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“Flexible manufacturing technology & innovative design are the hallmarks of one of Europe's largest specialist optoelectronic component manufacturers”



The best Backlight for your application

Our backlights are not just panels of light. We offer you the choice to simplify module designs and reduce costs (often by more than the cost of the backlight), by integrating assembly aids and innovative features at the design stage, see page 11 for some ideas. You can select the appropriate cost/performance options by working directly with our product support team. Be it a simple 30cent (about £0.20 GBP) device or a sophisticated item costing several \$, you *will* make the right choice - with our help.

Worldwide supplies and ready availability

With a continually expanding worldwide distribution network you can expect rapid & expert response from our representatives. We also welcome direct contact with our support teams in our European headquarters in Redruth, Cornwall, UK.

OMC Backlights

Winning product in 1993 of the UK Electronic Component Award for Innovation

A Quality Manufacturer Certified to International Standards



AN
ISO 9001
CERTIFIED
MANUFACTURER

Certificate No.
96-LON-AQ-030



Applications

L.E.D. Backlight units are ideal for a wide range of consumer and industrial applications.

Their long life and bright, even illumination make them perfect for applications where, previously, an incandescent lamp device failure would result in total product failure. The low current and power demands offer major benefits in automotive applications.



The light guide can be manufactured in virtually any shape, so product designers have the opportunity to illuminate entire facias - even irregular shapes with cutouts and voids.

The implementation of a wide variety of production techniques allows full applications flexibility. Examples include both high performance industrial clocks and low cost radio alarms.



"SECRET 'TILL LIT"

The face of a backlight can be printed and can contain a legend or graphic which is only revealed on illumination.

Backlights are particularly effective complementing a membrane switch assembly. The emitters can be strategically placed for maximum efficiency and contrast.



Backlight light guides can act as an assembly aid in the application of liquid crystal displays, they are cost-effective for high-volume consumer products, as well as industrial applications.

Backlighting with L.E.D.s

All this from a single product range:

- Low cost
- Low current
- High reliability
- High brightness
- Sunlight viewable
- Even illumination
- Simplicity of application
- Full design flexibility

An introduction to the best of all backlighting solutions

Promoting a new product concept and a new technology is always difficult because customers have first to understand what has been achieved. It is harder still when a product seems to offer the best of all worlds - better reliability, performance and design flexibility combined with lower cost. Quite naturally people tend to be sceptical and ask

"What's the catch?".

With the **OMC** backlight range
there is no catch -

it really is the best solution for almost every application and since the Company introduced backlights at the Displays Exhibition in 1990 they have proved a godsend to literally dozens of companies.

The product has evolved rapidly, and performance enhancements to the range have provided cost saving innovations. These include a special design of backlight with accurate guides for elastomeric connectors and P.C.B. location studs.

1992 saw the incorporation of the backlights into the Farnell Electronic Components Catalogue. This has proved to be particularly valuable to both U.K. and overseas customers who can now quickly assess the potential of the technology.

New manufacturing facility

The success of the product today speaks for itself. Indeed in March 1993, in the middle of the worst ever recession in Europe, a new factory investment totalling around 1,000,000 pounds sterling (1.55 million U.S. dollars) started shipping product at even lower prices and in larger volumes than ever before.

From 'one off' to several million

There are three production methods:-

- By hand controlled machine... for one offs, samples and small quantities
- By semi automatic machinery... for about 100 to 10,000 pieces
- By fully automatic machines... for the lowest cost and larger quantities

Example applications

The product has received some prestige recognition, in projects such as:-

- A new intercom system for British Rail trains
- Ticketing equipment for the French T.G.V.
- Agricultural machinery
- Supermarket data collection equipment
- Computer indicator switches
- Car parking meters

Ultra low cost solution

The devices are exceptionally low cost when produced in high volumes. Companies making, for example, car radios, central heating controllers, telephones, washing machines and traffic control equipment are studying the potential closely.

New developments underway

- Very thin panels (1.5mm - 2.0mm)
- White light output
- Integral infrared filter (for compatibility with night vision systems)
- Further improvements in evenness of illumination
- Expanding worldwide distribution network (new enquiries welcome)

Full design engineering support

The devices are easy to use with minimal additional current limiting circuitry and are available to run at very low currents from 1mA to 20mA average. Extremely bright models can be produced. A key feature of the product allows a display to be viewed in full sunlight when used in conjunction with transmissive style L.C.D.s.

Principal Features

High reliability, solid state device

The backlight modules, which offer expected life of better than 100,000 hours, are solid state panels using an acrylic lightguide coated with a phosphorescent material. (Patent file ref: 9024472.4). The likelihood of complete device failure is reduced almost to zero by individually connecting each element. The emitting elements are specially designed, side firing L.E.D. devices.

Even lighting effect over a large area

A very even area of light up to half A4 size (100mm × 300mm) or as small as 5mm × 10mm is produced in a variety of pure colours (red, green, orange, yellow) or multicolour.

New developments have demonstrated that, by using more than one device in a 'layered' format, it is possible to virtually eliminate the area of lower brightness apparent in the centre of very large panels. Total thickness of this design is approximately 5mm.

Very low current consumption

Emitting elements with drive requirements of 1-2mA are now available so that a simple 2 element backlight (4 dice) @ 5V D.C. or an 8 emitter device (16 dice) @28V can use as little as 2-4mA.

More typically, the low cost options will operate in the range 10-40mA, still considerably less current than alternative types of L.E.D. backlight. Further power reductions can be achieved by pulsing the emitters at higher currents for the appropriate duty cycle. This technique also offers the possibility of even greater brightness levels.

Sunlight viewable

When used with transmissive types of L.C.D., the **Royale** types of backlight provide an active display that is clearly visible in all lighting conditions including darkness, twilight, and direct sunlight. We believe this is the first time this useful function has become available.

Extremely cost effective

The product is designed to be used in all kinds of equipment from 'one offs' to quantities of several million and is suitably competitive in respect of price. The

company does not wish small volume users to be discouraged, so three production methods are used to allow maximum design and production flexibility.

Fully custom and really low tooling costs

Any shape or size can be made within reason, and tooling is frequently as little as £250 (400 U.S.\$). Very high volume projects are most likely to fall in the range £1,000 to £4,500 (1,500 to 6,800 U.S.\$). The current average is around £1,500 (2,300 U.S.\$)*.

Local manufacture (E.E.C.)

A major advantage to European customers is the ease of transportation, lack of inter-governmental interference, and particularly strict controls concerning product quality. (ISO 9001).

Simple to apply

The backlights can be driven from either a low voltage D.C. supply or from a pulsed D.C. source. Only a current limit resistor(s) or constant current circuit is required.

Highly efficient, low heat output, small infrared signature

This kind of device uses the minimum number of L.E.D.'s for maximum backlighting effect.

Ongoing development from a professional manufacturer

OMC is long established and well known as a manufacturer and supplier of optoelectronic components. The Company listens to your requests and suggestions, as well as continually introducing new products and improvements on existing items.

Price examples

Prices can fall in the range £0.25 (USD \$0.38) for a standard, simple device to around £50 (80 U.S.\$) for a large and complex 'one-off'.

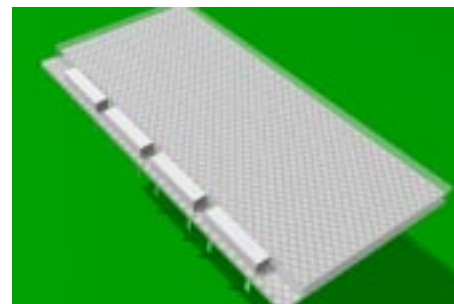
* Correct at time of going to print

Types of LED backlight

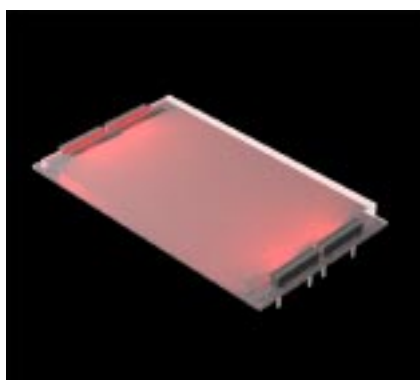
Conventional Edge Lit Backlights



Conventional backlighting is edge lit. It is now possible to use through hole or surface mount side firing LED's.

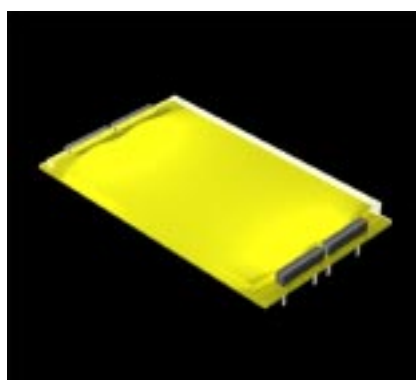


Conventional Backlight with White Reflector



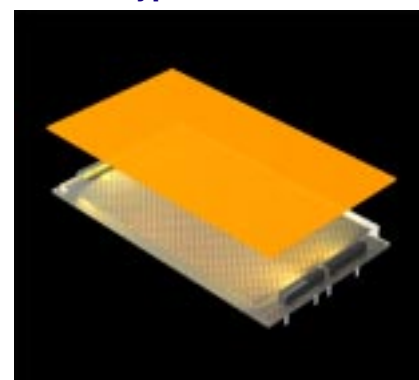
*Low cost

Conventional Backlight with Coloured Reflector



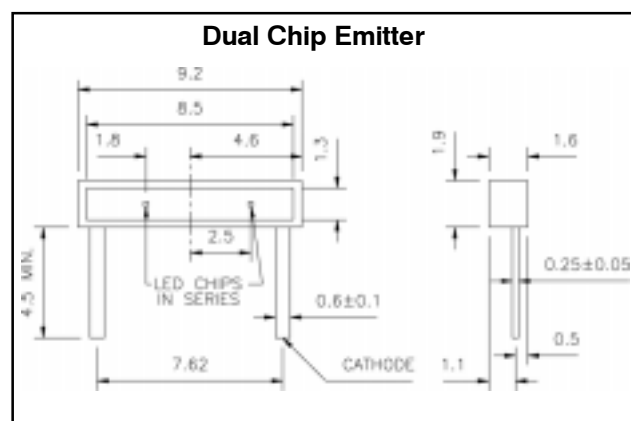
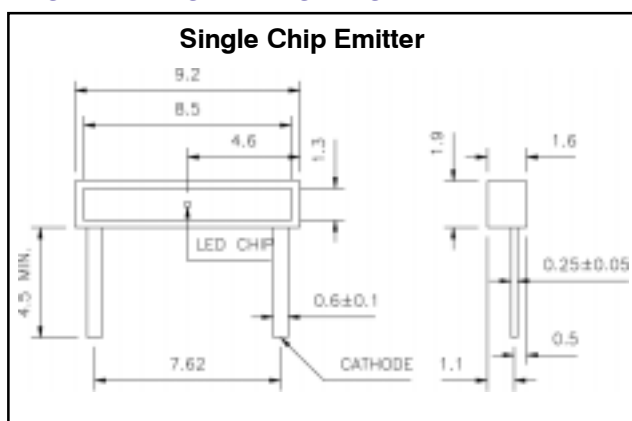
*Sunlight viewable

