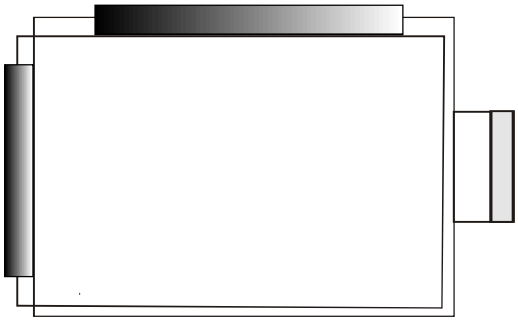
HANTRONIX

PRODUCT SPECIFICATION

HDM240GS16-1

240x160 GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JK	**REV.:** 1.0	HDM240GS16-1	SHEET 1 OF 18 **DATE:** 11/27/01

1. MECHANICAL DATA

(1) Product No.		HDM240GS16-1
(2) Module Size		74.6 (W)mm X 56.1 (H)mm X 4.5 (D)mm
(3) Dot Size		0.23 (W)mm X 0.23 (H)mm
(4) Dot Pitch		0.24 (W)mm X 0.24 (H)mm
(5) Number of Dots		240 (W) X 160 (H) Dots
(6) Duty		1/160
(7) LCD Display Mode	FSTN:	Black and White(Normally White/Positive Image)
	Rear Polarizer:	☐ Reflective ☐ Transflective ☐ Transmission
(8) Viewing Direction		☐ 6 O'clock ☐ 12 O'clock
(9) Backlight		☐ W/O ☐ EL (White) ☐ EL (Blue Green)
(10) Weight		W/O B/L : 15 g (Approx.)
		EL B/L : 17 g (Approx.)
(11) Controller		Excluded
(12) DC/DC Converter		Excluded

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0 V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	6.5	V	
Input Voltage	VEE-VSS	0	27	V	
Static Electricity	-	-	-	-	Note 1

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.				WIDE TEMP.			
	OPERATING		STORAGE		OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70	-20	70	-30	80
Humidity (Without Condensation)	Note 2,4		Note 3,4		Note 4,5		Note 4,6	
Vibration(Note 7)	-		49cm/S^2 (5G)		-		49cm/S^2 (5G)	

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 70°C will be < 120 hrs

Note 4 Background color will change slightly depending on ambient temperature. That phenomenon is reversible.

Note 5 Ta ≦ 70°C : 75%RH max
Ta > 70°C : Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 6 Ta at -30°C will be < 48 hrs, at 80°C will be < 120 hrs

Note 7

Frequency (HZ)	10~55~10/1 min
Vibration Width	1.5 m/m
Vibration Direction	X/Y/Z
Vibration Time	15 min/cycle X 3 directions

3. ELECTRICAL CHARACTERISTICS

(VDD = 3.3V±10%)

ITEM			SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Supply voltage for logic			VDD-VSS	-		2.97	3.3	3.63	V
Input Voltage			VIH	H level		0.8VDD	-	VDD	V
			VIO	L level		0	-	0.2VDD	
Recommended LC Driving Voltage (Normal Temp. LCM)			VEE-VSS (Vop)	1/240 Duty 1/13 Bias	0°C	21.7	22.0	22.3	V
					25°C	20.1	20.4	20.7	
					50°C	18.0	18.3	18.6	
Recommended LC Driving Voltage (Wide Temp. LCM)			VEE-VSS (Vop)	1/240 Duty 1/13 Bias	0°C	22.3	22.6	22.9	V
					0°C	21.2	21.5	21.8	
					25°C	20.5	20.8	21.1	
					50°C	19.6	19.9	20.2	
					50°C	18.6	18.9	19.2	
Power Supply Current (Normal Temp. LCM)			IDD	VDD= 3.3 V VSS= 0V VEE-VSS= 20.4V FLM=70Hz PATTERN :		-	0.55	0.83	mA
			IEE			-	0.8	1.2	
Power Supply Current (Wide Temp. LCM)			IDD	VDD= 3.3 V VSS= 0V VEE-VSS=20.8V FLM=70Hz PATTERN :		-	0.58	0.88	mA
			IEE			-	0.9	1.4	
EL Power Supply Current			IEL	65Vrms 250HZ		-	4.7	7.1	mA
LCM	Surface Luminance (Normal Temp. LCM)	L	VDD= 3.3 V VSS= 0V VEE-VSS= 20.4V 65Vrms 250HZ	S227J	PATTERN: (Dots All On)	-	0.42	-	cd/m²
				H227K		-	0.96	-	
				H227L		-	1.23	-	
				S227J	PATTERN: (Dots All Off)	-	2.01	-	
				H227K		-	3.4	-	
				H227L		-	4.37	-	
LCM	Surface Luminance (Wide Temp. LCM)	L	VDD= 3.3 V VSS= 0V VEE-VSS= 20.8V 65Vrms 250HZ	Z227L5K	PATTERN: (Dots All On)	-	-	-	cd/m²
				T227J5GK		-	-	-	
				Z227L5K	PATTERN: (Dots All Off)	-	-	-	
				T227J5GK		-	-	-	

