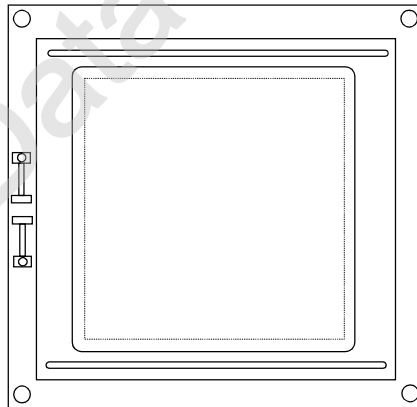


HANTRONIX

PRODUCT SPECIFICATION

HDM128GS12_-1

128 x 128 GRAPHICS
(small size)
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 2.2	HDM128GS12_-1	SHEET 1 OF 17
				DATE: 4/22/02

1. MECHANICAL DATA

(1) Product No. **HDM128GS12_-1**
 (2) Module Size 72.4 (W)mm x 69.9 (H)mm x MAX13.5 (D)mm
 (LED B.L.)
 72.4 (W)mm x 69.9 (H)mm x MAX9.5 (D)mm
 (W/O,EL B.L.)
 (3) Dot Size 0.32 (W)mm x 0.32 (H)mm
 (4) Dot Pitch 0.35 (W)mm x 0.35 (H)mm
 (5) Number of Dots 128 (W) x 128 (H)Dots
 (6) Duty 1/128
 (7) LCD Display Mode STN: Gray Mode Yellow Mode Blue Mode
 FSTN: Black and White(Normal White/Positive Image)
 Black and White(Normal Black/Negative Image)
 Rear Polarizer: Reflective Transflective Transmissive
 Transflective(High Transmissive)
 (8) Viewing Direction 6 O'clock 12 O'clock ___O'clock
 (9) Backlight W/O EL LED CCFT
 (10) LCD Controller BUILT-IN T6963C (TOSHIBA)
 (11) Weight W/O B/L: about 51.4 g
 EL B/L: about 54.3 g
 LED B/L: about 63 g

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM128GS12_-1	SHEET 2 OF 17
	JK	2.2		DATE: 4/22/02

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

V_{SS}=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	V	
Power Supply for LC Drive	VDD-VEE	0	25.0	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 \leq 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 \leq 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.:	HDM128GS12_-1	SHEET 3 OF 17
	JK	2.2		DATE:

3. ELECTRICAL CHARACTERISTICS

(VDD= 5V ± 10%)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply	VDD-VSS	-	4.75	5.0	5.25	V
Input Voltage	VIH	H level	0.8VDD	-	VDD	V
	VIL	L level	0	-	0.2VDD	V
Recommended LC Driving Voltage (Normal Temp. LCM)	VDD-VEE 1/12 Bias	0℃	-	19.0	20.0	V
		25℃	16.8	17.6	18.2	
		50℃	15.7	16.1	-	
Recommended LC Driving Voltage (Wide Temp. LCM)	VDD-VEE 1/12 Bias	-20℃	-	16.9	17.4	V
		-10℃	15.2	16.1	16.7	
		0℃	15.2	16.1	16.5	
		25℃	15.2	16.1	16.4	
		50℃	15.2	15.9	16.4	
		70℃	14.3	14.9	-	
Supply Current (LCD) (Normal Temp. LCM)	IDD	VDD = 5.0V	-	-	9	mA
	IEE	VEE = 12.6V	-	-	4	mA
LED Power Supply Current	I _{LED}	V _{BL} = 5V _{DC} (R _{BL} = 3.3Ω)	-	240	400	mA
LED Average Brightness	B(LED)		-	32.1	-	cd/m ²
EL Power Supply Current	I _{EL}	V _{EL} = 110V _{AC} 400Hz	-	-	5	mA
EL Average Brightness	B(EL)		-	20.18	-	cd/m ²

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

Q.A.:
JK

REV.:
2.2

HDM128GS12_-1

SHEET 4 OF 17

DATE:
4/22/02

4-1. OPTICAL CHARACTERISTICS

(For Normal Temperature Mode LCM)

