



MOP-TFT240320-24A-BLM-TPR

Hardware Manual

Revision 1.0

Revision History

Revision	Date	Description	Author
1.0	July 5, 2018	Initial Release	Divino



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1 General Information

Item	Dimension	Unit
LCD Type	TFT/Transmissive (Anti-Glare)	/
Module Size (L*W*H)	47.72x60.26x3.71	mm
Active Size (L*W)	36.72*48.96	mm
Pixel Pitch (L*W)	0.153*0.153	mm
Resolution	240*320	/
Driver IC	ILI9341V	/
Interface Type	MCU/RGB+SPI	/
Viewing Direction	6 O'Clock	/
Gray Scale Inversion Direction	12 O'Clock	/
Backlight Type	LED	/
Touch Panel Type	Resistive	/

2 Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit
Supply voltage for analog	VCC	-0.3	4.6	V
Supply voltage for logic	VCC	-0.3	4.6	V
Supply current (One LED)	ILED		30	mA
Operating temperature	TOP	-20	+70	°C
Storage temperature	TST	-30	+80	°C

***Note:** The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

3 Electrical Characteristics

DC Characteristics (at Ta=25 °C)

Item	Symbol	Min	Typ	Max	Unit	Conditions
Supply Voltage for Analog	VCC	2.5	2.8	3.3	V	
Supply Voltage for Logic	VCC	1.65	1.8/2.8	3.3	V	
Input Voltage	VIL	GND	-	0.3VCC	V	
	VIH	0.8 VCC	-	VCC		
Input leakage Current	ILKG	-1		1	μA	

4 Backlight Characteristics

(at Ta=25 °C, RH=60%)

Item	Symbol	Value			Unit	Conditions
		Min	Typ	Max		
Voltage for LED Backlight	VF	2.8	3.2	3.4	V	IL =60mA
Current for LED Backlight	IL		60	-	mA	
Power Consumption	P		0.192		W	
LED Life Time		30,000			Hr	Note

