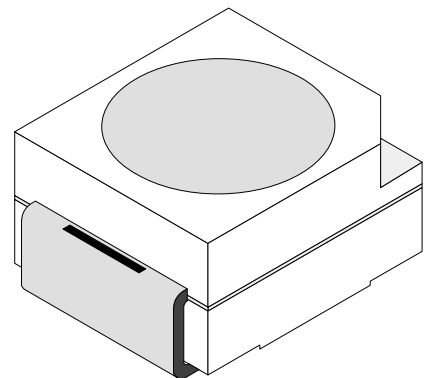


## SMD LED in P-LCC-2 Package

Color	Type	Technology	Angle of Half Intensity $\pm\varphi$
High efficiency red	TLMH310.	GaAsP on GaP	60°
Soft orange	TLMO310.	GaAsP on GaP	60°
Yellow	TLMY310.	GaAsP on GaP	60°
Green	TLMG310.	GaP on GaP	60°
Pure green	TLMP310.	GaP on GaP	60°

### Description

These devices have been designed to meet the increasing demand for surface mounting technology. The package of the TLM.310. is the P-LCC-2 (equivalent to a size B tantalum capacitor). It consists of a lead frame which is embedded in a white thermoplast. The reflector inside this package is filled up with clear epoxy.



94 8553

### Features

- SMD LEDs with exceptional brightness
- Luminous intensity categorized
- Compatible with automatic placement equipment
- EIA and ICE standard package
- Compatible with infrared, vapor phase and wave solder processes according to CECC
- Available in 8 mm tape
- Low profile package
- Non-diffused lens: excellent for coupling to light pipes and backlighting
- Low power consumption
- Luminous intensity ratio in one packaging unit  
 $I_{Vmax}/I_{Vmin} \leq 2.0$ , optional  $\leq 1.6$

### Applications

Automotive: backlighting in dashboards and switches  
 Telecommunication: indicator and backlighting in telephone and fax  
 Indicator and backlight for audio and video equipment  
 Indicator and backlight in office equipment  
 Flat backlight for LCDs, switches and symbols  
 General use

### Absolute Maximum Ratings

$T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified

**TLMH310. , TLMO310. , TLMY310. , TLMG310. , TLMP310.**

Parameter	Test Conditions	Symbol	Value	Unit
Reverse voltage		$V_R$	6	V
DC forward current	$T_{amb} \leq 60^{\circ}\text{C}$	$I_F$	30	mA
Surge forward current	$t_p \leq 10 \mu\text{s}$	$I_{FSM}$	0.5	A
Power dissipation	$T_{amb} \leq 60^{\circ}\text{C}$	$P_V$	100	mW
Junction temperature		$T_j$	100	$^{\circ}\text{C}$
Operating temperature range		$T_{amb}$	-40 to +100	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	-55 to +100	$^{\circ}\text{C}$
Soldering temperature	$t \leq 5 \text{ s}$	$T_{sd}$	260	$^{\circ}\text{C}$
Thermal resistance junction/ambient	mounted on PC board (pad size > 16 mm <sup>2</sup> )	$R_{thJA}$	400	K/W

### Optical and Electrical Characteristics

$T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified

**High efficiency red (TLMH310.)**

Parameter	Test Conditions	Type	Symbol	Min	Typ	Max	Unit
Luminous intensity <sup>2)</sup>	$I_F = 10 \text{ mA}$	TLMH3100	$I_V$	2.5	6		mcd
		TLMH3101	$I_V$	4		12.5	mcd
		TLMH3102	$I_V$	6.3		20	mcd
Dominant wavelength	$I_F = 10 \text{ mA}$		$\lambda_d$	612		625	nm
Peak wavelength	$I_F = 10 \text{ mA}$		$\lambda_p$		635		nm
Angle of half intensity	$I_F = 10 \text{ mA}$		$\phi$		$\pm 60$		deg
Forward voltage	$I_F = 20 \text{ mA}$		$V_F$		2.4	3	V
Reverse voltage	$I_R = 10 \mu\text{A}$		$V_R$	6	15		V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$		$C_j$		15		pF

<sup>2)</sup> in one Packing Unit  $I_{VMin.} / I_{VMax.} \leq 2$

**Soft orange (TLMO310.)**

Parameter	Test Conditions	Type	Symbol	Min	Typ	Max	Unit
Luminous intensity <sup>2)</sup>	$I_F = 10 \text{ mA}$	TLMO3100	$I_V$	2.5	8		mcd
		TLMO3101	$I_V$	4		12.5	mcd
Dominant wavelength	$I_F = 10 \text{ mA}$		$\lambda_d$	598		611	nm
Peak wavelength	$I_F = 10 \text{ mA}$		$\lambda_p$		605		nm
Angle of half intensity	$I_F = 10 \text{ mA}$		$\phi$		$\pm 60$		deg
Forward voltage	$I_F = 20 \text{ mA}$		$V_F$		2.2	3	V
Reverse voltage	$I_R = 10 \mu\text{A}$		$V_R$	6	15		V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$		$C_j$		15		pF

<sup>2)</sup> in one Packing Unit  $I_{VMin.} / I_{VMax.} \leq 2$



**Yellow (TLMY310.)**

Parameter	Test Conditions	Type	Symbol	Min	Typ	Max	Unit
Luminous intensity <sup>2)</sup>	$I_F = 10 \text{ mA}$	TLMY3100	$I_V$	2.5	6		mcd
Luminous intensity <sup>1)</sup>		TLMY3101	$I_V$	4		12.5	mcd
		TLMY3102	$I_V$	6.3		20	mcd
Dominant wavelength	$I_F = 10 \text{ mA}$		$\lambda_d$	581		594	nm
Peak wavelength	$I_F = 10 \text{ mA}$		$\lambda_p$		585		nm
Angle of half intensity	$I_F = 10 \text{ mA}$		$\phi$		$\pm 60$		deg
Forward voltage	$I_F = 20 \text{ mA}$		$V_F$		2.4	3	V
Reverse voltage	$I_R = 10 \text{ }\mu\text{A}$		$V_R$	6	15		V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$		$C_j$		15		pF

<sup>1)</sup> in one Packing Unit  $I_{V\text{Min.}}/I_{V\text{Max.}} \leq 1.6$     <sup>2)</sup> in one Packing Unit  $I_{V\text{Min.}}/I_{V\text{Max.}} \leq 2$

**Green (TLMG310.)**

Parameter	Test Conditions	Type	Symbol	Min	Typ	Max	Unit
Luminous intensity <sup>2)</sup>	$I_F = 10 \text{ mA}$	TLMG3100	$I_V$	4	9		mcd
		TLMG3101	$I_V$	4		12.5	mcd
		TLMG3102	$I_V$	10		20	mcd
		TLMG3105	$I_V$	6.3		20	mcd
		TLMG3106	$I_V$	6.3		12.5	mcd
Dominant wavelength	$I_F = 10 \text{ mA}$		$\lambda_d$	562		575	nm
Peak wavelength	$I_F = 10 \text{ mA}$		$\lambda_p$		565		nm
Angle of half intensity	$I_F = 10 \text{ mA}$		$\phi$		$\pm 60$		deg
Forward voltage	$I_F = 20 \text{ mA}$		$V_F$		2.2	3	V
Reverse voltage	$I_R = 10 \text{ }\mu\text{A}$		$V_R$	6	15		V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$		$C_j$		15		pF

<sup>2)</sup> in one Packing Unit  $I_{V\text{Min.}}/I_{V\text{Max.}} \leq 2$

**Pure green (TLMP310.)**

Parameter	Test Conditions	Type	Symbol	Min	Typ	Max	Unit
Luminous intensity <sup>2)</sup>	$I_F = 10 \text{ mA}$	TLMP3100	$I_V$	1	4		mcd
		TLMP3101	$I_V$	1.6		5	mcd
		TLMP3106	$I_V$	1.6		3.2	mcd
		TLMP3107	$I_V$	2.5		5	mcd
Luminous intensity <sup>1)</sup>		TLMP3102	$I_V$	2.5		8	mcd
Dominant wavelength	$I_F = 10 \text{ mA}$		$\lambda_d$	555		565	nm
Peak wavelength	$I_F = 10 \text{ mA}$		$\lambda_p$		555		nm
Angle of half intensity	$I_F = 10 \text{ mA}$		$\phi$		$\pm 60$		deg
Forward voltage	$I_F = 20 \text{ mA}$		$V_F$		2.4	3	V
Reverse voltage	$I_R = 10 \text{ }\mu\text{A}$		$V_R$	6	15		V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$		$C_j$		15		pF

<sup>1)</sup> in one Packing Unit  $I_{V\text{Min.}}/I_{V\text{Max.}} \leq 1.6$     <sup>2)</sup> in one Packing Unit  $I_{V\text{Min.}}/I_{V\text{Max.}} \leq 2$

Typical Characteristics ( $T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified)

