

|            |           |
|------------|-----------|
| MSL-194B   | MSL-194DR |
| MSL-194UB  | MSL-194Y  |
| MSL-194TG  | MSL-194N  |
| MSL-194UTG | MSL-194HR |
| MSL-194UG  | MSL-194HG |
| MSL-194UYL | MSL-194G  |
| MSL-194SO  | MSL-194PG |
| MSL-194UOL |           |

## Technical Data Chip LEDs

02/27/2002

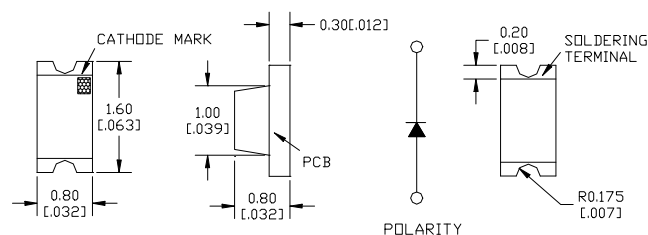
### Features

- **Package** : 1.6×0.8×0.8mm (0603) standard package
- **Feature of the device** : extremely wide viewing angle;  
ideal for backlighting and coupling in light guides
- **Wavelength** : 640 nm (red), 625 nm (red)  
605 nm (orange), 590 nm (amber),  
573nm (green), 525 nm (true green),  
470 nm (blue)
- **Viewing angle** : Extremely Wide (130°)
- **Technology** : AlGaAs (red)  
GaAsP (orange)  
GaP (green, yellow)  
AlInGaP (red, orange, amber, green)  
InGaN (True green, blue)
- **Grouping parameter** : luminous intensity
- **Assembly methods** : suitable for all SMT assembly methods
- **Soldering methods** : IR reflow soldering
- **Preconditioning** : acc. to JEDEC Level 2
- **Taping** : 8-mm tape with 4000/reel,  $\phi 180$ mm

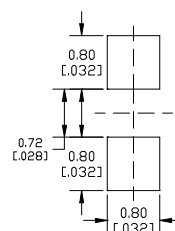
### Applications

- **Automotive** : Dashboards , stop lamps , turn signals
- **Backlighting** : LCDs , Key pads , advertising
- **Status indicators** : Comsumer & industrial electronics

### Package Dimensions

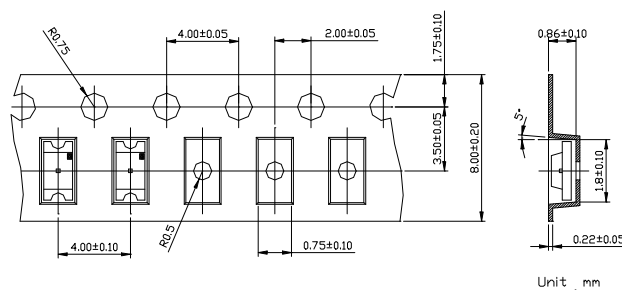


### Recommended Solder Patterns



### Method of Taping / Polarity and Orientation

Packing unit 3000/reel



Notes :

1. All dimensions are in millimeters (inches)

## Selection Guide

| Part Number | Color of Emission | Lens Color  | Luminous Intensity<br>$I_V$ (mcd) @ 20mA |
|-------------|-------------------|-------------|------------------------------------------|
| MSL-194B    | Blue              | Water clear | 28                                       |
| MSL-194UB   | Blue              |             | 40                                       |
| MSL-194TG   | True Green        |             | 60                                       |
| MSL-194UTG  | True Green        |             | 150                                      |
| MSL-194UG   | Green             |             | 40                                       |
| MSL-194UYL  | Amber             |             | 50                                       |
| MSL-194SO   | Orange            |             | 60                                       |
| MSL-194UOL  | Red               |             | 50                                       |
| MSL-194DR   | Red               |             | 22.5                                     |
| MSL-194Y    | Yellow            |             | 12                                       |
| MSL-194N    | Amber             |             | 12                                       |
| MSL-194HR   | Red               |             | 12                                       |
| MSL-194HG   | Green             |             | 14.5                                     |
| MSL-194G    | Yellow Green      |             | 6.5                                      |
| MSL-194PG   | Pure Green        |             | 4.5                                      |

