

**PRODUCT** : AMOLED MODULE  
**MODEL NO.** : TR095A120SPC  
**SUPPLIER** : TRULY (HUI ZHOU)  
SMART DISPLAY LTD.  
**DATE** : Jan 18,2019

# SPECIFICATION

Revision: 0.1

## TR095A120SPC

This module uses ROHS material



If there is no special request from customer, TRULY (HUI ZHOU) SMART DISPLAY LTD. will not reserve the tooling of the product under the following conditions:

1. There is no response from customer in two years after TRULY (HUI ZHOU) SMART DISPLAY LTD. submit the samples;
2. There is no order in two years after the latest mass production.

And correlated data (include quality record) will be reserved one year more after tooling was discarded.

**TRULY (HUIZHOU) SMART DISPLAYLTD:**

**CUSTOMER:**

Quality Assurance Department: \_\_\_\_\_

Approved by:

Technical Department: \_\_\_\_\_

Approved by:

**REVISION RECORD**

REV NO.	REV DATE	CONTENTS	REMARKS
0.1	2019-01-18	First release	Preliminary

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WRITTEN BY	CHECKED BY	APPROVED BY
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## ■ SCOPE

This AMOLED module Specification defines general provisions and inspection standard, AMOLED modules Involved are supplied by TRULY (HUIZHOU) SMART DISPLAY LIMITED. In the process of using, if unforeseen problem or unspecified items may occur, we have to negotiate to resolve the issue with the customer certainly.

## ■ FEATURES

- 1) Display color: 16.7M colors(24bits)
- 2) Display format: 0.95Inch Circle 120×240
- 3) Interface: SPI
- 4) Driver IC: RM69310
- 5) Polarizer: Hard Coating Polarizer
- 6) ID: DA=0XAA,DB=0X10,DC=0X06

## ■ APPLICATION

Smart Watch

## ■ GENERAL INFORMATION

Item	Contents	Unit
Display Mode	AMOLED	/
LTPS Glass Outline (W×H)	12.8 × 27.35	mm
Encapsulation Glass Outline (W×H)	12.8 × 24.4	mm
Active area (W×H)	10.8×21.6	mm
Number of Dots	120×3(RGB)×240	/
Diagonal Inch	0.95	inch
Pixel pitch (W×H)	80× 80	um
Glass Thickness	0.2 (LTPS) 0.305 (Encap)	mm
Total Thickness	0.78(Total)	mm

## ■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Supply voltage (Display)	VCI_DIS_28	-0.3	5.5	V
	VDDIO	-0.3	5.5	V
	ELVDD	0.0	6.0	V
	ELVSS	-6.5	0.0	V
Operating temperature	T <sub>OP</sub>	-20	70	°C
Storage temperature	T <sub>ST</sub>	-30	80	°C
Humidity	RH	-	90	%RH

**Note:** Absolute maximum ratings means the product can withstand short-term, NOT more than 120 hours. If the product is a long time to withstand these conditions, the life time would be shorter.

## ■ ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	
Supply voltage (Display)	VCI_DIS_28		2.7	2.8	3.6	V	
	VDDIO		1.65	1.8	3.3	V	
	ELVDD	-	4.55	4.6	4.65	V	
	ELVSS	-	-2.25	-2.2	-2.15	V	
Input voltage	'L' level	VIL	VDDIO=1.65V ~3.3V	GND	-	0.2*VDDIO	V
	'H' level	VIH		0.8*VDDIO	-	VDDIO	V
Output voltage	'L' level	VOL	I(OH)=-1mA I(OL)=+1mA	GND	-	0.2*VDDIO	V
	'H' level	VOH		0.8*VDDIO	-	VDDIO	V
Current (Display)	Sleep out mode	I <sub>VCI_DIS_28</sub>	Full white display 450nits,60Hz		3.2	5	mA
		I <sub>VDDIO</sub>			1	2	mA
		I <sub>ELVDD/ELVSS</sub>			7	10.5	mA
	Sleep in mode	I <sub>VCI_DIS_28</sub>			12	30	uA
		I <sub>VDDIO</sub>			8	30	uA
	Deep Standby Mode	I <sub>VCI_DIS_28</sub>			1	3	uA
I <sub>VDDIO</sub>				0.1	1	uA	
Frame Frequency	f <sub>FRM</sub>		-	60	-	Hz	

■ OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Type	Max	Unit	Note
Surface Luminance	Lv	$\theta=0^\circ$	400	450	500	cd/m <sup>2</sup>	Note1
Luminance uniformity	$\delta$ WHITE	$\varnothing=0^\circ$	85	-	-	%	Note2
Contrast Ratio	Cr	Ta=25°C	80000	-	-	-	Note3
Viewing Angle	$\theta$	Up/Down/Right/Left Cr $\geq$ 10	88	-	-	deg	Note4
Color Coordinate of CIE1931	Red x	$\theta=0^\circ$ $\varnothing=0^\circ$ Ta=25°C	0.630	0.660	0.690	-	Note 5
	Red y		0.310	0.340	0.370	-	
	Green x		0.170	0.220	0.270	-	
	Green y		0.680	0.730	0.780	-	
	Blue x		0.115	0.140	0.165	-	
	Blue y		0.025	0.050	0.075	-	
	White x		0.280	0.300	0.320	-	
	White y		0.290	0.310	0.330	-	
NTSC ratio	-	-	85	100	-	%	CIE1931
Gamma	-	$\theta=0^\circ$ $\varnothing=0^\circ$ Ta=25°C V(Gray)=44,68,100, 132,164,196,228,25 2,255	2.0	2.2	2.4	-	
Lifetime	T95	25°C	240			h	

**Note1. Surface Luminance**

- Measurement equipment: CS2000 or similar equipment.
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- The data are measured after OLEDs are lighted on for more than 5 minutes and all pixels are fully white.
- The Surface Luminance is the average value of 5 measured spots (Fig-1):

$$L_v = \text{Average Luminance with all white pixels (P}_1, P_2, P_3, P_4, P_5)$$

**Note2. Luminance Uniformity**

- Measurement equipment: CS2000 or similar equipment.
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- The data are measured after OLEDs are lighted on for more than 5 minutes and all pixels are fully white.
- The Luminance Uniformity is calculated by using following formula:

$$\delta \text{ WHITE} = L_p (\text{Min.}) / L_p (\text{Max.}) \times 100 (\%)$$

$$L_p (\text{Min.}) = \text{Minimum Luminance with all white pixels (P}_1, P_2, P_3, P_4, P_5)$$

$$L_p (\text{Max.}) = \text{Maximum Luminance with all white pixels ((P}_1, P_2, P_3, P_4, P_5)$$

**Note3. Contrast Ratio**

- Measurement equipment: CS2000 or similar equipment.
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- The data are measured after OLEDs are lighted on for more than 5 minutes.

- The Contrast Ratio is calculated by using following formula:

$$\text{Contrast Ratio(Cr)} = L_w / L_b$$

$L_w$  = Average Luminance with all **white** pixels (P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub>, P<sub>4</sub>, P<sub>5</sub>)

$L_b$  = Average Luminance with all **black** pixels (P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub>, P<sub>4</sub>, P<sub>5</sub>)

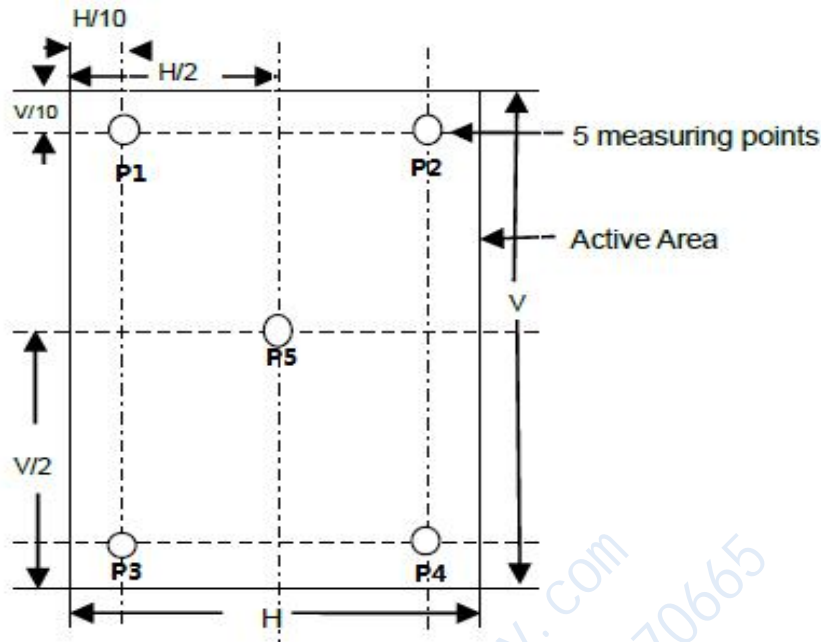


Fig-1

**Note4. Viewing Angle**

- Measurement equipment: DMS803 or similar equipment.
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- The Viewing Angle is the angle at which 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 display surface.

