



深圳市华远显示器件有限公司
SHENZHEN HUAYUAN DISPLAY CO.,LTD.

液晶显示模块规格书

Specification for Liquid Crystal Display Module

HYG1286494G-bT62L-VD

Prepared By	Reviewed By	Approved By
Date:	Date:	Date:

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

CONTENTS

REVISION HISTORY	2
CONTENTS	3
1.0 GENERAL DESCRIPTION	4
2.0 FEATURES	4
3.0 MECHANICAL SPECIFICATION	4
4.0 BLOCK DIAGRAM	5
5.0 EXTERNAL DIMENSIONS	6
6.0 INTERFACE PIN DESCRIPTIONS	7
7.0 ABSOLUTE MAXIMUM RATINGS	8
8.0 ELECTRICAL CHARACTERISTICS	8
9.0 OPTICAL CHARACTERISTICS	9
10.0 TIMING CHARACTERISTICS	11
11.0 BACKLIGHT CHARACTERISTICS	15
12.0 OPERATING PRINCIPLES & METHODS	16
13.0 INSTRUCTION DESCRIPTION	22
14.0 QUALITY GUARANTEE	35
15.0 RELIABILITY	40
16.0 PRECAUTIONS FOR USING LCD MODULES	41
17.0 USING LCD MODULES	43
18.0 APPENDIX	47

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

1.0 GENERAL DESCRIPTION

The HYG1286494G-bT62L-VD is a 128x64 dots dot-matrix LCD module. It has a STN panel composed of 128 segments and 64 commons. The LCM can be easily accessed by microcontroller via 4-wires serial interface.

2.0 FEATURES

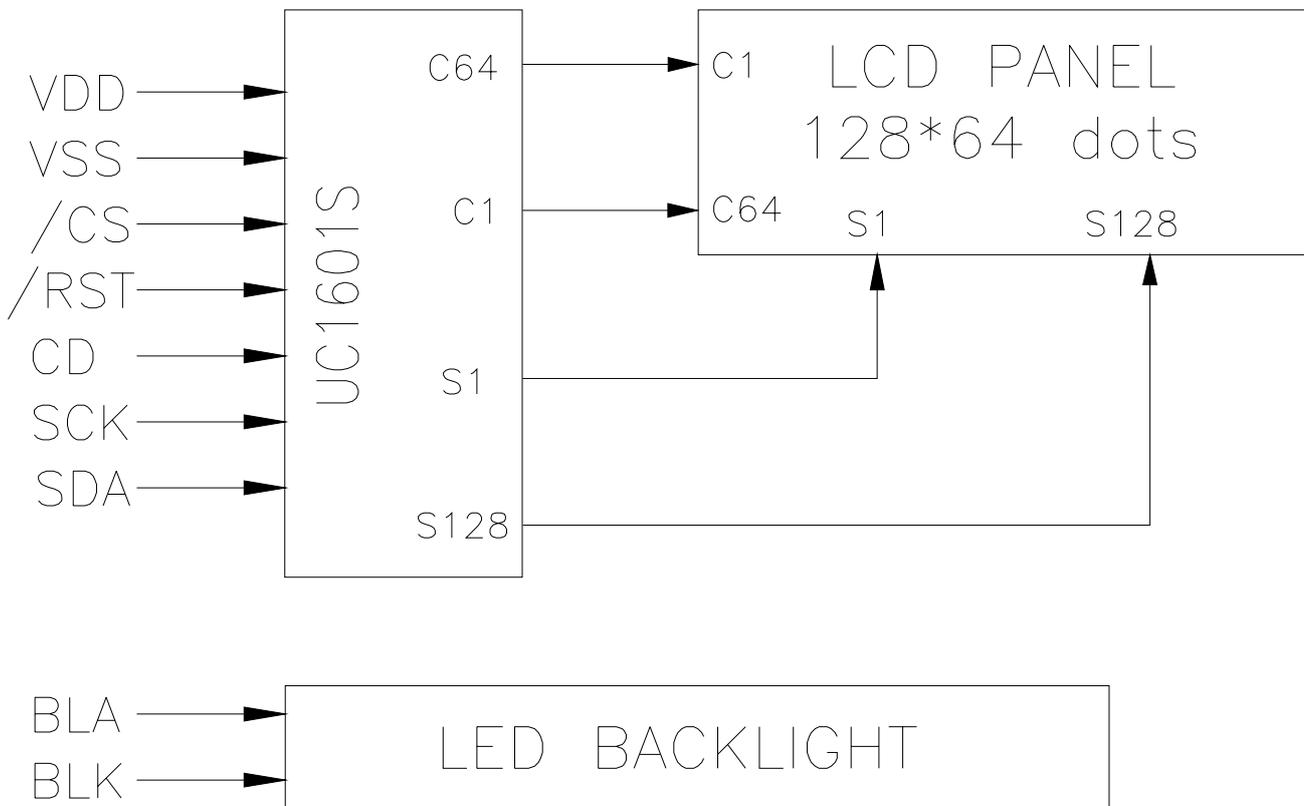
Display Format	128x 64 dots
LCD Type	STN-BLUE-NEGATIVE
Polarizer Mode	TRANSMISSIVE
Drive Method	1/65 Duty, 1/9 Bias
Viewing Direction	6 O'clock
Controller	UC1601s
Interface	4-wires serial interface
Backlight	White Side-Light Type LED Backlight

3.0 MECHANICAL SPECIFICATION

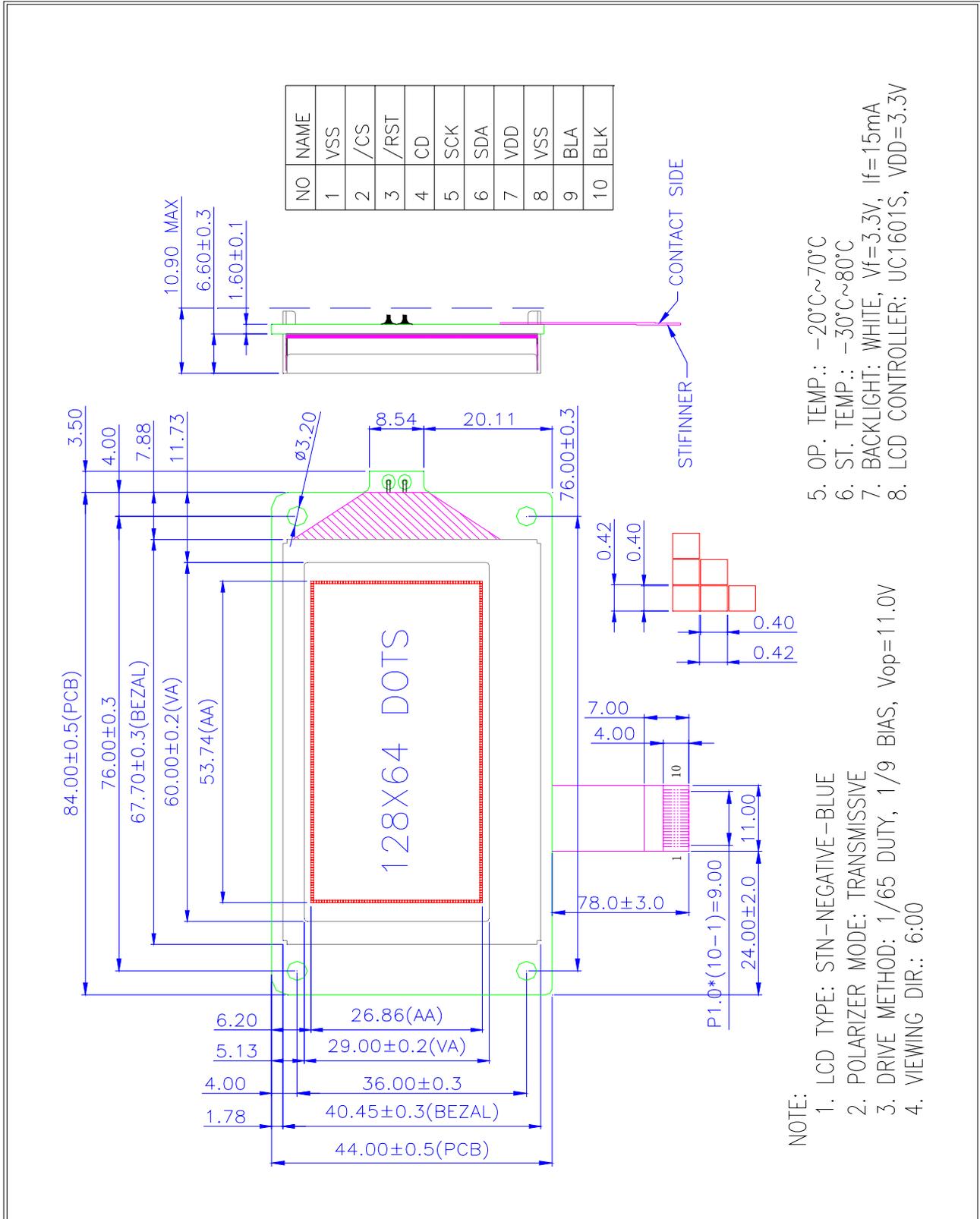
Item	Description	Unit
Module Dimension	84.0(W) × 44.0(H) × 10.9(Max)(T)	mm
Viewing Area	60.0(W) × 29.0(H)	mm
Active Area	53.74(W) × 26.86(H)	mm
Dot Size	0.40(W) × 0.40(H)	mm
Dot Pitch	0.42(W) × 0.42 (H)	mm
Character Size	——	mm



