



US Micro Products
Electronic Products for the OEM

LCD PRODUCT SPECIFICATION

PART NUMBER:	USMPG-TQ240128B-TZWFH
DESCRIPTION:	240x128 Graphic LCD; FSTN Display Mode; Transflective, Positive with White LED Sidelight and 6 O'Clock Viewing Direction.

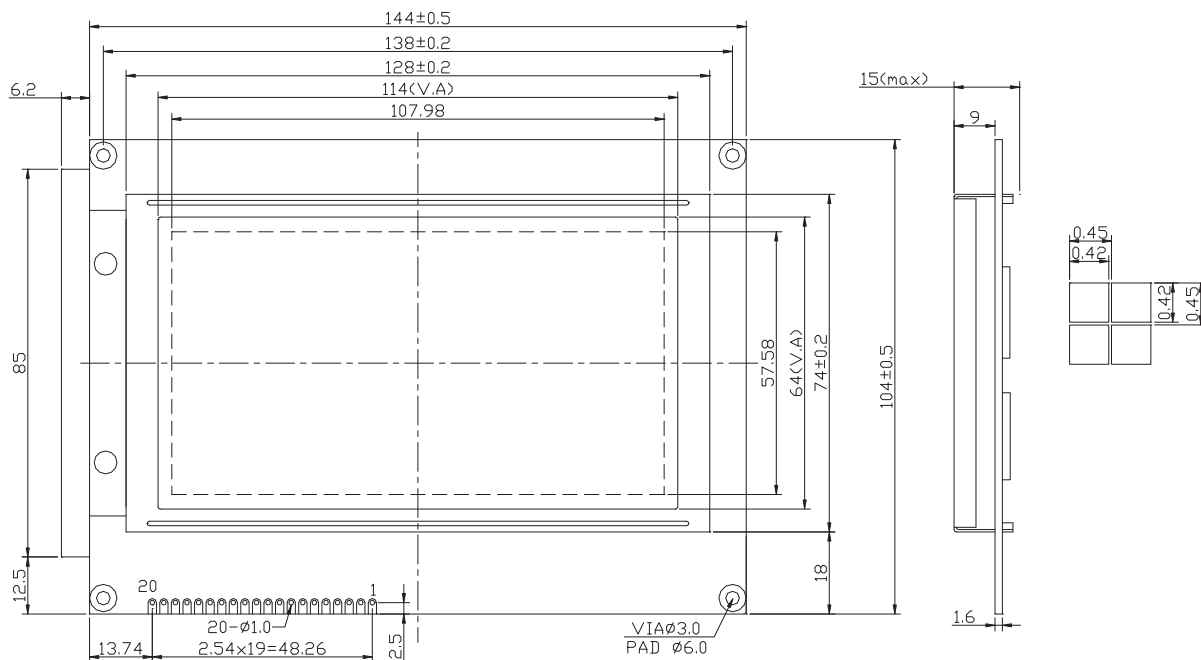
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SPECIFICATIONS OF LCD MODULE

1. Features

- a) 240x128 dots graphic LCD module
- b) Built-in controller T6963C or equivalence
- c) Easy interface with 4-bit and 8-bit MPU
- d) +5V power supply, 1/128 duty cycle
- e) FSTN LCD, transfective mode, positive display
- f) 6:00 O'clock viewing direction.
- g) White LED side backlight
- h) Build-in DC/DC negative voltage

2. Outline dimension

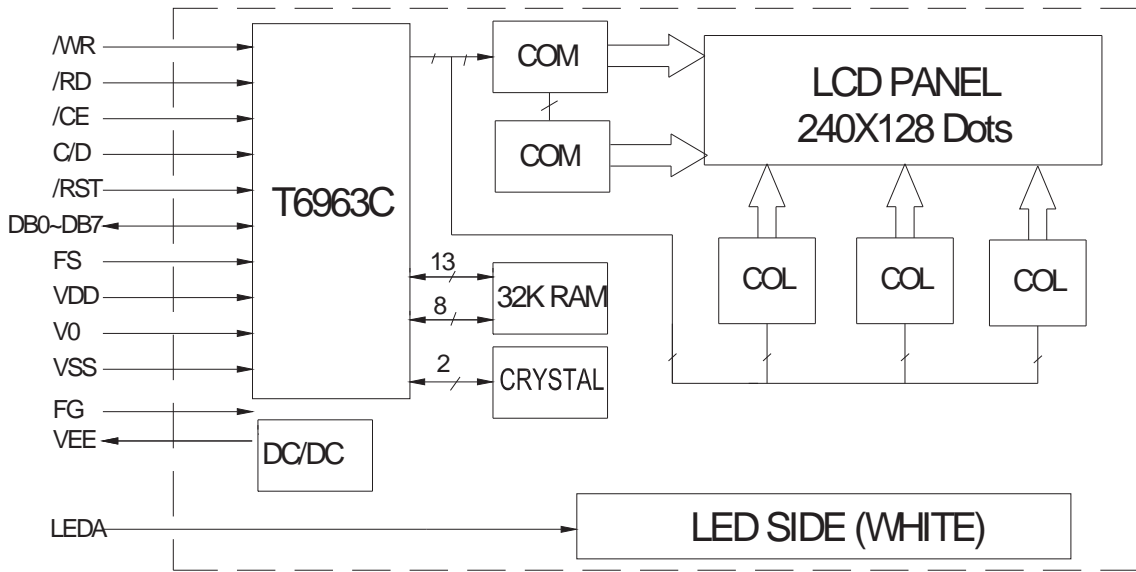


3. Absolute maximum ratings

Item	Symbol	Standard			Unit
Power voltage	$V_{DD}-V_{SS}$	0	-	7.0	V
Input voltage	V_{IN}	V_{SS}	-	V_{DD}	
Operating temperature range	T_{OP}	-20	-	+70	°C
Storage temperature range	T_{ST}	-30	-	+80	

