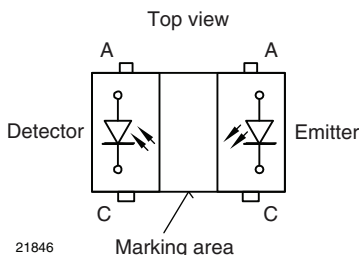


# Reflective Optical Sensor with PIN Photodiode Output



19967


**RoHS**  
COMPLIANT

## FEATURES

- Package type: surface mount
- Detector type: pin photodiode
- Dimensions (L x W x H in mm): 6 x 4.3 x 3.75
- Peak operating distance: 6 mm
- Operating range within > 20 % relative collector current: 2 mm to 25 mm
- Typical output current under test:  $I_{ra} > 0.11 \mu A$
- Daylight blocking filter
- High linearity
- Emitter wavelength: 940 nm
- Lead (Pb)-free soldering released
- Moisture sensitivity level (MSL): 4
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

## APPLICATIONS

- Proximity sensor
- Object sensor
- Motion sensor
- Touch key

## PRODUCT SUMMARY

| PART NUMBER | DISTANCE FOR MAXIMUM CTR <sub>rel</sub> <sup>(1)</sup> (mm) | DISTANCE RANGE FOR RELATIVE I <sub>out</sub> > 20 % (mm) | TYPICAL OUTPUT CURRENT UNDER TEST <sup>(2)</sup> (mA) | DAYLIGHT BLOCKING FILTER INTEGRATED |
|-------------|-------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|-------------------------------------|
| TCND5000    | 6                                                           | 2 to 25                                                  | 0.0015                                                | Yes                                 |

### Notes

- (1) CTR: current transfer ratio,  $I_{out}/I_{in}$   
(2) Conditions like in table basic characteristics/sensors

## ORDERING INFORMATION

| ORDERING CODE | PACKAGING     | VOLUME                       | REMARKS |
|---------------|---------------|------------------------------|---------|
| TCND5000      | Tape and reel | MOQ: 2000 pcs, 2000 pcs/reel | Drypack |

### Note

- MOQ: minimum order quantity

## ABSOLUTE MAXIMUM RATINGS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

| PARAMETER              | TEST CONDITION                                             | SYMBOL          | VALUE | UNIT |
|------------------------|------------------------------------------------------------|-----------------|-------|------|
| <b>INPUT (EMITTER)</b> |                                                            |                 |       |      |
| Reverse voltage        |                                                            | V <sub>R</sub>  | 5     | V    |
| Forward current        |                                                            | I <sub>F</sub>  | 100   | mA   |
| Peak forward current   | t <sub>p</sub> = 50 μs, t = 2 ms, T <sub>amb</sub> ≤ 25 °C | I <sub>FM</sub> | 500   | mA   |
| Power dissipation      |                                                            | P <sub>V</sub>  | 190   | mW   |
| Junction temperature   |                                                            | T <sub>j</sub>  | 100   | °C   |



| ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                |           |             |                    |
|-------------------------------------------------------------------------------------------------|----------------|-----------|-------------|--------------------|
| PARAMETER                                                                                       | TEST CONDITION | SYMBOL    | VALUE       | UNIT               |
| OUTPUT (DETECTOR)                                                                               |                |           |             |                    |
| Reverse voltage                                                                                 |                | $V_R$     | 60          | V                  |
| Power dissipation                                                                               |                | $P_V$     | 75          | mW                 |
| Junction temperature                                                                            |                | $T_j$     | 100         | $^{\circ}\text{C}$ |
| SENSOR                                                                                          |                |           |             |                    |
| Ambient temperature range                                                                       |                | $T_{amb}$ | -40 to +85  | $^{\circ}\text{C}$ |
| Storage temperature range                                                                       |                | $T_{stg}$ | -40 to +100 | $^{\circ}\text{C}$ |
| Soldering temperature                                                                           | acc. fig. 14   | $T_{sd}$  | 260         | $^{\circ}\text{C}$ |

