



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model : CV12032C - _ _ - _ _ - _ _ - _ _

Revision	06
Engineering	Yamaha Yam
Date	29 September 2003
Our Reference	4908

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MODE OF DISPLAY

Display mode	Display condition	Viewing direction
STN : <input type="checkbox"/> Yellow green	<input type="checkbox"/> Reflective type	<input type="checkbox"/> 6 O' clock
<input type="checkbox"/> Grey	<input type="checkbox"/> Transflective type	<input type="checkbox"/> 12 O' clock
<input type="checkbox"/> Blue (negative)	<input type="checkbox"/> Transmissive type	<input type="checkbox"/> 3 O' clock
<input type="checkbox"/> FSTN positive	<input type="checkbox"/> Others	<input type="checkbox"/> 9 O' clock
<input type="checkbox"/> FSTN negative		

LCD MODULE NUMBER NOTATION:

CV12032C- MY - S F - N 6 - T
 | | | | | | | |
 (1) (2) (3) (4) (5) (6) (7) (8)

*(1)---Model number of standard LCD Modules

*(2)---Backlight type

- N – No backlight
- E – EL backlight
- L – Side-lited LED backlight
- M– Array LED backlight
- C – CCFL

*(3)---Backlight color

- N – No backlight
- A – Amber
- B – Blue
- O– Orange
- W–White
- Y – Yellow green

*(4)---Display mode

- T – TN
- V – TN (Negative)
- S – STN Yellow green
- G – STN Grey
- B – STN Blue (Negative)
- F – FSTN
- N – FSTN (Negative)

*(5)---Rear polarizer type

- R – Reflective
- F – Transflective
- T – Transmissive

*(6)---Temperature range

- N – Normal
- W– Extended

*(7)---Viewing direction

- 6 – 6 O'clock
- 2 – 12 O'clock
- 3 – 3 O'clock
- 9 – 9 O'clock

*(8)---Special code for other requirements
 (Can be omitted if not used)

- T – Touch panel (Analog)
- P – Touch panel (Digital)

GENERAL DESCRIPTION

Display mode : 120 X 32 dots, Graphic LCD module
 Interface : 4-bit or 8-bit parallel
 Driving method : 1/32 duty, 1/5 bias
 Controller IC : SITRONIX ST7920 or equivalent
 For the detailed information, please refer to the IC specifications.

MECHANICAL DIMENSIONS

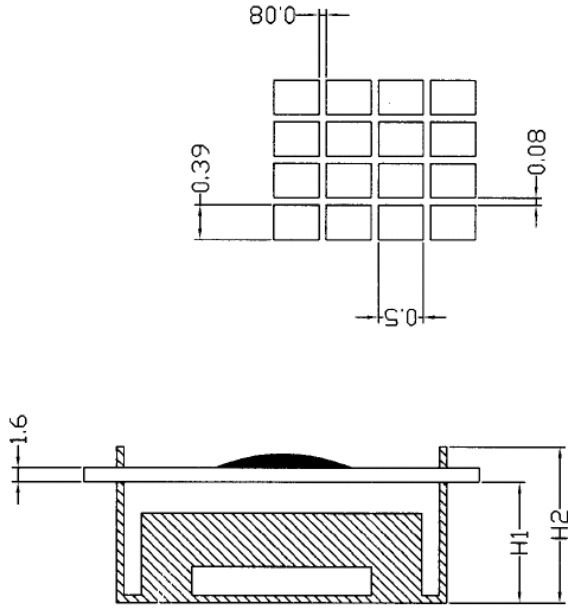
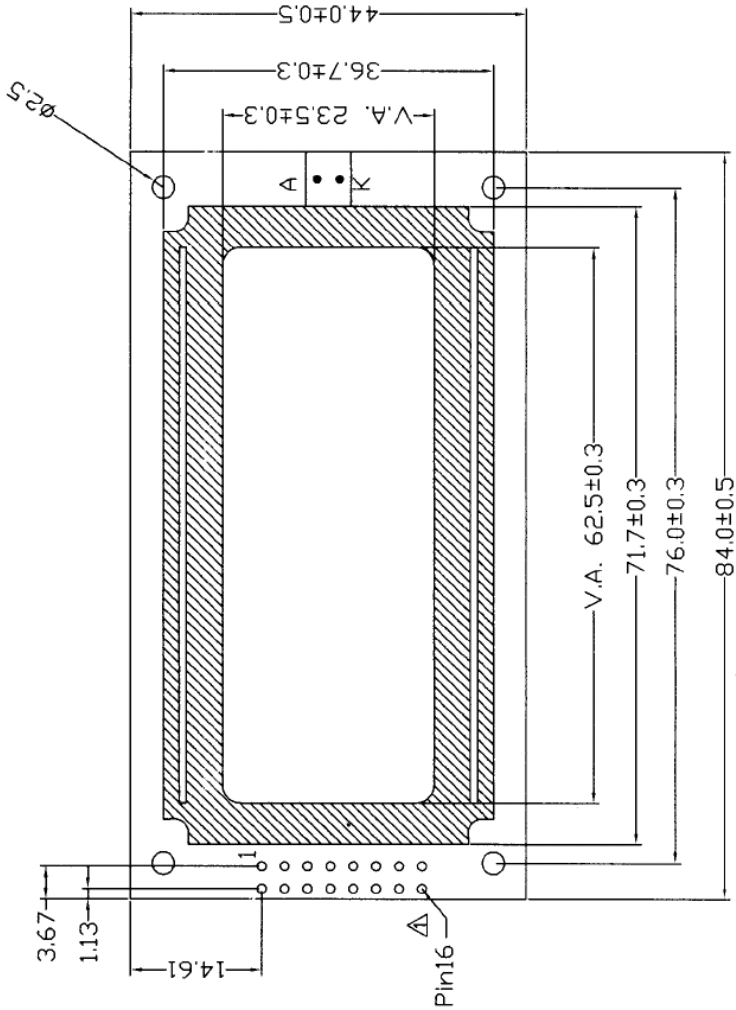
Item	Dimension		Unit	Item	Dimension		Unit
Outline Dimension	84.0(L)x44.0(W)x (H1/H2)		mm	Dot Pitch	0.47(L)x0.58(W)		mm
Viewing Area	62.5(L)x23.5(W)		mm	Dot Size	0.39(L)x0.50(W)		mm
No Backlight (N)	H1	7.9	mm	Side Backlight (L)	H1	—	mm
	H2	12.0	mm		H2	—	mm
EL Backlight (E)	H1	7.9	mm	Array Backlight (M)	H1	10.4	mm
	H2	12.0	mm		H2	14.5	mm

