

# **CLOVER DISPLAY LTD.**

## LCD MODULE SPECIFICATION

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

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

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## **MODE OF DISPLAY**

Display mode	Display	condition	Viewing direction
STN: Yellow green	☐ Refle	ective type	☐ 6 O' clock
☐ Grey	☐ Tran	sflective type	☐ 12 O' clock
☐ Blue (negative)	☐ Tran	smissive type	☐ 3 O' clock
☐ FSTN positive	Othe	ers	9 O' clock
☐ FSTN negative			
LCD MODULE NUMBER NOT	TATION:		
<u>CV14412A</u> - <u>MY</u> - <u>S</u> <u>F</u> - <u>N</u> <u>6</u>	<u>− T</u>	*(1)Model r	number of standard LCD Modules
		*(2)Backlig	ht type
$(1) \qquad (2) (3) (4) (5) (6) (7)$	7) (8)		N – No backlight
			E – EL backlight
			L – Side-lited LED backlight
			M– Array LED backlight
		*(2) D 11:	C – CCFL
		*(3)Backlig	
			N – No backlight
			A – Amber B – Blue
			O- Orange
			W–White
			Y – Yellow green
		*(4)Display	=
		(1) Display	T – TN
			V – TN (Negative)
			S – STN Yellow green
			G – STN Grey
			B – STN Blue (Negative)
			F - FSTN
			N – FSTN (Negative)
		*(5)Rear po	~ 1
			R – Reflective
			F – Transflective
			T – Transmissive
		*(6)Temper	
			N – Normal
		Ψ <i>(</i> Π) <b>Σ</b> 1	W– Extended
		*(7)Viewing	
			6 – 6 O'clock 2 – 12 O'clock
			2 – 12 O clock 3 – 3 O'clock
			9 – 9 O'clock
		*(8)Special	code for other requirements
			omitted if not used)
		(Can be	T – Touch panel (Analog)
			P – Touch panel (Digital)

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### **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**

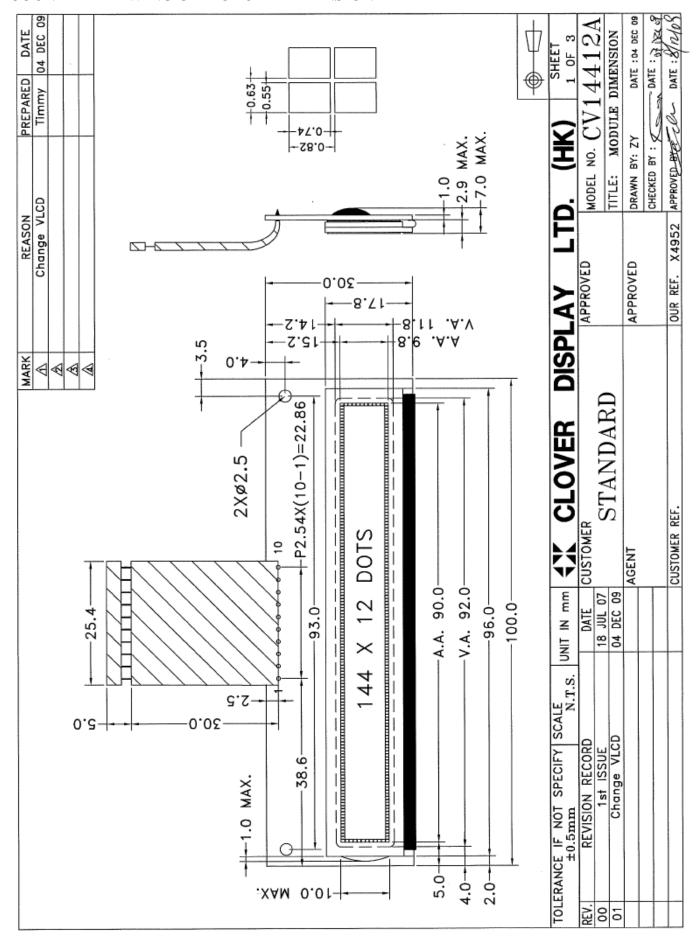
Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension	100.0(L) X 30.0(W) X 7.0MAX.(H)	mm	Viewing Area	92.0 (L)x11.8 (W)	mm
Dot Pitch	0.63 (L)x0.82(W)	mm	Dot Size	0.55(L)x0.74(W)	mm