4.0 BLOCK DIAGRAM



5.0 EXTERNAL DIMENSIONS





Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

6.0 INTERFACE PIN DESCRIPTIONS

PIN No.	Symbol	Level	Description
1	V _{SS}	P	Ground
2	/CS	H/L	Chip Select. Chip is selected when /CS = "L".
3	/RST	H/L	When RST="L", all control registers are re-initialized by their default states. Since UC1601s has built-in Power-On Reset and Software Reset command, /RST pin is not required for proper chip operation. When /RST is not used, connect the pin to VDD.
4	CD	H/L	Select Control data or Display data for read/write operation. . "L": Control data "H": Display data
5	SCK	H/L	The serial clock input.
6	SDA	H/L	The serial data input
7	V _{DD}	P	Power supply for logic(+3.3V)
8	V _{SS}	P	Ground
9	BLA	P	Power supply for LED Backlight + (+3.3V)
10	BLK	P	Power supply for LED Backlight - (0V)



7.0 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit
Supply Voltage (Logic)	$V_{DD}-V_{SS}$	-0.3	4.0	V
Supply Voltage (LCD)	V_0-V_{SS}	-0.3	13.2	V
Input Voltage	V_I	-0.4	$V_{DD}+0.3$	V
Operating Temperature	T_{opr}	-20	70	°C
Storage Temperature	T_{stg}	-30	80	°C

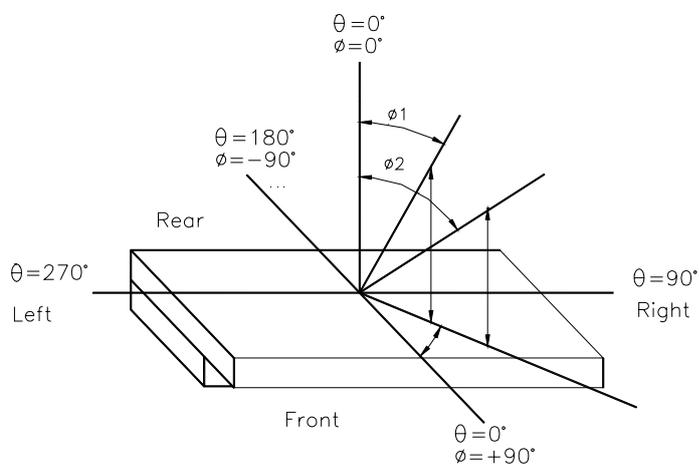
8.0 ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Supply voltage for Logic	V_{DD}	--	3.0	3.3	3.3	V
LCD Operating Voltage	V_0-V_{SS}	-20°C				V
		+25°C	9.7	11.0	10.8	V
		+70°C				V
Input voltage H level	V_{IH}	For all inputs	$0.8V_{DD}$	---	---	V
Input voltage L level	V_{IL}	For all inputs	--	---	$0.2V_{DD}$	V
Output High Voltage	V_{OH}	$I_{OH} = -0.5 \text{ mA}$	$0.8V_{DD}$	---	---	V
Output Low Voltage	V_{OL}	$I_{OL} = 0.5 \text{ mA}$	---	---	$0.2V_{DD}$	V
Average Frame Rate	fFR	LC[3] = 0b	-10%	80	+10%	Hz

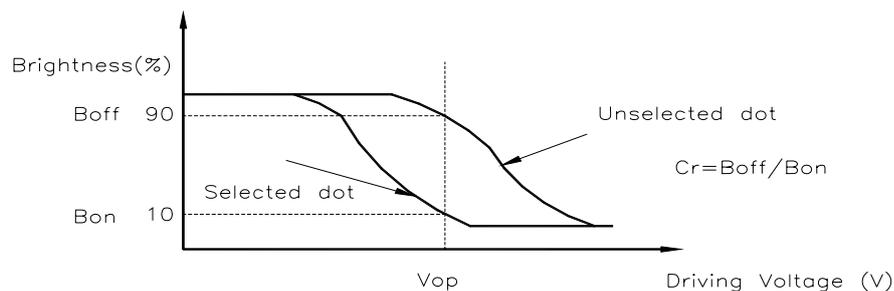
9.0 OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Response time	Ton	$\theta=0^\circ$ and $T_a=-20^\circ\text{C}$		--		ms
		$\theta=0^\circ$ and $T_a=+25^\circ\text{C}$		--		ms
		$\theta=0^\circ$ and $T_a=+70^\circ\text{C}$		--		ms
	Toff	$\theta=0^\circ$ and $T_a=-20^\circ\text{C}$		--		ms
		$\theta=0^\circ$ and $T_a=+25^\circ\text{C}$		--		ms
		$\theta=0^\circ$ and $T_a=+70^\circ\text{C}$		--		ms
Contrast ration	CR(MAX)	$T_a=25^\circ\text{C}$	5	10		---
Viewing Angle	θ	Deg $\theta=0^\circ$	CR \geq 2.0 $T_a=25^\circ\text{C}$	50		Deg
		Deg $\theta=90^\circ$		35		
		Deg $\theta=180^\circ$		30		
		Deg $\theta=270^\circ$		35		
Crosstalk		$T_a=25^\circ\text{C}$		1.2		---

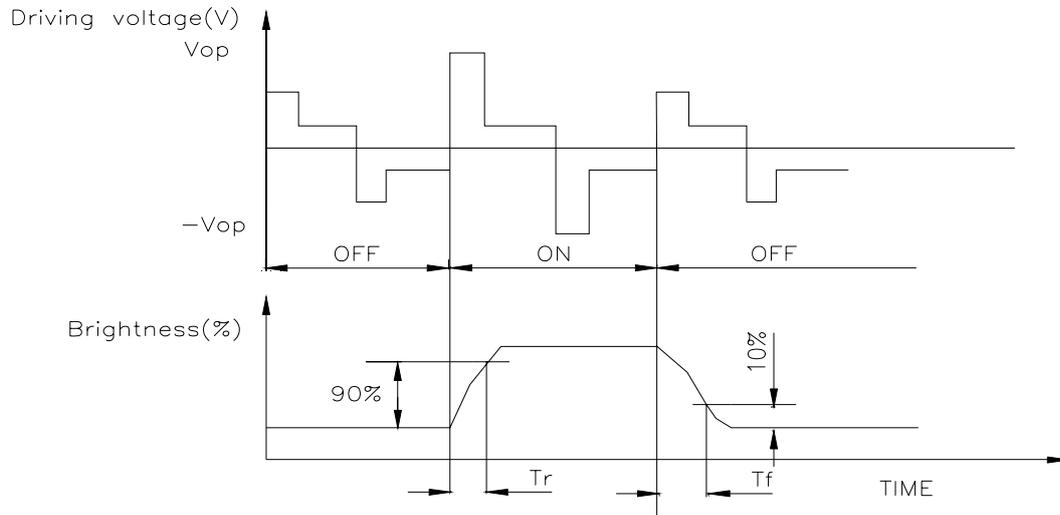
9.1 Viewing Angle θ , θ and Viewing Angle Range: $\Delta\theta = |\theta_2 - \theta_1|$



