

TWM333A

LCD Module User Manual

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Rev.	Descriptions	Release Date
0.1	New release	2008-04-12

Table of Content

1. Basic Specifications	3
1.1 Display Specifications	3
1.2 Mechanical Specifications	3
1.3 Block Diagram	3
1.4 Terminal Functions	4
2. Absolute Maximum Ratings	4
3. Electrical Characteristics	4
3.1 DC Characteristics	4
3.2 AC Characteristics	5
4. Function Specifications	6
4.1 Basic Setting	6
4.2 Command and Data format	6
4.3 Interfacing	7
4.4 Icons Memory Mapping	7
4.5 Command Listing	8
4.6 Initialization	9
5. Design and Handling Precaution	10

1. Basic Specifications

1.1 Display Specifications

- 1) LCD Display Mode : TN, Positive, Transflective
- 2) Display Color : Display Data = "1" : Black (*1)
: Display Data = "0" : Light Gray (*2)
- 3) Viewing Angle : 12 H
- 4) Driving Method : 1/4 duty, 1/3 bias
- 5) Backlight : White LED backlight

Note:

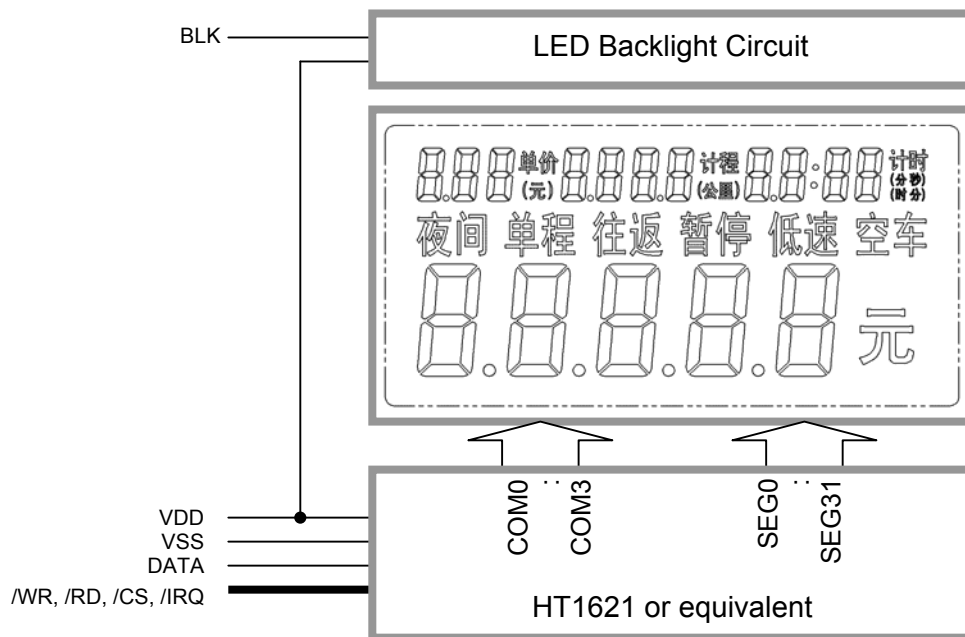
*1. Color tone may slightly change by Temperature and Driving Condition.

*2. The Color is defined as the inactive / background color

1.2 Mechanical Specifications

- 1) Outline Dimension : 79.0 x 42.3 x 9.6MAX
see attached Outline Drawing for details

1.3 Block Diagram



1.4 Terminal Functions

Pin No.	Pin Name	I/O	Descriptions
1	VDD	Power	Positive Power Supply for Key Circuit
2	VSS	Power	Negative Power Supply, GND (0V) for LCD
3	/IRQ	Output	Inquire output
4	DATA	I/O	Serial Data I/O
5	/WR	Input	Write Clock input with internal pull-up resistor. Data on the DATA pin are latched on the rising edge of this signal
6	/RD	Input	Read Clock input with internal pull-up resistor Data will appear the DATA pin at the low level of this signal
7	/CS	Input	Chip Selection input with internal pull-up resistor /CS=High, disable data or command writing /CS=Low, enable data or command writing
8	BLK	Power	Negative Power Supply

Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V _{DD}	-0.3	5.5	V	VSS = 0V
Input Voltage	V _{IN}	V _{SS} -0.3	V _{DD} +0.3	V	VSS = 0V
Operating Temperature	T _{OP}	-20	70	°C	No Condensation
Storage Temperature	T _{ST}	-30	80	°C	No Condensation

