

# DATA IMAGE CORPORATION

## LCD Module Specification

ITEM NO.: TG322411FFSWA-T1

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R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
<i>Alex</i>	<i>Eric</i>	<i>Ken</i>	<i>heien</i>
Version:	Issued Date:	Sheet Code:	Total Pages:
B	2003/8/8		24

## 2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
B	08/AUG/03	5	5	1.Change Logic Power Minimum Voltage from 3.0V to 2.7V.

### 3. GENERAL SPECIFICATION

Display Format : 320 dots (W) × 240 (H) dots  
Dot Size : 0.225 (W) × 0.225 (H) mm  
View Area : 79.25 (W) × 60.0 (H) mm  
Outline Dimensions : 96.3 (W) × 71.05 (H) × 11.1 (T) mm Max.  
Weight : 80g max.

LCD Type :  STN Gray  STN BLUE  FSTN  TN

Polarizer mode :  Reflective  Transflective

Transmissive  Negative

View Angle :  6 O'clock  12 O'clock  Others \_\_\_\_\_

Backlight :  LED  EL  CCFL

Backlight Color :  Yellow green  Amber  Blue

White  Others

Controller / Driver : NT7701/NT7702

Temperature Range :  Normal  Wide Temperature  
Operating 0 to 50°C Operating -20 to 70°C  
Storage -20 to 60°C Storage -30 to 80°C

## 4. ABSOLUTE MAXIMUM RATINGS

### 4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

$V_{SS}=0V$ ,  $T_a = 25^{\circ}C$

Item	Symbol	Min.	Max.	Unit
Supply Voltage (Logic)	$V_{DD}-V_{SS}$	-0.3	6.0	V
Supply Voltage (LCD Driver)	$V_{EE}-V_{SS}$	0	30	V
Input Voltage	$V_I$	$V_{SS}$	$V_{DD}$	V
Operating Temperature	$T_{OP}$	-20	70	$^{\circ}C$
Storage Temperature	$T_{STG}$	-30	80	$^{\circ}C$

### 4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

Item	Operating		Storage		Comment
	(Min.)	Max.)	(Min.)	(Max.)	
Ambient Temp	-20	70	-30	80	Note (1)
Humidity	Note (2)		Note(2)		Without Condensation
Vibration	--	4.9M/S <sup>2</sup>	--	19.6M/S <sup>2</sup>	XYZ Direction
Shock	--	29.4M/S <sup>2</sup>	--	490M/S <sup>2</sup>	XYZ Direction

Note(1)  $T_a = 0^{\circ}C$  : 50Hr Max.

Note(2)  $T_a \leq 40^{\circ}C$  : 90% RH Max.

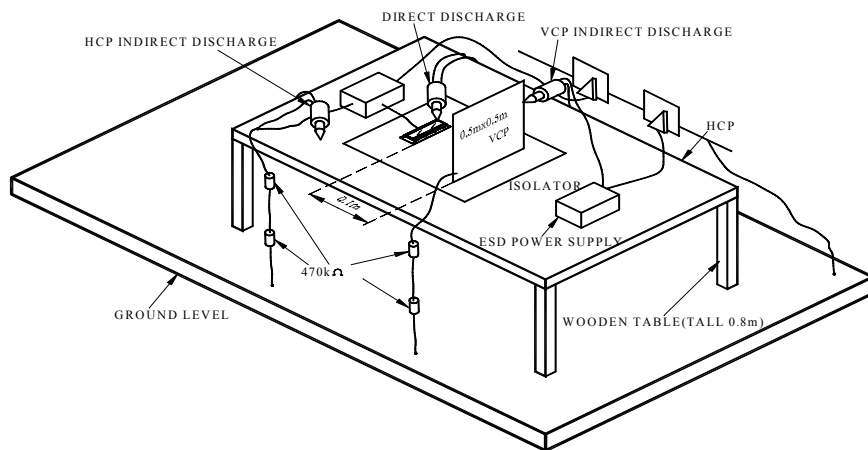
$T_a \geq 40^{\circ}C$  : Absolute humidity must be lower than the humidity of 90% RH at 40 $^{\circ}C$ .

### 4.3 Electronic Static Discharge maximum rating

ESD test method : IEC1000-4-2

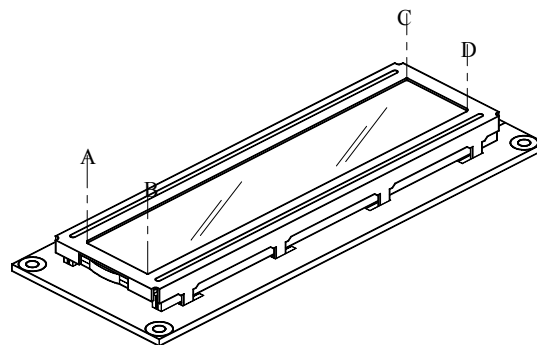
Item	Description	
Testing environment	Ambient temperature : 15°C to 35 °C Humidity: 30% to 60 % LCM ( E.U.T ) : Power up	
Testing equipment	Manufacture: Noise Ken, Model No. ESD-100L	
Testing condition	See drawing 1	
Direct discharge	0 to ± 6 KV	Discharge point, see drawing 2
Indirect discharge	0 to ± 12KV	Discharge point, see drawing 1
Pass condition	No malfunction of unit. Temporary malfunction of unit which can be recovered by system reset	
Fail condition	Non. Recoverable malfunction of LCM or system	

FIG 1 ESD TESTING EQUIPMENT



(1)

### DIRECT CONTACT DISCHARGE CONTACT POINT : A.B.C.D



(2)

## 5. ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage (Logic)	VDD-VSS		2.7	3.3	5.5	V
Supply Voltage (LCD)	VEE-VSS	-20°C	21.4	21.78	22.53	V
		25°C	20.07	20.71	21.46	
		70°C	18.42	19.0	19.79	
Input Voltage	V <sub>IH</sub>	--	0.8*VDD	--	VDD	V
	V <sub>IL</sub>		VSS	--	0.2*VDD	
Logic Supply Current	I <sub>DD</sub>	VDD-VSS=3.3V	--	20	--	mA

## 6. ELECTRO-OPTICAL CHARACTERISTICS

ITEM	Symbol	Condition	Min.	Typ.	Max.	Unit	Ref.
Rise Time	Tr	0°C	--	790	1300	ms	Note (1)
		25°C		265	300		
Fall Time	Tf	0°C	--	670	1100	ms	
		25°C		106	320		
Contrast	CR	25°C	--	8.3	--		Note (3)
View Angle	θ <sub>1-θ2</sub> ∅ <sub>1, ∅2</sub>	25°C & CR≥3	--	33	--		Note (2)
			--	32	--		
Frame Frequency	Ff	25°C	--	70	--	Hz	

