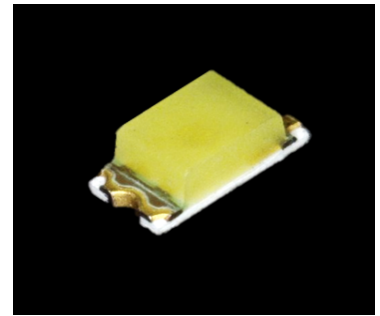


## ■ Features

- Long life exceeding 90% residual luminous rate even after 1,000hrs (Ta=85°C,IF=20mA)

## ■ Outline

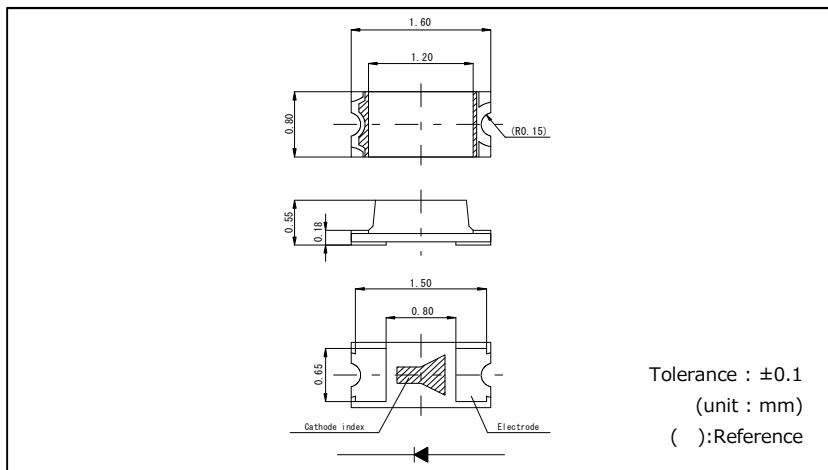


## ■ Size

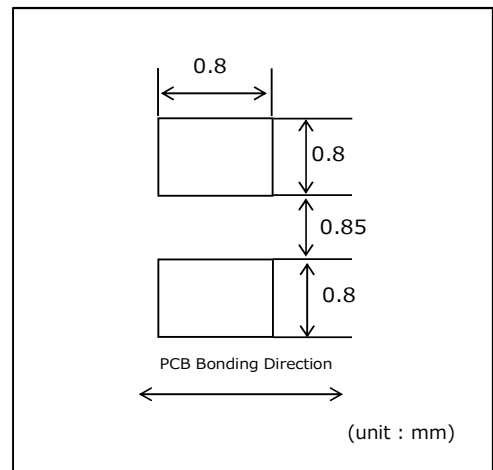
1608 (0603)  
1.6 × 0.8mm (t=0.55mm)



## ■ Dimensions



## ■ Recommended Solder Pattern



## ■ Specifications

| Part No.       | Chip Structure | Emitting Color | Absolute Maximum Ratings (Ta=25°C) |                     |                      |                    |                       | Electrical and Optical Characteristics (Ta=25°C) |                                |                |                                |                |                                                                   |       |        |                                   |      |      |                |
|----------------|----------------|----------------|------------------------------------|---------------------|----------------------|--------------------|-----------------------|--------------------------------------------------|--------------------------------|----------------|--------------------------------|----------------|-------------------------------------------------------------------|-------|--------|-----------------------------------|------|------|----------------|
|                |                |                | Power                              | Forward Current     | Peak Forward Current | Reverse Voltage    | Operating Temp.       | Storage Temp.                                    | Forward Voltage V <sub>F</sub> |                | Reverse Current I <sub>R</sub> |                | Dominant Wavelength λ <sub>D</sub> / Chromaticity coordinate(x,y) |       |        | Luminous Intensity I <sub>v</sub> |      |      |                |
|                |                |                | Dissipation P <sub>D</sub> (mW)    | I <sub>F</sub> (mA) | I <sub>FP</sub> (mA) | V <sub>R</sub> (V) | T <sub>opr</sub> (°C) | T <sub>stg</sub> (°C)                            | Typ.                           | I <sub>F</sub> | Max.                           | V <sub>R</sub> | Min.*2                                                            | Typ.  | Max.*2 | I <sub>F</sub>                    | Min. | Typ. | I <sub>F</sub> |
| SMLD12EN1W     | InGaN          | Green          | 70                                 |                     |                      |                    |                       |                                                  | 3.0                            |                |                                |                | 520                                                               | 527   | 535    |                                   | 56   | 140  |                |
| SMLD12E2N1W    |                | Blue Green     |                                    |                     |                      |                    |                       |                                                  |                                |                |                                |                | 500                                                               | 505   | 512    |                                   |      | 120  |                |
| SMLD12E3N1W    |                |                | 66                                 | 20                  | 100 <sup>*1</sup>    | 5                  | -40 ~ +100            | -40 ~ +100                                       | 2.9                            | 5              | 10                             | 5              | 490                                                               | 496   | 502    | 5                                 | 56   | 85   | 5              |
| SMLD12BN1W     |                | Blue           |                                    |                     |                      |                    |                       |                                                  |                                |                |                                |                | -                                                                 | 470.0 | -      |                                   | 14   | 40   |                |
| SMLD12WBN1W *3 |                | White          |                                    |                     |                      |                    |                       |                                                  |                                |                |                                |                | (x,y)(0.295, 0.280)                                               |       |        |                                   | 56   | 120  |                |

\*1 : 1/10,1kHz \*2 : Measurement tolerance:±1nm. \*3: Brightness for white color is noted with chromaticity coordinate(x,y).