## **CONNECTOR PIN ASSIGNMENT**

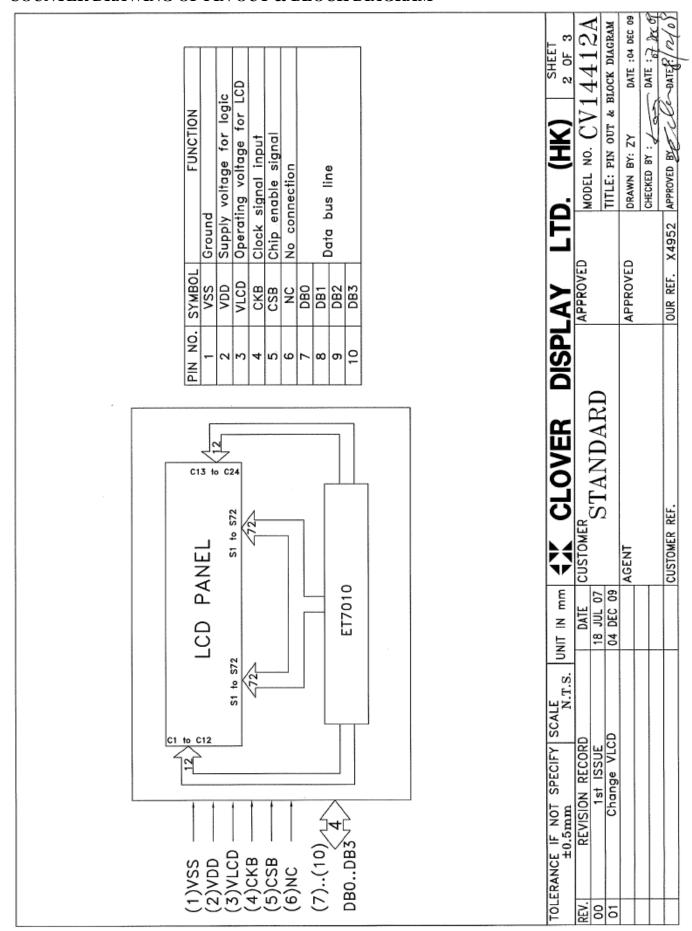
PIN NO.	SYMBOL	FUNCTION
1	VSS	Ground
2	VDD	Supply voltage for logic
3	VLCD	Operating voltage for LCD
4	CKB	Clock signal input
5	CSB	Chip enable signal
6	NC	No connection
7	DB0	
8	DB1	Data bus line
9	DB2	2 **** 0 ***
10	DB3	

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### COUNTER DRAWING OF MODULE DIMENSION



### COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



### **ELECTRICAL CHARACTERISTICS**

<b>ELECTRICAL CH</b>	ARAC	<b>TERIS</b>	STIC	S			Conditions: VSS=0V, Ta=25°C							
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	μΑ	"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	$V_{ m DD}$	-0.3 to 7.0	-0.3 to 7.0	V
Supply voltage range	$V_{LCD}$	-0.3 to 8.0	-0.3 to 8.0	V
Input voltage range	$V_{\rm IN}$	-0.3 to VDD+0.3	-0.3 to VDD+0.3	V
Operating Temperature	Topr	0 to 50	-20 to 70	$^{\circ}\!\mathbb{C}$
Storage Temperature	Tstg	-10 to 60	-30 to 80	$^{\circ}\!\mathbb{C}$

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## 1-byte CMD

Mana			(	CMD	) co	de					Function
Name	R/W	Hex	b <sub>7</sub>	b <sub>6</sub>	$b_5$	$b_4$	$b_3$	$b_2$	$b_1$	bo	runction
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	1	0	The first Reading data from memory, second writing to memory then auto
KUIWKTT	vv	2211	0	۰	1	0	U	U	1	۰	increment address
WRTRD++	w	23H	0	0	1	0	0	0	,	١,	The first writing data to memory, second reading from memory then auto
WKIKD++	vv	2311	U	U	1	U	U	U	1	1	increment address
LPage	W	1xH	0	0	0	1	РЗ	P2	Р1	P0	DDRAM page address setting
LColumn	W		1	Α6	Α5	Α4	АЗ	Α2	Α1	Α0	DDRAM column address setting

## 2-byte CMD

									СМ	Dο	ode									
Name	D /144				Fi	irst	by	te					S	econ	d by	te			PWR initial	Function
	R/W	Hex	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	b <sub>3</sub>	$b_2$	b <sub>1</sub>	b <sub>0</sub>	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	b <sub>0</sub>		
SYS0	W	30H	0	0	1	1	0	0	0	0	-	-	-	-	-	LRM	UE	MC	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	[0:1	-	во	-	-	-	-	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	7:0]				1111 1111	Frame rate counter
CLine	R	3DH	0	0	1	1	1	1	0	1	RD	-	L5	L4	L3	L2	L1	LO		Current-line

