



## 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:  $\lambda_p = 940 \text{ nm}$
- 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, acc. 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
- Punched tape readers
- Encoder
- Photointerrupters

PRODUCT SUMMARY				
COMPONENT	$I_e$ (mW/sr)	$\phi$ (deg)	$\lambda_p$ (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 <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage		V <sub>R</sub>	5	V
Forward current		I <sub>F</sub>	100	mA
Peak forward current	t <sub>p</sub> /T = 0.5, t <sub>p</sub> = 100 μs	I <sub>FM</sub>	200	mA
Surge forward current	t <sub>p</sub> = 100 μs	I <sub>FSM</sub>	1.0	A
Power dissipation		P <sub>V</sub>	190	mW
Junction temperature		T <sub>j</sub>	100	°C
Operating temperature range		T <sub>amb</sub>	-40 to +85	°C
Storage temperature range		T <sub>stg</sub>	-40 to +100	°C
Soldering temperature	t ≤ 5 s	T <sub>sd</sub>	< 260	°C
Thermal resistance junction/ambient	Soldered on PCB, pad dimensions: 4 mm x 4 mm	R <sub>thJA</sub>	400	°C



Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

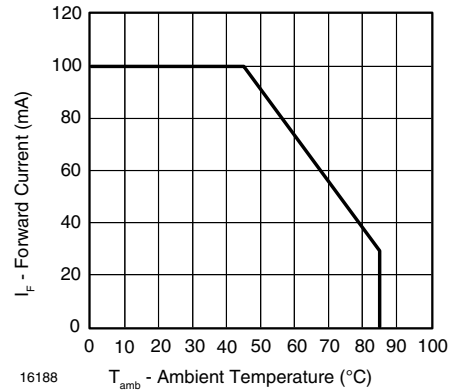


Fig. 2 - Forward Current vs. Ambient Temperature

BASIC CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Forward voltage	I <sub>F</sub> = 20 mA, t <sub>p</sub> = 20 ms	V <sub>F</sub>		1.2	1.5	V
	I <sub>F</sub> = 1 A, t <sub>p</sub> = 100 μs	V <sub>F</sub>		2.2		V
Temperature coefficient of V <sub>F</sub>	I <sub>F</sub> = 1 mA	TK <sub>V<sub>F</sub></sub>		-1.8		mV/K
Reverse current	V <sub>R</sub> = 5 V	I <sub>R</sub>			10	μA
Junction capacitance	V <sub>R</sub> = 0 V, f = 1 MHz, E = 0	C <sub>j</sub>		40		pF
Radiant intensity	I <sub>F</sub> = 20 mA, t <sub>p</sub> = 20 ms	I <sub>e</sub>	3	11	15	mW/sr
Radiant power	I <sub>F</sub> = 100 mA, t <sub>p</sub> = 20 ms	φ <sub>e</sub>		40		mW
Temperature coefficient of φ <sub>e</sub>	I <sub>F</sub> = 20 mA	TK <sub>φ<sub>e</sub></sub>		-0.6		%/K
Angle of half intensity		φ		± 12		deg
Peak wavelength	I <sub>F</sub> = 100 mA	λ <sub>p</sub>		940		nm
Spectral bandwidth	I <sub>F</sub> = 100 mA	Δλ		30		nm
Temperature coefficient of λ <sub>p</sub>	I <sub>F</sub> = 100 mA	TK <sub>λ<sub>p</sub></sub>		0.2		nm/K
Rise time	I <sub>F</sub> = 100 mA	t <sub>r</sub>		15		ns
Fall time	I <sub>F</sub> = 100 mA	t <sub>f</sub>		15		ns



