



YEEBO LCD Limited

LCM Specialist

# SPECIFICATION FOR LCD MODULE

MODULE NO: BTG-128160B-FBWB-G-G-B1

Doc.Version:06

Customer Approval:

☐ Accept

☐ Reject

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APPROVAL FOR SPECIFICATIONS ONLY

☐ APPROVAL FOR SPECIFICATIONS AND SAMPLE

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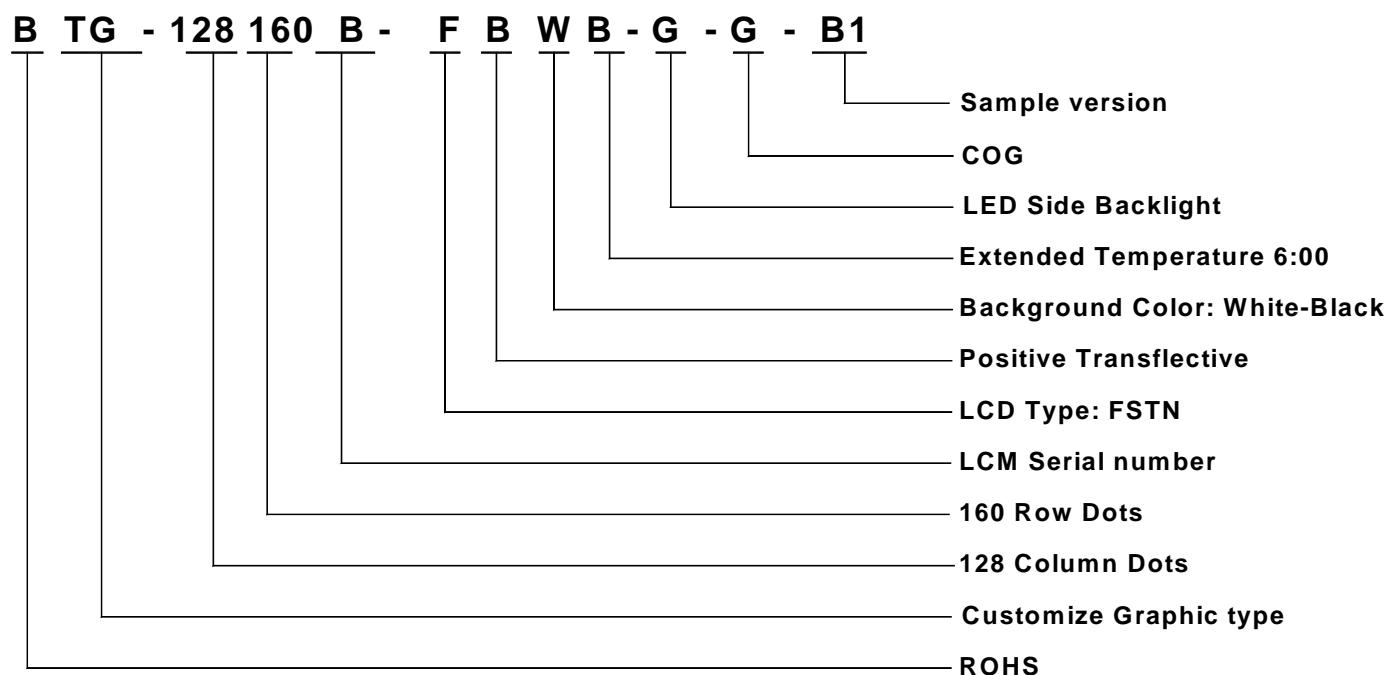
## DOCUMENT REVISION HISTORY

Sample Version	DOC. Version	DATE	DESCRIPTION		CHANGED BY
B0	00	2014-04-14	SPEC ONLY	First issue	LZD
B0	01	2014-04-16	SPEC ONLY	Revised the Block diagram on page 4	LZD
B0	02	2014-05-16	FULL SPEC	First sample issue	LZD
B1	03	2014-07-08	SPEC ONLY	Changed some dimension on P5	LZD
B1	04	2014-7-11	SPEC ONLY	Added the LED NO. and provider on P5	LZD
B1	05	2014-07-17	SPEC ONLY	Added some dimension on P5	LZD
B1	06	2014-07-23	SPEC ONLY	Changed some dimension on P5	LZD