***Note:** Brightness to be decreased to 50% of the initial value at ambient temperature TA=25°C



5 External Dimensions

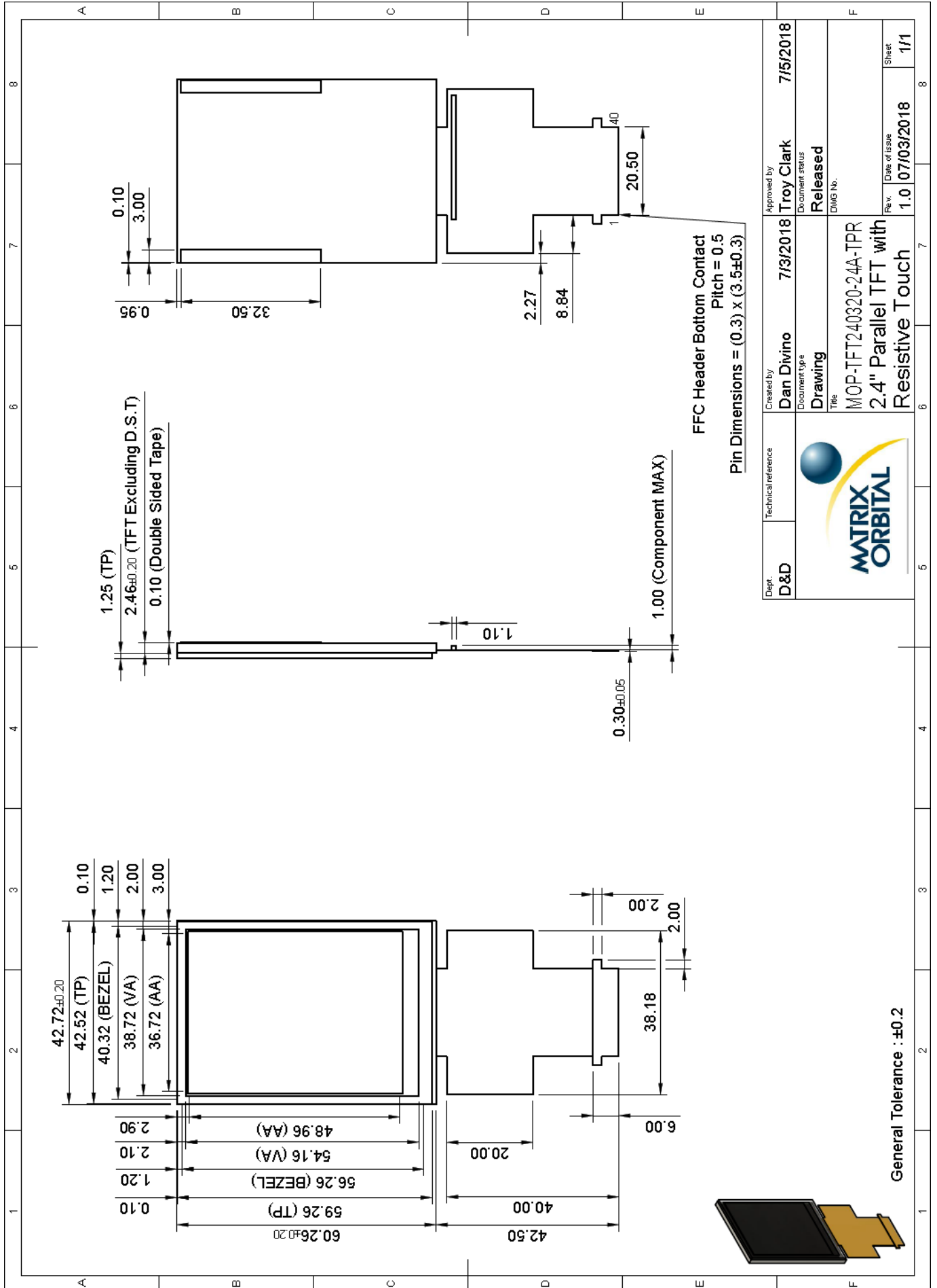


Figure 1: MOP-TFT240320-24A-BLM-TPR Drawing



6 Electro-Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	
Luminance	L	IL =60mA	290	370	450	Cd/m2	Note 4	
Contrast Ratio	CR	$\theta=0$		250			Note 2	
Response Time	T_{ON}	25°C	-	30	-	ms	Note 3	
	T_{OFF}							
CIE Colour Coordinate	White	X_W	Viewing Normal Angle	0.289	0.309	0.329		
		Y_W		0.325	0.345	0.365		
Viewing Angle	Vertical	U	CR ≥ 10	-	45	-	Degree	Note 1
		D		-	45	-		
	Horizontal	L		-	45	-		
		R		-	20	-		
Uniformity	Un		80			%		