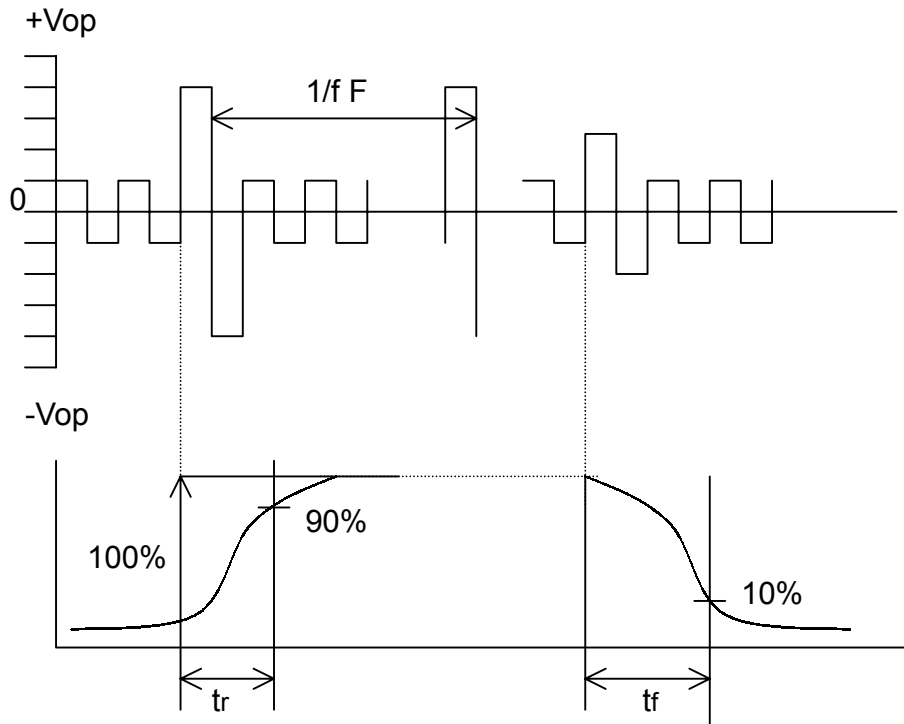
Note (1) & (2) : See next page

Note (3) : Contrast ratio is defined under the following condition:

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

- ( a ). Temperature ----- 25°C
- ( b ). Frame frequency ---- 70Hz
- ( c ). Viewing angle ----- θ= 0°, ∅ = 0°
- ( d ). Operating voltage --- 20.71V

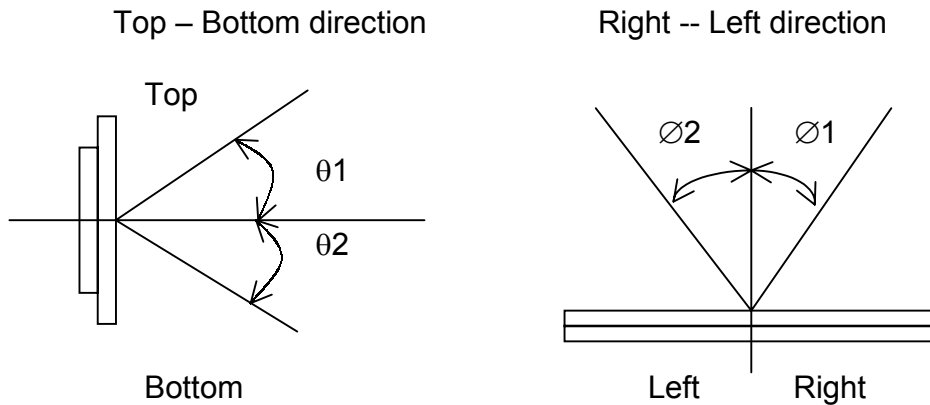
Note (1) Response time is measured as the shortest period of time possible between the change in state of an LCD segment as demonstrated below:



Condition:

- ( a ) . Temperature ----- $25^{\circ}C$
- ( b ) . Frame frequency ----- 70Hz
- ( c ) . View Angle -----  $\theta = 0^{\circ}, \varnothing = 0^{\circ}$
- ( d ) . Operating voltage ----- $20.71V$

Note (2) Definition of View Angle



## 6.1 LED ELECTRO-OPTICAL CHARACTERISTIC

Ta = 25°C

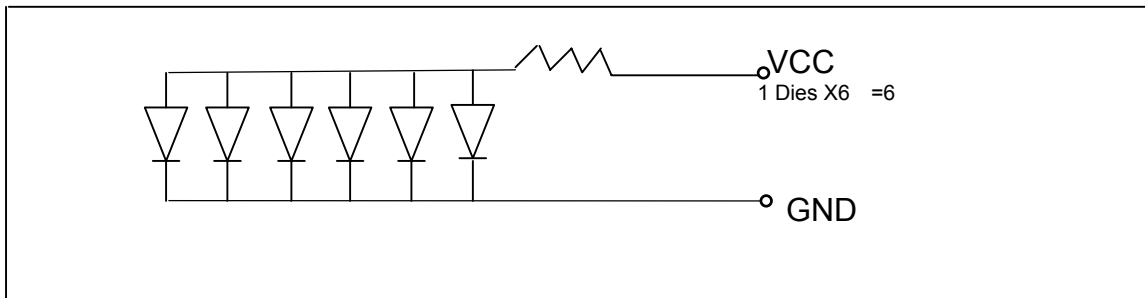
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 120mA White	--	5.0	5.5	V
Luminous Intensity	I <sub>v</sub>	I <sub>F</sub> = 120mA White	200	250	--	cd/m <sup>2</sup>
Chromaticity	X	I <sub>F</sub> = 120mA White	0.288	0.318	0.348	nm
	Y		0.225	0.255	0.285	
Spectrum Radiation	Δλ	I <sub>F</sub> = 120mA White	--	--	--	nm
Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 5V White	--	--	0.6	mA

Note : Measured at the bared LED backlight unit.

## 6.2 LED MAXIMUM OPERATING RANGE

Item	Symbol	White	Unit
Power Dissipation	PAD	0.456	W
Forward Current	I <sub>AF</sub>	120	mA
Reverse Voltage	V <sub>R</sub>	5	V

