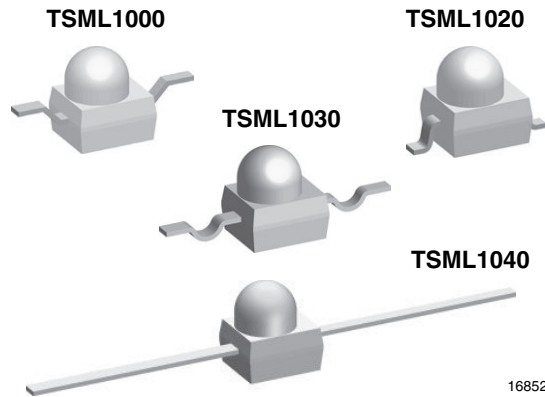




# THE DATASHEET OF TSML1040



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



16852

### 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:  $\phi = \pm 12^\circ$
- 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, according to J-STD-020
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**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
- Encoder
- Photointerrupters

PRODUCT SUMMARY				
COMPONENT	$I_e$ (mW/sr) at $I_f = 20 \text{ mA}$	$\phi$ (°)	$\lambda_p$ (nm)	$t_r$ (ns)
TSML1000	11	$\pm 12$	940	15
TSML1020	11	$\pm 12$	940	15
TSML1030	11	$\pm 12$	940	15
TSML1040	11	$\pm 12$	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 ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage		$V_R$	5	V
Forward current		$I_F$	100	mA
Peak forward current	$t_p/T = 0.5, t_p = 100\text{ }\mu\text{s}$	$I_{FM}$	200	mA
Surge forward current	$t_p = 100\text{ }\mu\text{s}$	$I_{FSM}$	1.0	A
Power dissipation		$P_V$	160	mW
Junction temperature		$T_j$	100	$^{\circ}\text{C}$
Operating temperature range		$T_{amb}$	-40 to +85	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	-40 to +100	$^{\circ}\text{C}$
Soldering temperature	According to Fig. 10, J-STD-020	$T_{sd}$	260	$^{\circ}\text{C}$
Thermal resistance junction to ambient	EIA / JESD51	$R_{thJA}$	400	K/W

