AZ DISPLAYS, INC.

COMPLETE LCD SOLUTIONS

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

PART NUMBER: **AGM1616C SERIES**
DATE: **MAR. 12, 2007**

1. General Specifications

1-1.Features

A. Drive Method:1/160 Duty, 1/13 Bias

B. The Module Operating Voltage: 3.3V;

C. The LCD Operating Voltage :20.0V;

D. Viewing Direction: 6:00

E. Operating Temperature: 0℃~50℃

F. Storage Temperature: -20℃~70℃

G. Display type: FSTN Positive

1-2.Mechanical Data:

(1) Module Size ---------- 75.5 W * 70.5 H mm

(2) Viewing Area ---------- 61.5 W * 61.5 H mm

(3) Dot Size ---------- 0.3345 W * 0.3345 H mm

(4) Dot Matrix---------- 160 * 160

(5) Outline Dimensions---------- See Attached Drawing

1-3. Absolute Maximum Ratings:

Characteristics	Symbol	Ratings
Operating Voltage	VDD	-0.3V to +7.0V
Driver Supply Voltage	V_{LCD}	-0.3V to +30V
Input Voltage Range	V_{IN}	-0.3V to VDD+0.3V

1-4. DC Characteristics:

Segment mode

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Operating Voltage	V_{DD}	2.5	-	5.5	V	
Operating Voltage	V_0	15	-	30	V	
Input high voltage	V_{IH}	0.8 V_{DD}	-	-	V	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2 and $\overline{DISPOFF}$ pins
Input low voltage	V_{IL}	-	-	0.2 V_{DD}	V	
Output high voltage	V_{OH}	V_{DD} - 0.4	-	-	V	EIO_1, EIO_2 pins, I_{OH} = -0.4mA
Output low voltage	V_{OL}	-	-	+0.4	V	EIO_1, EIO_2 pins, I_{OL} = +0.4mA
Input leakage current 1	I_{IH}	-	-	+1	μA	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2 and $\overline{DISPOFF}$ pins, $V_I = V_{DD}$
Input leakage current 2	I_{IL}	-	-	-1	μA	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2 and $\overline{DISPOFF}$ pins, V_I = Vss
Output resistance	R_{ON}	-	1.0	1.5	kΩ	V_0 = +30.0V; Y_1 - Y_{160} pins, $\lvert\Delta V_{ON}\rvert$ = 0.5V
		-	1.5	2.0		V_0 = +20.0V
Stand-by current	I_{SB}	-	-	5	μA	Vss pin, Note 1
Consumed current (1) (Deselection)	I_{DD1}	-	-	2.0	mA	V_{DD} pin, Note 2
Consumed current (2) (Selection)	I_{DD2}	-	-	8.0	mA	V_{DD} pin, Note 3
Consumed current	I_0	-	-	1.0	mA	V_0 pin, Note 4

Common mode

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Operating Voltage	V_{DD}	2.5	-	5.5	V	
Operating Voltage	V_0	15	-	30	V	
Input high voltage	V_{IH}	0.8 V_{DD}	-	-	V	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2 and $\overline{DISPOFF}$ pins
Input low voltage	V_{IL}	-	-	0.2 V_{DD}	V	
Output high voltage	V_{OH}	V_{DD} - 0.4	-	-	V	EIO_1, EIO_2 pins, I_{OH} = -0.4mA
Output low voltage	V_{OL}	-	-	+0.4	V	EIO_1, EIO_2 pins, I_{OL} = +0.4mA
Input leakage current 1	I_{IH}	-	-	+1	μA	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2 and $\overline{DISPOFF}$ pins, $V_I = V_{DD}$
Input leakage current 2	I_{IL}	-	-	-1	μA	D0 - 7, XCK, LP, L/R, FR, MD, S/C, EIO_1, EIO_2 and $\overline{DISPOFF}$ pins, V_I = Vss
Output resistance	R_{ON}	-	1.0	1.5	kΩ	V_0 = +30.0V; Y_1 - Y_{160} pins, $\lvert\Delta V_{ON}\rvert$ = 0.5V
		-	1.5	2.0		V_0 = +20.0V
Stand-by current	I_{SB}	-	-	5	μA	Vss pin, Note 1
Consumed current (1) (Deselection)	I_{DD1}	-	-	2.0	mA	V_{DD} pin, Note 2
Consumed current (2) (Selection)	I_{DD2}	-	-	8.0	mA	V_{DD} pin, Note 3
Consumed current	I_0	-	-	1.0	mA	V_0 pin, Note 4

