SPECIFICATION
FOR
LCD MODULE

Customer : __CDYIN__

Product Model: __LMG-240EA1-WUN1G__

Designed by	Checked by	Approved by

Final Approval by Customer

☐ OK

☐ NG   Problem survey:

Approved By _____

The specification of "TBD" should   refer to the measured value of sample .   If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.
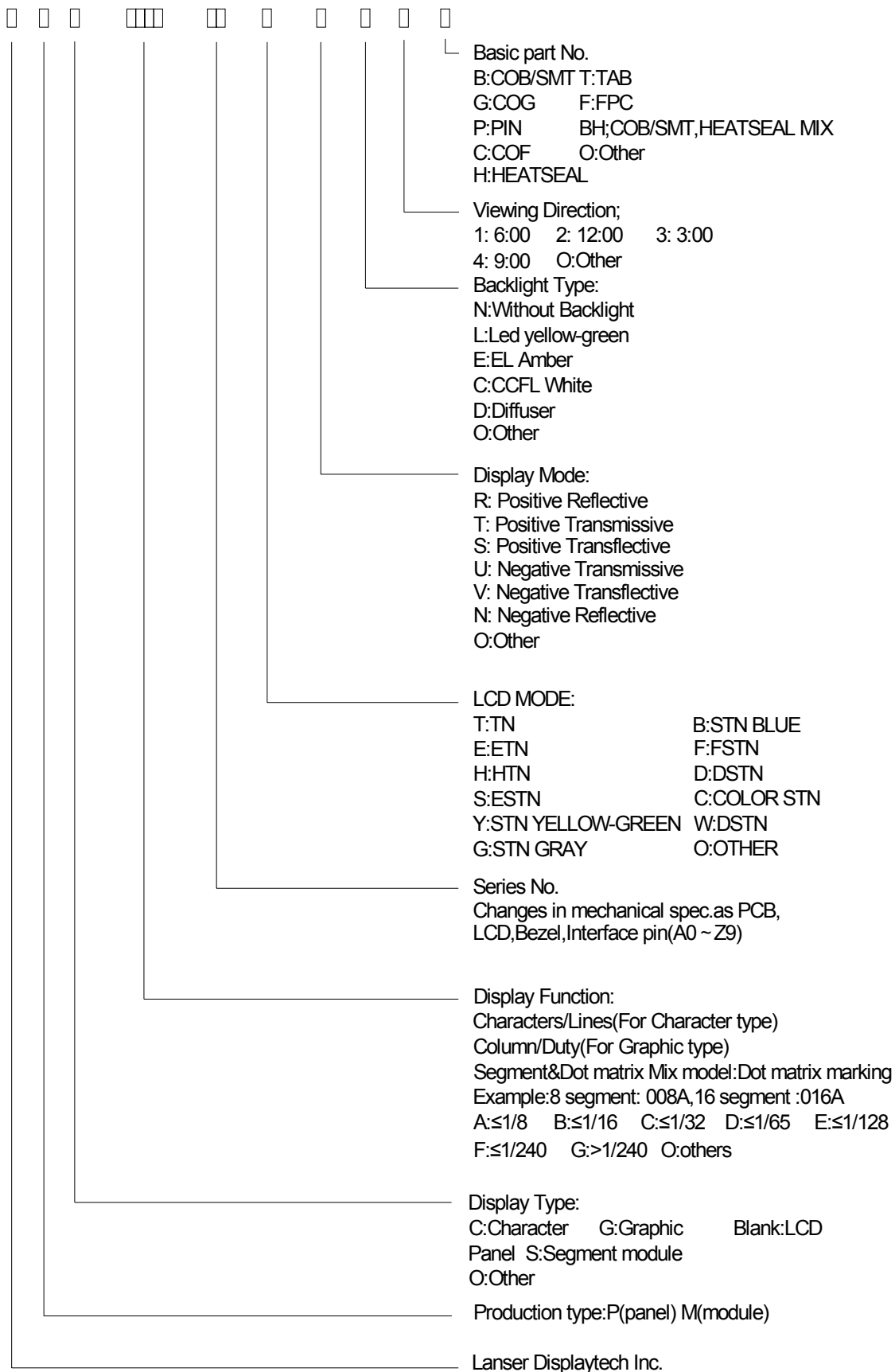
Revision History