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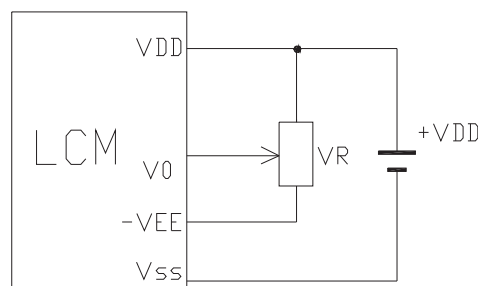
4. Block diagram



5. Interface pin description

Pin No.	Symbol	External connection	Function
1	V _{SS}	Power supply	Signal ground for LCM (GND)
2	V _{DD}		Power supply for logic (+5V) for LCM
3	V ₀		Operating voltage for LCD
4	C/D	MPU	H: Instruction L: Data
5	/RD	MPU	Read enable signal
6	/WR	MPU	Write enable signal
7~14	DB0~DB7	MPU	Data bus line
15	/CE	MPU	Chip enable signal
16	/RST	MPU	Reset signal
17	V _{EE}		Negative voltage output
18	MD2		Selection of number of columns:H-32,L-40
19	FS	MPU	Font selection: H=6x8 dot matrix, L=8x8 dot matrix
20	LED A	BKL power supply	Power supply for BKL (+5V)

Contrast adjust

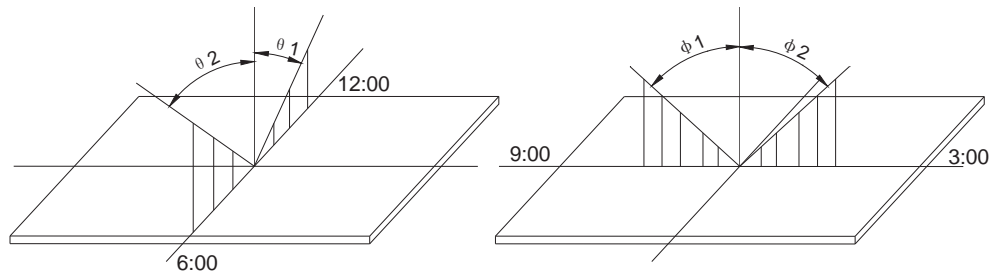


V_{DD}~V₀: LCD Driving voltage

VR: 10k~20k

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6. Optical characteristics

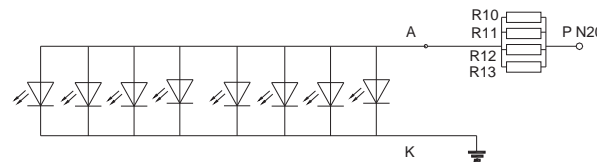


FSTN type display module ($T_a=25^\circ\text{C}$, $V_{DD}=5.0\text{V}$)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing angle	θ	$Cr \geq 5$	-60	-	45	deg
	Φ		-40	-	40	
Contrast ratio	Cr	-	-	6	-	-
Response time (rise)	T_r	-	-	180	270	ms
Response time (fall)	T_r	-	-	190	280	

7. Electrical characteristics

➤ Backlight circuit diagram(light 8X1)



LED Color: White

➤ LED ratings

PIN20 +5VDC power supply

Item	Symbol	Min	Typ.	Max	Unit
Forward Voltage	V_{LED}	2.8	3.0	3.2	V
Forward current	I_f	-	-	160	mA
Power	P			700	mW
Peak wave length	λ_p				nm
Luminance	Lv		150		Cd/m^2

➤ DC characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage for LCD	$V_{DD}-V_0$	$T_a = 25^\circ\text{C}$	-	18.5	-	V
Input voltage	V_{DD}		4.7	5.0	5.5	
Supply current	I_{DD}	$T_a=25^\circ\text{C}$, $V_{DD}=5.0\text{V}$	-	15	18	mA
Input leakage current	I_{LKG}		-	-	1.0	μA
“H” level input voltage	V_{IH}		2.2	-	V_{DD}	V
“L” level input voltage	V_{IL}	Twice initial value or less	0	-	0.6	
“H” level output voltage	V_{OH}	$I_{OH}=-0.25\text{mA}$	2.4	-	-	
“L” level output voltage	V_{OL}	$I_{OH}=1.6\text{mA}$	-	-	0.4	
Backlight supply voltage	V_F	$R(R_{10}/R_{11}/R_{12}/R_{13})=25\Omega$	-	5.0	5.5	
Supply current	I_F	$V_F=5.0\text{V}$, $R=25\Omega$	-	100	120	mA