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

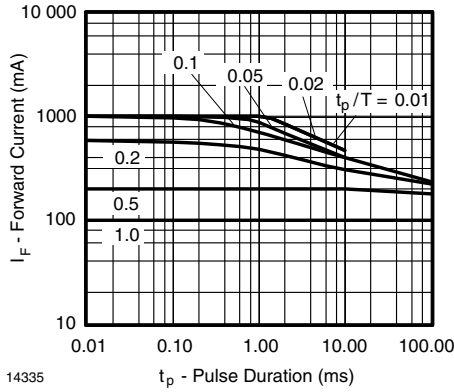


Fig. 3 - Pulse Forward Current vs. Pulse Duration

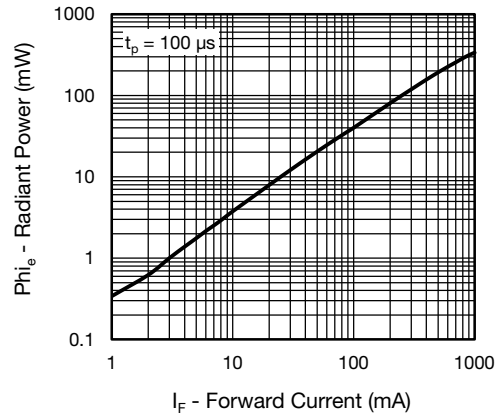


Fig. 6 - Radiant Power vs. Forward Current



Fig. 4 - Forward Current vs. Forward Voltage

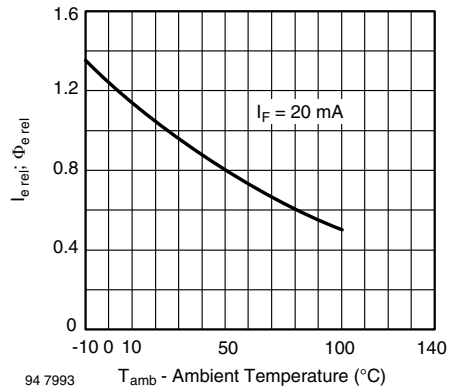


Fig. 7 - Relative Radiant Intensity/Power vs. Ambient Temperature

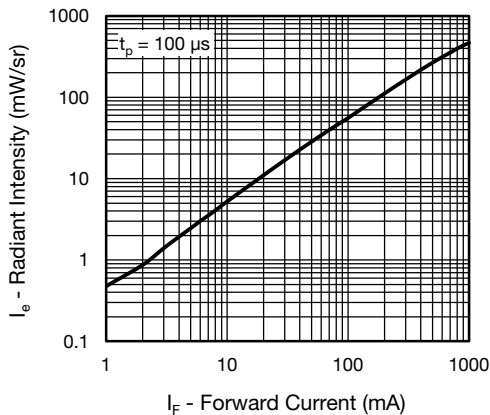


Fig. 5 - Radiant Intensity vs. Forward Current

