



# SPECIFICATION FOR TFT LCD MODULE

CUSTOMER : \_\_\_\_\_

CUSTOMER MODULE : \_\_\_\_\_

HG MODEL :     HG055HD017    

Preliminary Specification

Final Specification

Customer Confirmation column:

Approved by : \_\_\_\_\_ Dept. : \_\_\_\_\_ Data : \_\_\_\_\_

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Designed by	Checked by	Approved by



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## 1 Scope

This Specification defines AMOLED manufactured by ShenZhen HongGuang Display Limited . In the case of any unspecified item, it may require both HG and the party designs this module into its product to work out a solution.

## 2 Features

### 2.1 Product Applications

Mobile phone, portable GPS, handheld game console...

### 2.2 Product Features

- 1) Display color: 16.7M (RGB x 8bits)
- 2) Display format: 5.55"HD(720RGBx1280)
- 3) Pixel arrangement: Real RGB arrangement
- 4) Interface: MIPI 4 lanes
- 5) Driver IC: SH1386 (Sino)

## 3 Mechanical Specifications

Item	Specification	unit
Dimension outline	72.80*131.20*1.181 (w/o cushion)	mm
LTPS Glass outline	72.80*131.20	mm
Encapsulation Glass outline	72.80*127.80	mm
Number of dots	720(W) x RGB x 1280(H)	dots
Active area	69.12*122.88	mm
Diagonal size	5.551	inch
Pixel pitch	32*96	μm
Glass thickness (LTPS/encapsulation glass)	0.5 / 0.5	mm
Weight	26 (±10%)	g

Note: Refer to 9 Outline Dimension Drawing



## 4 Maximum Rating

Parameter	Symbol	Spec			Unit	Note
		Min.	Typ.	Max.		
Analog/boost power voltage	VCI	-0.3	-	5.28	V	-
VCI I/O voltage	VCI_IF	-0.3	-	5.28	V	-
I/O voltage	VDDI	-0.3	-	3.96	V	-
VSP voltage	VSP	-	-	6.5	V	-
VPP(OTP power)	VPP(NC)	-	-	8.64	V	-
Operating temperature	Top	-20		70	°C	
Storage temperature	Tstg	-30		80	°C	

## 5 Electrical Specifications

### 5.1 Electrical Characteristics

#### 5.1.1 Power Characteristic:

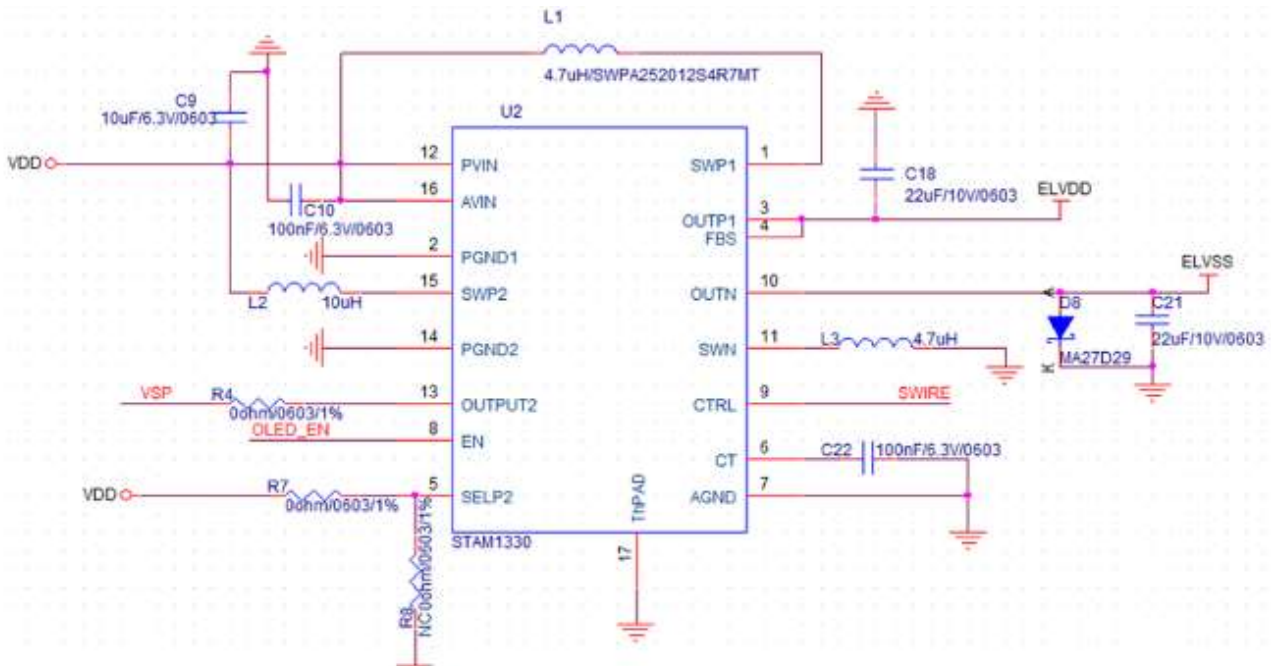
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
AMOLED Power positive	ELVDD	-	4.6	-	V	
AMOLED power Negative	ELVSS	-	-3.5	-	V	Ref
OTP power	VPP(NC)	7.4	7.6	7.8	V	Ref
Gamma Voltage	VSP		-	6.5	V	Ref
Digital Power supply	VDDI	1.65	1.8	3.6	V	Ref
Analog Power supply	VCI	2.5	3.3	4.8	V	Ref