4-1. OPTICAL CHARACTERISTICS

(FOR NORMAL TEMPERATURE MODE LCM)

AT V_{OP}

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.
G	L	–	5.5	–	5.0	–	4.0	–	74	–	±37
S	J	–	8.0	–	7.5	–	6.0	–	70	–	±35
H	K	–	8.0	–	6.5	–	5.0	–	68	–	±33
H	L	–	8.2	–	7.0	–	5.5	–	69	–	±34
NOTE		NOTE 6						NOTE 5			

NOTE :

G : REFLECTIVE

S : TRANSFLECTIVE(normal)

H : TRANSFLECTIVE
(high transparency)

J : NORMALLY WHITE, 6 O'CLOCK

L : NORMALLY WHITE, 6 O'CLOCK
(special lighter background color)

K : NORMALLY WHITE, 12 O'CLOCK

AT $\phi=0°$ $\theta=0°$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	–	800	–	ms	NOTE 2
		25°C	–	230	–		
		50°C	–	100	–		
Response Time (fall)	Tf	0°C	–	300	–	ms	NOTE 2
		25°C	–	115	–		
		50°C	–	65	–		

4-2. OPTICAL CHARACTERISTICS

(FOR WIDE TEMPERATURE MODE LCM)

AT Vop

ITEM / MODE		Cr(Contrast Ratio)										θ(Viewing Angle)		φ(Viewing Angle)	
		-20°C		-0°C		25°C		50°C		70°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
Z	L	–	8.5	–	9.5	–	10	–	9.0	–	6.0	–	–	–	–
T	J	–	4.5	–	5.0	–	4.5	–	4.0	–	3.0	–	–	–	–
note		NOTE 6										NOTE 5			

NOTE :

Z : OTHER
T : TRANSMISSION

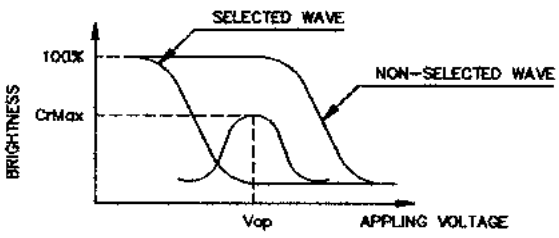
J : NORMALLY WHITE 6 O'CLOCK
L : NORMALLY WHITE 6 O'CLOCK
(special lighter background color)

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

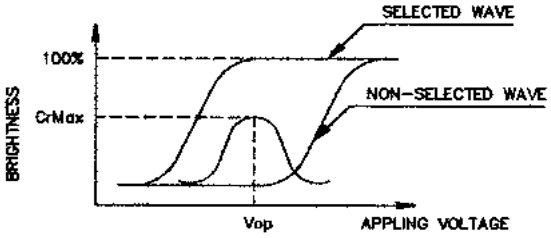
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20°C	–	300	–	ms	NOTE 2
		0°C	–	700	–		
		25°C	–	200	–		
		50°C	–	90	–		
		70°C	–	60	–		
Response Time (fall)	Tf	-20°C	–	2000	–	ms	NOTE 2
		0°C	–	400	–		
		25°C	–	100	–		
		50°C	–	50	–		
		70°C	–	30	–		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



(negative type)

*Conditions

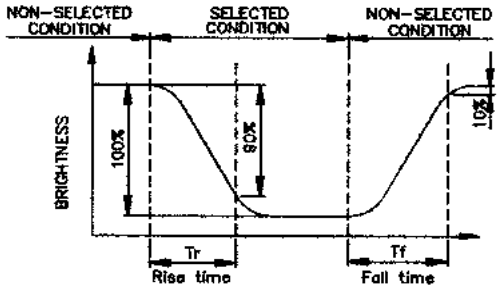
Viewing Angle : 0

Frame Frequency : 70Hz

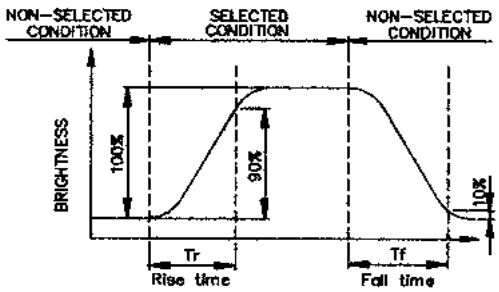
Appling Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



(negative type)

