PRODUCT   SPECIFIICATION

C2002C

V2.0

December 29,2005

REV	DESCRIPTION	DATA
V2.0		December 29,2005

CONTENTS

1. Type Number and Description

Type Number: C2002C

Description: 20 Characters   x   2 Lines
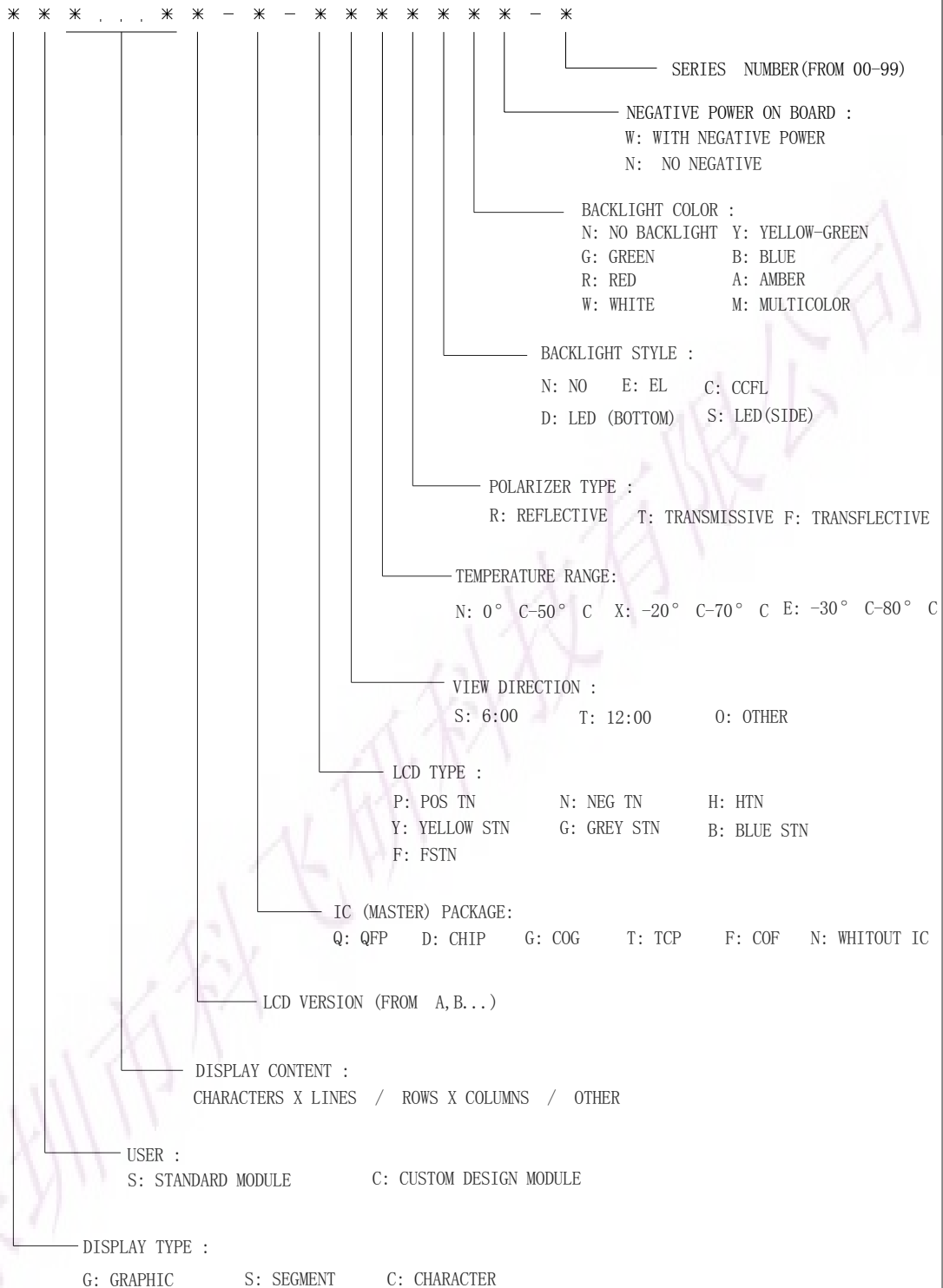
LCD Panel: STN ,Yellow-Green, Positive(And-Blue/White Light)

Operating Temperature: -20 ^{0}C   70 ^{0}C

Storage Temperature: -30^{0}C 80^{0}C

Viewing angle: 6H

Backlight Voltage: 5.0V

BackLight Mode: Bottom

BackLight Color: Yellow-Green(And--White)

