

## 4-Quadrant Silicon PIN Photodiode



### DESCRIPTION

K857PE is a 4-quadrant photo detector in surface-mount package. Each quadrant PD has an active area of 1.6 mm<sup>2</sup>.

### LINKS TO ADDITIONAL RESOURCES



### FEATURES

- Package type: surface-mount
- Technology: epitaxial
- Package form: top view
- Dimensions (L x W x H in mm): 4.72 x 4.72 x 0.75
- AEC-Q101 qualified
- High photo sensitivity
- Floor life: 168 h, MSL 3, according to J-STD-020
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### PRODUCT SUMMARY

| COMPONENT | $I_{ra}$ (μA)<br>( $E_e = 1.0 \text{ mW/cm}^2$ , $\lambda = 850 \text{ nm}$ , $V_R = 5 \text{ V}$ ) | $\phi$ (°) | $\lambda_{0.1}$ (nm) |
|-----------|-----------------------------------------------------------------------------------------------------|------------|----------------------|
| K857PE    | 8.5                                                                                                 | ± 60       | 690 to 1050          |

#### Note

- Test conditions see table “Basic Characteristics”

### ORDERING INFORMATION

| ORDERING CODE | PACKAGING     | REMARKS                      | PACKAGE FORM |
|---------------|---------------|------------------------------|--------------|
| K857PE        | Tape and reel | MOQ: 1000 pcs, 1000 pcs/reel | Top view     |
| K857PE-GS15   | Tape and reel | MOQ: 5000 pcs, 5000 pcs/reel | Top view     |

#### Note

- MOQ: minimum order quantity

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

| PARAMETER                   | TEST CONDITION                            | SYMBOL      | VALUE       | UNIT |
|-----------------------------|-------------------------------------------|-------------|-------------|------|
| Reverse voltage             |                                           | $V_R$       | 20          | V    |
| 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   |
| ESD safety HBM              | ± 2000 V, 1.5 kΩ, 100 pF, 3 pulses        | $ESD_{HBM}$ | 2.0         | kV   |

| <b>BASIC CHARACTERISTICS, SINGLE QUADRANT</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                            |                 |      |             |      |               |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------|------|-------------|------|---------------|
| PARAMETER                                                                                                            | TEST CONDITION                                                             | SYMBOL          | MIN. | TYP.        | MAX. | UNIT          |
| Forward voltage                                                                                                      | $I_F = 50\text{ mA}$                                                       | $V_F$           | -    | 0.9         | 1.3  | V             |
| Reverse dark current                                                                                                 | $V_R = 10\text{ V}$ , $E = 0$                                              | $I_{ro}$        | -    | 1           | 10   | nA            |
| Diode capacitance                                                                                                    | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0$                          | $C_D$           | -    | 11          | -    | pF            |
|                                                                                                                      | $V_R = 3\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0$                          | $C_D$           | -    | 7           | -    | pF            |
| Short circuit current                                                                                                | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 850\text{ nm}$                       | $I_k$           | -    | 8.5         | -    | $\mu\text{A}$ |
| Temperature coefficient of $I_{ra}$                                                                                  | $E_e = 1\text{ mW/cm}^2$ , $V_R = 5\text{ V}$                              | $TK_{Ira}$      | -    | 0.15        | -    | %/K           |
| Reverse light current                                                                                                | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 850\text{ nm}$ , $V_R = 5\text{ V}$  | $I_{ra}$        | 7    | 8.5         | 11   | $\mu\text{A}$ |
|                                                                                                                      | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 940\text{ nm}$ , $V_R = 5\text{ V}$  | $I_{ra}$        | -    | 5.7         | -    | $\mu\text{A}$ |
| Angle of half sensitivity                                                                                            |                                                                            | $\phi$          | -    | $\pm 60$    | -    | $^{\circ}$    |
| Wavelength of peak sensitivity                                                                                       |                                                                            | $\lambda_p$     | -    | 840         | -    | nm            |
| Range of spectral bandwidth                                                                                          |                                                                            | $\lambda_{0.1}$ | -    | 690 to 1050 | -    | nm            |
| Rise time                                                                                                            | $V_R = 10\text{ V}$ , $R_L = 50\text{ }\Omega$ , $\lambda = 830\text{ nm}$ | $t_r$           | -    | 30          | -    | ns            |
| Fall time                                                                                                            | $V_R = 10\text{ V}$ , $R_L = 50\text{ }\Omega$ , $\lambda = 830\text{ nm}$ | $t_f$           | -    | 30          | -    | ns            |

