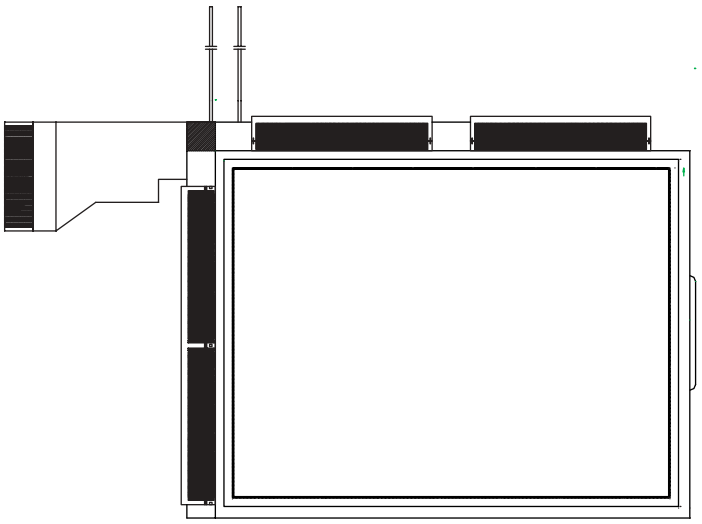
HANTRONIX

PRODUCT SPECIFICATION

HDM3224L-G

320 x240 MONOCHROME GRAPHICS LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: ZW	REV.: 1.0	HDM3224L-G	SHEET 1 OF 12 DATE: 8/16/06

1. General Specifications

1-1.Features

A. Drive Method:1/240 Duty, 1/13 Bias

B. The Module Operating Voltage: 3.0V;

C. The LCD Operating Voltage :22.0V;

D. Viewing Direction: 9:00

E. Operating Temperature: -20 ° C ~70 ° C

F. Storage Temperature: -30 ° C ~85 ° C

G. Display type: FSTN Positive

1-2.Mechanical Data:

(1) Module Size ---------- 88.3W * 69.1 H * 6.5 L mm

(2) Viewing Area ---------- 79.8 W * 60.6 H mm

(3) Dot Size ---------- 0.225 W * 0.225 H mm

(4) Dot Matrix---------- 320 * 240

(5) Outline Dimensions---------- See Attached Drawing

1-3 . Absolute Maximum Ratings

Characteristics	Symbol	Ratings
Power Supply Voltage	VDD	-0.3V to +7.0V
Driver supply voltage	V0	-0.3V to +30V
Input Voltage	V_{IN}	-0.3V to Vdd+0.3V

1-4.Pin Connections:

Pin No.	Symbol	Function
1-6	VLCD ,V6, V3,V4 V5,V2	Power supply pin for LCD driver voltage
7	GND	Ground
8	VDD	Power Supply
9	FLM	First line marker
10	CL2	Display data shift clock input for segment mode
11	M	AC signal
12	CL1	Latch pulse input/shift clock input for the shift register
13	/DOFF	Control input for deselect output level
14	GND	Ground
15-18	D3-D0	Display data

1-5.DC Characteristics

Segment Mode (V_{SS} = V_S = 0V, V_{DD} = 2.5 - 5.5V, V_O = 15 to 30 V, and T_A = -30 to +85°C, unless otherwise noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition	
Operating Voltage	V_{DD}	2.5	-	5.5	V		
Operating Voltage	V_O	15	-	30	V		
Input high voltage	V_{IH}	0.8 V_{DD}	-	-	V	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2 and $\overline{DISPOFF}$ pins	
Input low voltage	V_{IL}	-	-	0.2 V_{DD}	V		
Output high voltage	V_{OH}	V_{DD} - 0.4	-	-	V	EIO_1, EIO_2 pins, I_{OH} = -0.4mA	
Output low voltage	V_{OL}	-	-	+0.4	V	EIO_1, EIO_2 pins, I_{OL} = +0.4mA	
Input leakage current 1	I_{IH}	-	-	+1	µA	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2 and $\overline{DISPOFF}$ pins, V_I = V_{DD}	
Input leakage current 2	I_{IL}	-	-	-1	µA	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2 and $\overline{DISPOFF}$ pins, V_I = Vss	
Output resistance	R_{ON}	-	1.0	1.5	kΩ	V_O = +30.0V	Y_1 - Y_{960} pins, $\lvert\Delta V_{ON}\rvert$ = 0.5V
		-	1.5	2.0		V_O = +20.0V	
Stand-by current	I_{SB}	-	-	5	µA	Vss pin, Note 1	
Consumed current (1) (Deselection)	I_{DD1}	-	-	2.0	mA	V_{DD} pin, Note 2	
Consumed current (2) (Selection)	I_{DD2}	-	-	8.0	mA	V_{DD} pin, Note 3	
Consumed current	I_O	-	-	1.0	mA	V_O pin, Note 4	