■ Electrical Characteristics Curves

Reference

Fig.1 Forward Current - Forward Voltages

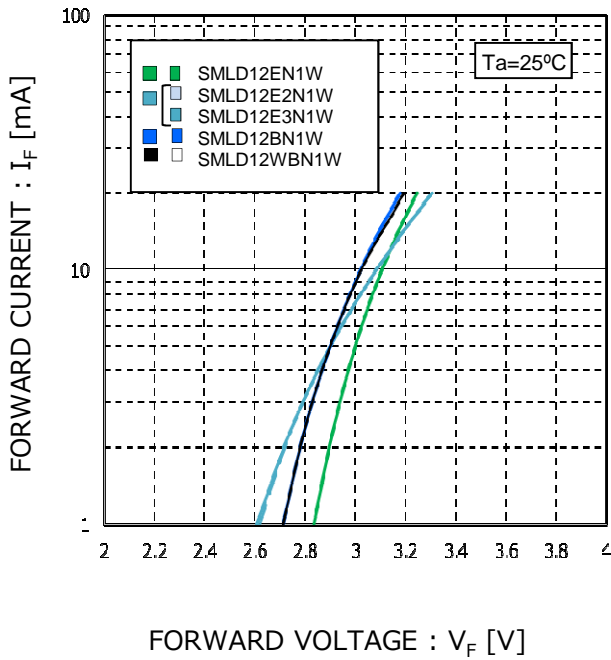


Fig.2 Luminous Intensity - Atmosphere Temperature

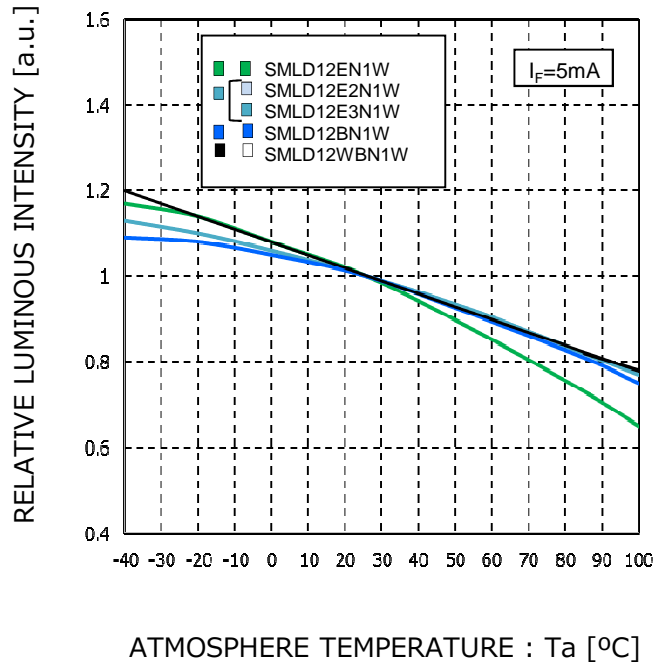


Fig.3 Luminous Intensity - Forward Current

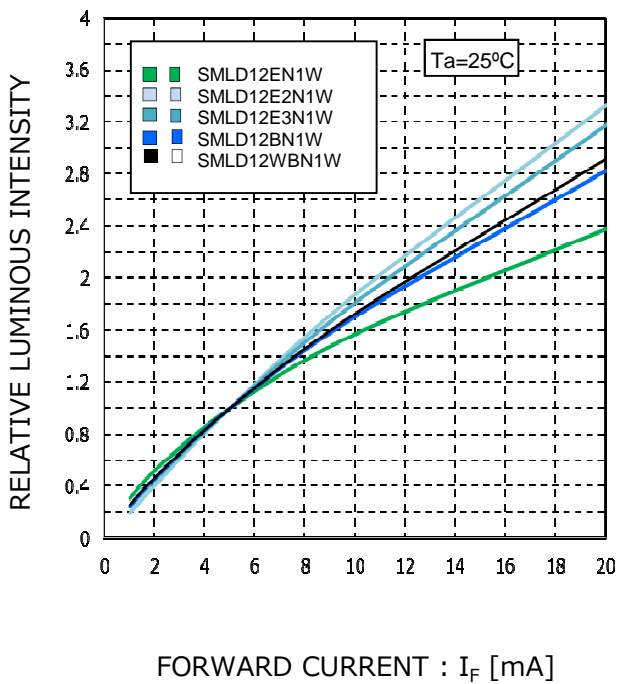
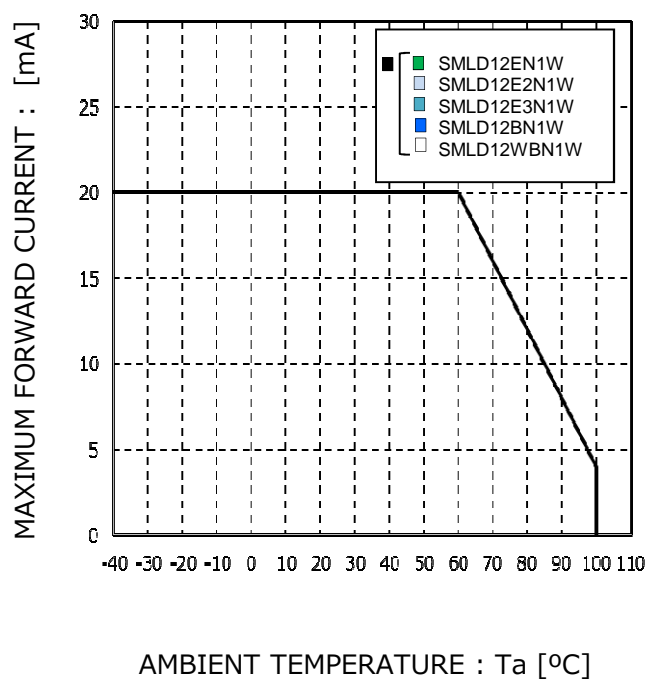
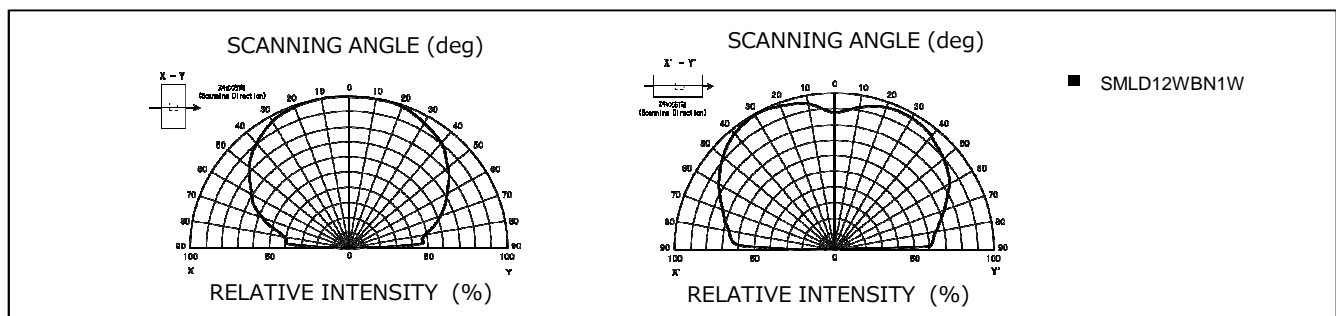
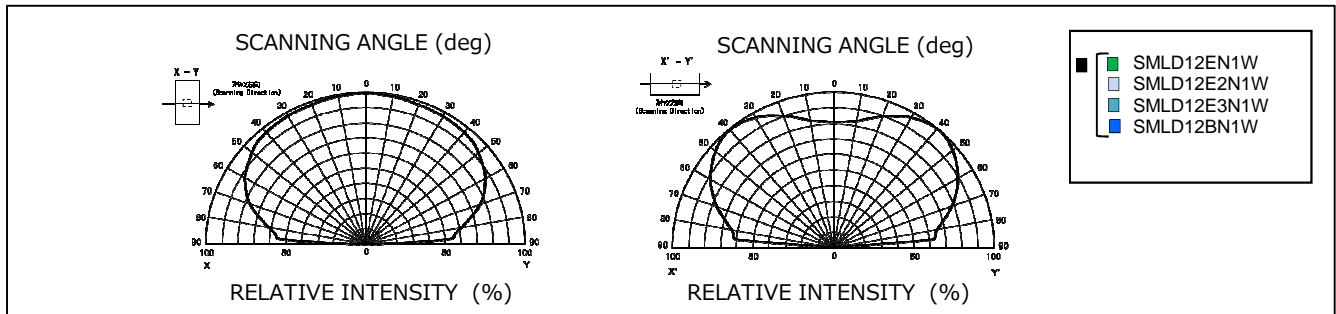


Fig.4 Derating



■ Viewing Angle

Reference



■ Rank Reference of Brightness\*

\*Measurement tolerance: ±10%

Green (E) , Blue Green (E2/E3)

(Ta=25°C, If=5mA)

| Rank        | K       | L       | M    | N     | P     | Q     | R     | S      | T       | U       | V       | W       | X        | Y         | Z         |
|-------------|---------|---------|------|-------|-------|-------|-------|--------|---------|---------|---------|---------|----------|-----------|-----------|
| lv (mcd)    | 3.6~5.6 | 5.6~9.0 | 9~14 | 14~22 | 22~36 | 36~56 | 56~90 | 90~140 | 140~220 | 220~360 | 360~560 | 560~900 | 900~1400 | 1400~2200 | 2200~3600 |
| SMLD12EN1W  |         |         |      |       |       |       |       |        |         |         |         |         |          |           |           |
| SMLD12E2N1W |         |         |      |       |       |       |       |        |         |         |         |         |          |           |           |
| SMLD12E3N1W |         |         |      |       |       |       |       |        |         |         |         |         |          |           |           |

Blue(B)

(Ta=25°C, If=5mA)

