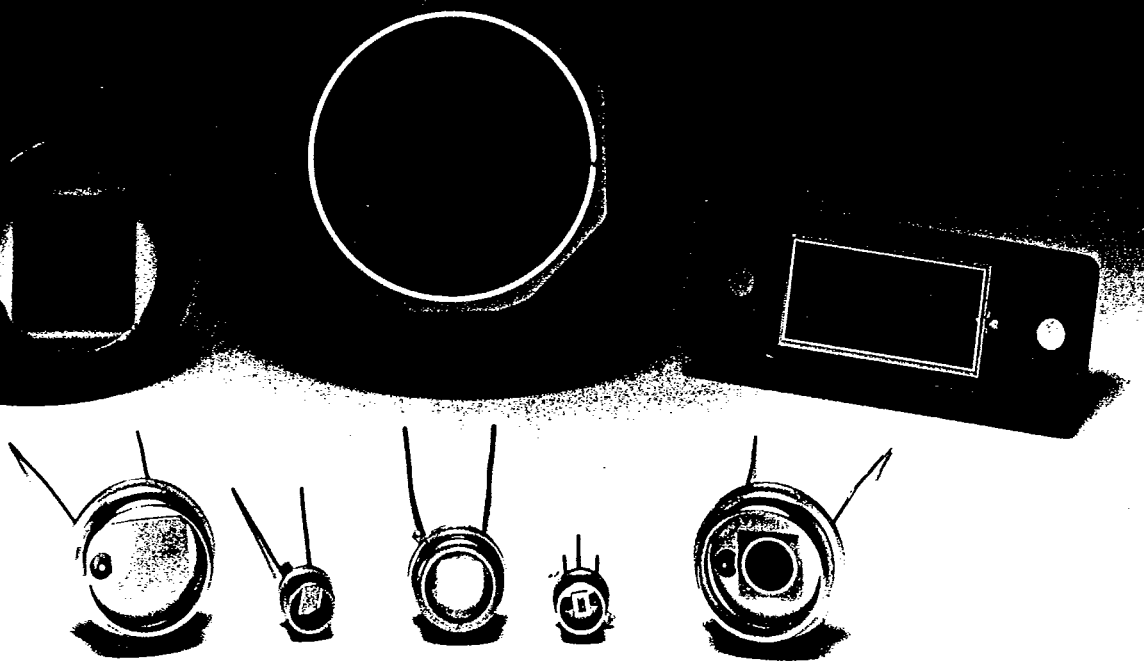
PIN SERIES

PLANAR-DIFFUSED SILICON PHOTODIODES



UNITED DETECTOR TECHNOLOGY

PIN SERIES
PLANAR-DIFFUSED SILICON F

D SERIES PIN PHOTODIODE SPECIFICATIONS

	RESPONSIVITY	CAPACITANCE		DARK CURRENT	MINIMUM BREAKDOWN VOLTAGE	NEP	RISE TIME	ACTIVE AREA
	850nm	10V	50V	10V	Volts	850nm/1kHz	50V/50Ω LOAD	mm²
	A/W	pF	pF	nA		W/√Hz	nsec	
PIN-2DI	0.50	40	N/A	10	25	1×10^{-13}	50	1.5
PIN-3CD	0.50	10	6	20	50	2×10^{-13}	15	3.2
PIN-5D	0.50	15	7	100	50	5×10^{-13}	15	5.1
PIN-6D PIN-6DI	0.50	60	30	300	50	8×10^{-13}	15	20.3
PIN-10D	0.45	350	190	500	50	1×10^{-12}	25	100
PIN-10DI	0.45	350	190	500	50	1×10^{-12}	25	100
PIN-25D	0.45	2500	1000	4000	50 @ 50μA	5×10^{-12}	100	613
PIN-44D	0.50	190	100	400	50	9×10^{-13}	20	44
PIN-220D	0.45	600	300	1500	50 @ 50μA	1.4×10^{-12}	100	200

Note: Typical specifications represent approximately 50% of yield. Photodiodes can be selected at extra charge.

