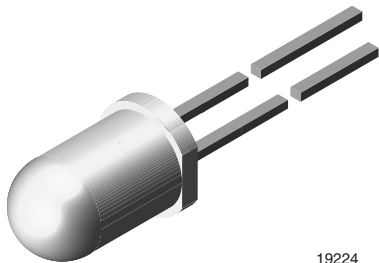


## High Efficiency LED in Ø 5 mm Tinted Diffused Package



19224

### DESCRIPTION

The TLH.640. series was developed for standard applications like general indicating and lighting purposes.

It is housed in a 5 mm tinted diffused plastic package. The wide viewing angle of these devices provides a high on-off contrast.

Several selection types with different luminous intensities are offered. All LEDs are categorized in luminous intensity groups. The green and yellow LEDs are categorized additionally in wavelength groups.

That allows users to assemble LEDs with uniform appearance.

### PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: 5 mm
- Product series: standard
- Angle of half intensity:  $\pm 30^\circ$

### FEATURES

- Choice of three bright colors
- Standard T-1 $\frac{3}{4}$  package
- Small mechanical tolerances
- Suitable for DC and high peak current
- Wide viewing angle
- Luminous intensity categorized
- Yellow and green color categorized
- TLH.640. without stand-offs
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### APPLICATIONS

- Status lights
- Off / on indicator
- Background illumination
- Readout lights
- Maintenance lights
- Legend light

### PARTS TABLE

| PART           | COLOR  | LUMINOUS INTENSITY (mcd) |      |      | at I <sub>F</sub> (mA) | WAVELENGTH (nm) |      |      | at I <sub>F</sub> (mA) | FORWARD VOLTAGE (V) |      |      | at I <sub>F</sub> (mA) | TECHNOLOGY   |
|----------------|--------|--------------------------|------|------|------------------------|-----------------|------|------|------------------------|---------------------|------|------|------------------------|--------------|
|                |        | MIN.                     | TYP. | MAX. |                        | MIN.            | TYP. | MAX. |                        | MIN.                | TYP. | MAX. |                        |              |
| TLHR6400       | Red    | 1.6                      | 10   | -    | 10                     | 612             | -    | 630  | 10                     | -                   | 2    | 3    | 20                     | GaAsP on GaP |
| TLHR6400-CS12Z | Red    | 1.6                      | 10   | -    | 10                     | 612             | -    | 630  | 10                     | -                   | 2    | 3    | 20                     | GaAsP on GaP |
| TLHR6401       | Red    | 4                        | 12   | -    | 10                     | 612             | -    | 630  | 10                     | -                   | 2    | 3    | 20                     | GaAsP on GaP |
| TLHR6405       | Red    | 6.3                      | 14   | -    | 10                     | 612             | -    | 630  | 10                     | -                   | 2    | 3    | 20                     | GaAsP on GaP |
| TLHR6405-ASZ   | Red    | 6.3                      | 14   | -    | 10                     | 612             | -    | 630  | 10                     | -                   | 2    | 3    | 20                     | GaAsP on GaP |
| TLHY6400       | Yellow | 1.6                      | 10   | -    | 10                     | 581             | -    | 594  | 10                     | -                   | 2.4  | 3    | 20                     | GaAsP on GaP |
| TLHY6400-CS12Z | Yellow | 1.6                      | 10   | -    | 10                     | 581             | -    | 594  | 10                     | -                   | 2.4  | 3    | 20                     | GaAsP on GaP |
| TLHY6400-MS12Z | Yellow | 1.6                      | 10   | -    | 10                     | 581             | -    | 594  | 10                     | -                   | 2.4  | 3    | 20                     | GaAsP on GaP |
| TLHY6401       | Yellow | 4                        | 12   | -    | 10                     | 581             | -    | 594  | 10                     | -                   | 2.4  | 3    | 20                     | GaAsP on GaP |
| TLHY6405       | Yellow | 6.3                      | 14   | -    | 10                     | 581             | -    | 594  | 10                     | -                   | 2.4  | 3    | 20                     | GaAsP on GaP |
| TLHY6405-ASZ   | Yellow | 6.3                      | 14   | -    | 10                     | 581             | -    | 594  | 10                     | -                   | 2.4  | 3    | 20                     | GaAsP on GaP |
| TLHG6400       | Green  | 1.6                      | 10   | -    | 10                     | 562             | -    | 575  | 10                     | -                   | 2.4  | 3    | 20                     | GaP on GaP   |
| TLHG6400-AS12Z | Green  | 1.6                      | 10   | -    | 10                     | 562             | -    | 575  | 10                     | -                   | 2.4  | 3    | 20                     | GaP on GaP   |
| TLHG6400-CS12Z | Green  | 1.6                      | 10   | -    | 10                     | 562             | -    | 575  | 10                     | -                   | 2.4  | 3    | 20                     | GaP on GaP   |
| TLHG6401       | Green  | 4                        | 12   | -    | 10                     | 562             | -    | 575  | 10                     | -                   | 2.4  | 3    | 20                     | GaP on GaP   |
| TLHG6401-AS12Z | Green  | 4                        | 12   | -    | 10                     | 562             | -    | 575  | 10                     | -                   | 2.4  | 3    | 20                     | GaP on GaP   |
| TLHG6405       | Green  | 6.3                      | 15   | -    | 10                     | 562             | -    | 575  | 10                     | -                   | 2.4  | 3    | 20                     | GaP on GaP   |
| TLHG6405-ASZ   | Green  | 6.3                      | 15   | -    | 10                     | 562             | -    | 575  | 10                     | -                   | 2.4  | 3    | 20                     | GaP on GaP   |