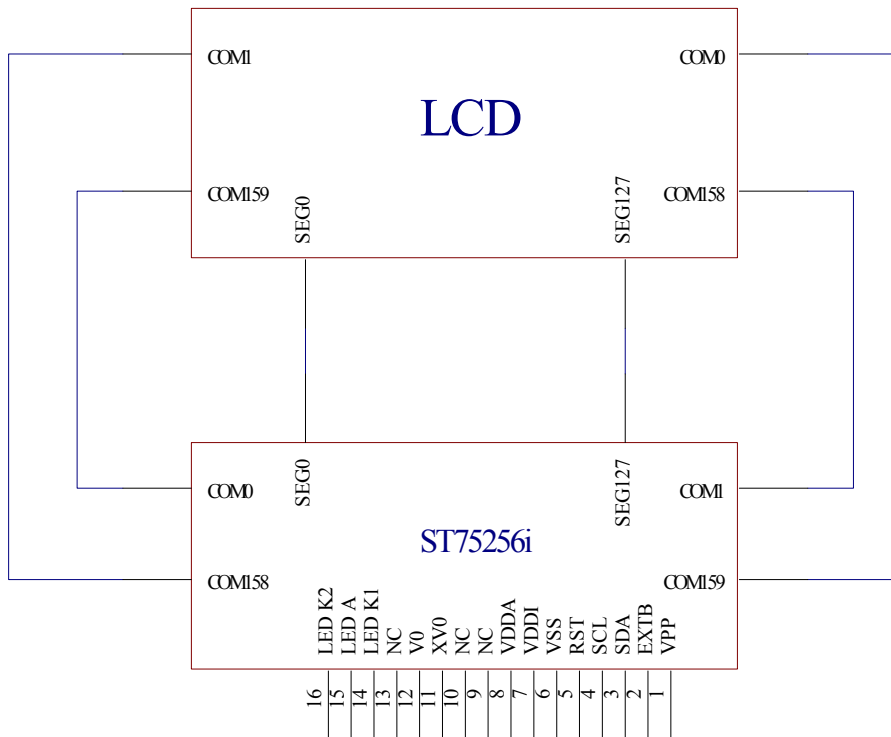
## **CONTENTS**

<b>1. NOTATION OF THE MODULE NUMBER</b>	<b>3</b>
<b>2. MECHANICAL SPECIFICATION</b>	<b>3</b>
<b>3. BLOCK DIAGRAM</b>	<b>4</b>
<b>4. POWER SUPPLY</b>	<b>4</b>
<b>5. DIMENSIONAL OUTLINE</b>	<b>5</b>
<b>6. PIN DESCRIPTION</b>	<b>6</b>
<b>7. ABSOLUTE MAXIMUM RATINGS</b>	<b>6</b>
<b>8. ELECTRICAL CHARACTERISTICS</b>	<b>7</b>
<b>9. INSTRUCTION DESCRIPTION</b>	<b>9</b>
<b>10. PACKAGE</b>	<b>13</b>
<b>11. ELECTRO-OPTICAL CHARACTERISTICS</b>	<b>14</b>
<b>12. QUALITY SPECIFICATION</b>	<b>16</b>