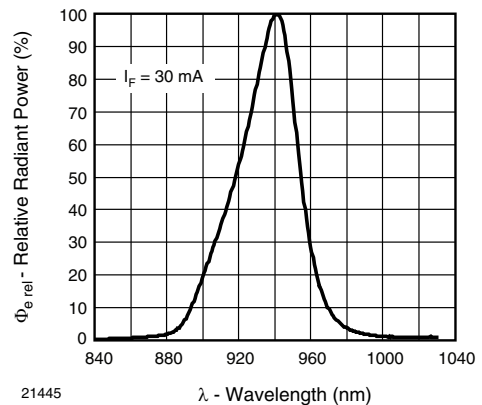


Fig. 8 - Relative Radiant Power vs. Wavelength

**REFLOW SOLDER PROFILE**

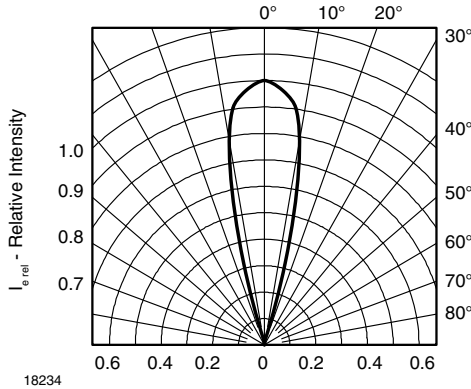


Fig. 9 - Relative Radiant Intensity vs. Angular Displacement

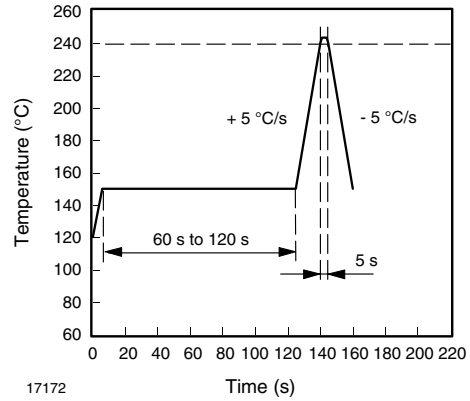


Fig. 10 - Lead Tin (SnPb) Reflow Solder Profile

**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.

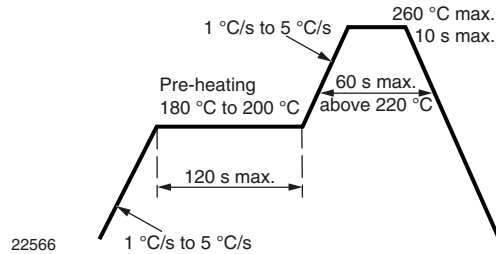
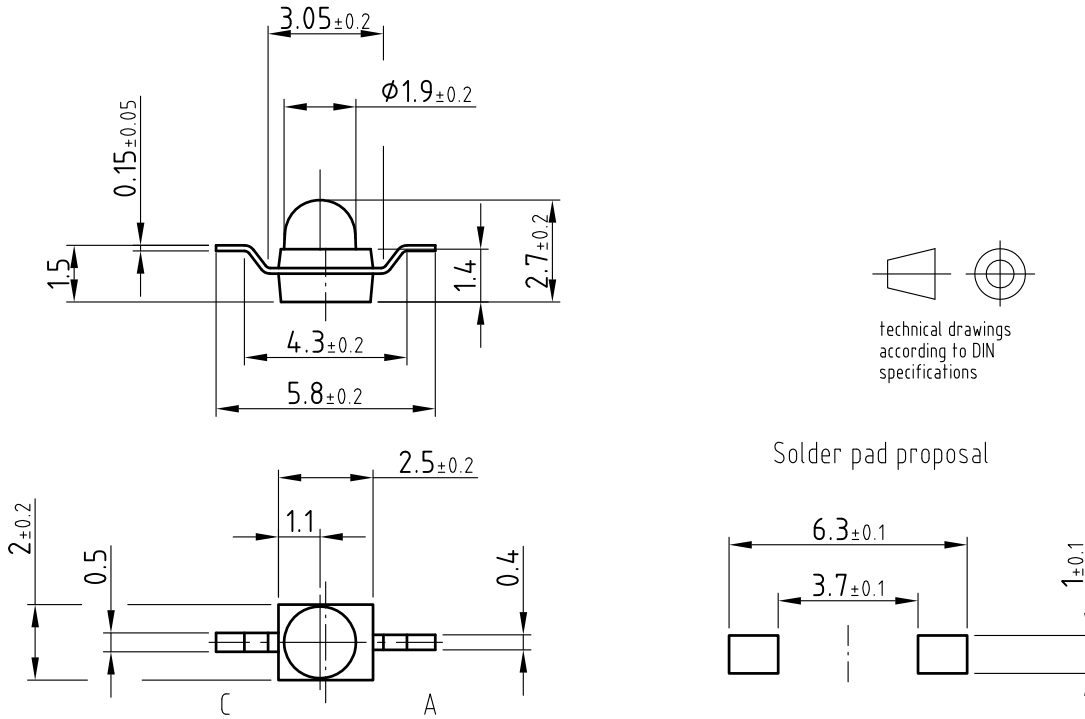


