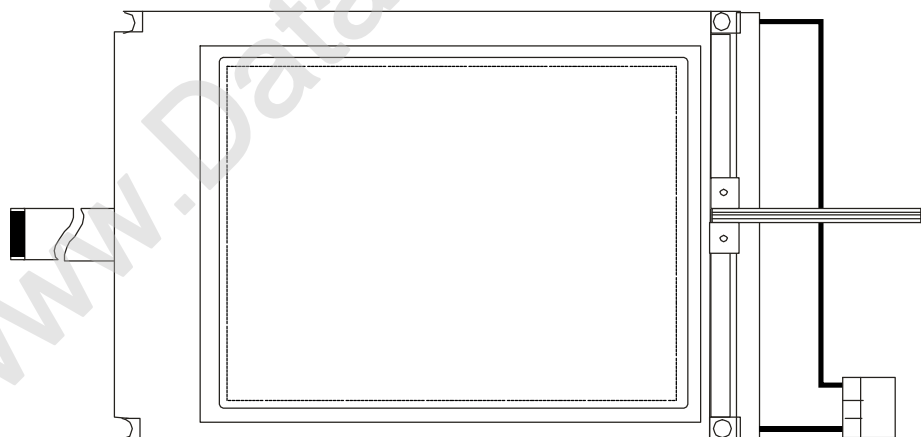


HANTRONIX

PRODUCT SPECIFICATION

HDM3224ATS-C

320x240 COLOR GRAPHICS
LCD DISPLAY MODULE
WITH TOUCH SCREEN



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 1.1	HDM3224ATS-C	SHEET 1 OF 19
				DATE: 6/26/01

1.MECHANICAL DATA

(1) Product No.	HDM3224ATS-C
(2) Module Size	168.0 (W)mm x 111.0 (H)mm x 9.4(D)mm
(3) Dot Size	0.09 (W)mm x 0.33 (H)mm
(4) Dot Pitch	0.12 (W)mm x 0.36 (H)mm
(5) Number of Dots	320 xRGB(W) x 240 (H)Dots
(6) Duty	1/240
(7) LCD Display Mode	FSTN: Color STN module Rear Polarizer: Color Transmissive Type
(8) Viewing Direction	6 O'clock
(9) Backlight	CCFL
(10) Controller	Excluded
(11) DC/DC Converter	Excluded
(12) Touch Panel	Included
(13) Weight	230 g(approx.)

2.ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	V	
Power Supply for LCD Drive	VLCD-VSS	0	30.0	V	
Input Voltage	VI	-0.3	VDD+0.3	V	
Static Electricity	—	—	—	—	Note 1

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	60
Humidity (Without Condensation)	Note 2,4		Note 3,4	

Note 1 LCM should be grounded during handling LCM.

Note 2 Ta ≤ 50°C : 85%RH max

Ta > 50°C : Absolute humidity must be lower
than the humidity of 85%RH at 50°C

Note 3 Ta at -20°C will be < 48 hrs, at 60°C will be < 120 hrs

Note 4 Background will color change slightly depending on ambient temperature.

That phenomenon is reversible.

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3. ELECTRICAL CHARACTERISTICS

3-1. CHARACTERISTICS OF LCM

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply		VDD-VSS	Ta= 25°C		4.5	5.0	5.5	V
Input Voltage		V _{IH}	H level		0.8VDD	—	VDD	V
		V _{IL}	L level		0	—	0.2VDD	V
Recommended LCD Driving Voltage		V _{LCD} -VSS	Duty=1/240 Bias=1/13 VDD=5.0V	0°C	23.2	23.6	24.0	V
				25°C	22.2	22.6	23.0	
				50°C	21.0	21.4	21.8	
Supply Current for Logic		I _{DD}	VDD-VSS = 5.0V V _{LCD} -VSS = 22.6V Ta= 25°C		—	1.5	5.0	mA
Supply Current for LCD		I _{LCD}	PATTERN: □ ■ □ ■ □ ■ □ ■ ■ □ ■ □ ■ □ ■ □		—	6.5	13.0	mA
LCM	Surface Luminance	L	PATTERN: (Dots All On of White Color) □ □ □ □ □ □ □ □		—	65.0	—	cd/m ² (NOTE 2)
			PATTERN: (Dots All Off) ■ ■ ■ ■ ■ ■ ■ ■		—	3.0	—	
Touch Screen	Rating Voltage	V _R	—		—	—	7.0	V
	Resistance of Electrodes	R _{EXT}	X Electrode		400	—	900	Ω
			Y Electrode		200	—	500	
	Insulation Resistance	R _{OFF}	V _{DC} ≈ 25V		10	—	—	MΩ
	Linearity	L	—		—	—	1.5	%
	Activation Force	F _{ON}	NOTE 1		5	—	50	g
Surface Hardness		S _H	—		3	—	—	H
Recommended Frame Frequency for Optimum Contrast		FLM	—		115	120	125	Hz

NOTE 1 : The force is given with R0.8 Polyacetal pen or R8, HS60 silicon rubber and the analog output could be detected stably.

NOTE 2 : The Value of LCM Surface Luminance is Through Touch Screen.

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3--2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used lamp : Rating

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	V _L	—	320	—	V _{rms}	T _a = 25°C
Lamp current	I _L	4	5	6	mA _{rms}	(*1) T _a = 25°C
Lamp power consumption	P _L	—	1.6	—	W	(*2) T _a = 25°C
Lamp frequency	F _L	20	35	50	KHz	T _a = 25°C
Starting voltage	V _s	—	455	—	V _{rms}	T _a = 0°C
		—	350	—	V _{rms}	T _a = 25°C
Lamp life time	L _L	—	20000	—	hrs	I _L = 5mA _{rms} , T _a = 25°C

(*1) It is recommended that I_L be not more than 5.0 mA_{rms} so that heat radiation of CCFT backlight may least affect the display quality .