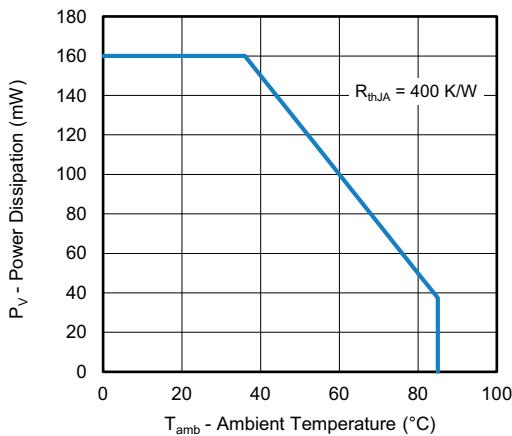


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

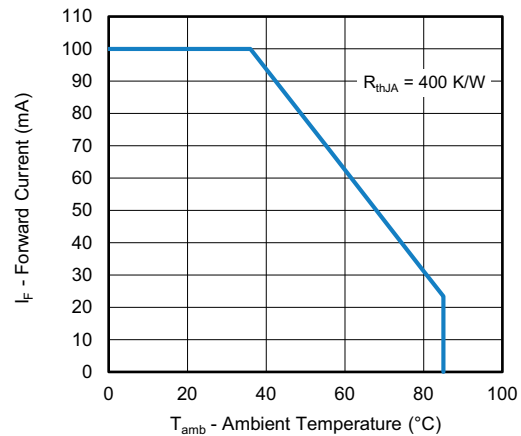


Fig. 2 - Forward Current vs. Ambient Temperature

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



## BASIC CHARACTERISTICS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

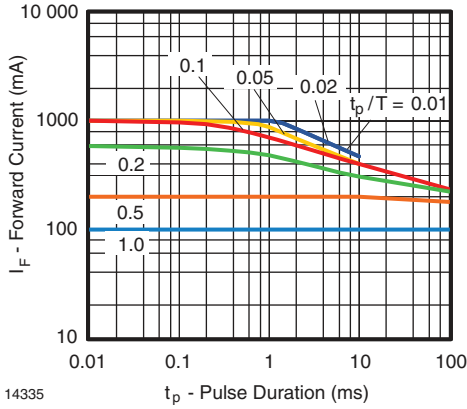


Fig. 3 - Pulse Forward Current vs. Pulse Duration

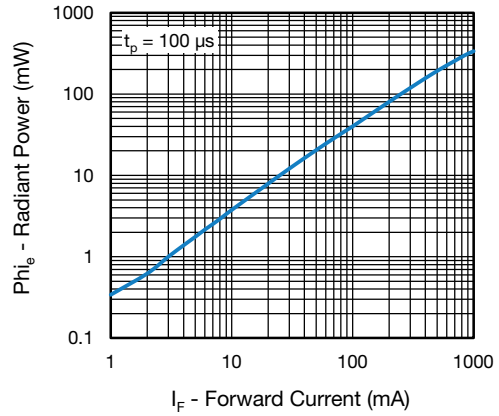


Fig. 6 - Radiant Power vs. Forward Current

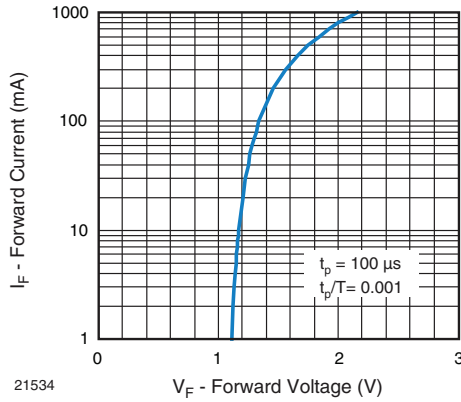


Fig. 4 - Forward Current vs. Forward Voltage

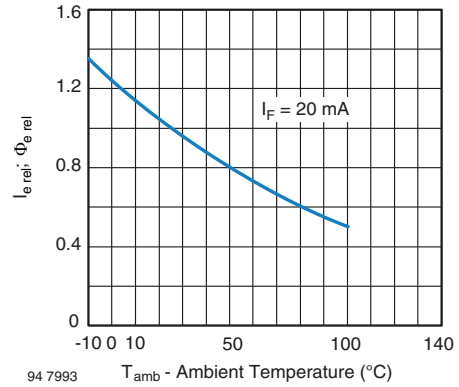


Fig. 7 - Relative Radiant Intensity/Power vs. Ambient Temperature

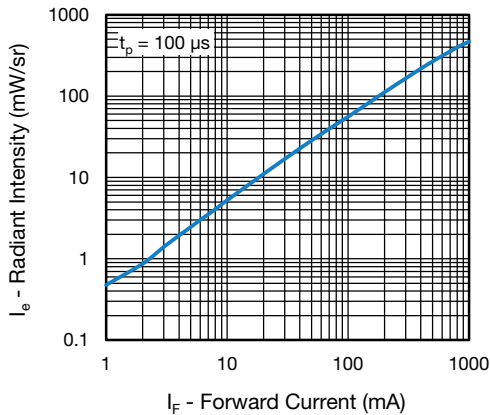


Fig. 5 - Radiant Intensity vs. Forward Current

