OCM240160 图形点阵液晶显示模块

使用说明书

感谢您关注和使用我们的液晶显示器产品， 欢迎您提出您的要求、意见和建议，我们将竭诚为您服务、让您满意。您可以浏览 www.shsixian.com了解最新的产品与应用信息,或拨打热线电话 021-53083613 以及向sx@shsixian.com 邮箱发 E-mail 获取具体的技术咨询与服务

上海思先电子有限公司

Shanghai Sixian Electronics Co; Ltd.

单位名称：上海思先电子有限公司
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目录

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1. 产品简介

显示点阵：**240×160Dot**
显示类型：**FSTN-TRANSFLECTIVE-POSITIVE**
背光类型：**LED COLOR-WHITE**
LCD Duty：1/160
LCD Bias：1/11
工作温度：－**20**℃～＋**70**℃
储存温度：－**30**℃～＋**80**℃
控制芯片：**ST7529**

2. 引用文件

ST7529

3. 机械特性

类别	标准值	单位
模块	**87．00**（W）×**75.00(H)X12.0(T)**	mm
有效显示区	**70.0(W)X47.8(H)**	mm
点大小	**0．24(W)X0.25(H)**	mm
点间距	**0.02(W)*0.02(H)**	mm

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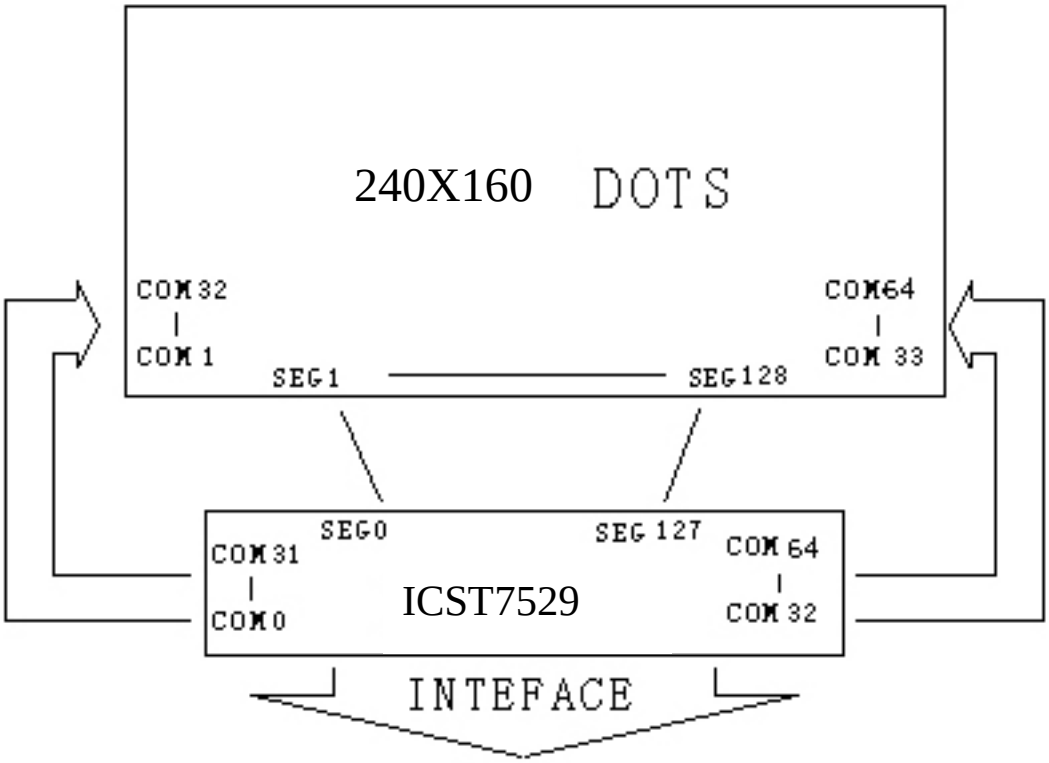
4. 连线图



5. 光电特性

类别	符号	条件	最小值	额定值	最大值	单位
驱动电压	**Vop**	**25**℃	**15.3**	**15.5**	**15.7**	**V**
响应时间	**Ton**	**25**℃		**40**	**400**	**mS**
	Toff	**25**℃		**200**	**400**	**mS**
对比度	**CR**	**25**℃		**7**		
视角范围		**25**℃		**88**		**DEG**
交叉效应		**25**℃		**1.2**		

6. 极限参数

参数	符号	最小值	最大值	单位
供电电压	**Vdd**	**－0.4**	**4.0**	**V**
工作温度	**Top**	**－20**	**＋70**	℃
储存温度	**Tst**	**－30**	**＋80**	℃

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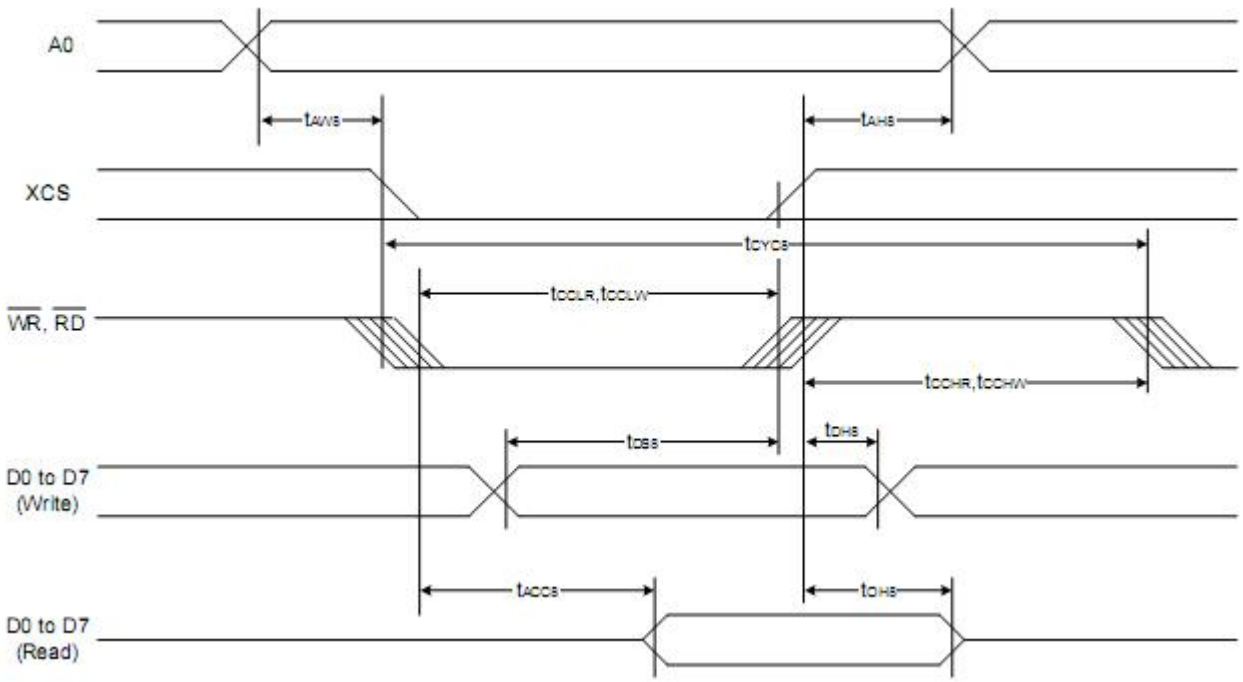
7. 接口时序



(VDD = 3.3V , Ta = –30 to 85℃, Die)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH8	-	20	-	ns
Address setup time		tAW8	-	20	-	
System cycle time		tCYC8	-	200	-	
Enable L pulse width (WRITE)	WR	tCCLW	-	100	-	
Enable H pulse width (WRITE)		tCCHW	-	100	-	
Enable L pulse width (READ)	RD	tCCLR	-	100	-	
Enable H pulse width (READ)		tCCHR	-	100	-	
WRITE Data setup time	D0 to D7	tDS8	-	150	-	
WRITE Address hold time		tDH8	-	20	-	
READ access time		tACC8	CL = 100 pF	-	40	
READ Output disable time		tOH8	CL = 100 pF	-	30	

