

## Segmented Photodiodes (SPOT Series)

### Position Sensing Detector (PSD)

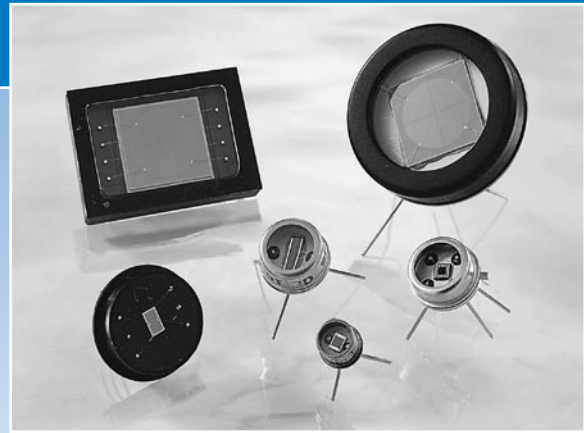
The SPOT Series are common substrate photodetectors segmented into either two (2) or four (4) separate active areas. They are available with either a 0.005" or 0.0004" well defined gap between the adjacent elements resulting in high response uniformity between the elements. The SPOT series are ideal for very accurate nulling or centering applications. Position information can be obtained when the light spot diameter is larger than the spacing between the cells.

Spectral response range is from 350-1100nm. Notch or bandpass filters can be added to achieve specific spectral responses.

These detectors exhibit excellent stability over time and temperature, fast response times necessary for high speed or pulse operation, and position resolutions of better than 0.1  $\mu\text{m}$ .

Maximum recommended power density is 10 mW /  $\text{cm}^2$  and typical uniformity of response for a 1 mm diameter spot is  $\pm 2\%$ .

The circuit on the opposite page represents a typical biasing and detection circuit set up for both bi-cells and quad-cells. For position calculations and further details, refer to "Photodiode Characteristics" section of the catalog.



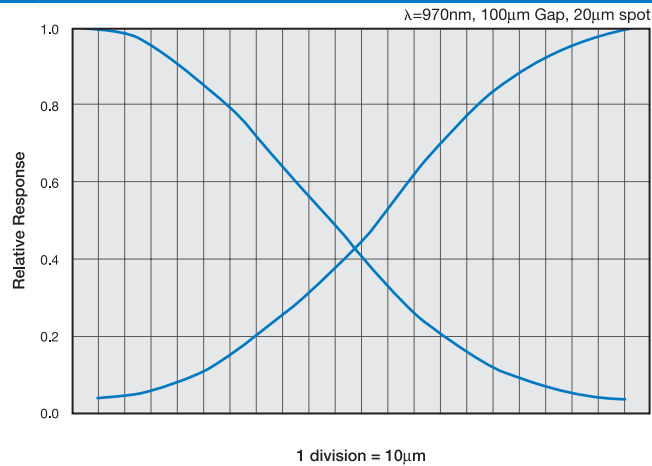
### APPLICATIONS

- Machine Tool Alignment
- Position Measuring
- Beam Centering
- Surface Profiling
- Targeting
- Guidance Systems

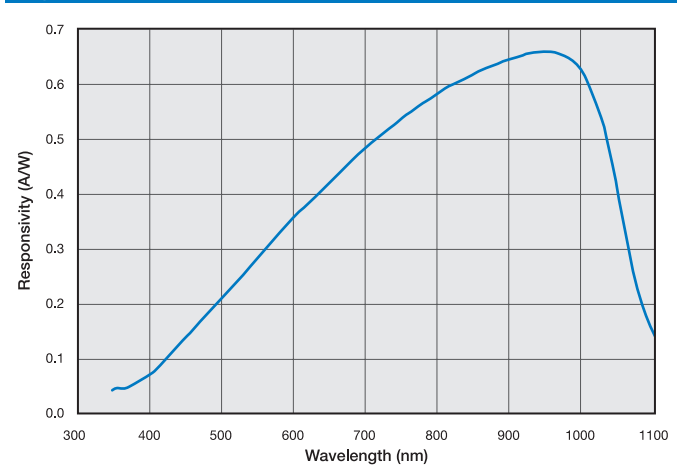
### FEATURES

- High Accuracy
- Excellent Resolution
- High-Speed Response
- Ultra Low Dark Current
- Excellent Response Match
- High Stability over Time and Temperature