Cautions:

Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

2. Electrical Characteristics

2.1 DC Characteristics

V_{SS}=0V, V_{DD} =5.0V, T_{OP} =25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Operating Voltage (*1)	V _{DD}	4.8	5.0	5.2	V	VDD
Input High Voltage	V _{IN}	0.85xVDD	-	VDD	V	DATA, /RD, /WR, /CS
Input Low Voltage	V _{IN}	VSS	-	0.8	V	DATA, /RD, /WR, /CS
Operating Current	I _{DD}	-	0.3	1.2	mA	VDD

Note:

1. The variation of Operating Voltage may affect the LCD display contrast.
2. No Data transfer.

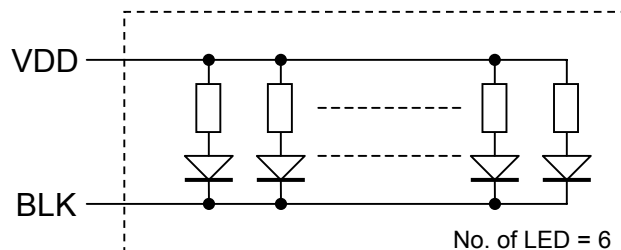
2.2 LED Backlight Circuit Characteristics

V_{SS}=0V, I_{fBLA}=102mA, T_{OP} =25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Forward Voltage	V _{fBLA}	-	5.0	-	V	BLA
Forward Current	I _{fBLA}	-	102	130	mA	BLA

Cautions:

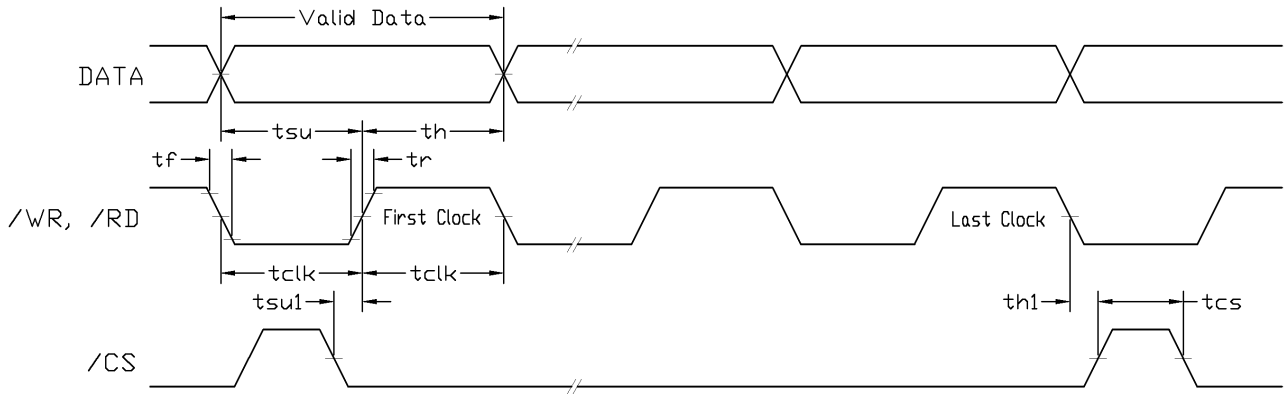
Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.



2.3 AC Characteristics

$V_{SS}=0V, V_{DD}=5.0V, T_{OP}=25^{\circ}C$

Symbol	MIN.	TYP.	MAX.	Unit	Descriptions
tcs	310	-	-	ns	Serial I/F Reset Pulse Width
tclk	5	-	-	μs	/WR, /RD Input Pulse Width
tr, tf	-	-	100	ns	Rise / Fall Time Serial Data
tsu	150	-	-	ns	Setup Time for DATA to /WR, /RD
th	150	-	-	ns	Hold Time for DATA to /WR, /RD
tsu1	130	-	-	ns	Setup Time for /CS to /WR, /RD
th1	130	-	-	ns	Hold Time for /CS to /WR, /RD



3. Function Specifications

3.1 Basic Setting

To drive the LCD module correctly and provide normally display, please use the following setting

BIAS = 1/3
 No. of Commons = 4
 LCD Display = on

Note:
 These setting/commands should issue to controllers while start up.
 See the Command Listing section for details.

3.2 Command and Data format

The LCD module could be controlled by software in two Operation modes. Modes are identified by "Mode ID".

