Microtips TECHNOLOGY

Model No: MTD0550AZOM-T-3

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Record of Revision

Date	Revision No.	Summary
2017-04-05	1.0	Rev 1.0 was issued
2017-04-21	1.1	Change the size of components area on the CTP

1. Scope

This data sheet is to introduce the specification of **MTD0550AZOM-T-3,** AMOLED display module. It is composed of an AMOLED panel, driver IC, FPC and Capacitive touch panel. The 5.49″ display area contains 1080(RGB) x 1920 pixels.

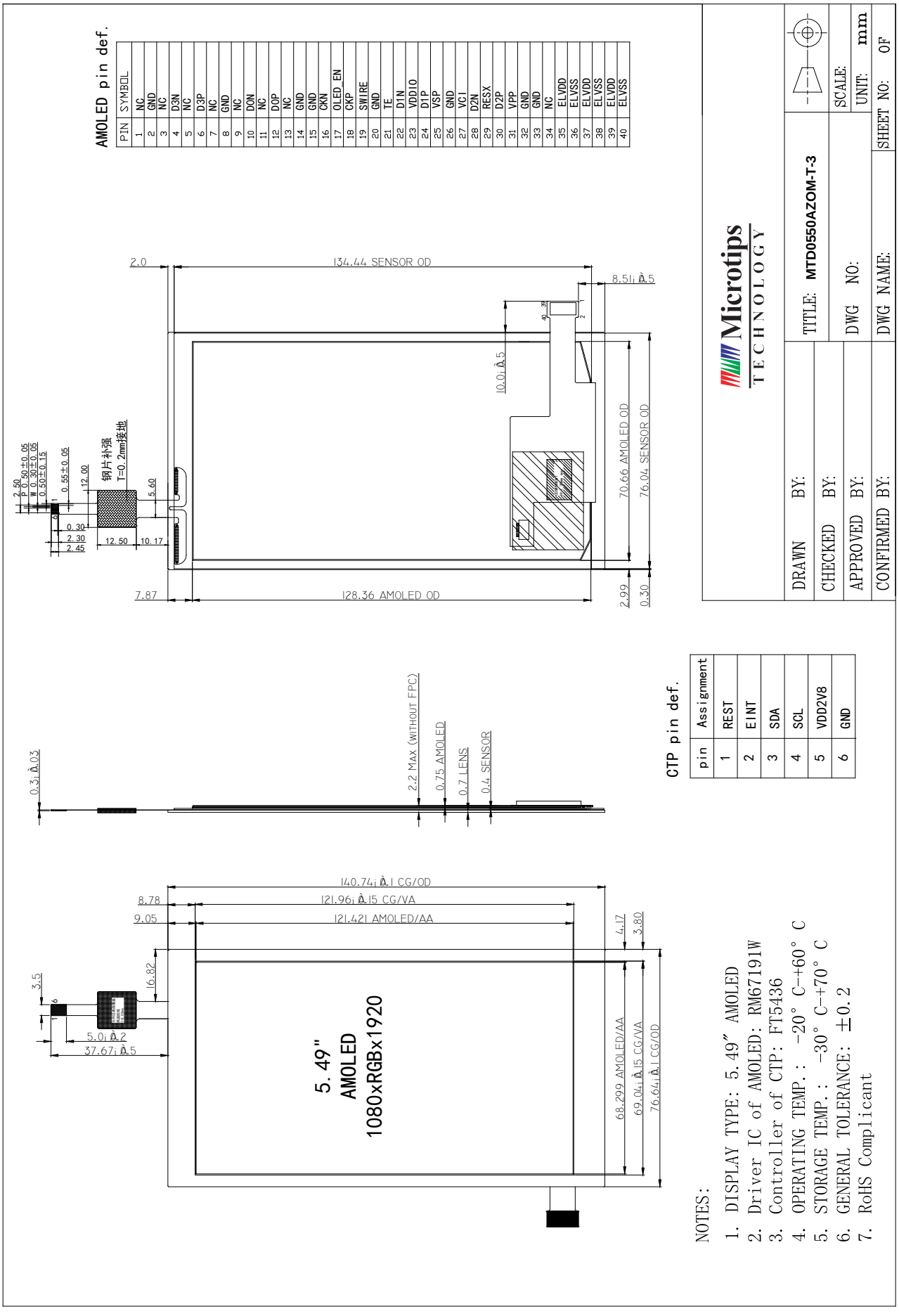
2. Application

Digital equipments which need display, mobile phone, remote control, electronic product.