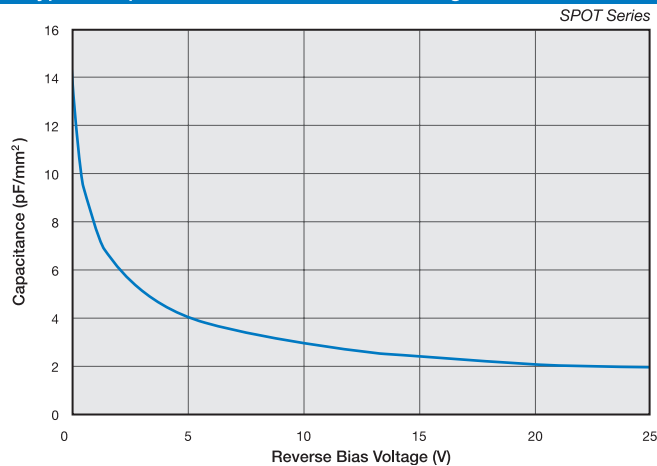
### Typical Cross-Over Characteristics



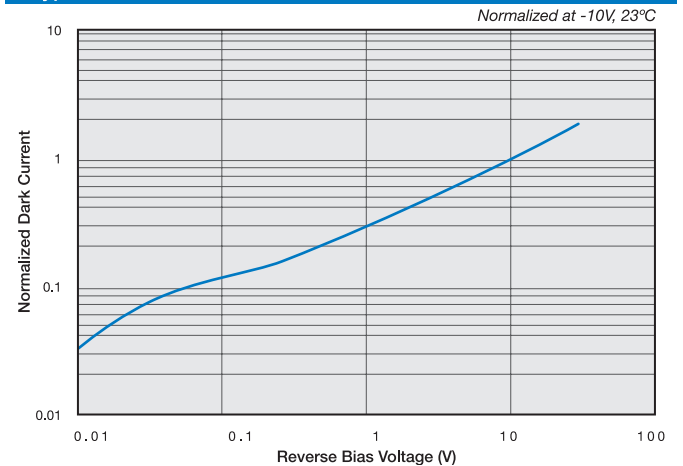
### Typical Spectral Response



### Typical Capacitance vs. Reverse Bias Voltage



### Typical Dark Current vs. Reverse Bias



# Segmented Photodiodes (SPOT Series)

Typical Electro-Optical Specifications at  $T_A=23^{\circ}\text{C}$

Model Number	Active Area Per Element		Element Gap (mm)	Responsivity (A/W)		Capacitance (pF)	Dark Current (nA)		NEP (W/√Hz)	Reverse Voltage (V)	Rise Time (ns)	Temp Range (°C)		Package Style †
	Area (mm <sup>2</sup> )	Dimensions (mm)		970 nm		-10 V	-10 V		-10 V 970 nm		-10 V 780 nm 50 Ω	Operating	Storage	
				min.	typ.	typ.	typ.	max.	typ.		max.			

## Two-Element Series, Metal Package

Model Number	Area (mm <sup>2</sup> )	Dimensions (mm)	Element Gap (mm)	Responsivity (A/W) min.	Responsivity (A/W) typ.	Capacitance (pF) 50@ -15V	Capacitance (pF) 20@ -15V	Dark Current (nA) min.	Dark Current (nA) max.	NEP (W/√Hz) typ.	Reverse Voltage (V) max.	Rise Time (ns) 300@ -15V	Temp Range (°C) Operating	Temp Range (°C) Storage	Package Style †	
CD-25T	2.3	4.6 x 0.5	0.2	0.60	0.65	50	20	1.1 e-14	30	6.2 e-15	30	300	-40 ~ +100	-55 ~ +125	2 / TO-5	
SPOT-2D	3.3	1.3 x 2.5	0.127			11	0.15					2.0			5	41 / TO-5
SPOT-2DMI	0.7	0.6 x 1.2	0.013			3	0.05					1.0			7	40 / TO-18
SPOT-3D	2.8	0.6 x 4.6	0.025			7	0.13					2.0			9.9 e-15	4

