LCD Module Specification

Model: LG3202402-LMDWH6V-CN3

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RECORD OF REVISION

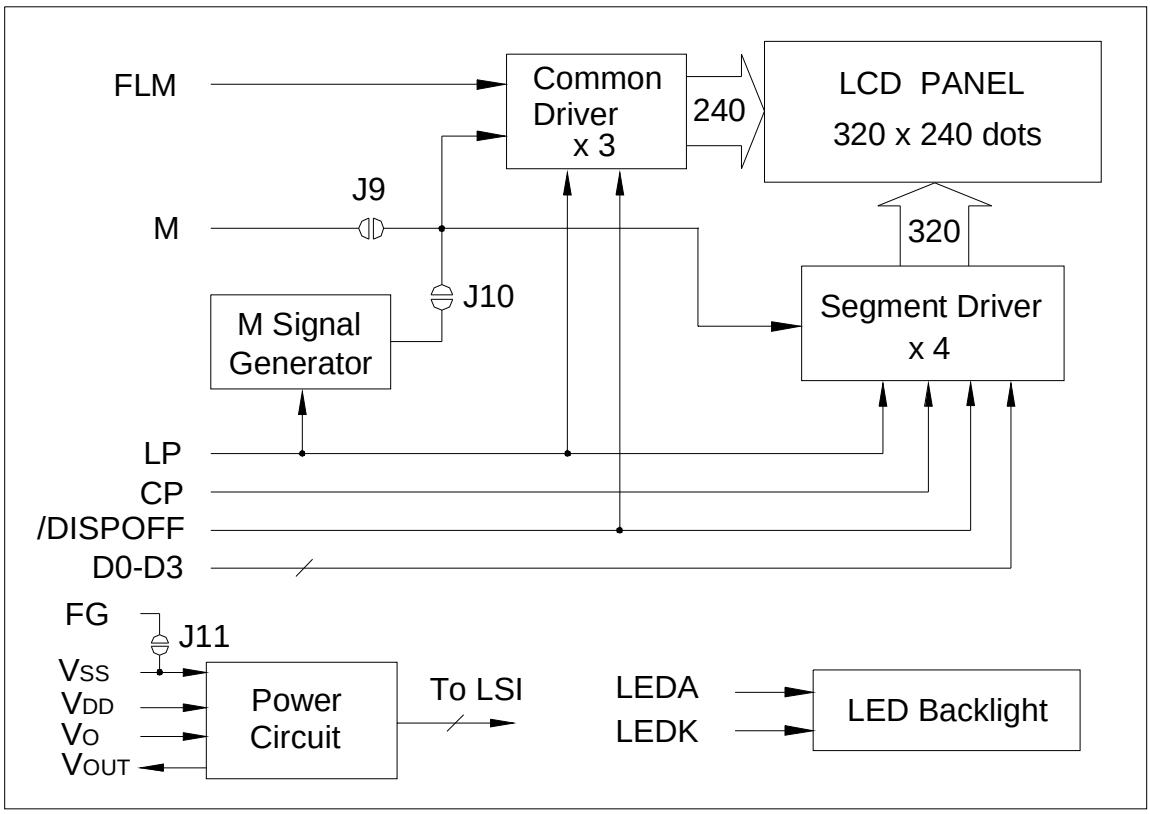
Rev.	Date	Page	Item	Description
0.1	2007/04/16	--	--	New release
0.2	2007/10/18	3, 9	1.3, 5	Modify: Terminal Pin Assignment

1. BASIC SPECIFICATIONS

1.1 Features

Display Format	:	320 X 240 Dots
LCD Mode	:	FSTN－Blue－Negative－Transmissive
Driving Method	:	1/240 Duty, 1/15 Bias
Viewing Direction	:	6:00
Backlight	:	LED, white color
Outline Dimension	:	160.0(W) X 109.0(H) X 13.0(T) mm
Viewing Area	:	122.0(W) X 92.0(H) mm
Dot Size	:	0.33 X 0.33 mm
Dot Pitch	:	0.36 X 0.36 mm
Weight	:	220 g
Driver	:	S6B2086
Inferface	:	4 bits parallel data input
Power supply	:	3.3 to 5.0V for logic Built in DC-DC converter for LCD driving 5.0V for LED backlight

