



## High Speed Infrared Emitting Diodes, 940 nm, GaAlAs, DH

VSMB2000X01



21725-4

VSMB2020X01



### FEATURES

- Package type: surface mount
- Package form: GW, RGW
- Dimensions (L x W x H in mm): 2.3 x 2.3 x 2.8
- AEC-Q101 qualified
- Peak wavelength:  $\lambda_p = 940$  nm
- High reliability
- High radiant power
- High radiant intensity
- Angle of half intensity:  $\phi = \pm 12^\circ$
- Low forward voltage
- Suitable for high pulse current operation
- Terminal configurations: gullwing or reserve gullwing
- Package matches with detector VEMD2000X01 series
- Floor life: 4 weeks, MSL 2a, acc. J-STD-020
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



### DESCRIPTION

VSMB2000X01 series are infrared, 940 nm emitting diodes in GaAlAs (DH) technology with high radiant power and high speed, molded in clear, untinted plastic packages (with lens) for surface mounting (SMD).

### APPLICATIONS

- IrDA compatible data transmission
- Miniature light barrier
- Photointerrupters
- Optical switch
- Control and drive circuits
- Shaft encoders

### Note

\*\* Please see document "Vishay Material Category Policy": [www.vishay.com/doc?99902](http://www.vishay.com/doc?99902)

| PRODUCT SUMMARY |                        |              |                  |                     |
|-----------------|------------------------|--------------|------------------|---------------------|
| COMPONENT       | I <sub>e</sub> (mW/sr) | $\phi$ (deg) | $\lambda_p$ (nm) | t <sub>r</sub> (ns) |
| VSMB2000X01     | 40                     | $\pm 12$     | 940              | 15                  |
| VSMB2020X01     | 40                     | $\pm 12$     | 940              | 15                  |

### Note

- Test conditions see table "Basic Characteristics"

| ORDERING INFORMATION |               |                              |                  |
|----------------------|---------------|------------------------------|------------------|
| ORDERING CODE        | PACKAGING     | REMARKS                      | PACKAGE FORM     |
| VSMB2000X01          | Tape and reel | MOQ: 6000 pcs, 6000 pcs/reel | Reverse gullwing |
| VSMB2020X01          | Tape and reel | MOQ: 6000 pcs, 6000 pcs/reel | Gullwing         |

### 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 $\mu$ s | I <sub>FM</sub>   | 200           | mA   |
| Surge forward current   | t <sub>p</sub> = 100 $\mu$ s                          | I <sub>FSM</sub>  | 1             | A    |
| Power dissipation   |   | P <sub>V</sub>    | 160           | 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 $\leq$ 5 s  | T <sub>sd</sub>   | 260           | °C   |
| Thermal resistance junction/ambient   | J-STD-051, leads 7 mm, soldered on PCB                | R <sub>thJA</sub> | 250           | K/W  |

