

EXAMINED BY : <i>[Signature]</i>	EMERGING DISPLAY TECHNOLOGIES CORPORATION	FILE NO . CAS-10356
APPROVED BY: <i>[Signature]</i>		ISSUE : NOV.23,2004
		TOTAL PAGE : 11
		VERSION : 5

CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO. :

13BB0(WHITE LED TYPES)

FOR MESSRS :

CUSTOMER'S APPROVAL

DATE : _____

BY : _____

DOC . FIRST ISSUE

APR.27,2004

RECORDS OF REVISION

DATE	REVISED PAGE NO.	SUMMARY																																																										
MAY.12,2004	3	<p>4. ELECTRICAL CHARACTERISTICS</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY VOLTAGE FOR LOGIC</td> <td>VDD - VSS</td> <td>—</td> <td>3.15</td> <td>3.3</td> <td>3.45</td> <td>V</td> </tr> <tr> <td rowspan="3">RECOMMENDED LCD DRIVING VOLTAGE</td> <td rowspan="3">VDD - V5 ∅=10° θ=0° DUTY=1/65</td> <td>Ta = -20 °C</td> <td>(10.5)</td> <td>(10.8)</td> <td>(11.1)</td> <td rowspan="3">V</td> </tr> <tr> <td>Ta = 25 °C</td> <td>(10.0)</td> <td>(10.3)</td> <td>(10.6)</td> </tr> <tr> <td>Ta = 70 °C</td> <td>(9.2)</td> <td>(9.5)</td> <td>(9.8)</td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY VOLTAGE FOR LOGIC</td> <td>VDD - VSS</td> <td>—</td> <td>(3.15)</td> <td>3.3</td> <td>(3.45)</td> <td>V</td> </tr> <tr> <td rowspan="3">RECOMMENDED LCD DRIVING VOLTAGE</td> <td rowspan="3">V0 - VSS ∅=10° θ=0° DUTY=1/64</td> <td>Ta = -20 °C</td> <td>(10.5)</td> <td>(10.8)</td> <td>(11.1)</td> <td rowspan="3">V</td> </tr> <tr> <td>Ta = 25 °C</td> <td>(10.0)</td> <td>(10.3)</td> <td>(10.6)</td> </tr> <tr> <td>Ta = 70 °C</td> <td>(9.2)</td> <td>(9.5)</td> <td>(9.8)</td> </tr> </tbody> </table> <p>NOTE(1) : APPLIED TO TERMINALS RS,D0 ~ D7, \overline{RD}, \overline{WR}, \overline{CSI}, \overline{RES} .→ NOTE(1) : APPLIED TO TERMINALS RS,D0~D5,D6(SCL),D7(SI), \overline{RD} (E), \overline{WR} (R/W), \overline{CSI}, \overline{RES}, C86,P/S. NOTE(2) : APPLIED TO TERMINALS D0 ~ D7 .→ NOTE(2) : APPLIED TO TERMINALS D0 ~ D5,D6(SCL),D7(SI) .</p>	PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	3.15	3.3	3.45	V	RECOMMENDED LCD DRIVING VOLTAGE	VDD - V5 ∅=10° θ=0° DUTY=1/65	Ta = -20 °C	(10.5)	(10.8)	(11.1)	V	Ta = 25 °C	(10.0)	(10.3)	(10.6)	Ta = 70 °C	(9.2)	(9.5)	(9.8)	PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	(3.15)	3.3	(3.45)	V	RECOMMENDED LCD DRIVING VOLTAGE	V0 - VSS ∅=10° θ=0° DUTY=1/64	Ta = -20 °C	(10.5)	(10.8)	(11.1)	V	Ta = 25 °C	(10.0)	(10.3)	(10.6)	Ta = 70 °C	(9.2)	(9.5)	(9.8)
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT																																																						
POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	3.15	3.3	3.45	V																																																						
RECOMMENDED LCD DRIVING VOLTAGE	VDD - V5 ∅=10° θ=0° DUTY=1/65	Ta = -20 °C	(10.5)	(10.8)	(11.1)	V																																																						
		Ta = 25 °C	(10.0)	(10.3)	(10.6)																																																							
		Ta = 70 °C	(9.2)	(9.5)	(9.8)																																																							
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT																																																						
POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	(3.15)	3.3	(3.45)	V																																																						
RECOMMENDED LCD DRIVING VOLTAGE	V0 - VSS ∅=10° θ=0° DUTY=1/64	Ta = -20 °C	(10.5)	(10.8)	(11.1)	V																																																						
		Ta = 25 °C	(10.0)	(10.3)	(10.6)																																																							