AT V_{OP}

MODE	ITEM	Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	3	4	40	60	25	30
	C	4	6	40	60	25	35
	J	4	6	40	60	25	35
S	A	3	4	40	60	20	30
	C	4	6	40	60	25	35
	J	3.5	6	40	55	20	30
T	E	3	4	35	65	20	40
	G	6	15	45	90	30	50
note		NOTE6		NOTE5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	-	450	900	ms	NOTE 2
		25℃	-	110	220		
		50℃	-	65	130		
Response Time (fall)	Tf	0℃	-	650	1100	ms	NOTE 2
		25℃	-	135	250		
		50℃	-	80	150		

note:

R: REFLECTIVE
 S: TRANSFLECTIVE
 T: TRANSMISSIVE
 A: GRAY
 C: YELLOW
 E: BLUE
 G: NORMALLY BLACK
 J: NORMALLY WHITE

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM128GS12_-1	SHEET 5 OF 17
	JK	2.2		DATE:

4-2.OPTICAL CHARACTERISTICS

(For Wide Temperature Mode LCM)

AT Vop

MODE	ITEM	Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	3.0	4.0	40	60	28	35
	C	-	-	-	-	-	-
	J	4.0	6.5	35	52	25	33
S	A	3.0	3.8	35	50	20	25
	C	-	-	-	-	-	-
	J	-	-	-	-	-	-
T	A	-	2.5	20	40	15	20
	G	5	10	50	86	35	50
note		NOTE6			NOTE5		

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	2200	4400	ms	NOTE 2
		-10℃	-	940	1880		
		0℃	-	440	880		
		25℃	-	120	240		
		50℃	-	60	120		
		70℃	-	50	100		
Response Time (fall)	Tf	-20℃	-	3800	6000	ms	NOTE 2
		-10℃	-	1260	2400		
		0℃	-	620	1200		
		25℃	-	180	350		
		50℃	-	80	150		
		70℃	-	70	130		

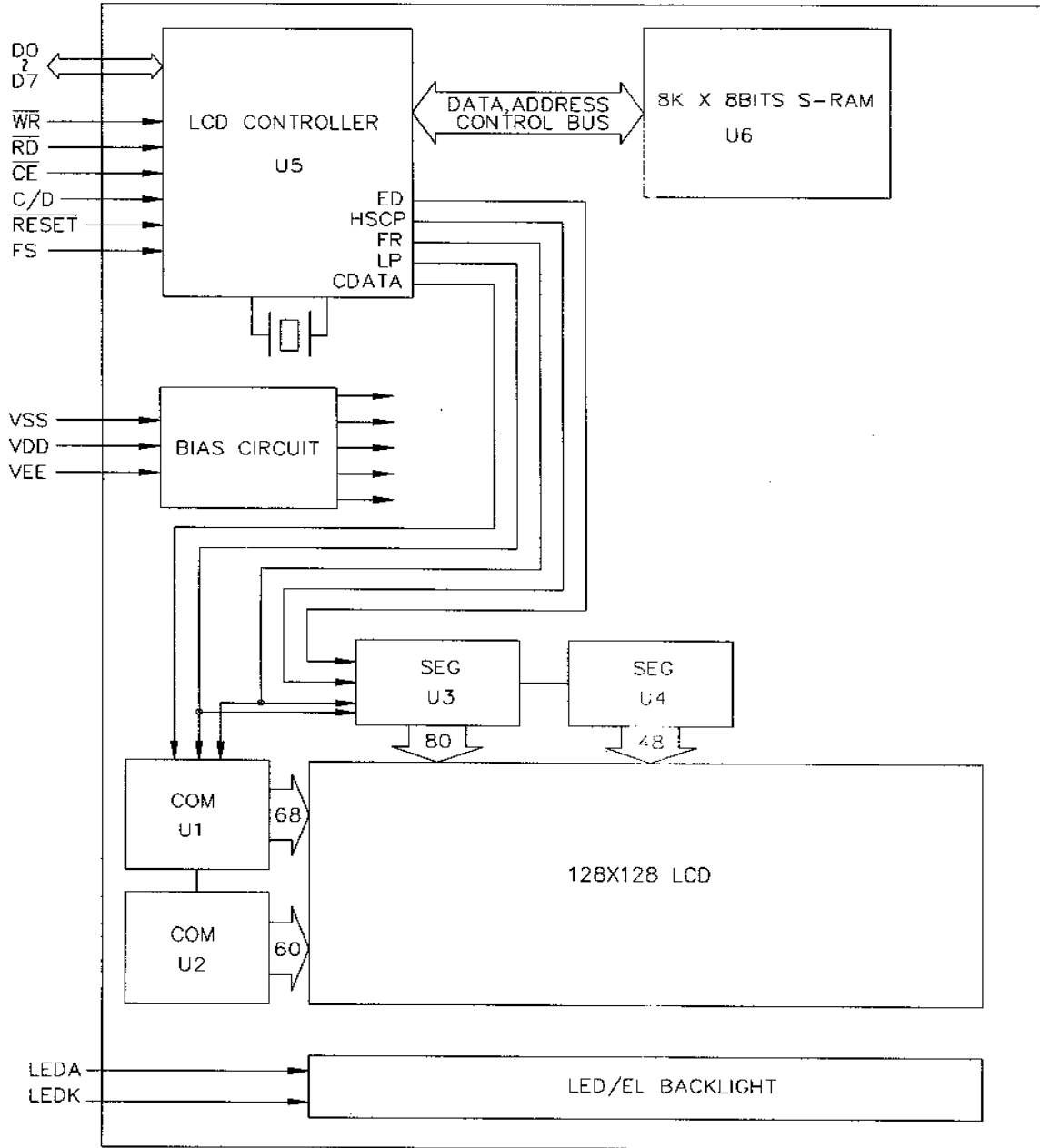
note:

R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY

C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM128GS12_-1	SHEET 6 OF 17
	JK	2.2		DATE: 4/22/02

5. BLOCK DIAGRAM



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 2.2	HDM128GS12_-1	SHEET 7 OF 17
				DATE: 4/22/02

6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
1	VSS	GROUND
2	VDD	POWER SUPPLY FOR LOGIC CIRCUIT
3	VEE	POWER SUPPLY FOR LCD CIRCUIT
4	\overline{WR}	DATA WRITE
5	\overline{RD}	DATA READ
6	\overline{CE}	CHIP ENABLE
7	C/D	\overline{WR} ="L",C/D="H" : COMMAND WRITE \overline{WR} ="L",C/D="L" : DATA WRITE \overline{RD} ="L",C/D="H" : STATUS READ \overline{RD} ="L",C/D="L" : DATA READ
8	\overline{RESET}	CONTROLLER RESET
9	D0	DATA INPUT/OUTPUT
10	D1	DATA INPUT/OUTPUT
11	D2	DATA INPUT/OUTPUT
12	D3	DATA INPUT/OUTPUT
13	D4	DATA INPUT/OUTPUT
14	D5	DATA INPUT/OUTPUT
15	D6	DATA INPUT/OUTPUT
16	D7	DATA INPUT/OUTPUT
17	FS	FONT SELECT CONNECT TO VDD : 6X8 PIXELS/CHARACTER CONNECT TO VSS : 8X8 PIXELS/CHARACTER
18	NC	NO CONNECTION
19	LEDK	LED or EL BACKLIGHT
20	LEDA	LED or EL BACKLIGHT

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10080 BUBB RD.
CUPERTINO, CA 95014

Q.A.:

JK

REV.:

2.2

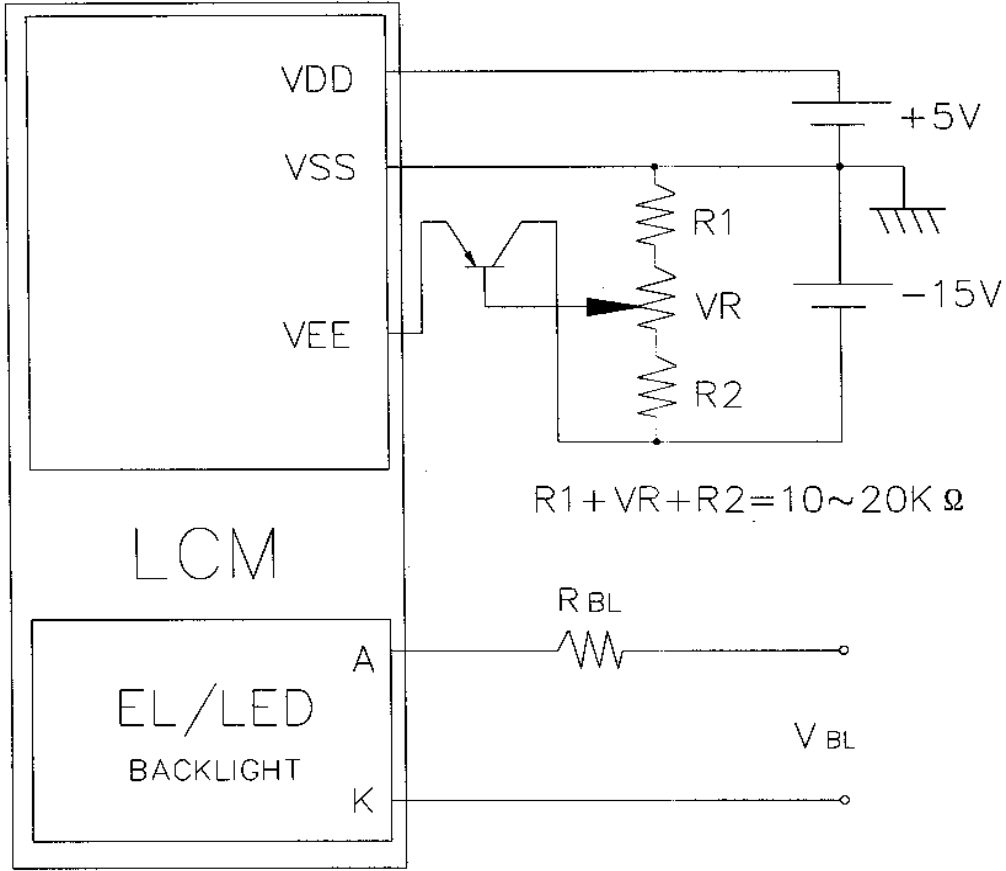
HDM128GS12_-1

SHEET 8 OF 17

DATE:

4/22/02

7. POWER SUPPLY



Recommended Value for R_{BL} and V_{BL}:

ITEM Back Light Interface	R _{BL}		V _{BL}	
	LED	EL	LED	EL
A,K PIN	3.3Ω	0Ω	5V _{DC}	110 V _{AC} 400Hz

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

Q.A.:
JK

REV.:
2.2

HDM128GS12_-1

SHEET 9 OF 17

DATE:
4/22/02

8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

ITEM	ITEM	CONDITION	MIN.	MAX.	UNIT
C/D SET UP TIME	t_{CDS}	Fig.	100	-	ns
C/D HOLD TIME	t_{CDH}	Fig.	10	-	ns
$\overline{CE}, \overline{RD}, \overline{WR}$ CLOCK WIDTH	t_{CP}, t_{RP}, t_{WP}	Fig.	80	-	ns
DATA SET UP TIME	t_{DS}	Fig.	80	-	ns
DATA HOLD TIME	t_{DH}	Fig.	40	-	ns
ACCESS TIME	t_{ACC}	Fig.	-	150	ns
DATA OUTPUT HOLD TIME	t_{OH}	Fig.	10	50	ns