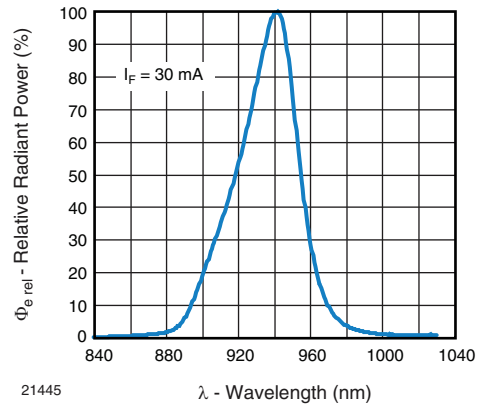


Fig. 8 - Relative Radiant Power vs. Wavelength

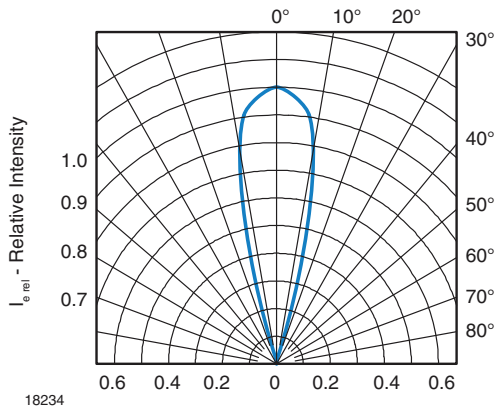


Fig. 9 - Relative Radiant Intensity vs. Angular Displacement

## 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, according 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

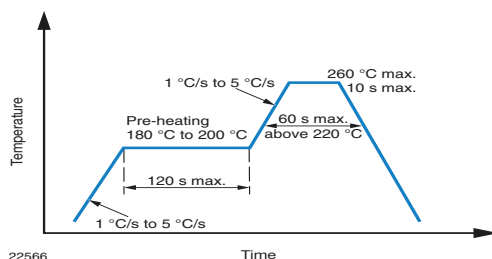
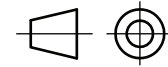
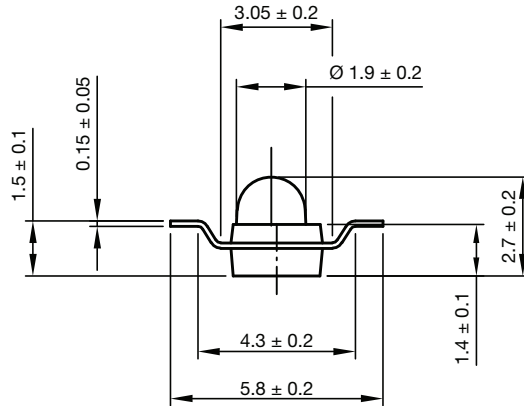


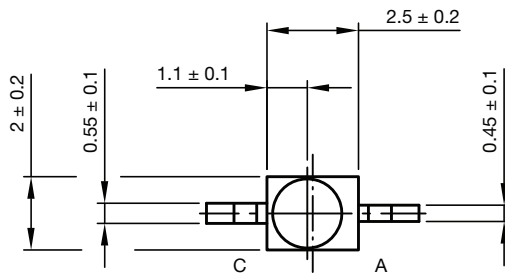
Fig. 10 - Lead (Pb)-Free Reflow Solder Profile According to J-STD-020



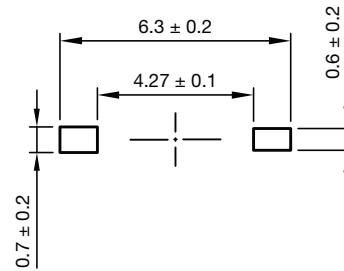
## PACKAGE DIMENSIONS in millimeters: TSML1000



Technical drawings according to DIN specifications

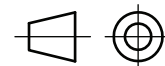
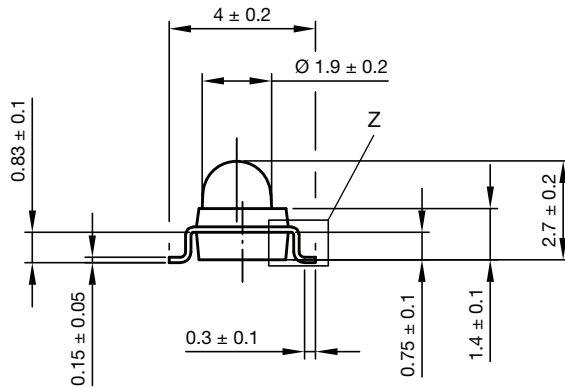