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TLHR640., TLHY640., TLHG640.**

| PARAMETER                              | TEST CONDITION                            | SYMBOL     | VALUE       | UNIT               |
|----------------------------------------|-------------------------------------------|------------|-------------|--------------------|
| Reverse voltage                        |                                           | $V_R$      | 6           | V                  |
| DC forward current                     | $T_{amb} \leq 65\text{ }^{\circ}\text{C}$ | $I_F$      | 30          | mA                 |
| Surge forward current                  | $t_p \leq 10\text{ }\mu\text{s}$          | $I_{FSM}$  | 1           | A                  |
| Power dissipation                      | $T_{amb} \leq 65\text{ }^{\circ}\text{C}$ | $P_V$      | 100         | mW                 |
| Junction temperature                   |                                           | $T_j$      | 100         | $^{\circ}\text{C}$ |
| Operating temperature range            |                                           | $T_{amb}$  | -40 to +100 | $^{\circ}\text{C}$ |
| Storage temperature range              |                                           | $T_{stg}$  | -55 to +100 | $^{\circ}\text{C}$ |
| Soldering temperature                  | $t \leq 5\text{ s}$ , 2 mm from body      | $T_{sd}$   | 260         | $^{\circ}\text{C}$ |
| Thermal resistance junction-to-ambient |                                           | $R_{thJA}$ | 350         | K/W                |

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TLHR640., RED**

| PARAMETER                         | TEST CONDITION                          | PART     | SYMBOL      | MIN. | TYP.     | MAX. | UNIT       |
|-----------------------------------|-----------------------------------------|----------|-------------|------|----------|------|------------|
| Luminous intensity <sup>(1)</sup> | $I_F = 10\text{ mA}$                    | TLHR6400 | $I_V$       | 1.6  | 10       | -    | mcd        |
|                                   |                                         | TLHR6401 | $I_V$       | 4    | 12       | -    | mcd        |
|                                   |                                         | TLHR6405 | $I_V$       | 6.3  | 14       | -    | mcd        |
| Dominant wavelength               | $I_F = 10\text{ mA}$                    |          | $\lambda_d$ | 612  | -        | 630  | nm         |
| Peak wavelength                   | $I_F = 10\text{ mA}$                    |          | $\lambda_p$ | -    | 635      | -    | nm         |
| Angle of half intensity           | $I_F = 10\text{ mA}$                    |          | $\phi$      | -    | $\pm 30$ | -    | $^{\circ}$ |
| Forward voltage                   | $I_F = 20\text{ mA}$                    |          | $V_F$       | -    | 2        | 3    | V          |
| Reverse voltage                   | $I_R = 10\text{ }\mu\text{A}$           |          | $V_R$       | 6    | 15       | -    | V          |
| Junction capacitance              | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ |          | $C_j$       | -    | 50       | -    | pF         |

