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LCD MODULE SPECIFICATION
FOR CUSTOMER'S APPROVAL

CUSTOMER : Standard

MODULE TYPE : NMTG-F32240JFWHSGW

APPROVED BY: (FOR CUSTOMER USE ONLY)

Approved by	Checked by		Made by
微 端 2007/1/2 張秀美	微 端 2007/1/2 趙長慶	微 端 2007/1/2 蔡宜夢	微 端 2007/1/2 陳雅靖

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SPECIFICATION FOR

LIQUID CRYSTAL DISPLAY MODULE

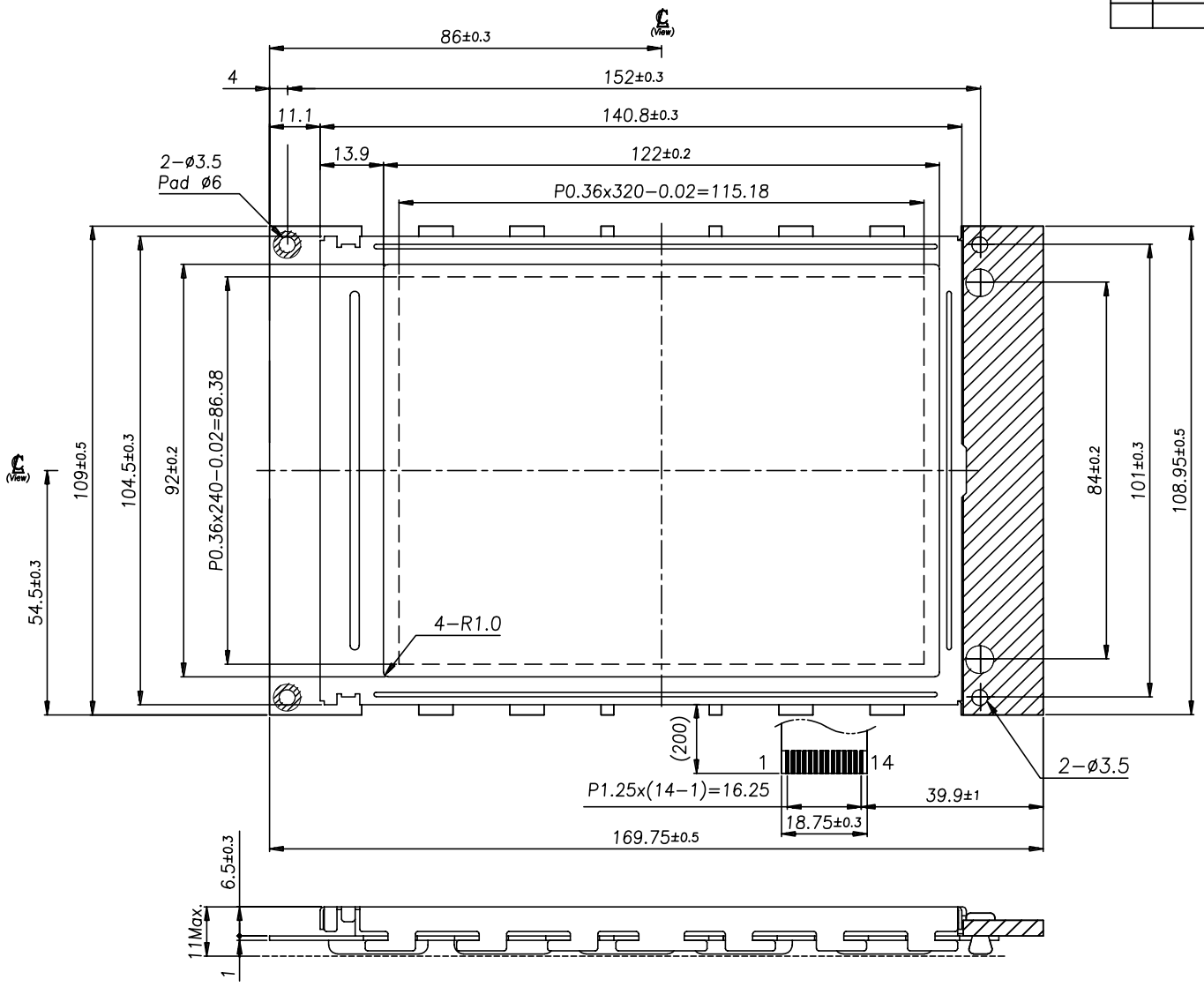
MODEL NO. : NMTG-F32240JFWHSGW

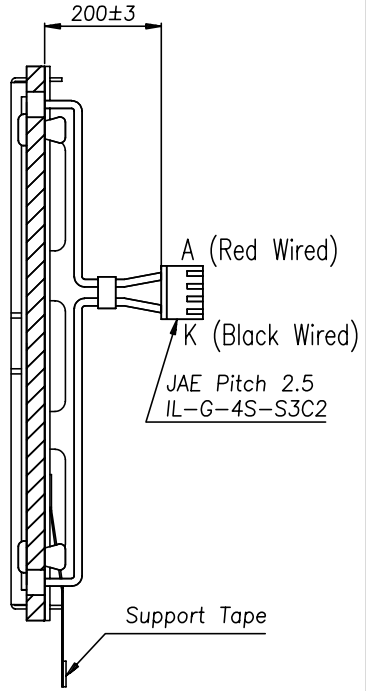
View Direction	☑ 6 O'clock			☐12 O'clock	
LCD Type	☑ FSTN Positive			☐ FSTN Negative	
	☐ STN Gray	☐ STN Yellow Green		☐ STN Blue	
Rear Polarizer	☐ Reflective	☑ Transflective		☐ Transmissive	
Backlight Type	☑ LED	☐ Internal Power	☐ EL	☑ 4V input	
		☑ External Power	☐ CCFL	☐ 12V input	
Backlight Color	☑ White	☐ Amber	☐ Blue Green	☐ Yellow Green	☐ Green
Temperature Range	☐ Normal	☑ Wide		☐ Super Wide	
CCFL Inverter	☐ Build-in	☑ Not Build-in			
Touch Screen	☐ With	☑ Without			

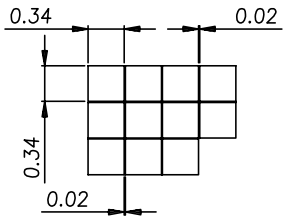
TO BE VERY CAREFUL !

The LCD driver ICs are made of CMOS process, which is very easy to be damaged by static charge, make sure the user is grounded when handling the LCM.

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE







Dots

PIN ASSIGNMENT							
1.	DB0	5.	/DISPOFF	9.	CP	13.	V0
2.	DB1	6.	FLM	10.	VDD	14.	FGND
3.	DB2	7.	NC	11.	VSS	15.	
4.	DB3	8.	LP	12.	VEE	16.	

NO.	PART NAME	Q'TY	DATE:	MATERIAL	FINISH
	M−32240J (LED)	1	11/15/01'	M	

DRAWN	CHECK	APP'D	UNIT: MM	SCALE: 1/1	PRODUCT: MTG−32240J