## Luminous Intensity Groups

|     |                       |
|-----|-----------------------|
| A : | 1.801 ~ 3.111         |
| B : | 2.546 ~ 4.400         |
| C : | 3.601 ~ 6.222         |
| D : | 5.091 ~ 8.800         |
| E : | 7.201 ~ 12.443        |
| F : | 10.182 ~ 17.600       |
| G : | 14.401 ~ 24.886       |
| H : | 20.363 ~ 35.200       |
| I : | 28.801 ~ 49.773       |
| J : | 40.724 ~ 70.400       |
| K : | 57.601 ~ 99.546       |
| L : | 81.447 ~ 140.800      |
| M : | 115.201 ~ 199.091     |
| N : | 162.894 ~ 281.600     |
| O : | 230.401 ~ 398.182     |
| P : | 325.787 ~ 563.200     |
| Q : | 460.801 ~ 796.365     |
| R : | 651.572 ~ 1,126.400   |
| S : | 921.601 ~ 1,592.730   |
| T : | 1,303.143 ~ 2,252.800 |
| U : | 1,843.201 ~ 3,185.459 |
| V : | 2,606.286 ~ 4,505.600 |

Unit : mcd

## Maximum Ratings

| Parameter                                               | Symbol    | Value            |                |                      | Unit |
|---------------------------------------------------------|-----------|------------------|----------------|----------------------|------|
|                                                         |           | UOL,SO<br>UYL,UG | B,UB<br>TG,UTG | HG,G,PG<br>DR,Y,N,HR |      |
| Operating Temp. range                                   | $T_{OP}$  | -30 ~ +85        |                |                      | °C   |
| Storage Temp. range                                     | $T_{stg}$ | -40 ~ +100       |                |                      | °C   |
| Junction temperature                                    | $T_j$     | 95               |                |                      | °C   |
| Forward current                                         | $I_F$     | 30               |                | 25                   | mA   |
| Surge current<br>$t \leq 1\text{m sec, Duty} \leq 1/20$ | $I_{FM}$  | 100<br>48 (UG)   | 48             | 60                   | mA   |
| Reverse Voltage                                         | $V_R$     | 5                |                |                      | V    |
| Power dissipation                                       | $P_{tot}$ | 78               | 120            | 57                   | mW   |

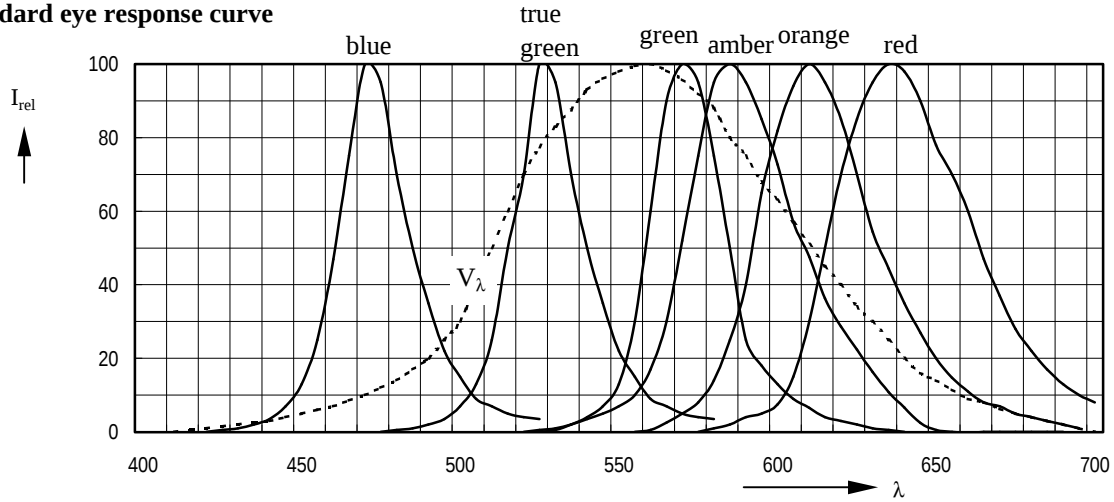
## Optical Characteristics at T<sub>A</sub>=25°C

