2-CHANNEL THERMOELECTRIC CONTROLLER

VTC1052-A /B /C

Datasheet

The VTC1502 is a DC bipolar output thermoelectric temperature controller featuring our patent pending technology that delivers outstanding temperature stability with high-power efficiency. With an input voltage range of 12 – 36V, it delivers up to 16A @ 36V to control each TEC (Peltier element), achieving temperature stability to within ±0.002°C (1 hour duration @ 25°C ambient temperature) and power efficiency of 95% @ 50% load.

The VTC1502 supports both analog and digital inputs for temperature sensing. There are 8 analog inputs for NTC, PT100, PT1000, TMP61/63/64 temperature probes, and 16 digital sensors (e.g. TMP117, TMP116, TMP1075, MAX30208) for inputs on the I2C bus. There are 6 configurable GPIOs that can be used (as inputs or outputs) for customer applications.

The VTC1502 can operate in stand-alone mode or be remotely controlled via USB/RS485/TTL UART using the APIs or the supplied VTC Utility Software. Configuration of the controller is done using the VTC Utility Software. The auto-tuning feature of VTC1502 enables users to easily determine the appropriate PID control parameters for their application.

Users familiar with PID loops, can fine-tune the PID control parameters with the manual tuning feature. VTC1502 also supports thermal profile control, making this controller ideal for applications that requires thermal cycling (e.g. PCR machines).

The VTC1502 has built-in multiple levels of thermal protection. To protect the device, temperature, hot and cold limits can be set independently via the VTC Utility Software. This safety feature ensures that your TEC will not be driven beyond the specified limits. Additionally, VTC1502 continuously monitors the temperature sensors and when a fault is detected, the controller will alert the user, and automatically turn off the power to your TEC. Lastly, VTC1502 supports external thermal fuse implementation for the further protection of the system.

Besides being a highly precise and highly efficient TEC controller, the VTC1502 is also highly flexible. Many of its parameters are configurable using the supplied VTC Utility Software, making this a very powerful controller.

Other models in the VTC1500 series offer configuration in various numbers of channels.

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VTC1502-A /B /C Feature Set	
TEC Controller	**OEM Type Family of TEC Controller Board**
Performance	• **Input Voltage V_{in}:** 12 – 36VDC • **Max Input Current:** 30A • **Output Voltage V_{max}:** $\pm V_{in}$ • **Output Current I_{max}:** ±16A per channel • **Typical Cooling Power Per Channel:** 288W (50% of output electrical power) • **Power Control Scheme:** Configurable input current limit, dynamic power allocation • **Temperature Stability:** ±0.002°C (1 hour duration @ 25°C ambient temperature) • **Power Efficiency:** 95% @ 50% load, 98% @ 100% load
Features	• **Bipolar Output:** Heat & Cool • **Analog Temperature Input:** 8x PT100, PT1000, NTC, TMP61, TMP63, TMP64 • **Digital Temperature Input:** 3x I2C bus for sensor IC (e.g. TMP117, TMP116, TMP1075, MAX30208) • **PID Control:** Auto-tune, Manual-tune, Direct feedback (sensor) and indirect feedback (sensor + thermal model) • **Operating Mode:** Constant temperature, Constant voltage / current, Temperature profile • **Communication:** USB / RS485 / TTL UART • **GPIO:** 6x Configurable, 3.3V output, 3.3V to 5V input (GPIO5 support V_{in} output) • **Fan Control:** 3x (fan Voltage = V_{in}, 4A max, speed control & detection)
Operating Environment	• **Operating:** -40 to 60°C at RH 0 to 85% • **Storage:** -40 to 85°C at RH 0 to 85%. • **Regulatory:** RoHS
Usability	• **VTC Utility Software:** Windows Software (Windows 10 and above) • **Middleware Service Library (Windows 10)** • **Documentation:** HW Setup / SW User / SW API / Middleware User Guide
Others	• **Dimensions W x H x D:** 90mm x 70mm x 15mm

VTC1502-A /B /C Electrical Characteristics

Unless otherwise noted: T_a = 25°C, V_{in} = 36V

Parameters	Conditions	Min	Typ	Max	Units
Supply Voltage (V_{in})	Measured directly on power input terminals	10	36	36.5	V
Bipolar Output Current Swing per Channel (I_{out})				±16	A
Bipolar Output Voltage Swing per Channel (V_{out})	V_{in} = V_{out} measured directly on terminals			$\pm V_{in}$	V
Power Efficiency per Channel	@ 50% load (output: 18V, 16A) @ 100% load (output: 36V, 16A)		95 98		% %
Current Readout Precision (Resolution = 10mA)	@ 16A		2	5	%
Voltage Readout Precision (Resolution = 1mV)	@ 36V		1	2	%
Fan Output	Max current = 4A	V_{in}	V_{in}	V_{in}	V

PT100 and PT1000 RTD Probe Temperature Range

Unless otherwise noted: T_a = 25°C, measurement configuration = 24bit / 2-wire twist unshielded cable.
Support cable resistance compensated through calibration process. ADC Gain is adjustable using the supplied VTC Utility Software.

