

# LCD MODULE SPECIFICATION

**MODEL NO.**

**BG320240C series**

FOR MESSRS:

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ON DATE OF:

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APPROVED BY:

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## **C O N T E N T S**

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## 1. Numbering System

<u>B</u>	<u>C</u>	<u>2004</u>	<u>A</u>	<u>G</u>	<u>P</u>	<u>L</u>	<u>E</u>	<u>B</u>	<u>xxx</u>
0	1	2	3	4	5	6	7	8	9

<b>0</b>	Brand		Bolymin						
<b>1</b>	Module Type			C= character type G= graphic type P= TAB/TCP type		O= COG type F= COF type			
<b>2</b>	Format			2002=20 characters, 4 lines 12232= 122 x 32 dots					
<b>3</b>	Version No.			A type					
<b>4</b>	LCD Color			G=STN/gray Y=STN/yellow-green C=color STN		B=STN/blue F=FSTN T=TN			
<b>5</b>	LCD Type			R=positive/reflective P=positive/transflective		M=positive/transmissive N=negative/transmissive			
<b>6</b>	Backlight type/color			L=LED array/ yellow-green H=LED edge/white R=LED array/red G=LED edge/yellow-green		D=LED edge/blue E=EL/white B=EL/blue C=CCFL/white			
<b>7</b>	CGRAM Font (applied only on character type)			J=English/Japanese Font E=English/European Font		C=English/Cyrillic Font H=English/Hebrew Font			
<b>8</b>	View Angle/ Operating Temperature			B=Bottom/Normal Temperature H=Bottom/Wide Temperature U=Bottom/Ultra wide Temperature		T=Top/Normal Temperature W=Top/Wide Temperature C=9H/Normal Temperature			
<b>9</b>	Special Code			3=3 volt logic power supply n=negative voltage for LCD c=cable/connector xxx=to be assigned on data sheet		t=temperature compensation for LCD p=touch panel			

## 2. General Specification

### (1) Mechanical Dimension

Item	Standard Value	Unit
Number of dots	320x240	dots
Outline dimension (W*H*T)	156.7x 98.0 x 17.0max - LED bottom B/L 156.7x 98.0 x 11.4max - LED edge B/L, EL or No B/L, CCFL	mm
View area	106.0(W)x 80.6(H)	mm
Active area	95.98(W)x 71.98(H)	mm
Dot size	0.27(W)x 0.27(H)	mm
Dot pitch	0.3(W)x 0.3(H)	mm

(2) Controller IC: No built-in Controller (Recommended controller: SED1335)

### (3) Temperature Range

	Normal	Wide
Operating	0 ~+50°C	-20 ~+70°C
Storage	-10 ~+ 60°C	-30 ~+80°C

## 3. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T <sub>OP</sub>	-20	—	+70	°C
Storage Temperature	T <sub>ST</sub>	-30	—	+80	°C
Input Voltage	V <sub>I</sub>	-0.3	—	V <sub>DD</sub>	V
Supply Voltage For Logic	V <sub>DD</sub>	0	—	6.5	V
Supply Voltage For LCD	V <sub>DD</sub> -V <sub>EE</sub>	0	—	32	V

#### 4. Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic	$V_{DD}-V_{SS}$	—	—	5.0	5.5	V
Supply Voltage For LCD * Wide Temp、Type	$V_{DD}-V_o$	* Ta=-20°C	—	—	23.6	V
		Ta=25°C	—	21.6	—	V
		* Ta=+70°C	19.6	—	—	V
Input High Vol.	$V_{IH}$	—	0.8V <sub>DD</sub>	—	V <sub>DD</sub>	V
Input Low Vol.	$V_{IL}$	—	0	—	0.2V <sub>DD</sub>	V
Output High Vol.	$V_{OH}$	—	V <sub>DD</sub> -0.4	—	—	V
Output Low Vol.	$V_{OL}$	—	—	—	0.4	V
Supply Current	$I_{DD}$	V <sub>DD</sub> =5V	—	45	50	mA

#### 5. Optical Characteristics

##### a. FSTN

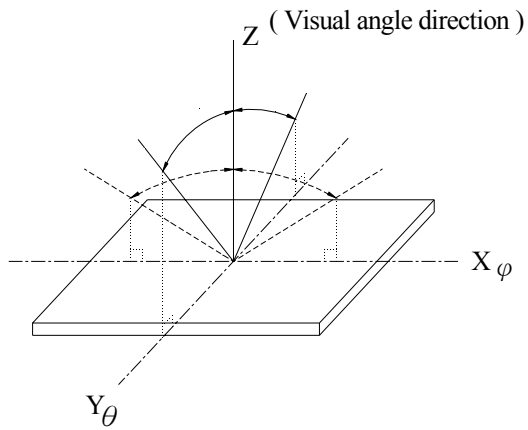
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) $\theta$	CR $\geq$ 3	10		120	deg
	(H) $\varphi$	CR $\geq$ 3	-45		45	deg
Contrast Ratio	CR	—		5		—
Response Time	T rise	—		200	300	ms
	T fall	—		150	200	ms

