

MODEL NO. BTF035A-AWR\$ VER.01

FOR MESSRS:		
ON DATE OF:		
APPROVED BY:		

BOLYMIN, INC.

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History of Version

Version	Contents	Date	Note
01	NEW VERSION	2019/08/07	SPEC.
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		VIII	



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1. Numbering System

<u>B</u>	Ι	<u>F</u>	<u>035</u>	<u>A</u>	=	<u>A</u>	W	<u>R</u>	<u>\$</u>	Customer code
1	2	3	4	5		6	7	8	9	10

1	Brand	Bolymin DISPLAY	
2	Module Type	T=TFT	
3	Function Type	C= TFT Controller H= TFT / HDMI B= TFT / Bar Z= Customize	A= TFT / AD Board G= TFT / HMI / GUI F= TFT / LCD
4	Module Size	025= 2.5 inch 070= 7.0 inch	
5	Version No.	A type	
6	TFT Interface	A= TTL / RGB C= LVDS E= PARALLEL(MCU) G= SPI(MCU) I= VGA / CVBS / HDMI (AD Board)	B= TTL / MCU D= HDMI F= I ² C(MCU) H= UART/RS232/RS485 (HMI / GUI)
7	View Angle/ Operating Temperature	B=6:00 /Normal Temperature H=6:00 /Wide Temperature U=6:00/ Ultra wide Temperature	T=12:00//Normal Temperature W=12:00/Wide Temperature E=12:00/ultra wide temperature
8	Touch Panel	R=Resistive Touch Panel C=Capacitive Touch Panel	N=No Touch Panel
9	RoHS	\$=RoHS	
10	Customer code		



2. Handling Precaution

2.1 Precaution in use of LCD Module

- 2.1.1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure and/or sharp tools on the surface of display area.
- 2.1.2. The polarizer placed on the display surface is easily scratched and damaged. Extreme care should be taken when handling it. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isopropyl alcohol, ethyl alcohol, do not use water, ketone or aromatics to clear display surface, and never scrub it hard.
- 2.1.3. Keep LCD panels away from direct sunlight. The storage environment should be dust-free, clean, dry, temperature is 25°C ±10°C and the humidity is below 55% RH.
- 2.1.4. Do not input any signal before power is turned on.
- 2.1.5. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.
- 2.1.6. It's important to control soldering temperature and time. RoHS compliant materials might need higher temperature and time, but try to keep temperature under 350℃ and time in 3-5 sec.
- 2.1.7. EL is manufactured from the organic film, and is easily affected by temperature, humidity and other environmental impact. Long time storage might cause low quality of the case. Therefore, please start production in 3 months after reception of the LCM. If in any case, long time storage over 3 months is necessary, please keep EL in vacuum package or at least in humidity < 35% RH, and temperature 25°C±10°C. Note: 2.1.7. is applied to EL backlight only.

2.2 Static Electricity Precautions:

- 2.2.1. The LCD module contains a C-MOS LSI. People who operate the LCM should wear ESD protection equipment to prevent ESD hurt on products.
- 2.2.2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.
- 2.2.3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
- 2.2.4. The modules should be kept in anti-static bags or trays for storage.
- 2.2.5. Only properly grounded soldering irons should be used.
- 2.2.6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
- 2.2.7. The normal static prevention measures should be observed for work clothes and working benches.
- 2.2.8. Since dry air(almost low RH) is inductive to static, a humidity of 50-60% RH is recommended in assembly line.

2.3 Operation Precautions:

- 2.3.1. DC voltage applied on LCM causes electrochemical reactions, which will deteriorate the display over time. The applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
- 2.3.2. LCD driving voltage should be kept within specified range; excess voltage will shorten display life, while less voltage may not turn on LCM.
- 2.3.3. LCM response time will be extremely delayed in low operating temperature(such as -20 °C) than in room operating temperature. Therefore, higher LCD driving voltage is required in low operating temperature; On the other hand, in high operating temperature (such as +70°C) LCD shows dark background color, therefore lower LCD driving voltage is required. Be sure to use the specified LCD driving voltage in different operating temperature.