**Note**<sup>(1)</sup> In one packing unit  $I_{Vmin.}/I_{Vmax.} \leq 0.5$ **OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TLHY640., YELLOW**

| PARAMETER                         | TEST CONDITION                          | PART     | SYMBOL      | MIN. | TYP.     | MAX. | UNIT       |
|-----------------------------------|-----------------------------------------|----------|-------------|------|----------|------|------------|
| Luminous intensity <sup>(1)</sup> | $I_F = 10\text{ mA}$                    | TLHY6400 | $I_V$       | 1.6  | 10       | -    | mcd        |
|                                   |                                         | TLHY6401 | $I_V$       | 4    | 12       | -    | mcd        |
|                                   |                                         | TLHY6405 | $I_V$       | 6.3  | 14       | -    | mcd        |
| Dominant wavelength               | $I_F = 10\text{ mA}$                    |          | $\lambda_d$ | 581  | -        | 594  | nm         |
| Peak wavelength                   | $I_F = 10\text{ mA}$                    |          | $\lambda_p$ | -    | 585      | -    | nm         |
| Angle of half intensity           | $I_F = 10\text{ mA}$                    |          | $\phi$      | -    | $\pm 30$ | -    | $^{\circ}$ |
| Forward voltage                   | $I_F = 20\text{ mA}$                    |          | $V_F$       | -    | 2.4      | 3    | V          |
| Reverse voltage                   | $I_R = 10\text{ }\mu\text{A}$           |          | $V_R$       | 6    | 15       | -    | V          |
| Junction capacitance              | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ |          | $C_j$       | -    | 50       | -    | pF         |

**Note**<sup>(1)</sup> In one packing unit  $I_{Vmin.}/I_{Vmax.} \leq 0.5$ **OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TLHG640., GREEN**

| PARAMETER                         | TEST CONDITION                          | PART     | SYMBOL      | MIN. | TYP.     | MAX. | UNIT       |
|-----------------------------------|-----------------------------------------|----------|-------------|------|----------|------|------------|
| Luminous intensity <sup>(1)</sup> | $I_F = 10\text{ mA}$                    | TLHG6400 | $I_V$       | 1.6  | 10       | -    | mcd        |
|                                   |                                         | TLHG6401 | $I_V$       | 4    | 12       | -    | mcd        |
|                                   |                                         | TLHG6405 | $I_V$       | 6.3  | 15       | -    | mcd        |
| Dominant wavelength               | $I_F = 10\text{ mA}$                    |          | $\lambda_d$ | 562  | -        | 575  | nm         |
| Peak wavelength                   | $I_F = 10\text{ mA}$                    |          | $\lambda_p$ | -    | 565      | -    | nm         |
| Angle of half intensity           | $I_F = 10\text{ mA}$                    |          | $\phi$      | -    | $\pm 30$ | -    | $^{\circ}$ |
| Forward voltage                   | $I_F = 20\text{ mA}$                    |          | $V_F$       | -    | 2.4      | 3    | V          |
| Reverse voltage                   | $I_R = 10\text{ }\mu\text{A}$           |          | $V_R$       | 6    | 15       | -    | V          |
| Junction capacitance              | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ |          | $C_j$       | -    | 50       | -    | pF         |

**Note**<sup>(1)</sup> In one packing unit  $I_{Vmin.}/I_{Vmax.} \leq 0.5$

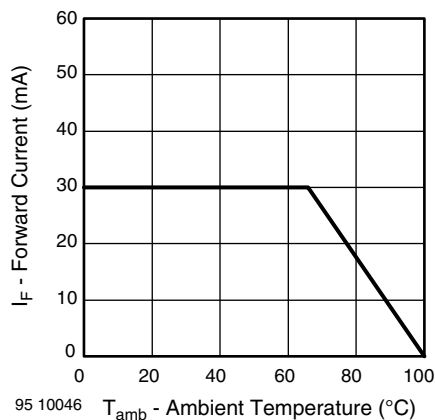
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Forward Current vs. Ambient Temperature

