

## UV Enhanced Series

### Inversion Layers and Planar Diffused Silicon Photodiodes

OSI Optoelectronics offers two distinct families of UV enhanced silicon photodiodes. Inversion channel series and planar diffused series. Both families of devices are especially designed for low noise detection in the UV region of electromagnetic spectrum.

Inversion layer structure UV enhanced photodiodes exhibit 100% internal quantum efficiency and are well suited for low intensity light measurements. They have high shunt resistance, low noise and high breakdown voltages. The response uniformity across the surface and quantum efficiency improves with 5 to 10 volts applied reverse bias. In photovoltaic mode (unbiased), the capacitance is higher than diffused devices but decreases rapidly with an applied reverse bias. Photocurrent non-linearity sets in at lower photocurrents for inversion layer devices compared to the diffused ones. Below 700nm, their responsivities vary little with temperature.

Planar diffused structure (UV-D Series) UV enhanced photodiodes show significant advantages over inversion layer devices, such as lower capacitance and higher response time. These devices exhibit linearity of photocurrent up to higher light input power compared to inversion layer devices.

They have relatively lower responsivities and quantum efficiencies compared to inversion layer devices. There are two types of planar diffused UV enhanced photodiodes available: UVD and UVE. Both series have almost similar electro-optical characteristics, except in the UVE series, where the near IR responses of the devices are suppressed. This is especially desirable if blocking the near IR region of the spectrum is necessary. UVD devices peak at 970 nm and UVE devices at 720 nm (see graph). Both series may be biased for lower capacitance, faster response and wider dynamic range. Or they may be operated in the photovoltaic (unbiased) mode for applications requiring low drift with temperature variations. The UVE devices have a higher shunt resistance than their counterparts of UVD devices, but have a higher capacitance.

These detectors are ideal for coupling to an OP-AMP in the current mode configuration as shown below.

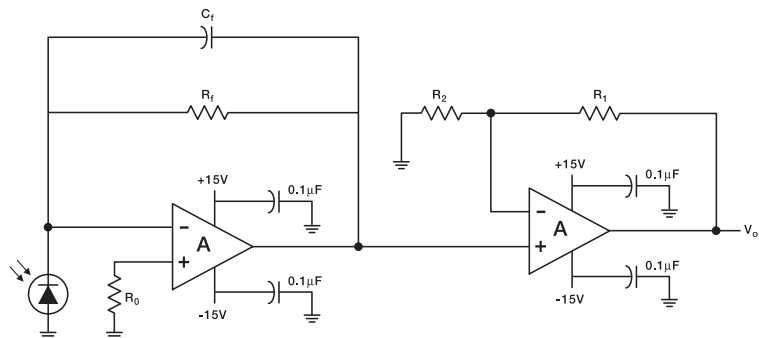


#### APPLICATIONS

- Pollution Monitoring
- Medical Instrumentation
- UV Exposure Meters
- Spectroscopy
- Water Purification
- Fluorescence

#### FEATURES

- Inversion series:
  - 100% Internal QE
- Ultra High  $R_{SH}$
- Planar Diffused Series:
  - IR Suppressed
  - High Speed Response
  - High Stability
- Excellent UV response



# Inversion Layer UV Enhanced Photodiodes

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

Model Number	Active Area		Responsivity (A/W)		Capacitance (pF)	Shunt Resistance ( $M\Omega$ )		NEP (W/ $\sqrt{\text{Hz}}$ )	Reverse Voltage (V)	Rise Time ( $\mu\text{s}$ )	Operating Current (mA)	Temp.* Range ( $^\circ\text{C}$ )		Package Style $\ddagger$
	Area (mm $^2$ )	Dimensions (mm)	254 nm		0 V	-10 mV		0V 254 nm		0 V 254 nm 50 $\Omega$	0 V	Operating	Storage	
			min.	typ.	max.	min.	typ.	typ.	max.	typ.				