2.4 Safety:

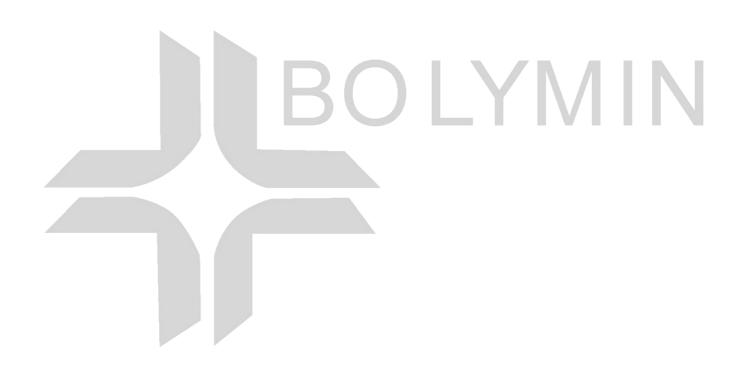
2.4.1 If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

2.5 WARRANTY POLICY

Bolymin .Will provide one-year warranty for the products only if under specification operating conditions.

If there are functional defects found during the period of warranty, the defective products would be replaced on a one-to-one basis.

Bolymin would not be responsible for any direct/indirect liabilities consequential to any parties.





3. General Specification

(1) Mechanical Dimension

Item	Standard Value	Unit
LCD TYPE	TFT / Transmissive / Normal White	
Module dimension	76.9 (W)x 63.9 (H)x 4.35 (T)	mm
Active area	70.08 (W)x 52.56 (H)	mm
Pixel pitch	0.219 (W)x 0.219 (H)	mm
Number of dots	320 x RGB x 240	dots
Driver IC	HX8238D	
Interface	SPI+24BIT RGB	
TOP polarizer Type	ANTI-GLARE	
Recommend viewing direction	12	O'clock
Gray scale inversion direction	6	O'clock
Backlight type	6-DIES WHITE LED	
TOUCH PANEL type	RTP	



4. Absolute Maximum Rating

4.1 Electrical Absolute Maximum Ratings

(Vss=0V, Ta=25°C)

Item	Symbol	Min	Max	Unit
Supply Voltage for analog	VDD	-0.3	+4.5	V
Supply Voltage for logic	VDD	-0.3	+4.5	V
Supply current (One LED)	ILED		30	mA

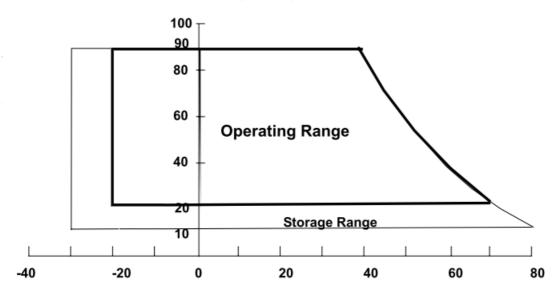
4.2 Environmental Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Note
Operating Temperature	TOP	-20	70	$^{\circ}\!\mathbb{C}$	(1)
Storage Temperature	TST	-30	80	$^{\circ}\!\mathbb{C}$	(1)

Note (1)

- (a) 90 %RH Max. (Ta <= 40 °C).
- (b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).
- (c) No condensation.

Relative Humidity (%RH)





5. Electrical Characteristics

5.1 Input Power for TFT

Ta=25°C

Item	Symbol	Condition	Min.	Тур.	Max.	Unit
Supply Voltage for analog	VDD	_	3.0	3.3	3.6	V
Supply Voltage For Logic	VDD	_	3.0	3.3	3.6	V
Input High Voltage	V _{IH}	_	0.7VDD	_	VDD	V
Input Low Voltage	$V_{\rm IL}$	_	GND	_	0.3VDD	V
Supply Current	Idd	VDD =3.3V	_		_	mA

^{*}Optimum LCD driving voltage value, referring to above mentioned range, is changed due to different batch of LCD glass.