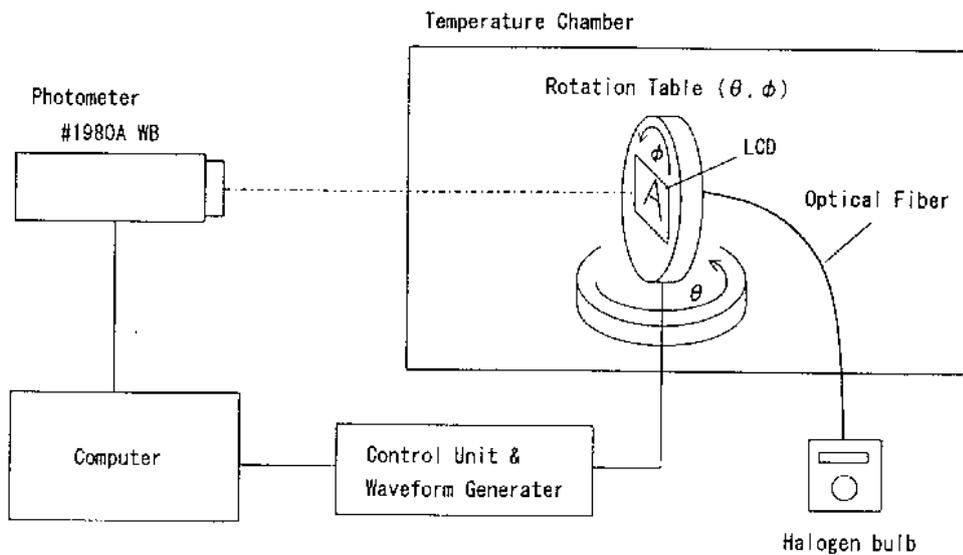
9.2 Contrast ratio(CR)



9.3 Response Time

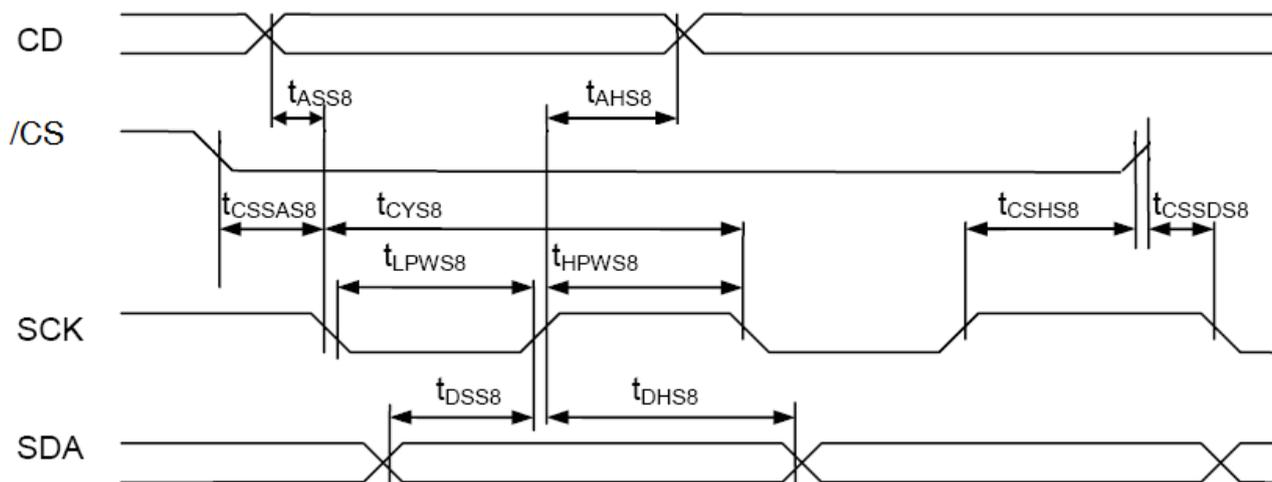


9.4 Optical Measurement System



10.0 TIMING CHARACTERICS

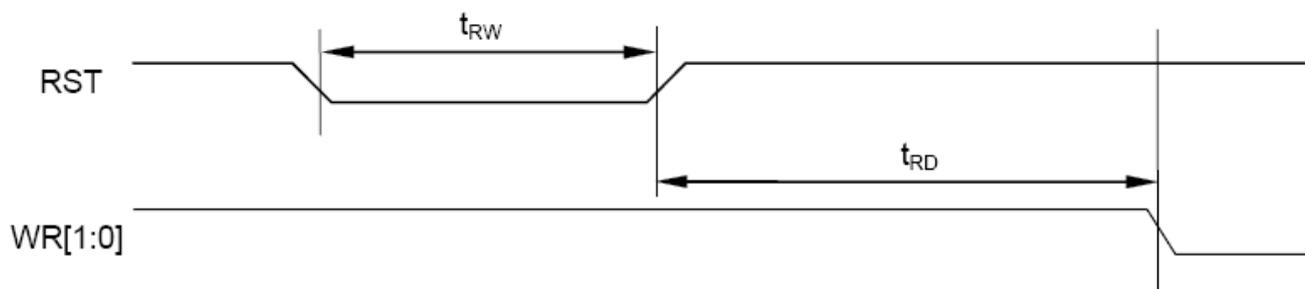
10.1 Serial Bus Timing Characteristics



Symbol	Signal	Description	Condition	Min.	Max.	Units
Write						
t_{ASS8}	A0	Address setup time		0	–	nS
t_{AHS8}		Address hold time		0	–	nS
t_{CYS8}	SCK	System cycle time		30	–	nS
t_{LPWS8}		Low pulse width		15	–	nS
t_{HPWS8}		High pulse width		15	–	nS
t_{DSS8} t_{DHS8}	SDA	Data setup time Data hold time		12 0	–	nS
t_{CSSAS8} t_{CSHS8}	/CS	Chip select setup time		55		nS



10.2 Reset Characteristics



Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{RW}	RST	Reset low pulse width		3	–	μ S
t_{RD}	RST, WR	Reset to WR pulse delay		6	–	mS



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

11.0 BACKLIGHT CHARACTERISTICS

11.1 ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

Item	Symbol	Condition	Rating	Unit
Reverse Voltage	Vr		5.0	V
Absolute maximum forward current	Ifm		20	mA
Forward Current	If	Vf=3.3V	15	mA
Power Description	Pd		45	mW
Operating temperature range	Topr		-20~+70	°C
Storage temperature range	Tst		-30~+80	°C

11.2 ELECTRICAL/OPTICAL CHARACTERISTICS

(Ta=25°C)

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward Voltage	Vf	3.2	3.3	3.4	V	If=15 mA
Reverse Current	Ir		10		uA	Vr=5.0 V
Dominant wave length	λ_p		--		nm	If=15 mA
Spectral Line Half width	$\Delta \lambda$		--			If=15 mA
Luminance	Lv		--		cd/m ²	If=15 mA
Color Coordinate	X		White			If=15 mA
	Y					

12.0 OPERATING PRINCIPLES & METHODS

12.1 The Serial Interface (4-Wire)

Only write operations are supported in 4-wire serial mode. Pin /CS are used for chip select and bus cycle reset. Pin CD is used to determine the content of the data been transferred. During each write cycle, 8 bits of data, MSB first, are latched on eight rising SCK edges into an 8-bit data holder.

If CD=0, the data byte will be decoded as command. If CD=1, this 8-bit will be treated as data and transferred to proper address in the Display Data RAM on the rising edge of the last SCK pulse.

Pin CD is examined when SCK is pulled low for the LSB (D0) of each token.