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(VDD = 2.7 V , Ta = –30 to 85℃ ,Die)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH8	-	20	-	ns
Address setup time		tAW8	-	30	-	
System cycle time		tCYC8	-	250	-	
Enable L pulse width (WRITE)	WR	tCCLW	-	150	-	
Enable H pulse width (WRITE)		tCCHW	-	100	-	
Enable L pulse width (READ)	RD	tCCLR	-	150	-	
Enable H pulse width (READ)		tCCHR	-	100	-	
WRITE Data setup time	D0 to D7	tDS8	-	200	-	
WRITE Address hold time		tDH8	-	20	-	
READ access time		tACC8	CL = 100 pF	-	40	
READ Output disable time		tOH8	CL = 100 pF	-	30	

*1 The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cyde time is extremely fast, (tr +tf) ≦ (tCYC8 – tCCLW – tCCHW) for (tr + tf) ≦ (tCYC8 – tCCLR – tCCHR) are specified.

*2 All timing is specified using 20% and 80% of VDD as the reference.

*3 tCCLW and tCCLR are specified as the overlap between XCS being “L” and WR and RD being at the “L” level.

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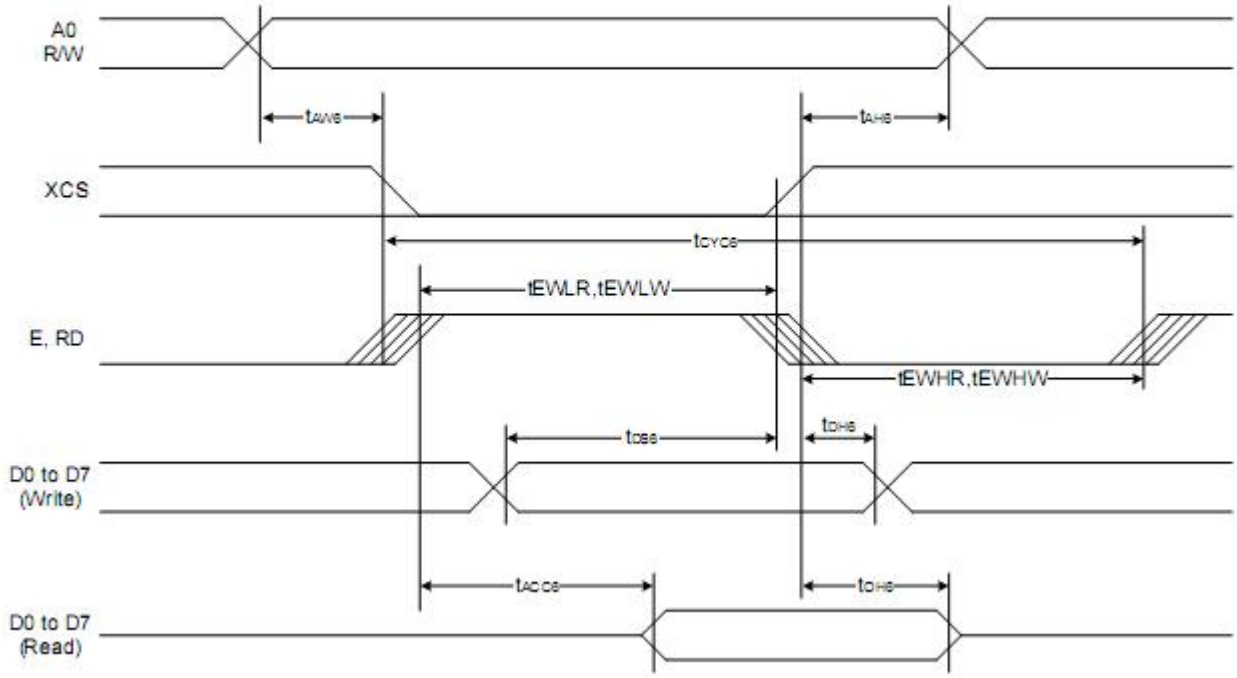
System Bus Read/Write Characteristics 1 (For the 6800 Series MPU)



(VDD = 3.3 V , Ta = –30 to 85℃,Die)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH6	-	20	-	ns
Address setup time		tAW6	-	20	-	
System cycle time	E	tCYC6	-	200	-	
Enable L pulse width (WRITE)		tEWLW	-	100	-	
Enable H pulse width (WRITE)		tEWHW	-	100	-	
Enable L pulse width (READ)	RD	tEWLR	-	100	-	
Enable H pulse width (READ)		tEWHR	-	100	-	
WRITE Data setup time	D0 to D7	tDS6	-	150	-	
WRITE Address hold time		tDH6	-	20	-	
READ access time		tACC6	CL = 100 pF	-	40	
READ Output disable time		tOH6	CL = 100 pF	-	30	

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(VDD = 2.7V , Ta =–30 to 85℃, Die)

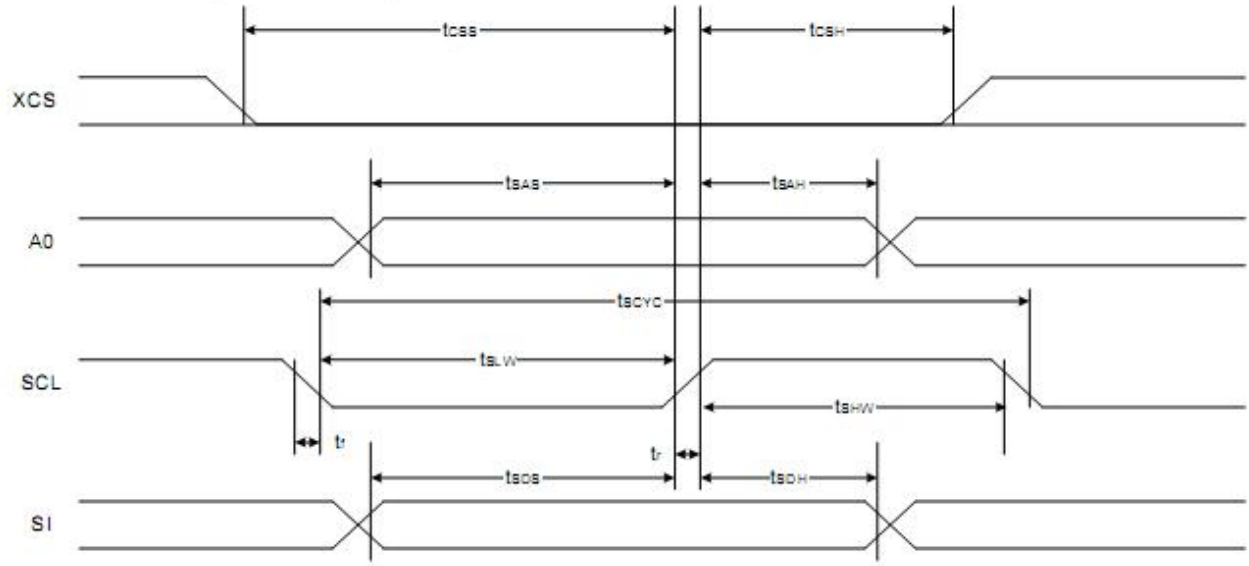
Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH6	-	20	-	ns
Address setup time		tAW6	-	30	-	
System cycle time	E	tCYC6	-	250	-	
Enable L pulse width (WRITE)		tEWLW	-	150	-	
Enable H pulse width (WRITE)		tEWHW	-	100	-	
Enable L pulse width (READ)	RD	tEWLR	-	150	-	
Enable H pulse width (READ)		tEWHR	-	100	-	
WRITE Data setup time	D0 to D7	tDS6	-	200	-	
WRITE Address hold time		tDH6	-	20	-	
READ access time		tACC6	CL = 100 pF	-	40	
READ Output disable time		tOH6	CL = 100 pF	-	30	

*1 The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cyde time is extremely fast, (tr +tf) ≦ (tCYC6 – tEWLW – tEWHW) for (tr + tf) ≦ (tCYC6 – tEWLR – tEWHR) are specified.

