EVE 3 4.3"

This datasheet gives detailed information about the Riverdi 4.3" EVE3 displays. The displays come in different versions: with **capacitive, resistive, or no touchscreen**, with a decorative **cover glass**, as well as with our without a **metal mounting frame**.

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Rev.1.0
2018-10-22

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally white	/
Size	4.3	Inch
Viewing Direction	12:00 (without image inversion)	O' Clock

Gray Scale Inversion Direction		6:00	O' Clock
Number of Dots		480 x (RGB) × 272	/
Driver IC		BT81x	/
Interface Type		SPI/QSPI	/
Module Memory Size		1 MB (BT81x) + 64 Mb (external flash)	/
Brightness	no touch module	550	cd/m2
	CTP module	500	
	RTP module	440	
Color Depth		16.7M	/
Pixel Arrangement		RGB Vertical Stripe	/
Surface Treatment		Anti-glare / Clear (for CTP)	/
Input Voltage		3.3	V

Note 1: RoHS, REACH SVHC compliant

Note 2: LCM weight tolerance: ± 5%.

Revision Record

REV NO.	REVDATE	CONTENTS	REMARKS
1.0	2018-10-22	Initial Release	

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1. Module classification information

RV	T	43	x	L	B	x	W	x	00
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

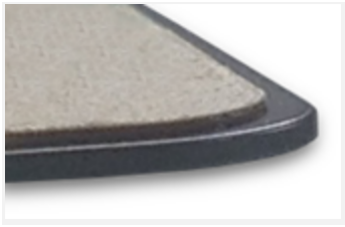
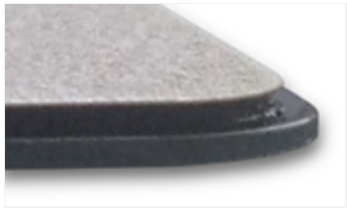
1.	**BRAND**	**RV – Riverdi**
2.	**PRODUCT TYPE**	**T – TFT Standard** F – TFT Custom
3.	**DISPLAY SIZE**	**43 – 4.3”**
4.	**MODEL SERIAL NO.**	A (A-Z) U – UxTouch
5.	**RESOLUTION**	**L– 480×272 px**
6.	**INTERFACE**	**B – TFT + Controller BT81x**
7.	**FRAME**	N – No Frame F – Mounting Frame
8.	**BACKLIGHT TYPE**	**W – LED White**
9.	**TOUCH PANEL**	N – No Touch Panel R – Resistive Touch Panel C – Capacitive Touch Panel
10.	**VERSION**	00 (00-99)

2. Assembly guide – integration

Three options of rear side adhesive tape are available: double side adhesive tape 0.2 mm with 3M 467MP glue, foam double side adhesive tape 0.5 mm with DST 3M 9495LE glue or without any tape.

There are also two versions of glass color: black and white.

Rear side adhesive tape options:

		
Double side adhesive tape with DST 3M 9495LE glue (total thickness 0.2mm)	Foam double side adhesive tape with 3M 9495LE glue (total thickness 0.5mm)	Without tape

Cover glass color options:

BLACK	WHITE

Product options:

NAME OF THE PRODUCT	PART NUMBER	DESCRIPTION
RiTFT-43	RVT43ALBNWN00	BT816, no touch panel
RiTFT-43-RES	RVT43ALBNWR00	BT816, resistive touch panel
RiTFT-43-CAP	RVT43ALBNWC00	BT815, capacitive touch panel
RiTFT-43- FR	RVT43ALBFWN00	BT816, no touch panel, mounting frame
RiTFT-43-RES-FR	RVT43ALBFWR00	BT816, resistive touch panel, mounting frame
RiTFT-43-CAP-FR	RVT43ALBFWC00	BT815, capacitive touch panel, mounting frame
RiTFT-43-CAP-UX	RVT43ULBNWC00	BT815, uxTouch, black cover glass, 0.2mm DST
	RVT43ULBNWC01	BT815, uxTouch, black cover glass, 0.5 mm DST
	RVT43ULBNWC02	BT815, uxTouch, black cover glass, no DST
	RVT43ULBNWC03	BT815, uxTouch, white cover glass, 0.2mm DST
	RVT43ULBNWC04	BT815, uxTouch, white cover glass, 0.5 mm DST

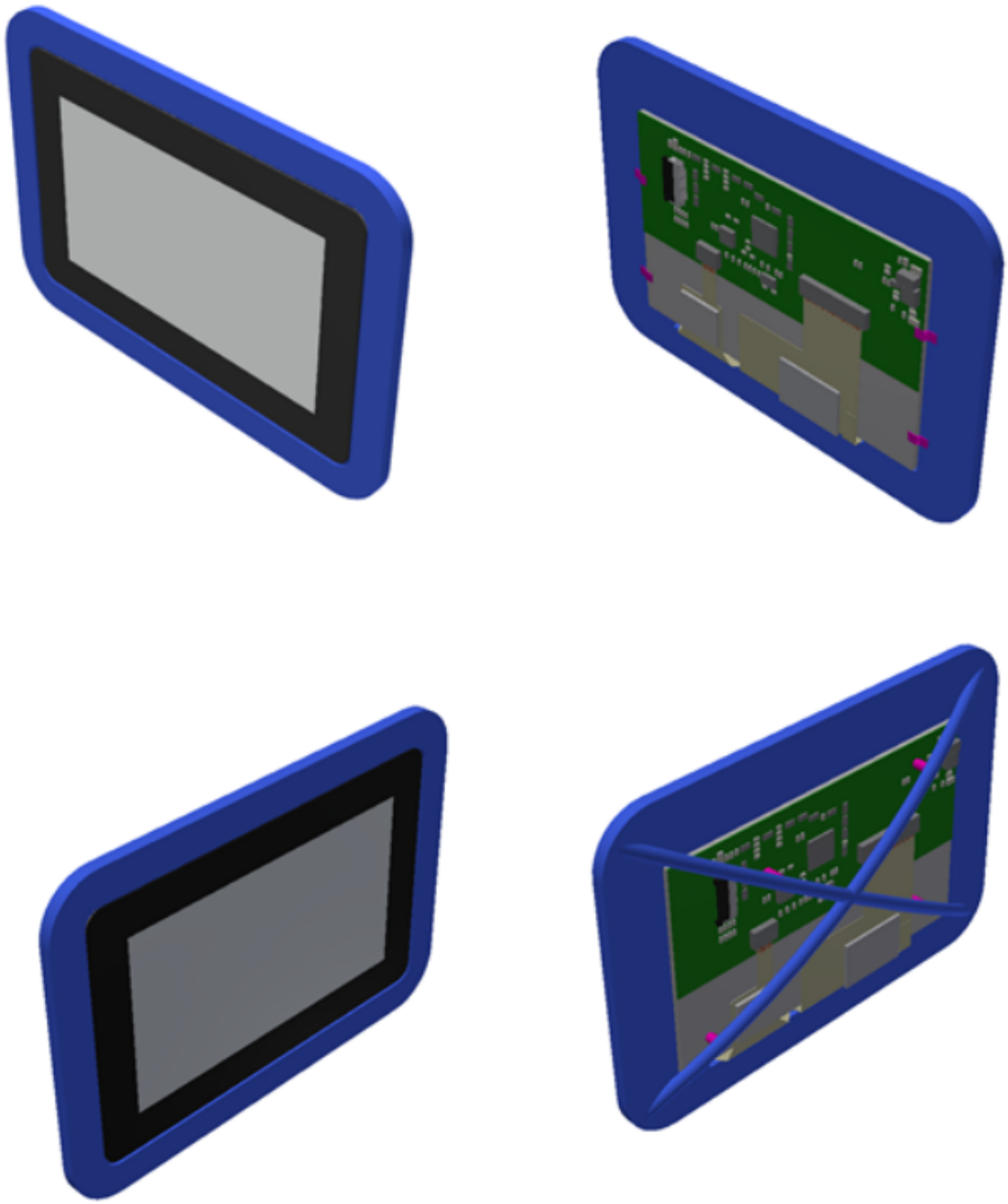
RVT43ULBNWC05	BT815, uxTouch, white cover glass, no DST

