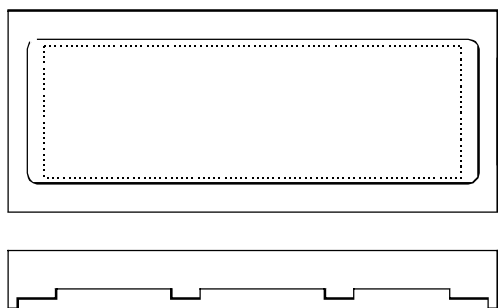




PRODUCT SPECIFICATION

HDM32GS12Y-3

122x32 GRAPHICS
(SMALL SIZE, LOW POWER)
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM32GS12Y-3	SHEET 1 OF 17
	JK	1.1		DATE: 2/4/03

1. MECHANICAL DATA

(1) Product No.	HDM32GS12Y-3	
(2) Module Size	66.1 (W)mm x 27.3 (H)mm x 8.5 (D)mm (W/O, EL B.L.)	
(3) Dot Size	0.40 (W)mm x 0.45 (H)mm	
(4) Dot Pitch	0.44 (W)mm x 0.49 (H)mm	
(5) Number of Characters	122 (W) x 32 (H)DOTs	
(6) Duty	1/32	
(7) LCD Display Mode	STN: <input type="checkbox"/> Gray Mode <input type="checkbox"/> Yellow Mode	
	Rear Polarizer: <input type="checkbox"/> Reflective <input type="checkbox"/> Transflective	
(8) Viewing Direction	6 O'clock	
(9) Backlight	<input type="checkbox"/> W/O <input type="checkbox"/> EL B/L	
(10) LCD Controller	AX6120AA	
(11) Weight	W/O B/L: 16.0 g	
	EL B/L: 17.0 g	

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 1.1	HDM32GS12Y-3	SHEET 2 OF 17
				DATE: 2/4/03

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

V_{SS}=0V

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

Note 1 LCM should be grounded during handling LCM.

(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 1,3		Note 2,3		Note 3,4		Note 3,5	

Note 1 Ta ≤ 50°C : 85%RH max

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

Note 2 Ta at -20°C will be < 48hrs, at 70°C will be < 120hrs

Note 3 Background color changes slightly depending on ambient temperature.
This phenomenon is reversible.

Note 4 Ta ≤ 70°C : 75%RH max

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

Note 5 Ta at -30°C will be < 48hrs, at 80°C will be < 120hrs

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM32GS12Y-3	SHEET 3 OF 17
	JK	1.1		DATE:

3. ELECTRICAL CHARACTERISTICS

(VDD = 5V±10%)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT										
Input Voltage	VIH	H level	0.8VDD	-	VDD	V										
	VIO	L level	0	-	0.2VDD	V										
Recommended LC Driving Voltage (NORMAL TEMP. LCM)	VDD-VEE	DUTY=1/32 Bias=1/4.7	0°C	-	6.0	-	V									
			25°C	-	5.4	-										
			50°C	-	4.7	-										
Recommended LC Driving Voltage (WIDE TEMP. LCM)	VDD-VEE	DUTY=1/32 Bias=1/4.7	-20°C	-	7.3	-	V									
			0°C	-	7.2	-										
			25°C	-	7.0	-										
			50°C	-	6.7	-										
			70°C	-	6.2	-										
Power Supply Current (NORMAL TEMP. LCM)	IDD	VDD=5.0V VDD-VEE=5.4V PATTERN :	-	0.4	0.6	mA										
	IEE	<table border="0"> <tr> <td>□</td><td>■</td><td>□</td><td>■</td><td>□</td><td>■</td> </tr> <tr> <td>■</td><td>□</td><td>■</td><td>□</td><td>■</td><td>□</td> </tr> </table>	□	■	□		■	□	■	■	□	■	□	■	□	-
□	■	□	■	□	■											
■	□	■	□	■	□											
Power Supply Current (WIDE TEMP. LCM)	IDD	VDD=5.0V VDD-VEE=7.0V PATTERN :	-	0.5	0.75	mA										
	IEE	<table border="0"> <tr> <td>□</td><td>■</td><td>□</td><td>■</td><td>□</td><td>■</td> </tr> <tr> <td>■</td><td>□</td><td>■</td><td>□</td><td>■</td><td>□</td> </tr> </table>	□	■	□		■	□	■	■	□	■	□	■	□	-
□	■	□	■	□	■											
■	□	■	□	■	□											
Power Supply Current For EL	IEL	VBL=110VAC 400Hz	-	2.1	3.5	mA										
LCM Surface Luminance	LMD62S042C13M_	L	VDD=5.0V VDD-VEE=5.4V VBL=110VAC 400Hz	PATTERN: (Dots All On)	-	2.3	-	cd/m ²								
			PATTERN: (Dots All Off)	-	8.1	-										
	LMD62S042A13M_	L	VDD=5.0V VDD-VEE=5.4V VBL=110VAC 400Hz	PATTERN: (Dots All On)	-	3.0	-	cd/m ²								
				PATTERN: (Dots All Off)	-	7.7	-									
	LMD62S042A13DM_	L	VDD=5.0V VDD-VEE=7.0V VBL=110VAC 400Hz	PATTERN: (Dots All On)	-	3.0	-	cd/m ²								
				PATTERN: (Dots All Off)	-	7.7	-									