### 6.2.1 LED ARRAY BLOCK DIAGRAM





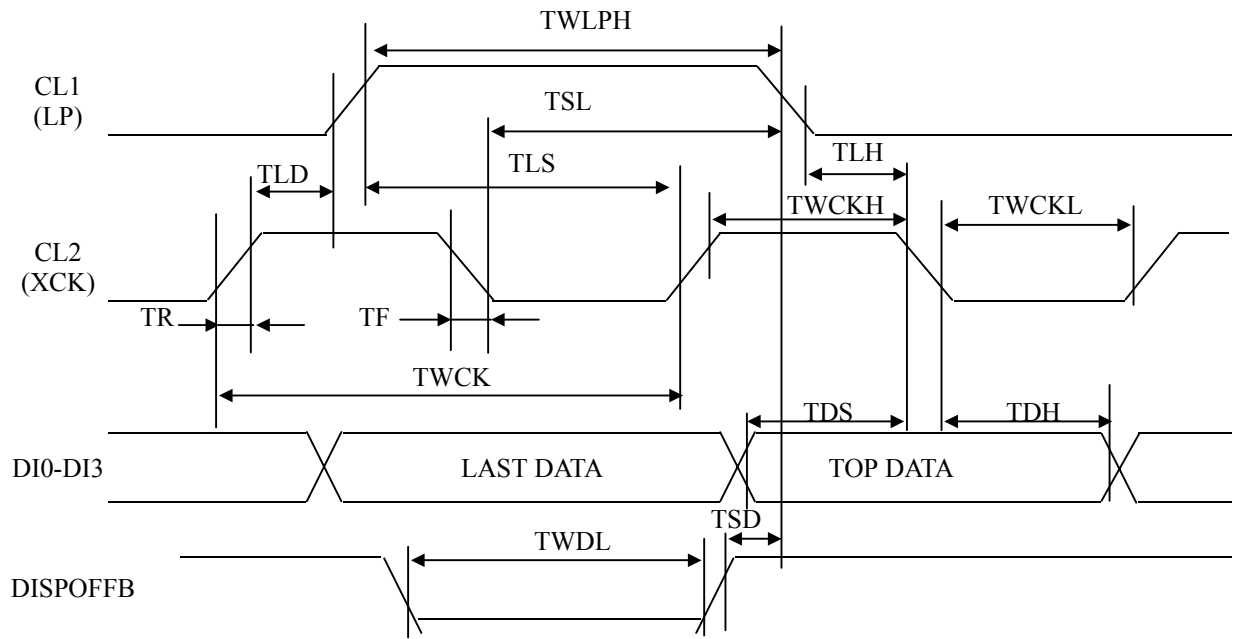
## 7. 7. TIMING CHARACTERISTIC

### Segment timing:

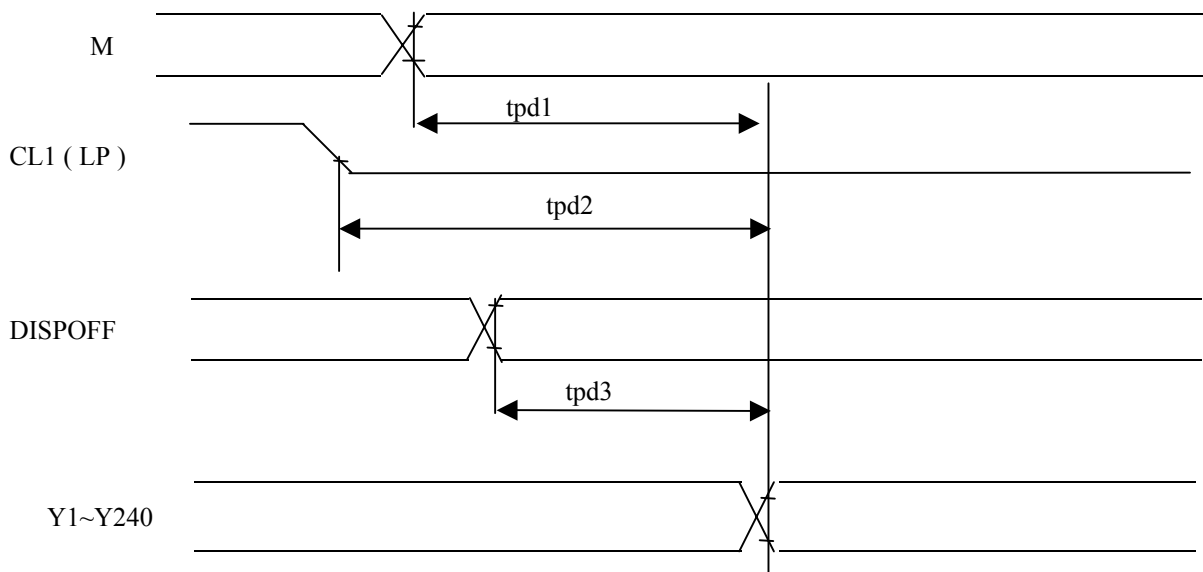
Item	Symbol	Condition	Min.	Typ.	Max.	Units
Shift Clock Period *1	TWCK	TR,TF≤10ns	125			ns
Shift Clock Pulse Width	TWCKH TWCKL		51			ns
Data Set Up Time	TDS		30			ns
Data Hold Time	TDH		40			ns
Latch Pulse “H” Pulse Width	TWLPH		51			ns
Shift Clock Rise to Latch Pulse Rise Time	TLD		0			ns
Shift Clock Fall to Latch Pulse Fall Time	TSL		51			ns
Latch Pulse Rise to Shift Clock Rise Time	TLS		51			ns
Latch Pulse Fall to Shift Clock Fall Time	TLH		51			ns
Input Signal Rise/ Fall Time *2	TR, TF				50	ns
Enable Setup Time	TS		36			ns
DISPOFFB Removal Time	TSD		100			ns
DISPOFFB “L” Pulse Width	TWDL		1.2			u
Output Delay Time (1)	TD	CL=15pF			78	ns
Output Delay Time (2)	TPD1, TPD2	CL=15pF			1.2	us
Output Delay Time (3)	TPD3	CL=15pF			1.2	us

Note: \*1. Take the cascade connection into consideration.

\*2.  $(TWCK-TWCKH-TWCKL)/2$  is maximum in the case of high speed operation.

