DOCUMENT NUMBER AND REVISION

VL-FS-COG-C144MVGI-08 REV.B

(COG-C144MVGI-08)

DOCUMENT TITLE:

SPECIFICATION

OF

LCD MODULE TYPE

MODEL NUMBER: COG-C144MVGI-08

DEPARTMENT	NAME	SIGNATURE	DATE
PREPARED BY	CHEN YUE	Chen Yue	2011.04.18
CHECKED BY	ANDY LIAO	Andy liao	18/4-2011
APPROVED BY	REDSUN ZHANG	Redsun Zhang	18/4-11
QUALITY BY	MICHAEL HUI	黄	2011.04.18

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DOCUMENT REVISION HISTORY

DOCUMENT REVISION FROM	TO	DATE	DESCRIPTION	CHANGED BY	CHECKED BY
	A	2009.12.09	First Release.	BETTY MAO	CALM ZHONG
A	B	2011.04.18	Items 1~5 were updated. 1.) (Headers of whole document & Page 1) "VL-PS-COG-C144MVGI-08" was change to "VL-FS-COG-C144MVGI-08". 2.) (Page 1&Page 4) "Preliminary" was deleted. 3.) (Page 4, Table 1) Weight was added. 4.) (Page 9, Table 5) The value of VLCD and ICC were updated. 5.) (Page 24, Point 7) "Packing Removal and Handing Requirement" were added.	CHEN YUE	ANDY LIAO

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Preliminary Specification
of
LCD Module Type
Model No.: COG-C144MVGI-08

1. General Description

- 1.44" CSTN, 128 x RGB x 128 dots, 65K, Transmissive, Graphic display LCD module.
- Viewing angle: 6 O'clock.
- Driving IC: 'SAMSUNG' S6B3306 (COG) LCD Controller/Driver or equivalent.
- Data interface: Serial interface.
- Logic voltage: ~2.8V&~2.8V.
- FPC connection.
- White LED backlight.
- "RoHS" compliance.

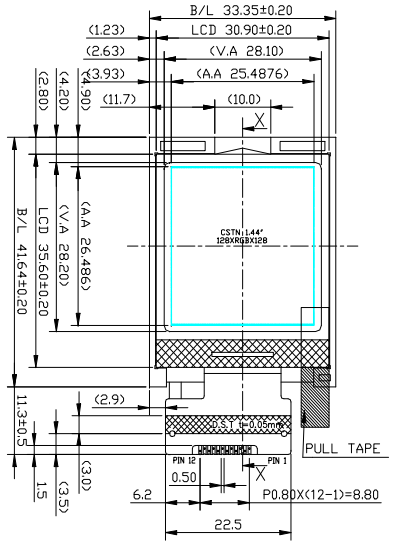
2. Mechanical Specifications

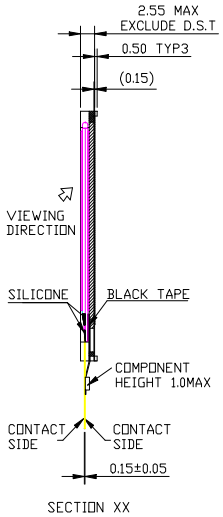
The mechanical detail is shown in Fig.1 and summarized in Table 1 below.

Table 1

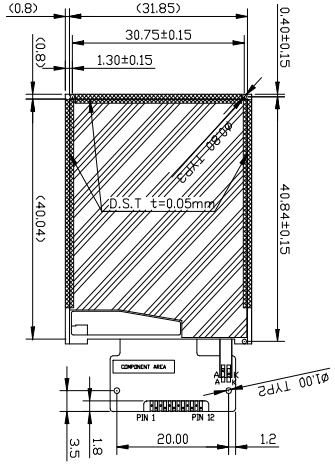
Parameter		Specifications	Unit
Outline dimensions		33.35 (W) x 52.90 (H) x 2.55 (D)	mm
Color STN 128 x RGB x 128	Viewing area	28.10(W) x 28.20(H)	mm
	Active area	25.49(W) x 26.49(H)	mm
	Display format	128 x RGB x 128	dots
	Color configuration	RGB stripe	-
	Dot size	0.1892 (RGB)(W) x 0.197 (H)	mm
	Dot spacing	0.01 (W) x 0.01 (H)	mm
	Dot pitch	0.1992(RGB)(W) x 0.207(H)	mm
Weight		6.0	gram

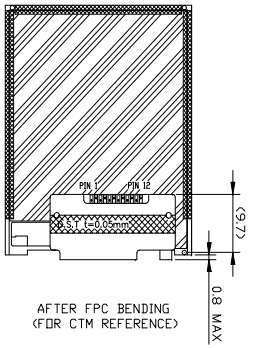
ISSUE	AMENDMENT	DATE





SECTION XX



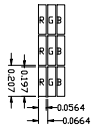


AFTER FPC BENDING
(FOR CTM REFERENCE)

PINS ASSIGNMENT:

1	VSS
2	LED K
3	LED A
4	VSS
5	/RESET
6	AO
7	SDA
8	SCK
9	VDDA
10	VDDIO
11	/CS
12	VSS

CIRCUIT DIAGRAM



DETAIL A
(FOR REFERENCE ONLY)

DISPLAY TYPE	CSTN,65K TRANSMISSIVE		
DISPLAY RESOLUTION	128 X RGB X 128		
VIEWING ANGLE	6 O'CLOCK		
LCD CONTROLLER/DRIVER	S6B3306		
LOGIC VOLTAGE/ANALOGIC	~2.8V&~2.8V		
OPERATING TEMPERATURE	-20°C TO +70°C		
STORAGE TEMPERATURE	-30°C TO +80°C		
BACKLIGHT	TYPE	LED05	
	COLOR	White	
	COORDINATE	--	
	DRIVING VOLTAGE	~3.2V@20mA	
	LUMINANCE(cd/m2) (ON THE BACKLIGHT SURFACE)	Min.	--
		Typ.	2500
		Max.	--

NOTES:
1. ◇ : SPECIAL CHARACTERISTIC
2. + : SAFETY CHARACTERISTIC
3. ▽ : CRITICAL DIMENSION
4. (...) : REFERENCE DIMENSION

VARITRONIX LIMITED

TITLE: SPECIFICATION OF MODULE			
PROJECT NO:COG-C144MVGI-08			
CUSTOMER NO: N/A			
TOLERANCE UNLESS OTHERWISE SPECIFIED:	X.X ±0.3 X.XX ±0.1		
DIMENSIONS IN MM			
MATERIAL: N/A	FINISH: N/A		
SCALE: DO NOT ON SCALE	OVERALL THK: N/A		
THIRD ANGLE PROJECTION			
	NAME	SIGN	DATE
DRAWN:	ANNA HE		09.11.25
CHECKED:	CALM ZHONG		
APPROVED:	REDSUN ZHANG		
ITEM NO.:COG-C144MVGI-08			
DESCRIPTION:COG-C144MVGI-08			
FILE NO:COG-C144MVGI-08	REV: 0		
SHEET 1 OF 1			

Figure 1: Module Specification

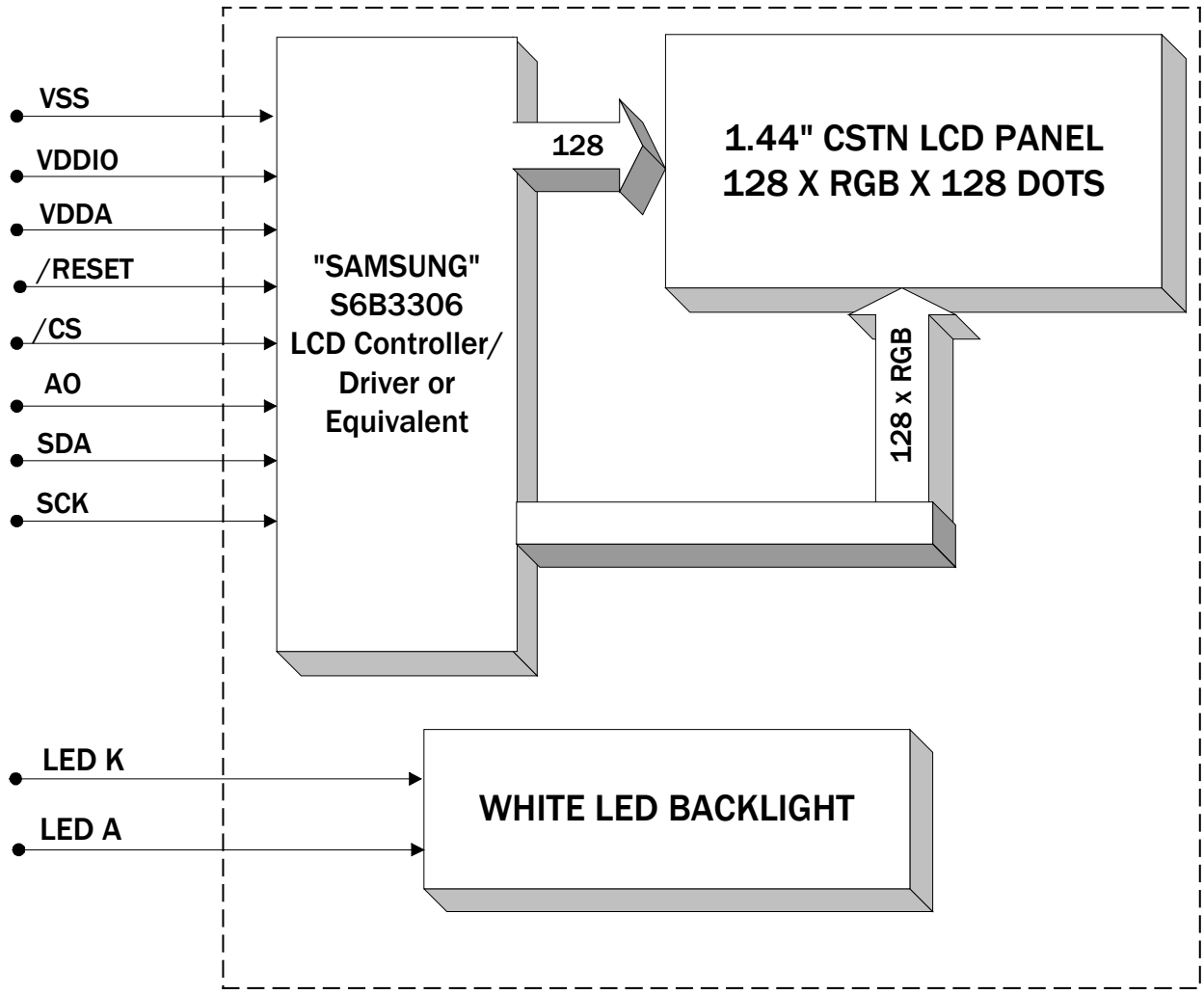


Figure 2: Block Diagram.

