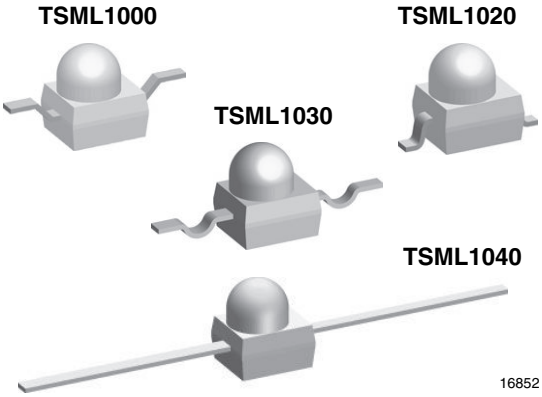
# High Power Infrared Emitting Diode, 940 nm, GaAlAs, MQW




## 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 nm
- High radiant power
- High radiant intensity
- Angle of half intensity: $\varphi$ = ± 12°
- 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

Pb-free

e3

RoHS COMPLIANT

## 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).

## APPLICATIONS

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

**PRODUCT SUMMARY**

| COMPONENT | $I_e$ (mW/sr) | $\varphi$ (deg) | $\lambda_P$ (nm) | $t_r$ (ns) |
|---|---|---|---|---|
| TSML1000 | 11 | ± 12 | 940 | 15 |
| TSML1020 | 11 | ± 12 | 940 | 15 |
| TSML1030 | 11 | ± 12 | 940 | 15 |
| TSML1040 | 11 | ± 12 | 940 | 15 |

**Note**

- Test conditions see table “Basic Characteristics”

**ORDERING INFORMATION**

| ORDERING CODE | PACKAGING | REMARKS | PACKAGE FORM |
|---|---|---|---|
| TSML1000 | Tape and reel | MOQ: 1000 pcs, 1000 pcs/reel | Reverse gullwing |
| TSML1020 | Tape and reel | MOQ: 1000 pcs, 1000 pcs/reel | Gullwing |
| TSML1030 | Tape and reel | MOQ: 1000 pcs, 1000 pcs/reel | Yoke |
| TSML1040 | Bulk | MOQ: 1000 pcs, 1000 pcs/bulk | Axial leads |

**Note**

- MOQ: minimum order quantity

| **ABSOLUTE MAXIMUM RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| Reverse voltage | | $V_R$ | 5 | V |
| Forward current | | $I_F$ | 100 | mA |
| Peak forward current | $t_p/T$ = 0.5, $t_p$ = 100 µs | $I_{FM}$ | 200 | mA |
| Surge forward current | $t_p$ = 100 µs | $I_{FSM}$ | 1.0 | A |
| Power dissipation | | $P_V$ | 190 | mW |
| Junction temperature | | $T_j$ | 100 | °C |
| Operating temperature range | | $T_{amb}$ | -40 to +85 | °C |
| Storage temperature range | | $T_{stg}$ | -40 to +100 | °C |
| Soldering temperature | t ≤ 5 s | $T_{sd}$ | < 260 | °C |
| Thermal resistance junction/ambient | Soldered on PCB, pad dimensions: 4 mm x 4 mm | $R_{thJA}$ | 400 | °C |