2.1. UxTouch assembly

UxTouch are LCD TFT displays with specially designed projected capacitive touch panels. UxTouch display can be mounted without any holed in the housing. Our standard UxTouch displays include double-sided adhesive tape (DST) to stick TFT easily to the housing. Basic series include 4.3”, 5.0” and 7.0” display sizes.

UxTouch models with double-side adhesive tape (PN with endings 00, 01, 03, 04) can be mounted by connecting the glass to the housing. Riverdi recommends to use support brackets assembled to display’s back. An additional support will stiffen the whole structure and minimize the influence of external factors such as vibration. Figure 1 and Figure 2 below show examples of using support elements.

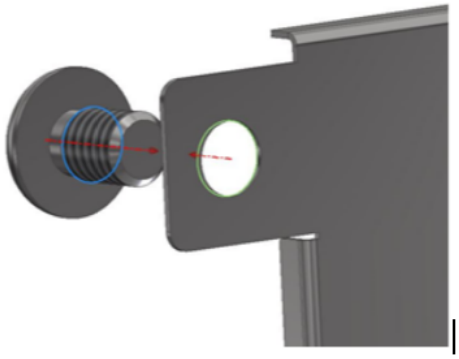
Figure 1. Example of using support brackets



2.2. Mounting frame

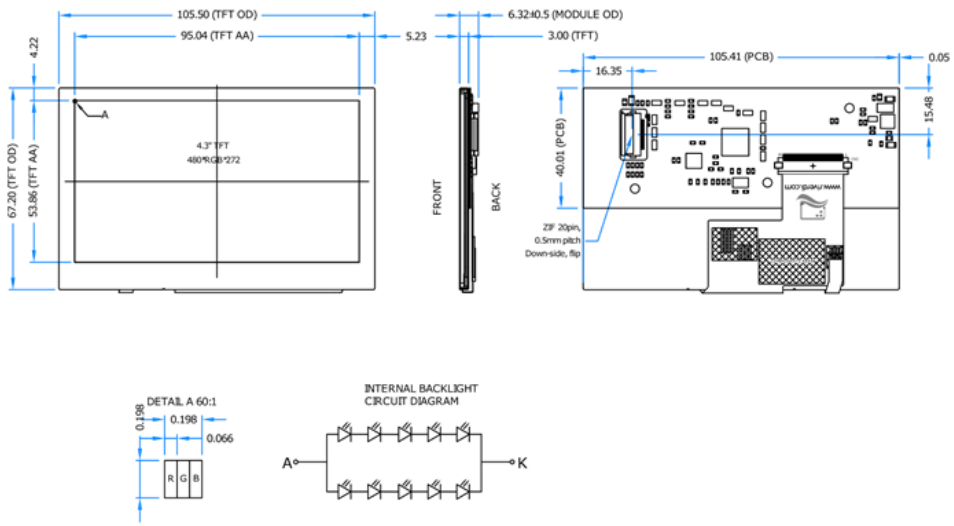
For dimensions 3.5”, 4.3”, 5.0” and 7.0” the product with mounting frame version is available. Thanks to the four catches attached to the side, frame provides strong assembly to the surface by mounting element (like the screw, see Figure 2). The frames are specially designed to fit Riverdi products perfectly. The diameter of the mounting hole is 3.5mm.

Figure 2. Mounting frame



3. Module drawing

Revision:	Changes:	Date:
1.0	Initial Case	6.12.2018



TFT PINOUT	
PIN	DESC
1	VDD
2	GND
3	SPI_SCLK
4	MISO/IO1
5	MOSI/IO0
6	CS
7	INT
8	PD
9	NC
10	AUDIO_OUT
11	GPIO0/IO2
12	GPIO1/IO3
13	GPIO2
14	GPIO3
15	NC
16	NC
17	BLVDD
18	BLVDD
19	BLGND
20	BLGND

GEMERAL NOTES:

1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
2. OPERATION VOLTAGE: VDD=3.3V
3. VIEWING DIRECTION: 12 O'CLOCK
4. IC CONTROLLER: BT816
5. OPERATING TEMP.: -20℃ ~ 70℃
6. STORAGE TEMP.: -30℃ ~ 80℃
7. LED BACKLIGHT: 10-LED WHITE, BUILT-IN INVERTER
8. SURFACE LUMINANCE: 550 cd/m²
9. GENERAL TOLERANCE: ±0.2 mm
10. RoHS COMPLIANT

