CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model: CV14412A - _ _ - _ _ - _ _ - _

Revision	01
Engineering	Timmy Kwan
Date	13 December 2009
Our Reference	X4952

ADDRESS : 1st FLOOR, EFFICIENCY HOUSE, 35 TAI YAU STREET, SAN PO KONG, KOWLOON, HONG KONG.

TEL : (852) 2341 3238 (SALES OFFICE) (852) 2342 8228 (GENERAL OFFICE)

FAX : (852) 2357 4237 (SALES OFFICE)

E-MAIL : cdl@cloverdisplay.com

URL : http://www.cloverdisplay.com

MODE OF DISPLAY

Display mode	**Display condition**	**Viewing direction**
STN : ☐ Yellow green	☐ Reflective type	☐ 6 O' clock
☐ Grey	☐ Transflective type	☐ 12 O' clock
☐ Blue (negative)	☐ Transmissive type	☐ 3 O' clock
☐ FSTN positive	☐ Others	☐ 9 O' clock
☐ FSTN negative		

LCD MODULE NUMBER NOTATION:

CV14412A- 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 : 144 X 12 dots, graphic COB LCD module

Fonts type built in : Chinese Traditional & Simplified, English, Europeans Eastern & Western, Japanese, Korean, Latin, Greek, Arabic & Symbol

Interface : 4 bits parallel

Driving method : 1/24 duty, 1/5 bias

Driver IC : CHIPMAST ET7010 or equivalent
For the detailed information, please refer to the IC specifications.

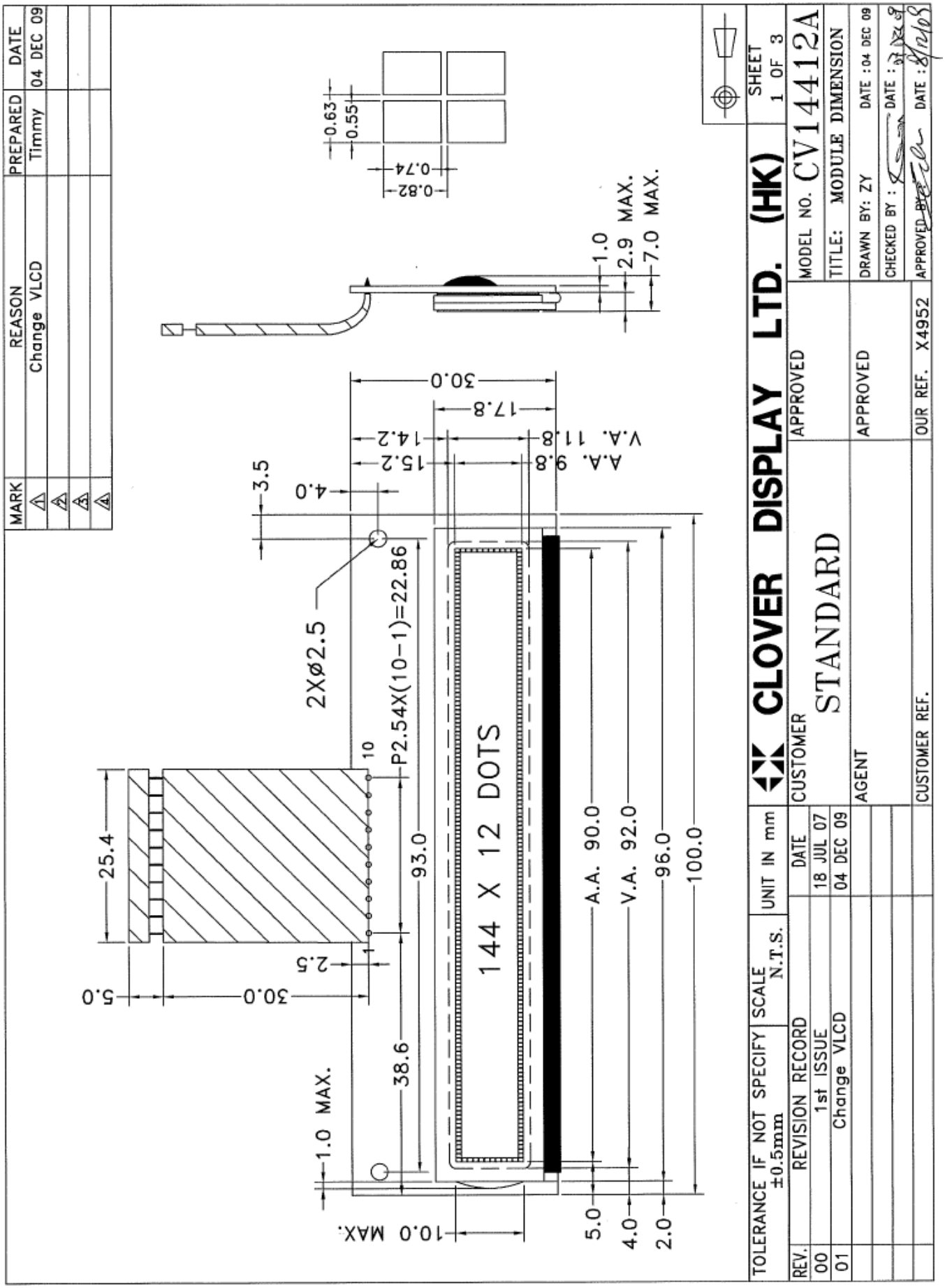
MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension	100.0(L) X 30.0(W) X 7.0MAX.(H)	mm	Viewing Area	92.0 (L)x11.8 (W)	mm
Dot Pitch	0.63 (L)x0.82(W)	mm	Dot Size	0.55(L)x0.74(W)	mm

