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Date :	2018/05/23

CUSTOMER APPROVAL SHEET

Company Name	**BSI**
MODEL	**H120BLX01.0**
CUSTOMER	**Title :**
APPROVED	**Name :**

☐ **APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver.____)**

☐ **APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver.____)**

☐ **APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver.____)**

☐ **CUSTOMER REMARK :**

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Product Specification

1.2" AMOLED

MODEL NAME: H120BLX01.0

AUO Product P/N: 95.01H83.000

< ◆ >Preliminary Specification
< >Final Specification

Note: The content of this specification is subject to change.

Record of Revision

Version	Revise Date	Page	Content
1.0	2017/10/13	1-25	First edition
2.0	2018/02/01	8	Display DC Characteristics
		8-9	Display & TP Current Consumption
		14	Operating Sequence
		19	Optical Specifications
		22	HB mode Optical Specifications
		25	Outline Demension
		26	Precaution
3.0	2018/03/07	5	FPC Pin Assignment
		9	Display Current Consumption
		25	Outline Demension
4.0	2018/05/11	8-9	Display & TP Current Consumption
		25	Outline Demension
5.0	2018/05/23	8-9	Display & TP Current Consumption

Contents

A. General Specification

1. Physical Specifications

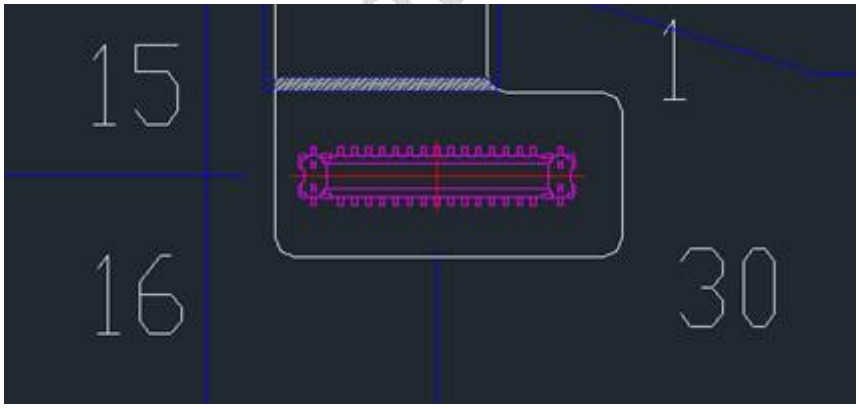
	Item	Description	Remark
1	Screen Size (inch)	1.20”	
2	Display Mode	AMOLED	
3	Display Resolution	390x390	
4	Active Area (mm*mm)	30.42(H)×30.42(V)	
5	Frame rate (normal mode)	45 (Hz)	
6	Pixel Configuration	Hyper R.G.B	
7	Display Color (M)	16.7	
8	Brightness (nits)	350	
9	Interface	MIPI	CMD Mode
10	Driver IC	WT010	
11	Outline Dimension (mm*mm*mm)	33.95(H) × 33.62(V) × 0.607(T)	Thickness under confirm

2. FPC Pin Assignment

Main FPC Pin assignment — AMOLED Panel Input/Output Signal Interfac

FPCA recommended connector: AXG230144 / AXG230144KV1

Main board recommended connector: AXG130144 / AXG130144KV1



#	Pin_name	I/O	Description
1	VDDIO	Power	Power supply for interface system except MIPI interface
2	VDDIO	Power	Power supply for interface system except MIPI interface
3	VCI	Power	Driver analog power supply (Power IC need to follow AUO’s suggestion)
4	VCI	Power	Driver analog power supply (Power IC need to follow AUO’s suggestion)
5	SWIRE	O	SWIRE signal for PWR IC control
6	CSX	I	SPI Enable Signal

7	SCL	I	SPI Clock signal
8	DCX	I	SPI CMD/Data selection signal
9	SDI	I/O	SPI data signal
10	SDO	O	SPI Output signal
11	TE	O	Vsync (vertical sync) signal output from panel to avoid tearing effect
12	NC	-	Floating
13	ELVSS	Power	AMOLED negative power supply (Power IC need to follow AUO's suggestion)
14	ELVSS	Power	AMOLED negative power supply (Power IC need to follow AUO's suggestion)
15	ELVSS	Power	AMOLED negative power supply (Power IC need to follow AUO's suggestion)
16	ELVDD	Power	AMOLED positive power supply (Power IC need to follow AUO's suggestion)
17	ELVDD	Power	AMOLED positive power supply (Power IC need to follow AUO's suggestion)
18	ELVDD	Power	AMOLED positive power supply (Power IC need to follow AUO's suggestion)
19	GND	Power	Ground
20	DSI_D0P	I/O	MIPI positive data signal
21	DSI_D0N	I/O	MIPI negative data signal
22	GND	Power	Ground
23	DSI_CLKP	I	MIPI positive clock signal
24	DSI_CLKN	I	MIPI negative clock signal
25	GND	Power	Ground
26	RESX	I	Device reset signal (0 : enable ; 1 : Disable)
27	TP_RES	I	TP Reset signal
28	TP_SCL	I	TP Clock signal
29	TP_SDA	I	TP Data signal
30	TP_INT	I	TP initial signal

Note 1: I = input; O = output; P = Power; I/O = input / Output; NC= No Connection

Note 2: AUO suggest only use MIPI I/F, and pin of SPI I/F is connected as below.

(SCL & DCX & SDI & SDO pin is GND, and CSX is connected to VDDIO.)

3. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
Digital Power Supply	VDDIO	-0.3	5.5	V	
Analog Power Supply	VCI	-0.3	5.5	V	
ELVDD power Supply	ELVDD	-	5.0	V	
ELVSS power Supply	ELVSS	-5.0	-	V	

Note : If the module exceeds the absolute maximum ratings, it may be damaged permanently.

B. DC Characteristics

1. Display DC Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Digital Power Supply		VDDIO	1.65	1.8	1.95	V	Note1
Analog power Voltage		VCI	3.27	3.3	3.33	V	Note1
ELVDD power Supply		ELVDD	3.27	3.3	3.33	V	Note1
ELVSS power Supply		ELVSS	-3.33	-3.3	-3.27	V	Note1
			-4.75	-4.7	-4.65	V	Note2
Input Signal Voltage	H Level	VIH	0.8* VDDIO	-	VDDIO	V	Note1
	L Level	VIL	0	-	0.2* VDDIO	V	
Output Signal Voltage	H Level	VOH	0.8* VDDIO	-	VDDIO	V	Note1
	L Level	VOL	0	-	0.2* VDDIO	V	Note1

Note 1: The operation is guaranteed under the recommended operating conditions only. The operation is not guaranteed if a quick voltage change occurs during the operation. To prevent the noise, a bypass capacitor must be inserted into the line closed to the power pin.

