

MULTEK

PRODUCT SPECIFICATIONS
HTN TRANSMISSIVE POSITIVE LCM
MODEL NUMBER: 1671TGPBTOPH-01

Rev: 03

CUSTOMER PN:

Multek Display	PREPARED BY	CHECKED BY	APPROVED BY
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DATE	2012-5-31	2012-5-31	2012-5-31

CUSTOMER APPROVAL	SIGNATURE	DATE

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Revision History

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1. General Description

This document defines the product specifications and inspection criteria for HTN Transmissive negative LCM, supplied by Multek Display.

2. Module Parameters

Features	Details	Unit
View Direction	12 O'clock	-
Module Outline	79.3(W) X 43.6 (H) X 14.8(T)	mm
Viewing Area (VA)	61.35 (W) X35.45 (H)	mm
AA	53.33 (W) X 31.08 (H)	mm
Display Mode	HTN Transmissive Negative	-
Driving Method	1/4 Duty, 1/3 Bias	-
Operating Temperature	-5~85	°C
Storage Temperature	-35~85	°C

3. Backlight Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V _F	Ta=25 °C,I _F =12mA	16	18	20	V
Luminance(on the BL surface)	L _V		45	65	-	cd/m ²
Wavelength	λ		460	465	470	nm
LED	6 BLUE LED, constant current					

Note : Expected Life time of LED on the B/L

1,000 hrs ,(Condition: +70 ± 3°C, I_F (MAX) =20 mA)

4. Electro-Optical Characteristics

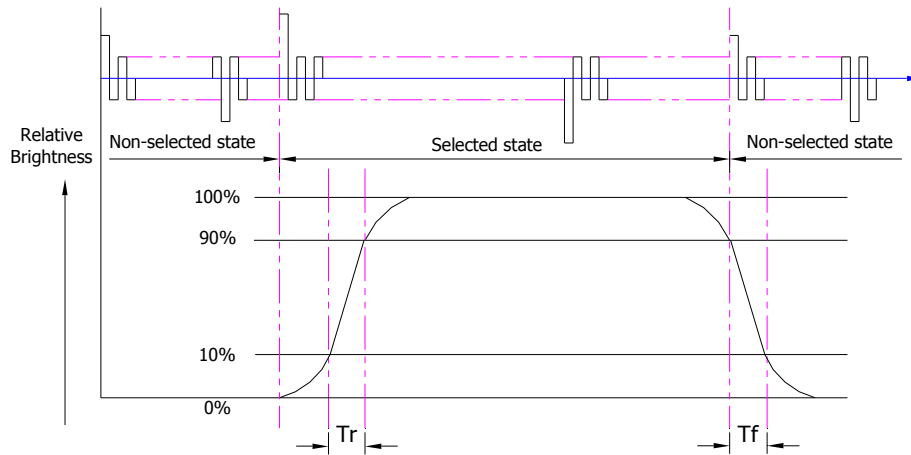
4.1. Optical Characteristics

Ta=25°C, 1/4duty, 1/3 bias

Item	Symbol	Condition	Min	Typ	Max
Driving voltage(V)	V_{OP}	Ta=25°C	2.7	3.0	3.3
Response Time (ms) (See 4.2)	Rise Time	Ta=25°C, $\theta=0^\circ$	-	70	-
	Fall Time	Ta=25°C, $\theta=0^\circ$	-	60	-
Contrast ratio (see 4.3)	Cr	Ta=25°C, $\theta=0^\circ$	-	18	-
Viewing Angle (see 4.4)	θ_{x+}	Ta=25°C, CR≥2, 3 o'clock	-	55	-
	θ_{y-}	Ta=25°C, CR≥2, 6 o'clock	-	15	-
	θ_{x-}	Ta=25°C, CR≥2, 9 o'clock	-	55	-
	θ_{y+}	Ta=25°C, CR≥2, 12 o'clock	-	50	-

4.2. Definition of Response Time

4.2.1. Normally Black Type (Negative)

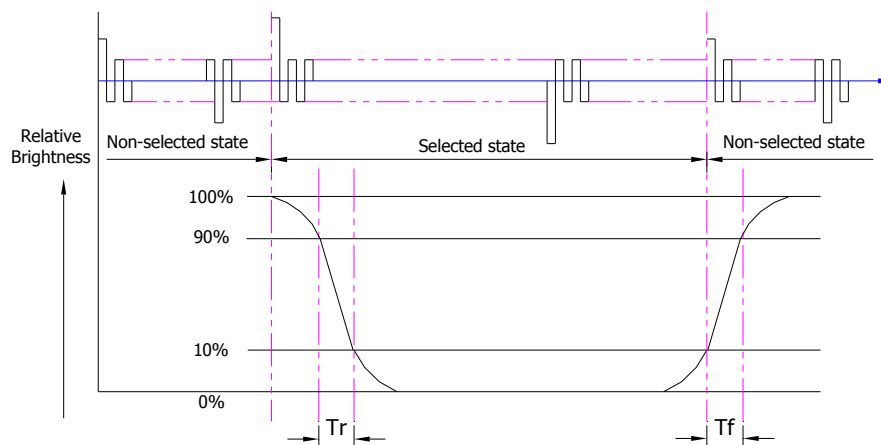


T_r is the time it takes to change from non-selected state with relative luminance 10% to selected state with relative luminance 90%;