Version	Contents	Date	Note
A	Original	JUN., 2005	

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1 Numbering System

Basic part No.
B:COB/SMT T:TAB
G:COG   F:FPC
P:PIN   BH;COB/SMT,HEATSEAL MIX
C:COF   O:Other
H:HEATSEAL

Viewing Direction;
1: 6:00   2: 12:00   3: 3:00
4: 9:00   O:Other

Backlight Type:
N:Without Backlight
L:Led yellow-green
E:EL Amber
C:CCFL White
D:Diffuser
O:Other

Display Mode:
R: Positive Reflective
T: Positive Transmissive
S: Positive Transflective
U: Negative Transmissive
V: Negative Transflective
N: Negative Reflective
O:Other

LCD MODE:

T:TN	B:STN BLUE
E:ETN	F:FSTN
H:HTN	D:DSTN
S:ESTN	C:COLOR STN
Y:STN YELLOW-GREEN	W:DSTN
G:STN GRAY	O:OTHER

Series No.
Changes in mechanical spec.as PCB,
LCD,Bezel,Interface pin(A0   Z9)

Display Function:
Characters/Lines(For Character type)
Column/Duty(For Graphic type)
Segment&Dot matrix Mix model:Dot matrix marking
Example:8 segment: 008A,16 segment :016A
A:≤1/8   B:≤1/16   C:≤1/32   D:≤1/65   E:≤1/128
F:≤1/240   G:>1/240   O:others

Display Type:
C:Character   G:Graphic   Blank:LCD
Panel S:Segment module
O:Other

Production type:P(panel) M(module)

Lanser Displaytech Inc.

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2 Scope

This specification applies to the LCD module which is designed and manufactured by Lanser Displaytech Inc.

It is capable of using 8bits data bus and operating with 8080-series MPU.

3 Normative Reference

GB/T4619-1996
 Liquid Crystal Display Test Method
GB/T2424
 Basic environmental Testing Procedures for Electric and Electronic Products.
GB/T2423
 Basic Testing Procedures for Electric and Electronic Products
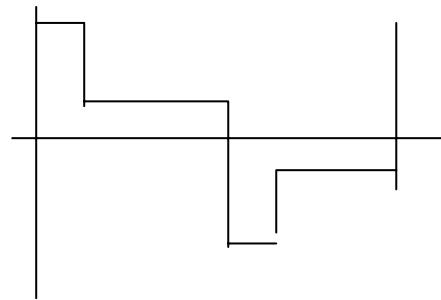IEC61747-1
 SIXTH PARTGB2828`2829-87 National Standard of PRC

4 Definitions

4.1 Definitions of Vop

The definitions of threshold voltage Vth1, Vth2 the following typical waveforms are applied on liquid crystal by the method of equalized voltage for each duty and bias
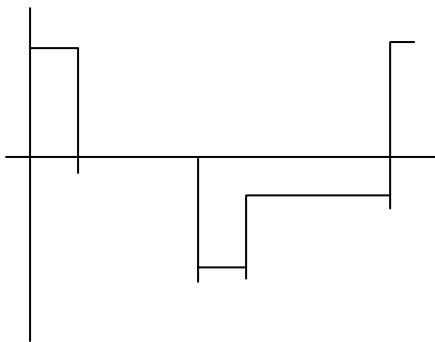
         selected waveform   non-selected waveform

Vth1: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of selected waveform
(f_f=80Hz, =10° =270° at 25)

Vth2: The voltage which the brightness of segment indicates 30% of saturated
value on the conditions of non-selected waveform
(f_f=80Hz, =10° =270° at 25)

Vop: (Vth1(50%)+Vth2(30%))/2   (f_f=80Hz, =10° =270° at 25)

