LCD MODULE SPECIFICATION
FOR CUSTOMER'S APPROVAL

CUSTOMER : <u>Standard</u>

MODULE TYPE : <u>MTG-F16160FFWHSEB</u>

APPROVED BY: (FOR CUSTOMER USE ONLY)

Approved By	Checked By	Prepared By	MT File No	Date Issued

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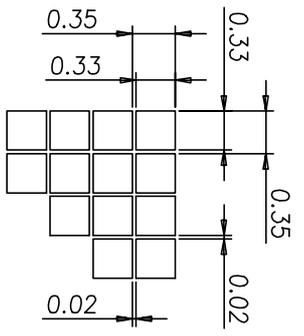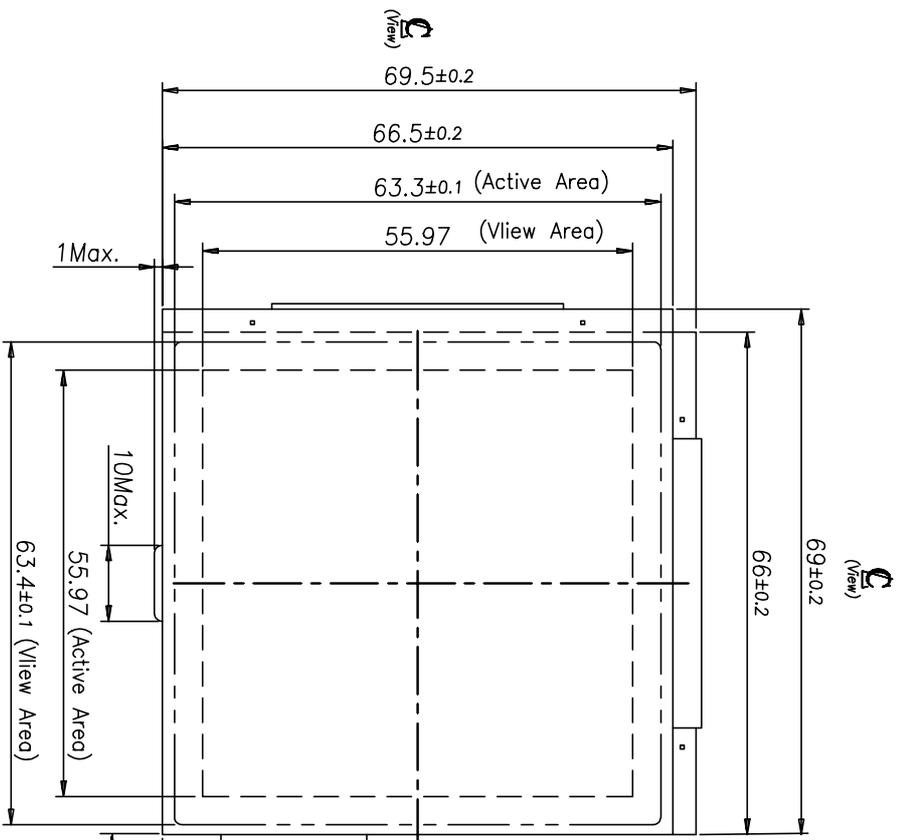| ITEM	PAGE
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SPECIFICATION FOR

LIQUID CRYSTAL DISPLAY MODULE

MODEL NO. : MTG-F16160FFWHSEB

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	☐ 5V input	
		☐ External Power	☐ CCFL	☐ 12V input	
Backlight Color	☐ White	☐ Amber	☑ Blue Green	☐ Yellow Green	☐ Other
Temperature Range	☐ Normal	☑ Wide		☐ Super Wide	
EL Driver IC	☑ Build-in	☐ Not Build-in			
Touch Screen	☐ With	☑ Without			

TO BE VERY CAREFUL !

The TCP package ICs are very easy to be destroyed by static charge, make sure the user is grounded when handling the LCM.

PIN ASSIGNMENT

No.	Symbol	No.	Symbol	No.	Symbol	No.	Symbol
1.	VSS	5.	M(N.C)	9.	D3	13.	TP_L	17.	VSS
2.	FLM	6.	VDD	10.	D2	14.	TP_U	18.	VSS
3.	CL1(LP)	7.	EL_ON	11.	D1	15.	TP_R	19.	
4.	CL2(SCP)	8.	VEE	12.	D0	16.	TP_D	20.	

69.5±0.2

66.5±0.2

63.3±0.1 (Active Area)

55.97 (Vliew Area)

1Max.

10Max.

55.97 (Active Area)

63.4±0.1 (View Area)

66±0.2

69±0.2

(View)

13±1

8±2

4

18

P1x(18-1)=17 W=0.6

7.62

19

0.7±0.1

0.7±0.1

2.4±0.3

0.8

5.5Max.