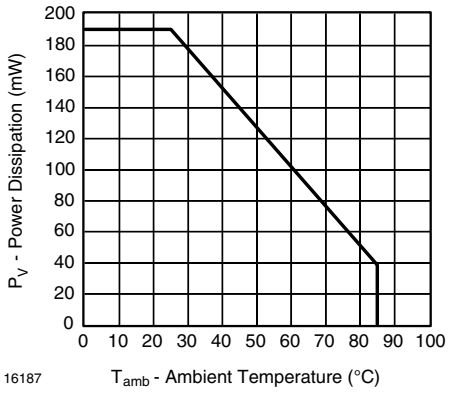



Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

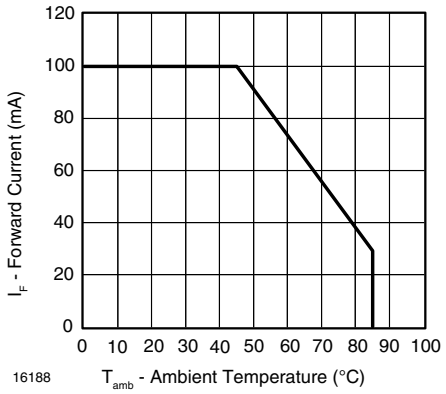



Fig. 2 - Forward Current vs. Ambient Temperature

| **BASIC CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| Forward voltage | $I_F$ = 20 mA, $t_p$ = 20 ms | $V_F$ | | 1.2 | 1.5 | V |
| | $I_F$ = 1 A, $t_p$ = 100 µs | $V_F$ | | 2.2 | | V |
| Temperature coefficient of $V_F$ | $I_F$ = 1 mA | $TK_{VF}$ | | -1.8 | | mV/K |
| Reverse current | $V_R$ = 5 V | $I_R$ | | | 10 | µA |
| Junction capacitance | $V_R$ = 0 V, f = 1 MHz, E = 0 | $C_j$ | | 40 | | pF |
| Radiant intensity | $I_F$ = 20 mA, $t_p$ = 20 ms | $I_e$ | 3 | 11 | 15 | mW/sr |
| Radiant power | $I_F$ = 100 mA, $t_p$ = 20 ms | $\phi_e$ | | 40 | | mW |
| Temperature coefficient of $\phi_e$ | $I_F$ = 20 mA | $TK\phi_e$ | | -0.6 | | %/K |
| Angle of half intensity | | $\varphi$ | | ± 12 | | deg |
| Peak wavelength | $I_F$ = 100 mA | $\lambda_p$ | | 940 | | nm |
| Spectral bandwidth | $I_F$ = 100 mA | $\Delta\lambda$ | | 30 | | nm |
| Temperature coefficient of $\lambda_p$ | $I_F$ = 100 mA | $TK\lambda_p$ | | 0.2 | | nm/K |
| Rise time | $I_F$ = 100 mA | $t_r$ | | 15 | | ns |
| Fall time | $I_F$ = 100 mA | $t_f$ | | 15 | | ns |