1.2 Block Diagram



1.3 Terminal Functions (CN1: Thru Hole Terminal, CN2: 1.0mm FFC Terminal, CN3: 1.25mm FFC Terminal)

Pin No.	Symbol	Level	Function
1	D0	H/L	Display data 0
2	D1	H/L	Display data 1
3	D2	H/L	Display data 2
4	D3	H/L	Display data 3
5	/DISPOFF	H/L	H: Display on L: Display off
6	FLM	H	Scan start-up pulse
7	NC (M)	--	No connection **<Default>** or External M signal for AC driving. Ref. to Section 1.5
8	LP	H→L	Display data latch pulse
9	CP	H→L	Display data shift pulse
10	V_{DD}	+3.3~5V	Power supply for logic
11	V_{SS}	0V	Ground
12	V_{OUT}	-21.5V	Output voltage for LCD driving
13	V_O	--	Operating voltage for LCD (contrast adjusting)
14	FGND	--	Frame ground (connects to V_{SS} via J11)
15	LEDA	+5V	Power supply for LED backlight
16	LEDK	0V	Power supply for LED backlight

Notes:

1. Only CN1 is with Pin 15 and Pin 16 terminals
2. Only CN3 is with FFC connector, CN2 is without connector

1.4 Terminal Functions (CN4: Thru Hole Terminal)

Pin No.	Symbol	Level	Function
1	LEDA	+5V	Power supply for LED backlight
2	NC	--	No connection
3	LEDK	0V	Power supply for LED backlight

1.5 Select Internal or External M Signal by Jumpers

J9	J10	Pin 7 Function	Description
Open	Close	NC	Use internal M signal, leave Pin 7 open **<Default>**
Close	Open	External M signal	External M signal input for AC driving
Close	Close	--	Not allowed

2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit
Supply Voltage(Logic)	VDD-VSS	-0.3	7.0	V
Supply Voltage(LCD)	VDD-VO	-0.3	30.0	V
Input Voltage	VI	-0.3	VDD+0.3	V
Operating Temp.	Topr	-20	70	℃
Storage Temp.	Tstg	-30	80	℃