4.OPTICAL CHARACTERISTICS

4-1.FOR NORMAL TEMPERATURE MODE LCM

ITEM MODE		Cr(Contrast Ratio)						θ (Viewing Angle)		AT Vop	
		0°C		25°C		50°C		50°C		50°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	-	3.0	-	3.0	-	2.5	-	51	-	(L) 17 (R) 20
	C	-	5.0	-	4.5	-	4.5	-	58	-	(L) 22 (R) 24
S	A	-	3.0	-	3.0	-	2.5	-	46	-	(L) 15 (R) 19
	C	-	4.5	-	3.5	-	4.5	-	59	-	(L) 20 (R) 26
NOTE		NOTE 6						NOTE 5			

NOTE :

R: REFLECTIVE
S: TRANSFLECTIVE
A: GRAY
C: YELLOW

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0 τ	-	1000	-	ms	NOTE 2
		25 τ	-	300	-		
		50 τ	-	100	-		
Response Time (fall)	Tf	0 τ	-	500	-	ms	NOTE 2
		25 τ	-	150	-		
		50 τ	-	100	-		

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM32GS12Y-3	SHEET 5 OF 17
	JK	1.1		DATE:

4-2. FOR WIDE TEMPERATURE MODE LCM

AT Vop

ITEM		Cr(Contrast Ratio)										θ (Viewing Angle)		ϕ (Viewing Angle)	
		-20°C		0°C		25°C		50°C		70°C		25°C		25°C	
MODE		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
S	A	-	3.0	-	3.0	-	3.0	-	3.0	-	2.0	-	44	-	(L) 8 (R) 17
note		NOTE 6										NOTE 5			

NOTE :

S: TRANSFLECTIVE

A: GRAY

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20°C	-	2000	-	ms	NOTE 2
		0°C	-	400	-		
		25°C	-	100	-		
		50°C	-	100	-		
		70°C	-	50	-		
Response Time (fall)	Tf	-20°C	-	1000	-	ms	NOTE 2
		0°C	-	200	-		
		25°C	-	100	-		
		50°C	-	50	-		
		70°C	-	50	-		

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

Q.A.:

JK

REV.:

1.1

HDM32GS12Y-3

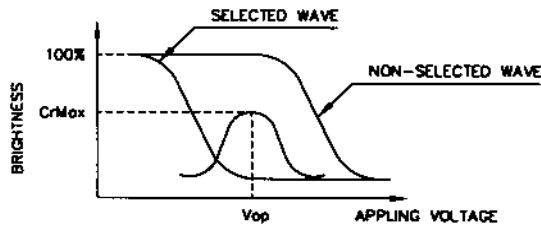
SHEET 6 OF 17

DATE:

