

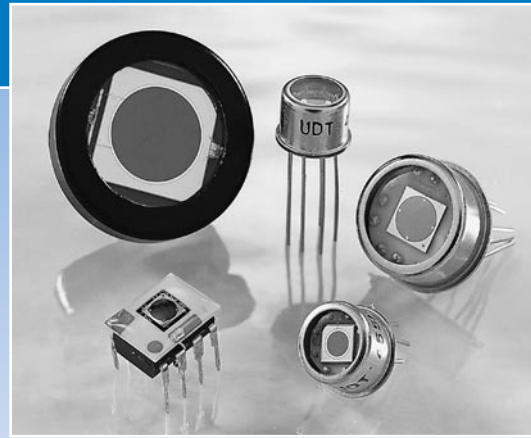
Photops™

Photodiode-Amplifier Hybrids

The Photop™ Series, combines a photodiode with an operational amplifier in the same package. Photops™ general-purpose detectors have a spectral range from either 350 nm to 1100 nm or 200 nm to 1100nm. They have an integrated package ensuring low noise output under a variety of operating conditions. These op-amps are specifically selected by OSI Optoelectronics engineers for compatibility to our photodiodes.

Among many of these specific parameters are low noise, low drift and capability of supporting a variety of gains and bandwidths determined by the external feedback components. Operation from DC level to several MHz is possible in an either unbiased configuration for low speed, low drift applications or biased for faster response time. LN-Series Photops™ are to be used with OV-bias.

Any modification of the above devices is possible. The modifications can be simply adding a bandpass optical filter, integration of additional chip (hybrid) components inside the same package, utilizing a different op-amp, photodetector replacement, modified package design and / or mount on PCB or ceramic. For your specific requirements, contact one of our Applications Engineers.



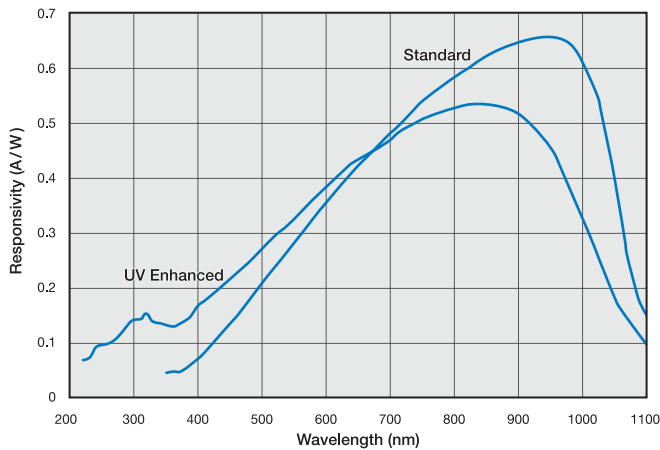
APPLICATIONS

- General Purpose Light Detection
- Laser Power Monitoring
- Medical Analysis
- Laser Communications
- Bar Code Readers
- Industrial Control Sensors
- Pollution Monitoring
- Guidance Systems
- Colorimeter

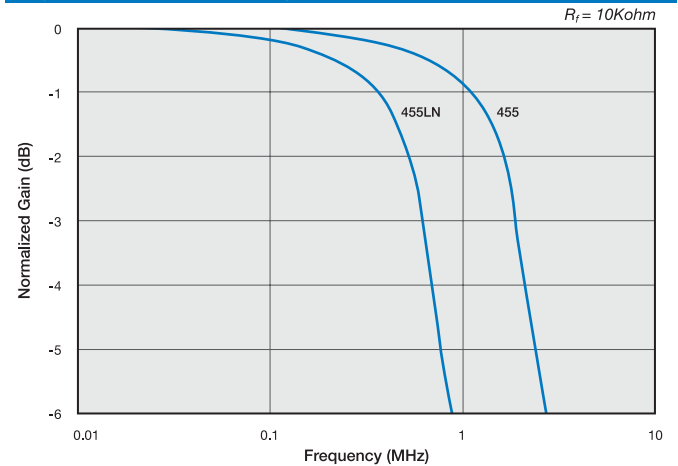
FEATURES

- Detector/Amplifier Combined
- Adjustable Gain/Bandwidth
- Low Noise
- Wide Bandwidth
- DIP Package
- Large Active Area