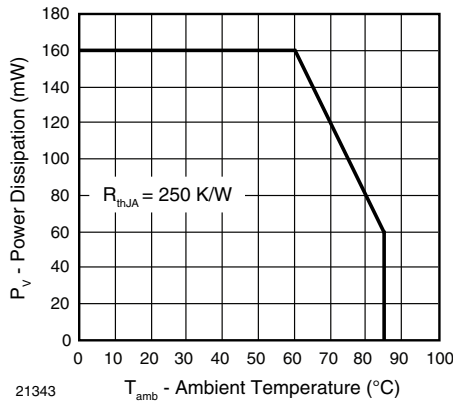


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

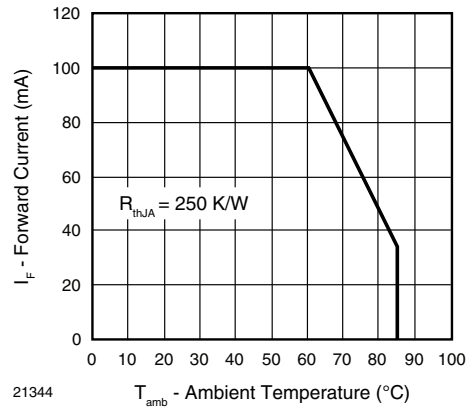


Fig. 2 - Forward Current Limit vs. Ambient Temperature

| BASIC CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |                  |      |          |      |               |
|--|--|------------------|------|----------|------|---------------|
| PARAMETER  | TEST CONDITION   | SYMBOL           | MIN. | TYP.     | MAX. | UNIT          |
| Forward voltage  | $I_F = 100\text{ mA}$ , $t_p = 20\text{ ms}$                     | $V_F$            | 1.15 | 1.35     | 1.6  | 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          |
|  | $I_F = 100\text{ mA}$  | $TK_{V_F}$       |      | -1.1     |      | mV/K          |
| Reverse current  | $V_R = 5\text{ V}$   | $I_R$            |      |          | 10   | $\mu\text{A}$ |
| Junction capacitance   | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0\text{ mW/cm}^2$ | $C_J$            |      | 70       |      | pF            |
| Radiant intensity  | $I_F = 100\text{ mA}$ , $t_p = 20\text{ ms}$                     | $I_e$            | 20   | 40       | 60   | mW/sr         |
|  | $I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$              | $I_e$            |      | 330      |      | mW/sr         |
| Radiant power  | $I_F = 100\text{ mA}$ , $t_p = 20\text{ ms}$                     | $\phi_e$         |      | 40       |      | mW            |
| Temperature coefficient of radiant power   | $I_F = 1\text{ mA}$  | $TK_{\phi_e}$    |      | -1.1     |      | %/K           |
|  | $I_F = 100\text{ mA}$  | $TK_{\phi_e}$    |      | -0.51    |      | %/K           |
| Angle of half intensity  |  | $\varphi$        |      | $\pm 12$ |      | deg           |
| Peak wavelength  | $I_F = 30\text{ mA}$   | $\lambda_p$      | 920  | 940      | 960  | nm            |
| Spectral bandwidth   | $I_F = 30\text{ mA}$   | $\Delta\lambda$  |      | 25       |      | nm            |
| Temperature coefficient of $\lambda_p$   | $I_F = 30\text{ mA}$   | $TK_{\lambda_p}$ |      | 0.25     |      | nm/K          |
| Rise time  | $I_F = 100\text{ mA}$ , 20 % to 80 %                             | $t_r$            |      | 15       |      | ns            |
| Fall time  | $I_F = 100\text{ mA}$ , 20 % to 80 %                             | $t_f$            |      | 15       |      | ns            |
| Cut-off frequency  | $I_{DC} = 70\text{ mA}$ , $I_{AC} = 30\text{ mA pp}$             | $f_c$            |      | 23       |      | MHz           |
| Virtual source diameter  |  | $d$              |      | 1.5      |      | mm            |