"SMS™" - Simulated Multi Source Type with Diffuser

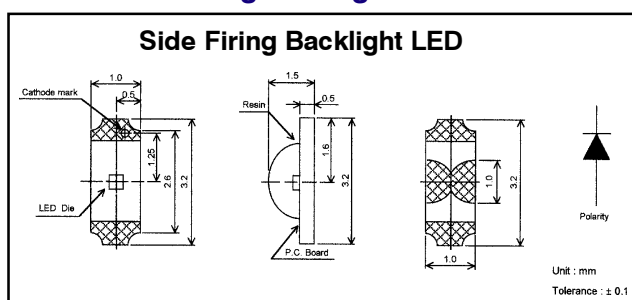


*Very even illumination

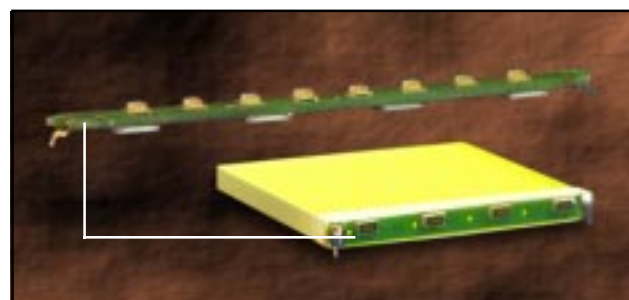
Edge Emitting Backlighting LEDs



Surface Mounting Backlight LED



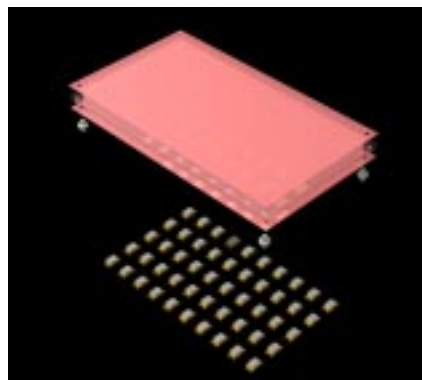
2nd Generation Backlighting using surface mounting LEDs



“Superdiffuser™” Backlights

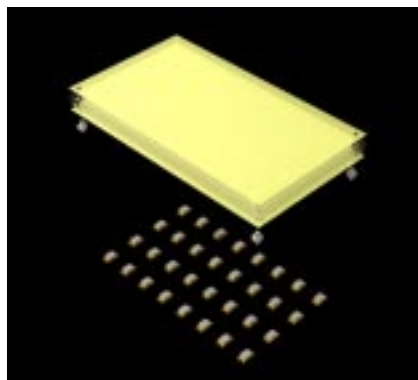
There are also three different types of “Superdiffuser™” Backlights, which use SMD LEDs. These are:

1mm Thick “Superdiffuser™” Backlight Using SMD LEDs



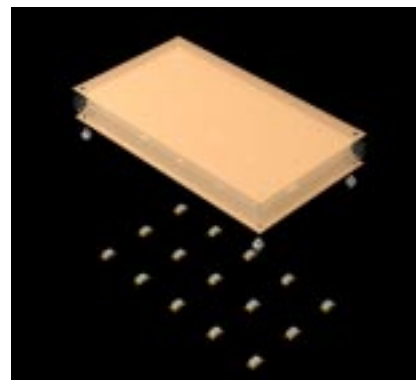
Use when LEDs are very close together

2mm Thick “Superdiffuser™” Backlight Using SMD LEDs



Use with medium LED population

3mm Thick “Superdiffuser™” Backlight Using SMD LEDs

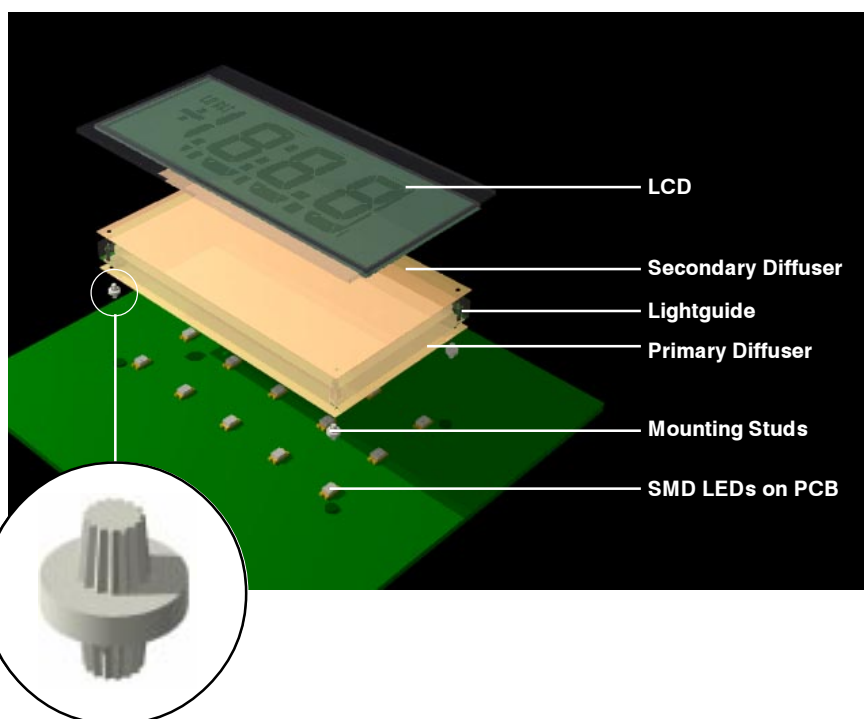


Use with low LED population.

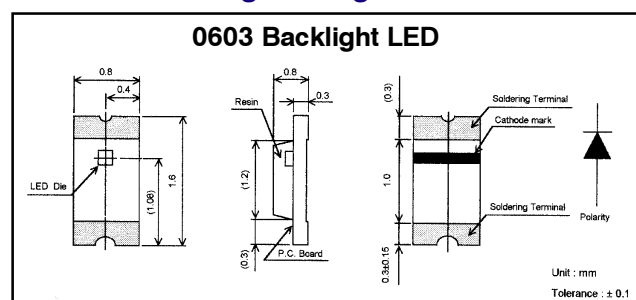
Other thicknesses are available to special order. (The thicker the panel, the smaller number of LEDs needed to get even illumination).

For use with surface mount LEDs

- The brightest possible backlight with outstanding uniformity.
- Using LEDs behind the LCD provides a heat source.
- “Superdiffuser™” technology allows the lowest possible height of backlight. (<2mm with 0603 style LED).
- Three different thicknesses of “Superdiffuser™” allow a wide range of brightness and uniformity options.



Surface Mounting Backlight LED



Integral Reflector - multicolour custom backlights

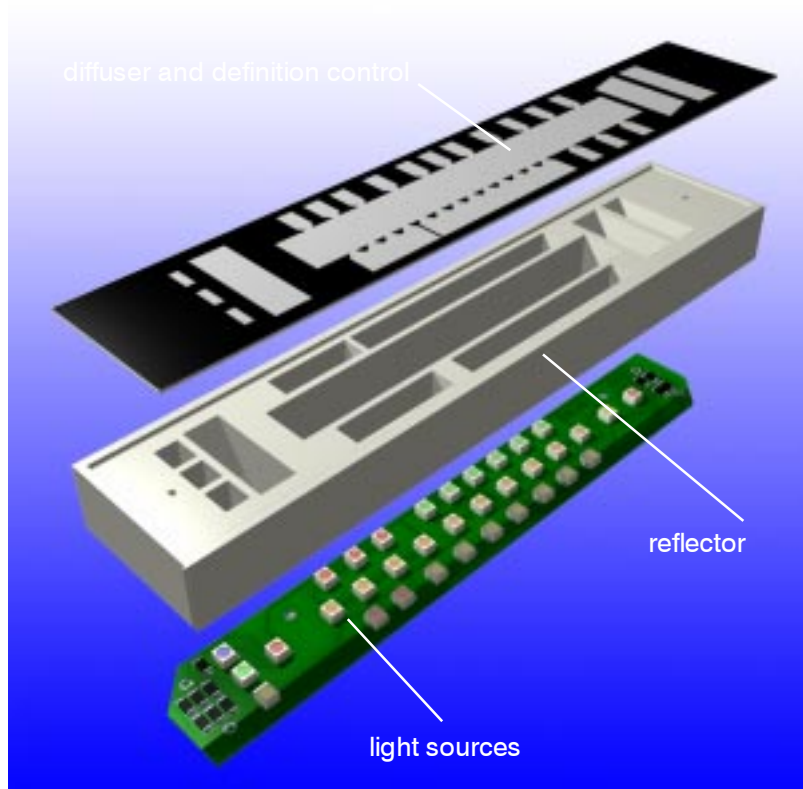
**DOES YOUR FRONT PANEL
LOOK THIS FANTASTIC?**

These superb multi-colour bar arrays combine our displays and diffuser technologies with a negative image LCD to provide a stunning result at a very competitive cost.



Our unique diffuser and reflector technology allows us to produce you a cost effective display solution. Each project is customer specific.

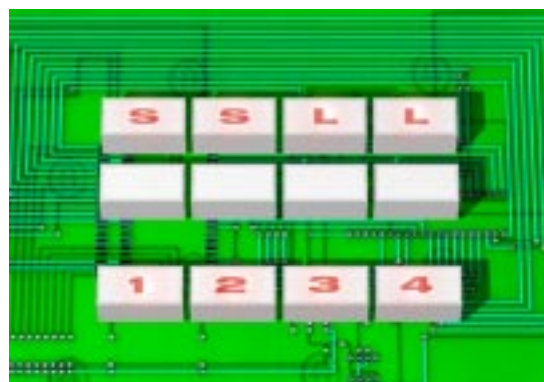
Contact our sales support group for more information.



Solid State Legend Lamps

Our unique diffuser system lets you have high performance light bars - with legends printed on them at less than the list price of our competitors' standard products.

