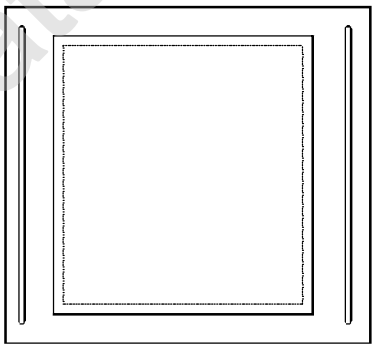
HANTRONIX

PRODUCT SPECIFICATION

HDM16016TSC

160x160 COLOR GRAPHICS
LCD DISPLAY MODULE
with Touch Screen



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JK	**REV.:** 1.1	HDM16016TSC	SHEET 1 OF 19 **DATE:** 6/16/03

1. MECHANICAL DATA

(1) Product No.		**HDM16016TSC**
(2) Module Size		62.2 (W)mm x 77.4 (H)mm x 8.1 (D)mm
(3) Dot Size		0.077 (W)mm x 0.271 (H)mm
(4) Dot Pitch		0.097 (W)mm x 0.291 (H)mm
(5) Number of Dots		(160 xRGB (W)) x 160 (H) Dots
(6) Duty		1/160
(7) LCD Display Mode	FSTN:	Color STN Module
	REAR POLARIZER:	Color Transmissive Type
(8) Viewing Direction		6 O'clock
(9) Backlight		LED
(10) Weight		47.4g (Approx.)
(11) Controller		Excluded
(12) DC/DC Converter		Excluded

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD	-0.3	7.0	V	Note 1
Power Supply For LC	VCH	-0.3	+25	V	Note 1
	VM	-0.3	5.0	V	Note 1
Static Electricity	-	-	-	-	Note 2

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70
Humidity (Without Condensation)	Note 3,5		Note 4,5	

Note 1 : All voltage values are referred to VSS=0V

Note 2 : Make certains you are GROUNDED when handling LCM

Note 3 : Ta≦50°C : 85%RH max
Ta>50°C : Absolute humidity must be lower than the humidity of 85%RH at 50°C

Note 4 : To at -20°C will be < 48hrs,at 70°C will be < 120 hrs

Note 5 : Background color will change slightly depending on ambient temperature. That phenomenon is reversible.

3. ELECTRICAL CHARACTERISTICS

3-1. ELECTRICAL CHARACTERISTICS of LCM

(VDD=3.0V±10%)

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Input Voltage		VIH	H level		0.8VDD	–	VDD	V
		VIL	L level		0	–	0.2VDD	V
Recommended LC Driving Voltage		VCH	VDD=3.0V Duty= 1/160	0°C — 50°C	19.7	21.0	21.7	V
Power Supply Current		IDD	VDD= 3.0V VSS= 0V Bias=1/13 VCH=21.0V FLM=70Hz PATTERN :		–	1.0	1.5	mA
		ICH			–	0.1	0.15	
LCM	Surface Luminance	L	VDD-VSS=3.0V Ta= 25°C	PATTERN: (Dots All On of White Color)	–	36.2	–	cd/m²
				PATTERN: (Dots All Off)	–	1.3	–	cd/m²

3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used LED Rating

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Peak forward current	I_P	–	–	25	mA	–
Maximum reverse voltage	V_R	–	–	–16	V	–
Applied forward current	I_F	–	18.5	–	mA	at V_F = 13.5 V
Applied forward voltage	V_F	–	13.5	–	V	at I_F = 18.5 mA
LED power consumption	P_F	–	0.25	–	W	–
LED life time	L_L	–	70000	–	hrs	at I_F = 18.5 mA (*1)

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

3-3.CHARACTERISTICS OF TOUCH SCREEN

Used Touch screen Rating

Temp.=25°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Applied Rating Voltage	V_R	–	–	–	7.0	V
Operating Temperature	T_{OPR}	20%~85% R.H. Max. Avoid Dew Condensation at Any Time	0	–	50	°C
Storage Temperature	T_{STO}		-20	–	70	
Resistance of Terminal Electrodes	R_{ETD}	X Electrode	400	520	1100	Ω
		Y Electrode	200	240	700	
Linearity	L	–	–	–	1.5	%
Insulation Resistance	R_{OFF}	V_{DC} =25V	20	–	–	MΩ
Transparency	T	According to JIS-K7015	80	83	–	%
Surface Hardness	S_H	According to JIS-K5400	2	–	–	H

