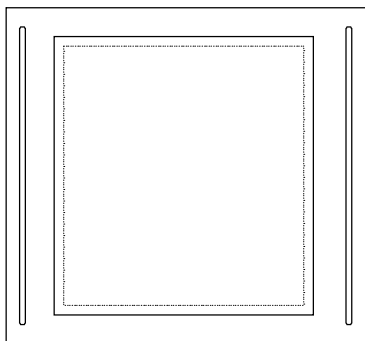




PRODUCT SPECIFICATION

HDM160GS16L-A

160x160 GRAPHICS
LCD DISPLAY MODULE



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1. MECHANICAL DATA

(1) Part Name	HDM160GS16L-A
(2) Module Size	75.5(W)mm X 71.5(H)mm X 10.4(D)mm
(3) Dot Size	0.335 (W)mm x 0.335 (H)mm
(4) Dot Pitch	0.350 (W)mm x 0.350 (H)mm
(5) Number of Dots	160 (W) x 160 (H)Dots
(6) Duty	1/160
(7) LCD Display Mode	STN: Normally White
	Rear Polarizer: Transflective(High Transparency)
(8) Viewing Direction	6 or 12 O'clock
(9) Controller	Excluded
(10) Backlight	LED
(11) Weight	50.0 g (approx)

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2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

V_{SS}=0V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	V	
Power Supply For LC Drive	VEE-VSS	-0.3	30	V	
Input Voltage	V _I	-0.3	VDD+0.3	V	
Static Electricity	-	-	-	-	Note 1

Note 1 : LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	WIDE TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-20	70	-40	80
Humidity (Without Condensation)	Note 2,4		Note 3,4	

Note 2 Ta ≤ 70°C : 75%RH max

Note 3 Ta at -40°C will be < 120hrs, at 80°C will be < 120hrs

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

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3. ELECTRICAL CHARACTERISTICS

3-1. ELECTRICAL CHARACTERISTICS OF LCM

(VDD= 3.3V ± 5%)

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	VEE-VSS (Vop)	1/160 Duty	-20°C	21.1	21.5	21.9	V
			0°C	20.2	20.6	21.0	
			25°C	19.6	20.0	20.4	
			50°C	18.9	19.3	19.7	
			70°C	17.9	18.3	18.7	
Power Supply Current	IDD	VDD=3.3V VSS=0V VEE=20.0V FLM=70Hz	-	0.8	1.2	mA	
	IEE		-	0.7	1.4		
Surface Luminance of LCM	L	PATTERN: (Dots All On) ■ ■ ■ ■ ■ ■ ■ ■	-	-	-	cd/m ²	
		PATTERN: (Dots All Off) □ □ □ □ □ □ □ □	12	15	-		

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3-2. ELECTRICAL CHARACTERISTICS OF BACKLIGHT (White LED)

Used LED Rating

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Peak forward current	IP	-	-	120	mA	-
Maximum reverse voltage	VR	-	-	5	V	-
Applied forward current	IAK	-	-	80	mA	at VAK = 5V
Applied forward voltage	VAK	-	5	-	V	at IAK = 80 mA
LED power consumption	PAK	-	-	0.6	W	-
LED life time	LL	-	10000	-	hrs	at IAK = 80 mA (*1)

(*1) LED life time is defined as follows : The final brightness is at 50% of original brightness .

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3-2. ELECTRICAL CHARACTERISTICS OF BACKLIGHT (Yellow LED)

Used LED Rating

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Peak forward current	I_P	-	-	175	mA	-
Maximum reverse voltage	V_R	-	-	4	V	-
Applied forward current	I_{AK}	-	-	90	mA	at $V_{AK} = 3.3$ V
Applied forward voltage	V_{AK}	-	3.3	-	V	at $I_{AK} = 90$ mA
LED power consumption	P_{AK}	-	0.3	-	W	-
LED life time	LL	-	40000	-	hrs	at $I_{AK} = 90$ mA (*1)

(*1) LED life time is defined as follows : The final brightness is at 50% of original brightness .