Mode	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
ANSI @ Gray 255	IELVDD/ELVSS	VELVDD=4.6V VELVSS=-3.5V	-	200	260	mA	Ref
	IVCI	VCI=3.3V	-	70	110	mA	Ref
	IVSP	VSP=6.1V	-	15	25	mA	Ref



## 5.1.2 Power supply circuit application (This is for reference only):

Power IC recommend: ST:STAM1330, Silicon Mitus:SM3301, Richtek:RT4722



## 5.2 I/O Connection and Block Diagrams

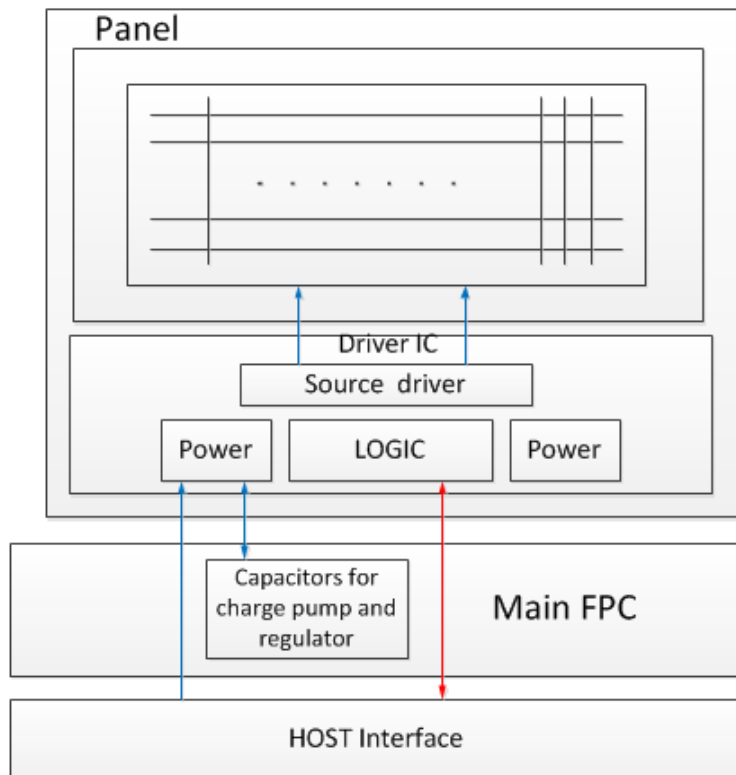
### 5.2.1 I/O Connection

#	Pin name	I/O	Description
1	GND	Power	Ground
2	VCI	Power	Driver IC analog supply
3	SWIRE	O	Power IC control pin
4	VDDI	Power	Driver IC digital I/O supply
5	LCD_ID		Ground
6	VPP(NC)	Power	Power supply for OTP. Leave the pin to open when not in use.
7	VSP	Power	PFM's Voltage
8	RST	I	This signal will reset the device and must be applied to properly initialize the chip. Active low.
9	TE	O	Tear effect output
10	ELVDD	Power	AMOLED power Positive
11	ELVDD	Power	AMOLED power Positive
12	OLED_EN	O	Power IC enable
13	ELVSS	Power	AMOLED power Negative
14	ELVSS	Power	AMOLED power Negative