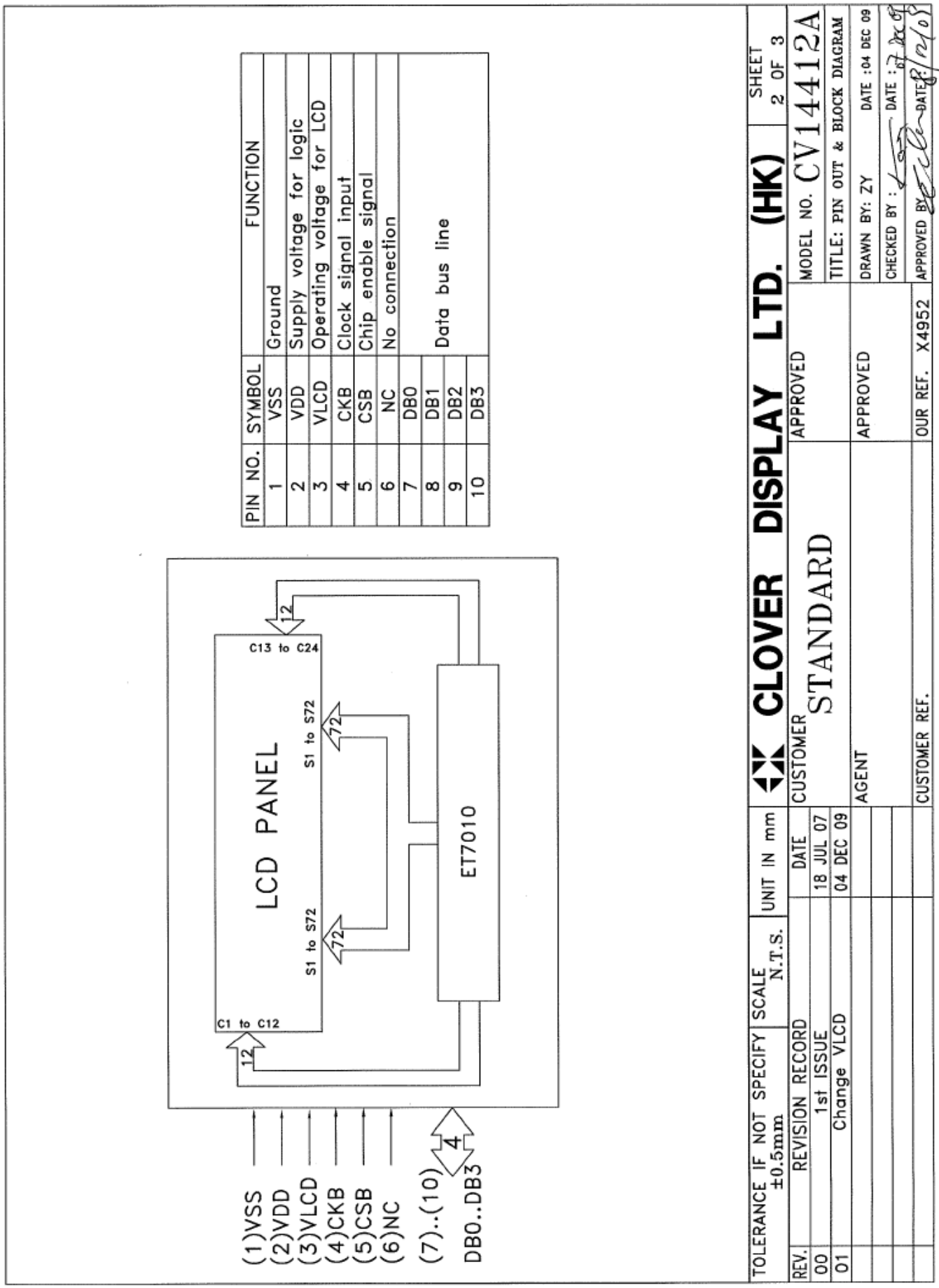
CONNECTOR PIN ASSIGNMENT

PIN NO.	SYMBOL	FUNCTION
1	VSS	Ground
2	VDD	Supply voltage for logic
3	VLCD	Operating voltage for LCD
4	CKB	Clock signal input
5	CSB	Chip enable signal
6	NC	No connection
7	DB0	Data bus line
8	DB1	
9	DB2	
10	DB3	

COUNTER DRAWING OF MODULE DIMENSION



COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, Ta=25℃

Item	Symbol	MIN.	TYP.	MAX.	Unit	Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	4.75	5.0	5.25	V	"H"Level Input Voltage	VIH	0.8VDD	—	VDD	V
Supply Current for Logic	IDD	—	60	90	μA	"L"Level Input Voltage	VIL	VSS	—	0.2VDD	V
Operating voltage for LCD (*)	VLCD	4.7	6.0	6.3	V	—	—	—	—	—	—

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

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 range	V_{DD}	-0.3 to 7.0	-0.3 to 7.0	V
	V_{LCD}	-0.3 to 8.0	-0.3 to 8.0	V
Input voltage range	V_{IN}	-0.3 to VDD+0.3	-0.3 to VDD+0.3	V
Operating Temperature	Topr	0 to 50	-20 to 70	℃
Storage Temperature	Tstg	-10 to 60	-30 to 80	℃

COMMANDS TABLE

1-byte CMD

Name	CMD code										Function
	R/W	Hex	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	
Continue	W	00H	0	0	0	0	0	0	0	0	Continue to access the DDRAM or CGROM data
Reset	W	01H	0	0	0	0	0	0	0	1	Device reset; **the device will ready after 4 system clocks.**
Write++	W	20H	0	0	1	0	0	0	0	0	Writing data to memory then auto increment address
Read++	W	21H	0	0	1	0	0	0	0	1	Reading data from memory then auto increment address
RDTWR++	W	22H	0	0	1	0	0	0	1	0	The first Reading data from memory, second writing to memory then auto increment address
WRTRD++	W	23H	0	0	1	0	0	0	1	1	The first writing data to memory, second reading from memory then auto increment address
LPage	W	1xH	0	0	0	1	P3	P2	P1	P0	DDRAM page address setting
LColumn	W		1	A6	A5	A4	A3	A2	A1	A0	DDRAM column address setting

2-byte CMD

Name	CMD code																		PWR initial	Function
	R/W	Hex	First byte								Second byte									
			b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0		
SYS0	W	30H	0	0	1	1	0	0	0	0	-	-	-	-	-	LRM	UDM		---- -xxx	System control register0
SYS1	W	31H	0	0	1	1	0	0	0	1	-	-	-	-	CA	-	DT[1:0]		---- 0-xx	System control register1
SYS2	W	32H	0	0	1	1	0	0	1	0	M[1:0]		-	BO	-	-	-	-	00-0 ----	System control register2
STARTL	W	33H	0	0	1	1	0	0	1	1	-	-	St5	St4	St3	St2	St1	St0	--00 0000	LCD scan starting line
Frame	W	34H	0	0	1	1	0	1	0	0	Fr[7:0]								1111 1111	Frame rate counter
CLine	R	3DH	0	0	1	1	1	1	0	1	RD	-	L5	L4	L3	L2	L1	L0	---- ----	Current-line