Test condition : T/P is placed horizonally in a vessel and no power is supplied to T/P.
Normal state is temperature : 25±10°C, relative humidity : 60±25%

4. OPTICAL CHARACTERISTICS

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.
T	M	25	35	35	45	30	40	–	110	–	±55
Note		NOTE 6						NOTE 5			

NOTE :
T: TRANSMISSIVE
M: 6 O'CLOCK COLOR STN MODULE

AT $\phi=0°$ $\theta=0°$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	450	600	900	ms	NOTE 2
		25°C	130	160	240		
		50°C	120	150	220		
Response Time (fall)	Tf	0°C	450	550	800	ms	NOTE 2
		25°C	130	160	240		
		50°C	40	50	75		

4-2 Color of CIE Coordinate

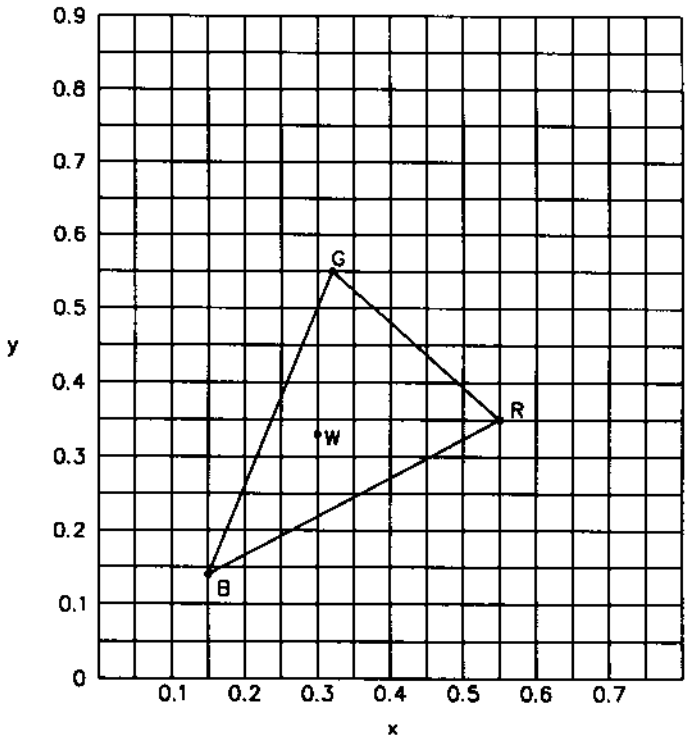
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	BRIGHTNESS (cd/m²)	NOTE
Color of CIE Coordinate	Red	X	Φ=0°, θ=0°	0.52	9.3	Note✱
		y		0.35		
	Green	X		0.32	23.8	
		y		0.54		
	Blue	X		0.15	7.1	
		y		0.14		
	White	X		0.30	36.2	
		y		0.33		

Note✱ Measuring at position 3 on Fig.1 CIE chromaticity diagram

Tolerance : ±0.05

Fig.1



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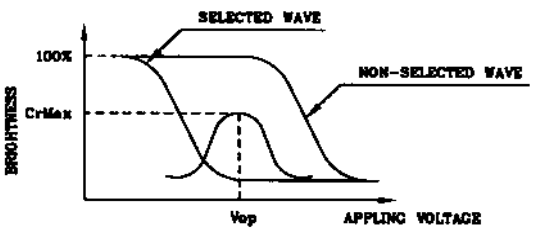
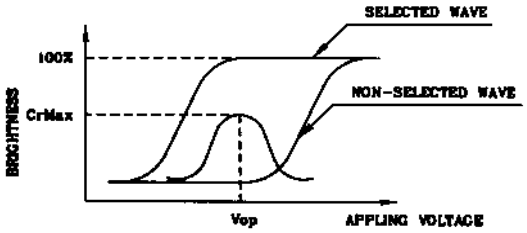
(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



