**DATA SHEET**

**DN620**

## LOW NOISE CHARGE SENSITIVE PREAMPLIFIER

The DN620 is a low noise Charge Sensitive Inverting Preamplifier for use with detectors with capacitance from less than one to several thousand picofarads. This includes detectors such as photodiodes, pyroelectric devices photomultipliers, as well as other sensors that give up charge when stimulated.

Housed in a TO-99 Package, the input stage of this hybrid circuit amplifier is a low noise Junction FET. A 1 pF capacitor in parallel with a 1,000 MΩ resistor provides internal feedback which gives the amplifier an initial sensitivity of one volt output per picocoulomb of input charge. The gain and frequency response of the amplifier can be modified by adding external feedback components. The internal feedback components can also be factory selected to meet a customer's specific needs.

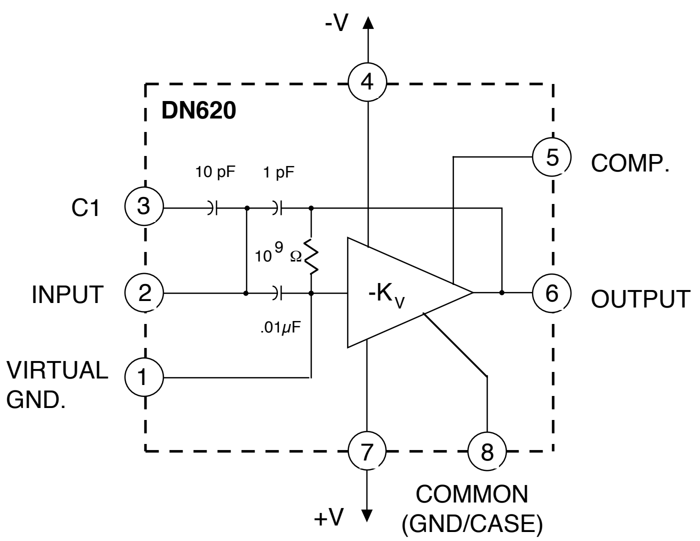
## FEATURES

- **Low Noise**
- **Internal Gain Set Components**
- **< 20 Nano Second Rise Time**
- **External Frequency Compensation Adjustment**

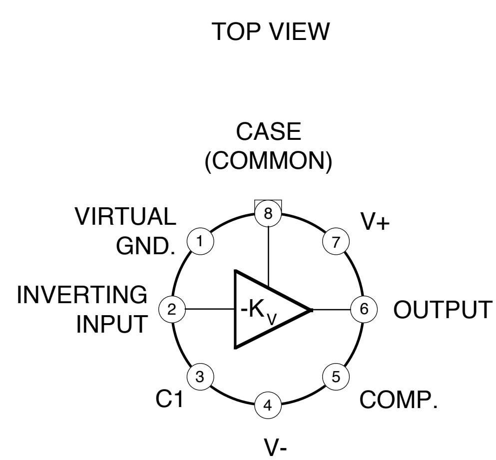
## APPLICATIONS

- **Piezoelectric Amplifiers**
- **Electrometer Amplifier**
- **Solid State Photo Detectors**
- **Capacitive Microphone Amplifier**
- **Nuclear Monitoring**
- **Pyroelectric Detectors**
- **Hydrophones**
- **Ultrasonic Transducers**

### SIMPLIFIED SCHEMATIC DIAGRAM




### PIN CONFIGURATION




T0-99 METAL PACKAGE

## ABSOLUTE MAXIMUM RATINGS

Supply Voltage..............................................................±12V
Internal Power Dissipation........................................500mW
Storage Temperature....................................-65°C to +150°C
Operating Temperature................................-25°C to +85°C
Lead Temperature (Soldering, 10sec).........................300°C