1-5. AC Characteristics:

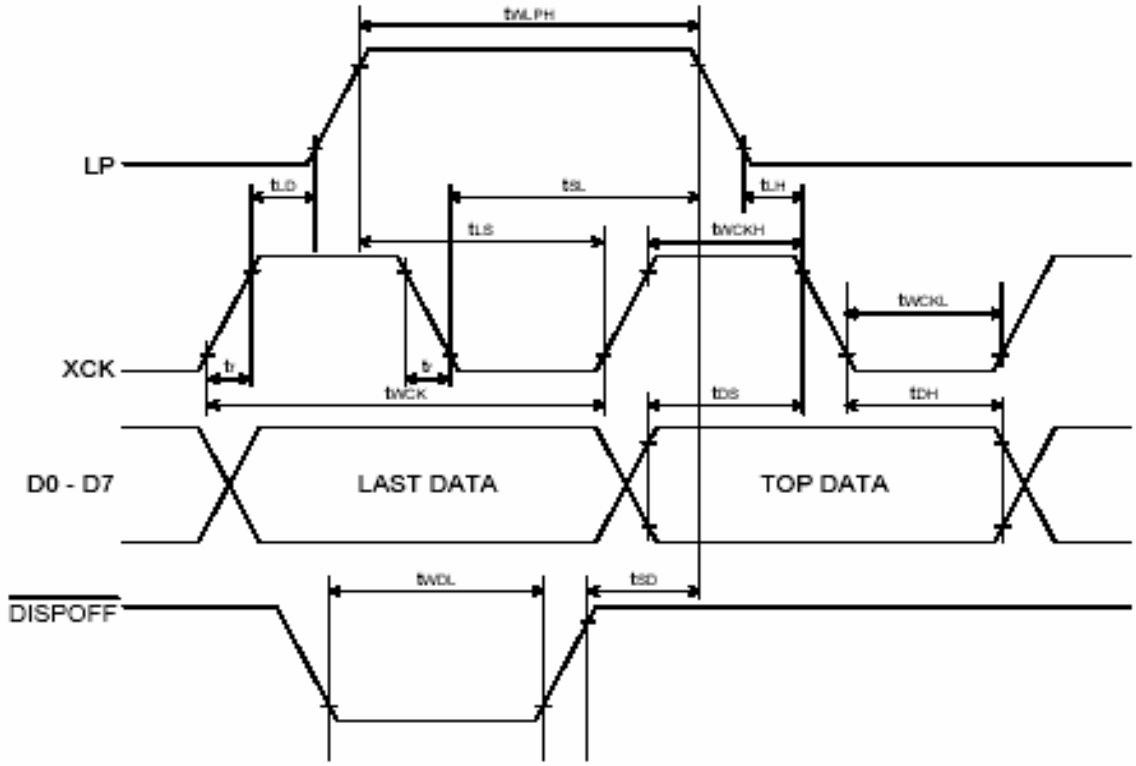
Segment mode

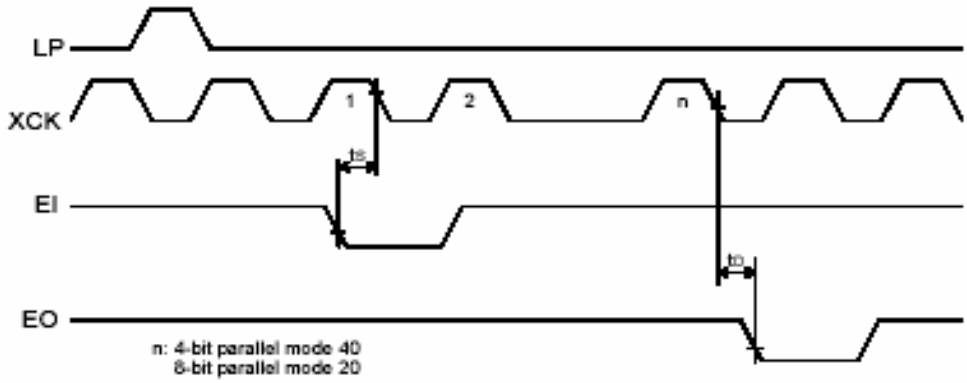
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Shift clock period	t_{WCK}	125	-		ns	tr, tf ≦ 11ns, Note 1
Shift clock "H" pulse width	t_{WCKH}	51	-		ns	
Shift clock "L" pulse width	t_{WCKL}	51	-		ns	
Data setup time	t_{DS}	30	-		ns	
Data hole time	t_{DH}	40	-		ns	
Latch pulse "H" pulse width	t_{WLPH}	51	-		ns	
Shift clock rise to Latch pulse rise time	t_{LD}	0	-		ns	
Shift clock fall to Latch pulse fall time	t_{SL}	51	-		ns	
Latch pulse rise to Shift clock rise time	t_{LS}	51	-		ns	
Latch pulse fall to Shift clock fall time	t_{LH}	51	-		ns	
Input signal rise time	t_r		-	50	ns	Note 2
Input signal fall time	t_f		-	50	ns	Note 2
Enable setup time	t_S	36	-		ns	
$\overline{\text{DISPOFF}}$ Removal time	t_{SD}	100	-		ns	
$\overline{\text{DISPOFF}}$ enable pulse width	t_{WDL}	1.2	-		μs	
Output delay time (1)	t_D		-	78	ns	CL = 15pF
Output delay time (2)	t_{pd1}, t_{pd2}		-	1.2	μs	CL = 15pF
Output delay time (3)	t_{pd3}		-	1.2	μs	CL = 15pF

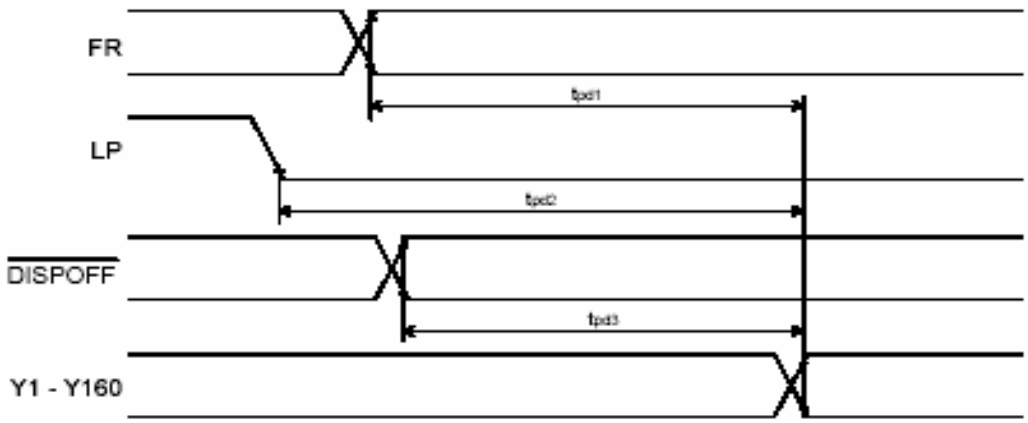
Note

1. Take the cascade connection into consideration.
2. (t_{CK} - t_{WCKH} - t_{WCKL})/2 is the maximum in the case of high speed operation.