| Part Number | Luminous Intensity<br>I <sub>V</sub> (mcd) @ 20mA |      | Peak Wavelength<br>λ <sub>peak</sub> (nm) | Color, Dominant Wavelength<br>λ <sub>d</sub> (nm) | Viewing Angle<br>2θ 1/2 (Degrees) | Temperature Coefficient of V <sub>F</sub><br>@I <sub>F</sub> =20mA, T <sub>cv</sub> (mV /K) | Spectral Bandwidth at 50% I <sub>rel</sub> max (nm) |
|-------------|---------------------------------------------------|------|-------------------------------------------|---------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------|
|             | Min.                                              | Typ. | Typ.                                      | Typ.                                              | Typ.                              |                                                                                             |                                                     |
| MSL-194B    | 10                                                | 28   | 468                                       | 470                                               | 130                               | -2.6                                                                                        | 26                                                  |
| MSL-194UB   | 15                                                | 40   | 468                                       | 470                                               | 130                               | -2.6                                                                                        | 26                                                  |
| MSL-194TG   | 30                                                | 60   | 523                                       | 525                                               | 130                               | -3.1                                                                                        | 36                                                  |
| MSL-194UTG  | 70                                                | 150  | 518                                       | 525                                               | 130                               | -3.1                                                                                        | 35                                                  |
| MSL-194UG   | 25                                                | 40   | 575                                       | 573                                               | 130                               | -2.6                                                                                        | 16                                                  |
| MSL-194UYL  | 25                                                | 50   | 590                                       | 590                                               | 130                               | -2.3                                                                                        | 16                                                  |
| MSL-194SO   | 30                                                | 60   | 610                                       | 605                                               | 130                               | -2.3                                                                                        | 20                                                  |
| MSL-194UOL  | 25                                                | 50   | 630                                       | 625                                               | 130                               | -2.3                                                                                        | 20                                                  |
| MSL-194DR   | 10                                                | 22.5 | 660                                       | 640                                               | 130                               | -2.5                                                                                        | 20                                                  |
| MSL-194Y    | 5                                                 | 12   | 583                                       | 585                                               | 130                               | -1.7                                                                                        | 32                                                  |
| MSL-194N    | 5                                                 | 12   | 620                                       | 607                                               | 130                               | -1.7                                                                                        | 35                                                  |
| MSL-194HR   | 5                                                 | 12   | 630                                       | 618                                               | 130                               | -2.0                                                                                        | 35                                                  |
| MSL-194HG   | 5                                                 | 14.5 | 568                                       | 570                                               | 130                               | -1.4                                                                                        | 30                                                  |
| MSL-194G    | 1.5                                               | 6.5  | 568                                       | 570                                               | 130                               | -1.4                                                                                        | 30                                                  |
| MSL-194PG   | 1.5                                               | 4.5  | 555                                       | 557                                               | 130                               | -1.4                                                                                        | 25                                                  |