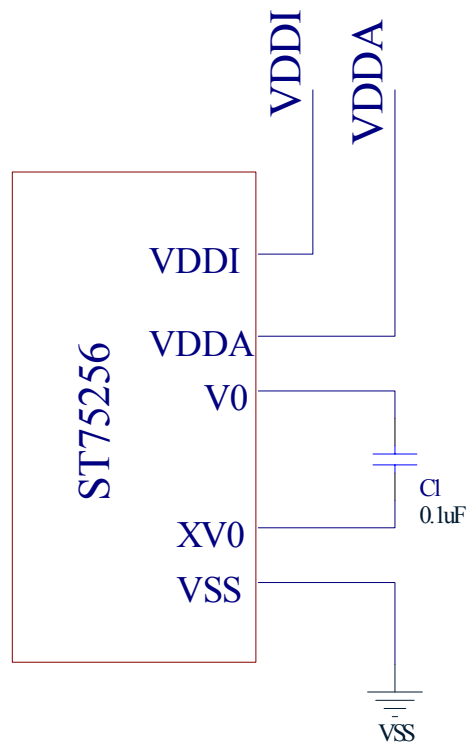
**1. NOTATION OF THE MODULE NUMBER:****2. MECHANICAL SPECIFICATIONS**

ITEM	SPECIFICATION
LCD Description	128 *160 Dots Graphic
Module dimension	50.00(W)*65.00(H)* 6.60 (T)
Viewing area	43.00(W)*52.00(H)
Active area	38.38 (W)*47.98 (H)
Character dot pitch	0.30(W)*0.30 (H)
Character dot size	0.28(W)*0.28 (H)
Duty/Bias	1/160 duty, 1/12 bias
LCD display mode	FSTN/White-Black mode/Positive/ Transflective
Viewing direction	6 o'clock
Driver IC	ST75256i
Module weight	TBD