##### b. STN

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) $\theta$	CR $\geq$ 3	10	—	105	deg.
	(H) $\varphi$	CR $\geq$ 3	-30	—	30	deg.
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	200	300	ms
	T fall	—	—	150	200	ms

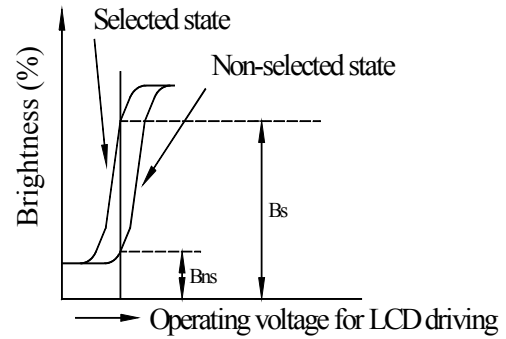
## 5.1 Definitions

### ■ View Angles

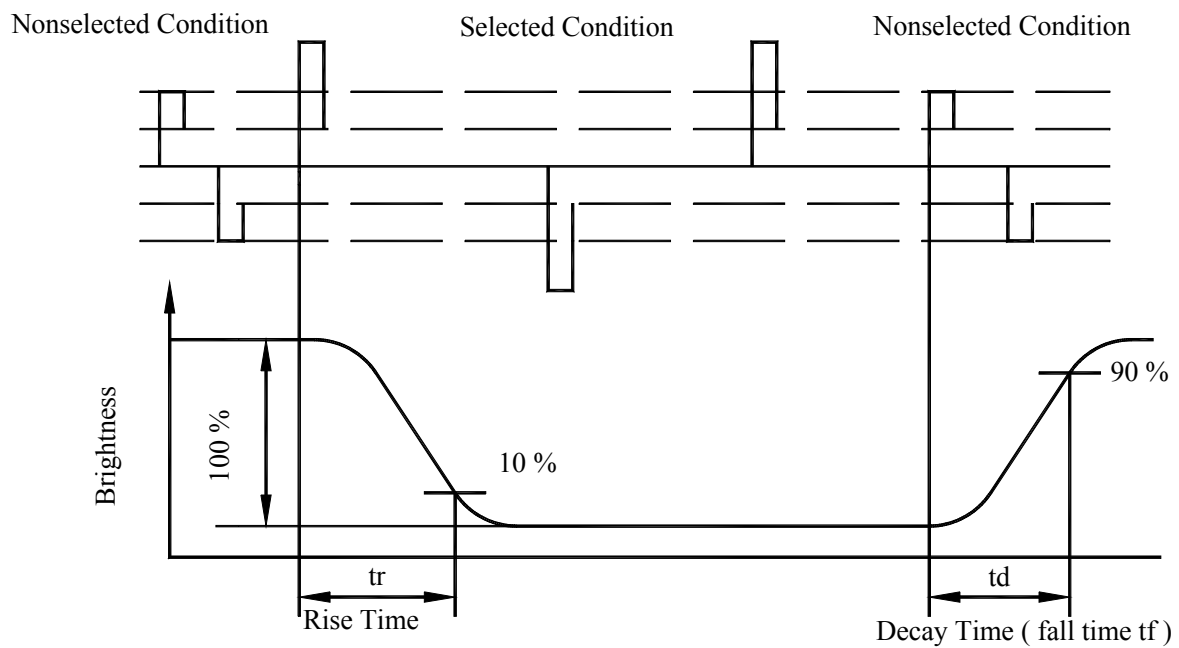


### ■ Contrast Ratio

$$CR = \frac{\text{Brightness at selected state (BS)}}{\text{Brightness at non-selected state (Bns)}}$$