## Four Element Series, Metal Package

Model Number	Area (mm <sup>2</sup> )	Dimensions (mm)	Element Gap (mm)	Responsivity (A/W) min.	Responsivity (A/W) typ.	Capacitance (pF) 5	Capacitance (pF) 1	Capacitance (pF) 60	Dark Current (nA) min.	Dark Current (nA) max.	NEP (W/√Hz) typ.	Reverse Voltage (V) max.	Rise Time (ns) 3	Temp Range (°C) Operating	Temp Range (°C) Storage	Package Style †
SPOT-4D	1.61	1.3 sq	0.127	0.60	0.65	5	0.10	1.0	30	3	8.7 e-15	30	-40 ~ +100	-55 ~ +125	41 / TO-5	
SPOT-4DMI	0.25	0.5 sq	0.013			1	0.01	0.5								2.8 e-15
SPOT-9D	19.6	10 φ ‡	0.102			60	0.50	10.0								1.9 e-14
SPOT-9DMI	19.6		0.010													

Model Number	Active Area Per Element		Element Gap (mm)	Responsivity 257 nm		Capacitance 0 V	Shunt Resistance (MΩ)		NEP	Reverse Voltage (V)	Rise Time 0 V, 257 nm	Package Style †
	Area (mm <sup>2</sup> )	Dimensions (mm)		A/W		pF	MΩ		(W/√Hz)		μs	
				min.	typ.	typ.	min.	max.	typ.		max.	

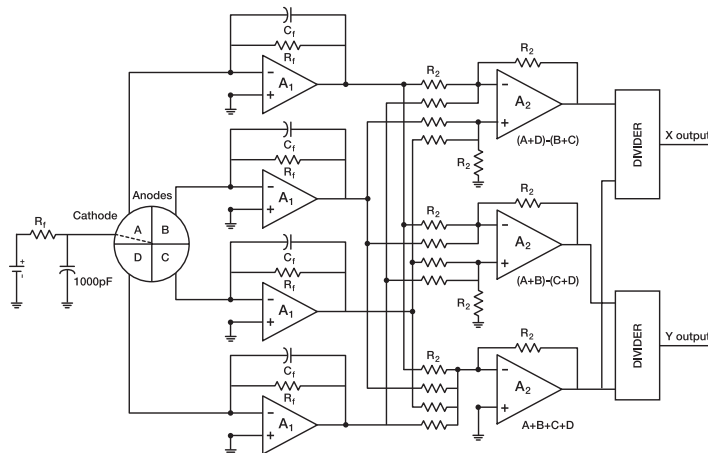
## UV-Enhanced Four Elements, Metal Package §

Model Number	Area (mm <sup>2</sup> )	Dimensions (mm)	Element Gap (mm)	Responsivity (A/W) min.	Responsivity (A/W) typ.	Capacitance (pF) 40	Shunt Resistance (MΩ) min.	Shunt Resistance (MΩ) max.	NEP (W/√Hz) typ.	Reverse Voltage (V) max.	Rise Time (ns) 10	Temp Range (°C) Operating	Temp Range (°C) Storage	Package Style †
SPOT-4DUV	1.61	1.3 sq	0.127	0.08	0.10	40	100	500	1.3 e-13	5	10	-10 ~ +60	-20 ~ +70	41 / TO-5

‡ Overall Diameter (All four Quads)

† For mechanical drawings please refer to pages 58 thru 69.

Chip centering within ±0.010".



## 1. Parameter Definitions:

A = Distance from top of chip to top of glass.

a = Photodiode Anode.

B = Distance from top of glass to bottom of case.

c = Photodiode Cathode

(Note: cathode is common to case in metal package products unless otherwise noted).

W = Window Diameter.

F.O.V. = Field of View (see definition below).