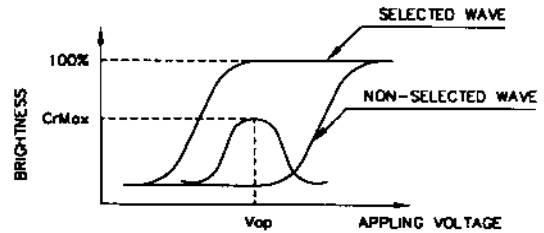
2/4/03

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



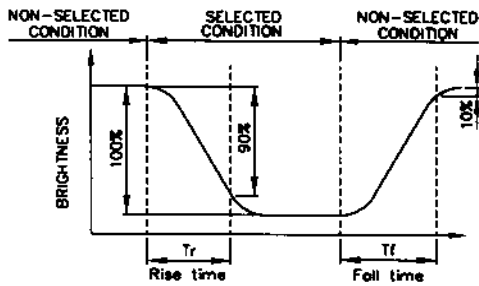
(negative type)

*Conditions

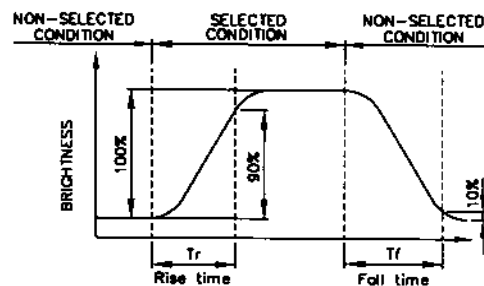
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



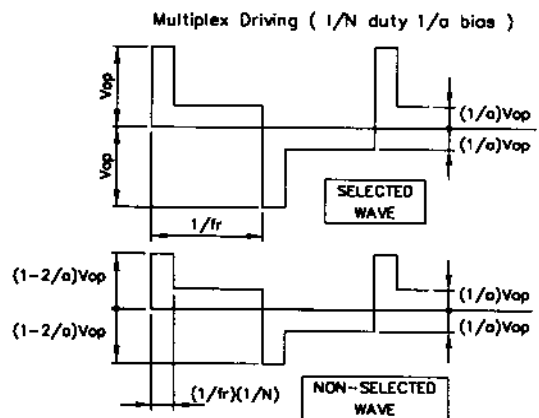
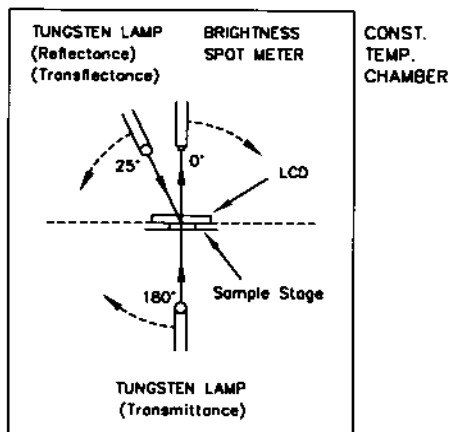
(negative type)

*Conditions

Operating Voltage : Vop
 Viewing Angle (θ,φ) : (0,0)
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

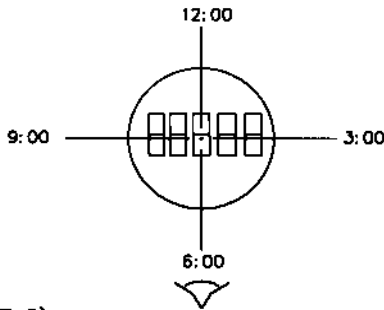
Description of Measuring Equipment and Driving Waveforms



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM32GS12Y-3	SHEET 7 OF 17
	JK	1.1		DATE:

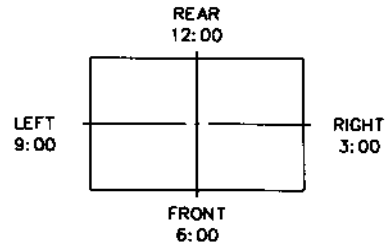
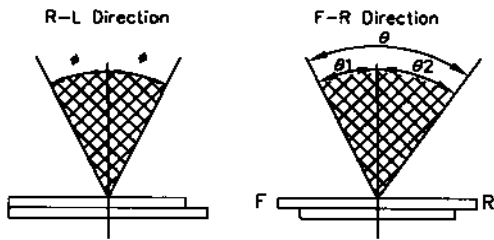
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