Note 2: The Voltage of HBM mode

2. Display Current Consumption

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Panel Power	Normal	P_{OLED}	ELVDD:3.3V ELVSS:-3.3V	--	--	97	mW	Note1
		I_{OLED}		--	--	14.7	mA	Note1
	HBM	P_{OLED}	ELVDD:3.3V ELVSS:-4.7V	--	--	400	mW	Note 2
		I_{OLED}		--	--	50	mA	Note 2
IC	Normal (TP Normal)	P_{VCI}	VCI : 3.3V	--	12.2	14.5	mW	Note3,6
		I_{VCI}		--	3.7	4.4	mA	Note3,6
		P_{VDDIO}	VDDIO :1.8V	--	4.0	4.9	mW	Note3,6
		I_{VDDIO}		--	2.2	2.7	mA	Note3,6
	Idle (TP Idle)	P_{VCI}	VCI : 3.3V	--	4.3	5.2	mW	Note4,5,6
		I_{VCI}		--	1.3	1.6	mA	Note4,5,6
		P_{VDDIO}	VDDIO :1.8V	--	1.7	2.0	mW	Note4,6
		I_{VDDIO}		--	0.9	1.1	mA	Note4,6

	Sleep (TP Gesture)	**P_{VCI}**	**VCI : 3.3V**	--	--	0.4	mW	Note6
		I_{VCI}		--	--	0.12	mA	Note6
		P_{VDDIO}	**VDDIO :1.8V**	--	--	0.9	mW	Note6
		I_{VDDIO}		--	--	0.5	mA	Note6
	HBM (TP Normal)	**P_{VCI}**	**VCI : 3.3V**	**--**	14.2	16.5	mW	Note6,7
		I_{VCI}		**--**	4.3	5.0	mA	Note6,7
		P_{VDDIO}	**VDDIO :1.8V**	**--**	4.0	4.9	mW	Note6,7
		I_{VDDIO}		**--**	2.2	2.7	mA	Note6,7

Note 1: Based on L255 (350nits) full white pattern

Note 2: Based on L255 full white pattern at HBM mode

Note 3: Based on black pattern. MIPI-DSI frame rate 45Hz command mode.

Note 4: Based on black pattern. MIPI-DSI frame rate 15Hz command mode.

Note 5: VCI Current must < 1.9 mA at Idle mode.

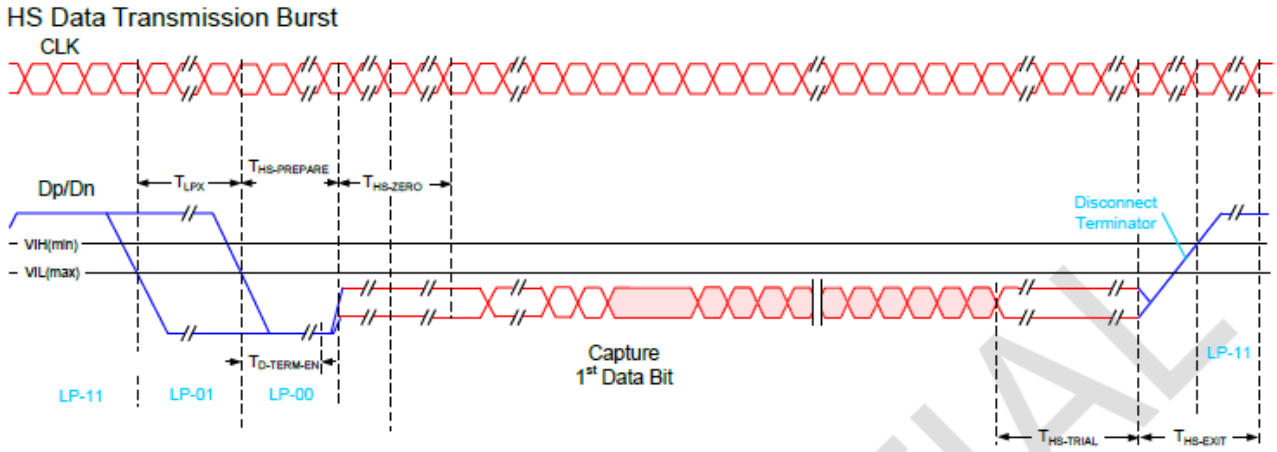
Note 6: Power consumption spec. is base on TP FW of V2.2.0.1B. The power consumption may be revised according to the TP FW version.

Note 7: Based on black pattern.

