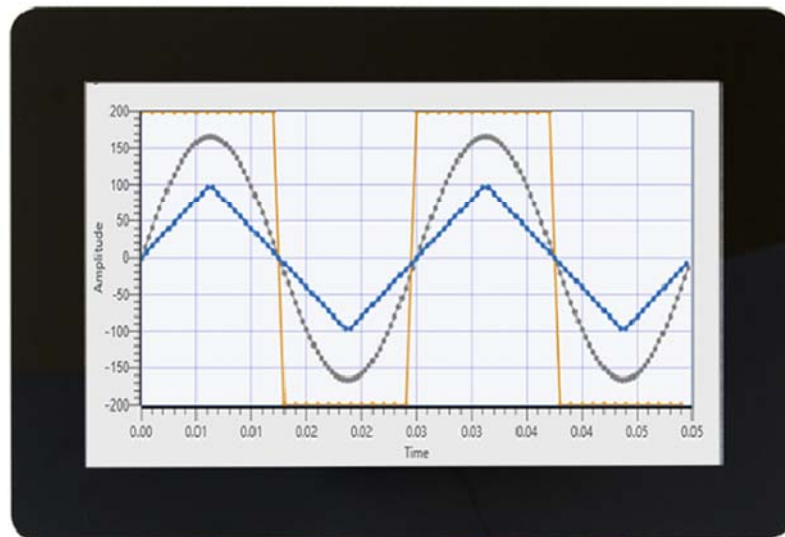
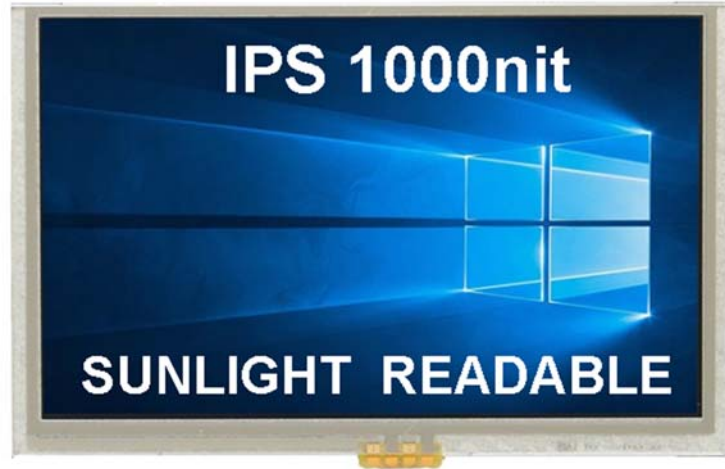


MOP-TFT800480-50A/G-IPS

Hardware Manual

Revision 1.0



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1 Contact



On Shore and In-House Design

In-House Sales

In-House Support

In Calgary, Canada

Sales

Phone: (403) 229-2737

Email: sales@matrixorbital.ca

Support

Phone: (403) 229-2737

Email: support@matrixorbital.ca

Online

Purchasing: www.matrixorbital.com

Support: www.matrixorbital.com

Free support forums

<https://www.lcdforums.com/forums>

Example Code on GitHub

<https://github.com/MatrixOrbital>

2 Customization

Need a custom solution? No problem! Since we manufacture our products in-house, we are highly flexible, have low MOQ's and provide you what you need. From custom headers to custom cables to entire custom displays, we can make what you need.

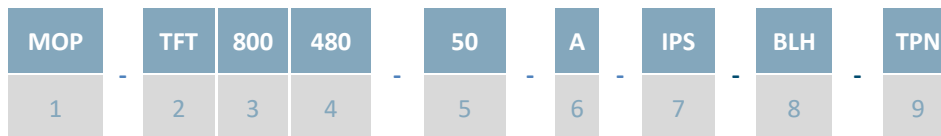


3 General Information

The MOP-TFT800480 is a 5.0" TFT.

