



# Wincom Tech. CO., LTD.

## The LCD(M) Specialist

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FOR MESSRS. : \_\_\_\_\_

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ACCEPTED BY: ..... PROPOSED BY: .....

## RECORD OF REVISION

DATE	PAGE	SUMMARY

### 3. General specifications

#### 3.1 General specifications

PLEASE REFER TO:

“CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (MS-10-10000)”.

#### 3.2 Quality Assurance and Warranty

PLEASE REFER TO:

“QUALITY ASSURANCE MANUL (MS-10-10001)”.

#### 3.3 This individual specification is prior to general specifications

### 4. Features

- \* Display Model: FSTN Positive , Reflective;
- \* Color :     Display dot    : Black;  
                  Back ground : White;  
                  (STN negative with white LED back light is available)
- \* Display Format :   128 x 64 dots;
- \* IC : ST7565BP;
- \* Interface Input Data : 8-bit Parallel 8080 MPU;
- \* Driving Method : 1/65 Duty, 1/9 bias;
- \* Viewing Direction: 6 o'clock;
- \* Back light : No

### 5. Mechanical Specs.

Item	Specification	Unit
Module Size	77.4(W) X 201(H) X 2.8MAX(T)	mm
Viewing Area	70.7(W) X 38.8(H)	mm
Effective Display Area	66.52(W) X 33.24(H)	mm
Number of Dots	128 X 64 Dots	-
Dot Size	0.48(W) X 0.48(H)	mm
Dot Pitch	0.52(W) X 0.52(H)	mm

## 6. Electrical characteristics

Ta = 25°C V<sub>DD</sub> = 5.0 ± 0.25 V

### 6.1 Absolute Max Rating

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	V <sub>DD</sub>	0.3	-	5.0	V
Supply Voltage For LCD Drive	V <sub>0</sub> , V <sub>OUT</sub>	0.3	-	18.0	V
Operating Temp.	T <sub>OP</sub>	-20	-	+70	°C
Storage Temp.	T <sub>ST</sub>	-30	-	+80	°C
Static Electricity	Be sue that you are ground when handing LCM				

### 6.2 Electrical characteristics;

Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic	V <sub>DD</sub> - V <sub>SS</sub>	-	1.8	3.0	3.3	V
Supply Voltage For LCD	V <sub>0</sub> - V <sub>SS</sub>	-	10.1	10.3	10.5	V
Input Voltage	"H" Level	-	0.8V <sub>DD</sub>	-	V <sub>DD</sub>	V
	"L" Level		V <sub>SS</sub>	-	0.2V <sub>DD</sub>	V
Output Voltage	"H" Level	I <sub>OUT</sub> = -0.5mA	0.8V <sub>DD</sub>	-	V <sub>DD</sub>	V
	"L" Level	I <sub>OUT</sub> = 0.5mA	V <sub>SS</sub>	-	0.2V <sub>DD</sub>	V
Current Consumption	I <sub>DD</sub>	V <sub>IN</sub> = V <sub>DD</sub>	-	0.41	1.0	mA

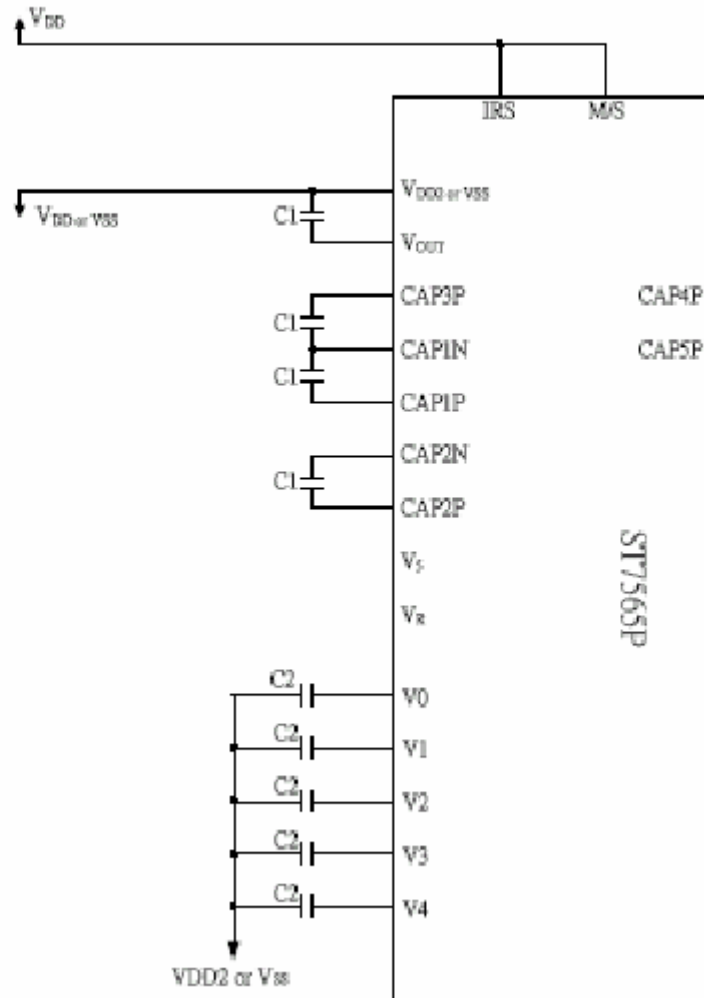
NOTE: 1) Duty ratio=1/64, Bias=1/9  
2) Measured in Dots ON-state