3-byte CMD

Name	CMD code																								Function
	R/W	First byte								Second byte								Third byte								
		b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	
MAddress	W	0	1	-	-	A_{19}	A_{18}	A_{17}	A_{16}	A_{15}	A_{14}	A_{13}	A_{12}	A_{11}	A_{10}	A_9	A_8	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0	Setting CGROM memory started address

System Control Register0 (30H)

Name	CMD code														PWR initial	Function
	R/W	First byte								Second byte							
		b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	b_7	b_6	b_5	b_4	b_3	b_2	b_1 b_0	
SYS0	W	0	0	1	1	0	0	0	0	-	-	-	-	-	LRM	UDM	---- -xxx	System control register0

UDM: Common mirror select

0: Normal

1: Common mirror (Common will scroll to 0 if Cn+# > 63)

Duty	Common						
16	Cn	Cn+1	Cn+2	-----	Cn+13	Cn+14	Cn+15
	Cn+15	Cn+14	Cn+13	-----	Cn+2	Cn+1	Cn
24	Cn	Cn+1	Cn+2	-----	Cn+21	Cn+22	Cn+23
	Cn+23	Cn+22	Cn+21	-----	Cn+2	Cn+1	Cn
32	Cn	Cn+1	Cn+2	-----	Cn+29	Cn+30	Cn+31
	Cn+31	Cn+30	Cn+29	-----	Cn+2	Cn+1	Cn
48	Cn	Cn+1	Cn+2	-----	Cn+45	Cn+46	Cn+47
	Cn+47	Cn+46	Cn+45	-----	Cn+2	Cn+1	Cn
64	Cn	Cn+1	Cn+2	-----	Cn+61	Cn+62	Cn+63
	Cn+63	Cn+62	Cn+61	-----	Cn+2	Cn+1	Cn

2: Data mirror (mirror every 8 common, n=0~56)

Duty	Common							
16/24/32	Cn	Cn+1	Cn+2	Cn+3	Cn+4	Cn+5	Cn+6	Cn+7
48/64	Cn+7	Cn+6	Cn+5	Cn+4	Cn+3	Cn+2	Cn+1	Cn

3: Reserved

LRM: This option ***inverts*** relation of assignment between Display data RAM ***column*** address and segment outputs.

0: Normal

1: Segment mirror

Duty	SEG0	SEG1	SEG2	---	SEG62	SEG63	---	SEG70	SEG71	---	SEG78	SEG79
16	SEG79	SEG78	SEG77	---	SEG17	SEG16	---	SEG9	SEG8	---	SEG1	SEG0
24	SEG71	SEG70	SEG69	---	SEG9	SEG8	---	SEG1	SEG0	x	x	x
32	SEG63	SEG62	SEG61	---	SEG1	SEG0	x	x	x	x	x	x

System Control Register1 (31H)

Name	R/W	CMD code																PWR initial	Function
		First byte								Second byte									
		b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0		
SYS1	W	0	0	1	1	0	0	0	1	-	-	-	-	CA	-	DT[1:0]		---- 0-xx	System control register1

CA & DT[1:0]: Duty select (include cascading)

CA	DT[1:0]	Duty	SEGxCOM
0	00	1/16	80x16
0	01	1/24	72x24
0	10	1/32	64x32
1	00	1/32	160x32
1	01	1/48	144x48
1	10	1/64	128x64

Ps. DT[1:0]=11 is reserved.

System Control Register2 (32H)

Name	R/W	CMD code																PWR initial	Function
		First byte								Second byte									
		b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0		
SYS2	W	0	0	1	1	0	0	1	0	M[1:0]		-	BO	-	-	-	-	00-0 ----	System control register2

BO: LCD ON/OFF

0: OFF 1: ON

Oscillator table M[1:0] :

M1	M0	Oscillating method
0	0	Disable
0	1	External R & Built-in C (35KHz)
1	0	Crystal 32768Hz
1	1	Reserved

LCD Scan starting line (33H)

Name	R/W	CMD code																PWR initial	Function
		First byte								Second byte									
		b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0		
StartL	W	0	0	1	1	0	0	1	1	-	-	St5	St4	St3	St2	St1	St0	--00 0000	LCD scan starting line

St[5:0]: This register is a pointer which determines the start line corresponding to COM0 for display of data in the Display Data RAM.

Frame rate Register (34H)

Name	R/W	CMD code																PWR initial	Function
		First byte								Second byte									
		b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0		
Frame	W	0	0	1	1	0	1	0	0	Fr[7:0]								1111 1111	Frame rate counter

Frame Rate= 32768/(Fr+1)/duty (duty depend on R1 bit3,1,0)

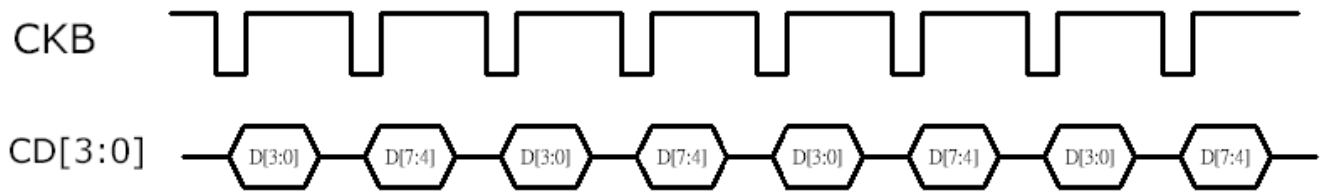
Current-line Register (3DH)

Name	R/W	CMD code																PWR initial	Function
		First byte								Second byte									
		b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0		
CLine	R	0	0	1	1	1	1	0	1	RD	-	L5	L4	L3	L2	L1	L0	---- ----	Current line

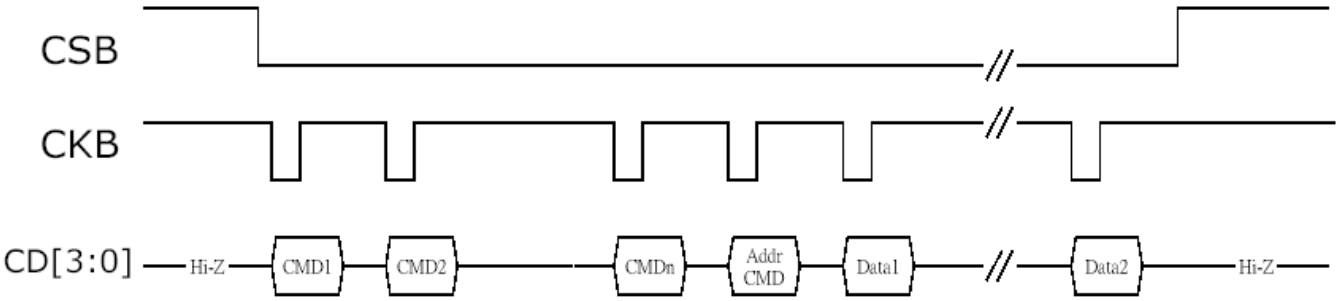
L[5:0]: This register is a pointer which line scan out now.

