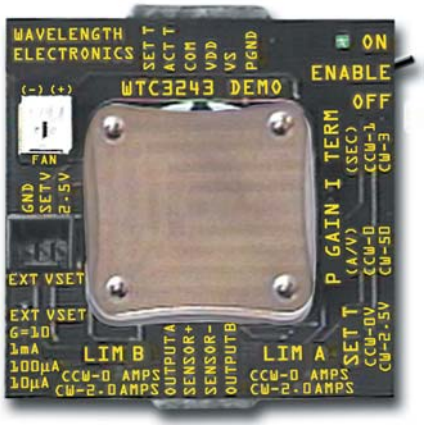
WAVELENGTH ELECTRONICS

WTC3293

WTC3243 Thermoelectric Temperature Controller Demo Board



WTC3243 NOT INCLUDED

GENERAL DESCRIPTION:

Quickly interface a WTC3243 temperature controller to your thermoelectric or resistive heater load without having to design a printed circuit board. Connect a WTC3243 thermoelectric Temperature Controller to the easy-to-configure demo board to control temperature using thermistors, 100 Ω Platinum RTDs, or linear temperature sensors such as the LM335 by National Semiconductor or the AD590 by Analog Devices. Adjust temperature using the onboard trimpot or use the external VSET connector to adjust the setpoint temperature using a remote potentiometer or voltage source. Other adjustable trimpots configure heat and cool current limits, proportional gain, and integrator time constant. A five-position dipswitch allows the sensor bias current and sensor gain to be optimized for your sensor type. The removable input cable sets allows easy connection to your power supply and monitoring equipment while the output cable set quickly connects to your thermal load and temperature sensor. High power applications can use the onboard fan connector to power a WXC303 or WXC304 (+5 or +12 V) dc fan attached to a WHS302 heatsink.

FEATURES:

- Controls temperature using thermistors and 100 Ω Platinum RTDs, LM335 and AD590 type temperature sensors
- Adjustable Heat and Cool Current Limits
- Adjustable Proportional Gain (10 to 75 A/V)
- Adjustable Integrator Time Constant (1 to 3 Seconds)
- Selectable Sensor Bias (10 µA, 100 µA, and 1 mA)
- Selectable Sensor Gain (1 or 10)
- Enable/Disable Switch and LED
- Includes Input/Output Cable Set
- Includes a Fan Connector
- Easily connects to an external control potentiometer or voltage source