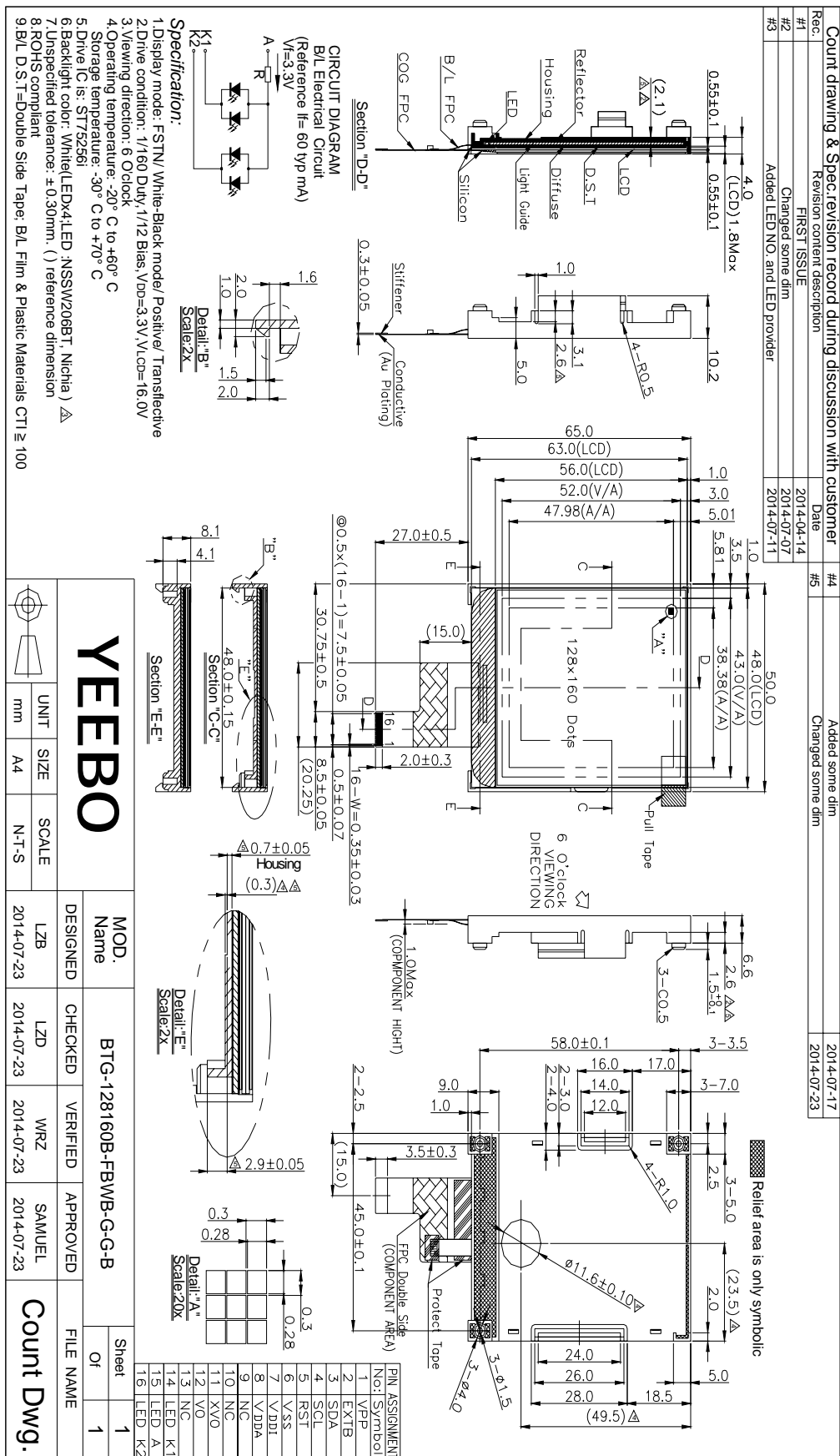
### 3. BLOCK DIAGRAM



### 4. POWER SUPPLY



## 5. DIMENSIONAL OUTLINE



## 6. PIN DESCRIPTION

Pin no.	Symbol	Function
1	VPP	The programming power supply of the built-in OTP. Apply external power (6.5~6.75V) here when programming
2	EXTB	EXTB="L": Enable the extension operation mode. When programming OTP, connect EXTB to VSS1 externally. This pin has an internal pull-high resistor. Please leave this pin OPEN after special operation.
3	SDA	Serial data
4	SCL	Serial input clock .
5	RST	Reset input pin. When RSTB is "L", internal initialization procedure is executed.
6	VSS	Ground
7	VDDI	Digital Power Supply Voltage
8	VDDA	Analog Power supply voltage
9	NC	No connection.
10	NC	No connection.
11	XV0	Negative operating voltage of COM-drivers.
12	V0	Positive operating voltage of COM-drivers.
13	NC	No connection.
14	LED K1	BL cathode
15	LED A	BL anode
16	LED K2	BL cathode

## 7. ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Item	Symbol	Min	Max	Unit
Digital Power Supply Voltage	V <sub>DDI</sub>	-0.3	+4.0	V
Analog Power supply voltage	VDDA	-0.3	+4.0	V
LCD driver voltage	V0 – XV0	-0.3	19	V
Operating temperature	T <sub>OPR</sub>	-20	+60	°C
Storage temperature	T <sub>STG</sub>	-30	+70	°C

Note: Voltage greater than above may damage the module  
All voltages are specified relative to V<sub>SS</sub>=0

## 8. ELECTRICAL CHARACTERISTICS.

### 8-1 DC Characteristics (Ta=25°C)

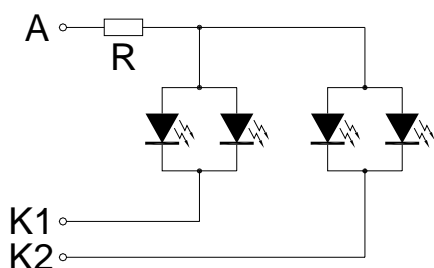
Item	Symbol	Min	Typ	Max	Unit	Applicable terminal	Test condition
Operating voltage	V <sub>DD</sub>	3.1	3.3	3.5	V	(VDDI+VDDA)	-
Supply current	I <sub>DD</sub>	-	1.3	2.0	mA	-	-
Input voltage	V <sub>IL</sub>	0.7 V <sub>DD</sub>	-	V <sub>DD</sub>	V	-	-
	V <sub>IH</sub>	V <sub>SS</sub>	-	0.3V <sub>SS</sub>	V		-
Output voltage	V <sub>OL</sub>	V <sub>SS</sub>	-	0.2V <sub>SS</sub>	V	SDA, SCL	-
	V <sub>OH</sub>	0.8 V <sub>DD</sub>	-	V <sub>DD</sub>	V		
Input leakage current	I <sub>IL</sub>	-1.0	-	1.0	μA	-	-
LCD driving voltage	V <sub>LCD</sub>	15.8	16.0	16.2	V	V <sub>0</sub> - XV <sub>0</sub>	Ta=25°C

Optimum LCD driving voltage will varies and control within the above specified range.