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4. OPTICAL CHARACTERISTICS

AT Vop

ITEM		Cr(Contrast Ratio)										θ (Viewing Angle)		ϕ (Viewing Angle)	
		-20 τ		0 τ		25 τ		50 τ		75 τ		25 τ		25 τ	
MODE		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
W	Y	4.0	4.5	4.5	5.0	5.5	6.0	4.5	5.0	2.5	3.0	-	(F) 30 (R) 35	-	(L) 35 (R) 35
Note		NOTE 6										NOTE 5			

NOTE :

W : TRANSFLECTIVE

Y : NORMALLY WHITE , 12 O'clock

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20 τ	1400	1850	2700	ms	NOTE 2
		0 τ	450	580	850		
		25 τ	130	160	250		
		50 τ	100	125	180		
		70 τ	60	70	100		
Response Time (fall)	Tf	-20 τ	1300	1750	2500	ms	NOTE 2
		0 τ	280	360	550		
		25 τ	120	150	220		
		50 τ	50	60	90		
		70 τ	40	50	70		

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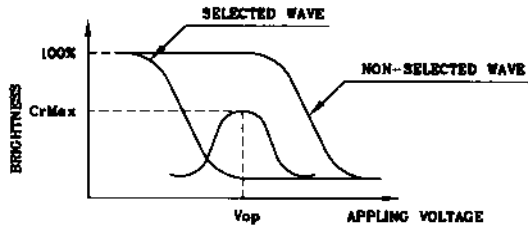
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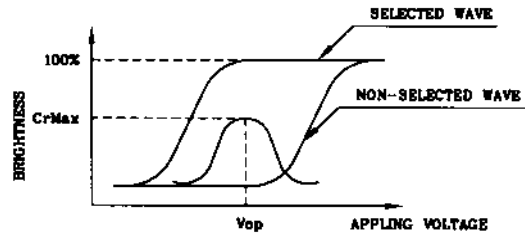
DATE:
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(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



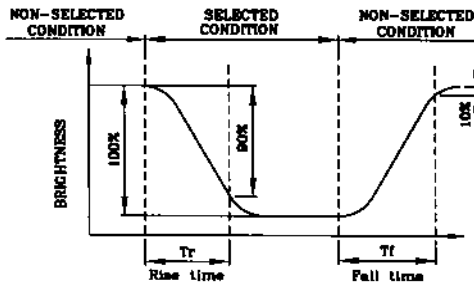
(negative type)

*Conditions

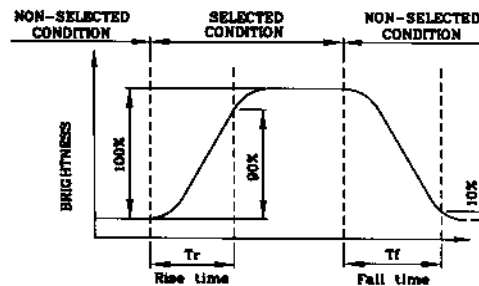
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



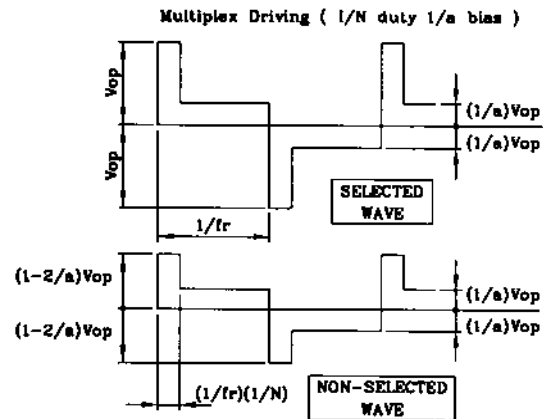
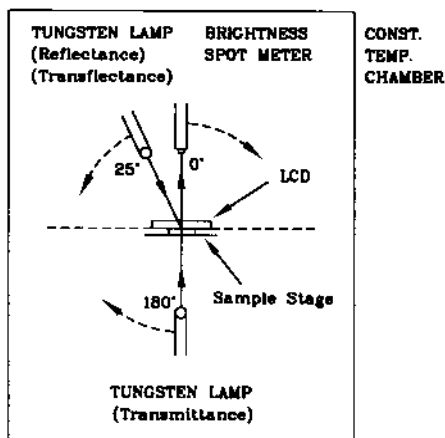
(negative type)

