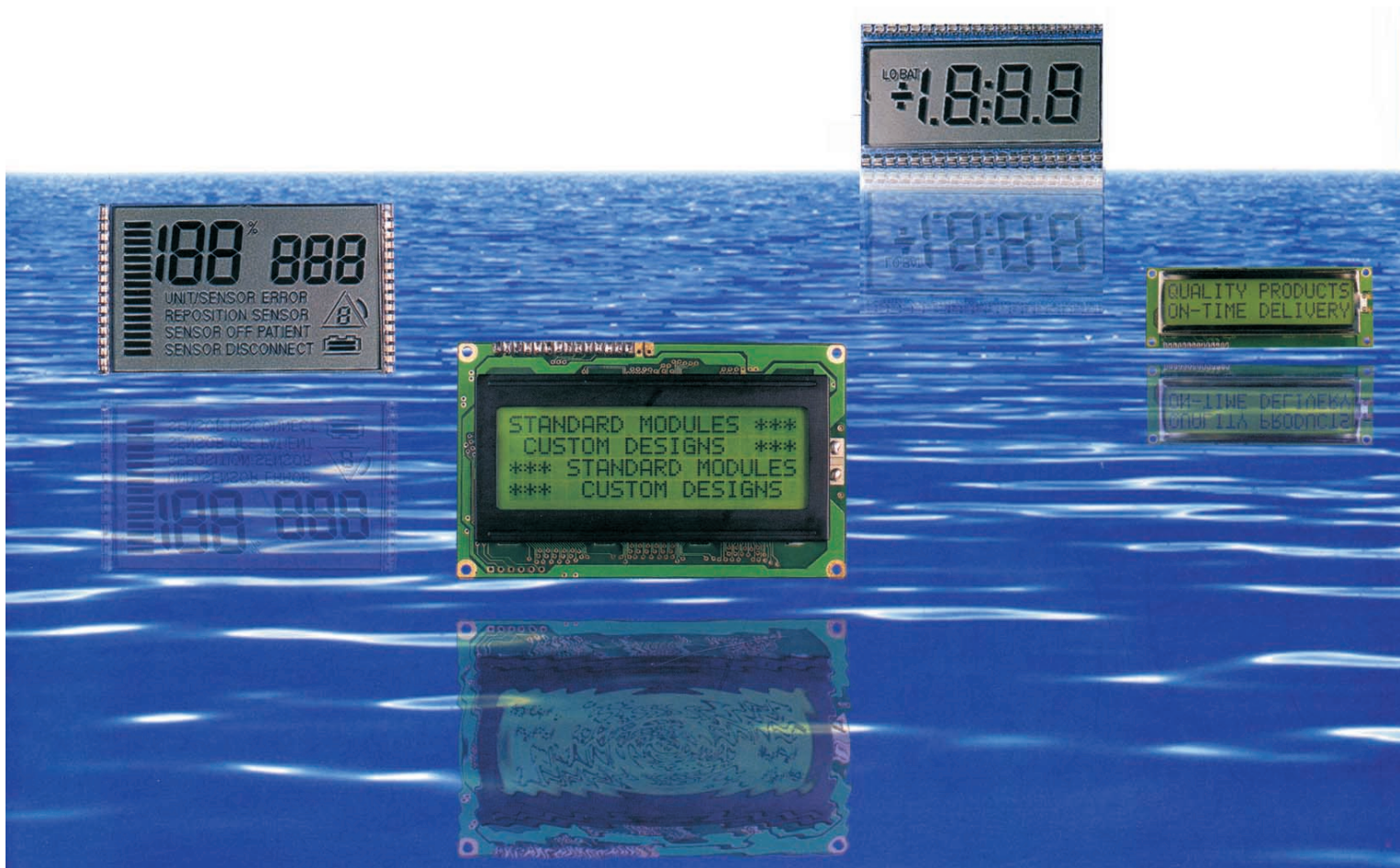




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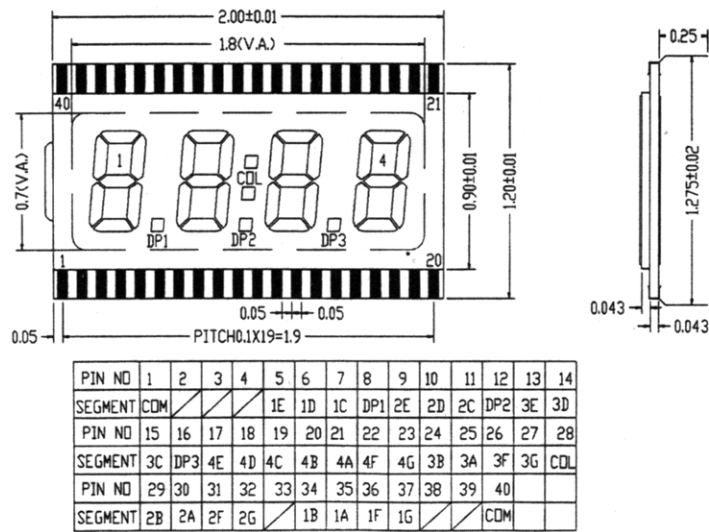
LCD DEVICES



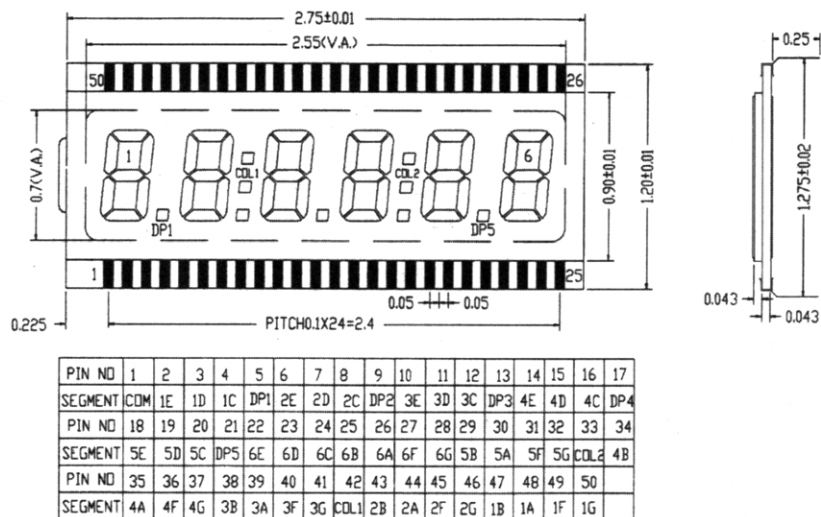
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Standard LCD Panels	3
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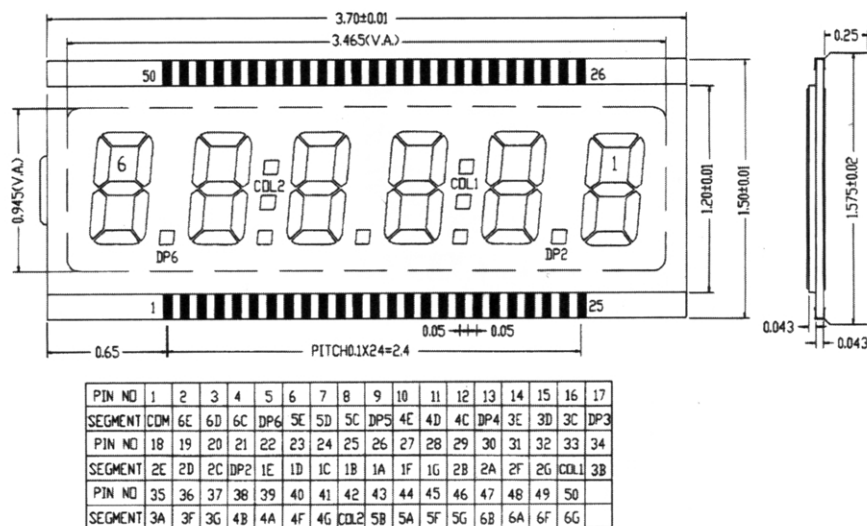
EL 008



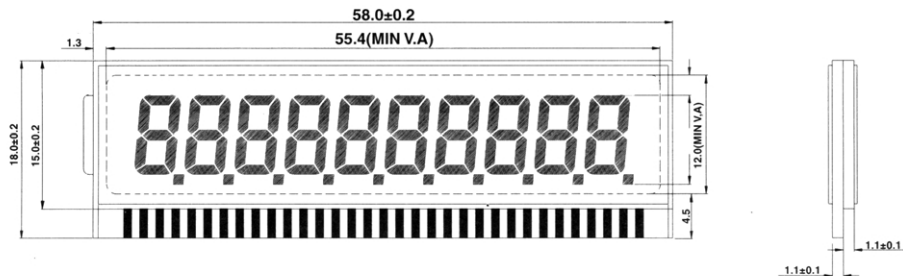
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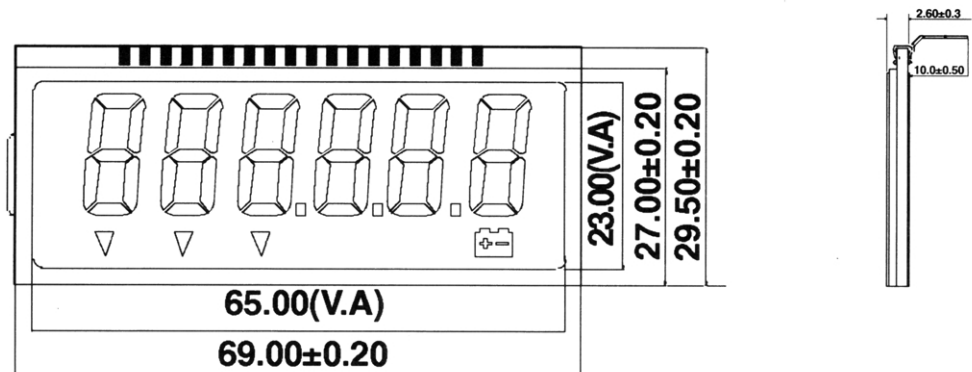
EL 013



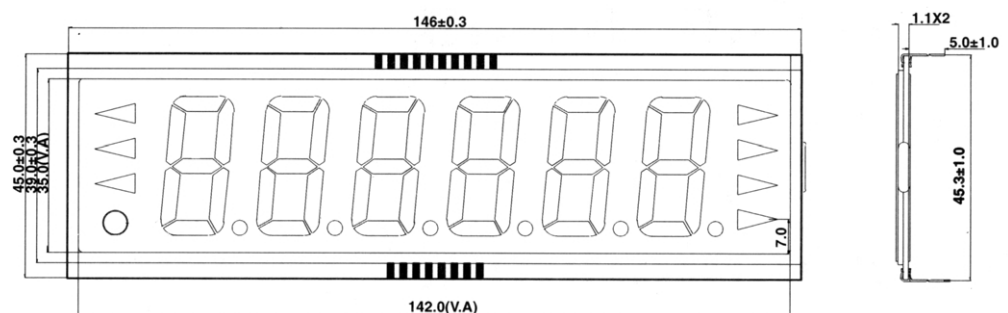
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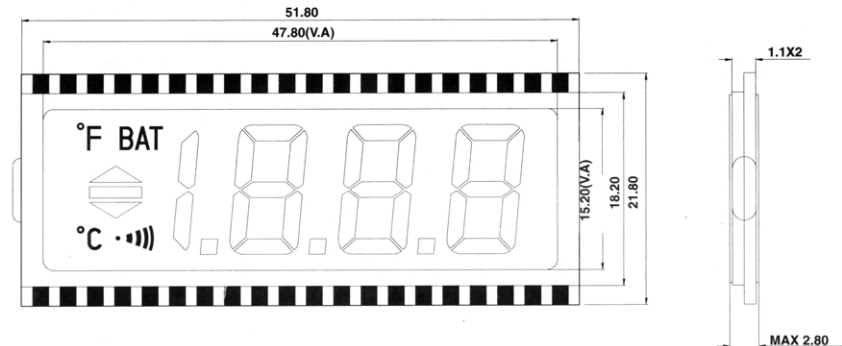
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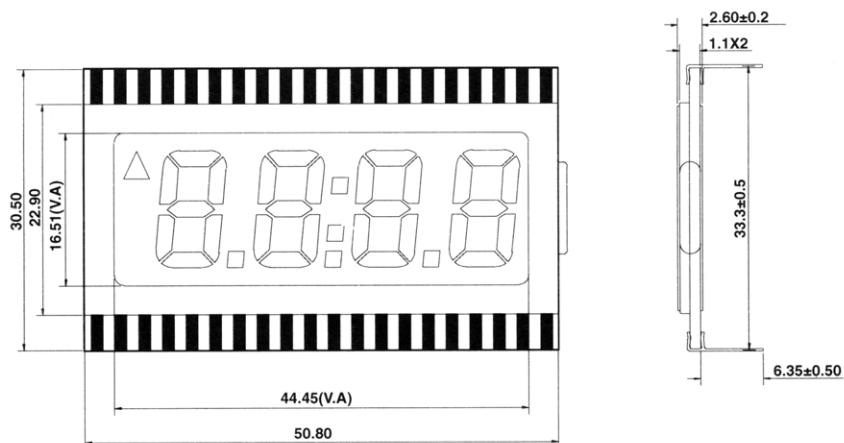
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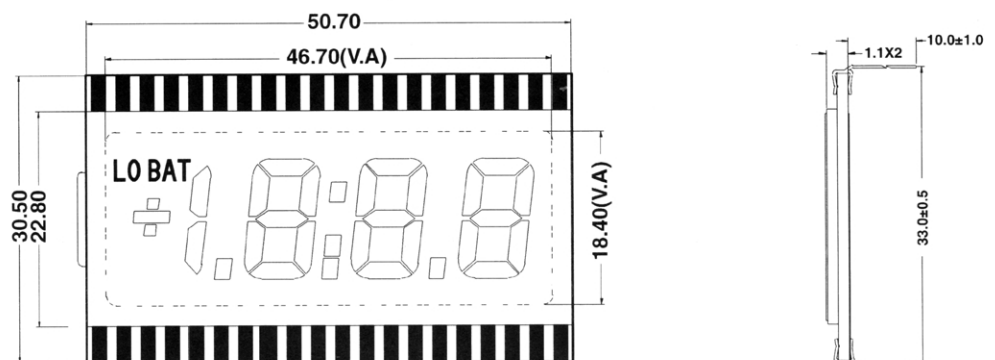
EL 028



EL 042AP



EL 057BP

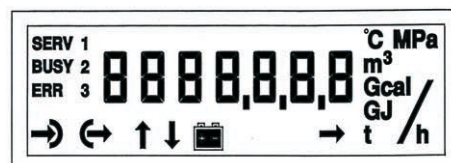


Custom LCD Panels Differ You from Your Competition

One of advanced items that may differ your product from another is the face of the LCD display. The operation of your device will be better arranged thanks to suitable graphic symbols on the customized LCD.