3. Interface signals

Table 2: Pin assignment

1	VSS	Ground.
2	LED K	Cathode of LED backlight.
3	LED A	Anode of LED backlight.
4	VSS	Ground.
5	/RESET	Reset input pin. When RSTB is “L”, initialization is executed.
6	A0	Display Data / Instruction select input pin. RS = “H”: DB0 to DB15 are display data. RS = “L”: DB0 to DB7 are instruction data.
7	SDA	Serial data input pin. The data is latched at the rising edge of SCL.
8	SCK	Serial clock input pin.
9	VDDA	Power supply.
10	VDDIO	I/O power supply.
11	/CS	Chip select input pin.
12	VSS	Ground.

4. Absolute Maximum Ratings

4.1 Electrical Maximum Ratings - for IC Only

Table 3

Parameter	Symbol	Min.	Max.	Unit
Supply voltage range	VDD3	-0.3	+5.0	V
	VIN1	-0.3	+5.0	V
LCD Supply voltage range	|VCC-VEE|	0	+25	V
Input voltage range	Vin	-0.3	VDD3+0.3	V

Note:

1. The modules may be destroyed if they are used beyond the absolute maximum ratings.
2. All voltage values are referenced to GND=0V.

4.2 Environmental Conditions

Table 4

Item	Operating temperature (Topr)		Storage temperature (Tstg) (Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient temperature (Ta)	-20°C	+70°C	-30°C	+80°C	Dry
Humidity (Note 1)	90% max. RH for Ta ≤ 40°C < 50% RH for 40°C < Ta ≤ Maximum operating temperature				No condensation
Vibration (IEC 68-2-6) cells must be mounted on a suitable connector	Frequency: 10 ~ 55 Hz Amplitude: 0.75 mm Duration: 20 cycles in each direction.				3 directions
Shock (IEC 68-2-27) Half-sine pulse shape	Pulse duration: 11 ms Peak acceleration: 981 m/s^2 = 100g Number of shocks: 3 shocks in 3 mutually perpendicular axes.				3 directions

Note 1: Product cannot sustain at extreme storage conditions for long time.

5. Electrical Specifications

5.1 Typical Electrical Characteristics

At Ta = 25 °C, VDDA=2.8V, VSS=0V.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage	VDDA-VSS		2.7	2.8	2.9	V
Supply voltage (LCD)	VLCD	At Ta =25 °C, VCC=2.8V, Note 1	-	14.0	-	V
Input signal voltage	V_{IH}	"H" level	0.7VDDA	-	VDDA	V
	V_{IL}	"L" level	VSS	-	0.3VDDA	V
Supply Current (Logic & LCD)	ICC	All mode, VCC=2.8V.	-	0.85	-	mA
Supply voltage of white LED backlight	VLED	Forward current = 20mA	-	3.2	-	V
Luminance of backlight (on the backlight surface)		Number of LED dies= 1	-	2500	-	cd/m^2

Note 1: There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.

Note 2: Do not display a fixed pattern for more than 30 min. because it may cause image sticking due to LCD characteristics. It is recommended to change display pattern frequently. If customer must fix display pattern on the screen, please consider to activate screen saver.

5.2 Timing Characteristics

5.2.1 Reset Timing

At Ta =-20 °C To +70 °C, VDDA=2.8V, VSS=0V.

Table 6

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Reset low pulse width	RSTB	TRW		1000	–	ns
Reset time	–	tR		–	1000	ns

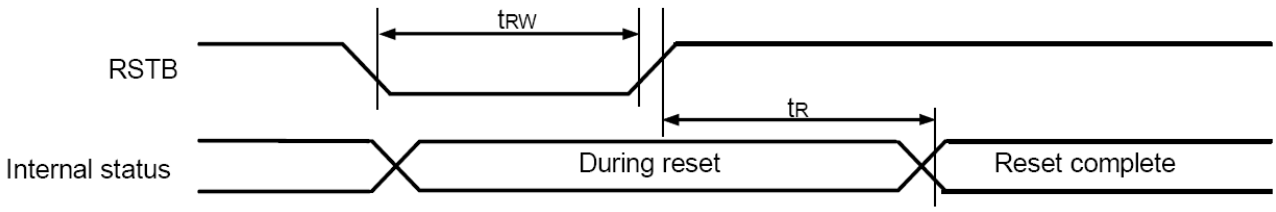


Figure 3: Reset Input Timing Diagram

5.2.2 Serial Data Interface(4 Pin) Timing

At Ta =-20 °C To +70 °C, VDDA=2.8V, VSS=0V.

Table 7

Item	Signal	Symbol	Condition	Min	Unit
SCL Cycle Time	SCL	tSCYC		75	ns
SCL High Pulse Width	SCL	tSHW		20	ns
SCL Low Pulse Width	SCL	tSLW		20	ns
SDI Setup time	SDI	tSDS		10	ns
SDI Hold time	SDI	tSDH		10	ns
RS Setup time	RS	tSAS		10	ns
RS Hold time	RS	tSAH		10	ns
Chip Select Setup time	CS1B (CS2)	tCSS		10	ns
Chip Select Hold time	CS1B (CS2)	tCSH		0	ns

NOTE: (tr + tf) < (tSCYC – tSHW – tSLW) for write,

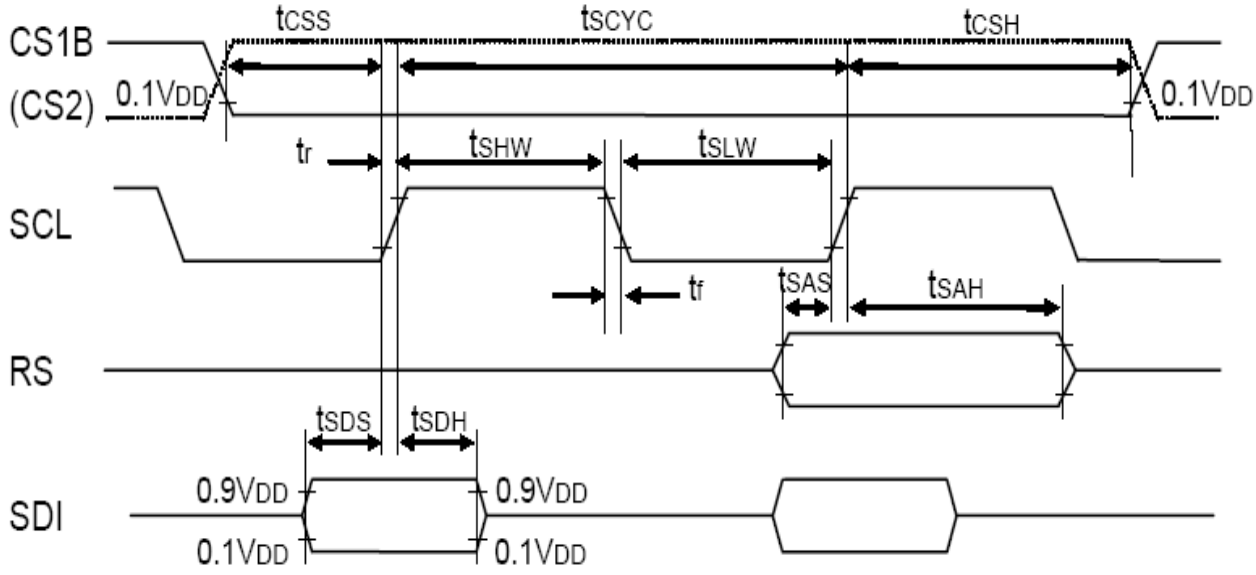


Figure 4: Serial Interface (4 Pin) Timing Diagram.

5.2.3 Serial Data Interface(3 Pin) Timing

At Ta =-20 °C To +70 °C, VDDA=2.8V, VSS=0V.

Table 8

Item	Signal	Symbol	Condition	Min	Unit
SCL Cycle Time	SCL	tSCYC		75	ns
SCL High Pulse Width	SCL	tSHW		20	ns
SCL Low Pulse Width	SCL	tSLW		20	ns
SDI Setup time	SDI	tSDS		10	ns
SDI Hold time	SDI	tSDH		10	ns
Chip Select Setup time	CS1B (CS2)	tCSS		10	ns
Chip Select Hold time	CS1B (CS2)	tCSH		0	ns