***Note 1:** Definition of Viewing Angle θ_x and θ_y :

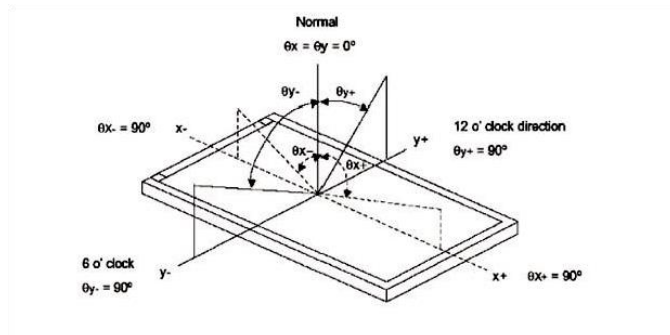


Figure 2: The Definition of Viewing Angle

***Note 2:** Definition of contrast ratio CR:

$$CR = \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

***Note 3:** Definition of Response Time(T_r, T_f)

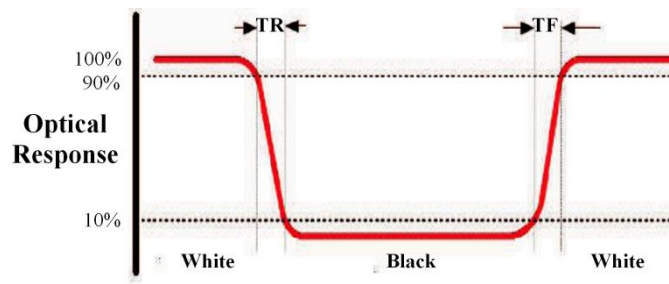


Figure 3: The Definition of Response Time



***Note 4:** Definition of Luminance

1. The Brightness Test Equipment Setup
Field=2°(As measuring “black” image, field=2°is the best testing condition)

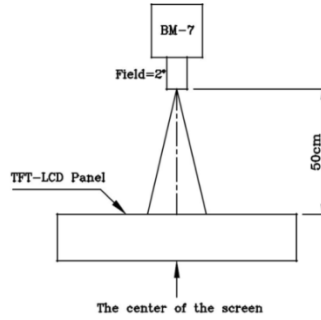


Figure 4: Brightness Test Equipment Setup

2. The Brightness Test Point Setup

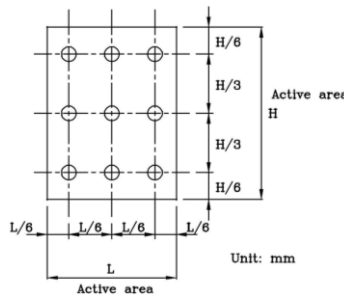


Figure 5: Brightness Test Point Setup

7 Interface Description

7.1 LCM Interface Description

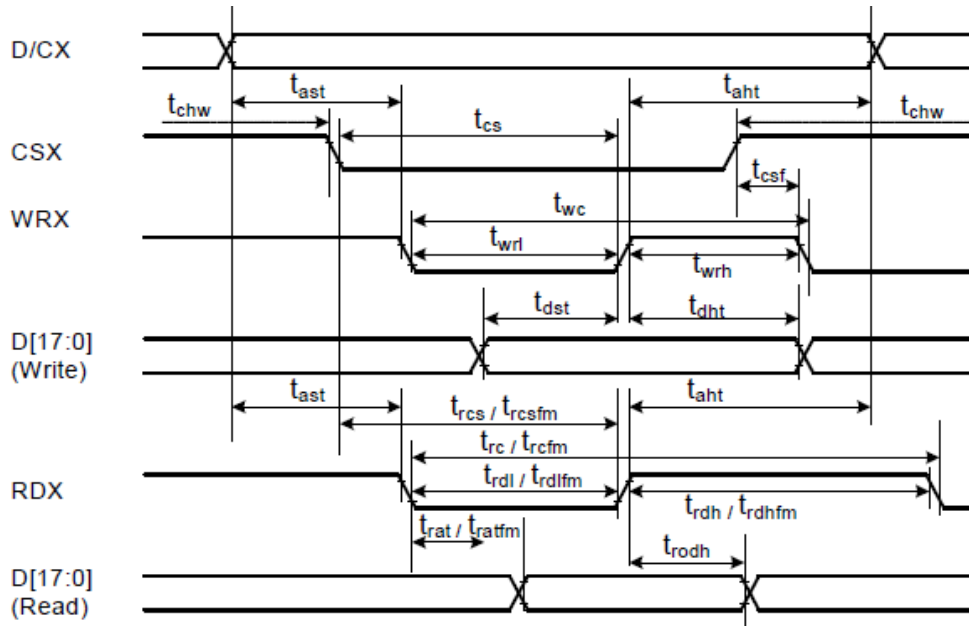
Interface No.	Name	I/O Pin Connections	Description
1	LEDK	P	Power for LED backlight(Cathode)
2	LEDA	P	Power for LED backlight(Anode)
3	GND	P	Power Ground
4	NC	-	No Connection
5	NC	-	No Connection
6	NC	-	No Connection
7	SDA	I/O	Data input pin serial interface
8	DOTCLK	I	Clock signal to sample each data
9	DE	I	Line Synchronization input
10	VSYNC	I	Frame/Ram Write Synchronization input
11	HSYNC	I	Line Synchronization input
12	VCC	P	Power Supply
13	RESET	I	Reset Pin
14	GND	P	Power Ground
15 – 32	DB17-DB0	I/O	Data Bus
33	RD	I	Read Data Signal
34	WR	I	Write Data Signal
35	RS	I	Data or Command select
36	CS	I	Chip select (Active low)
37	XR	-	TP: X Right
38	YD	-	TP: Y Bottom
39	XL	-	TP: X Left
40	YU	-	TP: Y Top

***Note:** I = Input, O=Output, P=Power



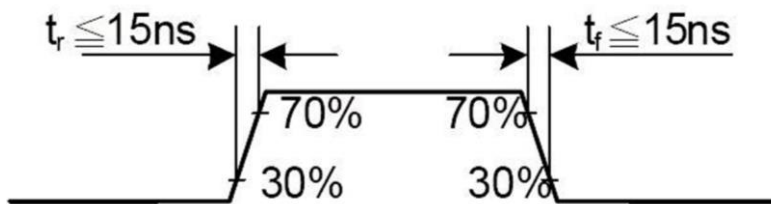
8 Timing Characteristics

8.1 MPU Interface Characteristic

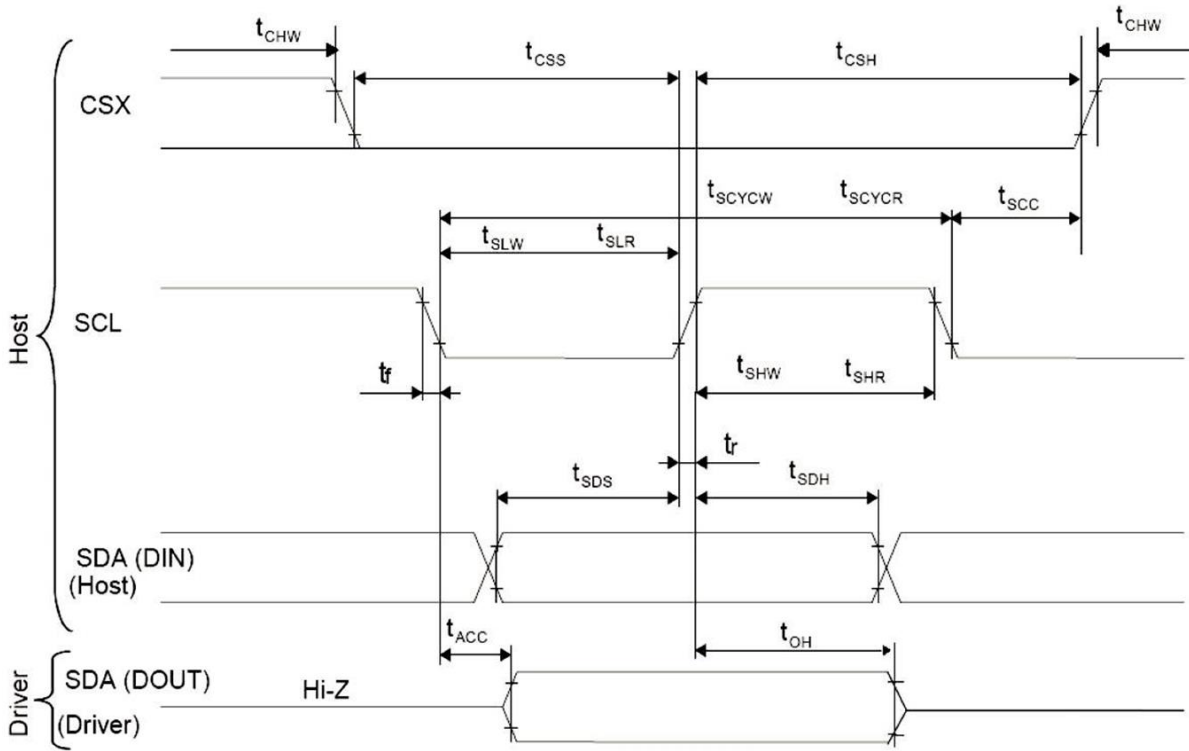


Signal	Symbol	Parameter	Min	Max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	0	-	ns	
CSX	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select wait time (Write/Read)	10	-	ns	
WRX	twc	Write Cycle	66	-	ns	
	twrh	Write Control pulse H duration	15	-	ns	
	twrl	Write Control pulse L duration	15	-	ns	
RDX(FM)	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdfm	Read Control L duration (FM)	355	-	ns	
RDX(ID)	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
D[17:0] D[17:10]&D[8:1] D[17:10] D[17:9]	tdst	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pf
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