## 7. Power supply and block diagram

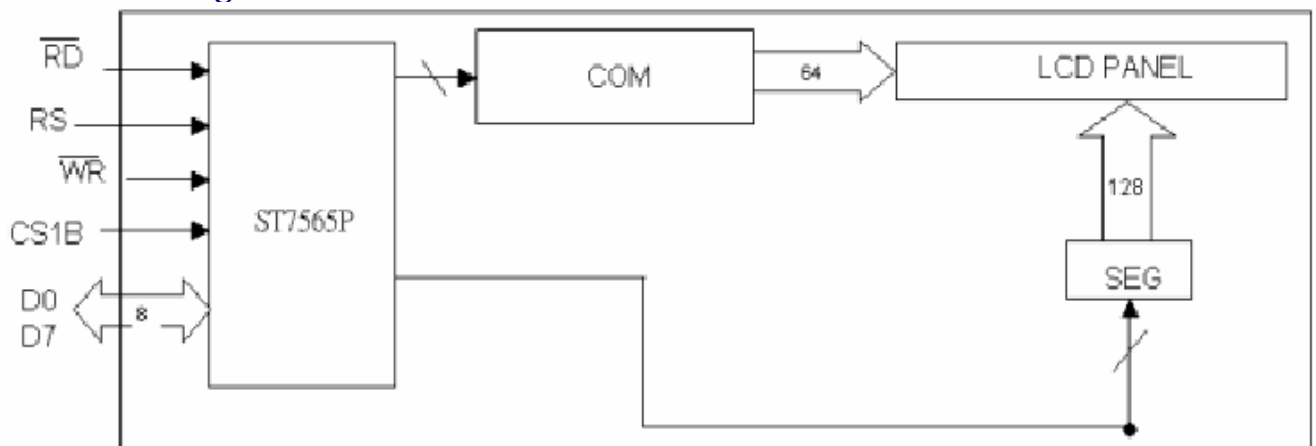
### 7.1 Power supply

(1) When the voltage regulator internal resistor is used.

(Example where  $V_{DD2} = V_{DD}$ , with 4x step-up)