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: LCD-5100

4.2.2. Normally White Type (Positive)



T_r is the time it takes to change from non-selected state 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%;

Note: Measuring machine: LCD-5100

4.3. Definition of Contrast Ratio

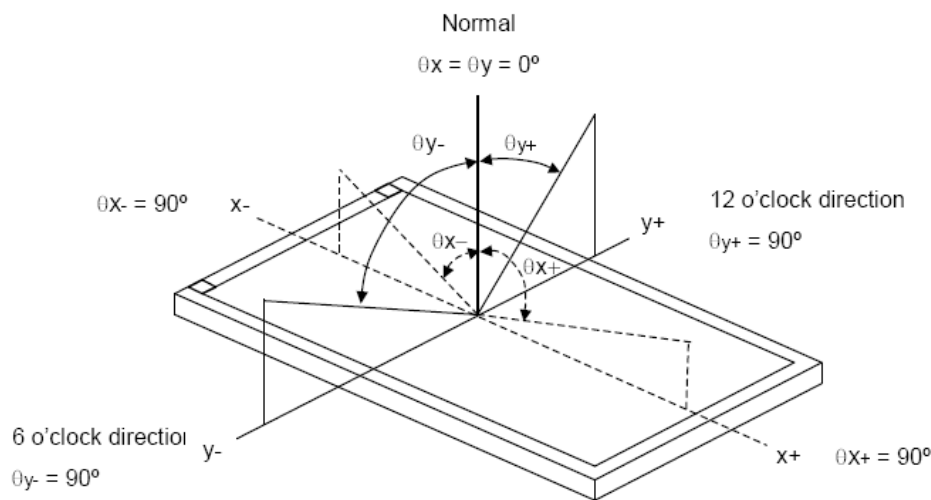
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	BM-7
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