0.35

0.33

0.33

0.35

0.02

0.02

160x160
Dots

NO.				REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE

PART NAME: M-16160F

DRAWN: Tony

CHECK: Chris

APP'D: Steele

Q'TY: 1

DATE: 09/26/00'

UNIT: MM

SCALE: 1 / 1

MATERIAL

PRODUCT: MTG-16160F

DWG NO.: G16160F

FILE: DWG\G160\G16160F

SHEET 1 / 1

Rev: A

FINISH

UNLESS OTHERWISE SPECIFIED
TOLERANCE ON
FRACTIONS DECIMALS ANGLES
0.10 0.5°

Microtips Technology

GENERAL SPECIFICATION

Item	Content
Display Resolution	160(H)× 160(W)
Dimensional Outline(mm)	69.0(H)× 69.5(W)× 5.5max(D)
Display mode	Transflective Type/ Positive Display
Circuit	Common-Driver IC, Segment-driver IC
Interface	Data (D0～D3), SCP, LP, FP, V_{EE},

ABSOLUTE MAXIMUN RATING

(1) Electrical Absolute Ratings

Item	Symbol	Min.	Max.	Unit	Note
Power Supply for Logic	V_{DD}-V_{SS}	-0.3	6.5	Volt	
Power Supply for LCD	V_{EE}-V_{SS}	0	26.0	Volt	
Input Voltage	V1	-0.3	V_{DD}	Volt	

(2) Environmental Absolute Maximum Ratings

Item	Normal Temperature				Wide Temperature			
	Operating		Storage		Operating		Storage	
	Max,	Min.	Max,	Min.	Max,	Min.	Max,	Min.
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	3.0	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	
Recommend LCD Module Driving Voltage	V_{EE} -V_{SS}	Ta＝-20℃	19.4	19.6	19.8	Volt	
		Ta＝25℃	18.8	19.3	19.8		
		Ta＝70℃	17.8	18.0	18.2		
Power Supply Current for LCM	I_{DD}(EL B/L OFF)	V_{DD} =3.3V V_{EE}-V_{SS} =19.3V FLM=64Hz VEL=5.0V VELG=0V	-	0.07	0.2	mA	
	I_{EE}		-	1.0	2.0		
	I_{EL} (EL B/L ON)		-	-	20		

OPTICAL CHARACTERISTICS

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	note
Viewing angle range	Φf(12 o'clock)		When Cr≧2	-	34	-	Degree	9,10
	Φb(6 o'clock)			-	41	-		
	Φl(9 o'clock)			-	30	-		
	Φr(3 o'clock)			-	35	-		
Rise Time/ Fall Time	Tr/Tf	0℃	V_{EE}-V_{SS} =+19.6V	-	-	-	mS	
		25℃	V_{EE}-V_{SS} =+19.0V	-	239/140	-		
		50℃	V_{EE}-V_{SS} =+18.0V	-	-	-		
Frame frequency	Frm			-	64	-	Hz	8,10
Contrast	Cr		-	-	7.3	-		7

MECHANICAL SPECIFICATION

Product No.		MTG-F16160FFWHSEB
Module Size		69.0(W)mm× 69.5(H)mm× 5.5(D)mm Max
Dot Size		0.33(W)mm× 0.33(H)mm
Dot Pitch		0.35(W)mm× 0.35(H)mm
Resolution		160(W)× 160(H) Dots Matrix
Duty Ratio		1/160 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 ☐ Transflective(High Transmissive)
Viewing Direction		☑6 O'clock ☐12 O'clock ☐3 O'clock ☐9 O'clock
Backlight		☐W/O ☐CCFL ☑EL ☐LED
Controller		Without
DC/DC Converter		Without
EL Driver		Without (Optional)

INTERFACE PIN ASSIGNMENT

Pin No.	Pin Out	Description
1	V_{SS}	GND
2	FLM	Frame start signal (Data signal from the common driver shift register)
3	CL1 (Latch)	Common driver data shift signal: also latches the data of the line immediately above.
4	CL2 (Shift)	Clock pulse for segment shift register
5	NC	No Connection
6	V_{DD}	Logic supply voltage
7	NC/ EL Enable	◦ If EL driver build-in：Enable signal(3V~5V) for EL driver circuit ◦ If EL driver not build-in：No Connection
8	V_{EE}	LCD driver supply voltage
9	D3	Data Bus
10	D2	
11	D1	
12	D0	
13	TP_L	Touch Panel Input, don't care if no Touch Panel.
14	TP_U	
15	TP_R	
16	TP_D	
17	V_{SS}	GND
18	V_{SS}	GND

[Note 7] Definition of Operation Voltage (Vop)