Note:

1. V_{DD} = +5.0V, V_O = +30V, V_I = Vss
2. V_{DD} = +5.0V, V_O = +30V, f_{XCK} = 14MHz, No-load, EI = V_{DD}
   The input data is turned over by the data taking clock (4-bit parallel input mode)
3. V_{DD} = +5.0V, V_O = +30V, f_{XCK} = 14MHz, No-load, EI = Vss
   The input data is turned over by the data taking clock (4-bit parallel input mode)
4. V_{DD} = +5.0V, V_O = +30V, f_{XCK} = 14MHz, f_{LP} = 41.6kHz, f_{FR} = 80 Hz, No-load
   The input data is turned over by the data taking clock (4-bit parallel-input mode)

Common Mode (V_{SS} = V_S = 0V, V_{DD} = 2.5 - 5.5V, V_O = 15 to 30 V, and T_A = -30 to +85°C, unless otherwise noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition	
Operating Voltage	V_{DD}	2.5	-	5.5	V		
Operating Voltage	V_O	15	-	30	V		
Input high voltage	V_{IH}	0.8 V_{DD}	-	-	V	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2, $\overline{DISPOFF}$ pins	
Input low voltage	V_{IL}	-	-	0.2 V_{DD}	V		
Output high voltage	V_{OH}	V_{DD} - 0.4	-	-	V	EIO_1, EIO_2 pins, I_{OH} = -0.4mA	
Output low voltage	V_{OL}	-	-	+0.4	V	EIO_1, EIO_2 pins, I_{OL} = +0.4mA	
Input leakage current 1	I_{IH}	-	-	+10.0	µA	D0 - 6, LP, L/R, FR, MD, S/C and $\overline{DISPOFF}$ pins, V_I = V_{DD}	
Input leakage current 2	I_{IL}	-	-	-10.0	µA	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2, $\overline{DISPOFF}$ pins, V_I = Vss	
Input pull down current	I_{PD}	-	-	100	µA	XCK, EIO_1, EIO_2, D7 pins	
Output resistance	R_{ON}	-	1.5	2.0	k	V0 = +30.0V	Y1 - Y240 pins, $\lvert V_{ON}\rvert$ = 0.5V
		-	2.0	2.5		V0 = +20.0V	
Stand-by current	I_{SB}	-	-	75	µA	Vss pin, Note 1	
Consumed current (1)	I_{DD}	-	-	120	µA	V_{DD} pin, Note 2	
Consumed current (2)	I_O	-	-	240	µA	V_O pin, Note 2	

Note:

1. V_{DD} = +5.0V, V_O = +30.0V, V_I = Vss
2. V_{DD} = +5.0V, V_O = +30.0V, f_{LP} = 41.6KHz, f_{FR} = 80Hz, case of 1/480 duty operation, No-load

