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TWM09002

LCD Module User Manual

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Date: 2009-04-08	Date:	Date:

Rev.	Descriptions	Release Date
0.1	Preliminary Release	2009-04-06
0.2	Type correction on DC Characteristics & AC Characteristics	2009-04-08

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1. Basic Specifications

1.1 Display Specifications

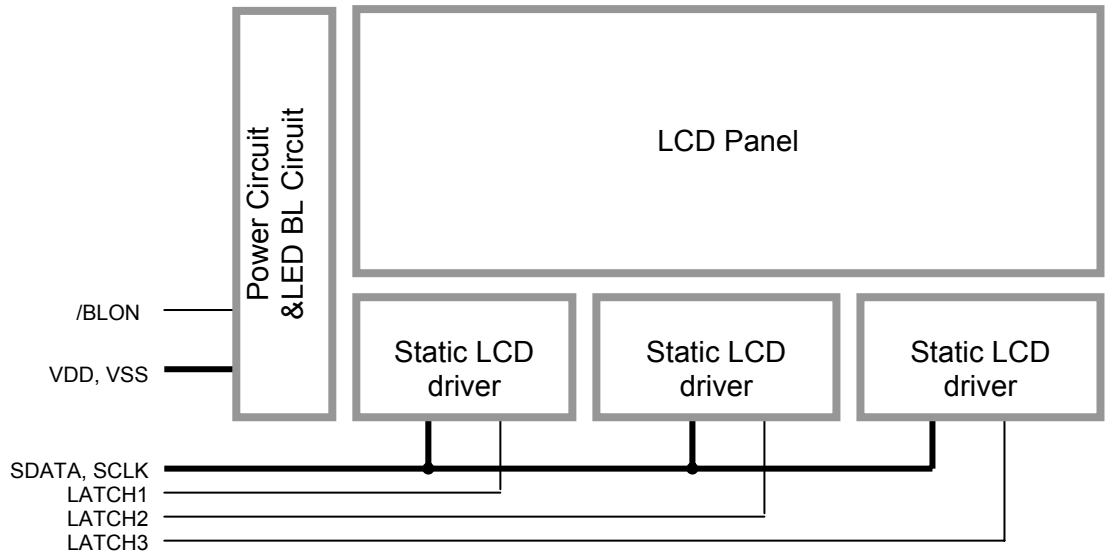
1) LCD Display Mode : TN, Negative, Transmissive
2) Display Color : Display Data = “1” : White (*1)
: Display Data = “0” : Black (*2)
3) Viewing Angle : 12 H
4) Driving Method : Static
5) Backlight : White LED backlight

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 : 84.3 x 43.0 x 13.3 MAX (exclude terminal header)
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
2	VDD	Power	Positive Power Supply
3	NC	-	No connection, leave open
4	NC	-	No connection, leave open
5	NC	-	No connection, leave open
6	SDATA	Input	Serial Data
7	NC	-	No connection, leave open
8	SCLK	Input	Serial Data clock
9	NC	-	No connection, leave open
10	LATCH1	Input	Latch Signal for sending the buffer data to display (chip1) Positive plus trigger
11	NC	-	No connection, leave open
12	LATCH2	Input	Latch Signal for sending the buffer data to display (chip2) Positive plus trigger
13	NC	-	No connection, leave open
14	LATCH3	Input	Latch Signal for sending the buffer data to display (chip3) Positive plus trigger
15	NC	-	No connection, leave open
16	/BLON	Input	BL Control Signal: /BLON=”0”,BL ON; /BLON=”1”,BL OFF;
17	VSS	Power	Negative Power Supply, Ground
18	VSS	Power	Negative Power Supply, Ground

2. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V_{DD}	-0.3	5.5	V	V_{SS} = 0V
Input Voltage	V_{IN}	V_{SS}-0.3	V_{DD}+0.3	V	V_{SS} = 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.

