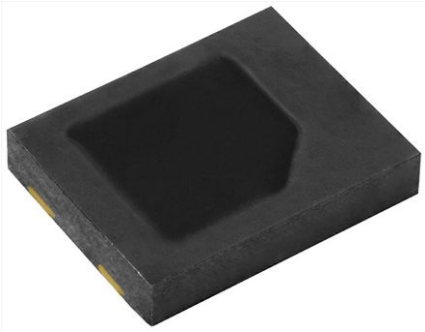
# Silicon PIN Photodiode



## FEATURES

- Package type: surface mount
- Package form: top view
- Dimensions (L x W x H in mm): 5 x 4 x 0.9
- Radiant sensitive area (in $mm^2$): 7.5
- AEC-Q101 qualified
- Daylight blocking filter matched with 850 nm to 890 nm emitters
- High radiant sensitivity
- Excellent $I_{ra}$ linearity
- Fast response times
- Angle of half sensitivity: $\varphi = \pm 65°$
- Floor life: 72 h, MSL 4, according to J-STD-020
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

e4

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

## DESCRIPTION

VEMD5160X01 is a high speed and high sensitive PIN photodiode with a highly linear photoresponse. It is a low profile surface mount device (SMD) including the chip with a 7.5 $mm^2$ sensitive area and a daylight blocking filter matched with IR emitters operating at wavelength 850 nm or 890 nm.

## APPLICATIONS

- High speed photo detector
- Small signal detection
- Proximity sensors

| PRODUCT SUMMARY | | | |
|---|---|---|---|
| **COMPONENT** | **$I_{ra}$ (µA)** | **φ (deg)** | **$\lambda_{0.1}$ (nm)** |
| VEMD5160X01 | 26 | ± 65 | 700 to 1070 |

**Note**

- Test conditions see table “Basic Characteristics”

| ORDERING INFORMATION | | | |
|---|---|---|---|
| **ORDERING CODE** | **PACKAGING** | **REMARKS** | **PACKAGE FORM** |
| VEMD5160X01 | Tape and reel | MOQ: 1000 pcs, 1000 pcs/reel | Top view |
| VEMD5160X01-GS15 | Tape and reel | MOQ: 5000 pcs, 5000 pcs/reel | Top view |

**Note**

- MOQ: minimum order quantity

| ABSOLUTE MAXIMUM RATINGS ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| Reverse voltage | | $V_R$ | 20 | V |
| Power dissipation | $T_{amb} \leq 25$ °C | $P_V$ | 240 | mW |
| Junction temperature | | $T_j$ | 110 | °C |
| Operating temperature range | | $T_{amb}$ | -40 to +110 | °C |
| Storage temperature range | | $T_{stg}$ | -40 to +110 | °C |
| Soldering temperature | According to reflow solder profile fig. 8 | $T_{sd}$ | 260 | °C |
| Thermal resistance junction / ambient | According to EIA / JESD51 | $R_{thJA}$ | 350 | K/W |
| ESD safety HBM | ± 2000 V, 1.5 kΩ, 100 pF, 3 pulses | $ESD_{HBM}$ | ≥ 2 | kV |