Figure 1
Top View

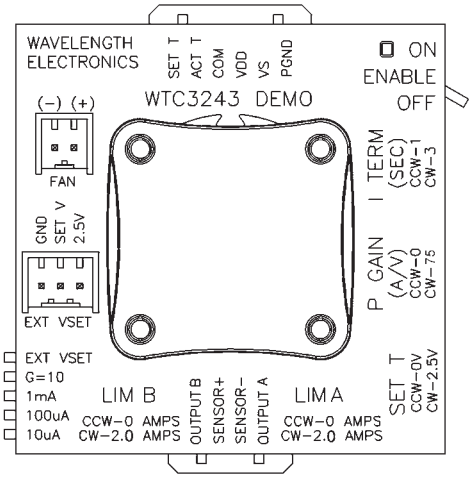


Figure 2
WTC3293 Schematic

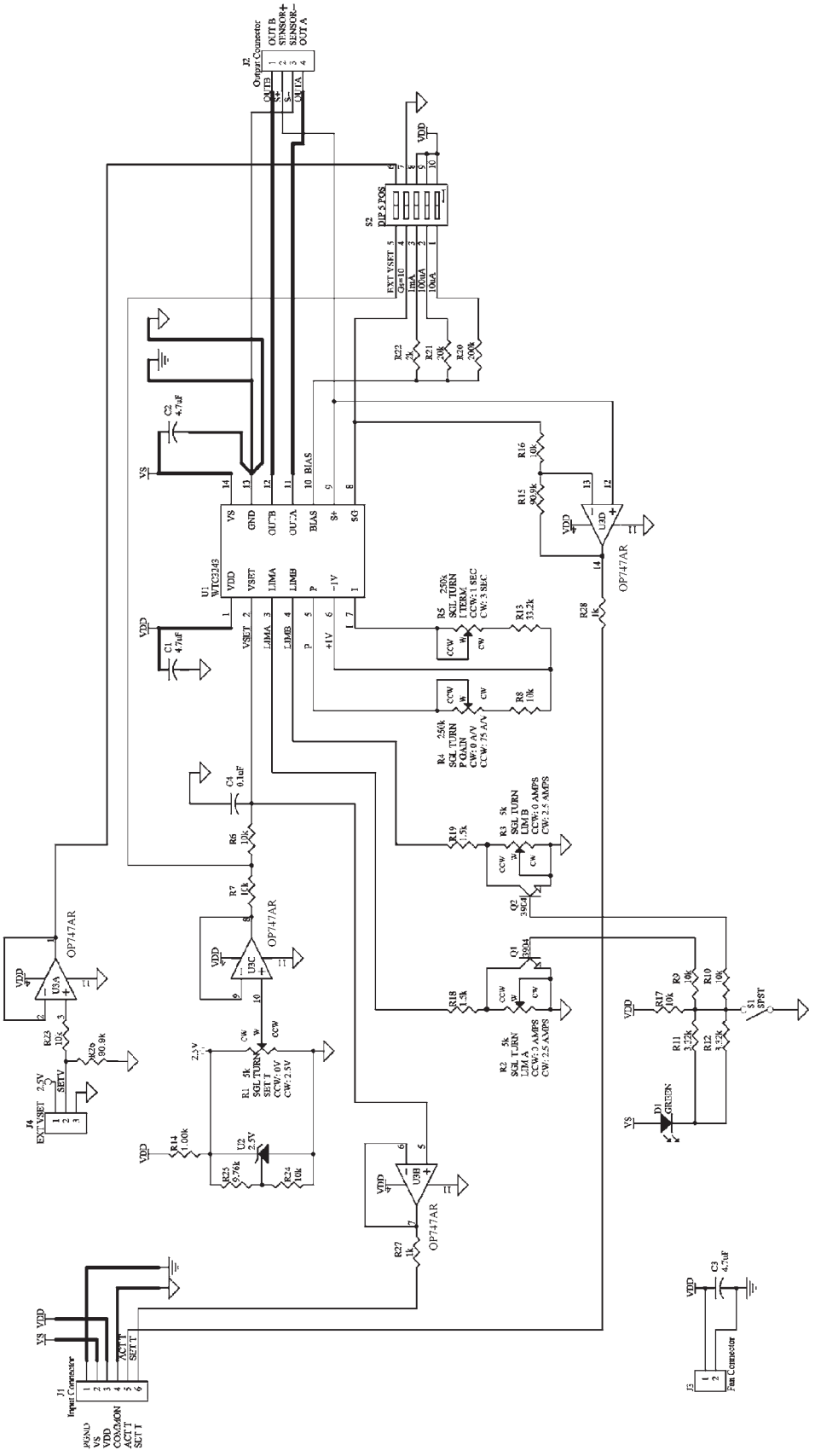
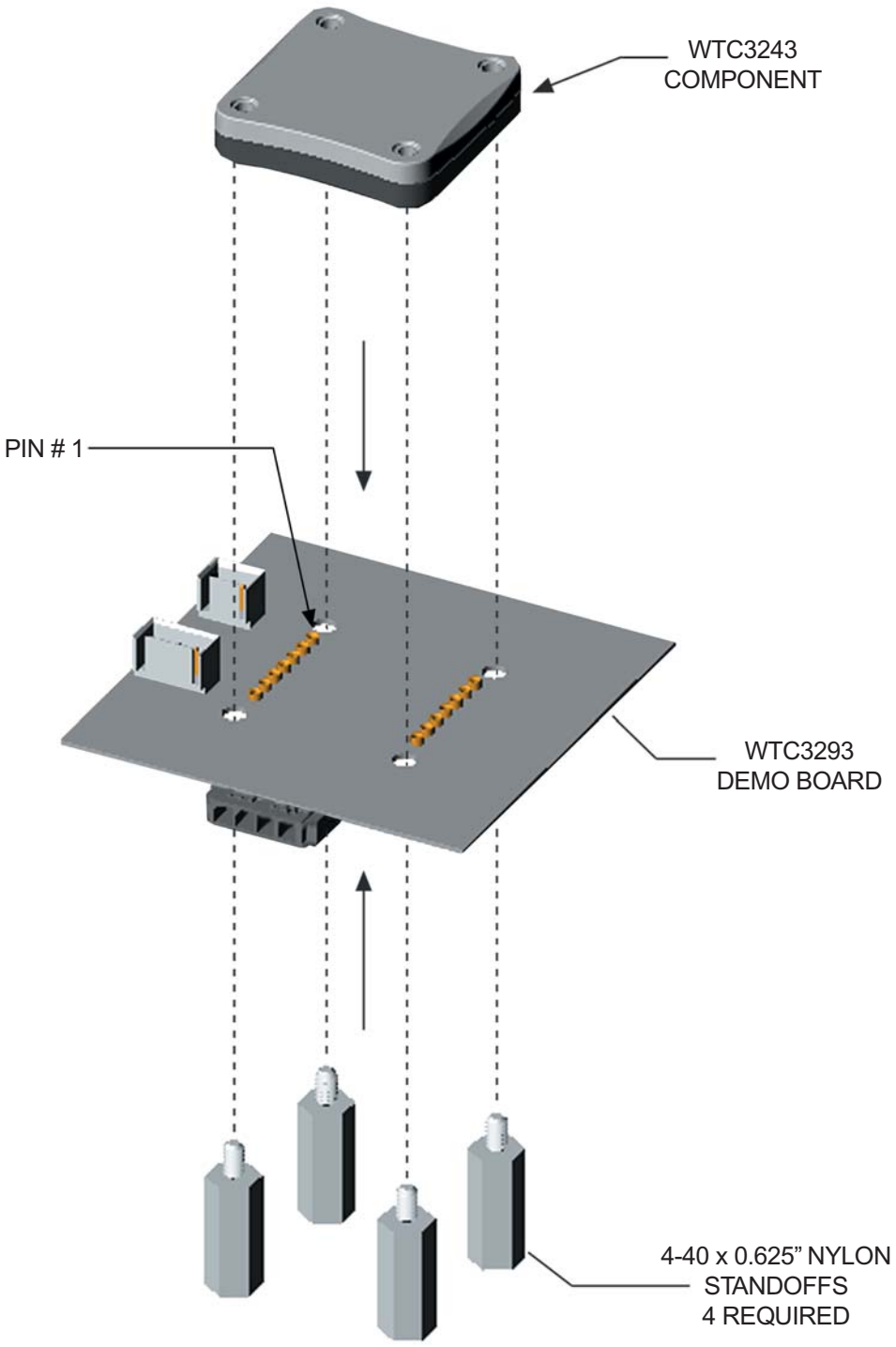