CONNECTOR PIN ASSIGNMENT

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	VSS	0V Power Supply	9	DB2	Data Bus Line
2	VDD	5V Power Supply	10	DB3	Data Bus Line
3	NC	No Connection	11	DB4	Data Bus Line
4	RS	Register Select Input	12	DB5	Data Bus Line
5	R/W	Read/Write	13	DB6	Data Bus Line
6	E	Enable Signal	14	DB7	Data Bus Line
7	DB0	Data Bus Line	15	A	Backlight Supply (+)
8	DB1	Data Bus Line	16	K	Backlight Supply (-)

COUNTER DRAWING OF MODULE DIMENSION

MARK	REASON	PREPARED	CHECKED
△	Add Backlight Pinouts	Brian	22-01-03
△			
△			
△			

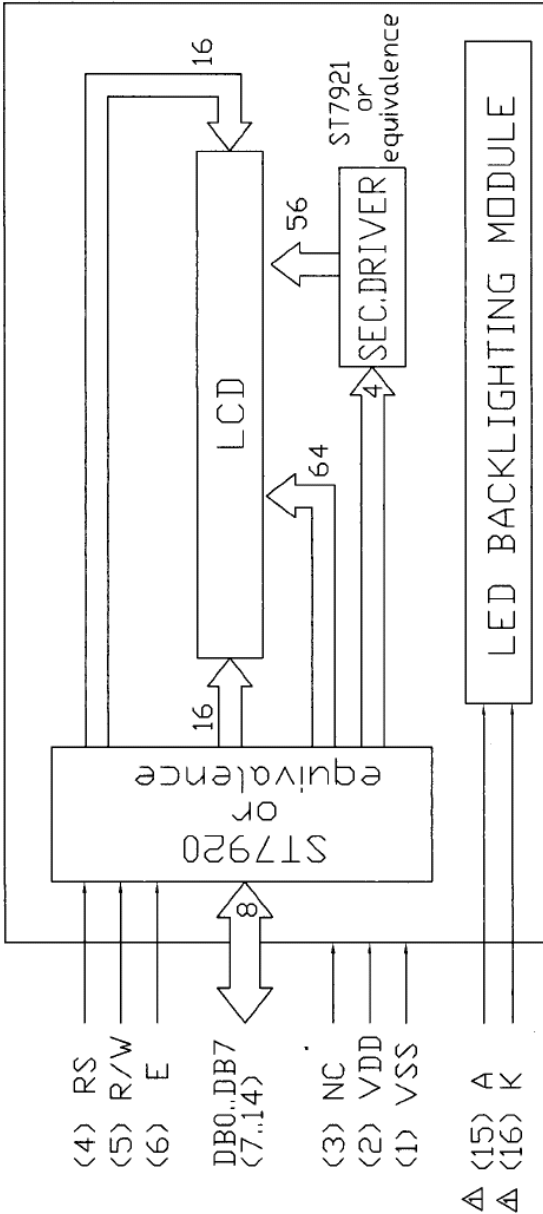


23/1/03
[Signature]

TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 1 OF 3
REV.	REVISION RECORD	DATE	DATE	APPROVED	MODEL NO. CV12032C	
00	1st ISSUE	22-06-02	22-06-02		TITLE MODULE DIMENSION	
01	Change Pinout	22-01-03	22-01-03	APPROVED	DRAWN BY : Brian	DATE : 22-01-03
					APPROVED BY : <i>[Signature]</i>	DATE : 23/1/03
				OUR REF. 4908		
				CUSTOMER REF.		

COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM

PIN NO.	SYMBOL	FUNCTION
1	VSS	0V Power Supply
2	VDD	5V Power Supply
3	NC	No Connection
4	RS	Register Select Input
5	R/W	Read/Write
6	E	Enable Signal
7	DB0	Data Bus Line
8	DB1	Data Bus Line
9	DB2	Data Bus Line
10	DB3	Data Bus Line
11	DB4	Data Bus Line
12	DB5	Data Bus Line
13	DB6	Data Bus Line
14	DB7	Data Bus Line
15	A	Backlight Supply (+)
16	K	Backlight Supply (-)



23/1/03

TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 2 OF 3
REV. 00	REVISION RECORD 1st ISSUE	DATE 22-06-02	CUSTOMER	APPROVED		MODEL NO. CV12032C
01	Change Pinout	22-01-03	AGENT	APPROVED		TITLE PIN OUT & BLOCK DIAGRAM
			CUSTOMER REF.	OUR REF. 4908		DRAWN BY : Brian DATE : 22-01-03
						APPROVED BY : <i>[Signature]</i> DATE : 23/1/03

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, @Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit	Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	VDD	4.75	5.00	5.25	V	“H”Level Input Voltage	VIH	2.2	—	VDD	V
Supply Current	IDD	—	2.10	—	mA	“L”Level Input Voltage	VIL	0	—	0.6	V
Backlight Voltage						Backlight Current					
EL (@ Frequency 400Hz)	VEL	—	100	150	V	—	—	—	—	—	—
Side-lited LED						Side-lited LED					
White	VBL	—	—	—	V	White	IBL	—	—	—	mA
Blue	VBL	—	—	—	V	Blue	IBL	—	—	—	mA
Yellow Green	VBL	—	—	—	V	Yellow Green	IBL	—	—	—	mA
Array LED						Array LED					
Yellow Green	VBL	3.85	4.05	4.25	V	Yellow Green	IBL	—	100	180	mA
Amber	VBL	—	—	—	V	Amber	IBL	—	—	—	mA
Orange	VBL	—	—	—	V	Orange	IBL	—	—	—	mA
Soft Orange	VBL	—	—	—	V	Soft Orange	IBL	—	—	—	mA
CCFL						CCFL					
White	VBL	—	—	—	V _{rms}	White	IBL	—	—	—	mA _{rms}

ABSOLUTE MAXIMUM RATINGS

Please make sure not to exceed the following maximum rating values under the worst application conditions

Item	Symbol	Rating (for normal temperature)	Rating (for wide temperature)	Unit
Supply Voltage	VDD	7	7	V
Input Voltage	VT	-0.3 to VDD +0.3	-0.3 to VDD +0.3	V
Operating Temperature	T _{opr}	0 to 50	-20 to 70	°C
Storage Temperature	T _{stg}	-10 to 60	-30 to 80	°C

INSTRUCTIONS

The ST7920 which have two categories of instructions that:

Instruction Table: (RE=0: Enable basic instruction.)

Instruction	Instruction Code										Description	Execution Time (450KHZ)
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	2.5 ms
Return Home	0	0	0	0	0	0	0	0	1	X	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	2.5 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	60us
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1: entire display on C=1: cursor on B=1: cursor position on	60 us
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	X	X	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	60 us
Function Set (Modify)	0	0	0	0	1	DL	N	0	G	X	DL: interface data is 8/4 bits N=1 & RE=0: 3 Line setting N=1 & RE=1: 4 Line setting G=1: Graphic display on G=0: Graphic display off Others: 2 Line setting RE=1: Extended instruction setting. RE=0: Normal instruction setting.	60 us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	60 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	60 us
Read Busy flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM/IRAM/GRAM)	60 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM/IRAM/GRAM)	60 us

Instruction Table: (RE=1: Enable extension instruction.)