*Conditions

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

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



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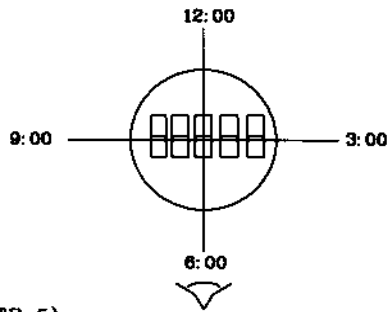
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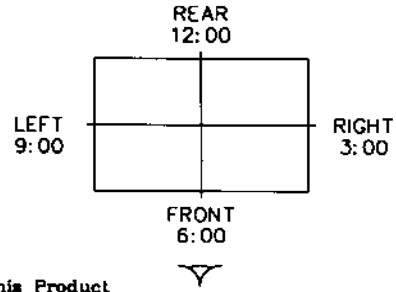
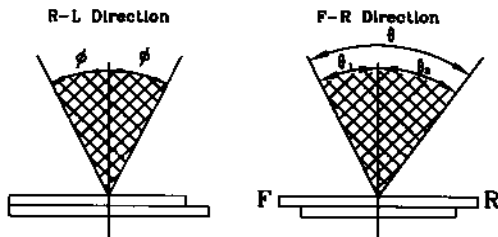
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

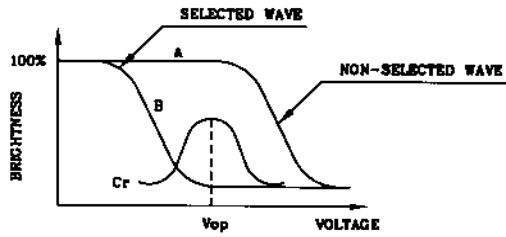
$$\theta = \theta_1 + \theta_2$$

*Conditions

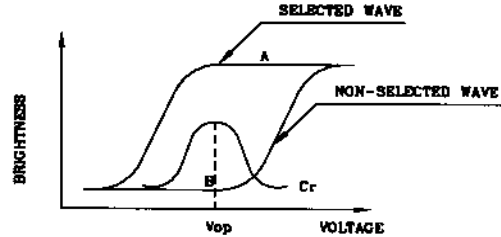
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

Contrast Ratio : $Cr = A/B$

*Conditions

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

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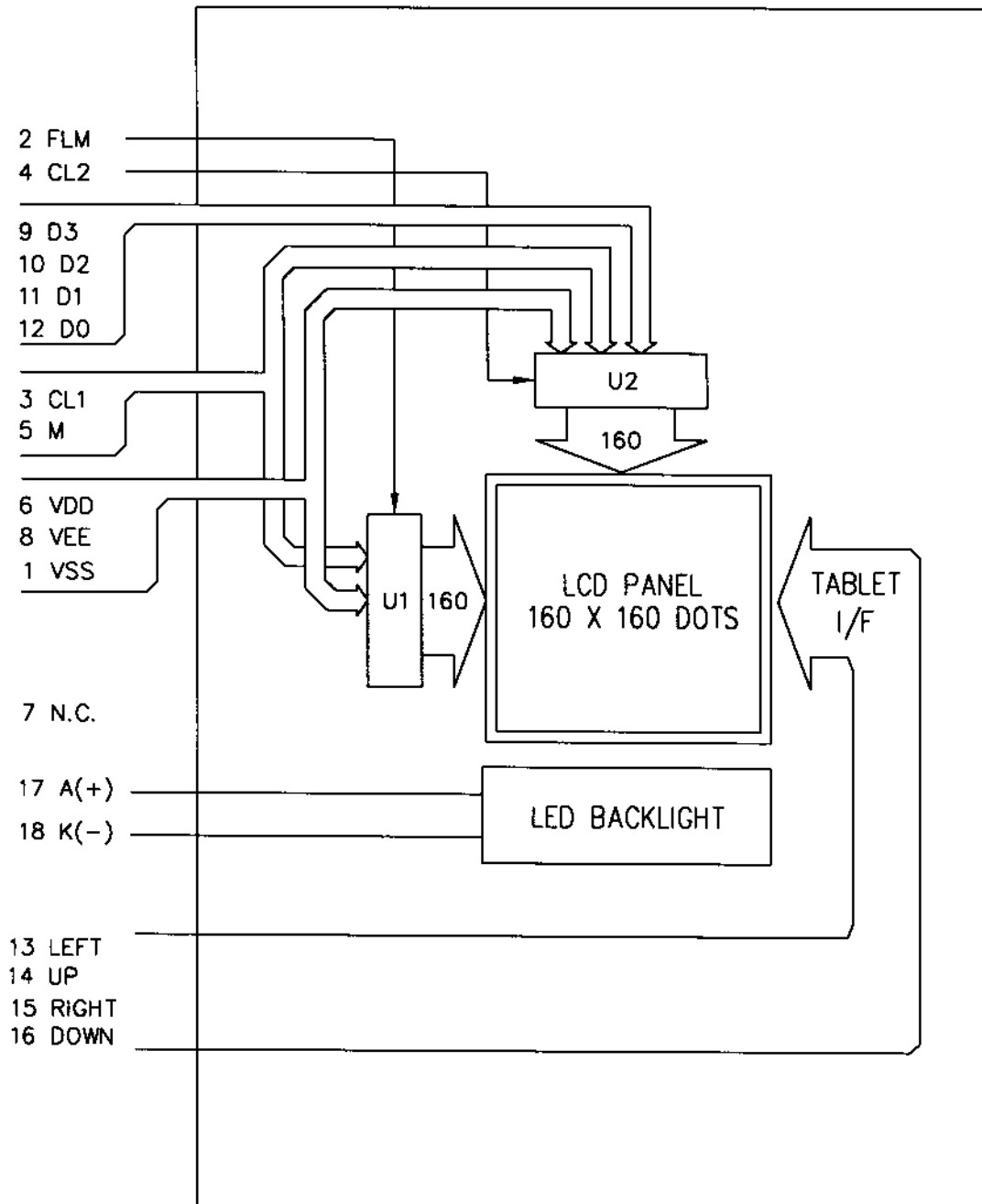
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5. BLOCK DIAGRAM



