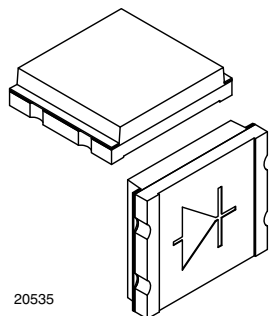


# Silicon PIN Photodiode, RoHS Compliant, Released for Lead (Pb)-free Reflow Soldering, AEC-Q101 Released



20535

## DESCRIPTION

TEMD5020X01 is a high speed and high sensitive PIN photodiode. It is a miniature surface mount device (SMD) including the chip with a 4.4 mm<sup>2</sup> sensitive area detecting visible and near infrared radiation.

## FEATURES

- Package type: surface mount
- Package form: top view
- Dimensions (L x W x H in mm): 5 x 4.24 x 1.12
- Radiant sensitive area (in mm<sup>2</sup>): 4.4
- AEC-Q101 qualified
- High photo sensitivity
- High radiant sensitivity
- Suitable for visible and near infrared radiation
- Fast response times
- Angle of half sensitivity:  $\phi = \pm 65^\circ$
- Floor life: 72 h, MSL 4, acc. J-STD-020
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AUTOMOTIVE  
GRADE

RoHS  
COMPLIANT  
**GREEN**  
(5-2008)\*\*

## Note

\*\* Please see document "Vishay Material Category Policy":  
[www.vishay.com/doc?999902](http://www.vishay.com/doc?999902)

## APPLICATIONS

- High speed photo detectors

## PRODUCT SUMMARY

| COMPONENT   | $I_{ra}$ (μA) | $\phi$ (deg) | $\lambda_{0.1}$ (nm) |
|-------------|---------------|--------------|----------------------|
| TEMD5020X01 | 35            | $\pm 65$     | 430 to 1100          |

## Note

- Test conditions see table "Basic Characteristics"

## ORDERING INFORMATION

| ORDERING CODE | PACKAGING     | REMARKS                      | PACKAGE FORM |
|---------------|---------------|------------------------------|--------------|
| TEMD5020X01   | Tape and reel | MOQ: 1500 pcs, 1500 pcs/reel | Top view     |

## Note

- MOQ: minimum order quantity

## ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25^\circ\text{C}$ , unless otherwise specified)

| PARAMETER                           | TEST CONDITION                                   | SYMBOL     | VALUE         | UNIT             |
|-------------------------------------|--------------------------------------------------|------------|---------------|------------------|
| Reverse voltage                     |                                                  | $V_R$      | 60            | V                |
| Power dissipation                   | $T_{amb} \leq 25^\circ\text{C}$                  | $P_V$      | 215           | mW               |
| Junction temperature                |                                                  | $T_j$      | 100           | $^\circ\text{C}$ |
| Operating temperature range         |                                                  | $T_{amb}$  | - 40 to + 100 | $^\circ\text{C}$ |
| Storage temperature range           |                                                  | $T_{stg}$  | - 40 to + 110 | $^\circ\text{C}$ |
| Soldering temperature               | Acc. reflow solder profile fig. 8                | $T_{sd}$   | 260           | $^\circ\text{C}$ |
| Thermal resistance junction/ambient | Soldered on PCB with pad dimensions: 4 mm x 4 mm | $R_{thJA}$ | 350           | K/W              |