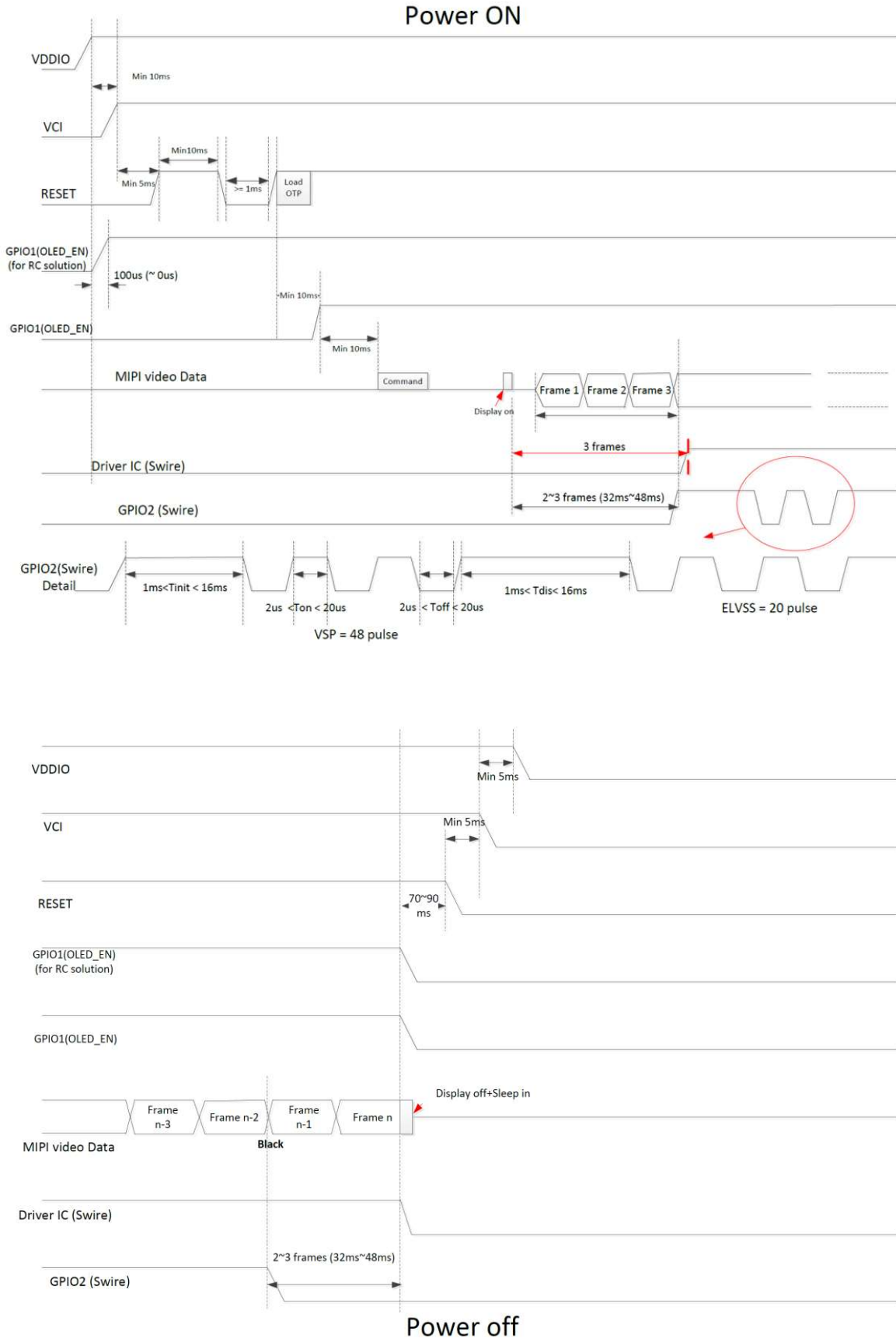
15	GND	Power	Ground
16	D3P	I	MIPI DSI data3+
17	D3N	I	MIPI DSI data3-
18	GND	Power	Ground
19	D2P	I	MIPI DSI data2+
20	D2N	I	MIPI DSI data2-
21	GND	Power	Ground
22	CLKP	I	MIPI DSI clock+
23	CLKN	I	MIPI DSI clock-
24	GND	Power	Ground
25	D1P	I	MIPI DSI data1+
26	D1N	I	MIPI DSI data1-
27	GND	Power	Ground
28	D0P	I	MIPI DSI data0+
29	D0N	I	MIPI DSI data0-
30	GND	Power	Ground

