

## ● FILAMENT REPLACEMENT LEDs - T1

## FEATURES

**202 SERIES**

PACK QUANTITY = 20 PIECES

- Direct replacement for French Style T1 MF SX3s
- Flat-topped for enhanced, even illumination of large lens areas
- Centre contact Anode as standard
- Reverse polarity available

## SPECIFICATIONS

Ordering Information &amp; Typical Technical Characteristics (Ta = 25°C)

Mean Time Between Failure = 100,000 Hours. Luminous intensity figures refer to the unmodified discrete LED.

| PART NUMBER    | COLOUR     | LENS                                                                                | VOLTAGE<br>DC<br>Vopr | CURRENT<br>DC<br>Iopr | LUMINOUS<br>INTENSITY<br>lv@20mA | WAVE<br>LENGTH<br>λp | OPERATING<br>TEMP<br>Topr | STORAGE<br>TEMP<br>Tstg |  |     |
|----------------|------------|-------------------------------------------------------------------------------------|-----------------------|-----------------------|----------------------------------|----------------------|---------------------------|-------------------------|--------------------------------------------------------------------------------------|-----|
| HIGH INTENSITY |            |                                                                                     |                       |                       |                                  |                      |                           |                         |                                                                                      |     |
| 202-301-21-38  | Red        |  | Water Clear           | 12                    | 20                               | 900                  | 660                       | -40 ~ +85^              | -40 ~ +85                                                                            | Yes |
| 202-325-21-38  | Yellow     |  | Water Clear           | 12                    | 20                               | 4300                 | 590                       | -30 ~ +85^              | -40 ~ +120                                                                           | Yes |
| 202-324-21-38  | Green      |  | Water Clear           | 12                    | 20                               | 7800                 | 525                       | -30 ~ +85^              | -40 ~ +100                                                                           | Yes |
| 202-934-21-38  | Blue       |  | Water Clear           | 12                    | 19                               | 2300                 | 470                       | -30 ~ +85^              | -40 ~ +100                                                                           | Yes |
| 202-998-21-38  | Cool White |  | Water Clear           | 12                    | 19                               | 4600                 | *see below                | -30 ~ +85^              | -40 ~ +100                                                                           | Yes |
| 202-301-23-38  | Red        |  | Water Clear           | 24-28                 | 20                               | 900                  | 660                       | -40 ~ +85^              | -40 ~ +85                                                                            | Yes |
| 202-325-23-38  | Yellow     |  | Water Clear           | 24-28                 | 20                               | 4300                 | 590                       | -30 ~ +85^              | -40 ~ +120                                                                           | Yes |
| 202-324-23-38  | Green      |  | Water Clear           | 24-28                 | 20                               | 7800                 | 525                       | -30 ~ +85^              | -40 ~ +100                                                                           | Yes |
| 202-934-23-38  | Blue       |  | Water Clear           | 24-28                 | 20                               | 2300                 | 470                       | -30 ~ +85^              | -40 ~ +100                                                                           | Yes |
| 202-998-23-38  | Cool White |  | Water Clear           | 24-28                 | 20                               | 4600                 | *see below                | -30 ~ +85^              | -40 ~ +100                                                                           | Yes |
| UNITS          |            |                                                                                     | Vdc                   | mA                    | mcd                              | nm                   | °C                        | °C                      |                                                                                      |     |

|            |                                     |       |       |       |
|------------|-------------------------------------|-------|-------|-------|
| <b>998</b> | *Typical emission colour cool white |       |       |       |
| x          | 0.296                               | 0.283 | 0.330 | 0.330 |
| y          | 0.276                               | 0.305 | 0.339 | 0.318 |

Intensities (lv) and colour shades of white (x,y co-ordinates) may vary between LEDs within a batch.

^ = Products must be derated according to the derating information. Each derating graph refers to specific LEDs. Appropriate LED numbers shown. - Refer to page 3.

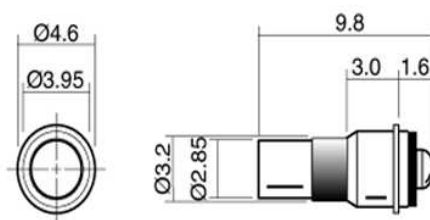
## How to Order:

website: [www.marl.co.uk](http://www.marl.co.uk) • email: [sales@marl.co.uk](mailto:sales@marl.co.uk) •

• Telephone +44 (0)1229 582430 • Fax: +44 (0)1229 585155

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## 202 Series



Dimensions in mm (Typical)  
Not to scale

Green dot on base of product signifies centre contact cathode -ve. Colour sleeve on product denotes LED colour.