		Ta = 70 °C	(9.2)	(9.5)	(9.8)																																																							
5, 6	6. OUTLINE DIMENSIONS REVISION NOTE																																																											
7	7. BLOCK DIAGRAM																																																											
9	9. INTERFACE SIGNALS	<table border="1"> <thead> <tr> <th>PIN NO</th> <th>SYMBOL</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>\overline{WR}</td> <td>WRITE DATA CONTROL</td> </tr> <tr> <td>8</td> <td>\overline{RD}</td> <td>READ DATA CONTROL</td> </tr> <tr> <td>15</td> <td>D6</td> <td rowspan="2">DATA BUS</td> </tr> <tr> <td>16</td> <td>D7</td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1"> <thead> <tr> <th>PIN NO</th> <th>SYMBOL</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>\overline{WR} (R/W)</td> <td>8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW WRITE STROBE. 6800 FAMILY INTERFACE ACTS AS THE READ/WRITE CONTROL SIGNAL.</td> </tr> <tr> <td>8</td> <td>\overline{RD} (E)</td> <td>8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW READ STROBE. 6800 FAMILY INTERFACE ACTS AS THE ACTIVE-HIGH ENABLE CLOCK.</td> </tr> <tr> <td>15</td> <td>D6(SCL)</td> <td>WHEN THE SERIAL INTERFACE IS SELECTED(P/S:L)</td> </tr> <tr> <td>16</td> <td>D7(SI)</td> <td>D6: THE SERIAL CLOCK INPUT(SCL),D7:SERIAL DATA INPUT(SI) D0 TO D5 ARE SET TO HIGH IMPEDANCE</td> </tr> </tbody> </table> <p>ADD PIN NO.17,18</p>	PIN NO	SYMBOL	FUNCTION	7	\overline{WR}	WRITE DATA CONTROL	8	\overline{RD}	READ DATA CONTROL	15	D6	DATA BUS	16	D7	PIN NO	SYMBOL	FUNCTION	7	\overline{WR} (R/W)	8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW WRITE STROBE. 6800 FAMILY INTERFACE ACTS AS THE READ/WRITE CONTROL SIGNAL.	8	\overline{RD} (E)	8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW READ STROBE. 6800 FAMILY INTERFACE ACTS AS THE ACTIVE-HIGH ENABLE CLOCK.	15	D6(SCL)	WHEN THE SERIAL INTERFACE IS SELECTED(P/S:L)	16	D7(SI)	D6: THE SERIAL CLOCK INPUT(SCL),D7:SERIAL DATA INPUT(SI) D0 TO D5 ARE SET TO HIGH IMPEDANCE																													
PIN NO	SYMBOL	FUNCTION																																																										
7	\overline{WR}	WRITE DATA CONTROL																																																										
8	\overline{RD}	READ DATA CONTROL																																																										
15	D6	DATA BUS																																																										
16	D7																																																											
PIN NO	SYMBOL	FUNCTION																																																										
7	\overline{WR} (R/W)	8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW WRITE STROBE. 6800 FAMILY INTERFACE ACTS AS THE READ/WRITE CONTROL SIGNAL.																																																										
8	\overline{RD} (E)	8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW READ STROBE. 6800 FAMILY INTERFACE ACTS AS THE ACTIVE-HIGH ENABLE CLOCK.																																																										
15	D6(SCL)	WHEN THE SERIAL INTERFACE IS SELECTED(P/S:L)																																																										
16	D7(SI)	D6: THE SERIAL CLOCK INPUT(SCL),D7:SERIAL DATA INPUT(SI) D0 TO D5 ARE SET TO HIGH IMPEDANCE																																																										
MAY.26,2004	0-2	NUMBERING SYSTEM ADD STN+Blue : B																																																										
	5	6. OUTLINE DIMENSIONS CHANGE BACKLIGHT CONFIGURATION ADD NOTE : MARK Δ MODIFY (NUMBER NOTE MODIFY VERSION)																																																										

