

# DATA IMAGE CORPORATION

## LCD Module Specification

ITEM NO.: **GM322402GNSWAGT2**

### Table of Contents

1. COVER & CONTENTS .....	1
2. RECORD OF REVISION .....	2
3. GENERAL SPECIFICATIONS .....	3
4. ABSOLUTE MAXIMUM RATINGS .....	4
5. ELECTRICAL CHARACTERISTICS .....	6
6. ELECTRO-OPTICAL CHARACTERISTIC .....	6
7. PIN CONNECTIONS.....	9
8. POWER SUPPLY .....	9
9. BLOCK DIAGRAM .....	10
10. QUALITY ASSURANCE .....	11
11. TOUCH PANEL CHARACTERISTIC.....	15
12. LOT NUMBERING SYSTEM .....	16
13. LCM NUMBERING SYSTEM .....	16
14. PRECAUTIONS IN USE LCM .....	17
15. OUTLINE DRAWING .....	18
16. PACKAGE INFORMATION .....	19

Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	JACK	ERIC	KEN	HELEN
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	A	2005/11/16		19





### 3. GENERAL SPECIFICATION

Display Format : 320 (W) × 240 (H) dots  
Dots Size : 0.33 (W) × 0.33 (H) mm  
View Area : 122 (W) × 92 (H) mm  
Outline Dimensions : 160.0 (W) × 109.0 (H) × 13.5 (T) mm Max.  
Weight : 210g max.

LCD Type & Background Color:  STN Blue       STN Yellow Green       FSTN Dark Gray

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 Green

White       Others

Controller / Driver : RA8835 /NT7086

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

Pixel Color: White

#### REMARK:

Our components and processes are compliant to RoHS standard

## 4. ABSOLUTE MAXIMUM RATINGS

### 4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

GND= 0V, Ta = 25°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage (Logic)	VDD-GND	-0.3	7.0	V
Supply Voltage (LCD Driver)	VDD-V <sub>O</sub>	0	30	V
Input Voltage	V <sub>I</sub>	-0.3	VDD+0.3	V
Operating Temperature	T <sub>OP</sub>	0	50	°C
Storage Temperature	T <sub>STG</sub>	-20	70	°C

### 4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

Item	Operating		Storage		Comment
	(Min.)	Max.)	(Min.)	(Max.)	
Ambient Temp	0	50	-20	70	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) Ta = 0°C : 50Hr Max.

Note(2) Ta ≤ 40°C : 90% RH Max.

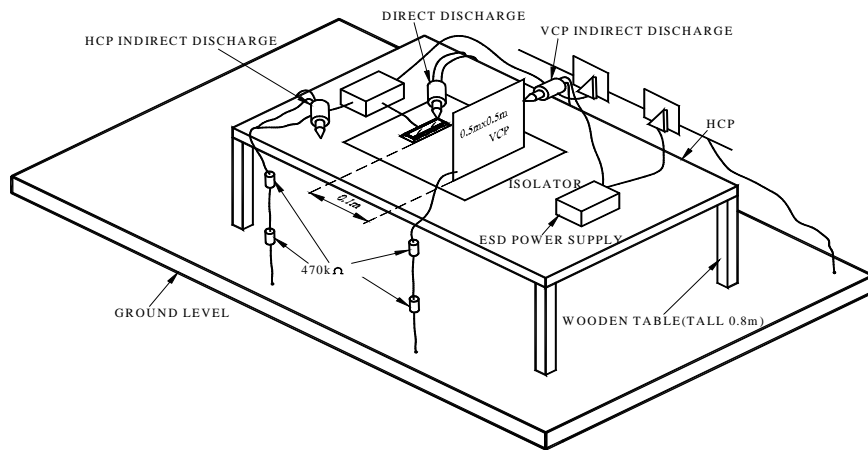
Ta ≥ 40°C : Absolute humidity must be lower than the humidity of 90% RH at 40°C.

### 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	

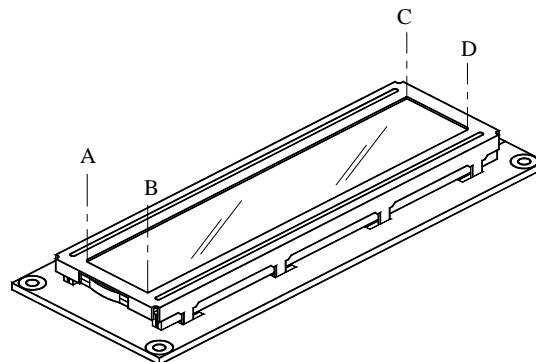
FIG 1 ESD TESTING EQUIPMENT



(1)