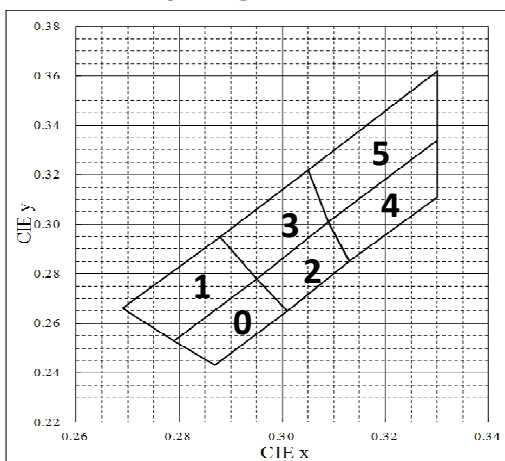
| Rank       | K       | L       | M    | N     | P     | Q     | R     | S      | T       | U       | V       | W       | X        | Y         | Z         |
|------------|---------|---------|------|-------|-------|-------|-------|--------|---------|---------|---------|---------|----------|-----------|-----------|
| lv (mcd)   | 3.6~5.6 | 5.6~9.0 | 9~14 | 14~22 | 22~36 | 36~56 | 56~90 | 90~140 | 140~220 | 220~360 | 360~560 | 560~900 | 900~1400 | 1400~2200 | 2200~3600 |
| SMLD12BN1W |         |         |      |       |       |       |       |        |         |         |         |         |          |           |           |

White(WB)

(Ta=25°C, If=5mA)

| Rank       | K       | L       | M    | N     | P     | Q     | R     | S      | T       | U       | V       | W       | X        | Y         | Z         |
|------------|---------|---------|------|-------|-------|-------|-------|--------|---------|---------|---------|---------|----------|-----------|-----------|
| lv (mcd)   | 3.6~5.6 | 5.6~9.0 | 9~14 | 14~22 | 22~36 | 36~56 | 56~90 | 90~140 | 140~220 | 220~360 | 360~560 | 560~900 | 900~1400 | 1400~2200 | 2200~3600 |
| SMLD12WB1W |         |         |      |       |       |       |       |        |         |         |         |         |          |           |           |

■ Chromaticity Diagram

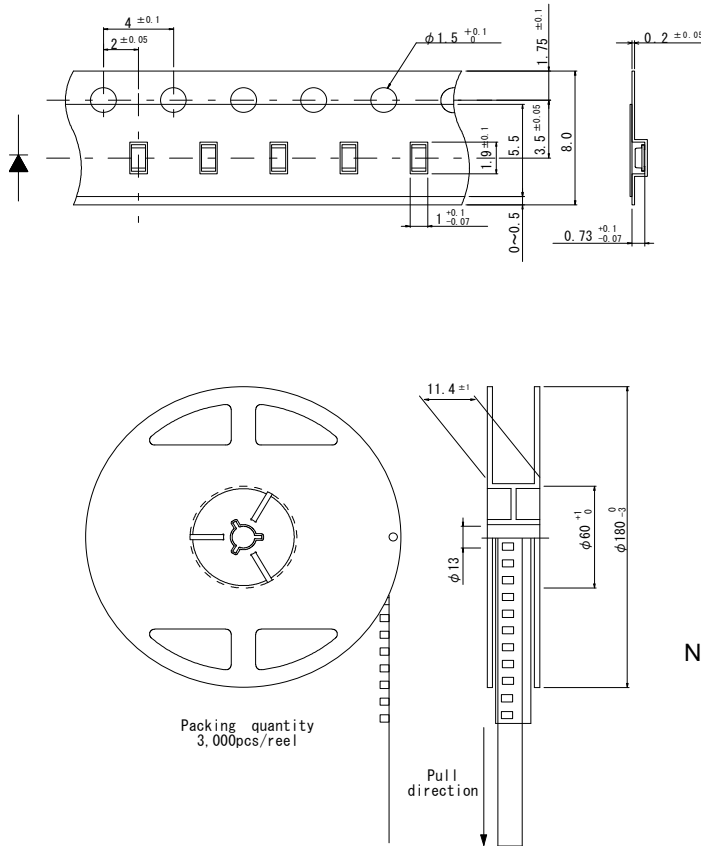


( T a = 25°C、If=5mA)

| 0     |       | 1     |       | 2     |       | 3     |       | 4     |       | 5     |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| x     | y     | x     | y     | x     | y     | x     | y     | x     | y     | x     | y     |
| 0.287 | 0.243 | 0.279 | 0.253 | 0.301 | 0.265 | 0.295 | 0.278 | 0.313 | 0.285 | 0.309 | 0.301 |
| 0.279 | 0.253 | 0.269 | 0.266 | 0.295 | 0.278 | 0.288 | 0.295 | 0.309 | 0.301 | 0.305 | 0.322 |
| 0.295 | 0.278 | 0.288 | 0.295 | 0.309 | 0.301 | 0.305 | 0.322 | 0.330 | 0.334 | 0.330 | 0.362 |
| 0.301 | 0.265 | 0.295 | 0.278 | 0.313 | 0.285 | 0.309 | 0.301 | 0.330 | 0.311 | 0.330 | 0.334 |

Measurement tolerance : ±0.02

■ Taping(T86)



Packing quantity  
3,000pcs/reel

Unit:mm

Note)Tolerance is within ±0.2mm unless otherwise specified.

