

SPECIFICATION FOR AMOLED Module

MODULE No:	ID-041HDOIN002-C000
CUSTOMER:	

I-DISPLAY	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Revision History

[illegible]

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* **Description**

This is a color active matrix AMOLED module using Low Temperature Poly-silicon Thin Film Transistors as active switching devices. This module has a 4.1 inch diagonally measured active area with 568 horizontal by 1232 vertical pixel arrays. Each pixel is divided into RED and GREEN dots, or BLUE and GREEN dots, and two pixels share RED or BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors.

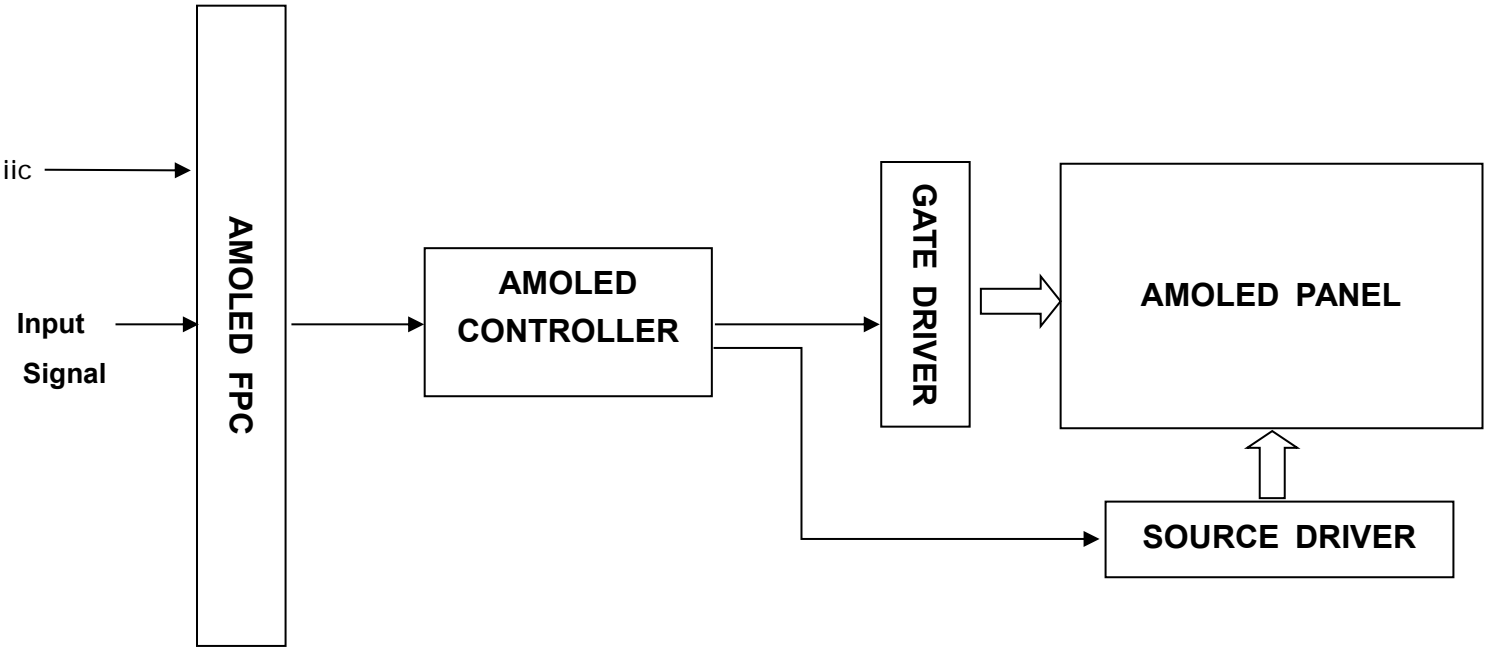
* **Features**

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	43.55(H)*94.47(V) (4.1 inch)	mm	
Driver element	TFT active matrix	-	
Display colors	16.7M	colors	
Pixel pitch	76.68(H)*76.68(V)	um	
Number of pixels	568(RGB)*1232	dots	
Viewing angle	ALL	o'clock	
Controller IC	RM69A10	-	
Touch Controller IC	GT9895	-	
Interface	MIPI	-	
Display mode	AMOLED	-	
Operating temperature	-20~+70	℃	
Storage temperature	-30~+80	℃	