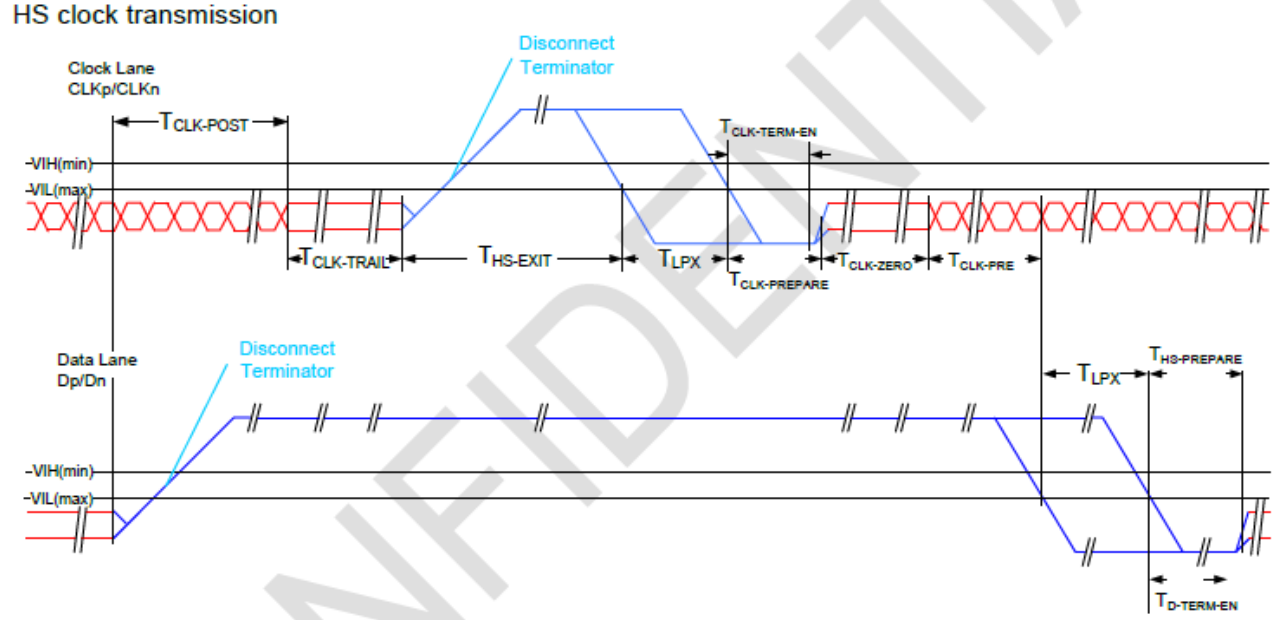
C. AC Characteristics

1. MIPI Interface Characteristics

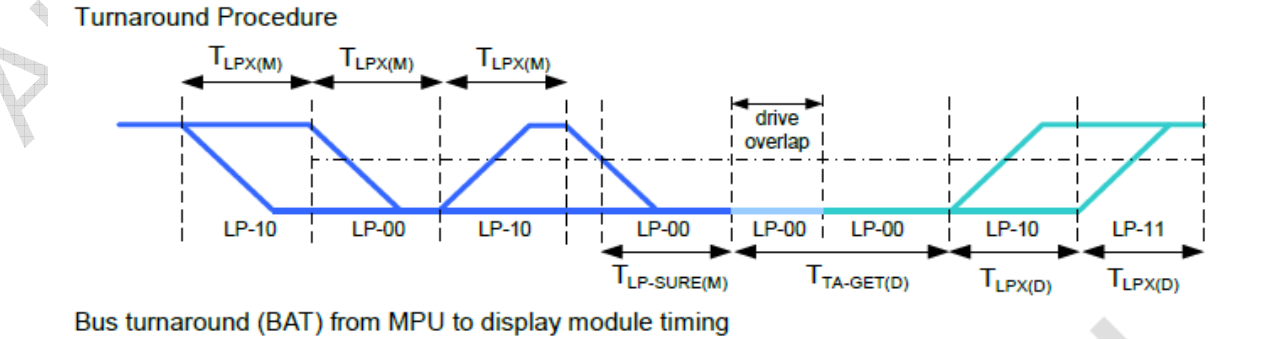
HS Data Transmission Burst



HS clock transmission

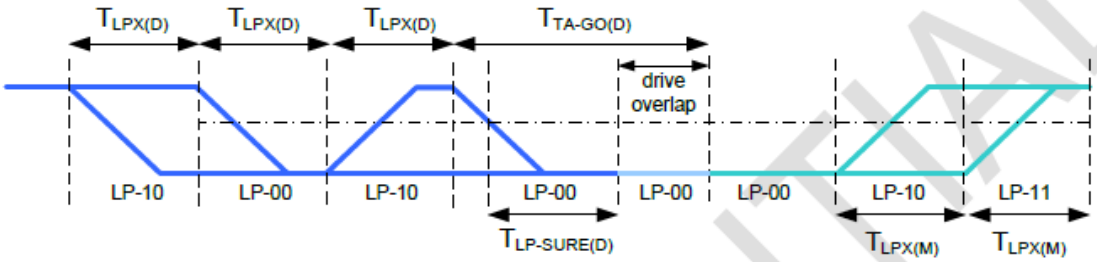


Turnaround Procedure



Bus turnaround (BAT) from MPU to display module timing

Bus turnaround (BAT) from MPU to display module timing



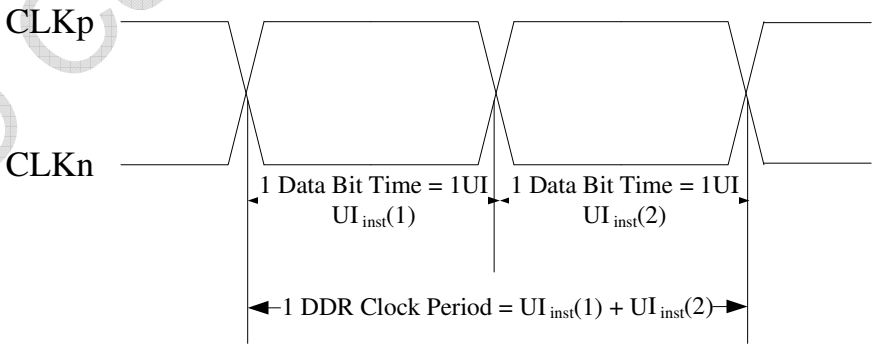
Bus turnaround (BAT) from display module to MPU timing

Timing Parameters

Symbol	Description	Min	Typ	Max	Unit
$T_{CLK-POST}$	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			Ns
$T_{CLK-TRAIL}$	Time that the transmitter drives the HS-0 state after the last payload clock bit of a HS transmission burst.	60			Ns
$T_{HS-EXIT}$	Time that the transmitter drives LP-11 following a HS burst.	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 $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		38	Ns
$T_{CLK-PREPARE}$	Time that the transmitter drives the Clock Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission.	38		95	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			UI
$T_{CLK-PREPARE}$ + $T_{CLK-ZERO}$	$T_{CLK-PREPARE}$ + time that the transmitter drives the HS-0 state prior to starting the Clock.	300			Ns
$T_{D-TERM-EN}$	Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$.	Time for Dn to Reach $V_{TERM-EN}$		35 ns +4*UI	
$T_{HS-PREPARE}$	Time that the transmitter drives the Data Lane LP-00 Line state immediately before	40ns + 4*UI		85 ns + 6*UI	ns

	the HS-0 Line state starting the HS transmission				
$T_{HS-PREPARE}$ + $T_{HS-ZERO}$	$T_{HS-PREPARE}$ + time that the transmitter drives the HS-0 state prior to transmitting the Sync sequence.	145ns + 10*UI			Ns
$T_{HS-TRAIL}$	Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst	60ns + 4*UI			Ns
$T_{LPX(M)}$	Transmitted length of any Low-Power state period of MCU to display module	50		150	Ns
$T_{TA-SURE(M)}$	Time that the display module waits after the LP-10 state before transmitting the Bridge state (LP-00) during a Link Turnaround.	$T_{LPX(M)}$		$2*T_{LPX(M)}$	Ns
$T_{LPX(D)}$	Transmitted length of any Low-Power state period of display module to MCU	50		150	Ns
$T_{TA-GET(D)}$	Time that the display module drives the Bridge state (LP-00) after accepting control during a Link Turnaround.		$5*T_{LPX(D)}$		Ns
$T_{TA-GO(D)}$	Time that the display module drives the Bridge state (LP-00) before releasing control during a Link Turnaround.		$4*T_{LPX(D)}$		Ns
$T_{TA-SURE(D)}$	Time that the MPU waits after the LP-10 state before transmitting the Bridge state (LP-00) during a Link Turnaround.	$T_{LPX(D)}$		$2*T_{LPX(D)}$	Ns

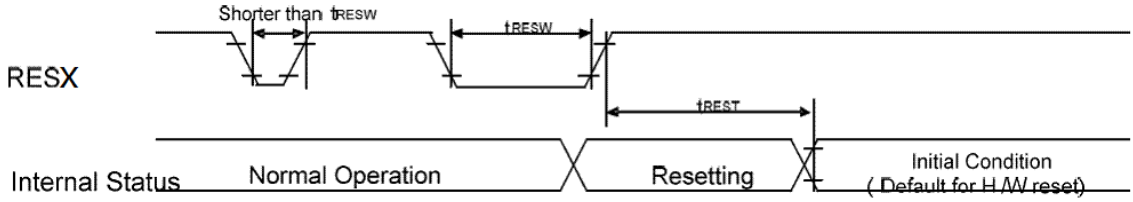
DDR Clock Definition



Clock Parameter	Symbol	Min	Typ	Max	Units
UI instataneous	UI_{inst}	2		12.5	ns

2. Display RESET Timing Characteristics

Reset input timing



Timing Parameters

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	10	-	-	-	µs
t_{REST}	*2) Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-		-	120	When reset applied during Sleep out mode	ms

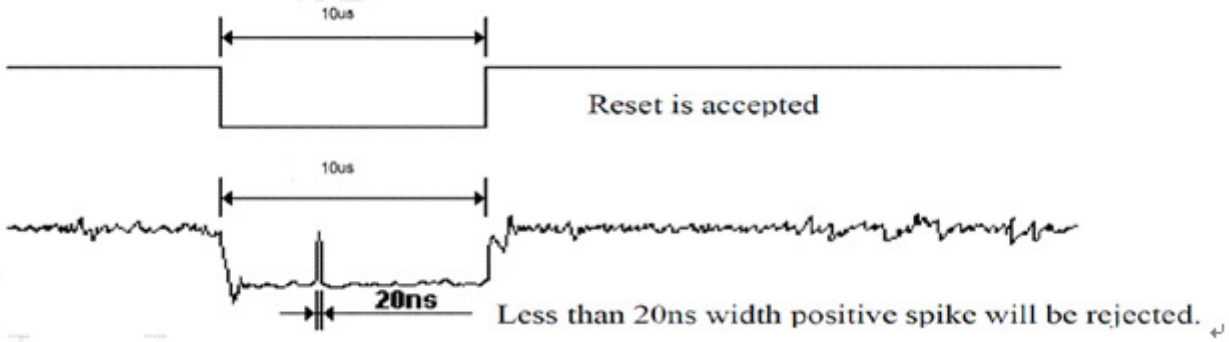
Note 1. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5µs	Invalid Reset
Longer than 10µs	Valid Reset
Between 5µs and 10µs	Reset Initialigation Precedure

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 (tREST) within 5ms after a rising edge of RESX.

