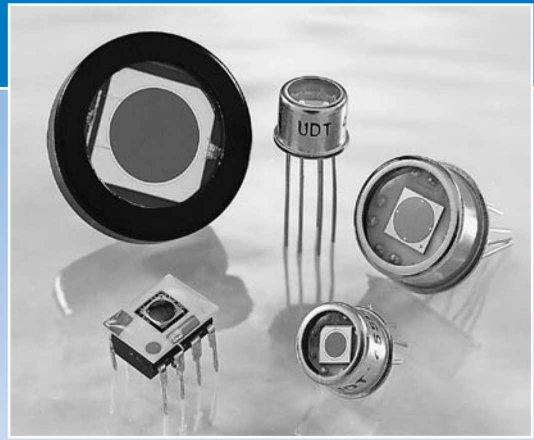
Photops™

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.



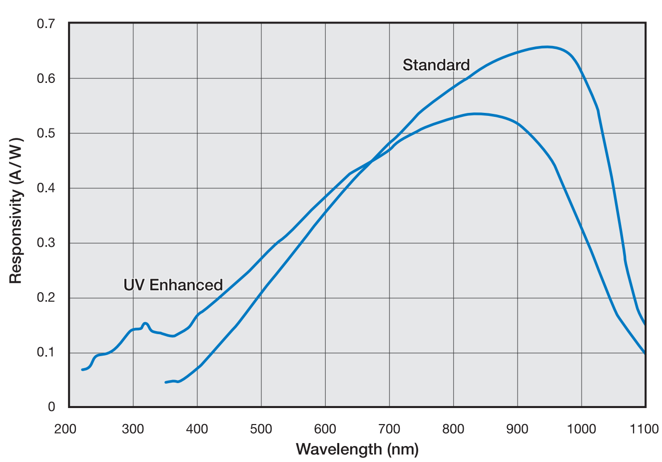
APPLICATIONS

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

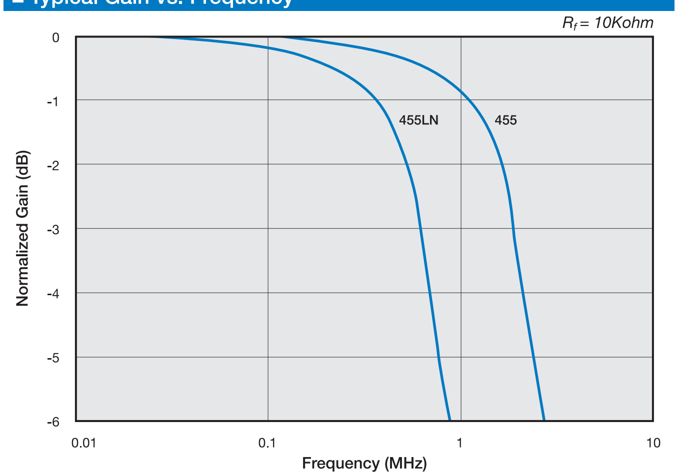
FEATURES

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

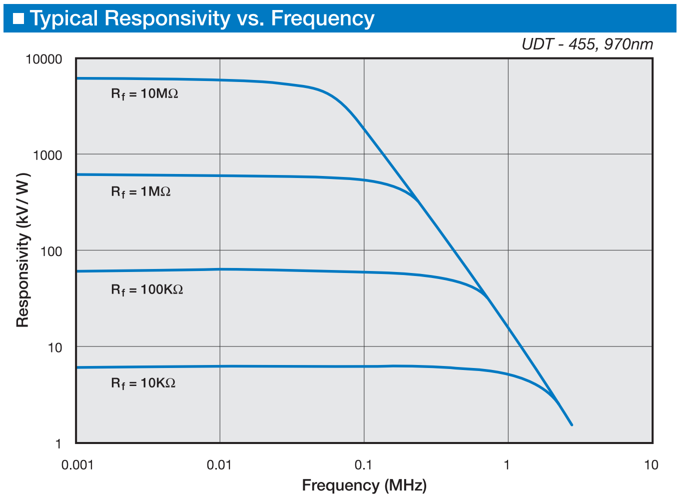
Typical Spectral Response



Typical Gain vs. Frequency



Typical Responsivity vs. Frequency



▪ Photops™ (Photodiode Specifications)

