Pollin ELECTRONIC

DATA SHEET

LCM MODULE

TG12864B-13B

Specification for Approval

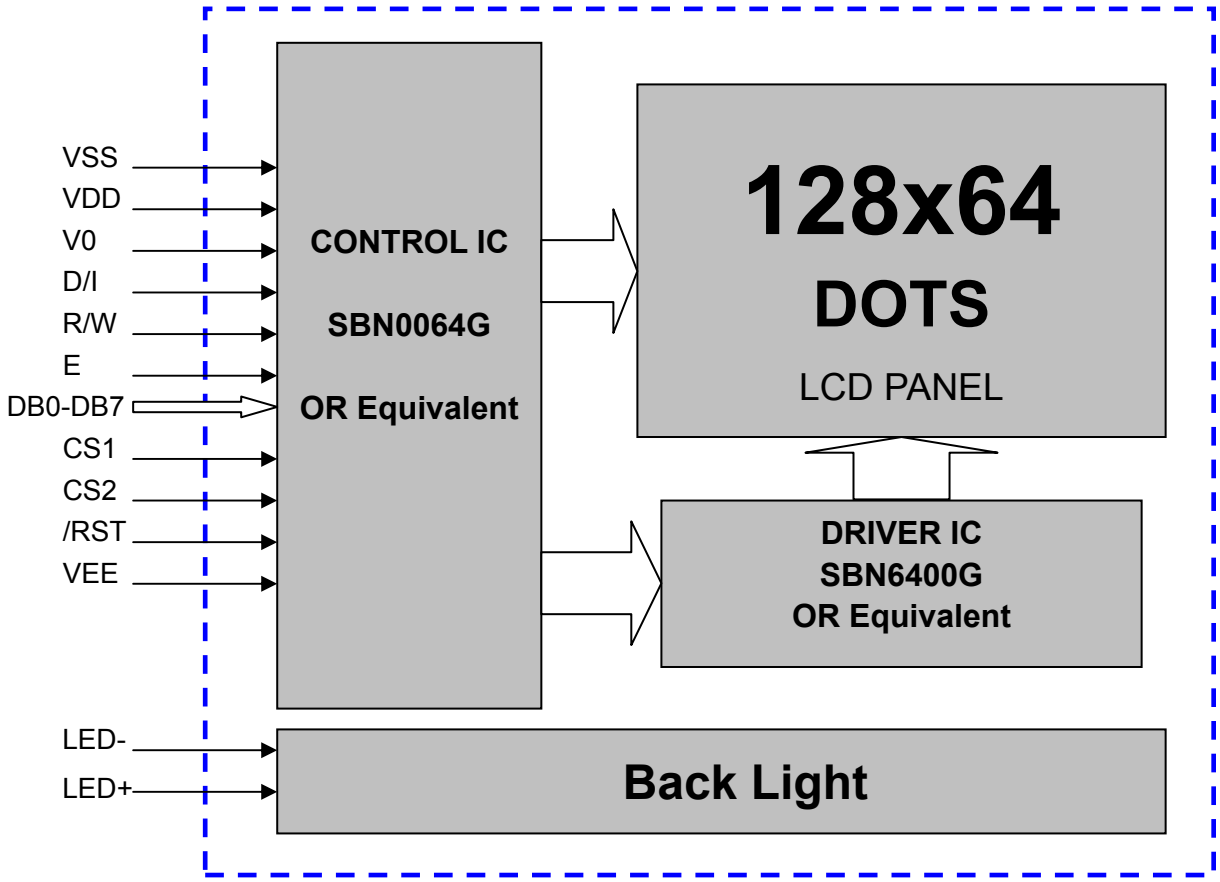
2011-09-14

CONTENTS

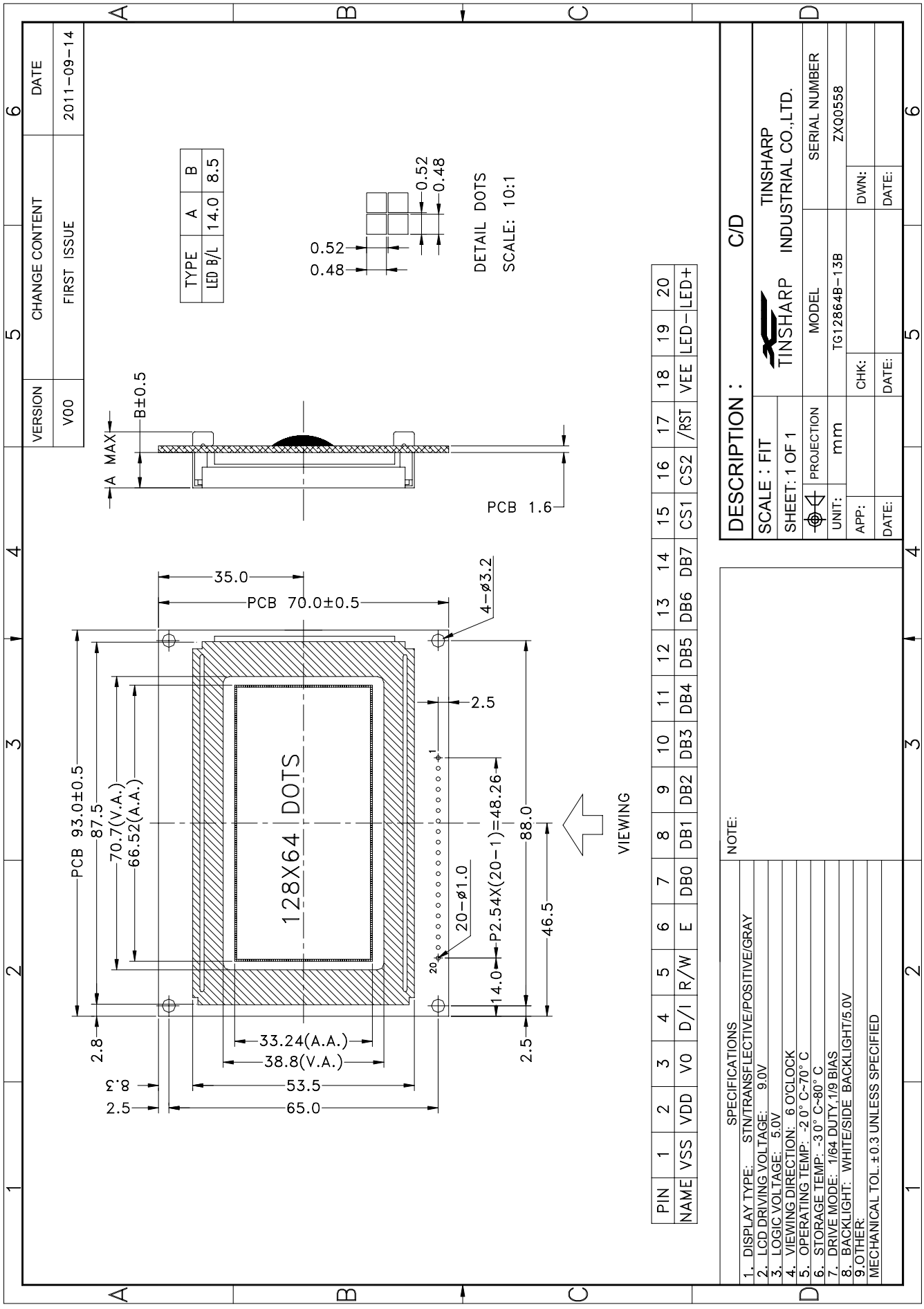
FUNCTIONS & FEATURES

- Construction : COB(Chip-on-Board)
- Display Format : 128x64 dots
- Display Type : STN, Transflective, Positive, Gray
- Controller : SBN0064G or compatible controller
- Interface : 8-bit parallel interface
- Backlight : white/side light
- Viewing Direction : 6 O'clock
- Driving Scheme : 1/64 Duty Cycle, 1/9 Bias
- Power Supply Voltage : 5.0 V
- V_{LCD} Adjustable For Best Contrast : 9.0 V ($V_{OP.}$)
- Operation temperature : -20˚ to +70˚
- Storage temperature : -30˚ to +80˚

BLOCK DIAGRAM



MODULE OUTLINE DRAWING



INTERFACE PIN FUNCTIONS

Pin No.	Symbol	Level	Description
1	VSS	0V	Ground output for pad option.
2	VDD	+5.0V	Supply voltage for logic operating.
3	V0	--	LCD driver supplies adjusting voltages.
4	D/I	H/L	Command/Data selection from the host microcontroller. When D/I=0, the data on the 8-bit data bus(DB0～DB7) are either code data to be written to an internal register, or status from the internal status register. When D/I=1, the data on the 8-bit data bus(DB0～DB7) are data to be written to or read from the display data memory.