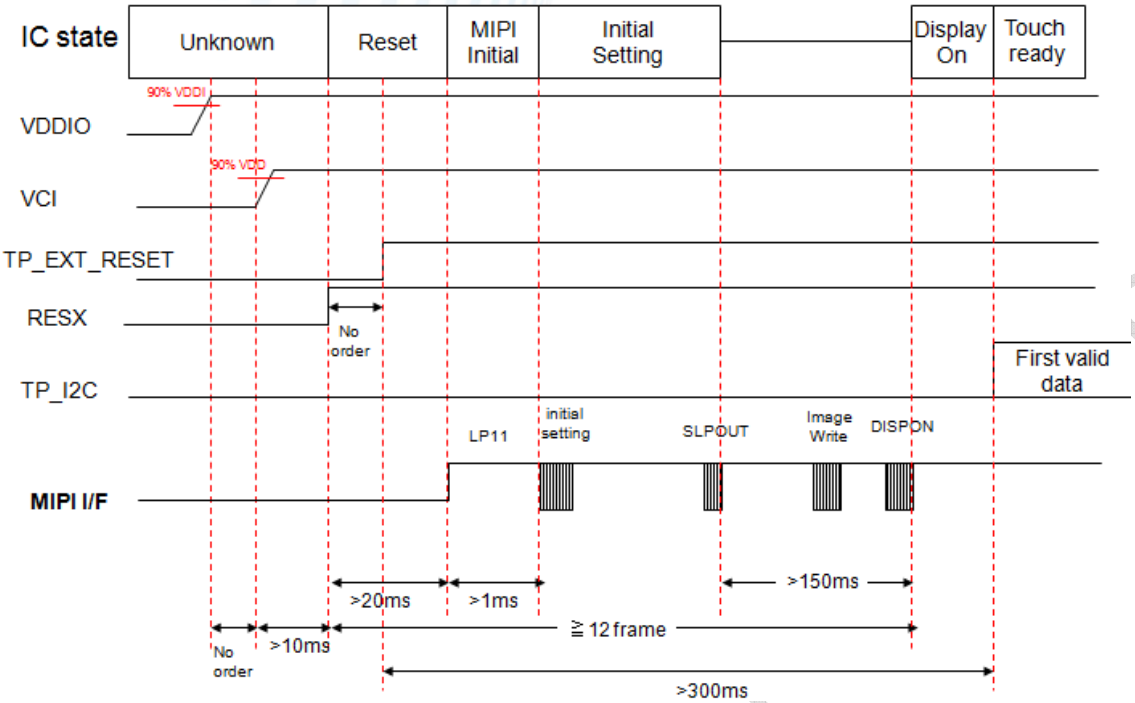
Note 4. Spike Rejection also applies during a valid reset pulse as shown below:



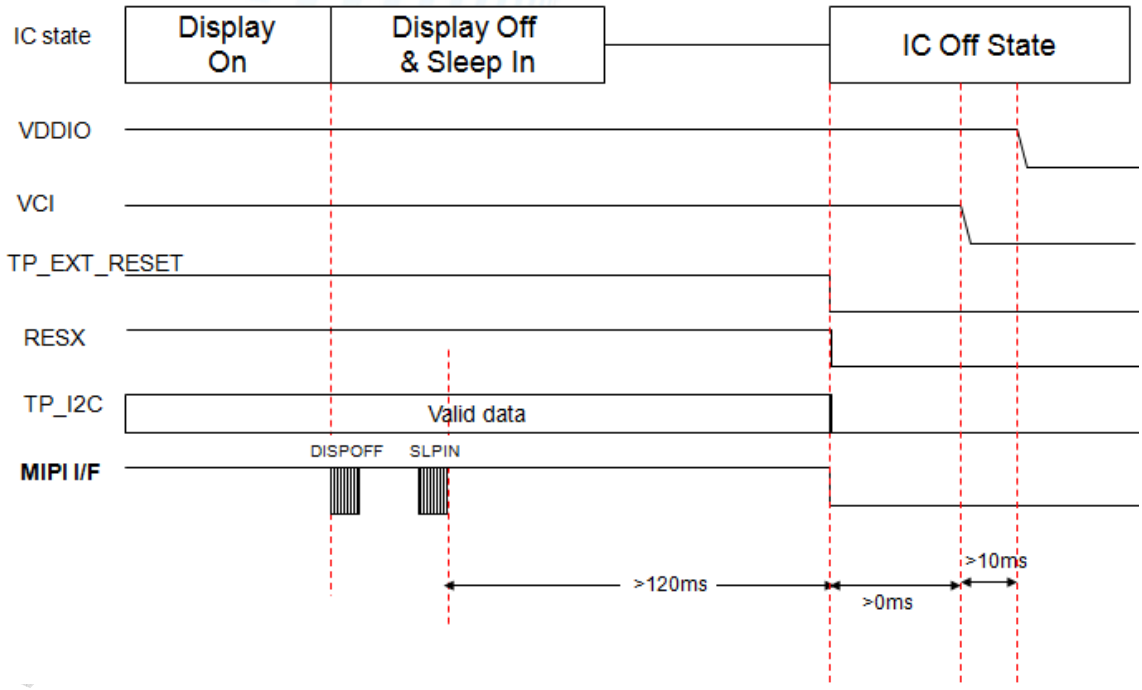
Note 5. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

Operating Sequence

Power on sequence

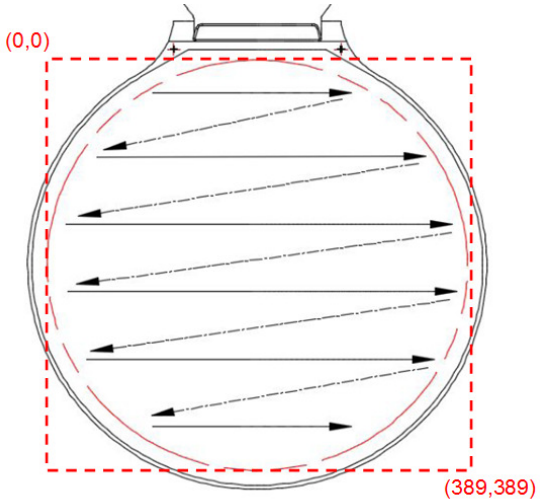


Power off sequence



3. Display Scan Direction & Coordinate

IC side



Panel Start Point = (0 , 0)

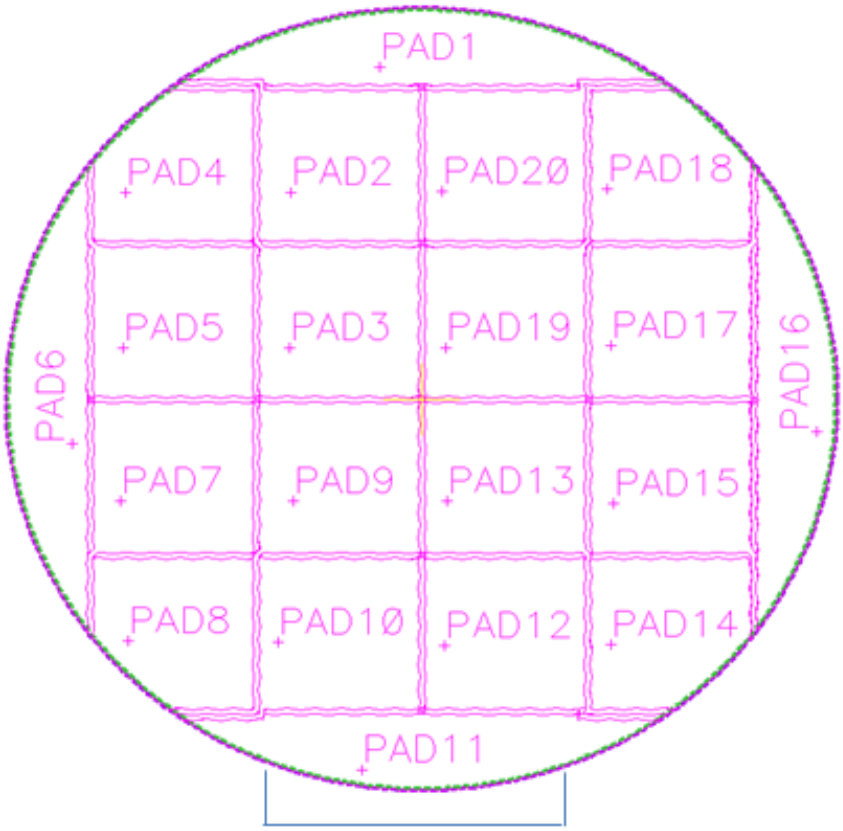
Panel End Point = (389 , 389)