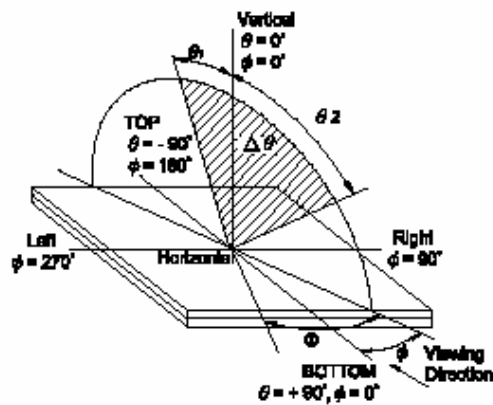
### 7.2 Block Diagram



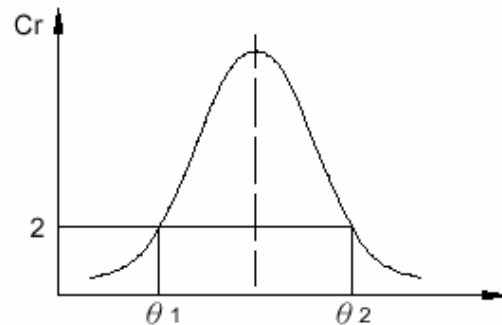
## 8. Electro – Optical Characteristics

Item	Symbol	Temp.	Min.	Typ.	Max.	Unit	Conditions	Note
Viewing Angle	$ \theta_2 - \theta_1 $	25°C	30	112	-	Deg.	-	1,2
	$\Phi$		60	118	-			
Contrast Ratio	Cr	25°C	2	4.25	10.78	-	$\theta = 0^\circ$ $\Phi = 0^\circ$	3
Response Time(rise)	Tr	25°C	-	49	250	ms	$\theta = 0^\circ$ $\Phi = 0^\circ$	4
		0°C	-	950	1150			
Response Time(fall)	Tf	25°C	-	134	250	ms	$\theta = 0^\circ$ $\Phi = 0^\circ$	4
		0°C	-	950	1150			

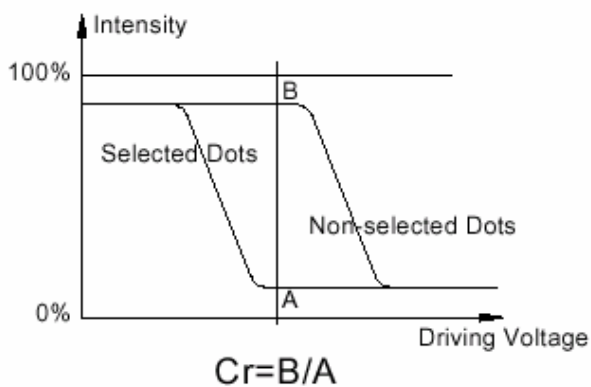
Note1 . Definition of Angle  $\theta$  &  $\Phi$



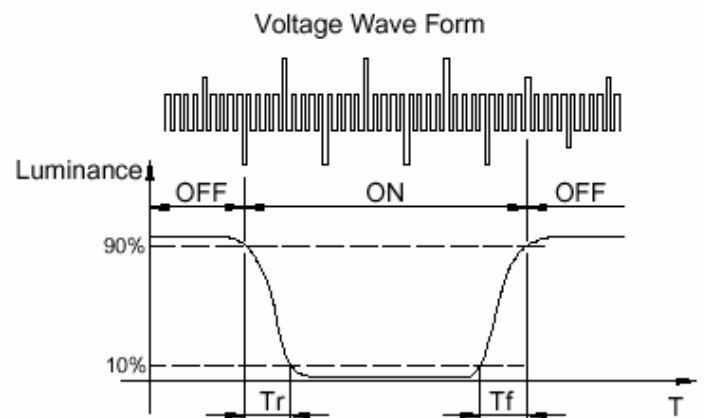
Note2. Definition of Viewing Angle  $\theta_1$  &  $\theta_2$



Note3 . Definition of Contrast Cr



Note4. Definition of Optical Response



### 9.Interface Pin Assignment

Pin NO.	Symbol	I / O	Functions
1	/CS1	I	This is the chip select signal.
2	/RES	I	When RES is set to "L", the setting are initialized.
3	A0	I	This is connect to the least significant bit of the Norman MPU address bus, and it determines whether the <u>data</u> bits are data or a command.
4	/WR	I	The data bus are latched at the rising edge of the WR signal
5	/RD	I	The data bus is in output status when this signal is "L"
6~13	D0~ D7	I/O	This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus.
14	V <sub>DD</sub>	Power supply	Power supply
15	V <sub>SS</sub>	Power supply	Ground
16	V <sub>OUT</sub>	O	DC/DC voltage converter. Connect a capacitor between this terminal and v <sub>ss</sub> or VDD
17	CAP3P	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
18	CAP1N	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1P terminal.
19	CAP1P	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
20	CAP2P	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2N terminal.
21	CAP2N	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2P terminal.
22~26	V4~ V0	Power supply	This is a multi-level power supply for the liquid crystal drive.