(*2) Power consumption excluded inverter loss .

4.OPTICAL CHARACTERISTICS

4-1.Optical Char. of Normal Temp. Mode

AT Vop

ITEM MODE		Cr(Contrast Ratio)						θ (Viewing Angle)		ϕ (Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	M	—	40	—	35	—	5	—	90	—	±58
NOTE		NOTE 6						NOTE 5			

note:

T: TRANSMISSIVE
M: FOR 6 O'CLOCK STN MODULE

AT $\phi=0^\circ$ $\theta=0^\circ$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	—	550	750	ms	NOTE 2
		25°C	—	230	330		
		50°C	—	100	140		
Response Time (fall)	Tf	0°C	—	270	530	ms	NOTE 2
		25°C	—	80	110		
		50°C	—	60	85		

4--2.Color of CIE Coordinate

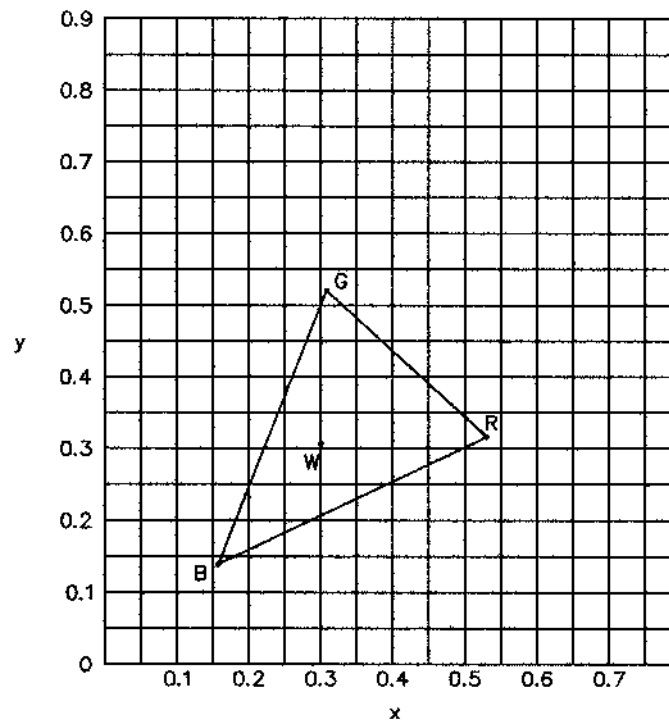
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	BRIGHTNESS (cd/m ²)	NOTE
Color of CIE Coordinate	Red	X	$\phi=0^\circ$, $\theta=0^\circ$	0.542	18.4	Note※
		y		0.329		
	Green	X		0.302	42.5	
		y		0.538		
	Blue	X		0.159	14.3	
		y		0.138		
	White	X		0.295	65.0	
		y		0.312		

Note* Measuring at position 3 on Fig.1
CIE chromaticity diagram

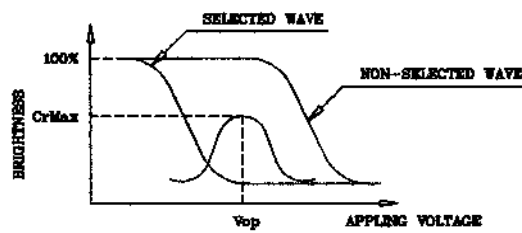
Tolerance : ± 0.05

Fig.1

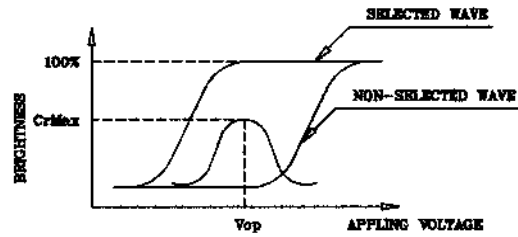


(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



(negative type)

*Conditions

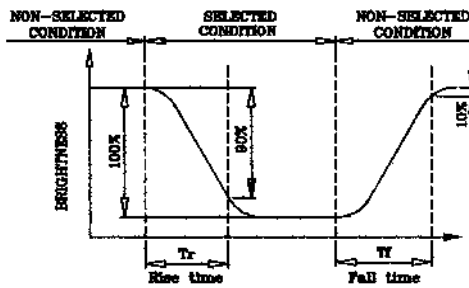
Viewing Angle : 0

Frame Frequency : 120Hz

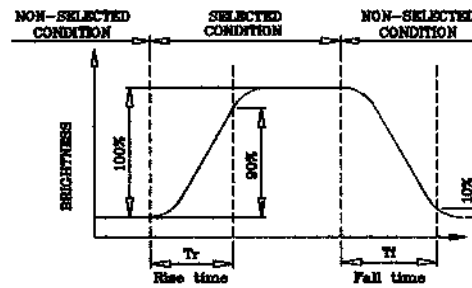
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(T_r , T_f)



(positive type)



(negative type)