Instruction	Instruction Code										Description	Execution Time (540KHZ)
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Standby Mode	0	0	0	0	0	0	0	0	0	1	Enter standby mode, only Icon areas display. Standby mode can be released by any other instructions.	60 us
Start Row Enable	0	0	0	0	0	0	0	0	1	SR	SR=1: Allow change start display Row. SR=0: Disable start display Row change.	60 us
Reverse Line Select	0	0	0	0	0	0	0	1	R1	R0	Choice one of 4 lines which data is reverse display.	60 us
Sleep mode and Set GRAM page	0	0	0	0	0	0	1	SL	GD	GW	SL=0: Enter sleep mode. SL=1: Wake-up from sleep mode. GD: Display graphic page 0 or 1 GW: Write data to graphic page 0 or 1. (Effective while GP=1)	60 us
Display Shift by dot	0	0	0	0	0	1	OA	LR	L1	L0	OA=1: One of 4 lines shift enable. OA=0: All line shift enable. LR=1: Dot by dot shift right. LR=0: Dot by dot shift left. L1, L0: Choice one of 4 lines shift.	60 us
Function Set (Modify)	0	0	0	0	1	CL	N	1	G	GP	CL=1: Select 16 character line CL=0: Select 8 character line N=1 & RE=1: 4 line display RE=1: Extended instruction setting. RE=0: Normal instruction setting. G=1: Graphic display on G=0: Graphic display off GP=1: Two page GRAM GP=0: One page GRAM	60 us
Set IRAM or Start Row address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	SR=1: AC5~AC0 is start row SR=0: AC5~AC0 is ICON RAM address	60 us
Set Graphic RAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set Graphic RAM address in address counter. Execute once set the address of display row. Execute again set the address of display column. Each address of display column has data of 16 bits. Therefore write data should execute 2 times.	60 us

Note:

Be sure the ST7920 is not in the busy state (BF = 0) before sending an instruction from the MPU to the ST7920. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to Instruction Table for the list of each instruction execution time.

DISPLAY DATA RAM (DDRAM)

Character Code (DDRAM data)				CGRAM Address				CGRAM data (High byte)								CGRAM data (Low byte)																
B15~ B4				B3	B2	B1	B0	B5	B4	B3	B2	B1	B0	D1	D0	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	
0	X	00	X	00	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
					0	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	
					0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
					0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
					0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	
					0	1	0	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	
					0	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	
					0	1	1	1	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
					1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
					1	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	
					1	0	1	0	0	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
					1	0	1	1	0	0	0	1	0	0	1	1	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	
					1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
					1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	X	01	X	01	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
					0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	
					0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	
					0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
					0	1	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
					0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
					0	1	1	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
					1	0	0	0	1	1	1	1	0	1	0	0	1	0	0	1	0	1	0	1	0	0	1	0	0	0	1	
					1	0	0	1	0	1	0	0	1	0	0	1	0	0	1	0	1	0	1	0	0	1	0	0	0	1	0	
					1	0	1	0	0	1	0	0	1	0	0	1	1	0	0	1	1	0	0	1	0	0	1	0	1	0	1	
					1	1	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
					1	1	0	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
					1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Relationship between CGRAM Addresses, Character Codes (DDRAM) and Character patterns (CGRAM Data)

Notes:

- Character code bits 1 to 2 correspond to CGRAM address bits 4 to 5 (2 bits: 4 types).
- CGRAM address bits 0 to 3 designate the character pattern line position. The 16th line is the cursor position and a logical OR with the cursor forms its display. Maintain the 16th line data, corresponding to the cursor display position, at 0 as the cursor display. If the 16th line data is 1, 1 bits will light up the 16th line regardless of the cursor presence.
- Character pattern row positions correspond to CGRAM data bits 0 to 15 (bit 15 being at the left).
- *4. As shown Table, CGRAM character patterns are selected when character code bits 4 to 15 are all 0 and bit 0 and bit 3 are don't care (x).**

ICON RAM (IRAM)