3. General Information

Item	Contents	Unit
Size	5.49	inch
Resolution	1080(RGB) x 1920	/
Display Color	16.7M (RGBx8bits)	
Interface	MIPI 4 lanes	
Pixel pitch	0.0632 x 0.0632	mm
Outline Dimension (W x H x D)	76.64 x 140.74 x 2.2	mm
Active Area(W x H)	68.299 x 121.421	mm
Driver IC of AMOLED	RM67191	
Controller of CTP	FT5436	
Polarizer	Hard Coating Polarizer	/
Operating Temperature	-20℃ ~ +60℃	
Storage Temperature	-30℃ ~ +70℃	

4. Outline Drawing



5. Interface signals

No	Pin name	I/O	Description
1	NC	-	No connection
2	GND	Power	The power ground
3	NC	-	No connection
4	D3N	I/O	MIPI DSI data3-
5	NC	-	No connection
6	D3P	I/O	MIPI DSI data3+
7	NC	-	No connection
8	GND	Power	The power ground
9	NC	-	No connection
10	D0N	I/O	MIPI DSI data0-
11	NC	-	No connection
12	D0P	I/O	MIPI DSI data0+
13	NC	-	No connection
14	GND	Power	The power ground
15	GND	Power	The power ground
16	CKN	I	MIPI DSI clock-
17	OLED_EN	O	Power IC enable
18	CKP	I	MIPI DSI clock+
19	SWIRE	O	Power IC control pin
20	GND	Power	The power ground
21	TE	O	Tear effect output
22	D1N	I/O	MIPI DSI data1-
23	VDDIO	Power	Driver IC digital I/O supply
24	D1P	I/O	MIPI DSI data1+
25	VSP	Power	PFM's Voltage
26	GND	Power	The power ground
27	VCI	Power	Driver IC analog supply
28	D2N	I/O	MIPI DSI data2-
29	RESX	I	This signal will reset the device and must be applied to properly initialize the chip. Active low.
30	D2P	I/O	MIPI DSI data2+
31	VPP	Power	Power supply for OTP. Leave the pin to open when not in use.
32	GND	Power	The power ground
33	GND	Power	The power ground
34	NC	-	No connection
35	ELVDD	Power	AMOLED power Positive
36	ELVSS	Power	AMOLED power Negative
37	ELVDD	Power	AMOLED power Positive
38	ELVSS	Power	AMOLED power Negative
39	ELVDD	Power	AMOLED power Positive
40	ELVSS	Power	AMOLED power Negative

CTP:

PIN	Symbol	Description	Remark
1	REST	Reset Signal	
2	EINT	Interrupt output Pin	
3	SDA	Data input	
4	SCL	Clock for the data input	
5	VDD2V8	Power supply	
6	GND	Power Ground	

6. Absolute maximum Ratings

6.1 Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Analog/boost power voltage	VCI	-0.3	5.5	V	
VCI_IO voltage	VCI_IF	-0.3	5.5	V	
I/O voltage	VDDIO	-0.3	5.5	V	
VSP voltage	VSP	-0.3	6.6	V	
VPP(OTP power)	VPP	-	8.64	V	

6.2 Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	60	℃	
Storage Temperature	TSTG	-30	70	℃	