*Conditions

Operating Voltage : V_{op}

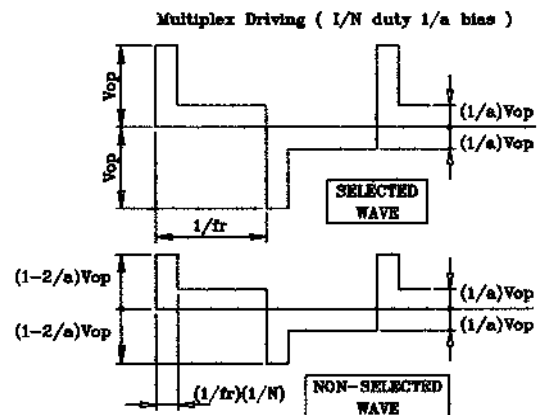
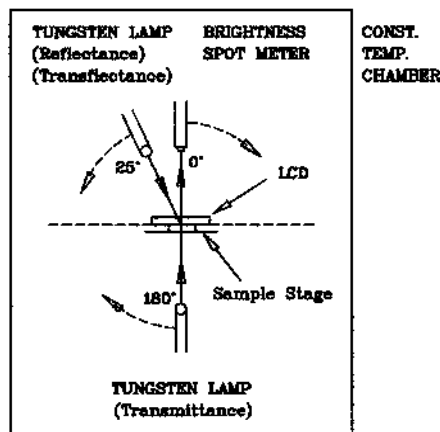
Viewing Angle (θ, ϕ) : (0,0)

Frame Frequency : 120Hz

Applying Waveform : 1/N duty 1/a bias

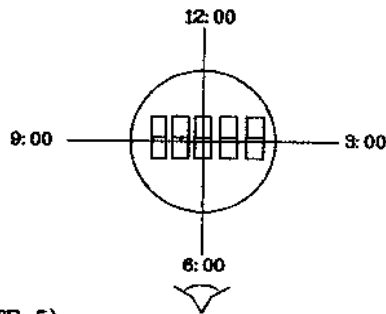
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



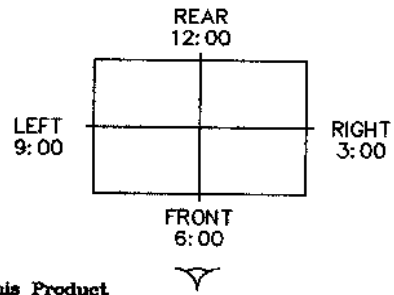
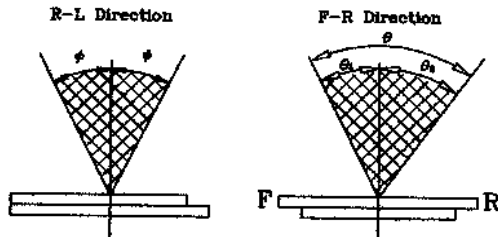
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product

The Viewing Direction is 6 O'clock
So $\theta_1 > \theta_2$

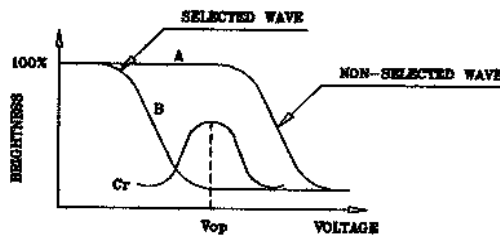
$$\theta = \theta_1 + \theta_2$$

*Conditions

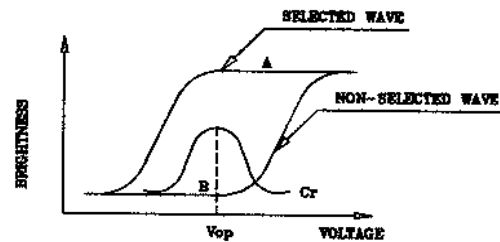
Operating Voltage : V_{op}
Frame Frequency : 120Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