### 8-2 Backlight Characteristics (Ta=25°C)

Backlight Characteristics						
Item	Symbol	Min	Typ	Max	Unit	Test condition
Forward Current of BL	V <sub>f</sub>	2.5	3.0	3.3	V	If=60mA
Colour chromaticity (Central point)	X	0.26	0.29	0.34	-	If=60mA
	Y	0.26	0.29	0.34	-	
Module Luminance	L <sub>v</sub>	TBD	TBD	TBD	cd/m <sup>2</sup>	
Uniformity	Avg	70	-	-	%	
Color	White					

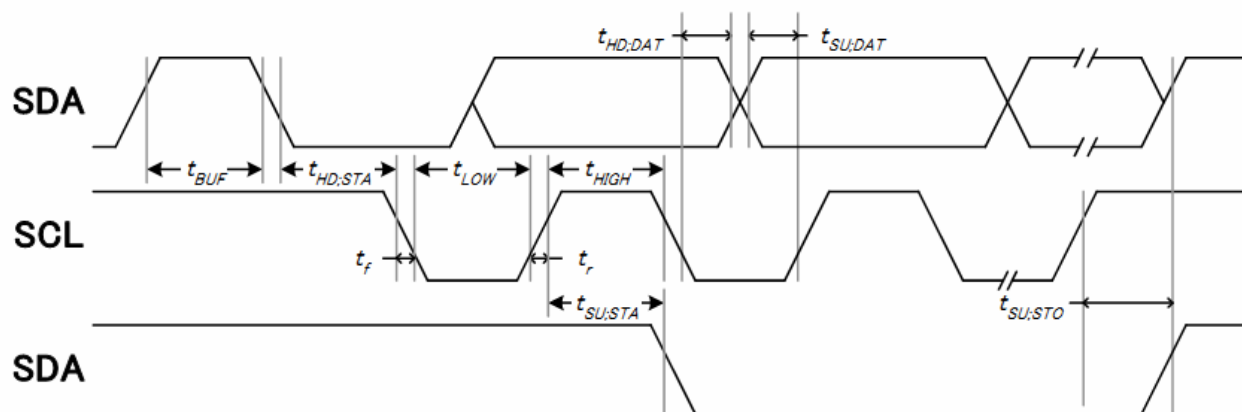
#### B/L Electrical Circuit (LED 2x2= 4 SMD)





**8-3 AC Characteristics (VDD=3.3V, Ta=25°C).**

SERIAL INTERFACE (I2C Interface)



Item	Signal	Symbol	Condition	Rating		Unit
				Min.	Max.	
SCL clock frequency	SCL	fSCL		-	400	KHZ
SCL clock low period		tLOW		1.3	-	us
SCL clock high period		tHIGH		0.6	-	
Data set-up time	SDA	tSU;Data		0.1	-	
Data hold time		tHD;Data		0	0.9	
Setup time for a repeated START condition		tSU;STA		0.6	-	
Start condition hold time		tHD;STA		0.6	-	
Setup time for STOP condition		tSU;STO		0.6	-	
Bus free time between a STOP and START		tBUF		0.1	-	
Signal rise time	SCL	tr		20+0.1Cb	300	ns
Signal fall time		tf		20+0.1Cb	300	
Capacitive load represented by each bus line	SDA	Cb			400	pF
Tolerable spike width on bus		tSW			50	ns