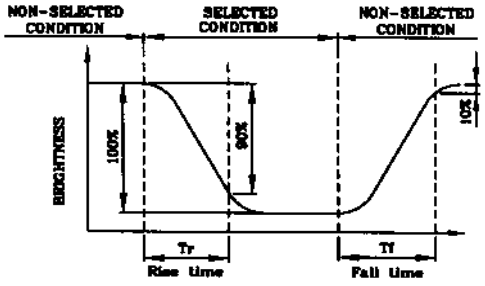
(negative type)

*Conditions

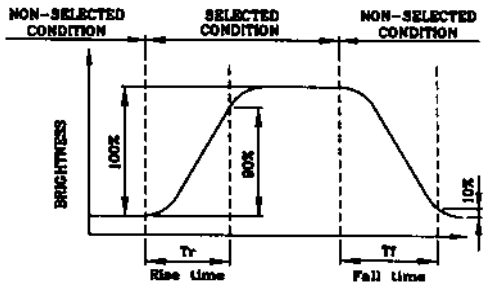
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



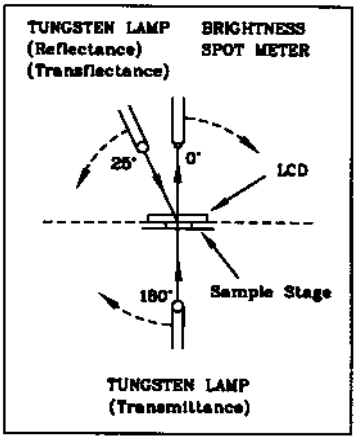
(negative type)

*Conditions

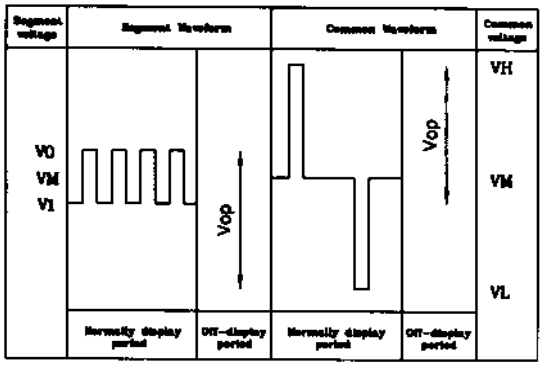
Operating Voltage : Vop
Viewing Angle (ϕ,θ) : (0,0)
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



The voltage relationship of each signal is as follow
Multiplex Driving (1/N duty 1/a bias)



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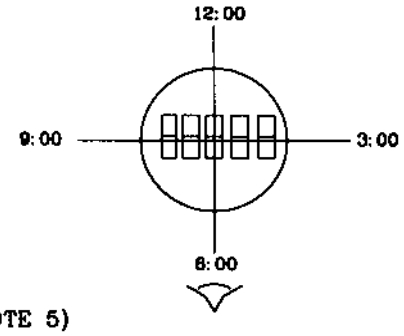
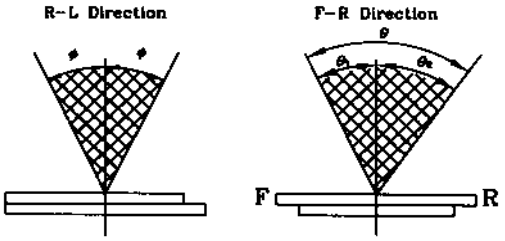
(NOTE 4)

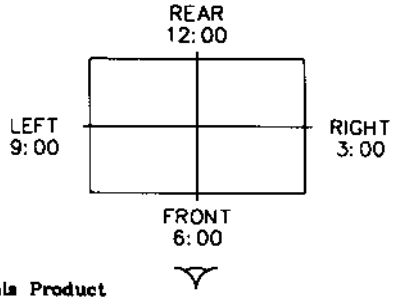
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta 1 > \theta 2$