*Conditions

Operating Voltage : Vop

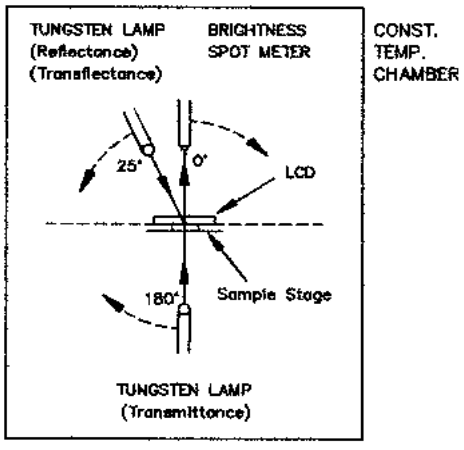
Viewing Angle (θ,ϕ) : (0,0)

Frame Frequency : 70Hz

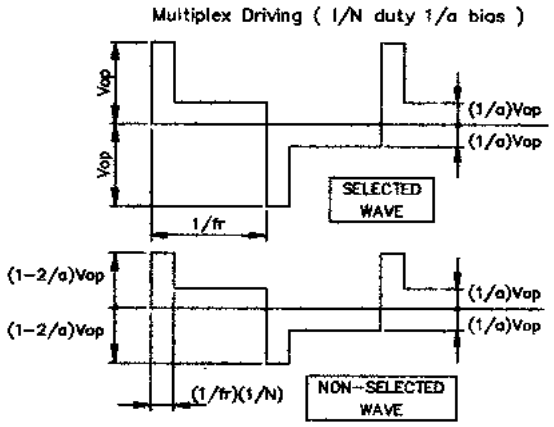
Appling Waveform : 1/N duty 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



Multiplex Driving (1/N duty 1/a bias)



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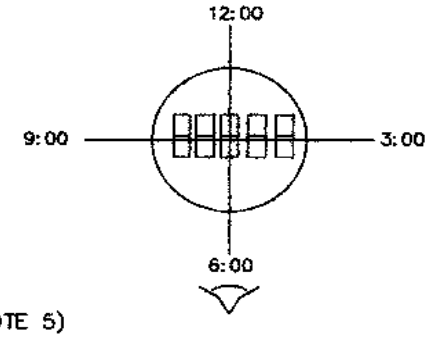
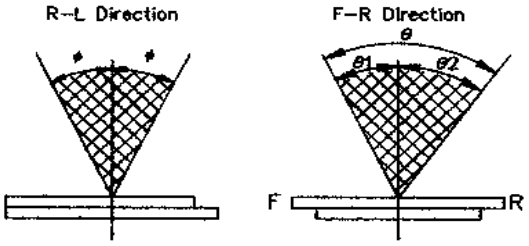
(NOTE 4)

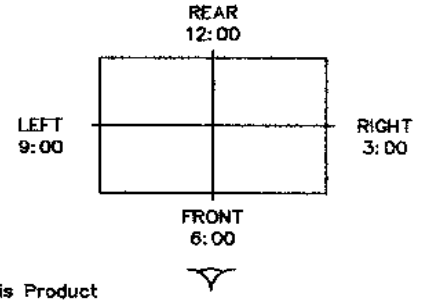
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





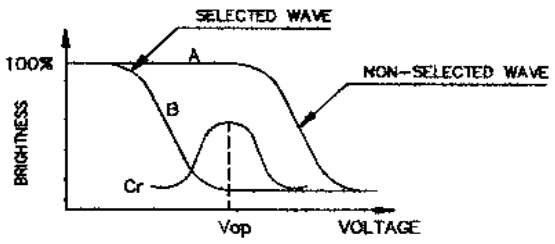
*For This Product
The Viewing Direction Is 6 O'clock
So θ1 > θ2

$\theta = \theta 1 + \theta 2$

*Conditions
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



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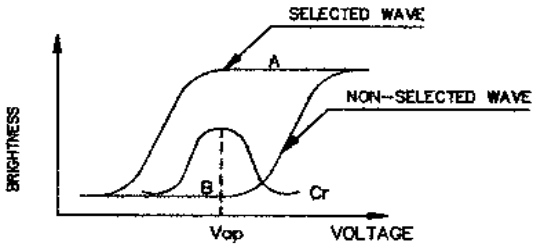

(negative type)