*2 All timing is specified using 20% and 80% of VDD as the reference.

*3 tEWLW and tEWLR are specified as the overlap between XCS being "L" and E.

SERIAL INTERFACE (4-Line Interface)



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(V_{DD}=3.3V,Ta= –30 to 85℃,Die)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC	-	100	-	ns
SCL “H” pulse width		tSHW	-	50	-	
SCL “L” pulse width		tSLW	-	50	-	
Address setup time	A0	tSAS	-	40	-	
Address hold time		tSAH	-	30	-	
Data setup time	SI	tSDS	-	30	-	
Data hold time		tSDH	-	30	-	
CS-SCL time	XCS	tCSS	-	20	-	
CS-SCL time		tCSH	-	50	-	

(V_{DD}=2.7V,Ta= –30 to 85℃,Die)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC	-	110	-	ns
SCL “H” pulse width		tSHW	-	60	-	
SCL “L” pulse width		tSLW	-	50	-	
Address setup time	A0	tSAS	-	50	-	
Address hold time		tSAH	-	40	-	
Data setup time	SI	tSDS	-	40	-	
Data hold time		tSDH	-	40	-	
CS-SCL time	XCS	tCSS	-	30	-	
CS-SCL time		tCSH	-	60	-	

*1 The input signal rise and fall time (tr, tf) are specified at 15 ns or less.

*2 All timing is specified using 20% and 80% of VDD as the standard.

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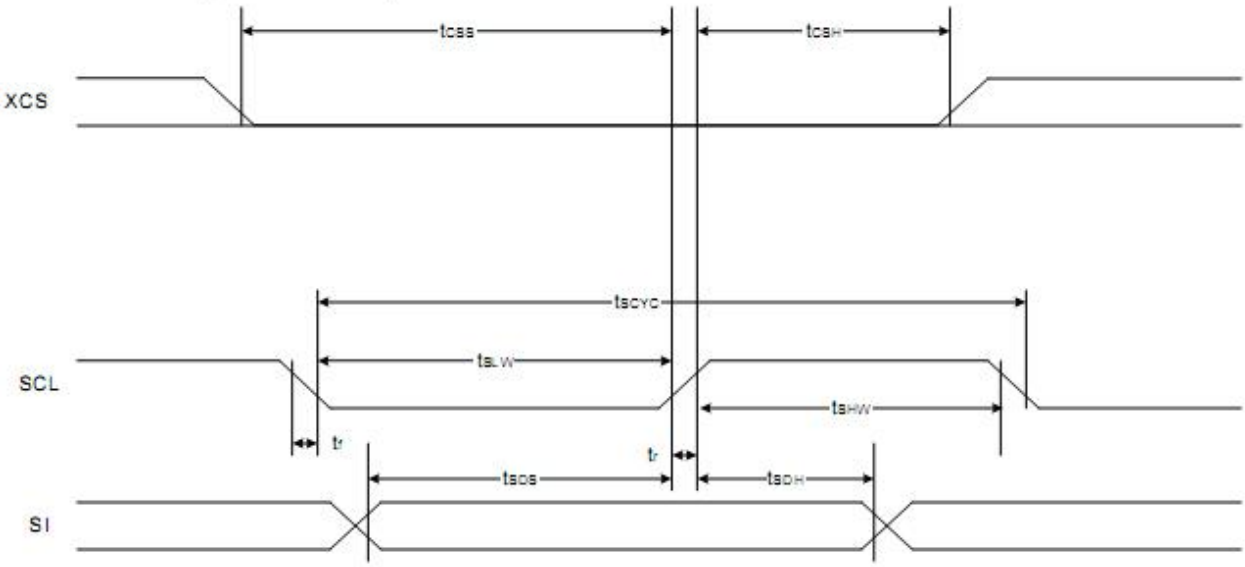
SERIAL INTERFACE (3-Line Interface)



(V_{DD}=3.3V,Ta= –30 to 85℃,Die)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC	-	100	-	ns
SCL “H” pulse width		tSHW	-	50	-	
SCL “L” pulse width		tSLW	-	50	-	
Data setup time	SI	tSDS	-	30	-	
Data hold time		tSDH	-	30	-	
CS-SCL time	XCS	tCSS	-	20	-	
CS-SCL time		tCSH	-	50	-	

(V_{DD}=2.7V,Ta= –30 to 85℃,Die)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC	-	110	-	ns
SCL “H” pulse width		tSHW	-	60	-	
SCL “L” pulse width		tSLW	-	50	-	
Data setup time	SI	tSDS	-	40	-	
Data hold time		tSDH	-	40	-	
CS-SCL time	XCS	tCSS	-	30	-	
CS-SCL time		tCSH	-	60	-	

*1 The input signal rise and fall time (tr, tf) are specified at 15 ns or less.

*2 All timing is specified using 20% and 80% of VDD as the standard.

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8. 直流特性

T_a = -30℃ to +85℃

Item		Symbol	Condition	Rating			Units	Applicable Pin
				Min.	Typ.	Max.		
Operating Voltage (1)		VDD VDD1	-	2.4	-	3.3	V	VDD*1 VDD1
Operating Voltage (2)		VDD2 VDD3 VDD4 VDD5	(Relative to VSS)	2.4	-	3.3	V	VDD2 VDD3 VDD4 VDD5
High-level Input Voltage		VIH	-	0.7 VDD	-	VDD	V	*2
Low-level Input Voltage		VIL	-	VSS	-	0.3 VDD	V	*2
High-level Output Current		IOH	VDD=2.7V VOH =2.2V	0.5	-	-	mA	*3
Low-level Output Current		IOL	VDD=2.7V VOL = 0.5V	-	-	-0.5	mA	*3
Input leakage current		ILI	VIN = VDD or VSS	-1.0	-	1.0	μA	*4
Liquid Crystal Driver ON Resistance		RON	Ta = 25℃ (Relative To VSS) V0 = 14.0V VDD = 2.7V	-	1.4	2.0	KΩ	SEGn COMn *5
Oscillator Frequency	Internal Oscillator	fOSC	1/160 duty Ta = 25℃ VDD = 2.7V CLD = 0	-	12.4	26	kHz	CL*6
	External Input	fCL		-	12.4	26	kHz	CL
	Frame frequency	fFRAME		-	78	160	Hz	SEGn

Item		Symbol	Condition	Rating			Units	Applicable Pin
				Min.	Typ.	Max.		
Internal Power	Input voltage	VDD	(Relative To VSS)	2.4	-	3.3	V	VDD
	Supply Step-up output voltage Circuit	VLCDOUT	(Relative To VSS)	-	-	18	V	VLCDOUT
	Voltage regulator Circuit Operating Voltage	VLCDIN	(Relative To VSS)	-	-	18	V	VLCDIN

*** Recommended LCD V_{OP} voltage is 12V~14V .**

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Dynamic Consumption Current : During Display, with the Internal Power Supply ON.