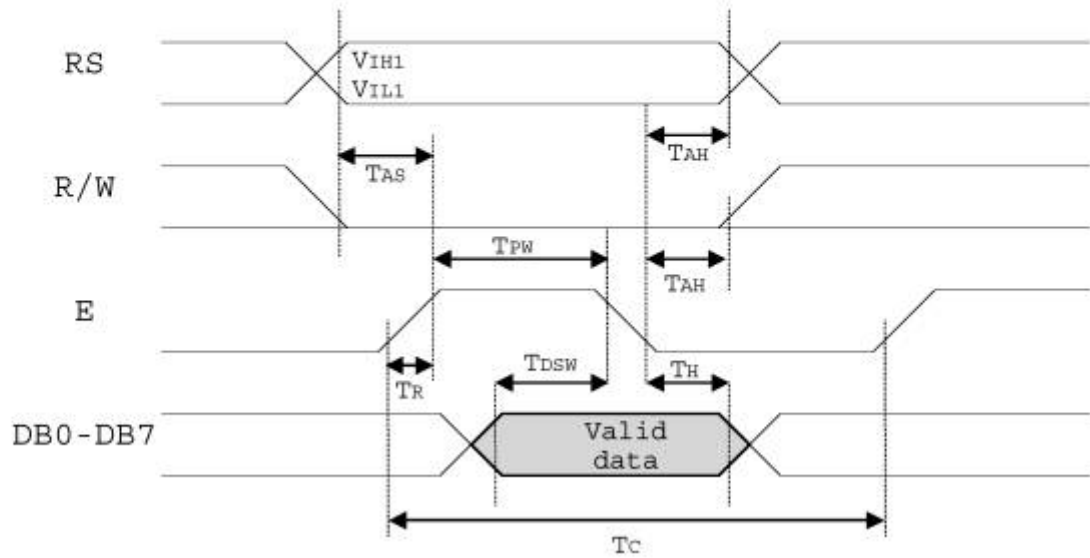
		ICON RAM Data															
		High Byte								Low Byte							
		D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Icon RAM Address (AC3~AC0)	0	SEG0	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7	SEG8	SEG9	SEG10	SEG11	SEG12	SEG13	SEG14	SEG15
	1	SEG16	SEG17	SEG18	SEG19	SEG20	SEG21	SEG22	SEG23	SEG24	SEG25	SEG26	SEG27	SEG28	SEG29	SEG30	SEG31
	2	SEG32	SEG33	SEG34	SEG35	SEG36	SEG37	SEG38	SEG39	SEG40	SEG41	SEG42	SEG43	SEG44	SEG45	SEG46	SEG47
	3	SEG48	SEG49	SEG50	SEG51	SEG52	SEG53	SEG54	SEG55	SEG56	SEG57	SEG58	SEG59	SEG60	SEG61	SEG62	SEG63
	4	SEG64	SEG65	SEG66	SEG67	SEG68	SEG69	SEG70	SEG71	SEG72	SEG73	SEG74	SEG75	SEG76	SEG77	SEG78	SEG79
	5	SEG80	SEG81	SEG82	SEG83	SEG84	SEG85	SEG86	SEG87	SEG88	SEG89	SEG90	SEG91	SEG92	SEG93	SEG94	SEG95
	6	SEG96	SEG97	SEG98	SEG99	SEG100	SEG101	SEG102	SEG103	SEG104	SEG105	SEG106	SEG107	SEG108	SEG109	SEG110	SEG111
	7	SEG112	SEG113	SEG114	SEG115	SEG116	SEG117	SEG118	SEG119	SEG120	SEG121	SEG122	SEG123	SEG124	SEG125	SEG126	SEG127
	8	SEG128	SEG129	SEG130	SEG131	SEG132	SEG133	SEG134	SEG135	SEG136	SEG137	SEG138	SEG139	SEG140	SEG141	SEG142	SEG143
	9	SEG144	SEG145	SEG146	SEG147	SEG148	SEG149	SEG150	SEG151	SEG152	SEG153	SEG154	SEG155	SEG156	SEG157	SEG158	SEG159
	A	SEG160	SEG161	SEG162	SEG163	SEG164	SEG165	SEG166	SEG167	SEG168	SEG169	SEG170	SEG171	SEG172	SEG173	SEG174	SEG175
	B	SEG176	SEG177	SEG178	SEG179	SEG180	SEG181	SEG182	SEG183	SEG184	SEG185	SEG186	SEG187	SEG188	SEG189	SEG190	SEG191
	C	SEG192	SEG193	SEG194	SEG195	SEG196	SEG197	SEG198	SEG199	SEG200	SEG201	SEG202	SEG203	SEG204	SEG205	SEG206	SEG207
	D	SEG208	SEG209	SEG210	SEG211	SEG212	SEG213	SEG214	SEG215	SEG216	SEG217	SEG218	SEG219	SEG220	SEG221	SEG222	SEG223
	E	SEG224	SEG225	SEG226	SEG227	SEG228	SEG229	SEG230	SEG231	SEG232	SEG233	SEG234	SEG235	SEG236	SEG237	SEG238	SEG239
	F	SEG240	SEG241	SEG242	SEG243	SEG244	SEG245	SEG246	SEG247	SEG248	SEG249	SEG250	SEG251	SEG252	SEG253	SEG254	SEG255

Relationship between ICON RAM Addresses, Data and Segment Pin Location Bit Map.

