**Liquid Crystal Display** 





Global LCD Panel Exchange Center

# **Product Specification**

# **SPECIFICATION FOR APPROVAL**

(		)	Pr	elin	nin	ary	Sp	ec	ifica	tio	n
_	_	-		_	_		_	_			

( ) Final Specification

Title	Customer Approval Sheet for Lenovo
Customer	Lenovo
Part Number	5D19A6MW6C
SUPPLIER	BOE
MODEL	BV050HDM-N00-190H
Version	Ex. 1.0

SIGNATURE	DATE
Please return 1 copy for your o	

APPROVED BY	DATE
REVIEWED BY	





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### **RECORD OF REVISIONS**

Revision No.	Revision Date	Page	Description
Ex.1.0	Ex.2014.06.04	-	First release

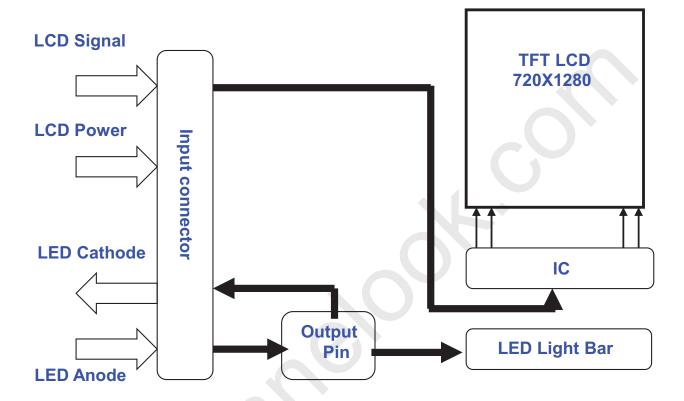
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#### 1-1. GENERAL DESCRIPTION

### **Block Diagram**

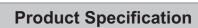


#### **Features**

BV050HDM-N00-190H is 4.99" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, MIPI driver ICs, control ci rcuit and backlight. By applying 8 bit digital data, 720×RGB (3) ×1280, 16. 7M-color images are displayed on the 4.99" diagonal screen

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# 1-2. General Spec

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No	Item	Specification	unit	Remark
1	Screen Size	4.99	inch	-
2	Active Area	62.10(H)x110.40(V)	mm	
3	Panel Size	64.50(H)x117.59(V)	mm	-
4	Outline Dimension	66.3 (H)×121 (V)×1.8 (TYP.)	mm	-
5	Display Resolution	720 (H) ×RGB×1280 (V)	pixel	-
6	Pixel Pitch	0.08625(H)×0.08625(V)	mm	-
7	Display Method	a-Si	-	-
8	Display Mode	ADS	-	-
9	Display Color	16.7M	-	8bit
10	Color Gamut	70%	%	typ
11	Luminance	350	nit	Typ, center P
12	Contrast Ratio	800	-	Typ, center P
13	Viewing Angle	85/85/85	٥	CR>10(U/D/L/R)
14	Pol Surface Treatment	AG	-	-
15	Weight	30	g	max
16	D-IC	NT35521	-	RAMIess
17	Inversion Method	Column		-
18	LED Q'ty	5S2P	ea	String*Parallel
19	Power Consumption	White Patten: 0.75W +0.12W	mw	Backlight + Logic



# 1-3. Key Part List(5pcs average data)

	item	Supplier	Spec/Size	Weight/ g	Remark
	TFT Glass	Corning	EXG/1100*1300		
	C/F Glass	Corning	EXG/1100*1300		
	Upper Pol	日东	POL_050HD_F_00_0- TAC_AG42_ADS_N 64.1*113.49*0.122(mm)		With G-Film
	Lower Pol	日东	POL_050HD_R_00_0- TAC_HC_ADS_N 64.1*113.79*0.122(mm)		With G-Film
Cell	Liquid Crystal	JNC	BOE-F0XX		
	UV Glue/Tuffy	Sekisui	SWB-73		
	D-IC	NOVATEK	NT35521		
	ACF(COG)	Sony	CP34531-AB 1.5MM*100M		
	ACF(FOG)	Sony	CP1231-SD 1.5MM*100M	•	
	COG Ass'y	BOE	64.50*117.59*0.67 mm		
	FPC	SD	( )		
	EMI coating	Yasen	-		
	Main Connector	Panasonic	AXE630124		
	LED lightbar CNT	-	-		
FPCA	Insulation Tape	TESA	TESA4972		
	Conductive Tape	3M	9725		
	Release film on conductive tape		-		
	CNT Stiffener	-	-		
	FPC Ass'y	SD	FPC/FPCA		
	B/W tape	DIC	#3806BH, 60um		
	Upper Prism	LMS	HLAS4.20UM3,95um		
	Lower Prism	LMS	HLAS1.20U, 65um		
	Diffuser Sheet	激智	B38VA-2,52um		
	LGP	三菱	HL7002, 520um		
BLU	Mold frame	出光	URZ2501		
DLU	Double Tape	积水	#550TL6BW2FX, 60um		
	Reflector	3M	ESR, 65um		
	Metal Frame	德仓	SUS304 0.15mm		
	LED	聚飞	01.JT.CBS206W, 0.6t		
	LED Lightbar	驰阳	-		
	BLU Ass'y	德仓	66.30*121.00*1.80		
Total	-	-	-		

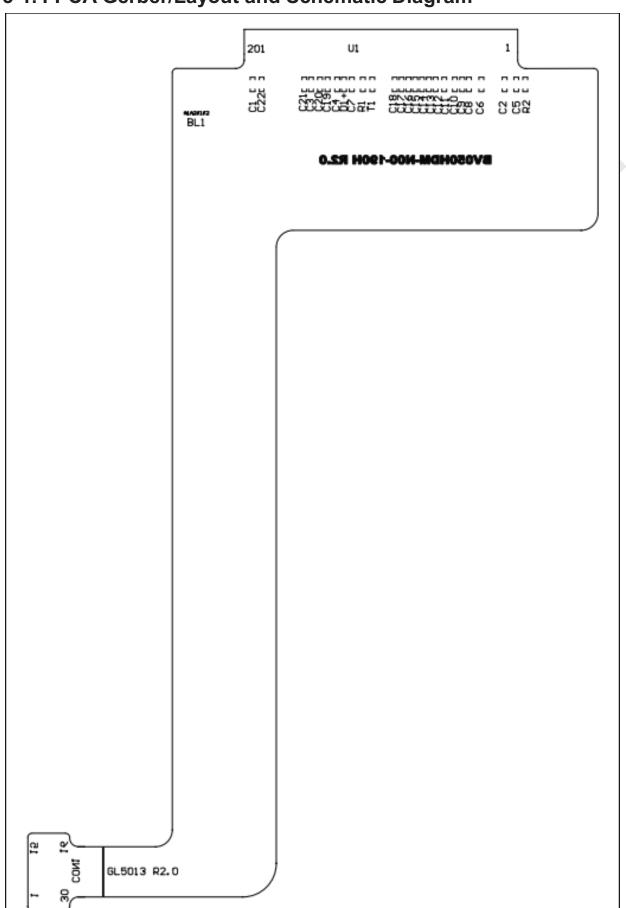
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BV050HDM-N00-190H Liquid Crystal Display



# **Product Specification**

# 1-3-1. FPCA Gerber/Layout and Schematic Diagram



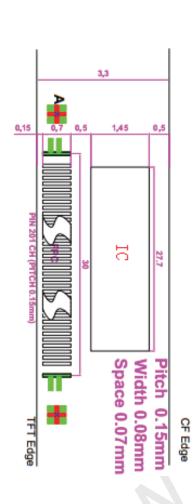


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# **Product Specification**

# 1-3-2. FPC Pin Assignment

Please pay attention that IC bump down(TFT glass up and C/F glass down)