## 5.2.2 Display Module Block Diagram





## 5.3 Recommended Operating Sequence

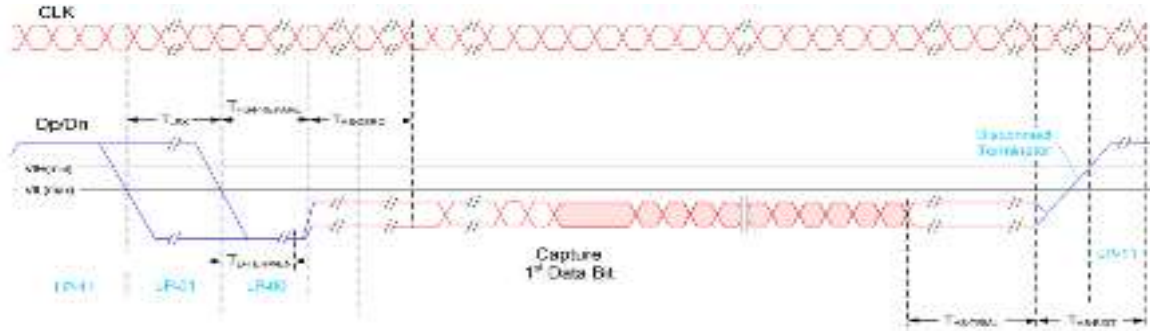




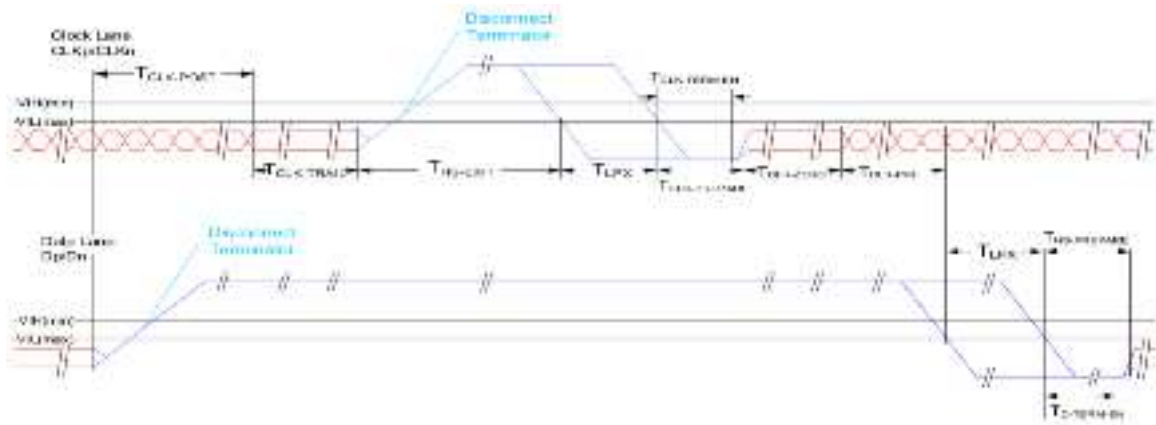


## 5.4 AC Characteristics (MIPI)

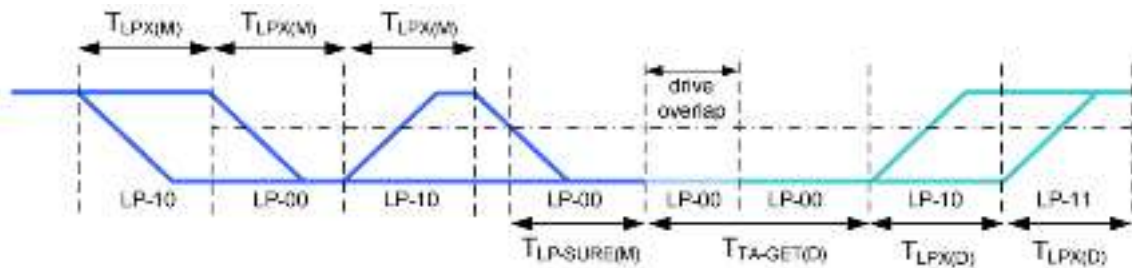
### 5.4.1 HS Data Transmission Burst



### 5.4.2 HS Clock Transmission



### 5.4.3 Turnaround Procedure





## 5.4.4 Timing Parameters

Symbol	Description	Min	Typ	Max	Unit
T <sub>REOT</sub>	30%-85% rise time and fall time	-	-	35	ns
T <sub>CLK-MISS</sub>	Timeout for receiver to detect absence of Clock transitions and disable the Clock Lane HS-RX.	-	-	60	ns
T <sub>CLK-POST*1</sub>	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 <sub>HS-TRAIL</sub> to the beginning of T <sub>CLK-TRAIL</sub> .	60ns + 52*UI (For DCS)	-	-	ns
T <sub>CLK-PRE</sub>	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 <sub>CLK-SETTLE</sub>	Time interval during which the HS receiver shall ignore any Clock Lane HS transitions, starting from the beginning of T <sub>CLK-PRE</sub> .	95	-	300	ns
T <sub>CLK-TERM-EN</sub>	Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses V <sub>IL</sub> , MAX.	Time for Dn to reach V <sub>TERM-EN</sub>		38	ns
T <sub>HS-SETTLE</sub>	Time interval during which the HS receiver shall ignore any Data Lane HS transitions, starting from the beginning of T <sub>HS-PREPARE</sub> .	85 ns + 6*UI		145 ns + 10*UI	ns
T <sub>EOT</sub>	Time from start of T <sub>HS-TRAIL</sub> or T <sub>CLK-TRAIL</sub> period to start of LP-11 state	-	-	105ns+48*UI	ns
T <sub>HS-EXIT(1)</sub>	time to drive LP-11 after HS burst	100	-	-	ns
T <sub>HS-PREPARE</sub>	Time to drive LP-00 to prepare for HS transmission	40ns + 4*UI	-	85ns+6*UI	ns
T <sub>HS-PREPARE + T<sub>HS-ZERO</sub></sub>	T <sub>HS-PREPARE</sub> + Time to drive HS-0 before the Sync sequence	145ns + 10*UI	-	-	ns