[positive type]

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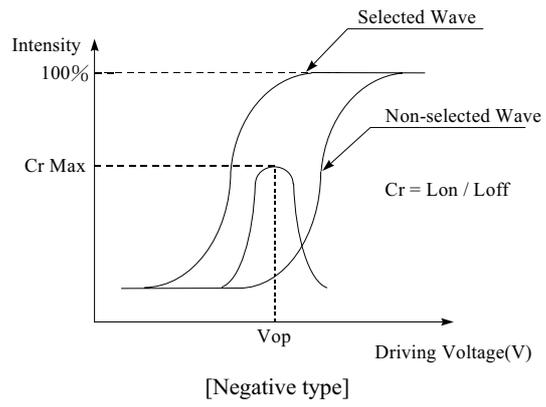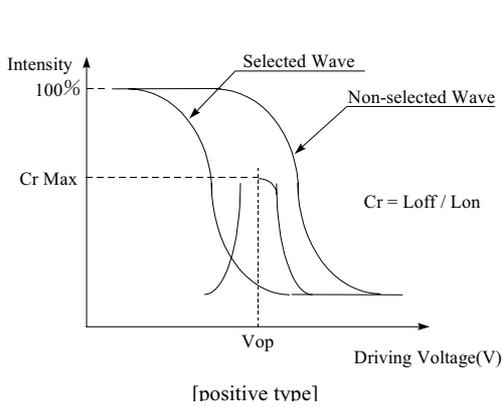
[Note 8] Definition of Response Time (Tr, Tf)

[positive type]

[Negative type]
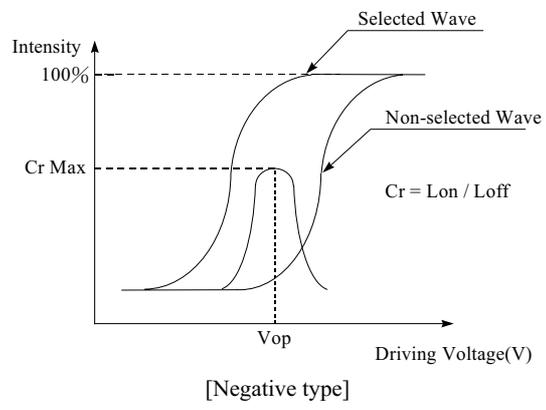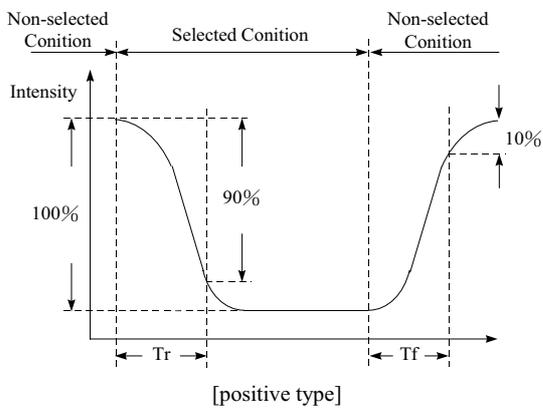
Conditions:

Operating Voltage : Vop   **Viewing Angle(θ, φ): 0°, 0°**
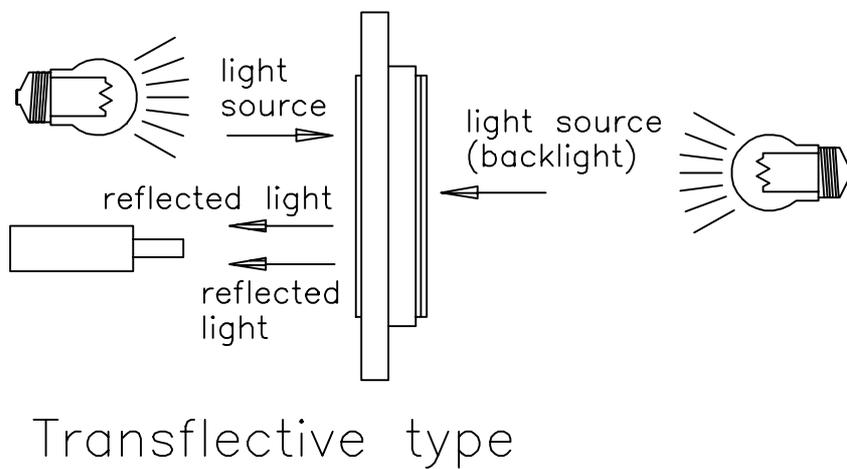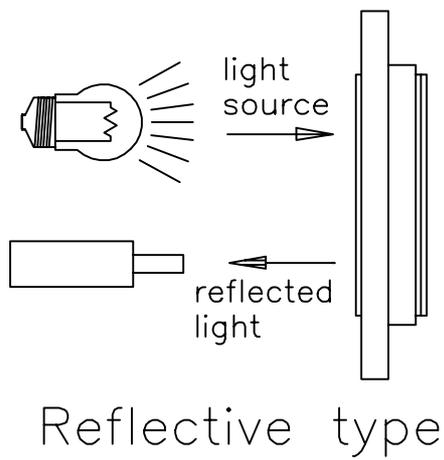**Frame Frequency : 64 Hz**   **Driving Wave form : 1/N duty, 1/a bias**