**BASIC CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified)

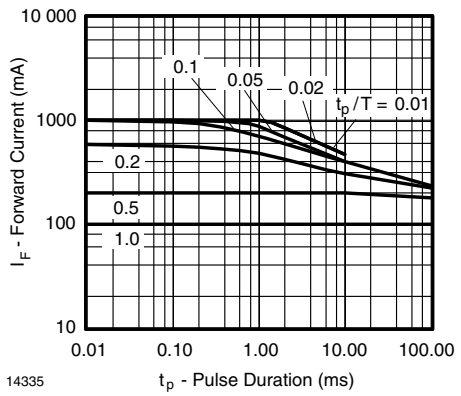



Fig. 3 - Pulse Forward Current vs. Pulse Duration

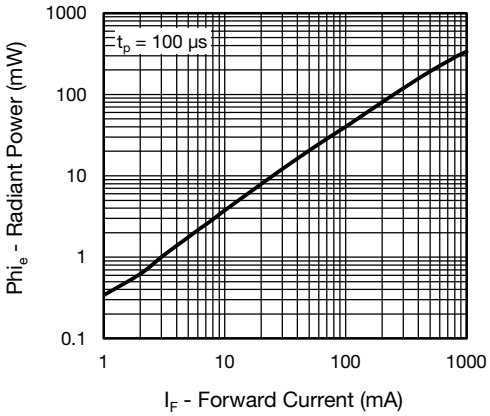



Fig. 6 - Radiant Power vs. Forward Current

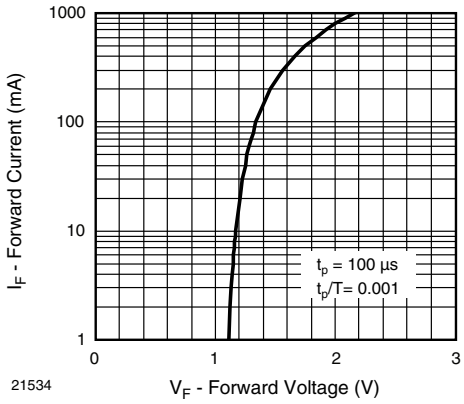



Fig. 4 - Forward Current vs. Forward Voltage

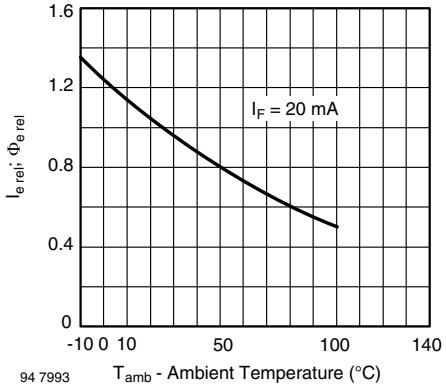



Fig. 7 - Relative Radiant Intensity/Power vs. Ambient Temperature

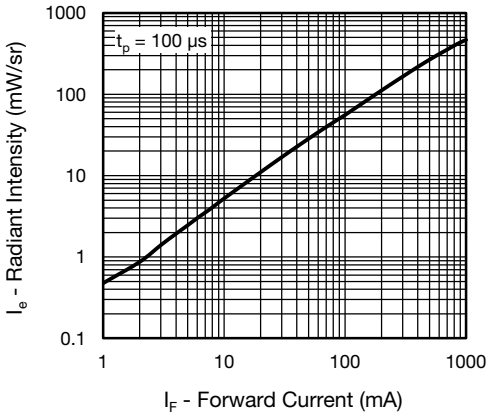