RD: Device Ready flag. 1: ready 0: not ready

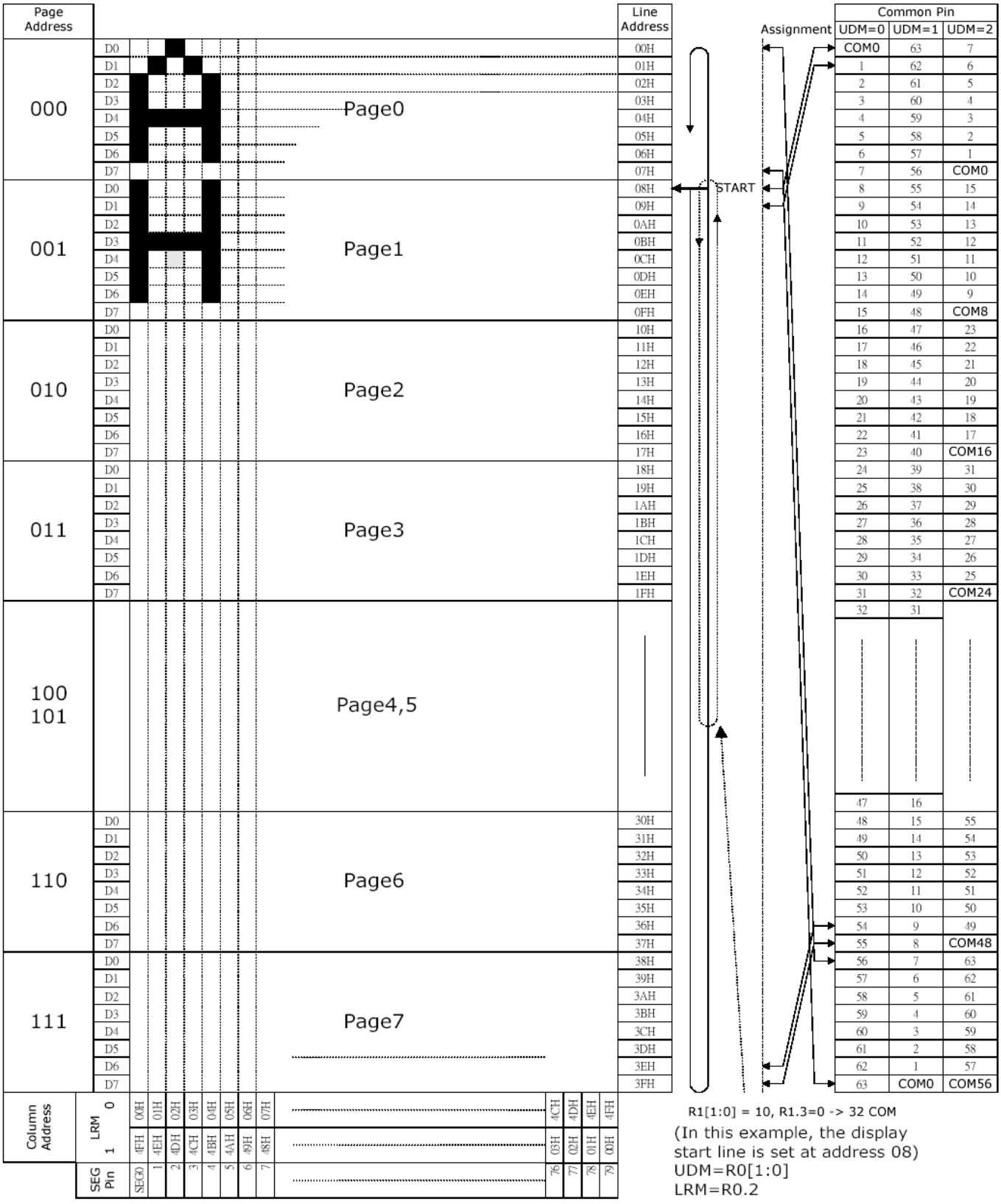
DATA SEQUENCE MODE



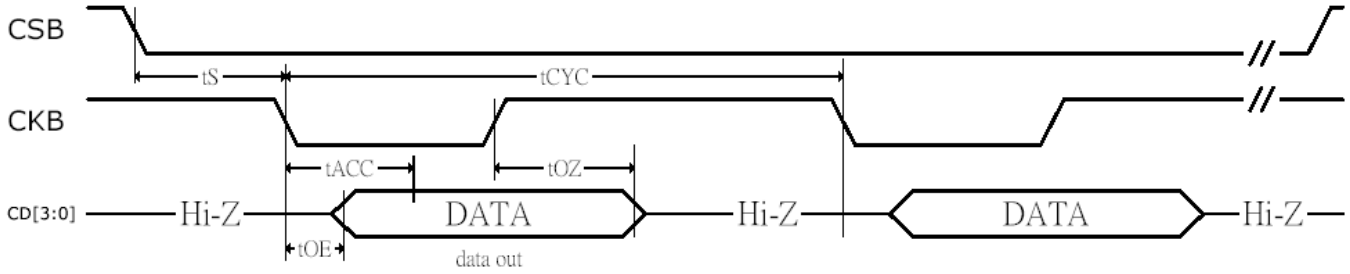
COMMAND WAVEFORM



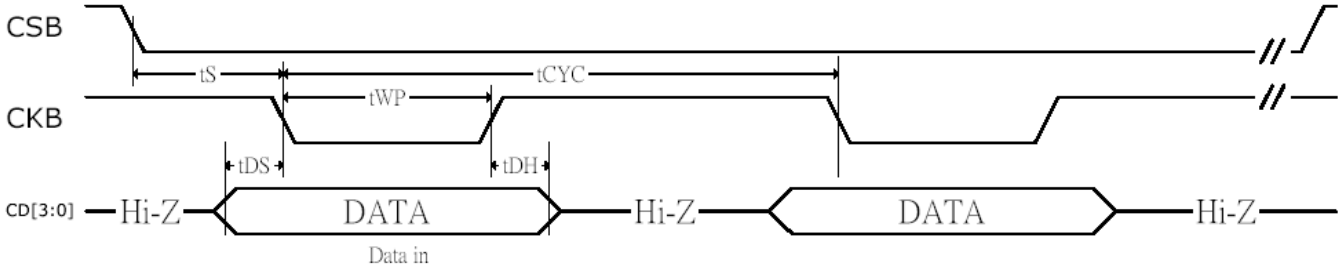
DISPLAY DATA RAM



READ MODE DIAGRAM



WRITE MODE DIAGRAM



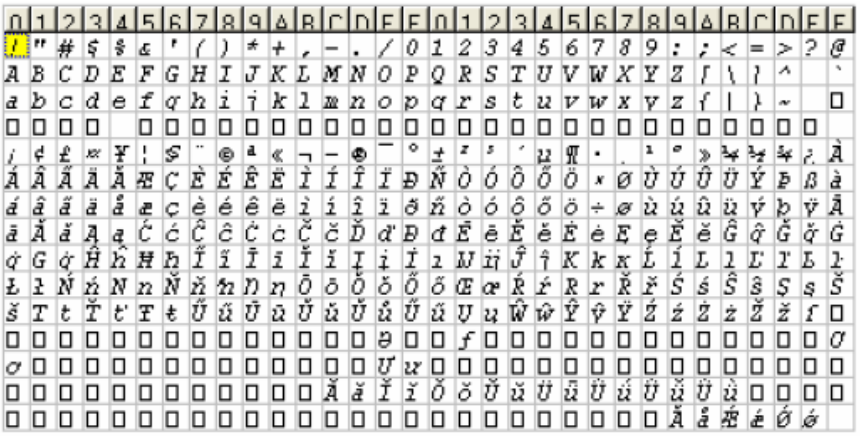
TIMING CHARACTERISTICS

Name	Content	Min.	Typ.	Max.	Units
tS	CKB setup time	0	-	-	ns
tOE	Output Enable time	0	-	250	ns
tACC	Data Access time	0	-	250	ns
tOZ	Data Disable time	0	-	250	ns