## 2. Dimensions are in inches (1 inch = 25.4 mm).

## 3. Pin diameters are 0.018 ± 0.002" unless otherwise specified.

## 4. Tolerances (unless otherwise noted)

General: 0.XX ±0.01"

0.XXX ±0.005"

Chip Centering: ±0.010"

Dimension 'A': ±0.015"

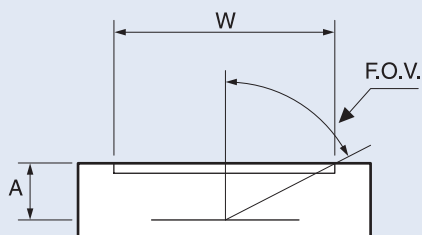
## 5. Windows

All '**UV**' Enhanced products are provided with QUARTZ glass windows, 0.027 ± 0.002" thick.

All '**XUV**' products are provided with removable windows.

All '**DLS**' PSD products are provided with A/R coated glass windows.

All '**FIL**' photoconductive and photovoltaic products are epoxy filled instead of glass windows.



$$F.O.V. = \tan^{-1} \left( \frac{W}{2A} \right)$$



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- Or -  
On the Internet at

**www.osioptoelectronics.com**

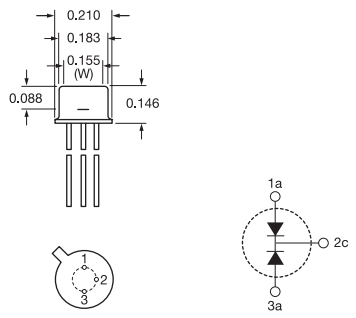
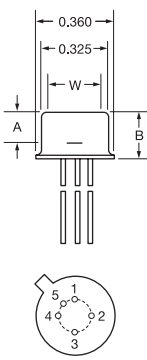
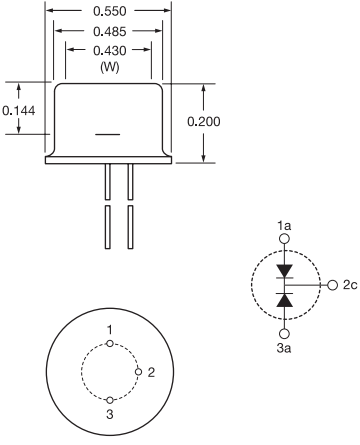
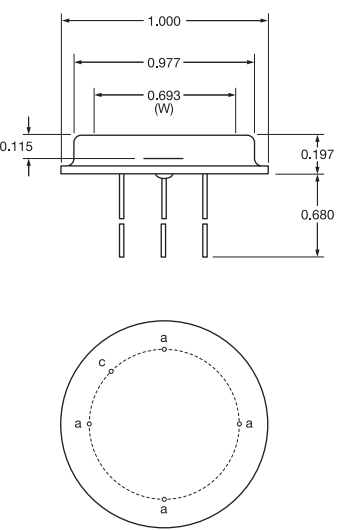
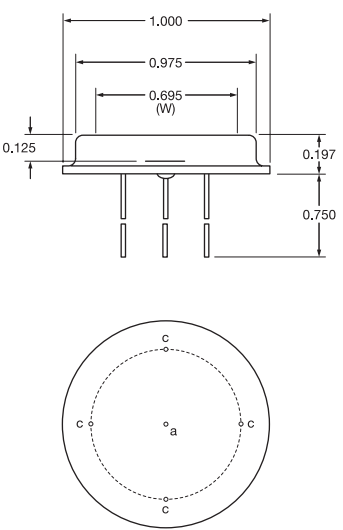
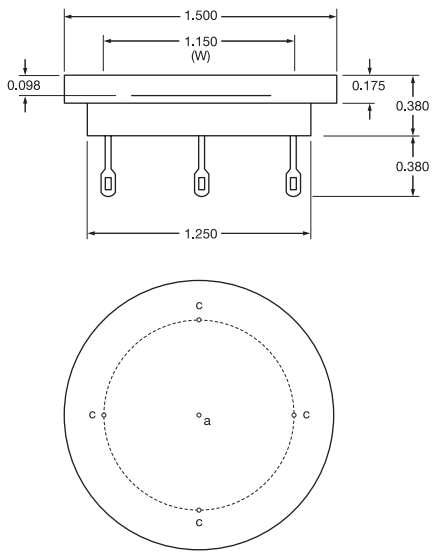
# Mechanical Specifications

All units in inches. Pinouts are bottom view.