1-6.AC Characteristics

Segment Mode 1 (V_{SS} = V_S = 0V, V_{DD} = 4.5 - 5.5V, V_O = 15 to 30, and T_A = -30 to +85°C, unless otherwise noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Shift clock period	t_{WCK}	71	-		ns	tr, tf ≦ 10ns, Note 1
Shift clock "H" pulse width	t_{WCKH}	23	-		ns	
Shift clock "L" pulse width	t_{WCKL}	23	-		ns	
Data setup time	t_{DS}	10	-		ns	
Data hole time	t_{DH}	20	-		ns	
Latch pulse "H" pulse width	t_{WLPH}	23	-		ns	
Shift clock rise to Latch pulse rise time	t_{LD}	0	-		ns	
Shift clock fall to Latch pulse fall time	t_{SL}	25	-		ns	
Latch pulse rise to Shift clock rise time	t_{LS}	25	-		ns	
Latch pulse fall to Shift clock rise time	t_{LH}	25	-		ns	
Input signal rise time	t_r		-	50	ns	Note 2
Input signal fall time	t_f		-	50	ns	Note 2
Enable setup time	ts	21	-		ns	
$\overline{DISPOFF}$ Removal time	t_{SD}	100	-		ns	
$\overline{DISPOFF}$ enable pulse width	t_{WDL}	1.2	-		μs	
Output delay time (1)	t_D		-	40	ns	CL = 15pF
Output delay time (2)	t_{pd1}, t_{pd2}		-	1.2	μs	CL = 15pF
Output delay time (3)	t_{pd3}		-	1.2	μs	CL = 15pF

Note

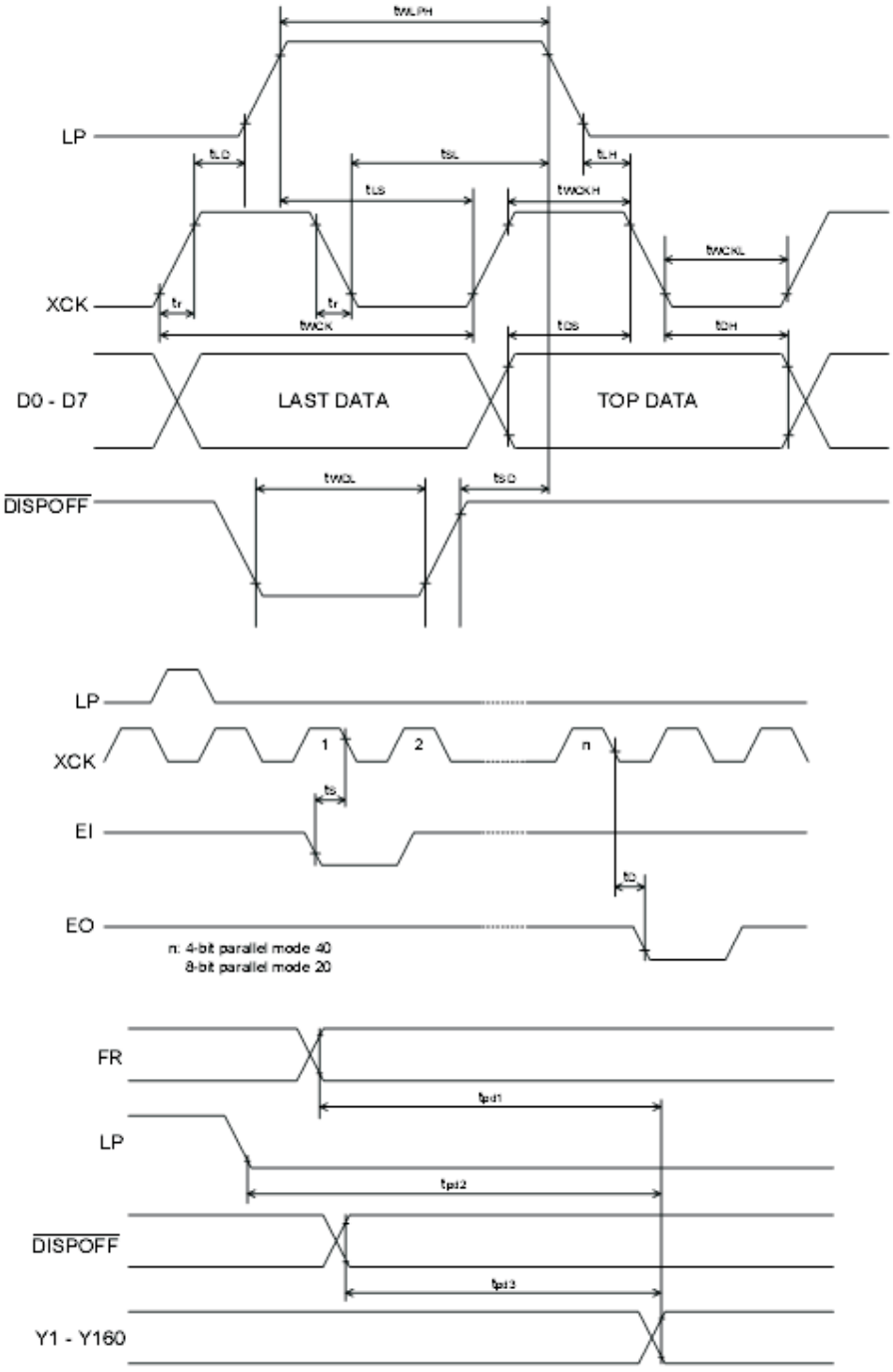
1. Take the cascade connection into consideration.
2. (T_{ck} - t_{WCKH} - t_{WCKL})/2 is the maximum in the case of high speed operation.

