LIQUID CRYSTAL DISPLAY MODULE
MODEL: NMTB-F000230FWHSGW-11A
Customer's No.: N/A

Acceptance

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Approved and Checked by

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微端 93.10.15 陳宏誠		微端 93.10.15 連俊傑	微端 93.10.15 馬中平

Revise Records

Rev.	Date	Contents	Written	Approved
A	10/15/2004	Initial Release	David Ma	Garry Chen
B	11/29/2006	See Note2.	Sherry	Danny Lian

Special Notes

Note1.	With LCD LSI S6B1713. With FPCB protective tape (silver).
Note2.	The LCD module is compliant with RoHS
Note3.	
Note4.	
Note5.	

Contents

1. General Specifications

Operating Temperature	:	Min. -20°C ～ Max. 70°C
Storage Temperature	:	Min. -30°C ～ Max. 80°C
Dot Pixels	:	128 (W) x 64 (H) dots
Dot Size	:	0.40 (W) x 0.40 (H) mm
Dot Pitch	:	0.43 (W) x 0.43 (H) mm
Viewing Area	:	60.0 (W) x 31.1 (H) mm
Outline Dimensions	:	75.0 (W) x 52.7* (H) x 6.5 max.**(D) mm
		* Without FPC connector
		** Without LED cable
Weight	:	N/A
LCD Type	:	FSTN/ Positive-mode /Transflective
Viewing Direction	:	6:00
Data Transfer	:	8-bit parallel data transfer
LSI	:	S6B1713
Backlight	:	LED (White) Edge-Type
Drawings	:	As attached drawings

2. Electrical Specification

2.1 Absolute Maximum Ratings

(V_{SS}=0V)

Parameter	Symbol	Conditions	Min.	Max.	Units
Supply Voltage (Logic)	V_{DD} - V_{SS}	--	- 0.3	7.0	V
Supply Voltage (LCD Drive)	V_{LCD}	--	-0.3	17.0	V
Input Voltage	V_I	--	- 0.3	V_{DD} + 0.3	V

Notes:

1. VDD and VLCD are based on VSS = 0V.
2. Voltages V0 >V1>V2>V3>V4>VSS(GND) must always be satisfied.(VLCD = V0 - VSS)
3. If supply voltage exceeds its absolute maximum range, this LSI may be damaged permanently. It is desirable to use this LSI under electrical characteristic conditions during general operation. Otherwise, this LSI may malfunction or reduced LSI reliability may result.

2.2 DC Characteristics

V_{SS} = 0V, V_{DD} = 2.4V to 5.5V, Ta = -40 to +85°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	Pin Used
Supply Voltage (Logic)	V_{DD}-V_{SS}	--	2.4	--	5.5	V	V_{DD} *1
Supply Voltage (LCD Drive)	V_0 - V_{SS}	Shown in 3.1				V	Vo *2
High Level (Input Voltage)	V_{IH}	--	0.8 V_{DD}	--	V_{DD}	V	*3
Low Level (Input Voltage)	V_{IL}	--	V_{SS}	--	0.2 V_{DD}	V	*3
High Level (Output Voltage)	V_{OH}	I_{OH} =- 0.50mA	0.8 V_{DD}	--	V_{DD}	V	*4
Low Level (Output Voltage)	V_{OL}	I_{OL}= 0.50mA	V_{SS}	--	0.2 V_{DD}	V	*4
Supply Current	I_{DD}	V_{IN}=V_{DD} or V_{SS}	-1.0	--	+1.0	µA	*5
	I_{EE}	V_{IN}=V_{DD} or V_{SS}	-3.0	--	+3.0	µA	*6

Notes:

*1. Though the wide range of operating voltages is guaranteed, a spike voltage change may affect the voltage assurance during access from the MPU

*2. In case of external power supply is applied.

*3. /CS1, CS2, RS, DB0 to DB7, E_/RD, RW_/RW, /RESET, MS, C68, PS, INTRS, HPM, /DC5, CLS, CL,M, DISP pins.

*4. DB0 to DB7, M, FRS, DISP, CL pin.

*5. /CS1, CS2, RS, DB7 to DB0, E_/RD, RW_/WR, /RESET, MS, C68, PS, INTRS, HPM, /DC5, CLS, CL, M, DISP pin.