5	R/W	H/L	Read/Write(R/W) control signal from the host microcontroller. This pin should be connected to the R/W output of the host microcontroller. A HIGH level on this pin indicates that the microcontroller intends to do a READ operation. A LOW level on this pin indicates that the microcontroller intends to do a WRITE operation.
6	E	H/L	Enable signal (E) from the host microcontroller.
7	DB0	H/L	Bi-direction, tri-state 8-bit parallel data bus for interface with a host microcontroller. This data bus is for data transfer between the host microcontroller and the SBN0064G.
8	DB1	H/L	
9	DB2	H/L	
10	DB3	H/L	
11	DB4	H/L	
12	DB5	H/L	
13	DB6	H/L	
14	DB7	H/L	
15	CS1	H/L	Chip Selection: When CS1=1, Left area is selected.
16	CS2	H/L	Chip Selection: When CS2=1, Right area is selected.
17	/RST	H/L	When /RST is set to “L,” the settings are initialized.
18	VEE	--	DC/DC voltage converter output.
19	LED-	0V	The backlight ground.
20	LED+	+5.0V	Power supply for backlight.

ABSOLUTE MAXIMUM RATINGS (Ta = 25)

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	V_{DD}	-0.3	+7.0	V
Supply voltage for LCD	V_o	--	13	V
Input voltage	V_I	-0.3	V_{DD} +0.3	V
Normal Operating temperature	T_{OP}	-20	+70	˚
Normal Storage temperature	T_{ST}	-30	+80	˚

Note: Stresses beyond those given in the Absolute Maximum Rating table may cause operational errors or damage to the device. For normal operational conditions see AC/DC Electrical Characteristics.