Fig. 11 - Lead (Pb)-Free Reflow Solder Profile acc. J-STD-020

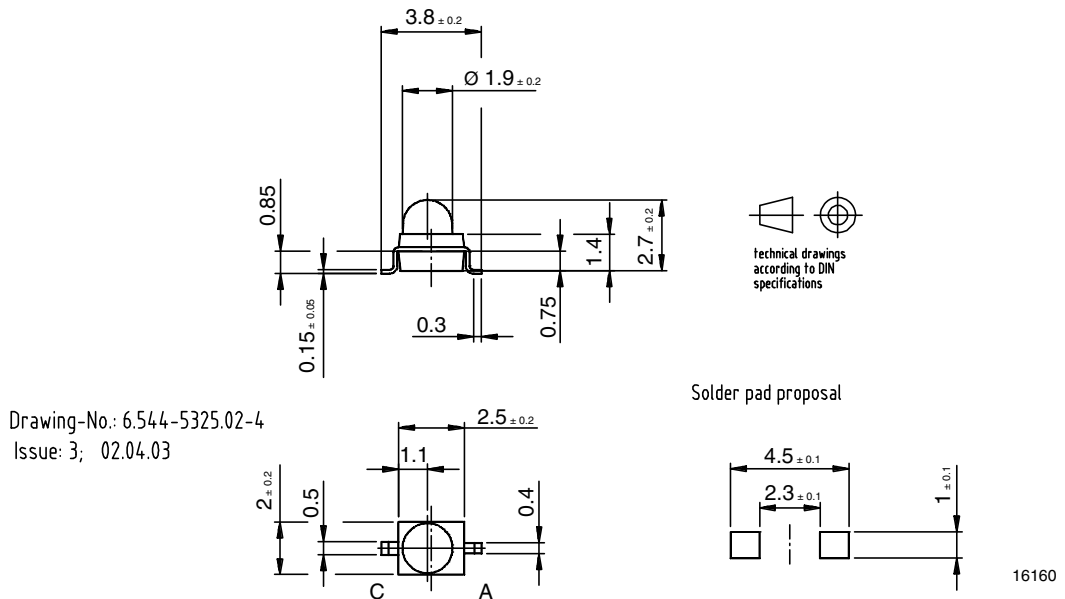


## PACKAGE DIMENSIONS in millimeters: TSML1000



Drawing-No.: 6.544-5326.02-4  
 Issue: 3; 02.04.03  
 16159

## PACKAGE DIMENSIONS in millimeters: TSML1020

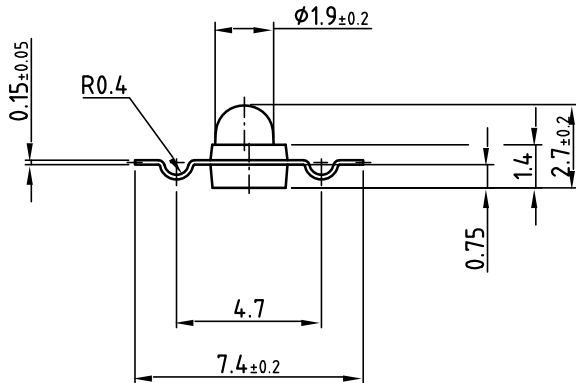


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 Issue: 3; 02.04.03

16160

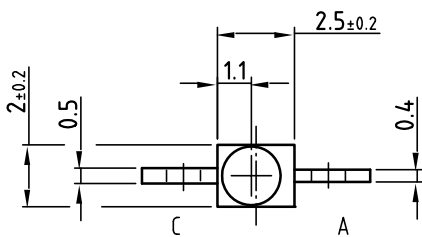
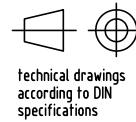


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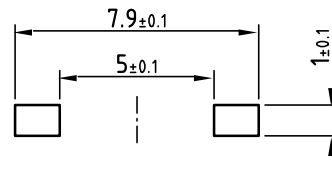


