



# USEC133SRSUSN

13.3" E-paper Display with  
Unisystem`s Controller



SPECIFICATIONS

# Revision Record

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Rev No.	Rev Date		Author	Remarks
1.0	20.11.2020	Documentation Release	B. Soczyński	-

# Contents

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Revision Record .....	1
1. General Description.....	2
2. Mechanical drawing .....	3
3. Driving Board Block Diagram.....	4
4. Pinout.....	4
5. Absolute Maximum Ratings .....	5
6. Electrical Characteristics.....	5
7. Optical characteristics.....	5
8. Reliability Tests of Display.....	6
9. SPI Timing .....	7
10. Example Application.....	7
11. Precautions .....	8
12. Legal information .....	9
13. Contact information .....	10

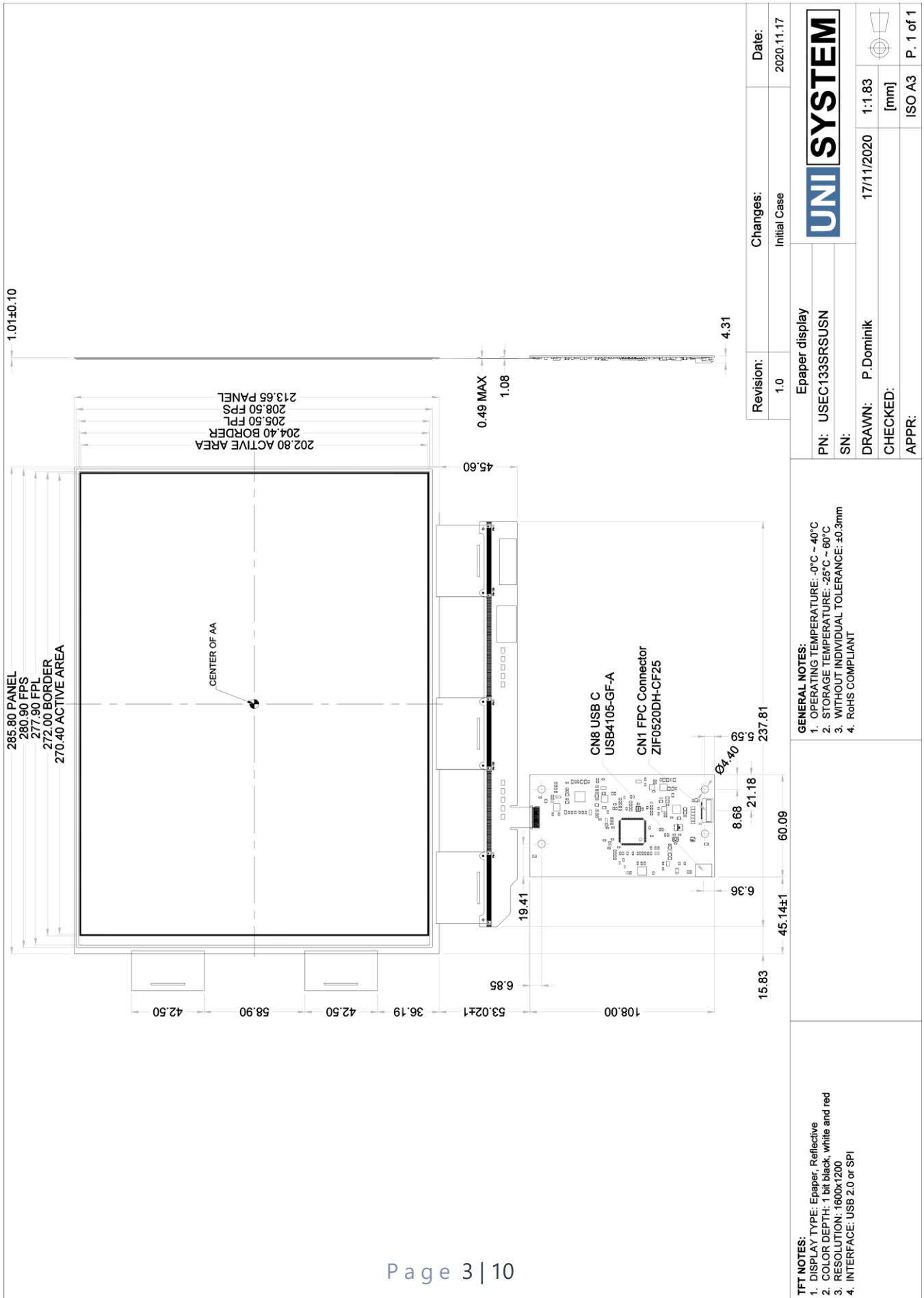
# 1. General Description

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USEC133SRSUSN is a comprehensive solution consisting of assembled Electronic Paper Display (EPD) and Unisystem's EPD Controller. It ensures easy implementation of the module in the final product and facilitates EPD image handling. The display has 13.3" active area with 1600x1200 pixels and is capable to display 1-bit black, white and red images. The Unisystem's EPD Controller supports both partial changes of the displayed image and flashless mode. The controller enables communication via USB and SPI interfaces.

