Wincom Tech. CO., LTD.

The LCD(M) Specialist

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PART NO. : COG12864F

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 , Transflective;
* Color : Display dot : Black;
  Back ground : White;

* Display Format : 128 x 64 dots with Icons;
* IC : NT 7532H;
* Interface Input Data : 8-bit Parallel;
* Driving Method : 1/65 Duty, 1/9 bias;
* Viewing Direction: 6 o'clock;
* Back light : NA

5. Mechanical Specs.

Item	Specification	Unit
Module Size	38.3(W) x 50.0(H) x 2.1MAX(T)	mm
Viewing Area	33.8(W) x 22.2(H)	mm
Effective Display Area	30.705(W) x 19.185(H)	mm
Number of Dots	128 X 64 Dots	-
Dot Size	0.225(W) x 0.285(H)	mm
Dot Pitch	0.24(W) x 0.30(H)	mm

6. Electrical characteristics

6.1 Absolute Max Rating

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	V_{DD}-Vss	-0.3	-	+3.6	V
Supply Voltage For LCD Drive	V_0	-0.3	-	+13.5	V
Input Voltage	V_{IN}	-0.3	-	V_{DD}+0.3	V
Operating Temp.	T_{OP}	-20	-	+70	°C
Storage Temp.	T_{ST}	-30	-	+80	°C

6.2 Electrical characteristics;

Item		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage		V_{DD} – Vss	-	2.5	3.0	3.5	V
LCD Drive Voltage (Recommended Voltage)		V_0 – Vss	-	8.3	8.8	9.3	V
Input Voltage	"H" Level	V_{IH}	-	0.8V_{DD}	-	V_{DD}	V
	"L" Level	V_{IL}		VSS	-	0.2V_{DD}	V
Output Voltage	"H" Level	V_{OH}	I_{OH}=-0.5mA I_{OL}=0.5mA	0.8V_{DD}	-	V_{DD}	V
	"L" Level	V_{OL}		V_{DD}	-	0.2 V_{DD}	V
Current Consumption		I_{DD}	-	-	0.51	1.0	mA

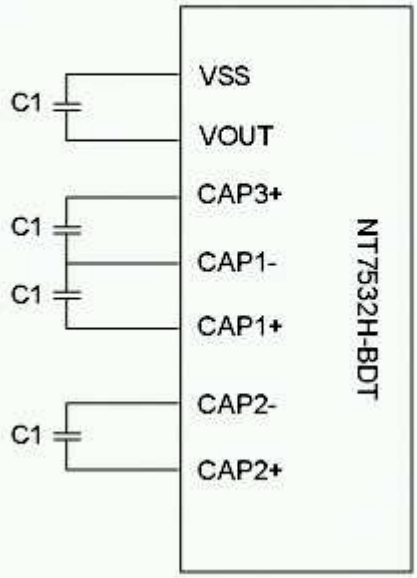
NOTE: 1) Duty Ratio=1/65, Bias Ratio=1/9