3. Electrical Characteristics

3.1 DC Characteristics

V_{SS}=0V, V_{DD} =5.0V, T_{OP} =25°C

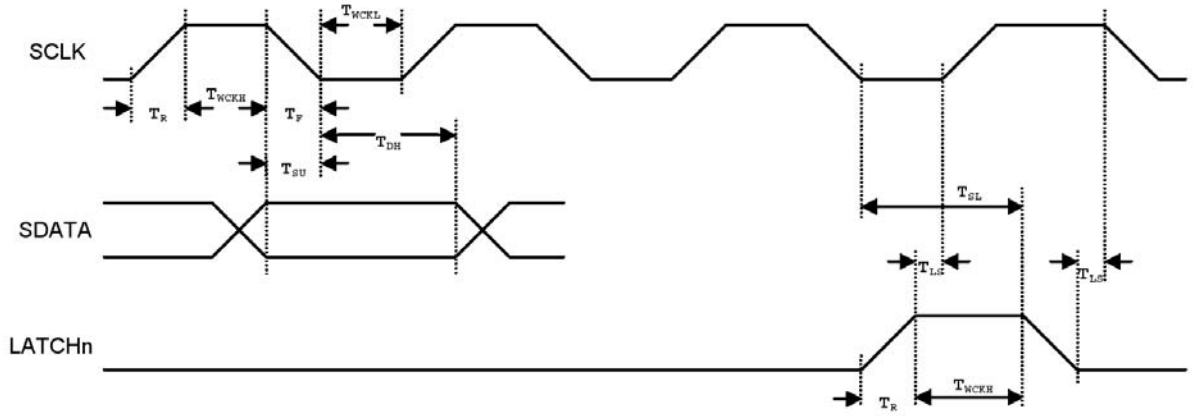
Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Operating Voltage (*1)	V_{DD}	4.5	5.0	5.5	V	VDD
Input High Voltage	V_{IN}	0.8xVDD	-	VDD	V	DATA, /RD, /WR, /CS
Input Low Voltage	V_{IN}	VSS	-	0.5	V	DATA, /RD, /WR, /CS
Operating Current (*2) (BL OFF)	I_{DD}	-	0.1	2.0	mA	VDD
Operating Current (*2) (BL ON)	I_{DD}	-	51	60	mA	VDD

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

3.2 AC Characteristics

V_{SS}=0V, V_{DD} =5.0V, T_{OP} =25°C

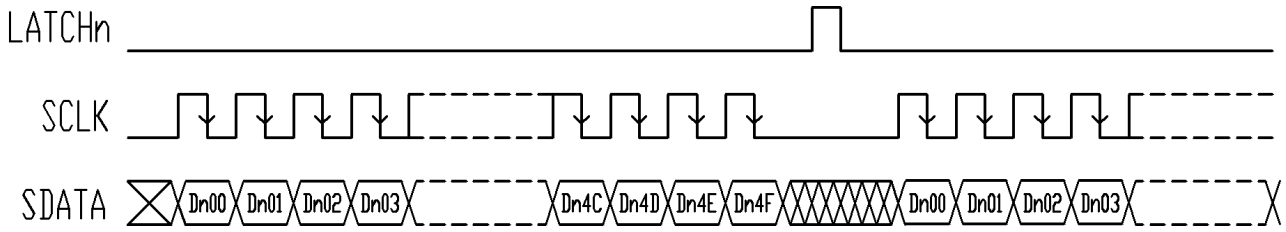
Symbol	MIN.	TYP.	MAX.	Unit	Descriptions
FCL	-	-	400	kHz	Data Shift Freq
TWCKH	1000	-	-	ns	Clcok High Level Width
TWCKL	1000	-	-	ns	Clock Low Level Width
TSL	625	-	-	ns	Clock Setup Time
TLS	625	-	-	ns	Latch Setup Time
TR/TF	-	-	160	ns	Signal Rise/Fall Time
TSU	375	-	-	ns	Data Setup Time
TDH	375	-	-	ns	Data Hold Time



4. Function Specifications

4.1 Data format and timing

The LCD module contains four serial to parallel buffers (80bit).
The four buffers share the same SCLK and SDATA as clock and data respectively.
After the input data shift into the buffer by SCLK falling edge,
The inputted data will be latched into to LCD driver n by the toggle on LATCHn.
Then the corresponding LCD segment will be display accordingly.
(please see the display mapping for details)



Timing Diagram of Write Data Mode

4.2 Display Maping

LCD driver 1, (accessed by Latch1)