DC ELECTRICAL CHARACTERISTICS

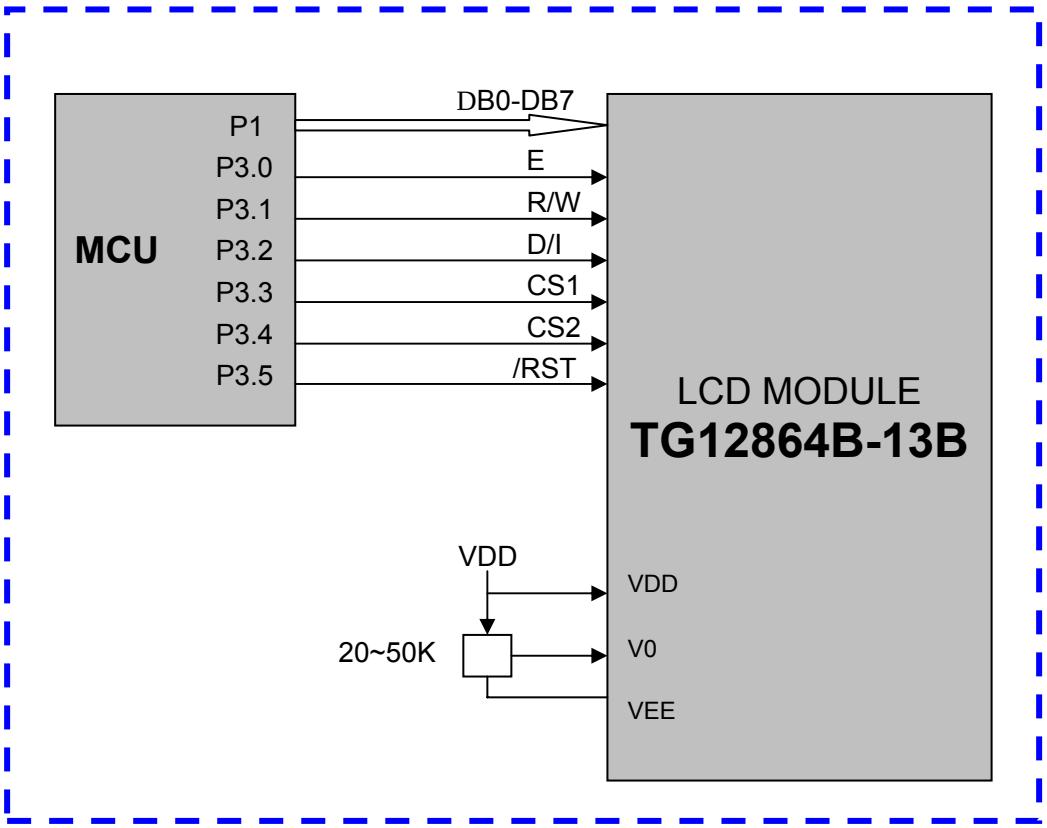
Parameter	Symbol	Condition	M_{IN}	T_{YP}	M_{AX}	Unit
Supply voltage for logic	V_{DD}	--	4.8	5.0	5.2	V
Supply current for logic	I_{DD}	--	--	6	12	mA
Operating voltage for LCD	VLCD	-20˚				
		+25˚	8.8	9.0	9.2	V
		+70˚				
Supply voltage for Back Light	V_{BL}	--	4.8	5.0	5.2	V
Supply current for Back Light	I_{BL}	--	--	75	90	mA
Input voltage“H”level	VIH	--	VDD-2.2	--	VDD	V
Input voltage “L” level	VIL	--	0	--	0.8	V

LED BACKLIGHT CHARACTERISTICS

Colour: white

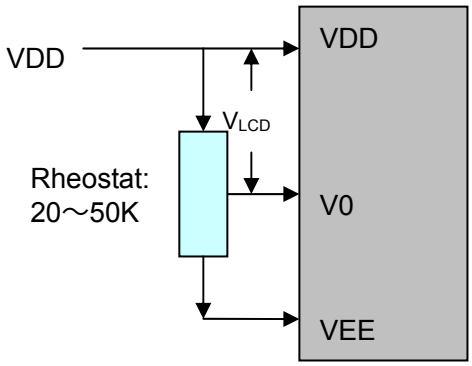
Parameter	Symbol	Condition	M_{IN}	T_{YP}	M_{AX}	Unit
Forward Voltage	Vf	If=75mA	2.8	3.0	3.2	V
Reverse Current	Ir	Vr=5.0V	--	--	50	μ A
Wavelength	λ d	If=75mA	--	--	--	nm
Color Coordinate	X	If=75mA	0.280	0.300	0.320	nm
	Y		0.270	0.290	0.310	
Spectral width at half height	Δλ	If=75mA	--	30	--	nm
Luminance	Lv Sub.	If=75mA	650	700	--	cd/m^2
Uniformity	Δ	M_{IN}/M_{AX}*100%	80	--	--	%

CONNECTION WITH MCU



TYPICAL V0 CONNECTIONS FOR DISPLAY CONTRAST

Adjust V0 to VDD (V_{LCD}=9.0V) as an initial setting. When the module is operational, readjust V0 for optimal display appearance.