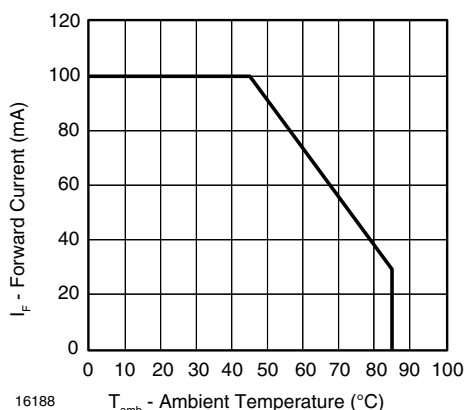


Fig. 1 - Forward Current Limit vs. Ambient Temperature

| BASIC CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                             |                  |      |          |      |               |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------|------|----------|------|---------------|
| PARAMETER                                                                                    | TEST CONDITION                                              | SYMBOL           | MIN. | TYP.     | MAX. | UNIT          |
| INPUT (EMITTER) <sup>(1)</sup>                                                               |                                                             |                  |      |          |      |               |
| Forward voltage                                                                              | $I_F = 50\text{ mA}$ , $t_p = 20\text{ ms}$                 | $V_F$            |      | 1.2      | 1.5  | V             |
| Temperature coefficient of $V_F$                                                             | $I_F = 1\text{ mA}$                                         | $TK_{V_F}$       |      | -1.3     |      | mV/K          |
| Reverse current                                                                              | $V_R = 5\text{ V}$                                          | $I_R$            |      |          | 10   | $\mu\text{A}$ |
| Junction capacitance                                                                         | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0\text{ lx}$ | $C_j$            |      | 40       |      | pF            |
| Radiant intensity                                                                            | $I_F = 20\text{ mA}$ , $t_p = 20\text{ ms}$                 | $I_e$            |      | 11       | 15   | mW/sr         |
| Angle of half intensity                                                                      |                                                             | $\phi$           |      | $\pm 12$ |      | deg           |
| Peak wavelength                                                                              | $I_F = 100\text{ mA}$                                       | $\lambda_p$      | 930  | 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            |

| <b>BASIC CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                                                  |                 |      |             |      |               |
|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------|------|-------------|------|---------------|
| PARAMETER                                                                                           | TEST CONDITION                                                                                   | SYMBOL          | MIN. | TYP.        | MAX. | UNIT          |
| <b>OUTPUT (DETECTOR) <sup>(2)</sup></b>                                                             |                                                                                                  |                 |      |             |      |               |
| Forward voltage                                                                                     | $I_F = 50\text{ mA}$                                                                             | $V_F$           |      | 1           | 1.3  | V             |
| Breakdown voltage                                                                                   | $I_R = 100\text{ }\mu\text{A}$                                                                   | $V_{BR}$        | 60   |             |      | V             |
| Reverse dark current                                                                                | $V_R = 10\text{ V}$ , $E = 0\text{ lx}$                                                          | $I_{ro}$        |      | 1           | 10   | nA            |
| Diode capacitance                                                                                   | $V_R = 5\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0\text{ lx}$                                      | $C_D$           |      | 1.8         |      | pF            |
| Reverse light current                                                                               | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 950\text{ nm}$ , $V_R = 5\text{ V}$                        | $I_{ra}$        |      | 12          |      | $\mu\text{A}$ |
| Temperature coefficient of $I_{ra}$                                                                 | $\lambda = 870\text{ nm}$ , $V_R = 5\text{ V}$                                                   | $TK_{ira}$      |      | 0.2         |      | %/K           |
| Angle of half intensity                                                                             |                                                                                                  | $\phi$          |      | $\pm 15$    |      | deg           |
| Wavelength of peak sensitivity                                                                      |                                                                                                  | $\lambda_p$     |      | 930         |      | nm            |
| Range of spectral bandwidth                                                                         |                                                                                                  | $\lambda_{0.5}$ |      | 840 to 1050 |      | nm            |
| <b>SENSOR</b>                                                                                       |                                                                                                  |                 |      |             |      |               |
| Reverse Light Current                                                                               | $V_R = 2.5\text{ V}$ , $I_F = 20\text{ mA}$ , $D = 30\text{ mm}$ , reflective mode: see figure 2 | $I_{ra}$        | 110  | 260         |      | nA            |