•For This Product
The Viewing Direction Is 6 O'clock
So $\theta_1 > \theta_2$

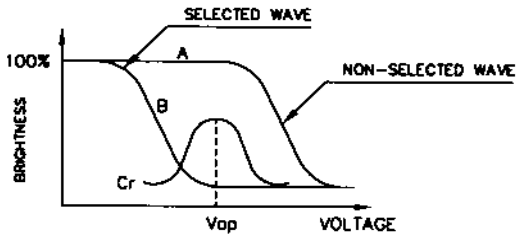
$$\theta = \theta_1 + \theta_2$$

•Conditions

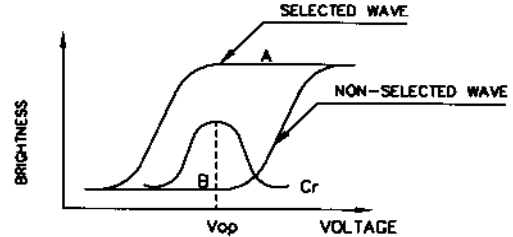
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (C_r)



(positive type)



(negative type)

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

•Conditions

Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

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

Q.A.:
JK

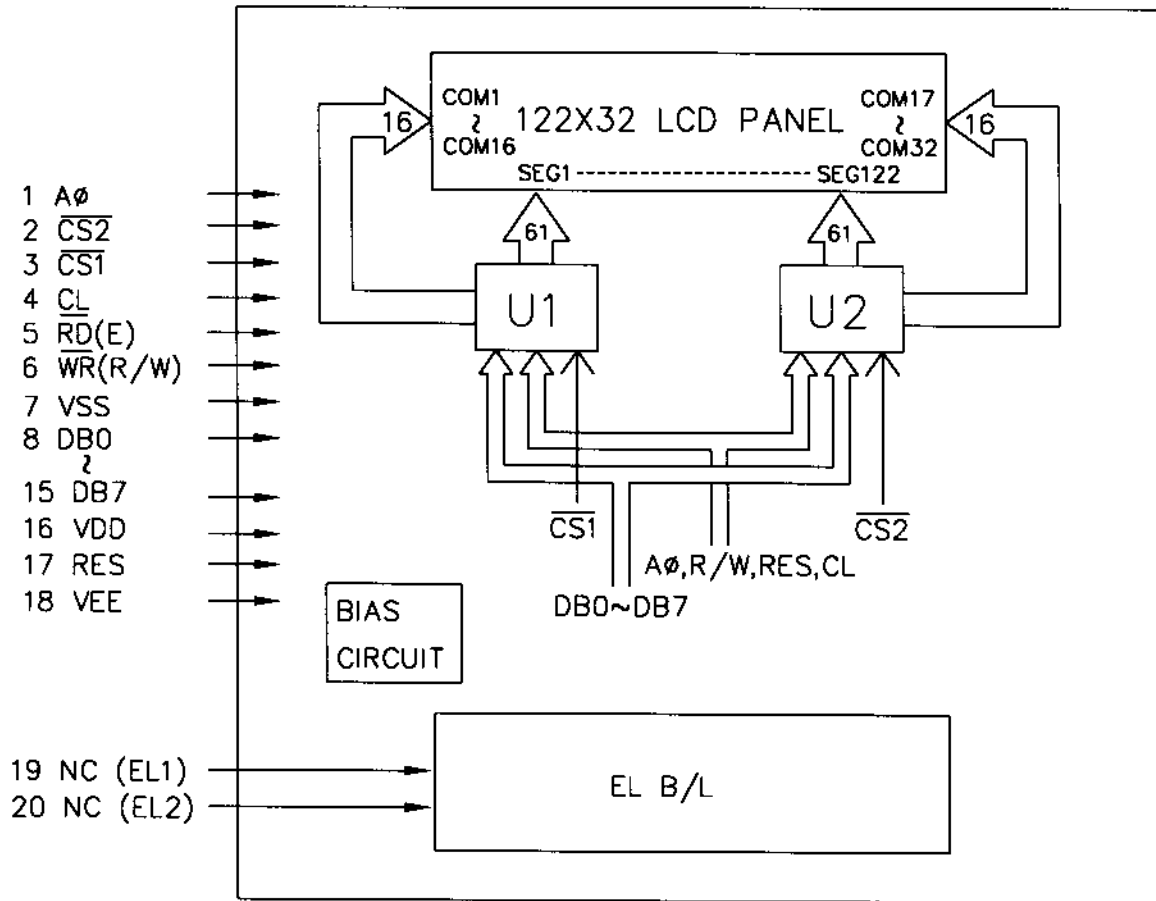
REV.:
1.1

HDM32GS12Y-3

SHEET 8 OF 17

DATE:
2/4/03

5. BLOCK DIAGRAM



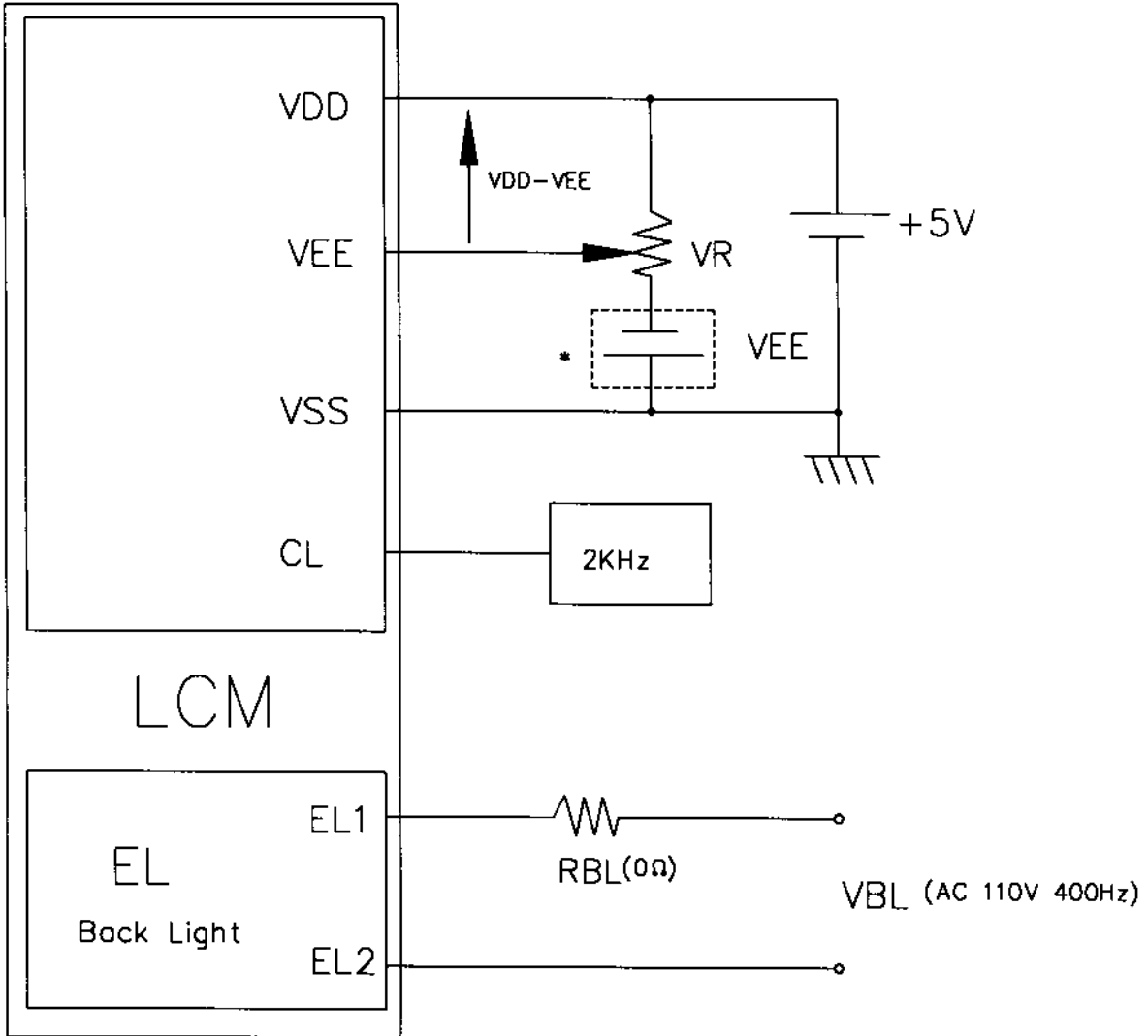
HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM32GS12Y-3	SHEET 9 OF 17
	JK	1.1		DATE:

6. INTERNAL PIN CONNECTION

PinNo.	Symbol	Level	Function
1	A \emptyset	H/L	L→INSTRUCTION H→DATA
2	$\overline{CS2}$	L	CHIP ENABLE ACTIVE "L"
3	$\overline{CS1}$	L	CHIP ENABLE ACTIVE "L"
4	CL	H/L	EXTERNAL CLOCK(2KHZ)
5	$\overline{RD}(E)$	—	\overline{RD} FOR 80 SERI,E FOR 68 SERI
6	$\overline{WR}(R/W)$	—	\overline{WR} FOR 80 SERI,R/W FOR 68 SERI
7	VSS	—	GROUND
8	DB0	H/L	DATA BUS LINE
9	DB1	H/L	
10	DB2	H/L	
11	DB3	H/L	
12	DB4	H/L	
13	DB5	H/L	
14	DB6	H/L	
15	DB7	H/L	
16	VDD	—	POWER SUPPLY FOR LOGIC CIRCUIT
17	RES	H/L	L→80 SERIES H→68 SERIES
18	VEE	—	POWER SUPPLY FOR LCD
19	NC (EL1)	—	NC (NO CONNECTION): FOR LMA62x042x13x EL1,EL2 (POWER SUPPLY FOR EL): FOR LMD62x042x13x
20	NC (EL2)	—	

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM32GS12Y-3	SHEET 10 OF 17
	JK	1.1		DATE:

7. POWER SUPPLY



VR = 20KΩ (Variable)

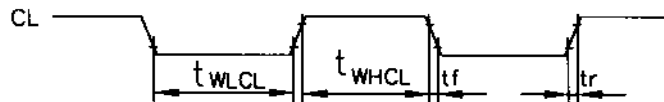
* VEE = 5V

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM32GS12Y-3	SHEET 11 OF 17
	JK	1.1		DATE:

8. TIMING CHARACTERISTICS

8-1. Control timing for 80-port/68-port display

Item	Signal	Symbol	Condition	Min	Typ	Max	Unit
LOW pulse width	CL	tWLCL		35	-	-	μs
HIGH pulse width		tWHCL		35	-	-	μs
Rising time		tr		-	30	150	ns
Falling time		tf		-	30	150	ns