Item	Contents	Unit
Display Size (Diagonal)	5.0"	inch
Display type	IPS TFT	
Resolution	800 x 480	Pixels
Display Mode	Transmissive, Normally Black	
Backlight	LED, 1000 cd/m ² , 50,000 hours	
View Direction	All	
Gray Scale Inversion Direction	None	
Module Outline	120.7 (W) x 75.8 (H)	mm
Active Area	108.0 (W) x 64.8 (H)	mm
Pixel Pitch	0.135 (W) x 0.135 (H)	mm
Polarizer Surface Treatment	Anti-glare	
Display Colors	16.7M 24-bit	
Interface	24-bit RGB interface	
Display Driver IC	HX8278 or Equivalent	
Capacitive Touch IC 50A	MXT336T or Equivalent	
Capacitive Touch IC 50G	GT911 or Equivalent	
Operating Temperature	-20 to 70	°C
Storage Temperature	-30 to 80	°C

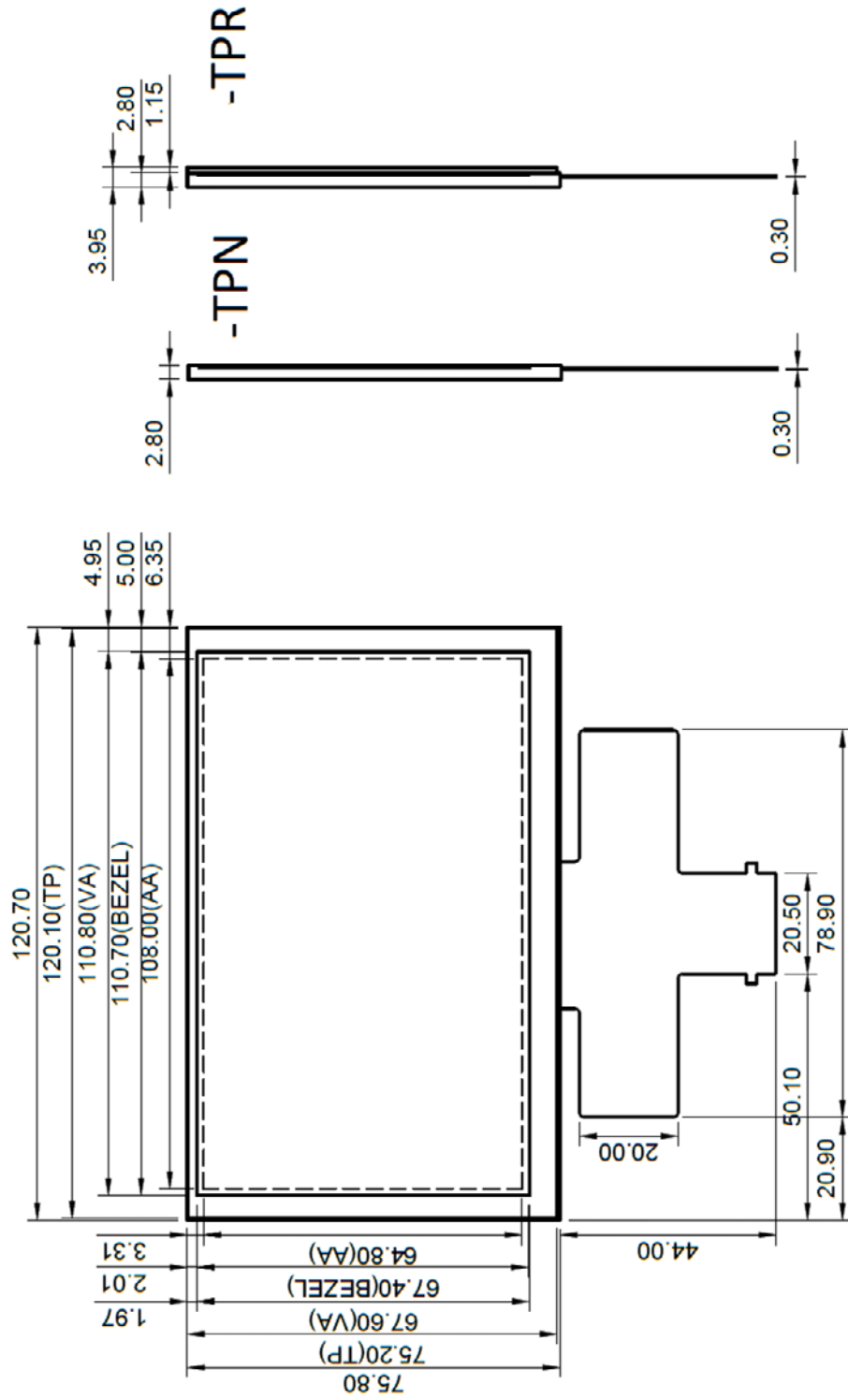
4 Part Numbering



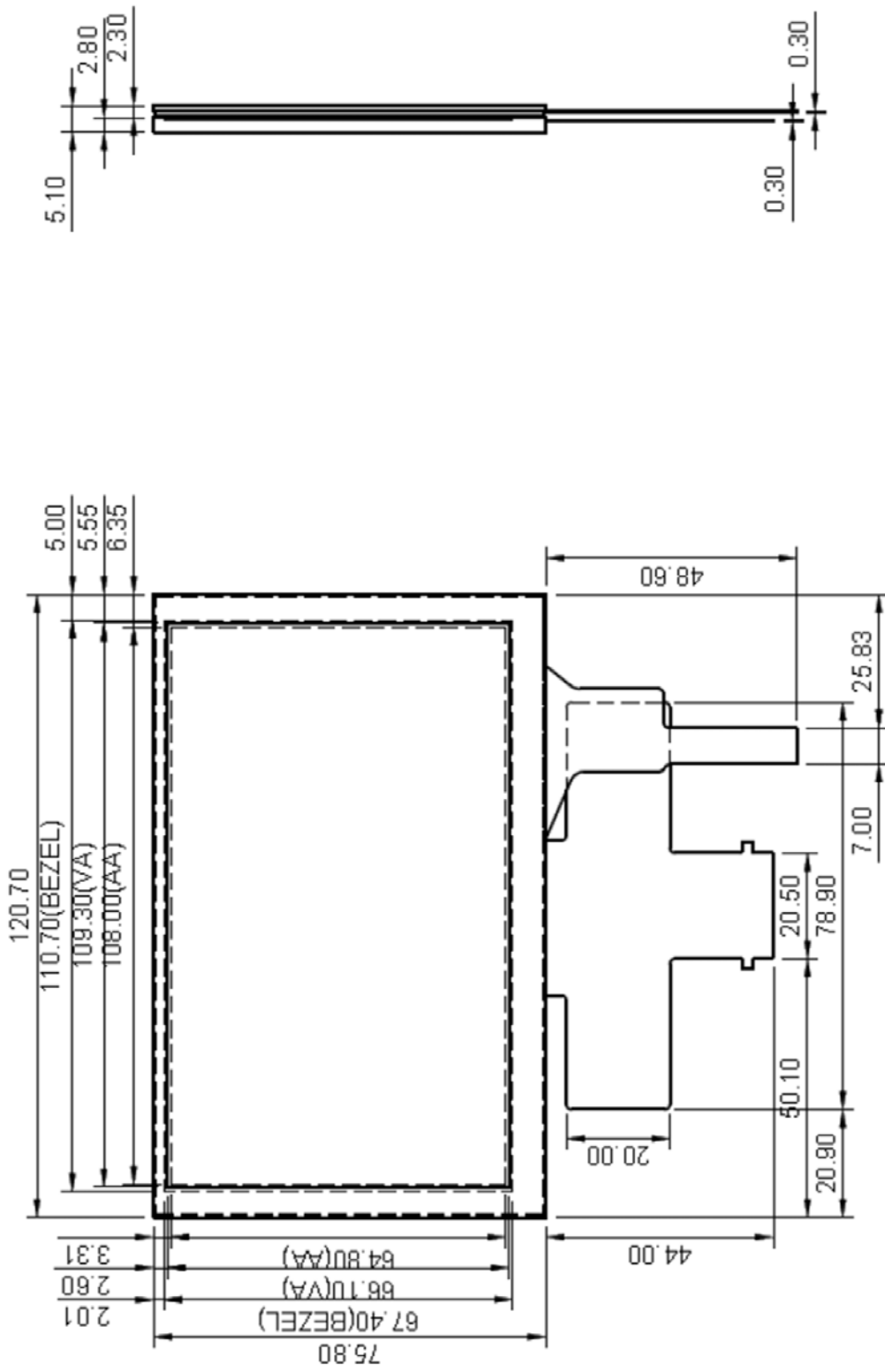
#	Designator	Options
1	Product Line	MOP: Matrix Orbital Parallel Display
2	Screen Type	TFT: Graphic TFT
3	Display Columns	800
4	Display Rows	480
5	Display Size	35: 3.5" 39: 3.9" 43: 4.3" 50: 5.0" 70: 7.0"
6	Display Form Factor	A: Standard TFT G: Extended Bezel capacitive touch panel
7	IPS Panel	-IPS
8	Brightness Level	-BLM: 300 - 600 Nit -BLH: 600 - 1000 Nit -BLD: 1000+ Nit
9	Touch Panel Type	TPN: None TPR: Resistive TPC: Capacitive