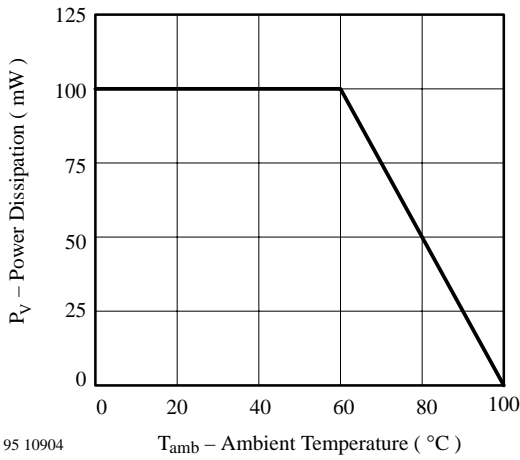


Figure 1. Power Dissipation vs. Ambient Temperature

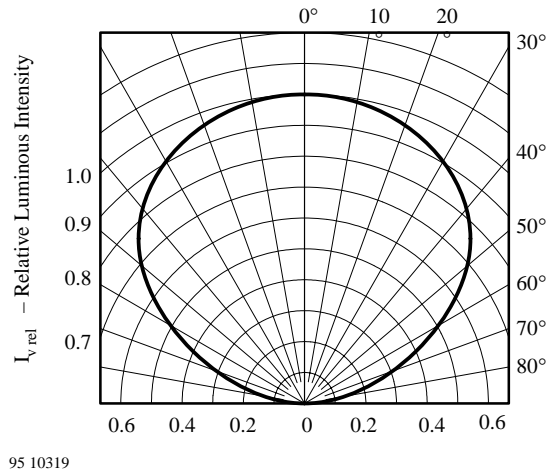


Figure 4. Rel. Luminous Intensity vs. Angular Displacement

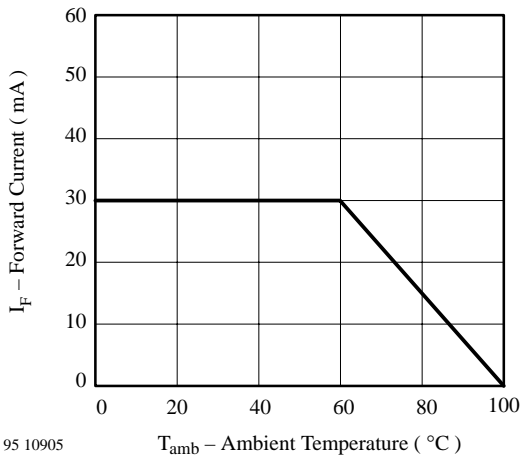


Figure 2. Forward Current vs. Ambient Temperature

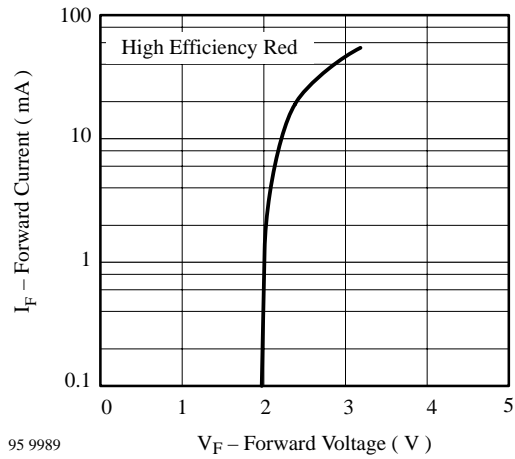


Figure 5. Forward Current vs. Forward Voltage

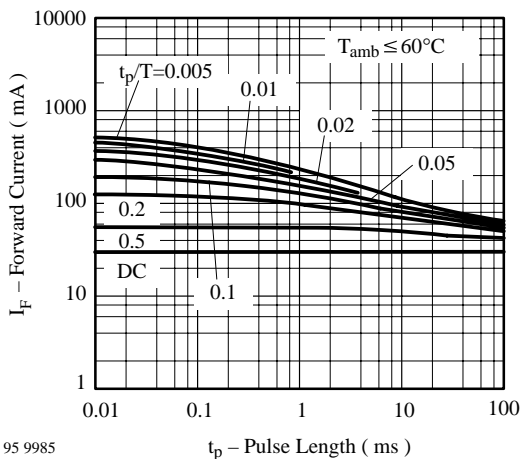


Figure 3. Forward Current vs. Pulse Length

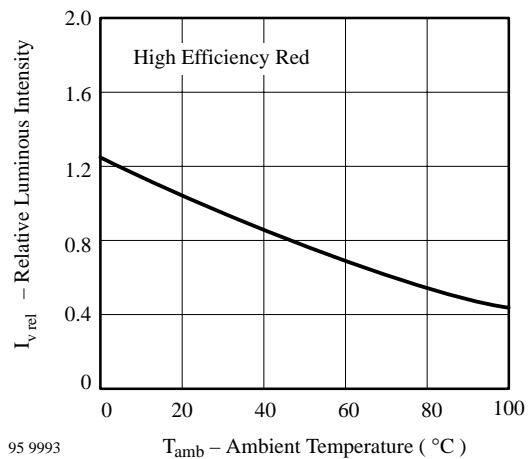


Figure 6. Rel. Luminous Intensity vs. Ambient Temperature

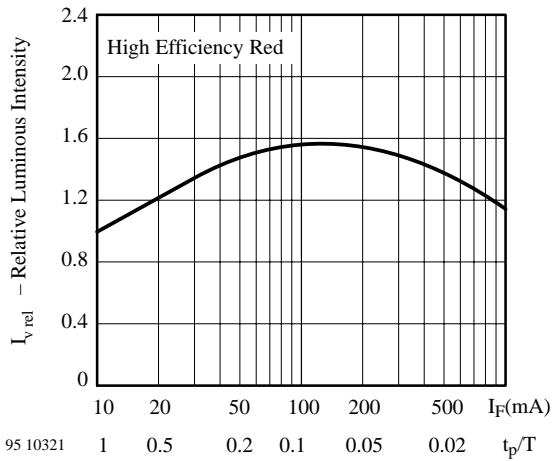


Figure 7. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

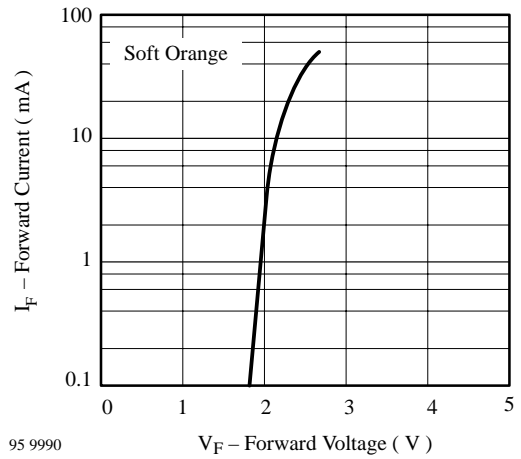


Figure 10. Forward Current vs. Forward Voltage

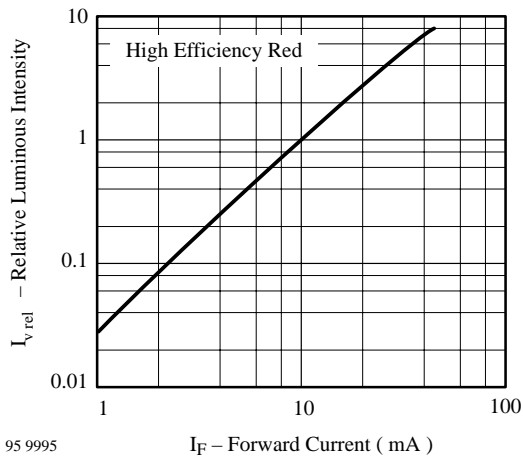


Figure 8. Relative Luminous Intensity vs. Forward Current

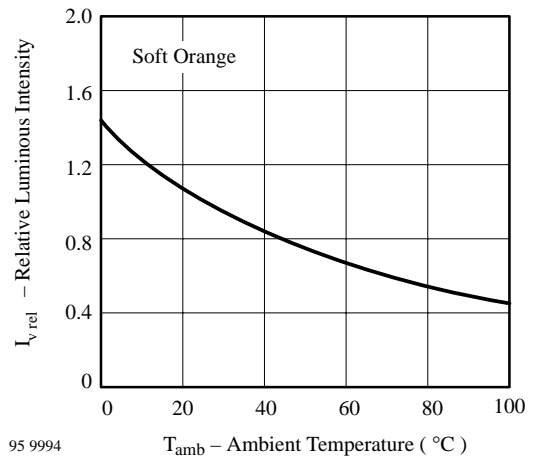


Figure 11. Rel. Luminous Intensity vs. Ambient Temperature

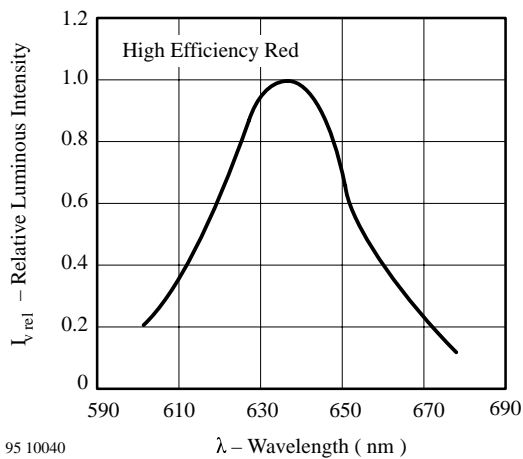


Figure 9. Relative Luminous Intensity vs. Wavelength

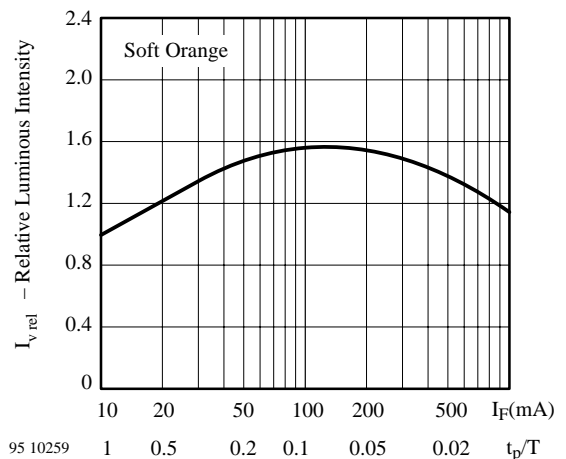


Figure 12. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

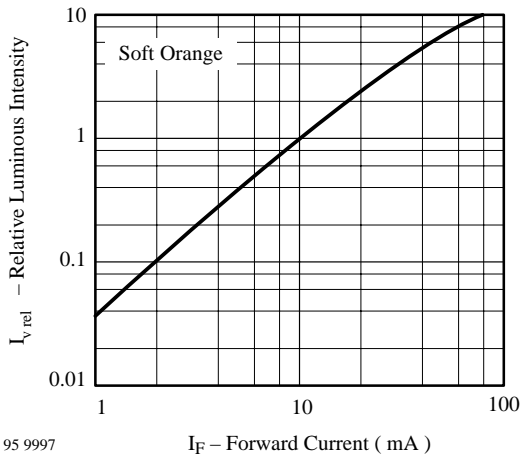


Figure 13. Relative Luminous Intensity vs. Forward Current

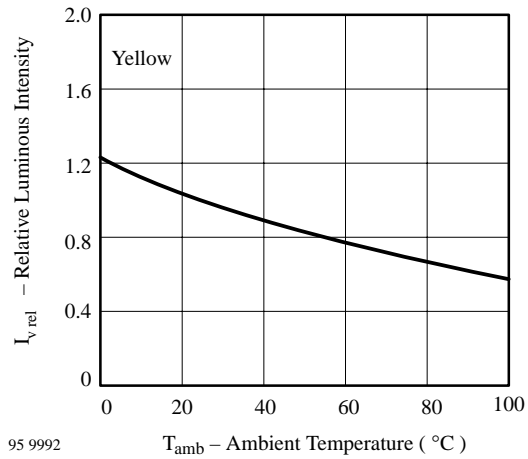


Figure 16. Rel. Luminous Intensity vs. Ambient Temperature

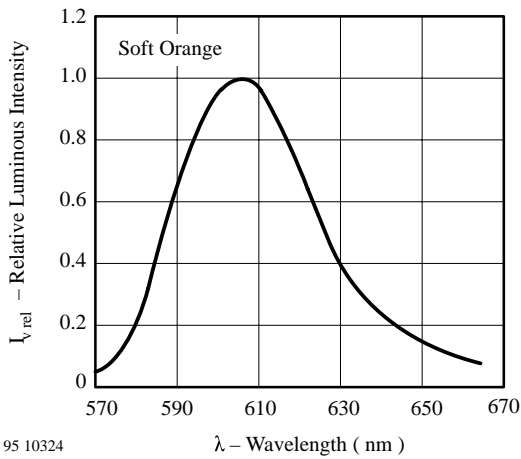


Figure 14. Relative Luminous Intensity vs. Wavelength

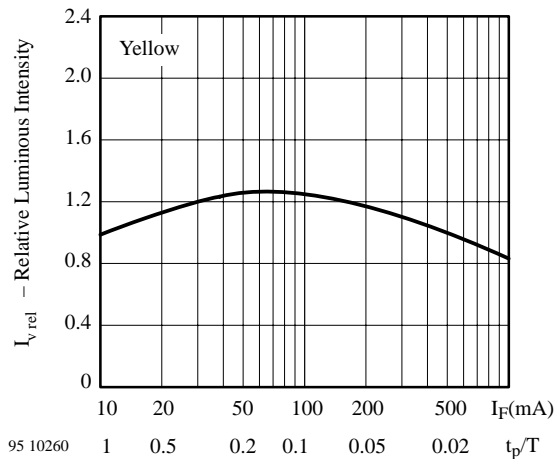


Figure 17. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

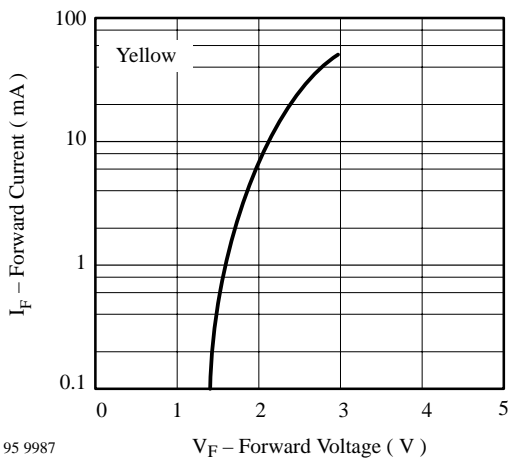


Figure 15. Rel. Luminous Intensity vs. Ambient Temperature

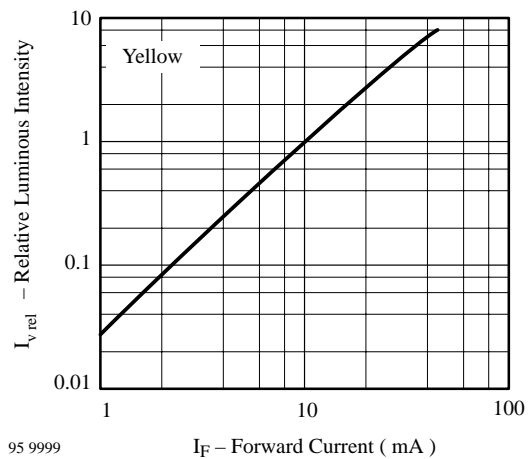


Figure 18. Relative Luminous Intensity vs. Forward Current

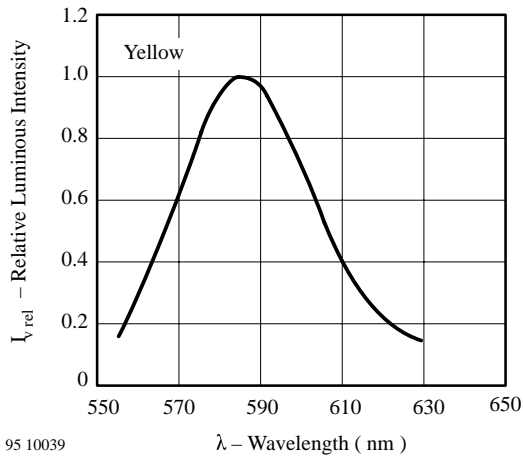


Figure 19. Relative Luminous Intensity vs. Wavelength

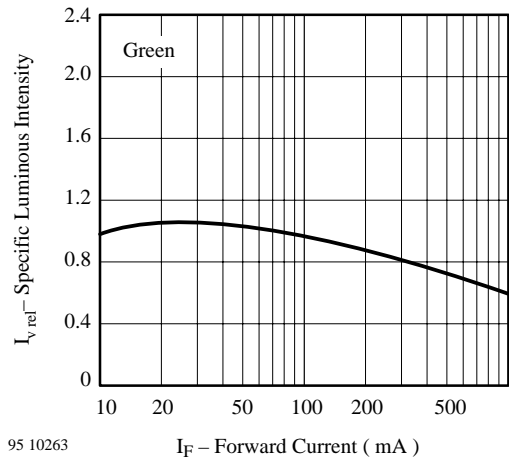


Figure 22. Specific Luminous Intensity vs. Forward Current

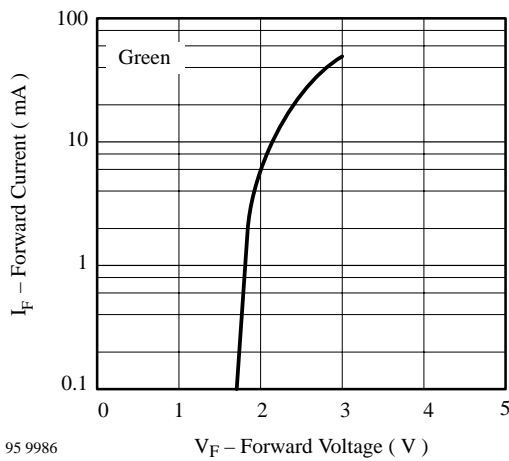


Figure 20. Forward Current vs. Forward Voltage

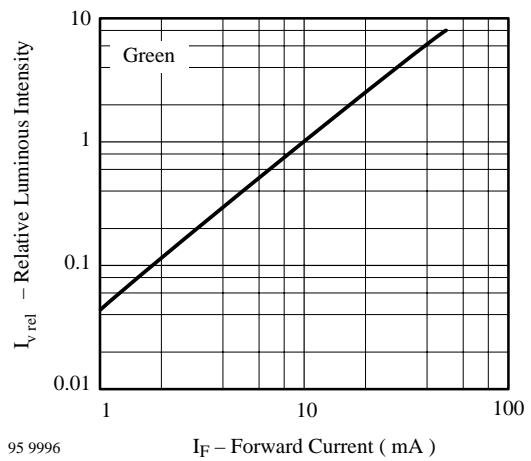


Figure 23. Relative Luminous Intensity vs. Forward Current

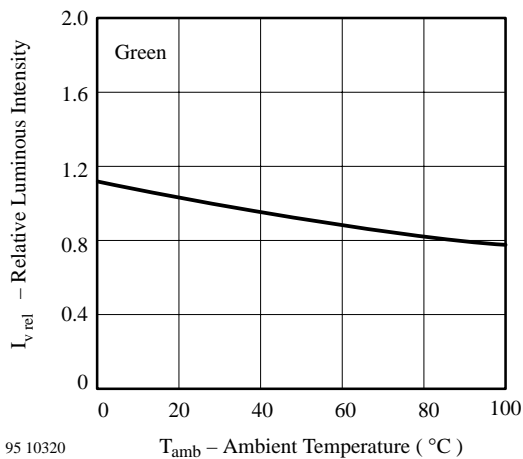


Figure 21. Rel. Luminous Intensity vs. Ambient Temperature