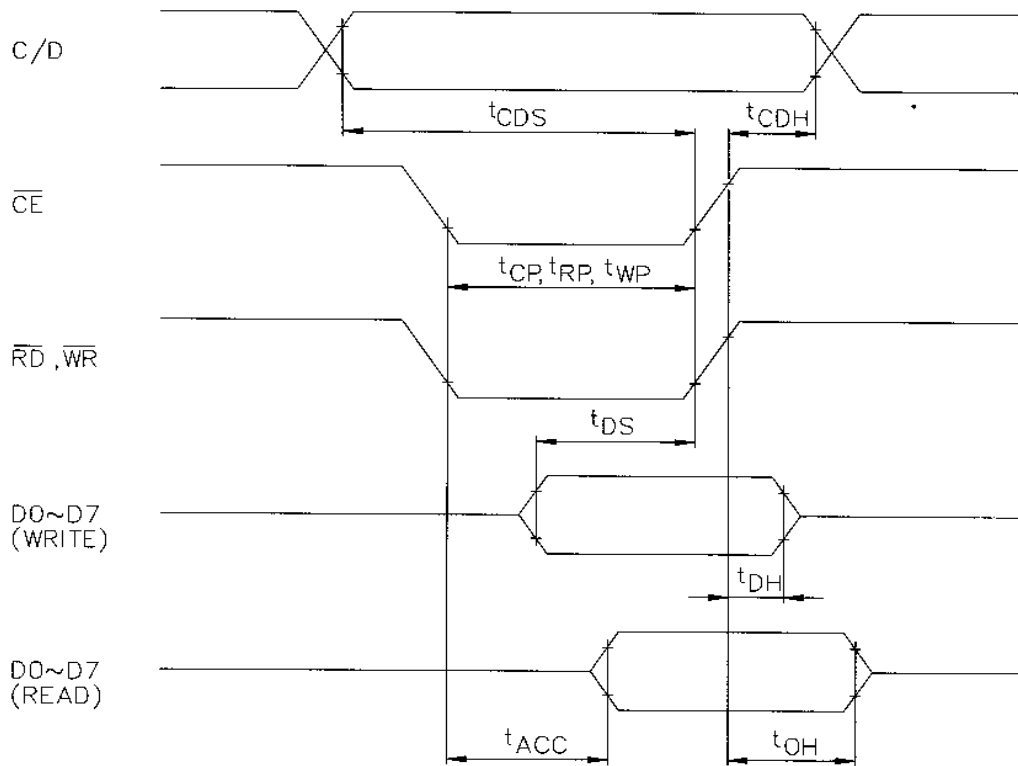
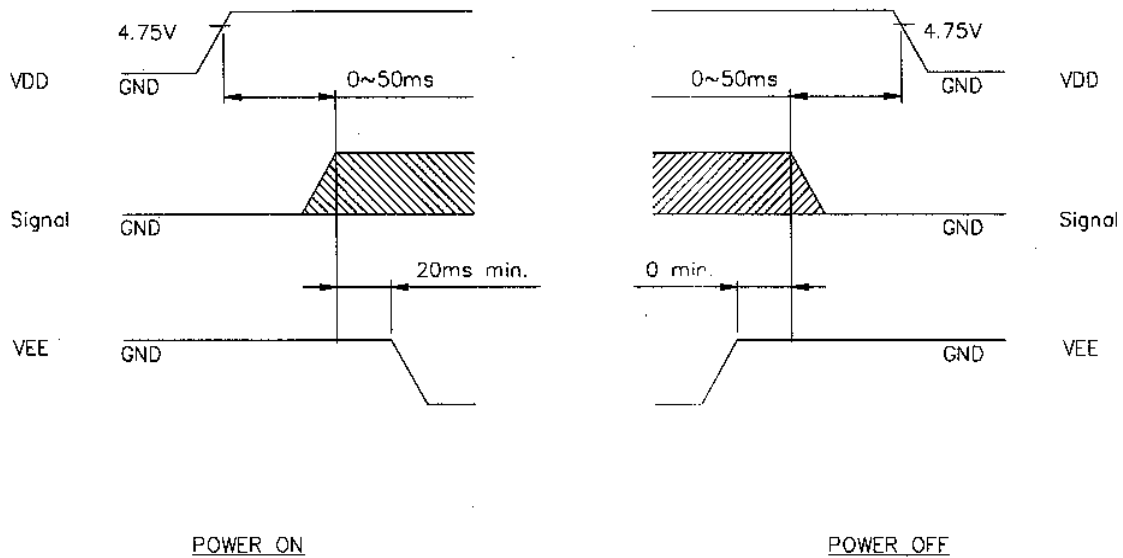