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

Values per quadrant  $q$  ( $q = 1, 2, 3, 4$ )

| <b>CROSS-TALK SPECIFICATION</b>                                                                                                                                                                |                    |            |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------|------|
| Laser illumination (850 nm, 65 $\mu\text{m}$ spot diameter, radiant power 0.7 mW) of center of PD quadrant 1 ( $q = 1$ ), $V_{R,q} = 5\text{ V}$ applied to all quadrants ( $q = 1, 2, 3, 4$ ) |                    |            |      |
| ILLUMINATED                                                                                                                                                                                    | MEASURED PARAMETER | TYP. VALUE | UNIT |
| Yes                                                                                                                                                                                            | $I_{ra\_850\_1}$   | 100        | %    |
| No                                                                                                                                                                                             | $I_{ra\_850\_2}$   | 0.1        | %    |
| No                                                                                                                                                                                             | $I_{ra\_850\_3}$   | 0.1        | %    |
| No                                                                                                                                                                                             | $I_{ra\_850\_4}$   | 0.05       | %    |

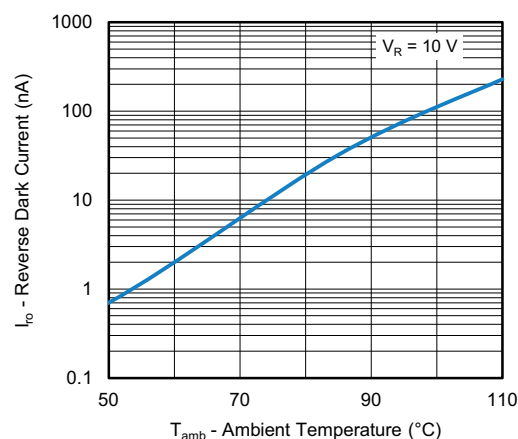
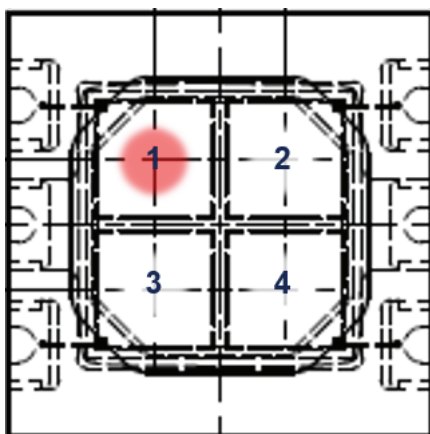


