High Efficiency LED in Ø 5 mm Tinted Diffused Package

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: ± 30°

FEATURES
- Choice of three bright colors
- Standard T-1 ¾ 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

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

PARTS TABLE

<table>
<thead>
<tr>
<th>PART</th>
<th>COLOR</th>
<th>LUMINOUS INTENSITY (mcd) at IF (mA)</th>
<th>WAVELENGTH (nm) at IF (mA)</th>
<th>FORWARD VOLTAGE (V) at IF (mA)</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MIN. TYP. MAX.</td>
<td>MIN. TYP. MAX.</td>
<td>MIN. TYP. MAX.</td>
<td></td>
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<tr>
<td>TLHR6400</td>
<td>Red</td>
<td>1.6 10 - 10</td>
<td>612 - 630</td>
<td>10 - 2 3 20</td>
<td>GaAsP on GaP</td>
</tr>
<tr>
<td>TLHR6400-CS12Z</td>
<td>Red</td>
<td>1.6 10 - 10</td>
<td>612 - 630</td>
<td>10 - 2 3 20</td>
<td>GaAsP on GaP</td>
</tr>
<tr>
<td>TLHR6401</td>
<td>Red</td>
<td>4 12 - 10</td>
<td>612 - 630</td>
<td>10 - 2 3 20</td>
<td>GaAsP on GaP</td>
</tr>
<tr>
<td>TLHR6405</td>
<td>Red</td>
<td>6.3 14 - 10</td>
<td>612 - 630</td>
<td>10 - 2 3 20</td>
<td>GaAsP on GaP</td>
</tr>
<tr>
<td>TLHR6405-ASZ</td>
<td>Red</td>
<td>6.3 14 - 10</td>
<td>612 - 630</td>
<td>10 - 2 3 20</td>
<td>GaAsP on GaP</td>
</tr>
<tr>
<td>TLHY6400</td>
<td>Yellow</td>
<td>1.6 10 - 10</td>
<td>581 - 594</td>
<td>10 - 2.4 3 20</td>
<td>GaAsP on GaP</td>
</tr>
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</tr>
<tr>
<td>TLHG6400</td>
<td>Green</td>
<td>1.6 10 - 10</td>
<td>562 - 575</td>
<td>10 - 2.4 3 20</td>
<td>GaP on GaP</td>
</tr>
<tr>
<td>TLHG6400-AS12Z</td>
<td>Green</td>
<td>1.6 10 - 10</td>
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<td>TLHG6405</td>
<td>Green</td>
<td>6.3 15 - 10</td>
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<td>562 - 575</td>
<td>10 - 2.4 3 20</td>
<td>GaP on GaP</td>
</tr>
</tbody>
</table>
### ABSOLUTE MAXIMUM RATINGS (\(T_{\text{amb}} = 25 \degree \text{C},\) unless otherwise specified)

TLHR640., TLHY640., TLHG640.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse voltage</td>
<td>(V_R)</td>
<td>6</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>DC forward current</td>
<td>(I_F)</td>
<td>30</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Surge forward current</td>
<td>(I_{FSM})</td>
<td>1</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Power dissipation</td>
<td>(P_V)</td>
<td>100</td>
<td>mW</td>
<td></td>
</tr>
<tr>
<td>Junction temperature</td>
<td>(T_J)</td>
<td>100</td>
<td>\degree C</td>
<td></td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>(T_{\text{amb}})</td>
<td>-40 to +100</td>
<td>\degree C</td>
<td></td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>(T_{\text{stg}})</td>
<td>-55 to +100</td>
<td>\degree C</td>
<td></td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>(t) \leq 5 s, 2 mm from body</td>
<td>(T_{\text{sd}})</td>
<td>260</td>
<td>\degree C</td>
</tr>
<tr>
<td>Thermal resistance junction-to-ambient</td>
<td></td>
<td></td>
<td>(R_{\text{thJA}})</td>
<td>350</td>
</tr>
</tbody>
</table>

### OPTICAL AND ELECTRICAL CHARACTERISTICS (\(T_{\text{amb}} = 25 \degree \text{C},\) unless otherwise specified)

TLHR640., RED

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>PART</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminous intensity (1)</td>
<td>(I_F = 10 \text{ mA})</td>
<td>TLHR6400</td>
<td>(I_y)</td>
<td>1.6</td>
<td>10</td>
<td>-</td>
<td>mcд</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLHR6401</td>
<td>(I_y)</td>
<td>4</td>
<td>12</td>
<td>-</td>
<td>mcд</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLHR6405</td>
<td>(I_y)</td>
<td>6.3</td>
<td>14</td>
<td>-</td>
<td>mcд</td>
</tr>
<tr>
<td>Dominant wavelength</td>
<td>(I_F = 10 \text{ mA})</td>
<td>(\lambda_d)</td>
<td>612</td>
<td>-</td>
<td>630</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Peak wavelength</td>
<td>(I_F = 10 \text{ mA})</td>
<td>(\lambda_p)</td>
<td>-</td>
<td>-</td>
<td>635</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Angle of half intensity</td>
<td>(I_F = 10 \text{ mA})</td>
<td>(\phi)</td>
<td>-</td>
<td>-</td>
<td>± 30</td>
<td>°</td>
<td></td>
</tr>
<tr>
<td>Forward voltage</td>
<td>(I_F = 20 \text{ mA})</td>
<td>(V_F)</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>(I_R = 10 \mu\text{A})</td>
<td>(V_R)</td>
<td>6</td>
<td>15</td>
<td>-</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Junction capacitance</td>
<td>(V_R = 0 \text{ V, } f = 1 \text{ MHz})</td>
<td>(C_J)</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