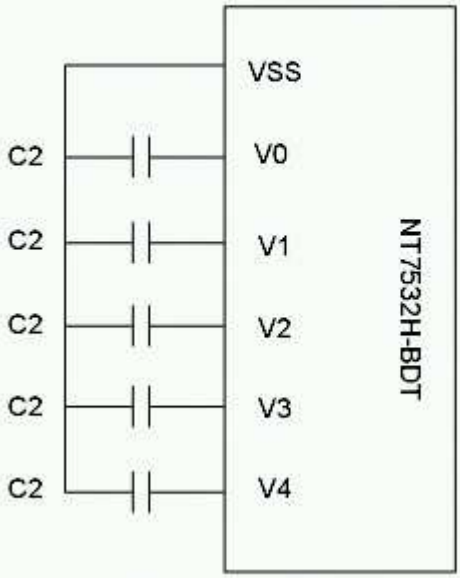
2) Measuring in Dots ON-state

7. Power supply and block diagram

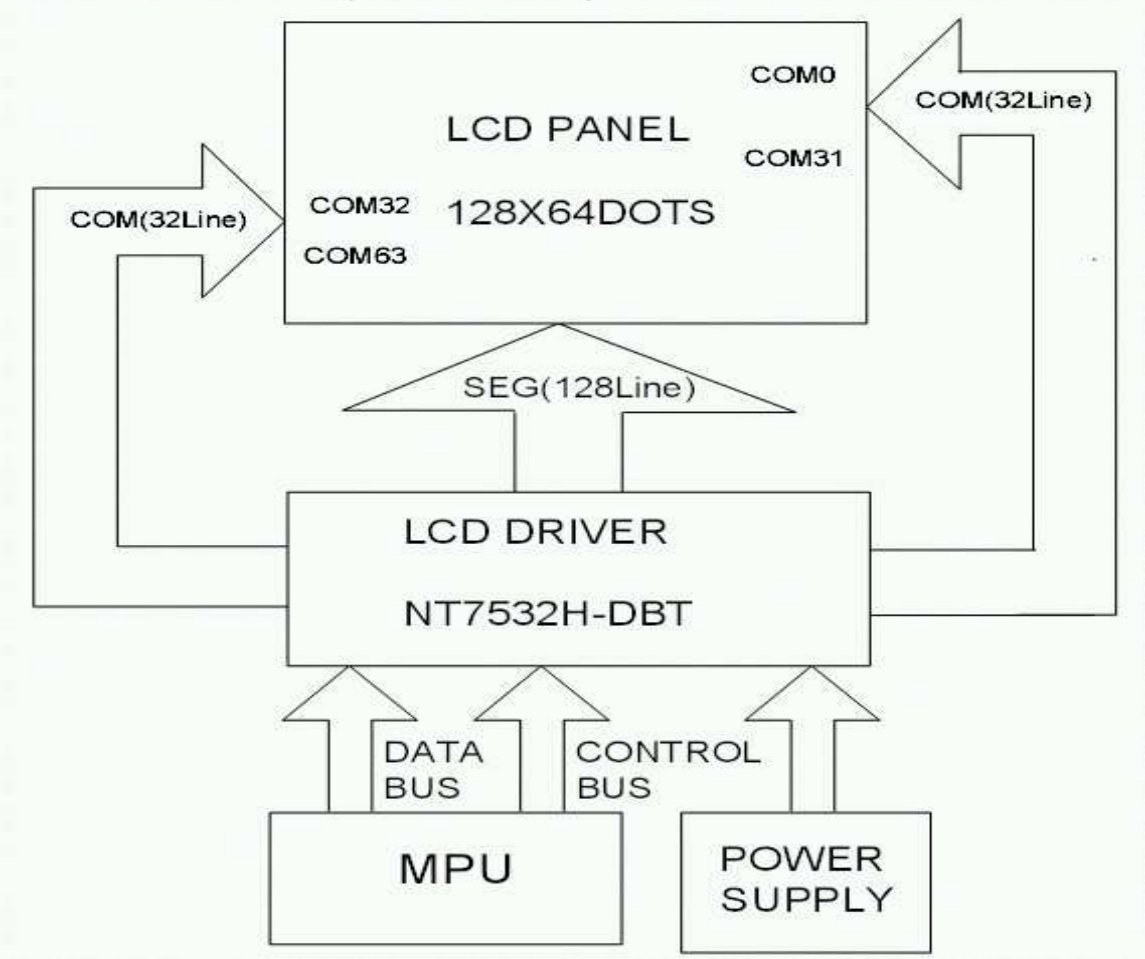
7.1 Power supply

Connect capacitor C1 between CAP1+ and CAP1-, between CAP2+ and CAP2-, between CAP1+ and CAP3-, and between VSS and VOUT , to produce a voltage level in the positive direction at the VOUT terminal that is 4 times the voltage level between VDD and VSS