Fig. 5 - Radiant Intensity vs. Forward Current

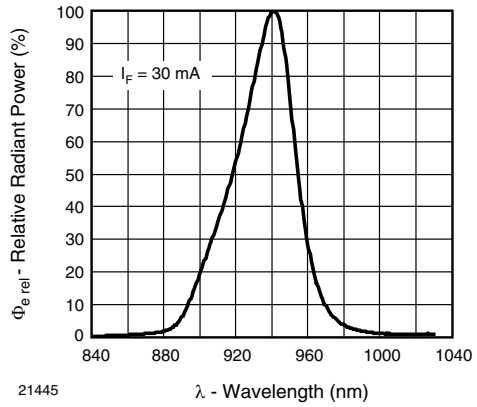



Fig. 8 - Relative Radiant Power vs. Wavelength

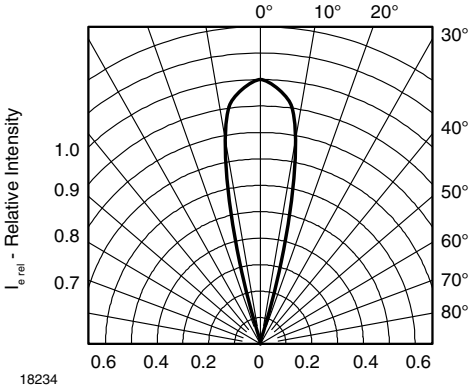



Fig. 9 - Relative Radiant Intensity vs. Angular Displacement

## 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.

## REFLOW SOLDER PROFILE

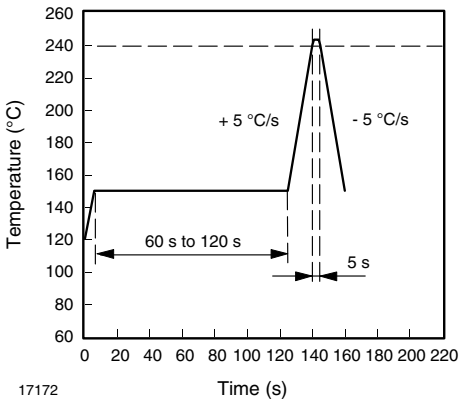



Fig. 10 - Lead Tin (SnPb) Reflow Solder Profile

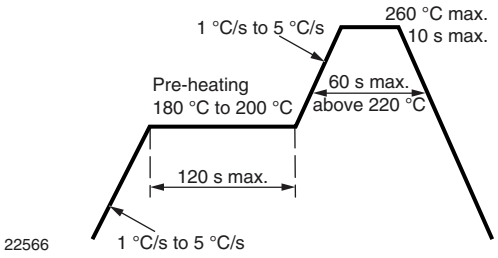
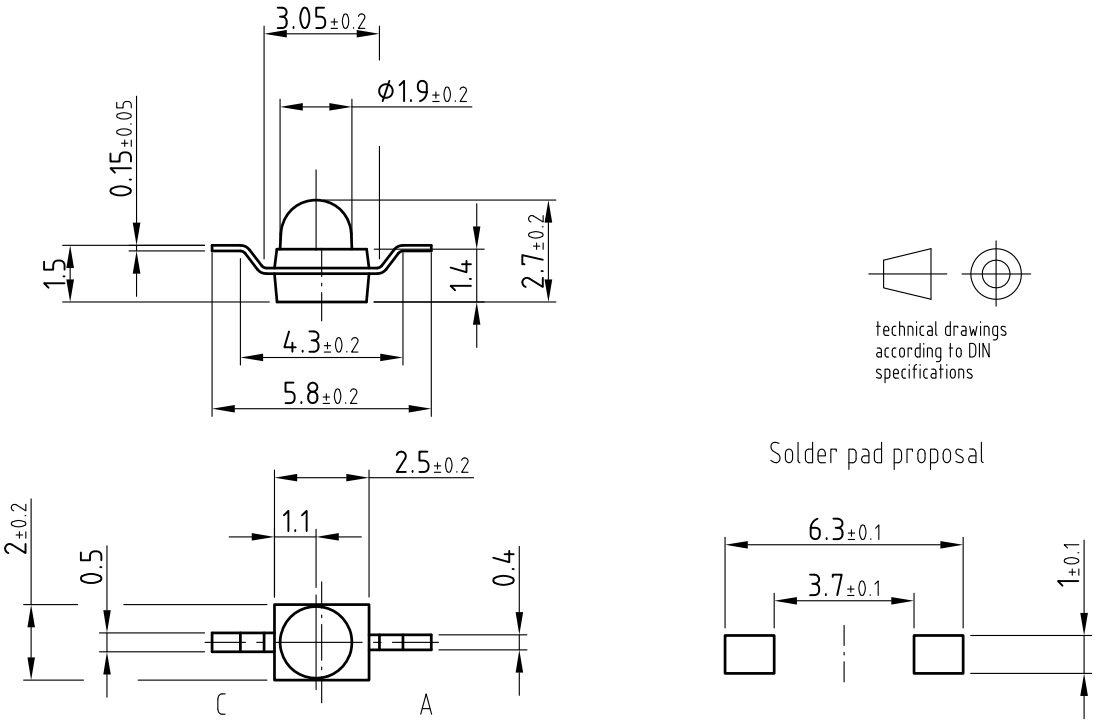