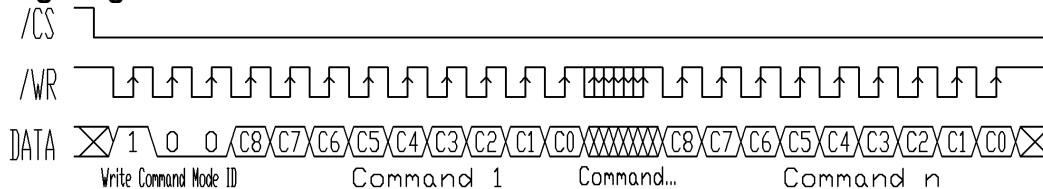
Operation Mode	Mode ID
Write Command	1 0 0
Write Data	1 0 1

The mode ID should be issued before the data or command is transferred.

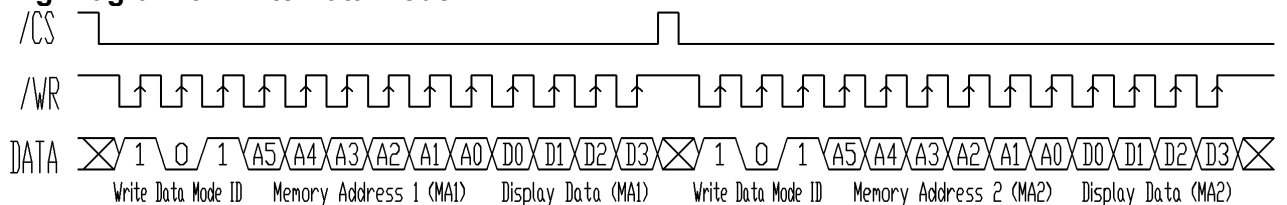
If successive commands is issuing, the command mode ID, namely **1 0 0**, can be omitted after the first command with mode ID. If successive data is issuing, the data mode ID, namely **1 0 1**, can be omitted after the first data with mode ID. In Write Data (Successive Address Writing) Mode the internal address pointer will be increased by 1 after each data received.

While the system is operating in the non-successive command or the non-successive address data mode, the /CS pin should be set to "1" and the previous operation mode will be reset also. Once the /CS pin returns to "0" a new operation mode ID should be issued first.

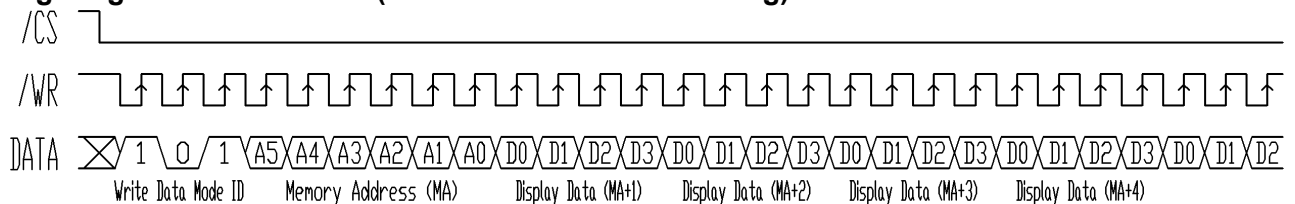
Timing Diagram of Write Command Mode



Timing Diagram of Write Data Mode



Timing Diagram of Write Data (Successive Address Writing) Mode



3.3 Interfacing

The /CS line are used to initialize the serial interface circuit and to terminate the communication between the host and LCD module. If the /CS pin is set to 1, the data or command issued between the host and the dedicated controller will be disabled and then initialized for further command or data. Before issuing a mode command or mode switching, a high level pulse is required on /CS to initialize the serial interface.

