



**SPECIFICATION
FOR
LCM Module
TS8050HD049-T**

MODULE:	TS8050HD049-T
CUSTOMER:	

TZD	INITIAL	DATE
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1. General Description

* DESCRIPTION

TS8050HD049-T AMOLED (ActiveMatrix/OrganicLightEmittingDiode) is a kind of active matrix organic light emitting diode decent board.AMOLED is the panel self-luminous, the effect is richer color, brighter, the most important is that AMOLED power consumption is much lower.The model is composed of autonomous emitting AMOLED panel and driving circuit unit.With a resolution of 5.0 inches, AMOLED contains 720*1280 pixels and can display colors up to 16.7 million colors

* Features

- Low Input Voltage: IOVCC: 1.65~3.3V;VCC: 2.5~3.3V
- Display Colors of AMOLED: 16.7M colors
- Interface: MIPI-4 Lanes
- Internal Power Supply Circuit.

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	61.88(H) *110.02(V)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	720(RGB) *1280	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	28.65(H) *85.95 (V)	um	-
Viewing angle	All	o'clock	-
Drive IC	RM67199	-	-
Display mode	Normally black	-	-
Operating temperature	-20~+60	°C	-
Storage temperature	-30~+70	°C	-

Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	74.75	-	mm	±0.05
	Vertical(V)	-	128.85	-	mm	±0.05
	Depth(D)	-	2.12	-	mm	±0.15
Weight		-	TBD	-	g	-



3. LCM Pin Description

Pin NO.	Symbol	Level	Remark
1	GND	L	Power Ground
2	VBAT (3.5~4.2V)	H	A supply voltage
3	VBAT (3.5~4.2V)	H	A supply voltage
4	VBAT (3.5~4.2V)	H	A supply voltage
5	VBAT (3.5~4.2V)	H	A supply voltage
6	VBAT (3.5~4.2V)	H	A supply voltage
7	GND	L	Power Ground
8	GND	L	Power Ground
9	GND	L	Power Ground
10	MTP-PWR		VPP(OTP power)
11	TE	H/L	Tearing effect output
12	RESET	H/L	Reset signal.
13	IOVCC (1.8V)	H	A supply voltage
14	GND	L	Power Ground
15	D2P	H/L	DSI_D2+ are differential data signal line
16	D2N	H/L	DSI_D2- are differential data signal line
17	GND	L	Power Ground
18	D1P	H/L	DSI_D1+ are differential data signal line
19	D1N	H/L	DSI_D1- are differential data signal line
20	GND	L	Power Ground
21	DCLKP	H/L	DSI_DCLK+ are differential data signal line
22	DCLKN	H/L	DSI_DCLK- are differential data signal line
23	GND	L	Power Ground
24	D0P	H/L	DSI_D0+ are differential data signal line
25	D0N	H/L	DSI_D0- are differential data signal line
26	GND	L	Power Ground
27	D3P	H/L	DSI_D3+ are differential data signal line
28	D3N	H/L	DSI_D3- are differential data signal line
29	GND	L	Power Ground
30	VCC (3.3V)	H	A supply voltage
31	GND	L	Power Ground
32	TP-VCC 3.3V	H/L	Power supply
33	NC	/	/
34	TP-INT	H/L	Interrupt pin
35	TP-SDA	H/L	Serial data input pin
36	TP-SCL	H/L	Serial clock input
37	TP-REST	H/L	Hardware reset pin
38	NC	/	/
39	GND	L	Power Ground



4. ELECTRICAL CHARACTERISTICS

4.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Remark
		Min	Max.		
Supply Voltage for Logic circuit	VDDIO	1.65	3.6	V	
Supply Voltage for analog circuit	Vcc	2.5	4.8	V	

4.2 DC ELECTRICAL CHARACTERISTICS

4.2.1 OPERATING CONDITIONS

Typical Operating Conditions (Ta=25°C)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Power Supply	Vcc	2.5	3.3	4.8	V	
Power Supply	VDDIO	1.65	1.8	3.3	V	
Normal mode Current consumption	Icc	-	-	35	mA	VCC=3.3V
AMOLED Power positive	ELVDD	-	-	-	V	
AMOLED power Negative	ELVSS	-	-	-	V	