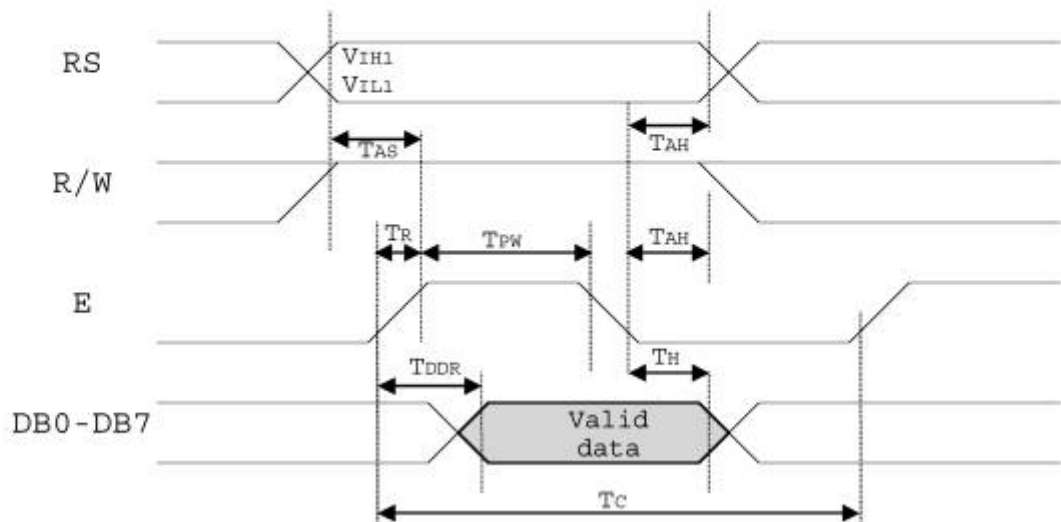
TIMING CHARACTERISTICS

8-Bit Parallel Mode

Writing data from MPU to ST7920



Reading data from ST7920 to MPU

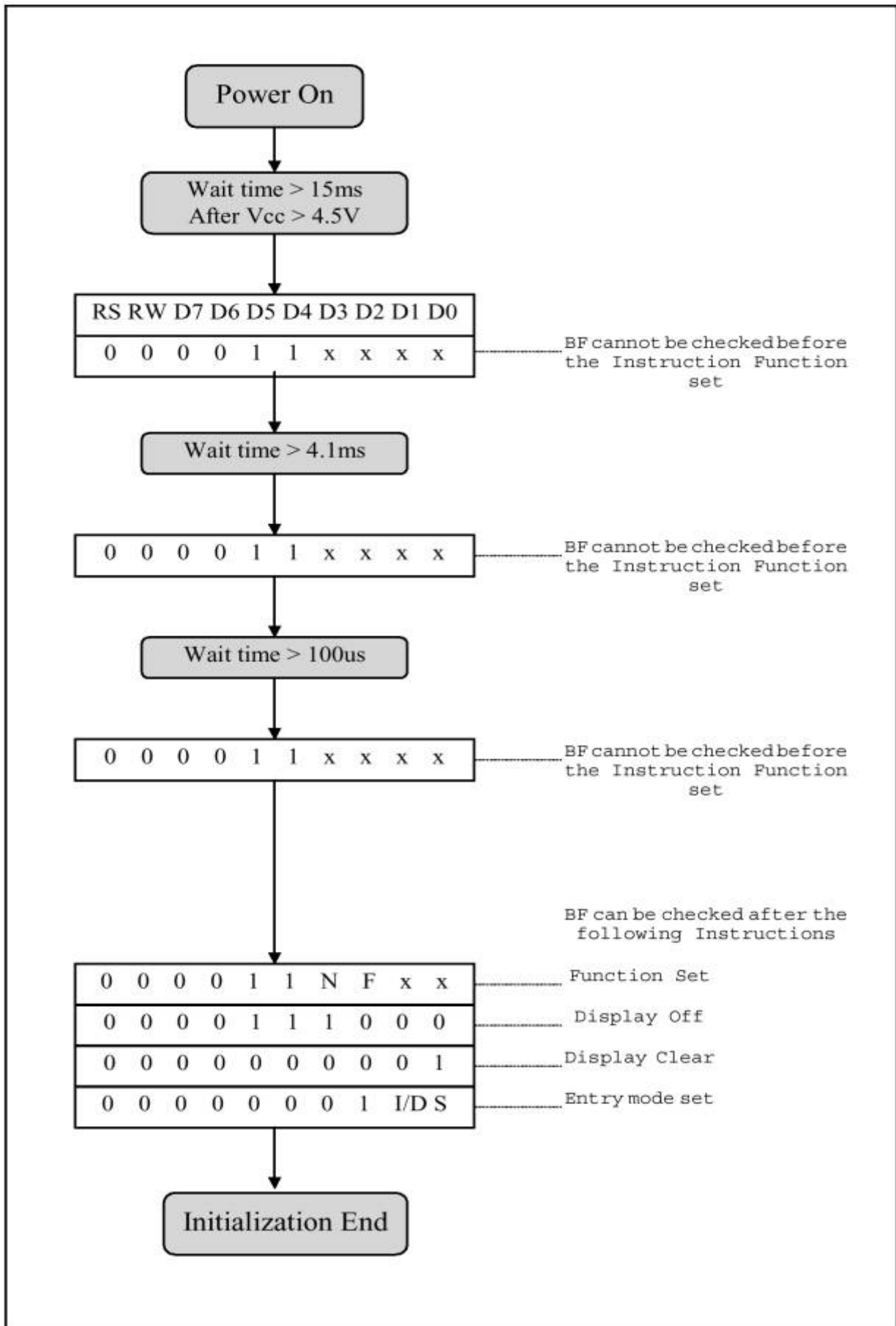


TIMING CHARACTERISTICS (CONT.)