## TECHNICAL INFORMATION

| Lamp Base Style           | Series | Metric Equivalent (mm) | Maximum Power Dissipation (mW) |
|---------------------------|--------|------------------------|--------------------------------|
| Sub-midget Flange T1 SX3s | 202    | 4                      | 360                            |

## DESIGN CONSIDERATIONS

### Single-Chip LEDs

All devices feature water clear high intensity LEDs as standard. The single chip LED devices have been modified by the removal of the domed portion of the encapsulation (flat-topped) to provide even illumination of switches and annunciators. Non flat topped versions are also available, please contact the sales department for details.

### Product Evaluation

Filament Replacement LEDs have been specifically designed to meet the primary objective of providing improved reliability. As this product range is suitable for both new-build and retro-fit, (sometimes in very old systems), a wide range of illuminated push button switches and lamp holders can be encountered. Due to subjectivity, evaluation of the LED type is recommended, (samples of all standard models are available). care should be taken to correctly simulate operating ambient light conditions to ensure that the correct device has been selected to maximise viewing characteristics such as viewing angle, colour compatibility and on/off contrast ratio.

### Electro-static Discharge (ESD)

Build up of electrostatic discharge occurs in many situations involving people moving and handling products. The range of possible situations is very diverse but voltage levels as high as several thousand volts can and do arise in many individual situations. When an operator charged up to these levels handles a 'static sensitive device', there is a very probable likelihood that the device will be irreversibly damaged. It is essential that precautions are taken at all stages during manufacture and assembly of these products. Although LEDs were never considered to be static sensitive devices, changes in manufacturing technology and materials used to produce higher intensity products over a large range of the wavelength spectrum have changed this. Marl has an approved system of ESD control from goods in, through production and into final packing and despatch. We recommend all users of LED based products follow the guidelines of BS 100015.

### Power derating

The forward voltage/current value of an LED is dependant upon the ambient temperature of the environment in which it is operated. Therefore, care must be taken to operate the LED at the correct voltage/current values, depending upon the ambient temperature. Consequently, a recommendation regarding operating voltages and currents is given in order to address these temperature effects. This recommendation is termed 'de-rating'.

It is usual for forward voltages and currents to be specified for ambient temperature of 25°C. However, because the values of these qualities vary with temperature, Marl should be contacted if the device is to be operated at a temperature significantly higher than 25°C.

Marl accept no liability for any product that is operated higher than the stated voltage.

Note: All luminous intensity figures refer to the unmodified discrete LED.

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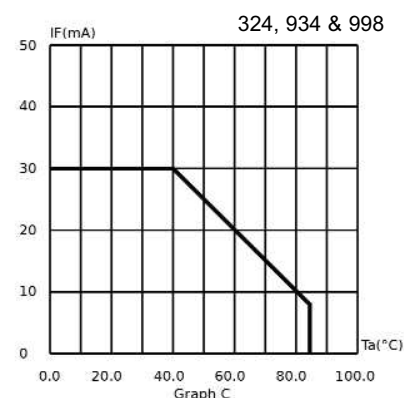
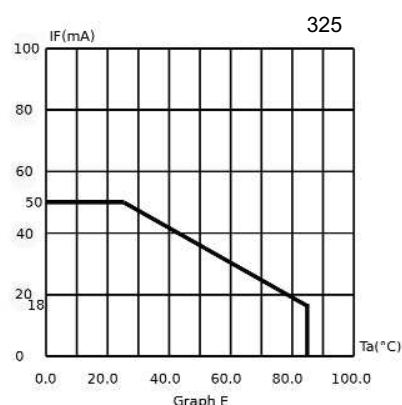
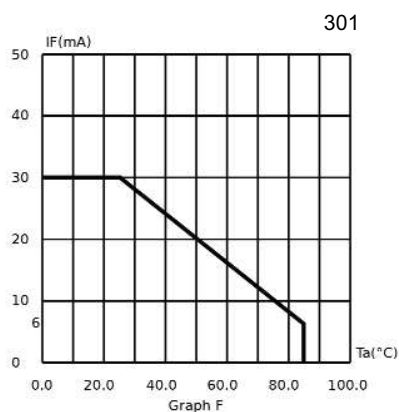
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## DERATING INFORMATION