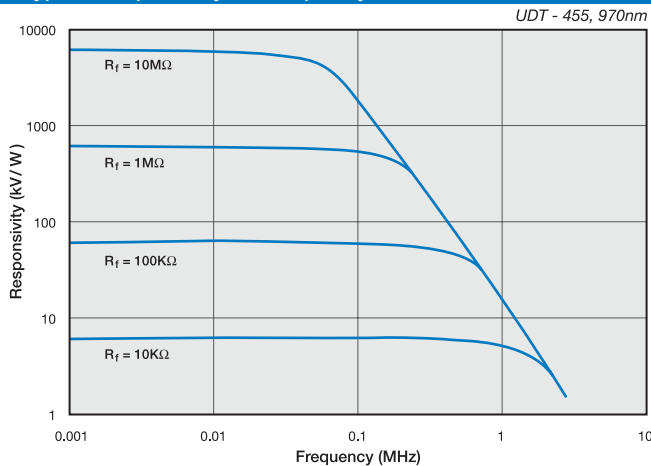
Typical Spectral Response



Typical Gain vs. Frequency



Typical Responsivity vs. Frequency



Photops™ (Photodiode Specifications)

Typical Electro-Optical Specifications at T_A=23°C

Model Number	Active Area		Responsivity (A/W)				Capacitance (pF)		Dark Current (nA)		Shunt Resistance (MΩ)	NEP (W/√Hz)		Reverse Voltage	Temp.* Range (°C)		Package Style				
	Area (mm ²)	Dimension (mm)	254 nm		970 nm		0 V	-10 V	-10 V		-10 mV	0 V	-10 V	V	Operating	Storage					
			min.	typ.	min.	typ.	typ.	typ.	typ.	max.		typ.	typ.					max.			
350-1100 nm Spectral Range																					
UDT-451	5.1	2.54 φ	---	0.60	0.65	85	15	0.25	3	---	---	1.4 e -14	30**	---	---	---	---	29 / DIP			
UDT-455																		30 / TO-5			
UDT-455LN**																		31 / TO-8			
OSI-515#																		32 / Special			
UDT-020D	16	4.57 φ	0.10	0.14	---	330	60	0.5	10	---	---	1.9 e -14	5**	---	---	---	---	31 / TO-8			
UDT555D	100	11.3 φ				1500	300	2	25			3.9 e -14						32 / Special			
200-1100 nm Spectral Range																					
UDT-455UV	5.1	2.54 φ	0.10	0.14	---	300	---	---	---	---	---	100	9.2 e -14	---	---	---	---	---	---	30 / TO-5	
UDT-455UV/LN**						1000						50	1.3 e -13							31 / TO-8	
UDT-020UV	16	4.57 φ	0.10	0.14	---	2500	---	---	---	---	---	20	2.1 e -13	---	---	---	---	---	---	32 / Special	
UDT-055UV	50	7.98 φ				4500						10	2.9 e -13							32 / Special	
UDT-555UV	100	11.3 φ	0.10	0.14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
UDT-555UV/LN**																					

Operational Amplifier Specifications Electro-Optical Specifications at T_A=23 °C

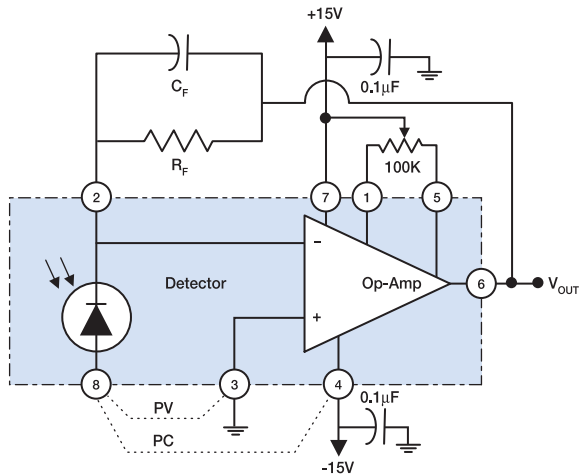
Model Number	Supply Voltage			Quiescent Supply Current (mA)		Input Offset Voltage		Temp. Coefficient Input Offset Voltage		Input Bias Current		Gain Bandwidth Product		Slew Rate		Open Loop Gain, DC		Input Noise Voltage		Temp.* Range (°C)
				± 15 V		mV		μV / °C		pA		MHz		V / μs		V / mV		100 Hz	1 kHz	1 kHz
	min.	typ.	max.	typ.	max.	typ.	max.	typ.	max.	typ.	max.	min.	typ.	min.	typ.	min.	typ.	typ.	typ.	typ.
UDT-451	---	±15	±18	1.4	2.5	3.0	6.0	10	---	30	200	---	4.0	---	13	50	150	---	18	10
UDT-455	---	±15	±18	2.8	5.0	0.5	3	4	30	±80	±400	3.0	5.4	5	9	50	200	20	15	10
UDT-455UV																				
UDT-020D																				
UDT-020UV	---	±15	±18	6.5	7.2	1	3	10	---	±15	±40	23	26	125	140	3	6.3	---	12	10
OSI-515#																				
UDT-455LN**	±5	±15	±18	0.9	1.8	0.26	1	---	20	0.15	0.3	0.5	1	0.5	3	50	2500	78	27	0.22
UDT-455UV/LN**																				
UDT-055UV	---	±15	±22	2.7	4.0	0.4	1	3	10	±40	±200	3.5	5.7	7.5	11	75	220	20	15	10
UDT-555D																				
UDT-555UV																				