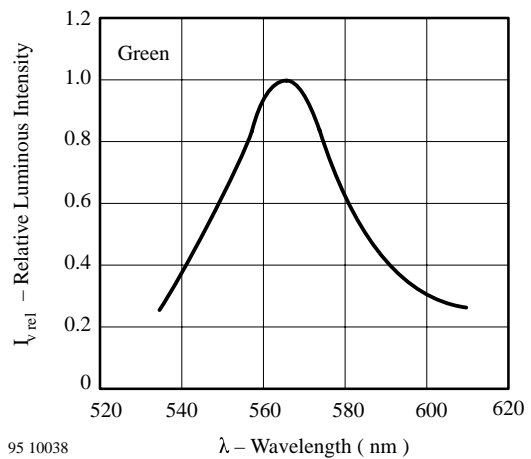


Figure 24. Relative Luminous Intensity vs. Wavelength

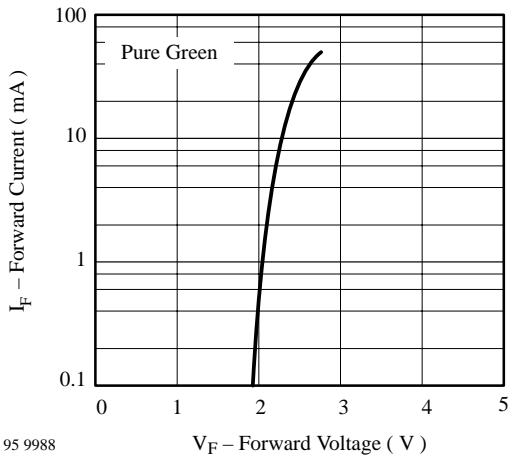


Figure 25. Forward Current vs. Forward Voltage

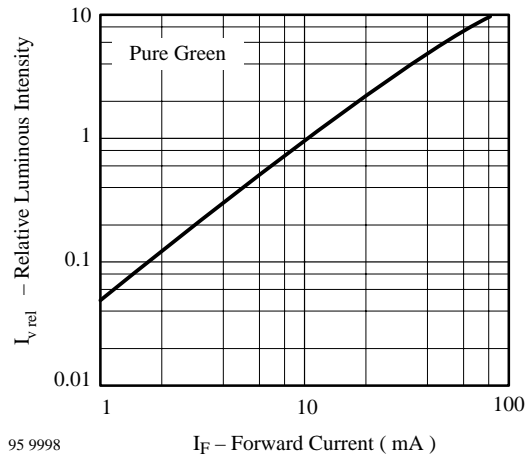


Figure 28. Relative Luminous Intensity vs. Forward Current

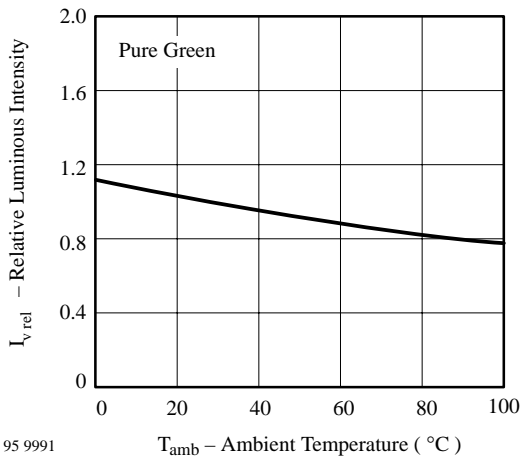


Figure 26. Rel. Luminous Intensity vs. Ambient Temperature

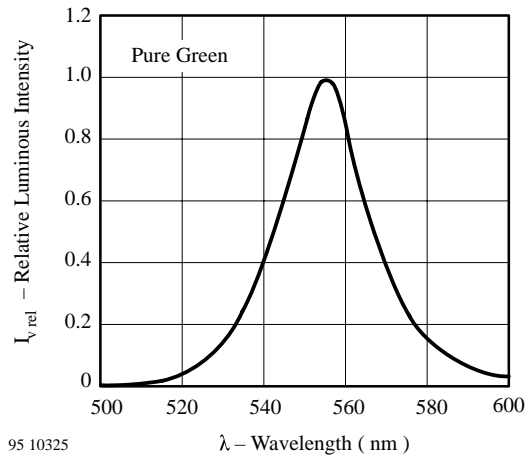


Figure 29. Relative Luminous Intensity vs. Wavelength

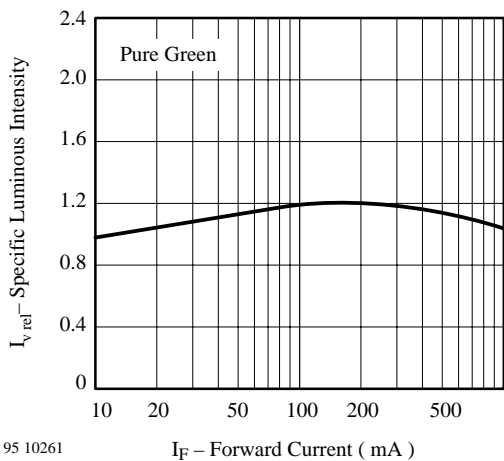
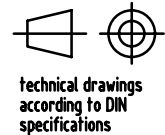
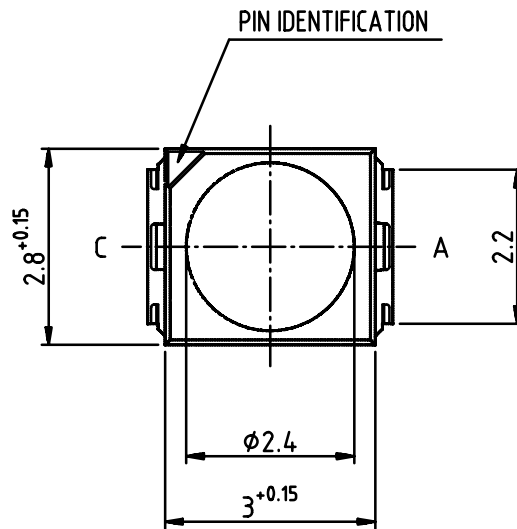
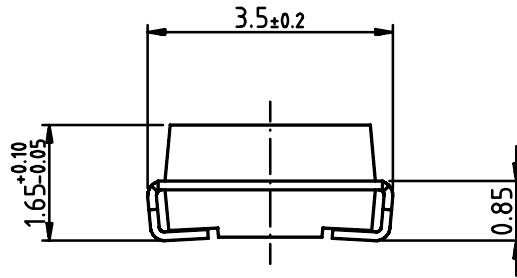


Figure 27. Specific Luminous Intensity vs. Forward Current

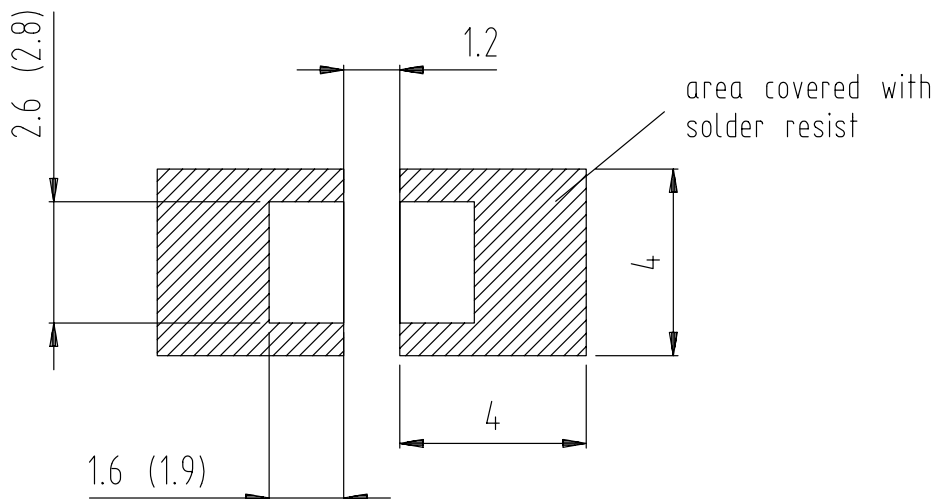


**Dimensions in mm**



95 11314

**PCB Layout in mm**



Dimensions: IR and Vaporphase  
( Wave Soldering )

95 10966

**Ozone Depleting Substances Policy Statement**

It is the policy of **Vishay Semiconductor GmbH** to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

**Vishay Semiconductor GmbH** has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

**Vishay Semiconductor GmbH** can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

**We reserve the right to make changes to improve technical design and may do so without further notice.**

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay-Telefunken products for any unintended or unauthorized application, the buyer shall indemnify Vishay-Telefunken against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany  
Telephone: 49 (0) 7131 67 2831, Fax number: 49 (0) 7131 67 2423

## Packing and Order Information

### General Information

Vishay offers LEDs and 7 Segment Displays with several packing options.

Device	Series	Bulk	Tape	Blister Tape	Tube
7 Segment Display	TD..				x
TELUX	TLW.				x
SMD	TLM.			x	
Pin Hole LED	TL..	x	x		

All Packing options are classified in terms of brightness (standard), color (optional) or forward voltage (optional). Reference for Parameter Selection

Codes is the chapter "Classification of Components", label code is SEL.

### Barcode Label Format

**Type**

- PTC – Assembly Location Code
- SEL – Parameter Selection Code**
- DC – Date Code
- BN – Batch Number
- PCS – Quantity**
- MN – Machine number