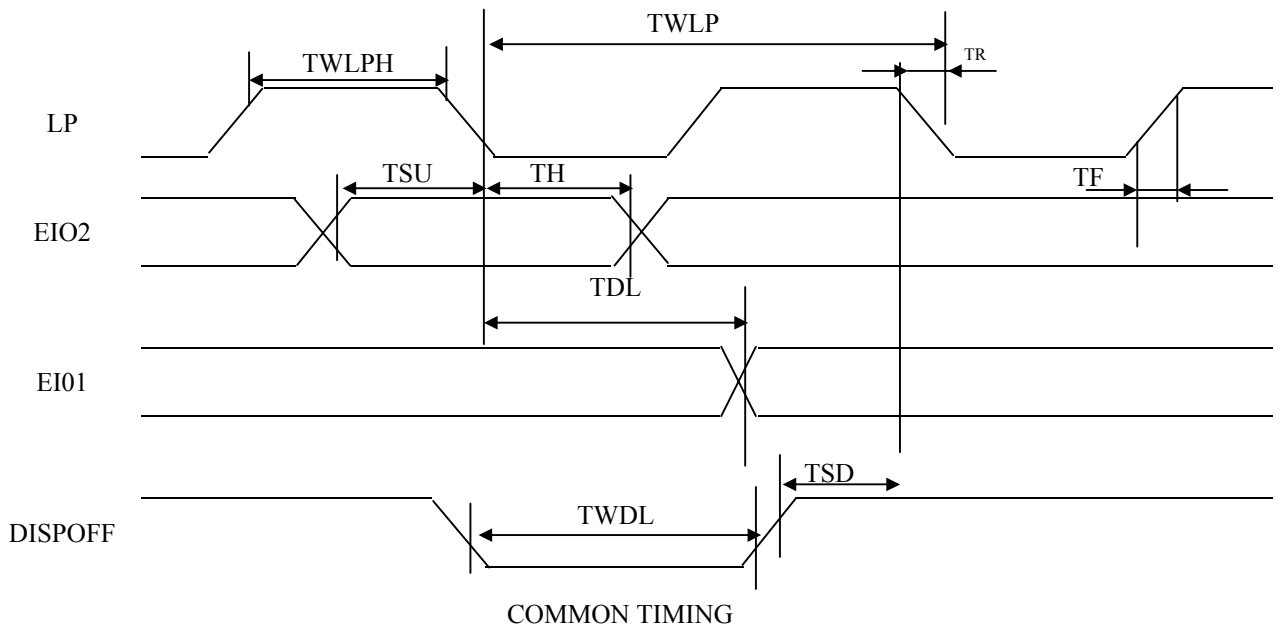


SEGMENT TIMING

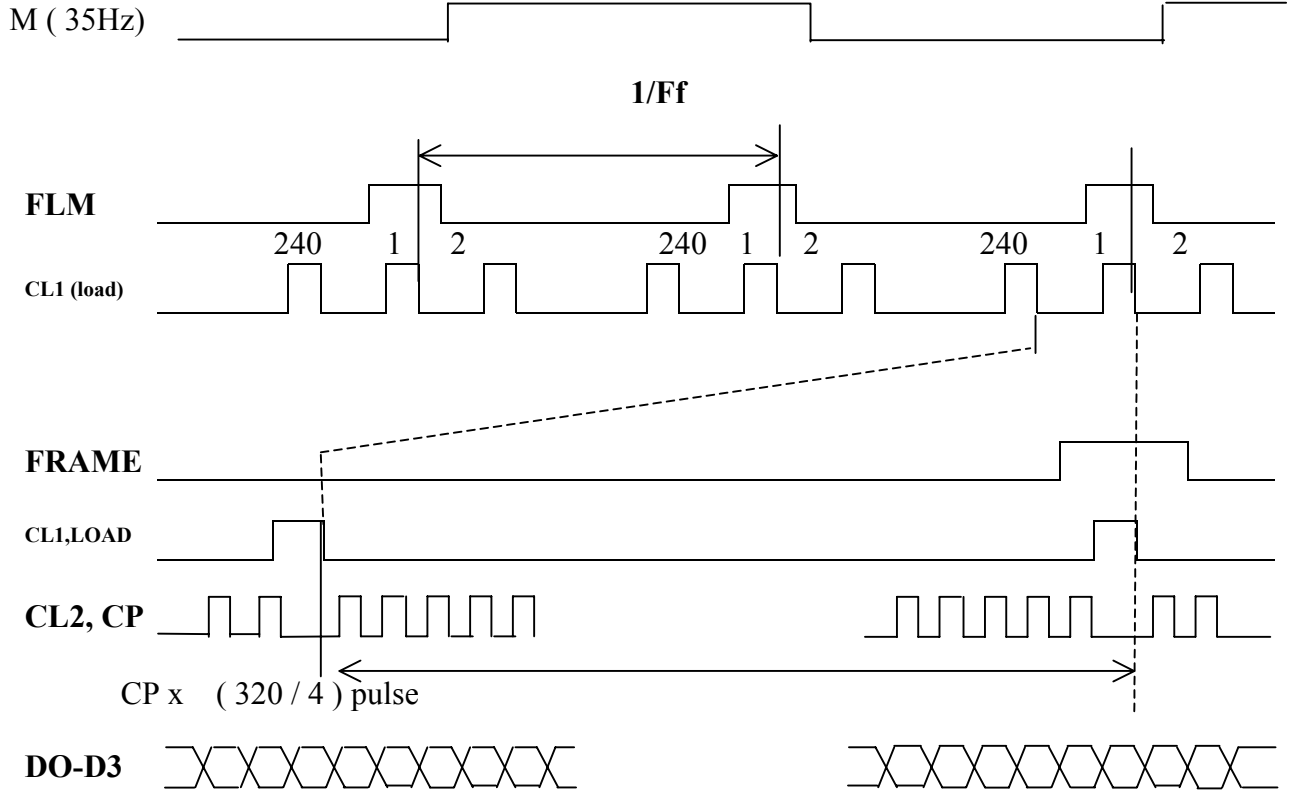


common timing:

Item	Symbol	Condition	Min.	Typ.	Max.	Units
Shift Clock Period	TWLP	$T_R, T_F \leq 20\text{ns}$	250			ns
Pulse "H" Pulse Width	TWLPH	$V_{DD} = +5.0\text{V} \pm 10\%$	15			ns
		$V_{DD} = +2.5\text{V} \sim +4.5\text{V}$	30			
Data Set Up Time	TSU		30			ns
Data Hold Time	TH		50			ns
Input Signal Rise/ Fall Time	$T_R, T_F$				50	ns
DISPOFFB Removal Time	TSD		100			ns
DISPOFFB "L" Pulse Width	TWDL		1.2			u
Output Delay Time (1)	TDL	$C_L = 15\text{pF}$			200	ns
Output Delay Time (2)	TPD1, TPD2	$C_L = 15\text{pF}$			1.2	us
Output Delay Time (3)	TPD3	$C_L = 15\text{pF}$			1.2	us



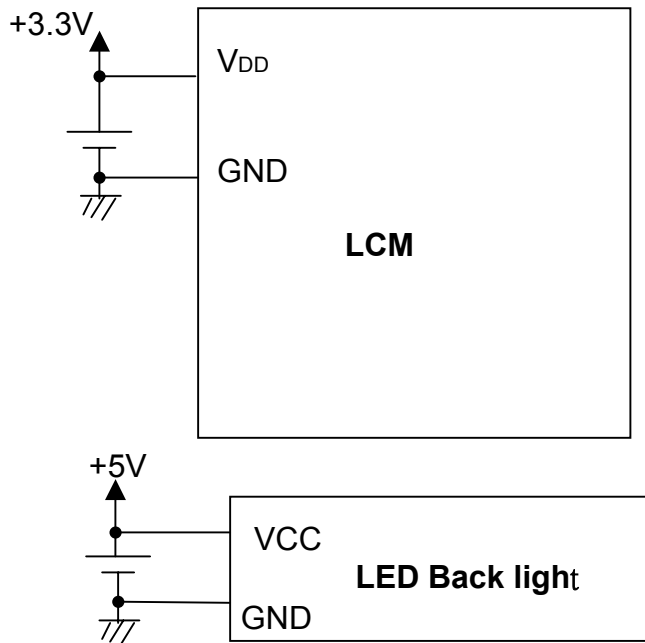
# 7.1 TIMING CHART



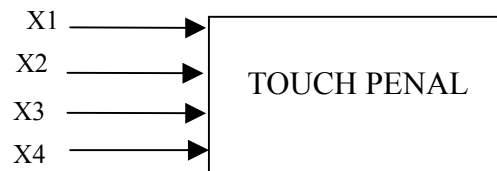
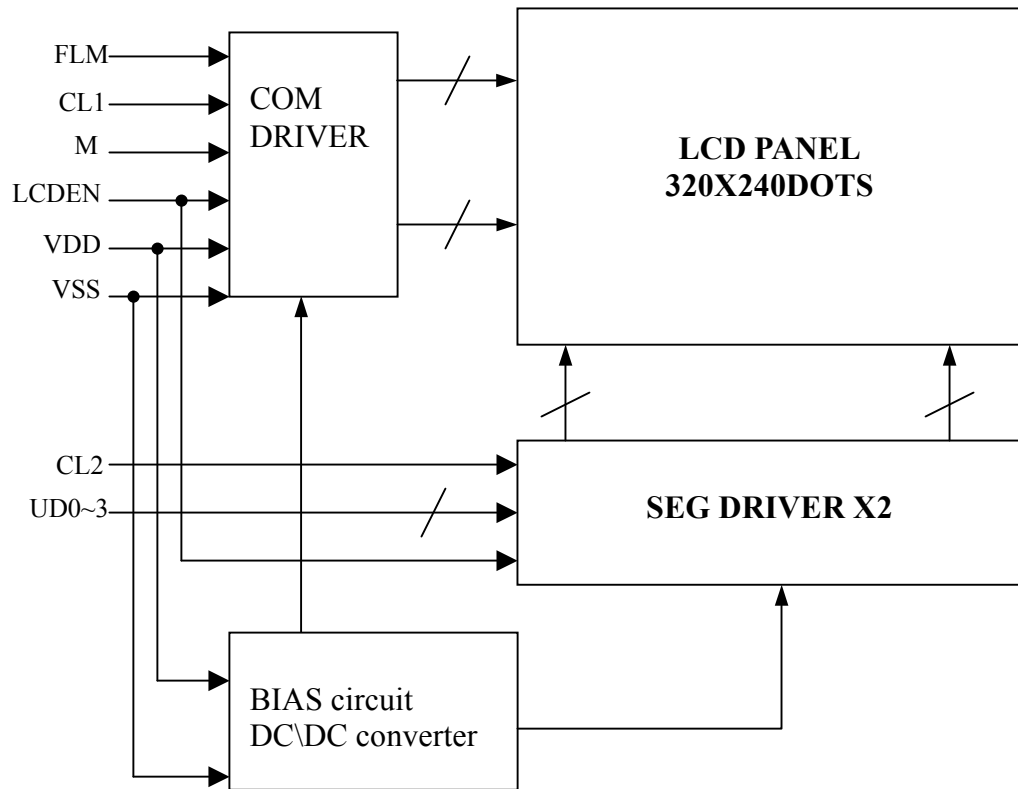
## 8 PIN CONNECTIONS