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

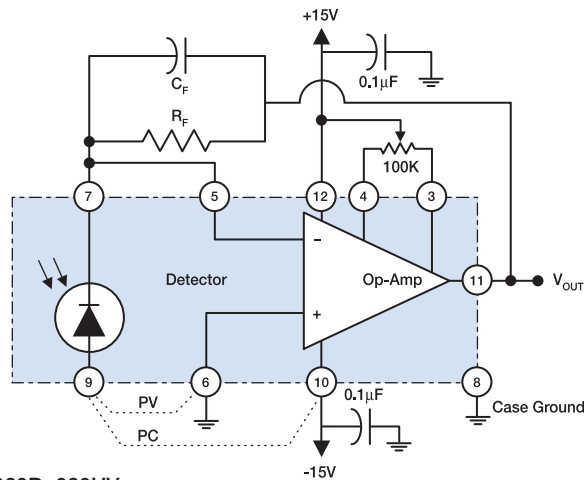
** LN – Series Devices are to be used with a 0V Bias.

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

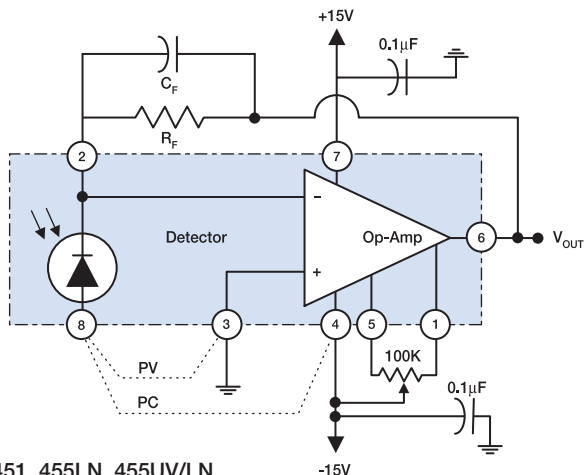
OSI-515 replaces UDT-455HS



UDT-455,
UDT-555D, 555UV, 055UV
OSI-515: pin 1 & 5 are N/C
(No offset adjustment needed).



UDT-020D, 020UV



UDT-451, 455LN, 455UV/LN
UDT-555UV/LN

The output voltage is proportional to the light intensity of the light and is given by:

$$V_{OUT} = I_P \times R_F \quad (1)$$

$$= (P \times R_\lambda) \times R_F$$

Frequency Response (Photodiode/Amplifier Combination)

The frequency response of the photodiode / amplifier combination is determined by the characteristics of the photodiode, pre-amplifier as well as the feedback resistor (R_F) and feedback capacitor (C_F). For a known gain, (R_F), the 3dB frequency response of the detector/pre-amp combination is given by:

$$f_{3dB} = \frac{1}{2\pi C_F R_F} \quad (2)$$

However, the desired frequency response is limited by the Gain Bandwidth Product (GBP) of the op-amp. In order to have a stable output, the values of the R_F and C_F must be chosen such that the 3dB frequency response of the detector / pre-amp combination, be less than the maximum frequency of the op-amp, i.e. $f_{3dB} \leq f_{max}$.

$$f_{max} = \sqrt{\frac{GBP}{2\pi R_F (C_F + C_J + C_A)}} \quad (3)$$

where C_A is the amplifier input capacitance.

In conclusion, an example for frequency response calculations, is given below. For a gain of 10^8 , an operating frequency of 100 Hz, and an op-amp with GBP of 5 MHz:

$$C_F = \frac{1}{2\pi f_{3dB} R_F} = 15.9pF \quad (4)$$

Thus, for $C_F = 15.9$ pF, $C_J = 15$ pF and $C_A = 7$ pF, f_{max} is about 14.5 kHz. Hence, the circuit is stable since $f_{3dB} \leq f_{max}$.