T <sub>HS-SKIP</sub>	Time-out at RX to ignore transition period of EoT	40	-	55ns+4*UI	ns



THS-TRAIL	Time to drive flipped differential state after last payload data bit of a HS transmission burst	$60 + 4 * UI$	-	-	ns
TLPX	Length of any Low-Power state period	50	-	-	ns
Ratio TLPX	Ratio of TLPX(MASTER)/TLPX(SLAVE) between Master and Slave side	2/3	-	3/2	ns
TTA-GET	Time to drive LP-00 by new TX	5*TLPX	5*TLPX	5*TLPX	ns
TTA-GO	Time to drive LP-00 after Turnaround Request	4*TLPX	4*TLPX	4*TLPX	ns
TTA-SURE	Time-out before new TX side starts driving	TLPX	-	2*TLPX	ns

### 5.4.5 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, TA=-20°C~+85°C)

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

Table: Reset timing

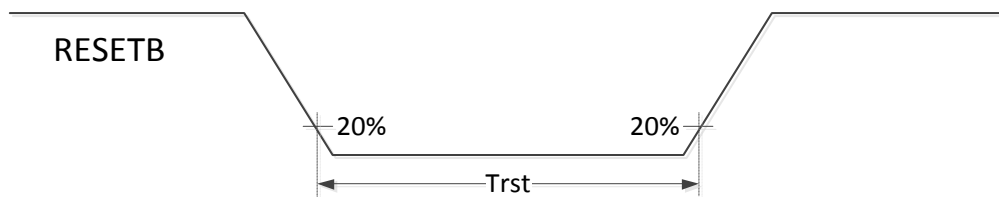


Figure: Reset timing



## 6 Electro-Optical Specification

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Remark	
Brightness		ANSI(2x4 Check Flag)	250	300	-	cd/m <sup>2</sup>	Note2	
Brightness Uniformity			70	85	-	%		
Contrast Ratio	CR		3000		-	-		
CIE Chromaticity	White	Normal to surface	x	0.265	0.30	0.335	-	
			y	0.285	0.32	0.355	-	
	Red		x	0.61	0.66	0.71	-	
			y	0.29	0.34	0.39	-	
	Green		x	0.13	0.18	0.23	-	
			y	0.69	0.74	0.79	-	
	Blue		x	0.08	0.13	0.18	-	
			y	0.01	0.06	0.11	-	
Color Gamut		vs. NTSC	75	105	-	%		
Viewing angle		U/D/L/R CR≥200		80	-	°		
Cross-talk		4% black or white window, 117 gray scale	-	-	5	%	Note3	
Gamma		V(Gray)=48,72,104,132,164,192,224,255	1.9	2.2	2.5	-		
Response time			-	-	2	ms	Note 4	

Note1: Temp.25°C, (Angle、distance)

Environmental conditions: Temp.25°C±3°C, 65±20%RH, Dark Room。

Distance of OLED display center to measuring machine is 50cm。

Note2: Brightness, Brightness Uniformity and Contrast Ratio definition



2x4 Check Flag (ANSI Definition)

W1~W8: 255 white ; B1~B8: 0 Black



ANSI: American National Standard Institute

Measure 16 points (W1~W8, B1~B8) of Display Brightness.