| <b>BASIC CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                               |                 |      |                     |      |                       |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------|------|---------------------|------|-----------------------|
| PARAMETER                                                                                           | TEST CONDITION                                                                | SYMBOL          | MIN. | TYP.                | MAX. | UNIT                  |
| Forward voltage                                                                                     | $I_F = 50\text{ mA}$                                                          | $V_F$           |      | 1                   | 1.3  | V                     |
| Breakdown voltage                                                                                   | $I_R = 100\text{ }\mu\text{A}$ , $E = 0$                                      | $V_{(BR)}$      | 60   |                     |      | V                     |
| Reverse dark current                                                                                | $V_R = 10\text{ V}$ , $E = 0$                                                 | $I_{ro}$        |      | 2                   | 30   | nA                    |
| Diode capacitance                                                                                   | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0$                             | $C_D$           |      | 48                  |      | pF                    |
|                                                                                                     | $V_R = 3\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0$                             | $C_D$           |      | 17                  | 40   | pF                    |
| Open circuit voltage                                                                                | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 950\text{ nm}$                          | $V_o$           |      | 350                 |      | mV                    |
| Temperature coefficient of $V_o$                                                                    | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 950\text{ nm}$                          | $TK_{V_o}$      |      | - 2.6               |      | mV/K                  |
| Short circuit current                                                                               | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 950\text{ nm}$                          | $I_k$           |      | 32                  |      | $\mu\text{A}$         |
| Temperature coefficient of $I_k$                                                                    | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 950\text{ nm}$                          | $TK_{I_k}$      |      | 0.1                 |      | %/K                   |
| Reverse light current                                                                               | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 950\text{ nm}$ ,<br>$V_R = 5\text{ V}$  | $I_{ra}$        | 25   | 35                  |      | $\mu\text{A}$         |
| Angle of half sensitivity                                                                           |                                                                               | $\phi$          |      | $\pm 65$            |      | deg                   |
| Wavelength of peak sensitivity                                                                      |                                                                               | $\lambda_p$     |      | 900                 |      | nm                    |
| Range of spectral bandwidth                                                                         |                                                                               | $\lambda_{0.1}$ |      | 430 to 1100         |      | nm                    |
| Noise equivalent power                                                                              | $V_R = 10\text{ V}$ , $\lambda = 950\text{ nm}$                               | NEP             |      | $4 \times 10^{-14}$ |      | W/ $\sqrt{\text{Hz}}$ |
| Rise time                                                                                           | $V_R = 10\text{ V}$ , $R_L = 1\text{ k}\Omega$ ,<br>$\lambda = 820\text{ nm}$ | $t_r$           |      | 100                 |      | ns                    |
| Fall time                                                                                           | $V_R = 10\text{ V}$ , $R_L = 1\text{ k}\Omega$ ,<br>$\lambda = 820\text{ nm}$ | $t_f$           |      | 100                 |      | ns                    |

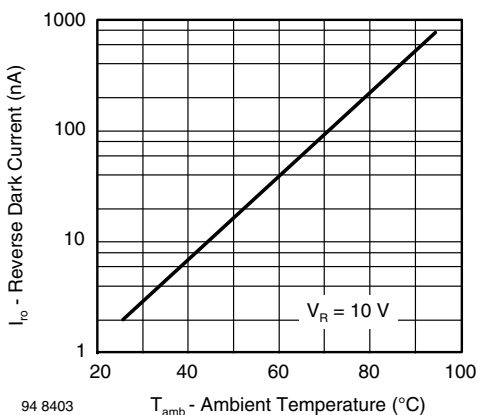
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Reverse Dark Current vs. Ambient Temperature