United Detector Technology's commitment to state-of-the-art light detection and measurement is exemplified by its PIN series planar-diffused silicon photodiodes. These devices exhibit long-term stability, very low noise, and high impedance, as well as high speed. They work over a wide spectral range, from 350 nm to 1100 nm, making them ideal for instrument use.

The D series photodiodes, optimized for voltage-biased (photoconductive) operation, provide response times under 500 nanoseconds, long term reliability, and the ability to tolerate high light levels. In addition, their high speed makes them the best choice for AC light measurements.

The DP series photodiodes, optimized for unbiased (photovoltaic) operation, offer high zero-bias impedance. Thus they are ideal for coupling to an opamp in the current mode. In the detector/opamp configuration, DC light level changes up to ten decades can be linearly detected and converted to an output voltage. Because of their very low noise and excellent NEP, the DP series photodiodes are a good choice for very low light level detection.

The features of each detector family are summarized below.

D SERIES
- ☐ Voltage-biased (photoconductive)
- ☐ Fast response time
- ☐ Low capacity
- ☐ Low dark current
- ☐ Excellent linearity

DP SERIES
- ☐ Unbiased (photovoltaic)
- ☐ Optimized for opamps
- ☐ Ultra-high impedance
- ☐ Ultra-low noise
- ☐ Ten decades of output linearity with DC light source

D SERIES APPLICATIONS.
D series photodiodes are ideal for use in laser rangers, OCR scanners, pulse detectors, production line sorters, and as opto-isolators. Also in video disc recorders, star trackers and spectrometers.

PHOTODIODES

TYPICAL SPECIFICATIONS AT 22°C

ACTIVE DIAMETER	TEMPERATURE RANGE		PACKAGE TYPE
INCHES	OPERATING °C	STORAGE °C	
0.04 x 0.061	−55 to +125	−65 to +150	TO-18
0.05 x 0.10	−55 to +125	−65 to +150	TO-18
0.10	−55 to +125	−65 to +150	TO-5
0.20	−55 to +125	−65 to +150	TO-8
0.444	0 to +70	−25 to +85	BNC SPECIAL
0.444	0 to +70	−25 to +85	ISOLATED HEADER
1.10	0 to +70	−25 to +85	BNC SPECIAL
0.261 x 0.261	−55 to +125	−65 to +150	TO-8
0.39 x 0.79	0 to +70	−25 to +85	SPECIAL

DP SERIES PIN PHOTODIODE SP

	RESPONSIVITY	CAPACITANCE	R
	850nm	OV	
	A/W	pF	
PIN-2DPI	0.45	160	
PIN-3CDP PIN-3DP	0.55	300	
PIN-5DP	0.55	500	
PIN-6DP PIN-6DPI	0.55	1800	
PIN-10DP	0.50	2400	
PIN-10DPI	0.50	2400	
PIN-25DP	0.45	9000	
PIN-44DP	0.55	700	
PIN-125DPL	0.50	30	
PIN-220DP	0.45	3000	

DP SERIES APPLICATIONS.

DP series photodiodes are a good choice for colorimeters, photometers and radiometers, and densitometers. Also for intrusion alarms, electro-optical blood analyzers and particle detectors. They have been used as a replacement for photo-transistors, as opto-couplers, and in the food processing industry.

CUSTOM DEVICES.

A major portion of our capability is devoted to fabricating special devices used in a variety of applications such as OCR, optical alignment, medical instruments, and infrared detection.

For harsh environments, we can supply hermetically-sealed, hi-rel devices.

Multielement PIN arrays, with from 4 to 128 elements, have already been built, and are available as standard parts. If one does not fit your needs, we can fabricate one that will.

Our capability extends to making single-element or multielement array hybrids. Hybrids, which combine a photodiode and opamp in one package, offer unique advantages in certain applications.