NOTE: (tr + tf) < (tSCYC – tsHW – tSLW) for write,

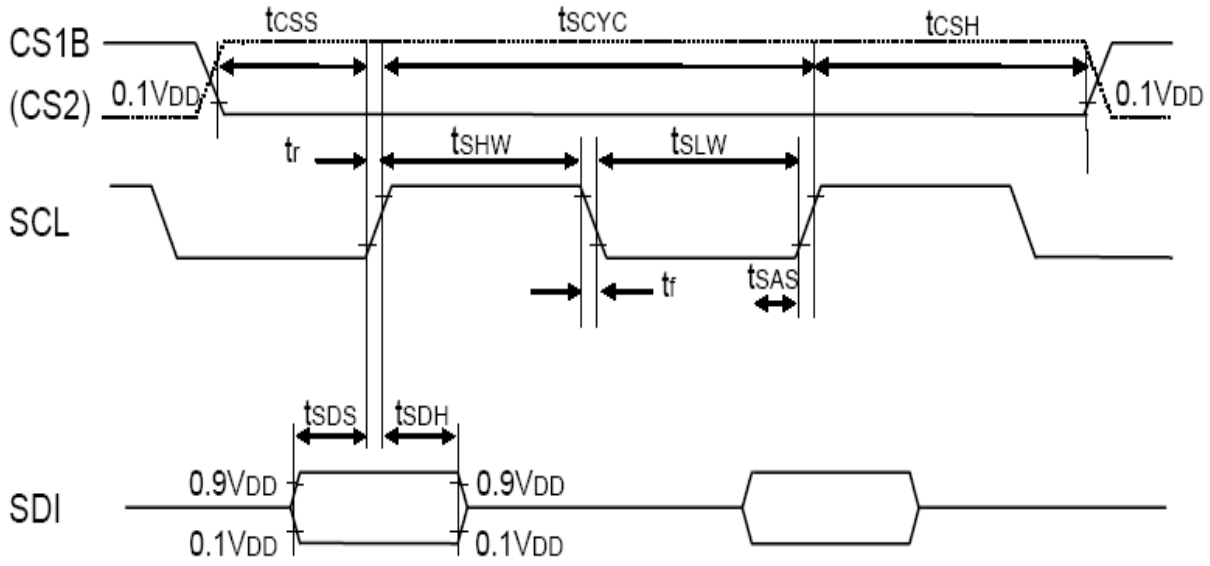
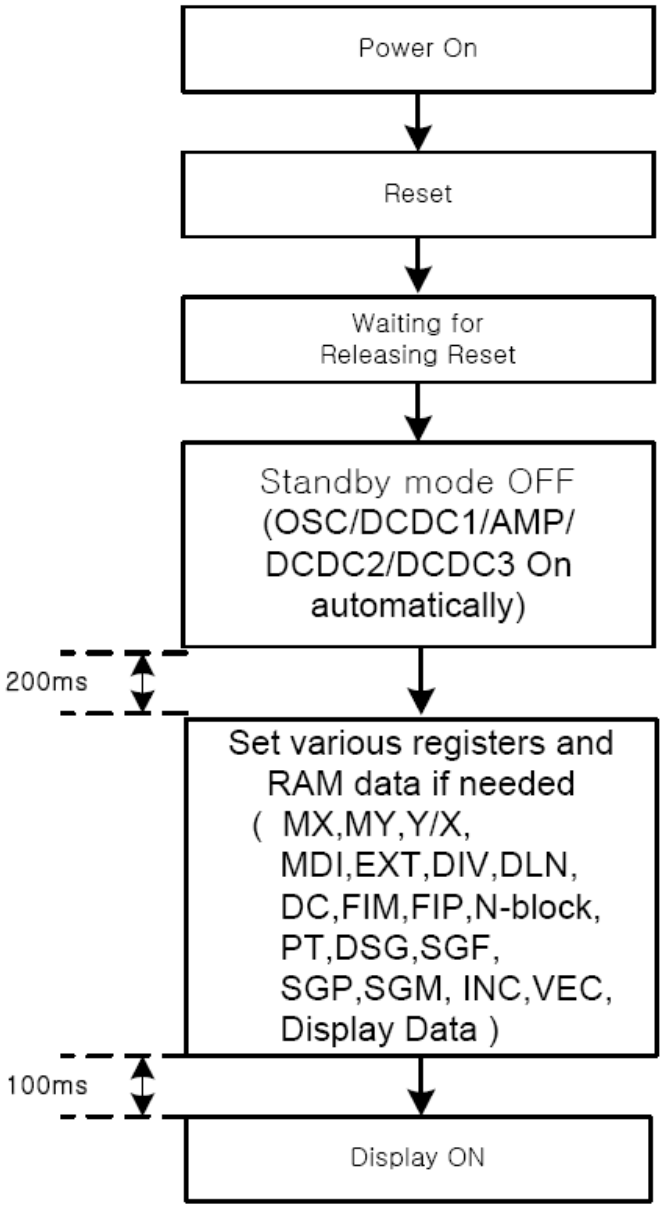


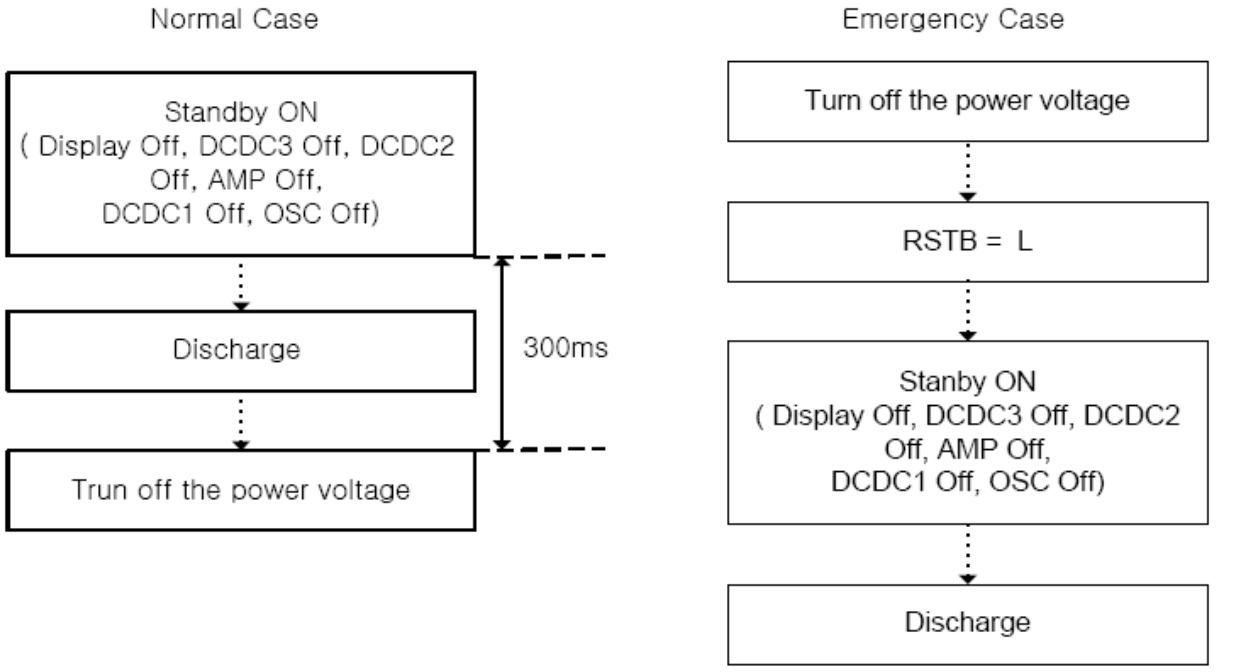
Figure 5: Serial Interface (3 Pin) Timing Diagram.