Features:

- low cost and quick development
- random dimensions and picture
- industrial temperature range
- power supply voltage from 2,7 (3) V
- connection: pins or rubber
- special offer: Chip on Glas LCD



The most demanded and the cheapest ones are just custom LCD panels. An internal driver is not included. These displays request an external driver or a microcontroller with LCD driver on chip, for example by NEC, Holtek or OKI. The minimum quantity is about 1000 pieces per shipment depending on the dimensions of LCD.

Custom Design :

The customer presents data prepared in Autocad, including the parameters required. After the initial consulting phase and when the requirements are discussed with the manufacturer, we will get samples to be tested in about 6 weeks. If the samples are approved by the customer, any amount of the customized displays may be received within approximately 6 weeks.

Don't hesitate to contact us, we will be pleased to give you advice and the best support in your development. We also may recommend you a suitable control microcontroller or a driver unit as well.

CUSTOMER LCD PANEL DESIGN GUIDE

APPLICATION	☐ Instrument ☐ Calculators ☐ Telephone	☐ Home Appliance ☐ Automobile ☐ Watch & Clock	☐ Game ☐ Audio Equipments ☐ Other
DIMENSION	Glass Length Glass Width Rear Glass Width Viewing Area Unit	A B C D x E..... ☐ mm ☐ inch	
LCD CONFIGURATION	The bold lines show the terminal electrodes.		
DRIVING METHOD	Driving VoltageV ☐ Static ☐ Dynamic	Duty Bias	
TEMPERATURE RANGE	Operating Temperature°C Storage Temperature°C		
VIEWING RANGE	☐ 6:00 ☐ 12:00 ☐ 3:00 ☐ 9:00		
DISPLAY MODE	☐ Positive Image	☐ Negative Image	
POLARIZER	☐ Reflective ☐ Transflective ☐ Transmissive		
CONNECTOR	☐ Rubber Connector ☐ Pin Connector ☐ Heat-Seal Connector		
OTHER	Number of Pin		

ORDERING INFORMATION

1 2 3 - 4 5 - 6 7 8 - 9

1	Module type	EL = Elatec Character (Alpha/Numeric) & Graphic LCD Module	
2	Module format	1602 = 16x2 2004 = 20x4 4002 = 40x2	12232 = 122x32 12864 = 128x64 240128 = 240x128
3	Design version	A through ZZ for different PCB sizes, controller IC's, etc. (Combine with module format to arrive at base model number.)	
4	Polarizer type	R = Reflective M = Transmissive, Positive	F = Transflective N = Transmissive, Negative
5	Backlight type	N = None L = LED	E = EL C = CCFT
6	Fluid type	T = TN B = Blue mode STN Y = Yellow mode STN	G = Gray mode STN F = FSTN(Film-compensated STN[B/W])
7	Viewing direction	B = Bottom view (6 o'clock)	T = Top view (12 o'clock)
8	Temperature range and power supply	W = Standard temp range w/single supply voltage (operating: -10 to 60°C and storage -20 to 70°C) H = Wide temp range w/dual supply voltage (operating: -20 to 70°C and storage: -30 to 80°C)	
9	Character pattern	R = English/Russian nil (no character) = English/Japanese	

EXAMPLE: EL 1602A – F L – Y B W (- R)
1 2 + 3 4 5 6 7 8 9

1	= EL
2+3	= Base model number
4	= Transflective
5	= LED
6	= Yellow mode STN
7	= Bottom view
8	= Standard temp range w/single supply voltage
9	= English/Russian

We prefer the following type of displays: EL xxxxx – FL – YBW (- R)

Other version on demand.

Character module

NUMBER OF CHARACTERS	MODULE PIN	PREFERRED	MODULE SIZE	VIEWING AREA (LxW)	CHARACTERS SIZE(LxW)	DOT SIZE (LxW)	DUTY CYCLE
8x2	EL0802A	Preferred	40x35.4x8.3	30.4x13.9	2.95x5.56	0.55x0.055	1/16
	EL0802B		58x32x9.5/13.5	38x16	2.96x5.56	0.56x0.66	1/18
16x1	EL1601A		80x36x9.5/13.5	64x13.8	3.07x6.56	0.55x0.75	1/16
	EL1601C		80x36x9.5/13.5	64.5x14	3.07x6.56	0.55x0.75	1/16
16x2	EL1602A	Preferred	80x36x9.5/13.5	64x13,8	4.35x2.95	0.55x0.5	1/16
	EL1602B	Preferred	84x44x9,5/13.5	64.5x16.4	2.95x4.35	0.56x0.61	1/16
	EL1602E		85x36x9.5/13.5	63x16.4	3.0x5.23	0.56x0.61	1/16
	EL1602K		80x36x9.5/13.5	64.5x16.4	3.0x5.23	0.56x0.61	1/16
	EL1602N		85x29.5x9.5/13.5	64.5x16.4	3.0x5.23	0.56x0.61	1/16
	EL1602T		85x32.6x9.5/13.5	64.5x16.4	3.0x5.23	0.56x0.61	1/16
	EL1602S	Preferred	122x44x9.5/13.5	99x24	5.2x9.55	1.0x1.15	1/16
	EL1602H		65.5x36.7x9.5/13.5	54x14.4	2.55x4.99	0.47x0.58	1/16
	EL1602C		66.7x23.3x4.3	61.7x15.6	2.95x5.55	0.55x0.65	1/16
16x4	EL1604C	Preferred	87x60x9.5/13.5	61.8x25.2	2.95x4.75	0.55x0.55	1/16
	EL1604B		87x60x9.5/14	61.8x25.2	2.95x4.75	0.55x0.55	1/16
20x2	EL2002A		146x43x10/14.2	134x23	4.84x9.22	0.92x1.1	1/16
	EL2002D	Preferred	116x37x9.5/13.5	83x18.6	3.2x5.55	0.6x0.65	1/16
20x4	EL2004D	Preferred	98x60x9.5/13.5	78x25.2	2.95x4.75	0,55x0,55	1/16
40x1	EL4001A		182x33.5x11	152.5x16.5	3.2x8.2	0.6x0.7	1/11

Complete marking preferred types

EL 0802A – RN – YBW (- R)
 EL 1602A – FL – YBW (- R)
 EL 1602B – FL – YBW (- R)
 EL 1602S – FL – YBW (- R)

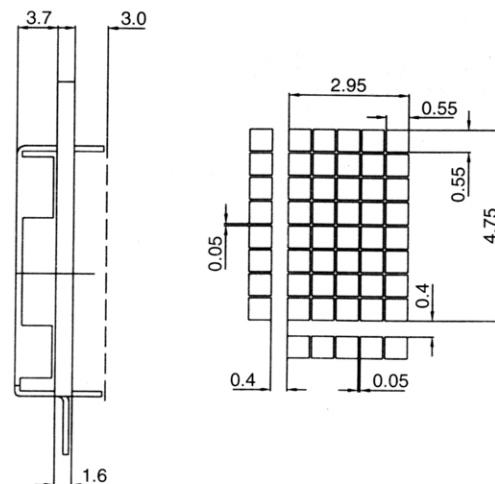
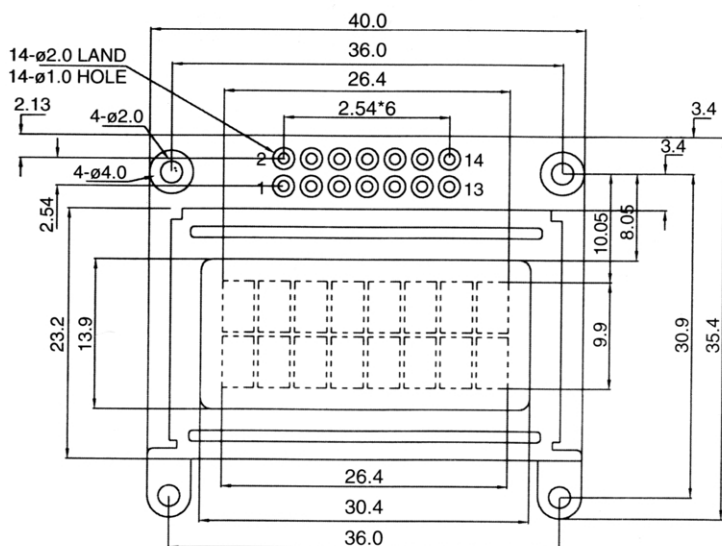
EL 1604C – FL – YBW (- R)
 EL 2002D – FL – YBW (- R)
 EL 2004D – FL – YBW (- R)

Graphic module

NUMBER OF DOTS	MODULE PIN		MODULE SIZE	VIEWING AREA (LxW)	DOT SIZE (LxW)	DUTY CYCLES
122x32	EL12232A		84x44x10/115	64x17.9	0.4x0.45	1/32
128x64	EL12864A		93x70x15	72x40	0.48x0.48	1/64
240x128	EL240128		144x104x9	114x64	0,4x0,4	1/128

EL 0802A

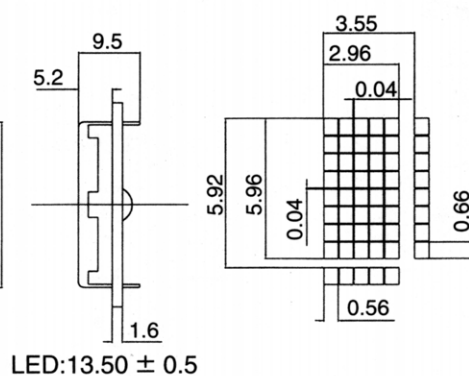
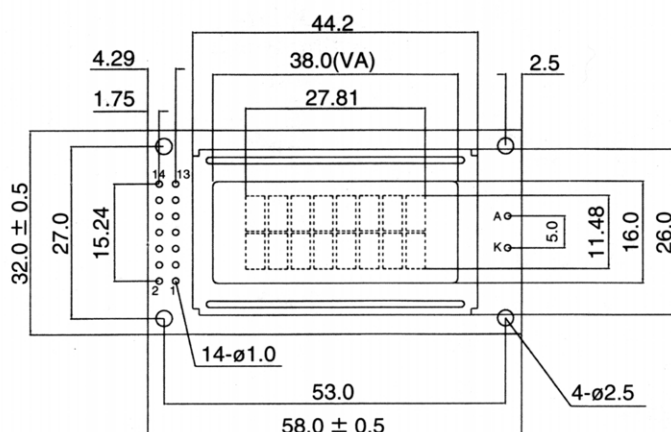
Preferred type



PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER:	REFLECTIVE
COLOR: GRAY, YELLOW	
BACKLIGHT: NO BACKLIGHT	
TEMPERATURE RANGE: STANDARD, WIDE	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	8	DB1
2	VDD	9	DB2
3	V0	10	DB3
4	RS	11	DB4
5	R/W	12	DB5
6	E	13	DB6
7	DB0	14	DB7