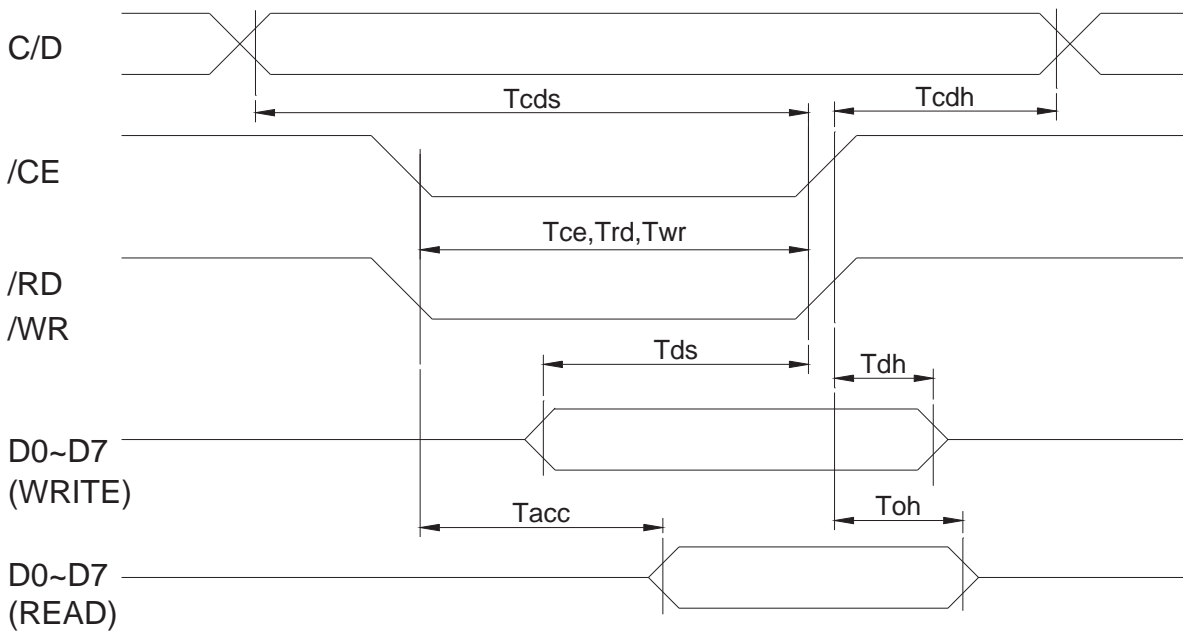
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➤ **Switching characteristics**

($T_a=25^\circ\text{C}$, $V_{DD}=5.0\text{V}$)

Item	Symbol	Test conditions	Min.	Typ.	Max.	Unit
C/D set-up time	Tcds	—	100	—	—	ns
C/D hold time	Tw		10	—	—	
/CE, /RD, /WR pulse width	Tce, Trd, Twr		80	—	—	
Data set-up time	Tds		80	—	—	
Data hold time	Tdh		40	—	—	
Access time	Tacc		—	—	150	
Output hold time	Toh		10	—	50	

Bus timing diagram



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8. Flowchart of communications with MPU

Status read

A status check must be performed before data is read or written. The status word format is as follows:

/RD	/WR	/CE	C/D	STA7	STA5	STA5	STA4	STA3	STA2	STA1	STA0
0	1	0	1	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0

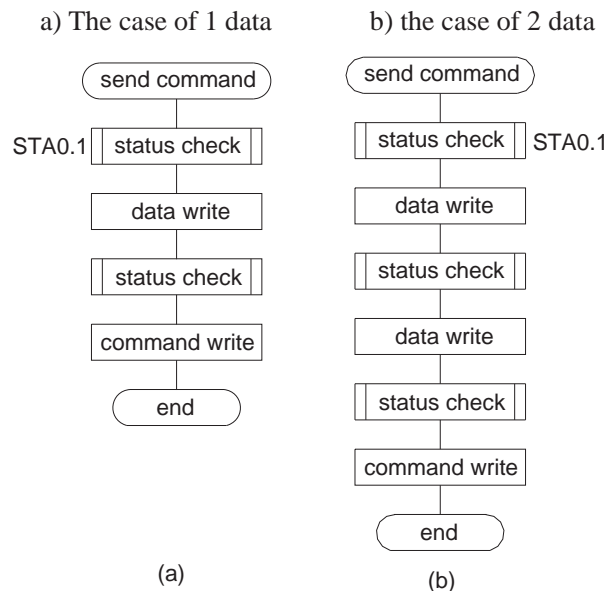
STA0	Check command execution capability	0: disable	1:enable
STA1	Check data read / write capability	0: disable	1:enable
STA2	Check auto mode data read capability	0: disable	1:enable
STA3	Check auto mode data write capability	0: disable	1:enable
STA4	Not used		
STA5	Check controller operation capability	0: disable	1:enable
STA6	Error flag. Used for screen peek and screen copy commands.	0: no error	1:error
STA7	Check the blink condition	0: display off	1:normal display

Notes:

1. It is necessary to check STA0 and STA1 at the same time. There is a possibility of erroneous operation due to a hardware interrupt.
2. For most modes STA0 / STA1 are used as a status check.
3. STA2 and STA3 are valid in auto mode; STA0 and STA1 are invalid.
4. When using the STA7=0 command, a status read must be performed. If a status check is not carried out, the T6963C cannot operate normally, even after a delay time. The hardware interrupt occurs during the address calculation period (at the end of each line). If a STA7=0 command is sent to the T6963c during this period, the T6963C enters wait status. If a status check is not carried out in this state before the next command is sent, there is the possibility that the command or data will not be received.

Setting data

When using the T6963C, first set the data, and then set the command. Procedure for sending a command:



Note: When sending more than two data, the last datum (or last two data) is valid.