tWP	Write pulse width time	250	-	-	ns
tDH	Data Hold time	250	-	-	ns
tCYC	Read/Write cycles time	1	-	-	us
tE	The time between End of CSB and last Data	1	-	-	us
tBI	Byte to Byte interval	1	-	-	us

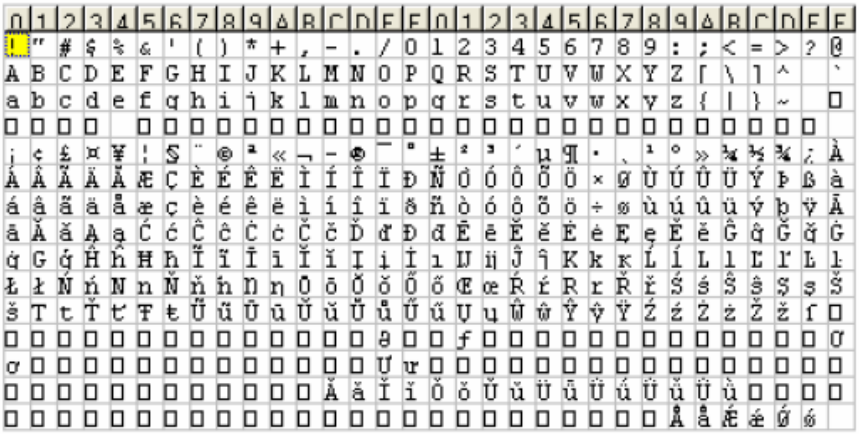
CHARACTER CODES AND CHARACTER PATTERN

GP3: Unicode 16(H) x 16(W) Font, contains English, Range FF01H ~ FFE6H.

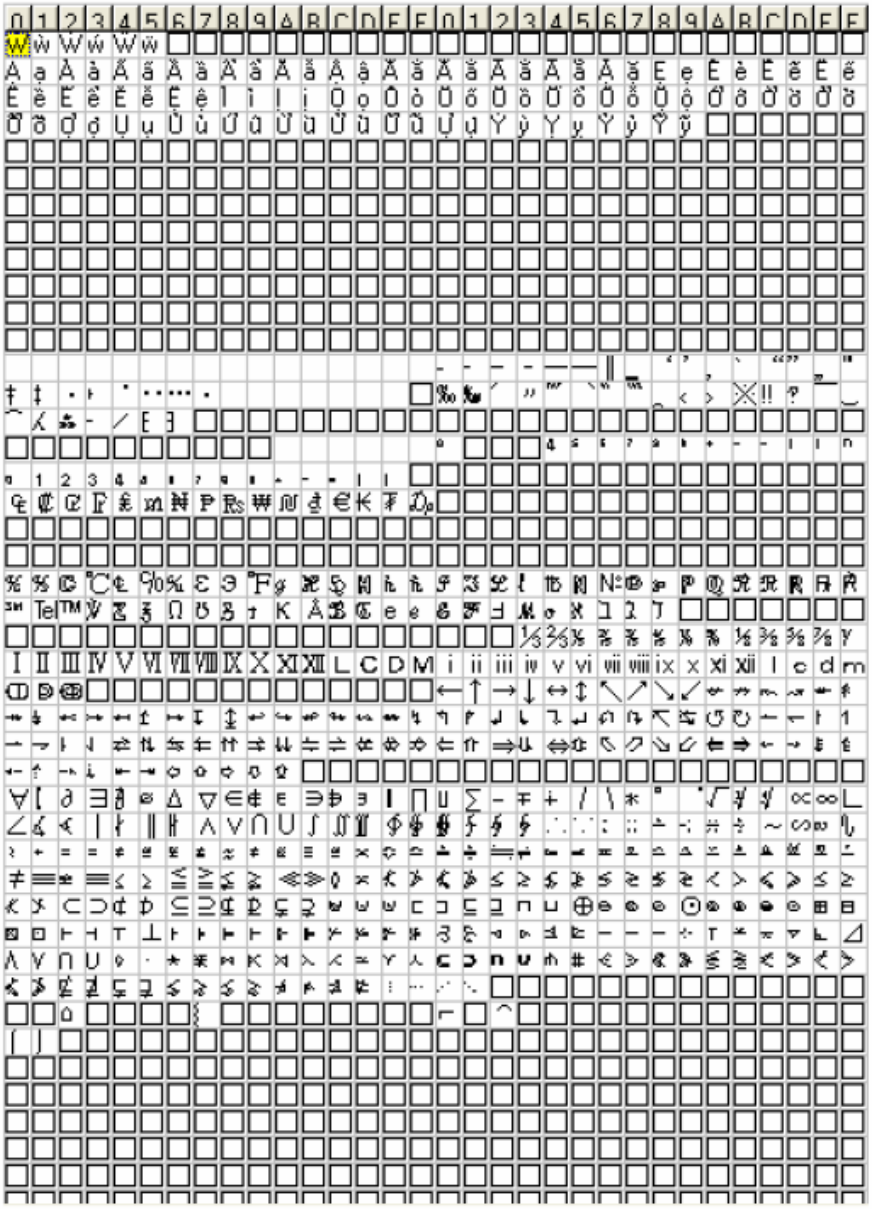
GP4: Unicode 12(H) x 12(W) ITALIC Font, contains English, Latin, Eastern/Western European Languages, Range 0020H ~ 01FFH.