5.2 Backlight Driving Conditions

Ta=25°€

Item	Symbol	Condition	Min.	Тур.	Max.	Unit
Voltage for LED Backlight	VF	IL=40mA	_	19.2		V
Current for LED Backlight	lL .		_	20	30	mA
Power Consumption	Р		_	0.384	_	W
LED Life Time			30000	50000	_	Hrs



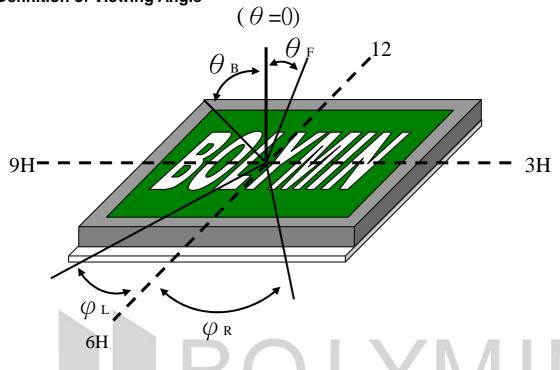
6. Optical Characteristics

(Ta=25 $^{\circ}$ C)

lt	em	Symbol Condition		Min.	Тур.	Max.	Unit
Lum	inance	L	IL=20mA	190	240	290	cd/m2
Contra	ast Ratio	CR	Θ=0	200	300	-	-
Respoi	nse Time	Ton Toff			40	80	ms
	RED			-	-	-	
0.5	GREEN			-	-	-	
CIE	BLUE	(x,y)		1 1	/ B	A 1 B	
	WHITE		B(0.270,0.294	Y - []	0.310,0.334	
		θF		-	50	-	deg
		θВ	(2)	-	60	-	deg
View	View Angle		(CR>=10)	-	60	-	deg
		φR		-	60	-	deg
Unif	ormity	Un		80			%



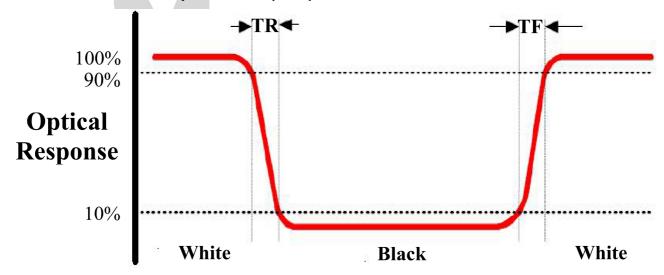
Note 1: Definition of Viewing Angle



Note 2: Definition of contrast ratio CR:

 $CR = \frac{Luminance of white state}{Luminance of black state}$

Note 3: Definition of Response Time(Tr,Tf)

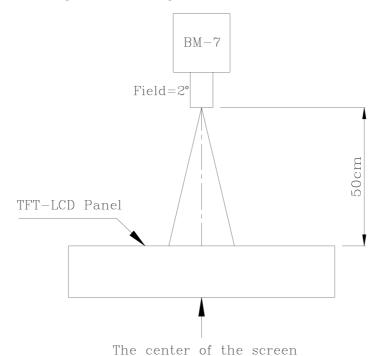




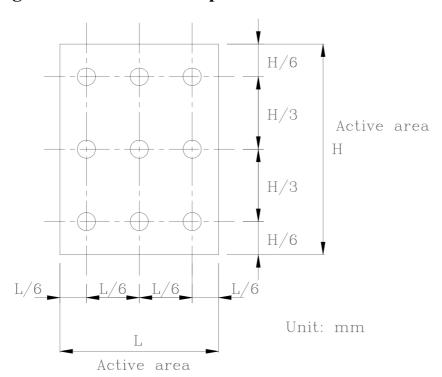
Note 4: Definition of Luminance

1 The Brightness Test Equipment Setup

Field=2° (As measuring "black" image, field=2° is the best testing condition)



2 The Brightness Test Point Setup





7. Interface Pin Function

Pin No.	Symbol	Description
1	LEDK	Cathode of LED backlight
2	LEDK	Cathode of LED backlight
3	LEDA	Anode of LED backlight
4	LEDA	Anode of LED backlight
5	YU	Touch panel control PIN: YU
6	XR	Touch panel control PIN: XR
7	NC	No connect
8	RESET	RESET PIN
9	SPENA	Chip select of serial interface
10	SPCLK	Clock pin of serial interface
11	SPDAT	Data input pin of serial interface
12~19	B0~B7	Blue data bus
20~27	G0~G7	Green data bus
28~35	R0~R7	Red data bus
36	HSYNC	Horizontal sync signal; negative polarity
37	VSYNC	Vertical sync signal; negative polarity
38	DCLK	Clock signal; latching data at the falling edge
39	NC	Touch panel control PIN: XL
40	NC	Touch panel control PIN: YU
41	VCC	Power supply
42	VCC	Power supply
43	YD	Touch panel control PIN: YD
44	XL	Touch panel control PIN: XL
45	NC	No connect
46	NC	No connect
47	NC	No connect
48	SEL2	
49	SEL1	Interface mode select(note)
50	SEL0	
51	NC	No connect
52	DEN	Display enable pin from controller
53	GND	Power ground
54	GND	Power ground