5 Dimensions

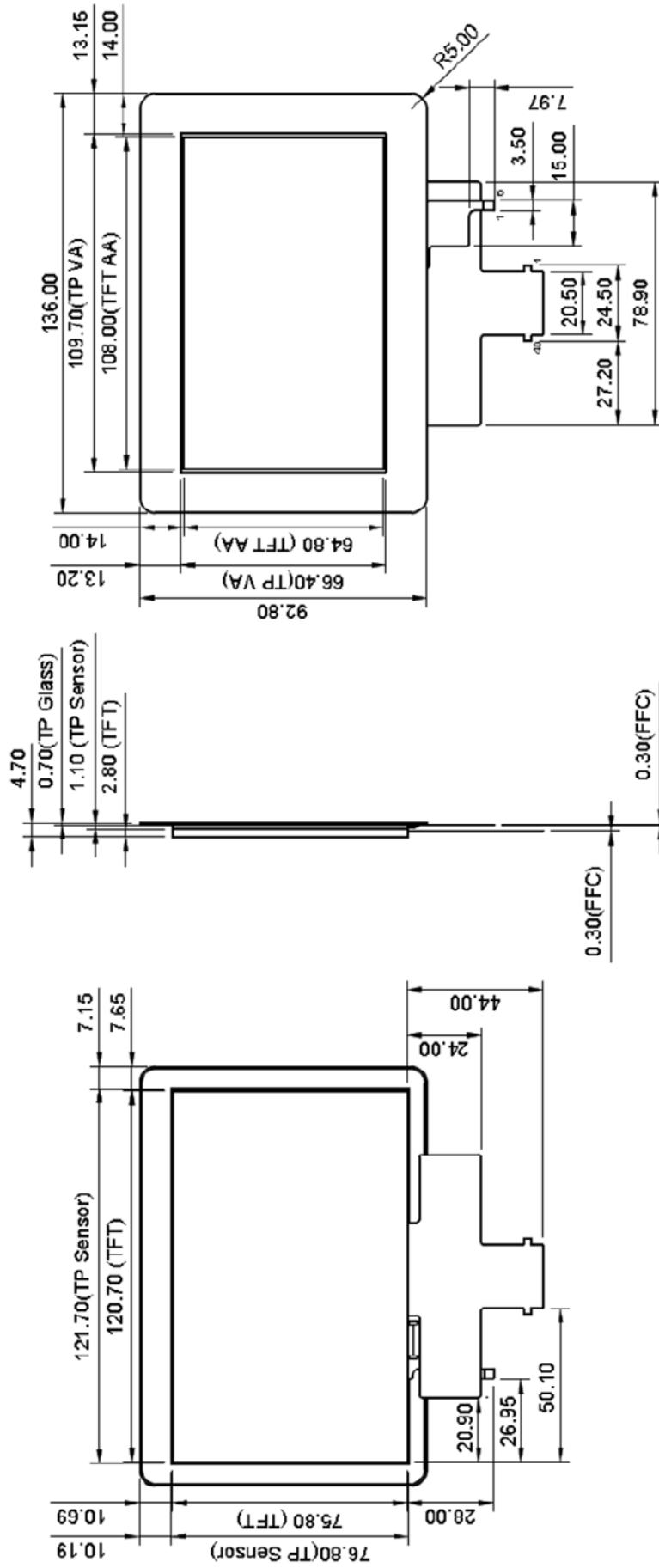
5.1 MOP-TFT800480-50A TPN & TPR



5.2 MOP-TFT800480-50A TPC



5.3 MOP-TFT800480-50G TPC



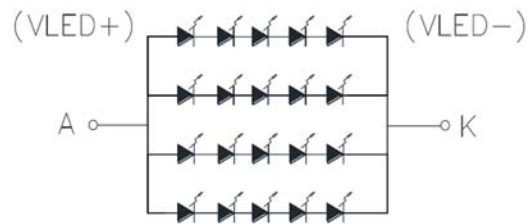
6 Electrical Characteristics

Item	Symbol	Min	Typ	Max	Unit
Digital Interface Supply Voltage	VCC	2.6	3.3	3.6	V
Logic Low input voltage	V _{IL}	GND	-	0.3*VCC	V
Logic High input voltage	V _{IH}	0.7*VCC	-	VCC	V
Logic Low output voltage	V _{OL}	GND	-	GND+0.4	V
Logic High output voltage	V _{OH}	VCC-0.4	-	VCC	V

7 Backlight Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	14.5	15.5	16.5	V
Forward Current	I _F	-	80	-	mA
Drive method	Constant current				
LED Configuration	20 White LEDs, 5 Serial x 4 Parallel				
Backlight life	50,000 hours				

Values at 25°C, 60% RH, at 50k hours backlight will be at 50% brightness



Item	TPN	TPR	TPC	Unit
Luminance	1000	800	900	nit
Contrast Ratio	500	500	500	

8 Touch Panel Characteristics

Coordinate Origin: top left corner

Parameter	-TPR (resistive)	-TPC (capacitive)
IC	NA	MXT336T or GT911
Touch Points	1	5
Hardness	3H	6H

8.1 Resistive

Item	Min.	Typ.	Max.	Unit	Note
Linearity	-3	-	3	%	Analog X and Y directions