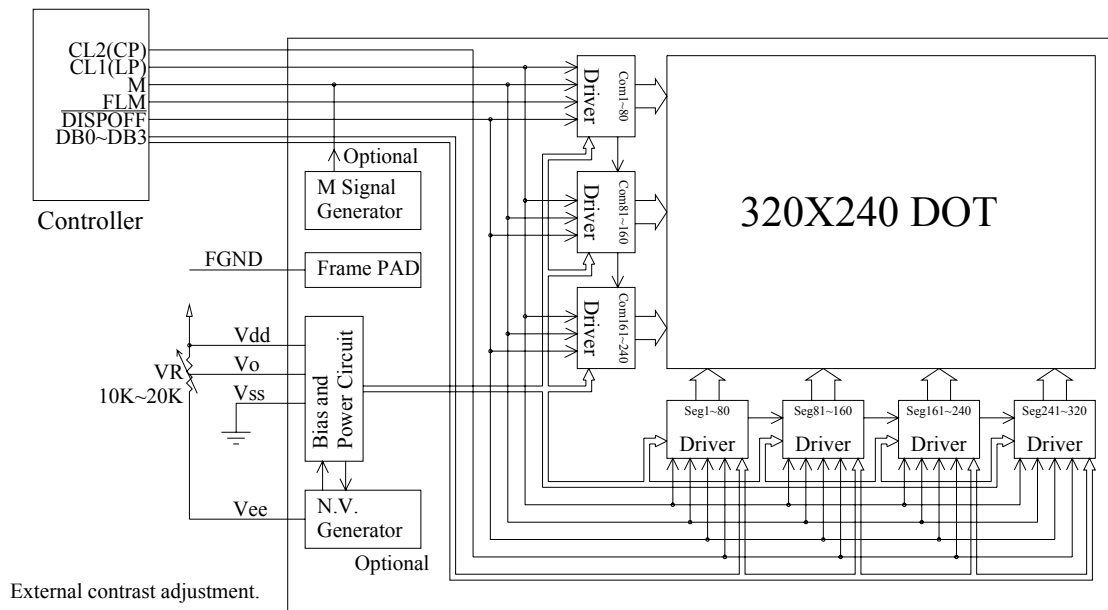
### ■ Response time



## 6. Interface Description

Pin No.	Symbol	Level	Description
1	FLM	H/L	First line marker
2	M	H/L	Frame reverse signal
3	LP	H to L	Data latch pulse
4	CP	H to L	Data shift pulse
5	$\overline{\text{DISPOFF}}$	H/L	H: Display ON, L: Display OFF
6	DB0	H/L	Display data, bit0
7	DB1	H/L	Display data, bit1
8	DB2	H/L	Display data, bit2
9	DB3	H/L	Display data, bit3
10	VDD	5.0V	Power supply for Logic ( option +3V)
11	VSS	0V	Ground
12	VEE		Negative Voltage -25V(option)
13	V <sub>O</sub>	(Variable)	Driving voltage for LCD
14	FGND		Frame Ground