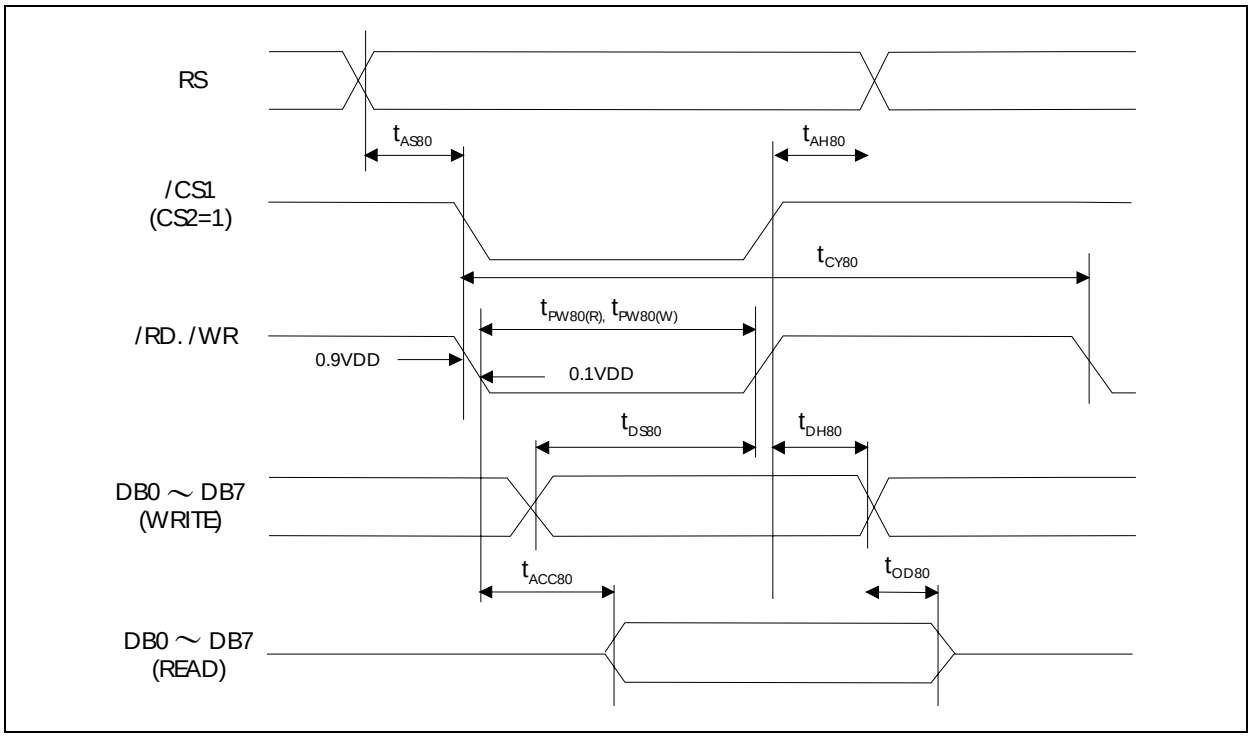
*6. Applies when then DB7 to DB0, M, DISP, and CL, pins are in high impedance.

2.3 AC Characteristics (Read/Write operation sequence – 8080-series MPU)

(V_{DD} = 4.5 to 5.5V, Ta = -40 to +85°C)

Parameter		Symbol	Min.	Typ.	Max.	Condition	Units
Address Setup Time	RS	t_{AW6}	10	--	--	--	ns
Address Hold Time		t_{AH6}	10	--	--	--	ns
System Cycle Time	/WR,/RD	t_{CYC6}	150	--	--	--	ns
Enable High Pulse Width (Read)	/WR,/RD	t_{EWHR}	25	--	--	--	ns
Enable High Pulse Width (Write)		t_{EWHW}	105	--	--	--	ns
Enable Low Pulse Width (Read)	/WR,/RD	t_{EWLR}	65	--	--	--	ns
Enable Low Pulse Width (Write)		t_{EWLW}	25	--	--	--	ns
Data Set Up Time	DB0~DB7	t_{DS6}	18	--	--	--	ns
Data Hold Time		t_{DH6}	10	--	--	--	ns
Access Time		t_{ACC6}	--	--	65	CL=100pF	ns
Output Disable Time		t_{OH6}	10	--	45		ns

*1 The rise and fall times (tr and tf) of the input signal are specified at 15 ns or less.
Or (tr+tf) < (t_{CYC8}–t_{CCLW}–t_{CCHW}) for write, (tr+tf) < (t_{CYC8}–t_{CCLR}–t_{CCHR}) for read.