Test pattern	Symbol	Condition	Rating			Units	Notes
			Min.	Typ.	Max.		
Display Pattern (checkerboard)	ISS	VDD = 2.8 V, V0 – VSS = 16.0 V Booster = 6x Bias = 1/12 Duty = 1/160 Bare chip Cap = 1.0uF	-	460	600	μA	*7
Power Down	ISS	Ta = 25℃	-	-	10	μA	-

9. 引脚描述

接口定义 **1**

引脚序号	引脚	描述
1	**VSS**	信号地
2	**VDD**	供电（＋**3.3V**）
3	**DC-DC ON/OFF**	**DC-DC** 电压转换器开关脚
4	**A0**	**H**＝数据 **L**＝指令
5	**/WR**	**L=**数据写信号
6	**/RD**	**L=**数据读信号
7－14	**D0－D7**	数据总线
15	**XCS**	**L**＝使能信号
16	**/RST**	**L=**复位信号
17	**A**	**LED Anode**
18	**K**	**LED Cathode**

接口定义 2

引脚序号	引	描述
1	**VSS**	信号地
2	**VDD**	供电（＋**3.3V**）
3-10	**D0－D7**	数据总线
11	**WR**	**L=**数据写信号

12	**A0**	**H**＝数据 **L**＝指令
13	**RD**	**L=**数据读信号
14	**RST**	复位信号
15	**CS**	**L**＝使能信号
16	**NC**	悬空
17	**K**	背光电源负
18	**A**	背光电源正
19	**G-CS**	字库片选
20	**G-SO**	字库输出
21	**G-SI**	字库输入
22	**G-SCLK**	字库时钟

10. 命令描述

11.

指令表

Ext=0 or Ext=1

Index	*Command*	*A0*	*RD*	*WR*	*D7*	*D6*	*D5*	*D4*	*D3*	*D2*	*D1*	*D0*	*Function*	*Hex*	*Parameter*
1	Ext In	0	1	0	0	0	1	1	0	0	0	0	Ext=0 Set	30	None
2	Ext Out	0	1	0	0	0	1	1	0	0	0	1	Ext=1 Set	31	None

27	EPSRRD1	0	1	0	0	1	1	1	1	1	0	0	READ Register1	7C	None
28	EPSRRD2	0	1	0	0	1	1	1	1	1	0	1	READ Register2	7D	None
29	NOP	0	1	0	0	0	1	0	0	1	0	1	NOP Instruction	25	None
30	STREAD	0	0	1	Read Data								Status Read		
31	EPINT	0	1	0	0	0	0	0	0	1	1	1	Initial code(1)	07	1 byte

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Ext=0

Index	Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function	Hex	Parameter
1	DISON	0	1	0	1	0	1	0	1	1	1	1	Display On	AF	None
2	DISOFF	0	1	0	1	0	1	0	1	1	1	0	Display Off	AE	None
3	DISNOR	0	1	0	1	0	1	0	0	1	1	0	Normal Display	A6	None
4	DISINV	0	1	0	1	0	1	0	0	1	1	1	Inverse Display	A7	None
5	COMSCN	0	1	0	1	0	1	1	1	0	1	1	COM Scan Direction	BB	1 byte
6	DISCTRL	0	1	0	1	1	0	0	1	0	1	0	Display Control	CA	3 bytes
7	SLPIN	0	1	0	1	0	0	1	0	1	0	1	Sleep In	95	None
8	SLPOUT	0	1	0	1	0	0	1	0	1	0	0	Sleep Out	94	None
9	LASET	0	1	0	0	1	1	1	0	1	0	1	Line Address Set	75	2 bytes
10	CASET	0	1	0	0	0	0	1	0	1	0	1	Column Address Set	15	2 bytes
11	DATSDR	0	1	0	1	0	1	1	1	1	0	0	Data Scan Direction	BC	3 bytes
12	RAMWR	0	1	0	0	1	0	1	1	1	0	0	Writing to Memory	5C	Data
13	RAMRD	0	1	0	0	1	0	1	1	1	0	1	Reading from Memory	5D	Data
14	PTLIN	0	1	0	1	0	1	0	1	0	0	0	Partial display in	A8	2 bytes
15	PTLOUT	0	1	0	1	0	1	0	1	0	0	1	Partial display out	A9	None
16	RMWIN	0	1	0	1	1	1	0	0	0	0	0	Read and Modify Write	E0	None
17	RMWOUT	0	1	0	1	1	1	0	1	1	1	0	RMW end	EE	None
18	ASCSET	0	1	0	1	0	1	0	1	0	1	0	Area Scroll Set	AA	4 bytes
19	SCSTART	0	1	0	1	0	1	0	1	0	1	1	Scroll Start Set	AB	1 byte
20	OSCON	0	1	0	1	1	0	1	0	0	0	1	Internal OSC on	D1	None
21	OSCOFF	0	1	0	1	1	0	1	0	0	1	0	Internal OSC off	D2	None
22	PWRCTRL	0	1	0	0	0	1	0	0	0	0	0	Power Control	20	1 byte
23	VOLCTRL	0	1	0	1	0	0	0	0	0	0	1	EC control	81	2 bytes
24	VOLUP	0	1	0	1	1	0	1	0	1	1	0	EC increase 1	D6	None
25	VOLDOWN	0	1	0	1	1	0	1	0	1	1	1	EC decrease 1	D7	None
26	RESERVED	0	1	0	1	0	0	0	0	0	1	0	Not Use	82	0
27	EPSRRD1	0	1	0	0	1	1	1	1	1	0	0	READ Register1	7C	None
28	EPSRRD2	0	1	0	0	1	1	1	1	1	0	1	READ Register2	7D	None
29	NOP	0	1	0	0	0	1	0	0	1	0	1	NOP Instruction	25	None
30	STREAD	0	0	1	Read Data								Status Read		
31	EPINT	0	1	0	0	0	0	0	0	1	1	1	Initial code(1)	07	1 byte

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Ext=1

Index	Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function	Hex	Parameter
1	Gray 1 Set	0	1	0	0	0	1	0	0	0	0	0	FRAME 1 Gray PWM Set	20	16 bytes
2	Gray 2 Set	0	1	0	0	0	1	0	0	0	0	1	FRAME 2 Gray PWM Set	21	16 bytes
3	ANASET	0	1	0	0	0	1	1	0	0	1	0	Analog Circuit Set	32	3 bytes
4	SWINT	0	1	0	0	0	1	1	0	1	0	0	Software Initial	34	None
5	EPCTIN	0	1	0	1	1	0	0	1	1	0	1	Control EEPROM	CD	1 byte
6	EPCOUT	0	1	0	1	1	0	0	1	1	0	0	Cancel EEPROM	CC	None
7	EPMWR	0	1	0	1	1	1	1	1	1	0	0	Write to EEPROM	FC	None
8	EPMRD	0	1	0	1	1	1	1	1	1	0	1	Read from EEPROM	FD	None

Note: The table above is for 8-bit interface. For the application of 16-bit interface, fill D15~8 with 0, and other bits are just the same with the table above.

EXT= "0" or "1"

(1) Extension instruction disable (EXT IN) - Parameter Byte: None (30H)

Use the "EXT=0" command table

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	0	0	1	1	0	0	0	0

(2) Extension instruction enable (EXT OUT) - Parameter Byte: None (31H)

Use the extended command table EXT="1"

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	0	0	1	1	0	0	0	1

EXT= "0"

(1) Display ON (DISON) - Parameter Byte: None (AFH)

It is to turn the display on. When the display is turned on, segment and common outputs are generated at the level corresponding to the display data and display timing. As long as the sleep mode is selected, the display cannot be turned on. Thus, whenever using this command, the sleep mode must be cancelled first.

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	0	1	0	1	1	1	1

(2) Display OFF (DISOFF) - Parameter Byte: None (AEH)

It is to forcibly turn the display off. As long as the display is turned off, every segment and common outputs are forced to VSS level.

(3) Normal display (DISNOR) - Parameter Byte: None (A6H)

It is to normally highlight the display area without modifying contents of the display data RAM.

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	0	1	0	0	1	1	0

(4) Inverse display (DISINV) - Parameter Byte: None (A7)

It is to inversely highlight the display area without modifying contents of the display data RAM. This command does not invert non-display areas in case of using partial display.

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	0	1	0	0	1	1	1

(5) Common scan (COMSCN) - Parameter Byte: 1 (BBH)

It is to specify the common output scan direction. This command is for the convenience of wiring on the LCD panel.