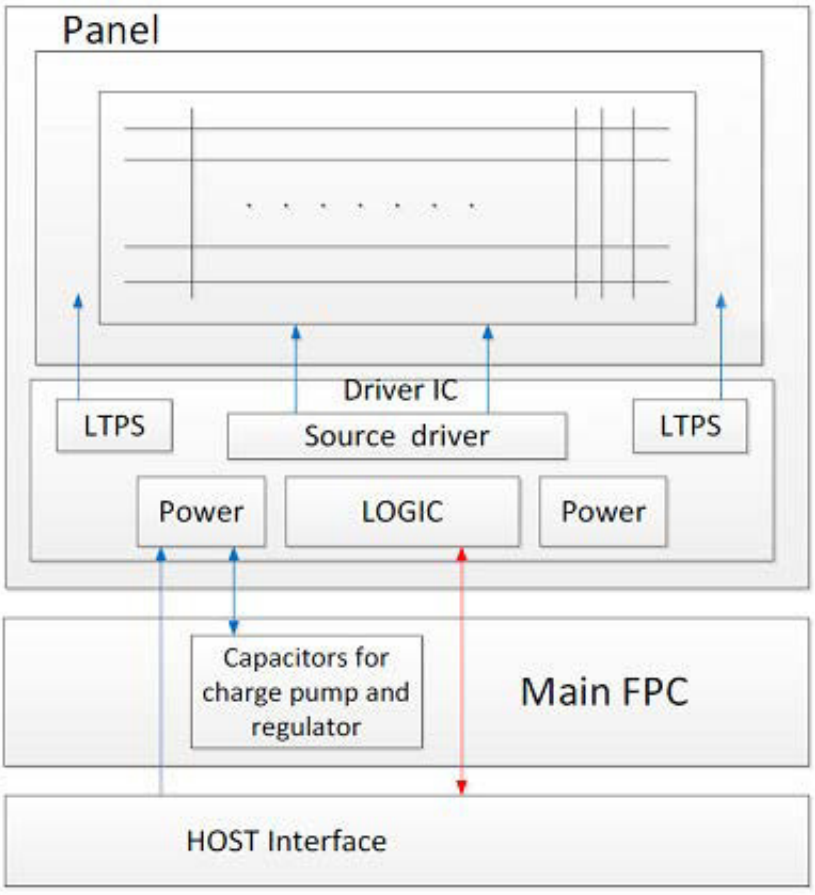
7. Electrical Specifications

7.1 Electrical characteristics

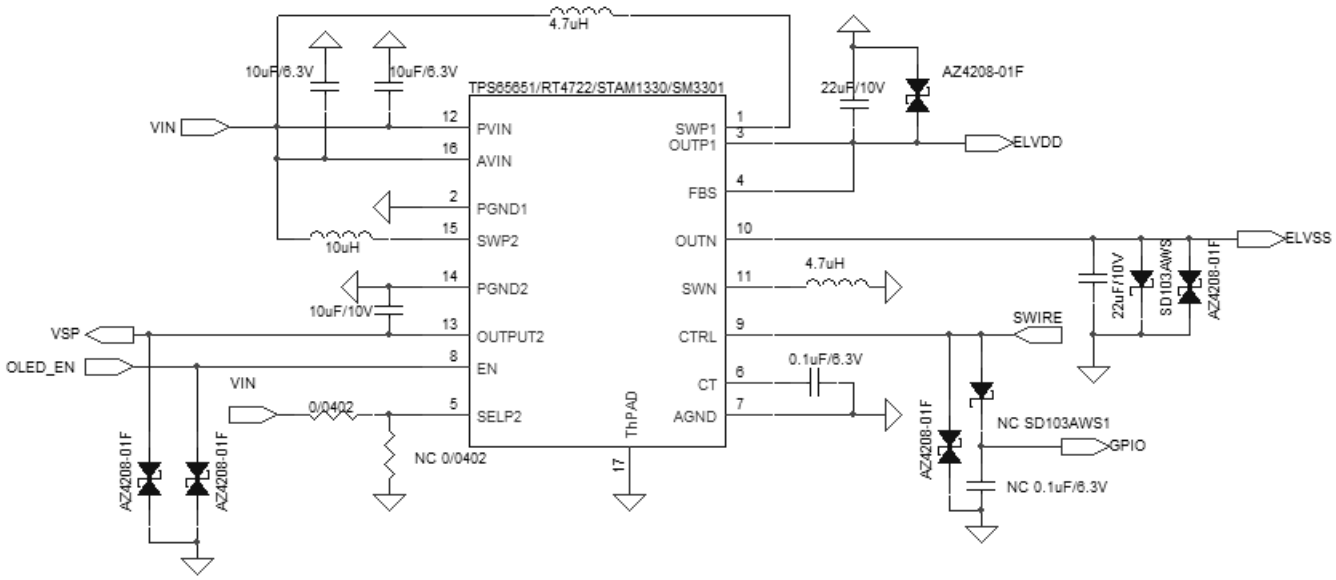
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
AMOLED Power positive	ELVDD	-	4.6	-	V	
AMOLED power Negative	ELVSS	-	-2.5	-	V	Ref
Gamma Voltage	VSP	6.3	6.4	6.5	V	Ref
Digital Power supply	VDDIO	1.65	1.8	3.6	V	Ref
Analog Power supply	VCI	2.5	3.3	4.8	V	Ref

Mode	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
350 Nits @Full White	I_{ELVDD}/I_{ELVSS}	VELVDD=4.6V VELVSS=-2.5V VCI=3.3V VDDIO=1.8V VSP=6.4V	-	190	230	mA	-
	I_{VCI}		-	2	3	mA	-
	I_{VDDIO}		-	50	55	mA	-
	I_{VSP}		-	15	20	mA	-
Normal Operation	Iopr	MCLK=24MHz		13.2		mA	-
Monitor	Imon			0.43		mA	-
Sleep	Islp			42		uA	-

