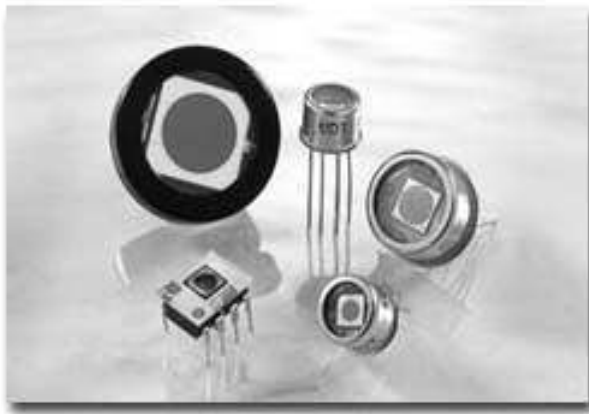


PHOTOPS™

PHOTODIODE-AMPLIFIER HYBRIDS



APPLICATIONS

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

FEATURES

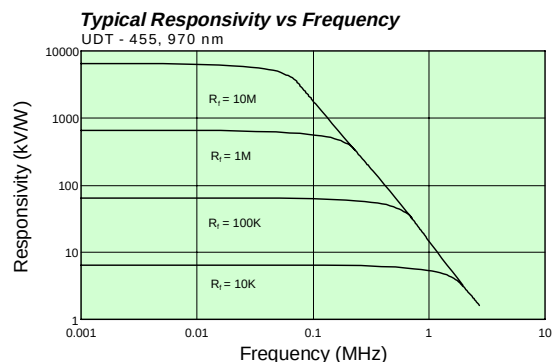
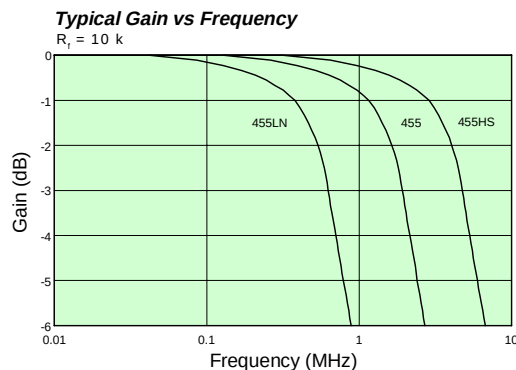
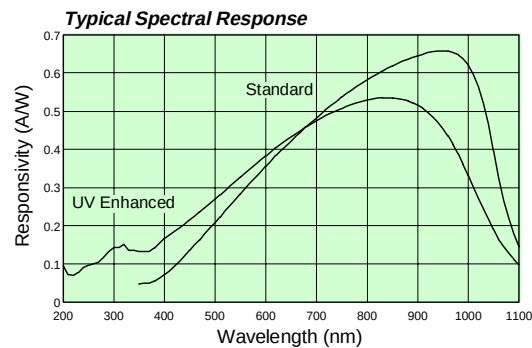
- Detector/Amplifier Combined
- Adjustable Gain/Bandwidth
- Low Noise
- Wide Bandwidth
- DIP Package
- Large Active Area

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 UDT Sensors 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.

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.



Model No.	Active Area		Responsivity (A/W)				Capacitance (pF)		Dark Current (nA)		Shunt Resistance (M-ohm)	NEP (W/√Hz)		Reverse Voltage (V)	Temp Range (°C)		Package Style †								
	Area (mm ²)	Dimension (mm)	200 nm		970 nm		0 V	-10 V	-10 V		-10 mV	0 V 200 nm	-10V 970 nm												
			Min	typ	min	typ	typ	typ	typ	max	typ	typ	typ		max	Operating		Storage							
350-1100 nm Spectral Range																									
UDT-451	5.1	2.54f				85	15	.25	3		1.4 e- 14	30	0 ~ +70 -30 ~ +100			28/ DIP									
UDT-455																									
UDT-455LN																									
UDT-455HS																									
UDT-020D	16	4.57f				330	60	.5	10		1.9 e- 14					30 / TO-8									
UDT-555D	100	11.3 f				1500	300	2	25		3.9 e- 14					31 / Special									
200-1100 nm Spectral Range																									
UDT-455UV	5.1	2.54f	.10	.14		300				100	9.2 e- 14	5							29 / TO-5						
UDT-455UV/LN																									
UDT-020UV	16	4.57f									1000								50	1.3 e- 13	30 / TO-8				
UDT-055UV	50	7.98f									2500								20	2.1 e- 13	31 / Special				
UDT-555UV	100	11.3f				4500														10	2.9 e- 13			31 / Special	
UDT-555UV/LN																									