[Note 9] Definition of Viewing Direction
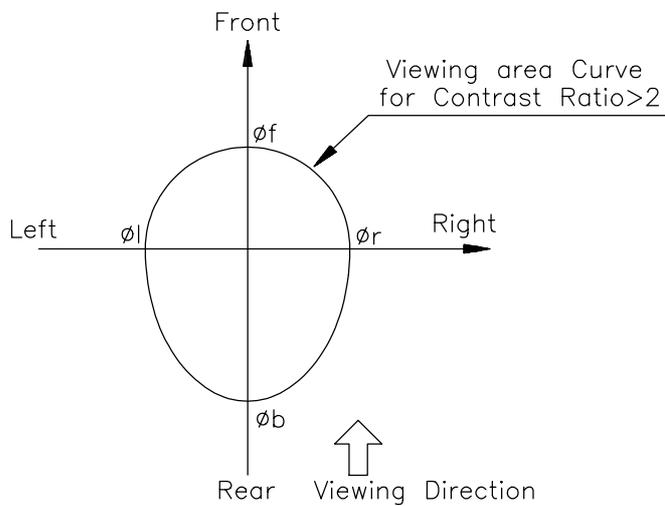
[Note 10] Definition of viewing angle
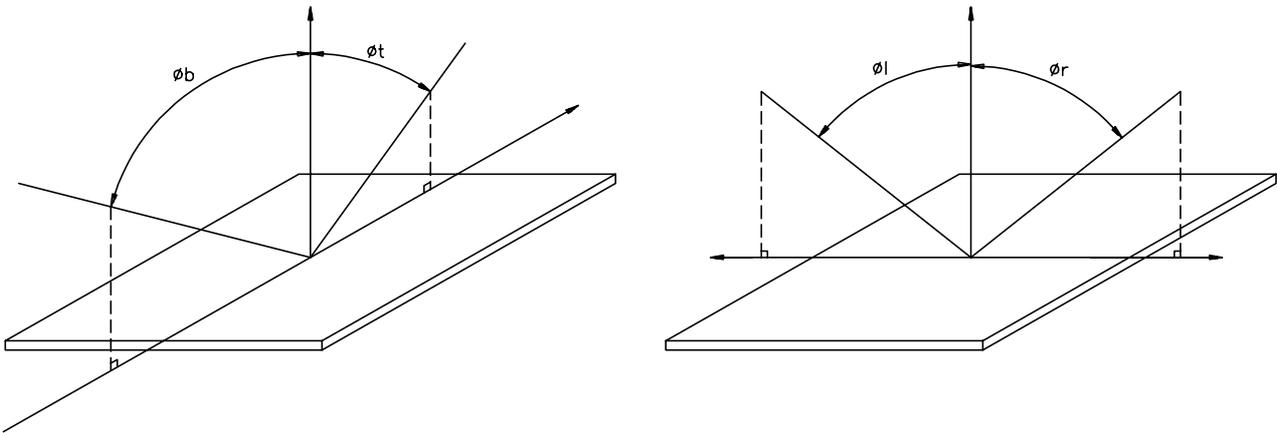
[Note 11] Description of Measuring Equipment