Fig. INTERFACE TIMING CHART

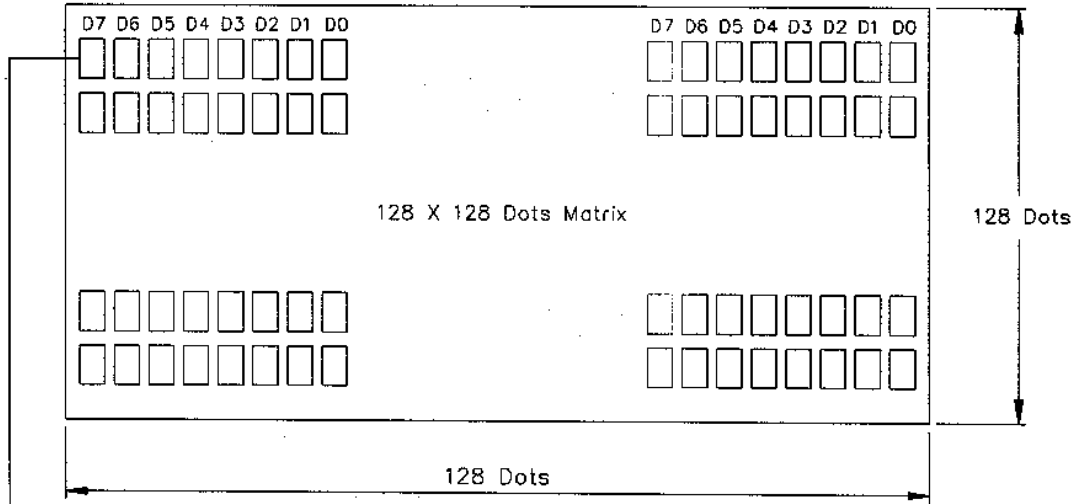
8-2. POWER ON/OFF TIMING



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

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM128GS12_-1	SHEET 11 OF 17
	JK	2.2		DATE: 4/22/02

9. DISPLAY PATTERN



Starting dot for the starting address of display RAM.

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

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 2.2	HDM128GS12_-1	SHEET 12 OF 17
				DATE: 4/22/02

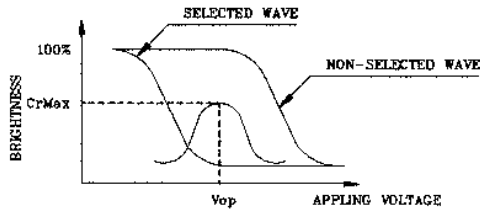
10. RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Leaving	70°C	120HR		Appearance without defect	
2	Low Temp. Leaving	-20°C	120HR		Appearance without defect	
3	High Temp. & High Humi. Leaving	40°C 90%RH	120HR		Appearance without defect	
4	Thermal Shock	-20°C,30min→25°C,5min →60°C,30min→25°C,5min (1cycle)			Appearance without defect	5 cycles

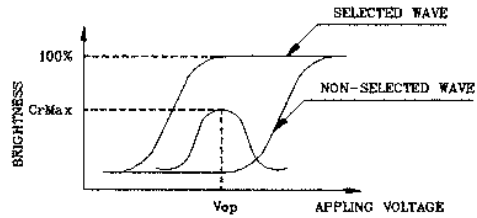
HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	HDM128GS12_-1	SHEET 13 OF 17
	JK	2.2		DATE: 4/22/02

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



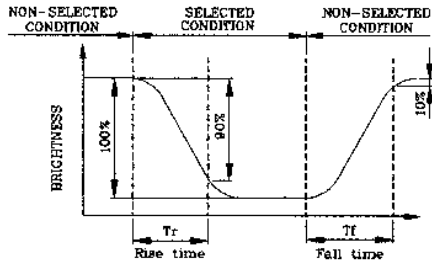
(negative type)

*Conditions

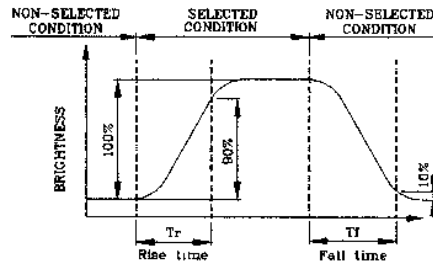
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



