

User's Guide

GXM12864D-SNCW

Liquid Crystal Display Module

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CHAPTER 1

Introduction to GXM12864D-SNCW LCM

GXM12864D-SNCW is a dot matrix graphic LCD module that is fabricated by low power COMS technology. It can display 128*64 dots size LCD panel using a 128*64 bit-mapped Display Data RAM (DDRAM). It interfaces with an 8-bit microprocessor.

Features

- Display format: 128*64 dots matrix graphic
- STN blue mode
- Easy interface with 8-bit MPU
- CCFL back-light
- Viewing angle: 6 O'clock
- Driving method : 1/64 duty , 1/9 bias
- LCD driver IC: KS0108B(2 ↑)、KS0107B(1 ↑)
- Connector: Zebra

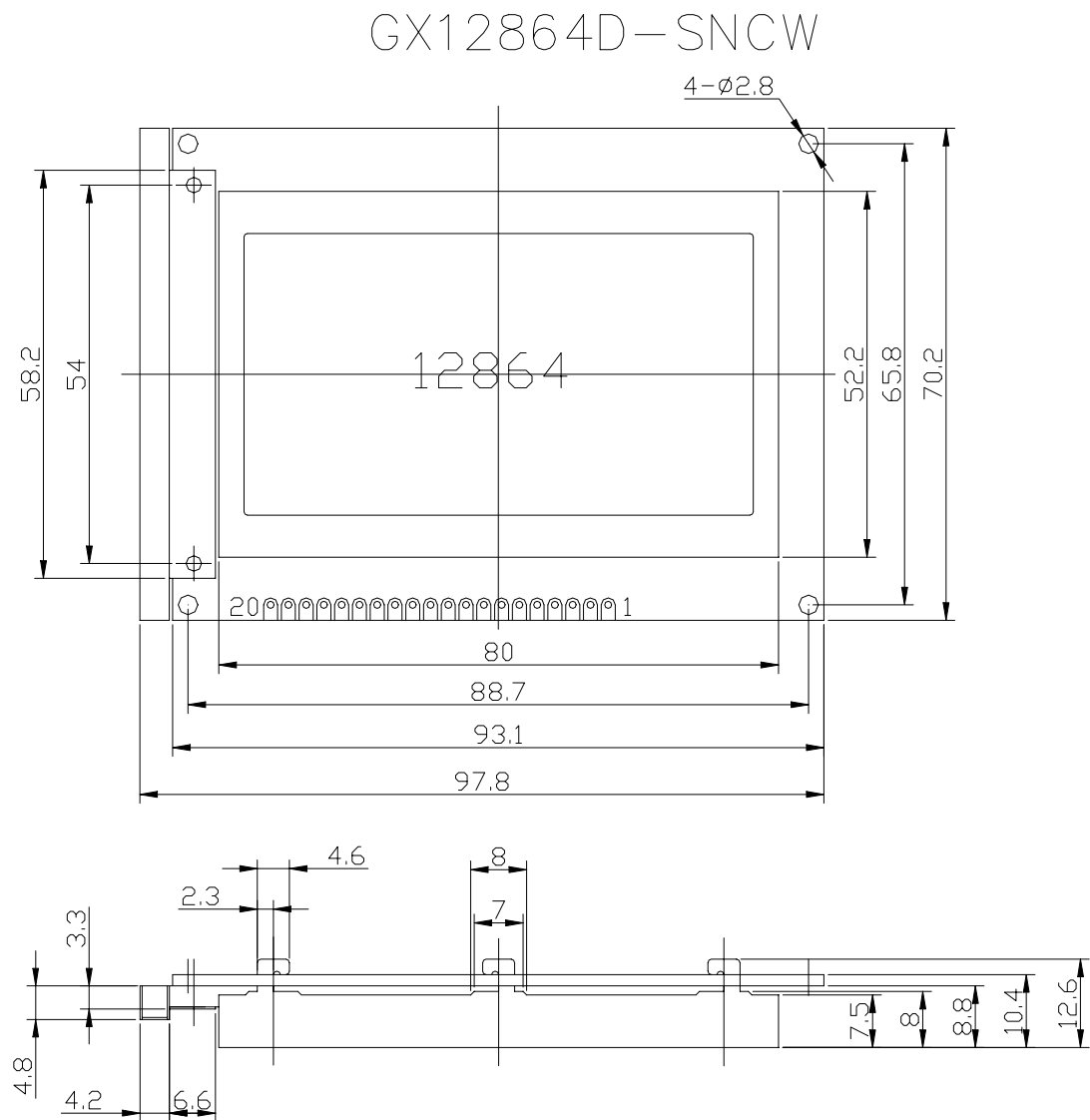
Mechanical Specifications

Item	Dimension	Unit
Module Size(W*H*T)	97.8*70.2*12.6	mm
Viewing Area(W*H)	72.0*40.0	mm
Number of Dots	128.0*64.0	PCS
Dot Size(W*H)	0.48*0.48	mm
Dot Pitch(W*H)	0.52*0.52	mm

Temperature Characteristics

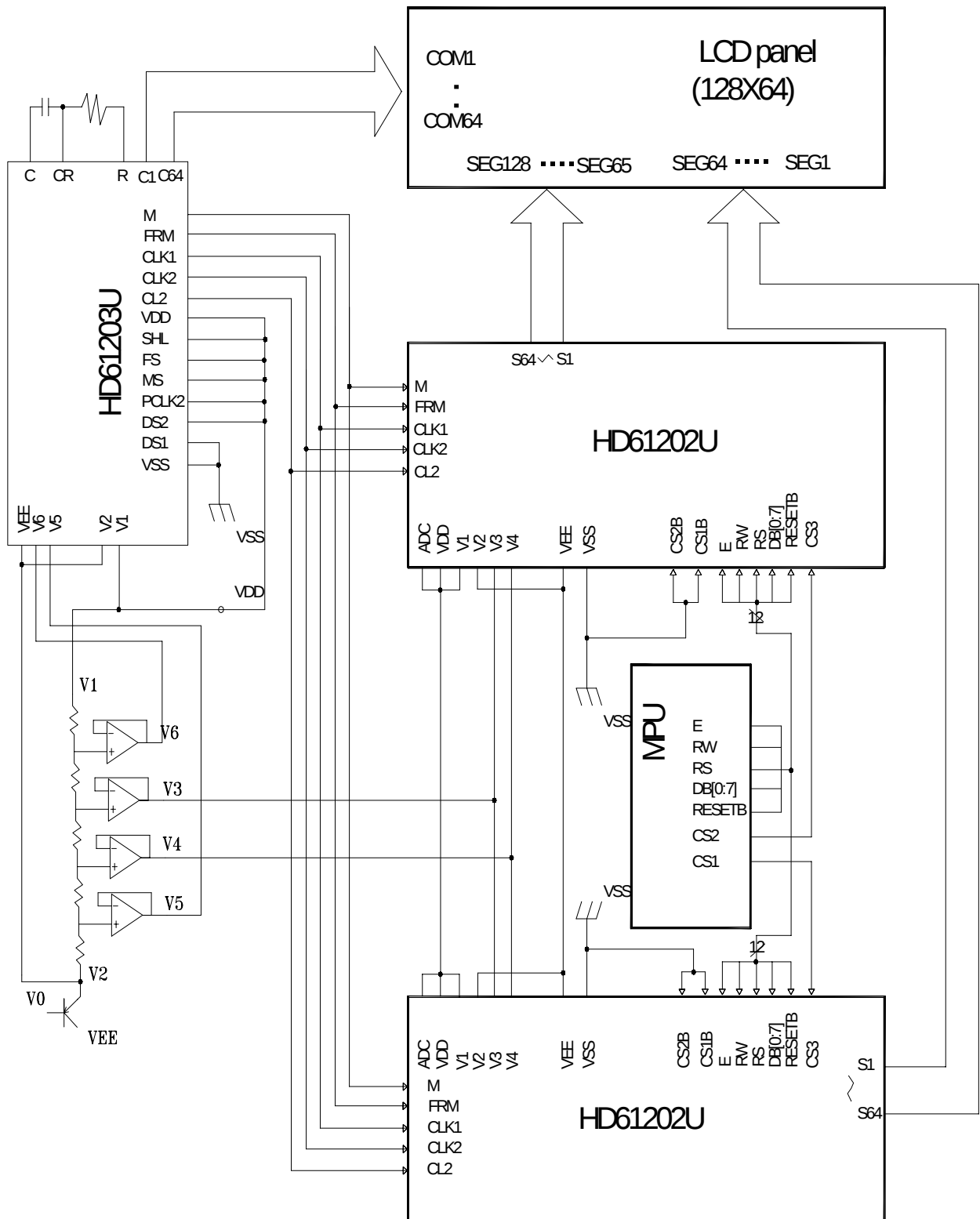
Parameter	Symbol	Rating	Unit
Operating temperature	Topr	-20~+70	
Storage temperature	Tstg	-30~+75	