Controller: KS0066U-00 OR Equivalent

IC Package: Bonding

Logic Voltage: 5.0V

2. LCD Module Numbering System

LCD MODULE NUMBERING SYSTEM

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SERIES NUMBER(FROM 00-99)

NEGATIVE POWER ON BOARD :
W: WITH NEGATIVE POWER
N: NO NEGATIVE

BACKLIGHT COLOR :
N: NO BACKLIGHT Y: YELLOW-GREEN
G: GREEN   B: BLUE
R: RED   A: AMBER
W: WHITE   M: MULTICOLOR

BACKLIGHT STYLE :
N: NO   E: EL   C: CCFL
D: LED (BOTTOM) S: LED(SIDE)

POLARIZER TYPE :
R: REFLECTIVE T: TRANSMISSIVE F: TRANSFLECTIVE

TEMPERATURE RANGE:
N: 0°C-50°C X: -20°C-70°C E: -30°C-80°C

VIEW DIRECTION :
S: 6:00   T: 12:00   O: OTHER

LCD TYPE :
P: POS TN   N: NEG TN   H: HTN
Y: YELLOW STN   G: GREY STN   B: BLUE STN
F: FSTN

IC (MASTER) PACKAGE:
Q: QFP   D: CHIP   G: COG   T: TCP   F: COF   N: WHITOUT IC

LCD VERSION (FROM A,B...)

DISPLAY CONTENT :
CHARACTERS X LINES / ROWS X COLUMNS / OTHER

USER :
S: STANDARD MODULE   C: CUSTOM DESIGN MODULE

DISPLAY TYPE :
G: GRAPHIC   S: SEGMENT   C: CHARACTER

3. Mechanical Specifications:

ITEM	STANDARD VALUE	UNIT
NUMBER OF CHARACTERS	20 CHARACTERS X 2 LINES	
CHARACTER FORMAT	5 X 7 DOTS with CURSOR	
MODULE DIMENSION	146.0(W) X 43.0(H) X 13.0(T)	mm
EFFECTTVE DISPLAY AREA	123.0(W) X 23.0(H)	mm
CHARACTER SIZE	4.84(W) X 9.22(H)	mm
CHARACTER PITCH	6.0(W) X 9.75(H)	mm
DOT SIZE	0.92(W) X 1.1(H)	mm
DOT PITCH	0.98(W) X 1.16(H)	mm
APPROX WEIGHT	50G	g
LCD TYPE	STN (YELLOW/BLUE mode)	
DUTY AND BIAS	1/16 DUTY; 1/5 BIAS	
VIEWING DIRECTION	6:00	
BACK LIGHT	Yellow-Green (And--White) LED	
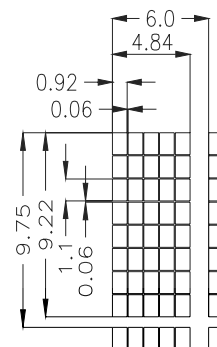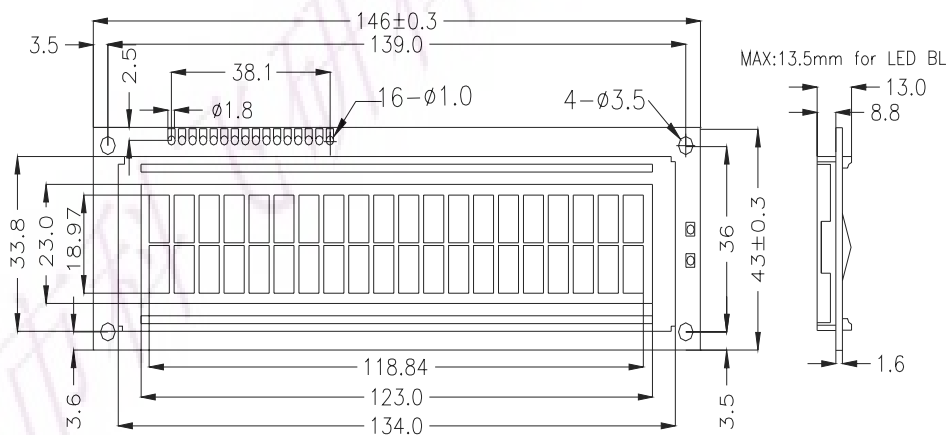
4. Electrical   Block   Diagram

PINS DEFINITION

PIN	SYMBOL	FUNCTION
1	Vss	Power Supply(GND)
2	Vdd	Power Supply(+5V)
3	Vo	Contrast Adjust
4	RS	Instruction/Data Register Select
5	R/W	L: Write ; H: Read
6	E	Enable Signal
7-14	DB0-DB7	Data Bus Line
15	A	Power Supply for LED B/L(+)
16	K	Power Supply for LED B/L(-)