Common Mode (V_{SS} = V_S = 0V, V_{DD} = 2.5 - 5.5V, V_O = 15 to 30V and T_A = -30 to +85°C, unless otherwise noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Shift clock period	t_{WLP}	250	-	-	ns	tr, tf ≦ 20ns
Shift clock "H" pulse width	t_{WLPH}	15	-	-	ns	V_{DD} = +5.0V ± 10%
		30	-	-	ns	V_{DD} = +2.5 - +4.5V
Data setup time	t_{SU}	30	-	-	ns	
Data hole time	t_H	50	-	-	ns	
Input signal rise time	t_r		-	50	ns	
Input signal fall time	t_f		-	50	ns	
$\overline{DISPOFF}$ Removal time	t_{SD}	100	-	-	ns	
$\overline{DISPOFF}$ enable pulse width	t_{WDL}	1.2	-	-	μs	
Output delay time (1)	t_{DL}	-	-	200	ns	C_L = 15pF
Output delay time (2)	t_{pd1}, t_{pd2}	-	-	1.2	μs	C_L = 15pF
Output delay time (3)	t_{pd3}	-	-	1.2	μs	C_L = 15pF

1. 7Timing waveform

Timing waveform of the Segment Mode



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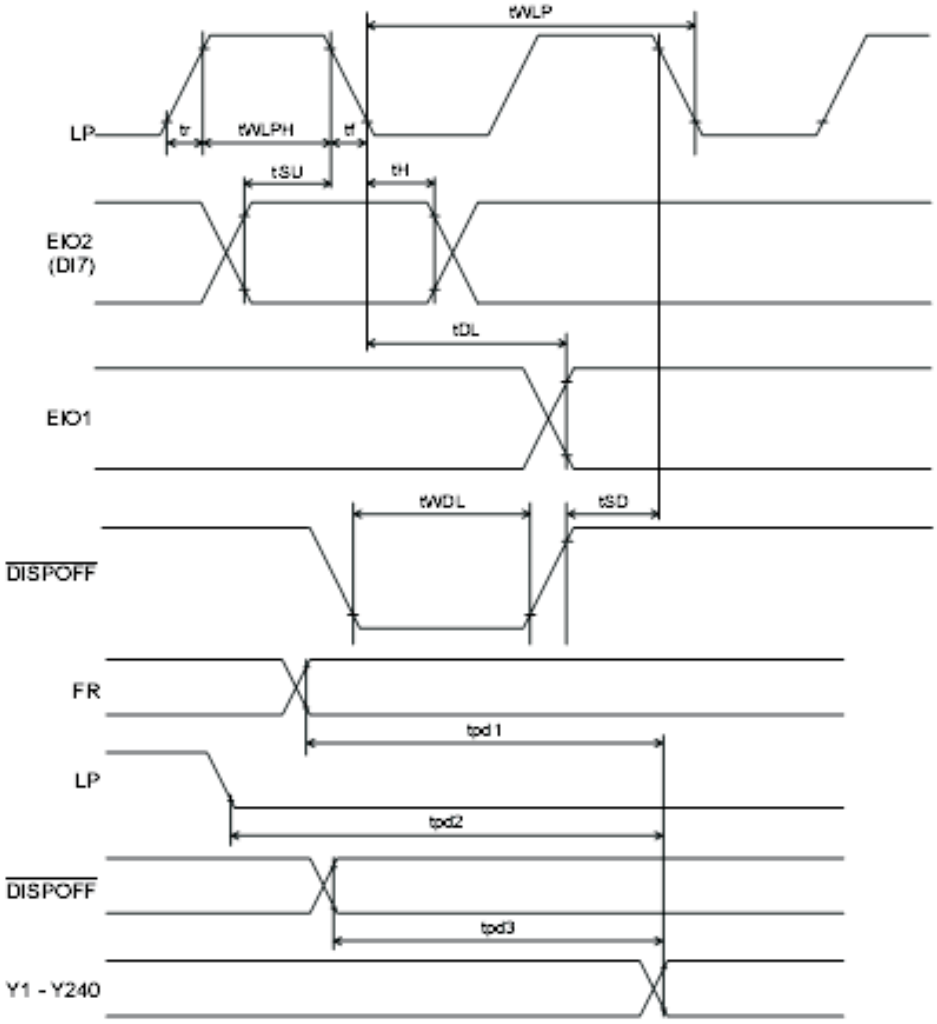
Timing Characteristics of Common Mode