### DIRECT CONTACT DISCHARGE

CONTACT POINT : A.B.C.D



(2)

## 5. ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage (Logic)	V <sub>DD-GND</sub>		2.7	5.0	5.5	V
Supply Voltage (LCD)	V <sub>DD-VO</sub>	0°C	--	--	--	V
		25°C	23.1	23.6	24.0	
		50°C	--	--	--	
Input Voltage	V <sub>IH</sub>	V <sub>DD-GND</sub> =2.7~5.5V	0.8*V <sub>DD</sub>	--	V <sub>DD</sub>	V
	V <sub>IL</sub>		GND	--	0.2*V <sub>DD</sub>	
Logic Supply Current	I <sub>DD</sub>	V <sub>DD-GND</sub> = 5V	--	50	--	mA

## 6. ELECTRO-OPTICAL CHARACTERISTICS

ITEM	Symbol	Condition	Min.	Typ.	Max.	Unit	Ref.
Rise Time	Tr	0°C	--	--	--	ms	Note (1)
		25°C	--	--	350		
Fall Time	Tf	0°C	--	--	--	ms	
		25°C	--	--	350		
Contrast	CR	25°C	3	--	--		Note (3)
View Angle	θ <sub>1~θ2</sub> ∅ <sub>1, ∅2</sub>	25°C & CR≥2	-20~30			deg	Note (2)
			-30~30				
Frame Frequency	Ff	25°C	32	64	200	Hz	

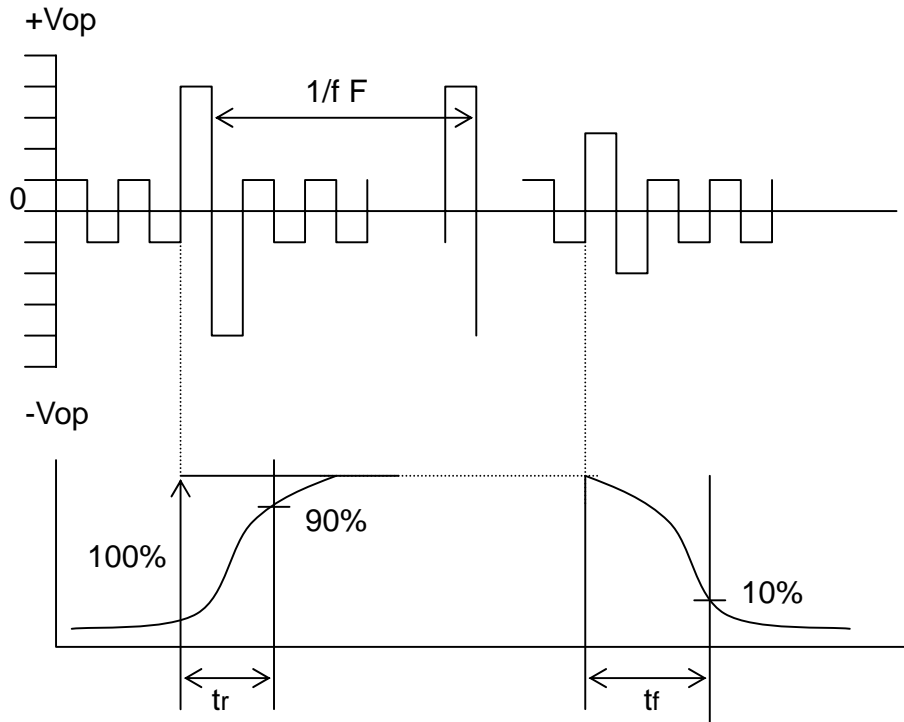
Note (1) & (2) : See next page

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 ---- 64Hz
- ( c ). Viewing angle ----- θ= 0°, ∅ = 0°
- ( d ). Operating voltage --- 23.6V

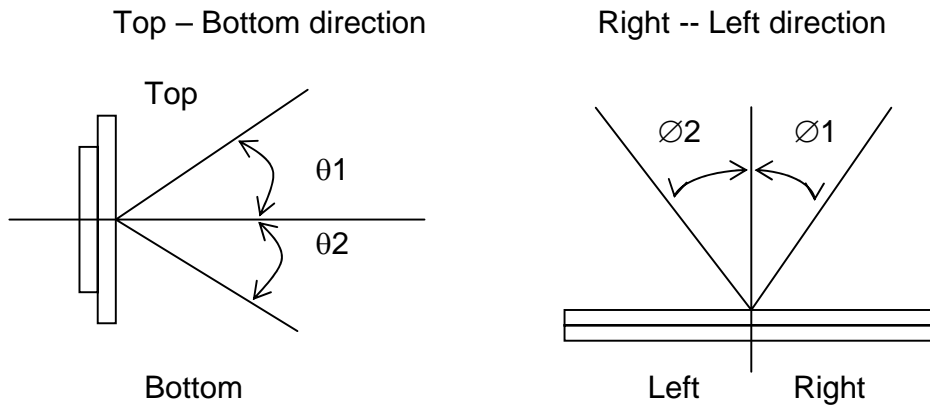
Note (1) Response time is measured as the shortest period of time possible between the change in state of an LCD segment as demonstrated below:



Condition:

- ( a ) . Temperature -----25°C
- ( b ) . Frame frequency ----- 64Hz
- ( c ) . View Angle -----  $\theta = 0^\circ, \varnothing=0^\circ$
- ( d ) . Operating voltage ----- 23.6V

Note (2) Definition of View Angle



## 6.1 LED ELECTRO-OPTICAL CHARACTERISTICS

 $T_a = 25^{\circ}\text{C}$ 

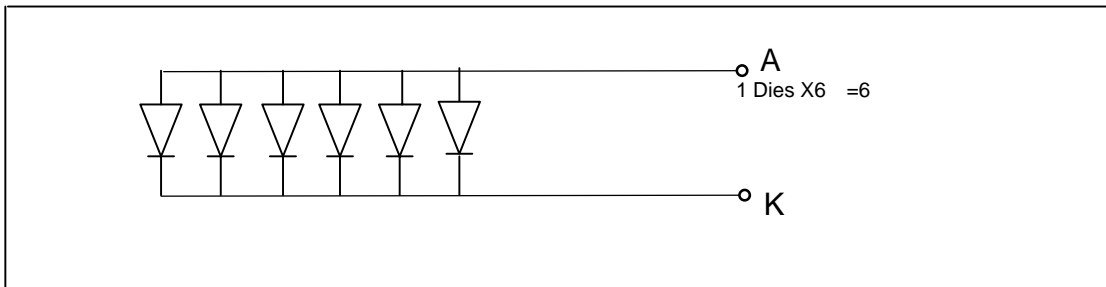
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	$V_F$	$I_F = 120\text{mA}$ White	3.0	3.4	3.8	V
Luminous Intensity	$I_v$	$I_F = 120\text{mA}$ White	100	--	--	$\text{cd/m}^2$
Chromaticity	X	$I_F = 120\text{mA}$ White	0.28	0.30	0.35	--
	Y		0.27	0.31	0.36	
Reverse Current	$I_R$	$V_R = 5\text{V}$ White	100	--	--	$\mu\text{A/series}$
Uniformity	--	$I_F = 120\text{mA}$ White	70	--	--	%

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	$I_{AF}$	120	mA
Reverse Voltage	$V_R$	5	V