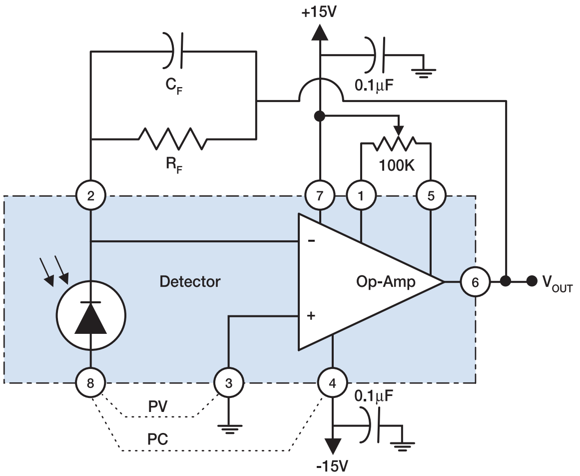
Typical Electro-Optical Specifications at T_A=23°C

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 (mm²)	Dimension (mm)	254 nm		970 nm		0 V	-10 V	-10 V		-10 mV	0 V 254 nm	-10 V 970 nm	V	Operating	Storage	
			min.	typ.	min.	typ.	typ.	typ.	typ.	max.	typ.	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**	0 ~ +70	-30 ~ +100	29 / DIP
UDT-455	5.1	2.54 ϕ	---	---	0.60	0.65	85	15	0.25	3	---	---	1.4 e -14	30**	0 ~ +70	-30 ~ +100	30 / TO-5
UDT-455LN**	5.1	2.54 ϕ	---	---	0.60	0.65	85	15	0.25	3	---	---	1.4 e -14	30**	0 ~ +70	-30 ~ +100	30 / TO-5
OSI-515#	5.1	2.54 ϕ	---	---	0.60	0.65	85	15	0.25	3	---	---	1.4 e -14	30**	0 ~ +70	-30 ~ +100	30 / TO-5
UDT-020D	16	4.57 ϕ	---	---	0.60	0.65	330	60	0.5	10	---	---	1.9 e -14	30**	0 ~ +70	-30 ~ +100	31 / TO-8
UDT555D	100	11.3 ϕ	---	---	0.60	0.65	1500	300	2	25	---	---	3.9 e -14	30**	0 ~ +70	-30 ~ +100	32 / Special
200-1100 nm Spectral Range																	
UDT-455UV	5.1	2.54 ϕ	0.10	0.14	---	---	300	---	---	---	100	9.2 e -14	---	5**	0 ~ +70	-30 ~ +100	30 / TO-5
UDT-455UV/LN**	5.1	2.54 ϕ	0.10	0.14	---	---	300	---	---	---	100	9.2 e -14	---	5**	0 ~ +70	-30 ~ +100	30 / TO-5
UDT-020UV	16	4.57 ϕ	0.10	0.14	---	---	1000	---	---	---	50	1.3 e -13	---	5**	0 ~ +70	-30 ~ +100	31 / TO-8
UDT-055UV	50	7.98 ϕ	0.10	0.14	---	---	2500	---	---	---	20	2.1 e -13	---	5**	0 ~ +70	-30 ~ +100	32 / Special
UDT-555UV	100	11.3 ϕ	0.10	0.14	---	---	4500	---	---	---	10	2.9 e -13	---	5**	0 ~ +70	-30 ~ +100	32 / Special
UDT-555UV/LN**	100	11.3 ϕ	0.10	0.14	---	---	4500	---	---	---	10	2.9 e -13	---	5**	0 ~ +70	-30 ~ +100	32 / Special