PN:	RVT43ALBNWN00
SN:	####
DRAWN: P.M.	01/02/19
CHECKED:	
APPR:	

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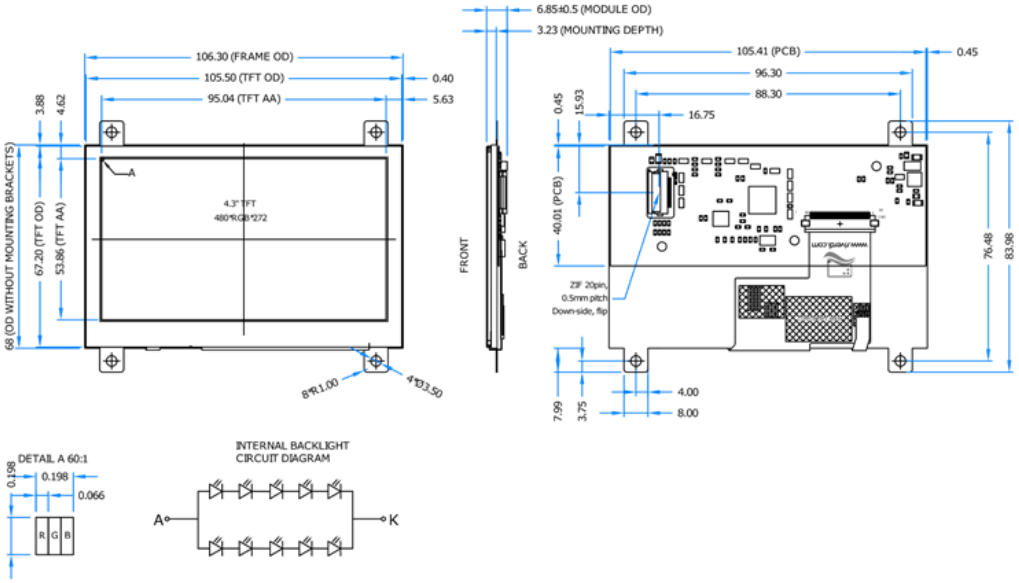

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7	INT
8	PD
9	NC
10	AUDIO_OUT
11	GPIO0/IO2
12	GPIO1/IO3
13	GPIO2
14	GPIO3
15	NC
16	NC
17	BLVDD
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20	BLGND

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PN: RVT43ALBFWN00			
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DRAWN: P.M.	01/02/19	1:1.00	
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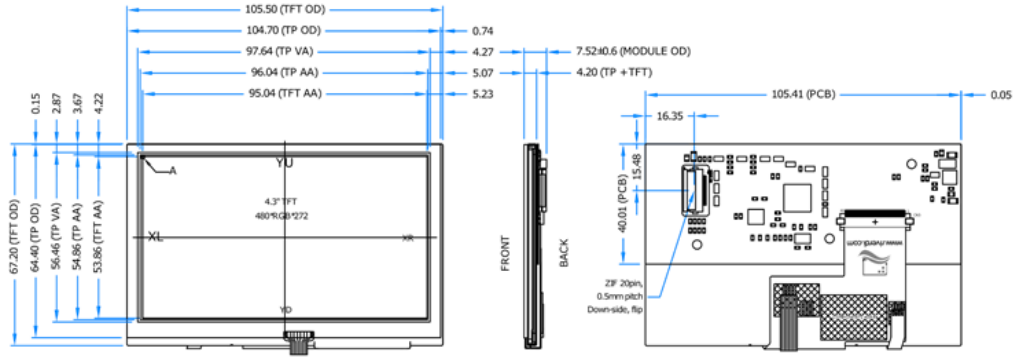

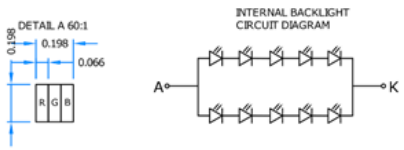

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13	GPIO2
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7. LED BACKLIGHT: 10-LED WHITE, BUILT-IN INVERTER
8. SURFACE LUMINANCE: 440 cd/m²
9. GENERAL TOLERANCE: ±0.2 mm
10. RoHS COMPLIANT

PN: RVT43ALBNWR00			
SN: ####			
DRAWN: P.M.	01/02/19	1:1.00	
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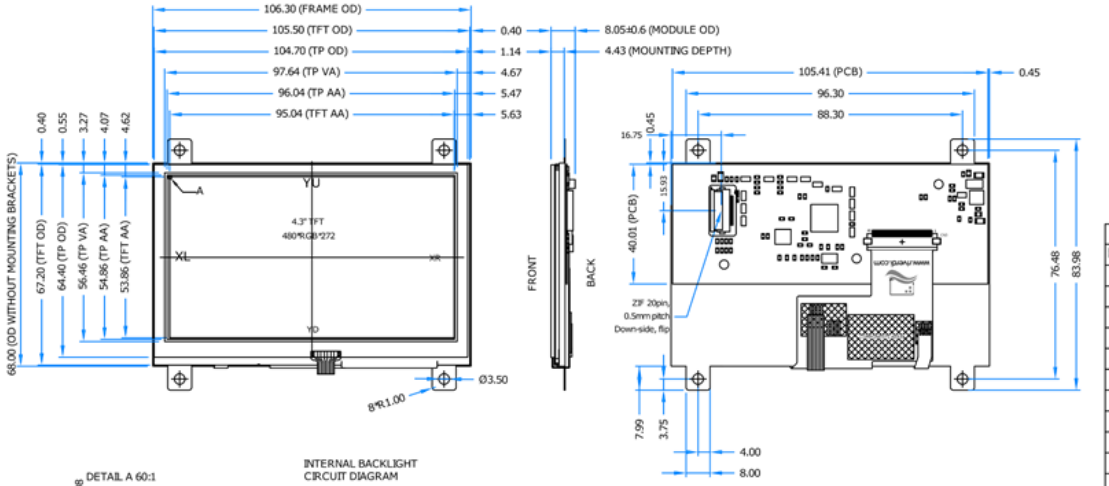