NO	Symbol	Function
1	VCC	Power Supply for Backlight
2	GND	Ground for Backlight
3	VDD	Power Supply for Logic
4	VSS	Ground for Logic
5	FLM	First line pulse.
6	CL1	Data latch pulse.
7	VSS	Ground for Logic
8	CL2	Data latch pulse.
9	M	Switch signal to convert LCD drive wave form into AC
10	LCDEN	LCD display enable
11	UD3	Display data bus
12	UD2	
13	UD1	
14	UD0	
15	X1	Signal for touch panel
16	X2	
17	X3(Y1)	
18	X4(Y2)	

## 9. POWER SUPPLY



## 10. BLOCK DIAGRAM



# 11. TOUCH PANEL CHARACTERISTICS

## 1.Scope

This specification is applied to DATA IMAGE Display Devices Product/ TG322411

## 2. Features

Type : Analog Resistive Type Touch Panel

Input Mode : Pen or Finger

Structure: PET-----Non Glare ITO Film, 175 $\mu$ m

Clear ITO Film, 175 $\mu$ m

Glass-----ITO Glass, 0.7mm/1.1mm/1.8mm

Tape Gasket---60 $\mu$ m

Dot pitch-----1.0 mm(Optional)

Connector : FPC

## 3. General Specification

Item	Specification	Unit
ITO Glass	0.7 $\pm$ 0.07(T)/1.1 $\pm$ 0.1(T)/1.8 $\pm$ 0.1(T)	mm
FPC (ITO Film)	175 $\pm$ 15(ITO Film)	$\mu$ m
Connector	FPC,4-pin connector (L23.3*W5.5),Pitch=1.0	mm
Total Thickness	87.3 $\pm$ 0.3(W)*69.3 $\pm$ 0.3(H)*0.95 $\pm$ 0.15(T)	mm

## 4. RATING

4.1 The maximum voltage: DC 7Volts

4.2 Usable Temperature Range From: -20 $^{\circ}$ C to 60  $^{\circ}$ C(20~90%)

4.3 Storage Temperature Range From: -40 $^{\circ}$ C to 80  $^{\circ}$ C(20~90%)

## 5. Electrical Specification

5.1 Resistance between leads: FILM(X axis) GLASS (Y axis):200~900 $\Omega$

5.2 Linearity : X axis  $\pm$ 1.5% $\downarrow$ , Y axis  $\pm$ 1.5% $\downarrow$

5.3 Insulation resistance: 20M $\Omega$  $\uparrow$  @DC 25V

5.4 Chattering Time : 10msec @100K $\Omega$  $\downarrow$  Pull -UP

## 6. Mechanical Specification

6.1 Input Method pen or Finger

6.2 Operating Force: 80g $\downarrow$  With R8.0 HS40 $^{\circ}$  Silicon Rubber

80g $\downarrow$  With R0.8 Polyacetal pen

6.3 Surface Hardness: 2H (Pencil Test) ,Hard Coated PET

6.4 Light Transmission: 75% $\uparrow$  (Non Glare Type),80% $\uparrow$  (Clear Type)

(@550nm, Spectro Photometer Hitachi U3300)

## 7. Durability

7.1 Durability against Writing Characters

After writing 200,000 characters in the same area (20mm\*20mm),

Force : 250g , Speed: 1,000 characters/hour

- Resistance Between Leads : FILM (X axis) GLASS (Y axis)
- Linearity : X axis  $\pm$ 1.0% $\downarrow$ , Y axis  $\pm$ 1.0% $\downarrow$
- Insulation Resistance: 20M $\Omega$  $\uparrow$  @DC 25V

7.2 Punching Life

After Punching 1,200,000 Times with the R8.0 silicon rubber

Force : 250g, Speed:2/sec

- Resistance Between Leads : FILM (X axis) GLASS (Y axis)
- Linearity : X axis  $\pm$ 1.0% $\downarrow$ , Y axis  $\pm$ 1.0% $\downarrow$

- Insulation Resistance:  $20M\Omega\uparrow$  @DC 25V

7.3 Impact Resistance:

No damage when  $\phi 9$ mm steel ball is dropped on the surface from 30cm height at 1 time.

7.4 Flexible Pattern Heat Seal Peeling Strength :1.5N/cm (peeling upward by 90deg. Speed:50mm/min)

7.5 Flexible Pattern Bending Resistance Bending: 3 times or more by bending radius R1.0mm.

7.6 Flexible Pattern insert/pull out Resistance 5 times at least.  
The requirements in 5.1 shall be satisfied.

7.7 Vibration Resistance (In operation)

No faulty operation when sweep vibration of 0.2G 10~55Hz (1min.) is given for 30min. each in the directions of X,Y,Z.

(Not in operation )

The requirements in 6.2 and 5.1~5.4 shall be satisfied after sweep vibration of 2g 10~55Hz (1min.) is given for 30min. each in the directions of X,Y,Z.

7.8 Package Drop

No damage to the product.(1 corner edge, 2 ridges, 4 surfaces, drop from 50 cm height:65cm for the bottom)

## 8. Reliability

### 8.1 High Temperature Test

After putting Panels at 80°C for 120 hours, then leaving for 24 hours at room temperature.

- Resistance Between Leads : FILM (X axis) GLASS(Y axis)
- Linearity : X axis  $\pm 1.5\%\downarrow$ , Y axis  $\pm 1.5\%\downarrow$
- Insulation Resistance:  $20M\Omega\uparrow$  @DC 25V
- Operating Fore : 80g $\downarrow$  With R8.0 HS40° Silicon Rubber  
80g $\downarrow$  With R0.8 Polyacetal pen

### 8.2 Low Temperature Test

- After putting panels at -40°C for 120 hours, then leaving for 24 hours at room temperature.
- Resistance Between Leads : FILM (X axis) GLASS(Y axis)
- Linearity : X axis  $\pm 1.5\%\downarrow$ , Y axis  $\pm 1.5\%\downarrow$
- Insulation Resistance:  $20M\Omega\uparrow$  @DC 25V
- Operating Fore : 80g $\downarrow$  With R8.0 HS40° Silicon Rubber  
80g $\downarrow$  With R0.8 Polyacetal pen

### 8.3 Temperature and Humidity Test: After putting panels at 60°C, 90%RH for 120 hours, then leaving for 24 hours at room temperature

- Resistance Between Leads : FILM (X axis) GLASS(Y axis)
- Linearity : X axis  $\pm 1.5\%\downarrow$ , Y axis  $\pm 1.5\%\downarrow$
- Insulation Resistance:  $20M\Omega\uparrow$  @DC 25V
- Operating Fore: 80g $\downarrow$  With R8.0 HS40° Silicon Rubber  
80g $\downarrow$  With R0.8 Polyacetal pen

### 8.4 Repetition of High and Low Temperature

After putting panels at the condition of -40°C for 30minutes, and then 80°C for 30 minutes and this process is repeated by 10 cycles, then leaving for 24 hours at room temperature.