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9. Command definitions

Command	Code	D1	D2	Function
Registers setting	00100001	X address	Y address	Set cursor pointer
	00100010	Data	00H	Set offset register
	00100100	Low address	High address	Set address pointer
Set control word	01000000	Low address	High address	Set text home address
	01000001	columns	00H	Set text area
	01000010	Low address	High address	Set graphic home address
	01000011	columns	00H	Set graphic area
Mode set	1000X000			OR mode
	1000X001			EXOR mode
	1000X011			AND mode
	1000X100			Text attribute mode
	1000XXX			Internal CG ROM mode
	10001XXX			External CG RAM mode
Display mode	10010000			Display off
	1001XX10			Cursor on, blink off
	1001XX11			Cursor on, blink on
	100101XX			Text on, graphic off
	100110XX			Text off, graphic on
	100111XX			Text on, graphic on
Cursor select pattern	10100000			1- Line cursor
	10100001			2- Line cursor
	10100010			3- Line cursor
	10100011			4- Line cursor
	10100100			5- Line cursor
	10100101			6- Line cursor
	10100110			7- Line cursor
	10100111			8- Line cursor
Data auto read / write	10110000			Set data auto write
	10110001			Set data auto read
	10110010			Auto reset
Data read / write	11000000	Data		Data write and increment ADP
	11000001			Data read and increment ADP
	11000010	Data		Data write and decrement ADP
	11000011			Data read and decrement ADP
	11000100	Data		Data write and no variable ADP
	11000101			Data read and no variable ADP
Screen peek	11100000			Screen peek
Screen copy	11101000			Screen copy
Bit set / reset	11110XXX			Bit reset
	11111XXX			Bit set
	1111X000			Bit 0 (LSB)
	1111X001			Bit 1
	1111X010			Bit 2
	1111X011			Bit 3
	1111X100			Bit 4
	1111X101			Bit 5
	1111X110			Bit 6
	1111X111			Bit 7(MSB)

Note: When an MPU program with checking the busy flag (DB7) is made, it must be necessary 1/2fosc is necessary for executing the next instruction by the falling edge of the “E” signal after the busy flag (DB7) goes to “Low”.

X: invalid

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Contents

1). Setting registers

D1	D2	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
X	X	0	0	1	0	0	N2	N1	N0

CODE	HEX.	FUNCTION	D1	D2
00100001	21H	Set cursor pointer	X ADRS	Y ADRS
00100010	22H	Set offset register	DATA	00H
00100100	24H	Set address pointer	Low ADRS	High ADRS

➤ Set cursor pointer

X ADRS and Y ADRS specify the position or the cursor. The cursor position can only be moved by this command. Data read / write from the MPU never changes the cursor pointer. X ADRS and Y ADRS are specified as follows.

X ADRS 00H to 4FH (lower 7 bits are valid)

Y ADRS 00H to 1FH (lower 5 bits are valid)

a) Single-scan

X ADRS 00H to 4FH

Y ADRS 00H to 0FH

b) Dual-scan

X ADRS 00H to 4FH

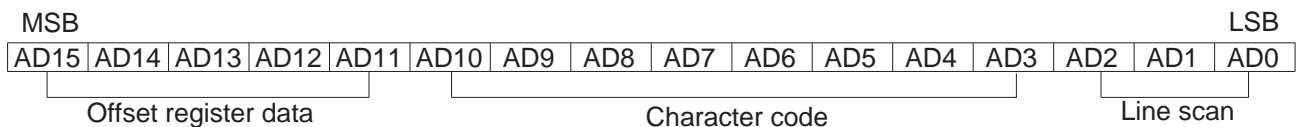
Y ADRS 00H to 0FH (upper screen)

Y ADRS 10H to 1FH (lower screen)

➤ Set offset register

The offset register is used to determine the external character generator RAM area.

The T6963C has a 16-bit address bus as follows:



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6963C assign external character generator, when character code set 80H to FFH in using internal character generator. Character code 00H to 80H assign External character generator, when External generator mode.

The senior five bits define the start address in external memory of the CGRAM area. The next eight bits represent the character code of the character. In internal CGRAM mode, character codes 00H to 7FH represent the predefined “internal” CGRAM characters, and codes 80H to FFH represent the user’s own “external” characters. In external CGRAM mode, all 256 codes from indicate one of the eight rows of eight dots that define the character’s shape.

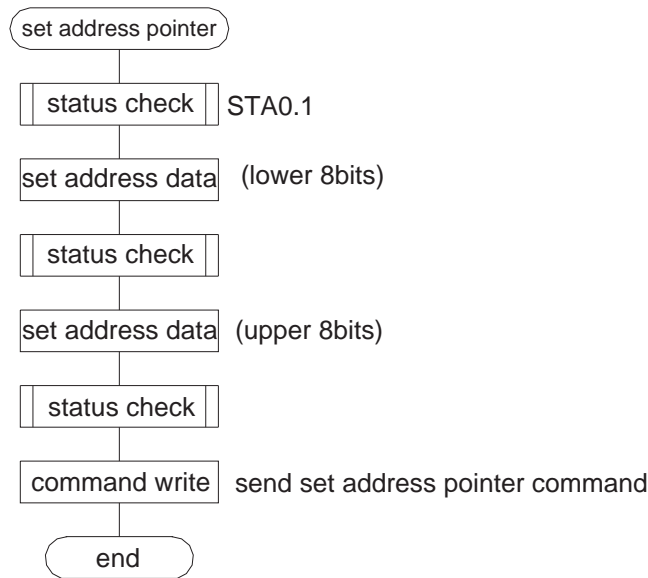
➤ Set address pointer

The set address pointer command is used to indicate the start address for writing to (or reading from) external RAM.