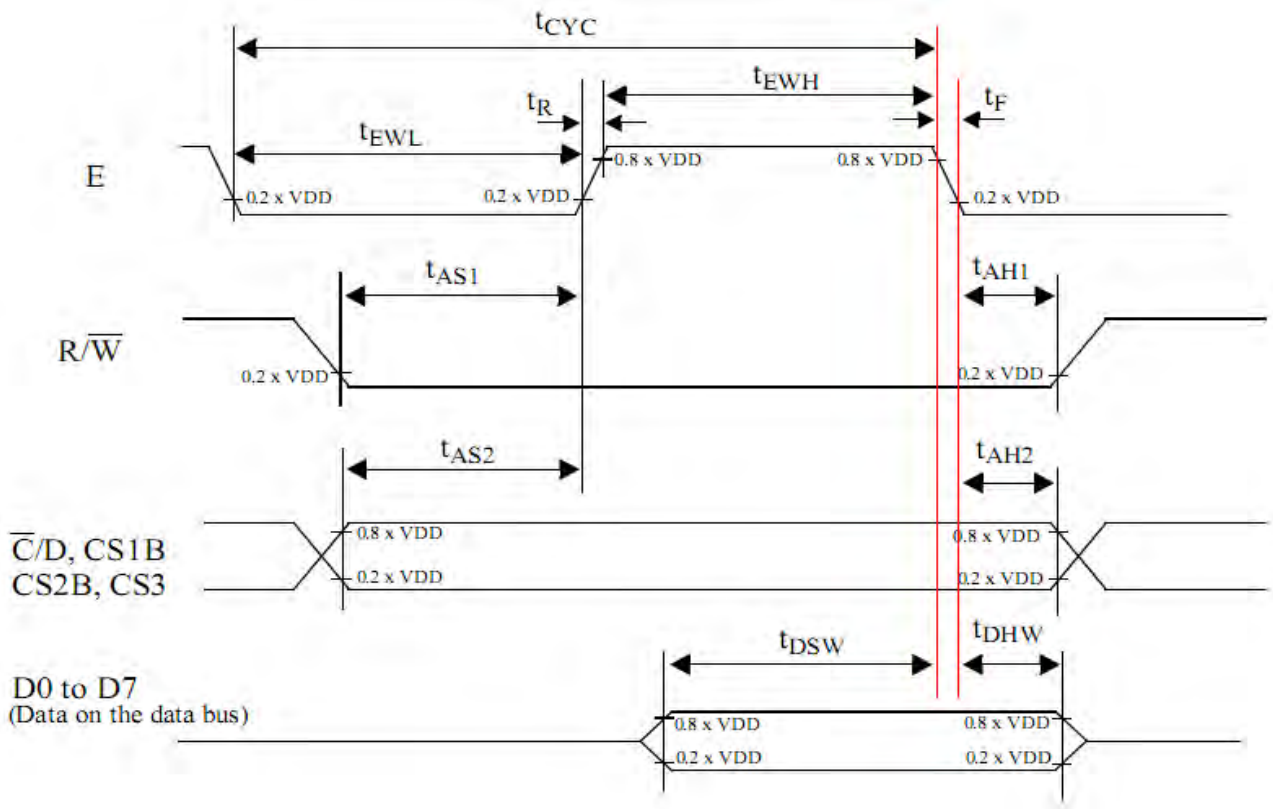
We recommend allowing field adjustment of V0 for all designs. The optimal value for V0 will change with temperature, variations in VDD, and viewing angle. V0 will also vary module-to-module and batch-to-batch due to normal manufacturing variations.

Ideally, adjustment to V0 should be available to the end user so each user can adjust the display to the optimal contrast for their required viewing conditions. As a minimum, your design should allow V0 to be adjusted as part of your product's final test.

Although a potentiometer is shown as a typical connection, V0 can be driven by your microcontroller, either by using a DAC or a filtered PWM. Displays that require Vo to be negative may need a level-shifting circuit. Please do not hesitate to contact Tinsharp application support for design assistance on your application.