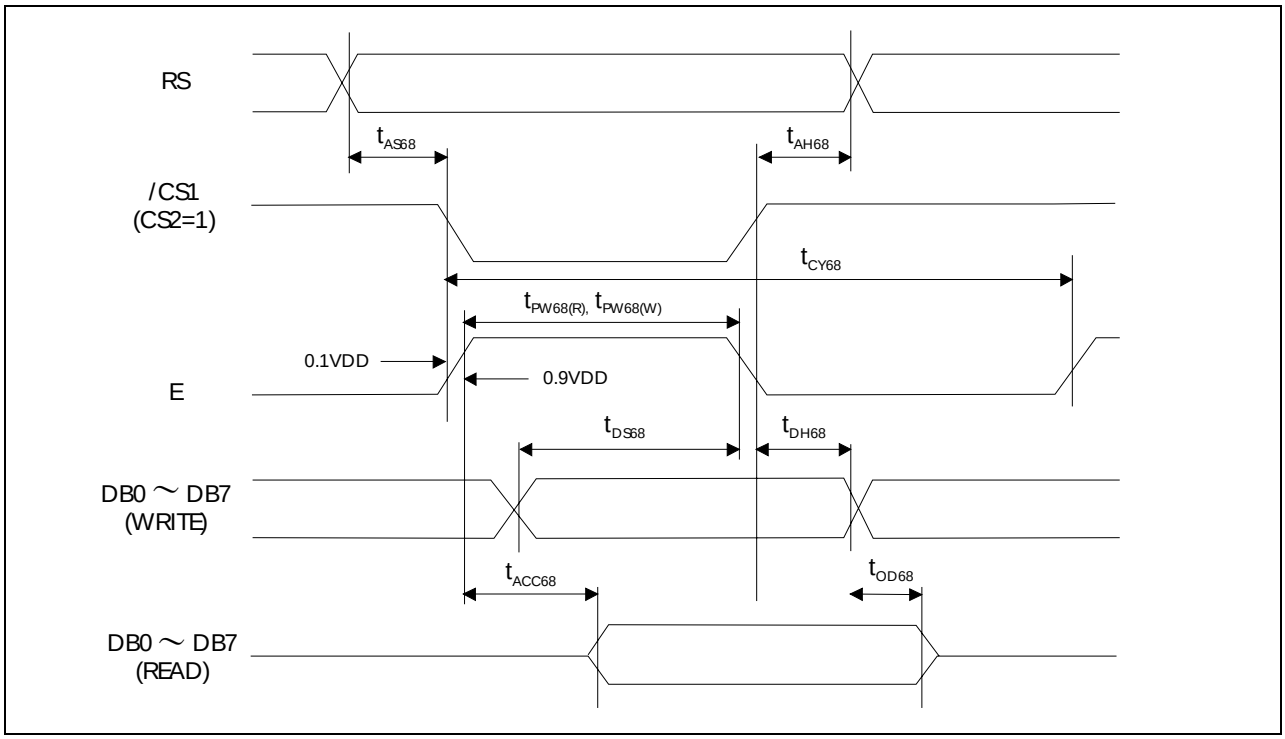


2.4 AC Characteristics (Read/Write operation sequence 6800-series MPU)

(V_{DD} = 4.5 to 5.5V, Ta = -40 to +85°C)

Parameter		Symbol	Min.	Typ.	Max.	Condition	Units
Address Setup Time	RS,RW	t_{AW6}	10	--	--	--	ns
Address Hold Time		t_{AH6}	10	--	--	--	ns
System Cycle Time	E	t_{CYC6}	160	--	--	--	ns
Enable High Pulse Width (Read)	E	t_{EWHR}	65	--	--	--	ns
Enable High Pulse Width (Write)		t_{EWHW}	105	--	--	--	ns
Enable Low Pulse Width (Read)	E	t_{EWLR}	65	--	--	--	ns
Enable Low Pulse Width (Write)		t_{EWLW}	25	--	--	--	ns
Data Set Up Time	DB0~DB7	t_{DS6}	18	--	--	--	ns
Data Hold Time		t_{DH6}	10	--	--	--	ns
Access Time		t_{ACC6}	--	--	65	CL=100pF	ns
Output Disable Time		t_{OH6}	10	--	45		ns

*1 The rise and fall times (tr and tf) of the input signal are specified at 15 ns or less.
Or (tr+tf) < (t_{CYC8}–t_{CCLW}–t_{CCHW}) for write, (tr+tf) < (t_{CYC8}–t_{CCLR}–t_{CCHR}) for read.



2.5 Spec. for LED back-light

2.5.1 Absolute Maximum Ratings

Ta = 25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Forward Current	I_F	--	--	--	100	mA
Reverse Voltage	V_R	--	--	--	5.0	V
LED Power Dissipation	P_D	--	--	--	420	mW
Operating Temperature	Topr	--	-20	--	+65	°C
Storage Temperature	Tstg	--	-30	--	+70	°C

2.5.2 Operating Characteristics

Ta = 25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Forward Voltage	V_F	I_F=80mA	--	4.2	--	V
Luminance of Backlight Surface*	L	I_F=80mA	110	130	--	cd/m^2
Uniformity*	--	--	--	80	--	%
Chromaticity Coordinates	X	--	0.28	0.31	0.34	--
	Y	--	0.29	0.32	0.35	--

*Uniformity = (Min./Max.) x 100%

3. Optical Specifications

3.1 LCD Driving Voltage

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Recommended LCD Driving Voltage Note 1	V_0 - V_{SS}	Ta= -20 °C	9.7	10.0	10.3	V
		Ta=25 °C	8.3	8.5	8.8	V
		Ta=70 °C	6.7	7.0	7.3	V

Note 1 : Voltage (Applied actual waveform to LCD Module) for the best contrast. The range of minimum and maximum shows tolerance of the operating voltage. The specified contrast ratio and response time are not guaranteed over the entire range.

3.2 Optical Characteristics

Ta=25°C, 1/64 Duty, 1/8 Bias, (Note 4), θ = 0°, ϕ = 0°

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Units
Contrast Ratio Note 1		CR	θ = 0°, ϕ = 0°	2	4	--	--
Viewing Angle (Shown in 3.3)		Front-Back	θ_L - θ_H, ϕ = 0°	40	to	30	deg.
		Left-Right	θ_L - θ_R, ϕ = 0°	35	to	35	deg.
Response Time	Rise Note 2	T_{ON}	--	--	250	750	ms
	Decay Note 3	T_{OFF}	--	--	300	900	ms

Note 1 : Contrast ratio is defined as follows.
CR = L_{OFF} / L_{ON}
L_{ON} : Luminance of the ON segments, L_{OFF} : Luminance of the OFF segments

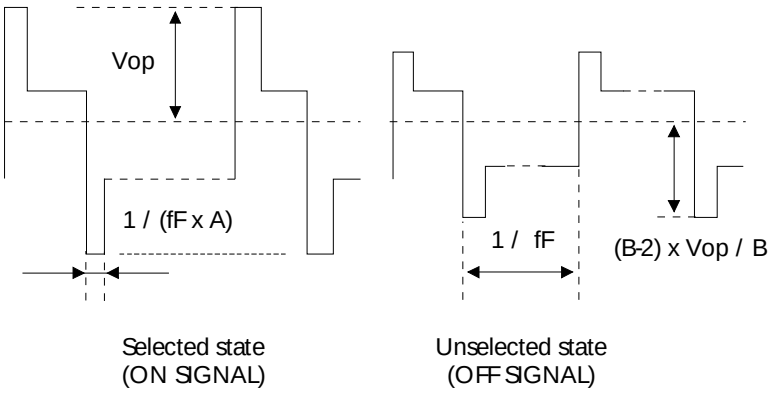
Note 2 : The time that the luminance level reaches 90% of the saturation level from 0% when ON signal is applied.

Note 3 : The time that the luminance level reaches 10% of the saturation level from 100% when OFF signal is applied.