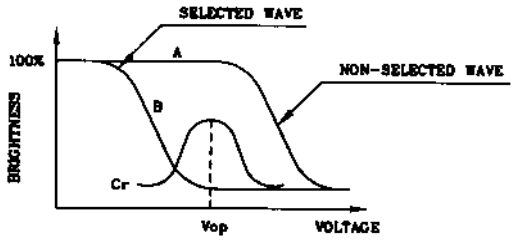
$\theta = \theta_1 + \theta_2$

*Conditions

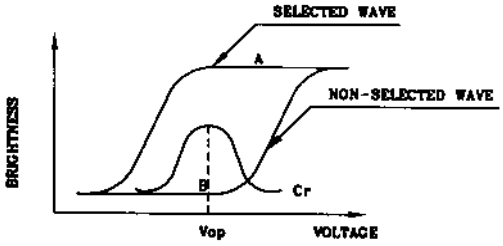
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(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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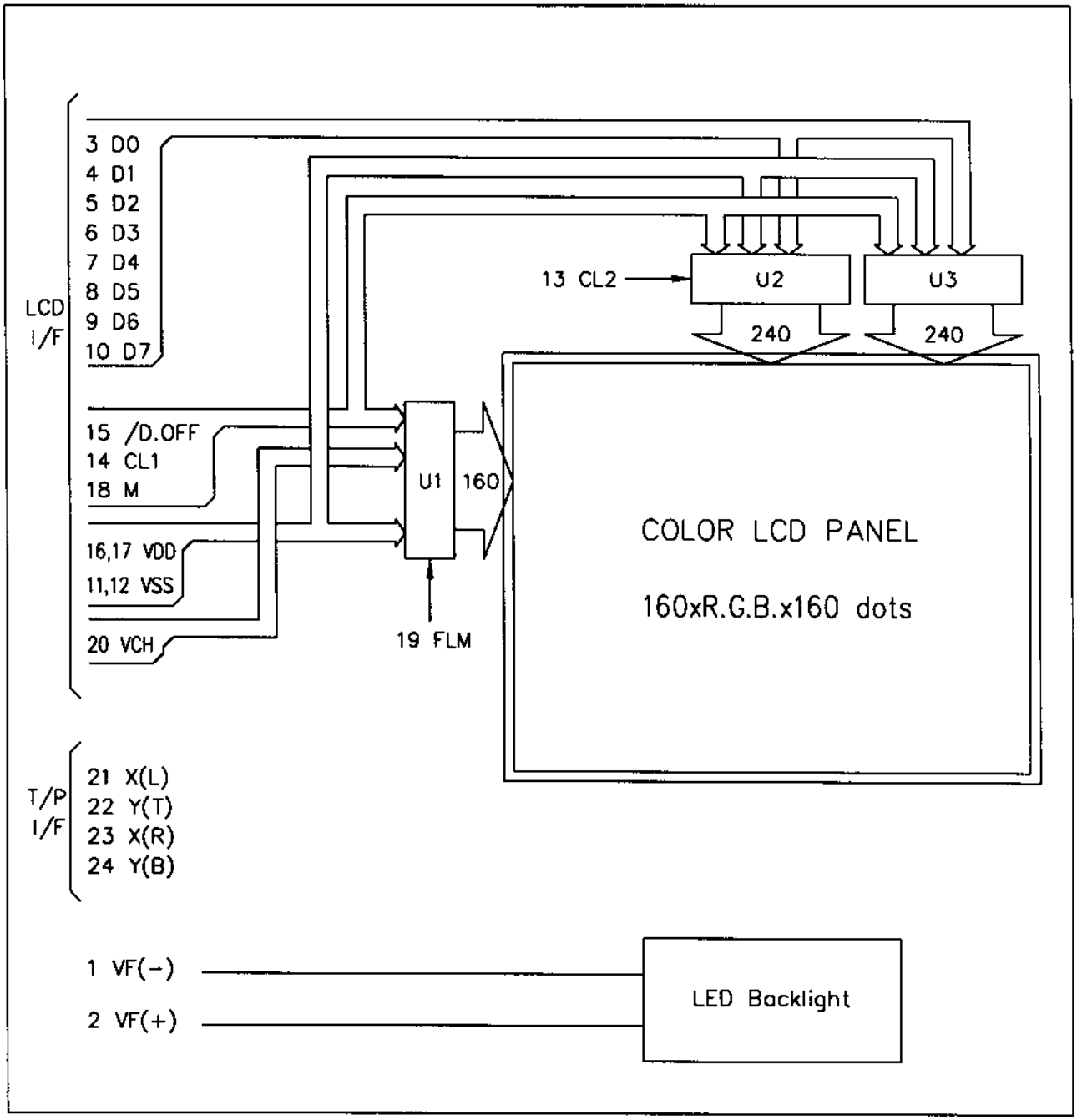
5. BLOCK DIAGRAM