## 9. INSTRUCTION DESCRIPTION

INSTRUCTION	A0	R/W	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
1.Extension Command	0	0	0	0	1	1	EXT1	0	0	EXT0	Set extension instruction
<b>Ext[1:0]=0,0 (Extension Command 1)</b>											
2.Display ON/OFF	0	0	1	0	1	0	1	1	1	DSP	Set LCD display DSP=0: Display off DSP=1: Display on
3.Inverse Display	0	0	1	0	1	0	0	1	1	INV	Set inverse display INV=0: Normal display INV=1: Inverse display
4.All Pixel ON/OFF	0	0	0	0	1	0	0	0	1	AP	Set all pixel on mode AP=0: All pixel off mode AP=1: All pixel on mode
5.Display Control	0	0	1	1	0	0	1	0	1	0	Set display control CLD :Set CL dividing ratio LF[4:0] : Set N-line inversion counter DT[7:0] : Set the number of duty FI : Set the inversion type of frame at the end of common scan cycle
	1	0	0	0	0	0	0	CLD	0	0	
	1	0	DT7	DT6	DT5	DT4	DT3	DT2	DT1	DT0	
	1	0	0	0	LF4	FI	LF3	LF2	LF1	LF0	
6.Power Save	0	0	1	0	0	1	0	1	0	SLP	Set power save mode SLP=0: Sleep out mode SLP=1: Sleep in mode
7.Set Page Address	0	0	0	1	1	1	0	1	0	1	Set Page Address Starting Page address: 00h ≤ YS ≤ 28h Ending Page address: YS ≤ YE ≤ 28h
	1	0	YS7	YS6	YS5	YS4	YS3	YS2	YS1	YS0	
	1	0	YE7	YE6	YE5	YE4	YE3	YE2	YE1	YE0	
8.Set Column Address	0	0	0	0	0	1	0	1	0	1	Set Column Address Starting Column address: 00h ≤ XS ≤ FFh Ending Column address: XS ≤ XE ≤ FFh
	1	0	XS7	XS6	XS5	XS4	XS3	XS2	XS1	XS0	
	1	0	XE7	XE6	XE5	XE4	XE3	XE2	XE1	XE0	
9.Data Scan Direction	0	0	1	0	1	1	1	1	0	0	Set normal/ inverse display of address and address scan direction
	1	0	0	0	0	0	0	C/L	MX	MY	
10.Write Data	0	0	0	1	0	1	1	1	0	0	Write data to DDRAM
	1	0	D7	D6	D5	D4	D3	D2	D1	D0	
11.Read Data	0	0	0	1	0	1	1	1	0	1	Read data from DDRAM
	1	1	D7	D6	D5	D4	D3	D2	D1	D0	
12.Partial In	0	0	1	0	1	0	1	0	0	0	Set partial area Starting partial display address: 00h ≤ PTS ≤ A1h Ending partial display address: 00h ≤ PTE ≤ A1h
	1	0	PTS7	PTS6	PTS5	PTS4	PTS3	PTS2	PTS1	PTS0	
	1	0	PTE7	PTE6	PTE5	PTE4	PTE3	PTE2	PTE1	PTE0	



INSTRUCTION	A0	R/W	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
13. Partial Out	0	0	1	0	1	0	1	0	0	1	Exit the partial mode
14. Read/Modify/Write In	0	0	1	1	1	0	0	0	0	0	Enable read modify write
15. Read/Modify/Write Out	0	0	1	1	1	0	1	1	1	0	Disable read modify write
16. Scroll Area	0	0	1	0	1	0	1	0	1	0	Set scroll area
	1	0	TL7	TL6	TL5	TL4	TL3	TL2	TL1	TL0	
	1	0	BL7	BL6	BL5	BL4	BL3	BL2	BL1	BL0	
	1	0	NSL7	NSL6	NSL5	NSL4	NSL3	NSL2	NSL1	NSL0	
	1	0	0	0	0	0	0	0	SCM1	SCM0	
17. Set Start Line	0	0	1	0	1	0	1	0	1	1	Set scroll start address $00h \leq SL \leq A1h$
	1	0	SL7	SL6	SL5	SL4	SL3	SL2	SL1	SL0	
18. OSC ON	0	0	1	1	0	1	0	0	0	1	Turn on the internal oscillator
19. OSC OFF	0	0	1	1	0	1	0	0	1	0	Turn off the internal oscillator
20. Power Control	0	0	0	0	1	0	0	0	0	0	Power circuit operation VB=0: OFF, VB=1: ON VF=0: OFF, VF=1: ON VR=0: OFF, VR=1: ON
	1	0	0	0	0	0	VB	0	VF	VR	
21. Set Vop	0	0	1	0	0	0	0	0	0	1	Set Vop
	1	0	0	0	Vop5	Vop4	Vop3	Vop2	Vop1	Vop0	
	1	0	0	0	0	0	0	Vop8	Vop7	Vop6	
22. Vop Control	0	0	1	1	0	1	0	1	1	VOL	Control Vop VOL=0: Vop increase one step VOL=1: Vop decrease one step
23. Read Register Mode	0	0	0	1	1	1	1	1	0	REG	Set read register mode REG=0: read the register value of VPR[5:0] REG=1: read the register value of VPR[8:6]
24. Nop	0	0	0	0	1	0	0	1	0	1	No operation
25. Read Status	0	1	D7	D6	D5	D4	D3	D2	D1	D0	Read status byte
26. Data Format Select	0	0	0	0	0	0	1	DO	0	0	DO=0: LSB on bottom (Default) DO=1: LSB on top
27. Display Mode	0	0	1	1	1	1	0	0	0	0	Set display mode DM=0: Mono(Default) DM=1: 4Gray Scale Mode
	1	0	0	0	0	1	0	0	0	DM	
28. ICON Control	0	0	0	1	1	1	0	1	1	ICON	Enable/Disable ICON ICON=1: Enable ICON=0: Disable