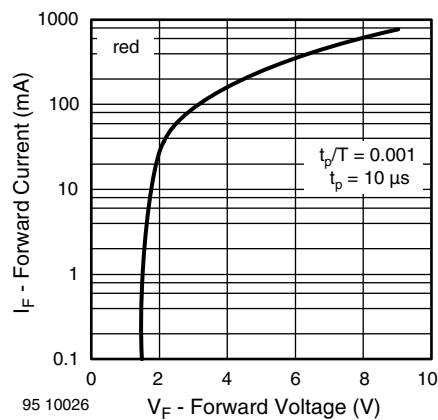


Fig. 4 - Forward Current vs. Forward Voltage

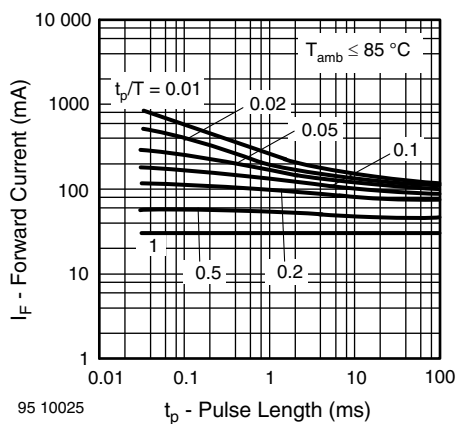


Fig. 2 - Forward Current vs. Pulse Length

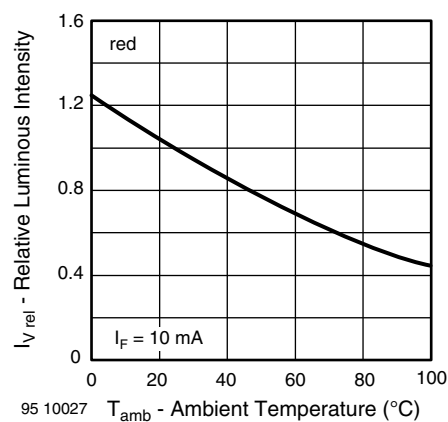


Fig. 5 - Relative Luminous Intensity vs. Ambient Temperature

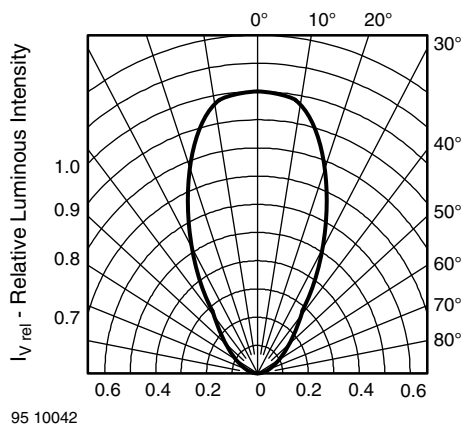


Fig. 3 - Relative Luminous Intensity vs. Angular Displacement

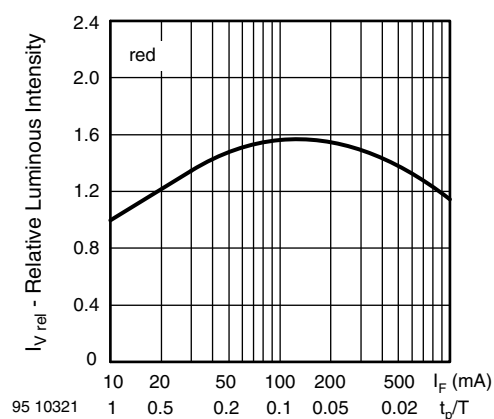