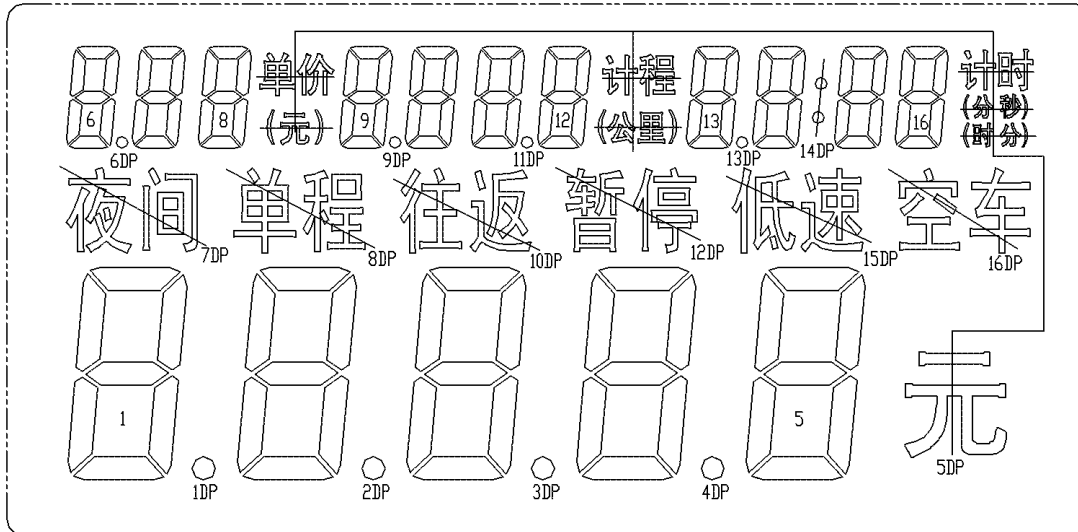
The DATA line is the serial data input line. Data or commands to be written have to be passed through the DATA line.

The /WR line is the WRITE clock input. The data, address, and command on the DATA line are all latched into the LCD module at the rising edge of the /WR signal.

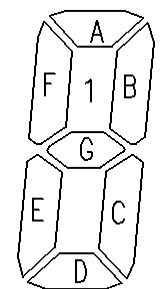
3.4 Icons Memory Mapping

		Address Location (hex)															
		00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
D0		1F	1A	2F	2A	3F	3A	4F	4A	5F	5A	6F	6A	7F	7A	8F	8A
D1		1G	1B	2G	2B	3G	3B	4G	4B	5G	5B	6G	6B	7G	7B	8G	8B
D2		1E	1C	2E	2C	3E	3C	4E	4C	5E	5C	6E	6C	7E	7C	8E	8C
D3		1D	1DP	2D	2DP	3D	3DP	4D	4DP	5D	5DP	6D	6DP	7D	7DP	8D	8DP

		Address Location (hex)															
		10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
D0		9F	9A	10F	10A	11F	11A	12F	12A	13F	13A	14F	14A	15F	15A	16F	16A
D1		9G	9B	10G	10B	11G	11B	12G	12B	13G	13B	14G	14B	15G	15B	16G	16B
D2		9E	9C	10E	10C	11E	11C	12E	12C	13E	13C	14E	14C	15E	15C	16E	16C
D3		9D	9DP	10D	10DP	11D	11DP	12D	12DP	13D	13DP	14D	14DP	15D	15DP	16D	16DP



Icons Key



7-Segment Key

3.5 Command Listing

Command Mode

Command	Mode ID	Code										Function	Note
		C8	C7	C6	C5	C4	C3	C2	C1	C0			
SYS DIS	100	0	0	0	0	0	0	0	0	x		Turn off both system oscillator and LCD bias generator	*1
SYS EN	100	0	0	0	0	0	0	0	1	x		Turn on system oscillator	
LCD OFF	100	0	0	0	0	0	0	1	0	x		Turn off LCD by turn off LCD bias generator	*1
LCD ON	100	0	0	0	0	0	0	1	1	x		Turn on LCD by turn on LCD bias generator	
TIMER DIS	100	0	0	0	0	0	1	0	0	x		Disable Time-base output	
WDT DIS	100	0	0	0	0	0	1	0	1	x		Disable WDT time-out flag output	
TIMER EN	100	0	0	0	0	0	1	1	0	x		Enable Time-base output	
WDT EN	100	0	0	0	0	0	1	1	1	x		Enable WDT time-out flag output	
CLR TIMER	100	0	0	0	0	1	1	x	x	x		Clear the contents of Time-base generator	
CLR WDT	100	0	0	0	0	1	1	1	x	x		Clear the contents of WDT stage	
RC256K	100	0	0	0	1	1	0	x	x	x		Select System clock source to on-chip oscillator	*1
BIAS 1/2	100	0	0	1	0	a	b	x	0	x		1/2 bias driving option ab=00 : 2 commons option ab=01 : 3 commons option ab=10 : 4 commons option	
BIAS 1/3	100	0	0	1	0	a	b	x	1	x		1/3 bias driving option ab=00 : 2 commons option ab=01 : 3 commons option ab=10 : 4 commons option	
/IRQ DIS	100	1	0	0	x	0	x	x	x	x		Disable /IRQ output	*1
/IRQ EN	100	1	0	0	x	1	x	x	x	x		Enable /IRQ output	
F1	100	1	0	1	x	x	0	0	0	x		Time-base / WDT clock output : 1Hz WDT time-out flag after : 4s	
F2	100	1	0	1	x	x	0	0	1	x		Time-base / WDT clock output : 2Hz WDT time-out flag after : 2s	
F4	100	1	0	1	x	x	0	1	0	x		Time-base / WDT clock output : 4Hz WDT time-out flag after : 1s	
F8	100	1	0	1	x	x	0	1	1	x		Time-base / WDT clock output : 8Hz WDT time-out flag after : 0.5s	
F16	100	1	0	1	x	x	1	0	0	x		Time-base / WDT clock output : 16Hz WDT time-out flag after : 0.25s	
F32	100	1	0	1	x	x	1	0	1	x		Time-base / WDT clock output : 32Hz WDT time-out flag after : 0.125s	
F64	100	1	0	1	x	x	1	1	0	x		Time-base / WDT clock output : 64Hz WDT time-out flag after : 0.0625s	
F128	100	1	0	1	x	x	1	1	1	x		Time-base / WDT clock output : 128Hz WDT time-out flag after : 0.03125s	*1
TEST	100	1	1	1	0	0	0	0	0	x		Test mode, not used	
NORMAL	100	1	1	1	0	0	0	1	1	x		Normal mode	*1