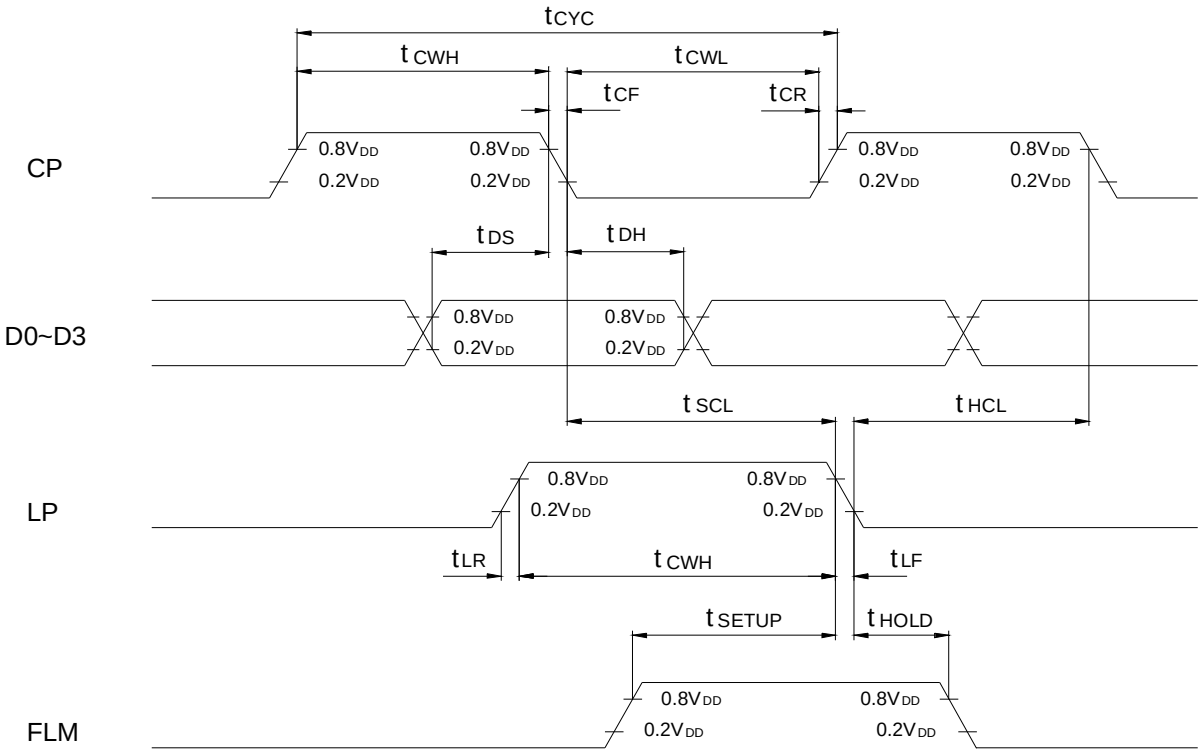
3. ELECTRICAL CHARACTERISTICS

3.1 DC Characteristics (Ta=25℃)

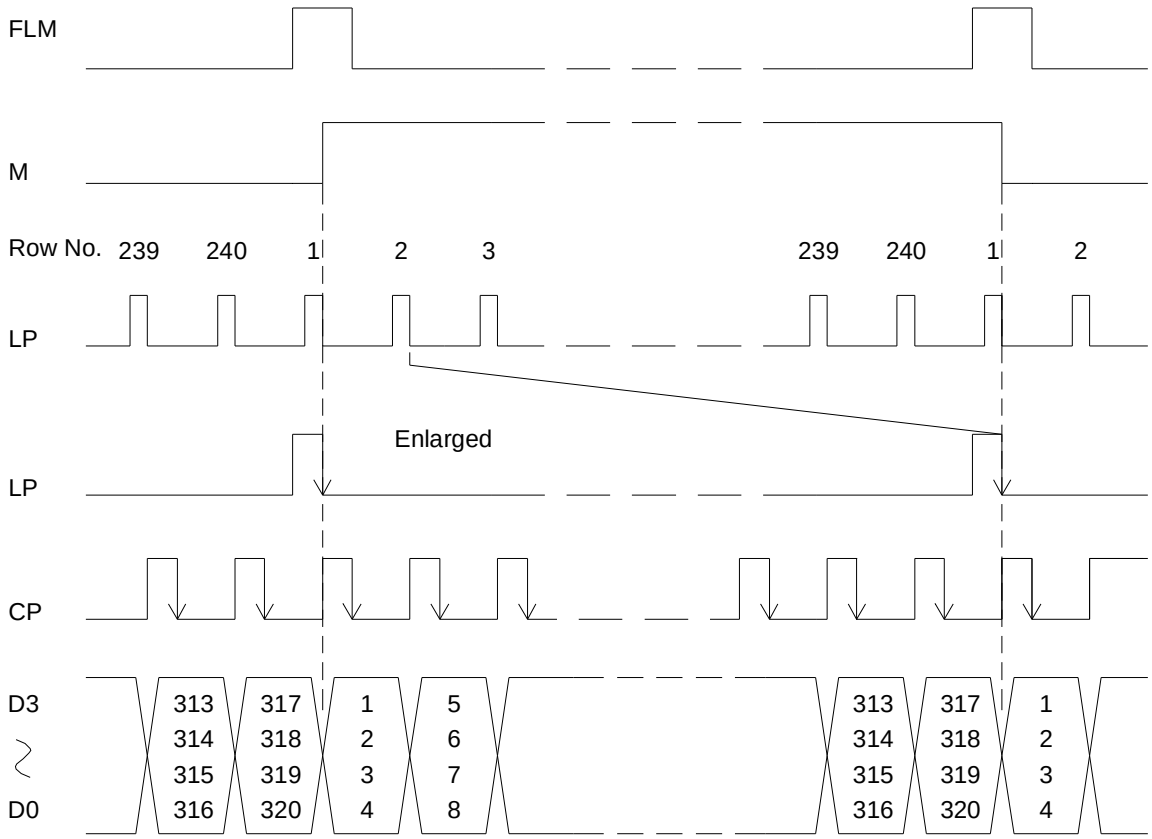
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage (Logic)	VDD		3.3	--	5.5	V
Supply Voltage (LCD Drive)	VDD-VO		--	22.6	--	V
Input High Voltage	VIH		0.8VDD	--	VDD	V
Input Low Voltage	VIL		0	--	0.2VDD	V
Supply Current (Logic)	IDD	VDD=5.0V	--	30.0	60.0	mA
	IDD	VDD=3.3V	--	40.0	90.0	mA