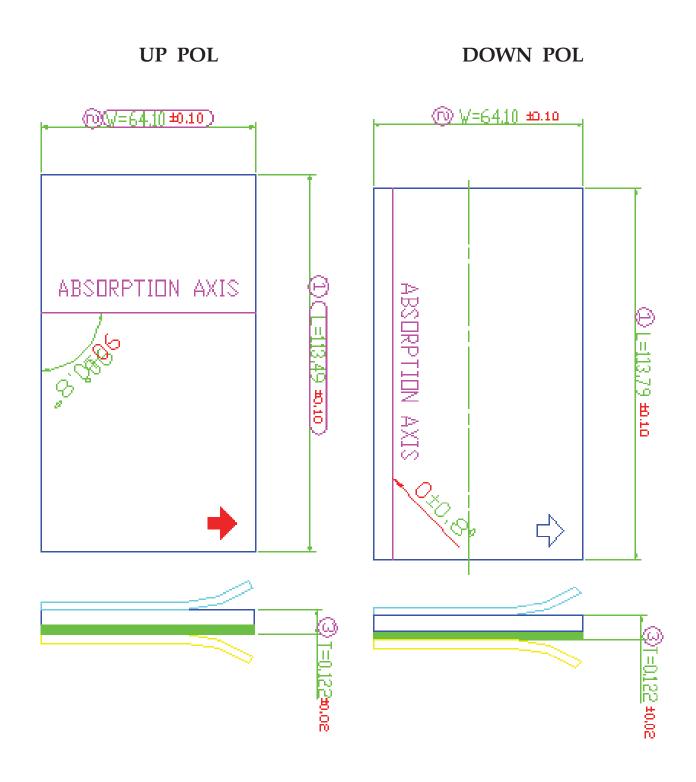


1	DUMMY	42	VSN	83	VDD1	124	DB8	165	HS_VSS
2	NULL	43	VSP	84	VDD1	125	DB9	166	HS_VSS
3	GND	44	VSP	85	VDD1	126	DB10	167	HS_D3P
4	VGL	45	VSPC	86	PCCS1	127	DB11	168	HS_D3P
5	GND	46	C42N	87	VSSD	128	DB12	169	HS_D3N
6	GND	47	C42N	88	PCCS0	129	DB13	170	HS_D3N
7	VCOM	48	C42P	89	VDD1	130	DB14	171	HS_VSS
8	VCOM	49	C42P	90	RS2	131	DB15	172	HS_D2P
9	VCOMR	50	C41N	91	VSSD	132	VSSD	173	HS_D2P
10	LVGL	51	C41N	92	RS1	133	DB16	174	HS_D2N
- 11	LVGL	52	C41P	93	VDD1	134	DB17	175	HS_D2N
12	C31N	53	C41P	94	RS0	135	DB18	176	HS_VSS
13	C31N	54	VCL	95	VSSD	136	DB19	177	HS_CP
14	C31P	55	VCL	96	BS1	137	DB20	178	HS_CP
15	C31P	56	VDD3	97	VDD1	138	DB21	179	HS_CN
16	VGL	57	VDD3	98	BS0	139	DB22	180	HS_CN
17	VGL	58	VSSD	99	VSSD	140	DB23	181	HS_VSS
18	C24N	59	VSSD	100	RESX	141	VSSD	182	HS_D1P
19	C24N	60	VREF	101	TE1	142	TS1	183	HS_D1P
20	C24P	61	VSNR	102	TE1	143	TS2	184	HS_D1N
21	C24P	62	VSPR	103	TE	144	TS3	185	HS_D1N
22	C23N	63	VSSA	104	TE	145	TS4	186	HS_VSS
23	C23N	64	VSSA	105	CABC_PW M_OUT	146	VSSD	187	HS_DOP
24	C23P	65	VSSAC	106	SDO	147	VSSD	188	HS_DOP
25	C23P	66	VDDDN	107	SDI	148	VSSD	189	HS_DON
26	VSSD	67	VDDDN	108	SCL	149	VSSD	190	HS_DON
27	VSSD	68	VDD2	109	CSX	150	VDDD	191	HS_VSS
28	VDD3	69	VDD2	110	DCX	151	VDDD	192	VTESTOUTP
29	VDD3	70	VTESTOUTN	111	PCLK	152	VDDD	193	VSSA
30	VGH	71	VPP	112	DE	153	VDDD	194	VSSA
31	VGH	72	VPP	113	VSYNC	154	VDD1	195	VSSA
32	C22N	73	VCSW1	114	HSYNC	155	VDD1	196	VCOM
33	C22N	74	VCSW1	115	DB0	156	VDD1	197	VCOM
34	C22P	75	VCSW2	116	DB1	157	VDD1	198	GND
35	C22P	76	VCSW2	117	DB2	158	HS_VCC	199	GND
36	C21N	77	VSSD	118	DB3	159	HS_VCC	200	NULL
37	C21N	78	VSSD	119	DB4	160	HS_VCC	201	DUMMY
38	C21P	79	VSSD	120	DB5	161	HS_LDO		
39	C21P	80	VDDD	121	DB6	162	HS_LDO		
40	VSNC	81	VDDD	122	DB7	163	HS_LDO		
41	VSN	82	VDDD	123	VSSD	164	HS_VSS		

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# 1-3-3. Pol General Spec







## 1-4. Change List

	No	Daggan	Change D	etails	Remarks	
	No.	Reason	Before	After	Remarks	
	1					
H/W change	2					
	1	电镀引线	LED焊盘 侧冲孔	连接器位置 引线		
Design Change	2					
S/M shangs	1					
S/W change						

#### Remarks:

- 1. H/W change includes all materials, components, label etc.
- 2. Design change includes size, position etc.
- 3. S/W change includes initial code etc.

Please pay attention that this list is just a summary, an individual Design C hange List which contain much more information is also needed





# 2-1. Absolute Maximum Ratings

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

**Table 2.1 Absolute Maximum Ratings** 

Parameter	Symbol	Valu	ies	Units	Notes	
raidilletei	Symbol	Min	Max	Ullits	140163	
LCD Analog Voltage	VCC	2.3	4.8	V		
LCD I/O Voltage	IOVCC	1.65	3.3	V		
LED Current	I <sub>LED</sub>	NA	30	mA		
Storage Humidity	Hstg	5%	90%	%RH		
Storage Temperature	Tstg	-30℃	70℃	$^{\circ}$		

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# **Product Specification**

#### 3-1. ELECTRICAL CHARACTERISTICS

#### **Table 3.1 Electrical Characteristics Of TFT-LCD Module**

Democratic	4	Comple of		Values		Unit	Neter	
Parameter		Symbol	Min	Тур Мах		s	Notes	
LCD Input Analog V	oltage	VCC-Vss	2.5	3.3	3.6	V	If necessary	
LCD Logic I/O Volta	ige	IOVCC-Vss	1.65	1.8	3.6	٧		
LED Input Current		I <sub>LED</sub>	-	20		mA		
"H" Level Input Voltage		V <sub>IH</sub>	0.7xIOVCC	-	IOVCC	V	Applicable Pin : REST	
"L" Level Input Volta	age	V <sub>IL</sub>	0.0	-	0.3xIOVCC	V	Applicable Pin: REST	
"H" Level Output Vo	ltage	V <sub>OH</sub>	0.8xIOVCC	-	IOVCC	V	Applicable Pin: BC I OUT = -1mA	
"L" Level Output Voltage		V <sub>OL</sub>	0.0		0.2xIOVCC	V	Applicable Pin: BC I OUT = +1mA	
Input high level leakage current		I <sub>IH</sub>	-	_	1	μA	Applicable Pin:REST	
Input low level leakage current		I <sub>IL</sub>	-1	-	-	μA	H:IOVCC L:Vss	
	Normal	P <sub>N</sub>	-	0.1	0.2	W	1	
LCD Power Consumption	Sleep in	P <sub>D</sub>	-	182	620	uW		
Consumption	BLU	P <sub>B</sub>	-	700	720	mW	2	

#### Notes:

(2) LED Backlight assumptions: 21 Vf(MAX), 60 mA. (7S3P LED Total Input )

# 3-2. Logic Power Consumption

Parameter	Symbol	Val	ues	Units	Notes
r ai ailletei	Зуппоот	Тур	Max	Office	Notes
Normal Mode	I <sub>IOVCC</sub>	35	40	mA	White Pattern
	I <sub>vcc</sub>			mA	If necessary
Claan Mada	I <sub>IOVCC</sub>	500	580	uA	White Pattern
Sleep Mode	I <sub>vcc</sub>	1	5	uA	If necessary

<sup>(1)</sup> The specified current and power consumption are under the conditions at VCC = 3.3V,IOVCC = 1.8V, T = 25°C, and fv = 60 Hz, at white pattern (TYP)

The specified current and power consumption are under the conditions at VCC = 3.3V,IOVCC = 1.8V, T = 25°C, and fv = 60 Hz, at R/G/B pattern (MAX)



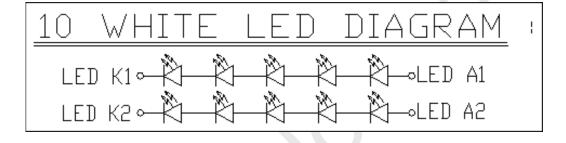


### 3-3. BACK LIGHT UNIT

3-3-1 The edge-lighting type of back light unit consists of 21 LEDs which is connected in serial.

Table 2-3-1 Electrical Characteristics Of Back Light Unit

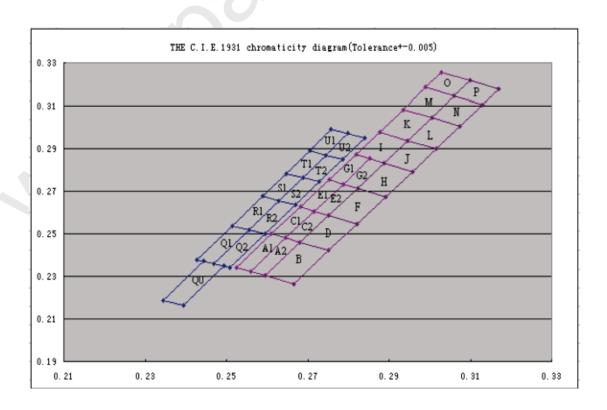
Parameter	Symbol		Values	Units	Notes		
Parameter	Symbol	Min	Тур.	Max	Units	Notes	
LED Current	I <sub>LED</sub>		40		mA	5S2P	
LED Forward Voltage	$V_{LED}$			17	V	5S2P	



LED Circuit Diagram

3-3-2 LED Rank

01.JT.CBS206W : G/H



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#### 3-4. LCD INTERFACE CONNECTIONS

Interface Connector: AXE630124

**Table 3.4 LCD Connector Pin Configuration** 

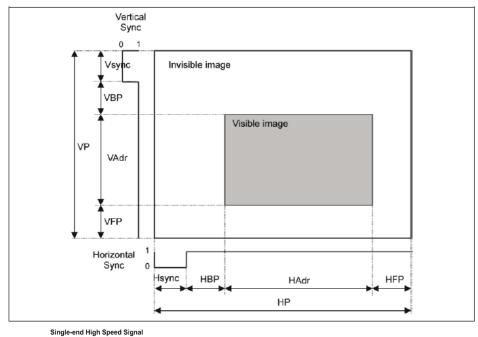
Pin No.	Symbol	I/O	Description		
1	LED_A1		LED Anode(+)		
2	LED_A2	I	LED Anode(+)		
3	LED_C1	I	LED Anode(-)		
4	LED_C2	I	LED Anode(-)		
5	GND		Ground		
6	PWM	0	CABC PWM OUTPUT		
7	TE	0	Frame Head Pulse Signal (OPEN)		
8	NRES		Hardware Reset Signal(Low Active)		
9	ID(GND)		Identify Signal(GND)		
10	IOVCC	0	Power Supply, 1.8V		
11	GND		Ground		
12	VSP(+5V)	l	Power Supply for positive gamma voltage		
13	VSN(-5V)		Power Supply for negative gamma voltage		
14	MTP		MTP Power Supply		
15	GND		Ground		
16	DATA_3P	I	MIPI Input Data Pair		
17	DATA_3N		MIPI Input Data Pair		
18	GND		Ground		
19	DATA_2P		MIPI Input Data Pair		
20	DATA_2N		MIPI Input Data Pair		
21	GND		Ground		
22	CLK_P		MIPI Input Data Pair		
23	CLK_N		MIPI Input Data Pair		
24	GND		Ground		
25	DATA_1P		MIPI Input Data Pair		
26	DATA_1N		MIPI Input Data Pair		
27	GND		Ground		
28	DATA_0P		MIPI Input Data Pair		
29	DATA_0N		MIPI Input Data Pair		
30	GND		Ground		

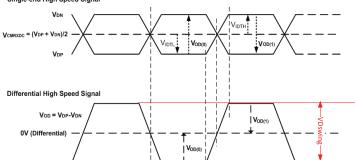
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#### 3-5. SIGNAL TIMING SPECIFICATIONS

	ITEM SYNBOL				UNIT
LCD		Frame Rate	-	60	Hz
	DCLK	Frequency	fCLK	63.61	MHz
	DCLK	Period	Tclk	15.72	ns
		Horizontal total time	tHP	808	t <sub>CLK</sub>
		Horizontal Active time	tHadr	720	t <sub>CLK</sub>
	Horizontal	Horizontal Pulse Width	tHsync	2	t <sub>CLK</sub>
Time in a		Horizontal Back Porch	tHBP	42	t <sub>CLK</sub>
Timing		Horizontal Front Porch	tHFP	44	t <sub>CLK</sub>
		Vertical total time	tvp	1312	t <sub>H</sub>
		Vertical Active time	tVadr	1280	t <sub>H</sub>
	Vertical	Vertical Pulse Width	tVsync	2	t <sub>H</sub>
		Vertical Back Porch	tVBP	14	t <sub>H</sub>
		Vertical Front Porch	tVFP	16	t <sub>H</sub>
	Differential Swing VDswing			250	mV
		Bit Rate	TX SPD(MBPS)	382	Mbps
		Pixel Fomat		888	Data bit/pixel
	Lane				Lane