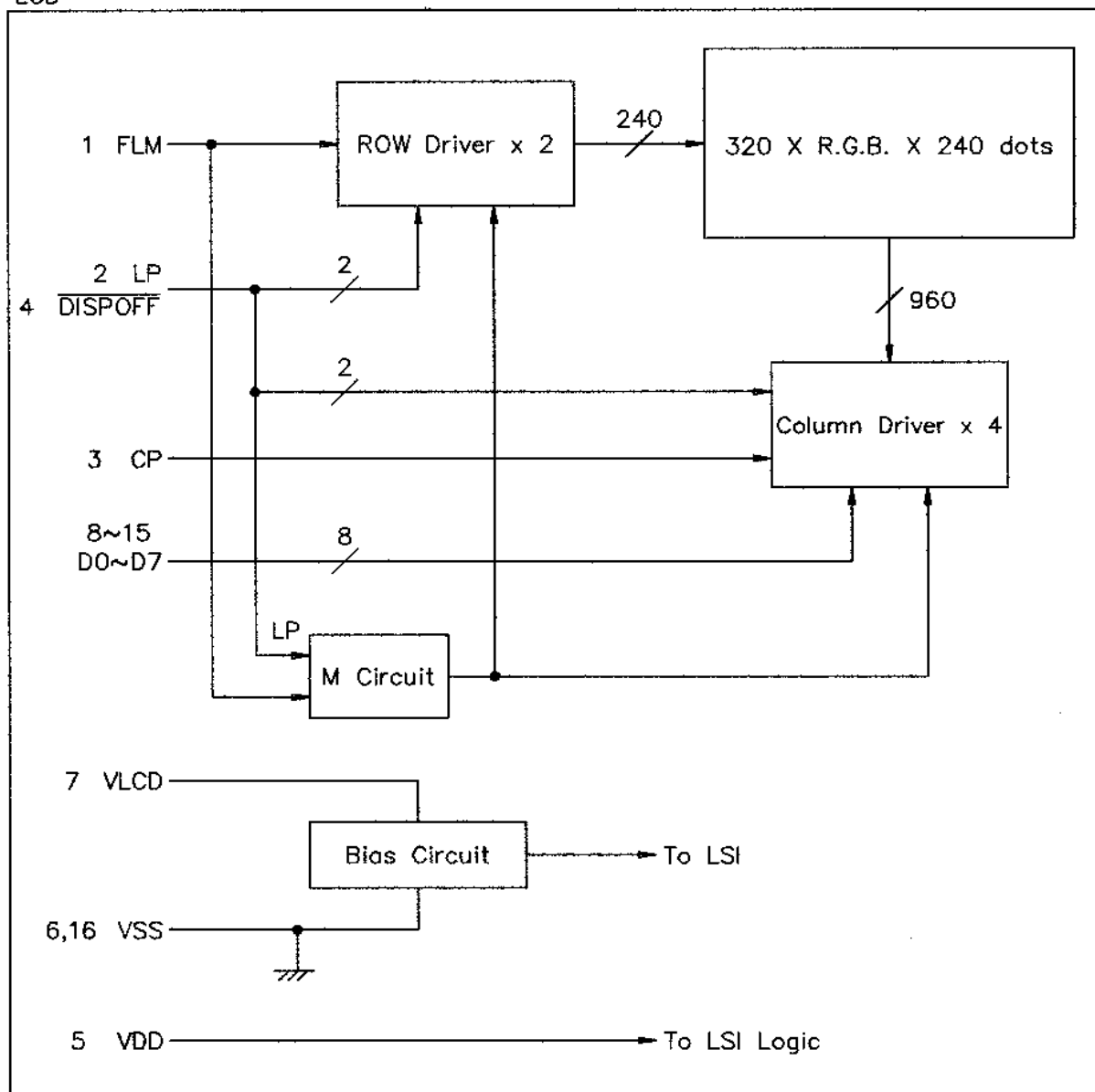
$$\text{Contrast Ratio : } Cr = A/B$$

*Conditions

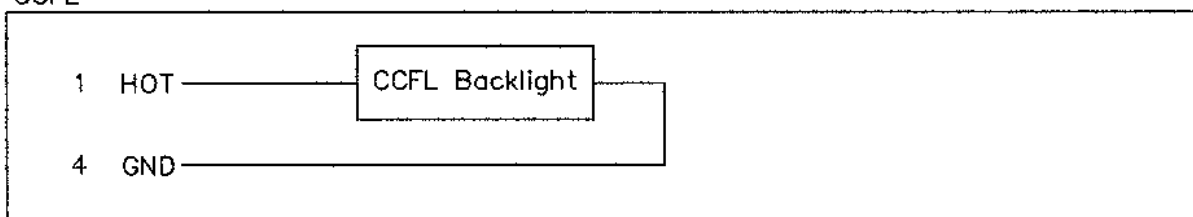
Viewing Angle : 0
Frame Frequency : 120Hz
Applying Waveform : 1/N duty 1/a bias

5. BLOCK DIAGRAM

LCD



CCFL



6.INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Level	Function
1	FLM	H/L	First Line Marker
2	LP	H→L	Data Latch Signal
3	CP	H→L	Clock Signal for Shifting Data
4	DISPOFF	H/L	Display Control Signal, H : Display on L : Display off
5	VDD	—	Power Supply for Logic
6	VSS	—	Power Supply (0V,GND)
7	VLCD	—	Power Supply for LCD Drive
8	D0	H/L	Display Data
9	D1	H/L	Display Data
10	D2	H/L	Display Data
11	D3	H/L	Display Data
12	D4	H/L	Display Data
13	D5	H/L	Display Data
14	D6	H/L	Display Data
15	D7	H/L	Display Data
16	VSS	—	Power Supply (0V,GND)

LCD INTERFACE CABLE :

FFC,N16,Pitch 1.0 mm (Thickness = 0.3 mm)

MATING CONNECTOR :

MOLEX 52207-1690 or COMPATIBLE

CCFL

Pin No.	Symbol	Level	Function
1	HOT	—	Power Supply for CCFL(HOT)
2	NC	—	Non-connection
3	NC	—	Non-connection
4	GND	—	Power Supply for CCFL(GND)

CCFL CONNECTOR : M63M83-04 (MITSUMI)