### Drypacks

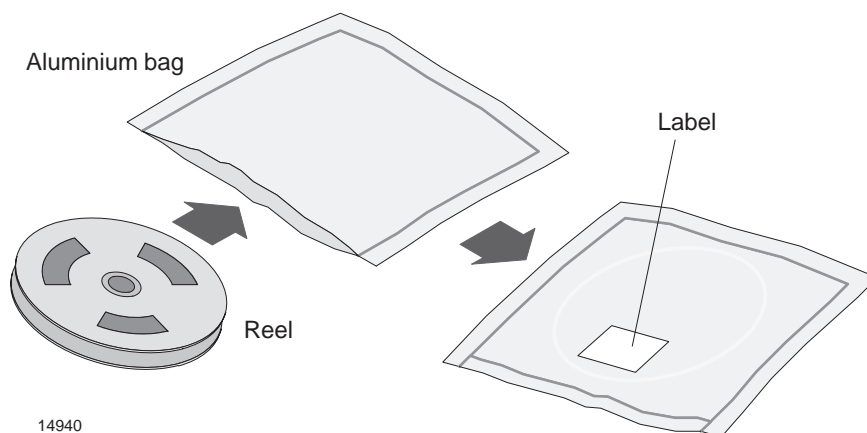
Blister tapes are packed in anti-humidity aluminium bags to prevent the products from moisture absorption during transportation and storage. Each bag contains a desiccant with moisture indicators. In cases of moisture absorption, the indicators change their color from blue to pink.

Dry box storage is recommended to prevent the parts from moisture absorption. The following conditions should be preserved if dry boxes are not available.

Storage condition max. 1 year: Temperature: 10 to 30°C Humidity: 60% RH max  
 unlimited: Temperature: 10 to 30°C Humidity: 20% RH max

In case of moisture absorption the device will recover to the former condition by drying under the following recommended conditions:

192 hours at 40°C + 5°C and < 5% RH.



## Vishay Telefunken

### Fan Fold Packing

Fan fold box is the standard containment for Reel, Tube and Bulk. Label Format is identically with packing options as described above. Packing might contain tubes or reels with several Parameter Selection Codes. In this case the label code of Fan Fold Packing is SEL000.

Exception: TELUX fan fold boxes contain one SEL code only.

### Minimum Order Quantity

Packing Options describe the small physical packing unit. Vishay Sales representatives can provide information on the Minimum Order Quantity per type.

### Number of Components

Quantity (bulk): 3mm: 5000 pcs  
5mm: 4000 pcs

Quantity per reel: 3 mm: 2000 pcs  
5 mm: 1000 pcs

Quantity per ammpack: 3 mm: 2000 pcs  
5 mm: 1000 pcs

### Order Codes

The type designation of the device is extended by tape option codes.

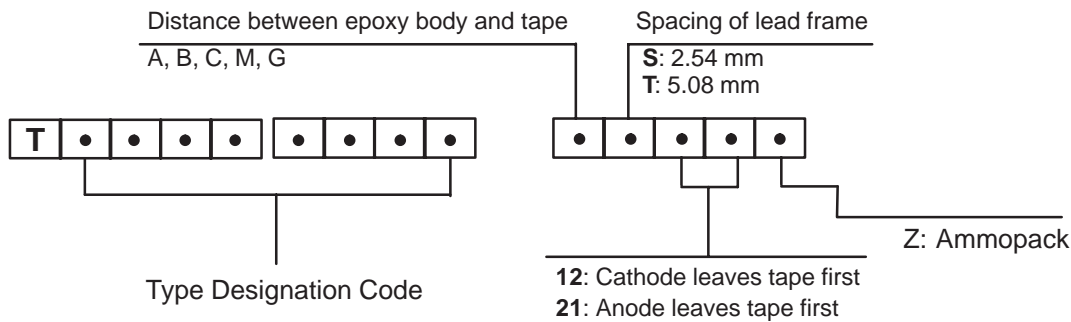


Figure 1. Taping code

**Example:** TLME3100 GS08  
TLHE4200 AS21  
TLHE4200 AS12Z  
optional since 1999:  
TLHE4200 ASZ

### Missing Components

Up to 3 consecutive components may be missing if the gap is followed by at least 6 components. A maximum of 0.5% of the components per reel quantity may be missing. At least 5 empty positions are present at the start and the end of the tape to enable tape insertion.

**Tensile strength** of the tape:  $\geq 15$  N

**Pulling force** in the plane of the tape, at right angles to the reel:  $\geq 5$  N

### Note:

Shipment in fan-fold packages are standard for radial taped devices.