In addition to the planar-diffused devices covered in this data sheet, UDT also offers strong capability in Schottky barrier-junction and inversion-layer technology.

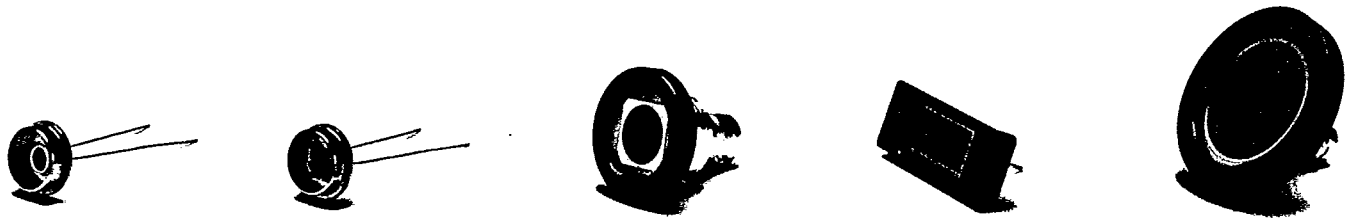
Whatever your needs in light detection and measurement, chances are good that UDT can help. Just send us your requirements. We'll give you our recommendations and a quote.

CONSTRUCTION.

Planar-diffused PIN photodiodes are produced by introducing a heavily doped P region and a heavily doped N region into silicon, separated by a lightly doped I region. The I region resistivity can range from 10 ohm-cm to 100,000 ohm-cm, while the P and N region resistivities are less than 0.1 ohm-cm.

A top surface oxide layer serves as a diffusion mask to define the shape of the active area as well as to form a stable, passivated construction.

The metalized layer on the bottom of the silicon chip provides a low resistance ohmic contact to the outside world. The metalized layer also acts as an optical reflector, which improves sensi-

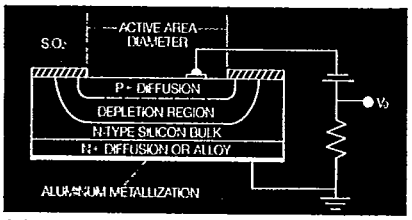


ECIFICATIONS

TYPICAL SPECIFICATIONS AT 22°C

SOURCE ESISTANCE	NEP	RISE TIME	ACTIVE AREA	ACTIVE DIAMETER	TEMPERATURE RANGE		PACKAGE TYPE
MΩ	850nm/1kHz	OV/50Ω LOAD	mm²	INCHES	OPERATING	STORAGE	
	W/√Hz	nsec			°C	°C	
50	4×10^{-14}	500	1.5	0.04 x 0.061	−55 to +125	−65 to +150	TO-18
300	5×10^{-14}	500	3.2	0.05 x 0.10	−55 to +125	−65 to +150	TO-18
50	6×10^{-14}	500	5.1	0.10	−55 to +125	−65 to +150	TO-5
30	8×10^{-14}	1000	20.3	0.20	−55 to +125	−65 to +150	TO-8
2	3×10^{-13}	2000	100	0.444	0 to +70	−25 to +85	BNC SPECIAL
2	3×10^{-13}	2000	100	0.444	0 to +70	−25 to +85	ISOLATED HEADER
0.4	5×10^{-13}	5000	613	1.10	0 to +70	−25 to +85	BNC SPECIAL
10	1×10^{-13}	1000	44	0.261 x 0.261	−55 to +125	−65 to +150	TO-8
20	1×10^{-13}	1000	1.6	0.05 x 0.05	−55 to +75	−65 to +100	TO-18
5	1.4×10^{-13}	3000	200	0.39 x 0.79	0 to +70	−25 to +85	SPECIAL

