POWERTIP TECH. CORP.

DISPLAY DEVICES FOR BETTER ELECTRONIC DESIGN

Specification For Approval

【產品規格書】

Customer : _____

Model Type : LCD Module

Sample Code : _____

Mass Production Code : PC1602ARS-ENH-A

Edition : 0

Customer Sign	Sales Sign	Approved By	Prepared By

CONTENTS

1. SPECIFICATIONS

1.1 Features

- 16-characters, two-lines liquid crystal display of 5*7 dot matrix + cursor
- 1/16 Duty, 1/4 bias
- STN LCD, positive, gray display
- Reflective LCD
- 6 o' clock viewing angle
- 4 bits or 8 bits parallel data input

1.2 Mechanical Specifications

- Outline dimension : 66.7mm(L)* 23.3mm(W)*4.7mm max.(H)
- Viewing area : 61.0mm * 15.9mm
- Active area : 56.2mm * 11.85mm
- Dot size : 0.55mm * 0.65mm
- Dot pitch : 0.6mm * 0.7mm
- Character Size : 2.95mm * 5.55mm

1.3 Absolute Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Power supply Voltage	V_{DD}	-	-0.3	7.0	V
LCD drive Supply voltage	V_{DD}-V_O	-	V_{DD}-13.5	V_{DD}+0.3	V
Input voltage	V_{IN}	-	-0.3	V_{DD}+0.3	V
Operating temperature	T_{OPR}	-	0	50	°C
Storage temperature	T_{STG}	-	-20	70	°C
Humidity	HD	-	-	90	%RH

1.4 DC Electrical Characteristics

V_{DD}=+5V±10%,V_{SS}=0V,TA=25°C

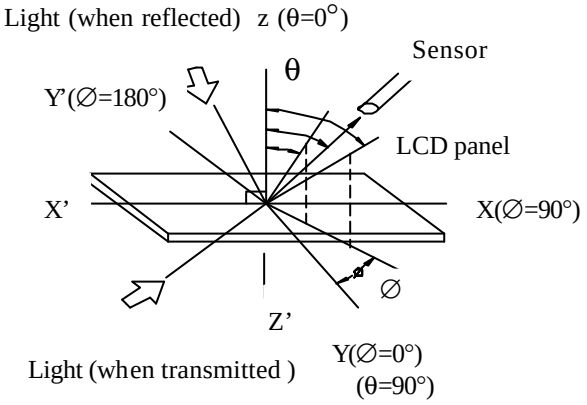
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply voltage	V_{DD}	-	4.5	5.0	5.5	V
"H" input voltage	V_{IH}	-	2.2	-	V_{DD}	V
"L" input voltage	V_{IL}	-	-0.3	-	0.8	V
"H" output voltage	V_{OH}	I_{OH}=-0.25mA	2.4	-	-	V
"L" output voltage	V_{OL}	I_{OL}=1.2mA	-	-	0.4	V
Supply current	I_{DD}	V_{DD}=5V	-	2.0	3.0	mA
LCD driving voltage	V_{OP}	V_{DD}-V_O	4.0	4.2	4.4	V

1.5 Optical Characteristics

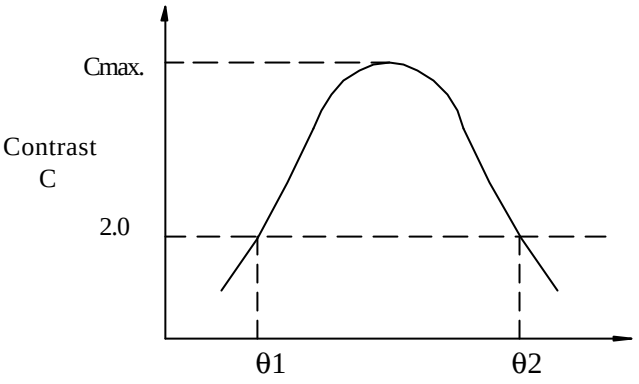
1/16 duty, 1/4 bias, V_{OP}=4.2V, Ta=25°C

Item	Symbol	Conditions	Min.	Typ.	Max	Reference
Viewing angle	θ	C≥2.0,∅=0°	45°	-	-	Notes 1 & 2
Contrast	C	θ=25°, ∅=0°	5	7	-	Note 3
Response time(rise)	T_r	θ=25°, ∅=0°	-	148ms	-	Note 4
Response time(fall)	T_f	θ=25°, ∅=0°	-	302ms	-	Note 4