INSTRUCTION	A0	R/W	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
Ext[1:0]=0,1 (Extension Command 2)											
29.Analog Circuit Set	0	0	0	0	1	1	0	0	1	0	Set analog set BE[1:0]: Booster efficiency set BS[2:0]: Set bias ratio
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	0	0	0	BE1	BE0	
	1	0	0	0	0	0	0	0	BS2	BS1	
30.Booster Level	0	0	0	1	0	1	0	0	0	1	Set booster level
	1	0	1	1	1	1	1	0	1	BST	
31. Driving Select	0	0	0	1	0	0	0	0	0	DS	Power type DS=0: Internal (Default) DS=1 : External
32.High Power Mode	0	0	0	1	0	0	1	0	0	HPM	Set high power mode HPM=0 ; Normal Mode HPM =1 ; High Power Mode
33.Auto Read Control	0	0	1	1	0	1	0	1	1	1	Set auto-read instruction XARD=0: Enable auto read XARD=1: Disable auto read
	1	0	1	0	0	XARD	1	1	1	1	
34.OTP WR/RD Control	0	0	1	1	1	0	0	0	0	0	OTP WR/RD control WR/RD=0: Enable OTP read WR/RD=1: Enable OTP write
	1	0	0	0	WR/RD	0	0	0	0	0	
35.OTP Control Out	0	0	1	1	1	0	0	0	0	1	OTP control out
36.OTP Write	0	0	1	1	1	0	0	0	1	0	OTP write
37.OTP Read	0	0	1	1	1	0	0	0	1	1	OTP read
38.OTP Selection Control	0	0	1	1	1	0	0	1	0	0	OTP selection control Ctrl=1: Disable OTP Ctrl=0: Enable OTP
	1	0	1	Ctrl	0	1	1	0	0	1	
39.OTP Programming Setting	0	0	1	1	1	0	0	1	0	1	OTP programming setting
	1	0	0	0	0	0	1	1	1	1	
40.Frame Rate	0	0	1	1	1	1	0	0	0	0	Frame rate setting in different temperature range
	1	0	0	0	0	FRA4	FRA3	FRA2	FRA1	FRA0	
	1	0	0	0	0	FRB4	FRB3	FRB2	FRB1	FRB0	
	1	0	0	0	0	FRC4	FRC3	FRC2	FRC1	FRC0	
	1	0	0	0	0	FRD4	FRD3	FRD2	FRD1	FRD0	
41.Temperature Range	0	0	1	1	1	1	0	0	1	0	Temperature range setting
	1	0	0	TA6	TA5	TA4	TA3	TA2	TA1	TA0	
	1	0	0	TB6	TB5	TB4	TB3	TB2	TB1	TB0	
	1	0	0	TC6	TC5	TC4	TC3	TC2	TC1	TC0	



