

# Model 4202

## Quad Pyroelectric Laser Detector for UV/Vis/IR



Manufactured under one or more of the following U.S. patents: 3,839,640 - 4,218,620 - 4,326,663 - 4,384,207 - 4,437,003 - 4,441,023 - 4,523,095

**Model 4202** is a 4 element laser detector with the elements in a quadrant configuration. Lithium tantalate is the pyroelectric sensing material. The elements are heat-sunk to the TO-5 transistor header for rapid heat dissipation. The housing contains an optical filter to limit optical bandwidth. See ELTECdata #101 for filter selection guide.

The Model 4202 is recommended for beam alignment, monitoring beam wander, or for quadrant diagnostics. If each channel's output is terminated in a resistance and the optical radiation input is chopped or pulsed faster than 5 Hz, the voltage output will be approximately

$$R_V = R_i \times Z_{eff}$$

$$(V/W = A/W \times \Omega)$$

where:

$R_V$  = Voltage Responsivity (V/W)  
 $R_i$  = Current Responsivity (A/W)  
 $Z_{eff}$  = Lumped Impedance ( $\Omega$ )

$$Z_{eff} = \frac{R_L}{\sqrt{1 + (R_L C_T \omega)^2}}$$

where:

$R_L$  = Load Resistance  
 $C_T$  = Total Capacitance  
 ( $C_{det.} + C_{stray}$ )  
 $\omega$  = Angular Frequency ( $2\pi f$ )

and:

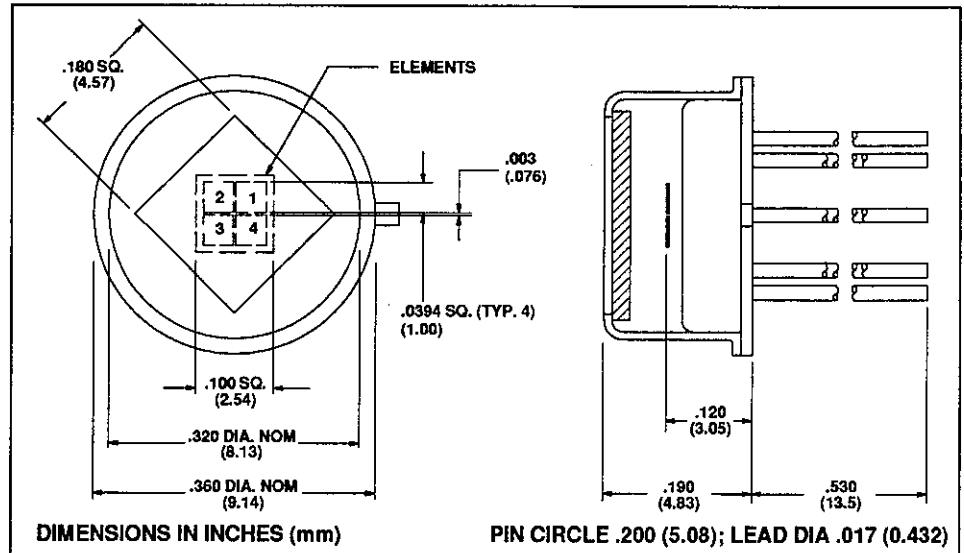
$$\tau_t \gg \tau_e$$

where:

$\tau_t$  = Thermal Time Constant  
 $\tau_e$  = Electrical Time Constant

While the choice of R directly influences the magnitude of the signal, it also determines the ability to follow a pulse. When a pulse is within one percent of the RC time constant, the decay is less than one percent (as per the relation,  $\exp(-t/RC)$  where t is the pulse width).

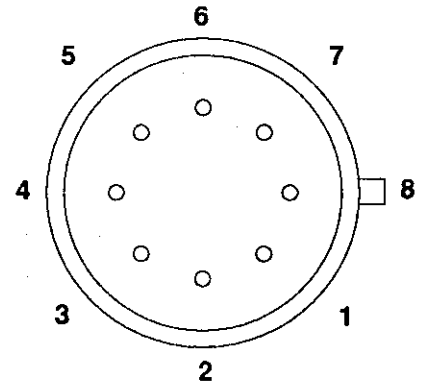
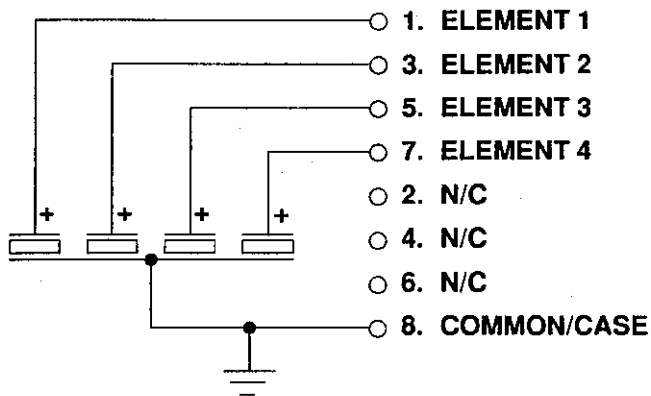
For information on power limits of lithium tantalate laser detectors, see ELTECdata #109.



| Characteristics                         | 4202                | Unit        | Test Conditions                               | ELTECdata Reference |
|-----------------------------------------|---------------------|-------------|-----------------------------------------------|---------------------|
| Detector Type                           | Quad                | —           |                                               |                     |
| Element Size                            | 1.0 x 1.0           | mm          | Nominal                                       |                     |
| Element Spacing                         | 0.076               | mm          |                                               |                     |
| Element Resistance                      | $>5 \times 10^{12}$ | $\Omega$    |                                               |                     |
| Optical Bandwidth                       | .0001 to 1000       | $\mu m$     | Without Filter                                | 101                 |
| Current Responsivity (typ)              | 0.48                | $\mu A/W$   | 10Hz (each element)<br>(8.3 to 14.2 $\mu m$ ) |                     |
| Response Uniformity (typ)               | 16                  | %           |                                               |                     |
| Capacitance (min)                       | 7                   | pF          | Each                                          |                     |
| Capacitance (max)                       | 12                  | pF          | Element                                       |                     |
| Thermal Breakpoint (typ)                | 5                   | Hz          |                                               | 102                 |
| Electrical Time Constant $\tau_e$ (typ) | 475                 | pSec        | $R_L = 50\Omega$                              | 102                 |
| Recommended Operating Temperature       | -55 to +125         | $^{\circ}C$ |                                               |                     |
| Curie Temperature (max)                 | 610                 | $^{\circ}C$ |                                               |                     |
| Storage Temperature                     | -55 to +125         | $^{\circ}C$ |                                               |                     |
| Incident Power Limit                    | 5                   | $W/cm^2$    |                                               |                     |
| Output Polarity                         | + for + Change      |             |                                               |                     |

Characteristics at 25 $^{\circ}C$  with -25 filter, unless otherwise noted.  
 Data established on a sample basis and is believed to be representative.

## Model 4202 Pin Connections



**BOTTOM VIEW (NO SCALE)**

## SAMPLE CIRCUITS (Typical for each channel)