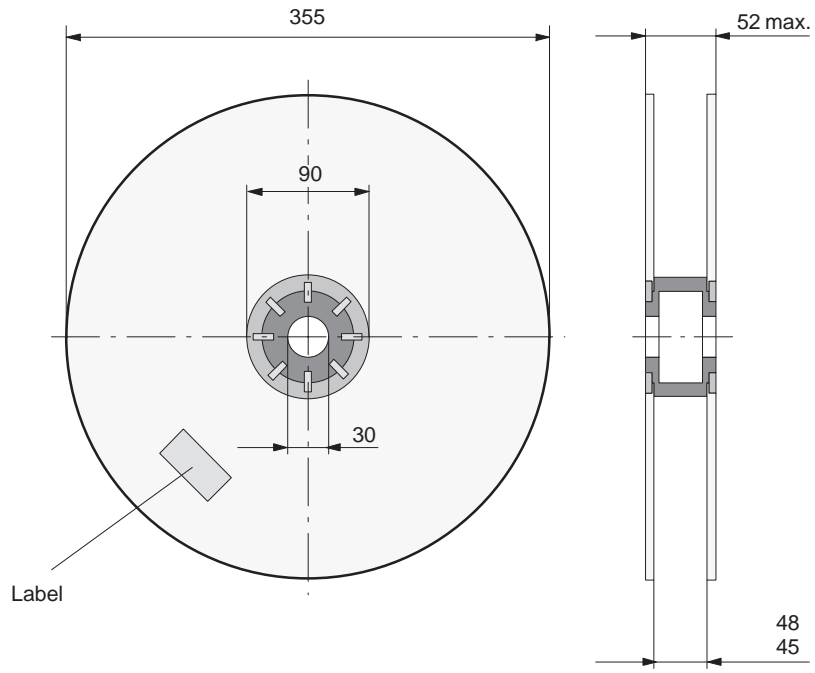
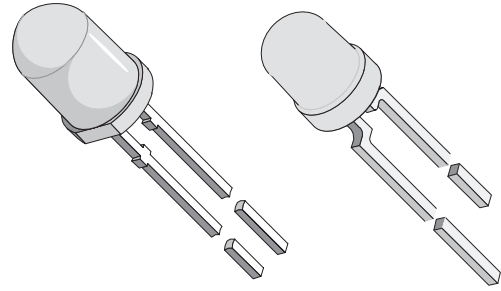
Shipments in reel packing are only possible if the customer guarantees the removal of empty reels.

According to a German packaging decree (Verpackungsverordnung) we are not able to accept the return of reels.

### Specification of Packing Options

Pin Hole LED (TL.. – series)

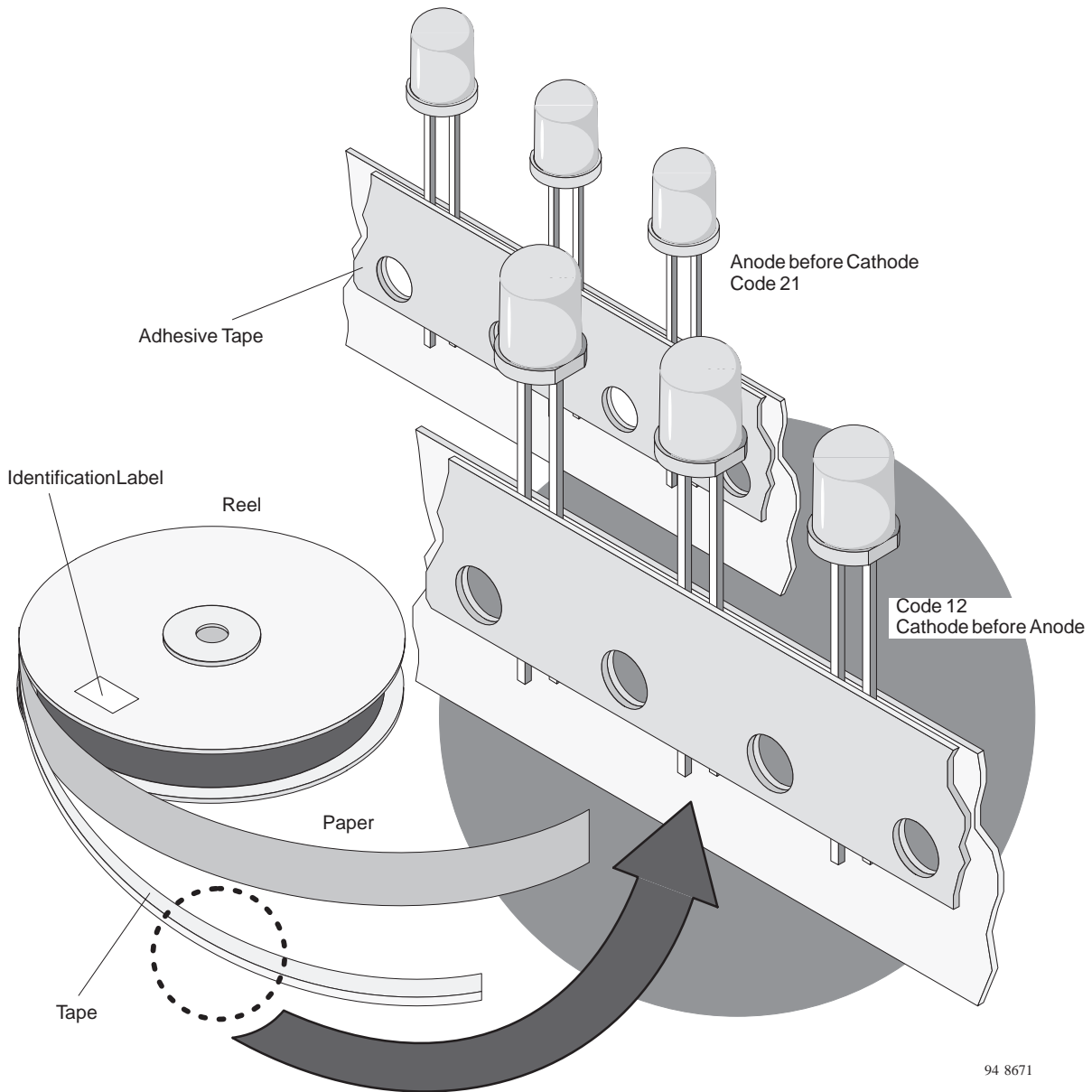
Reel



94 8641

Figure 2. Reel dimensions

Tape



94 8671

Figure 3. LED in tape

**Ammopack**

The tape is folded in concertina arrangement and laid in the cardboard box.

If the components are required with the cathode before the anode (figure 4), the start of the tape should be

taken from the side of the box marked “-”. If the components are required with the anode before cathode (figure 7), the tape should be taken from the side of the box marked “+”.

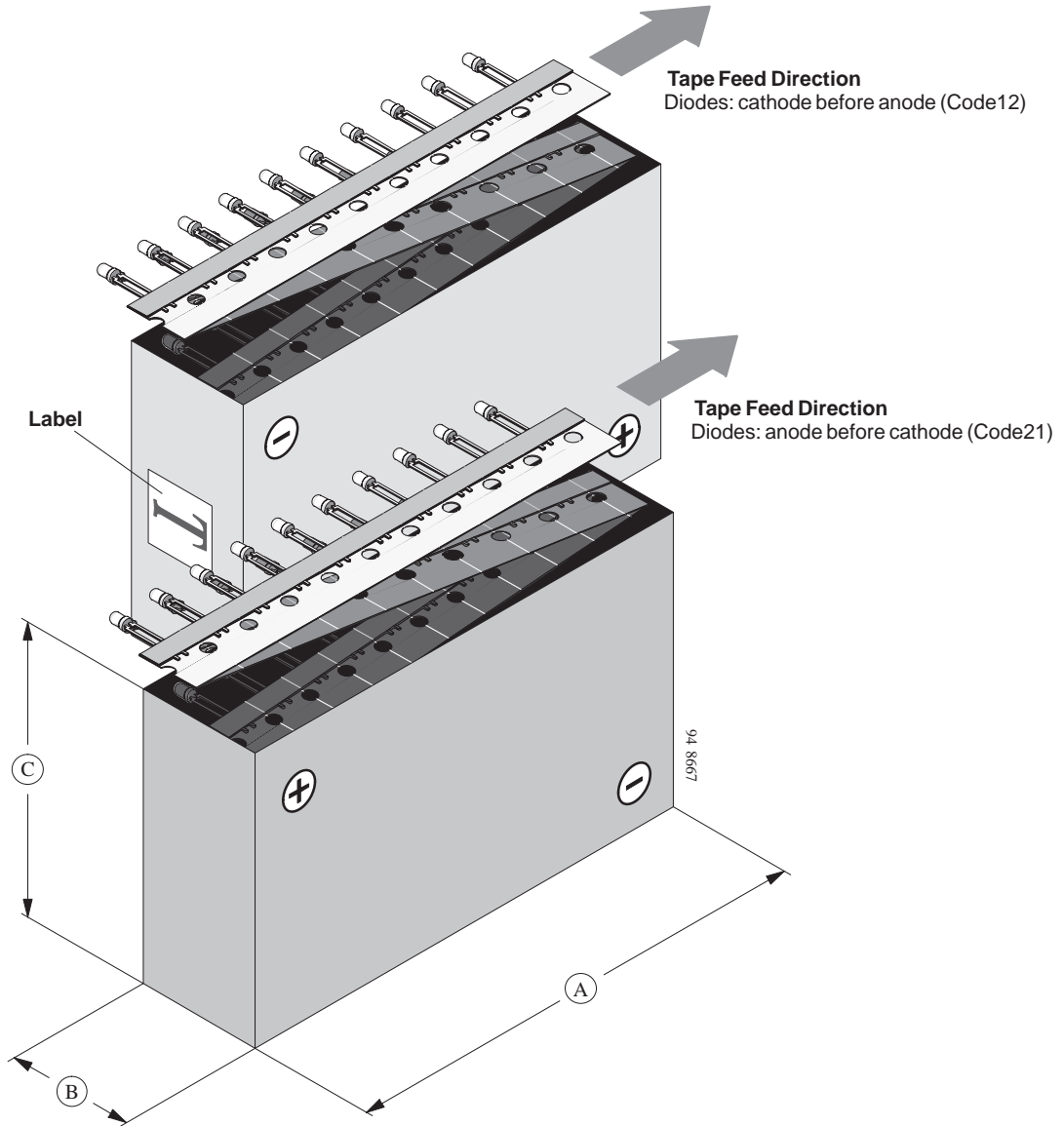


Figure 4. Tape direction

Table 1. Inner dimensions

A	B	C	Packages
340	46	125	Ø5 mm
340	34	140	Ø3 mm AS-Taping
340	41	140	Ø3 mm other than AS-Taping

## Options

### Tape Dimensions for $\varnothing$ 3 mm Standard Packages

Available Package Variations: 12, 12Z, 21

Table 2. Tape variations (3 mm standard)

LED Series	
TLH. 4...	AS, MS, BT
TLL. 4...	AS, MS, BT
TLS. 21..	AS
TLU. 24..	AS
TLUR.4...	AS, MS, BT
TLD. 4...	AS, MS, BT
TLV. 4...	AS, MS, BT

Table 3.