### 6.2.1 LED ARRAY BLOCK DIAGRAM

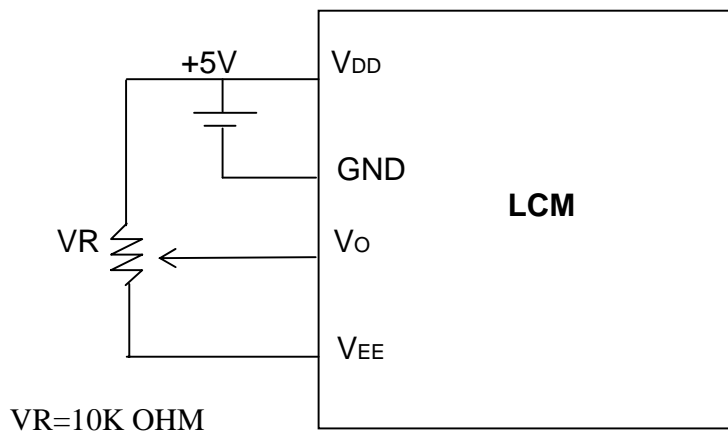




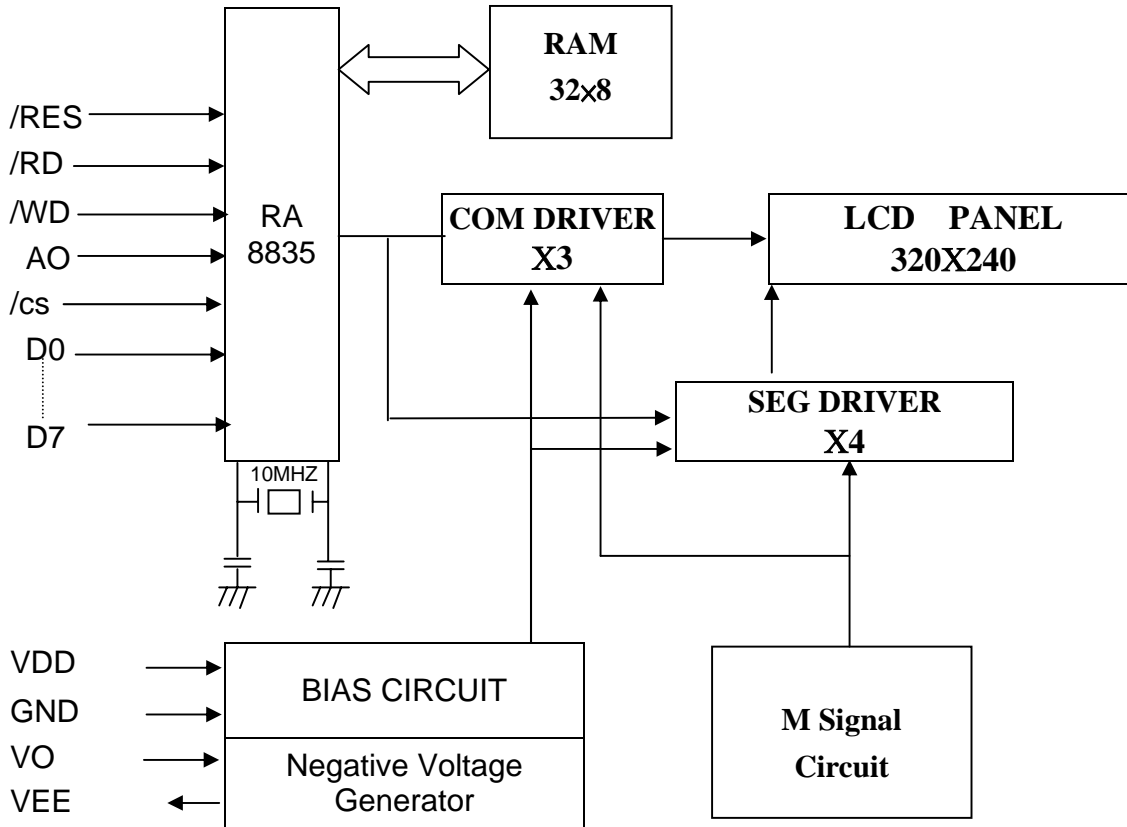
## 7. PIN CONNECTIONS

No.	Symbol	Function
1	/RES	LCD Controller Function reset
2	/RD	Data read
3	/WR	Data write
4	/CS	LCD IC Chip Select
5	A0	Command / Data Select
6	D0	Data bus line 0
7	D1	Data bus line 1
8	D2	Data bus line 2
9	D3	Data bus line 3
10	D4	Data bus line 4
11	D5	Data bus line 5
12	D6	Data bus line 6
13	D7	Data bus line 7
14	VDD	Logic Power input
15	GND	Ground(0V)
16	VEE	Negative voltage output(-24V)
17	VO	LCD contrast control
18	/DISPOFF	Display on/off control, High= ON Low= OFF

## 8. POWER SUPPLY



## 9. BLOCK DIAGRAM



\*LCD Controller's Timing and Function .Please Refer to the RA8835.PDF SPEC.

## 10. QUALITY ASSURANCE

### 10.1 Test Condition

10.1.1 Temperature and Humidity(Ambient Temperature)

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

Humidity :  $65 \pm 5\%$

10.1.3 Operation

Unless specified otherwise, test will be conducted under function state.

10.1.4 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

10.1.5 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

10.1.6 Test Method

No.	Parameter	Conditions	Regulations
1	High Temperature Operating	$50 \pm 2^{\circ}\text{C}$	Note 3
2	Low Temperature Operating	$0 \pm 2^{\circ}\text{C}$	Note 3
3	High Temperature Storage	$70 \pm 2^{\circ}\text{C}$	Note 3
4	Low Temperature Storage	$-20 \pm 2^{\circ}\text{C}$	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.

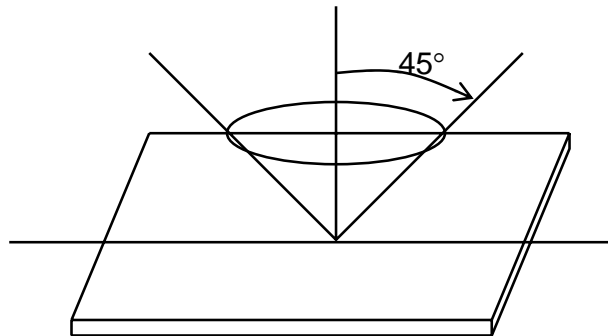
Note 2: No dew condensation to be observed.