INSTRUCTION	A0	R/W	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
42.Temperature Gradient Compensation	0	0	1	1	1	1	0	1	0	0	Set temperature gradient compensation coefficient
	1	0	MT13	MT12	MT11	MT10	MT03	MT02	MT01	MT00	
	1	0	MT33	MT32	MT31	MT30	MT23	MT22	MT21	MT20	
	1	0	MT53	MT52	MT51	MT50	MT43	MT42	MT41	MT40	
	1	0	MT73	MT72	MT71	MT70	MT63	MT62	MT61	MT60	
	1	0	MT93	MT92	MT91	MT90	MT83	MT82	MT81	MT80	
	1	0	MTB3	MTB2	MTB1	MTB0	MTA3	MTA2	MTA1	MTA0	
	1	0	MTD3	MTD2	MTD1	MTD0	MTC3	MTC2	MTC1	MTC0	
	1	0	MTF3	MTF2	MTF1	MTF0	MTE3	MTE2	MTE1	MTE0	
Ext[1:0]=1,0(Extension Command 3)											
43.Set ID	0	0	1	1	0	1	0	1	0	1	Set ID
	1	0	ID7	ID6	ID5	ID4	ID3	ID2	ID1	ID0	
44 Read ID	0	0	0	1	1	1	1	1	1	RID	Read ID RID=1 ; Enable RID=0 ; Disable
	0	1	D7	D6	D5	D4	D3	D2	D1	D0	



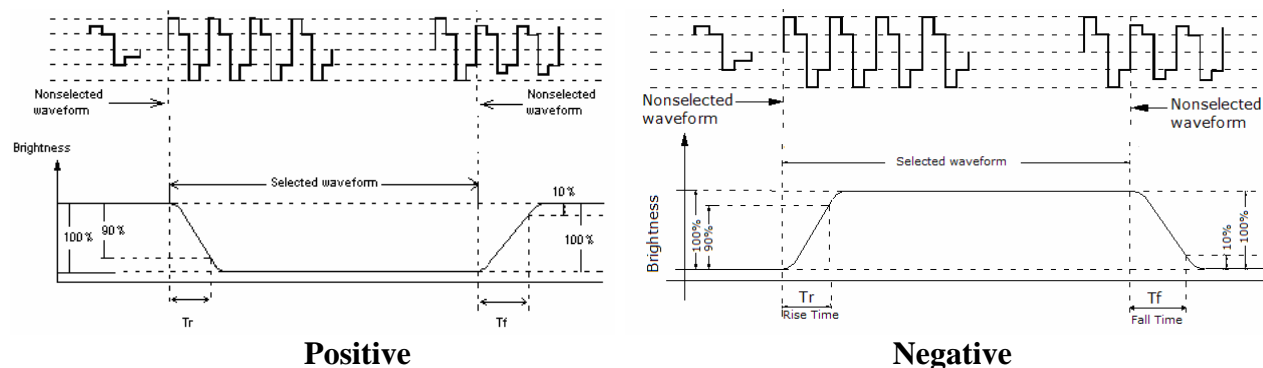
## **10. PACKAGE**

TBD

## 11. ELECTRO-OPTICAL CHARACTERISTICS

NO	ITEM		Symbol	Temp	Rating			Unit
					Min	Typ	Max	
1	Response time	Rise time	Tr	25	-	80	400	ms
		Fall time	Tf	25	-	169	400	
2	Operating Frequency		Fr	25	-	77	-	Hz
3	Contrast Rate		Cr	25	2	13	-	-
4	Viewing Direction		6 O'CLOCK					
5	Viewing Angle Cr 2	12H $\phi$ =90°	$\theta 1$	25	35	45	-	Deg
		6H $\phi$ =270°	$\theta 2$		35	45	-	
		3H $\phi$ =0°	$\theta 3$		35	50	-	
		9H $\phi$ =180°	$\theta 4$		35	50	-	
6	Current Consumption		Is	25	-	14	21	$\mu$ A
7	Capacitance		C	25	-	6	-	nF

### Response Time



### Measuring Condition:

1. Driving waveform: Duty, Bias selected waveform.
2. Driving Frequency: Typical value in Individual specification.
3. Operating Voltage: LCD driving voltage getting maximum contrast rate.
4. Measuring Angle: See Individual Specification.
5. Measuring Temperature: See Individual Specification.