<b>Size (inch)</b>	13.3
<b>Resolution (Pixel)</b>	1600 (H) x 1200 (V)
<b>Controller Interface</b>	USB, SPI
<b>Active Area (mm)</b>	270.4 (H) x 202.8 (V)
<b>EPD Outline Dimensions (mm)</b>	285.80 (W) x 213.65 (H) x 0.97 (D)
<b>Pixel Pitch (mm)</b>	0.169
<b>Driving Board Outline Dimensions (mm)</b>	108 (H) x 60.085 (V)
<b>Operating temp. (°C)</b>	0 to +40
<b>Storage temp. (°C)</b>	-25 to +60

# 2.Mechanical drawing



### 3. Driving Board Block Diagram

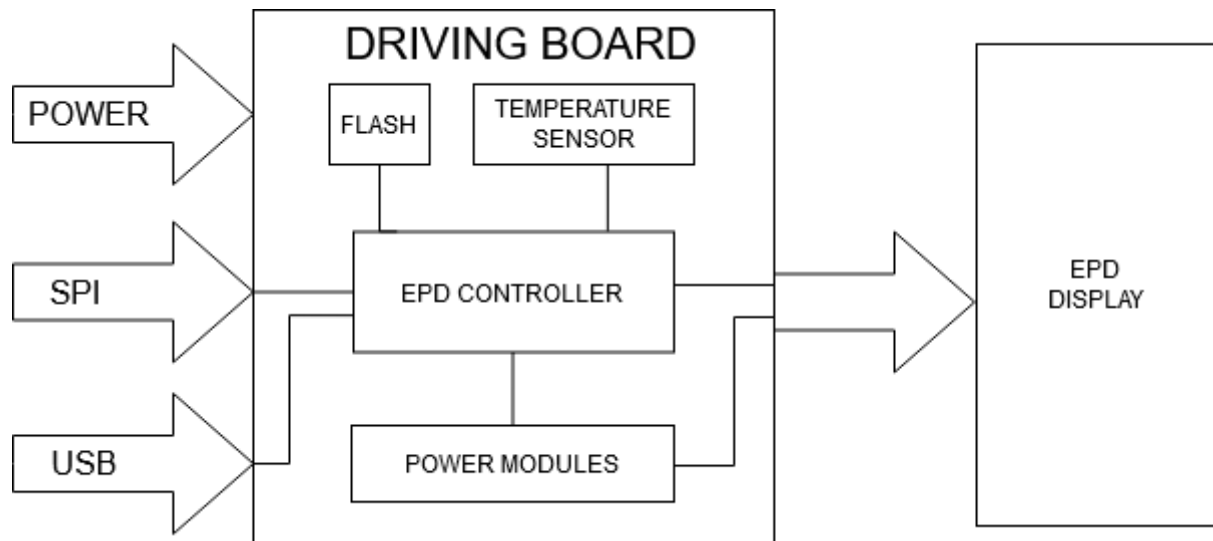


Figure 3.1 - Driving Board Block Diagram

### 4. Pinout

USEC133SRSUSN is powered by USB C connector (CN8) or by FFC Connector (CN1). CN8 connector is also dedicated for USB 2.0 communication and CN1 is dedicated for SPI communication. Table 4.1 presents the pinout of CN1 connector.

Pin Number	Pin name	Description
1, 17, 18	VIN	Input voltage
2, 19, 20	GND	Ground
3	SCK	SPI Clock signal input pin
4	MISO	SPI MISO output pin
5	MOSI	SPI MOSI input pin
6	CS	SPI Chip Select input pin for selecting internal controller (active low)
7	HRDY	Ready signal output. Do not send a command to the selected controller until the state of HRDY line is high
8	RST	Reset signal input (active low)
9-14	NC	No connection
15, 16	Reserved	Reserved pins. Leave those pins unconnected

Table 4.1 - FFC connector pinout

## 5. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
USEC Power Supply	V <sub>IN</sub>	-0.3	6	V
Logic Signals Voltage (RST, HRDY, MOSI, MISO, SCK, CS)	V <sub>LOG</sub>	-0.3	3.5	V
Operating temperature	T <sub>op</sub>	0	40	°C
Storage temperature	T <sub>st</sub>	-25	60	°C

Table 5.1 - Absolute Maximum Ratings

Note 5.1 Exceeding one or more limiting values from Table 5.1 may cause permanent damage to the module.

Note 5.2 For USB maximum ratings, please refer to USB 2.0 specification.

## 6. Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
USEC Power Supply	V <sub>IN</sub>	4.75	5	5.25	V
Logic Signals High State Voltage (RST, HRDY, MOSI, MISO, SCK, CS)	V <sub>LOG_H</sub>	2.9	3.3	-	V
Logic Signals Low State Voltage (RST, HRDY, MOSI, MISO, SCK, CS)	V <sub>LOG_L</sub>	-	0	0.4	V
Supply Current (when V <sub>IN</sub> = 5V)	I <sub>IN</sub>	-	TBD	3	A

Table 6.1 - Electrical Characteristics

Note 6.1 For USB electrical characteristics, please refer to the USB 2.0 specification.

