

## 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 0.8
- 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)

 AUTOMOTIVE  
GRADE

**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

PRODUCT SUMMARY			
COMPONENT	$I_{ra}$ ( $\mu A$ ) ( $E_e = 1.0 \text{ mW/cm}^2$ , $\lambda = 850 \text{ nm}$ , $V_R = 5 \text{ V}$ )	$\phi$ ( $^\circ$ )	$\lambda_{0.1}$ (nm)
K857PE	8.5	$\pm 60$	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 ( $T_{amb} = 25 \text{ }^\circ C$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage		$V_R$	20	V
Operating temperature range		$T_{amb}$	-40 to +110	$^\circ C$
Storage temperature range		$T_{stg}$	-40 to +110	$^\circ C$
Soldering temperature	According to reflow solder profile Fig. 8	$T_{sd}$	260	$^\circ C$
ESD safety HBM	$\pm 2000 \text{ V}$ , 1.5 k $\Omega$ , 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	$V_R = 10\text{ V}, R_L = 50\ \Omega, \lambda = 830\text{ nm}$	$t_r$	-	30	-	ns
Fall time	$V_R = 10\text{ V}, R_L = 50\ \Omega, \lambda = 830\text{ nm}$	$t_f$	-	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	%

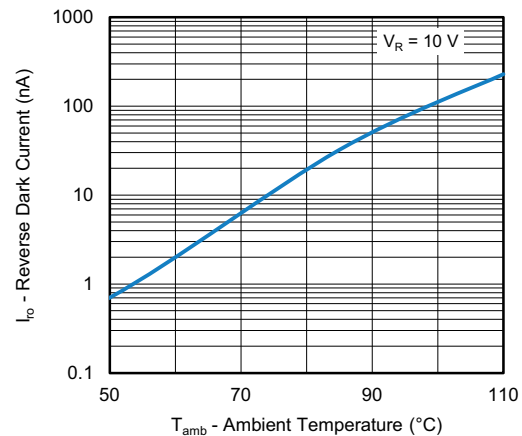
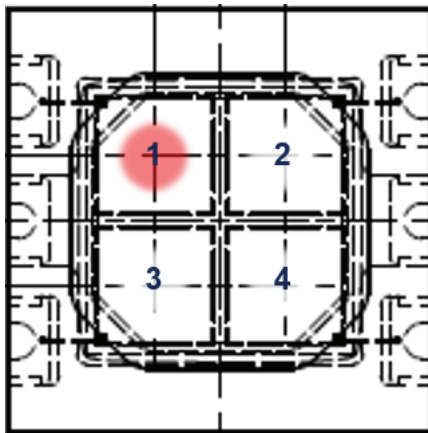