Troy He	Chris Luo	Raymond		UNLESS OTHERWISE SPECIFIED TOLERANCE ON FRACTIONS DECIMALS ANGLES 0.10 0.5°	DWG NO.: G32240J5
					FILE: DWG\MTG320\G32240J
					SHEET 1 / 1 Rev: X

GENERAL SPECIFICATION

Item	Content
Display Resolution	320(W)x240(H)
Dimensional Outline(mm)	169.8(W)x109.0(H)x11.0 max(D)
Display mode	Transflective/ Positive Type
Circuit	Common-Driver IC, Segment-driver IC
Interface	Data (D0～D3), CL1, CL2, FRM, V_{EE} , F_GND

ABSOLUTE MAXIMUN RATING

(1) Electrical Absolute Ratings

Item	Symbol	Min.	Max.	Unit	Note
Power Supply for Logic	V_{DD}-V_{SS}	-0.3	7.0	Volt	
Power Supply for LCD	V_{DD}-V_{EE}	0	30.0	Volt	
Input Voltage	V_{IN}	-0.3	V_{DD}	Volt	

Note: Operator should be grounded during handling LCM.

(2) Environmental Absolute Maximum Ratings

Item	Normal Temperature				Wide Temperature			
	Operating		Storage		Operating		Storage	
	Min.	Max,	Min.	Max,	Min.	Max,	Min.	Max,
Ambient Temperature	0℃	+50℃	-20℃	+70℃	-20℃	+70℃	-30℃	+80℃
Humidity(without condensation)	Note 2,4		Note 3,5		Note 4,5		Note 4,6	

Note 2 Ta≦50℃: 80% RH max
Ta>50℃: Absolute humidity must be lower than the humidity of 85%RH at 50℃
Note 3 Ta at -20℃ will be<48hrs at 70℃will be <120hrs when humidity is higher than 75%.
Note 4 Background color changes slightly depending on ambient temperature. This phenomenon is reversible.
Note 5 Ta≦70℃: 75RH max
Ta>70℃: absolute humidity must be lower than the humidity of 75%RH at 70℃
Note 6 Ta at -30℃ will be <48hrs, at 80 ℃ will be <120hrs when humidity is higher than 75%.

ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	note
Power Supply for Logic	V_{DD}-V_{SS}	-	2.7	4.5	5.5	Volt	
Input Voltage	V_{IL}	L level	V_{SS}	0.2 V_{DD}	-	Volt	
	V_{IH}	H level	0.8 V_{DD}	V_{DD}	-	Volt	
LCM Recommend LCD Module Driving Voltage	V_{DD}-V_O	Ta＝-20℃	24.7	25.2	25.7	Volt	
		Ta＝0℃	21.7	22.2	22.7		
		Ta＝25℃	20.8	21.2	21.6		
		Ta＝50℃	20.1	20.6	21.1		
		Ta＝70℃	19.5	20.0	20.5		
Power Supply Current for LCM	I_{DD}	V_{DD}= 4.5V V_{DD}-V_O= 21.2V FLM= 64Hz	-	3.4	-	mA	
	I_{EE}		-	2.9	-		
Power Supply For backlight	Vled	-		4		Volt	
	Iled		100	110	120	mA	

OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ	Max.	Unit	note
Viewing angle range	Φf(12 o'clock)	When Cr≧2	-	15	-	Degree	9,10
	Φb(6 o'clock)		-	30	-		
	Φl(9 o'clock)		-	30	-		
	Φr(3 o'clock)		-	30	-		
Rise Time	T_r	V_{DD}-V_O = 21.2V		239		mS	
Fall Time	T_f			140			
Frame frequency	Frm		-	64	-	Hz	8,10
Contrast	Cr	25	-	7.36	-		7

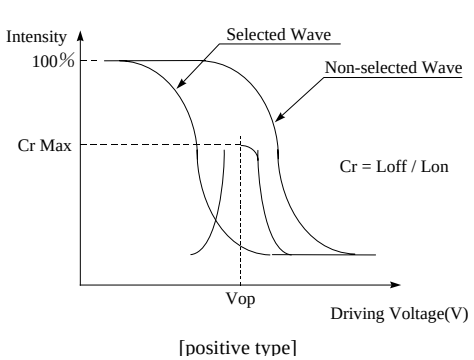
MECHANICAL SPECIFICATION

Product No.		NMTG-F32240JFWHSGW
Module Size		169.8(W)mm×109.0(H)mm×11.0(D)mm Max
Dot Size		0.34(W)mm×0.34(H)mm
Dot Pitch		0.36(W)mm×0.36(H)mm
Resolution		320(W)×240(H) Dots Matrix
Duty Ratio		1/240 Duty
LCD Display Mode	STN	☐Gray Mode ☐Yellow Mode ☐Blue Mode
	FSTN	☑ Black & White(Normally White/Positive Image) ☐ Black & White(Normally White/Negative Image)
	Rear Polarizer:	☐ Reflective ☑ Transflective ☐ Transmissive
Viewing Direction		☑6 O'clock ☐12 O'clock ☐3 O'clock ☐9 O'clock
Backlight		☐Without ☐CCFL ☐EL ☑LED
Controller		Without
DC/DC Converter		Without
Touch Screen		Without
CCFL Inverter		Without

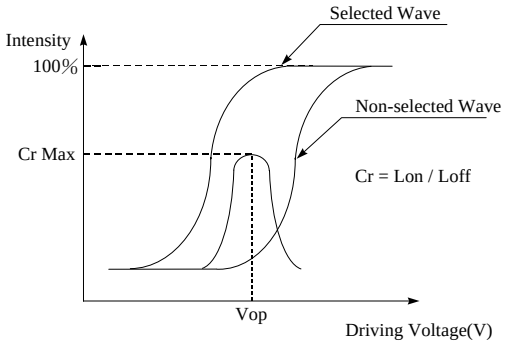
INTERFACE PIN ASSIGNMENT

Pin No.	Pin Out	Description
1	D0	Data input signal
2	D1	Data input signal
3	D2	Data input signal
4	D3	Data input signal
5	DispOFF	Display OFF. Active LOW.
6	FRM	Frame start signal (Data signal from the common driver shift register)
7	NC	No Connection.
8	CL1	Common driver data shift signal: also latches the data of the line immediately above.
9	CL2	Clock pulse for segment shift register
10	V_{DD}	Logic supply voltage
11	V_{SS}	GND
12	V_{EE}	Negative power supply voltage
13	Vo	Power supply for LCD panel
14	FGND	Frame ground

[Note 7] Definition of Operation Voltage (Vop)

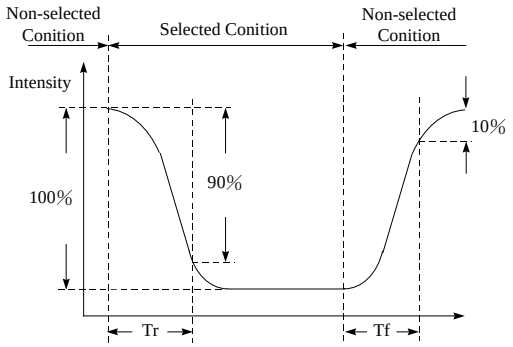


[positive type]