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

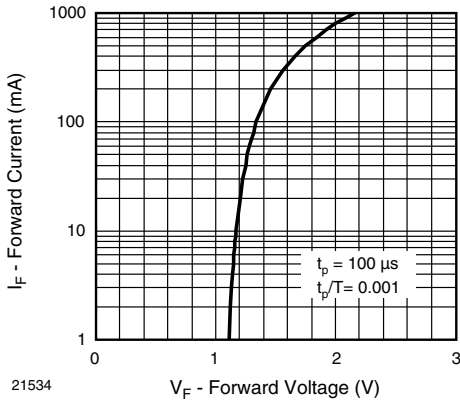


Fig. 3 - Forward Current vs. Forward Voltage

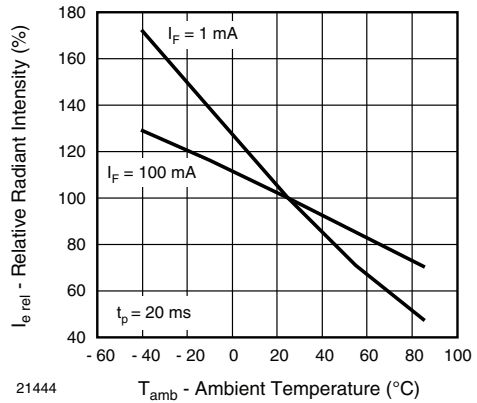


Fig. 6 - Relative Radiant Intensity vs. Ambient Temperature

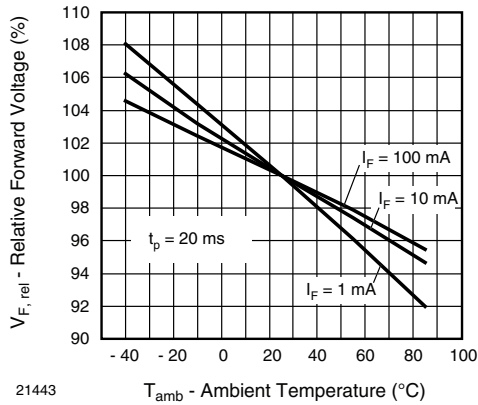


Fig. 4 - Relative Forward Voltage vs. Ambient Temperature

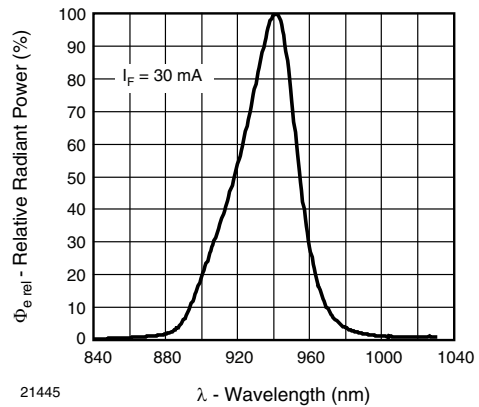


Fig. 7 - Relative Radiant Power vs. Wavelength

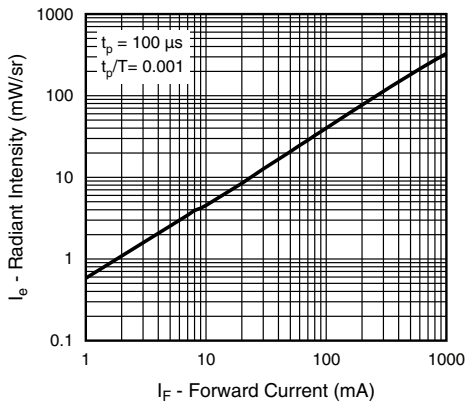


Fig. 5 - Radiant Intensity vs. Forward Current

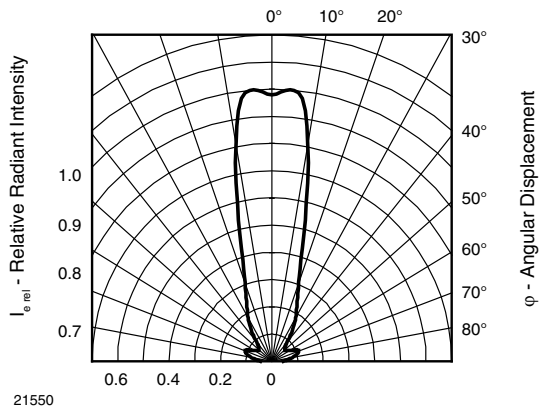


Fig. 8 - Relative Radiant Intensity vs. Angular Displacement

## SOLDER PROFILE

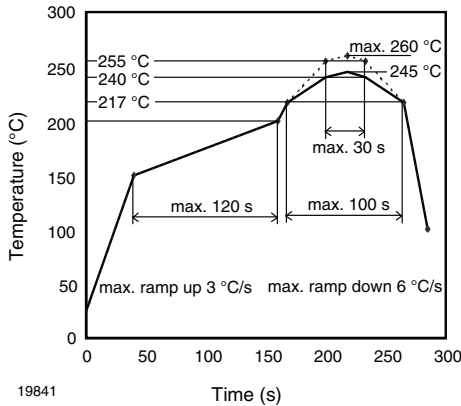


Fig. 9 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

## 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

Floor life (time between soldering and removing from MBB) must not exceed the time indicated on MBB label:

Floor life: 4 weeks

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

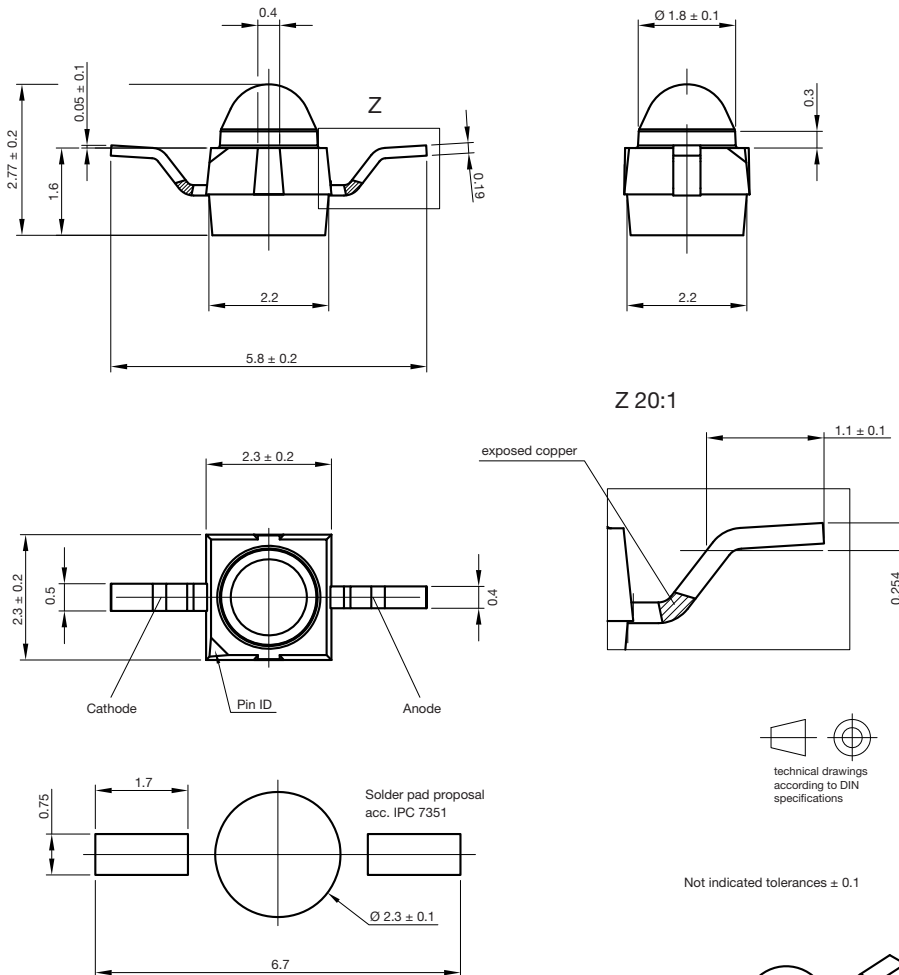
Moisture sensitivity level 2a, acc. to J-STD-020.

## DRYING

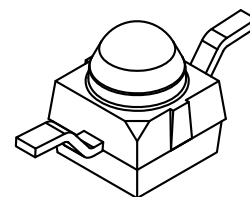
In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020 or label.

Devices taped on reel dry using recommended conditions 192 h at 40 °C (+ 5 °C), RH < 5 %.

## PACKAGE DIMENSIONS in millimeters: VSMB2000

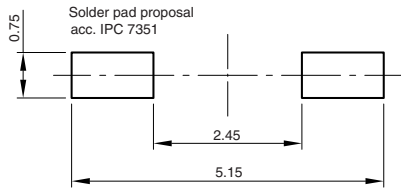
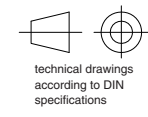
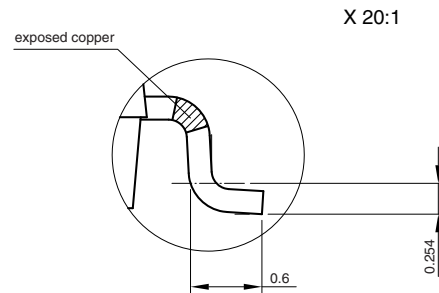
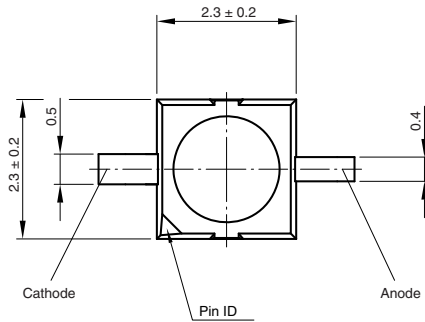
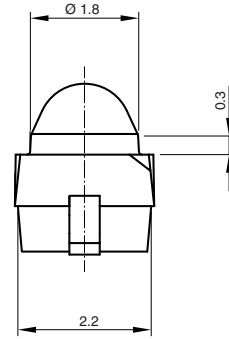
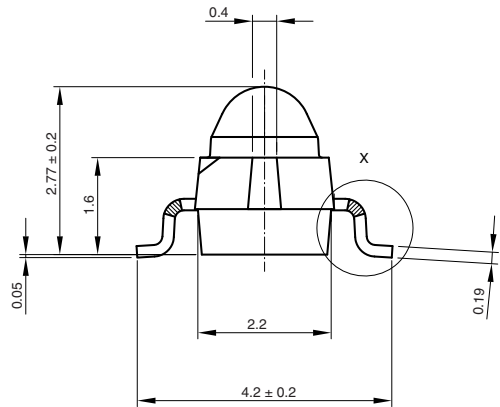


