FM13301 液晶显示屏使用手册

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一. 概述：

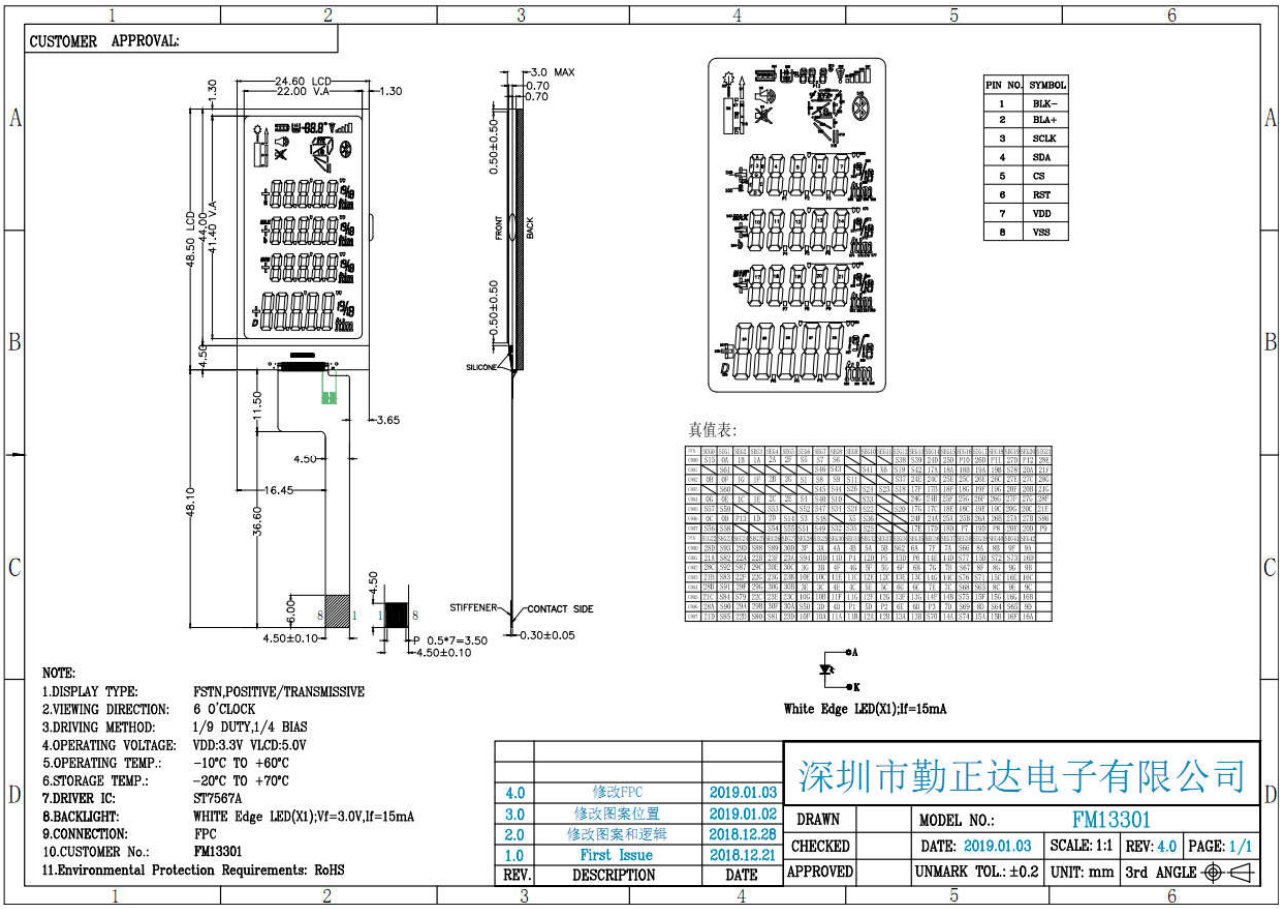
FM13301 是一款段码型液晶显示屏。它主要采用动态驱动原理由 ST7567A 控制器对段码进行控制并驱动显示。此显示器采用了 COG 加 FPC 的封装方式,使其寿命长，连接可靠。