| Device Type | Forward Voltage<br>V <sub>F</sub> (Volts)<br>@I <sub>F</sub> = 20mA |     | Reverse Current<br>I <sub>R</sub> (uA)<br>@ V <sub>R</sub> = 5V |
|-------------|---------------------------------------------------------------------|-----|-----------------------------------------------------------------|
|             | Typ.                                                                | Max | Max                                                             |
| MSL-194B    | 3.3                                                                 | 4.0 | 100                                                             |
| MSL-194UB   | 3.7                                                                 | 4.2 | 100                                                             |
| MSL-194TG   | 3.3                                                                 | 4.0 | 100                                                             |
| MSL-194UTG  | 3.7                                                                 | 4.2 | 100                                                             |
| MSL-194UG   | 2.0                                                                 | 2.6 | 100                                                             |
| MSL-194UYL  | 2.0                                                                 | 2.6 | 100                                                             |
| MSL-194SO   | 2.0                                                                 | 2.6 | 100                                                             |
| MSL-194UOL  | 2.0                                                                 | 2.6 | 100                                                             |
| MSL-194DR   | 1.8                                                                 | 2.6 | 100                                                             |
| MSL-194Y    | 2.1                                                                 | 2.7 | 100                                                             |
| MSL-194N    | 2.1                                                                 | 2.7 | 100                                                             |
| MSL-194HR   | 1.8                                                                 | 2.3 | 100                                                             |
| MSL-194HG   | 2.2                                                                 | 2.7 | 100                                                             |
| MSL-194G    | 2.2                                                                 | 2.7 | 100                                                             |
| MSL-194PG   | 2.2                                                                 | 2.7 | 100                                                             |

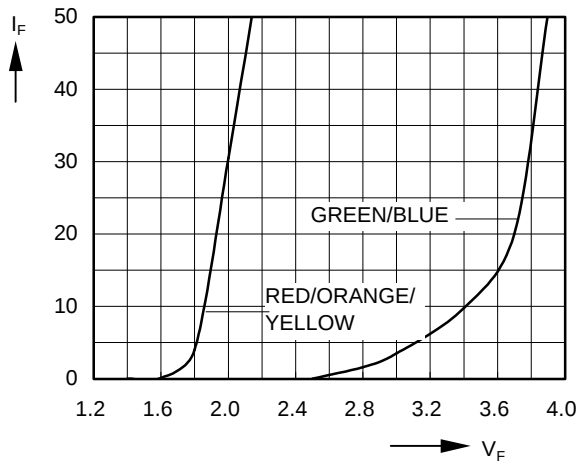
**Relative spektrale Emission**  $I_{rel} = f(\lambda)$ ,  $T_A = 25^\circ\text{C}$ ,  $I_F = 10\text{mA}$