Solder pad proposal

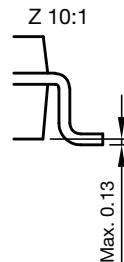
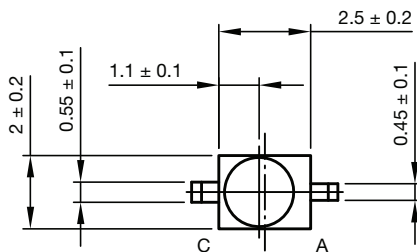


Drawing-No.: 6.544-5326.02-4  
Issue: 5; 15.09.2021

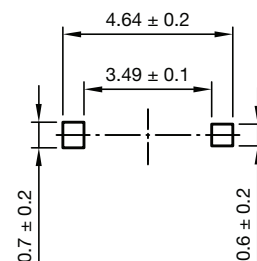
## PACKAGE DIMENSIONS in millimeters: TSML1020



Technical drawings according to DIN specifications



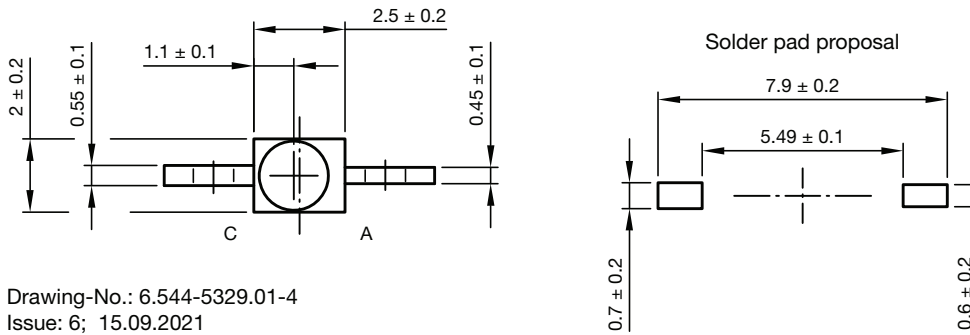
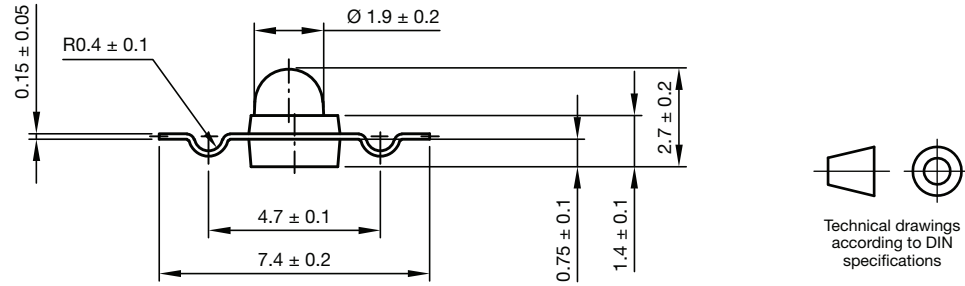
Solder pad proposal