- Resistance Between Leads : FILM (X axis) GLASS(Y axis)
- Linearity : X axis  $\pm 1.5\%\downarrow$ , Y axis  $\pm 1.5\%\downarrow$
- Insulation Resistance:  $20M\Omega\uparrow$  @DC 25V
- Operating Fore : 80g $\downarrow$  With R8.0 HS40° Silicon Rubber  
80g $\downarrow$  With R0.8 Polyacetal pen



## 12. QUALITY ASSURANCE

### 12.1 Test Condition

#### 12.1.1 Temperature and Humidity(Ambient Temperature)

Temperature :  $20 \pm 5^{\circ}\text{C}$

Humidity :  $65 \pm 5\%$

#### 12.1.2 Operation

Unless specified otherwise, test will be conducted with LCM in operation.

#### 12.1.3 Container

Unless specified otherwise, vibration test will be conducted on module only.

#### 12.1.4 Test Frequency

Single cycle.

#### 12.1.5 Test Method

No.	Parameter	Conditions	Regulations
1	High Temperature Operating	$70 \pm 2^{\circ}\text{C}$	Note 3
2	Low Temperature Operating	$-20 \pm 2^{\circ}\text{C}$	Note 3
3	High Temperature Storage	$80 \pm 2^{\circ}\text{C}$	Note 3
4	Low Temperature Storage	$-30 \pm 2^{\circ}\text{C}$	Note 3
5	Vibration Test (Non-operation state)	Total fixed amplitude : 1.5mm Vibration Frequency : 10 ~ 55Hz One cycle 60 seconds to 3 directions of X.Y.Z. for each 15 minutes	Note 3
6	Damp Proof Test (Non-operation state)	$40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 90~95%RH, 96h	Note 1,2
7	Shock Test (Non-operation state)	To be measured after dropping from 60cm high once concrete surface in packing state	Note 3

Note 1: Returned under normal temperature and humidity for 4 hrs.

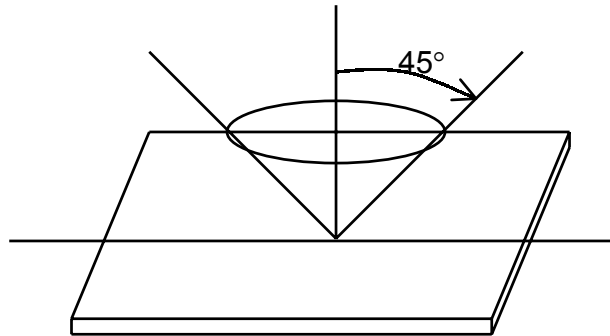
Note 2: No dew condensation to be observed.

Note 3: No change on display and in operation under the test condition

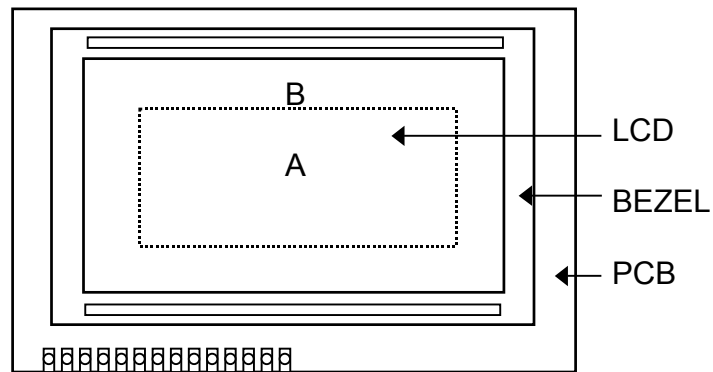
## 12.2 Inspection condition

### 12.2.1 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.



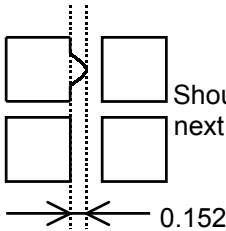
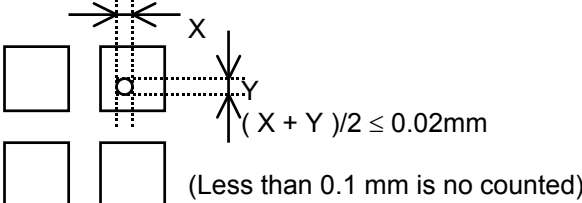
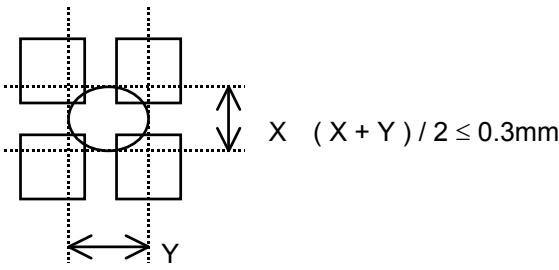
### 12.2.2 Definition of applicable Zones