***Note:** Ta=-30 to 70°C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, VSS=0V

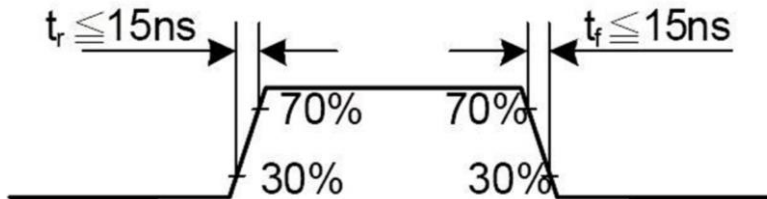


8.2 Serial Interface Timing Characteristic (3-line SPI system)

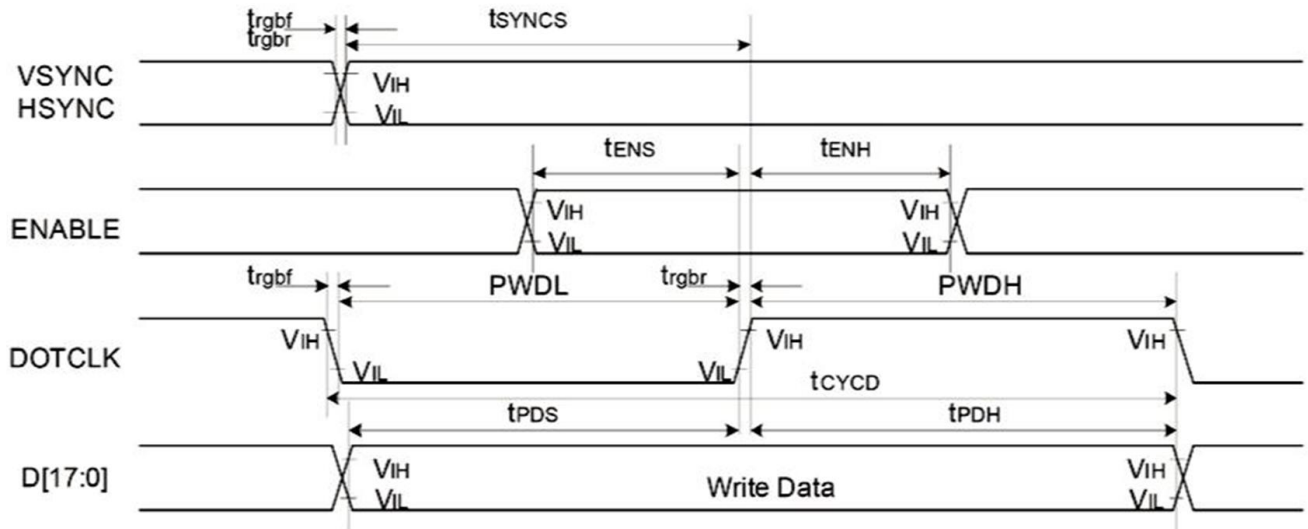


Signal	Symbol	Parameter	Min	Max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA/SDI (Input)	tsds	Data Setup Time (Write)	30	-	ns	
	tsdh	Data hold Time (Write)	30	-	ns	
SDA/SDO (Output)	tacc	Access Time (Read)	10	-	ns	
	toh	Output Disable Time (Read)	10	50	ns	
CSX	tsc	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcs		65	-	ns	

*Note: $T_a = 25^\circ\text{C}$, $V_{DDI} = 1.65\text{V to }3.3\text{V}$, $V_{CI} = 2.5\text{V to }3.3\text{V}$, $AGND = VSS = 0\text{V}$