Figure 1. External Dimensions



PIN	1	2	3	4	5	6	7	8	9	10
SIGNAL	VSS	VDD	V0	D/I	R/W	E	DB0	DB1	DB2	DB3
PIN	11	12	13	14	15	16	17	18	19	20
SIGNAL	DB4	DB5	DB6	DB7	CS1	CS2	RES	VEE	NC	NC

Figure 2. Application Diagram



***Note**

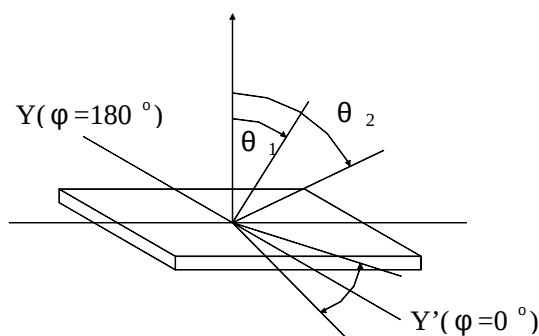
1/64 duty, 1/9 bias
 $V_{DD} \geq V1 \geq V2 \geq V3 \geq V4 \geq V5 \geq V_{EE}$

Electro-Optical characteristics

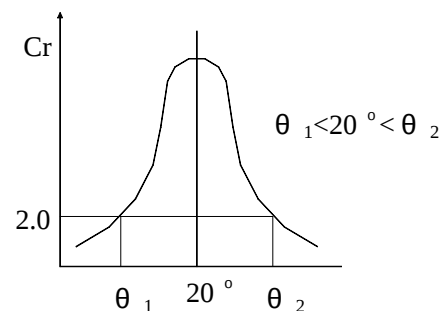
STN Type (Super Twisted Nematic)

Item	Symbol	Min.	Typ.	Max.	Unit	Condition	Note
Viewing Angle	$\frac{\theta_2 - \theta_1}{\varphi}$	70 -90	-	+90	deg.	Cr = 2.0	1,2
Contrast Ratio	Cr	-	4	-	-	$\theta = 20^\circ$ $\varphi = 0^\circ$	3
Response Time (rise)	t_R	-	110	-	ms	$\theta = 20^\circ$ $\varphi = 0^\circ$	4
Response Time (fall)	t_F	-	110	-	ms	$\theta = 20^\circ$ $\varphi = 0^\circ$	4

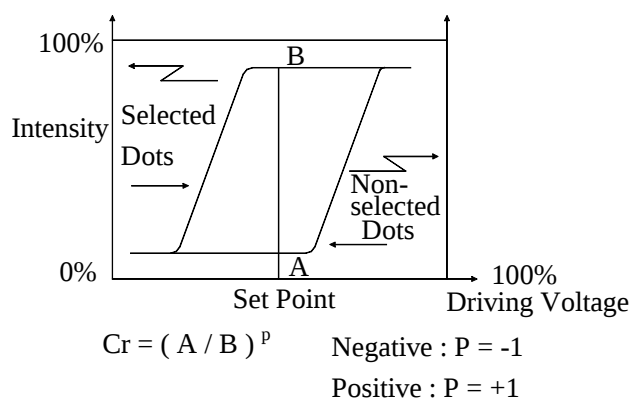
1. Definition of angle θ & φ



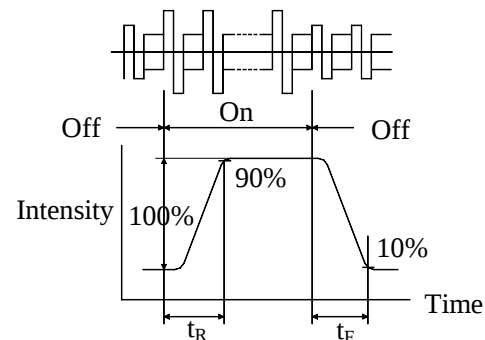
2. Definition of viewing angle θ_1 & φ_2



