

XP160128C

LCD MODULE USER MANUAL

1. FUNCTIONS & FEATURES

Features

- Dot Matrix: 160×128 Dots
- LCD Mode: STN
- Controller IC: T6963C or Equivalent
- Driving Method: 1/128 Duty; 1/12 Bias
- Viewing Angle: 6 O'clock direction
- 8080 serial 8-Bit MPU Interface
- Backlight: LED
- Operating Temperature Range: -20 to 70°C;
- Storage Temperature Range : -30 to 80°C;

Note: Color tone is slightly changed by temperature and driving voltage.

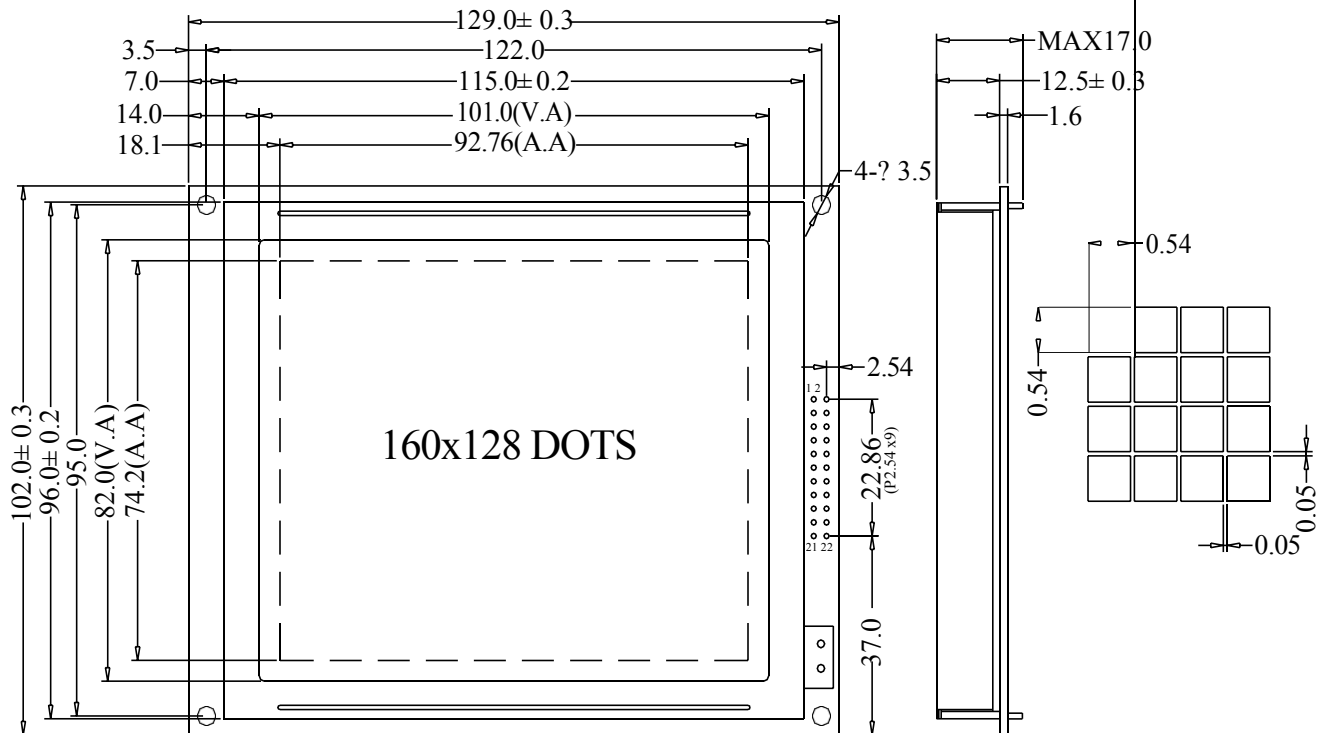
2. MECHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
Module Size	129.0L×102.0W×17.0 (max) H	mm