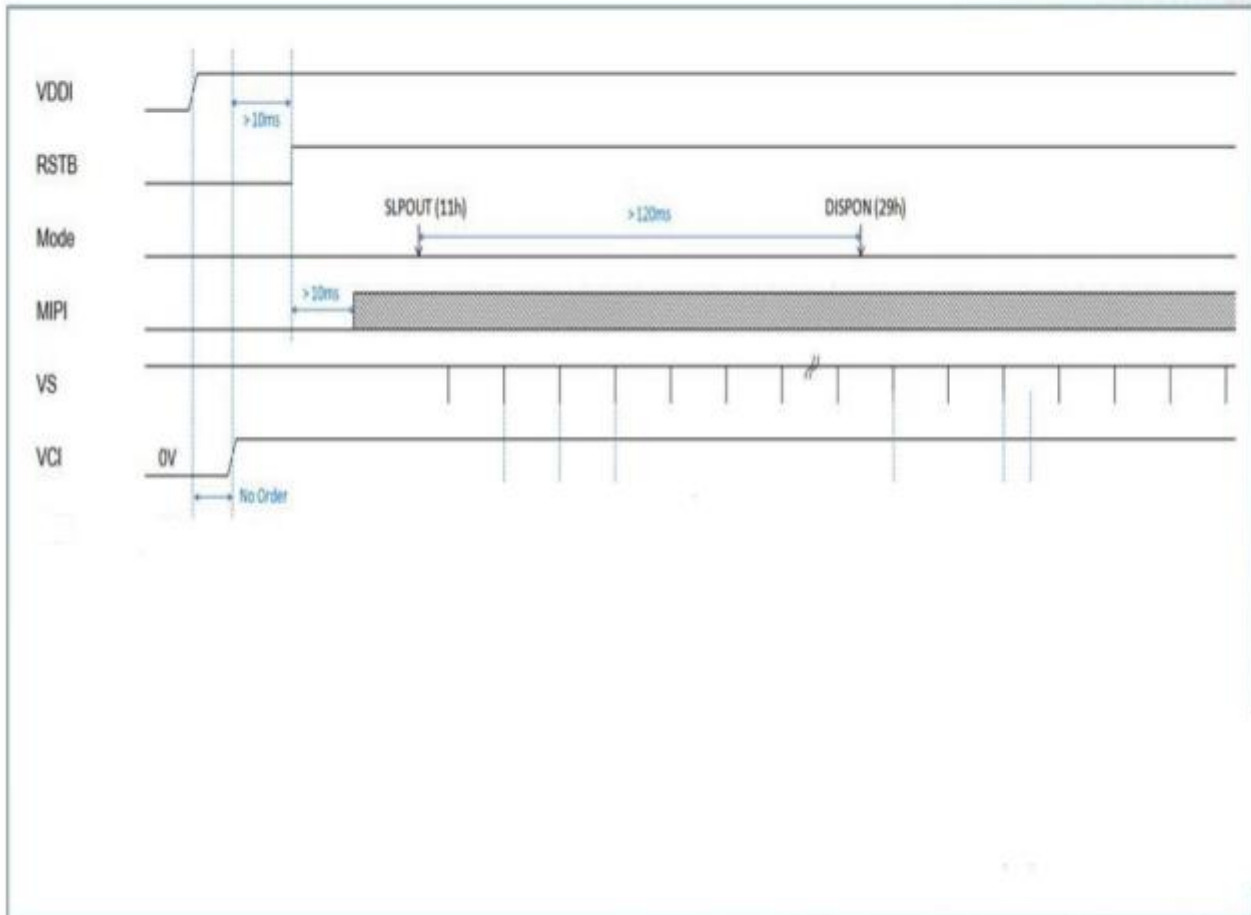
4.2.2 BACKLIGHT UNIT (GND=0V)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Forward supply Voltage	Vf				V	
Forward supply Current	If	-		-	mA	
LCM Luminance	L _V	290	320	-	cd/m ²	
Uniformity	/	80			%	-