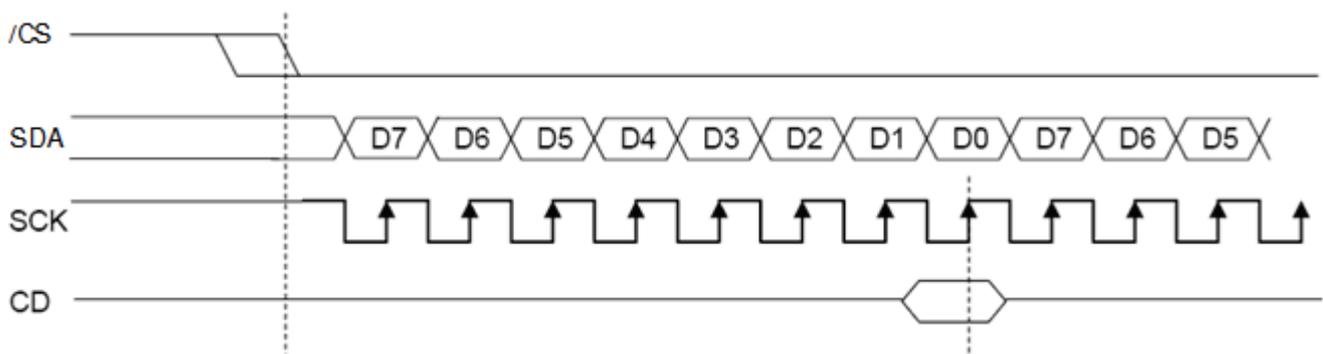


Figure 12-1

12.2 Display Data RAM

The input display data is stored to a dual port static DDRAM (DDRAM, for Display Data RAM) organized as 65x132



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

12.4 CONTROL REGISTERS

UC1601s contains registers, which control the chip operation. The following table is a summary of these control registers, a brief description and the default values. These registers can be modified by commands, which will be described in the next two sections, Command Table and Command Description.

Name: The Symbolic reference of the register. Note that, some symbol name refers to bits (flags) within another register.

Default: Numbers shown in Bold font are default values after Power-Up-Reset and System-Reset

Name	Bits	Default	Description
SL	6	00H	Scroll Line. Scroll the displayed image up by SL rows. The valid SL value is between 0 (for no scrolling) and 63. Setting SL outside of this range causes undefined effects on the displayed image. This register does not affect icon output CIC.
CA	8	00H	Column Address of DDRAM (Display Data RAM). Value range is 0~131. (Used in Host to access DDRAM)
PA	4	0H	Page Address of DDRAM. Value range 0~8. (Used in Host to access DDRAM)
BR	2	3H	Bias Ratio. The ratio between VLCD and VD. 00: 6 01: 7 10: 8 11: 9
TC	2	0H	Temperature Compensation (per °C). 00: -0.05% 01: -0.10% 10: -0.15% 11: -0.00%
PM	8	C0H	Electronic Potentiometer to fine tune the value of VLCD
PC	3	6H	Power Control. PC [0]: 0: LCD: ≤ 15nF 1: LCD: 15~24nF PC [2:1] :00: External VLCD 11: Internal VLCD (7x charge pump)
AC	3	1H	Address Control. AC[0]: WA: automatic column/page Wrap Around (Default 1: ON) AC[1]: Auto-Increment order 0: Column (CA) first 1: Page (PA) first AC[2]: PID:PA (page address) auto Increment Direction (0:+1 1:-1)
DC	3	0H	Display Control: DC[0]: PXV: Pixels Inverse (bit-wise data inversion. Default 0: OFF) DC[1]: APO: All Pixels ON (Default 0: OFF) DC[2]: Display ON/OFF (Default 0: OFF) When DC[2] is set to 0, the IC will enter Sleep Mode



Title	HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

Name	Bits	Default	Description
LC	5	00H	LCD Control: LC[0]: Reserved. LC[1]: MX, Mirror X SEG/Column sequence inversion (Default: OFF) LC[2]: MY, Mirror Y COM/Row sequence inversion (Default: OFF) LC[3]: Frame Rate 0b: 80 fps 1b: 100 fps LC[4]: Partial Display control 0b: Disable Mux-Rate = CEN+1 (DST, DEN not used) 1b: Enabled Mux-Rate = DEN-DST+1
CEN	6	3FH	COM-scanning End (last COM with full line cycle, 0-based index)
DST	6	00H	Display Start (first COM with active scan pulse, 0-based index)
DEN	6	3FH	Display End (last COM with active scan pulse, 0-based index)
			Please maintain the following relationship: CEN = (the actual number of pixel rows on the LCD) - 1 CEN ≥ DEN ≥ DST + 9
APC		N/A	Advanced Program Control. For UltraChip only. Please do not use.
Status Registers			
OM	2	–	Operating Modes (Read only) 00b: Reset 01b: (Not used) 10b: Sleep 11b: Normal
ID	2	PIN	Access the connected status of ID pins.



12.5 VLCD QUICK REFERENCE

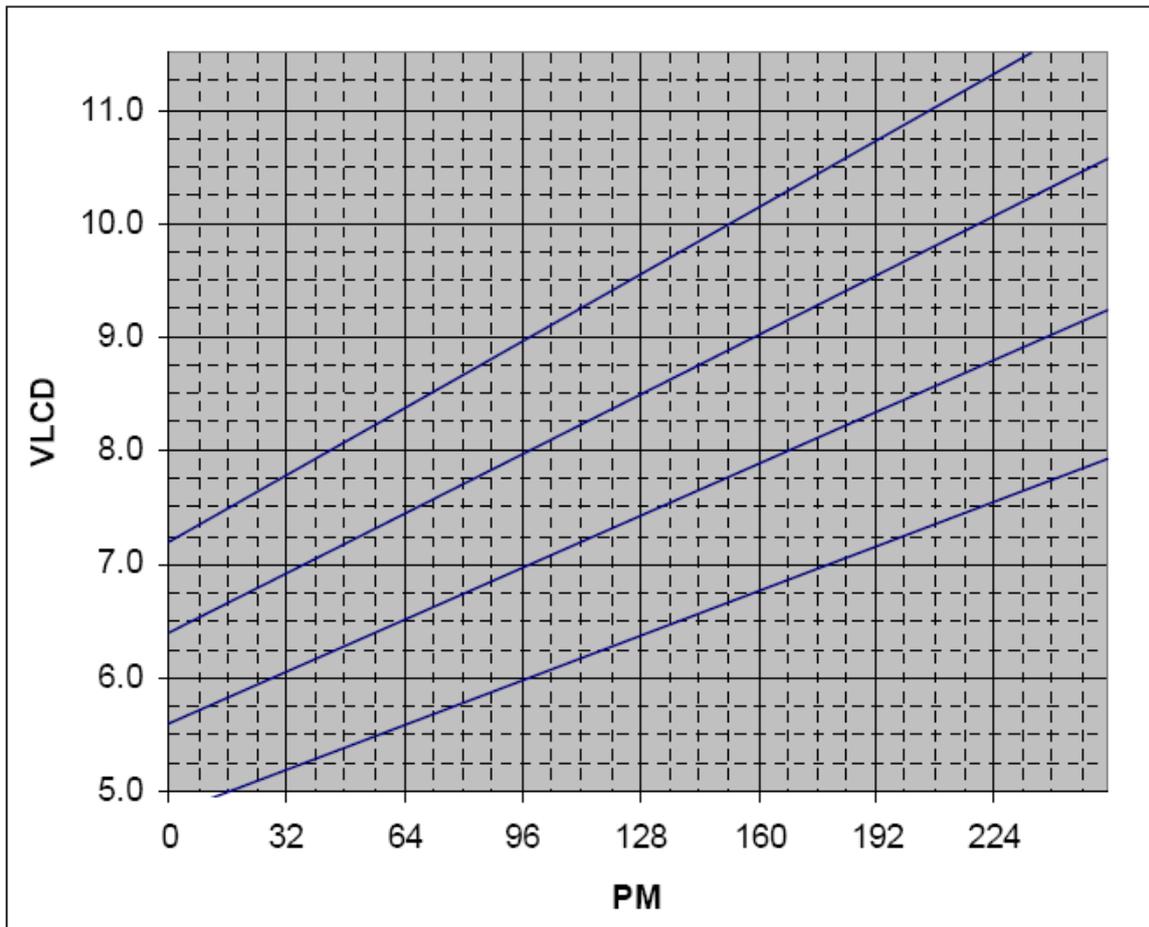


Figure 12-3 VLCD Programming Curve

BR	CV0 (V)	CPM (mV)	PM	VLCD Range (V)
6	4.800	12.24	0	4.80
			255	7.92
7	5.600	14.28	0	5.60
			255	9.24
8	6.400	16.32	0	6.40
			255	10.56
9	7.200	18.36	0	7.20
			234	11.50

Note:

1. For good product reliability, keep VLCD under 11.5V over all temperature.
2. The integer values of BR above are for reference only and may have slight shift.