## 'UV Enhanced' Series, Inversion Layer, Metal Package $\S$

UV-001	0.8	1.0 $\phi$	0.09	0.14	60	250	500	6.4 e-14	5	0.2	0.1	-20 ~ +60	-55 ~ +80	5 / TO-5
UV-005	5.1	2.54 $\phi$			300	80	200	1.0 e-13		0.9				
UV-015	15	3.05 x 3.81			800	30	100	1.4 e-13		2.0				
UV-20	20	5.08 $\phi$			1000	25	50	2.0 e-13		2.0				
UV-35	35	6.60 x 5.33			1600	20	30	1.7 e-13		3.0		-10 ~ +60	-20 ~ +70	
UV-50	50	7.87 $\phi$			2500	10	20	2.6 e-13		3.5				
UV-50L $\ddagger$					100	11.28 $\phi$	4500	5		10		4.5 e-13	5.9	
UV-100	11 / BNC													
UV-100L	10 / Lo-Prof													

## 'UV Enhanced' Series, Inversion Layer, Plastic Package $\S$

FIL-UV005	5.1	2.54 $\phi$	0.09	0.14	300	50	100	9.2 e-14	5	0.9	0.1	-10 ~ +60	-20 ~ +70	14 / Plastic
FIL-UV20	20	5.08 $\phi$			1000	20	50	1.3 e-13		2.0				25 / Plastic
UV-35P	35	6.60 x 5.33			1600	15	30	1.7 e-13		3.0				15 / Plastic
FIL-UV50	50	7.87 $\phi$			2500	10	20	2.1 e-13		3.5				
FIL-UV100	100	11.28 $\phi$			4500	5	10	2.9 e-13		5.9				

Model Number	Active Area		Responsivity (A/W)		Capacitance (pF)	Shunt Resistance ( $G\Omega$ )		NEP (W/ $\sqrt{\text{Hz}}$ )	Reverse Voltage (V)	Rise Time ( $\mu\text{s}$ )	Dark Current (pA)	Temp.* Range ( $^\circ\text{C}$ )		Package Style $\ddagger$
	Area (mm $^2$ )	Dimensions (mm)	254 nm		0 V	-10 mV		0V 254 nm		0 V 254 nm 1k $\Omega$	Vr=10mV	Operating	Storage	
			min.	typ.	max.	min.	typ.	typ.	max.	typ.				

## '7' Series, Super UV

OSD1.2-7U	1.2	1.1 sq	0.08	0.10	40	0.5	5.0	1.5 e-14	5	0.1	2	-25 ~ +70	-40 ~ +100	7 / TO-18
OSD1.2-7Q	1.2	1.1 sq	0.10	0.12	40	0.5	5.0	1.5 e-14		0.1	2			7 / TO-18
OSD5.8-7U	5.8	2.4 sq	0.08	0.10	180	0.5	3.0	2.0 e-14		0.4	3			5 / TO-5
OSD5.8-7Q	5.8	2.4 sq	0.10	0.12	180	0.5	3.0	2.0 e-14		0.4	3			5 / TO-5
OSD35-7Q	33.6	5.8 sq	0.10	0.12	1000	0.1	0.5	6.0 e-14		2.0	20			3 / TO-8
OSD35-7CO	33.6	5.8 sq	0.11	0.13	1000	0.1	0.5	6.0 e-14		2.0	20			25 / Ceramic

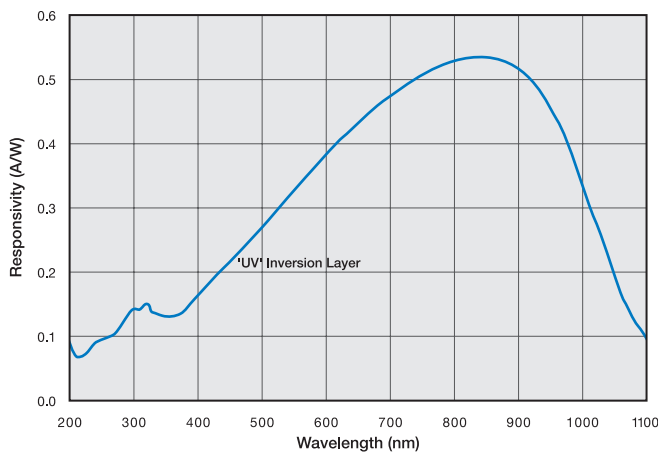
$\ddagger$  The 'l' or 'L' suffix on the model number is indicative of the photodiode chip being isolated from the package by an additional pin connected to the case.