Note:

- 1. The mode control (SEL2) not use, it can't control CCIR601 interface, If not use CCIR601, it can floating.
- 2. For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If DE signal is fixed low, SYNC mode is used. Otherwise, DE+SYNC mode is used. Suggest used SYNC mode!!Suggest the DE signal usually pull low.
- 3. IF select serial RGB or CCIR601/656 input mode is selected, only DX0-DX7 used, and the other short to GND, Only selected serial RGB、CCIR601/656 interface, DX BUS will enable, Digital input mode DX0 is LSB and DX7 is MSB.

Interface select table

SEL2	SEL1	SEL0	Interface Mode
0	0	0	Parallel-RGB Data format interface
U	U	U	(only support stripe type color filter)
0	0	1	Serial-RGB data format
0	1	0	CCIR 656 data format (640RGB)
0	1	1	CCIR 656 data format (720RGB)
1	0	0	YUV mode A data format(Cr-Y-Cb-Y)
1	0	1	YUV mode A data format(Cr-Y-Cb-Y)
1	1	0	YUV mode B data format(Cb-Y-Cr-Y)
1	1	1	YUV mode B data format(Cb-Y-Cr-Y)



8. Quality Assurance

8.1 Inspection conditions

- 1. The LCD shall be inspected under 20~40W white fluorescent light.
- 2. Checking Direction shall be in the 40 degree from perpendicular line of specimen surface.
- 3. Checker shall see over 30 cm.
- 4. Inspect about 5 seconds for each side.
- 5. Defect that is located at outside of VA and doesn't affect function is ignored.

8.2 Inspection Parameters

NO.	Item	Criterion	AQL
01	Electrical Testing	 1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker 	0.65
02	Black or White spots or Bright spots or Color spots on LCD (Display only)	 21 White and black or color spots on display ≤ 0.25mm, no more than Five spots. 22 Densely spaced: No more than three spots within 3mm. 	1.5
	LCD and Touch Panel black	3.1 Round type: As following drawing Φ = (X+Y) / 2 X Y Y * Densely spaced: No more than two spots within 3mm.	1.5
03	spots, white spots, contaminat i on (non – display)	* Densely spaced: No more than two lines within 3mm.	1.5



NO.	Item		Criterion			AQL
		If bubbles are visible judge using black spe	,	Size Φ(mm) Φ≦0.30	Acceptable Q'ty Accept no	
	Polarizer	specifications, not ea	I	$\Psi = 0.30$	dense	
04	bubbles	to find, must check	in 0.3	30< Φ≦ 0.50	0	1.5
		specify direction	0.9	50< Φ≦ 1.00	0]
				1.00< Ф	0]
				Total Q'ty	0	
05	Scratches	Follow NO.3 -2 Line	Туре.			
06	Chipped glass	L: Electrode pad leng 6.1 General glass chi		-		1.5
		 ⊙ If there are 2 or not 6.1.2 Corner crack: z: Chip thickness z ≤ 1/2t 1/2t< z ≤ 2t ⊙ Unit: mm 	y: Chip width Not over viewing area Not exceed 1/3k	x: Chip lengt x≤1/8a x≤1/8a	h	



NO.	Item	Criterion	AQL					
		Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length 7.2 Protrusion over terminal: 7.2.1 Chip on electrode pad:						
		y: Chip width x: Chip length z: Chip thickness						
		y ≤ 0.5mm x ≤ 1/8a 0< z ≤ t						
07	Glass crack	Non-conductive portion:	1.5					
		y: Chip width x: Chip length z: Chip thickness						
		y ≦ L						
		 If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. If the product will be heat sealed by the customer, the alignment mark must mot be damaged. 7.2.3 Substrate protuberance and internal crack y: width x: length y ≤ 1/3L X ≤ a 						