The flow chart for setting address pointer command:

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2). Set control word

D1	D2	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
X	X	0	1	0	0	0	0	N1	N0

CODE	HEX.	FUNCTION	D1	D2
01000000	40H	Set text home address	Low address	High address
01000001	41H	Set text area	Columns	00H
01000010	42H	Set graphic home address	Low address	High address
01000000	43H	Set graphic area	Columns	00H

The home address and column size are defined by this command.

➤ **Set text home address**

The starting address in the external display RAM for text display is defined by this command.

The text home address indicates the leftmost and uppermost position.

The relationship between external display RAM address and display position

TH		TH +CL
TH+TA		TH+TA+CL
(TH+TA)+TA		TH+2TA+CL
(TH+2TA)+TA		TH+3TA+CL
/		/
TH+(N-1) TA		TH+(N-1) TA+CL

TH: text home address

TA: text area number (columns)

CL: columns ate fixed by hardware (pin-programmable)

➤ **Set graphic home address**

The starting address of the external display RAM used for graphic display is defined by this command. The graphic home address indicates the leftmost and uppermost position.

The relationship between external display RAM address and display position

GH		GH +CL
GH+GA		GH + GA +CL
(GH+ GA)+ GA		GH +2 GA +CL
(GH +2 GA)+ GA		GH +3 GA +CL
/		/
GH +(N-1) GA		GH +(N-1) GA +CL

GH: Graphic home address

GA: Graphic area number (columns)

CL: columns ate fixed by hardware (pin-programmable)

➤ **Set text area**

The display columns are defined by the hardware setting. This command can be used to adjust the columns of the display.

➤ **Set graphic area**

The display columns are defined by the hardware setting. This command can be used to adjust the columns of the graphic display.

If the graphic area setting is set to match the desired number of columns on the LCD, the addressing scheme will be automatically modified so that the start address of each line equals the end address of the previous line +1.

3). Mode set

CODE	FUNCTION	OPERAND
1000X000	OR Mode	—
1000X001	EXOR Mode	—
1000X011	AND Mode	—
1000X100	TEXT Attribute Mode	—
10000XXX	Internal character Mode	—
10001XXX	External character Mode	—

The display mode is defined by this command. The display mode does not change until the next command is sent. The logical OR, EXOR, AND of text or graphic display can be displayed.

In internal character generator mode, character codes 00H to 7FH are assigned to the built-in character generator ROM. The character codes 80H to FFH are automatically assigned to the external character generator RAM.

NOTE: attribute functions can only be applied to text display, since the attribute data is placed in the graphic RAM area.

Attribute function

The attribute operations are reverse display, character blink and inhibit. The attribute data is written into the graphic area, which was defined by the set control word command. Only text display is possible in attribute function mode; graphic display is automatically disabled. However, the display mode command must be used to turn both text and graphic on in order for the attribute function to be available.

The attribute data for each character in the text area is written to the same address in the graphic area. The attribute function is defined as follows.

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Attribute RAM 1byte

X	X	X	X	DB3	DB2	DB1	DB0
---	---	---	---	-----	-----	-----	-----

DB3	DB2	DB1	DB0	FUNCTION
0	0	0	0	Normal display
0	1	0	1	Reverse display
0	0	1	1	Inhibit display
1	0	0	0	Blink of normal display
1	1	0	1	Blink of reverse display
1	0	1	1	Blink of inhibit display

4). Display mode

CODE	FUNCTION	OPERAND
10010000	Display off	---
1001xx10	Cursor on, blink off	---
1001xx11	Cursor on, blink on	---
100101xx	Text on, graphic off	---
100110xx	Text off, graphic on	---
100111xx	Text on, graphic on	---

1	0	0	1	DB3	DB2	DB1	DB0
---	---	---	---	-----	-----	-----	-----

- DB0: cursor blink on: 1 off: 0
- DB1: cursor display on: 1 off: 0
- DB2: text display on: 1 off: 0
- DB3: graphic display on: 1 off: 0

NOTE: It is necessary to turn on “text display” and “graphic display” in the following cases.

- a) Combination of text / graphic display
- b) Attribute function

5). Cursor pattern select

CODE	FUNCTION	OPERAND
10100000	1-line cursor	
10100001	2-line cursor	
10100010	3-line cursor	
10100011	4-line cursor	
10100100	5-line cursor	
10100101	6-line cursor	
10100110	7-line cursor	
10100111	8-line cursor	

When cursor display is on, this command selects the cursor pattern in the range 1 line to 8 lines. The cursor pointer set command defines the cursor address.