* **Mechanical Information**

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		48.24		mm	-
	Vertical(V)		100.84		mm	-
	Depth(D)		2.64		mm	-
Weight			17		g	-

1. Block Diagram



3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	TP_INT	TP Interrupt Pin	O
2	GND	Ground	P
3	TP_SCL	TP I2C SDA	I
4	TP_SDA	TP I2C SDA	I/O
5	TP_RST	TP Reset Pin	I
6	TP_VDDIO	TP_IO_Supply	P
7	TP_VDD	TP_Power supply	P
8	NC(SWDIO)	NC	-
9	GND	Ground	P
10	TE	Tearing effect	-
11	RESET	DDIC RESET	I
12	VDDIO	DDIC IO POWER	P
13	VDD	DDIC ANALOG POWER	P
14	VDD	DDIC ANALOG POWER	P
15	GND	Ground	P
16	GND	Ground	P
17	GND	Ground	P
18	D1_P	MIPI_DATA1	I
19	D1_N	MIPI_DATA1	I
20	GND	Ground	P
21	CLK_P	MIPI_CLK	I
22	CLK_N	MIPI_CLK	I
23	GND	Ground	P
24	D0_P	MIPI_DATA0	I/O
25	D0_N	MIPI_DATA0	I/O
26	GND	Ground	P

27	NC(VPP)	OTP Power PIN	-
28	GND	Ground	P
29	GND	Ground	P
30	GND	Ground	P
1A	GND	Ground	P
30A	GND	Ground	P
15A	VBAT	PMIC POWER INPUT	P
16A	VBAT	PMIC POWER INPUT	P

4. AMOLED Optical Characteristics

4.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	Θ=0 Normal	100000	--	--		(1)(2)
Luminance		LV	White Mode	200	280	--	cd/m2	
Color gamut		S(%)	vs. NTSC	95	100	--	%	(1)
Color Filter Chromaticity	White	W _X		-0.04	0.299	+0.04		(1)
		W _Y			0.315			
	Red	R _X			0.674			
		R _Y			0.325			
	Green	G _X			0.234			
		G _Y			0.385			
	Blue	B _X			0.139			
		B _Y			0.040			
OLED Life Time				30000	--	--	Hrs	
Option View		ALL						

Measuring Condition

Measuring surrounding : dark room

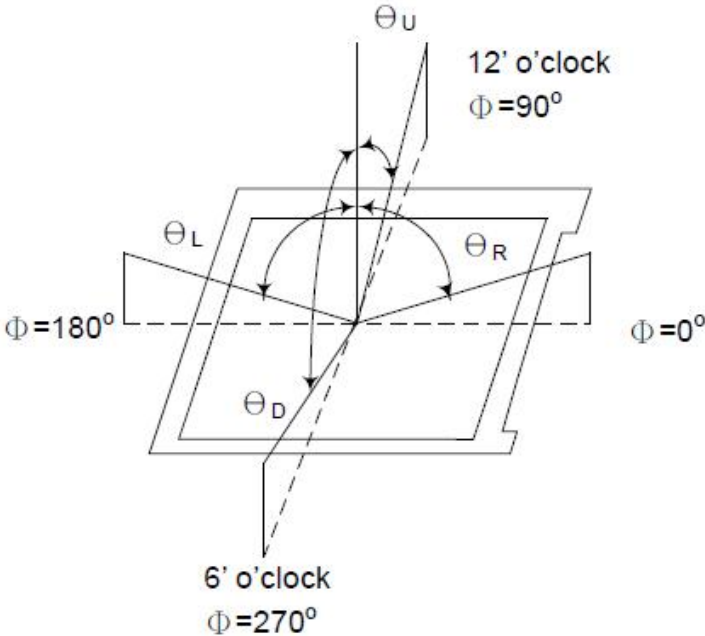
Ambient temperature : 25±2°C

15min. warm-up time.

Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

Note (1): Definition of Viewing Angle :



Note (2): Definition of Contrast Ratio(CR) :measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

5. AMOLED Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 VSS=0V)

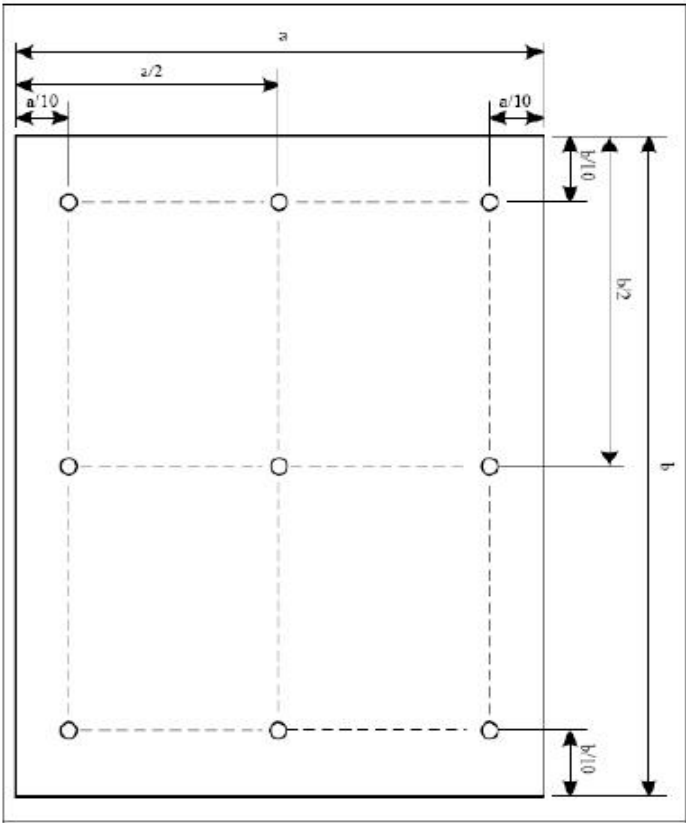
Characteristics	Symbol	Min.	Max.	Unit
Analog Power supply	VCI	-0.3	4	V
Logic Power supply	IOVCC	-0.3	3.6	V
Operating temperature	T _{OP}	-20	+70	°C
Storage temperature	T _{ST}	-30	+80	°C

NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Logic Power Supply	VDDI	1.65	1.8	1.95	V	--
Analog Power Supply	VCI	3.1	3.3	3.5	V	--
Analog Power Supply	VBAT	3.5	3.7	3.9	V	--

NOTE 3: Luminance Uniformity of these 9 points is defined as below:

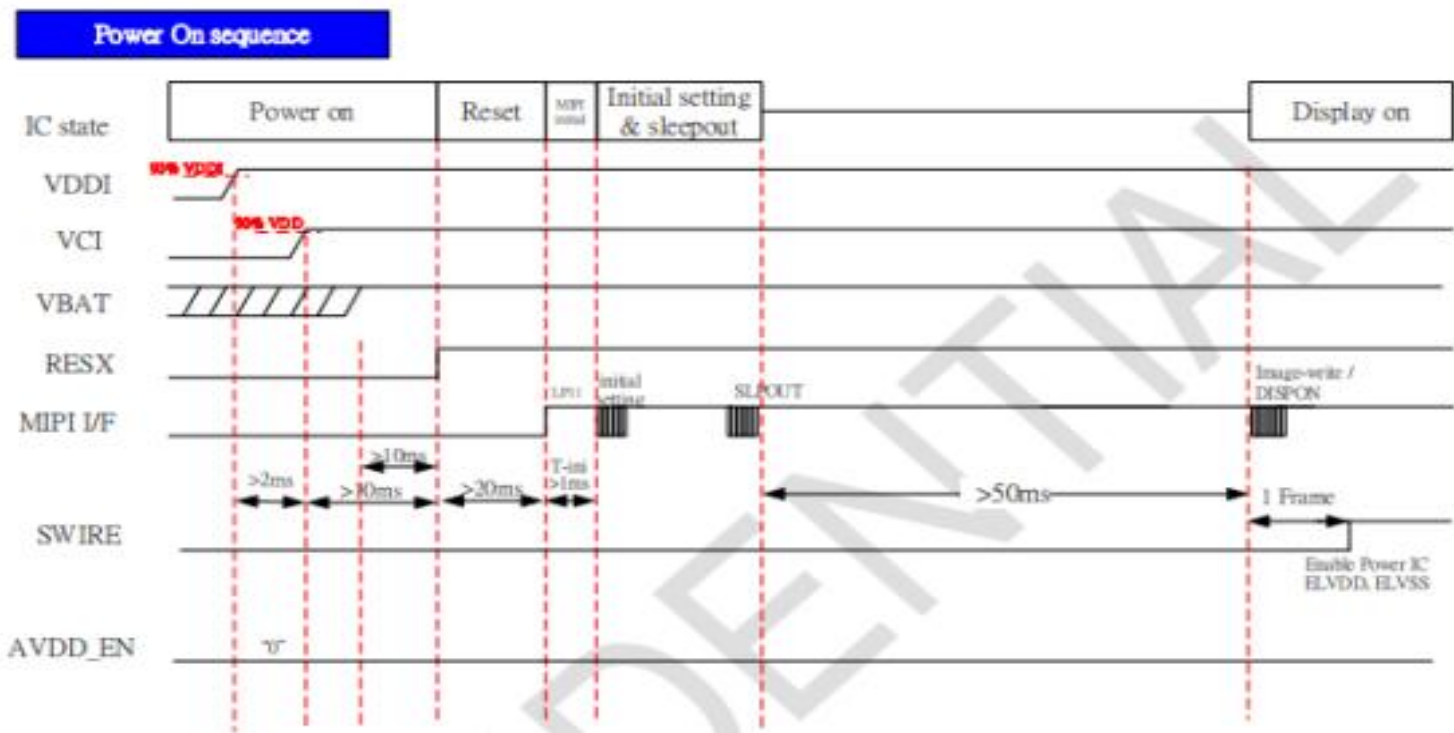


$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

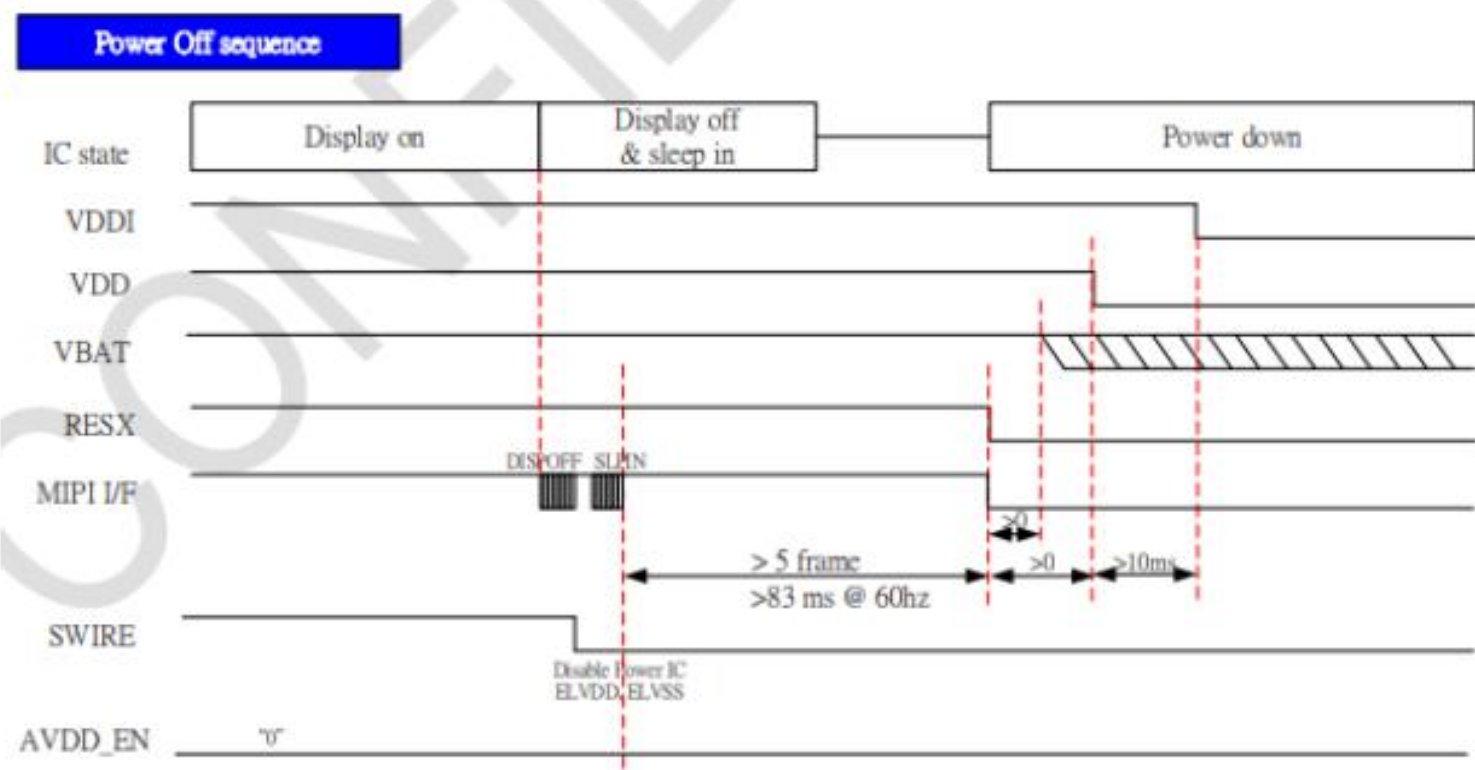
$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