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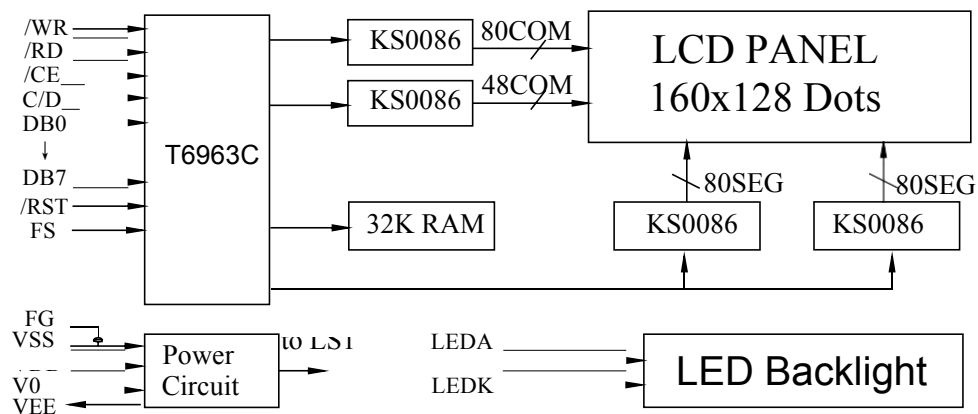
View Area	101.0×82.0	mm
Effective Area	160×128	dots
Dot Size	0.54×0.54	mm
Dot Pitch	0.59×0.59	mm

3. EXTERNAL DIMENSIONS

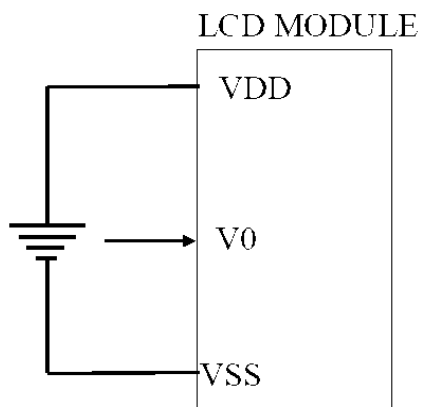


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4. BLOCK DIAGRAM



5. POWER SUPPLY



6. PIN DESCRIPTION

ITEM	SYMBOL	LEVEL	FUNCTION
1	F.G	0V	Frame Ground
2	VSS	0V	Power Ground
3	VDD	5.0V	Power Supply For Logic
4	V0	—	Contrast Adjust
5	Vout	—	Negative Power output For LCD Driving
6	/WR	L	Write Signal
7	/RD	L	Read Signal

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8	/CE	L	Chip Select Signal
9	C/D	H/L	H: Data L: Command
10	HALT	H/L	H: Normal display L: Stop oscillation of clock
11	/RST	L	Reset Signal
12 ~ 19	DB0 ~ DB7	H/L	Data Bus
20	NC/BLA	—	No Connection/ Or used as LED Backlight anode
21	LEDA/NC	5.0V	Power Supply For LED Backlight/ Or left open
22	LEDK/NC	0V	

7. MAXIMUM ABSOLUTE LIMIT (T=25°C)

Items	Symbol	Standard Value	Unit
Supply Voltage	Vdd	-0.3~6.0	V
Input Voltage	Vin	Vss~Vdd	V
Operating Temperature	Top	-20~70	°C
Storage Temperature	Tst	-30~80	°C

Note: Voltage greater than above may damage the module.
All voltages are specified relative to VSS=0V.