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Issue: 5; 15.09.2021

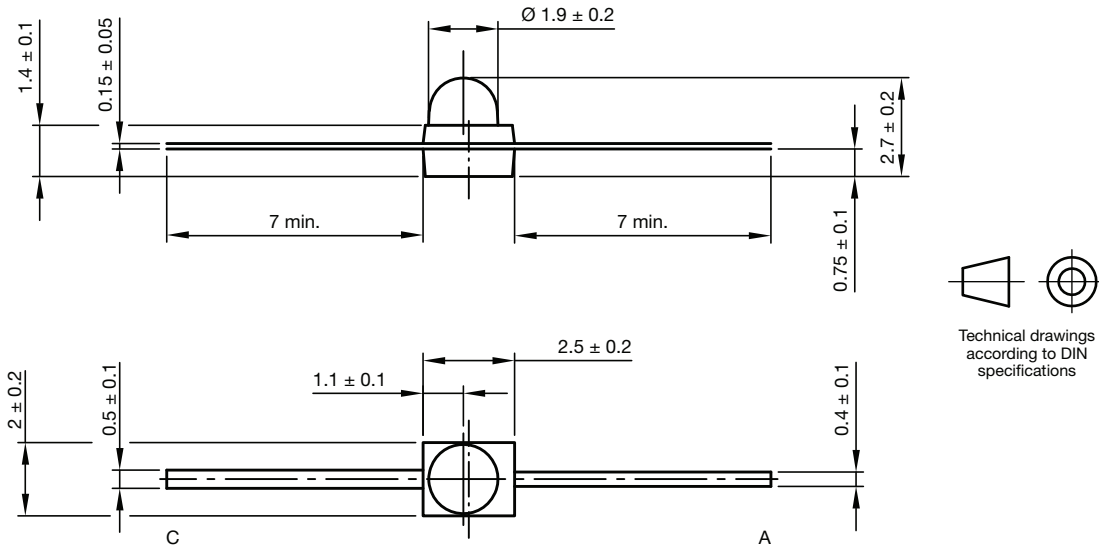


## PACKAGE DIMENSIONS in millimeters: TSML1030



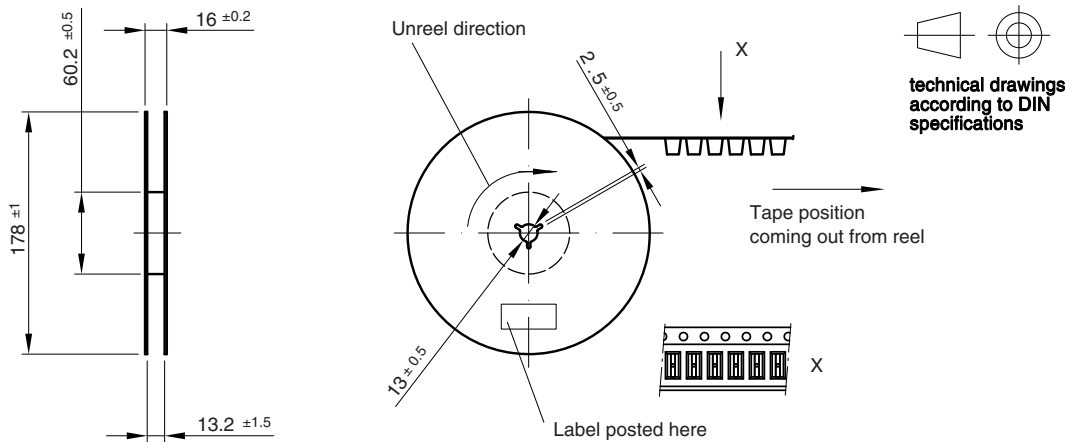
Drawing-No.: 6.544-5329.01-4  
Issue: 6; 15.09.2021