4.4. Definition of Viewing Angles

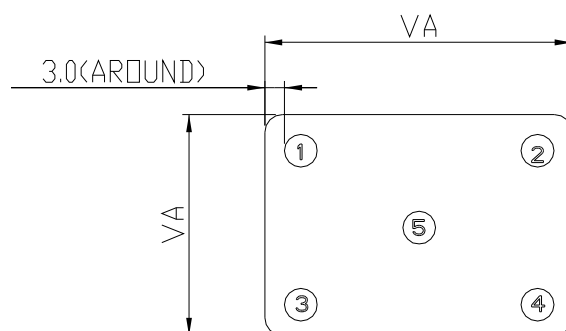


Measuring machine: LCD-5100

4.5. Definition of Backlight light Surface Luminance

4.5.1. Surface Luminance: $L_V = \text{average } (L_{P1}:L_{P5})$

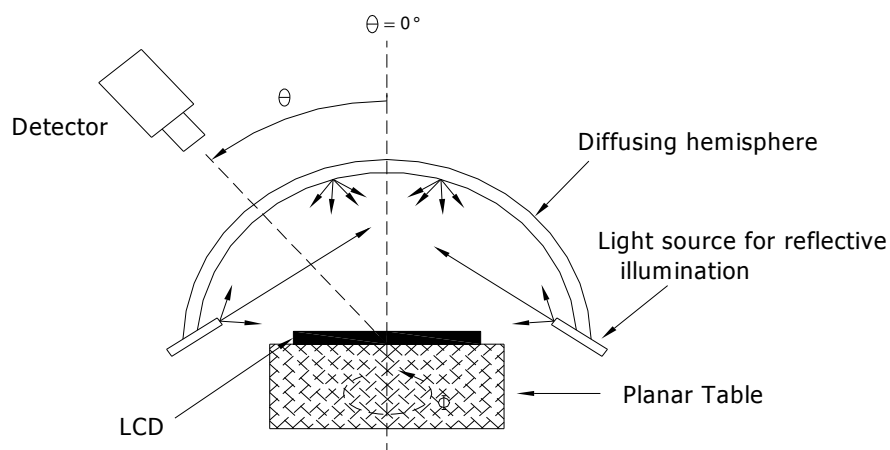
Note : Measuring machine: BM-7

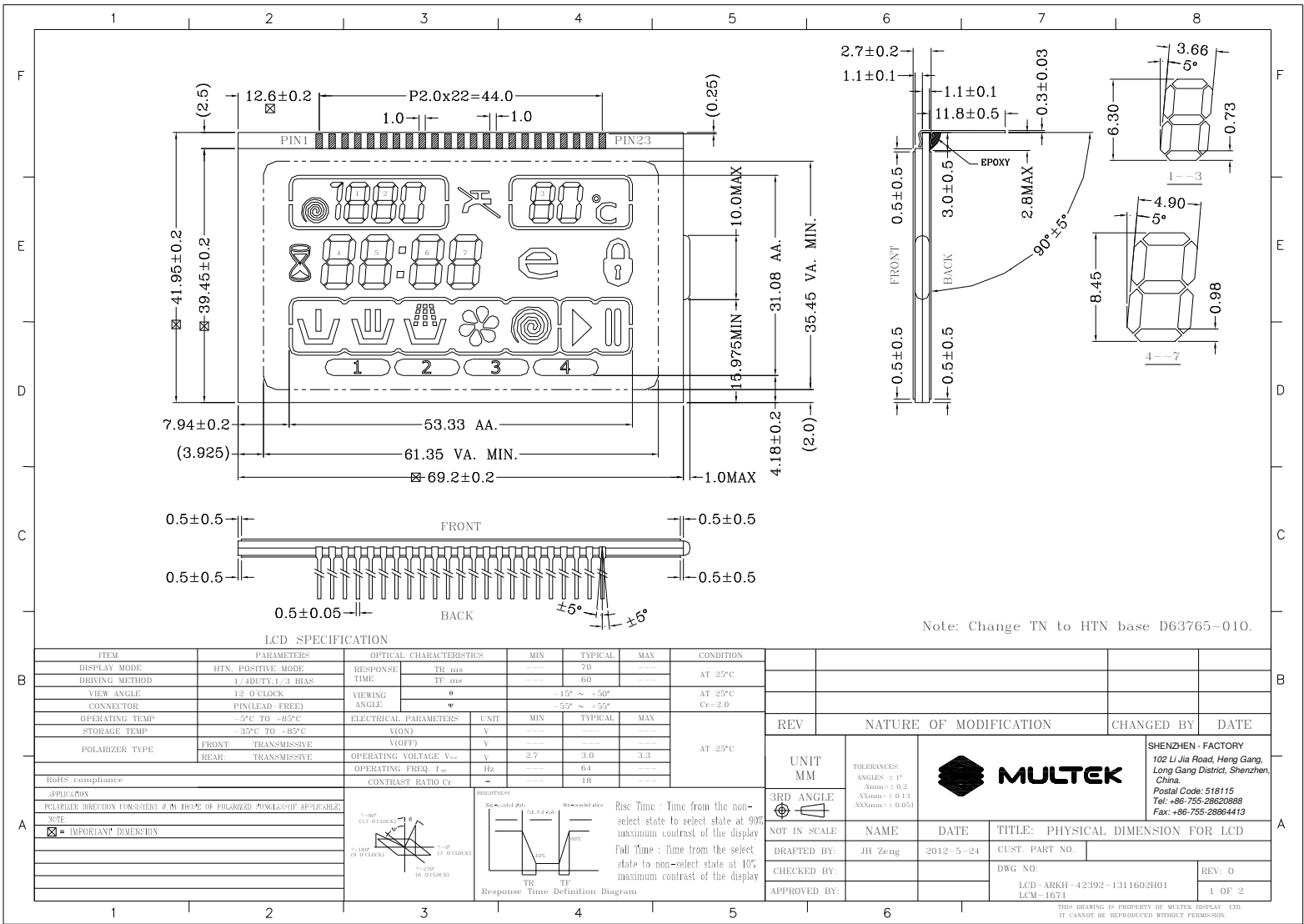


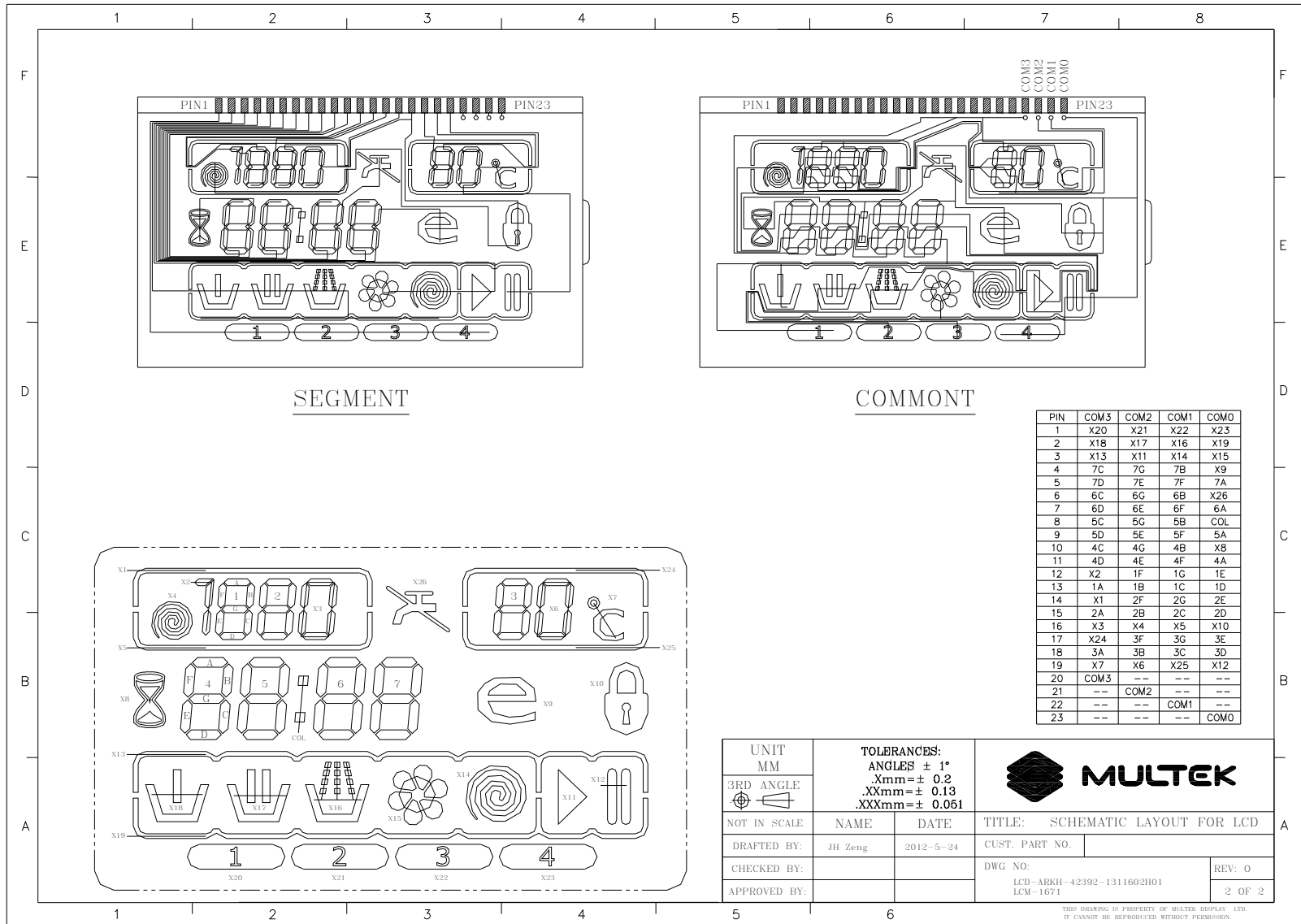
MEASURE POINTS

4.6. 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. Quality Assurance

6.1. Purpose

This is to define the control standards and inspection criteria practiced by Multek Display to assure the quality of LCD module products supplied to our customers.

6.1.1. Sampling Plan:

ANSI / ASQC Z1.4-1993

Single sampling, normal inspection

6.1.2. Sampling Criteria:

Visual inspection: AQL 1.5%

Electrical functional: AQL 0.65%.

6.1.3. Reliability Test:

For details refer to Reliability Test Specification

6.1.4. Nonconforming Analysis & Disposition

6.1.4.1. Customer shall provide adequate information of non-conforming sample for each complaint.