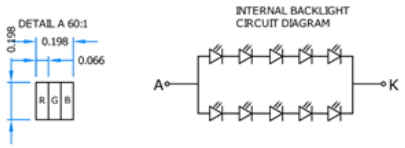

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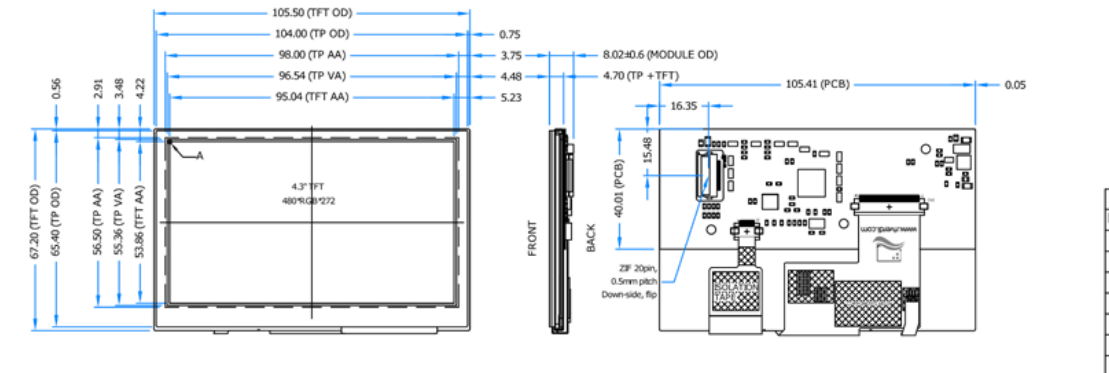

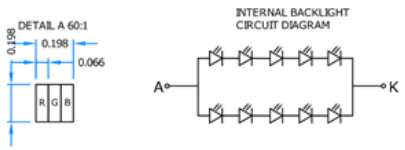

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2. OPERATION VOLTAGE: VDD=3.3V
3. VIEWING DIRECTION: 12 O'CLOCK
4. IC CONTROLLER: BT815
5. OPERATING TEMP.: -20℃ ~70℃
6. STORAGE TEMP.: -30℃ ~80℃
7. LED BACKLIGHT: 10-LED WHITE, BUILT-IN INVERTER
8. SURFACE LUMINANCE: 500 cd/m²
9. GENERAL TOLERANCE: ±0.2 mm
10.RoHS COMPLIANT

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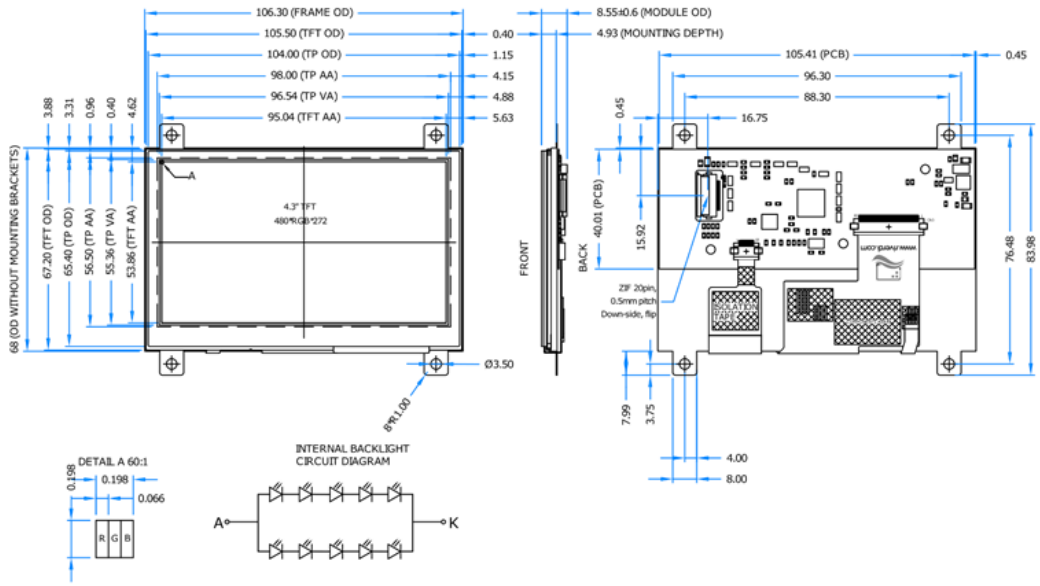

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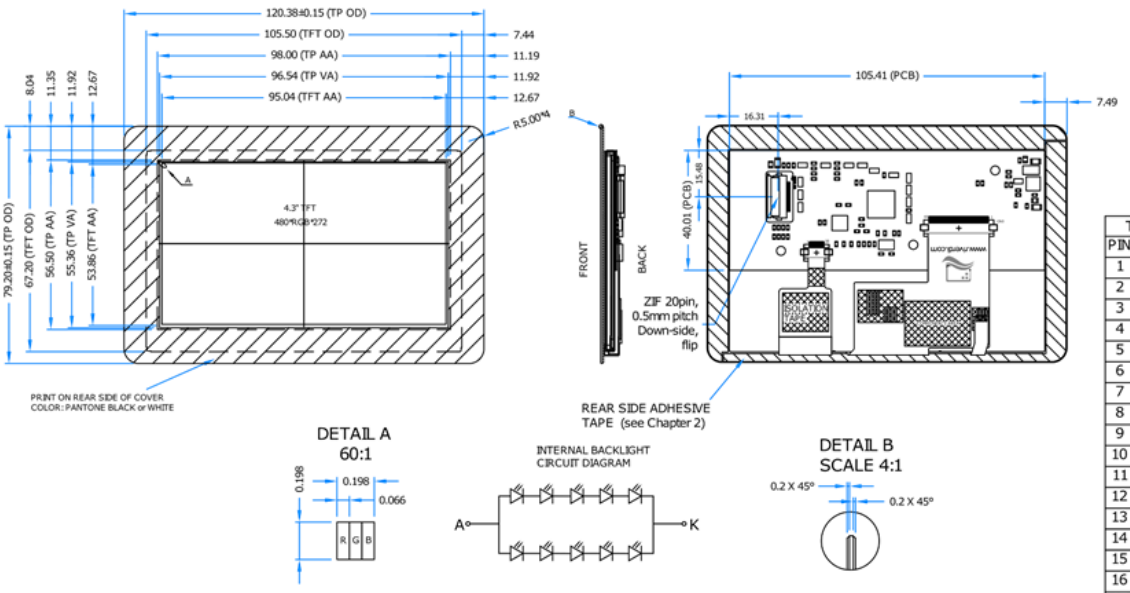