## 3-byte CMD

	CMD code  Name . First byte Second byte Third byte															Eupation										
Name	R/W			Fi	rst	by	te			Second byte										Th	ird	by	te			Function
	K/ W	b <sub>7</sub> b <sub>6</sub> b <sub>5</sub> b <sub>4</sub> b <sub>3</sub> b <sub>2</sub> b <sub>1</sub>									b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	Ьз	b <sub>2</sub>	b <sub>1</sub>	bo	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b4	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	b <sub>0</sub>	Setting CGROM memory started address
MAddress	W	0	1	-	-	A19	A <sub>18</sub>	A <sub>17</sub>	A16	A <sub>15</sub>	A <sub>14</sub>	A <sub>13</sub>	A <sub>12</sub>	A <sub>11</sub>	A10	A <sub>9</sub>	A <sub>8</sub>	A <sub>7</sub>	Α <sub>6</sub>	A <sub>5</sub>	Α4	А3	A <sub>2</sub>	A <sub>1</sub>	Α0	Setting COKOM memory started address

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System Control Register (30H)

Г			CMD code First byte Second byte																	
	Name	D /W			Fi	irst	by	te					S	econ	d by	te			PWR initial	Function
		K/W	b <sub>7</sub> b <sub>6</sub> b <sub>5</sub> b <sub>4</sub> b <sub>3</sub> b <sub>2</sub> b <sub>1</sub> b									b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	b <sub>0</sub>		
	SYS0	W	W 0 0 1 1 0 0 0							0	1	-	ı	ı	ı	LRM	UE	M	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				Com	mon			
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: Seament 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	Х	Х	Х
32	SEG63	SEG62	SEG61	 SEG1	SEG0	Х	Х	Х	Х	Х	Х

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## **CLOVER DISPLAY LTD.**

System Control Register1 (31H)

						_	_			_									
									CM	1D co	ode								
Name	D /W			Fi	irst	by	te					S	econ	d by	te			PWR initial	Function
	R/W	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	b <sub>0</sub>	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	b₃	b <sub>2</sub>	b <sub>1</sub>	b₀		
SYS1	W	0	0	1	1	0	0	0	1	1	1	1	-	CA	1	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 Register 2 (32H)

									CM	ID co	ode								
Name	D /W/			Fi	rst	by	te					S	econ	d by	te			PWR initial	Function
	R/W	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	b <sub>0</sub>	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	b₃	b <sub>2</sub>	b <sub>1</sub>	b₀		
SYS2	W	0	0	1	1	0	0	1	0	M[1	:0]	ı	во	ı	1	ı	-	00-0	System control register2

BO: LCD ON/OFF

0: OFF 1: ON

Oscillator table M[1:0]:

M1	МО	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)

									C٢	1D co	ode								
Name	D/W			Fi	irst	by	te					S	econ	d by	te			PWR initial	Function
	R/W	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	$b_0$	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	b <sub>o</sub>		
StartL	W	0	0	1	1	0	0	1	1	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 COMO for display of data in the Display Data RAM.

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## **CLOVER DISPLAY LTD.**

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## Frame rate Register (34H)

I	·									CM	1D cc	de								
ı	Name	D /W			First byte 6 b <sub>5</sub> b <sub>4</sub> b <sub>3</sub> b <sub>2</sub> b <sub>1</sub> b <sub>0</sub>								S	econ	d by	te			PWR initial	Function
ı	IR/W H	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	$b_3$	$b_2$	b <sub>1</sub>	$b_{0} \\$	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b₄	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	b <sub>0</sub>			
I	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)

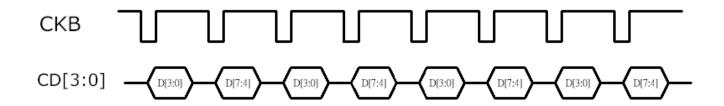
## **Current-line Register (3DH)**

									C٢	1D cc	ode								
Name	D //W	Fi	rst	byt	te					S	econ	d by	te			PWR initial	Function		
	R/W	$b_7$	b <sub>6</sub>	$b_5$	b₄	$b_3$	$b_2$	b <sub>1</sub>	$b_0$	b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b₄	b <sub>3</sub>	b <sub>2</sub>	$b_1$	b <sub>o</sub>		
CLine	R	0	0	1	1	1	1	0	1	RD	-	L5	L4	L3	L2	L1	LO		Current line

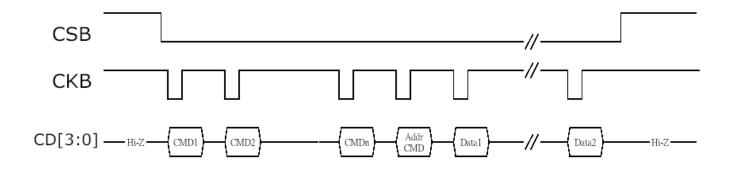
L[5:0]: This register is a pointer which line scan out now.