Option	x $\pm$ 0.5mm	Preference
<b>AS</b>	<b>17.3</b>	<b>standard</b>
<b>MS</b>	<b>22.5</b>	<b>standard</b>
CS	22.0	
KS	19.3	
LS	21.0	
BT	20.0	
MT	25.5	

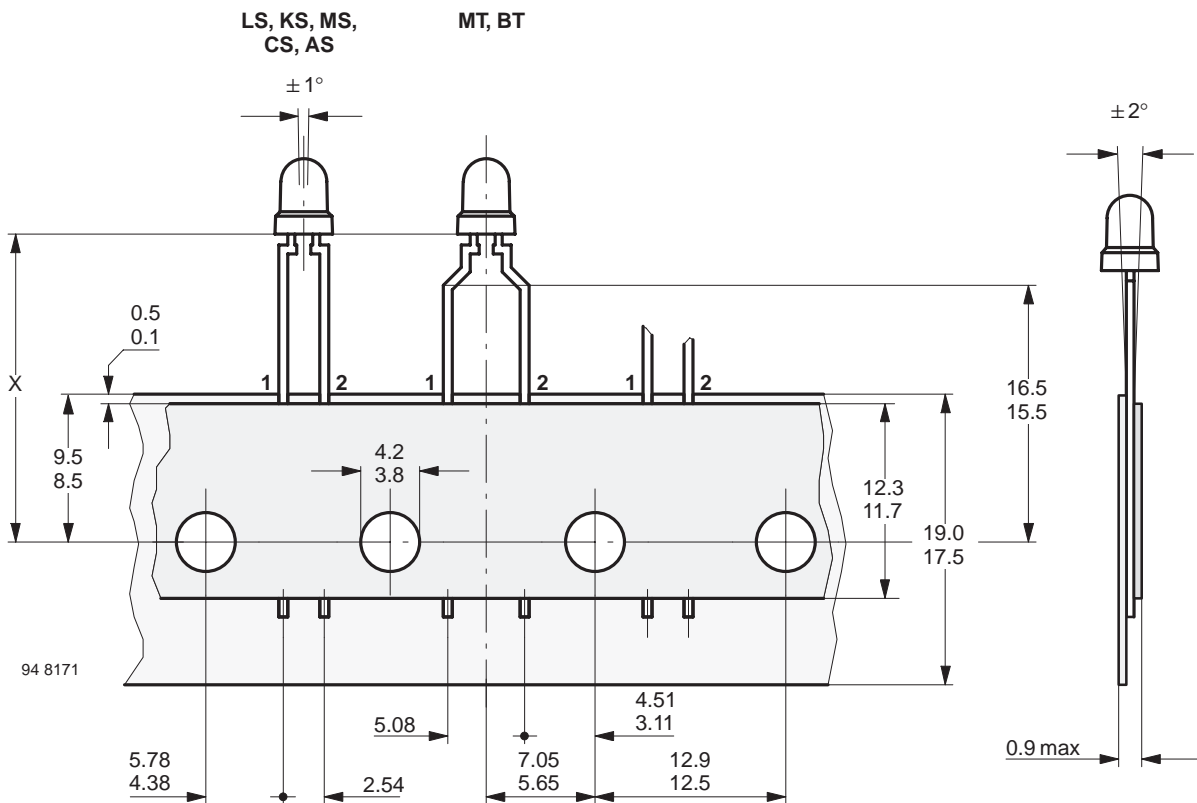


Figure 5. Tape dimensions  $\varnothing$  3mm devices



Tape Dimensions for  $\varnothing$  5 mm Standard Packages

Available Package Variations: 12, 12Z, 21

Table 4. Tape variations (5 mm standard)

LED Series	
TLH. 5...	AS, BT, MT
TLL. 5...	AS, BT, MT
TLS. 5..	AS
TLUR. 5...	AS, BT, MT
TLD. 5...	AS, BT, MT
TLUR6..	BT, CS
TLH.6	BT, CS

Table 5.

Option	x $\pm$ 0.5mm	Preference
<b>AS</b>	<b>19.7</b>	<b>standard</b>
MS	25.5	
<b>CS</b>	<b>22.0</b>	<b>standard</b>
KS	21.7	
BT	20.0	
MT	25.5	

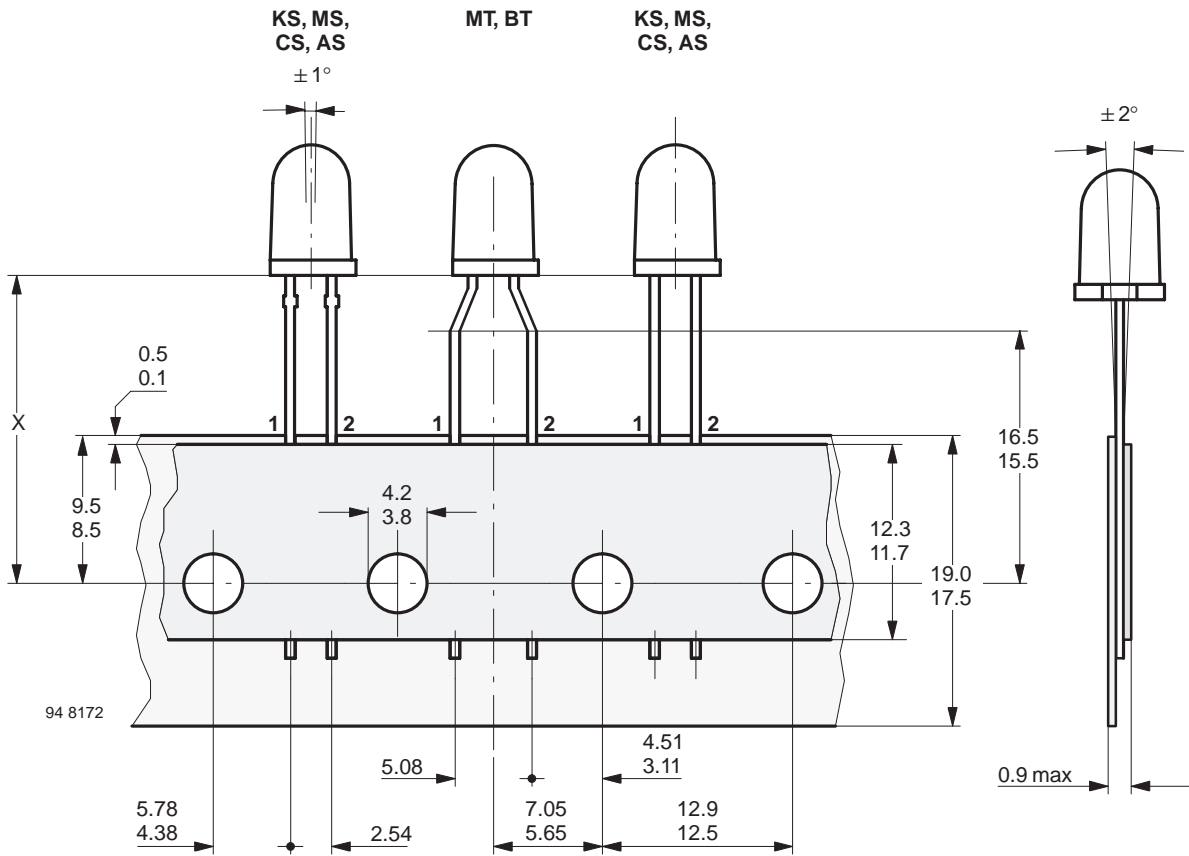
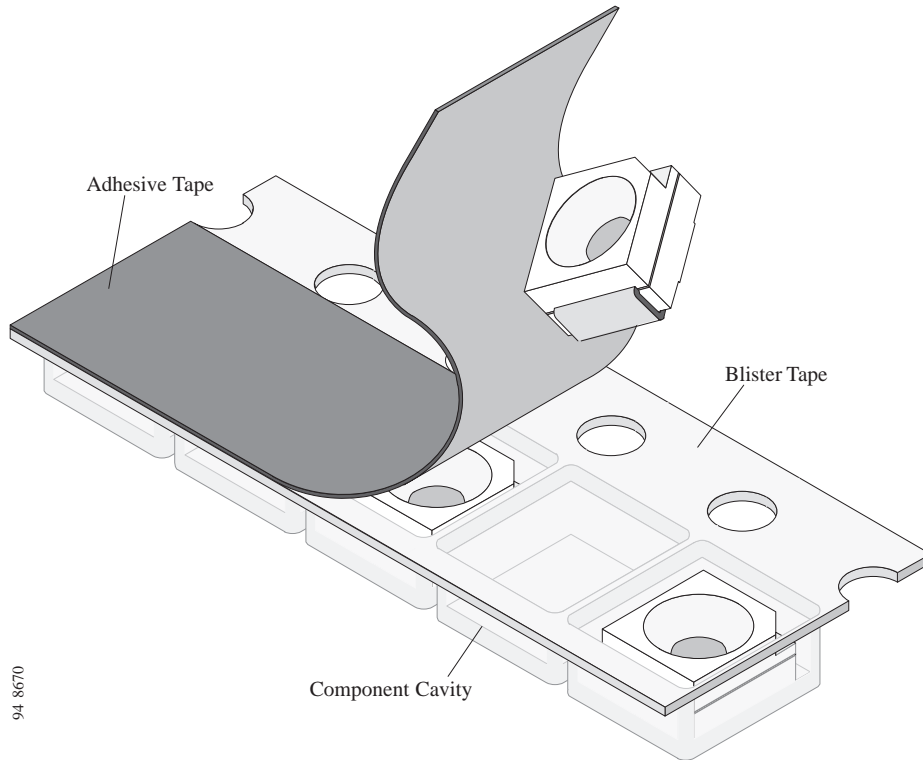


Figure 6. Tape dimensions  $\varnothing$  5 mm devices

**SMD LED (TLM. – series)**

Vishay's LEDs in SMD packages are available in an antistatic 8 mm blister tape (in accordance with DIN IEC 40 (CO) 564) for automatic component

insertion. The blister tape is a plastic strip with impressed component cavities, covered by a top tape.