6.1.4.2. After receipt of detailed information from customer, the analysis of nonconforming parts is usually finished in one week.

6.1.4.3. If Multek Display cannot finish the analysis on time, customer shall be notified of the progress status.

6.1.4.4. Non-conforming product over pre-agreed ppm level shall be replaced.

6.1.4.5. The cause of non-conformance shall be analyzed. Corrective action shall be discussed and implemented.

6.2. Agreement Items

Multek Display and customer shall negotiate if the following situation occurs

6.2.1. Discrepancies between the standard of quality assurance of both parties

6.2.2. Additional requirement to be added into the product specification.

6.2.3. Any other special issues.

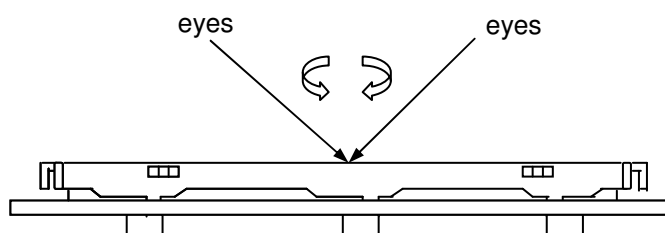
6.3. Standard of the Product Visual Inspection

6.3.1. Appearance inspection

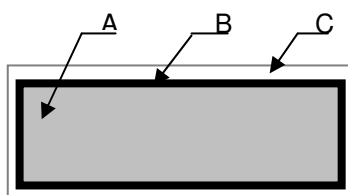
6.3.1.1. The inspection shall be done under 20W X 2 or 40W fluorescent lighting at a distance of 2 meters between LCD and light source, and the distance of view must be at 30cm $\pm$ 2cm.