**Notes**

- (1) See figures 2 to 8 accordingly  
(2) See figures 9 to 12 accordingly

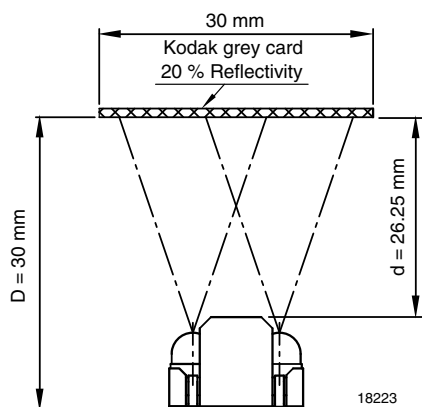


Fig. 2 - Test Circuit

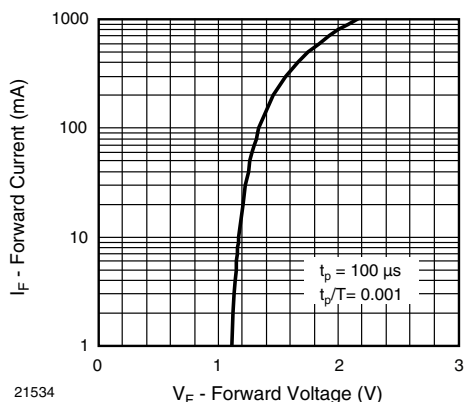
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 3 - Forward Current vs. Forward Voltage