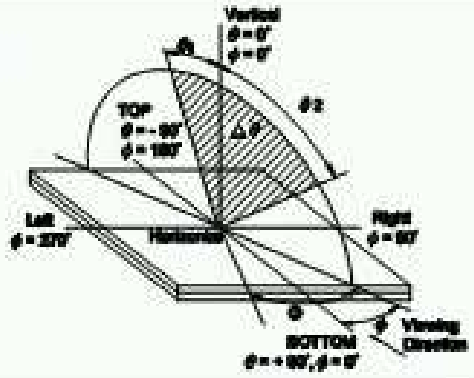
Note:C1=1.0~4.7 μ F,C2=0.47~1.0 μ F



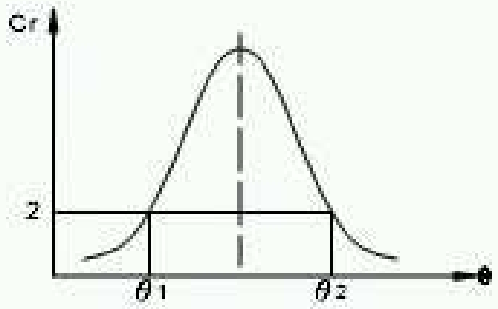
8. Electro – Optical Characteristics

Item	Symbol	Temp.	Min.	Typ.	Max.	Unit	Conditions	Note
Viewing Angle	$\frac{\lvert\theta 2-\theta 1\rvert}{\Phi}$	25℃	30	118	-	Deg.	-	1,2
			60	120	-			
Contrast Ratio	Cr	25℃	-	6.54	6.70	-	θ=0° Φ=0°	3
Response Time(rise)	Tr	25℃	-	96	250	ms	θ=0° Φ=0°	4
		0℃	-	950	1150			
Response Time(fall)	Tf	25℃	-	198	250	ms	θ=0° Φ=0°	4
		0℃	-	950	1150			

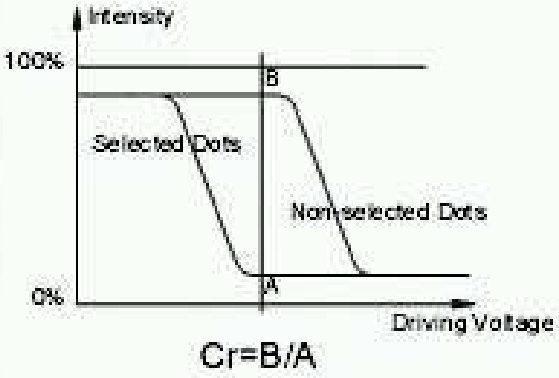
Note1 . Definition of Angle θ&Φ



Note2. Definition of Viewing Angle θ_1&θ_2

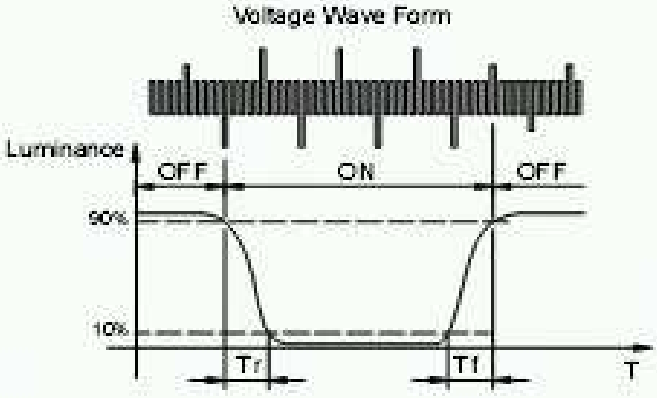


Note3 . Definition of Contrast Cr



Cr=B/A

Note4. Definition of Optical Response



9.Interface Pin Assignment

Pin NO.	Symbol	I / O	Functions
1	VDD	I	Power Supply for Logic
2	C86	I	H: 6800 MPU L: 8080 MPU
3	VSS	I	Power Supply (GND)
4~8	V0~V4	Supply	Power Supply for LCD
9	CAP2-	O	DC/DC voltage converter Capacitors I/O
10	CAP2+		
11	CAP1+		
12	CAP1-		
13	CAP3+		
14	VOUT		
15	VSS	I	Power Supply (GND)
16~23	D7~D0	I/O	8-Bit data bus lines
24	/RD	I	Read signal for 8080 MPU
25	/WR	I	Write signal for 8080 MPU
26	A0	I	Data/Command select
27	/RES	I	Reset signal
28	/CS1	I	Chip select (active low)