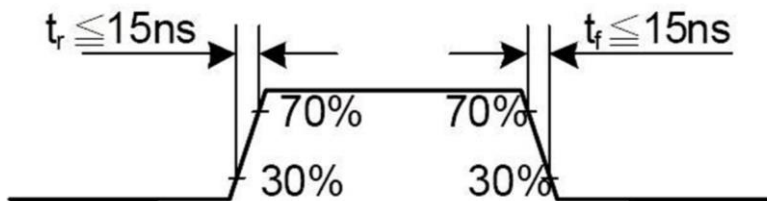


8.3 Parallel RGB interface timing characteristic



Signal	Symbol	Parameter	min	max	Unit	Description	
VSYNC/HSYNC	tSYNCS	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode	
	tSYNCH	VSYNC/HSYNC hold time	15	-	ns		
DE	tENS	DE setup time	15	-	ns		
	tENH	DE hold time	15	-	ns		
D[17:0]	tPOS	Data setup time	15	-	ns		
	tPDH	Data hold time	15	-	ns		
DOTCLK	PWDH	DOTCLK high-level period	15	-	ns		
	PWDL	DOTCLK low-level period	15	-	ns		
	Tcycd	DOTCLK cycle time	100	-	ns		
	trgbf, trgb	DOTCLK, HSYNC, VSYNC rise/fall time	-	15	ns		
VSYNC/HSYNC	tSYNCS	VSYNC/HSYNC setup time	15	-	ns		6-bit bus RGB interface mode
	tSYNCH	VSYNC/HSYNC hold time	15	-	ns		
DE	tENS	DE setup time	15	-	ns		
	tENH	DE hold time	15	-	ns		
D[17:0]	tPOS	Data setup time	15	-	ns		
	tPDH	Data hold time	15	-	ns		
DOTCLK	PWDH	DOTCLK high-level period	15	-	ns		
	PWDL	DOTCLK low-level period	15	-	ns		
	Tcycd	DOTCLK cycle time	50	-	ns		
	trgbf, trgb	DOTCLK, HSYNC, VSYNC rise/fall time	-	15	ns		

***Note:** Ta = 25°C, VDDI = 1.65V to 3.3V, VCI = 2.5V to 3.3V, AGND = VSS = 0V



9 Standard Specification for Reliability

9.1 Standard specification for reliability of LCD module

No.	Item	Description	Remarks
1	High temperature operation	The sample should be able to withstand 70°C for 240 hours under driving conditions and then operate at normal temperature condition for 2 hours.	Note 1 IEC60068-2-2, GB2423.2-89
2	Low temperature operation	The sample should be able to withstand -20°C for 240 hours under driving conditions and then operate at normal temperature condition for 2 hours.	Note2 IEC60068-2-1 GB2423.1-89
3	High temperature storage	The sample should be able to withstand 80°C for 240 hours under no-load condition, and then operate at normal temperature condition for 2 hours.	IEC60068-2-2 GB2423.2-89
4	Low temperature storage	The sample should be able to withstand -30°C for 240 hours under no-load condition, and then operate at normal temperature conditions for 2 hours.	IEC60068-2-1 GB/T2423.1-89
5	Moisture storage	The sample should be able to withstand 60°C, 90%RH MAX for 240 hours under no-load condition, then operate at normal temperature conditions after taking it out and drying for 2 hours.	IEC60068-2-1 GB/T2423.3-2006
6	Thermal shock storage	The sample should be allowed to stand the following 10 cycles : -30°C for 30 minutes → normal temperature for 5 minutes → +80°C for 30 minutes → normal temperature for 5 minutes, as one cycle.	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Packing vibration	Frequency range: 10Hz ~ 55Hz Amplitude of vibration: 1.5mm Sweep time: 12 min X, Y, Z 2 hours for each direction.	IEC61000-2-6 GB/T2423.5-1995
8	Packing drop test	According to ASTM-D-5327	IEC60068-2-32 GB/T2423.8-1995
9	Electrical static discharge	Air: ±4KV 150pF/330Ω 5 times Contact: ±2KV 150pF/330Ω 5 time	IEC61000-4-2 GB/T17626.2-1998

*Note 1: Ts is the temperature of panel's surface.

*Note 2: Ta is the ambient temperature of sample.

**Note: Sample size for each test item is 3~5pcs.

9.2 Testing Conditions and Inspection Criteria

For the final test, the testing sample must be stored at room temperature for 24 hours. After the tests listed in Table 9.2, standard specifications for reliability will be executed in order to ensure stability.

No.	Item	Test Model	In section Criteria
01	Current Consumption	Refer To Specification	The current consumption should conform to the product specification.
02	Contrast	Refer To Specification	After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests.
03	Appearance	Visual inspection	Defect free.



9.3 MTBF

Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature ($25\pm 5^{\circ}\text{C}$), normal humidity ($50\pm 10\% \text{RH}$), and in areas not exposed to direct sun light.

10 Specification of Quality Assurance

This standard of Quality Assurance confirms to the quality of LCD module products supplied by Matrix Orbital.

10.1 Quality Test

- Before delivering, the supplier should conduct the following tests to confirm the quality of products.
- Electrical-Optical Characteristics: According to the individual specification to test the product.
- Appearance Characteristics: According to the individual specification to test the product.
- Reliability Characteristics: According to the definition of reliability on the specification for testing products.

10.2 Delivery Test

Before delivering, the supplier should conduct the delivery test.

- Test method: According to MIL-STD105E.General Inspection Level II .
- The defects classify of AQL as following:
Major defect: AQL = 0.65
Minor defect: AQL = 2.5
Total defects: AQL = 2.5

10.3 Standard of the Product Appearance Test

Manner of appearance test

- The test must be under $20\text{W} \times 2$ or 40W fluorescent light, and the distance of view must be at $30\pm 5\text{cm}$.
- When testing a Transmissive product, a reflective plate is added to the model.
- The test direction is based on around 10° of vertical line.
- Temperature: $25\pm 5^{\circ}\text{C}$ Humidity: $60\pm 10\% \text{RH}$