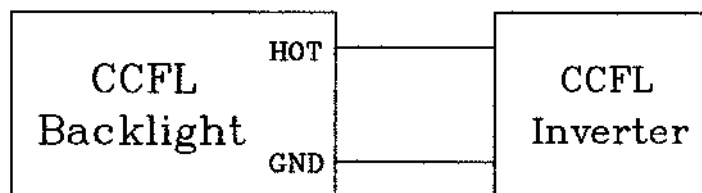
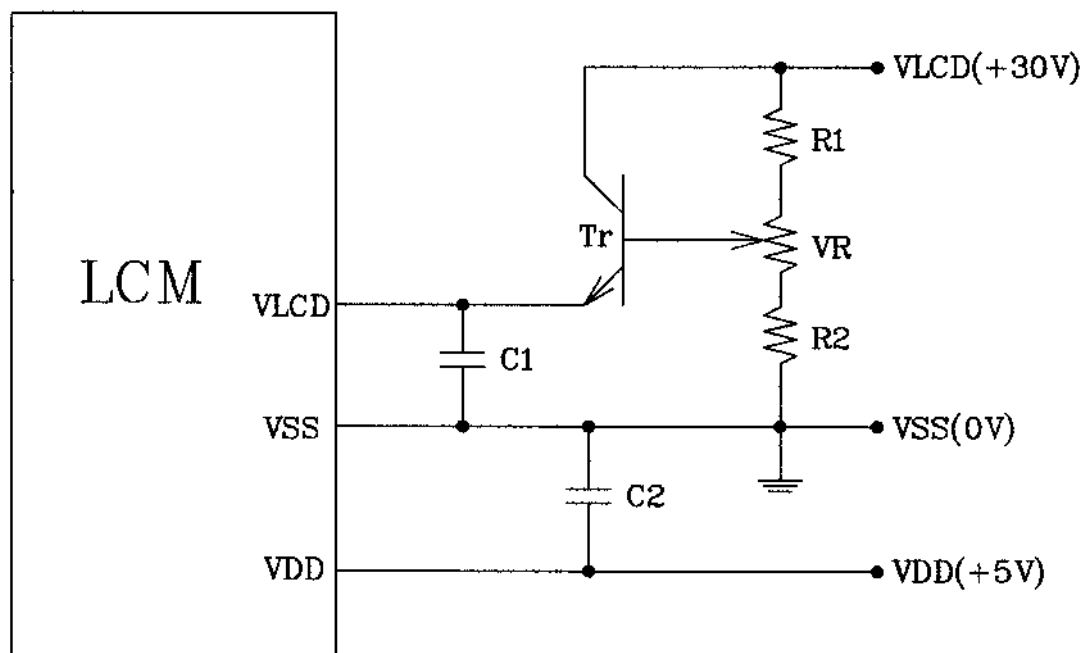
TOUCH SCREEN

Pin No.	Symbol	Level	Function
1	UP	—	Up Direction
2	RIGHT	—	Right Direction
3	DOWN	—	Down Direction
4	LEFT	—	Left Direction

TOUCH SCREEN CABLE :

N4,Pitch 1.0mm (Thickness = 0.3 mm)

7. POWER SUPPLY



Recommended :

1. $R1 + R2 + VR = 10 \sim 20K\Omega$

2. $C1, C2 = 10\mu F$

3. CCFL Backlight Inverter : TDK CXA-L10L
TDK CXA-M10L-L

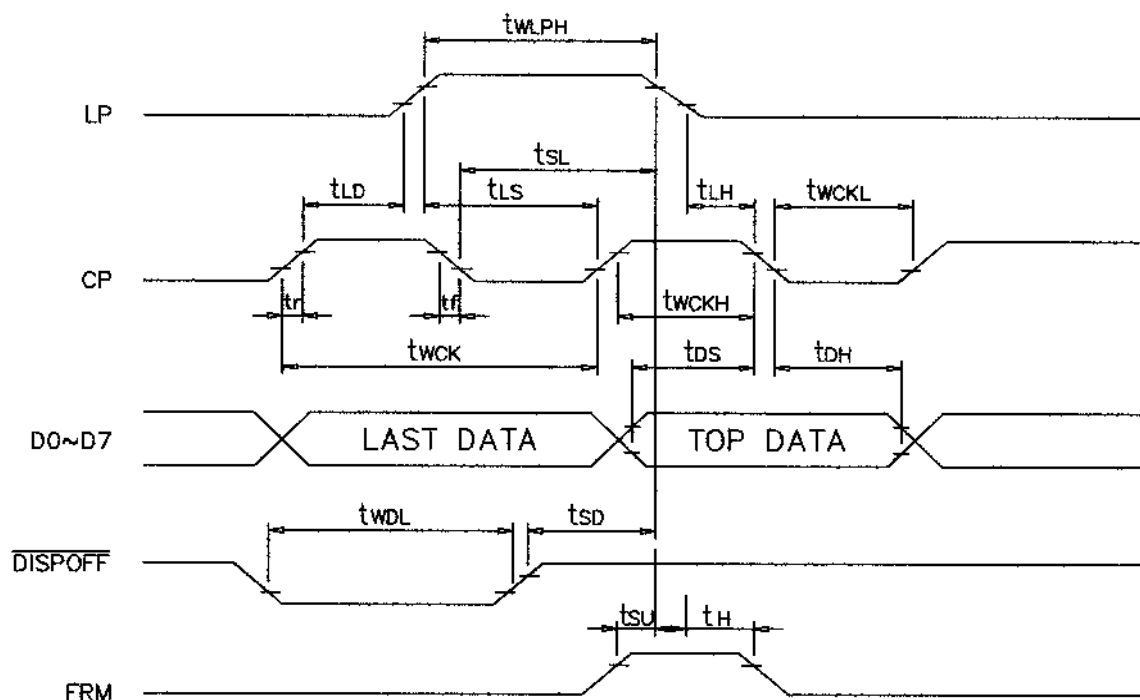
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8. TIMING CHARACTERISTICS