Fig. 11 - Lead (Pb)-Free Reflow Solder Profile acc. J-STD-020

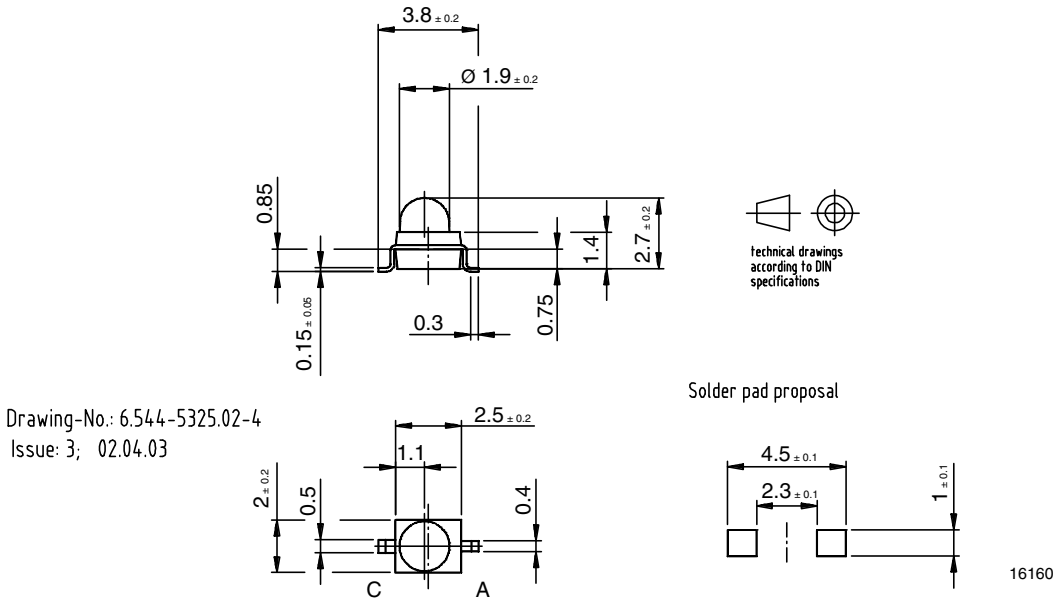
**PACKAGE DIMENSIONS** in millimeters: **TSML1000**




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

16159

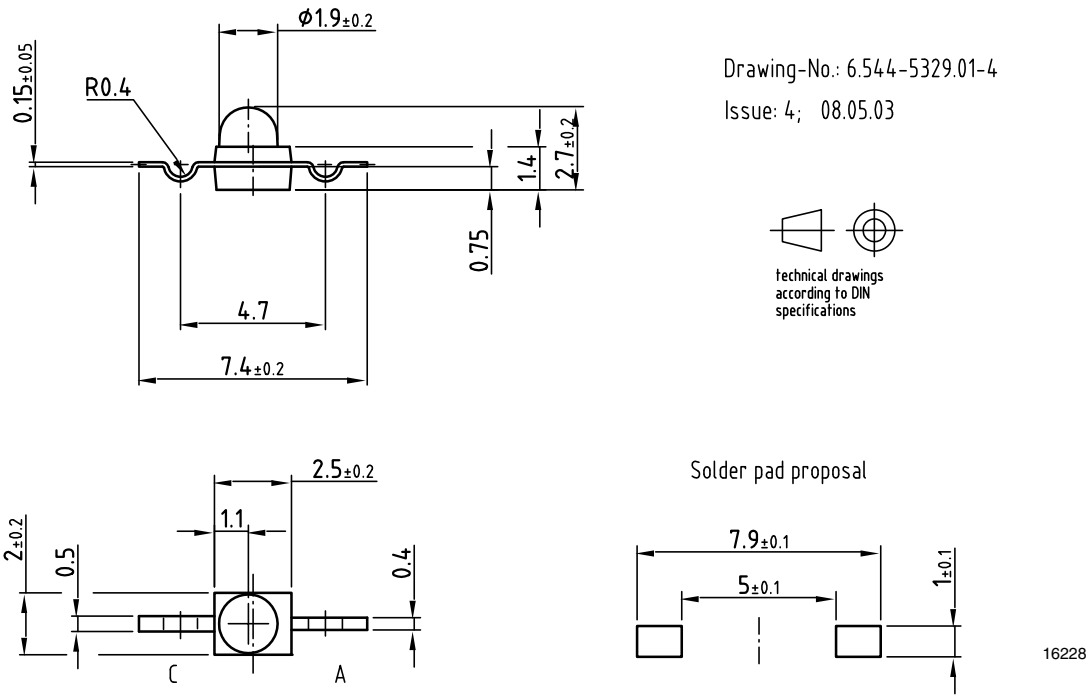
**PACKAGE DIMENSIONS** in millimeters: **TSML1020**