Timing waveform of the Segment Mode

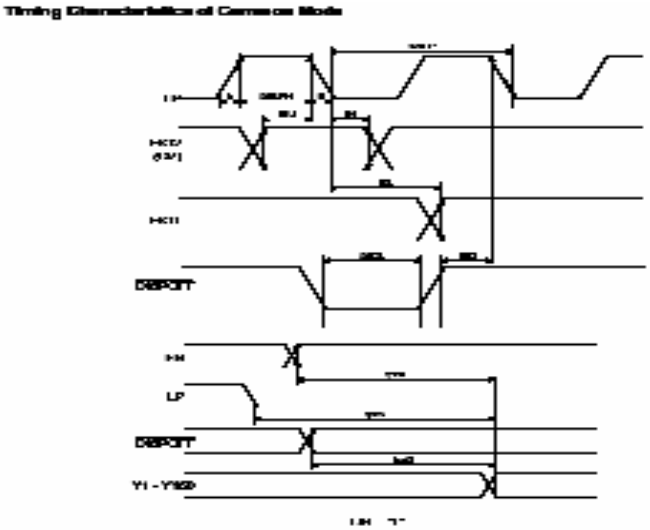


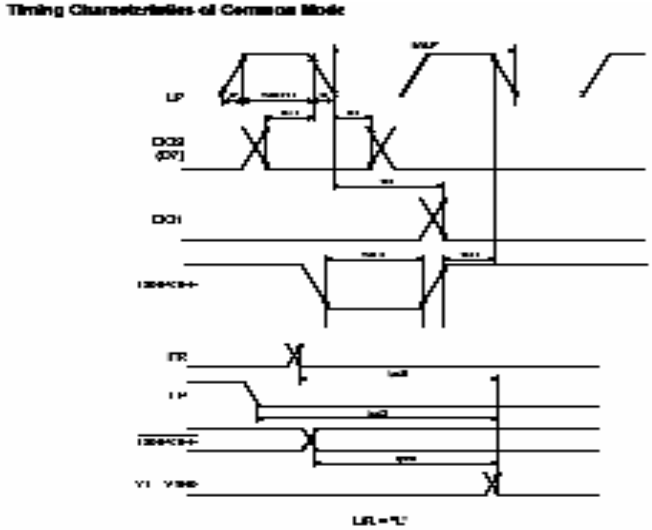




Common mode

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Shift clock period	t_{WLP}	250	-	-	ns	t_r, $t_f \leqq$ 20ns
Shift clock "H" pulse width	t_{WLPH}	15	-	-	ns	V_{DD} = +5.0V ± 10%
		30	-	-	ns	V_{DD} = +2.5 - +4.5V
Data setup time	t_{SU}	30	-	-	ns	
Data hole time	t_H	50	-	-	ns	
Input signal rise time	t_r		-	50	ns	
Input signal fall time	t_f		-	50	ns	
$\overline{\text{DISPOFF}}$ Removal time	t_{SD}	100	-	-	ns	
$\overline{\text{DISPOFF}}$ enable pulse width	t_{WDL}	1.2	-	-	μs	
Output delay time (1)	t_{DL}	-	-	200	ns	C_L = 15pF
Output delay time (2)	t_{pd1}, t_{pd2}	-	-	1.2	μs	C_L = 15pF
Output delay time (3)	t_{pd3}	-	-	1.2	μs	C_L = 15pF





2.The Characteristics and The Reliability Test

1.Electro-Optic Characteristics:

Condition:TEMP=(23。}3)。・ Hum=(70。}5)%RH

V_{dd}: 5.0V

NO	Item		Symbol	Min	Typ.	Max	Unit	Condition
1	Supply Voltage(Logic)		Vdd-Vss		3.3		V	
2	LCD Operating Voltage		Vdd-V_0		20.4		V	-20℃
					20.0		V	25℃
					19.6		V	70℃
3	Response Time		Ton		268		ms	
			Toff		96		ms	
4	Contrast		CR	3				
5	Viewing Angel	12H	θ 1		56		Deg.	(CR≥3.0)
		6H	θ 2		64			
		3H	θ 3		60			
		9H	θ 4		60			
6	LCD Threshold Voltage		Vth		18.0		V	25℃

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2. Characteristics of backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	VF		5.0		V	
Forward Current	IF		80	120	mA	VF=5.0V
Reverse Voltage	VR			5.0	V	
Reverse Current	IR		0.04		mA	
Luminous LV			230		cd/m^2	VF= 5.0V
Color WHIT	E					