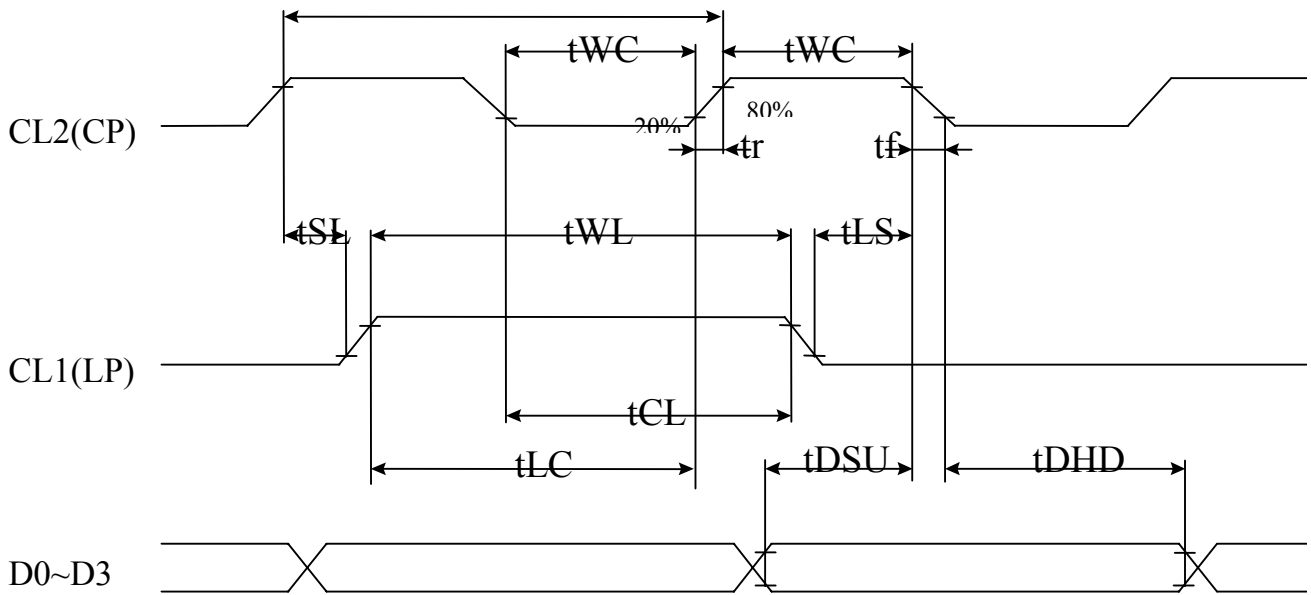
## 7. Block Diagram



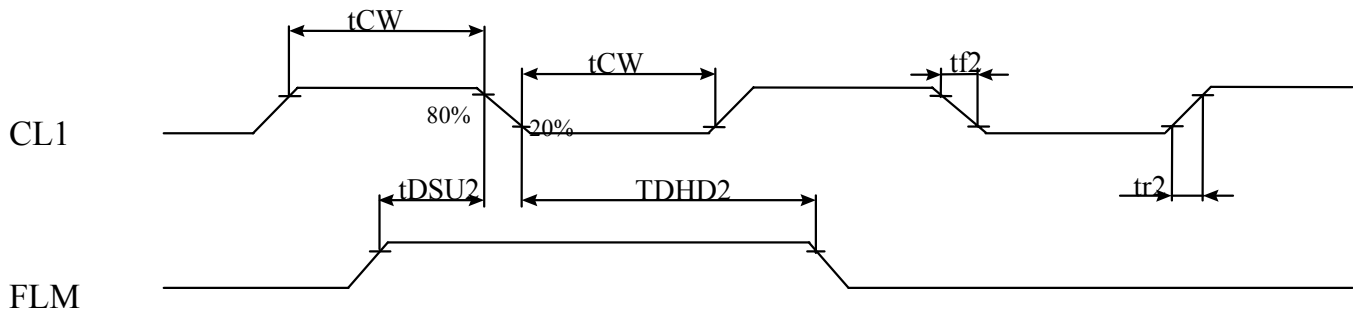
## 8. Timing Characteristics

Item	symbol	Test Condition	Min.	Typ.	Max.	Units
Clock Cycle	tC	Fig.1	100	—	—	ns
CP Pulse Width	tWC	Fig.1	50	—	—	ns
LP Pulse Width	tWL	Fig.1	50	—	—	ns
Data Set Up Time	tDSU	Fig.1	30	—	—	ns
Data Hold Time	tDHD	Fig.1	30	—	—	ns
CP Rise/Fall Time	tr,tf	Fig.1	—	—	50	ns
CP to LOAD	tCL	Fig.1	80	—	—	ns
LOAD to CP	tLC	Fig.1	110	—	—	ns
LP Pulse Width	tLW	Fig.1	50	—	—	ns
CL1 Pulse Width	tCW	Fig.2	63	—	—	ns
Data Set Up Time	tDSU2	Fig.2	100	—	—	ns
Data Hold Time	tDHD2	Fig.2	100	—	—	ns
CL1 Rise/Fall Time	tr2,tf2	Fig.2	—	—	50	ns





