



## Miniature Amplifier PCB

### Applications

Facilitates fast R&D startup time that can be integrated into your prototypes or final system design.

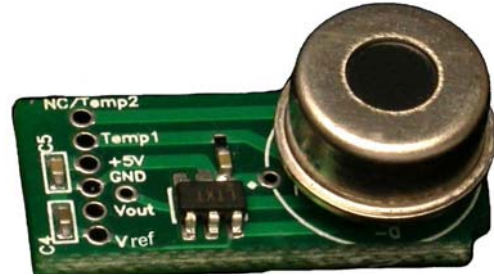
- Non-contact Temperature measurement
- Gas analysis
- Multiplexing of a number of thermopiles
- Reduction of noise on long cables

### General Description

Available in three amplifier gains: 300, 500 and 1,000, this PCB includes a LM20 temperature sensor and 1.25V voltage reference. Although sized for single channel TO-5 packages, this amplifier is electrically compatible with all Dexter Research Center detectors, providing convenient buffering and pre-amplification of thermopile signal. The amplifier circuit board is impressively small (0.35" x 0.85") and is designed around the AD8628 amplifier with ultra low offset ( $<1\mu\text{V}$ ), low drift ( $<0.005\mu\text{V}/^\circ\text{C}$ ), and low bias current (100pA). The Mini Amp will operate on a 2.7V to 5.5V single supply, is chopper stabilized and has greatly reduced digital switching noise ( $0.5\mu\text{V}_{\text{p-p}}$  from 0Hz to 10Hz, input referred).

The LM20 temperature sensor (National Semiconductor) has precision analog output. The transfer function of LM20 is predominantly linear, yet has slight predictable parabolic curvature. The accuracy of the LM20 when specified to a parabolic transfer function is  $1.5^\circ\text{C}$  at room temperature. There is an option to connect any two terminal temperature sensor in place of LM20, for example a thermistor.

The LT1790 low drop out voltage reference combines high accuracy (0.05%) and low drift (10ppm/ $^\circ\text{C}$ ). The voltage reference has operational temperature range from  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ . The board may be used with an external voltage reference as well.

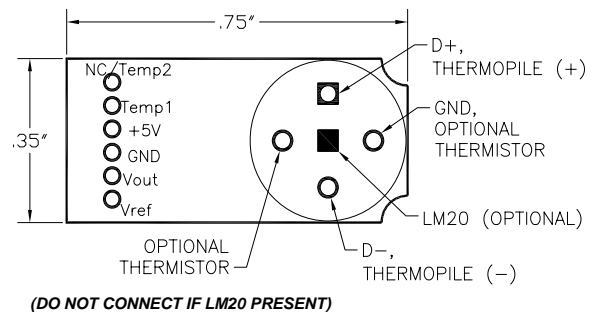


Miniature Amplifier PCB w/ optional ST60 (shown 3x actual size)

### Highlights

- Auto-zeroing operational amplifier on-board
- Several standard gain options available
- Low noise
- Temperature sensor on board
- Single power supply (2.7V – 5.5V)
- Low Power (1mA @ 5V)
- Voltage reference on board

### PCB Configuration



### Top View

### Absolute Maximum Ratings

$V_s$ to GND:.....	6V
Lead temperature soldering, 60 sec max:.....	$300^\circ\text{C}$
Storage temperature:.....	$-65^\circ\text{C}$ to $85^\circ\text{C}$
Operating temperature:.....	$-40^\circ\text{C}$ to $+85^\circ\text{C}$



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### Typical Operating Characteristics

<b>Technical Specifications:</b> Specifications apply at 23°C						
Parameter	Min.	Typ.	Max.	Symbol	Units	Comments
Supply Voltage	2.7		5.5	V <sub>s</sub>	V	Single supply
Supply Current		1	1.2	I <sub>IN</sub>	mA	
Amplifier Gain	1		1000	A <sub>v</sub>	V/V	PCB available with standard gains of 300, 500, or 1,000
Bandwidth (-3dB)	DC to 15.9				Hz	For preset gain of 300, 500, or 1,000
Noise		0.5			μV	p-p from 0Hz to 10Hz
Offset			1		μV	
Drift			<.12		μV/°C	Below our measurement capability
LM20 Accuracy	1.5		5		°C	Min at 30°C; Max. at operating extremes (-55°C & 130°C)
LM20 Transfer Function	-11.77mV /°C x T + 1.86V			V <sub>T</sub>	V	To give best accuracy, the LM20 must be calibrated

### Pricing

QTY	1	10	50	100	500	>1000
Miniature Amplifier PCB w/o Detector Purchase	\$69	\$60	\$43	\$34	\$27	\$22
Miniature Amplifier PCB when purchased with any DRC Detector	\$65	\$55	\$39	\$30	\$24	\$20
DX-0438: ST60R, 5μm LWP Si, N2 when purchased with amplifier	\$16.50	\$12.60	\$7.50	\$5.80	call	call

### Part Number Selection

PCB P/N	GAIN	w/ LM20*
AM-0001	1000	No
AM-0002	1000	Yes
AM-0003	500	No
AM-0004	500	Yes
AM-0005	300	No
AM-0006	300	Yes

Please specify with or without LM20 and select gain of 300, 500, or 1,000 when ordering.

