High Power Infrared Emitting Diode, 940 nm, GaAlAs, MQW

DESCRIPTION
TSML1000 is an infrared, 940 nm emitting diode in GaAlAs multi quantum well (MQW) technology with high radiant power and high speed molded in a clear, untinted plastic package (with lens) for surface mounting (SMD).

FEATURES
- Package type: surface mount
- Package form: GW, RGW, yoke, axial
- Dimensions (L x W x H in mm): 2.5 x 2 x 2.7
- Peak wavelength: \( \lambda_p = 940 \text{ nm} \)
- High radiant power
- High radiant intensity
- Angle of half intensity: \( \varphi = \pm 12^\circ \)
- Low forward voltage
- Suitable for high pulse current operation
- Good spectral matching with Si photodetectors
- Versatile terminal configurations
- Package matches with detector TEMT1000
- Floor life: 168 h, MSL 3, acc. J-STD-020
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS
- For remote control
- Punched tape readers
- Encoder
- Photointerrupters

PRODUCT SUMMARY

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>( I_e ) (mW/sr)</th>
<th>( \varphi ) (deg)</th>
<th>( \lambda_p ) (nm)</th>
<th>( t_r ) (ns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSML1000</td>
<td>11</td>
<td>( \pm 12 )</td>
<td>940</td>
<td>15</td>
</tr>
<tr>
<td>TSML1020</td>
<td>11</td>
<td>( \pm 12 )</td>
<td>940</td>
<td>15</td>
</tr>
<tr>
<td>TSML1030</td>
<td>11</td>
<td>( \pm 12 )</td>
<td>940</td>
<td>15</td>
</tr>
<tr>
<td>TSML1040</td>
<td>11</td>
<td>( \pm 12 )</td>
<td>940</td>
<td>15</td>
</tr>
</tbody>
</table>

Note
- Test conditions see table “Basic Characteristics”

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>ORDERING CODE</th>
<th>PACKAGING</th>
<th>REMARKS</th>
<th>PACKAGE FORM</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSML1000</td>
<td>Tape and reel</td>
<td>MOQ: 1000 pcs, 1000 pcs/reel</td>
<td>Reverse gullwing</td>
</tr>
<tr>
<td>TSML1020</td>
<td>Tape and reel</td>
<td>MOQ: 1000 pcs, 1000 pcs/reel</td>
<td>Gullwing</td>
</tr>
<tr>
<td>TSML1030</td>
<td>Tape and reel</td>
<td>MOQ: 1000 pcs, 1000 pcs/reel</td>
<td>Yoke</td>
</tr>
<tr>
<td>TSML1040</td>
<td>Bulk</td>
<td>MOQ: 1000 pcs, 1000 pcs/bulk</td>
<td>Axial leads</td>
</tr>
</tbody>
</table>

Note
- MOQ: minimum order quantity
**ABSOLUTE MAXIMUM RATINGS** *(T\text{amb} = 25 °C, unless otherwise specified)*

<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></td>
<td>VR</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Forward current</td>
<td></td>
<td>IF</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>Peak forward current</td>
<td>t\text{p}/T = 0.5, t\text{p} = 100 μs</td>
<td>IF\text{pM}</td>
<td>200</td>
<td>mA</td>
</tr>
<tr>
<td>Surge forward current</td>
<td>t\text{p} = 100 μs</td>
<td>IF\text{pM}</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Power dissipation</td>
<td></td>
<td>PV</td>
<td>190</td>
<td>mW</td>
</tr>
<tr>
<td>Junction temperature</td>
<td></td>
<td>TJ</td>
<td>100</td>
<td>°C</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td></td>
<td>T\text{amb}</td>
<td>-40 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td></td>
<td>T\text{stg}</td>
<td>-40 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>t ≤ 5 s</td>
<td>T\text{sd}</td>
<td>&lt; 260</td>
<td>°C</td>
</tr>
<tr>
<td>Thermal resistance junction/ambient</td>
<td>Soldered on PCB, pad dimensions: 4 mm x 4 mm</td>
<td>R\text{th JA}</td>
<td>400</td>
<td>°C</td>
</tr>
</tbody>
</table>