Fig. 1 - Reverse Dark Current vs. Ambient Temperature

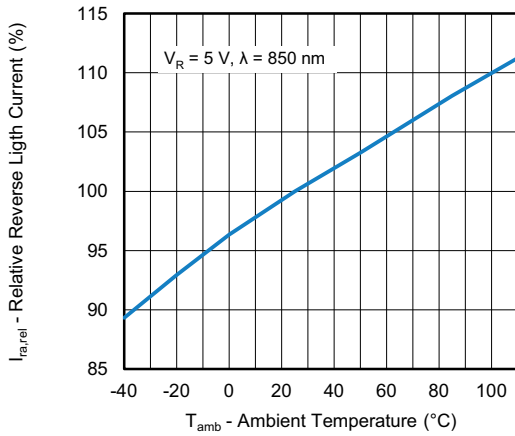


Fig. 2 - Relative Reverse Light Current vs. Ambient Temperature

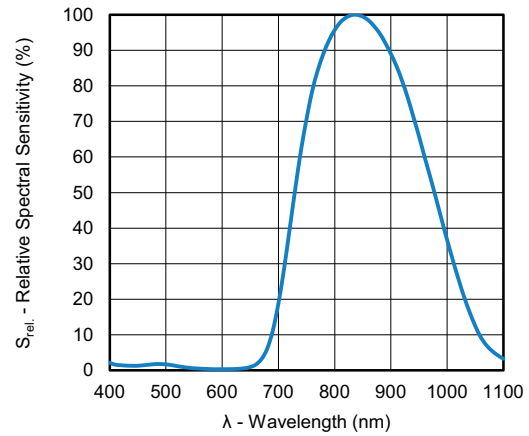


Fig. 5 - Relative Spectral Sensitivity vs. Wavelength

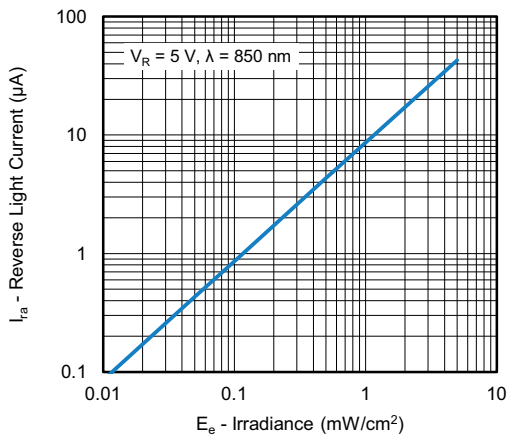


Fig. 3 - Reverse Light Current vs. Irradiance

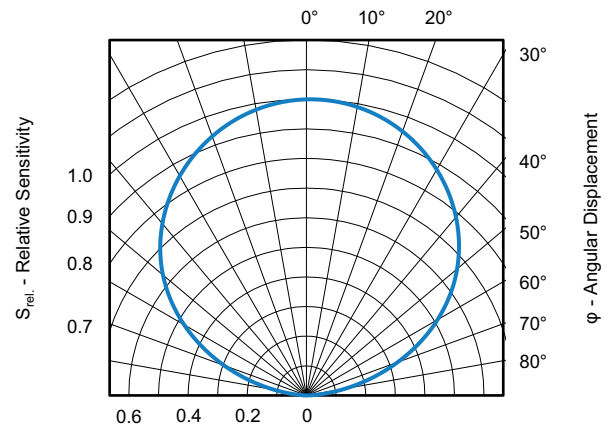


Fig. 6 - Relative Sensitivity vs. Angular Displacement

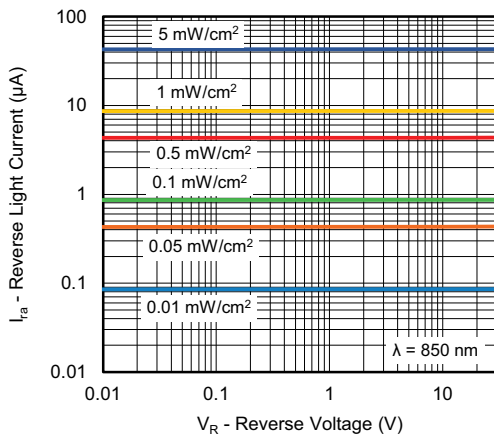
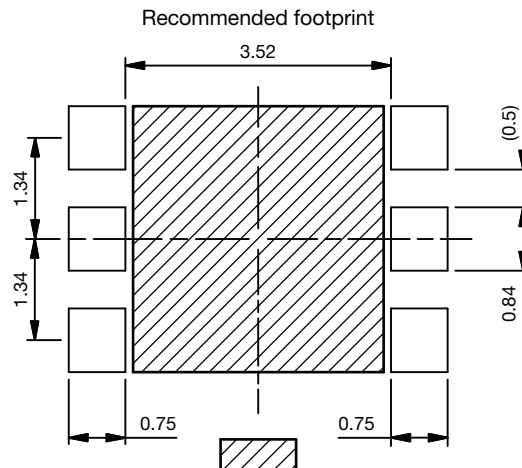
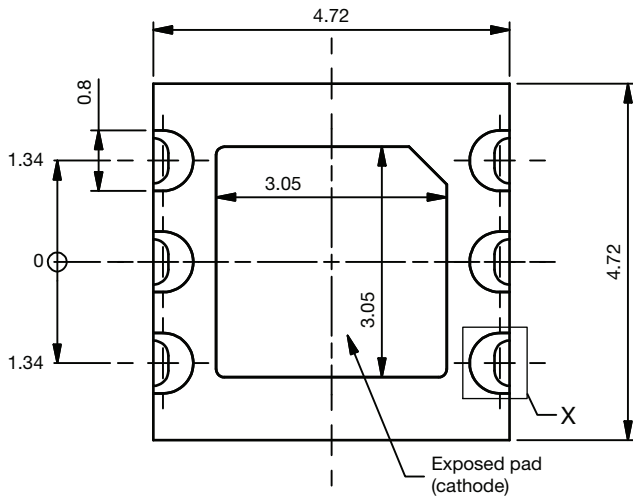
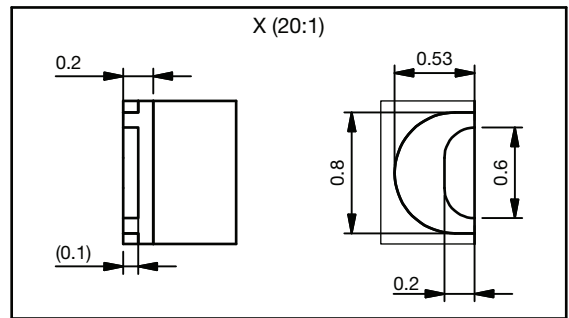
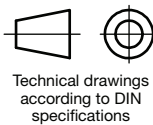
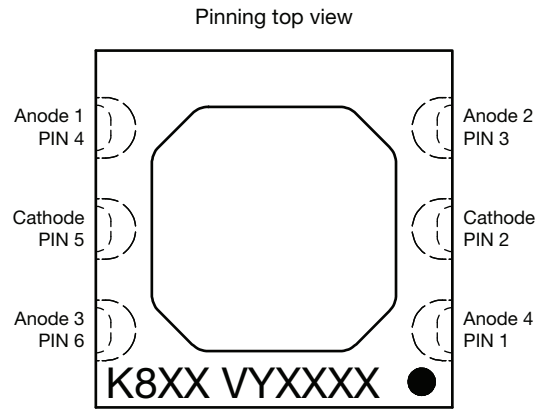
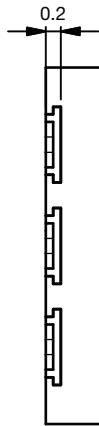
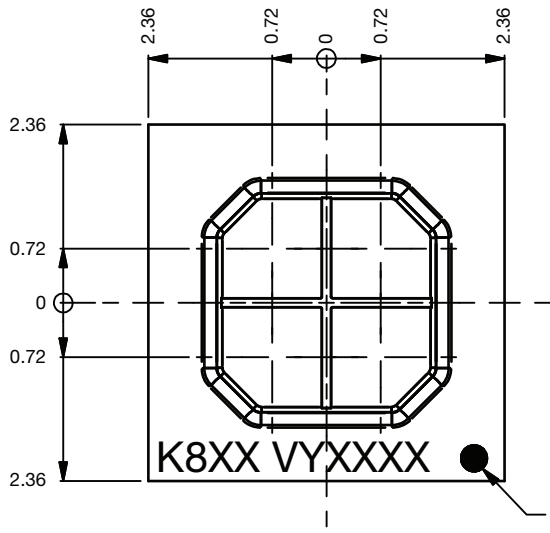