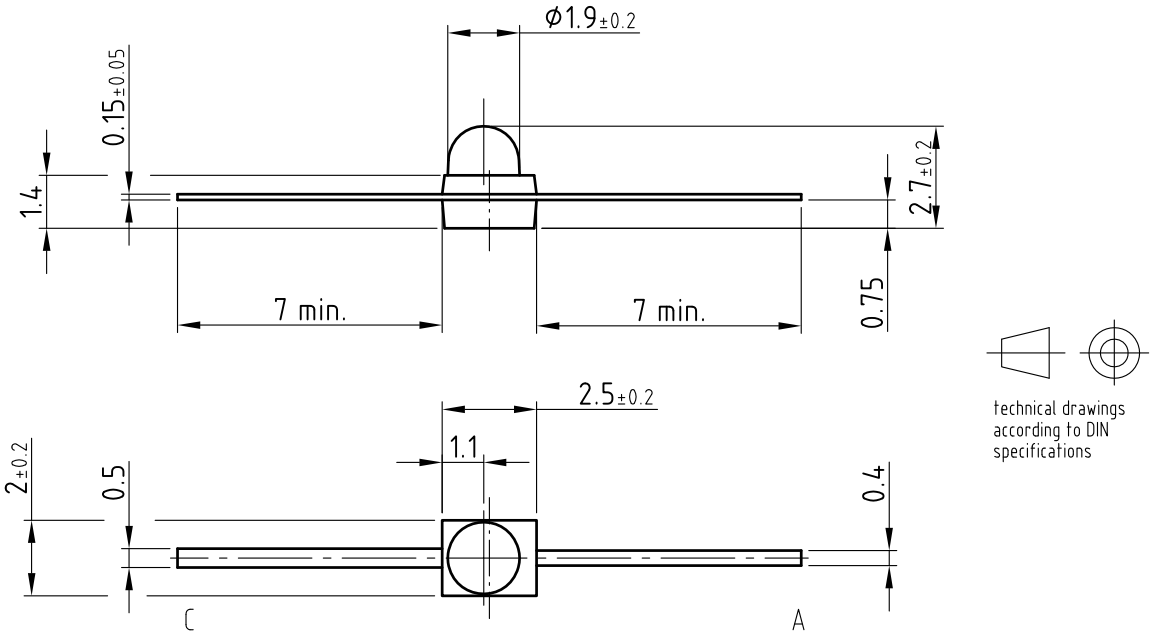

Drawing-No.: 6.544-5325.02-4
Issue: 3; 02.04.03

16160

**PACKAGE DIMENSIONS** in millimeters: **TSML1030**

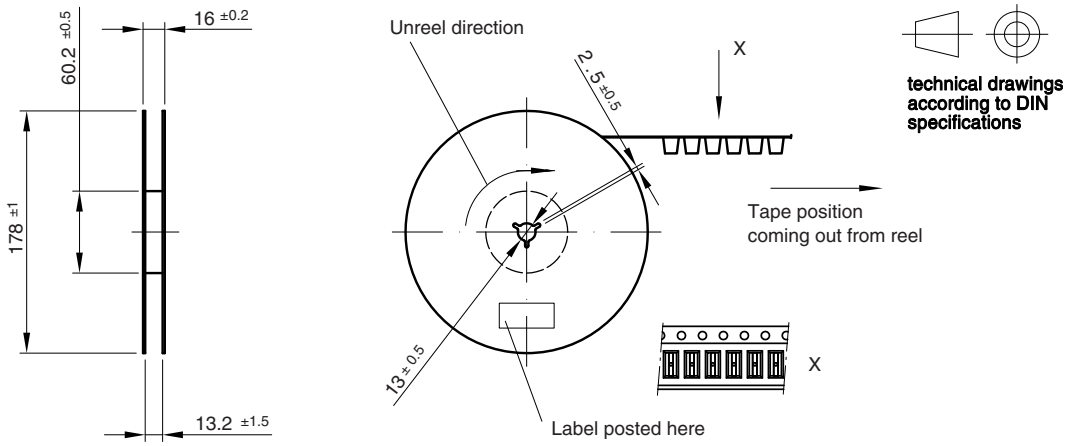



**PACKAGE DIMENSIONS** in millimeters: **TSML1040**

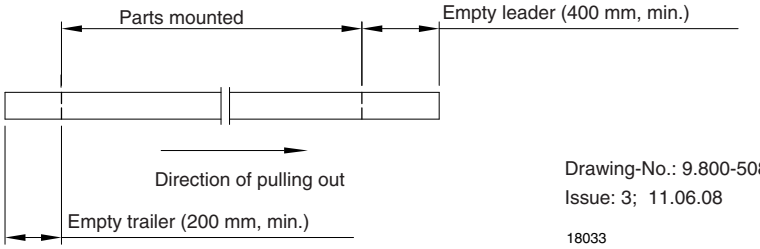



Drawing-No.: 6.544-5339.02-4