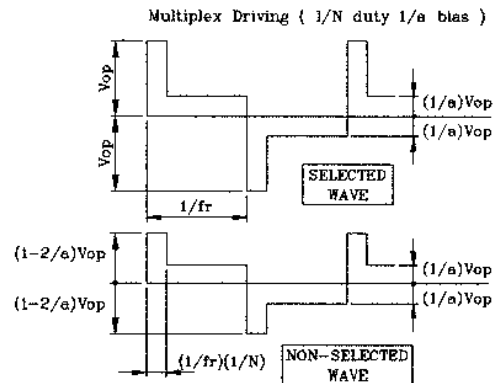
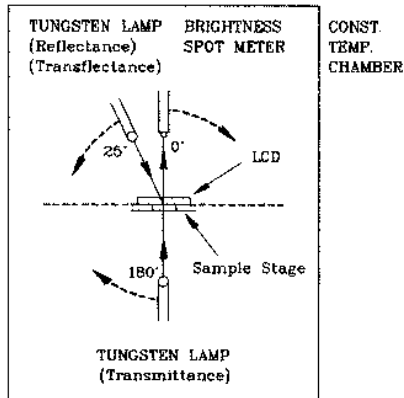
(negative type)

*Conditions

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

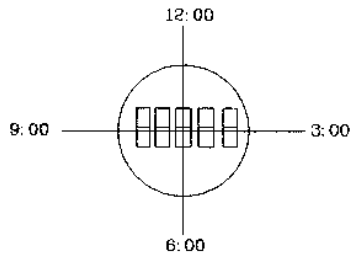
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



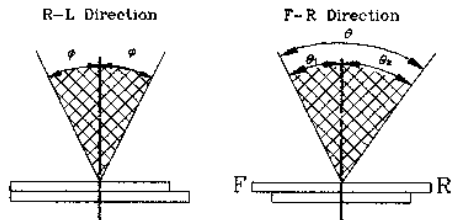
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle

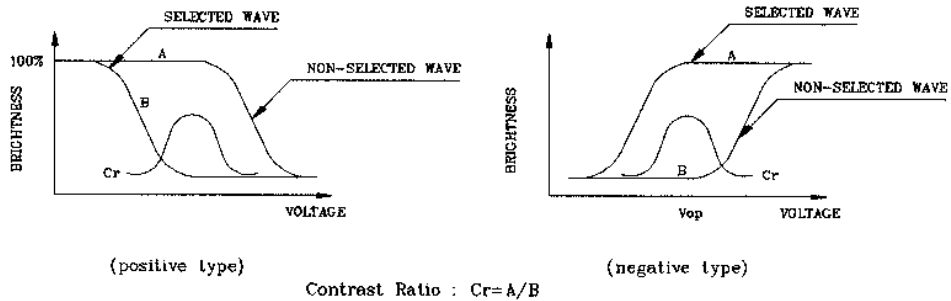


*Conditions

- 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 (Cr)



*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.:
2.2

HDM128GS12_-1

SHEET 15 OF 17

DATE:
4/22/02

(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.