二. 特性：

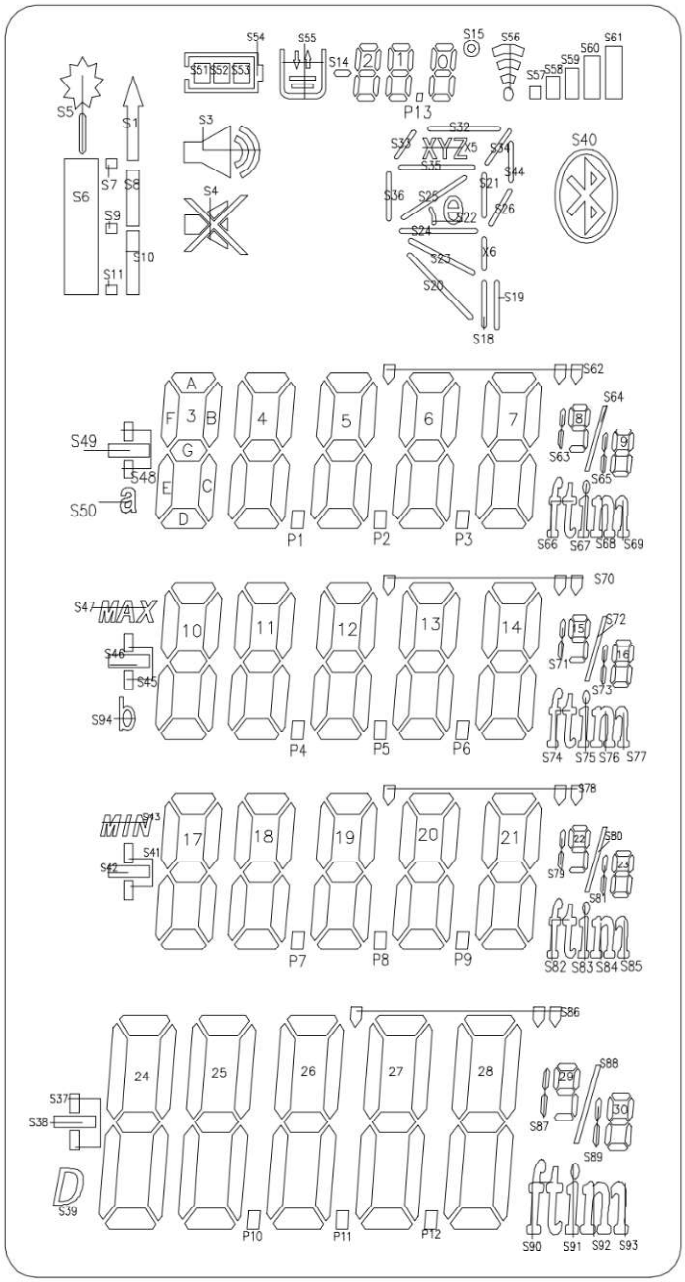
1. 工作电压为+3.3V ,内建升压器。
2. 与 CPU 接口采用 3-Line SPI 总线协议。

三. 外形尺寸：

1. 外形结构图:



2. 逻辑图:



PTN	SEG0	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7	SEG8	SEG9	SEG10	SEG11	SEG12	SEG13	SEG14	SEG15	SEG16	SEG17	SEG18	SEG19	SEG20	SEG21
COM0	S15	0A	1B	1A	2A	2F	S5	S7	S6				S38	S39	24D	25D	P10	26D	P11	27D	P12	28E
COM1		S61						S46	S43		S41	X6	S19	S42	17A	18A	18B	19A	19B	S78	20A	21F
COM2	0B	0F	1G	1F	2B	2G	S1	S8	S9	S11			S37	24E	24C	25E	25C	26E	26C	27E	27C	28G
COM3		S60						S45	S44	S26	S24	S23	S18	17F	17B	18F	18G	19F	19G	20F	20B	21G
COM4	0G	0E	1C	1E	2C	2E	S4	S40	S10		S33			24G	24B	25F	25G	26F	26G	27F	27G	28F
COM5	S57	S59			S53		S52	S47	S34	S21	S22		S20	17G	17C	18E	18C	19E	19C	20G	20C	21E
COM6	0C	0D	P13	1D	2D	S14	S3	S48		X5	S36			24F	24A	25A	25B	26A	26B	27A	27B	S86
COM7	S56	S58			S54	S55	S51	S49	S32	S35	S25			17E	17D	18D	P7	19D	P8	20E	20D	P9
PTN	SEG22	SEG23	SEG24	SEG25	SEG26	SEG27	SEG28	SEG29	SEG30	SEG31	SEG32	SEG33	SEG34	SEG35	SEG36	SEG37	SEG38	SEG39	SEG40	SEG41	SEG42	
COM0	28D	S93	29D	S88	S89	30D	3F	3A	4A	4B	5A	5B	S62	6A	7F	7A	S66	8A	8B	9F	9A	
COM1	21A	S82	22A	22B	23F	23A	S94	10D	11D	P4	12D	P5	13D	P6	14E	14D	S77	15D	S72	S73	16D	
COM2	28C	S92	S87	29C	30E	30C	3G	3B	4F	4G	5F	5G	6F	6B	7G	7B	S67	8F	8G	9G	9B	
COM3	21B	S83	22F	22G	23G	23B	10E	10C	11E	11C	12E	12C	13E	13C	14G	14C	S76	S71	15C	16E	16C	
COM4	28B	S91	29F	29G	30G	30B	3E	3C	4E	4C	5E	5C	6G	6C	7E	7C	S68	S63	8C	9E	9C	
COM5	21C	S84	S79	22C	23E	23C	10G	10B	11F	11G	12F	12G	13F	13G	14F	14B	S75	15F	15G	16G	16B	
COM6	28A	S90	29A	29B	30F	30A	S50	3D	4D	P1	5D	P2	6E	6D	P3	7D	S69	8D	S64	S65	9D	
COM7	21D	S85	22D	S80	S81	23D	10F	10A	11A	11B	12A	12B	13A	13B	S70	14A	S74	15A	15B	16F	16A	