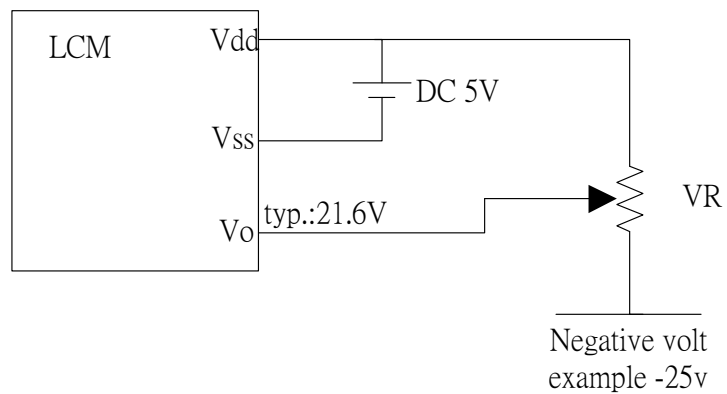
**Fig 1. SEGMENT TIMING**



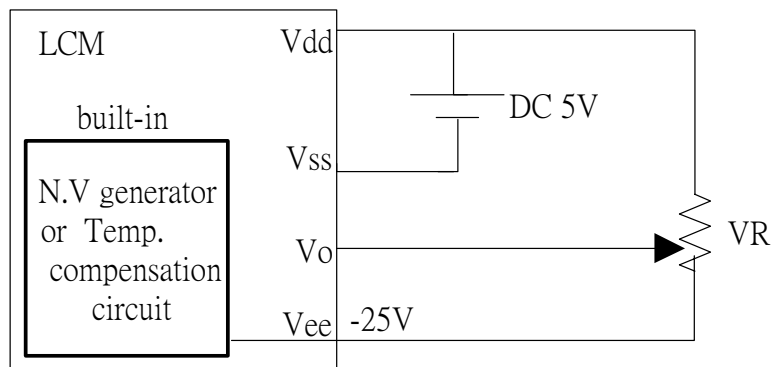
**Fig 2 COMMON TIMING**

## 9. Power Supply for LCD Module and LCD Operating Voltage a Adjustment

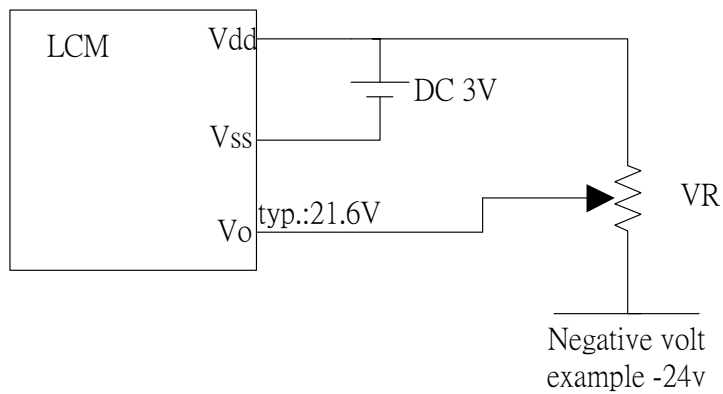
\*(Optional) LCM operating on " DC 5V " input with external negative voltage



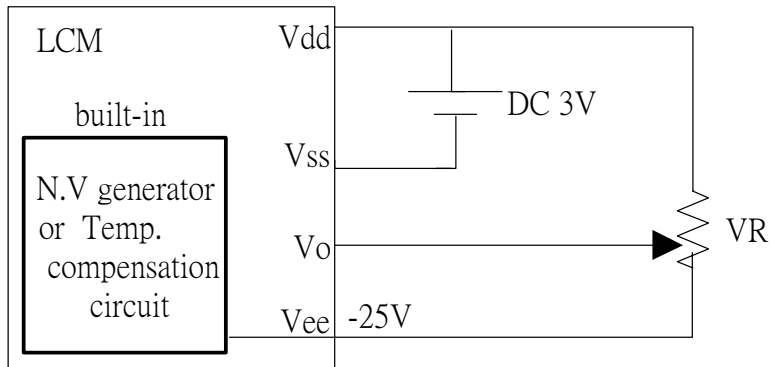
\*(Optional) LCM operating on "DC 5V" input with built-in negative voltage



\*(Optional) LCM operating on " DC 3V " input with external negative voltage



\* (Optional) LCM operating on "DC 3V" input with built-in negative voltage



## 10. Backlight Information

### 10.1 Specification

(1) LED bottom / yellow-green

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	I <sub>LED</sub>	—	720		mA	V=4.2V
Supply Voltage	V	—	4.2	4.6	V	—
Reverse Voltage	V <sub>R</sub>	—	—	8	V	—
Luminous Intensity	I <sub>V</sub>	80	100	—	cd/m <sup>2</sup>	I <sub>LED</sub> =720mA
Wave Length	λ <sub>p</sub>	—	570	572	nm	I <sub>LED</sub> =720mA
Life Time	—	—	100000	—	Hr.	V ≤ 4.2V
Color	Yellow-green					

## (2) LED edge / white

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	I <sub>LED</sub>	—	160	—	mA	V=3.5V
Supply Voltage	V	—	3.5	3.5	V	—
Reverse Voltage	V <sub>R</sub>	—	—	10	V	—
Luminous Intensity	I <sub>V</sub>	—	23	—	cd/m <sup>2</sup>	I <sub>LED</sub> =160mA
Wave Length	λ <sub>p</sub>	—	—	—	nm	I <sub>LED</sub> =160mA
Life Time	—	—	70000	—	Hr.	V ≤ 3.6V
Color	White					

## (3) EL / white

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Drive Voltage	V <sub>max</sub>	—	110	170	V <sub>rms</sub>	25°C
Drive Wave	F <sub>max</sub>	—	400	1000	Hz	25°C
Brightness		35	—	—	cd/m <sup>2</sup>	110V/400Hz
Power Consumption		—	280.6	—	mW	110V/400Hz
Chromatism	X	—	0.330	—	—	110V/400Hz
	Y	—	0.365	—	—	110V/400Hz
Life time			5000		hour	110V/400Hz
Color			White		—	Light on 110V/400Hz

(4) CCFL / white

(Ta=25°C)