Coordinate

Y	StartX	EndX	Total	Y	StartX	EndX	Total	Y	StartX	EndX	Total	Y	StartX	EndX	Total	Y	StartX	EndX	Total	Y	StartX	EndX	Total	Y	StartX	EndX	Total
1	181	208	28	61	54	335	282	121	15	374	360	181	1	388	388	241	5	384	380	301	31	358	328	361	92	297	206
2	171	218	48	62	53	336	284	122	14	375	362	182	0	389	390	242	6	383	378	302	32	357	326	362	94	295	202
3	164	225	62	63	52	337	286	123	14	375	362	183	0	389	390	243	6	383	378	303	32	357	326	363	95	294	200
4	158	231	74	64	51	338	288	124	14	375	362	184	0	389	390	244	6	383	378	304	33	356	324	364	97	292	196
5	153	236	84	65	50	339	290	125	13	376	364	185	0	389	390	245	6	383	378	305	34	355	322	365	99	290	192
6	149	240	92	66	49	340	292	126	13	376	364	186	0	389	390	246	7	382	376	306	34	355	322	366	100	289	190
7	145	244	100	67	48	341	294	127	12	377	366	187	0	389	390	247	7	382	376	307	35	354	320	367	102	287	186
8	141	248	108	68	47	342	296	128	12	377	366	188	0	389	390	248	7	382	376	308	36	353	318	368	104	285	182
9	138	251	114	69	47	342	296	129	12	377	366	189	0	389	390	249	7	382	376	309	36	353	318	369	106	283	178
10	135	254	120	70	46	343	298	130	11	378	368	190	0	389	390	250	8	381	374	310	37	352	316	370	108	281	174
11	132	257	126	71	45	344	300	131	11	378	368	191	0	389	390	251	8	381	374	311	38	351	314	371	110	279	170
12	129	260	132	72	44	345	302	132	11	378	368	192	0	389	390	252	8	381	374	312	39	350	312	372	112	277	166
13	126	263	138	73	43	346	304	133	10	379	370	193	0	389	390	253	9	380	372	313	39	350	312	373	114	275	162
14	124	265	142	74	42	347	306	134	10	379	370	194	0	389	390	254	9	380	372	314	40	349	310	374	117	272	156
15	121	268	148	75	42	347	306	135	10	379	370	195	0	389	390	255	9	380	372	315	41	348	308	375	119	270	152
16	119	270	152	76	41	348	308	136	9	380	372	196	0	389	390	256	10	379	370	316	42	347	306	376	121	268	148
17	117	272	156	77	40	349	310	137	9	380	372	197	0	389	390	257	10	379	370	317	42	347	306	377	124	265	142
18	114	275	162	78	39	350	312	138	9	380	372	198	0	389	390	258	10	379	370	318	43	346	304	378	126	263	138
19	112	277	166	79	39	350	312	139	8	381	374	199	0	389	390	259	11	378	368	319	44	345	302	379	129	260	132
20	110	279	170	80	38	351	314	140	8	381	374	200	0	389	390	260	11	378	368	320	45	344	300	380	132	257	126
21	108	281	174	81	37	352	316	141	8	381	374	201	0	389	390	261	11	378	368	321	46	343	298	381	135	254	120
22	106	283	178	82	36	353	318	142	7	382	376	202	0	389	390	262	12	377	366	322	47	342	296	382	138	251	114
23	104	285	182	83	36	353	318	143	7	382	376	203	0	389	390	263	12	377	366	323	47	342	296	383	141	248	108
24	102	287	186	84	35	354	320	144	7	382	376	204	0	389	390	264	12	377	366	324	48	341	294	384	145	244	100
25	100	289	190	85	34	355	322	145	7	382	376	205	0	389	390	265	13	376	364	325	49	340	292	385	149	240	92
26	99	290	192	86	34	355	322	146	6	383	378	206	0	389	390	266	13	376	364	326	50	339	290	386	153	236	84
27	97	292	196	87	33	356	324	147	6	383	378	207	0	389	390	267	14	375	362	327	51	338	288	387	158	231	74
28	95	294	200	88	32	357	326	148	6	383	378	208	0	389	390	268	14	375	362	328	52	337	286	388	164	225	62
29	94	295	202	89	32	357	326	149	6	383	378	209	0	389	390	269	14	375	362	329	53	336	284	389	171	218	48
30	92	297	206	90	31	358	328	150	5	384	380	210	1	388	388	270	15	374	360	330	54	335	282	390	181	208	28
31	90	299	210	91	30	359	330	151	5	384	380	211	1	388	388	271	15	374	360	331	55	334	280				
32	89	300	212	92	30	359	330	152	5	384	380	212	1	388	388	272	16	373	358	332	56	333	278				
33	87	302	216	93	29	360	332	153	5	384	380	213	1	388	388	273	16	373	358	333	57	332	276				
34	86	303	218	94	29	360	332	154	4	385	382	214	1	388	388	274	17	372	356	334	58	331	274				
35	84	305	222	95	28	361	334	155	4	385	382	215	1	388	388	275	17	372	356	335	59	330	272				
36	83	306	224	96	27	362	336	156	4	385	382	216	1	388	388	276	17	372	356	336	60	329	270				
37	81	308	228	97	27	362	336	157	4	385	382	217	1	388	388	277	18	371	354	337	61	328	268				
38	80	309	230	98	26	363	338	158	4	385	382	218	1	388	388	278	18	371	354	338	62	327	266				
39	79	310	232	99	26	363	338	159	3	386	384	219	1	388	388	279	19	370	352	339	63	326	264				
40	77	312	236	100	25	364	340	160	3	386	384	220	2	387	386	280	19	370	352	340	64	325	262				
41	76	313	238	101	24	365	342	161	3	386	384	221	2	387	386	281	20	369	350	341	65	324	260				
42	75	314	240	102	24	365	342	162	3	386	384	222	2	387	386	282	20	369	350	342	66	323	258				
43	73	316	244	103	23	366	344	163	3	386	384	223	2	387	386	283	21	368	348	343	67	322	256				
44	72	317	246	104	23	366	344	164	3	386	384	224	2	387	386	284	21	368	348	344	69	320	252				
45	71	318	248	105	22	367	346	165	2	387	386	225	2	387	386	285	22	367	346	345	70	319	250				
46	70	319	250	106	22	367	346	166	2	387	386	226	2	387	386	286	22	367	346	346	71	318	248				
47	69	320	252	107	21	368	348	167	2	387	386	227	3	386	384	287	23	366	344	347	72	317	246				
48	67	322	256	108	21	368	348	168	2	387	386	228	3	386	384	288	23	366	344	348	73	316	244				
49	66	323	258	109	20	369	350	169	2	387	386	229	3	386	384	289	24	365	342	349	75	314	240				
50	65	324	260	110	20	369	350	170	2	387	386	230	3	386	384	290	24	365	342	350	76	313	238				
51	64	325	262	111	19	370	352	171	2	387	386	231	3	386	384	291	25	364	340	351	77	312	236				
52	63	326	264	112	19	370	352	172	1	388	388	232	3	386	384	292	26	363	338	352	79	310	232				
53	62	327	266	113	18	371	354	173	1	388	388	233	4	385	382	293	26	363	338	353	80	309	230				
54	61	328	268	114	18	371	354	174	1	388	388	234	4	385	382	294	27	362	336	354	81	308	228				
55	60	329	270	115	17	372	356	175	1	388	388	235	4	385	382	295	27	362	336	355	83	306	224				
56	59	330	272	116	17	372	356	176	1	388	388	236	4	385	382	296	28	361	334	356	84	305	222				
57	58	331	274	117	17	372	356	177	1	388	388	237	4	385	382	297	29	360	332	357	86	303	218				
58	57	332	276	118	16	373	358	178	1	388	388	238	5	384	380	298	29	360	332	358	87	302	216				
59	56	333	278	119	16	373	358	179	1	388	388	239	5	384	380	299	30	359	330	359	89	300	212				
60	55	334	280	120	15	374	360	180	1	388	388	240	5	384	380	300	30	359	330	360	90	299	210				