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2.The Characteristics and The Reliability Test

2- 1.Electro-Optic Characteristics:

V_{dd} :3.3V Condition:TEMP=(23 ± 3)° C Hum=(70 ± 5)%RH

NO	Item		Symbol	Min	Typ.	Max	Unit	Condition
1	Supply Voltage(Logic)		Vdd-Vss		3.0		V	
2	LCD Operating Voltage		VLCD		22.4		V	-20 °C
					22.0		V	25 ° C
					21.6		V	70 ° C
3	Response Time		Ton		140		ms	
			Toff		344		ms	
4	Contrast		CR	3				
5	Viewing Angel	12H	θ1		50		Deg.	(CR ≥3.0)
		6H	θ2		55			
		3H	θ3		40			
		9H	θ4		40			
6	LCD Threshold Voltage		Vth		18.8		V	25 ° C

:

2. Characteristics of backlight

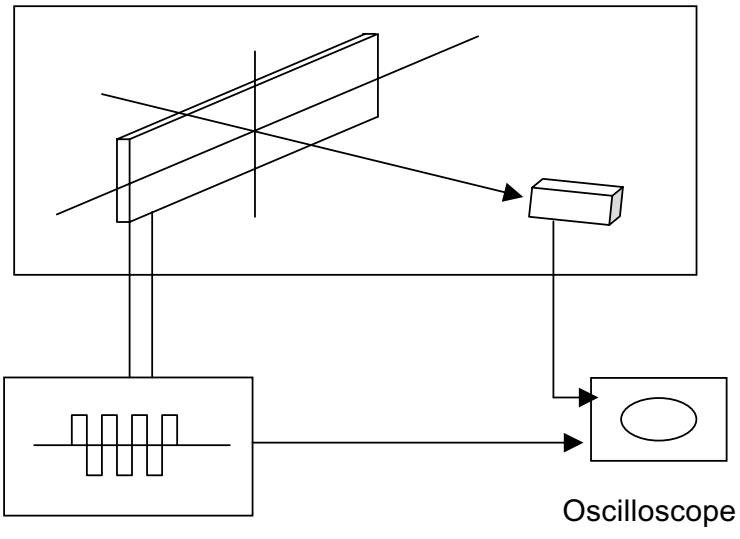
Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	VF	2.9	3.0	3.1	V	IF=60mA
Forward Current	IF		60		mA	
Reverse Voltage	VR		5.0		V	
Reverse Current	IR			10	uA	
Color	WHITE					

WARNING:

A BACKLIGHT IS A KIND OF CURRENT DEVICE,IT MUST CONNECT A RESISTANCE FOR LIMITING CURRENT ,OR IT WILL BE DAMAGED.