Fig. 6 - Relative Luminous Intensity vs. Forward Current/Duty Cycle

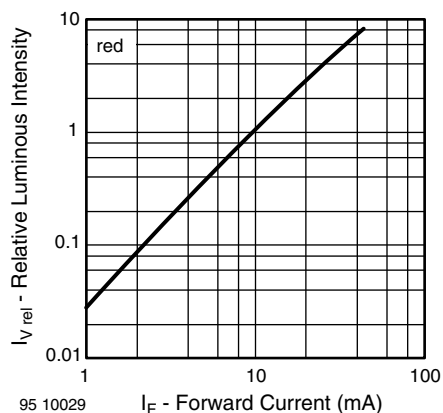


Fig. 7 - Relative Luminous Intensity vs. Forward Current

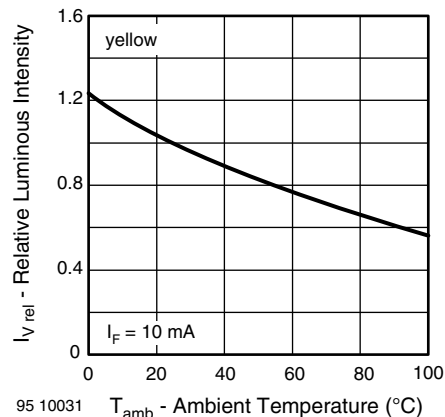


Fig. 10 - Relative Luminous Intensity vs. Ambient Temperature

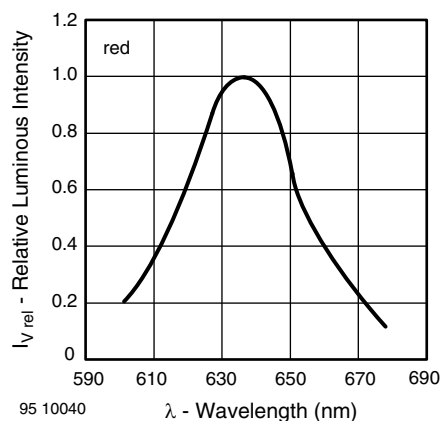


Fig. 8 - Relative Intensity vs. Wavelength

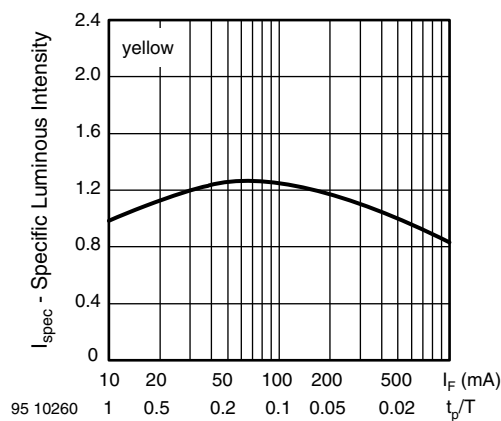


Fig. 11 - Relative Luminous Intensity vs. Forward Current/Duty Cycle