EL 0802B

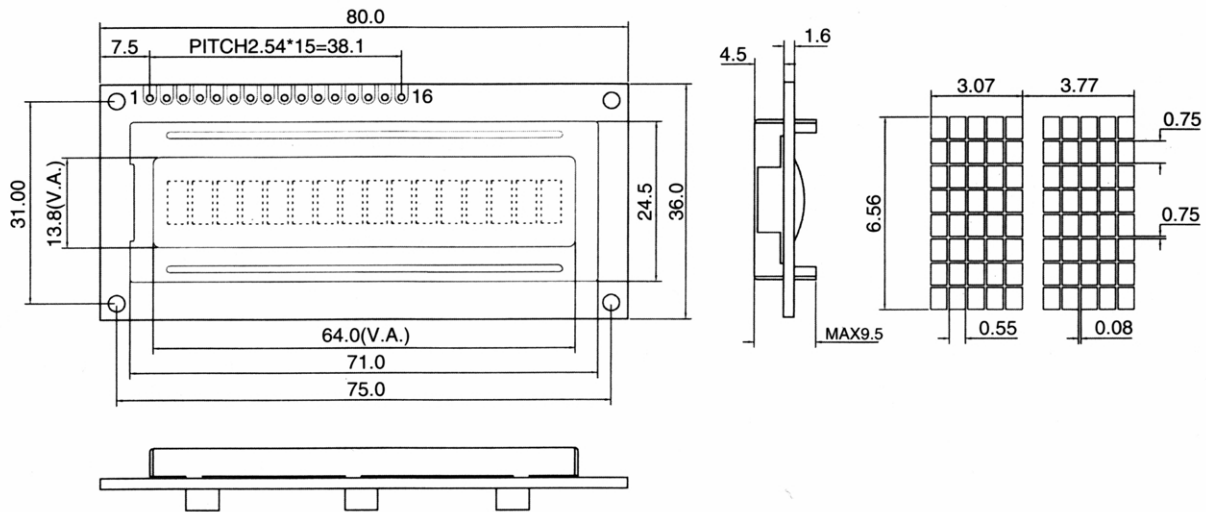


LED: 13.50 ± 0.5

PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER:	REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE
COLOR: GRAY, YELLOW	
BACKLIGHT: LED	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066 (OR EQUIVALENT)	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	K	LED-

EL 1601A

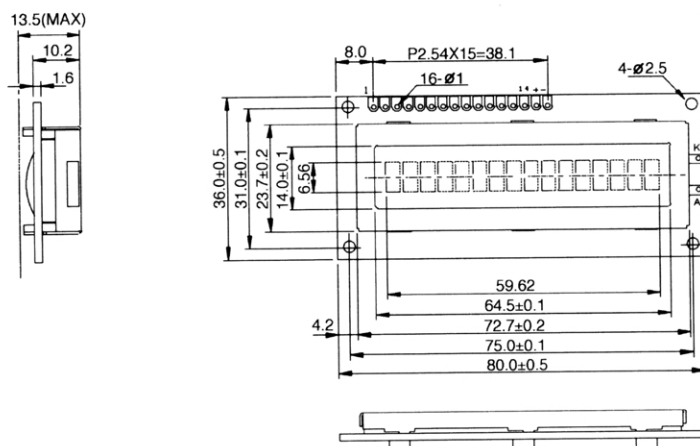


PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER:	REFLECTIVE
VIEWING ANGLE: 6:00	
BACKLIGHT: NO	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

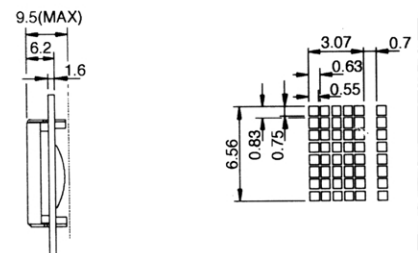
PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	K	LED-

EL 1601C

LED BKL



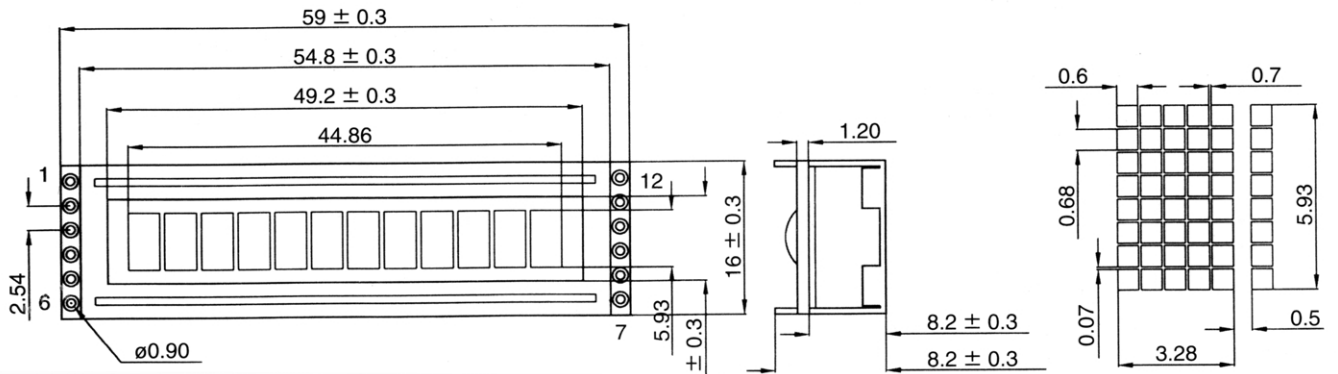
EL BKL/or without BKL



PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER:	REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE
COLOR: GRAY, YELLOW, BLUE	
BACKLIGHT: LED, YELLOW-GREEN	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	K	LED-

EL 1201A



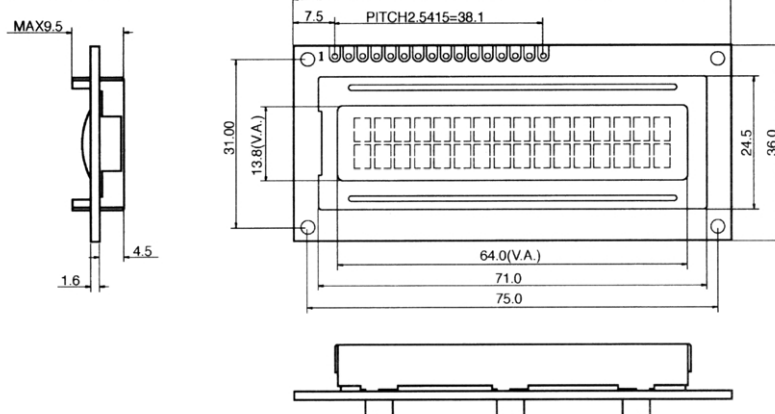
PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER: REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE	
COLOR: GRAY (YELLOW-GREEN)	
BACKLIGHT: LED	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066 (OR EQUIVALENT)	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	7	DB4
2	VDD	8	DB5
3	V0	9	DB6
4	RS	10	DB7
5	R/W	11	A
6	E	12	K

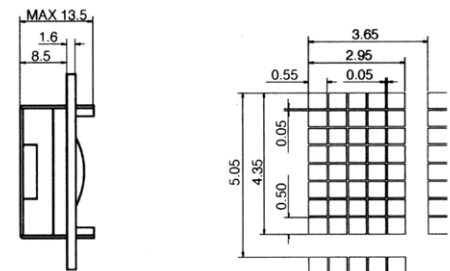
EL 1602A

Preferred type

EL BKL/or
without BKL



LED BKL



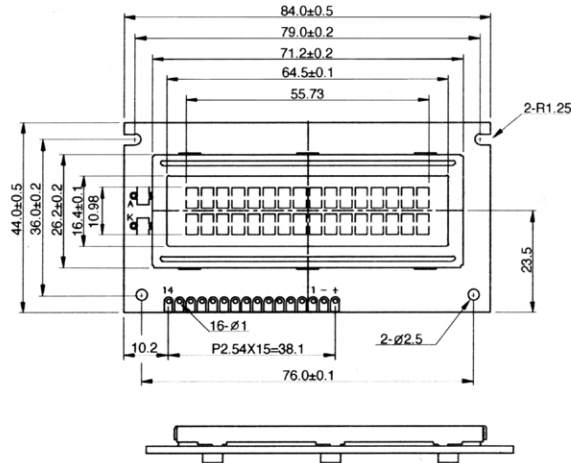
PERFORMANCE FEATURES	
LC FLUID: TN	
POLARIZER: REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE	
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED+
8	DB1	16	LED-

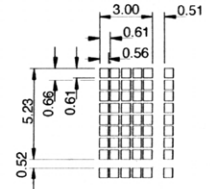
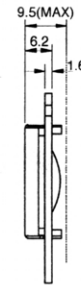
EL 1602B

Preferred type

LED BKL



EL BKL/or
without BKL

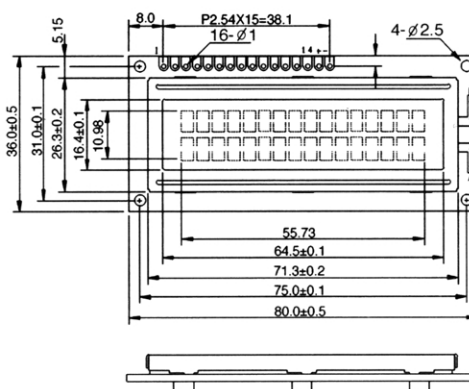


PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER:	REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE
COLOR: GRAY, YELLOW, BLUE	
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

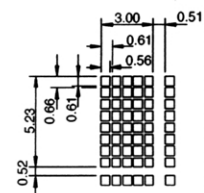
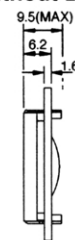
PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	B	LED-

EL 1602K

LED BKL



EL BKL/or
without BKL

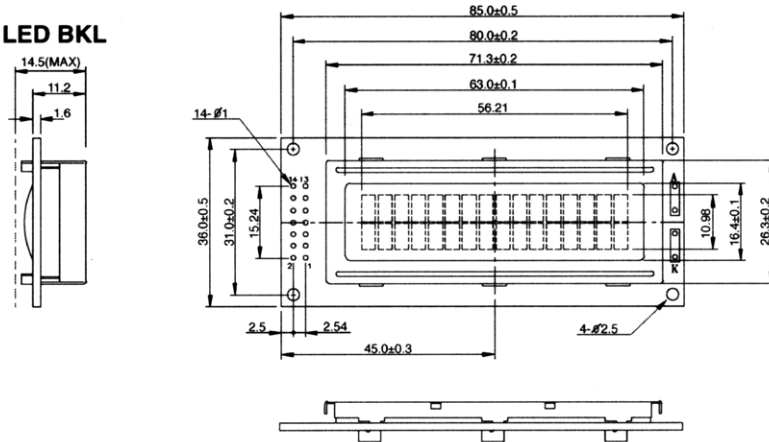


PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER:	REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE
COLOR: GRAY, YELLOW, BLUE	
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	

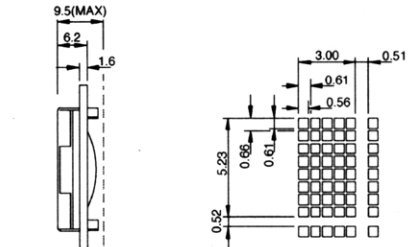
PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	B	LED-

EL 1602E

LED BKL



EL BKL/or with BKL

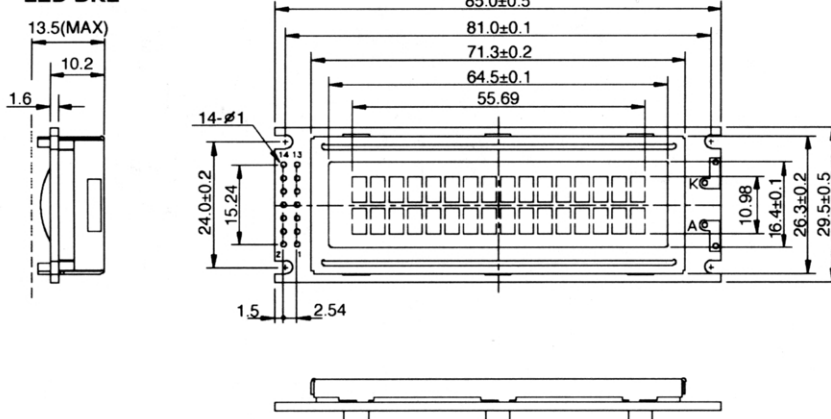


PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER: REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE	
COLOR: GRAY, YELLOW, BLUE	
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

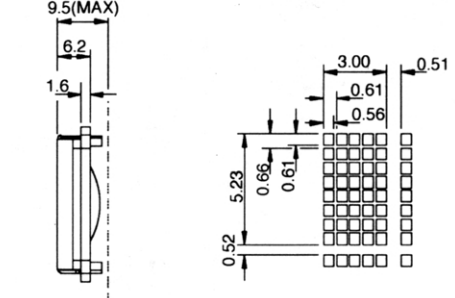
PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	B	LED-

EL 1602N

LED BKL



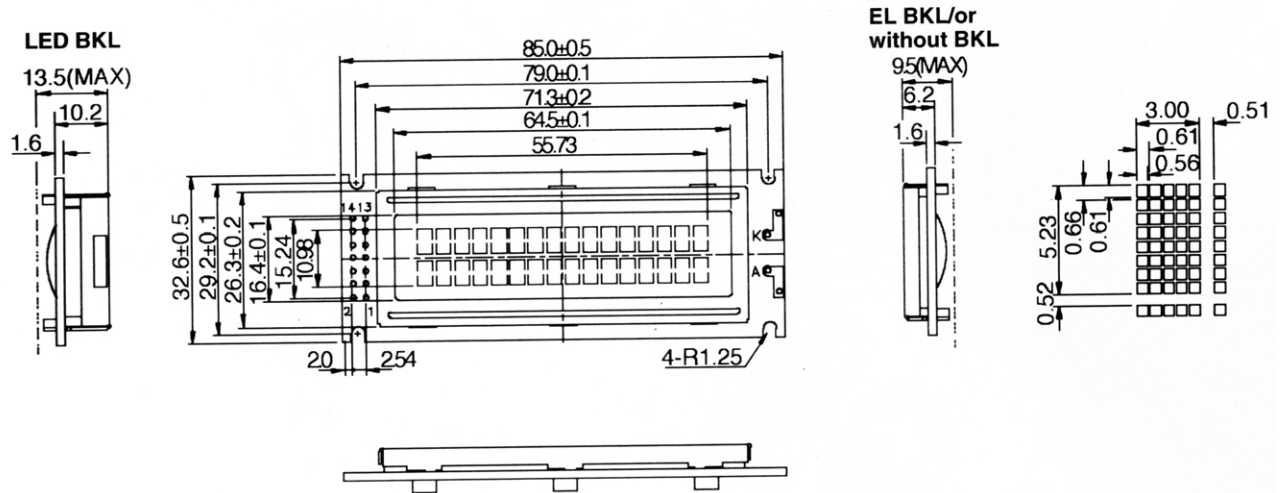
EL BKL/or without BKL



PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER: REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE	
COLOR: GRAY, YELLOW, BLUE	
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	B	LED-