6.3.1.2. When inspecting transmissive-mode products, back light must be lit.

- 6.3.1.3. The viewing angle shall be in accordance to customer's viewing angle specifications, or in the absence of such, at 45° from the vertical line without reflection



- 6.3.1.4. Definition of area :(refer to product drawing)

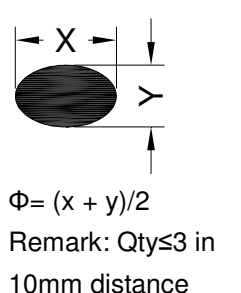


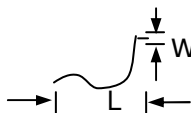
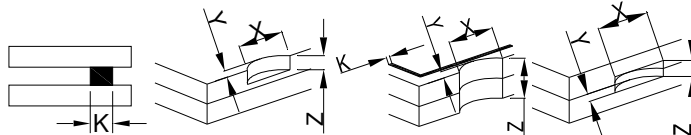
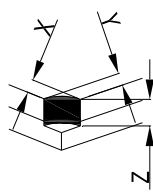
- A. Display Area
B. Viewing Area
C. Out of viewing area

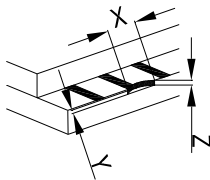
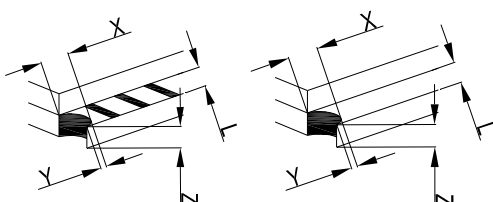
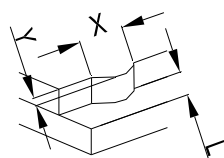
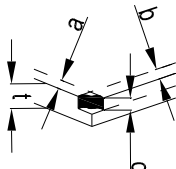
6.3.2. Basic principles:

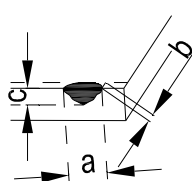
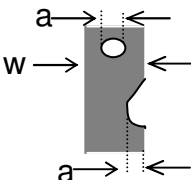
- 6.3.2.1. According to IPC standards if standard is not described in specification.
6.3.2.2. A set of sample to indicate the limit of acceptable quality level must be established between Multek Display and the customer in cases of subjective judgment.

6.4. Inspection Specification:

No.	Item	Criteria																																		
1	Electrical Testing	The below defects must be rejected. a) Missing vertical / horizontal segment, segment contrast defect. b) Missing character, dot or icon. c) Display malfunction. d) No function or no display. e) Current consumption exceeds product specifications. f) LCD viewing angle defect. g) Mixed product types. h) Contrast defect.																																		
2	Black and white spot, Red, blue and green spot Dent Foreign material (Round type)	 $\Phi = (x + y)/2$ Remark: Qty≤3 in 10mm distance	<table><tr><th rowspan="2">Size \ Area</th><th colspan="3">Acc. Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>$\varphi \leq 0.10$</td><td>NC</td><td>NC</td><td>NC</td></tr><tr><td>$0.10 < \varphi \leq 0.15$</td><td colspan="2">3</td><td>NC</td></tr><tr><td>$0.15 < \varphi \leq 0.20$</td><td colspan="2">2</td><td>NC</td></tr><tr><td>$0.20 < \varphi \leq 0.25$</td><td colspan="2">1</td><td>NC</td></tr><tr><td>$0.25 < \varphi$</td><td colspan="2">0</td><td>NC</td></tr><tr><td>Total</td><td colspan="3">5</td></tr></table>	Size \ Area	Acc. Qty			A	B	C	$\varphi \leq 0.10$	NC	NC	NC	$0.10 < \varphi \leq 0.15$	3		NC	$0.15 < \varphi \leq 0.20$	2		NC	$0.20 < \varphi \leq 0.25$	1		NC	$0.25 < \varphi$	0		NC	Total	5				
Size \ Area	Acc. Qty																																			
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$0.20 < \varphi \leq 0.25$	1		NC																																	
$0.25 < \varphi$	0		NC																																	
Total	5																																			

No.	Item	Criteria														
3	Black and White line Scratch Foreign material (Line type)	Unit: mm 	Length	Width	Acc. Qty											
			-----	$W \leq 0.01$	A	B	C									
			$L \leq 2.0$	$0.01 < W \leq 0.02$	NC	NC	NC									
			$L \leq 1.0$	$0.02 < W \leq 0.03$	1	1	NC									
			-----	$W > 0.03$	1	2	NC									
4	Polarizer bubbles	If bubbles are visible, must check in specific direction and look it as round type and detailed specifications as above table.	Size (Unit: mm)		Acc. Qty											
			$\varphi \leq 0.20$		Acceptable											
			$0.20 < \varphi \leq 0.50$		3											
			$0.50 < \varphi \leq 0.80$		2											
			$0.80 < \varphi$		0											
			Total		5											
5	Polarizer wrinkles	Unacceptable														
6	Glass cracked	Symbols X: Chip length Y: Chip width Z: Chip thickness T: Glass thickness L: Electrode pad length a) General glass chip 1. Chip on panel surface and crack between panels														
																