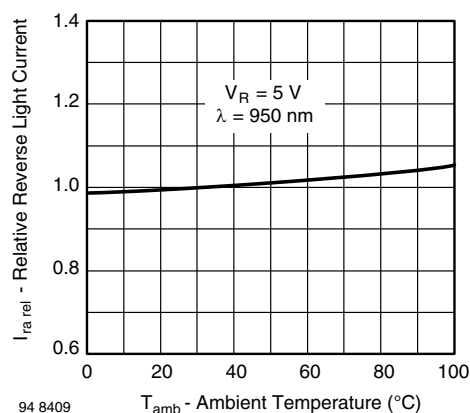


Fig. 2 - Relative Reverse Light Current vs. Ambient Temperature

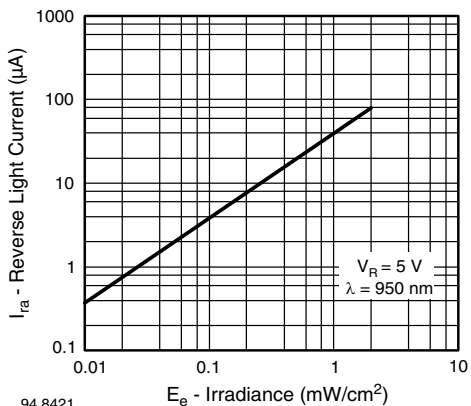


Fig. 3 - Reverse Light Current vs. Irradiance

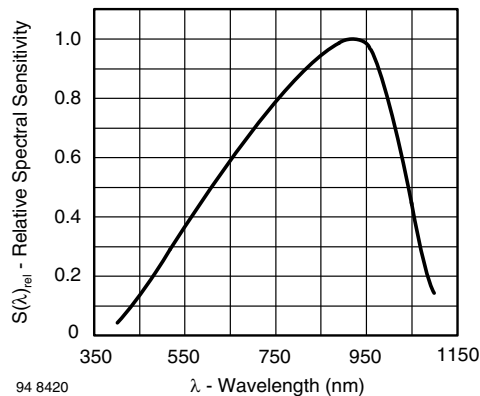


Fig. 6 - Relative Spectral Sensitivity vs. Wavelength