Parameters	Conditions	Min	Typ	Max	Units
PT100 Temperature Range	ADC Gain = 32	-193		+240	°C
PT1000 Temperature Range	ADC Gain = 1	-193		+240	°C
Resolution			0.0001		°C

NTC Probe Temperature Range

Unless otherwise noted: T_a = 25°C, measurement configuration = 2-wire twist unshielded cable.
Support cable resistance compensated through calibration process.

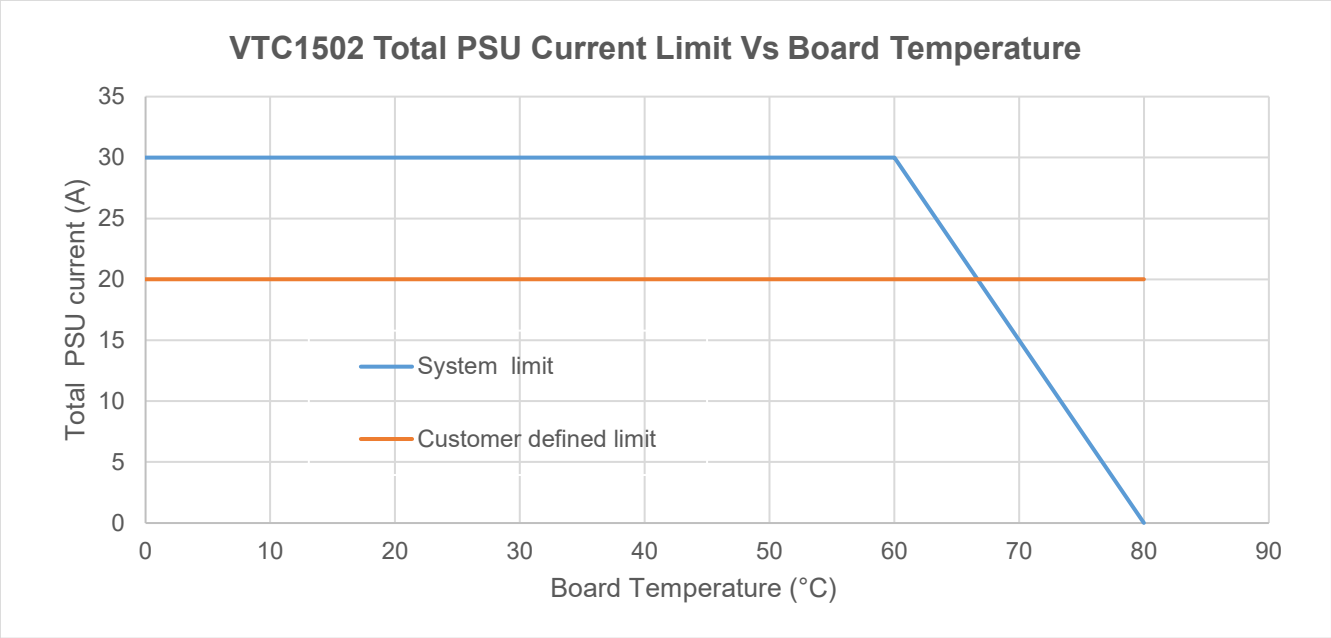
Parameters	Conditions	Min	Typ	Max	Units
NTC Temperature Range	ADC Gain = 1	-40		+150	°C
NTC Resistance Range		50		5M	Ohm
Resolution			0.0001		°C

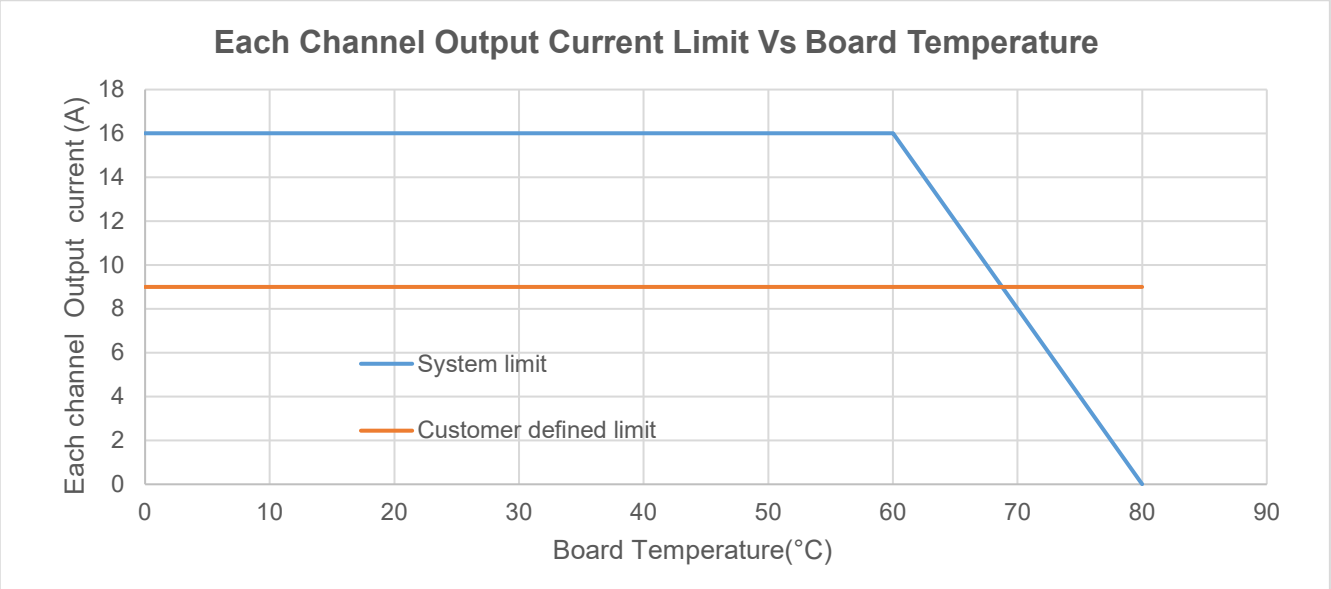
General Purpose Digital I/O Characteristics