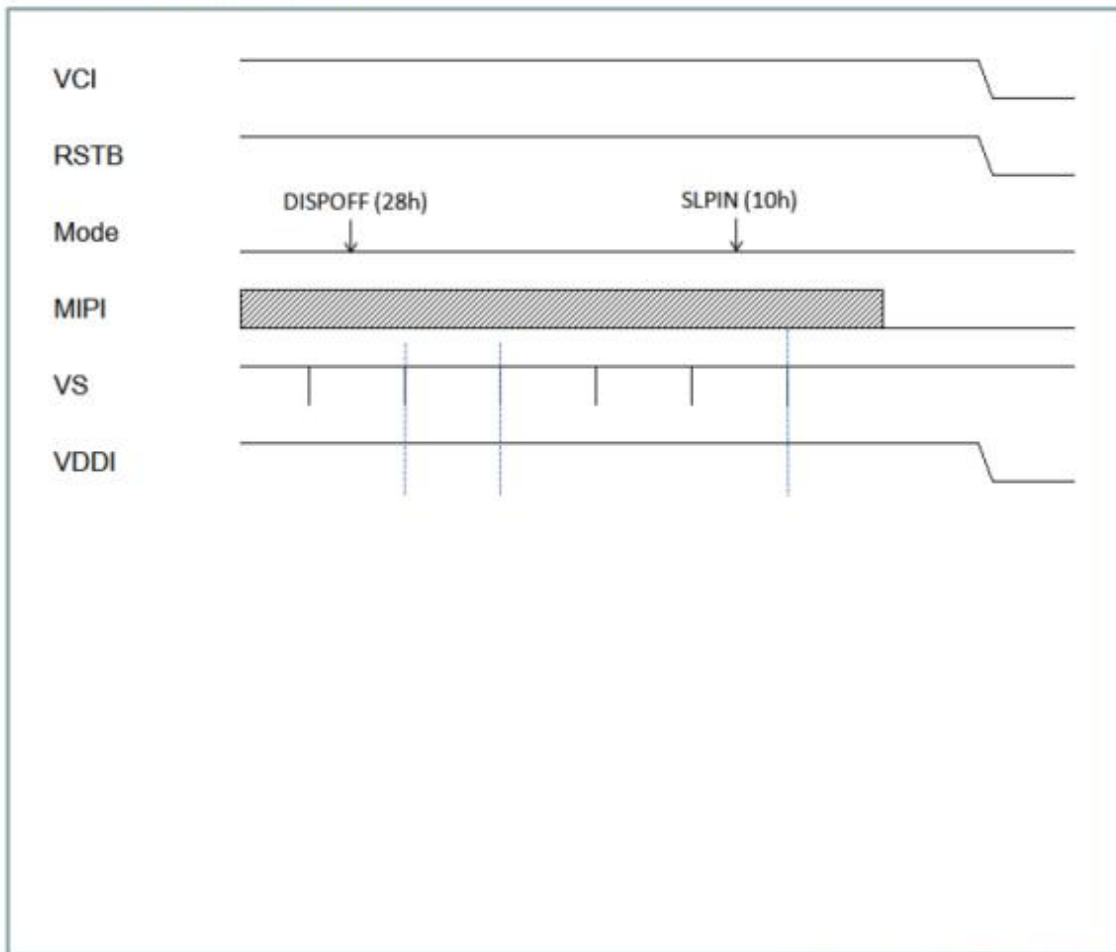
4.3 MIPI Interface Characteristics

5.3.1 Power on sequence



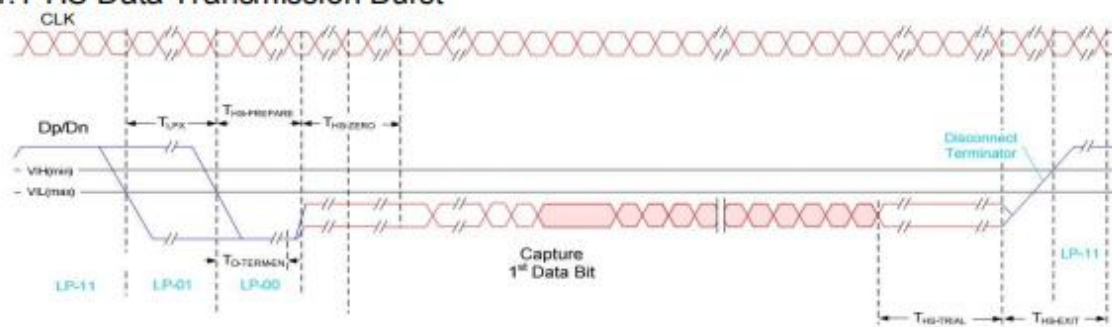


5.3.2 Power off sequence



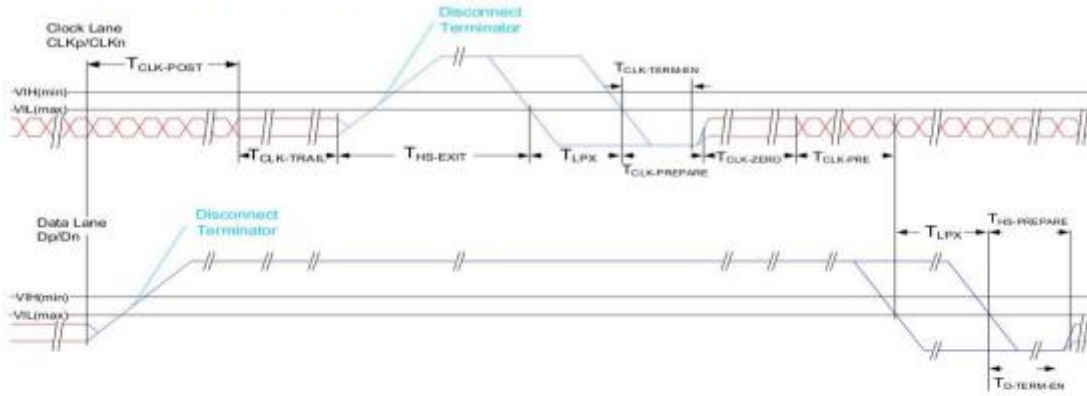
5.4 AC Characteristics (MIPI)