RECORDS OF REVISION	DOC . FIRST ISSUE	APR.27,2004
---------------------	-------------------	-------------

DATE	REVISED PAGE NO.	SUMMARY																																																																																																										
JUN.14,2004	2	<p>3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>MIN.</th> <th>MAX.</th> <th>UNIT</th> <th>REMARK</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY FOR LOGIC</td> <td>VDD - VSS</td> <td>-0.3</td> <td>+5</td> <td>V</td> <td></td> </tr> <tr> <td>POWER SUPPLY FOR LCD DRIVING</td> <td>VDD - VS</td> <td>-0.3</td> <td>+16.0</td> <td>V</td> <td></td> </tr> <tr> <td>INPUT VOLTAGE</td> <td>VI</td> <td>-0.3</td> <td>VDD+0.3</td> <td>V</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>MIN.</th> <th>MAX.</th> <th>UNIT</th> <th>REMARK</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY FOR LOGIC</td> <td>VDD - VSS</td> <td>0.3</td> <td>+3.5</td> <td>V</td> <td></td> </tr> <tr> <td>POWER SUPPLY FOR LCD DRIVING</td> <td>VO - VOUT</td> <td>0.3</td> <td>+18.0</td> <td>V</td> <td></td> </tr> </tbody> </table>	PARAMETER	SYMBOL	MIN.	MAX.	UNIT	REMARK	POWER SUPPLY FOR LOGIC	VDD - VSS	-0.3	+5	V		POWER SUPPLY FOR LCD DRIVING	VDD - VS	-0.3	+16.0	V		INPUT VOLTAGE	VI	-0.3	VDD+0.3	V		PARAMETER	SYMBOL	MIN.	MAX.	UNIT	REMARK	POWER SUPPLY FOR LOGIC	VDD - VSS	0.3	+3.5	V		POWER SUPPLY FOR LCD DRIVING	VO - VOUT	0.3	+18.0	V																																																																	
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	REMARK																																																																																																							
POWER SUPPLY FOR LOGIC	VDD - VSS	-0.3	+5	V																																																																																																								
POWER SUPPLY FOR LCD DRIVING	VDD - VS	-0.3	+16.0	V																																																																																																								
INPUT VOLTAGE	VI	-0.3	VDD+0.3	V																																																																																																								
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	REMARK																																																																																																							
POWER SUPPLY FOR LOGIC	VDD - VSS	0.3	+3.5	V																																																																																																								
POWER SUPPLY FOR LCD DRIVING	VO - VOUT	0.3	+18.0	V																																																																																																								
	3	<p>4. ELECTRICAL CHARACTERISTICS</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY VOLTAGE FOR LOGIC</td> <td>VDD - VSS</td> <td>—</td> <td>(3.15)</td> <td>3.3</td> <td>(3.45)</td> <td>V</td> </tr> <tr> <td>POWER SUPPLY CURRENT FOR LOGIC NOTE (3)</td> <td>IDD</td> <td>VDD - VSS =3.3V</td> <td>—</td> <td>(0.5)</td> <td>(1.0)</td> <td>mA</td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY VOLTAGE FOR LOGIC</td> <td>VDD - VSS</td> <td>—</td> <td>2.7</td> <td>3.0</td> <td>3.3</td> <td>V</td> </tr> <tr> <td>POWER SUPPLY CURRENT FOR LOGIC NOTE (3)</td> <td>IDD</td> <td>VDD - VSS =3.0V</td> <td>—</td> <td>(0.5)</td> <td>(1.0)</td> <td>mA</td> </tr> </tbody> </table>	PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	(3.15)	3.3	(3.45)	V	POWER SUPPLY CURRENT FOR LOGIC NOTE (3)	IDD	VDD - VSS =3.3V	—	(0.5)	(1.0)	mA	PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	2.7	3.0	3.3	V	POWER SUPPLY CURRENT FOR LOGIC NOTE (3)	IDD	VDD - VSS =3.0V	—	(0.5)	(1.0)	mA																																																																
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT																																																																																																						
POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	(3.15)	3.3	(3.45)	V																																																																																																						
POWER SUPPLY CURRENT FOR LOGIC NOTE (3)	IDD	VDD - VSS =3.3V	—	(0.5)	(1.0)	mA																																																																																																						
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT																																																																																																						
POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	2.7	3.0	3.3	V																																																																																																						
POWER SUPPLY CURRENT FOR LOGIC NOTE (3)	IDD	VDD - VSS =3.0V	—	(0.5)	(1.0)	mA																																																																																																						
	10	10.1 POWER SUPPLY FOR LCM VDD (3.3V) → VDD(+3.0V)																																																																																																										
NOV.23,2004	0-3	NUMBERING SYSTEM EW13BB0FLW → ES13BB0FLW																																																																																																										
	2	3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS.(AT Ta=25°C) LED POWER DISSIPATION : (0.4)MAX. → 0.45MAX. LED FORWARD CURRENT : (80)MAX. → 90MAX. LED REVERSE VOLTAGE : 8.0MAX. → 10.0MAX.																																																																																																										
	3	<p>4. ELECTRICAL CHARACTERISTICS</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY CURRENT FOR LOGIC NOTE (3)</td> <td>IDD</td> <td>VDD - VSS =3.0V</td> <td>—</td> <td>(0.5)</td> <td>(1.0)</td> <td>mA</td> </tr> <tr> <td>RECOMMENDED LCD DRIVING VOLTAGE</td> <td>VO - VSS</td> <td>∅=10° θ=0° DUTY=1/64</td> <td>Ta = 20 °C Ta = 25 °C Ta = 70 °C</td> <td>(10.5) (10.0) (9.2)</td> <td>(10.8) (10.3) (9.8)</td> <td>V</td> </tr> <tr> <td>LED FORWARD VOLTAGE</td> <td>VF</td> <td>IF = (60 mA)</td> <td>—</td> <td>5</td> <td>—</td> <td>V</td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY CURRENT FOR LOGIC NOTE (3)</td> <td>IDD</td> <td>VDD - VSS =3.0V</td> <td>—</td> <td>0.5</td> <td>1.5</td> <td>mA</td> </tr> <tr> <td>RECOMMENDED LCD DRIVING VOLTAGE</td> <td>VO - VSS</td> <td>∅=10° θ=0° DUTY=1/64</td> <td>Ta = 20 °C Ta = 25 °C Ta = 70 °C</td> <td>10.2 9.8 9.4</td> <td>10.7 10.3 9.9</td> <td>11.2 10.8 10.4</td> <td>V</td> </tr> <tr> <td>LED FORWARD VOLTAGE</td> <td>VF</td> <td>IF = 60 mA</td> <td>—</td> <td>5</td> <td>—</td> <td>V</td> </tr> </tbody> </table>	PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	POWER SUPPLY CURRENT FOR LOGIC NOTE (3)	IDD	VDD - VSS =3.0V	—	(0.5)	(1.0)	mA	RECOMMENDED LCD DRIVING VOLTAGE	VO - VSS	∅=10° θ=0° DUTY=1/64	Ta = 20 °C Ta = 25 °C Ta = 70 °C	(10.5) (10.0) (9.2)	(10.8) (10.3) (9.8)	V	LED FORWARD VOLTAGE	VF	IF = (60 mA)	—	5	—	V	PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	POWER SUPPLY CURRENT FOR LOGIC NOTE (3)	IDD	VDD - VSS =3.0V	—	0.5	1.5	mA	RECOMMENDED LCD DRIVING VOLTAGE	VO - VSS	∅=10° θ=0° DUTY=1/64	Ta = 20 °C Ta = 25 °C Ta = 70 °C	10.2 9.8 9.4	10.7 10.3 9.9	11.2 10.8 10.4	V	LED FORWARD VOLTAGE	VF	IF = 60 mA	—	5	—	V																																																	