## 202 Series

Part numbers also available in the 202 Series:

| PART NO.      | COLOUR | VOLTAGE<br>(Vdc) Vopr | PART NO.      | COLOUR | VOLTAGE<br>(Vdc) Vopr | PART NO.                                       | COLOUR | VOLTAGE<br>(Vdc) Vopr |
|---------------|--------|-----------------------|---------------|--------|-----------------------|------------------------------------------------|--------|-----------------------|
| 202-000-04-51 | Orange | 20mA                  | 202-324-22-50 | Green  | 24Vdc                 | 202-998-22-38                                  | White  | 24Vdc                 |
| 202-301-04-38 | Red    | 20mA                  | 202-324-22-51 | Green  | 24Vdc                 | 202-998-22-50                                  | White  | 24Vdc                 |
| 202-301-20-38 | Red    | 5/6Vdc                | 202-324-23    | Green  | 28Vdc                 | 202-998-23-38                                  | White  | 28Vdc                 |
| 202-301-22-38 | Red    | 24Vdc                 | 202-324-30-38 | Green  | 5/6Vdc RP             | 202-998-23-50                                  | White  | 28Vdc                 |
| 202-301-22-50 | Red    | 24Vdc                 | 202-324-32-50 | Green  | 24Vdc RP              | 202-998-23-51                                  | White  | 28Vdc                 |
| 202-301-22-51 | Red    | 24Vdc                 | 202-324-33-38 | Green  | 28Vdc RP              | 202-998-24-38                                  | White  | 48Vdc                 |
| 202-301-23-38 | Red    | 28Vdc                 | 202-325-04-38 | Yellow | 20mA                  | 202-998-30-38                                  | White  | 5/6Vdc RP             |
| 202-301-24-38 | Red    | 48Vdc                 | 202-325-20-38 | Yellow | 5/6Vdc                | 202-998-32-38                                  | White  | 24Vdc RP              |
| 202-301-30-38 | Red    | 5/6Vdc RP             | 202-325-22-38 | Yellow | 24Vdc                 | 202-998-33-38                                  | White  | 28Vdc RP              |
| 202-302-23    | Red    | 28Vdc                 | 202-325-22-50 | Yellow | 24Vdc                 | UNITS                                          |        |                       |
| 202-303-22-38 | Red    | 24Vdc                 | 202-325-30-38 | Yellow | 5/6Vdc RP             | Please note: - RP equates to Reverse Polarity. |        |                       |
| 202-303-23    | Red    | 28Vdc                 | 202-325-33-38 | Yellow | 28Vdc RP              |                                                |        |                       |
| 202-303-23-38 | Red    | 28Vdc                 | 202-350-23-29 | Red    | 28Vdc                 |                                                |        |                       |
| 202-305-22-38 | Red    | 24Vdc                 | 202-351-23-29 | Yellow | 28Vdc                 |                                                |        |                       |
| 202-306-23-38 | Orange | 28Vdc                 | 202-352-23-29 | Green  | 28Vdc                 |                                                |        |                       |
| 202-311-22-38 | Yellow | 24Vdc                 | 202-934-20-38 | Blue   | 5/6Vdc                |                                                |        |                       |
| 202-314-22-38 | Green  | 24Vdc                 | 202-934-22-38 | Blue   | 24Vdc                 |                                                |        |                       |
| 202-314-23-38 | Green  | 28Vdc                 | 202-934-22-50 | Blue   | 24Vdc                 |                                                |        |                       |
| 202-320-22-38 | Blue   | 24Vdc                 | 202-934-30-38 | Blue   | 5/6Vdc RP             |                                                |        |                       |
| 202-324-04-38 | Green  | 20mA                  | 202-998-04-38 | White  | 20mA                  |                                                |        |                       |
| 202-324-20-38 | Green  | 5/6Vdc                | 202-998-04-50 | White  | 20mA                  |                                                |        |                       |
| 202-324-22-38 | Green  | 24Vdc                 | 202-998-20-38 | White  | 5/6Vdc                |                                                |        |                       |
| UNITS         |        |                       | UNITS         |        |                       |                                                |        |                       |

Please note: - RP equates to Reverse Polarity.

The products listed above illustrate all of the options available to order. These products may have custom modifications that alter their operation beyond the generic information contained within this datasheet. Please contact sales for further information.

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