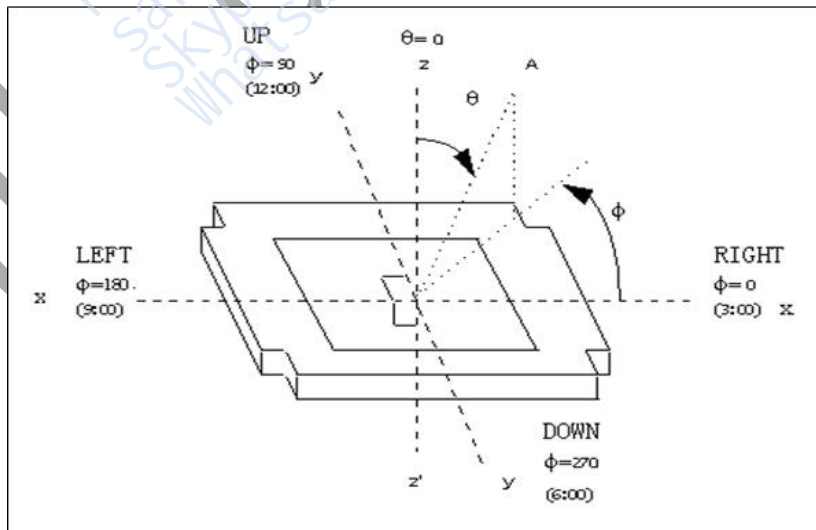


Fig-2

**Note5. Color Coordinate of CIE1931**

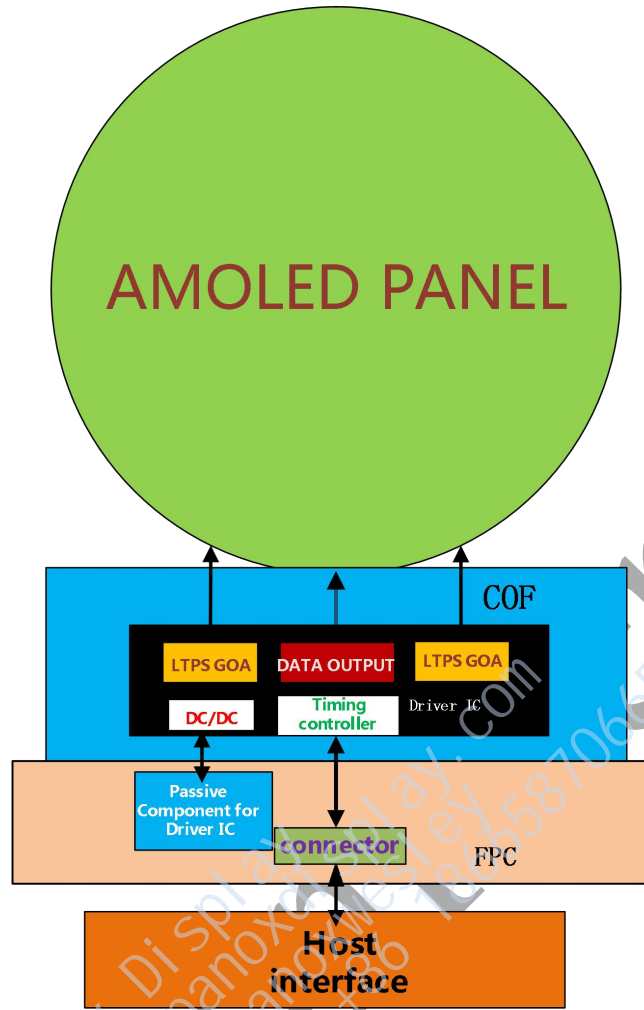
- Measurement equipment: CS2000 or similar equipment.
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- The x, y value of Color Coordinate is determined by measuring at center position of the display panel.