AC CHARACTERISTICS

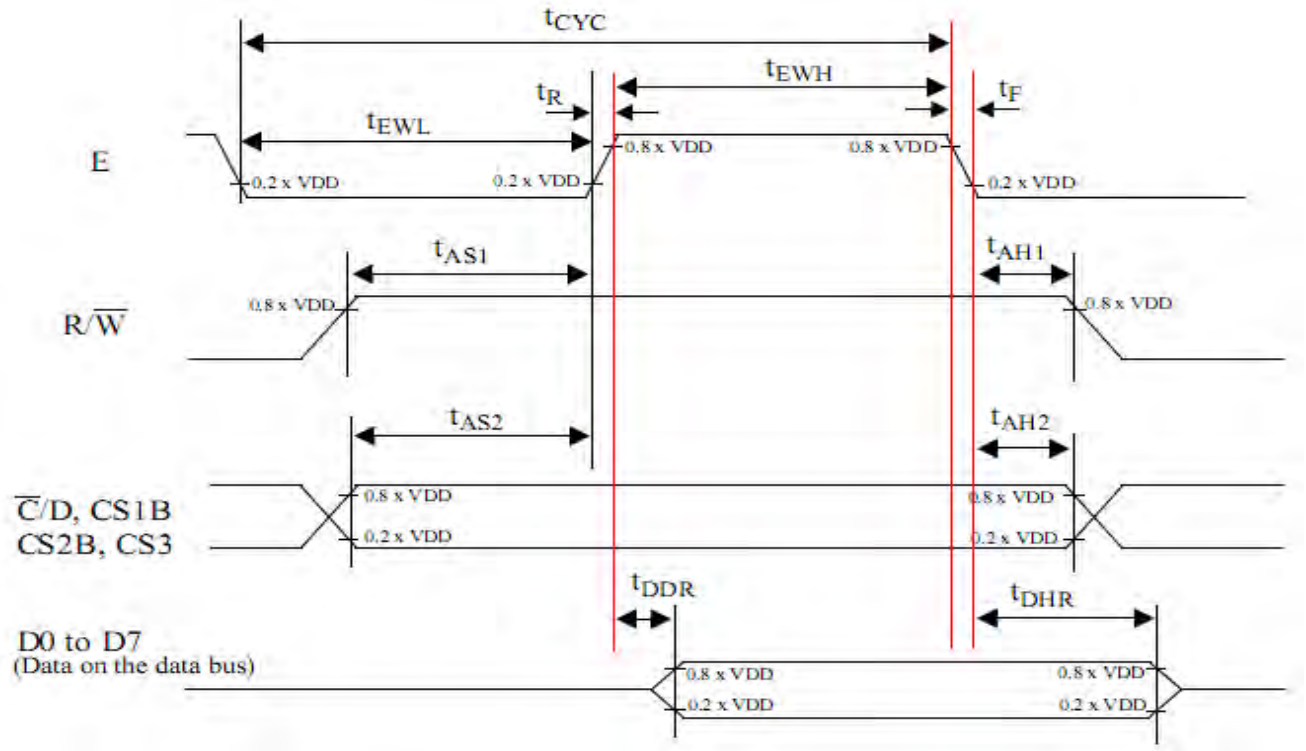
Microcontroller Interface timing for writing to the SBN0064G



V_{DD} = 5 V ±10%; V_{SS} = 0 V; T_{amb} = -20 °C to +75°C.

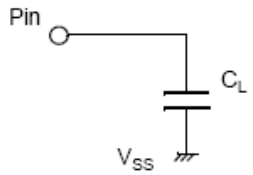
symbol	parameter	min.	max.	test conditions	unit
t_{CYC}	Enable (E) cycle time	1000			ns
t_{EWL}	Enable (E) LOW width	450			
t_{EWH}	Enable (E) HIGH width	450			
t_R	Enable (R) rise time		20		
t_F	Enable (F) fall time		20		
t_{AS1}	Write set-up time	140			
t_{AH1}	Write hold time	10			
t_{AS2}	C/D, CS1B, CS2B, CS3 set-up time	140			
t_{AH2}	C/D, CS1B, CS2B, CS3 hold time	10			
t_{DSW}	Data setup time (on the data bus)	200		The loading on the data bus is shown in Fig. 18.	
t_{DHW}	Data hold time (on the data bus)	10			

Microcontroller Interface timing for reading from the SBN0064G



V_{DD} = 5 V ±10%; V_{SS} = 0 V; T_{amb} = -20 °C to +75°C.

symbol	parameter	min.	max.	test conditions	unit
t_{CYC}	Enable (E) cycle time	1000			ns
t_{EWL}	Enable (E) LOW width	450			
t_{EWH}	Enable (E) HIGH width	450			
t_R	Enable (R) rise time		20		
t_F	Enable (F) fall time		20		
t_{AS1}	READ set-up time	140			
t_{AH1}	READ hold time	20			
t_{AS2}	C/D, CS1B, CS2B, CS3 set-up time	140			
t_{AH2}	C/D, CS1B, CS2B, CS3 hold time	10			
t_{DDR}	Data delay time (on the data bus)	320		The loading on the data bus is shown in Fig. 18.	
t_{DHR}	Data hold time (on the data bus)	20			



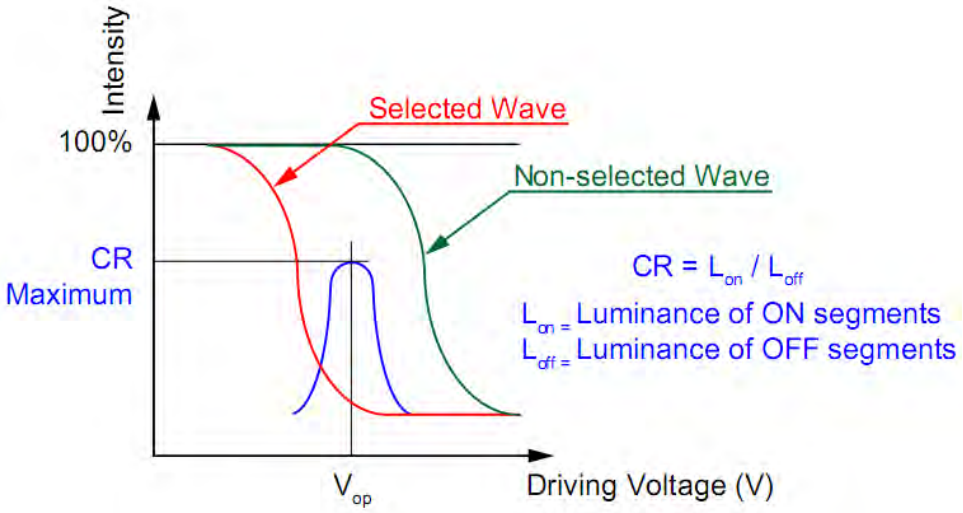
C_L = 50 pF (including wiring and probe capacitance).