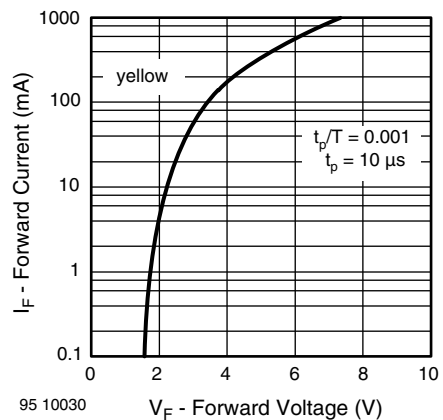


Fig. 9 - Forward Current vs. Forward Voltage

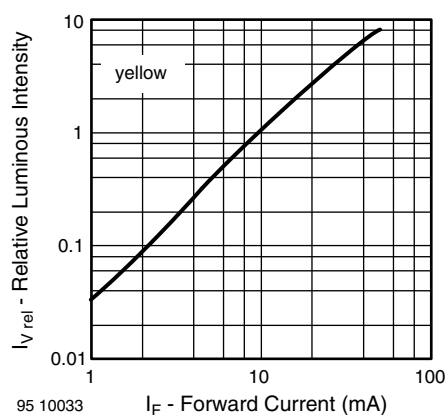


Fig. 12 - Relative Luminous Intensity vs. Forward Current

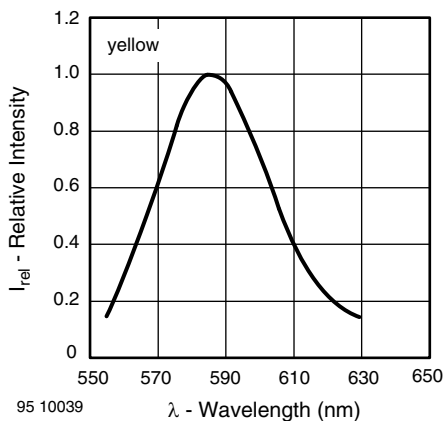


Fig. 13 - Relative Intensity vs. Wavelength

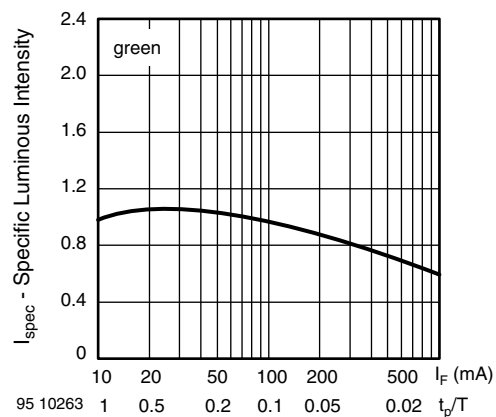


Fig. 16 - Specific Luminous Intensity vs. Forward Current

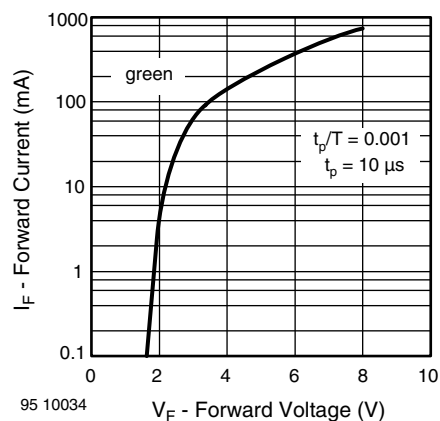