## ■ INTERFACE DESCRIPTION

Interface NO.	Symbol	I/O or Connected to	Description	When not in use
1	GND	Power	Ground	/
2	TP_SDA	I/O	Touch I2C data.	/
3	TP_SCL	I	Touch I2C clock	/
4	VDD_TP	Power	power of touch IC	/
5	GND	Power	Ground	/
6	SWIRE	O	Swire protocol setting pin of Power IC.	Open
7	ELVDD	Power	Power supply for pixel circuit.	/
8	ELVDD	Power	Power supply for pixel circuit.	/
9	VCI_DIS_28	Power	Power supply for Analog circuit.	/
10	VDDIO	Power	Power supply for interface system	/
11	GND	Power	Ground	/
12	SPI_SDI	I	Reads strobe signal to write data when RDX is "Low".	Open
13	SPI_CLK	I	A synchronous clock signal in SPI I/F.	Connect to GND
14	GND	Power	Ground	/
15	AN_A	I	NFC ID SWICH	/
16	AN_B	I	NFC ID SWICH	/
17	GND	Power	Ground	/
18	SPI_CS	I	Chip select input pin ("Low" enable) in SPI I/F.	Connect to VDDIO
19	SPI_DCX	I	Display data / command selection in 4-wire SPI I/F.	Connect to GND
20	SPI_SDO	O	Serial output signal in SPI I/F. The data is output on the rising/falling edge of the SCL signal.	Connect to GND
21	GND	Power	Ground	/
22	DIS_RST	I	This signal will reset the device and must be applied to properly initialize the chip.	Open
23	ELVSS	Power	Power supply for pixel circuit.	/
24	ELVSS	Power	Power supply for pixel circuit.	/
25	TE	O	Tearing effect output pin to synchronize MCU to frame writing, activated by S/W command.	Open
26	MTP	Power	MTP programming power	/
27	TP_INT	O	Touch I2C ATTN interrupt.	/
28	TP_RST	I	reset signal of touch IC	/
29	GND	Power	Ground	/
30	KEY_SIGNAL	TBD	TBD	Open