1) Brightness definition

$$\text{Brightness} = \text{Average} ( L_{W1} \sim L_{W8} )$$

2) Brightness Uniformity definition

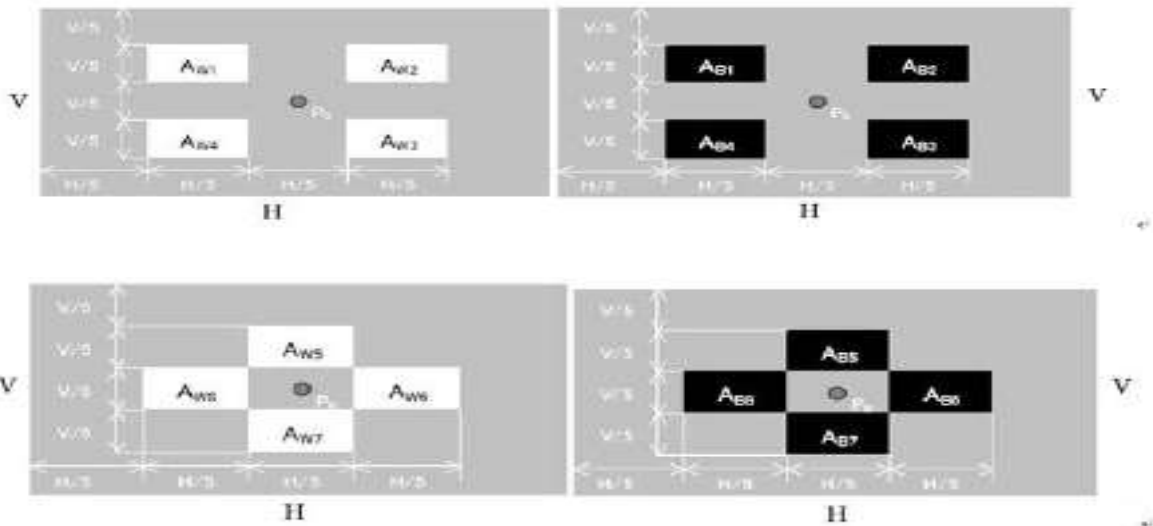
$$\text{Brightness Uniformity} = L_{\min(W1\sim W8)} / L_{\max(W1\sim W8)} \times 100\%$$

3) Contrast Ratio definition

$$\text{Dark Room C.R} = \text{Average} ( L_{W1} \sim L_{W8} ) / \text{Average} ( L_{B1} \sim L_{B8} )$$

Note3: Cross-talk

4% black or white window , 117 gray background.



$$L_{W\_OFF} = \frac{L_{W1} + L_{W2} + L_{W3} + L_{W4}}{4}$$

$$L_{B\_OFF} = \frac{L_{B1} + L_{B2} + L_{B3} + L_{B4}}{4}$$

$$CT = \frac{|L_{Wi\_ON} - L_{W\_OFF}|}{L_{W\_OFF}} \times 100\% (i = 5 \text{ to } 8)$$

For white windows  $A_{Wi}$  ( $i = 5$  to  $8$ ), and

$$CT = \frac{|L_{Bi\_ON} - L_{B\_OFF}|}{L_{B\_OFF}} \times 100\% (i = 5 \text{ to } 8)$$

For black windows  $A_{Bi}$  ( $i = 5$  to  $8$ ).

The maximum cross-talk value shall be noted in the measurement report.

Note4: Response Time

Response time=Pixel turn on and turn off time (White<=>Black).

It is measuring transition time from 10% to 90% of luminance.



## 7 Reliability

### 7.1 Environmental Test

No	Item	Conditions(Note1)
1	High Temperature Operation	70°C / 128 hours
2	High Temperature non-Operation	80°C / 128 hours
3	Low Temperature Operation	-20°C / 128 hours
4	Low Temperature non-Operation	-30°C / 128 hours
5	High Temperature/Humidity Operation	40°C / 128 hours 95%RH
6	High Temperature/Humidity non-OP	60°C / 128 hours 90%RH

### 7.2 Electrical Test

No	Item	Conditions
1	Air discharge	±8KV,150PF/330Ω (Module level)
2	Contact discharge	±4KV, 150PF/330Ω (Module level)