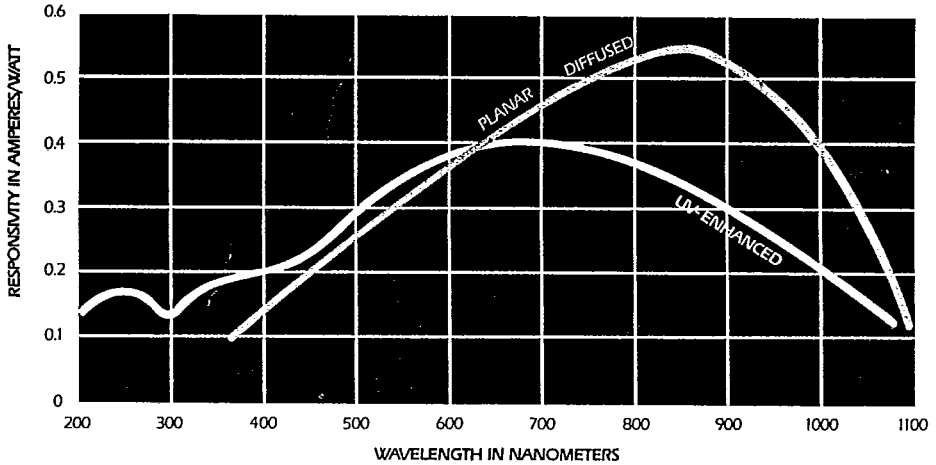
PLANAR-DIFFUSED PHOTODIODE.



tivity at longer wavelengths, where the incident light would normally penetrate the silicon.

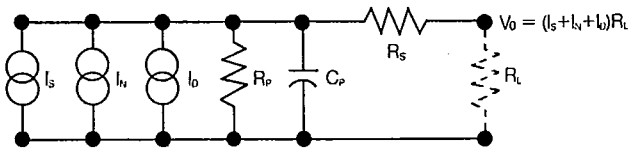
The D series is constructed with high breakdown voltage and low capacitance, ideal for photoconductive operation.

The DP series is optimized for high impedance and excellent NEP, for photovoltaic operation and opamp coupling.



Typical spectral response.

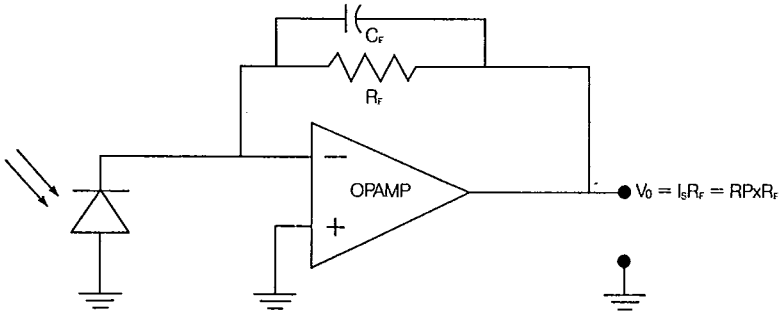
EQUIVALENT CIRCUIT FOR ALL MODELS.



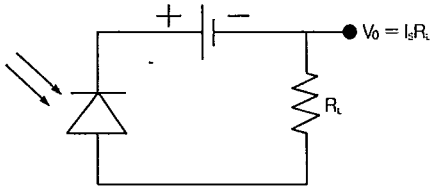
DEFINITION OF TERMS.

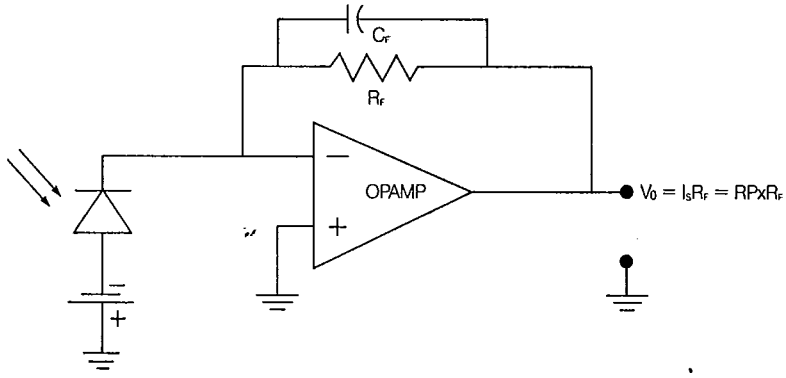
I_S = signal current in amps = RP
P = incident optical power in watts
R = responsivity in amps/watt
I_N = noise current in amps
I_D = dc dark current in amps
R_L = load resistance in ohms
C_P = barrier capacitance in farads
R_P = barrier resistance in ohms
R_S = series resistance in ohms