■ Part No. Construction

Special Code will be applied for Emitting color WB/B/E series.      Chromaticity rank (for white LED)      Rank sign (Brightness Rank)\*

|             |   |   |              |           |                |             |                      |   |   |   |   |   |
|-------------|---|---|--------------|-----------|----------------|-------------|----------------------|---|---|---|---|---|
| S           | M | L | D            | 1         | 2              | E           | N1                   | W | T | 8 | 6 | R |
| Series name |   |   | Package Type | Chip type | Emitting Color | Resin Color | Taping Specification |   |   |   |   |   |

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|----------------------|------------------|-----------|------------------|-----------|------------------|-----------|-----------------|----------------------|-----------------|-----------|-------------------|----------------------|------------------|-----------|-----------------|-----------|------------------|-----------|-----------------|-----------|-----------------|------------|-----------------|------------|-----------------|-----------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------|----------|------------------|----------|----------------------|----------|----------------------------|----------|----------|----------|----------|----------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|----------|-----|-----------|-----|----------|--------|-----------|--------|-----------|--------|----------|--------|----------|--------|-----------|--------------|----------|--------------|----------|-------|----------|-------|----------|-------|----------------------|------------|----------|------|-----------|-------|----------|------------------|------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------|----------|--------------|----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------|------------|--------------------------------------|----------|----------------|----------|-------------------------------|------------|-----------------------------------------|------------|----------------------------------------|
| <b>SML</b> Chip LED  | <table border="1" style="width:100%; border-collapse: collapse;"> <tr><td><b>P1</b></td><td>1.0x0.6 t=0.2mm</td></tr> <tr><td><small>EV/EN</small></td><td>1.6x0.8 t=0.36mm</td></tr> <tr><td><b>D1</b></td><td>1.6x0.8 t=0.55mm</td></tr> <tr><td><b>H1</b></td><td>2.0x1.25 t=0.8mm</td></tr> <tr><td><b>M1</b></td><td>3.0x2.0 t=1.3mm</td></tr> <tr><td><small>ZU/ZN</small></td><td>3.5x2.8 t=1.9mm</td></tr> <tr><td><b>A1</b></td><td>1.6x1.15 t=0.55mm</td></tr> <tr><td><small>B1/B2</small></td><td>3.4x1.25 t=1.1mm</td></tr> <tr><td><b>K1</b></td><td>4.5x2.0 t=0.6mm</td></tr> <tr><td><b>S1</b></td><td>3.2x1.6 t=1.85mm</td></tr> <tr><td><b>P2</b></td><td>1.0x1.0 t=0.2mm</td></tr> <tr><td><b>52</b></td><td>1.3x1.5 t=0.6mm</td></tr> <tr><td><b>P34</b></td><td>1.0x1.0 t=0.2mm</td></tr> <tr><td><b>P36</b></td><td>1.5x1.0 t=0.2mm</td></tr> <tr><td><b>VN</b></td><td>3.5x2.8 t=0.6mm</td></tr> </table> | <b>P1</b> | 1.0x0.6 t=0.2mm | <small>EV/EN</small> | 1.6x0.8 t=0.36mm | <b>D1</b> | 1.6x0.8 t=0.55mm | <b>H1</b> | 2.0x1.25 t=0.8mm | <b>M1</b> | 3.0x2.0 t=1.3mm | <small>ZU/ZN</small> | 3.5x2.8 t=1.9mm | <b>A1</b> | 1.6x1.15 t=0.55mm | <small>B1/B2</small> | 3.4x1.25 t=1.1mm | <b>K1</b> | 4.5x2.0 t=0.6mm | <b>S1</b> | 3.2x1.6 t=1.85mm | <b>P2</b> | 1.0x1.0 t=0.2mm | <b>52</b> | 1.3x1.5 t=0.6mm | <b>P34</b> | 1.0x1.0 t=0.2mm | <b>P36</b> | 1.5x1.0 t=0.2mm | <b>VN</b> | 3.5x2.8 t=0.6mm | <table border="1" style="width:100%; border-collapse: collapse;"> <tr><td><b>0</b></td><td>Standard Type</td></tr> <tr><td><b>1</b></td><td>Low Current Type</td></tr> <tr><td><b>2</b></td><td>High Brightness type</td></tr> <tr><td><b>3</b></td><td rowspan="5">Ultra High Brightness type</td></tr> <tr><td><b>4</b></td></tr> <tr><td><b>5</b></td></tr> <tr><td><b>6</b></td></tr> <tr><td><b>7</b></td></tr> <tr><td><b>8</b></td><td></td></tr> </table> | <b>0</b> | Standard Type | <b>1</b> | Low Current Type | <b>2</b> | High Brightness type | <b>3</b> | Ultra High Brightness type | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> | <b>8</b> |  | <table border="1" style="width:100%; border-collapse: collapse;"> <tr><td><b>V</b></td><td>Red</td></tr> <tr><td><b>U</b></td><td>Red</td></tr> <tr><td><b>U2</b></td><td>Red</td></tr> <tr><td><b>D</b></td><td>Orange</td></tr> <tr><td><b>Y3</b></td><td>Yellow</td></tr> <tr><td><b>Y2</b></td><td>Yellow</td></tr> <tr><td><b>Y</b></td><td>Yellow</td></tr> <tr><td><b>W</b></td><td>Yellow</td></tr> <tr><td><b>M2</b></td><td>Yellow green</td></tr> <tr><td><b>M</b></td><td>Yellow green</td></tr> <tr><td><b>F</b></td><td>Green</td></tr> <tr><td><b>P</b></td><td>Green</td></tr> <tr><td><b>E</b></td><td>Green</td></tr> <tr><td><small>E2/E3</small></td><td>Blue Green</td></tr> <tr><td><b>B</b></td><td>Blue</td></tr> <tr><td><b>WB</b></td><td>White</td></tr> <tr><td><b>T</b></td><td>Phototransistors</td></tr> <tr><td><b>RGB</b></td><td>Red/Green/Blue</td></tr> </table> | <b>V</b> | Red | <b>U</b> | Red | <b>U2</b> | Red | <b>D</b> | Orange | <b>Y3</b> | Yellow | <b>Y2</b> | Yellow | <b>Y</b> | Yellow | <b>W</b> | Yellow | <b>M2</b> | Yellow green | <b>M</b> | Yellow green | <b>F</b> | Green | <b>P</b> | Green | <b>E</b> | Green | <small>E2/E3</small> | Blue Green | <b>B</b> | Blue | <b>WB</b> | White | <b>T</b> | Phototransistors | <b>RGB</b> | Red/Green/Blue | <table border="1" style="width:100%; border-collapse: collapse;"> <tr><td><b>T</b></td><td>Transparent Colorless</td></tr> <tr><td><b>W</b></td><td>Milkey White</td></tr> <tr><td><b>B</b></td><td>Black</td></tr> </table> | <b>T</b> | Transparent Colorless | <b>W</b> | Milkey White | <b>B</b> | Black | <table border="1" style="width:100%; border-collapse: collapse;"> <tr><td><b>T86</b></td><td>Cathode at sprocket hole side(the top)</td></tr> <tr><td><b>T87</b></td><td>Anode at sprocket hole side(the top)</td></tr> <tr><td><b>1</b></td><td>For white LED,</td></tr> <tr><td><b>3</b></td><td>csthode at sprocket hole side</td></tr> </table> <p>notice) S1 series, 81 seires</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr><td><b>T86</b></td><td>Cathode at sprocket hole side(the back)</td></tr> <tr><td><b>T68</b></td><td>Cathode at sprocket hole side(the top)</td></tr> </table> | <b>T86</b> | Cathode at sprocket hole side(the top) | <b>T87</b> | Anode at sprocket hole side(the top) | <b>1</b> | For white LED, | <b>3</b> | csthode at sprocket hole side | <b>T86</b> | Cathode at sprocket hole side(the back) | <b>T68</b> | Cathode at sprocket hole side(the top) |