1 TO-18	2 TO-5	3 TO-8																																		
<p><b>Products:</b></p> <p>PIN-020A PIN-040A PIN-040-DP/SB</p> <p>Pin Circle Dia.=0.100</p> <table border="1"> <thead> <tr> <th>P/N</th> <th>A</th> <th>B</th> <th>W</th> </tr> </thead> <tbody> <tr> <td>PIN-020A</td> <td>0.075</td> <td>0.200</td> <td>0.155</td> </tr> <tr> <td>PIN-040A</td> <td>0.075</td> <td>0.200</td> <td>0.155</td> </tr> </tbody> </table>	P/N	A	B	W	PIN-020A	0.075	0.200	0.155	PIN-040A	0.075	0.200	0.155	<p><b>Products:</b></p> <p>PIN-5DI PIN-5DPI PIN-13DI PIN-13DPI PIN-5-YAG CD-25T</p> <p>Pin Circle Dia.=0.200</p> <table border="1"> <thead> <tr> <th>P/N</th> <th>A</th> <th>B</th> <th>W</th> </tr> </thead> <tbody> <tr> <td>All Others</td> <td>0.094</td> <td>0.180</td> <td>0.240</td> </tr> <tr> <td>CD-25T</td> <td>0.050</td> <td>0.130</td> <td>0.23</td> </tr> </tbody> </table>	P/N	A	B	W	All Others	0.094	0.180	0.240	CD-25T	0.050	0.130	0.23	<p><b>Products:</b></p> <p>PIN-6DI PIN-6DPI PIN-44DI PIN-44DPI OSD35-0 OSD35-7Q</p> <p>Pin Circle Dia.=0.295</p> <table border="1"> <thead> <tr> <th>P/N</th> <th>A</th> </tr> </thead> <tbody> <tr> <td>PIN-6DI/6DPI</td> <td>0.115</td> </tr> <tr> <td>PIN-44DI/44DPI</td> <td>0.125</td> </tr> <tr> <td>OSD35-0</td> <td>0.130</td> </tr> <tr> <td>OSD35-7Q</td> <td>0.130 Quartz Window</td> </tr> </tbody> </table>	P/N	A	PIN-6DI/6DPI	0.115	PIN-44DI/44DPI	0.125	OSD35-0	0.130	OSD35-7Q	0.130 Quartz Window
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<p><b>Products:</b></p> <p>PIN-3CD PIN-3CDP BPX-65 OSD1-0 OSD1-5T OSD3-5T OSD1.2-7Q OSD1.2-7U</p> <p>Pin Circle Dia.=0.100</p> <table border="1"> <thead> <tr> <th>P/N</th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>PIN-3CD / 3CDP</td> <td>0.087</td> <td>0.146</td> </tr> <tr> <td>BPX-65</td> <td>0.075</td> <td>0.200</td> </tr> <tr> <td>OSD-Prefix Devices</td> <td>0.080</td> <td>0.200</td> </tr> </tbody> </table> <p>Quartz Window: OSD1.2-7Q UV Transmissive Window: OSD1.2-7U</p>	P/N	A	B	PIN-3CD / 3CDP	0.087	0.146	BPX-65	0.075	0.200	OSD-Prefix Devices	0.080	0.200	<p><b>Products:</b></p> <p>PIN-125DPL</p> <p>Pin Circle Dia.=0.100</p>	<p><b>Products:</b></p> <p>PIN-HR005 PIN-HR008 PIN-HR020 PIN-HR026 PIN-HR040</p> <p>Pin Circle Dia.=0.100</p>																						