Fig.18 Load circuit for each bit of the data bus.

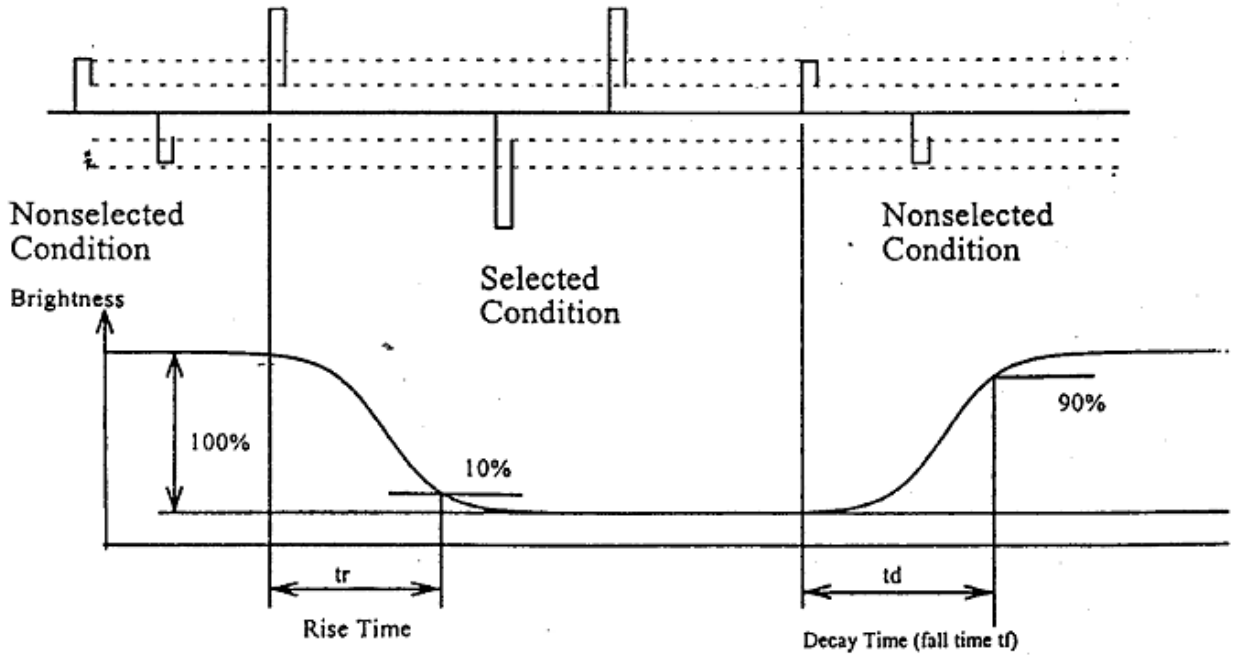
OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Contrast ratio	CR	θ=0, Φ=0	--	5	--	--	--
Response time(rise)	Tr	25˚	--	--	250	ms	--
Response time(fall)	Td		--	--	350		--
Viewing angle	θf	25˚	--	35	--	deg.	--
	θb		--	30	--		--
	θl		--	20	--		--
	θr		--	20	--		--