Figure 3
Assembling the WTC3243 Thermoelectric Controller to the WTC3293 Demo Board



INPUT / OUTPUT CONNECTOR CONFIGURATION

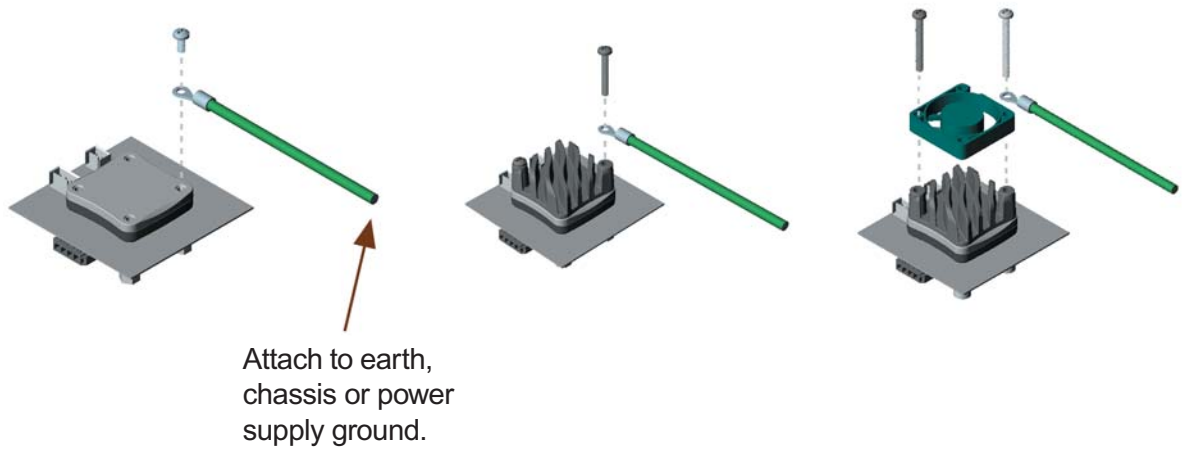
Table 1 - INPUT CABLE

PIN #	Load Type	Function
1	BLUE	PGND
2	ORANGE	VS
3	RED	VDD
4	BLACK	COM
5	WHITE	ACT T
6	GREEN	SET T

Table 2 - OUTPUT CABLE

PIN #	Load Type	Function
1	RED	OUTPUT B
2	GREEN	SENSOR +
3	WHITE	SENSOR -
4	BLACK	OUTPUT A

Figure 4
Attaching the optional grounding strap to the heat spreader for low noise operation.



CONFIGURING THE DEMO BOARD

STEP 1: ATTACHING HEATSINK AND FANS

The WTC3243 is designed to handle currents as high as 2.0 Amps. Refer to the WTC3243 data sheet to determine the SOA and proper thermal solution for your application. Refer to the WHS302 and WXC303/WXC304 datasheets for proper assembly instructions. (WEV300, WEV301, and WEV302 Thermal Solutions Kits include: heatsink, thermal washer, fan, and screw fasteners).

The onboard fan connector makes connecting a fan quick and easy. The fan connector uses IDC (Insulation Displacement Contacts) to connect the fan wires to the connector housing. Place the fan's red wire in the positive contact indicated on the demo board and press down using the end of a screwdriver. Perform the same step for connecting the fan's negative terminal.

STEP 2: CONFIGURING THE HEAT AND COOL CURRENT LIMITS

The demo boards LIMA and LIMB trimpots independently adjust the heat and cool current limits from zero to a full 2.0 Amps. Use Table 3 to adjust the heat and cool current limits. Do not exceed SOA limits.

Table 3 - LIMA and LIMB Current Limit Trimpot Configuration

Sensor Type	Load Type	LIMA Trimpot	LIMB Trimpot
Thermistor	Thermoelectric	Cool Current Limit	Heat Current Limit
100 Ω Platinum RTD, LM335, AD590	Thermoelectric	Heat Current Limit	Cool Current Limit
Thermistor	Resistive Heater	Turn Fully CCW	Heat Current Limit
100 Ω Platinum RTD, LM335, AD590	Resistive Heater	Heat Current Limit	Turn Fully CCW

STEP 3: CONNECTING YOUR THERMAL LOAD

Use Table 4 to determine how to connect the WTC3243 outputs (OUTA or OUTB) to your thermoelectric or resistive heater.

Table 4 - Output Configuration

Sensor Type	Load Type	Output A	Output B
Thermistor	Thermoelectric	Negative TE Terminal	Positive TE Terminal
100 Ω Platinum RTD, LM335, AD590	Thermoelectric	Positive TE Terminal	Negative TE Terminal
Thermistor	Resistive Heater	**Quick Connection**: Simply connect the resistive heater to OUTA and OUTB. Adjust the cooling current limit to zero by turning the LIMA trimpot fully CCW. **Maximum Voltage Connection**: Connect one side of the resistive heater to OUTB and the other side to the voltage source V_S.	
100 Ω Platinum RTD, LM335, AD590	Resistive Heater	**Quick Connection**: Simply connect the resistive heater to OUTA and OUTB. Adjust the cooling current limit to zero by turning the LIMB trimpot fully CCW. **Maximum Voltage Connection**: Connect one side of the resistive heater to OUTA and the other side to the voltage source V_S.	

CONFIGURING THE DEMO BOARD

STEP 4: CONNECTING YOUR TEMPERATURE SENSOR

Use Table 5 to configure the demo board for your temperature sensor type.