8. ELECTRICAL CHARACTERISTICS

8.1 DC Characteristics (VDD=+5V, VSS=0V, Ta=-0~+50° C)

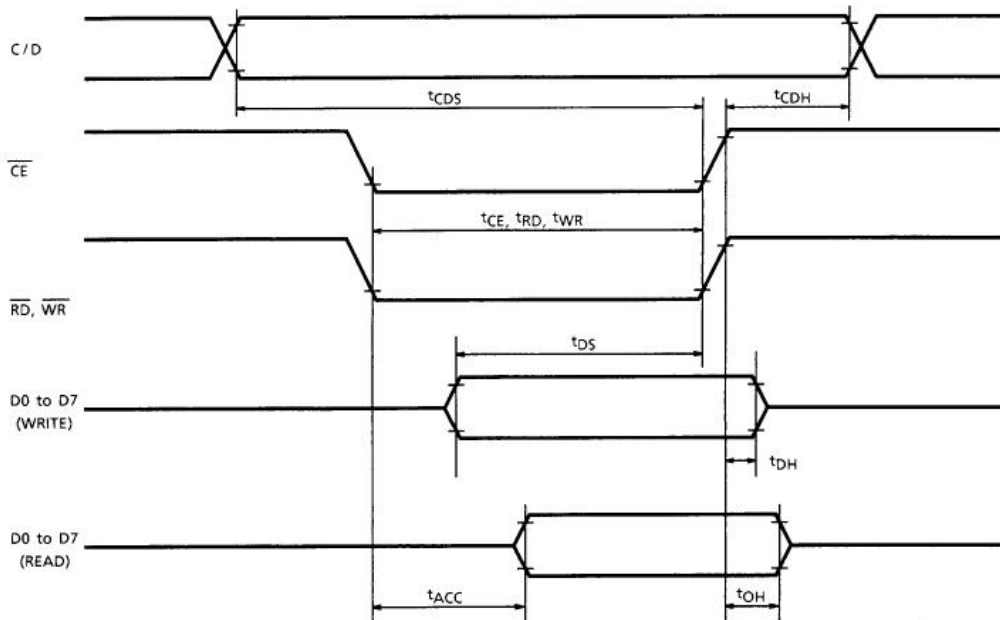
Items	Symbol	Min	TYP	Max	Unit	Condition
Operating Voltage	Vdd	4.8	5.0	5.2	V	Vdd
Supply Current	Idd	—	8	15	mA	except LED backlight
Input High Voltage	Vin	Vdd -2.2	—	Vdd	V	RS,RW,E,DB0-DB7
Input Low Voltage	Vil	0	—	0.8	V	
Output High Voltage	Voh	Vdd -0.3	—	Vdd	V	Ioh=-0.1mA,DB0-DB7
Output Low Voltage	Vol	—	—	0.3	V	Iol=0.1mA,DB0-DB7
LCD Driving Voltage	Vlcd	15.2	15.5	15.8	V	Vdd-V0

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8.2 AC Characteristics (VDD=+5V, VSS=0V, T_{Ta}=-20~75°)

Items	Symbol	Min	Max	Unit
C/D set-up time	t _{CDS}	100	—	nS
C/D hold time	t _{CDH}	10	—	nS
/CE, /RD, /WR pulse width	t _{CE} , t _{RD} , t _{WR}	80	—	nS
Data set-up time	t _{DS}	80	—	nS
Data hold time	t _{DH}	40	—	nS
Access time	t _{ACC}	—	150	nS
Output hold time	t _{OH}	10	50	nS

MPU write timing

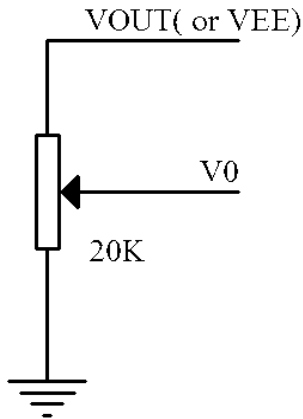


9. FUNCTION SPECIFICATIONS

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9.1. Adjusting The LCD Display Contrast

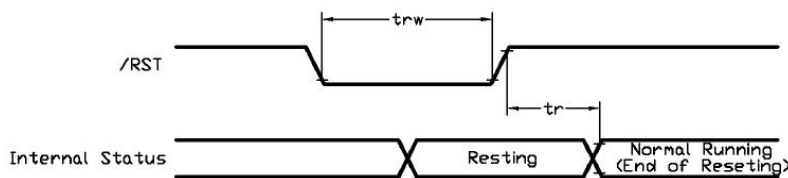
A Variable-Resistor must be connected to the LCD module for providing a reference to V0. The recommended value of the Variable-Resistor is 20K to 50K.