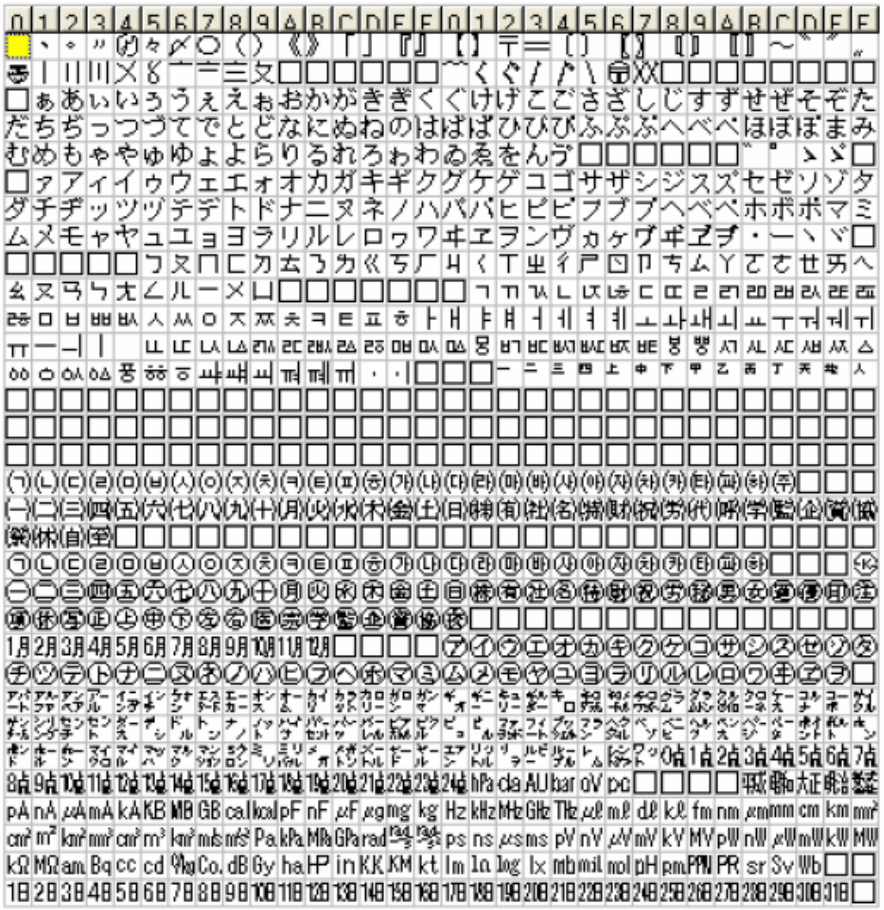
GP5: Unicode 12(H) x 12(W) Font, contains English, Latin, Eastern/Western European Languages, Greek, Slav, Arabic, Range 0020H ~ 11F9H.



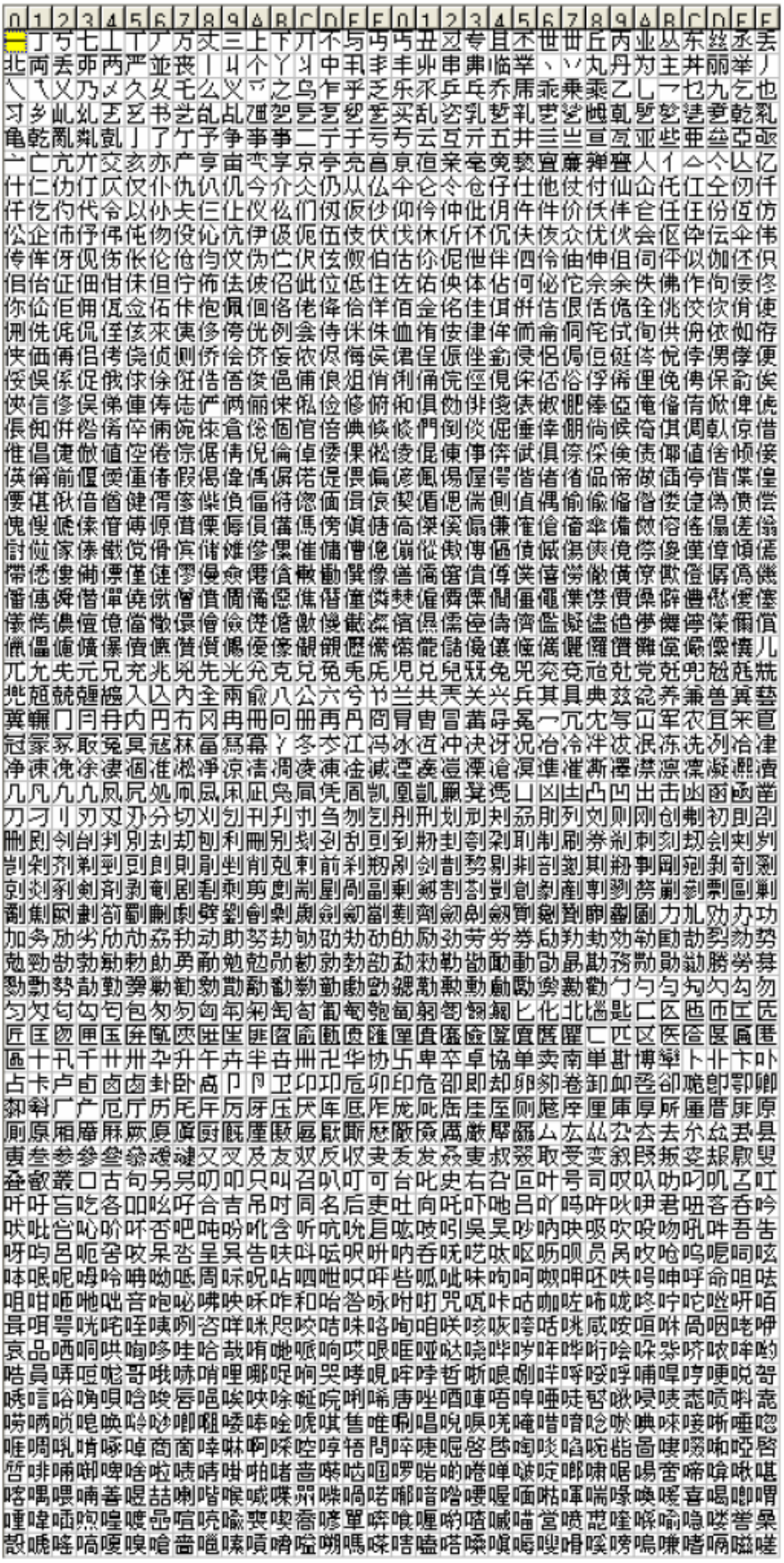
GP6: Unicode 12(H) x 12(W) Font, contains Latin, Symbol, …, Range 1E80H ~ 27BFH.