Table 5 - Sensor Dipswitch Configuration

Sensor Type	10 µA	100 µA	1 mA	G=10	EXT VSET
0 to 2.5 kΩ Thermistor	Off	On	Off	On	N/A
2.5 kΩ to 25 kΩ Thermistor	Off	On	Off	Off	
25 kΩ to 250 kΩ Thermistor	On	Off	Off	Off	
100 Ω Platinum RTD	Off	Off	On	On	
LM335	Off	Off	On	Off	
AD590 (Follow the WTC3243 datasheet for connecting an AD590)	Off	Off	Off	Off	

STEP 5: ADJUSTING THE LOOP COMPENSATION PROPORTIONAL GAIN AND INTEGRATOR TIME CONSTANT

Use Table 6 to configure the demo board loop compensation for optimal temperature stability. Start with these settings and begin increasing the proportional gain while decreasing the integrator time constant until optimal stability is achieved.

Table 6 - Proportional Gain and Integrator Time Constant Trimpot Configuration

Sensor Type	P Gain [A/V]	I Time Constant [Seconds]
Thermistor	10	3
100 Ω Platinum RTD	50	1
LM335	25	2
AD590 (Attach a 10 kΩ resistor across Sensor + and Sensor -)	25	2

STEP 6: ATTACHING THE V_{DD} AND V_S POWER SUPPLIES

For simple operation tie V_{DD} to V_S. The V_{DD} power supply is used to power the WTC3243 internal control electronics and must be capable of supplying 100 mA of current. The V_S power supply is used to power the WTC3243 output H-Bridge and must be capable of supplying a current greater than the LIMA and LIMB current limit settings. A separate V_S power supply allows the H-Bridge to operate at a voltage lower than the 4.5 volts required by the V_{DD} supply. Select V_S approximately 2.5 volts above the maximum voltage drop across OUTA and OUTB to reduce the power dissipation in the WTC3243 component and minimize your heatsinking requirements. Connect both power supplies via the input connector.

CONFIGURING THE DEMO BOARD

STEP 7: MONITORING THE TEMPERATURE SETPOINT VOLTAGE AND ACTUAL TEMPERATURE SENSOR VOLTAGE

The input connector includes three lines for externally monitoring the WTC3243 temperature setpoint voltage (SET T) and the actual temperature sensor voltage levels (ACT T). Both the SET T and ACT T voltages are measured from the COMMON terminal.

Use Table 7 to convert these monitor voltages to sensor resistance for thermistors and RTDs or temperature for the LM335 and AD590.

Table 7 - Converting the SET T and ACT T Monitor Voltages

Sensor Type	Voltage Conversion
Thermistor	$R = \frac{\text{Voltage*}}{\text{Sensor Bias Current}}\ [\Omega]$
100 Ω Platinum RTD	$R = \frac{\text{Voltage*}}{\text{Sensor Bias Current}}/10\ [\Omega]$
LM335 or AD590	T= (Voltage* - 2.7315) * 100 [°C]

* Voltage refers to the measurements made from the ACT T or SET T terminals on the input connection.

STEP 8: ADJUSTING THE TEMPERATURE SETPOINT VOLTAGE

The setpoint voltage can be adjusted from 0 to 2.5 Volts either by using the demo board's onboard SET T trimpot or by connecting and external voltage source or potentiometer to the EXT VSET connector.

Connecting An External Potentiometer:

The onboard EXT VSET connector makes connecting a potentiometer quick and easy. The EXT VSET connector uses IDC (Insulation Displacement Contacts) to connect size #28 wires to the connector housing. Place the potentiometer's CW terminal in the contact marked 2.5V on the demo board and press down using the end of a screwdriver. Perform the same step for connecting the potentiometer's wiper (W) to the contact marked SETV and CCW terminal to the contact marked GND.