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PN:	RVT43ULBNWC0X
SN:	####
DRAWN: P.M.	01/02/19
CHECKED:	
APPR:	
1:1.00 [mm]	ISO A3
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4. Absolute maximum ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage for Logic	VDD	0	4.0	V
Supply Voltage for LED Inverter	BLVDD	0	7.0	V
Input Voltage for Logic	VIN	0	4.0	V
LED forward current (each LED)	IF	–	25	mA
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Humidity	RH	–	90% (Max 60°C)	RH

5. Electrical characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Supply Voltage For Module	VDD	3.0	3.3	3.6	V	
Input Voltage for LED Inverter	BLVDD	2.8	5.0	5.5	V	
LED Backlight Current	IDDbacklight	–	260	325	mA	BLVDD=3.3V
LED Backlight Current	IDDbacklight	–	150	187	mA	BLVDD=5V
Input Voltage ' H ' level	V_{IH}	0.7VDD	–	VDD	V	
Input Voltage ' L ' level	V_{IL}	0	–	0.2VDD	V	
Input Current	I_{In}		TBD		mA	
Input Current for module with CTP	I_{InC}		TBD		mA	

6. Backlight characteristics

ITEM	SYMBOL	MIN	TYP	MAX	UNIT

Voltage for LED backlight	V_l	–	16	–	V
Current for LED backlight	I_l	–	40	60	mA
LED Life Time	–	30000	50000	–	H_{rs}

Note: The LED Supply Voltage is defined by the numbers of LED at Ta=25°C and IL= 40mA.

7. Electro-optical characteristics

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK	NOTE
Response Time		Tr+Tf	θ=0° ⌀=0° Ta=25	–	20	30	ms	Figure 4	4
Contrast Ratio		Cr		320	400	–	—	Figure 5	1
Luminance Uniformity		δ WHITE		80	–	–	%	Figure 5	3
Surface Luminance	TFT	Lv		440	550	–	cd/m2	Figure 5	2
	TFT+CTP			400	500	–			
	TFT+RTP			350	440	–			
Viewing Angle Range		θ	⌀ = 90°	35	50	–	deg	Figure 6	6
			⌀ = 270°	55	70	–	deg	Figure 6	
			⌀ = 0°	55	70	–	deg	Figure 6	
			⌀ = 180°	55	70	–	deg	Figure 6	
CIE (x, y) Chromaticity	Red	x	θ=0° ⌀=0° Ta=25	0.570	0.620	0.670	Figure 6		5
		y		0.294	0.344	0.394			
	Green	x		0.256	0.306	0.356			
		y		0.513	0.563	0.613			
	Blue	x		0.083	0.133	0.183			
		y		0.099	0.149	0.199			
	White	x		0.250	0.300	0.350			
		y		0.280	0.330	0.380			

Note 1. Contrast Ratio(CR) is defined mathematically as below, for more information see Figure 4 .

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P3, P4, P5)}}$$

Note 2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information, see Figure 4 .

$$Lv = \text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}$$

Note 3. The uniformity in surface luminance δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information, see Figure 4 .

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

Note 4. Response time is the time required for the display to transition from white to black (Rise Time, Tr) and from black to white (Decay Time, Tf). For additional information see FIG 1. The test equipment is Autronic-Melchers's ConoScope series.

Note 5. CIE (x, y) chromaticity, the x, y value is determined by measuring luminance at each test position 1 through 5, and then make average value.

Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see Figure 4.

Note 7. For viewing angle and response time testing, the testing data is based on Autronic-Melchers's ConoScope series. Instruments for Contrast Ratio, Surface Luminance, Luminance Uniformity, CIE the test data is based on TOPCON's BM-5 photo detector.

Note 8. For TFT module, Gray scale reverse occurs in the direction of panel viewing angle.

Figure 3. The definition of response time

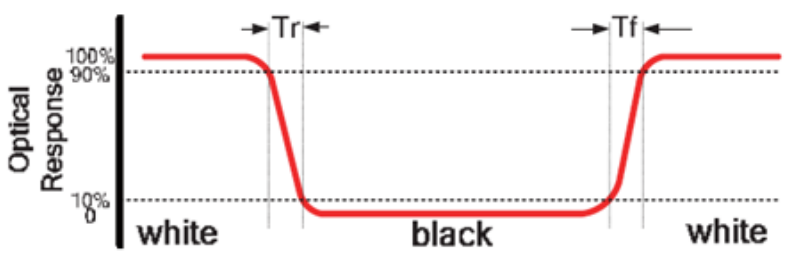


Figure 4. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

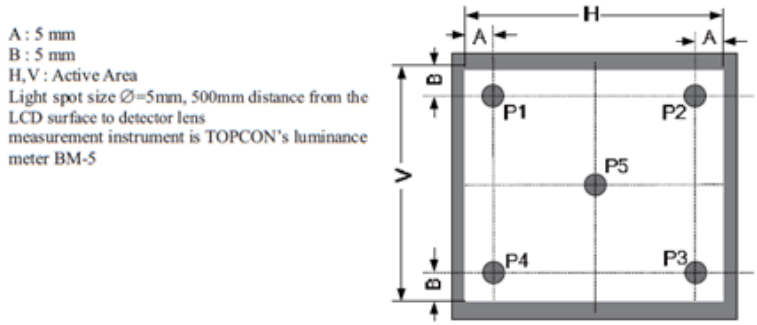
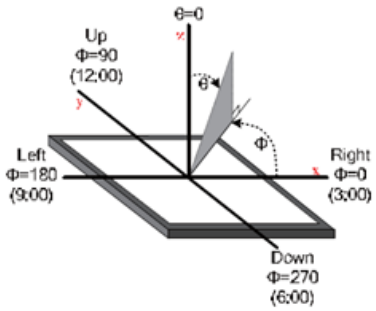