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

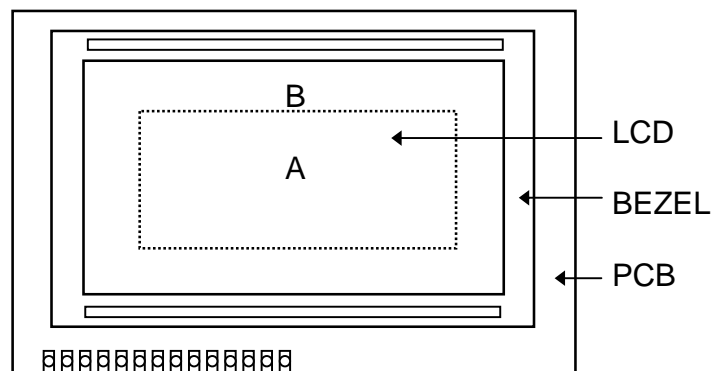
## 10.2 Inspection condition

### 10.2.1 Inspection conditions

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

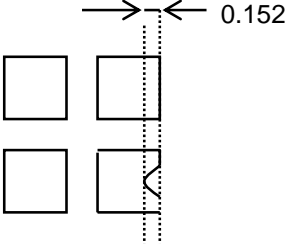


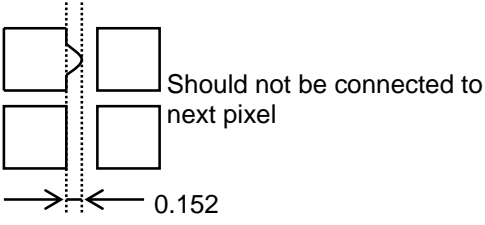
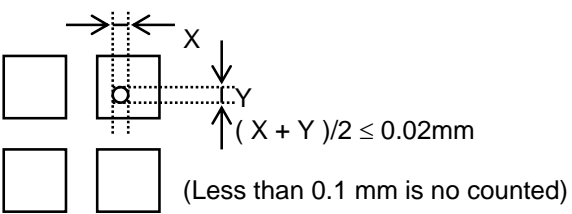
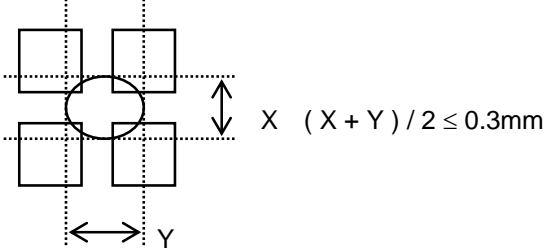
### 10.2.2 Definition of applicable Zones



A : Display Area  
B : Non-Display Area

## 10.2.3 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 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 rowspan="4">Minor</td> <td rowspan="4">2.5</td> </tr> <tr> <td>3.0 ≥ L</td> <td>0.06 ≥ W</td> <td>4</td> <td>4</td> </tr> <tr> <td>2.0 ≥ L</td> <td>0.08 ≥ W</td> <td>2</td> <td>3</td> </tr> <tr> <td>—</td> <td>0.1 &lt; W</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>	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
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										
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																												
4	Uniformity of Pixel	<p>(1) Pixel shape (with Dent)</p> 																												

4	Uniformity of Pixel	(2) Pixel shape ( with Projection)  (3) Pin hole  (4) Deformation  Total acceptable number : 1/pixel, 5/cell	
		<b>Class of defects</b>	<b>Major</b>
	<b>Minor</b>	AQL 2.5%	It is a defect that will not result in functioning problem with deviation classified.

### 10.3 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

## 11. TOUCH PANEL CHARACTERISTICS

### 1). Scope

This specification is applied to DATA IMAGE Display Devices Product GM322402

### 2). ENVIRONMENTAL CONDITIONS

#### 2.1) OPERATION TEMPERATURE

0°C ~ 50°C 70%RH or less

#### 2.2) STORAGE TEMPERATURE

-20°C ~ 70°C 90%RH or less

### 3). OPERATING VOLTAGE

DC5V or less

### 4). MECHANICAL CHARACTERISTICS

#### 4.1). Operation force

Writing force less than 100g (with R0.8 mm plastic stylus)

Touch force 130g (with R0.8 mm silicone finger)

#### 4.2). Impact resistance

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

#### 4.3). Static load resistance

After 45N load is applied on the area(25 cm<sup>2</sup>) of the touch panel after 30sec , and it shall be satisfied the requirements in section 4.1&5

#### 4.4). Surface hardness

3H or lenger(with JIS K5400 standard)

#### 4.5). Flexible pattern heat seal peeling

0.5kg/cm peeling upward b 90deg

#### 4.6). Flexible pattern bending resistance

Bending 10 times or more by bending radius R1.0 mm 500g , each left and right side 135 deg.

