204 SERIES
BULB REPLACEMENT LED

MARL INTERNATIONAL

FEATURES

- T1¾ Bi Pin
- Flat topped LED
- Range of LED colour options
- Range of voltage options
- Fit and Forget
- Warm White version available

BENEFITS

- Direct replacement for standard bulb fitting
- Flat topping gives even illumination of large lens areas
- No colour filter required
- Manufactured with internal resistor
- Outstanding reliability
- Warm White LED may be used behind coloured lens as a true replacement for a filament lamp

Marl Part Number	LED Colour	Typical Voltage DC Vopr	Max. Reverse Voltage	Typical Current DC Iopr	Typical LED Luminous Intensity	Typical LED Wavelength λp	Operating Temp Topr *	Storage Temp Tstg
204-501-20-38	Red	5-6	3	7-10	112-236	619	-30 to +75	-40 to +100
204-521-20-38	Yellow	5-6	3	7-10	103-217	585	-30 to +75	-40 to +100
204-532-20-38	Green	5-6	3	7-10	814-1360	520	-30 to +75	-40 to +100
204-930-20-38	Blue	5-6	3	7-10	154-270	468	-30 to +75	-40 to +100
204-993-20-38	Warm White	5-6	3	5-8	222-420	See Below	-30 to +75	-40 to +100
204-997-20-38	Cool White	5-6	3	7-10	393-743	See Below	-30 to +75	-40 to +100
204-501-21-38	Red	12	3	10	236	619	-30 to +75	-40 to +100
204-521-21-38	Yellow	12	3	10	217	585	-30 to +75	-40 to +100
204-532-21-38	Green	12	3	11	1360	520	-30 to +75	-40 to +100
204-930-21-38	Blue	12	3	11	270	468	-30 to +75	-40 to +100
204-993-21-38	Warm White	12	3	11	420	See Below	-30 to +75	-40 to +100
204-997-21-38	Cool White	12	3	11	743	See Below	-30 to +75	-40 to +100
204-501-23-38	Red	24-28	3	7-8	112-236	619	-30 to +75	-40 to +100
204-521-23-38	Yellow	24-28	3	7-8	103-217	585	-30 to +75	-40 to +100
204-532-23-38	Green	24-28	3	6-8	814-1360	520	-30 to +75	-40 to +100
204-930-23-38	Blue	24-28	3	9-10	270	468	-30 to +75	-40 to +100
204-993-23-38	Warm White	24-28	3	6-8	222-420	See Below	-30 to +75	-40 to +100
204-997-23-38	Cool White	24-28	3	6-8	393-743	See Below	-30 to +75	-40 to +100
204-501-24-38	Red	48	3	5	112	619	-30 to +75	-40 to +100
204-521-24-38	Yellow	48	3	5	103	585	-30 to +75	-40 to +100
204-532-24-38	Green	48	3	4	814	520	-30 to +75	-40 to +100
204-930-24-38	Blue	48	3	4	154	468	-30 to +75	-40 to +100
204-993-24-38	Warm White	48	100	4	222	See Below	-30 to +75	-40 to +100
204-997-24-38	Cool White	48	3	4	393	See Below	-30 to +75	-40 to +100
		Vdc	**Vdc**	**mA**	**mcd**	**nm**	**°C**	**°C**

Typical Emission Colours Warm White LED			
X	0.4129	0.4255	0.4970	0.4770
Y	0.3725	0.4000	0.4466	0.4137

Typical Emission Colours Cool White LED			
X	0.275	0.28	0.29
Y	0.27	0.28	0.30

NOTES

Intensities (Iv) and colour shades of white (X-Y co-ordinates) may vary between LEDs within a batch. Additional LED Colours, Voltage Options and Reverse Polarity options available for semi-custom projects. Please contact our Sales Team. All LED components are supplied in anti-static packaging.

* Characteristics at Ta = 25°C. For operating temperature derating graphs, please refer to sheet 2.

bsi. ISO 9001 Quality Management Q 05480   RoHS 2015/863/EU   CE

204 SERIES
BULB REPLACEMENT LED

TECHNICAL DATA

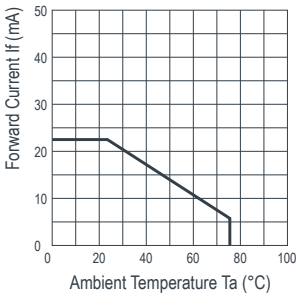| Series	Lamp Base Style	Metric Equivalent	Max. Power Dissipation
204	T1¾ Bi Pin	5	500
		mm	mW

TECHNICAL DRAWING

Weight (g): 0.5

Dimensions in mm (typical). Not to scale. Colour dot on product sleeve denotes LED colour. Green dot on base indicates cathode -ve termination.
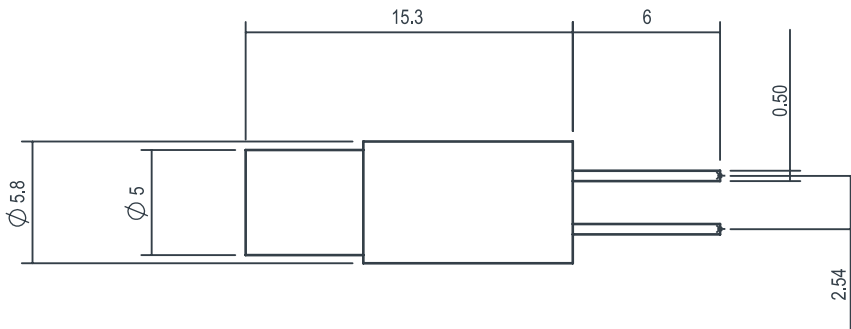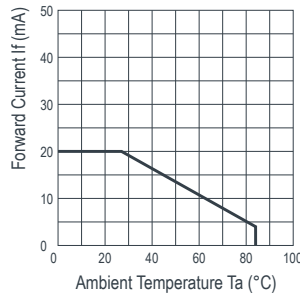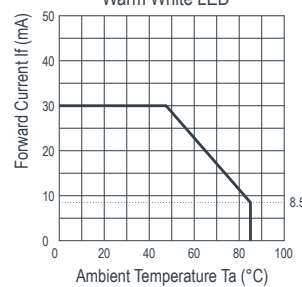

DE-RATING GRAPHS

Red / Green / Blue / Cool White LED

Yellow LED

Warm White LED

DESIGN CONSIDERATIONS

Single-Chip LEDs
All devices feature water clear high intensity LEDs as standard. In devices where discrete LEDs are used, 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.
Flat-topping does not apply to devices using surface-mounted device (SMD) LEDs.

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 electro-static 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. Marl recommend all users of LED based products follow the current BSI guidelines for protection of electronic devices from electrostatic phenomena.

Voltage, Current and Temperature
The forward voltage / current value of an LED is dependent 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.

Marl should be contacted if the device is to be operated outside the temperature range specified. Marl accept no liability for any product that is operated outside the stated voltage or temperature range.