7.2 Display Module Block Diagram



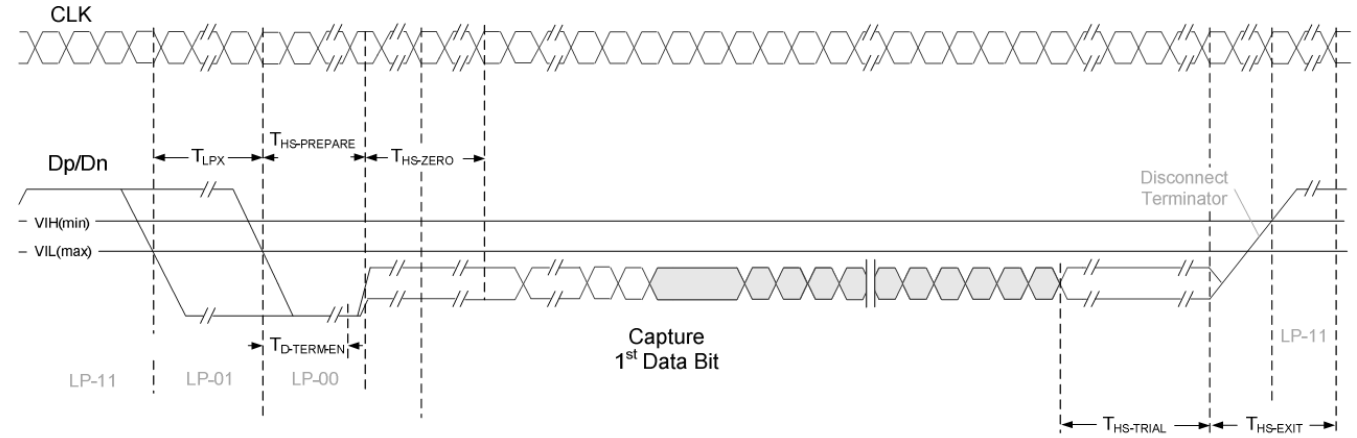
7.3 Application circuit



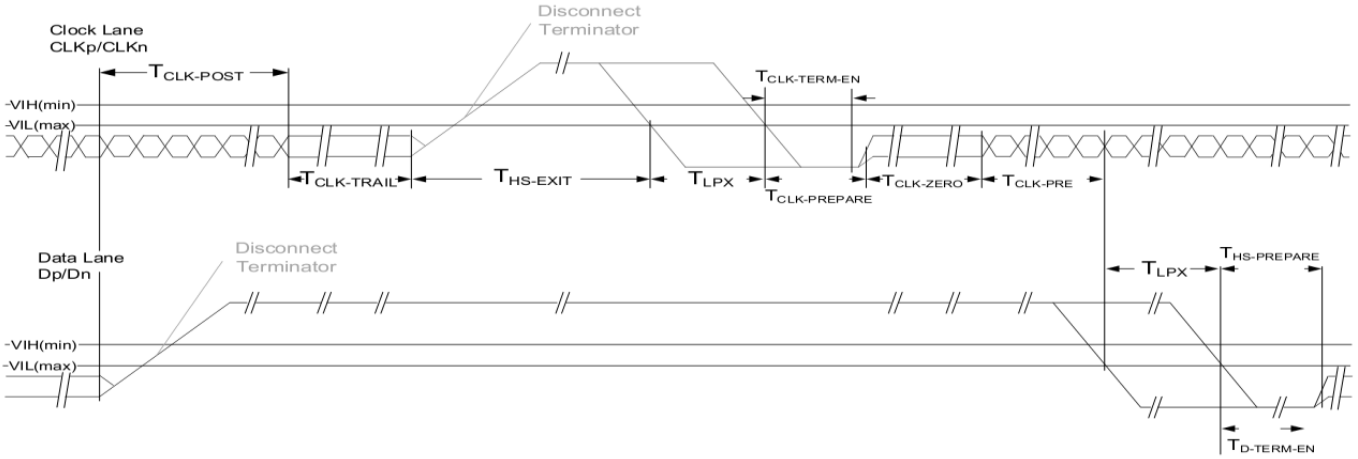
8. Command/AC Timing

8.1 AC Characteristics (MIPI)

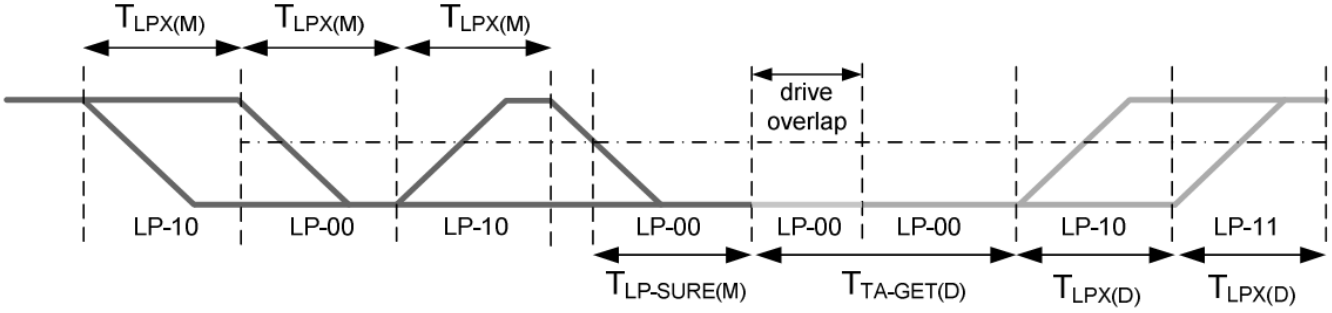
8.1.1 HS Data Transmission Burst



8.1.2 HS Clock Transmission



8.1.3 Turnaround Procedure



8.1.4 Timing Parameters

Symbol	Description	Min	Typ	Max	Unit
T_{REOT}	30%-85% rise time and fall time	-	-	35	ns
$T_{CLK-MISS}$	Timeout for receiver to detect absence of Clock transitions and disable the Clock Lane HS-RX.	-	-	60	ns
$T_{CLK-POST}$	Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of $T_{HS-TRAIL}$ to the beginning of $T_{CLK-TRAIL}$.	60ns + 52*UI (For DCS)	-	-	ns
$T_{CLK-PRE}$	Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.	8	-	-	ns
$T_{CLK-SETTLE}$	Time interval during which the HS receiver shall ignore any Clock Lane HS transitions, starting from the beginning of $T_{CLK-PRE}$.	95	-	300	ns
$T_{CLK-TERM-EN}$	Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses VIL, MAX.	Time for Dn to reach VTERM-EN		38	ns
$T_{HS-SETTLE}$	Time interval during which the HS receiver shall ignore any Data Lane HS transitions, starting from the beginning of $T_{HSPREPARE}$.	85ns + 6*UI		145ns+10*UI	ns
T_{EOT}	Time from start of $T_{HS-TRAIL}$ or $T_{CLK-TRAIL}$ period to start of LP-11 state	-	-	105ns+48*UI	ns
$T_{HS-EXIT}$(1)	time to drive LP-11 after HS burst	100	-	-	ns