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	1	0	1	1	1	0	1	1	–
Parameter Byte 1 (PB1)	1	1	0	*	*	*	*	*	CD2	CD1	CD0	Common Scan direction

When 1/160 is selected for the display duty, pins and common output are scanned in the order shown below.

CD2	CD1	CD0	Common scan direction					
			COM0 pin		COM79 pin	COM80 pin		COM159 pin
0	0	0	0	→	79	80	→	159
0	0	1	0	→	79	159	→	80
0	1	0	79	→	0	80	→	159
0	1	1	79	→	0	159	→	80

Original graphic :

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CD[2-0] = [0,0,0] (0→79, 80→159)

CD[2-0] = [0,0,1] (0→79, 159→80)

CD[2-0] = [0,1,0] (79→0, 80→159)

CD[2-0] = [0,1,1] (79→0, 159→80)

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(6) Display control (DISCTRL) - Parameter Byte: 3 (CAH)

This command and succeeding parameters are used to perform the display timing-related setups. This command must be selected before using SLPOUT. Do not change this command while the display is turned on.

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	1	1	0	0	1	0	1	0	
Parameter Byte 1 (PB1)	1	1	0	*	*	*	0	0	CLD	0	0	CL dividing ratio, F1 and F2 drive pattern.
Parameter Byte 2 (PB2)	1	1	0	*	*	DT5	DT4	DT3	DT2	DT1	DT0	Drive duty
Parameter Byte 3 (PB3)	1	1	0	*	*	*	FI	LF3	LF2	LF1	LF0	FR inverse-set value

PB1 specifies the CL dividing ratio.

CLD: CL dividing ratio. They are used to change number of dividing stages of external or internal clock.

CLD=0: not divide, CLD=1: 2 divisions.

PB2 specifies the duty of the module on block basis. Initial: 00H

(Numbers of display lines)/4-1 = DT5 x 2^5 + DT4 x 2^4 + DT3 x 2^3 + DT2 x 2^2 + DT1 x 2^1 + DT0 x 2^0

For example, 1/128 duty → 128/4-1=31 → (DT5, DT4, DT3, DT2, DT1, DT0) = (0, 1, 1, 1, 1, 1)

PB3 specifies number of line cycles (range from 2 to 16) in a frame.

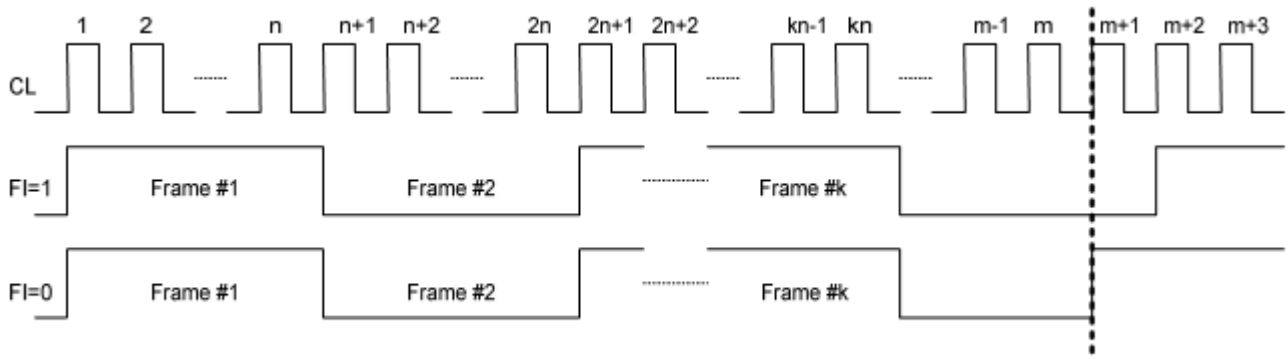
Number of line cycles-1 = LF3 x 2^3 + LF2 x 2^2 + LF1 x 2^1 + LF0 x 2^0

For example, 11 line cycles in a frame → 11-1=10 → (LF3, LF2, LF1, LF0) = (1, 0, 1, 0)

In the default, 11 line cycles in a frame is selected.

FI decides the inversion type of frame at the end of common scan cycle while the number of duty is not divisible by the number of line cycles per frame. For example, in the application of 1/m duty and n line cycles in a frame set, the difference of the choice in FI is shown as the following figure.

m = n x k + r, where m, n, k, and r are all whole numbers, and r is the remainder of m divided by n (r < n).



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(7) Sleep in (SLPIN) - Parameter Byte: None (95H)

This command is to enter the SLEEP MODE.

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	0	0	1	0	1	0	1

(8) Sleep out (SLPOUT) - Parameter Byte: None (94H)

This command is to exit the SLEEP MODE.

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	0	0	1	0	1	0	0

(9) Line address set (LASET) - Parameter Byte: 2 (75H)

This command is to specify the line address area when MPU makes access to the display data RAM. As the addresses are increased from the start to the end line in the line-direction scan, the column address is increased by 1 and the line address return to the start line. Note that the start and end line must be a pair. Moreover, the relation "start line <end line" must be maintained.

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	0	1	1	1	0	1	0	1	–
Parameter Byte 1 (PB1)	1	1	0	SL7	SL6	SL5	SL4	SL3	SL2	SL1	SL0	Start Line
Parameter Byte 2 (PB2)	1	1	0	EL7	EL6	EL5	EL4	EL3	EL2	EL1	EL0	End Line

Note: The range of line address is 0 ~ 159.

(10) Column address set (CASET) - Parameter Byte: 2 (15H)

This command is to specify the column address area when MPU makes access to the display data RAM. As the addresses are increased from the start to the end column in the column-direction scan, the line address is incremented by 1 and the column address is returned to the start column. Note that the start and end line must be a pair. Moreover, the relation "start column <end column" must be maintained.

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	0	0	0	1	0	1	0	1	–
Parameter Byte 1 (PB1)	1	1	0	SC7	SC6	SC5	SC4	SC3	SC2	SC1	SC0	Start Column
Parameter Byte 2 (PB2)	1	1	0	EC7	EC6	EC5	EC4	EC3	EC2	EC1	EC0	End Column

Note: The range of column address is 0 ~ 84.

(11) Data scan direction (DATSDR) - Parameter Byte: 3 (BCH)

This command is to setup various parameters in the operations of display data stored on the built-in RAM by MPU.

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	1	0	1	1	1	1	0	0	–
Parameter Byte 1 (PB1)	1	1	0	*	*	*	*	*	C/L	CI	LI	Normal/inverse display of address and address scan direction.
Parameter Byte 2 (PB2)	1	1	0	*	*	*	*	*	*	*	CLR	P1, P2, P3 arrangement
Parameter Byte 3 (PB3)	1	1	0	*	*	*	*	*	GS2	GS1	GS0	Gray-scale setup

PB1 is to specify the normal/inverse display of the line and column address and the address scanning direction.

LI: Normal/inverse direction of the line address. LI =0: Normal, LI =1: Inverse

CI: Normal/reverse direction of the column address. CI =0: Normal, CI =1: Reverse

C/L: Address-scan direction. C/L =0: In the column direction, C/L =1: In the line direction

PB2 is to change P1, P2, P3 arrangement of the segment output according to P1, P2, P3 arrangement on the LCD panel.

This command will set the writing position of data (P1, P2, P3) on the display memory to be changed or not.

CLR	SEG0	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7	...	SEG254
0	P1	P2	P3	P1	P2	P3	P1	P2	...	P3
1	P3	P2	P1	P3	P2	P1	P3	P2	...	P1

PB3 is to select desired gray scale display 2B3P mode or 3B3P mode.