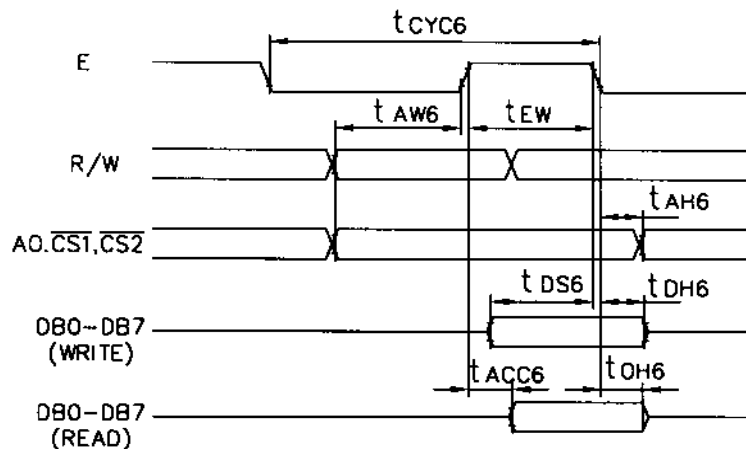


8-2. Read/write timing for the 68-port MPU

VDD=5V, Ta=-20~70°C

Item	Symbol	condition	Min.	Typ.	Max.	Unit
System cycle time (Note 1)	tCYC6		1000	-	-	ns
Address set-up time	tAW6		20	-	-	ns
Address hold time	tAH6		10	-	-	ns
Data set-up time	tDS6		80	-	-	ns
Data hold time	tDH6		10	-	-	ns
Output disable time	tOH6	CL=100pf	10	-	60	ns
Access time	tACC6		-	-	90	ns
Enable pulse width (Read)	tEW		100	-	-	ns
Enable pulse width (Write)			80	-	-	ns

Note: 1.tCYC6 indicates the cycle during which \overline{CS}/E are HIGH; it does not indicate the cycle of the E signal.



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

Q.A.:
JK

REV.:
1.1

HDM32GS12Y-3

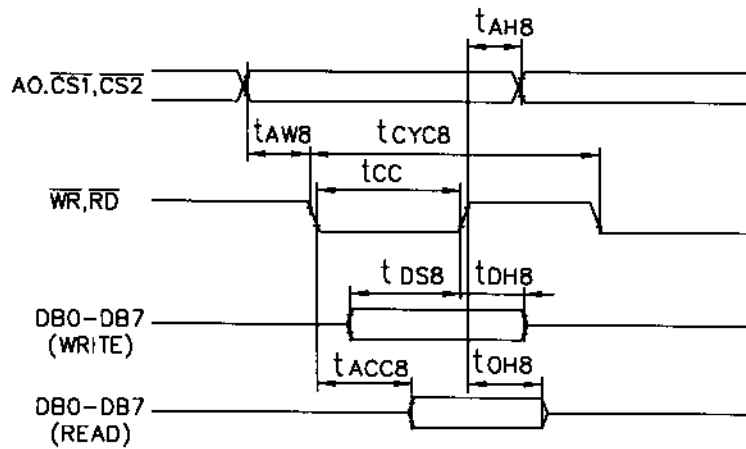
SHEET 12 OF 17

DATE:
2/4/03

8-3. Read/write timing for the 80-port MPU

VDD=5V, Ta=-20~70°C

Item	Symbol	condition	Min.	Typ.	Max.	Unit
Address hold time	tAH8		10	-	-	ns
Address set-up time	tAW8		20	-	-	ns
System cycle time	tCYC8		1000	-	-	ns
Control pulse width	tCC		200	-	-	ns
Data set-up time	tDS8		80	-	-	ns
Data hold time	tDH8		10	-	-	ns
RD access time	tACC8	C _L = 100pf	-	-	90	ns
Output disable time	tOH8		10	-	60	ns



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

Q.A.:
JK

REV.:
1.1

HDM32GS12Y-3

SHEET 13 OF 17

DATE:
2/4/03

9. DISPLAY PATTERN

Page	DATA			Com NO.	Driver
0	D0 ⋮ D7	122 x 16 Pixels		1	Master
1	D0 ⋮ D7			16	
2	D0 ⋮ D7	122 x 16 Pixels		17	Slave
3	D0 ⋮ D7			32	
Column Addr.	ADC=0	00H → 3C	00H → 3C		
Seg NO.	1	→ 61	62 → 122		
Driver		Master	Slave		

10. 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

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM32GS12Y-3	SHEET 15 OF 17
	JK	1.1		DATE: 2/4/03

(2) NOTE:

• 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.

