深圳市拓普微科技开发有限公司
SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LMT018DNBFWD-2

LCD Module User Manual

Prepared by:	Checked by:	Approved by:
Li keke		
Date: 2021-07-07	Date:	Date:

Rev.	Descriptions	Release Date
0.1	Preliminary New release	2020-06-09
0.2	Update Absolute Maximum Ratings	2021-02-04
0.3	Update LED Backlight Circuit Characteristics	2021-07-07

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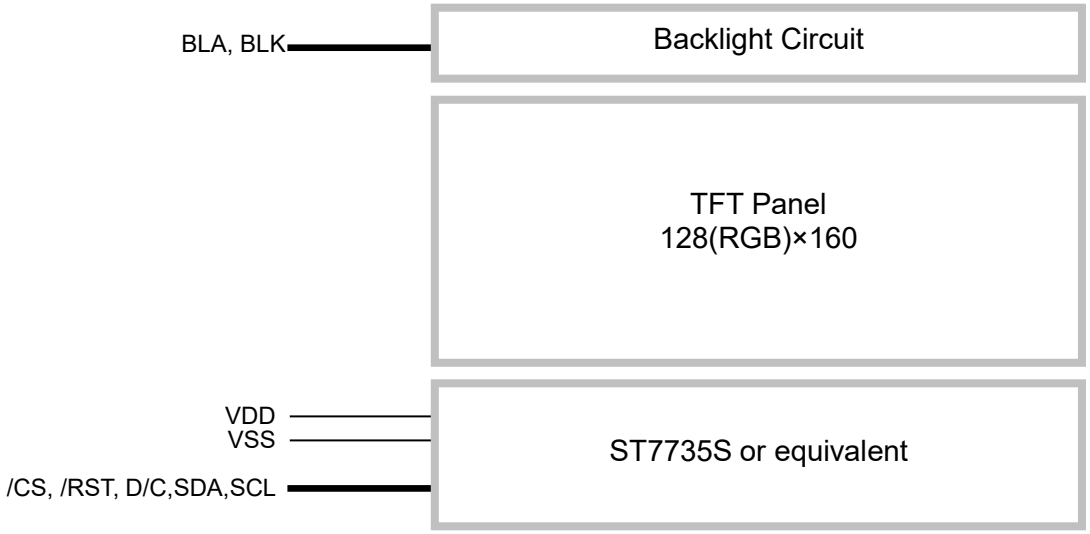
1. Basic Specifications

Screen Size(Diagonal) :	1.8”
Color Depth:	65k / 262k color
Number of dots :	128(RGB) x 160
Active Area :	28.03x35.04 mm
Dot Pitch :	0.219x0.219 mm
Display Technology :	a-Si TFT active matrix
Display Mode :	Transmissive / Positive
Pixel Configuration :	RGB Stripe
Viewing Direction :	12H (*1) (gray scale inverse) 6H (*2)
Polarizer Surface Treatment:	Glare
Backlight Type:	LEDs
Outline Dimension :	34.0 x 43.78 x 2.6 mm (exclude FPC , see dwg for details)
Operating Temperature :	-20 ~ +70°C (No Condensation)
Storage Temperature :	-30 ~ +80°C (No Condensation)

Note:

*1. For saturated color display content (eg. pure-red, pure-green, pure-blue or pure-colors-combinations).
*2. For “color scales” display content.
*3. Color tone may slightly change by temperature and driving condition.

1.1 Block Diagram



1.2 Terminal Functions

Pin No.	PIN Name	I/O	Descriptions
1	VSS	Power	Negative power supply,0V
2	VDD	Power	Positive power supply
3	SCL	Input	Serial interface clock pin
4	/RST	Input	Reset signal /RESET = L, Initialization is executed /RESET = H, Normal running.
5	/CS	Input	Chip Select /CS=L, enable access to the LCD module /CS=H, disable access to the LCD module
6	SDA	I/O	Serial input/output signal pin
7	D/C	Input	Register Select D/C = H, Transferring the Display Data D/C = L, Transferring the Control Data
8	BLK	Power	Negative power for LED backlight
9	BLA	Power	Positive power for LED backlight

2. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V_{DD}	-0.3	+4.6	V	V_{SS} = 0V
Input Voltage	V_{IN}	-0.3	+4.6	V	V_{SS} = 0V
Operating Temperature	T_{OP}	-20	+70	°C	No Condensation
Storage Temperature	T_{ST}	-30	+80	°C	No Condensation
High Temperature & High Humidity Storag	-	-	+60℃&90% RH	-	No Condensation IEC60068-2-78 GB/T2423.3