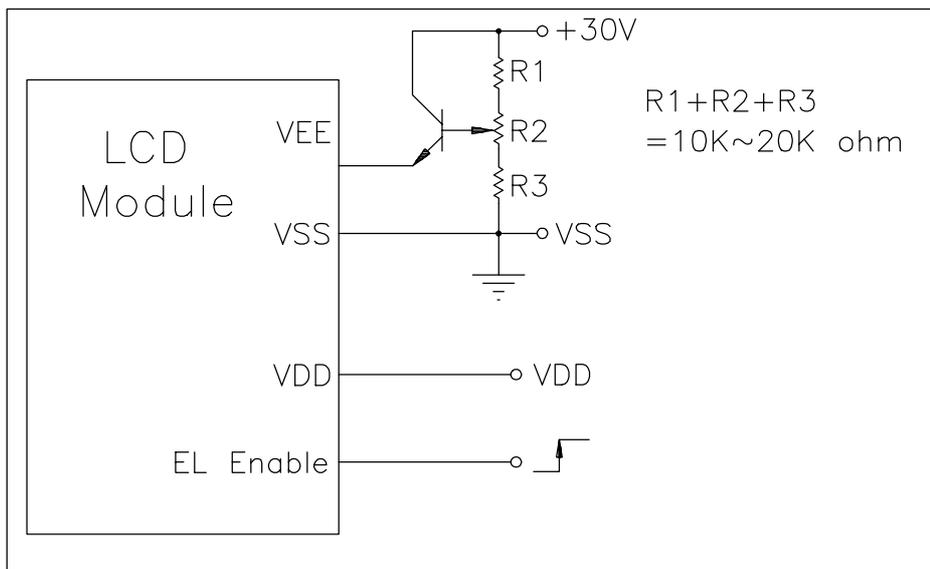Reflective type

Transflective type

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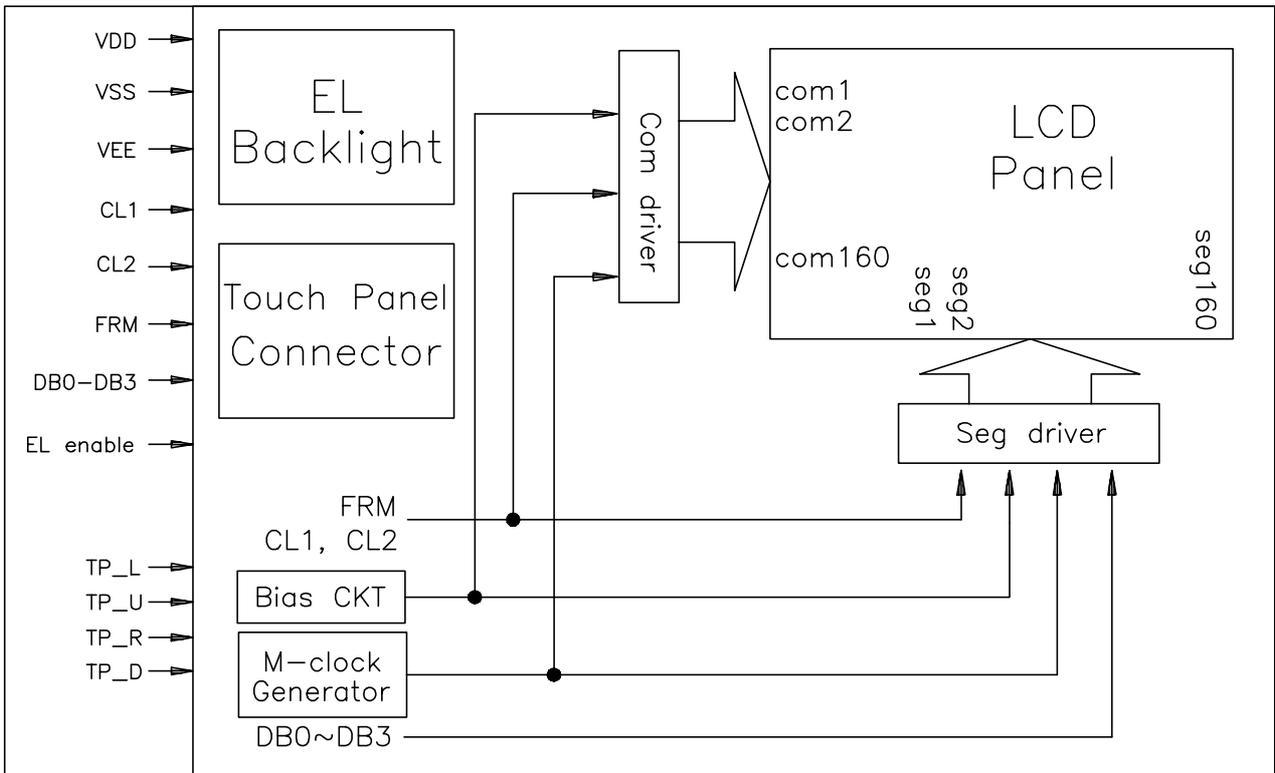
Built-in M-clock generating circuit, User do not have to supplier M-clock.