		<table><tr><td>Z: Chip thickness</td><td>Y: Chip width</td><td>X: Chip length</td></tr><tr><td>$Z \leq 1/2T$</td><td>Not expanded in viewing area</td><td>$X \leq 1/8A$</td></tr><tr><td>$1/2T < Z \leq 2T$</td><td>Not exceed $1/3K$</td><td>$X \leq 1/8A$</td></tr></table>						Z: Chip thickness	Y: Chip width	X: Chip length	$Z \leq 1/2T$	Not expanded in viewing area	$X \leq 1/8A$	$1/2T < Z \leq 2T$	Not exceed $1/3K$	$X \leq 1/8A$
		Z: Chip thickness	Y: Chip width	X: Chip length												
$Z \leq 1/2T$	Not expanded in viewing area	$X \leq 1/8A$														
$1/2T < Z \leq 2T$	Not exceed $1/3K$	$X \leq 1/8A$														
If there are 2 or more chips, X is the total length of each chip. 2. Corner crack:  X, Y, Z Spec. same as a.1. If there are 2 or more chips, X is the total length of each chip.																

No.	Item	Criteria						
6	Glass cracked	b) Protrusion over terminal: 1. Chip on electrode pad						
								
		<table><tr><td>Y: Chip width</td><td>X: Chip length</td><td>Z: Chip thickness</td></tr><tr><td>$Y \leq 0.5\text{mm}$</td><td>$X \leq 1/8A$</td><td>$0 < Z \leq T$</td></tr></table>	Y: Chip width	X: Chip length	Z: Chip thickness	$Y \leq 0.5\text{mm}$	$X \leq 1/8A$	$0 < Z \leq T$
		Y: Chip width	X: Chip length	Z: Chip thickness				
$Y \leq 0.5\text{mm}$	$X \leq 1/8A$	$0 < Z \leq T$						
2. Non-conductive portion								
								
		<table><tr><td>Y: Chip width</td><td>X: Chip length</td><td>Z: Chip thickness</td></tr><tr><td>$Y \leq L$</td><td>$X \leq 1/8A$</td><td>$0 < Z \leq T$</td></tr></table>	Y: Chip width	X: Chip length	Z: Chip thickness	$Y \leq L$	$X \leq 1/8A$	$0 < Z \leq T$
Y: Chip width	X: Chip length	Z: Chip thickness						
$Y \leq L$	$X \leq 1/8A$	$0 < Z \leq T$						
		If the chipped area reach the ITO terminal, over 2/3 of the ITO must be remained. If the product will be heat sealed by the customer, the alignment mark must not be damaged.						
		3. Substrate protuberance and internal crack						
								
		<table><tr><td>Y: Width</td><td>X: Length</td></tr><tr><td>$Y \leq 1/3L$</td><td>$X \leq A$</td></tr></table>	Y: Width	X: Length	$Y \leq 1/3L$	$X \leq A$		
Y: Width	X: Length							
$Y \leq 1/3L$	$X \leq A$							
		c) LCD with extensive crack line is unacceptable.						
7	Chip on IC	a) Corner chip						
								
		<table><tr><td>a</td><td>b</td><td>c</td></tr><tr><td colspan="2">$\leq 0.4\text{mm}$</td><td>$\leq 1/2t$</td></tr></table>	a	b	c	$\leq 0.4\text{mm}$		$\leq 1/2t$
a	b	c						
$\leq 0.4\text{mm}$		$\leq 1/2t$						
		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 glass`						

No.	Item	Criteria							
7	Chip on IC	b) Rim chip <table border="1" data-bbox="916 479 1267 568"><tr><td>a</td><td>b</td><td>c</td></tr><tr><td>Acceptable</td><td></td><td>≤0.2mm</td></tr></table> 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.	a	b	c	Acceptable		≤0.2mm	
a	b	c							
Acceptable		≤0.2mm							
8	Dot matrixes, Distortion, Big gap of dot matrixes		Dot matrixes distortion should be in 95~105% of normal dimension, and gap of dot matrixes should be in 150% of normal dimension.						
9	FPC/FFC /TAB/HSC		a) Dent, pinhole width $a < w/3$ (w: circuitry width) b) Open circuit is unacceptable. c) No oxidation, contamination and distortion. d) Follow IPC-6013A standard.						
10	RTV glue	a) Not exceed the surface of top polarizer, LCD left/right edges. Cover fully ITO, IC and the juncture of HSC and LCD. b) 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. c) No visible non-metal foreign material and metal material in RTV. d) Entrapped air bubble isn't permissible to exist on the juncture of RTV glue and pins of LCD. e) 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.							
11	Backlight	a) Spots or scratches that appear when light must be judged using LCD glass spot, line and contamination standards. b) Brightness and Chromaticity can't be out of specification.							
12	Bezel	a) No rust, distortion on the Bezel. b) No visible fingerprints, stains or other contamination.							