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

## DATA SEQUENCE MODE

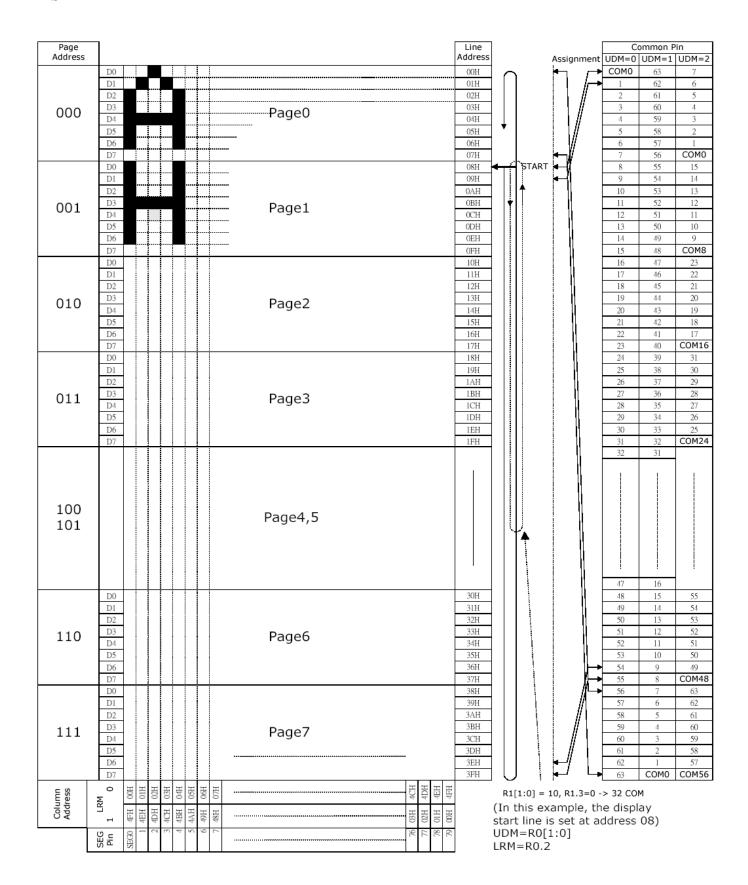


### **COMMAND WAVEFORM**



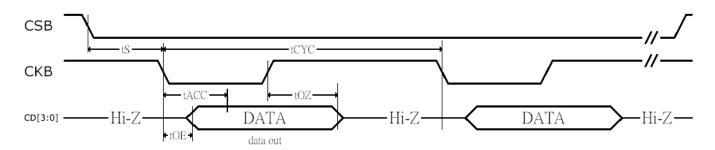
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#### **DISPLAY DATA RAM**

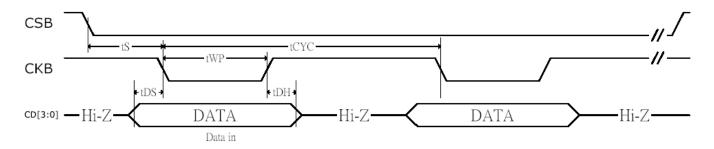


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## **READ MODE DIAGRAM**



## WRITE MODE DIAGRAM



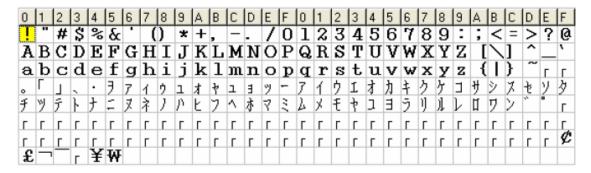
## TIMING CHARACTERISTICS

Name	Content	Min.	Тур.	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	ı	250	ns
tWP	Write pulse width time	250	ı	-	ns
tDH	Data Hold time	250	ı	-	ns
tCYC	Read/Write cycles time	1	1	-	us
tE	The time between End of CSB and	1	-	-	us
ιΕ	last Data				
tBI	Byte to Byte interval	1	-	-	us

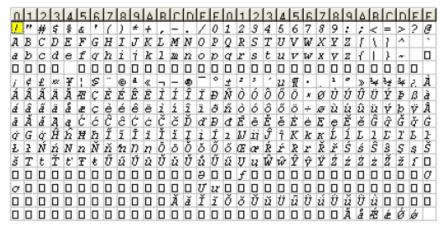
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#### CHARACTER CODES AND CHARACTER PATTERN

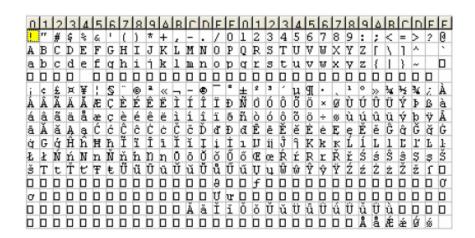
GP3: Unicode 16(H) x 16(W) Font, contains English, Range FF01H ~ FFE6H.