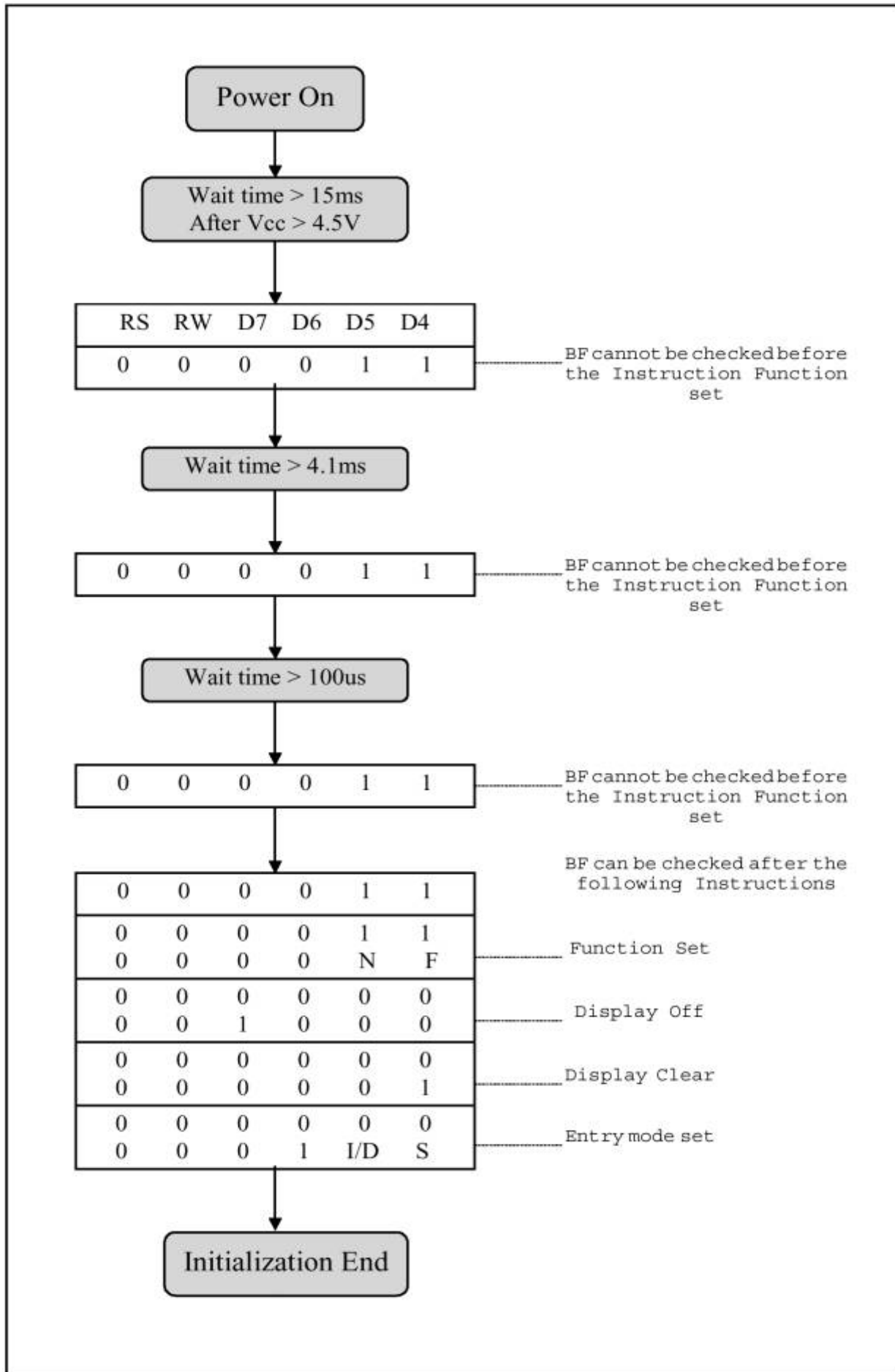
<i>Write Mode (Writing data from MPU to ST7920)</i>						
T_C	Enable Cycle Time	Pin E	1800	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	160	-	-	ns
T_R, T_F	Enable Rise/Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS,RW,E	10	-	-	ns
T_{AH}	Address Hold Time	Pins: RS,RW,E	20	-	-	ns
T_{DSW}	Data Setup Time	Pins: DB0 - DB7	40	-	-	ns
T_H	Data Hold Time	Pins: DB0 - DB7	20	-	-	ns
<i>Read Mode (Reading Data from ST7920 to MPU)</i>						
T_C	Enable Cycle Time	Pin E	1800	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	320	-	-	ns
T_R, T_F	Enable Rise/Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS,RW,E	10	-	-	ns
T_{AH}	Address Hold Time	Pins: RS,RW,E	20	-	-	ns
T_{DDR}	Data Setup Time	Pins: DB0 - DB7	-	-	260	ns
T_H	Data Hold Time	Pins: DB0 - DB7	20	-	-	ns