**Taping of TLM.31..**

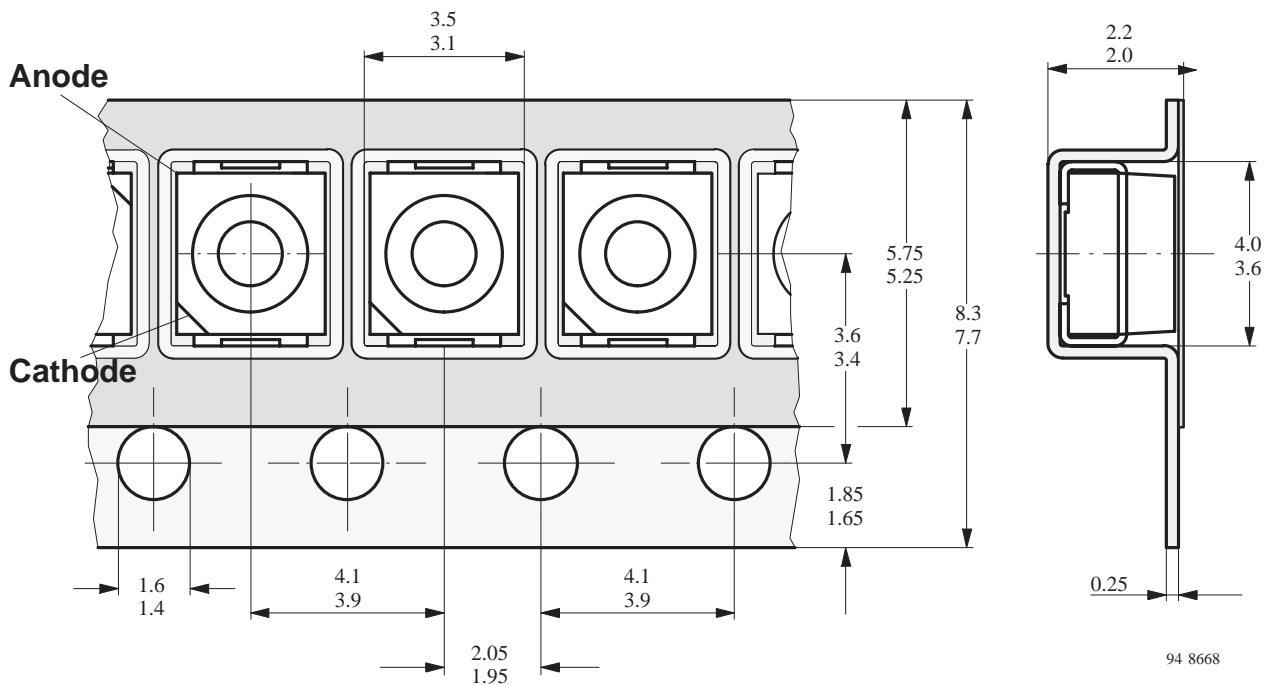


Figure 7. Tape dimensions in mm for PLCC2

Taping of TLMD3100

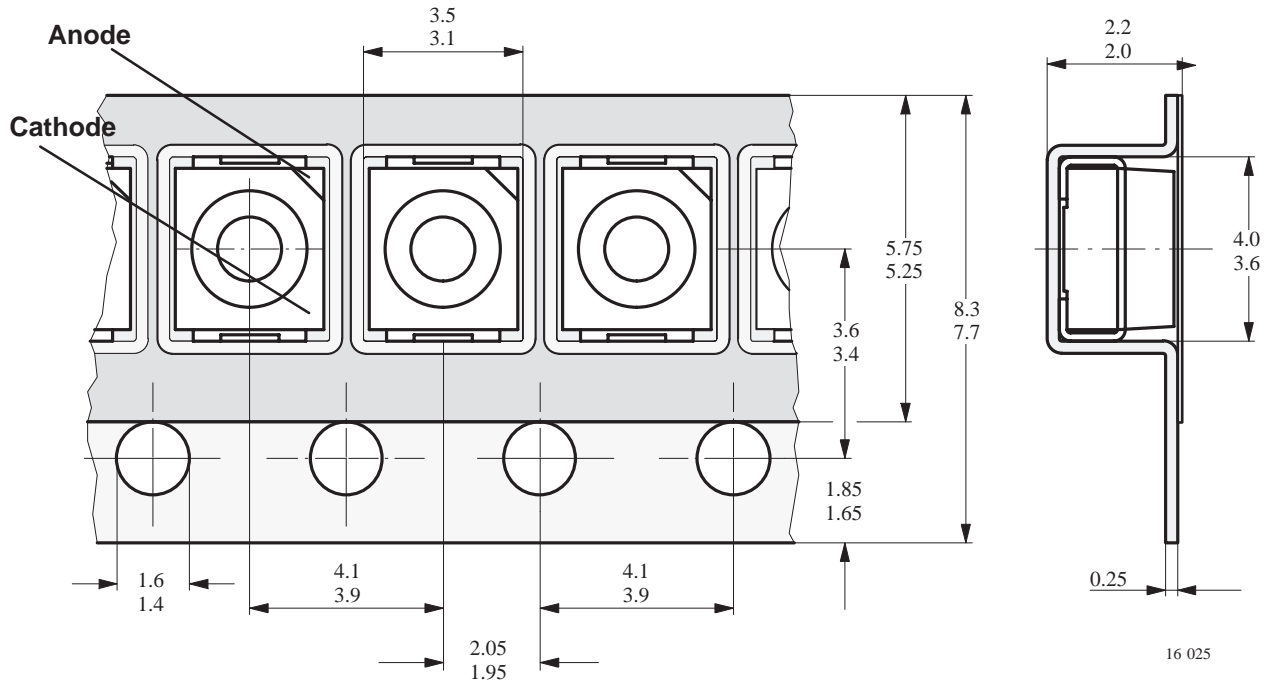


Figure 8. Tape dimensions in mm for PLCC2

Number of Components TLM. – series

Quantity per reel in	GS08	1500 pcs
	GS18	8000 pcs

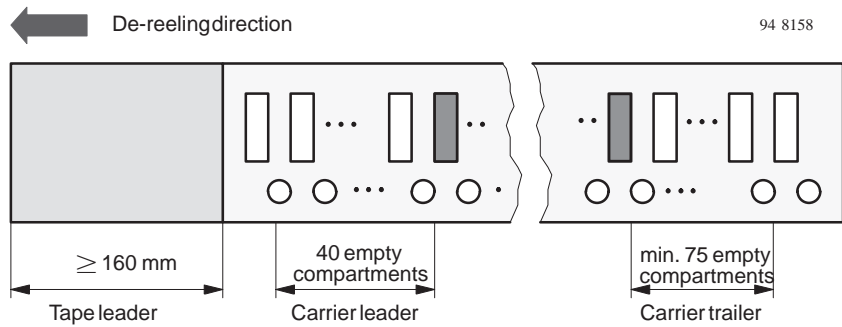


Figure 9. Beginning and end of reel

Reel Package dimension in mm for SMD LEDs, tape option GS08 (=1500 pcs.)

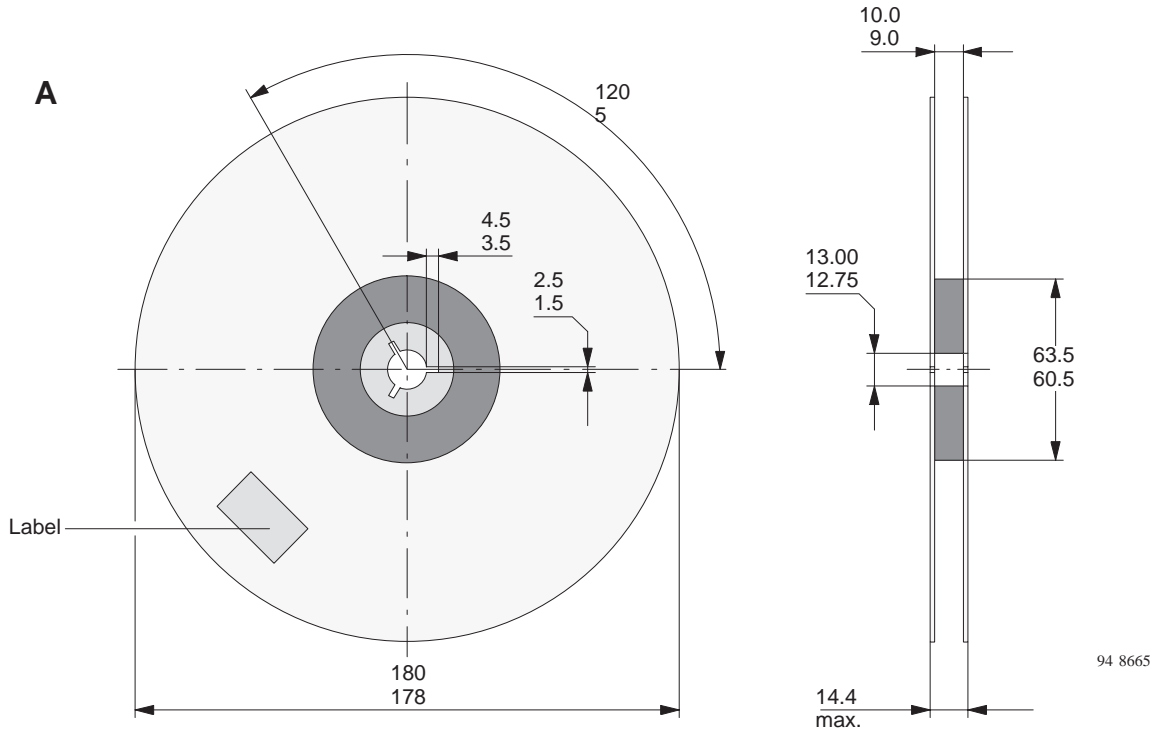


Figure 10. Reel dimensions –GS08

Reel Package dimension in mm for SMD LEDs, tape option GS18 (= 8000 pcs.) preferred

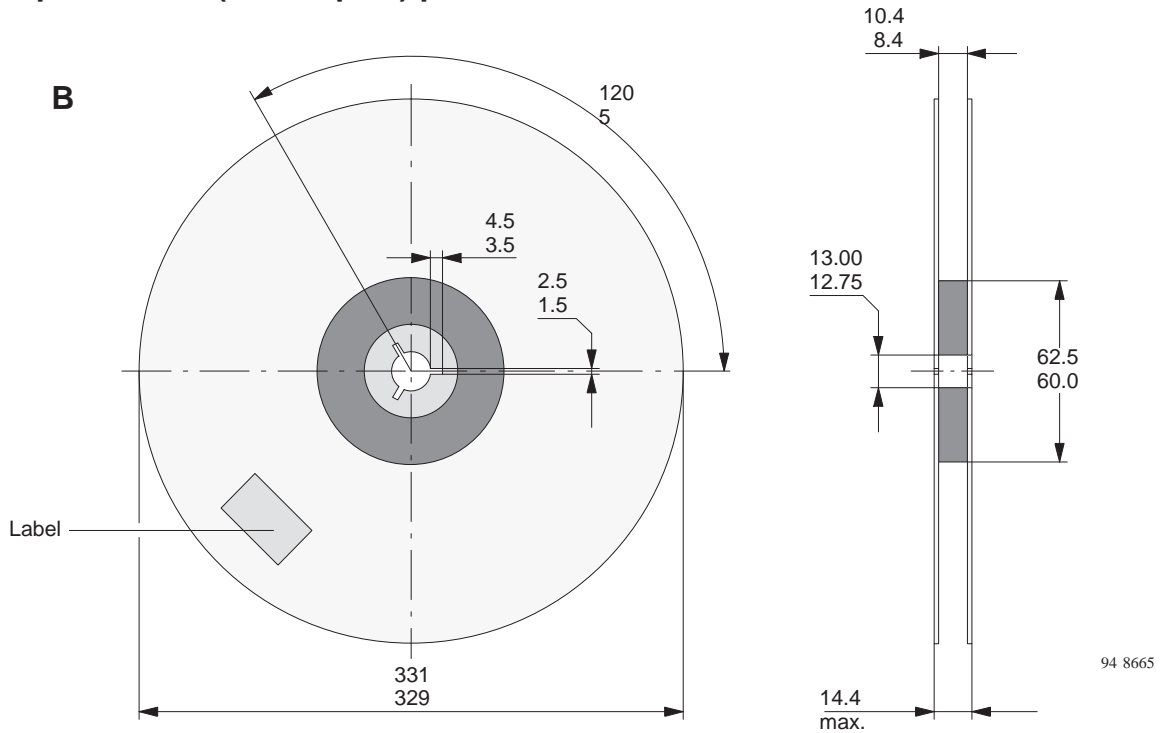


Figure 11. Reel dimensions –GS18

### Missing Devices

A maximum of 0.5% of the total number of components per reel may be missing, excluding missing components at the beginning and at the end of the reel. A maximum of three consecutive components may be missing, provided this gap is followed by six consecutive components.