四.引脚特性：

引脚号	引脚名称	级　别	引　脚　功　能　描　述
1	BLK-	0V	背光负极
2	BLA+	3.0V	背光正极
3	SCLK	H/L	串行接口锁存端
4	SDA	H/L	串行接口数据端
5	CS	H/L	片选信号
6	RST	H/L	复位，低有效
7	VDD	3.3V	电源正
8	VSS	0V	电源地

五.电气特性：

1.限定参数:

项　　目	名称	值	单位	备 注
Operating Voltage	VDD	+3.0 to +3.3	V	*1
Supply Voltage	VEE	VDD-3.3toVDD-3.0	V	*2

●

项　　目	名称	值	单位	备 注
Operating Temperature	T_{OPR}	-10 to +60	℃	
Storage Temperature	T_{STG}	-20 to +70	℃	

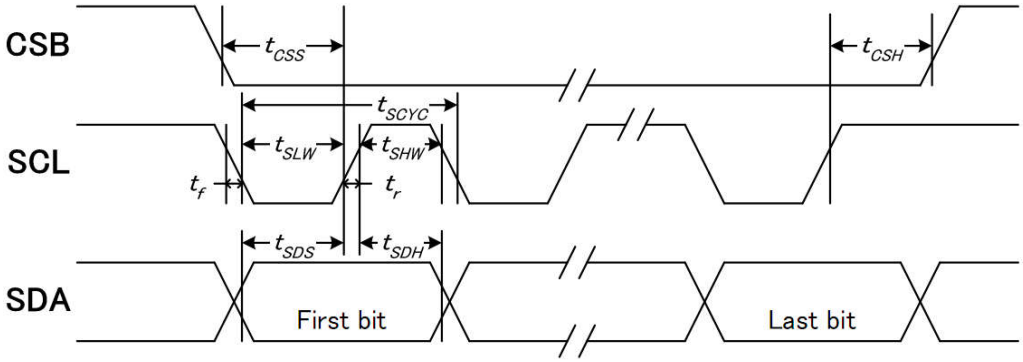
*1.Based on VSS=0V
*2.Applies to V_{LCD}

2.直流特性:（VDD=+3.3V，VSS=0V， VLCD=5.0V，Ta=-20～+70℃）

项　　目	名称	测试条件	Min	Typ	Max	单位	备注
Input High Voltage	V_{IH}	-	2.4	-	VDD	V	*1
Input Low Voltage	V_{IL}	-	0	-	0.6	V	*1
Output High Voltage	V_{OH}	I_{OH}=-500uA	2.4	-	-	V	*2
Output Low Voltage	V_{OL}	I_{OL}=0.5mA		-	0.6	V	*2
Input Leakage Current	I_{LKG}	V_{IN}=VSS～VDD	-1.0	-	1.0	uA	*3
Three-state(OFF) input Current	I_{TSL}	V_{IN}=VSS～VDD	-3.3	-	3.3	uA	*4
Operating Current	I_{DD1}	During Display	-	-	0.5	mA	*5
	I_{DD2}	During Access			1	mA	*5

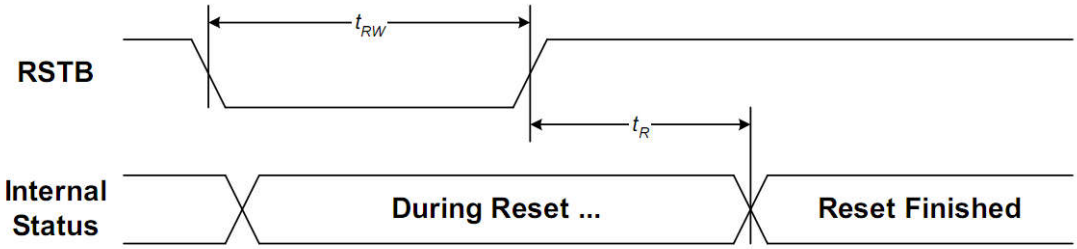
六. 时序特性及地址映射表:

3-Line SPI 时序图:



(VDD1 = 3.3V , Ta =25˚C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCL	tSCYC		50	—	ns
SCL “H” pulse width		tSHW		25	—	
SCL “L” pulse width		tSLW		25	—	
Data setup time	SDA	tSDS		20	—	
Data hold time		tSDH		10	—	
CSB-SCL time	CSB	tCSS		20	—	
CSB-SCL time		tCSH		40	—	



(VDD1 = 3.3V , Ta =25˚C)

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1.0	us
Reset “L” pulse width	tRW		1.0	—	

七. 指令列表:

INSTRUCTION	A0	R/W (RWR)	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
(1) Display ON/OFF	0	0	1	0	1	0	1	1	1	D	D=1, display ON D=0, display OFF
(2) Set Start Line	0	0	0	1	S5	S4	S3	S2	S1	S0	Set display start line
(3) Set Page Address	0	0	1	0	1	1	Y3	Y2	Y1	Y0	Set page address
(4)Set Column Address	0	0	0	0	0	1	X7	X6	X5	X4	Set column address (MSB)
	0	0	0	0	0	0	X3	X2	X1	X0	Set column address (LSB)
(5) Read Status	0	1	0	MX	D	RST	0	0	0	0	Read IC Status
(6) Write Data	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write display data to RAM
(7) Read Data	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read display data from RAM
(8) SEG Direction	0	0	1	0	1	0	0	0	0	MX	Set scan direction of SEG MX=1, reverse direction MX=0, normal direction
(9) Inverse Display	0	0	1	0	1	0	0	1	1	INV	INV =1, inverse display INV =0, normal display
(10) All Pixel ON	0	0	1	0	1	0	0	1	0	AP	AP=1, set all pixel ON AP=0, normal display
(11) Bias Select	0	0	1	0	1	0	0	0	1	BS	Select bias setting 0=1/9; 1=1/7 (at 1/65 duty)
(12) Read-modify-Write	0	0	1	1	1	0	0	0	0	0	Column address increment: Read:+0 , Write:+1
(13) END	0	0	1	1	1	0	1	1	1	0	Exit Read-modify-Write mode
(14) RESET	0	0	1	1	1	0	0	0	1	0	Software reset
(15) COM Direction	0	0	1	1	0	0	MY	-	-	-	Set output direction of COM MY=1, reverse direction MY=0, normal direction
(16) Power Control	0	0	0	0	1	0	1	VB	VR	VF	Control built-in power circuit ON/OFF
(17) Regulation Ratio	0	0	0	0	1	0	0	RR2	RR1	RR0	Select regulation resistor ratio
(18) Set EV	0	0	1	0	0	0	0	0	0	1	Double command!! Set electronic volume (EV) level
	0	0	0	0	EV5	EV4	EV3	EV2	EV1	EV0	
(19) Set Booster	0	0	1	1	1	1	1	0	0	0	Double command!! Set booster level: BL=0: 4X BL=1: 5X
	0	0	0	0	0	0	0	0	0	BL	
(20) Power Save	0	0	Compound Command								Display OFF + All Pixel ON
(21) NOP	0	0	1	1	1	0	0	0	1	1	No operation
(22) Set N-Line	0	0	1	0	0	0	0	1	0	1	Set N-Line inversion
	0	0	0	0	0	NL4	NL3	NL2	NL1	NL0	
(23) Release N-Line	0	0	1	0	0	0	0	1	0	0	Exit N-Line inversion
(24) SPI Read Status	0	1	1	1	1	1	1	1	0	0	SPI read status command
	0	1	0	MX	D	RST	ID3	ID2	ID1	ID0	
(25) SPI Read DDRAM	0	1	1	1	1	1	1	1	0	1	SPI read DDRAM command
	1	1	D7	D6	D5	D4	D3	D2	D1	D0	

EXTENSION COMMAND SET											
Extension Command Set	0	0	1	1	1	1	1	1	1	Mode	Mode=1: Enter extension command table Mode=0: Exit extension command table
(1) High Power Mode ON	0	0	0	1	1	0	1	0	1	1	Enter high power mode
(2) High Power Mode OFF	0	0	0	1	1	0	0	1	0	0	Exit high power mode
(3) Display Setting Mode	0	0	0	1	1	1	-	-	DSM	0	Complex command DSM=1: Enter display setting DSM=0: Exit display setting When DSM=1, Set duty(DT[3:0]), bias(BA[2:0]), frame rate(FR[2:0])
	0	0	1	1	0	1	DT3	DT2	DT1	DT0	
	0	0	1	0	0	1	0	BA2	BA1	BA0	
	0	0	1	0	0	1	1	FR2	FR1	FR0	

Note: 1. Symbol "-" means this bit can be "H" or "L".

2. Do not use instructions not listed in these tables.