POWER SUPPLY

R1+R2+R3
=10K~20K ohm

TIMING CHARACTERISTICS

1 Segment interface timing: ($V_{SS}=V_5=0V$, $V_{DD}=2.5V$ to $4.5V$, $V_{EE}=+15.0$ to $+24V$, Ta=0 to 50℃)

Item	Symbol	Test Condition	Min.	Max.	Unit
Shift clock cycle time *1	t_{WCK}	t_r, $t_f \leqq 11$ ns	125	-	ns
Shift clock Pulse Width	t_{WCKH}, t_{WCKL}		51	-	ns
Data Set Up Time	t_{DS}		30	-	ns
Data Hold Time	t_{DH}		40	-	ns
Latch pulse 'H' width	t_{WLPH}		51	-	ns
Input signal Rise/Fall Time	t_r, t_f		-	50	ns
Shift clock rise to Latch pulse rise	t_{LD}		0	-	ns
Shift clock fall to Latch pulse fall	t_{SL}		51	-	ns
Latch pulse rise to shift clock rise	t_{LS}		51	-	ns
Latch pulse fall to shift clock fall	t_{LH}		51	-	ns
Enable setup time	t_S		36	-	ns
DispOFF remove time	t_{SD}		100	-	ns
DispOFF 'L' pulse width	t_{WDL}		2	-	μs

【Note】: ＊1　Take the cascade connection into consideration.
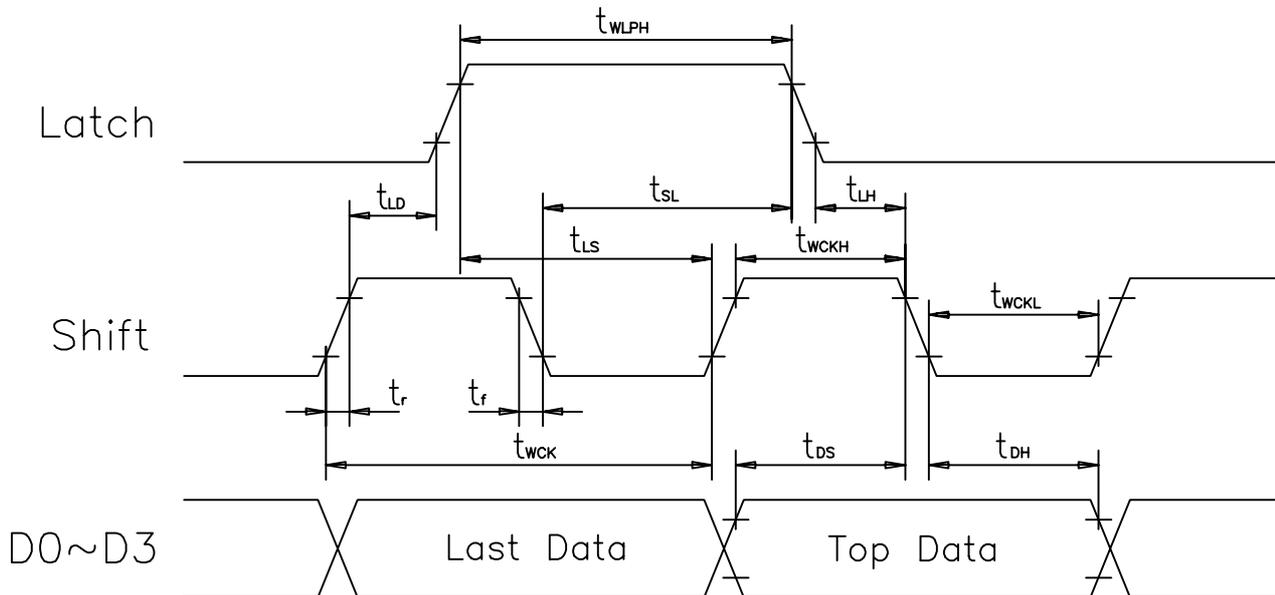
2 Power ON/OFF Timing