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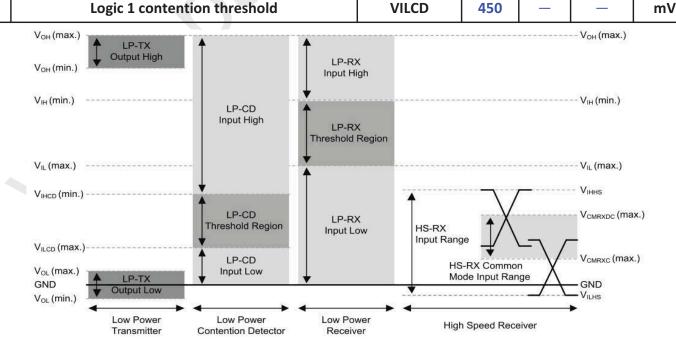




# 3-6. MIPI Data&CLK Line Impedance Test Result

- (1) MIPI Interface Timing Sequence
- (a) MIPI interface DC characteristic:

	Item	Parameter	Min.	Тур.	Max.	Unit
	Thevenin output high level	VOH	1.1	1.2	1.3	V
LP_T W	Thevenin output low level	VOL	-50		50	mV
	Output impedance of LP transmitter	ZOLP	80	100	125	Ω
	Common-mode voltage HS receive mode	VCMRX(DC)	70		330	mV
	Differential input high threshold	VIDTH			70	mV
HS_RX	Differential input low threshold	VIDTL	-70	_	_	mV
	Single-ended input high voltage	VIHHS		_	460	mV
113_KX	Single-ended input low voltage	VILHS	-40	_	_	mV
	Single-ended threshold for HS termination enabl e	VTERM-EN	_	_	450	mV
	Differential input impedance	ZID	80	100	125	Ω
	Logic 1 input voltage	VIH	880	_	_	mV
LP_RX	Logic 0 input voltage. not in ULPState	VIL	0	_	550	mV
	Input hysteresis	VHYST	25	_	_	mV
	Logic 1 contention threshold	VIHCD	_	_	200	mV
LP_CD	Logic 1 contention throchold	VII CD	450			m1/

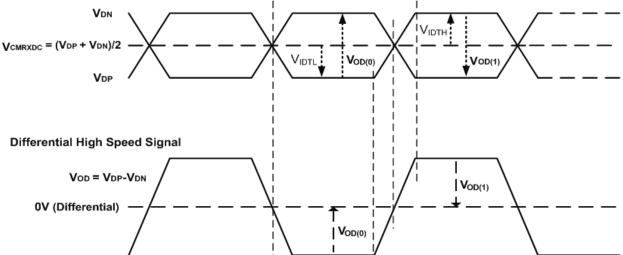


MIPI DC Diagram

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# Single-end High Speed Signal



Signal-ended and Resulting Differential HS Signals Diagram

## (b) MIPI data to clock timing definitions

Clock Parameter	Symbol	Min	Тур.	Max.	Unit
UI instantaneous	UIINST	1.6	_	4	ns
Data to Clock Setup Time [Receiver]	T SETUP[RX]	0.15	_		UI INST
Clock to Data Hold Time [Receiver]	T HOLD[RX]	0.15	_	_	UI INST
Data to Clock Skew (Measured at transmitter)	T SKEW[TX]	-0.15	_	0.15	_

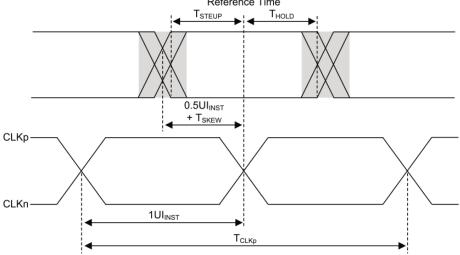
#### [Note]

- \*1) This max value corresponds to a minimum 80 Mbps data rate per lane
- \*2) The minimum UI shall not be violated for any single bit period, i.e., any DDR half cycle within a dat

burst.

- \*3) Total silicon and package delay budget of 0.3 UIINST
- \*4) Total setup and hold window for receiver of 0.3\* UIINST
- \*5) T SETUP[Rx] and T HOLD[RX] are only for RX without FPCB and connector and guaranteed by design.

  Reference Time



MIPI data to clock timing definitions

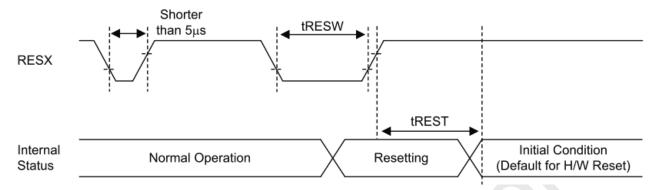


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#### **Product Specification**

## (2)Reset Input Timing



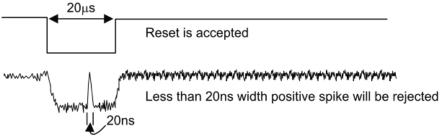
Symbol	Parameter	Pad	Min.	Тур.	Max.	Unit	Note
tRESW	Reset low pulse width	RESX	10			us	
tREST	Paget completion time	RESX			5	ma	Reset during Sleep In mode
IKESI	Reset completion time	RESX			120(5)	ms	Reset during Sleep Out mode

#### (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 5us	Reset Rejected		
Longer than 10us	Reset		
Between 5us and 10us	Reset Start		

- \*2) During the reset period, the display will be blanked. (The display is entering blanking sequence, for which the maximum time is 120ms, when Reset starts is sleep out-mode. The display remains in the blank state is Sleep In-mode) and then return to default condition for H/W reset.
- \*3) During Reset Completion Time, ID bytes (or similar) value in MTP block will be latched to the 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.
- \*4) Spike Rejection also applies during a valid reset pulse as shown below:



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

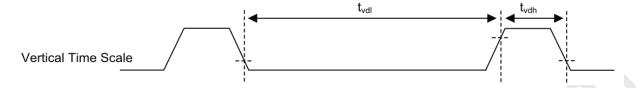
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# **Product Specification**

# (3)TE

4.1 Tearing Effect Line Modes the tearing effect output signal consists of V-sync information only.



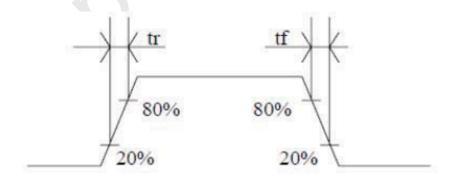
- t vdh = The LCD display is not updated.
- t vdl = The LCD display is updated (except Invisible line-see below).

•NOTE: During sleep in mode, the tearing effect output pin is low.

# 4.2 TE Input Timing

Symble	Parameter	Specification		Specification		Unit	Descripti
		Min.	Тур.	Max.		on	
tvdl	Vertical timing low duration	Base on MPU video mode					
tvdh	Vertical timing high duration	Setting		us			

NOTE: The signal's rise and fall times (tf, tr) are stipulated to become equal to or less than 15ns.



**Note Figure: Rise and Fall Times** 

BV050HDM-N00-190H Liquid Crystal Display

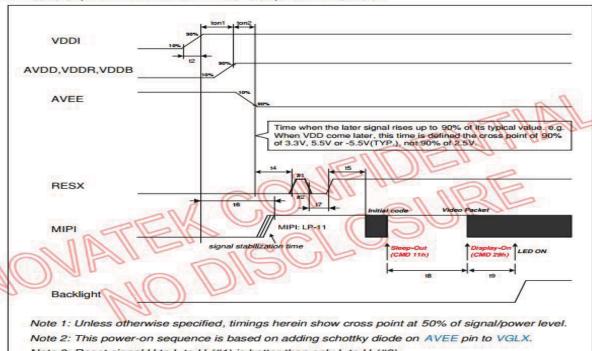


# **Product Specification**

# 3-7. Power On/Off Sequence

#### Power On

- 3 Input power (BTM[2:0]="100"): VDDI=1.65~3.6V, AVDD=VDDR=VDDB=4.5~6.0V, AVEE=-4.5~-6.0V

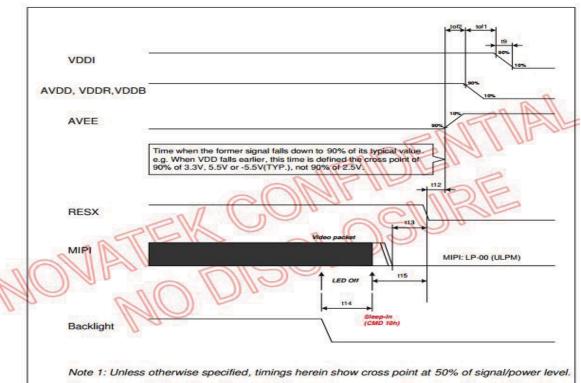


Note 3: Reset signal H to L to H (#1) is better than only L to H (#2).

Note 4: The EXTP enable control signal is only used by NT50198 power IC, if use other power IC, the enable control signal must control by HOST.