If your quantity is modest - don't worry, we can accommodate any volume above 1k pieces



SS-Series Solderless LCD Holders with Integral Backlighting Option



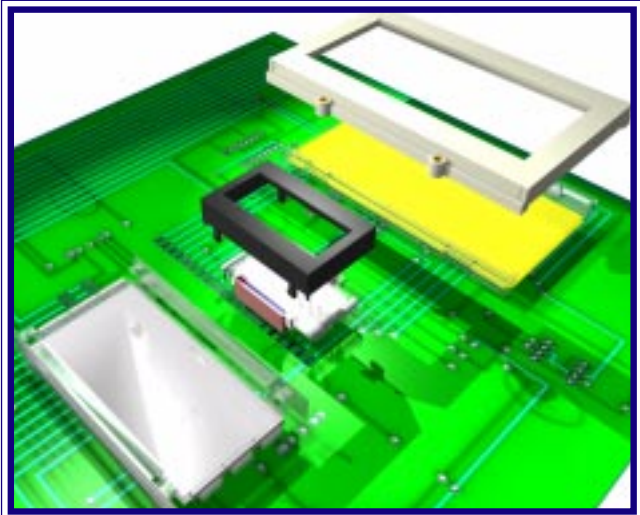
Introduction

“As from today all other LCD fittings should become obsolete”

- 5 seconds assembly time
- No LCD alignment required
- No pins - lower cost
- Optional bezel can be any colour*
- NRE for custom similar to any other LCD option
- Available for existing LCDs
- Integral edge-lit backlighting optional
- Special diffuser available for SMD backlighting

* A modest MOQ may apply

**SS-Series Currently Available in 3 Styles:
1 Part Snap Fit, 2 Part Snap Fit, 2 Part Screw Fit**



SS-Series LCDs connect simply to a PCB in just a few seconds. They use the kind of compressible elastomeric connectors that have been tried and tested

in LCD modules for over a decade. The difference is in the way in which the whole module is fixed to the circuit board, saving both time and cost.

So, How Does It Work...

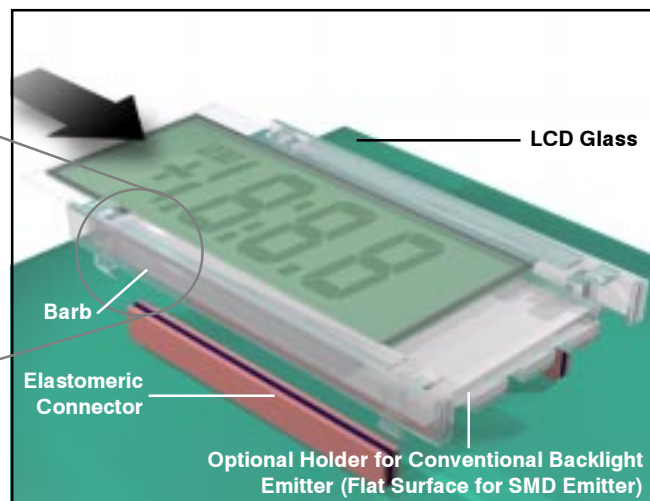
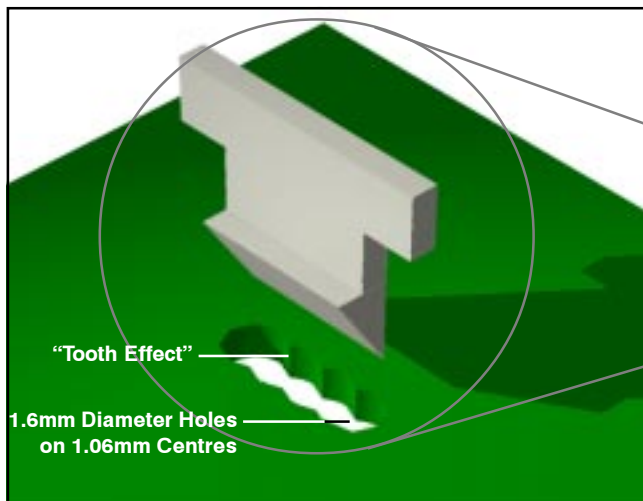
There are three types:

SS-Series Single Piece Snap Fit with Optional Bezel

Connects to the PCB in under 5 seconds using the specially designed barb system. (UK Patent File Ref: 9703730.3)

The PCB is drilled with overlapping holes of specified size. When the barb is inserted into the holes, connection is made in two ways. Firstly the flat, top

surface hooks underneath the PCB, holding the device in place. In addition, the “teeth” formed by the overlapping holes, bite into the special material from which the LCD holder/connector is made, gripping it firmly and providing secondary retention.

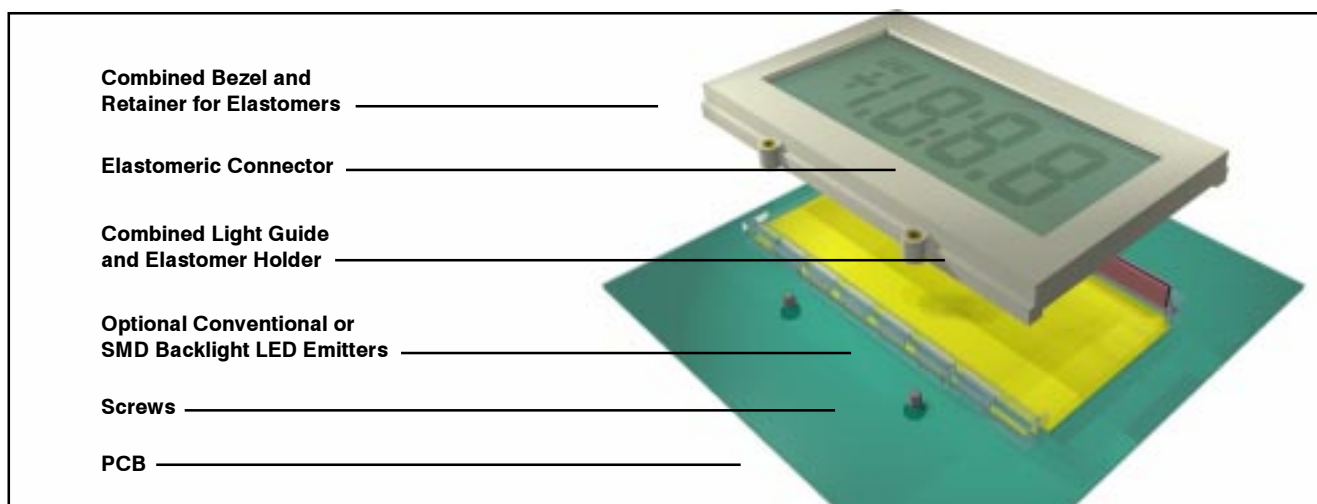


SS-Series Solderless LCD Panels

Two Piece Screw-Fit Holder With Integral Bezel

The operation of this two-part device is straightforward and reliable. The elastomer guide serves a dual purpose as positioning device for the LCD and

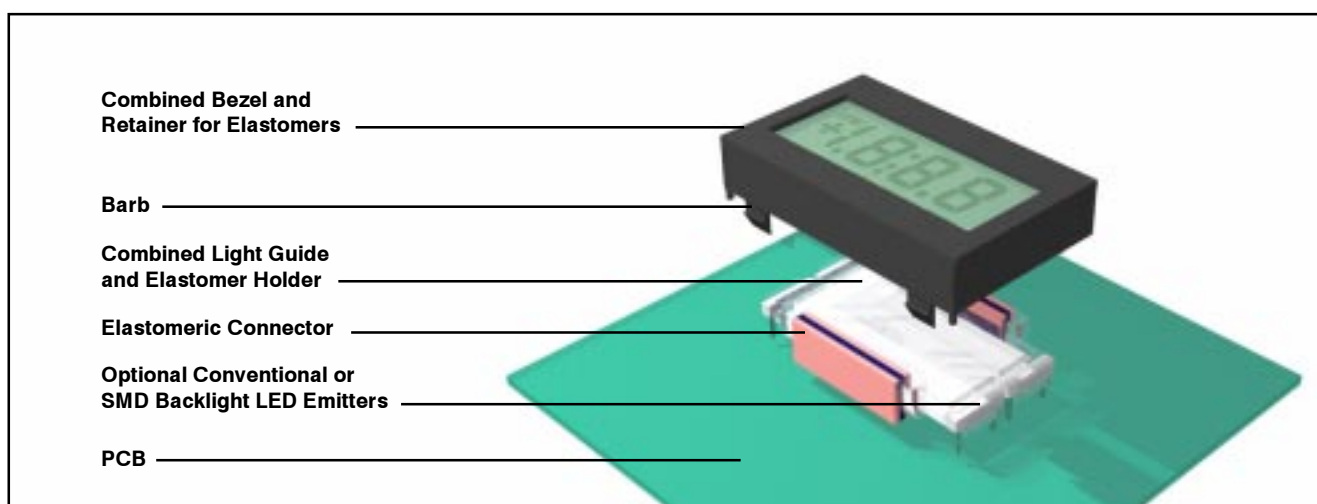
can be supplied processed to act as a lightguide and reflector for backlighting. The screw-fit bezel is particularly strong and therefore suitable for large LCDs.



Two Piece Snap-Fit Holder With Integral Bezel

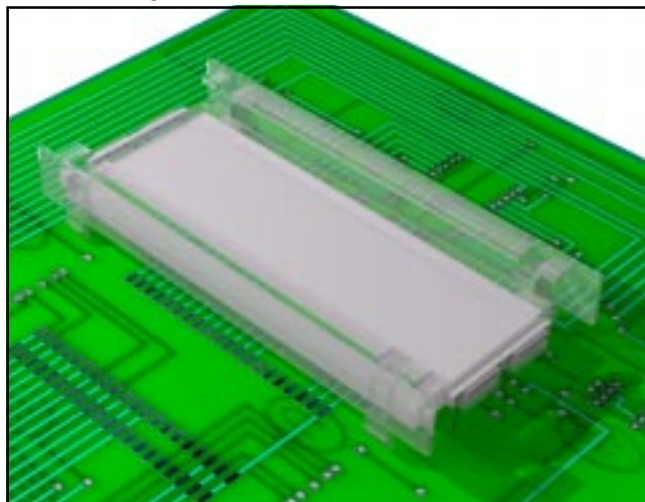
This model is principally designed for small LCD panels. The elastomer is compressed by the bezel which is retained using the barb system (UK Patent File Ref: 9703730.3). The elastomer guide and LCD support have

the additional function, if required, of acting as a light guide for backlighting with conventional or SMD side firing LED emitters.