Issue: 3; 02.04.03
16760

## **REEL DIMENSIONS** in millimeters



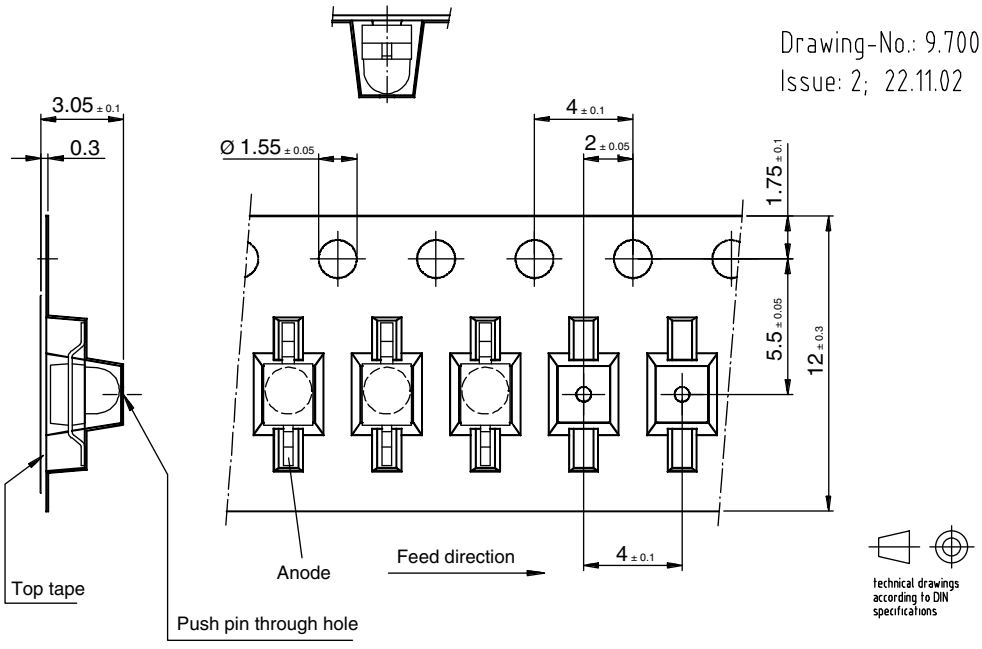

Leader and trailer tape:




Drawing-No.: 9.800-5080.01-4
Issue: 3; 11.06.08

18033

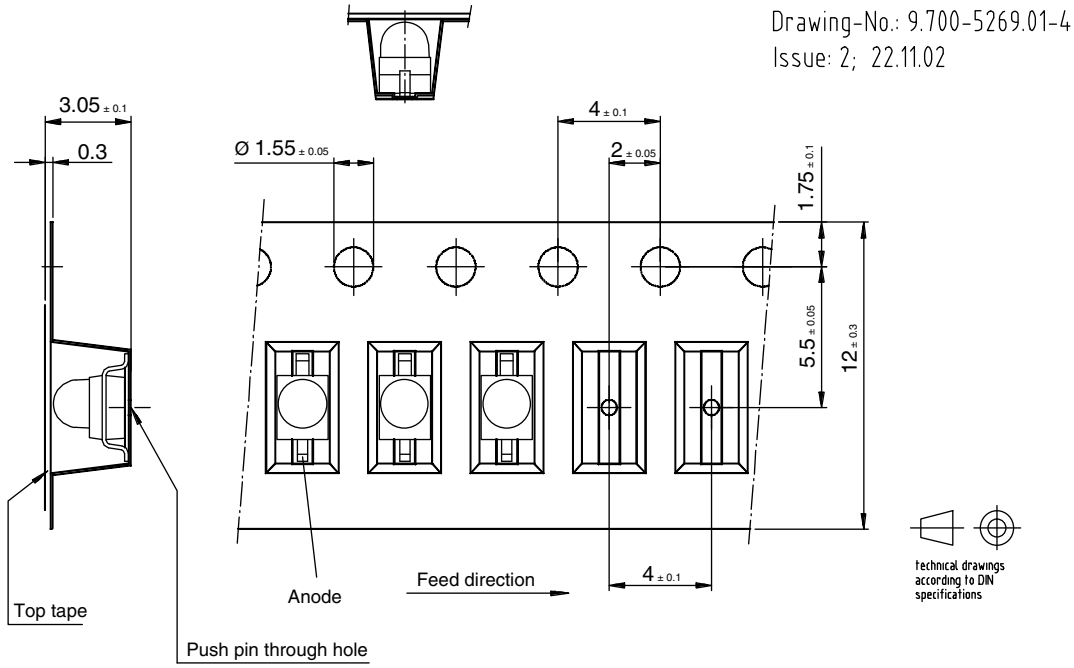
## **TAPING DIMENSIONS** in millimeters: **TSML1000**