#### 4.7). Flexible pattern insert/pull out resistance

20 times at least (for HSC/FPC connector).

### 5). ELECTRICAL PERFORMANCE

#### 5.1). TERMINAL RESISTANCE

X direction 200Ω ~ 900Ω

Y direction 200Ω ~ 900Ω

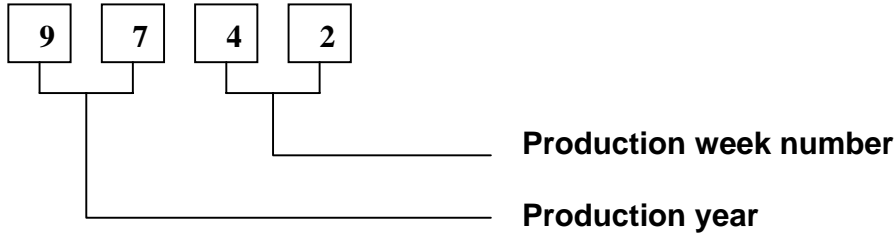
#### 5.2). LINEARITY

1.5% or less Measurement as per appendix A

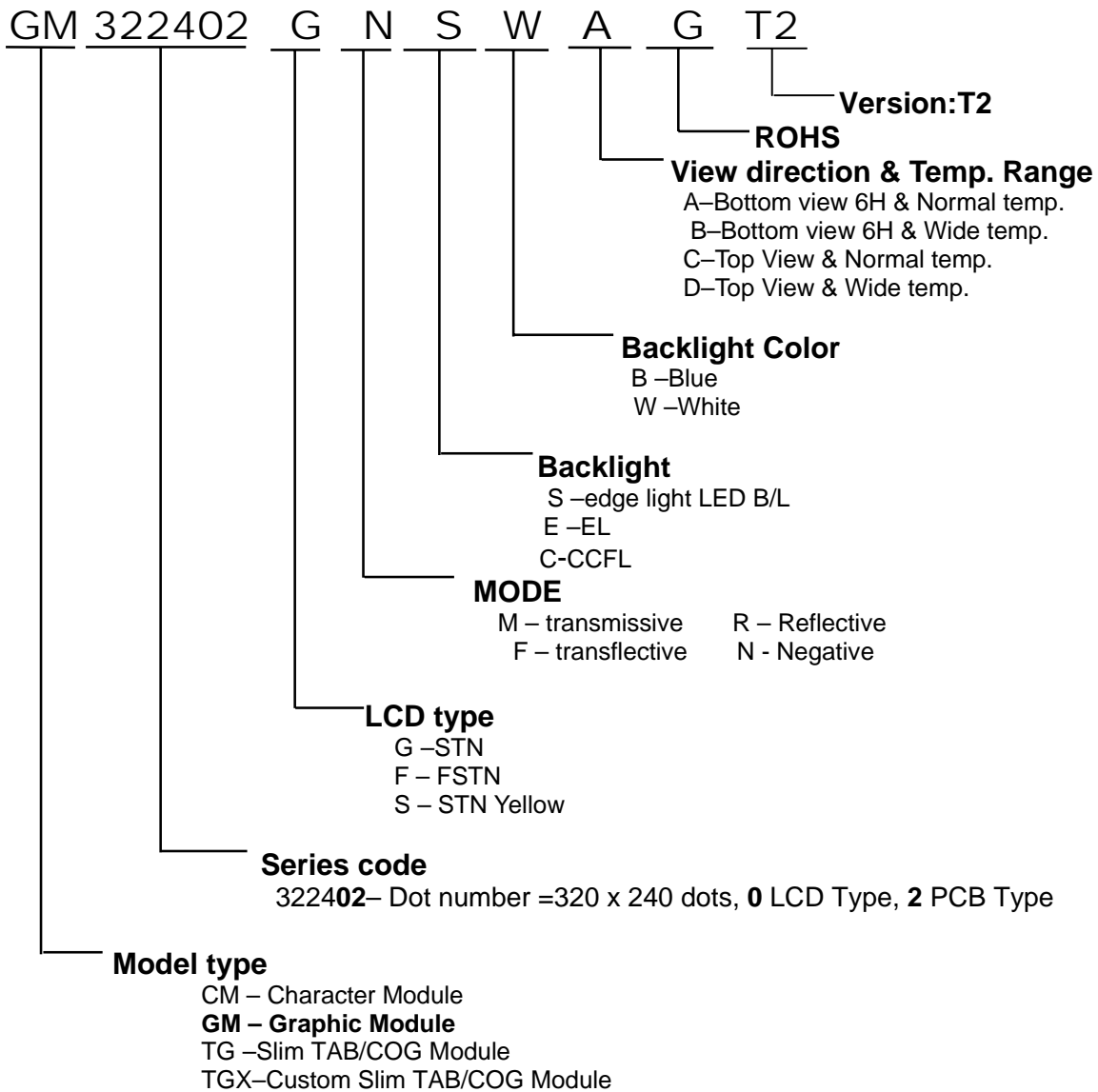
#### 5.3). INSULATION RESISTANCE

DC25V and 20MΩ or more

## 12. LOT NUMBERING SYSTEM



## 13. LCM NUMBERING SYSTEM





## 14. 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 benzine.
- (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 a 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  $V_0$ .
- (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".