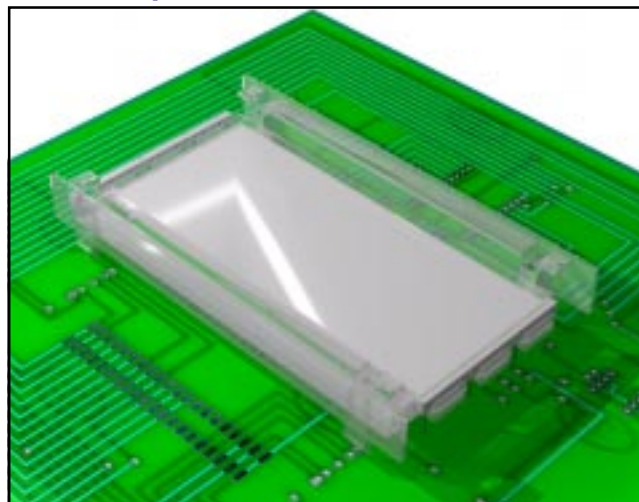


SS-Series Solderless LCD - Package Dimensions

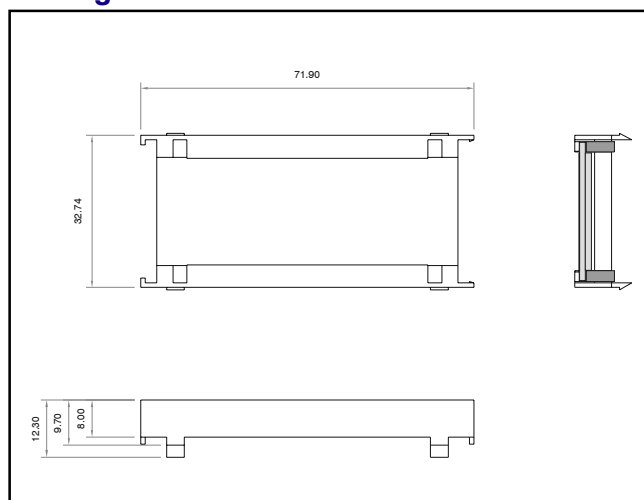
1 Part Snap Fit LCD Holder - 1000 & 1002



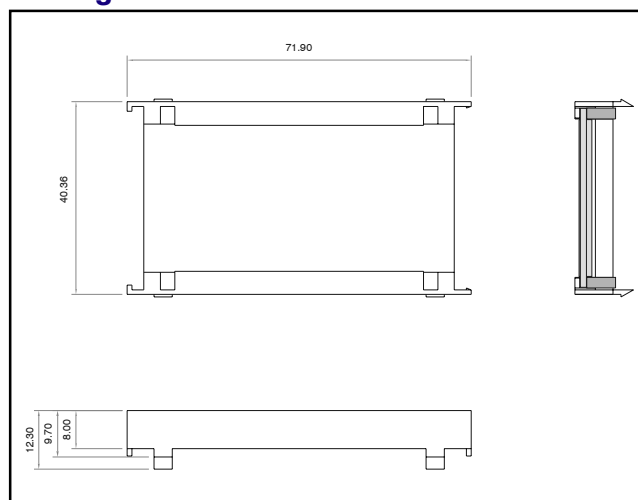
1 Part Snap Fit LCD Holder - 1001



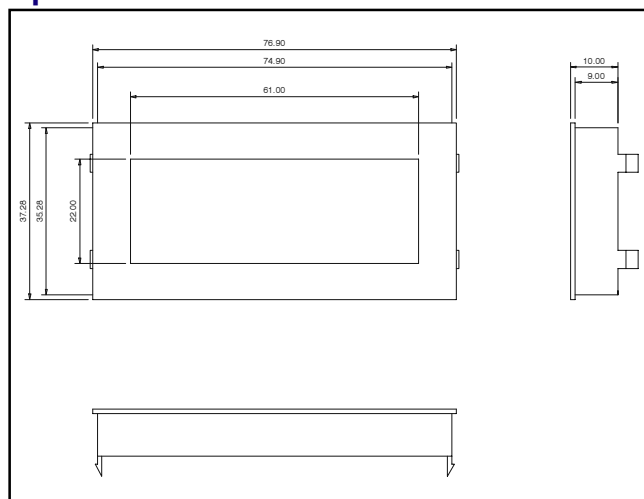
Backlight Dimensions - 1000 & 1002 Series



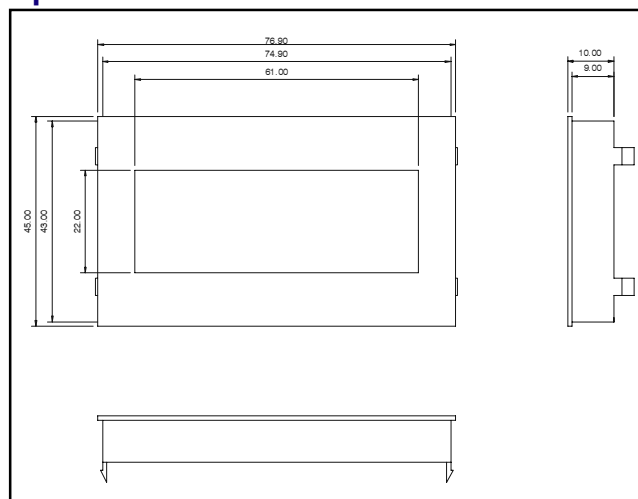
Backlight Dimensions - 1001 Series



Optional Bezel Dimensions

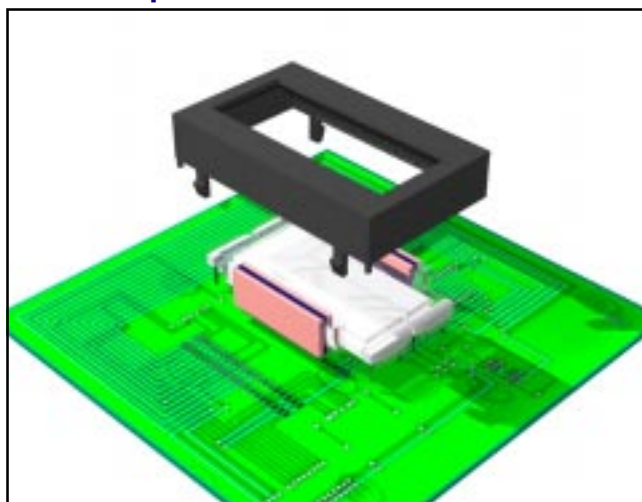


Optional Bezel Dimensions

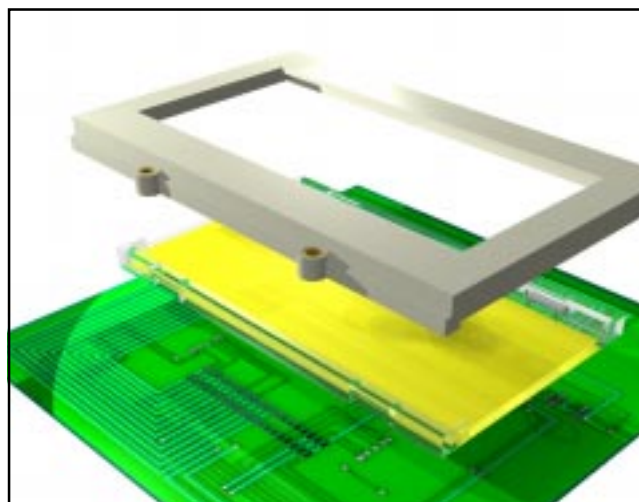


SS-Series Solderless LCD - Two Part, Special

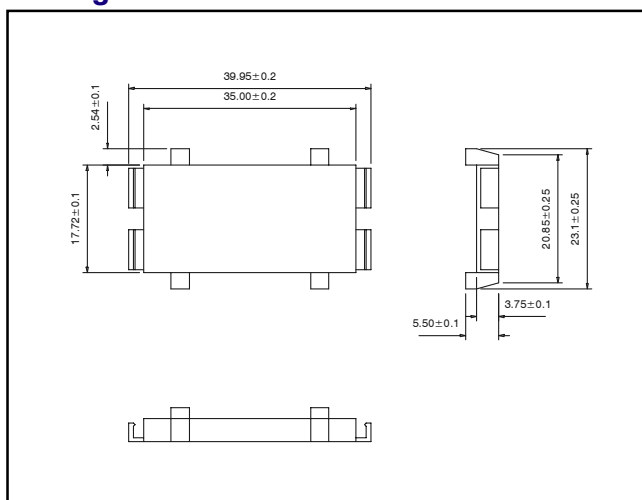
2 Part Snap Fit LCD Holder with Bezel.



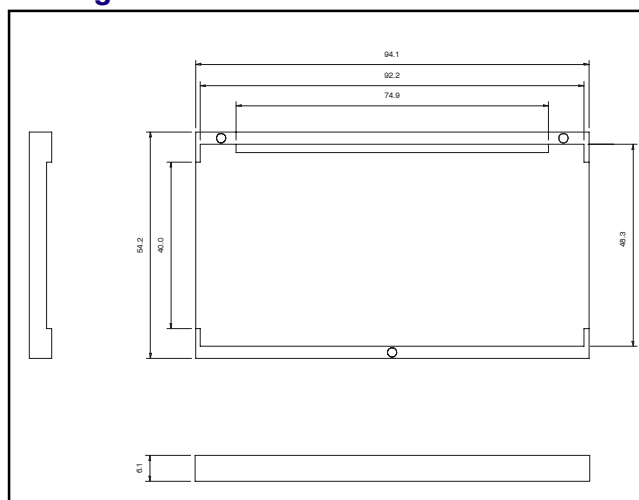
2 Part Screw Fit LCD Holder with Bezel.