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT																																																																																																						
POWER SUPPLY CURRENT FOR LOGIC NOTE (3)	IDD	VDD - VSS =3.0V	—	(0.5)	(1.0)	mA																																																																																																						
RECOMMENDED LCD DRIVING VOLTAGE	VO - VSS	∅=10° θ=0° DUTY=1/64	Ta = 20 °C Ta = 25 °C Ta = 70 °C	(10.5) (10.0) (9.2)	(10.8) (10.3) (9.8)	V																																																																																																						
LED FORWARD VOLTAGE	VF	IF = (60 mA)	—	5	—	V																																																																																																						
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT																																																																																																						
POWER SUPPLY CURRENT FOR LOGIC NOTE (3)	IDD	VDD - VSS =3.0V	—	0.5	1.5	mA																																																																																																						
RECOMMENDED LCD DRIVING VOLTAGE	VO - VSS	∅=10° θ=0° DUTY=1/64	Ta = 20 °C Ta = 25 °C Ta = 70 °C	10.2 9.8 9.4	10.7 10.3 9.9	11.2 10.8 10.4	V																																																																																																					
LED FORWARD VOLTAGE	VF	IF = 60 mA	—	5	—	V																																																																																																						
	4	<p>5. OPTICAL CHARACTERISTICS</p> <table border="1"> <thead> <tr> <th colspan="2">I T E M</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> <th>NOTE</th> </tr> </thead> <tbody> <tr> <td rowspan="2">VIEWING ANGLE</td> <td>STN</td> <td rowspan="2">∅2 - ∅1</td> <td rowspan="2">K ≥ 2.0</td> <td>—</td> <td>(40)</td> <td>—</td> <td>deg.</td> <td>1</td> </tr> <tr> <td>FSTN</td> <td>—</td> <td>(50)</td> <td>—</td> <td>deg.</td> <td>1</td> </tr> <tr> <td rowspan="2">CONTRAST RATIO</td> <td>STN</td> <td rowspan="2">K</td> <td rowspan="2">∅ = 10° θ = 0°</td> <td>—</td> <td>(7)</td> <td>—</td> <td>—</td> <td>1</td> </tr> <tr> <td>FSTN</td> <td>—</td> <td>(14)</td> <td>—</td> <td>—</td> <td>1</td> </tr> <tr> <td rowspan="2">BRIGHTNESS OF MODULE</td> <td rowspan="2"></td> <td rowspan="2">L</td> <td rowspan="2">IF=(60mA)</td> <td>(4.5)</td> <td>(7.5)</td> <td>—</td> <td>cd / m²</td> <td>1, 2</td> </tr> <tr> <td>(3)</td> <td>(5)</td> <td>—</td> <td>—</td> <td>1, 3</td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1"> <thead> <tr> <th colspan="2">I T E M</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> <th>NOTE</th> </tr> </thead> <tbody> <tr> <td rowspan="2">VIEWING ANGLE</td> <td>STN</td> <td rowspan="2">∅2 - ∅1</td> <td rowspan="2">K ≥ 2.0</td> <td>—</td> <td>50</td> <td>—</td> <td>deg.</td> <td>1</td> </tr> <tr> <td>FSTN</td> <td>—</td> <td>30</td> <td>—</td> <td>deg.</td> <td>1</td> </tr> <tr> <td rowspan="2">CONTRAST RATIO</td> <td>STN</td> <td rowspan="2">K</td> <td rowspan="2">∅ = 10° θ = 0°</td> <td>5.1</td> <td>5.8</td> <td>—</td> <td>—</td> <td>1</td> </tr> <tr> <td>FSTN</td> <td>4.1</td> <td>4.7</td> <td>—</td> <td>—</td> <td>1</td> </tr> <tr> <td rowspan="2">BRIGHTNESS OF MODULE</td> <td rowspan="2"></td> <td rowspan="2">L</td> <td rowspan="2">IF=60mA</td> <td>18</td> <td>24</td> <td>—</td> <td>cd / m²</td> <td>1, 2</td> </tr> <tr> <td>12</td> <td>16</td> <td>—</td> <td>—</td> <td>1, 3</td> </tr> </tbody> </table>	I T E M		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE	VIEWING ANGLE	STN	∅2 - ∅1	K ≥ 2.0	—	(40)	—	deg.	1	FSTN	—	(50)	—	deg.	1	CONTRAST RATIO	STN	K	∅ = 10° θ = 0°	—	(7)	—	—	1	FSTN	—	(14)	—	—	1	BRIGHTNESS OF MODULE		L	IF=(60mA)	(4.5)	(7.5)	—	cd / m²	1, 2	(3)	(5)	—	—	1, 3	I T E M		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE	VIEWING ANGLE	STN	∅2 - ∅1	K ≥ 2.0	—	50	—	deg.	1	FSTN	—	30	—	deg.	1	CONTRAST RATIO	STN	K	∅ = 10° θ = 0°	5.1	5.8	—	—	1	FSTN	4.1	4.7	—	—	1	BRIGHTNESS OF MODULE		L	IF=60mA	18	24	—	cd / m²	1, 2	12	16	—	—	1, 3
I T E M		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE																																																																																																				
VIEWING ANGLE	STN	∅2 - ∅1	K ≥ 2.0	—	(40)	—	deg.	1																																																																																																				
	FSTN			—	(50)	—	deg.	1																																																																																																				
CONTRAST RATIO	STN	K	∅ = 10° θ = 0°	—	(7)	—	—	1																																																																																																				
	FSTN			—	(14)	—	—	1																																																																																																				
BRIGHTNESS OF MODULE		L	IF=(60mA)	(4.5)	(7.5)	—	cd / m²	1, 2																																																																																																				
				(3)	(5)	—	—	1, 3																																																																																																				
I T E M		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE																																																																																																				
VIEWING ANGLE	STN	∅2 - ∅1	K ≥ 2.0	—	50	—	deg.	1																																																																																																				
	FSTN			—	30	—	deg.	1																																																																																																				
CONTRAST RATIO	STN	K	∅ = 10° θ = 0°	5.1	5.8	—	—	1																																																																																																				
	FSTN			4.1	4.7	—	—	1																																																																																																				
BRIGHTNESS OF MODULE		L	IF=60mA	18	24	—	cd / m²	1, 2																																																																																																				
				12	16	—	—	1, 3																																																																																																				