## 7. Optical characteristics

Table 7.1 presents the optical parameters of the display for temperature 25 °C and 45 degree angle of illumination. Contrast ratio is the ratio between the reflectance in the full white area and the reflectance in the dark area.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Reflectance	R	White	30	35	-	%
Contrast Ratio	CR	-	10	15	-	-
Update time (Black/White)	T <sub>update</sub>	Black/White	-	12	-	s
Update time (Red)	T <sub>update_R</sub>	Red	-	18	-	s

Table 7.1 - Optical parameters

## 8. Reliability Tests of Display

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Item	TEST	CONDITION
1	High Temperature Operation	T = +40°C, RH = 35% for 240 hrs
2	Low Temperature Operation	T = 0°C for 240 hrs
3	High Temperature Storage	T = +60°C, RH = 40% for 240 hrs
4	Low Temperature Storage	T = -25°C for 240 hrs
5	High Temperature, High Humidity Operation	T = +40°C, RH = 80% for 168 hrs
6	High-Temperature, High-Humidity Storage	T = +50°C, RH = 80% for 240 hrs

*Table 8.1 - Reliability Test of Display*

## 9. SPI Timing

Figure 9.1 presents SPI Timing diagram:

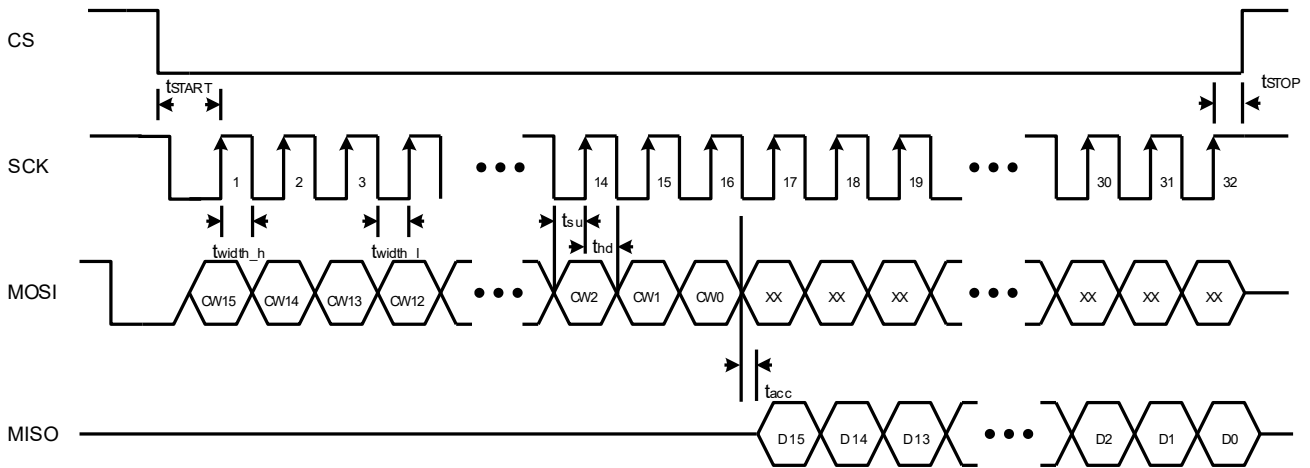


Figure 9.1 - SPI Timing diagram

Table 9.1 presents the values of timing parameters:

Symbol	Parameter	Min	Max	Unit
t <sub>START</sub>	CS falling to SCK rising edge	10	-	ns
t <sub>STOP</sub>	SCK rising to CS rising edge	10	-	ns
t <sub>width_h</sub>	SCK high pulse width	20	-	ns
t <sub>width_l</sub>	SCK low pulse width	20	-	ns
t <sub>su</sub>	MOSI to SCK setup time	10	-	ns
t <sub>hd</sub>	MOSI to SCK hold time	10	-	ns
t <sub>acc</sub>	MISO access time after SCK falling edge	-	20	ns

Table 9.1 - SPI Timing values

## 10. Example Application

Exemplary application code is available on request. Please contact your supplier.



## 11. Precautions

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Please pay attention to the following precautions while using the USEC133SRSUSN.

### **Handling**

Handle with care. The display glass may break when it is dropped or bumped on a hard surface. Please avoid bending the module.

### **Storage and Operation**

1. The module should be stored and operated in suggested ranges of temperature.
2. The module should be stored and operated in an environment without the abrupt changes in the conditions. They can cause the malfunction of the module.
3. Do not hit the module with sharp-edged or hard objects.

### **Others**

1. The product meets the specification requirement of the RoHS standard criteria.
2. Avoid applying high voltage and static charges to the module.
3. Keep the module's surface clean for the proper optical characteristics.
4. If the display breaks, do not touch the electrophoretic material. In case of contact with electrophoretic material, use water and soap to remove particles from the skin.

## 12. Legal information

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## 13. Contact information

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