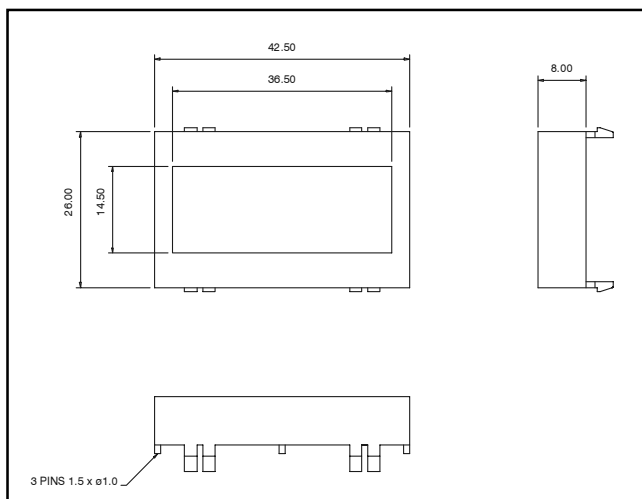
Backlight Dimensions



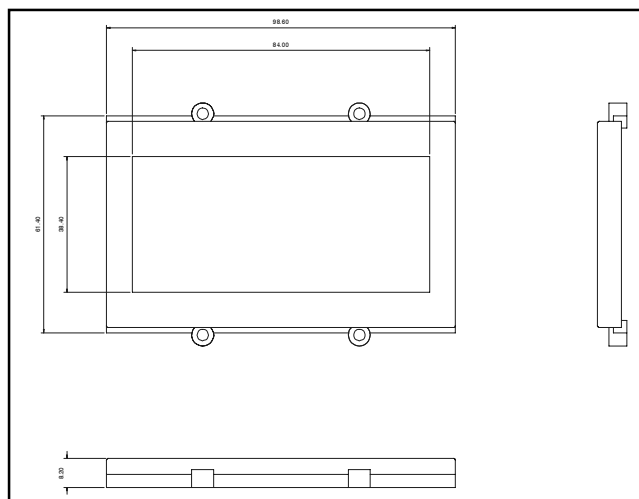
Backlight Dimensions



Bezel Dimensions

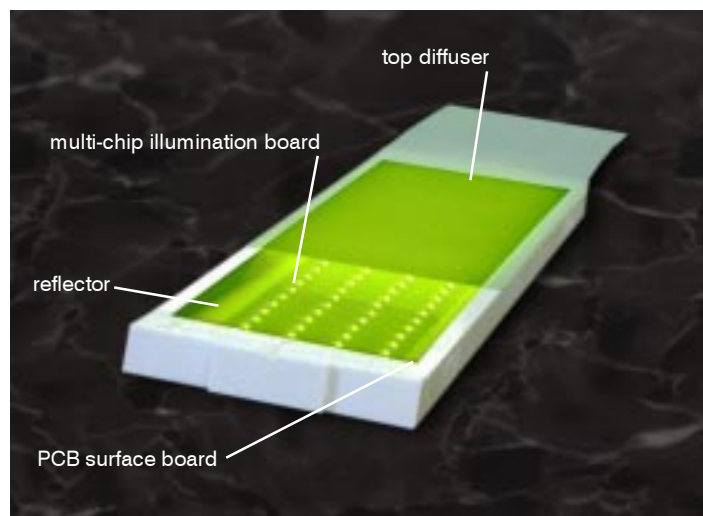


Bezel Dimensions

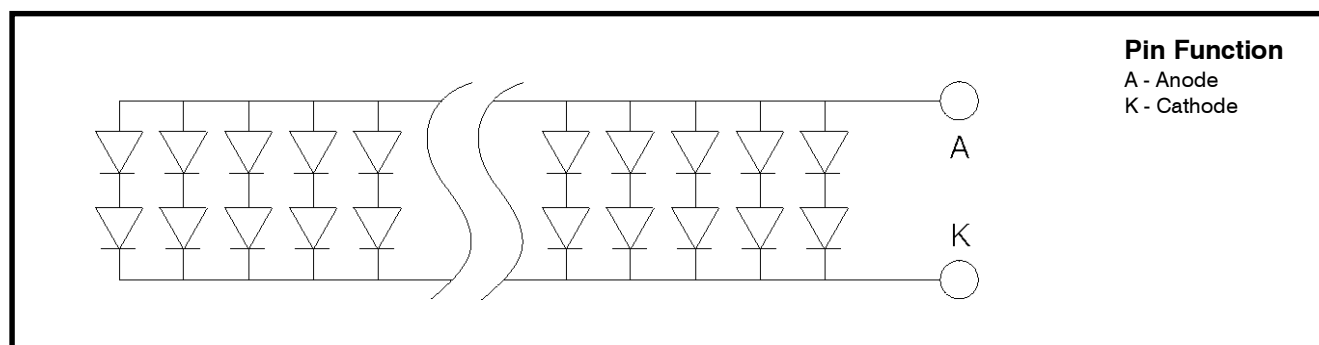


Fully populated chip-on board backlights

- **Low current requirements**
- **Excellent character appearance**
- **High Light Output**
- **IC Compatible**
- **Low Profile**



Circuit Diagram



Examples of standard sizes*

*Please contact the factory for the latest sizes available.

DIMENSIONS	LED CHIP		PEAK WAVELENGTH @20mA(V)	FORWARD VOLTAGE @1140mA(V)		LUMINOUS INTENSITY @1140mA(cd/m ²)	
	MATERIAL	EMITTING COLOUR		TYP.	MAX.	MIN.	TYP.
51.4 x 144.4 x 0.6mm	GaP	GREEN	567	4.2	5.2	160	240
51.4 x 144.4 x 0.6mm	GaAsP ON GaP	YELLOW	585	4.2	6.0	105	160
51.4 x 144.4 x 0.6mm	GaAsP ON GaP	HIGH EFFICIENCY RED	635	4.2	6.0	120	180
18.0 x 69.0 x 4.05mm	GaP	GREEN	567	4.2	5.2	160	240
18.0 x 69.0 x 4.05mm	GaAsP ON GaP	YELLOW	585	4.2	6.0	105	160
18.0 x 69.0 x 4.05mm	GaAsP ON GaP	HIGH EFFICIENCY RED	635	4.2	6.0	120	180
18.0 x 69.0 x 4.05mm	GaP	GREEN	567	4.2	5.2	160	240
18.0 x 69.0 x 4.05mm	GaAsP ON GaP	YELLOW	585	4.2	6.0	105	160
18.0 x 69.0 x 4.05mm	GaAsP ON GaP	HIGH EFFICIENCY RED	635	4.2	6.0	120	180

Recommended handling precautions for Backlights

(i) Anti-static handling

Whilst the L.E.D. devices are not generally considered to be static sensitive, we recommend the use of standard anti-static handling procedures. Statistical research has shown these precautions can enhance long-term reliability and M.T.B.F.

(ii) Soldering

Inappropriate soldering will cause backlight failure. You must check your soldering system to ensure the delicate, miniature LEDs are not being damaged. Use low melting point solder. (Controlled hand soldering is recommended). Always pre-form the LED legs *before* PCB insertion making sure the LED is *not* used as a fulcrum. (If you have stress applied to the LED legs, then the wirebond can break as the plastic case of the device may soften during soldering and the leadframe can move).

Absolute Maximum Soldering Conditions:

260 deg C for 5 seconds at least 2mm from the base of LED body. (Note: in through plated holes, the nearest point to the base of the LED should be considered the point of soldering).

Nearly all backlights have customer specified dimensions. It is possible to ensure, through design, that the LED is far enough from the heat source, but it is essential that the customer makes us aware of special requirements if this is necessary. Our standard design assumes a PCB without through hole plating, minimum 1.6mm thick and soldered on the non-component side. To reduce stresses, a 1mm PCB hole is suggested.

We also manufacture a stress relieving assembly aid which is strongly recommended.

(iii) Leg bending and general handling

The L.E.D. emitting element is a miniature component and in order to maintain long term reliability and device integrity, gentle handling is most important. In the event of leg bending or indelicate handling, stresses can be communicated to the wire bonds.

(iv) Device cleaning

Use alcohol based cleaners such as Isopropyl Alcohol (Isopropanol) or equivalents. It is important that users assess the compatibility of their cleaning systems before using this product.

Do not use solvent cleaning agents, such as Trichloroethane, as these may remove the special backing layers on the acrylic light guide, reducing the effectiveness of the device.

We will modify our screen printing process or use alternative materials for light guides in consultation with customers who have special requirements.

(v) Over current protection

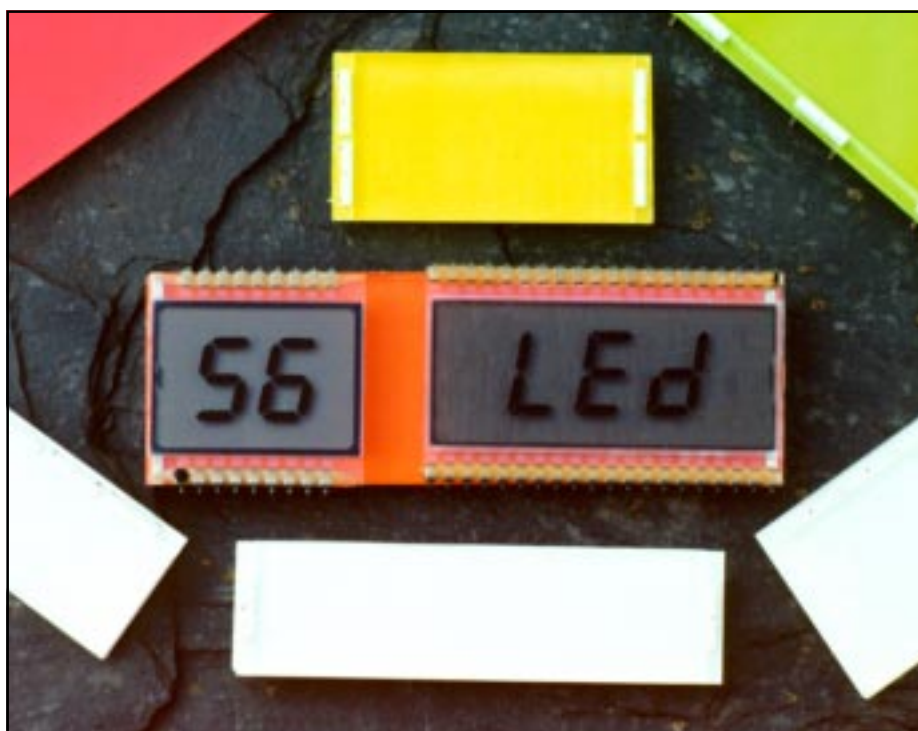
Current limiting must be incorporated into circuit design. Overdriving the L.E.D.s will reduce life and reliability. Some suggested circuits are detailed on page 19 (Fig.4).

(vi) Homogeneity of L.E.D. light output

The L.E.D. emitters are selected for uniformity of brightness at the specified current. Use the highest D.C. supply voltage available within specifications and connect the maximum number of emitters possible in series. Higher supply voltages reduce forward current differences resulting from L.E.D. forward voltage variations. This method also reduces forward current demand.

(vii) Exposure to U.V. light

Continual direct exposure to sources of U.V. light will tend to de-activate the phosphor on **Royale** models.



Applications

Some Suggested Backlight types for popular LCD glass sizes

LCD Description		Approximate viewing area (mm) of LCD	Suggested Backlight Model(s)
Digit Height	Number of Digits		
8.89mm (0.35")	4	13 x 46	S003 05 or S036 04
10.14mm (0.40")	5	18 x 46	S003 05, S007 04 or S038 04
12.70mm (0.50")	2	16 x 22	S003 03
12.70mm (0.50")	3½	18 x 46	S003 05, S007 04 or S038 04
12.70mm (0.50")	4	18 x 46	S003 05 or S007 04
12.70mm (0.50")	6	18 x 63	S003 07 or S005 02
12.70mm (0.50")	8	18 x 90	S003 09
15.24mm (0.60")	5	24 x 63	S004 07, S008 06 or S037 06
17.78mm (0.70")	3½ or 4	24 x 63	S004 07, S008 006 or S037 06
17.78mm (0.70")	5	24 x 75	S004 08 or S006 04
17.78mm (0.70")	6	24 x 88	S004 09

Select the best Backlight for your application

The above chart is by no means comprehensive and is for illustration purposes only. The most important feature of this range of backlighting devices is the ease with which it can be customised, *with no minimum order quantities and minimal tooling costs*. Custom and standard backlights cost the same.