No.	Item	Criteria
13	Touch Panel	D: diameter W: width L: length (Unit: mm) a) Spot: $D < 0.25\text{mm}$ is acceptable $0.25 \leq D \leq 0.4\text{mm}$ 2dots are acceptable and the distance between defects should more than 40mm. $D > 0.4$ is unacceptable b) Dent and rim: $D > 0.40$ is unacceptable c) Scratch: $W \leq 0.03$, $L \leq 25$ is acceptable $0.03 < W \leq 0.05$, $L \leq 25$ is acceptable (The distance between 2 defects should more than 40mm.) $W > 0.05$ is unacceptable
14	PCB	a) No distortion or contamination on PCB terminals. b) All components on PCB must same as documented on the BOM/component layout. c) Follow IPC-A-600F
15	Soldering	Follow IPC-A-610C standard

6.5. RoHS Compliance

This product is RoHS Compliance.

7. Reliability Specification

Test item	Condition	Cycle time	Quantity	Remark
Constant Temp./Constant Humidity Test	+40 ± 3°C, 90 ± 3%RH	240hrs	8pcs	Note1,4
High Temp. Operation Test	+85 ± 3°C	240hrs	8pcs	
High Temp. storage Test	+85 ± 3°C	96hrs	8pcs	
Low Temp. Operation Test	-5 ± 3°C	240hrs	8pcs	
Low Temp. storage Test	-30 ± 3°C	96hrs	8pcs	
Thermal cycle Shock Test	-30 ± 3°C (1hour) to 25 ± 3°C (30min) to 80 ± 3°C (1hour)	60 cycles	5pcs	
Thermal Shock Test	-30 ± 3°C (1hour) to 80 ± 3°C (1hour)	32 cycles	5pcs	Note2,4
Vibration Test	Frequency: 10Hz to 55Hz to 10Hz, Swing:1.5mm,time: X,Y,	2hrs, 20 cycles	8pcs	
Mechanical shock test	1,5mm;10-50Hz;3 axis	11ms pulse	5pcs	Note2,4
ESD Test(end product)	Contact discharge:±8KV, Air discharge:±12KV.330Ω 150pF	10times	8pcs	Note2,3
Packing Drop test	1 drop on 3sides, 1 drop on a corner, 1 drop on an edge	5times	One inner Carton	Note2

Note 1. 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
- I_{DD} is greater than twice initial value.
- Others as per QA Inspection Criteria

Note 2. No defect is allowed after testing.

Note 3. ESD should be applied to LCD glass panel, not other areas (such as on IC and so on)

- I_{DD} should be within twice initial value.
- Any transient display abnormality that recovers to initial normal state after resetting shall be regarded as good and acceptable part.

Note 4 Reliability testing Condition shall be conducted by customer(Arcelik) only.

8. Precautions and Warranty

8.1. Safety

- 8.1.1. 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.
- 8.1.2. Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

8.2. Handling

- 8.2.1. Do not exceed the absolute maximum ratings in order to keep performance and prevent damage.
- 8.2.2. Do not wipe the polarizer with dry cloth, as it might cause scratches. 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.

8.3. Storage

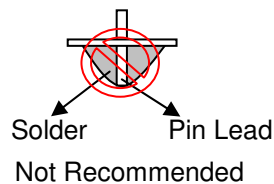
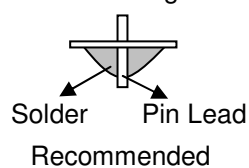
- 8.3.1. Do not store the LCD module beyond the specified temperature ranges.

8.4. Metal Pin (Apply to Products with Metal Pins)

8.4.1. Pins of LCD and Backlight

- 8.4.1.1. Solder tip can touch and press on the tip of Pin Leads during the soldering
- 8.4.1.2. Recommended soldering conditions
 - Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1
 - Maximum Solder Temperature: 320℃
 - Maximum Solder Time: 3s at the maximum temperature
 - Recommended Soldering Temp: 300℃
 - Typical Soldering Time: ≤3s

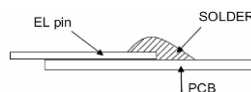
8.4.1.3. Solder Wetting



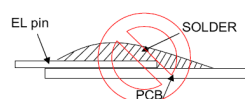
8.4.2. Pins of EL

- 8.4.2.1. Solder tip can touch and press on the tip of EL leads during soldering.
- 8.4.2.2. No solder paste on the soldering pad on the motherboard is recommended.
- 8.4.2.3. Recommended Soldering Conditions
 - Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm
 - Maximum solder temperature: 320℃
 - Typical Soldering Time: ≤2s
 - Minimum solder distance from EL lamp (body): 2.0mm
- 8.4.2.4. No horizontal force on the EL leads during soldering is allowed
- 8.4.2.5. 180° bending of EL leads must not exceed three times.