$T_{HS-PREPARE}$	Time to drive LP-00 to prepare for HS transmission	40ns + 4*UI	-	85ns+6*UI	ns
$T_{HS-PREPARE}$ + $T_{HS-ZERO}$	$T_{HS-PREPARE}$ + Time to drive HS-0 before the Sync sequence	145ns + 10*UI	-	-	ns
$T_{HS-SKIP}$	Time-out at RX to ignore transition period of EoT	40	-	55ns+4*UI	ns
$T_{HS-TRAIL}$	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60 + 4*UI	-	-	ns
T_{LPX}	Length of any Low-Power state period	50	-	-	ns
Ratio T_{LPX}	Ratio of $T_{LPX(MASTER)}/T_{LPS(SLAVE)}$ between Master and Slave side	2/3	-	3/2	ns
T_{TA-GET}	Time to drive LP-00 by new TX	5*TLPX	5*TLPX	5*TLPX	ns
T_{TA-GO}	Time to drive LP-00 after Turnaround Request	4*TLPX	4*TLPX	4*TLPX	ns
$T_{TA-SURE}$	Time-out before new TX side starts driving	TLPX	-	2*TLPX	ns

8.1.5 Timing requirements for RESETB

When RESETB of the reset pin equals to Low, it will be in the condition of reset.

When it is in the condition of reset, it will make the device recover the initial set.

However, in order to avoid the reset noise cause reset, there is a mechanism to judge about whether the reset is needed or not.

The closed interval of Low can be shown as the following.

(Test condition: VDDIO=1.65V~3.6V, VSS=0V, T_A=-20℃~+85℃)

Parameter	Symbol	Conditions	Spec			Unit
			Min.	Typ.	Max.	
Reset low pulse width	Trst	-	20	-	-	μs

Table: Reset timing

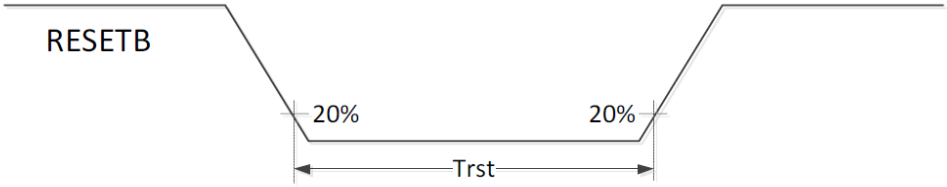
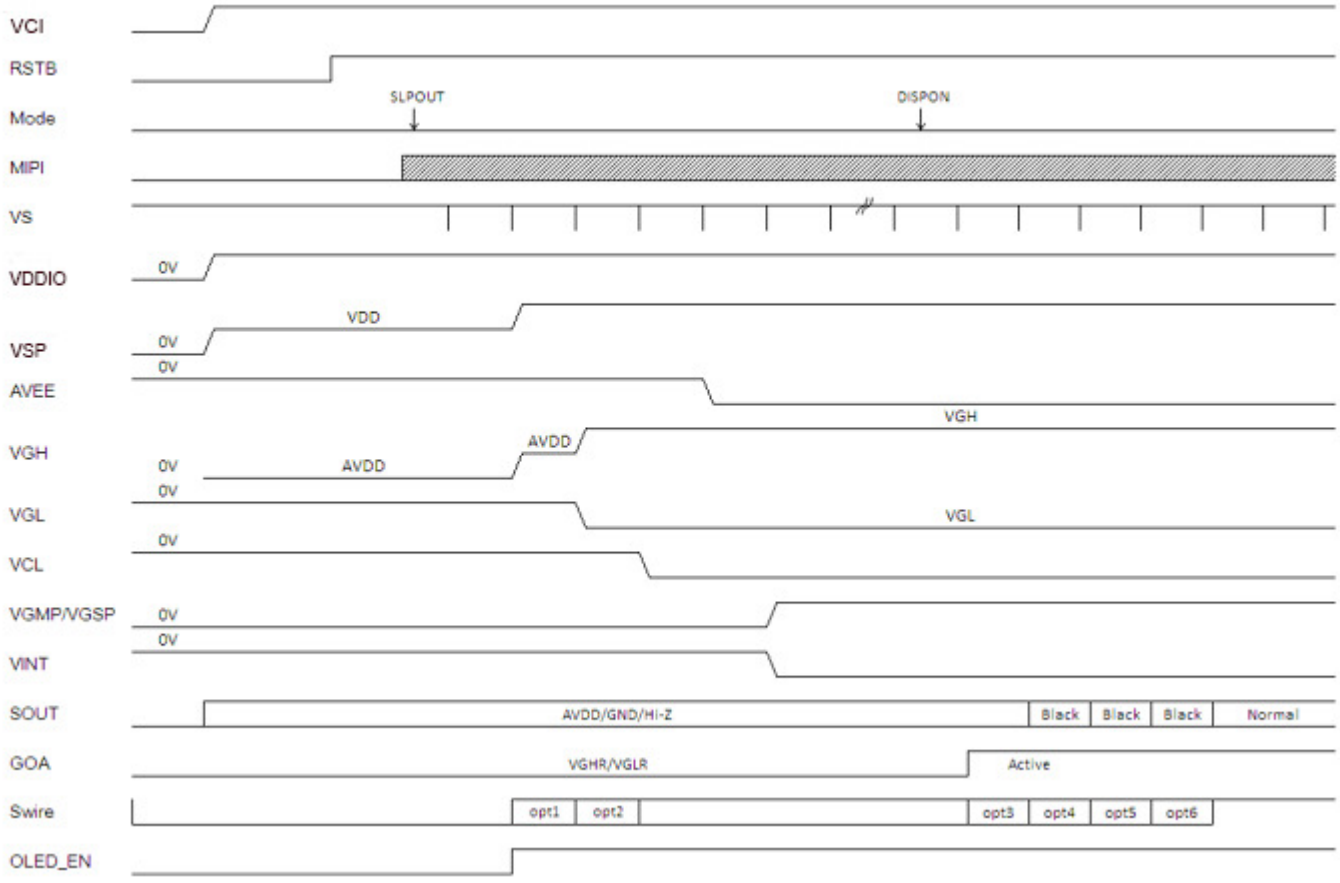