The application pages cover the various aspects of this technology including:-

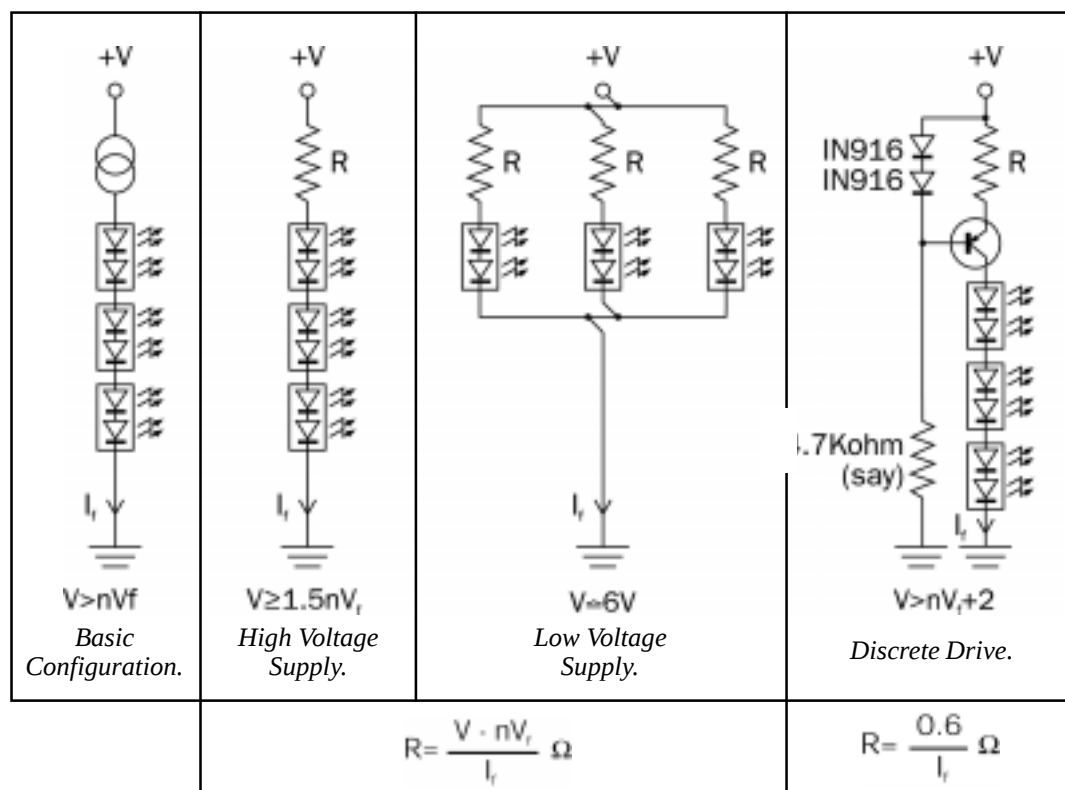
- the way the light diminishes in intensity with distance from the source.
- reactions of the human eye to variations in brightness.
- considerations of price versus performance.

Custom design accounts for over 80% of the backlights produced since their launch in 1990.

The variation is almost unlimited. Some backlights have been made purely with price in mind. Such designs are fully functional and aesthetically acceptable, but above all constitute the lowest cost of incorporating a backlight which is reliable and offers long life. Other backlight models have been produced where performance, not price, has been the primary consideration. In either case, this technology offers the most appropriate solution and is combined with straightforward assembly into the end product.

Applications

Fig. 4. Possible drive configurations for backlights.



n is the number of emitters in series (dependent upon the supply voltage available). V_f is the forward voltage across one emitter. I_f is the forward current required. R is the value of current limit resistor. V is the supply voltage.

As with all LED applications never connect several emitters in parallel with a single current limit resistor to supply. Variations in forward voltage may cause "current hogging" and reduce lifetime as well as causing unevenness of illumination. See the "Low Voltage Supply" example for correct parallel connection.

The measurement of light output of Backlights

There is little or no reason to use a non specific measuring system for this range of products. It is an item which, in over 90% of applications, relies totally upon a human eye interpretation of its suitability.

OMC has elected to measure light output as a grid map of variable optical power over the surface of the backlight. The resolution of the intensity map will vary according to individual customer demands and is supplied on request as a sample measurement.

The absolute measurement is defined as follows...

The total light output as measured into an area of 0.786mm^2 with acceptance angle of 60° , at the top surface of the panel.

The light output power is specified in microwatts or dBm (dB below 1mW).

The conversion factor for microwatts per sq. centimetre is ($\times 127.23$).

The conversion factor for microwatts per sq. millimetre is ($\times 1.272$).



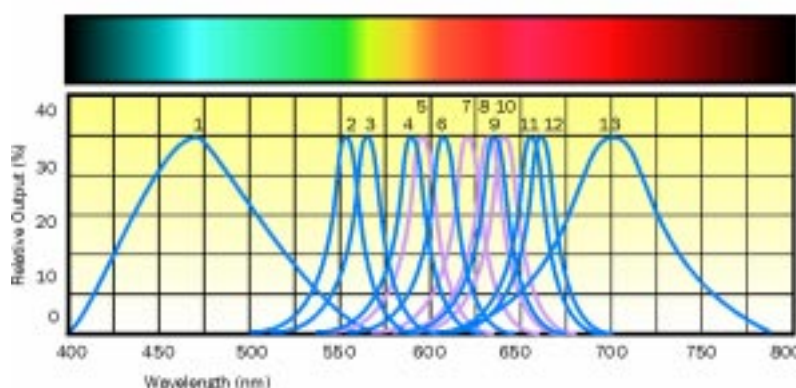
Definition of measurement system

Applications

Selection of standard semiconductor device types				
Designation in part number		Colour description	Wavelength (nm)	Comments
	SB	Bright Blue	470nm	Blue is now approaching intensity levels of high efficiency colours.
	PG	Pure Green	555nm	An excellent emerald green colour. Not as bright as type 02.
	02	High Performance Green	567nm	High brightness 'yellow-green' light. Very cost effective.
	SG	Superbright Green	567nm	The brightest green available. Quite close in intensity to superbright red.
	03	High Performance Yellow	585nm	A good, consistent yellow. Can offer tight colour match at extra cost.
	UY	Ultrabright Yellow	585nm	The brightest yellow available. Equivalent in brightness to Ultrabright Red (UR)
	08	Sunset Orange	610nm	This is a true, bright orange, as its title & description suggest.
	S8	Superbright Orange	615nm	An extremely bright option with orange/red appearance.
	04	High Efficiency Red	635nm	The industry standard bright red. (Sometimes called orange)
	07/7M	Superbright Red	660nm	A very bright, deep red. (Cost effective.) 7M is lower brightness & lower cost
	UR	Ultrabright Red	660nm	The best devices so far. A deep very, very bright red.
Low current devices				
	2L	5mA Yellow/Green	565nm	Emits useable light at 5mA. Very useful for small panels.
	GL	2mA Yellow/Green	565nm	Emits useable light at 2mA. Use higher I _f for larger panels.
	3L	5mA Yellow	585nm	Emits useable light at 5mA. Very useful for small panels.
	YL	2mA Yellow	585nm	Emits useable light at 2mA. Use higher I _f for larger panels.
	4L	5mA High Efficiency Red	635nm	Emits useable light at 5mA. Very useful for small panels.
	UL	1mA Red	660nm	Emits useable light at 1mA. Use higher I _f for larger panels.
	7L	2mA Red	660nm	Emits useable light at 2mA. Use higher I _f for larger panels.

Please note it is impossible to simulate the true light output in the printing process.

CURRENTLY AVAILABLE STANDARD EMITTING WAVELENGTHS



Key:

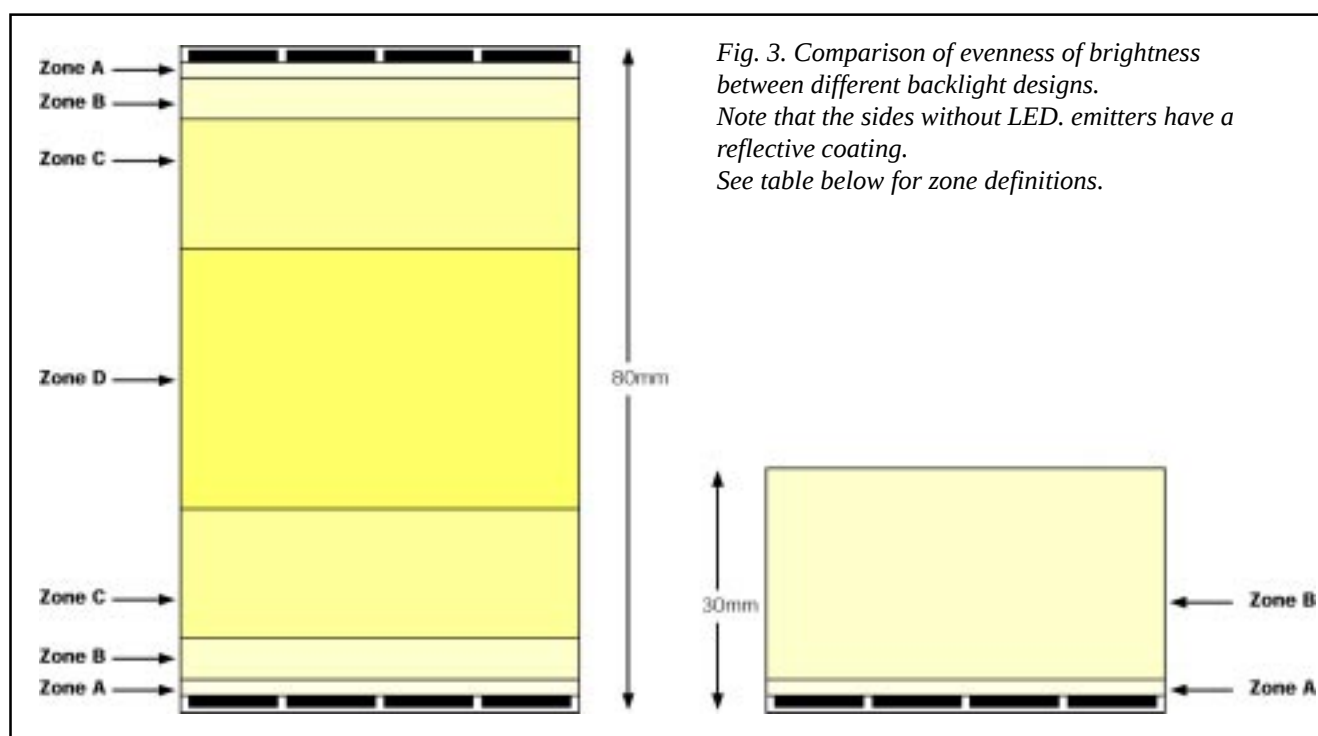
- 1: BL
 - 2: PG
 - 3: 02/SG/2L/GL
 - 4: 03/3L/SY
 - 5: Ultrabright Yellow*
 - 6: 08
 - 7: Ultrabright Orange*
 - 8: Ultrabright Reddish Orange*
 - 9: 04/4L
 - 10: Ultrabright Red*
 - 11: 01
 - 12: 07/UR/7L/UL
 - 13: 05
- *from the Micron Plus™ range

The design of an applications specific (custom) Backlight

Step one - Ring our design experts or e-mail us on omc@optomanfcorp.com

80% of our backlights are custom manufactured. To illustrate the importance of proper development, Fig. 3. shows how the overall design can change the illumination properties of certain areas of the panel.

It is clear from Fig. 3. that the larger panel would benefit from a different location of emitters, such as the two 80mm sides. These could be either in addition to, or instead of, the emitters shown.