$\S$  The photodiode chips in "FIL" series are isolated in a low profile plastic package. They have a large field of view as well as in line pins.

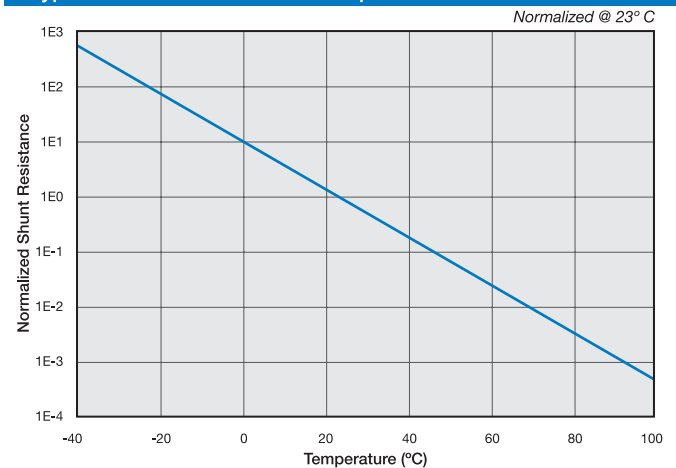
$\ddagger$  For mechanical drawings please refer to pages 58 thru 69.

\* Non-Condensing temperature and Storage Range, Non-Condensing Environment.

### Typical Spectral Response



### Typical Shunt Resistance vs. Temperature



# Planar Diffused UV Enhanced Photodiodes

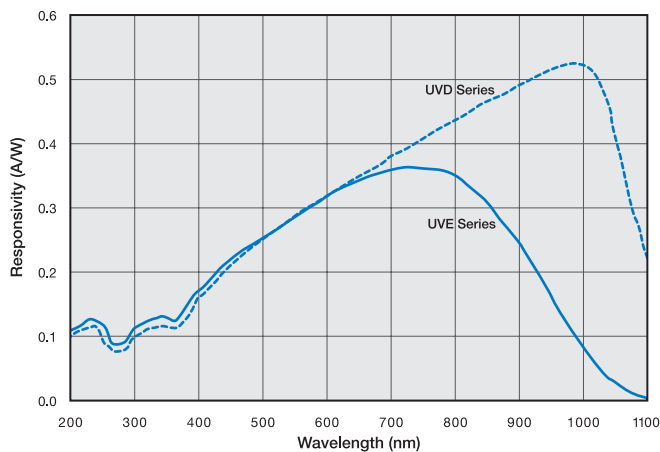
Typical Electro-Optical Specifications at  $T_A=23^\circ\text{C}$

Model Number	Active Area		Peak Wavelength $\lambda_p$ (nm)	Responsivity (A/W)			Capacitance (pF)		Shunt Resistance ( $G\Omega$ )		NEP (W/ $\sqrt{\text{Hz}}$ ) 0V 254 nm	Reverse Voltage (V)	Rise Time ( $\mu\text{s}$ ) 0 V 254 nm 50 $\Omega$	Temp.* Range ( $^\circ\text{C}$ )		Package Style ¶
	Area (mm <sup>2</sup> )	Dimension (mm)		254 nm	633 nm	930 nm	0 V		-10 mV					Operating	Storage	
				typ.	typ.	typ.	typ.	min.	typ.	typ.						
<b>'UVD' Series Planar Diffused, Metal Package</b>																
UV-005D	5.7	2.4 sq	970	0.10	0.33	0.50	100	0.30	4	2.0 e -14	5	0.10	-20 ~ +60	-55 ~ +80	5 / TO-5	
UV-013D	13	3.6 sq					225	0.20	2	2.8 e -14		0.20				
UV-035D	34	5.8 sq					550	0.10	0.50	5.6 e -14		0.40				6 / TO-8
<b>'UVD' Series Planar Diffused, Ceramic Package</b>																
UV-005DC	5.7	2.4 sq	970	0.10	0.33	0.50	100	0.30	4	2.0 e -14	5	0.10	-20 ~ +60	-20 ~ +80	25 / Ceramic	
UV-035DC	34	5.8 sq					550	0.10	0.5	5.6 e -14		0.20				
UV-100DC	100	10 sq					1750	0.04	0.20	9.1 e -14		1.00				
<b>'UVE' Series Planar Diffused, Metal Package</b>																
UV-005E	5.7	2.4 sq	720	0.10	0.33	0.17	200	0.50	10	1.3 e -14	5	0.15	-20 ~ +60	-55 ~ +80	5 / TO-5	
UV-013E	13	3.6 sq					400	0.40	5	1.8 e -14		0.30				
UV-035E	34	5.8 sq					1000	0.20	1	4.1 e -14		0.80				6 / TO-8
<b>'UVE' Series Planar Diffused, Ceramic Package</b>																
UV-005EC	5.7	2.4 sq	720	0.10	0.33	0.17	200	0.50	10	1.3 e -15	5	0.15	-20 ~ +60	-20 ~ +80	25 / Ceramic	
UV-035EC	34	5.8 sq					1000	0.20	1	4.1 e -14		0.80				
UV-100EC	100	10 sq					2500	0.10	0.50	5.8 e -14		1.00				