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C UNLESS OTHERWISE SPECIFIED, $V_{SUPPLY}$ = ±9V)

| SYMBOL | CHARACTERISTIC | TEST CONDITIONS | DN620 | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| $G_{vc}$ | Electron charge Input to Output Voltage Gain (Measured in Volts per pico Coulomb) | See Fig. 1 $C_{fb}$ = 1.0pF | 0.8 | 1.0 | | V/pC |
| $R_{fb}$ | Feed Back Resistor | | | 1,000 | | MΩ |
| $C_{fb}$ | Internal Feed Back Capacitor C1 | | 0.8 | 1.0 | 1.2 | pF |
| C2 | Internal Capacitor C2 | | 8 | 10.0 | 12 | pF |
| $V_O$ | D.C. Output Voltage ( No input signal is present) | | -2.0 | -1.0 | 0 | Vdc |
| $V_O$ (p-p) | Maximum Peak to Peak Output Voltage ( f in = 100KHz) R load 100,000Ω in parallel with 10pF | | 8 | 10 | | $V_{p-p}$ |
| $t_r$ | Output Voltage Rise Time | See Fig. 1 C = 1.0pF | 20 | | | nSec |
| $t_f$ | Output Voltage Fall Time | See Fig. 1 C = 1.0pF | 50 | | | nSec |
| $K_v$ | Open Loop Voltage Gain | | 70 | | | dB |
| $e_n$ | Equivalent Input Noise voltage | See Fig. 2 | | | | |