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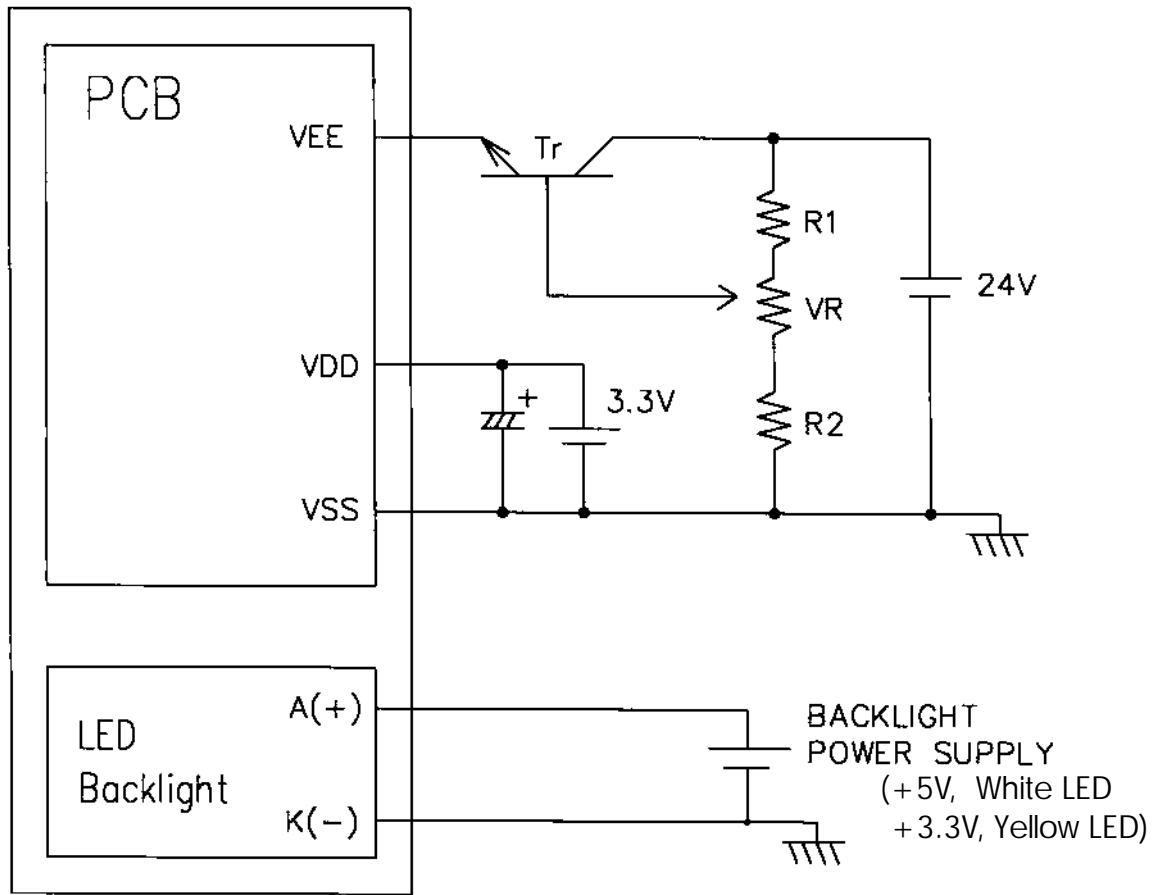
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6. INTERNAL PIN CONNECTION