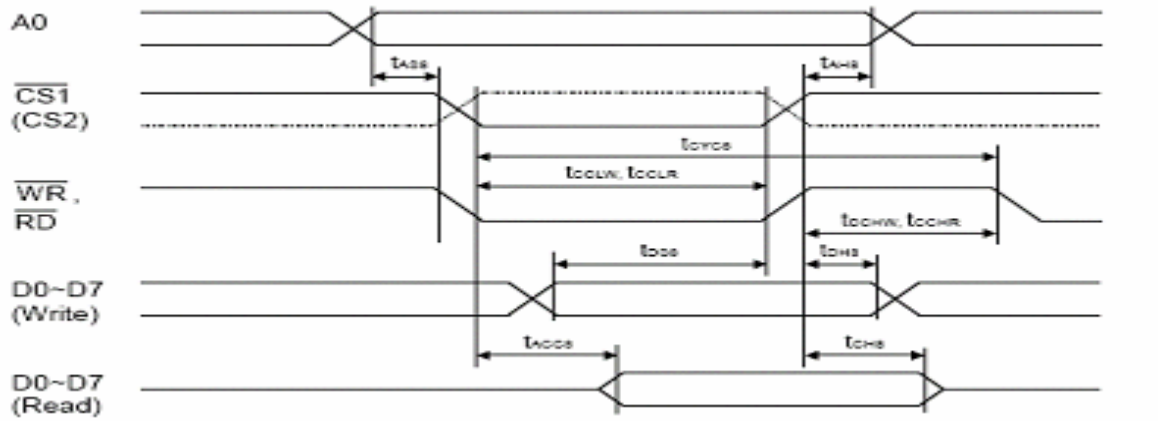
10.Command

Command	A0	RD	WR	Code								Hex	Function
				D7	D6	D5	D4	D3	D2	D1	D0		
(1) Display OFF	0	1	0	1	0	1	0	1	1	1	0 1	AEh AFh	Turn on LCD panel when goes high, and turn off when goes low
(2) Set Display Start Line	0	1	0	0	1	Display Start Address						40h to 7Fh	Specifies RAM display line for COM0
(3) Set Page Address	0	1	0	1	0	1	1	Page Address				B0h to BFh	Set the display data RAM page in Page Address register
(4) Set Column Address	0	1	0	0	0	0	1	Higher Column Address				00h to 1Fh	Set 4 higher bits and 4 lower bits of column address of display data RAM in register
	0	1	0	0	0	0	0	Lower Column Address					
(5) Read Status	0	0	1	Status				0	0	0	0	XX	Reads the status information
(6) Write Display Data	1	1	0	Write Data								XX	Write data in display data RAM
(7) Read Display Data	1	0	1	Read Data								XX	Read data from display data RAM
(8) ADC Select	0	1	0	1	0	1	0	0	0	0	0 1	A0h A1h	Set the display data RAM address SEG output correspondence
(9) Normal/Reverse Display	0	1	0	1	0	1	0	0	1	1	0 1	A6h A7h	Normal indication when low, but full indication when high
(10)Entire Display ON/OFF	0	1	0	1	0	1	0	0	1	0	0 1	A4h A5h	Selects normal display (0) or entire display on
(11)Set LCD Bias	0	1	0	1	0	1	0	0	0	1	0 1	A2h A3h	Sets LCD driving voltage bias ratio
(12)Read-Modify-Write	0	1	0	1	1	1	0	0	0	0	0	E0h	Increments column address counter during each write
(13)End	0	1	0	1	1	1	0	1	1	1	0	EEh	Releases the Read-Modify-Write
(14)Reset	0	1	0	1	1	1	0	0	0	1	0	E2h	Resets internal functions
(15)Common Output Mode Select	0	1	0	1	1	0	0	0 1	*	*	*	C0h to CFh	Selects COM output scan direction *: invalid data
(16)Set Power Control	0	1	0	0	0	1	0	1	Operation Status			28h to 2Fh	Selects the power circuit operation mode
(17)V0 Voltage Regulator Internal Resistor ratio Set	0	1	0	0	0	1	0	0	Resistor Ratio			20h to 27h	Selects internal resistor ratio Rb/Ra mode
(18)Electronic Volume mode Set	0	1	0	1	0	0	0	0	0	0	1	81h	
Electronic Volume Register Set	0	1	0	*	*	Electronic Control Value						XX	Sets the V0 output voltage electronic volume register
(19)Set Static indicator ON/OFF	0	1	0	0	0	1	0	1	0	1	0 1	ACh ADh	Sets static indicator ON/OFF 0: OFF, 1: ON
Set Static Indicator Register	0	1	0	*	*	*	*	*	*	Mode		XX	Sets the flash mode
(20)Power Save	0	1	0	-	-	-	-	-	-	-	-	-	Compound command of Display OFF and Entire Display ON
(21)NOP	0	1	0	1	1	1	0	0	0	1	1	E3h	Command for non-operation
(22)Test Command	0	1	0	1	1	1	1	*	*	*	*	F1h to FFh	IC test command. Do not use!
(23)Test Mode Reset	0	1	0	1	1	1	1	0	0	0	0	F0h	Command of test mode reset