$V(\lambda)$  = Standard eye response curve



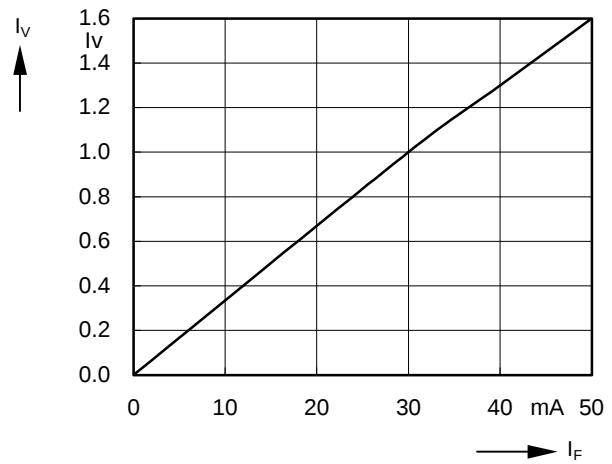
**Forward Current**  $I_F = f(V_F)$

$T_A = 25^\circ\text{C}$

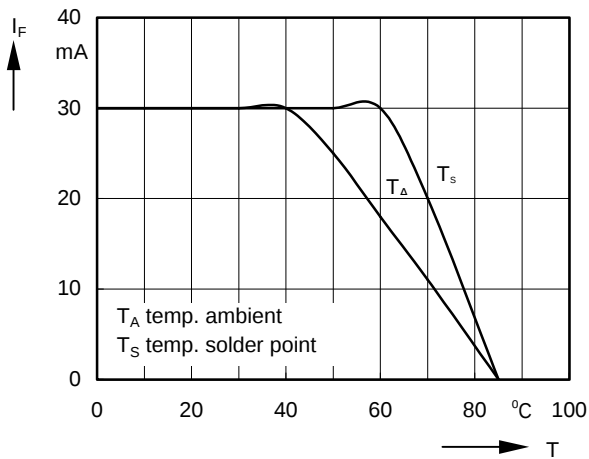


**Relative Luminous Intensity**  $I_V/I_V(10\text{mA}) = f(I_F)$

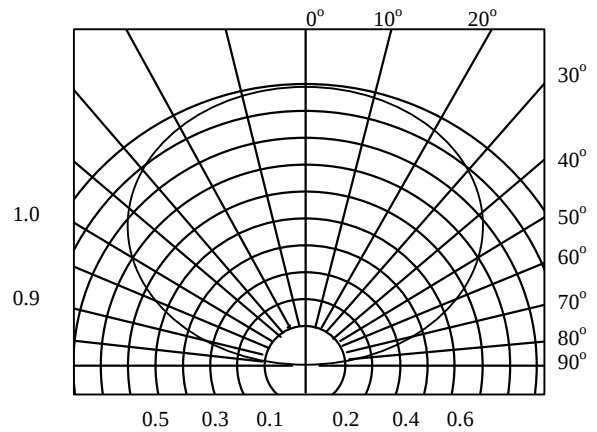
$T_A = 25^\circ\text{C}$



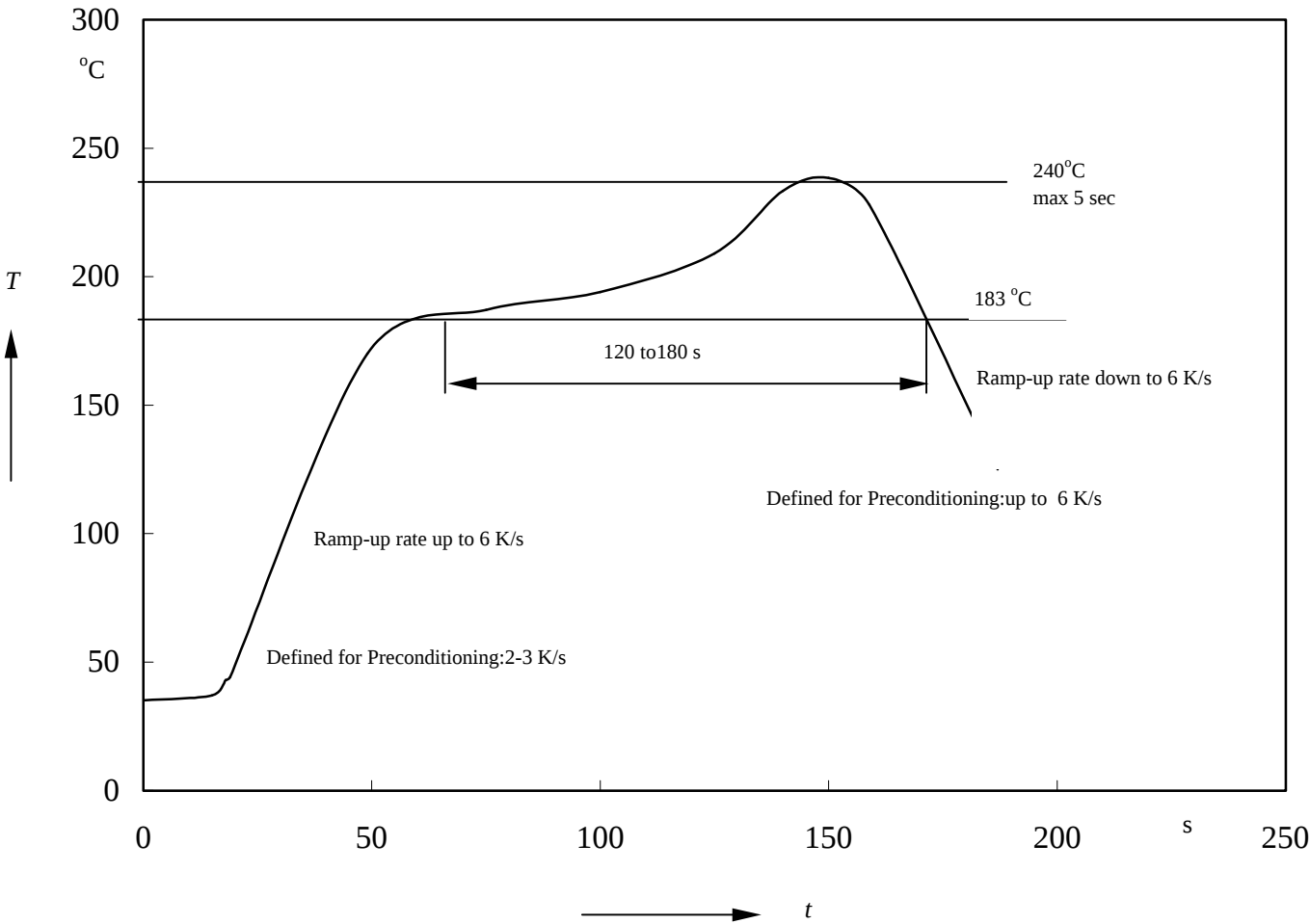
**Max. Permissible Forward Current**  $I_F = f(T_A)$