Contrast Ratio : Cr=A/B

*Conditions
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias

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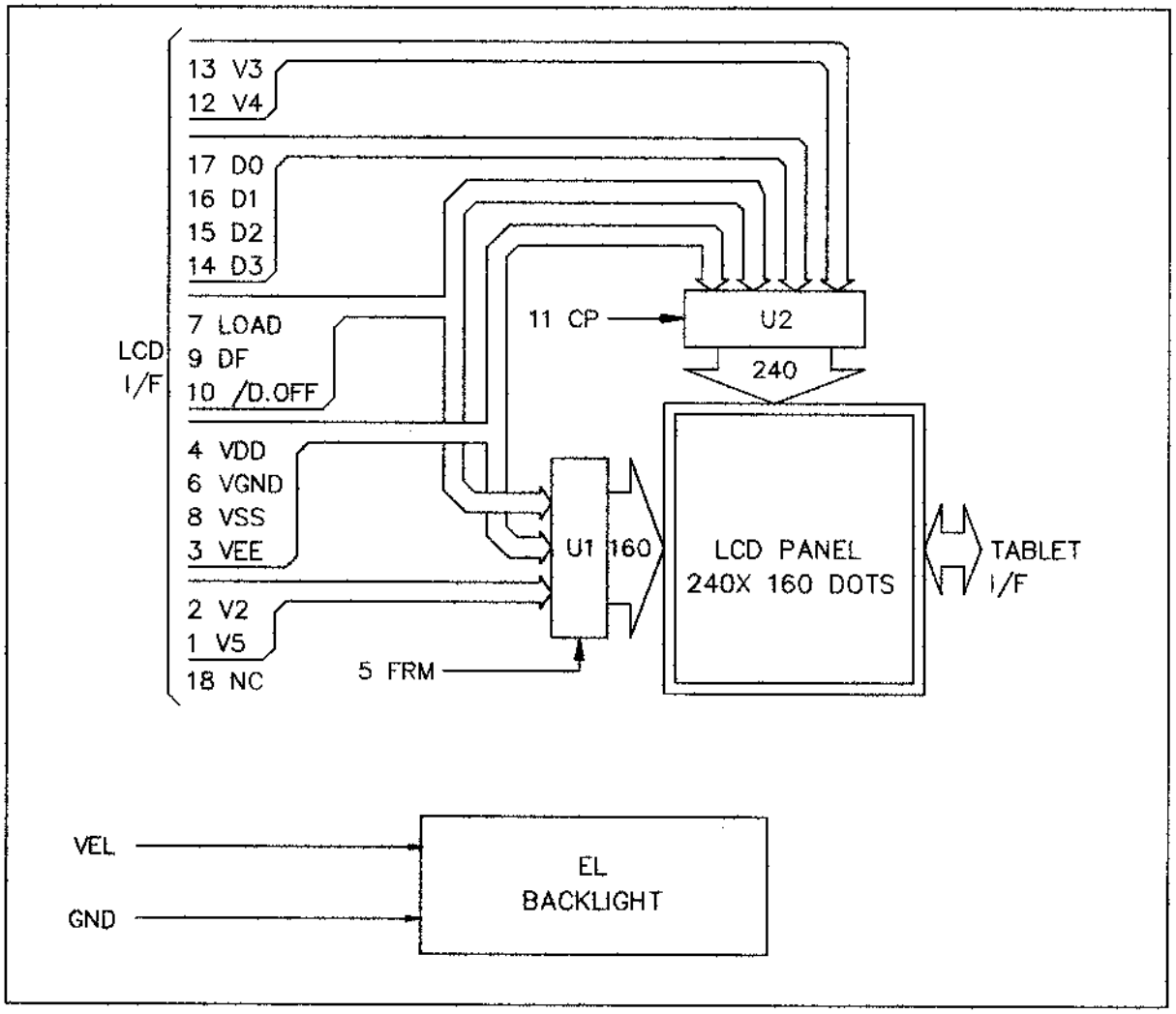
5. BLOCK DIAGRAM



Note1 :

1)Controller and bias voltage supply circuit are not included.

2)VEE, VGND, V2, V3, V4 and V5 are power supply voltage for LCD.
(VEE>V2>V3>V4>V5>VGND)