NUMBERING SYSTEM

Polarizer Mode	Backlight	Code value
Transflective	LED	L
Transmissive	LED	M

E	S	13	B	B0	F	L	W
---	---	----	---	----	---	---	---

LCD type + LCD color	Code Value
STN + Yellow-Green	Y
STN + Gray	G
FSTN + White	F
FSTN + Black	N
STN + Blue	B

MODEL NO.	VERSION	PAGE
13BB0(WHITE LED TYPES)	5	0-4

TABLE OF CONTENTS

NO.	ITEM	PAGE
1.	GENERAL SPECIFICATIONS -----	1
2.	MECHANICAL SPECIFICATIONS -----	1
3.	ABSOLUTE MAXIMUM RATINGS -----	2
4.	ELECTRICAL CHARACTERISTICS -----	3
5.	OPTICAL CHARACTERISTICS -----	4
6.	OUTLINE DIMENSIONS -----	5 , 6
7.	BLOCK DIAGRAM -----	7
8.	DETAIL DRAWING OF DOT MATRIX -----	8
9.	INTERFACE SIGNAL -----	9
10.	POWER SUPPLY -----	10
11.	INSTRUCTION DESCRIPTION -----	11

1. GENERAL SPECIFICATIONS

1.1 APPLICATION NOTES FOR CONTROLLER/DRIVER

PLEASE REFER TO :

SITRONIX ST7565P

2. MECHANICAL SPECIFICATIONS

- | | | |
|-----------------------|-------|---|
| (1) NUMBER OF DOTS | ----- | 128W * 64H DOTS |
| (2) MODULE SIZE | ----- | 87.6W * 50.4H * 5.9D(max) mm |
| (3) EFFECTIVE AREA | ----- | 70W * 37H mm |
| (4) ACTIVE AREA | ----- | 65.265W * 32.625H mm |
| (5) DOT SIZE | ----- | 0.495W * 0.495H mm |
| (6) DOT PITCH | ----- | 0.51W * 0.51H mm |
| (7) LCD TYPE* | | |
| (8) DRIVING METHOD | ----- | 1 / 64 DUTY MULTIPLEX DRIVE
1 / 9 BIAS |
| (9) VIEWING DIRECTION | ----- | 6 O'CLOCK |
| (10) BACK LIGHT | ----- | LED , COLOR : WHITE |

* PLEASE REFER TO NUMBERING SYSTEM .

3. ABSOLUTE MAXIMUM RATINGS

3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS . (AT Ta = 25 °C)

PARAMETER	SYMBOL	MIN .	MAX .	UNIT	REMARK
POWER SUPPLY FOR LOGIC	VDD – VSS	0.3	+3.5	V	
POWER SUPPLY FOR LCD DRIVING	VO – VOUT	0.3	+ 18.0	V	
STATIC ELECTRICITY	—	—	200.00	V	NOTE (1)
LED POWER DISSIPATION	PD	—	0.45	W	
LED FORWARD CURRENT	IF	—	90	mA	
LED REVERSE VOLTAGE	VR	—	10	V	

NOTE (1) : TEST METHOD AND CONDITIONS :
AFTER CHARGING UP 200 PF CAPACITOR BY STATED VOLTAGE ,
THE CAPACITOR IS CONNECTED WITH INTERFACE PINS OF THE
MODULE .

3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS .

I T E M	OPERATING		STORAGE		REMARK
	MIN .	MAX .	MIN .	MAX .	
AMBIENT TEMPERATURE	- 2 0 °C	7 0 °C	- 3 0 °C	8 0 °C	NOTE (2) , (3)
HUMIDITY	—	8 5 % RH	—	8 5 % RH	WITHOUT CONDENSATION
VIBRATION	—	2 . 4 5 m/S ² (0 . 2 5 G)	—	1 1 . 7 6 m/S ² (1 . 2 G)	10~100 Hz XYZ DIRECTIONS 1 Hr . EACH
SHOCK	—	2 9 . 4 m/S ² (3 G)	—	4 9 0 m/S ² (5 0 G)	10 m SECONDS XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (2) : Ta AT -30°C : 240HR MAX .
80°C : 240HR MAX .

NOTE (3) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT
TEMPERATURE THIS PHENOMENON IS REVERSIBLE .

4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C

PARAMETER	SYMBOL	CONDITION	MIN .	TYP .	MAX .	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	2.7	3.0	3.3	V
INPUT VOLTAGE NOTE (1)	VIH	H LEVEL	0.8VDD	—	VDD	V
	VIL	L LEVEL	VSS	—	0.2VDD	V
OUTPUT VOLTAGE NOTE (2)	VOH	IOH = - 0.5 mA	0.8VDD	—	VDD	V
	VOL	IOH = 0.5 mA	VSS	—	0.2VDD	V
POWER SUPPLY CURRENT FOR LOGIC NOTE (3)	IDD	VDD - VSS =3.0V	—	0.5	1.5	mA
RECOMMENDED LCD DRIVING VOLTAGE	V0 - VSS ∅=10° θ=0° DUTY=1/64	Ta =- 20 °C	10.2	10.7	11.2	V
		Ta = 25 °C	9.8	10.3	10.8	
		Ta = 70 °C	9.4	9.9	10.4	
OSCILLATION FREQUENCY	fosc	1/64 DUTY	17	20	24	KHz
LED FORWARD VOLTAGE	VF	IF = 60 mA	—	5	—	V

NOTE (1) : APPLIED TO TERMINALS RS , D0 ~ D5,D6(SCL),D7(SI), \overline{RD} (E), \overline{WR} (R/W), $\overline{CS1}$, \overline{RES} , C86,P/S.

NOTE (2) : APPLIED TO TERMINALS D0 ~ D5 , D6(SCL) , D7(SI) .

NOTE (3) : THIS DISPLAY PATTERN IS ALL ON OR OFF.