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

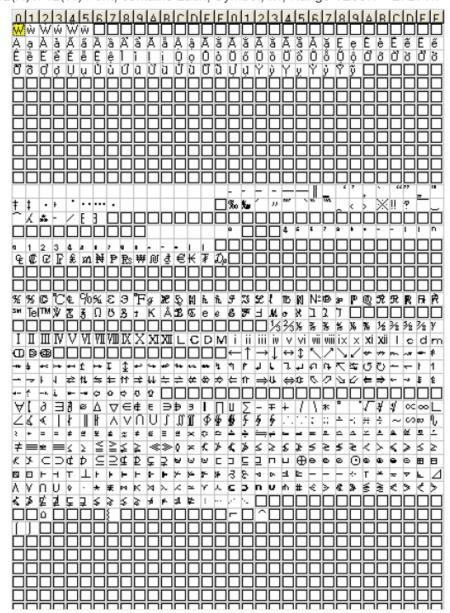


GP5: Unicode 12(H) x 12(W) Font, contains English, Latin, Eastern/Western European Languages, Greek, Slav, Arabic, Range 0020H ~ 11F9H.



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



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

Ω	1	2	3	4	5	a	7	8	9	Δ	R	r	n	F	F	n	1	2	3	1	5	8	7	8	9	Δ	R			F	F
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GP8: Unicode 12(H)x12(W) Font, contains Traditional/Simple Chinese, Range 4E00H ~ 9FA5H.

