



# HIGH EFFICIENCY TEC CONTROLLER

**Main features:** high efficiency and high power density, high precision, and zero EMI.

## Specifications

Target* temp. stability v.s. ambient temp.:	0.002°C/°C
Target temp. offset:	±0.01°C
Target temp. response time:	to ≤0.1°C in less than 5 seconds at 1°C step
Efficiency:	≥90%
Max. output current:	4A
Max. output voltage:	externally adjustable from 0V to Vps – 0.2V
Power supply voltage:	3.1V to 3.5V or 4.75V to 5.25V (specify 3.3V or 5V when ordering)
Set-point temp.** control voltage:	0 to Vps
Packaging:	through hole
Shielding:	complete metal shielding on all 6 sides
Default set-point temp. range***:	15°C to 37°C @ Vps = 3.3V 15°C to 50°C @ Vps = 5V
Operating ambient temp. range:	-25°C to 85°C

\* Target temperature refers to the actual cold side temperature of the TEC, on where the target is mounted.

\*\* Set-point temperature is the temperature desired to have on the target.

\*\*\* Can be customized to any range by requirement.

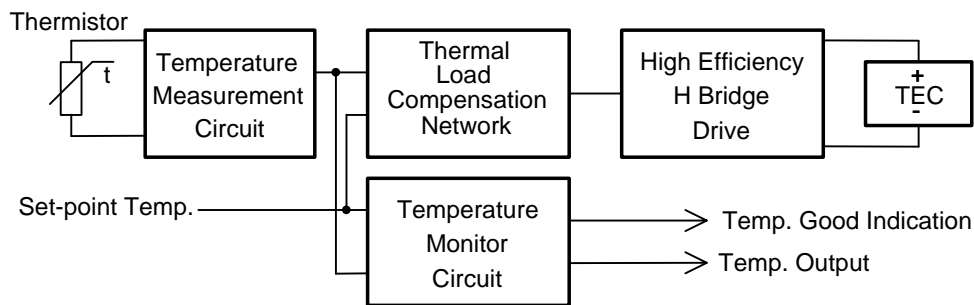


Figure 1 TEC Controller Block Diagram

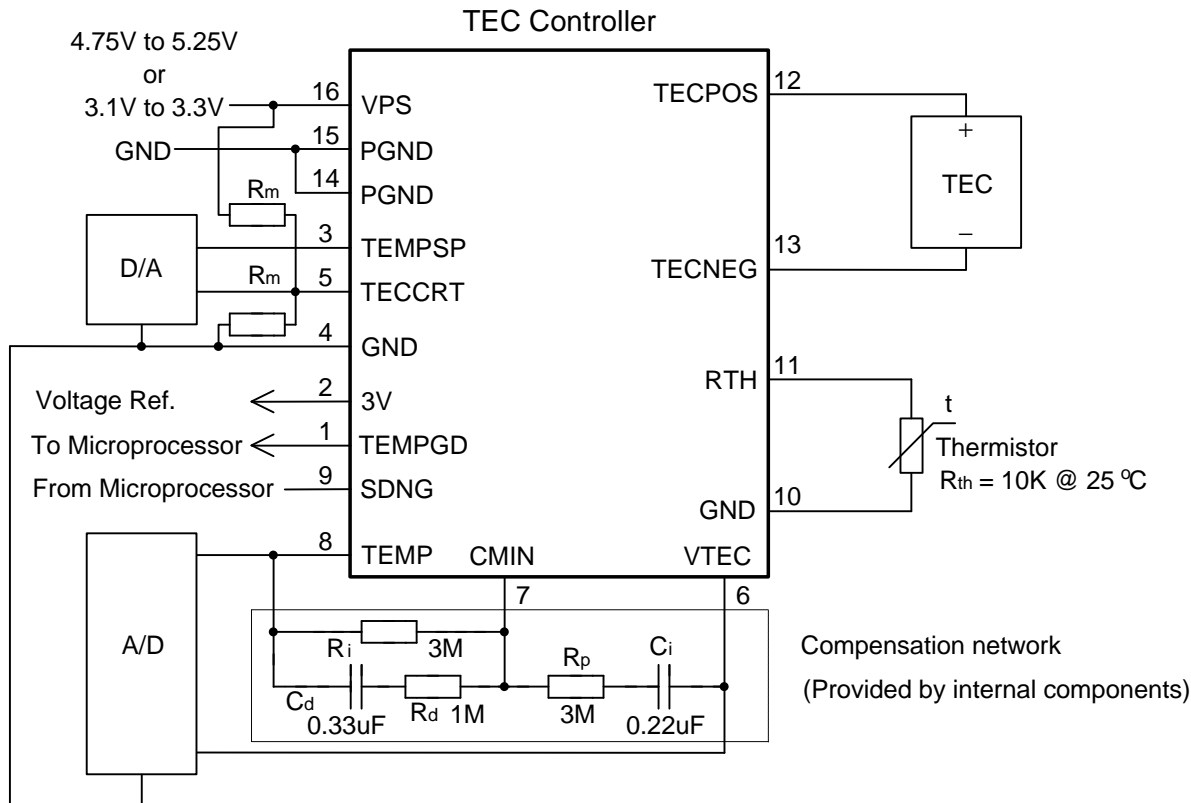


Figure 2 TEC Controller Connections

### Pin Descriptions

**Pin 1, TEMPGD**, Temperature good indication. It is pulled high when the set-point temperature and the actual target temperature are less than 0.1°C in difference. The internal pull up resistor to Vps is 10K Ohm. The pull down resistance is 250 Ohm @ Vps = 5V and 330 Ohm @ Vps = 3.3V.

**Pin 2, 3V**, reference voltage output, 3V. It can be used for external A/D's and/or D/A's. Maximum output sourcing current 1.5mA and sinking current is 4mA.  $\Delta V_o = 50\text{ppm}/^\circ\text{C}$  max.

**Pin 3, TEMPSP**, target temperature set-point value. The open circuit voltage is 1.5V, corresponding to a set-point temperature of 25°C. When Vps = 5V, it can be set from 0V to 5V and the set-point temperature changes from 15°C to 50°C (See the curve in the back). The input impedance is 10KΩ. When Vps = 3.3V, the max. TEMPSP can be set to 3.3V, corresponding to 37°C. This pin can be set by using a D/A, a POT, or a single resistor. When the set-point temp. is fixed at 25°C, leave this pin unconnected.

**Pin 4, GND**, signal ground for the A/D, D/A and the thermistor.

**Pin 5, TECCRT**, TEC control voltage input. It can be left unconnected or used to control the TEC voltage directly. Set TECCRT between 0V to Vps, the voltage across TEC will be:

TEC voltage =  $V_{ps} - 2 \cdot \text{TECCRT}$ . It can also be used to configure the maximum voltage cross the TEC: Max. TEC voltage =  $V_{ps} \cdot R_m / (R_m + 10K)$ , where Rm is the resistance of the two resistors one between TECCRT to GND and the other between TECCRT to Vps, see Figure 2.