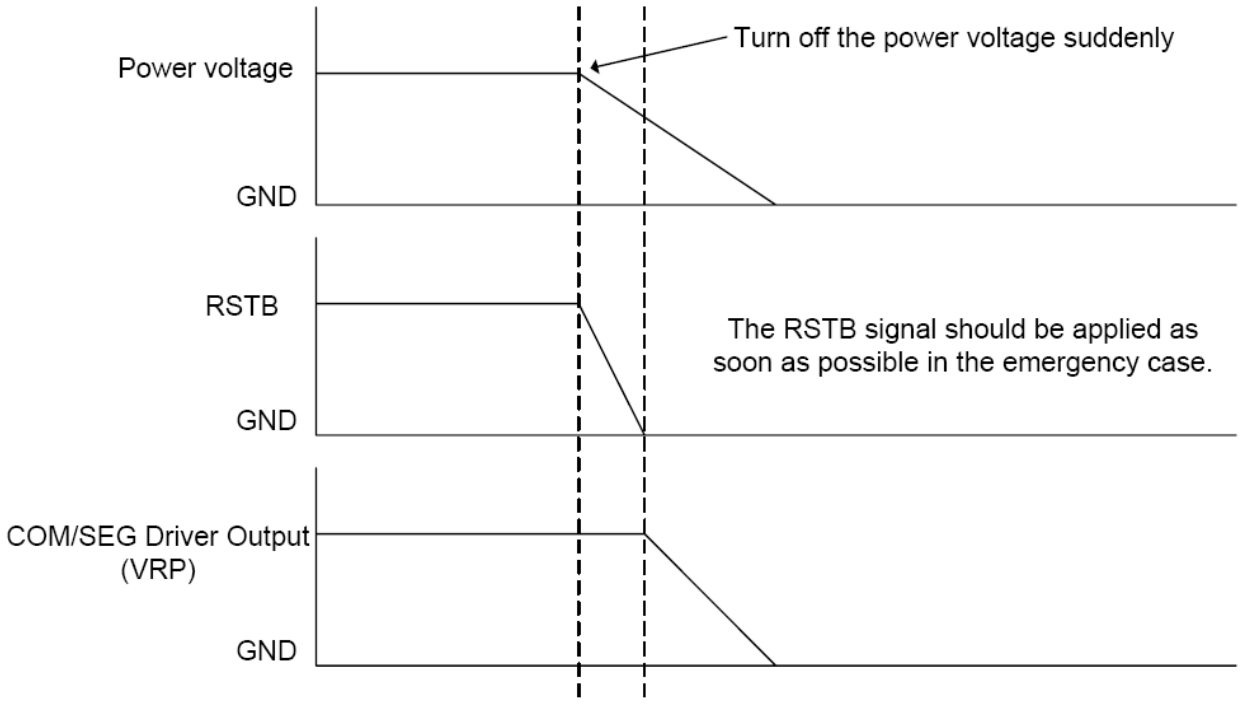
5.3 Power ON/OFF sequence

1.) Power On sequence



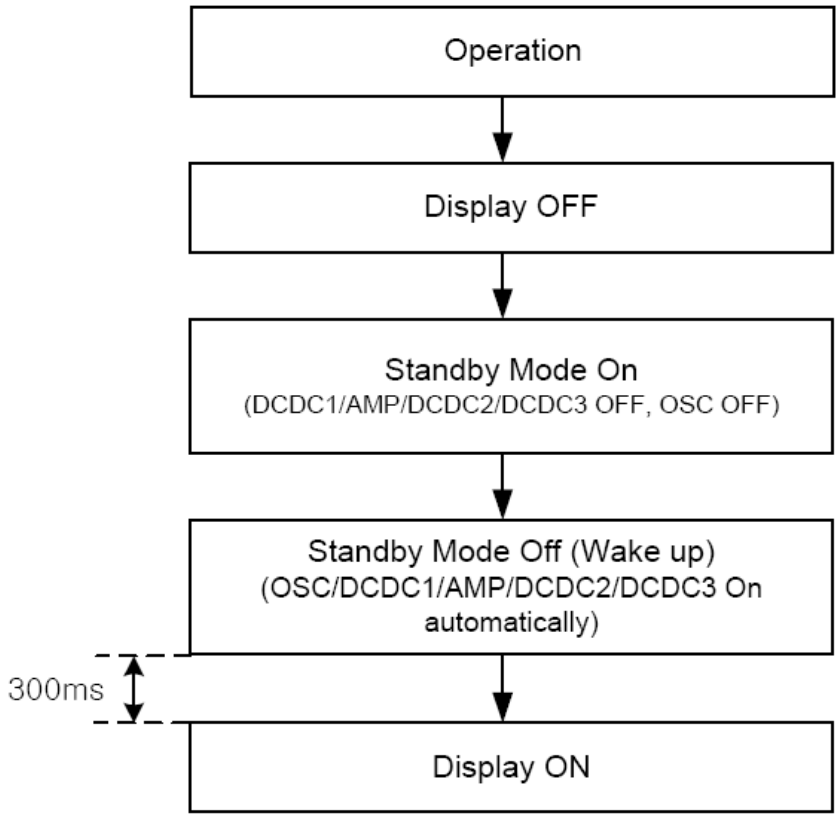
2.) Power Off Sequence





Note: When the signal of the hardware reset comes during the power-off period, COM/SEG output is forcibly lowered to the GND levels.