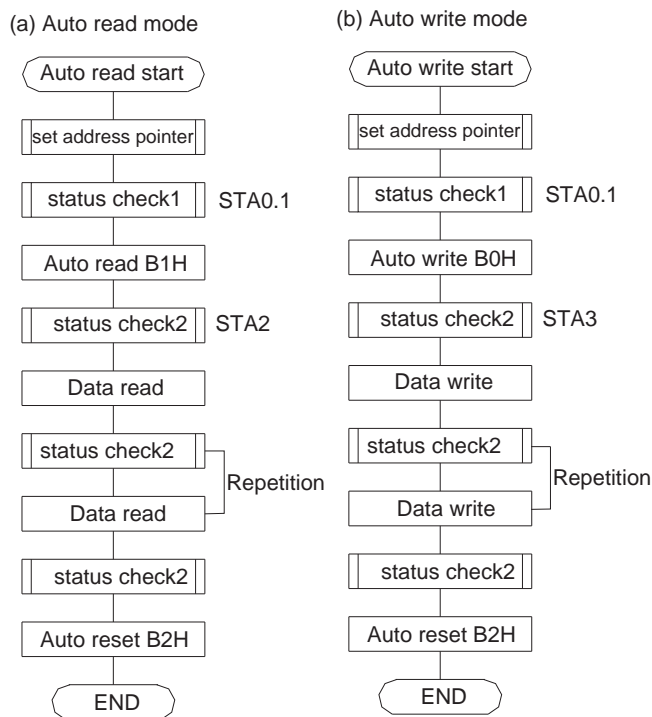
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6). Data auto read / write

CODE	HEX.	FUNCTION	OPERAND
10110000	B0H	Set data auto write	—
10110001	B1H	Set data auto read	—
10110010	B2H	Auto rest	—

The command is convenient for sending a full screen of data from the external display RAM. After setting auto mode, a data write (or read) command is not need to be sent between each datum. A data auto write (or read) command must be send after a set address pointer command. After this command, the address pointer is automatically incremented by 1 after each datum. In auto mode, the T6963C cannot accept any other commands. The auto reset command must be sent to the T6963C after all data has been sent, to clear auto mode.

NOTE: A status check for auto mode (STA2, STA3 should be checked between sending of each datum. Auto reset should be performed after checking STA3=1(STA2=1)). Refer to the following flowchart.



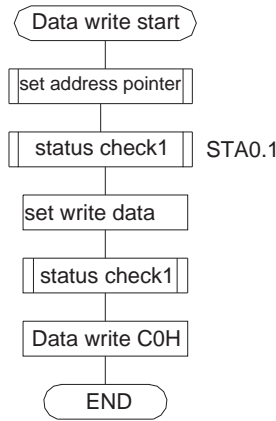
7). Data read / write

CODE	HEX.	FUNCTION	OPERAND
11000000	C0H	Data write and increment ADP	Data
11000001	C1H	Data read and increment ADP	—
11000010	C2H	Data write and decrement ADP	Data
11000011	C3H	Data read and decrement ADP	—
11000100	C4H	Data write and no variable ADP	Data
11000101	C5H	Data read and no variable ADP	—

This command is used for writing data from the MPU to external display RAM, and reading data from external display RAM to the MPU. Data write /data read should be executed after setting address using ser address pointer command. The address pointer can be automatically incremented or decremented using this command.

Note: This command is necessary for each 1-byte datum. Refer to the following flowchart.

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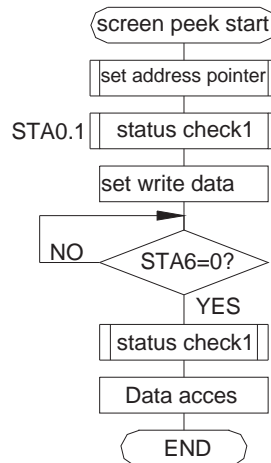
8). Screen peek

CODE	HEX.	FUNCTION	OPERAND
11100000	E0H	Screen peek	—

This command is used to transfer 1 byte of displayed data to the data stack; this byte can then be read from the MPU by data access. The logical combination of text and graphic display data on the LCD screen can be read by read by this command.

The status (STA6) should be checked just after the screen peek command. If the address determined by the set address pointer command is not in the graphic area, this command is ignored and a status flag (STA6) is set.

Refer to the following flowchart.



Note: This command is available when hardware column number and software column number are the same. Hardware column number is related to MD2 and MD3 setting. Software column number is related to ser text area and set graphic area command.

9). Screen copy

CODE	HEX.	FUNCTION	OPERAND
11101000	E8H	Screen copy	—

This command copies a raster line of data to the graphic area.

The start point must be set using the set address pointer command.

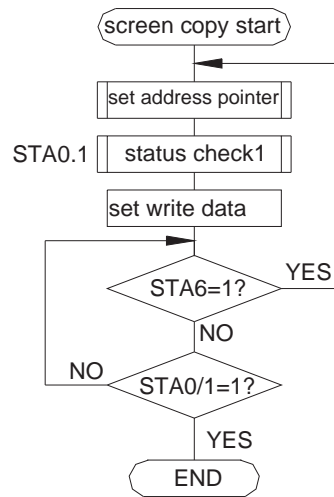
Note:

If the attribute function is being used, this command is not available. (With attribute data is graphic area data.)

With dual-scan, this command cannot be used (because the T6963C cannot separate the upper screen data and lower

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screen data). Refer to the following flowchart.

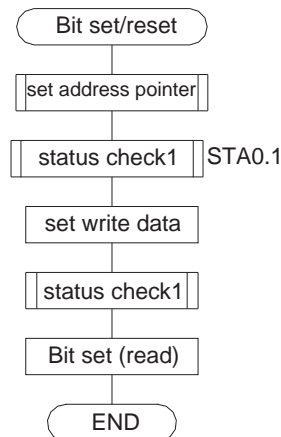


This command is available when hardware column number and software column number are the same. Hardware column number is related to MD2 and MD3 setting. Software column number is related to set text area and set graphic area command.