GS2	GS1	GS0	Numbers of gray-scale
0	0	1	32 gray-scale 2Byte 3Pixel mode
0	1	0	32 gray-scale 3Byte 3Pixel mode

(12) Memory write (RAMWR) - Parameter Byte: Numbers of data written (5CH)

This command turns on the data entry mode when MPU writes data to the display memory. This command will always sets the line and column address at the start address while executed. The following parameter byte rewrites contents of the display data RAM and increases the line or column address automatically. The write mode is automatically cancelled if any other command is entered.

1. 8-bit bus

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	0	1	0	1	1	1	0	0	–
Parameter Byte 1 (PB1)	1	1	0	Data to be written								Data to be written

2. 16-bit bus

	A0	RD	RW	D15	D14	...	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	*	*	...	*	*	0	1	0	1	1	1	0	0	Memory write
Parameter Byte 1 (PB1)	1	1	0	Data to be written													Write date

(13) Memory read (RAMRD) - Parameter Byte: Numbers of data read (5DH)

This command turns on the data read mode when MPU read data from the display memory. This command will always sets the line and column address at the start address while executed. The contents of the display data RAM will be read in the following parameter byte and increases the line or column address automatically. The data read mode is automatically cancelled if any other command is entered.

1. 8-bit bus

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	0	1	0	1	1	1	0	1	--
Parameter Byte 1 (PB1)	1	0	1	Data to be read								Data to be read

2. 16-bit bus

	A0	RD	RW	D15	D14	....	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	*	*	*	*	*	0	1	0	1	1	1	0	1	Memory read
Parameter Byte 1 (PB1)	1	0	1	Data to be read													Read data

(14) Partial in (PTLIN) - Parameter Byte: 2 (A8H)

This command is to specify the partial display area. It will turn on partial display of the screen (dividing screen by lines) to save power. Since ST7529 processes the liquid crystal display signal on 4-line basis (block basis), the display and no-display areas are also specified on 4-bit line (block basis).

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	1	0	1	0	1	0	0	0	--
Parameter Byte 1 (PB1)	1	1	0	*	*	PTS5	PTS4	PTS3	PTS2	PTS1	PTS0	Start block address
Parameter Byte 2 (PB2)	1	1	0	*	*	PTE5	PTE4	PTE3	PTE2	PTE1	PTE0	End block address

Only the address of the display block can be specified for the partial display. Do not specify an address not to be displayed when scrolled.

(15) Partial out (PTLOUT) - Parameter Byte: none (A9H)

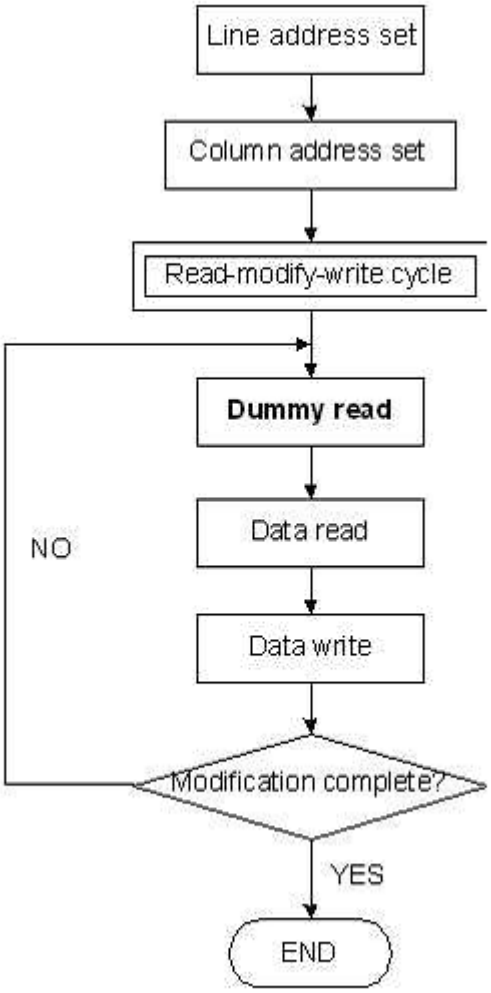
This command is to exit the PARTIAL DISPLAY MODE.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	0	1	0	1	0	0	1

(16) Read modify write in (RMWIN) - Parameter Byte: none (E0H)

This command is used along with the (9) line address set command (LASET), (10) column address set command (CASET), and (17) read modify write out command (RMWOUT). This function is for frequently modified data on a specific area, such as blinking cursor. First, set a specific display area using the column and line address commands. Then, execute this command to set the column and line addresses as the start address of the specific area. When this operation is complete, the column and line address will not be modified by the display data read command. It is increased only when the display data write command is executed. You can cancel this mode by entering the read modify write out or any other command.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	1	1	0	0	0	0	0



(17) Read modify write out (RMWOUT) - Parameter Byte: none (EEH)

This command cancels the read modify write mode.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	1	1	0	1	1	1	0

(18) Area scroll set (ASCSET) - Parameter Byte: 4 (AAH)

It is to scroll only the specified portion of the screen (dividing the screen by lines). This command specifies the scrolling type of area, fixed area and scrolled area.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	1	0	1	0	1	0	1	0	--
Parameter Byte 1 (PB1)	1	1	0	*	*	TB5	TB4	TB3	TB2	TB1	TB0	Top block address
Parameter Byte 2 (PB2)	1	1	0	*	*	BB5	BB4	BB3	BB2	BB1	BB0	Bottom block address
Parameter Byte 3 (PB3)	1	1	0	*	*	NSB5	NSB4	NSB3	NSB2	NSB1	NSB0	Number of specified blocks
Parameter Byte 4 (PB4)	1	1	0	*	*	*	*	*	*	SCM1	SCM0	Area scroll mode

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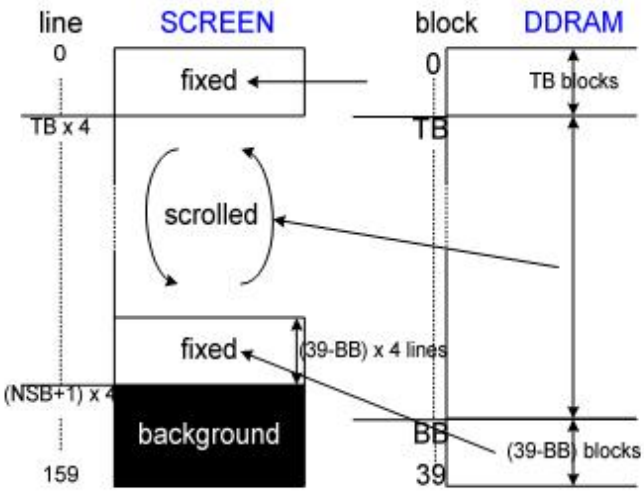
PB4: It is used to specify the scrolling mode.

SCM1	SCM0	Scrolling Mode	Settings		
			Top block address (TB)	Bottom block address (BB)	Number of specified blocks (NSB)
0	0	Center mode	Top(fixed area) height = Top address	Bottom(fixed area) height = 39-Bottom address	Bottom start address = Specified number
0	1	Top mode	0	Bottom(fixed area) height = 39-Bottom address	Bottom start address = Specified number
1	0	Bottom mode	Top(fixed area) height = Top address	39	39
1	1	Whole mode	0	39	39

Since ST7529 processes the liquid crystal display signals on the four-line basis (block basis), fixed and scrolled areas are also specified on the four-line basis (block basis).

DDRAM address of the top fixed area is set in the block address increasing direction starting with the 0th block. DDRAM address of the bottom fixed area is set in the block address decreasing direction starting with 39st block. The DDRAM address of other blocks fixed areas are assigned to the scrolled + background areas.



PB1 is to specify the top block address of the scrolled + background areas. Specify the 0th block for the top screen scroll or whole screen scroll.

PB2 specifies the bottom address of the scroll + background areas. Specify the 39th block for the bottom or whole screen scroll. The relation that top block address < bottom block address must be maintained.