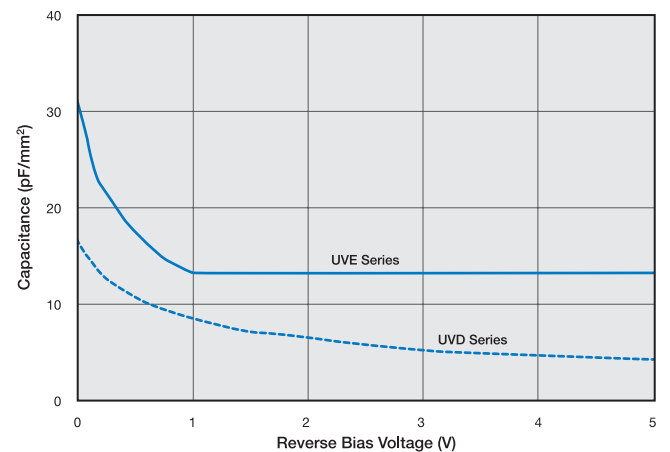
¶ For mechanical specifications please refer to pages 58 thru 69.

\* Non-Condensing temperature and Storage Range, Non-Condensing Environment.

## Typical Spectral Response



## Typical Capacitance vs. Reverse Bias



## 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"

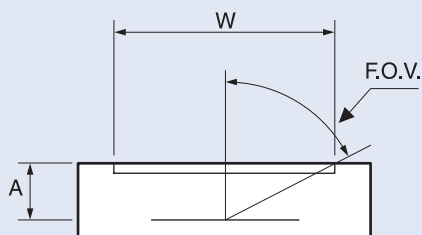
## 5. Windows

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.



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



For Further Assistance  
Please Call One of Our Experienced  
Sales and Applications Engineers

**310-978-0516**



- Or -  
On the Internet at

[www.osioptoelectronics.com](http://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-2DI PIN-2DPI PIN-3CDP PIN-3CDPI BPX-65R</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>BPX-65R</td> <td>0.070</td> <td>0.200</td> </tr> <tr> <td>All Others</td> <td>0.090</td> <td>0.150</td> </tr> </tbody> </table>	P/N	A	B	BPX-65R	0.070	0.200	All Others	0.090	0.150	<p><b>Products:</b></p> <p>PIN-5D PIN-5DP PIN-5DP/SB PIN-13D PIN-13DP PIN-005E-550F UV-001 UV-005 UV-005D UV-005E UV-013D UV-013E UV-015 OSD-5-0 OSD15-0 OSD5-5T OSD15-5T OSD5.8-7Q OSD5.8-7U</p> <p>Pin Circle Dia.=0.200</p> <table border="1"> <thead> <tr> <th>P/N</th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>OSD-Prefix Devices</td> <td>0.050</td> <td>0.130</td> </tr> <tr> <td>All Others</td> <td>0.102</td> <td>0.180</td> </tr> </tbody> </table> <p>Quartz Window: OSD5.8-7Q UV Transmissive Window: OSD5.8-7U</p>	P/N	A	B	OSD-Prefix Devices	0.050	0.130	All Others	0.102	0.180	<p><b>Products:</b></p> <p>PIN-6D PIN-6DP PIN-44D PIN-44DP UV-020 UV-035D UV-035E UV-035</p> <p>Pin Circle Dia.=0.295</p>																
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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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All units in inches. Pinouts are bottom view.