D. Touch Performance

1. Touch Sensor Drawing



2. Touch pattern design

Item	TP sensor
Number of touch panel sensors	20

3. Touch Specifications

TP performance

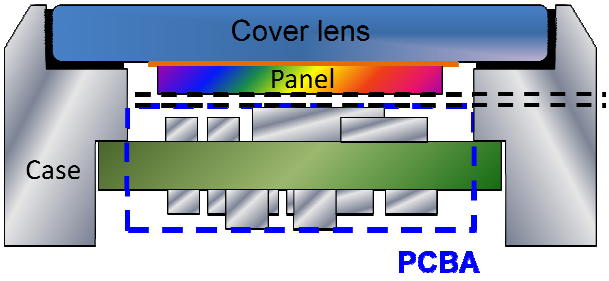
No.	Item		Spec.	Remark
1	Multi-Finger		2	
2	Report Rate		≧90Hz	
3	Performance	Accuracy (at Ø 9 mm)	Non-border ≦ 1.5mm, Border ≦ 2mm	
		Linearity (at Ø 9 mm)	Non-border ≦ 1.5mm, Border ≦ 2mm	
		Jitter (at Ø 9 mm)	Non-border ≦ 1.5mm, Border ≦ 2mm	

Waterproof

Item	Condition	Judgment	**Remark**
Waterproof (Anit-Water)	1000 ul	No touch is detected (without report any coordinates)	
Waterproof (Moisture)	100 ul	Touch function work	

Design requirements of in-cell touch are as follows.

1. **Cover lens design - Type: Glass, ε ≧7.6, Thickness: ≦1.2mm**
2. **System gap ≧0.3mm**



System gap:
1. **the gap between bottom of AMOLED module and system parts/component.**
2. **The gap excludes system part thickness tolerance.**

E. Optical Specifications

Item		Abbr.	Min.	Typ.	Max.	Unit	Remark
Optical Characteristic		Brightness	315	350	385	nits	Note 3
Contrast ratio		@25deg	10000	--	--		Note 4
Brightness Uniformity		350nits	85	--	--		Note 5
Viewing angle CR>1600		Top	80°	--	--	deg	Note 6
		Bottom	80°	--	--	deg	
		Left	80°	--	--	deg	
		Right	80°	--	--	deg	
Color	White	CIE1931 x	0.28	0.30	0.32		Note 7
	White	CIE1931 y	0.29	0.31	0.33		
	Red	CIE1931 x	0.640	0.670	0.700		
	Red	CIE1931 y	0.300	0.330	0.360		
	Green	CIE1931 x	0.186	0.236	0.286		
	Green	CIE1931 y	0.661	0.711	0.761		
	Blue	CIE1931 x	0.090	0.130	0.170		
	Blue	CIE1931 y	0.025	0.065	0.105		
NTSC		CIE x , y	82	100	--	%	
Life time	LT95	25℃	150	--	--	hrs	Note 8
Crosstalk	L128△CT	Vertical	--	--	110	%	Note 9
Flicker			--	--	-30	db	Note 10
Gamma		γ	1.9	2.2	2.5		Note 11

Note 1: Ambient temperature =25 ºC±2 ºC, measured by CA-310

Note 2: To be measured in the dark room.

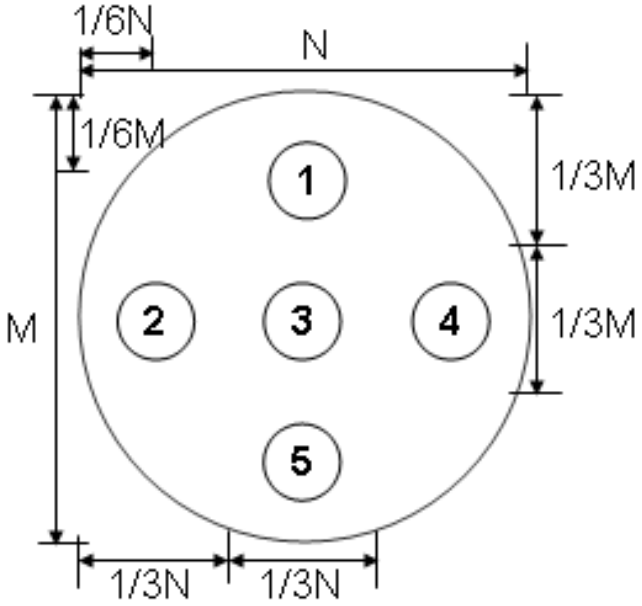
Note 3: The brightness measurement shall be done at the center of the display with a full white image.

Note 4: Definition of contrast ratio:

Contrast ratio is calculated with the following formula:

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when OLED is at “White” state}}{\text{Photo detector output when OLED is at “Black}}$$

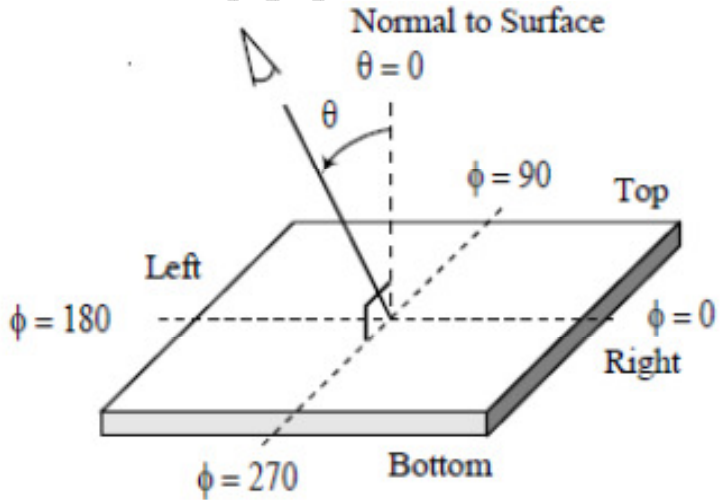
Note 5: Uniformity. Refer to figure as below



- △Bp = Bp (Min.) / Bp (Max.)×100 (%)
- Bp (Max.) = Maximum brightness in 5 measured spots
- Bp (Min.) = Minimum brightness in 5 measured spots.

Note 6: Definition of viewing angle :

The optical performance is specified as the driver IC located at =270°



Note 7: The color chromaticity should be based on sample performance because new OLED material should be verified later.