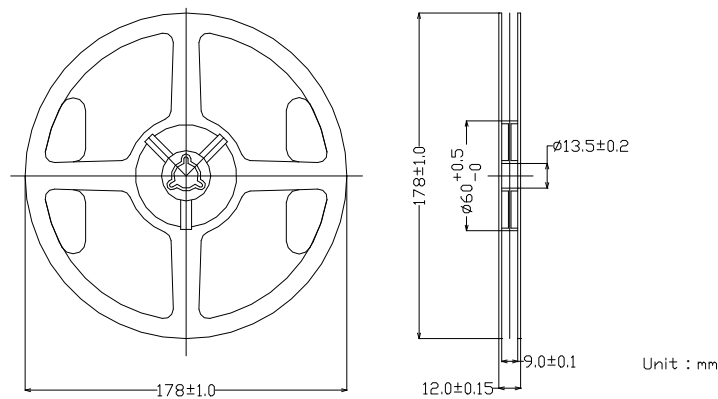
**Radiation Characteristic**  $I_{rel} = f(j)$



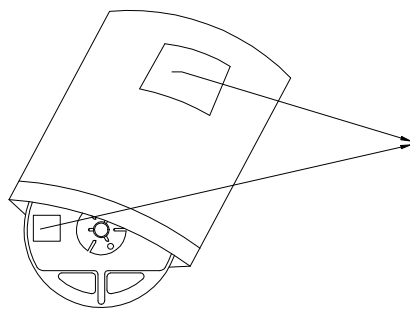
IR Reflow Soldering Profile



Package Dimensions of Reel



Packaging

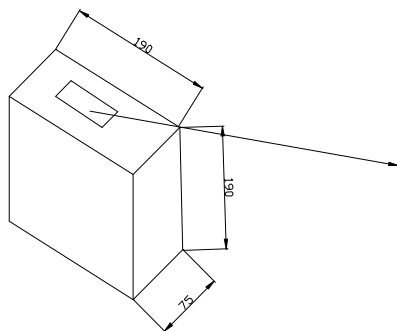


Product lable

|                |
|----------------|
| CUSTOMER :     |
| CUSTOMER P/N : |
| DEVICE TYPE:   |
| BIN :          |
| COLOR RANK:    |
| LOT NO:        |
| Q'TY:          |

CAUTION : After open the aluminum laminate bag the lamps should be storage in the follow condition  
Temperaure : 5 to 30°C ; Humidity : 70% ; Storage time : 72hrs max  
Backing condition : If backing is necessary, we recommended the backing condition is 60 +/- 5°C 10hours

Packing



Product lable

|                |
|----------------|
| CUSTOMER :     |
| CUSTOMER P/N : |
| DEVICE TYPE:   |
| BIN :          |
| COLOR RANK:    |
| LOT NO:        |
| Q'TY:          |