3.) Wake Up Sequence



6. LCD Specifications

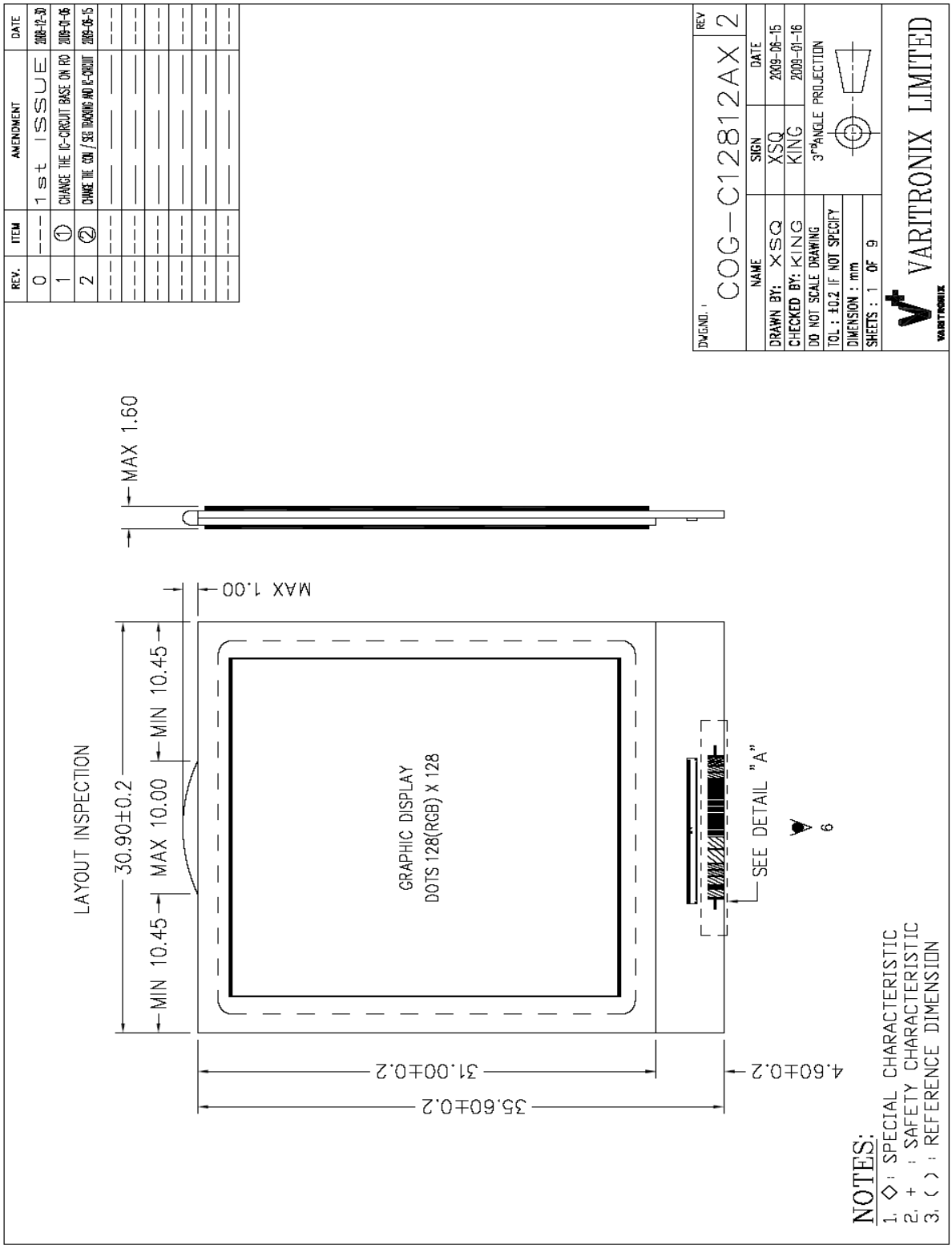


Figure 5: LCD Drawing 1

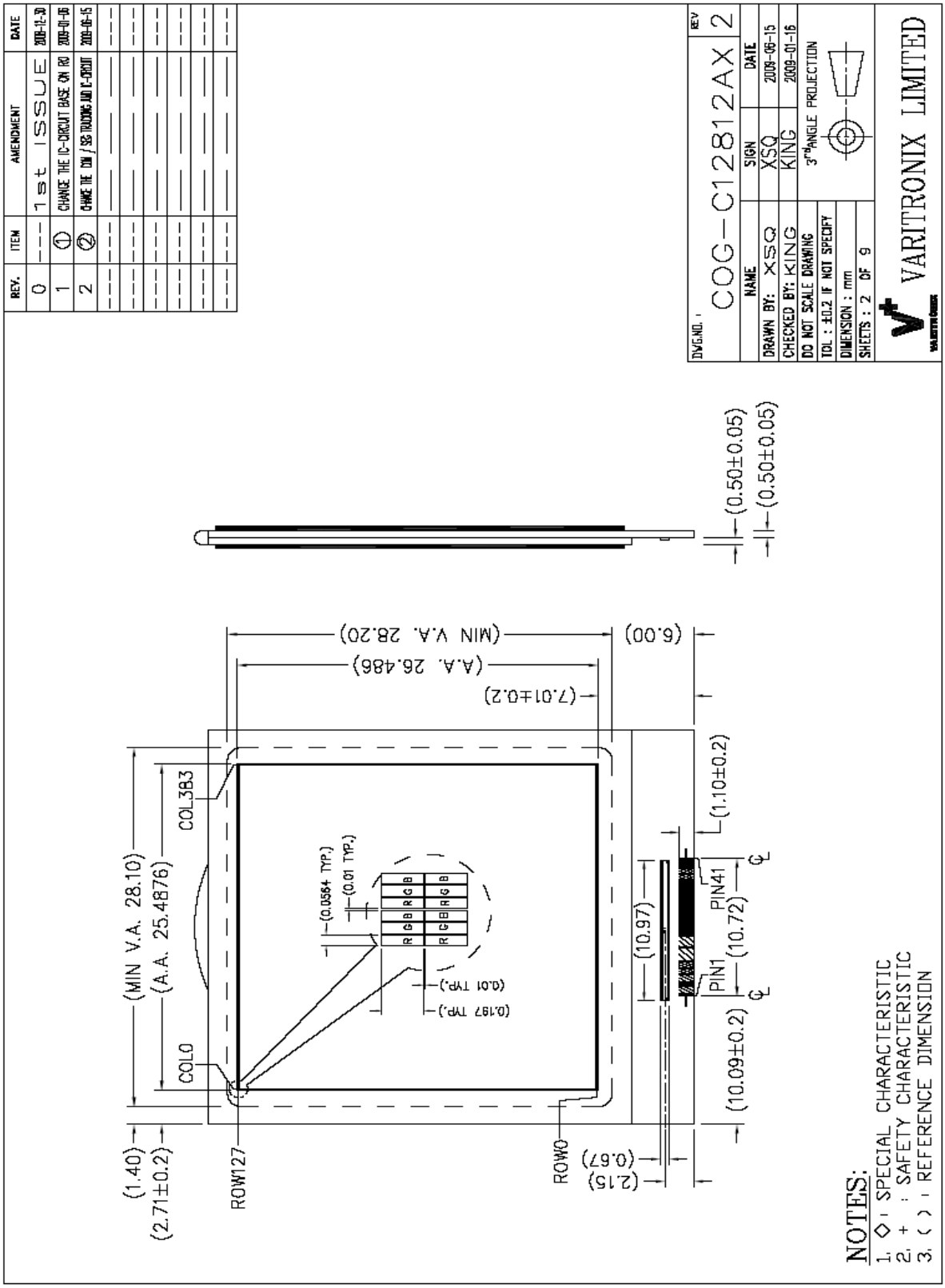


Figure 6: LCD Drawing 2

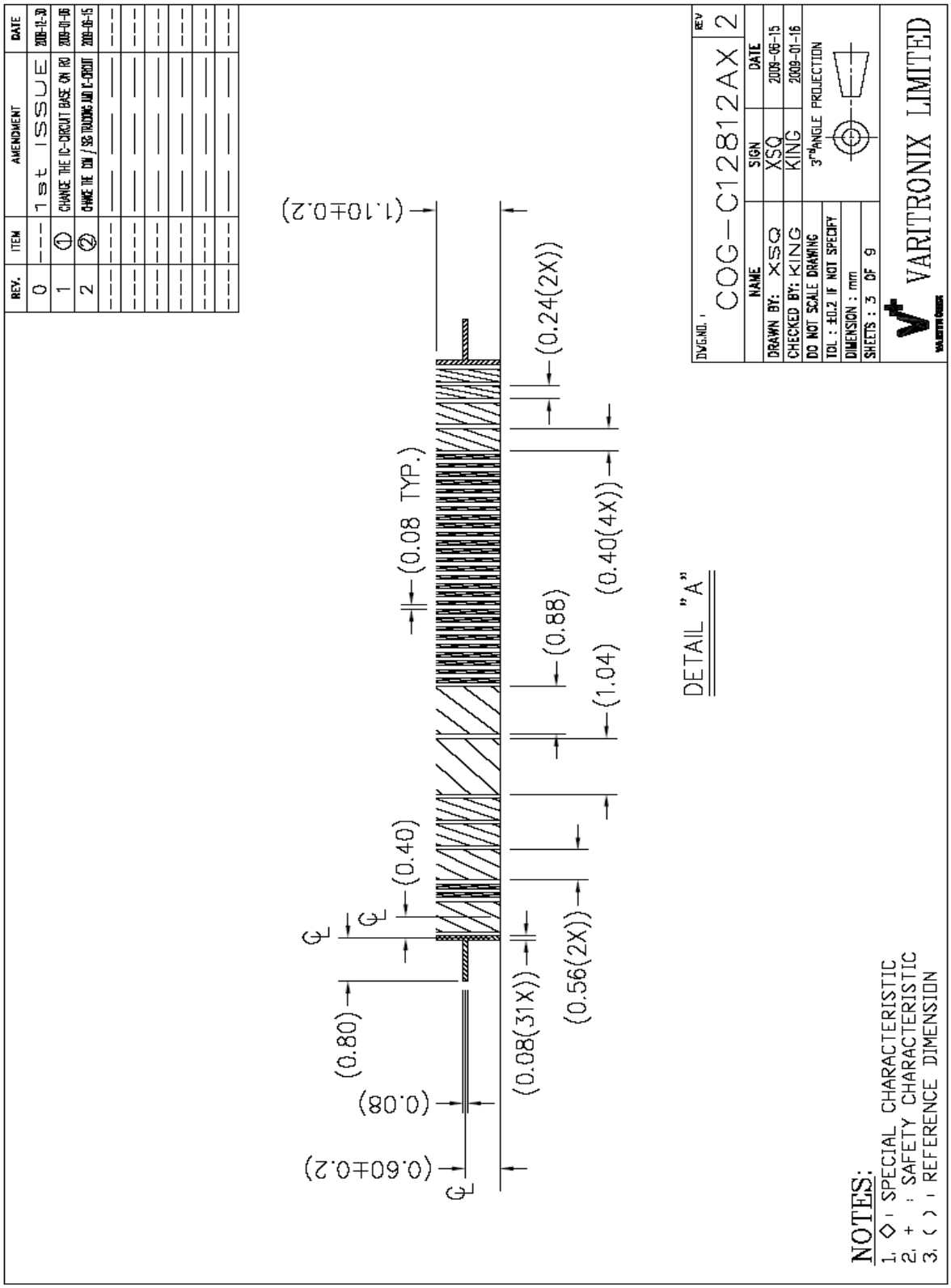


Figure 7: LCD Drawing 3

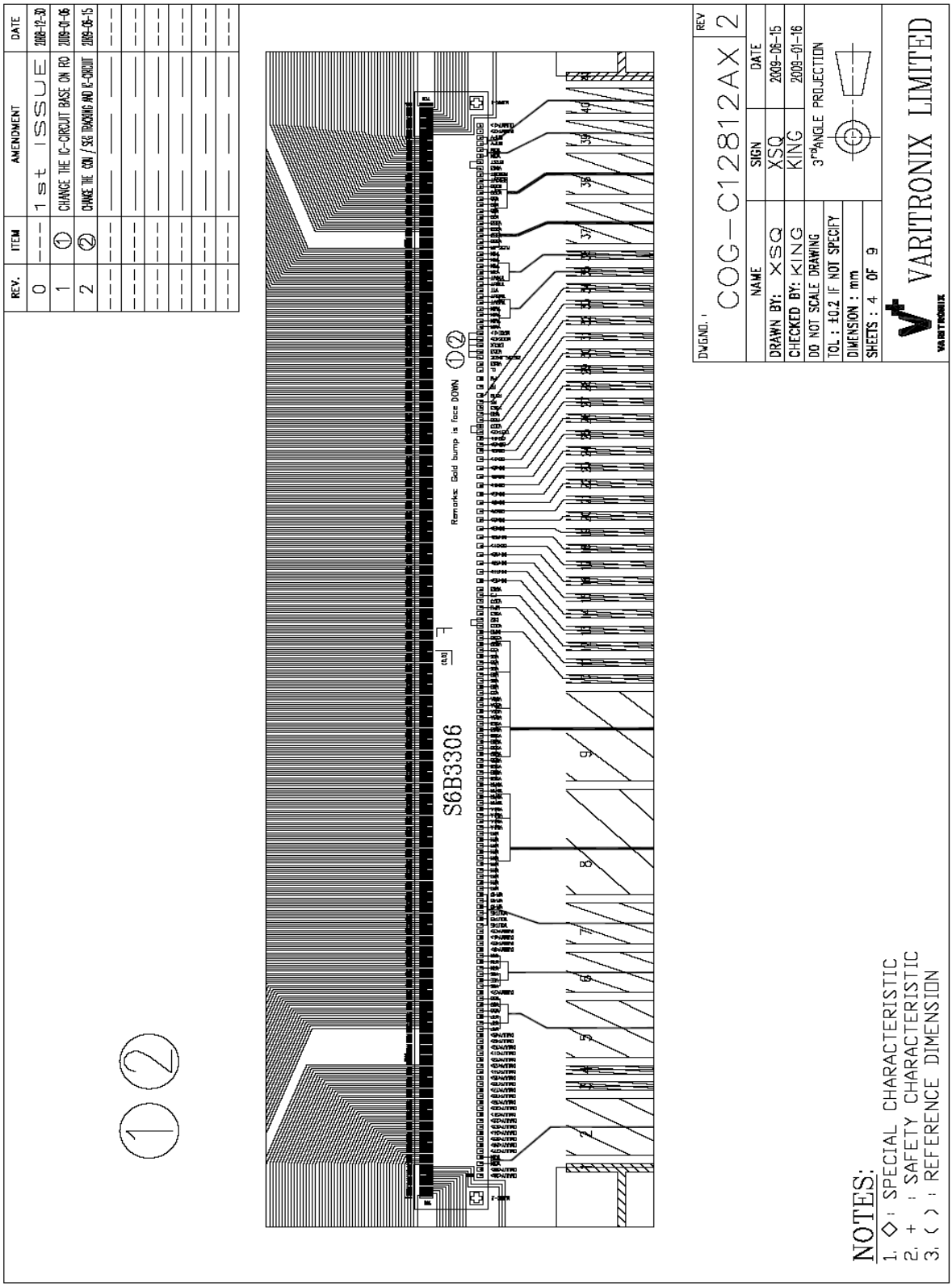