4.2 Definition of Response Time Tr, Td

Tr: The time required which the brightness of segment becomes 10% from 100% when waveform is switched to selected one from non-selected one. (f_f=80Hz, =10° =270° at 25)
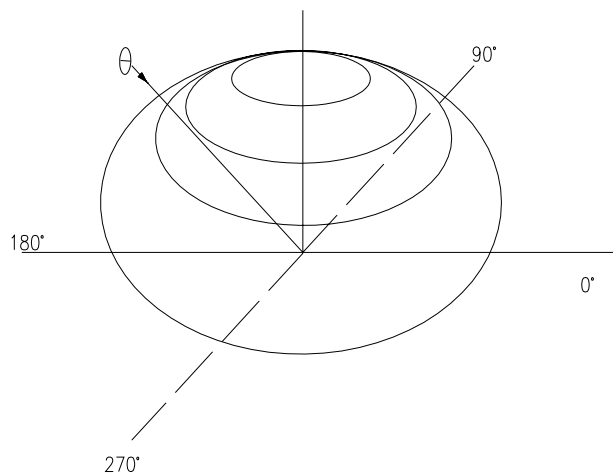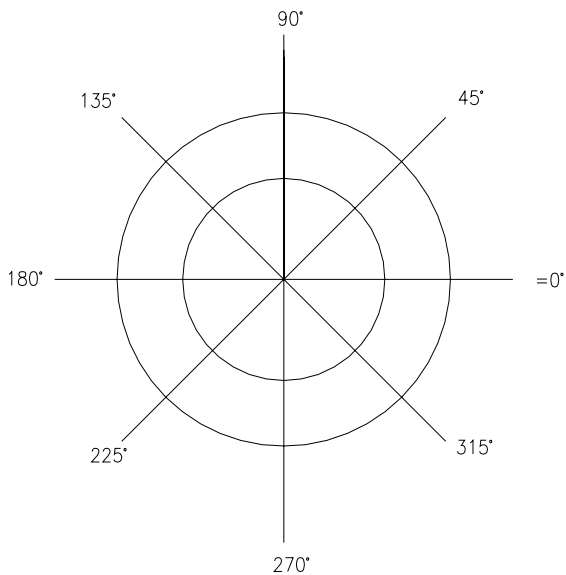
Td: The time required which the brightness of segment becomes 90% from 10% when waveform is switched to selected one from selected one. (f_f=80Hz, =10° =270° at 25)
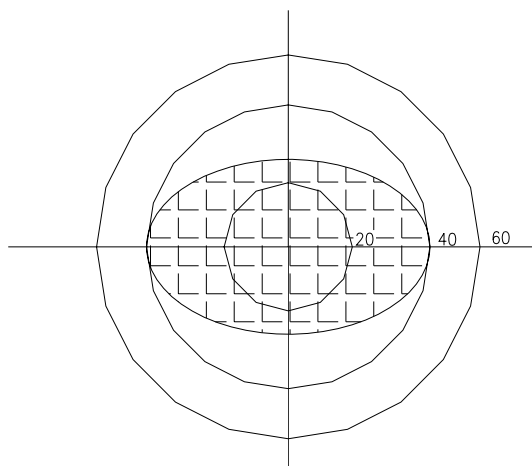
4.3 Definition of Contrast Ratio Cr

Cr=A/B

A: Segments brightness in case of non-selected waveform
Segments brightness in case of selected waveform

4.4 Definition of Angle and Viewing Range

Angular Graph: Constrast Ratio

Such as:
Viewing Angle Range:
        80(Cr>2) Horizontal
        70(Cr>2) Vertical

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5 Technology Specifications

5.1 Feature

Display Mode   :   Transmissive / Negative

Display Format   :   240(W)× 128(H) Pixels

Input Data   :   8-bit parallel data interface from a MPU

Multiplexing Ratio :   1/128 Duty 1/11.3 Bias

Viewing Direction :   6 o' clock

LCD driver   :   UC1608XGBE-U0

5.2 Mechanical Specifications

Item	Specifications	Unit
Dimensional Outline	[72.00+1.0 (Seal)] (W) ×61.40(H)×1.75Max(T)	mm
Number Of Dots	240(W) ×128(H) Pixels	
Viewing Area	68.00(W) ×30.50(H)	mm
Active Area	59.97W) ×26.85(H)	mm
Pixel Pitch	0.25(W) ×0.21(H)	mm
Dots Size	0.22(W) ×0.18(H)	mm

5.3 Absolute Max. Rating

Symbol	Parameter	Min	Max	Unit
Vdd	Supply voltage	-0.3	+4.0	V
Vdd2	LCD Generator Supply voltage	-0.3	+4.0	V
Vdd3	Analog Circuit Supply voltage	-0.3	+4.0	
VLCD	LCD Generated voltage(-30 ~+80)	-0.3	+17.0	V
Vin	Input voltage	-0.4	VDD+0.5	V
Topr	Operating temperature	-30	+85	
Tstr	Storage temperature	-55	+125	