5.4.1 HS Data Transmission Burst

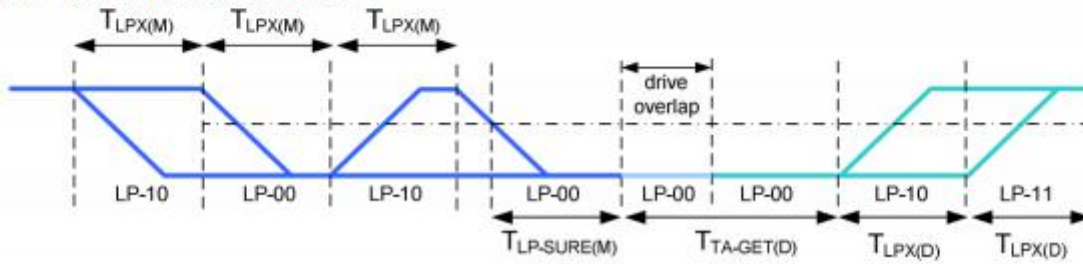




5.4.2 HS Clock Transmission



5.4.3 Turnaround Procedure





5.4.4 Timing Parameters

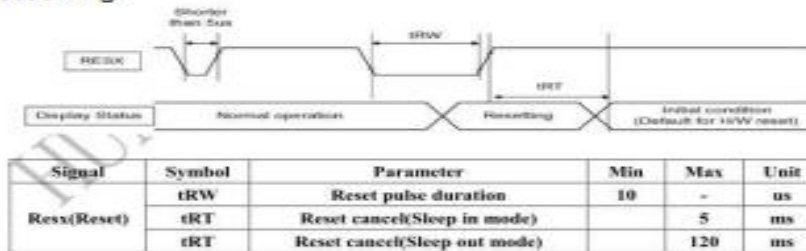
Symbol	Description	Min	Typ	Max	Unit
T _{REOT}	30%-85% rise time and fall time	-	-	35	ns
T _{CLK-MISS}	Timeout for receiver to detect absence of Clock transitions and disable the Clock Lane HS-RX.	-	-	60	ns
T _{CLK-POST*1}	Time that the transmitter continues to send HS clock after the last associated 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 _{HS-PREPARE} .	85 ns + 6*UI	-	145 ns + 10*UI	ns
T _{EOF}	Time from start of T _{HS-TRAIL} OF 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



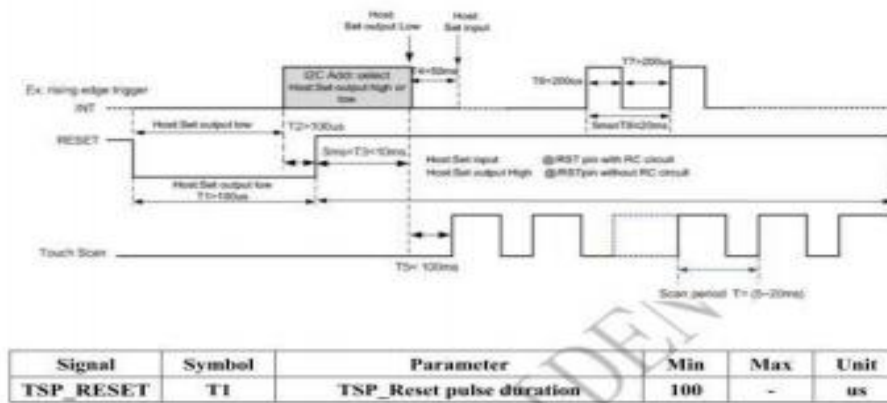
T _{HS-SKIP}	Time-out at RX to ignore transition period of EoT	40	-	55ns +4*UI	ns
T _{HS-TRAIL}	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60 + 4*UI	-	-	ns
T _{LPIX}	Length of any Low-Power state period	50	-	-	ns
Ratio T _{LPIX}	Ratio of T _{LPIX(MASTER)} /T _{LPIX(SLAVE)} between Master and Slave side	2/3	-	3/2	ns
T _{TA-GET}	Time to drive LP-00 by new TX	5*T _{LPIX}	5*T _{LPIX}	5*T _{LPIX}	ns
T _{TA-GO}	Time to drive LP-00 after Turnaround Request	4*T _{LPIX}	4*T _{LPIX}	4*T _{LPIX}	ns
T _{TA-SURE}	Time-out before new TX side starts driving	T _{LPIX}	-	2*T _{LPIX}	ns

5.4.5 Reset Timing Sequence Requirement

Display panel reset timing:



TP reset timing:





5. OPTICAL CHARACTERISTICS

Specification

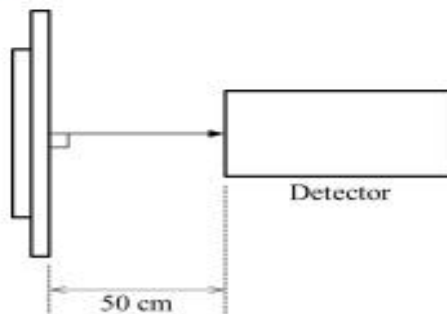
Ite		Symbol	Conditio	Min.	Typ.	Max.	Unit	Remark
Brightness			Full White	285	320	355	cd/m2	Note 14
Brightness Uniformity				75	85	-	%	Note 15
Contrast Ratio		CR		10000	20000			Based on CA-310 Note 17
CIE Chromaticity	White	u'	Normal to surface (CIE 1976)	0.181	0.196	0.211	-	Ref.
		v'		0.441	0.456	0.471	-	Ref.
	Red	u'		0.447	0.477	0.497	-	Ref.
		v'		0.519	0.528	0.537	-	Ref.
	Green	u'		0.062	0.070	0.100	-	Ref.
		v'		0.571	0.578	0.585	-	Ref.
	Blue	u'		0.137	0.159	0.185	-	Ref.
		v'		0.123	0.146	0.203	-	Ref.