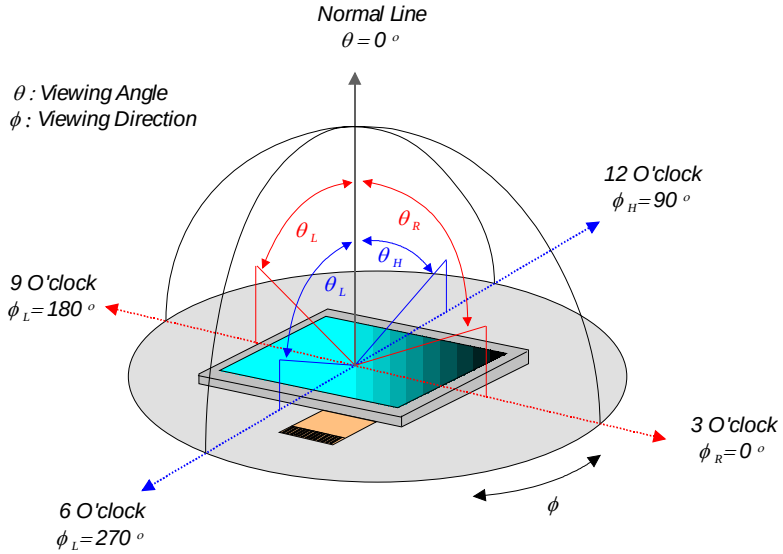
Note 4 : Definition of Driving Voltage V_D. Assuming that the typical driving waveforms shown below are applied to the LCD Panel at /A Duty - 1/B Bias (A : Duty Number, B : Bias Number). Driving voltage V_D is defined s follows: V_D = (Vth1+Vth2) / 2

Vth1 : The voltage VO-P that should provide 50% of the saturation level in the luminance at the segment which the ON signal is applied to.

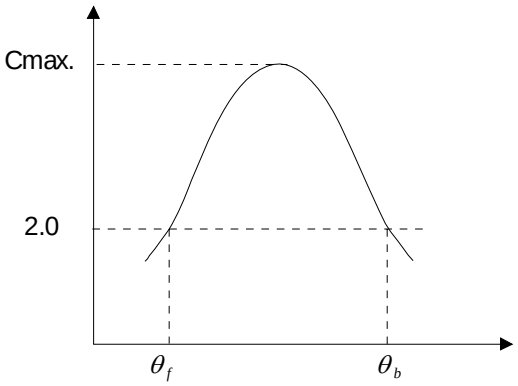
Vth2 : The voltage VO-P that should provide 50% of the saturation level in the luminance at the segment which the OFF signal is applied to.



3.3 Definition of Viewing Angle and Optimum Viewing Area



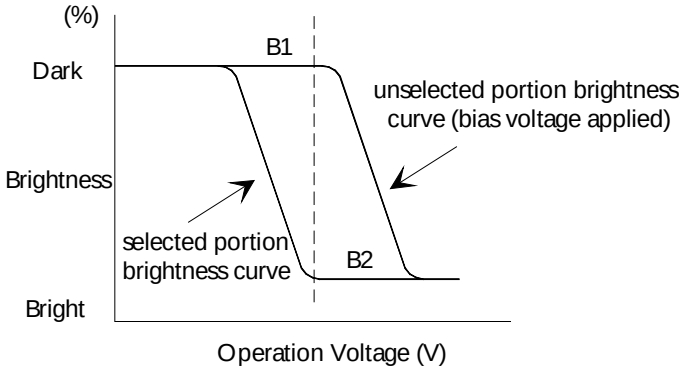
3.4 Definition of Viewing Angle θ_f and θ_b



Viewing angles θ (ϕ fixed)

Optimum viewing angle with the naked eye and viewing angle θ at Cmax. Above are not always the same.

3.5 Definition of Contrast C, *C= Brightness of selected dot (B1)/ Brightness of unselected dot (B2)*



4. I/O Terminal

4.1 Pin Assignment

LCD

No.	Symbol	Level	Function
1	USER1	--	No Connection (Connect to Pin2)
2	USER2	--	No Connection (Connect to Pin1)
3	/CS1	--	Chip select input pin. Data input/output is enables only when /CS1 is low and CS2 is high.
4	CS2	--	Chip select input pin. When chip select is non-active, DB7 to DB0 will be high impedance.
5	/RESET	--	Hardware reset input pin. When /RESET is “L”, initialization is executed.
6	RS	I	Register select input pin. RS = “H”: The data on DB7 to DB0 is used the display data. RS = “L”: The data on DB7 to DB0 is used the control data.
7	RW_/WR	I	Interfacing with 6800-series MPU, read/write is enabled at; RW_/WR = “H”: read. RW_/WR = “L”: write. Interfacing to an 8080-series MPU, RW_/WR is enabled at low. The signals on the data bus are latched at the rising edge of the RW_/WR signal.
8	E_/RD	I	When interfacing to a 6800-series MPU: Active High. When interfacing to a 8080-series MPU: Active Low.
9	DB0	I/O	8-bit bi-directional data bus.
10	DB1	I/O	8-bit bi-directional data bus. When chip select is not active, DB7 to DB0 will be high impedance.
11	DB2	I/O	8-bit bi-directional data bus.
12	DB3	I/O	8-bit bi-directional data bus.
13	DB4	I/O	8-bit bi-directional data bus.
14	DB5	I/O	8-bit bi-directional data bus.
15	DB6	I/O	8-bit bi-directional data bus.
16	DB7	I/O	8-bit bi-directional data bus. In case of serial interface,(PS = ”L”). DB7: Serial input data(SID) DB6: Serial input clock(SCLK). DB5 to DB0 : High impedance
17	DSEL0	I	The LCD driver duty ratio
18	DSEL1	I	The LCD driver duty ratio
19	C68	I	This pin is the MPU interface switch terminal. C68 = “H”: 6800 series MPU interface C68 = “L”: 8080 series MPU interface
20	PS	--	Parallel/Serial select input pin. When PS= “L”, DB5 to DB0 are high impedance. E_/RD and RW_/WR are fixed to either “H” or “L”. With serial data input, RAM display data reading is not supported.
21	VSS	--	This is a 0V terminal connected to the system GND.
22	VDD	--	Shared with the MPU power supply terminal VCC.
23	VOUT	I/O	Capacitor3- connect for the internal voltage converter
24	C3+	O	Capacitor3+ connect for the internal voltage converter
25	C3-	O	Capacitor3- connect for the internal voltage converter
26	C1+	O	Capacitor1+ connect for the internal voltage converter
27	C1-	O	Capacitor1- connect for the internal voltage converter
28	C2+	O	Capacitor2+ connect for the internal voltage converter
29	C2-	O	Capacitor2- connect for the internal voltage converter