Pin No.	Symbol	Function
1	VSS	Power Supply (0V)
2	FLM(EI02)	First Line Mark for Common Scan
3	CL1(LP)	H → L DATA Latch Pulse
4	CL2(XCK)	Clock Pulse for Segment shift register
5	M(FR)	H/L Frame Reverse Signal
6	VDD	H/L Supply for logic (+3.3V)
7	NC	No Connection
8	VEE	Power Supply for LCD
9	D3	H/L Display Data
10	D2	H/L Display Data
11	D1	
12	D0	
13	LEFT	Touch Panel Connection
14	UP	
15	RIGHT	
16	DOWN	
17	A	Power Supply For LED Backlight
18	K	Power Supply For LED Backlight

7. POWER SUPPLY

LCM



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

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8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

● VDD=3.0V±5%, Ta=-20~85 °C

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CL2 Cycle Time	tC	Fig.a	125	-	-	ns
CL2 Pulse Width	tSWH,tSWL	Fig.a	51	-	-	ns
CL2 Rise/Fall Time	tCR,tCF	Fig.a	-	-	50	ns
Data Set Up Time	tDSU	Fig.a	30	-	-	ns
Data Hold Time	tDHD	Fig.a	40	-	-	ns
CL1 Cycle Time	tL	Fig.b	250	-	-	ns
CL1 "H" Pulse Width	tLWH	Fig.a , Fig.b	51	-	-	ns
CL1 Rise/Fall Time	tLR,tLF	Fig.b	-	-	50	ns
CL2 To CL1 Delay Time	tCL	Fig.a	51	-	-	ns
CL1 To CL2 Delay Time	tLC	Fig.a	51	-	-	ns
FLM TO CL1 SETUP TIME	tFLS	Fig.b	30	-	-	ns
FLM TO CL1 HOLD TIME	tFLH	Fig.b	50	-	-	ns

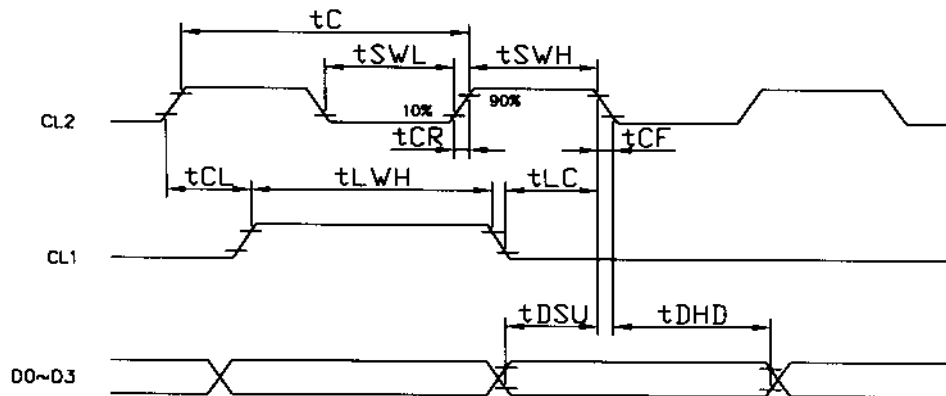


Fig . a Interface timing (SEGMENT)

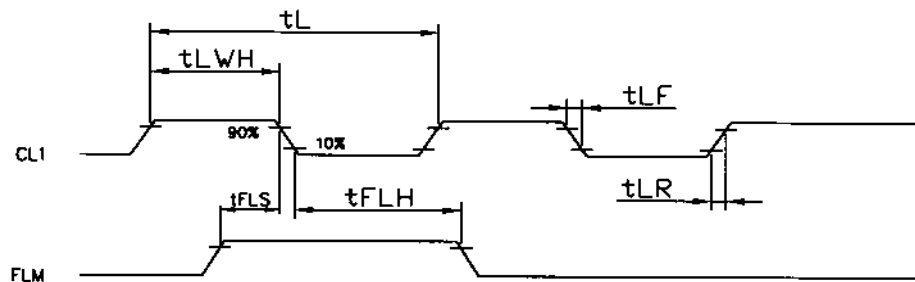


Fig . b Interface timing (COMMON)