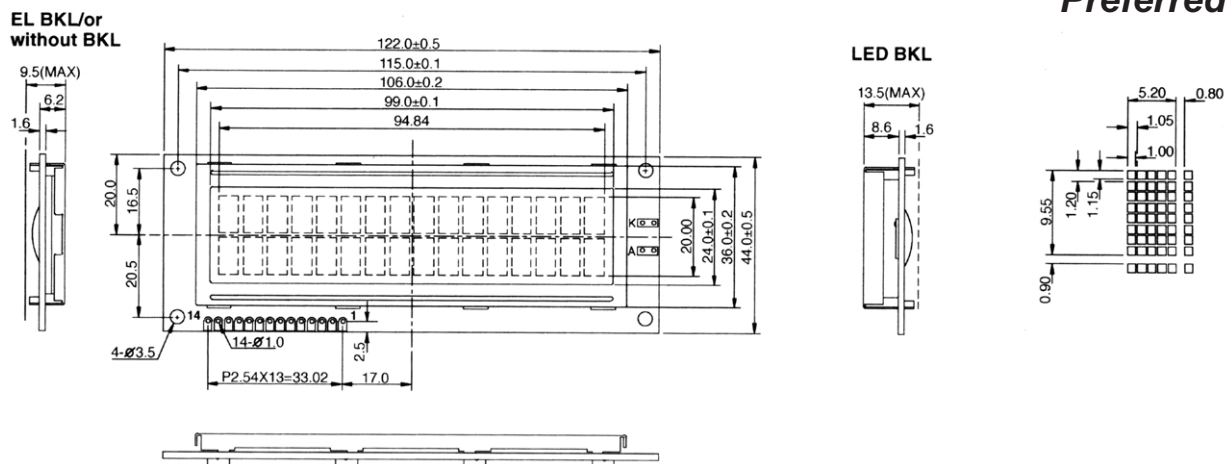
EL 1602T



PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER: REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE	
COLOR: GRAY, YELLOW, BLUE	
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	B	LED-

EL 1602S

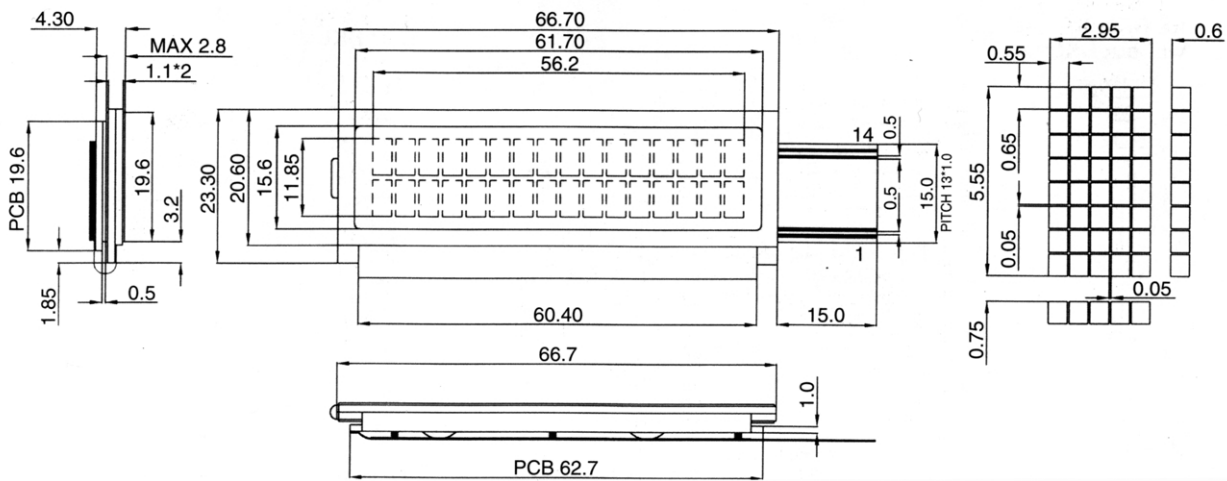


Preferred type

PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER: REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE	
COLOR: GRAY, YELLOW	
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	B	LED-

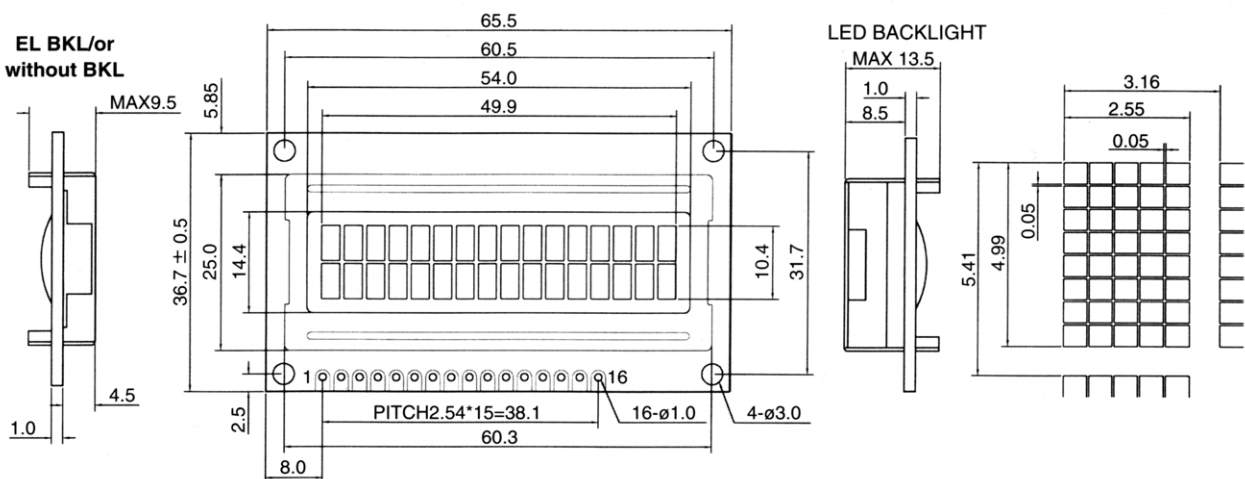
EL 1602C



PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER: REFLECTIVE	
COLOR: GRAY, YELLOW, BLUE)	
BACKLIGHT: NO BACKLIGHT	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066 (OR SPLC780A2)	

PIN	SIGNAL	PIN	SIGNAL
1	VDD	8	DB2
2	V0	9	DB3
3	RS	10	DB4
4	R/W	11	DB5
5	E	12	DB6
6	DB0	13	DB7
7	DB1	14	VSS

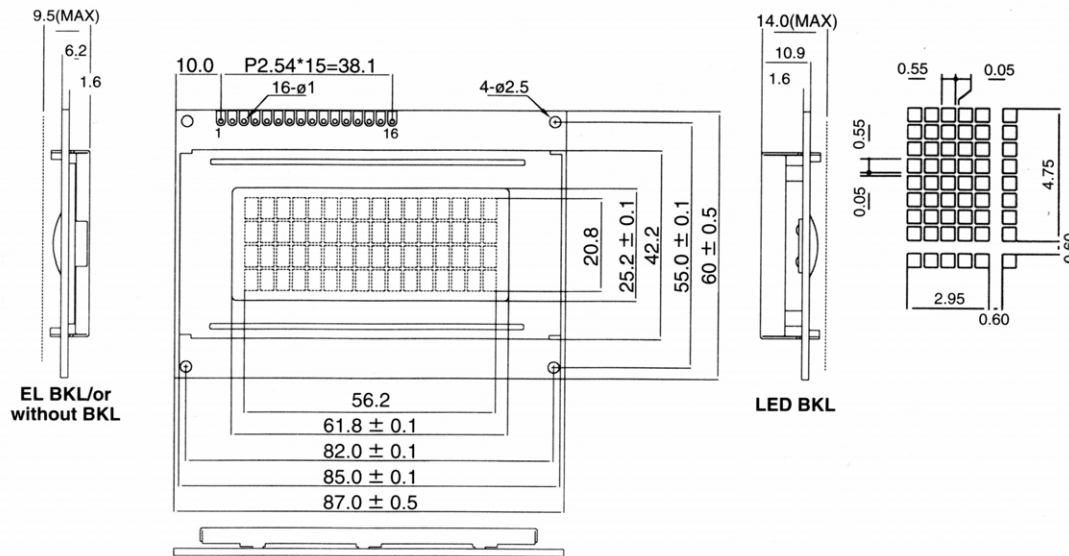
EL 1602H



PERFORMANCE FEATURES	
LC FLUID: STN, TN	
POLARIZER: REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE	
VIEWING ANGLE: 6:00	
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED+
8	DB1	16	LED-

EL 1604B

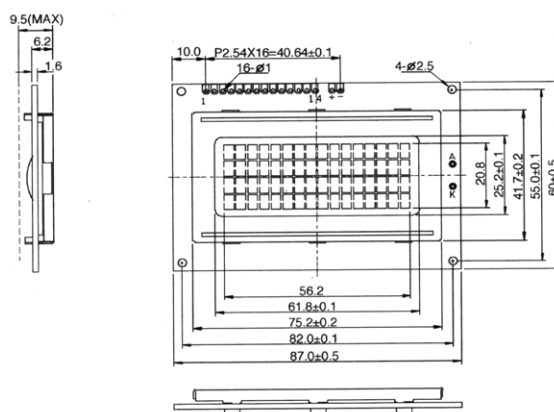


PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER:	REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE
COLOR:	GRAY, YELLOW, BLUE
BACKLIGHT:	LED (YELLOW-GREEN)
TEMPERATURE RANGE:	STANDARD, WIDE
CONTROLLER:	KS0066

PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	B	LED-

EL 1604C

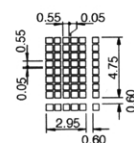
EL BKL/or
without BKL



LED BKL



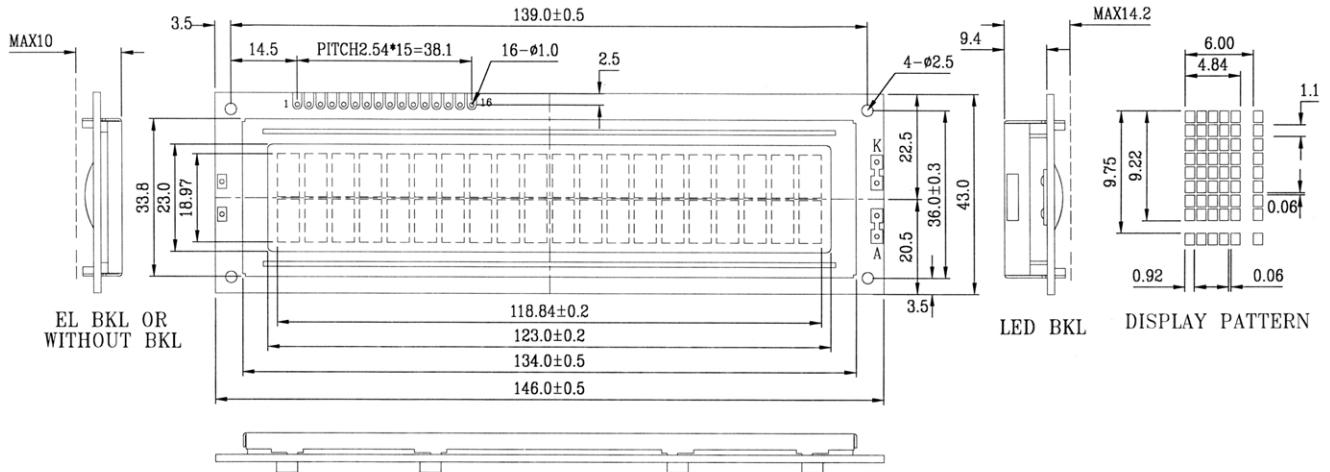
Preferred type



PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER:	REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE
COLOR:	GRAY, YELLOW
BACKLIGHT:	LED (YELLOW-GREEN)
TEMPERATURE RANGE:	STANDARD, WIDE
CONTROLLER:	KS0066

PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	+	LED+
8	DB1	-	LED-

EL 2002A

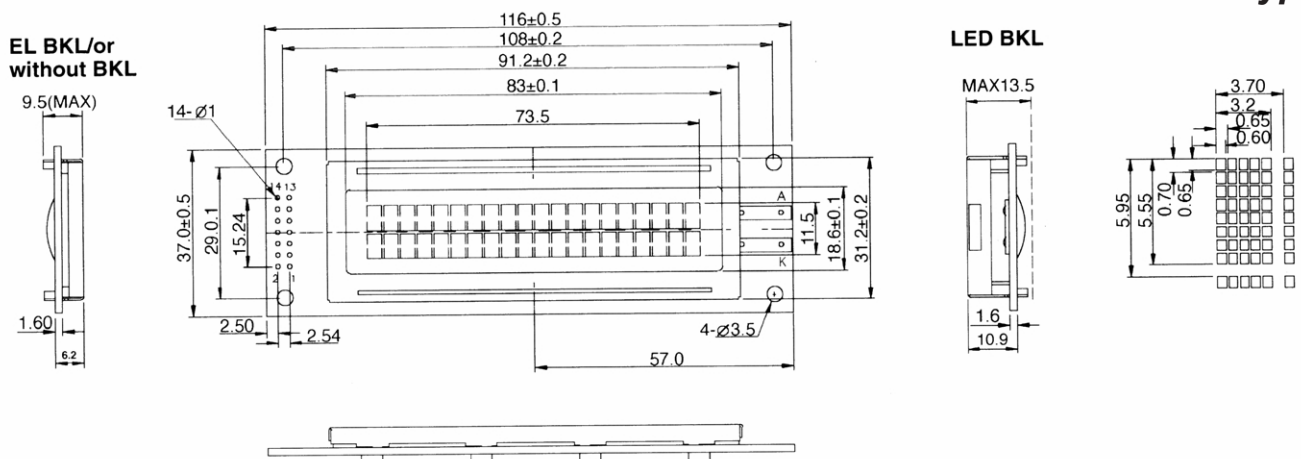


PERFORMANCE FEATURES	
LC FLUID: TN, STN	
POLARIZER:	REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	A	LED+
8	DB1	K	LED-

EL 2002D

Preferred type



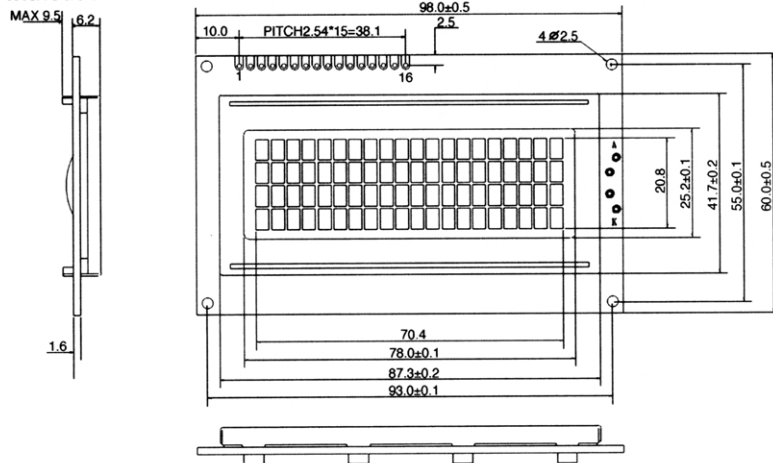
PERFORMANCE FEATURES	
LC FLUID: TN, STN (GRAY, YELLOW)	
POLARIZER:	REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	8	DB1
2	VDD	9	DB2
3	V0	10	DB3
4	RS	11	DB4
5	R/W	12	DB5
6	E	13	DB6
7	DB0	14	DB7

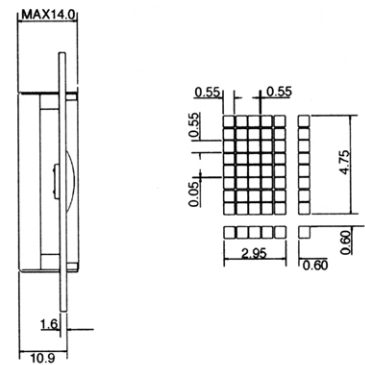
EL 2004D

Preferred type

EL BKL/or
without BKL



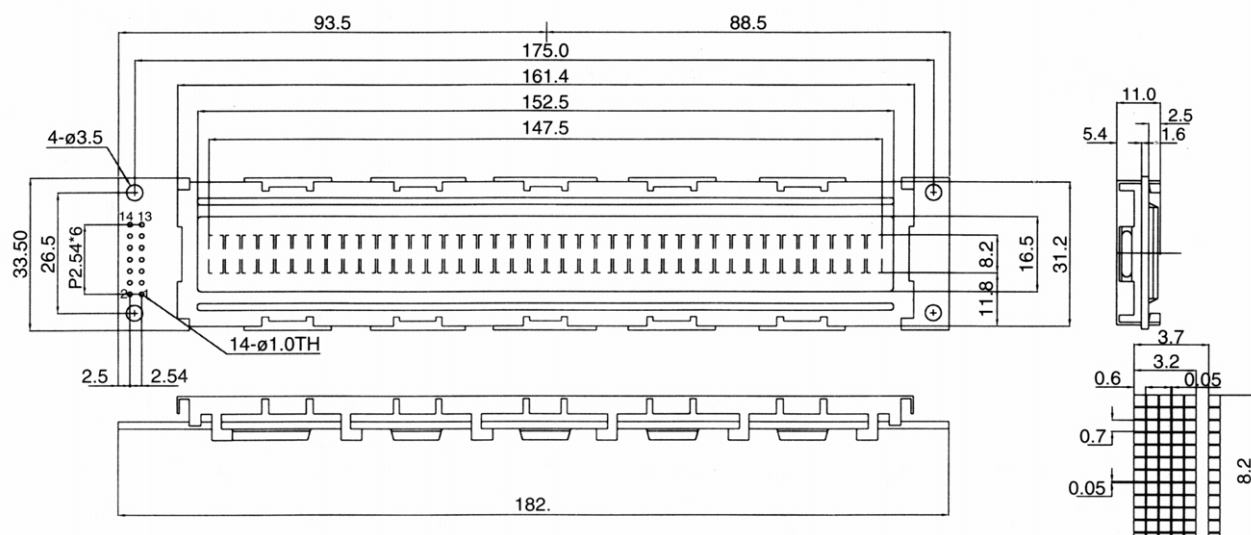
LED BKL



PERFORMANCE FEATURES	
LC FLUID: TN, STN (GRAY, YELLOW)	
POLARIZER:	REFLECTIVE, TRANSLECTIVE, TRANSMISSIVE
BACKLIGHT: LED YELLOW-GREEN	
TEMPERATURE RANGE: STANDARD	
CONTROLLER: KS0066	

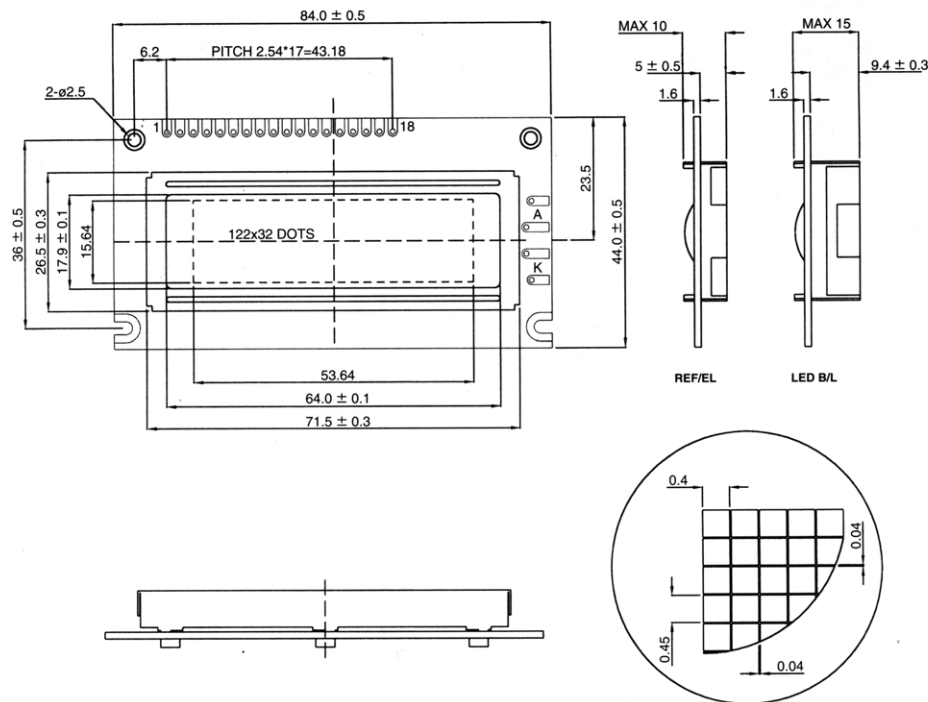
PIN	SIGNAL	PIN	SIGNAL
1	VSS	9	DB2
2	VDD	10	DB3
3	V0	11	DB4
4	RS	12	DB5
5	R/W	13	DB6
6	E	14	DB7
7	DB0	15	LED+
8	DB1	16	LED-

EL 4001A



PERFORMANCE FEATURES	
LC FLUID: TN	
POLARIZER:	REFLECTIVE, TRANSFECTIVE, TRANSMISSIVE
BACKLIGHT: LED (YELLOW-GREEN)	
TEMPERATURE RANGE: STANDARD, WIDE	
CONTROLLER: KS0066 (OR EQUIVALENT)	

PIN	SIGNAL	PIN	SIGNAL
1	VSS	8	DB1
2	VDD	9	DB2
3	V0	10	DB3
4	RS	11	DB4
5	R/W	12	DB5
6	E	13	DB6
7	DB0	14	DB7

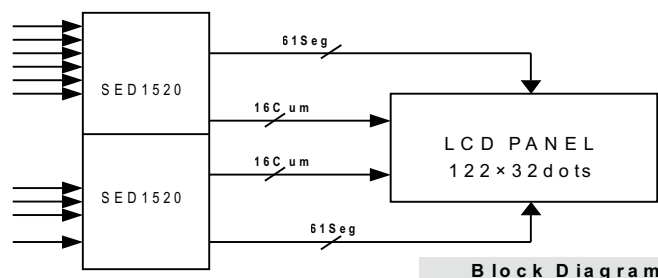
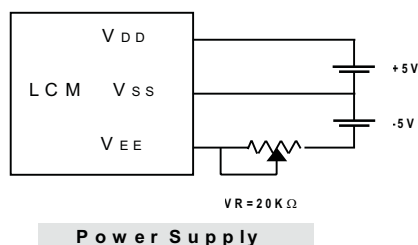


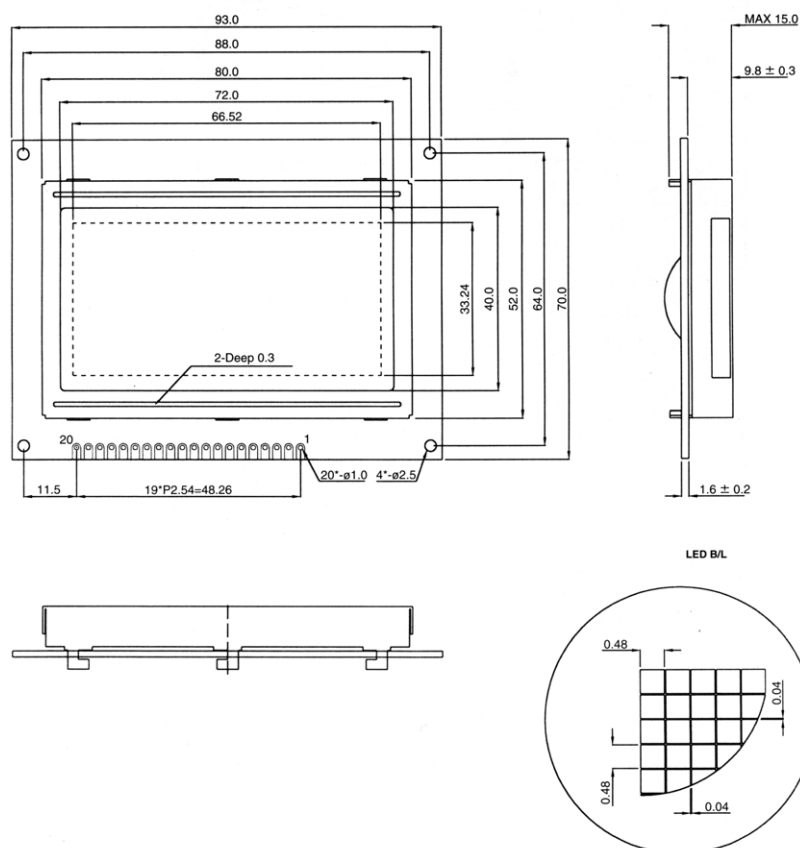
EL 12232 122x32 dots □ STN, □ Reflective/EL backlight/LED backlight

Dimensional Data			Absolute Maximum Ratings						
Item	Measurements(W) x (H) x (T)	Unit	Item	Symbol	Condition	Min.	Max.	Unit	
Module Size	84.0 x 44.0 x 10.0 / 15.0	mm	Supply Voltage (Logic)	$V_{DD}-V_{SS}$	$T_a = 25^\circ C$	0	8	V	
Viewing Area	64.0 x 17.9	mm	Supply Voltage (LCD)	$V_{DD}-V_{EE}$		0	16.5	V	
Dot Pitch	0.44 x 0.49	mm	Input Voltage	V_I		$V_{SS} - 0.3$	$V_{SS} + 0.3$	V	
Dot Size	0.40 x 0.45	mm	Operating Temp.	T_{opr}	--	0	50	$^\circ C$	
Weight		g	Storage Temp.	T_{stg}	--	-20	70	$^\circ C$	