Terminal resistance	1100	-	2600		X (Film side)
	10	-	250		Y (Glass side)
Insulation resistance	20	-	-	M	DC ≤10V
Voltage	-	-	10	V	DC
Chattering	-	-	10	ms	

***Note:** Do not operate it with a thing except a polyacetal pen (tip R0.8mm or less) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.

Item	Min.	Typ.	Max.	Unit	Note
Activation force	20	-	100	g	*Note
Durability-surface scratching	Write 20,000	-	-	Characters	*Note 2
Durability-surface pitting	1,000,000	-	-	Touches	*Note 3
Surface Hardness	3	-	-	H	

***Note 1:** Stylus pen Input: R0.8mm polyacetal pen or Finger

***Note 2:** Measurement for Surface area

- Force: 150-250gf
- Speed: 60mm/sec
- Stylus: R0.8 polyacetal pen or Finger

***Note 3:** Pit 1,000,000 times on the Film with a R3.75 silicon rubber.

- Force: 2.45N
- Speed: 3 times/sec

8.2 Capacitive

For increased sensitivity through acrylic or glass please contact us.

Item	
MXT336T: I2C Slave Address	0x4A (7bit)
GT911: I2C Slave Address	0x5D (7bit)
Touch Count Max	5
Durability	64g steel ball at 100cm

9 Interface Description

9.1 40 pin RGB

Suggested mating FFC connector, 40 position, 0.5mm pitch, Top contact.