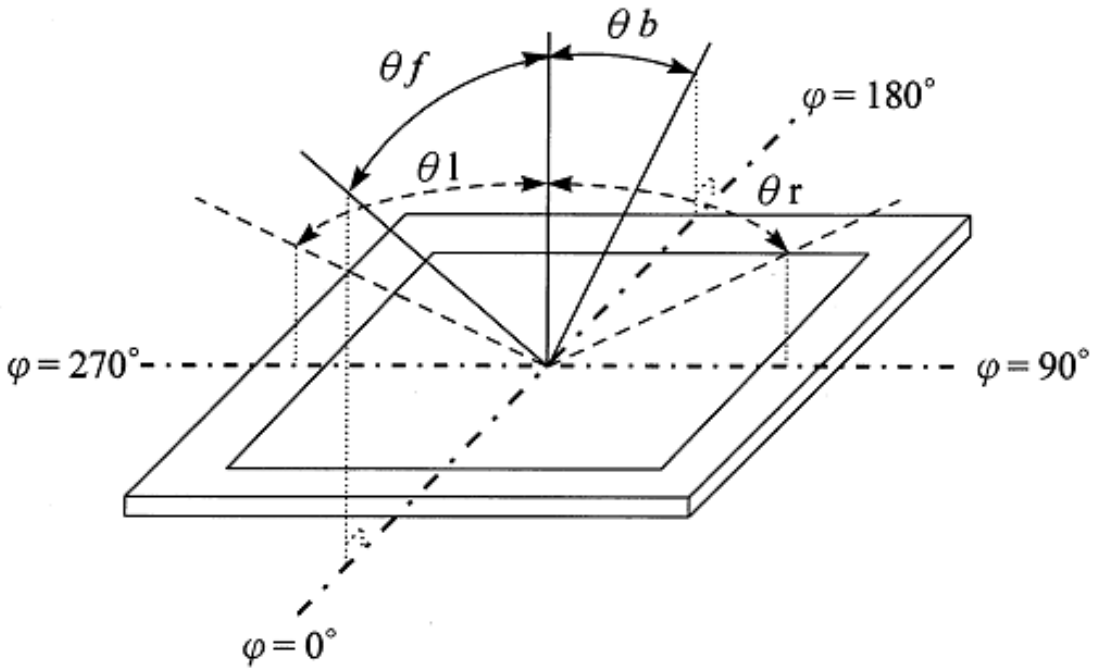
Note1: Definition Operation Voltage (V_{OP})



Note2: Response time



Note3: Viewing angle

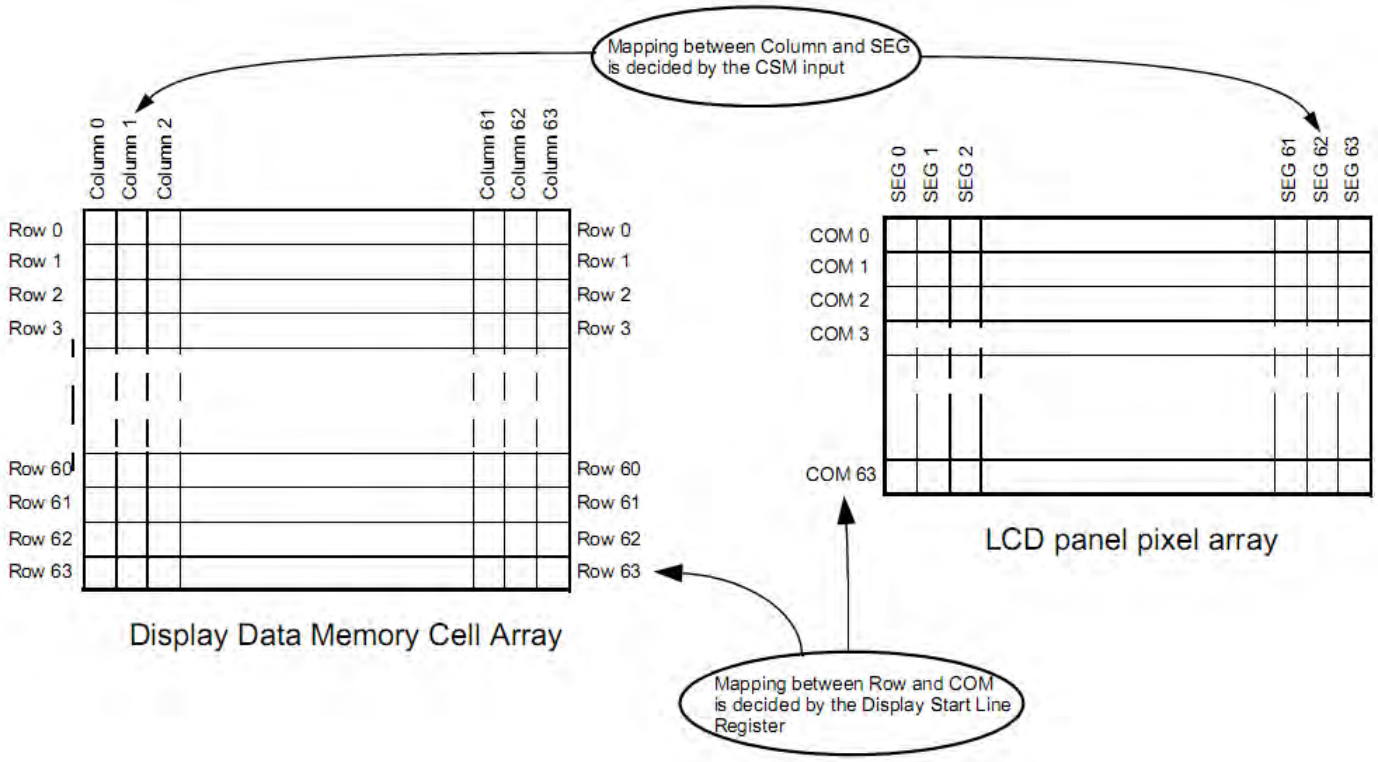


DISPLAY DATA RAM (DD RAM)

The Display Data Memory is a static memory bit(cell) array of 64-row x 64-column. So, the total bit number is 64 x 64 = 4096 bits (512 bytes). Each bit of the memory is mapped to a single pixel (dot) on the LCD panel. A "1" stored in the Display Data Memory bit corresponds to an ON pixel (black dot in normal display). A "0" stored in the Display Data Memory bit corresponds to an OFF pixel (background dot in normal display).