Note:

*1. Power on default setting

*2. Refer to Timing Diagram for details.

*3. x = don't care bit

*4. For details, please refer to HT1621 data sheet

Data Mode

Command	Mode ID	Code											Function	Note
		A5	A4	A3	A2	A1	A0	D0	D1	D2	D3			
Read Display Data	1 1 0	Display Memory Address (00h - 3Fh)					Display Data				Read Data form the Display Memory			
Write Display Data	1 0 1	Display Memory Address (00h - 3Fh)					Display Data				Write Data to Display Memory			
READ-MODIFY-WRITE	1 0 1	Display Memory Address (00h - 3Fh)					Display Data				READ and Write to the RAM			

Note:

- *1. Power on default setting
- *2. Refer to Timing Diagram for details.
- *3. x = don't care bit
- *4. For details, please refer to HT1621 data sheet

3.6 Initialization

Issue the following commands for normal display.

Steps	Command	Mode ID	Code										Function
			C8	C7	C6	C5	C4	C3	C2	C1	C0		
1	SYS EN	1 0 0	0	0	0	0	0	0	0	0	1	x	Turn on system oscillator
2	RC256K	1 0 0	0	0	0	1	1	0	x	X	x	Using on-chip RC oscillator	
3	BIAS 1/3	1 0 0	0	0	1	0	1	0	x	1	x	1/3 bias driving and 4 commons	
4	NORMAL	1 0 0	1	1	1	0	0	0	1	1	x	Normal mode	
5	LCD ON	1 0 0	0	0	0	0	0	0	1	1	x	Turn on LCD for normal display	

4. Design and Handling Precaution

1. The LCD panel is made by glass. Any mechanical shock (eg. dropping from high place) will damage the LCD module.
2. Do not add excessive force on the surface of the display, which may cause the Display color change abnormally.
3. The polarizer on the LCD is easily get scratched. If possible, do not remove the LCD protective film until the last step of installation.
4. Never attempt to disassemble or rework the LCD module.
5. Only Clean the LCD with Isopropyl Alcohol or Ethyl Alcohol. Other solvents (eg. water) may damage the LCD.
6. When mounting the LCD module, make sure that it is free from twisting, warping and distortion.
7. 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.
8. Only hold the LCD module by its side. Never hold LCD module by add force on the heat seal or TAB.
9. Never add force to component of the LCD module. It may cause invisible damage or degrade of the reliability.
10. LCD module could be easily damaged by static electricity. Be careful to maintain an optimum anti-static work environment to protect the LCD module.
11. When peeling off the protective film from LCD, static charge may cause abnormal display pattern. It is normal and will resume to normal in a short while.
12. Take care and prevent get hurt by the LCD panel sharp edge.
13. Never operate the LCD module exceed the absolute maximum ratings.
14. Keep the signal line as short as possible to prevent noisy signal applying to LCD module.
15. Never apply signal to the LCD module without power supply.
16. IC chip (eg. TAB or COG) is sensitive to the light. Strong lighting environment could possibly cause malfunction. Light sealing structure casing is recommend.
17. LCD module reliability may be reduced by temperature shock.
18. 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