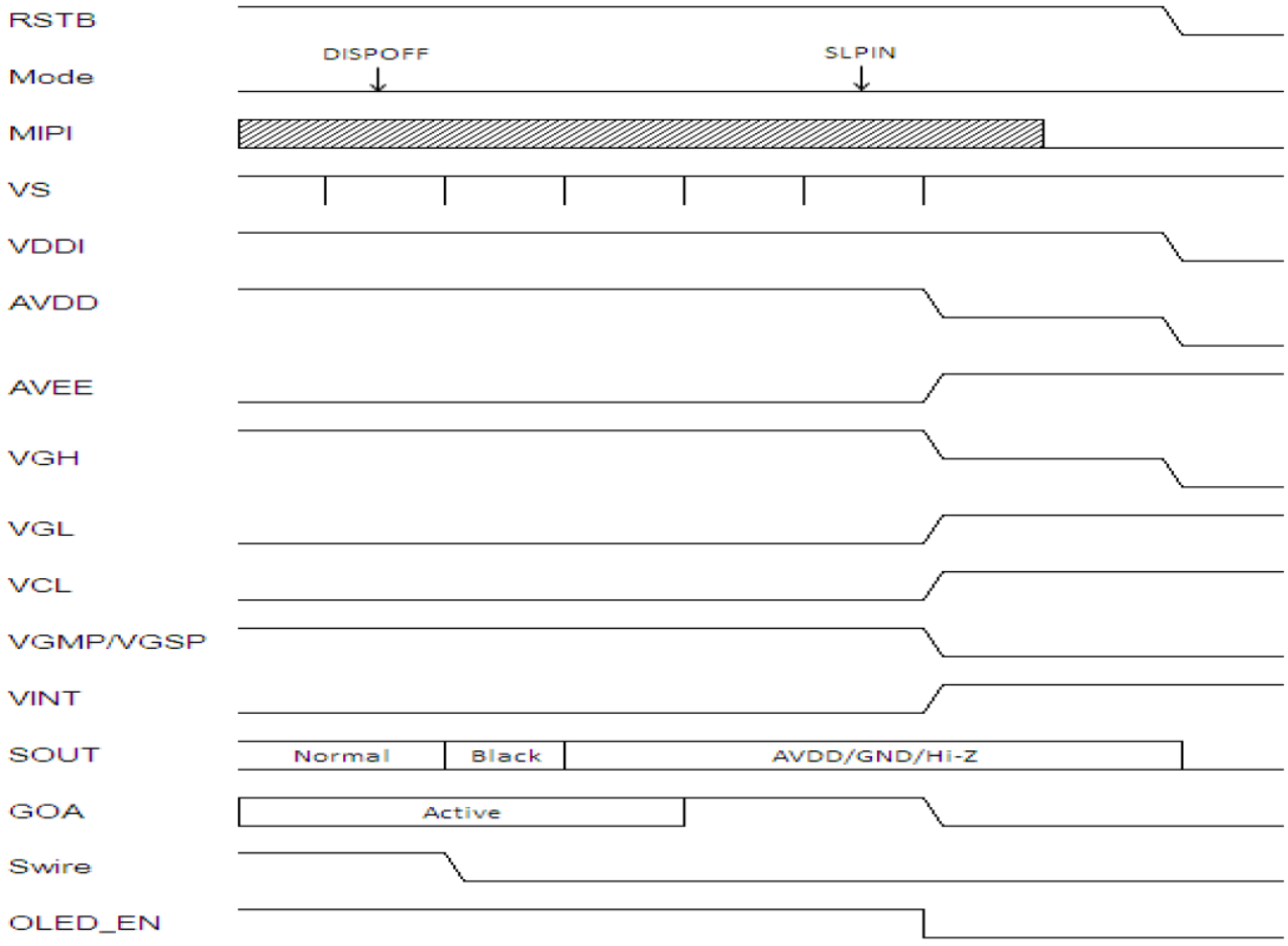
Figure: Reset timing

8.2 Power on and Power off sequence

8.2.1 Power on sequence



8.2.2 Power off sequence



9. Optical Specification

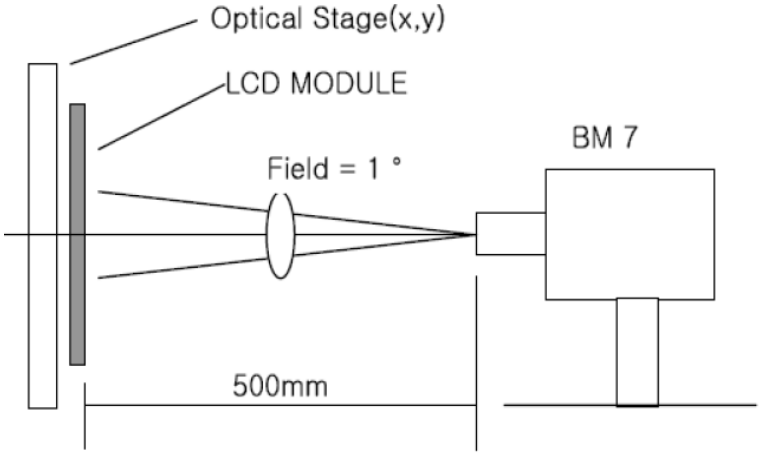
Ta=25℃

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio		CR	θ=0°	60000	-	-		Note1 Note2
View Angles		Θ	U/D/L/R CR≥1000	80		-	Degree	Note 3
Chromaticity	White	x	Without Polarizer	0.28	0.30	0.32		Note4, Note1
		y		0.30	0.32	0.34		
	Red	x		0.64	0.67	0.70		
		y		0.30	0.33	0.36		
	Green	x		0.16	0.20	0.24		
		y		0.68	0.72	0.76		
	Blue	x		0.10	0.13	0.16		