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Issue: 4; 08.05.03

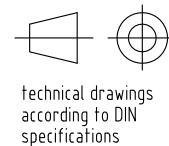
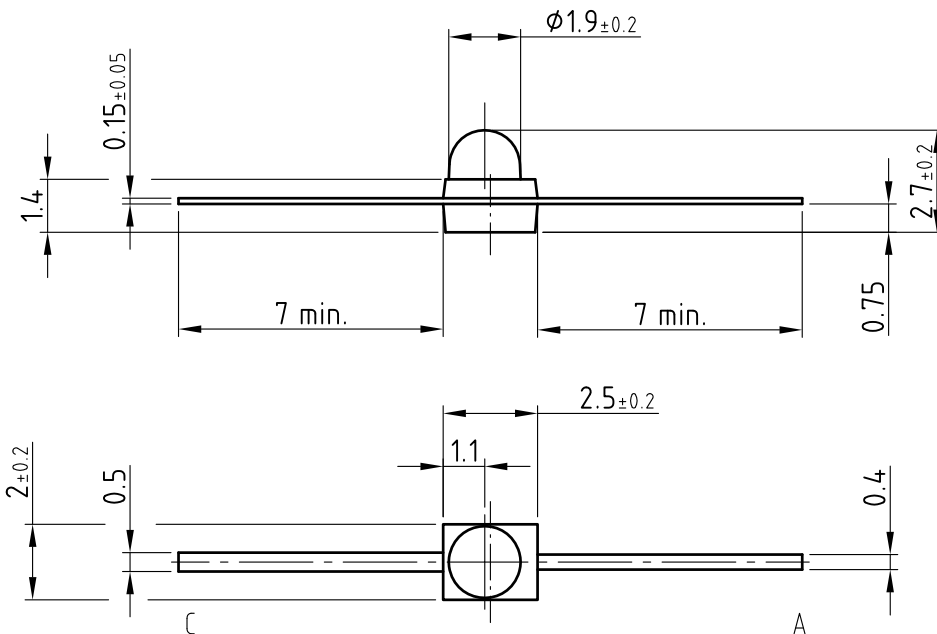


Solder pad proposal



16228

## PACKAGE DIMENSIONS in millimeters: TSML1040

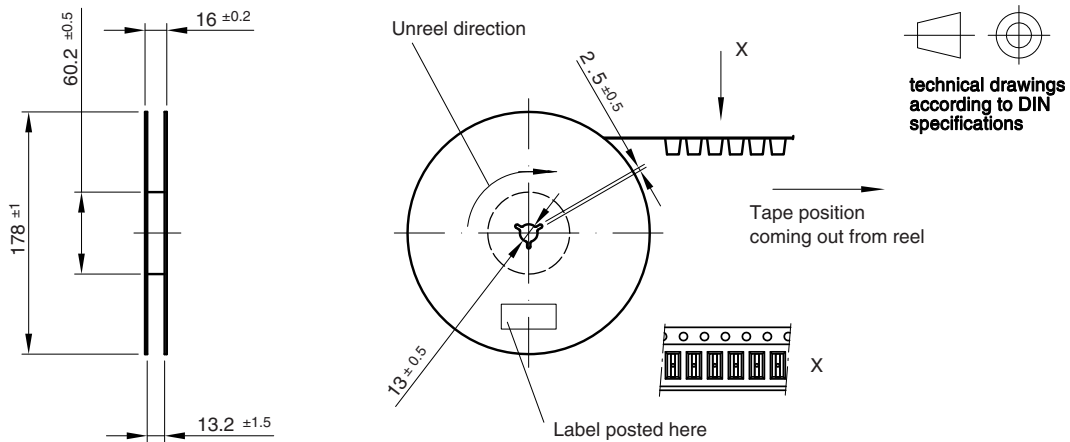


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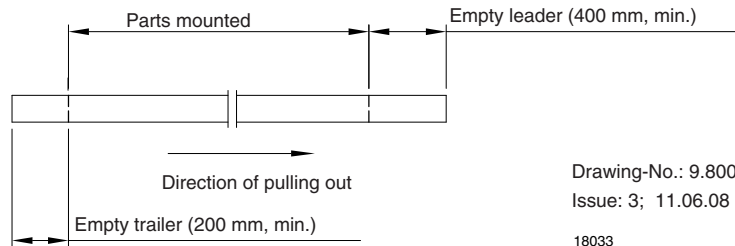
Issue: 3; 02.04.03