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, T_{OP}=25°C

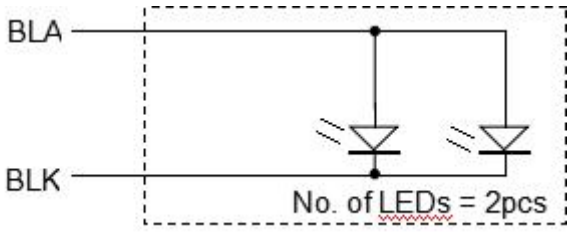
Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition / Application Pin
Operating Voltage	V_{DD}	2.6	3.3	3.6	V	VDD
Input High Voltage	V_{IH}	0.8xV_{DD}	-	V_{DD}	V	/RST, /CS, D/C, SDA,SCL
Input Low Voltage	V_{IL}	V_{SS}	-	0.2xV_{DD}	V	
Operating Current	I_{DD}	-	1.8	4.5	mA	VDD (*1)

3.2 LED Backlight Circuit Characteristics

T_{OP} =25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Forward Voltage	Vf	2.8	3.2	3.6	V	For each LED
Forward Current	I_F	-	15	20	mA	For each LED
Backlight Power Consumption	WBL	-	96	144	mW	For total LEDs
LED lifetime	L	-	20000	-	Hours	

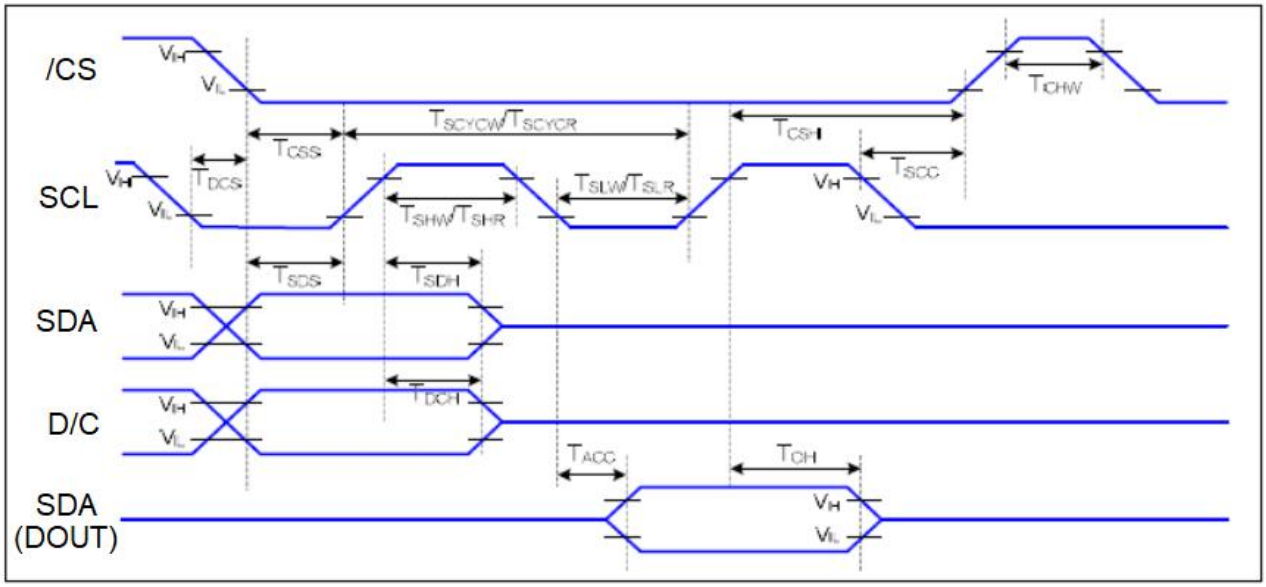
Note1:LED CIRCUIT DIAGRAM



Note 2:LED: VF =3.2V, IF =15mA(TYP)
Note 3:IF is defined for one LED.
Optical performance should be evaluated at Ta=25℃ only.
If LED is driven by high current, high ambient temperature & humidity condition.
The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness.
Typical operating life time is estimated data.
Note 4:Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