		y		0.03	0.06	0.09		
NTSC				90	105		%	
Brightness Uniformity			Full White	75			%	Note6
Luminance		L	Full White	270	300	330	cd/m^2	Note1 Note5

Note 1: Definition of optical measurement system.

Temperature = 25℃(±3℃)

LED back-light: ON, Environment brightness < 150 lx

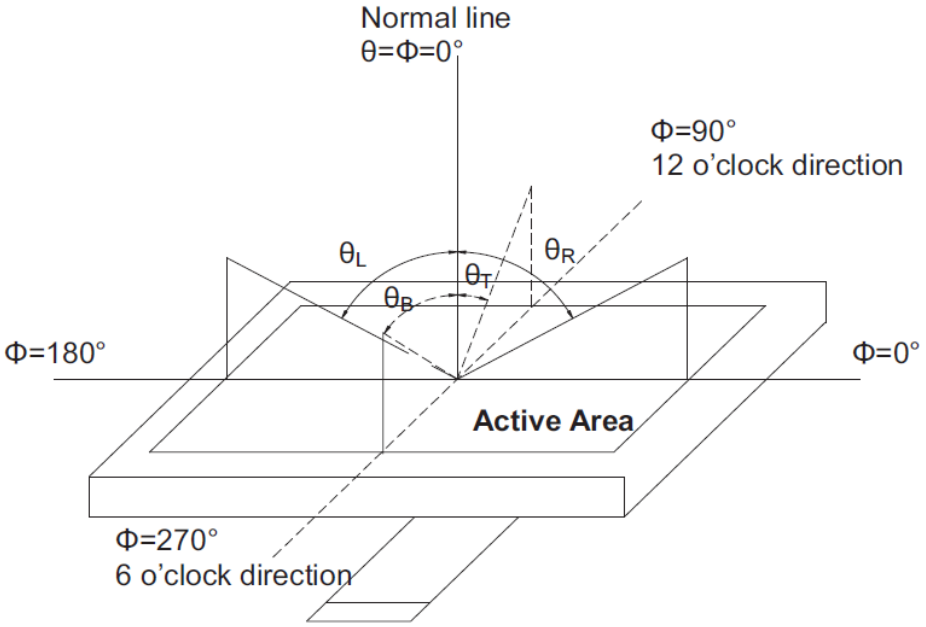


Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

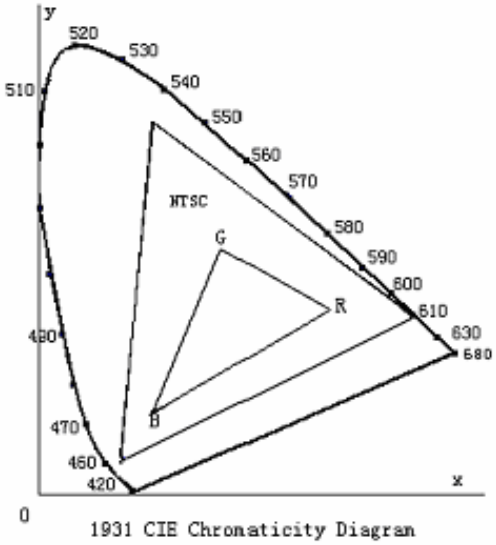
Note 3: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



Note 4: Color chromaticity is defined as follow: (CIE1931)

Color coordinates measured at center point of LCD.