Fig. 14 - Forward Current vs. Forward Voltage

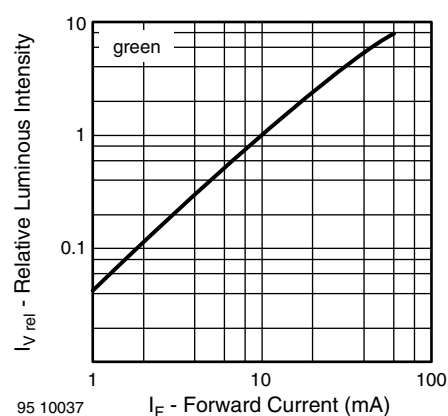


Fig. 17 - Relative Luminous Intensity vs. Forward Current

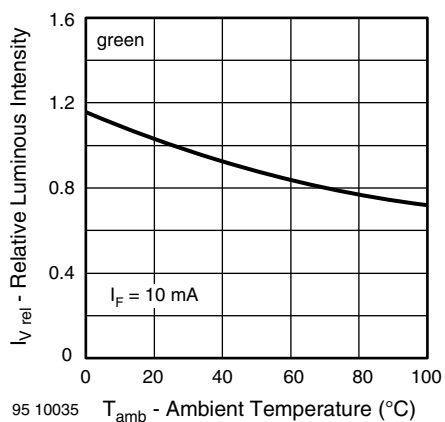


Fig. 15 - Relative Luminous Intensity vs. Ambient Temperature

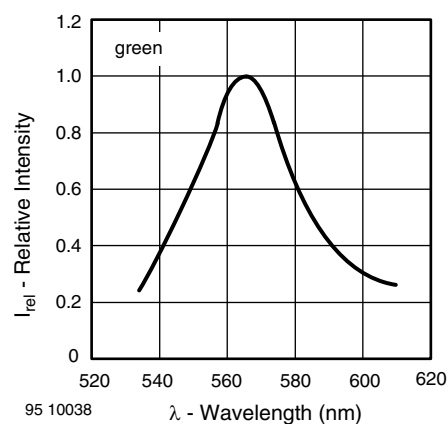
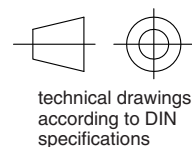
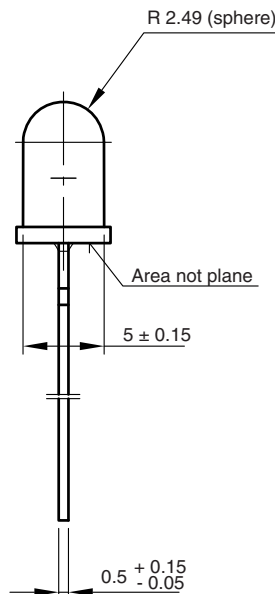
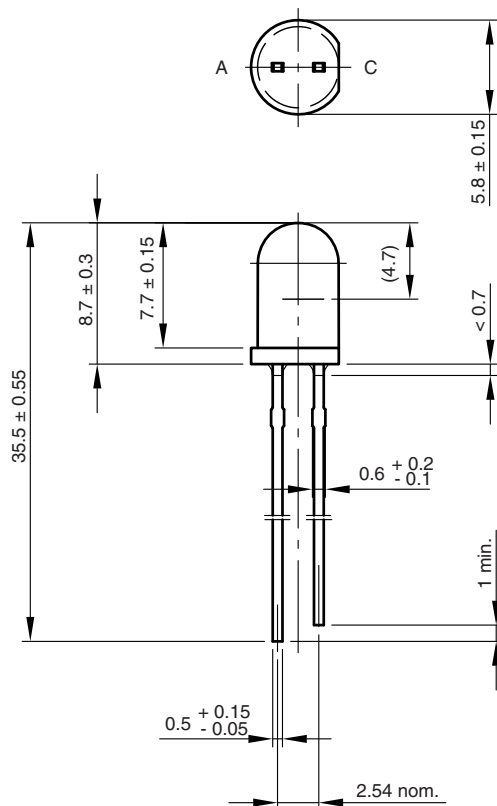