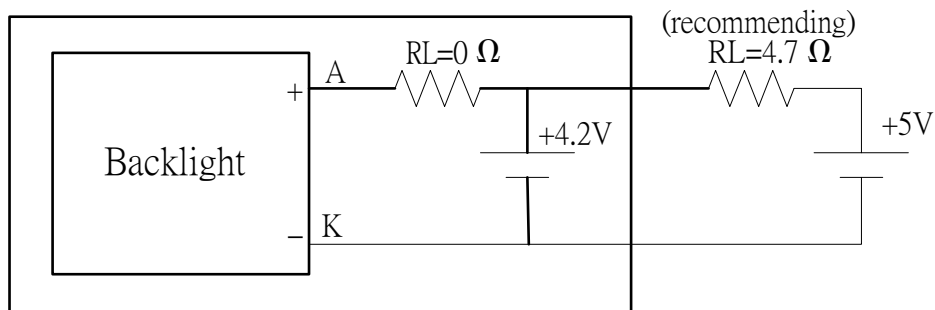
Item	Symbol	Specification			Unit	Condition
		Min	Typ	Max		
Driving Voltage	$V_{FL}$	—	278	—	Vrms	—
Input current	$I_{FL}$	3.0	5.0	6.0	mA rms	—
Power consumption	W	—	1.35	—	W	—
Starting Voltage	$V_{FLS}$	—	530	—	Vrms	—
Luminance	L	—	550	—	Cd/m <sup>2</sup>	$\varphi, \theta = 0 \text{ deg}, I_{FL} = 5.0 \text{ mA rms}$
Chromaticity	x	—	0.340	—	—	—
	y	—	0.370	—	—	—
Luminance Uniformity (Testing 9 point)	—	75%	—	—	%	$\varphi, \theta = 0 \text{ deg}, I_{FL} = 5.0 \text{ mA rms}$
Life time	—	15000	—	—	hrs	

10.2 Backlight driving methods

a. LED B/L driven from A.K cable directly

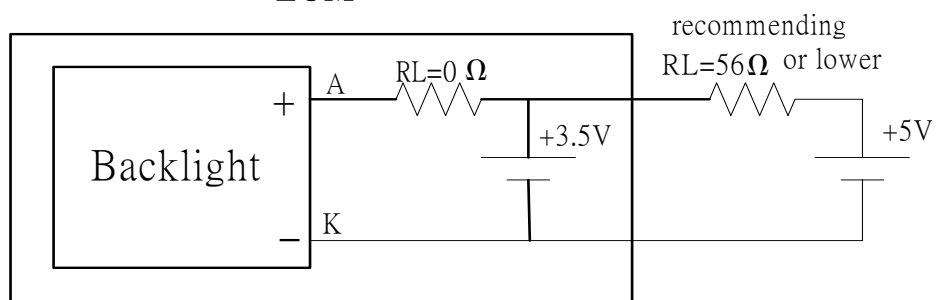
a.1 bottom (yellow-green)

LCM

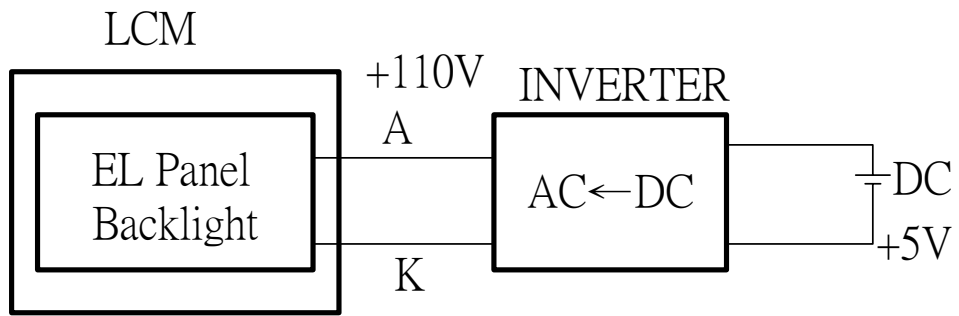


a.2 edge (white)

