

# CHARGE SENSITIVE PREAMPLIFIER - DISCRIMINATOR

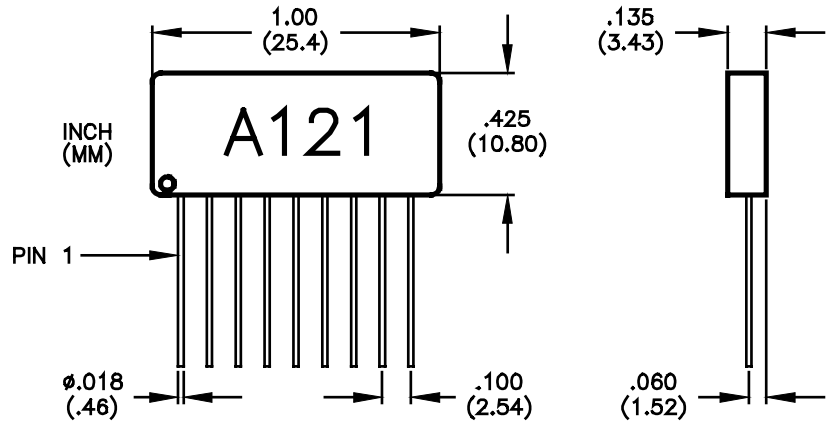
# A121

Model **A121** is a hybrid charge sensitive preamplifier-discriminator designed for use in fast pulse counting mode with microchannel plates, channel electron multipliers, low gain photomultiplier tubes, proportional counters and solid state detectors.

## FEATURES:

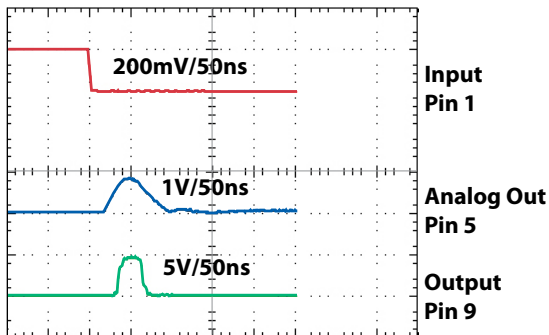
- Sensitivity:  $5 \times 10^4$  electrons (Voltage Adjustable)
- Frequency: 12MHz periodic
- Analog monitor output
- Output Pulse: 35 ns minimum (Adjustable)
- $V_s = +4$  to  $+7$  VDC (20 mW)
- Input Noise:  $15 \times 10^{-16}$  coulombs RMS; 9,650 e<sup>-</sup> RMS; 19% of threshold
- Noise Slope:  $1.8 \times 10^{-17}$  coulombs RMS/pF

## A121 DIMENSIONS



## A121 RESPONSE

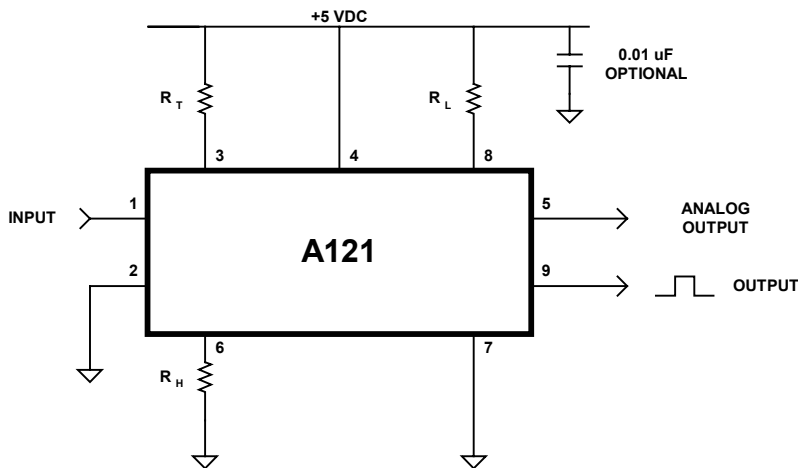
STEP INPUT THROUGH 2 pF TEST CAPACITOR



AT THRESHOLD:

- Input Test = 4 mV, through 2 pF
- $Q = CV = (2 \text{ pF})(4 \text{ mV}) = 8 \text{ fC} = 5 \times 10^4$  electrons
- Analog Output (Pin 5) Sensitivity: 120 mV (15 V/pC)
- Analog Output Risettime: 10 ns
- Output (Pin 9): 5 V; 50 ns wide