Column outputs (Column 0~63) of the Display Data Memory is mapped to SEG 0~63 outputs of the SBN0064G. The mapping can be Normal Mapping or Inverse Mapping. Normal Mapping means that Column 0 is mapped to SEG0, Column 1 to SEG1, Column 2 to SEG2, and so on. Inverse Mapping means that Column 0 is mapped to SEG 63, Column 1 to SEG 62, Column 2 to SEG 61, and so on. The mapping relation is decided by the CSM input (Column/Segment Mapping). CSM=1 selects Normal Mapping and CSM=0 selects Inverse Mapping.

Any row (64 bits) of the Display Data Memory can be selected to map to the first row (COM0) of the LCD panel. This is decided by the Display Start Line Register. The Display Start Line Register points at a row of the Display Data Memory, which will be mapped to COM0 of LCD Display.



RELIABILITY TEST CONDITION

No.	TEST Item	Content of Test	Test Condition	Applicable Standard
1	High temperature storage	Endurance test applying the high storage Temperature for a long time.	80ºC 96hrs	--
2	Low temperature storage	Endurance test applying the low storage Temperature for a long time	-30ºC 96hrs	--
3	High temperature operation	Endurance test applying the electric stress (Voltage & current)and the thermal stress to the element for a long time	70ºC 96hrs	--
4	Low temperature operation	Endurance test applying the electric stress Under low temperature for a long time	-20ºC 96hrs	--
5	High temperature/ Humidity storage	Endurance test applying the electric stress(Voltage & current) and Temperature/ Humidity stress to the element for a long time	40ºC 90%RH 96hrs	--
6	High temperature/ Humidity operation	Endurance test applying the electric stress (voltage & current)and temperature/ humidity stress to the element for a long time	40ºC 90%RH 96hrs	--
7	Temperature cycle	Endurance test applying the low and high temperature cycle. -20ºC →25ºC→70ºC 30min←5min←30min.(1 cycle)	-20ºC/70ºC 10 cycle	--

Supply voltage for logic system = 5V. Supply voltage for LCD system = Operating voltage at 25ºC.

MECHANICAL TEST

Vibration test	Endurance test applying the vibration during transportation and using	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hour	Applicable Standard
Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G half sign wave 11 msede 3 times of each direction	--
Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air	115mbar 40hrs	--
Static electricity test	Endurance test applying the electric stress to the terminal	VS=800V,RS-1.5KΩ CS=100pF, 1 time	--

ENVIRONMENTAL CONDITION

The inspection should be performed at the 1metre height from the LCD module under 2 pieces of 40W white fluorescent lamps (Normal temperature 20~25˜ and normal humidity 60±15%RH).

PRECAUTION FOR SOLDERING TO THE LCM

(1) Observe the following when soldering lead wire, connector cable and etc. to the LCM.
- Soldering iron temperature : 275°C ± 10°C.
- Soldering time : 3-6 sec.
- Solder : eutectic solder.

If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

(2) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

(3) When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

PRECAUTION FOR USING LCD MODULE

- Please remove the protection foil of polarizer before using.
- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If the substance come into contact with your skin or clothes promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.
- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
  -Be sure to ground the body when handling the LCD module.
  -Tools required for assembly, such as soldering irons, must be properly grounded.
  -To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
  -The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
- Storage precautions
  When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
  Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0˜).Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.

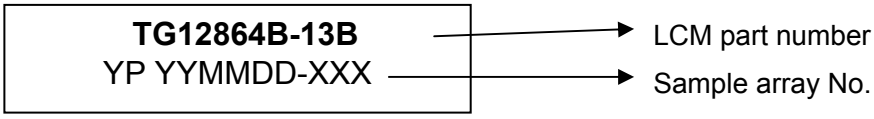
- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.

- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules :
  - Exposed area of the printed circuit board
  - Terminal electrode sections

A. DATE CODE RULES

A.1. DATE CODE FOR SAMPLE

YP: meaning sample



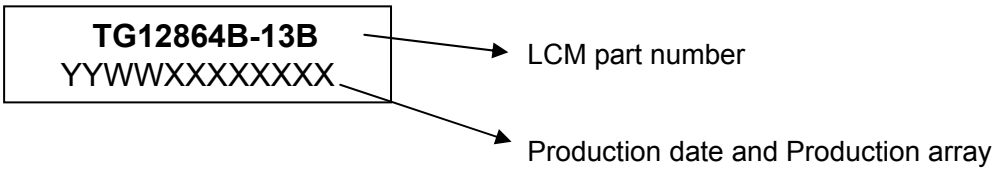
A. **TG12864B-13B** represents LCM part number

B. YYMMDD represents Year, Month,Day

YY—Year MM—Month DD—Day

XXX—SAMPLE array No.

A.2. DATE CODE FOR PRODUCTION



A. **TG12864B-13B** represents LCM part number

B. YYWW represents Year, Week

YY—Year WW—Week

XXXXXXXX—Production array No.

B. CHANGE NOTES:

Ver.	Descriptions	Editor	Date
V00	First Issue	ZXQ	2011-09-14