5.4 DC characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Supply for digital circuit		2.7	2.8	3.3	V
$V_{DD2/3}$	Supply for bias & pump		2.7	2.8	3.3	V
V_{LCD}	Charge pump output	$V_{DD2/3} \geqslant 2.7\,V, 25^{O}C$		12.5	16	V
V_D	LCD data voltage	$V_{DD2/3} \geqslant 2.7\,V, 25^{O}C$			1.53	V
V_{IL}	Input logic LOW				$0.2V_{DD}$	V
V_{IH}	Input logic HIGH		$0.8V_{DD}$			V
V_{OL}	Output logic LOW				$0.2V_{DD}$	V
V_{OH}	Output logic HIGH		$0.8V_{DD}$			V
I_{IL}	Input leakage current				1.5	μA
C_{IN}	Input capacitance			5	10	PF
C_{OUT}	Output capacitance			5	10	PF
$R_{0(SEG)}$	SEG output impedance	$V_{LCD} = 12.5V$		1.5	3	kΩ
$R_{0(COM)}$	COM output impedance	$V_{LCD} = 9$		1.5	3	kΩ
f_{LINE}	Average frame rate		69	75	--	Hz

5.5 Optical Characteristics

Item	Symbol	Temp	Condition	Value			Unit
				Min	Typ	Max	
Response time	tr	-20	=0 =0	TBD	TBD	TBD	ms
		25		-	120	220	
	tf	-20		TBD	TBD	TBD	
		25		-	172	272	
Viewing angle		25	=0	65 CR>2 Horizontal			Deg
			=90	71CR>2 Vertical			
Contrast ratio	Cr	25	=0 =0	3	3	-	

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5.6 Interface Pin Connections

Pin No.	Symbol	Description
1	NC	---
2	NC	---
3	BM1	Interface select
4	BM0	Series select
5	CS	Chip select input pin
6	RES	reset input pin
7	CD	Control / Display data select
8	WR0	Read / write operation select
9	WR1	
10	D0	Data bus
11	D1	
12	D2	
13	D3	
14	D4	
15	D5	
16	D6	
17	D7	
18	VDD	Digital VDD.
19	VDD2	Analog power supply
20	VDD3	
21	VSS2	GND
22	VSS	
23	VBIAS	Reference voltage
24	VLCD	LCD Power Supply.
25	VB0+	LCD Bias Voltages.
26	VB0-	
27	VB1+	
28	VB1-	
29	NC	
30	NC	

6 Signal timing diagram and Circuit block diagram

6.1 Circuit block diagram

```
                    ┌─────────────────────────┐
  ┌──────────────►  │      LCD PANEL          │  ◄──────────────┐
  │  COM128~2        │   240× 128 DOTS         │   COM127~1       │
  │  ────────────►   │                         │   ◄───────────   │
  │                  └─────────────────────────┘                  │
  │                       ▲             ▲                         │
  │                       │  SEG1~240   │                         │
  │                  ┌────┴─────────────┴─────┐                   │
  └──────────────────│   UC1608XGBE-U0        │───────────────────┘
                     └────────────────────────┘
```