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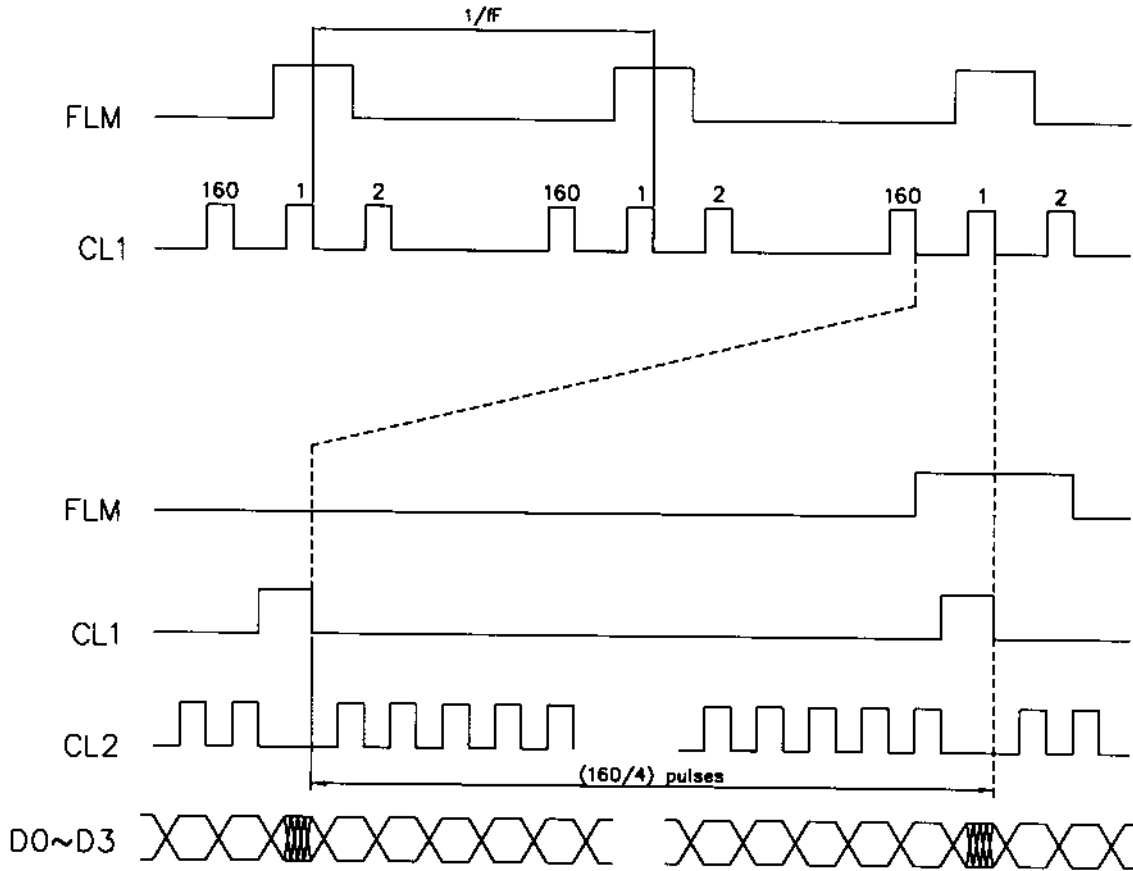
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8-2. TIMING CHART OF INPUT SIGNAL