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

13.0 INSTRUCTION DESCRIPTION

13.1 INSTRUCTION TABLE

	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default
1	Write Data Byte	1	0	#	#	#	#	#	#	#	#	Write 1 byte	N/A
2	Read Data Byte	1	1	#	#	#	#	#	#	#	#	Read 1 byte	N/A
3	Get Status	0	1	ID	MX	MY	WA	DE	0	0	0	Get Status	--
				Product Code				Ver					
4	Set Column Address LSB	0	0	0	0	0	0	#	#	#	#	Set CA [3:0]	0
	Set Column Address MSB	0	0	0	0	0	1	#	#	#	#	Set CA [7:4]	0
5	Set Temp. Compensation	0	0	0	0	1	0	0	1	#	#	Set TC[1:0]	00b
6	Set Power Control	0	0	0	0	1	0	1	#	#	#	Set PC[2:0]	110b
7	Set Adv. Program Control (double byte command)	0	0	0	0	1	1	0	0	0	R	Set APC[R][7:0], R = 0, or 1	N/A
				#	#	#	#	#	#	#	#		
8	Set Scroll Line	0	0	0	1	#	#	#	#	#	#	Set SL[5:0]	0
9	Set Page Address	0	0	1	0	1	1	#	#	#	#	Set PA[3:0]	0
10	Set VBIAS Potentiometer (double-byte command)	0	0	1	0	0	0	0	0	0	1	Set PM[7:0]	C0H
				#	#	#	#	#	#	#	#		
11	Set Partial Display Control	0	0	1	0	0	0	0	1	0	#	Set LC[4]	0b
12	Set RAM Address Control	0	0	1	0	0	0	1	#	#	#	Set AC[2:0]	001b



Title
HYG1286494G-bT62L-VD
SPECIFICATION

DOC#:

Rev. : R00

Effective Date: 2011-08-30

续表

	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default
13	Set Frame Rate	0	0	1	0	1	0	0	0	0	#	Set LC[3]	0b
14	Set All-Pixel-ON	0	0	1	0	1	0	0	1	0	#	Set DC[1]	0b
15	Set Inverse Display	0	0	1	0	1	0	0	1	1	#	Set DC[0]	0b
16	Set Display Enable	0	0	1	0	1	0	1	1	1	#	Set DC[2]	0b
17	Set LCD Mapping Control	0	0	1	1	0	0	0	#	#	0	Set LC[2:1]	00b
18	System Reset	0	0	1	1	1	0	0	0	1	0	System Reset	N/A
19	NOP	0	0	1	1	1	0	0	0	1	1	No operation	N/A
20	Set Test Control (double-byte command)	0	0	1	1	1	0	0	1	TT		For testing only. Do not use.	N/A
				#	#	#	#	#	#	#			
21	Set LCD Bias Ratio	0	0	1	1	1	0	1	0	#	#	Set BR[1:0]	11b: 9
22	Set COM End	0	0	1 -	1 #	1 #	1 #	0 #	0 #	0 #	1 #	Set CEN[6:0]	63
23	Set Partial Display Start	0	0	1 -	1 #	1 #	1 #	0 #	0 #	1 #	0 #	Set DST[6:0]	0
24	Set Partial Display End	0	0	1 -	1 #	1 #	1 #	0 #	0 #	1 #	1 #	Set DEN[6:0]	63
Serial Read Command													
25	Read Data Byte	1	0	1	1	1	1	1	1	1	1	Read until chip disabled	N/A
		1	1	#	#	#	#	#	#	#	#		
26	Get Status	0	0	1	1	1	1	1	1	1	0	Get status till chip disabled	N/A
		0	1	MX	MY	WA	DE	Prod code	0	Ver			

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

13.2 COMMAND DESCRIPTION

1) Write Data Byte to Memory

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Write data	1	0	8-bit data write to SRAM							

2) Read Data Byte from Memory

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Read data	1	1	8-bit data read from SRAM							

Write/Read Data Byte (Command 1,2) access Display Data RAM based on Page Address (PA) register and Column Address (CA) register. To minimize bus interface cycles, PA and CA will increase or decrease automatically after each bus cycle, depending on the setting of Access Control (AC) registers. PA and CA can also be programmed directly by issuing Set Page Address and Set Column Address commands.

If Wrap-Around (WA) is OFF (AC[0] = 0), CA will stop increasing after reaching the end of the page, and system programmers need to set the values of PA and CA explicitly. If WA is ON (AC[0]=1), when CA reaches the end of the page, CA will be reset to 0 and PA will increase or decrease by 1, depending on the setting of Page Increment Direction (PID, AC[2]). When PA reaches the boundary of RAM, PA will be wrapped around to the other end of RAM and continue. (See command 30, Window Programming, for more details)

3) Get Status

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Get Status	0	1	ID	MX	MY	WA	DE	0	0	0
	0	1	Product Code				Ver	0	0	0

Status1 definitions:

ID: Provide access to ID pins connection status.

MX: Status of register LC[1], mirror X.

MY: Status of register LC[2], mirror Y.

WA: Status of register AC[0]. Automatic column/row wrap around.

DE: Display Enable flag. DE=1 when display is enabled.

Status2 definitions:

Product Code: production identification. Default: 0110b.

Ver: IC Version, 0~ 1.



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

4) Set Column Address

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Column Address LSB CA[3:0]	0	0	0	0	0	0	CA3	CA2	CA1	CA0
Set Column Address MSB CA[7:4]	0	0	0	0	0	1	CA7	CA6	CA5	CA4

Set the SRAM column address before Write/Read memory from host interface.
CA value range: 0~131

5) Set Temperature Compensation

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Temperature Comp. TC[1:0]	0	0	0	0	1	0	0	1	TC1	TC0

Set VBIAS temperature compensation coefficient (%-per-degree-C)
Temperature compensation curve definition:
00b= -0.05%/ °C **01b**= -0.10%/°C **10b**= -0.15%/ °C **11b**= -0.00%/°C

6) Set Power Control

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Power Control PC[2:0]	0	0	0	0	1	0	1	PC2	PC1	PC0

Set PC[0] according to the capacitance loading of LCD panel.
Panel loading definition: **0b** : ≤15nF **1b** : 15~24nF

Set PC[2:1] to program the build-in charge pump stages.
00b = External VLCD **11b** = Internal VLCD (x7)

7) Set Advanced Program Control (Double byte command)

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Adv. Program Control APC[R][7:0]	0	0	0	0	1	1	0	0	0	R
	0	0	APC register parameter							

For UltraChip only. Please **Do NOT** use.

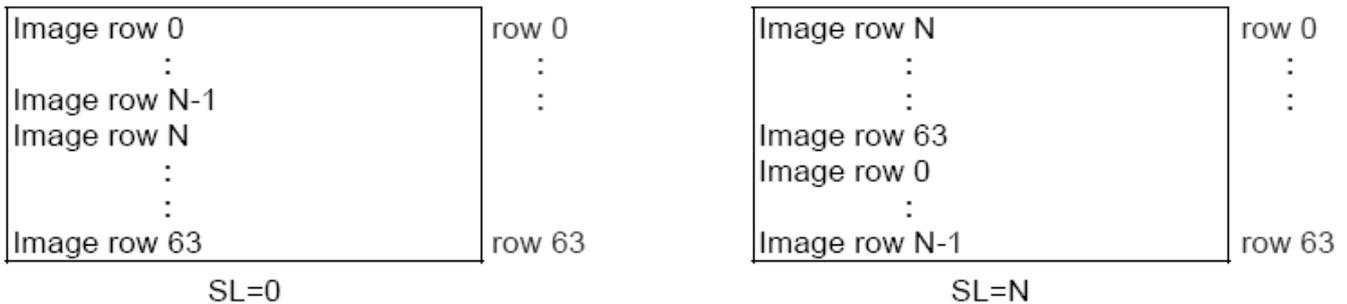
	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

8) Set Scroll Line

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Scroll Line SL[5:0]	0	0	0	1	SL5	SL4	SL3	SL2	SL1	SL0

Set the scroll line number.

Scroll line setting will scroll the displayed image up by **SL** rows. Icon output CIC will not be affected by **Set Scroll Line** command.