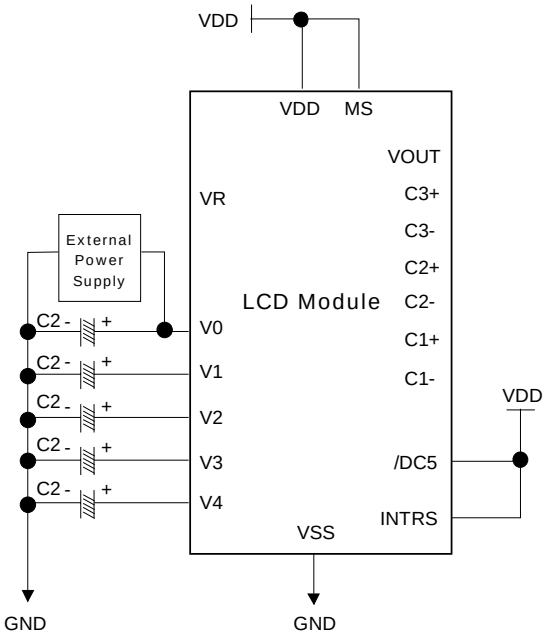
30	VR	I	V0 voltage adjustment pin. It is valid only when using external resistors.(INTRS="L")
31	V0	I/O	The voltage is determined by the LCD pixel impedance-converted for application by an operational amplifier. V0 >V1>V2>V3>V4>VSS(GND)
32	V1	I/O	The voltage is determined by the LCD pixel impedance-converted for application by an operational amplifier. V0 >V1>V2>V3>V4>VSS(GND)
33	V2	I/O	The voltage is determined by the LCD pixel impedance-converted for application by an operational amplifier. V0 >V1>V2>V3>V4>VSS(GND)
34	V3	I/O	The voltage is determined by the LCD pixel impedance-converted for application by an operational amplifier. V0 >V1>V2>V3>V4>VSS(GND)
35	V4	I/O	The voltage is determined by the LCD pixel impedance-converted for application by an operational amplifier. V0 >V1>V2>V3>V4>VSS(GND)
36	DC5	I	5 times boosting circuit enable input pin.
37	HPM	I	Power control pins of the power supply circuit for the LCD driver. HPM = "H": High power mode. HPM = "L": Normal mode
38	INTRS	I	Internal resistor selects pin. INTRS = "H": using built-in resistors. INTRS = "L": not using built-in resistors.
39	USER3	--	No Connection (Connect to Pin40)
40	USER4	--	No Connection (Connect to Pin39)

LED Backlighting

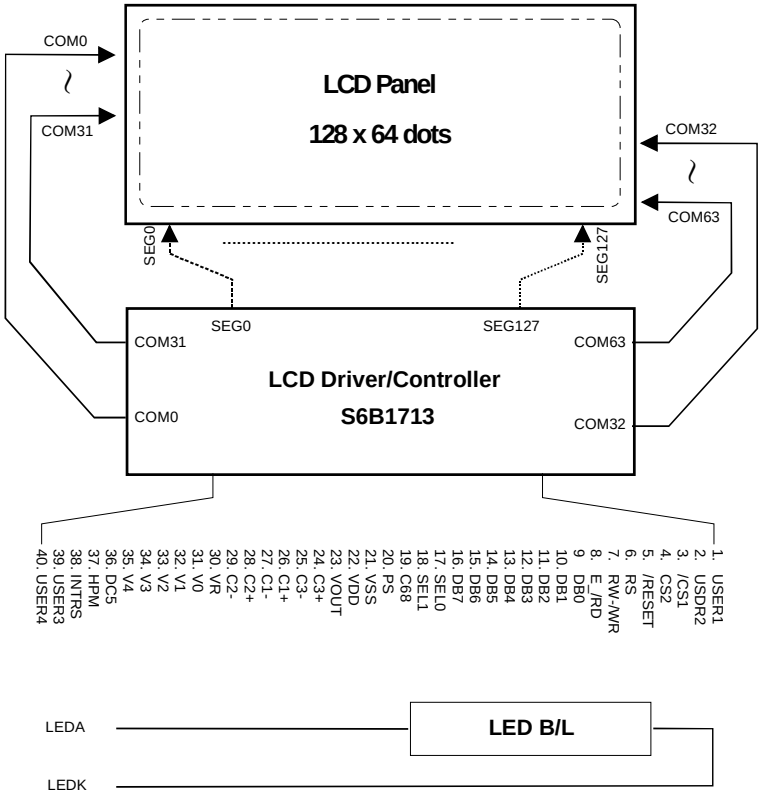
No.	Symbol	Level	Function
1.	LEDA (+)	--	Power Supply for LED Backlight Anode (+)
2.	LEDK (-)	--	LED Backlight Power Supply Cathode (-)Ground Potential