Figure 5.The definition of viewing angle



8. Interface description

PIN NO.	SYMBOL	DESCRIPTION
1	VDD	Power Supply
2	GND	Ground
3	SPI_SCLK	SPI SCK Signal, Internally 47k Pull UP
4	MISO/ IO1	SPI MISO Signal / SPI Quad mode: SPI data line 1
5	MOSI/ IO0	SPI MOSI Signal / SPI Quad mode: SPI data line 0
6	CS	SPI Chip Select Signal , Internally 47k Pull UP
7	INT	Interrupt Signal, Active Low, Internally 47k Pull UP
8	PD	Power Down Signal, Active Low, Internally 47k Pull UP
9	NC	Not Connected
10	AUDIO_OUT	Audio Out Signal
11	GPIO0/IO2	SPI Single mode: General purpose IO0/ SPI Quad mode: SPI data line 2
12	GPIO1/IO3	SPI Single mode: General purpose IO1/ SPI Quad mode: SPI data line 3
13	GPIO2	General purpose IO2
14	GPIO3	General purpose IO3 or analog input for ADC
15	NC	Not Connected

16	NC	Not Connected
17	BLVDD	Backlight Power Supply, Can Be Connected to VDD
18	BLVDD	Backlight Power Supply, Can Be Connected to VDD
19	BLGND	Backlight Ground, Internally connected to GND
20	BLGND	Backlight Ground, Internally connected to GND

9. BT8x Controller specifications

BT8x or EVE3 (Embedded Video Engine 3) simplifies the system architecture for advanced human machine interfaces (HMIs) by providing functionality for display, audio, and touch as well as an object oriented architecture approach that extends from display creation to the rendering of the graphics.

9.1. Serial host interface

Figure 6. SPI interface connection

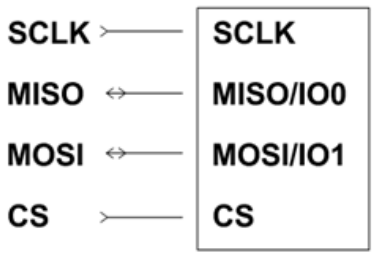
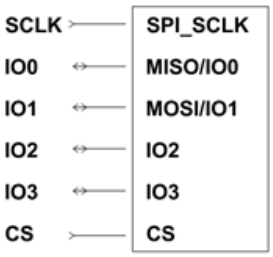


Figure 7. QSPI interface connection

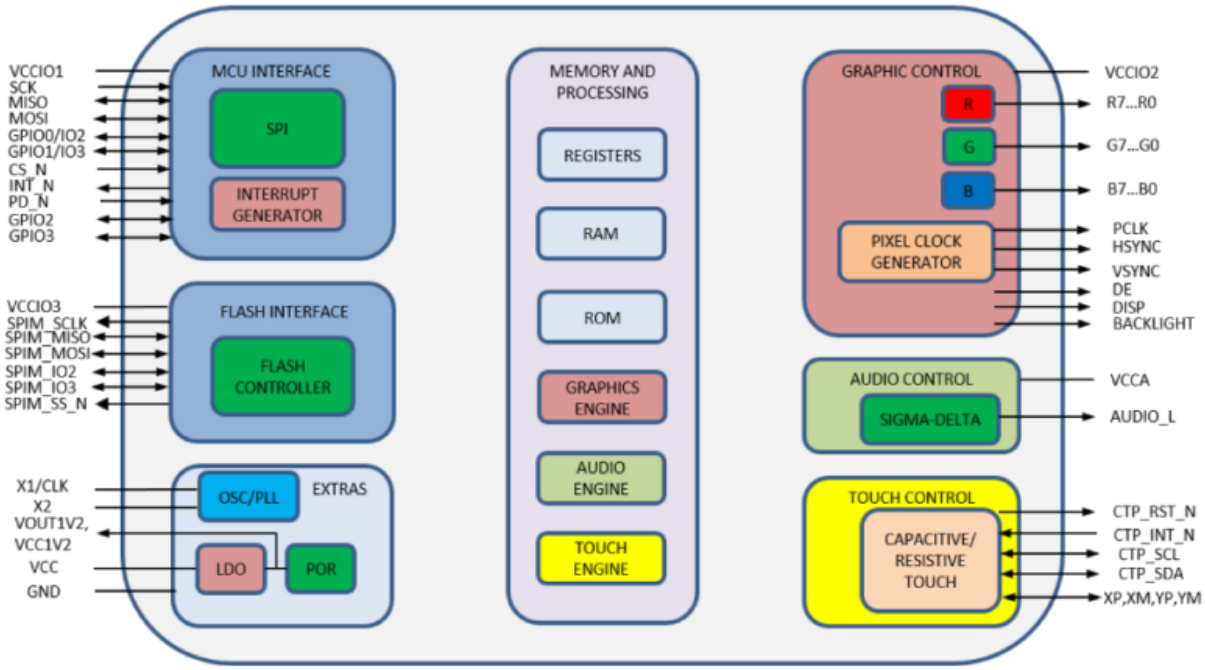


SPI Interface – the SPI slave interface operates up to 30MHz.

Only SPI mode 0 is supported. The SPI interface is selected by default (MODE pin is internally pulled low by 47k resistor).

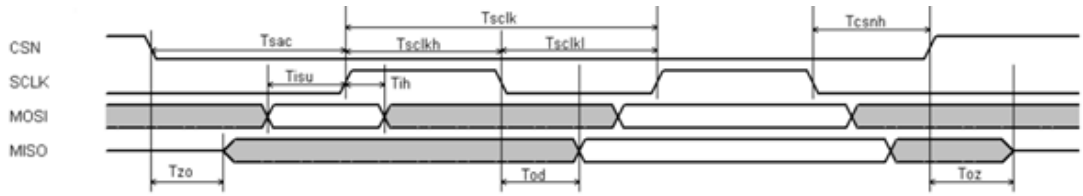
9.2. Block diagram

Figure 8. BT8x Block diagram



9.3. Host Interface SPI mode 0

Figure 9. SPI timing diagram



For more information about BT8x controller please go to official BT8x website.

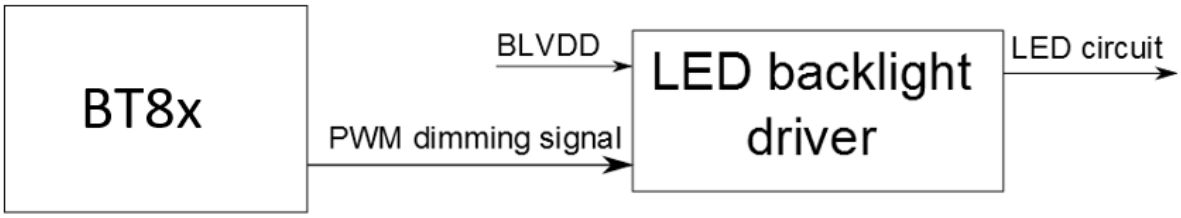
https://www.ftdichip.com/Products/ICs/BT81X.html

9.4. Backlight driver block diagram

Backlight enable signal is internally connected to BT8x Backlight control pin. This pin is controlled

by two BT8x's registers. One of them specifies the PWM output frequency, second one specifies the duty cycle. Refer to BT8x datasheet for more information.