9) Set Page Address

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Page Address	0	0	1	0	1	1	PA3	PA2	PA1	PA0

Set the SRAM page address before write/read memory from host interface. Each page of SRAM corresponds to 8 COM lines on LCD panel, except for the last page. The last page corresponds to the icon output CIC.

Possible value = 0~8.

10) Set VBIAS Potentiometer (Double byte command)

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set VBIAS Potentiometer PM [7:0]	0	0	1	0	0	0	0	0	0	1
	0	0	PM7	PM6	PM5	PM4	PM3	PM2	PM1	PM0

Program VBIAS Potentiometer (PM[7:0]). See section LCD Voltage Setting for more detail.
Effective range: 0 ~ 255

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

11) Set Partial Display Control

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Partial Display Enable LC [4]	0	0	1	0	0	0	0	1	0	LC4

This command is used to enable partial display function.

LC[4] : **0b**: Disable Partial Display, Mux-Rate = CEN+1 (DST, DEN not used.)

1b: Enable Partial Display, Mux-Rate = DEN-DST+1

12) Set RAM Address Control

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set AC [2:0]	0	0	1	0	0	0	1	AC2	AC1	AC0

Program registers AC[2:0] for RAM address control. It controls the auto-increment behavior of CA and PA.

AC[0] – WA, Automatic column/page wrap around.

0: CA or PA (depends on AC[1]= 0 or 1) will stop increasing after reaching boundary

1: CA or PA (depends on AC[1]= 0 or 1) will restart, and CA or PA will increase by one.

AC[1] – Auto-Increment order

0 : column (CA) increasing (+1) first until CA reach CA boundary, then PA will increase by (+/-1).

1 : page (PA) increasing (+/-1) first until PA reach PA boundary, then CA will increase by (+1).

AC[2] – PID, page address (PA) auto increment direction (0/1 = +/- 1)

When WA=1 and CA reaches CA boundary, PID controls whether page address will be adjusted by +1 or -1.

13) Set Frame Rate

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Frame Rate LC [3]	0	0	1	0	1	0	0	0	0	LC3

Program LC [3] for frame rate setting

0b: 80 fps 1b: 100 fps (fps: frame-per-second)



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

14) Set All Pixel ON

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set All Pixel ON DC [1]	0	0	1	0	1	0	0	1	0	DC1

Set DC[1] to force all SEG drivers to output ON signals. This function has no effect on the existing data stored in display RAM.

15) Set Inverse Display

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Inverse Display DC [0]	0	0	1	0	1	0	0	1	1	DC0

Set DC[0] to force all SEG drivers to output the inverse of the data (bit-wise) stored in display RAM. This function has no effect on the existing data stored in display RAM.

16) Set Display Enable

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Display Enable DC[2]	0	0	1	0	1	0	1	1	1	DC2

This command is for programming register DC[2]. When DC[2] is set to 1, UC1601s will first exit from sleep mode, restore the power and then turn on COM drivers and SEG drivers.

17) Set LCD Mapping Control

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set LCD Control LC[2:1]	0	0	1	1	0	0	0	MY	MX	0

Set LC[2:1] for COM (row) mirror (MY), SEG (column) mirror (MX).

MY is implemented by reversing the mapping order between RAM and COM (row) electrodes. The data stored in RAM is not affected by MY command. MY will have immediate effect on the display image.

MX is implemented by selecting the CA or 50-CA as write/read (from host interface) display RAM column address so this function will only take effect after rewriting the RAM data.



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

18) System Reset

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
System Reset	0	0	1	1	1	0	0	0	1	0

This command will activate the system reset.

Control register values will be reset to their default values. Data store in RAM will not be affected.

19) NOP

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
No Operation	0	0	1	1	1	0	0	0	1	1

This command is used for “no operation”.

20) Set Test Control (Double byte command)

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set TT	0	0	1	1	1	0	0	1	TT	0
	0	0	Testing parameter							

This command is used for UltraChip production testing. Please **do NOT** use

21) Set LCD Bias Ratio

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set Bias Ratio BR [1:0]	0	0	1	1	1	0	1	0	BR1	BR0

Bias ratio definition:

00b= 6 01b= 7 10b= 8 **11b= 9**

22) Set COM End (Double-byte command))

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set CEN [6:0]	0	0	1	1	1	1	0	0	0	1
	0	0	CEN register parameter							

This command programs the ending COM electrode. CEN defines the number of used COM electrodes, and it should correspond to the number of pixel-rows in the LCD. When the LCD has less



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

than 64 pixel rows, the LCM designer should set CEN to N-1 (where N is the number of pixel rows) and use COM1 through COM-N as COM driver electrodes.

23) Set Partial Display Start (Double-byte command)

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set DST [6:0]	0	0	1	1	1	1	0	0	1	0
	0	0	DST register parameter							

This command programs the starting COM electrode, which has been assigned a full scanning period and will output an active COM scanning pulse.

24) Set Partial Display End (Double-byte command)

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Set DEN [6:0]	0	0	1	1	1	1	0	0	1	1
	0	0	DEN register parameter							

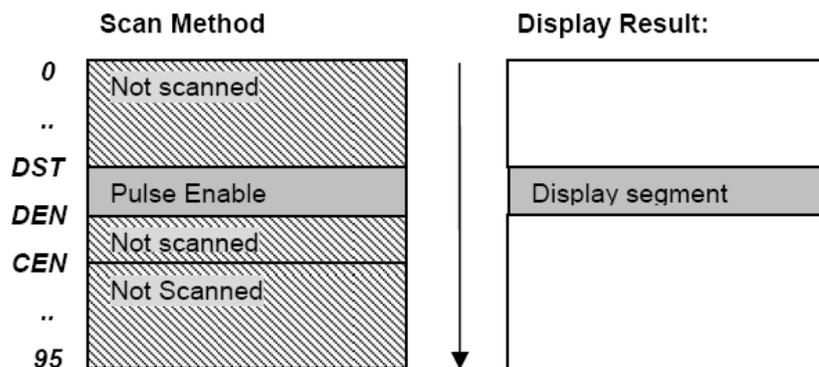
This command programs the ending COM electrode, which has been assigned a full scanning period and will output an active COM scanning pulse.

CEN, DST, and DEN are 0-based index of COM electrodes. They control only the COM electrode activity, and do not affect the mapping of display RAM to each COM electrodes. The image displayed by each pixel row is therefore not affected by the setting of these three registers.

When LC[4]=1b, the Mux-Rate is narrowed down to DST-DEN+1. When MUX rate is reduced, reduce the frame rate accordingly to reduce power. Changing MUX rate also require BR and VLCD to be reduced.

For minimum power consumption, set LC[4]=1b, set (DST, DEN, CEN) to minimize Mux rate, use slowest frame rate which satisfies the flicker requirement, set PC[0]=0b, and use lowest BR, lowest VLCD which satisfies the contrast requirement. When Mux-Rate is under 16, it is recommended to set BR=6 for optimum power saving.

In either case, DST/DEN defines a small subsection of the display which will remain active while shutting down all the rest of the display to conserve energy.





Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

25) Read Data Byte from Memory

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Read data	1	1	1	1	1	1	1	1	1	1
			8-bit Data read from SRAM							

26) Get Status

Action	CD	W/R	D7	D6	D5	D4	D3	D2	D1	D0
Get Status	0	1	1	1	1	1	1	1	1	0
			MX	MY	WA	DE	Prod_Code	0	Ver	

	Title	DOC#:	Rev. : R00
	HYG1286494G-bT62L-VD SPECIFICATION	Effective Date: 2011-08-30	

14.0 QUALITY GUARANTEE

14.1 ACCEPTABLE QUALITY LEVEL

Inspection items	Sampling procedures	AQL
Visual-operating (Electro-optical)	GB2828-81 Inspection level II Normal inspection Single sample inspection	0.65
Visual-not operating	GB2828-81 Inspection level II Normal inspection Single sample inspection	1.5
Dimension measurement	GB2828-81 Inspection level II Normal inspection Single sample inspection	1.5

14.2 Conditions of Cosmetic Inspection

- Environmental condition

The inspection should be performed at the 1m of height from the LCD module under 2 pieces of 40W white fluorescent lamps (Normal temperature 20~25°C and normal humidity 60±15%RH).

- Inspection method

The visual check should be performed vertically at more than 30cm distance from the LCD panel.