**Fig. 1 - Power Dissipation Limit vs. Ambient Temperature**

**Fig. 2 - Forward Current vs. Ambient Temperature**

**BASIC CHARACTERISTICS** *(T\text{amb} = 25 °C, unless otherwise specified)*

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward voltage</td>
<td>IF = 20 mA, t\text{p} = 20 ms</td>
<td>VF</td>
<td>1.2</td>
<td>1.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IF = 1 A, t\text{p} = 100 μs</td>
<td>VF</td>
<td>2.2</td>
<td>5.0</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient of VF</td>
<td>IF = 1 mA</td>
<td>TKVF</td>
<td>-1.8</td>
<td>-1.8</td>
<td>mV/K</td>
<td></td>
</tr>
<tr>
<td>Reverse current</td>
<td>V\text{R} = 5 V</td>
<td>IR</td>
<td>0.01</td>
<td>0.1</td>
<td>μA</td>
<td></td>
</tr>
<tr>
<td>Junction capacitance</td>
<td>V\text{R} = 0 V, f = 1 MHz, E = 0</td>
<td>CI</td>
<td>40</td>
<td></td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Radiant intensity</td>
<td>IF = 20 mA, t\text{p} = 20 ms</td>
<td>IE</td>
<td>3</td>
<td>11</td>
<td>15</td>
<td>mW/sr</td>
</tr>
<tr>
<td>Radiant power</td>
<td>IF = 100 mA, t\text{p} = 20 ms</td>
<td>φe</td>
<td>40</td>
<td></td>
<td>mW</td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient of φe</td>
<td>IF = 20 mA</td>
<td>TKφe</td>
<td>-0.6</td>
<td>-0.6</td>
<td>%/K</td>
<td></td>
</tr>
<tr>
<td>Angle of half intensity</td>
<td></td>
<td>φ</td>
<td>± 12</td>
<td></td>
<td>deg</td>
<td></td>
</tr>
<tr>
<td>Peak wavelength</td>
<td>IF = 100 mA</td>
<td>λp</td>
<td>940</td>
<td></td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Spectral bandwidth</td>
<td>IF = 100 mA</td>
<td>Δλ</td>
<td>30</td>
<td></td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient of λp</td>
<td>IF = 100 mA</td>
<td>TKλp</td>
<td>0.2</td>
<td></td>
<td>nm/K</td>
<td></td>
</tr>
<tr>
<td>Rise time</td>
<td>IF = 100 mA</td>
<td>tr</td>
<td>15</td>
<td></td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Fall time</td>
<td>IF = 100 mA</td>
<td>tf</td>
<td>15</td>
<td></td>
<td>ns</td>
<td></td>
</tr>
</tbody>
</table>
BASIC CHARACTERISTICS \( (T_{\text{amb}} = 25 \, ^{\circ}\text{C}, \text{unless otherwise specified}) \)

**Fig. 3** - Pulse Forward Current vs. Pulse Duration

**Fig. 4** - Forward Current vs. Forward Voltage

**Fig. 5** - Radiant Intensity vs. Forward Current

**Fig. 6** - Radiant Power vs. Forward Current

**Fig. 7** - Relative Radiant Intensity/Power vs. Ambient Temperature

**Fig. 8** - Relative Radiant Power vs. Wavelength
PRECAUTIONS FOR USE

1. Over-current-proof
   Customer must apply resistors for protection, otherwise slight voltage shift will cause big current change (burn out will happen).

2. Storage
   - Storage temperature and rel. humidity conditions are: 5 °C to 35 °C, R.H. 60 %.
   - Floor life must not exceed 168 h, acc. to JEDEC level 3, J-STD-020.
     Once the package is opened, the products should be used within a week. Otherwise, they should be kept in a damp proof box with desiccant.
     Considering tape life, we suggest to use products within one year from production date.
   - If opened more than one week in an atmosphere 5 °C to 35 °C, R.H. 60 %, devices should be treated at 60 °C ± 5 °C for 15 h.
   - If humidity indicator in the package shows pink color (normal blue), then devices should be treated with the same conditions as 2.3.
PACKAGE DIMENSIONS in millimeters: **TSML1000**

![Diagram of TSML1000 package dimensions]

Drawing-No.: 6.544-5326.02-4
Issue: 3; 02.04.03

16159

PACKAGE DIMENSIONS in millimeters: **TSML1020**

![Diagram of TSML1020 package dimensions]

Drawing-No.: 6.544-5325.02-4
Issue: 3; 02.04.03

16160
**REEL DIMENSIONS** in millimeters

![Diagram of reel dimensions](image)

**TAPING DIMENSIONS** in millimeters: **TSML1000**

![Diagram of taping dimensions](image)
TAPING DIMENSIONS in millimeters: **TSML1020**

![Diagram of TSML1020 taping dimensions]

Quantity per reel: 1000 pcs or 5000 pcs

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TAPING DIMENSIONS in millimeters: **TSML1030**

![Diagram of TSML1030 taping dimensions]

Quantity per reel: 1000 pcs or 5000 pcs
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