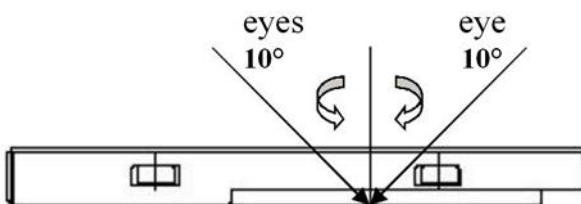


Figure 6: Definition of Area

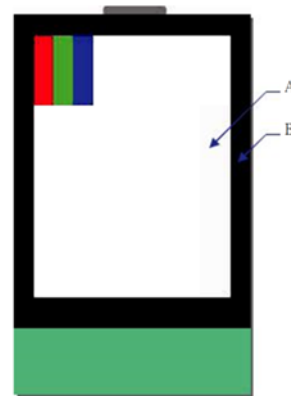


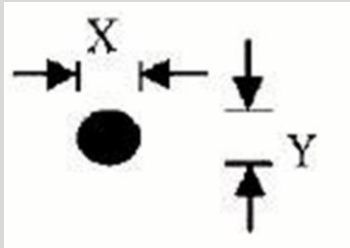
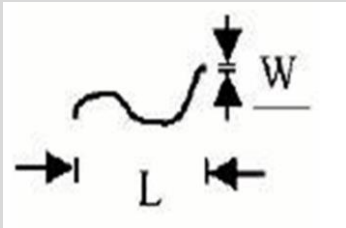
Figure 7: A is viewing area and B is outside viewing area

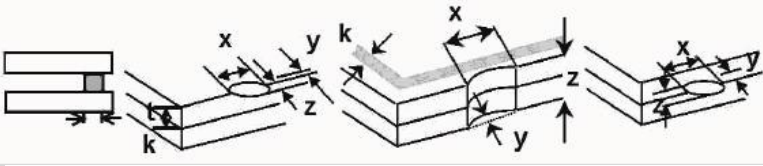
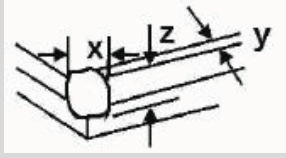
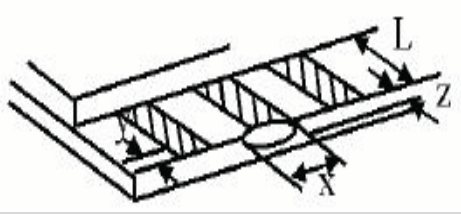
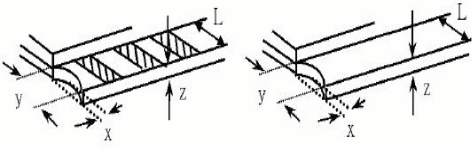
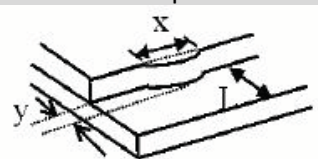
Basic principle

- When the standard cannot be described, AQL will be applied.
- The sample of the lowest acceptable quality level must be negotiated by both supplier and customer when any dispute happened.
- New items must be added on time when it is necessary.

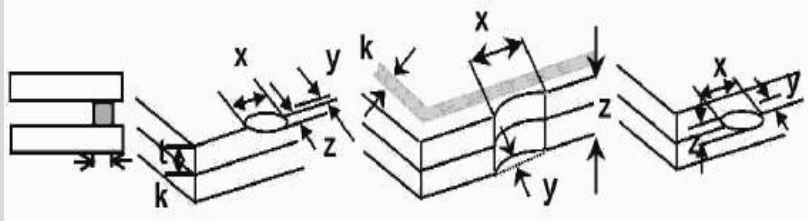
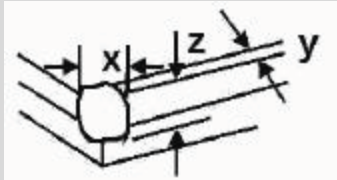


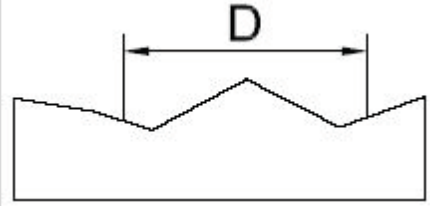
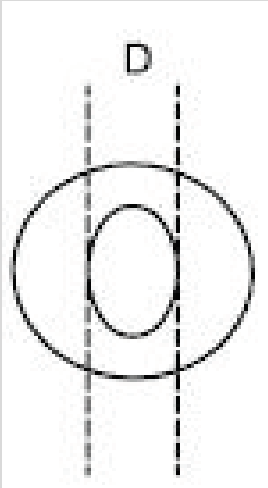
10.4 Inspection Specification