Viewing angle	Left	θL	CR \geq 10	75	80	-	Deg.	Note 18
	Right	θR		75	80		Deg.	Note 18
	Top	ϕT		75	80		Deg.	Note 18
	Bottom	ϕB		75	80		Deg.	Note 18
Color Shift			White @ 30 degree			6	JNCD	Note 19
Flicker						-30	dB	Note 20
Cross Talk						1.7	%	Note 21
Gamma			At brightness 350nit	2.0	2.2	2.4		
OLED Life Time			With a Full-white image, lighting on with brightness of 350 nits for 120 hrs.	T94 \geq 120h				
Response time						2	ms	Note 30

Note 14: Luminance Measurement

- Environmental conditions: Temp. 25°C \pm 3°C, 65 \pm 20%RH, Dark Room.
- The data are measured after OLEDs are lighted on for more than 5 minutes and displays are fully white. The brightness is the average value of 9 measured spots. Measurement equipment: CS2000 or similar equipment. (Field of view: 1 deg., Distance: 50 cm)

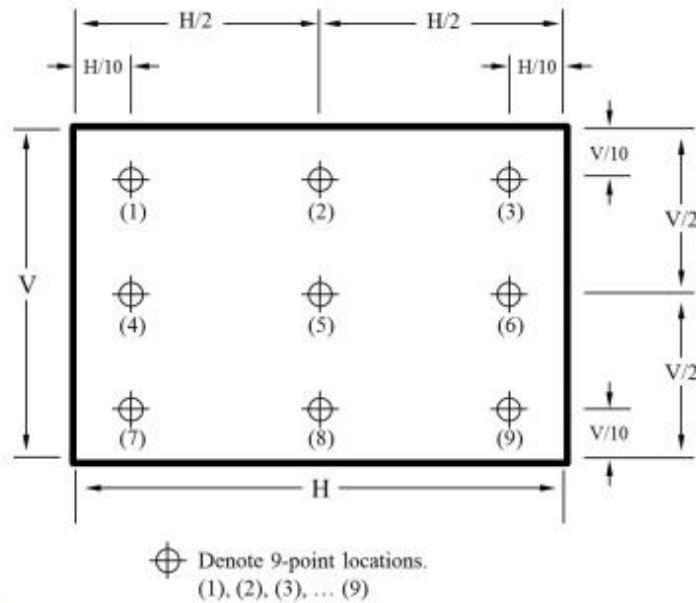


Note 15: Brightness Uniformity

- Environmental conditions: Temp. 25°C \pm 3°C, 65 \pm 20%RH, Dark Room.



- Measurement equipment: CS2000 or similar equipment.
- The brightness uniformity is calculated by using following formula:
Brightness uniformity = $\text{Bri.}(\text{Min.}) / \text{Bri.}(\text{Max.}) \times 100\%$
Bri.(Min.) = Minimum brightness measured in 9 measuring spots.
Bri.(Max.) = Maximum brightness measured in 9 measuring spots.
- Illustration of 9 measuring spots as follows



Note 17: Contrast Ratio

Dark Room C.R= L_W/L_B

L_W : Full white brightness of display center P0;

L_B : Full black brightness of display center P0.

Note 18: Viewing Angle

Refer to the figure below marked by θ and ϕ .