3.3 AC Characteristics

4-SPI Mode Timing

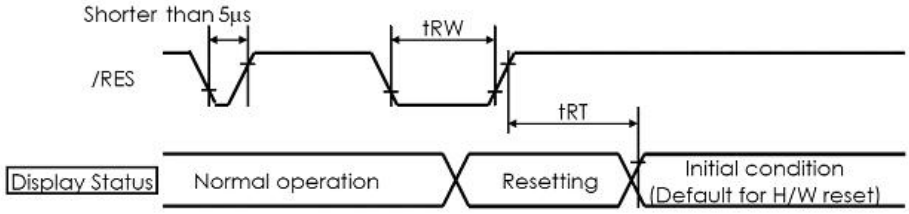


V_{SS}=0V ,V_{DD}=2.8V , T_{OP}=25°C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
/CS	TCSS	Chip Select Setup Time (Write)	45		ns	
	TCSH	Chip Select Hold Time (Write)	45		ns	
	TCSS	Chip Select Setup Time (Read)	60		ns	
	TSCC	Chip Select Hold Time (Read)	65		ns	
	TCHW	Chip Select "H" Pulse Width	40		ns	
SCL	TSCYCW	Serial Clock Cycle (Write)	66		ns	-Write Command & Data Ram
	TSHW	SCL "H" Pulse Width (Write)	15		ns	
	TSLW	SCL "L" Pulse Width (Write)	15		ns	
	TSCYCR	Serial Clock Cycle (Read)	150		ns	-Read Command & Data Ram
	TSHR	SCL "H" Pulse Width (Read)	60		ns	
	TSLR	SCL "L" Pulse Width (Read)	60		ns	
D/C	TDCS	D/C Setup Time	10		ns	
	TDCH	D/C Hold Time	10		ns	
SDA (DIN) (DOUT)	TSDS	Data Setup Time	10		ns	For Maximum CL=30pF For Minimum CL=8pF
	TSDH	Data Hold Time	10		ns	
	TACC	Access Time	10	50	ns	
	TOH	Output Disable Time	15	50	ns	

Note:
*1. Input signal rise/fall time should be less than 15ns .
*2. All timing is using 20% and 80% of VDD as the reference.
*3. Please refer to ST7735S datasheet for details

Reset Timing



Item	Symbol	MIN.	TYP.	MAX.	Unit
Reset LOW pulse width	t_{RW}	10	-	-	us
Reset time	T_{RT}	-	-	120	ms

4. Optical Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Note/ Condition
View Angles		θT	50	60	-	Degree	CR≥10 (*1, *3)
		θB	40	50	-		
		θL	50	60	-		
		θR	50	60	-		
Contrast Ratio		CR	300	500	-		θ=0° (*4)
Response Time		T_{ON}	-	20	30	ms	25℃ (*5)
		T_{OFF}					
Chromaticity	white	x	0.226	0.276	0.326		Backlight is on (*6)
		y	0.252	0.302	0.352		
	red	x	-	TBD	-		
		y	-	TBD	-		
	green	x	-	TBD	-		
		y	-	TBD	-		
	blue	x	-	TBD	-		
		y	-	TBD	-		
Uniformity		U	80	-	-	%	θ=0°, Φ=0° (*1,*2)
NTSC			-	50	-	%	θ=0°, Φ=0° (*1, *6)
Luminance		L	150	180	-	cd/m2	θ=0°, Φ=0° (*1,*2)

Test Conditions:

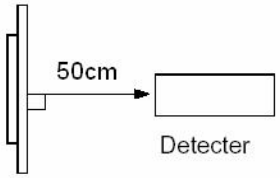
1. I_F= 30mA, and the ambient temperature is 25℃.

Note:

*1. Measurement

The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots.

Measurement equipment PR-705 (Φ8mm)



Measuring condition:

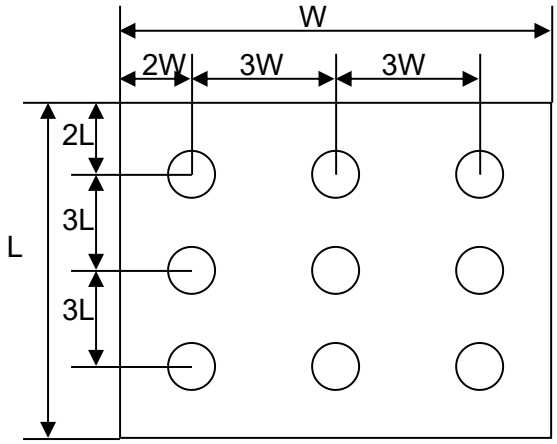
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25℃.
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.

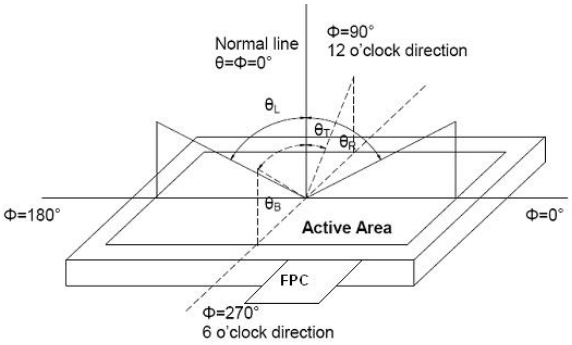
*2. The luminance uniformity
It is calculated by using following formula.