## PACKAGE DIMENSIONS in millimeters: TSML1040

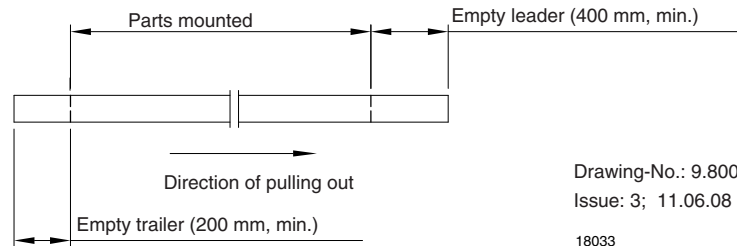


Drawing-No.: 6.544-5339.02-4  
Issue: 4; 04.08.2021

## REEL DIMENSIONS in millimeters



### Leader and trailer tape:

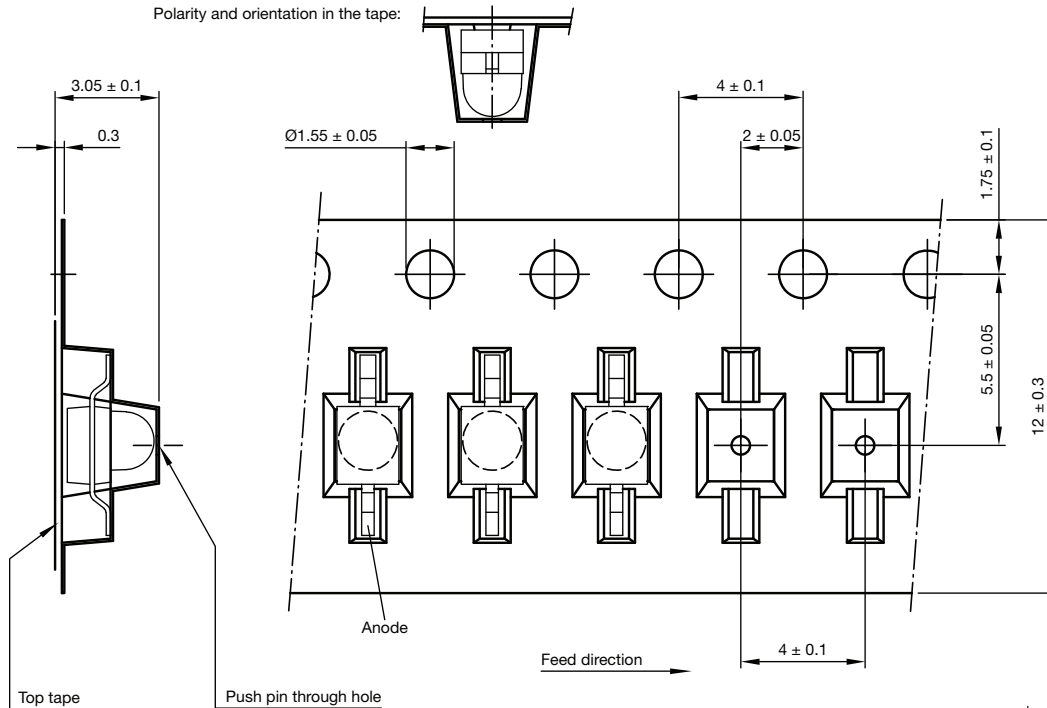


Drawing-No.: 9.800-5080.01-4  
Issue: 3; 11.06.08

18033

## TAPING DIMENSIONS in millimeters: TSML1000

Polarity and orientation in the tape:



Quantity per reel: 1000 pcs.

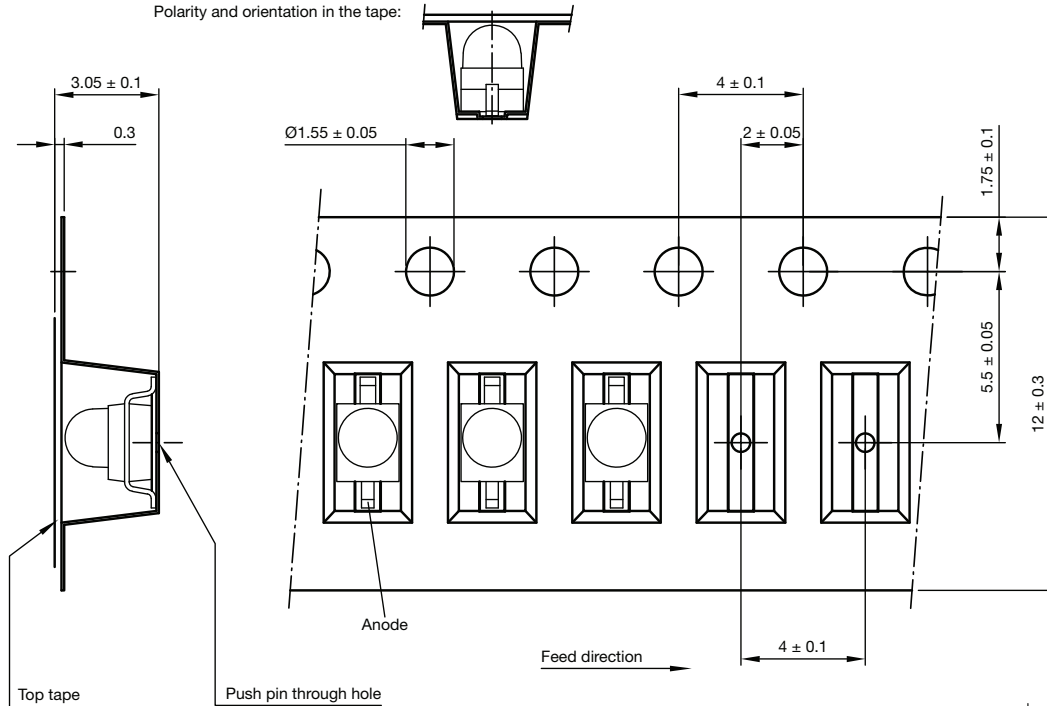
Drawing-No.: 9.700-5268.01-4  
Issue: 3; 28.09.2021