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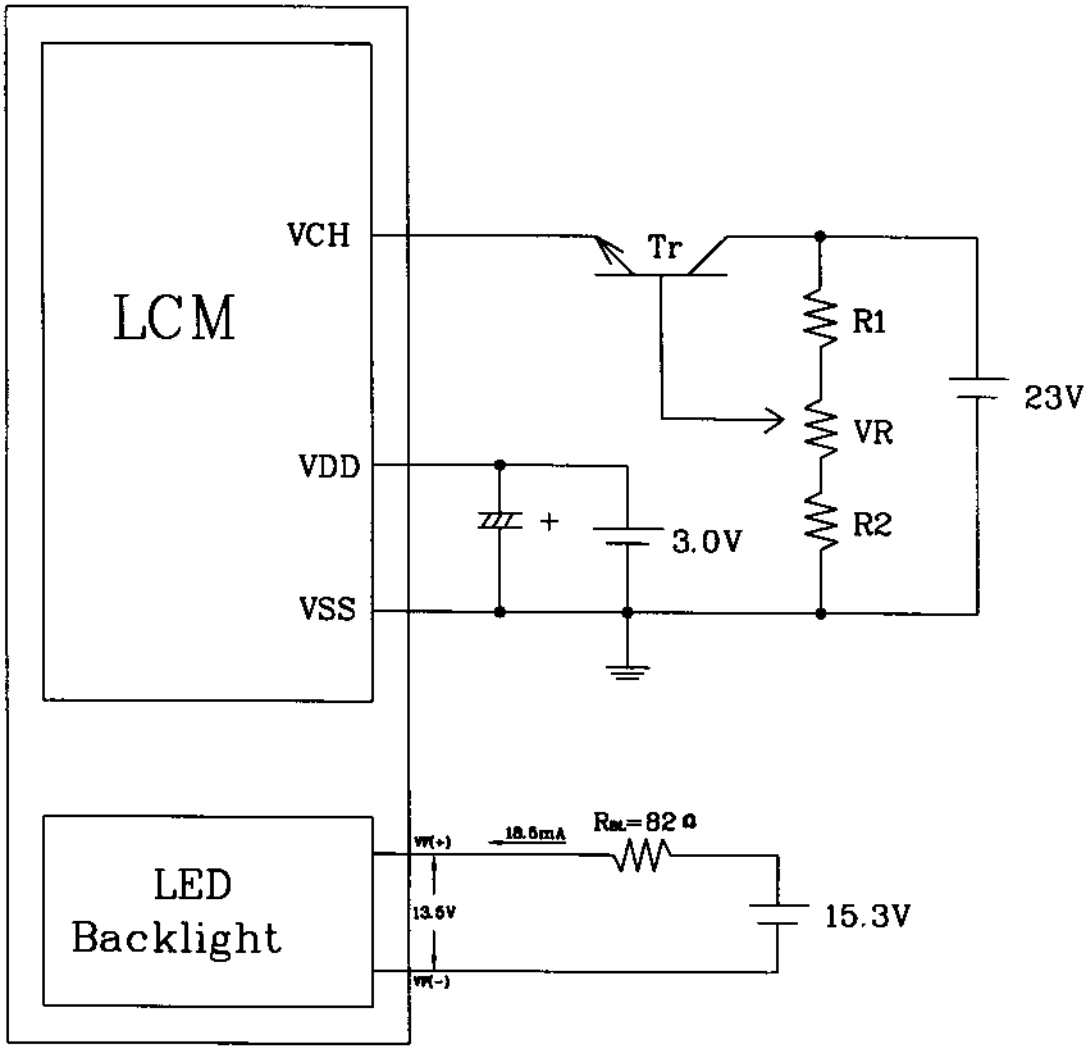
6. INTERNAL PIN CONNECTION