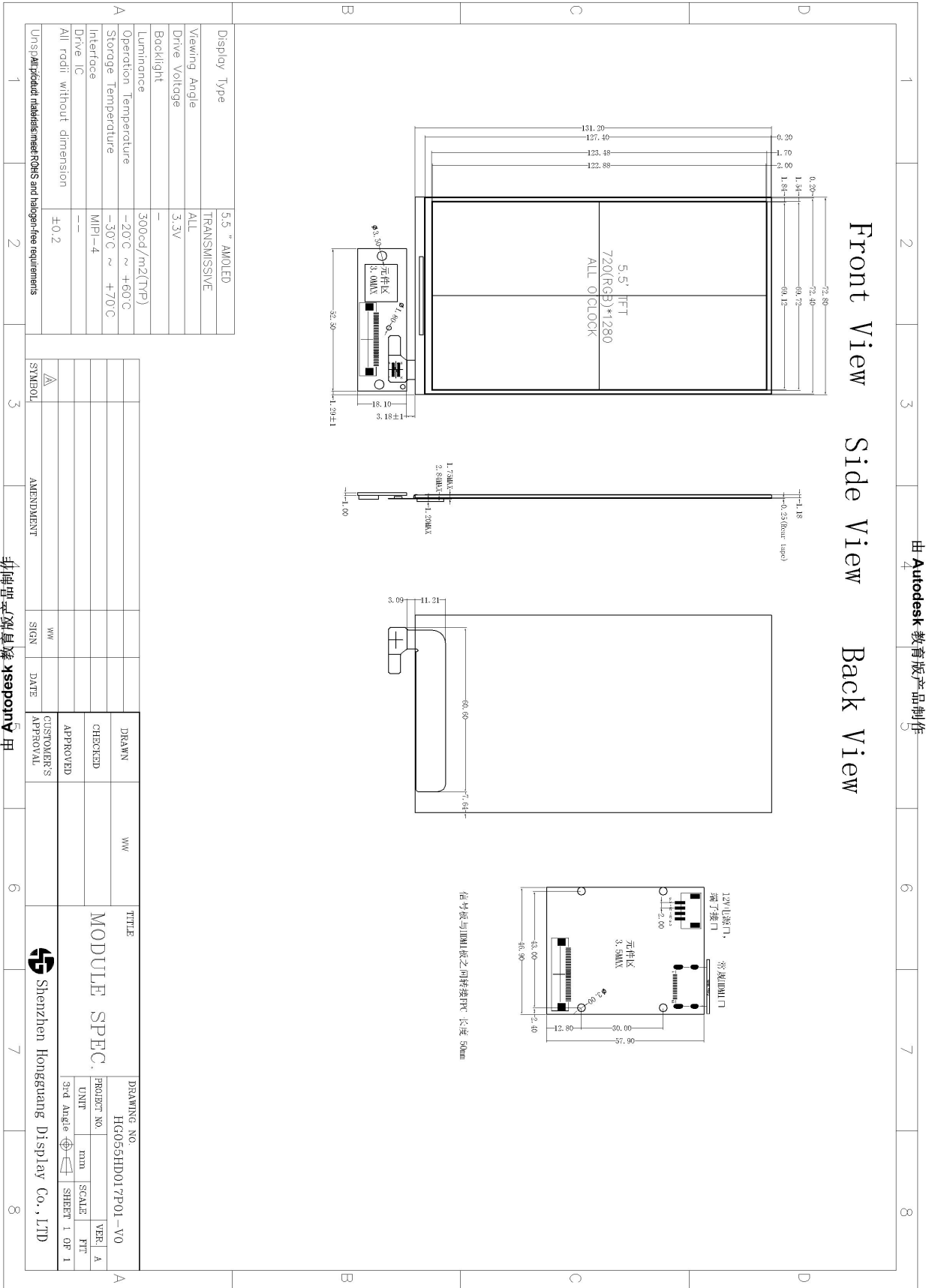
## 8 Handling Precautions

- 8.1 When cleaning ITO pad, avoid using hard and abrasive material or corrosive solution.
- 8.2 Keep module away from direct sunlight or fluorescent light, and keep it at room temperature and humidity.
- 8.3 Strong impact & pressure on module and packing is prohibited.
- 8.4 Following normal power on/off sequence is necessary for preventing abnormal display or permanent damage to display.
- 8.5 Optimal contrast ratio under ideal voltage is AMOLED module's characteristic, hence it is recommended a voltage control function available.
- 8.6 Image sticking may occur if an image displays for an extended period of time.
- 8.7 When interfered by system's overall mechanical design, an abnormal display may occur.
- 8.8 After considering emitting energy, you should plan your design to satisfy EMI standards.
- 8.9 Host side should place a surge-prevent circuit at power trace (ie: VCI, Vddi) to protect AMOLED module.