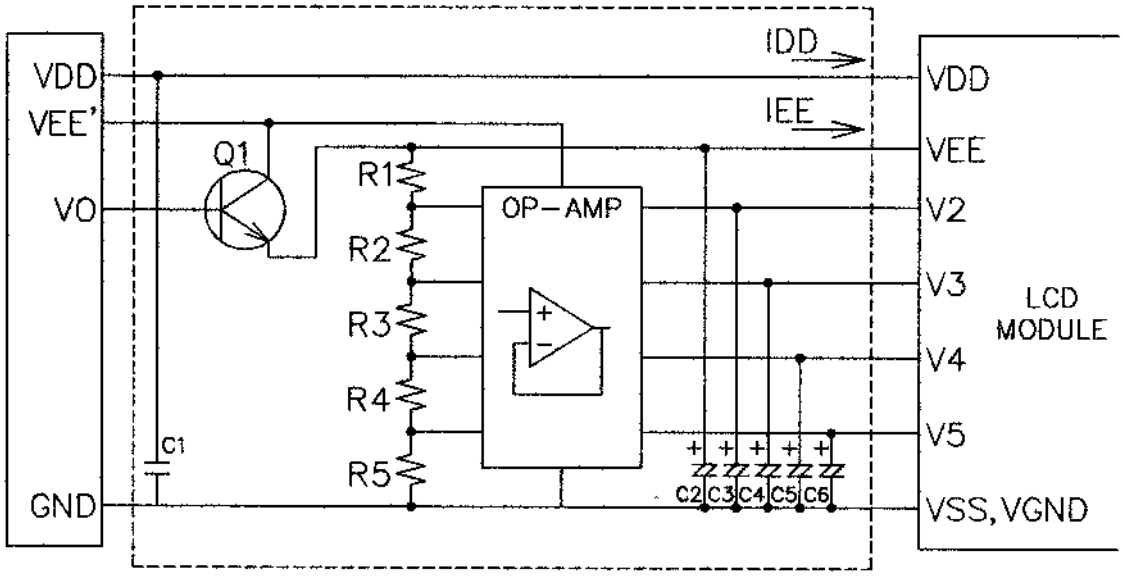
3)The bias is 1/13, { VOP=VEE−VSS=20.4 V.(Normal Temp.)
{ VOP=VEE−VSS=20.8 V.(Wide Temp.)

6. INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Function
1	V5	Bias voltage for non-select (Common driver)
2	V2	Bias voltage for non-select (Common driver)
3	VEE	Power supply for LCD (+V)
4	VDD	Power supply for logic (+3.3V)
5	FRM	Frame start signal (Data signal of the shift register of the common driver)
6	VGND	GND,Power supply for LCD
7	LOAD	1)Latch pulse of display data 2)Shift clock for common driver
8	VSS	GND
9	DF	Switch signal to convert LCD drive waveform into AC
10	/D.OFF	H : Display ON, L : Display OFF
11	CP	Clock pulse for segment shift register
12	V4	Bias voltage for non-select (Segment driver)
13	V3	Bias voltage for non-select (Segment driver)
14	D3	Input data signal
15	D2	Input data signal
16	D1	Input data signal
17	D0	Input data signal
18	N.C.	No connection

7. POWER SUPPLY



Q1 : 2SC1815
OP-AMP : LP324
R1=R2=R4=R5=10KΩ, R3=9R1=91KΩ(1/13 Bias)
C1=0.1μF, C2~C6=3.3μF

Note 1 : These are general values.
In case to decrease LCD driving voltage with minimizing bias value, set these values with check display to avoid display's deterioration (response etc).

Note 2 : EL Driving Method
a. Constant Voltage Source Driving : AC 100 Vrms 400 Hz
b. Inverter IC Driving : HV823 (Supertex) or SP4428CN(Sipex)

8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

● VDD=3.3V±10%, Ta= 0~50 ℃

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CP Cycle Time	tC	Fig.a	82	–	–	ns
CP Pulse Width	tSWH,tSWL	Fig.a	28	–	–	ns
CP Rise/Fall Time	tCR,tCF	Fig.a	–	–	50	ns
Data Set Up Time	tDSU	Fig.a , Fig.b	20	–	–	ns
Data Hold Time	tDHD	Fig.a , Fig.b	23	–	–	ns
LOAD Cycle Time	tL	Fig.b	250	–	–	ns
LOAD "H" Pulse Width	tLWH	Fig.a , Fig.b	30	–	–	ns
LOAD Rise/Fall Time	tLR,tLF	Fig.b	–	–	50	ns
CP To LOAD Delay Time	tCL	Fig.a	30	–	–	ns
LOAD To CP Delay Time	tLC	Fig.a	65	–	–	ns
FRM TO LOAD SETUP TIME	tFLS	Fig.b	30	–	–	ns
FRM TO LOAD HOLD TIME	tFLH	Fig.b	50	–	–	ns

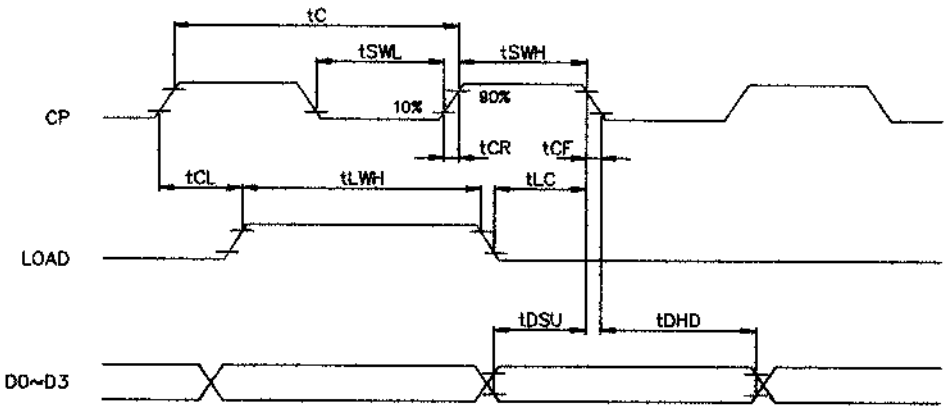


Fig . a Interface timing (SEGMENT)