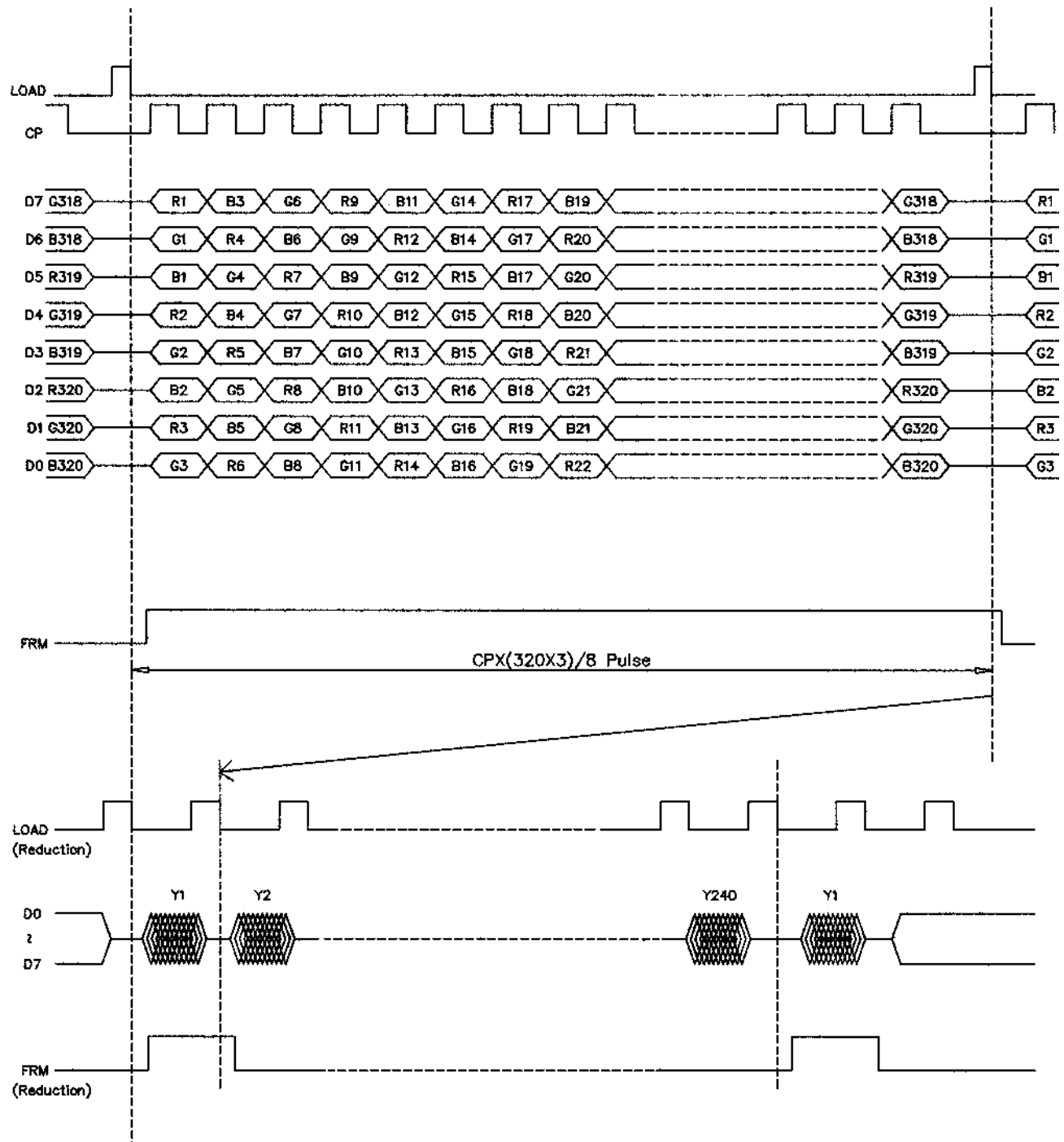
8-1. INTERFACE TIMING

VDD=5.0V ± 10%

Parameter	SYMBOL	MIN.	MAX.	UNIT
CLOCK PULSE CYCLE TIME	t_{wck}	40	—	ns
CLOCK PULSE HIGH LEVEL WIDTH	t_{wckH}	12	—	ns
CLOCK PULSE LOW LEVEL WIDTH	t_{wckL}	14	—	ns
LATCH PULSE HIGH LEVEL WIDTH	t_{wLPH}	15	—	ns
CP→LP RISE TIME	t_{LD}	5	—	ns
CP→LP FALL TIME	t_{SL}	25	—	ns
LP→CP RISE TIME	t_{LS}	25	—	ns
LP→CP FALL TIME	t_{LH}	25	—	ns
CLOCK PULSE RISE/FALL TIME	t_r, t_f	—	50	ns
DATA SETUP TIME	t_{DS}	5	—	ns
DATA HOLD TIME	t_{DH}	15	—	ns
DISPOFF LOW LEVEL WIDTH	t_{WDL}	1.2	—	μs
DISPOFF CANCELLATION TIME	t_{SD}	100	—	ns
FLM SETUP TIME	t_{SU}	30	—	ns
FLM HOLD TIME	t_H	50	—	ns