Note 1: Definition of angles θ and ∅



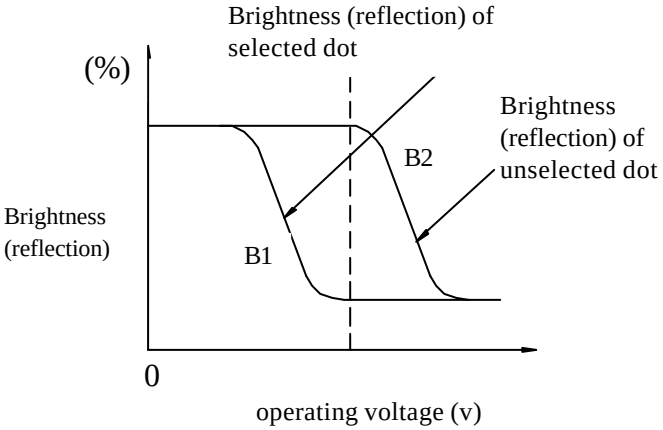
Note 2: Definition of viewing angles θ1 and θ2



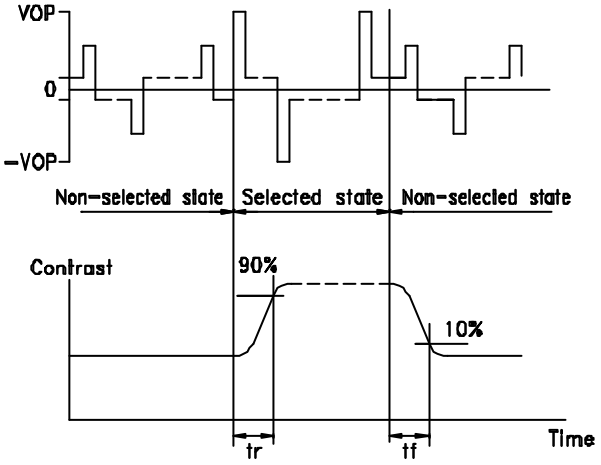
Note : Optimum viewing angle with the naked eye and viewing angle θ at Cmax. Above are not always the same

Note 3: Definition of contrast C

$$C = \frac{\text{Brightness (reflection) of unselected dot (B2)}}{\text{Brightness (reflection) of selected dot (B1)}}$$