Electrical Characteristics						
Item	Symbol	Condition	Standard Value			Unit
			Min.	Typ.	Max.	
Supply Voltage (Logic)	$V_{DD}-V_{SS}$	--	4.5	5	5.5	V
Supply Voltage (LCD)	$V_{DD}-V_{EE}$	--	--	6.4	--	V
Supply Current	I_{DD}	--	--	0.6	1.1	mA
	I_{EE}	--	--	0.5	--	mA
Input Voltage "H" Level	V_{IH}	High Level	$V_{SS} + 2.0$	--	V_{DD}	V
Input Voltage "H" Level	V_{IL}	Low Level	V_{SS}	--	$V_{SS} + 0.8$	V

Pin Assignments							
Pin	Symbol	Level	Function	Pin	Symbol	Level	Function
1	V_{SS}	--	Ground (0V)	10	DB1	H/L	Data Bus Line
2	V_{DD}	--	+5V	11	DB2	H/L	
3	V_{EE}	--	Power Supply For LCD Drive	12	DB3	H/L	
4	RST	H/L	Reset	13	DB4	H/L	
5	E1	--	--	14	DB5	H/L	
6	E2	--	--	15	DB6	H/L	
7	R/W	--	/W R	16	DB7	H/L	
8	A0	H/L	L? Instruction H? Data	17	LEDA	--	Power Supply for LED Backlight
9	DB0	H/L	Data Bus Line	18	LEDK	--	



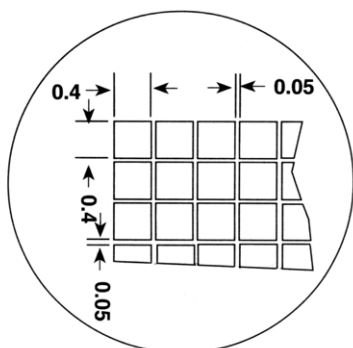
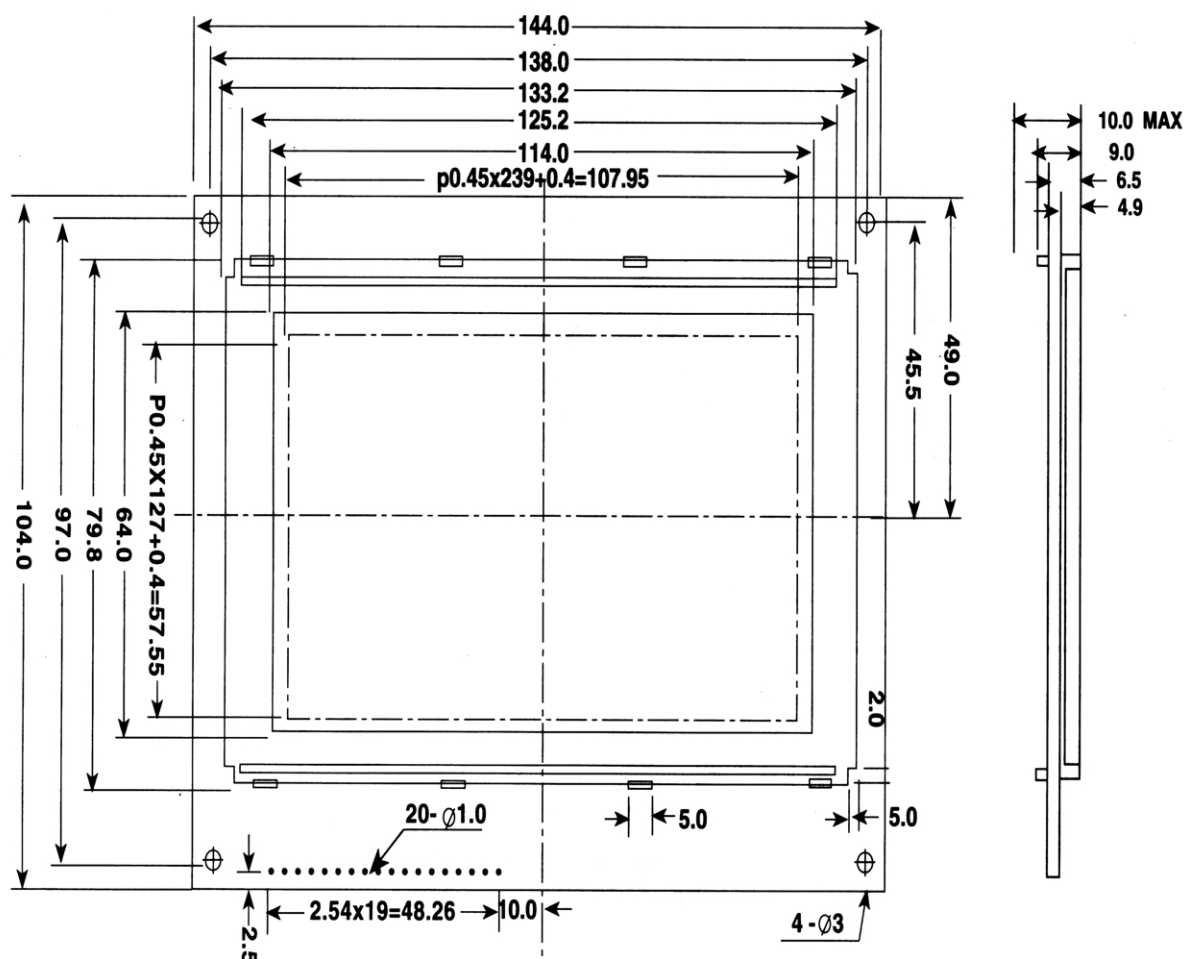


Interface Pin Connection			
Pin No.	Symbol	I/O Type	Description
1	VSS	Supply	Ground
2	VDD	Supply	Power supply
3	V0	Supply	LCD driver supply
4	D/I		Data input/output pin of internal shift register
5	R/W		Read or Write
6	E		Enable signal
7	DB0	I/O	Data bus [0~7]
8	DB1		Bi-directional data bus
9	DB2		
10	DB3		
11	DB4		
12	DB5		
13	DB6		
14	DB7		
15	CS1	I	Chip selection
16	CS2		When CS1=H,CS2=L, select IC1 When CS1=L,CS2=H, select IC2
17	RESETB	I	Reset signal.
18	VEE	Power	VEE is connected by the same voltage.
19	A		Back-light anode
20	K		Back-light cathode

Mechanical Specification		
Item	Dimension	Unit
Module	93.0*70.0*10.0	mm
Viewing	72.0*40.0	mm
Dots	128.0*64.0	PCS
Dot Size(W*H)	0.48*0.48	mm
Dot	0.52*0.52	mm
Module Size	93.0*70.0*15.0	mm

Temperature Characteristics			
Parameter	Symbol	Rating	Unit
Operating	T _{opr}	0 to +50	°C
Storage	T _{stg}	-20 to +70	°C

Electrical Absolute Maximum Ratings				
Parameter	Symbol	Rating	Unit	Note
Operating	V _{DD}	-0.3 ~	V	*1
Supply voltage	V _{EE}	V _{DD} -19.0 ~ V _{DD} +0.3	V	*4
Driver supply voltage	V _B	-0.3 ~ V _{DD} +0.3	V	*1,2
	V _{LCD}	V _{EE} -0.3 ~ V _{DD} +0.3	V	*3,4



Preliminary type

PIN #	1	2	3	4	5	6	7	8	9	10
SYM	V1	V2	FG	GND	VCC	VEE	/WR	/RD	/CE	C/D
PIN #	11	12	13	14	15	16	17	18	19	20
SYM	/RST	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	FS

Custom LCD Modules with LCD Driver on Board

It is advantageous in many cases the customer to get a ready LCD module including a driver circuit. It simplifies connecting with other electronic devices because the communication is done through only few wires. It is not necessary to connect all the display segments separately then. The display itself can be made on the customers request, for instance Text LCD combined with Graphic symbols, etc. Modules can contain not only a customer LCD panel and a LCD driver but also all necessary components, such as push-buttons, LED diodes or other circuits. A ready module can be placed for example right under the front panel of the device.

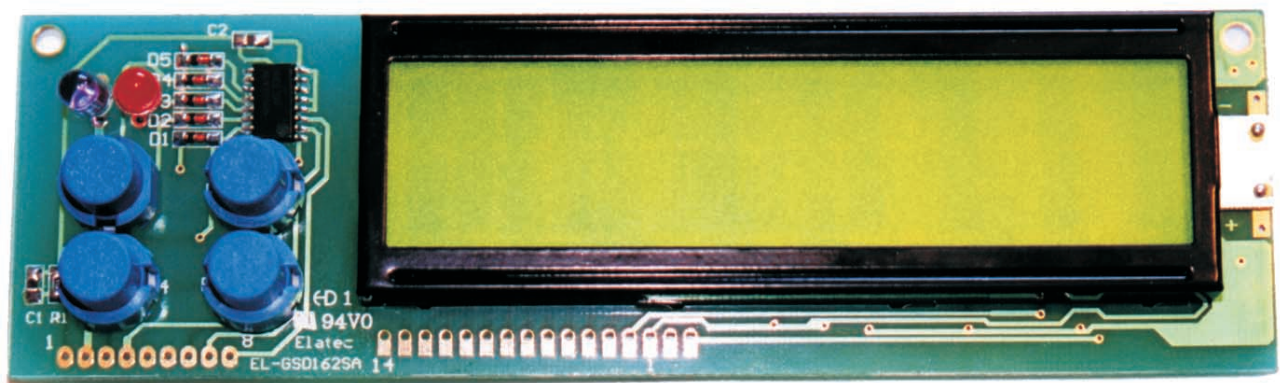
Features:

- segment, character or graphic LCDs
- custom dimensions and features
- Chip on Board, Chip on Glas technology
- other components on board possible

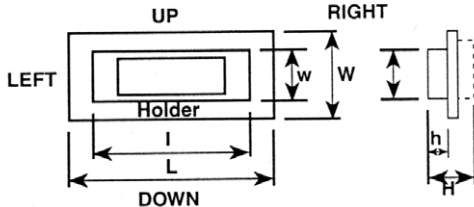
Custom Design :

After the initial consulting phase and when the requirements are discussed with the manufacturer, we will get samples to be tested in about 6 weeks. Don't hesitate to contact us. We will be pleased to give you the best support and recommend you a suitable control microcontroller or a driver unit as well.

Development charge incl. Samples ... depending on LCD design



CUSTOMER LCD MODULE DESIGN GUIDE

Application				
LCD Type		TN – Grey STN – Yellow, - Grey, - Blue, - Single Layer R/W, - Double Layer B/W, - Color		
Module Specification	Display Specification	General	Dot matrix (UC,UG)	
			Character font	_____ x _____ With/Without Cursor
			Columns x Lines (dots x dots)	_____ X _____
			Character Generator Built-in	☐ Yes ☐ No
	Mechanical Specification		Holder Length(l)= Holder Width(w)= Holder Height(h)= External Length(L)= External Width(W)= External Height(H)= Terminal Lead-out direction U, D, L, R.	
Reliability (Standards)		Operating Temperature _____°C ~ _____°C. Storage Temperature _____°C ~ _____°C		
Parts Structure	LCD (Consumer/High Reliability)	Desired Size _____ x _____ Glass Thickness = _____ Specifications _____. Viewing angle: ☐ 6:00 ☐ 12:00 ☐ Other _____ o'clock ☐ Positive type ☐ Negative type ☐ Reflective ☐ Transflective ☐ Transmissive		
	LCD Driver			
	Holder	☐ Metal ☐ Resin ☐ Others, Material _____		
	P.C.B.	_____		
Back Light	Light Source	☐ Yes ☐ No ☐ EL ☐ LED ☐ CCFL ☐ Others _____ Color _____		
	Light Source Position	☐ Edge (Left/Right/Up/Down) ☐ Buried ☐ Rear ☐ Other _____		
Others	LCD, PCB connection	☐ Elastomer (Zebra) ☐ Heat seal ☐ With pin ☐ Others _____.		
	Switch	☐ Yes ☐ No		
	External Connection method	☐ Non ☐ Straight pin header ☐ Right angle pin header ☐ Flexibel Cabel ☐ Other _____		
Others Conditions				

1.0 ABSOLUTE MAXIMUM RATINGS

1.1 For Character Display Modules

ITEM	SYMBOL	TEST CONDITION	VALUE		UNIT
			MIN.	MAX.	
Supply Voltage for Logic	Vdd - Vss	Ta =25°C	0	7.0	V
Supply Voltage for LCD	Vdd - Vss		0	6.5	V
Input Voltage	V1		Vss	Vdd	V
Standard Operating Temperature	Topr	-	-10	60	°C
Standard Storage Temperature	Tstg	-	-20	70	°C
Wide Operating Temperature	Topr	-	-20	70	°C
Wide Storage Temperature	Tstg	-	-30	80	°C