#### Power Off

3 Input power (BTM[2:0]="100"):
 VDDI=1.65~3.6V, AVDD=VDDR=VDDB=4.5~6.0V, AVEE=-4.5~-6.0V



#### 3-8. Software Flow

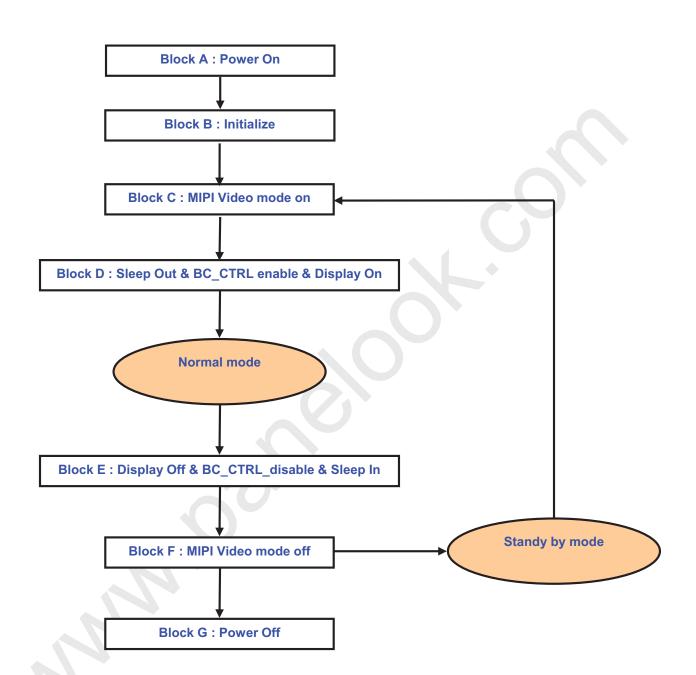


Fig 3.7 Software Flowchart

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#### 3-9. Initial Code

**MIPI** initial code TABLE

\*

CMD\_FF\_4DATAM DBH FF,AA,55,A5,80 CMD 6F 2DATAM DBH 6F,11,00 CMD F7 2DATAM DBH F7,20,00 CMD\_6F\_1DATAM DBH 6F,06 CMD F7 1DATAM DBH F7,A0 CMD\_6F\_1DATAM DBH 6F,19 CMD F7 1DATAM DBH F7,12 CMD\_6F\_1DATAM DBH 6F,02 CMD\_F7\_1DATAM DBH F7,47 CMD 6F 1DATAM DBH 6F,17 CMD F4 1DATAM DBH F4,70 CMD\_6F\_1DATAM DBH 6F,01 CMD F9 1DATAM DBH F9,46 CMD\_F0\_50DATAM DBH F0,55,AA,52,08,00 CMD BD 5DATAM DBH BD,01,A0,10,10,01 CMD B8 4DATAM DBH B8,01,02,0C,02 CMD\_BB\_2DATAM DBH BB,11,11 CMD\_BC\_2DATAM DBH BC,00,00 CMD B6 1DATAM DBH B6,04 CMD\_C8\_1DATAM DBH C8,80 CMD D9 2DATA0 DBH D9,01,01 CMD D4 1DATA0 DBH D4,C7

CMD\_F0\_5DATAM1 DBH F0,55,AA,52,08,01
CMD\_B0\_2DATAM DBH B0,09,09
CMD\_B1\_2DATAM DBH B1,09,09
CMD\_BC\_2DATAM1 DBH BC,90,00
CMD\_BD\_2DATAM DBH BD,90,00
CMD\_CA\_1DATAM DBH CA,00
CMD\_C0\_1DATAM DBH C0,0C
CMD\_B5\_2DATAM DBH B5,03,03
CMD\_BE\_1DATAM DBH BE,4F
CMD\_B3\_2DATAM DBH B3,19,19
CMD\_B4\_2DATAM DBH B4,19,19
CMD\_B9\_2DATAM DBH B9,26,26

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CMD\_BA\_2DATAM DBH BA,24,24



CMD\_F0\_51DATAM DBH F0,55,AA,52,08,02 CMD\_EE\_1DATAM2 DBH EE,01 CMD\_B0\_16DATAM2DBH B0,00,43,00,4A,00,58,00,66,00,73,00,89,00,9F,00,C4 CMD\_B1\_16DATAM2DBH B1,00,E4,01,1B,01,48,01,94,01,D3,01,D5,02,11,02,55 CMD\_B2\_16DATAM2DBH B2,02,7F,02,BE,02,E6,03,1F,03,44,03,75,03,93,03,BC CMD\_B3\_4DATAM2 DBH B3,03,EA,03,FF CMD C0 1DATAM2 DBH C0,04

> CMD\_F0\_5DATAM6 DBH F0,55,AA,52,08,06 CMD B0 2DATAM6 DBH B0,10,12 CMD\_B1\_2DATAM6 DBH B1,14,16 CMD B2 2DATAM6 DBH B2,00,02 CMD\_B3\_2DATAM6 DBH B3,31,31 CMD\_B4\_2DATAM6 DBH B4,31,34 CMD\_B5\_2DATAM6 DBH B5,34,34 CMD B6 2DATAM6 DBH B6,34,31 CMD B7 2DATAM6 DBH B7,31,31 CMD B8 2DATAM6 DBH B8,31,31 CMD\_B9\_2DATAM6 DBH B9,2D,2E CMD\_BA\_2DATAM6 DBH BA,2E,2D CMD BB 2DATAM6 DBH BB,31,31 CMD\_BC\_2DATAM6 DBH BC,31,31 CMD BD 2DATAM6 DBH BD,31,34 CMD BE 2DATAM6 DBH BE,34,34 CMD\_BF\_2DATAM6 DBH BF,34,31 CMD\_C0\_2DATAM6 DBH C0,31,31 CMD\_C1\_2DATAM6 DBH C1,03,01 CMD\_C2\_2DATAM6 DBH C2,17,15 CMD C3 2DATAM6 DBH C3,13,11 CMD E5 2DATAM6 DBH E5,31,31 CMD\_C4\_2DATAM6 DBH C4,17,15 CMD\_C5\_2DATAM6 DBH C5,13,11 CMD\_C6\_2DATAM6 DBH C6,03,01 CMD C7 2DATAM6 DBH C7,31,31 CMD C8 2DATAM6 DBH C8,31,34 CMD C9 2DATAM6 DBH C9,34,34 CMD\_CA\_2DATAM6 DBH CA,34,31 CMD\_CB\_2DATAM6 DBH CB,31,31

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### **Product Specification**

CMD CC 2DATAM6 DBH CC,31,31 CMD CD 2DATAM6 DBH CD,2E,2D CMD\_CE\_2DATAM6 DBH CE,2D,2E CMD\_CF\_2DATAM6 DBH CF,31,31 CMD D0 2DATAM6 DBH D0,31,31 CMD D1 2DATAM6 DBH D1,31,34 CMD D2 2DATAM6 DBH D2,34,34 CMD D3 2DATAM6 DBH D3,34,31 CMD\_D4\_2DATAM6 DBH D4,31,31 CMD D5 2DATAM6 DBH D5,00,02 CMD\_D6\_2DATAM6 DBH D6,10,12 CMD\_D7\_2DATAM6 DBH D7,14,16 CMD E6 2DATAM6 DBH E6,32,32 CMD\_D8\_5DATAM6 DBH D8,00,00,00,00,00 CMD\_D9\_5DATAM6 DBH D9,00,00,00,00,00 CMD E7 1DATAM6 DBH E7,00

CMD F0 5DATAM5 DBH F0,55,AA,52,08,05 CMD ED 1DATAM5 DBH ED,30 CMD\_B0\_2DATAM5 DBH B0,17,06 CMD\_B8\_1DATAM5 DBH B8,00 CMD C0 1DATAM5 DBH C0,0D CMD\_C1\_1DATAM5 DBH C1,0B CMD C2 1DATAM5 DBH C2,23 CMD C3 1DATAM5 DBH C3,40 CMD\_C4\_1DATAM5 DBH C4,84 CMD C5 1DATAM5 DBH C5,82 CMD\_C6\_1DATAM5 DBH C6,82 CMD\_C7\_1DATAM5 DBH C7,80 CMD C8 2DATAM5 DBH C8,0B,30 CMD C9 2DATAM5 DBH C9,05,10 CMD\_CA\_2DATAM5 DBH CA,01,10 CMD\_CB\_2DATAM5 DBH CB,01,10 CMD D1 5DATAM5 DBH D1,03,05,05,07,00 CMD D2 5DATAM5 DBH D2,03,05,09,03,00 CMD D3 5DATAM5 DBH D3,00,00,6A,07,10

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CMD D4 5DATAM5 DBH D4,30,00,6A,07,10



CMD_F0_5DATAM3 DBH F0,55,AA,52,08,03
CMD_B0_2DATAM3 DBH B0,00,00
CMD_B1_2DATAM3 DBH B1,00,00
CMD_B2_5DATAM3 DBH B2,05,00,0A,00,00
CMD_B3_5DATAM3 DBH B3,05,00,0A,00,00
CMD_B4_5DATAM3 DBH B4,05,00,0A,00,00
CMD_B5_5DATAM3 DBH B5,05,00,0A,00,00
CMD_B6_5DATAM3 DBH B6,02,00,0A,00,00
CMD_B7_5DATAM3 DBH B7,02,00,0A,00,00
CMD_B8_5DATAM3 DBH B8,02,00,0A,00,00
CMD_B9_5DATAM3 DBH B9,02,00,0A,00,00
CMD_BA_5DATAM3 DBH BA,53,00,0A,00,00
CMD_BB_5DATAM3 DBH BB,53,00,0A,00,00
CMD_BC_5DATAM3 DBH BC,53,00,0A,00,00
CMD_BD_5DATAM3
CMD_C4_1DATAM3 DBH C4,60
CMD_C5_1DATAM3 DBH C5,40
CMD_C6_1DATAM3 DBH C6,64
CMD_C7_1DATAM3 DBH C7,44
CMD_6F_16DATAM DBH 6F,11
CMD_F3_1DATAMM DBH F3,01

CMD\_11\_0DATAM DBH

CMD\_29\_0DATAM DBH

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# 3-10. IC General Spec and Size

#### 1 DESCRIPTION

#### 1.1 Purpose of this Document

This document has been created to provide complete reference specifications for the NT35521. IC design engineers should refer to these specifications when designing ICs, test engineers when testing the compliance of manufactured ICs to guarantee their performance, and application engineers when helping customers to make sure they are using this IC properly.

### 1.2 General Description

The NT35521 device is a single-chip solution for a-Si TFT LCD that incorporates gate drivers and is capable of 800RGBx1280, 768RGBx1280, 720RGBx1280, 640RGBx1024, 600RGBx1024 and 540RGB x 960 without internal CGRAM. It includes a timing controller with glass interface level-shifters and a glass power supply circuit.

The NT35521 supports MIPI Interface only.

The NT35521 is also able to make gamma correction settings separately for RGB dots to allow benign adjustments to panel characteristics, resulting in higher display qualities.

This LSI is suitable for small or medium-sized portable mobile solutions requiring long-term driving capabilities, including bi-directional pagers, digital audio players, cellular phones and handheld PDA.

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# 3-11. Power Consumption

	Parameter	Symbol	Тур	Unit	Remarks
		L0	41.94	mW	
		L32	41.94	mW	
		L64	41.94	mW	
		L96	41.94	mW	
		L127	41.94	mW	
		L160	43.56	mW	
	Logic Power	L192	43.38	mW	
CADO -#		L224	43.56	mW	
CABC off		L256	43.2	mW	
		R255	43.56	mW	)
		G255	43.38	mW	
		B255	43.2	mW	
		8 color bar	43.2	mW	
		0-255 Gray Transition	43.56	mW	
		Lenovo UI			Langua will sand nis
		Icon Interface			Lenovo will send pic.