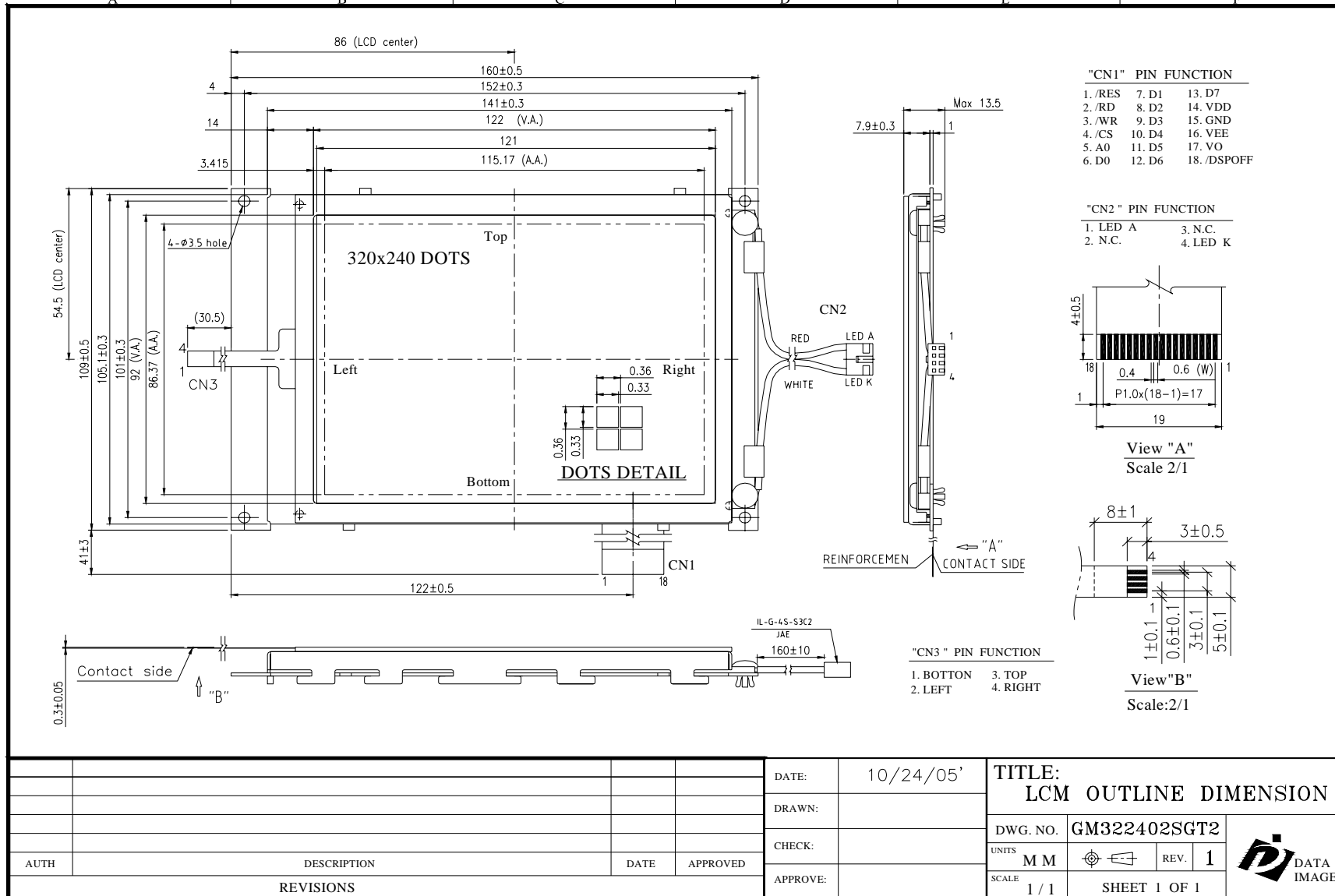
#### 2.5 Storage

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

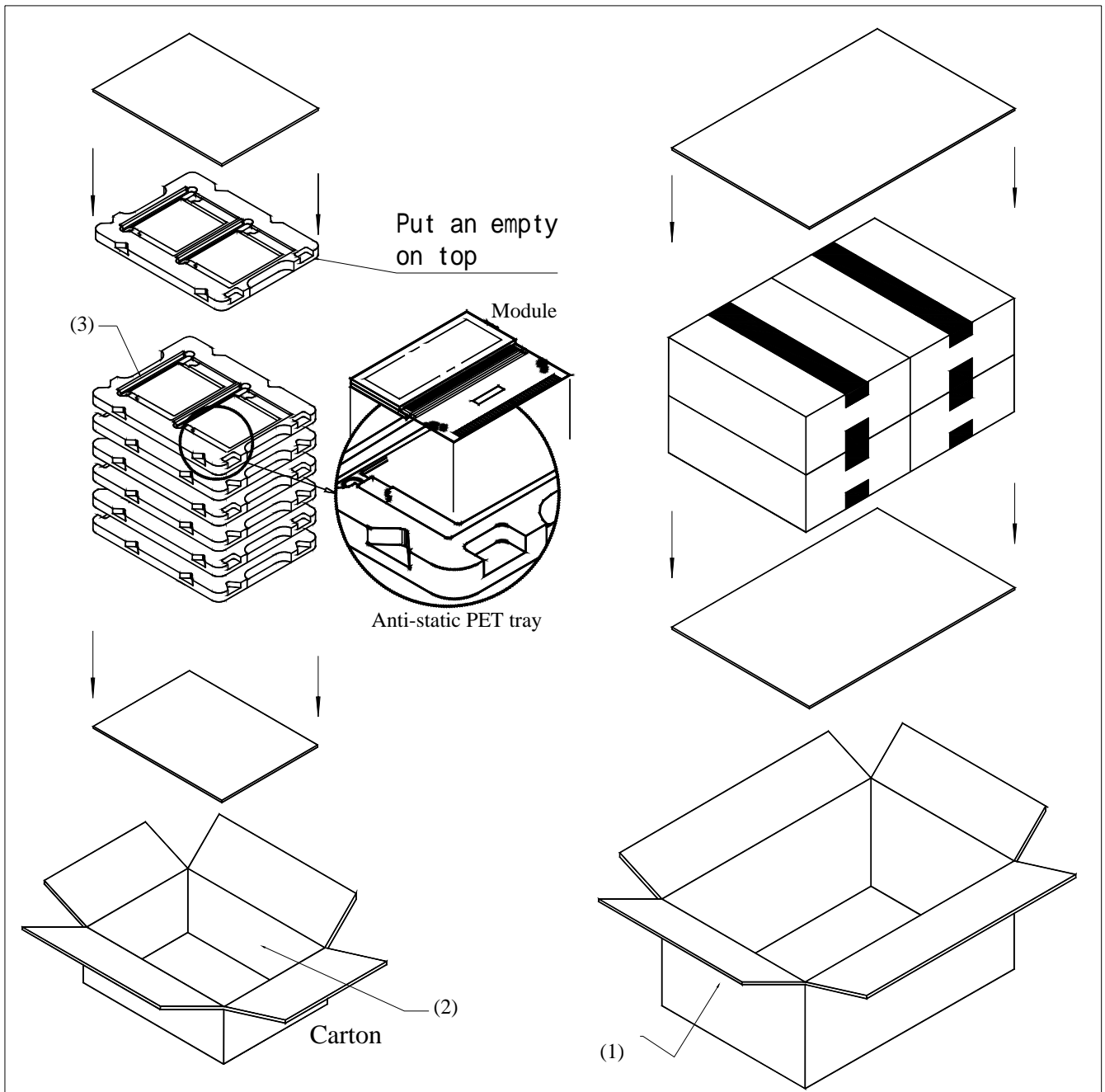
Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of 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.

Confidential Document  
**15. OUTLINE DRAWING**



				DATE:	10/24/05'	TITLE: LCM OUTLINE DIMENSION	
				DRAWN:		DWG. NO. GM322402SGT2	
				CHECK:		UNITS	M M
				APPROVE:		SCALE	1 / 1
AUTH	DESCRIPTION	DATE	APPROVED	REV. 1			
REVISIONS				SHEET 1 OF 1			

# 16. PACKAGE INFORMATION



Item	Size(L*W*H)	Quantity	Note
1.Master Carton	482*282*279	1	
2.Inner Carton	267*224*115	4	
Quantity Per Inner Carton	12	Quantity per Master Carton	48
N . W	10.1 (kg)	G . W	11.1 (kg)