Interface

Data

Control

Power line
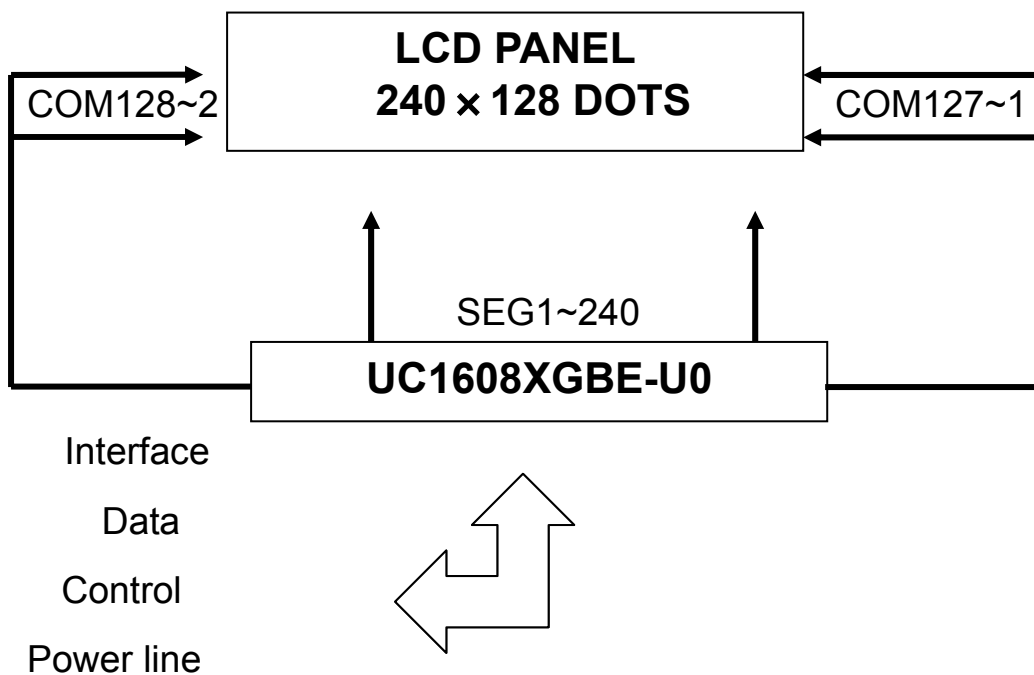
6.2 Signal timing diagram for LCD driver UC1608XGBE

● **8 bit Parallel Bus Timing Characteristics(for 8080 MCU)**
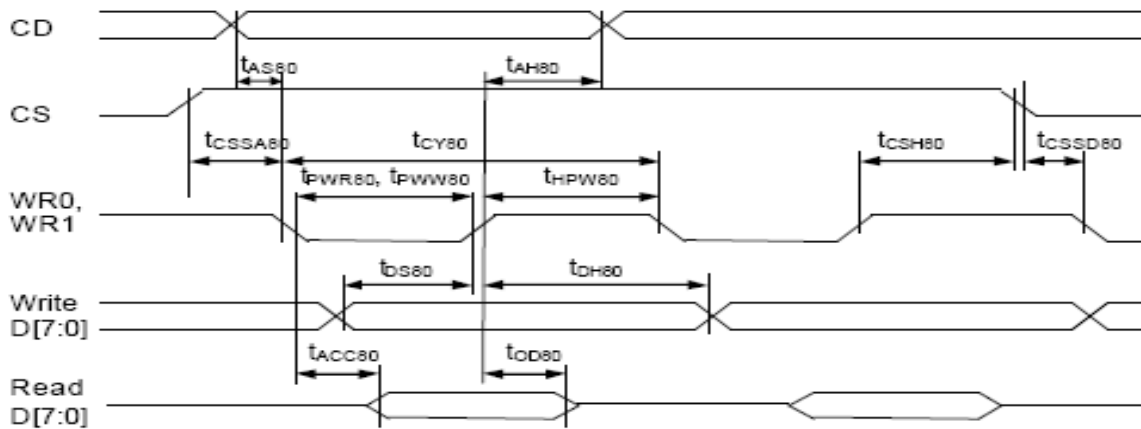
Parallel Bus Timing Characteristics (for 8080 MCU)

$(2.7V \leqslant V_{DD} < 3.3V,$ Ta= −30 to +85 ℃)

Symbol	Signal	Description		Condition	Min.	Max.	Units
t_{AS80}	CD	Address setup time			0	–	nS
t_{AH80}		Address hold time			20		
t_{CY80}		System cycle time				–	nS
		8 bits bus	(read)		140		
			(write)		140		
		4 bits bus	(read)		140		
			(write)		140		
t_{PWR80}	WR1	Pulse width	8 bits (read)		65	–	nS
			4 bits		65		
t_{PWW80}	WR0	Pulse width	8 bits (write)		35	–	nS
			4 bits		35		
t_{HPW80}	WR0, WR1	High pulse width				–	nS
		8 bits bus	(read)		65		
			(write)		35		
		4 bits bus	(read)		65		
			(write)		35		
t_{DS80}	D0~D7	Data setup time			30	–	nS
t_{DH80}		Data hold time			20		
t_{ACC80}		Read access time		$C_L = 100pF$	–	60	nS
t_{OD80}		Output disable time			12	20	
t_{SSA80}	CS1/CS0	Chip select setup time			10		nS
t_{CSSD80}					10		
t_{CSH80}					20		