Figure 8: LCD Drawing 4

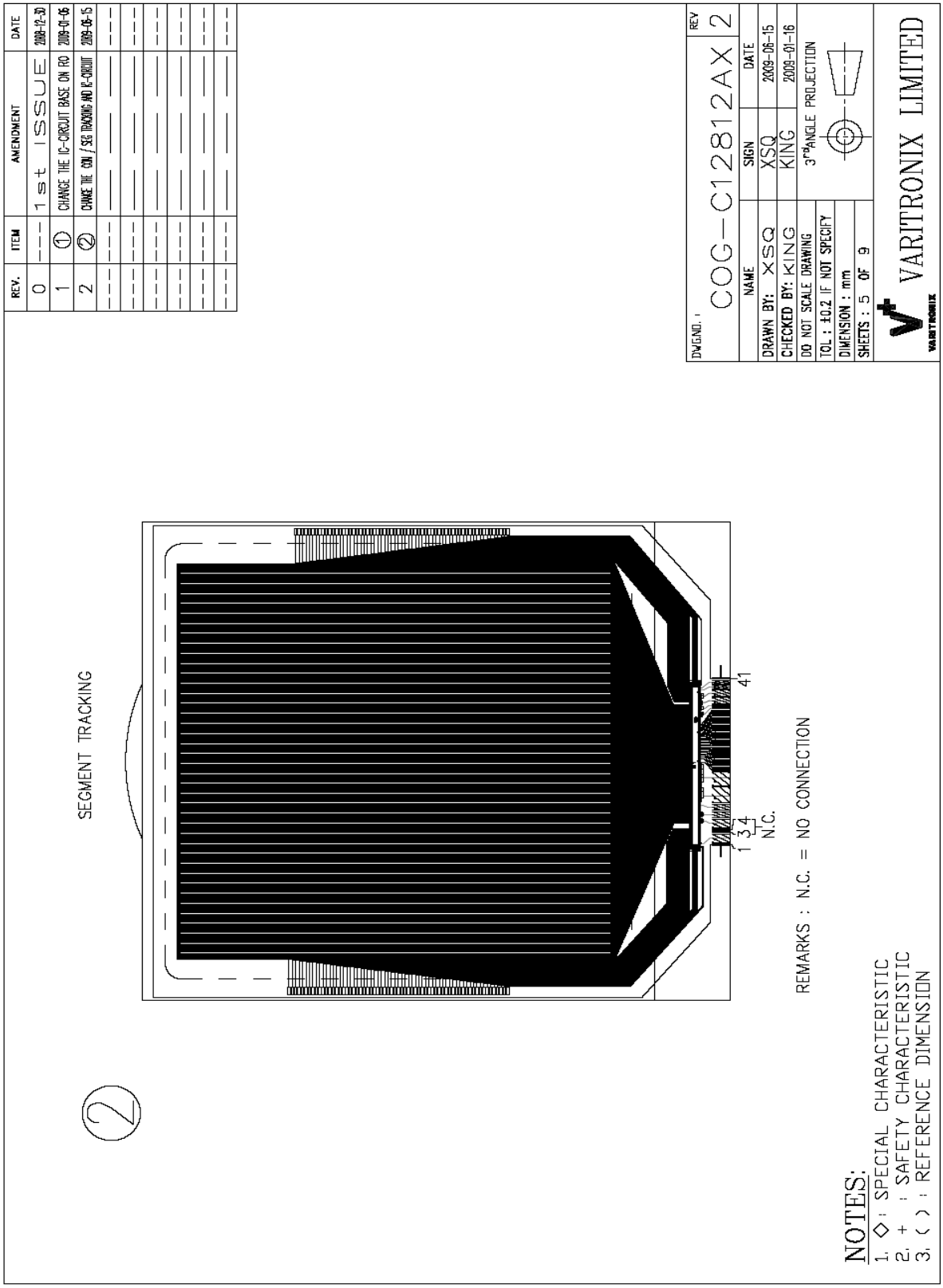


Figure 9: LCD Drawing 5

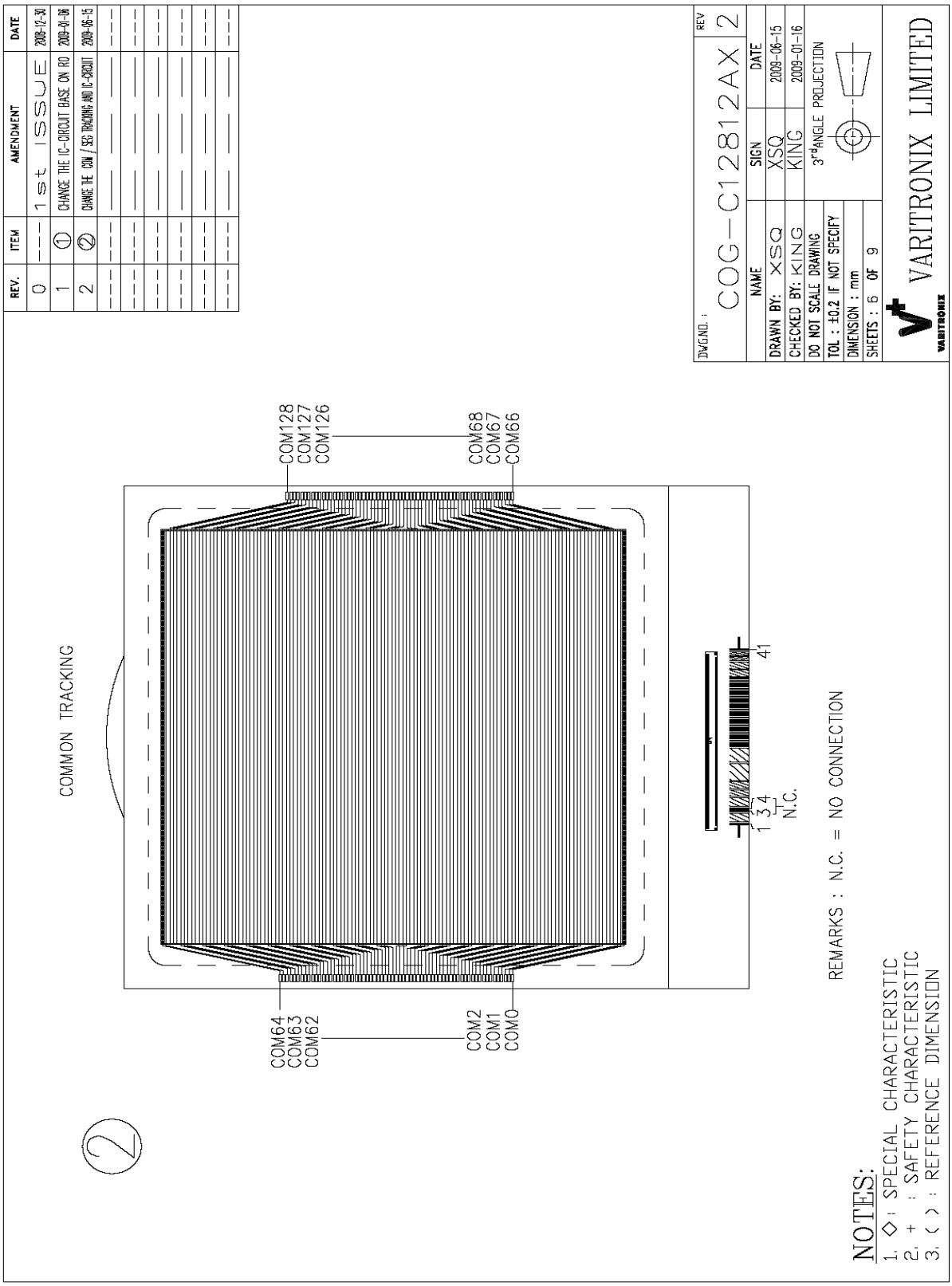


Figure 10: LCD Drawing 6

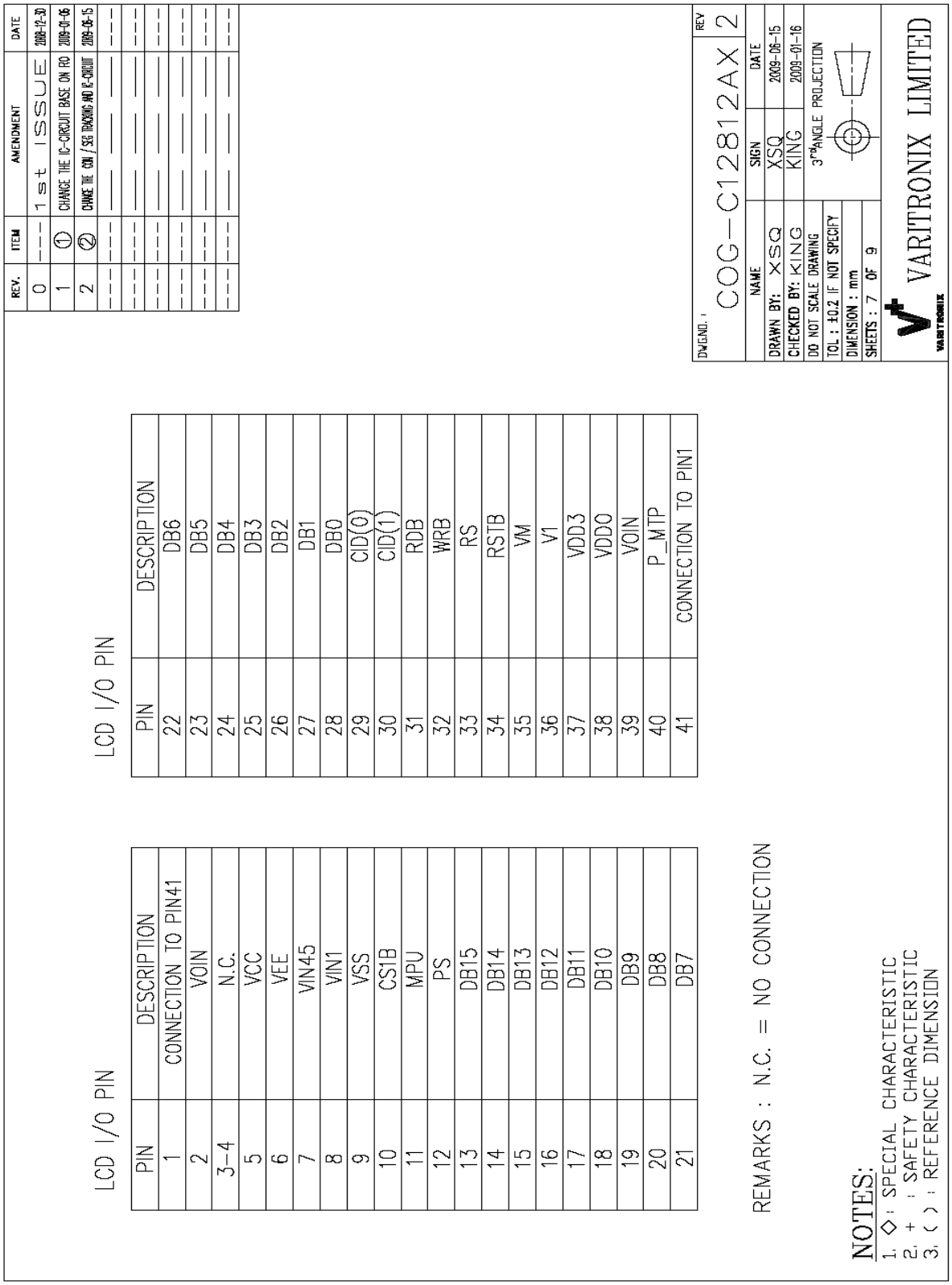


Figure 11: LCD Drawing 7

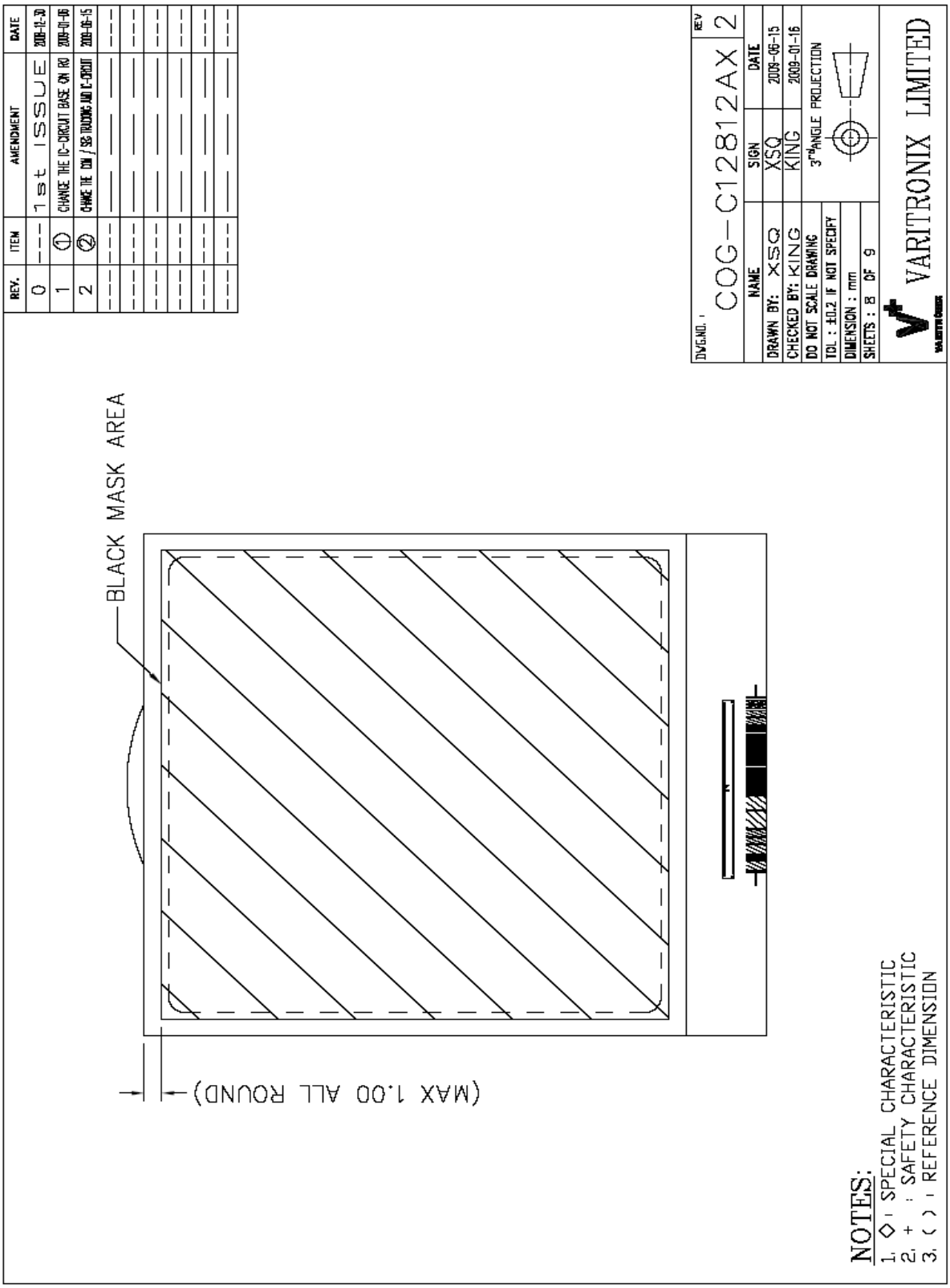


Figure 12: LCD Drawing 8