1.2 For Graphic Display Modules

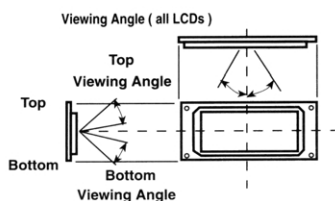
ITEM	SYMBOL	TEST CONDITION	STANDARD VALUE		UNIT
			MIN.	MAX.	
Supply Voltage for Logic	Vdd - Vss	Refer to individual spec.			V
Supply Voltage for LCD	Vdd - Vss				V
Input Voltage	V1				V
Operating Temperature	Topr				°C
Storage Temperature	Tstg				°C

2.0 OPTICAL CHARACTERISTIC

2.1 For TN Display Modules

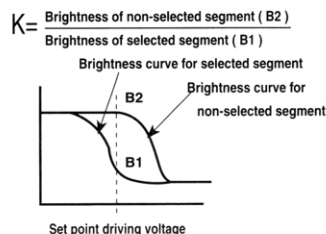
ITEM	SYMBOL	TEST CONDITION	STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Viewing Angle	θ	K = 1.4	10	-	40	degree
	Φ		-30	-	30	degree

Note 1.) Definition of Viewing Angle

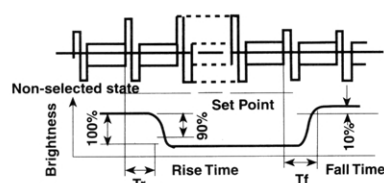


* NOTE: Select either top or bottom viewing angle

Note 2.) Definition of Contrast Ratio "K"



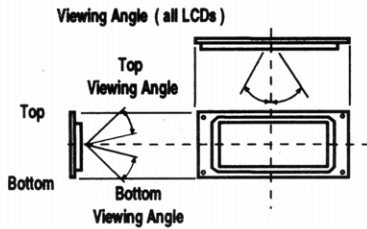
Note 2.) Definition of Optical Response Time



2.1 For STN Display Modules

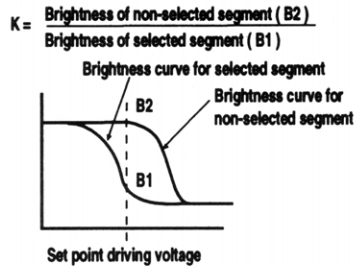
ITEM	SYMBOL	TEST CONDITION	STANDARD VALUE			UNIT	NOTES TO SEE
			MIN.	TYP.	MAX.		
Viewing Angle	θ	K = 2.0	10	-	40	degree	1,2
	Φ		-30	-	30	degree	1,2
Response Time (rise)	Tr	$\alpha = \Phi^\circ \quad \theta = 0$	-	250	300	ms	3
Response Time (fall)	Tr	$\alpha = \Phi^\circ \quad \theta = 0$	-	250	350	ms	3

Note 1.) Definition of Viewing Angle

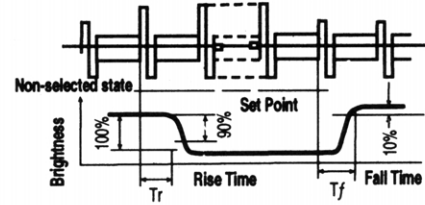


* NOTE : Select either top or bottom viewing angle

Note 2.) Definition of Contrast Ratio "K"



Note 3.) Definition of Optical Response Time

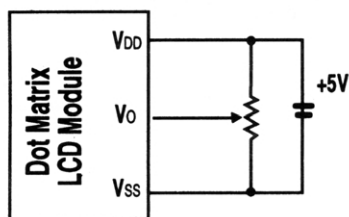


3.0 POWER SUPPLY SCHEMATIC

See individual module specification pages for voltage settings to obtain optimum contrast and viewing angle.

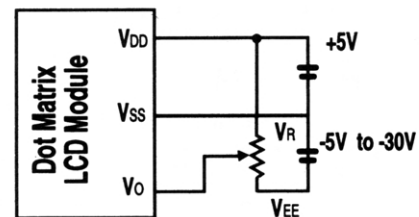
NOTE: Vr = Variable Resistor 10k to 20k for Adjusting Contrast

■ 3.1 For Single Source



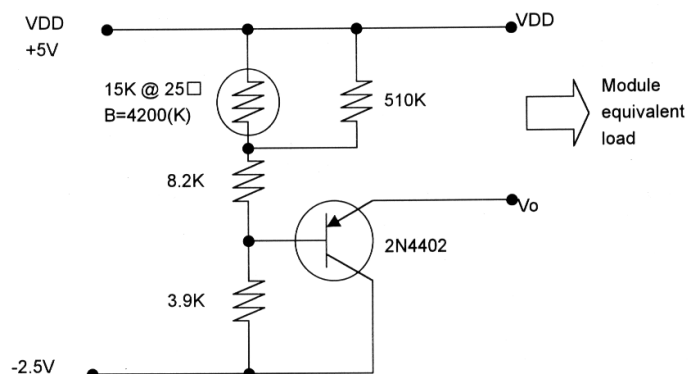
For Modules With Normal Temperature Range Fluid

■ 3.1 For Double Source



For Modules With Extended Temperature Range Fluid or Wide Viewing Cone Fluid

Example of Temperature Compensation Circuit for Extended Power Supply (Only for Reference)

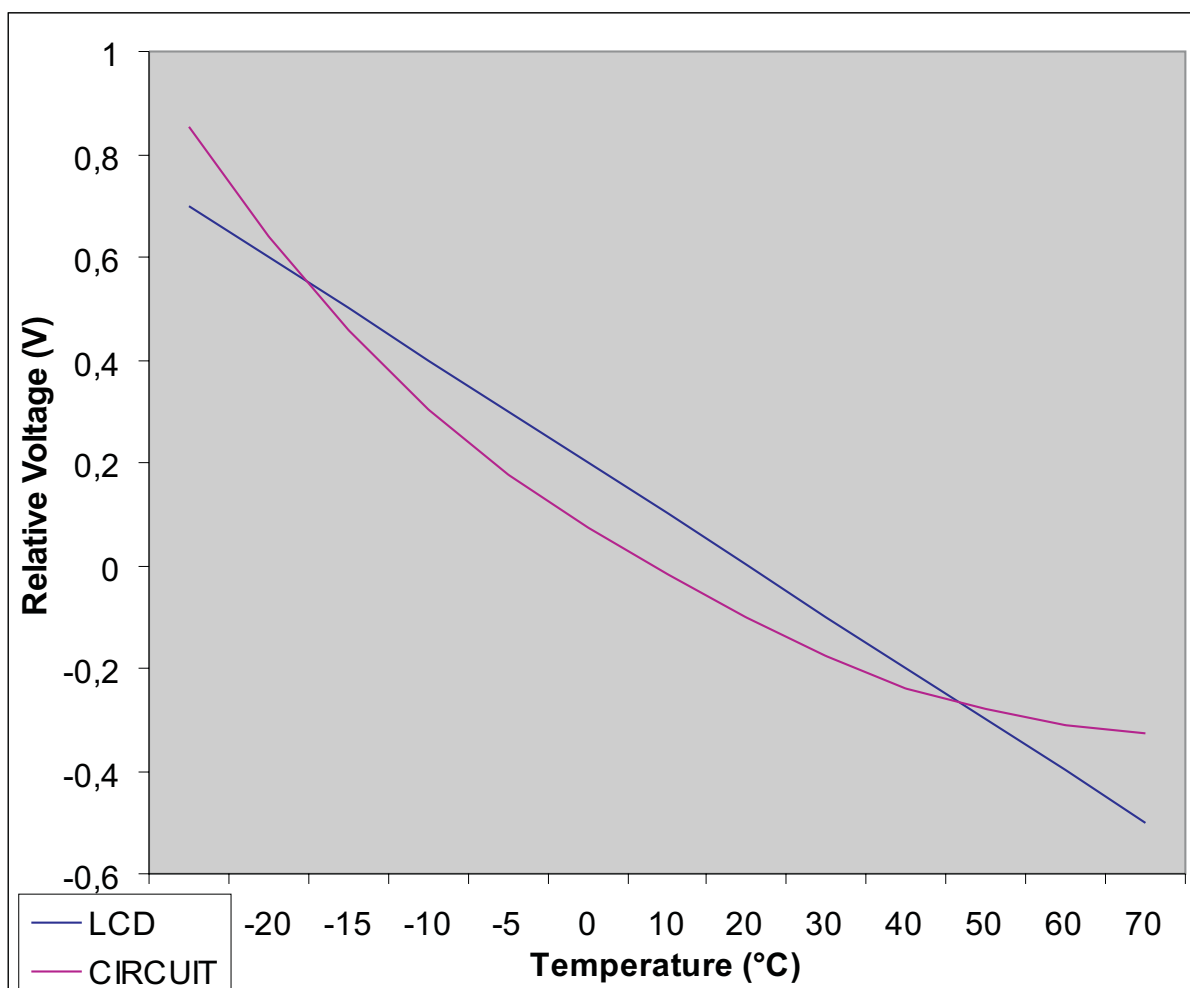


Temperature Range

LCD displays are available in two temperature range, Standard and Extended. A Standard temperature range display is intended for use indoor and an Extended range display is for use outdoor and in rugged environments.

STANDARD TEMPERATURE		EXTENDED TEMPERATURE	
OPERATING	STORAGE	OPERATING	STORAGE
-10 to +60°C (0°C to 50°C)	-20 to +70°C	-20 to 70°C	-30 to +85°C

The contrast adjustment voltage is specified for a given temperature. This is done because the LCD fluid is sensitive to temperature in a Standard temperature range module the variation of contrast over the temperature range is small enough so that no temperature compensation is required. In the Extended temperature models however a temperature compensation circuit is often used to retain optimal contrast at the extremes of temperature. Figure is the characteristic curve for an Extended temperature display.



4.0 INTERFACE PIN CONNECTION

PIN NO.	SIGNAL	LEVEL	DESCRIPTION	FUNCTION
1	VSS	-	GROUND	0V
2	VDD	-	Supply Voltage for Logic & LCD	5V $\pm$ 5%
3	V0	-	Supply Voltage for LCD	Decision by user system
4	RS	H/L	Register selection	H: Data L: Instruction code
5	R/W	H/L	Read/Write	H: Read L: Write
6	E	H/L $\rightarrow$ L	Enable signal	
7	DB0	H/L	Data bit 0	
8	DB1	H/L	Data bit 1	
9	DB2	H/L	Data bit 2	
10	DB3	H/L	Data bit 3	
11	DB4	H/L	Data bit 4	
12	DB5	H/L	Data bit 5	
13	DB6	H/L	Data bit 6	
14	DB7	H/L	Data bit 7	
15 (A)	LED+	-	Power supply for B/L	See warning please
16 (K)	LED-	-	Power supply for B/L	

Warning:

Displays are usually equipped by resistors for direct driving LED backlight from power supply (pin2) pin number 15 and 16 is not necessary the. Unless the direct driving LED backlight through pin 15 and 16. is requested, it is necessary to remove this resistors from PCB.

5.0 HOW TO USE ELATEC LCD CHARACTER MODULE

5.1 Dot Matrix LCD Controller & Driver

The module has a dot matrix LCD controller & driver LSI which is fabricated by low power CMOS technology.

➤ FUNCTION

- Character type dot matrix LCD controller & driver.
- Internal driver : 16 common and 40 segment signal output.
- Display character format : 5x7dots + cursor, 5x10 dots + 10.
- Easy interface with a 4-bit MPU.
- Display character pattern: Refer to Standard Character Patterns "5x7 dots format: 192 kinds, 5x10 dots format : 32 kids.
- The special character pattern can be programmable by Character Generator RAM directly.
- A customer character pattern can by programmable by mask option.
- Automatic power on RESET function
- It is possible to read both Character Generator and Display Data RAM from MPU.

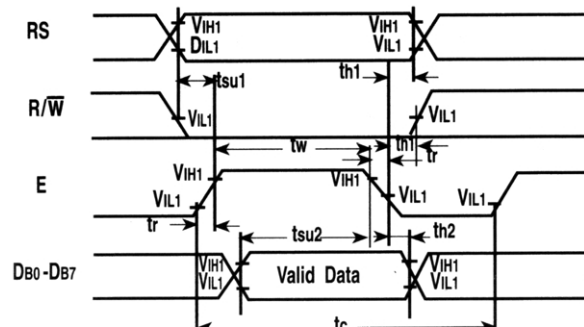
➤ FEATURES

- Internal memory
 - Character Generator ROM: 8320 bits.
 - Character Generator RAM: 512 bits.
 - Display Data RAM : 80x8 bits or 80 digits.
- Supply voltage for logic and LCD (+): 5V±10%
- Supply voltage for LCD (-) : -5V
- CMOS process
- 1/8 duty, 1/11 duty or 1/16 duty: selectable (1/8 duty, 5x7 dots format 1 line, 1/11 duty; 5x10 dots format 1 line, 1/16 duty : 5x7 dots format 2 lines.)