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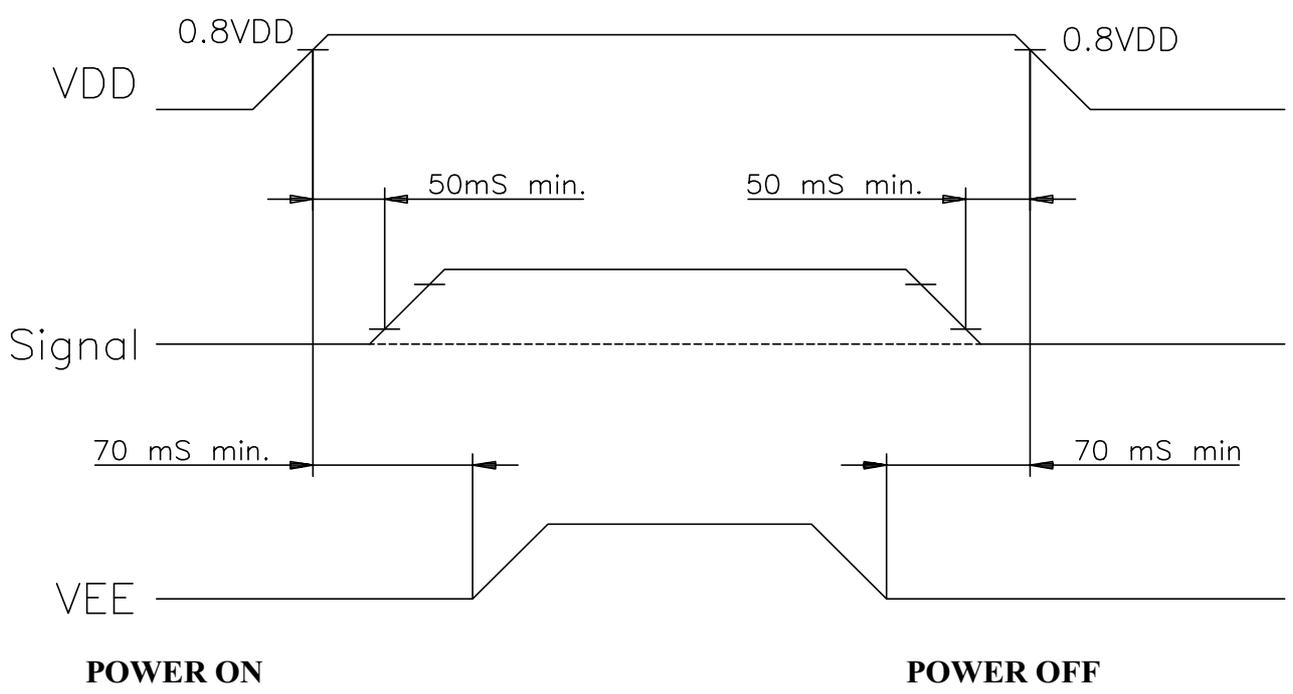
The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

DISPLAY PATTERN

Relationship between every signal

FRM

CL1

159 160 1 2   159 160 1 2   159 160 1 2

CL1

1   2   3

CL2

39 40 1 2   39 40 1 2   39 40 1 2

D0~D3

First Data

	SEG1	SEG2	SEG3	SEG4		SEG157	SEG158	SEG159	SEG160
COM1	D3	D2	D1	D0	……………………………………………………	D3	D2	D1	D0
COM2	D3	D2	D1	D0	……………………………………………………	D3	D2	D1	D0
COM159	D3	D2	D1	D0	……………………………………….……………………	D3	D2	D1	D0
COM160	D3	D2	D1	D0	………………………………………………………	D3	D2	D1	D0