5. OPTICAL CHARACTERISTICS

Ta = 25 °C

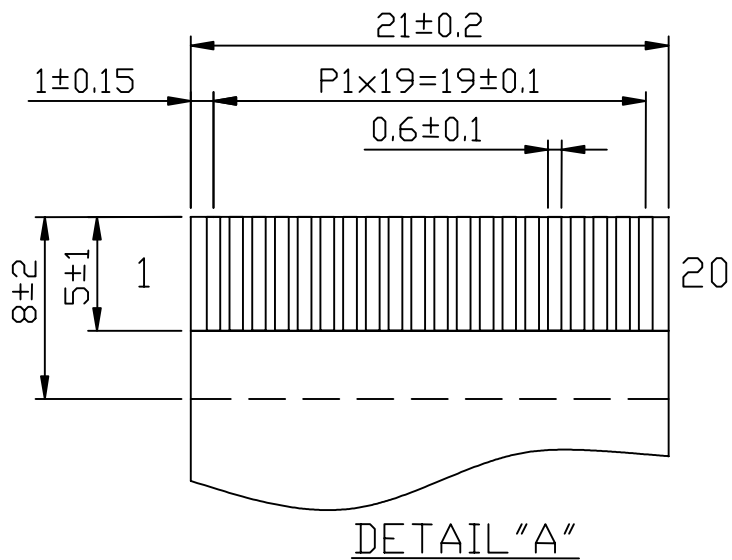
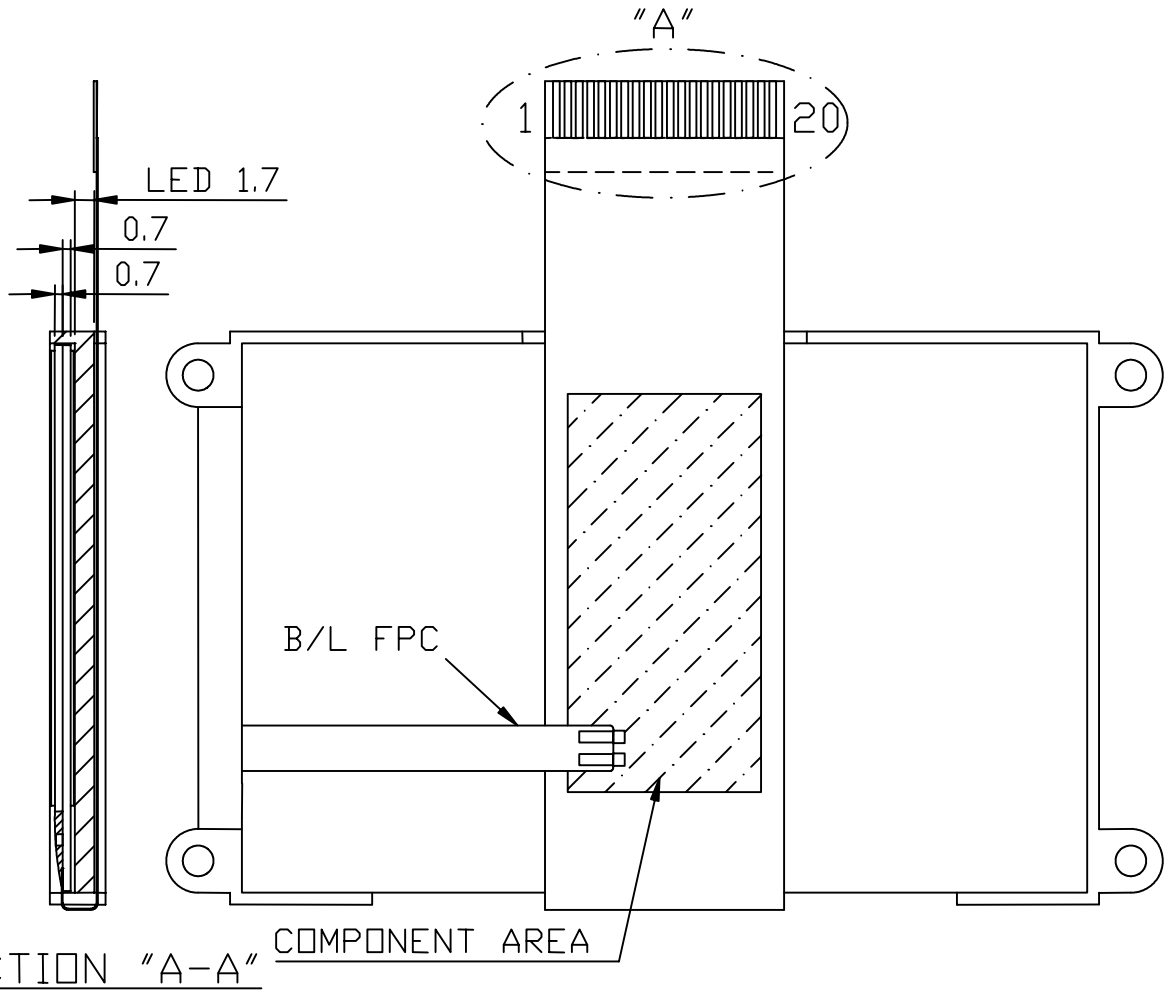
VDD = 5.0 V

I T E M		SYMBOL	CONDITION	MIN .	TYP .	MAX.	UNIT	NOTE
VIEWING ANGLE	STN	∅2 - ∅1	K ≥ 2.0	—	50	—	deg.	1
	FSTN			—	30	—	deg.	1
CONTRAST RATIO	STN	K	∅ = 10° θ = 0°	5.1	5.8	—	—	1
	FSTN			4.1	4.7	—	—	1
RESPONSE TIME	tr (rise)	∅=10° θ = **	Ta = -20 °C	—	TBD	—	ms	1
			Ta = 25 °C	—	TBD	—		
			Ta = 70 °C	—	TBD	—		
	tf (fall)		Ta = -20 °C	—	TBD	—		
			Ta = 25 °C	—	TBD	—		
			Ta = 70 °C	—	TBD	—		
BRIGHTNESS OF MODULE	L	IF=60mA	18	24	—	cd / m ²	1, 2	
			12	16	—		1, 3	