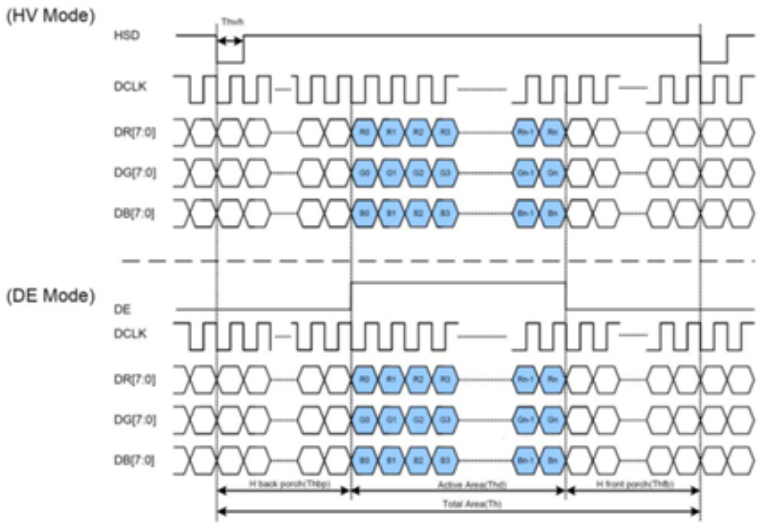
Figure 10. Backlight driver block diagram



10. LCD timing characteristics

10.1. Clock and data input time diagram

Figure 11. Clock and data input time diagram



10.2. Parallel RGB timing table

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
DCLK Frequency	Fclk	5	9	12	MHz
VSD Period Time	Tv	277	288	400	H
VSD Display Area	Tvd	272	272	272	H
VSD Back Porch	Tvb	3	8	31	H
VSD Front Porch	Tvfp	2	8	97	H
HSD Period Time	Th	520	525	800	DCLK
HSD Display Area	Thd	480	480	480	DCLK

HSD Back Porch	Thbp	36	40	255	DCLK
HSD Front Porch	Thfp	4	5	65	DCLK

11. Touch panel specifications

11.1. Electrical characteristics

Note: Avoid operating with hard or sharp material such as a ball point pen or a mechanical pencil except a polyacetal pen (tip R0.8mm or less) or a finger

11.1.1. For capacitive touch panel

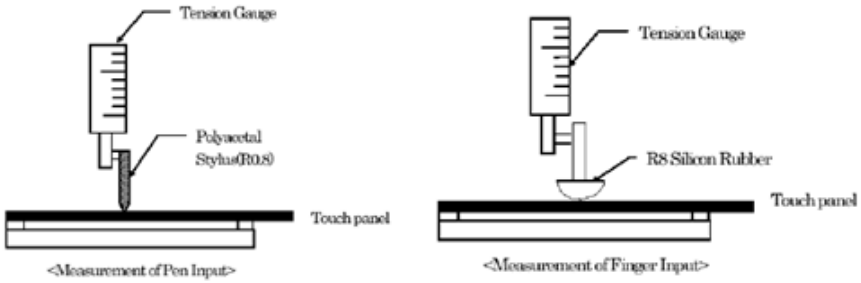
DESCRIPTION		SPECIFICATION
Operating Voltage		DC 2.8~3.6V
Power Consumption (IDD)	Active Mode	10~18mA
	Sleep Mode	30~50μA
Interface		I^2C
Linearity		<1.5%
Controller		FT5446
I2C address		0x38 (7 bit address)
Resolution		1280*768

11.1.2. For resistive touch panel

ITEM	VALUE			UNIT	REMARK
	Min.	Typ.	Max.		
Linearity	-3.0	–	3.0	%	Analog X and Y directions
Terminal Resistance	400	–	1050	Ω	X
	100	–	450	Ω	Y
Insulation Resistance	–	–	–	MΩ	DC DC 25V
Voltage	–	–	10	V	DCDC
Chattering	–	–	10	ms	100kΩ pull-up
Transparency	80	–	–	%	JIS K7105

11.2. Mechanical characteristics

Note 1: Force test condition, Input DC 5V on X direction, Drop off Polyacetal Stylus (R0.8), until output voltage stabilize, then get the R8.0mm Silicon rubber and do finger Activation force test. Next step, 9 points.



Note 2: Measurement surface area conditions, Scratch 100,000 times straight line on the film with a stylus change every 20,000 times with Force: 250gf, Speed: 60mm/sec by R0.8 polaceteal stylus.

Note 3: Pitting test, Pit 1, 000, 000 times on the film with R0.8 silicon rubber with Force: 250gf and Speed: 2 times/sec.

11.2.1 for capacitive touch panel

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	4.3 inch	
Outline Dimension (OD)	103.1mm x 65.4mm	Cover Lens Outline
Outline Dimension (OD) – UxTouch	120.38 x 79.20mm	
Product Thickness	1.70mm	
Glass Thickness	0.7 mm	
Ink View Area	97.00mm x 55.50mm	
Sensor Active Area	97.4mm x 56.40mm	
Input Method	5 Finger	
Activation Force	Touch	
Surface Hardness	≥7H	

11.2.2. For resistive touch panel

Note 1: Force test condition, Input DC 5V on X direction, drop off Polyacetal Stylus (R0.8), until output voltage stabilize, then get the R8.0mm Silicon rubber and do finger Activation force test. Next step, 9 points.

ITEM	VALUE			UNIT	REMARK
	Min.	Typ.	Max.		
Activation Force	80	–	–	gf	Note 1
Durability-Surface Scratching	Write 100,000	–	–	characters	Note 2
Durability-Surface Pitting	1,000,000	–	–	touches	Note 3
Surface Hardness	3	–	–	H	JIS K5400

12. Inspection

Standard acceptance/rejection criteria for TFT module.