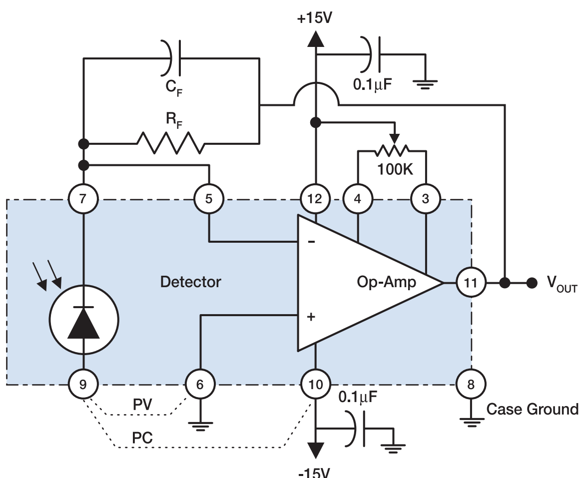
Operational Amplifier Specifications Electro-Optical Specifications at T_A=23 °C

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		Input Noise Current
				± 15 V		mV		µV / °C		pA		MHz		V / µs		V /mV		nV/ √Hz		fA/ √Hz
																		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	---	±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-020D	---	±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-020UV	---	±15	±18	2.8	5.0	0.5	3	4	30	±80	±400	3.0	5.4	5	9	50	200	20	15	10
OSI-515#	---	±15	±18	6.5	7.2	1	3	10	---	±15	±40	23	26	125	140	3	6.3	---	12	10
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**	±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-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	---	±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-555UV	---	±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

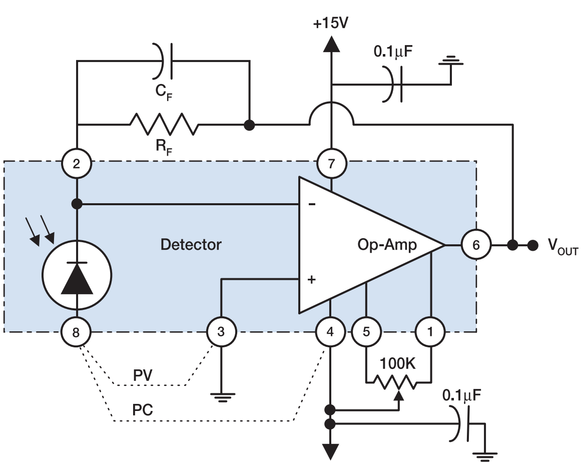
¶ For mechanical drawings please refer to pages 58 thru 69.
** LN – Series Devices are to be used with a 0V Bias.
* Non-Condensing temperature and Storage Range, Non-Condensing Environment.
# OSI-515 replaces UDT-455HS



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:

$$\begin{aligned} V_{OUT} &= I_P \times R_F \\ &= (P \times R_\lambda) \times R_F \end{aligned} \quad (1)$$

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 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. $f_{3dB} \le f_{max}$.

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

where C_A is the amplifier input capacitance.