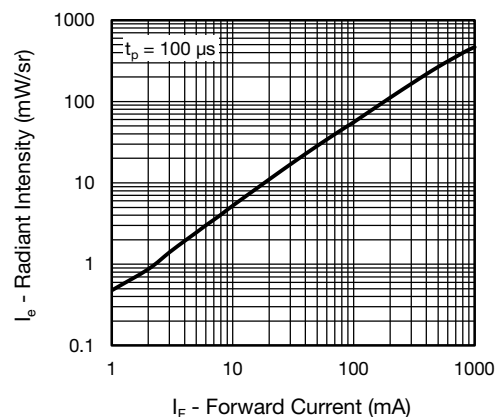


Fig. 4 - Radiant Intensity vs. Forward Current

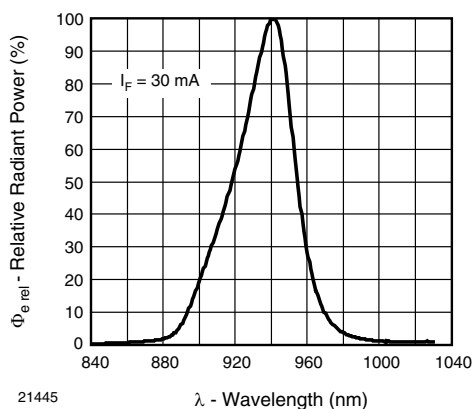


Fig. 5 - Relative Radiant Power vs. Wavelength

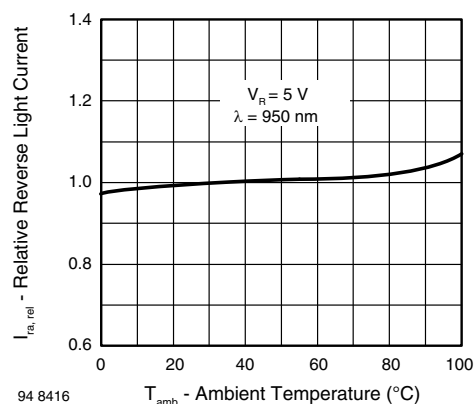


Fig. 8 - Relative Reverse Light Current vs. Ambient Temperature

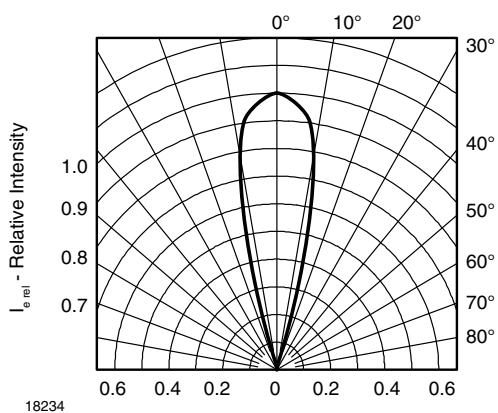


Fig. 6 - Relative Radiant Intensity vs. Angular Displacement

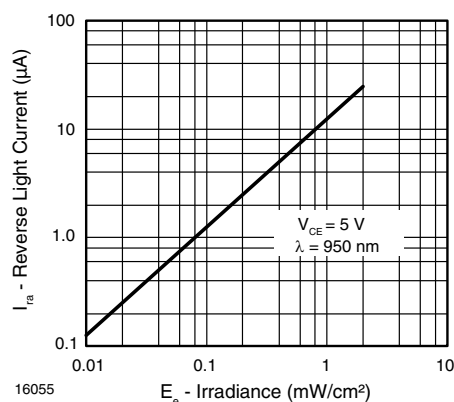


Fig. 9 - Reverse Light Current vs. Irradiance

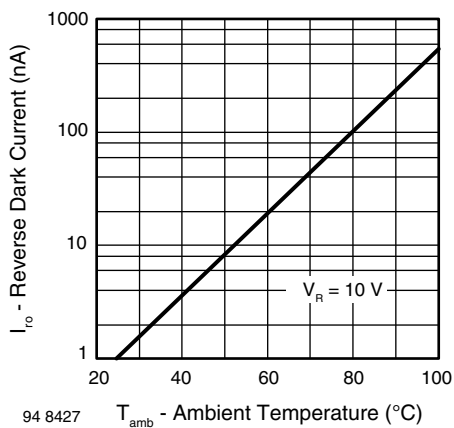


Fig. 7 - Reverse Dark Current vs. Ambient Temperature