6. QUALITY SPECIFICATIONS

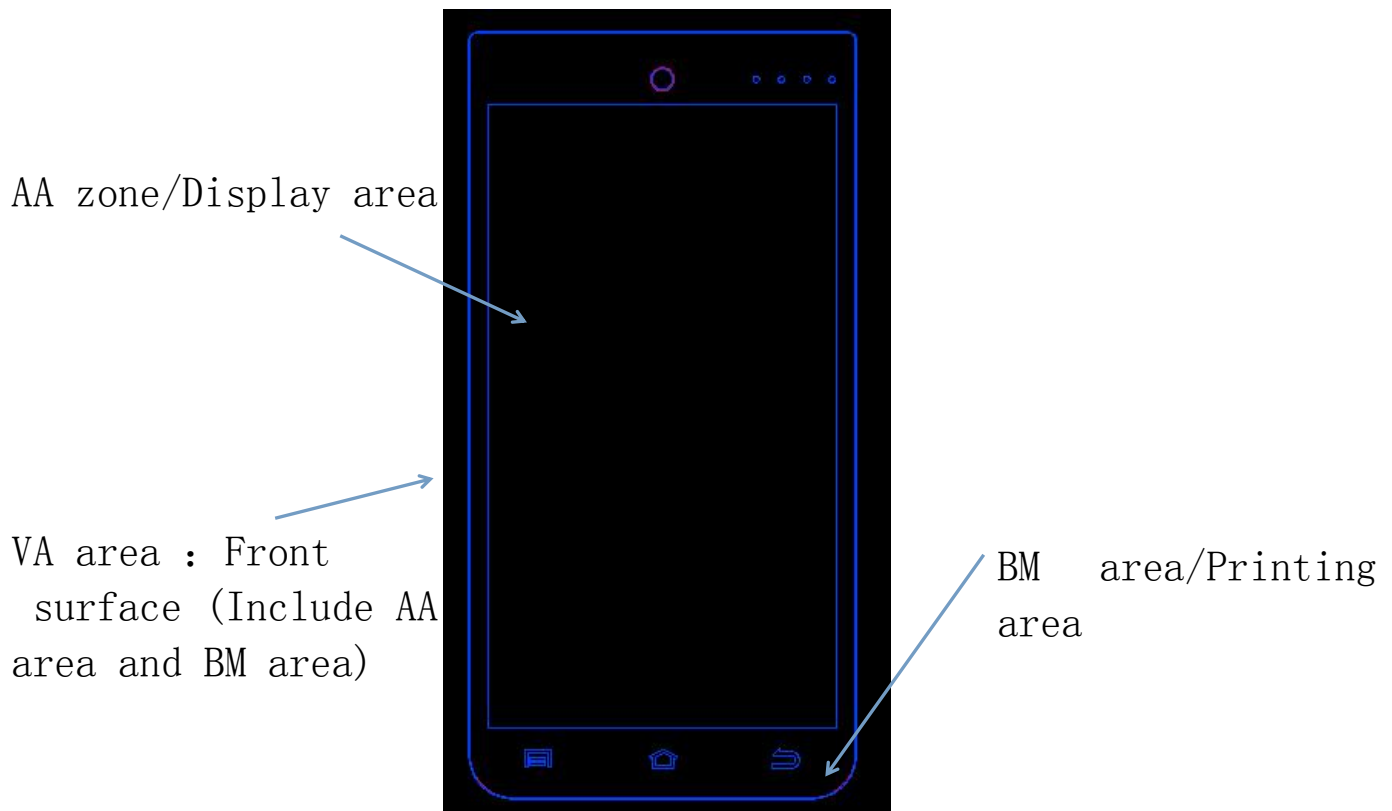
1. Inspection condition

1.1: Cosmetic inspection: viewing distance is about 30cm with bare eyes, and under an environment of 20~40W light intensity (600~1200LUX), all directions for inspecting the sample should be within 45° against perpendicular line.

6.1.2: Function inspection: viewing distance is about 30cm with bare eyes, and under an environment of 300LUX light intensity, all directions for inspecting the sample should be within 45° against perpendicular line.

2. Definition of Inspection Item.

2.1 Definition of Inspection zone in I-touch module.



AA zone: Character/Display area

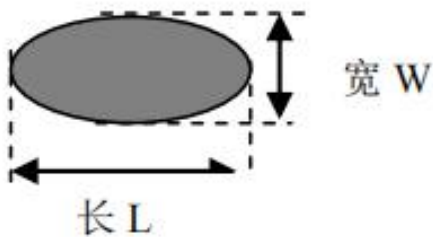
BM zone: Printing area

VA zone: Viewing area (AA area + BM area = viewing area)

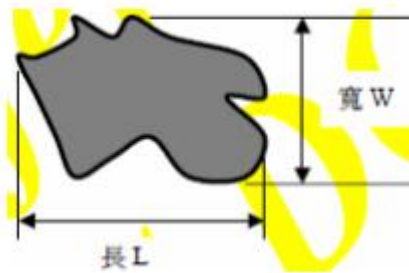


3. Defect definition

3.1 Circular defect

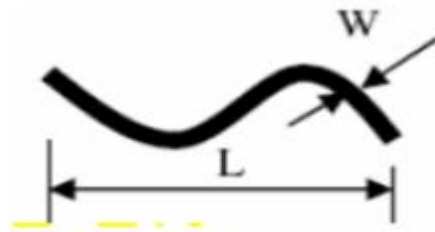


Diameter $\Phi = 1/2(L+W)$

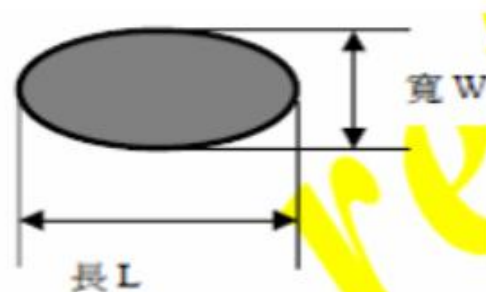
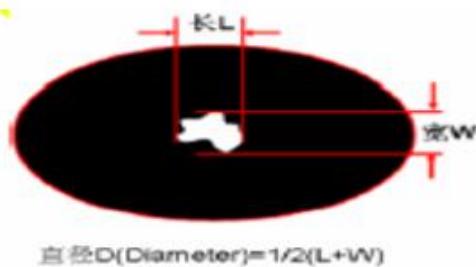


Diameter $\Phi = 1/2(L+W)$

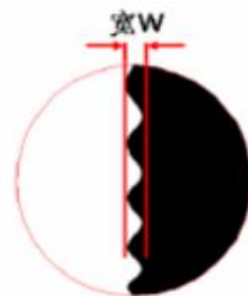
3.2 Linear defect



3.3 Pin hole



3.4 Zigzag



4. Inspection

4.1 Major

standards defect



-Item -No	Items to be inspected	Inspection Standard	Classificat ion of defects
4.1.1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical, horizontal segment 4) Short circuit 5) Touch panel abnormal.	Major
4.1.2	Missing	Missing component	
4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
4.1.4	LCM Mura	LCM Mura according to ND 5% keep out to determine, if keep out distance at 30cm be seen by eyes is NG, otherwise will be ok if invisible.	