5.2 Timing Characteristic

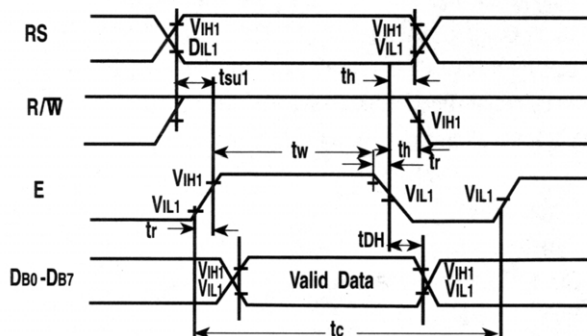
Electrical characteristic (Ta = 25°C, Vdd = 5.0V ±0.25V, Vee = -19.0V)

CHARACTERISTIC	SYMBOL				UNIT	APPLICABLE PIN
		MIN.	TYP.	MAX.		
E Cycle Time	tc	-	-	-	ns	E
E Rise Time	tr	-	-	25	ns	E
E Fall Time	tf	-	-	25	ns	E
E Pulse Width (High, Low)	tw	220	-	-	ns	E
R/W and RS Setup Time	tsu1	40	-	-	ns	R/W, RS
R/W and RS Hold Time	th1	10	-	-	ns	R/W, RS
Data Setup Time	tsu2	60	-	120	ns	DB0-DB7
Data Hold Time	th2	20	-	-	ns	DB0-DB7



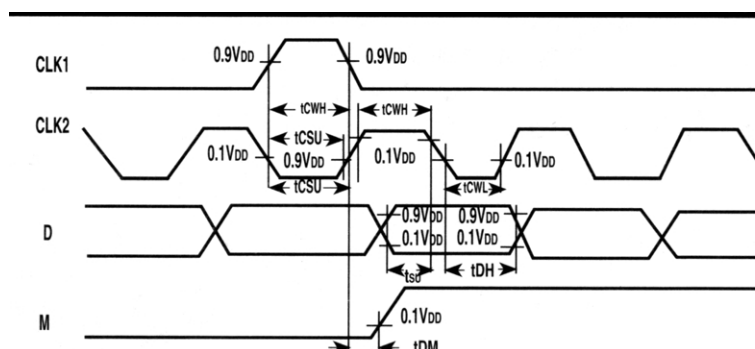
AC Characteristic ($V_{dd}=5V \pm 10\%$, $V_{ss}=25^\circ C$) Write Mode

CHARACTERISTIC	SYMBOL	STANDARD VALUE			UNIT	APPLICABLE PIN
		MIN.	TYP.	MAX.		
E Cycle Time	t_c	500	-	-	ns	E
E Rise Time	t_r	-	-	25	ns	E
E Fall Time	t_f	-	-	25	ns	E
E Pulse Width	t_w	220	-	-	ns	E
R/W and RS Setup Time	t_{su}	40	-	-	ns	R/W, RS
R/W and RS Hold Time	t_h	10	-	-	ns	R/W, RS
Data Output delay Time	t_p	60	-	-	ns	DB0-DB7



Interface Mode

CHARACTERISTIC	SYMBOL	STANDARD VALUE			UNIT	APPLICABLE PIN
		MIN.	TYP.	MAX.		
Clock Pulse Width High	t_{cWH}	800	-	-	ns	CLK
Clock Pulse Width Low	t_{cWL}	800	-	-	ns	CLK
Data Setup Time	t_{su}	300	-	-	ns	DB0-DB7
Data Hold Time	t_{DH}	300	-	-	ns	DB0-DB7
Clock Setup Time	t_{csu}	500	-	-	ns	CLK
M Delay Time	t_{DM}	-1000	-	1000	ns	M



5.3 Power Supply RESET

The internal RESET circuit will not operate properly if the following power supply condition is not satisfied. In that case, please perform initial setting to the instruction.

ITEM	SYMBOL		STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Power Supply Rise Time	trcc	-	0.1	-	10	ms
Power Supply Off Time	toff	-	1	-	-	ms



Note: The item toff defines the time when the power supply shuts down momentarily or repeats on off state.

➤ RESET Function

Initializing by Internal RESET Circuit

The module automatically initializes (resets) when power is turned on using the internal RESET circuit. The following instructions are executed in initialization. The busy flag (BF) is kept in busy state until initialization ends. (BF=1) The busy state is 10ms after Vdd rises to 4.5V.

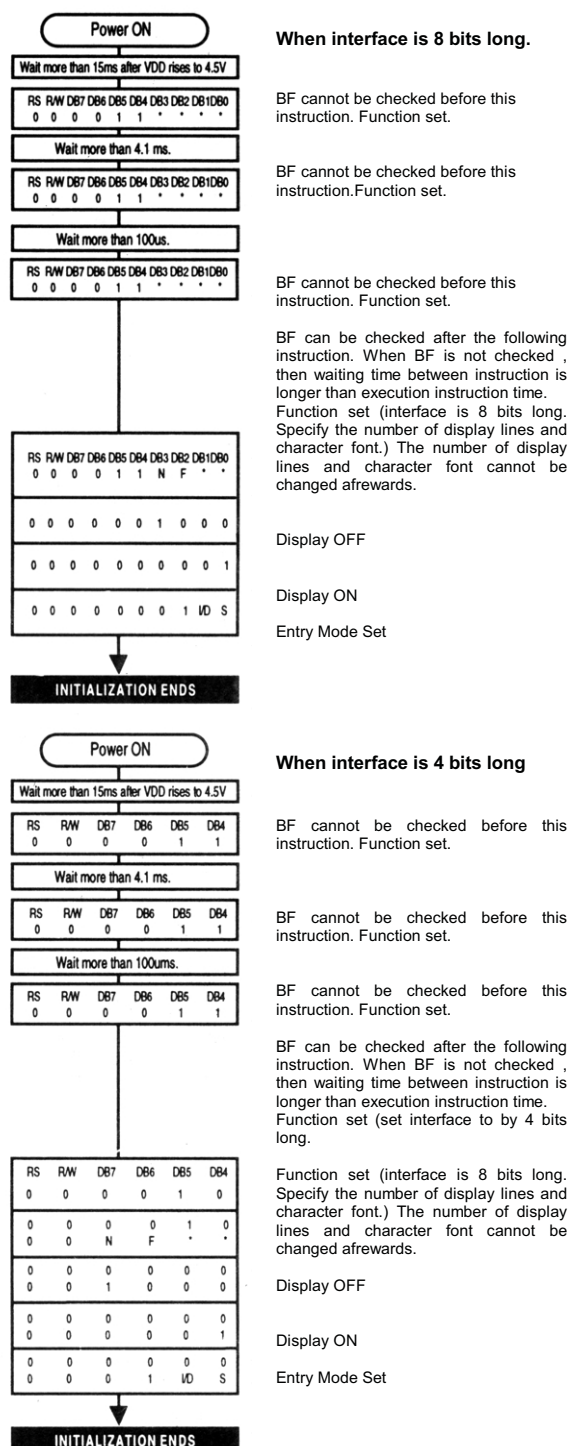
- 1) Display Clear
- 2) Function Set
 - DL=1 : 8 bit interface data
 - DL=0 : 4 bit
 - F=0 : 5x7 dots character fonts
 - N=1 : 1/16 duty
 - N=0 : 1/8 duty, 1/11 duty
- 3) Display ON/OFF control
 - D=0 : Display OFF
 - C=0 : Cursor OFF
 - B=0 : Blink OFF
- 4) Entry mod set
 - 1/D=1 : + 1(increment)
 - S=0 : No shift

Note: When condition in "Power Supply Condition Using Internal RESET Circuit" are not met, the internal RESET circuit will not operate normally and initializing will not be performed. In this case initialize by MPU according to "Initializing by Instruction".

➤ Initializing by Instruction

If the power supply condition for correctly operating the internal RESET circuit are not met, initialization by instruction is required.

Use the following procedure for initialization.



5.4 Instruction

INSTRUCTION	CODE										DESCRIPTION	EXECUTE TIME (MAX)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clear all display and returns the cursor to the home position (Address 0).	1.64ms
Cursor at home	0	0	0	0	0	0	0	0	1	-	Returns the cursor to the home position. Also return the display being shifted to the original position. DDRAM contents remain unchanged.	1.64ms
Entry mod set	0	0	0	0	0	0	0	1	I/D	S	Sets the cursor move direction and specifies or not to shift the display. These operation are performed during data write and read.	40μS
Display ON/OFF control	0	0	0	0	0	0	1	D	C	B	Sets ON/OFF of all display (D) cursor ©, and blink of cursor position character (B).	40μS
Cursor / Display Shift	0	0	0	0	0	1	S/C	R/L	-	-	Moves the cursor and shift the display without changing DDRAM contents	40μS
Function Set	0	0	0	0	1	DL	N	F	-	-	Sets interface data length (DL) number of display lines (L) and character font (F)	40μS
CGRAM Address	0	0	0	1	ACG						Sets the CGRAM address. CGRAM data is sent and receive after this setting.	40μS
DDRAM Address	0	0	1	ADD							Sets the DDRAM address. DDRAM data is sent and receive after this setting.	40μS
Busy Flag/ Address read	0	1	BF	AC							Read Busy flag (BF) indicated internal operation is being performed and reads address counter contents.	0μS
CGRAM/DDRAM Data write	1	0	Write data								Write data into DDRAM or CGRAM	40μS
CGRAM/DDRAM Data read	1	0	Read data								Read data from DDRAM or CGRAM	40μS

CODE		DESCRIPTION	EXECUTE TIME (MAX)
VD = 1 : Increment	DL = 0 : 4 bit	DDRAM : Display data RAM	fcp or fosc=250kHz
VD = 0 : Decrement	N = 1 : 1/16 Duty	CGRAM : Character generator RAM	
S = 1 : With display shift	N = 0 : 1/8 Duty, 1/11 Duty	ACG : CGRAM address	How ever, when frequency changes, execution time also changes
S/C = 1 : Display shift	F = 1 : 5x10 dots	ADD : DDRAM address	
S/C = 0 : Cursor movement	F = 1 : 5x7 dots	corresponds to cursor address	When fcp or fosc = 270kHz
R/L = 1 : Shift to right	BF = 1 : Internal Operation is being performed	AC : Address counter, used for both DDRAM and CGRAM	
R/L = 0 : Shift to left	BF = 0 : Instruction acceptable		
D/L = 1 : 8 bit			

Standard Character Pattern

English/Russian

		Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)				00P`P						Б04.24					
	1	CG RAM (2)				!1A0a9						Г9w.04					
	2	CG RAM (3)				"2BRbr						Е6ь.04					
	3	CG RAM (4)				#3C5cs						Ж5u.24					
	4	CG RAM (5)				\$4DTdt						Згь.7ф					
	5	CG RAM (6)				%5EUeu						Иё3x4					
	6	CG RAM (7)				&6FVfv						Йкк.7w4					
	7	CG RAM (8)				'7GVgw						Ј3aI`E					
	8	CG RAM (1)				(8HXhx						Пк<I`E					
	9	CG RAM (2)				)9IViv						Уё<I`E					
	A	CG RAM (3)				*:JZjz						Фк.4e9					
	B	CG RAM (4)				+;KCKk						ЧгP`Kф					
	C	CG RAM (5)				,<L*1I						ШкK*H0					
	D	CG RAM (6)				-=MIm>						бH<H#8					
	E	CG RAM (7)				.>N^n						бH<H#8					
	F	CG RAM (8)				/?0_Lo						3тE.0					

English/Japanese

		Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)				00P`P							ー3=op				
	1	CG RAM (2)				!1A0a9							。74&9				
	2	CG RAM (3)				"2BRbr							「イッ×pθ				
	3	CG RAM (4)				#3C5cs							」7てEε				
	4	CG RAM (5)				\$4DTdt							、イトpμ				
	5	CG RAM (6)				%5EUeu							。オ+1ε0				
	6	CG RAM (7)				&6FVfv							ヲカニ3pZ				
	7	CG RAM (8)				'7GVgw							ヲ+ア7gπ				
	8	CG RAM (1)				(8HXhx							イ7*リrX				
	9	CG RAM (2)				)9IViv							ヲ7/ル'y				
	A	CG RAM (3)				*:JZjz							エコHvj7				
	B	CG RAM (4)				+;KCKk							オ7レ0*7				
	C	CG RAM (5)				,<L*1I							オ7フ7φA				
	D	CG RAM (6)				-=MIm>							ユズ\0t÷				
	E	CG RAM (7)				.>N^n							オ7レ0*7				
	F	CG RAM (8)				/?0_Lo							ウ7マ"0				

The English/Japanese and English/Russian character sets differ in characters on the following addresses 7B,7C,7D,7E and 7F.

When you need these different characters, you can very easily pre-set these characters to the CGRAM.

Prefer the English/Russian character pattern, please.

6.0 DISPLAY CHARACTER POSITION AND CHARACTER ADDRESS

		DISPLAY POSITION							
8X1	LINE 1	1	2	3	4	5	6	7	8
		00	01	02	03	04	05	06	07
		DDRAM ADDRESS							

		DISPLAY POSITION															
16X1	LINE 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
		DDRAM ADDRESS															

		DISPLAY POSITION															
16X2	LINE 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
LINE 2		40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
		DDRAM ADDRESS															

		DISPLAY POSITION															
16X4	LINE 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
LINE 2		40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
LINE 3		10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
LINE 4		50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
		DDRAM ADDRESS															

		DISPLAY POSITION																			
20X2		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LINE 1		00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
LINE 2		40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53
		DDRAM ADDRESS																			

		DISPLAY POSITION																			
20X4		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LINE 1		00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
LINE 2		40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53
LINE 3		14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27
LINE 4		54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60	61	62	63	64	65	66	67
		DDRAM ADDRESS																			

		DISPLAY POSITION																			
24X1 LINE 1		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	40	41	42	43
																		21	22	23	24
																		44	45	46	47
		DDRAM ADDRESS																			