PB3 specifies a specific number of blocks {Numbers of (Top fixed area +Scroll area) block-1}. In the case of the bottom scroll or whole screen scroll, the value is identical with PB2.

The user can turn on the area scroll function by executing the area scroll set command first and then specifying the display start block of the scroll area with the scroll start set command.

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(19) Scroll start address set (SCSTART) - Parameter Byte: 1 (ABH)

This command is to specify which line address of DDRAM to be the start line content shown on screen. Note that you must execute this command after executing the area scroll set command. Scroll becomes available by dynamically changing the start block address.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	1	0	1	0	1	0	1	1	--
Parameter Byte 1 (PB1)	1	1	0	*	*	SB5	SB4	SB3	SB2	SB1	SB0	Start block address

Note : Don't repeat "Area scroll set(AAH)" instruction when "Scroll start address set" is executed.

(20) Internal oscillation on (OSCON) - Parameter Byte: none (D1H)

This command turns on the internal oscillation circuit. It is valid only when the internal oscillation circuit CLS = HIGH.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	1	0	1	0	0	0	1

(21) Internal oscillation off (OSCOFF) - Parameter Byte: none (D2H)

It turns off the internal oscillation circuit. The circuit is also turned off in the reset mode.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	1	0	1	0	0	1	0

(22) Power control set (PWRCTRL) - Parameter Byte: 1 (20H)

This command is used to turn on or off the Booster circuit, voltage regulator circuit, and reference voltage.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	1	0	0	1	0	0	0	0	0	--
Parameter Byte 1 (PB1)	1	1	0	*	*	*	0	VB	0	VF	VR	LCD drive power

VR turns on/off the reference voltage generation circuit. VR = "1": ON, VR =" 0": OFF

VF turns on/off the circuit voltage follower. VF = "1": ON, VF =" 0": OFF

VB: It turns on or off the Booster. VB = "1": ON, VB =" 0": OFF

(23) Electronic volume control (VOLCTRL) - Parameter Byte: 2 (81H)

The command is used to program the optimum LCD supply voltage V_0. Refer to 7.10.2.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	1	0	0	0	0	0	0	1	--
Parameter Byte 1 (PB1)	1	1	0	*	*	VPR5	VPR4	VPR3	VPR2	VPR1	VPR0	VPR[5:0]
Parameter Byte 2 (PB2)	1	1	0	*	*	*	*	*	VPR8	VPR7	VPR6	VPR[8:6]

With the VOLUP and VOLDOWN command the V_0 voltage and therewith the contrast of the LCD can be adjusted.

(24) Increment electronic control (VOLUP) - Parameter Byte: none (D6H)

This command increments electronic control offset value of voltage regulator (V0) circuit by 1. Each step is 0.04V.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	1	0	1	0	1	1	0

If you set the electronic control value to 111111, the control value is set to 000000 after this command has been executed.

(25) Decrement electronic control (VOLDOWN) - Parameter Byte: none (D7H)

This command decrements electronic control offset value of voltage regulator (V0) circuit by 1. Each step is 0.04V.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	1	0	1	0	1	1	1

If you set the electronic control value to 000000, the control value is set to 111111 after this command has been executed.

(26) Reserved (82H)

Do not use this command.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	0	0	0	0	0	1	0

(27) Read Register 1 (EPSRRD1) Command: 1 Parameter Byte: none (7CH)

Execute the EPSRRD1 and STREAD (Status Read) commands in succession to read the Electronic Control value.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	0	1	1	1	1	1	0	0

Execute the Status Read command immediately after this command and execute the NOP command after the STREAD (Status Read) command.

(28) Read Register 2 (EPSRRD2) Command: 1 Parameter Byte: none (7DH)

Execute the EPSRRD2 and STREAD (Status Read) commands in succession to read the built-in resistance ratio.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	0	1	1	1	1	1	0	1

Execute the Status Read command immediately after this command and execute the NOP(Reset) command after the STREAD (Status Read) command.

(29) Non-operating (NOP) - Parameter Byte: none (25H)

This command does not affect the operation but has the function of canceling the IC test mode. Thus, it is recommended to enter it periodically to prevent malfunctioning due to noise and so on.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	0	0	1	0	0	1	0	1

(30) Status read (STREAD) - Parameter Byte: none

The command is to read the internal condition of the IC. One status can be displayed depending on the setting status after reset or after NOP operation.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	0	1	Status data							

D7: Area scroll mode	Refer to SCM1 (ASCSET)	
D6: Area scroll mode	Refer to SCM0 (ASCSET)	
D5: RMW on/off	0 : Out	1 : In
D4: Scan direction	0 : Column	1 : Line
D3: Display ON/OFF	0 : OFF	1 : ON
D2: EEPROM access	0: OutAccess	1: InAccess
D1: Display normal/inverse	0 : Inverse	1 : Normal
D0: Partial display	0 : OFF	1 : ON

(31) Initial code (1) (EPINT) Command: 1; Parameter: 1 (07H)

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0	Function
Command	0	1	0	0	0	0	0	0	1	1	1	07H
Parameter(P1)	1	1	0	0	0	0	1	1	0	0	1	19H

This command is used for EEPROM internal ACK signal generating ,suggest using this command before EEPROM read/write operation . This command improve the EEPROM internal ACK signal under unstable power system.

PB2: Booster Efficiency set

BE1	BE0	Frequency on booster capacitors (Hz)
0	0	3K
0	1	6K (Default)
1	0	12K
1	1	24K

PB3: Select LCD bias ratio of the voltage required for driving the LCD.

BS2	BS1	BS0	LCD bias
0	0	0	1/14
0	0	1	1/13
0	1	0	1/12
0	1	1	1/11
1	0	0	1/10
1	0	1	1/9
1	1	0	1/7
1	1	1	1/5

(4) Software Initial (SWINT) - Parameter Byte: None (34H)

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	0	0	1	1	0	1	0	0

(5) Control EEPROM (EPCTIN) - Parameter Byte: 1 (CDH)

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	1	0	0	1	1	0	1
Parameter Byte 1 (PB1)	1	1	0	0	0	EEWR	0	0	0	0	0

When EEWR = "1", EEPROM will be Write Enable; when EEWR = "0", EEPROM will be Read Enable.

(6) Cancel EEPROM Command (EPCOUT) - Parameter Byte: None (CCH)

This command is to cancel the EEPROM Read/Write Enable.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	1	0	0	1	1	0	0

(7) Write data to EEPROM (EPMWR) - Parameter Byte: None (FCH)

This command is to Write data to EEPROM.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	1	1	1	1	1	0	0

(8) Read data from EEPROM (EPMRD) - Parameter Byte: None (FDH)

This command is to Read data from EEPROM.

	A0	RD	RW	D7	D6	D5	D4	D3	D2	D1	D0
Command	0	1	0	1	1	1	1	1	1	0	1

12. 附录

读写 EEPROM 子程序

Example：EEPROM Read Operation

```
void ReadEEPROM( void )
    {

        Write( COMMAND, 0x0030 );          // Ext = 0
        Write( COMMAND, 0x0007 );          // Initial code (1)
        Write( DATA, 0x0019 );
        Write( COMMAND, 0x0031 );          // Ext = 1
        Write( COMMAND, 0x00CD );          // EEPROM ON
        Write( DATA, 0x0000 );             // Entry "Read Mode"
        Delay( 100ms );                    // Waite for EEPROM Operation ( 100ms )
        Write( COMMAND, 0x00FD );          // Start EEPROM Reading Operation
        Delay( 100ms );                    // Waite for EEPROM Operation ( 100ms )
        Write( COMMAND, 0x00CC );          // Exist EEPORM Mode
        Write( COMMAND, 0x0030 );          // Ext = 0

    }
```