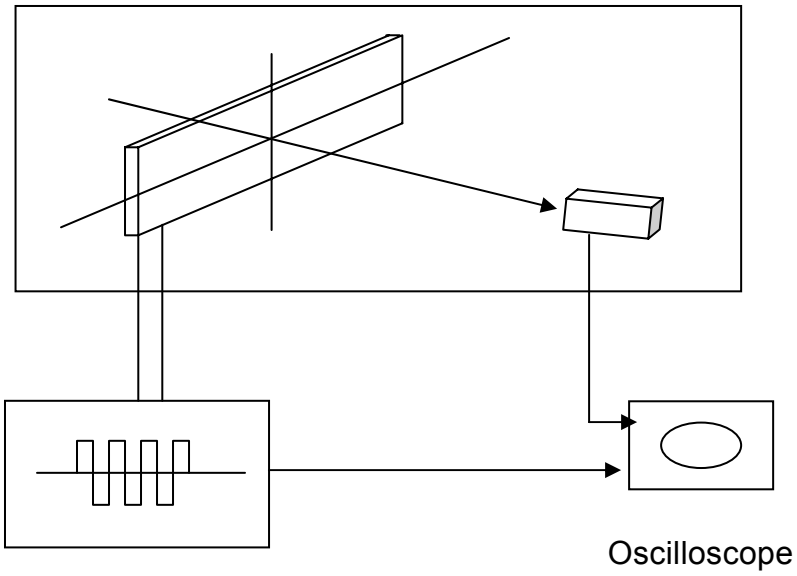
WARNING:

A BACKLIGHT IS A KIND OF CURRENT DEVICE,IT MUST CONNECT A RESISTANCE FOR LIMITING CURRENT ,OR IT WILL BE DAMAGED.