FFC Header	Part Number
Matrix Orbital	
Omron Electronics	XF2M-4015-1A

Pin	Name	Description
1	LEDK	Backlight Cathode
2	LEDA	Backlight Anode
3	GND	Ground
4	VCC	Power source
5-12	Red (0-7)	Red data signal
13-20	Green (0-7)	Green data signal
21-28	Blue (0-7)	Blue data signal
29	GND	Ground
30	CLK	Clock signal to sample each data
31	DISP	Display on/off signal. High Display on; Low Display off
32	HSYNC	Horizontal sync
33	VSNC	Vertical sync
34	DEN	No connection
35	NC	No connection
36	GND	Ground
37	XR	Resistive touch (-TPR) otherwise NC
38	YD	Resistive touch (-TPR) otherwise NC
39	XL	Resistive touch (-TPR) otherwise NC
40	YU	Resistive touch (-TPR) otherwise NC

9.2 Capacitive Touch

MOP-TFT800480-50A TPC

Suggested mating FFC connector, 6 position, 1.0mm pitch, Top & Bottom contact.

FFC Header	Part Number for 50A
Amphenol ICC	HFW6R-2STE1H1LF

Pin	Name	Description
1	GND	Ground
2	INT	External interrupt to the host
3	RST	External Reset, Low is active
4	VDD	Power
5	SCL	I2C Clock
6	SDA	I2C Data

*Note: Pull up resistors of 10K ohms to VDD are recommended for RST and INT

**Note: Pull up resistors of 1k-10k ohms to VDD are required for SCL and SDA

MOP-TFT800480-50G TPC

Suggested mating FFC connector, 6 position, 0.5mm pitch, Top & Bottom contact.

FFC Header	Part Number for 50G
Molex	5034800600

Pin	Name	Description
1	GND	Ground
2	INT	External interrupt to the host
3	RST	External Reset, Low is active
4	VDD	Power
5	SCL	I2C Clock
6	SDA	I2C Data

*Note: Pull up resistors of 10K ohms to VDD are recommended for RST and INT

**Note: Pull up resistors of 1k-10k ohms to VDD are required for SCL and SDA

10 Interface Pixel Timing

Characteristics		Symbol	Min.	Typ.	Max.	Unit
DOTCLK Frequency		Fclk		33.3	50	MHz
Hsync	Period Time	Th	862	1056	1200	DCLK
	Display Period	Thdisp		800		DCLK
	Back Porch	Thbp		46		DCLK
	Front Porch	Thfp	16	210	354	DCLK
	Pulse Width	Thw	1		40	DCLK
Vsync	Period Time	Tv	510	525	650	H
	Display Period	Tvdisp		480		H
	Back Porch	Tvbp		23		H
	Front Porch	Tvfp	7	22	147	H
	Pulse Width	Tvw	1		20	H