$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 5: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels "White" at the center of display area on optimum contrast.

Note 6: Luminance Uniformity is defined as follow:

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Uniformity(U)} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$

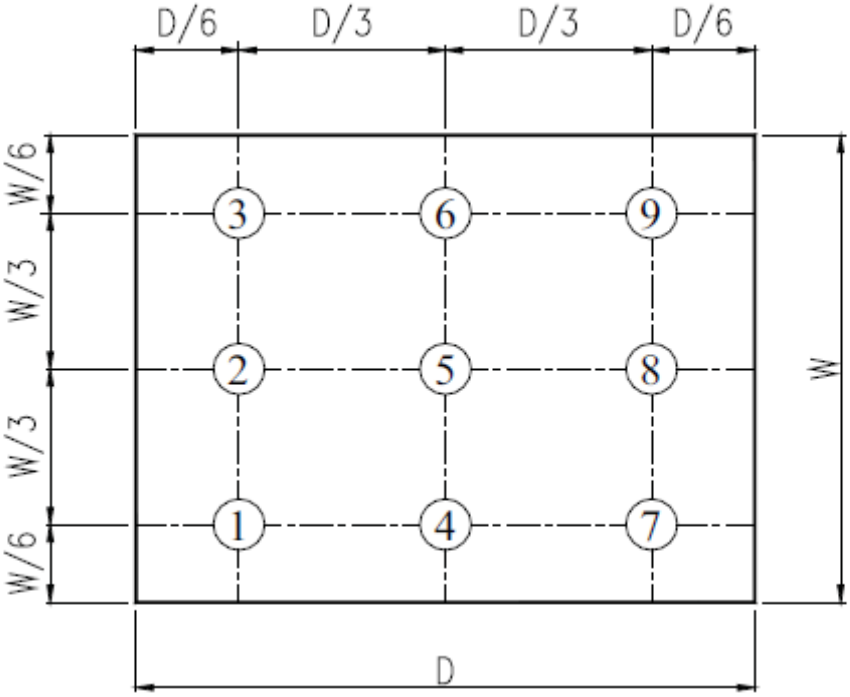


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+60℃, 120hrs	Per table in below
2	Low Temp Operation	Ta=-20℃, 120hrs	Per table in below
3	High Temp Storage	Ta=+70℃, 120hrs	Per table in below
4	Low Temp Storage	Ta=-30℃, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+40℃, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30℃ 30 min~+70℃ 30 min, Change time:5min, 10 Cycles	Per table in below
7	ESD (Operation)	C=150pF, R=330Ω , 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times;	Per table in below
8	Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.	Per table in below
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	Per table in below
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the OLED Panel
Alignment of OLED Panel	No Bubbles in the OLED Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

11. Precautions for Use of OLED Modules

11.1 Safety

The liquid crystal in the OLED is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

11.2 Handling

A. The OLED and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.

B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability

C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.

D. Provide a space so that the panel does not come into contact with other components.

E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.

F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.

G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.

H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

11.3 Static Electricity

A. Ground soldering iron tips, tools and testers when they are in operation.

B. Ground your body when handling the products.

C. Power on the OLED module before applying the voltage to the input terminals.

D. Do not apply voltage which exceeds the absolute maximum rating.

E. Store the products in an anti-electrostatic bag or container.

11.4Storage

A. Store the products in a dark place at +25℃±10℃ with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.

B. Storage in a clean environment, free from dust, active gas, and solvent.

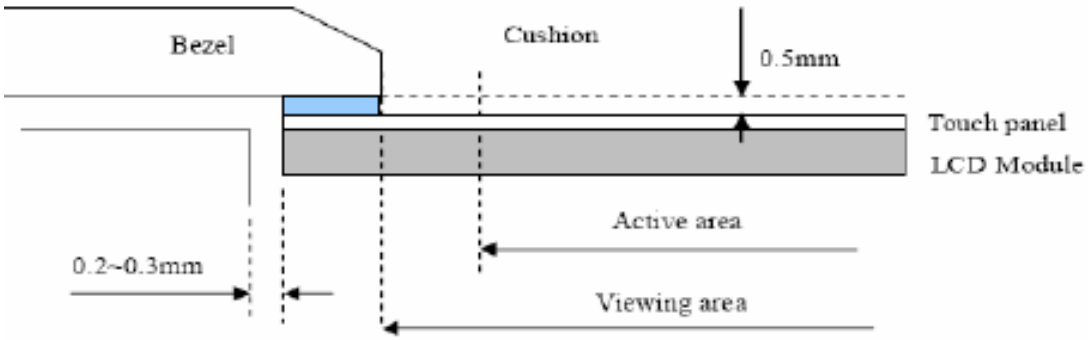
11.5 Cleaning

A. Do not wipe the touch panel with dry cloth, as it may cause scratch.

B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

11.6 Cautions for installing and assembling

Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.



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