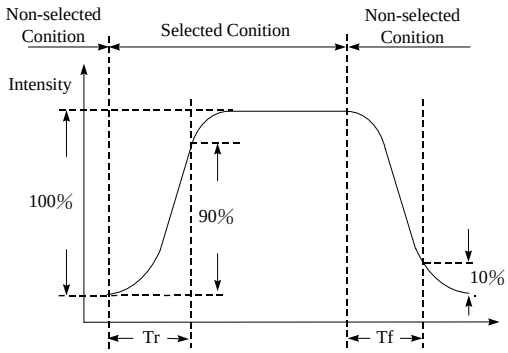


[Negative type]

[Note 8] Definition of Response Time (Tr, Tf)



[positive type]



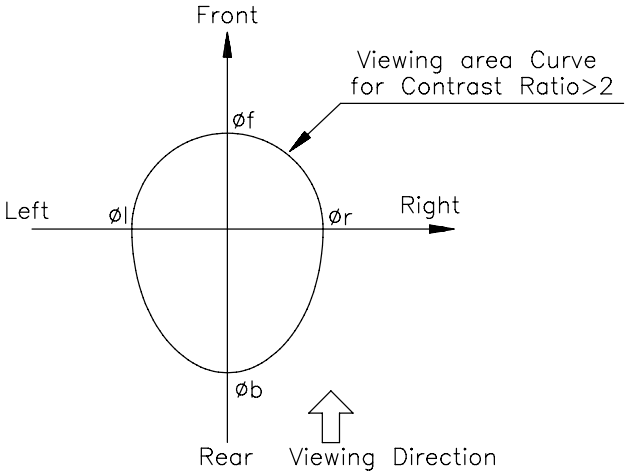
[Negative type]

Conditions:

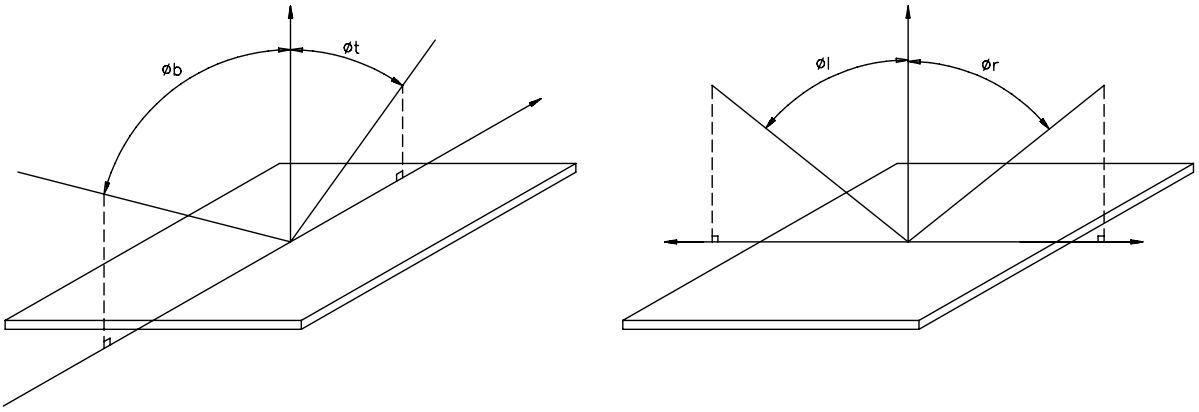
Operating Voltage : Vop **Viewing Angle(θ , φ): 0° , 0°**

Frame Frequency : 64 Hz **Driving Wave form : 1/N duty, 1/a bias**

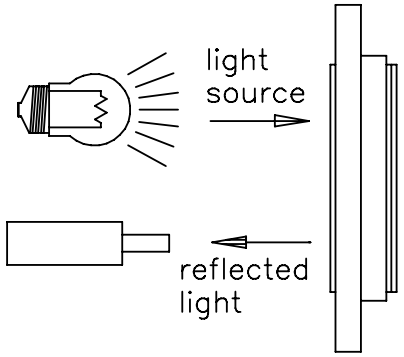
[Note 9] Definition of Viewing Direction