3.2 AC Characteristics (Ta=25℃)

Parameters	Symbol	VDD=4.5 to 5.5V		VDD=3.3 to 4.5V		Unit
		Min.	Max.	Min.	Max.	
Clock cycle time	tCYC	125	--	250	--	ns
Clock pulse width	tWCH, tWCL	45	--	95	--	ns
CP rise/fall time	tCR , tCF	--	30	--	30	ns
LP rise/fall time	tLR , tLF	--	50	--	50	ns
Data set up time	tDS	30	--	65	--	ns
Data hold time	tDH	30	--	65	--	ns
Clock set up time	tSCL	80	--	120	--	ns
Clock hold time	tHCL	80	--	120	--	ns
FLM set up time	tSETUP	30	--	65	--	ns
FLM hold time	tHOLD	30	--	65	--	ns



3.3 Timing Chart of Input Signals



3.4 Display Data Pattern

SEG / COM	S1	S2	S3	S4	S5	• • • • • •	S316	S317	S318	S319	S320
C1	D3	D2	D1	D0	D3	• • • • • •	D0	D3	D2	D1	D0
C2	D3	D2	D1	D0	D3	• • • • • •	D0	D3	D2	D1	D0
•											
•											
•											
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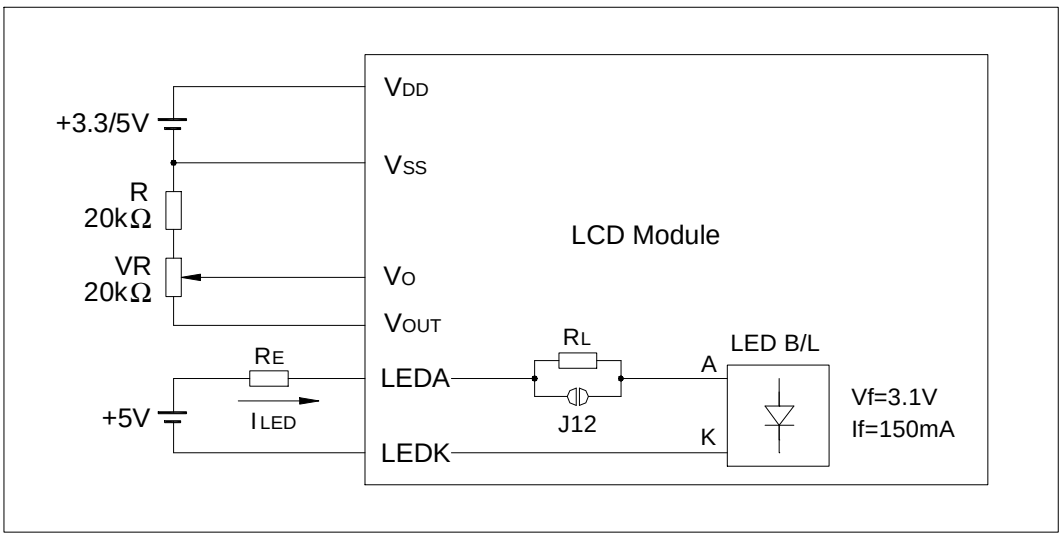
C239	D3	D2	D1	D0	D3	• • • • • •	D0	D3	D2	D1	D0
C240	D3	D2	D1	D0	D3	• • • • • •	D0	D3	D2	D1	D0

Input data	Dots (Row) on display				
D3	Dot 1	Dot 5	• • •	Dot 313	Dot 317
D2	Dot 2	Dot 6	• • •	Dot 314	Dot 318
D1	Dot 3	Dot 7	• • •	Dot 315	Dot 319
D0	Dot 4	Dot 8	• • •	Dot 316	Dot 320

3.5 LED Backlight Characteristics (Ta=25℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	Vf		2.9	3.1	3.3	V
Forward Current	If	Vf=3.1V	--	150	--	mA
Color	White					

3.6 Power Supply

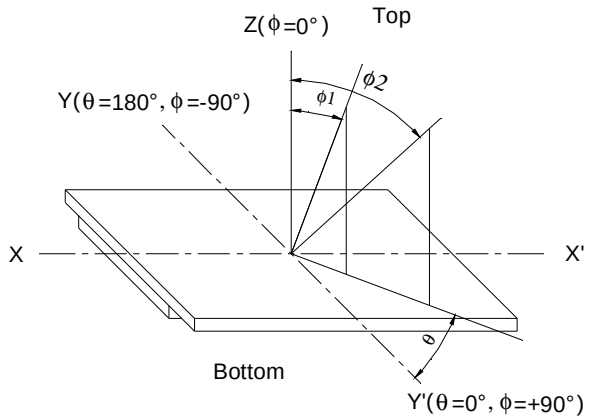


* VR is for LCD contrast adjusting, V_{DD}-V_O is around 22.6V
* R_L (internal) and R_E (external) are the current limiting resistors for LED backlight
  J12 Open: R_E=0Ω, supply 5.0V to LEDA and LEDK **<Default>**
  J12 Close: R_E=(5.0V-3.1V)/150mA=13Ω, supply 3.1V to LEDA and LEDK