16760

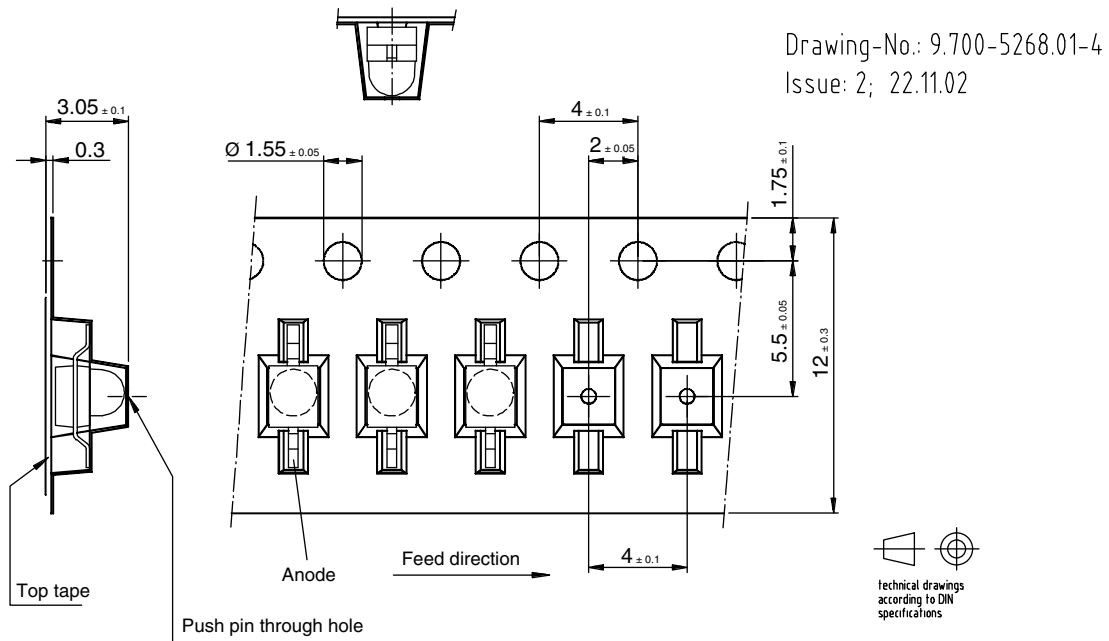
## REEL DIMENSIONS in millimeters



### Leader and trailer tape:



## TAPING DIMENSIONS in millimeters: TSML1000

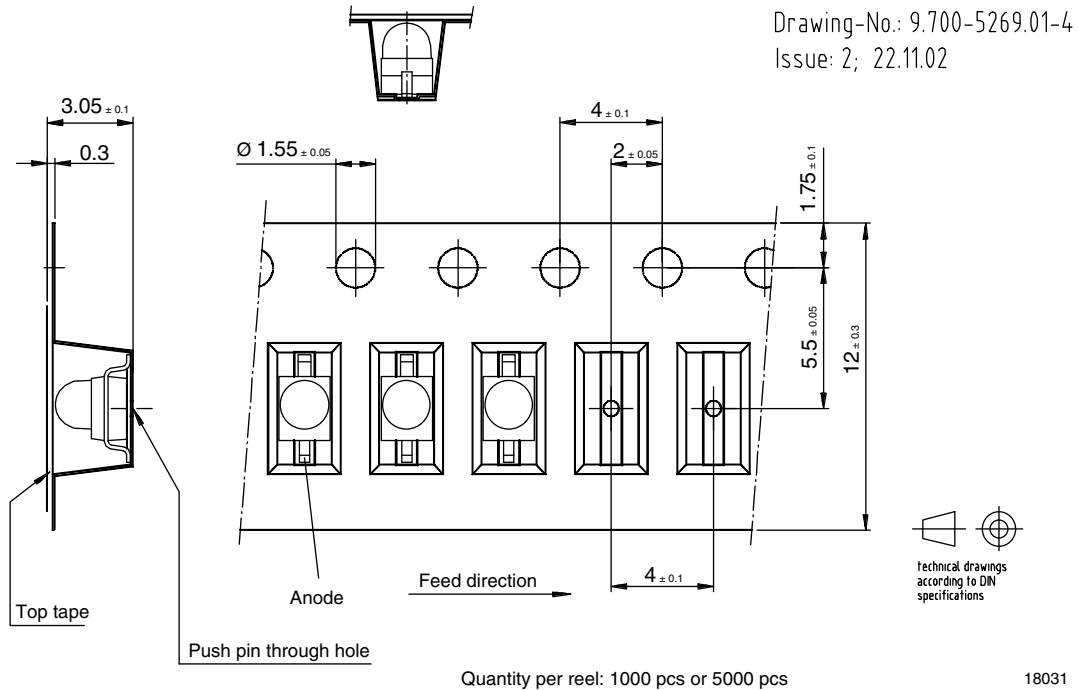