4.2 Example of Power Supply

It is recommended to apply a potentiometer for the contrast adjust due to the tolerance of the driving voltage and its temperature dependence



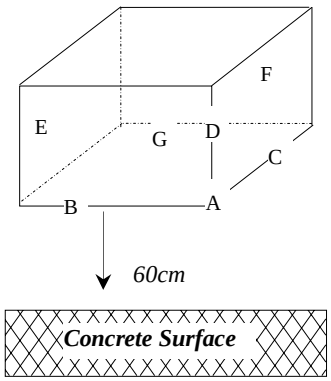
4.3 Block Diagram



5. Reliability Test

5.1 Test Item

No change on display and in operation under the following test condition.

No.	Test Item	Description	Condition	Note
1.	High Temperature (Operation)	Durability test under long time high temperature with electrical stress (voltage, current)	70°C ± 2°C 96hrs	
2.	High Temperature (Storage)	Durability test under long time high temperature storage	80°C ± 2°C 96hrs	4
3.	Low Temperature (Operation)	Durability test under long time low temperature with electrical stress (voltage, current)	-20°C ± 2°C, 96hrs	3
4.	Low Temperature (Storage)	Durability test under long time low temperature storage	-30°C ± 2°C, 96hrs	3, 4
5.	Damp Proof Test	Durability test under long time high temperature and high humidity	40°C± 2°C, 90～95% RH 96hrs	3 , 4
6.	Vibration Test	Total fixed amplitude: 1.5mm Vibration frequency: 10～55Hz One cycle 60 seconds to 3 directions of X, Y, Z for each 15 minutes	- -	5
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  *Dropping method corner dropping* *A corner: once* *Edge dropping* *B, C, D edge: once* *Face dropping* *E, F, G face: once*		

Note 1: Unless otherwise specified, tests will be conducted under the following condition,
Temperature : 25°C ± 2°C
Humidity : 65% ± 5%
Note 2: Unless otherwise specified, tests will be not conducted under functioning state.
Note 3: No dew condensation to be observed.
Note 4: The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
Note 5: Vibration test will be conducted to the product itself without putting it in a container.

5.2 Judgment Standard

Failure Mode	Test Item	Judgment Standard

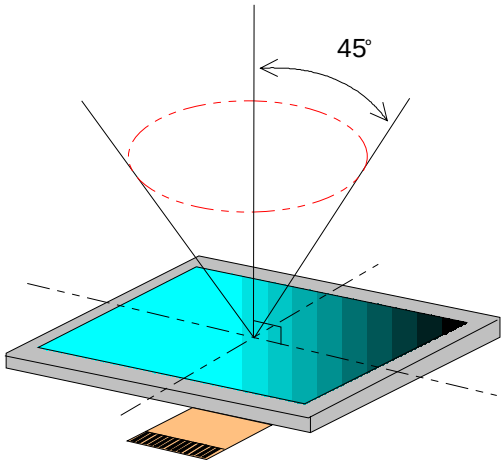
	1	2	3	4	5	6	7	
Orientation	*	*	*	*	*			No remarkable degradation of appearance under bias/ non-bias condition
Current Value (IAC)	*	*	*	*	*			No remarkable increase
Contrast	*		*	*	*			No remarkable poor contrast
Domain	*	*	*	*	*			Less than 20% of all dots have reverse tilt of more than on third of one dot area.
Bubble (Inside Cell)	*	*	*	*	*	*		As per “Appearance Standard” (Note. In-cluding one which disappear after 25°C 2H)
Polarizer	*				*	*		As per “Appearance Standard” no remarkable appearance change
Glass Damage							*	As per “Appearance Standard”

Note. 1. * is strong linkage between Failure Mode and Test Item.
2. Number of Test Item should be referred to former page.
3. Judgment and Standard value should be fixed by other inspection standard and criteria samples.

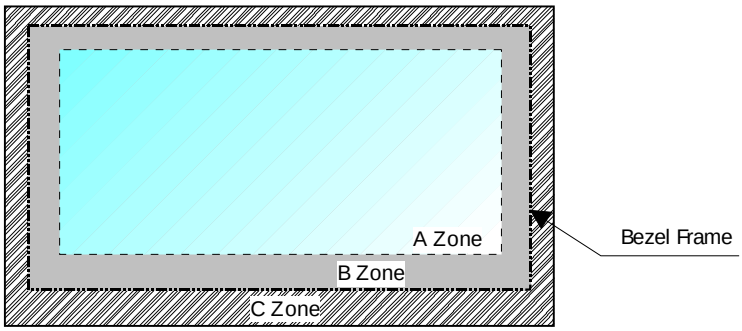
6. Appearance Standards

6.1 Inspection Conditions

The LCD shall be inspected under 40W white fluorescent light. The distance between the eyes and the sample shall be more than 30cm. All directions for inspecting the sample should be within 45° against perpendicular line.