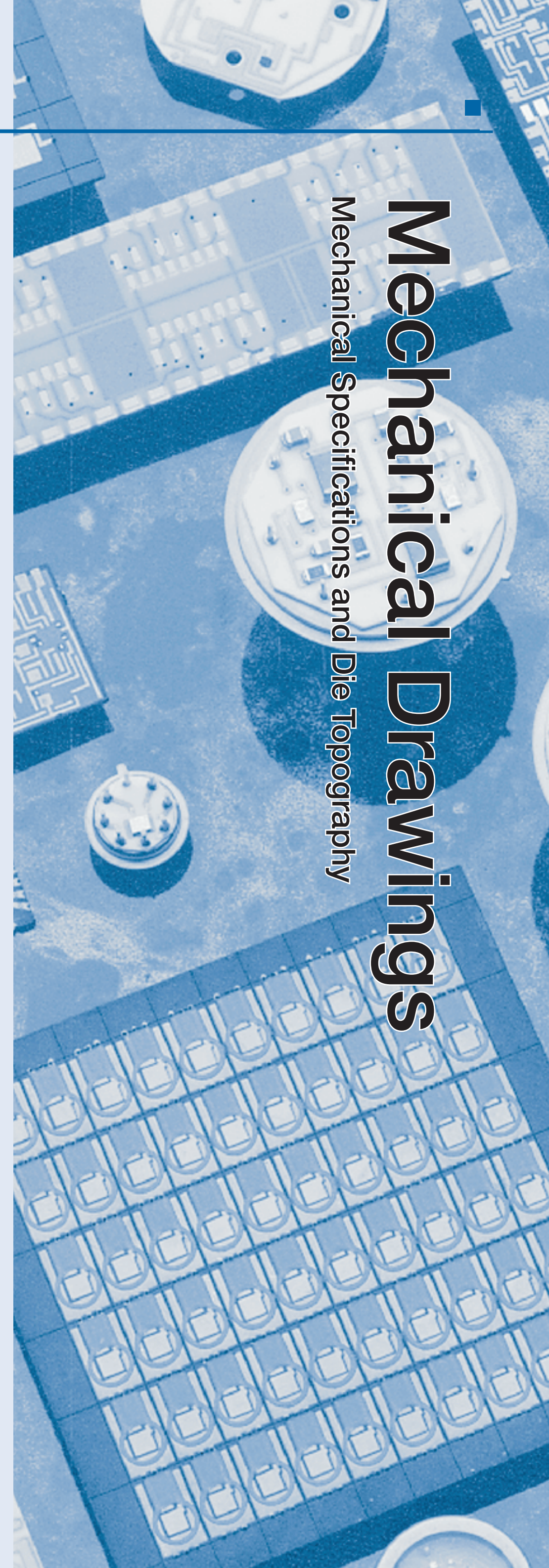
In conclusion, an example for frequency response calculations, is given below. For a gain of 10^8, an operating frequency of 100 Hz, and an op-amp with GBP of 5 MHz:

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

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 $f_{3dB} \le f_{max}$.

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. = Filed 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"

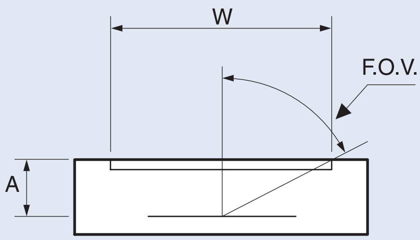
5. Windows

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

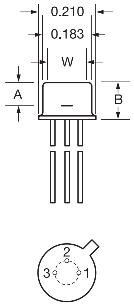
Mechanical Specifications

All units in inches. Pinouts are bottom view.

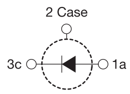
1 TO-18

Products:

PIN-020A
PIN-040A
PIN-040-DP/SB



Pin Circle Dia.=0.100

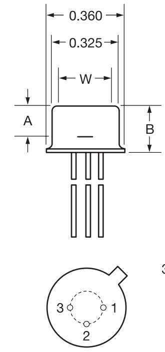


P/N	A	B	W
PIN-020A	0.075	0.200	0.155
PIN-040A	0.075	0.200	0.155

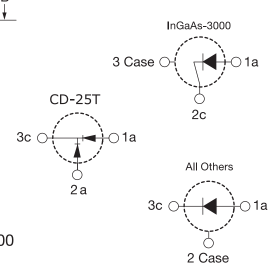
2 TO-5

Products:

PIN-5DI
PIN-5DPI
PIN-13DI
PIN-13DPI
PIN-5-YAG
CD-25T



Pin Circle Dia.=0.200

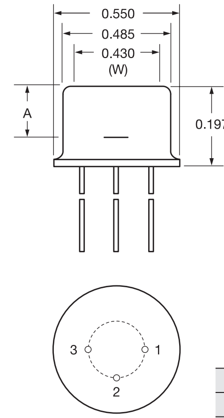


P/N	A	B	W
All Others	0.094	0.180	0.240
CD-25T	0.050	0.130	0.23

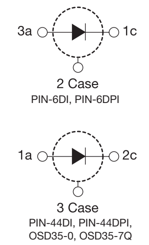
3 TO-8

Products:

PIN-6DI
PIN-6DPI
PIN-44DI
PIN-44DPI
OSD35-0
OSD35-7Q



Pin Circle Dia.=0.295

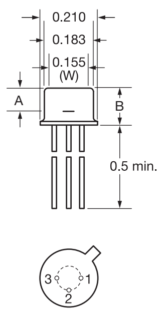


P/N	A
PIN-6DI/6DPI	0.115
PIN-44DI/44DPI	0.125
OSD35-0	0.130
OSD35-7Q	0.130 Quartz Window

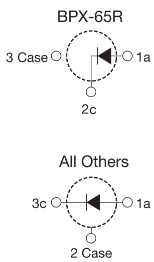
4 TO-18

Products:

PIN-2DI
PIN-2DPI
PIN-3CDP
PIN-3CDPI
BPX-65R



Pin Circle Dia.=0.100

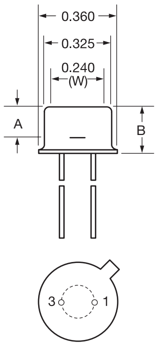


P/N	A	B
BPX-65R	0.070	0.200
All Others	0.090	0.150

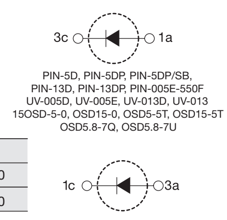
5 TO-5

Products:

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



Pin Circle Dia.=0.200



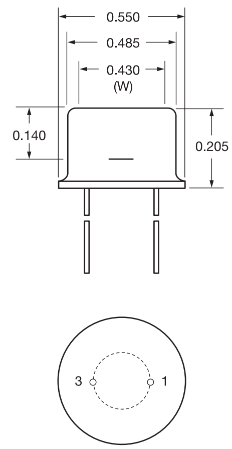
P/N	A	B
OSD-Prefix Devices	0.050	0.130
All Others	0.102	0.180

Quartz Window: OSD5.8-7Q
UV Transmissive Window: OSD5.8-7U

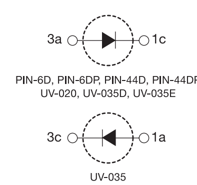
6 TO-8

Products:

PIN-6D
PIN-6DP
PIN-44D
PIN-44DP
UV-020
UV-035D
UV-035E
UV-035



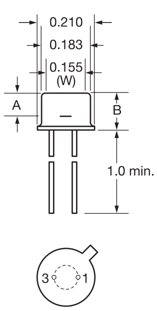
Pin Circle Dia.=0.295



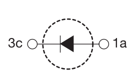
7 TO-18

Products:

PIN-3CD
PIN-3CDP
BPX-65
OSD1-0
OSD1-5T
OSD3-5T
OSD1.2-7Q
OSD1.2-7U



Pin Circle Dia.=0.100



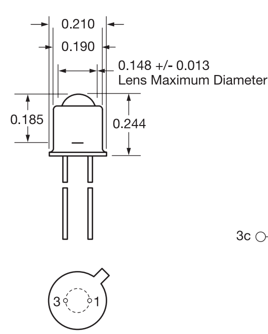
P/N	A	B
PIN-3CD / 3CDP	0.087	0.146
BPX-65	0.075	0.200
OSD-Prefix Devices	0.080	0.200

Quartz Window: OSD1.2-7Q
UV Transmissive Window: OSD1.2-7U

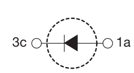
8 TO-18

Products:

PIN-125DPL



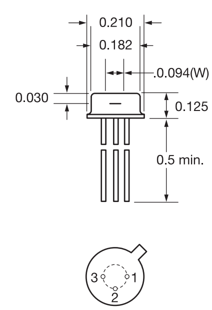
Pin Circle Dia.=0.100



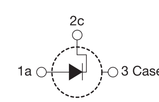
9 TO-18

Products:

PIN-HR005
PIN-HR008
PIN-HR020
PIN-HR026
PIN-HR040



Pin Circle Dia.=0.100

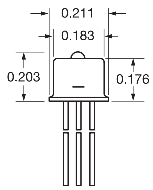


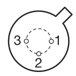
Mechanical Specifications

All units in inches. Pinouts are bottom view.