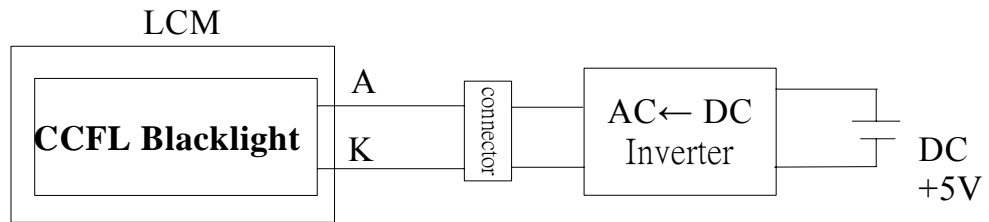
LCM



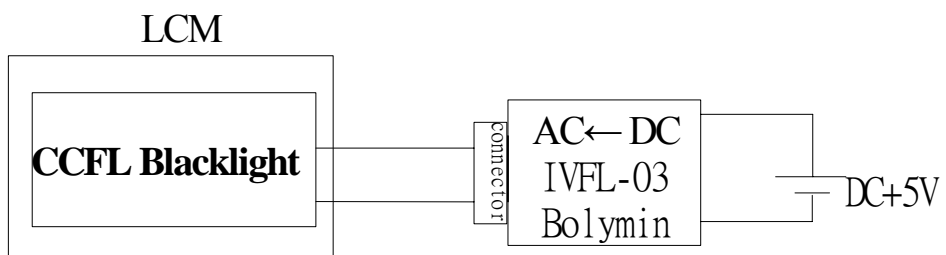
b.EL B/L drive from A.K directly



c. CCFL B/L driven from A.K cable directly  
type1:



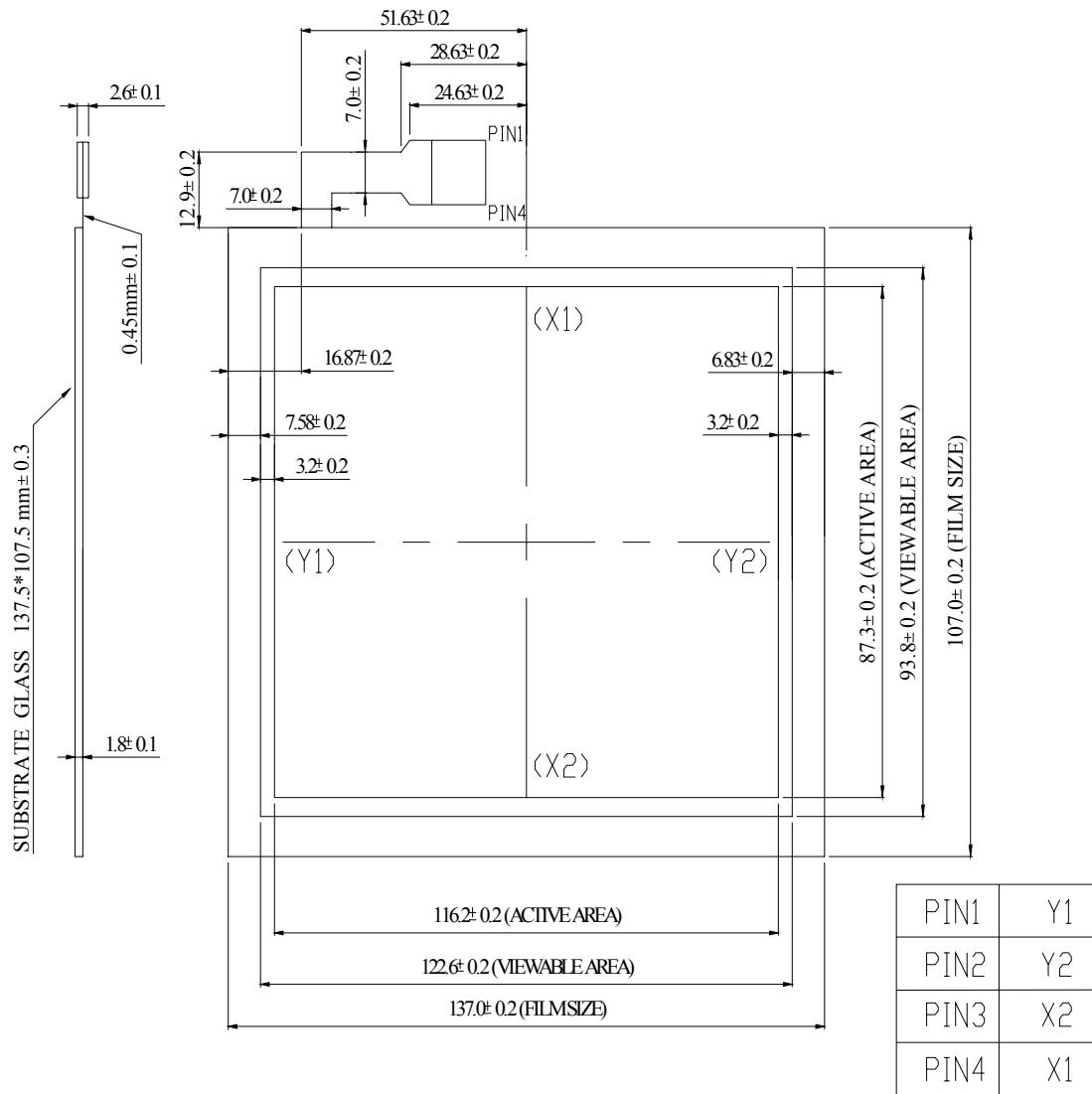
type2:



### 10.3 CCFL INVENTER DATA (P/N:IVFL-03)

As shown on next page

# 11.Touch panel Information





## 11.1 Electrical Specifications

Item	Specification	Condition
On Resistance	250 $\Omega$ ~ 750 $\Omega$	Direction :X
	250 $\Omega$ ~ 800 $\Omega$	Direction :Y
Insulation Resistance	More Than 20M $\Omega$	DC 25V
Chattering Time	Less Than 10 msec	100K $\Omega$ Pull-Up
Linearity	$\pm 1.0\%$	X AXIS
	$\pm 1.0\%$	Y AXIS

## 11.2 Machine Specifications

Item	Specification	Condition
Operating Force	Less Than 80g	R8.0 HS 40 ° Silicon Rubber Or R0.8 POLYACETAL PEN
Surface Hardness	More Than 2H	Pencil Test
Light Transmission	More Than 80 %	@550nm HITACHI U3300
Durability For Pen Selections	More Than 1,200,000 Times	Force:250g Speed:2cm/sec

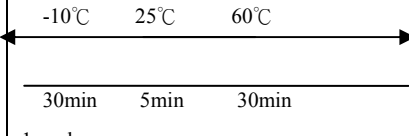
## 12. Quality Assurance

### ◆ Screen Cosmetic Criteria

No.	Defect	Judgement Criterion	Partition																				
1	Spots	<p>A)Clear</p> <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td><math>d \leq 0.1</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.1 &lt; d \leq 0.2</math></td> <td>6</td> </tr> <tr> <td><math>0.2 &lt; d \leq 0.3</math></td> <td>2</td> </tr> <tr> <td><math>0.3 &lt; d</math></td> <td>0</td> </tr> </tbody> </table> <p>Note: Including pin holes and defective dots which must be within one pixel size.</p> <p>B)Unclear</p> <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td><math>d \leq 0.2</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.2 &lt; d \leq 0.5</math></td> <td>6</td> </tr> <tr> <td><math>0.5 &lt; d \leq 0.7</math></td> <td>2</td> </tr> <tr> <td><math>0.7 &lt; d</math></td> <td>0</td> </tr> </tbody> </table>	Size: d mm	Acceptable Qty in active area	$d \leq 0.1$	Disregard	$0.1 < d \leq 0.2$	6	$0.2 < d \leq 0.3$	2	$0.3 < d$	0	Size: d mm	Acceptable Qty in active area	$d \leq 0.2$	Disregard	$0.2 < d \leq 0.5$	6	$0.5 < d \leq 0.7$	2	$0.7 < d$	0	Minor
Size: d mm	Acceptable Qty in active area																						
$d \leq 0.1$	Disregard																						
$0.1 < d \leq 0.2$	6																						
$0.2 < d \leq 0.3$	2																						
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$0.2 < d \leq 0.5$	6																						
$0.5 < d \leq 0.7$	2																						
$0.7 < d$	0																						
2	Bubbles in Polarize	<table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td><math>d \leq 0.3</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.3 &lt; d \leq 1.0</math></td> <td>3</td> </tr> <tr> <td><math>1.0 &lt; d \leq 1.5</math></td> <td>1</td> </tr> <tr> <td><math>1.5 &lt; d</math></td> <td>0</td> </tr> </tbody> </table>	Size: d mm	Acceptable Qty in active area	$d \leq 0.3$	Disregard	$0.3 < d \leq 1.0$	3	$1.0 < d \leq 1.5$	1	$1.5 < d$	0	Minor										
Size: d mm	Acceptable Qty in active area																						
$d \leq 0.3$	Disregard																						
$0.3 < d \leq 1.0$	3																						
$1.0 < d \leq 1.5$	1																						
$1.5 < d$	0																						
3	Scratch	In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor																				
4	Allowable Density	Above defects should be separated more than 30mm each other.	Minor																				
5	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-light type should be judged with back-light on state only.	Minor																				

### 13. Reliability

#### Content of Reliability Test

Environmental Test				
No.	Test Item	Content of Test	Test Condition	Applicable Standard
1	High Temperature storage	Endurance test applying the high storage temperature for a long time.	60°C 200hrs	—
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-10°C 200hrs	—
3	High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	50°C 200hrs	—
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	0°C 200hrs	—
5	High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60°C,90%RH 96hrs	—
6	High Temperature/ Humidity Operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	50°C,90%RH 96hrs	—
7	Temperature Cycle	Endurance test applying the low and high temperature cycle.   1 cycle	-10°C/60°C 10 cycles	—
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	—
9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msdc 3 times of each direction	—
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115mbar 40hrs	—
Others				
11	Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	—

\*\*\*Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25°C