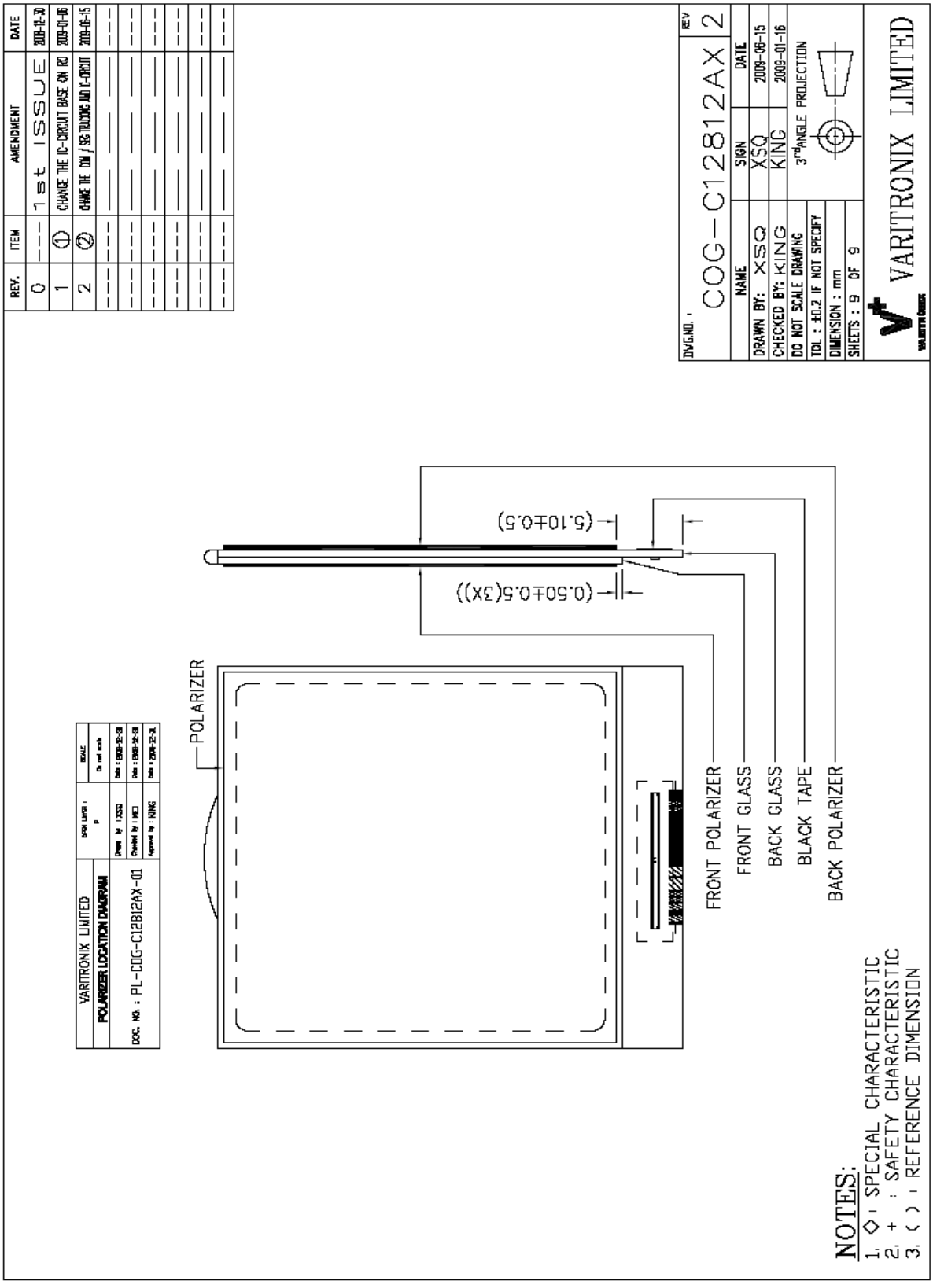
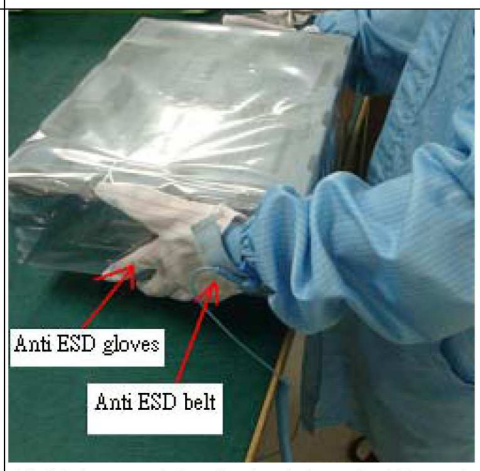
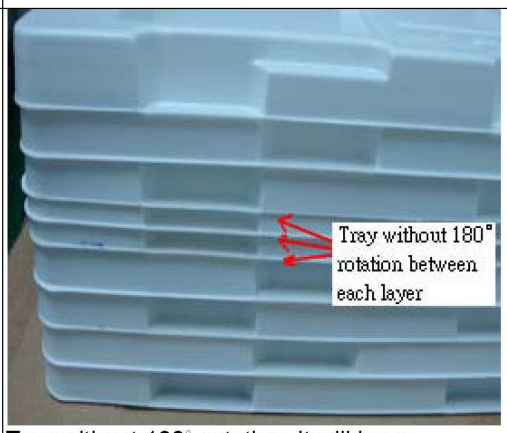
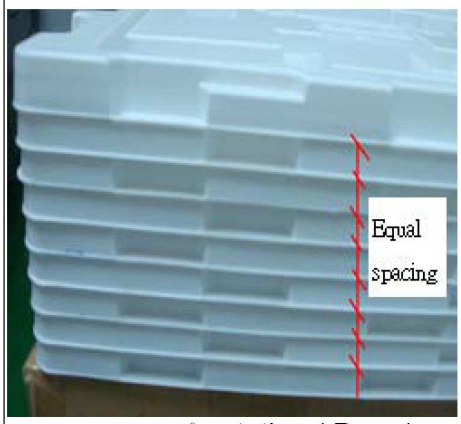
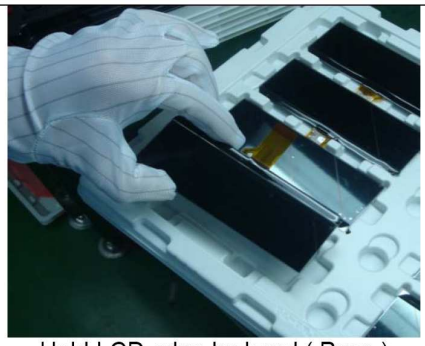
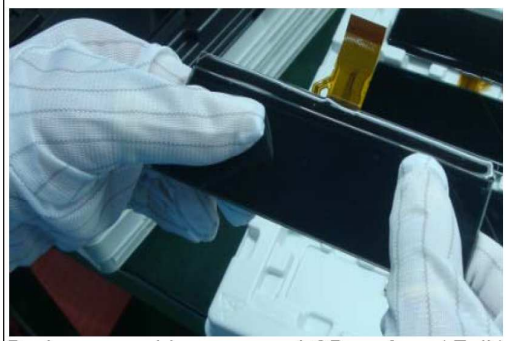
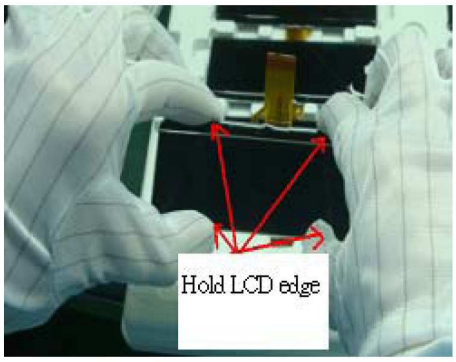