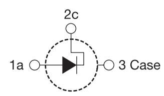
16 TO-18 Lensed Cap

Products:
PIN-HR005L
PIN-HR008L
PIN-HR020L
PIN-HR026L
PIN-HR040L



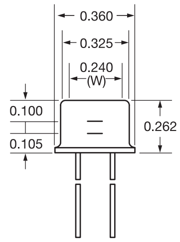


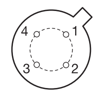
Pin Circle Dia.=0.100



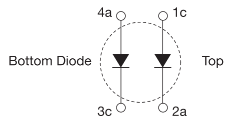
17 TO-5

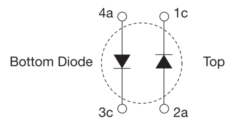
Products:
PIN-DSS
PIN-DSIn





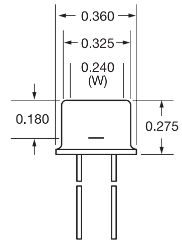
Pin Circle Dia.=0.220

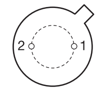




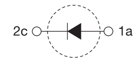
18 TO-5

Products:
PIN-005D-245F



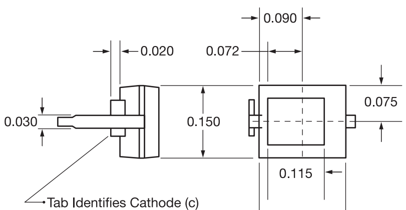


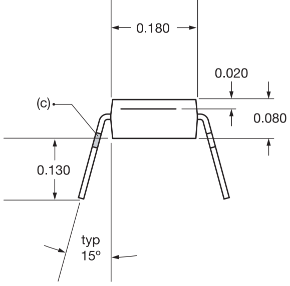
Pin Circle Dia.=0.215



19 Plastic Mold

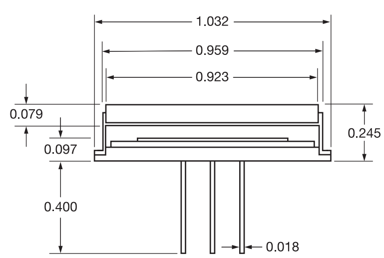
Products:
BPW34
BPW34B

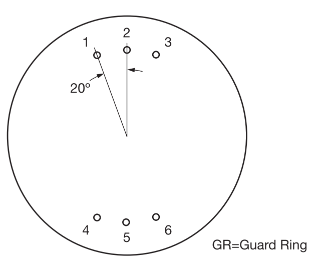




20 Special Metal

Products:
SPOT-15-YAG
SPOT-9-YAG
PIN-100-YAG





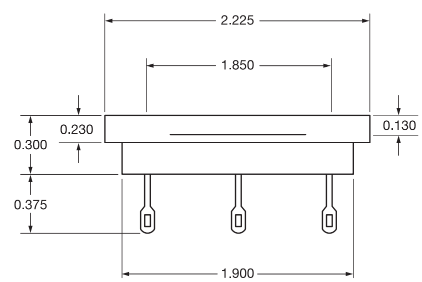
Pin Circle Dia.=0.750

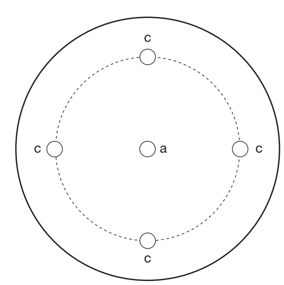
Pinouts

P/N	1	2	3	4	5	6
SPOT-15-YAG	C1	GR	C4	C2	A	C3
SPOT-9-YAG	C1	GR	C4	C2	A	C3
PIN-100-YAG	--	C	--	--	A	--

21 Special Metal

Products:
SC-50D





Pin Circle Dia.=1.110