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<p><b>Products:</b> SPOT-2DMI</p>  <p>Pin Circle Dia.=0.100</p>	<p><b>Products:</b> SC-4D SL3-1 SPOT-2D SPOT-3D SPOT-4D SPOT-4DMI SPOT-4DUV QD7-0</p>  <p>Pin Circle Dia.=0.200</p> <table border="1" data-bbox="592 682 1031 913"> <caption>Dimensions</caption> <thead> <tr> <th>P/N</th> <th>A</th> <th>B</th> <th>W</th> </tr> </thead> <tbody> <tr> <td>SC-4D</td> <td>0.071</td> <td>0.142</td> <td>0.240</td> </tr> <tr> <td>SL3-1</td> <td>0.106</td> <td>0.195</td> <td>0.217</td> </tr> <tr> <td>SPOT-2D</td> <td>0.063</td> <td>0.114</td> <td>0.240</td> </tr> <tr> <td>SPOT-3D</td> <td>0.104</td> <td>0.138</td> <td>0.240</td> </tr> <tr> <td>SPOT-4D</td> <td>0.063</td> <td>0.142</td> <td>0.240</td> </tr> <tr> <td>SPOT-4DMI</td> <td>0.063</td> <td>0.142</td> <td>0.240</td> </tr> <tr> <td>SPOT-4DUV</td> <td>0.063</td> <td>0.142</td> <td>0.240</td> </tr> <tr> <td>QD7-0</td> <td>0.050</td> <td>0.130</td> <td>0.230</td> </tr> </tbody> </table> <table border="1" data-bbox="592 934 1031 1165"> <caption>Pinouts</caption> <thead> <tr> <th>P/N</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> </thead> <tbody> <tr> <td>SC-4D</td> <td>c</td> <td>c</td> <td>c</td> <td>c</td> <td>a</td> </tr> <tr> <td>SL3-1</td> <td>a</td> <td>c</td> <td>a</td> <td>--</td> <td>--</td> </tr> <tr> <td>SPOT-2D</td> <td>a</td> <td>c</td> <td>a</td> <td>--</td> <td>--</td> </tr> <tr> <td>SPOT-3D</td> <td>a</td> <td>c</td> <td>a</td> <td>--</td> <td>--</td> </tr> <tr> <td>SPOT-4D</td> <td>a</td> <td>a</td> <td>a</td> <td>a</td> <td>c</td> </tr> <tr> <td>SPOT-4DMI</td> <td>a</td> <td>a</td> <td>a</td> <td>a</td> <td>c</td> </tr> <tr> <td>SPOT-4DUV</td> <td>a</td> <td>a</td> <td>a</td> <td>a</td> <td>c</td> </tr> <tr> <td>QD7-0</td> <td>a</td> <td>a</td> <td>a</td> <td>a</td> <td>c</td> </tr> </tbody> </table>	P/N	A	B	W	SC-4D	0.071	0.142	0.240	SL3-1	0.106	0.195	0.217	SPOT-2D	0.063	0.114	0.240	SPOT-3D	0.104	0.138	0.240	SPOT-4D	0.063	0.142	0.240	SPOT-4DMI	0.063	0.142	0.240	SPOT-4DUV	0.063	0.142	0.240	QD7-0	0.050	0.130	0.230	P/N	1	2	3	4	5	SC-4D	c	c	c	c	a	SL3-1	a	c	a	--	--	SPOT-2D	a	c	a	--	--	SPOT-3D	a	c	a	--	--	SPOT-4D	a	a	a	a	c	SPOT-4DMI	a	a	a	a	c	SPOT-4DUV	a	a	a	a	c	QD7-0	a	a	a	a	c	<p><b>Products:</b> SL5-1</p>  <p>Pin Circle Dia.=0.300</p>
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<p><b>43 Low Profile</b></p> <p><b>Products:</b> SPOT-9D SPOT-9DMI</p>  <p>Pin Circle Dia.=0.730</p>	<p><b>44 Special</b></p> <p><b>Products:</b> SC-10D</p>  <p>Pin Circle Dia.=0.730</p>	<p><b>45 Special</b></p> <p><b>Products:</b> SC-25D</p>  <p>Pin Circle Dia.=0.950</p>																																																																																										