△Bp = Bp (Min.) / Bp (Max.)×100 (%)

Bp (Max.) = Maximum brightness in 9 measured spots
Bp (Min.) = Minimum brightness in 9 measured spots.
Measurement equipment PR-705 (Φ8mm)



*3. The definition of viewing angle:
Refer to the graph below marked by θ and Φ

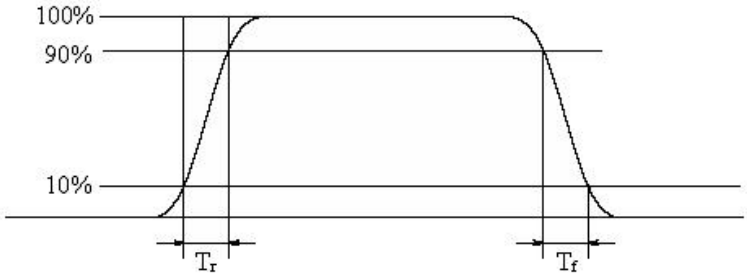


*4. The definition of contrast ratio (Test LCM using PR-705):

$$\text{Contrast Ratio(CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

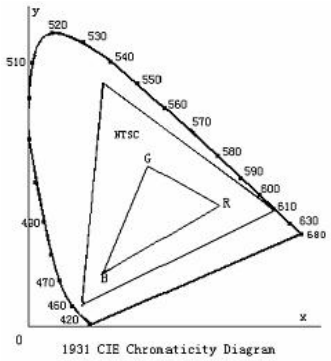
(Contrast Ratio is measured in optimum common electrode voltage)

*5. Definition of Response time.(Test LCD using DMS501):
The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



*6: Definition of Color of CIE Coordinate and NTSC Ratio.

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$



5. Functions

5.1 Display Commands

Instruction	Refer	D/CX	WRX	RDX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	Hex	Function
NOP	0	0	↑	1	-	0	0	0	0	0	0	0	0	(00h)	No Operation
SWRESET	0	0	↑	1	-	0	0	0	0	0	0	0	1	(01h)	Software Reset
RDDID	0	0	↑	1	-	0	0	0	0	0	1	0	0	(04h)	Read Display ID
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	ID17	ID16	ID15	ID14	ID13	ID12	ID11	ID10		ID1 Read
		1	1	↑	-	1	ID26	ID25	ID24	ID23	ID22	ID21	ID20		ID2 Read
		1	1	↑	-	ID37	ID36	ID35	ID34	ID33	ID32	ID31	ID30		ID3 Read
RDDST	0	0	↑	1	-	0	0	0	0	1	0	0	1	(09h)	Read Display Status
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	BSTON	MY	MX	MV	ML	RGB	MH	ST24		-
		1	1	↑	-	ST23	IFPF2	IFPF1	IFPF0	IDMON	PTLON	SLOUT	NORON		-
		1	1	↑	-	VSSON	ST14	INVON	ST12	ST11	DISON	TEON	GCS2		-
		1	1	↑	-	GCS1	GCS0	TEM	ST4	ST3	ST2	ST1	ST0		-
RDDPM	0	0	↑	1	-	0	0	0	0	1	0	1	0	(0Ah)	Read Display Power Mode
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	BSTON	IDMON	PTLON	SLPOUT	NORON	DISON	-	-		-
RDD MADCTL	0	0	↑	1	-	0	0	0	0	1	0	1	1	(0Bh)	Read Display MADCTL
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	MY	MX	MV	ML	RGB	MH	-	-		-
RDD COLMOD	0	0	↑	1	-	0	0	0	0	1	1	0	0	(0Ch)	Read Display Pixel Format
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	0	0	0	0	-	IFPF2	IFPF1	IFPF0		-
RDDIM	0	0	↑	1	-	0	0	0	0	1	1	0	1	(0Dh)	Read Display Image Mode
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	VSSON	D6	INVON	-	-	GCS2	GCS1	GCS0		-
RDDSM	0	0	↑	1	-	0	0	0	0	1	1	1	0	(0Eh)	Read Display Signal Mode
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	TEON	TEM	-	-	-	-	-	-		-
RDDSDR	0	0	↑	1	-	0	0	0	0	1	1	1	1	(0Fh)	Read Display Self-diagnostic result
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	RELD	FUND	ATTD	BRD	-	-	-	-		-