Quantity per reel: 1000 pcs or 5000 pcs

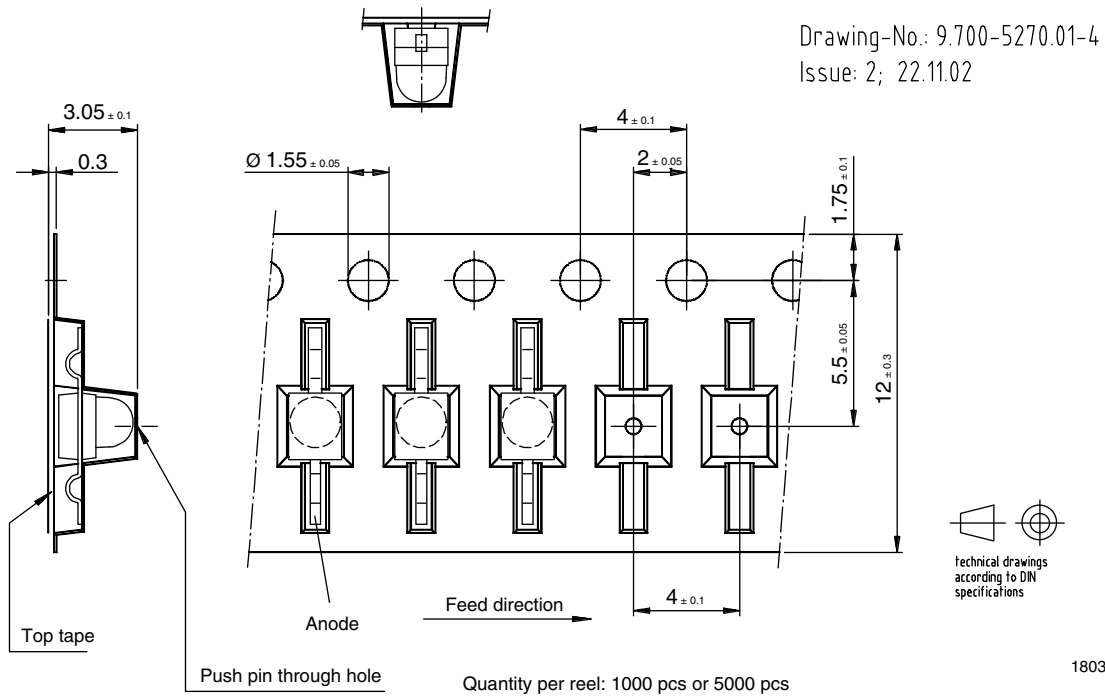
18030



## TAPING DIMENSIONS in millimeters: TSML1020



## TAPING DIMENSIONS in millimeters: TSML1030







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