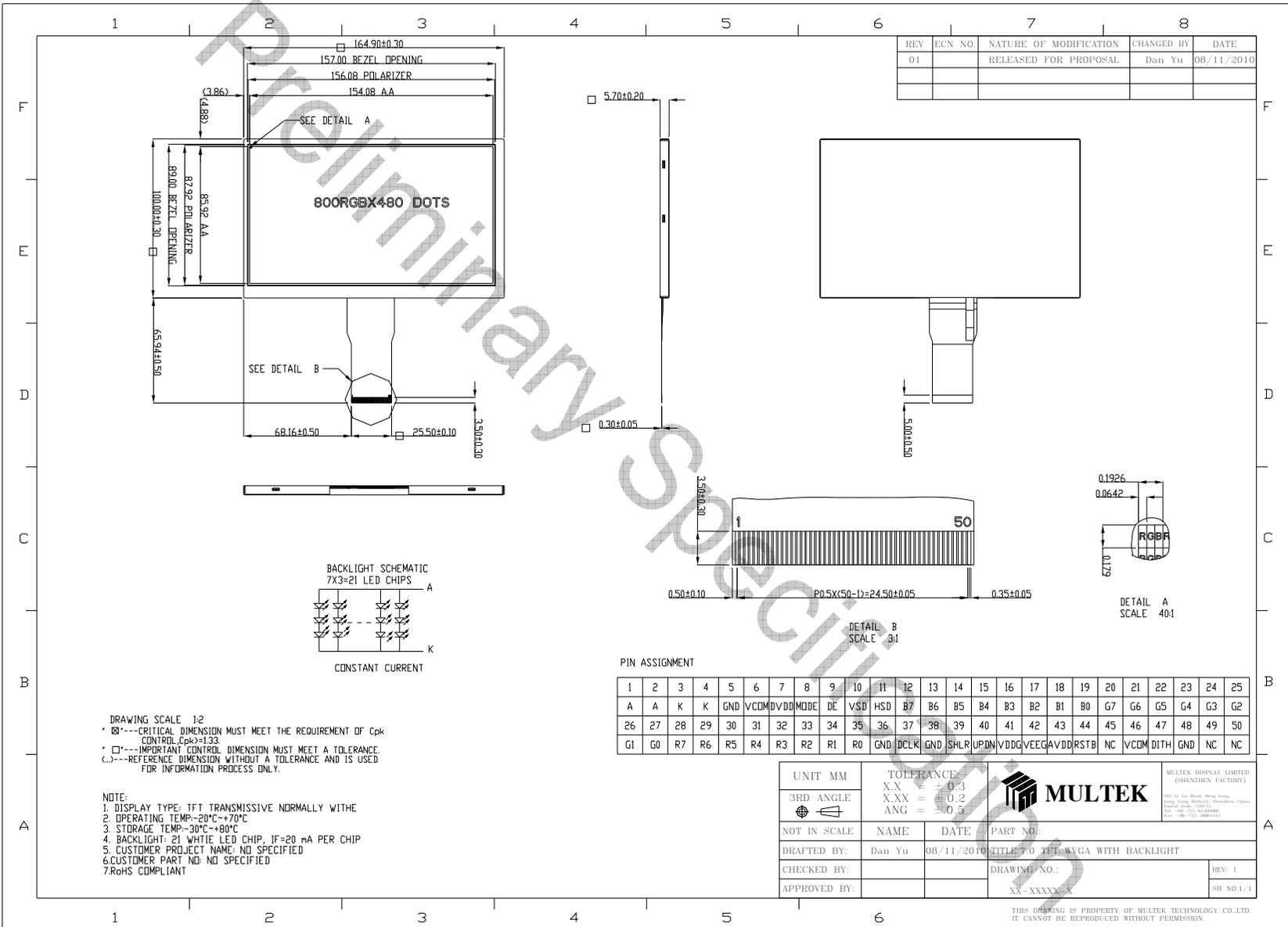
Preliminary Specification



MUTITEK

7.0" 800RGB x 480 TFT\_03  
9928DPTL070H-01 Rev: 1

15. Outline Drawing



**Reference**

Item	Description	Revision

Preliminary Specification