A : Display Area  
B : Non-Display Area

12.2.3 Inspection Parameters

No.	Parameter	Criteria																																	
1	Black or White spots	<table border="1"> <thead> <tr> <th rowspan="2">Zone Dimension</th> <th colspan="2">Acceptable number</th> <th rowspan="2">Class Of Defects</th> <th rowspan="2">AQL Level</th> </tr> <tr> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>D &lt; 0.15</td> <td>*</td> <td>*</td> <td rowspan="4">Minor</td> <td rowspan="4">2.5</td> </tr> <tr> <td>0.15 ≤ D &lt; 0.2</td> <td>4</td> <td>4</td> </tr> <tr> <td>0.2 ≤ D ≤ 0.25</td> <td>2</td> <td>2</td> </tr> <tr> <td>D ≤ 0.3</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p style="text-align: center;">D = (Long + Short) / 2      * : Disregard</p>	Zone Dimension	Acceptable number		Class Of Defects	AQL Level	A	B	D < 0.15	*	*	Minor	2.5	0.15 ≤ D < 0.2	4	4	0.2 ≤ D ≤ 0.25	2	2	D ≤ 0.3	0	1												
Zone Dimension	Acceptable number			Class Of Defects	AQL Level																														
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D ≤ 0.3	0	1																																	
2	Scratch, Substances	<table border="1"> <thead> <tr> <th rowspan="2">X (mm) \ Y (mm)</th> <th colspan="2">Zone</th> <th colspan="2">Acceptable number</th> <th rowspan="2">Class Of Defects</th> <th rowspan="2">AQL Level</th> </tr> <tr> <th>X (mm)</th> <th>Y (mm)</th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>*</td> <td>0.04 ≥ W</td> <td></td> <td>*</td> <td>*</td> <td rowspan="4">Minor</td> <td rowspan="4">2.5</td> </tr> <tr> <td>3.0 ≥ L</td> <td>0.06 ≥ W</td> <td></td> <td>4</td> <td>4</td> </tr> <tr> <td>2.0 ≥ L</td> <td>0.08 ≥ W</td> <td></td> <td>2</td> <td>3</td> </tr> <tr> <td>—</td> <td>0.1 &lt; W</td> <td></td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p style="text-align: center;">X : Length    Y : Width      * : Disregard Total defects should not exceed 4/module</p>	X (mm) \ Y (mm)	Zone		Acceptable number		Class Of Defects	AQL Level	X (mm)	Y (mm)	A	B	*	0.04 ≥ W		*	*	Minor	2.5	3.0 ≥ L	0.06 ≥ W		4	4	2.0 ≥ L	0.08 ≥ W		2	3	—	0.1 < W		0	1
X (mm) \ Y (mm)	Zone			Acceptable number		Class Of Defects	AQL Level																												
	X (mm)	Y (mm)	A	B																															
*	0.04 ≥ W		*	*	Minor	2.5																													
3.0 ≥ L	0.06 ≥ W		4	4																															
2.0 ≥ L	0.08 ≥ W		2	3																															
—	0.1 < W		0	1																															
3	Air Bubbles (between glass & polarizer)	<table border="1"> <thead> <tr> <th rowspan="2">Zone Dimension</th> <th colspan="2">Acceptable number</th> <th rowspan="2">Class of Defects</th> <th rowspan="2">AQL Level</th> </tr> <tr> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>D ≤ 0.15</td> <td>*</td> <td>*</td> <td rowspan="3">Minor</td> <td rowspan="3">2.5</td> </tr> <tr> <td>0.15 &lt; D ≤ 0.25</td> <td>2</td> <td>*</td> </tr> <tr> <td>0.25 &lt; D</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p style="text-align: center;">* : Disregard Total defects shall not excess 3/module.</p>	Zone Dimension	Acceptable number		Class of Defects	AQL Level	A	B	D ≤ 0.15	*	*	Minor	2.5	0.15 < D ≤ 0.25	2	*	0.25 < D	0	1															
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0.25 < D	0	1																																	
4	Uniformity of Pixel	<p>(1) Pixel shape (with Dent)</p>																																	

4	Uniformity of Pixel	<p>(2) Pixel shape ( with Projection)</p>  <p>Should not be connected to next pixel</p>	
		<p>(3) Pin hole</p>  <p>(Less than 0.1 mm is no counted)</p>	
		<p>(4) Deformation</p>  <p>Total acceptable number : 1/pixel, 5/cell</p>	
Class of defects	<b>Major</b>	AQL 0.65%	<b>Definition</b>
		AQL 1.00%	It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
	<b>Minor</b>	AQL 2.5%	It is a defect that is likely to assembly size and not result in functioning problem.
		It is a defect that will not result in functioning problem with deviation classified.	

### 12.3 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

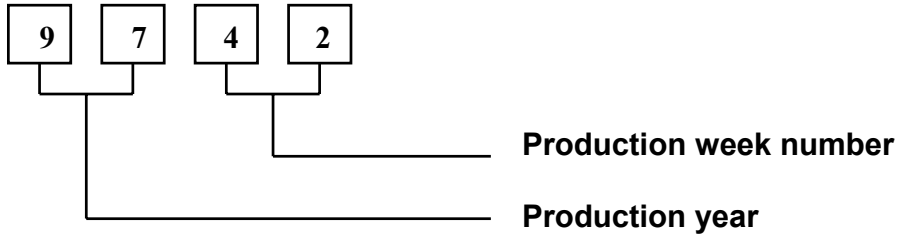
Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling

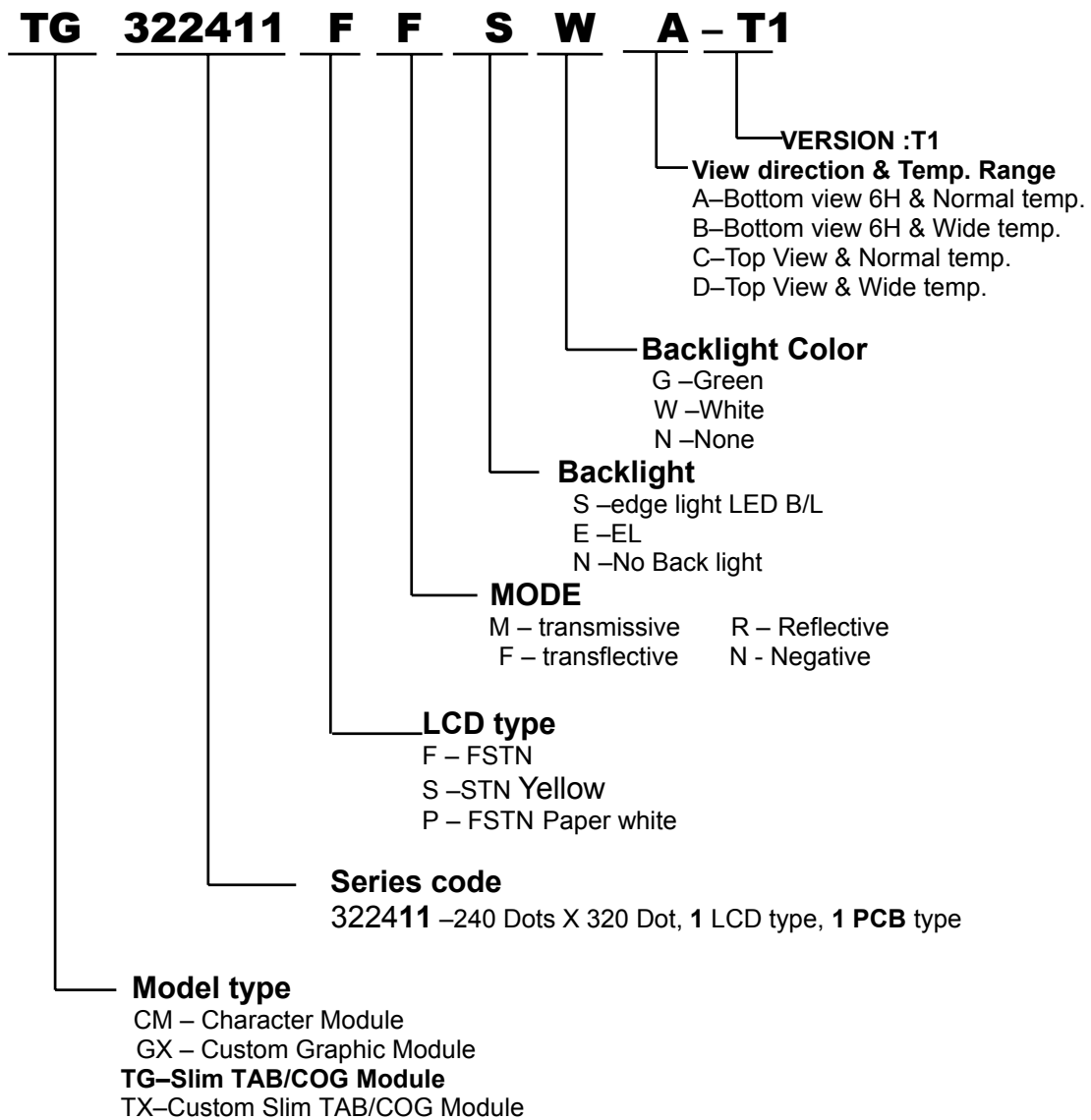
Sampling table: MIL-STD-105E

Inspection level: Level II

### 13. LOT NUMBERING SYSTEM



### 14. LCM NUMBERING SYSTEM



## 15. PRECAUTION FOR USING LCM

### 1. LIQUID CRYSTAL DISPLAY (LCD)

LCD is made up of glass, organic sealant, organic fluid, and polymer based polarizers. The following precautions should be taken when handling,