● 8 bit Parallel Bus Timing Characteristics(for 6800 MCU)
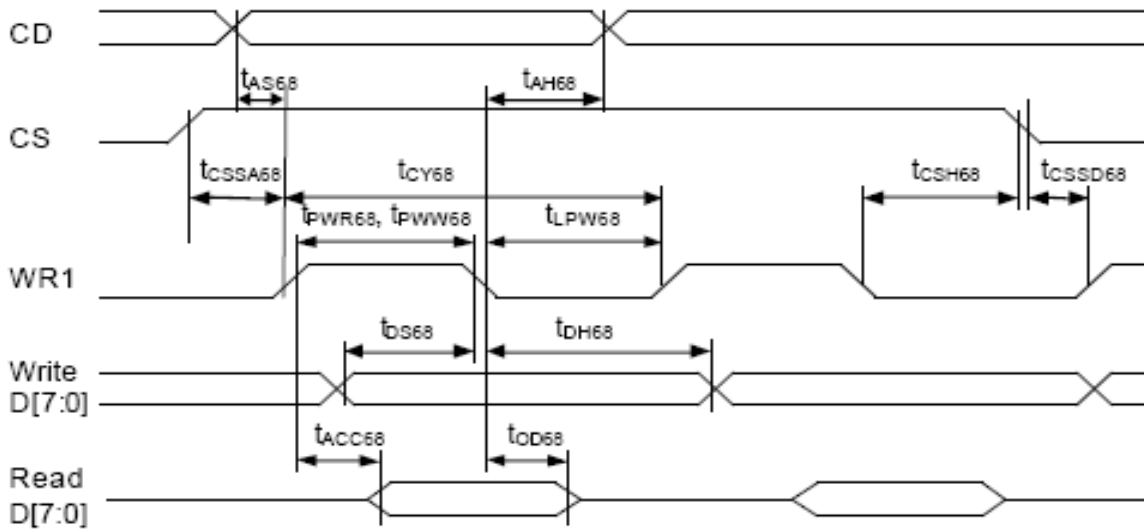
Parallel Bus Timing Characteristics (for 6800 MCU)

$(2.7V \leq V_{DD} < 3.3V, Ta= -30 \text{ to } +85^{\circ}C)$

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{AS68}	CD	Address setup time		0	–	nS
t_{AH68}		Address hold time		20		
T_{CY68}		System cycle time			–	nS
		8 bits bus (read)		140		
		(write)		140		
		4 bits bus (read)		140		
		(write)		140		
t_{PWR68}	WR1	Pulse width 8 bits (read)		65		
		4 bits		65	–	nS
t_{PWW68}		Pulse width 8 bits (write)		35	–	nS
		4 bits		35		
t_{LPW68}		Low pulse width			–	nS
		8 bits bus (read)		65		
		(write)		35		
		4 bits bus (read)		65		
		(write)		35		
t_{DS68}	D0~D7	Data setup time		30	–	nS
t_{DH68}		Data hold time		20		
t_{ACC68}		Read access time	$C_L = 100pF$	–	60	nS
t_{OD68}		Output disable time		12	20	
t_{CSSA68}	CS1/CS0	Chip select setup time		10		nS
t_{CSSD68}				10		
t_{CSH68}				20		

● Reset Timing Characteristics
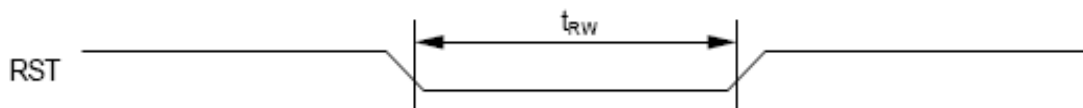
Reset Characteristics
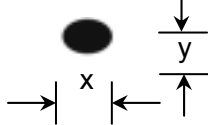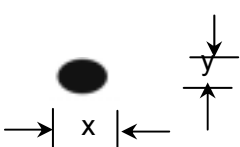
$(2.7V \leq V_{DD} < 3.3V, Ta= -30 \text{ to } +85^{\circ}C)$
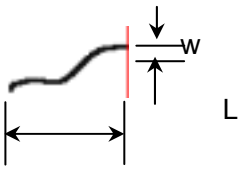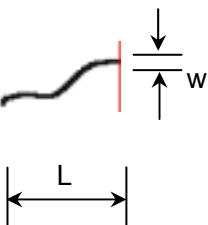
Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{RW}	RST	Reset low pulse width		1000	–	nS