	Symbol	Logic	BLU	Unit	Remarks
	L0	42.84	770.5	mW	
	L32	43.74	782.5	mW	
	L64	43.92	784.5	mW	
	L96	44.46	783.5	mW	
	L127	43.92	827	mW	
	L160	44.82	867.5	mW	
	L192	44.46	912.5	mW	
	L224	44.82	988.5	mW	
	L255	43.92	1058.5	mW	
CABC on	R255	45.18	820.5	mW	
	G255	45.18	820.5	mW	
	B255	45.18	820.5	mW	
	8 color bar	45.18	821.5	mW	
	0-255 Gray Transition	45.18	992	mW	
	Lenovo UI	TBD	TBD	mW	Lenovo will send pic.
		25% on	0.272	W	·
	DI II	50% on	0.688	W	
	BLU	75% on	0.886	W	
		100% on	1.058	W	

If there is more than one mode for CABC function, please fill out all data

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## 4. OPTICAL CHARACTERISTICS

# 4-1. Optical Characteristics – Backlight 100%

Parameter	Symbol	Condition	Min	Тур	Max	Unit	Remarks
	Θ12	CR >10	80	85	-	0	Note 1
	Θ6		80	85	-	0	Note 1
	Θ9		80	85	-	٥	Note 1
Viouing Angle	Θ3		80	85	-	°	Note 1
Viewing Angle	Θ1	CR>10	60	65	-	٥	Note 1
	Θ4		60	65	-	0	Note 1
	Θ7		60	65	-	۰	Note 1
	Θ11		60	65	-	0	Note 1
	Θ12			200		-	Note 1
Combract Datio	Θ6	Viewing Angle		230		-	Note 1
Contrast Ratio	Θ9	=60°		250		-	Note 1
	Θ3			250		-	Note 1
Contrast Ratio	CR	Optimal	600	800	-	-	Note 1,4
Brightness	Lv	Optimal	300	350	_	Cd/m <sup>2</sup>	Note 1
Brightness Uniformity	Υ	Optimal	80		-	%	Note 1,7(5P)
Brightness Officiality	Υ	optimal			-	%	Note 1.7(13P)
Flicker				-20		dB	Note 1,2
Crosstalk					2	%	Note 1,3
Response time	T <sub>f</sub> or T <sub>r</sub>	Θ =0 ° Ta =25 °C	-	30	35	ms	Note 1,6
Color Gamut	NTSC		65	70	-	%	Note 1
White Chromoticity	Х	CIE 1021	0.270	0.300	0.320	-	Note 1
White Chromaticity	У	CIE 1931	0.290	0.320	0.350	-	Note 1
Red Chromaticity	Х	CIE 1931	0.610	0.640	0.67	-	Note 1
	у		0.3	0.330	0.36	-	Note 1
Green Chromaticity	х	CIE 1021	0.28	0.310	0.34	-	Note 1
	У	CIE 1931	0.57	0.600	0.63	-	Note 1
Plus Chromoticity	Х	CIE 1931	0.11	0.140	0.17	-	Note 1
Blue Chromaticity	у		0.040	0.070	0.100	-	Note 1

# 4-2. Cell&BLU Optical Characteristics

Parameter	Тур	Unit	Remarks
Aperture Ratio	61.2	%	
Upper Pol Trans.	43.5	%	
Lower Pol Trans.	42	%	
Panel Trans.	3.2	%	w/o APF
Panel Trans.		%	with APF
BLU Luminance	11200	Cd/m <sup>2</sup>	Center
BLU Luminance Uniformity	80	%	Note1,7



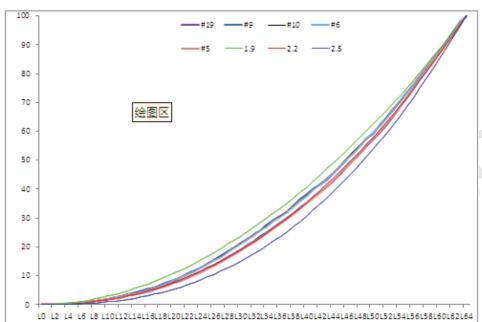
**Liquid Crystal Display** 

### **Product Specification**

# 4-3. Gamma/Color Coordinate Uniformity/CE Function/CABC Function

#### 4.3-1 Gamma Curve

Request: R/G/B/W, 0-255 gray scale, step 1 gray scale



#### 4.3-2 Color Coordinate Uniformity

Request: white pattern, 0-255 gray scale, step 15 gray scale.

Gray Scale	X	У	White	X	У
0	0.2932	0.2848	135	0.3108	0.3240
15	0.3028	0.3076	150	0.3109	0.3239
30	0.3083	0.3193	165	0.3109	0.3239
45	0.3095	0.3218	180	0.3108	0.3237
60	0.3100	0.3229	195	0.3107	0.3235
75	0.3103	0.3234	210	0.3106	0.3232
90	0.3104	0.3236	225	0.3102	0.3227
105	0.3106	0.3238	240	0.3096	0.3218
120	0.3107	0.3239	255	0.3082	0.3199

#### 4.3-3 CE function(on and off)

Request: Macbeth color checker. Please provide all CE on data if there is more than one CE solution. Need color coordinate of Macbeth color checker, while CE on and CE off

#### 4.3-4 CABC function(on and off)

Request: Movies comparison( three segments with different frames details, lighter, light+dark, darker) Measure LCD power consumption of three segments, including logic and BLU

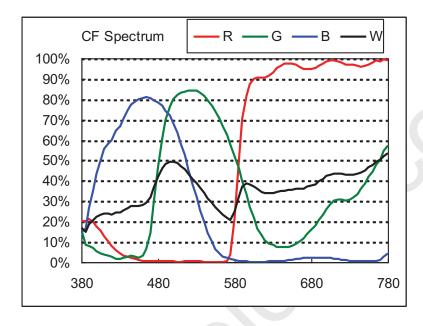


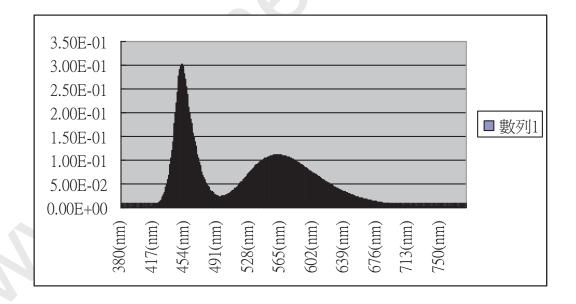
BV050HDM-N00-190H **Liquid Crystal Display** 

# **Product Specification**

# 4-4. LCD Spectrum and BLU Spectrum

**Center Point** 





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### **Product Specification**

#### [Note 1] Optical Test Equipment Setup

The LCD module should be turn-on to a stable luminance level to be reached. The measure ment should be executed after lighting Backlight for 20 minutes and in a dark room.

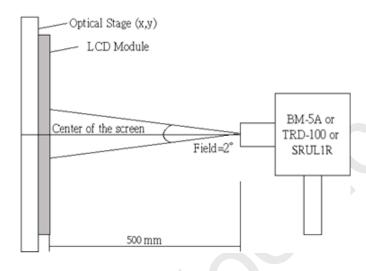
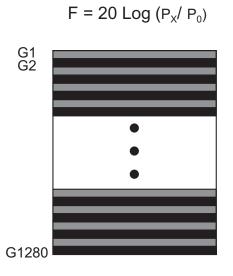


Fig 4.1. Optical Characteristic Measurement Equipment and Method

#### [Note 2] Flicker

The flicker level should be measured with horizontal gray/black stripes. The flicker is essentially a ratio of the powers in the frequency spectrum at 30 Hz ( $P_x$ ) and 0 Hz ( $P_0$ . DC level).



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[Note 3] Crosstalk

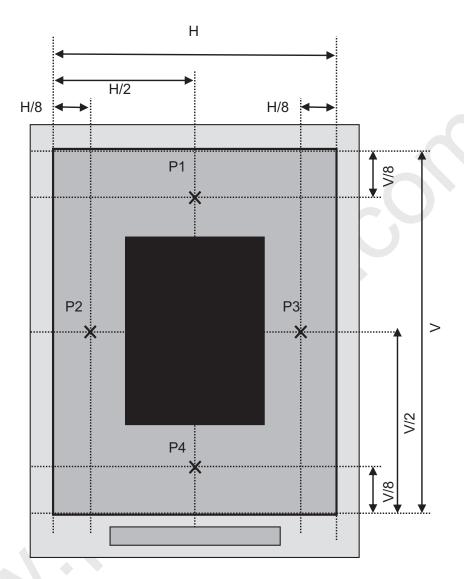


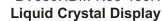
Fig 2-5. Crosstalk measurement points

A: Luminance for P1 ~ P4 with all 127gray pixels

B: Luminance for P1  $\sim$  P4 with 127gray pixels when the black box is applied

Crosstalk [%] = Maximum 
$$\left[ Absolute \left( \frac{A - B}{A} \right) \right]$$

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[Note 4]

Contrast Ratio is defined as follows;

Photo detector output with LCD being "White" Contrast Ratio(CR) = Photo detector output with LCD being "Black"

[Note 5]

Viewing Angle Range is defined as follows;

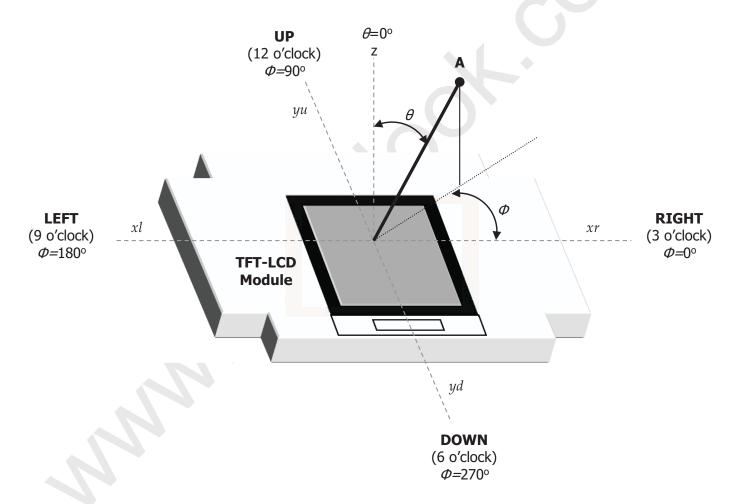
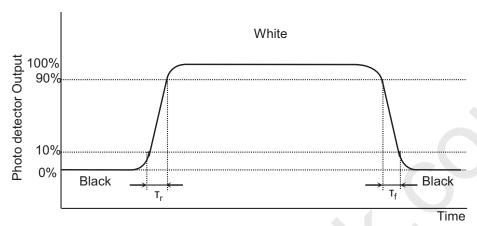


Fig 4.2 Viewing Angle Definitions



#### [Note 6]

Response time is obtained by measuring the transition time of photo detector output, when input signals are applied so as to make the area "black" to and from "white".



#### [Note 7]

Fig 4.3 Response Time Definition

The brightness measurement is taken at point 5P/13P.