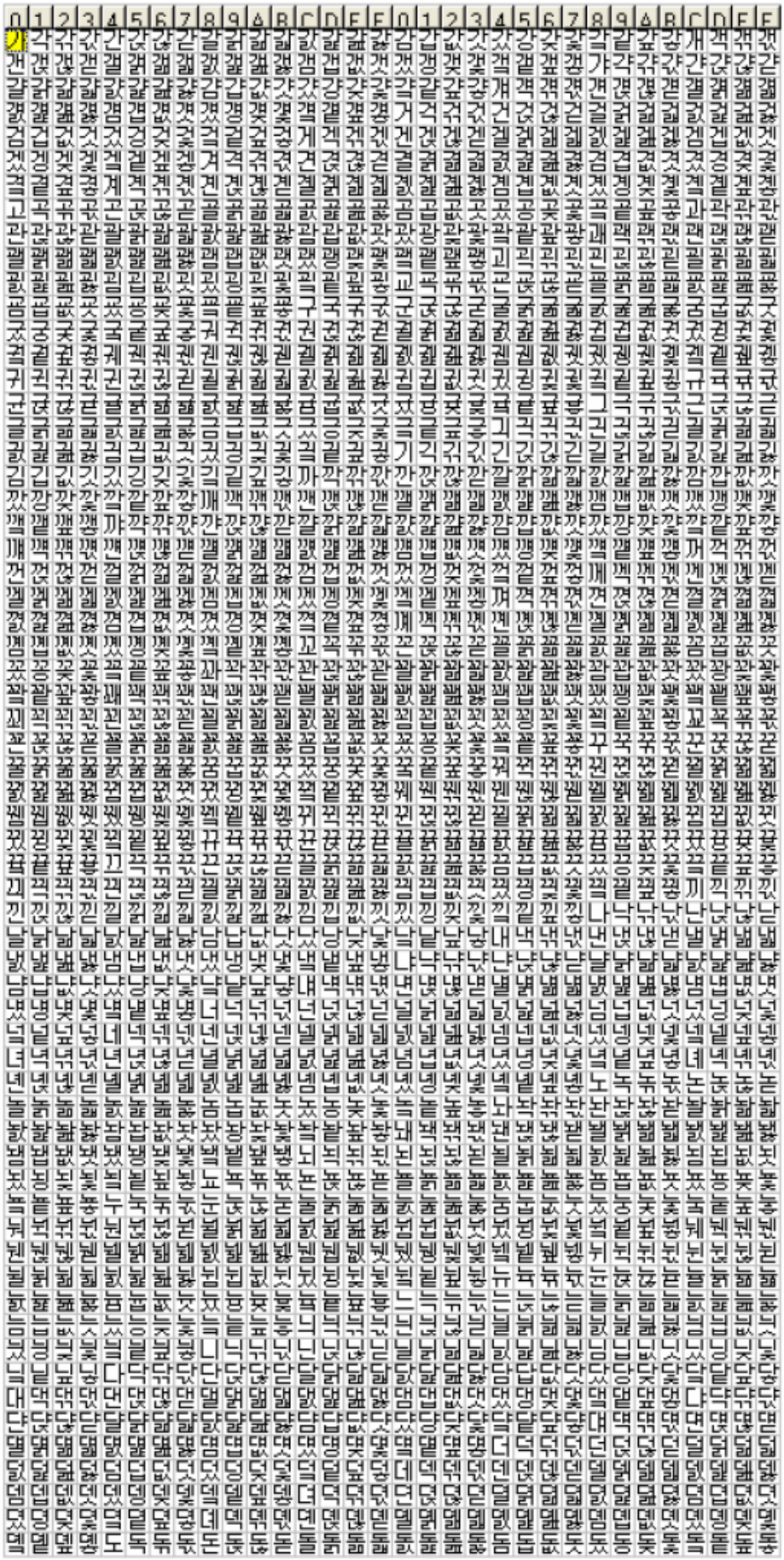
GP7: Unicode 12(H) x 12(W) Font, contains Symbol, Japanese, Chinese Phonetic Notation, …,
Range 3000H ~ 33FFH.