Note 4: Definition of response time



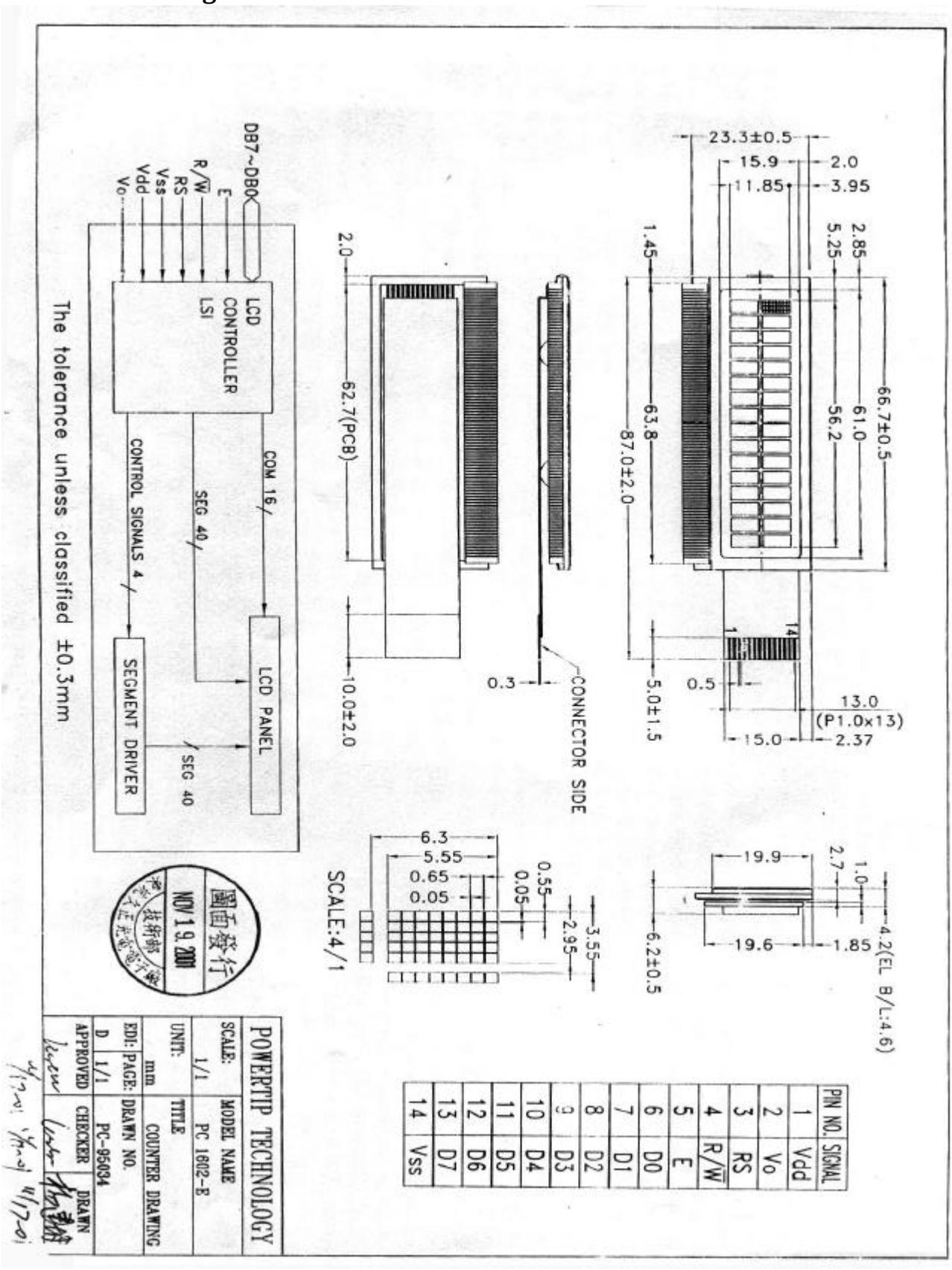
Note: Measured with a transmissive LCD panel which is displayed 1 cm^2

V_{OPR} : Operating voltage f_{FRM} : Frame frequency

t_r : Response time (rise) t_f : Response time (fall)