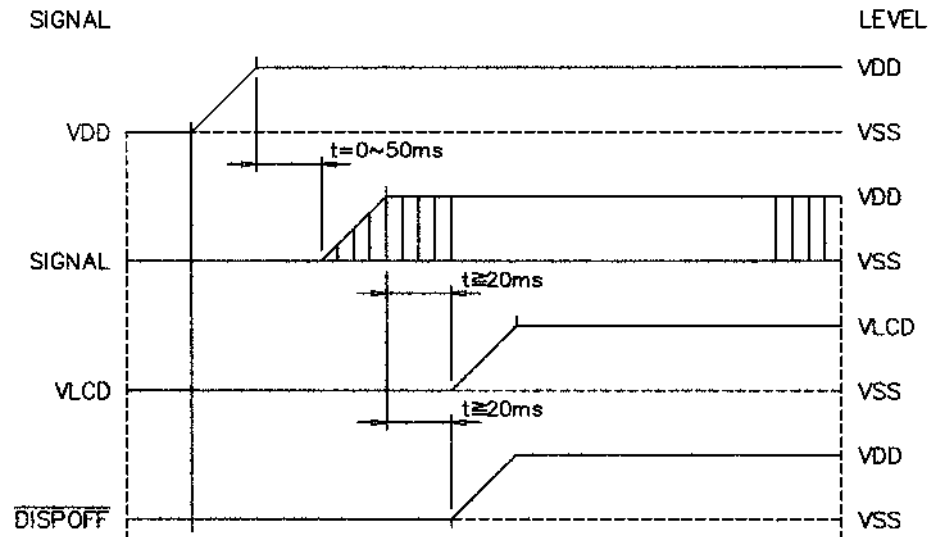


8-2.TIMING CHART

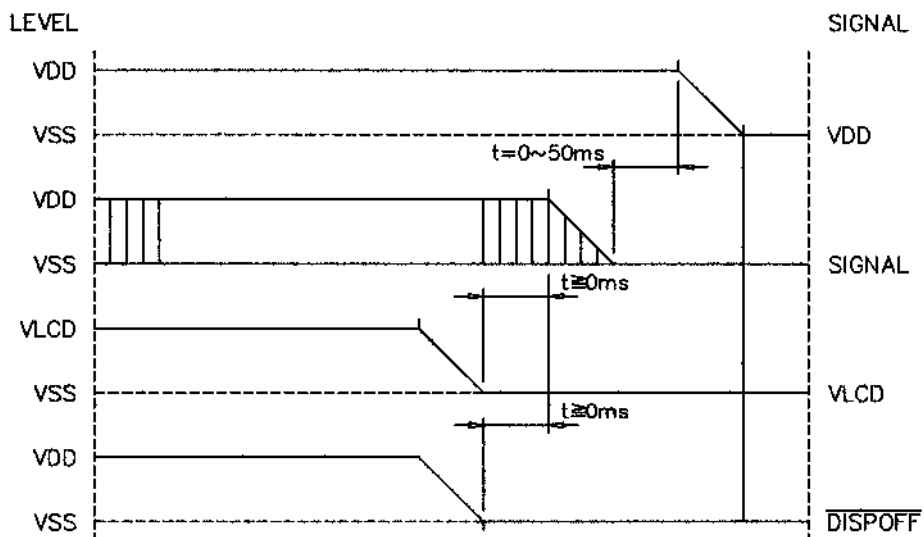


8-3. POWER ON/OFF TIMING

ON SEQUENCE

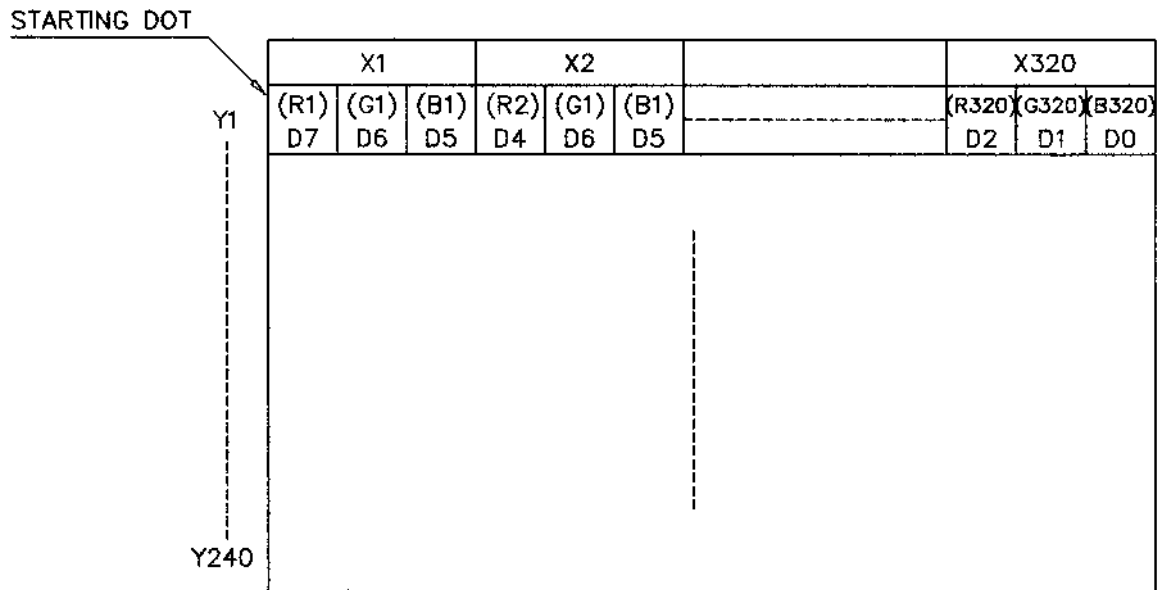


OFF SEQUENCE



Please maintain the above sequence when turning on and off the power supply of the module. If DISPOFF is supplied to the module while internal alternate signal for LCD driving(M) is unstable, DC component will be supplied to the LCD panel. This may cause damage the LCD module.

8-4.DISPLAY PATTERN



D0~D7 are 8 bits transmitted data, where D0 is LSB and D7 is MSB.

9. RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70°C	120HR		Appearance without defect	
2	Low Temp. Storage	-20°C	120HR		Appearance without defect	
3	High Temp. & High Humi. Storage	40°C 90%RH	120HR		Appearance without defect	
4	Thermal Shock	-20°C, 30min → 25°C, 5min → 70°C, 30min → 25°C, 5min (1 cycle)			Appearance without defect	5 cycles

NOTICE:

- SAFETY

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

- HANDLING

- 1.Avoid static electricity which can damage the CMOS LSI.
- 2.Do not remove the panel or frame from the module.
- 3.The polarizing plate of the display is very fragile. So, please handle it very carefully.
- 4.Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- 5.Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.