3.The LCD Measuring Method and Equipment

1. Threshold Voltage and Response Time Measuring

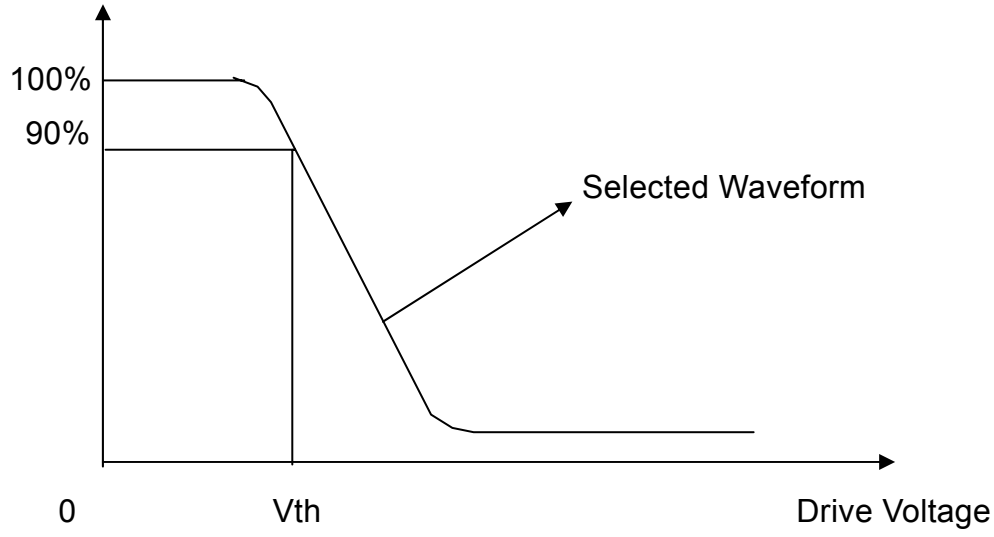
(1) Equipment



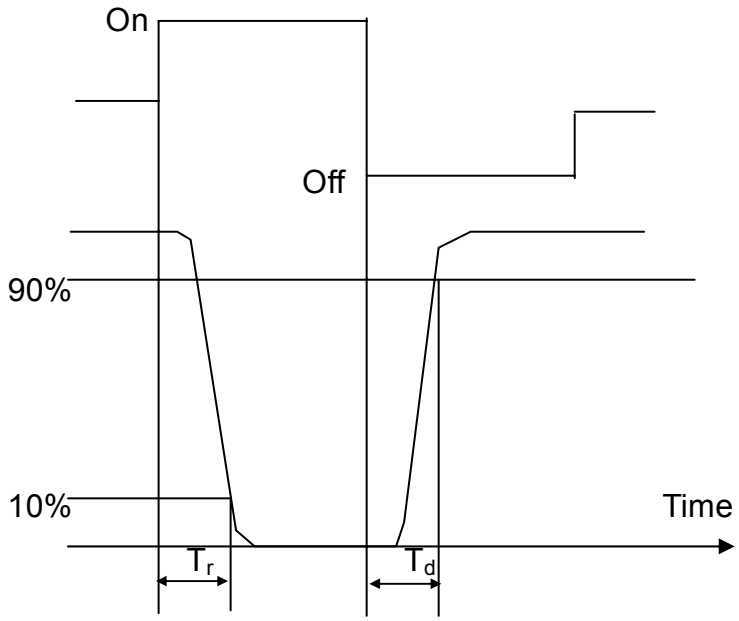
(2) Definition

A. Threshold Voltage (Vth)

Brightness