PIN NO	SYMBOL	LEVEL	FUNCTION
1	VF(-)		POWER SUPPLY FOR LED BACKLIGHT
2	VF(+)		POWER SUPPLY FOR LED BACKLIGHT
3	D0	H/L	DISPLAY DATA
4	D1	H/L	DISPLAY DATA
5	D2	H/L	DISPLAY DATA
6	D3	H/L	DISPLAY DATA
7	D4	H/L	DISPLAY DATA
8	D5	H/L	DISPLAY DATA
9	D6	H/L	DISPLAY DATA
10	D7	H/L	DISPLAY DATA
11	VSS		GND
12	VSS		GND
13	CL2	H-> L	DATA SHIFT
14	CL1	H-> L	DATA LATCH
15	DISP.OFF	H/L	H : ON / L : OFF
16	VDD		POWER SUPPLY FOR LOGIC
17	VDD		POWER SUPPLY FOR LOGIC
18	M	H/L	AC SIGNAL INPUT FOR LCD DRIVE WAVEFORM
19	FLM	H	FIRST LINE MARKER
20	VCH		POWER SUPPLY FOR LCD
21	X(L)		ANALOG SIGNAL TOUCH PANEL
22	Y(T)		ANALOG SIGNAL TOUCH PANEL
23	X(R)		ANALOG SIGNAL TOUCH PANEL
24	Y(B)		ANALOG SIGNAL TOUCH PANEL

LCD INTERFACE CABLE
Pitch 0.5mm ,Width 12.5mm/Suitable Connector : 52689-2493(molex)

7. POWER SUPPLY



1. R1+R2+VR=10~20KΩ

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8. TIMING CHARACTERISTICS

8-1 INTERFACE TIMING

● VDD=3.3V±10%, To=-20~70℃

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CL2 Clock Cycle	tCYC2	Fig.a	152	-	-	ns
CL2 HIGH-LEVEL Width	tCWH2	Fig.a	66	-	-	ns
CP LOW-LEVEL Width	tCWL2	Fig.a	66	-	-	ns
Data Set Up Time	tDS2	Fig.a	50	-	-	ns
Data Hold Time	tDH2	Fig.a	50	-	-	ns
CL2 Rise/Fall Time	tr2,tf2	Fig.a	-	-	30	ns
Clock Set Up Time	tSCL	Fig.a	80	-	-	ns
Clock Hold Time	tHCL	Fig.a	80	-	-	ns
M Set Up Time	tMS	Fig.a	20	-	-	ns
M Hold Time	tMH	Fig.a	20	-	-	ns

● VDD=3.3V±10%, To=-20~70℃

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CL1 Clock Cycle	tCYC1	Fig.b	400	-	-	ns
CL1 HIGH-LEVEL Width	tCWH1	Fig.b	25	-	-	ns
CL1 LOW-LEVEL Width	tCWL1	Fig.b	370	-	-	ns
Data Set Up Time	tDS1	Fig.b	100	-	-	ns
Data Hold Time	tDH1	Fig.b	10	-	-	ns
CL1 Rise/Fall Time	tr1,tf1	Fig.b	-	-	30	ns

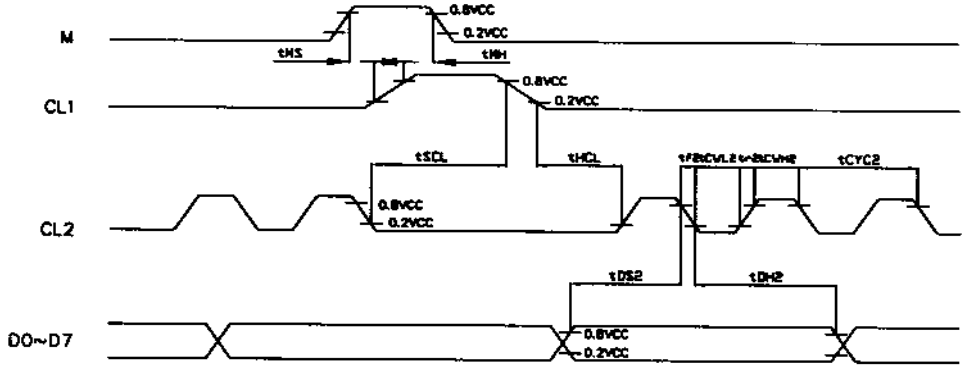


Fig . a Interface timing (SEGMENT)