- (1). Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel off or bubble.
- (2). Do not contact the exposed polarizers with anything harder than an HB pencil lead. To clean dust off the display surface, wipe gently with cotton, chamois or other soft material soaked in petroleum benzin.
- (3). Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.
- (4). Glass can be easily chipped or cracked from rough handling, especially at corners and edges.
- (5). Do not drive LCD with DC voltage.

### 2. Liquid Crystal Display Modules

#### 2.1 Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

- (1). Do not tamper in any way with the tabs on the metal frame.
- (2). Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.
- (3). Do not touch the elastomer connector, especially insert an backlight panel (for example, EL).
- (4). When mounting a LCM make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
- (5). Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

#### 2.2. Static Electricity

LCM contains CMOS LSI's and the same precaution for such devices should apply, namely

- (1). The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.
- (2). The modules should be kept in antistatic bags or other containers resistant to static for storage.
- (3). Only properly grounded soldering irons should be used.
- (4). If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

(5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.

(6). Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

#### 2.3 Soldering

- (1). Solder only to the I/O terminals.
- (2). Use only soldering irons with proper grounding and no leakage.
- (3). Soldering temperature :  $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$
- (4). Soldering time: 3 to 4 sec.
- (5). Use eutectic solder with resin flux fill.
- (6). If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed after wards.

#### 2.4 Operation

- (1). The viewing angle can be adjusted by varying the LCD driving voltage V0.
- (2). Driving voltage should be kept within specified range; excess voltage shortens display life.
- (3). Response time increases with decrease in temperature.
- (4). Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".
- (5). Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".

#### 2.5 Storage

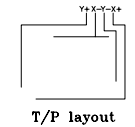
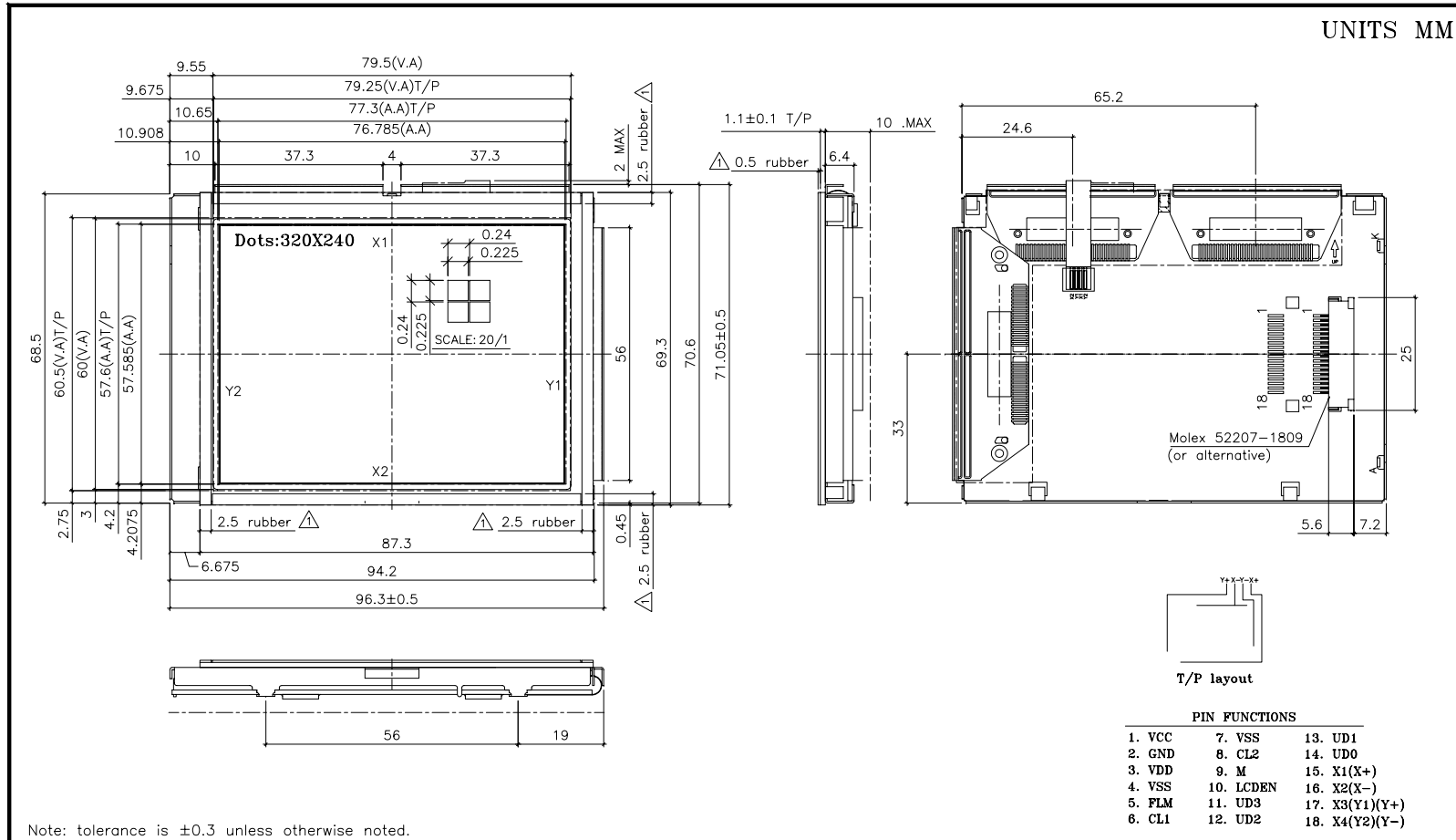
If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.

#### 2.6 Limited Warranty

Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of DATA IMAGE is limited to repair and/or replacement on the terms set forth above. DATA IMAGE will not responsible for any subsequent or consequential events.

# 16. OUTLINE DRAWING

UNITS MM



**PIN FUNCTIONS**

1. VCC	7. VSS	13. UD1
2. GND	8. CL2	14. UD0
3. VDD	9. M	15. X1(X+)
4. VSS	10. LCDEN	16. X2(X-)
5. FLM	11. UD3	17. X3(Y1)(Y+)
6. CL1	12. UD2	18. X4(Y2)(Y-)

				DATE:	05/05/03'	DATA IMAGE Corporation	
				DRAWN:		TITLE: LCM OUTLINE DIMENSION	
				CHECK:		ISSUE DATE:	
				APPROVE:		A4 DWG. NO. TG322411 REV. 2	
REVISIONS				SCALE :	1/1.2	SHEET 1 OF 1	
△	Change rubber position	05/19/03'					
AUTH	DESCRIPTION	DATE	APPROVED				

# 17. PACKAGE INFORMATION