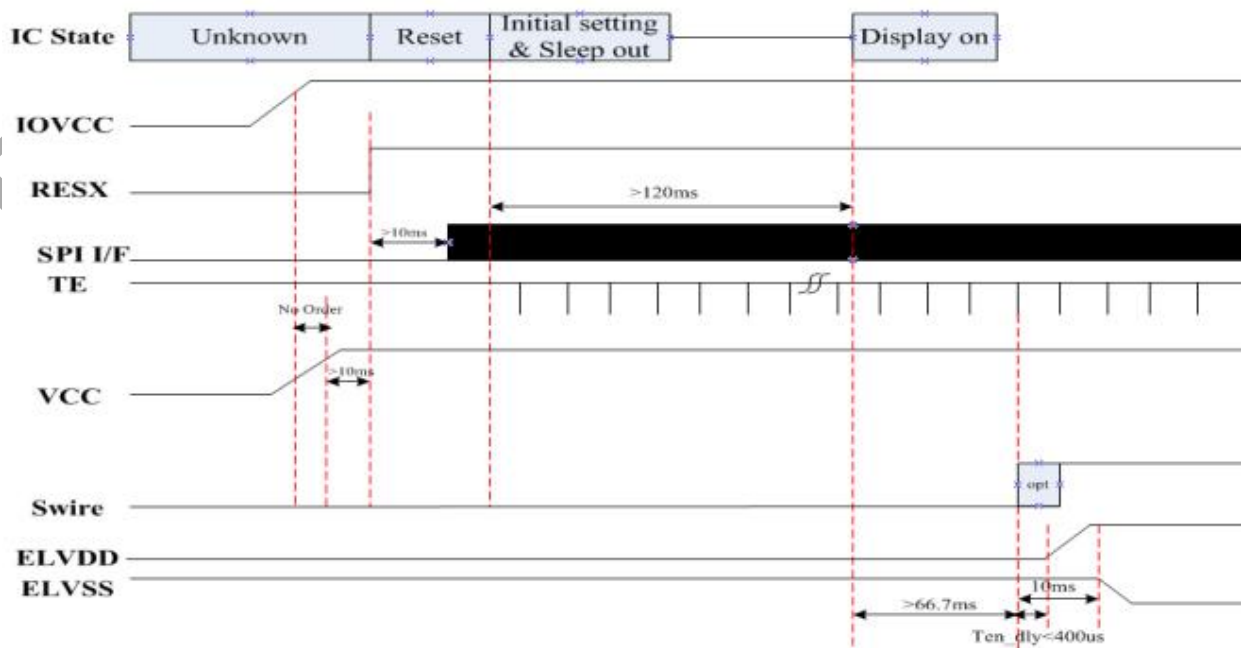
Module Block Diagram



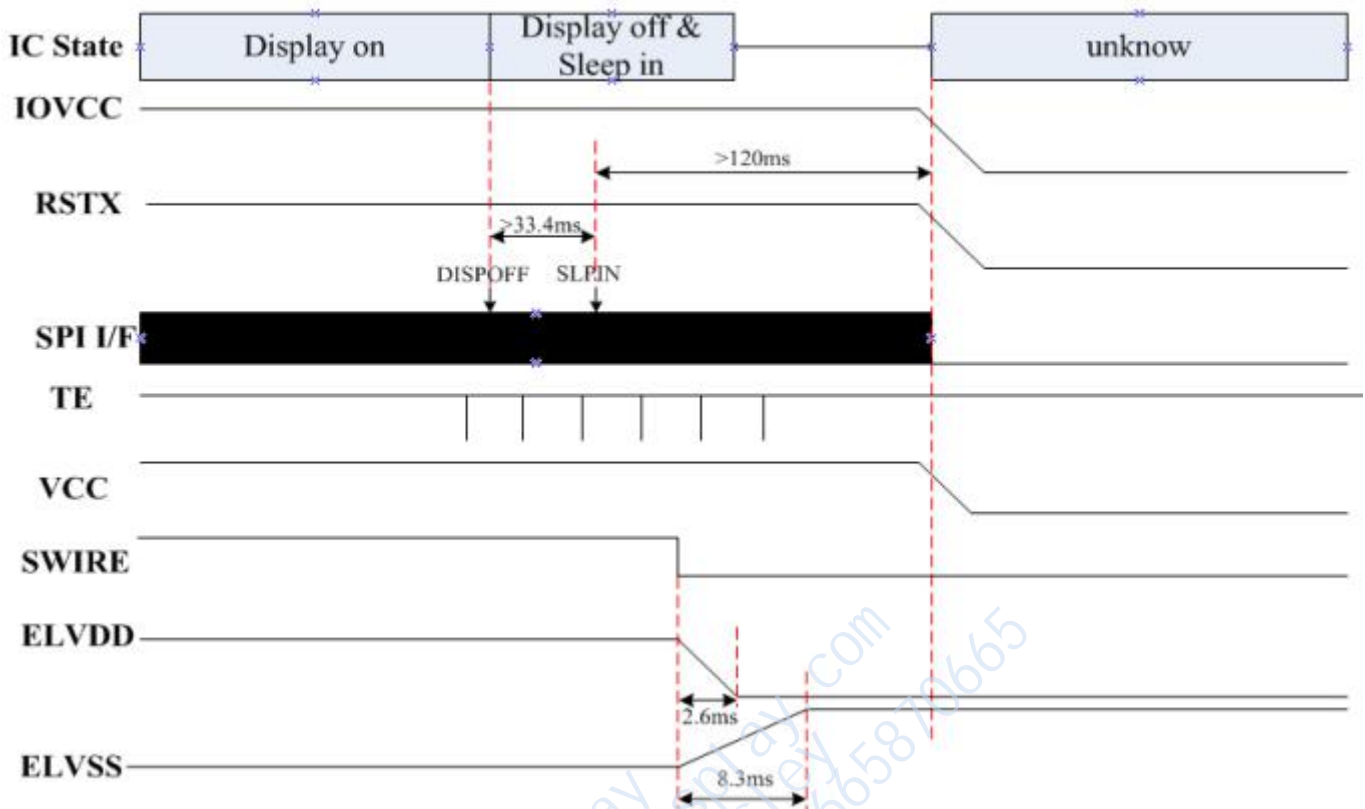
Recommended Operating Sequence

Power on sequence

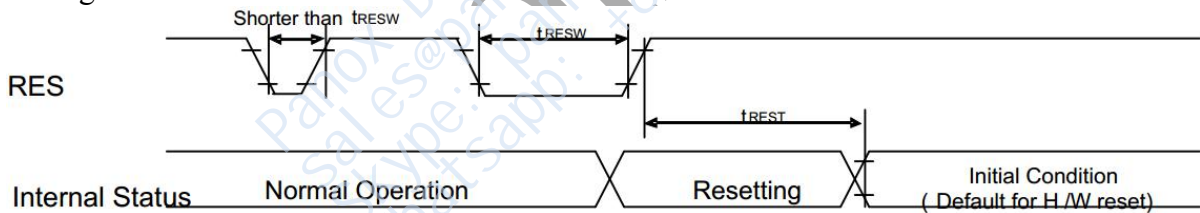
VCC=VCI\_DIS\_28 IOVCC=VDDIO



Power off sequence



Reset Timing



Reset input timing:

VDDIO=1.65 to 3.3V, VCI\_DIS\_28=2.7 to 3.6V, AGND=DGND=0V, Ta=-40 to 85°C

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
$t_{RESW}$	Reset low pulse width	RESX	10	-	-	-	Us
$t_{REST}$	Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-	-	-	120	When reset applied during Sleep out mode	ms