## 9 Outline Dimension Drawing

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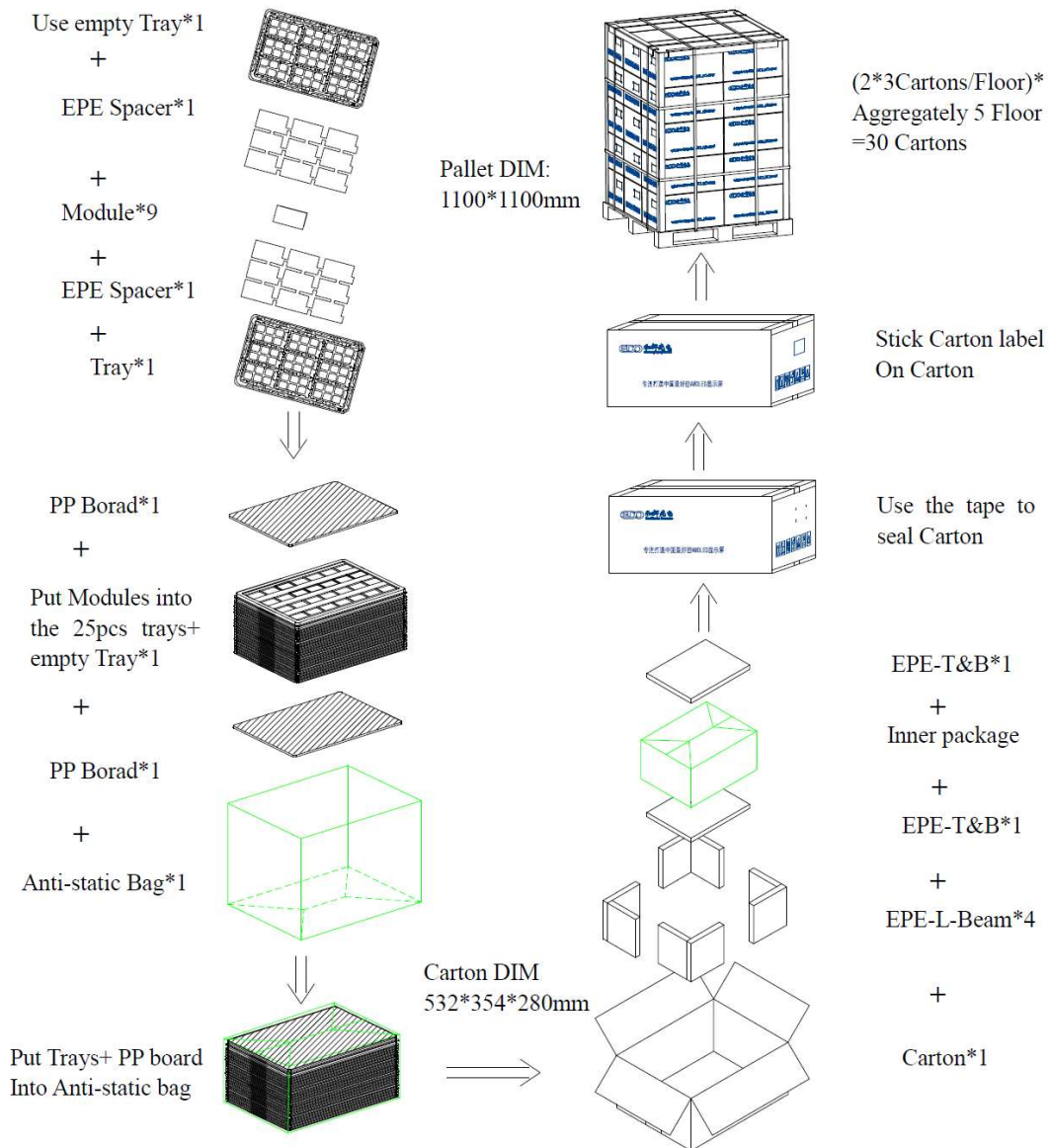


## 10 Packing Specification

1. Packaging Material (Per Carton)						
NO	Item	Model (Material)	Dimensions (mm)	Unit Weight (g)	Quantity	Remark
1	Module	FOG	TBD	TBD	175	
2	Tray	PET(White)	480.00*302.00*14.00	TBD	26	
3	Anti-static bag	PE	TBD	TBD	1	
4	Carton	Corrugated paper	532*354*280	TBD	1	
5	EPE Spacer	EPE	TBD	TBD	50	
6	EPE-T&B	EPE	511.00*333.00*15.00	TBD	2	
7	EPE-L-Beam	EPE	115*213.00*115.00	TBD	4	
8	PP Board	PP	481.00*303.00*5.00	TBD	2	
9	Carton Label	paper	52.00*100.00*0.10	TBD	1	
10	Pallet	Wood	1100*1100	TBD	1/30	

2. Packaging specification and quantity (PCS) :	
(1) Module quantity per Tray:	quantity per row 3 X quantity per column 2+1=7
(2) Module quantity in carton:	quantity per Tray 7 X quantity of Trays 25=175
(3) Total Modules quantity in pallet:	quantity per Carton 175 X quantity of Cartons 30=5250



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