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| **BASIC CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| Forward voltage | $I_F$ = 50 mA | $V_F$ | - | 0.8 | 1.0 | V |
| Breakdown voltage | $I_R$ = 100 µA, E = 0 | $V_{(BR)}$ | 20 | - | - | V |
| Reverse dark current | $V_R$ = 10 V, E = 0 | $I_{ro}$ | - | 0.2 | 10 | nA |
| Diode capacitance | $V_R$ = 0 V, f = 1 MHz, E = 0 | $C_D$ | - | 80 | - | pF |
| | $V_R$ = 3 V, f = 1 MHz, E = 0 | $C_D$ | - | 35 | 40 | pF |
| Open circuit voltage | $E_e$ = 1 mW/cm², λ = 950 nm | $V_o$ | - | 350 | - | mV |
| Temperature coefficient of $V_o$ | $E_e$ = 1 mW/cm², λ = 950 nm | $TK_{Vo}$ | - | -2.6 | - | mV/K |
| Short circuit current | $E_e$ = 1 mW/cm², λ = 950 nm | $I_k$ | - | 26 | - | µA |
| Temperature coefficient of $I_k$ | $E_e$ = 1 mW/cm², λ = 835 nm | $TK_{Ik}$ | - | 0.1 | - | %/K |
| Reverse light current | $E_e$ = 1 mW/cm², λ = 950 nm, $V_R$ = 5 V | $I_{ra}$ | 20 | 26 | 31 | µA |
| | $E_e$ = 1 mW/cm², λ = 890 nm, $V_R$ = 5 V | $I_{ra}$ | - | 38 | - | µA |
| Angle of half sensitivity | | φ | - | ± 65 | - | deg |
| Wavelength of peak sensitivity | | $\lambda_p$ | - | 840 | - | nm |
| Range of spectral bandwidth | | $\lambda_{0.1}$ | - | 700 to 1070 | - | nm |
| Rise time | $V_R$ = 5 V, $R_L$ = 50 Ω, λ = 820 nm | $t_r$ | - | 30 | - | ns |
| Fall time | $V_R$ = 5 V, $R_L$ = 50 Ω, λ = 820 nm | $t_f$ | - | 30 | - | ns |

## BASIC CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified)

*Basic characteristics graphs to be extended to 110 °C ambient temperatures where applicable.*

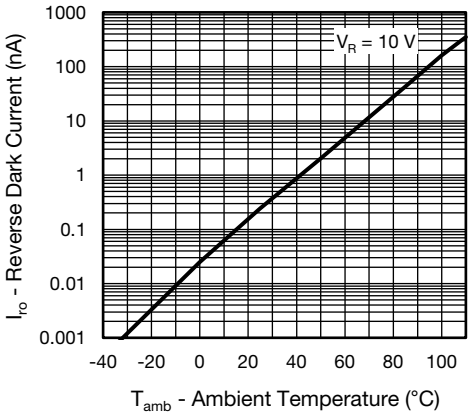


Fig. 1 - Reverse Dark Current vs. Ambient Temperature

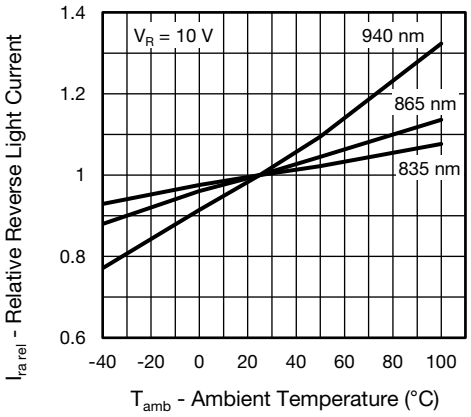


Fig. 2 - Relative Reverse Light Current vs. Ambient Temperature


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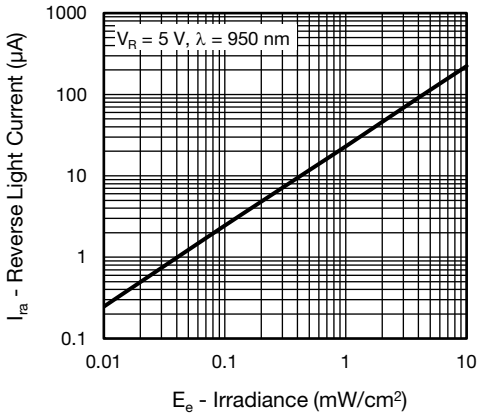