| <b>P1</b>            | 1.0x0.6 t=0.2mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <small>EV/EN</small> | 1.6x0.8 t=0.36mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>D1</b>            | 1.6x0.8 t=0.55mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>H1</b>            | 2.0x1.25 t=0.8mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>M1</b>            | 3.0x2.0 t=1.3mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <small>ZU/ZN</small> | 3.5x2.8 t=1.9mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>A1</b>            | 1.6x1.15 t=0.55mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <small>B1/B2</small> | 3.4x1.25 t=1.1mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>K1</b>            | 4.5x2.0 t=0.6mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>S1</b>            | 3.2x1.6 t=1.85mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>P2</b>            | 1.0x1.0 t=0.2mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>52</b>            | 1.3x1.5 t=0.6mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>P34</b>           | 1.0x1.0 t=0.2mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>P36</b>           | 1.5x1.0 t=0.2mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>VN</b>            | 3.5x2.8 t=0.6mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>0</b>             | Standard Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>1</b>             | Low Current Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>2</b>             | High Brightness type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>3</b>             | Ultra High Brightness type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>4</b>             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>5</b>             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>6</b>             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>7</b>             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>8</b>             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>V</b>             | Red                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>U</b>             | Red                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>U2</b>            | Red                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>D</b>             | Orange                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>Y3</b>            | Yellow                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>Y2</b>            | Yellow                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>Y</b>             | Yellow                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>W</b>             | Yellow                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>M2</b>            | Yellow green                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>M</b>             | Yellow green                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>F</b>             | Green                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>P</b>             | Green                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>E</b>             | Green                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <small>E2/E3</small> | Blue Green                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>B</b>             | Blue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>WB</b>            | White                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>T</b>             | Phototransistors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>RGB</b>           | Red/Green/Blue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>T</b>             | Transparent Colorless                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>W</b>             | Milkey White                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>B</b>             | Black                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>T86</b>           | Cathode at sprocket hole side(the top)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>T87</b>           | Anode at sprocket hole side(the top)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>1</b>             | For white LED,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>3</b>             | csthode at sprocket hole side                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>T86</b>           | Cathode at sprocket hole side(the back)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |
| <b>T68</b>           | Cathode at sprocket hole side(the top)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |                 |                      |                  |           |                  |           |                  |           |                 |                      |                 |           |                   |                      |                  |           |                 |           |                  |           |                 |           |                 |            |                 |            |                 |           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |               |          |                  |          |                      |          |                            |          |          |          |          |          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |     |          |     |           |     |          |        |           |        |           |        |          |        |          |        |           |              |          |              |          |       |          |       |          |       |                      |            |          |      |           |       |          |                  |            |                |                                                                                                                                                                                                                              |          |                       |          |              |          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                        |            |                                      |          |                |          |                               |            |                                         |            |                                        |