## 10. Command List

**Table 16: Table of ST7565 Commands**

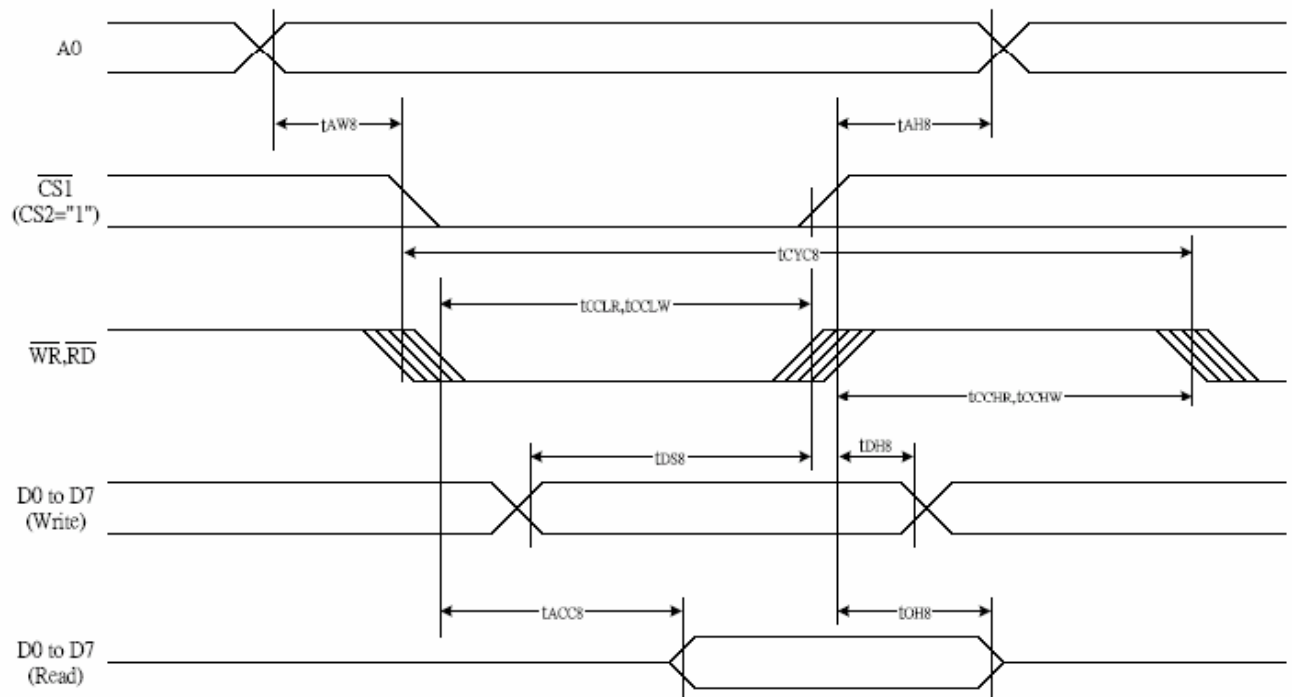
Command	Command Code										Function	
	A0	$\overline{RD}$	$\overline{WR}$	D7	D6	D5	D4	D3	D2	D1		D0
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	Display start address						Sets the display RAM display start line address
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address. Sets the least significant 4 bits of the display RAM column address.
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address				
(5) Status read	0	0	1	Status			0	0	0	0	0	Reads the status data
(6) Display data write	1	1	0	Write data							Writes to the display RAM	
(7) Display data read	1	0	1	Read data							Reads from the display RAM	
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	Sets the LCD display normal/reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565)
(12) Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0	*	*	*	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode		Select internal power supply operating mode	
(17) V5 voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio		Select internal resistor ratio(Rb/Ra) mode	
(18) Electronic volume mode set Electronic volume register set	0	1	0	1	0	0	0	0	0	0	1	Set the V5 output voltage electronic volume register
(19) Static indicator ON/OFF Static indicator register set	0	1	0	1	0	1	0	1	1	0	0	0: OFF, 1: ON Set the flashing mode
(20) Power saver												Display OFF and display all points ON compound command
(21) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(22) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

(Note) \*: disabled data



## 11. Timing Character

### 8080 Series MPU



(V<sub>DD</sub> = 3.3V, T<sub>a</sub> = 25°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	t <sub>AH8</sub>		0	—	Ns
Address setup time		t <sub>AW8</sub>		0	—	
System cycle time		t <sub>CYC8</sub>		240	—	
Enable L pulse width (WRITE)	WR	t <sub>OCLW</sub>		80	—	
Enable H pulse width (WRITE)		t <sub>OCHW</sub>		80	—	
Enable L pulse width (READ)	RD	t <sub>OCLR</sub>		140	—	
Enable H pulse width (READ)		t <sub>OCHR</sub>		80	—	
WRITE Data setup time	D0 to D7	t <sub>DS8</sub>		40	—	
WRITE Address hold time		t <sub>DH8</sub>		0	—	
READ access time		t <sub>ACC8</sub>	CL = 100 pF	—	70	
READ Output disable time		t <sub>OH8</sub>	CL = 100 pF	5	50	