4.2 Cosmetic defect

Item No	Items to be inspected	Inspection Standard	Classificat ion of defects										
4.2.1	Dot defect	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Zone Size (mm)</th> <th style="width: 50%; text-align: center;">VA area Acceptable Qty</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi \leq 0.1$</td> <td style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.10 < \Phi \leq 0.25$</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">$0.25 < \Phi \leq 0.30$</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">$0.30 < \Phi$</td> <td style="text-align: center;">0</td> </tr> </tbody> </table>	Zone Size (mm)	VA area Acceptable Qty	$\Phi \leq 0.1$	Ignore	$0.10 < \Phi \leq 0.25$	2	$0.25 < \Phi \leq 0.30$	1	$0.30 < \Phi$	0	Minor
		Zone Size (mm)	VA area Acceptable Qty										
		$\Phi \leq 0.1$	Ignore										
		$0.10 < \Phi \leq 0.25$	2										
		$0.25 < \Phi \leq 0.30$	1										
$0.30 < \Phi$	0												



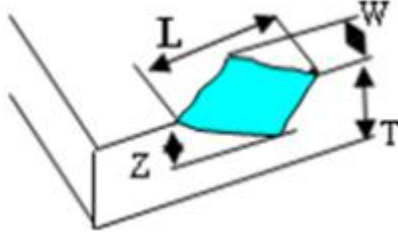
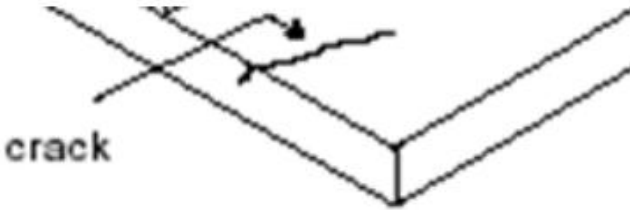
深圳市天正达电子股份有限公司
SHENZHEN TECHSTAR ELECTRONICS CO., LTD.

4.2.2	Dim Spots: Circle shaped and dim edged defects	Zone		VA area	Minor
		Size (mm)		Acceptable Qty	
		$\Phi \leq 0.20$		Ignore	
		$0.20 < \Phi \leq 0.40$		2	
		$0.40 < \Phi \leq 0.60$		1	
$0.60 < \Phi$		0			
Item No	Items to be inspected	Inspection Standard			Classification of defects
4.2.3	Dent Spot Fish eye	Zone		VA area	Minor
		Size (mm)		Acceptable Qty	
		$\Phi \leq 0.10$		Ignore	
		$0.10 < \Phi \leq 0.20$		2	
		$0.20 < \Phi \leq 0.30$		1	
$0.30 < \Phi$		0			





4.2.4	Line defect	Zone		VA area	Minor
		Size (mm)			
		L (Length)	W (Width)	Acceptable Qty	
		Ignore	$W \leq 0.03$	Ignore	
		$L \leq 5.0$	$0.03 < W \leq 0.05$	2	
		$L \leq 3.0$	$0.05 < W \leq 0.07$	1	
	/	$0.07 < W$	Define as spot defect		
4.2.5	Scratch	<p>If the scratch can be seen after mobile phone cover assembling or in the operating condition, judged as the line defect of 4.2.4.</p> <p>If the scratch can be seen only in non-operating condition or some special angle, judged as the following table.</p>			Minor
		Size (mm)		VA area	
		L (Length)	Acceptable Qty	Acceptable Qty	
		Ignore	$W \leq 0.03$	Ignore	
		$5.0 < L \leq 10.0$	$0.03 < W \leq 0.05$	2	
		$L \leq 5.0$	$0.05 < W \leq 0.08$	1	
		/	$W > 0.08$	0	