NO.	Item	Criterion	AQL
08	Cracked glass	No crack is allowed.	1.5
09	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color is wrong.	1.5 1.5 0.65
10	Bezel	No scratches with W>0.1 and Length>2.5mm.	1.5
11	PCB、COB	 11.1 COB seal may not have pinholes larger than 0.2mm or contamination. 11.2 COB seal surface may not have pinholes through to the IC. 11.3 The height of the COB should not exceed the height indicated in the assembly diagram. 11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places. 11.5 Parts on PCB must be the same as on the production characteristic chart, There should be no wrong parts, missing parts or excess parts. 11.6 The jumper on the PCB should conform to the product characteristic chart. 	1.5 1.5 1.5 1.5 0.65
12	FPC	12.1 FPC terminal damage \leq 1/2 FPC terminal width and can not affect the function , we judge accept. 12.2 FPC alignment hole damage \leq 1/2 alignment area and can not affect the function , we judge accept.	1.5 1.5
13	Soldering	13.1 No cold solder joints, missing solder connections, oxidation or icicle.13.2 No short circuits in components on PCB or FPC.	1.5 0.65



Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Touch Panel Total thickness a: LCD side length L: Electrode pad length 14.1 General glass chip: 14.1.1 Chip on panel surface and crack between panels: z: Chip thickness y: Chip width x: Chip length ≤ 1/2 k and not over viewing area viewing area viewing area viewing area 1.5 Unit: mm olif there are 2 or more chips, x is the total length of each chip 14.1.2 Corner crack: z: Chip thickness y: Chip width x: Chip length z: Chip thickness y: Chip width x: Chip length	NO.	Item		Criterion	*****	AQL
	14		x: Chip length y: Ck: Seal width t: TL: Electrode pad leng 14.1 General glass cl 14.1.1 Chip on panel z: Chip thickness Z≦t Ounit: mm If there are 2 or n	y: Chip width 1/2 k and not over viewing area	ess a: LCD side length een panels: x: Chip length x≤ 1/8a	1.5
			z: Chip thickness	y: Chip width ≦1/2 k and not over	x: Chip length	



NO.	Item	Crit	erion	AQL			
15	Touch Panel(Fish eye、dent and bubble on film)	$\begin{array}{c cccc} SIZE(mm) & Acceptable Q'ty \\ \hline \Phi \leq 0.2 & Accept no dense \\ \hline 0.2 < D \leq 0.4 & 5 \\ \hline 0.4 < D \leq 0.5 & 2 \\ \hline 0.5 < D & 0 \\ \hline \end{array}$					
16	Touch Panel Newton ring	Newton ring dimension $\leq 1/2$ touch panel area and not affect font and line distortion($\leq 2.5\%$), it is acceptable.					
17	Touch Panel Linearity	Less than 1.5% is acceptable.					
18	LCD Ripple	Touch the touch panel , can not see the LCD ripple. Pen: R 1.0mm silicon rubber. Operation Force: 80g					
19	General appearance	 19.1 Pin type must match type in specification sheet. 19.2 LCD pin loose or missing pins. 19.3 Product packaging must the same as specified on packaging specification sheet. 19.4 Product dimension and structure must conform to product specification sheet. 					

Other Inspection standard reference Bolymin standard.