Fig. 1 - Reverse Dark Current vs. Ambient Temperature

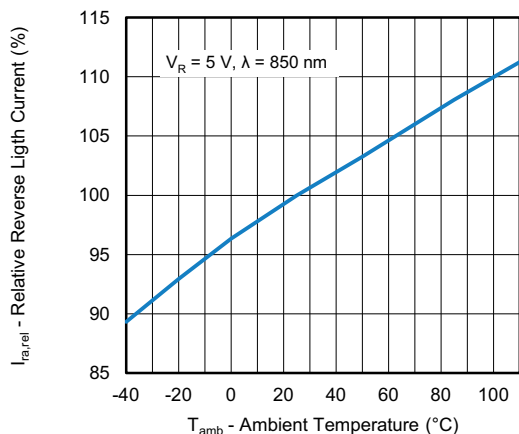


Fig. 2 - Relative Reverse Light Current vs. Ambient Temperature

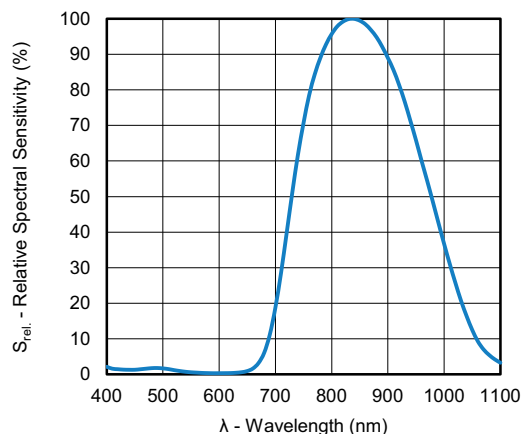


Fig. 5 - Relative Spectral Sensitivity vs. Wavelength

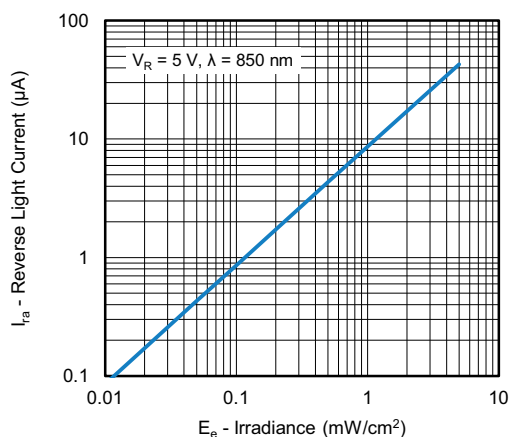


Fig. 3 - Reverse Light Current vs. Irradiance

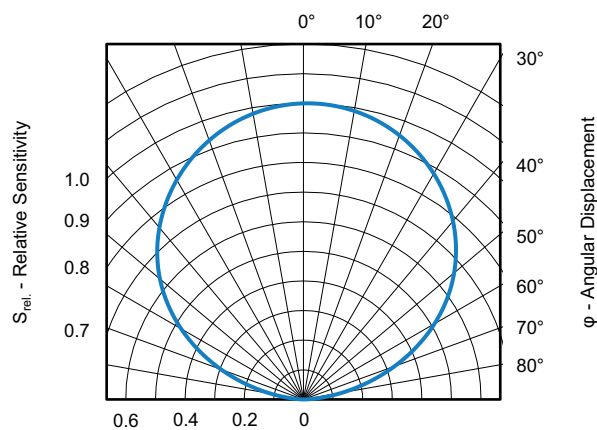