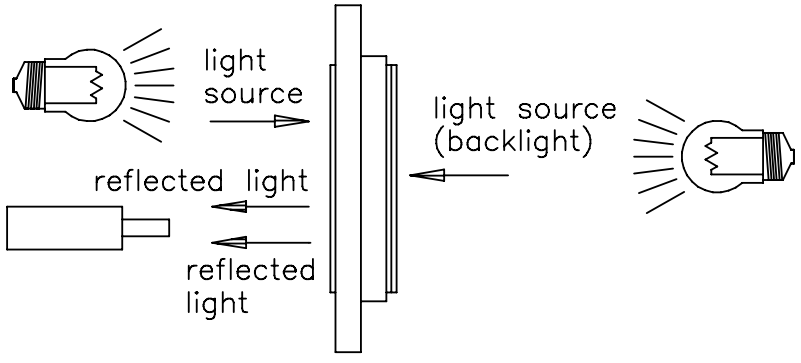
[Note 10] Definition of viewing angle



[Note 11] Description of Measuring Equipment



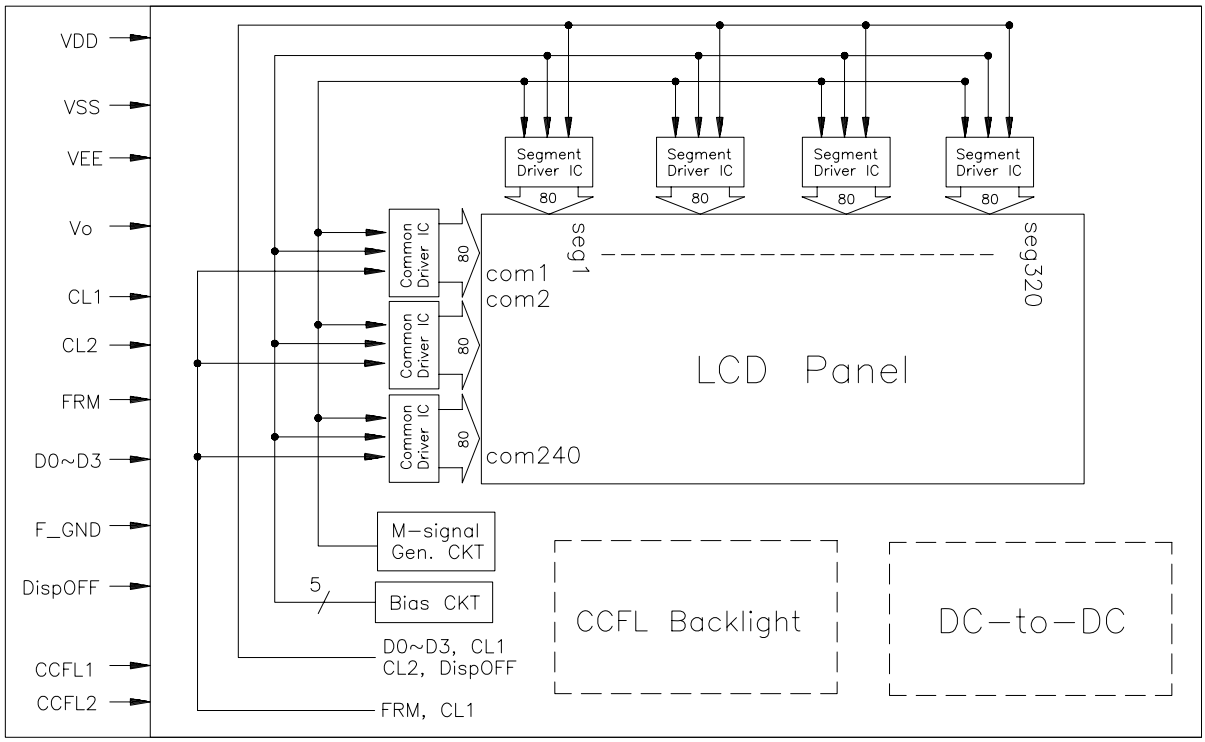
Reflective type



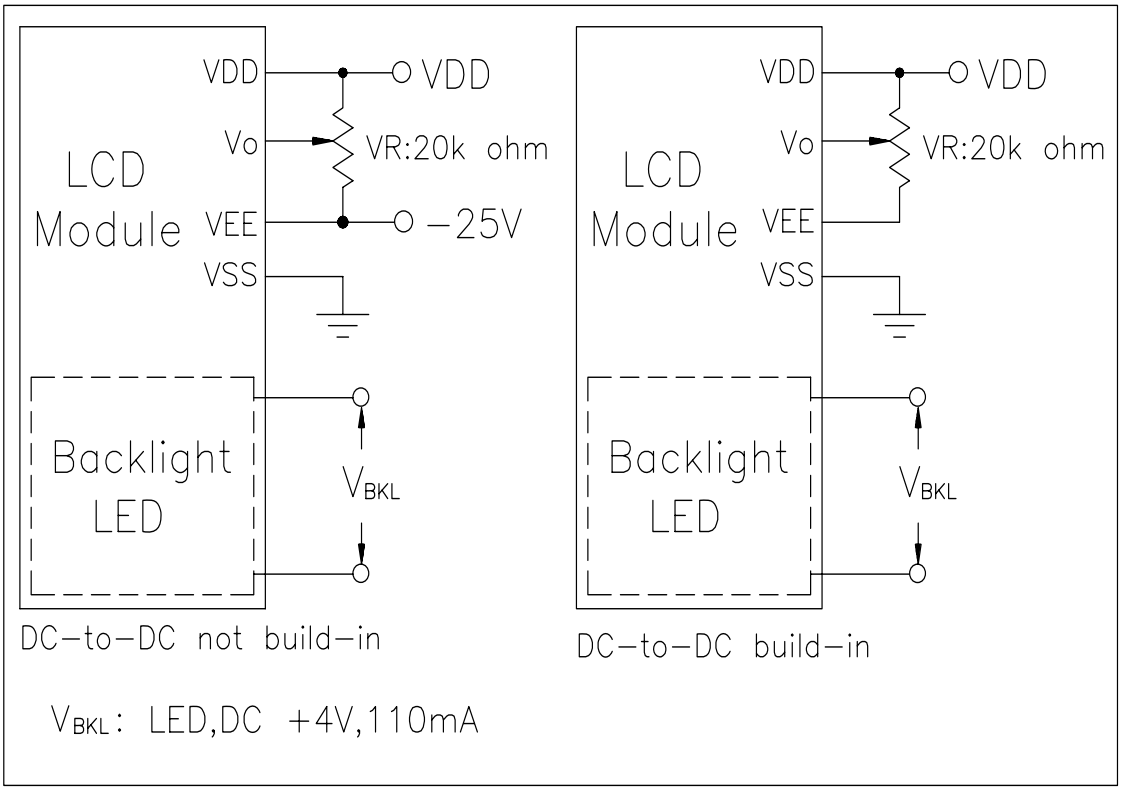
Transflective type

BLOCK DIAGRAM

- Built-in M-clock generating circuit, User do not have to supplier M-clock.