- Driving voltage

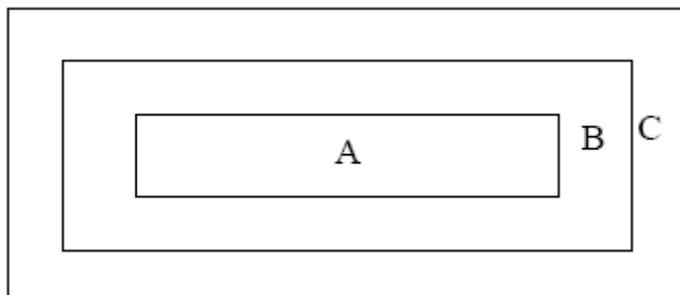
The V0 value which the most optimal contrast can be obtained near the specified V0 in the specification. (Within ±0.5V of the typical value at 25°C.).

14.3 Definition of inspection zone in LCD

Zone A: character/Digit area

Zone B: viewing area except Zone A (ZoneA+ZoneB=minimum Viewing area)

Zone C: Outside viewing area (invisible area after assembly in customer's product)



Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

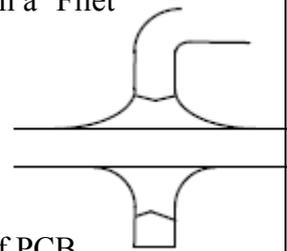
14.4 Inspection Standard

● Major Defect

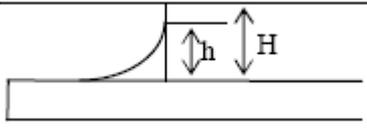
Item No	Items to be inspected	Inspection Standard	Classification of defects
1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical, horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting.	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	

● Module Cosmetic Criteria

No.	Item	Judgment Criterion	Partition
1	Difference in Spec.	None allowed	Major
2	Pattern peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing No soldering bridge No cold soldering	Major Major Minor
4	Resist flaw on substrate	Invisible copper foil ($\varnothing 0.5\text{mm}$ or more) on substrate pattern	Minor
5	Accretion of metallic Foreign matter	No soldering dust No accretion of metallic foreign matters (Not exceed $\varnothing 0.2\text{mm}$)	Minor Minor
6	Stain	No stain to spoil cosmetic badly	Minor
7	Plate discoloring	No plate fading, rusting and discoloring	Minor
8	1. Solder amount Lead parts	a. Soldering side of PCB Solder to form a 'Filet' all around the lead. Solder should not hide the lead form perfectly. (too much) b. Components side (In case of 'Through Hole PCB') Solder to reach the Components side of PCB.	Minor
	2. Flat packages	Either 'Toe' (A) or 'Seal' (B) of the lead to be covered by 'Filet'. Lead form to be assume over solder.	



	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

No.	Item	Judgment Criterion	Partition
8	3. Chips	$(3/2) H \geq h \geq (1/2) H$ 	Minor

● Screen Cosmetic Criteria (Non-Operating)

No.	Defect	Judgment Criterion	Partition															
1	Spots	In accordance with <i>Screen Cosmetic Criteria (Operating) No.1.</i>	Minor															
2	Lines	In accordance with <i>Screen Cosmetic Criteria (Operating) No.2.</i>	Minor															
3	Bubbles in polarizer	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Size : d</th> <th>mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>d</td> <td>≤ 0.3</td> <td>Disregard</td> </tr> <tr> <td>0.3 < d</td> <td>≤ 1.0</td> <td>3</td> </tr> <tr> <td>1.0 < d</td> <td>≤ 1.5</td> <td>1</td> </tr> <tr> <td>1.5 < d</td> <td></td> <td>0</td> </tr> </tbody> </table>	Size : d	mm	Acceptable Qty in active area	d	≤ 0.3	Disregard	0.3 < d	≤ 1.0	3	1.0 < d	≤ 1.5	1	1.5 < d		0	Minor
Size : d	mm	Acceptable Qty in active area																
d	≤ 0.3	Disregard																
0.3 < d	≤ 1.0	3																
1.0 < d	≤ 1.5	1																
1.5 < d		0																
4	Scratch	In accordance with spots and lines operating cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor															
5	Allowable density	Above defects should be separated more than 30mm each other.	Minor															
6	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-lit type should be judged with back-lit on state only.	Minor															
7	Contamination	Not to be noticeable.	Minor															

Note: Size : d = (long length + short length) / 2



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

● Screen Cosmetic Criteria (Operating)

No.	Defect	Judgment Criterion	Partition																				
1	Spots	<p>A) Clear</p> <table border="1"> <thead> <tr> <th>Size : d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.1$</td> <td>Disregard</td> </tr> <tr> <td>$0.1 < d \leq 0.2$</td> <td>6</td> </tr> <tr> <td>$0.2 < d \leq 0.3$</td> <td>2</td> </tr> <tr> <td>$0.3 < d$</td> <td>0</td> </tr> </tbody> </table> <p>Note : Including pin holes and defective dots which must be within one pixel size.</p> <p>B) Unclear</p> <table border="1"> <thead> <tr> <th>Size : d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.2$</td> <td>Disregard</td> </tr> <tr> <td>$0.2 < d \leq 0.5$</td> <td>6</td> </tr> <tr> <td>$0.5 < d \leq 0.7$</td> <td>2</td> </tr> <tr> <td>$0.7 < d$</td> <td>0</td> </tr> </tbody> </table>	Size : d mm	Acceptable Qty in active area	$d \leq 0.1$	Disregard	$0.1 < d \leq 0.2$	6	$0.2 < d \leq 0.3$	2	$0.3 < d$	0	Size : d mm	Acceptable Qty in active area	$d \leq 0.2$	Disregard	$0.2 < d \leq 0.5$	6	$0.5 < d \leq 0.7$	2	$0.7 < d$	0	Minor
Size : d mm	Acceptable Qty in active area																						
$d \leq 0.1$	Disregard																						
$0.1 < d \leq 0.2$	6																						
$0.2 < d \leq 0.3$	2																						
$0.3 < d$	0																						
Size : d mm	Acceptable Qty in active area																						
$d \leq 0.2$	Disregard																						
$0.2 < d \leq 0.5$	6																						
$0.5 < d \leq 0.7$	2																						
$0.7 < d$	0																						
2	Lines	<p>A) Clear</p> <p>Note :</p> <ul style="list-style-type: none"> () - Acceptable Qty in active area L - Length (mm) W - Width (mm) ∞ - Disregard <p>B) Unclear</p> <p>‘Clear’ = The shade and size are not changed by Vop. ‘Unclear’ = The shade and size are changed by Vop.</p>	Minor																				

Note: Size : d = (long length + short length) / 2



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

● **Screen Cosmetic Criteria (Operating) (Continued)**

No.	Defect	Judgment Criterion	Partition
3	Rubbing line	Not to be noticeable.	Minor
4	Allowable density	Above defects should be separated more than 10mm each other.	Minor
5	Rainbow	Not to be noticeable.	Minor
6	Dot size	To be 95% ~ 105% of the dot size (Typ.) in drawing. Partial defects of each dot (ex. pin-hole) should be treated as pot'. (see <i>Screen Cosmetic Criteria (Operating) No.1</i>)	Minor
7	Uneven brightness (only back-lit type module)	Uneven brightness must be $B_{MAX} / B_{MIN} \leq 2$ - B_{MAX} : Max. value by measure in 5 points - B_{MIN} : Min. value by measure in 5 points Divide active area into 4 vertically and horizontally. Measure 5 points shown in the following figure. <div style="text-align: center;"> <p>○ : Measuring points</p> </div>	Minor

Note :

- (1) The limit samples for each item have priority.
- (2) Complex defects are defined item by item, but if the numbers of defects are defined in above table, the total number should not exceed 10.
- (3) In case of 'concentration', even the spots or the lines of 'disregarded' size should not allowed. Following three situations should be treated as 'concentration'.
 - 7 or over defects in circle of $\varnothing 5\text{mm}$.
 - 10 or over defects in circle of $\varnothing 10\text{mm}$.
 - 20 or over defects in circle of $\varnothing 20\text{mm}$.