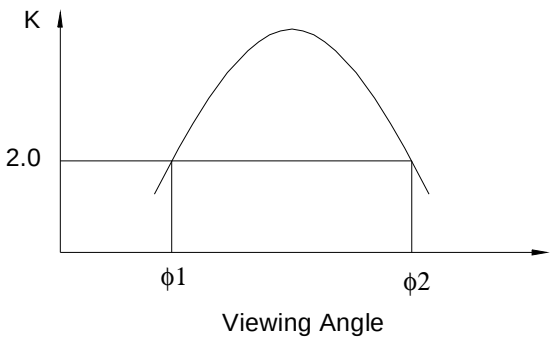
4. ELECTRO—OPTICAL CHARACTERISTICS (Ta=25℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
View Angle	Φ2-Φ1	K≥2 , θ=0°	--	60	--	Deg	Note1, Note2
Contrast	K	Φ=0° ,θ=0°	3	--	--	--	Note3
Response Time	tr (rise)	Φ=0° ,θ=0°	--	250	--	ms	Note3
	tf (fall)	Φ=0° ,θ=0°	--	250	--	ms	

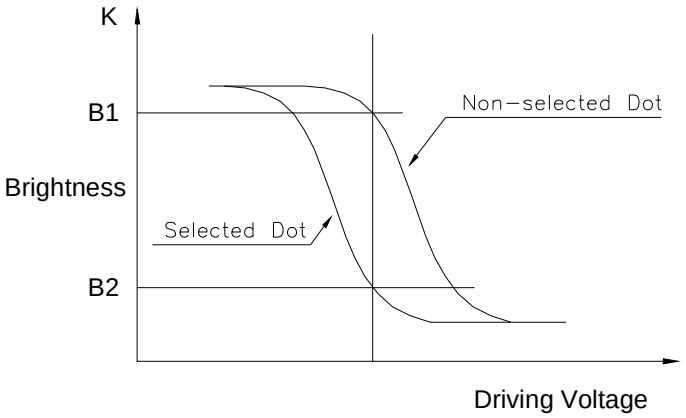
Note1: Definition of Viewing Angle θ , Φ