Note: Do not use any other command, or system malfunction may result.

11. Timing Character

8080 series

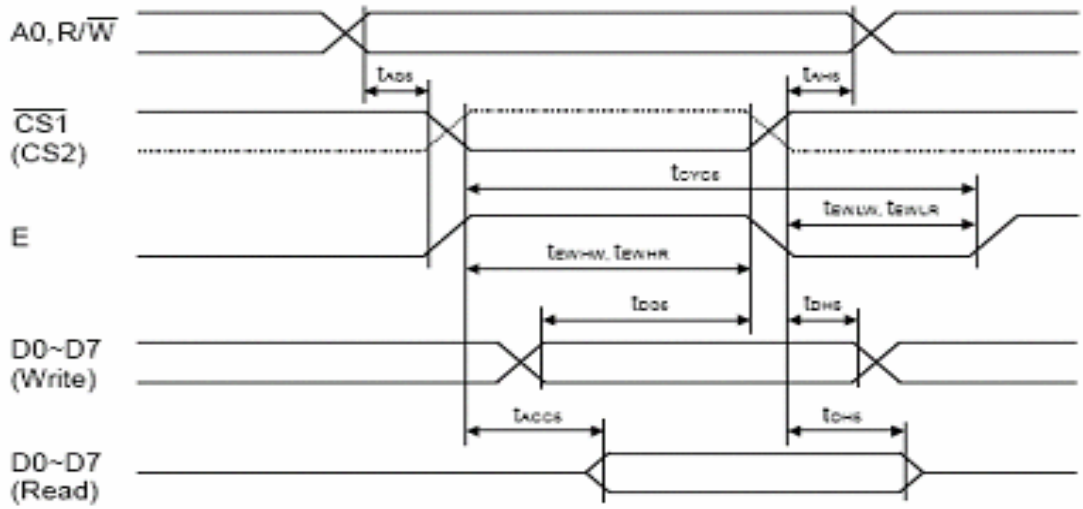


(VDD = 2.7 ~ 3.3V, Ta = -40 ~ +85°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
t_{AH8}	Address hold time	0	-	-	ns	A0
t_{AS8}	Address setup time	0	-	-	ns	
t_{CYC8}	System cycle time	300	-	-	ns	
t_{CCLW}	Control low pulse width (write)	90	-	-	ns	$\overline{WR}$
t_{CCLR}	Control low pulse width (read)	120	-	-	ns	$\overline{RD}$
t_{CCHW}	Control high pulse width (write)	120	-	-	ns	$\overline{WR}$
t_{CCHR}	Control high pulse width (read)	60	-	-	ns	$\overline{RD}$
t_{DS8}	Data setup time	40	-	-	ns	D0~D7
t_{DH8}	Data hold time	15	-	-	ns	
t_{ACC8}	$\overline{RD}$ access time	-	-	140	ns	D0~D7, CL = 100pF
t_{CH8}	Output disable time	10	-	100	ns	