Fig. 3 - Reverse Light Current vs. Irradiance

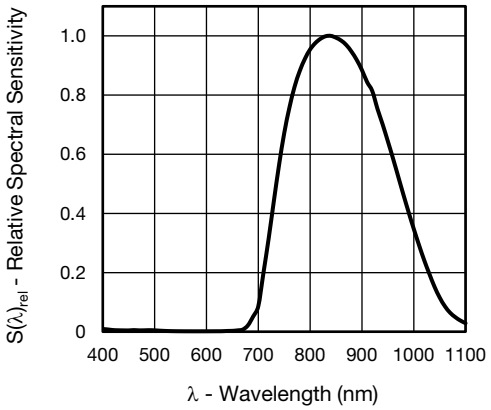


Fig. 6 - Relative Spectral Sensitivity vs. Wavelength

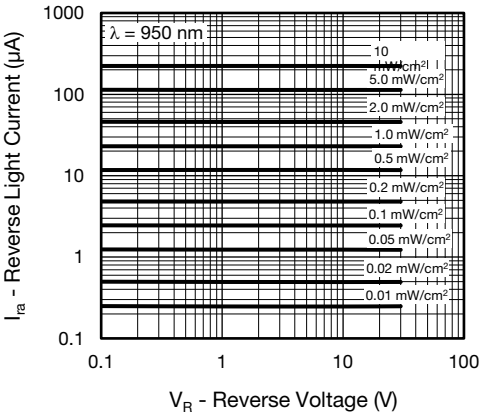


Fig. 4 - Reverse Light Current vs. Reverse Voltage

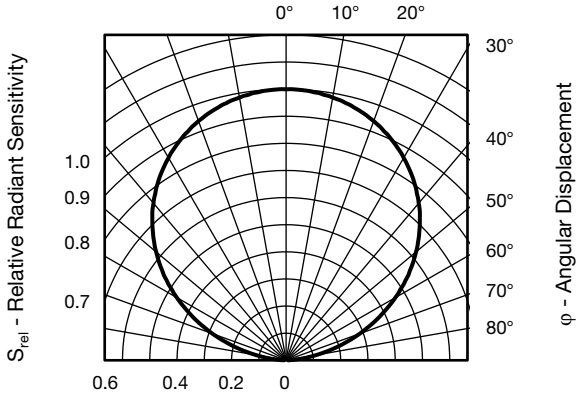


Fig. 7 - Relative Radiant Sensitivity vs. Angular Displacement