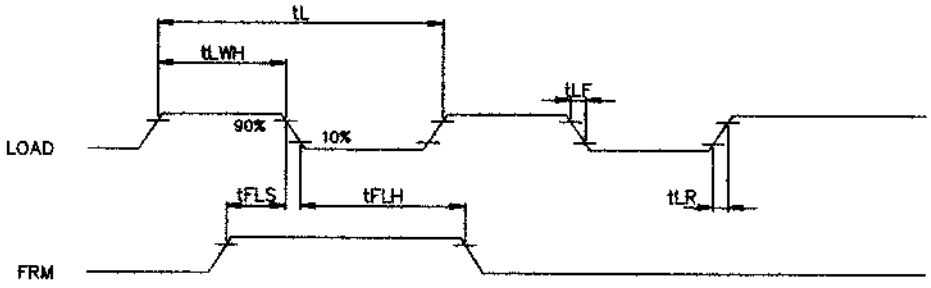
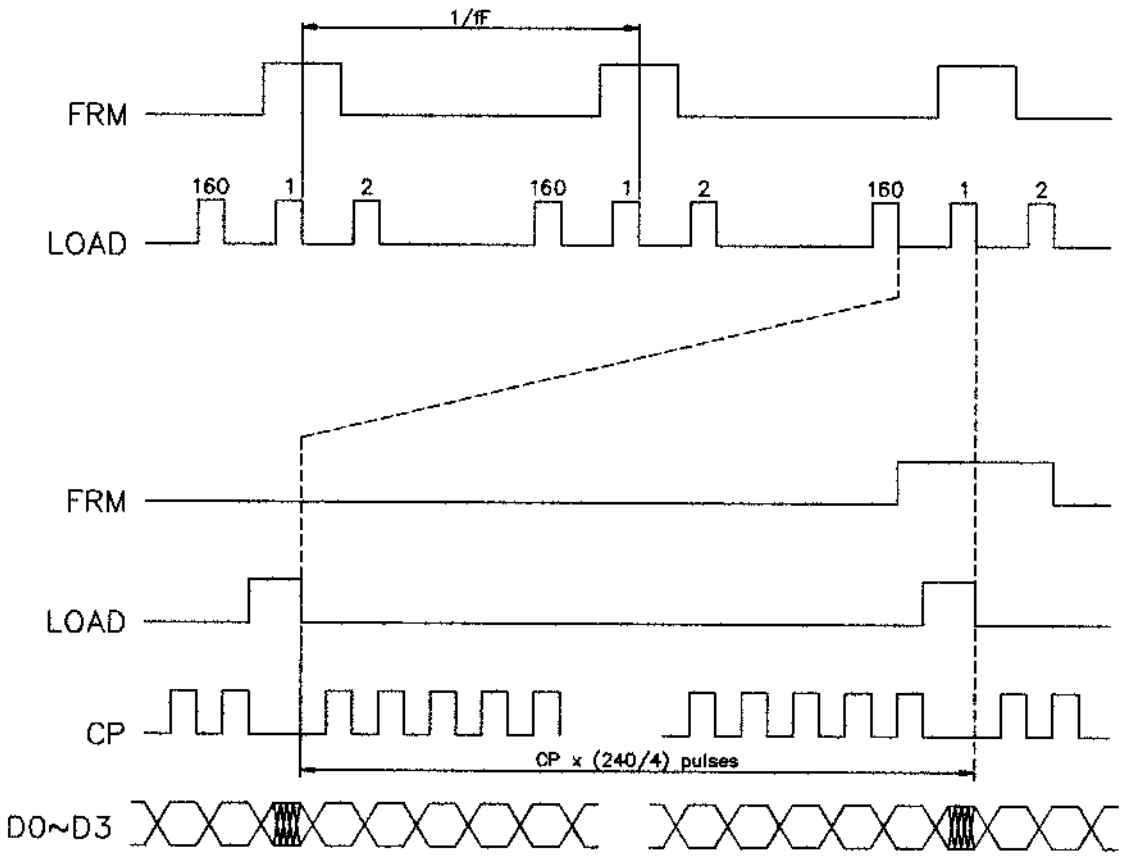


Fig . b Interface timing (COMMON)