3. Definition of contrast Cr



4. Definition of optical response

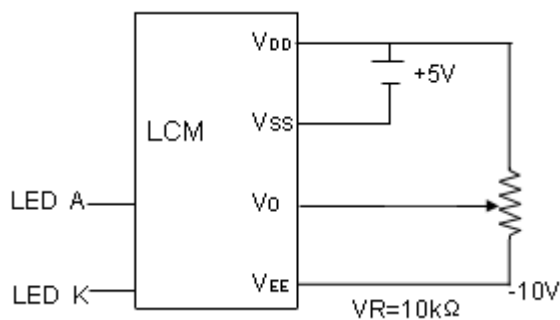


Interface Pin Connections

Pin No.	Symbol	I/O Type	Description
1	VSS	Supply	Ground (0V)
2	VDD	Supply	Power supply (5V)
3	V0	Supply	Power supply for LCD drive
4	D/I	H/L	H → Data L → Instruction
5	R/W	H/L	H → Data Read (LCD → MPU)

L → Data Write (LCD ← MPU)			
6	E	H,H/L	Enable signal
7	DB0	H/L	Data bus line
8	DB1		
9	DB2		
10	DB3		
11	DB4		
12	DB5		
13	DB6		
14	DB7		
15	CS1	H	Chip selection
16	CS2		When CS1=H, select IC1 When CS2=H, select IC2
17	/RET	L	IC function Reset, Active LOW
18	VEE	Power	Negative Voltage for LCD
19	NC		
20	NC		

Power supply



Electrical Absolute Maximum Ratings

Item	Symbol	Limit	Unit	Notes
Power supply voltage(1)	Vcc	-0.3 to +7.0	V	2
Power supply voltage(2)	Vee	Vcc – 17.0 to Vcc +0.3	V	5
Terminal voltage (1)	Vt1	-0.3 to Vcc +0.3	V	2,3
Terminal voltage (2)	Vt2	Vee – 0.3 to Vcc +0.3	V	4,5
Operating temperature	Topr	-20 to +70		
Storage temperature	Tstg	-30 to +80		

- Notes:**
- IF LSIs are used beyond absolute maximum ratings ,they may be premanently Destroyed . We strongly recommend you to use the LSI within electrical characteristic limits for normal operation,because use beyond these conditions will cause malfunction and poor reliability.
 - Based on GND = 0V.
 - Applies to input terminals (except V1L , V1R , V2L , V2R , V5L , V5R , V6L , and I/O

Terminals at high impedance.

4. Applies to V1L , V1R , V2L , V2R , V5L , V5R , V6L and V6R .
5. Apply the same value of voltages to V1L and V1R , V2L and V2R , V5L and V5R , V6L and V6R , Vee (23pin)and Vee (58 pin)respectively.

Maintain $V_{CC} \geq V1L = V1R \geq V6L = V6R \geq V5L = V5R \geq V2L = V2R \geq V$

DC Electrical Characteristics

($V_{CC} = 2.7$ to $5.5V$, $GND = 0V$, $V_{CC} - V_{EE} = 8.0$ to $16.0V$, $T_a = -30$ to $+75$)

Test Item	Symbol	Min	Typ	Max	Unit	Test conditions	Note
Input high voltage	V_{IH}	$0.7 \times V_{CC}$	-	V_{CC}	V		1
Input low voltage	V_{IL}	GND	-	$0.3 \times V_{CC}$	V		1
Output high voltage	V_{OH}	$V_{CC} - 0.4$	-	-	V	$I_{OH} = -0.4mA$	2
Output low Voltage	V_{OL}	-	-	0.4	V	$I_{OL} = 0.4mA$	2
VI-XJ on resistance	R_{ON}	-	-	1.5	k Ω	$V_{CC} - V_{EE} = 10V$ Load current $\pm 150\mu A$	13
Input leakage current	I_{IL1}	-1.0	-	1.0	μA	$V_{IN} = 0$ to V_{CC}	3
Input leakage current	I_{IL2}	-2.0	-	2.0	μA	$V_{IN} = V_{EE}$ to V_{CC}	4
Operating frequency	fopr1	50	-	600	kHz	Im master mode external clock operation	5
Operating frequency	fopr2	0.5	-	1500	kHz	In slave mode shift register	6
Oscillation frequency	fosc	315	450	585	kHz	$C_f = 20pF \pm 5\%$ $C_f = 39 k\Omega \pm 2\%$	7,12
Dissipation current(1)	I_{GG1}	-	-	1.0	mA	In master mode 1/128 duty cycle $C_f = 20Pf$ $R_f = 39 k\Omega$	8,9
Dissipation current(2)	I_{GG2}	-	-	200	μA	In slave mode 1/128 duty cycle	8,10
Dissipation current	I_{EE}	-	-	100	μA	In master mode 1/128 duty cycle	8,11