Pricing independent of LM20 option and standard gain selection. Lead-time 1-2 weeks.

\* If a thermistor is to be attached to the Amplifier PCB, then the LM20 can't be mounted on the PCB

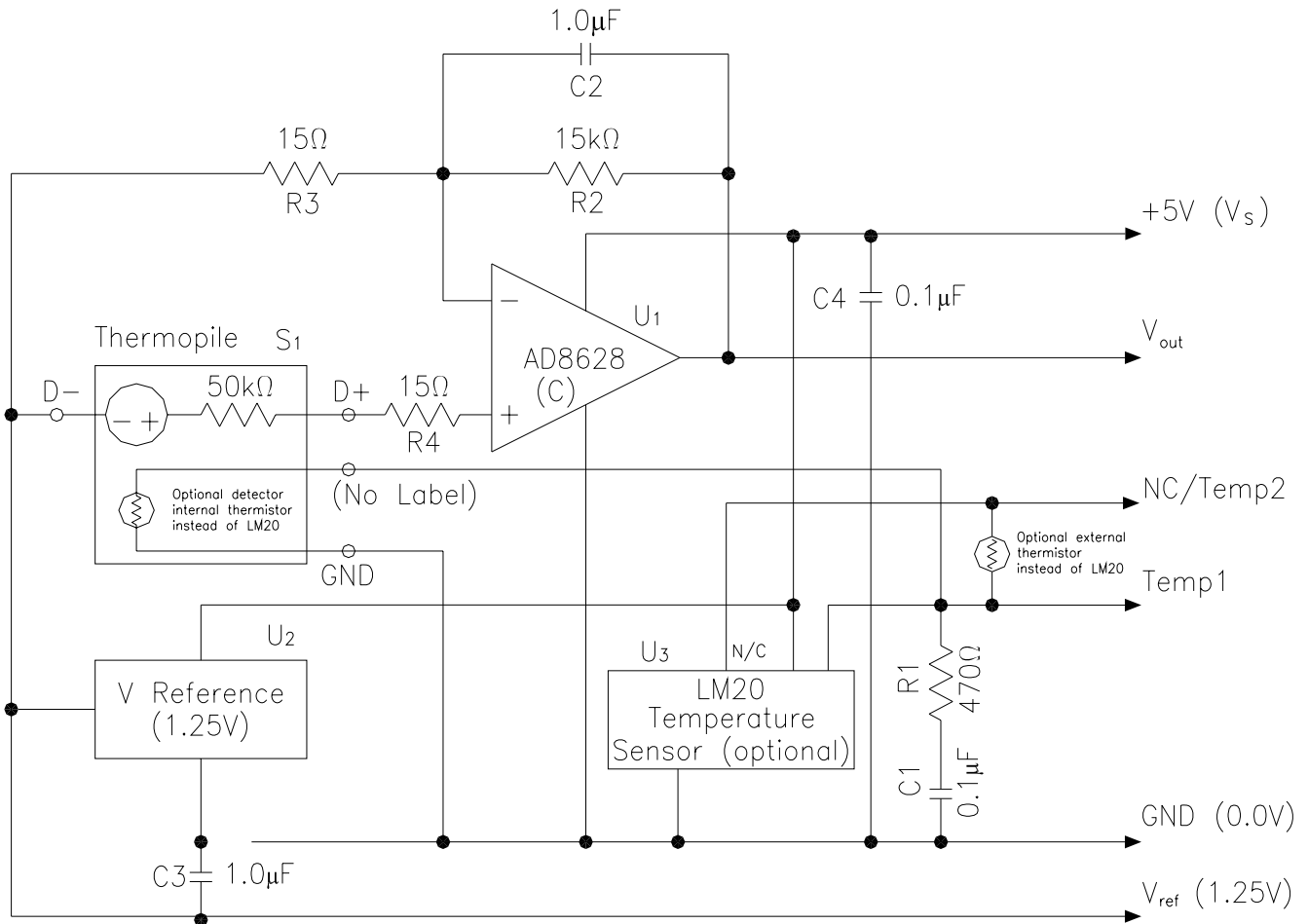


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### Typical Application

The diagram in Figure 1 shows the schematic of the ST60 detector connected to the board. The schematic has four main sections: S<sub>1</sub>: thermopile detector, U<sub>1</sub>: amplifier, U<sub>2</sub>: voltage reference, and U<sub>3</sub>: LM20 temperature sensor.

Figure 1. Amplifier schematic with gain of 1000



#### Amplified detector output Voltage range

Between  $V_{out}$  and GND: 0 to  $V_S$  (when detector package is at thermal equilibrium with target, zero volts detector output will produce 1.25V PCB output)

Between  $V_{out}$  and  $V_{ref}$ : Minimum output:  $-1.25V$ , Maximum output:  $V_S - 1.25V$  (when detector package is at thermal equilibrium with target, zero volts detector output will produce 0.0V PCB output)

Detector Mounting Notes: Use Thermal Epoxy or Thermally Conductive Paste between top of LM20 and detector header