Instruction	Refer	D/CX	WRX	RDX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	Hex	Function
SLPIN	0	0	↑	1	-	0	0	0	1	0	0	0	0	(10h)	Sleep In & Booster Off
SLPOUT	0	0	↑	1	-	0	0	0	1	0	0	0	1	(11h)	Sleep Out & Booster On
PTLON	0	0	↑	1	-	0	0	0	1	0	0	1	0	(12h)	Partial Mode On
NORON	0	0	↑	1	-	0	0	0	1	0	0	1	1	(13h)	Partial Off (Normal)
INVOFF	0	0	↑	1	-	0	0	1	0	0	0	0	0	(20h)	Display Inversion Off (Normal)
INVON	0	0	↑	1	-	0	0	1	0	0	0	0	1	(21h)	Display Inversion On
GAMSET	0	0	↑	1	-	0	0	1	0	0	1	1	0	(26h)	Gamma Curve Select
		1	↑	1	-	-	-	-	-	GC3	GC2	GC1	GC0		-
DISPOFF	0	0	↑	1	-	0	0	1	0	1	0	0	0	(28h)	Display Off
DISPON	0	0	↑	1	-	0	0	1	0	1	0	0	1	(29h)	Display On
CASET	0	0	↑	1	-	0	0	1	0	1	0	1	0	(2Ah)	Column Address Set
		1	↑	1	-	XS15	XS14	XS13	XS12	XS11	XS10	XS9	XS8		X Address Start: 0≤XS≤X
		1	↑	1	-	XS7	XS6	XS5	XS4	XS3	XS2	XS1	XS0		
		1	↑	1	-	XE15	XE14	XE13	XE12	XE11	XE10	XE9	XE8		X Address End: S≤ XE≤ X
		1	↑	1	-	XE7	XE6	XE5	XE4	XE3	XE2	XE1	XE0		
RASET	0	0	↑	1	-	0	0	1	0	1	0	1	1	(2Bh)	Row Address Set
		1	↑	1	-	YS15	YS14	YS13	YS12	YS11	YS10	YS9	YS8		Y Address Start: 0≤YS≤Y
		1	↑	1	-	YS7	YS6	YS5	YS4	YS3	YS2	YS1	YS0		
		1	↑	1	-	YE15	YE14	YE13	YE12	YE11	YE10	YE9	YE8		Y Address End:S≤YE≤Y
		1	↑	1	-	YE7	YE6	YE5	YE4	YE3	YE2	YE1	YE0		
RAMWR	0	0	↑	1	-	0	0	1	0	1	1	0	0	(2Ch)	Memory Write
		1	↑	1	-	D7	D6	D5	D4	D3	D2	D1	D0		Write Data
RGBSET	0	0	↑	1	-	0	0	1	0	1	1	0	1	(2Dh)	LUT for 4k,65k,262k Color display
		1	↑	1	-	-	-	R005	R004	R003	R002	R001	R000		Red Tone 0
		1	↑	1	-	-	-	:	:	:	:	:	:		:
		1	↑	1	-	-	-	Ra5	Ra4	Ra3	Ra2	Ra1	Ra0		Red Tone "a"
		1	↑	1	-	-	-	G005	G004	G003	G002	G001	G000		Green Tone 0
		1	↑	1	-	-	-	:	:	:	:	:	:		:
		1	↑	1	-	-	-	Gb5	Gb4	Gb3	Gb2	Gb1	Gb0		Green Tone "b"
		1	↑	1	-	-	-	B005	B004	B003	B002	B001	B000		Blue Tone 0
		1	↑	1	-	-	-	:	:	:	:	:	:		:
		1	↑	1	-	-	-	Bc5	Bc4	Bc3	Bc2	Bc1	Bc0		Blue Tone "c"
RAMRD	0	0	↑	1	-	0	0	1	0	1	1	1	0	(2Eh)	Memory Read
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	D7	D6	D5	D4	D3	D2	D1	D0		Read Data

Instruction	Refer	D/CX	WRX	RDX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	Hex	Function
PTLAR	10.1.25	0	↑	1	-	0	0	1	1	0	0	0	0	(30h)	Partial Start/End Address Set
		1	↑	1	-	PSL15	PSL14	PSL13	PSL12	PSL11	PSL10	PSL9	PSL8		Partial Start Address (0,1,2, ..P)
		1	↑	1	-	PSL7	PSL6	PSL5	PSL4	PSL3	PSL2	PSL1	PSL0		
		1	↑	1	-	PEL15	PEL14	PEL13	PEL12	PEL11	PEL10	PEL9	PEL8		Partial End Address (0,1,2, .., P)
		1	↑	1	-	PEL7	PEL6	PEL5	PEL4	PEL3	PEL2	PEL1	PEL0		
SCRLAR	10.1.26	0	↑	1	-	0	0	1	1	0	0	1	1	(33h)	Scroll area set
		1	↑	1	-	-	-	-	-	-	-	-	-		Top fixed area (0,1, 2, .., 161)
		1	↑	1	-	TFA7	TFA6	TFA5	TFA4	TFA3	TFA2	TFA1	TFA0		
		1	↑	1	-	-	-	-	-	-	-	-	-		Vertical scroll area (0,1, 2, .., 161)
		1	↑	1	-	VSA7	VSA6	VSA5	VSA4	VSA3	VSA2	VSA1	VSA0		
		1	↑	1	-	-	-	-	-	-	-	-	-		Bottom fixed area (0,1, 2, .., 161)
		1	↑	1	-	BFA7	BFA6	BFA5	BFA4	BFA3	BFA2	BFA1	BFA0		
TEOFF	10.1.27	0	↑	1	-	0	0	1	1	0	1	0	0	(34h)	Tearing effect line off
TEON	10.1.28	0	↑	1	-	0	0	1	1	0	1	0	1	(35h)	Tearing Effect Mode Set & on
		1	↑	1	-	-	-	-	-	-	-	-	TEM		Mode1: TEM="0" Mode2: TEM="1"
MADCTL	10.1.29	0	↑	1	-	0	0	1	1	0	1	1	0	(36h)	Memory Data Access Control
		1	↑	1	-	MY	MX	MV	ML	RGB	MH	-	-		-
VSCSAD	10.1.30	0	↑	1	-	0	0	1	1	0	1	1	1	(37h)	Scroll Start Address of RAM
		1	1	1	-	-	-	-	-	-	-	-			SSA=0,1,2,...,161
		1	1	1	-	SSA7	SSA6	SSA5	SSA4	SSA3	SSA2	SSA1	SSA0		
IDMOFF	10.1.31	0	↑	1	-	0	0	1	1	1	0	0	0	(38h)	Idle Mode Off
IDMON	10.1.32	0	↑	1	-	0	0	1	1	1	0	0	1	(39h)	Idle Mode On
COLMOD	10.1.33	0	↑	1	-	0	0	1	1	1	0	1	0	(3Ah)	Interface Pixel Format
		1	↑	1	-	-	-	-	-	-	IFPF2	IFPF1	IFPF0		Interface Format
RDID1	10.1.34	0	↑	1	-	1	1	0	1	1	0	1	0	(DAh)	Read ID1
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	ID17	ID16	ID15	ID14	ID13	ID12	ID11	ID10		Read Parameter
RDID2	10.1.35	0	↑	1	-	1	1	0	1	1	0	1	1	(DBh)	Read ID2
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	1	ID26	ID25	ID24	ID23	ID22	ID21	ID20		Read Parameter
RDID3	10.1.36	0	↑	1	-	1	1	0	1	1	1	0	0	(DCh)	Read ID3
		1	1	↑	-	-	-	-	-	-	-	-	-		Dummy Read
		1	1	↑	-	ID37	ID36	ID35	ID34	ID33	ID32	ID31	ID30		Read Parameter