- STORAGE

- 1.Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.
- 2.Do not place the module near organics solvents or corrosive gases.
- 3.Do not crush, shake, or jolt the module.

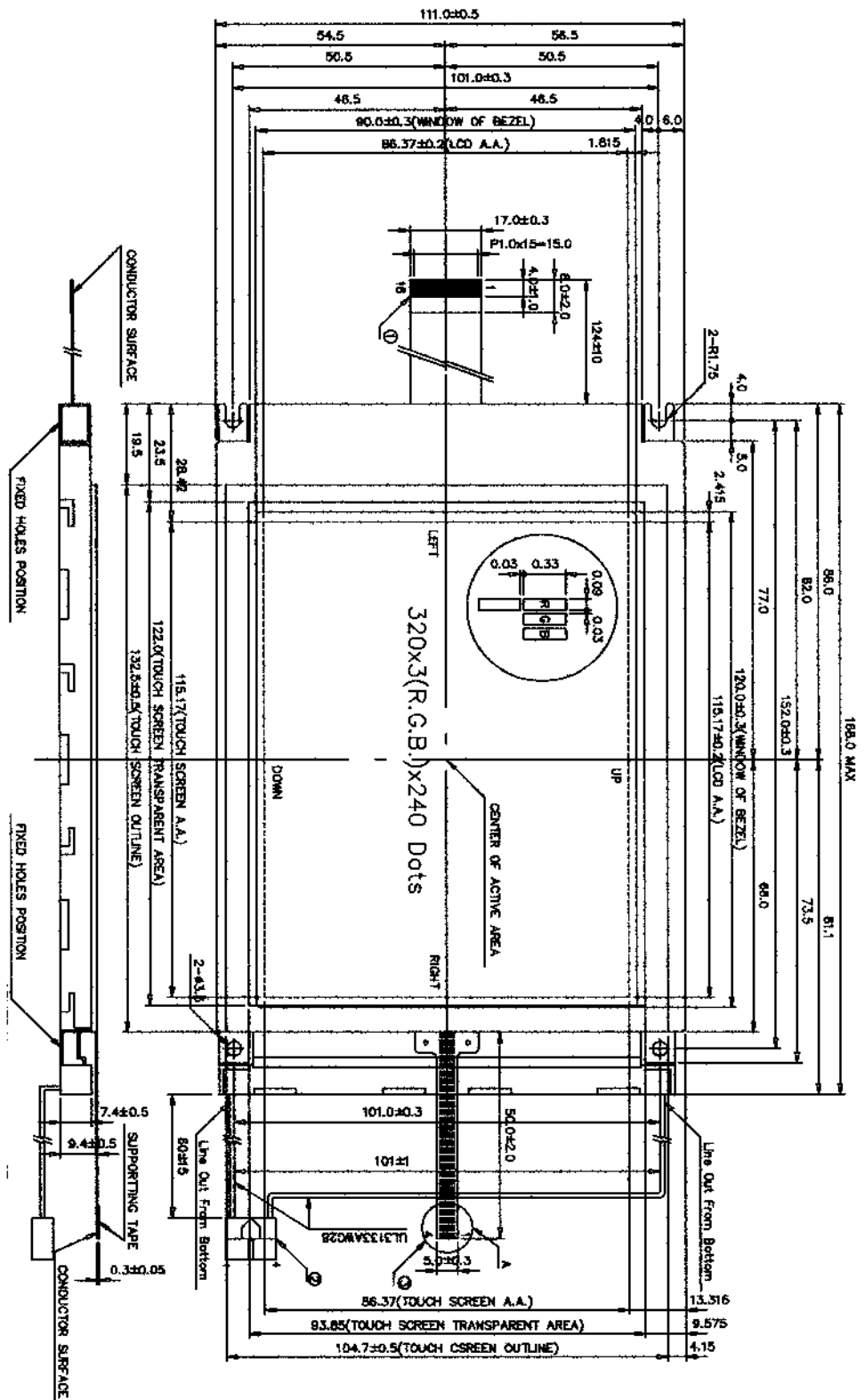
- TERMS OF WARRANT

- 1.Acceptance inspection period
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- 2.Applicable warrant period
The period is within twelve months since the date of shipping out under normal using and storage conditions.

- THE OPERATING LIFE TIME OF BACK LIGHT

- CCFT : 20,000hrs for lamp-current 5mA, 35KHz, 25°C
(Operating life time is defined as follows : The final brightness is at 50% of original brightness.)

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NOTE :

1. RESOLUTION : 320 X 3(R.G.B.) X 240 DOTS
2. CONTROLLER : EXCLUDED
3. DC/DC CONVERTER : EXCLUDED
4. INTERFACE CONNECTOR : EXCLUDED
FTC, N16 P1.0mm
5. TOUCH SCREEN CONNECTOR : EXCLUDED
M63M83-04(MITSUBISHI)
N4 P1.0mm
6. TOLERANCE NO SPECIFIED : ±0.5mm

A DETAIL

GENERAL TOLERANCE LIST	
DIMENSION	TOLERANCE
L ≤ 6	±0.25 (mm)
6 < L ≤ 18	±0.3 (mm)
18 < L ≤ 50	±0.4 (mm)
50 < L ≤ 125	±0.5 (mm)
125 < L	±0.6 (mm)
ANGLE	±1° (DEG)

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