10). Bit set /reset

CODE	FUNCTION	OPERAND
11110XXX	Bit reset	---
11111XXX	Bit set	---
1111X000	Bit 0 (LSB0)	---
1111X001	Bit 1	---
1111X010	Bit 2	---
1111X011	Bit 3	---
1111X100	Bit 4	---
1111X101	Bit 5	---
1111X110	Bit 6	---
1111X111	Bit 7 (LSB0)	---

This command use to set or reset a bit of the byte specified by the address pointer. Only one bit can be set or reset at a time. Refer to the following flowchart.



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10 Specification of Quality Assurance

1 Purpose

This specification provides the product technical conditions, quality inspection, reliability test and the method of packing, transport and storage for USMPG-TQ240128B-TZWFH module.

2 Scope of application

This specification applies to USMPG-TQ240128B-TZWFH graphic LCD module.

3 Requirements

- 3.1 All specs of USMPG-TQ240128B-TZWFH graphic module should be compliant to this specification.
- 3.2 The module structure, outline dimension, viewing area, display mode, viewing angle and pin-out interface for USMPG-TQ240128B-TZWFH should conform to the design drawing approved by client.
- 3.3 The cosmetic quality criteria of USMPG-TQ240128B-TZWFH are specified in table 1.

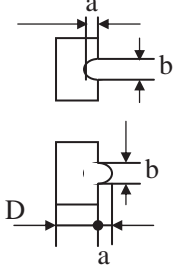
Table 1 LCM Cosmetic Quality Criteria

ITEM	INSPECTION CRITERIA								
Outline Dimension	Conforms to design drawing spec or sample approved by client								
Interface	Conforms to design drawing spec or sample approved by client								
Display Mode	Conforms to design drawing spec or sample approved by client								
Component Soldering	(1)Rejected when component is not attached on soldering surface and sticking up (2)Rejected when solder covers less than 2/3 of soldering area or component is not connected to soldering area								
Metal Frame	(1)Surface of metal frame should be clean and smooth. The scratch of coating or roasted lacquer layer is according to following standard: <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Width and Length of scratch</th> <th>Numbers allowed</th> </tr> </thead> <tbody> <tr> <td>W≤0.10; L≤5.0</td> <td>3</td> </tr> <tr> <td>W≤0.20; L≤3.0</td> <td>2</td> </tr> <tr> <td>W≤0.30; L≤3.0</td> <td>1</td> </tr> </tbody> </table> Rejected when scratch exceeds the above spec. (2) Shape of frame should conform to design drawing spec, out of shape is not allowed.	Width and Length of scratch	Numbers allowed	W≤0.10; L≤5.0	3	W≤0.20; L≤3.0	2	W≤0.30; L≤3.0	1
Width and Length of scratch	Numbers allowed								
W≤0.10; L≤5.0	3								
W≤0.20; L≤3.0	2								
W≤0.30; L≤3.0	1								
Adhesive Sealing	(1) Too small adhesive area to cause exposure of IC pin (Free of soldering-proof area) on PCB is rejected. (2) Exposure of chip bonding wire on COB board is rejected. (3) Bubble size on surface of adhesive sealing exceeding 0.5mm is rejected.								
PCB Board	(1)Size of drill hole on PCB board should conform to design drawing spec or sample approved by client. (2)Printing the non-concerned text or symbol on PCB is rejected.								

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3.4 Function test criteria of USMPG-TQ240128B-TZWFH are specified in table 2.

Table 2 LCM Function Test Criteria

ITEM		INSPECTION CRITERIA												
Display Pattern		Rejected when display the following patterns: a. Missing horizontal or vertical line; b. Uneven contrast of display pattern; c. Glimmering or jumping pattern; d. Disorder of display function; e. No display or light display.												
Pattern Defect	Rainbow	Viewing at specified viewing angle range, more than two color rainbow on display panel inspected by naked eye is not allowed.												
	Extra or Missing pattern	Not allowed												
	Pattern Intrusion or Protrusion	(1) $a \times b > 0.2 \times 0.2 \text{mm}^2$ Not allowed (2) a or $b > 1/5D$ Not allowed (3) When size of a or b is less than or equal to the above range, the total number of pattern intrusion or protrusion should not exceed 4. 												
LED Backlight Defect	Transmissive type LCD	Spot of LED backlight: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Diameter of spot</th> <th>Number allowed</th> </tr> </thead> <tbody> <tr> <td>Dia. $\leq 0.10\text{mm}$</td> <td>Ignored</td> </tr> <tr> <td>$0.10\text{mm} < \text{Dia.} \leq 0.20\text{mm}$</td> <td>6</td> </tr> <tr> <td>$0.20\text{mm} < \text{Dia.} \leq 0.25\text{mm}$</td> <td>5</td> </tr> <tr> <td>$0.25\text{mm} < \text{Dia.} \leq 0.40\text{mm}$</td> <td>3</td> </tr> <tr> <td>$0.40\text{mm} < \text{Dia.}$</td> <td>0</td> </tr> </tbody> </table>	Diameter of spot	Number allowed	Dia. $\leq 0.10\text{mm}$	Ignored	$0.10\text{mm} < \text{Dia.} \leq 0.20\text{mm}$	6	$0.20\text{mm} < \text{Dia.} \leq 0.25\text{mm}$	5	$0.25\text{mm} < \text{Dia.} \leq 0.40\text{mm}$	3	$0.40\text{mm} < \text{Dia.}$	0
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Dia. $\leq 0.10\text{mm}$	Ignored													
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$0.25\text{mm} < \text{Dia.} \leq 0.40\text{mm}$	3													
$0.40\text{mm} < \text{Dia.}$	0													
Function Defect		The followings are not allowed: a. No function switch; b. Slow response time.												