Brightness
Uniformity

= Minimum Photo detector output for P1-P5(P13) with all pixels white

Maximum Photo detector output for P1-P5(P13) with all pixels white

X 100

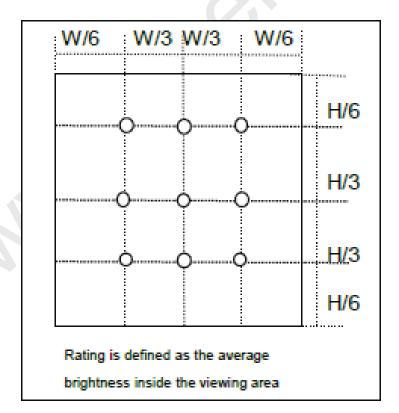
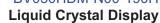


Fig 4.4 Brightness Measurement Points

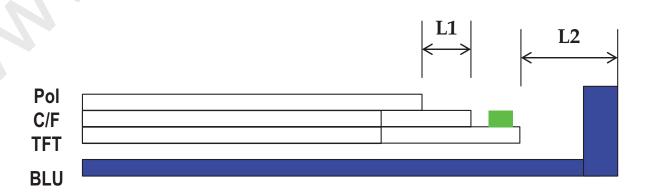




#### 5. MECHANICAL CHRACTERISTICS

The contents provide general mechanical characteristics for the model. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Items	Description	Тур.	Tolerance	Unit
Mother Glass	Size	1300*1100	-	mm
Q-Panel	Size		-	mm
C/F and TFT thickness after slimming	thickness	0.2/ 0.2	±0.02	mm
	A/A	62.1x110.4		mm
	C/F	64.50x114.29	±0.2	mm
	TFT	64.50x117.59	±0.2	mm
Panel	BM(U/D/L/R)	1.355/2.535 /1.2/1.2	-	mm
	IC Bonding Area	3.3	-	mm
	Pol Size	CF: 64.1*113.49	-	mm
	Gap Between Pol~C/F border (U/D/L/R)	CF: 0.2/0.6/0.2/0.2	±0.15	mm
Module	Horizontal	66.30	±0.1	mm
	Vertical	121.0	±0.1	mm
	Thickness	1.80	±0.05	mm
	UV Glue Thickness		-	mm
	Gap between Glass~L CM outline	0.9	±0.15	mm





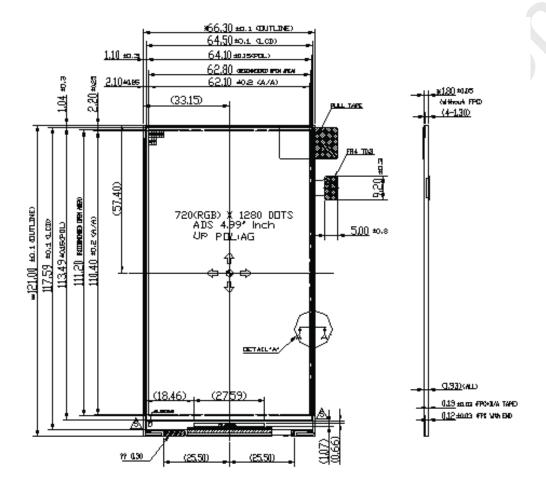


# 5.1 LCM Drawing

Folded and unfolded status

(1) Front side

[Unit: mm] The tolerance, not show in the figure, is  $\pm 0.15$ mm.



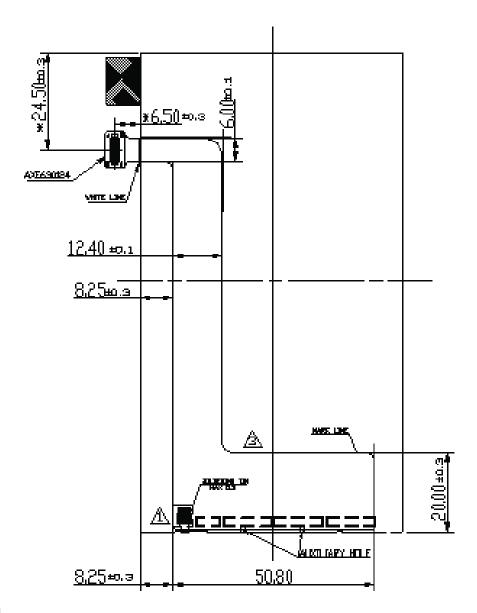
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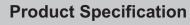
(1) Rear side

The tolerance, not show in the figure, is  $\pm 0.15$ mm. [Unit : mm]



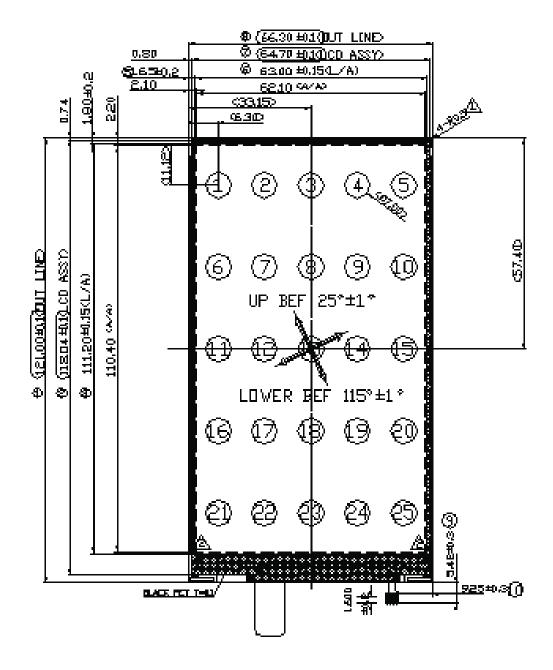
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### 5.2-1 BLU Outline Dimension

Including each film

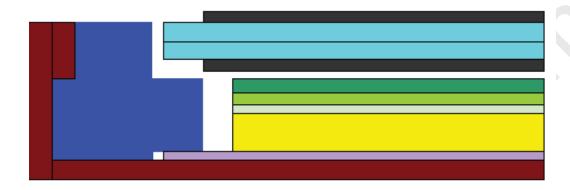


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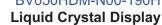
### 5.2-2 BLU Section Review



For Example

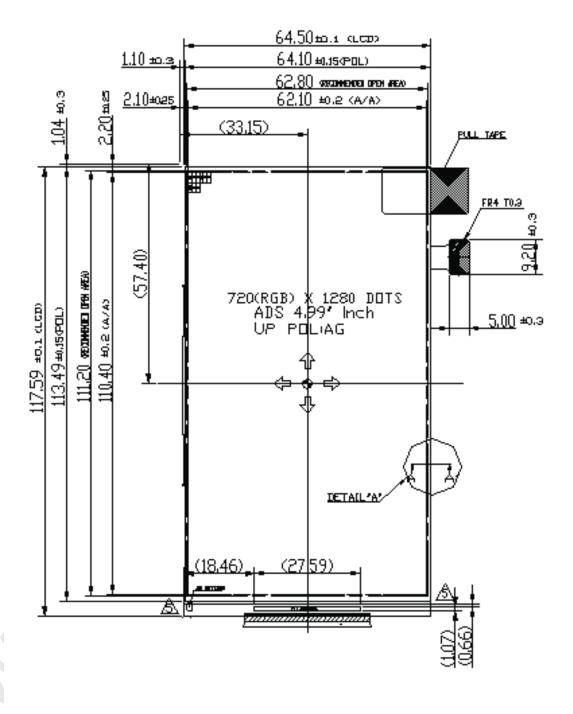
Remarks: Need L/R/U/D center point section stack-up, if there is difference in corner design, please add corner section review

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### **5.3 Panel Outline Dimension**

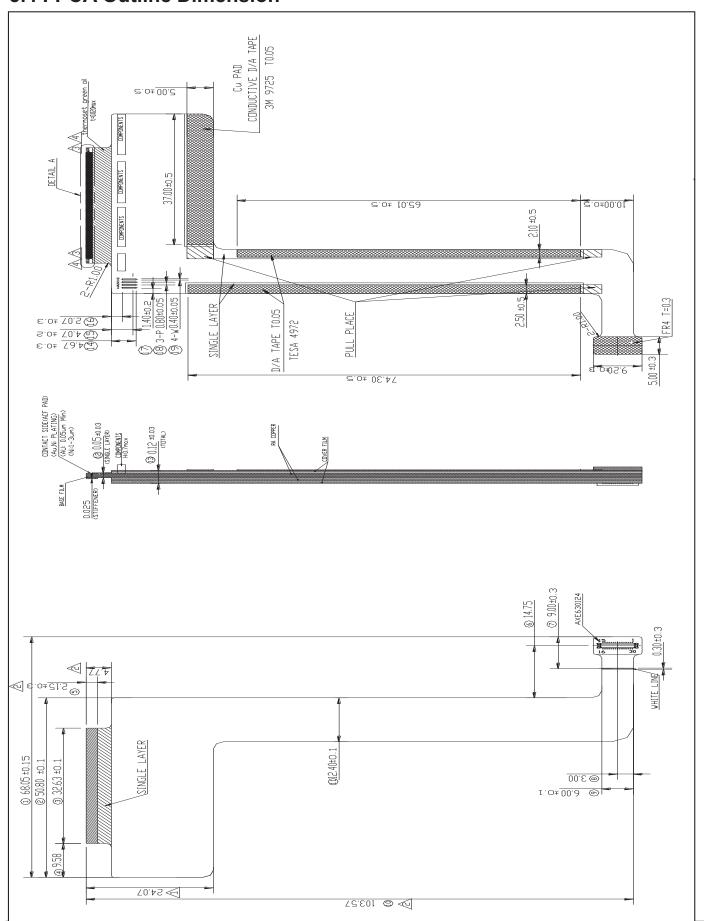


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### **5.4 FPCA Outline Dimension**







### 6. RELIABLITY TEST

Must be accordance with Lenovo RA test items

Test Items	Conditions
Operation Temperature	-20°C To 60°C
Operating Humidity	20% ~ 90%
Temperature when stored	-30°C To 70°C
Humidity when stored	5% ~ 90%
MTBF	>10,000POH

If after 10,000 hours, the brightness of the panel is 50% greater than the initial value, the MTBF report and SDA test report should be given to providers.

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**Liquid Crystal Display** 



## **Product Specification**

## 7. Safety & Environment Test Reports

Double-Click the "Attachment Icon" above for opening attachment file.