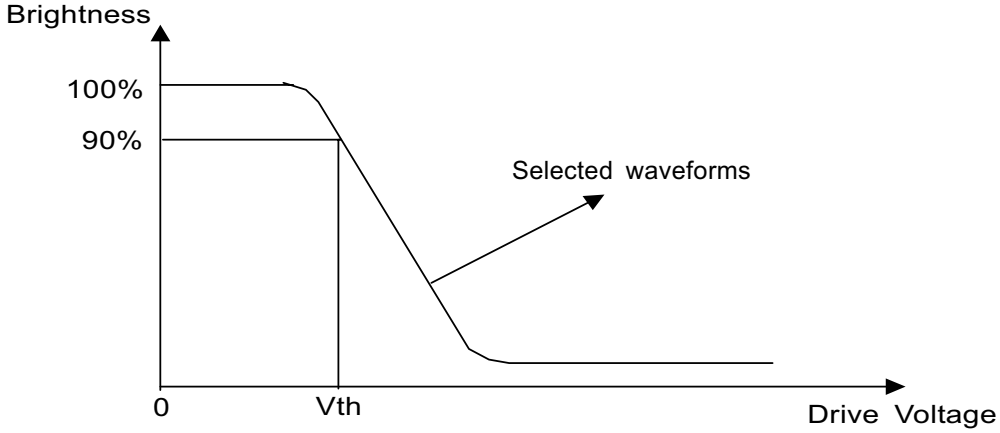
The Equipment and LCD Measuring Method

1. Equipment

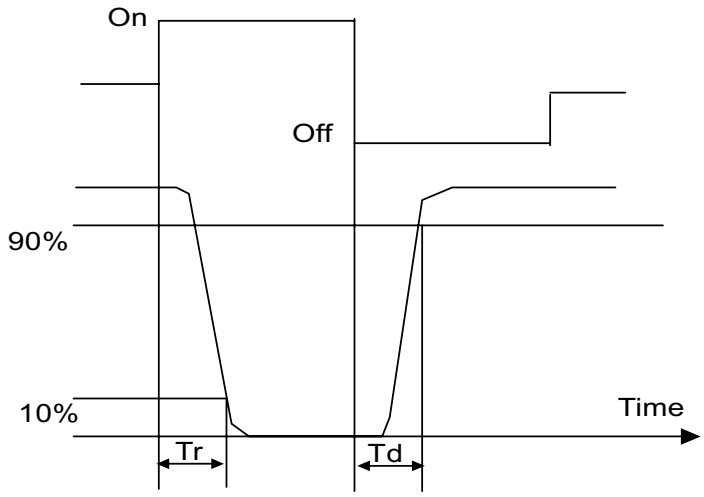


(2) Definition

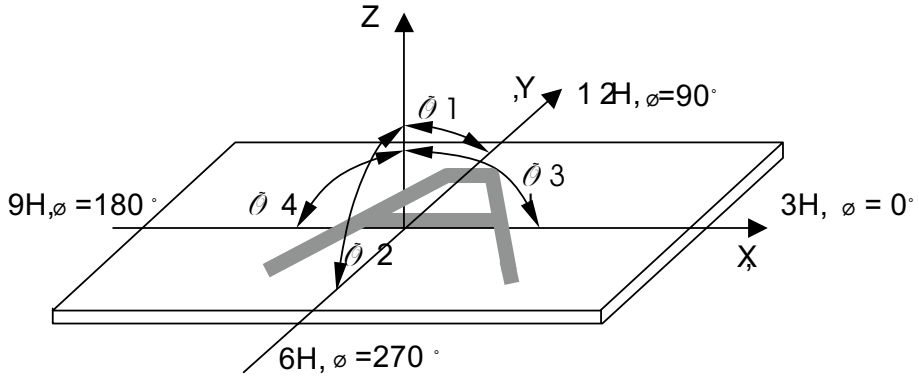
a. Threshold Voltage (Vth)



b. Response Time



a.Viewing Angle:



b.Contrast Ratio (positive)

$$CR = \frac{\text{Brightness of non-selected wave-form}}{\text{Brightness of selected wave-form}}$$