NO.	Item	Criterion	AQL													
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker	0.65													
02	Black or White spots or Bright spots or Color spots on LCD (Display only)	2.1 White and black or color spots on display $\leq 0.25\text{mm}$, no more than Five spots. 2.2 Densely spaced: No more than three spots within 3mm.	2.5													
03	LCD and Touch Panel black spots, white spots, contamination (non-display)	3.1 Round type: As following drawing $\Phi = (X+Y) / 2$  <table border="1" data-bbox="849 739 1295 999"> <thead> <tr> <th>Size(mm)</th> <th>Acceptable Quantity</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td>Accept no dents</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.20$</td> <td>2</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.25$</td> <td>2</td> </tr> <tr> <td>$0.25 < \Phi \leq 0.30$</td> <td>1</td> </tr> <tr> <td>$0.30 < \Phi$</td> <td>0</td> </tr> </tbody> </table>	Size(mm)	Acceptable Quantity	$\Phi \leq 0.10$	Accept no dents	$0.10 < \Phi \leq 0.20$	2	$0.20 < \Phi \leq 0.25$	2	$0.25 < \Phi \leq 0.30$	1	$0.30 < \Phi$	0	2.5	
		Size(mm)	Acceptable Quantity													
$\Phi \leq 0.10$	Accept no dents															
$0.10 < \Phi \leq 0.20$	2															
$0.20 < \Phi \leq 0.25$	2															
$0.25 < \Phi \leq 0.30$	1															
$0.30 < \Phi$	0															
* Densely spaced: No more than two spots within 3mm. 3.2 Line type: (As following drawing)  <table border="1" data-bbox="790 1142 1361 1400"> <thead> <tr> <th>Length(mm)</th> <th>Width(mm)</th> <th>Acceptable Quantity</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.02$</td> <td>Accept no dents</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.02 < W \leq 0.05$</td> <td rowspan="2">2</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.08$</td> </tr> <tr> <td>---</td> <td>$0.08 < W$</td> <td>Rejection</td> </tr> </tbody> </table>	Length(mm)	Width(mm)	Acceptable Quantity	---	$W \leq 0.02$	Accept no dents	$L \leq 3.0$	$0.02 < W \leq 0.05$	2	$L \leq 2.5$	$0.03 < W \leq 0.08$	---	$0.08 < W$	Rejection	2.5	
Length(mm)	Width(mm)	Acceptable Quantity														
---	$W \leq 0.02$	Accept no dents														
$L \leq 3.0$	$0.02 < W \leq 0.05$	2														
$L \leq 2.5$	$0.03 < W \leq 0.08$															
---	$0.08 < W$	Rejection														
4	Polarizer bubbles	If bubbles are visible, judge using black spot specifications. <table border="1" data-bbox="831 1473 1302 1731"> <thead> <tr> <th>Size $\Phi(\text{mm})$</th> <th>Acceptable Quantity</th> </tr> </thead> <tbody> <tr> <td>0.20</td> <td rowspan="2">No dents</td> </tr> <tr> <td>\leq</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.50$</td> <td>3</td> </tr> <tr> <td>$0.50 < \Phi \leq 1.00$</td> <td>2</td> </tr> <tr> <td>$1.00 < \Phi$</td> <td>0</td> </tr> <tr> <td>Total Quantity</td> <td>3</td> </tr> </tbody> </table>	Size $\Phi(\text{mm})$	Acceptable Quantity	0.20	No dents	\leq	$0.20 < \Phi \leq 0.50$	3	$0.50 < \Phi \leq 1.00$	2	$1.00 < \Phi$	0	Total Quantity	3	2.5
Size $\Phi(\text{mm})$	Acceptable Quantity															
0.20	No dents															
\leq																
$0.20 < \Phi \leq 0.50$	3															
$0.50 < \Phi \leq 1.00$	2															
$1.00 < \Phi$	0															
Total Quantity	3															
5	Scratches	Follow NO.3 -2 Line Type.														

NO.	Item	Criterion	AQL																		
6	Chipped glass	<p>Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length</p> <p>6.1 General glass chip: 6.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="480 499 1241 607"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td>$Z \leq 1/2t$</td> <td>Not over 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> </tbody> </table> <ul style="list-style-type: none"> • Unit: mm • If there are 2 or more chips, x is the total length of each chip <p>6.1.2 Corner crack:</p>  <table border="1" data-bbox="475 909 1249 1016"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td>$Z \leq 1/2t$</td> <td>Not over 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> </tbody> </table> <ul style="list-style-type: none"> • Unit: mm • If there are 2 or more chips, x is the total length of each chip 	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over 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 over 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																			
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7	Glass crack	<p>Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length</p> <p>7.2 Protrusion over terminal: 7.2.1 Chip on electrode pad:</p>  <table border="1" data-bbox="879 1379 1331 1487"> <thead> <tr> <th>y: Chip width</th> <th>x: Chip length</th> <th>z: Chip thickness</th> </tr> </thead> <tbody> <tr> <td>$y \leq 0.5\text{mm}$</td> <td>$x \leq 1/8a$</td> <td>$0 < z \leq t$</td> </tr> </tbody> </table> <p>7.2.2 Non-conductive portion:</p>  <table border="1" data-bbox="879 1637 1318 1744"> <thead> <tr> <th>y: Chip width</th> <th>x: Chip length</th> <th>z: Chip thickness</th> </tr> </thead> <tbody> <tr> <td>$y \leq L$</td> <td>$x \leq 1/8a$</td> <td>$0 < z \leq t$</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. • If the product will be heat sealed by the customer, the alignment mark must not be damaged. <p>7.2.3 Substrate protuberance and internal crack</p>  <table border="1" data-bbox="823 1968 1315 2040"> <thead> <tr> <th>y: width</th> <th>x: length</th> </tr> </thead> <tbody> <tr> <td>$y \leq 1/3L$</td> <td>$X \leq a$</td> </tr> </tbody> </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	$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$	y: width	x: length	$y \leq 1/3L$	$X \leq a$			
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y: width	x: length																				
$y \leq 1/3L$	$X \leq a$																				