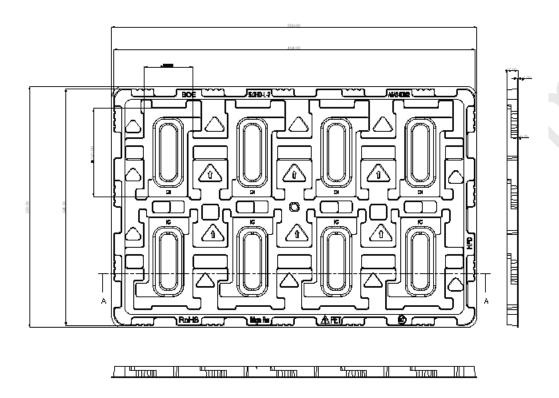
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## 8. Package

# 8.1. Packing Description



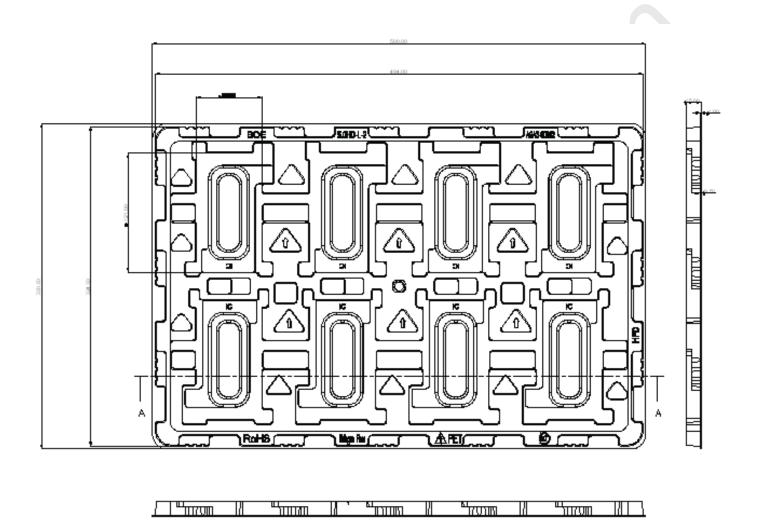


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# 8.2. Description of Packing Tray

LCM 8pcs/1 Tray

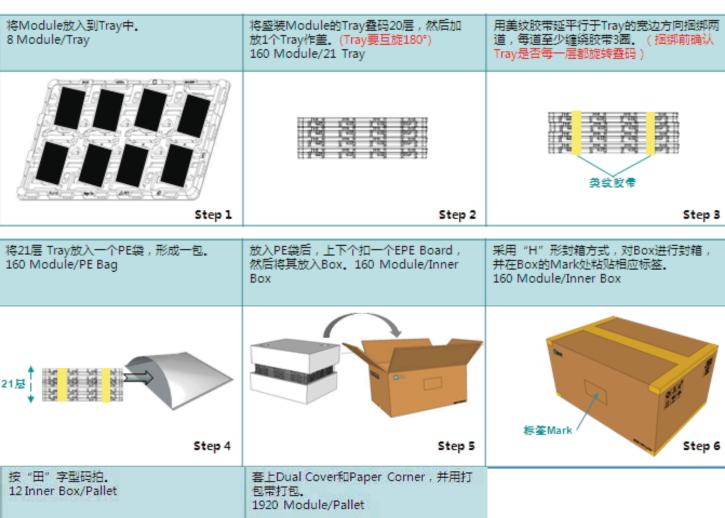


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### 8.3. Description of Packing Box







## 9. Incoming Inspection Standard

### 9.1.出货检验标准

(1.0) 目的

为使LCD,触摸屏材料质量能够合乎标准规格,特制定检验内容、项目及判定标准作为进料检验标准。

(2.0) 范围

所有LCD、触摸屏(LCD触摸屏、触摸按键)材料均可适用。

#### (3.0) 抽样方案与判定标准

#### (3.1) 抽样方案

采用GB/T2828.1-2003/ISO2859-1:1999抽样标准中的正常一次抽样方案。

日常的检验工作为抽样检验,抽样规则如下:

缺陷类型	检验项目	检验水平	AQL	备注
	1、玻璃	II	0.4	
	2、IC	II	0.4	
	3、FPC	II	0.4	
	4、电子元器件(焊接状况、Connector pin角)	II	0.4	
重 <del>헺</del> 陷 (MA)	5、显示不良(不显示、显示错误、花屏、显示缺行、 缺列、显著坏点、背光不良、亮度不均、偏色、偏暗 等)	II	0.4	
	6、结构尺寸(LCM结构尺寸、翘曲度、对位丝印)	S-2	0.4	
	1、外箱标示、外箱完整、出货检验报告等	II	0.65	
for his 1764	2、易撕纸、保护膜、FPC/PCB(变形)、LCD倾斜、 对位尺寸	· II	0.65	
轻缺陷 (MI)	3、点状缺陷(凹陷、气泡、异物、黑点、白点)	II	0.65	
()	4、线状缺陷(磨伤、偏光片划痕、毛屑、纤维)	II	0.65	
	5、器件缺件	II	0.65	
	6、PCBA	II	0.65	

#### (3.2) 判定标准

#### a.检查条件

光 源: D65,符合ISO10562:1999(E)标准要求;

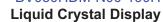
检查照度: 外观检查 垂直照度1000±200LUX,功能检查垂直照度200±50LUX;

距 离: 35±5cm, 垂直于被测面;

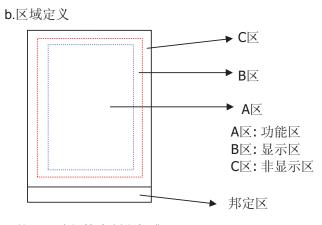
检查视角: 检视面与光源光线成45±15°, 眼睛视线与检视面成90±15°;

时 间:整个物料外观检验时间不超过10s; 检查环境:温度20±5℃,湿度45%~75%RH。









c.外观及功能检查判定标准

No	检查项目	判定基准	等级	备注
		A、B显示区不允许有裂痕	MA	
1	玻璃	1.破碎在边角         X       Y       Z         ≤1.5       ≤S       Z≤1/2T         注: S=接触插片部分长度       破碎在玻璃末端角部不允许延伸到ITO引线部分,也不能靠近封口。         2.裂痕       不允许有裂痕         X       Y       Z         ≤1.5       <环氧框内边框	MA	



No	检查项目	<b>学</b>	等级	备注	
2	IC	不允许出现破损、缺角、裂痕	MA		
3	FPC	金手指检验项目: (1) 手指划伤深度:不能漏(2) 粗细交错最多允许4Pir(3) 细线路划痕深度≤1/4f(4) 每个Pin的划痕长度≤(5) 总数只能有≤7Pin的划材质与封样相符,不允许破损			
4	电子元器件 (焊接状况、 Connector pin 角)	1.元器件 不允许缺件、掉件、连焊、原 2.Connector 不允许PIN 脚连焊、吃锡不足	MA		
5	结构尺寸	LCD结构、翘曲度,FPCA对(	立丝印位置依规格书要求检	验 MA	
		1.包装箱严重破损、凹陷、受 2.包装箱需包含制造商名称、 3.生产日期不允许超过6 个月。 4.包装箱内不允许散乱超过20 变形。 5.包装需附带出货检验报告,	MI		
7	点状&线状缺陷	缺陷定义: 线状缺陷 1.点状缺陷(凹陷,气泡,异物 缺陷尺寸(mm) D≤0.10mm	允许个数 忽略不计		
		0.10mm <d≤0.15mm< td=""><td>Distance≥10mm 允许2 个 Distance≥10mm</td><td> MI</td><td></td></d≤0.15mm<>	Distance≥10mm 允许2 个 Distance≥10mm	MI	
		0.15 <d≤0.2mm 超出以上规格</d≤0.2mm 	允许1 个 不允许	-	



No	检查项目	判定基准	等级	备注	
		2.像素坏点(亮点,暗点)			
		缺陷尺寸(mm) 允许个数			
		D≤0.10mm 忽略不计 Distance≥20mm	MA		
		0.10 <d≤0.2mm td="" 个<="" 允许1=""><td></td><td></td></d≤0.2mm>			
		超出以上规格    不允许			
		<ul> <li>缺陷尺寸(mm)</li> <li>从≤0.03</li> <li>②略不计Distance≥10mm</li> <li>0.03mm<w≤0.05mm< th=""><th>MI</th><th></th></w≤0.05mm<></li></ul>	MI		
8	显示色差, 亮度(手持 灰度仪器)	1.色差:测量白画面色坐标,参照规格白画面书色坐标要求; 2.亮度:测量屏幕亮度值,测量标准参照规格书亮度要求	MA		
9	器件缺件、 PCBA	1.与封样对比,不允许器件缺件。 2.PCBA依IPC-A-610C标准(不影响电气性能)。	MI		
10	易撕纸、保护膜 、FPC/PCB(变 形)、LCD 倾斜, 对位尺寸	B(变   1.勿捌纸、保护膜外灰与到杆相付,且保护膜勿捌起。			

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### 9.2.可靠性测试

No.	项目	样品数量	条件	试验内容	备注
1	高温运行	10pcs	70±3℃,240小时	长时间处于高温通电状 态。	实验样品点亮
2	高温存放	10pcs	80±3℃,240小时	长时间高温储存。	实验样品不点亮
3	低温运行	10pcs	-20±3℃,240小时	长时间处于低温通电状 态。	实验样品点亮
4	低温存放	10pcs	-40℃±3℃,240小时	长时间低温储存。	实验样品不点亮
5	高温/高湿度存放	10pcs	(60±2) ℃, 90%~95%RH, 240小时	长时间处于高温高湿度 储存。	实验样品不点亮
6	高温/高湿度运行	10pcs	(60±2)で,90%~95% RH,240小时	长时间高温高湿通电状 态	实验样品点亮
7	高低温冲击试验	10pcs	-40℃±3℃↔+80℃±3℃ 100周期	每个循环由二个30min 和二个转换所需时间组 成,如此循环100	
8	碰撞试验	5pcs	1.方向: 互相垂直的三个方向; 包: 2.加速度: 250m/s2±30%: 3.持续时间: 6ms±20%; 4.波形: 半正弦脉冲; 5.冲击次数: 1000 次	重点是否有器件脱落	实验样品不点亮
9	振动试验	5台	類率 随机振动ASD (加速度谱密度) 5~21Hz 0.96m2/s3 20~ 501Hz (20Hz 处), 其它-3dB/倍	整个振动持续时间建议 不超过5min。	
10	冲击试验	5pcs	1.方向: 互相垂直的三个方向; 2.加速度: 300m/s2±25%; 3.持续时间: 18ms±15%; 3.波形: 半正弦脉冲 4.冲击次数: 每个方向各3次 (共18次)	结构和机械耐久性试 验,运输中处于冲击状 态。	实验样品不点亮
11	ESD测试	10pcs	1.电压要求:空气放电± 8KV,接触放电±4KV; 2.放电方式:连续单次放电, 每秒放电不超过一次,连续各 放电10次	ABRACTP 单体表面四角图示位置	试验后样品各功能,测试正常
12	盐雾试验	10pcs	1.温度(15~35)℃; 2.氯化钠溶液浓度(5± 1)%; 3.储存条件(55±2℃);相对 湿度90%~95%	3 个喷雾周期,每个2 小时,每个喷雾周期后 有一个为期22 小时的湿 热存储周期	