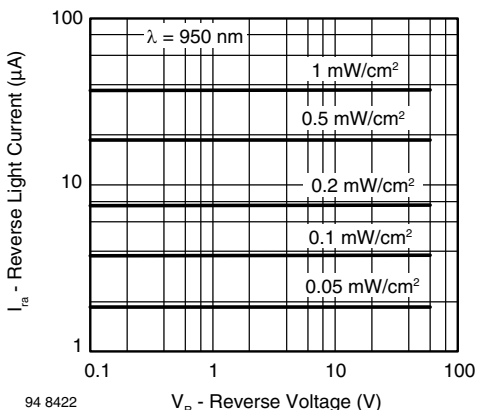


Fig. 4 - Reverse Light Current vs. Reverse Voltage

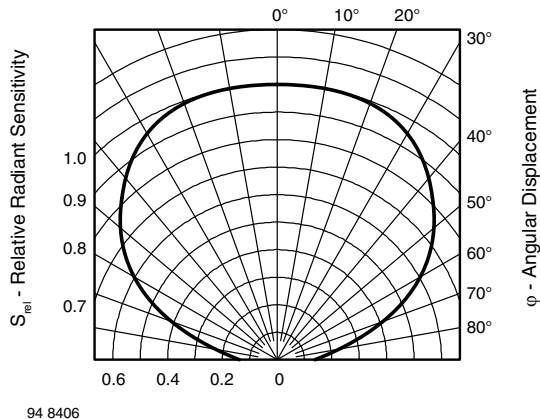


Fig. 7 - Relative Radiant Sensitivity vs. Angular Displacement

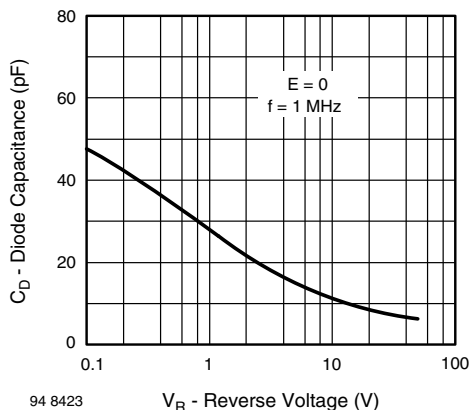
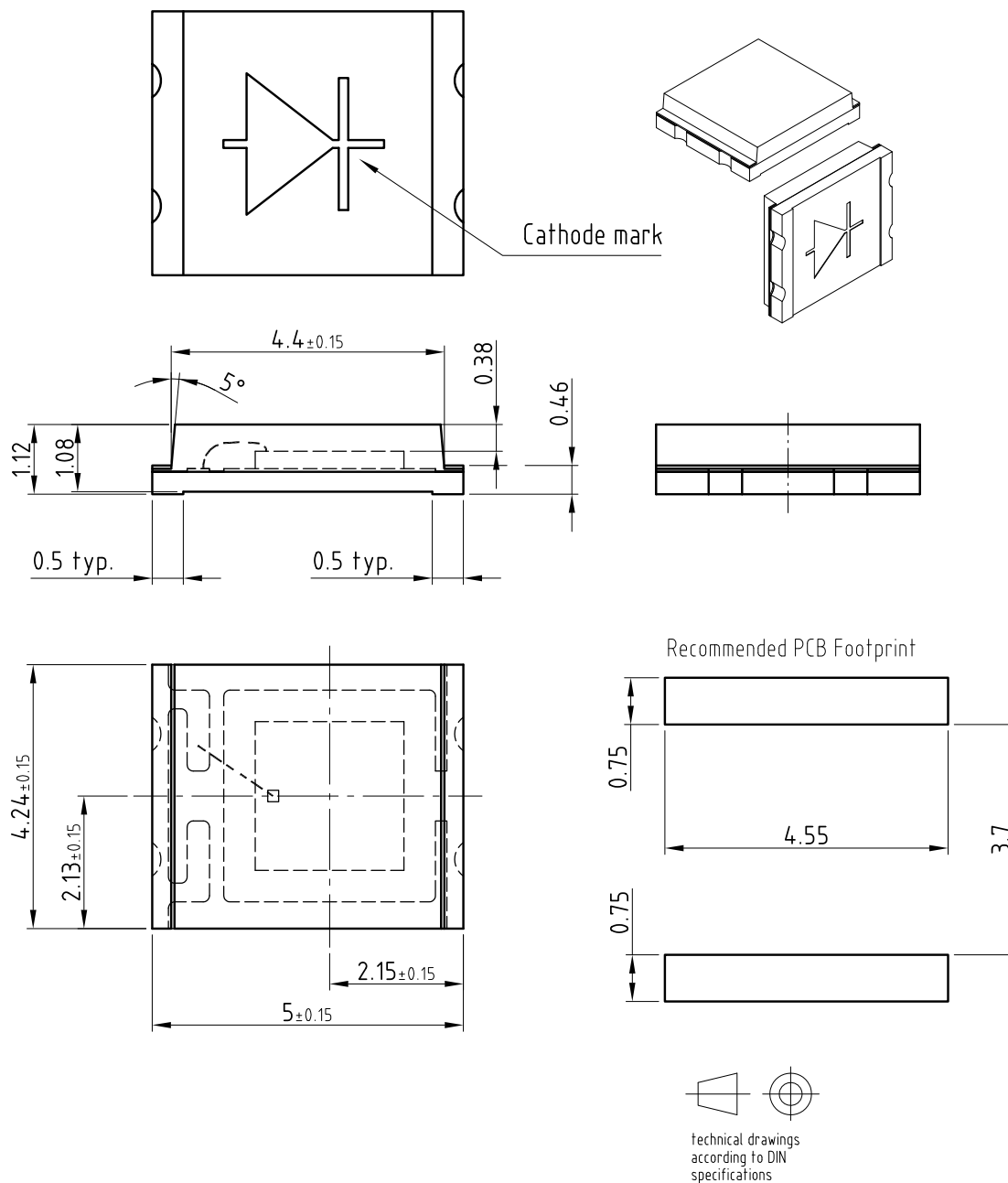
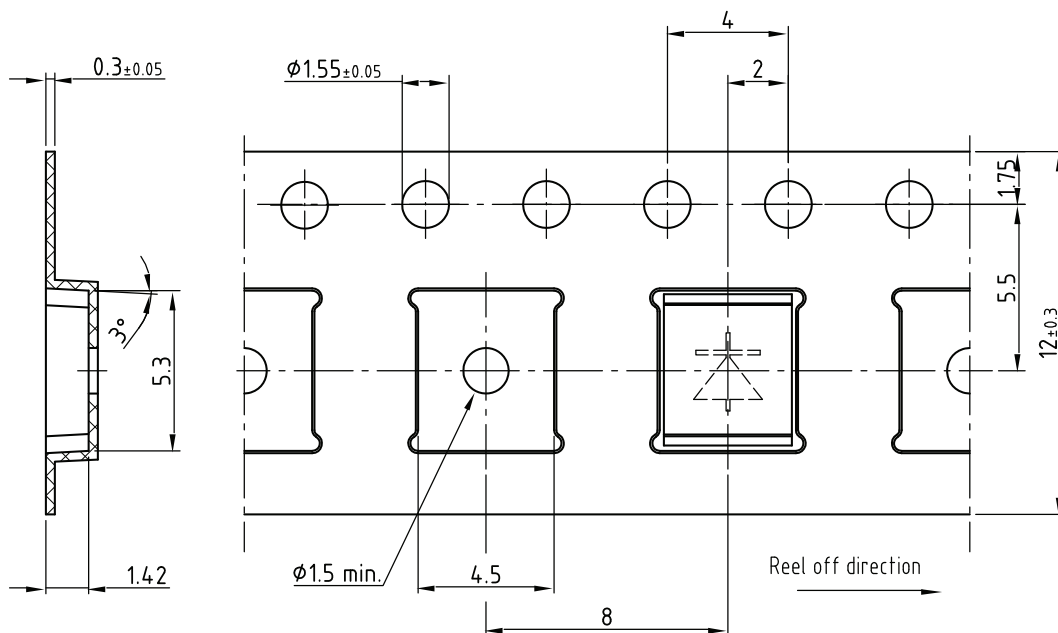