Fig. 6 - Relative Sensitivity vs. Angular Displacement

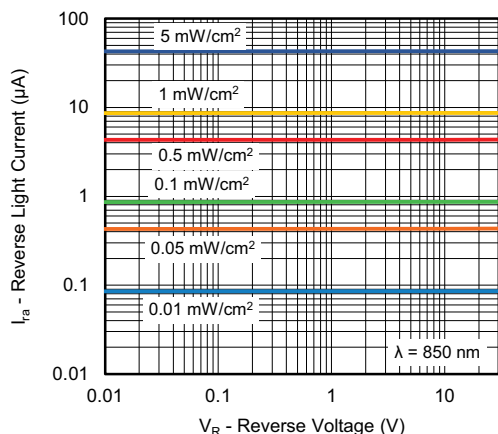
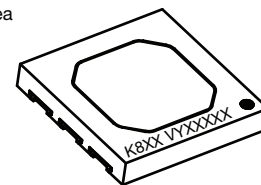
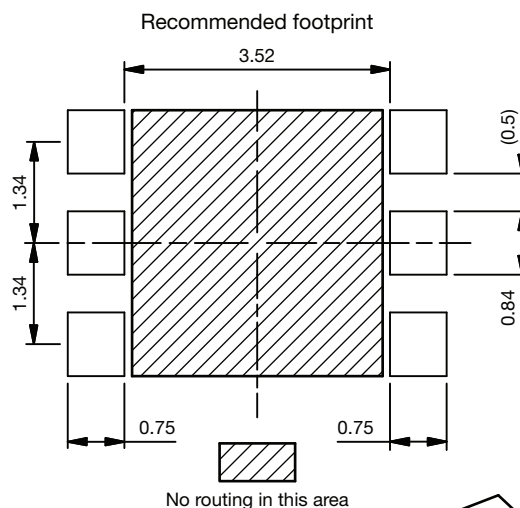
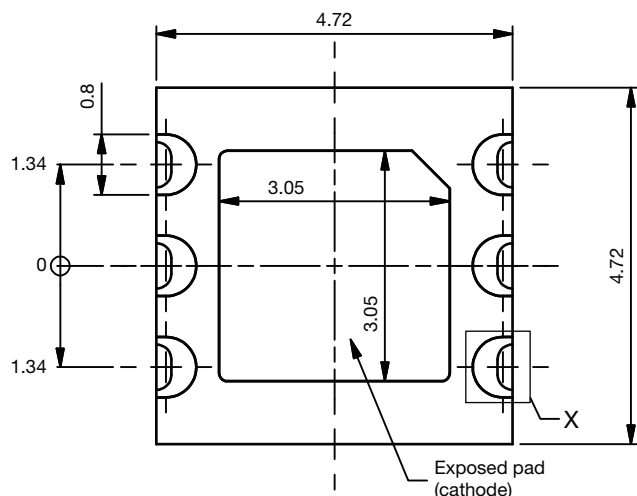
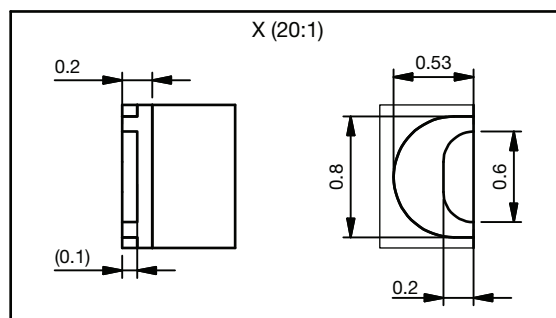
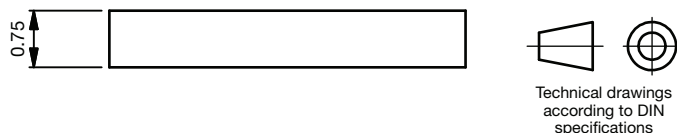
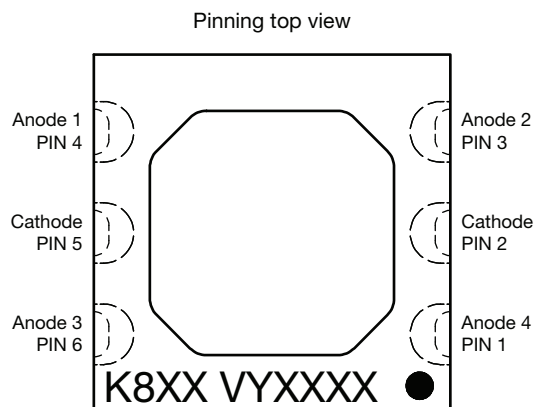
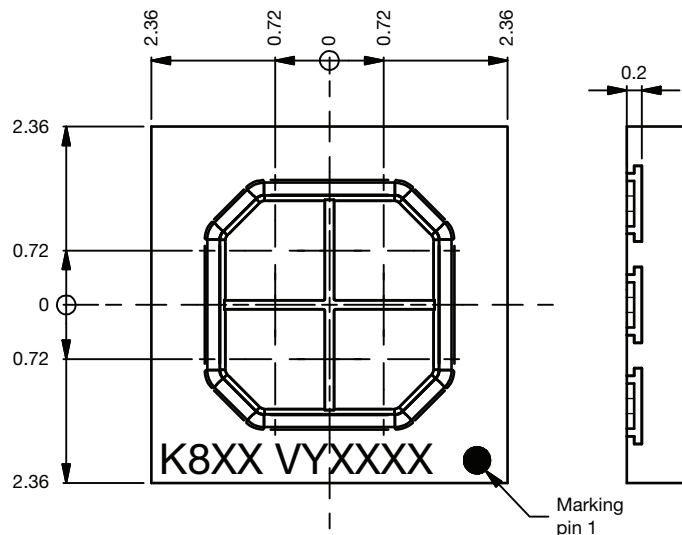