2. MODULE STRUCTURE

2.1 Counter Drawing

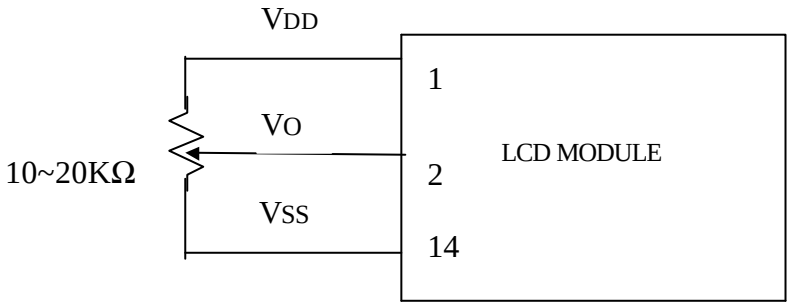


PIN NO.	SIGNAL
1	Vdd
2	Vo
3	RS
4	R/W
5	E
6	D0
7	D1
8	D2
9	D3
10	D4
11	D5
12	D6
13	D7
14	Vss

2.2 Interface Pin Description

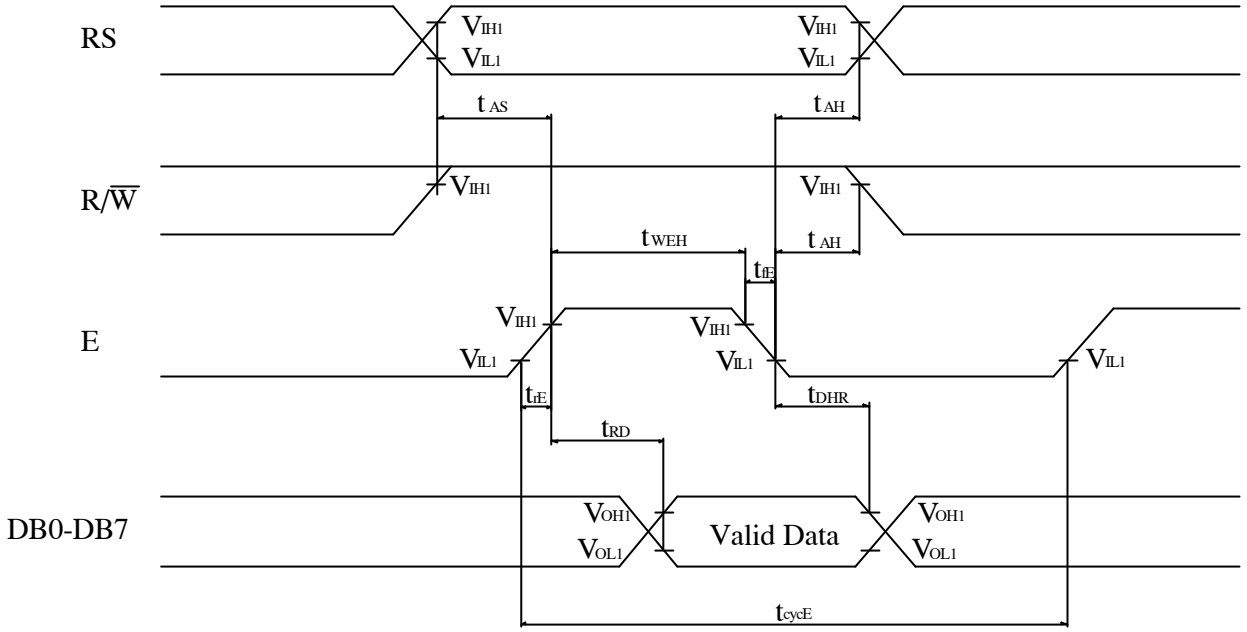
Pin No.	Symbol	Function
1	VDD	Power Supply (V_{DD}>V_{SS})
2	VO	Operating voltage (LCD Driver)
3	RS	Register Selection input High = Data register Low = Instruction register (for write) Busy flag address counter (for read)
4	R/$\overline{W}$	R/$\overline{W}$ signal input is used to select the read/write mode High = Read mode, Low = Write mode
5	E	Start enable signal to read or write the data
6~9	D0 ~ D3	Four low order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCD module. These four are not used during 4-bit operation.
10~13	D4~D7	Four high order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCD module. D7 can be used as a busy flag.
14	Vss	Power Supply (Vss=0)