Notes:
1. There will be no abnormal visible effects on the display when S/W or H/W Reset are applied.
2. After Powered-On Reset finishes within 10%s after both VDD & VDDI are applied.
3. Mode 1 means Tearing Effect Output Line consists of V-Blanking Information only.
4. Please refer to ST7735S datasheet for details

5.1 Power off the LCD Module

It recommends that enter Sleep Mode before power off the LCD module.

5.2 Refreshing The LCD Module

It recommends that the operating modes and display contents be refreshed periodically to prevent the effect of unexpected noise.

6. LCD Module Design and Handling Precautions

- Please ensure V0, VCOM is adjustable, to enable LCD module get the best contrast ratio under different temperatures, view angles and positions.
- Normally display quality should be judged under the best contrast ratio within viewable area. Unexpected display pattern may come out under abnormal contrast ratio.
- Never operate the LCD module exceed the absolute maximum ratings.
- Never apply signal to the LCD module without power supply.
- Keep signal line as short as possible to reduce external noise interference.
- IC chip (e.g. TAB or COG) is sensitive to light. Strong light might cause malfunction. Light sealing structure casing is recommended.
- Make sure there is enough space (with cushion) between case and LCD panel, to prevent external force passed on to the panel; otherwise that may cause damage to the LCD and degrade its display result.
- Avoid showing a display pattern on screen for a long time (continuous ON segment).
- LCD module reliability may be reduced by temperature shock.
- When storing and operating LCD module, avoids exposure to direct sunlight, high humidity, high or low temperature. They may damage or degrade the LCD module.
- Never leave LCD module in extreme condition (max./min storage/operate temperature) for more than 48hr.
- Recommend LCD module storage conditions is 0 C~40 C <80%RH.
- LCD module should be stored in the room without acid, alkali and harmful gas.
- Avoid dropping & violent shocking during transportation, and no excessive pressure press, moisture and sunlight.
- LCD module can be easily damaged by static electricity. Please maintain an optimum anti-static working environment to protect the LCD module. (eg. ground the soldering irons properly)
- Be sure to ground the body when handling LCD module.
- Only hold LCD module by its sides. Never hold LCD module by applying force on the heat seal or TAB.
- When soldering, control the temperature and duration avoid damaging the backlight guide or diffuser which might degrade the display result such as uneven display.
- Never let LCD module contact with corrosive liquids, which might cause damage to the backlight guide or the electric circuit of LCD module.
- Only clean LCD with a soft dry cloth, Isopropyl Alcohol or Ethyl Alcohol. Other solvents (e.g. water) may damage the LCD.
- Never add force to components of LCD module. It may cause invisible damage or degrade the module's reliability.
- When mounting LCD module, please make sure it is free