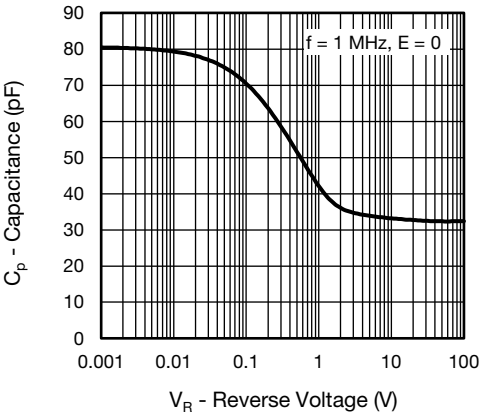


Fig. 5 - Diode Capacitance vs. Reverse Voltage


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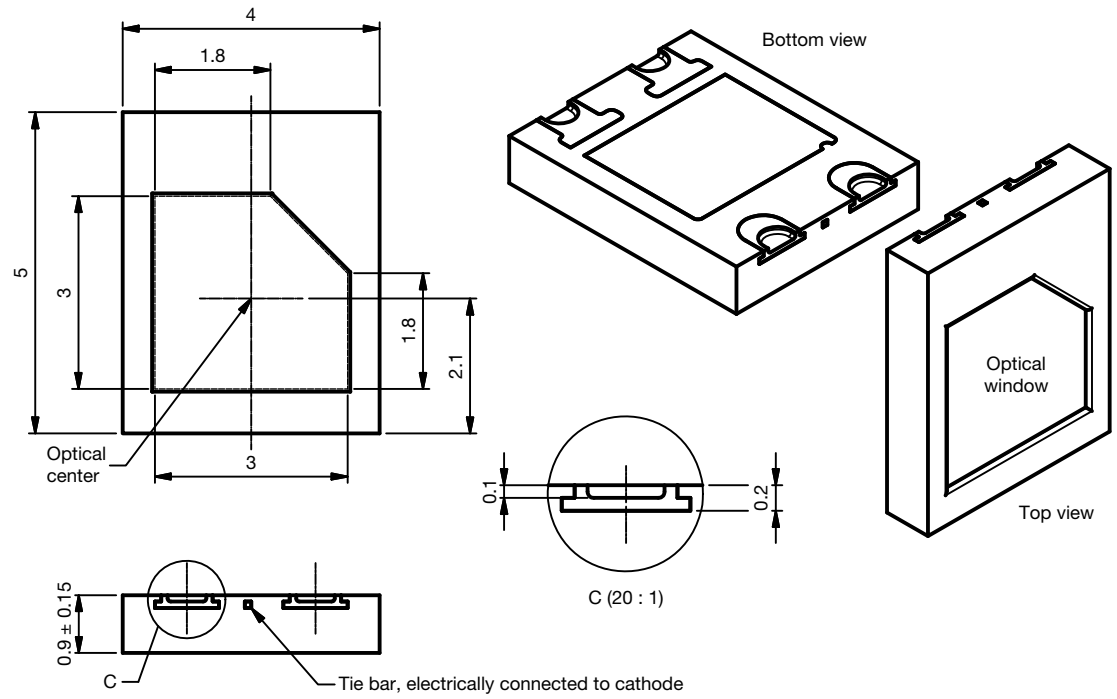
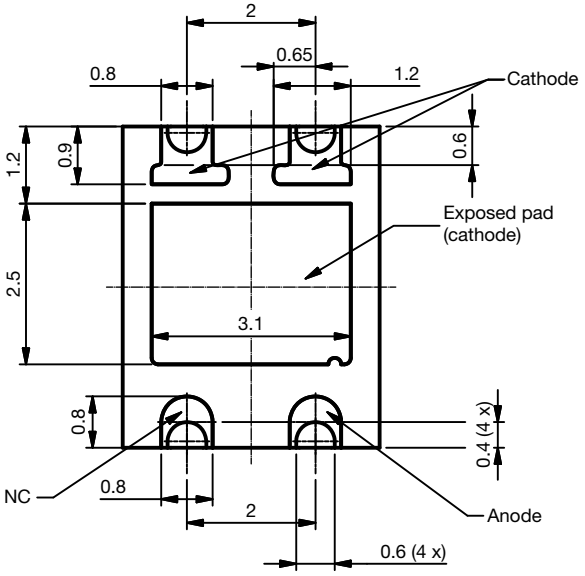
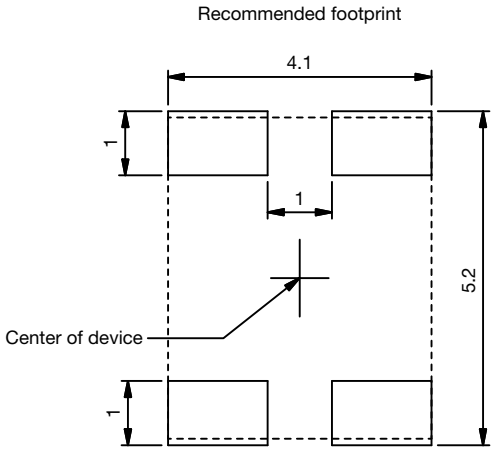
**PACKAGE DIMENSIONS** in millimeters