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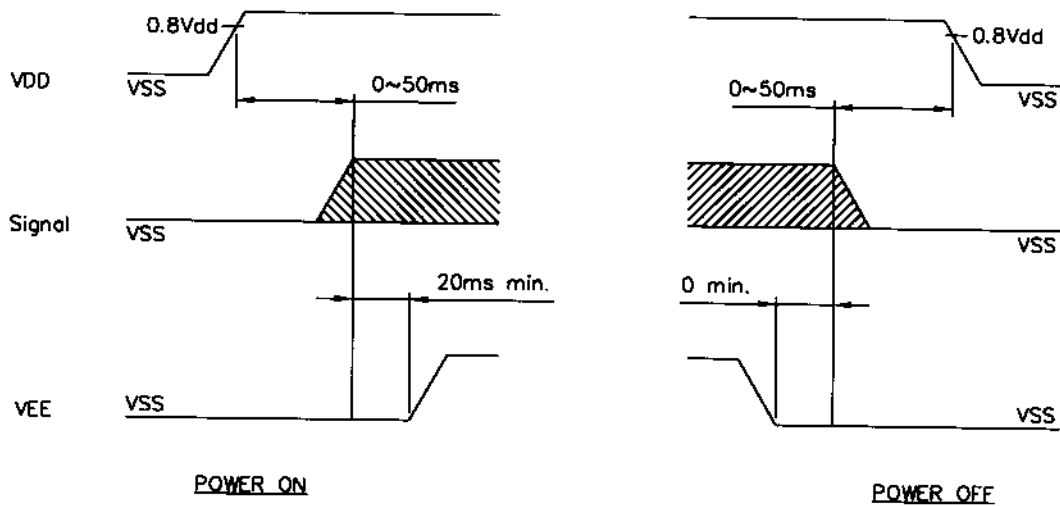
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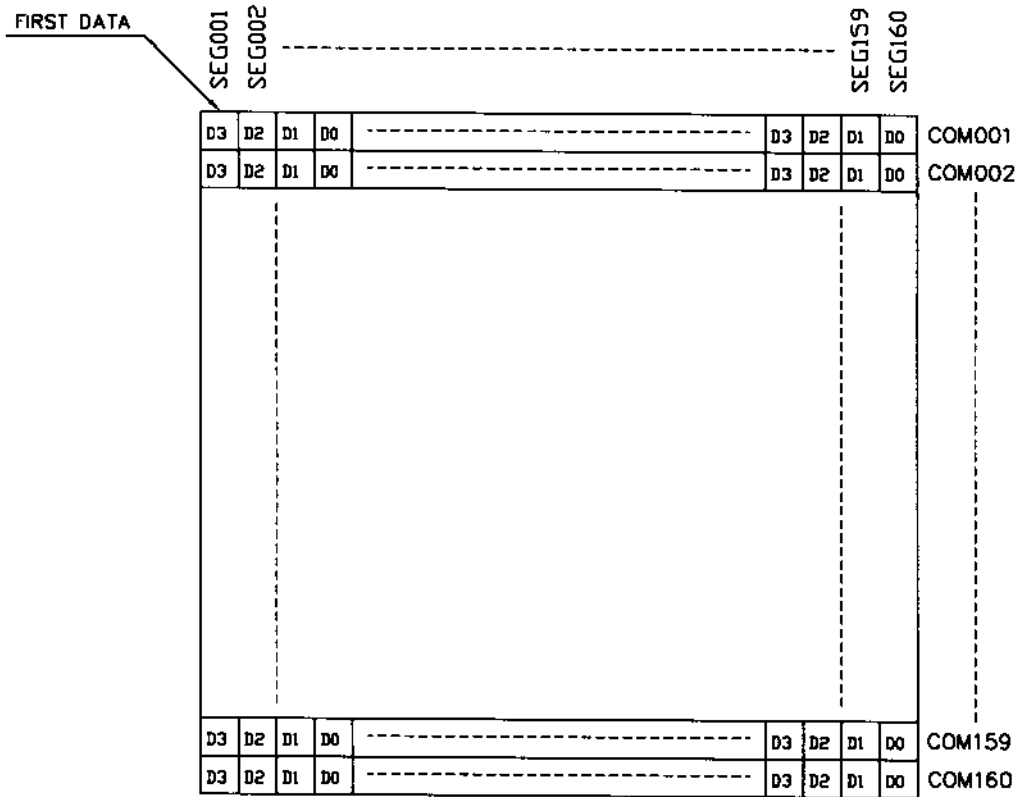
8-3. POWER ON/OFF TIMING



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

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8-4. DISPLAY PATTERN



D0: (1•4)~(1•8)(160•160)
 D1: (1•3)~(1•7)(160•159)
 D2: (1•2)~(1•6)(160•158)
 D3: (1•1)~(1•5)(160•157)

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

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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.