*1. The input signal rise time and fall time (t_r, t_f) is specified at 15ns or less.
($t_r + t_f$) < (t_{CYC8} - t_{CCLW} - t_{CCHW}) for write, ($t_r + t_f$) < (t_{CYC8} - t_{CCLR} - t_{CCHR}) for read.
*2. All timing is specified using 20% and 80% of VDD as the reference.
*3. t_{CCLW} and t_{CCLR} are specified as the overlap interval when $\overline{CS1}$ is low (CS2 is high) and $\overline{WR}$ or $\overline{RD}$ is low.

68000 Series



(VDD = 2.7 ~ 3.3V, Ta = -40 ~ +85°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
t_{AHS}	Address hold time	0	-	-	ns	A0
t_{ASS}	Address setup time	0	-	-	ns	
t_{CYCS}	System cycle time	300	-	-	ns	
t_{EWHW}	Control low pulse width (write)	90	-	-	ns	$\overline{WR}$
t_{EWHR}	Control low pulse width (read)	120	-	-	ns	$\overline{RD}$
t_{EWLW}	Control high pulse width (write)	120	-	-	ns	$\overline{WR}$
t_{EWLR}	Control high pulse width (read)	60	-	-	ns	$\overline{RD}$
t_{DSS}	Data setup time	40	-	-	ns	D0~D7
t_{DHS}	Data hold time	15	-	-	ns	
t_{ACCS}	$\overline{RD}$ access time	-	-	140	ns	D0~D7, CL = 100pF
t_{OHS}	Output disable time	10	-	100	ns	

*1. The input signal rise time and fall time (t_r, t_f) is specified at 15ns or less.
($t_r + t_f$) < (t_{CYCS} - t_{EWLW} - t_{EWHW}) for write, ($t_r + t_f$) < (t_{CYCS} - t_{EWLR} - t_{EWHR}) for read.
*2. All timing is specified using 20% and 80% of VDD as the reference.
*3. t_{EWLW} and t_{EWLR} are specified as the overlap interval when $\overline{CS1}$ is low (CS2 is high) and E is high.