**SCM** Chip LED      **01** 3.0x1.5 t=2.2mm

\*Concerning the Brightness rank.  
\*Please refer to the rank chart above for luminous intensity classification.  
\*Part name is individual for each rank.  
\*When shipped as sample,the part name be a representative part name.  
General products are free of ranks.  
Please contact sales if rank appointment is needed.

■ Packing Specification

ROHM LED products are being shipped with desiccant (silica gel) included in moisture-proof bags. Pasting the moisture sensitive label on the outer surface of the moisture-proof bags or enclosing the humidity indication card inside the bag is available upon request. Please contact the nearest sales office or distributor if necessary.

## ■ Precaution (Surface Mount Device)

### 1. Storage

If the product is heated during the reflow under the condition of hygroscopic state, it may vaporize and expand which will influence the performance of the product.

Therefore, the package is waterproof. Please use the product following the conditions:

#### •Using Conditions

| Classification          | Temperature | Humidity    | Expiration Date              | Remark                                                                   |
|-------------------------|-------------|-------------|------------------------------|--------------------------------------------------------------------------|
| ① Before using          | 5~30°C      | 30~70%RH    | Within 1 year from Receiving | Storage with waterproof package                                          |
| ② After opening package | 5~30°C      | Below 70%RH | Within 168h                  | Please storing in the airtight container with our desiccant (silica gel) |

#### •Baking

Bake the product in case of below:

① The expiration date is passed.

② The color of indicator (silica gel) turned from blue to colorless or from green to pink.

(Even if the product is within the expiration date.)

#### •Baking Conditions

| Temperature | Time                                                                                                                                                                                                                       | Humidity    |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 60±3°C      | 12~24h                                                                                                                                                                                                                     | Below 20%RH |
| Remark      | <ul style="list-style-type: none"> <li>• Bake products in reel.</li> <li>• Reel and embossed tape are easy to be deformed when baking, so please try not to apply stress on it.</li> <li>• Recommend bake once.</li> </ul> |             |

## 2. Application Methods

### 2 – 1. Precaution for Drive System and Off Mode

Design the circuit without the electric load exceeding the ABSOLUTE MAXIMUM RATING that applies on the products. If drive by constant voltage, it may cause current deviation of the LED and result in deviation of luminous intensity, so we recommend to drive by constant current.

(Deviation of VF Value will cause deviation of current in LED.) Furthermore, for off mode, please do not apply voltage neither forward nor reverse. Especially, for the products with the Ag-paste used in the die bonding, there's high possibility to cause electro migration and result in function failure.

### 2 – 2. About Derating

It is considered that derating characteristics will not result in LED chip's electrical destruction. Even within the derating, the reliability and luminous life can be affected depending on operating conditions and ambient environment. So we would be appreciate it if you can confirm with your application again.

### 2 – 3. About product life

Depending on operating conditions and environment(applied current, ambient temperature and humidity, corrosive gas), decreasing of luminosity and change of chromaticity may occur even within the specification conditions.

Please contact our sales office if you use it for the following applications.

① It requires long luminosity life

② It is always lit

### 2 – 4. Applied Stress on Product

No resin hardening agent such as filler is used in the sealing resin of the product.

Therefore, please pay attention to the overstress on it which may influence its reliability.

### 2 – 5. Usage

The Product is LED. We are not responsible for the usage as the diode such as Protection Chip, Rectifier, Switching and so on.

### 3. Others

#### 3 – 1. Surrounding Gas

Notice that if it is stored under the condition of acid gas (chlorine gas, sulfured gas) or alkali gas (ammonia), it may result in low soldering ability (caused by the change in quality of the plating surface ) or optical characteristics changes (light intensity, chrominance) and change in quality of cause die bonding (Ag-paste) materials. All of the above will function failure of the products.

Therefore, please pay attention to the storage environment for mounted product (concern the generated gas of the surrounding parts of the products and the atmospheric environment).

#### 3 – 2. Electrostatic Damage

The product is part of semiconductor and electrostatic sensitive, there's high possibility to be damaged by the electrostatic discharge. Please take appropriate measures to avoid the static electricity from human body and earthing of production equipment. Especially, InGaN type LEDs have lower resistance value of electrostatic discharge and it is recommended to introduce the ESD protection circuit.

The resistance values of electrostatic discharge (actual values) vary with products, therefore, please call our Sales staffs for inquiries.

#### 3 – 3. Electromagnetic Wave

Applications with strong electromagnetic wave such as, IH cooker, will influence the reliability of LED, therefore please evaluate before using it.

4 . Mounting

4 – 1 . Soldering

- No resin hardening agent such as filler is used in the sealing resin of the product. Therefore, resin expansion and moisture absorption at humidity will cause heat stress during soldering process and finally has bad influence on the product’s reliability.
- The product is not guaranteed for flow soldering.
- Thermal stress during the flow soldering of surrounding parts will influence the reliability of LED and please evaluate the soldering conditions before using it. Also please make sure the expiration date after opening the moistureproof package.
- Please set appropriate reflow temperature based on our product usage conditions and specification.
- The max for reflowing is 2 times, please finish the second reflow soldering and flow soldering with other parts within the usage limitation after open the moistureproof package.
- Compare with N2 reflow, during air reflow, because of the heat and surrounding conditions, it may cause the discoloration of the resin.
- For our product that has no solder resist, because of its solder amount and soldering conditions, one of its specific characteristics is that solder will penetrate into LED. Thus, there's high possibility that will influence its reliability. Therefore, please be informed, concerning it before using it.