For more detailed application specific discussions and further reading, refer to the APPLICATION NOTES INDEX in the catalog.

Note: The shaded boxes represent the Photop™ components and their connections. The components outside the boxes are typical recommended connections and components.

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"

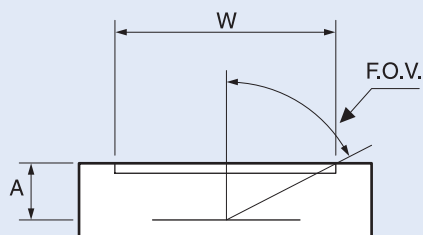
5. Windows

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

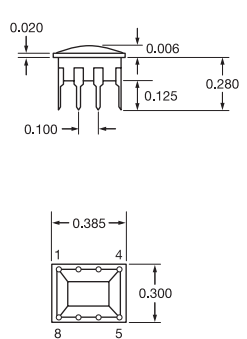
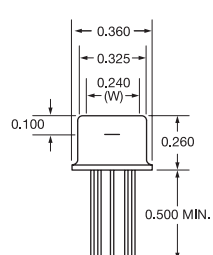
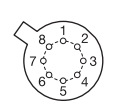
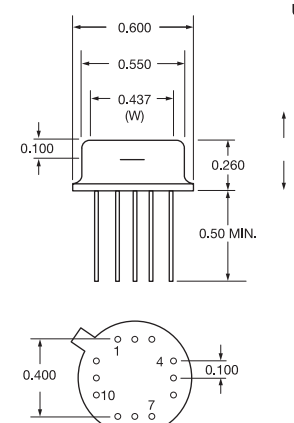


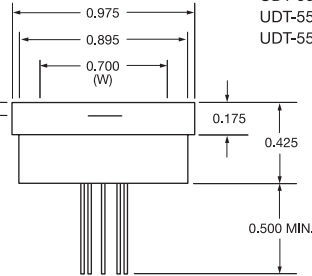
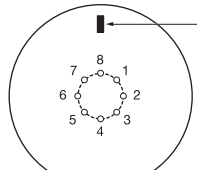
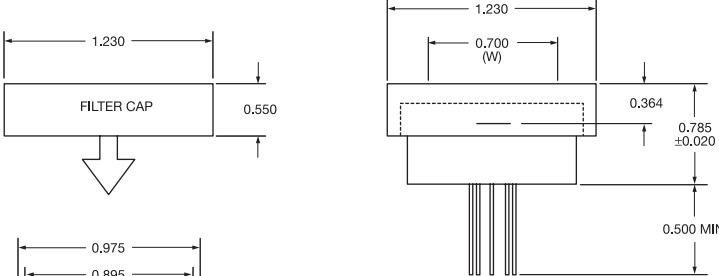
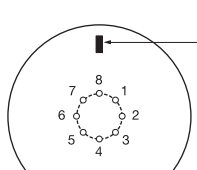
- Or -
On the Internet at

www.osioptoelectronics.com

Mechanical Specifications

All units in inches. Pinouts are bottom view.