INITIALIZATION

8-Bit Interface



4-Bit Interface



ELECTRO-OPTICAL CHARACTERISTICS

MEASURING CONDITION: POWER SUPPLY = $V_{OP} / 64 \text{ Hz}$
 TEMPERATURE = $22 \pm 5 \text{ }^\circ\text{C}$
 RELATIVE HUMIDITY = $60 \pm 15 \%$

ITEM	SYMBOL	UNIT	TYP. TN	TYP. STN
RESPONSE TIME	T_{on}	ms	100	200
	T_{off}	ms	80	200
CONTRAST RATIO	Cr	-	10	10
VIEWING ANGLE (6 O'clock) (Cr \geq 2)	V3:00	$^\circ$	20	20
	V6:00	$^\circ$	20	40
	V9:00	$^\circ$	20	20
	V12:00	$^\circ$	10	10

THE ELECTRO-OPTICAL CHARACTERISTICS ARE MEASURED VALUE BUT NOT GUARANTEED ONES.

RELIABILITY OF LCD MODULE

ITEM	TEST CONDITION FOR NORMAL TEMPERATURE	TEST CONDITION FOR WIDE TEMPERATURE	TIME
High temperature operating	50 $^\circ\text{C}$	70 $^\circ\text{C}$	240 hours
Low temperature operating	0 $^\circ\text{C}$	-20 $^\circ\text{C}$	240 hours
High temperature storage	60 $^\circ\text{C}$	80 $^\circ\text{C}$	240 hours
Low temperature storage	-10 $^\circ\text{C}$	-30 $^\circ\text{C}$	240 hours
Temperature-humidity storage	40 $^\circ\text{C}$ 90% R.H.	60 $^\circ\text{C}$ 90% R.H.	96 hours
Temperature cycling	-10 $^\circ\text{C}$ to 60 $^\circ\text{C}$ 30 Min Dwell	-30 $^\circ\text{C}$ to 80 $^\circ\text{C}$ 30 Min Dwell	5 cycles

QUALITY STANDARD OF LCD MODULE

1.0	Sampling Method		
	Sampling Plan : MIL STD 105 E Class of AQL : Level II/Single Sampling Critical : 0.25% Major 0.65% Minor 1.5%		
2.0	Defect Group	Failure Category	Failure Reasons
	Critical Defect 0.25%(AQL)	Malfunction	Open Short Burnt of dead component Missing part/improper part P.C.B. Broken
	Major Defect 0.65%(AQL)	Poor Insulation	Potential short High current Component damage or scratched or Lying too close improper coating
		Poor Conduction	Damage joint Wrong polarity Wrong spec. part Uneven/intermittent contact Loose part Copper peeling Rust or corrosion or dirt's
Minor Defect 1.5%(AQL)	Cosmetic Defect	Minor scratch Flux residue Thin solder Poor plating Poor marking Crack solder Poor bending Poor packing Wrong size	

HANDLING PRECAUTIONS

(1) CAUTION OF LCD HANDLING & CLEANING

Use soft cloth with solvent (recommended below) to clean the display surface and wipe lightly.
- Isopropyl alcohol, ethyl alcohol, trichlorotrifluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface. Do not use the following solvent;
-water, ketone, aromatics

(2) CAUTION AGAINST STATIC CHARGE

The LCD modules use CMOS LSI drivers, so customers are recommended that any unused input terminal would be connected to V_{DD} or V_{SS} , do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

(3) PACKAGING

Avoid intense shock and falls from a height and do not operate or store them exposed direct to sunshine or high temperature/humidity.

(4) CAUTION FOR OPERATION

It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life. The use of direct current drive should be avoided because an electrochemical reaction due to direct current causes LCD's undesirable deterioration.

Response time will be extremely delayed at low temperature, and LCD's show dark color at high temperature. However those phenomena do not mean malfunction or out of order with LCD's.

Some font will be abnormally displayed when the display area is pushed hard during operation. But it resumes normal condition after turning off once.

(5) SAFETY

For crash damaged or unnecessary LCD's, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol and should be burned up later.

When any liquid leaked out of a damaged glass cell comes in contact with your hands, wash it off with soap and water.

WARRANTY

CLOVER will replace or repair any of her LCD module in accordance with her LCD specification for a period of one year from date of shipment. The warranty liability of Clover is limited to repair and/or replacement. Clover will not be responsible for any subsequent or consequential event.