0.12345678948CDEE012345678948CDEE 丁万七上下广方丈三上下开不与丏丐丑过专且丕世世丘内业丛东兹丞丢 些両丢丣两严並丧于山个丫斗中和事事业事事临举、平九丹为主并丽举力 气、人乃以久及毛么义章之鸟乍乎乏乐不乒乓乔席乖乗乘乙七一也九乞也 习乡此处图图书艺乱乱遭望图图图图到题到题的题。则题这是更整型 龟乾亂難動了了ケ予争事事二子于亏亏云至元五井三里重互亚些垂垒重驱 一广方广庆仅仆仇仍仍今介交仍从仏平仓令仓仔任他仗付他合任任份位所 任他代令以孙失任任仪仫们彻依沙仰伶仲仳仍任件价仸件仓任任份位所 保企佈停保依伦俭佝佼伪仁仅依侧伯估价促使伴俩伶伷伸俱伺保似伽还俱 假份证佣付债但使佈债废诏舭位低住佐佑便体佔何必伦余余佚佛作佝佞佟 侣佁佂佃佄佅但佇佈佉佊佋佌位低住佐佑佒体佔何佖佗佘籴佚佛作佝佞佟 你你佢佣伍金佰作他佩個格佬條合佯佰金格佳俱倂信佷佸僱硂佻佼伙佾使佣侁侂侃侄伭來侇俢侉侊例侌侍侎侏侐侑侒侓侔侕龠侗侘侙侚供侜依侞侟快価偁侣侤僥侦则侨侩侪侫侬侭悔侯侰侱侲侳侴侵侶侷侸侹侺侻侼侽侾便 **受误係促俄依徐俇俈俉俊俋俌俍俎俏俐俑俒俓俔俕俖俗俘俙俚俛俜保兪俟** 俠信修俣俤俥俦俧俨俩俪俫俬俭修俯俰俱俲俳俴俵俶俷俸俹俺俻俼俽俾俿 倀倁倂倃倄倅倆倇倈凔倊個倌餢倎倏倐們倒倓倔倕倖僩倘候倚倛倜倝倞惜 傀俚傂傃傄傅傆傇傈傉傊傋傌傍阗傏傐傑傒傓傔傕傖傗傘備傚傛愮偒傞傟 傠傡傢傣傤傥傦傧储傩傪傫催傭傮傯傰傱敟傳傴債傶傷傸傹傺傻僷傽傾傿 僀僁僂傰僄僅僆嘐僈僉僊僋僌懄僎像僐僑僿僓僔笢憘憦徶僙僚僛僜僝僞僟 元記記程図入公内主用版八公介。17三六八六八六八六八六元 糞輛门目井内円有冈冉冊回册再丹冏冒冑冒載冔冕一元冘写面军农宜宋直 冠冢冢取冤冥冦冧富寫幕~冬本江冯冰冱冲决讶况治冷冸冹冺冻洗冽洽津 净凍洗涂凄涸准凇淨凉洁凋凌凍淦滅湮湊凒溧滄溟進催凘凙凚凛凜凝凞瀆 几凡九九凤兄処凧凤用凪凫凬凭凮凯凰凱凲凳漫口凶国凸凹出击凼函函置 刀刁!刃又办分切刈划刊利利刍刎刉别刑划利剌刕刖列刘则刚创剿初刞刟 刪則令剖判別却却刨利刪別划到刮回到刱刲刳刴刵制刷券剎刺刻却会剌刿 加务劢劣劤劥劦劧动助努劫劬劭劮劯劰励劲劳労券劶劷劸効劺劻劼劽劾势 勊勁勂勃勄勅勆勇勈勉勊勋勨勍勎勏勐勑勒勓勔動勖勗勘務勚勛勜朥勞募 勁勳勢前勤勢勒勧勃勩勵勸勤勤勵歐魏勵勲勳勵鄭數勸行与与为为为勿 为又与勾匄包匆匆匈和知甸訇匍甸匏甸匑匒匓網上化北邁匙口区匹匝工匠 匠匡囫匣匤匥葻匧匨匩匪匫匬匭匮匯匰匱匲匬匴匵匶匷匸匹区医匼匽匾匿 區十八千卅卅卆升午卉半卉卅卍华协卐卑卒卓協单卖南単卙博學卜卝卞卟 占卡卢直卤卤卦卧高卩卪卫卬卬卮卯印危卲即却卵卵卷卸卹卺卻卼卽卾卿 **厀斜广产厄厅历尼厅厉原压厌厍底厏厐厑厒厓厔厕尨厗厘厙厚所厜厝厞原** 听吁言吃各吅吆吁合吉吊时同名后吏吐向吒吓吔吕吖吗哖吙吚君吜吝吞吟 吠吡合吣吩呸否吧吨吩吪含听吭吮启吰吱吲吴吴吵吶映吸吹吸吻吼吽吾告 呀昀呂呃呄咬呆呇呈吳告呋呌呍呎呏呐吞呒呓呔呕呖呗员呙呚呛呜呝呞呟 体眼呢母哈姆呦低周际妃店咖世识平些呱呲味响呵呶呷呸昳呺呻呼命咀呿 咀咁咂呲咄音咆咇咈唤咊咋和咍咎咏咐咑咒嗫咔咕咖咗咘咙咚咛咜咝咞咟 咠咡咢晄咤咥咦咧咨咩咪咫咬咭咪咯咰咱咲咳咴晇咶咷瞂咹咺咻咼咽咾咿 哀品哂哃哄响哆哇哈哉哊哋哌响哎哏哐哑哒晓哔哕哖哗哘哙哚哛哜哝哞哟 皓員哢哣哤哥哦哧哨哩哪哫响哭哮峴哰哱哲哳哴哵哶哷哸哹哺哻哼哽哾哿 唀唁唂唃唄唅唆唇唈唉唊唋唌唍唎唏唐唑唒唓唔唕唖唗唘唙唚唛唜嗊唞唟 唠唡唢唣唤唥唦喞唨蜲唪唫唬唭售핱唰晿唲唳唴唵唶喑唸唹唺唻唼唽嚍唿 啀啁吼啃啄啅商商唪啉啊嗏啌哼啎問啐啑啒烙罄哅啖啗碗啙啚啛啜啝啞槢 啠啡啢啣啤啥啦啧啨啩啪啫啬啭啮啯啰啱啲啳啴啵啶啷嘨啹啺啻啼啽啾啿 喀喁喂哺善喅喆喇喈喉喊喋喌喍喎喏喐喑喒喓喔喕喖喗喘喙喚喛喜喝唧喟 喠喡喢喣喤喥喦喧喨喩喪喫鴌喭單喯喰囇喲쨥喴喵営喷喸喹喺碖喼喽喾櫐 嗀皫嗂嗃嗄嗅嗆嗇嗈嗉嗊嗋嗌嗍嗎嗏哠嗑嗒嗓嗔嗕嗖嗗嗘嗙嗚嗛嗜嗝螆暛

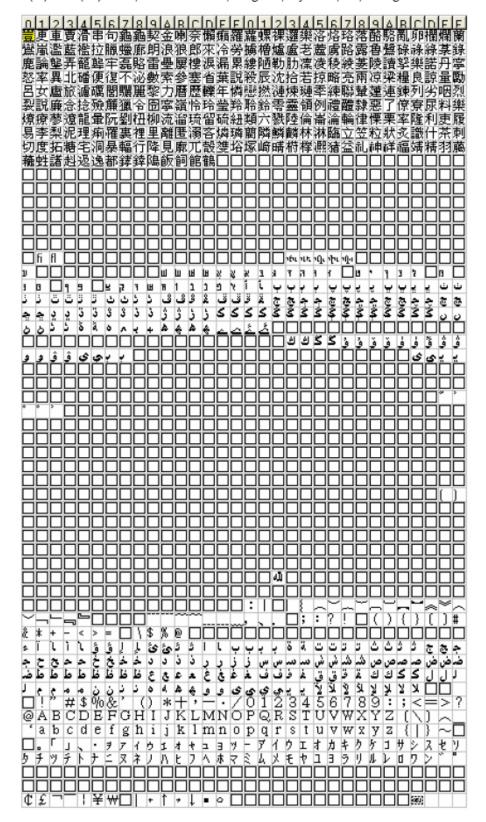
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GP9: Unicode 12(H) x 12(W) Font, contains Korean, Range AC00H ~ D7A3H.