6. 液晶显示模块设计和使用须知

- 请注意 V0, VCOM 的设定，以确保液晶显示模块在不同的使用温度下以及在不同的视角和位置观察模块显示，均能达到最佳对比度，请务必将应用电路上设置为对比度可调。
- 请注意液晶显示模块的显示品质判定是指在正常对比度下以及视窗(V.A)范围内进行的，非正常对比度下液晶可能会出现非预期的显示不良，应注意区分。
- 请勿在最大额定值以外使用液晶显示模块。
- 请勿在没有接通电源的条件下，给液晶显示模块输送信号。
- 请尽可能缩短信号线的连接，以避免对液晶显示模块的信号干扰。
- 集成电路因 IC 芯片(如 TAB 或 COG)对紫外线极为敏感，强光环境下可能会引起液晶显示模块功能失效，故应采用不透光的外壳。
- 请在液晶显示模块与外壳之间保留足够的空间(可使用衬垫)，以缓冲外力对液晶显示模块的损坏或因受力不均而产生的显示不匀等异常现象。
- 避免液晶显示屏在某一画面下长时间点亮，否则有出现残影的风险；请通过软件每隔一段时间改变一次画面。
- 液晶显示模块的可靠性可能因温度冲击而降低。
- 请勿在阳光直射、高湿、高温或低温下储存和使用液晶显示模块，这将造成液晶显示模块的损坏或失效。
- 请勿在极限环境(最大/最小存储/工作温度)下使用或放置液晶显示模块超过 48 小时以上。
- 液晶显示模块建议存储条件为：0 C~40 C <80%RH。
- 请勿让液晶显示模块存储于带有 酸性，碱性，有害气体环境之中。
- 在运输过程中，请勿让液晶显示模块跌落与猛烈震动，同时避免 异常挤压，高湿度，与阳光照射.
- 液晶显示模块极易受静电损坏，请务必保证液晶显示模块在防静电的工作环境中使用或保存。(如：烙铁正确接地,等)
- 拿取液晶显示模块时需注意操作人员的接地情况。
- 请手持液晶显示模块的边沿取放模块，防止热压纸或 TAB 部位受力。
- 焊接液晶模块时，请注意控制烙铁的温度、焊接时间，以免烫坏导光板或偏光片，导致显示不匀等不良现象发生。
- 请勿使用洗板水等腐蚀性液体接触液晶模块，以免腐蚀导光板或模块电路。
- 仅可使用柔软的干布，异丙醇或乙醇清洁液晶屏表面，其他任何溶剂(如:水)都有可能损坏液晶模块。
- 请勿挤压液晶显示模块上的元器件，以避免产生潜在的损坏或失效而影响产品可靠性。

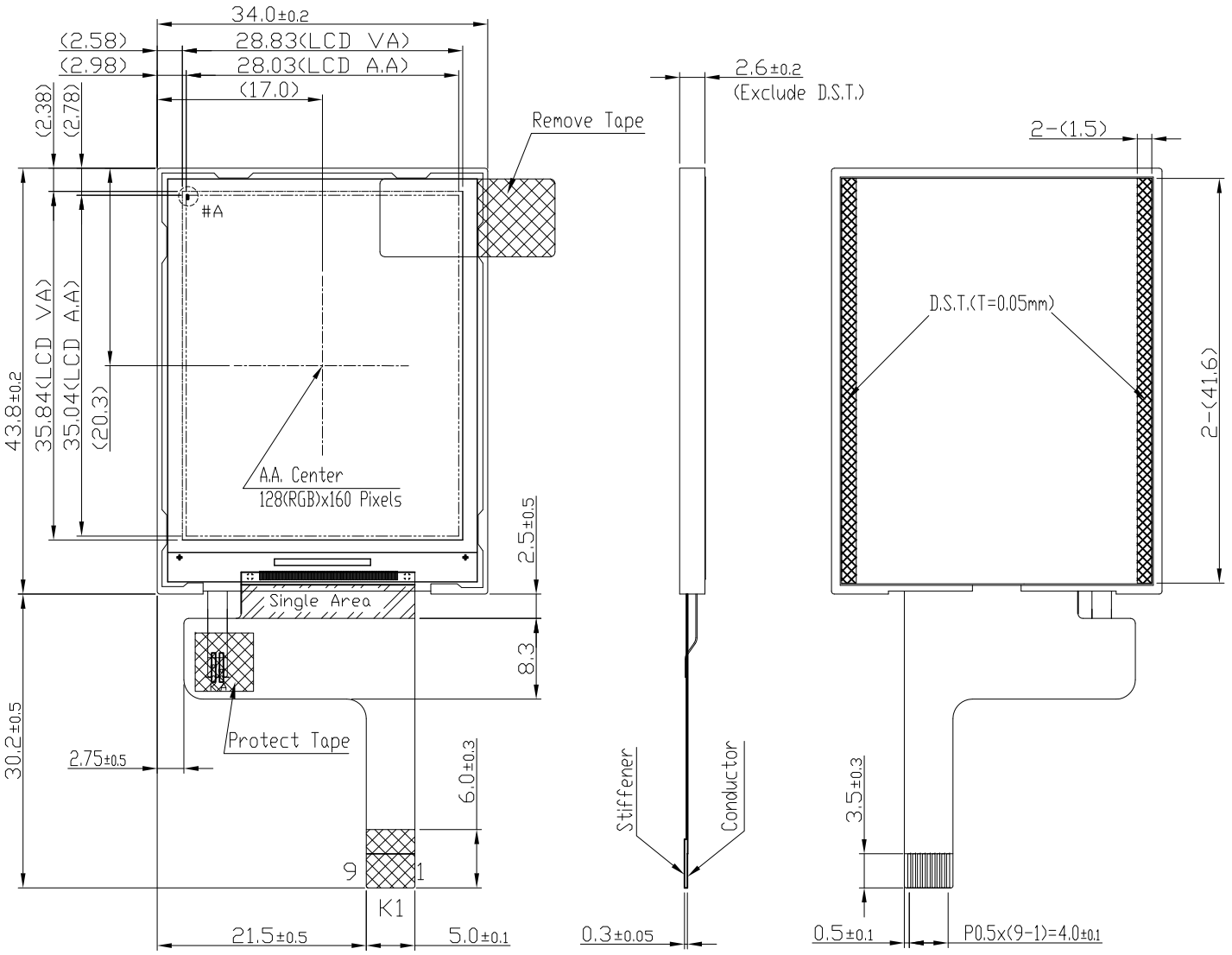
from twisting, warping and bending.
- Do not add excessive force on surface of LCD, which may cause the display color change abnormally.
- LCD panel is made with glass. Any mechanical shock (e.g. dropping from high place) will damage the LCD module.
- Protective film is attached on LCD screen. Be careful when peeling off this protective film, since static electricity may be generated.
- Polarizer on LCD gets scratched easily. If possible, do not remove LCD protective film until the last step of installation.
- When peeling off protective film from LCD, static charge may cause abnormal display pattern. The symptom is normal, and it will turn back to normal in a short while.
- LCD panel has sharp edges, please handle with care.
- Never attempt to disassemble or rework LCD module.
- If display panel is damaged and liquid crystal substance leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes promptly wash it off using soap and water.