The figures given in the table below approximate to actual measurements of luminous intensity from practical experiments with devices similar to those in Fig. 3.

There are a variety of extremely effective techniques developed by **OMC** designed to improve the evenness of illumination of backlight panels.

Zone A can be included in the design as part of the overall border area but is not normally used unless there are severe space restrictions.

When initiating a backlight design with **OMC** it is best to start with emitters on all sides. Fig. 2. on page 4 shows all four possible locations of emitters. Using a preliminary sample from **OMC** containing the maximum number of emitters, start with them all illuminated. Gradually turn them off to find the minimum number required

to give the brightness and evenness needed for the lowest cost. The process takes just a few minutes.

The total time scale from initial enquiry to final sample approval can be as little as 4-6 weeks, allowing for the two sets of samples to be made.

	Brightness Variation Across Zone		Special Note
	Large Model	Small Model	
Zone A	Zone A is the very small bright area, about 2mm wide, close to the emitters.		
Zone B	3dB	1.5dB	Brightness Variations of 1.5 and 2.0dB are not visible to the average human eye. A variation of 3.0dB begins to show as slightly uneven.
Zone C	3dB	N/A	
Zone D	2dB	N/A	

In Summary

We have summarised your options for using LED backlights in these pages, but you are best to contact us now to finalise the design.

Don't struggle with the concept yourself We have been designing and making this kind of product for many years. Let our experts save you hours of pondering!

OMC believe LED's solve all backlighting problems:

- Low current (2mA - ?)
- High reliability (100K hours +)(Compare with <10K hours for EL)
- Low noise (No inverter compared with EL)
- Thin size (1mm +)
- Lower cost than any other option (Easy to drive, low component cost)
- All colours, including white

Other group products

OMC are *the* experts in **FRONT PANEL PRODUCTS**

For approaching two decades we have helped to give our customers' products the edge over the competition. No wonder we have received a number of business awards including the UK's **National Component Award for Innovation**.



Technical Overview

Principle of operation

OMC backlights have a number of unique features. They operate using the principle of *total internal reflection* within an optically clear plastic (normally acrylic) lightguide. Light is launched into the edge of a panel using specially designed, side firing L.E.D. emitters.

The light is conducted around the guide and, at the surface with the backing layer, is partially scattered and reflected thus allowing some light to escape through the top surface of the device.

In the **Royale** series, with active backing layer, this effect is further enhanced by the absorption and re-emission of both the internal light and, when available, ambient light as well.

By incorporating a filter into the active backing layer it is therefore possible to use the ambient light to increase the overall appearance of brightness and evenness of illumination. This is not possible using alternative active display technologies. A bright and effective area of light is produced which can be used to illuminate behind L.C.D. displays, front panel facias, switch covers and keypads, as well as many other applications, even in direct sunlight.

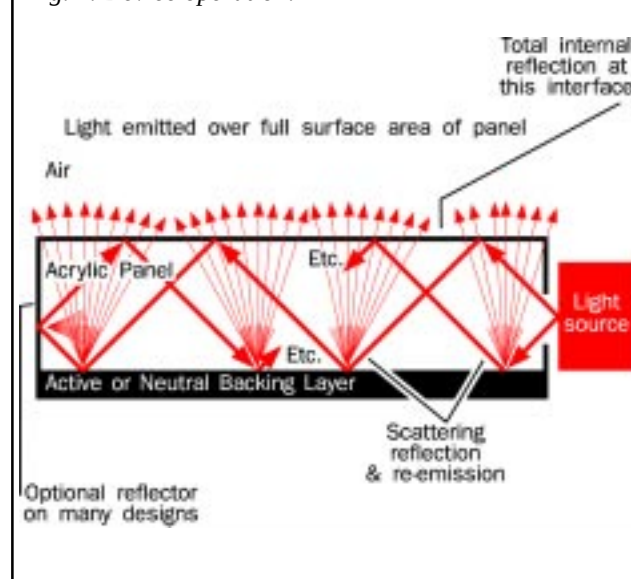
Size and evenness of illumination

Fundamental principles dictate that the overall performance of a backlight is dependent upon the number of emitters, their intensity, and the size of the lightguide.

The light diminishes in intensity from the light source in an approximate inverse square ratio, but a number of features can be applied to enhance the overall appearance such as incorporating a reflector on all, or some, sides of the panel. **OMC** has developed low cost methods of applying this as a standard option.

The L.E.D. emitters can be placed on opposite sides

Fig. 1. Device operation.



or all round the panel.

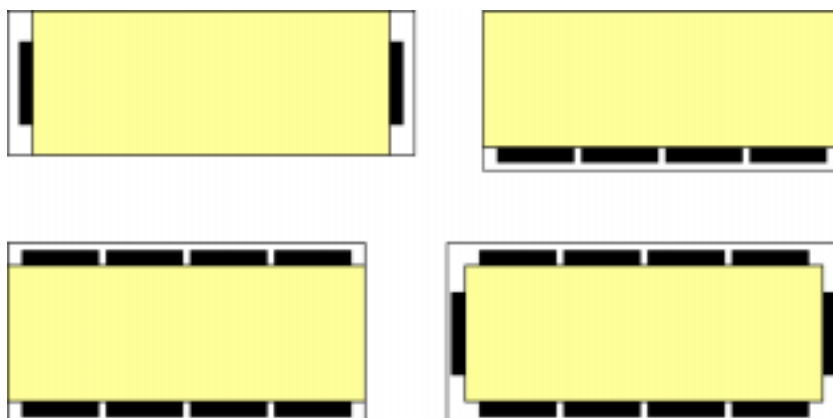
Another recently developed technique is to 'layer' two or more panels. This permits very large areas of up to half A4 size (100mm × 300mm) to be lit. Theoretically it is possible, using high intensity fibre bundle light sources and multilayering techniques, to produce huge panels with dimensions of, say, 1 metre × 2 metres.

Please see the applications section of this catalogue for more detailed information on these features.

Fig. 2. Possible emitter positions for a viewing area of 18mm × 50mm.

(Approximate 1 : 1 Scale.)

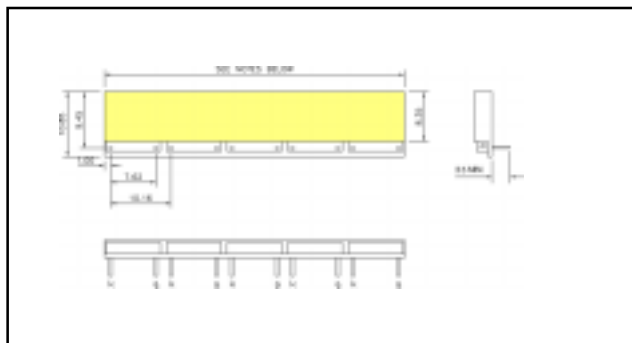
Brightness Zones are not indicated.



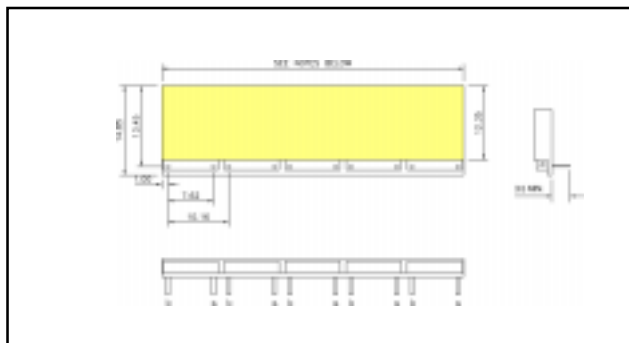
Conventional Edge Lit Backlights - Sizes

set heights & adjustable lengths*

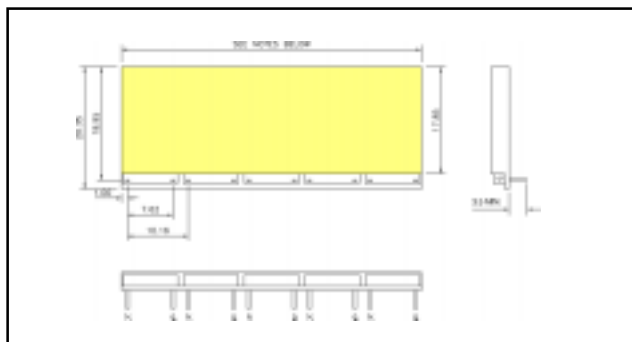
S001 Type



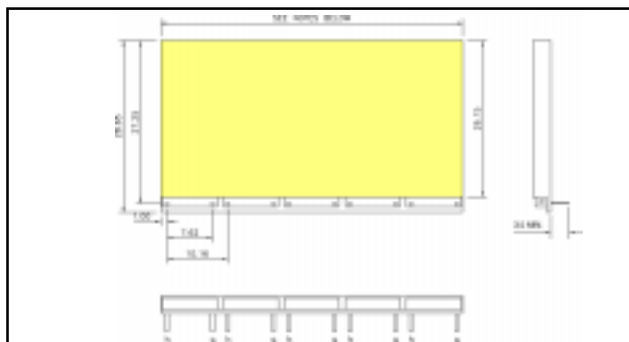
S002 Type



S003 Type



S004 Type



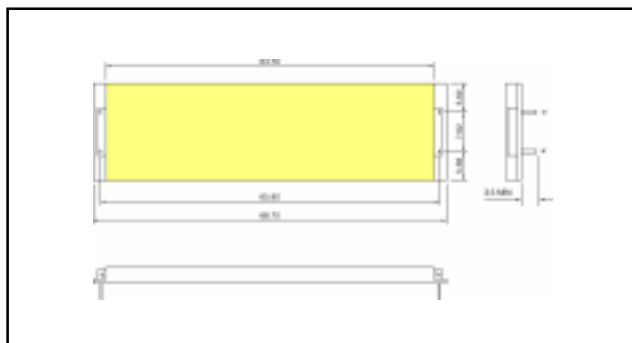
The length of the above backlights is determined by the number of emitting elements.

The table below gives lengths, of all the above, against number of emitting elements.