**Pin 6, VTEC**, TEC voltage indication. TEC voltage = [max. TEC voltage]\*[Vps – 2\*VTEC]/Vps. When TECRT is used to control the TEC voltage directly, measure TECRT to derive the TEC voltage instead, and use this formula: TEC voltage = Vps – 2\*TECRT. The maximum driving current of pin VTEC is 30mA and the output voltage swing is 0V to Vps.

**Pin 7, CMIN**, compensation input pin for the thermal loop control. Leave it open in production. When prototyping, use this pin with a tuner on the evaluation board (produced by ATI) to tune the compensation network to match the characteristics of the thermal load.

**Pin 8, TEMP**, actual target temperature. It swings from 0V to Vps, corresponds to 15°C to 37°C when Vps is 3.3V and 15°C to 50°C when Vps equals 5V, see the curve in the below.

**Pin 9, SDNG**, shut down control. When pulled low, it shuts down the controller. Leave it open or pull it high to activate the controller. This pin is internal pull up by a resistor of 100K to Vps.

**Pin 10, GND**, signal ground, internally connected to Pin 4 GND. Can be used for connecting the thermistor.

**Pin 11, RTH**, connect to the thermistor for sensing the target temp. Thermistor's other end connects to the signal ground, pin 4 or pin 10. Rth = 10KΩ @ 25°C. Other thermistors or temperature sensors can also be used, Consult with us.

**Pin 12, TECPOS**, connects to TEC positive terminal.

**Pin 13, TECNEG**, connects to TEC negative terminal.

**Pin 14, PGND**, power ground for connecting to the power supply.

**Pin 15, PGND**, power ground for connecting to the power supply, internally connected with pin 14.

**Pin 16, VPS**, positive power supply rail. Two possible values: 3.3V and 5V, depending on the module.

### Customizations

It is often found that some of the default specifications do not meet our users particular need. We offer customizations on these specifications:

1. Maximum TEC voltage. When ordering, the part number will become:  
TEC-4A-5V-(max. TEC voltage). E.g., TEC-4A-5V-4V.
2. Set-point temperature range. When ordering, specify the lower limit, the upper limit, and the open circuit temperature. The part number will become:  
TEC-4 A-5V-4V-(lower temp. limit)/(upper temp. limit)/(open circuit temp.),  
where lower temp. limit is the temperature corresponding to **TEMPSP** = 0V; upper temp. limit is the corresponding to **TEMPSP** = 3V; open circuit temp. corresponding to **TEMPSP** = 1.5V or being left unconnected. E.g., TEC-4A-5V-4V-20/80/60.