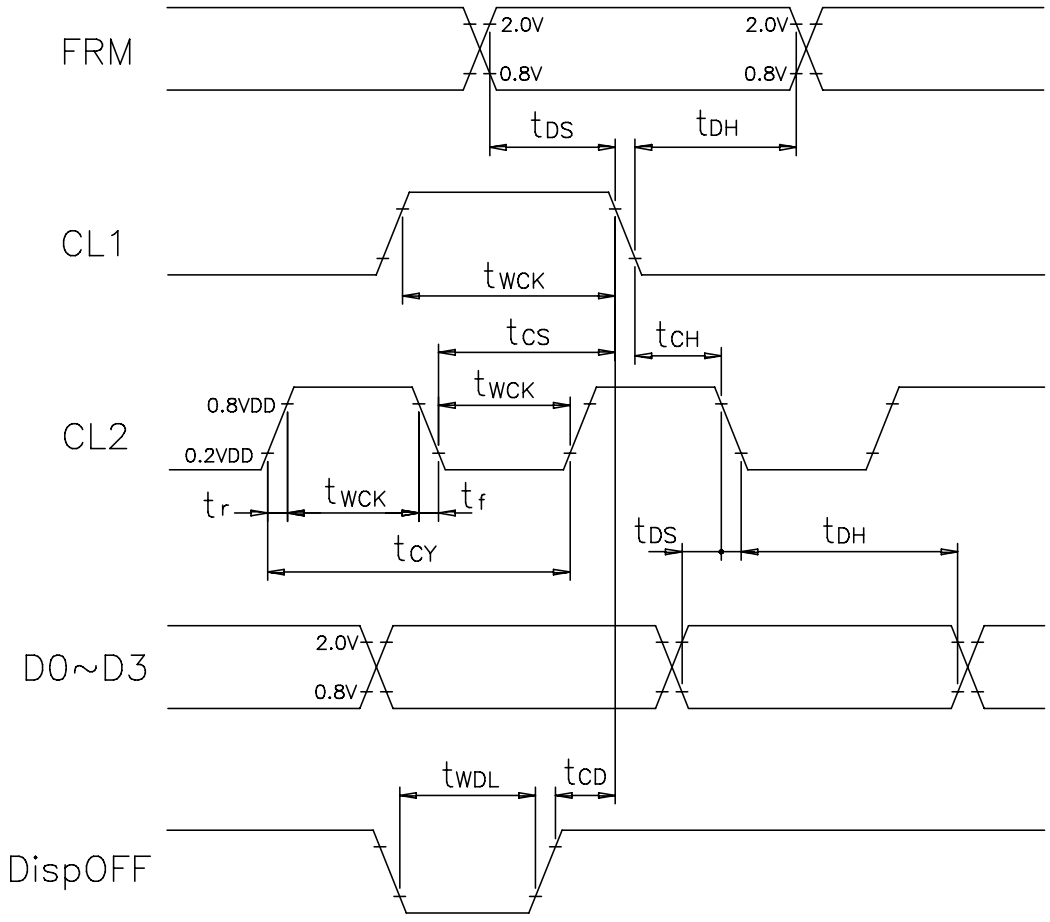
POWER SUPPLY



TIMING CHARACTERISTICS

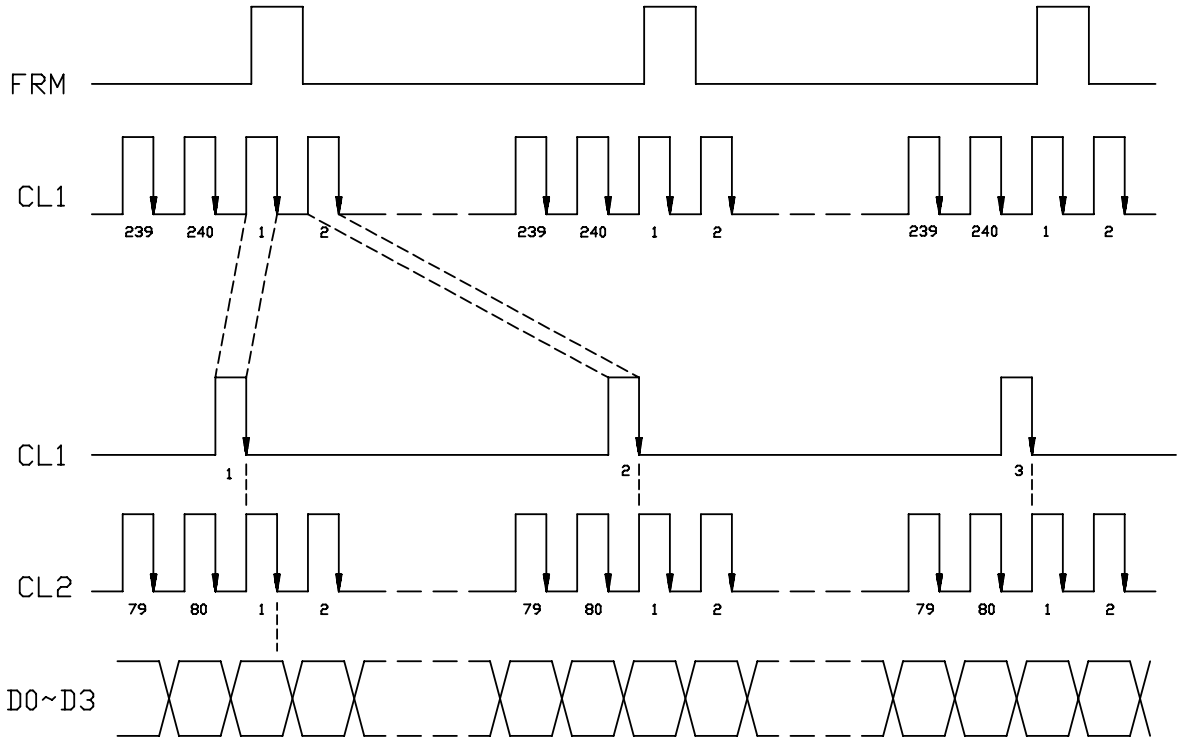
1 Segment interface timing: (V_{SS}= 0V, V_{DD}=2.7V to 5.0V, Ta=-20 to 70℃)

Item	Symbol	Test Condition	Min.	Max.	Unit
Clock cycle time	t_{CY}	Duty = 50%	250	-	ns
Clock Pulse Width	t_{WCK}		95	-	ns
Data Set Up Time	t_{DS}		65	-	ns
Data Hold Time	t_{DH}		65	-	ns
Latch pulse 'H' width	t_{WCK}		95	-	ns
Input signal Rise/Fall Time	t_r, t_f		-	30	ns
Clock Set Up Time	t_{CS}		120	-	ns
Clock hold time	t_{CH}		120	-	ns
FRM set-up time	t_{DS}		30		ns
FRM hold time	t_{DH}		30		ns
DispOFF clear time	t_{CD}		100	-	ns
DispOFF 'L' pulse width	t_{WDL}		1.2	-	μs



DISPLAY PATTERN

Relationship between every signal



The first data

	SEG1	SEG2	SEG3	SEG4	.....	SEG317	SEG318	SEG319	SEG320
COM1	D3	D2	D1	D0	.....	D3	D2	D1	D0
COM2	D3	D2	D1	D0	.....	D3	D2	D1	D0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
COM239	D3	D2	D1	D0	.....	D3	D2	D1	D0
COM240	D3	D2	D1	D0	.....	D3	D2	D1	D0