Technical drawings according to DIN specifications



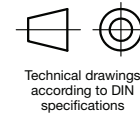
## TAPING DIMENSIONS in millimeters: TSML1020

Polarity and orientation in the tape:



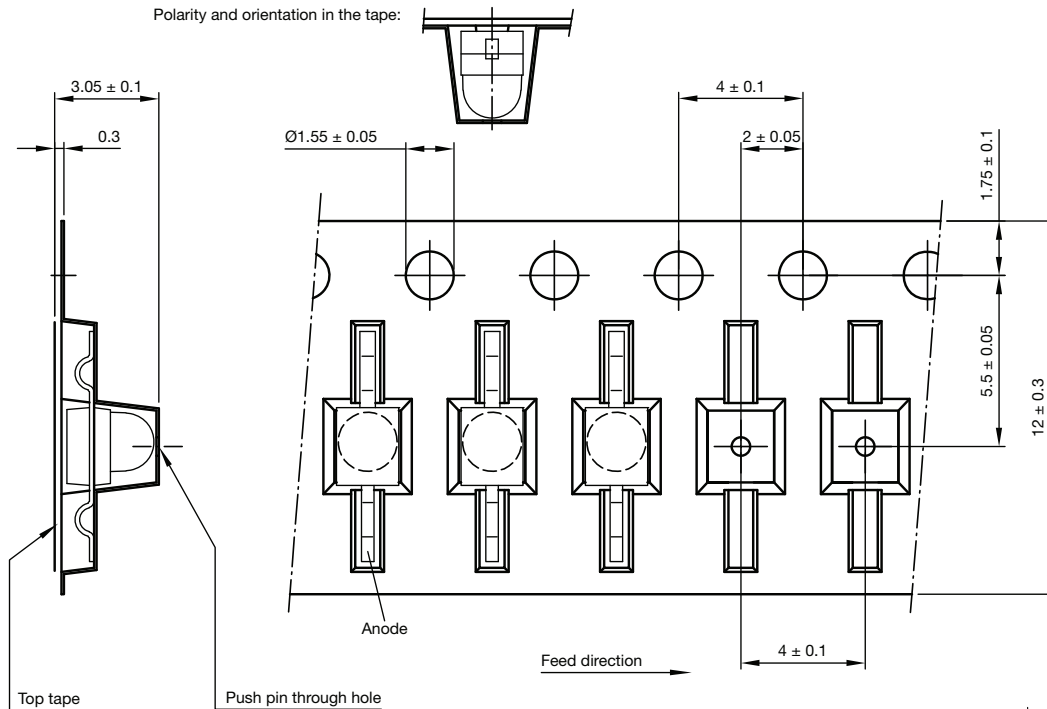
Quantity per reel: 1000 pcs.

Drawing-No.: 9.700-5269.01-4  
Issue: 3; 28.09.2021



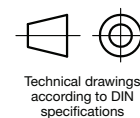
## TAPING DIMENSIONS in millimeters: TSML1030

Polarity and orientation in the tape:



Quantity per reel: 1000 pcs.

Drawing-No.: 9.700-5270.01-4  
Issue: 3; 28.09.2021





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