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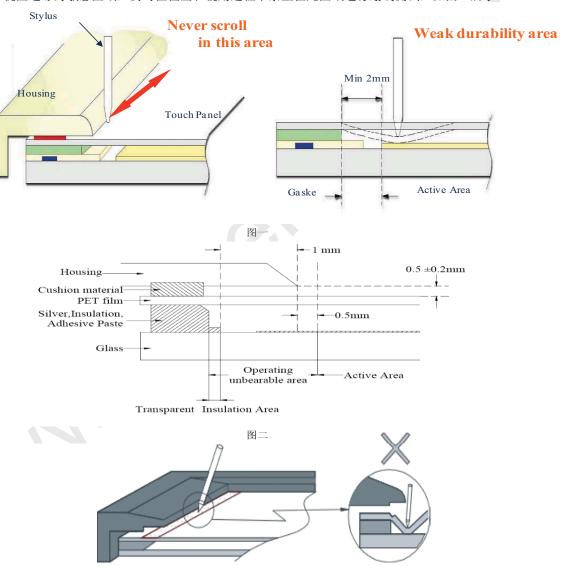
### 9.2. 可靠性测试

No.	项目	样品数量	条件	试验内容	备注
12	FOG 拉力强度测试		1.测试速度: 50mm/min 2.Jig size: 直径Φ 15mm,厚度3mm 的橡 胶压头	将显示屏固定在水平台面上,用夹子夹住FPC 并垂直向上拉起,要求拉力规格值>=7N/cm。观察FPC 与玻璃基板分离时的拉力。	
13	FPC柔韧度测试		测试速度 40~50 次/min (往复运动)	1、线路阻值(FPC 耐弯折性测试)把FPC 的导电端固定在导电夹上,往复运动10万次后量测FPC 电阻值变化率小于10% 2、金手指外观(FPC 端子部强度测试)把FPC 置于手动耐弯折测试仪内,弯折金手指以金手指的2/3 处为轴,成180角,R0.5mm 反复弯折3次后取出检查。试验后弯折3个循环不断裂、分层。	
14	包装跌落试验	1箱	1. 整箱按出货要求进行 包装; 2. 一角、三菱、六面, 各二次	产品重量 跌落高度 (Kg) (自由落体) <15 100±5cm 15~30 80±5cm 30~40 60±5cm >40 50±5cm	试验完后包装外箱、 内盒不得出现严重破 损、变形或散乱,内 装样品功能、外观及 装配应正常
15	包装振动试验	1箱	1.整箱按出货要求进行 包装; 2.每个面朝下各试验 10min,共60min	频率 Hz	试验完后包装外箱、 内盒不得出现严重破 损、变形或散乱,内 装样机功能、外观及 装配应正常。



### 9.3. 设计检查与使用注意事项

- (3.1)设计前盖时,建议前盖边缘要盖到touch panel可视区(VA区)和动作区(AA区)的之间以保护银线内2mm区的脆弱地带,如图一与图二所示。
- (3.2) Panel和Housing通过Panel支架来留出0.5+/-0.2mm的间距,如图二所示。
- (3.3) 为了防止Active Area被Panel支架压住,留出1.5mm以上的间距",如图二所示。
- (3.4)因可视区边缘为敏感区域,贵司在检查和使用过程中禁止在此区域进行划线测试,如图三所示。



图三





### 9.4.BHL&BMDT客户质量服务流程

BHL&BMDT为了更好地服务客户,定义产品售后质量服务流程如下:

- 1>BHL&BMDT根据客户发来的P/O,将需求的产品发送到客户指定地点。
- 2>客户组织人员对产品进行检验。
- 3>检验标准由BHL&BMDT提供,经客户批准生效,双方检验和不良品判定均以双方批准的标准进行。
- **4>**为了保证产品质量信息的及时沟通和服务的有效进行,客户质量负责人员定期(每周)将产品检查质量情况通报给BHL&BMDT指定的客户质量服务人员。
- 5>BHL&BMDT获取相关信息后,经过与客户质量代表协商,确定时间和地点,由双方共同对客户提出的不良产品进行判定。
- 6>当客户提出特殊质量服务需求时,BHL&BMDT予以配合。
- 7>双方判定完成后,由于BHL&BMDT质量问题的产品,由BHL&BMDT负责换货,BHL&BMDT将确认的不良产品带回,并将换货产品送到客户指定地点。
- 8>BHL&BMDT承诺向客户提供有关LCD产品的知识介绍和产品使用的相关培训。
- 9>客户应该按照LCD产品的使用方法进行操作,对未按照使用方法操作造成的产品不良,BHL&BMDT不承担相关责任。
- 10>双方遵照相互协商、配合的原则处理产品质量问题,对责任归属不明确的不良产品由双方共同协商解决。

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### **Liquid Crystal Display**



### **Product Specification**

#### 9.5.LCD模块操作指南

#### 9.5.1 储存注意事项

- 1>避免使LCD屏以各种方式直接受到较大的外力冲击,因为LCD是玻璃制品。
- 2>液晶产品在一定的温度范围以外,物质状态会发生变化,并且在温度恢复后不能回复到原来的性能。因此应该将LCD模块始终保存在SPEC.给定的储存温度范围内。同样,应该将LCD模块保存在SPEC规定的湿度范围内,湿度偏低会造成静电增加等因素,而湿度过高有可能会造成LCD产品ITO线路腐蚀等损害。合适的储存环境应该是:温度: 22±5℃,湿度: 55%±10%。
- 3>避免将LCD模块长时间直接暴露在日光、强荧光或者紫外光下,而应该将其放置在光线较暗的区域。
- 4>避免使LCD模块接触化学液体,如酒精、丙酮、IPA等,这些都会造成LCD的损伤。如果有水珠落在LCD表面,请马上擦掉,否则会造成偏光片颜色变化或其他方面的缺陷。尤其注意:避免LCD背光反射片与手机主板焊接 PAD直接接触,否则易发生背光反射片腐蚀或是划伤现象,要求与LCD接触的主板PAD焊接完后贴上绝缘膜;
- 5>如果储存和维修需要,LCD需要储存在防静电的聚乙烯袋子中,而不要将它长期暴露在大气中。

#### 9.5.2 组装上机注意事项

- 1>在组装使用LCD模块时,请确认工作人员有效佩带了静电腕带,放置模块的工作台等有效接地。
- 2>在移动LCD模块时,请将其放置在BHL&BMDT提供的产品托盘上移动,以避免对产品造成机械性损害。在拿取LCD模块时,拿住两侧的边框,以免造成损坏。在组装整机时,请非常小心的拿取、组装LCD,不要使它承受太大的压力或者扭曲力。
- 3>避免拆解LCD模块或者使LCD模块的FPC受到致命性损伤,这样会造成产品永久性不良。
- 4>避免使用质地较硬的物品擦拭LCD的表面。如果确实有必要擦拭,请选用去离子气枪(Air-gun)或非常柔软的棉布。LCD模块偏光片表面的保护膜只有在组装之前才能揭开,否则灰尘、唾液或者异物会黏附在LCD表面,保护膜以下。在揭开的保护膜后,只能使用去离子气枪(Air-gun)除去表面可能出现的灰尘或者异物。使用手指或者抹布等接触都是不允许的。避免用尖锐的物品触及LCD表面,这样会造成偏光片的永久损伤。
- 5>避免使PCB板受到扭曲、剥离、挤压或者撞击力,这样会造成PCB板线路或者相关原器件的损伤从而导致LCD功能性不良。
- 6>端子连接器的使用方法请参照BHL&BMDT提供的说明。
- 7>双屏产品请将小屏方向朝上,相邻的两个托盘成180°反向放置。在最上边盖上一个空托盘。
- 8>在LCD模块的PCB板上进行焊接作业时,请保证不要造成PCB原线路的短路或者断路,否则,会对LCD产品造成 致命伤害。
- 9>对CONNECTOR的操作请小心,由于客户操作原因造成的CONNECTOR损坏需要由客户来承担。

#### 9.5.3 使用注意事项

- 1>请避免将直流电直接加到LCD Panel上,也不要对LCD Panel或者模块施加高电压。这样会造成LCD产品功能性损坏或者寿命缩短。
- 2>在高温或者低温状态(-20℃-50℃以外)使用LCD模块,有可能会出现响应时间太慢或者异常显示等现象,但是并不意味着LCD产品功能性不良。如果将温度恢复到正常温度,LCD模块会正常显示。因此尽量不要在者低温状态下使用LCD产品,因为我们使用的是常温液晶。
- 3>请避免用力按压LCD屏的显示区域,这样会造成异常显示。同样,这样的情况并不意味着LCD产品功能性不良,在恢复到正常操作时,LCD产品的功能也会恢复到正常。
- 4>对LCD产品的电性能测试利用由客户提供的手机进行测试,有必要时可以使用Hy-LCD提供的功能检查装置进行检查。

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### 10. Checklist

	Description	Request	Value
	MIPI Impedance	100±10Ω	Yes
	B2B CNT	FR4, 0.3mm	Yes
Connection	ID Pin	1 <sup>st</sup> source: GND 2 <sup>nd</sup> source: 1.8V(different cell) 2 <sup>nd</sup> source: GND(same cell+IC)	IOVCC
IC	Protection	Shielding tape on IC	No
	Bending Area	Not exceed M/F	Yes
	FPC status	Unfolded while direct bonding	Yes
FPC	GND Area	Need GND area to connect SUS	Yes
	Test Points	Need shieling tape on it	Without
	Bending Area	Single layer	Yes
SUS	4 Corner side	At lease 1.2mm	Yes
	Glass Generation	G5?G6?	G5
	Cutting Q'ty	panel Q'ty each mother glass	171pcs
	Display mode	VA/IPS	ADS
	Mask Q'ty	Array mask	7
	Pixel Domain	1 or 2?	1
	ITO@C/F	ITO square resistance, thickness	<30Ω/□ , 150Å
	Scan direction	Single scan or dual scan	Dual scan
Panel	PS Parameter	Main/Sub PS density and size	Main: Φ10um, density=0.68%, Sub: Φ9um, density=98.6%
	Cell gap	Center point	3.4um (Center point)
	LC injection	Vacuum injection or ODF	ODF
	LC Margin	>6%	6%
	Pol compensation	A+C/B+B/None compensation film	APF
	UV Glue	Fill out at IC around	Yes
	Pol surf. Treatment	Direct bonding: HC+Glare Air bonding: Haze44+glare(>4inch)	HC+ APF
N	Pol position	Direct bonding: pol is higher 0.05mm than M/F Air bonding: pol is lower 0.05mm than M/F	Lower than M/F 0.05mi
	Surface resistance	10^4~10^9Ω	Yes
Package	Friction voltage	≦100V	Yes
	Layer in one Box	<10layer	Yes