Drawing-No.: 6.544-5391.02-4  
Issue: 2; 18.03.10  
21517

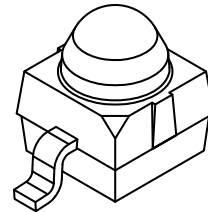




## PACKAGE DIMENSIONS in millimeters: VSMB2020

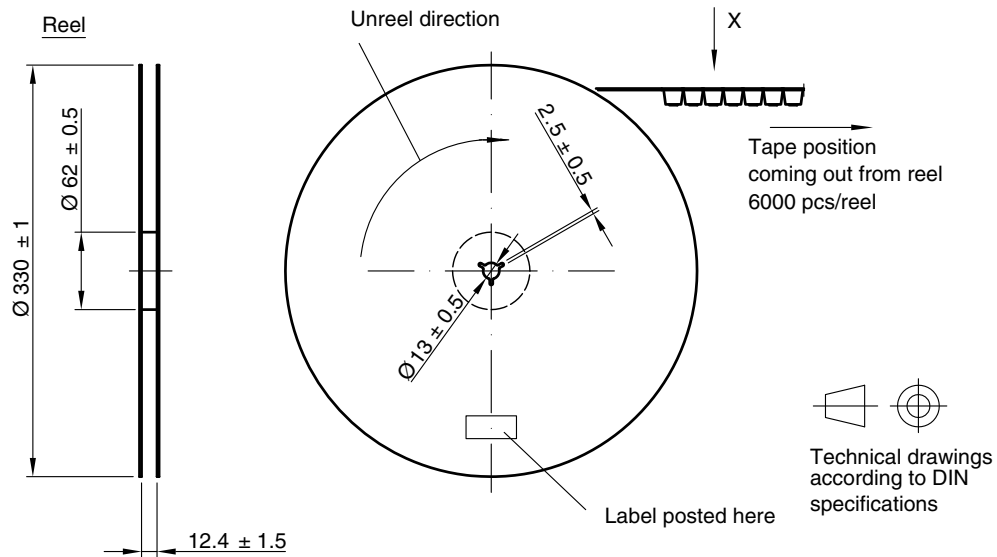


Not indicated tolerances ± 0.1

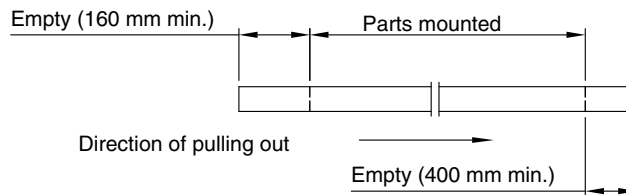


Drawing-No.: 6.544-5383.02-4  
 Issue: 4; 18.03.10  
 21488

## TAPING AND REEL DIMENSIONS in millimeters: VSMB2000

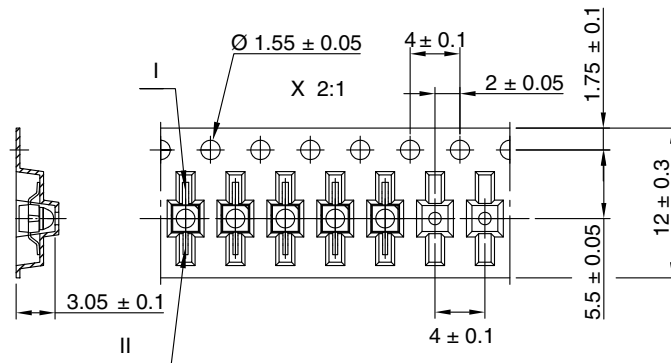


Leader and trailer tape:



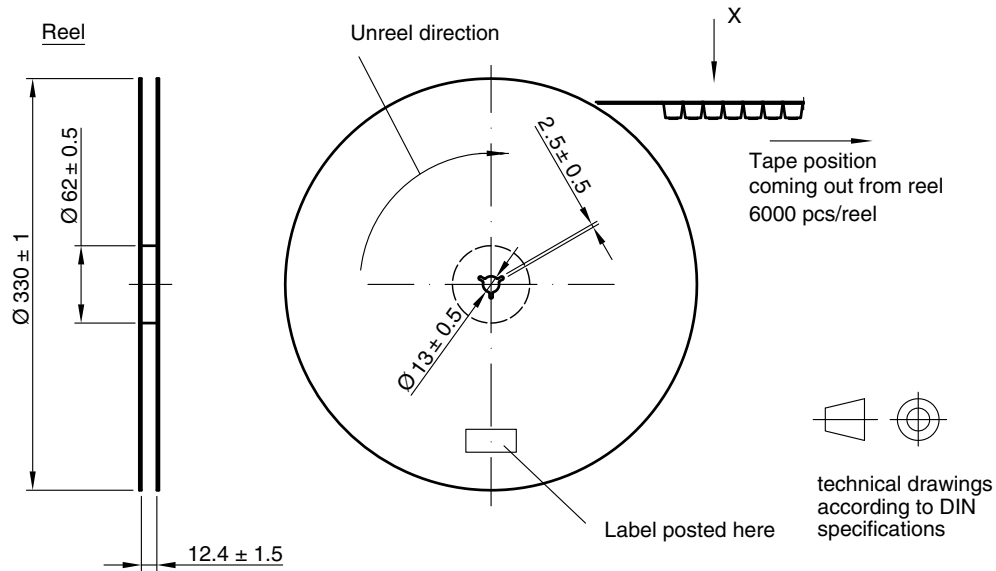
Terminal position in tape

| Device     | Lead I    | Lead II |
|------------|-----------|---------|
| VENT2000   | Collector | Emitter |
| VENT2500   |           | Emitter |
| VEMD2000   | Cathode   | Anode   |
| VEMD2500   |           |         |
| VSMB2000   |           |         |
| VSMG2000   | Anode     | Cathode |
| VSMY2850RG |           |         |

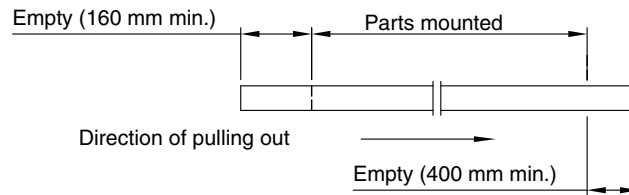


Drawing-No.: 9.800-5100.01-4  
 Issue: 2; 18.03.10  
 21572

## TAPING AND REEL DIMENSIONS in millimeters: VSMB2020

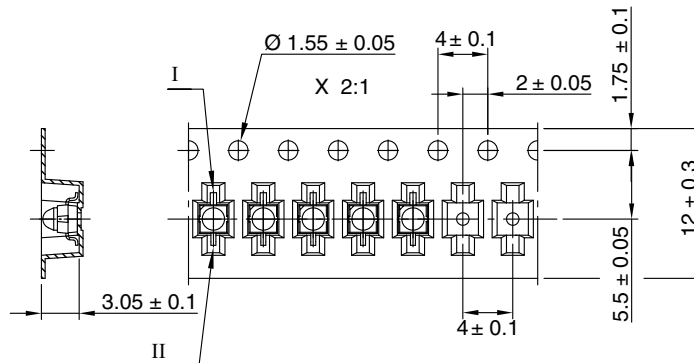


### Leader and trailer tape:



### Terminal position in tape

| Device    | Lead I    | Lead II |
|-----------|-----------|---------|
| VENT2020  | Collector | Emitter |
| VENT2520  |           | Emitter |
| VSMB2020  | Cathode   | Anode   |
| VSMG2020  |           |         |
| VEMD2020  |           |         |
| VEMD2520  |           |         |
| VSMY2850G | Anode     | Cathode |



Drawing-No.: 9.800-5091.01-4

Issue: 3; 18.03.10

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