9.2. Resetting The LCD Module

The LCD module should be initialized by using /RST terminal. When turning on the power supply maintain /RST terminal at low level. After the power supply stabilized, released the reset terminal. (/RST=H)

Items	Symbol	Min	TYP	Max	Unit
Reset time	t_r	—	—	100	uS
Reset low pulse width	t_{rw}	100	—	—	uS



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9.3. Display Control Instructions

Command		WR	RD	C/D	Code (8bit)	Note
Registers Setting	Set Cursor Pointer	0	1	0	<i>X Address</i>	
		0	1	0	<i>Y Address</i>	
		0	1	1	0010 0001	
	Set Offset Register	0	1	0	<i>DATA</i>	
		0	1	0	0000 0000	
		0	1	1	0010 0010	
	Set Address Pointer	0	1	0	<i>Low Address</i>	
		0	1	0	<i>High Address</i>	
		0	1	1	0010 0100	
Set Control Word	Set Text Home Address	0	1	0	<i>Low Address</i>	
		0	1	0	<i>High Address</i>	
		0	1	1	0100 0000	
	Set Text Area	0	1	0	<i>Columns</i>	
		0	1	0	0000 0000	
		0	1	1	0100 0001	
	Set Graphic Home Address	0	1	0	<i>Low Address</i>	
		0	1	0	<i>High Address</i>	
		0	1	1	0100 0010	
Set Graphic Area	0	1	0	<i>Columns</i>		
	0	1	0	0000 0000		
	0	1	1	0100 0011		
Mode Set	OR mode	0	1	1	1000 x000	
	EXOR mode	0	1	1	1000 x001	
	AND mode	0	1	1	1000 x011	
	Text Attribute mode	0	1	1	1000 x100	
	Internal CG ROM mode	0	1	1	1000 0xxx	
	External CG RAM mode	0	1	1	1000 1xxx	

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Mode Set	OR mode	0	1	1	1000 x000	
	EXOR mode	0	1	1	1000 x001	
	AND mode	0	1	1	1000 x011	
	Text Attribute mode	0	1	1	1000 x100	
	Internal CG ROM mode	0	1	1	1000 0xxx	
	External CG RAM mode	0	1	1	1000 1xxx	
Display Mode	Display off	0	1	1	1001 0000	D3: Graphic Display on D2: Text Display on D1: Cursor Display on D0: Cursor Blink on
	Cursor on, Blink off	0	1	1	1001 xx10	
	Cursor on, Blink on	0	1	1	1001 xx11	
	Text on, Graphic off	0	1	1	1001 01xx	
	Text off, Graphic on	0	1	1	1001 10xx	
	Text on, Graphic on	0	1	1	1001 11xx	
Cursor Pattern Select	1-line cursor	0	1	1	1010 0000	
	2-line cursor	0	1	1	1010 0001	
	3-line cursor	0	1	1	1010 0010	
	4-line cursor	0	1	1	1010 0011	
	5-line cursor	0	1	1	1010 0100	
	6-line cursor	0	1	1	1010 0101	
	7-line cursor	0	1	1	1010 0110	
	8-line cursor	0	1	1	1010 0111	
Data Auto Read/Write	Set Data Auto Write	0	1	1	1011 0000	
	Set Data Auto Read	0	1	1	1011 0001	
	Auto Reset	0	1	1	1011 0010	
Data Read/Write	Data Write Increment ADP	0	1	0	<i>Data</i>	
		0	1	1	1100 0000	
	Data Read Increment ADP	0	1	1	1100 0001	
		1	0	0	<i>Data</i>	
	Data Write Decrement ADP	0	1	0	<i>Data</i>	
		0	1	1	1100 0010	
	Data Read Decrement ADP	0	1	1	1100 0011	
		1	0	0	<i>Data</i>	
	Data Write Non-variable ADP	0	1	0	<i>Data</i>	
		0	1	1	1100 0100	
	Data Read Non-variable ADP	0	1	1	1100 0101	
		1	0	0	<i>Data</i>	