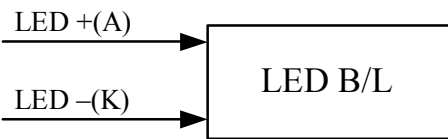
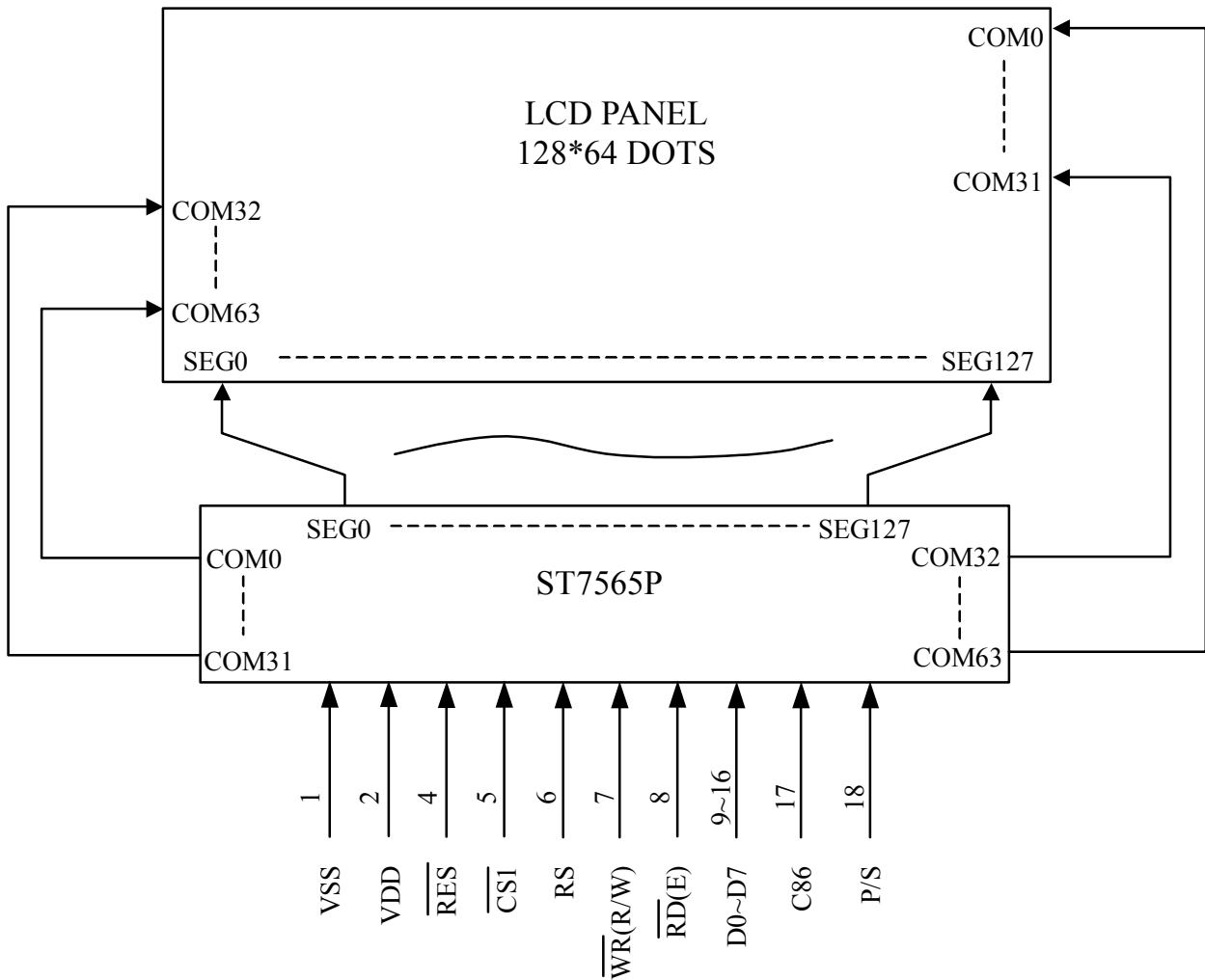
NOTE (1) : PLEASE REFER TO :
CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS. (EU - 002A)

NOTE (2) : POLARIZER MODE : TRANSMISSIVE

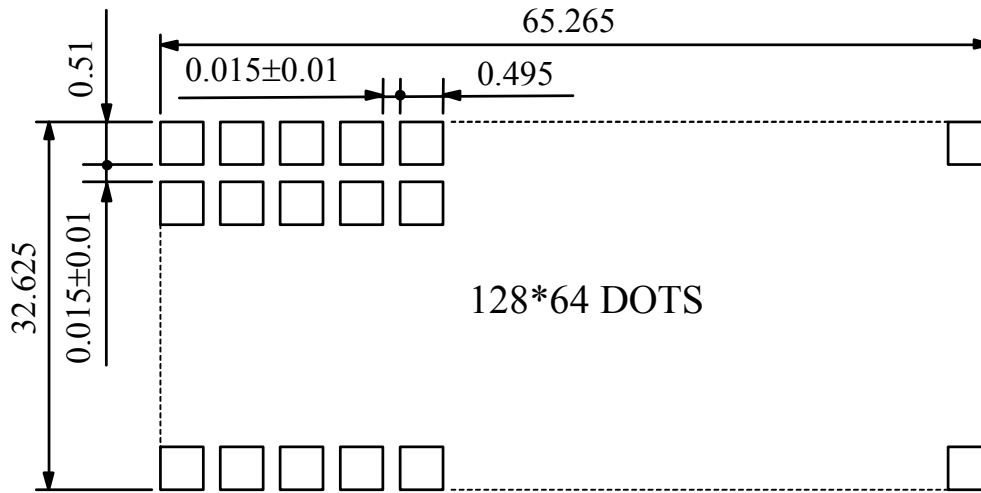
NOTE (3) : POLARIZER MODE : TRANSFLECTIVE