**GAIN OF 10 INVERTING VOLTAGE AMPLIFIER**

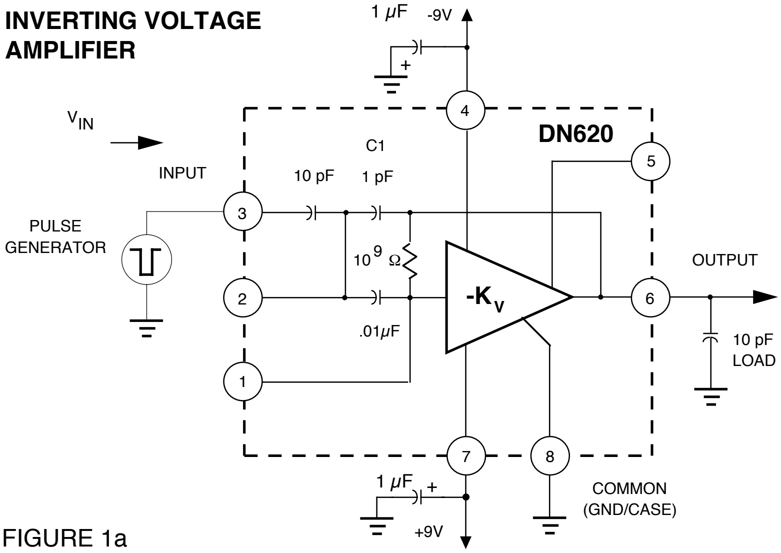



FIGURE 1a

**TYPICAL RISE AND FALL TIMES FOR THE AMPLIFIER SHOWN IN FIGURE 1a**

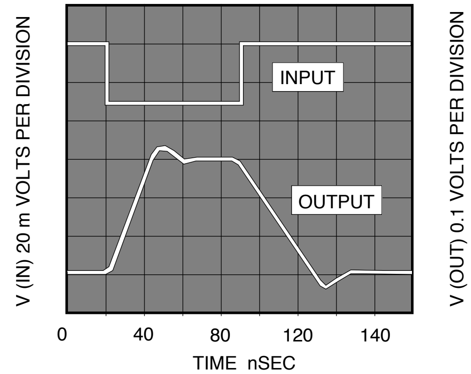



FIGURE 1b

**EQUIVALENT INPUT NOISE VOLTAGE MEASUREMENT CIRCUIT**

**WIDEBAND VOLTAGE NOISE, DC TO 20 KHz**

V (IN) 5µV/DIVISION

0.5 ms/DIV

FIGURE 2b

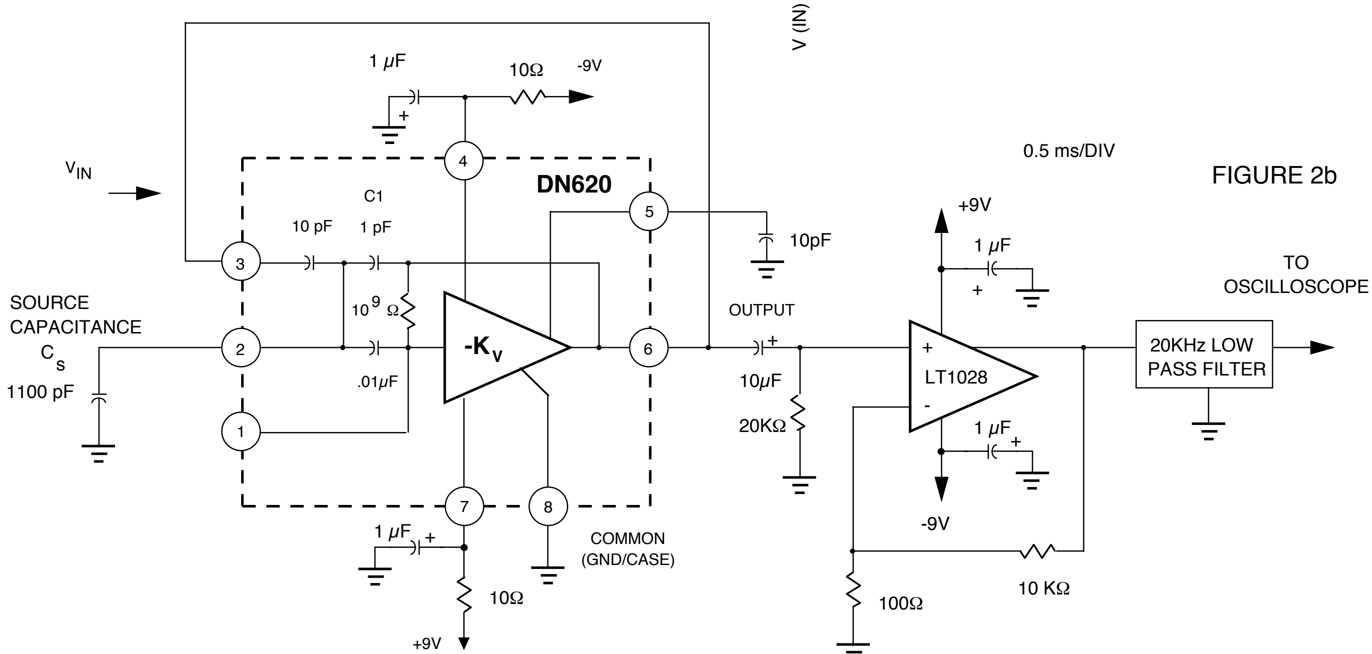



FIGURE 2a

FIRST STAGE
GAIN = 100

SECOND STAGE
GAIN = 100

**PYROELECTRIC DETECTOR AMPLIFIER**

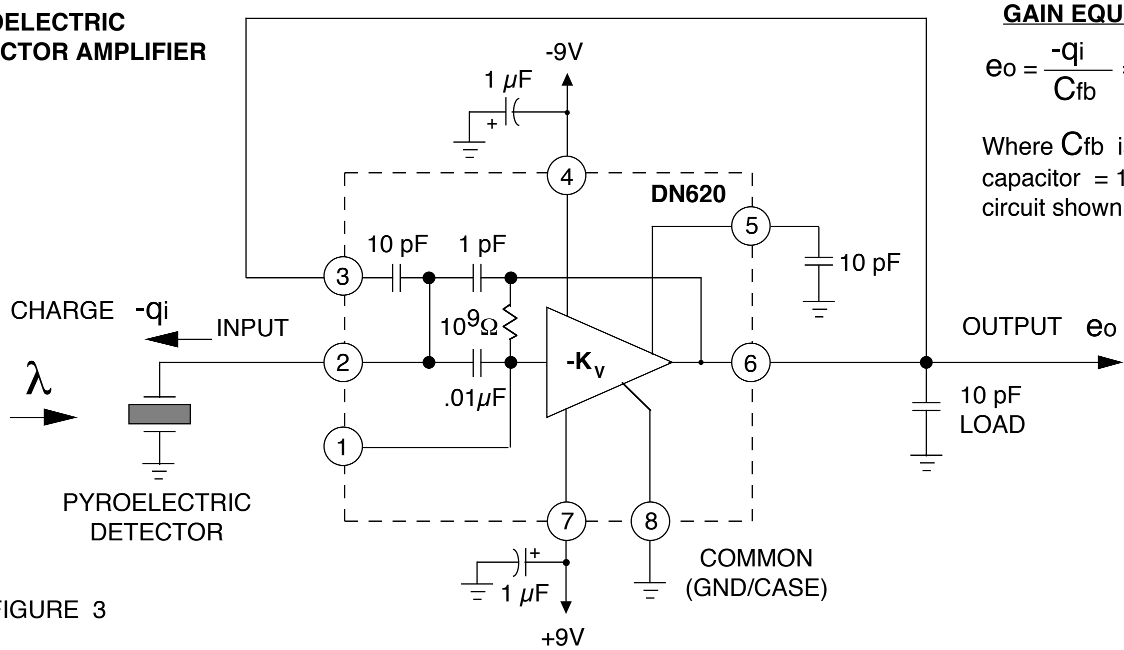


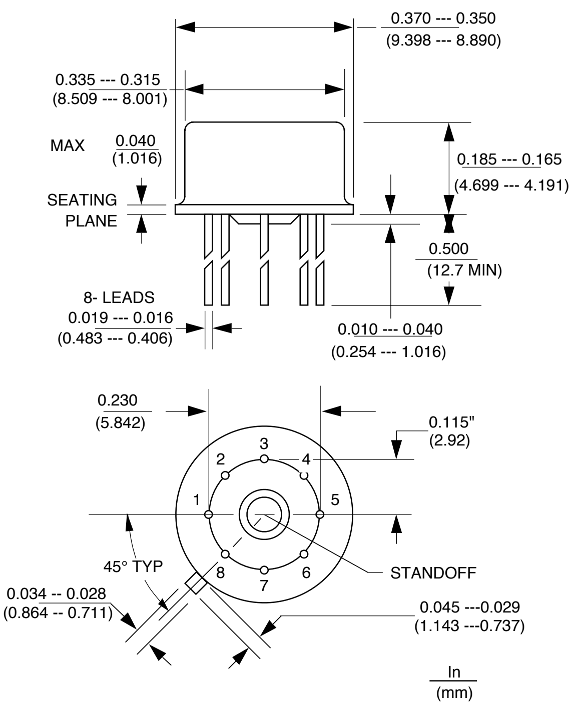

FIGURE 3

**GAIN EQUATION**

$$e_o = \frac{-q_i}{C_{fb}} = 90 \text{ mV/ pC}$$

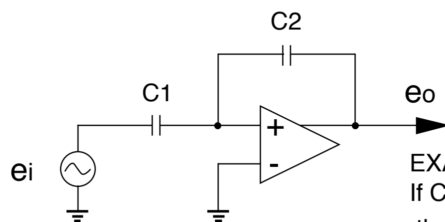
Where $C_{fb}$ is the feedback capacitor = 11pF in the circuit shown.