29 8 PIN DIP	30 TO-5	31 TO-8																																																								
Products:	Products:	Products:																																																								
<p>UDT-451</p>  <p>Pinout</p> <table border="1"> <tr><td>1</td><td>Offset Null</td></tr> <tr><td>2</td><td>Inverting Input Detector Cathode</td></tr> <tr><td>3</td><td>Noninverting Input</td></tr> <tr><td>4</td><td>V (-)</td></tr> <tr><td>5</td><td>Offset Null</td></tr> <tr><td>6</td><td>Output</td></tr> <tr><td>7</td><td>V (+)</td></tr> <tr><td>8</td><td>Detector Anode</td></tr> </table>	1	Offset Null	2	Inverting Input Detector Cathode	3	Noninverting Input	4	V (-)	5	Offset Null	6	Output	7	V (+)	8	Detector Anode	<p>UDT-455 UDT-455LN UDT-455UV UDT-455UV/LN OSI-515</p>   <p>Pin Circle Dia.=0.23</p> <p>Pinout</p> <table border="1"> <tr><td>1</td><td>Offset Null</td></tr> <tr><td>2</td><td>Inverting Input Detector Cathode</td></tr> <tr><td>3</td><td>Noninverting Input</td></tr> <tr><td>4</td><td>V (-)</td></tr> <tr><td>5</td><td>Offset Null</td></tr> <tr><td>6</td><td>Output</td></tr> <tr><td>7</td><td>V (+)</td></tr> <tr><td>8</td><td>Detector Anode</td></tr> </table> <p>OSI-515 pin 1 & 5 are N/C</p>	1	Offset Null	2	Inverting Input Detector Cathode	3	Noninverting Input	4	V (-)	5	Offset Null	6	Output	7	V (+)	8	Detector Anode	<p>UDT-020D UDT-020UV</p>  <p>Pin Circle Dia.=0.295</p> <p>Pinout</p> <table border="1"> <tr><td>1</td><td>Not Used</td></tr> <tr><td>2</td><td>Not Used</td></tr> <tr><td>3</td><td>Offset Null</td></tr> <tr><td>4</td><td>Offset Null</td></tr> <tr><td>5</td><td>Inverting Input</td></tr> <tr><td>6</td><td>Noninverting Input</td></tr> <tr><td>7</td><td>Detector Cathode</td></tr> <tr><td>8</td><td>Case Ground</td></tr> <tr><td>9</td><td>Detector Anode</td></tr> <tr><td>10</td><td>V (-)</td></tr> <tr><td>11</td><td>Output</td></tr> <tr><td>12</td><td>V (+)</td></tr> </table>	1	Not Used	2	Not Used	3	Offset Null	4	Offset Null	5	Inverting Input	6	Noninverting Input	7	Detector Cathode	8	Case Ground	9	Detector Anode	10	V (-)	11	Output	12	V (+)
1	Offset Null																																																									
2	Inverting Input Detector Cathode																																																									
3	Noninverting Input																																																									
4	V (-)																																																									
5	Offset Null																																																									
6	Output																																																									
7	V (+)																																																									
8	Detector Anode																																																									
1	Offset Null																																																									
2	Inverting Input Detector Cathode																																																									
3	Noninverting Input																																																									
4	V (-)																																																									
5	Offset Null																																																									
6	Output																																																									
7	V (+)																																																									
8	Detector Anode																																																									
1	Not Used																																																									
2	Not Used																																																									
3	Offset Null																																																									
4	Offset Null																																																									
5	Inverting Input																																																									
6	Noninverting Input																																																									
7	Detector Cathode																																																									
8	Case Ground																																																									
9	Detector Anode																																																									
10	V (-)																																																									
11	Output																																																									
12	V (+)																																																									

32 Special	33 Special																																
Products:	Products:																																
<p>UDT-055UV UDT-555D UDT-555UV UDT-555UV/LN</p>   <p>Pin Circle Dia.=0.230</p> <p>Pin 8 is designated by a printed mark on the bottom of case</p> <p>Pinout</p> <table border="1"> <tr><td>1</td><td>Offset Null</td></tr> <tr><td>2</td><td>Inverting Input Detector Cathode</td></tr> <tr><td>3</td><td>Noninverting Input</td></tr> <tr><td>4</td><td>V (-)</td></tr> <tr><td>5</td><td>Offset Null</td></tr> <tr><td>6</td><td>Output</td></tr> <tr><td>7</td><td>V (+)</td></tr> <tr><td>8</td><td>Detector Anode and Case</td></tr> </table>	1	Offset Null	2	Inverting Input Detector Cathode	3	Noninverting Input	4	V (-)	5	Offset Null	6	Output	7	V (+)	8	Detector Anode and Case	<p>PIN-555AP</p>   <p>Pin Circle Dia.=0.230</p> <p>Pin 8 is designated by a printed mark on the bottom of case</p> <p>Pinout</p> <table border="1"> <tr><td>1</td><td>Offset Null</td></tr> <tr><td>2</td><td>Inverting Input Detector Cathode</td></tr> <tr><td>3</td><td>Noninverting Input</td></tr> <tr><td>4</td><td>V (-)</td></tr> <tr><td>5</td><td>Offset Null</td></tr> <tr><td>6</td><td>Output</td></tr> <tr><td>7</td><td>V (+)</td></tr> <tr><td>8</td><td>Detector Anode and Case</td></tr> </table>	1	Offset Null	2	Inverting Input Detector Cathode	3	Noninverting Input	4	V (-)	5	Offset Null	6	Output	7	V (+)	8	Detector Anode and Case
1	Offset Null																																
2	Inverting Input Detector Cathode																																
3	Noninverting Input																																
4	V (-)																																
5	Offset Null																																
6	Output																																
7	V (+)																																
8	Detector Anode and Case																																
1	Offset Null																																
2	Inverting Input Detector Cathode																																
3	Noninverting Input																																
4	V (-)																																
5	Offset Null																																
6	Output																																
7	V (+)																																
8	Detector Anode and Case																																