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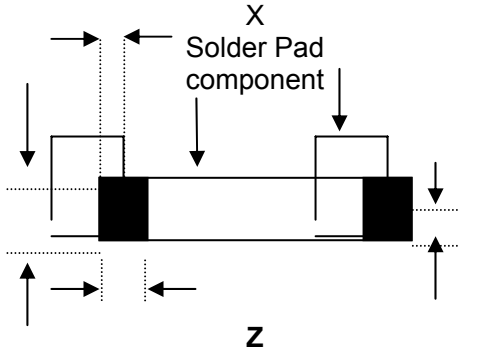
7 Reliability Test Conditions And Methods

NO	Item	Condition	Method
1	High / Low Temperature Storage	60 /-20 500hrs	Check and record every 96Hrs
2	High / Low Temperature Life	50 /-10 500hrs (operating mode)	Check and record every 96Hrs
3	High Temperature High Humidity Operating	40 90% RH, 120Hrs	Check and record every 48hrs
4	Thermal Shock	-30 (30Min) ⟶ 25 (5Min) ⟶ 80 (30Min) (conversion time, : 5 sec) 20 cycles	Each 10 cycles end , check
5	Vibration	10Hz~55Hz~10Hz Amplitude: 1.5mm 2hrs for each direction(X,Y,Z)	Each direction end, Check the Appearance and Electrical Characteristics
6	Static Electricity	Gap mood: ±1KV~±8KV (10 times air discharge with positive/negative voltage voltage gap : 1kv) Touch mood: ±1KV~±4KV	Each discharge end, Check the Electrical Characteristics
7	Curve	60 Thousand times, 40 times/min 150° (according to die if exist)	Check and record every 2~4 thousand times
8	Slump	Free faller movement for each side cording angle (75cm High 6 sides 2 angle 2 cording)	End
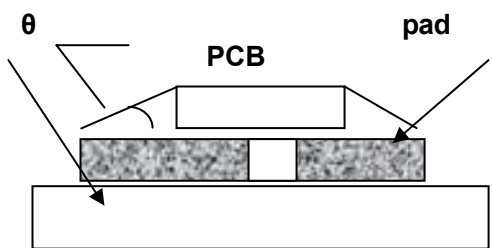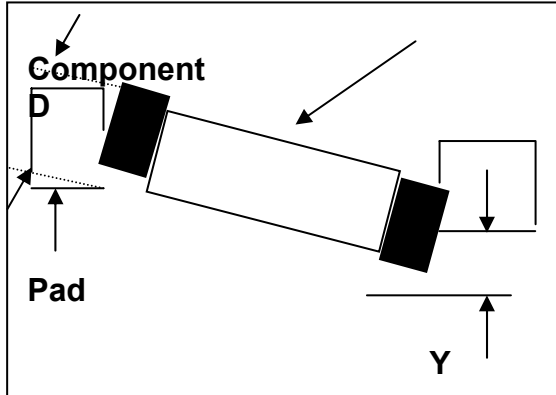
8 Inspection standard
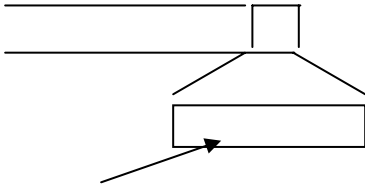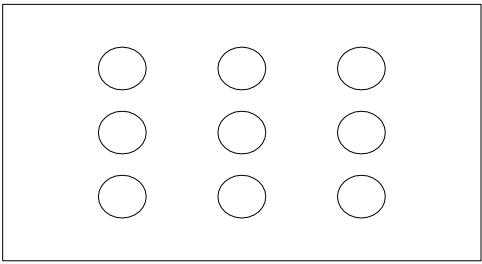
No	Item	Criterion
01	Outline Dimension	In accord with drawing
02	Position-finding Dimension Assemble Dimension	In accord with drawing
03	LCD black spots, white spots (Round type)	(see below)