3.5 Defects like bad alignment layer and fluid leakage are not allowed on the display panel. 3.6

Electrical and optical parameters for USMPG-TQ240128B-TZWFH refer to Table 3.

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Table 3 Electrical and Optical Parameters of LCM

ITEM	SYMBOL	STN Dot Matrix Character Type			UNIT
		MIN.	TYP.	MAX.	
LCD Operating Voltage	V_{LCD}	-	5.0	-	V
Contrast	C_r	10:1			-
Response Time (25°C)	t_r		150	250	ms
	t_d		150	250	
Viewing Angle (Cr=3)	θ	45	-	60	deg
	Φ	-40	-	40	
Operating Temp.	T_{OP}	-20~+70			°C
Storage Temp.	T_{ST}	-30~+80			
Minimum Life Time	τ	≥50000			h

3.7 Reliability Test

Items of reliability test are as the followings with no abnormalities and function failures found after the test:

(Number of specimen: 16)

3.7.1 Low Temperature and Storage Test

Wide temperature type -30 °C 500 Hours Restore 12 Hours

Standard temperature type -20°C 500 Hours Restore 12 Hours

3.7.2 High Temperature and Storage Test

Wide Temperature type 80 °C 500 Hours Restore 12 Hours

Standard temperature type 70°C 500 Hours Restore 12 Hours

3.7.3 Humidity Test

40±2°C, RH=93±2% 500 Hours Restore 12 Hours

3.7.4 Temperature Shock Test

-20°C 30Min→ 25°C 30min→ 70°C 30Min→ 25°C 30Min→ -20°C 30Min 10 Cycles, Restore 12 Hours

3.7.5 Vibration Test

Sweep for 3 min at 10Hz, and amplitude 2mm at 10Hz for 2 hours each in X, Y and Z direction

3.7.6 Drop Test

Drop shock from height of 1m 10pcs in packing

3.8 The LCM Must Have Following Distinct Marks:

- a) Brand of manufacturer.
- b) Part Number: USMPG-TQ240128B-TZWFH
- a) Product qualified label.
- b) Lot number or date of manufacture

4 General experiment or test conditions (TC)

Operating Voltage: V_{DD} =Driving Voltage of IC;

Environmental Temperature: $T_o=25\pm 3^\circ\text{C}$;

Environmental Humidity: $RH\leq 70\%$

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5 Inspection procedure

To guarantee the display in accordance with the technical spec, product inspection must be carried out in manufacturing and outgoing process.

5.1 Cosmetic and Display Function Inspection

This inspection includes all batch inspection of USMPG-TQ240128B-TZWFH module. Unless otherwise specified, all cosmetic items inspected are carried out with bare-eye inspection at the condition of normal illumination & eyesight and 25cm distance between inspector eye and module.

The items for cosmetic and display function inspection are shown in Table 4.

5.2 Outgoing Inspection

Before products are shipped out of factory, outgoing inspection is implemented according to the relevant regulation in this specification. All acceptance items must be passed prior to the delivery.

The outgoing AQL level is shown in Table 4.

Table 4 Items for cosmetic and display function inspection

ITEM	REQUIREMENT	CONDITION	METHOD	COSMETIC AND FUNCTION INSPECTION	OUTGOING INSPECTION AQL
Structure and Size	Chapter 3.2	Power Off	Measuring Tool	Random Sampling 20~25 Pcs	2.0
Cosmetic	Chapter 3.3	Power Off	Measuring Tool or Visual Check	100% Inspection	2.0
Display Function	Chapter 3.4, 3.5	Power Off or Whole Screen Display	Visual Check or Electrical Test		0.65
Marks	Chapter 3.8	Power Off	Visual Check		2.0

6 Packing, transportation and storage

6.1 Packing Content

6.1.1 Package for USMPG-TQ240128B-TZWFH LCM is anti-static bag (or shield bag) and carton box inside, and hard carton outside.

6.1.2 After LCM are packed into anti-static bag and put in box, separate alignment in good order with tight press and fixed position is required.

6.1.3 Unless otherwise specified, packing carton should be marked with description of P/N, quantity, date of manufacture, etc. and symbols of 'TAKE CARE' 'UP SIDE' 'NO WET'.

6.2 Transportation

Unless otherwise specified, carton with LCM can be carried by any means of transport. During transportation, being wet by rain, mechanical strike, close to corrosive materials such as acid and alkali etc. should be avoided.

6.3 Storage

6.3.1 Unless otherwise specified, LCM should be stored in circumstance of -20~+60 temperature range with relative humidity RH≤80%, good ventilation and free of corrosiveness.

6.3.2 After the LCM qualified is packed into warehouse, the storage time is generally less than half year. If the storage is longer than the time, the LCM should be re-inspected and qualified prior to shipping and use.

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Displays

US Micro Products is an industrial distributor specializing in engineered display solutions. We dedicate ourselves to providing the best in displays for the medical, industrial, gaming, automotive, aerospace, military and consumer markets.

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