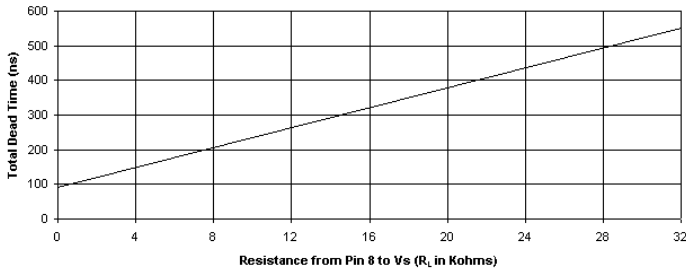
## A121 PIN CONFIGURATION



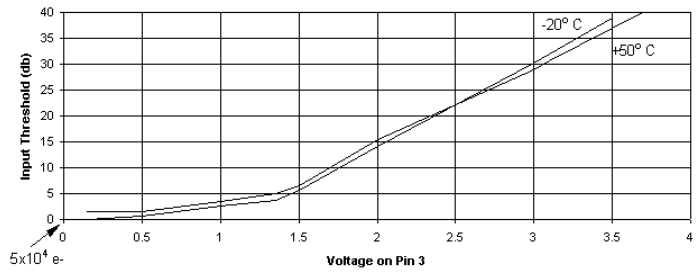
- Pin 1 Input
- Pin 2 Ground and case
- Pin 3 Threshold Adjust ( $5k \text{ ohms} < R_T$ ; open for maximum sensitivity)
- Pin 4  $V_s$  (+5 to +7 VDC MAX.)
- Pin 5 Analog Monitor
- Pin 6 Pulse Width Adjustment ( $R_H < 30K \text{ ohms}$ )  
 $R_H = 0$  For Minimum Pulse Width of 35 ns, see Figure C
- Pin 7 Ground and Case
- Pin 8 Deadtime Adjustment ( $R_L < 30K \text{ ohms}$ )  
 $R_L = 0$  For Minimum Deadtime of 80 ns, see Figure A
- Pin 9 Output

**Figure A**

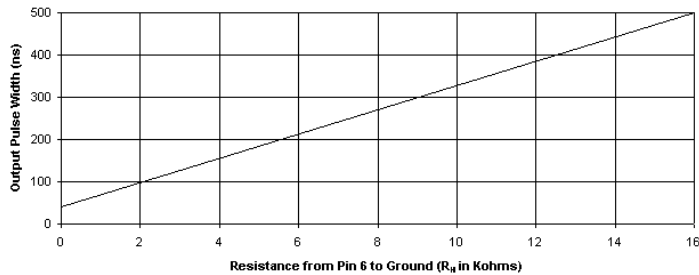
A121 Typical Total Dead Time As A Function Of Resistance  
From Pin 8 to +5 Volts DC

**Figure B**

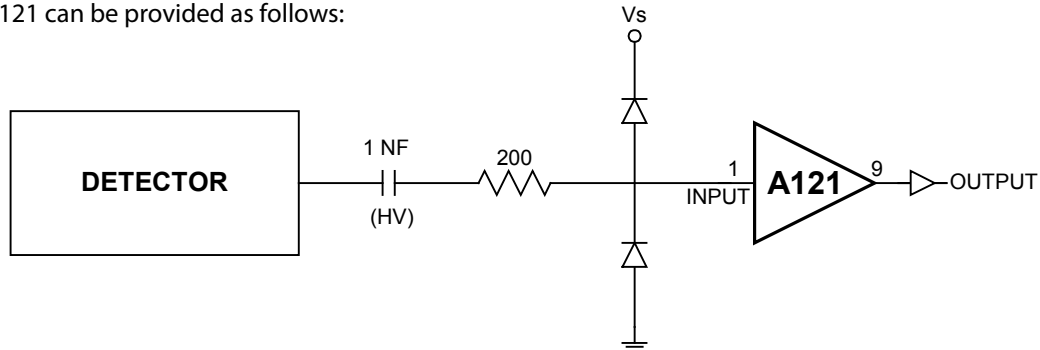
A121 Input Threshold Vs. Control Voltage on Pin 3  
(at +50° C and -20° C)

**Figure C**

A121 Typical Output Pulse Width  
Vs. Resistance to Ground from Pin 6

**NOTES ON A121****1. PIN 1, INPUT**

Pin 1 has a DC level of 1.2 volts. This DC level should not be changed by external circuitry. Pin 1 should be AC coupled to the detector. The High Voltage coupling capacitor should have adequate voltage rating in order to prevent breakdown which could damage the A121.

**2. Protection to the A121 can be provided as follows:****3. PIN 3, THRESHOLD ADJUST**

Threshold to the A121 can be changed remotely by changing the voltage level on Pin 3. A resistor from Pin 3 to Vs can be added in order to raise the threshold on the A121. The impedance at Pin 3 is about 10k ohms. (See Figure B)

**4. PIN 5, ANALOG MONITOR**

Pin 5 provides a positive analog pulse output from the preamplifier section just prior to the discriminator with a rise time of about 10 ns. At maximum sensitivity (Pin 3 = 0 volts) the amplitude of this pulse is proportional to the input charge,  $A = 15 \text{ V/pC}$ . At threshold this will correspond to a 120 mV pulse. If a voltage is present on Pin 3, the size of the analog pulse will be divided by the same threshold attenuation factor the voltage produced. Example: If 1.3 volts is present on Pin 3 (6 dB attenuation is a factor of 2), the size of the analog pulse will be 60 mV. This output must be capacitively coupled to external circuitry and can be used to monitor detector gain variations by performing pulse height analysis.

**5. PIN 9, OUTPUT**

The final output stage of the A121 is produced from a 74AC00 gate with a 200 ohm series resistor.