Drawing- No.: 6.550-5329.01-4
Issue: 2; 03.03.2016

Not indicated tolerances ± 0.1

Technical drawings according to DIN specification



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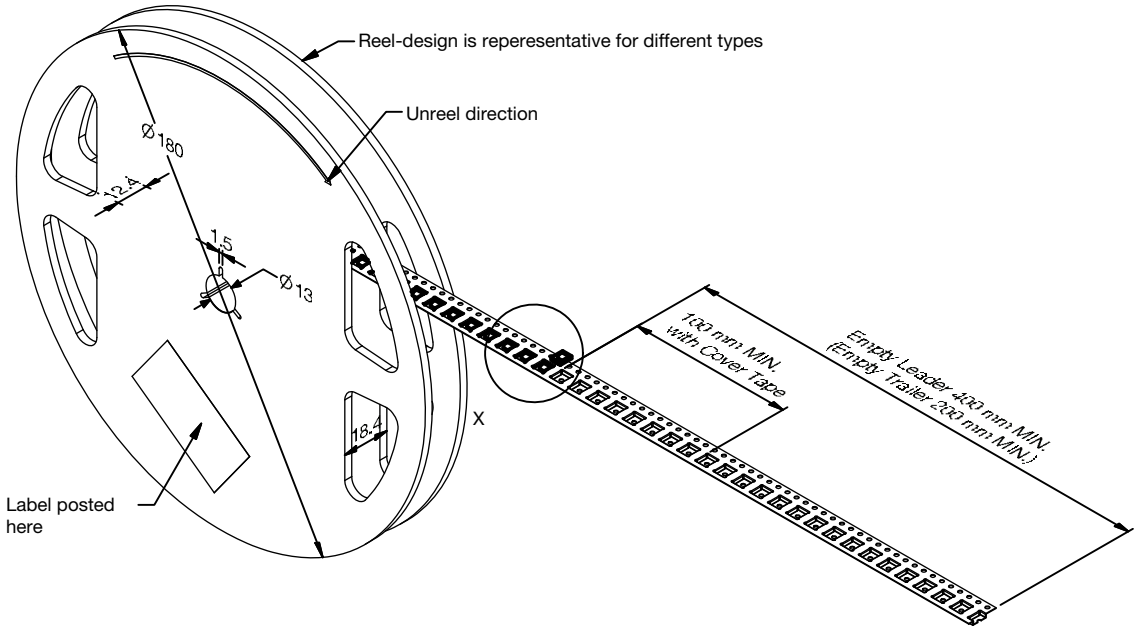
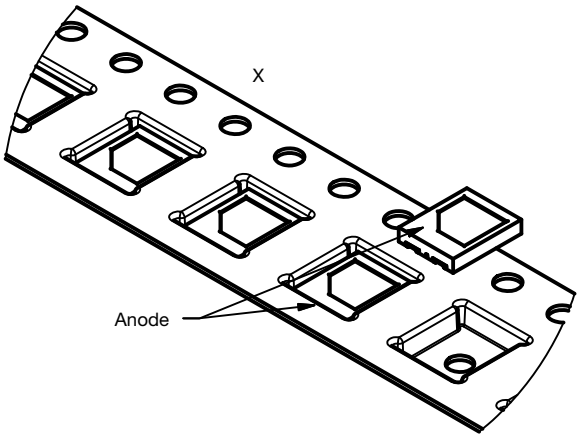
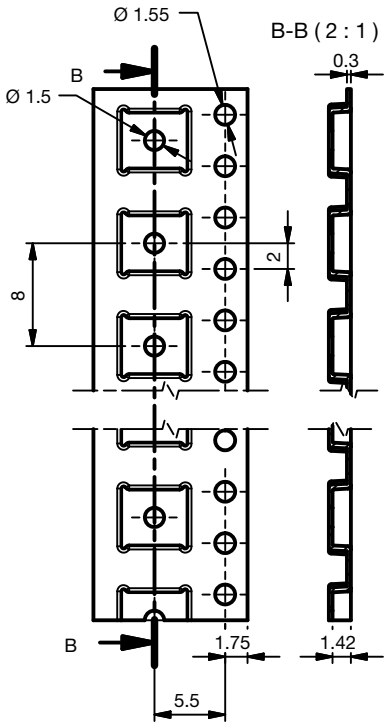
**TAPE AND REEL DIMENSIONS** in millimeters




Drawing-No.: 9.800-5129.01-4;
Issue: 1; 20.07.2015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## SOLDER PROFILE

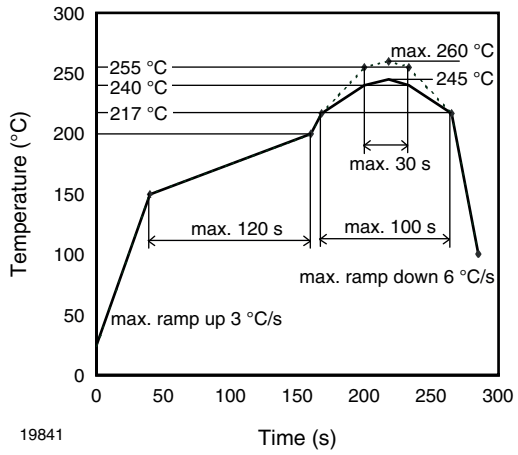


Fig. 8 - Lead (Pb)-free Reflow Solder Profile
According to J-STD-020D

## 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 °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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