9. Reliability

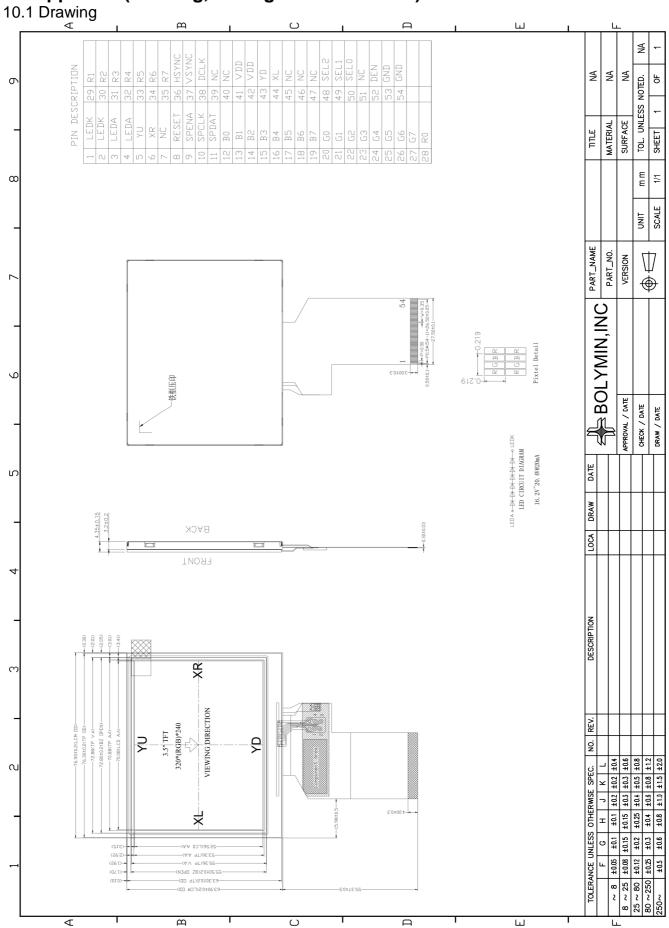
■Content of Reliability Test

Envi	ronmental Test			
No	Test Item	Content of Test	Test Condition	Applicable Standard
1	High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 96 hrs	
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30°ℂ 96 hrs	
3	High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°ℂ 96 hrs	
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 96 hrs	
5	Humidity Test	Endurance test applying the high humidity storage for a long time.	40°C,90%RH 96hrs	
6	Temperature cycle (Non-operation)	Endurance test applying the low and high temperature cycle30°C 80°C 4 30min 30min 1 cycle	-30°C/80°C 10 cycles	
7	Vibration test	Endurance test applying the vibration during transportation and using.	Total Fixed Amplitude:1.5mm Vibration Frequency:10~55Hz One cycle 60 seconds to 3 direction of X,Y,Z for each 15minutes	

^{**}Assess after placing at normal temperature and humidity for 4 hour • No abnormalities in functions and appearance •

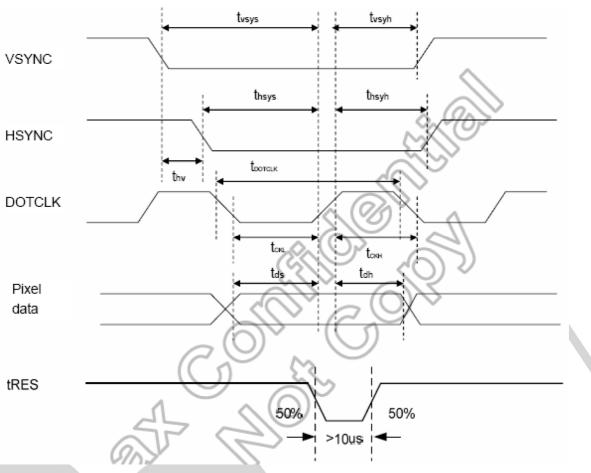


10. Appendix (Drawing, Timing Characteristics)





10.2 Timing characteristics 10.2.1 Pixel Timing Diagram

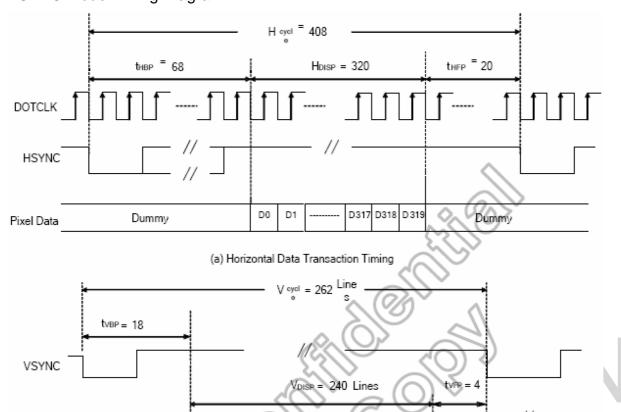


Characteristics	Symbol	Min.		Тур.		Max.		Unit
Characteristics	Syllibol	24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	Onit
DOTCLK Frequency	fDOTCLK	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Vertical Sync Setup Time	tvsys	20	10	-	-	-	-	ns
Vertical Sync Hold Time	tvsyh	20	10	-	-	-	-	ns
Horizontal Sync Setup Time	thsys	20	10	-	-	-	-	ns
Horizontal Sync Hold Time	thsyh	20	10	-	-	-	-	ns
Phase difference of Sync Signal Falling Edge	thv	1		-		240		tDOTCLK
DOTCLK Low Period	tCKL	50	15	-	-	-	-	ns
DOTCLK High Period	tCKH	50	15	-	-	-	-	ns
Data Setup Time	tds	12	10	-	-	-	-	ns
Data hold Time	tdh	12	10	-	-	-	-	ns
Reset pulse width	tRES	1	0	-		-		μS