Quantity per reel: 1000 pcs or 5000 pcs

18030

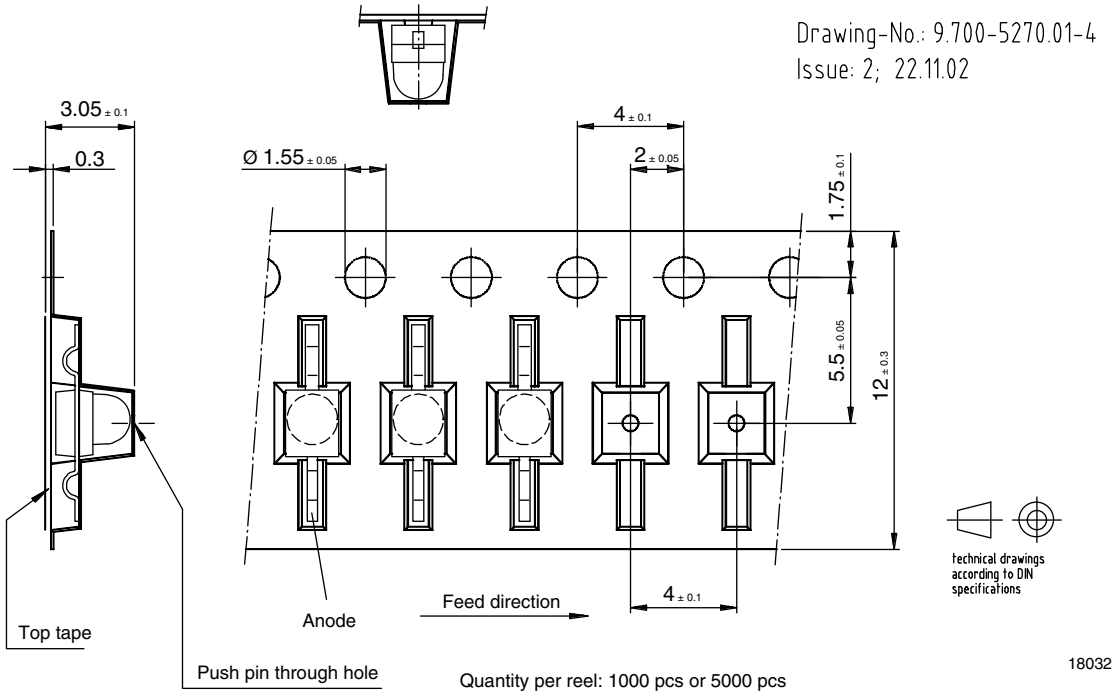
**TAPING DIMENSIONS** in millimeters: **TSML1020**




Quantity per reel: 1000 pcs or 5000 pcs

18031

**TAPING DIMENSIONS** in millimeters: **TSML1030**




18032

Quantity per reel: 1000 pcs or 5000 pcs

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