Figure 13: LCD Drawing 9

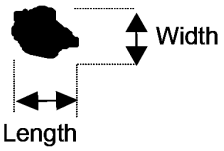
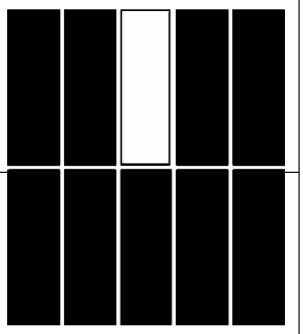
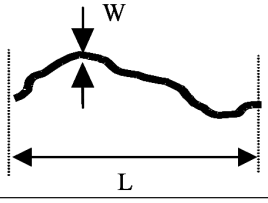
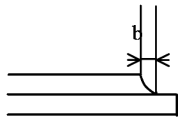
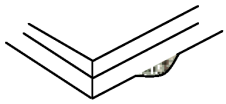
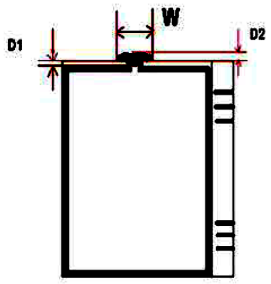
7. Packing Removal and Handing Requirement

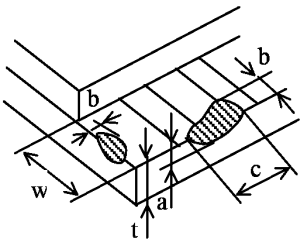
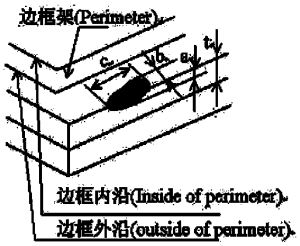
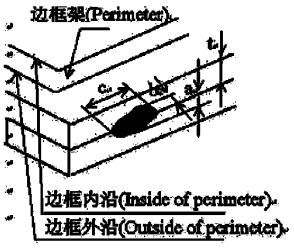
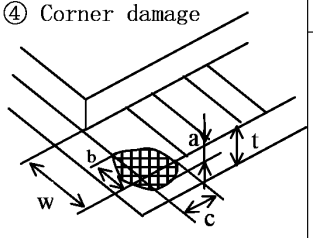
Requirement	Wrong	Correct
Get one package each times & hold the package by both hands with proper ESD shielding		 Hold the modules by both hands (Pass)
Prohibit to stack inner package over 3 layers	 Over 3 layers (Fail)	 Not exceed 3 layers (Pass)
Total packing tray height must within 40 cm	 Over 40 cm (Fail)	 Lower than 40 cm (Pass)

Requirement	Wrong	Correct
Packing tray must rotate 180° in each layer when stack together	 Tray without 180° rotation, It will have pressure on the module (Fail)	 Tray with 180° rotation (Pass)
Prohibit to touch LCD surface by fingers	 Hold LCD and touch its surface (Fail)	 Hold LCD edge by hand (Pass)
During assembly, prohibit to press on LCD surface by fingers, Must hold the LCD edges by both hands	 During assembly, press on LCD surface (Fail)	 During assembly, use both hands to hold LCD edge only (Pass)

Remark: For all ISTN display, it is extremely sensitive to external pressure, beside above handling requirement, special care to avoid pressure application on LCD surface is necessary.

8. CSTN Panel Inspection Specifications

Failure mode	Illustration	Category(Unit: mm)		Acceptable count	
				Viewing area	non-Viewing area
Black spot White spot	 Φ= (Length+width)/2	A	Φ≦0.10	Not count	Not count
		B	0.10<Φ≦0.15	2, The gap between the two spots should be 5 mm and above.	
		C	0.15<Φ≦0.20	1	
		D	0.20<Φ	0	
Bright spot(Red spot,green spot and blue spot caused by damaged colour filter)		A	Area≦1 sub-pixel	1	N/A
Black line White line		A	W≦0.03	Not count	Not count
		B	0.03<W≦0.05, L≦3.0	2	
		C	0.05<W	Judged by spot spec	
Below are cosmetic inspection specifications					
Excess glass		b≦1.0, this defect shall not affect the outline dimension or assembly process.(Remarks: For COG process, the defect size is decided by the dimension of LCD panel.)			
		This defect shall not affect the outline dimension or assembly process.			
The depth of UV glue entered in LCD cell		a. D1≥0.2，not enter into viewing area b. D2≦0.8, c. W=End mouth width + (2~6 mm)			

<table>
<tr><td rowspan="5">Glass defect(scratch ,damage)</td><td>① LCD ledge damage
  </td><td colspan="2">Category</td></tr>
<tr><td></td><td>A</td><td>The defect shall not affect the outline dimension or assembly process at non ITO zone.</td></tr>
<tr><td></td><td>B</td><td>b≦1/4w, a & c not count (at ITO zone)</td></tr>
<tr><td></td><td>C</td><td>Alignment mark on LCD ledge shall not be damaged.</td></tr>
<tr><td>② Outside of perimeter damage
  </td><td colspan="2">b can’t reach inside of perimeter.</td></tr>
<tr><td>③ Joint glass damage
  </td><td colspan="2">b can’t reach outside of perimeter or ITO layout.</td></tr>
<tr><td>④ Corner damage
  </td><td>A</td><td>a ≦ t， b ≦ 3.0， c ≦ 3.0</td></tr>
<tr><td colspan="3">B. Alignment mark on LCD ledge shall not be damaged.</td></tr>
<tr><td colspan="4">Remark: a stands for thickness of damage, b for width, c for length and t for glass thickness. (Unit: mm)</td></tr>
</table>

9. Remark

HANDLING LCD AND LCD MODULES

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 for use and storage. Excessive temperature and humidity could cause polarization degredation, polarizer peel-off or bubble generation. When storage for a long period over 40° C is required, the relative humidity should be kept below 60%.
(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. Never scrub hard.
(3) Varitronix does not responsible for any polarizer defect after the protective film has been removed from the display
(4) 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.
(5) PETROLEUM BENZIN is recommended to remove adhesives used to attach front/rear polarizers and reflectors, while chemicals like acetone, toluene, ethanol and isopropyl alcohol will cause damage to the polarizer. Avoid oil and fats. Avoid lacquer and epoxies which might contain solvents and hardeners to cause electrode errosion. Some solvents will also soften the epoxy covering the DIL pins and thereby weakening the adhesion of the epoxy on glass. This will cause the exposed electrodes to erode electrochemically when operating in high humidity and condensing environment.
(6) Glass can be easily chipped or cracked from rough handling, especially at corners and edges.
(7) Do not drive LCD with DC voltage.
(8) When soldering DIL pins, avoid excessive heat and keep soldering temperature between 260°C to 300°C for no more than 5 seconds. Never use wave or reflow soldering.

2. Liquid Crystal Display Modules (MDL)

2.1 Mechanical Considerations

MDL's 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 (conductive rubber), especially when inserting an EL panel.
(4) When mounting a MDL 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.
(6) If FPCA need to be bent, please refer the suggested bending area on the specification. The stiffener and component area on FPC/FFC/COF must not be bent during or after assembly (Note: for those models with FPC/FFC/COF +stiffener).
(7) Sharp bending should be avoided on FPC to prevent track cracking.

2.2 Static Electricity

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

(1) The operator should be grounded whenever he 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 part 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 inducive 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 is 280°C ± 10°C .
(4) Soldering time: 3 to 4 seconds.
(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 afterwards.
(7) Use proper de-soldering methods (e.g. suction type desoldering irons) to remove lead wires from the I/O terminals when necessary. Do not repeat the soldering/ desoldering process more than three times as the pads and plated through holes may be damaged.

2.4 Label

Identification labels will be stuck on the module without obstructing the viewing area of display.

3. Operation

(1) The viewing angle can be adjusted by varying the LCD driving voltage Vo.
(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 destructive and the display will return to normal once the temperature falls back to range.
(5) Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured". They will recover once the display is turned off.
(6) Condensation at terminals will cause malfunction and possible electrochemical reaction. Relative humidity of the environment should therefore be kept below 60%.
(7) Display performance may vary out of viewing area. If there is any special requirement on performance out of viewing area, please consult Varitronix.

4. Storage and Reliability

(1) LCD's should be kept in sealed polyethylene bags while MDL's should use antistatic ones. If properly sealed, there is no need for desiccant.
(2) Store in dark places and do not expose to sunlight or fluorescent light. Keep the temperature between 0°C and 35°C and the relative humidity low. Please consult VARITRONIX for other storage requirements.
(3) Water condensation will affect reliability performance of the display and is not allowed.
(4) Semi-conductor device on the display is sensitive to light and should be protected properly.
(5) Power up/down sequence.
   a) Power Up: in general, LCD supply voltage, Vo must be supplied after logic voltage, VDD becomes steady. Please refer to related IC data sheet for details.
   b) Power Down: in general, LCD supply voltage, Vo must be removed before logic voltage, VDD turns off. Please refer to related IC data sheet for details.

5. Safety

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 times.

LIMITED WARRANTY

VARITRONIX LCDs and modules are not consumer products, but may be incorporated by VARITRONIX's customers into consumer products or components thereof. VARITRONIX does not warrant that its LCDs and components are fit for any such particular purpose.

1. The liability of VARITRONIX is limited to repair or replacement on the terms set forth below. VARITRONIX will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user.

   Unless otherwise agreed in writing between VARITRONIX and the customer, VARITRONIX will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with VARITRONIX LCD Acceptance Standards (copies available on request), for a period of one year from the date of shipment. Confirmation of such date shall be based on freight documents.

2. No warranty can be granted if any of the precautions stated in HANDLING LCD and LCD Modules above have been disregarded. Broken glass, scratches on polarizers, mechanical damages as well as defects that are caused by accelerated environmental tests are excluded from warranty.
3. In returning the LCD and Modules, they must be properly packaged and there should be detailed description of the failures or defects.

IMPORTANT NOTICE

The information presented in this document has been carefully checked and is believed to be accurate, however, no responsibility is assumed for inaccuracies. VARITRONIX reserves the right to make changes to any specifications without further notice for performance, reliability, production technique and other considerations, VARITRONIX does not assume any liability arising out of the application or use of products herein. Please see Limited Warranty in the previous section.