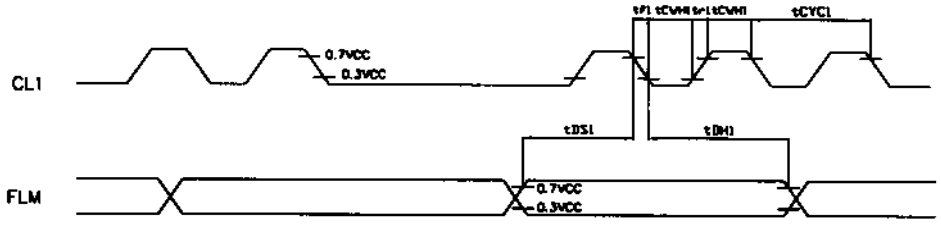
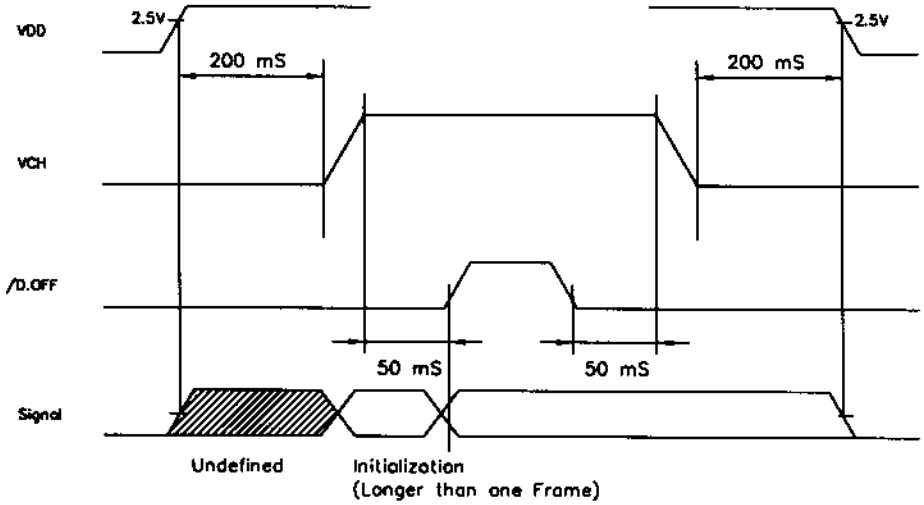


Fig . b Interface timing (COMMON)

8-2. POWER ON/OFF TIMING



POWER ON

POWER OFF

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

8-3. DISPLAY PATTERN

START DATA

	Y1			Y2			Y3		
X1	R1	G1	B1	R2	G2	B2	R3	G3	B3
	D7	D6	D5	D4	D3	D2	D1	D0	D7
X2	R1	G1	B1	R2	G2	B2	R3	G3	B3
	D7	D6	D5	D4	D3	D2	D1	D0	D7

	Y158			Y159			Y160		
	R158	G158	B158	R159	G159	B159	R160	G160	B160
	D0	D7	D6	D5	D4	D3	D2	D1	D0
	R158	G158	B158	R159	G159	B159	R160	G160	B160
	D0	D7	D6	D5	D4	D3	D2	D1	D0

X159	R1	G1	B1	R2	G2	B2	R3	G3	B3
	D7	D6	D5	D4	D3	D2	D1	D0	D7
X160	R1	G1	B1	R2	G2	B2	R3	G3	B3
	D7	D6	D5	D4	D3	D2	D1	D0	D7

	R158	G158	B158	R159	G159	B159	R160	G160	B160
	D0	D7	D6	U5	D4	D3	D2	D1	D0
	R158	G158	B158	R159	G159	B159	R160	G160	B160
	D0	D7	D6	U5	D4	D3	D2	D1	D0

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℃ 90%RH	120HR		Appearance without defect	
4	Thermal Shock	−20℃,30min→25℃,5min →70℃,30min→25℃,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.

NOTES:

1. RESOLUTION: 160 x (R.G.B) x 160 DOTS
2. BACKLIGHT: LED (WHITE)
3. FRAME MATERIAL : SUS430*2B
4. GLASS : 0.7mmt
5. TOUCH PANEL : CLEAR TYPE
   (1.0mmt GLASS + FILM)

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