NO.	Item	Criterion	AQL												
8	Cracked glass	The LCD with extensive crack is not acceptable.	2.5												
9	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color is wrong.	2.5 2.5 0.65												
10	Bezel	Bezel must comply with product specifications.	2.5												
11	PCB,COB	11.1 COB seal cannot have pinholes larger than 0.2mm or contamination. 11.2 COB seal surface cannot have pinholes through to the IC. 11.3 The height of the COB should not exceed the height indicated in the assembly diagram. 11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places. 11.5 Parts on PCB must be the same as on the production characteristic chart, There should be no wrong parts, missing parts or excess parts. 11.6 The jumper on the PCB should conform to the product characteristic chart.	2.5 2.5 2.5 2.5 0.65 0.65												
12	FPC	12.1 FPC terminal damage $\leq 1/2$ FPC terminal width and cannot affect the function. Each unit is judged for acceptance. 12.2 FPC alignment hole damage $\leq 1/2$ alignment area and cannot affect the function. Each unit is judged for acceptance.	2.5 2.5												
13	Soldering	13.1 No cold solder joints, missing solder connections, oxidation or icicle. 13.2 No short circuits in components on PCB or FPC.	2.5 0.65												
14	Touch Panel Chipped glass	<p>Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length</p> <p>14.1 General glass chip: 14.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="365 1413 1366 1525"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td>$Z \leq t$</td> <td>$\leq 1/2 k$ and not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • Unit: mm • If there are 2 or more chips, x is the total length of each chip <p>14.1.2 Corner crack:</p>  <table border="1" data-bbox="365 1883 1366 1995"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td>$z \leq t$</td> <td>$\leq 1/2 k$ and not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • Unit: mm • If there are 2 or more chips, x is the total length of each chip 	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$	2.5
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NO.	Item	Criterion	AQL										
15	Touch Panel(Fish eye dent and bubble on film)	<table border="1"> <thead> <tr> <th>SIZE(mm)</th> <th>Acceptable Quantity</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td>Accept no dents</td> </tr> <tr> <td>$0.2 < D \leq 0.4$</td> <td>5</td> </tr> <tr> <td>$0.4 < D \leq 0.5$</td> <td>2</td> </tr> <tr> <td>$0.5 < D$</td> <td>0</td> </tr> </tbody> </table>  	SIZE(mm)	Acceptable Quantity	$\Phi \leq 0.2$	Accept no dents	$0.2 < D \leq 0.4$	5	$0.4 < D \leq 0.5$	2	$0.5 < D$	0	2.5
SIZE(mm)	Acceptable Quantity												
$\Phi \leq 0.2$	Accept no dents												
$0.2 < D \leq 0.4$	5												
$0.4 < D \leq 0.5$	2												
$0.5 < D$	0												
16	Touch Panel Newton ring	Newton ring dimension $\leq 1/2$ touch panel area and not affect font and line distortion ($\leq 2.5\%$), it is acceptable.	2.5										
17	Touch Panel Linearity	Less than 2.5% is acceptable.	2.5										
18	LCD Ripple	Touch the touch panel, cannot see the LCD ripple. Pen: R 1.0mm silicon rubber. Operation Force: 80g	2.5										
19	General appearance	19.1 Pin type must match type in specification sheet. 19.2 LCD pin loose or missing pins. 19.3 Product packaging must the same as specified on packaging specification sheet. 19.4 Product dimension and structure must conform to product specification sheet.	0.65 0.65 0.65 0.65										



11 Handling Precaution

11.1 Handling of LCM

- Avoid external shock.
- Don't apply excessive force on the surface.
- Liquid in LCD is hazardous substance, do not lick or swallow. If the liquid makes contact with your hand, skin, cloth, etc., wash it thoroughly and immediately.
- Don't operate it above the absolute maximum rating.
- Don't disassemble the LCM.
- The operator should wear protection whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.
- The modules should be kept in antistatic bags or other containers resistant to static for storage.
- The module is coated with a film to protect the display surface, be careful when peeling off this protective film since static electricity may be generated.

11.2 Storage

- Store it in an ambient temperature of $25\pm 10^{\circ}\text{C}$, and in a relative humidity of $50\pm 10\%\text{RH}$. Don't expose to sunlight or fluorescent light.
- Store it in a clean environment, free from dust, active gas, and solvent.
- Store it in anti-static electricity container.
- Store it without any physical load.

11.3 Soldering

- Use only soldering irons with proper grounding and no leakage.
- Iron: no higher than $280\pm 10^{\circ}\text{C}$ and less than 3 sec during hand soldering.
- Rewiring: no more than 2 times.



12 Ordering

12.1 Part Numbering Scheme

Table 1: Parallel TFT Part Numbering Scheme

MOP	TFT	240	320	24	A	BLM	TPR
1	2	3	4	5	6	7	8

12.2 Options

Table 2: Parallel Part Options

#	Designator	Options
1	Product Line	MOP: Matrix Orbital Parallel Display
2	Screen Type	TFT: Graphic TFT
3	Display Columns	240: Two Hundred Forty Pixel Columns
4	Display Rows	320: Three Hundred Twenty Pixel Rows
5	Display Size	24: 2.4"
6	Display Form Factor	A: A Form Factor
7	Brightness Level	-BLS: Brightness < 300 Nit -BLM: 300 Nit < Brightness < 600 Nit -BLH: 600 Nit < Brightness < 1000 Nit -BLD: Brightness > 1000 Nit
8	Touch Panel Type	TPN: None TPR: Resistive TPC: Capacitive

13 Contact

Sales

Phone: 403.229.2737

Email: sales@matrixorbital.ca

Support

Phone: 403.204.3750

Email: support@matrixorbital.ca

Online

Purchasing: www.matrixorbital.com

Support: www.matrixorbital.ca