Round type: non display
3.1 Small area LCD   Unit : mm

Dimension	Qualified Quantity
D 0.15	Ignore
0.15 D 0.2	4
D 0.2	0

3.2 Large area LCD

Dimension	Qualified Quantity
D 0.15	Ignore
0.15 D 0.25	4
0.25 D 0.35	2
D 0.35	0

C-STN : if D 0.1 , unqualified

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| 04 | LCD black spots, white spots (Line Style) | 4.1 Small area LCD　　　　　　　　　　　Unit : mm |

4.1 Small area LCD　　　　　　　　　Unit : mm

Length	Width	Qualified Quantity
-	0.015	Ignore
1.0	0.015　W 0.025	2
2.0		1
1.0	0.025　W　0.05	1
-	D　0.05	According to circle

4.2Large area LCD

Length	Width	Qualified Quantity
-	0.015	Ignore
2.0	0.015　W 0.025	2
1.0	0.025　W　0.05	1
-	D　0.05	According to circle

CSTN : If W　　0.015 , unqualified
Ignore beyond viewing area

05	LCD Scratch Threadlike Fiber	Same to NO.3 circle sightline and surface of LCD is vertical (2)Same to NO.3 line style
06	POL	It is not admissible that POL is beyond the edge of glass, else, unqualified. It is essential that POL is over the 50 percent of width of frame , else ,unqualified. According to the drawing in case of special definition.
07	IC/FPC Bonding	Scratch　　　　　　　　　　　　Reject
		Intensity Of Adhesion　　　If lower than specification, reject
		Gold Fold Twist　　　　　　　　Reject

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08	IC/FPC Bonding	Silicon	According to outline, no gold outside, seal can not be higher than LCD
		FPC Gold Sever	Reject
09	SMT	Lack of Component Polarity Inverse	If exist, reject
		Leak Solder Virtual Solder	If exist, reject
		Short Circuit In Solder Point	If exist, reject
		Tin Ball	If exist, reject
		Tin Acumination	If visual, reject
		Height Solder Point	If higher 0.5mm than component. reject
		Height of component	Either side higher 0.5mm than component, reject
		Component Shift	X Solder Pad component Z X<3/4Z reject y. 1/3D reject

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10	SMT	Few Tin	θ pad **PCB** **If θ 20° reject**
		Component Deflection	**Component** **D** **Pad** **Y** If Y >1/3 D reject
		Component Carcass Sideways	Reject
		Component Carcass Sideways	If exist with visual inspection , reject
		Lot Tin	A: Tin accrete the solder side completely , hollowly ,Ok B: Tin accrete the solder side completely , full circle arc , ok C: Jointing include whole solder side, height of tin>50 percent of height of component, reject
		Few Tin	A: Tin accrete the solder side completely , hollowly ,Ok B: height of tin > 1/3 of solder side of component , ok C: height of tin 1/3 of solder side of component, reject

11	SMT	Normal Jointing side	
12	Light	Short circuit Open circuit	Forbid
13	Brightness	In accord with product specification	Drive condition is according to specification Measure location is in Follow Picture 3 Adjust brightness instrument tozero , burrow against the surface of LCD , press "measure" , record when the display is steady. (YOKOGAWA-3298) Measure location
14	CR (Max)	According to specification	According to product specification Measure instrument (DMS-501)
15	Response time	According to specification	According to product specification Measure instrument (DMS-501)
16	Viewing angle	According to specification	According to product specification Measure instrument (DMS-501)
17	Vibration Ring	Compare with the sample customer supply	Compare with the sample customer supply when assemble
18	Frequency Of FPC Bend	According to the use of product (main FPC of foldaway cell phone 6 thousand)	Measure instrument Bend angle : 150° Fix FPC in the casement when customer supply

9 Handling Precautions

9.1 Mounting method

The LCD panel of Lanser LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

9.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent
[recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

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

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns
Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Salfur (S)

If goods were sent without being sili8con coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (Cl), Salfur (S) from customer, Responsibility is on customer.

9.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

9.4 packing

- Module employ LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

9.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

9.6 storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.
- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
  [It is recommended to store them as they have been contained in the inner container at the time of delivery from us

9.7 Safety
- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

10 Precaution for use

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.
- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to Lanser , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

11 Dimensional Outline