6. AC Characteristic

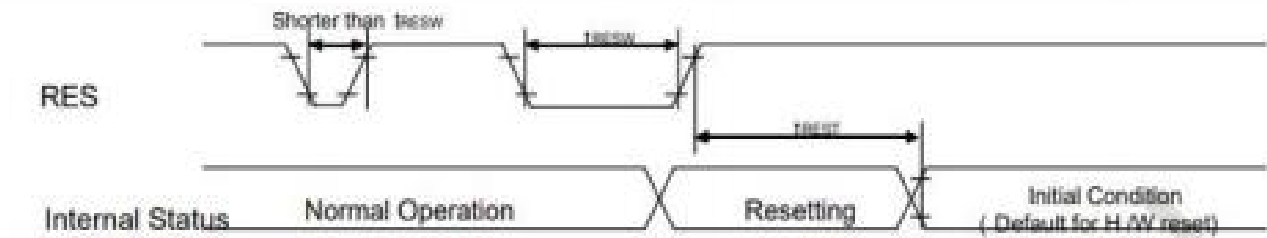
6.1 Power on sequence



6.2 Power off sequence



6.3 Display Reset



Reset input timing:

VDDI=1.65 to 1.95V, VCI=2.7 to 3.6V, AGND=DGND=0V, Ta=-40 to 85°C

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t _{RESW}	*1) Reset low pulse width	RESX	30	-	-	-	μs
t _{REST}	*2) Reset complete time	-	-	-	20	When reset applied during Sleep in mode	ms
		-	-	-	120	When reset applied during Sleep out mode	ms

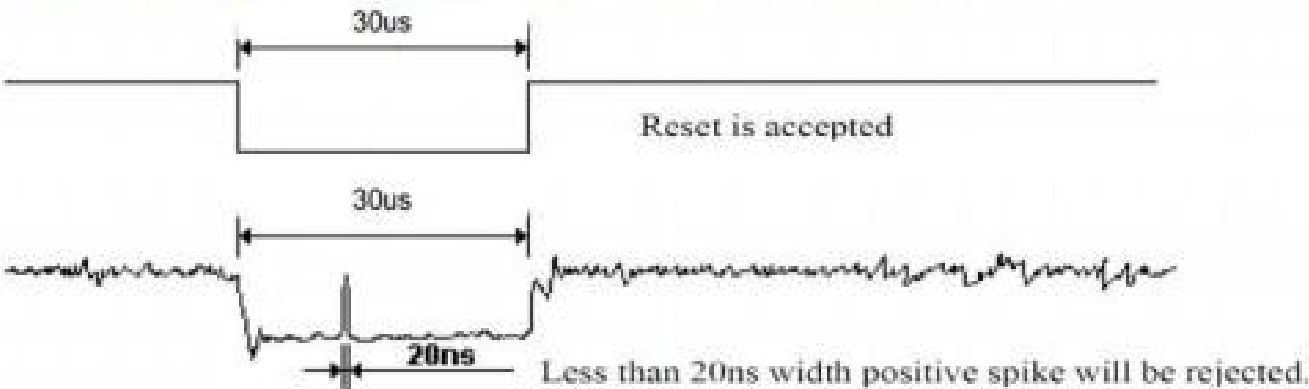
Note 1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5μs	Reset Rejected
Longer than 30μs	Reset
Between 5μs and 30μs	Reset starts (It depends on voltage and temperature condition.)