- 装配液晶显示模块时，请务必注意避免液晶显示模块的扭曲或变形。
- 请勿挤压液晶显示屏表面，这将导致显示颜色的异常。
- 液晶屏由玻璃制作而成，任何机械碰撞(如从高处跌落)均有可能损坏液晶显示模块。
- 液晶屏表面带有保护膜，揭除保护膜时需要注意可能产生的静电。
- 因液晶显示屏表面的偏光片极易划伤，安装完成之前请尽量不要揭下保护膜。
- 请缓慢揭除保护膜，在此过程中液晶显示屏上可能会产生静电线，此为正常情况，可在短时间内消失。
- 请注意避免被液晶显示屏的边缘割伤。
- 请不要试图拆卸或改造液晶显示模块。
- 当液晶显示屏出现破裂，内部液晶液体可能流出；相关液体不可吞吃，绝对不可接触嘴巴，如接触到皮肤或衣服，请使用肥皂与清水彻底清洗.

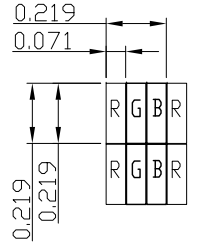
Warranty

This product has been manufactured to our company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

- We cannot accept responsibility for any defect, which may arise form additional manufacturing of the product (including disassembly and reassembly), after product delivery.
- We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
- We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed our company's acceptance inspection procedures.
- When the product is in CCFL models, CCFL service life and brightness will vary according to the performance of the inverter used, leaks, etc. We cannot accept responsibility for product performance, reliability, or defect, which may arise.
- We cannot accept responsibility for intellectual property of a third part, which may arise through the application of our product to our assembly with exception to those issues relating directly to the structure or method of manufacturing of our product.



K1 Terminal	
No.	Pin Name
1	VSS
2	VDD
3	SCL
4	/RST
5	/CS
6	SDA
7	D/C
8	BLK
9	BLA



#A Details
Scale=50/1

Note:
*1. LCD Display Type : TFT,Transmissive
*2. Pixel Arrangment : RGB-STRIPE
*3. Signal Interface : 4-wire SPI
*4. Color Depth : 262k Colors
*5. Operating Voltage : 3.3V
*6. Backlight : White LEDs
*7. Backlight Supply : 2x15mA (VF=3.2V, TYP)
*8. Recommended Connector : FH19SC-9S-0.5SH(HIROS) Or Equivalent
*9. Operating Temperature : -20°C~70°C
*10. Storage Temperature : -30°C~80°C

B		
A		
Rev	Note	Date
Dwg Title	LMT018DNBFWD-2 Outline Dwg	
Dwg No.	MK-006923-1-1	Date 2020-06-09
Scale 2/1	Tol. ±0.3 / Unit mm / Paper Size A3	
Approved	Checked	Drawn Luo Lin

TOPWAY