Connecting An External Voltage Source:

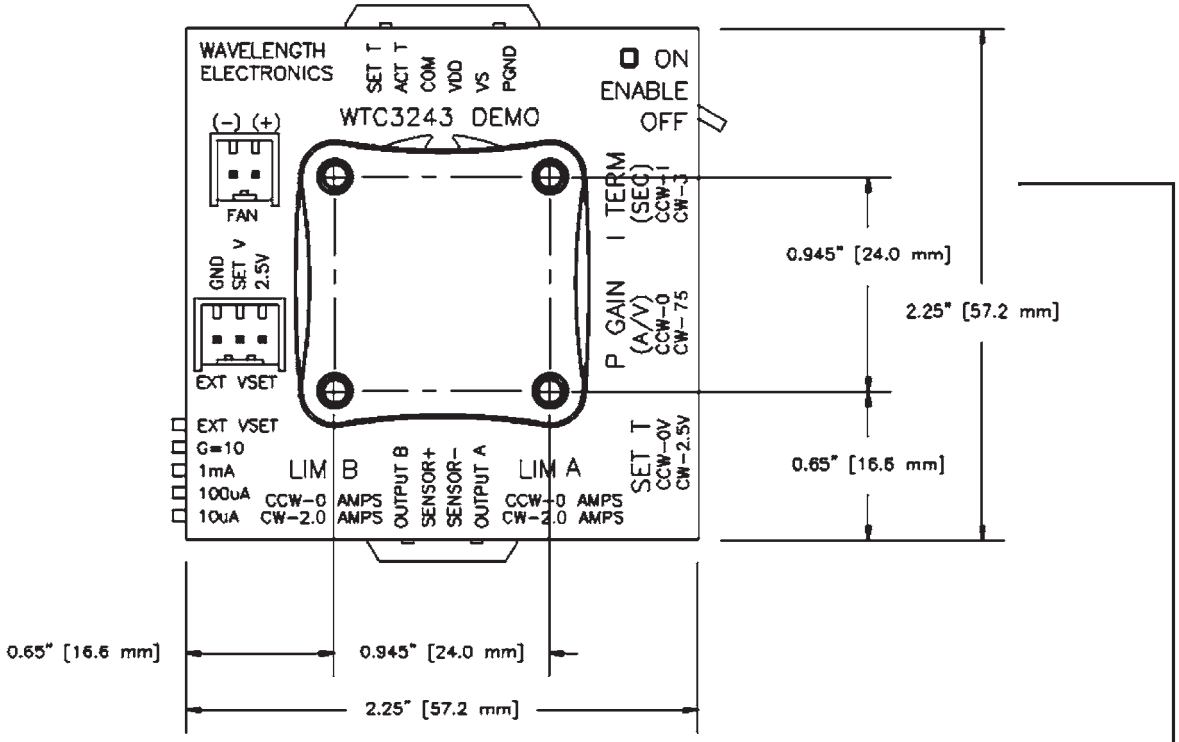
The onboard EXT VSET connector makes connecting an external voltage source quick and easy. The EXT VSET connector uses IDC (Insulation Displacement Contacts) to connect size #28 wires to the connector housing. Place the external voltage source's positive output in the contact marked SETV on the demo board and press down using the end of a screwdriver. Perform the same step by connecting the external voltage source's negative output to the contact marked GND on the demo board.

STEP 9: ENABLING AND DISABLING THE OUTPUT CURRENT

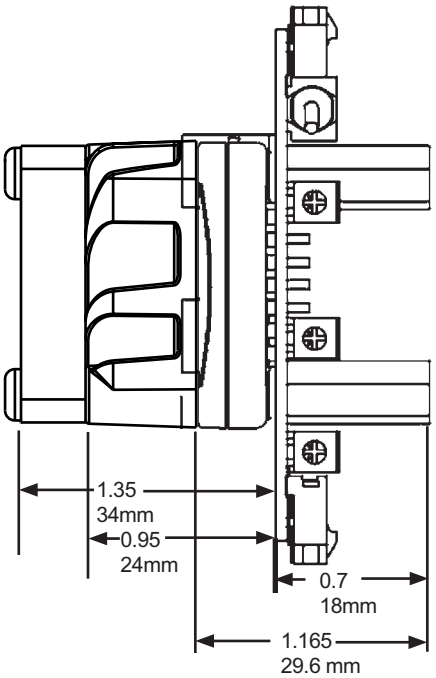
The WTC3243 output current can be enabled and disabled using the onboard toggle switch. The output is enabled when the green ON LED indicator is lit.

MECHANICAL SPECIFICATIONS

TOP VIEW



RIGHT SIDE VIEW



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