8-2. TIMING CHART OF INPUT SIGNAL



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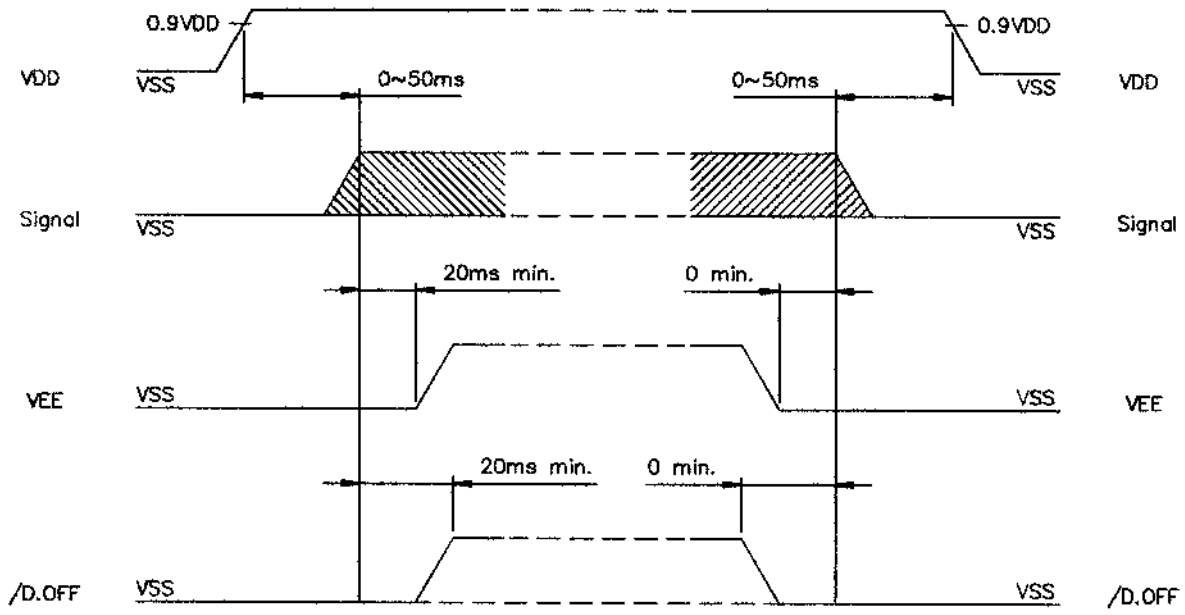
8-3.POWER ON/OFF TIMING