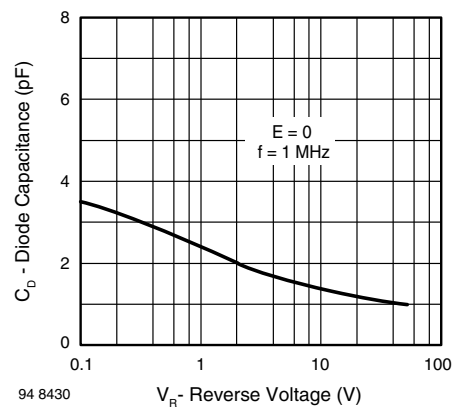


Fig. 10 - Diode Capacitance vs. Reverse Voltage

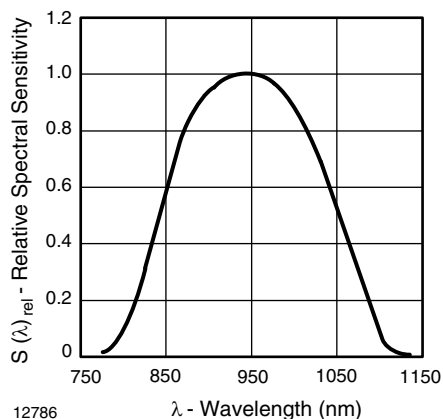


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

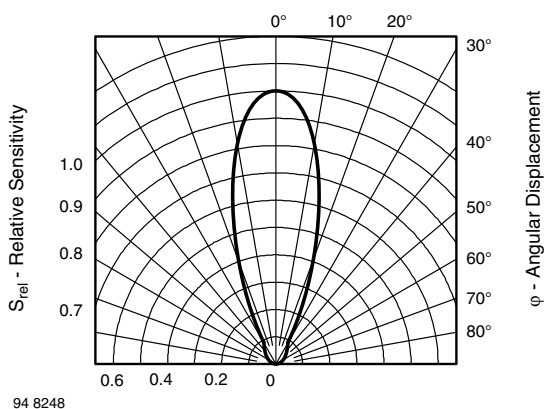


Fig. 12 - Relative Radiant Sensitivity vs. Angular Displacement

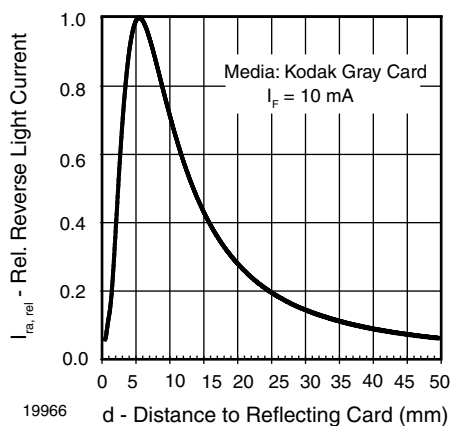
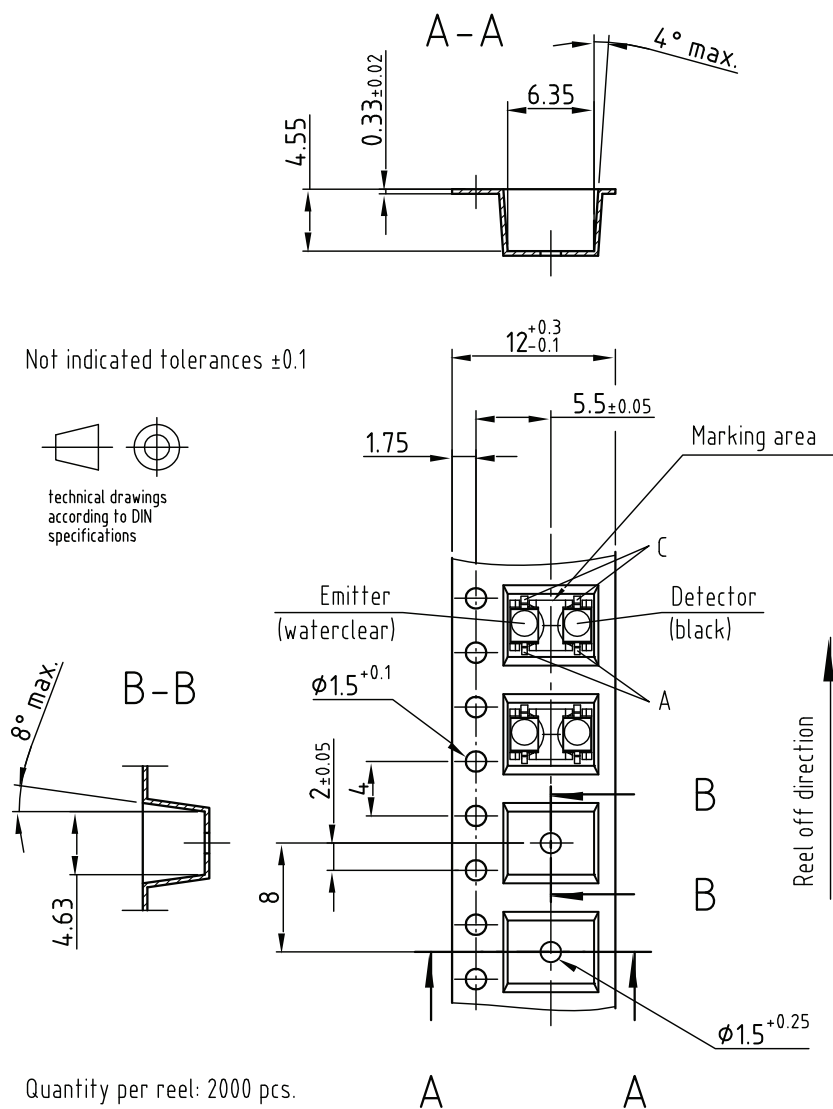


Fig. 13 - Relative Reverse Light Current vs. Distance

**TAPING DIMENSIONS** in millimeters


Material of Blistertape: PC black

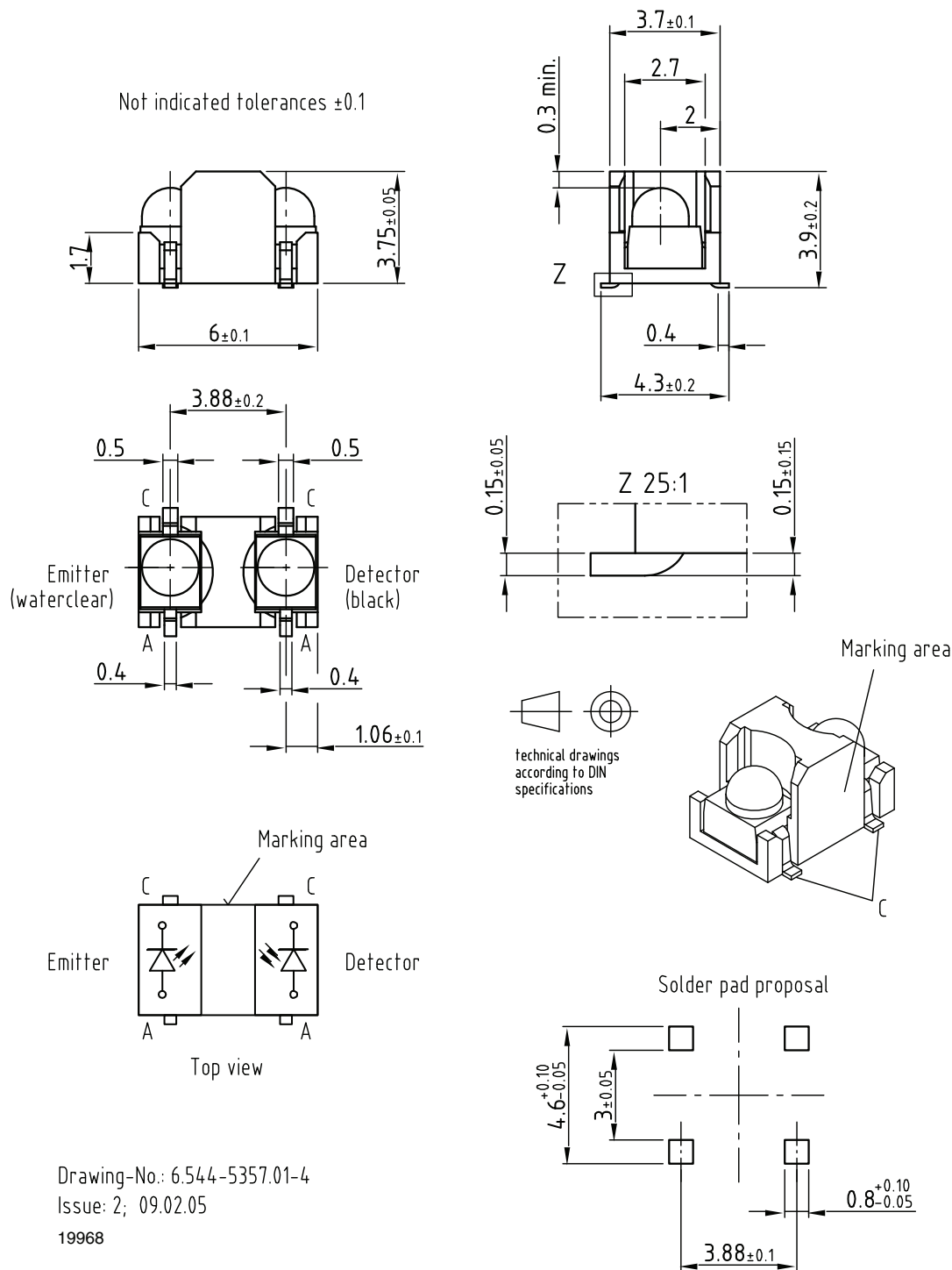
Sealing of cavities with hot sealing cover tape,