Note2: Definition of viewing Angle Range: Φ1, Φ2

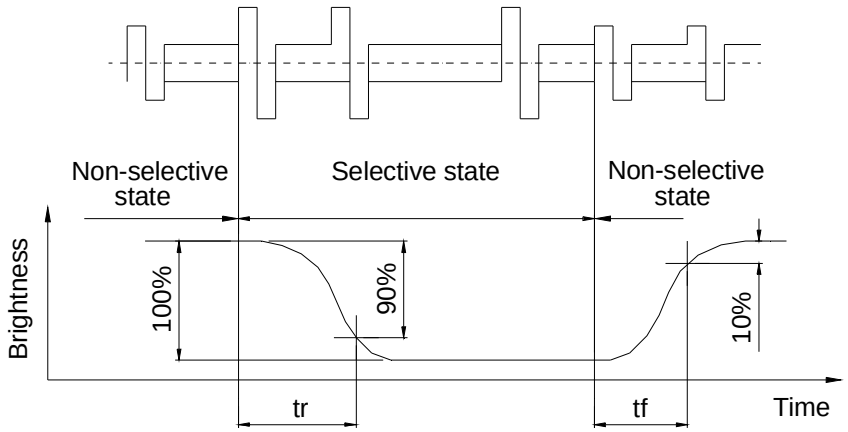


Note3: Definition of Contrast

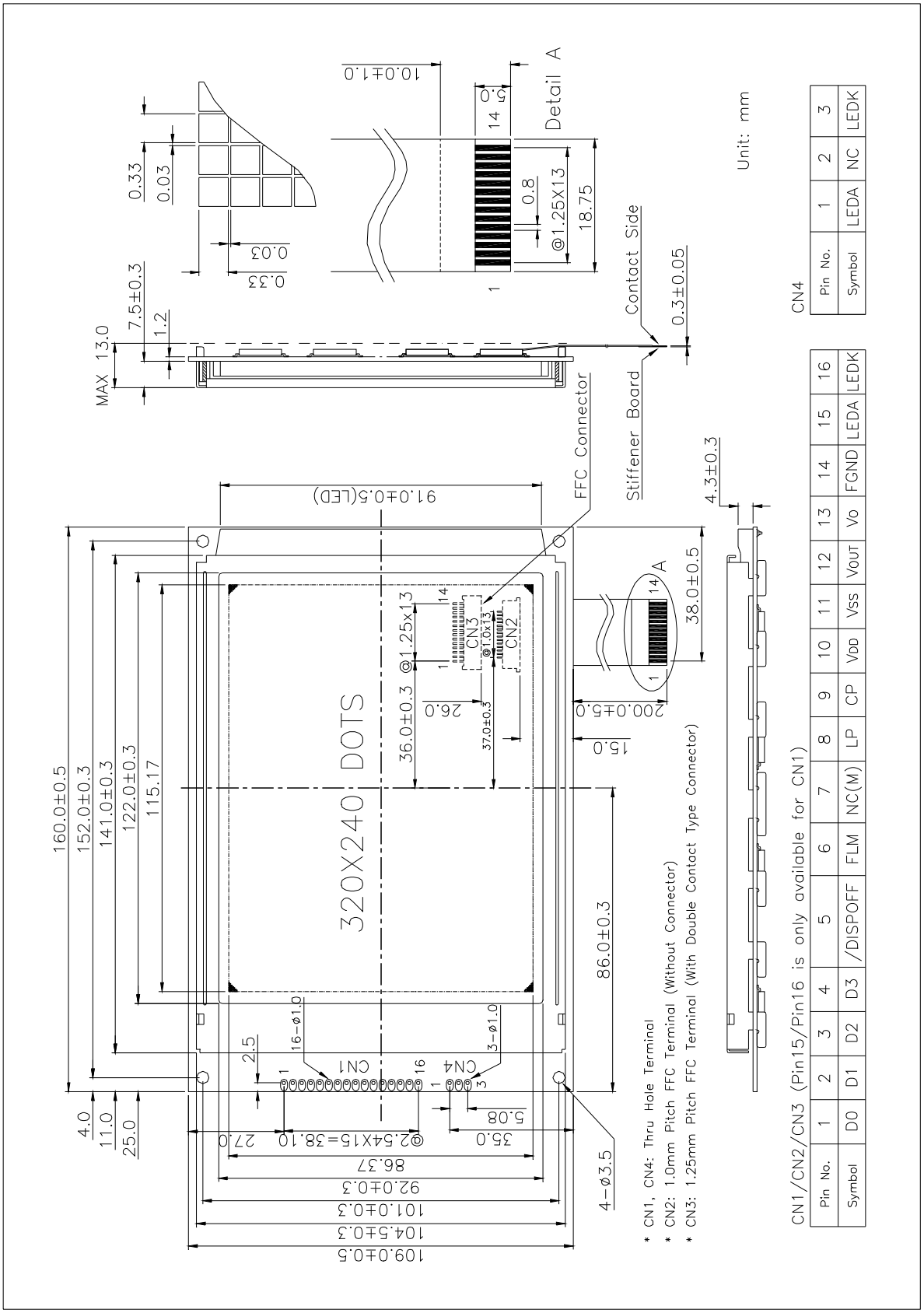


$$\text{Contrast} = \frac{\text{Brightness of non-selected dot (B1)}}{\text{Brightness of selected dot (B2)}}$$

Note4: Definition of Response Time



5. DIMENSIONAL OUTLINE



CN4

Pin No.	1	2	3
Symbol	LEDA	NC	LEDK

CN1/CN2/CN3 (Pin15/Pin16 is only available for CN1)

Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Symbol	D0	D1	D2	D3	/DISPOFF	FLM	NC(M)	LP	CP	VDD	Vss	VOUT	Vo	FGND	LEDA	LEDK

6. LCD MODULE NUMBERING SYSTEM

L	G	320	240	2	—	L	M	D	W	H	6	V	—	CN3
(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)	(11)	(12)		(13)