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

15.0 RELIABILITY

15.1 Content of Reliability Test

No.	Test Item	Test Condition	Inspection after test
1	High Temperature Storage	80°C±2°C/200 hours	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Sealleak; 3.Non-display; 4.missing segments; 5.Glass crack; 6.Current Idd is twice higher than initial value.
2	Low Temperature Storage	-30°C±2°C/200 hours	
3	High Temperature Operating	70°C±2°C/120 hours	
4	Low Temperature Operating	-20°C±2°C/120 hours	
5	Temperature Cycle	-20°C±2°C~25~70°C±2°C×10cycles (30min.) (5min.) (30min.)	
6	High Temperature Humidity operation /	50°C±5°C×90%RH/120 hours	
7	Vibration Test	Frequency : 10Hz~55Hz~10Hz Amplitude : 1.5mm, X , Y , Z direction for total 3hours (Packing condition)	
8	Drooping test	Drop to the ground from 1m height, one time, and every side of carton. (Packing condition)	
9	Static electricity test	Voltage:±8KV R: 330Ω C: 150pF Air discharge, 10time	
Remark: 1. The test samples should be applied to only one test item. 2. Sample size for each test item is 5~10pcs. 3. For Damp Proof Test, Pure water(Resistance>10MΩ) should be used. 4. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part. 5. EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has. 6. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.			

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

16.0 PRECAUTIONS FOR USING LCD MODULES

16.1 Handling Precautions

(1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it or impact.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents :

- Isopropyl alcohol
- Ethyl alcohol

(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.

- Water
- Ketone
- Aromatic solvents

(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

16.2 Storage Precautions

When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

16.3 Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
- Terminal electrode sections.

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

17.0 USING LCD MODULES

17.1 About Liquid Crystal Display Modules

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

(1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

(2) Do not touch, push or rub the exposed polarizer with anything harder than an HB pencil lead (glass, tweezers, etc.).

(3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizer and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropyl alcohol.

(4) When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum benzin. Do not scrub hard to avoid damaging the display surface.

(5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

(6) Avoid contacting oil and fats.

(7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(8) Do not put or attach anything on the display area to avoid leaving marks on.

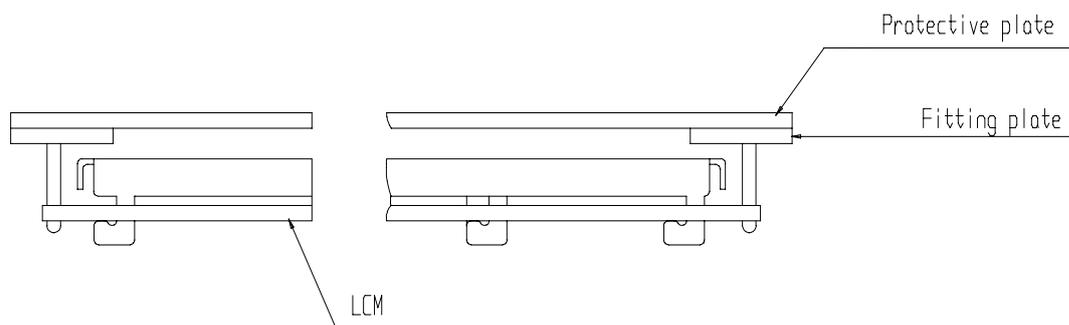
(9) Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinate to the polarizer).

(10) As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

17.2 Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



(2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

individual specifications for measurements. The measurement tolerance should be ± 0.1 mm.

17.3 Electro-Static Discharge Control

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

- (1) Make certain that you are grounded when handing LCM.
- (2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
- (3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
- (4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutation of the motor.
- (5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
- (6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

17.4 Soldering to the LCM

- (1) Observe the following when soldering lead wire, connector cable and etc. to the LCM.
 - Soldering iron temperature : $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$.
 - Soldering time : 3-4 sec.
 - Solder : eutectic solder.

If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

- (2) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.
- (3) When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

17.5 Operation

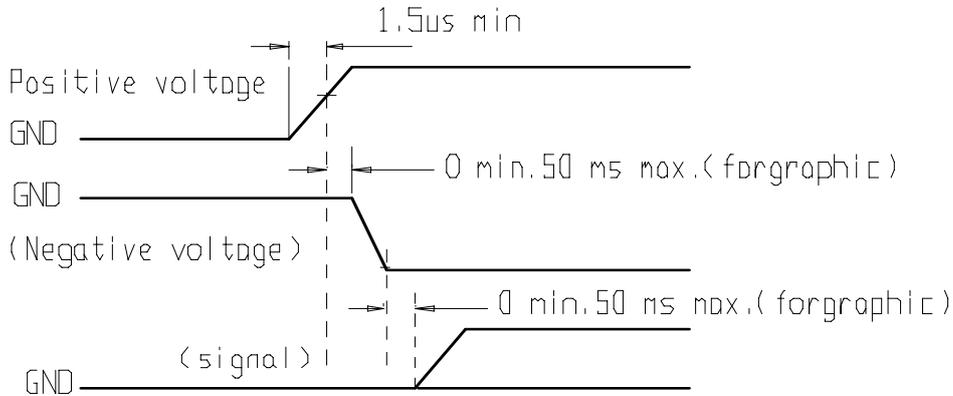
- (1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.
- (2) Driving the LCD in the voltage above the limit shortens its life.
- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.



Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
	Effective Date: 2011-08-30	

(5) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.

(6) When turning the power on, input each signal after the positive/negative voltage becomes stable.



17.6 Storage

When storing LCDs as spares for some years, the following precaution are necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for desiccant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.

(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)

(4) Environmental conditions:

- Do not leave them for more than 168hrs. at 60°C.
- Should not be left for more than 48hrs. at -20°C.

17.7 Safety

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

(2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

17.8 Limited Warranty

Unless agreed between HYDISPLAY and customer, HYDISPLAY will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with HYDISPLAY LCD/LCM acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to HYDISPLAY within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of HYDISPLAY limited to repair and/or replacement on the terms set forth above. HYDISPLAY will not be responsible for any subsequent or consequential events.

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

17.9 Return LCM under warranty

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are:

- Broken LCD glass.
- PCB eyelet's damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
- Soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

	Title HYG1286494G-bT62L-VD SPECIFICATION	DOC#:	Rev. : R00
		Effective Date: 2011-08-30	

18.0 APPENDIX

18.1 Initialization Code

```
//Send 8-bit data to UC1601s
```

```
#pragma disable
```

```
void SendBit(uchar uc_dat)
```

```
{
    uchar uc_BitCnt;
    LCD_SCK = 1;
    for(uc_BitCnt=0;uc_BitCnt<8;uc_BitCnt++)
    {
        if ( uc_dat & 0x80 )
            LCD_SDA = 1;
        else
            LCD_SDA = 0;

        LCD_SCK = 0;
        LCD_SCK = 1;
        uc_dat =uc_dat <<1;
    }
}
```

```
//Write Diaply data
```

```
#pragma disable
```

```
void wr_dat(uchar uc_dat)
```

```
{
    LCD_CS = 0;
    LCD_CD = 1;
    SendBit(uc_dat);
    LCD_CS = 1;
}
```

```
//Write Instruction Data
```

```
#pragma disable
```

```
void wr_cmd(uchar uc_cmd)
```

```
{
    LCD_CS = 0;
    LCD_CD = 0;
    SendBit(uc_cmd);
    LCD_CS = 1;
}
```



```
#pragma disable
void Initial()
{
    wr_cmd(0xE2); // Internal Reset
    delay(250);

    wr_cmd(0xAE); // Display OFF

    wr_cmd(0xA0); // Set The DDRAM Address SEG output Correspondence (ADC=0)SEG1--SEG128

    wr_cmd(0xC4); // Set LCD Mapping Control
    wr_cmd(0x88); // Set RAM Address Control

    wr_cmd(0xA6); // Set The LCD Display(Normal)
    wr_cmd(0xA4); // Sets Display all points 0: normal display
    wr_cmd(0xA1); // Set Frame Rate 1=100fps

    wr_cmd(0x2F); // Set Power Control : Internal VLCD
    wr_cmd(0x26); // Set Temperature Compensation : 10b=-0.15%, 00b=0%

    wr_cmd(0x81); // Set VBIAS Potentiometer
    wr_cmd(0xC0);

    wr_cmd(0xAF); // Display ON
}
}
```

18.2 Power Supply Circuit Diagram