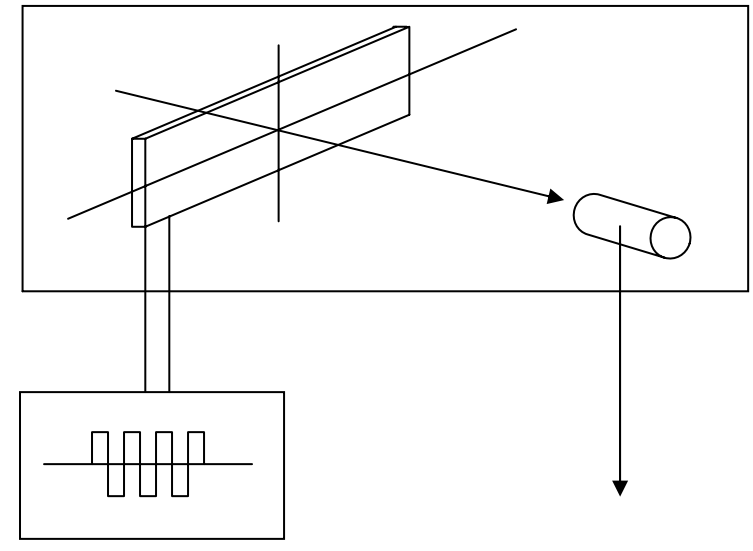


B. Response Time



2. Contrast Measuring

(1) Equipment

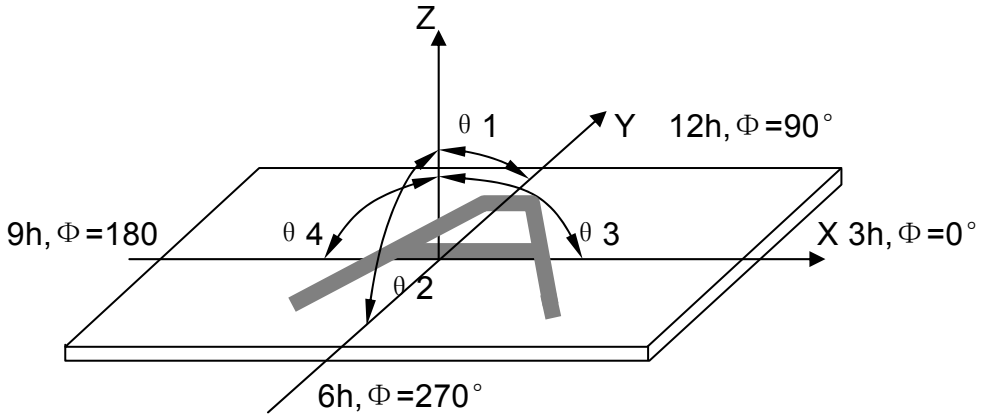


Spectrophotometer

Waveform Generator

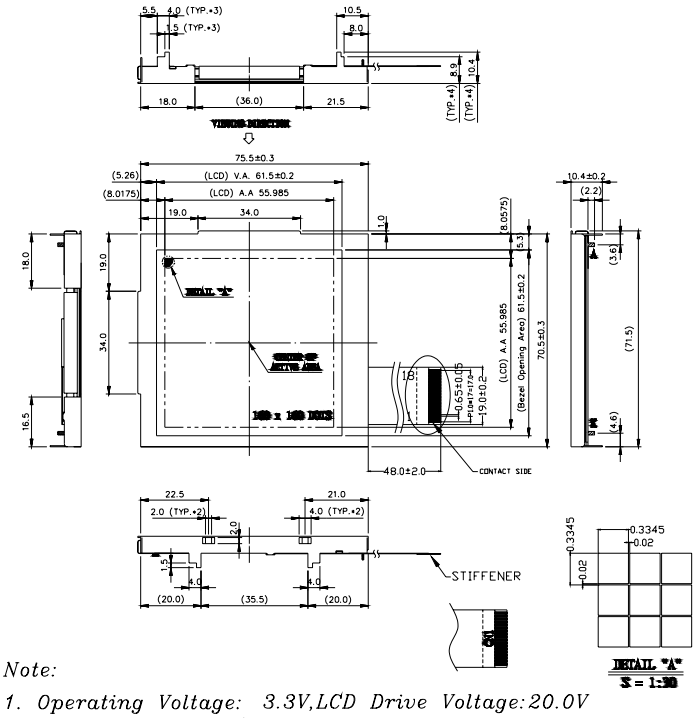
(2)Definition:

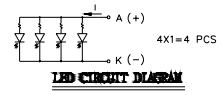
A.Viewing Angle:



B. Contrast Ratio (Positive)

$$CR = \frac{\text{Brightness of non-selected wave-form}}{\text{Brightness of selected wave-form}}$$

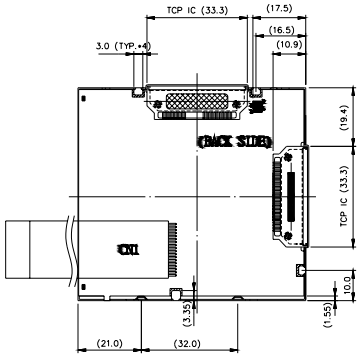




LED CIRCUIT DIAGRAM

LED Backlight Specification:

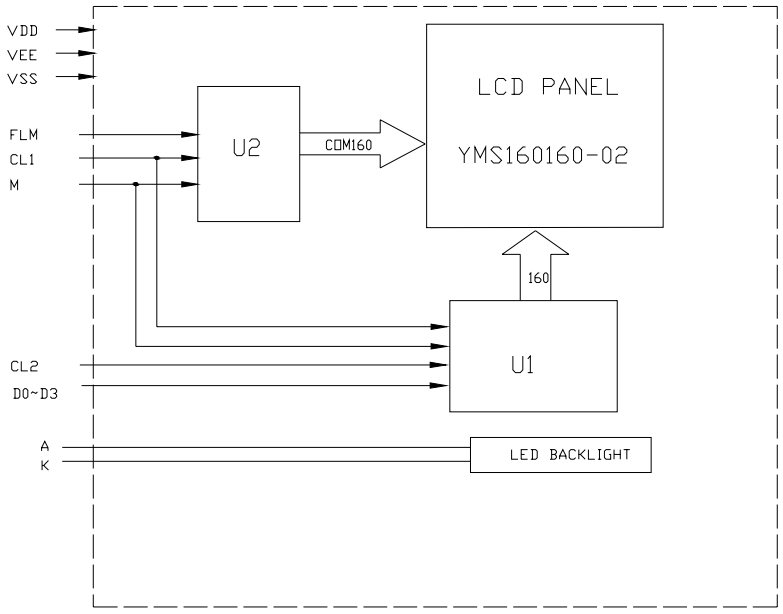
Color		WHITE			
ITEM	SYMBOL	MIN	TYP	MAX	
AVG.X OF 1931 C.I.E.	X	0.28	0.31	0.34	
AVG.Y OF 1931 C.I.E.	Y	0.28	0.31	0.34	
Forward Current	I_F	-	-	80	mA
Forward Voltage	V_F	-	5.0	-	V

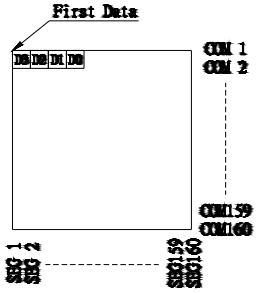


Note:

1. *Operating Voltage: 3.3V,LCD Drive Voltage:20.0V*
2. *Drive method: 1/160Duty, 1/13Bias*
3. *Viewing Direction: 6:00*
4. *Operating Temp: 0°C~50°C*
5. *Storage Temp: -20°C~70°C*
6. *Display type: FSTN,Positive*
7. *LCD DRIVER:NT7701H-TAB18*
8. *BACKLIGHT:LED/W*
9. *Frame Matrial:Covered With Nickel(0.4mmt)*

Unspecified Tolerance: ±0.2





DATA SEQUENCE

INTERFACE (CN1)

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