Note 8: Time to 95% Luminance

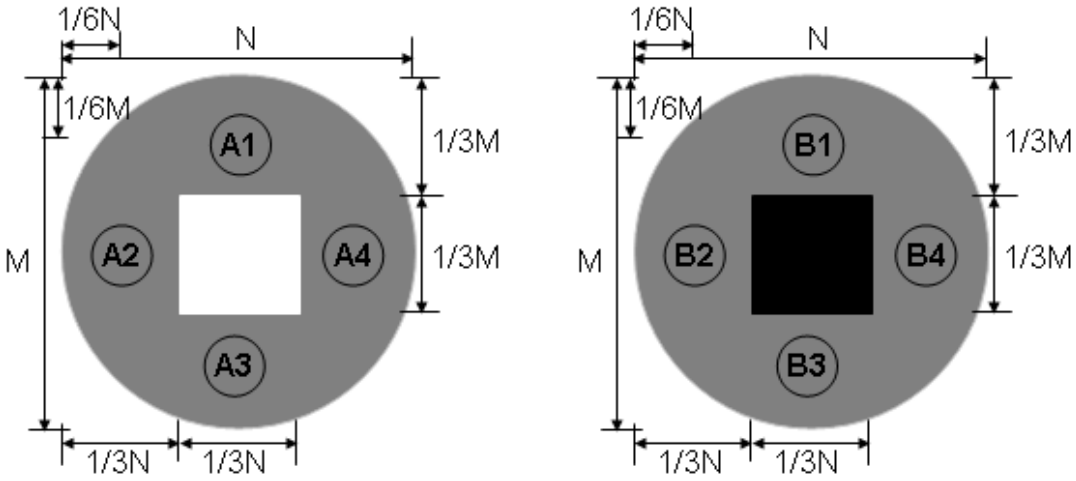
To measure the burn-in effect, a test pattern with white background applied to the AMOLED display at 100% loading

Note 9: Cross-talk

- There should be no visible cross-talk in normal direction of the display when the two ”Cross-talk Test Patterns ” below are loaded.
- Measurement equipment: DMS-803 or similar equipments
- The point should be marked is, the background of Cross-talk Test Pattern-“gray “ are defined as middle gray scale . For example, RGB 24bit “gray” defined as below:

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

- △Bpn = Bpn (gray) / Bpn (white)
  Which n means the dot No. In the Cross-talk Test Pattern ;
  Bpn (gray) means the brightness of the No.n spots in Cross-talk Test Pattern A and B;
  Bpn (white) means the brightness of the No.n spots in Full white Test Pattern;
- △Bp (Max.) = Maximum value in A1~A4 and B1~B4.
- △Bp (Min.) = Minimum value in A1~A4 and pB1~B4.
- △CT=△Bp (Max.)/ △Bp(Min.).
- △CT must be less than 1.10



Note 10: Flicker

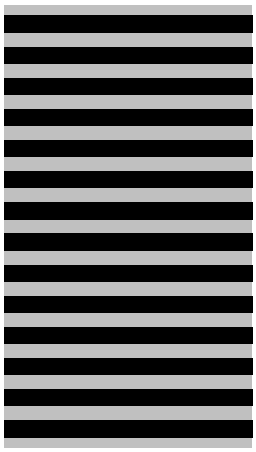
The flicker level is defined using Fast Fourier Transformation (FTT) as follows:

$$Flic\ker = 20\log_{10}\left(2\frac{f_{FFTC}(n)}{f_{FFTC}(0)}\right) + FS(Hz) \quad \text{(dB)}$$

where fFFTC(n) is the nth FFT coefficient, and fFFTC(0) is the 0th FFT coefficient which is DC component. FS(Hz) is the flicker sensitivity as a function of frequency.

The flicker level shall be measured with the test pattern in below.

The gray leves of test pattern is 128.

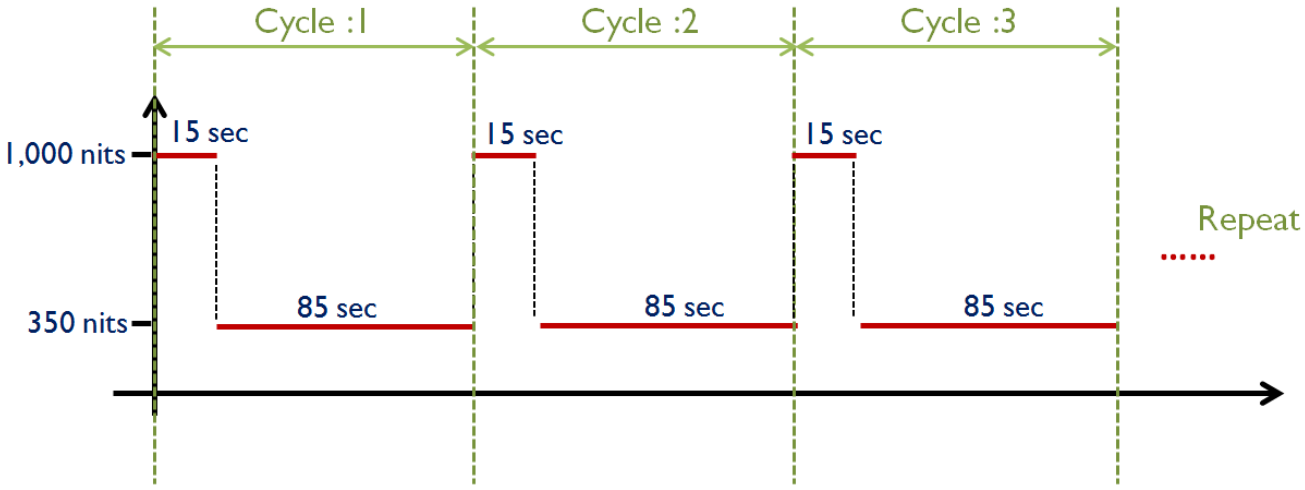


Note 11 : Gamma spec. is based on Gray level 255, 250, 244, 240, 232, 224, 206, 192, 160, 128, 95, 63, 47 & 31.

HB mode Optical Specifications

Item		Abbr.	Min.	Typ.	Max.	Unit	Remark
Optical Characteristic		Brightness	900	1000	1100	nits	
Life time	LT95	25℃	150	--	--	hrs	Note 1

Note 1 : HB mode lifetime test rule as below :



F. Reliability Test Items

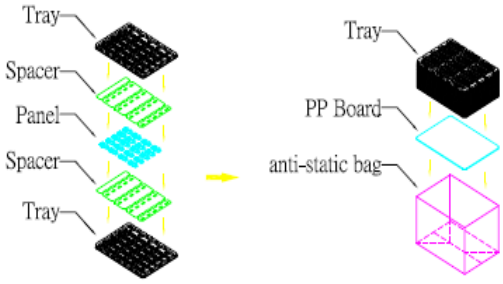
Category	No.	Test items		Conditions	Amount	Remark
Reliability (Environment)	1	High Temp. Operation		Ta= 60°C 240 hrs	5 pcs	
	2	High Temp. Storage		Ta= 70 °C 240 hrs	5 pcs	Non-operation
	3	Low Temp. Operation		Ta= -20 °C 240 hrs	5 pcs	
	4	Low Temp. Storage		Ta= -30 °C 240 hrs	5 pcs	Non-operation
	5	High Temp./Humi. Operation		Ta= 60 °C. 90% RH 240 hrs	5 pcs	
	6	Thermal Shock		-40 °C ~70 °C, Dwell for 30 min. 100 cycles.	5 pcs	Non-operation
	7	ESD	Contact mode	± 4KV; discharge time:10; Interval:1sec; Criteria: B	5 pcs	Test model：IEC61000-4-2，150pf，330ohm
			Air mode	± 8KV; discharge time:10;Interval:Discharge; Criteria: B	5 pcs	

Judge Criteria: No functional defect.