For MECHANICAL DRAWINGS Click Here

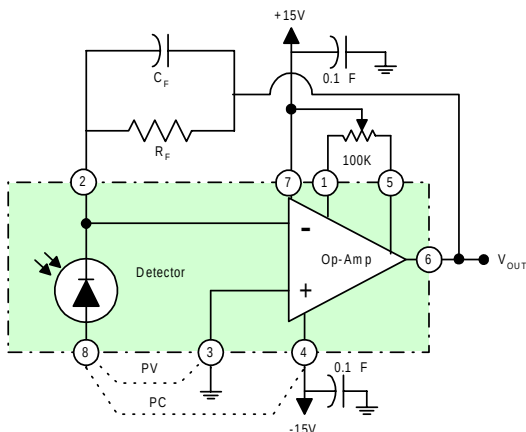
OPERATIONAL AMPLIFIER SPECIFICATIONS

TYPICAL ELECTRO-OPTICAL SPECIFICATIONS AT $T_A=23^{\circ}\text{C}$

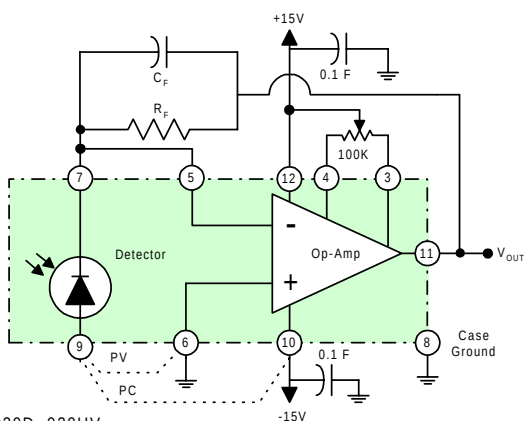
Model No.	Supply Voltage (V)			Quiescent Supply Current (mA)		Input Offset Voltage (mV)		Temp Coefficient Input Offset Voltage ($\mu\text{V}/^{\circ}\text{C}$)		Input Bias Current (pA)		Gain Bandwidth Product (MHz)		Slew Rate (V/ μs)		Open Loop Gain, DC (V / mV)		Input Noise Voltage (nV/√Hz)		Input Noise Current (fA/√Hz)
	min	typ	max	typ	max	typ	max	typ	max	typ	max	min	typ	min	typ	min	typ	100 Hz	1 kHz	1 kHz
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																				
UDT-455HS	---	±15	±18	4.8	8.0	0.5	3	4	30	±80	±500	11	26	25	40	50	200	20	15	10
UDT-455LN	±5	±15	±18	0.9	1.8	.26	1	---	20	.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																				
UDT-555UV/LN	±5	±15	±18	2.5	3.5	.05	0.25	0.5	1	0.5	1	---	2	1	2	1k	1770	11	7	0.4

PHOTOP™ SERIES

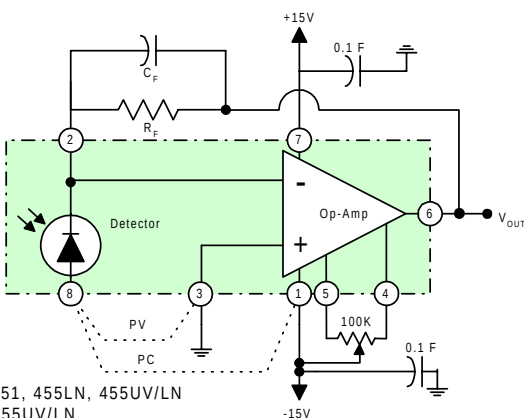
SCHEMATIC DIAGRAMS



UDT-455, 455HS
UDT-555, 555UV, 055UV



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:

$$V_{OUT} = I_p \times R_F$$

$$= (P \times R) R_F$$

FREQUENCY RESPONSE (PHOTODIODE /AMPLIFIER COMBINATION)

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

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

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 3 dB frequency response of the detector / pre-amp combination, be less than the maximum frequency of the op-amp, i.e. $f_{3dB} < f_{max}$.

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

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:

$$C_F = \frac{1}{2 \pi f_{3dB} R_F} = 15.9 \text{ pF}$$

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

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 (TM) components and their connections. The components outside the boxes are typical recommended connections and components.