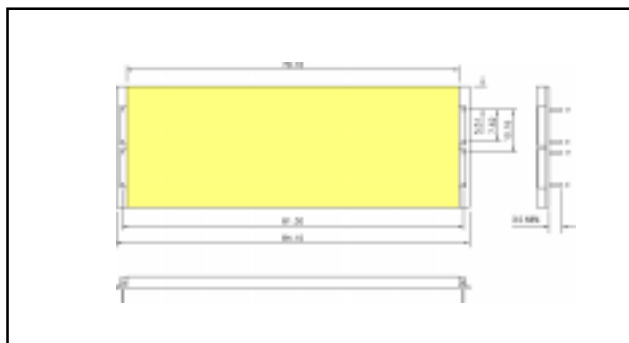
Nº of Elements	Length of Backlight (mm)
01	9.62
02	19.78
03	29.94
04	40.10
05	50.26
06	60.42
07	70.58

Nº of Elements	Length of Backlight (mm)
08	80.74
09	90.90
10	101.06
11	111.22
12	121.38
13	131.54
14	141.70

S005 Type



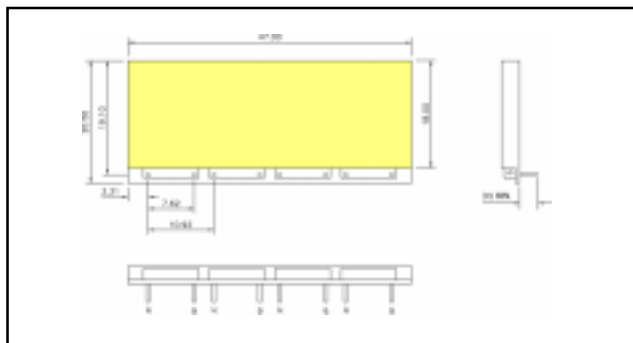
S006 Type



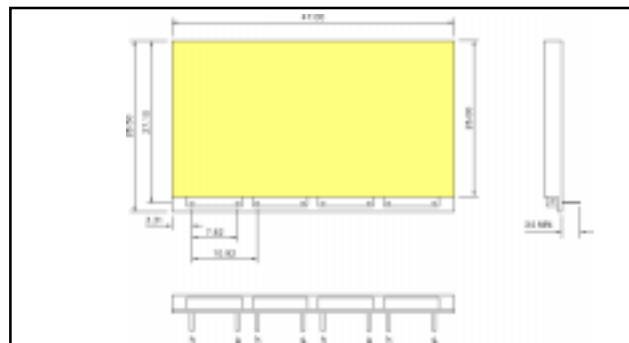
Conventional Edge Lit Backlights - Popular Sizes

set heights & lengths*

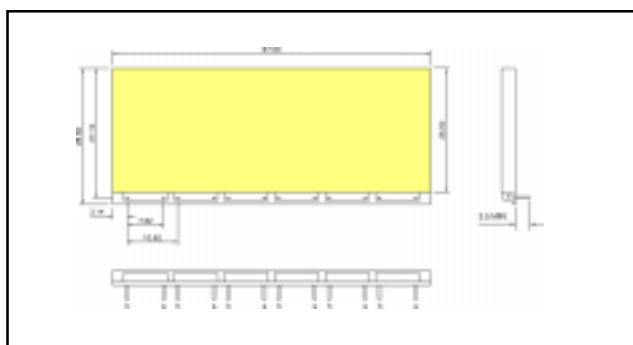
S007 Type



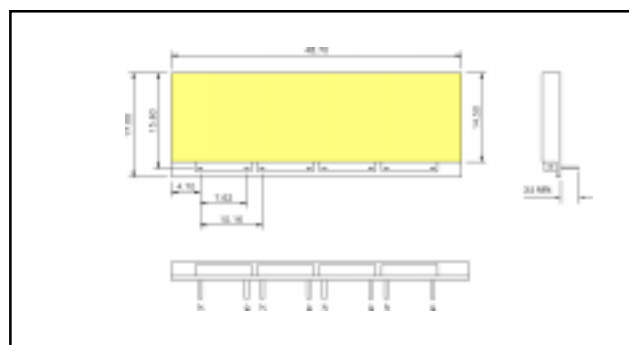
S077 Type



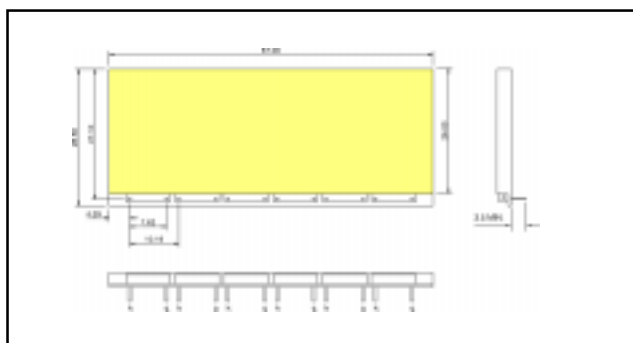
S008 Type



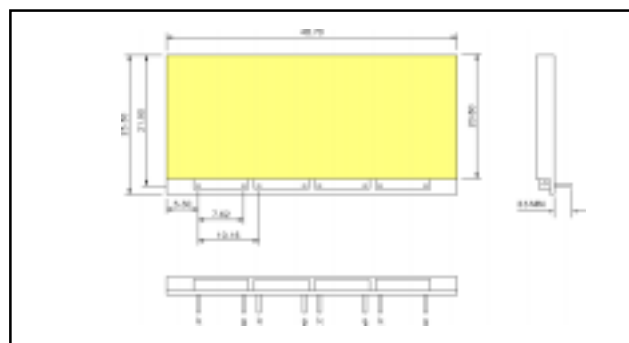
S036 Type



S037 Type



S038 Type



All dimensions given in millimetres.
Tolerance: ± 0.3 (unless otherwise stated).

a Denotes anode lead
k Denotes cathode lead

Recommended P.C.B. hole size: 1.0mm
Brightness zones are not indicated.

*** All Standard Backlights are 3mm deep $\pm 10\%$**

Standard Sizes* of Backlight

Available without setup costs * List is regularly updated

DWG N°/N° LEDs (LxWxD)	Dimensions	DWG N°/N° LEDs (LxWxD)	Dimensions	DWG N°/N° LEDs (LxWxD)	Dimensions
S001 01	9.62x10.58x3.00	S002 05	50.26x14.85x3.00	S030 14	81.28x53.43x3.00
S002 01	9.62x14.85x3.00	S003 05	50.26x20.35x3.00	S072 08	82.50x22.70x3.00
S003 01	9.62x20.35x3.00	S004 05	50.26x28.65x3.00	S093 16	82.74x46.00x3.00
S004 01	9.62x28.65x3.00	S056 05	50.26x20.50x3.00	S006 04	84.10x28.80x3.00
S001 02	19.78x10.58x3.00	S041 02	52.00x18.00x3.00	S082 06	85.00x43.40x3.00
S002 02	19.78x14.85x3.00	S062 08	52.30x28.50x3.00	S091 10	86.74x37.50x3.00
S003 02	19.78x20.35x3.00	S057 12	53.00x22.00x1.50	S001 09	90.90x10.58x3.00
S004 02	19.78x28.65x3.00	S050 02	54.00x16.00x3.00	S002 09	90.90x14.85x3.00
S083 03	21.8x19.40 Special	S029 04	55.88x14.50x3.00	S003 09	90.90x20.35x3.00
S092 02	24.00x11.00x3.00	S039 10	56.00x53.60x3.00	S004 09	90.90x28.65x3.00
S053 04	27.00x20.00x3.00	S087 05	56.42x31.08x3.00	S069 09	91.00x38.00x3.00
S043 02	29.00x15.00x3.00	S031 04	58.40x28.80x3.00	S071 32	92.00x92.00x3.00
S001 03	29.94x10.58x3.00	S066 06	60.00x60.00x3.00	S074 04	93.50x23.00x3.00
S002 03	29.94x14.85x3.00	S001 06	60.42x10.58x3.00	S040 18	93.90x43.65x3.00
S003 03	29.94x20.35x3.00	S002 06	60.42x14.85x3.00	S052 02	93.90x38.65x3.00
S004 03	29.94x28.65x3.00	S003 06	60.42x20.35x3.00	S070 18	94.40x54.20 Special
S026 02	30.00x22.00x3.00	S004 06	60.42x28.65x3.00	S058 04	96.00x45.00x3.00
S063 01	30.00x17.50x3.00	S084 06	60.42x25.00x3.00	S027 18	100.00x33.00x3.00
S080 02	30.00x15.00x3.00	S060 02	65.00x22.00x2.00	S081 20	101.00x31.00x3.00
S094 02	40.00x10.00x3.00	S008 06	67.00x28.50x3.00	S001 10	101.06x10.58x3.00
S001 04	40.10x10.58x3.00	S019 06	67.00x28.50x3.00	S002 10	101.06x14.85x3.00
S002 04	40.10x14.85x3.00	S037 06	67.00x28.50x3.00	S003 10	101.06x20.35x3.00
S003 04	40.10x20.35x3.00	S009 03	68.00x26.50x3.00	S004 10	101.06x28.65x3.00
S004 04	40.10x28.65x3.00	S005 02	68.70x18.80x3.00	S001 11	111.22x10.58x3.00
S073 04	42.00x25.16 Special	S048 06	69.02x23.10x3.00	S002 11	111.22x14.85x3.00
S051 04	44.00x27.00x3.00	S085 04	70.00x23.50x3.00	S003 11	111.22x20.35x3.00
S065 02	45.00x19.00x3.00	S001 07	70.58x10.58x3.00	S004 11	111.22x28.65x3.00
S068 02	45.60x15.00x3.00	S002 07	70.58x14.85x3.00	S001 12	121.38x10.58x3.00
S055 04	45.72x33.00x3.00	S003 07	70.58x20.35x3.00	S002 12	121.38x14.85x3.00
S049 04	46.00x23.00x3.00	S004 07	70.58x28.65x3.00	S003 12	121.38x20.35x3.00
S007 04	47.00x20.50x3.00	S078 02	70.90x18.00x2.00	S004 12	121.38x28.65x3.00
S018 04	47.00x28.50x3.00	S044 02	71.20x16.80x3.00	S001 13	131.54x10.58x3.00
S042 02	47.00x17.00x2.00	S078 02	72.00x18.00x2.00	S002 13	131.54x14.85x3.00
S077 04	47.00x28.50x3.00	S035 06	73.00x49.00x3.00	S003 13	131.54x20.35x3.00
S079 02	47.00x11.00x3.00	S089 22	73.92x56.14x3.00	S004 13	131.54x28.65x3.00
S036 04	47.50x17.00x3.00	S047 07	74.00x21.00x3.00	S001 14	141.70x10.58x3.00
S061 08	47.70x28.50x3.00	S045 14	80.00x75.00x3.00	S002 14	141.70x14.85x3.00
S076 08	48.00x38.90x3.00	S001 08	80.74x10.58x3.00	S003 14	141.70x20.35x3.00
S038 04	48.70x23.30x3.00	S002 08	80.74x14.85x3.00	S004 14	141.70x28.65x3.00
S090 04	48.70x25.00x3.00	S003 08	80.74x20.35x3.00	S088 12	143.00x32.00x3.00
S075 04	50.00x20.00x3.00	S004 08	80.74x28.65x3.00	S033 50	150.00x118.60x3.00
S001 05	50.26x10.58x3.00	S046 08	80.74x31.65x3.00	S059 50	262.60x69.09x3.00

THE NEW MICRON PLUS™ SEMICONDUCTORS

These ultrabright devices combine high intensity, low current, improved colour matching and very cost-effective prices.

These wavelengths are available now:

1. 593nm Ultrabright Yellow
2. 621nm Ultrabright Orange
3. 632nm Ultrabright Reddish Orange
4. 639nm Ultrabright Red

Contact us for latest developments