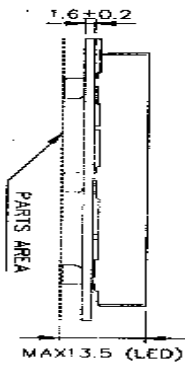
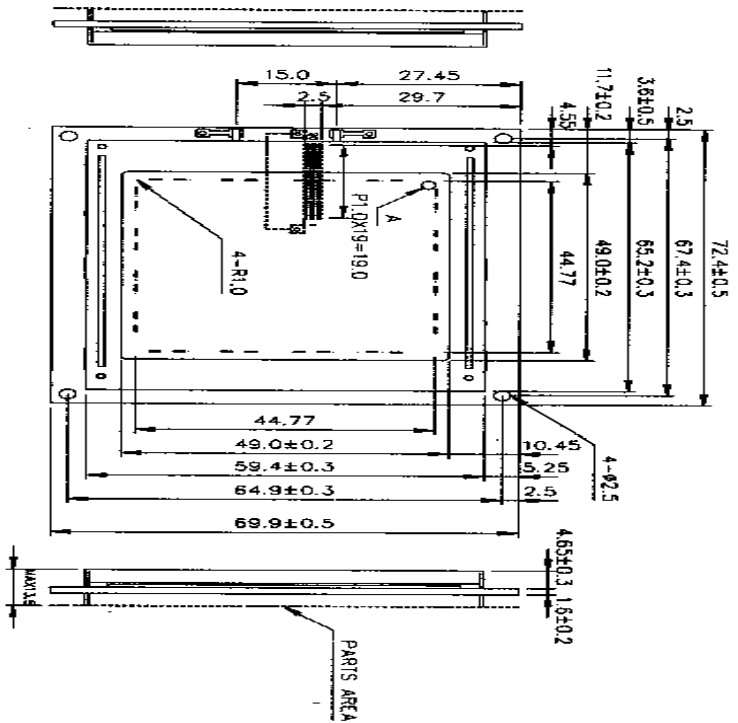
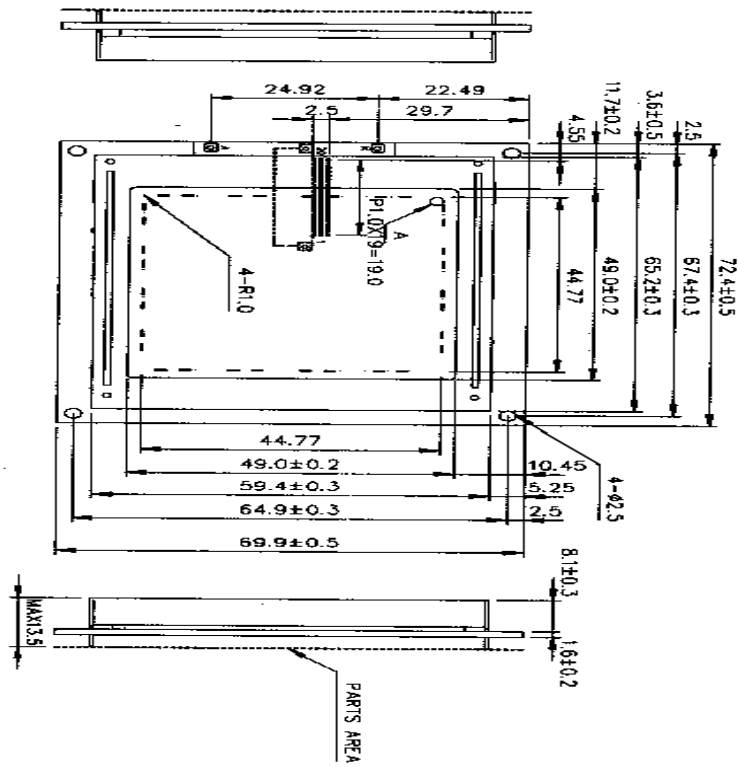
• TERMS OF WARRANT

- 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

- LED : 50,000HR
EL : 5,000HR
CCFT : 10,000HR

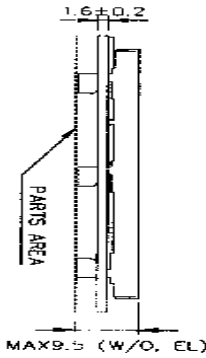
HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 2.2	HDM128GS12_-1	SHEET 16 OF 17
				DATE: 4/22/02



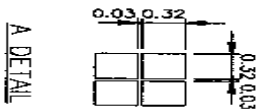
LED BL

NOTES:

- 1. RESOLUTION: 128X128 DOTS
- 2. CONTROLLER: T6963C (TOSHIBA)
- 3. DC/DC: W/THOUT
- 4. BACKLIGHT: LED (YELLOW GREEN)
EL (WHITE)



W/O BL
EL BL



HANTRONIX, INC.
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CUPERTINO, CA 95014

Q.A.:
JK

REV.:
2.2

HDM128GS12_-1

SHEET 17 OF 17

DATE:
4/22/02