8.4.2.6. Solder Wetting

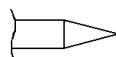


Recommended

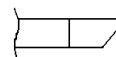


Not Recommended

8.4.2.7. The type of the solder iron:

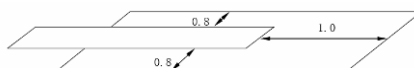


Recommended



Not Recommended

8.4.2.8. Solder Pad



8.5. Operation

- 8.5.1. Do not drive LCD with DC voltage
- 8.5.2. Response time will increase with lowering of ambient temperatures.
- 8.5.3. Display may change color with temperature changes.
- 8.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear "fractured".

8.6. Static Electricity

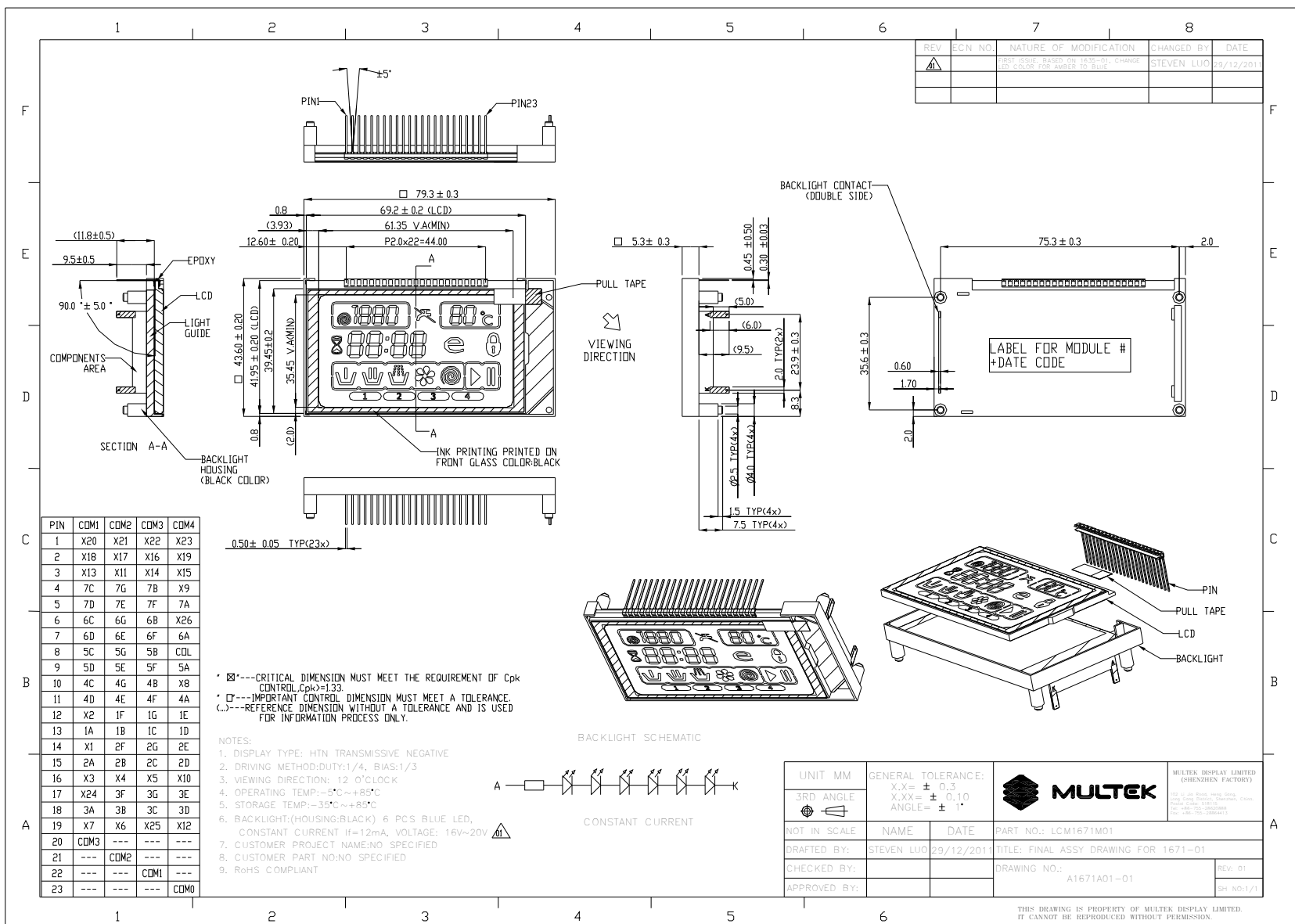
- 8.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static discharge, by proper electrical grounding, shielding, etc.
- 8.6.2. Work clothes, work benches, etc., shall be adequately static-free
- 8.6.3. The module should be kept in anti-static bags or other containers resistant to static for storage.

8.7. Limited Warranty

- 8.7.1. 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.
- 8.7.2. The warranty liability of Multek Display is limited to repair and/or replacement. Multek Display shall not be responsible for any consequential loss.



9. Outline Drawing





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1671TGPBTOPH-01 Rev:03

10. Packaging Drawing