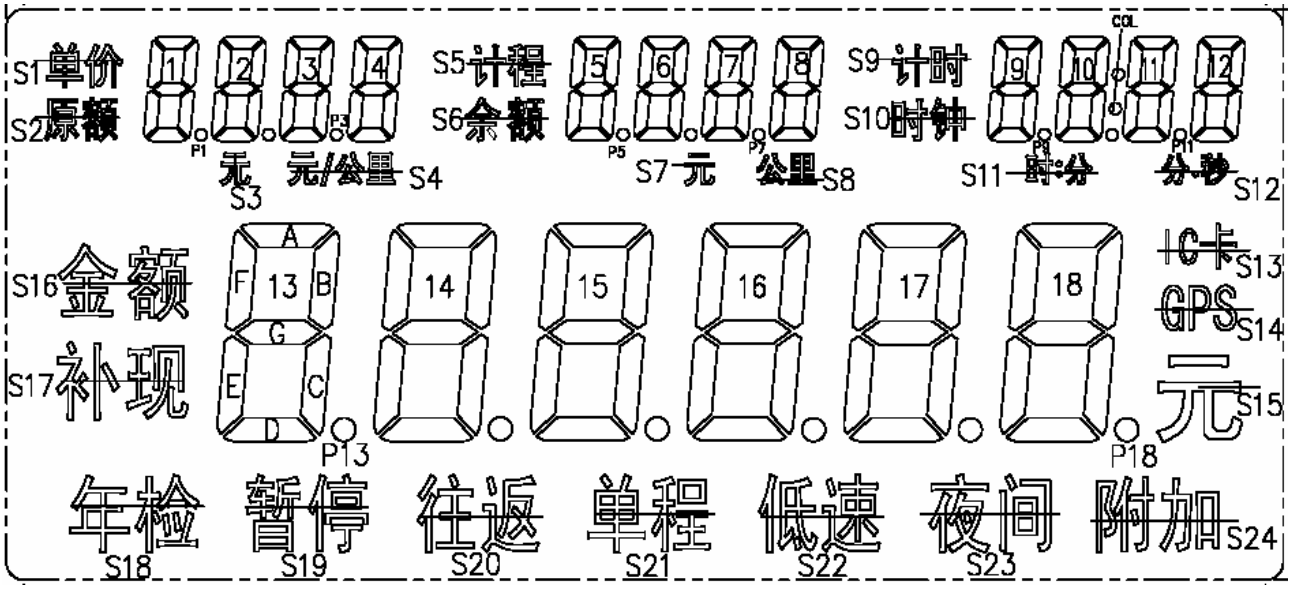
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D10x	--	--	--	--	S8	S7	S6	S5	--	8B	8C	8D	8E	8G	8F	8A
D11x	P7	7B	7C	7D	7E	7G	7F	7A	P6	6B	6C	6D	6E	6G	6F	6A
D12x	P5	5B	5C	5D	5E	5G	5F	5A	--	--	--	--	S4	S3	S2	S1
D13x	--	4B	4C	4D	4E	4G	4F	4A	P3	3B	3C	3D	3E	3G	3F	3A
D14x	P2	2B	2C	2D	2E	2G	2F	2A	P1	1B	1C	1D	1E	1G	1F	1A

LCD driver 2, (accessed by Latch2)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D20x	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D21x	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D22x	--	--	--	--	--	--	--	--	--	--	--	--	S12	S11	S10	S9
D23x	COL	12B	12C	12D	12E	12G	12F	12A	P11	11B	11C	11D	11E	11G	11F	11A
D24x	P10	10B	10C	10D	10E	10G	10F	10A	P9	9B	9C	9D	9E	9G	9F	9A

LCD driver 3, (accessed by Latch3)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D30x	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D31x	--	--	--	--	S24	S23	S22	S21	S20	S19	S18	S17	S16	S15	S14	S13
D32x	P18	18B	18C	18D	18E	18G	18F	18A	P17	17B	17C	17D	17E	17G	17F	17A
D33x	P16	16B	16C	16D	16E	16G	16F	16A	P15	15B	15C	15D	15E	15G	15F	15A
D34x	P14	14B	14C	14D	14E	14G	14F	14A	P13	13B	13C	13D	13E	13G	13F	13A



Segment Keys

5. Design and Handling Precaution

1. The LCD panel is made by glass. Any mechanical shock (eg. dropping form 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 form 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