11 Power Sequence

11.1 Power Up Sequence

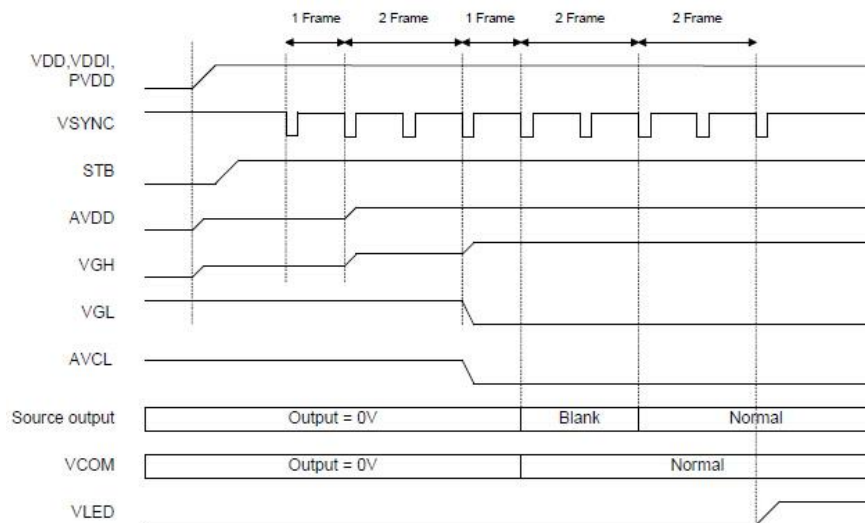


Figure 1: Power Up Sequence

11.2 Power Down Sequence

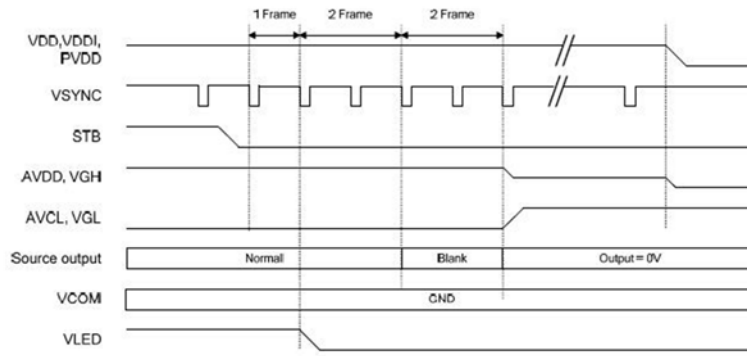


Figure 2: Power Down Sequence

12 Environmental

Item	Min	Max	Unit
Operation Temperature	-20	70	°C
Storage Temperature	-30	80	°C
Humidity		90%*	RH

*noncondensing

13 Suggested Products

EVE3x-50A/50G: 800x480 TFT, 1000nit IPS, SPI or USB TFT using the EVE3 graphics engine

<https://www.matrixorbital.com/eve3x-50a-ips>

<https://www.matrixorbital.com/eve3x-50g-ips>

HTT50A/50G: 800x480 TFT, 1000nit IPS, HDMI display with USB touch

<https://www.matrixorbital.com/htt50a-ips>

<https://www.matrixorbital.com/htt50g-ips>

GTT50A: Intelligent UART 5.0" 1U TFT USB, I2C, Serial, RS422 with software development tools.

<https://www.matrixorbital.com/gtt50a>

14 Inspection Criterion

Description

This specification is made to be used as the standard acceptance/rejection criteria.

Sample plan

Sampling plan:

1999 and ANSI/ASQC Z1.4-1993

Single sampling, normal inspection

Visual inspection: AQL 1.5%

Electrical functional: AQL 0.65%

Inspection condition

- Viewing distance for cosmetic inspection is about 30 ± 2 cm with bare eyes, and under a 1000~1500lux environment for visual inspection. All directions for inspecting the sample should be within 45° against perpendicular line. (Normal temperature $18\sim 28^\circ\text{C}$ and normal humidity $60\pm 15\%\text{RH}$).
- During testing, the LCD is driven using the voltage level (Within $\pm 0.5\text{V}$ of the typical value at 25°C .) that provides the most optical contrast

Definition of inspection zone in LCD

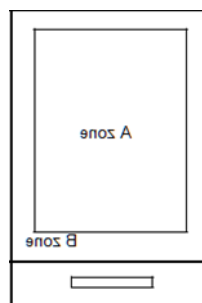


Figure 3: Inspection Zones in an LCD

Zone A: Active Area

Zone B: Viewing Area

Function Defect

Items to be inspected	Inspection criterion	Classification of defects
-----------------------	----------------------	---------------------------

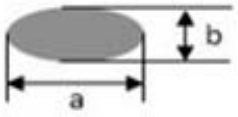
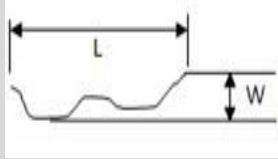
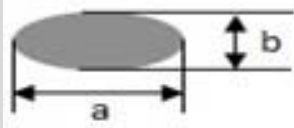
All functional defects	1) No display 2) Display abnormally 3) Missing vertical, horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting. 6) obvious striation 7) Current beyond specification value	MA
Missing	Missing component	
Outline dimension	Overall outline dimension exceeds the drawing is not allowed.	