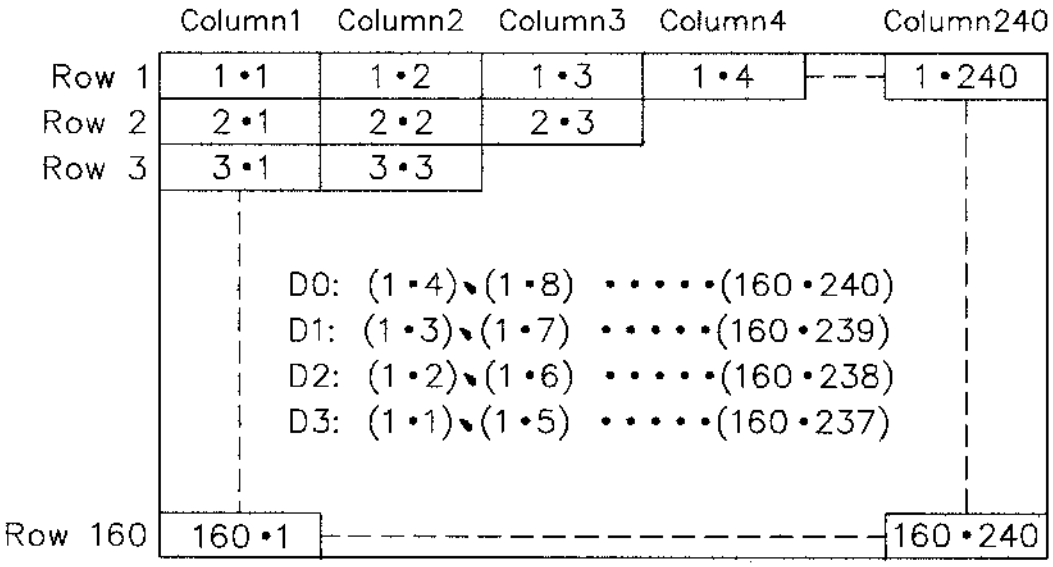


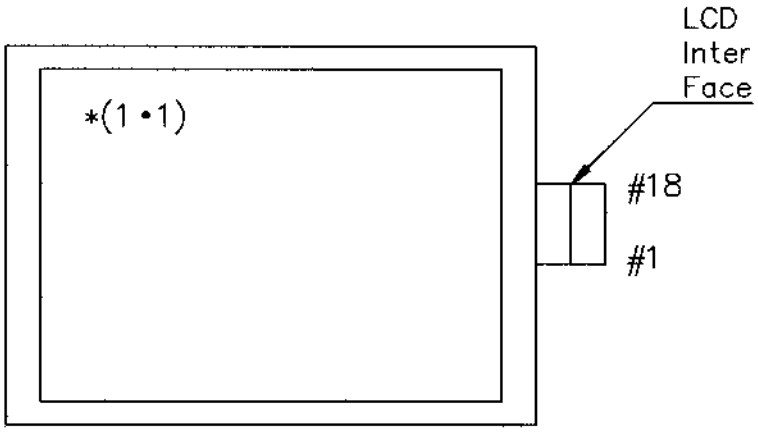
POWER ON

POWER OFF

The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

8–4.DISPLAY PATTERN





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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 (1cycle)			Appearance without defect	5 cycles

NOTICE:

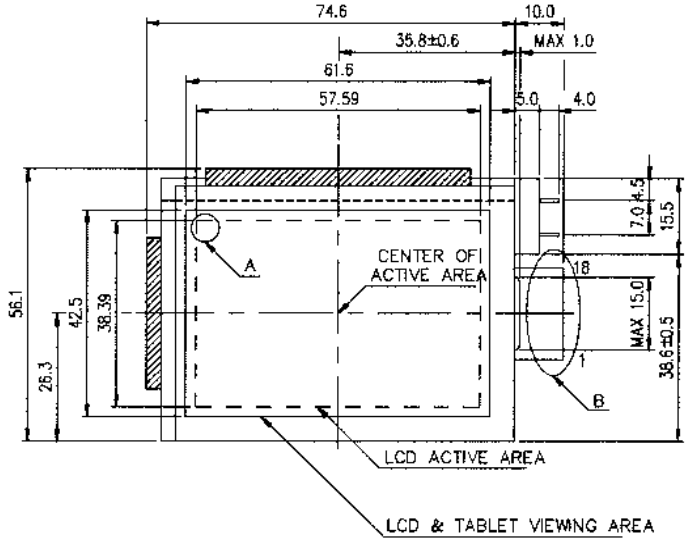
- SAFETY
  1. If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.
  2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

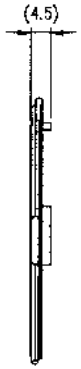
- HANDLING
  1. Avoid static electricity which can damage the CMOS LSI.
  2. Do not remove the panel or frame from the module.
  3. The polarizing plate of the display is very fragile. So, please handle it very carefully.
  4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch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

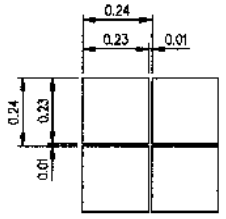
- STORAGE
  1. Store the panel or module in a dark place where the temperature is 25°C±5°C and the humidity is below 65% RH.
  2. Do not place the module near organics solvents or corrosive gases.
  3. Do not crush, shake, or jolt the module.

- 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.

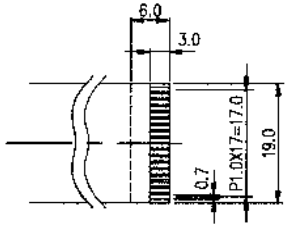
- THE OPERATING LIFE TIME OF BACK LIGHT
  EL : 2000hrs for AC 100Vrms, 400Hz, 20°C, 60%RH
  (Operating life time is defined as follows : The final brightness is at 50% of original brightness.)







A DETAIL



B DETAIL

VIEWING DIRECTION

NOTE :
1. RESOLUTION : 240x160 DOTS
2. DROVER IC : EK7004
   EK7005
3. BACKLIGHT: EL (WHITE)

LCD CONNECTION

PIN NO	SYMBOL	FUNCTION	PIN NO	SYMBOL	FUNCTION
1	V5	Bias voltage for non-select (Common driver)	9	DF	Switch signal to convert LCD driver waveform into AC
2	V2	Bias voltage for non-select (Common driver)	10	/D.OFF	H:Display ON, L:Display OFF
3	VEE	Power supply for LCD (+V)	11	CP	Clock Pulse for segment shift register
4	VDD	Power supply for logic (+3.3V)	12	V4	Bias voltage for non-select (Segment driver)
5	FRM	Frame start signal (Data Signal of the shift register of the common driver)	13	V3	Bias voltage for non-select (Segment driver)
			14	D3	Input data signal
6	VGND	GND , Power supply for LCD	15	D2	Input data signal
7	LOAD	(1) Latch pulse of display data (2) Shift clock for common driver	16	D1	Input data signal
			17	D0	Input data signal
8	VSS	GND	18	NC	No connectoin

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)

SHEET 18 OF 18

DATE: 11/27/01

HDM240GS16-1

REV.: 1.0

Q.A.: JK

HANTRONIX, INC.
10080 BUBB RD.
CUPERTINO, CA 95014