Fig. 18 - Relative Intensity vs. Wavelength



**PACKAGE DIMENSIONS** in millimeters



6.544-5259.02-4  
Issue: 8; 19.05.09  
95 10917

**REEL**

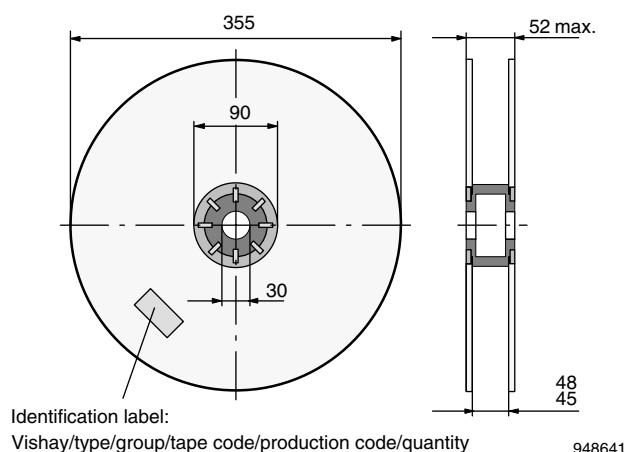


Fig. 19 - Reel Dimensions

**TAPE**

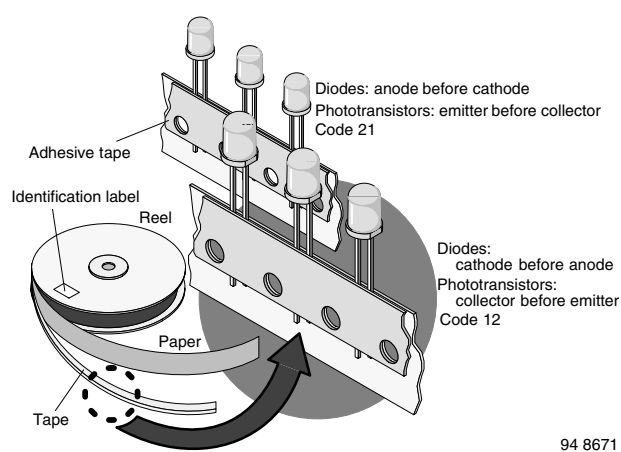


Fig. 20 - LED in Tape

AS12 = cathode leaves tape first  
AS21 = anode leaves tape first

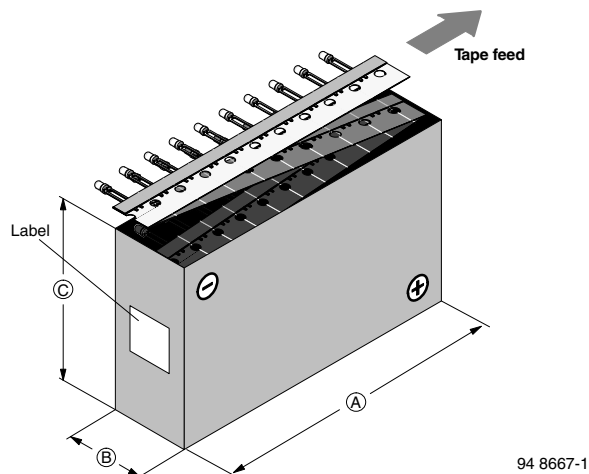
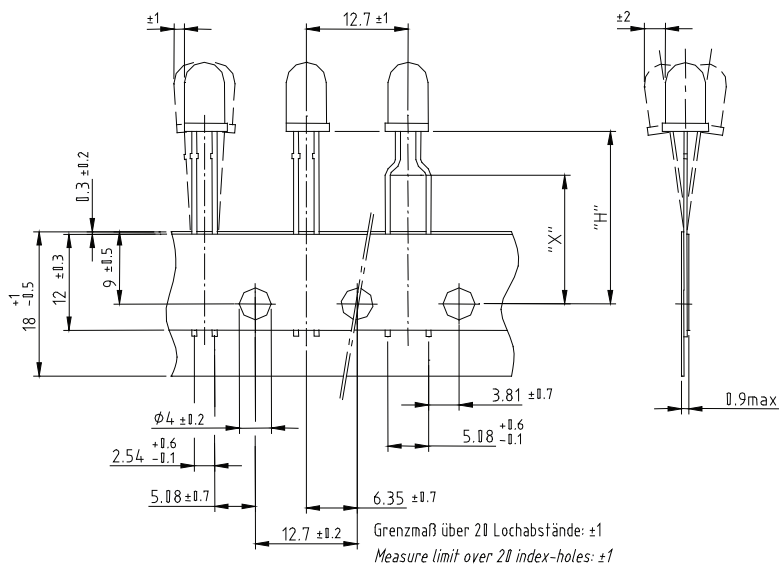
**AMMOPACK**


Fig. 21 - Tape Direction

**Note**

- The new nomenclature for ammpack is e.g. ASZ only, without suffix for the LED orientation. The carton box has to be turned to the desired position: "+" for anode first, or "-" for cathode first. AS12Z and AS21Z are still valid for already existing types, BUT NOT FOR NEW DESIGN

**TAPE DIMENSIONS** in millimeters


|               |                                |
|---------------|--------------------------------|
| Quantity per: | Ampack/reel<br>(Mat.-No. 1764) |
|               | 1000                           |

948172\_1

| Option | Dim. "H" ± 0.5 mm | Dim. "X" ± 0.5 mm |
|--------|-------------------|-------------------|
| AS     | 17.3              |                   |
| BT     | 20.0              | 16.0              |
| CS     | 22.0              |                   |
| MS     | 25.5              |                   |



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