Drop test

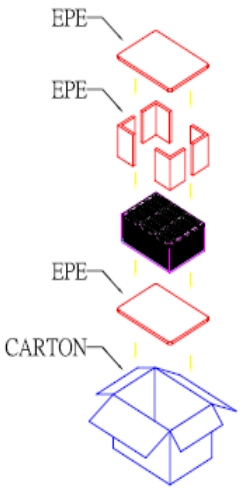
Test items	Conditions	Remark
Drop Test	Drop the packing from 76cm height, 6 surfaces, 3 edges and 1 corner.	Box

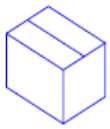
G. Packing



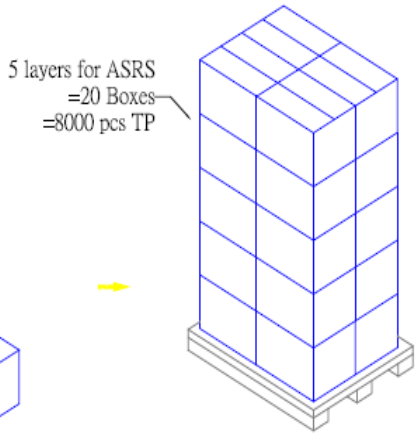
1 tray for 20 pcs Panels

1 set for 20+1 pcs trays =400 pcs panels

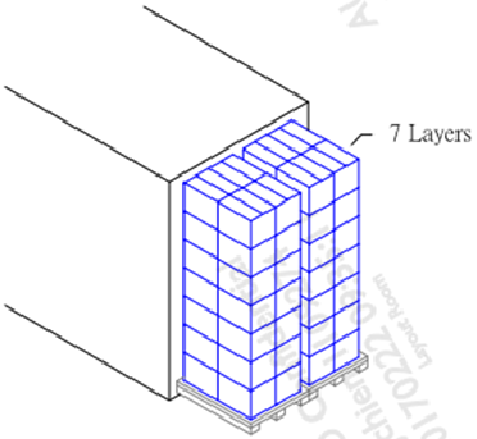




Carton DIM：
540*400*265 mm

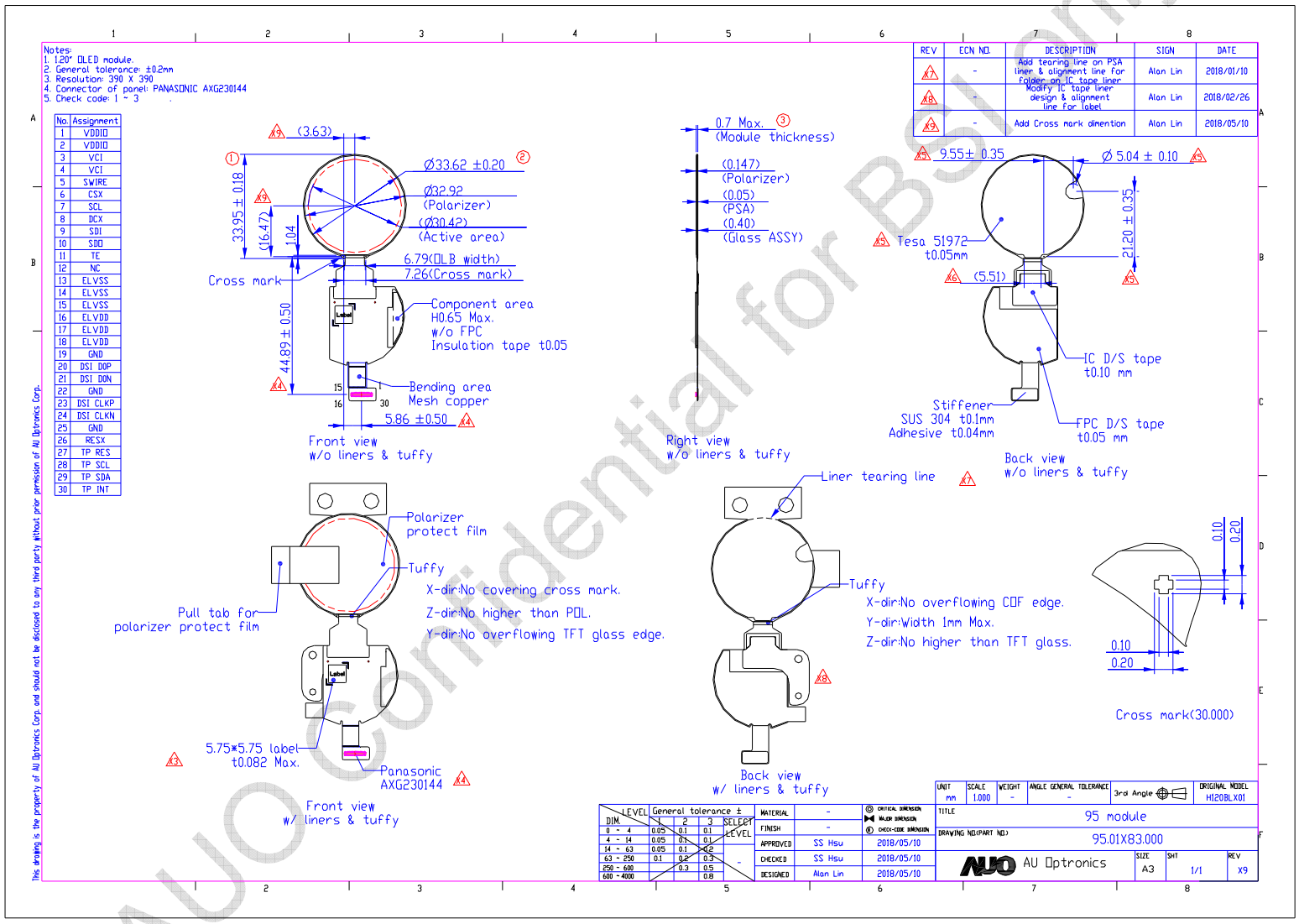


Pallet DIM：
1150*840*132 mm



For 20’ Container:12 Pallets=336 cartons=134400 pcs Panels
For 40’ Container:28 Pallets=784 cartons=313600 pcs Panels

H. Outline Dimension



I. Precaution

Please pay attention to the following items when you use the OLED Modules(Panel):

1. Do not twist or bend the module(panel) and prevent the unsuitable external force for display during assembly.
2. Adopt measures for good heat radiation. Be sure to use the module(panel) with in the specified temperature.
3. Avoid dust or oil mist during assembly.
4. Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module(panel).
5. Less EMI: it will be more safety and less noise.
6. Please operate module(panel) in suitable temperature. The response time & brightness will drift by different temperature.
7. Avoid to display the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause image sticking.
8. Please be sure to turn-off the power when connecting or disconnecting the circuit.
9. Polarizer scratches easily, please handle it carefully.
10. Display surface never likes dirt or stains.
11. A dew drop may lead to destruction. Please wipe off any moisture before using module(panel).
12. Sudden temperature changes cause condensation, and it will cause polarizer damaged.
13. High temperature and humidity may degrade performance. Please do not expose the module(panel) to the direct sunlight and so on.
14. Acetic acid or chlorine compounds are not friends with AMOLED display module(panel).
15. Static electricity will damage the module(panel), please do not touch the module(panel) without any grounded device.
16. Please avoid any static electricity damage (ESD) during producing and operating.
17. Do not disassemble and reassemble the module(panel) by self.
18. Be careful do not touch the rear side directly.
19. No strong vibration or shock. It will cause module(panel) broken.
20. Storage the modules(panel) in suitable environment with regular packing.
21. Be careful of injury from a broken display module(panel).
22. Please avoid the pressure adding to the surface (front or rear side) of modules(panel), because it will cause the display non-uniformity or other function issue.
23. Touch code is decided by (1) cover lens type, (2) lens lamination parameters, and (3) customers' hardware/software setting. Please be noted if above factors was changed, AUO need new samples to re-adjusted touch code.
24. Please take some protective action at the interface between rear side of panel and system hardware.
25. Please avoid any reflection material to cause the light radiated from rear side or broadside of panel.
26. Please NOTICE to keep the flatness between system board and AMOLED display, it will be much safer during the module drop test.