4 – 2 . Automatic Mounting

4-2-1 . Silicon Resin Sealing Product

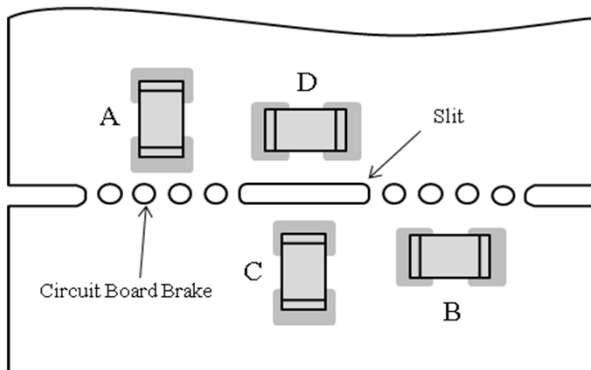
The sealing resin of LED is very soft, so please select adsorption nozzle that would not apply stress directly on the sealing section.

4-2-2 . Mini Package (Smaller than 1608 size)

- Vibration may result in low mounting rate since it will cause the static electricity of product and adhere to top cover tape. We recommend to
  - set magnet on parts feeder cassette of the mounter to control the product stabilization
  - set ionizer to prevent electrostatic charge

4 – 3 . Mounting Location

The stress like bending stress of circuit board dividing after mounting, may cause LED package crack or damage of LED internal junction, therefore, please concern the mounting direction and position to avoid bending or screwing with great stress of the circuit board.



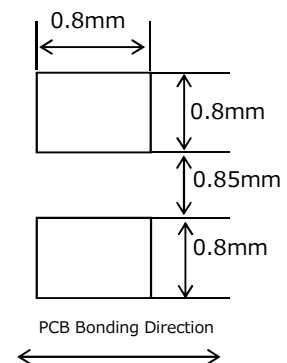
Stress strength according to the mounting position:  
A > B > C > D

4 – 4 . Mechanical Stress after Mounting

The mechanical stress may damage the LED after Circuit Mounting, so please pay attention to the touch on product.

4 – 5 . Soldering Pattern for Recommendation

We recommend the soldering pattern that shows on the right. It will be different according to mounting situation of circuit board, therefore, please concern before designing.



- ※The product has adopted the electrode structure that it should solder with back electrode of the product. Thus, please be informed that the shape of electrode pin of solder fillet formation is not guaranteed. The through hole on electrode surface is for conduction of front and rear electrodes but not for formation of solder fillet.



4 – 6. Reflow Profile

For reflow profile, please refer to the conditions below:(※)

■ Meaning of marks, Conditions

| Mark                | Meanings                                         | Conditions     |
|---------------------|--------------------------------------------------|----------------|
| T <sub>Smax</sub>   | Maximum of pre-heating temperature               | 180°C          |
| T <sub>Smin</sub>   | Minimum of pre-heating temperature               | 140°C          |
| t <sub>s</sub>      | Time from T <sub>Smin</sub> to T <sub>Smax</sub> | Over 60sec.    |
| T <sub>L</sub>      | Reference temperature                            | 230~260°C      |
| t <sub>L</sub>      | Retention time for T <sub>L</sub>                | Within 40sec.  |
| T <sub>P</sub>      | Peak temperature                                 | 260°C(Max)     |
| t <sub>p</sub>      | Time for peak temperature                        | Within 10sec.  |
| ΔT <sub>R</sub> /Δt | Temperature rising rate                          | Under 3°C/sec. |
| ΔT <sub>D</sub> /Δt | Temperature decreasing rate                      | Over -3°C/sec. |



※Above conditions are for reference. Therefore, evaluate by customer’s own circuit boards and reflow furnaces before using, because stress from circuit boards and temperature variations of reflow furnaces vary by customer’s own conditions.

4 – 7. Attention Points in Soldering Operation

This product was developed as a surface mount LED especially suitable for reflow soldering. So reflow soldering is recommended. In case of implementing manual soldering, please take care of following points.

①SOLDER USED

Sn-Cu, Sn-Ag-Cu, Sn-Ag-Bi-Cu

②HAND SOLDERING CONDITION

LED products do not contain reinforcement material such as a glass fillers.

So thermal stress by soldering greatly influence its reliability.

Please keep following points for manual soldering.

|    | ITEM                     | RECOMMENDED CONDITION                                                                                                 |
|----|--------------------------|-----------------------------------------------------------------------------------------------------------------------|
| a) | Heating method           | Condition ) Temp. of iron top less than 400°C within 3 sec.<br>Heating on PCB pattern, not direct to the LED. (Fig-1) |
| b) | Handling after soldering | Please handle after the part temp. goes down to room temp.                                                            |



4 – 8. Cleaning after Soldering

Please follow the conditions below if the cleaning is necessary after soldering.

|                     |                                                                  |
|---------------------|------------------------------------------------------------------|
| Solvent             | We recommend to use alcohols solvent such as, isopropyl alcohols |
| Temperature         | Under 30°C within 3 minutes                                      |
| Ultrasonic Cleaning | 15W/ Below 1 liter (capacity of tank)                            |
| Drying              | Under 100°C within 3 minutes                                     |

## Notes

- 1) The information contained herein is subject to change without notice.
- 2) Before you use our Products, please contact our sales representative and verify the latest specifications :
- 3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.  
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Products beyond the rating specified by ROHM.
- 4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.
- 5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.
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- 7) The Products specified in this document are not designed to be radiation tolerant.
- 8) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.
- 9) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.
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