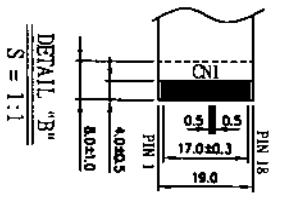
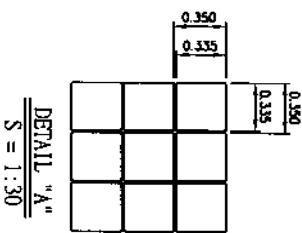
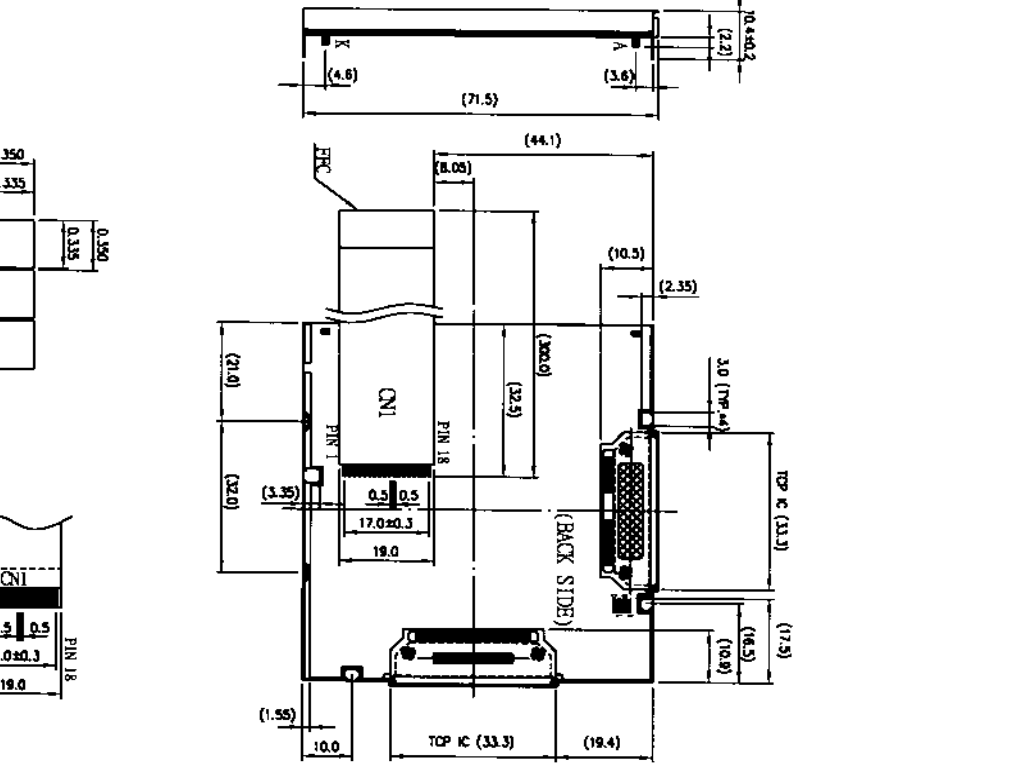
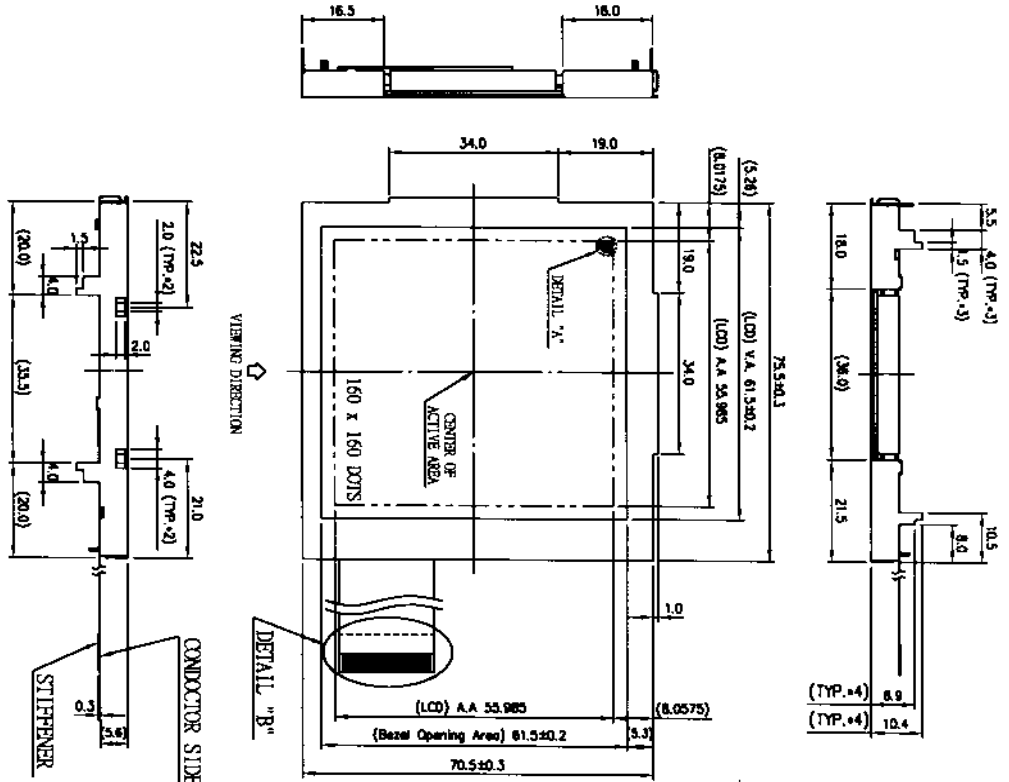
• STORAGE

- 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.

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