**PACKAGE DEMENSIONS**




**TO-99 TY**

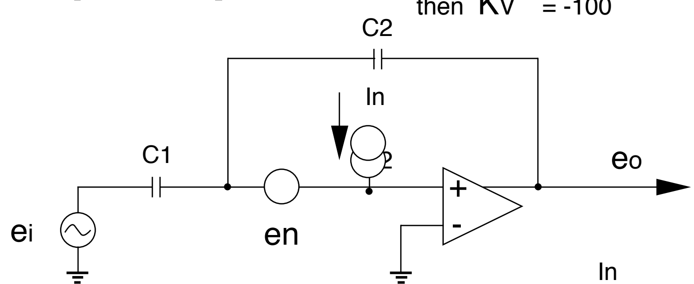
GAIN EQUATIONS FOR A TRANSCONDUCTANCE AMPLIFIER WITH CAPACITIVE INPUT AND FEEDBACK ELEMENTS.




VOLTAGE GAIN

$$K_V = -\frac{e_o}{e_i} = -\frac{C1}{C2}$$

EXAMPLE:
If C1 = 10 pF and C2 = 1,000 pF
then $K_V$ = -100




$$e_{oi} = -\frac{In}{2\pi f C_2}$$

Note that the larger the detector capacitance C1 the larger the output voltage due to the equivlent amplifer input noise voltage en.

$e_{oi}$ this is the output noise of the amplifier due to noise current (en = 0).

$$e_{oe} = -\ e_n \left\{1 + C1/C2\right\}$$

$e_{oe}$ is the output noise of the amplifier due to noise voltage. (In = 0 )

1004 Mallory Way, Carson City, NV 89701 • Ph (775) 882-7721 • Fax (775) 882-7675 • http://www.thermoptics.com