Display Control Instructions(continue)

Command		/WR	/RD	C/D	Code (8bit)	Note
Screen Peek/Copy	Screen Peek	0	1	1	1110 0000	Not use
	Screen Copy	0	1	1	1110 1000	Not use
Bit Set/Reset	Bit Reset	0	1	1	1111 0xxx	D3: Set/Clear bit D2,D1,D0: bit no.
	Bit Set	0	1	1	1111 1xxx	
	Bit 0 (LSB)	0	1	1	1111 x000	
	Bit 1	0	1	1	1111 x001	
	Bit 2	0	1	1	1111 x010	
	Bit 3	0	1	1	1111 x011	
	Bit 4	0	1	1	1111 x100	
	Bit 5	0	1	1	1111 x101	
	Bit 6	0	1	1	1111 x110	
Bit 7 (MSB)	0	1	1	1111 x111		
Status Check	Check the status	1	0	1	<i>Status</i>	D0: Command execution ready D1: Data read/write ready D2: Auto mode data read ready D3: Auto mode data write ready D4: not used D5: Controller operation normal D6: Error Flag D7: Normal display

Note:

When sending commands or data, status check must be performed. Otherwise, T6963C can't operate normally, even after a delay time.

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For the details of the commands and T6963C operate please refer to T6963C datasheet.

10.DESIGN AND HANDING PRECAUTION

- 10.1. The LCD panel is made by glass. Any mechanical shock (eg. Dropping form high place) will damage the LCD module. Do not add excessive force on the surface of the display, which may cause the Display color change abnormally.
- 10.2. The polarizer on the LCD is easily get scratched. If possible, do not remove the LCD protective film until the last step of installation.
- 10.3. Never attempt to disassemble or rework the LCD module.
- 10.4. Only Clean the LCD with Isopropyl Alcohol or Ethyl Alcohol. Other solvents (eg. water) may damage the LCD.
- 10.5. When mounting the LCD module, make sure that it is free form twisting, warping and distortion.
- 10.6. Ensure to provide enough space(with cushion) between case and LCD panel to prevent external force adding on it, or it may cause damage to the LCD or degrade the display result
- 10.7. Only hold the LCD module by its side. Never hold LCD module by add force on the heat seal or TAB.
- 10.8. Never add force to component of the LCD module. It may cause invisible damage or degrade of the reliability.
- 10.9. LCD module could be easily damaged by static electricity. Be careful to maintain an optimum anti-static work environment to protect the LCD module.
- 10.10. When peeling of the protective film form LCD, static charge may cause abnormal display pattern. It is normal and will resume to normal in a short while.
- 10.11. Take care and prevent get hurt by the LCD panel edge.
- 10.12. Never operate the LCD module exceed the absolute maximum ratings.
- 10.13. Keep the signal line as short as possible to prevent noisy signal applying to LCD module.
- 10.14. Never apply signal to the LCD module without power supply.
- 10.15. IC chip (eg. TAB or COG) is sensitive to the light. Strong lighting environment could possibly cause malfunction. Light sealing structure casing is recommend.
- 10.16. LCD module reliability may be reduced by temperature shock.
- 10.17. When storing the LCD module, avoid exposure to the direct sunlight, high humidity, high temperature or low temperature. They may damage or degrade the LCD module