The tape leader is at least 160 mm and is followed by a carrier tape leader with at least 40 empty compartments. The tape leader may include the carrier tape as long as the cover tape is not connected to the carrier tape.

The last component is followed by a carrier tape trailer with at least 75 empty compartments and sealed with cover tape.

### Top Tape Removal Force

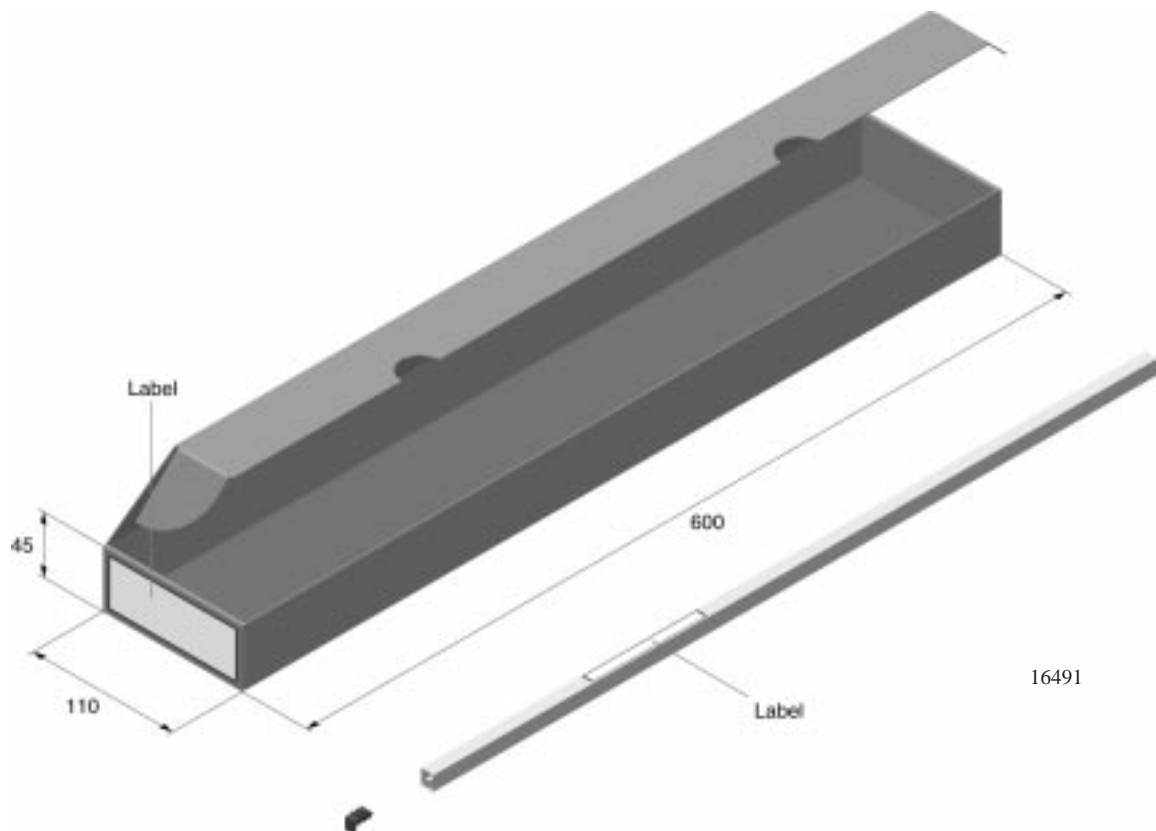
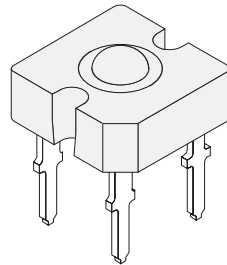
The removal force lies between 0.1 N and 1.0 N at a removal speed of 5 mm/s.

In order to prevent components from popping out of the blisters, the cover tape must be pulled off at an angle of 180°C with regard to the feed direction.

### Order Codes

**Example:** TLMB3100–GS08

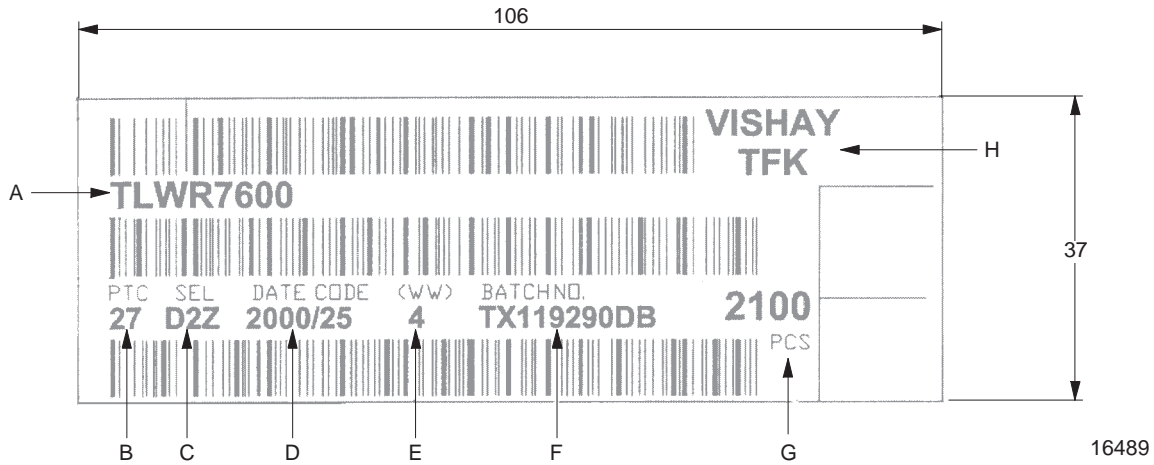
## TELUX™ Fan Fold Box



16491

# Vishay Telefunken

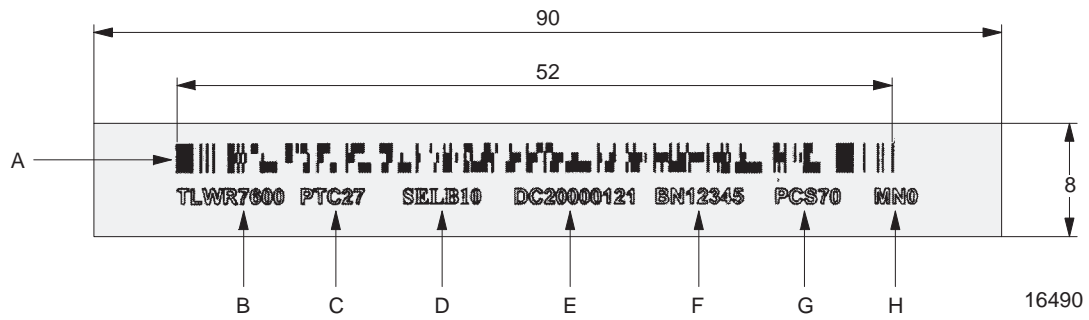
## Label of Fan Fold Box



- A) Type of component
- B) Manufacturing plant
- C) SEL – Selection code (Bin)  
Digit1 – code for Luminous Flux group  
Digit2 – code for Dominant Wavelength group  
Digit3 – code for Forward Voltage group
- D) Date code
- E) Week code
- F) Batch No.
- G) Total quantity
- H) Company code

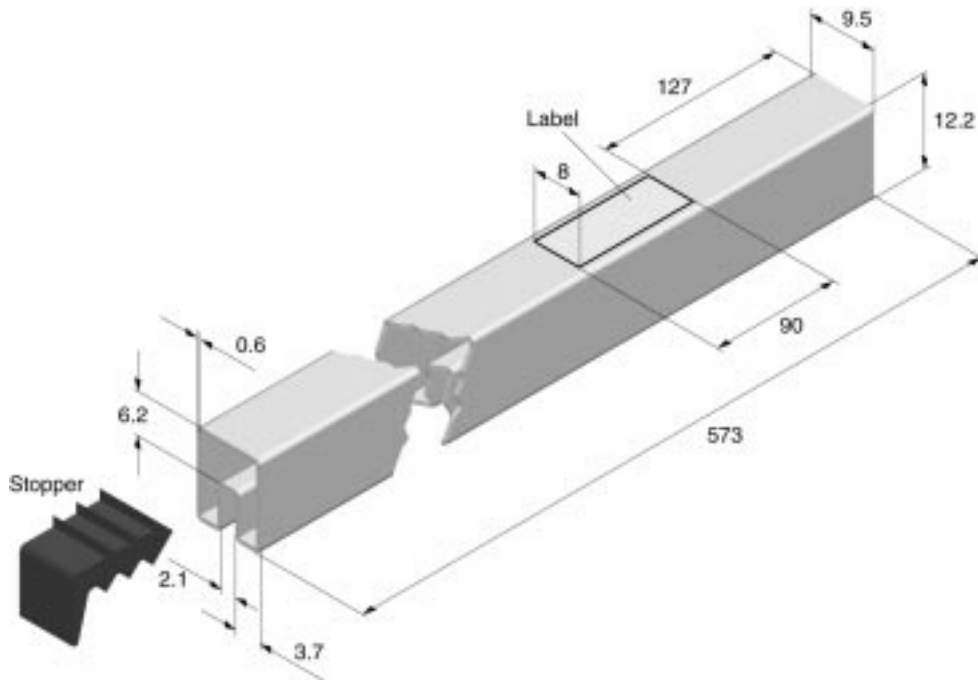
Note: Any distance between bar code and character is more than 1mm.

Example for TELUX tube label



- A) Bar code
- B) Type of component
- C) Manufacturing plant
- D) SEL – Selection code (Bin)  
 Digit1 – code for Luminous Flux group  
 Digit2 – code for Dominant Wavelength group  
 Digit3 – code for Forward Voltage group
- E) Date code
- F) Batch No.
- G) Total quantity
- H) Company code

Tube with Bar code label



Drawing proportions not scaled