Notes:

1. Applies to input terminals FS , DS1 , DS2 , CR , SHL , M/S , and FCS and I/O terminals DL , M , DR , and CL2 in the input state.
2. Applies to output terminals , Ø1, Ø2,and FRM and I/O common terminals DL , M , DR , and CL2 in the output status.
3. Applies to input terminals FS , DS1 , DS2, CR , STB/ , SHL, M/S, FCS , CL1 , and TH , I/O terminals DL , M , DR ,and CL2 in the input state and NC terminals.
4. Applies to V1L , V1R, V2L , V2R, V5L, V5R , V6L , and V6R. Donnot connect any lines to $\times 1$ to $\times 64$.
5. External clock is as follows.

$$\text{Duty cycle} = TH \div (TH + TL) \times 100\%$$

	Min	Typ	Max	Unit
Duty cycle	45	50	55	%
Trcp	-	-	50	ns
Trcp	-	-	50	ns

6. Applies to the shift register in the slave mode .For details ,refer to AC characteristics.
7. Connect oscillation resistor(R_f)and oscillation capacitance(C_f) as shown in this figure.

- Oscillation frequency(f_{osc}) is twice as much as the frequency ($f_{\emptyset}$) at $\emptyset 1$ or twice $\emptyset 2$.
8. NO lines are connected to output terminals and current flowing through the input circuit is excluded. This value is specified at $V_{IH} = V_{CC}$ and $V_{IL} = GND$.
 9. This value is specified for current flowing through GND in the following conditions: Internal Oscillation circuit is used. Each terminal of DS1, DS2, FS, SHL, M/S, STB/, and FCS is connected to V_{CC} and each of CL1 and TH to GND, Oscillator is set as /described in note 7.
 10. This value is specified for current flowing through GND under the following conditions: Each terminal of DS1, DS2, FS, SHL, STB/, FCS and CR is connected to V_{CC} , CL1, TH, and M/S to GND and the terminals CL2, M, and CR is connected to V_{CC} , CL1, TH, and M/S to GND and the terminals CL2, M, and DL are respectively connected to terminals CL2, M, and DL of the HD1203U under the condition described in note 9.
 11. This value is specified for current flowing through V_{EE} under the condition described in note 9. Do not connect any lines to terminal V.
 12. This figure shows a typical relation among oscillation frequency, R_f and C_f . Oscillation frequency may vary with the mounting conditions.
 13. Resistance between terminal X and terminal V (one of V1L, V1R, V2L, V2R, V5L, V5R, V6L, and V6R) when load current flows through one of the terminals $\times 1$ to $\times 64$. This value is specified under the following conditions:

$$V_{CC} - V_{EE} = 10\text{ V}$$

$$V_{1L} = V_{1R}, V_{6L} = V_{6R} = V_{CC} - 1/7(V_{CC} - V_{EE})$$

$$V_{2L} = V_{2R}, V_{5L} = V_{5R} = V_{EE} + 1/7(V_{CC} - V_{EE})$$
 The following is a description of the range of power supply voltage for liquid crystal display drive. Apply positive voltage to $V_{1L} = V_{1R}$ and $V_{6L} = V_{6R}$ and negative voltage to $V_{2L} = V_{2R}$ and $V_{5L} = V_{5R}$ within the ΔV range. This range allows stable impedance on driver output (RON). Notice that ΔV depends on power supply voltage $V_{CC} - V_{EE}$.
 14. Specified at +75 for die products

CHAPTER 2

Driver IC Function Description

- 1 [KS0107B Driver IC](#)
64COM graphic driver for dot matrix LCD
- 2 [KS0108B Driver IC](#)
64SEG graphic driver for dot matrix LCD

CHAPTER 3

[DC-AC Inverter CXA-L10A](#)