6.2 Definition of Applicable Zones



A Zone : Active display area
B Zone : Area from outside of "A Zone" to validity viewing area
C Zone : Rest parts
A Zone + B Zone = Validity viewing area

6.3 Standards

No.	Parameter	Criteria
		(1) Round Shape

	Spots, Foreign Substances	(1) Dot Shape

Dimension (mm) \ Zone	Acceptable Number		
	A	B	C
D ≤ 0.1	*	*	*
0.1 < D ≤ 0.2	3	5	*
0.2 < D ≤ 0.25	2	3	*
0.25 < D ≤ 0.3	0	1	*
0.3 < D	0	0	*

D = (Long + Short)/2 *: Disregard

(2) Line Shape

X (mm) \ Zone	Y (mm) \ Zone	Acceptable Number		
		A	B	C
- -	0.03 ≥ W	*	*	*
2.0 ≥ L	0.05 ≥ W	3	3	*
1.0 ≥ L	0.1 ≥ W	3	3	*
- -	0.1 < W	In the same way (1)		

X : Length Y: Width *: Disregard

Total defects shall not exceed 5.

2.	Air Bubbles (between glass & polarizer)	

Dimension (mm) \ Zone	Acceptable Number		
	A	B	C
D ≤ 0.3	*	*	*
0.3 < D ≤ 0.4	3	*	*
0.4 < D ≤ 0.6	2	3	*
0.6 < D	0	0	*

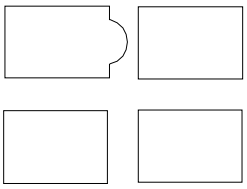
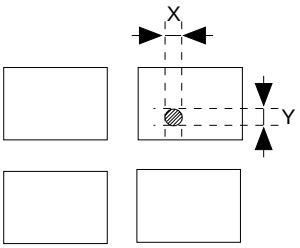
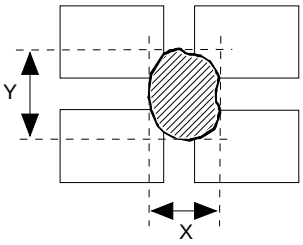
*: Disregard

Total defects shall not exceed 3.

To be continued……

No.	Parameter	Criteria
		(1) Dot Shape (with Dent)

0.15≥ 

		hand. (2) Dot Shape (with Projection)  Should not be connected to next dot. (3) Pin Hole  (X+Y)/2 ≤ 0.2mm (Less than 0.1mm is no counted.) (4) Deformation  (X+Y)/2 ≤ 0.2mm Total acceptable number: 1/dot, 5/cell (Defect number of (4): 1pc.)
4.	Polarizer Scratches	Not to be conspicuous defects.
5.	Polarizer Dirts	I f the stains are removed easily from LCDP surface, the module is not defective.
6.	Complex Foreign Substance Defects	Black spots, line shaped foreign substance or air bubbles between glass & polarizer should be 5pcs maximum in total.
7.	Distance between different Foreign Substance defects	D ≤ 0.2 : 20mm or more 0.2 < D : 40mm or more

7. Handling and Precautions

The Following precautions will guide you in handling our product correctly.

1 Liquid crystal display devices

1.1 The liquid crystal display device panel used in the liquid crystal display module is made of plate glass. Avoid any strong mechanical shock. Should the glass break handle it with care.

1.2 The polarizer adhering to the surface of the LCD is made of a soft material. Guard against scratching it.

2 Care of the liquid crystal display module against static electricity discharge.

2.1 When working with the module, be sure to ground your body and any electrical equipment you may be using. We strongly recommend the use of anti static mats (made of rubber), to protect work tables against the hazards of electrical shock.

2.2 Avoid the use of work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

2.3 Slowly and carefully remove the protective film from the LCD module, since this operation can generate static electricity.

3 When the LCD module alone must be stored for long periods of time:

3.1 Protect the modules from high temperature and humidity.

3.2 Keep the modules out of direct sunlight or direct exposure to ultra-violet rays.

3.3 Protect the modules from excessive external forces.

4 Use the module with a power supply that is equipped with an over current protector circuit, since the module is not provided with this protective feature.

5 Do not ingest the LCD fluid itself should it leak out of a damaged LCD module. Should hands or clothing come in contact with LCD fluid, wash immediately with soap.

6 Conductivity is not guaranteed for models that use metal holders where solder connections between the metal holder and the PCB are not used. Please contact us to discuss appropriate ways to assure conductivity.

8. Warranty:

This product has been manufactured to your 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.