PHOTOVOLTAIC MODE OF OPERATION.

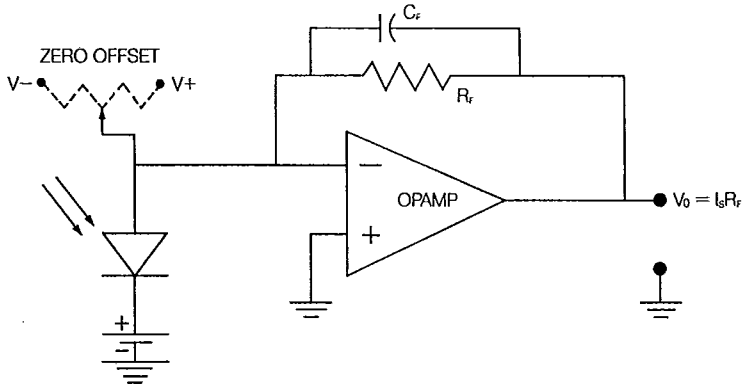


PHOTOCONDUCTIVE MODE OF OPERATION.





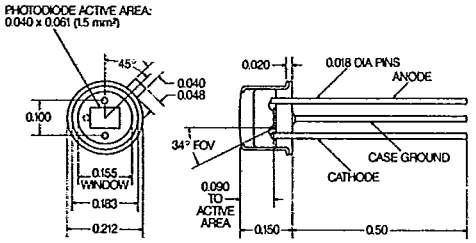
BACKGROUND LIGHT COMPENSATION.



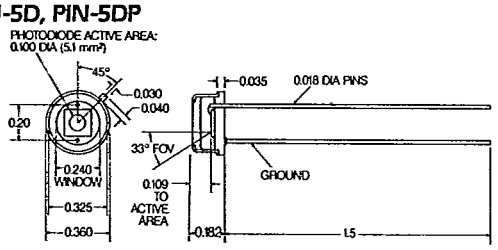
MECHANICAL DETAILS.

NOTES: 1. Dimensions in inches, unless otherwise specified.
2. Typical centering of detector chip is ±0.010 inch.