(1) In one packing unit \(I_{\text{min.}}/I_{\text{max.}} \leq 0.5\)

TLHY640., YELLOW

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>PART</th>
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<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminous intensity (1)</td>
<td>(I_F = 10 \text{ mA})</td>
<td>TLHY6400</td>
<td>(I_y)</td>
<td>1.6</td>
<td>10</td>
<td>-</td>
<td>mcд</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLHY6401</td>
<td>(I_y)</td>
<td>4</td>
<td>12</td>
<td>-</td>
<td>mcд</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLHY6405</td>
<td>(I_y)</td>
<td>6.3</td>
<td>14</td>
<td>-</td>
<td>mcд</td>
</tr>
<tr>
<td>Dominant wavelength</td>
<td>(I_F = 10 \text{ mA})</td>
<td>(\lambda_d)</td>
<td>581</td>
<td>-</td>
<td>594</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Peak wavelength</td>
<td>(I_F = 10 \text{ mA})</td>
<td>(\lambda_p)</td>
<td>-</td>
<td>-</td>
<td>585</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Angle of half intensity</td>
<td>(I_F = 10 \text{ mA})</td>
<td>(\phi)</td>
<td>-</td>
<td>-</td>
<td>± 30</td>
<td>°</td>
<td></td>
</tr>
<tr>
<td>Forward voltage</td>
<td>(I_F = 20 \text{ mA})</td>
<td>(V_F)</td>
<td>-</td>
<td>2.4</td>
<td>3</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>(I_R = 10 \mu\text{A})</td>
<td>(V_R)</td>
<td>6</td>
<td>15</td>
<td>-</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Junction capacitance</td>
<td>(V_R = 0 \text{ V, } f = 1 \text{ MHz})</td>
<td>(C_J)</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

(1) In one packing unit \(I_{\text{min.}}/I_{\text{max.}} \leq 0.5\)

TLHG640., GREEN

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>PART</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminous intensity (1)</td>
<td>(I_F = 10 \text{ mA})</td>
<td>TLHG6400</td>
<td>(I_y)</td>
<td>1.6</td>
<td>10</td>
<td>-</td>
<td>mcд</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLHG6401</td>
<td>(I_y)</td>
<td>4</td>
<td>12</td>
<td>-</td>
<td>mcд</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLHG6405</td>
<td>(I_y)</td>
<td>6.3</td>
<td>15</td>
<td>-</td>
<td>mcд</td>
</tr>
<tr>
<td>Dominant wavelength</td>
<td>(I_F = 10 \text{ mA})</td>
<td>(\lambda_d)</td>
<td>562</td>
<td>-</td>
<td>575</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Peak wavelength</td>
<td>(I_F = 10 \text{ mA})</td>
<td>(\lambda_p)</td>
<td>-</td>
<td>-</td>
<td>565</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Angle of half intensity</td>
<td>(I_F = 10 \text{ mA})</td>
<td>(\phi)</td>
<td>-</td>
<td>-</td>
<td>± 30</td>
<td>°</td>
<td></td>
</tr>
<tr>
<td>Forward voltage</td>
<td>(I_F = 20 \text{ mA})</td>
<td>(V_F)</td>
<td>-</td>
<td>2.4</td>
<td>3</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>(I_R = 10 \mu\text{A})</td>
<td>(V_R)</td>
<td>6</td>
<td>15</td>
<td>-</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Junction capacitance</td>
<td>(V_R = 0 \text{ V, } f = 1 \text{ MHz})</td>
<td>(C_J)</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

(1) In one packing unit \(I_{\text{min.}}/I_{\text{max.}} \leq 0.5\)
TYPICAL CHARACTERISTICS (T_{amb} = 25 \degree C, unless otherwise specified)

Fig. 1 - Forward Current vs. Ambient Temperature

Fig. 2 - Forward Current vs. Pulse Length

Fig. 3 - Relative Luminous Intensity vs. Angular Displacement

Fig. 4 - Forward Current vs. Forward Voltage

Fig. 5 - Relative Luminous Intensity vs. Ambient Temperature

Fig. 6 - Relative Luminous Intensity vs. Forward Current/Duty Cycle
Fig. 7 - Relative Luminous Intensity vs. Forward Current

Fig. 8 - Relative Intensity vs. Wavelength

Fig. 9 - Forward Current vs. Forward Voltage

Fig. 10 - Relative Luminous Intensity vs. Ambient Temperature

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

Fig. 12 - Relative Luminous Intensity vs. Forward Current
Fig. 13 - Relative Intensity vs. Wavelength

Fig. 14 - Forward Current vs. Forward Voltage

Fig. 15 - Relative Luminous Intensity vs. Ambient Temperature

Fig. 16 - Specific Luminous Intensity vs. Forward Current

Fig. 17 - Relative Luminous Intensity vs. Forward Current

Fig. 18 - Relative Intensity vs. Wavelength
PACKAGE DIMENSIONS in millimeters

Fig. 19 - Reel Dimensions

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

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95 10917

Diodes: anode before cathode
Phototransistors: emitter before collector
Code 21

Diodes: cathode before anode
Phototransistors: collector before emitter
Code 12

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Note

- The new nomenclature for ammopack 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

<table>
<thead>
<tr>
<th>Option</th>
<th>Dim. “H” ± 0.5 mm</th>
<th>Dim. “X” ± 0.5 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS</td>
<td>17.3</td>
<td></td>
</tr>
<tr>
<td>BT</td>
<td>20.0</td>
<td>16.0</td>
</tr>
<tr>
<td>CS</td>
<td>22.0</td>
<td></td>
</tr>
<tr>
<td>MS</td>
<td>25.5</td>
<td></td>
</tr>
</tbody>
</table>
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