12.Mechanical Drawing

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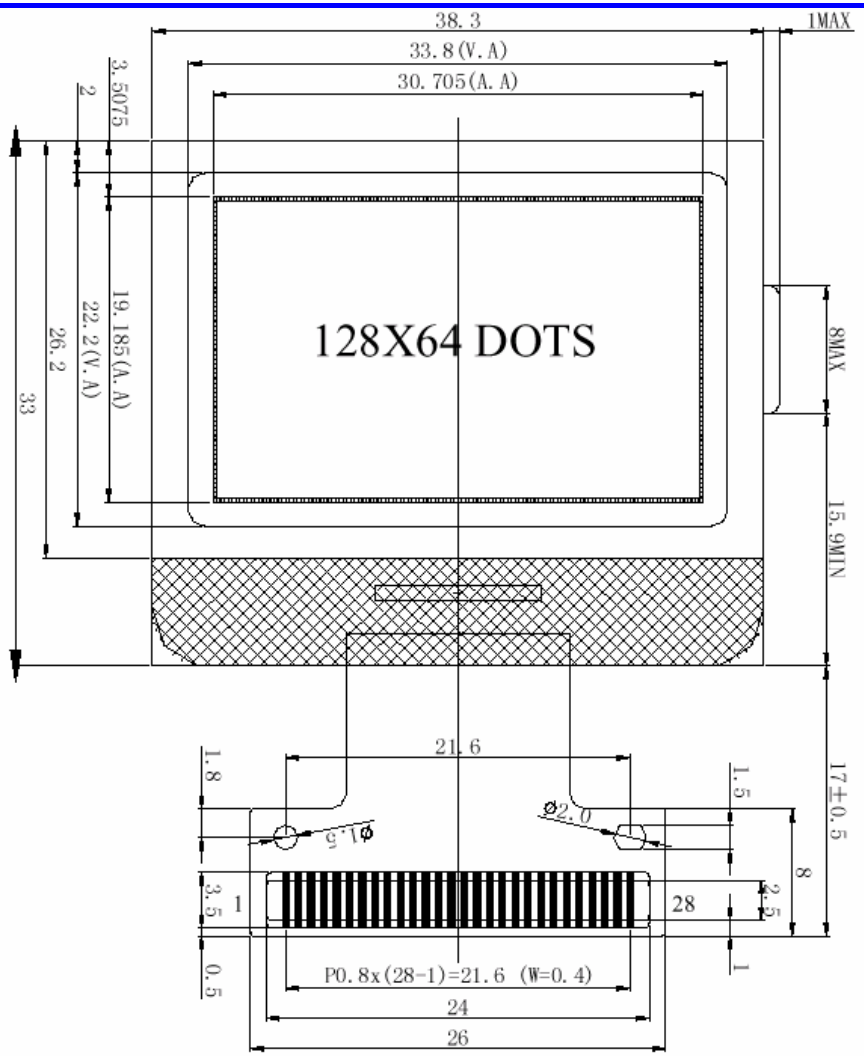
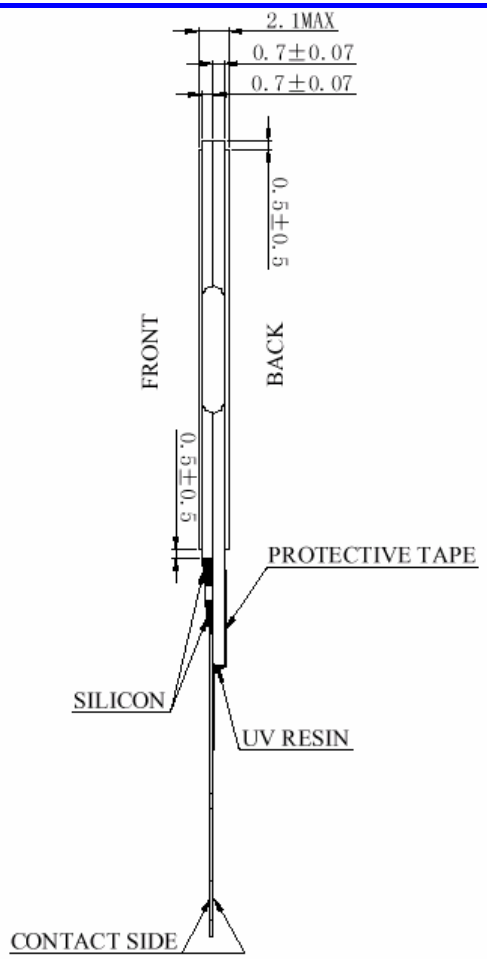
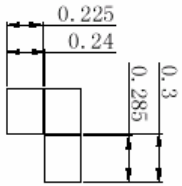
COG12864F





PIN FUNCTION:

NO	SYMBOL	NO	SYMBOL
1	VDD	15	VSS
2	C86	16	D7
3	VSS	17	D6
4	V0	18	D5
5	V4	19	D4
6	V3	20	D3
7	V2	21	D2
8	V1	22	D1
9	CP2-	23	D0
10	CP2+	24	/RD
11	CP1+	25	/WR
12	CP1-	26	A0
13	CP3+	27	/RES
14	VOUT	28	/CS1



DOTS DETAIL
SCALE:10X

NOTES:
1.DISPLAY TYPE:FSTN
2.VIEWING DIRECTION:6 O'CLOCK
3.POLARIZER MODE:TRANSFLECTIVE/POSITIVE
4.DRIVE METHOD:1/65 DUTY 1/9BIAS
5.LCD DRIVE VOLTAGE:8.8V
6.LOGIC POWER SUPPLY VOLTAGE:3V
7.OPREATING TEMP:-20°C~+70°C
8.STORAGE TEMP:-30°C~+80°C
9.DRIVER IC:NT7532H-BDT
10.CONNECTION TYPE:COG