(1) Brand

(2) Module type

C - Character module

G - Graphic module

(3) Display format

Character module : Number of characters per line, two digits XX

Graphic module : Number of columns, tow or three digits XX or XXX

(4) Display format

Character module : Number of lines, one digit X

Graphic module : Number of rows, two or three digits XX or XXX

(5) Development number : One or two digits X or HX

(6) LCD mode

T - TN Positive, Gray **N** - TN Negative, Blue

S - STN Positive, Yellow-green **G** - STN Positive, Gray

B - STN Negative, Blue **F** - FSTN Positive, White

K - FSTN Negative, Black **L** - FSTN Negative, Blue

(7) Polarizer mode

R - Reflective **F** - Transflective **M** - Transmissive

(8) Backlight type

N - Without backlight **L** - Array LED **D** - Edge light LED **E** - EL **C** - CCFL

(9) Backlight color

Y - Yellow-green **B** - Blue **W** - White **G** - Green

A - Amber **R** - Red **M** - Multi color **Nil** –Without backlight

(10) Operating temperature range

S - Standard temperature (0 ~ +50 ^{o}C) **H** - Extended Temperature (-20 ~ +70 ^{o}C)

(11) Viewing direction

3 - 3:00 **6** – 6:00 **9** – 9:00 **U** – 12:00

(12) DC-DC Converter

N or Nil – Without DC-DC converter **V** – Built in DC-DC converter

(13) Version code

Nil or 0~ZZZZ – Version code

7. PRECAUTIONS FOR USE OF LCD MODULE

7.1 Handing Precautions

1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
2) If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth. If the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
3) Do not apply excessive force on the surface of display or the adjoining areas of LCD module since this may cause the color tone to vary.
4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
5) If the display surface of LCD module becomes contaminated, blow on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents.
   · Isopropyl alcohol
   · Ethyl alcohol

   Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
   · Water
   · Ketone
   · Aromatic Solvents
6) When mounting the LCD module make sure that it is free of twisting, warping, and distortion. Distortion has great influence upon display quality. Also keep the stiffness enough regarding the outer case.
7) Be sure to avoid any solvent such as flux for soldering never stick to Heat-Seal. Such solvent on Heat-Seal may cause connection problem of heat-Seal and TAB.
8) Do not forcibly pull or bend the TAB I/O terminals.
9) Do not attempt to disassemble or process the LCD module.
10) NC terminal should be open. Do not connect anything.
11) If the logic circuit power is off, do not apply the input signals.
12) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
   · Be sure to ground the body when handling the LCD module.
   · Tools required for assembly, such as soldering irons, must be properly grounded.
   · To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
   · The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

7.2 Storage Precautions

1) When storing the LCD module, avoid exposure to direct sunlight or to the light of fluorescent lamps and high temperature/high humidity. Whenever possible, the

LCD module should be stored in the same conditions in which they were shipped from our company.

2) Exercise care to minimize corrosion of the electrodes. Corrosion of the electrodes is accelerated by water droplets or a current flow in a high humidity environment.

7.3 Design Precautions

1) The absolute maximum ratings represent the rated value beyond which LCD module can not exceed. When the LCD modules are used in excess of this rated value, their operating characteristics may be adversely affected.
2) To prevent the occurrence of erroneous operation caused by noise, attention must be paid to satisfy VIL, VIH specification values, including taking the precaution of using signal cables that are short.
3) The liquid crystal display exhibits temperature dependency characteristics. Since recognition of the display becomes difficult when the LCD is used outside its designated operating temperature range, be sure to use the LCD within this range. Also, keep in mind that the LCD driving voltage levels necessary for clear displays will vary according to temperature.
4) Sufficiently notice the mutual noise interference occurred by peripheral devices.
5) To cope with EMI, take measures basically on outputting side.
6) If DC is impressed on the liquid crystal display panel, display definition is rapidly deteriorated by the electrochemical reaction that occurs inside the liquid crystal display panel. To eliminate the opportunity of DC impressing, be sure to maintain the AC characteristics of the input signals sent to the LCD Module.

7.4 Others

1) Liquid crystals solidify under low temperatures (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white).
   Air bubbles may also be generated if the LCD module is subjected to a strong shock at a low temperature.
2) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
3) To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity, etc., exercise care to avoid touching the following sections when handling the module:
   · Terminal electrode sections.
   · Part of pattern wiring on TAB, etc.