Note 2. During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition for H/W reset.

Note 3. During Reset Complete Time, data in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (t_{REST}) within 20ms after a rising edge of RESX.

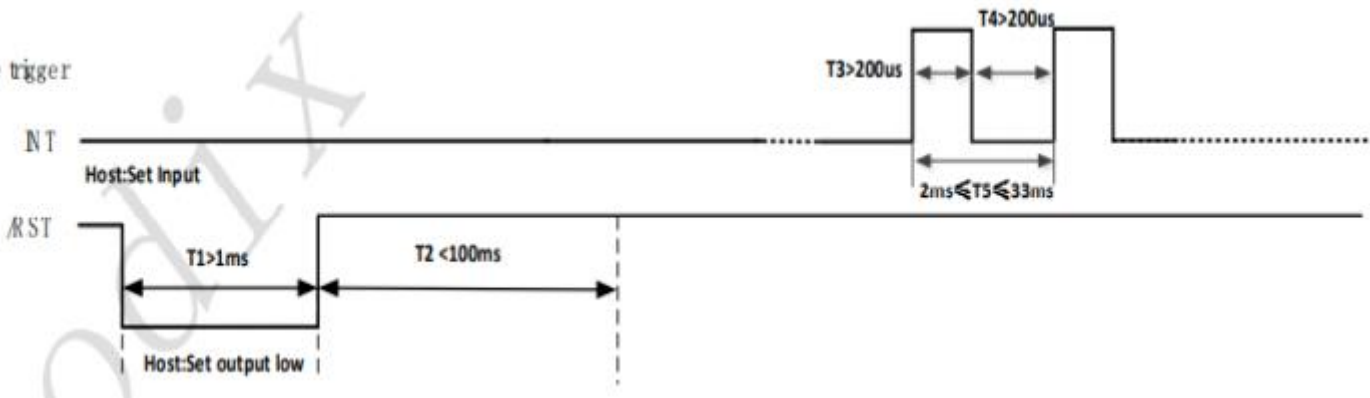
Note 4. Spike Rejection also applies during a valid reset pulse as shown below:



Note 5. It is necessary to wait 20msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

6.4 TP Reset Timing

Ex: rising edge trigger



7. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	70°C,96H	
Low Temperature Operating	-20°C, 96HR	
High Temperature Storage	80°C, 96HR	
Low Temperature Storage	-40°C, 96HR	
High Temperature & High	+60°C, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-40°C,30 min ↔ 80°C,30 min, Change time:5min 20CYC.	

8. Cautions and Handling Precautions

8.1 Handling Precautions:

- (1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from height..
 - (2) Do not press down the screen or the adjoining areas too hard because the color tone may be shifted.
 - (3) The polarizer covering the display surface of the AMOLED module is soft and easily scratched. Handle this polarizer carefully.
 - (4) If the display surface is contaminated, blow on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear, moisten the cloth with ethyl alcohol.
 - (5) Solvents may damage the polarizer. Do not use water, ketone or aromatic solvents except ethyl alcohol.
- Do not attempt to disassemble the AMOLED Module.
- (6) If the logic circuit power is off, do not apply the input signals.
 - (7) To prevent destruction from static electricity, be careful to maintain an optimum working environment.
 - (8) Be sure to make yourself in contact with the ground when handling with the AMOLED Modules.
 - (9) Tools required for assembly, such as soldering irons, must be properly ground.
 - (10) To reduce the generation of static electricity, do not conduct assembly or other work under dry conditions.
 - (11) To protect the display surface, the AMOLED Module is coated with a film. Be careful when peeling off this protective film, because static electricity may generate.

8.2 Storage Precautions.

- (1) When storing the AMOLED modules, be sure that they are not directly exposed to the sunlight or the light of fluorescent lamps.
- (2) The AMOLED modules should be stored under the storage temperature range. If the AMOLED modules will be stored for a long time, the recommended condition is: Temperature: 0℃~40℃ Relatively humidity: ≤80%
- (3) The AMOLED modules should be stored in the room without acid, alkali or harmful gas.

8.3 Transportation Precautions:

- (1) The AMOLED modules should not be suffered from falling and violent shocking during transportation. Besides, excessive press, water, damp and sunshine, should be avoided.

9. Packing

----TBD-----