4.2 ELECTRICAL BLOCK DIAGRAM
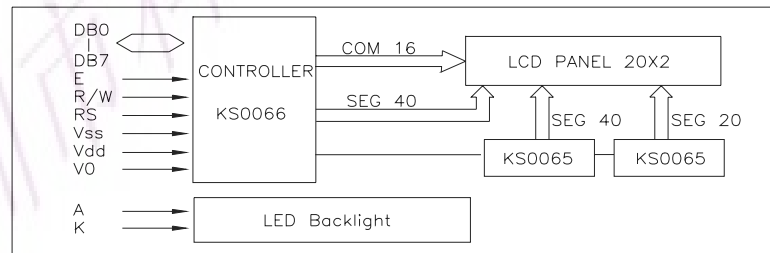
4.3 DISPLAY CHARACTER ADDRESS CODE

DISPLAY POSITION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DDRAM ADDRESS	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53

5. Absolute Maximum Ratings

5.1 Electrical Maximum Ratings (Ta=25deg C)

ITEM	SYMBOL	CONDITION	MIN	MAX	UNIT
Supply Voltage (Logic)	Vdd Vss	-	0	7.0	V
Supply Voltage (LCD Drive)	Vdd V0	-	0	11.5	V
Input Voltage	Vi	-	-0.3	Vdd +0.3	V

5.2 Environmental Conditions

ITEM	SYMBOL	CONDITION	MIN	MAX	UNIT
Operating Temp	Topr	-	0	50	deg C
Storage Temp	Ttsg	-	-20	70	deg C
Humidity Endurance	RH	no ondensation Ta</=40 deg	-	95	%
Vibration	-	3 directions	see note (a), page 3		-
Shock	-	3 directions	see note (b), page 3		-

note (a): frequency : varying from 10 Hz in a 1-minute cycle

amplitude : 1.5mm

duration : 120 cycles, each lasting 1 minute,

for each of the 3 directions, x,y,z

note (b): nutually perpendicular directions

direction normal to surface of LCD glass

80G, half-sine pulse of duration 11ms

other 2 directions

100G, half-sine pulse of duration 11ms

6. Electrical   Specifications

6.1 Electrical Characteristics at Ta=25 deg C, Vdd = 5V + / - 5%

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Supply Voltage (logic)	Vdd-Vss	-	4.5	5	5.5	V
Supply Voltage (LCD)	Vdd-V0	Vdd = 5V	4.3	4.7	4.8	V
Input signal voltage (for E, DB0-7,R/W,RS)	V-ih	H level	2.2	-	Vdd	V
	V-il	L level	0	-	0.6	V
Supply Current (logic)	Icc	-	-	1	1.2	mA
Supply Current (LCD)	Io	-	0.15	0.22	0.27	mA
Supply Voltage (LED)	V-bl	see note 1	4.1	4.2	4.6	V
Supply Current (LED)	I-bl	see note 1	300	350	400	mA

Note 1: LED backlight chips are arranged in two branches of 2 in series

6.2 TIMING SPECIFICATIONS at Ta = 25 deg C, Vdd = 5V+/-10%, Vss =0V

6.2.1   Write mode

ITEM	SYMBOL	MIN	MAX	UNIT
E cycle time	tc	500	-	ns
E rise time	tR	-	25	ns
E fall time	tF	-	25	ns
E-pulse width (H, L)	tw	220	-	ns
R/W and RS set-up time	tsul	40	-	ns
R/W and RS hold time	tH1	10	-	ns
Data set-up time	tsu2	60	-	ns
Data hold time	tH2	10	-	ns

6.2.2   Read mode

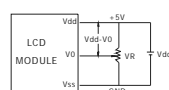| ITEM	SYBOL	MIN	MAX	UNIT
E cycle time	tc	500	-	ns
E rise time	tR	-	25	ns
E fall time	tF	-	25	ns
E-pulse width (H, L)	tw	220	-	ns
R/W and RS set-up time	tsu	40	-	ns
R/W and RS hold time	tH	10	-	ns
Data output delay	tD	-	120	ns
Data hold time	tDH	20	-	ns

6.2.3 Timing Diagram

WRITE MODE TIMING DIAGRAM
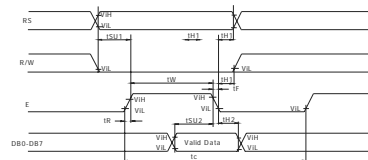
READ MODE TIMING DIAGRAM
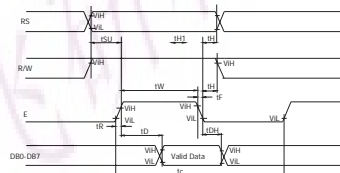
7. Power Supply for LCD Module