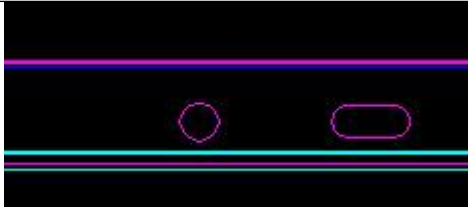


Item No	Items to be inspected	Inspection Standard	Classification of defect										
4.2.6	Bubble	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">Zone</td> <td style="width: 50%; text-align: center;">VA area</td> </tr> <tr> <td style="text-align: center;">Size (mm)</td> <td style="text-align: center;">Acceptable Qty</td> </tr> <tr> <td style="text-align: center;">$\Phi \leq 0.15$</td> <td style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.15 < \Phi \leq 0.25$</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">$0.25 < \Phi$</td> <td style="text-align: center;">0</td> </tr> </table>	Zone	VA area	Size (mm)	Acceptable Qty	$\Phi \leq 0.15$	Ignore	$0.15 < \Phi \leq 0.25$	2	$0.25 < \Phi$	0	Minor
Zone	VA area												
Size (mm)	Acceptable Qty												
$\Phi \leq 0.15$	Ignore												
$0.15 < \Phi \leq 0.25$	2												
$0.25 < \Phi$	0												
4.2.7	Glass defect	<p>4.2.7a Chip on corner or surface</p> <div style="text-align: center;">  </div> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px auto;"> <thead> <tr> <th style="width: 33%;">L(length)</th> <th style="width: 33%;">W(width)</th> <th style="width: 33%;">Z(thickness)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$L \leq 0.30$</td> <td style="text-align: center;">$W \leq 0.20$</td> <td style="text-align: center;">T/2</td> </tr> </tbody> </table> <p>Notes: T=Lens thickness, $\Phi \leq 0.10$ ignore Acceptable Qty: Single edge $N \leq 2$, Total $N \leq 4$</p> <p>4.2.7b Cracks Cracks tend to break are not allowed.</p> <div style="text-align: center;">  </div>	L(length)	W(width)	Z(thickness)	$L \leq 0.30$	$W \leq 0.20$	T/2					
L(length)	W(width)	Z(thickness)											
$L \leq 0.30$	$W \leq 0.20$	T/2											



Item No	Items to be inspected	Inspection Standard	Classification of defect
4.2.8	Parts alignment	1) Not allow IC and FPC/heat-seal lead width is more than 50% beyond lead pattern. 2) Not allow chip or solder component is off center more than 50% of the pad outline.	Minor
4.2.9 view area/ printing area of front surface and view area of rear surface	LOGO Pattern	 <p>Dot: according to Dot spec. Thickness odds:</p> $\frac{ \text{Spec pattern width} - \text{Print pattern width} \times 100\%}{\text{Spec pattern width}} \leq 30\%$ <p>Drawing slant:</p> <p>Print pattern length $\leq 10\text{mm}$, slant angle $\leq 3^\circ$; $10\text{mm} < \text{Print pattern length} \leq 20\text{mm}$, slant angle $\leq 1.5^\circ$</p>  <p>Pattern serration: $H \leq 0.05 \text{ mm}$</p> <p>Pattern leak print/ error/overprint: not allowed</p> <p>Pattern break line: width $\leq 0.10 \text{ mm}$</p> <p>Logo pattern color windage / color thin: Follow the limit samples.</p>	Minor



Item No	Items to be inspected	Inspection Standard	Classification of defects
4.2.10 view area/printing area of front surface and view area of rear surface	IR hole(A)/ Light sensor hole(B)/ LED hole(C)	 <ol style="list-style-type: none"> 1. A.B.C hole must be according the transmittancy 2. Light leakage on A.B.C hole or follow the limited sample. 3. A.B.C hole (LED) hole only judge by black background, no need to check in the lamb condition. 	Minor
	Surface dirty	<ol style="list-style-type: none"> 1. Dirty can not be cleaned follow the dot spec. 2. Accept while the dirty can be cleaned. 3. The quality guarantee period of protective film is 3months, during the period, the spot or contamination is not allowed. 	
	Printing area Light leakage	Follow the dot defect spec, MAX, Severity - see light leakage limit sample	
	Ink overflow	Visual inspection 30cm not allowed	
	Color discordant	Obvious color difference in the BM area is not allowed	
	Icon scratch of printing logo area	Icon printing logo area is not allow penetrability scratch	



7. RELIABILITY

Test Item	Test Condition
High Temperature Operation	60°C for 96 hours
Low Temperature Operation	-40°C for 96 hours
High Temperature Storage	70°C for 96 hours
Low Temperature Storage	-40°C for 96 hours
High Temperature Operation Humidity Operation	60°C, 90%RH for 72 hours
Thermal Shock	-40°C (30min) ~+25°C (5min)~ +60°C (30min) for 10 cycles
Vibration Test (No Operation)	Frequency: 10-55Hz Amplitude:1.0mm Sweep Time: 11min Test Period: 6 Cycles for each direction of X, Y, Z
Static electricity test	Touch 4KV,air touch 8KV



8. HANDLING PRECAUTION

8.1 STORAGE CONDITIONS

- (1) Store the panel or module in a dark place where the temperature is $23\pm 5^{\circ}\text{C}$ and the humidity is below $50\pm 20\% \text{RH}$.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.

8.2 HANDLING PRECAUTIONS

- (1) Avoid static electricity which can damage the CMOS LSI.
- (2) The polarizing plate of the display is very fragile. So, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface.
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonic solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.

8.3 WARRANTY

- 1) The period is within twelve months since the date of shipping out under normal using and storage conditions.
- 2) According to Techstar AMOLED quality standard, Techstar will rework or exchange for functional defect goods since within one year.