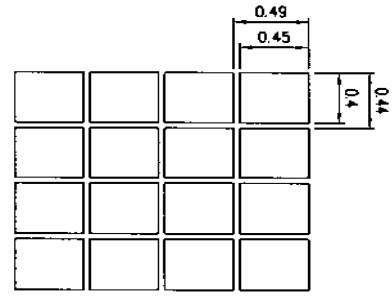
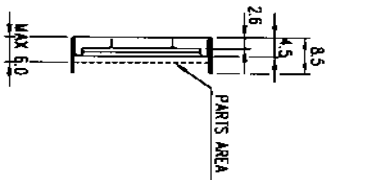
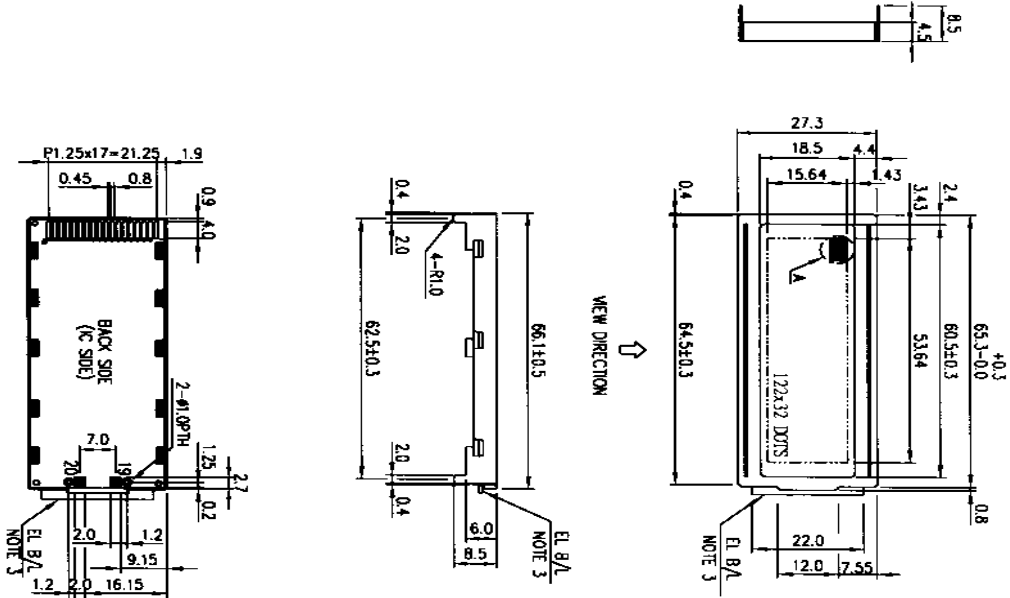
• TERMS OF WARRANT

- 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

- EL : 2000hrs for AC 110Vrms, 400Hz, 20°C, 60%RH
(Operating life time is defined as follows : The final brightness is at 50% of original brightness.)

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM32GS12Y-3	SHEET 16 OF 17
	JK	1.1		DATE: 2/4/03



A
DETAIL
S = 30:1

- NOTE:
1. RESOLUTION : 122x32 DOTS
 2. NC (NO CONNECTION)
 - EL1, EL2 (POWER SUPPLY FOR EL)
 3. EL B/L : WHITE
 4. DRIVER IC : AK6120AA
 5. FRAME MATERIAL : TIN PLATE

INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION	PIN NO.	SYMBOL	FUNCTION
1	A ϕ	I: INSTRUCTION H: DATA	11	DB3	
2	TS ϕ	CHIP ENABLE ACTIVE "1"	12	DB4	
3	CS ϕ		13	DB5	DATA BUS LINE
4	CL	EXTERNAL CLOCK (XINZ)	14	DB6	
5	SD(E)	SD FOR 80 SERIAL E FOR 68 SERIAL	15	DB7	
6	WR(R/W)	WR FOR 80 SERIAL R/W FOR 68 SERIAL	16	VDD	POWER SUPPLY FOR LOGIC CIRCUIT
7	VSS	GROUND	17	RES	E: 80 SERIAL H: 68 SERIAL
8	DB0		18	VEE	POWER SUPPLY FOR LED
9	DB1	DATA BUS LINE	19	NC (EL1)	
10	DB2	DATA BUS LINE	20	NC (EL2)	NOTE 2

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

Q.A.:
JK

REV.:
1.1

HDM32GS12Y-3

SHEET 17 OF 17
DATE: 2/4/03