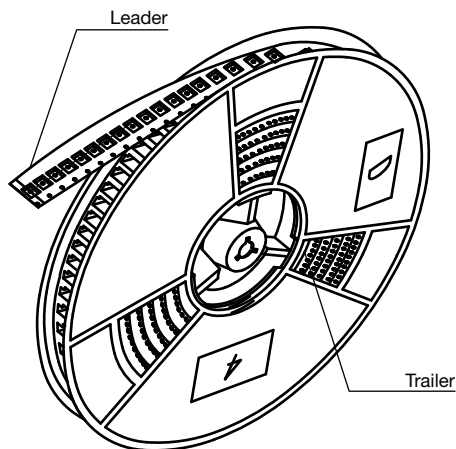
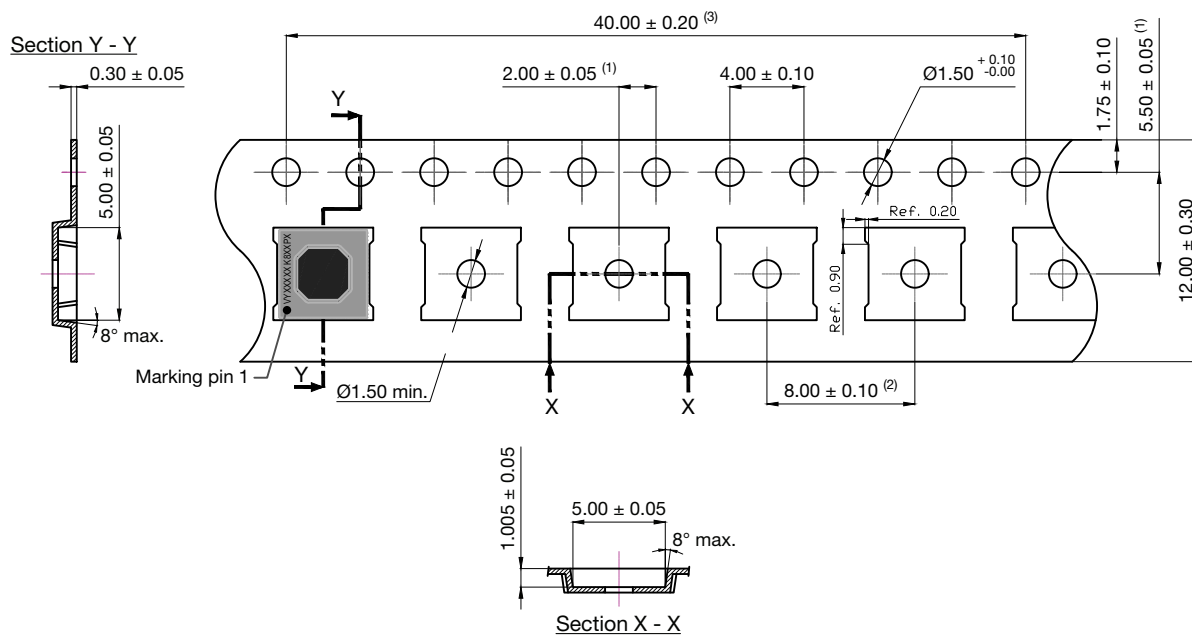
Fig. 4 - Reverse Light Current vs. Reverse Voltage

**PACKAGE DIMENSIONS** in millimeters

Not indicated tolerances  $\pm 0.1$  mm

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Active area photodiodes:

|                |                     |
|----------------|---------------------|
| Single PD:     | 1.6 mm <sup>2</sup> |
| All PDs:       | 6.4 mm <sup>2</sup> |
| Total opening: | 7.1 mm <sup>2</sup> |

**TAPE AND REEL DIMENSIONS** in millimeters

**Notes**

- Allowable camber to be 1 mm per 250 mm in length for single winding and 2 mm per 250 mm in length for cross winding
- (1) Measure from centerline of sprocket hole to centerline of pocket
- (2) Measure from centerline of pocket to centerline of pocket
- (3) Pitch tolerance for sprocket hole, 10 pitch cumulative tolerance is ± 0.2 mm

## SOLDER PROFILE

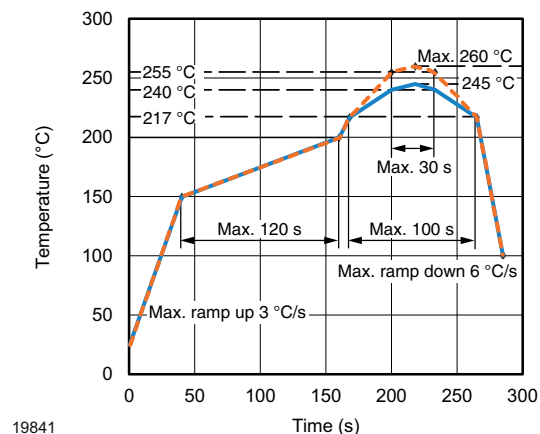


Fig. 7 - Lead (Pb)-free Reflow Solder Profile  
According to J-STD-020D

## 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 3

Floor life: 168 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-033D or recommended conditions:

192 h at  $40\text{ °C} (+ 5\text{ °C})$ ,  $RH < 5\%$

or

96 h at  $60\text{ °C} (+ 5\text{ °C})$ ,  $RH < 5\%$



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