C-Pak Type CP - 2010 AS ( Thickness: 0.055 - 0.075mm; Base Material: Polyester )

Drawing-No.: 9.700-5281.01-4

Issue: 4; 10.02.05

18222

**PACKAGE DIMENSIONS** in millimeters


Drawing-No.: 6.544-5357.01-4  
Issue: 2; 09.02.05  
19968



## 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

2.1 Storage temperature and rel. humidity conditions are: 5 °C to 30 °C, RH 60 %

2.2 Floor life must not exceed 72 h, acc. to JEDEC® level 4, J-STD-020.

Once the package is opened, the products should be used within 72 h. 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.

2.3 If opened more than 72 h in an atmosphere 5 °C to 30 °C, RH 60 %, devices should be treated at 60 °C ± 5 °C for 15 h.

2.4 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 PROFILES

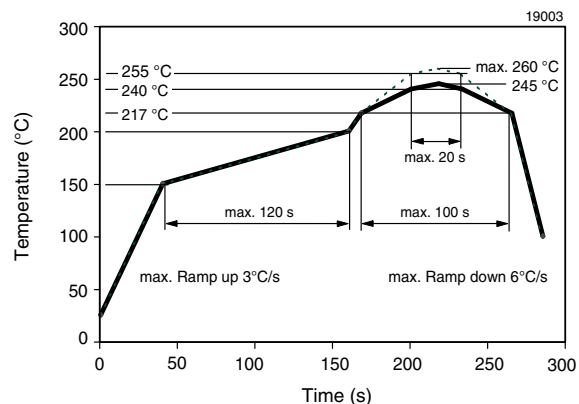


Fig. 14 - Lead (Pb)-Free Reflow Solder Profile

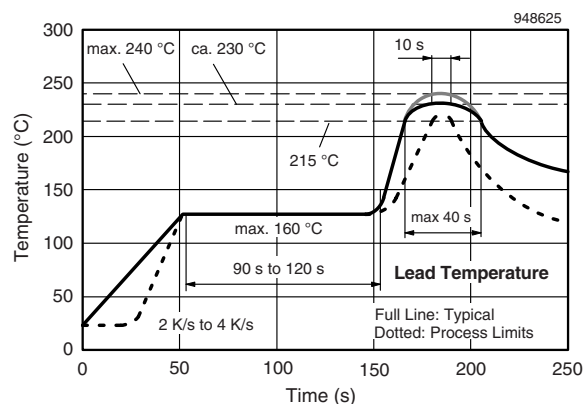


Fig. 15 - Lead Tin (SnPb) Reflow Solder Profile



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