1 We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.

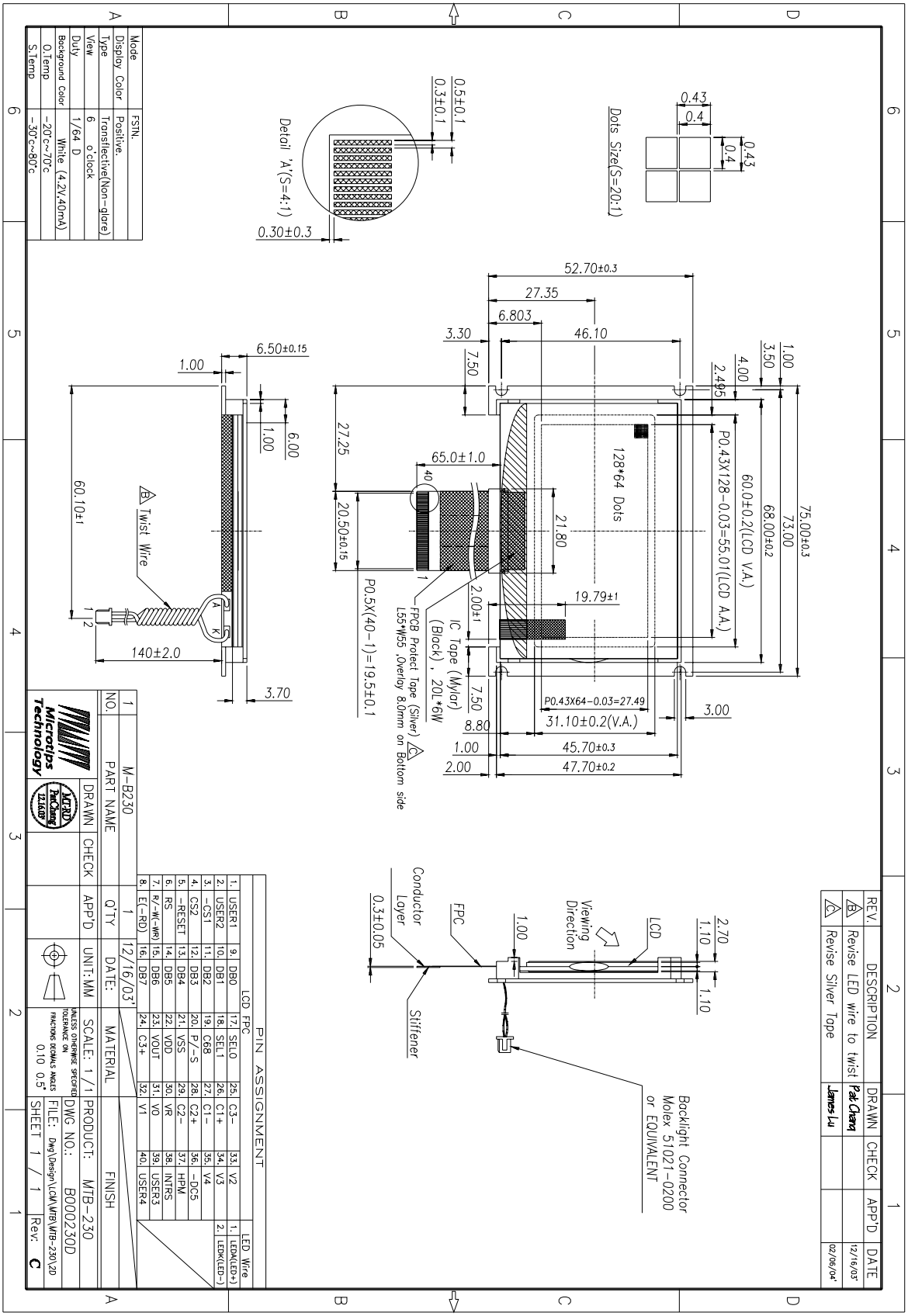
2 We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.

3 We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed your company's acceptance inspection procedures.

4 We cannot accept responsibility for industrial property, which may arise through the use of your product, with exception to those issues relating directly to the structure or method of manufacturing of our product. Microtips-origin longer than one year from Microtips production.

9. Dimensional Outlines

- See the next page……..


Mode FSTN.
Display Color Positive.
Type Transflective(Non-glare)
View 6 o'clock
Duty 1/64 D
Background Color White (4.2V,40mA)
O.Temp -20°c~70°c
S.Temp -30°c~80°c
Detail 'A'(S=4:1)
0.5±0.1
0.3±0.1
0.30±0.3
Dots Size(S=20:1)
0.43
0.4
52.70±0.3
27.35
6.803
3.30
46.10
7.50
4.00
3.50
1.00
2.495
27.25
65.0±1.0
40
20.50±0.15
128*64 Dots
21.80
19.79±1
2.00±1
P0.43X128-0.03=55.01(LCD V.A.)
60.0±0.2(LCD V.A.)
68.00±0.2
73.00
75.00±0.3
P0.43X64-0.03=27.49
31.10±0.2(V.A.)
8.80
1.00
45.70±0.3
2.00
47.70±0.2
3.00
P0.5X(40-1)=19.5±0.1
FPCB Protect Tape (Silver)
L55*W55 ,Overlay 8.0mm on Bottom side
IC Tape (Mylar)
(Black), 20L*6W
6.50±0.15
1.00
6.00
60.10±1
Twist Wire
140±2.0
3.70
Conductor Layer
0.3±0.05
FPC
Stiffener
Viewing Direction
LCD
2.70
1.10
1.10
Backlight Connector
Molex 51021-0200
or EQUIVALENT
PIN ASSIGNMENT
LCD FPC
1. USER1 9. DB0 17. SEL0 25. C3- 33. V2
2. USER2 10. DB1 18. SEL1 26. C1+ 34. V3
3. -CS1 11. DB2 19. C68 27. C1- 35. V4
4. CS2 12. DB3 20. P/-S 28. C2+ 36. -DC5
5. -RESET 13. DB4 21. VSS 29. C2- 37. HPM
6. RS 14. DB5 22. VDD 30. VR 38. INTRS
7. R/-W(-WR) 15. DB6 23. VOUT 31. VO 39. USER3
8. E(-RD) 16. DB7 24. C3+ 32. V1 40. USER4
LED Wire
1. LEDA(LED+)
2. LEDK(LED-)
REV. DESCRIPTION DRAWN CHECK APP'D DATE
A Revise Silver Tape James Lu 02/06/04'
B Revise LED wire to twist Pat Chang 12/16/03'
NO. PART NAME M-B230
DRAWN
CHECK
APP'D Q'TY 1
UNIT: MM DATE: 12/16/03'
SCALE: 1/1 MATERIAL
UNLESS OTHERWISE SPECIFIED TOLERANCE ON FRACTIONS DECIMALS ANGLES 0.10 0.5
PRODUCT: MTB-230
DWG NO.: B000230D
FILE: Dwg\Design\LCM\MTB\MTB-230\20
SHEET 1 / 1 Rev. C
Microtips Technology