Example：EEPROM Write Operation

```
void WriteEEPROM( void )
    {

        Write( COMMAND, 0x0030 );          // Ext = 0
        Write( COMMAND, 0x00AE );          // Display OFF
        Write( COMMAND, 0x0007 );          // Initial code(1)
        Write( DATA, 0x0019 );
        Write( COMMAND, 0x0031 );          // Ext = 1
        Write( COMMAND, 0x00CD );          // EEPROM ON
        Write( DATA, 0x0020 );             // Entry "Write Mode"
        Delay( 100ms );                    // Waite for EEPROM Operation ( 100ms )
        Write( COMMAND, 0x00FC );          // Start EEPROM Writing Operation
        Delay( 100ms );                    // Waite for EEPROM Operation ( 100ms )
        Write( COMMAND, 0x00CC );          // Exist EEPROM Mode
        Write( COMMAND, 0x0030 );          // Ext = 0
        Write( COMMAND, 0x00AF );          // Display ON

    }
```

自定义初始化

Example：Initial code for 255X160

```
void ST7529_Init( void )
    {
```

Write(COMMAND, 0x0030);	//Ext = 0
Write(COMMAND, 0x0094);	//Sleep Out
Write(COMMAND, 0x00D1);	//OSC On
Write(COMMAND, 0x0020);	//Power Control Set
Write(DATA, 0x0008);	//Booster Must Be On First
Delay(1ms);	
Write(COMMAND, 0x0020);	//Power Control Set
Write(DATA, 0x000B);	//Booster, Regulator, Follower ON
Write(COMMAND, 0x0081);	//Electronic Control
Write(DATA, 0x0004);	//Vop=14.0V
Write(DATA, 0x0004);	
Write(COMMAND, 0x00CA);	//Display Control
Write(DATA, 0x0000);	//CL=X1
Write(DATA, 0x0027);	//Duty=160
Write(DATA, 0x0000);	//FR Inverse-Set Value
Write(COMMAND, 0x00A6);	// Normal Display
Write(COMMAND, 0x00BB);	//COM Scan Direction
Write(DATA, 0x0001);	// 0→79 159→80
Write(COMMAND, 0x00BC);	//Data Scan Direction
Write(DATA, 0x0000);	//Normal
Write(DATA, 0x0000);	//RGB Arrangement
Write(DATA, 0x0001);	//65K COLOR
Write(COMMAND, 0x0075);	//Line Address Set
Write(DATA, 0x0000);	//Start Line=0
Write(DATA, 0x009F);	//End Line =159
Write(COMMAND, 0x0015);	//Column Address Set
Write(DATA, 0x0000);	//Start Column=0
Write(DATA, 0x0054);	//End Column =84

Write(COMMAND, 0x0031);	//Ext = 1
Write(COMMAND, 0x0032);	//Analog Circuit Set
Write(DATA, 0x0000);	//OSC Frequency =000 (Default)
Write(DATA, 0x0001);	//Booster Efficiency=01(Default)
Write(DATA, 0x0000);	//Bias=1/14
Write(COMMAND, 0x0034);	//Software Initial
ReadEEPROM();	//Read EEPROM Flow
Write(COMMAND, 0x0030);	//Ext = 0
Write(COMMAND, 0x00AF);	//Display On

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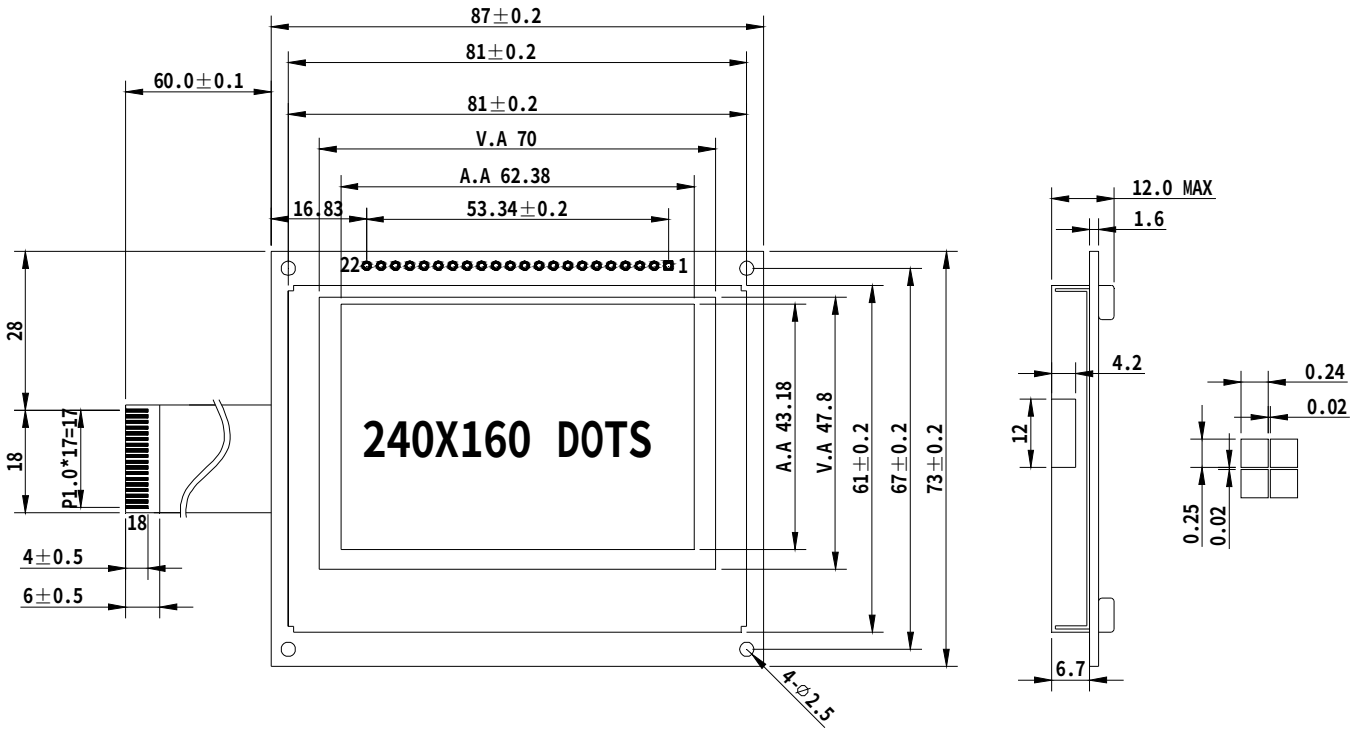
```
 //设置 XY 坐标
void SetAddress(unsigned char ucXpos,unsigned char ucYpos)
{

      LCD_CmdWrite(0X30);     //EXT=0

      LCD_CmdWrite(0X75);     //THIRD    COMMAND SET LINE ADDRESS
      LCD_DataWrite(ucXpos);       //START LINE
      LCD_DataWrite(159);    //END     LINE

      LCD_CmdWrite(0X15);     //THIRD    COMMAND SET COLUMN ADDRESS
      LCD_DataWrite(ucYpos);    //START COLUMN
      LCD_DataWrite(0xef);    //END     COLUMN

}

点阵测试程序
void WretPointTest(unsigned char ucData)
{
     unsigned int i,j;

     LCD_CmdWrite(0X30);     //EXT=0

     LCD_CmdWrite(0X75);     //THIRD    COMMAND SET LINE ADDRESS
     LCD_DataWrite(0);       //START LINE
     LCD_DataWrite(159);    //END     LINE

     LCD_CmdWrite(0X15);     //THIRD    COMMAND SET COLUMN ADDRESS
     LCD_DataWrite(0);    //START COLUMN
     LCD_DataWrite(79);    //END     COLUMN    设定行从 0 行开始到 159 行结束

     LCD_CmdWrite(0X5C);     //DATA WRITE

        for(i=0;i<160;i++)
        {
             for (j=0;j<80;j++)
           {
                    LCD_DataWrite(ucData);
                    LCD_DataWrite(ucData);
                    LCD_DataWrite(ucData);
             }
        }
```

}

模块外形尺寸



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