뉌뀼쉾럇똣뿄퉦돢꼅얞켂킘퓁딦싮퓁KP电다두767排기눮디잢디K기电자두꺤뱮꺝뇶쩄젔췠똣꺴묲캮두ጻ얈췙킘쥂꾚윲뀾컜묲컜F767끪쾶삤짅눉ᄕ电면F1561개1멾데삸똣똣묲픾두561개1뒲JW,뒤XJ电기F1361개1급1압EF151111111111 휞퓠싔짟짟곘곘녣쳶썞홪칮퓇폋홪팏짂펟쳶귏퍉덨팾긤핳깠뺻꺏꺯쩠곗쨄쪟쯗꺆뵅퐯꺯쩢즟쨫꿯꿪祥进꿟꺯삤슻냋벟뜏덠넴뱳멿텻넻뽰홯퐈뇶닖뛻뛇퉷넻뽰뷺킞긷믜늷댒뚑댭쯗떕댬뎐뎬뺇뚌 认为EPJ超现象分人对张君拿了农业已超超过数量人了美好多对我们出口超过数对人的表现多期代的L例超级数期人是实验的对处LPJ超现数别人的表现是可以加上LI超过数D 긷껠캀퍰겻곗뼥곗굕홝홿훽믮쯗궦궦긘뼐팘긤윘쌁뺘뺼껠쩴쪔쪴굨뺇훽묠왌쭵쮗쮂퓌끡쀤뉗낤떰뚰덐뎨틧몔봀놖됈쾪녺둰뉄뛼븀똤풰뎙츱CHCGGGCC 얞갭뮖윘빏ૠ윲즛똣곘쿂쾪똣굔뚕궒쾶쾗퉵괻땂퍞똣뀨쾪캮귂홠门뛢긤텚긤땂깆똣깠϶꺆옦퍥뱮젉쾶켔렖젽찞뼺똣쮼묲퐱똒쬤홚썖캶뵖컜잢뼺똣껿묲낊녺띴홠밁닆넲뚬땂긏똣몊϶뎈뜌멷뱮녪쿂냺뇠땂컜똣꿮핖녺퉦훻괢꾑넲늰땂긎똣끸퍞슙뜌먠뱮귾렒퍰럞뎐땂뎊똣뗩퍞돆 쓷갧캻뿄줐컜컜컜묏믵휇홿굋슢뽰콯쾏궏긤햶겷긲즟뽰꺟쨗쨷쩗쩷쪉꼣쩵쭇꽸꾇뾻꾫쮺췟쮗짷꾶꾚꾇킯낧벆슻냋볗텏뎏댬몖똟뚓됓됓됳눇뒫뺆딇듓넻믷짷닧먠턟떓텻덳덌먕돇 쓷갧캻뿄줐궦컜곘꾚괇쾗홿굋슢뽰콯궦궏뢷햀긤긨긲뽸꺈뺼쩘쪰쪉쪷쨞꽸꾇뾻꾫뀱췟쮗꿯뫇끡껠킯낧벆슻냋볗텏뎏댬몖똟놧됓됓됳눇뒫뺆딇듓넻믷짷닧먠댪떓G덪뎊뗢먛돇 多分公开与西班及对人才的主命时的国际国际的人,对的对象中心自己的国际的研究的是一种的人的国际国际的人 建光型变化 对自己的复数 计人名英格兰 갺걋챵쨺걺둺곘삸묏똣폤빏캮쾓홪킖튑멾띰쌼묏똣궦다똣긤\$긤뿹门븁깠쌼똣꺘볖젔똣껝횮쭵뼲낊쯦헠봓꽾묲쯖끉챦쫾쨆쐒찞묲쯗끂낁뜌댬녆냶댬냺댽씴똣뎊뱬덌똣냺홚쾶됈뇞뵺똣뇀녰캮딝з닖剌닖뼚듸튒딝씴딝똣슙电뱝 给1. 准己到该相关部可是含含的人每可见整数的现在用用。多数智规等对他到我是对引用 . 개5기하게 기이기 보다 기차에 기차에 기차에 가는 ᄉᄁᄠᇧᄒᄀᄿ게ᄕᅧᆲ곓ᆚᄉᇕᇎᆅᄒᄑᄿᄀᄕᅧᆲᆌᆶᆛᄉᅙᇎᄀᅙᄀᄿᄁᄔᅄᆲᄁᆶᆅᄉᄍᇎᄳᅙᆒᄿᄁᅹᆸᆲᆅᆶᆁᄾᄰᇎᄁᅙᆒᅑᄱᄓᇸᄁᇶᆆᄾᆔᇎᄕᅙᄕᄿᄖᄕᄕᆲᄖᆶᅜᄾᄖᄠᄛᅜᆅᄭᆈᄔᇸᄕᇹᅚᄼᄓᇎᄫᇹᆝᄿᄓᄕᆸᆸᆲᅡᆶᄕᄾᄕᇎᅞᄗᄿᄄᄕᄜᆲᄩᇕ プロ개혁거용기소전소계하고 보겠다고함교육 구축권 8개혁 1寸 그 그리합기용 까수깨 8개혁 1寸 지민 2합께용 2수 교육 해양교육 2 관계회사용 과수 1寸 보고 보내를 다용 내수 1寸 보내를 다음 내수 1寸 보내를 다음 보내로 되었다면 되었다면 되었다면 되었다면 되었다 ᄉ雅ᄣ거ᅘᅧᅐᆁᆜᆲᇕᆲᄉᆈᄥᄙᄛᅒᄼᆒᆈᆌᆲᆙᆶᅼᆺᆁᄥᆈᅙᄬᇄᇄᇎᆲᇘᇏᄞᄼᇛᄥᆁᇬᅒᄼᄱᄥᄳᇷᄥᇷᆓᄼᅑᄥᆒᅘᄗᅑᄱᆈᆈᆲᇌᇕᆣᄉᅜᄣᆣᅘᄓᄿᄓᆸᆸᆲᇅᇸᅩᆺᆋᄣᆅᅘᅜᄿᆣᆸᆲᆒᇸᆛᄾᇦᄥᆈᄛᄓᄿᄓᄔᆲᆸᇥᄄᄼᄓᄣᄓᅁᅜᄕ 给되게견곌묤꽙됐知F구권콀귌큠크给F꺄짼꺌뻀껌뗐쳨꾜 꽌 <u>漫到名次每开港咨询四大组用户增货但关系与上户货制力每十户已经的品价目的</u> 分比上通路5人过25多米,各种通路多人大量多利,由于通路5人02506万日时间68万人 话语话话话只听并强强地 医环冲坏 透调话话还说话记忆的话话 · (몇55년 미놃놣됏됯눃뮋뉃뉇늃 놠됅됉뇹눙웥ᆉ뉹늞긜걉앦떕댹덙덹멽뎹뚕 놜놼된뇼눜눼 뒨뉼냜딈다삵다면덜덼뎜뎫 됋뇟뇿늏눿뉟늂 납청닡딱댡덁덡뎁뎡돁 스탠덢덿뎟뎿톶