Fig. 5 - Diode Capacitance vs. Reverse Voltage

**PACKAGE DIMENSIONS** in millimeters


Drawing-No.: 6.541-5059.01-4  
Issue: 4; 26.04.07  
19280

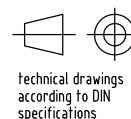
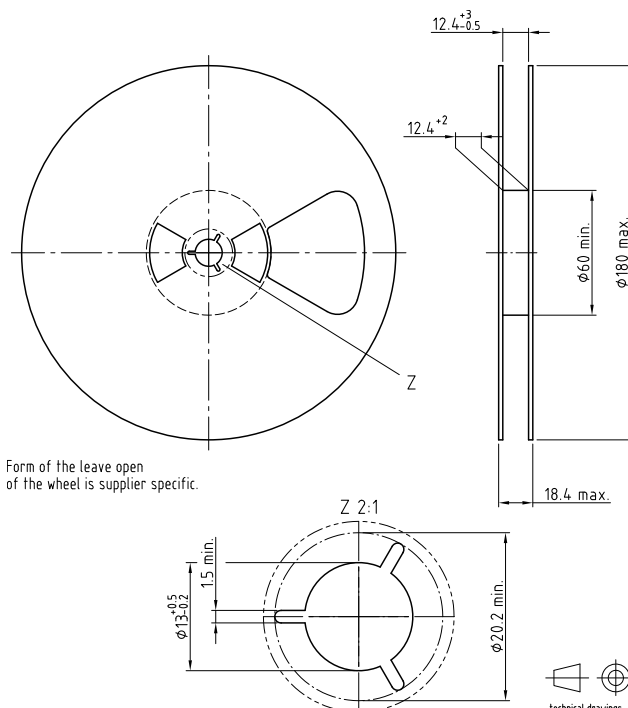
Not indicated tolerances  $\pm 0.1$

**TAPING DIMENSIONS** in millimeters


Drawing-No.: 9.700-5293.01-4

Issue: 1; 03.12.04

20537

Not indicated tolerances  $\pm 0.1$ 

**REEL DIMENSIONS** in millimeters

Form of the leave open  
of the wheel is supplier specific.

Drawing-No.: 9.800-5097.01-4

Issue: 1; 05.05.08

20874





## SOLDER PROFILE

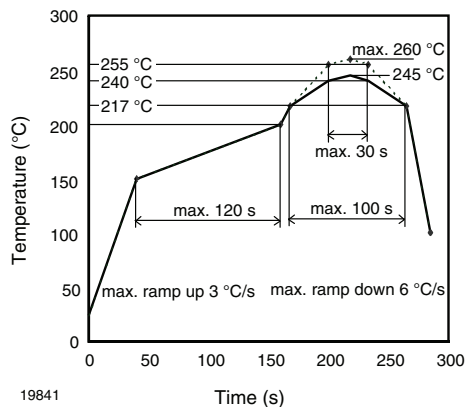


Fig. 8 - Lead (Pb)-free Reflow Solder Profile  
acc. J-STD-020D

## DRYPACK

Devices are packed in moisture barrier bags (MBB) to prevent the products from moisture absorption during transportation and storage. Each bag contains a desiccant.

## FLOOR LIFE

Time between soldering and removing from MBB must not exceed the time indicated in J-STD-020:

Moisture sensitivity: level 4

Floor life: 72 h

Conditions:  $T_{amb} < 30\text{ °C}$ , RH < 60 %

## DRYING

In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020 or recommended conditions:

192 h at 40 °C (+ 5 °C), RH < 5 %

or

96 h at 60 °C (+ 5 °C), RH < 5 %.



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