**Low Profile**

Products:  
 PIN-10DI  
 PIN-10DPI  
 PIN-10DPI/SB  
 UV-50L  
 UV-100L

Pin Circle Dia.=0.73

**BNC**

Products:  
 PIN-10D  
 PIN-10DP  
 PIN-10DP/SB  
 UV-50  
 UV-100

Outer Contact — Anode	PIN-10D, PIN-10DP, PIN-10DP/SB
Outer Contact — Cathode	UV-50, UV-100

**BNC**

Products:  
 PIN-25D  
 PIN-25DP

Outer Contact — Anode

**Special BNC**

Products:  
 PIN-10AP  
 PIN-10DF

P/N	A	B	C
PIN-10DF	0.217	0.330	1.020
PIN-10AP	0.386	0.550	1.415

**Special Plastic**

Products:  
 FIL-5C  
 FIL-20C  
 FIL-UV20  
 FIL-C4DG

P/N	A	B
FIL-5C FIL-20C	0.060	0.130
FIL-UV005 FIL-UV20 FIL-C4DG	0.087	0.152

P/N	1	2	3	4	5	6
FIL-5C FIL-20C FIL-UV005	a	-	c	a	-	c
FIL-UV20	c	-	a	c	-	a
FIL-C4DG	c	a	c	c	a	c

**Special Plastic**

Products:  
 FIL-44C  
 FIL-100C  
 FIL-UV50  
 FIL-UV100  
 FIL-C10DG

P/N	A	B
FIL-44C FIL-100C	0.052	0.130
FIL-UV50 FIL-UV100 FIL-C10DG	0.090	0.155

P/N	1	2	3	4	5	6	7	8
FIL-44C FIL-100C	a	-	-	c	a	-	-	c
FIL-UV50 FIL-UV100	c	-	-	a	c	-	-	a
FIL-C10DG	c	a	a	c	c	a	a	c

All units in inches. Pinouts are bottom view.

**22 TO-5**

Products:  
XUV-005

Pin Circle Dia.=0.200

**23 TO-8**

Products:  
XUV-020  
XUV-035

Pin Circle Dia.=0.295

**24 TO-8**

Products:  
PIN-DSIn-TEC

Pinout

1	TEC (-)
2	Thermistor
3	Thermistor
4	TEC (+)
5	Bottom InGaAs, Cathode
6	Bottom InGaAs, Anode
7	Top Silicon, Anode
8	Top Silicon, Cathode

**25 Special Ceramic / Plastic**

Products:  
RD-100  
RD-100A  
UV-35P  
UV-005EC  
UV-035EC  
UV-100EC  
UV-005DC  
UV-035DC  
UV-100DC  
XUV-50C  
XUV-100C  
OSD35-7CO  
OSD35-LR-A  
OSD35-LR-D

Notch Indicates Anode Pin

Dimensions				
P/N	A	B	C	D
UV-005EC	0.400	0.350	0.030	0.280
UV-035EC	0.400	0.350	0.030	0.290
UV-100EC	0.650	0.590	0.048	0.500
UV-005DC	0.400	0.350	0.030	0.280
UV-035DC	0.400	0.350	0.030	0.290
UV-100DC	0.650	0.590	0.053	0.500
XUV-50C	0.650	0.590	0.027	0.490
XUV-100C	0.650	0.590	0.027	0.490
RD-100	0.650	0.590	0.027	0.490
RD-100A	0.650	0.590	0.027	0.490
UV-35P	0.390	0.345	0.050	0.275
OSD35-7CO	0.390	0.350	---	0.290
OSD35-LR-A	0.390	0.350	---	0.290
OSD35-LR-D	0.390	0.350	---	0.290

Note: OSD35-prefix packages come with 0.31" (min.) leads

**26 TO-8**

Products:  
PIN-RD07  
PIN-RD15

Pin Circle Dia.=0.295

**27 Special Plastic**

Products:  
PIN-220D  
PIN-220DP  
PIN-220DP/SB

Pin Diameter=0.040

**28 BNC**

Products:  
XUV-100

BNC Connector  
Outer Contact = Cathode