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



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### **ELECTRO-OPTICAL CHARACTERISTICS**

MEASURING CONDITION: POWER SUPPLY = VOP / 64 HzTEMPERATURE =  $23 \pm 5$  °C

RELATIVE HUMIDITY =  $60 \pm 20 \%$ 

ITEM	SYMBOL	UNIT	TYP. TN	TYP. STN
RESPONSE TIME	Ton	ms	140	170
	Toff	ms	180	220
CONTRAST RATIO	Cr	-	7	15
	V3:00	0	70	40
VIEWING ANGLE	V6:00	0	43	70
(Cr ≥ 2)	V9:00	0	70	40
	V12:00	0	3	50

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

## RELIABILITY OF LCD MODULE

	mnam acriminari	TEGE GOLD TETOL	1
	TEST CONDITION	TEST CONDITION	
ITEM	FOR NORMAL TEMPERATURE	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°C to 80°C	5 avala
	30 Min Dwell	30 Min Dwell	5 cycle
Vibration Test at LCM Level	Freq 10-55 Hz	Freq 10-55 Hz	
	Sweep rate: 10-55-10 at 1 min	Sweep rate: 10-55-10 at 1 min	
	Sweep mode Linear	Sweep mode Linear	_
	Displacement: 2 mm p-p	Displacement: 2 mm p-p	
	1 Hour each for X, Y, Z	1 Hour each for X, Y, Z	

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## QUALITY STANDARD OF LCD MODULE

1.0	Sampling Method	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	Malfunction	Open	
	0.25%(AQL)		Short	
			Burnt or dead component	
			Missing part/improper part P.C.B.	
			Broken	
	Major Defect	Poor Insulation	Potential short	
	0.65%(AQL)		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	Cosmetic Defect	Minor scratch	
	1.5%(AQL)		Flux residue	
			Thin solder	
			Poor plating	
			Poor marking	
			Crack solder	
			Poor bending	
			Poor packing	
			Wrong size	

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#### 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.

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.

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<sup>\*</sup>Usable solvent: Alcohol (ethanol, IPA and the like)

<sup>\*</sup>Appropriate solvent: Ketones, ethyl alcohol