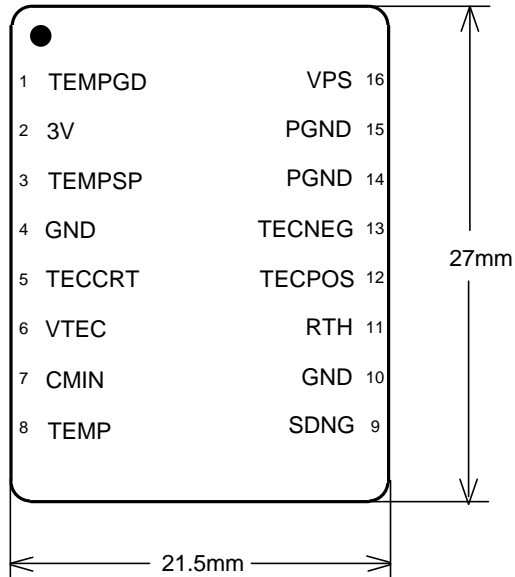


Figure 3 Top View of TEC-4A

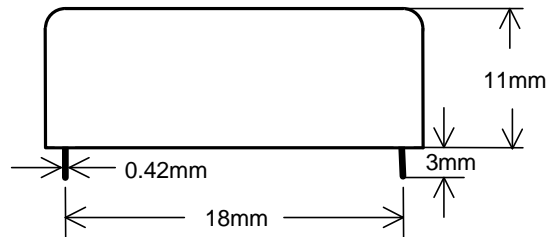


Figure 4 End View of TEC-4A

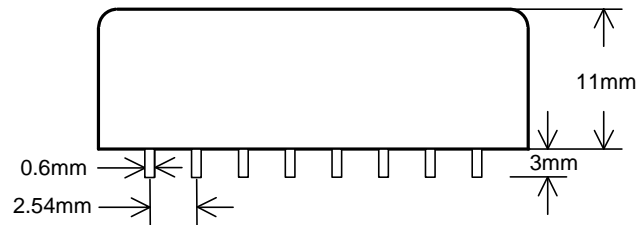


Figure 5 Side View of TEC-4A



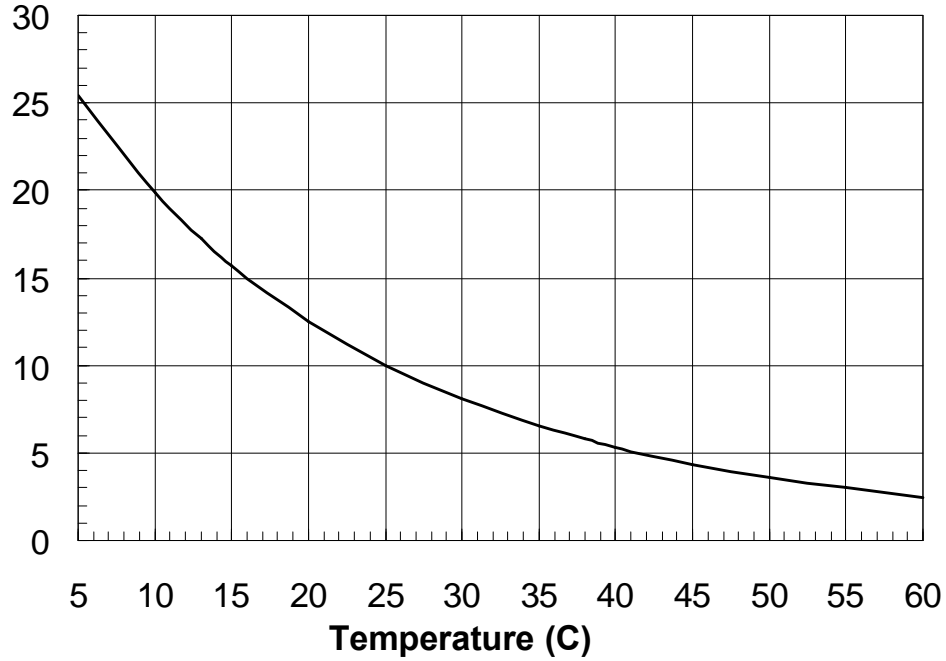
Ordering Guide

Part Number	Description	Note
TEC-4A-5V-XX	5V power supply in DIP package.	Max. TEC voltage can be selected from 4.8V, 4V, 3.5V, 3V, 2.5V and 2V or required one
TEC-4A-3V-XX	3.3V power supply in DIP package.	Max. TEC voltage can be selected from 2.5V and 2V or required one



Rth v.s. Temperature

Rth (K Ohm)



TEMPSP v.s. Temperature

TEMPSP (V)