14
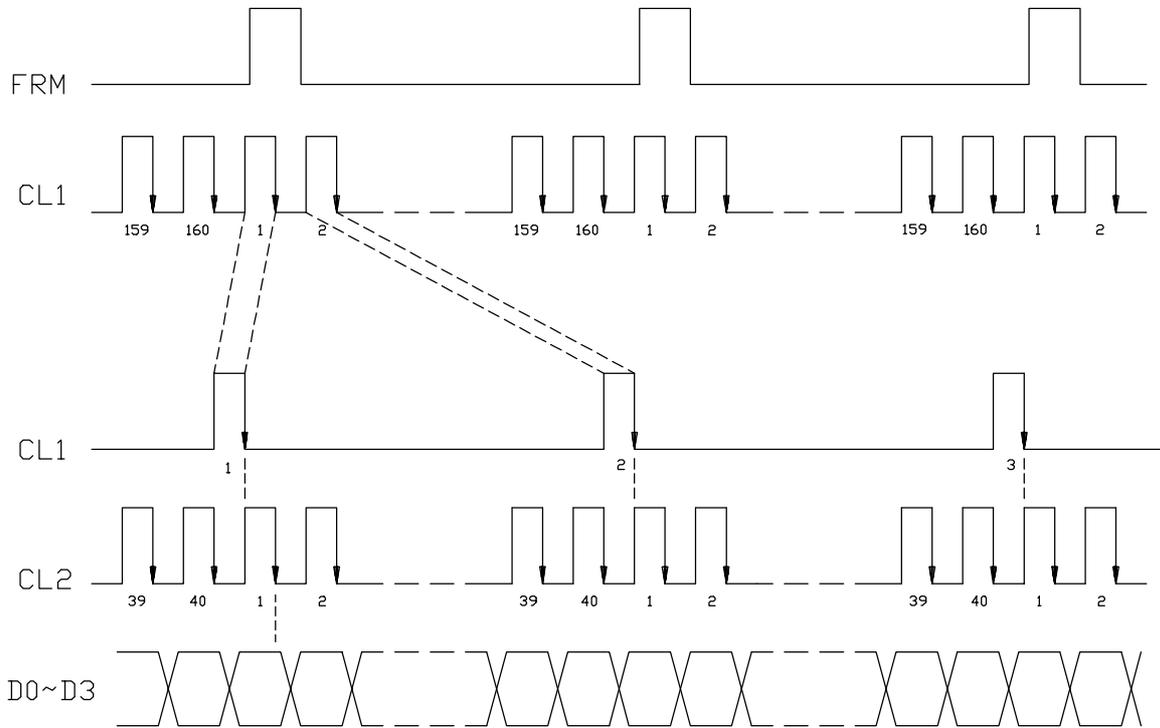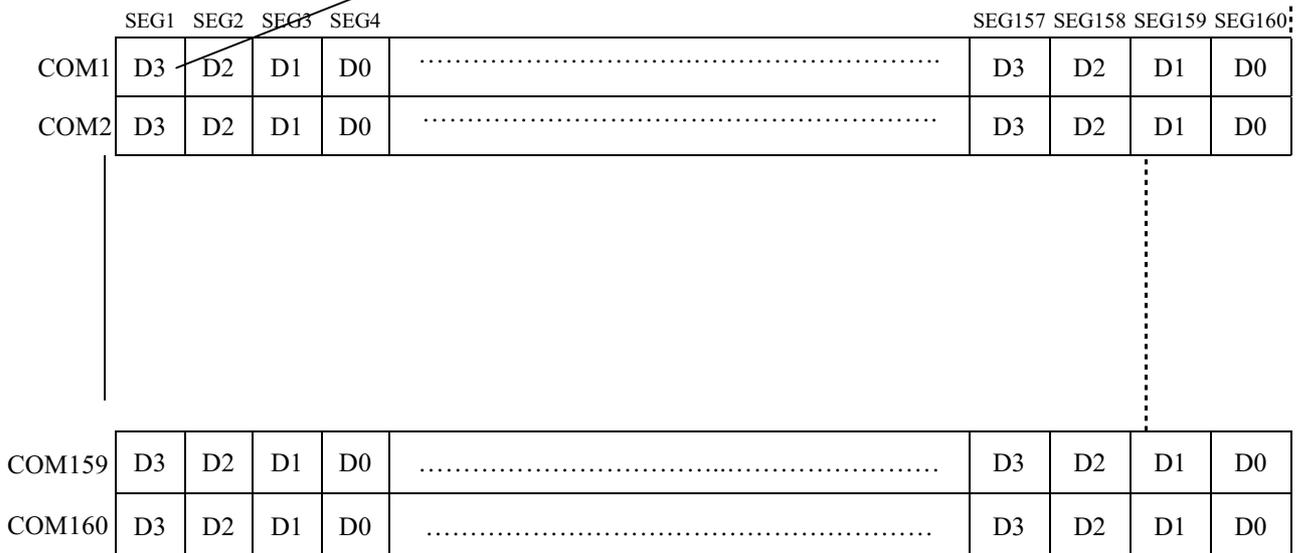
RELIABILITY TEST

No	Item	Conditions		Note
1	High Temp. Operation	50℃	240 HR	
2	High Temp. Storage	70℃	240 HR	
3	Low Temp. Operation	0℃	240 HR	
4	Low Temp. Storage	-20℃	240 HR	
5	High Temp./Humid Storage	40℃ 90%RH	240 HR	
6	Thermal Shock	0℃ ,30min +50℃ ,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.

Active Area
Viewing Area

15
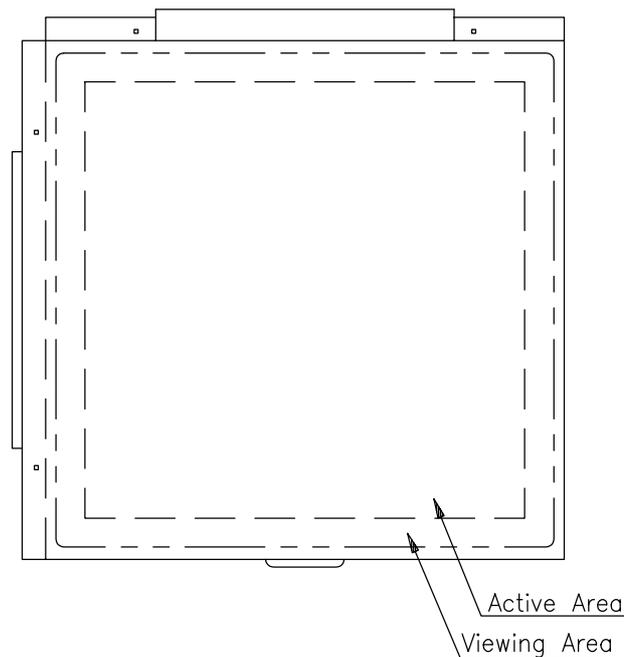
HANDLING PRECAUTIONS

(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＜1　　　　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