Fig. 4 - Reverse Light Current vs. Reverse Voltage

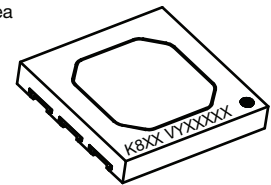
**PACKAGE DIMENSIONS** in millimeters

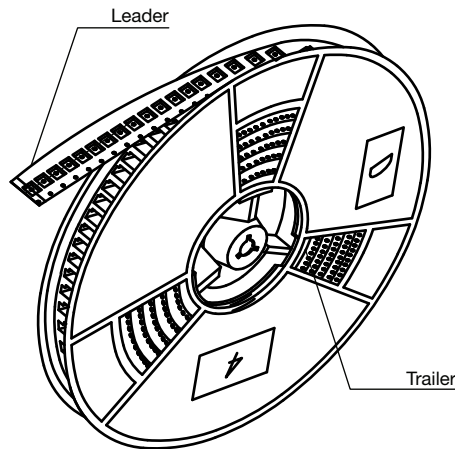
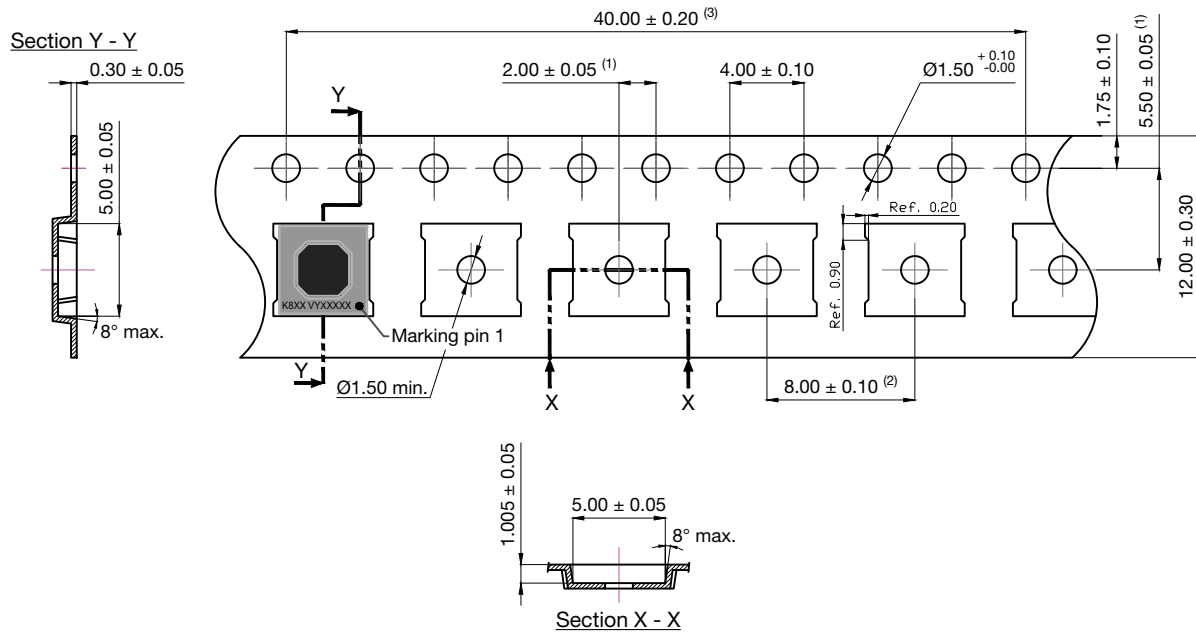


Not indicated tolerances  $\pm 0.1$  mm

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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  $\pm 0.2$  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 °C (+ 5 °C),  $RH < 5\%$

or

96 h at 60 °C (+ 5 °C),  $RH < 5\%$



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