LCD pixel defect (bad dot) (defect type: MI)

Checking item	Judgment criterion	Total
Bright dot	0	0
Dark dot	N≤2	N≤2
Total dot	N≤2	N≤2
Mura	Not visible through 5% ND filters	

*Note: Bright dot caused by scratch and foreign object accords to item 1.

Dot and line defect (defect type: MI)

Checking item	Judgment criterion			Figure
	Diameter(mm)\LCD Size		S ≤5.0 Inch	
Dot defect	D≤0.10		Allowed	 $D=(a+b)/2$
	0.10<D≤0.15		2	
	0.15<D≤0.25		1	
	0.25<D		0	
	Total		2	
	Distance between 2 defects should be more than 3mm apart.			
Line defect	Length(mm)	Width(mm)	Judgment criterion	
	---	W≤0.03	allowed	
	L≤2.5	0.03<W≤0.05	3	
	L≤2.5	0.05<W≤0.10	2	
	---	0.1<W	0	
	Total		3	
Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable				
Concave point and air bubble for polarizer	Size(mm)		Judgment criterion	 $D=(a+b)/2$
	D≤0.20		allowed	
	0.20<D≤0.30		4	
	0.30<D≤0.50		1	
	D>0.50		None	

15 Handling Precautions

Mounting method

Do not make extra holes in the display or modify its shape. When mounting the display, ensure that the display does not flex, bend or twist. Extreme care should be used when handling the LCD modules.

LCD Handling and Cleaning Precaution

To clean the display surface, it is recommended to wipe lightly using a soft cloth with either Isopropyl alcohol or Ethyl alcohol. Do not wipe the display surface with dry or hard materials as it may damage the polarizer surface. Do not use Water or Aromatics to clean the display.

Do not wipe ITO pad area with dry or hard materials that will damage the ITO patterns

Do not use Soldering flux, Chlorine (Cl), and Sulfur(S) on the pad or prevent it from being contaminated.

If the display is sent without applying a silicon coat on the pad, the ITO patterns could be damaged due to corrosion as time goes on.

If ITO corrosion occurs due to customer miss-handling, or if the customer applies materials such as Chlorine (Cl), Sulfur (S) to the display, the responsibility is placed the customer.

Static Charge Precaution

The LCD module uses CMOS LSI drivers, so we recommend that you:

- Connect any unused input terminal to VDD or VSS
- Do not input any signals before power is turned on
- Ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

Packing

The module employs LCD elements and must be treated as such.

- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

Precautions during Operation

- It is an indispensable condition to drive the LCD module within the specified voltage limits. Applying voltage higher than the limit will reduce the life span of the LCD.
- Using direct drive current should be avoided, as it will induce an electrochemical reaction causing undesirable deterioration.
- The LCD's response time will be delayed when operating at a temperature lower than the suggested operating range. When operating at a temperature higher than the suggested range, the LCD will be noticeably darker. The display will return to normal when it is brought back to the specified operation temperature.
- If the display area is pushed hard during operation, some font may be abnormally drawn but the LCD will return to normal after it is reset.
- Slight dew depositing on terminals can cause an electro-chemical reaction, damaging traces and resulting in an open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required

Storage Recommendations

When storing the LCD for a prolonged period of time, the following recommendations will help prevent damage or deterioration

- Store the display in an ambient temperature range between 10°C to 30°C, and in a relative humidity of 45% to 75%.
- Do not leave the display exposed to sunlight or fluorescent light.
- Place the display in a polyethylene bag with the opening sealed.
- Ensure that nothing is making contact with the polarizer surface.
- It is recommended to store them in the same packaging that was provided upon purchase

Safety Precautions

In the case that the LCD glass has shattered, it is recommended to remove any glass pieces, wash off the liquid crystal using either acetone or ethanol, and proceed to burn any remaining display pieces.

If any liquid leaked out of a damaged glass cell, and comes in contact with your hands, please wash it off well with soap and water.

16 Revision History

Revision	Date	Description	Author
1.0	July 1 2020	Initial Release	Henry