Parameters	Comments	Min	Typ	Max	Units
Logic High Input Threshold (V_{ih})		2.38			V
Logic Low Input Threshold (V_{il})				0.93	V
Maximum Input Voltage (V_{imax})		-0.5		5.5	V
Logic High Output Voltage (V_{oh})	Output current 8mA	2.8			V
Logic Low Output Voltage (V_{ol})	Input current 8mA			0.4	V

Current Limit with Temperature

The total input power and maximum output current per channel are controlled by the on-board microprocessor of the VTC1502-A /B /C controller. Both input and output values are subjected to temperature changes. The relationship between temperature and the input / output values is illustrated in the charts below.

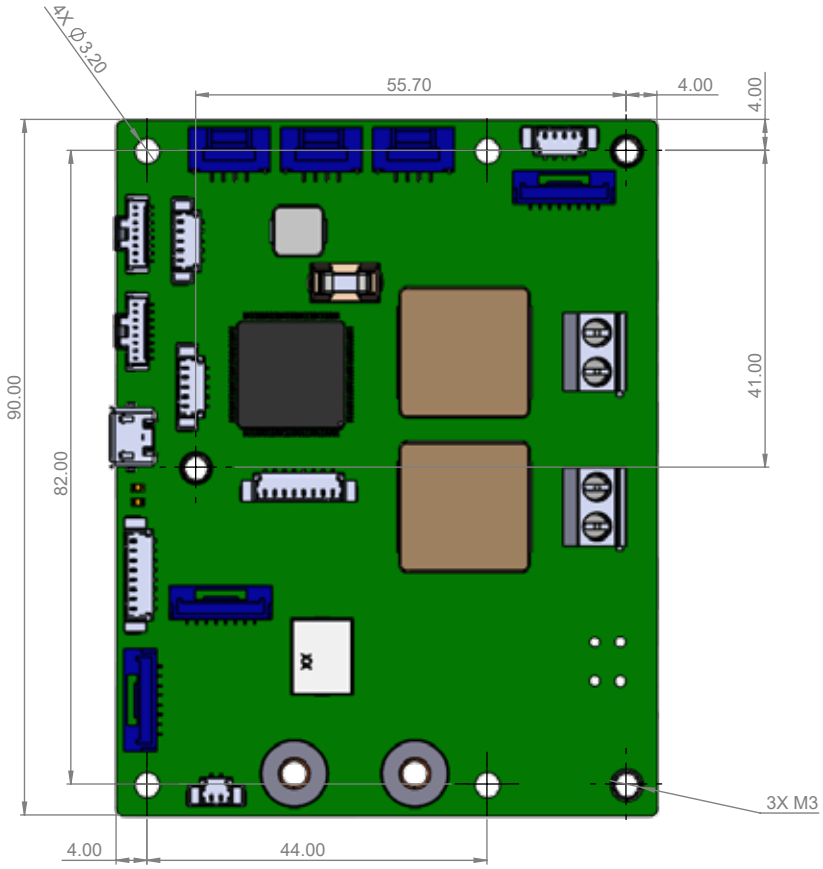


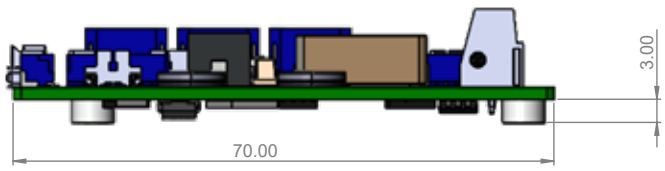


The end user can define the input power and output current limit. The final value depends on the temperature and will always take the lower of the user defined limit and the system limit.

VTC1502	Connector Type
A	 Terminal Block AWG 14-28
B	 Molex 2002411212 AWG 12-16
C	 Molex 2002411112 AWG 12-16

2D Drawing





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