12.1. Inspection condition

Ambient conditions:

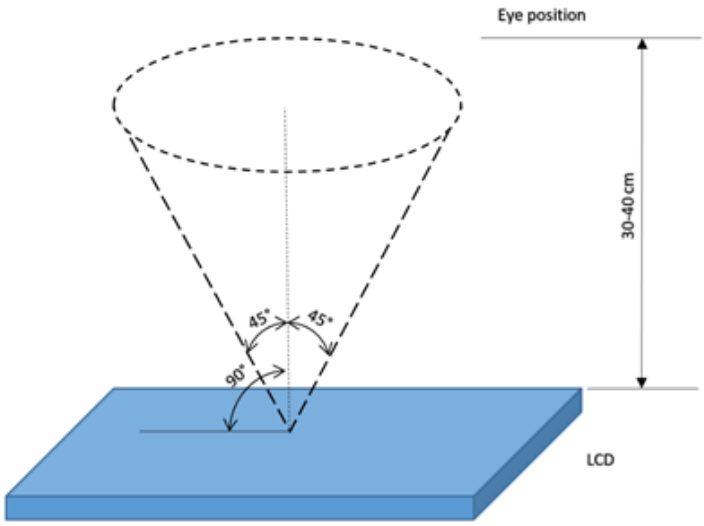
- Temperature: 25±°C
- Humidity: (60±10) %RH
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

Viewing distance:

35±5cm between inspector bare eye and LCD.

Viewing Angle:

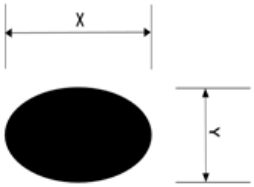
U/D: 45°/45°, L/R 45°/45°



12.2 Inspection standard

Item	Criterion

Black spots, white spots, light leakage, Foreign Particle (round Type)



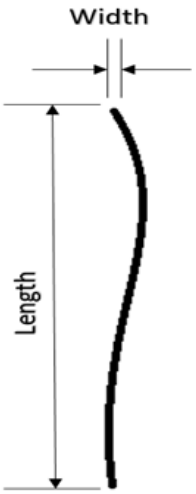
$$D = \frac{(x + y)}{2}$$

*Spots density: 10 mm

Size < 5”	
Average Diameter	Qualified Qty
D < 0.2 mm	Ignored
0.2 mm < D < 0.3 mm	3
0.3 mm < D < 0.5 mm	2
0.5 mm < D	0

Size >= 5”	
Average Diameter	Qualified Qty
D<0.2 mm	Ignored
0.2 mm < D < 0.3 mm	4
0.3 mm < D < 0.5 mm	2
0.5 mm < D	0

LCD black spots, white spots, light leakage (line Type)



*Spots density: 10 mm

Size < 5”		
Length	Width	Qualified Qty
–	W< 0.02	Ignored
L < 3.0	0.02 < W <0.05	2
L < 2.5	0.05 < W <0.08	
–	0.08 < W	0

Size >= 5”		
Length	Width	Qualified Qty
–	W< 0.02	Ignored
L < 3.0	0.02 < W <0.05	4
L < 2.5	0.05 < W <0.08	
–	0.08 < W	0

Item	Criterion
Clear spots	

Size < 5”	
Average Diameter	Qualified Qty
D < 0.2 mm	Ignored
0.2 mm < D < 0.3 mm	3
0.3 mm < D < 0.5 mm	2
0.5 mm < D	0

Size >= 5”

Average Diameter	Qualified Qty
D<0.2 mm	Ignored
0.2 mm < D < 0.3 mm	4
0.3 mm < D < 0.5 mm	2
0.5 mm < D	0

*Spots density: 10 mm

Polarizer bubbles

Size < 5”	
Average Diameter	Qualified Qty
D < 0.2 mm	Ignored
0.2 mm < D < 0.5 mm	3
0.5 mm < D < 1 mm	2
1 mm < D	0
Total Q’ty	3

Size >= 5”	
Average Diameter	Qualified Qty
D<0.25 mm	Ignored
0.25 mm < D < 0.5 mm	3
0.5 mm < D	0

Electrical Dot Defect

Size < 5”	
item	Qualified Qty
Black do defect	4
Bright dot defect	2
Total Dot	5

Size >= 5”	
item	Qualified Qty
Black do defect	5
Bright dot defect	2
Total Dot	5

Item	Criterion

Touch panel spot

Size < 5”	
Average Diameter	Qualified Qty
D < 0.2 mm	Ignored
0.2 mm < D < 0.4 mm	5
0.4 mm < D < 0.5 mm	2
0.5 mm < D	0

Size >= 5”	
Average Diameter	Qualified Qty
D<0.25 mm	Ignored

0.25 mm < D < 0.5 mm	4
0.5 mm < D	0

Touch panel White Line Scratch

Size < 5”		
Length	Width	Qualified Qty
–	W< 0.02	Ignored
L < 3.0	0.02 < W <0.05	2
L < 2.5	0.05 < W <0.08	
–	0.08 < W	0

Size >= 5”		
Length	Width	Qualified Qty
–	W< 0.03	Ignored
L < 5.0	0.03 < W <0.05	2
–	0.05 < W	0

13. Reliability test

NO.	TEST ITEM	TEST CONDITION	REMARKS
1	High Temperature Storage	80±2°C/240hours	Note 2
2	Low Temperature Storage	-30±2°C/240hours	Note 1,2
3	High Temperature Operating	70±2°C/240hours	
4	Low Temperature Operating	-20±2°C/240hours	Note 1
5	Temperature Cycle	-30±2°C~25±2°C ~80±2°C × 20 cycles (30min.) (5min.) (30min.)	Note 1,2
6	Damp Proof Test	60°C ±5°C × 90%RH/240hours	
7	Vibration Test	Frequency 10Hz~55Hz Amplitude of vibration : 1.5mm Sweep time: 12 min X, Y, Z 2 hours for each direction.	
8	Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
9	ESD Test	Air: ±4KV 150pF/330Ω 5 times Contact: ±2KV 150pF/330Ω 5 times	

10	ESD Test for RTP	Air: ±8KV 150pF/330Ω 5 times Contact: ±4KV 150pF/330Ω 5 times	

Note 1: Without water condensation.

Note 2: The function test shall be conducted after 2 hours storage at the room temperature and humidity after removed from the test chamber.

Still stuck How can we help

Updated on April 30, 2020

← EVE 3 3.5"

EVE 3 5" →

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