RELIABILITY TEST

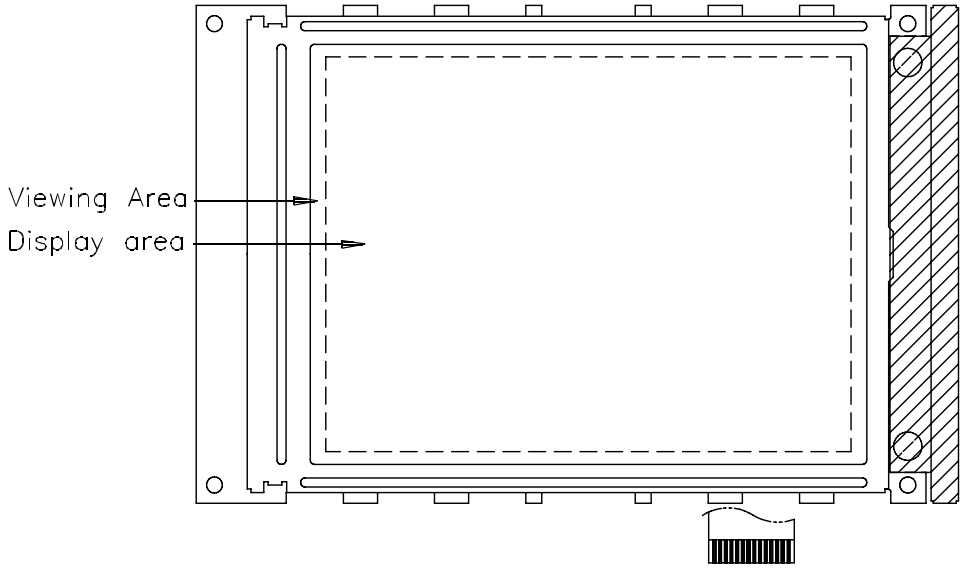
No	Item	Conditions		Note
1	High Temp. Operation	70℃	240HR	
2	High Temp. Storage	80℃	240HR	
3	Low Temp. Operation	-20℃	240HR	
4	Low Temp. Storage	-30℃	240HR	
5	High Temp./Humid Storage	40℃ 90%RH	240HR	
6	Thermal Shock	-20℃ ,30min +60℃ ,30min	10 cycles	
7	Vibration Test (IEC-68-2-6)	Frequency : 10~55 Hz Duration : 20 times, 6 min/time Amplitude : 0.75 mm	-	
8	Shock (IEC 68-2-27)	Duration : 11 mS Acceleration : 100g	-	X, Y, Z direction

APPEARANCE CHECK

CONDIITON OF APPEARANCE CHECK:

(1)Specimen shall be checked by eyes in distance of 30cm under 40w-fluorescence lamp.

(2)Checking direction shall be in 45 degree from perpendicular line op specimen surface.



HANDLING PRECAUTIONS

(1)Treat polarizer very carefully since it is easy to be damaged.

(2)When cleaning the display surface, use soft cloth (e.g. gauss) with a solvent (recommended below) and wipe lightly.

- ethyl alcohol
- iso-prcolol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvents:

- water
- ketone
- aromatics

(3)Direct current causes electro-chemical reaction with remarkable degradation of the display quality. Give careful consideration to prevent direct current at ON/OFF timing and during operation.

(4)Avoid strong shock and drop from the height.

(5)To prevent LCD panels from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

(6)Give careful consideration to avoid electrical static discharge with causes uneven contrast.

(7)Even a small condensation on the contact pads (terminals) causes electro-chemical reaction which makes missing row and column. Give careful attention to avoid condensation. When assembling with zebra connector, clean the surface of the pads with alcohol and keep the air very clean.

LCD PRODUCT QUALITY STANDARD

DISPLAY APPEARANCE

No	Item	Criteria
1	inclusions (black spot, white spot, dust)	(1)round type diameter mm(a*) no of defect* a≦0.20 neglect 0.20＜a≦0.35 5max 0.35＜a none (2)linear type length mm(l) width mm(W) no. of defect na W≦0.03 neglect l≦3 0.03＜W≦0.08 6 3＜l 0.08＜W none
2	scratch	1.scratch on protective film is permitted. 2.scratch on polarizer shall be as follow: (1)round type diameter mm(a*) no of defect a≦0.15 neglect 0.15＜a≦0.20 2 max 0.20＜a none (2)linear type be judged bye 1.-(2) linear type
3	dent	diameter ＜ 1.5mm
4	bubble	not exceeding 0.5mm average diameter is acceptable between glass and polarizing film
5	pin hole	(a+b)/2 ≦ 0.15mm maximum number: ignored 0.15＜(a+b)/2≦0.20mm maximum number:10
6	dot defect	(a+b)/2≦0.20mm maximum number: ignored 0.20＜(a+b)/2≦0.30mm maximum number:5 x=width
7	contrast irregularity(spot)	diameter spec no of defect a≦0.50mm neglect 0.50＜a≦0.75 5 0.75＜a≦1.00 3 1.00＜a none
8	dot width	design width ±15%
9	color tone and uniformity	obvious uneven color is not permitted

REVISION HISTORY

Revision Content	Page	Date
The LCD module is compliant with RoHS	3-16	2007/1/2