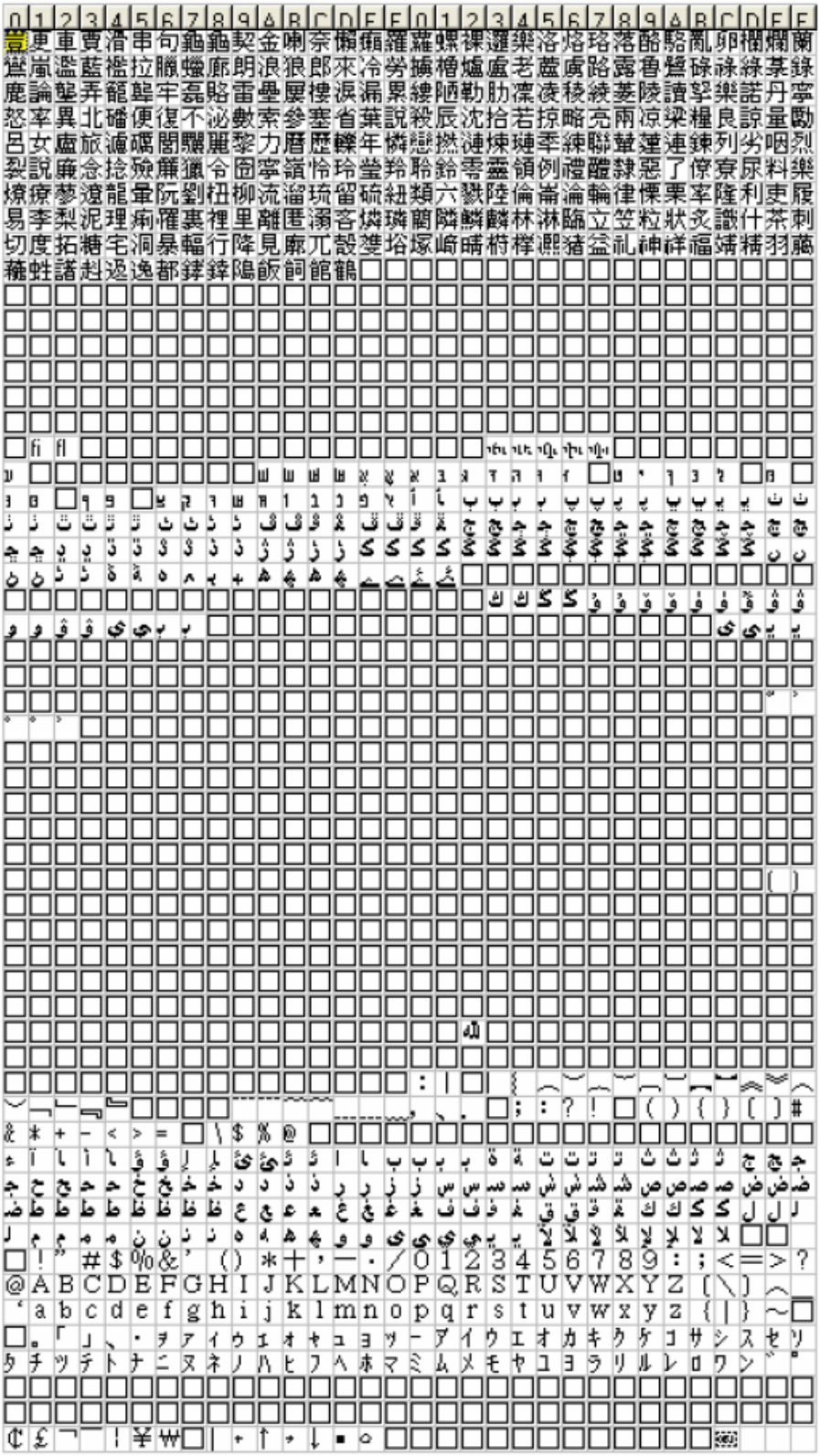
GP8: Unicode 12(H)x12(W) Font, contains Traditional/Simple Chinese, Range 4E00H ~ 9FA5H.



GP9: Unicode 12(H) x 12(W) Font, contains Korean, Range AC00H ~ D7A3H.



GP10: Unicode 12(H) x 12(W) Font, contains CJK, English, Symbol, …, Range F900H ~ FFFCH.



ELECTRO-OPTICAL CHARACTERISTICS

MEASURING CONDITION: POWER SUPPLY = V_{OP} / 64 Hz
TEMPERATURE = 23 ± 5 °C
RELATIVE HUMIDITY = 60 ± 20 %

ITEM	SYMBOL	UNIT	TYP. TN	TYP. STN
RESPONSE TIME	Ton	ms	140	170
	Toff	ms	180	220
CONTRAST RATIO	Cr	-	7	15
VIEWING ANGLE (Cr ≥ 2)	$V_{3:00}$	°	70	40
	$V_{6:00}$	°	43	70
	$V_{9:00}$	°	70	40
	$V_{12:00}$	°	3	50

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°C	70°C	240 hours
Low temperature operating	0°C	-20°C	240 hours
High temperature storage	60°C	80°C	240 hours
Low temperature storage	-10°C	-30°C	240 hours
Temperature-humidity storage	40°C 90% R.H.	60°C 90% R.H.	96 hours
Temperature cycling	-10°C to 60°C 30 Min Dwell	-30°C to 80°C 30 Min Dwell	5 cycle
Vibration Test at LCM Level	Freq 10-55 Hz Sweep rate: 10-55-10 at 1 min Sweep mode Linear Displacement: 2 mm p-p 1 Hour each for X, Y, Z	Freq 10-55 Hz Sweep rate: 10-55-10 at 1 min Sweep mode Linear Displacement: 2 mm p-p 1 Hour each for X, Y, Z	—

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 or 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

The polarizing plate on the surface of the panel is made from organic substances. Be very careful for chemicals not to touch the plate or it leads the polarizing plate to deteriorate.

If the use of a chemical is unavoidable, wipe the panel lightly with soft materials, such as gauze and absorbent cotton, soaked in a solvent.

*Usable solvent: Alcohol (ethanol, IPA and the like)
*Appropriate solvent: Ketones, ethyl alcohol

Avoid wiping with a dry cloth, since it could damage the surface of the polarizing plate and others.
Do not expose to direct sunlight or fluorescent light for a long time

(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) ESD PRECAUTION

Inputs and outputs are protected against electrostatic discharge in normal handling. However, to be totally safe, it is recommended to take normal precautions appropriate to handling LCM module. For example: product surface grounding.

Always take ESD precaution when handling the *LCD Module*. Components are exposed for direct finger touches and can be damaged unless ESD precaution is taken.

(4) PACKAGING

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

(5) CAUTION FOR OPERATION

The viewing angle can be adjusted by varying the LCD driving voltage VO.

Driving voltage should be kept within specified range, excess voltage shortens display life.

Response time increases with decrease in temperature.

Display may turn black or dark Blue at temperature above its operational range; this is however not destructive and the display will return to normal once the temperature falls back to range.

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.

Condensation at terminals will cause malfunction and possible electrochemical reaction. Relative humidity of the environment should therefore be kept below 60%.

(6) SAFETY

Liquid crystal may leak out of a damaged LCD, it is recommended to wash off the liquid crystal by using solvents such as acetone or ethanol and should be burned up later.

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

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.