Note: External clock source must be provided to DOTCLK pin of HX8238-D. The driver will not operate if absent of the clocking signal.



10.2.2 SYNC mode Timing Diagram

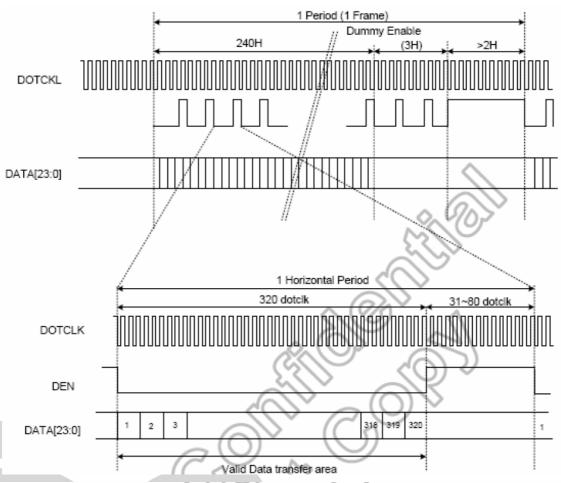


Characterist	ioo	Cumbal	Mi	n.	Tv	p.	M	ax.	Unit
Characterist	ics	Symbol	24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	Unit
DOTCLK Frequenc	Y-()	fDOTCLK	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	V/A	tDOTCLK)	100	33.3	154	51.3	-	-	ns
Horizontal Frequen	cy (Line)	fH.	-		14	.9	22	.35	KHz
Vertical Frequency	(Refresh)	(\f\)	-		6	0	9	90	Hz
Horizontal Back Po	rch	THBP	-	-	68	204	-	-	tDOTCLK
Horizontal Front Po	rch	tHFP	-	-	20	60	-	-	tDOTCLK
Horizontal Data Sta	rt Point	tHBP	-	1	68	204	-	-	tDOTCLK
Horizontal Blanking	Period	tHBP + tHFP	-	-	88	264	-	-	tDOTCLK
Horizontal Display A	∖rea	HDISP	1	ı	320	960	-	-	tDOTCLK
Horizontal Cycle		Hcycle	-	-	408	1224	450	1350	tDOTCLK
Vertical Back Porch	1	tVBP	-		18		-		Lines
Vertical Front Porch	1	tVFP	-		4		-		Lines
Vertical Data Start I	Point	tVBP	-		18		-		Lines
Vertical Blanking Period		tVBP + tVFP	-		22		-		Lines
Vertical Display NTSC					240				
Vertical Display Area	PAL	VDISP	-		280(PALM=0)		1	-	Lines
Alca	PAL				288(PALM=1)		1		
Vertical Cyale	NTSC	Vavala	-		262		250		Linco
Vertical Cycle	PAL	Vcycle			313		350		Lines

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10.2.3 DE mode Timing Diagram



Characteristics	Symbol	Min.		Тур.		Max.		Unit
Characteristics	Symbol	24-bit	8-bit	24- bit	8-bit	24-bit	8-bit	Oille
DOTCLK Frequency	fDOTCLK	/		6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Horizontal Blanking Period	tHBP + tHFP	52	146	88	264	180	960	tDOTCLK
Horizontal Display Area	HDISP	1	-	320	960	-	-	tDOTCLK
Horizontal Cycle	Hcycle	372	1106	408	1224	500	1920	tDOTCLK
Vertical Blanking Period	tVBP + tVFP	2		-		47		Lines
Vertical Display Area	VDISP	-		240		-		Lines
Vertical Cycle	Vcycle	24	2	-		287		Lines

Note: For more detail information, please refer to HX8238D datasheet.