Contrast Adjust

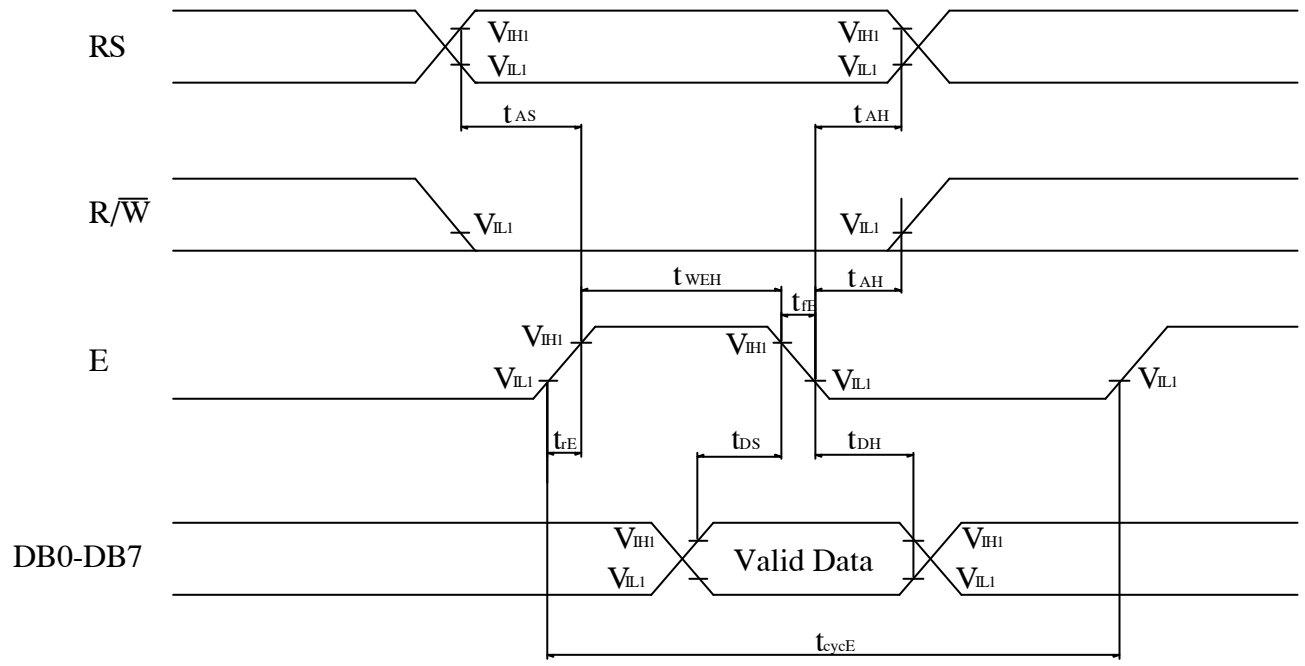


2.3 Timing Characteristics

- Read cycle



- Write cycle



• Read cycle

V_{DD}=5.0V±10%,VSS=0V,Ta=25℃

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Unit
Enable cycle time	t_{cycE}	-	500	-	-	ns
Enable "H" level pulse width	t_{WEH}	-	300	-	-	ns
Enable rise/fall time	t_{rE}, t_{fE}	-	-	-	25	ns
RS,R/W setup time	t_{AS}	-	60[1]	-	-	ns
			100[2]			
RS,R/W address hold time	t_{AH}	-	10	-	-	ns
Read data output delay	t_{RD}	C_L=100pF	-	-	190	ns
Read data hold time	t_{DHR}		20	-	-	ns

• Write cycle

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Unit
Enable cycle time	t_{cycE}	-	500	-	-	ns
Enable "H" level pulse width	t_{WEH}	-	300	-	-	ns
Enable rise/fall time	t_{rE}, t_{fE}	-	-	-	25	ns
RS,R/$\overline{W}$ setup time	t_{AS}	-	60[1]	-	-	ns
			100[2]			
RS,R/$\overline{W}$ address hold time	t_{AH}	-	10	-	-	ns
Data setup time	t_{DS}	-	100	-	-	ns
Write data hold time	t_{DH}	-	10	-	-	ns

Notes: 1: 8-bit operation mode

2: 4-bit operation mode

2.4 Display Command

Instructions	Instruction Code										Description	Execution Time(max) (f_{osc}= 250KHZ)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clear entire display area, restore display from shift, and load address counter with DD RAM address 00H	1.64ms
Display/ Cursor Home	0	0	0	0	0	0	0	0	1	×	Restore display from shift and load address counter with DD RAM address00H	1.64ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Specify direction of cursor movement and display shift mode.This operation takes place after each data transfer(read/write)	40μs
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Specify activation of display (D) cursor (C) and blinking of character at cursor position (B).	40μs
Display/ Cursor Shift	0	0	0	0	0	1	S/C	R/L	×	×	Shift display or move cursor.	40μs
Function Set	0	0	0	0	1	DL	N	F	×	×	Set interface data length (D), number of display line (N), and character font (F).	40μs
RAM Address Set	0	0	0	1	ACG						Load the address counter with a CG RAM address. Subsequent data access is for CG RAM data.	40μs
DD RAM Address Set	0	0	1	ADD							Load the address counter with a DD RAM address. Subsequent data access is for DD RAM data.	40μs
Busy Flag/Address Counter Read	0	1	AC								Read Busy Flag (BF) and contents of Address Counter (AC).	40μs
CG RAM/DD RAM Data Write	1	0	Write data								Write data to CG RAM or DD RAM.	40μs
CG RAM/DD RAM Data Read	1	1	Read data								Read data from CG RAM or DD RAM	40μs

Note 1: Symbol " * " signifies an insignifcant bit (disregards).

Note 2:Correct input value for " N " is predetermined for each model.

2.5 Character Pattern

■ CHARACTER PATTERN(SH/EH,NH)

Specification Revision History

Model No. :PC1602ARS-ENH-A				Total pages : 11	
No.	**Version**	**Page**	**Description**	**Engineer**	**Date**
1	0		Revised Contents	James	2002/05/13