Vdd-V0: LCD Driving Voltage
VR: 10K - 20K

8. Electro-Optical　Characteristic

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REF.
Contrast	CR	25℃	--	12	--		Note1
Rise Time	tr	25℃	--	160	240	ms	Note2
Fall Time	tf	25℃	--	100	150	ms	note 2
Viewing Angle	θ1-θ2		--	--	60	DEG	Note 3
	Ø1, Ø2	25℃	-40	--	40		
Frame Frequency	Ff	25℃	--	70	--	Hz	note 2

Note(3): Contrast ratio is defined under the following condition:

   CR=   brightness of non-selected condition

          brightness of non-selected condition

(a).　Temperature------------25C

(b).　Frame Frequency------64Hz

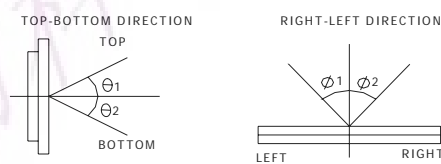(c).　Viewing angle----------θ=0, Ø=0

(d).　Operating Voltage---5.0V

Note(1): definition of response time:
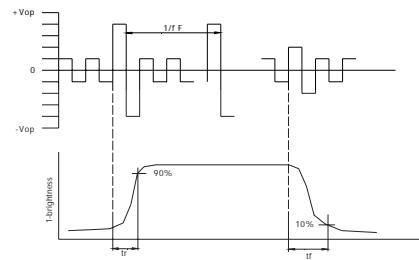
Condition:

(a). Temperature------------25C

(b). Frame Frequency------64Hz

(c). Viewing angle----------θ=0, Ø=0

(d). Operating Voltage---5.0V

Note(2): definition of view angle:

TOP-BOTTOM DIRECTION

TOP

θ1

θ2

BOTTOM

RIGHT-LEFT DIRECTION

Ø1 Ø2

LEFT   RIGHT

9. Instruction   Table

Instruction	Instruction Code										Description	Execution time (fosc= 270KHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to '00H' from AC.	1.52 ms
Return Home	0	0	0	0	0	0	0	0	1	X	Set DDRAM address to '00H' from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.52 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and make shift of entire dispaly enable.	37 µs
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Set display(D), cursor(C), and blinking of cursor(B) on/off control bit.	37 µs
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	X	X	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	37 µs
Function Set	0	0	0	0	1	DL	N	F	X	X	Set interface data length (DL : 4-bit/8-bit), numbers of display line (N : 1-line/2-line), display font type(F : 5 X 8 dots/ 5 X 11 dots)	37 µs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	37 µs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	37 µs
Read Busy Flag and Address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 µs
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	43 µs
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	43 µs

- "X" : don't care

10. Precaution   For   Using   LCM

1.   LIQUID CRYSTAL DISPLAY (LCD)

LCD is made up of glass, organic sealant, organic fluid, and polymer based polarizers. The   following precautions should be taken when handing,

(1).   Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degredation, polarizer peel off or bubble.

(2).   Do not contact the exposed polarizers with anything harder than an HB pencil lead. To clean dust off the display surface. Wipe gently with cotton. Chamois or other soft material soaked in petroleum benzin.

(3).   Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.

(4).   Glass can be easily chipped or cracked from rough handing. especially at corners and edges.

(5).   Do not drive LCD with DC voltage.

2.   Liquid Crystal Display Modules

2.1   Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

(1).   Do not tamper in any way with the tabs on the tabs on the metal frame.

(2).   Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattem.

(3).   Do not touch the elastomer connector, especially insert an backlight panel (for example, EL).

(4).   When mounting a LCM make sure that the PCB is not under any tress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.

(5).   Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing piels.

2.2.   Static Electricity

LCM contains CMOS LSI s and the same precaution for such devices should apply, namely

(1).   The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.

(2).   The modules should be kept in antistatic bags or other containers resistant to static for storage.

(3).   Only properly grounded soldering irons should be used.

(4).   If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

(5).   The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.

(6).   Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

2.3.   Soldering

(1).   Solder only to the I/O terminals.

(2).   Use only soldering irons with proper grounding and no leakage.

(3).   Soldering temperature: 280 ℃±10℃

(4).   Soldering time: 3 to 4 sec.

(5).   Use eutectic solder with resin flux fill.

(6).   If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed after wards.

2.4.   Operation

(1).   The viewing angle can be adjusted by varying the LCD driving voltage V0.

(2).   Driving voltage should be kept within specified range; excess voltage shortens display life.

(3).   Response time increases with decrease in temperature.

(4).   Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear   fractured .

(5).   Mechanical disturbance during operation (such as pressing on the viewing area) nay cause the segments to appear   fractured .