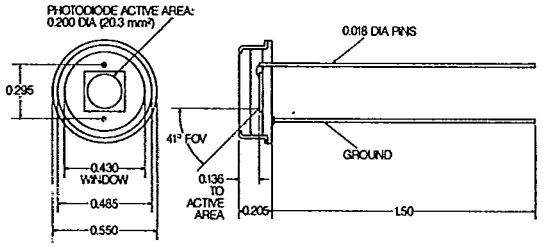
PIN-2DI, PIN-2DPI



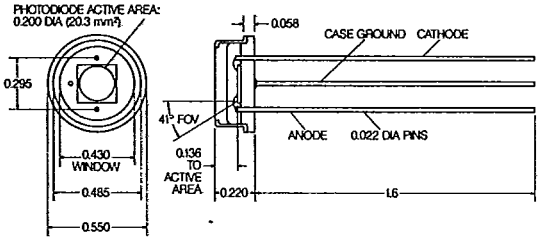
PIN-5D, PIN-5DP



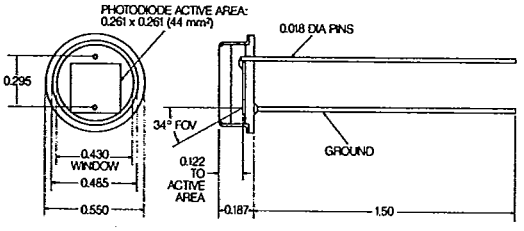
PIN-6D, PIN-6DP



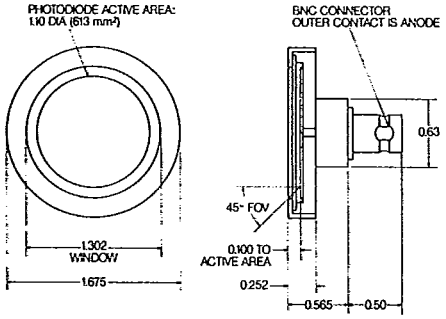
PIN-6DI, PIN-6DPI



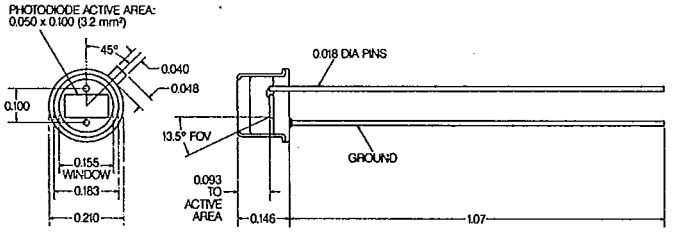
PIN-44D, PIN-44DP



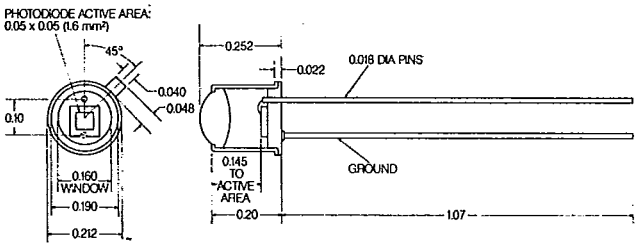
PIN-25D, PIN-25DP



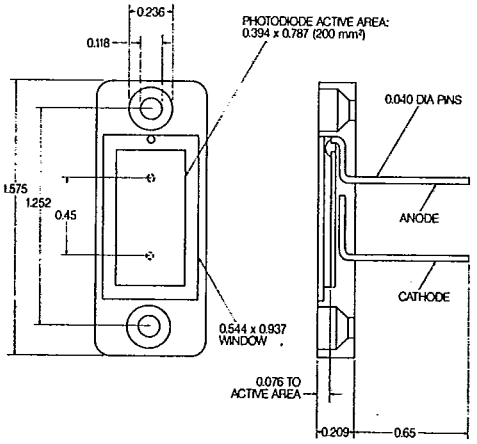
PIN-3CD, PIN-3CDP, PIN-3DP



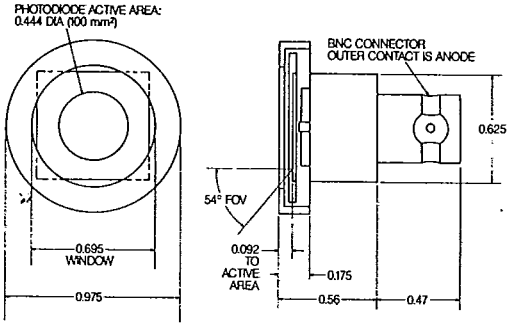
PIN-125DPL



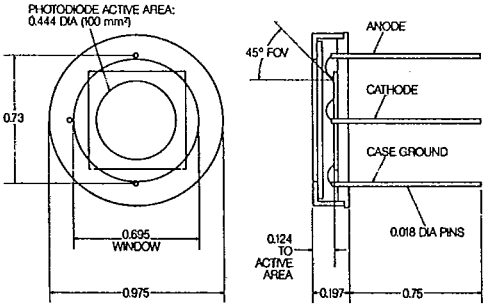
PIN-220D, PIN-220DP



PIN-10D, PIN-10DP



PIN-10DI, PIN-10DPI



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