7. BLOCK DIAGRAM



8. DETAIL DRAWING OF DOT MATRIX



UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.1

9. INTERFACE SIGNALS

PIN NO	SYMBOL	FUNCTION															
1	VSS	GROUND (0 V)															
2	VDD	POWER SUPPLY FOR LOGIC CIRCUIT															
3	NC	NO CONNECTION															
4	$\overline{\text{RES}}$	RESET SIGNAL															
5	$\overline{\text{CSI}}$	CHIP SELECTION															
6	RS	DATA / COMMAND CONTROL SIGNAL RS = "H" : INDICATES THAT DO TO D7 ARE DISPLAY DATA RS = "L" : INDICATES THAT DO TO D7 ARE CONTROL DATA															
7	$\overline{\text{WR}}$ (R/W)	8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW WRITE STROBE. 6800 FAMILY INTERFACE ACTS AS THE READ/WRITE CONTROL SIGNAL.															
8	$\overline{\text{RD}}$ (E)	8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW READ STROBE. 6800 FAMILY INTERFACE ACTS AS THE ACTIVE-HIGH ENABLE CLOCK.															
9	D0	DATA BUS															
10	D1																
11	D2																
12	D3																
13	D4																
14	D5																
15	D6(SCL)	WHEN THE SERIAL INTERFACE IS SELECTED(P/S=L) D6:THE SERIAL CLOCK INPUT(SCL) D7:SERIAL DATA INPUT(SI)															
16	D7(SI)	D0 TO D5 ARE SET TO HIGH IMPEDANCE															
17	C86	C86="H"=6800 SERIES MPU INTERFACE C86="L"=8080 MPU INTERFACE															
18	P/S	THIS IS THE PARALLEL DATA INPUT/SERIAL DATA INPUT SWITCH TERMINAL. P/S="H":PARALLEL DATA INPUT. P/S="L":SERIAL DATA INPUT. THE FOLLOWING APPLIES DEPENDING ON THE P/S STATUS: <table border="1"> <thead> <tr> <th>P/S</th> <th>DATA/COMMAND</th> <th>DATA</th> <th>READ/WRITE</th> <th>SERIAL CLOCK</th> </tr> </thead> <tbody> <tr> <td>"H"</td> <td>RS</td> <td>D0 TO D7</td> <td>$\overline{\text{RD}}$, $\overline{\text{WR}}$</td> <td>X</td> </tr> <tr> <td>"L"</td> <td>RS</td> <td>SI(D7)</td> <td>WRITE ONLY</td> <td>SCL(D6)</td> </tr> </tbody> </table> WHEN P/S ="L",D0 TO D5 FIXED "H". $\overline{\text{RD}}$ (E) AND $\overline{\text{WR}}$ (R/W) ARE FIXED TO EITHER "H" OR "L". WITH SERIAL DATA INPUT , IT IS IMPOSSIBLE READ DATA FROM RAM.	P/S	DATA/COMMAND	DATA	READ/WRITE	SERIAL CLOCK	"H"	RS	D0 TO D7	$\overline{\text{RD}}$, $\overline{\text{WR}}$	X	"L"	RS	SI(D7)	WRITE ONLY	SCL(D6)
P/S	DATA/COMMAND	DATA	READ/WRITE	SERIAL CLOCK													
"H"	RS	D0 TO D7	$\overline{\text{RD}}$, $\overline{\text{WR}}$	X													
"L"	RS	SI(D7)	WRITE ONLY	SCL(D6)													
19	LED +	POWER SUPPLY FOR LED BACKLIGHT (ANODE)															
20	LED-	POWER SUPPLY FOR LED BACKLIGHT (CATHODE)															

10. POWER SUPPLY

10.1 POWER SUPPLY FOR LCM



10.2 POWER SUPPLY FOR LED BACKLIGHT



11. INSTRUCTION DESCRIPTION

(Note) *: disabled data

Command	Command Code										Function		
	RS	/RD	/WR	D7	D6	D5	D4	D3	D2	D1		D0	
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	1	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	Display start address						Sets the display RAM display start line address	
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address	
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address. Sets the least significant 4 bits of the display RAM column address.	
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address					
(5) Status read	0	0	1	Status				0	0	0	0	Reads the status data	
(6) Display data write	1	1	0	Write data								Writes to the display RAM	
(7) Display data read	1	0	1	Read data								Reads from the display RAM	
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0	1	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	1	Sets the LCD display normal/reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	1	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0	1	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565P)
(12) Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write	
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset	
(15) Common output mode select	0	1	0	1	1	0	0	0	*	*	*	1	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode	
(17) V ₀ voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio(R _b /R _a) mode	
(18) Electronic volume mode set Electronic volume register set	0	1	0	1	0	0	0	0	0	0	0	1	Set the V ₀ output voltage electronic volume register
(19) Static indicator ON/OFF Static indicator register set	0	1	0	1	0	1	0	1	1	0	0	1	0: OFF, 1: ON Set the flashing mode
(20) Booster ratio set	0	1	0	1	1	1	1	1	0	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
(21) Power saver													Display OFF and display all points ON compound command
(22) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation	
(23) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command	