4. Reliability Test:

Equipment : Tenny

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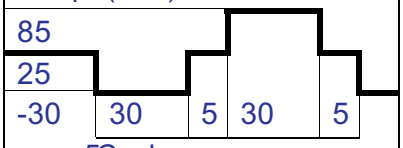
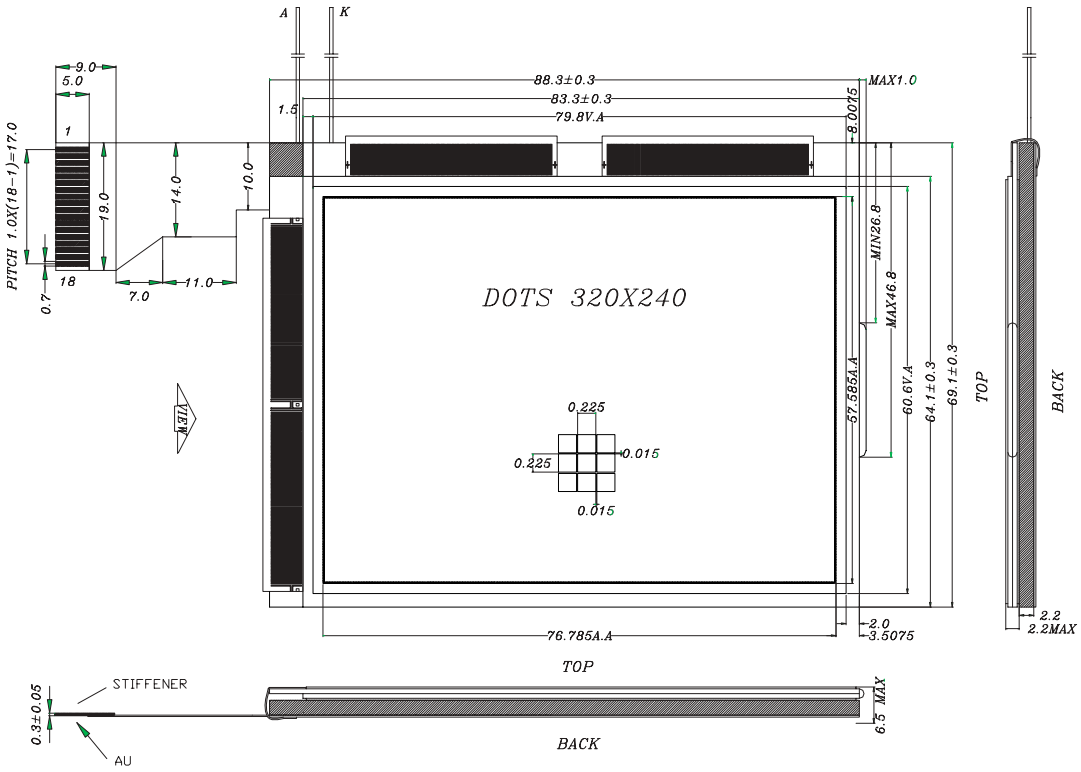
2.Reliability Test

No	Items	Test Condition	Equipment	Test Result
1	High Temp Storage	Temp: 85 ± 2 ° C Time:96h Restore:24h	Tenny	Passed
2	Low Temp Storage	Temp:-30 ± 3 ° C Time:96h Restore:24h	Tenny	Passed
3	High Temp Static drive	Temp:70 ± 2 ° C Vop:3.3V Time:24h Restore:24h	Tenny	Passed
4	Low Temp Static drive	Temp: -2 ± 2 ° C Vop:3.3V Time:24h Restore:24h	Tenny	Passed
5	High Temp High Hum Storage	Temp:40 ± 2 ° C Hum:95%Rh Time:96h Restore:24h	Tenny	Passed
6	Thermal Shock	Temp: (° C)  5Cycles Restore:24h	Tenny	Passed



Notes:
1. Operating Voltage: 3.0V; Vlcd: 22.0v
2. Drive mothod: 1/240Duty, 1/13Bias
3. Viewing Direction: 9:00
4. Operating Temp: -20 C~70 C
5. Storage Temp: -30 C~85 C
6. Display Type: FSTN, Positive
7. NT7701,NT7702

1	2	3	4	5	6	7	8	9
VLCD(V1)	V6	V3	V4	V5	GND(V2)	GND	VDD	FLM
10	11	12	13	14	15	16	17	18
CL2	M	CL1	DISPOFF	GND	D3	D2	D1	D0

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